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SWEDEN 2007-16

Modern Quantum Mechanics

Atomic Theory and the Description of Nature

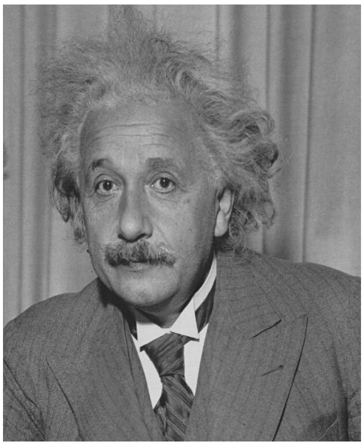
Fifth (5th) Solvay Congress, Brussels, 1927. "Institut International de Physique Solvay, Cinquieme Conseil de Physique, Bruxelles, 1927." Back Row L-R: A. Piccard; E. Henriot; P. Ehrenfest; E. Herzen; T. de Donder, E. Schrodinger; E. Verschaffelt; W. Pauli; W. Heisenberg; R.H. Fowler; L. Brillouin. Middle row L-R: P. Debye; M. Knudsen; W.L. Bragg; H.A. Kramers; P. Dirac; A.H. Compton; L. de Broglie; M. Born; N. Bohr. Front Row L-R: I. Langmuir; M. Planck; M. Curie; H.A. Lorentz; A. Einstein; P. Langevin; C. Guye; C.T.R. Wilson; O.W. Richardson. Absent: Sir W.H. Bragg; H Deslandres; E. Van Aubel. [15].

Modern Quantum Mechanics are written in one way to find the speed of light corresponding what the light speed is in nature. This know how is important for the future of nature science, high tech development and human nature resource. Through this work of investigation I can confirm that there are no photons going up in the S-orbital in Hydrogen and that there exists another speed of light on Hydrogen atoms surface, then what's known today. Self I hope through this paper to become a doctor in medicine and medical physiology.

Atomic Theory and the Description of Nature

The speed of light and the behavior of the electron

Niels Henrik Bohr [1885-1962]



Albert Einstein [1879-1955] [13]

Erwin Schrödinger [1887-1961]

Abstract
This essay will take up theoretical studies of the Hydrogen atom and through this understand the difference when the electron has relativistic action at first orbital and when it's on rest at Hydrogen surface. The differential between the constants alpha α_0, beta β_0 and β_1 will also be estimated and through this explain the interaction with nature laws. This essay will also take up the difference between the speeds of electric *Emax*, magnetic *Bmax* and speed omega c_Ω. The electron speed c_2 will play a final decision to find all new formulas to the speed of light. The electrons behaviour in a polar trajectory path is of importance to both transport of energy between lobes inside atoms, the distance between lobes and the speed the electron has at this momentum. If find the delta time lambda takes up to surface, then we have find the length the electron takes under its travel path between lobes and through this get light speed *c* at surface.

Max Karl Planck (1858-1947). M. Planck received 1919 the Nobel Prize in Physics for year 1918 "in recognition of the services he rendered to the advancement of physics by his discovery of the energy quanta" [13]. He also proposed that light energy travels in discrete packets called quanta. Before M. Planck's work with blackbody radiation, light energy was from classical ideas thought to be continuous, but this theory left many nature phenomena unexplained. While working out the mathematic to the black body radiation he discovered the energy quantum *h* (Wirkungsquantum) in the year 1900. These where later verified by other scientist and it where the basis of an entirely new field of modern physics, known as quantum mechanics, which could explain the atomic structure of matter in all the atoms and molecules. The constant *h* takes the energy pro Js of one revolution or frequency Hz, and it's the smallest unbreakable energy of light quanta. M. Planck's conclusion gives us the quantum hypothesis, which stated a discontinuities and precision with the all nature processes. This conclusion has developed through Nils Bohr modern quantum theory, which includes also the old classical mechanics and old principles of electrodynamics. M. Planck was an honorary member of the science academy (1922). Today Max Planck honors the institute of Modern Physics in Berlin.

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1. Introduction – Modern Quantum Mechanics

This essay will investigate the theory of the Hydrogen atom and through this find the speed of light on the atoms surface. The buildings stones are the modern version of the kinetic energy in quantum mechanics, where the kinetic energies are equal to mass and light speed in square.

$$E\psi = ½ \cdot m_e \cdot c_0^2 \cdot \left(\frac{1}{\beta_1^2} - 1 \right) = ½ \cdot m_e \cdot c_0^2 \cdot \left(\left(\alpha_0^2 + 1 \right) - 1 \right) \qquad \text{Hint: } m_0 = m_e \cdot \left(\alpha_0^2 + 1 \right)$$

This is the original kinetic energy of the electron and here is H. Loretz relation for relativistic action, beta β_1, changed to be in square. This statement is running through the whole essay of Modern Quantum Mechanics. The electron have mass m_e at the first orbital r_1 in Hydrogen, because circumstances under relativistic actions. The electron mass m_0 at surface include the kinetic energy. The real kinetic energy the electron needs to travel between the lobes and up to surface of the atom will be in this essay the key concept to find the speed of light c and the electron speed c_2 at first orbital in Hydrogen. This will be possibly through the discovery of one new constant, namely the value of the beta β_1 constant, which has the value at first orbital r_1, and β_0 at rest on surface r_0. Through weighting of the constant value of beta β_1, it gives the exact value of alpha α_0 at surface. These make it possibly to find the electro speed c_0 at the atoms surface, without any other constant involved then alpha α_0. One reference of spectra line data in the Lyman series of Hydrogen are used, which make it possibly to find the space between first orbital and Hydrogen surface and through this find the length of the first orbital.

$$\therefore \quad \Psi H = \left[- \left(\sqrt{\frac{e \cdot \Delta\psi}{\pi \cdot u_0}} + \frac{2 \cdot h^2}{m_e \cdot \lambda^2} \cdot \nabla^2 \right) \cdot \sin\left(\frac{\pi}{2} \right) \right] \qquad \text{If: } \nabla^2 = \frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2}$$

1. $$E_k = - \left(\frac{h^2}{8\pi^2 \cdot m_e} \cdot \nabla^2 + U \right) \qquad \Rightarrow \qquad \text{If: } \nabla^2 = \left(\frac{4\pi}{\lambda} \right)^2 \text{ and } U = \left(\frac{e \cdot \Delta\psi}{\pi \cdot u_0} \right)^{\frac{1}{2}}$$

2. $$\frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2} + \frac{m_e \cdot \lambda^2}{2 \cdot h^2} \cdot \left(E - U \right) \Psi = 0 \qquad \text{If: } E_k = E\text{, } E_p = U \text{ and } \Psi = \psi\left(x, y, z \right) \cdot f\left(t \right)$$

If put the operator into the Schrödinger wave equation, we get the new Ψ Hamiltonian wave. This wave equation has one kinetic energy part and one potential part to λ-lambda of interest.

Modern quantum mechanics have a great potential to application in business and life science. The tropic of Magic Squares of order $n = 4$ and $n = 5$ have give a modern cubic 3D-structure of 64-bit Magic Square and 125-bit Magic Square. The 64-bit Magic Square, where each row, column and main diagonal have property to one magic constant corresponding to the formula:

$$\Sigma = \left(n : a.d \right) = \frac{1}{2} \cdot n \cdot \left[2 \cdot a + d \cdot \left(n^3 - 1 \right) \right]$$

where a is the start value of the key and d is the entire increasing of an arithmetic progression series with integer between terms. The Genetic Code are the best example of nature process that use Magic Squares when transcript DNA into RNA, where the Genetic Code govern the protein synthesis. Probably will it be possibly in the future to mapping out the DNA-structure of bacteria like *Escherichia coli* with the key into Magic Squares. In a fusion process will it be absolute necessary to understand the fine structure of Hydrogen, and through the cubic 3D 125-bit Magic Square will it be possibly to find the Inertia of mass and length into the centre. Modern quantum cryptographic who can guarantee the absolute security is other applications.

1.1 **Energy quanta of the electron**

The kinetic energy of a particle with mass can be measured in terms of *inertia*, which is twice the energy it has when the speed is one constant unit. If a particle like the electron is moving around its own axis and at same time moving in circle of radius r, its motion can be described in terms of its angular speed omega, measured in radians per unit time. In one frequency or one revolution the particle travels a distance 2π·r in time 2π/Ω. Its speed v_0 are then related to its angular speed omega to the formula $v_0 = \Omega \cdot r$. The second derivative of the wave will give:

$$\therefore \; \frac{\partial^2 U}{\partial \cdot t^2} = c^2 \cdot \nabla^2 \cdot U = 1 \quad \Rightarrow \quad v_0 = \sqrt{\frac{1}{\nabla^2 \cdot U}} = 2173071.114 ms^{-1}$$

$$\text{If:} \quad U = \left(\frac{2\pi}{\Omega}\right)^2 = 2.3410685 \cdot 10^{-32} s^2 \quad \text{and} \quad \nabla^2 = \left(\frac{1}{s_0 \cdot c_0 \cdot R_\infty}\right)^2 = 9.04561294 \cdot 10^{18} \left(m^{-1}\right)^2$$

This is probably the velocity v_0 to the amplitude of kinetic energy. When a rigid body particle like the electron is rotating with angular speed omega about an axis, the body will occupies a region *R* and has density $\delta = \delta(x, y, z)$, then each mass element $dm = \delta \cdot dV$ to kinetic energies.

$$\therefore \; E_k = ½ \cdot \Omega^2 \iiint_R r^2 \delta dV = ½ \cdot I \cdot \Omega^2 \qquad [11]$$

I is the moment of *inertia* of a rotating electron body around an axis. The moment of *inertia* is twice the kinetic energy of the electron body, when it's rotating with angular speed omega.

$$\therefore \; T = I \cdot \Omega^2 \qquad \text{If: } I = \iiint_R r^2 \delta dV \qquad \text{and} \qquad \Omega^2 = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2}$$

Newton second law of linear motion can describe the rational motion of *torque*, where the acceleration corresponds to omega in square. If take *torque* into natural units of electron, then

$$\therefore \; \omega = \frac{1}{t_0} = \frac{1}{1.29550914 \cdot 10^{-21} s} = 7.71897293 \cdot 10^{20} s^{-1} \qquad \text{Hint: } \omega = rad \cdot s^{-1}$$

$$\therefore \; \Omega^2 = \frac{d\omega}{dt_0} = \frac{d^2\theta}{dt_0^2} = \frac{7.7189729 \cdot 10^{20} s^{-1}}{1.29550914 \cdot 10^{-21} s} = 5.95825431 \cdot 10^{41} \left(s^{-1}\right)^2$$

Here the angular frequency ω and through this get the angular acceleration. Thus, the *inertia*:

$$\therefore \; I = m_e \cdot r_e^2 = 9.17034684 \cdot 10^{-31} kg \cdot \left(2.81523349 \cdot 10^{-15} m\right)^2 = 7.26799473 \cdot 10^{-60} kg \cdot m^2$$

$$\therefore \; T = I \cdot \Omega^2 = 7.26799473 \cdot 10^{-60} kg \cdot m^2 \cdot 5.95825431 \cdot 10^{41} \left(s^{-1}\right)^2 = 4.3304561 \cdot 10^{-18} J$$

Newton´s second law states that $F = \left(\frac{d}{dt}\right) \cdot m_e \cdot v_0 = \frac{dp}{dt}$, where $p = m_e \cdot v_0$ is the linear momentum of a particle like the electron with mass δdV under the influence of a force *F (Coulombs law).*

$$\therefore \; F = \frac{dp}{dt_2} = \frac{1.99278158 \cdot 10^{-24}}{2.43515833 \cdot 10^{-17}} = 8.18337604 \cdot 10^{-8} N \qquad [11]$$

The force *F* of motion is equal the rate of change of linear momentum of the electron particle.

The quantities $H = r_1 \times (m_e \cdot v_0)$ and $T = r_1 \times F$ are the angular momentum of the particle about the origin and the torque T of the force F about the origin. The torque is equal Hartree energy.

$$\therefore\ T = \frac{dH}{dt_2} = \frac{1.0545346 \cdot 10^{-34}\, Js}{2.43515827 \cdot 10^{-17}\, s} = 4.3304561 \cdot 10^{-18}\, J \qquad \therefore\ F = m_e \cdot \frac{v_0^2}{r_1}$$

The torque of the external forces is equal to the rate of change of the angular momentum of the electron, the rational motion into classical mechanics, which gives the Hartree E_h energy.

$$\therefore\ T = r_1 \times F = 5.29177209 \cdot 10^{-11} \cdot 8.18337604 \cdot 10^{-8} = 4.3305609 \cdot 10^{-18}\, J$$

If make the same procedure of *torque*, with atomic units into time t_2 and radius distance r_1.

$$\therefore\ \omega = \frac{1}{t_2} = \frac{1}{2.4351583 \cdot 10^{-17}\, s} = 4.10650927 \cdot 10^{16}\, s^{-1} \qquad \text{Hint: } \omega = rad \cdot s^{-1}$$

$$\therefore\ \Omega^2 = \frac{d\omega}{dt_2} = \frac{d^2\theta}{dt_2^2} = \frac{4.10650927 \cdot 10^{16}\, s^{-1}}{2.43515827 \cdot 10^{-17}\, s} = 1.68634184 \cdot 10^{33} \left(s^{-1}\right)^2$$

The angular frequency and through this get the angular acceleration in Hydrogen orbital ½ S.

$$\therefore\ I = m_e \cdot r_1^2 = 9.17034684 \cdot 10^{-31}\, kg \cdot \left(5.291772091 \cdot 10^{-11}\, m\right)^2 = 2.56795864 \cdot 10^{-51}\, kg \cdot m^2$$

$$\therefore\ T = I \cdot \Omega^2 = 2.56795864 \cdot 10^{-51}\, kg \cdot m^2 \cdot 1.68634184 \cdot 10^{33} \left(s^{-1}\right)^2 = 4.330561 \cdot 10^{-18}\, J$$

The torque of Hydrogen system, which corresponds to the kinetic energy in Hydrogen, and its moment of inertia *x* angular acceleration, the rational motion in old classical mechanics. The torques T is here identical to both the electron in a natural unit and Hydrogen in atomic units.

1) $H = r_1 \times p$
2) $H = I \cdot \omega$

$$H \quad \Leftrightarrow \quad \hbar = 1.0545346 \cdot 10^{-34}\, Js$$

Angular momentum is equal linear momentum $p = m_e \cdot v_0 \times r_1$. The cross product, H (h –bar) are the quanta of action and its vector is perpendicular to both the vector r_1 and the linear momentum p in a field of magnetic flux quantum. In 2) for a electron body with a fixed mass m_e or δdV that is rotating about a axis, the angular momentum is expressed as the product of the moment of *inertia* of the electron body and its angular velocity, where I is the moment of *inertia* of the electron and ω its angular speed omega, which gives the angular momentum ω^2.

$$\therefore\ E_k = ½ \cdot I \cdot \Omega^2 = 2.16522805 \cdot 10^{-18}\, J \quad \Leftrightarrow \quad E_k = ½ \cdot \Omega \cdot \hbar = \Omega \cdot \frac{h}{4\pi} \quad \Rightarrow \quad H = I \cdot \Omega = 1.0545346 \cdot 10^{-34}\, Js$$

$$\therefore\ s_0 = \frac{h}{4\pi} \qquad \therefore S_0 = \text{spin unit of angular momentum (a quanta)} \qquad \Delta p \times \Delta x \geq \frac{h}{4\pi}$$

This is the energy quanta of the electron, and it's the smallest possibly quanta of energy. Here are *s* the smallest possibly product from delta linear momentum and the position vector of the electron particle. This is stated from Werner Heisenberg (1901-1976), into the uncertainty principles. The orbital angular momentum is here denoted s_0 and it arises into the *z*-direction.

1.2 **Electric and magnetic fields**

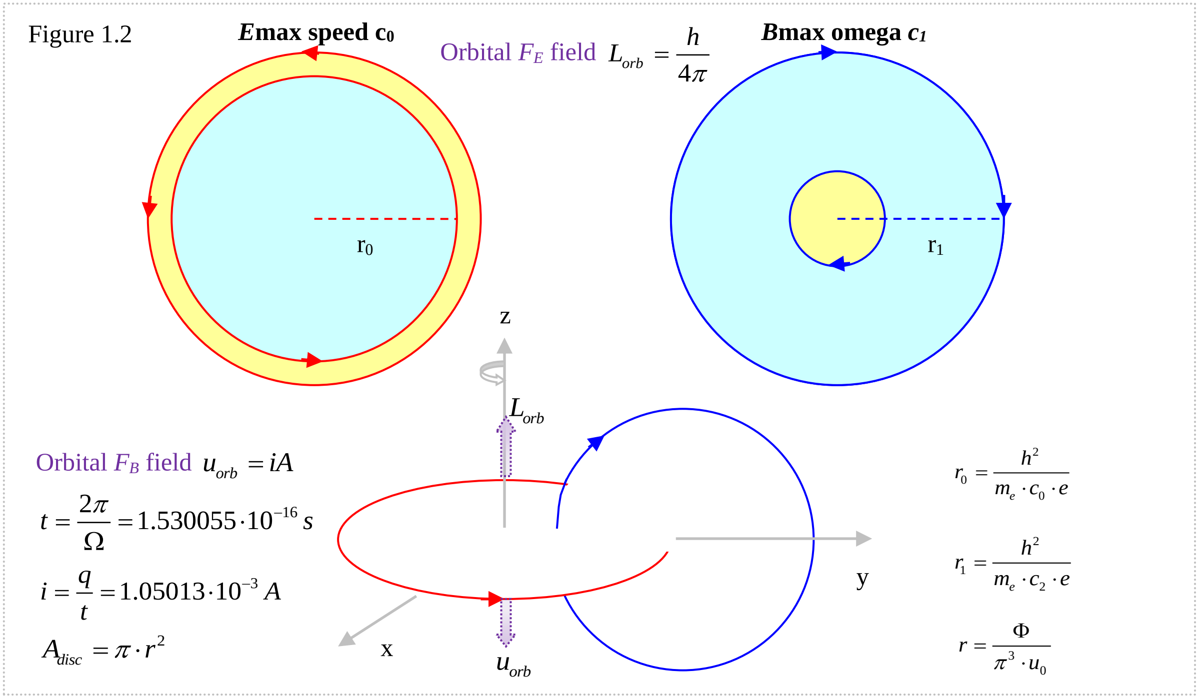


Figure 1.2

To simplify the difficulties of the different speeds *c* in Hydrogen it's necessary to investigate. The electromagnetic speed *c* of *E*max -the electro speed c_0, and *B*max -the magnetic speed c_1. In the diagram above, the blue area of *B*max, are equal the blue area in *E*max, and the yellow area of *E*max are equal the yellow area in *B*max. But radius r_1 of magnetic disc is different to a smaller radius r_0 of electric disc. This makes the speeds to *E*max vs. *B*max. That makes that we have speed omega as velocity between the lobes, but calculation of energies is to speed c_0.

$\therefore\ F_E = \varepsilon_0 \oint E \cdot dA = q$ ∴ Gauss´ law for electricity [21]

The integral must be taken over the entire closed surface; there exist free charge *q* on surface.

$\therefore\ F_B = \oint B \cdot dA = 0$ ∴ Gauss´ law for magnetism [21]

The integral states, that the magnetic flux through any closed surface must be zero. Through statements, observation says that there can't exist any source, sinks and magnetic monopoles.

$\therefore\ F = \oint E \cdot ds = -\frac{dF_B}{dt}$ ∴ Faraday´s law of induction [21]

This implies that an electric field is produced by a changing magnetic field through induction.

$\therefore\ F_E = q \cdot E$ [23]

$\therefore\ F_B = q \cdot v_0 \times B$ [23]

This equation shows that the force fields of magnetic flux are perpendicular to the velocity v_0 and into charge *q*. In the diagram above, the velocity vector are then going in the *y*-direction.

$\therefore\ F = F_E + F_B = q \cdot (E + v_0 \times B)$ [23]

Lorentz-force, when both vector of the magnetic and electric fields working together in wave.

1.3 **Energy of the electron**

According to the early quantum statement from Albert Einstein (1879-1955), that energy is equivalent to mass and the speed of light in square, we have the electron energy in Hydrogen.

$$\therefore\ m_e = \left(m_e + \left(m_e \cdot \alpha_0^2\right)\right)\cdot \beta_1^2 = \left(m_e + m_\Delta\right)\cdot \beta_1^2 \quad \Rightarrow \quad m_0 = m_e + m_\Delta = m_e \cdot \left(\alpha_0^2 + 1\right)$$

Here m_0 are the electron mass at Hydrogen surface and at rest (theoretically), m_e correspond to the electron in relativistic action at first orbital in Hydrogen. Delta mass m_Δ of energy that needs to remove the electron, which is equivalent to the kinetic energy, or energy the electron has at first orbital in the Hydrogen atom, the Hartree energy. If follow the statement from [7]:

$$\therefore\ \frac{m_0}{c_0^2} = \frac{m_e + m_\Delta}{c_0^2} \quad \Rightarrow \quad m_0 \cdot c_0^2 = c_0^2 \cdot \left(m_e + m_\Delta\right) = m_e \cdot c_0^2 \cdot \left(1 + \alpha_0^2\right)$$

1. $\Psi_k = m_0 \cdot c_0^2 \cdot \left(1 - \beta_1^2\right) = 4.33045609 \cdot 10^{-18}\ J$

2. $\Psi_k = m_e \cdot c_0^2 \cdot \left(\frac{1}{\beta_1^2} - 1\right) = 4.33045609 \cdot 10^{-18}\ J$

3. $\Psi_k = m_e \cdot c_0^2 \cdot \left(\left(\alpha_0^2 + 1\right) - 1\right) = 4.33045609 \cdot 10^{-18}\ J$

$$\Delta\Psi_k = 2 \cdot R_\infty \cdot h \cdot c_0$$

Here are the three possibly equations from the electron mass it selves which gives the delta kinetic energy, the energy the electron needs to travel between first orbital and atom surfaces.

$$\therefore\ r_1 = \left(r_1 + \left(r_1 \cdot \alpha_0^2\right)\right)\cdot \beta_1^2 = \left(r_1 + r_e\right)\cdot \beta_1^2 \quad \Rightarrow \quad r_0 = r_1 + r_e = r_1 \cdot \left(\alpha_0^2 + 1\right) \quad \Leftrightarrow \quad r_0 = \frac{\alpha_0}{4\pi \cdot IP_H} \text{ and } r_1 = \frac{\alpha_0}{4\pi \cdot R_\infty}$$

Similar equation to the surface radius in Hydrogen, and here the surface are on the electrons surface it selves. Where r_1 is the radius of the first orbital, and r_e is the radius of the electrons. If Avogadro's constant has value N_A = 6.02214179(30)*10^{23} mol^{-1} [5]. Then Faradays constant:

$$\therefore\ NA_e = 96761.15243\ \text{C mol}^{-1} \qquad \text{If: } e = 1.6067566 \cdot 10^{-19}\ C$$

$$\therefore\ IE = \frac{\alpha_0^2 \cdot NA_e}{\pi \cdot u_0 \cdot 1000} = 1303.930923\ \text{kJ mol}^{-1} \quad \Leftrightarrow \quad IE = \frac{\Delta eV \cdot NA_e}{1000} \qquad \text{If: } \Delta eV = \frac{\alpha_0^2}{\pi \cdot u_0}$$

The electron Ionization Energy IE has here nearly a constant value of energy to remove the electron from the Hydrogen system. In Faraday constant you need to know the electron value.

$$\therefore\ IE = R_\infty \cdot f\,\Delta eV \cdot 0.00001 = 1303.930923\ \text{kJ mol}^{-1} \qquad \text{If: } f\,\Delta = 11.88800381 eV \text{ and } R_\infty = 10968459.83\ \text{m}^{-1}$$

This energy formula for the Ionization Energy is true for every atom, like Hydrogen, Helium and Argon. The factor constant f is from Hydrogen in electron volt, but is valid in every atom.

$$\therefore\ c_\Omega = \frac{f\,\Delta eV \cdot e}{h \cdot IP_H} = 2.62842616 \cdot 10^8\ ms^{-1} \qquad \therefore\ \Psi_k = 2 \cdot R_\infty \cdot h \cdot c_\Omega \cdot \nabla \qquad \text{If: } \nabla = \left(\frac{0.01 \cdot R_\infty}{NA_e}\right)$$

This is the speed c in the z- direction, the speed between the orbital the electron has in Atom.

The kinetic and potential energy of the electron in Hydrogen has two main formulas, namely:

$$\therefore\ E_k = \frac{2\cdot e}{\pi\cdot u_0}\cdot\left(\frac{1}{\beta_1^2}-1\right) = 4.33045609\cdot 10^{-18}\ J$$

$$\therefore\ E_k = m_e\cdot c_0^2\cdot\left(\frac{1}{\beta_1^2}-1\right) = 4.33045609\cdot 10^{-18}\ J$$

$$\Delta\psi = R_\infty\cdot h\cdot c_0\cdot\alpha_0^2 = 1.15190572\cdot 10^{-22}\ J$$

This is the kinetic energy of the π-electron when are in a relativistic action at the first orbital.

$$\therefore\ E_p = \frac{2\cdot e}{\pi\cdot u_0}\cdot\left(1-\beta_1^2\right) = 4.33022575\cdot 10^{-18}\ J$$

$$\therefore\ E_p = m_e\cdot c_0^2\cdot\left(1-\beta_1^2\right) = 4.33022575\cdot 10^{-18}\ J$$

$$\Delta\psi = ½\cdot\left(E_k - E_p\right) = 1.15190572\cdot 10^{-22}\ J$$

This is the potential energy of the π-electron when are at rest on the Hydrogen atoms surface. According to the early quantum statement from Erwin Schrödinger (1887-1961), the electron wave energy is equivalent to the kinetic energy of electrons in a particle formulated formula:

$$\therefore\ \nabla^2 = \frac{4\pi^2\cdot E_k^2}{h^2\cdot c_0^2} = \frac{8\pi^2\cdot m_e\cdot\Delta\psi}{h^2} \qquad\Rightarrow\qquad \Delta\psi = \frac{E_k^2}{2\cdot m_e\cdot c_0^2} = 1.15190572\cdot 10^{-22}\ J$$

This is the classical kinetic energy formula of the electron [8]. In modern version it looks like

$$\therefore\ \Psi H\Delta\psi = -\frac{h^2}{8\pi^2\cdot m_e}\cdot\nabla^2 \qquad [4]$$

$$\therefore\ \Psi H\Delta\psi = -\frac{h^2}{8\pi^2\cdot m_e}\cdot\frac{4\pi^2\cdot E_k^2}{h^2\cdot c_0^2} \qquad\Rightarrow\qquad \Delta\psi = -\frac{E_k^2}{2\cdot m_e\cdot c_0^2} = \frac{1}{2}\cdot\left(\left(m_e\cdot c_0^2\cdot\left(\left(\frac{1}{\beta_1^2}\right)-1\right)\right)-\left(m_e\cdot c_0^2\cdot\left(1-\beta_1^2\right)\right)\right)$$

$$\therefore\ \Psi H\Delta\psi = -\frac{h^2}{8\pi^2\cdot m_e}\cdot\nabla^2 = -1.15190572\cdot 10^{-22}\ J$$

Here the Hamiltonian wave equation in a simple version, where the operator value is known.

$$\therefore\ \Psi E_k = m_e\cdot c_0^2 = \frac{E_k^2}{2\cdot\Delta\psi} = \frac{2\cdot e}{\pi\cdot u_0} \qquad\Rightarrow\qquad E_k^2 = \frac{4\cdot e\cdot\Delta\psi}{\pi\cdot u_0}$$

$$\therefore\ E_h = \sqrt{\frac{4\cdot e\cdot\Delta\psi}{\pi\cdot u_0}} = 4.33045609\cdot 10^{-18}\ J$$

Here the kinetic energy the electron has when circulation around at first orbital in Hydrogen. The kinetic wave energy $\Delta\psi$ is the relativistic change of the electrons potential energy, from first orbital up to surface, when the electron are at surfaces, they usually have mass m_0 at rest.

$$\therefore\ R_\infty = IP_H + ½S = IP_H + \left(R_\infty\cdot\alpha_0^2\right) = 10967876.34 + 583.5243 = 10968459.84 m^{-1}$$

The electron energy at first orbital starts at level ½S and there are energy to $1/\lambda = IP_H + ½S$.

The natural unit n.u. of length in quantum mechanics is stated as the A. Compton length λ_C.

$$\therefore\ \lambdabar_C = \frac{\hbar}{m_e \cdot c_0} = 3.85973756 \cdot 10^{-13}\, m \qquad [14]$$

$$\therefore\ \frac{1}{R_\infty} = \frac{4\pi}{\alpha_0^2} \cdot \left(\frac{\hbar}{m_e \cdot c_0} \right) \quad \Rightarrow \quad R_\infty = \frac{m_e \cdot c_0 \cdot \alpha_0^2}{2 \cdot h} = 10968459.83\ \mathrm{m}^{-1}$$

The formula of Rydberg´s constant in Hydrogen [4], and 4π has her probably with flow to do.

$$\therefore\ R_\infty = \frac{\pi^2 \cdot m_p \cdot c_2}{2 \cdot h \cdot c_0} = \frac{m_e \cdot c_0 \cdot \alpha_0^2}{2 \cdot h} \quad \Rightarrow \quad \Psi_k = m_e \cdot c_0^2 \cdot \alpha_0^2 = \pi^2 \cdot m_p \cdot c_2 = 4.33045609 \cdot 10^{-18}\, J$$

$$\therefore\ t_3 = \frac{\pi^2 \cdot m_p \cdot s_0}{2 \cdot h} = \frac{R_f \cdot s_0}{c_2} = 1.27778752 \cdot 10^{-18}\, s \quad \Rightarrow \quad c_2 = \frac{2 \cdot R_f \cdot h}{\pi^2 \cdot m_p} = \frac{2 \cdot e \cdot \Delta eV}{\pi^2 \cdot m_p}$$

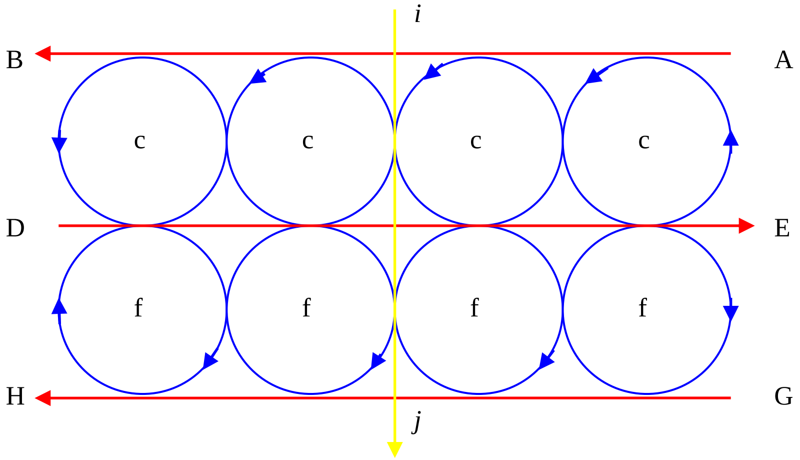
$$\therefore\ c_2 = \frac{2 \cdot e \cdot \alpha_0^2}{\pi^3 \cdot u_0 \cdot m_p} = 2.602090263 \cdot 10^8\, ms^{-1} \qquad \text{If: } \Delta eV = \frac{\alpha_0^2}{\pi \cdot u_0}$$

Here we have the time t_3, which correspond to the time t it takes for the electron to wrap one lap around the proton at first orbital, and the electron speed it selves with delta kinetic energy on its surface is the electron speed c_2. This electron speed c_2 has diff to the magnetic *B*max c_1.

$$\therefore\ y^2 = -c_2^2 \cdot t_3^2 = 0 \quad \Leftrightarrow \quad y = c_2 \cdot t_3 \quad \Rightarrow \quad R = c_2 \cdot t_3 = 3.32491847 \cdot 10^{-10}\, m \qquad \text{Hint: } R = 2\pi \cdot r_1$$

Here we have the distance of one wrap around the proton at first orbital, and the formula only confirm the concept of both time t_3 it takes for the electron and the electron speed c_2 it selves.

Figure 1.3



[22]

This diagram illustrates the electromagnetic ψ-wave movement of spreading. The red line of electric *E*max →AB is caused a magnetic blue line c circle of *B*max through induction. These blue lines will then rising up a new electric *E*max → DE, which again through induction will rise up blue f circles of magnetic *B*max of forces lines. These blue circles will then rising up new electric *E*max → GH. Through Maxwell theory of light movement, the wave has change position from *i* to *j* with the speed omega c_Ω. And we could see in the diagram above that the speed isn't *E*max or *B*max, it's the yellow vector. This is the travel technique inside the atom.

1.4 **The nature of light speed**

James Clerk Maxwell (1831-1879). British professor in physics at Cambridge 1871-78. His pioneer work was on the kinetic gas theory, and other essays were on the magnetic power vector, the paper "Matter and motion", and "Treatise on electricity and magnetism" from year 1873 are fundamental theory of today's know how in electromagnetism. Maxwell equations; are known in the way electric and/or magnetic fields are produced in three-spaces by the presence of charges and current magnetic field. In general, the properties and behavior of light propagating in free vacuum space is described by James Maxwell's four main equations.

$$\therefore\ divE = \frac{\delta}{\varepsilon_0} \qquad [11]$$

Implies that the circulation of an electric field around a very small disc of simple closed curve correspond to change in the magnetic flux quantum to variable δ that correspond to a charges.

$$\therefore\ divB = 0 \qquad [11]$$

Implies the fact that there are no known magnetic monopoles, that's is no *sources* or *sinks* in the interior of the domain and the field lines must of *B* be closed curves, and that at all points.

$$\therefore\ curlE = -\mu_0 \frac{\partial B}{\partial t} \qquad [11]$$

Implies that the electric field could, if and only if, oscillate if the magnetic field is constant in time. That means that the domain has magnetic flux and the minus sign indicates circulation. Must discussion of the four mean equation of the electromagnetic light theory from Maxwell is next equation, because he says that magnetic fields produced by changing of electric fields.

$$\therefore\ curlB = J + \varepsilon_0 \frac{\partial E}{\partial t} \qquad [11]$$

Implies that the vector to pathway direction is dependent on time *t* and *J* stands for current, but could also stand for the normal *N* -radius. J. Maxwell's equations govern the way electric and magnetic fields are produced in *3-spaces* by the presence of electric charges and current. The quantization of an electric field can also be described by Coulomb's Law with a point charge q^2 on surface at position *r*, to generate electric fields. If *r* are first radius and *s* surface.

$$\therefore\ \Psi(r) = -\frac{q^2}{4\pi\cdot\varepsilon_0}\cdot\frac{1}{|r-s|} \qquad \text{Hint: } r_e = |r-s|$$

Where ε_0 is the permittivity of free space and 4π stands for the flux of inverse square laws fields through a closed surface S. The distance between r and surface s correspond to r_e.

$$\therefore\ \Psi(r) = -\frac{e^2}{4\pi\cdot\varepsilon_0}\cdot\frac{1}{r_e} \quad \Leftrightarrow \quad \Psi(r) = m_e\cdot c_0^2 \qquad \text{Hint: } r_e = \frac{u_0\cdot e^2}{4\pi\cdot m_e}$$

$$\therefore\ \Psi(r) = 8.13992401\cdot 10^{-14}\, J$$

Here it's shown that Coulomb's Law gives the mass energy corresponding to $\Psi(r)$ and that without the electron mass it selves are involved. The electron radius correspond r_e.

Let us now proof the flux of inverse square law fields through an closed surface *S*. Imagine a domain with a cavity of $\partial D = S - S_0$, where S_0 is a spherical domain inside the main domain.

Figure 1.4:1

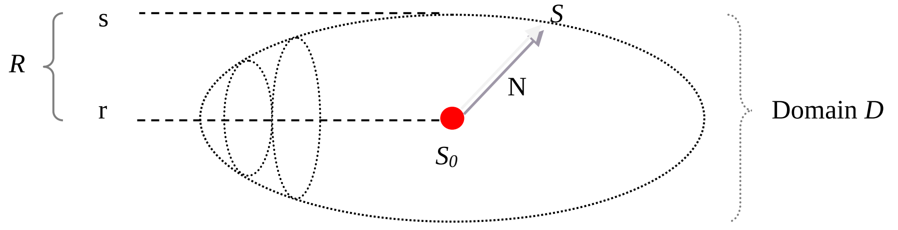


Figure to theorem and proof $\Phi = 4\pi$

For every closed surface *S* is flux 4π, that include the origin in its interior. We let *D* be the domain inside *S* and outside of small sphere S_0 with centre 0. We take the outward *N* normal on an orbital S_0. Then the oriented boundary of the domain *D* is the derivative of $\partial D = S - S_0$

Proof: By Stokes divergence theorem:

$$\iint_S B \bullet d\sigma - \iint_{S_0} B \bullet d\sigma = \iint_{\partial D} B \bullet d\sigma = \iiint_D (divB) dV$$

But if compute *divB*, then if: $p \le a$ and $p^2 = x^2 + y^2 + z^2$, hence: $pp_x = x$, $pp_y = y$, $pp_z = z$

$$divB = \frac{\partial}{\partial x}\left(\frac{x}{p^3}\right) + \frac{\partial}{\partial y}\left(\frac{y}{p^3}\right) + \frac{\partial}{\partial z}\left(\frac{z}{p^3}\right) = \frac{p^3 - 3px^2}{p^6} + \frac{p^3 - 3py^2}{p^6} + \frac{p^3 - 3pz^2}{p^6} =$$

$$divB = \frac{3p^3 - 3p(x^2 + y^2 + z^2)}{p^6} = \frac{3p^3 - 3p^3}{p^6} = \frac{0}{p^6} = 0 \qquad divB = 0$$

It follows: $\iint_S B \bullet d\sigma = \iint_{S_0} B \bullet d\sigma = 4\pi$ and the flux is constant independent of *S*.

Thus: $\iint_{p=a} B \bullet d\sigma = 4\pi$ and let us now compute the flux.

$$\Phi = \iint_S B \bullet d\sigma, \; B = \frac{1}{p^3} x, \; p = |x|$$

These force fields obey the inverse square laws. Suppose *S* is in the sphere $p = a$.

Hence: 1) $$\iint_S B \bullet d\sigma = \frac{1}{a^3} \iint_S x \cdot d\sigma = \frac{1}{a^3}(3V) \qquad [10]$$

2) $$V = \iint_{S_0} = \frac{4}{3}\pi \cdot a^3 d\sigma \qquad [10]$$

(2 in 1) Let S be a closed surface in R^3 that surrounds S_0, take the normal *N* outward. Then

$$\Phi = \iint_S \frac{dxdydz + dydzdx + dzdxdy}{(x^2 + y^2 + z^2)^{3/4}} = 4\pi$$

This proof says there exist a flow of 4π inside the atom, and it's between orbital and surface.

One of the four mean equations of the electromagnetic light theory from Maxwell is possibly to proof. The derivative gives the polar light speed to 2π, but if compute this speed it gives the light speed. The electric field could only oscillate if magnetic field is constant in time.

$$\therefore\ curlE = -u_0 \frac{\partial B}{\partial t} \qquad \therefore\ \Phi = \int BdA$$

Let us now proof the flux of polar inverse square laws through a closed surface of a cylinder sphere. Imagine a domain D of a surface of simple closed curves of a cylinder sphere with a cavity of $\partial D = \delta \pm 1$, where 1 and -1 are cylindrical domain on the surface δ.The flow of flux:

Proof: $$\iint_{\delta} \vec{B} \cdot ds \qquad [12]$$

$$\vec{B} = xy^2\,\vec{i} + x^2 y\,\vec{j} + y\,\vec{k}$$

$$\delta \rightarrow \textit{the surface of cylinder sphere } x^2 + y^2 = 1 \quad \textit{and } z = \pm 1$$

By Stokes divergence theorem:

$$\iint_{\delta} \vec{B} \cdot \vec{ds} = \iiint_{D} div\left(\vec{B}\right) dv = \iiint_{D} \left[y^2 + x^2 + 0\right] dv \qquad [12]$$

Figure 1.4:2

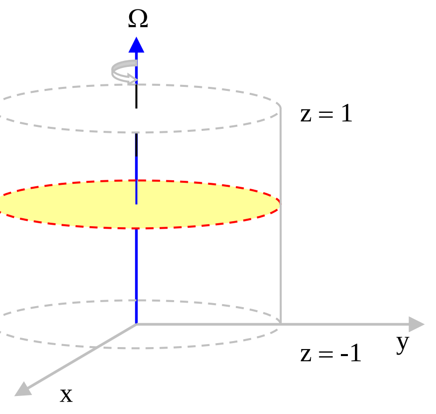


Figure to theorem and proof Φ = π

Now switch from rectangular to polar coordinate. Then: $x^2 + y^2 = r^2$ and $dv = rdr \cdot d\theta \cdot dz$

The flow of omega: $$\Phi = \int_0^{2\pi} d\theta \cdot \int_0^1 rdr \cdot \int_{-1}^{1} r^2 dz = 2 \cdot \int_0^{2\pi} d\theta \cdot \int_0^1 r^3 dr = 2 \cdot 2\pi \cdot \left(\frac{r^4}{4}\right) \cdot \Big|_0^1 = \pi$$

But if compute Maxwell’s electromagnetic equation of *curl E*, then 2π will convert as follow

$$\therefore\ curlE = -u_0 \frac{\partial B}{\partial t} = -u_0 \frac{\Phi \cdot \pi}{t_0} = 2\pi \qquad \Rightarrow \qquad c_0 = \frac{2 \cdot \alpha_0}{\pi^3 \cdot u_0}$$

Here the derivative of the magnetic field is the magnetic flux quantum and time t is in natural units. The speed is going on the surface δ of sphere, and the flux inside of the cylinder sphere. This proof says that there exists a charge q on cylinder surface δ, and flow to one π- electron.

1.5 **The behavior of the electron**

Albert Einstein (1879-1955). He received the Nobel Prize in Physics 1921 “for his services to the theoretical Physics and especially for his discovery of the law of the photoelectric effect”. In year 1916 Einstein published “Die spezielle und die allgemeine Relativitätstheorie”. In this work he put together the laws of electromagnetic and the laws of gravitation, with one very important change of the space and time concept. The relation of atomic energy in Hydrogen is possibly to state from the derivative $E = m_e \cdot c_0^2$ It’s possibly to find the value of electron volt

$$\Delta\Psi = m_e \cdot c_0^2 = \frac{2 \cdot e}{\pi \cdot u_0} \qquad \Rightarrow \qquad c_0 = \sqrt{\frac{2 \cdot e}{\pi \cdot u_0 \cdot m_e}}$$

$$\Delta = \frac{m_e \cdot c_0^2}{e} = \frac{2}{\pi \cdot u_0} = 5.06605918 \cdot 10^5\, eV$$

Value of delta electron volts is constant independent of value to mass, charge and light speed.

$$\therefore\ \Delta eV\psi = \frac{R_\infty \cdot h \cdot c_0 \cdot \alpha_0^2}{e} = 7.16913638 \cdot 10^{-4}\, eV \qquad \Leftrightarrow \qquad \Delta\psi = \frac{\alpha_0^4}{\pi \cdot u_0} = 7.16913638 \cdot 10^{-4}\, eV$$

These equations correspond to the kinetic energy in *eV* of the electron in an Hydrogen model.

$$\Delta\psi = \frac{R_\infty \cdot h \cdot c_0 \cdot \alpha_0^2}{e} = \frac{\alpha_0^4}{\pi \cdot u_0} \qquad \Rightarrow \qquad R_f = \frac{\pi^2 \cdot \alpha_0^2}{e} = 3.26785624 \cdot 10^{15}\, Hz$$

If put both equation together, we get one fin frequency formula for the electron at first orbital. The delta kinetic energy *eV* are here with Rydbergs constant R_∞, Plancks constant *h*, speed of light c_0, alpha constant α_0^2 at first orbital, and the electron charge of one electron volt *e*.

$$\therefore\ \alpha_0 = \sqrt{\left(\left(\frac{1}{\beta_1^2}\right) - 1\right)} = 7.2938469259 \cdot 10^{-3} \qquad \text{Hint: } \beta_1 = 0.999973400959812 \text{ (exact)}$$

Through weighting beta β_1 in Excel and through this get an exact value of the alpha constant.

$$\therefore\ \alpha_0^2 = \left(\left(\frac{1}{\beta_1^2}\right) - 1\right) = \sqrt{\left(\left(\frac{1}{\beta_1^2} - 1\right) - \left(1 - \beta_1^2\right)\right)} / \beta_1 = 5.320020298 \cdot 10^{-5}$$

$$\therefore\ r_1 = \frac{\alpha_0 \cdot \beta_1^2}{4\pi \cdot IP_H} = 5.29177209 \cdot 10^{-11}\, m \qquad \text{Hint: } IP_H = R_\infty \cdot \beta_1^2$$

$$\therefore\ r_0 = \frac{\alpha_0}{4\pi \cdot IP_H} = 5.29205361 \cdot 10^{-11}\, m \qquad \therefore\ IP_H = 10967876.34 m^{-1}$$

$$\therefore\ r_e = r_0 - r_1 = r_1 \cdot \alpha_0^2 = \frac{u_0 \cdot e^2}{4\pi \cdot m_e} = 2.81523349 \cdot 10^{-15}\, m$$

When weighting the beta constant, the only stable constant was the Ionization Potential IP_H in Hydrogen. It’s the inverse of lambda exact at the momentum when the electron is at surfaces.

In general, the different between classical and relativistic quantum mechanics of any moving body like the electron in action greater than half the speed of light, the moving body involves a factor discovered by the Dutch physicist Henrik Antoon Lerentz (1853-1928) and the Irish physicist George Francis Fritzgerald late in the 19th century. This beta β factor are generally represented and determined by the velocity of the electron v_0 in accordance with the equation:

∴ If ratio: $|\alpha_0|^2 + |\beta_0|^2 = 1 \quad \Rightarrow \quad \frac{v_0^2}{c_0^2} + \beta_0^2 = 1 \quad \Rightarrow \quad \beta_0 = \sqrt{1 - \frac{v_0^2}{c_0^2}}$

$$\therefore \ \beta_0 = \sqrt{1 - \frac{v_0^2}{c_0^2}} = 0.9999734 \quad \Rightarrow \quad \alpha_0 = \sqrt{\left(1 - \beta_0^2\right)} = 7.2938469 \cdot 10^{-3}$$

Here the basic formulas to get the value of beta β_0 and alpha α_0 with its dimensionless values.

$$\therefore \Delta\Psi_k = \frac{\alpha_0^2}{\pi \cdot u_0} = 13.47576884 eV \qquad \therefore \ c_0 = \frac{2 \cdot \Delta eV}{\pi^2 \cdot u_0 \cdot \alpha_0}$$

The kinetic energy formula of the electron in Hydrogen and the potential energy formula are:

$$\therefore \ \Psi E = m_e \cdot c_0^2 = \frac{\hbar^2}{2 \cdot m_e} \cdot \nabla^2 \qquad \text{If: } \nabla^2 = \left(\frac{\sqrt{2}}{\alpha_0 \cdot r_1}\right)^2$$

$$\therefore \ \lambda\!\!\!{}^{-}_C = r_1 \cdot \alpha_0 = \frac{\hbar}{m_e \cdot c_0} \qquad (1)$$

The nature unit of length are named after Arthur Holly Compton (1892-1962) and called the Compton length. American physicist discovered the Compton Effect when he study 1922 the change in wavelength of high energy electromagnetic radiation when it scatters off electrons. The Compton Effect confirmed that the electromagnetic radiation has one wave and particle properties, a central principle of modern quantum theory. The kinetic energies equation gives:

$$\therefore \ \Psi_k = \frac{1}{2} \cdot m_e \cdot c_0^2 \cdot \left(\frac{1}{\beta_1^2} - 1\right) = 2.16522805 \cdot 10^{-18} J \quad \Leftrightarrow \quad \Psi_k = R_\infty \cdot h \cdot c_0 = 2.16522805 \cdot 10^{-18} J$$

These two formulas are the classics model of estimating the kinetic energy of the π-electron.

$$\therefore \ \Psi_p = IP_H \cdot h \cdot c_0 = 2.16511286 \cdot 10^{-18} J \quad \Leftrightarrow \quad E = \frac{h \cdot c_0}{\lambda}$$

$$\therefore \ \Psi_p = R_\infty \cdot h \cdot c_0 \cdot \left(1 - \alpha_0^2\right) = 2.16511286 \cdot 10^{-18} J$$

These formulas give the potential energy or the energy of lambda λ, the value of the photon.

$$\therefore \ t_0 = \frac{\hbar}{m_e \cdot c_0^2} = \frac{e}{4\pi^3} = 1.29550914 \cdot 10^{-21} s \qquad t_1 = \frac{4\pi \cdot h^2 \cdot R_\infty}{\sqrt{2} \cdot e \cdot m_e \cdot c_2}$$

$$\therefore \ \frac{r_1 \cdot \alpha_0}{c_0} = \frac{e}{4\pi^3} \quad \Rightarrow \quad r_1 = \frac{e \cdot c_0}{4\pi^3 \cdot \alpha_0} = 5.29177209 \cdot 10^{-11} m$$

If simplified equation (1) then it’s possibly to get one formulas of the nature unit of time t_0.

1.6 **Kinetic energy of the electron**

The special and general theory of relativity from Albert Einstein was written in year 1916 [7], and the general results of the theory was a series of the well-known expression of relativistic mass to energy. This kinetic energy is relativistic if the electron is in action near light speed *c*.

$$\therefore\ \Psi_k = \frac{m_e \cdot c_0^2}{\beta_1} = m_e \cdot c_0^2 + ½ \cdot m_e \cdot v_0^2 \qquad \Rightarrow \qquad \Psi_k = \frac{m_e \cdot c_0^2}{\beta_1^2} = m_e \cdot c_0^2 + m_e \cdot v_0^2$$

This expression approaches infinity as the velocity v_0 of the electron approaches the velocity of the speed of light *c*. The velocity must therefore always remain less than the speed of light.

$$\therefore\ \Psi_k = m_e \cdot c_0^2 = \beta_1 \cdot \left(m_e \cdot c_0^2 + ½ \cdot m_e \cdot v_0^2\right) \qquad \Rightarrow \qquad \Psi_k = m_e \cdot c_0^2 = \beta_1^2 \cdot \left(m_e \cdot c_0^2 + m_e \cdot v_0^2\right)$$

Here it's possibly to see that there must be one electron speed near, but lower the light speed.

$$\therefore\ \Delta E_p \psi = m_e \cdot c_0^2 - \beta_1^2 \cdot \left(m_e \cdot c_0^2 - m_e \cdot v_0^2\right) = 4.33022572 \cdot 10^{-18}\ J$$

If we put these equations of kinetic and potential energy to one expression, then we get delta.

$$\therefore\ \Delta E_k \psi = m_e \cdot c_0^2 \cdot \left(\left(\frac{1}{\beta_1} + ½ \cdot \alpha_0^2\right) - \left(\frac{1}{\beta_1} - ½ \cdot \alpha_0^2\right)\right) \qquad \Leftrightarrow \qquad \Delta E_k \psi = ½ \cdot m_e \cdot c_0^2 \cdot \left(\left(\frac{1}{\beta_1^2} + \alpha_0^2\right) - \left(\frac{1}{\beta_1^2} - \alpha_0^2\right)\right)$$

$$\therefore\ \Delta E_k \psi = 4.33045609 \cdot 10^{-18}\ J$$

These expressions give the Hartree energy, corresponding to the energy of the electron mass.

$$\therefore\ \Delta E_k \psi = \frac{1}{\pi \cdot u_0} \cdot \left(\frac{1}{\beta_1^2} - 1\right) = 13.47576884 eV$$

$$\therefore\ \Delta E_p \psi = \frac{1}{\pi \cdot u_0} = \left(1 - \beta_1^2\right) = 13.47505196 eV$$

Delta diff: $\Delta \psi = \left(\Delta E_k \psi - \Delta E_p \psi\right) / \beta_1^2 = 0.00716914\ eV$

$$\therefore\ \Delta \psi = \frac{\alpha_0^4}{\pi \cdot u_0} = 0.000716914 eV$$

Hint: $\Psi_k = ½ \cdot m_e \cdot c_0^2 = \frac{e}{\pi \cdot u_0}$

Here we have the kinetic energy of the electron in eV and the kinetic fine structure energy for the electron in a one electron - proton system, or the system in the Hydrogen atom. This is the delta fine structure energy that will convert to mass when the electron is at surface and at rest. These values are constant and independent of any fundamental constant, because beta β value is weighting to one new super fundamental constant, which gives the alpha α_0 value constant.

$$\therefore\ \Psi_k = \left(m_e + \frac{E_0}{c_0^2}\right) \cdot c_0^2 = \left(m_e + m_e \cdot \alpha_0^2\right) \cdot c_0^2 = m_e \cdot c_0^2 + m_e \cdot v_0^2 \qquad \Rightarrow \qquad \Psi_k = m_e \cdot c_0^2 = \beta_1^2 \cdot \left(m_e \cdot c_0^2 + m_e \cdot v_0^2\right)$$

Albert Einstein describes this phenomenon in his special relativity essay, where E_0 stands for the Hartree energy. If a body takes up an amount of a required energy E_0, then the body of mass is moving with the velocity v_0. The inertial mass of a body is not a constant, but varies according to the change in energies of the body with the relativistic action constant of beta β^2. Kinetic energies of electron in Hydrogen will also be solved with Schrödinger wave equation.

The total energy of the Hydrogen system can be described with the electron rest mass at the Hydrogen surface. Where m_0 are the electron mass at rest on Hydrogen surface and m_e are the electron mass in relativistic action at first orbital. The Hartree energy corresponds to delta *m*.

∴ $m_\Delta = m_e \cdot \alpha_0^2 = \dfrac{E_h}{c_0^2}$ ∴ E_h = Hartree energy

∴ $E_h = m_\Delta \cdot c_0^2 = \alpha_0^2 \cdot \left(m_e \cdot c_0^2\right) = \alpha_0^2 \cdot \left(\dfrac{2 \cdot e}{\pi \cdot u_0}\right)$ ∴ $m_e = m_0 \cdot \beta_1^2$

Note that the beta β_1 constant are standing in square, which gives the relativistic action.

∴ $E_h = \left(m_e - \dfrac{m_e}{\beta_1^2}\right) \cdot c_0^2 = \left(m_e - m_0\right) \cdot c_0^2 = -m_\Delta \cdot c_0^2$ ⇒ $E_h = -4.33045609 \cdot 10^{-18}\, J$

The difference between surface and first orbital for the electron mass, gives the energy.

∴ $m_\Delta = m_e - m_0 = m_e \cdot \left(1 - \beta_1^2\right) = m_e \cdot \alpha_0^2$ ⇒ $m_0 = m_e + m_\Delta = m_e \cdot \left(\alpha_0^2 + 1\right)$

∴ $m_\Delta = ½ \cdot e \cdot \pi^5 \cdot u_0^3 = 4.87864313 \cdot 10^{-35}\, kg$

Delta mass of the electron correspond to the difference of the relativistic energy in Hydrogen.

If: $m_\Delta = m_\Delta$ then: $\dfrac{\Delta eV \cdot 2 \cdot e}{c_0^2} = \dfrac{e \cdot \pi^5 \cdot u_0^2}{2}$ ⇒ $c_0 = \sqrt{\dfrac{4 \cdot \Delta eV}{\pi^5 \cdot u_0^3}}$

∴ $\Delta = \dfrac{\left(m_e - m_0\right) \cdot c_0^2}{2 \cdot e} = \dfrac{m_\Delta \cdot c_0^2}{2 \cdot e} = 13.47576884 eV$ ⇒ $c_0 = 2.979320975 \cdot 10^8\, ms^{-1}$

The kinetic energy to delta mass of the electron gives the speed of light at Hydrogen surface.

If: $\Delta eV = \Delta eV$ then: $\dfrac{\alpha_0^2}{\pi \cdot u_0} = \dfrac{m_\Delta \cdot c_0^2}{2 \cdot e}$ ⇒ 1) $c_0 = \sqrt{\dfrac{2 \cdot e \cdot \alpha_0^2}{\pi \cdot u_0 \cdot m_\Delta}}$

If: 2) $m_\Delta = m_e \cdot \alpha_0^2$ (2 in 1) ⇒ $c_0 = \sqrt{\dfrac{2 \cdot e}{\pi \cdot u_0 \cdot m_e}}$

If: 3) $e = \dfrac{m_\Delta \cdot 2}{\pi^5 \cdot u_0^3}$ (3 in 1) ⇒ $c_0 = \dfrac{2 \cdot \alpha_0}{\pi^3 \cdot u_0^2}$

If could understand the delta electron volt mass m_Δ between first orbital in Hydrogen and its surface on the relativistic electron, then it's possibly to get fine formulas to the speed of light.

∴ $R_\infty = \dfrac{\pi^2}{e \cdot c_0} \cdot \left(\dfrac{1}{\beta_1^2} - 1\right) = 10968459.83 m^{-1}$

∴ $IP_H = \dfrac{\pi^2}{e \cdot c_0} \cdot \left(1 - \beta_1^2\right) = 10967876.34 m^{-1}$

$\psi\Delta = \left(R_\infty - IP_H\right) / \beta_1^2 = R_\infty \cdot \alpha_0^2 = 583.52 m^{-1}$

Here the kinetic energy of the electron when located at first orbital and at Hydrogen surfaces.

One more common formula for the kinetic energies of the electron is with the electron radius.

$$\therefore\ R_\infty = \frac{\alpha_0}{4\pi \cdot r_e}\cdot\left(\frac{1}{\beta_1^2}-1\right) = 10968459.83m^{-1} \qquad \therefore\ IP_H = \frac{\alpha_0}{4\pi \cdot r_e}\cdot\left(1-\beta_1^2\right) = 10967876.34m^{-1}$$

If we put in an expression for the electron radius formula we will get the kinetic energies like:

$$\therefore\ IP_H = \frac{\alpha_0 \cdot m_e}{u_0 \cdot e^2}\cdot\left(1-\beta_1^2\right) \qquad \text{If: } r_e = \frac{u_0 \cdot e^2}{4\pi \cdot m_e}$$

$$\therefore\ R_\infty = \frac{\alpha_0 \cdot m_e}{u_0 \cdot e^2}\cdot\left(\frac{1}{\beta_1^2}-1\right) \qquad \text{If: } IP_H = R_\infty \cdot \beta_1^2$$

If make the expression more familiar with kinetic energies corresponding to electron velocity.

$$E_k = \frac{m_e \cdot v_0}{\pi^3 \cdot u_0^2}\cdot\left(\frac{1}{\beta_1^2}-1\right) = 2.16522805\cdot 10^{-18}\,J \qquad \text{If: } R_\infty = \frac{E_k}{h \cdot c_0}$$

$$\psi\Delta E = \left(E_k - E_p\right)/\,\beta_1^2 = E_k \cdot \alpha_0^2 = 1.15190572\cdot 10^{-22}\,J$$

$$E_p = \frac{m_e \cdot v_0}{\pi^3 \cdot u_0^2}\cdot\left(1-\beta_1^2\right) = 2.16511286\cdot 10^{-18}\,J \qquad \text{If: } h = \frac{e^2}{\pi^3 \cdot u_0}$$

Here we have the kinetic energy, which correspond to the radius of the electron it selves and it's the relativistic energy that needs to be added if wanted to remove the electron from atom. The energy of the relativistic electron mass makes it possibly to estimate the kinetic energies.

$$\therefore\ \Psi E = ½ \cdot m_e \cdot c_0^2 = \frac{m_e \cdot v_0}{\pi^3 \cdot u_0^2} = \frac{e}{\pi \cdot u_0} = 4.069962\cdot 10^{-14}\,J \quad \Rightarrow \quad c_0 = \frac{\pi^2 \cdot u_0 \cdot e}{\alpha_0 \cdot m_e} = 2.979320975\cdot 10^{8}\,ms^{-1}$$

Here a new formula for the speed of light, and it gives from a velocity formula from kinetics.

$$\therefore\ R = \frac{\alpha_0^2}{\pi \cdot u_0}\cdot\frac{s_0}{2\cdot\Phi} = 3.32491847\cdot 10^{-10}\,m \quad \Rightarrow \quad \text{If: } R = \Delta eV \cdot \frac{s_0}{2\cdot\Phi} \text{ and } t_1 = R_\infty \cdot s_0$$

$$\therefore\ c_0 = \sqrt{\frac{1}{\nabla^2 \cdot U}} = 2.979320975\cdot 10^{8}\,ms^{-1} \qquad \text{If: } \nabla^2 = \left(\frac{1}{R}\right)^2 \text{ and } U = \left(t_1\right)^2$$

This is the radius length and speed for electromagnetic wave one lap at first orbital Hydrogen.

$$r_1 = \frac{1}{4\pi \cdot R_\infty \cdot \alpha_0}\cdot\left(\frac{1}{\beta_1^2}-1\right) = 5.29177209\cdot 10^{-11}\,m \qquad \text{If: } r_e = r_1 \cdot \alpha_0^2$$

$$\psi\Delta r_e = r_0 - r_1 = r_1 \cdot \alpha_0^2 = 2.81523349\cdot 10^{-15}\,m$$

$$r_0 = \frac{1}{4\pi \cdot IP_H \cdot \alpha_0}\cdot\left(\frac{1}{\beta_1^2}-1\right) = 5.29205361\cdot 10^{-11}\,m \qquad \text{If: } r_1 = r_0 \cdot \beta_1^2$$

Here can it be possibly to understand that the surfaces of the electron are here equivalent to the surface of the Hydrogen atom. This makes that the speed of light c_0 are estimated on the electrons surface with a point wise calculation as the energy circulates around the electron when it's rising up in a trajectory path between the orbital inside the Hydrogen atom. The electron speed it selves correspond more from the electromagnetic wave, raised from proton.

1.7 **The speed of light**

In the system with one electron one proton or the system in Hydrogen, the speed of light are possibly to estimated on the atoms surface. In this essay it corresponds to the surface of the electron when it´s circulate around the proton on the first orbital in Hydrogen. Main formula:

$$\therefore \ \frac{\partial^2 \cdot U}{\partial \cdot t_0^2} = c_0^2 \cdot \nabla^2 \cdot U \qquad \Rightarrow \qquad c_0^2 \cdot \nabla^2 \cdot U = 1$$

Where: $\nabla^2 = \left(\frac{1}{\alpha_0 \cdot r_1}\right)^2$ and $U = t_0^2$ Hint: $t_0 = \frac{\hbar}{m_e \cdot c_0^2}$

Thus: $c_0 = \sqrt{\frac{1}{\nabla^2 \cdot U}} = 2.979320975 \cdot 10^8 \, ms^{-1}$

This wave equation is true *if and only if* $J = 0$ and $\delta = 0$ for the speed of light, with second derivative to time *t0*. If simplified the wave equation we will get the Compton wave length. Because the speed of light can take a value in an interval of interest, it must be estimated with precision through weighting the beta β constant value in computer program like Office Excel.

$$\therefore \ \alpha_0 = \sqrt{\frac{1}{\beta_1^2} - 1} \qquad \text{If: } \beta = 0.999973400959812$$

$$\therefore \ \alpha_0 = 7.2938469259 \cdot 10^{-3}$$

If estimated the beta β constant through put both alpha in square equation equal, then we get both alpha and beta with one very high precision. This will also be necessary if wanted to find the velocity of the electron, because it can probably be written to light speed as: $v = c \cdot \beta_1$

$$\therefore \ c_0 = \frac{2 \cdot \alpha_0}{\pi^3 \cdot u_0^2} \qquad (2)$$

$$\therefore \ c_0 = \frac{2 \cdot 7.29384693 \cdot 10^{-3}}{\pi^3 \cdot 1.5791367 \cdot 10^{-12}} = 2.979320975 \cdot 10^8 \, ms^{-1}$$

Here we have the exact value of the light speed estimated on the Hydrogen surface, where *u0* correspond to the permeability. This value is independent of any known fundamental constant in quantum mechanics. If investigate Maxwell's electromagnetic equation more precise, then:

$$\therefore \ curlE = -u_0 \frac{\partial B}{\partial t} = -u_0 \frac{\Phi \cdot \pi}{t_0} = 2\pi$$

$$\therefore \ curlE = -\frac{\pi \cdot u_0 \cdot m_e \cdot c_0^2}{2 \cdot e} = 1$$

If: $t_0 = \frac{\hbar}{m_e \cdot c_0^2}$ and if: $h = \frac{e^2}{\pi^3 \cdot u_0}$ and if: $\Phi = \frac{e}{2\pi^3 \cdot u_0}$

$$\therefore \ curlE = -m_e \cdot c_0^2 = \frac{2 \cdot e}{\pi \cdot u_0} \qquad \Rightarrow \qquad c_0 = \sqrt{\frac{2 \cdot e}{\pi \cdot u_0 \cdot m_e}} = 2.979320975 \cdot 10^8 \, ms^{-1}$$

The fundamental theorem of electrons energy *E* and minus sign indicate one circulation, *curl*.

When the electrons are going between the lobes in Hydrogen, Helium and Argon they will go with the velocity equal or greater than the speed of light in that medium. This phenomenon is called the Cherenkov Effect after the Russian physicist Pavel Cherenkov, who discovered the effect in the mid-1930s and it states if one particle like the electrons are going faster than the speed of light in a given media, like gases, it give a bluish light in the gas flames for example.

$$\therefore\ c_0 = \frac{E_k}{\sqrt{2 \cdot m_e \cdot \Delta\psi}} \qquad [8]$$

$$\therefore\ c_0 = \frac{4.33045609 \cdot 10^{-18}\, J}{\sqrt{2 \cdot 9.17034684 \cdot 10^{-31} \cdot 1.15190572 \cdot 10^{-22}\, J}} = 2.979320975 \cdot 10^{8}\, ms^{-1}$$

This is the Schrödinger velocity formula for electron between the lobes in medium like gases. The electron need then kinetic energy $\Delta\psi$, which correspond to energy diff up to the surfaces.

$$\therefore\ c_0 = \sqrt{\frac{2\pi^2 \cdot h}{m_e \cdot e}} \qquad (3)$$

$$\therefore\ c_0 = \sqrt{\frac{2 \cdot e}{\pi \cdot u_0 \cdot m_e}} \qquad \text{If: } h = \frac{e^2}{\pi^3 \cdot u_0}$$

$$\therefore\ \varepsilon_0 = \frac{\pi \cdot m_e}{2 \cdot e} = \frac{1}{u_0 \cdot c_0^2} \quad \Rightarrow \quad c_0 = \sqrt{\frac{2 \cdot e}{\pi \cdot u_0 \cdot m_e}} \quad \Leftrightarrow \quad c_0 = \sqrt{\frac{\pi \cdot s_0 \cdot c_2}{\sqrt{2} \cdot h}}$$

The speed of sunlight c_0 formula (3) and the two main formulas for the permittivity gives c_0.

$$\therefore\ \varepsilon_0 = \frac{\pi^5 \cdot u_0^2}{4 \cdot \Delta eV} = \frac{1}{u_0 \cdot c_0^2} \quad \Rightarrow \quad c_0 = \sqrt{\frac{4 \cdot \Delta eV}{\pi^5 \cdot u_0^3}} \qquad (4)$$

$$\therefore\ c_0 = \sqrt{\frac{4 \cdot 13.47576884}{\pi^5 \cdot 1.984402 \cdot 10^{-18}}} = 2.979320975 \cdot 10^{8}\, ms^{-1}$$

$$\therefore\ c_2 = \frac{8 \cdot \alpha_0^4}{\sqrt{2} \cdot \pi^3 \cdot u_0^3} = 2.602090263 \cdot 10^{8}\, ms^{-1} \qquad \therefore\ c_2 = \frac{2 \cdot e \cdot \alpha_0}{\pi^3 \cdot u_0 \cdot m_p}$$

The speed formula (4) takes the delta electron volt and for the delta of the kinetic energy, we get the speed of light c_0. The electron speed is only possibly to show in a typically trajectory helix path for the electron between the lobes to surface, and it’s going with angular speed Ω.

$$\therefore\ c_0 = \frac{\Omega}{4\pi \cdot R_\infty} \quad \Rightarrow \quad \Omega = \frac{E_k}{\hbar} = \frac{\pi \cdot B}{2 \cdot \varepsilon_0} = \frac{e \cdot B}{m_e} = \frac{1}{t_2} = 4.10650927 \cdot 10^{16}\, s^{-1}$$

Speed of light with Rydberg and Omega constant, the frequency of first orbital with 4π-flow.

$$\therefore\ f\Delta = \frac{NA_e}{(\Re_\infty = 1eV)} = 11.88800381 eV \quad \Rightarrow \quad c_0 = \frac{0.01 \cdot f\Delta}{NA \cdot h} = 2.979320975 \cdot 10^{8}\, ms^{-1}$$

Factor constant $f\Delta$ estimated in Hydrogen, but give same value of electron volt to every atom.

1.8 **Speed of light at surface**

If wanted to solve the speed of light c_0 at the Hydrogen surface, it must be solved with time *t*.

$$\therefore\ \frac{\partial^2 U}{\partial \cdot t_2^2} = \nabla^2 \cdot c_0^2 \cdot U \quad \Rightarrow \quad c_0 = \sqrt{\frac{1}{\nabla^2 \cdot U}} \qquad \text{Hint: } \nabla^2 \cdot c_0^2 \cdot U = 1$$

This formula is useful if wanted to show that the speed of light is a constant on atoms surface.

$$\therefore\ E\psi = -\frac{h^2}{8\pi^2 \cdot m_e} \cdot \nabla^2 \qquad \text{If: } \nabla^2 = \left(\frac{4\pi}{\lambda}\right)^2$$

$$\therefore\ \Delta\psi = \frac{2 \cdot h^2}{m_e \cdot \lambda^2} = 1.1517816 \cdot 10^{-22}\, J \qquad \text{If: } \lambda = \frac{1}{IP_H} = 9.11753533 \cdot 10^{-8}\, m$$

If put the operator into the Schrödinger wave equation, we get the delta kinetic wave energy.

$$\therefore\ \nabla^2 = \left(\frac{4\pi}{\lambda}\right)^2 = 1.89961162 \cdot 10^{16} \left(m^{-1}\right)^2$$

$$\therefore\ U = \left(t_2\right)^2 = \left(\frac{\lambda}{4\pi \cdot c_0}\right)^2 = 5.93062677 \cdot 10^{-34}\, s^2$$

$$c_0 = \sqrt{\frac{1}{\nabla^2 \cdot U}} = 2.979320975 \cdot 10^{8}\, ms^{-1}$$

Here the same operator will be put in the second derivative of the speed formula c_0 to surface.

$$\therefore\ m_\Delta = m_e \cdot \alpha_0^2 = ½ \cdot e \cdot \pi^5 \cdot u_0^3 = 4.87864 \cdot 10^{-35}\, kg$$

This is the delta mass that must be added to the electron mass, when the electron is at surface.

$$\therefore\ t_2 = \frac{\lambda}{4\pi \cdot c_0} = \frac{m_e + m_\Delta}{2\pi^8 \cdot u_0^3} = \frac{m_0}{2\pi^8 \cdot u_0^3} = 2.43528782 \cdot 10^{-17}\, s \qquad \text{Hint: } m_0 = m_e \cdot \left(\alpha_0^2 + 1\right)$$

$$c_0 = \frac{\pi^7 \cdot u_0^3}{2 \cdot m_0 \cdot IP_H} = 2.979320975 \cdot 10^{8}\, ms^{-1}$$

Speed c_0 when both the electron mass and Ionization Potential are none relativistic at surface.

$$\therefore\ t_2 = \frac{\hbar}{E_h} = \frac{1}{4\pi \cdot c_0 \cdot R_\infty} = \frac{m_e}{2\pi^8 \cdot u_0^3} = \frac{e}{4\pi^3 \cdot \alpha_0^2} = 2.4351583 \cdot 10^{-17}\, s$$

$$c_0 = \frac{\pi^7 \cdot u_0^3}{2 \cdot m_e \cdot \Re_\infty} = 2.979320975 \cdot 10^{8}\, ms^{-1}$$

Speed c_0 when both electron mass and Ionization Potential are in relativistic action at orbital.

$$\therefore\ t_0 = \frac{\hbar}{m_e \cdot c_0^2} = 1.29550914 \cdot 10^{-21}\, s \quad \Leftrightarrow \quad t_0 = \left(2.4352878 \cdot 10^{-17} - 2.4351583 \cdot 10^{-17}\right) = 1.295509 \cdot 10^{-21}\, s$$

The delta diff between t_2 first orbital and t_2 on Hydrogen surface correspond to n.u. of time t_0.

If wanted to solve the speed of light *c* at the Hydrogen surface, it must be solved with lambda corresponding to the inverse IP_H, and time Δt_1 and one max radius up to Hydrogen surface.

$$f\Delta = 11.8880038 eV \qquad \left\{\left[\frac{\pi}{2}\cdot\lambda\cdot f\Delta\cdot t_1 = \pi\cdot\Phi\cdot R\max\right]\right\} \qquad R_{\max} = 2.93316425\cdot 10^{-10} m$$

$E\max$ $B\max$

These equations states that both sides should be into equilibrium, left *Emax* and right *Bmax*. This is probably the only way with time *t* to show the speed of light on the Hydrogen surface.

$$\therefore\ \Delta t_1 = \frac{4\pi\cdot h^2}{\sqrt{2}\cdot m_e\cdot e\cdot\lambda\cdot c_2} = \left(\frac{4\pi\cdot h}{\sqrt{2}\cdot m_e\cdot c_2}\right)\cdot\left(\frac{2\cdot\Phi}{\lambda}\right) = 1.11599874\cdot 10^{-18} s \qquad \text{If: } \lambda = \frac{1}{IP_H}$$

$$\therefore\ \Delta t_1 = s_0\cdot IP_H = \frac{s_0}{\lambda} = 1.11599874\cdot 10^{-18} s \qquad \text{If: } s_0 = 1.01746167\cdot 10^{-25} ms$$

Amplitude 2×Φ reflection makes delta time t_1 to lambda and the unit of length *n:th*, here with Hydrogen Ionization Potential IP_H. This is the distance radius path corresponding to the total time *t* it should take up to surface and Hydrogen lambda of surface energy for the π- electron.

$$\therefore\ R_{\max} = \Delta t_1\cdot\frac{f\Delta\cdot e}{h\cdot IP_H} = 2.93316425\cdot 10^{-10} m \quad\Rightarrow\quad R_{\max} = \Delta t_1\cdot c_\Omega$$

$$\therefore\ c_\Omega = \sqrt{\frac{1}{\nabla^2\cdot U}} = 2.62842616\cdot 10^{8} ms^{-1} \qquad \text{If: } \nabla^2 = \left(\frac{1}{R\max}\right)^2 \text{ and } U = (\Delta t_1)^2$$

This is the light speed omega Ω, radius max and delta energy, for the magnetic max in a wave equation to surface. Now will it be possibly to take every delta time t_1 to lambdas of interest and calculate the radius up to surface, there are delta between *n:th* orbital's and surface. This is probably the only *one way* with delta time t_1 to estimate the light speed at the atom surface.

$$\therefore\ d_c = \frac{4\pi\cdot h^2\cdot c_\Omega}{\sqrt{2}\cdot m_e\cdot e\cdot c_2} = 2.67432287\cdot 10^{-17} m^2 \quad\Rightarrow\quad d_c = s_0\cdot c_\Omega$$

$$\therefore\ R_{\max} = \Delta t_1\cdot c_\Omega = d_c\cdot IP_H = 2.93316425\cdot 10^{-10} m \quad\Rightarrow\quad \Delta t_1 = \frac{s_0}{\lambda} \text{ and } R = \frac{d_c}{\lambda}$$

$$c_\Omega = \frac{d_c}{s_0} = 2.62842616\cdot 10^{8} ms$$

The distance constant d_c through lambda λ of interest gives the path radius *R* between orbital lobes the electron takes. And if take arc length s_0 through lambda λ of interest it gives time *t* of the travel path distance between lobes inside the atom, which at final gives speed omega *c*.

$$\therefore\ R_{\max} = \frac{4\pi\cdot h\cdot f\Delta}{\sqrt{2}\cdot m_e\cdot c_2} = 2.93316425\cdot 10^{-10} m \quad\Leftrightarrow\quad R_{\max} = n^{th}\cdot f\Delta \text{ and } R_{\max} = \frac{s_0\cdot c_\Omega}{\lambda}$$

This formula gives the maximum radius of distance the electron travels between lobes in Hydrogen, which will say from first orbital to Hydrogen surface. At surface the electron gives off an electromagnetic radiation, known as lambda λ, and this radiation correspond to the electrons travel path of radius between lobes. The formula above says that the delta electron volt correspond to the radius length to max radius and with velocity of electron into speed c_2.

1.9 **How get the speed of light**

One goal to estimate the main formulas to the speed of light is to have formulas without any fundamental constants involved. Difficulties arise when these fundamental constants have relativistic actions. It's probably only possibly to measure the speed of light with instruments on Hydrogen surface. In this essay we are trying to compute it through known atomic theory.

$$\therefore\ r_1 = \frac{\varepsilon_0 \cdot h^2}{\pi \cdot m_e \cdot e^2} \tag{5}$$

$\therefore\ r_1 = \dfrac{\varepsilon_0 \cdot e^2}{\pi^7 \cdot u_0^2 \cdot m_e}$ If: $h = \dfrac{e^2}{\pi^3 \cdot u_0}$ $\therefore\ m_e \cdot c_0^2 = \dfrac{e^2}{\pi^7 \cdot u_0^3 \cdot r_1}$ If: $\varepsilon_0 = \dfrac{1}{u_0 \cdot c_0^2}$

$\therefore\ m_e \cdot c_0^2 = \dfrac{2 \cdot e}{\pi \cdot u_0}$ If: $r_1 = \dfrac{e}{2\pi^6 \cdot u_0^2}$ $\Delta\Psi = m_e \cdot c_0^2 = \dfrac{2 \cdot e}{\pi \cdot u_0}$ $\Rightarrow$ $c_0 = \sqrt{\dfrac{2 \cdot e}{\pi \cdot u_0 \cdot m_e}}$

Here we have one of the main speed formulas estimated from Bohr´s first radius formula (5).

$$\therefore\ R_\infty = \frac{\alpha_0^2 \cdot m_e \cdot c_0}{2 \cdot h} \tag{6}$$

$\therefore\ R_\infty = \dfrac{\alpha_0^2 \cdot \pi^3 \cdot u_0 \cdot m_e \cdot c_0}{2 \cdot e^2}$ If: $h = \dfrac{e^2}{\pi^3 \cdot u_0}$ $\therefore\ R_\infty = \dfrac{\pi^8 \cdot u_0^4 \cdot c_0}{4 \cdot e}$ If: $\dfrac{e}{m_e} = \dfrac{2 \cdot \alpha_0^2}{\pi^5 \cdot u_0^3}$

$\therefore\ \dfrac{\alpha_0}{4\pi \cdot r_1} = \dfrac{\pi^8 \cdot u_0^4 \cdot c_0}{4 \cdot e}$ If: $R_\infty = \dfrac{\alpha_0}{4\pi \cdot r_1}$ $\therefore\ c_0 = \dfrac{2 \cdot \alpha_0}{\pi^3 \cdot u_0^2}$ If: $r_1 = \dfrac{e}{2\pi^6 \cdot u_0^2}$

Here we have the other one of the main speed formula which gives the speed of light, without any fundamental constant involved. Both formulas (5) & (6) are reference from; Codata [14].

1) $1eV = \dfrac{2 \cdot e}{\pi^2 \cdot m_p} = 1.9309401 \cdot 10^8\, ms^{-1}$ If: $\Im = \Im$

2) $\Delta eV = \dfrac{\alpha_0^2}{\pi \cdot u_0}$ $\Delta = 13.47576884eV$

(2 in 1) $c_2 = \dfrac{2 \cdot e \cdot \alpha_0}{\pi^3 \cdot m_p \cdot u_0} = 2.60209026 \cdot 10^8\, ms^{-1}$

This is the electron speed in hydrogen and the speed is dependent on charge and proton mass.

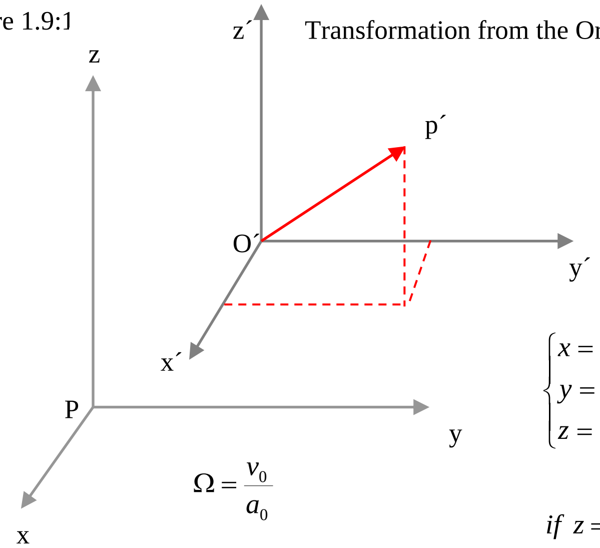
$\therefore\ c_0 = \dfrac{2 \cdot \alpha_0}{\pi^3 \cdot u_0^2} = 2.979320975 \cdot 10^8\, ms^{-1}$ If: $\alpha_0 = 7.2938469 \cdot 10^{-3}$

Here the speed of light formula with only the value of alpha when it's on Hydrogen surface. Index zero should normal correspond on value at surface and index one of a constant should be at the first orbital. Exceptions are the speed constants, here have automatically the highest speed value index zero. However, that's why Bohr's first radius have in this essay index one. To show equations when the light speed has free propagations in vacuum is nearly impossibly with only fundamental letter of the magnetic permeability and electrical vacuum permittivity.

Then will it be better to study the behavior of the electrons and find the amplitude speed on atoms surface, and a system with one electron – one proton we have in the Hydrogen atom.

Figure 1.9:1

Transformation from the Origin



$$\Omega = \frac{v_0}{a_0}$$

$$\begin{cases} O' = \alpha,\ \beta,\ \gamma \\ P = x,\ y,\ z \\ P' = x',\ y',\ z' \end{cases}$$

$$\begin{cases} x = x' + \alpha \ \rightarrow\ x' = x - \alpha \quad or \quad x' = x + \alpha \\ y = y' + \beta \ \rightarrow\ y' = y - \beta \quad or \quad y' = y + \beta \\ z = z' + \gamma \ \rightarrow\ z' = z - \gamma \quad or \quad z' = z + \gamma \end{cases}$$

$$if\ \ z = t \quad then \quad x^2 + y^2 - c^2 \cdot t^2 = x'^2 + y'^2 - c^2 \cdot t'^2$$

If the origin had a parallel movement of energy γ between O (proton) and electron (a_0), then it also have been an transformation of dot P to dot P´. Under this double movement describe the dot P into P´one oscillating wave. This helix spiral makes infinity orbit around a fix point O´.

- $a_0 = \sqrt{(x'-x)^2 + (y'-y)^2 + (z'-z)^2}$ If: $a_0 = PP'$
- $\nabla^2 = \iint_s \frac{dxdydz + dydzdx + dzdxdy}{(x'-x)^2 + (y'-y)^2 + (z'-z)^2}$ If: $\nabla^2 = \left(\frac{1}{a_0}\right)^2$

These are the arc length of the first orbital in three spaces, and length a_0 has positively values. If traced out from one double polar spiral, we have the known length: $r_1 = 5.29177209E\text{-}11$ m.

1) $\Psi E = \frac{h^2}{8\pi^2 \cdot m_e} \cdot \nabla^2$ If: $\nabla^2 = \left(\frac{1}{r_1}\right)^2$

2) $r_1 = \frac{\alpha_0}{4\pi \cdot \Re_\infty}$ $\therefore\ r_1 = \frac{\alpha_0^2 \cdot s_0}{4\pi^2 \cdot \Phi \cdot u_0} = \frac{\alpha_0^2}{\pi \cdot u_0} \cdot \frac{s_0}{4\pi \cdot \Phi}$

(2 in 1)

$$\therefore \quad \Psi E = \frac{2 \cdot h^2 \cdot R_\infty^2}{m_e \cdot \alpha_0^2} \quad \therefore\ E = R_\infty \cdot h \cdot c_0 = \frac{2 \cdot h^2 \cdot R_\infty^2}{m_e \cdot \alpha_0^2} \quad \Rightarrow \quad R_\infty = \frac{m_e \cdot c_0 \cdot \alpha_0^2}{2 \cdot h} = 10968459.83 m^{-1}$$

This is a modern alternative formula to the known Rydberg´s formula, and again Schrödinger wave equation plays a role to find the relativistic electron particle energy in Hydrogen atom.

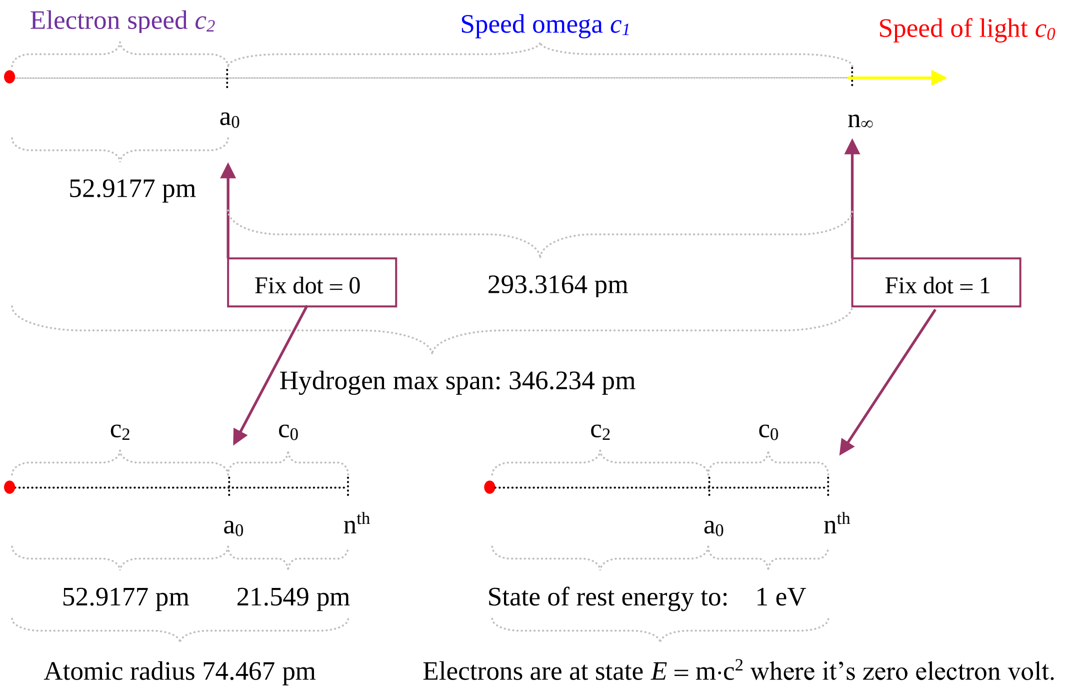
If: $R_\infty = R_\infty$

$$\therefore \frac{\pi^2 \cdot \alpha_0^2}{e \cdot c_0} = \frac{m_e \cdot c_0 \cdot \alpha_0^2}{2 \cdot h} \quad \Leftrightarrow \quad E_{tot} = m_e \cdot c_0^2 = \frac{2\pi^2 \cdot h}{e} \quad \Rightarrow \quad c_0 = \sqrt{\frac{2\pi^2 \cdot h}{m_e \cdot e}} = 2.979320975 \cdot 10^8\, ms^{-1}$$

Here probably the most perfect of all speed of light formulas with Planck’s constant of action.

2. Hydrogen electron wave

Figure 2.0:1 **Hydrogen span of atom**



This diagram shows the Hydrogen span of max radius vs. it neutral size. When a charge from outside act on the atom, the π-electron will through repulsion forces follow the n^{th} -band, and it will be elastic up to n^{th}, before the electron gives off an electromagnetic radiation and then fall through attraction forces back to first orbital where its zero electron volt to rest for mass. This n^{th} exist even in Helium, and here it could be two n^{th} -band, because two prim houses in Helium with opposite electron spins. The difficulty to know are if there exists an n^{th} -band to every valence electron. So, Hydrogen has at last one n^{th} –band to vector to speed of light c_0. This makes the atomic radius in a neutral Hydrogen atom together with length to first orbital.

$$\therefore\ n^{th} = \frac{4\pi \cdot h}{\sqrt{2} \cdot m_e \cdot c_2} = 2.46733118 \cdot 10^{-11}\, m \qquad \Leftrightarrow \qquad n^{th} = s_0 \cdot \frac{e}{h} = \frac{s_0}{2 \cdot \Phi} = \frac{\pi^3 \cdot s_0 \cdot u_0}{2 \cdot e}$$

$$\therefore\ s_0 = \frac{4\pi \cdot h^2}{\sqrt{2} \cdot m_e \cdot e \cdot c_2} = 1.01746167 \cdot 10^{-25}\, ms \qquad \text{If: } n^{th} = n^{th}$$

The n^{th} -band is probably going with the electron speed c_2, when the π-electron is in action. This is possibly to see through n^{th} -band, because the arc length s is to the frequency of one electron volt. It's also possibly to get out an electron action energy if use the electron speed c.

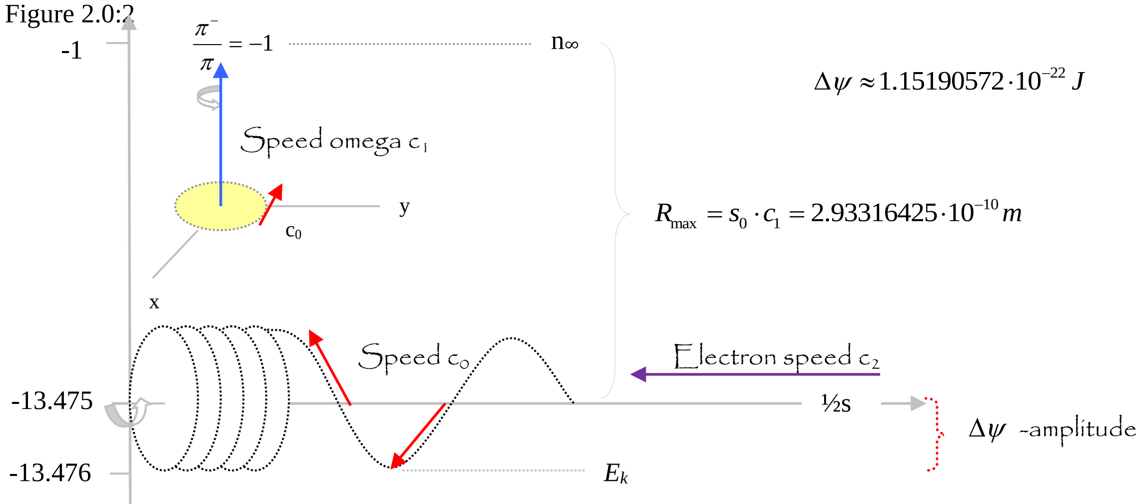
$$\therefore\ E_k = ½ \cdot \pi^2 \cdot m_p \cdot c_2 = 2.1652280 \cdot 10^{-18}\, J$$

$$\therefore\ R_\infty = \frac{\pi^2 \cdot m_p \cdot c_2}{2 \cdot h \cdot c_0} = 10968459.83 m^{-1} \qquad \text{If: } E_h = E_h$$

$$\therefore\ \Omega = \frac{\pi^2 \cdot m_p \cdot c_2}{\hbar} = 4.10650927 \cdot 10^{16}\, s^{-1} \qquad \Rightarrow \qquad E_h = \Omega \cdot \hbar$$

It's shown that speed omega Ω is traced out with the electron speed c_2 to the first orbital path.

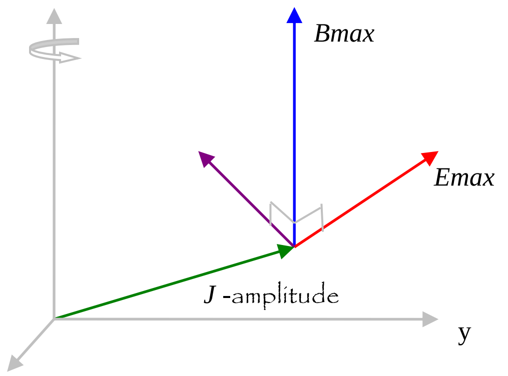
Figure 2.0:2



$$\Psi H = -\left(\sqrt{\frac{e \cdot \Delta\psi}{\pi \cdot u_0}} + \Delta\psi = \frac{2 \cdot h^2}{m_e \cdot \lambda^2}\right) \Leftrightarrow \Psi E_k = -\left(\frac{h \cdot c_0}{\lambda} + \frac{2 \cdot h^2}{m_e \cdot \lambda^2}\right)$$

This diagram shows where the speeds are located inside the atom and into the electron wave.

Figure 2.0:3



$$\therefore \; curlE = -\frac{x\vec{i} + y\vec{j}}{x^2 + y^2} \qquad [11]$$

∴ Inward across the disc circle of: $x^2 + y^2 = a^2$

$$-\oint \left(-\frac{x\vec{i} + y\vec{j}}{a^2}\right) \cdot \frac{x\vec{i} + y\vec{j}}{a} ds = \oint \frac{a^2}{a^3} ds = \frac{1}{a} \cdot 2\pi \cdot a = 2\pi$$

This diagram 3 shows that *Bmax* is perpendicular to *Emax* and its going into the perpendicular direction (purple arrow) with the velocity corresponding to electron speed c_2 at first orbital r_1.

1) $\frac{KE\max}{\omega B\max} = \frac{\pi}{\pi} = 1$ and $\frac{E\max}{B\max} = \frac{\Phi \cdot c_0}{\Phi} = c_0$

2) $\frac{KE\max}{\omega B\max} = \frac{\omega}{K} = c_0$ [16]

Here it’s proofed that the flow inside a disc circle with rotation always has constant value 2π.

$$\therefore \; \omega = 2\pi \cdot \frac{e}{h} = \frac{\pi}{\Phi} = 1.52366418 \cdot 10^{15} s^{-1}$$

$$K = \frac{2\pi}{\lambda \cdot eV} = \frac{2\pi \cdot R_\infty}{\Delta eV} = \frac{2\pi \cdot 10968459.83}{13.47576884} = 5.114132 \cdot 10^6 m^{-1}$$

$$\frac{\omega}{K} = \frac{1.5236642 \cdot 10^{15} s^{-1}}{5.1141324 \cdot 10^6 m^{-1}} = 2.97932098 \cdot 10^8 ms^{-1}$$

If put equation (2 in 1) above, then it´s possibly to get *pi* through *pi*, and at surface it will give 1 *eV*. The angular ω-frequency of 1 *eV*, has probably the flow of *pi* in the Ω-omega direction.

2.1 **The electron arc length**

There exist an electron orbital of disc. If find the distance of one revolution for the charge *q* around a circular trajectory Helix cylinder path, corresponding of closed magnetic field lines. Then it's possibly to find the length of path for the electron. One theory is that the electron it selves correspond to one electron volt and the length it takes correspond to delta electron volt.

$$\therefore\ s_0 = \frac{h^2}{m_e \cdot v_0 \cdot e \cdot \Delta eV} = 1.01746167 \cdot 10^{-25} ms \qquad \text{Hint: } \Delta = 13.47576884 eV$$

This formula of arc length *s* is equivalent with the formula we are going to proof, with Helix.

$$\therefore\ r_d = \frac{h}{m_e \cdot c_2 \cdot \Delta f}$$

$$\therefore\ r_d = \frac{h^2}{m_e \cdot c_2 \cdot e} = 1.14504668 \cdot 10^{-26} m \qquad \text{Hint: } \Delta f = \frac{e}{h}$$

This is the disc radius size of the electron with the value of one electron volt of frequency and with the electron speed c_1. The electron it selves has in Hydrogen always only one electron volt, and the energy of lambda depends on the length of travel path between the lobes surface.

$$\therefore\ c_2 = \frac{E_k}{\pi^2 \cdot m_p} = 2.60209026 \cdot 10^8 ms^{-1} \qquad \text{Hint: } \frac{m_p}{m_e} = \frac{1}{\sqrt{2} \cdot \pi^5 \cdot u_0}$$

This is the velocity of the electron in a polar helix trajectory path between the lobes to surface and the electron has a constant charge *q* of one electron volt, which could be calculated to one point calculation on cylinder surface δ, To understand the electromagnetic light speed, it can correspond to the flux of inverse square laws through a closed surface of a cylinder sphere δ. To find the length *s* of one cycle to the electron orbital, it's necessary to find the length of one revolution of the circular helix between the point (a, 0, 0) and (a, 0, 2πb). This is one constant of arc length in three spaces and it will only be possibly if could take the second derivative of the polar helix function to charges *q* in constant magnetic fields. The material points m_e to the electron transitions are travelling with the electron speed c_1 between the energy levels in the atoms, within the electron orbital. This make that the charge *q* must follow the electron spin around the cylindrical surfaces δ as the electron is rising up to higher energy levels *n* with the speed at surfaces of light c_0. The arc length *s* is possibly to find if switch to polar coordinates.

The Helix: $x = a\cos t$, $y = a\sin t$, $z = bt$ The polar function: $r = a\cos t\,\vec{i} + a\sin t\,\vec{j} + bt\,\vec{k}$

$$x^2 + y^2 = a^2$$

This curve spirals around the z-axis, rising with the electron spin as it turns on the cylinder δ:

The first derivative: $\omega = \frac{\partial r}{\partial t} = -a\sin t\,\vec{i} + a\cos t\,\vec{j} + b\,\vec{k}$

In terms of the parameter *t* the Helix trajectory is traced out at one constant electron speed c_2 and the required length s_0 corresponds to parameter interval to [0, 2π], that will say one cycle.

In kinematics terms the arc length of a particle m_{Δ} in magnetic flux is the integral of its speed.

The arc length: $$s = \int_0^{2\pi} \sqrt{(-a\sin t)^2 + (a\cos t)^2 + bt} \cdot \partial t$$

$$s = \int_0^{2\pi} \sqrt{a^2 \cdot \sin^2 t + a^2 \cdot \cos^2 t + b^2} \cdot \partial t$$ If: $\sin^2 t + \cos^2 t = 1$

$$s = \int_0^{2\pi} \sqrt{a^2 + b^2} \cdot \partial t$$

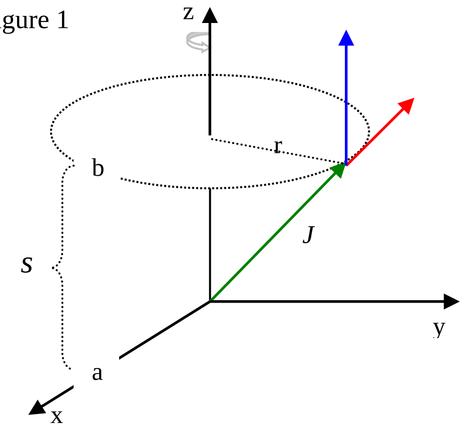
$$s = \sqrt{a^2 + b^2} \cdot \int_0^{2\pi} \cdot \partial t$$

$$s = \sqrt{a^2 + b^2} \cdot x\Big|_0^{2\pi}$$

$$s = 2\pi \cdot \sqrt{a^2 + b^2}$$

$$s = 2\pi \cdot \sqrt{r^2 + r^2}$$

Figure 1



Here is (a) the start point and (b) the end point of the arc length s, corresponding to one cycle. The electron amplitude of electron disc correspond here to J and one cycle to the value of 2π

$$\therefore\ s_0 = 2\pi \cdot \sqrt{r^2 + r^2} = 2\pi \cdot \sqrt{2} \cdot r$$

$$\therefore\ s_0 = \frac{4\pi \cdot h^2}{\sqrt{2} \cdot m_e \cdot e \cdot c_2} = 1.01746167 \cdot 10^{-25}\, ms \quad \Rightarrow \quad r = \frac{h^2}{m_e \cdot e \cdot c_2} \qquad (7)$$

This formula gives the arc length of one revolution in a trajectory, with the electron speed c_2. It's one new fundamental constant to take the length of travel path between the lobes to surface in atoms and it's here it is possibly to show the electron speed in a condition when the electron correspond to 1 eV. In equation (7), start points *a*, and *b*, are equal to electron disc *r*.

$$\therefore\ R = \Re_f \cdot s_0 = \frac{4\pi \cdot h^2 \cdot R_\infty \cdot c_0}{\sqrt{2} \cdot m_e \cdot e \cdot c_2} = 3.32491847 \cdot 10^{-10}\, m$$ Hint: $R = 2\pi \cdot r_1$

Through the arc length formula we have the length of one revolution of path for the electron.

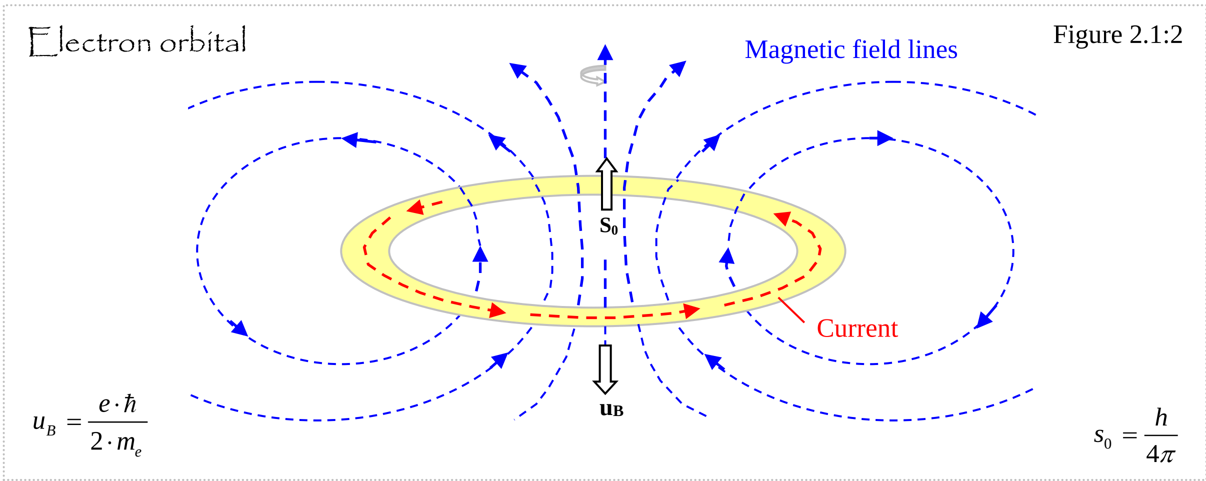
$$\therefore\ J = \frac{r_1}{R_\infty \cdot c_0} = 1.61934054 \cdot 10^{-26}\, ms$$ Hint: $r_1 = J \cdot \Re_f$

$$\therefore\ J = \frac{2 \cdot h^2}{\sqrt{2} \cdot m_e \cdot e \cdot c_2} \qquad (8)$$

Here [J] is the electron amplitude in meter x second and with the frequency it gives radius r_1.

$$\therefore\ E = m_e \cdot c_0^2 = \frac{2 \cdot e}{\pi \cdot u_0} \quad \Rightarrow \quad \frac{e}{m_e} = ½ \cdot \pi \cdot u_0 \cdot c_0^2 = \frac{2 \cdot \alpha_0^2}{\pi^5 \cdot u_0^3} \quad \Rightarrow \quad c_0 = \frac{2 \cdot \alpha_0}{\pi^3 \cdot u_0^2}$$

The energy formula for the electron is a fundamental theorem which gives the sunlight speed.



This diagram shows how the electron look like if only look at the electric and magnetic field. The magnetic lines of the magnetic spin moment u_B are opposite to the magnetic lines vector of the angular spin momentum s_0. The electron has mass m_e, charge e, angular momentum s_0 and magnetic moment u_B and circulation of an electric field (red) around a very small electron disc of simple closed curves. The deflection of a continuous electric current is possibly when, very strong magnetic fields are circulating around the electrostatic current field, and then it arise a helix around the magnetic flow [22]. The circulation of the magnetic field around the boundary surface S is equal to the total current flowing through the boundary surface S. The field lines of the magnetic lines must be closed curves and that at all points. Hence, by Stoke:

$$\oint_C B \bullet dr = \oiint_C J \bullet Nds \quad \text{by Stokes: } \iint_S (curlB - J) \bullet Nds = 0 \quad \Rightarrow \quad curlB = J + \varepsilon_0 \frac{\partial E}{\partial t} \qquad [11]$$

We have here in the diagram above the point wise version of A. Ampéres law with three main equation of modern description to electromagnetic radiation, or photon pathway between the lobes of energy. This indicates that magnetic fields are not just produced by current, but also by changing electric fields. In kinematics terms the distance *s* traveled by a moving current particle in a magnetic field is the integral of its speed. Thus, the particle γ is traced out at a constant speed omega as it rising up in a trajectory path around the electron yellow disc with distance *s* and energy *h* for each revolution and/or oscillation Hz. The new arc length *s* and energy *h* is then independent of frequency and intensity of the particle. The differences for all photons γ to all atoms are the distance *R* of length between orbital it must take to speed c_Ω. This makes the quantum mechanics theory of energy. The speed for current is light speed c_0.

$$\therefore\ r = \frac{h^2}{m_e \cdot c_2 \cdot e} = 1.14504668 \cdot 10^{-26}\, ms \qquad \text{and} \qquad t_1 = \frac{4\pi \cdot h^2 \cdot R_\infty}{\sqrt{2} \cdot m_e \cdot e \cdot c_2} = 1.11599874 \cdot 10^{-18}\, s$$

$$\therefore\ s_0 = \int_0^{2\pi} \sqrt{r^2 + r^2}\, dr \qquad \Rightarrow \qquad s_0 = 1.01746167 \cdot 10^{-25}\, ms \quad \text{and} \quad t_1 = s_0 \cdot R_\infty$$

This is the absolute new arc length s_0 of a revolution or a frequency in the unit meter· second.

$$J = \frac{2 \cdot h^2}{\sqrt{2} \cdot m_e \cdot c_2 \cdot e} = 1.61934054 \cdot 10^{-26}\, ms \qquad \text{and} \qquad t_2 = \frac{J}{4\pi \cdot r_1} = 2.43515827 \cdot 10^{-17}\, s$$

This is the value of the new electron amplitude in unit meter · second and it´s equivalent to Planck´s *h*-bar in unit *Joule ·second*. It´s possibly to get orbital length and vector radius to *Hz*.

The radius distances the electron will travel from its level at first ½ s-orbital are complicated.

$$\therefore\ R = \frac{4\pi \cdot h \cdot E_k}{\sqrt{2} \cdot m_e \cdot c_0 \cdot e} = 2.90392946 \cdot 10^{-10}\, m \qquad \therefore\ R_{\max} = \frac{e \cdot c_\Omega}{\pi^5 \cdot u_0^2 \cdot c_0} = 2.93332029 \cdot 10^{-10}\, m$$

The kinetic energy of the electron will give the radius of distance, without the time t it takes.

i. $$E_k = \frac{e}{\pi \cdot u_0} \cdot \left(\frac{1}{\beta_1^2} - 1 \right)$$

ii. $$E_k = \frac{h \cdot c_0}{\lambda} + \frac{2 \cdot h^2}{m_e \cdot \lambda^2} \qquad \text{If: } \lambda = \frac{1}{IP_H}$$

This is the kinetic energy for the electron at first ½ s-orbital. It corresponds to the kinetic energy of one lap around the proton at first orbital. And it's the energy which must be added to the system if wanted to remove the electron, to Hydrogen surface. The second formula to the kinetic energy is with lambda, which normal correspond to the potential energy of photon. Here the Ionization Potential of Hydrogen is the energy electron will leave at surface, and it's not energies needed to remove the electron from first orbital. It's here named kinetic energies.

$$R = R_\infty \cdot s_0 \cdot c_2 = R_\infty \cdot d_c = t_1 \cdot c_2 = 2.9039295 \cdot 10^{-10}\, m \qquad R = 2\pi \cdot r_1 = R_\infty \cdot s_0 \cdot c_0 = \Re_f \cdot s_0 = 3.32492 \cdot 10^{-10}\, m$$

$$\therefore\ t_1 = \frac{E_k \cdot s_0}{h \cdot c_0} = 1.11599874 \cdot 10^{-18}\, s \qquad \text{If: } R_\infty = \frac{E_k}{h \cdot c_0}$$

This is the time t it takes for the electron to travel from first ½ s–orbital to Hydrogen surface.

- $$R_{\max} = t_1 \cdot c_\Omega = 2.93316425 \cdot 10^{-10}\, m$$

This formula above is valid to get the maximum radius distance of travel path for the electron to atoms surface. Time t_1 to kinetic energies is relativistic but the time t_1 should be to surface, where the energy mass is none relativistic. This will happen if take time t to surface speed c_Ω.

- $$t = \frac{E_k \cdot s_0}{h \cdot c_0} \quad \text{and} \quad E_k = \left(\frac{h \cdot c_0}{\lambda} + \frac{2 \cdot h^2}{m_e \cdot \lambda^2} \right) \quad \Rightarrow \quad R\max = t \cdot c_\Omega$$

$$\therefore\ K = \frac{2\pi \cdot R_\infty}{\Delta eV} = \frac{\pi}{\Phi \cdot c_0} \quad \Rightarrow \quad c_0 = \frac{\Delta eV}{2 \cdot \Phi \cdot R_\infty} = \frac{13.47576884}{2 \cdot 2.06186684 \cdot 10^{-15} \cdot 10968459.83} = 2.97932098 \cdot 10^{8}\, ms^{-1}$$

- $$c_\Omega = \frac{\Delta eV}{2 \cdot \Phi \cdot IP_H} = \frac{11.88800381}{2 \cdot 2.06186684 \cdot 10^{-15} \cdot 10967876.34} = 2.62842616 \cdot 10^{8}\, ms^{-1} \qquad \therefore K \in \text{p. } 54$$

These are the formula combination to get the travel time t to every lambda λ into every atom. This will give the radius max of distance the electron must travel between the lobes of orbital up to surface. The whole concept of the radius of distance R is build up from the knowhow of the arc length s_0 of one revolution or one oscillation, which gives the time t of event that, can happen under influence of action. The arc length s_0, which gives in the unit meter · second, is then equivalent to Planck´s constant h, which gives in the unit joule · second. Both constants are taking actions of one oscillation, where Planck´s h -bar is similar to the new J -amplitude.

2.2 **The circular helix**

It´s a curve common in electromagnetic fields, and the curve spirals around the z-axis rising as it turns. The curve can represent a dot calculation on the electrons surface and rising up with the electron spin. This dot can then represent the kinetic energy on the electron surfaces, and length λ of the parameterized curvature corresponds to time of travel path between lobes.

$$\therefore \ \frac{1}{\lambda}=\int_0^{2\pi}\int_0^t \sqrt{r^2+r^2}\,dsdt=\int_0^{2\pi}\sqrt{r^2+r^2}\,ds\cdot\int_0^t 1\cdot dt=s\cdot\int_0^t 1\cdot dt=\frac{t}{s} \qquad \Rightarrow \qquad t=\frac{s_0}{\lambda}$$

These double integral shows that time *t* correspond to arc length *s*, through the lambda length of the electron path between atom lobes. Here *r* corresponds to the radius of the electron disc.

1. $\lambda=\frac{1}{R_\infty}=\frac{s_0}{t_1}=\frac{1.01746167\cdot10^{-25}ms}{1.115998741\cdot10^{-18}s}=9.1170503\cdot10^{-8}m$

2. $R=4\pi\cdot\frac{s_0}{t_2}=4\pi\cdot\frac{1.01746167\cdot10^{-25}ms}{2.43515827\cdot10^{-17}s}=3.32491847\cdot10^{-10}m$

If known the time of travel path for the electron, then it's possibly to get the lambda length of travel path. Probably it will be easier to get the travel time *t* if only known lambda of interest.

$$\therefore \ t=\frac{s_0}{\lambda} \qquad \Leftrightarrow \qquad t=\frac{E_p\cdot s_0}{h\cdot c_0} \qquad\qquad \therefore \ R=d_c\cdot\Re_\infty=2.90392946\cdot10^{-10}m$$

This lambda λ will then give the time *t* corresponding to the potential energy of electron path. Through the distance constant d_c will it be possibly to find the length of lambdas travel path.

$$\therefore \ \frac{1}{\lambda}=\int_0^{2\pi}\int_0^t\sqrt{a^2+b^2}\,dsdt \qquad \text{If: } \lambda=\frac{ds}{dt}=\sqrt{a^2+b^2} \qquad \text{and} \qquad c=\frac{1}{\sqrt{a^2+b^2}}$$

Helix: $c(s)=a\cos\left(\frac{s}{\sqrt{a^2+b^2}}\right)i+a\sin\left(\frac{s}{\sqrt{a^2+b^2}}\right)j+\frac{bs}{\sqrt{a^2+b^2}}k$ [11, 23]

This parameterization represent a circular helix wound on the cylinder surface $x^2+y^2=a^2$, in terms of arc length *s* from the point $(a,0,0)$ in the direction of an increasing time *t* to the path.

∴ The curvature of the helix is: $\kappa(s)=\left|\frac{dT}{ds}\right|=\frac{a}{(a^2+b^2)}$ assume: $a>0$ [11]

∴ The torsion of the helix is: $\tau(s)=\left|\frac{dB}{ds}\right|=\frac{b}{(a^2+b^2)}$ if: $\tau>0$ and $b>0$ [11]

This is the unit vectors comprising the Frenet frame at any point $r(s)$ on the helix. The Frenet frame theorem says that curvature is a measurement of the curvature to have divergence from to be a straight line, and the torsion is a measurement of divergence from to be a planar curve. There exist also a Frenet-Serret formulas, which are the fundamental theorem into theory of curves in 3-space, with divergence of curvature, unit normal vector and divergence of torsion. The torsion, in fact, if zero, then it must be a circle, and if nonzero, it must be a circular helix.

2.3 **The electron arc time *t***

The trajectory path for a particle in electromagnetic fields is common. For the electron it can be explain with the electron spin ±½S, and the delta kinetic energy represent then a dot on the electrons surface. This dot is then following the electron rotation as it travels forwards, and through this it´s possibly to calculate the arc length *s* of only one revolution of this dot on the electrons surface. These are then similar for Planck´s constant *h*, and for time *t* of one period.

$$\therefore\ R = \frac{s_0 \cdot c_0}{\lambda} \quad \Rightarrow \quad t = \frac{s_0}{\lambda} \quad \text{and if: } \lambda = \frac{1}{R_\infty}, \quad \text{then: } t_s = \frac{t_1}{\Re_f} = \frac{1.11599874 \cdot 10^{-18}\, s}{3.26785624 \cdot 10^{15}\, s^{-1}} = 3.4150791 \cdot 10^{-34}\, s^2$$

This is the time *t* of one arc length *s*, it's the time t_s of a cycle and it´s in unit square seconds.

$$\therefore\ t = t_s \cdot f \quad \Rightarrow \quad \frac{s_0}{\lambda} = t_s \cdot f \quad \text{and if: } f = \frac{c_0}{\lambda}, \quad \text{then: } \frac{s_0}{\lambda} = \frac{c_0 \cdot t_s}{\lambda} \quad \Rightarrow \quad c_0 = \frac{s_0}{t_s}$$

Now it's possibly to get the time *t* of interest, if only knows lambda or frequency of photons.

$$c_0 = \frac{s_0}{t_s} = \frac{1.01746167 \cdot 10^{-25}\, ms}{3.415079062 \cdot 10^{-34}\, s^2} = 2.97932098 \cdot 10^8\, ms^{-1} \quad \Re_f = \frac{t_1 \cdot c_0}{s_0} \Rightarrow t_1 = R_\infty \cdot s_0 = 1.1159987 \cdot 10^{-18}\, s$$

The speed of only one arc length is here corresponding to the speed of light c_0, and it was for the electron arc length cycles with the travel path at first orbital or between the lobes inside the Hydrogen atom. This is probably the speed for the dot calculation on the electron surface.

$$LOG(c_0) = LOG(Hz) + LOG(\lambda)$$

This fundamental expression holds for lambda to every emission of every photon from atoms.

$$\therefore\ r = \frac{h^2}{m_e \cdot e \cdot c_2} = 1.14504668 \cdot 10^{-26}\, ms \quad \text{and} \quad t = \frac{r}{v_0} = \frac{1.1450467 \cdot 10^{-26}\, ms}{2.173071.114 m \cdot s^{-1}} = 5.26925543 \cdot 10^{-33}\, s^2$$

This is the disc radius *r* in the polar helix trajectory. This vector is going with the velocity v_0.

$$\therefore\ t_{ds} = \int_0^{2\pi} \sqrt{\left(\frac{r}{v_0}\right)^2 + \left(\frac{r}{v_0}\right)^2}\, dt = 2\pi \cdot \sqrt{2} \cdot 5.26925543 \cdot 10^{-33}\, s^2 = 4.68213701 \cdot 10^{-32}\, s^2$$

This parameter integral have we proofed with the theorem of arc length *s*. Now it takes the time t_{ds} to one arc length. That will say the time of only one revolution around the π-electron.

$$\therefore\ t = t_{ds} \cdot 2 \cdot \Re_f = 4.68213701 \cdot 10^{-32}\, s^2 \cdot 2 \cdot 3.26785624 \cdot 10^{15}\, s^{-1} = 3.06011013 \cdot 10^{-16}\, s$$

Here the arc length time to the frequency of two Bohr radii r_1 to the first orbital in Hydrogen.

$$\therefore\ \lambda = c_0 \cdot t_4 = 2.979320975 \cdot 10^8\, ms^{-1} \cdot 3.06011013 \cdot 10^{-16}\, s = 9.11705030 \cdot 10^{-8}\, m$$

$$\therefore\ \lambda = \frac{1}{R_\infty} \quad \Rightarrow \quad \therefore \text{ the electron arc time: } t_{ds} = 4.68213701 \cdot 10^{-32}\, s^2$$

This arc time will give the velocity v_0, if switch to speed c_2 in the disc radius, then distance *R*.

2.4 **The electron amplitude**

The electrons trajectory path in a helix model, the electron has amplitude value to arc length.

$$\therefore\ t_A = \frac{J}{v_0} = 7.45185249 \cdot 10^{-33}\, s^2 \qquad \therefore\ J = 4\pi \cdot r_1 \cdot t_2 = 1.61934054 \cdot 10^{-26}\, ms$$

If take the amplitude *J* through the velocity of m_e, then we have one time t_A to the amplitude.

$$\therefore\ \eta = \frac{J \cdot \hbar}{t_A} = \hbar \cdot v_0 = 2.29157867 \cdot 10^{-28}\, Jm \qquad \therefore\ J = \frac{2 \cdot h^2}{\sqrt{2} \cdot m_e \cdot e \cdot c_2} = 1.61934054 \cdot 10^{-26}\, ms$$

This is a new constant neta η and it gives the amplitude value corresponding to joule *x* meter.

$$\therefore\ E_k = \frac{\eta}{r_1} = 4.33045609 \cdot 10^{-18}\, J \quad \Rightarrow \quad r_1 = \frac{\eta}{m_e \cdot v_0^2}$$

$$\therefore\ E = m_e \cdot c_0^2 = \frac{\eta}{r_e} = 8.13992401 \cdot 10^{-14}\, J \quad \Rightarrow \quad r_e = \frac{\eta}{m_e \cdot c_0^2}$$

The new constant η takes very simple energies of amplitude, to corresponding radius vector.

$$\therefore\ t_0 = t_A \cdot f = t_A \cdot 1.73850615 \cdot 10^{11}\, Hz = 1.29550914 \cdot 10^{-21}\, s$$

$$\therefore\ t_2 = t_A \cdot \Re_f = t_A \cdot 3.26785624 \cdot 10^{15}\, Hz = 2.43515827 \cdot 10^{-17}\, s$$

Here we have the natural unit of time t_0 and the atomic unit of time t_2, with frequency to t_A.

$$\therefore\ t_4 = t_A \cdot \Omega = 7.45185249 \cdot 10^{-33}\, s^2 \cdot 4.10650927 \cdot 10^{16}\, Hz = 3.06011013 \cdot 10^{-16}\, s \qquad \text{Hint: } t_4 = \frac{t_A}{t_2}$$

$$\therefore\ \lambda = t_4 \cdot c_0 = 9.11705030 \cdot 10^{-8}\, m \qquad \text{Hint: } \lambda = \frac{1}{R_\infty}$$

Here we have a new fundamental concept of time t_4. To the speed of light c_0 it gives lambda.

$$\therefore\ w = \frac{4\pi \cdot \hbar}{t_A} = \frac{4\pi \cdot E_k}{t_4} = 0.177830581 Js^{-1} \qquad \text{Hint: } w = watt$$

Here we have one modern version of an old energy statement in quantum mechanics. Her are energy in *Joule* equal energy in unit *watt*, and it correspond *seconds* trough *Joule*. Conclusion

$$\therefore\ \lambda\!\!\!^{-}_C = \frac{\hbar}{m_e \cdot c_0} = \frac{2 \cdot \Delta E\psi \cdot c_0}{w} = 3.85973756 \cdot 10^{-13}\, m \qquad (9)$$

$$\therefore\ \lambda = \frac{1}{R_\infty} = \frac{4\pi \cdot E_k \cdot c_0}{w} = 9.11705030 \cdot 10^{-8}\, m \quad \Rightarrow \quad \Re_f = \frac{w}{4\pi \cdot E_k}$$

In equation (9) we have the Compton length. Arthur Compton (1892-1962). He received the Noble Prize in Physics 1927 “for his discovery of the C effect named after him”. The effect confirmed that electromagnetic radiation of electron have both a particle and wave properties.

One unit of length that is between the atomic unit r_1 and electron radius r_e are the length unit:

$$\therefore\ ƛ_C = \frac{\hbar}{m_e \cdot c_0} = 3.85973756 \cdot 10^{-13}\, m \qquad (9)$$

This is the official nature unit of length in modern quantum mechanics, the Compton lambda.

$$\therefore\ E_k = \alpha_0 \cdot \frac{\eta}{ƛ_C} = \alpha_0 \cdot \frac{2.29157867 \cdot 10^{-28}}{3.85973756 \cdot 10^{-13}} = 4.33045609 \cdot 10^{-18}\, J \qquad E_k = \frac{\hbar}{t_2}$$

$$\therefore\ \Psi E = \alpha_0^{-1} \cdot \frac{\eta}{ƛ_C} = \alpha_0^{-1} \cdot \frac{2.29157867 \cdot 10^{-28}}{3.85973756 \cdot 10^{-13}} = 8.13992401 \cdot 10^{-14}\, J \qquad \Psi E = \frac{\hbar}{J \cdot R_\infty}$$

Here is some energy taken with the new constant neta η corresponding to the standard model.

- $$n^{th} = \int_0^{2\pi} \sqrt{\left(\frac{h}{m_e \cdot c_2}\right)^2 + \left(\frac{h}{m_e \cdot c_2}\right)^2}\, ds \quad \Rightarrow \quad n^{th} = \frac{4\pi \cdot h}{\sqrt{2} \cdot m_e \cdot c_2} = 2.46733118 \cdot 10^{-11}\, m$$

If take the linear momentum with the electron speed c_2, then we get the *n:th* length of atomic radius and together with first orbital length r_1, we get $r_A = 7.7591 \cdot 10^{-11}\, m$ as atomic radius of H.

- $$n^{th} = \frac{4\pi \cdot h \cdot \left(n^2 - 1\right)}{\sqrt{2} \cdot m_e \cdot c_2 \cdot n^2} \qquad n = 2.3.4....$$

$$\therefore\ E = E\psi \cdot \left(\frac{n^{th}}{r_e}\right) = 2.01910989 \cdot 10^{-18}\, J \qquad \because\ \Delta = 4\pi eV$$

The length to *n:th* orbital in Hydrogen, where *n* are integer count from first orbital. Energy to the *n:th* length correspond to flux of 4π electron volt. The length is going in a trajectory path.

$$\therefore\ \lambda = \frac{4\pi \cdot h \cdot \Delta eV}{\sqrt{2} \cdot m_e \cdot c_2} = 3.32491847 \cdot 10^{-10}\, m \qquad \Re_f = \frac{\varepsilon_0 \cdot c_2}{\sqrt{2} \cdot \pi \cdot e} = 3.26785624 \cdot 10^{15}\, Hz$$

If take the linear momentum above with the electron speed c_2 to the delta electron volt we get the orbital length λ of first orbital that will say one revolution for the π-electron in Hydrogen.

$$\therefore\ E_k = \frac{w \cdot e}{4\pi^3 \cdot \alpha_0^2} = 4.33045609 \cdot 10^{-18}\, J \qquad \text{If: } w = 0.177830581 Js^{-1}$$

$$\therefore\ E_k = w \cdot t_2 = 4.33045609 \cdot 10^{-18}\, J \qquad \because\ t_2 = \alpha_0^{-1} \cdot J \cdot R_\infty = t_A \cdot \Re_f = \frac{\hbar}{m_e \cdot v_0^2}$$

$$\therefore\ E\psi = w \cdot t_0 = 2.30381143 \cdot 10^{-22}\, J \qquad \because\ t_0 = \alpha_0 \cdot J \cdot R_\infty = t_A \cdot f = \frac{\hbar}{m_e \cdot c_0^2}$$

If know the time *t*, then it's possibly to get the energy if use the unit watt *x* time *t*. The time t_2 correspond to atomic unit (a.u.) of time *t* and time t_0 correspond to nature unit (n.u.) of time *t*.

The electron speed c_2 for the electron when it circulates around at first orbital in Hydrogen is the oscillation of the electron amplitude of one dot to another dot in a trajectory path gives by

$$\therefore\ c_2 = \frac{4\pi \cdot h \cdot \Delta eV}{\sqrt{2} \cdot m_e \cdot (2\pi \cdot r_1)} = 2.60209026 \cdot 10^8\, ms^{-1} \qquad \because\ \Delta = 13.47576884 eV$$

This is the vector speed for the electron, the charge it selves are going with the speed of light on the cylindrical surface δ. The time *t* the electron will take for one revolution at first orbital

$$\therefore\ t_3 = \frac{\Re_f \cdot s}{c_2} = 1.27778752 \cdot 10^{-18}\, s \qquad \Leftrightarrow \qquad t_3 = \frac{2\pi \cdot r_1}{c_2}$$

It's the same time t_3 for the π-electron with speed c_2 like it's for the frequency to a revolution with light speed c_0. There exists an electron speed c_2 and with one surface speed c_0 to its spin. If take time t_3 to unit of watt, the energy of one lap correspond to square rot of 2 electron volt.

$$\therefore\ \Psi = \frac{\partial^2 U}{\partial \cdot t^2} = c_0^2 \cdot \nabla^2 \cdot U = 1 \qquad \Rightarrow \qquad c_0 = \sqrt{\frac{1}{\nabla^2 \cdot U}} \qquad \hat{H}(r) \cdot \Psi = E \cdot \hat{\Psi}(r)$$

$$\therefore\ \nabla^2 = \left(\frac{1}{s \cdot \Re_f}\right)^2 = 9.04561294 \cdot 10^{18} \left(m^{-1}\right)^2 \qquad \because\ \Re_f = R_\infty \cdot c_0$$

$$\therefore\ U = t_3^2 = \left(\frac{\lambda}{c_2}\right)^2 = 1.63274095 \cdot 10^{-36}\, s^2 \qquad \because\ \lambda = 2\pi \cdot r_1$$

$$\therefore\ c_2 = \sqrt{\frac{1}{\nabla^2 \cdot U}} = 2.60209026 \cdot 10^8\, ms^{-1} \tag{10}$$

If investigate the amplitude *J* of the electron and its speed to arc length *s* to the frequency of a lap around in the first orbital, then we get the electron speed if know the time t_3 of revolution.

$$\therefore\ r_d = \frac{4\pi \cdot r_1}{\sqrt{2} \cdot \Omega} = 1.14504668 \cdot 10^{-26}\, ms \qquad \Rightarrow \qquad J = \frac{4\pi \cdot r_1}{\Omega}$$

$$\therefore\ \frac{1}{c_0^2} = \varepsilon_0 \cdot u_0 = \nabla^2 \cdot U = \frac{m_e}{\Psi E} \qquad \Rightarrow \qquad \Psi E = \frac{m_e}{\varepsilon_0 \cdot u_0} = \frac{m_e}{\nabla^2 \cdot U} = m_e \cdot c_0^2 = \alpha_0^{-1} \cdot \left(\frac{h}{R_\infty \cdot s_0}\right) = \frac{2 \cdot e}{\pi \cdot u_0}$$

$$\therefore\ s_0 = \frac{e}{2\pi^2 \cdot \alpha_0 \cdot R_\infty} = 1.01746167 \cdot 10^{-25}\, ms$$

From the derivative above we have got the arc length *s* of one unit to the helix trajectory path.

$$\therefore\ c_2 = \frac{8 \cdot \alpha_0^4}{\sqrt{2} \cdot \pi^3 \cdot u_0^3} = 2.60209026 \cdot 10^8\, ms^{-1} \qquad \text{If: } \Delta\psi = \frac{\alpha_0^4}{\pi \cdot u_0} = 7.16914 \cdot 10^{-4}\, eV$$

This is the electron speed c_2. With definition; it's the velocity speed the electron has when it´s circulate around at first orbital in the Hydrogen atom, with only the electron alpha constant α.

The difference of the constant value *h*-bar and the electron amplitude *J* are the unit *Js* and *ms*.

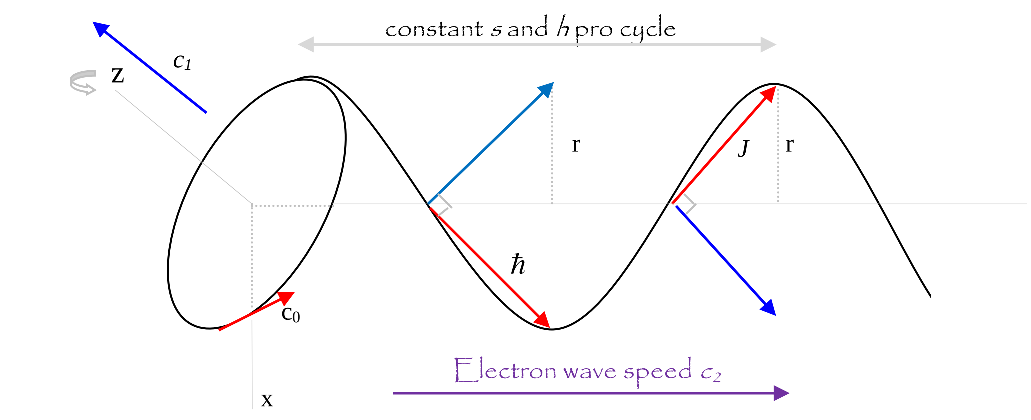


Figure 2.4:1

This diagram shows why the electron has wave behaviours, at same time it has particle mass. According to Maxwell's theory, electron that has revolution around its own axis (oscillations) should also send out electromagnetic waves, and electron should always have influence from both magnetic and electric powers. It's called "Zeemaneffect", and it proves the wave nature. According to older quantum theories, the velocity v_0 vector is perpendicular to the magnetic vector of *B*max, and also perpendicular to the electro *E*max vector. This conclusion makes that the velocity is equal the amplitude vector in calculations to classical quantum mechanics.

$$\therefore\ c_2 = \Delta\int_0^{2\pi}\sqrt{v_0^2+v_0^2}\,dv \qquad c_2 = 2\pi\cdot\sqrt{2}\cdot\Delta eV\cdot v_0 = 2.60209026\cdot10^{8}\,ms^{-1} \qquad \text{If: } \Delta = 13.47576884eV$$

$$\therefore\ c_2 = \frac{4\cdot h\cdot\Phi}{\sqrt{2}\cdot m_e\cdot J} \quad\Rightarrow\quad c_2 = \frac{4\pi\cdot h^2}{\sqrt{2}\cdot m_e\cdot e\cdot s_0} \qquad \therefore\ c_2 = \frac{h\cdot u_0^2}{\sqrt{2}\cdot m_p^2}$$

If the π-electron has its own value of delta energy eV at first orbital in Hydrogen, then it get the electron speed. Here it's shown that the classical velocity can be located in the amplitude.

$$\therefore\ \Re_f = \frac{\varepsilon_0\cdot c_2}{\sqrt{\pi^2+\pi^2}\cdot e} = \frac{\varepsilon_0\cdot c_2}{\sqrt{2}\cdot\pi\cdot e} = 3.267856244\cdot10^{15}\,Hz \qquad \therefore\ \Re_f = \frac{r_e}{J\cdot\alpha_0^2}$$

If the amplitude has value *pi* to the electron, then with charge, speed and permittivity it gives the frequency of one lap. This can declare why it's so familiar with the name of a π-electron.

$$\therefore\ \Re_f = \frac{c_0\cdot t_1}{s_0} = \frac{2.979320975\cdot10^{8}\,ms^{-1}\cdot1.11599874\cdot10^{-18}\,s}{1.01746167\cdot10^{-25}\,ms} = 3.267856244\cdot10^{15}\,Hz \qquad \therefore\ t_1 = 2\pi\cdot\alpha_0\cdot t_2$$

$$\therefore\ R = 2\pi\cdot r_1 = \Re_f\cdot s = t_1\cdot c_0 = 3.324918465\cdot10^{-10}\,m \qquad \therefore\ R\cdot R_\infty = \Re_f\cdot t_1$$

This is the distance *R* of one lap around the proton in the Hydrogen atom, for the π-electron. It's possibly to show that Plank´s *h*-bar and amplitude *J* are equivalent to energy and radius.

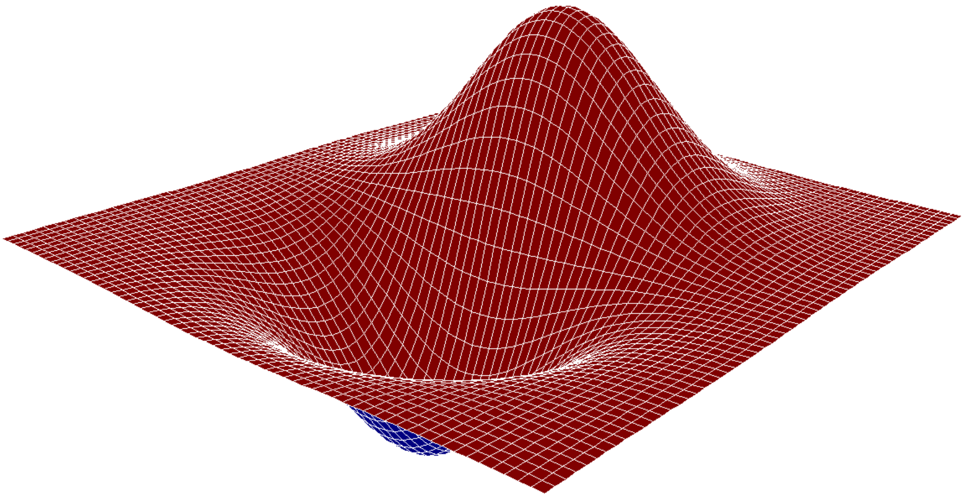
$$\therefore\ R = 4\pi^3\cdot\Delta eV\cdot\frac{J}{m_e\cdot c_0^2} = 3.267856244\cdot10^{-10}\,m \quad \text{and} \quad \therefore\ E_k = 4\pi^3\cdot\Delta eV\cdot\frac{\hbar}{m_e\cdot c_0^2} = 2.16522805\cdot10^{-18}\,J$$

$$\therefore\ c_2 = \frac{2\cdot E_k}{\pi^2\cdot m_p} = 2.60209026\cdot10^{8}\,ms^{-1} \quad\Rightarrow\quad E_k = -½\cdot\pi^2\cdot m_p\cdot c_2 \qquad \therefore\ E_k = \omega\cdot\frac{h}{4\pi} \qquad \text{If: } \omega = \frac{1}{t_2}$$

If the proton can have a negatively value, then we have the electron energy with a minus sign.

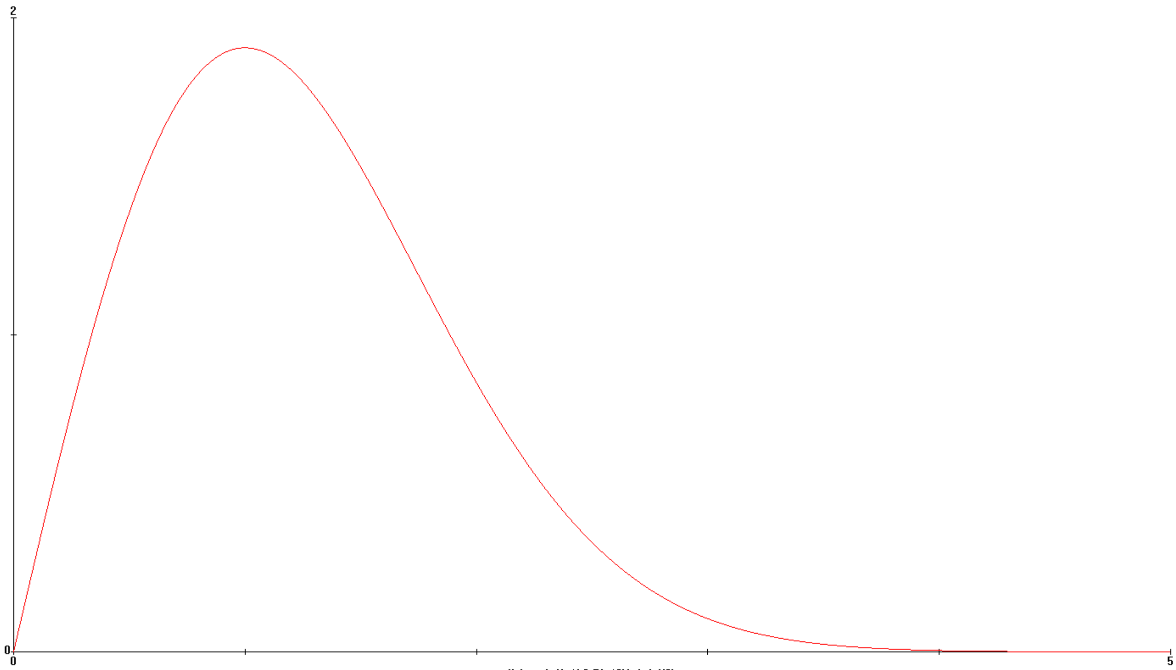
2.5 **The electron wave nature**

It is possibly in a wave function for the π-electron to show that it has only the value of ±1 eV.



f(x,y) = -x*pi*exp(-0.5*(x^2+y^2))*sin(pi/2)
x: -pi to pi, y: -pi to pi, Eye at (8, 7, 4)

This diagram show how the wave could look like at the atoms surface, with the proton in the potential cavity and the electron located where it’s zero to attraction vs. repulsion forces [17].



f(x) = x*pi*e^(-0.5*x^2)*sin(pi/2)

This diagram shows how the π-electron wave in nature could look like and without any roots.

$\therefore\ f(x,y) = -x \cdot \pi \cdot \exp\left[-½ \cdot \left(x^2 + y^2\right)\right] \cdot \sin\left(\frac{\pi}{2}\right)$ and $\therefore\ f(x) = x \cdot \pi \cdot e^{\left[-½ \cdot x^2\right]} \cdot \sin\left(\frac{\pi}{2}\right)$

Same formula in both diagrams and there are no roots if the wave are going into infinity right.

The improper Integral is important for the Ψ-wave function and also common in probability, its exact value could be found by using polar coordinate system which is common for particle in magnetic fields. Fundamental phenomenon arises when trying to solve the wave amplitude, without methods. This Integral will describe a Ψ-wave of π-electrons and its ψ-amplitude.

- $I = \int_{-\infty}^{\infty} e^{-x^2}\,dx$ and $I = \int_{-\infty}^{\infty} e^{-y^2}\,dy$ [10]

- $I^2 = \left(\int_{-\infty}^{\infty} e^{-x^2}\,dx\right)\cdot\left(\int_{-\infty}^{\infty} e^{-y^2}\,dy\right) = \iint_{R^2} e^{-\left(x^2+y^2\right)}dxdy$ [11]

Now switch from rectangular to polar coordinate. Then: $x^2 + y^2 = r^2$ and $dxdy = rdrd\theta$. Hence

- $I^2 = \int_0^{2\pi}\cdot\left(\int_0^{\infty} e^{-r^2}\,rdr\right)d\theta = \int_0^{\infty} 2\pi\cdot e^{-r^2}\,rdr = 2\pi\cdot\left(-\frac{1}{2}\cdot e^{-r^2}\right)\Bigg|_0^{\infty} = 2\pi\cdot\left(\frac{1}{2}\right) = \pi$

It follows from:

- $\Psi = \int_{-\infty}^{\infty} e^{-x^2}\,dx\cdot\int_{-\infty}^{\infty} e^{-y^2}\,dy = \iint_{R^2} e^{-\left(x^2+y^2\right)}dxdy = \pi$

- $\frac{\partial\Psi}{\partial x} = \frac{1}{\sin(x)}\iint_{R^2} x\cdot e^{-\frac{1}{2}\cdot\left(x^2+y^2\right)}dxdy = \sin\left(\frac{\pi}{2}\right)$

If integrate the improper integral, then it's possibly to get a simple sin π-wave in three space.

- $\Psi^2 = \left(\iint_{R^2} e^{-\left(x^2+y^2\right)}dxdy\right)\cdot\left(\iint_{R^2} e^{-\left(x^2+y^2\right)}dxdy\right) = \pi^2$

- $\Psi^2 = -x\cdot\pi\cdot\exp\left[-½\cdot\left(x^2+y^2\right)\right]\cdot\sin\left(\frac{\pi}{2}\right)$

The Ψ-function of *f(x ,y)* in three space can probably be explained with the improper integral. The value -½ in the exponential function has done with that Hydrogen has only one electron. The proof idea is here that the electron wave is an exponential function to a sin π-wave, with initial condition of the electron wave to a *pi*-electron in a *pi*-orbital, this make the sin π-wave.

The Laplacian operator in Schrödinger wave: $\nabla^2 = \nabla\bullet\nabla\psi$ is defined for scalar amplitude ψ

1. $\Psi = \nabla^2\psi = \nabla\bullet\nabla\psi = div\ grad\psi = \frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2}$

2. $\Psi = \iint_{R^2} e^{-\left(x^2+y^2\right)}dxdy \quad\Rightarrow\quad \Psi = \pi \qquad\therefore\quad \Psi^2\cdot\alpha_0^2 = \pi^2\cdot\alpha_0^2 = \Re_f\cdot e$

This is the value of atomic waves in electron orbital, and it gives us one standard *pi* -electron. Conclusion, the electrons wave behaviour makes that we have electron speed c_2, and the pi-electrons particle behaviour makes that we have $c_2\cdot\beta_1$ particle velocity v_0 =2.60202105E8 ms^{-1}.

3. The nature of energy in Hydrogen

Erwin Schrödinger (1887-1961). Austrian physicist who was director of Max Plack's institute in Berlin until 1940, when he become director for the institute of Advanced science study in Dublin until his retirement 1955. He published in 1926 theory of wave equation for electrons within the atom. The theory was equivalent to the theories of matrix mechanics published the previous year by the German physicist Werner Heisenberg (1901-1976). Both together their theories formed much of the foundation of modern quantum mechanics. Schrödinger shared the 1933 Noble Prize for physics with Paul Dirac. Heisenberg's *uncertainty principles* played an important role in the development of modern quantum physics. He was awarded the 1932 Noble Prize for physics, became director for Max Planck's institute of physics in Berlin 1941.

1) $$\Psi_k = \frac{h^2}{8\pi^2 \cdot m_e} \cdot \nabla^2 \qquad (11)$$

$$\therefore\ \Psi_k = \frac{m_e \cdot e^4}{8 \cdot \varepsilon_0^2 \cdot h^2} = 2.16522805 \cdot 10^{-18}\,J \qquad \text{If: } \nabla^2 = \left(\frac{1}{r_1}\right)^2 = \frac{\pi^2 \cdot m_e^2 \cdot e^4}{\varepsilon_0^2 \cdot h^4}$$

Her we have the modern version of the Schrödinger wave equation (11). If the operator with inverse square laws will correspond to Bohr's first radius formula (5), then it's possibly to find one version of Rydberg's energy constant. If investigate one new version to formula R_∞

$$\therefore\ R_\infty = \frac{\pi \cdot e^4}{2 \cdot \varepsilon_0 \cdot m_e \cdot c_0^3 \cdot h^2} = 10968459.83 m^{-1} \qquad (12)$$

$$\therefore\ E(\lambda) = \frac{\pi \cdot e^4}{2 \cdot \varepsilon_0 \cdot m_e \cdot c_0^2 \cdot h} = 2.16522805 \cdot 10^{-18}\,J \qquad (13)$$

$$\therefore\ \Re_f = \frac{\pi \cdot e^4}{2 \cdot \varepsilon_0 \cdot m_e \cdot c_0^2 \cdot h^2} = 3.26785624 \cdot 10^{15}\,Hz \qquad (14)$$

Here we have the same principles to find the energy of lambda (13) and its frequency (14) to Rydberg's energy formula (12). If now break out the energy formula (13) within the operator.

2) $$\Psi_k = \frac{\varepsilon_0 \cdot h^3}{2\pi \cdot m_e^3 \cdot c_0^2} \cdot \nabla^2 \qquad (15)$$

Where the operator are like in equation (11), if now take both (11) and (15) equal we will get:

$$\therefore\ \Psi_k = \frac{h^2}{8\pi^2 \cdot m_e} \cdot \nabla^2 = \frac{\varepsilon_0 \cdot h^3}{2\pi \cdot m_e^3 \cdot c_0^2} \cdot \nabla^2$$

$$\therefore\ \Psi E = m_e \cdot c_0^2 = \left(\frac{4\pi}{u_0} \cdot h\right)^{\frac{1}{2}} \quad \Rightarrow \quad \Psi\Delta E = \frac{m_e \cdot c_0^2}{e} = \frac{2}{\pi \cdot u_0} = 5.06605918 \cdot 10^5\,eV \qquad \text{If: } h = \frac{e^2}{\pi^3 \cdot u_0}$$

$$\therefore\ \Psi E = m_e \cdot c_0^2 = \left(\frac{4\pi}{u_0} \cdot h\right)^{\frac{1}{2}} = 8.13992401 \cdot 10^{-14}\,J = \left(\frac{4 \cdot e^2}{\pi^2 \cdot u_0^2}\right)^{\frac{1}{2}} = \frac{2 \cdot e}{\pi \cdot u_0} = \frac{E_h^2}{2 \cdot \Delta\psi} \quad \Rightarrow \quad E_k = \left(\frac{e \cdot \Delta\psi}{\pi \cdot u_0}\right)^{\frac{1}{2}}$$

The energy of the electron in relativistic action, gives kinetic energy from Schrödinger wave.

3.1 **Theory of undulatory dynamics**

E. Schrödinger (1887-1961) published 1926 in the Physics Review: "An undulatory theory of the mechanics of atoms and molecules". The Hamiltonian wave equation with a potential part and one kinetic part of energies the electron can have is Schrödinger's most famous equation.

$$\therefore\ \frac{\partial^2\Psi}{\partial x^2}+\frac{\partial^2\Psi}{\partial y^2}+\frac{\partial^2\Psi}{\partial z^2}+\frac{8\pi^2\cdot m_e}{h^2}\cdot\Delta E\psi\cdot\Delta\Psi=0 \qquad (16)$$

This is the wave equation in theory of undulatory dynamics. With the initial condition values:

$$\therefore\ \Delta\Psi-\frac{\Psi}{c_0^2}=0 \qquad \text{Hint: } -\frac{\Psi^2}{c_0^4}=\frac{\partial^2\Psi}{\partial x^2}+\frac{\partial^2\Psi}{\partial y^2}+\frac{\partial^2\Psi}{\partial z^2}$$

$$\therefore\ \Psi=-\frac{4\pi^2\cdot E_k^2}{h^2}=\frac{E_k^2}{\hbar^2} \qquad \text{Hint: } E_k=m_e\cdot c_0^2\cdot\left(\frac{1}{\beta_1^2}-1\right)$$

Here we have the initial condition to solve the wave equation, with kinetic energy and h -bar.

$$\therefore\ \Delta\Psi+8\pi^2\cdot m_e\cdot\Delta E\psi/h^2=0 \qquad \text{Hint: } \Delta E\psi=\tfrac{1}{2}\left(E_k-E_p\right)$$

$$\therefore\ H=\int\left(-\frac{E_k^2}{c_0^2\cdot\hbar^2}+\frac{2\cdot m_e\cdot\Delta E\psi}{\hbar^2}\right)dv=0 \qquad \hat{H}\cdot\Psi=E\cdot\hat{\Psi}$$

The Schrödinger undulatory wave equation and it will solve the kinetic energy for electrons.

$$\therefore\ \Delta E\psi=\frac{E_k^2}{2\cdot m_e\cdot c_0^2}=1.15190572\cdot10^{-22}\,J$$

$$\therefore\ c_0=\frac{\hbar\cdot\omega}{\left[2\cdot m_e\cdot\Delta E\psi\right]^{1/2}}=2.979320975\cdot10^{8}\,ms^{-1} \qquad \text{Hint: } \omega = \text{angular speed omega } \Omega$$

Here we have the kinetic energy for the electron to surface and its velocity the particle have when it travels between the lobes in atoms. It corresponds to speed of light c_0 for the electron.

$$\therefore\ v_0=\left[\frac{2\cdot\Delta E\psi}{m_e\cdot\alpha_0^2}\right]^{\frac{1}{2}}=2.173071\cdot10^{6}\,ms^{-1} \qquad \Leftrightarrow \qquad v_0=\left[\frac{E_k}{m_e}\right]^{\frac{1}{2}}$$

$$\therefore\ \lambda=\frac{h}{m_e\cdot v_0}=\frac{h\cdot\alpha_0}{\left[2\cdot m_e\cdot\Delta E\psi\right]^{1/2}} \qquad (17)$$

The two last formulas are changed from the original manuscript. The velocity formula above has been added with alpha α_0 in square and through that it gives exact the right velocity for the particle corresponding to the electron. To momentum (17) is alpha α_0 also added from the original manuscript If the electron has behavior like a particle when it circulate around in the first orbital r_1 with velocity v_0, then the same particle has wave behavior when it travels between the lobes of atoms, because through the wave equation the electron travels with the speed of light. This speed corresponds to the charge on the cylindrical surface of a helix path.

The wave equation that can explain the behavior of the electron, to the nature with a kinetic energy and potential energy part to every lambda, are named the Hamiltonian wave equation.

$$\therefore \quad \Psi H = \left[-\left(\sqrt{\frac{e \cdot \Delta\psi}{\pi \cdot u_0}} + \frac{2 \cdot h^2}{m_e \cdot \lambda^2} \cdot \nabla^2 \right) \cdot \sin\left(\frac{\pi}{2}\right) \right] \qquad \text{If: } \nabla^2 = \frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2}$$

3) $$E_k = -\left(\frac{h^2}{8\pi^2 \cdot m_e} \cdot \nabla^2 + U \right) \quad \Rightarrow \quad \text{If: } \nabla^2 = \left(\frac{4\pi}{\lambda}\right)^2 \text{ and } U = \left(\frac{e \cdot \Delta\psi}{\pi \cdot u_0}\right)^{\frac{1}{2}}$$

4) $$\frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2} + \frac{m_e \cdot \lambda^2}{2 \cdot h^2} \cdot (E - U)\Psi = 0 \qquad \text{If: } E_k = E,\ E_p = U$$

If put the operator into the Schrödinger wave equation, we get the new Ψ Hamiltonian wave. This wave equation has one kinetic energy part and one potential part to λ-lambda of interest.

$$\therefore \frac{\partial\Psi}{\partial x^2} + \frac{\partial\Psi}{\partial y^2} + \frac{\partial\Psi}{\partial z^2} + \frac{8\pi^2 \cdot m_e}{h^2} \cdot (E_k - E_p) \cdot \Delta\Psi = 0 \qquad \Psi = \psi(x,y,z) \cdot f(t) \qquad [18]$$

The original wave equation, where E_k is the total energy of the electron and E_p potential energy, and ψ is the oscillation of the amplitude of one dot to another dot in a trajectory path.

$$\therefore E_k = 2 \cdot h \cdot c_0 \cdot R_\infty = 4.330456093 \cdot 10^{-18} J \quad \text{and} \quad E_p = 2 \cdot h \cdot c_0 \cdot IP_H = 4.330225712 \cdot 10^{-18} J$$

$$\therefore \Delta\Psi - \frac{\Psi}{c_0^2} = 0 \quad \text{and} \quad -\frac{\Psi}{c_0^2} = \frac{\partial\Psi}{\partial x^2} + \frac{\partial\Psi}{\partial y^2} + \frac{\partial\Psi}{\partial z^2} \qquad [8]$$

$$\therefore \Psi = -\frac{4\pi^2 \cdot E_k^2}{h^2} \quad \text{and} \quad \Delta\Psi + 8\pi^2 \cdot m_e \cdot \Delta E\psi / h^2 = 0 \qquad [8]$$

The delta kinetic energy is: $\Delta E\psi = ½ \cdot E_h \cdot \alpha_0^2 = ½ \cdot (E_k - E_p) = h \cdot c_0 \cdot (R_\infty - IP_H) = 1.151905716 \cdot 10^{-22} J$

Thus: $$-\frac{4\pi^2 \cdot E_k^2}{c_0^2 \cdot h^2} + \frac{8\pi^2 \cdot m_e \cdot \Delta E\psi}{h^2} = 0 \quad \Rightarrow \quad E_k = (2 \cdot m_e \cdot c_0^2 \cdot \Delta E\psi)^{\frac{1}{2}} = 4.330456093 \cdot 10^{-18} J$$

$$u = \frac{E}{[2 \cdot m \cdot (E - V)]^{½}} \qquad \therefore \frac{1}{\nu} = \frac{\lambda}{u} \text{ and } \lambda = \frac{h}{[2 \cdot m_e \cdot \Delta E\psi]^{½}} \qquad [8]$$

This is the original velocity formula from Schrödinger him selves. He describes as velocity u between the lobes inside the atom and not a particle velocity v_0 for the electron at first orbital.

$$\therefore c_0 = \frac{E_k}{[2 \cdot m_e \cdot \Delta E\psi]^{½}} = 2.979320975 \cdot 10^8 ms^{-1} \qquad \Delta\psi = \frac{u_0 \cdot e^2}{4\pi \cdot m_e} = r_0 - r_1 = \frac{\alpha_0}{4\pi} \cdot \left(\frac{1}{IP_H} - \frac{1}{R_\infty}\right) = 2.18523 \cdot 10^{-15} m$$

This is the modern version c to the velocity u formula and they are approximately equivalent.

$$E_h = \left(m_e + \frac{E_k}{c_0^2}\right) \cdot c_0^2 - m_e \cdot c_0^2 = (m_e + m_\Delta) \cdot c_0^2 - m_e \cdot c_0^2 = m_e \cdot c_0^2 \cdot \left((\alpha_0^2 + 1) - 1\right) = 4.33045609 \cdot 10^{-18} J \qquad [7]$$

If a body takes up an amount of energy E_k, then its inertial mass increases to: $m_0 = m_e \cdot (\alpha_0^2 + 1)$

3.2 **Quantum matrix mechanics**

The angular speed ω of a moving particle is constant in a flux of constant magnetic field. The polar helix path is normally one typically trajectory of a charged particle in constant magnetic fields. Such a particle must satisfy Newton's law of acceleration, and the magnetic force law:

$$\therefore\ F = m \cdot a \qquad \Leftrightarrow \qquad F = (q \cdot v) \times B \qquad [10]$$

Hence, its velocity and acceleration vector must satisfy:

$$\therefore\ (q \cdot v) \times B = m \cdot a \qquad [10]$$

If a constant magnetic field is vertical to y-axis, then: $B = bk \ \Rightarrow\ r = a\cos t\ \vec{i} + a\sin t\ \vec{j} + bt\ \vec{k}$

The polar functions first derivative: $\omega = \frac{\partial r}{\partial t} = -a\sin t\ \vec{i} + a\cos t\ \vec{j} + b\ \vec{k}$

This curve spirals around the z-axis, rising with the electron spin as it turns on the cylinder δ:
Then the velocity matrix vector:

$$(q \cdot v) \times B = q \cdot \begin{vmatrix} i & j & k \\ -a \cdot \omega \cdot \sin(t) & a \cdot \omega \cdot \cos(t) & b \\ 0 & 0 & B \end{vmatrix} =$$

$$= q \cdot a \cdot \omega \cdot B \cdot \left(\vec{i}\cos(t) + \vec{j}\sin(t) \right)$$

The acceleration vector gives:

$$m \cdot a = -m \cdot a \cdot \omega \cdot \left(\vec{i}\cos(t) + \vec{j}\sin(t) \right)$$

When comparing the last two results above, the helix would go with the angular speed ω.

That is: $q \cdot a \cdot \omega \cdot B = -m \cdot a \cdot \omega^2$

Matrix mechanics gives: $\Omega = -B \cdot \frac{e}{m_e} = -4.10650927 \cdot 10^{16}\ s^{-1}$ Hint: Ω = ω

Here *q* stands for the electron charge *e* and *m* for the electron mass m_e. Thus, *B* stands for the atomic unit (a.u) of the magnetic flux density (*T*). If show the derivative of the kinetic energy:

$$\therefore\ E_k = \frac{\Omega}{\left(\frac{\pi}{\Phi \cdot e}\right)} = \frac{\Omega \cdot \Phi \cdot e}{\pi} = \Omega \cdot \hbar \qquad \Rightarrow \qquad E_k = \Omega \cdot \hbar \qquad \Omega = \frac{w}{m_\Delta \cdot c_0^2}$$

The angular speed omega Ω. The frequency to kinetic energies for electrons in one helix path with Planck's *h* bar and magnetic flux quantum Φ. The new energy constant Watt *w* is in J /s.

$$\therefore\ E_k = B \cdot \hbar \cdot \frac{e}{m_e} = \frac{\hbar^2}{m_e \cdot r_1^2} \qquad \text{If: } B = \frac{\hbar}{e \cdot r_1^2} = \frac{2 \cdot \varepsilon_0}{t_2 \cdot \pi}$$

$$\therefore\ E_k = \frac{e \cdot \alpha_0^2}{\pi \cdot u_0} = 4.33045609 \cdot 10^{-18}\ J \qquad \text{If: } h = \frac{e^2}{\pi^2 \cdot u_0}$$

The frequency of angular speed omega Ω and Watt *w* are two modern fundamental constants.

3.3 **The uncertainty principles**

Werner Karl Heisenberg (1901-1976). W. Heisenberg was associated professor in theoretical physics at Göttingen University (Germany), and W. Heisenberg has also in several doctoral papers delivered contribution and development to modern atomic physics. The uncertainty principles discovered from him, which stated that it's impossible to precisely specify position and the momentum of the electron simultaneously at the same time. W. Heisenberg received the Nobel Prize in Physics year 1932 "for the creation of quantum mechanics, the application which has equivalent, led to the discovery of the allotropic forms of Hydrogen". Modification of the wave equation was through Erwin Schrödinger possibly, and the wave equation where equivalent to the W. Heisenberg matrixes. If we assume that wave equation has final energy equivalent to the lambda energy formula, with wave to kinetic and potential energy part [13].

$$\therefore\; I_1 = \iiint \left[\frac{h^2}{8\pi^2 \cdot m_e} \cdot \left(\nabla^2 = \frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2} \right) \right] dxdydz \qquad [8]$$

$$\therefore\; I_2 = \iiint \Psi^2 dxdydz = 1 \qquad \text{If: } \nabla^2 \cdot U \cdot c_0^2 = 1$$

This is the original wave equation from Schrödinger him selves and the ψ -wave is harmonic.

$$\therefore\; ds^2 = c^2 dt^2 - dx^2 - dy^2 - dz^2 \qquad [7]$$

$$\therefore\; \nabla^2 = -dx^2 - dy^2 - dz^2 \qquad \text{If: } \nabla^2 \cdot t^2 \cdot c_0^2 = 1$$

This is the original wave equation from Einstein him selves and the wave is time *t* dependent.

$$\therefore\; \Psi H = -\Delta\psi + E_k$$

$$\therefore\; \Psi E_p = -h \cdot c_0 \cdot \left(R_\infty - IP_H \right) + ½ \cdot \pi^2 \cdot m_p \cdot c_2$$

$$\therefore\; E_p = -1.15184485 \cdot 10^{-22} J + 2.16522805 \cdot 10^{-18} J = 2.16511286 \cdot 10^{-18} J$$

This is the potential energy for the electron at moment the electron mass is at rest on surface.

$$\therefore\; U = t_1^2 = \left(1.1159987 \cdot 10^{-18} s\right)^2 = 1.2454532 \cdot 10^{-36} s^2$$

$$\therefore\; U = \frac{2\pi \cdot r_1 \cdot s_0 \cdot R_\infty}{c_0} = 1.2454532 \cdot 10^{-36} s^2$$

$$\therefore\; \nabla^2 = \left(\frac{1}{s_0 \cdot c_0 \cdot R_\infty} \right)^2 = 9.04561294 \cdot 10^{18} \left(m^{-1}\right)^2$$

$$c_0 = \sqrt{\frac{1}{\nabla^2 \cdot U}} = 2.97932098 \cdot 10^8 ms^{-1}$$

If switch over to surface energy IP_H

$$U = \frac{2\pi \cdot r_1 \cdot s_0 \cdot IP_H}{c_0} = 1.24538694 \cdot 10^{-36} s^2$$

$$\nabla^2 = \left(\frac{1}{s_0 \cdot c_0 \cdot IP_H} \right)^2 = 9.0465754 \cdot 10^{18} \left(m^{-1}\right)^2$$

$$c_1 = \sqrt{\frac{1}{\nabla^2 \cdot U}} = 2.97924173 \cdot 10^8 ms^{-1}$$

This is the light speed c_0 for the electric max and if switch over from R_∞ to IP_H then it will be a corresponding speed to $c = c_0 \cdot \beta_1$, however time *t* in square correspond to the wave potential.

If take another value into the wave potential, but the same operator in the previous examples.

$$\therefore\ U = \left(\frac{\pi^2 \cdot m_p \cdot s_0}{2 \cdot h} \right)^2 = 1.63274095 \cdot 10^{-36}\, s^2 \qquad \nabla^2 = \left(\frac{1}{s_0 \cdot c_0 \cdot R_\infty} \right)^2 = 9.04561294 \cdot 10^{18} \left(m^{-1} \right)^2$$

$$c_2 = \sqrt{\frac{1}{\nabla^2 \cdot U}} = 2.60209026 \cdot 10^8\, ms^{-1}$$

With this value of the wave potential, we have got the electron speed c_2, the speed at orbital.

$$\therefore\ \nabla^2 = \left(\frac{1}{s_0 \cdot c_0 \cdot IP_H} \right)^2 = 9.04657542 \cdot 10^{18} \left(m^{-1} \right)^2 \qquad c_0 = \sqrt[3]{\frac{c_2}{\sqrt{2} \cdot \pi \cdot u_0 \cdot e \cdot \Re_\infty}}$$

$$\therefore\ U = \left(\frac{4\pi \cdot h^2 \cdot IP_H}{\sqrt{2} \cdot m_e \cdot e \cdot c_2} \right)^2 = 1.24532069 \cdot 10^{-36}\, s^2$$

$$c_0 = \sqrt{\frac{1}{\nabla^2 \cdot U}} \quad \Rightarrow \quad \nabla^2 = \left(\frac{\lambda}{s_0 \cdot c_0} \right)^2 \quad \text{and} \quad U = \left(\frac{4\pi \cdot h^2}{\sqrt{2} \cdot m_e \cdot e \cdot c_2 \cdot \lambda} \right)^2$$

Here we get the light speed c_0 for the electric max and the formula is true for every lambda λ. In 1941 W. Heisenberg became director of the Kaiser Wilhelm Institute for physics in Berlin, later named Max Planck´s Institute for physics in 1946. He was one of the world´s foremost theoretical physicists in modern theory of atomic structure through the uncertainty principles.

$$\therefore\ \Delta p \cdot \Delta x \geq \frac{h}{4\pi} \quad \Leftrightarrow \quad \Delta E \cdot \Delta t \geq \frac{h}{4\pi} \qquad [19]$$

Implying that smallest quanta value of action could not one be measured precisely, the other must get more uncertain. It will be impossibly to specify both the momentum and location at the same time exactly. Similar will it be for both the kinetic electron energy, and time of path.

$$\therefore\ \Delta E_k \left(2.16522805^{-18}\, J \right) \cdot \Delta t_2 \left(2.43515827 \cdot 10^{-17}\, s \right) \geq \frac{h}{4\pi} \left(5.27267298 \cdot 10^{-35}\, Js \right) \qquad \therefore\ \Omega \cdot t_2 = 1$$

Here are the smallest action quanta in modern quantum mechanics. Probably it has to do with ½ S-orbital at ground level at the first orbital in the Hydrogen atom, because action ½ · h-bar.

$$\therefore\ \Omega = \frac{\hbar}{m_e \cdot r_1^2} = 4.10650927 \cdot 10^{16}\, s^{-1} \qquad \therefore\ \alpha_0^2 = \Omega \cdot t_0$$

This is the angular speed omega and this frequency is going in a trajectory path for a charged particle in electromagnetic fields. If take this Ω formula to the quanta stated from Heisenberg.

$$\therefore\ \Psi E_k = \frac{\hbar}{m_e \cdot r_1^2} \cdot \frac{h}{4\pi} \quad \Leftrightarrow \quad \Psi E_k = \frac{h^2}{8\pi^2 \cdot m_e} \cdot \nabla^2 \qquad \text{If: } \nabla^2 = \left(\frac{1}{r_1} \right)^2$$

If take the smallest allowed action quanta into the speed omega, then we have got the energy.

3.4 **Hydrogen levels and Ionization potential**

The Coulomb interaction between the nucleus and the electron is dominant, so that it caused a magnetic moment. The largest energies of separation for a single electron from the proton are associated with that Hydrogen levels having different levels of *n*, corresponding to integer. [11]

$$\therefore \; ½E_p = \frac{(n^2-1)\cdot R_\infty \cdot h \cdot c_0}{n^2} \quad \text{and} \quad ½E_k = \frac{(n^2-1)\cdot R_\infty \cdot h \cdot c_0}{n^2 \cdot \beta_1^2} \qquad \text{Hint: } n = 2, 3, 4\ldots$$

These expressions give the energy of lambda λ, corresponding to energy level *n* in Hydrogen.

$$½E_p = \frac{(n^2-1)\cdot R_\infty \cdot h \cdot c_0}{n^2} = 2.16511286\cdot 10^{-18}\,J \qquad ½E_k = \frac{(n^2-1)\cdot R_\infty \cdot h \cdot c_0}{n^2 \cdot \beta_1^2} = 2.16522804\cdot 10^{-18}\,J \qquad n = 137$$

If the inverse of alpha will be used, then it’s possibly to get potential and kinetic energy of H.

$$\therefore \; E\psi = R_\infty \cdot h \cdot c_0 \cdot \left(-\frac{(n^2-1)}{n^2\cdot\beta_1^2} + \frac{(n^2-1)}{n^2} \right) = -1.1519\cdot 10^{-22}\,J \qquad \text{Hint: } n = 2, 3, 4\ldots \text{ and If: } n = 137$$

This expression gives the kinetic energy the electron needs for transition between lobes of *n*. If alpha inverse will be used, then it’s possibly to get the kinetic energy the electron needs for transition between lobes and the relativistic action is changed for the electron, so that the supply energy is converted to delta electron mass. When the electrons gets its critical mass caused from the magnetic moment, it probably left electromagnetic radiation correspond to the path of travel distance between the lobes of level *n* in the atoms, its distance radius *Rmax*.

$$1)\quad E_n = -\frac{(n^2-1)\cdot E_k}{n^2} \quad \text{and} \quad 2)\quad \Re_f = \frac{\pi^2 \cdot m_p \cdot c_2}{2\cdot h} \qquad E_k = \Re_f \cdot h$$

$$(2 \text{ in } 1)\qquad E_n = -\frac{\pi^2 \cdot m_p \cdot c_2 \cdot (n^2-1)}{2\cdot n^2} \qquad \text{Hint: } n = 2, 3, 4\ldots$$

To find energy levels n corresponding to the electron in Hydrogen, when it gives off electro-magnetic light, we could then expect that the electron’s wave function obey certain boundary conditions and hence have quantized energy levels. Allowed energy levels are then as follow:

$$\therefore \; R_\infty = \frac{m_e \cdot c_0}{2\cdot h} \cdot \left(\frac{1}{\beta_1^2} - 1 \right) = 10968459.83 m^{-1} \qquad \text{If: } \frac{m_e \cdot c_0}{2\cdot h} = \frac{\pi^2}{e\cdot c_0} \quad \Rightarrow \quad E_{tot} = m_e \cdot c_0^2 = \frac{2\pi^2\cdot h}{e}$$

$$\therefore \; IP_H = \frac{m_e \cdot c_0}{2\cdot h} \cdot (1-\beta_1^2) = 10967876.34 m^{-1} \qquad \frac{1}{\lambda} = \frac{(n^2-1)\cdot IP_H}{n^2} \quad \Leftrightarrow \quad \frac{1}{\lambda} = IP_H - \left(\frac{IP_H}{n^2} \right)$$

Here we have the two formulas which gives the Rydberg’s constant of energy, the energy the electron has at first orbital r_1, because in relativistic action. If the electron are at surface, then the Ionization Potential IP_H. So, if have one correct Ionization Potential energy in m^{-1}, then it’s easy to get every lambda to energy level *n* in Lymann series of Hydrogen atom. The lowest energy state is called the ground state, here is the principal quantum number *n* equal to one. In the formula above it will give zero energy, because no photon γ are involved when the electron circulates around the proton. It has to do with repulsion vs. attraction for the electron when it’s without energy from outside. The energy needed to remove the electron from its ground state is often called the Ionization Energy. Here the principal quantum number *n* is zero or as it going to infinity, the formula holds for every energy level.

3.5 **Lymann series in Hydrogen**
It's possibly to show the potential levels *n* of energy in the Lymann-series of Hydrogen atom.

$$\therefore\ \Psi E_p = ½ \cdot m_e \cdot c_0^2 \cdot \left(-\frac{(n^2-1)}{n^2 \cdot \beta_1^2} + \frac{(n^2-1)}{n^2} \right)$$ Hint: $n = 2.3.4....$

This formula gives the potential energy at level *n* in Hydrogen to energy of the electron mass.

$$\therefore\ \Psi E_p(eV) = \frac{1}{\pi \cdot u_0} \cdot \left(-\frac{(n^2-1)}{n^2 \cdot \beta_1^2} + \frac{(n^2-1)}{n^2} \right)$$ Hint: $n = 2.3.4....$

This expression gives the potential energy electron volt at level *n* and with *n* infinity or value alpha inverse it gives the value $\psi = 13.47505193 eV$ (exact!). In this formula are no fundamental constants used, only the constant beta β in square, and a mathematically expression to level *n*.

$$\therefore\ \Psi E_k(eV) = \frac{\alpha_0^2}{\pi \cdot u_0} = 13.47576884 eV \qquad \therefore\ \Psi E_k = \left(R_\infty - \left(\frac{R_\infty}{n^2} \right) \right) \cdot h \cdot c_0 \qquad \therefore\ n = 2.3.4....$$

$$\therefore \Psi E_k(eV) = \frac{1}{\pi \cdot u_0} \cdot \left(\frac{1}{\beta_1^2} - 1 \right) \quad \Rightarrow \quad \Psi E_p(eV) = \frac{1}{\pi \cdot u_0} \cdot \left(1 - \beta_1^2 \right)$$

These expressions show the exact values of kinetic end potential energies in Hydrogen atom and that only with the new beta β constant in square and alternative formula to kinetic energy:

$$\therefore\ \Delta E \psi = \frac{1}{\pi \cdot u_0} \cdot \left(-\left(\frac{1}{\beta_1^2} - 1 \right) + \left(1 - \beta_1^2 \right) \right) = 7.16913638 \cdot 10^{-4} eV \quad \Leftrightarrow \quad \Delta \psi = \frac{1}{\pi \cdot u_0} \cdot \alpha_0^2 \cdot \left(1 - \beta_1^2 \right)$$

This expression shows the kinetic energy corresponding to the energy of mass changes of the electron, when goes from relativistic action on first orbital up to the Hydrogen atom surfaces.

$$\therefore\ H\Psi = \frac{h^2}{8\pi^2 \cdot m_e} \cdot \nabla^2 + ½ \cdot m_e \cdot c_0^2 \cdot \left(-\frac{(n^2-1)}{n^2 \cdot \beta_1^2} + \frac{(n^2-1)}{n^2} \right)$$ Hint: $\nabla^2 = \left(\frac{4\pi}{\lambda \cdot \beta_1^2} \right)^2$

This expression shows the Hamiltonian for Lymann series in Hydrogen with energy level *n*. Where *n* are integers corresponding to level $n = 2.3.4...$ The Hamiltonian wave expression has one kinetic part, the Schrödinger equation with corresponding lambda, and one potential part.

$$\therefore\ \Delta E \psi = -\frac{h^2}{8\pi^2 \cdot m_e} \cdot \nabla^2 = -1.15190572 \cdot 10^{-22} J$$ If: $\lambda_n = \frac{n^2}{(n^2-1) \cdot IP_H}$

Here we have Schrödinger's wave expression for the electron and it gives the kinetic energy.

$$\therefore\ H\Psi = -\frac{h^2}{8\pi^2 \cdot m_e} \cdot \nabla^2 + ½ \cdot m_0 \cdot c_0^2 \cdot \left(-\frac{(n^2-1)}{n^2 \cdot \beta_1^2} + \frac{(n^2-1)}{n^2} \right)$$ Hint: $m_0 = m_e \cdot (\alpha_0^2 + 1)$

The Hamiltonian wave shows potential energies to electron mass m_0 at the Hydrogen surface.

3.6 **Potential and kinetic energies**

There is some energy formula that works from reference material [6]. If assume the electron:

$$\therefore\ E(r)=\frac{1}{4\pi\cdot\varepsilon_0}\cdot\frac{(-e)\cdot(e)}{r}=-\frac{e^2}{4\pi\cdot\varepsilon_0\cdot r} \qquad \Rightarrow \qquad \Psi E(r_e)=\frac{e^2}{4\pi\cdot\varepsilon_0\cdot r_e}=m_e\cdot c_0^2=8.13993401\cdot10^{-14}\,J$$

Here we have both the charges from proton and electron, and the inverse square laws of flux through a closed surface of field lines. The electric permittivity ε_0 and radius r gives energies.

$$\therefore\ E_k=\frac{e^2}{4\pi\cdot\varepsilon_0\cdot r_1}=4.33045609\cdot10^{-18}\,J \qquad \text{If: } r_1=\frac{\alpha_0}{4\pi\cdot R_\infty}\ \text{(first orbital)}$$

$$\therefore\ E_p=\frac{e^2}{4\pi\cdot\varepsilon_0\cdot r_0}=4.33022572\cdot10^{-18}\,J \qquad \text{If: } r_0=\frac{\alpha_0}{4\pi\cdot IP_H}\ \text{(surface)}$$

Here we have kinetic respectively potential energies in Hydrogen, which gives from radius to first orbital, respectively radius to surface and difference of energies are the relativistic mass of delta kinetic energy. The difference between mass at rest, and its relativistic electron mass. The differences between relativistic and none relativistic action are beta β constant in square, which can correspond to a dot of energy on surface or a dot of energy on first orbital motion.

$$\therefore\ \Psi E=\frac{h^2}{8\pi^2\cdot m_e}\nabla^2=½\cdot\hbar\cdot\omega \qquad \text{If: } \nabla^2=\left(\frac{1}{r_1}\right)^2=\left(\frac{m_e\cdot\omega}{\hbar}\right)$$

$$\therefore\ \Psi E=½\cdot\hbar\cdot\omega=2.16522805\cdot10^{-18}\,J$$

The energy needed to put off the electron when it's circulated around at first orbital level n_1.

$$\therefore t_2=\frac{E_k}{w}=\frac{4.33045609\cdot10^{-18}\,J}{0.177830581Js^{-1}}=2.43515827\cdot10^{-17}\,s \qquad t_2=J\cdot R_\infty\cdot\alpha_0^{-1}$$

Here we have the atomic unit time t_1 if take the kinetic energy through the old unit of watt w.

$$\therefore\ \Delta E\psi=h\cdot c_0\cdot(R_\infty-IP_H)=1.15190572\cdot10^{-22}\,J$$

The hyperfine ground-state transition frequency in Hydrogen atom is proportional to $\Re_f\cdot\alpha_0^2$.

$$\therefore\ \Delta E\Psi=-\frac{E_k^2}{m_e\cdot c_0^2} \qquad \left\{\left[E_k=\frac{u_0\cdot e^2}{\sqrt{2}\cdot2\pi\cdot m_p}=2.16522805\cdot10^{-18}\,J\right]\right\} \qquad (18)$$

$$\therefore\ \Delta E\Psi=-E_k+E_p=-m_e\cdot c_0^2\cdot\left(\frac{1}{\beta_1^2}-1\right)+m_e\cdot c_0^2\cdot(1-\beta_1^2)=-2.030381143\cdot10^{-22}\,J$$

$$\therefore\ \frac{1}{R_\infty}=\frac{2\cdot h}{\sqrt{m_e\cdot\Delta E\Psi}}=9.1170503\cdot10^{-8}\,m \qquad R_\infty=\sqrt{\frac{\alpha_0}{4\pi\cdot J\cdot c_0}}$$

Here E_k is the Hartree kinetic energy and E_p is the Hartree potential energy in the Hydrogen.

Through the hyperfine ground-state transition frequency in Hydrogen atom, it's possibly to show that alpha α_0 only can have one formula of origin, with the constant of beta β in square.

$$\therefore\ \Delta V_H = R_\infty \cdot c_0 \cdot \alpha_0^2 = \left(R_\infty - IP_H\right)\cdot c_0 \cdot \frac{1}{\beta_1^2} = R_{\infty\cdot} \cdot c_0 \cdot \left(\frac{1}{\beta_1^2} - 1\right) = 1.73850615\cdot 10^{11}\, Hz$$

$$\therefore\ \alpha_0^2 = \frac{\left(R_\infty - IP_H\right)}{R_\infty}\cdot\frac{1}{\beta_1^2} \qquad \Rightarrow \qquad \alpha_0 = \sqrt{\frac{1}{\beta_1^2} - 1} \qquad \text{Hint: } IP_H = R_\infty \cdot \beta_1^2$$

ΔV_H is here the frequency of transition corresponding to the ground-state of Hydrogen atom. The frequency is proportional to the expression $\alpha_0^2 \cdot R_\infty \cdot c_0$ and in principle a value of alpha α_0 can be obtained be equating an experimental value of the hyperfine transition frequency to its calculated theoretical expression (Codata 2006). Here it's possibly to show that: $\gamma = 1.0000532$

$$\therefore\ \Delta E\psi = ½\cdot E_k \cdot \alpha_0^2 = ½\cdot\left(E_k - E_p\right)\cdot\frac{1}{\beta_1^2} = ½\cdot E_k \cdot\left(\frac{1}{\beta_1^2} - 1\right) = 1.15190572\cdot 10^{-22}\, J$$

$$\therefore\ \alpha_0^2 = \frac{\left(E_k - E_P\right)}{E_K}\cdot\frac{1}{\beta_1^2} \qquad \Rightarrow \qquad \alpha_0 = \sqrt{\frac{1}{\beta_1^2} - 1} \qquad \text{Hint: } E_P = E_K \cdot \beta_1^2$$

$\Delta E\psi$ is here the real kinetic energy that's need to be applied into the system of Ionization energy in Hydrogen. If remove the kinetic energy above through relativistic action, it gives the energy between delta of first orbital and surface of neutral Hydrogen atom. Conclusion will be that the transition state at ground level is equal delta between first orbital and surface.

$$\therefore\ r_e = r_1 \cdot \alpha_0^2 = r_0 - r_1 = 2.81523349\cdot 10^{-15}\, Hz \qquad \text{Hint: } r_e = r_0 \cdot \left(1 - \beta_1^2\right)$$

$$\therefore\ \alpha_0 = \sqrt{\frac{r_0}{r_1} - 1} \quad \text{and} \quad r_1 = r_0 \cdot \beta_1^2 \qquad \Rightarrow \qquad \alpha_0 = \sqrt{\gamma - 1} \qquad \text{Hint: } \gamma = \frac{1}{\beta_1^2} = 1.0000532$$

The delta between the space of r_1 and r_0, or the length to first orbital r_1 and the length up to surface r_0 correspond to the relativistic length of the electron radius when circulates at orbital.

$$\therefore\ \Delta E\psi = \frac{2\cdot h^2 \cdot R_\infty^2}{m_e} = ½\cdot m_e \cdot c_0^2 \cdot \alpha_0^2 = 1.15190572\cdot 10^{-22}\, J$$

$$\therefore\ \alpha_0 = \sqrt{\frac{2\cdot h \cdot R_\infty}{m_e \cdot c_0}} = \sqrt{\frac{1}{\beta_1^2} - 1} \qquad \Rightarrow \qquad R_\infty = \frac{m_e \cdot c_0}{2\cdot h}\cdot\left(\gamma - 1\right) = 1.09684598\cdot 10^{7}\, m^{-1} \qquad \text{Hint: } \gamma = \frac{1}{\beta_1^2}$$

This energy is necessary to supply if wanted to remove the electron from the system, because mass will increase if none relativistic m_0 mass at surface which gives the Ionization potential.

$$\therefore\ \Psi E = \beta^2 \cdot\left(\left(\frac{m_\Delta \cdot c_0^2}{2}\right) + \left(\frac{m_\Delta \cdot v_0^2}{2}\right)\right) = 2.16522805\cdot 10^{-18}\, J \qquad \text{Hint: } m_\Delta = m_e \cdot \alpha_0^2 = \frac{E_K}{c_0^2}$$

The relativistic kinetic energy corresponds to the derivative $\partial v + \partial u$ for system of the electron.

3.7 **Formula One of Energy**
There are one energy formulas over all the other energy formula for the electron in Hydrogen.

$$\therefore\ \Psi E = m_e \cdot c_0^2 \qquad [7]$$

Formula from early quantum mechanics, from Einstein and it gives the energy of the electron.

$$\therefore\ c_0 = \frac{E_k}{\sqrt{2 \cdot m_e \cdot \Delta\psi}} \qquad [8]$$

Formula from early quantum mechanics from Schrödinger, and it gives the velocity between the lobes in Atoms. There exists some theory that it's also the light speed the formula shows.

If put these formulas equal, then:

$$\therefore\ \Psi E = \frac{E_k^2}{2 \cdot \Delta\psi} = m_e \cdot c_0^2 = \frac{2 \cdot e}{\pi \cdot u_0} \quad \text{and} \quad \frac{1}{R_\infty} = \frac{2 \cdot h}{\sqrt{2 \cdot m_e \cdot \Delta\psi}} \quad \Rightarrow \quad \Delta\psi = \frac{2 \cdot h^2 \cdot R_\infty^2}{m_e}$$

Here the "formula one" combination of energy in this essay of; Modern Quantum Mechanics.

1. $\Psi E = \frac{E_k^2}{2 \cdot \Delta\psi} = m_e \cdot c_0^2 = \frac{2 \cdot e}{\pi \cdot u_0} \quad \Rightarrow \quad \varepsilon_0 = \frac{\pi \cdot m_e}{2 \cdot e} \quad \Delta\psi = \frac{e \cdot \alpha^4}{\pi \cdot u_0}$

2. $\Psi E = \frac{E_k^2}{2 \cdot \Delta\psi} = m_e \cdot c_0^2 = \frac{2 \cdot e}{\pi \cdot u_0} \quad \Rightarrow \quad c_0 = \sqrt{\frac{2 \cdot e}{\pi \cdot u_0 \cdot m_e}}$

3. $\Psi E = \frac{E_k^2}{2 \cdot \Delta\psi} = m_e \cdot c_0^2 = \frac{2 \cdot e}{\pi \cdot u_0} \quad \Rightarrow \quad \frac{E_k}{2} = \sqrt{\frac{e \cdot \Delta\psi}{\pi \cdot u_0}}$

Here the three main formulas that it's possibly to get out from the formula one combination.

- $E = \sqrt{\frac{e \cdot \Delta\psi}{\pi \cdot u_0}} = 2.165228 \cdot 10^{-18}\, J$ If: $\Delta\psi = 1.15190572 \cdot 10^{-22}\, J$

These are probably the most exact energy formula that is possibly to get out from this essay corresponding to nature science. The electron speed formula, if put the electron radius equal.

1. $r_1 = \sqrt{\frac{\Delta 1eV \cdot r_e}{\pi \cdot u_0}} \qquad \therefore\ c_2 = \frac{8 \cdot \Delta\psi eV}{\sqrt{2} \cdot \pi^2 \cdot u_0^2}$

2. $\Delta 1eV = \frac{2 \cdot h}{\sqrt{2} \cdot m_e \cdot c_2} = 3.92687954 \cdot 10^{-12}\, m$ and $r_e = \frac{u_0 \cdot e^2}{4\pi \cdot m_e} = 2.81523349 \cdot 10^{-15}\, m$

(2 in 1)

$$\therefore\ r_1 = \sqrt{\frac{\Delta 1eV \cdot r_e}{\pi \cdot u_0}} = 5.29177209 \cdot 10^{-11}\, m \qquad E_h = \frac{2 \cdot e \cdot \alpha_0^2}{\pi \cdot u_0} = 4.33045609 \cdot 10^{-18}\, J$$

This formula gives the radius of the first orbital, if known the electron radius and value of eV.

The Hamiltonian wave equation with a potential and a kinetic energy part looks like follows.

$$\therefore \frac{\partial^2\Psi}{\partial\cdot x^2}+\frac{\partial^2\Psi}{\partial\cdot y^2}+\frac{\partial^2\Psi}{\partial\cdot z^2}+\frac{m_e\cdot\lambda^2}{2\cdot h^2}\cdot\Delta\psi=0 \qquad \text{Hint:} \qquad \Psi E_k=\frac{h\cdot c_0}{\lambda}+\frac{2\cdot h^2}{m_e\cdot\lambda^2}$$

This is the new "Formula one" equation for lambda energies, causes from the electromagnetic radiation from electron at the quantization level of energies in Hydrogen, Helium and Argon. The second derivative shows that the electron is going in a trajectory part, between the lobes.

$$\therefore E_k=-\sqrt{\frac{e\cdot\Delta\psi}{\pi\cdot u_0}}-\Delta\psi=\frac{2\cdot h^2}{m_e\cdot\lambda^2} \tag{19}$$

$$\therefore E_k=-\left(\sqrt{\frac{e\cdot\Delta\psi}{\pi\cdot u_0}}+\Delta\psi=\frac{2\cdot h^2}{m_e\cdot\lambda^2}\right) \qquad \therefore E_k=\frac{2\cdot\Delta\psi\cdot m_e}{\pi^5\cdot u_0^2\cdot e}$$

Because there are a minus sign in equation (19) to kinetic energies, the Hamiltonian will be 0. It indicates at the same time that lambda energy is rotated around the electron in a trajectory.

$$\therefore \Delta\psi=\frac{2\cdot h^2}{m_e\cdot\left(9.11753533\cdot10^{-8}\right)^2}=1.15178316\cdot10^{-22}\,J \qquad \text{If: } \lambda=\frac{1}{IP_H}=9.11753533\cdot10^{-8}\,m$$

$$\therefore E_p=\sqrt{\frac{e\cdot\Delta\psi}{\pi\cdot u_0}}2.16511286\cdot10^{-18}\,J \qquad \Rightarrow \qquad E_p=13.47505196eV$$

This is the potential part of the new Hamiltonian wave equation. That will say the energy the electron gives off into an electromagnetic radiation lambda, on the Hydrogen atoms surfaces. When the electron is at Hydrogen surface, it gives off the electromagnetic energy named IP_H.

$$\therefore E_k=-\left(\sqrt{\frac{e\cdot\Delta\psi}{\pi\cdot u_0}}+\Delta\psi=\frac{2\cdot h^2}{m_e\cdot\lambda^2}\right)=-\left(2.16511286\cdot10^{-18}\,J+1.15178316\cdot10^{-22}\,J\right)=-2.16522804\cdot10^{-18}\,J$$

$$\therefore E_k=-2.16522804\cdot10^{-18}\,J \qquad \Rightarrow \qquad E_k=-13.47576884eV$$

This is the kinetic energy needed to remove the electron from its first orbital into the surfaces.

$$\therefore E\Psi=-\frac{h^2}{8\pi^2\cdot m_e}\cdot\nabla^2 \qquad \text{If: } div\nabla=\frac{4\pi}{\lambda}$$

$$\therefore \Delta E\Psi=-\frac{2\cdot h^2}{m_e\cdot\lambda^2}\cdot\nabla^2 \qquad \text{If: } \nabla^2=\frac{\partial^2\Psi}{\partial\cdot x^2}+\frac{\partial^2\Psi}{\partial\cdot y^2}+\frac{\partial^2\Psi}{\partial\cdot z^2}$$

If put the operator into the Schrödinger wave equation, we get the new energy Formula One.

$$\therefore H=\iiint_R\left(divE-\frac{\delta}{\varepsilon_0}\right)dv=0 \qquad \textit{because } divE=div\nabla\Phi=\nabla^2\Phi \textit{ and } \nabla^2\Phi=\frac{\delta}{\varepsilon_0}$$

Here it's shown that the operator in the Hamiltonian wave equation is harmonic, since *R* is an arbitrary region in space, which are a divergence theorem of surface integral from Gauss law.

4. Elementary particles

According to the relativistic quantum field theory, matter consists of particles called fermions [half-odd integral spin], and forces are mediated by the interaction or the exchange of other particles called bosons [whole integral spin]. In the standard model, the basic fermions come in three families, with each family made up of certain quarks and leptons (electrons), and each of these particles has an antiparticle according to P. Dirac's equation. The first family of the standard model consists of low-mass quarks and leptons, which consist of the up↑ and down↓ quarks, and the electron and its neutrino (positron). Quarks interact with each other and other particles through the strong forces, and the leptons interact with other particles through the weak forces, the electromagnetic force and the gravitational force. The quarks are binding into simple triplets to form neutrons [↓↑↓] and protons [↑↓↑], which bind together to form nuclei, which binds together to electrons to form atoms and molecules. The proton has an intrinsic angular momentum (spin), and thus a magnetic flux moment. The antiproton, the antiparticle of the proton, is also called a negatively proton. It differs from the proton when cancelled out with the electron to having a negative charge. The antiproton is stable in vacuum and does not decay spontaneously. When antiproton collides in particle accelerators with neutron, the two particles are transformed into mesons; positively and negatively pions.

Paul A.M. Dirac (1902-1984). He was professor in mathematics at University of Cambridge from 1933 to 1968. He shared the Noble Prize in Physics 1933 with E. Schrödinger: "for the discovery of new productive forms of atomic theory". He could early shown that the work of E. Schrödinger and W. Heisenberg where equivalent. He stated one hypothesis 1928 through theoretical studies that all matter in system of the atoms building stones has opposite charged antimatter. He wrote the essay: "Principles of Quantum Mechanics" (1930), which predicted the existence of the positron, or the anti-electron with same fundamental mass and spin (½) like the electron, but with an opposite positively charged mass. Dirac's theory of the positron was confirmed in 1932 through physical experiment from American physicist Carl Anderson.

$$\therefore\ m_p \cdot \underbrace{\pi^2 \cdot \sqrt{\pi^2 + \pi^2}}_{\text{quarks}} \cdot e^2 \cdot \Phi_0 = m_e \cdot \pi \cdot e^2 \cdot r_1$$

Hidekei Yukawa (1907-1981). He received the Nobel Prize in Physics the year 1949 "for his prediction of the existence of mesons on the basis of theoretical work on the nuclear forces". The Japanese physics predicted in year 1935 that pion's exist, but they were not discovered until 1947. The pion comes in three variables, namely one that is positively charged (π^+), the negatively charged antiparticle (π^-) with the same mass, and the neutral pion (π^0), which has its own antiparticle. The charged pion's are unstable without an interaction in the proton to have lifetime of about 2.6030 ± 0.0024·10^{-8}s [3]. The decay of a charged pion almost always produces muons, with relative mass m=139.5675 ± 0.0004 MeV [3]. Charged pions has value

$$\Upsilon \qquad \pi^- = \mu^- + \overline{v_\mu}$$

$$\Upsilon \qquad \pi^+ = \mu^+ + v_\mu$$

The pions interact within protons and neutrons via the strong nuclear forces. Hadrons are one combination of these three quark and there antiquarks, two of them are quark up↑ and down↓.

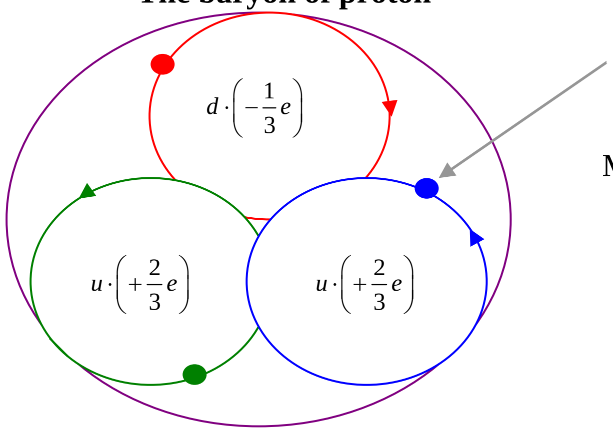
$$\Upsilon \qquad \pi^- = e^- + \overline{v_e} \tag{20}$$

But sometime of the Muon we have the value of an π-electron, a myonneutro-electroneutrino.

The individual quarks are held together by particles called gluons. The up and down quarks in the protons are believed to be two of three fundamental particles of all matter in the universe. Quarks cannot be separated from each other, for this would requires far more energy than even the most powerful particle accelerator in the world can and will provide, and the quarks are today observed bound strong together in pairs, forming particles called pion with mesons.

The baryon of proton

Figure 4.0:1



Meson:

$$\Upsilon \qquad \pi^- = d \cdot \left(-\frac{1}{3}e\right) + \bar{u} \cdot \left(-\frac{2}{3}e\right)$$

$$\Upsilon \qquad \pi^+ = \bar{d} \cdot \left(+\frac{1}{3}e\right) + u \cdot \left(+\frac{2}{3}e\right)$$

[14]

This diagram illustrates the proton in a atom like Hydrogen, with radius of. $r_p = 0.89612 \cdot 10^{-15}\, m$

Thus, the proton has an angular momentum and quark spin. This makes the proton to lambdas factory as soon charge on the electron works from outside. This makes that the magnetic flux moment are in the proton. These three rgb colors above make together the proton color white. If we assume that the proton has the value one to the electron in a system of a proton electron.

$$\therefore\ proton = m_p \cdot \left(\pi^-\right)^2 \cdot \sqrt{\left(\pi^+\right)^2 + \left(\pi^+\right)^2} \cdot e^2 \cdot \Phi_0 \qquad \Rightarrow \qquad \pi^+ = up \quad and \quad \pi^- = down$$

$$\therefore\ proton = m_p \cdot \left(\pi^-\right)^2 \cdot \sqrt{2} \cdot \pi^+ \cdot e^2 \cdot \Phi_0$$

Thus, if the forces of a system with one proton – one electron, or the system in Hydrogen are:

$$\therefore\ m_p \cdot \left(\pi^-\right)^2 \cdot \sqrt{2} \cdot \pi^+ \cdot e^2 \cdot \Phi_0 = m_e \cdot \pi^- \cdot e^2 \cdot r_1$$

$$\therefore\ m_p \cdot \pi^- \cdot \sqrt{2} \cdot \pi^+ \cdot \Phi_0 = m_e \cdot r_1 \qquad \Rightarrow \qquad r_1 = \frac{\Phi}{\pi^3 \cdot u_0} = 5.291772 \cdot 10^{-11}\, m \qquad \text{Hint: } \frac{m_p}{m_e} = \frac{1}{\sqrt{2} \cdot \pi^5 \cdot u_0}$$

Thus, we have for the proton π^+ and π^-, that will say one positively charged particle π^+ and its antiparticle π^-. This conclusion agrees very well with P. Diracs equation from the year 1930, which stated that all particle matter has its anti particle. Thus the meson equation will give us:

- $\pi^- = d + \bar{u}$
- $\pi^+ = \bar{d} + u$

The pi-meson has spin of integer (0,1,.) and are observed in pairs of two quarks, or in pairs of three quarks, forming elementary particles called Baryons, which include proton and neutron consisting of three quarks. Pions are continually exchanged between the neutron and protons, which forms the nucleus interaction of baryons to atoms strong forces, of the standard model.

The meson equation:

$$\Psi \qquad (\pi^-)\cdot(\pi^+) = (d+\bar{u})\cdot(\bar{d}+u) \quad = d\cdot\bar{d} + d\cdot u + \bar{d}\cdot\bar{u} + u\cdot\bar{u}$$

$$= (-)\frac{1}{3}\cdot\frac{1}{3} + (-)\frac{1}{3}\cdot\frac{2}{3} + (-)\frac{1}{3}\cdot\frac{2}{3} + (-)\frac{2}{3}\cdot\frac{2}{3}$$

$$= -\frac{1}{9} - \frac{2}{9} - \frac{2}{9} - \frac{4}{9} = -\frac{9}{9}$$

$$= -1$$

The meson equation has a net charge *e* of a negative coulomb charge. These makes probably the repulsion forces to the electrons and the attraction are probably to magnetic flux quantum. This equation gives the relative mass into the proton and also the small particles of the fundamental building stones of the proton. Here we could see that there exists three pi-particles and there anti pi-particles, but if the π-electron will be cancelled out from the proton equation there only are two pions, one π^- and one π^+. These will then fit the charge for electrons in the Helium atoms. According to the standard model, the proton has an intrinsic angular momentum or spin, and thus one magnetic flux quantum moment. The antiproton, the antiparticle of the proton, is also called a negatively proton. It differs from one proton when cancelled out with the electron to having a negative charge. Conclusion are then that the negatively proton exist when the electron has no charge and only mass at distance r_1 from the proton in one polar systems. The antiproton is also stable in vacuum, and does not decay spontaneously. When an antiproton collides in a particle accelerator with a proton or neutron, the two particles are transformed into mesons, which have one extremely short half-life time. In 1936 Carl Anderson could confirm through laboratory experiment at California Institute of Technology the existence of the fundamental elementary nuclear particle called, meson. The theory of the meson where predicted in 1935, year before from the physicist Yukawa Hideki.

The theory of how the nucleus is holding together is possibly to explain with the muon theory

$$\Psi \qquad m_p = \int_0^{2\pi} \sqrt{m_u^2 + m_u^2}\, dv \qquad \Rightarrow \qquad m_u = 1.89765\cdot 10^{-28}\, kg$$

The particle has a weight of about $2\pi\cdot\sqrt{2}$ mass of the proton, or about 207 times the mass of the electron. The muon was discovered in 1936 and in the standard model; muon's belongs to the second family of *charm* and *strange* quarks. The muon has the same spin (½) and same charge like the electron. The life-time of a muon outside the nucleus is of about $2\cdot 10^{-6}\, s$ and converts then probably to electrons and pions. The standard model describes the fundamental forces of nature, through the understanding of elementary particles behavior and interactions.

Hadrons are composed of two classes of elementary particles, namely mesons and baryons. The first, mesons, include the lighter pion particles and second, baryons, include the heavier proton and neutron particle. Hadrons interact with the strong forces and other fundamental nature forces that interaction with hadrons are the gravitation, electromagnetism and the weak forces. Elementary particles like Fermion are also classified by their angular momentum, or its spin. Where electrons, protons and neutrons have half-odd integer multiples of Planck's *h*-bar constant, and in contrast to mesons, which have whole integer number of its spin and are called bosons. Fermions obey Wolfgang Pauli's: "Exclusion principles" and bosons do it not.

4.1 **The electron repulsion vs. attraction**

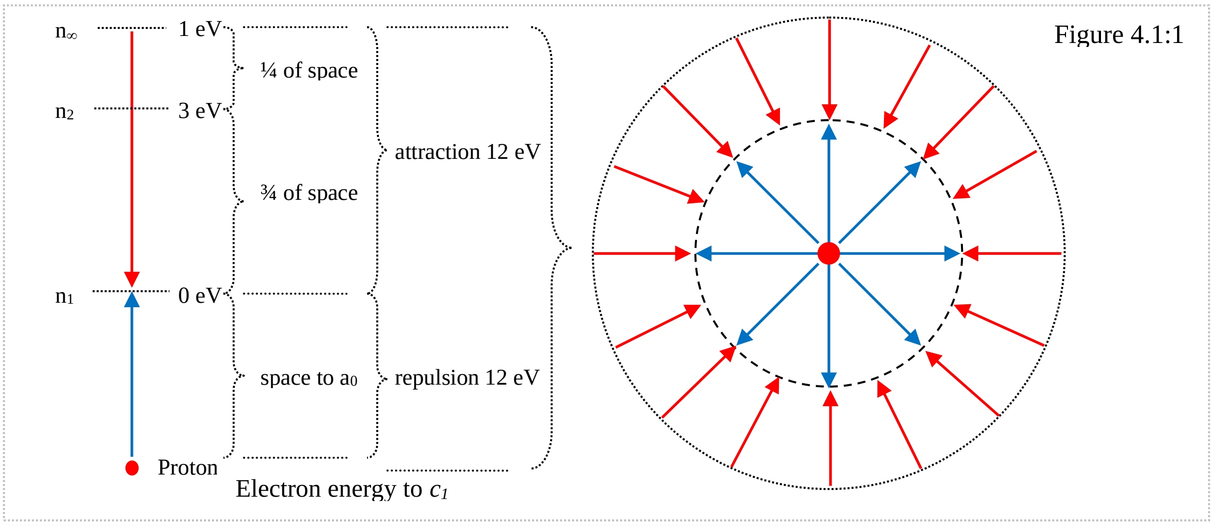
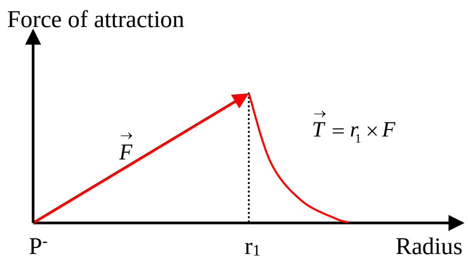


Figure 4.1:1

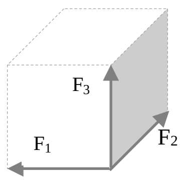
This diagram shows how the force of repulsion vs. attraction is located in the Hydrogen atom. If the density is constant to one the magnitude of the force increases linearly with the distance from centre of the atom up to the status quo and then decrease with the square of the distance as delta mass of the electron recedes from the first orbital r_1. This holds for both electrostatic repulsion and attraction of a point charge by a uniform charge density over the first orbital as a spherical shell, which is also governed by the inverse square laws of flow/flux. In particular there is no net electrostatic forces q on a charged particle mass located inside the first orbital.



$$\underbrace{m_p \cdot \pi^2 \cdot \sqrt{\pi^2 + \pi^2} \cdot q^2 \cdot \Phi_0}_{\text{Proton and its pion}} = \underbrace{m_e \cdot \pi \cdot q^2 \cdot r_1}_{\pi\text{ -electron}}$$

The electron is at distance from the proton where it's status quo to the electrostatic forces of repulsion vs. attraction. If have a distance to the proton that's make the attraction smaller than one electron volt to the repulsion, then will the electron leave the atomic orbital in Hydrogen. If classify the smallest possibly charge in three spaces that is allowed with the vector fields of

○ $$\vec{F} = \begin{cases} \vec{F}_1 = x \quad 1 \quad 0 \\ \vec{F}_2 = 0 \quad x \quad 1 \\ \vec{F}_3 = 1 \quad 0 \quad 1 \end{cases} \qquad x \in \Re$$



The charge generates of F_1, F_2, F_3, {abs of determinant} $= (\pm \det A) \cdot$ (charges generates of $\vec{F}$):

○ $$\det(A) \cdot \begin{pmatrix} x & 1 & 0 \\ 0 & x & 1 \\ 1 & 0 & 1 \end{pmatrix} = x \cdot \begin{vmatrix} x & 1 \\ 0 & 1 \end{vmatrix} - 0 \cdot \begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} + 1 \cdot \begin{vmatrix} 1 & 0 \\ x & 1 \end{vmatrix}$$ [12]

If $x = 0$

○ $$\det(A) \cdot \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 1 \end{pmatrix} = 0 \cdot \begin{vmatrix} 0 & 1 \\ 0 & 1 \end{vmatrix} - 0 \cdot \begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} + 1 \cdot \begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} = 0 + 0 + 1 = 1$$ [12]

Here it's proofed that the smallest allowed potential in three spaces is one electrostatic unit q.

It is possibly to shown that the Hydrogen atom could have polar behavior in its neutral form. It's probably possibly to shown in connection into water-molecule, because a dipole moment.

$\therefore\ K = \frac{2\pi}{\lambda \cdot \Delta eV} = \frac{2\pi \cdot R_\infty}{\Delta eV} = 2\pi \cdot \frac{10968459.83}{13.47576884} = 5.1141324 \cdot 10^6\, m^{-1}$ ∴ angular energy m^{-1} to 1 eV.

$\therefore\ KE \max = \left(5.1141324 \cdot 10^6\right) \cdot \left(2.0618668 \cdot 10^{-15}\right) \cdot \left(2.97932098 \cdot 10^8\right) = \pi$ ∴ π-electron

This is the value of the electron at surfaces for the electric max, which has a circulation.

$\therefore\ \omega = 2\pi \cdot \frac{e}{h} = \frac{\pi}{\Phi} = 2\pi \cdot 2.42498687 \cdot 10^{14} = 1.5236642 \cdot 10^{15}\, s^{-1}$ ∴ angular frequency s^{-1} to 1 eV.

$\therefore\ \omega B \max = \left(1.5236642 \cdot 10^{15}\right) \cdot \left(2.0618668 \cdot 10^{-15}\right) = \pi$ ∴ π-electron

This is the value of the electron at surface for the magnetic max, frequency to 1 electron volt.

- $\frac{E \max}{B \max} = \frac{\Phi \cdot c_0}{\Phi}$ $\Rightarrow$ $\frac{KE \max}{\omega B \max} = \frac{\Phi^2 \cdot c_0 \cdot \pi}{\Phi^2 \cdot c_0 \cdot \pi} = \frac{\pi}{\pi} = 1$ ∴ surface = 1 eV.

Here it's possibly to see that when the electron is at surface, it has the value one electron volt. Thus, $E = \nabla^2 \cdot \Phi$ is conservative throughout in 3-space and that at all point. If $divE = \nabla^2 \cdot \Phi$ then

$\therefore\ E = divE \quad \Rightarrow \quad E = \frac{\delta}{\varepsilon_0}$ *but now:* $div\left(J + \varepsilon_0 \frac{\partial E}{\partial t}\right) = 0$ Hint: $curlB = J + \varepsilon_0 \frac{\partial E}{\partial t}$

The operator $\nabla^2 \cdot \Phi$ is harmonic in three space, which is one divergence from the Gausses law. That implies that *divJ* could not be zero, because $\partial E / \partial t = \delta$ (Ampérés law again). If current *J*:

$\therefore\ \delta = \varepsilon_0 divE \quad \Rightarrow \quad -divJ = \frac{\partial \delta}{\partial t} = \varepsilon_0 div \frac{\partial E}{\partial t} = 1 \quad \therefore \quad \frac{\partial E}{\partial t} = \delta$ *and* $\varepsilon_0 \frac{\partial E}{\partial t} = -J \quad \Rightarrow \quad J = -\varepsilon_0 \delta \quad \therefore\ i = \frac{q}{t} A$

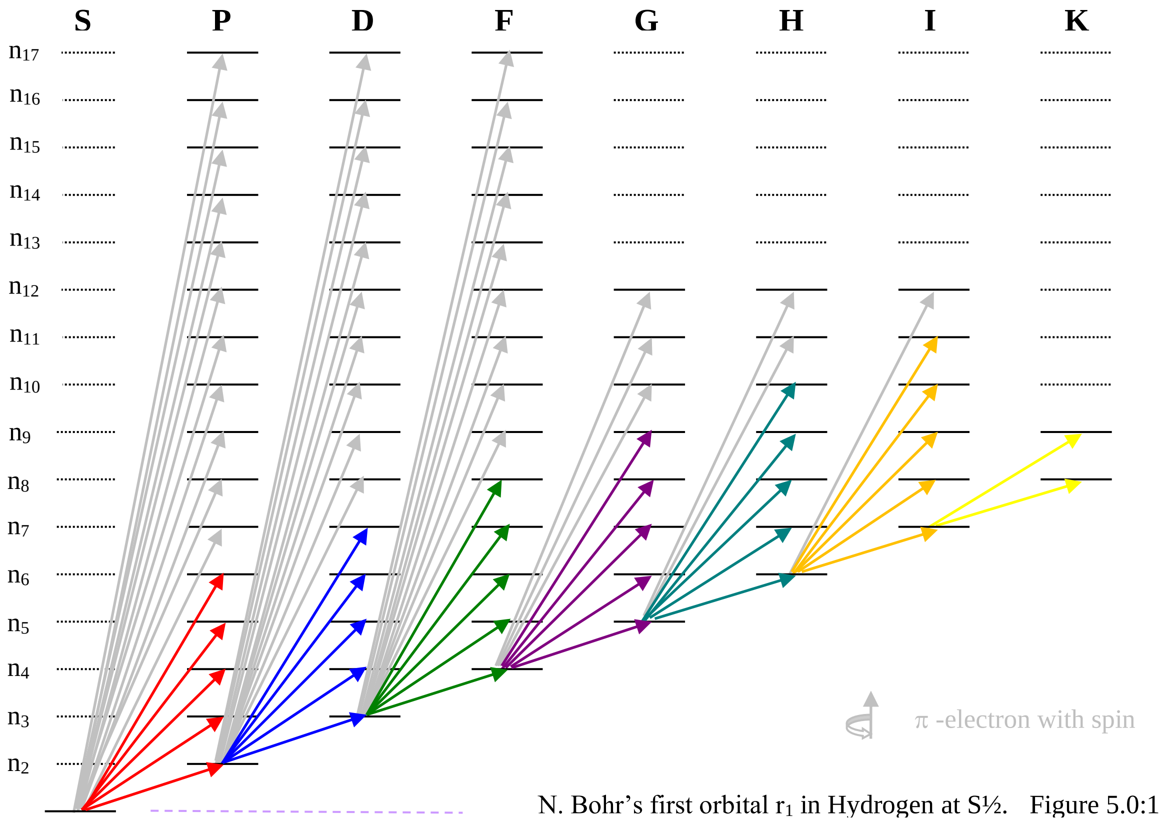
Implies that Maxwell says above: $curlB = \left(\varepsilon_0 \frac{\partial E}{\partial t} - \varepsilon_0 \frac{\partial E}{\partial t}\right) = 0$ but Ampéré says above $curlB = J$

About Maxwell's laws vs. Ampére's laws to speed c_0 and speed c_1 of light with argument to *J*

- $curlB = 0$: If and only if $J = 0$ and $\delta = 0$
- $curlB = J$: If and only if $J \neq 0$ and $\delta \neq 0$

André Marie Ampére (1775-1836). French mathematician and physician, his first work were "Considéraations sur la théorie mathématique du jeu", which gives him one professor's title in mathematical analyse at the École Polytechnique School in Paris 1809. His most important investigations was in differential equations, with paper like "Des considerations générales sur les integrals des equations aux differences partielles", and the essay "Une application de ces considérations á l'intégration des équations différentielles du premier et du deuxiéme ordre". Later in year 1824 he gets one new professor title in physics at College de France. Ampéres later works were manly on essays like electrodynamics and on electromagnetism "Recueil d'observations électrodynamiques" in year 1822, and "Exposé méthodique des phénoménes électrodynamiques" year 1823, and the paper "Théorie des phénoménes électrodynamiques, uniquement déduite de l'expérience", from the year 1826. Ampére laws where controversial.

5. The structure of Hydrogen

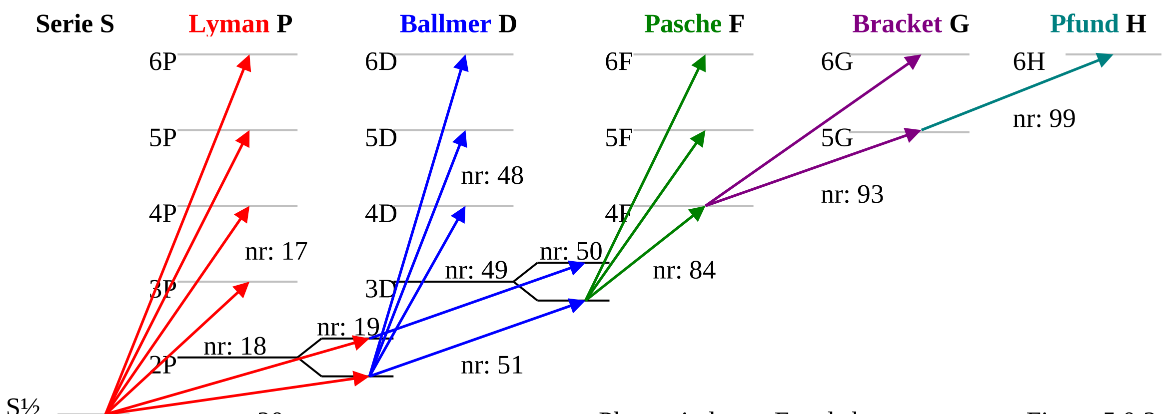


N. Bohr's first orbital r_1 in Hydrogen at S½. Figure 5.0:1

This diagram shows how the π -electron are going before it will be any radiation γ emission. Note that the π-electron are <u>not</u> going up in the S-series of Hydrogen. In Lyman, Ballmer and Pasche series the π-electron are going up to n_{32}, but the Lyman series they are probably only up to n_{20}, and over that energy level *n*, the frequency has a high electromagnetic radiation [2].

$$\frac{1}{\lambda}=\frac{(n^2-1)\cdot IP_H}{n^2} \quad \Leftrightarrow \quad \frac{1}{\lambda}=IP_H-\left(\frac{IP_H}{n^2}\right) \quad \Rightarrow \quad IP_H=\frac{n^2}{(n^2-1)\cdot\lambda_n} \qquad n=2,3,4....$$

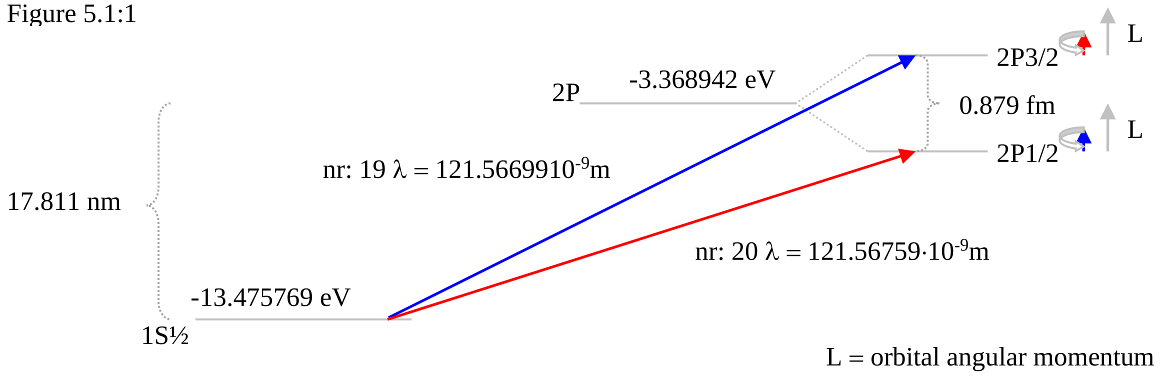
These formulas hold for every energy level *n* in Hydrogen. The energies levels *n* have exactly the form suggested by the lambda wavelength of Lyman line measured through spectroscopy. If investigate the fine structure in Hydrogen at energy level n_2 and n_3 two new *J*-couplings constant in Lyman and Ballmer series arises. Through spectroscopic analyses, Hydrogen fine structure splitting looks like follows according to this essays main reference material [1, 2, 3].



Photon index to Excel sheet Figure 5.0:2

5.1 **Hydrogen fine structure**; Two *J* -coupling, the first splitting occurs in 2P Lyman series.

Figure 5.1:1



This diagram shows the radius and lambdas between the first and second orbital in Hydrogen with splitting. In 2P½ of Lyman series arises all the electron transfer to the Ballmer D -series.

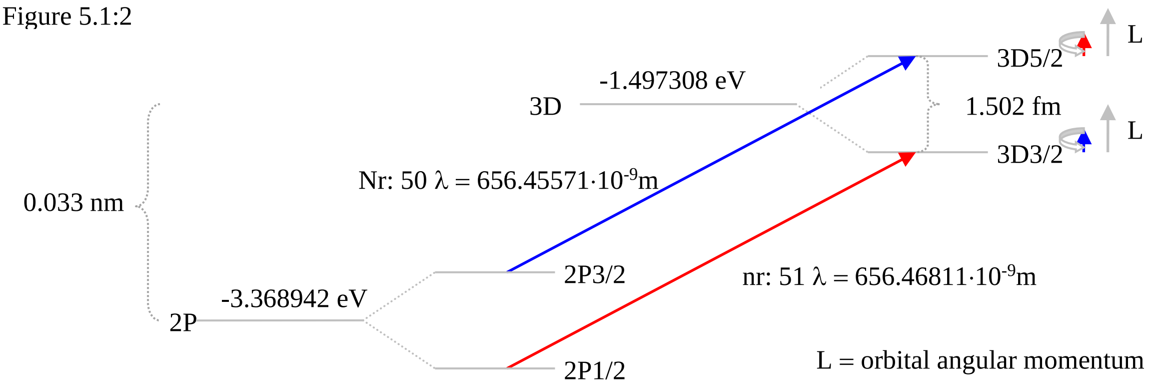
J-coupling of 19 & 20: $\left(\frac{3}{2}\right)\cdot(82259.17400)=123388.7610$

$$\left(\frac{1}{2}\right)\cdot(82258.76814)=41129.38407$$

The energy level of 2P: $\Sigma=\frac{(123388.761+41129.38407)}{2}=82259.07254\ cm^{-1}$

These are the energy at second energy level *n* of Lyman series orbital, in the Hydrogen atom.

Figure 5.1:2



This diagram shows the radius and lambdas between the second and third orbital in Hydrogen with splitting. In 3D3/2 of Ballmer series arises all the electron transfer into Pasche F -series.

J-coupling of 50 & 51: $\left(\frac{5}{2}\right)\cdot(15233.32025+82259.17400)=243731.2356$

$$\left(\frac{3}{2}\right)\cdot(15233.03242+82258.76814)=146237.7008$$

The energy level on 3D: $\Sigma=\frac{(243731.2356+146237.7008)}{4}=97492.23412\ cm^{-1}$

These are the energies at third energy level *n* of Ballmer series orbital in the Hydrogen atom. And these two *J* -splitting constants in the Hydrogen atom will change all lambdas λ -values.

Hydrogen 2P has only two J-coupling constants in its Lyman series shell of Hydrogen atom.

- 2P: $n_2 = \frac{(n^2-1)\cdot IP_H}{n^2} = \frac{3\cdot 109678.7634}{4} = 82259.07255\ cm^{-1}$

The energy on level two in Hydrogen is in cm^{-1} and the Ionization Potential in Hydrogen IP_H has the value 109678.7634 cm^{-1}. It's simply the energy electron has on the Hydrogen surface.

- $\left(\frac{3}{2}\right)\cdot x + \left(\frac{1}{2}\right)\cdot y = 2\cdot 82259.07255 = 164518.1451 cm^{-1}$
- $\left(\frac{3}{4}\right)\cdot IP_H = \frac{164518.1451}{2} \quad \Leftrightarrow \quad \left(\frac{3}{2}\right)\cdot IP_H = 164518.1451\ cm^{-1}$
- $\left(\frac{3}{2}\right)\cdot IP_H = \left(\frac{3}{2}\right)\cdot x + \left(\frac{1}{2}\right)\cdot y \quad \Rightarrow \quad x + \left(\frac{1}{3}\right)\cdot y = IP_H$
- $y = 3\cdot(IP_H - x) \quad \Leftrightarrow \quad 3x + y = 329036.2901 cm^{-1}$

Here we have get the formula for the energy in cm^{-1} with y-value at P-level (1/2) if known the x-value of P-level (3/2). It will be possibly through calculation with references of λ in Excel.

- $x = 82259.17400 cm^{-1}$ then: $x = \frac{82259.3011}{82259.1740} = 1.00000154$ Ref: nr 19 = 82259.3011 cm^{-1}
- $y = 82258.76814 cm^{-1}$ then: $y = \frac{82258.89510}{82258.76814} = 1.00000154$ Ref: nr 20 = 82258.8951 cm^{-1}

Here we have get the *J*-couplings values so exact as possibly, with reference of lambda. [2, 3]

- $x + \left(\frac{1}{3}\right)\cdot y = IP_H \quad \Leftrightarrow \quad \left(\frac{1}{3}\right)\cdot x + y = IP_{fs} \quad \Rightarrow \quad x = 3\cdot(IP_{fs} - y)$ If: $IP_{fs} = 109678.4928 cm^{-1}$

There exists a fine structure value of the Ionization Potential of Hydrogen, with value above.

The equation:

$$\begin{array}{rcrcl} \frac{x}{3} & + & y & = & 109678.4928 \\ 3x & + & y & = & 329036.2901 \end{array} \quad \Rightarrow \quad \begin{array}{rcrcl} -\frac{x}{3} & + & -y & = & -109678.4928 \\ 3x & + & y & = & 329036.2901 \\ \hline & & \frac{8x}{3} & = & 219357.7973 \\ & & x & = & \frac{3\cdot 219357.7973}{8} \\ & & x & = & 82259.17400 \\ & & y & = & 82258.76814 \end{array}$$

- $2P(3/2) = 82259.17400\ cm^{-1} \Rightarrow \lambda = 121.5669878\cdot 10^{-9}\ m$
- $2P(1/2) = 82258.76814\ cm^{-1} \Rightarrow \lambda = 121.5675876\cdot 10^{-9}\ m$

The values of *J*-couplings constants of the fine structure can only be changed if IP_H changes. Because there are no air coefficient involved at level two, to lambdas, its exact values of 2P.

Hydrogen 3D has only two J-couplings constants in its Ballmer series shell of the Hydrogen.

- 3D: $n_3 = \frac{(n^2-1)\cdot IP_H}{n^2} = \frac{8\cdot 109678.7634}{9} = 97492.23413\, cm^{-1}$

The energy level three in Hydrogen is in cm^{-1} and the Ionization Potential in Hydrogen IP_H has the value 109678.7634 cm^{-1}. It's simply the energy electron has on the Hydrogen surface.

- $\left(\frac{5}{2}\right)\cdot x + \left(\frac{3}{2}\right)\cdot y = 4\cdot 97492.23413 = 389968.9365 cm^{-1}$
- $\left(\frac{8}{9}\right)\cdot IP_H = \frac{389968.9365}{4} \quad \Leftrightarrow \quad \left(\frac{32}{9}\right)\cdot IP_H = 389968.9365\, cm^{-1}$
- $\left(\frac{32}{9}\right)\cdot IP_H = \left(\frac{5}{2}\right)\cdot x + \left(\frac{3}{2}\right)\cdot y \quad \Rightarrow \quad \left(\frac{45}{64}\right)x + \left(\frac{27}{64}\right)\cdot y = IP_H$
- $y = \frac{64}{27}\cdot\left(IP_H - \frac{45}{64}[x]\right) \quad \Leftrightarrow \quad 5x + 3y = 779937.873 cm^{-1}$ Hint: $[x] = \left(n_2\cdot\left(\frac{3}{2}\right) + n_3\cdot\left(\frac{5}{2}\right)\right)$

Here we have get the formula for the y-value at D-level (3/2) if known the x-value of D-level.

- $\left(\frac{5}{2}\right)\cdot x + \left(\frac{3}{2}\right)\cdot y = 4\cdot 97492.23413\, cm^{-1} \quad \Rightarrow \quad 5x + 3y = 8\cdot 97492.23413\, cm^{-1}$
- $\left(\frac{1}{8}\right)\cdot x + y = IP_{fs} \quad \Rightarrow \quad \left(\frac{1}{8}\right)\cdot x + y = 109678.3623\, cm^{-1}$

The equation:

$$\begin{array}{rcrcl} \frac{x}{8} & + & y & = & 109678.3623 \\ 5x & + & 3y & = & 779937.8729 \end{array} \quad \Rightarrow \quad \begin{array}{rcrcl} -\frac{3x}{8} & + & -3y & = & -3\cdot 109678.3623 \\ 5x & + & 3y & = & 779937.8729 \\ \hline & & \frac{37x}{8} & = & 450902.7859 \\ & & x & = & \frac{8\cdot 450902.7859}{37} \\ & & x & = & 97492.49425 \\ & & y & = & 97491.80056 \end{array}$$

$$3D(5/2) = 97492.49425 - 82259.1740\, cm^{-1} \Rightarrow \quad 15233.32025\, cm^{-1} \Rightarrow \quad \lambda = 656.45571\cdot 10^{-9}\, m$$
$$3D(3/2) = 97491.80056 - 82258.76814\, cm^{-1} \Rightarrow \quad 15233.03242\, cm^{-1} \Rightarrow \quad \lambda = 656.46811\cdot 10^{-9}\, m$$

Hydrogen fine structure has two *J*-couplings constants, for 2P and 3D, and these are both *Jc*. If weighting the two J-coupling constants to reference values with air coefficient added, then:

$[x] = 82259.17400 + 15233.32025 = 97492.49425 cm^{-1}$ Hint: $15233.42931 / 15233.32025 = 1.00000716$

$[y] = 82258.76814 + 15233.03242 = 97491.80056 cm^{-1}$ Hint: $15233.14149 / 15233.03242 = 1.00000716$

Probably can the 3D level of fine structure value to IP be changed with a new air-coefficient?

Hydrogen 2P and 3D fine structure values of the Ionization Potential have follow equations:

- $2P = \left(3 \cdot IP_H\right) - \left(\frac{8}{3}\right) \cdot x = IP_{fs} \quad \Rightarrow \quad IP_{fs} = 109678.4928 cm^{-1}$ If: $x = 82259.1740 cm^{-1}$

This equation is necessary if known the x-value of 2P (3/2) through weighting or a reference.

$$\begin{aligned} -\left(\frac{x}{3}\right) - y &= -IP_{fs} = -109678.4928 \\ 3x + y &= 3 \cdot IP_H = 329036.2901 cm^{-1} \end{aligned} \quad \Rightarrow \quad \begin{aligned} x &= \left(\frac{3}{8}\right) \cdot \left(3 \cdot IP_H - IP_{fs}\right) \\ y &= 3 \cdot \left(IP_H - x\right) \end{aligned}$$

$$\begin{aligned} \left(\frac{3}{2}\right) \cdot x &= \left(3/2\right) \cdot 82259.17400 = 123388.761 \\ \left(\frac{1}{2}\right) \cdot y &= \left(1/2\right) \cdot 82258.76814 = 41129.38407 \end{aligned} \quad \Rightarrow \quad \Sigma_n = \frac{\left(123388.761 + 41129.38407\right)}{2} = 82259.07254\ cm^{-1}$$

This is the final solution for the *J*-coupling constants at level 2P; with x = (3/2) and y = (1/2).

- $3D = \left(\frac{\left(\frac{64 \cdot IP_H}{9}\right) - \left(\frac{37 \cdot x}{8}\right)}{3}\right) = IP_{fs} \quad \Rightarrow \quad IP_{fs} = 109678.3623 cm^{-1}$ If: $x = 97492.49425 cm^{-1}$

This equation is necessary if known the x-value of 3D (5/2) through weighting or a reference.

$$\begin{aligned} -\left(\frac{3}{8}\right) \cdot x + 3y &= -3 \cdot IP_{fs} = -329035.0870 \\ 5x + 3y &= \left(\frac{64}{9}\right) \cdot IP_H = 779937.8729 cm^{-1} \end{aligned} \quad \Rightarrow \quad \begin{aligned} x &= \left(\frac{8}{37}\right) \cdot \left(\left(\left(\frac{64}{9}\right) \cdot IP_H\right) - \left(3 \cdot IP_{fs}\right)\right) \\ y &= \left(\frac{1}{3}\right) \cdot \left(\left(\frac{64}{9}\right) \cdot IP_H - 5x\right) \end{aligned}$$

$$\begin{aligned} \left(\frac{5}{2}\right) \cdot x &= \left(5/2\right) \cdot 97492.49425 = 243731.2356 \\ \left(\frac{3}{2}\right) \cdot y &= \left(3/2\right) \cdot 97491.80056 = 146237.7008 \end{aligned} \quad \Rightarrow \quad \Sigma_n = \frac{\left(243731.2356 + 146237.7008\right)}{4} = 97492.23412\ cm^{-1}$$

This is the final solution for the *J*-coupling constants at level 3D; with x = (5/2) and y = (3/2).

To find the energy levels *n* corresponding to the electron in Hydrogen atom, when gives off electromagnetic light, we could then expect that the electron's wave function obey certain boundary conditions and hence have quantized energy levels. For Lyman series in Hydrogen:

$$\Psi_n = -\frac{\left(n^2 - 1\right) \cdot h \cdot c_0 \cdot R_\infty}{n^2} \qquad n = 2, 3, 4.... \qquad \text{If:} \quad R_\infty = 10968459.83 m^{-1}$$

This formula gives the kinetic energy at every energy level in the Lyman series of Hydrogen. To get the exact energy values in Ballmer, Pasch, Bracket and Phund series it's necessary to take the two *J*-coupling constants of the fine structure into considerations. The fine structures change namely all lambda value through these two J-couplings level at 2P and 3D Hydrogen.

5.2 **Table of Hydrogen**

nr	Intes	Lambda λ (m)	Potential energy	ΔEnergy kinetic	Kinetic energy J	Time of path s	Distance radius
1		9.1403863E-08	2.1597001E-18	1.1460314E-22	2.1598147E-18	1.1132086E-18	2.9258309E-10
2		9.1428618E-08	2.1591153E-18	1.1454109E-22	2.1592299E-18	1.1129072E-18	2.9250387E-10
3	5	9.1457630E-08	2.1584304E-18	1.1446844E-22	2.1585449E-18	1.1125541E-18	2.9241108E-10
4	6	9.1491934E-08	2.1576211E-18	1.1438261E-22	2.1577355E-18	1.1121369E-18	2.9230143E-10
5	7	9.1532904E-08	2.1566554E-18	1.1428024E-22	2.1567697E-18	1.1116391E-18	2.9217060E-10
6	8	9.1582386E-08	2.1554901E-18	1.1415678E-22	2.1556043E-18	1.1110385E-18	2.9201273E-10
7	10	9.1642919E-08	2.1540664E-18	1.1400603E-22	2.1541804E-18	1.1103046E-18	2.9181983E-10
8	12	9.1718064E-08	2.1523015E-18	1.1381929E-22	2.1524154E-18	1.1093948E-18	2.9158073E-10
9	16	9.1812943E-08	2.1500774E-18	1.1358417E-22	2.1501909E-18	1.1082483E-18	2.9127940E-10
10	20	9.1935148E-08	2.1472194E-18	1.1328241E-22	2.1473326E-18	1.1067751E-18	2.9089219E-10
11	30	9.2096316E-08	2.1434617E-18	1.1288627E-22	2.1435746E-18	1.1048382E-18	2.9038311E-10
12	40	9.2315045E-08	2.1383831E-18	1.1235196E-22	2.1384954E-18	1.1022203E-18	2.8969504E-10
13	50	9.2622581E-08	2.1312830E-18	1.1160711E-22	2.1313946E-18	1.0985603E-18	2.8873311E-10
14	20	9.3074840E-08	2.1209269E-18	1.1052513E-22	2.1210374E-18	1.0932221E-18	2.8733006E-10
15	30	9.3780363E-08	2.1049708E-18	1.0886839E-22	2.1050797E-18	1.0849972E-18	2.8516832E-10
16	50	9.4974326E-08	2.0785083E-18	1.0614834E-22	2.0786145E-18	1.0713565E-18	2.8158317E-10
17	100	9.7253710E-08	2.0297933E-18	1.0123094E-22	2.0298945E-18	1.0462453E-18	2.7498323E-10
18	300	1.0257227E-07	1.9245448E-18	9.1005089E-23	1.9246358E-18	9.9199302E-19	2.6072417E-10
19	1000	1.2156699E-07	1.6238366E-18	6.4787963E-23	1.6239014E-18	8.3698896E-19	2.1998466E-10
20	500	1.2156759E-07	1.6238286E-18	6.4787323E-23	1.6238934E-18	8.3698483E-19	2.1998358E-10
21		3.6612753E-07	5.3916986E-19	7.1426744E-24	5.3917700E-19	2.7790184E-19	7.3040560E-11
22		3.6622168E-07	5.3903125E-19	7.1390024E-24	5.3903838E-19	2.7783039E-19	7.3021783E-11
23		3.6632546E-07	5.3887854E-19	7.1349581E-24	5.3888568E-19	2.7775169E-19	7.3001096E-11
24		3.6644022E-07	5.3870977E-19	7.1304897E-24	5.3871690E-19	2.7766470E-19	7.2978233E-11
25		3.6656759E-07	5.3852260E-19	7.1255356E-24	5.3852973E-19	2.7756822E-19	7.2952876E-11
26		3.6670947E-07	5.3831425E-19	7.1200230E-24	5.3832137E-19	2.7746083E-19	7.2924651E-11
27		3.6686816E-07	5.3808139E-19	7.1138646E-24	5.3808851E-19	2.7734081E-19	7.2893106E-11
28		3.6704644E-07	5.3782004E-19	7.1069558E-24	5.3782715E-19	2.7720610E-19	7.2857701E-11
29		3.6724767E-07	5.3752535E-19	7.0991695E-24	5.3753245E-19	2.7705421E-19	7.2817778E-11
30		3.6747598E-07	5.3719138E-19	7.0903508E-24	5.3719847E-19	2.7688207E-19	7.2772536E-11
31		3.6773648E-07	5.3681085E-19	7.0803091E-24	5.3681793E-19	2.7668593E-19	7.2720985E-11
32		3.6803552E-07	5.3637467E-19	7.0688077E-24	5.3638174E-19	2.7646111E-19	7.2661896E-11
33		3.6838114E-07	5.3587144E-19	7.0555500E-24	5.3587850E-19	2.7620173E-19	7.2593723E-11
34		3.6878356E-07	5.3528668E-19	7.0401599E-24	5.3529372E-19	2.7590032E-19	7.2514505E-11
35	2	3.6925603E-07	5.3460178E-19	7.0221555E-24	5.3460880E-19	2.7554730E-19	7.2421721E-11
36	3	3.6981587E-07	5.3379248E-19	7.0009110E-24	5.3379949E-19	2.7513017E-19	7.2312086E-11
37	4	3.7048615E-07	5.3282675E-19	6.9756019E-24	5.3283373E-19	2.7463240E-19	7.2181258E-11
38	5	3.7129815E-07	5.3166150E-19	6.9451251E-24	5.3166845E-19	2.7403179E-19	7.2023401E-11
39	8	3.7229514E-07	5.3023773E-19	6.9079773E-24	5.3024464E-19	2.7329793E-19	7.1830522E-11
40	9	3.7353841E-07	5.2847291E-19	6.8620693E-24	5.2847977E-19	2.7238829E-19	7.1591441E-11
41	10	3.7511717E-07	5.2624872E-19	6.8044300E-24	5.2625552E-19	2.7124187E-19	7.1290130E-11
42	15	3.7716551E-07	5.2339073E-19	6.7307227E-24	5.2339746E-19	2.6976877E-19	7.0902957E-11
43	20	3.7989291E-07	5.1963310E-19	6.6344245E-24	5.1963973E-19	2.6783197E-19	7.0393910E-11
44	5	3.8364246E-07	5.1455444E-19	6.5053744E-24	5.1456094E-19	2.6521426E-19	6.9705903E-11
45	6	3.8901023E-07	5.0745434E-19	6.3270837E-24	5.0746066E-19	2.6155465E-19	6.8744051E-11
46	8	3.9711452E-07	4.9709825E-19	6.0714736E-24	4.9710432E-19	2.5621680E-19	6.7341111E-11
47	15	4.1028397E-07	4.8114220E-19	5.6879602E-24	4.8114789E-19	2.4799256E-19	6.5179545E-11
48	30	4.3416261E-07	4.5467971E-19	5.0794980E-24	4.5468479E-19	2.3435298E-19	6.1594675E-11
49	80	4.8626135E-07	4.0596467E-19	4.0493576E-24	4.0596872E-19	2.0924382E-19	5.4995267E-11
50	120	6.5645571E-07	3.0071325E-19	2.2218502E-24	3.0071547E-19	1.5499434E-19	4.0736950E-11
51	180	6.5646811E-07	3.0070757E-19	2.2217663E-24	3.0070979E-19	1.5499141E-19	4.0736181E-11
52		8.2782453E-07	2.3846229E-19	1.3971694E-24	2.3846368E-19	1.2290861E-19	3.2303902E-11
53		8.2830600E-07	2.3832368E-19	1.3955456E-24	2.3832507E-19	1.2283717E-19	3.2285125E-11
54		8.2883706E-07	2.3817097E-19	1.3937578E-24	2.3817237E-19	1.2275846E-19	3.2264439E-11
55		8.2942480E-07	2.3800220E-19	1.3917832E-24	2.3800360E-19	1.2267147E-19	3.2241576E-11
56		8.3007760E-07	2.3781503E-19	1.3895950E-24	2.3781642E-19	1.2257500E-19	3.2216220E-11
57		8.3080548E-07	2.3760668E-19	1.3871612E-24	2.3760807E-19	1.2246761E-19	3.2187994E-11
58		8.3162046E-07	2.3737382E-19	1.3844437E-24	2.3737521E-19	1.2234759E-19	3.2156450E-11
59		8.3253709E-07	2.3711247E-19	1.3813968E-24	2.3711386E-19	1.2221288E-19	3.2121045E-11
60		8.3357310E-07	2.3681778E-19	1.3779652E-24	2.3681916E-19	1.2206099E-19	3.2081123E-11
61		8.3475028E-07	2.3648381E-19	1.3740815E-24	2.3648519E-19	1.2188886E-19	3.2035882E-11
62		8.3609567E-07	2.3610328E-19	1.3696629E-24	2.3610465E-19	1.2169272E-19	3.1984332E-11
63		8.3764314E-07	2.3566710E-19	1.3646069E-24	2.3566847E-19	1.2146790E-19	3.1925243E-11
64		8.3943562E-07	2.3516387E-19	1.3587853E-24	2.3516523E-19	1.2120853E-19	3.1857072E-11
65		8.4152817E-07	2.3457911E-19	1.3520362E-24	2.3458046E-19	1.2090713E-19	3.1777855E-11
66		8.4399239E-07	2.3389421E-19	1.3441526E-24	2.3389555E-19	1.2055411E-19	3.1685072E-11
67		8.4692281E-07	2.3308491E-19	1.3348669E-24	2.3308625E-19	1.2013698E-19	3.1575439E-11
68		8.5044643E-07	2.3211918E-19	1.3238284E-24	2.3212051E-19	1.1963922E-19	3.1444613E-11
69		8.5473726E-07	2.3095393E-19	1.3105704E-24	2.3095524E-19	1.1903862E-19	3.1286758E-11
70		8.6003918E-07	2.2953016E-19	1.2944616E-24	2.2953145E-19	1.1830477E-19	3.1093882E-11
71		8.6670313E-07	2.2776534E-19	1.2746322E-24	2.2776661E-19	1.1739514E-19	3.0854804E-11

72		8.7525018E-07	2.2554115E-19	1.2498596E-24	2.2554240E-19	1.1624874E-19	3.0553498E-11
73	2	8.8648343E-07	2.2268316E-19	1.2183846E-24	2.2268438E-19	1.1477566E-19	3.0166331E-11
74	3	9.0169901E-07	2.1892553E-19	1.1776126E-24	2.1892670E-19	1.1283889E-19	2.9657291E-11
75	4	9.2311351E-07	2.1384687E-19	1.1236096E-24	2.1384799E-19	1.1022123E-19	2.8969294E-11
76	5	9.5481508E-07	2.0674677E-19	1.0502365E-24	2.0674782E-19	1.0656166E-19	2.8007456E-11
77	7	1.0051645E-06	1.9639068E-19	9.4765745E-25	1.9639163E-19	1.0122389E-19	2.6604537E-11
78	12	1.0940523E-06	1.8043463E-19	7.9992530E-25	1.8043543E-19	9.2999772E-20	2.4443003E-11
79	20	1.2820821E-06	1.5397214E-19	5.8249733E-25	1.5397272E-19	7.9360400E-20	2.0858186E-11
88		1.6411564E-06	1.2028405E-19	3.5548863E-25	1.2028440E-19	6.1996815E-20	1.6294538E-11
89		1.6810998E-06	1.1742606E-19	3.3879627E-25	1.1742640E-19	6.0523746E-20	1.5907373E-11
90		1.7366734E-06	1.1366843E-19	3.1746023E-25	1.1366874E-19	5.8586981E-20	1.5398336E-11
91		1.8178963E-06	1.0858977E-19	2.8972598E-25	1.0859006E-19	5.5969331E-20	1.4710343E-11
92	40	1.8754548E-06	1.0525710E-19	2.7221525E-25	1.0525737E-19	5.4251605E-20	1.4258875E-11
93		1.9450742E-06	1.0148967E-19	2.5307735E-25	1.0148992E-19	5.2309789E-20	1.3748510E-11
94	5	2.1661054E-06	9.1133577E-20	2.0406404E-25	9.1133781E-20	4.6972043E-20	1.2345598E-11
98	8	2.6258502E-06	7.5177530E-20	1.3886275E-25	7.5177669E-20	3.8747967E-20	1.0184075E-11
100		2.7582460E-06	7.1569008E-20	1.2585186E-25	7.1569134E-20	3.6888061E-20	9.6952386E-12
101		2.8729734E-06	6.8711020E-20	1.1600119E-25	6.8711136E-20	3.5414995E-20	9.3080748E-12
102		3.0391784E-06	6.4953386E-20	1.0366048E-25	6.4953490E-20	3.3478235E-20	8.7990387E-12
103		3.2969659E-06	5.9874726E-20	8.8083938E-26	5.9874814E-20	3.0860591E-20	8.1110470E-12
104		3.7405273E-06	5.2774626E-20	6.8432117E-26	5.2774694E-20	2.7201058E-20	7.1492168E-12
105	15	4.0522379E-06	4.8715039E-20	5.8309023E-26	4.8715098E-20	2.5108666E-20	6.5992764E-12
106		4.3764170E-06	4.5106518E-20	4.9990589E-26	4.5106568E-20	2.3248763E-20	6.1104405E-12
107	3	4.6537420E-06	4.2418538E-20	4.4210053E-26	4.2418582E-20	2.1863325E-20	5.7463078E-12
108		2.8729734E-06	6.8711020E-20	1.1600119E-25	6.8711136E-20	3.5414995E-20	9.3080748E-12
109		5.1286136E-06	3.8490895E-20	3.6402036E-26	3.8490932E-20	1.9838941E-20	5.2142418E-12
110		5.9081629E-06	3.3412236E-20	2.7429678E-26	3.3412263E-20	1.7221301E-20	4.5262510E-12
111	20	7.4598016E-06	2.6462491E-20	1.7205650E-26	2.6462508E-20	1.3639268E-20	3.5847901E-12
112		7.5024291E-06	2.6312135E-20	1.7010686E-26	2.6312152E-20	1.3561772E-20	3.5644220E-12
113		1.1308593E-05	1.7456188E-20	7.4870112E-27	1.7456196E-20	8.9972475E-21	2.3647343E-12
114	3	1.2371794E-05	1.5956047E-20	6.2554746E-27	1.5956053E-20	8.2240462E-21	2.1615148E-12
115		1.9061727E-05	1.0356088E-20	2.6351245E-27	1.0356091E-20	5.3377216E-21	1.4029061E-12
116	R∞	9.1175353E-08	2.1651129E-18	1.1517832E-22	2.1652280E-18	1.1159987E-18	2.9331642E-10

Reference intensity indicated in blue colour is from: [2, 3]. Rest of left intensity from reference of pathways [1].

Grotrian diagram

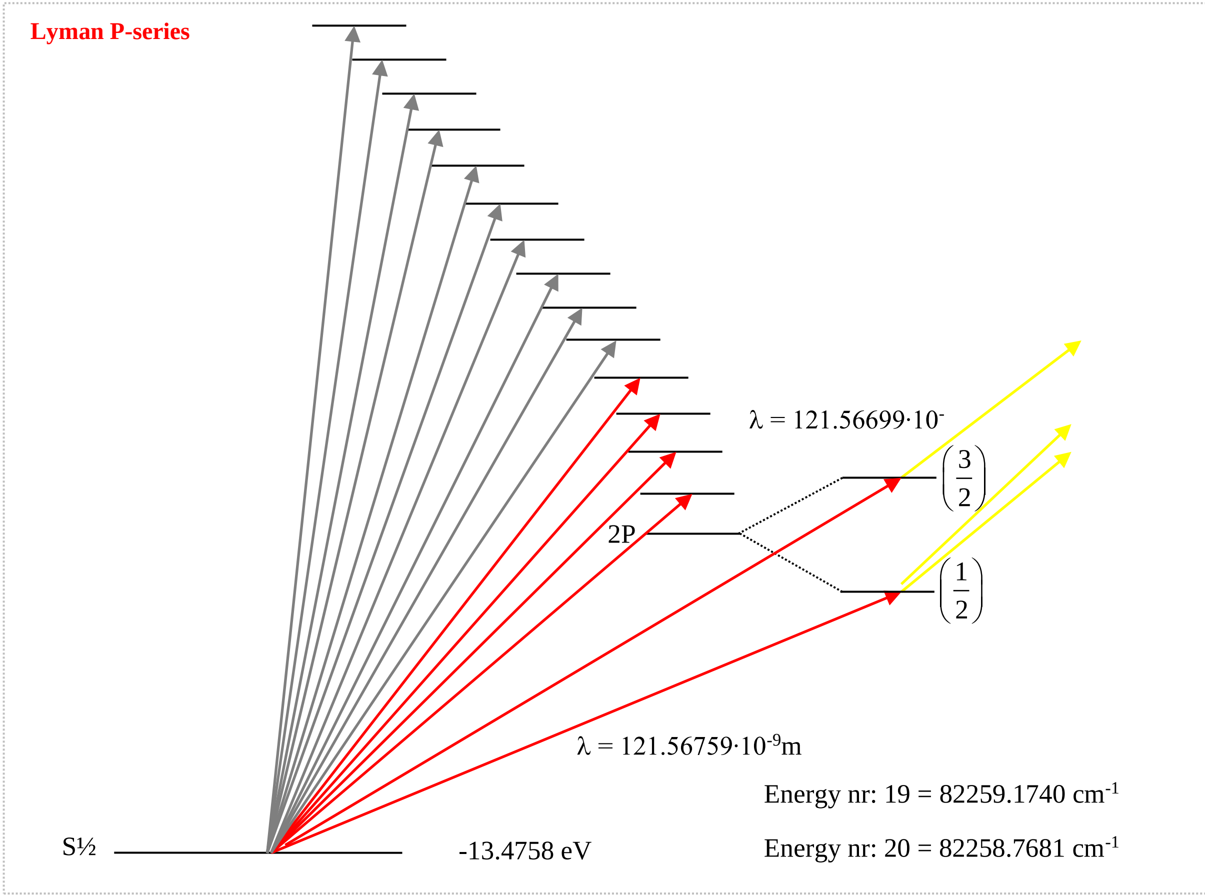
transition	Lyman series	kinetic energy	transition	Ballmer series	kinetic energy	transition	Pasche series	kinetic energy
20:1 P^2	2.15981E-18	1.14903E-22	20:1 D^2	5.35900E-19	2.85100E-23	20:1 F^2	2.3518E-19	1.2511E-23
19:1 P^2	2.15923E-18	1.14871E-22	19:1 D^2	5.35315E-19	2.84789E-23	19:1 F^2	2.3459E-19	1.2480E-23
18:1 P^2	2.15855E-18	1.14835E-22	18:1 D^2	5.34630E-19	2.84424E-23	18:1 F^2	2.3391E-19	1.2444E-23
17:1 P^2	2.15774E-18	1.14792E-22	17:1 D^2	5.33821E-19	2.83994E-23	17:1 F^2	2.3310E-19	1.2401E-23
16:1 P^2	2.15677E-18	1.14741E-22	16:1 D^2	5.32855E-19	2.83480E-23	16:1 F^2	2.3213E-19	1.2349E-23
15:1 P^2	2.15560E-18	1.14679E-22	15:1 D^2	5.31690E-19	2.82860E-23	15:1 F^2	2.3097E-19	1.2287E-23
14:1 P^2	2.15418E-18	1.14603E-22	14:1 D^2	5.30266E-19	2.82103E-23	14:1 F^2	2.2954E-19	1.2212E-23
13:1 P^2	2.15242E-18	1.14509E-22	13:1 D^2	5.28501E-19	2.81164E-23	13:1 F^2	2.2778E-19	1.2118E-23
12:1 P^2	2.15019E-18	1.14391E-22	12:1 D^2	5.26277E-19	2.79980E-23	12:1 F^2	2.2555E-19	1.1999E-23
11:1 P^2	2.14733E-18	1.14239E-22	11:1 D^2	5.23419E-19	2.78460E-23	11:1 F^2	2.2270E-19	1.1847E-23
10:1 P^2	2.14358E-18	1.14039E-22	10:1 D^2	5.19661E-19	2.76461E-23	10:1 F^2	2.1894E-19	1.1648E-23
09:1 P^2	2.13850E-18	1.13768E-22	09:1 D^2	5.14582E-19	2.73759E-23	09:1 F^2	2.1386E-19	1.1377E-23
08:1 P^2	2.13140E-18	1.13391E-22	08:1 D^2	5.07481E-19	2.69981E-23	08:1 F^2	2.0676E-19	1.1000E-23
07:1 P^2	2.12104E-18	1.12840E-22	07:1 D^2	*4.97125E-19*	*2.64471E-23*	07:1 F^2	1.9640E-19	1.0449E-23
06:1 P^2	2.10508E-18	1.11991E-22	06:1 D^2	*4.81168E-19*	*2.55982E-23*	06:1 F^2	1.8044E-19	9.5997E-24
05:1 P^2	2.07862E-18	1.10583E-22	05:1 D^2	*4.54704E-19*	*2.41903E-23*	05:1 F^2	1.5398E-19	8.1918E-24
04:1 P^2	2.02990E-18	1.07991E-22	04:1 D^2	*4.05986E-19*	*2.15986E-23*	04:1 F^2	1.0526E-19	5.6000E-24
03:1 P^2	1.92465E-18	1.02392E-22	35/2 D^2	*3.00729E-19*	*1.59989E-23*	-	-	-
23/2 P^2	1.62392E-18	8.63930E-23	33/2 D^2	*3.00724E-19*	*1.59986E-23*	-	-	-
21/2 P^2	1.62392E-18	8.63926E-23	-	-	-	-	-	-

This Grotrian diagram shows the energy levels in comparison to the delta difference to kinetic energy Hydrogen.

$$\Psi H = -\left(\sqrt{\frac{e\cdot\Delta\psi}{\pi\cdot u_0}} + \Delta\psi = \frac{2\cdot h^2}{m_e\cdot\lambda^2}\right) \quad \Leftrightarrow \quad \Psi E_k = -\left(\frac{h\cdot c_0}{\lambda} + \frac{2\cdot h^2}{m_e\cdot\lambda^2}\right) \quad \text{and} \quad t = \frac{E_k\cdot s}{h\cdot c_0} \quad \Rightarrow \quad R_{\max} = t\cdot c$$

The Hamiltonian with one kinetic part and one potential part, and the equation is equivalent into the kinetic energy of the electron system. Through this knowhow, it's possibly to get the time of travel pathway for the electron, and through this get the distance radius max of travel between orbital and atoms Δsurface. The kinetic energy to the electron system in Hydrogen is necessary because there exist a delta up to surface and/or there exist a delta at first ½S orbital.

5.3 **Transition of Hydrogen**

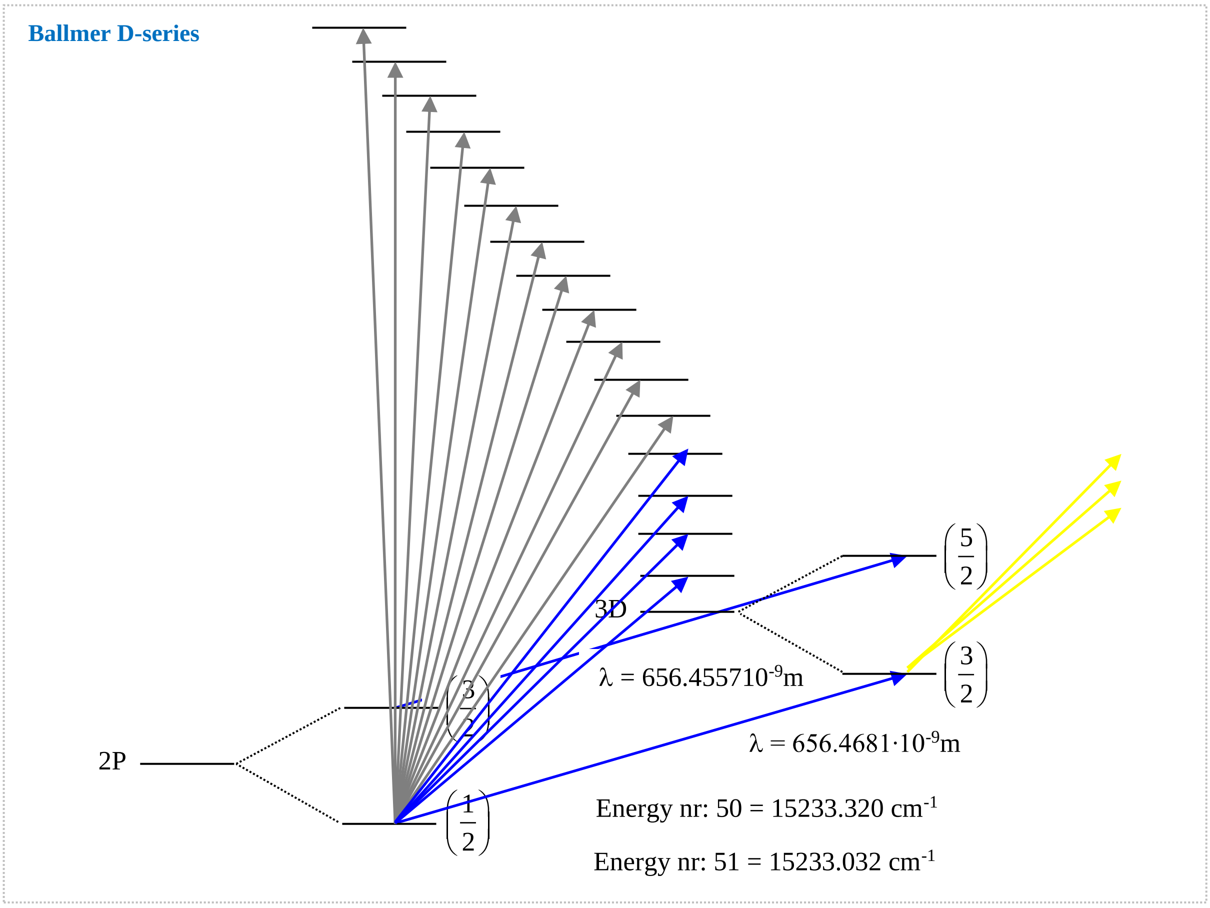


This diagram shows how the energies are going from the ground state with particular distance from: S½ at first orbital to Lyman series are indicated in red color. The electron has opposite vector when gives off electromagnetic radiation when falling down from higher *n* to lower *n*.

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
1	-	9.140390E-08	vacuum	109405	109404.5221	1/2 - 3/2	[01S^2 1/2 -> 20P^2 3/2]
2	-	9.142860E-08	vacuum	109375	109374.9658	1/2 - 3/2	[01S^2 1/2 -> 19P^2 3/2]
3	5	9.145760E-08	vacuum	109340	109340.2845	1/2 - 3/2	[01S^2 1/2 -> 18P^2 3/2]
4	6	9.149190E-08	vacuum	109299	109299.2932	1/2 - 3/2	[01S^2 1/2 -> 17P^2 3/2]
5	7	9.153290E-08	vacuum	109250	109250.3351	1/2 - 3/2	[01S^2 1/2 -> 16P^2 3/2]
6	8	9.158240E-08	vacuum	109191	109191.2857	1/2 - 3/2	[01S^2 1/2 -> 15P^2 3/2]
7	10	9.164290E-08	vacuum	109119	109119.2007	1/2 - 3/2	[01S^2 1/2 -> 14P^2 3/2]
8	12	9.171810E-08	vacuum	109030	109029.7335	1/2 - 3/2	[01S^2 1/2 -> 13P^2 3/2]
9	16	9.181290E-08	vacuum	108917	108917.1565	1/2 - 3/2	[01S^2 1/2 -> 12P^2 3/2]
10	20	9.193510E-08	vacuum	108772	108772.3840	1/2 - 3/2	[01S^2 1/2 -> 11P^2 3/2]
11	30	9.209630E-08	vacuum	108582	108581.9952	1/2 - 3/2	[01S^2 1/2 -> 10P^2 3/2]
12	40	9.231500E-08	vacuum	108325	108324.7576	1/2 - 3/2	[01S^2 1/2 -> 09P^2 3/2]
13	50	9.262260E-08	vacuum	107965	107965.0107	1/2 - 3/2	[01S^2 1/2 -> 08P^2 3/2]
14	20	9.307480E-08	vacuum	107440	107440.4672	1/2 - 3/2	[01S^2 1/2 -> 07P^2 3/2]
15	30	9.378040E-08	vacuum	106632	106632.0894	1/2 - 3/2	[01S^2 1/2 -> 06P^2 3/2]
16	50	9.497430E-08	vacuum	105292	105291.6421	1/2 - 3/2	[01S^2 1/2 -> 05P^2 3/2]
17	100	9.725370E-08	vacuum	102824	102823.8514	1/2 - 3/2	[01S^2 1/2 -> 04P^2 3/2]
18	300	1.025722E-07	vacuum	97492	97492.3030	1/2 - 3/2	[01S^2 1/2 -> 03P^2 3/2]
19	1000	1.215668E-07	vacuum	82259	82259.3011	1/2 - 3/2	[01S^2 1/2 -> 02P^2 3/2]
20	500	1.215674E-07	vacuum	82259	82258.8951	1/2 - 1/2	[01S^2 1/2 -> 02P^2 1/2]

The intensity sources are mainly from reference 1, 2 & 3. Hydrogen lambda transition and J-coupling reference are mainly from reference 1.

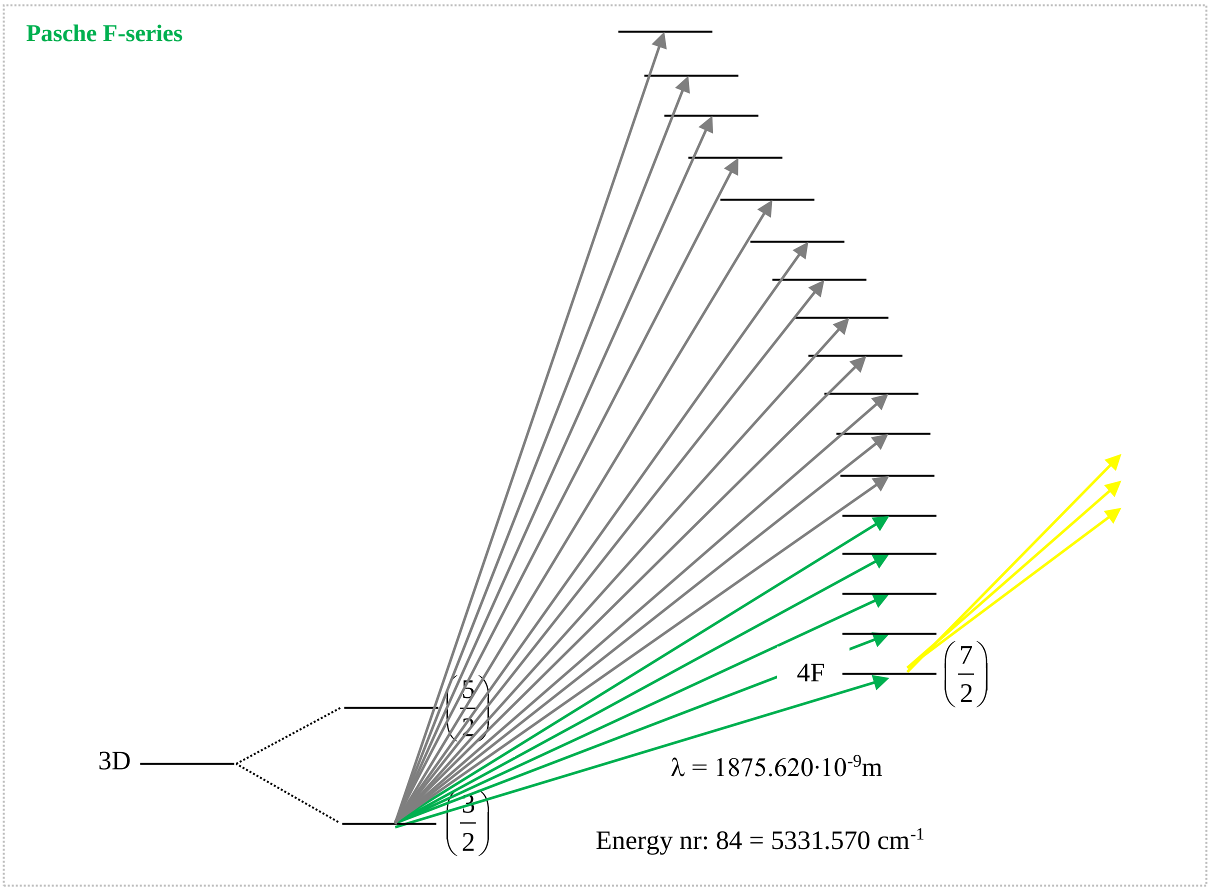
These are the photons that are going up with the electron from ground state at S½ to Lyman series n_{20}. Normal Hydrogen shell is going up to n_{32}, but between n_{32} to n_{21} they have a high magnetic radiation, an ultraviolet lambda. The Campton effect is the change in wavelength of very high energy electromagnetic radiation [X-ray] when it scatters of electrons. The effect confirmed that electromagnetic radiation of electrons have both particle and wave properties.



Here the main transition for the electrons from Lyman 2P (½) over Ballmer D-series (visible).

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
21	-	3.660279E-07	3.661275E-07	109572	27312.8927	1/2 - 5/2	[02P^2 1/2 -> 32D^2 5/2]
22	-	3.661221E-07	3.662217E-07	109565	27305.8653	1/2 - 5/2	[02P^2 1/2 -> 31D^2 5/2]
23	-	3.662258E-07	3.663254E-07	109557	27298.1334	1/2 - 5/2	[02P^2 1/2 -> 30D^2 5/2]
24	-	3.663406E-07	3.664402E-07	109548	27289.5790	1/2 - 5/2	[02P^2 1/2 -> 29D^2 5/2]
25	-	3.664679E-07	3.665676E-07	109539	27280.0994	1/2 - 5/2	[02P^2 1/2 -> 28D^2 5/2]
26	-	3.666097E-07	3.667094E-07	109528	27269.5478	1/2 - 5/2	[02P^2 1/2 -> 27D^2 5/2]
27	-	3.667684E-07	3.668682E-07	109517	27257.7483	1/2 - 5/2	[02P^2 1/2 -> 26D^2 5/2]
28	-	3.669466E-07	3.670464E-07	109503	27244.5112	1/2 - 5/2	[02P^2 1/2 -> 25D^2 5/2]
29	-	3.671478E-07	3.672477E-07	109488	27229.5809	1/2 - 5/2	[02P^2 1/2 -> 24D^2 5/2]
30	-	3.673761E-07	3.674760E-07	109472	27212.6596	1/2 - 5/2	[02P^2 1/2 -> 23D^2 5/2]
31	-	3.676365E-07	3.677365E-07	109452	27193.3846	1/2 - 5/2	[02P^2 1/2 -> 22D^2 5/2]
32	-	3.679355E-07	3.680356E-07	109430	27171.2861	1/2 - 5/2	[02P^2 1/2 -> 21D^2 5/2]
33	-	3.682810E-07	3.683812E-07	109405	27145.7956	1/2 - 5/2	[02P^2 1/2 -> 20D^2 5/2]
34	-	3.686833E-07	3.687836E-07	109375	27116.1746	1/2 - 5/2	[02P^2 1/2 -> 19D^2 5/2]
35	2	3.691557E-07	3.692561E-07	109340	27081.4747	1/2 - 5/2	[02P^2 1/2 -> 18D^2 5/2]
36	3	3.697154E-07	3.698160E-07	109299	27040.4769	1/2 - 5/2	[02P^2 1/2 -> 17D^2 5/2]
37	4	3.703855E-07	3.704862E-07	109250	26991.5554	1/2 - 5/2	[02P^2 1/2 -> 16D^2 5/2]
38	5	3.711974E-07	3.712984E-07	109191	26932.5182	1/2 - 5/2	[02P^2 1/2 -> 15D^2 5/2]
39	8	3.721940E-07	3.722952E-07	109119	26860.4027	1/2 - 5/2	[02P^2 1/2 -> 14D^2 5/2]
40	9	3.734370E-07	3.735386E-07	109030	26770.9968	1/2 - 5/2	[02P^2 1/2 -> 13D^2 5/2]
41	10	3.750154E-07	3.751174E-07	108917	26658.3205	1/2 - 5/2	[02P^2 1/2 -> 12D^2 5/2]
42	15	3.770632E-07	3.771658E-07	108772	26513.5413	1/2 - 5/2	[02P^2 1/2 -> 11D^2 5/2]
43	20	3.797900E-07	3.798933E-07	108582	26323.1805	1/2 - 5/2	[02P^2 1/2 -> 10D^2 5/2]
44	5	3.835386E-07	3.836429E-07	108325	26065.9051	1/2 - 5/2	[02P^2 1/2 -> 09D^2 5/2]
45	6	3.889051E-07	3.890109E-07	107965	25706.2217	1/2 - 5/2	[02P^2 1/2 -> 08D^2 5/2]
46	8	3.970074E-07	3.971154E-07	107440	25181.5980	1/2 - 5/2	[02P^2 1/2 -> 07D^2 5/2]
47	15	4.101737E-07	4.102853E-07	106632	24373.2856	1/2 - 5/2	[02P^2 1/2 -> 06D^2 5/2]
48	30	4.340468E-07	4.341649E-07	105292	23032.7254	1/2 - 5/2	[02P^2 1/2 -> 05D^2 5/2]
49	80	4.861332E-07	4.862654E-07	102824	20564.9002	1/2 - 5/2	[02P^2 1/2 -> 04D^2 5/2]
50	120	6.562725E-07	6.564510E-07	97493	15233.4293	3/2 - 5/2	[02P^2 3/2 -> 03D^2 5/2]
51	180	6.562849E-07	6.564634E-07	97492	15233.1415	1/2 - 3/2	[02P^2 1/2 -> 03D^2 3/2]

The intensity sources are mainly from reference 1, 2 & 3. Hydrogen lambda transition and J-coupling reference are mainly from reference 1.

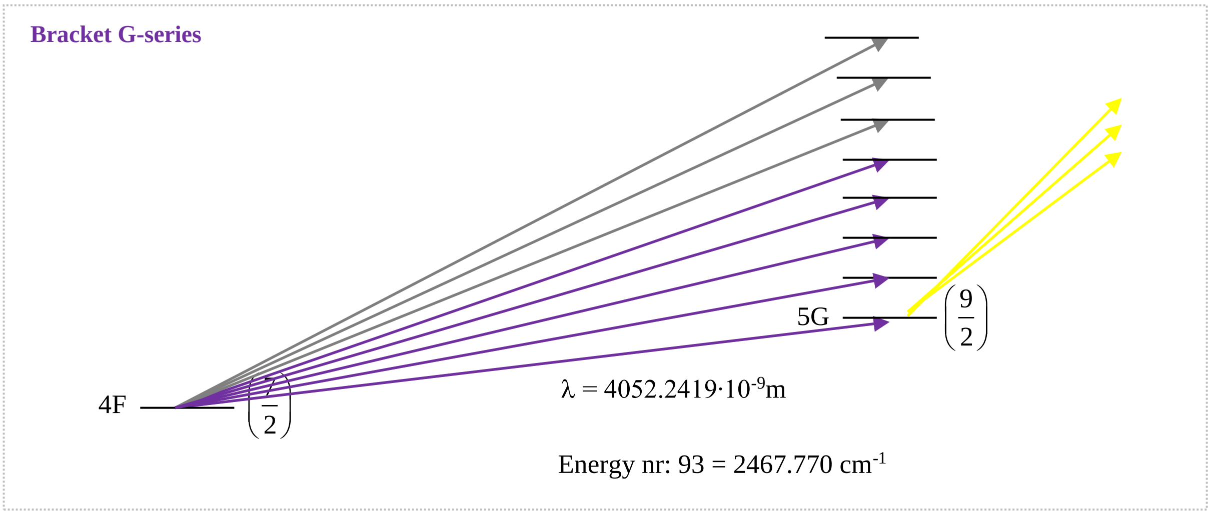


Here the main transition for electrons from Ballmer 3D (3/2), over Pasche F-series (infrared).

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
52	-	8.276310E-07	8.278561E-07	109571	12079.3938	3/2 - 7/2	[03D^2 3/2 -> 32F^2 7/2]
53	-	8.281125E-07	8.283377E-07	109564	12072.3703	3/2 - 7/2	[03D^2 3/2 -> 31F^2 7/2]
54	-	8.286434E-07	8.288688E-07	109557	12064.6357	3/2 - 7/2	[03D^2 3/2 -> 30F^2 7/2]
55	-	8.292309E-07	8.294565E-07	109548	12056.0880	3/2 - 7/2	[03D^2 3/2 -> 29F^2 7/2]
56	-	8.298837E-07	8.301094E-07	109539	12046.6045	3/2 - 7/2	[03D^2 3/2 -> 28F^2 7/2]
57	-	8.306115E-07	8.308374E-07	109528	12036.0490	3/2 - 7/2	[03D^2 3/2 -> 27F^2 7/2]
58	-	8.314262E-07	8.316523E-07	109516	12024.2551	3/2 - 7/2	[03D^2 3/2 -> 26F^2 7/2]
59	-	8.323428E-07	8.325692E-07	109503	12011.0137	3/2 - 7/2	[03D^2 3/2 -> 25F^2 7/2]
60	-	8.333785E-07	8.336052E-07	109488	11996.0867	3/2 - 7/2	[03D^2 3/2 -> 24F^2 7/2]
61	-	8.345553E-07	8.347823E-07	109471	11979.1711	3/2 - 7/2	[03D^2 3/2 -> 23F^2 7/2]
62	-	8.359006E-07	8.361280E-07	109452	11959.8918	3/2 - 7/2	[03D^2 3/2 -> 22F^2 7/2]
63	-	8.374478E-07	8.376756E-07	109430	11937.7957	3/2 - 7/2	[03D^2 3/2 -> 21F^2 7/2]
64	-	8.392400E-07	8.394683E-07	109404	11912.3025	3/2 - 7/2	[03D^2 3/2 -> 20F^2 7/2]
65	-	8.413321E-07	8.415609E-07	109375	11882.6807	3/2 - 7/2	[03D^2 3/2 -> 19F^2 7/2]
66	-	8.437958E-07	8.440253E-07	109340	11847.9859	3/2 - 7/2	[03D^2 3/2 -> 18F^2 7/2]
67	-	8.467256E-07	8.469559E-07	109299	11806.9901	3/2 - 7/2	[03D^2 3/2 -> 17F^2 7/2]
68	-	8.502487E-07	8.504800E-07	109250	11758.0665	3/2 - 7/2	[03D^2 3/2 -> 16F^2 7/2]
69	-	8.545384E-07	8.547708E-07	109191	11699.0421	3/2 - 7/2	[03D^2 3/2 -> 15F^2 7/2]
70	-	8.598394E-07	8.600733E-07	109119	11626.9163	3/2 - 7/2	[03D^2 3/2 -> 14F^2 7/2]
71	-	8.665021E-07	8.667378E-07	109030	11537.5147	3/2 - 7/2	[03D^2 3/2 -> 13F^2 7/2]
72	-	8.750475E-07	8.752855E-07	108917	11424.8435	3/2 - 7/2	[03D^2 3/2 -> 12F^2 7/2]
73	2	8.862787E-07	8.865198E-07	108772	11280.0643	3/2 - 7/2	[03D^2 3/2 -> 11F^2 7/2]
74	3	9.014911E-07	9.017363E-07	108582	11089.7165	3/2 - 7/2	[03D^2 3/2 -> 10F^2 7/2]
75	4	9.229017E-07	9.231527E-07	108324	10832.4437	3/2 - 7/2	[03D^2 3/2 -> 09F^2 7/2]
76	5	9.545974E-07	9.548571E-07	107965	10472.7718	3/2 - 7/2	[03D^2 3/2 -> 08F^2 7/2]
77	7	1.004938E-06	1.005211E-06	107440	9948.1567	3/2 - 7/2	[03D^2 3/2 -> 07F^2 7/2]
78	12	1.093809E-06	1.094107E-06	106632	9139.8779	3/2 - 7/2	[03D^2 3/2 -> 06F^2 7/2]
79	20	1.281805E-06	1.282154E-06	105291	7799.3772	3/2 - 7/2	[03D^2 3/2 -> 05F^2 7/2]
84	40	1.875110E-06	1.875620E-06	102824	5331.5703	3/2 - 7/2	[03D^2 3/2 -> 04F^2 7/2]

The intensity sources are mainly from reference 1, 2 & 3. Hydrogen lambda transition and J-coupling reference are mainly from reference 1.

The lambda vector is opposite for the electron when gives off electromagnetic radiation when falling down from higher to lower *n*. Before falling down, the electron must raise up higher *n*.

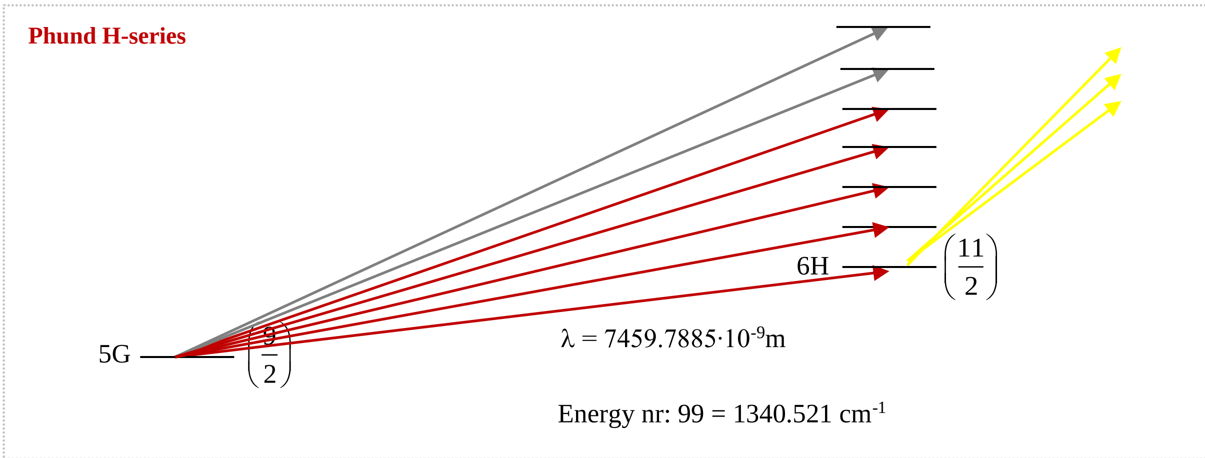


Here the main transition for electrons from Pasche 4F (7/2) to Bracket G-series (far infrared).

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
80	-	1.640720E-06	1.641166E-06	108917	6093.2278	7/2 - 9/2	[04F^2 7/2 -> 12G^2 9/2]
81	-	1.680650E-06	1.681107E-06	108772	5948.4609	7/2 - 9/2	[04F^2 7/2 -> 11G^2 9/2]
82	-	1.736210E-06	1.736682E-06	108582	5758.1057	7/2 - 9/2	[04F^2 7/2 -> 10G^2 9/2]
83	-	1.817410E-06	1.817904E-06	108324	5500.8395	7/2 - 9/2	[04F^2 7/2 -> 09G^2 9/2]
85	-	1.944560E-06	1.945089E-06	107965	5141.1531	7/2 - 9/2	[04F^2 7/2 -> 08G^2 9/2]
86	5	2.165520E-06	2.166109E-06	107440	4616.5728	7/2 - 9/2	[04F^2 7/2 -> 07G^2 9/2]
87	8	2.625130E-06	2.625844E-06	106632	3808.2993	7/2 - 9/2	[04F^2 7/2 -> 06G^2 9/2]
93	15	4.051140E-06	4.052242E-06	105291	2467.7697	7/2 - 9/2	[04F^2 7/2 -> 05G^2 9/2]

The intensity sources are mainly from reference 1, 2 & 3. Hydrogen lambda transition and J-coupling reference are mainly from reference 1.

The first five transitions are indicated purple in Bracket series, which correspond to G -series.

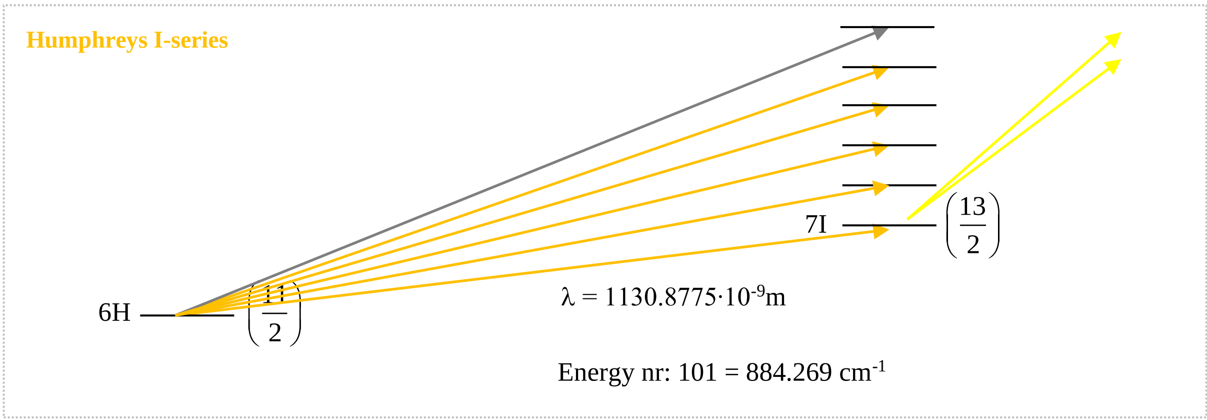


Here the main transition for electrons from Bracket 5G (9/2), to Phund H-series (far infrared).

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
88	-	2.757500E-06	2.758250E-06	108917	3625.4871	9/2 - 11/2	[05G^2 9/2 -> 12H^2 11/2]
89	-	2.872200E-06	2.872981E-06	108772	3480.7049	9/2 - 11/2	[05G^2 9/2 -> 11H^2 11/2]
90	-	3.038400E-06	3.039226E-06	108582	3290.3109	9/2 - 11/2	[05G^2 9/2 -> 10H^2 11/2]
91	-	3.296100E-06	3.296997E-06	108324	3033.0635	9/2 - 11/2	[05G^2 9/2 -> 09H^2 11/2]
92	-	3.739500E-06	3.740517E-06	107965	2673.4271	9/2 - 11/2	[05G^2 9/2 -> 08H^2 11/2]
95	3	4.652470E-06	4.653735E-06	107440	2148.8114	9/2 - 11/2	[05G^2 9/2 -> 07H^2 11/2]
99	20	7.457760E-06	7.459789E-06	106632	1340.5206	9/2 - 11/2	[05G^2 9/2 -> 06H^2 11/2]

The intensity sources are mainly from reference 1, 2 & 3. Hydrogen lambda transition and J-coupling reference are mainly from reference 1.

The first five transitions are indicated dark red in Phund series, which correspond to H-series. One new named series are the Humphreys series, which indicates, far infrared transitions [4].

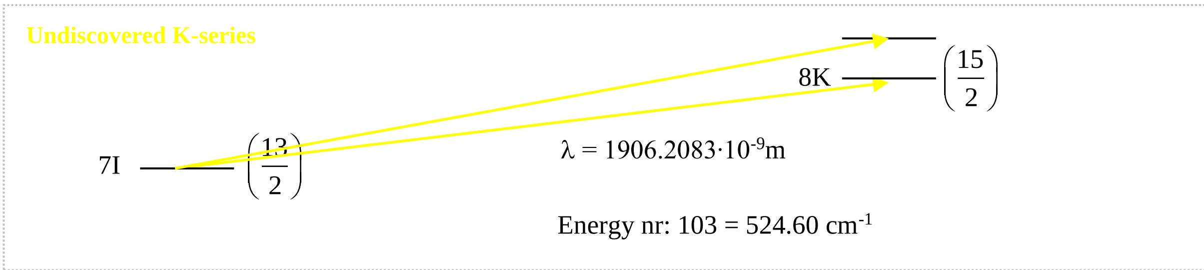


The main transitions for electrons from Phund 6H (11/2) to Humphreys I-series (far infrared).

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
94	-	4.375300E-06	4.376490E-06	108917	2284.9361	11/2 - 13/2	[06H^2 11/2 -> 12I^2 13/2]
96	-	4.671200E-06	4.672471E-06	108772	2140.1954	11/2 - 13/2	[06H^2 11/2 -> 11I^2 13/2]
97	-	5.127300E-06	5.128695E-06	108582	1949.8139	11/2 - 13/2	[06H^2 11/2 -> 10I^2 13/2]
98	-	5.906600E-06	5.908207E-06	108324	1692.5610	11/2 - 13/2	[06H^2 11/2 -> 09I^2 13/2]
100	-	7.500450E-06	7.502490E-06	107965	1332.8908	11/2 - 13/2	[06H^2 11/2 -> 08I^2 13/2]
101	-	1.130570E-05	1.130878E-05	107516	884.2691	11/2 - 13/2	[06H^2 11/2 -> 07I^2 13/2]

The intensity sources are mainly from reference 1, 2 & 3. Hydrogen lambda transition and J-coupling reference are mainly from reference 1.

The first five transitions indicated orange in Humphreys series, which correspond to I-series. The main transition for electron from Humphreys 7I (13/2) to undiscovered K-series (yellow)



Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
102	3	1.236840E-05	1.237176E-05	108324	808.2922	13/2 - 15/2	[07I^2 13/2 -> 09K^2 15/2]
103	-	1.905690E-05	1.906208E-05	108041	524.6016	13/2 - 15/2	[07I^2 13/2 -> 08K^2 15/2]

The intensity sources are mainly from reference 1, 2 & 3. Hydrogen lambda transition and J-coupling reference are mainly from reference 1.

These two transitions are the two last known transitions in Hydrogen, I-series, up to K-series. Through these diagrams and data tablets, all known transitions and lambdas electromagnetic radiation are explained. Exceptions are the ultraviolet electromagnetic radiation [X-ray] in the Lyman series n_{32} to n_{21} of Hydrogen, which is not shown with calculations and diagrams. There lambdas are possibly to find with the *number one formula* of energy level in Hydrogen.

$$\Re_f = \frac{\left(n^2 - 1\right) \cdot c_0 \cdot R_\infty}{n^2} \qquad n = 2, 3, 4, ...$$

This formula is true for every frequency to lambdas in Lyman P-series of the Hydrogen atom. Because the difficulties with the J-coupling at 2P and 3D levels, the formula above only holds for lambdas in Lyman series for *n* between n_2 up to n_{32}. To get the frequencies with formulas above, the Ionization Potential with kinetic energies are used. Transition for the electron from one lower *n* to one higher *n*, it needs supply of energy, which correspond to kinetic energy. When the electron is at rest on the Hydrogen surface, it has the Ionization Potential IP energy.

6. The structure of Helium

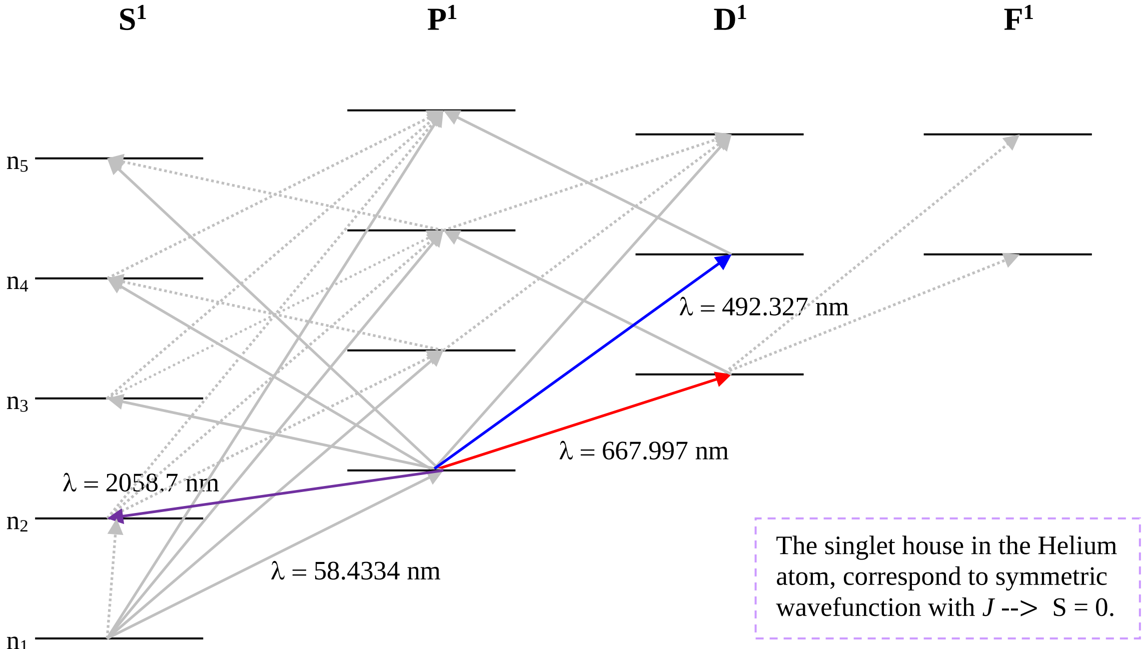


Figure 6.0:1

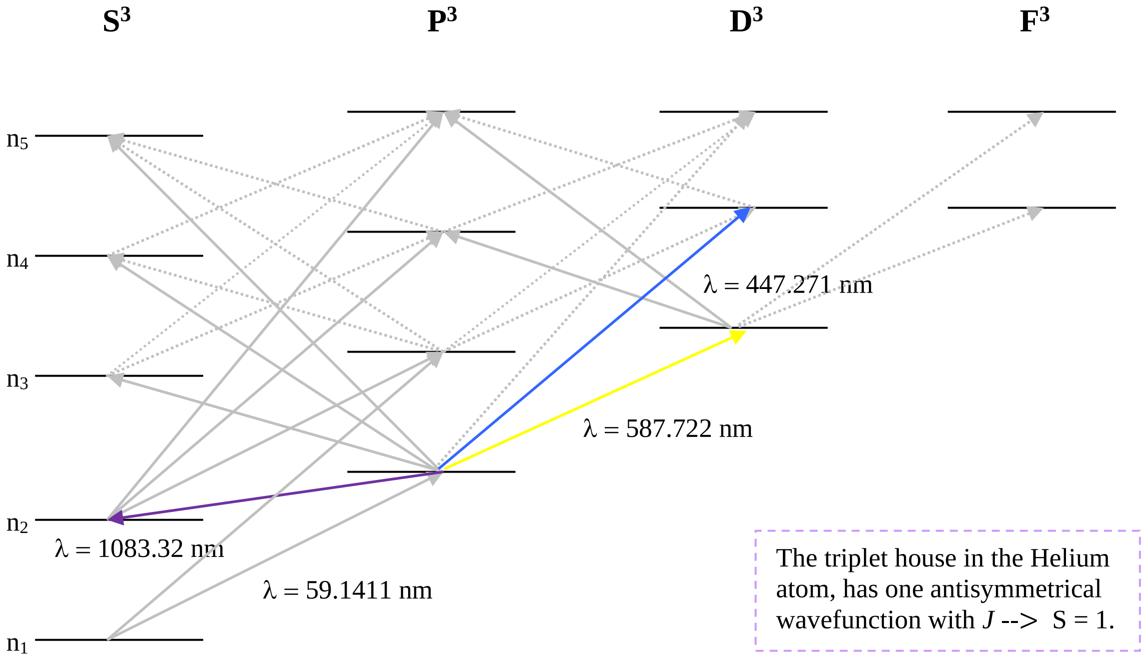
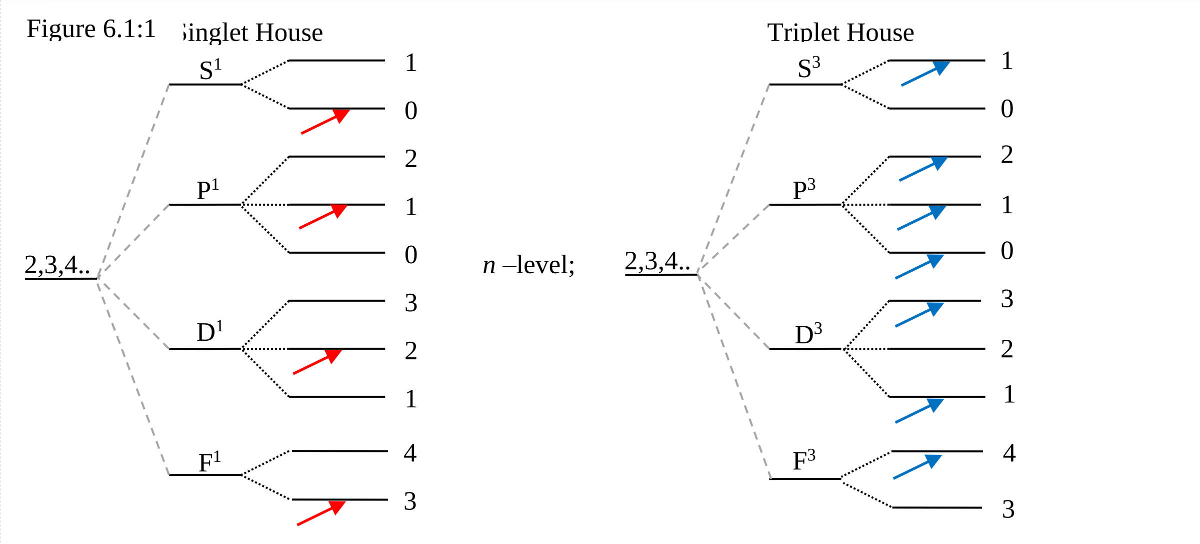


Figure 6.0:2

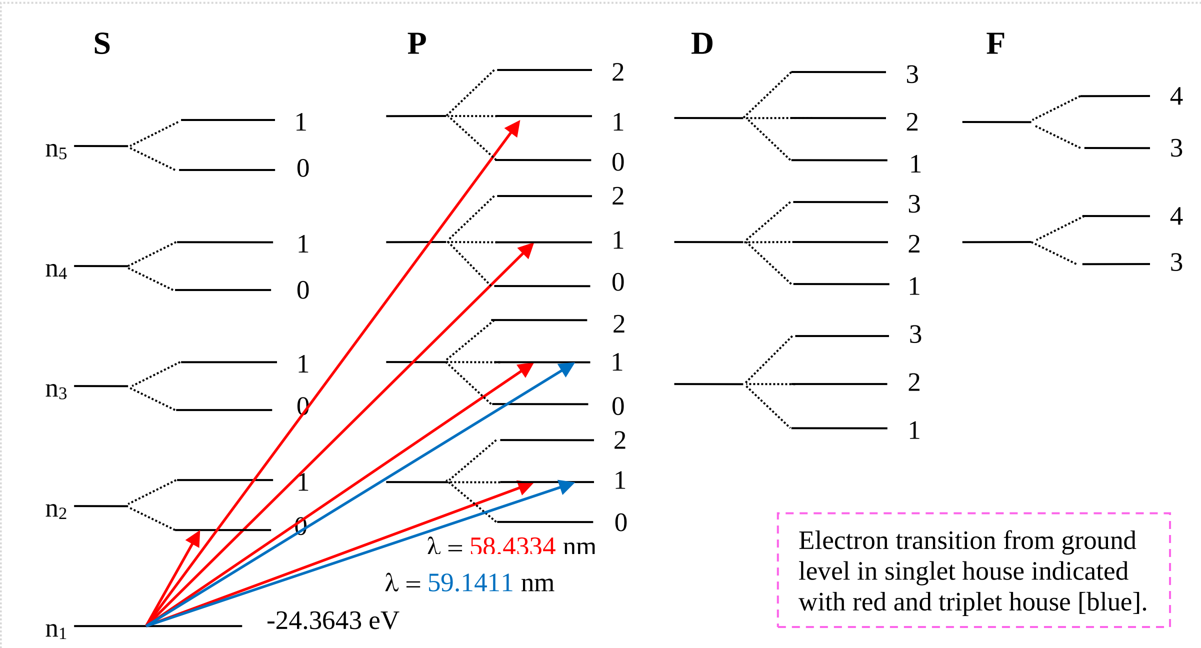
Helium I has two houses to photon γ one singlet and one triplet. That's because the electrons have opposite electron spin at ground level. Note that the arrows not are showing down like usually, here they have magnitude and direction. The only arrows that shows down here are in both diagram **2P1**→ **2S0** & **2S1**. Remark that these photon are at same level of n (n_2 to n_2). It's important to understand that the arrows (vectors) not are showing down, because after an emitting of λ -radiation the electron could go down only one n, and then starts with one new coulomb charge another path. The pathway down for the electron didn't need to be the same way like it was for the electrons pathway. This fact talks for: "Modern Quantum Mechanics". The energy levels of n^{th} in Helium are also not same in the singlet with comparison to the triplet house. If wanted to calculate the kinetic energy and the potential energy, then its only possibly if count with the pathway up for the electron as carrier to electromagnetic radiation.

6.1 **Fine structure in Helium**

Figure 6.1:1



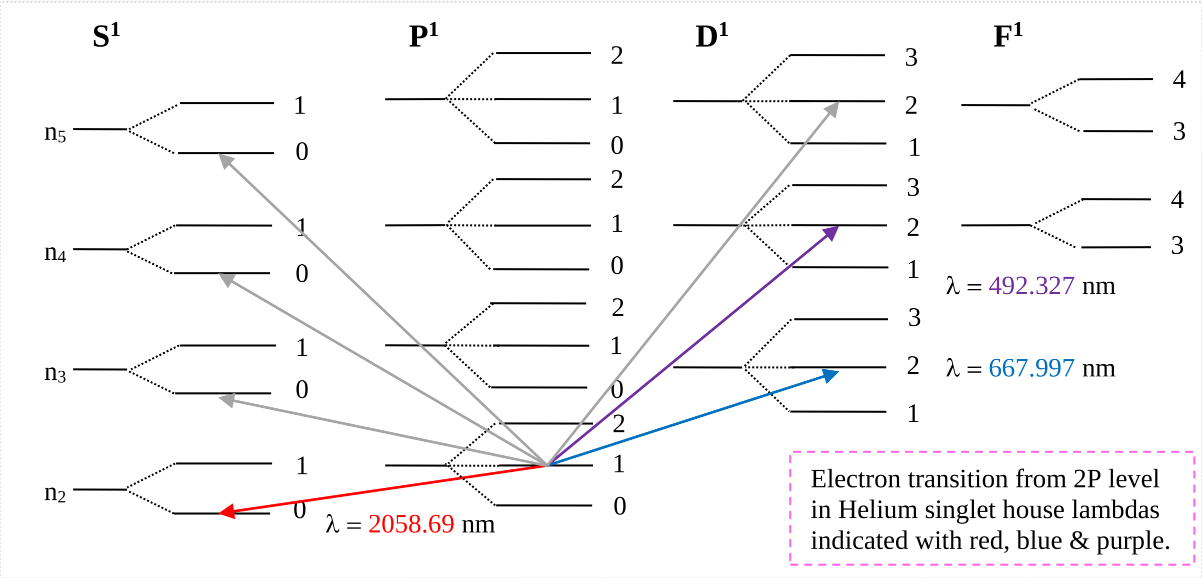
Electron transitions in the singlet house with *J* - [0, 1, 2, 3] and in the triplet house of Helium.



This diagram shows how the electron transitions are going from Helium atoms ground level.

Index	→	Intensity	Lambda ref: [1]	Lambda λ [air]	upper λ cm^{-1}	λ energy cm^{-1}	J coupling	Photon γ transition states
1	P	2	5.055000E-08	vacuum	197824	197823.937	0-1	01:00S^1 --> 15:01P^1
2	P	3	5.056840E-08	vacuum	197752	197751.956	0-1	01:00S^1 --> 14:01P^1
3	P	4	5.059122E-08	vacuum	197663	197662.757	0-1	01:00S^1 --> 13:01P^1
4	P	5	5.062000E-08	vacuum	197550	197550.375	0-1	01:00S^1 --> 12:01P^1
5	P	7	5.065702E-08	vacuum	197406	197406.006	0-1	01:00S^1 --> 11:01P^1
6	P	10	5.070576E-08	vacuum	197216	197216.253	0-1	01:00S^1 --> 10:01P^1
7	P	15	5.077178E-08	vacuum	196960	196959.807	0-1	01:00S^1 --> 09:01P^1
8	P	20	5.086431E-08	vacuum	196602	196601.507	0-1	01:00S^1 --> 08:01P^1
9	P	25	5.099979E-08	vacuum	196079	196079.239	0-1	01:00S^1 --> 07:01P^1
10	P	35	5.120982E-08	vacuum	195275	195275.047	0-1	01:00S^1 --> 06:01P^1
11	P	50	5.156165E-08	vacuum	193943	193942.591	0-1	01:00S^1 --> 05:01P^1
12	P	100	5.222128E-08	vacuum	191493	191492.817	0-1	01:00S^1 --> 04:01P^1
13	P	400	5.370296E-08	vacuum	186209	186209.475	0-1	01:00S^1 --> 03:01P^1
14	P	1000	5.843340E-08	vacuum	171135	171135.002	0-1	01:00S^1 --> 02:01P^1
15	P	50	5.914117E-08	vacuum	169087	169086.949	0-1	01:00S^3 --> 02:01P^3
16	S	5	6.014041E-08	vacuum	166278	166277.549	0-0	01:00S^1 --> 02:00S^1
155	P	-	5.388960E-08	vacuum	185565	185564.56	0-1	01:00S^3 --> 03:01P^3

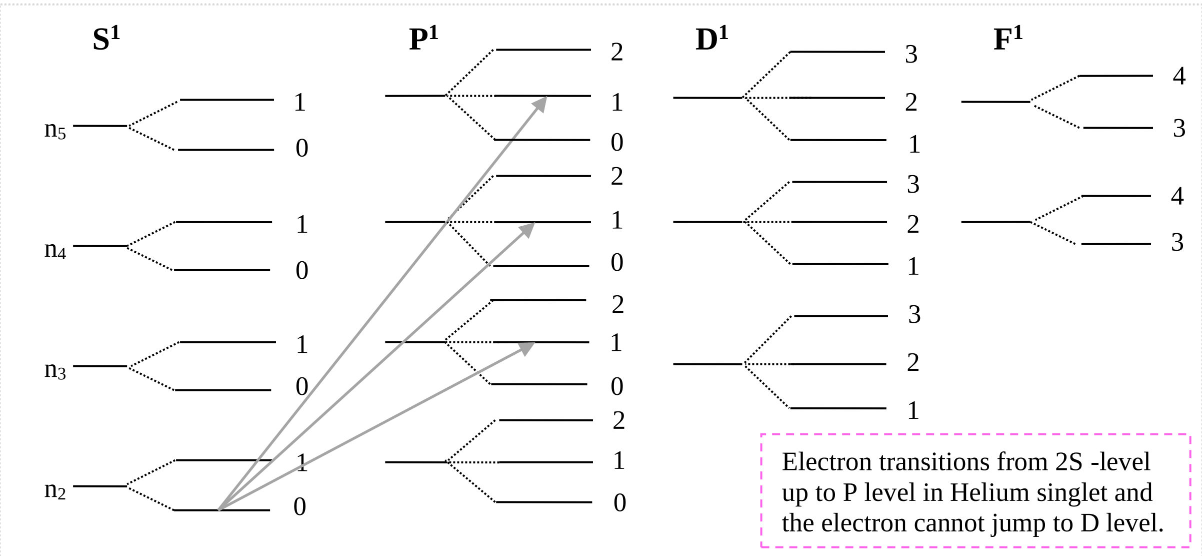
The intensity sources are mainly from reference 1, 2 and 3. Helium lambdas transition and J-coupling reference are mainly from reference 1.



This diagram shows transitions of the electron in the Helium singlet house from the $2P^1$-level.

Index	→	Intensity	Lambda ref: [1]	Lambda λ [air]	upper λ cm^{-1}	λ energy cm^{-1}	J coupling	Photon γ transition states
60	D	1	3.756107E-07	3.757129E-07	197751	26616.0701	1-2	02:01P^1 --> 14:02D^1
61	D	2	3.768784E-07	3.769809E-07	197662	26526.5421	1-2	02:01P^1 --> 13:02D^1
62	D	2	3.784862E-07	3.785891E-07	197549	26413.8580	1-2	02:01P^1 --> 12:02D^1
63	D	3	3.805740E-07	3.806775E-07	197404	26268.9536	1-2	02:01P^1 --> 11:02D^1
66	D	4	3.833554E-07	3.834597E-07	197213	26078.3616	1-2	02:01P^1 --> 10:02D^1
67	S	2	3.838100E-07	3.839144E-07	197182	26047.4733	1-0	02:01P^1 --> 10:00S^1
70	D	5	3.871791E-07	3.872844E-07	196956	25820.8171	1-2	02:01P^1 --> 09:02D^1
71	S	3	3.878181E-07	3.879236E-07	196913	25778.2727	1-0	02:01P^1 --> 09:00S^1
73	D	7	3.926534E-07	3.927602E-07	196596	25460.8281	1-2	02:01P^1 --> 08:02D^1
74	S	2	3.935912E-07	3.936983E-07	196535	25400.1633	1-0	02:01P^1 --> 08:00S^1
76	D	1	4.009268E-07	4.010359E-07	196070	24935.4265	1-2	02:01P^1 --> 07:02D^1
77	S	2	4.023973E-07	4.025068E-07	195979	24844.3037	1-0	02:01P^1 --> 07:00S^1
82	D	3	4.143761E-07	4.144888E-07	195261	24126.1037	1-2	02:01P^1 --> 06:02D^1
83	S	3	4.168967E-07	4.170101E-07	195115	23980.2348	1-0	02:01P^1 --> 06:00S^1
84	D	10	4.387929E-07	4.389123E-07	193919	22783.5952	1-2	02:01P^1 --> 05:02D^1
85	S	3	4.437551E-07	4.438758E-07	193664	22528.8244	1-0	02:01P^1 --> 05:00S^1
90	D	20	4.921931E-07	4.923270E-07	191447	20311.7044	1-2	02:01P^1 --> 04:02D^1
92	S	10	5.047738E-07	5.049111E-07	190940	19805.4668	1-0	02:01P^1 --> 04:00S^1
95	D	100	6.678151E-07	6.679967E-07	186105	14970.1328	1-2	02:01P^1 --> 03:02D^1
98	S	50	7.281349E-07	7.283330E-07	184865	13729.9843	1-0	02:01P^1 --> 03:00S^1
151	S	1000	2.058130E-06	2.058690E-06	166278	4857.4583	0-1	02:01P^1 <-- 02:00S^1

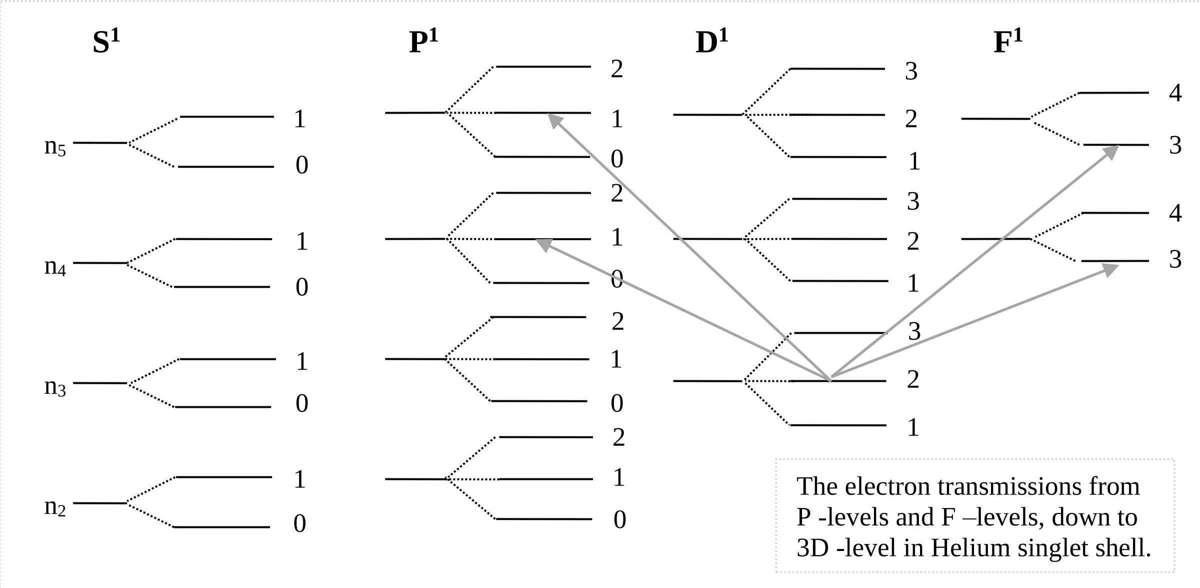
The intensity sources are mainly from reference 1, 2 and 3. Helium lambdas transition and J-coupling reference are mainly from reference 1.



This diagram shows transitions of the electron in the Helium singlet house from the $2S^1$-level.

Index	→	Intensity	Lambda ref: [1]	Lambda λ [air]	upper λ cm^{-1}	λ energy cm^{-1}	J coupling	Photon γ transition states
27	P	2	3.196742E-07	3.197612E-07	197551	31273.3425	0-1	02:00S^1 --> 12:01P^1
28	P	2	3.211568E-07	3.212442E-07	197407	31128.9711	0-1	02:00S^1 --> 11:01P^1
29	P	3	3.231266E-07	3.232145E-07	197217	30939.2069	0-1	02:00S^1 --> 10:01P^1
30	P	5	3.258275E-07	3.259161E-07	196960	30682.7408	0-1	02:00S^1 --> 09:01P^1
31	P	7	3.296773E-07	3.297670E-07	196602	30324.4438	0-1	02:00S^1 --> 08:01P^1
32	P	1	3.354550E-07	3.355462E-07	196080	29802.1515	0-1	02:00S^1 --> 07:01P^1
33	P	2	3.447586E-07	3.448524E-07	195275	28997.9155	0-1	02:00S^1 --> 06:01P^1
51	P	3	3.613643E-07	3.614626E-07	193943	27665.3802	0-1	02:00S^1 --> 05:01P^1
75	P	20	3.964729E-07	3.965807E-07	191493	25215.5469	0-1	02:00S^1 --> 04:01P^1
91	P	100	5.015678E-07	5.017042E-07	186210	19932.0629	0-1	02:00S^1 --> 03:01P^1

The intensity sources are mainly from reference 1, 2 and 3. Helium lambdas transition and J-coupling reference are mainly from reference 1.



This diagram shows transition of the electron in the Helium singlet house from the $3D^1$-level.

Index	→	Intensity	Lambda ref: [1]	Lambda λ [air]	upper λ cm^{-1}	λ energy cm^{-1}	J coupling	Photon γ transition states
111	P	1	9.529270E-07	9.531862E-07	196596	10491.1297	2-3	03:02D^1 --> 08:03F^1
118	P	2	1.003116E-06	1.003389E-06	196071	9966.2260	2-3	03:02D^1 --> 07:03F^1
128	P	1	1.090216E-06	1.090513E-06	195275	9170.0000	2-1	03:02D^1 --> 06:01P^1
130	P	3	1.091698E-06	1.091995E-06	195263	9157.5516	2-3	03:02D^1 --> 06:03F^1
139	P	20	1.279027E-06	1.279375E-06	193921	7816.3172	2-3	03:02D^1 --> 05:03F^1
146	P	1	1.855555E-06	1.856060E-06	191493	5387.7577	2-1	03:02D^1 --> 04:01P^1
148	P	200	1.869694E-06	1.870203E-06	191452	5347.0144	2-3	03:02D^1 --> 04:03F^1

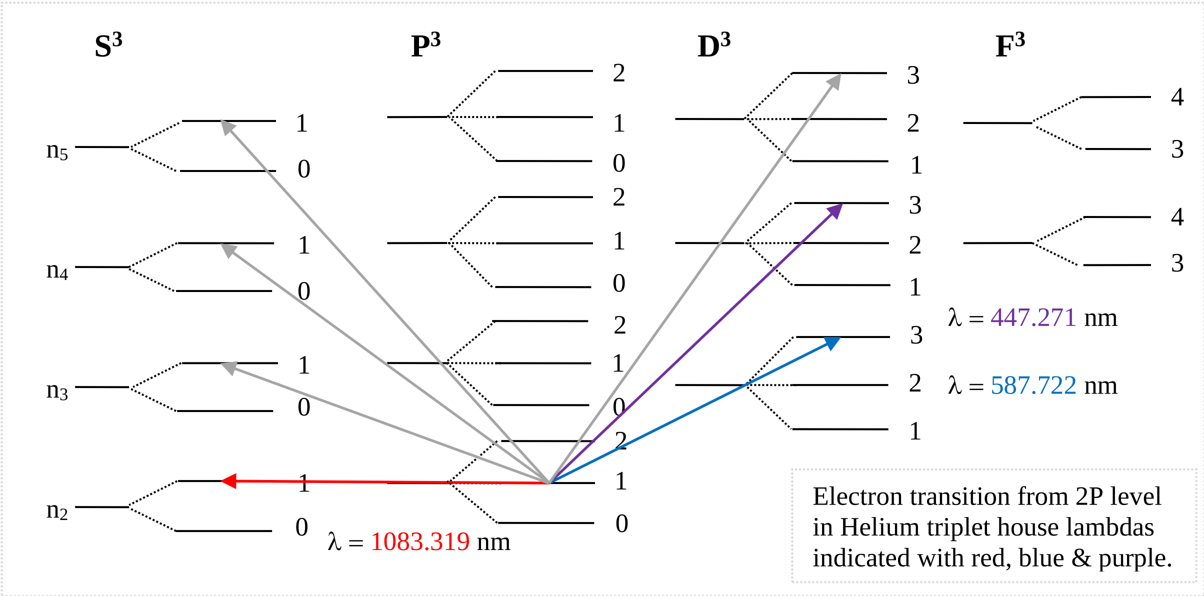
The intensity sources are mainly from reference 1, 2 and 3. Helium lambdas transition and J-coupling reference are mainly from reference 1.

Index	→	Intensity	Lambda ref: [1]	Lambda λ [air]	upper λ cm^{-1}	λ energy cm^{-1}	J coupling	Photon γ transition states
-	P	-	-	1275.903 nm	193943	7837.585	2-1	03:02D^1 --> 05:01P^1

This transition is missing from main reference [1]. It has probably the energy in cm^{-1} above.

Index	→	Intensity	Lambda ref: [1]	Lambda λ [air]	upper λ cm^{-1}	λ energy cm^{-1}	J coupling	Photon γ transition states
151	S	1000	2.058130E-06	2.058690E-06	166278	4857.4583	0-1	02:01P^1 <-- 02:00S^1

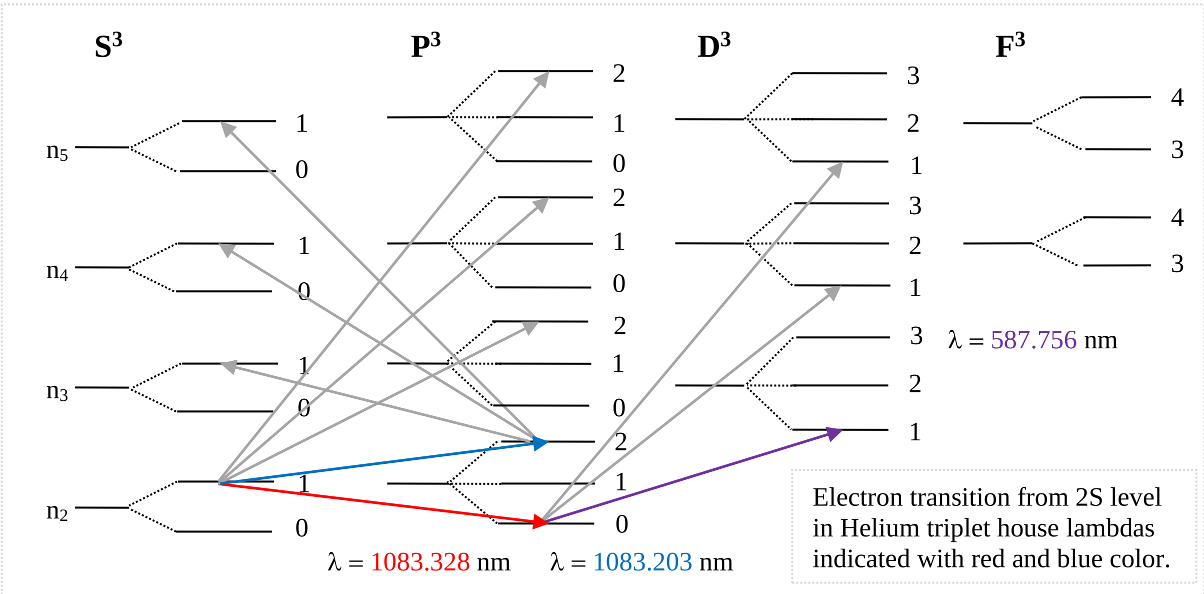
This index has only one strong electromagnetic emission, so the electron can only go down in energy level if gets off a lambda. The electron can only get one transition from ground level up to $2S^1$-level, but not from $2P^1$-level. This index; 115 of lambda energy is the only example in the singlet house of the Helium atom where this phenomena occurs. The pathway down for the electron, when gives off an electromagnetic emission, didn't need to be the same way like it was for the electron pathway up. Probably must the electron always be in the same house in Helium. That will say in the singlet house or in the triplet house. It has, once again, to do with that the electrons has different and opposite electron spin to each other. Probably has Helium also one instinct proton spin in its nucleus that will say one opposite proton spin into electron.



This diagram shows transition of the electron in the Helium triplet house, from the $2P^3$-level.

Index	→	Intensity	Lambda ref: [1]	Lambda λ [air]	upper λ cm^{-1}	λ energy cm^{-1}	J coupling	Photon γ transition states
44	D	7	3.554415E-07	3.555382E-07	197213	28126.3745	1-3	02:01P^3 --> 10:03D^3
47	D	1	3.587270E-07	3.588246E-07	196956	27868.7713	1-3	02:01P^3 --> 09:03D^3
50	S	2	3.599448E-07	3.600427E-07	196861	27774.4830	0-1	02:01P^3 --> 09:01S^3
52	D	2	3.634232E-07	3.635221E-07	196596	27508.6476	1-3	02:01P^3 --> 08:03D^3
54	S	7	3.651990E-07	3.652983E-07	196462	27374.8853	1-1	02:01P^3 --> 08:01S^3
56	D	3	3.705005E-07	3.706013E-07	196070	26983.1775	1-3	02:01P^3 --> 07:03D^3
58	S	1	3.732865E-07	3.733880E-07	195869	26781.7902	1-1	02:01P^3 --> 07:01S^3
64	D	10	3.819607E-07	3.820646E-07	195261	26173.5833	1-3	02:01P^3 --> 06:03D^3
68	S	30	3.867475E-07	3.868527E-07	194937	25849.6325	1-1	02:01P^3 --> 06:01S^3
78	D	50	4.026191E-07	4.027286E-07	193918	24830.6159	1-3	02:01P^3 --> 05:03D^3
80	S	12	4.120815E-07	4.121936E-07	193347	24260.4454	1-1	02:01P^3 --> 05:01S^3
86	D	200	4.471479E-07	4.472695E-07	191445	22357.8837	1-3	02:01P^3 --> 04:03D^3
88	S	30	4.713146E-07	4.714427E-07	190298	21211.4834	1-1	02:01P^3 --> 04:01S^3
93	D	500	5.875621E-07	5.877219E-07	186102	17014.8496	1-3	02:01P^3 --> 03:03D^3
96	S	200	7.065190E-07	7.067112E-07	183237	14150.0522	1-1	02:01P^3 --> 03:01S^3
126	S	1000	1.083025E-06	1.083319E-06	159856	9230.8881	1-1	02:01P^3 <-- 02:01S^3

The intensity sources are mainly from reference 1, 2 and 3. Helium lambdas transition and J-coupling reference are mainly from reference 1.



This diagram shows transition of the electron in the Helium triplet house, from the $2S^3$-level. The transition of $2P^3$-level, with J - [0, 2], are also indicated of some transitions probabilities of the electron in Helium triplet house. There is quantization pattern of the electron pathway.

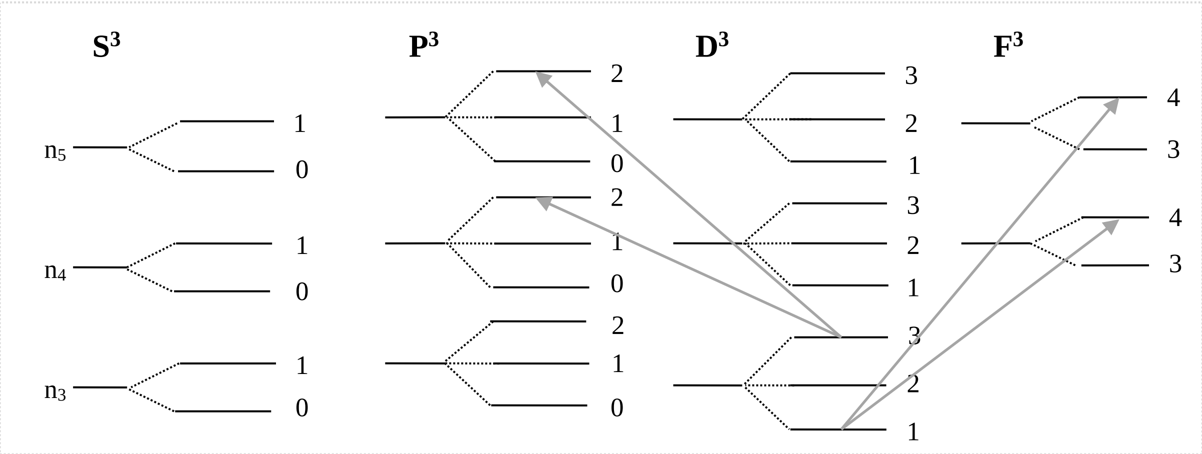
Index	→	Intensity	Lambda ref: [1]	Lambda λ [air]	upper λ cm^{-1}	λ energy cm^{-1}	J coupling	Photon γ transition states
17	P	2	2.644802E-07	2.645521E-07	197656	37799.7322	1-2	02:01S^3 --> 13:02P^3
18	P	3	2.652848E-07	2.653570E-07	197541	37685.0869	1-2	02:01S^3 --> 12:02P^3
19	P	4	2.663271E-07	2.663995E-07	197394	37537.6022	1-2	02:01S^3 --> 11:02P^3
20	P	5	2.677135E-07	2.677863E-07	197199	37343.2073	1-2	02:01S^3 --> 10:02P^3
21	P	7	2.696119E-07	2.696852E-07	196936	37080.2652	1-2	02:01S^3 --> 09:02P^3
22	P	1	2.723191E-07	2.723932E-07	196568	36711.6399	1-2	02:01S^3 --> 08:02P^3
23	P	2	2.763804E-07	2.764556E-07	196028	36172.1770	1-2	02:01S^3 --> 07:02P^3
24	P	4	2.829076E-07	2.829846E-07	195194	35337.6181	1-2	02:01S^3 --> 06:02P^3
25	P	10	2.945106E-07	2.945907E-07	193801	33945.4021	1-2	02:01S^3 --> 05:02P^3
26	P	20	3.187745E-07	3.188612E-07	191218	31361.6075	1-2	02:01S^3 --> 04:02P^3
72	P	500	3.888648E-07	3.889706E-07	185565	25708.8858	1-2	02:01S^3 --> 03:02P^3
125	P	300	1.082909E-06	1.083203E-06	169088	9231.8769	1-2	02:01S^3 --> 02:02P^3
127	P	2000	1.083034E-06	1.083328E-06	169087	9230.8122	1-0	02:01S^3 --> 02:00P^3

The intensity sources are mainly from reference 1, 2 and 3. Helium lambdas transition and J-coupling reference are mainly from reference 1.

Index	→	Intensity	Lambda ref: [1]	Lambda λ [air]	upper λ cm^{-1}	λ energy cm^{-1}	J coupling	Photon γ transition states
34	D	1	3.471818E-07	3.472762E-07	197882	28795.5208	0-3	02:00P^3 --> 16:03D^3
35	D	2	3.478957E-07	3.479903E-07	197823	28736.4309	0-3	02:00P^3 --> 15:03D^3
36	D	2	3.487723E-07	3.488672E-07	197751	28664.2051	0-3	02:00P^3 --> 14:03D^3
37	S	2	3.490685E-07	3.491634E-07	197727	28639.8823	0-1	02:00P^3 --> 14:01S^3
38	D	3	3.498645E-07	4.947831E-07	189298	20210.8754	0-3	02:00P^3 --> 13:03D^3
39	S	2	3.502379E-07	3.503332E-07	197631	28544.2573	0-1	02:00P^3 --> 13:01S^3
40	D	4	3.512512E-07	3.513467E-07	197549	28461.9120	0-3	02:00P^3 --> 12:03D^3
41	S	2	3.517317E-07	3.518274E-07	197510	28423.0302	0-1	02:00P^3 --> 12:01S^3
42	D	5	3.530491E-07	3.531451E-07	197404	28316.9699	0-3	02:00P^3 --> 11:03D^3
43	S	3	3.536809E-07	3.537771E-07	197353	28266.3857	0-1	02:00P^3 --> 11:01S^3
45	D	1	3.554547E-07	3.555514E-07	197212	28125.3300	0-1	02:00P^3 --> 10:01D^3
46	S	4	3.562979E-07	3.563948E-07	197146	28058.7698	0-1	02:00P^3 --> 10:01S^3
48	D	2	3.587405E-07	3.588381E-07	196955	27867.7226	0-1	02:00P^3 --> 09:01D^3
49	S	5	3.599314E-07	3.600293E-07	196862	27775.5171	0-1	02:00P^3 --> 09:01S^3
53	D	2	3.634369E-07	3.635358E-07	196594	27507.6106	0-1	02:00P^3 --> 08:01D^3
55	S	2	3.652130E-07	3.653123E-07	196462	27373.8359	2-1	02:02P^3 --> 08:01S^3
57	D	3	3.705148E-07	3.706156E-07	196069	26982.1360	0-1	02:00P^3 --> 07:01D^3
59	S	3	3.733010E-07	3.734025E-07	195869	26780.7500	2-1	02:02P^3 --> 07:01S^3
65	D	1	3.819758E-07	3.820797E-07	195259	26172.5500	0-1	02:00P^3 --> 06:01D^3
69	S	5	3.867630E-07	3.868682E-07	194937	25848.5965	2-1	02:02P^3 --> 06:01S^3
79	D	5	4.026359E-07	4.027454E-07	193916	24829.5811	0-1	02:00P^3 --> 05:01D^3
81	S	2	4.120992E-07	4.122113E-07	193347	24259.4034	2-1	02:02P^3 --> 05:01S^3
87	D	25	4.471682E-07	4.472898E-07	191444	22356.8687	0-1	02:00P^3 --> 04:01D^3
89	S	4	4.713376E-07	4.714658E-07	190298	21210.4461	2-1	02:02P^3 --> 04:01S^3
94	D	100	5.875966E-07	5.877564E-07	186101	17013.8506	0-1	02:00P^3 --> 03:01D^3
97	S	30	7.065707E-07	7.067629E-07	183237	14149.0168	2-1	02:02P^3 --> 03:01S^3

The intensity sources are mainly from reference 1, 2 and 3. Helium lambdas transition and J-coupling reference are mainly from reference 1.

The triplet house in Helium is more complicated than the singlet house of Helium. In singlet house, the electron has only one J –coupling constant to each orbital. In comparison to triplet house, where there is several J –coupling constant [0, 1, 2, 3] to P^3 and D^3 –orbital in Helium.



This diagram shows transition of the electron in the Helium triplet house, from the $3D^3$-level with J- [1, 3]. It shows how the electron transition to F-orbital can occur, before it falls down.

Index	→	Intensity	Lambda ref: [1]	Lambda λ [air]	upper λ cm^{-1}	λ energy cm^{-1}	J coupling	Photon γ transition states
103	F	2	8.996978E-07	8.999425E-07	197213	11111.8208	1-4	03:01D^3 --> 10:04F^3
106	F	2	9.210337E-07	9.212842E-07	196955	10854.4136	1-4	03:01D^3 --> 09:04F^3
110	F	3	9.526170E-07	9.528761E-07	196595	10494.5437	1-4	03:01D^3 --> 08:04F^3
112	P	2	9.552890E-07	9.555488E-07	196567	10465.1898	3-2	03:03D^3 --> 08:02P^3
117	F	6	1.002773E-06	1.003046E-06	196070	9969.6349	1-4	03:01D^3 --> 07:04F^3
119	P	3	1.007204E-06	1.007478E-06	196026	9925.7755	3-2	03:03D^3 --> 07:02P^3
129	F	9	1.091292E-06	1.091589E-06	195262	9160.9585	1-4	03:01D^3 --> 06:04F^3
131	P	3	1.099656E-06	1.099955E-06	195192	9091.2801	3-2	03:03D^3 --> 06:02P^3
138	F	50	1.278479E-06	1.278827E-06	193920	7819.6675	1-4	03:01D^3 --> 05:04F^3
142	P	2	1.298489E-06	1.298842E-06	193801	7699.1648	3-2	03:03D^3 --> 05:02P^3
147	F	500	1.868596E-06	1.869104E-06	191451	5350.1563	1-4	03:01D^3 --> 04:04F^3
150	P	20	1.954313E-06	1.954845E-06	191216	5115.4962	3-2	03:03D^3 --> 04:02P^3

The intensity sources are mainly from reference 1, 2 and 3. Helium lambdas transition and J-coupling reference are mainly from reference 1.

Changes are made from reference of *J* -coupling indicated purple in the Helium triplet house.

Index	→	Intensity	Lambda ref: [1]	Lambda λ [air]	upper λ cm^{-1}	λ energy cm^{-1}	J coupling	Photon γ transition states
126	S	1000	1.083025E-06	1.083319E-06	159856	9230.8881	1-1	02:01P^3 <-- 02:01S^3

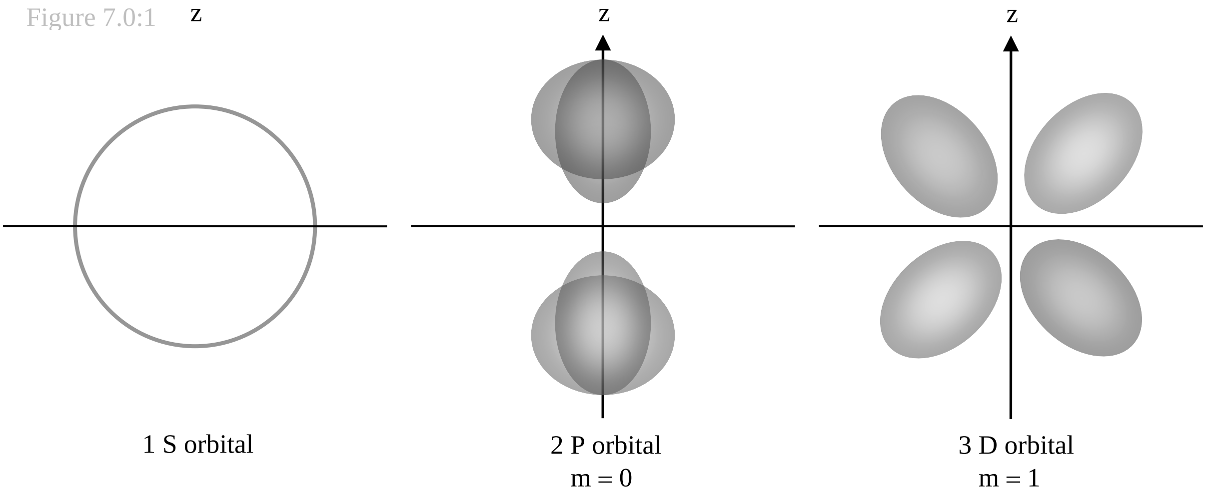
This index has only one strong electromagnetic emission, so the electron can only go down in energy level if gets off a lambda. The electron cannot go up through one transition to $2S^3$ [1]-level. This index; 126 of lambda energy is the only example in the triplet house of the Helium atom where this phenomena occurs. Thus, the pathway down for the electron, when gives off an electromagnetic emission, didn't need to be the same way like it was for the electron pathway up. Probably must the electron always be in the same house in Helium. That will say in the singlet house or in the triplet house. It has, once again, to do with that the electrons has different and opposite electron spin into each other. Probably has Helium also one instinct proton spin in its nucleus that will say one opposite proton spin to another, and into electrons.

One house in Helium I is symmetrical and the other house is antisymmetrical. This make that transition between them not are allowed. Because each electron in Helium I has $S=½$ or $S=-½$ it´s possibly expect $S=0$ and $S=1$, corresponding to the singlet and the triplet house, respectively. For singlet terms, $J=L$; for the triplets terms, the Clebsch-Gordan series gives $J=L+1,\ \ J=L,\ \ J=L-1$ provided that $L>0$ [4]. This make that we can expect level of orbital such as symmetrical singlet $P^1 1$ and antisymmetrical triplet $P^3 0$, $P^3 1$, $P^3 2$ to stem from each $1S^1 nP^1$ configuration, and these levels are expected to be split by a spin-orbit *J* –coupling [4].

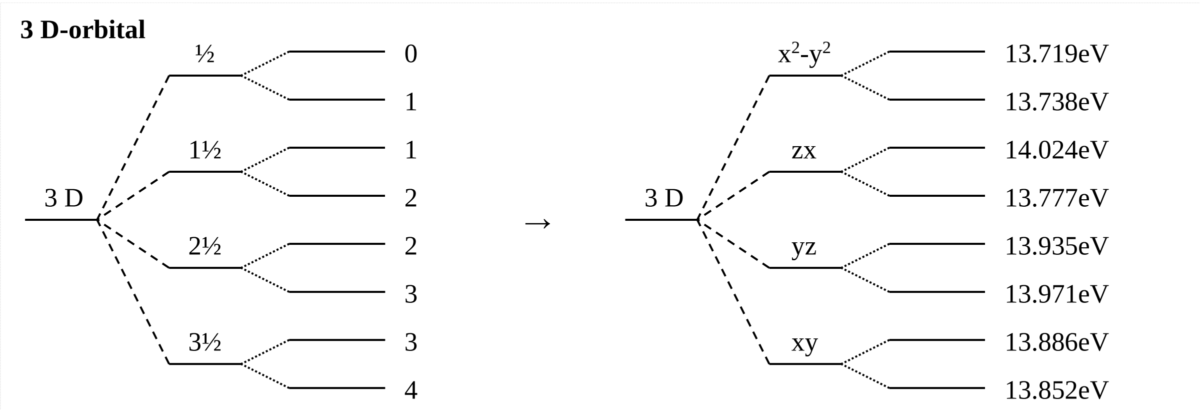
The ground-state configuration $1S^1$ must be symmetrical, because both electrons occupy the same orbital, and therefore mainly symmetric states has transitions intensity from the ground-state. Modern Quantum Mechanics take into consideration the postulate from Wolfgang Pauli which consider the state of system when the spin of the electrons are taken into account. The state of two electrons corresponding to $S=0$, and it´s one state of a symmetric wavefunction. With the Pauli principle, elementary particles can be classified as fermions or boson, where f*ermions* is particle like the electron or the proton with half -integral spin [4], and a *boson* are particles like photons with integral spin 1 and α-particles, like Helium-4 nuclei, with integral spin 0. The total wavefunction, according to W. Pauli Exclusion principles to space and spin, must be antisymmetric under the interchange of any pair of identical *fermions* (electron and proton) and symmetrical under the interchange of any pair of identical *bosons* (integral spin). These make that; no two electrons can occupy the same transition states in orbital. However, if the two electrons in Helium I are described with an antisymmetric wavefuction, there spin state must be symmetrical and correspond then to $S=1$ like it´s in the triplet house of Helium. If the spin of the two electrons in Helium are parallel, then the Pauli principles requires them to have an antisymmetric wavefunction, like it's in the triplet house of Helium, which implies that the electrons cannot be found at the same point in the same orbital house simultaneously.

7. The structure of Argon

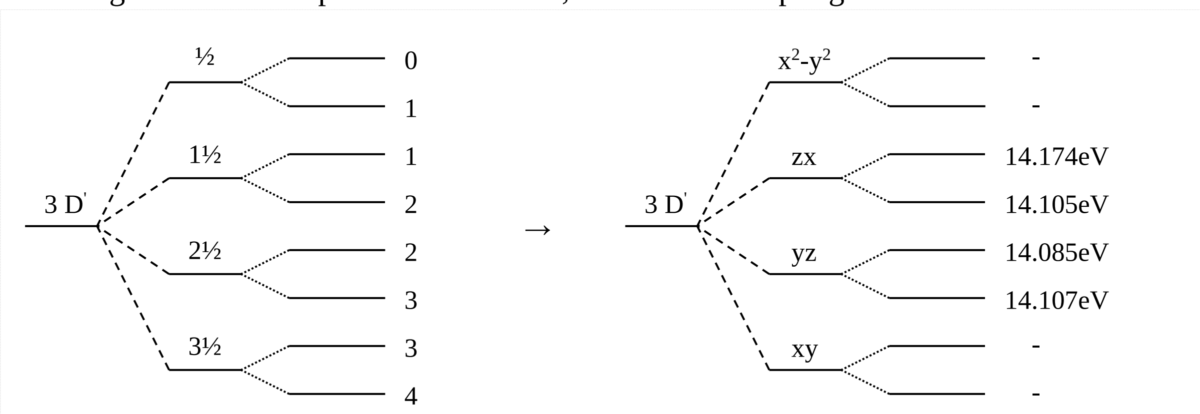
Figure 7.0:1



This diagram shows the orbital density and there shapes in 3-spaces. These atomic orbital are mathematical description of where the electrons in an atom are most likely to be found. In the first 1s orbital we have spherical shells where the radius could be different from atom to atom or molecule. The 2p orbital has three orbital with two lobes, where the upper above is a dark positive lobe. The shapes of the p-orbital are confirmed by research experiment with scanning tunneling microscope. The 3d orbital has five orbital with mostly four lobes, where the dark lobes are positive. There lobes have different energies and they have also a more complicated boundary surface then the s -or p-orbital. When two electrons occupy one lobe, then we have distribution of spherically symmetrical electron clouds. In Argon the photons start at level n_3.



This diagram shows the positive 3-d orbital, with their J-coupling lobes and their level of eV.



This diagram shows the negative lobes in 3-d orbital of Argon. *J*-coupling reference from [2].

The boundary surfaces of the four d-orbital are denoted x^2-y^2, zx, yz and xy. They could be in a different pattern to the proposal above. But in every orbital lobe, there is one J-coupling to two electrons. The location of an electron in an atom is described be a quantum mechanical wave function known as an atomic orbital. To understand all the lobes, we must classify the shells. Argon is classified to be a Noble gas that will say it has a full house of eight electrons.

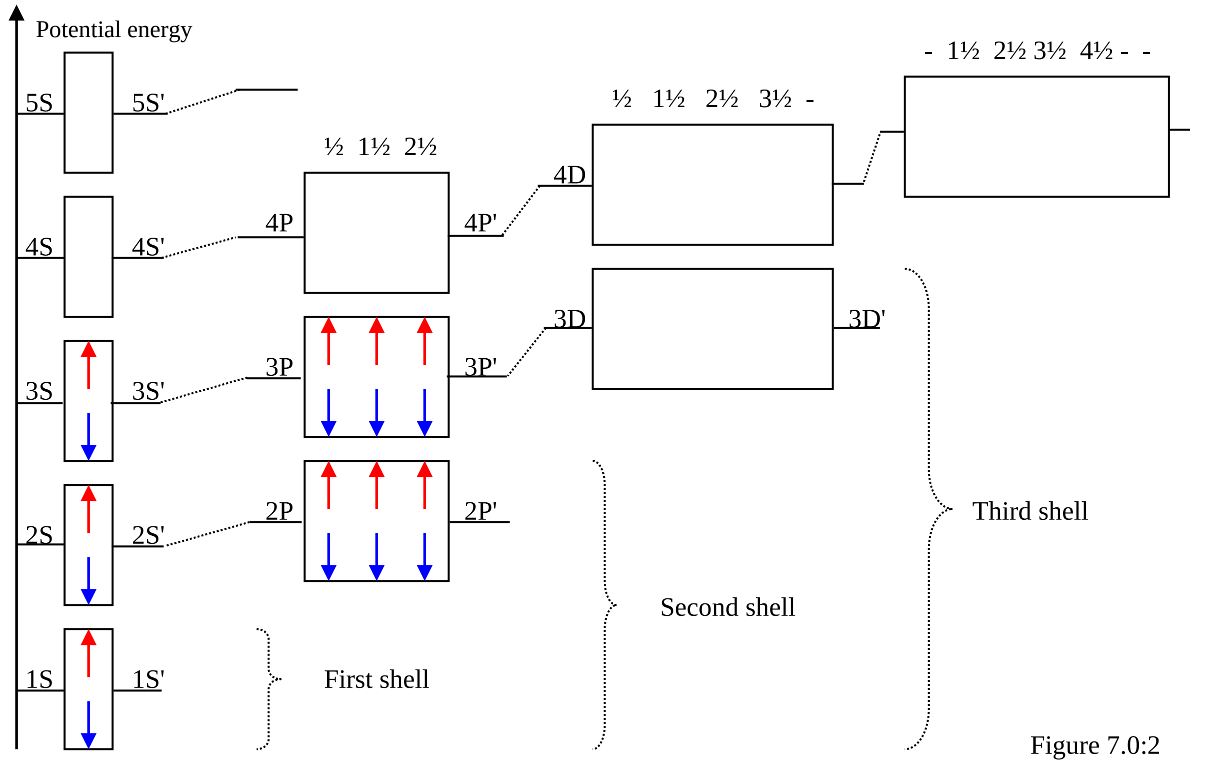
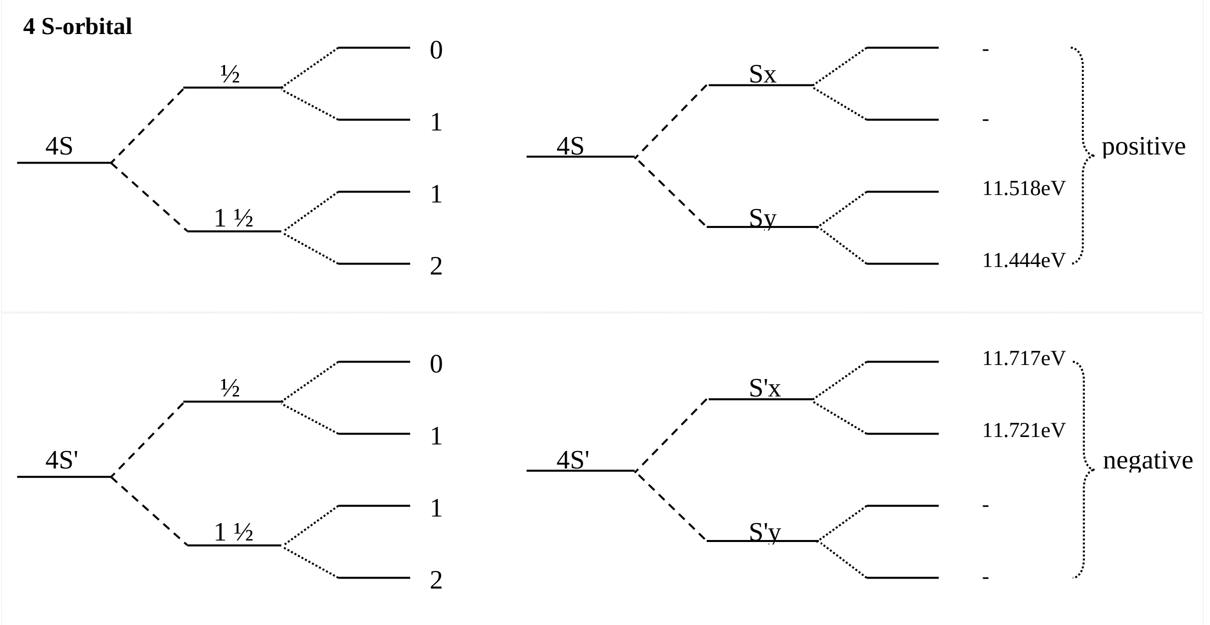


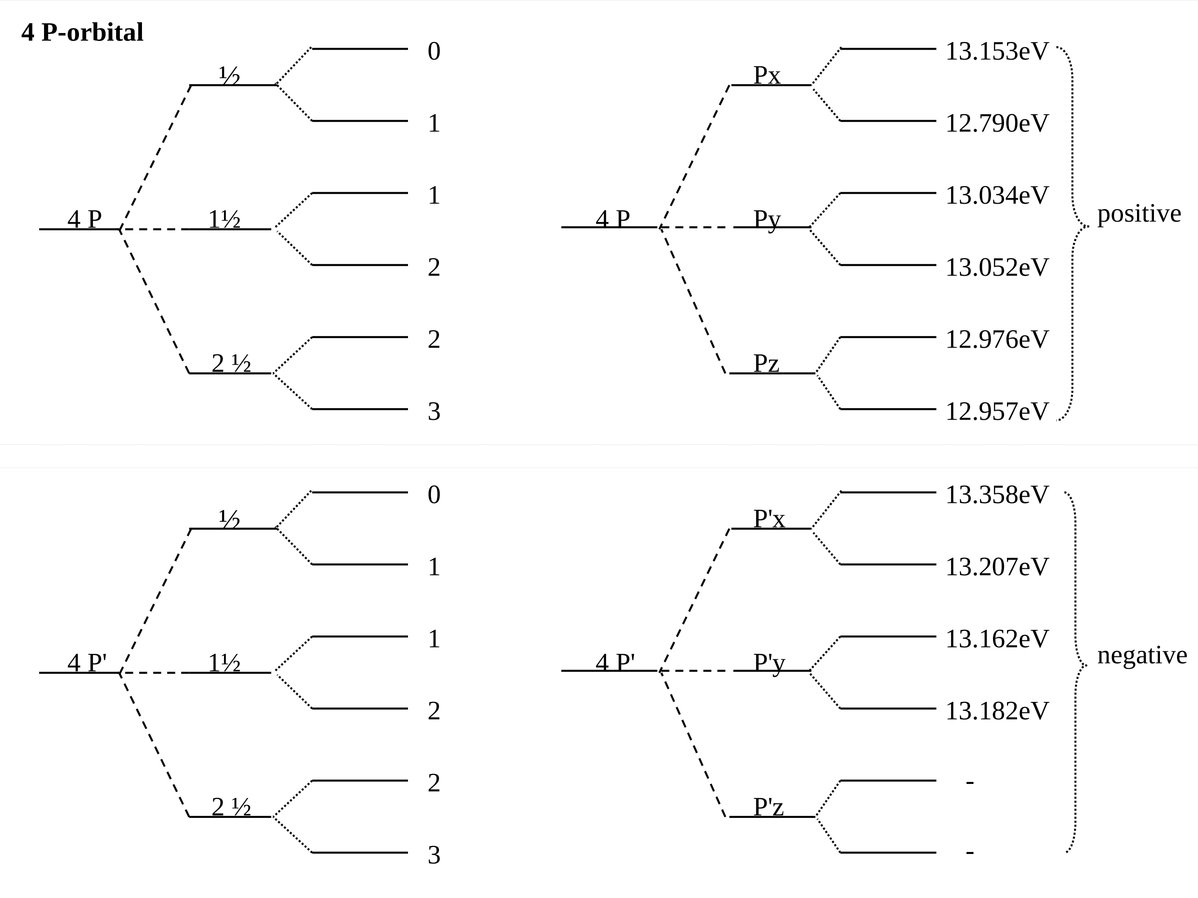
Figure 7.0:2

This diagram shows Argons eighteen electrons occupied the sub shell up to the 3 p-orbital. It shows also that the electron could go to the 3 d-orbital, because they are located at a higher energy level then 3 p-orbital. The red arrows indicated a electron spin up and blue spin down.



This diagram shows the 4S orbital with J-coupling and there positive and negative lobes. So, the photons γ are going from 3P orbital and in this case also to the 4S orbital. Because each subshell in S-orbital could only occupy two electrons, the combination for the positive lobes and the negative lobes are limited. This pattern above will then represent all higher; S-orbital.

To get better overview of the 4 p orbital, it's necessary to make one energy diagram of levels.



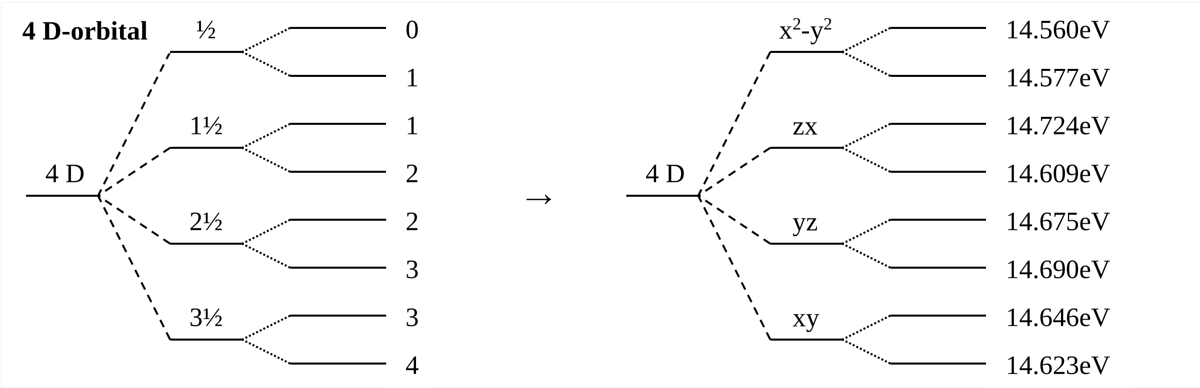
This diagram shows the 4 p orbital lobes with the *J*-coupling left and the energies level right.

Orbital	Energy	Orbital	Energy
3D [½]:0	13.719	3D' [½]:0	-
3D [½]:1	13.738	3D' [½]:1	-
3D [1½]:1	14.024	3D' [1½]:1	14.174
3D [1½]:2	13.777	3D' [1½]:2	14.105
3D [2½]:2	13.935	3D' [2½]:2	14.085
3D [2½]:3	13.971	3D' [2½]:3	14.107
3D [3½]:3	13.886	3D' [3½]:3	-
3D [3½]:4	13.852	3D' [3½]:4	-

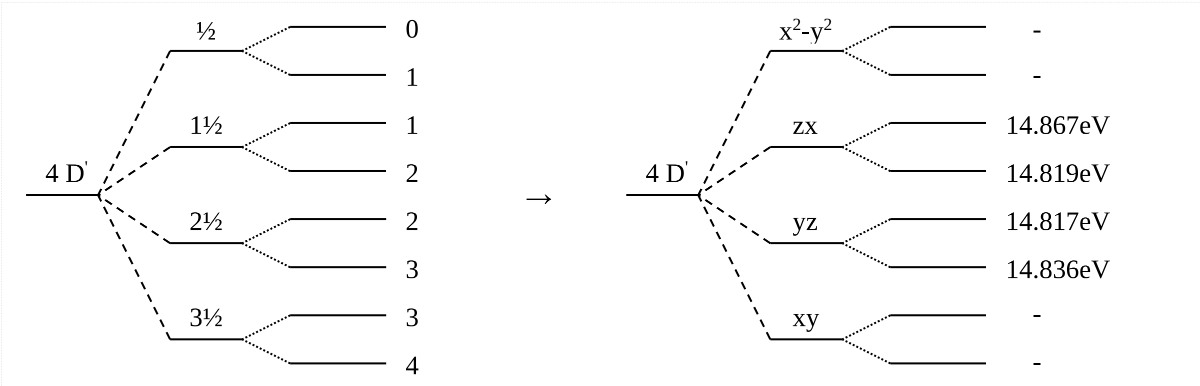
Orbital	Energy	Orbital	Energy
4P [½]:0	13.153	4P' [½]:0	13.358
4P [½]:1	12.780	4P' [½]:1	13.207
4P [1½]:1	13.034	4P' [1½]:1	13.162
4P [1½]:2	13.052	4P' [1½]:2	13.182
4P [2½]:2	12.976	4P' [2½]:2	-
4P [2½]:3	12.957	4P' [2½]:3	-

This model is one proposal of energies level *eV* to their lobes.

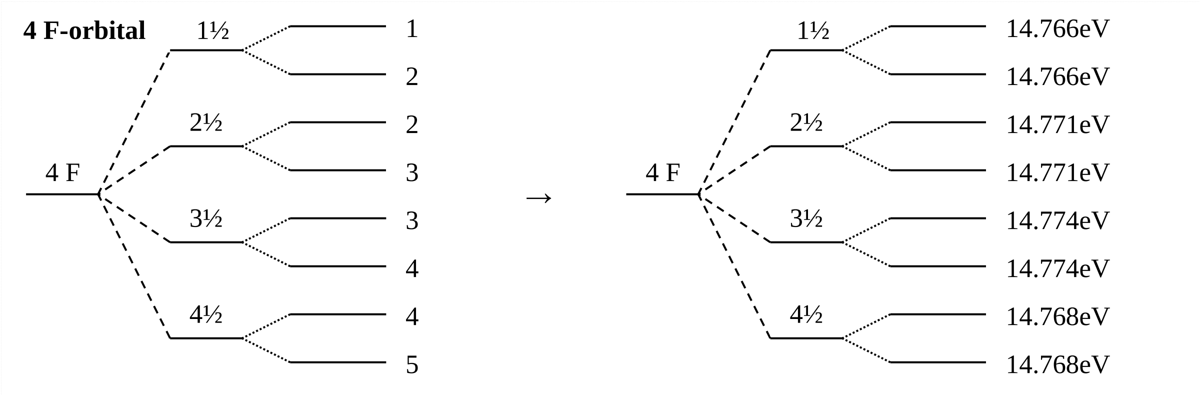
This table shows the 3 d orbital and the 4 p orbital in argon lobes with energy in electron volt. The 4 s orbital has probably a proposal of *J*-coupling for both the positive and negative lobes. There are about $2 \cdot 6 = 12$ possibly combination to form the p orbital. But probably is only one combination to the p orbital standard in the Argon atom. P prime stands here for the negative orbital lobes. When the π-electron give off an electromagnetic radiation, it's the energy of the orbit the electron has when it circulate one revolution of that orbit. Hence, the atomic radius it has up in the polar helix gives the orbit if take this to 2π, and these energies stadium to the π -electrons correspond to one revolution of orbit. This make that the ionization potential energy is the energy the electron has corresponding to one orbit path at ground level together with its energy in the amplitude, this makes the π -ionization potential. The π -potential is possibly to take with Einstein-Lorentz transformation to E_p, like the case is for the Hydrogen atom. And the electron amplitude energy is possibly to get with the wave equation from E. Schrödinger.

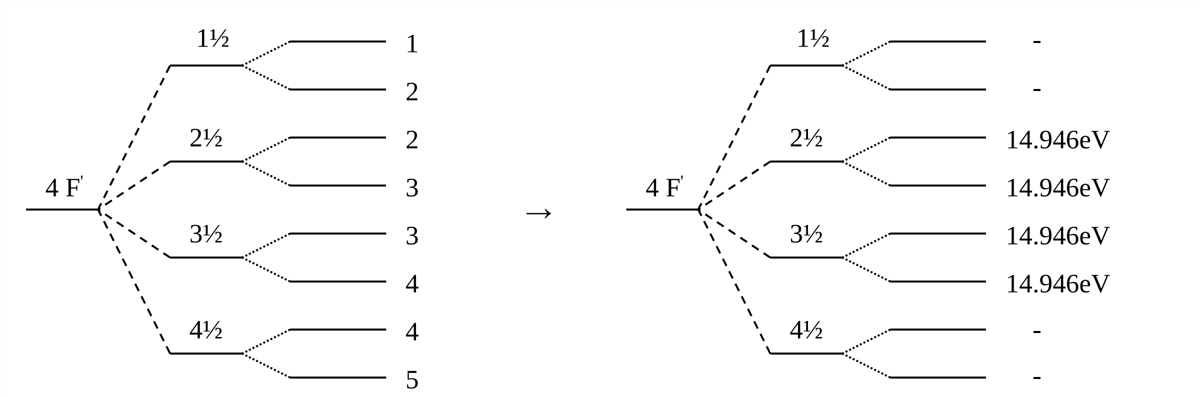


The diagram above shows different positive lobes in the 4d orbital with their energies level in electron volt, the diagram down shows same orbital but they are heir the 4d´of negative lobes.



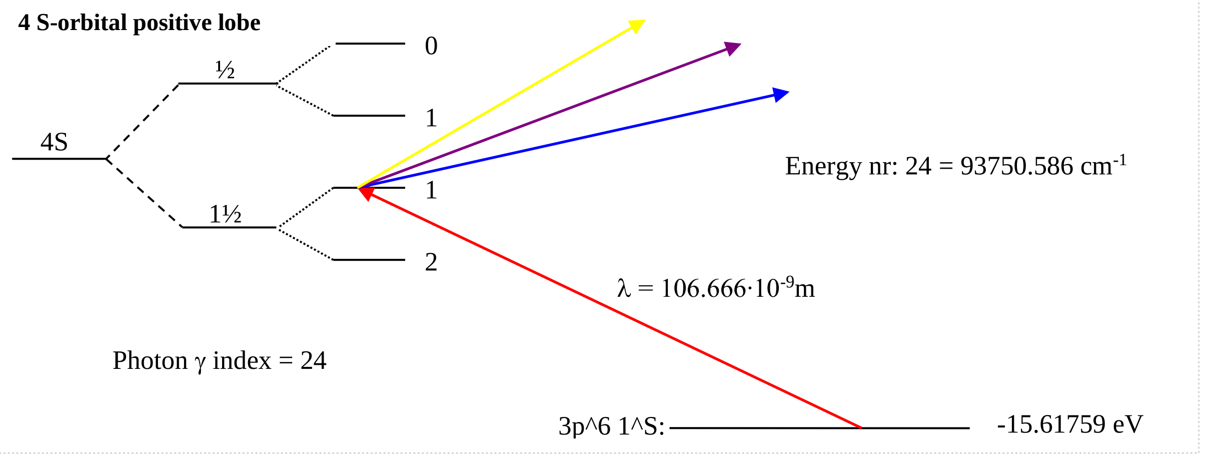
All the nth d-orbital in Argon have same positive and negative lobes, the difference is only the energy levels in electron volt between higher or lower d/f-orbital. There are now heirs same gap in the negative lobe without any energy indicated in two of the lobes. Probably will these energy gaps be the space for what atom like xenon needed, they have more photon transition.





7.1. **Transition red in Argon**

To get an overview of how the photons γ are going between the energy level in Argon I, thus:



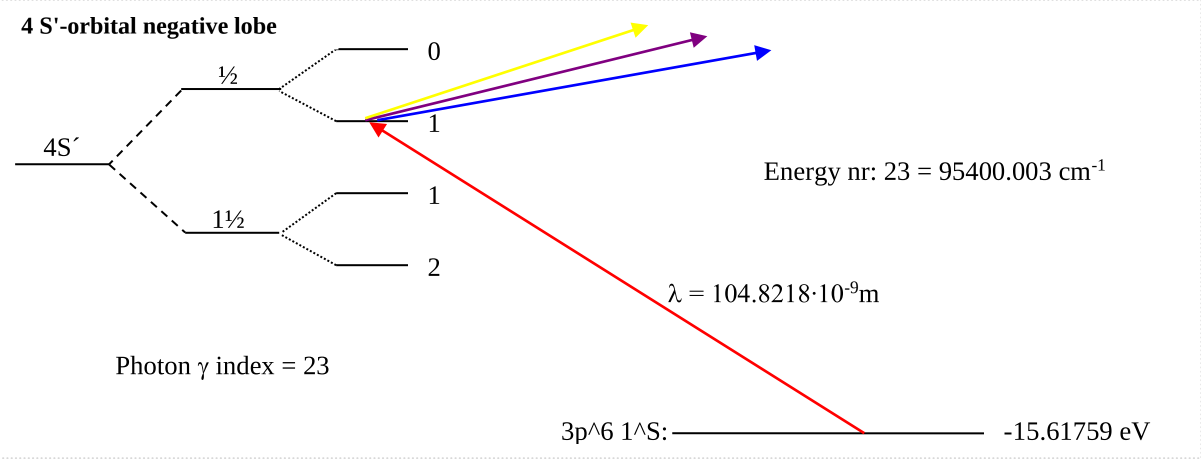
This diagram shows how the energies are going from the ground state with particular distance from: 3p^6 1^S to 4s [1½], with *J* {0-1}. The electromagnetic radiation is opposite's vectors.

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
30	1	3.074150E-07	3.074986E-07	126271	32529.3170	1-0	04S [1½]¤ --> 13P [½]
35	1	3.090180E-07	3.091021E-07	126102	32360.5745	1-0	04S [1½]¤ --> 12P [½]
37	1	3.092970E-07	3.093811E-07	126073	32331.3838	1-1	04S [1½]¤ --> 12P [½]
39	3	3.110660E-07	3.111506E-07	125889	32147.5185	1-0	04S [1½]¤ --> 11P [½]
40	1	3.114100E-07	3.114947E-07	125854	32112.0067	1-2/1	04S [1½]¤ --> 11P [1½]
41	1	3.114960E-07	3.115807E-07	125845	32103.1410	1-1	04S [1½]¤ --> 11P [½]
42	1	3.116220E-07	3.117068E-07	125832	32090.1605	1-0	04S [1½]¤ --> 08P´[½]
45	3	3.120060E-07	3.120909E-07	125793	32050.6657	1-2	04S [1½]¤ --> 08P [1½]
51	3	3.142600E-07	3.143455E-07	125563	31820.7853	1-0	04S [1½]¤ --> 10P [½]
52	1	3.145420E-07	3.146276E-07	125534	31792.2567	1-2	04S [1½]¤ --> 10P [1½]
53	1	3.145630E-07	3.146486E-07	125532	31790.1342	1-1	04S [1½]¤ --> 10P´[1½]
54	1	3.148200E-07	3.149056E-07	125506	31764.1827	1-1	04S [1½]¤ --> 10P´[½]
55	1	3.150420E-07	3.151277E-07	125484	31741.7995	1-2	04S [1½]¤ --> 06F´[2½]
58	1	3.159550E-07	3.160409E-07	125392	31650.0768	1-2	04S [1½]¤ --> 08F [2½]
59	5	3.160060E-07	3.160920E-07	125387	31644.9688	1-1/2	04S [1½]¤ --> 08F [1½]
63	5	3.186630E-07	3.187497E-07	125123	31381.1142	1-0	04S [1½]¤ --> 09P [½]
64	2	3.191500E-07	3.192368E-07	125075	31333.2289	1-2	04S [1½]¤ --> 09P [1½]
65	2	3.191720E-07	3.192588E-07	125073	31331.0691	1-1	04S [1½]¤ --> 09P [1½]
67	5	3.195120E-07	3.195989E-07	125040	31297.7290	1-1	04S [1½]¤ --> 09P [½]
75	2	3.212990E-07	3.213864E-07	124866	31123.6574	1-2	04S [1½]¤ --> 07F [2½]
76	2	3.213840E-07	3.214714E-07	124858	31115.4258	1-1/2	04S [1½]¤ --> 07F [1½]
79	100	3.234491E-07	3.235371E-07	124659	30916.7656	2/1-2/2	04S [1½]¤ --> 07P´ [1½]
84	100	3.257585E-07	3.258471E-07	124440	30697.5873	1-0	04S [1½]¤ --> 08P´ [½]
85	3	3.263780E-07	3.264668E-07	124382	30639.3201	1-2	04S [1½]¤ --> 08P [1½]
86	3	3.264290E-07	3.265178E-07	124377	30634.5331	1-1	04S [1½]¤ --> 08P [1½]
87	1	3.266340E-07	3.267228E-07	124358	30615.3064	1-2	04S [1½]¤ --> 08P [2½]
88	10	3.271160E-07	3.272050E-07	124312	30570.1953	1-1	04S [1½]¤ --> 08P [½]
98	2	3.299260E-07	3.300157E-07	124052	30309.8271	1-2	04S [1½]¤ --> 06F [2½]
99	20	3.300300E-07	3.301198E-07	124043	30300.2757	1-1/2	04S [1½]¤ --> 06F [1½]
116	7	3.373482E-07	3.374400E-07	123385	29642.9597	1-0	04S [1½]¤ --> 07P [½]
119	20	3.387600E-07	3.388521E-07	123262	29519.4238	1-2	04S [1½]¤ --> 07P [1½]
120	20	3.388365E-07	3.389287E-07	123255	29512.7591	1-1	04S [1½]¤ --> 07P [1½]
123	3	3.392310E-07	3.393233E-07	123221	29478.4380	1-2	04S [1½]¤ --> 07P [2½]
126	20	3.397920E-07	3.398844E-07	123172	29429.7688	1-1	04S [1½]¤ --> 07P [½]
131	10	3.442580E-07	3.443516E-07	122791	29047.9815	1/1-0/0	04S [1½]¤ --> 06P´ [½]
133	3	3.452320E-07	3.453259E-07	122709	28966.0286	1-2	04S [1½]¤ --> 05F [2½]
134	20	3.454944E-07	3.455884E-07	122687	28944.0292	1-1	04S [1½]¤ --> 05F [1½]
136	7	3.461079E-07	3.462020E-07	122635	28892.7281	1-2	04S [1½]¤ --> 06P´ [1½]
137	1	3.464080E-07	3.465022E-07	122610	28867.6936	1-1	04S [1½]¤ --> 06P´ [½]
138	2	3.465150E-07	3.466093E-07	122602	28858.7796	1-1	04S [1½]¤ --> 06P´ [1½]
155	7	3.606522E-07	3.607503E-07	121471	27727.5416	1-0	04S [1½]¤ --> 06P [½]
156	300	3.632684E-07	3.633672E-07	121271	27527.8577	1-2	04S [1½]¤ --> 06P [1½]
157	300	3.634461E-07	3.635449E-07	121258	27514.4000	1-1	04S [1½]¤ --> 06P [1½]
158	100	3.643117E-07	3.644108E-07	121192	27449.0231	1-2	04S [1½]¤ --> 06P [2½]
160	100	3.659531E-07	3.660526E-07	121069	27325.9097	1-1	04S [1½]¤ --> 06P [½]

169	10	3.775441E-07	3.776468E-07	120230	26486.9734	1-2	04S [1½]¤ --> 04F [2½]
170	300	3.781357E-07	3.782386E-07	120189	26445.5326	1-1/2	04S [1½]¤ --> 04F [1½]
179	10	3.979715E-07	3.980797E-07	118871	25127.4281	1-0	04S [1½]¤ --> 05P´ [½]
181	50	4.044419E-07	4.045519E-07	118469	24725.4333	1-2	04S [1½]¤ --> 05P´ [1½]
182	150	4.045966E-07	4.047066E-07	118460	24715.9776	1-1	04S [1½]¤ --> 05P´ [½]
183	80	4.054525E-07	4.055628E-07	118408	24663.7997	1-1	04S [1½]¤ --> 05P´ [1½]
194	200	4.198318E-07	4.199460E-07	117563	23819.0650	1-0	04S [1½]¤ --> 05P [½]
204	100	4.266287E-07	4.267447E-07	117184	23439.5869	1-2	04S [1½]¤ --> 05P [1½]
206	150	4.266287E-07	4.267447E-07	117184	23407.3137	1-2	04S [1½]¤ --> 05P [1½]
210	100	4.300101E-07	4.301271E-07	117000	23255.2672	1-2	04S [1½]¤ --> 05P [2½]
215	80	4.363796E-07	4.364983E-07	116660	22915.8299	1-1	04S [1½]¤ --> 05P [½]
296	2	4.901260E-07	4.902593E-07	114148	20402.9168	1-1	04S [1½]¤ --> 03D [1½]
621	100	6.677281E-07	6.679097E-07	108723	14976.1553	1-0	04S [1½]¤ --> 04P´ [½]
662	2000	7.272935E-07	7.274913E-07	107496	13749.6075	1-1	04S [1½]¤ --> 04P´ [½]
670	10000	7.383980E-07	7.385988E-07	107290	13542.8326	1-2	04S [1½]¤ --> 04P´ [1½]
677	4	7.471168E-07	7.473200E-07	107132	13384.7887	1-1	04S [1½]¤ --> 04P´ [1½]
681	15000	7.514651E-07	7.516695E-07	107054	13307.3372	1-0	04S [1½]¤ --> 04P [½]
707	20000	8.006157E-07	8.008334E-07	106238	12490.3877	1-2	04S [1½]¤ --> 04P [1½]
717	20000	8.103692E-07	8.105896E-07	106087	12340.0544	1-1	04S [1½]¤ --> 04P [1½]
741	20000	8.424647E-07	8.426939E-07	105617	11869.9331	1-2	04S [1½]¤ --> 04P [2½]
816	25000	9.657784E-07	9.660411E-07	104102	10354.3420	1-1	04S [1½]¤ --> 04P [½]

The intensity sources are mainly from reference 1, 2 and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.

This table will show how the photons γ are going between the energy level n from only one λ source of origin. The diagram will get one better overview of the 24 first photons γ in Argon I

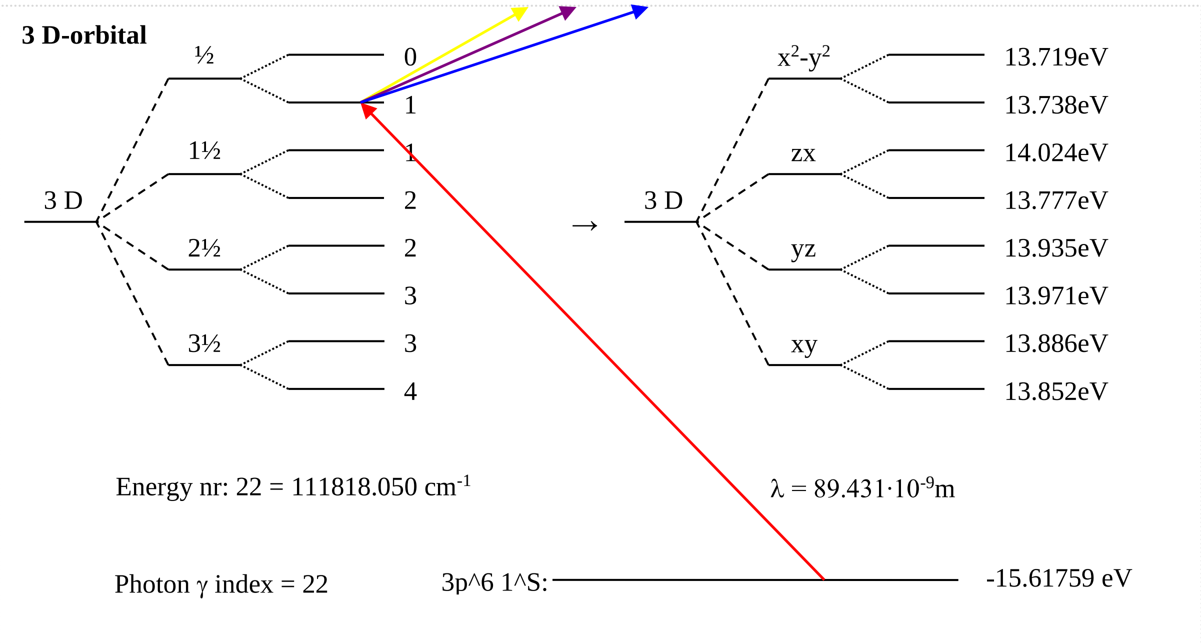


This diagram shows how the energies are going from the ground state with particular distance from: 3p^6 1^S to 4s´ [½], with J {0-1}. The table will show all the photon γ of this emission.

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
74	2	3.211990E-07	3.212864E-07	126525	31133.3472	1-0	04S´ [½]¤ --> 09P´ [½]
81	1	3.238490E-07	3.239371E-07	126270	30878.5885	1-0	04S´ [½]¤ --> 13P [½]
83	2	3.256200E-07	3.257086E-07	126102	30710.6443	1-0	04S´ [½]¤ --> 12P [½]
90	3	3.278930E-07	3.279822E-07	125889	30497.7538	1-0	04S´ [½]¤ --> 11P [½]
92	1	3.282700E-07	3.283593E-07	125854	30462.7289	1-2	04S´ [½]¤ --> 11P [1½]
93	1	3.283740E-07	3.284633E-07	125845	30453.0809	1-1	04S´ [½]¤ --> 11P [½]
94	2	3.285100E-07	3.285994E-07	125832	30440.4737	1-0	04S´ [½]¤ --> 08P´ [½]
95	3	3.289390E-07	3.290285E-07	125793	30400.7734	1-2	04S´ [½]¤ --> 08P´ [1½]
101	2	3.314490E-07	3.315392E-07	125562	30170.5541	1-0	04S´ [½]¤ --> 10P [½]
102	1	3.317540E-07	3.318442E-07	125535	30142.8167	1-2	04S´ [½]¤ --> 10P [1½]
105	2	3.320670E-07	3.321573E-07	125506	30114.4046	1-1	04S´ [½]¤ --> 10P [½]
110	2	3.333840E-07	3.334747E-07	125387	29995.4407	1-1/2	04S´ [½]¤ --> 08F [1½]
113	20	3.363470E-07	3.364385E-07	125123	29731.2002	1-0	04S´ [½]¤ --> 09P [½]
114	1	3.368840E-07	3.369756E-07	125076	29683.8081	1-2	04S´ [½]¤ --> 09P [1½]
115	3	3.372880E-07	3.373797E-07	125040	29648.2531	1-1	04S´ [½]¤ --> 09P [½]
125	7	3.393752E-07	3.394675E-07	124858	29465.9109	2/1-1/1	04S´ [½]¤ --> 07F [1½]
127	30	3.406180E-07	3.407107E-07	124750	29358.3980	1-0	04S´ [½]¤ --> 07P´ [½]
128	5	3.416800E-07	3.417729E-07	124659	29267.1506	1-2	04S´ [½]¤ --> 07P´ [1½]
129	3	3.417680E-07	3.418610E-07	124652	29259.6147	1-1	04S´ [½]¤ --> 07P´ [½]
130	3	3.418510E-07	3.419440E-07	124645	29252.5106	1-1	04S´ [½]¤ --> 07P´ [1½]

132	2	3.449520E-07	3.450458E-07	124382	28989.5406	1-2	04S´ [½]¤ --> 08P [1½]
135	3	3.457810E-07	3.458751E-07	124312	28920.0390	1-1	04S´ [½]¤ --> 08P [½]
140	3	3.490500E-07	3.491449E-07	124041	28649.1907	1-1/2	04S´ [½]¤ --> 06F [1½]
149	300	3.572296E-07	3.573268E-07	123386	27993.2010	1-0	04S´ [½]¤ --> 07P [½]
151	3	3.588110E-07	3.589086E-07	123262	27869.8256	1-2	04S´ [½]¤ --> 07P [1½]
152	2	3.588970E-07	3.589946E-07	123256	27863.1474	1-1	04S´ [½]¤ --> 07P [1½]
153	-	3.593418E-07	3.594395E-07	123221	27828.6578	1-2	04S´ [½]¤ --> 07P [2½]
154	20	3.599712E-07	3.600691E-07	123172	27780.0033	1-1	04S´ [½]¤ --> 07P [½]
159	800	3.649833E-07	3.650826E-07	122791	27398.5138	1-0	04S´ [½]¤ --> 06P´ [½]
161	5	3.663760E-07	3.664757E-07	122687	27294.3643	1-1/2	04S´ [½]¤ --> 05F [1½]
162	300	3.670669E-07	3.671668E-07	122636	27242.9881	1-2	04S´ [½]¤ --> 06P´ [1½]
163	2	3.674050E-07	3.675049E-07	122611	27217.9203	1-1	04S´ [½]¤ --> 06P´ [½]
164	300	3.675237E-07	3.676236E-07	122602	27209.1319	1-1	04S´ [½]¤ --> 06P´ [1½]
171	7	3.834679E-07	3.835722E-07	121471	26077.8034	1-0	04S´ [½]¤ --> 06P [½]
172	10	3.864267E-07	3.865318E-07	121271	25878.1297	1-2	04S´ [½]¤ --> 06P [1½]
173	5	3.866275E-07	3.867327E-07	121258	25864.6875	1-1	04S´ [½]¤ --> 06P [1½]
174	10	3.876080E-07	3.877134E-07	121192	25799.2611	1-2	04S´ [½]¤ --> 06P [2½]
175	300	3.894660E-07	3.895720E-07	121069	25676.1803	1-1	04S´ [½]¤ --> 06P [½]
180	20	4.032970E-07	4.034067E-07	120189	24795.6221	1-1/2	04S´ [½]¤ --> 04F [1½]
202	200	4.259362E-07	4.260520E-07	118871	23477.6962	1-0	04S´ [½]¤ --> 05P´ [½]
212	100	4.333561E-07	4.334740E-07	118469	23075.7096	1-2	04S´ [½]¤ --> 05P´ [1½]
213	50	4.335338E-07	4.336517E-07	118460	23066.2517	1-1	04S´ [½]¤ --> 05P´ [½]
214	25	4.345167E-07	4.346349E-07	118408	23014.0752	1-1	04S´ [½]¤ --> 05P´ [1½]
230	100	4.510734E-07	4.511960E-07	117563	22169.3434	1-0	04S´ [½]¤ --> 05P [½]
243	80	4.589288E-07	4.590536E-07	117184	21789.8724	1-2	04S´ [½]¤ --> 05P [1½]
244	15	4.596096E-07	4.597347E-07	117152	21757.5941	1-1	04S´ [½]¤ --> 05P [1½]
247	7	4.628441E-07	4.629700E-07	117000	21605.5476	1-2	04S´ [½]¤ --> 05P [2½]
251	15	4.702316E-07	4.703595E-07	116660	21266.1188	1-1	04S´ [½]¤ --> 05P [½]
321	2	5.006840E-07	5.008202E-07	115367	19972.6774	1-1	04S´ [½]¤ --> 03D´ [1½]
679	20000	7.503869E-07	7.505910E-07	108723	13326.4595	1-0	04S´ [½]¤ --> 04P´ [½]
740	15000	8.408209E-07	8.410496E-07	107290	11893.1386	1-2	04S´ [½]¤ --> 04P´ [1½]
747	15000	8.521443E-07	8.523761E-07	107132	11735.1019	1-1	04S´ [½]¤ --> 04P´ [1½]
751	5	8.578060E-07	8.580393E-07	107054	11657.6475	1-0	04S´ [½]¤ --> 04P [½]
795	15000	9.224496E-07	9.227005E-07	106238	10840.7013	1-2	04S´ [½]¤ --> 04P [1½]
802	1600	9.354218E-07	9.356762E-07	106087	10690.3645	1-1	04S´ [½]¤ --> 04P [1½]
821	450	9.784501E-07	9.787162E-07	105617	10220.2453	1-2	04S´ [½]¤ --> 04P [2½]
897	400	1.148812E-06	1.149124E-06	104102	8704.6445	1-1	04S´ [½]¤ --> 04P [½]

The intensity sources are mainly from reference 1, 2 and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.

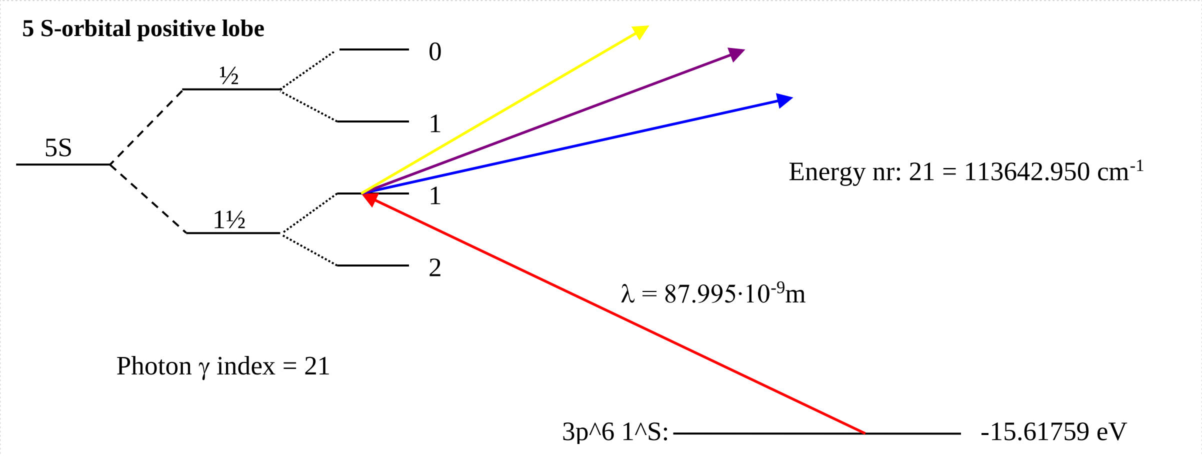


This diagram with index 22 of the start photon γ in Argon I will explain all possibly photons γ from index 22 that will say which possible randomness of path the lambda from this emission could choose. Next table have all these possibilities listed with intensity, lambdas and all the transition to *J*-coupling, which is necessary if wanted to understand the energy levels of lobe.

Table to λ nr: 22

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
685	2	7.662300E-07	7.664384E-07	124865	13050.9116	1-2	03D [½]¤ --> 07F [2½]
686	4	7.667030E-07	7.669115E-07	124857	13042.8601	1-1/2	03D [½]¤ --> 07F [1½]
722	10	8.171950E-07	8.174173E-07	124052	12236.9814	1-2	03D [½]¤ --> 06F [2½]
724	20	8.178960E-07	8.181185E-07	124041	12226.4933	1-2	03D [½]¤ --> 06F [1½]
755	1	8.642890E-07	8.645241E-07	123385	11570.2039	1-0	03D [½]¤ --> 07P [½]
761	2	8.736190E-07	8.738566E-07	123262	11446.6375	1-2	03D [½]¤ --> 07P [1½]
764	1	8.741260E-07	8.743638E-07	123255	11439.9984	1-1	03D [½]¤ --> 07P [1½]
768	3	8.805160E-07	8.807555E-07	123172	11356.9770	1-1	03D [½]¤ --> 07P [½]
789	1	9.111300E-07	9.113778E-07	122791	10975.3822	1-0	03D [½]¤ --> 06P´ [½]
791	6	9.180170E-07	9.182667E-07	122708	10893.0445	1-2	03D [½]¤ --> 05F [2½]
793	50	9.198610E-07	9.201112E-07	122686	10871.2077	1-1/2	03D [½]¤ --> 05F [1½]
796	1	9.242170E-07	9.244684E-07	122635	10819.9698	1-2	03D [½]¤ --> 06P´ [1½]
835	30	1.016345E-06	1.016621E-06	121655	9839.1786	1-2	03D [½]¤ --> 04F´ [2½]
844	1	1.035760E-06	1.036042E-06	121470	9654.7463	1-0	03D [½]¤ --> 06P [½]
850	4	1.057618E-06	1.057906E-06	121271	9455.2097	1-2	03D [½]¤ --> 06P [1½]
851	2	1.059123E-06	1.059411E-06	121257	9441.7740	1-1	03D [½]¤ --> 06P [1½]
905	5	1.188447E-06	1.188770E-06	120230	8414.3424	1-2	03D [½]¤ --> 04F [2½]
907	25	1.194350E-06	1.194675E-06	120189	8372.7551	1-1/2	03D [½]¤ --> 04F [1½]
991	13	1.863217E-06	1.863724E-06	117184	5367.0614	1-2	03D [½]¤ --> 05P [1½]
1000	16	2.064717E-06	2.065279E-06	116660	4843.2788	1-1	03D [½]¤ --> 05P [½]

The intensity sources are mainly from reference 1, 2 and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.



This diagram shows how lambda with index 21 is going, but there are only two photons to λ.

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
884	1	1.102860E-06	1.103160E-06	122708	9067.3340	1-2	05S [1½]¤ --> 05F [2½]
1013	35	2.550440E-06	2.551134E-06	117563	3920.8921	1-0	05S [1½]¤ --> 05P [½]

The intensity sources are mainly from reference 1, 2 and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.

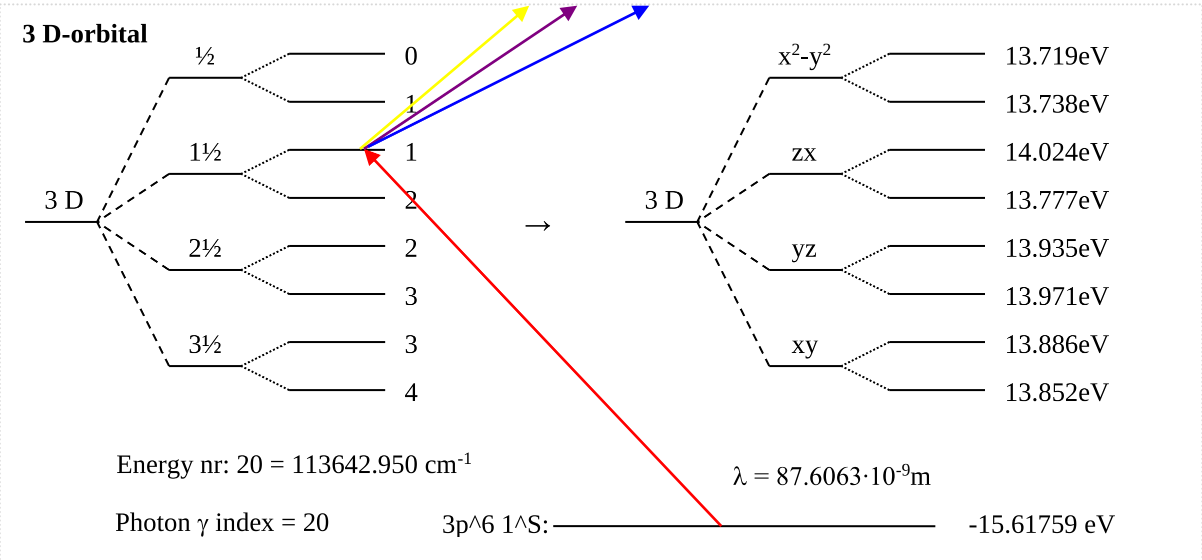


Table to λ nr: 20

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
769	1	8.819370E-07	8.821769E-07	125483	11338.6784	1-2	03D [1½]¤ --> 06F´ [2½]
775	1	8.891700E-07	8.894119E-07	125391	11246.4433	1-2	03D [1½]¤ --> 08F [2½]
776	1	8.895420E-07	8.897840E-07	125386	11241.7401	1-1/2	03D [1½]¤ --> 08F [1½]
798	2	9.328080E-07	9.330617E-07	122856	10720.3197	2-2	03D [1½]¤ --> 07F [2½]
800	8	9.334800E-07	9.337339E-07	124857	10712.6023	1-1/2-3	03D [1½]¤ --> 07F [1½]
828	3	1.000761E-06	1.001033E-06	124137	9992.3958	1-2	03D [1½]¤ --> 05F´ [2½]
833	8	1.009432E-06	1.009707E-06	124052	9906.5613	1-2	03D [1½]¤ --> 06F [2½]
834	4	1.010482E-06	1.010757E-06	124041	9896.2673	1-1/2	03D [1½]¤ --> 06F [1½]
870	1	1.082274E-06	1.082568E-06	123385	9239.8043	1-0	03D [1½]¤ --> 07P [½]
883	1	1.097730E-06	1.098029E-06	123255	9109.7082	1-1	03D [1½]¤ --> 07P [1½]
900	4	1.167847E-06	1.168165E-06	122708	8562.7655	1-2	03D [1½]¤ --> 05F [2½]
902	3	1.170822E-06	1.171140E-06	122686	8541.0079	1-1/2	03D [1½]¤ --> 05F [1½]
977	18	1.643692E-06	1.644139E-06	120230	6083.8649	1-2	03D [1½]¤ --> 04F [2½]
979	6	1.654981E-06	1.655431E-06	120188	6042.3654	1-1/2	03D [1½]¤ --> 04F [1½]

The intensity sources are mainly from reference 1, 2 and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.

This table shows all the lambda emission that is possibly from the start energy with index; 20.

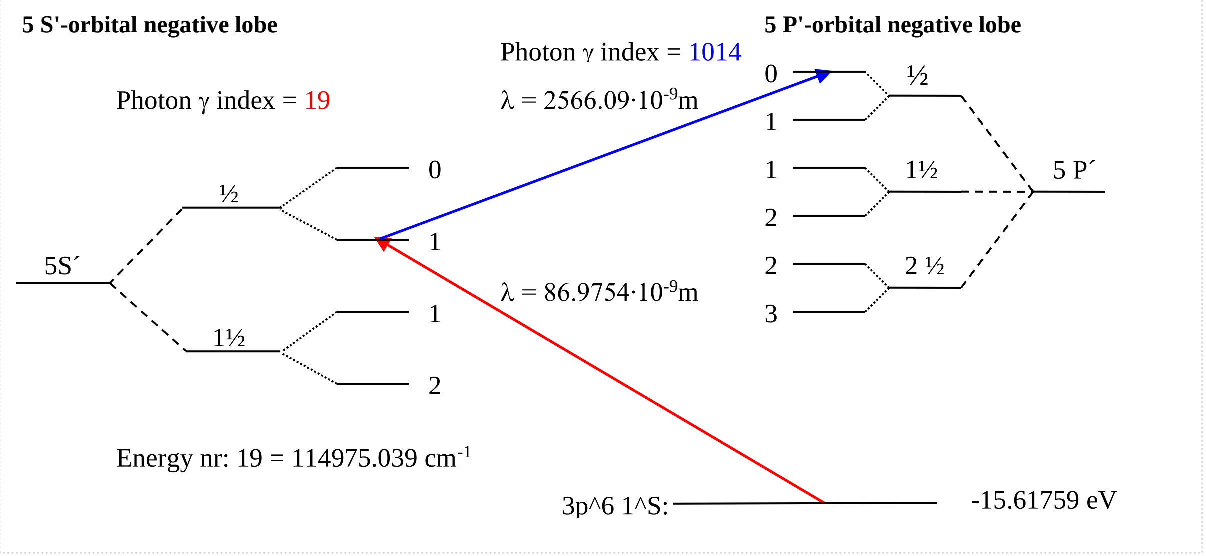


Table to λ nr: 19

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
1014	65	2.566090E-06	2.566788E-06	118871	3896.9795	1-0	05S´ [½]¤ --> 05P´ [½]

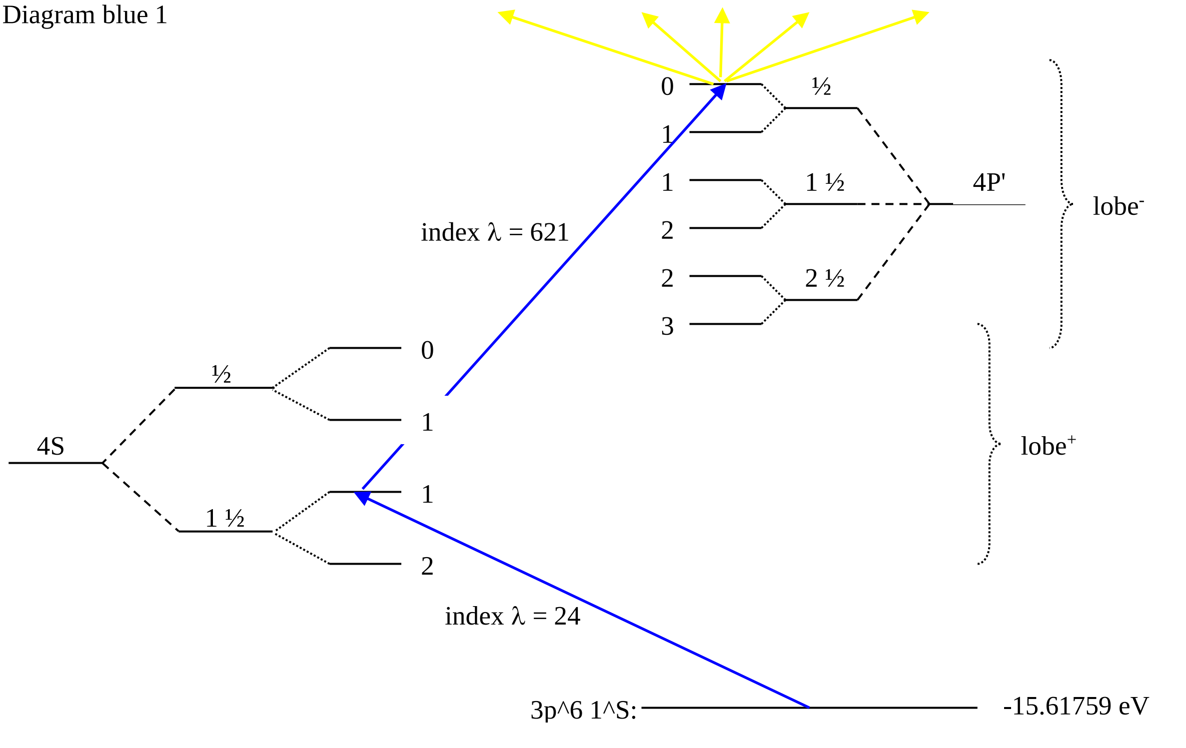
This diagram and table shows how the only emission from energy nr; 19 is going to 5 p´ [½].

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
824	6	9.882180E-07	9.884868E-07	125483	10119.2247	1-2	03D´ [1½]¤ --> 06F´ [2½]
894	7	1.139863E-06	1.140173E-06	124137	8772.9841	1-2	03D´ [1½]¤ --> 05F´ [2½]
974	20	1.589993E-06	1.590425E-06	121655	6289.3359	1-2	03D´ [1½]¤ --> 04F´ [2½]
1001	11	2.073335E-06	2.073899E-06	120189	4823.1472	1-1	03D´ [1½]¤ --> 04F [1½]

This table shows the possibly lambda emission from start photon nr: 18. They are going from third negative orbital lobe like in the diagram above for photon nr: 20. The rest of the start photon γ with index 1-17 has no following emission, because the energy level in electron volt will be too high. This transmission chapter explains the possibly emission from the photon γ with ground level zero or start at $3p^6\ ^1S$ orbital. In Argon I the transmission could go from 4n to 4n or 5n to 5n, because the *J*-coupling in all the different lobes have different electron volt levels. But they are going from lower energy to higher energy levels, count in electron volt between the lobes. This fact talks again for this paper of: “Modern Quantum Mechanics” as one common atomic theory to all matter of atoms like these of Hydrogen, Helium and Argon.

7.2. **Transitions blue in Argon**

Diagram blue 1



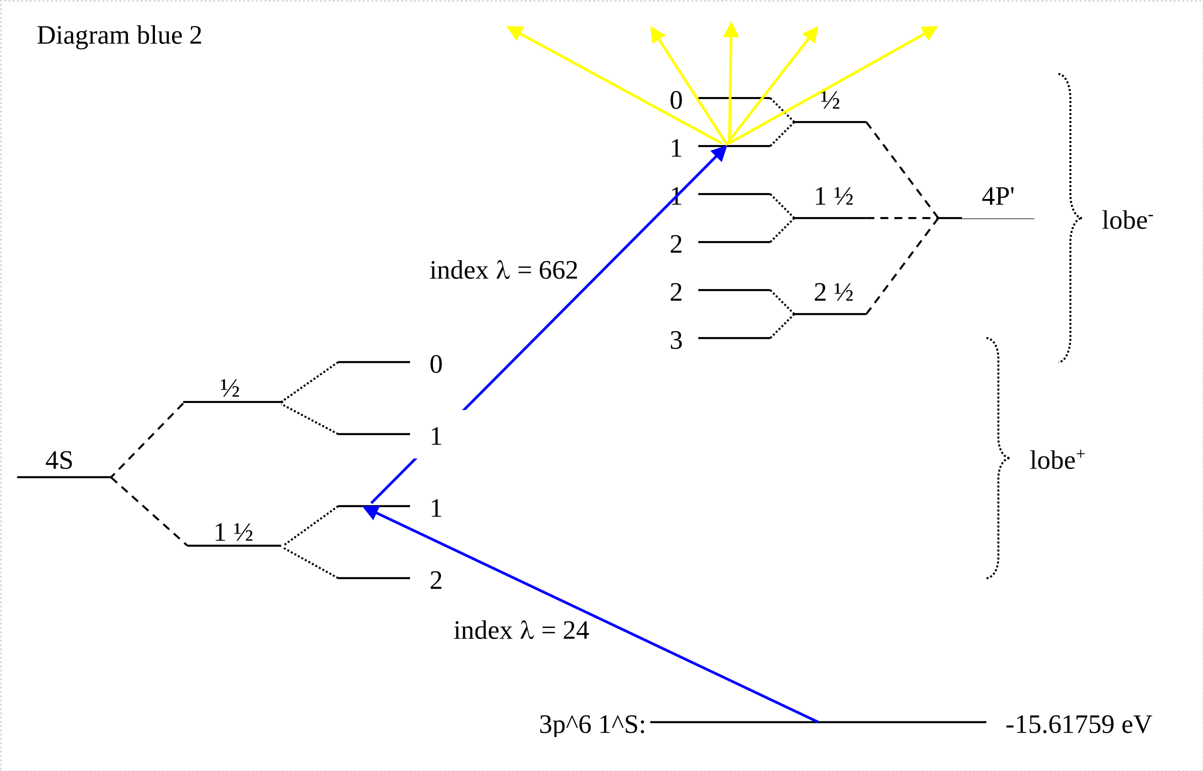
This diagram shows the first two main transitions in Argon. Here between lobes 4S [1½] 1 and lobes 4P' [½] 0. From this lobes several photon γ are going with an emission λ when the electron are falling down one step from a higher lobes. The table will get one better overview.

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
609	2	6.571370E-07	6.573157E-07	123936	15217.5269	0-2	04P´ [½] --> 06D [1½]¤
611	2	6.594660E-07	6.596454E-07	123882	15163.7840	0-1	04P´ [½] --> 07S´ [½]¤
632	4	6.779933E-07	6.781777E-07	123468	14749.4083	0-1	04P´ [½] --> 06D [½]¤
660	2	7.267200E-07	7.269177E-07	122479	13760.4579	0-1	04P´ [½] --> 07S [1½]¤
710	20	8.037230E-07	8.039416E-07	121161	12442.0976	0-1	04P´ [½] --> 06S´ [½]¤
785	2	9.057510E-07	9.059974E-07	119760	11040.5619	0-1	04P´ [½] --> 06S [1½]¤
832	50	1.006904E-06	1.007178E-06	118651	9931.4334	0-1	04P´ [½] --> 04D [½]¤
965	100	1.504642E-06	1.505051E-06	115367	6646.0992	0-1	04P´ [½] --> 03D´ [1½]¤
975	30	1.598934E-06	1.599369E-06	114975	6254.1668	0-1	04P´ [½] --> 05S´ [½]¤
987	12	1.842768E-06	1.843269E-06	114148	5426.6191	0-1	04P´ [½] --> 03D [1½]¤
997	23	2.031682E-06	2.032235E-06	113643	4922.0301	0-1	04P´ [½] --> 05S [1½]¤

The intensity sources are mainly from reference 1, 2 and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.

The upper energy cm^{-1} is the level where the electron is before it will be any electromagnetic emissions. Here the electron will immediately go down in energy level, count in electron volt. Then the electron could choose if it will go down another level down or one new transmission up in energy level. Here in the diagram above the electron are going from n_4 to n_4 or 4s to 4p'. Here we must work with the radius quota for understanding the energy difference of level n.

The blue vector up in the diagram above indicates the pathway of the electron when its travel up in energy level n^{th}. The yellow vector indicates the final travel path before the electron will go down again and in the same time lose some energy in cm^{-1} in the form of electromagnetic radiation that will causes the light of the photon γ. This energy has then left the atomic system which makes that the electron through repulsion vs. attraction forces are falling down exact so much what the energy emission correspond in electron volt or λ-radius.

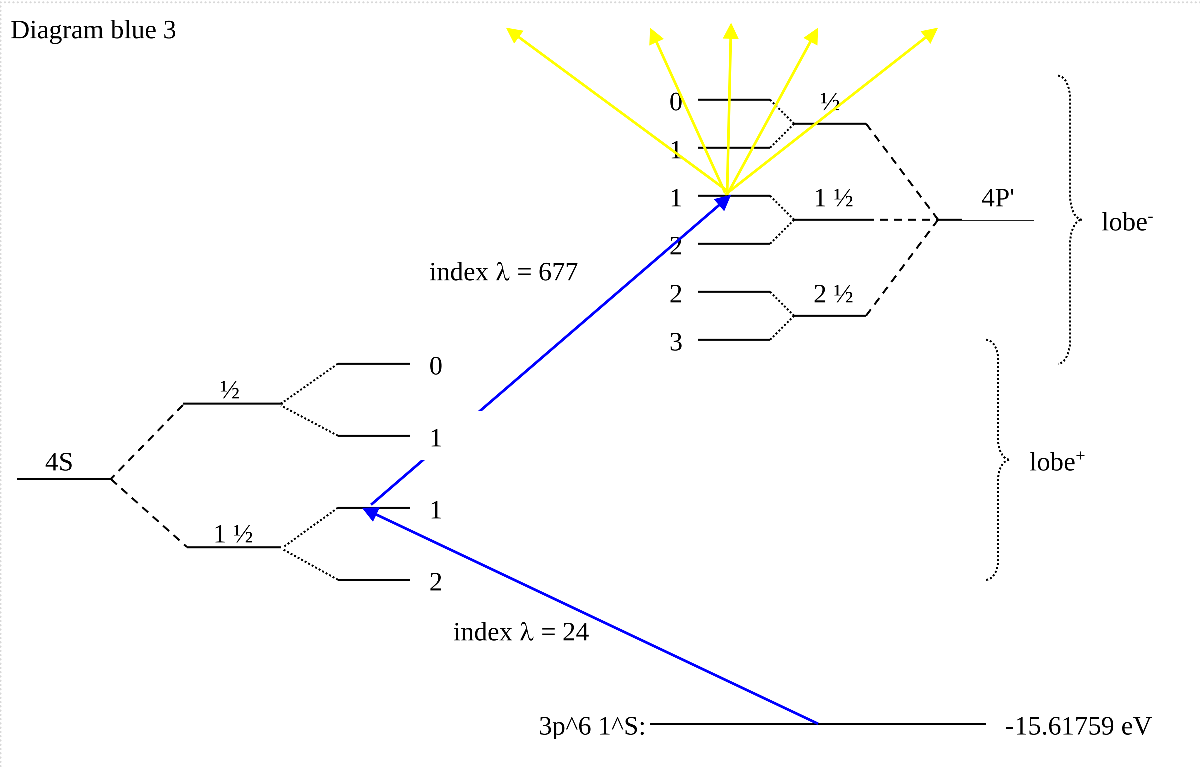


This diagram shows the first two main transitions in Argon. Here between lobes 4S [1½] 1 and lobes 4P' [½] 1. From this lobes several photon γ are going with an emission λ when the electron are falling down one step from higher lobes. This table will get one better overview.

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
415	10	5.341780E-07	5.343233E-07	126212	18720.3516	1-1	04P´ [½] --> 09S´ [½]¤
416	5	5.344280E-07	5.345734E-07	126203	18711.5945	1-0	04P´ [½] --> 09S´ [½]¤
438	2	5.422550E-07	5.424025E-07	125933	18441.5081	1-2	04P´ [½] --> 10D [1½]¤
441	10	5.430270E-07	5.431747E-07	125907	18415.2906	1-2	04P´ [½] --> 10D [1½]¤
442	1	5.432600E-07	5.434078E-07	125899	18407.3924	1-1	04P´ [½] --> 10D [½]¤
443	1	5.433480E-07	5.434958E-07	125896	18404.4112	1-0	04P´ [½] --> 10D [½]¤
469	5	5.518200E-07	5.519701E-07	125613	18121.8513	1-1	04P´ [½] --> 09D [½]¤
470	5	5.523700E-07	5.525202E-07	125595	18103.8072	1-0	04P´ [½] --> 09D [½]¤
489	20	5.598500E-07	5.600023E-07	125354	17861.9273	1-1	04P´ [½] --> 08S´ [½]¤
493	20	5.604360E-07	5.605884E-07	125335	17843.2506	1-0	04P´ [½] --> 08S´ [½]¤
494	5	5.605250E-07	5.606775E-07	125332	17840.4175	1-1	04P´ [½] --> 08D [1½]¤
500	2	5.620636E-07	5.622165E-07	125283	17791.5809	1-1	04P´ [½] --> 06D´ [1½]¤
514	1	5.667400E-07	5.668942E-07	125137	17644.7754	1-2/1-1	04P´ [½] --> 08D [½]¤
515	1	5.674730E-07	5.676274E-07	125114	17621.9838	1-2	04P´ [½] --> 06D´ [2½]¤
520	200	5.689910E-07	5.691458E-07	125067	17574.9704	1-2	04P´ [½] --> 06D´ [1½]¤
536	2	5.843740E-07	5.845329E-07	124604	17112.3287	1-2	04P´ [½] --> 07D [1½]¤
538	2	5.870260E-07	5.871857E-07	124527	17035.0206	1-0	04P´ [½] --> 07D [½]¤
566	4	6.081245E-07	6.082899E-07	123936	16444.0012	1-1	04P´ [½] --> 06D [1½]¤
569	1	6.093330E-07	6.094987E-07	123903	16411.3875	1-2	04P´ [½] --> 08S [1½]¤
571	6	6.101160E-07	6.102820E-07	123882	16390.3258	1-1	04P´ [½] --> 07S´ [½]¤
572	6	6.104600E-07	6.106260E-07	123873	16381.0897	1-0/1-0	04P´ [½] --> 07S´ [½]¤
578	8	6.128726E-07	6.130393E-07	123809	16316.6048	1-1	04P´ [½] --> 05D´ [1½]¤
589	6	6.243396E-07	6.245094E-07	123509	16016.9246	1-0	04P´ [½] --> 06D [½]¤
591	1	6.259410E-07	6.261113E-07	123468	15975.9466	1-1	04P´ [½] --> 06D [½]¤
593	7	6.296876E-07	6.298589E-07	123373	15880.8903	1-2	04P´ [½] --> 05D´ [1½]¤
617	6	6.656880E-07	6.658691E-07	122515	15022.0524	1-1	04P´ [½] --> 05D [1½]¤
623	2	6.689910E-07	6.691730E-07	122440	14947.8842	1-2	04P´ [½] --> 07S [1½]¤
635	4	6.851884E-07	6.853748E-07	122087	14594.5261	1-2	04P´ [½] --> 05D [1½]¤
640	2	6.925010E-07	6.926894E-07	121933	14440.4124	1-1	04P´ [½] --> 05D [½]¤
645	4	6.992170E-07	6.994072E-07	121794	14301.7118	1-0	04P´ [½] --> 05D [½]¤
665	25	7.316007E-07	7.317997E-07	121162	13668.6587	1-1	04P´ [½] --> 06S´ [½]¤
667	5	7.350780E-07	7.352779E-07	121097	13603.9985	1-0	04P´ [½] --> 06S´ [½]¤
682	30	7.618330E-07	7.620402E-07	120619	13126.2363	1-2	04P´ [½] --> 04D´ [1½]¤
683	50	7.628860E-07	7.630935E-07	120601	13108.1184	1-2	04P´ [½] --> 04D´ [2½]¤
716	20	8.094060E-07	8.096262E-07	119848	12354.7392	1-1	04P´ [½] --> 04D [1½]¤
721	3	8.151860E-07	8.154077E-07	119760	12267.1390	1-1	04P´ [½] --> 06S [1½]¤

725	20	8.203420E-07	8.205651E-07	119683	12190.0378	1-2	04P´ [½] --> 06S [1½]¤
736	3	8.367030E-07	8.369306E-07	119445	11951.6722	1-2	04P´ [½] --> 04D [2½]¤
765	200	8.761691E-07	8.764074E-07	118907	11413.3223	1-2	04P´ [½] --> 04D [1½]¤
777	40	8.962190E-07	8.964628E-07	118652	11157.9871	1-1	04P´ [½] --> 04D [½]¤
788	20	9.075420E-07	9.077889E-07	118512	11018.7738	1-0	04P´ [½] --> 04D [½]¤
923	150	1.270239E-06	1.270585E-06	115367	7872.5342	1-1	04P´ [½] --> 03D´ [1½]¤
943	11	1.357360E-06	1.357729E-06	114862	7367.2423	1-0	04P´ [½] --> 05S´ [½]¤
946	200	1.367853E-06	1.368225E-06	114805	7310.7271	2-2	04P´ [½] --> 03D´ [1½]¤
953	10	1.399259E-06	1.399640E-06	114641	7146.6398	1-2	04P´ [½] --> 03D´ [2½]¤
964	42	1.503071E-06	1.503480E-06	114148	6653.0457	1-1	04P´ [½] --> 03D [1½]¤
980	5	1.673994E-06	1.674449E-06	113469	5973.7371	1-2	04P´ [½] --> 05S [1½]¤
1005	58	2.153416E-06	2.154002E-06	112139	4643.7846	1-2	04P´ [½] --> 03D [1½]¤
1011	20	2.396668E-06	2.397320E-06	111668	4172.4594	1-0	04P´ [½] --> 03D [½]¤

The intensity sources are mainly from reference 1, 2 and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.



This diagram shows the first two main transitions in Argon. Here between lobes 4S [1½] 1 and lobes 4P' [1½] 1. From this lobes several photon γ are going with an emission λ when the electron are falling down one step from higher lobes. This table will get one better overview.

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
391	2	5.239710E-07	5.241135E-07	126212	19085.0257	1-0	04P´ [1½] --> 09S´ [½]¤
393	2	5.242130E-07	5.243556E-07	126203	19076.2152	1-0	04P´ [1½] --> 09S´ [½]¤
412	5	5.324800E-07	5.326248E-07	125907	18780.0481	1-2	04P´ [1½] --> 10D [1½]¤
413	1	5.327070E-07	5.328519E-07	125899	18772.0454	1-1	04P´ [1½] --> 10D [½]¤
432	1	5.402080E-07	5.403549E-07	125638	18511.3882	1-2	04P´ [1½] --> 09D [1½]¤
433	1	5.409340E-07	5.410811E-07	125613	18486.5436	1-1	04P´ [1½] --> 09D [½]¤
459	20	5.486470E-07	5.487962E-07	125354	18226.6558	1-1	04P´ [1½] --> 08S´ [½]¤
462	40	5.492060E-07	5.493554E-07	125335	18208.1041	1-0	04P´ [1½] --> 08S´ [½]¤
463	20	5.493490E-07	5.494984E-07	125330	18203.3643	1-2	04P´ [1½] --> 10S [1½]¤
466	10	5.505180E-07	5.506677E-07	125292	18164.7103	1-2	04P´ [1½] --> 08D [2½]¤
468	10	5.507630E-07	5.509128E-07	125284	18156.6300	1-1	04P´ [1½] --> 06D´ [1½]¤
476	2	5.542730E-07	5.544238E-07	125169	18041.6510	1-1	04P´ [1½] --> 08D [½]¤
480	200	5.559620E-07	5.561132E-07	125114	17986.8408	1-2	04P´ [1½] --> 06D´ [2½]¤
484	5	5.574200E-07	5.575716E-07	125067	17939.7941	1-2	04P´ [1½] --> 06D´ [1½]¤
511	5	5.662000E-07	5.663540E-07	124789	17661.6037	1-1	04P´ [1½] --> 07D [1½]¤
512	1	5.663800E-07	5.665341E-07	124783	17655.9907	1-1	04P´ [1½] --> 09S [1½]¤
521	1	5.693100E-07	5.694649E-07	124692	17565.1227	1-2	04P´ [1½] --> 07D [2½]¤
524	5	5.737960E-07	5.739521E-07	124555	17427.7966	1-1	04P´ [1½] --> 07D [½]¤
527	2	5.747180E-07	5.748743E-07	124527	17399.8378	1-0	04P´ [1½] --> 07D [½]¤
548	10	5.949260E-07	5.950878E-07	123936	16808.8146	1-1	04P´ [1½] --> 06D [1½]¤

549	1	5.949260E-07	5.950878E-07	123936	16755.1618	1-1	04P´ [1½] --> 06D [1½]¤
550	5	5.949260E-07	5.950878E-07	123936	16745.9206	1-1	04P´ [1½] --> 06D [1½]¤
553	2	5.988110E-07	5.989739E-07	123827	16699.7600	1-2	04P´ [1½] --> 06D [2½]¤
554	2	5.994660E-07	5.996291E-07	123809	16681.5132	1-1	04P´ [1½] --> 05D´ [1½]¤
573	10	6.105635E-07	6.107296E-07	123506	16378.3117	1-2	04P´ [1½] --> 05D´ [2½]¤
575	2	6.119662E-07	6.121327E-07	123468	16340.7718	1-1	04P´ [1½] --> 06D [½]¤
605	6	6.499109E-07	6.500877E-07	122514	15386.7245	1-1	04P´ [1½] --> 05D [1½]¤
606	8	6.513848E-07	6.515620E-07	122480	15351.9087	1-1	04P´ [1½] --> 07S [1½]¤
607	1	6.530520E-07	6.532296E-07	122440	15312.7163	1-2	04P´ [1½] --> 07S [1½]¤
622	6	6.684730E-07	6.686548E-07	122087	14959.4673	1-2	04P´ [1½] --> 05D [1½]¤
629	8	6.754300E-07	6.756137E-07	121933	14805.3832	1-1	04P´ [1½] --> 05D [½]¤
633	4	6.818291E-07	6.820146E-07	121794	14666.4318	1-0	04P´ [1½] --> 05D [½]¤
651	25	7.125825E-07	7.127763E-07	121162	14033.4628	1-1	04P´ [1½] --> 06S´ [½]¤
653	15	7.158830E-07	7.160777E-07	121097	13968.7631	1-0	04P´ [1½] --> 06S´ [½]¤
656	2	7.202550E-07	7.204509E-07	121012	13883.9716	1-1	04P´ [1½] --> 04D´ [1½]¤
672	15	7.412334E-07	7.414350E-07	120619	13491.0273	1-2	04P´ [1½] --> 04D´ [1½]¤
673	6	7.422260E-07	7.424279E-07	120601	13472.9853	1-2	04P´ [1½] --> 04D´ [2½]¤
697	15	7.861910E-07	7.864048E-07	119848	12719.5554	1-1	04P´ [1½] --> 04D [1½]¤
702	20	7.916450E-07	7.918603E-07	119760	12631.9247	1-1	04P´ [1½] --> 06S [1½]¤
706	3	7.965080E-07	7.967247E-07	119683	12554.8017	1-2	04P´ [1½] --> 06S [1½]¤
719	50	8.119180E-07	8.121388E-07	119445	12316.5147	1-2	04P´ [1½] --> 04D [2½]¤
745	40	8.490300E-07	8.492609E-07	118907	11778.1468	1-2	04P´ [1½] --> 04D [1½]¤
757	60	8.678430E-07	8.680791E-07	118652	11522.8215	1-1	04P´ [1½] --> 04D [½]¤
766	30	8.784590E-07	8.786979E-07	118512	11383.5705	1-0	04P´ [1½] --> 04D [½]¤
910	50	1.213979E-06	1.214309E-06	115367	8237.3748	1-1	04P´ [1½] --> 03D´ [1½]¤
925	12	1.274631E-06	1.274978E-06	114975	7845.4078	1-1	04P´ [1½] --> 05S´ [½]¤
927	50	1.293333E-06	1.293685E-06	114862	7731.9608	1-0	04P´ [1½] --> 05S´ [½]¤
930	5	1.302827E-06	1.303181E-06	114805	7675.6162	1-2	04P´ [1½] --> 03D´ [1½]¤
936	1000	1.331339E-06	1.331701E-06	114641	7511.2349	1-2	04P´ [1½] --> 03D´ [2½]¤
955	7	1.424993E-06	1.425381E-06	114148	7017.5783	1-1	04P´ [1½] --> 03D [1½]¤
970	2	1.535351E-06	1.535769E-06	113643	6513.1687	1-1	04P´ [1½] --> 05S [1½]¤
973	50	1.588321E-06	1.588753E-06	113426	6295.9565	1-2	04P´ [1½] --> 03D [2½]¤
994	37	1.996575E-06	1.997118E-06	112139	5008.5772	1-2	04P´ [1½] --> 03D [1½]¤
1004	15	2.133327E-06	2.133907E-06	111818	4687.5139	1-1	04P´ [1½] --> 03D [½]¤
1006	9	2.203957E-06	2.204556E-06	111668	4537.2936	1-0	04P´ [1½] --> 03D [½]¤

The intensity sources are mainly from reference 1, 2and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.

The difficulty to know is if there is same significant angel theta between the lobes or from the blue vector to the yellow vector. This make that the atomic radius from upper energy in cm^{-1} *could* be different in comparison with the sum of each lambdas radii, if countdown to proton. If could map out all the different lobes of positive and negative lobes in Argon, then it can be possibly understood where the electron are mostly like to be, the electron density in the atom.

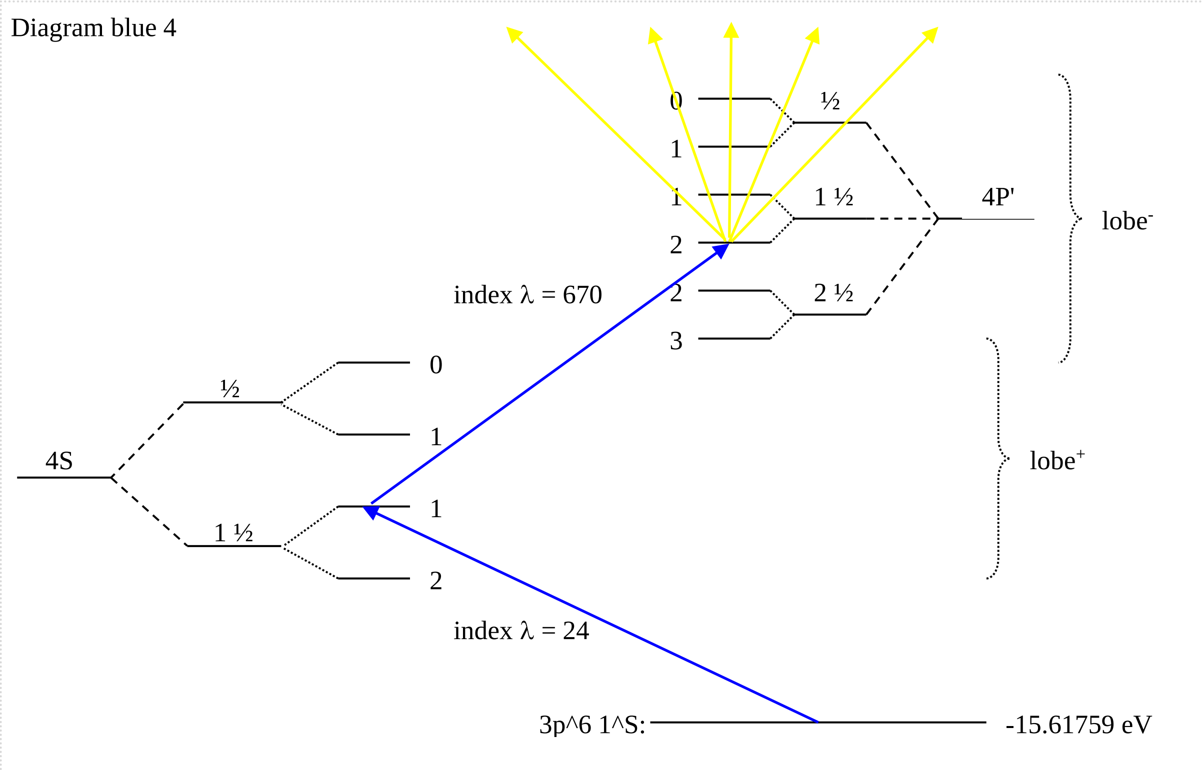
Diagram 5; with λ index 654, 693 and 754 are going in there transition between $n_4 \rightarrow n_4 \rightarrow n_4$ or 4S → 4P → 4D. Index 908 has the pattern of $n_4 \rightarrow n_4 \rightarrow n_3$ or 4S → 4P →3D. Thus, the only recommendation is to work with the radius quota instead for the ordinary level of quota. The common pattern in Argon and Hydrogen is that the electron is falling down from a level of higher electron volt to level of lower electron volt. But not necessary from a higher level n to an lower level n. Otherwise the electron should need kinetic energy for the way down and if just have give away electromagnetic radiation, then have the electron only its own energy. The pathway down could be explained with repulsion vs. attraction forces. If then only have a proton and one electron e^-, which is the case in the Hydrogen atom. Then have the electron e^- repulsion to e^2 and attraction to Φ_0 which is located in the atoms proton, because the equation

Hydrogen atom:

Repulsion

$$\underbrace{m_p \cdot \pi^2 \cdot \sqrt{\pi^2 + \pi^2} \cdot e^2 \cdot \Phi_0}_{\text{Proton}} = \underbrace{m_e \cdot \pi \cdot e^2 \cdot r_1}_{\text{Electron}}$$

This equation shows why there are forces of repulsion vs. attraction, for the electron in atoms.



This diagram shows the first two main transitions in Argon. Here between lobes 4S [1½] 1 and lobes 4P' [1½] 2. From this lobes several photon γ are going with an emission λ when the electron are falling down one step from higher lobes. This table will get one better overview.

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
404	20	5.283430E-07	5.284867E-07	126054	18927.0985	1-2/2-1	04P´ [1½] --> 09S´ [½]¤
408	1	5.296910E-07	5.298351E-07	126164	18878.9313	2-3	04P´ [1½] --> 11D [2½]¤
411	60	5.317726E-07	5.319172E-07	126090	18805.0306	2-2	04P´ [1½] --> 07D´ [2½]¤
414	20	5.328020E-07	5.329469E-07	126053	18768.6983	2-2	04P´ [1½] --> 07D´ [1½]¤
422	1	5.362480E-07	5.363939E-07	125933	18648.0882	2-3	04P´ [1½] --> 10D [3½]¤
423	5	5.369970E-07	5.371431E-07	125907	18622.0780	2-2	04P´ [1½] --> 10D [1½]¤
424	1	5.372900E-07	5.374361E-07	125897	18611.9228	2-1	04P´ [1½] --> 10D [½]¤
439	1	5.427390E-07	5.428866E-07	125710	18425.0625	2-2	04P´ [1½] --> 11S [1½]¤
444	1	5.435830E-07	5.437309E-07	125681	18396.4546	2-3	04P´ [1½] --> 09D [2½]¤
449	10	5.448610E-07	5.450092E-07	125638	18353.3048	2-2	04P´ [1½] --> 09D [1½]¤
451	5	5.456010E-07	5.457494E-07	125613	18328.4122	2-1	04P´ [1½] --> 09D [½]¤
473	60	5.534450E-07	5.535955E-07	125354	18068.6428	2-1	04P´ [1½] --> 08S´ [½]¤
474	40	5.540900E-07	5.542407E-07	125333	18047.6096	3-2/2-1	04P´ [1½] --> 08D [1½]¤
475	2	5.541460E-07	5.542967E-07	125331	18045.7858	2-2	04P´ [1½] --> 10S [1½]¤
477	10	5.552760E-07	5.554270E-07	125294	18009.0622	2-2	04P´ [1½] --> 08D [2½]¤
478	2	5.553400E-07	5.554911E-07	125292	18006.9867	2-2	04P´ [1½] --> 08D [2½]¤
481	10	5.560220E-07	5.561732E-07	125270	17984.8999	2-3	04P´ [1½] --> 08D [3½]¤
488	500	5.597478E-07	5.599001E-07	125150	17865.1876	2-2	04P´ [1½] --> 06D´ [2½]¤
492	2	5.601850E-07	5.603374E-07	125136	17851.2456	2-1	04P´ [1½] --> 08D [½]¤
496	20	5.608900E-07	5.610426E-07	125114	17828.8078	2-2	04P´ [1½] --> 06D´ [2½]¤
502	60	5.623778E-07	5.625308E-07	125067	17781.6407	2-2	04P´ [1½] --> 06D´ [1½]¤
528	5	5.758840E-07	5.760406E-07	124650	17364.6082	2-3	04P´ [1½] --> 07D [3½]¤
530	40	5.774000E-07	5.775571E-07	124604	17319.0163	2-2	04P´ [1½] --> 07D [1½]¤
533	5	5.790390E-07	5.791965E-07	124555	17269.9939	2-1	04P´ [1½] --> 07D [½]¤
556	4	6.005725E-07	6.007358E-07	123936	16650.7802	2-1	04P´ [1½] --> 08S [1½]¤
558	1	6.017530E-07	6.019167E-07	123903	16618.1141	2-2	04P´ [1½] --> 08S [1½]¤
559	5	6.025152E-07	6.026790E-07	123882	16597.0930	2-1	04P´ [1½] --> 07S´ [½]¤
562	1	6.045340E-07	6.046984E-07	123827	16541.6668	2-2	04P´ [1½] --> 06D [2½]¤
565	6	6.064758E-07	6.066408E-07	123774	16488.7041	2-3	04P´ [1½] --> 06D [3½]¤
580	10	6.145443E-07	6.147115E-07	123558	16272.2194	2-3	04P´ [1½] --> 05D´ [2½]¤
582	8	6.165123E-07	6.166800E-07	123506	16220.2765	2-2	04P´ [1½] --> 05D´ [2½]¤
585	4	6.179410E-07	6.181091E-07	123468	16182.7747	2-1	04P´ [1½] --> 06D [½]¤
587	5	6.215942E-07	6.217633E-07	123373	16087.6654	2-2	04P´ [1½] --> 05D´ [1½]¤
610	2	6.581600E-07	6.583390E-07	122480	15193.8738	2-1	04P´ [1½] --> 07S [1½]¤
613	6	6.598684E-07	6.600479E-07	122440	15154.5369	2-2/1-2	04P´ [1½] --> 07S [1½]¤

627	4	6.722893E-07	6.724722E-07	122160	14874.5488	2-3	04P´ [1½] --> 05D [3½]¤
630	5	6.756100E-07	6.757938E-07	122087	14801.4387	2-2	04P´ [1½] --> 05D [1½]¤
634	30	6.827253E-07	6.829110E-07	121933	14647.1797	2-1	04P´ [1½] --> 05D [½]¤
657	70	7.206981E-07	7.208941E-07	121161	13875.4351	2-1	04P´ [1½] --> 06S´ [½]¤
663	6	7.284440E-07	7.286421E-07	121014	13727.8912	2-1	04P´ [1½] --> 04D´ [1½]¤
674	10	7.425290E-07	7.427310E-07	120754	13467.4875	2-3	04P´ [1½] --> 04D´ [2½]¤
680	10	7.510420E-07	7.512463E-07	120601	13314.8346	2-2	04P´ [1½] --> 04D´ [2½]¤
705	2	7.960840E-07	7.963005E-07	119848	12561.4885	2-1	04P´ [1½] --> 04D [1½]¤
713	20	8.066600E-07	8.068794E-07	119683	12396.7967	2-2	04P´ [1½] --> 06S [1½]¤
720	10	8.143540E-07	8.145755E-07	119566	12279.6720	2-2/3	04P´ [1½] --> 04D [2½]¤
726	6	8.224720E-07	8.226957E-07	119445	12158.4686	2-2	04P´ [1½] --> 04D [2½]¤
737	60	8.384730E-07	8.387011E-07	119213	11926.4425	2-3	04P´ [1½] --> 04D [3½]¤
753	7	8.605779E-07	8.608120E-07	118907	11620.0985	2-2	04P´ [1½] --> 04D [1½]¤
767	100	8.799082E-07	8.801475E-07	118652	11364.8219	2-1	04P´ [1½] --> 04D [½]¤
929	200	1.300847E-06	1.301201E-06	114975	7687.2991	2-1	04P´ [1½] --> 05S´ [½]¤
934	500	1.327305E-06	1.327666E-06	114822	7534.0634	2-3	04P´ [1½] --> 03D´ [2½]¤
935	3	1.330237E-06	1.330599E-06	114805	7517.4574	2-2	04P´ [1½] --> 03D´ [1½]¤
944	30	1.359918E-06	1.360288E-06	114641	7353.3845	2-2	04P´ [1½] --> 03D´ [2½]¤
957	10	1.457751E-06	1.458148E-06	114148	6859.8821	2-1	04P´ [1½] --> 03D [1½]¤
982	128	1.744493E-06	1.744968E-06	113021	5732.3245	2-3/1-3	04P´ [1½] --> 03D [3½]¤
999	50	2.061621E-06	2.062182E-06	112139	4850.5521	2-2	04P´ [1½] --> 03D [1½]¤
1007	53	2.207720E-06	2.208320E-06	111818	4529.5599	2-1	04P´ [1½] --> 03D [½]¤

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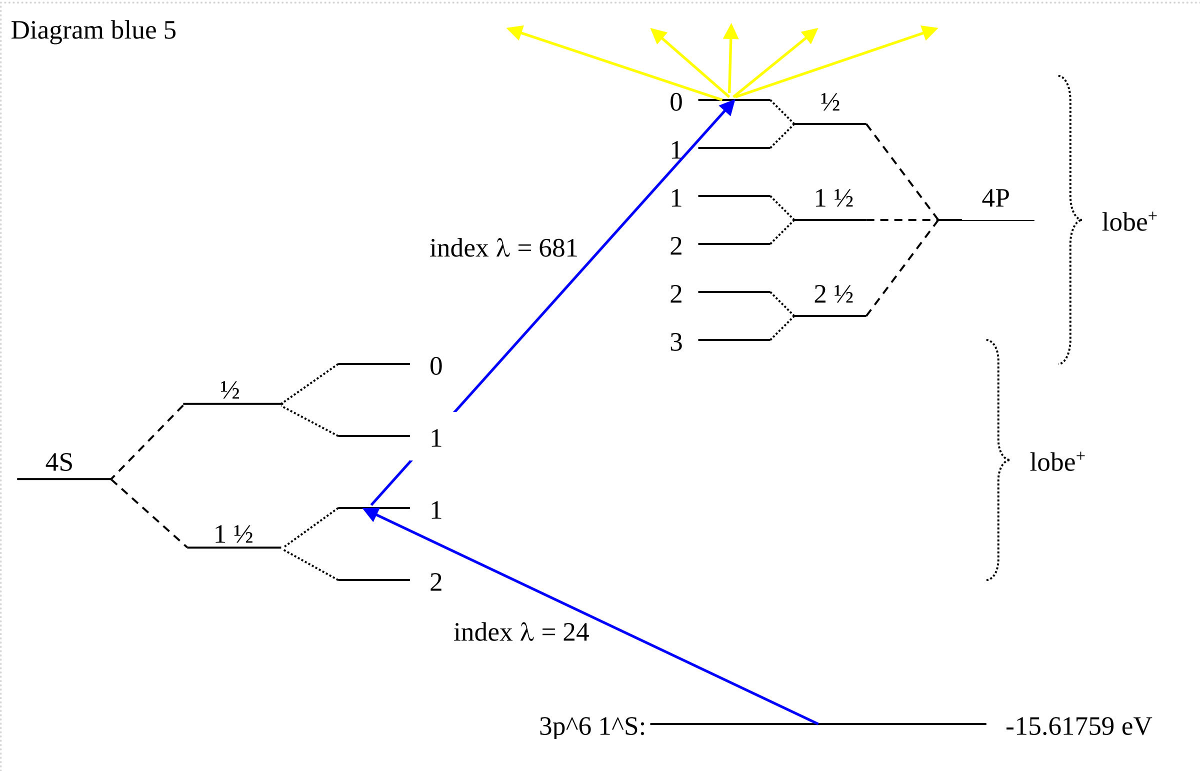
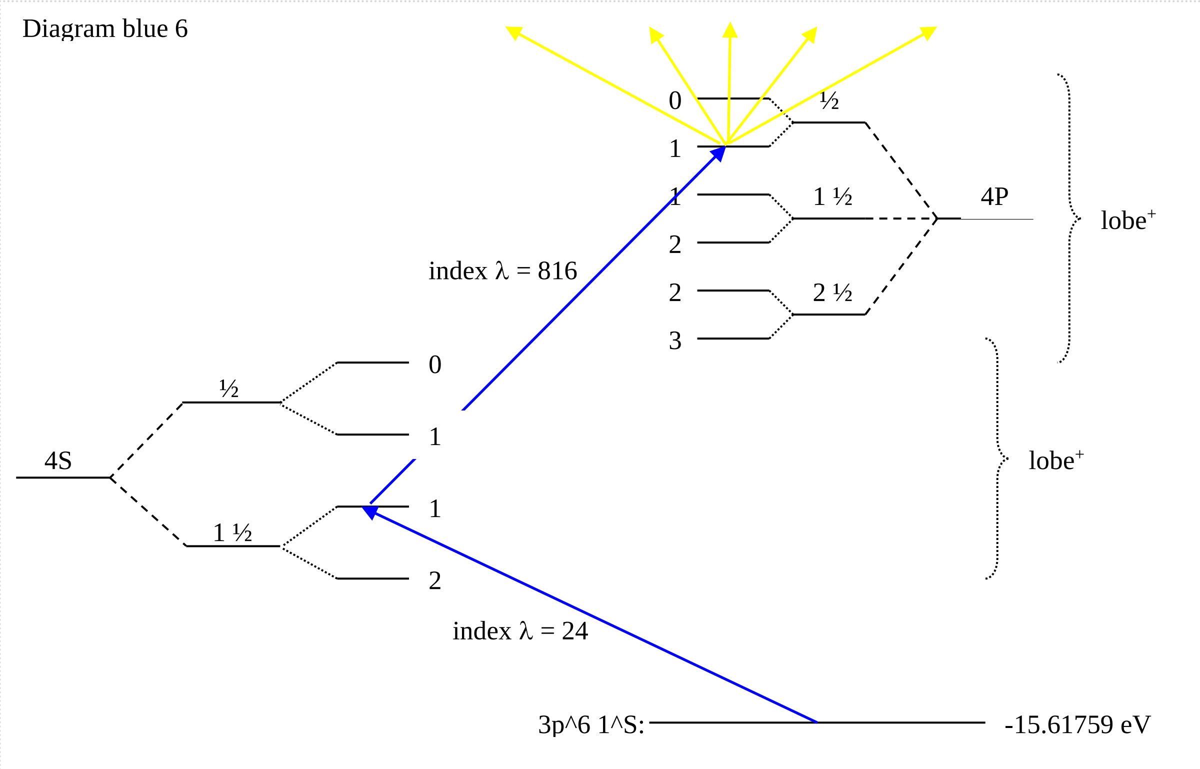


This diagram shows the first two main transitions in Argon. Here between lobes 4S [1½] 1 and lobes 4P [½] 0. From this lobes several photon γ are going with an emission λ when the electron are falling down one step from higher lobes. This table will get one better overview.

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
409	1	5.305170E-07	5.306613E-07	125899	18849.5373	0-1	04P [½] --> 10D [½]¤
426	1	5.386790E-07	5.388255E-07	125613	18563.9314	0-1	04P [½] --> 09D [½]¤
472	40	5.528930E-07	5.530434E-07	125136	18086.6822	0-1	04P [½] --> 08D [½]¤
505	20	5.637290E-07	5.638823E-07	124789	17739.0200	0-1	04P [½] --> 07D [1½]¤
506	100	5.639110E-07	5.640644E-07	124783	17733.2948	0-1	04P [½] --> 09S [1½]¤
523	1	5.712480E-07	5.714034E-07	124555	17505.5317	0-1	04P [½] --> 07D [½]¤
545	2	5.940860E-07	5.942476E-07	123882	16832.5798	0-1	04P [½] --> 07S´ [½]¤
568	10	6.090787E-07	6.092443E-07	123468	16418.2409	0-1/0-1	04P [½] --> 06D [½]¤
626	100	6.719219E-07	6.721047E-07	121933	14882.6814	0-1	04P [½] --> 05D [½]¤
649	15	7.086700E-07	7.088628E-07	121161	14110.9402	0-1	04P [½] --> 06S´ [½]¤
654	8	7.162570E-07	7.164518E-07	121012	13961.4691	0-1	04P [½] --> 04D´ [1½]¤

693	10	7.814330E-07	7.816455E-07	119848	12797.0024	0-1	04P [½] --> 04D [1½]¤
698	40	7.868200E-07	7.870340E-07	119760	12709.3872	0-1	04P [½] --> 06S [1½]¤
754	100	8.620460E-07	8.622805E-07	118651	11600.3088	0-1	04P [½] --> 04D [½]¤
908	5	1.202663E-06	1.202990E-06	115367	8314.8812	0-1	04P [½] --> 03D´ [1½]¤
921	6	1.262182E-06	1.262525E-06	114975	7922.7877	0-1	04p [½] --> 05S´ [½]¤
966	25	1.517233E-06	1.517646E-06	113643	6590.9455	0-1	04P [½] --> 05S [1½]¤
1003	30	2.098610E-06	2.099181E-06	111818	4765.0588	0-1	04P [½] --> 03D [½]¤

The intensity sources are mainly from reference 1, 2 and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.



This diagram shows the first two main transitions in Argon. Here between lobes 4S [1½] 1 and lobes 4P [½] 1. From this lobes several photon γ are going with an emission λ when the electron are falling down one step from higher lobes. This table will get one better overview.

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
219	5	4.445840E-07	4.447049E-07	126589	22492.9372	1-2	04P [½] --> 08D´ [1½]¤
228	1	4.507450E-07	4.508676E-07	126282	22185.4929	1-0	04P [½] --> 12D [½]¤
232	1	4.523350E-07	4.524580E-07	126204	22107.5088	1-0	04P [½] --> 09S´ [½]¤
234	20	4.541600E-07	4.542835E-07	126115	22018.6718	1-0	04P [½] --> 11D [½]¤
236	15	4.554319E-07	4.555558E-07	126053	21957.1795	1-2	04P [½] --> 07D´ [1½]¤
238	2	4.568640E-07	4.569883E-07	125985	21888.3519	1-1	04P [½] --> 12S [1½]¤
239	2	4.569690E-07	4.570933E-07	125980	21883.3225	1-2	04P [½] --> 12S [1½]¤
240	10	4.584958E-07	4.586205E-07	125907	21810.4506	1-2	04P [½] --> 07D´ [1½]¤
241	10	4.586610E-07	4.587858E-07	125899	21802.5949	1-1	04P [½] --> 10D [½]¤
242	5	4.587210E-07	4.588458E-07	125896	21799.7432	1-0	04P [½] --> 10D [½]¤
245	10	4.625460E-07	4.626718E-07	125716	21619.4714	1-1	04P [½] --> 11S [1½]¤
246	30	4.626780E-07	4.628038E-07	125710	21613.3034	1-2	04P [½] --> 11S [1½]¤
248	80	4.642148E-07	4.643411E-07	125638	21541.7518	1-2	04P [½] --> 09D [1½]¤
249	40	4.647493E-07	4.648757E-07	125613	21516.9770	1-1	04P [½] --> 09D [½]¤
250	20	4.651388E-07	4.652653E-07	125595	21498.9590	1-0	04P [½] --> 09D [½]¤
252	2	4.704350E-07	4.705630E-07	125353	21256.9218	1-1	04P [½] --> 08S´ [½]¤
253	2	4.708460E-07	4.709741E-07	125335	21238.3667	1-0	04P [½] --> 08S´ [½]¤
254	10	4.709080E-07	4.710361E-07	125332	21235.5704	1-1	04P [½] --> 08D [1½]¤
255	30	4.709500E-07	4.710781E-07	125330	21233.6766	1-2	04P [½] --> 10S [1½]¤
256	2	4.718100E-07	4.719383E-07	125291	21194.9726	1-2	04P [½] --> 08D [2½]¤
258	20	4.719940E-07	4.721224E-07	125283	21186.7100	1-1	04P [½] --> 06D´ [1½]¤
262	80	4.746823E-07	4.748114E-07	125163	21066.7219	1-0	04P [½] --> 08D [½]¤
264	150	4.752940E-07	4.754233E-07	125136	21039.6074	1-1	04P [½] --> 08D [½]¤
265	150	4.768675E-07	4.769972E-07	125067	20970.1856	1-2	04P [½] --> 06D´ [1½]¤
276	5	4.832790E-07	4.834105E-07	124789	20691.9812	1-1	04P [½] --> 07D [1½]¤
277	30	4.834100E-07	4.835415E-07	124783	20686.3739	1-1	04P [½] --> 09S [1½]¤

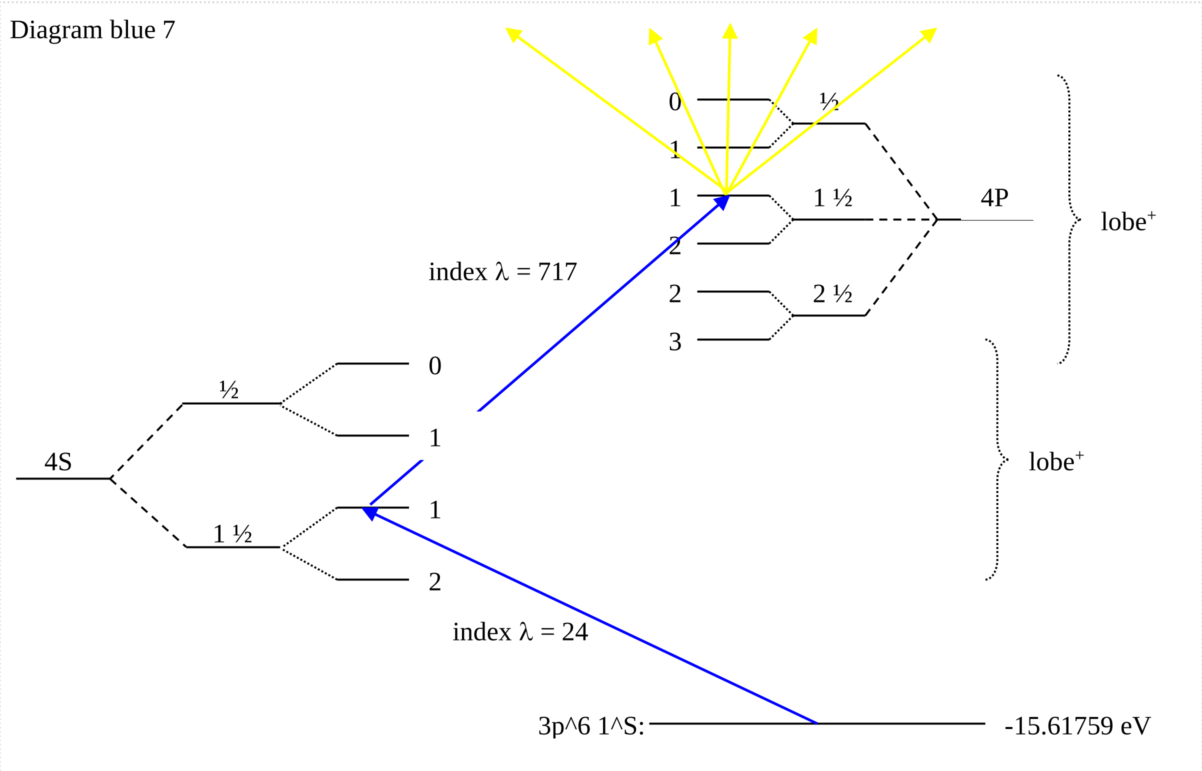
279	150	4.836697E-07	4.838013E-07	124772	20675.2666	1-2	04P [½] --> 09S [1½]¤
282	1	4.855370E-07	4.856691E-07	124692	20595.7527	1-2	04P [½] --> 07D [2½]¤
288	200	4.876262E-07	4.877588E-07	124604	20507.5121	1-2	04P [½] --> 07D [1½]¤
293	200	4.887948E-07	4.889277E-07	124555	20458.4836	1-1	04P [½] --> 07D [½]¤
295	150	4.894691E-07	4.896022E-07	124527	20430.2993	1-0	04P [½] --> 07D [½]¤
331	10	5.040510E-07	5.041881E-07	123936	19839.2623	1-1	04P [½] --> 06D [1½]¤
336	500	5.048813E-07	5.050186E-07	123903	19806.6357	1-2	04P [½] --> 08S [1½]¤
337	300	5.054178E-07	5.055553E-07	123882	19785.6099	1-1	04P [½] --> 07S´ [½]¤
338	200	5.056530E-07	5.057905E-07	123873	19776.4079	1-0	04P [½] --> 07S´ [½]¤
343	5	5.068390E-07	5.069769E-07	123827	19730.1313	1-2	04P [½] --> 06D [2½]¤
347	200	5.073076E-07	5.074456E-07	123809	19711.9073	1-1	04P [½] --> 05D´ [1½]¤
368	5	5.151394E-07	5.152795E-07	123509	19412.2201	1-0	04P [½] --> 06D [½]¤
371	15	5.162286E-07	5.163690E-07	123468	19371.2638	1-1	04P [½] --> 06D [½]¤
373	20	5.187751E-07	5.189162E-07	123373	19276.1769	1-2	04P [½] --> 05D´ [1½]¤
445	500	5.439990E-07	5.441470E-07	122480	18382.3857	1-1	04P [½] --> 07S [1½]¤
450	10	5.451654E-07	5.453137E-07	122440	18343.0573	1-2	04P [½] --> 07S [1½]¤
465	10	5.499000E-07	5.500496E-07	122282	18185.1246	1-2	04P [½] --> 05D [2½]¤
479	25	5.558703E-07	5.560215E-07	122087	17989.8077	1-2	04P [½] --> 05D [1½]¤
495	35	5.606734E-07	5.608259E-07	121933	17835.6951	1-1	04P [½] --> 05D [½]¤
509	20	5.650705E-07	5.652242E-07	121794	17696.9056	1-0	04P [½] --> 05D [½]¤
539	15	5.882625E-07	5.884225E-07	121097	16999.2138	1-0	04P [½] --> 06S´ [½]¤
541	50	5.912086E-07	5.913694E-07	121012	16914.5033	1-1	04P [½] --> 04D´ [1½]¤
563	10	6.052723E-07	6.054370E-07	120619	16521.4885	1-2	04P [½] --> 04D´ [1½]¤
564	20	6.059374E-07	6.061022E-07	120601	16503.3563	1-2	04P [½] --> 04D´ [2½]¤
596	2	6.349200E-07	6.350927E-07	119848	15750.0158	1-1	04P [½] --> 04D [1½]¤
599	20	6.384719E-07	6.386456E-07	119760	15662.3967	1-1	04P [½] --> 06S [1½]¤
600	70	6.416308E-07	6.418053E-07	119683	15585.2880	1-2	04P [½] --> 06S [1½]¤
636	150	6.871290E-07	6.873159E-07	118652	14553.3085	1-1	04P [½] --> 04D [½]¤
641	50	6.937666E-07	6.939553E-07	118512	14414.0699	1-0	04P [½] --> 04D [½]¤
774	4	8.874840E-07	8.877254E-07	115367	11267.8088	1-1	04P [½] --> 03D´ [1½]¤
792	550	9.194637E-07	9.197138E-07	114975	10875.9052	1-1	04P [½] --> 05S´ [½]¤
801	3	9.340590E-07	9.343131E-07	104102	10705.9618	1-2	04P [½] --> 03D´ [1½]¤
810	3	9.486020E-07	9.488600E-07	114641	10541.8289	1-2	04P [½] --> 03D´ [2½]¤
826	20	9.951880E-07	9.954587E-07	114148	10048.3527	1-1	04P [½] --> 03D [1½]¤
846	13	1.047810E-06	1.048095E-06	113643	9543.7150	1-1	04P [½] --> 05S [1½]¤
855	200	1.067355E-06	1.067645E-06	113469	9368.9541	1-2	04P [½] --> 05S [1½]¤
860	6	1.072222E-06	1.072514E-06	113426	9326.4268	1-2	04P [½] --> 03D [2½]¤
916	200	1.243919E-06	1.244257E-06	112139	8039.1087	1-2	04P [½] --> 03D [1½]¤
928	500	1.295659E-06	1.296011E-06	111818	7718.0801	1-1	04P [½] --> 03D [½]¤
931	200	1.321470E-06	1.321829E-06	111667	7567.3303	1-0	04P [½] --> 03D [½]¤

The intensity sources are mainly from reference 1, 2 and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.

The air coefficient of 1.000272 is measured in the Excel sheet of Hydrogen. Through this air coefficient it's possibly to get the right lambdas value in Argon I. This makes it possibly to find the upper energy level in cm^{-1} with precision. If take the main lambdas reference [1] with the air coefficient and then puzzle the pathway up, it gives almost exact the upper energy in cm^{-1} from reference [2, 3]. Through the air coefficient of about; 1.000272 it's possibly to eliminate all error of ± 1 cm^1, which should be the case if use some other value of coefficient. The intensity pattern in Argon is; if the electron γ must travel far away from the origin lobes, then the intensity are low. But if the pathway to the upper lobes is near from the lower lobes, then the intensity are very high in Argon. In Argon the highest intensity is up to about 35 000.

The travel paths for the photons γ are inside the atom with a polar helix around the electron as the electron is rising up to higher energy levels. But outside the atom the photons travels with a technique of conserved energy, which could be possibly if the photons oscillates. Here the vector path of travel could be with speed of sunlight c_1 and not with the electro max speed c_0. The difficulties now are that all the energies to lambdas are calculated with the speed c_0. The lights packed of quanta correspond to energy of only one single orbit for γ -electrons at level they give of this energy, which correspond to the electromagnetic radiation to lambda. This energy of packed has the energy to kinetic *Emax* speed c_0 but the velocity vector of path is c_1.

The electron it selves has the electron velocity/speed c_2 when it circulates in its orbital around the protons. So there probably exist *Emax* speed c_0, *Bmax* speed c_1 and the electron speed c_2.



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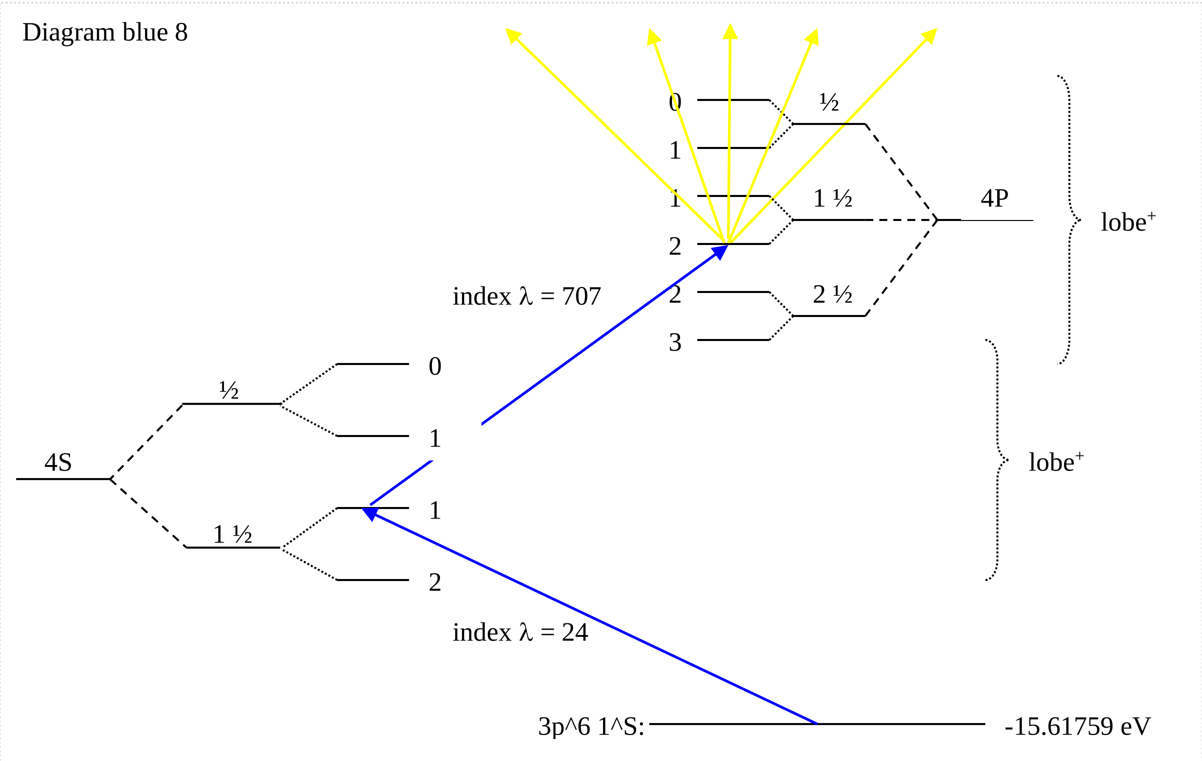
Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
309	1	4.969880E-07	4.971232E-07	126203	20121.2102	1-0	04P [1½] --> 09S´ [½]¤
317	1	4.991660E-07	4.993018E-07	126115	20033.4157	1-0	04P [1½] --> 11D [½]¤
322	2	5.007090E-07	5.008452E-07	126054	19971.6802	1-2	04P [1½] --> 07D´ [1½]¤
326	1	5.025740E-07	5.027107E-07	125980	19897.5673	1-2	04P [1½] --> 12S [1½]¤
329	10	5.034250E-07	5.035619E-07	125946	19863.9321	1-2	04P [1½] --> 10D [2½]¤
333	2	5.044150E-07	5.045522E-07	125907	19824.9457	1-2	04P [1½] --> 10D [1½]¤
334	1	5.047000E-07	5.048373E-07	125896	19813.7507	1-0	04P [1½] --> 10D [½]¤
354	10	5.093320E-07	5.094705E-07	125716	19633.5593	1-1	04P [1½] --> 11S [1½]¤
355	1	5.094840E-07	5.096226E-07	125710	19627.7018	1-2	04P [1½] --> 11S [1½]¤
358	20	5.104740E-07	5.106128E-07	125672	19589.6363	1-2	04P [1½] --> 09D [2½]¤
359	1	5.113500E-07	5.114891E-07	125638	19556.0771	1-2	04P [1½] --> 09D [1½]¤
361	1	5.120010E-07	5.121403E-07	125613	19531.2119	1-1	04P [1½] --> 09D [½]¤
363	1	5.124720E-07	5.126114E-07	125595	19513.2612	1-0	04P [1½] --> 09D [½]¤
375	5	5.194020E-07	5.195433E-07	125335	19252.9101	1-0	04P [1½] --> 08S´ [½]¤
376	20	5.194770E-07	5.196183E-07	125332	19250.1304	1-1	04P [1½] --> 08D [1½]¤
377	1	5.195290E-07	5.196703E-07	125330	19248.2037	1-2	04P [1½] --> 10S [1½]¤
379	10	5.205790E-07	5.207206E-07	125292	19209.3803	1-2	04P [1½] --> 08D [2½]¤
381	10	5.208040E-07	5.209457E-07	125283	19201.0814	1-1	04P [1½] --> 06D´ [1½]¤
396	1	5.248180E-07	5.249608E-07	125136	19054.2245	1-1	04P [1½] --> 08D [½]¤
399	60	5.254471E-07	5.255900E-07	125114	19031.4115	1-2	04P [1½] --> 06D´ [2½]¤
401	2	5.267480E-07	5.268913E-07	125067	18984.4100	1-2	04P [1½] --> 06D´ [1½]¤
417	20	5.345810E-07	5.347264E-07	124789	18706.2391	1-1	04P [1½] --> 07D [1½]¤
418	200	5.347412E-07	5.348866E-07	124783	18700.6350	1-1	04P [1½] --> 09S [1½]¤
419	20	5.350580E-07	5.352035E-07	124772	18689.5626	1-2	04P [1½] --> 09S [1½]¤
425	500	5.373495E-07	5.374957E-07	124692	18609.8616	1-2	04P [1½] --> 07D [2½]¤
431	20	5.399010E-07	5.400479E-07	124604	18521.9142	1-2	04P [1½] --> 07D [1½]¤
435	10	5.413320E-07	5.414792E-07	124555	18472.9519	1-1	04P [1½] --> 07D [½]¤
491	60	5.601080E-07	5.602603E-07	123936	17853.6996	1-1	04P [1½] --> 06D [1½]¤
497	20	5.611350E-07	5.612876E-07	123904	17821.0235	1-2	04P [1½] --> 08S [1½]¤
498	60	5.618010E-07	5.619538E-07	123882	17799.8971	1-1	04P [1½] --> 07S´ [½]¤
501	60	5.620890E-07	5.622419E-07	123873	17790.7769	1-0	04P [1½] --> 07S´ [½]¤
504	60	5.635575E-07	5.637108E-07	123827	17744.4183	1-2	04P [1½] --> 06D [2½]¤
507	60	5.641340E-07	5.642874E-07	123809	17726.2849	1-1	04P [1½] --> 05D´ [1½]¤
525	20	5.738416E-07	5.739977E-07	123509	17426.4117	1-0	04P [1½] --> 06D [½]¤
526	10	5.739521E-07	5.741082E-07	123506	17423.0576	1-2	04P [1½] --> 05D´ [2½]¤

531	40	5.783541E-07	5.785114E-07	123373	17290.4454	1-2	04P [1½] --> 05D´ [1½]¤
567	2	6.085860E-07	6.087515E-07	122514	16431.5315	1-1	04P [1½] --> 05D [1½]¤
570	7	6.098805E-07	6.100463E-07	122480	16396.6558	1-1	04P [1½] --> 07S [1½]¤
574	8	6.113463E-07	6.115126E-07	122440	16357.3412	1-2	04P [1½] --> 07S [1½]¤
584	10	6.173098E-07	6.174777E-07	122282	16199.3216	1-2	04P [1½] --> 05D [2½]¤
590	15	6.248406E-07	6.250106E-07	122087	16004.0807	1-2	04P [1½] --> 05D [1½]¤
595	8	6.309140E-07	6.310856E-07	121933	15850.0208	1-1	04P [1½] --> 05D [½]¤
597	20	6.364895E-07	6.366626E-07	121794	15711.1795	1-0	04P [1½] --> 05D [½]¤
616	8	6.632087E-07	6.633891E-07	121162	15078.2099	1-1	04P [1½] --> 06S´ [½]¤
618	5	6.660678E-07	6.662490E-07	121097	15013.4857	1-0	04P [1½] --> 06S´ [½]¤
624	6	6.698474E-07	6.700296E-07	121012	14928.7733	1-1	04P [1½] --> 04D´ [1½]¤
637	5	6.879590E-07	6.881461E-07	120619	14535.7500	1-2	04P [1½] --> 04D´ [1½]¤
639	10	6.888170E-07	6.890044E-07	120601	14517.6432	1-2	04P [1½] --> 04D´ [2½]¤
659	15	7.265173E-07	7.267149E-07	119848	13764.2971	1-1	04P [1½] --> 04D [1½]¤
664	35	7.311724E-07	7.313713E-07	119760	13676.6650	1-1	04P [1½] --> 06S [1½]¤
678	15	7.484240E-07	7.486276E-07	119445	13361.4101	1-2	04P [1½] --> 04D [2½]¤
692	30	7.798550E-07	7.800671E-07	118907	12822.8966	1-2	04P [1½] --> 04D [1½]¤
704	10	7.956990E-07	7.959154E-07	118652	12567.5664	1-1	04P [1½] --> 04D [½]¤
711	50	8.046130E-07	8.048319E-07	118512	12428.3351	1-0	04P [1½] --> 04D [½]¤
865	30	1.077335E-06	1.077628E-06	115367	9282.1639	1-1	04P [1½] --> 03D´ [1½]¤
892	8	1.124833E-06	1.125139E-06	114975	8890.2086	1-1	04P [1½] --> 05S´ [½]¤
893	50	1.139366E-06	1.139676E-06	114862	8776.8110	1-0	04P [1½] --> 05S´ [½]¤
896	30	1.146757E-06	1.147069E-06	114805	8720.2433	1-2	04P [1½] --> 03D´ [1½]¤
901	5	1.168761E-06	1.169079E-06	114641	8556.0692	1-2	04P [1½] --> 03D´ [2½]¤
914	200	1.240288E-06	1.240625E-06	114148	8062.6435	1-1	04P [1½] --> 03D [1½]¤
933	100	1.323137E-06	1.323497E-06	113643	7557.7964	1-1	04P [1½] --> 05S [1½]¤
942	15	1.354375E-06	1.354743E-06	113469	7383.4795	1-2	04P [1½] --> 05S [1½]¤
945	400	1.362238E-06	1.362609E-06	113426	7340.8611	1-2	04P [1½] --> 03D [2½]¤
978	30	1.652014E-06	1.652463E-06	112139	6053.2175	1-2	04P [1½] --> 03D [1½]¤

The intensity sources are mainly from reference 1, 2 and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.

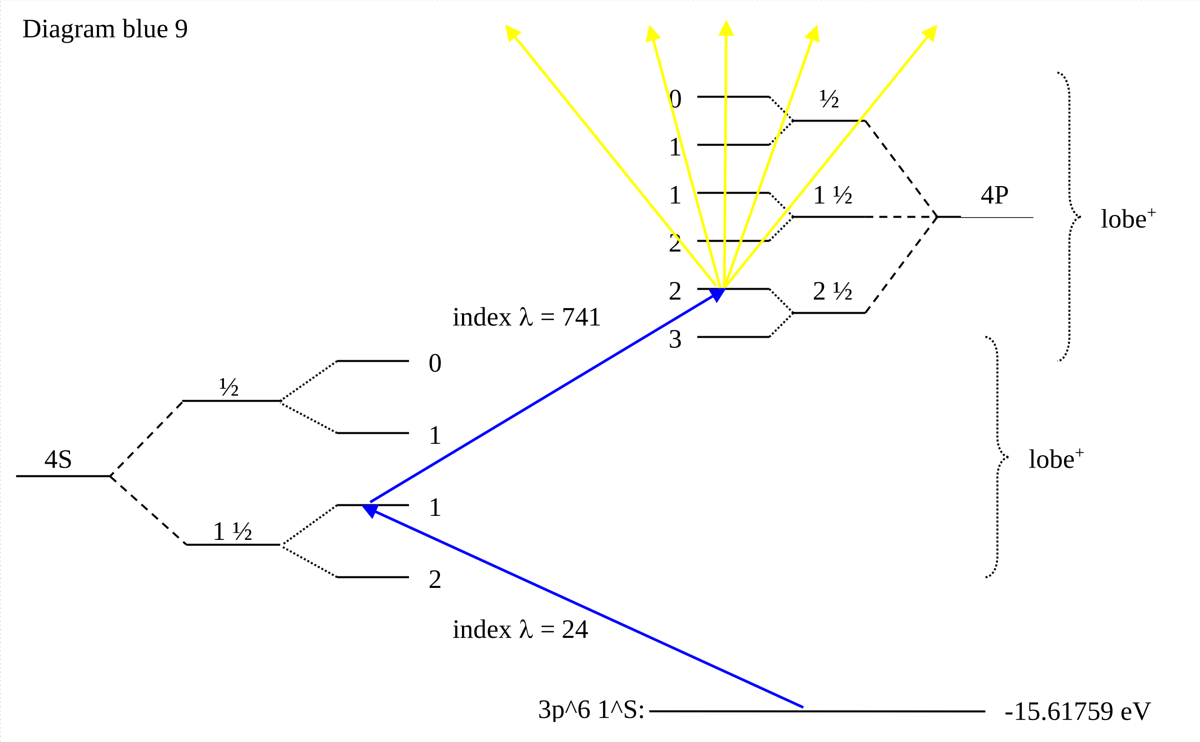


This diagram shows the first two main transitions in Argon. Here between the positive lobes 4S [1½] 1 and the positive lobes 4P [1½] 2. From this lobes several photon γ are going with an emission electromagnetic radiation or λ when the electron are falling down one step from a higher lobes. The vector path is showing up, it has to do with that the electrons are a carrier to the photon γ charge to the final orbit of level. The kinetic energy is probably the energy of the electron amplitude and the energy corresponding to the atomic radius up to the nth- orbit. The length of the travel path between the lobes for the electron gives the kinetic energy of λ.

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
305	1	4.949640E-07	4.950986E-07	126436	20203.4895	2-3	04P [1½] --> 13D [2½]¤
313	1	4.979050E-07	4.980404E-07	126316	20084.1526	2-3	04P [1½] --> 12D [2½]¤
320	1	5.005130E-07	5.006491E-07	126212	19979.5010	2-1	04P [1½] --> 09S´ [½]¤
323	1	5.013470E-07	5.014834E-07	126179	19946.2648	2-2	04P [1½] --> 13S [1½]¤
324	5	5.017250E-07	5.018615E-07	126163	19931.2372	2-3	04P [1½] --> 11D [2½]¤
330	5	5.035880E-07	5.037250E-07	126090	19857.5026	2-3	04P [1½] --> 07D´ [2½]¤
340	1	5.062720E-07	5.064097E-07	125985	19752.2281	2-1	04P [1½] --> 12S [1½]¤
341	5	5.063990E-07	5.065367E-07	125980	19747.2744	2-2	04P [1½] --> 12S [1½]¤
344	5	5.069660E-07	5.071039E-07	125958	19725.1887	2-3	04P [1½] --> 10D [2½]¤
348	1	5.076030E-07	5.077411E-07	125933	19700.4352	2-3	04P [1½] --> 10D [3½]¤
352	1	5.084790E-07	5.086173E-07	125899	19666.4956	2-1	04P [1½] --> 10D [½]¤
365	1	5.132640E-07	5.134036E-07	125716	19483.1510	2-1	04P [1½] --> 11S [1½]¤
366	2	5.134170E-07	5.135566E-07	125710	19477.3449	2-2	04P [1½] --> 11S [1½]¤
367	20	5.141810E-07	5.143209E-07	125681	19448.4044	2-3	04P [1½] --> 09D [2½]¤
369	20	5.153110E-07	5.154512E-07	125638	19405.7569	2-2	04P [1½] --> 09D [1½]¤
370	10	5.159690E-07	5.161093E-07	125613	19381.0093	2-1	04P [1½] --> 09D [1½]¤
388	40	5.229860E-07	5.231283E-07	125353	19120.9707	2-1	04P [1½] --> 08S´ [½]¤
390	20	5.236210E-07	5.237634E-07	125330	19097.7826	2-2	04P [1½] --> 10S [1½]¤
394	40	5.246240E-07	5.247667E-07	125294	19061.2705	2-3	04P [1½] --> 08D [2½]¤
395	5	5.246760E-07	5.248187E-07	125292	19059.3814	2-2	04P [1½] --> 08D [2½]¤
397	40	5.249200E-07	5.250628E-07	125283	19050.5220	2-1	04P [1½] --> 06D´ [1½]¤
405	60	5.286071E-07	5.287509E-07	125150	18917.6422	2-3	04P [1½] --> 06D´ [2½]¤
406	20	5.290000E-07	5.291439E-07	125136	18903.5917	2-1	04P [1½] --> 08D [½]¤
407	5	5.296320E-07	5.297761E-07	125114	18881.0344	2-2	04P [1½] --> 06D´ [2½]¤
410	200	5.309517E-07	5.310961E-07	125067	18834.1049	2-2	04P [1½] --> 06D´ [1½]¤
428	40	5.389100E-07	5.390566E-07	124789	18555.9741	2-1	04P [1½] --> 07D [1½]¤
429	40	5.390720E-07	5.392186E-07	124783	18550.3977	2-1	04P [1½] --> 09S [1½]¤
430	200	5.393971E-07	5.395438E-07	124772	18539.2172	2-2	04P [1½] --> 09S [1½]¤
434	500	5.410475E-07	5.411947E-07	124715	18482.6656	2-3	04P [1½] --> 07D [2½]¤
436	10	5.417220E-07	5.418693E-07	124692	18459.6527	2-2	04P [1½] --> 07D [2½]¤
440	20	5.429690E-07	5.431167E-07	124650	18417.2577	1-2/2-3	04P [1½] --> 07D [3½]¤
447	100	5.443210E-07	5.444691E-07	124604	18371.5124	2-2	04P [1½] --> 07D [1½]¤
453	10	5.457750E-07	5.459235E-07	124555	18322.5688	2-1	04P [1½] --> 07D [½]¤
508	200	5.648660E-07	5.650196E-07	123936	17703.3137	2-1	04P [1½] --> 08S [1½]¤
510	500	5.659128E-07	5.660667E-07	123903	17670.5675	2-2	04P [1½] --> 08S [1½]¤
513	5	5.665820E-07	5.667361E-07	123883	17649.6959	2-1	04P [1½] --> 07S´ [½]¤
516	500	5.681901E-07	5.683447E-07	123833	17599.7422	2-3	04P [1½] --> 06D [2½]¤
517	40	5.683730E-07	5.685276E-07	123827	17594.0799	2-2	04P [1½] --> 06D [2½]¤
519	200	5.689640E-07	5.691188E-07	123809	17575.8044	2-1	04P [1½] --> 05D´ [1½]¤
522	60	5.700874E-07	5.702425E-07	123774	17541.1700	2-3	04P [1½] --> 06D [3½]¤
529	100	5.772116E-07	5.773686E-07	123558	17324.6692	2-3	04P [1½] --> 05D´ [2½]¤
532	20	5.789477E-07	5.791052E-07	123506	17272.7174	2-2	04P [1½] --> 05D´ [2½]¤
534	40	5.802081E-07	5.803659E-07	123468	17235.1957	2-1	04P [1½] --> 06D [½]¤
535	5	5.834266E-07	5.835853E-07	123373	17140.1167	2-2	04P [1½] --> 05D´ [1½]¤
579	1	6.142050E-07	6.143721E-07	122514	16281.2090	2-1	04P [1½] --> 05D [1½]¤
581	60	6.155239E-07	6.156914E-07	122480	16246.3221	2-1/1-2	04P [1½] --> 07S [1½]¤
583	7	6.170176E-07	6.171854E-07	122440	16206.9929	2-2	04P [1½] --> 07S [1½]¤
586	10	6.212504E-07	6.214194E-07	122330	16096.5681	2-3	04P [1½] --> 05D [2½]¤
588	4	6.230928E-07	6.232623E-07	122282	16048.9738	2-2	04P [1½] --> 05D [2½]¤
592	6	6.278652E-07	6.280360E-07	122160	15926.9856	2-3	04P [1½] --> 05D [3½]¤
594	15	6.307660E-07	6.309375E-07	122087	15853.7402	2-2	04P [1½] --> 05D [1½]¤
598	7	6.369578E-07	6.371311E-07	121933	15699.6265	2-1	04P [1½] --> 05D [½]¤
625	100	6.698875E-07	6.700697E-07	121161	14927.8792	2-1	04P [1½] --> 06S´ [½]¤
631	15	6.766613E-07	6.768454E-07	121012	14778.4415	2-1	04P [1½] --> 04D´ [1½]¤
638	20	6.887100E-07	6.888973E-07	120754	14519.8995	2-3	04P [1½] --> 04D´ [2½]¤
642	7	6.951460E-07	6.953351E-07	120619	14385.4672	2-2	04P [1½] --> 04D´ [1½]¤
643	7	6.960230E-07	6.962123E-07	120601	14367.3413	2-2	04P [1½] --> 04D´ [2½]¤
666	1	7.345340E-07	7.347338E-07	119848	13614.0737	2-1	04P [1½] --> 04D [1½]¤
671	20	7.392970E-07	7.394981E-07	119760	13526.3636	2-1	04P [1½] --> 06S [1½]¤
675	25	7.435330E-07	7.437352E-07	119683	13449.3022	2-2	04P [1½] --> 06S [1½]¤
689	20	7.704810E-07	7.706906E-07	119213	12978.9054	2-3	04P [1½] --> 04D [3½]¤
699	10	7.891078E-07	7.893224E-07	118907	12672.5403	2-2	04P [1½] --> 04D [1½]¤
712	7	8.053305E-07	8.055495E-07	118652	12417.2622	2-1	04P [1½] --> 04D [½]¤
881	120	1.095074E-06	1.095372E-06	115367	9131.8030	2-1	04P [1½] --> 03D´ [1½]¤
895	12	1.144183E-06	1.144494E-06	114975	8739.8607	2-1	04P [1½] --> 05S´ [½]¤
899	200	1.166872E-06	1.167189E-06	114805	8569.9203	2-2	04P [1½] --> 03D´ [1½]¤
906	3	1.189660E-06	1.189984E-06	114641	8405.7630	2-2	04P [1½] --> 03D´ [2½]¤
922	2	1.263901E-06	1.264245E-06	114148	7912.0121	2-1	04P [1½] --> 03D [1½]¤
938	1000	1.336738E-06	1.337102E-06	113717	7480.8975	2-3	04P [1½] --> 03D [2½]¤
940	30	1.349924E-06	1.350291E-06	113643	7407.8244	2-1	04P [1½] --> 05S [1½]¤
948	10	1.382599E-06	1.382975E-06	113468	7232.7551	2-2	04P [1½] --> 05S [1½]¤
951	10	1.390741E-06	1.391119E-06	113426	7190.4114	2-2	04P [1½] --> 03D [2½]¤

962	3	1.473911E-06	1.474312E-06	113021	6784.6702	2-3	04P [1½] --> 03D [3½]¤
981	500	1.694039E-06	1.694500E-06	112139	5903.0518	2-2	04P [1½] --> 03D [1½]¤

The intensity sources are mainly from reference 1, 2 and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.



The summary of these tables in Argon I are the description of the two main (blue) pathways in the Argon atom. If have all these transitions, *J* -couplings and upper levels energies to the orbital, it will simplify the difficulties between lobes 4S [1½] 1 and lobes 4P [2½] 2 in Atom.

Index	Intensity	Lambda ref: [1]	Lambda λ [air]	E upper cm^{-1}	E lambda cm^{-1}	J - coupling	Photon γ transition states
271	5	4.804330E-07	4.805637E-07	126426	20814.5569	2-3	04P [2½] --> 13D [3½]¤
275	5	4.832380E-07	4.833694E-07	126305	20693.7368	2-3	04P [2½] --> 12D [3½]¤
281	1	4.854370E-07	4.855690E-07	126212	20599.9955	2-1	04P [2½] --> 09S´ [½]¤
284	1	4.862160E-07	4.863483E-07	126179	20566.9908	2-2	04P [2½] --> 13S [1½]¤
285	1	4.865910E-07	4.867234E-07	126163	20551.1405	2-3	04P [2½] --> 11D [2½]¤
290	30	4.883270E-07	4.884598E-07	126090	20478.0813	2-3	04P [2½] --> 07D´ [2½]¤
297	10	4.908520E-07	4.909855E-07	125985	20372.7396	2-1	04P [2½] --> 12S [1½]¤
298	2	4.909710E-07	4.911045E-07	125980	20367.8018	2-2	04P [2½] --> 12S [1½]¤
299	1	4.915030E-07	4.916367E-07	125958	20345.7558	2-3	04P [2½] --> 10D [2½]¤
300	5	4.917850E-07	4.919188E-07	125946	20334.0891	2-2	04P [2½] --> 10D [2½]¤
301	80	4.921042E-07	4.922381E-07	125933	20320.8995	2-3	04P [2½] --> 10D [3½]¤
302	2	4.929160E-07	4.930501E-07	125899	20287.4323	2-1	04P [2½] --> 10D [½]¤
311	10	4.974180E-07	4.975533E-07	125716	20103.8161	2-1	04P [2½] --> 11S [1½]¤
312	2	4.975660E-07	4.977013E-07	125710	20097.8363	2-2	04P [2½] --> 11S [1½]¤
314	1	4.982810E-07	4.984165E-07	125681	20068.9972	2-3	04P [2½] --> 09D [2½]¤
315	10	4.985090E-07	4.986446E-07	125672	20059.8184	2-2	04P [2½] --> 09D [2½]¤
316	80	4.989948E-07	4.991305E-07	125652	20040.2890	2-3	04P [2½] --> 09D [3½]¤
318	1	4.999650E-07	5.001010E-07	125613	20001.4001	2-1	04P [2½] --> 09D [½]¤
342	5	5.065480E-07	5.066858E-07	125353	19741.4658	2-1	04P [2½] --> 08S´ [½]¤
345	40	5.070990E-07	5.072369E-07	125332	19720.0152	2-1	04P [2½] --> 10S [1½]¤
346	5	5.071300E-07	5.072679E-07	125331	19718.8098	2-2	04P [2½] --> 10S [1½]¤
350	10	5.081440E-07	5.082822E-07	125291	19679.4609	2-2	04P [2½] --> 08D [2½]¤
353	60	5.087085E-07	5.088469E-07	125270	19657.6232	2-3	04P [2½] --> 08D [3½]¤
360	60	5.118206E-07	5.119598E-07	125150	19538.0971	2-3	04P [2½] --> 06D´ [2½]¤
362	5	5.121880E-07	5.123273E-07	125136	19524.0810	2-1	04P [2½] --> 08D [½]¤
364	60	5.127802E-07	5.129197E-07	125114	19501.5330	2-2	04P [2½] --> 06D´ [2½]¤
383	200	5.214774E-07	5.216192E-07	124788	19176.2865	2-1	04P [2½] --> 07D [1½]¤
384	60	5.216280E-07	5.217699E-07	124783	19170.7500	2-1	04P [2½] --> 09S [1½]¤
385	40	5.219300E-07	5.220720E-07	124772	19159.6574	2-2	04P [2½] --> 09S [1½]¤
389	5	5.234740E-07	5.236164E-07	124715	19103.1455	2-3	04P [2½] --> 07D [2½]¤
392	60	5.241091E-07	5.242517E-07	124692	19079.9969	2-2	04P [2½] --> 07D [2½]¤

398	300	5.252789E-07	5.254218E-07	124650	19037.5056	2-3	04P [2½] --> 07D [3½]¤
402	20	5.279050E-07	5.280486E-07	124555	18942.8022	2-1	04P [2½] --> 07D [½]¤
452	200	5.457416E-07	5.458900E-07	123936	18323.6909	2-1	04P [2½] --> 06D [1½]¤
455	60	5.467163E-07	5.468650E-07	123903	18291.0236	2-2	04P [2½] --> 08S [1½]¤
457	500	5.473455E-07	5.474944E-07	123882	18269.9958	2-1	04P [2½] --> 07S´ [½]¤
460	2	5.488460E-07	5.489953E-07	123832	18220.0472	2-3	04P [2½] --> 06D [2½]¤
461	60	5.490122E-07	5.491615E-07	123827	18214.5315	2-2	04P [2½] --> 06D [2½]¤
467	5	5.506115E-07	5.507613E-07	123774	18161.6261	2-3	04P [2½] --> 06D [3½]¤
483	10	5.572543E-07	5.574059E-07	123558	17945.1291	2-3	04P [2½] --> 05D´ [2½]¤
486	500	5.588722E-07	5.590242E-07	123506	17893.1780	2-2	04P [2½] --> 05D´ [2½]¤
490	40	5.600430E-07	5.601953E-07	123468	17855.7718	2-1	04P [2½] --> 06D [½]¤
503	10	5.630440E-07	5.631971E-07	123373	17760.6013	2-2	04P [2½] --> 05D´ [1½]¤
544	15	5.928812E-07	5.930425E-07	122480	16866.7843	2-1	04P [2½] --> 07S [1½]¤
546	5	5.942672E-07	5.944289E-07	122440	16827.4468	2-2	04P [2½] --> 07S [1½]¤
551	5	5.981900E-07	5.983527E-07	122330	16717.0966	2-3	04P [2½] --> 05D [2½]¤
555	5	5.999000E-07	6.000632E-07	122282	16669.4438	2-2	04P [2½] --> 05D [2½]¤
561	35	6.043225E-07	6.044869E-07	122160	16547.4549	2-3/2-3	04P [2½] --> 05D [3½]¤
577	15	6.127416E-07	6.129083E-07	121933	16320.0932	2-1	04P [2½] --> 05D [½]¤
601	15	6.431559E-07	6.433308E-07	121161	15548.3297	2-1	04P [2½] --> 06S´ [½]¤
604	15	6.493971E-07	6.495737E-07	121012	15398.8985	2-1	04P [2½] --> 04D´ [1½]¤
615	15	6.604854E-07	6.606651E-07	120754	15140.3796	2-3	04P [2½] --> 04D´ [2½]¤
619	5	6.664053E-07	6.665866E-07	120619	15005.8824	2-2	04P [2½] --> 04D´ [1½]¤
620	2	6.672100E-07	6.673915E-07	120601	14987.7850	2-2	04P [2½] --> 04D´ [2½]¤
648	100	7.068730E-07	7.070653E-07	119760	14146.8128	2-1	04P [2½] --> 06S [1½]¤
650	25	7.107478E-07	7.109411E-07	119683	14069.6889	2-2	04P [2½] --> 06S [1½]¤
668	70	7.353316E-07	7.355316E-07	119213	13599.3068	3-3/1-2	04P [2½] --> 04D [3½]¤
687	50	7.670040E-07	7.672126E-07	118652	13037.7417	2-1	04P [2½] --> 04D [½]¤
857	50	1.068340E-06	1.068631E-06	114975	9360.3160	2-1	04P [2½] --> 05S´ [½]¤
875	25	1.086104E-06	1.086399E-06	114822	9207.2214	2-3	04P [2½] --> 03D´ [2½]¤
876	150	1.088096E-06	1.088392E-06	114805	9190.3656	2-2	04P [2½] --> 03D´ [1½]¤
886	11	1.107887E-06	1.108188E-06	114641	9026.1913	2-2	04P [2½] --> 03D´ [2½]¤
903	12	1.171951E-06	1.172270E-06	114148	8532.7800	2-1	04P [2½] --> 03D [1½]¤
912	50	1.234372E-06	1.234708E-06	113716	8101.2855	2-3	04P [2½] --> 03D [2½]¤
917	100	1.245605E-06	1.245944E-06	113643	8028.2272	2-1	04P [2½] --> 05S [1½]¤
924	30	1.273359E-06	1.273705E-06	113468	7853.2448	2-2	04P [2½] --> 05S [1½]¤
926	200	1.280268E-06	1.280616E-06	113426	7810.8646	2-2	04P [2½] --> 03D [2½]¤
941	1000	1.350399E-06	1.350766E-06	113021	7405.2188	2-3	04P [2½] --> 03D [3½]¤
968	10	1.532956E-06	1.533373E-06	112139	6523.3444	2-2	04P [2½] --> 03D [1½]¤
976	27	1.612297E-06	1.612736E-06	111818	6202.3312	2-1	04P [2½] --> 03D [½]¤

The intensity sources are mainly from reference 1, 2 and 3. Argon lambdas transition and J-coupling reference are mainly from reference 1.

The Hamiltonian wave equation is probably the only *Formula* that gives the kinetic energies in atoms like Hydrogen, Helium and Argon. The potential energies are easily to confirm with classical formulas if use the values of constants in this essay. The wave equation of energies:

$$\therefore\ \Psi H = -\left(\sqrt{\frac{e\cdot\Delta\psi}{\pi\cdot u_0}} + \Delta\psi = \frac{2\cdot h^2}{m_e\cdot\lambda^2}\cdot\nabla^2\right) = -\left(2.5092121\cdot10^{-18}\,J + 1.5469789\cdot10^{-22}\,J\right) = -2.50936679\cdot10^{-18}\,J$$

$$\therefore\ E_k = -2.509936679\cdot10^{-18}\,J \qquad \Rightarrow \qquad \Delta = -15.61759eV \qquad \text{If: } \lambda = \frac{1}{IP_{Ar}} = \frac{1}{12710990} = 7.867207626\cdot10^{-8}\,m$$

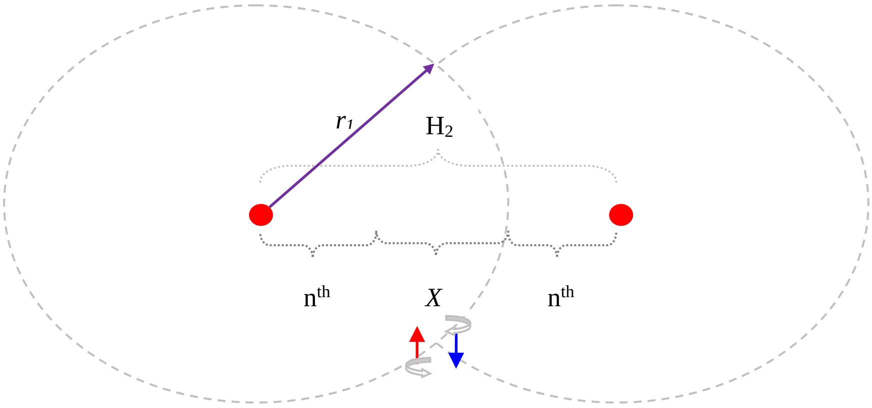
This is the energy that needs to remove the first electron in Argon I. The Ionization Potential above is from ref: [1], and it´s probably the energy the electron has left on the atoms surfaces. The operator indicates that the kinetic energy is going in a trajectory path around the electron. Which can correspond to relativistic action of the electrons mass m_e, because a difference of mass when the electron are at rest at atoms surface and when the electron are in lobes orbital path. Through the Hamiltonian it will be possibly to make a kinetic and potential energy part.

Argon [9]

8. Hydrogen bond length

In the bond length H_2 of the Hydrogen molecule, the electrons occupy a lower energy stage then in a single Hydrogen atom. The electrons are still at distance r_1 from proton, but because repulsion forces from 2nd proton, they are at a stage where it's zero electron volt in molecule.

Figure 8.0:1



The molecular orbital of homo nuclear diatomic molecules are build from the valence shell of atomic orbital. In H_2-molecule two atomic 1s-orbitals forms into a two molecular orbital. The bonding will be one σ-orbital, which look like a sausage shaped orbital in 3-space. Because Hydrogen are Z = 1 it has only one electron in it's orbital so the molecule will form bonding of lower energy in σ-orbital. So, the measurement of distance for H_2 bond length could not be done between the both electrons in the σ_{1s}^2-molecule. It could only be done between the two protons of the σ_{1s}^2-molecule of Hydrogen. The electron energy in a H_2-molecule is lower than in separated atoms of Hydrogen, which makes that it only can exist one molecular σ-bond. [5]

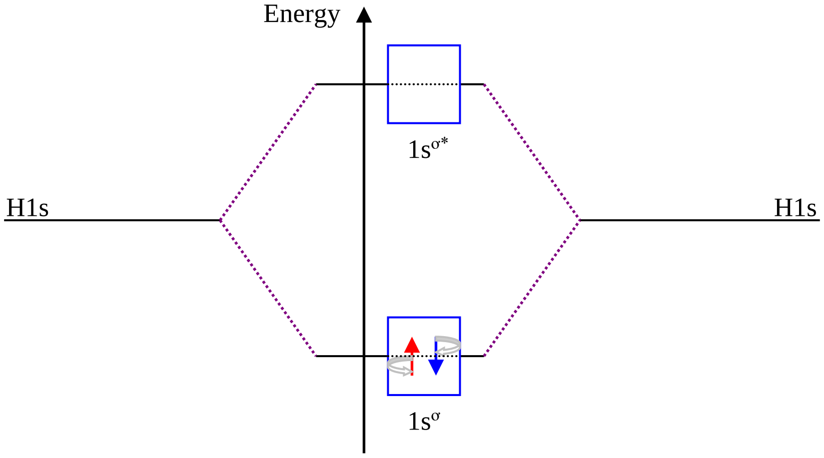
$$\therefore\ n^{th} = \frac{4\pi \cdot h}{\sqrt{2} \cdot m_e \cdot c_0} = 2.15492674 \cdot 10^{-11}\, m$$

$$\therefore\ r_1 = \frac{\varepsilon_0 \cdot h^2}{\pi \cdot m_e \cdot e^2} = 5.29177209 \cdot 10^{-11}\, m$$

$$H_2 = r_1 + n^{th} = \left(2 \cdot n^{th}\right) + X = 7.4466988 \cdot 10^{-11}\, m$$

The bond length in H_2 is approximately 1.407 times the length of first orbital r_1 in Hydrogen.

Figure 8.0:2



[5]

Reference [4] has an observed length of 1.401 times to a_0 and it makes about 74.14 pm to H_2. This diagram shows two electrons from a H_2-molecule occupy the lower energy bonding of a σ-orbital, which result in one stable diatomic molecule. And according to W. Pauli exclusion principles, each σ-orbital can occupy up to two electrons, which must be paired. That will say the electrons must have anti parallel spin, and the electrons are also first occupying the lower energy 1s$^{\sigma}$-state. The energy of a chemical bond is measured by its dissociation energy *D*, the energy required to separate the Hydrogen molecule bond are normally taken with experiment.

- $H_2 \rightarrow H(g) + H(g)$

A bond length is the distance between the centres of two atoms joined into a covalent bond. The potential dissociation energy in the Hydrogen H_2-molecule is measured with minus sign.

$$\therefore\ H_2 = -\Psi^2 \cdot \int_0^{\infty} X \cdot e^{-ax^2}\,dx = \frac{\pi^2}{2\cdot a} = 74.467\cdot 10^{-11}\,m \qquad \text{If: } a = \frac{\pi^2}{2\cdot\left(r_1 + n^{th}\right)}$$

CRC Handbook of Physics and Chemistry [3], has H_2 –bond length of 74.14 pm, *UV*-method.

From W. Pauli exclusion principles we know that the wave function for two identical waves must be anti symmetric that will say the electrons must have opposite spins. That guarantees that the whole wave function is anti symmetric that will say the product of the spin and space.

The electron ψ-amplitude at ground level in Hydrogen corresponding to the electron ±½-spin, and this energy must be added into the dissociation energy to every spin-electron in molecule.

- $$\psi_s = \frac{h}{m_e\cdot c_\Omega^2}\cdot\left(\frac{1}{1}-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\frac{1}{9}-\frac{1}{11}+\frac{1}{13}-\frac{1}{15}+\frac{1}{17}-\frac{1}{19}+\frac{1}{21}\cdots\right)$$

- $$\frac{\pi\cdot h}{4\cdot m_e\cdot c_\Omega^2} = \frac{\pi\cdot 6.62583628\cdot 10^{-34}}{4\cdot 9.17034684\cdot 10^{-31}\cdot\left(2.62842616\cdot 10^{8}\right)^2} = 8.21397275\cdot 10^{-21}\,J$$

This is probably the energy corresponding to the electron spin momentum to its own velocity.

$$\therefore\ n^{th} = \frac{4\pi\cdot h}{\sqrt{2}\cdot m_e\cdot c_2} = 2.46733118\cdot 10^{-11}\,m$$

This is the n^{th} length for one electron volt, and the vector for the electron length to first orbital must be added to the separation of the molecule to both electrons. If $2\pi\cdot r_0$ corresponds to ΔeV

$$\therefore\ \Delta = \frac{r_0}{n:th} = \frac{5.29205361\cdot 10^{-11}}{2.46733118\cdot 10^{-11}} = 2.1448493eV$$

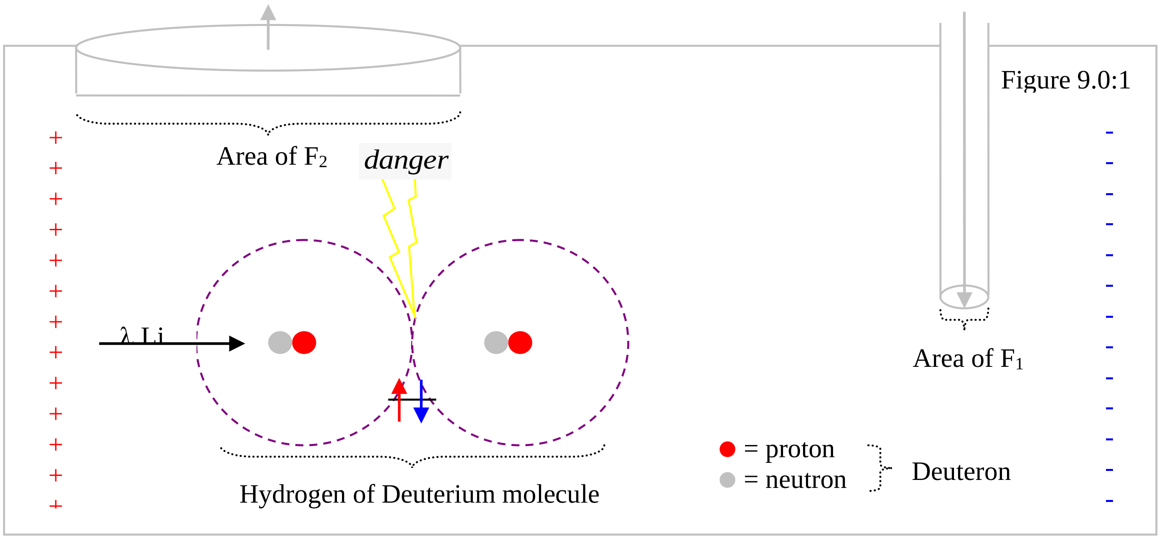
$$\therefore\ D_\Delta = \left(2\cdot\Delta eV\right) + \Delta\left(2\cdot\psi\right) = 4.28969865 + 0.1022429 = 4.39194155eV$$

$$\therefore\ D = NA_e\cdot eV = 96761.15243\cdot 4.39194155 = 424969.3252\ J/mol$$

$$\therefore\ D = 424.970\ kJ\cdot mol^{-1}$$

This is the dissociation energy to separate both electrons from the Hydrogen molecule, or the energy needed to break up the molecules covalent bond to two separated Hydrogen atoms. CRC Handbook of Physics and Chemistry has dissociation energy of about; 436 kJ/mol [3], and dissociation energy into the Hydrogen molecule of about; 424 kJ/mol is also reported [5].

9. Power reinforcement to break bonds



This diagram illustrates an atomic chamber with automatic control engineering of pressure. If lower the pressures in the chamber then will bond of the H_2-molecule disintegrate into two H_D-atoms. Exact at this momentum shoot over one of the protons with Li photon on neutron. The electrons have attraction to opposite proton in a bond, but in a short time when the bond is broken it has attraction to both the protons because it's the phase when it will have back the attraction to the ordinary proton and get distance to the normal value to it first orbital in atom with 1s-shell. This chamber model is probably in action when its thunderstorm and flashing in the nature. In oceanic sea water exists of approximately 0.02 percent deuterium molecules.

The Hydrogen proton has the value 1.00758 u and a neutral neutron 1.00893 u. This makes that it should be 4.03302 u of mass weight in Helium. But, in the Helium nucleus we have 4.0028 u of mass weight. The loss of this mass in Helium is the binding energy of its nucleus.

Suppose the piston in F_1 (vector ↓) has an area of $A_1 = 1.2\ cm^2$, and the piston in F_2 (vector ↑) has an area of $A_2 = 300\ cm^2$. What will the power be of F_2 if the piston will be pressed down with $F_1 = 60$ N. The follow equation has real association to nature it shows how to *know how*.

- $P = F_1 / A_1 \qquad \Rightarrow \qquad F_2 = P \cdot A_2 = F_1 \cdot \frac{A_2}{A_1}$
- $F_2 = 60N \cdot \frac{300cm^2}{1.2cm^2} = 15000N \qquad \Rightarrow \qquad F_2 = 15kN$

This is the power reinforcement on area A_2 that will lower the pressure in the chamber above in diagram. If power from out act on a liquid or a gas it will causes one pressure that will give arise to all other dots in the liquid or gas in the chamber. Now, the proton radius in Hydrogen:

$$\therefore\ r = \frac{\left(6.6258628 \cdot 10^{-34}\right)^2}{1.68620952 \cdot 10^{-27} \cdot 2.979320975 \cdot 10^{8} \cdot 1.60675660 \cdot 10^{-19}} = 5.43879236 \cdot 10^{-30}\, m$$

$$\therefore\ \Re_p = \sqrt{r^2 + r^2} = \sqrt{2} \cdot r = \sqrt{2} \cdot 5.43879236 \cdot 10^{-30} = 7.69161392 \cdot 10^{-30}\, ms$$

$$R_p = \Re_p \cdot v = 7.69161392 \cdot 10^{-30}\, ms \cdot 2.42498687 \cdot 10^{14}\, Hz \qquad \Rightarrow \qquad R_p = 1.86520627 \cdot 10^{-15}\, m$$

This is probably the proton radius in a neutral Hydrogen atom and r_p is smaller to electron r_e.

Here it's not necessary to calculate with α -angular frequency, because there are none orbital inside the first orbital in Hydrogen. Other theories exist to a multiple of *pi* to electron radius. The proton radius in Helium is more difficult to calculate then in Hydrogen, because here we also have two neutrons [14] not only two protons, with the reduced μ-mass it could be worth.

$$\therefore\ \mu = \frac{m_p \cdot m_n}{m_p + m_n} = \frac{1.6862095 \cdot 10^{-27} \cdot 1.6885338 \cdot 10^{-27}}{1.6862095 \cdot 10^{-27} + 1.6885338 \cdot 10^{-27}} = 8.43685435 \cdot 10^{-28}\, kg \quad \text{Hint: } m_n = \frac{m_e}{\sqrt{2} \cdot \pi^5 \cdot u_0} \cdot \left[\frac{m_n}{m_p}\right]$$

$$\therefore\ r = \frac{h^2}{m_\mu \cdot c_0 \cdot e} = \frac{\left(6.6258628 \cdot 10^{-34}\right)^2}{8.43685435 \cdot 10^{-28} \cdot 2.979320975 \cdot 10^{8} \cdot 1.6067566 \cdot 10^{-19}} = 1.08700981 \cdot 10^{-29}\, m$$

$$\therefore\ \Re_p = \sqrt{r^2 + r^2} = \sqrt{2} \cdot 1.08700981 \cdot 10^{-29} = 1.53726402 \cdot 10^{-29}$$

Helium: $R_p = \Re_p \cdot v = 1.53726402 \cdot 10^{-29} \cdot 2.42498687 \cdot 10^{14} = 3.72784505 \cdot 10^{-15}\, m$

The diameter of Hydrogen proton: $R_p = 2 \cdot r_p = 2 \cdot 1.86520627 \cdot 10^{-15} = 3.73041255 \cdot 10^{-15}\, m$

This is probably the proton radius in the Helium atom and it's near twice the ordinary radius of one single Hydrogen proton. Probably are this the difficulty in one fusion process with two Hydrogen of Deuterium, because the radius in the Helium proton is little smaller than what the radius of two Hydrogen proton are together. This vector field of Newton power to bring the two atoms together is the same vector field in power of charge *C* that will be won out of one fusion. And if needed to shoot on one neutron of the Deuterium nuclei with one Lithium photon γ to get its proton over to the other atom of H_D then will the neutron automatic follow over because force of repulsion vs. attraction. This could be reality if uses one Deuterium molecule like it's here in the camber model. Then will it also be necessary to know the speed of sunlight c_o with one error of only ± 10 ms^{-1}. This fact scientist already knows from fusion researches. Probably because it will only be possibly to hold both atoms in the molecule in position in a time of about: 1E-18s With A. Einstein's relation for particle forces at rest the mass could be written as: $m_p = E / c^2$. The energy in a fusion process of only one molecule of two Deuterium atoms that will be won out when forms is then like follows with the equation for binding energy of proton to neutron according to several reference material [5, 14, 16, 24]

The equation of reaction: ${}^{2}_{1}H + {}^{2}_{1}H \mapsto {}^{4}_{2}He \mapsto {}^{3}_{2}He + {}^{1}_{0}n$ Hint: α^4-particle in ${}^{4}_{2}He$ is radioactive.

- $m = 2 \cdot \left(1.68620952 \cdot 10^{-27} + 1.6885338 \cdot 10^{-27}\right) = 6.74948668 \cdot 10^{-27}\, kg$
- $m_\Delta = m - m_\mu = 6.74948668 \cdot 10^{-27} - 8.43685435 \cdot 10^{-28} = 5.90580125 \cdot 10^{-27}\, kg$
- $E = m_\Delta \cdot c_0^2 = 5.90580125 \cdot 10^{-27} \cdot \left(2.979320975 \cdot 10^{8}\right)^2 = 5.24219794 \cdot 10^{-10}\, J$
- $E_{bind} = \dfrac{5.24219794 \cdot 10^{-10}}{1.6067566 \cdot 10^{-19}} = 3.26259619 \cdot 10^{9}\, eV \Rightarrow 3.26 \cdot 10^{3}\, MeV$
- $E_{bind} = \dfrac{CV}{Wh^{-1}} = \dfrac{3.26259619 \cdot 10^{6}\, kJ}{3.600 \cdot 10^{3}\, kJ \cdot Wh^{-1}} = 906.3\, Wh \Rightarrow 0.9\, kWh$

This is the energy that will be won out of only one Deuterium molecule in one fusion process.

10. Notebook of Modern Quantum Mechanics

Niels H. Bohr (1885-1962). Bohr's first doctoral paper was named: "studier over metallernes electronteori". In the year 1911-12 he worked with Thomson in Cambridge and Rutherford in Manchester. This work had leaded him to develop the first orbital equation in Hydrogen. In year 1913 Bohr's pioneer work over the electron orbital in the atom was published. Through the quantum theory he could explain all the difficulties from the Rutherford's model of atom, which was later verified through other science physics experiment. The result from: "Über die serienspektren der Elementen" where published year 1920 in "Zeitschrift für Physik". "Atomernes bygning og stoffernes fysiske og kemiske egenskaper" and "Drei Aufsätze über Spektren und Atombau" 1922 in the paper: "Sammlung Vieweg". In May 1924 Niels Bohr published in the paper "Philosophical Magazine" the theory of atoms emission spectra and the quantum jump of the electrons [23]. He was honoured the Nobel Prize in Physics in year 1922 and received also the Nobel Prize in Physics 1922 "for his services in the investigation of the structure of atoms and of the radiation emanating from them" [13]. From the Russian chemist Dmitry Mendeleyev (1834-1907) idea of the periodic system of the basic elements, Bohr has developed the periodic system in accordance of atomic structure to older classical electromagnetic quantum theory, where the electron configuration play a central role in atom.

1. $a_0 = \dfrac{\varepsilon_0 \cdot h^2}{\pi \cdot m_e \cdot e^2}$ [24]

This is the modern original a_0 formula from Bohr him selves, but because difficulties with the vacuum permittivity, the letters for the electron are usable for us. If break up the proton value above into a new equation with proton mass, electrostatic charge, pions and quarks, we have:

- $m_p \cdot \pi^2 \cdot \sqrt{\pi^2 + \pi^2} \cdot e^2 \cdot \Phi_0 = m_e \cdot \pi \cdot e^2 \cdot a_0$

According to Bohr, the charge to the electron should be in square, but probably he means: q^2.

- $a_0 = \dfrac{m_p \cdot \pi \cdot \sqrt{\pi^2 + \pi^2} \cdot \Phi_0}{m_e}$ $\Leftrightarrow$ $a_0 = \dfrac{m_p \cdot 13.95773 \cdot \Phi_0}{m_e}$
- $a_0 = \dfrac{2\pi^2 \cdot m_p \cdot \Phi_0}{\sqrt{2} \cdot m_e}$ $\Rightarrow$ $Z^2 = \dfrac{m_e \cdot a_0}{\sqrt{2} \cdot \pi^2 \cdot m_p \cdot \Phi_0}$

2. $a_0 = \dfrac{\pi^2 \cdot m_p \cdot h}{\sqrt{2} \cdot m_e \cdot e}$ If: $h = 2 \cdot e \cdot \Phi_0$

3. $a_0 = \dfrac{\pi^2 \cdot h}{2 \cdot \pi^5 \cdot u_0 \cdot e}$ If: $\dfrac{m_p}{m_e} = \dfrac{1}{\sqrt{2} \cdot \pi^5 \cdot u_0}$

4. $a_0 = \dfrac{h}{2\pi^3 \cdot u_0 \cdot e} = 5.29177209 \cdot 10^{-11} m$ $a_0 = \dfrac{2 \cdot \Re_f \cdot h^2}{\sqrt{2} \cdot m_e \cdot e \cdot c_2}$

This is the first orbital length in Hydrogen and that without any speedy c_0. The electrostatic charge in square has an anti electrostatic charge in square in the proton. This makes repulsion to the electron-proton at the first orbital. The attraction is probably to magnetic flux quantum.

If investigate in the original language of cgs-units into a_0 equation like it was in the year 1913 when Niels Bohr's pioneer work over the electron orbital in the atoms where first published.

1. $\Psi E = -\frac{h^2}{8\pi^2 \cdot m_e}\nabla^2$ If: $\nabla^2 = \left(\frac{1}{a_0}\right)^2$

2. $a_0 = \frac{\hbar^2}{m_e \cdot q^2}$ [6]

(2 in 1) $E_k = -\frac{2\pi^2 \cdot m_e \cdot q^4}{h^2} = -2.1652281 \cdot 10^{-11} erg$

If now put N. Bohr´s first orbital radius a_0 into the operator in Schrödinger´s wave equation, we get the kinetic energy of the electron. This wave equation has same letter in both systems.

$$\therefore\ \Psi H = -\left(\frac{h \cdot c_0}{\lambda} + \frac{2 \cdot h^2}{m_e \cdot \lambda^2}\right) = -\frac{2\pi^2 \cdot m_e \cdot q^4}{h^2} \qquad \text{If: } \lambda = \frac{1}{IP_H} = 9.11753533 \cdot 10^{-6} cm$$

The Hamiltonian has same letter in both the *cgs - unit* and in the modern international system. Here the wave equation with one potential part and one kinetic part of energy, equal Bohr´s first orbital electron energy. Lambda λ corresponds to energy the electron will left on surface.

$$\therefore\ q^2 = \sqrt{\frac{h^2}{2\pi^2 \cdot m_e} \cdot \left(\frac{h \cdot c_0}{\lambda} + \frac{2 \cdot h^2}{m_e \cdot \lambda^2}\right)} = 2.29157867 \cdot 10^{-19} esu$$

In this wave equation we get the electron charge at distance a_0 to proton, and the charge q^2 is neither negatively or positively. The attraction vs. repulsion has to do with electromagnetism.

$$a_0 = \frac{\hbar^2}{m_e \cdot q^2} = 5.29177209 \cdot 10^{-9} cm \qquad \therefore\ \nu = \frac{2\pi^2 \cdot m_e \cdot q^4}{h^3}$$

This is the original a_0 formula from Bohr him selves, and without any alpha or beta constants. In his essay: "On the Constitution of Atoms and Molecules", published in 1913 N. Bohr has developed the formulas for the length a_0 from proton to first electron orbital in Hydrogen [6].

i. $a_0 = \frac{\hbar^2}{m_e \cdot q^2}$

ii. $a_0 = \frac{q^2}{m_e \cdot v_0^2}$

$\therefore\ q^2 = v_0 \cdot \hbar$ $q = 4.78704363 \cdot 10^{-10} esu$

iii. $E_k = \frac{2\pi^2 \cdot m_e \cdot q^4}{h^2} = \frac{2\pi^2 \cdot m_e \cdot v_0^2 \cdot h^2}{h^2 \cdot 4\pi^2} = \frac{m_e \cdot v_0^2}{2}$ $E_k = \frac{q^2}{2 \cdot a_0}$

Here are the two main equations from Bohr, for the length of a_0 and they give probably the amplitude to the electron charge q in square because the velocity and Planck´s constant h-bar.

10.1 **Fundamental physical constants**

· Alpha fine-structure constant……..............................	$\alpha_0 = 7.293846926 \cdot 10^{-3}$
· *B*eta constant surface……………..............................	$\beta_0 = 0.9999734$
· *B*eta constant (exact)…………….............................	$\beta_1 = 0.999973400959812$
· Permittivity……………………………………………	$\varepsilon_0 = 8.965108451 \cdot 10^{-12}$
· Permeability (exact)……………………………………	$u_0 = 1.2566370614359 \cdot 10^{-6}$
· Hydrogen energy surface……………………………..	$IP_H = 10967876.3381 m^{-1}$
· Rydberg constant………………………………………	$R_\infty = 10968459.8316 m^{-1}$
· Elementary charge…………………………………….	$e = 1.6067565958 \cdot 10^{-19}\,J$
· Electron mass………………………………………….	$m_e = 9.170346843 \cdot 10^{-31}\,kg$
· Proton mass…………………………………………...	$m_p = 1.686209519 \cdot 10^{-27}\,kg$
· Speed of light (*Emax*)………………………………….	$c_0 = 2.979320975 \cdot 10^{8}\,ms^{-1}$
· Speed of light (*Bmax*)………………………………….	$c_1 = 2.979241728 \cdot 10^{8}\,ms^{-1}$
· Electron velocity………………………………………	$c_2 = 2.602090263 \cdot 10^{8}\,ms^{-1}$
· Planck´s constant………………………………………	$h = 6.625836282 \cdot 10^{-34}\,Js$
· Plank´s constant *h*-bar…………………………………	$\hbar = 1.054534596 \cdot 10^{-34}\,Js$
· Magnetic flux quantum…………..............................	$\Phi = 2.06186684 \cdot 10^{-15}\,wb$
· Rydberg´s frequency……………………………………	$R_f = 3.267856244 \cdot 10^{15}\,Hz$
· Hydrogen kinetic energy……………………………....	$E_h = 4.330456093 \cdot 10^{-18}\,J$
· Kinetic electron energy……………………………….	$E_k = 2.16522805 \cdot 10^{-18}\,J$
· Fine structure energy………………………………….	$\Delta\psi = 1.15190572 \cdot 10^{-22}\,J$
· Boltzmann's constant …..………………………………	$k = 1.38415545 \cdot 10^{-23}\,JK$
· Faraday´s constant…………………………………….	$NA_e = 96761.15243 Jmol^{-1}$
· Electron amplitude…………………………………….	$J = 1.619340539 \cdot 10^{-26}\,ms$
· Electron arc length…………………………………….	$s_0 = 1.017461668 \cdot 10^{-25}\,ms$
· Amplitude constant *n*eta……………………………..	$\eta = 2.29157867 \cdot 10^{-28}\,Jm$
· Amplitude time *t*……………………………………...	$t_A = 7.451852489 \cdot 10^{-33}\,s^2$
· Time natural unit……………………………………..	$t_0 = 1.295509142 \cdot 10^{-21}\,s$
· Time of distance radius………………………………	$t_1 = 1.115998744 \cdot 10^{-18}\,s$
· Time atomic unit……………………………………..	$t_2 = 2.435158269 \cdot 10^{-17}\,s$
· First orbital radius a. u……………………………….	$r_1 = 5.291772091 \cdot 10^{-11}\,m$
· Orbital distance……………………………………….	$R = 2.90392946 \cdot 10^{-10}\,m$
· Orbital distance *max*…………..............................	$R_{\max} = 2.93316425 \cdot 10^{-10}\,m$
· Distance radius n^{th}……………………………………..	$n^{th} = 2.467331181 \cdot 10^{-11}\,m$
· Distance constant…...…………………………………	$d_c = 2.647432287 \cdot 10^{-17}\,m^2$

Fundamental constants in cgs – unit

· Electron energy...……………………………………	$E_k = 2.1652281 \cdot 10^{-11}\,erg$
· Electron charge……………………………………..	$q^2 = 2.29157867 \cdot 10^{-19}\,esu$
· Planck´s constant……………………………………	$h = 6.62583628 \cdot 10^{-27}\,erg \cdot s$
· Electron mass……………………………………….	$m_e = 9.17034684 \cdot 10^{-28}\,g$
· Speed of light *c*……..………………………………	$c_0 = 2.979320975 \cdot 10^{10}\,cm \cdot s^{-1}$
· Speed Omega *c*……………………………………..	$c_\Omega = 2.628426161 \cdot 10^{10}\,cm \cdot s^{-1}$

Rydbergs formula and first orbital

There exists one formula that gives the electron energy in the Hydrogen atom, at first orbital.

$$\therefore\ I_1 = \iiint \left[\frac{h^2}{8\pi^2 \cdot m_e \cdot E_k} \cdot \left(\nabla^2 = \frac{\partial^2 \psi}{\partial x^2} + \frac{\partial^2 \psi}{\partial y^2} + \frac{\partial^2 \psi}{\partial z^2} \right) \right] dxdydz \qquad [8]$$

$$\therefore\ I_2 = \iiint \Psi^2 dxdydz = 1 \qquad \therefore\ r_1 \cdot \pi \cdot m_e \cdot e^2 \cdot 4\pi = \pi^2 \cdot m_p \cdot h \cdot e \cdot \int_0^{2\pi} \sqrt{\pi^2 + \pi^2}\, ds$$

The initial condition in Rydbergs formula and they are from E. Schrödinger paper from 1927. If put the Schrödinger wave equation and Bohr´s first radius formula together, then we have:

1) $\Psi E = \frac{h^2}{8\pi^2 \cdot m_e} \cdot \nabla^2$ If: $\nabla^2 = \left(\frac{1}{r_1} \right)^2$

2) $r_1 = \frac{\varepsilon_0 \cdot h^2}{\pi \cdot m_e \cdot e^2}$

(2 in 1) $E_k = \frac{m_e \cdot e^4}{8 \cdot h^2 \cdot \varepsilon_0^2} = 2.16522805 \cdot 10^{-18}\, J$

$$\Re_f = \frac{m_e \cdot e^4}{8 \cdot h^3 \cdot \varepsilon_0^2} = 3.26785624 \cdot 10^{15}\, Hz$$

$$R_\infty = \frac{m_e \cdot e^4}{8 \cdot h^3 \cdot \varepsilon_0^2 \cdot c_0} = 10968459.83 m^{-1}$$

If take Bohr´s first radius r_1 formula and put it in the Schrödinger wave-equation, then we get the Rydbergs formula. The formula above gives electron energy, frequency and wave energy.

1) $R_\infty = \frac{m_e \cdot \alpha_0^2 \cdot c_0}{2 \cdot h}$ [24]

2) $\alpha_0 = \frac{u_0 \cdot c_0 \cdot e^2}{2 \cdot h}$ [24]

(2 in 1) $\Re_f = \frac{m_e \cdot e^4}{8 \cdot h^3 \cdot \varepsilon_0^2} = 3.26785624 \cdot 10^{15}\, Hz$

If use Sommerfeld´s alpha constant and put it in Rydbergs energy, then we get the frequency.

1) $m_e \cdot v_0 \cdot r_1 = \frac{h}{2\pi}$

2) $v_0 = \frac{e^2}{2 \cdot h \cdot \varepsilon_0}$

(2 in 1) $r_1 = \frac{\varepsilon_0 \cdot h^2}{\pi \cdot m_e \cdot e^2} = 5.29177209 \cdot 10^{-11}\, m$

If put the velocity in the original condition from N. Bohr´s paper, then we get the first radius.

These are also the official first radius formula in SIS-unit, named Bohr´s first radius formula.

1) $m_e \cdot v_0 \cdot r_1 = \frac{h}{2\pi}$

2) $v_0 = \frac{e}{\sqrt{2} \cdot \pi^3 \cdot m_p}$

(2 in 1) $r_1 = \frac{e}{2\pi^6 \cdot u_0^2} = 5.29177209 \cdot 10^{-11}\, m$

If: $h = \frac{e^2}{\pi^3 \cdot u_0}$

If: $\frac{m_p}{m_e} = \frac{1}{\sqrt{2} \cdot \pi^5 \cdot u_0}$

These are probably the most complete first radius r_1 formula, with only one electron charge. Some formulas to the first orbital length, which can be put into the energy initial condition Ψ.

1) $r_1 = \frac{\varepsilon_0 \cdot h^2}{\pi \cdot m_e \cdot e^2}$

2) $r_1 = \frac{e}{2\pi^6 \cdot u_0^2}$

3) $r_1 = \frac{m_p \cdot c_0^2}{\sqrt{2} \cdot 2}$

4) $r_1 = \frac{m_e \cdot c_0^2}{4\pi^5 \cdot u_0}$

5) $r_1 = \frac{\Phi}{\pi^3 \cdot u_0}$

6) $r_1 = J \cdot \Re_f$

7) $r_1 = \frac{\alpha_0}{4\pi \cdot R_\infty}$

8) $r_1 = \frac{u_0 \cdot e^2}{4\pi \cdot m_\Delta}$

9) $r_1 = \frac{s_0}{8\pi^2 \cdot t_2}$

10) $r_1 = t_2 \cdot v_0$

11) $r_1 = \sqrt{\frac{t_2 \cdot \hbar}{4 \cdot e \cdot \varepsilon_0}}$

12) $r_1 = k \cdot \frac{2\pi \cdot m_p}{\sqrt{2} \cdot u_0}$

$\therefore\ k = 1/4\pi \cdot \varepsilon_0$

13) $r_1 = \frac{t_1 \cdot c_0}{2\pi}$

14) $r_1 = \frac{\alpha_0 \cdot \hbar}{m_\Delta \cdot c_0}$

15) $r_1 = \frac{\Re_f \cdot t_1}{2\pi \cdot R_\infty}$

16) $r_1 = \frac{2 \cdot h \cdot \Delta eV}{\sqrt{2} \cdot m_e \cdot c_2}$

17) $r_1 = \frac{R\max \cdot c_0}{2\pi \cdot c_2}$

18) $r_1 = \frac{e^2}{4\pi \cdot \varepsilon_0 \cdot E_h}$

19) $r_1 = \frac{\hbar}{m_e \cdot v_0}$

20) $r_1 = \sqrt{\frac{\hbar}{4\pi \cdot m_e \cdot \Re_f}}$

21) $r_1 = \frac{J}{4\pi \cdot t_2}$

22) $r_1 = \frac{2\pi \cdot \Delta eV \cdot U}{m_e \cdot v_0}$

23) $r_1 = \sqrt{\frac{U}{4\pi^2 \cdot u_0 \cdot \varepsilon_0}}$

24) $r_0 = \frac{\alpha_0}{4\pi \cdot IP_H}$

25) $r_1 = \frac{2 \cdot m_p \cdot \Delta eV}{\sqrt{2} \cdot \pi^5 \cdot u_0^2}$

26) $r_1 = \sqrt{\frac{\hbar}{2\pi^8 \cdot u_0^3}}$

27) $r_1 = \sqrt{\frac{\hbar}{m_e \cdot \Omega}}$

28) $r_1 = E_k \cdot J \cdot h^{-1}$

29) $t_1 = \sqrt{\frac{\pi \cdot \alpha_0^2}{\Omega \cdot \Re_f}}$

30) $r_1 = \frac{\pi \cdot e^3 \cdot u_0}{\sqrt{2} \cdot m_e^2 \cdot c_2}$

31) $r_1 = \frac{\Delta 1eV \cdot \alpha_0^2}{\pi \cdot u_0}$

32) $\Delta 1eV = \frac{2 \cdot h}{\sqrt{2} \cdot m_e \cdot c_2}$

33) $r_e = \frac{E_h}{4\pi^5 \cdot u_0}$

$c_0 = \sqrt{\frac{2 \cdot r_1 \cdot \Omega}{\pi^3 \cdot u_0^2}}$

$c_0 = \frac{t_1 \cdot \Omega}{\pi^4 \cdot u_0^2}$

$c_0 = \sqrt{\frac{c_2}{\sqrt{2} \cdot \pi^4 \cdot u_0^2 \cdot \Delta eV}}$

To easily understand how to get the speed of light c_0 formulas, we have following conditions.

1) $m_e \cdot v_0 \cdot r_1 = \dfrac{h}{2\pi}$

(2 in 1) $\quad r_1 = \dfrac{\hbar}{m_e \cdot v_0}$ $\qquad \Re_\infty = \dfrac{\pi^2 \cdot m_p \cdot c_2}{2 \cdot h \cdot c_0}$

2) $v_0 = c_0 \cdot \alpha_0$

Then:

$$\therefore\ r_1 = \frac{\hbar}{m_e \cdot v_o} = \frac{h}{2\pi \cdot m_e \cdot c_0 \cdot \alpha_0} = \frac{\varepsilon_0 \cdot h^2}{\pi \cdot m_e \cdot e^2} \quad \Rightarrow \quad \varepsilon_0 = \frac{\pi^3 \cdot u_0}{2 \cdot c_0 \cdot \alpha_0}$$

$$\therefore\ \frac{\pi^3 \cdot u_0}{2 \cdot c_0 \cdot \alpha_0} = \frac{1}{u_0 \cdot c_0^2} \quad \Rightarrow \quad c_0 = \frac{2 \cdot \alpha_0}{\pi^3 \cdot u_0^2} = 2.979320975 \cdot 10^8\, ms^{-1}$$

$$\therefore\ \frac{\pi \cdot m_e}{2 \cdot e} = \frac{1}{u_0 \cdot c_0^2} \quad \Rightarrow \quad c_0 = \sqrt{\frac{2 \cdot e}{\pi \cdot u_0 \cdot m_e}} = 2.979320975 \cdot 10^8\, ms^{-1}$$

Because:

$$\therefore\ r_1 = \frac{\varepsilon_0 \cdot h^2}{\pi \cdot m_e \cdot e^2} = \frac{e}{2\pi^6 \cdot u_0^2} \quad \Rightarrow \quad \varepsilon_0 = \frac{\pi \cdot m_e}{2 \cdot e} \qquad \text{If: } h = \frac{e^2}{\pi^3 \cdot u_0}$$

$$\therefore\ \varepsilon_0 = \frac{\pi^3 \cdot m_p \cdot e}{\sqrt{2} \cdot h} = \frac{\pi^5 \cdot u_0^2}{4 \cdot \Delta eV} = \frac{\pi^3 \cdot u_0}{2 \cdot c_0 \cdot \alpha_0} = \frac{\pi \cdot m_e}{2 \cdot e} = \frac{1}{u_0 \cdot c_0^2} = 8.96510845 \cdot 10^{-12}$$

These are the electrical constants for permittivity in vacuum, a necessary condition for speed.

$$\therefore\ c_0 = \sqrt{\frac{2 \cdot v_0}{\pi^3 \cdot u_0}} = 2.979320975 \cdot 10^8\, ms^{-1} \qquad v_0 = \sqrt{\frac{c_2}{\sqrt{2} \cdot \pi^3 \cdot u_0}} = 2.1730711 \cdot 10^6\, ms^{-1} \qquad \therefore\ c_0 = \sqrt{\frac{4 \cdot \Delta eV}{\pi^5 \cdot u_0^3}}$$

$$c_0 = \sqrt[4]{\frac{4 \cdot c_2}{\sqrt{2} \cdot \pi^9 \cdot u_0^5}} \qquad \left\{\left[c_2 = \frac{2 \cdot e \cdot \alpha_0^2}{\pi^3 \cdot u_0 \cdot m_p} = 2.602090263 \cdot 10^8\, ms^{-1}\right]\right\} \qquad \therefore\ c_2 = \frac{E_h}{\pi^2 \cdot m_p}$$

These are probably the best light speed formulas, because experiment in a particle accelerator at CERN in Geneva at Switzerland confirm that the electron velocity/speed it selves are close to $2.60 \cdot 10^8\, ms^{-1}$ in the nature. This make it possibly through the speed formula above to get an interval of the light speed it selves. This is under all circumstances the electric *Emax* speed c_0.

$\therefore$ Allowed light speed interval: $\quad 2.97924000 \cdot 10^8\, ms^{-1} \le c_0 \le 2.97940000 \cdot 10^8\, ms^{-1}$

It's an interval of 16 000 ms^{-1}, but the diff of light speed should be close to about ± 10 ms^{-1} and the difference are probably between the *Know How* of the relativistic constants of beta β_0 and β_1 into how to get the alpha α_0 constant. Other theories says that the light speed in nature are close to the electron speed c_2 in the nature, but the nature speed of light should under all circumstances travel faster than the electron speed it selves. Because if the electron speed is greater than the speed of light, then a gas flame will have a bluish light, these phenomena are then called "the Cherenkov effect". Conclusion will then be that if the nature electron speed is c_2, then light speed corresponds to *Bmax* and into Omega speed c_1, but all calculation to c_0.

There exists one speed formula that looks like the inverse Rydbergs formula to the Hydrogen.

$$E_h = m_e \cdot c_0^2 \cdot \left(\frac{1}{\beta_1^2} - 1 \right) = 2 \cdot R_\infty \cdot h \cdot c_0 \quad \Leftrightarrow \quad E_h = \frac{m_e \cdot c_2}{\sqrt{2} \cdot \pi^3 \cdot u_0} \qquad \therefore\ R_\infty = \frac{m_\Delta \cdot c_0}{2 \cdot h}$$

1) $c_0 = \dfrac{2 \cdot R_\infty \cdot h}{m_e \cdot \alpha_0^2}$

(2 in 1) $$c_0 = \sqrt[3]{\frac{8 \cdot R_\infty \cdot h^3}{m_e \cdot u_0^2 \cdot e^4}} = 2.979320975 \cdot 10^8\, ms^{-1}$$

2) $\alpha_0 = \dfrac{u_0 \cdot c_0 \cdot e^2}{2 \cdot h}$

$$\Re_f = \frac{e \cdot c_\Omega}{\pi^5 \cdot u_0^3 \cdot d_c}$$

If use the alpha constant with Sommerfelds formula, we get a fine speed of light formula one.

$$\therefore\ r_1 = \beta_1^2 \cdot (r_1 + r_e) = \beta_1^2 \cdot r_0 = 5.29177209 \cdot 10^{-11}\, m \qquad \therefore\ r_0 = r_1 + \Delta r_1 dr = r_1 \cdot (1 + \alpha_0^2) = r_1 + r_e$$

This is the vector length to the first orbital length in Hydrogen, where r_e is the electron radius and r_0 is the vector length to surface. It can also correspond to the hyperfine transition at ½ S.

$$\therefore\ m_e = \beta_1^2 \cdot (m_e + m_\Delta) = \beta_1^2 \cdot m_0 = 9.17034684 \cdot 10^{-31}\, kg \qquad \therefore\ m_0 = m_e + \Delta m_e dm = m_e \cdot (1 + \alpha_0^2) = m_e + m_\Delta$$

Similar equation it´s possibly to make for the electron, but here m_0 correspond to the electron mass at surface and here are the mass non relativistic. The *beta* constant is the tool to get both length and mass relativistic, and the term means that the action is close to the speed of light *c*.

1) $r_1 = \dfrac{r_e}{\alpha_0^2}$

(2 in 1) $$r_1 = \frac{\varepsilon_0 \cdot h^2}{\pi \cdot m_e \cdot e^2} = 5.29177209 \cdot 10^{-11}\, m$$

2) $r_e = \dfrac{u_0 \cdot e^2}{4\pi \cdot m_e}$ and $\alpha_0 = \dfrac{u_0 \cdot c_0 \cdot e^2}{2 \cdot h}$

If use the alpha constant with Sommerfelds formula, we get a fine first orbital r_1 formula one.

$$\therefore\ v \to v + dv \qquad [18]$$

According to paper from M. Planck (1858-1947), the frequency should include the amplitude.

$$\therefore\ \Psi dv = \frac{\pi \cdot h}{4 \cdot m_e \cdot c_\Omega^2} = 8.21397275 \cdot 10^{-21}\, J \quad \Rightarrow \quad dv = 1.23968846 \cdot 10^{13}\, Hz \qquad \therefore\ \frac{2 \cdot l}{c_0 \cdot \beta_1}$$

$$\therefore\ \Re_f \to \Re_f + 2dv = 3.292650 \cdot 10^{15}\, Hz$$

If count with that the amplitude has light reflections, the corresponding frequency should then be twice the amplitude frequency, plus the vector frequency. This is probably only one guess, but the electron volt to frequency should be of about: *13.5780* *eV*. This delta value can be of important stance if trying with physical experiment to remove the electron from one single Hydrogen atom, but so long the electron m_e is inside the atom in orbital this calculation is not.

There are some frequency formulas corresponding to one lap around the proton in Hydrogen.

$$\therefore\ \Re_f = \sqrt[3]{\frac{h}{8\pi^2 \cdot m_e \cdot J^2}} = 3.26785624 \cdot 10^{15}\,Hz \qquad J = \frac{2 \cdot h^2}{\sqrt{2} \cdot m_e \cdot e \cdot c_2} \iff J = \frac{r_e}{v_H}$$

This is probably the best frequency formula with the amplitude going with the electron speed, and where d_c stands for a new distance constant, a distance electron takes between the lobes.

$$\therefore\ \Re_f = \frac{m_p \cdot c_0^2}{\sqrt{2} \cdot 2 \cdot J} \qquad \therefore\ r_1 = J \cdot \Re_f \qquad \therefore\ \Re_f = \frac{\pi^2 \cdot \alpha_0^2}{e} = 3.26785624 \cdot 10^{15}\,Hz$$

$$\therefore\ \Re_f = \sqrt{\frac{v_0}{4\pi \cdot J}} = 3.26785624 \cdot 10^{15}\,Hz \qquad \therefore\ R_\infty = \sqrt{\frac{\alpha_0}{2 \cdot s_0 \cdot c_0}} = 10968459.83 m^{-1}$$

$$\therefore\ \Re_f = \frac{1}{4\pi \cdot t_2} = 3.26785624 \cdot 10^{15}\,Hz \qquad \therefore\ R_\infty = \frac{e}{2\pi^2 \cdot s_0 \cdot \alpha_0} = 10968459.83 m^{-1}$$

$$\therefore\ \Re_f = \frac{\alpha_0}{4\pi \cdot J \cdot R_\infty} \qquad \therefore\ r_1 = J \cdot \Re_f \qquad \therefore\ R_\infty = \alpha_0 \cdot \frac{t_2}{J} = \alpha_0 \cdot \frac{2.43515827 \cdot 10^{-17}\,s}{1.6193405 \cdot 10^{-26}\,ms}$$

$$\therefore\ \Re_f = \frac{\pi^2 \cdot u_0^2}{\sqrt{2} \cdot 2 \cdot m_p} = 3.26785624 \cdot 10^{15}\,Hz \qquad \therefore\ R_\infty = \frac{\alpha_0}{\sqrt{2} \cdot \pi \cdot m_p \cdot c_0^2} = 10968459.83 m^{-1}$$

$$\therefore\ \Re_f = \frac{\pi^7 \cdot u_0^3}{2 \cdot m_e} = 3.26785624 \cdot 10^{15}\,Hz \qquad \therefore\ R_\infty = \frac{\lambda_e}{s_0 \cdot c_0} = \frac{2\pi \cdot r_1}{s_0 \cdot c_0} = 10968459.83 m^{-1}$$

$$\therefore\ \Re_f = \frac{\pi^2 \cdot m_p \cdot c_2}{2 \cdot h} = 3.26785624 \cdot 10^{15}\,Hz \qquad \therefore\ R_\infty = \frac{\pi^5 \cdot \alpha_0 \cdot u_0^2}{2 \cdot e} = 10968459.83 m^{-1}$$

$$\Re_f = \frac{2\pi \cdot r_1}{s_0} = \frac{3.3249185 \cdot 10^{-10}\,m}{1.017462 \cdot 10^{-25}\,ms} = 3.2679 \cdot 10^{15}\,Hz \qquad \therefore\ R_\infty = \frac{m_e \cdot \alpha_0 \cdot e^2}{4 \cdot h^2 \cdot \varepsilon_0} = 10968459.83 m^{-1}$$

$$\therefore\ \Re_f = \frac{\varepsilon_0 \cdot c_2}{\sqrt{2} \cdot \pi \cdot e} = 3.26785624 \cdot 10^{15}\,Hz \qquad \therefore\ IP_H = \sqrt{\frac{E_p \cdot NA_e}{0.01 \cdot h \cdot c_\Omega}} = 10967876.34 m^{-1}$$

$$\therefore\ \Re_f = \alpha_0 \cdot \frac{2 \cdot R_\infty}{\pi^3 \cdot u_0^2} = 3.26785624 \cdot 10^{15}\,Hz \qquad \therefore\ R\max = \frac{\pi \cdot e \cdot \alpha_0}{\sqrt{2} \cdot \varepsilon_0} = 2.90392946 \cdot 10^{-10}\,m$$

$$\therefore\ \Re_f = \frac{E_h}{2 \cdot h} = \frac{m_e \cdot v_0^2}{2 \cdot h} = 3.26785624 \cdot 10^{15}\,Hz \qquad \therefore\ R\max = \frac{4\pi \cdot h^2 \cdot R_\infty}{\sqrt{2} \cdot m_e \cdot e} = 2.90392946 \cdot 10^{-10}\,m$$

$$\therefore\ \Re_f = \frac{\Delta eV}{2\pi^3 \cdot u_0 \cdot r_1} \qquad \therefore\ \Delta eV = \frac{e \cdot u_0}{\sqrt{2} \cdot 2\pi \cdot m_p} \qquad \therefore\ d_c = \frac{4\pi \cdot h^2 \cdot c_\Omega}{\sqrt{2} \cdot m_e \cdot e \cdot c_2} = 2.647432287 \cdot 10^{-17}\,m^2$$

$$\therefore\ \Re_f = R_\infty \cdot c_0 = \frac{m_e \cdot c_0^2}{2 \cdot h} \cdot \left(\frac{1}{\beta_1^2} - 1\right) \qquad \therefore\ R\max = \frac{4\pi \cdot h \cdot \Delta eV}{\sqrt{2} \cdot m_e \cdot c_0} = 2.90392946 \cdot 10^{-10}\,m$$

$$\therefore\ v_H = \Re_f \cdot \alpha_0^2 = r_e / J = 1.73850616 \cdot 10^{11}\,Hz \qquad \therefore R\max = e \cdot c_2 / \pi^5 \cdot u_0^2 \cdot c_0 = 2.90392946 \cdot 10^{-10}\,m$$

10.2 **Formulation of the general laws of nature**

Arnold Sommerfeld (1868-1951). He where one of the first who early introduced the alpha α_0 constant in his work of quantum theory 1919, later named the Bohr-Sommerfeld atom model. Today we consider alpha α_0 as the coupling constant for the electromagnetic force. There are three other fundamental forces of interaction in nature, where the gravitational force, the weak nuclear force and the strong nuclear force are the main forces together with the electro-magnetic force. The coupling constant alpha is the strength of the electromagnetic force that governs how charged elementary particles, like electrons or photons interact into nature laws.

$$\therefore\ \alpha_0 = \frac{\pi^3 \cdot u_0}{2 \cdot \varepsilon_0 \cdot c_0} = 7.29384693 \cdot 10^{-3}$$

The fine structure α_0, where ε_0 are the electric constant (permittivity of vacuum), and u_0 is the magnetic constant (permeability of vacuum), and c_0 are the speed of light constant in vacuum. The beta β -constant makes the electron action into relativistic forms and can transform both length and weight into kinetic energies. The length element δdv and mass element δdm from the electron on surface will convert to relativistic action at first orbital, with Lorentz constant.

$$\therefore\ \beta_0 = \sqrt{(1+\alpha_0)\cdot(1-\alpha_0)} = \sqrt{(1-\alpha_0^2)} = 0.9999734 \qquad \therefore\ \beta_0 = \cos(\alpha_0)$$

$$\therefore\ \alpha_0 = \sqrt{\frac{1}{\beta_1^2} - 1} = 0.007293847 \qquad \Rightarrow \qquad \beta_1 = \sqrt{\frac{1}{(1+\alpha_0^2)}} = 0.999973401$$

$$\therefore\ \alpha_0 = \sqrt{\frac{\gamma_0 - \beta_1}{\gamma_0 \cdot \beta_1}} = 0.007293847 \qquad \Rightarrow \qquad \gamma_0 = \frac{1}{\beta_0} = 1.000026601$$

$$\therefore\ \beta_1 = \sqrt{(1-\beta_1^2) + \beta_0^2 \cdot \beta_1^2} = 0.999973401 \qquad \Leftrightarrow \qquad \beta_1 = \sqrt{\frac{(1-\beta_1^2)}{(1-\beta_0^2)}} = 0.999973401$$

These are the alpha, beta and epsilon constants, where beta β_1 -constant is exact measured in modern quantum Excel sheets. To calculate the speed of light with precision, then needs beta.

$$\therefore\ c_0 = \sqrt{\frac{4}{\pi^6 \cdot u_0^4} \cdot \left(\frac{1}{\beta_1^2} - 1\right)} = 2.979320975 \cdot 10^8\, ms^{-1} \qquad \therefore\ c_0 = \frac{2 \cdot \alpha_0}{\pi^3 \cdot u_0^2}$$

This speed formula is without any fundamental constants, here only with the beta β_1-constant. If now only change beta constant to β_0, then it will diff about 7925 m/s for the speed of light.

$$\therefore\ \beta_0 = \sqrt{1 - \left(\frac{v_{1eV}}{c_{1eV}}\right)^2} = 0.9999734 \qquad \Rightarrow \qquad \beta_0 = \sqrt{1-\alpha_0^2} \qquad \therefore\ c_0 = \sqrt{\frac{4}{\pi^6 \cdot u_0^4} \cdot (1-\beta_0^2)}$$

Where: $v_{1eV} = \frac{2}{\pi^2 \cdot u_0} = 161257.6722 ms^{-1}$ and $c_{1eV} = \frac{c_0}{\Delta eV} = \frac{2.979320975 \cdot 10^8}{13.47576884} = 22108727.23 ms^{-1}$

$$\therefore\ c_{1eV} = \frac{2}{\pi^2 \cdot u_0 \cdot \alpha_0} = 22108727.23 ms^{-1}$$

If: $c_0 = \frac{2 \cdot \alpha_0}{\pi^3 \cdot u_0^2} = 2.979320975 \cdot 10^8\, ms^{-1}$ and $\Delta eV = \frac{\alpha_0^2}{\pi \cdot u_0}$

If take the velocity v_0 to one electron volt and the speed of light c_0 to one electron volt, then its more easy to get a good value to the beta β_0 -constant with precision, because it gives α_0^2.

To understand how get the speed of light formula, we have following permittivity conditions.

$$\therefore\ \varepsilon_0 = \frac{\pi^6 \cdot u_0^3}{4 \cdot \alpha_0^2} = \frac{\pi^3 \cdot u_0}{2 \cdot v_0} = \frac{\pi \cdot m_e}{2 \cdot e} = \frac{1}{u_0 \cdot c_0^2} = 8.96510845 \cdot 10^{-12}$$

$$\therefore\ c_0 = \sqrt{\frac{2 \cdot v_0}{\pi^3 \cdot u_0}} = 2.979320975 \cdot 10^8\, ms^{-1} \quad \Leftrightarrow \quad c_0 = \sqrt{\frac{2 \cdot e}{\pi \cdot u_0 \cdot m_e}} = 2.979320975 \cdot 10^8\, ms^{-1}$$

Here are two good formulas if can have good reference of the velocity, or the electron charge. The velocity to v_0 corresponding to one electron volt is possibly to get without any constants.

$$\therefore\ \frac{v_0}{\Delta eV} = \frac{\pi^3 \cdot u_0^2 \cdot c_0^2}{2 \cdot \Delta eV} = \frac{2}{\pi^2 \cdot u_0} \quad \Rightarrow \quad c_0 = \sqrt{\frac{4 \cdot \Delta eV}{\pi^5 \cdot u_0^3}} = 2.979320975 \cdot 10^8\, ms^{-1}$$

Here another speed formula, which is true if delta electron volt are equal to: $\Delta = 13.4757688 eV$.

$$\therefore\ E_p = \tfrac{1}{2} \cdot \frac{m_e \cdot m_\Delta}{(m_e + m_\Delta)} \cdot c_0^2 = 2.1651129 \cdot 10^{-18}\, J \qquad \text{Where: } m_\Delta = m_e \cdot \alpha_0^2 \qquad \therefore\ E_p = 13.47505196 eV$$

Here the potential energy for the electron at the Hydrogen atoms surface. The alpha constant is a measurement constant to convert the mass to delta kinetic energy, and here into potential.

$$\therefore\ c_0 = \sqrt{\frac{2 \cdot e}{\sqrt{2} \cdot \pi^6 \cdot u_0^2 \cdot m_p}} = 2.979320975 \cdot 10^8\, ms^{-1} \qquad \therefore\ \alpha_0^2 = \tfrac{1}{2} \cdot \pi^5 \cdot u_0^3 \cdot \left(\frac{e}{m_e}\right)$$

$$\therefore\ c_2 = \frac{8 \cdot \Delta eV^2}{\sqrt{2} \cdot \pi \cdot u_0} = 2.60209026 \cdot 10^8\, ms^{-1} \qquad \text{If: } E_k = 13.47576884 eV$$

If could understand the delta electron volt for the electron at first orbital r_1 in Hydrogen, then it´s possibly to get out both the light speed c_0, and the electron speed c_2 with formulas above. The ground-state hyperfine transition frequency Δv_H of a Hydrogen atom, are proportional to:

$$\therefore\ \alpha_0^2 \cdot R_\infty \cdot c_0 \qquad [24]$$

the hyperfine splitting fine-structure transition frequency Δv_H are proportional to the formula above, and could be used to deduce one experimental value of the alpha α_0-constant. Hence:

- $\Delta v_H = \alpha_0^2 \cdot R_\infty \cdot c_0 = \alpha_0^4 \cdot \dfrac{m_e \cdot c_0^2}{2 \cdot h} = 1.73850615 \cdot 10^{11}\, Hz \qquad \therefore\ \alpha_0 = \sqrt{1 - \beta_0^2}$
- $\alpha_0 = \sqrt{\dfrac{E_h}{m_e \cdot c_0^2}} = 7.293846926 \cdot 10^{-3} \qquad \therefore\ \alpha_0 = \dfrac{2 \cdot e \cdot R_\infty}{\pi^5 \cdot u_0^2}$
- $E_h = m_e \cdot c_0^2 \cdot \left(\dfrac{1}{\beta_1^2} - 1\right) = 4.33045609 \cdot 10^{-18}\, J \qquad \therefore\ \alpha_0 = \sqrt{\Omega \cdot t_0}$

Modern Quantum Mechanics has one breakthrough through the beta β_1- constant to alpha α_0.

Because through the beta β_1 - constant it´s possibly to get the kinetics and through beta β_0 the potential values. But for alpha there exist only alpha α_0 corresponding alpha α_0 at the surface.

$$\therefore \; \Delta\psi E = \frac{e}{\pi \cdot u_0} \cdot \left(\frac{1}{\beta_1^2} - 1 \right) = 1.15190572 \cdot 10^{-22} \, J \qquad \therefore \; E_k = \frac{\pi \cdot R\max}{\sqrt{2} \cdot c_0}$$

$$\therefore \; \Delta\psi E = E_k \cdot \left(\frac{1}{\beta_0^2} - 1 \right) \quad \Rightarrow \quad \therefore \; E_k = 2.16522805 \cdot 10^{-18} \, J$$

$$\therefore \; m_\Delta = m_e \cdot \left(\frac{1}{\beta_1^2} - 1 \right) = 4.87864313 \cdot 10^{-35} \, kg \qquad \text{If: } m_e = 9.17034684 \cdot 10^{-31} \, kg$$

This is the real kinetic energy for the electron m_e, the diff from electron at rest on surface and to the electron at first orbital in one relativistic action. It´s the energy diff between m_0 and m_e.

$$\therefore \; \Delta v_H = \Re_f \cdot \left(\frac{1}{\beta_1^2} - 1 \right) = 1.73850616 \cdot 10^{11} \, Hz \qquad \text{If: } \Re_f = 3.26785624 \cdot 10^{15} \, Hz$$

$$\therefore \; \Delta R_H = R_\infty \cdot \left(\frac{1}{\beta_1^2} - 1 \right) = 5.83524289 \cdot 10^{2} \, m^{-1} \qquad \text{If: } R_\infty = 10968459.83 m^{-1}$$

These two values are for the hyperfine transition at the ground state, in Hydrogen ½ S.

$$\therefore \; \Delta r_e = r_1 \cdot \left(\frac{1}{\beta_1^2} - 1 \right) = 2.81523349 \cdot 10^{-15} \, m \qquad \text{If: } r_1 = 5.29177209 \cdot 10^{-11} \, m$$

$$\therefore \; \Delta t_0 = t_2 \cdot \left(\frac{1}{\beta_1^2} - 1 \right) = 1.29550914 \cdot 10^{-21} \, s \qquad \text{If: } t_2 = 2.4351583 \cdot 10^{-17} \, s$$

These two values correspond to the electron radius, and beta β_1 changes values from atomic unit a.u. into natural unit n.u. exception are the unit of length, because first radius atomic unit.

$$\therefore \; \lambda_C = \lambda \cdot \left(\frac{1}{\beta_1^2} - 1 \right) = 3.85973756 \cdot 10^{-13} \, m \quad \Rightarrow \quad \lambda = \frac{1}{4\pi \cdot R_\infty} \qquad \text{If: } \frac{1}{R_\infty} = 4\pi \cdot \lambda = 4\pi \cdot 7.255181 \cdot 10^{-9} \, m$$

The Compton length corresponds to the natural unit length, common in sunlight c_0 reflection.

$$\therefore \; \alpha_0 = \alpha_0^{-1} \cdot \left(\frac{1}{\beta_1^2} - 1 \right) \quad \Rightarrow \quad \alpha_0 = \sqrt{\left(\frac{1}{\beta_1^2} - 1 \right)} \quad \Leftrightarrow \quad \alpha_0 = \sqrt{1 - \beta_0^2}$$

Both beta one and two gives the alpha α constant, but one designed for kinetics and potential.

$$\therefore \; \Delta\psi eV = \frac{\alpha_0^2}{\pi \cdot u_0} \cdot \left(\frac{1}{\beta_1^2} - 1 \right) = 7.16913638 \cdot 10^{-4} \, eV \qquad \therefore \; \Delta eV = ½ \cdot \pi^4 \cdot u_0^2 \cdot \left(\frac{e}{m_e} \right) = 13.47576884 eV$$

Relativistic mass and length can convert to energy and light, with the tools of alpha and beta.

Some concept of alpha if inverse or not, because it can be the difference between a.u. and n.u.

$\therefore\ t_2 = \alpha_0^{-1} \cdot J \cdot R_\infty = 2.43515827 \cdot 10^{-17}\, s$ ∴ a.u.

$\therefore\ t_0 = \alpha_0 \cdot J \cdot R_\infty = 1.29550914 \cdot 10^{-21}\, s$ ∴ n.u.

These two formulas give the atomic unit of time *t* and the natural unit of time *t* with the alpha.

$$\therefore\ \Psi E = \alpha_0^{-1} \cdot \frac{\hbar}{J \cdot R_\infty} = 8.13992401 \cdot 10^{-14}\, J \qquad \therefore \text{n.u.}$$

$$\therefore\ E_h = \alpha_0 \cdot \frac{\hbar}{J \cdot R_\infty} = 4.33045609 \cdot 10^{-18}\, J \qquad \therefore \text{a.u.}$$

These two formulas give the atomic unit of energy, the Hartree energy, and the natural unit of energy, the concept of energy from A. Einstein, with mass and the speed of light c_0 in square.

$$\therefore\ r_1 = \alpha_0^{-1} \cdot \frac{\hbar}{m_e \cdot c_0} = 5.29177209 \cdot 10^{-11}\, m \qquad \therefore \text{a.u.}$$

$$\therefore\ r_e = \alpha_0 \cdot \frac{\hbar}{m_e \cdot c_0} = 2.81523349 \cdot 10^{-15}\, m \qquad \therefore\ r_e = \frac{E_k}{2\pi^5 \cdot u_0}$$

If take the alpha α_0 constant to the Compton length, the nature length, then two new formulas.

$$\therefore\ E_h = \alpha_0^{-1} \cdot \frac{\hbar}{J} \cdot \left(\frac{1}{R_\infty} - \frac{1}{IP_H} \right) = -4.330457 \cdot 10^{-18}\, J \qquad \therefore\ R_\infty = \sqrt{\frac{\alpha_0}{2 \cdot s \cdot c_0}}$$

$$\therefore\ E_H = \alpha_0 \cdot \frac{\hbar}{J} \cdot \left(\frac{1}{R_\infty} - \frac{1}{IP_H} \right) = -2.303812 \cdot 10^{-22}\, J \qquad \therefore\ \alpha_0 = \sqrt{\frac{IP_H}{R_\infty} \cdot \left(\frac{1}{\beta_0^2} - 1 \right)}$$

Here two classical concepts of the kinetic energy, respectively potential energy in Hydrogen.

If: $t = \alpha_0^{-1} \cdot \frac{\hbar}{m_e \cdot c_0^2} = J \cdot R_\infty = 1.77616717 \cdot 10^{-19}\, s$ and $w = 4\pi \frac{\hbar}{t_A} = 0.177830581 Js^{-1}$ ∴ (*w*= *watt*)

$$\left.\begin{aligned} &\therefore\ E_h = \alpha_0^{-1} \cdot t' \cdot w = 4.33045609 \cdot 10^{-18}\, J \\ &\therefore\ E_H = \alpha_0 \cdot t' \cdot w = 2.30381143 \cdot 10^{-22}\, J \end{aligned}\right\} \quad t' = 1.7761672 \cdot 10^{-19}\, s \qquad \therefore\ t' \in \text{p. } 116$$

The old unit of energy *watt* is very useful in calculations in quantum mechanics. The time *t* is the atomic unit length, if travel with the speed of light along the vector from proton to orbital.

$$\therefore\ E_p = ½ \cdot (-E_H + E_h) = ½ \cdot (-2.30381143 \cdot 10^{-22} + 4.33045609 \cdot 10^{-18}) = 2.165113 \cdot 10^{-18}\, J$$

This is the potential energy for the electron and it corresponds to the energy at surface, where the electron *m* is at rest and non relativistic. That will say the electron mass have the letter m_0.

10.3 **The electromagnetic energy**
There exists one potential theory to the electromagnetic energy of the electron into Hydrogen.

$$\therefore\ w = 4\pi \cdot \left(\frac{\partial^2 U}{\partial \cdot x^2} + \frac{\partial^2 U}{\partial \cdot y^2} + \frac{\partial^2 U}{\partial \cdot z^2} \right) = 1.77830581 \cdot 10^{-1}\, Js^{-1} \qquad \therefore\ 1 \cdot w = 1 \cdot Js^{-1}$$

Here the old cgs -unit *watt* stands for the electromagnetic effect. Thus, in classical mechanics:

$$\therefore\ a_\alpha = \frac{d\omega}{dt} = \frac{4.10650927 \cdot 10^{16}\, s^{-1}}{2.43515827 \cdot 10^{-17}\, s} = 1.68634184 \cdot 10^{33} \left(s^{-1}\right)^2$$

This is the angular acceleration for the electron, where speed Ω omega is the angular velocity and the atomic unit of time corresponds to time t_2. If now take the electromagnetic effect watt

$$\therefore\ \hbar = \frac{w}{a_\alpha} = \frac{0.177830581 Js^{-1}}{1.68634184 \cdot 10^{33} \left(s^{-1}\right)^2} = 1.05453460 \cdot 10^{-34}\, Js$$

We have here the action constant *h*-bar from M. Planck. If apply the electromagnetic effect to Newton's second law of motion, then it´s possibly to get out a useful statement of mechanics.

$$\therefore\ F = m \cdot a \qquad [16]$$

$$\therefore\ F = m_e \cdot a = \frac{E_k}{r_1} \qquad \Rightarrow \qquad a = \frac{E_k}{m_e \cdot r_1} = 8.92373667 \cdot 10^{22} \left(s^{-1}\right)^2 \qquad \therefore\ E_h = \sqrt{\hbar \cdot watt}$$

Then: $p = m_e \cdot v_0 = \frac{w}{a} = \frac{0.177830581 Js^{-1}}{8.92373667 \cdot 10^{22} \left(s^{-1}\right)^2} = 1.99278158 \cdot 10^{-24}\, kg \cdot ms^{-1} \qquad \therefore\ \lambda_e = 2\pi \cdot r_1 = \frac{h}{p} = \frac{h}{m_e \cdot v_0}$

This gives the atomic unit a.u. of linear momentum of the electron. Classical mechanics give:

$$F = \frac{dp}{dt} = \frac{r_1 \cdot m_e}{t_2^2} = 8.18337604 \cdot 10^{-8}\, N \qquad \therefore\ p = I \cdot w \cdot e = m_e \cdot v_0$$

The Newton force F in quantum mechanics. If apply the *watt* constant to same time unit, then

$$\therefore\ E_h = w \cdot t_2 = 0.177830581 Js^{-1} \cdot 2.43515827 \cdot 10^{-17}\, s = 4.33045609 \cdot 10^{-18}\, J \qquad \therefore\ t_2 = t_A \cdot \Re_f$$

$$\therefore\ E_k = ½ \cdot w \cdot t_2 = ½ \cdot 0.177830581 \cdot 2.43515827 \cdot 10^{-17} = 2.16522805 \cdot 10^{-18}\, J$$

Here the Hartree energy, the atomic unit of Hydrogen energy, and the E_k -kinetic energy.

$$\therefore\ \Psi E_H = w \cdot t_0 = 0.177830581 Js^{-1} \cdot 1.29550914 \cdot 10^{-21} s = 2.3038114 \cdot 10^{-22}\, J \qquad t_0 = ½ \cdot u_0 \cdot \Phi = 1.29551 \bullet 10^{-21} s$$

$$\therefore\ \psi E_H = ½ \cdot w \cdot t_0 = ½ \cdot 0.177830581 Js^{-1} \cdot 1.29550914 \cdot 10^{-21} s = 1.1519057 \cdot 10^{-22}\, J \qquad ½ \cdot u_0 = \frac{t_0}{\Phi} = \frac{2\pi}{10^7}$$

Here the relativistic kinetic energy to the electron, the difference if in relativistic action or at Hydrogen surface. It´s electron mass converted to energy through the energy formula $E = m \cdot c^2$

The relation between force (F) and power in effect (*watt*), could than through the classical mechanics:

$$\therefore\ E_h = F \cdot r_1 = \frac{r_1^2 \cdot m_e}{t_2^2} = 4.33045609 \cdot 10^{-18} J \qquad \Rightarrow \qquad w = \frac{r_1^2 \cdot m_e}{t_2^3} = 0.177830581 Js^{-1}$$

The power of effect (*watt*) has a close relation to the electron energy system, in the Hydrogen atom.

$$\therefore\ I = \frac{E_h \cdot e}{\hbar} = 4\pi \cdot \Re_f \cdot e = \Omega \cdot e = 6.59816085 \cdot 10^{-3} A \qquad \Rightarrow \qquad V = \frac{r_1^2 \cdot m_e}{t_2^3 \cdot I} = \frac{w}{I} = 26.95153768 eV$$

This is the atomic unit a.u. of the electric current in Ampere, and it gives the electric potential in watt per Amper. The new power constant (*watt*) is useful if wanted to measure the electromagnetic effect.

$$\therefore\ w = I \cdot V = 6.59816085 \cdot 10^{-3} \cdot 26.95153768 = 0.177830581 Js^{-1} \qquad \therefore\ \hbar = w \cdot t_2^2$$

$$\therefore\ E_h = F \cdot \frac{\hbar}{p} = F \cdot \frac{\hbar}{m_e v_0} = I \cdot \frac{\hbar}{e} = w \cdot t_2 = 4.33045609 \cdot 10^{-18} J \qquad \therefore\ e = I \cdot t_2$$

Here again the Hartree energy in Hydrogen and it´s possibly to see that energy is equal time t_2 to watt.

$$\therefore\ B = \frac{\hbar}{r_1^2 \cdot e} = \frac{m_e}{t_2^2 \cdot I} = \frac{V \cdot t_2}{r_1^2} = \frac{m_e}{t_2 \cdot e} = \frac{2 \cdot \varepsilon_0}{t_2 \cdot \pi} = \frac{E_k \cdot m_e}{\hbar \cdot e} = \Omega \cdot \frac{m_e}{e} = 2.34373485 \cdot 10^5 T \qquad \therefore\ \Omega = B \cdot \frac{e}{m_e}$$

This is the atomic unit a.u. of the magnetic flux density in unit Tesla, where $T = V \cdot s \cdot m^{-2} = kg \cdot s^{-2} \cdot A^{-1}$.

$$\therefore\ \Phi_0 = \frac{r_1^2 \cdot m_e}{t_2^2 \cdot I} = \frac{r_1^2 \cdot m_e}{t_2 \cdot e} = V \cdot t_2 = 26.95153768 \cdot 2.43515827 \cdot 10^{-17} = 6.56312598 \cdot 10^{-16} Wb \qquad \therefore\ \Phi_0 = \frac{m_\Delta}{\pi^7 \cdot u_0^4}$$

$$\therefore\ \Phi = \pi \cdot \Phi_0 = 2.06186684 \cdot 10^{-15} Wb \qquad \therefore\ \Phi / e = 1/2\pi^3 \cdot u_0 = 1.28324778 \cdot 10^4 Wb/J$$

This is the atomic unit a.u. of the magnetic flux Weber, where $Wb = Vs = m^2 \cdot kg \cdot s^{-2} \cdot A^{-1}$. Conclusion:

$$\therefore\ \hbar = \Phi_0 \cdot e = 1.0545346 \cdot 10^{-34} Js \qquad \therefore\ \hbar = V \cdot I \cdot t_2^2 = w \cdot t_2^2$$

This is probably the true letters for M. Planck’s action constant h –bar, with magnetic flux and charge.

$$\therefore\ \nabla = \frac{E_h}{e \cdot r_1^2} = \frac{V}{r_1^2} = \frac{B}{t_2} = \frac{2.34373485 \cdot 10^5 T}{2.43515827 \cdot 10^{-17} s} = 9.62456889 \cdot 10^{21} Ts^{-1} \qquad \therefore\ t_2 = \frac{m_e}{2\pi^8 \cdot u_0^3}$$

Here the atomic unit a.u. of the electric field gradient. N. Bohr magneton magnetic moment u_B is:

$$\therefore\ u_B = \frac{e \cdot \hbar}{2 \cdot m_e} = \frac{h}{4\pi} \cdot \frac{e}{m_e} = 9.23836605 \cdot 10^{-24} JT^{-1} \qquad \therefore\ u_B = \frac{\hbar \cdot v_0}{2\pi^2 \cdot u_0}$$

Here the smallest quanta of energy, stated from Heisenberg, to the quota of charge e and mass m_e.

$$\therefore\ ½E_h = -u_B \cdot B = -2.16522805 \cdot 10^{-18} J$$

The energy of a free electron with spin projector $½S_z$ in a magnetic flux density B into the z -direction, is equal to kinetic energy of one free electron circulating around at first polar orbital ½S in Hydrogen.

It´s possibly to find one new constant η, like the constant *h*-bar, but now are the energy in *Joul·meter*.

$$\therefore\ \eta = \frac{E_h \cdot v_0}{\Omega} = \frac{\hbar^2}{m_e \cdot r_1} = E_h \cdot r_1 = 2.29157867 \cdot 10^{-28}\, Jm \quad \Leftrightarrow \quad \eta = \frac{J \cdot w}{4\pi} \qquad \therefore\ R_\infty = \frac{m_e \cdot u_0 \cdot c_2}{\sqrt{2} \cdot 4 \cdot h \cdot \alpha_0}$$

This is a proposal of a new constant, the constant *neta*. There are some examples, how get the energy.

$$\therefore\ E_h = \frac{\eta}{r_1} = \frac{2.29157867 \cdot 10^{-28}\, Jm}{5.29177209 \cdot 10^{-11}\, m} = 4.33045609 \cdot 10^{-18}\, J \qquad \therefore\ r_1 = \frac{m_p \cdot v_0}{\sqrt{2} \cdot \pi^3 \cdot u_0^2}$$

$$\therefore\ \Psi E = \frac{\eta}{r_e} = \frac{2.29157867 \cdot 10^{-28}\, Jm}{2.81523349 \cdot 10^{-15}\, m} = 8.139924 \cdot 10^{-14}\, J \qquad \therefore\ \Psi E = m_e \cdot c_0^2$$

If use the new constant *neta* η to the a.u. of length, then it´s also possibly to get the a.u. of the energy.

$$\therefore\ E_h = \alpha_0 \cdot \frac{\eta}{\lambda_C} = \alpha_0 \cdot \frac{2.29157867 \cdot 10^{-28}\, Jm}{3.85973756 \cdot 10^{-13}\, m} = 4.33045609 \cdot 10^{-18}\, J \qquad \therefore\ E_h = m_\Delta \cdot c_0^2 = \frac{e \cdot \alpha_0^2}{\pi \cdot u_0}$$

$$\therefore\ \Psi E = \alpha_0^{-1} \cdot \frac{\eta}{\lambda_C} = \alpha_0^{-1} \cdot \frac{2.29157867 \cdot 10^{-28}\, Jm}{3.85973756 \cdot 10^{-13}\, m} = 8.139924 \cdot 10^{-14}\, J \qquad \therefore\ \Psi E = m_e \cdot c_0^2$$

If take the natural unit of length, the Compton length, then it´s possibly to get the energy with alpha.

$$\therefore\ t_A = \frac{2 \cdot h}{\pi \cdot w} = \frac{J}{v_0} = \frac{t_2}{\Re_f} = \frac{2.43515827 \cdot 10^{-17}\, s}{3.26785624 \cdot 10^{15}\, s^{-1}} = 7.45185249 \cdot 10^{-33}\, s^2 \qquad \therefore\ \psi E_H = \frac{e \cdot w}{8\pi^2} = \frac{e \cdot \hbar}{2\pi^2 \cdot t_A}$$

This constant corresponds to the amplitude time t_A. If looking after the acceleration to amplitude, then:

$$\therefore\ a_\alpha = \frac{d\omega}{dt} = \frac{1}{t_2} = \Omega^2 = 1.68634184 \cdot 10^{33} \left(s^{-1}\right)^2 \qquad \therefore\ t_2 = t_A \cdot \Re_f$$

$$\therefore\ \delta = t_A \cdot a_\alpha = 7.45185249 \cdot 10^{-33}\, s^2 \times 1.68634184 \cdot 10^{33} \left(s^{-1}\right)^2 = 4\pi rad / s \qquad \therefore\ t_0 = e / 4\pi^3$$

Here we have the angular velocity corresponding to the amplitude of the electron in relativistic action.

$$\therefore\ \Psi E = m_e \cdot c_0^2 = \alpha_0 \cdot \frac{\hbar}{J \cdot \Delta R_\infty} = \alpha_0 \cdot \frac{1.0545346 \cdot 10^{-34}\, Js}{1.61934054 \cdot 10^{-26}\, ms \cdot 583.5243 m^{-1}} = 8.13992401 \cdot 10^{-14}\, J \quad \therefore\ c_0 = \sqrt{\frac{\pi \cdot J \cdot c_2}{\sqrt{2} \cdot \hbar}}$$

$$\therefore\ \Psi E = m_e \cdot c_0^2 = \alpha_0^{-1} \cdot \frac{\hbar}{J \cdot R_\infty} = \alpha_0^{-1} \cdot \frac{1.0545346 \cdot 10^{-34}\, Js}{1.61934054 \cdot 10^{-26}\, ms \cdot 10968459.83 m^{-1}} = 8.13992401 \cdot 10^{-14}\, J \quad \therefore\ J = \frac{r_1}{R_\infty \cdot c_2}$$

Here two formulas to the natural units n.u. of electron energy. *J* and $\hbar$ correspond to the *e* -amplitude.

$$\therefore\ t_2 = \alpha_0^{-1} \cdot J \cdot R_\infty = \alpha_0^{-1} \cdot 1.61934054 \cdot 10^{-26}\, sm \cdot 10968459.83 m^{-1} = 2.43515827 \cdot 10^{-17}\, s$$

$$\therefore\ t_0 = \alpha_0 \cdot J \cdot R_\infty = \alpha_0 \cdot 1.61934054 \cdot 10^{-26}\, sm \cdot 10968459.83 m^{-1} = 1.29550914 \cdot 10^{-21}\, s$$

Here is both the time *t* of the atomic unit a.u. and the natural unit n.u., of time t_2 respectively time t_0. Max Planck´s constant *h* has relation to amplitude time t_A, namely: $h = ½ \cdot t_A \cdot w = 6.62583628 \cdot 10^{-34}\, Js$.

There is one electromagnetic energy formula over all, and it´s the natural unit of the electron energy.

$$\Psi E = m_e \cdot c_0^2 = h \cdot f = \frac{2\pi^2 \cdot h}{e} = \frac{2 \cdot e}{\pi \cdot u_0} = 8.13992401 \cdot 10^{-14}\, J \qquad \therefore\ f = \frac{2\pi^2}{e}$$

$$\therefore\ \Re_f = ½ \cdot \alpha_0^2 \cdot f = ½ \cdot \alpha_0^2 \cdot 1.2285127 \cdot 10^{20}\, Hz = 3.26785624 \cdot 10^{15}\, Hz \qquad \therefore\ E_h = \alpha_0^2 \cdot m_e \cdot c_0^2$$

Here it´s proofed that the alpha constant in square are the main converter from natural unit to atomic unit. And to get mass in rest to convert to relativistic action, the beta constant in square are important.

$$\therefore\ v_0 = \sqrt{\frac{c_2}{\sqrt{2} \cdot \pi^3 \cdot u_0}} = 2.17307111 \cdot 10^6\, ms^{-1} \quad \Rightarrow \quad E_h = m_e \cdot v_0^2 = \pi^2 \cdot m_p \cdot c_2 \ \text{ and } \ \frac{m_p}{m_e} = \frac{1}{\sqrt{2} \cdot \pi^5 \cdot u_0}$$

Here the classical electron velocity v_0 into amplitude theory with only the true linear electron speed c_2.

$$\therefore\ B = \frac{\hbar}{r_1^2 \cdot e} = \frac{\hbar}{e} \cdot \nabla^2 = \Delta eV \cdot \frac{2 \cdot m_e}{\hbar} = 2.34373485 \cdot 10^5\, T \qquad \therefore\ \Delta eV = \frac{\varepsilon_0 \cdot c_2}{\sqrt{2} \cdot \pi^4 \cdot u_0}$$

$$\therefore\ \Psi E_k = \frac{\hbar^2}{2 \cdot m_e} \cdot \nabla^2 = 2.16522805 \cdot 10^{-18}\, J \qquad \text{If: } \nabla^2 = \left(\frac{1}{r_1}\right)^2$$

Through the magnetic flux density, it´s possibly to get out the Schrödinger wave equation for electron.

$$\therefore\ n^{th} = s_0 \cdot \frac{e}{h} = \frac{4\pi \cdot h}{\sqrt{2} \cdot m_e \cdot c_2} = 2.46733118 \cdot 10^{-11}\, m \qquad \therefore\ n^{th} = \frac{R}{\Delta eV} \ \text{ and } \ v_0 = \frac{m_p \cdot c_2}{u_0 \cdot e}$$

$$\therefore\ s_0 = \frac{4\pi \cdot h^2}{\sqrt{2} \cdot m_e \cdot e \cdot c_2} = 1.01746167 \cdot 10^{-25}\, ms \quad \Leftrightarrow \quad s_0 = \frac{n^{th} \cdot e}{\pi^3 \cdot u_0} \qquad \therefore\ R = \frac{4 \cdot h \cdot \alpha_0^2}{\sqrt{2} \cdot m_e \cdot u_0 \cdot c_2}$$

$$\therefore\ n^{th} = \frac{\lambda_e}{\Delta eV} = \frac{2\pi \cdot r_1}{13.475768} = 2.46733118 \cdot 10^{-11}\, m \qquad \therefore\ \lambda_e = \sqrt{½ \cdot s_0 \cdot v_0}$$

This constant takes the length of 1 eV, the length of the electrons travel path to the speedy c_2.

$$\therefore\ \Omega = \frac{\hbar}{m_e} \cdot \nabla^2 = 4.10650927 \cdot 10^{16}\, Hz \qquad \text{If: } \nabla^2 = \left(\frac{1}{r_1}\right)^2$$

Here the angular speed Omega Ω, and the operator ∇^2 are very useful in Modern Quantum Mechanics.

$$\therefore\ t_2 = \sqrt{\frac{1}{v_0^2 \cdot \nabla^2}} = 2.43515827 \cdot 10^{-17}\, s \quad \Leftrightarrow \quad t_2 = \frac{e}{4\pi^3 \cdot \alpha_0^2} \qquad \text{If: } \nabla^2 = \left(\frac{1}{r_1}\right)^2$$

$$\therefore\ t_1 = \sqrt{\frac{1}{c_0^2 \cdot \nabla^2}} = 1.11599874 \cdot 10^{-18}\, s \quad \Leftrightarrow \quad t_1 = \sqrt{\frac{\hbar}{2\pi \cdot \Delta eV}} \qquad \text{If: } \nabla^2 = \left(\frac{1}{2\pi \cdot r_1}\right)^2$$

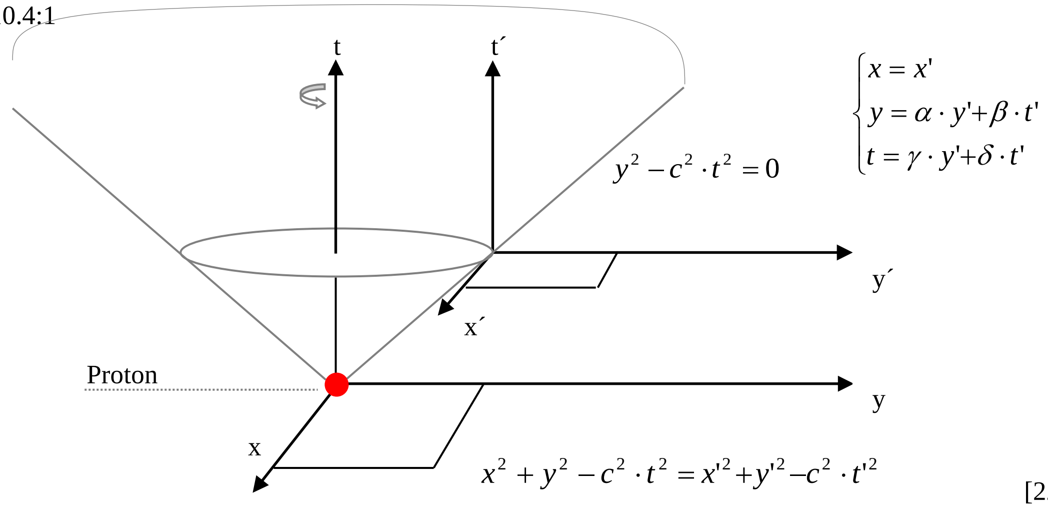
$$\therefore\ t_1 = \sqrt{\frac{1}{c_\Omega^2 \cdot \nabla^2}} = 1.11599874 \cdot 10^{-18}\, s \quad \Leftrightarrow \quad t_1 = \sqrt{\frac{\varepsilon_0 \cdot h}{\pi^7 \cdot u_0^2}} \qquad \text{If: } \nabla^2 = \left(\frac{1}{R\max}\right)^2$$

Here the time *t* dependent wave: $ds^2 = c_0^2 \cdot dt^2 - dx^2 - dy^2 - dz^2$ if: $\nabla^2 = -dx - dy - dz$ then: $\nabla^2 \cdot U \cdot c_0^2 = 1$.

10.4 **Special relativity theory**

Albert Einstein (1879-1955). He received the Nobel Prize in Physics 1921 “for his services to the theoretical Physics and especially for his discovery of the law of the photoelectric effect”. According to the theory of relativity, time is always dependent on another velocity: time it selves are super relative. The building stone of relativity are that the speed of light always is constant in vacuum, and that it has reflection, and/or oscillation in its forward speed. But that the vector speed of light must be a speed that are between c_0 and v_0 (figure 1), makes the time *t* are the fourth demission, not only 3- spaces with x, y, and z- coordinator of axis into vector. But all movements are relative for particle bodies with wave behaviors to a main reference source. Einstein’s early work was the theories of molecule structure of matter and the stoical mechanics that belongs to it. And of most importance of his work were the investigation of Browns molecule theory and the error of the: “second heat laws”, of the thermodynamic. He could in this work proof the existence of the molecules. This work was published in “Annalen der Physics” nr 17, 1905. In the same band he also published two other works, one about M. Planck’s black-body heat and the quantum hypothesis. In year 1906 he published in the same paper magazine the theory of bodies’ specific heat capacities and also the investigation of the second heat laws. In year 1916 Albert Einstein published “Die spezielle und die allgemeine Relativitätstheorie”. In this work he put together the laws of electromagnetic and the laws of gravitation, with a very important change of the space and time concept. His main work after this and after the publication of the photoelectric effect was mainly with molecular statistic. He has also one energy effect named after him with mass and light speed in square from 1915

Figure 10.4:1



[22]

This diagram shows the transformation of light from the main source of proton up to electron. If the time is at zero in the proton, and a light source start to send energy from the proton, we have that light speed are c_2 at start momentum in the proton. These sources of light energy represent the conic sphere on the diagram above, with the electron circulating on the conic ground level around in an orbit path. When a special time has gone, the light source is at the top in the circle, which forms an ellipse of the light cone of space. This is the relativistic time transformation from A. Einstein if the speed is same to all xy. Time *t* is the fourth dimension.

- $y^2 - c^2 \cdot t^2 = 0 \quad \Rightarrow \quad t' = \frac{y'}{c_2} = \frac{4.6217473 \cdot 10^{-11}}{2.60209026 \cdot 10^{8}} = 1.77616717 \cdot 10^{-19} s$

These are the time *t* transformation of light from the proton to the electron constant *n*eta. The time it takes to make one orbit around in the disk circle in the diagram which corresponds to time to energy release. This shows again that the transformation of time t is right understood.

- $t_1 = 2\pi \cdot t' = 2\pi \cdot 1.77616717 \cdot 10^{-19} = 1.11599874 \cdot 10^{-18}\, s$

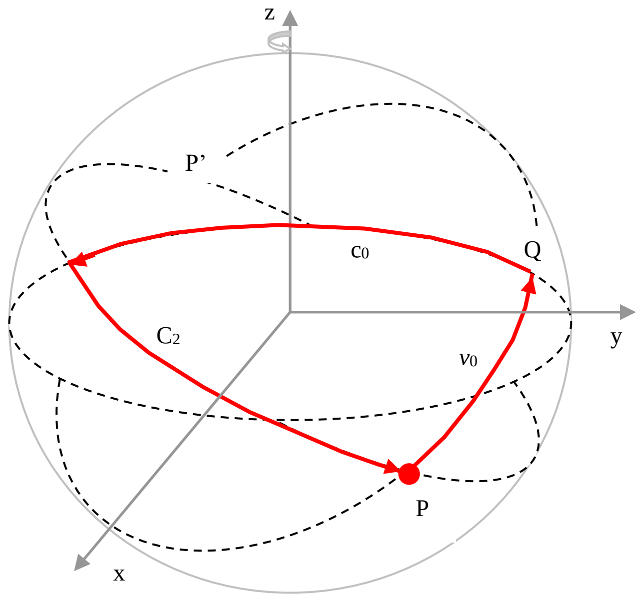
Einstein proposed that light has the same speed in the primed system what's like for observer.

- $x^2 + y^2 - c_0^2 \cdot t^2 = x'^2 + y'^2 - c_0^2 \cdot t'^2$ [22]

The system will be more complicated if it at same time has velocity omega in the conic plan to y- direction. Sunlight will under all circumstances have a reflection to its own source path.

The Riemann radius

Figure 10.4:2



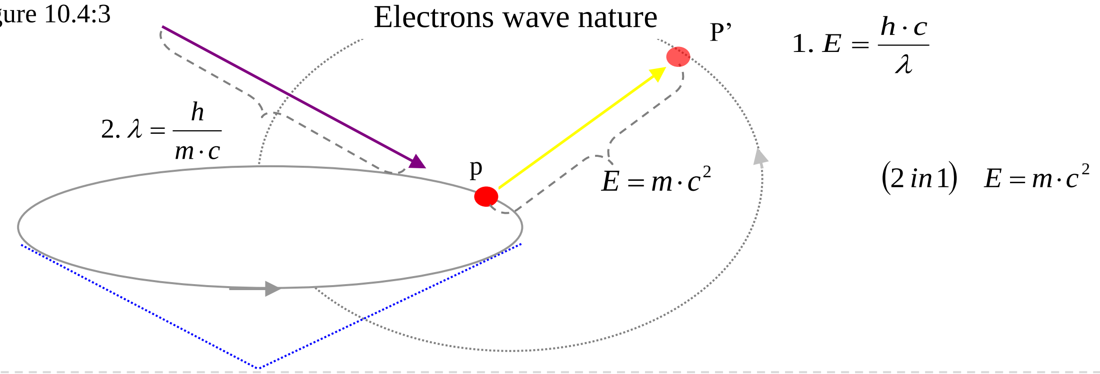
[22]

Bernhard Riemann [1826-1866]. He wrote in his doctoral paper at 1854; "about the geometry hypothesis". If walk along the red line from the dot P to dot Q or travel with the time velocity omega between the two energy level n, and then walk along the disc circle with speed c_0, and at last back to point P along the primed line with the electron speed, then we have walked the Riemann radius, which exact are $2\pi \cdot r$ for the path, or radius R. It says that it's impossible to make a parallel line at dot P prime to the red line; because the primed point P is the anti point.

- $R\max = 2\pi \cdot r = 2\pi \cdot 4.6217473 \cdot 10^{-11} = 2.90392946 \cdot 10^{-10}\, m$

The Riemann radius is equal to radius R, or $Rmax$. Louis de Broglie [1892-1987]. He stated a

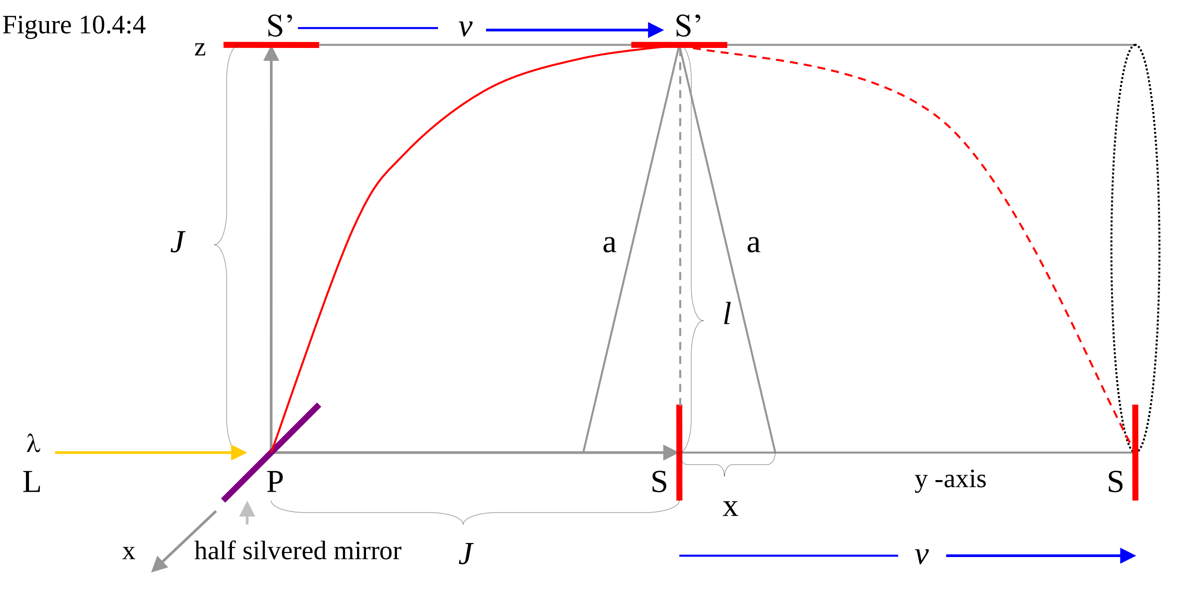
Figure 10.4:3



hypothesis 1924 that electron has wave behaviours, and here describes the Campton effect IP.

Albert Abraham Michelson (1852-1931). He received the Nobel Prize in Physics 1907 "for his optical precision instruments and the spectroscopic and metrological investigations carried out with their aid" [13]. Michelson, a German-American physicists, professor in Cleveland 1883, Worcester 1889 and Chicago 1892, was year 1927 chef leader of the US Mount Wilson observation. Under his leadership the speed c_0 of light was estimated in the laboratory and the light speed c where "proofed" to be about: $2.99796 \cdot 10^8 ms^{-1} \pm 4 \cdot 10^3 ms^{-1}$. Before this work he has in the same laboratory estimated with the interference method the distance between the moons of planet Jupiter. If now two beams of light sent in different perpendicular direction to the y -and z -axis from the light source through particle γ they are reflected at the same time t at mirror S and S'. But now, the particle γ has at the same time velocity movement in the y-direction. It's here a very special model of the Michelson-Morley experiment from year 1897, with an interferometer. Main sources for diagram are from [22].

Figure 10.4:4



This diagram shows the experiment idea from Albert Michelson. If both the letter PS and PS' have same length and if the electromagnetic lights speed are c_0 from the λ -source L, we have

○ $$t = \frac{2 \cdot l}{c_0} \quad \Rightarrow \quad t = \frac{2 \cdot J}{c_0} = 1.08705343 \cdot 10^{-34} s^2$$

This is the time t it takes if particle γ are at rest position. But if the particles γ now are moving in the LPS direction with velocity omega, then the time for moving forward and back again is

$$t = \frac{l}{c_0 - v_0} + \frac{l}{c_0 + v_0} = \frac{2 \cdot l \cdot c_0}{c_0^2 - v_0^2} \quad \Rightarrow \quad t = \frac{2 \cdot J}{c_0 \cdot \left(1 - \frac{v_0^2}{c_0^2}\right)} = (approximative) \frac{2 \cdot J}{c_0} \cdot \left(1 + \frac{v_0^2}{c_0^2}\right)$$

This is the time t for the electromagnetic reflection to direction PS, when the system is at rest. The equation is for potential time t in the direction *PS* forward and with reflection back again. It's the only one way to show that the potential speed c_1 will be traced out to a wave speed c_0. But for the light direction to PS' we have a Pythagoras, because of the velocity v_0 movement. Here are the velocity v_0 in the y- direction and belongs to the amplitude in the electron disc. If take x as the part of the out traced blue line, then will c_0 run slower (red line), and v_0 faster.

Then the equation is for length *a* through x in its direction *PS´* forward and with its reflection back again. But speed omega Ω is going with the charged wave particle in the z- direction, because a trajectory path, which is a common travel path for particle in electromagnetic field. If now both the letter PS and PS' have same length *J* corresponding to the electron amplitude:

- $\frac{x}{a} = \frac{v_0}{c_0} \quad \Rightarrow \quad a^2 = l^2 + x^2 = l^2 + a^2 \cdot \frac{v_0^2}{c_0^2}$
- $a = \frac{J}{\sqrt{1 - \frac{v_0^2}{c_0^2}}} = (approximative)\, J \cdot \left(1 + \frac{1}{2} \cdot \frac{v_0^2}{c_0^2}\right) \qquad \therefore\, k = \frac{h}{c_1 \cdot e}$

The time electromagnetic light need for reflection on the mirror S and S' with amplitude *J* is

- $t = \frac{2 \cdot J}{c_0 \cdot \sqrt{1 - \frac{v_0^2}{c_0^2}}} \quad \Rightarrow \quad k = \frac{2 \cdot \Phi}{c_0 \cdot \sqrt{1 - \frac{v_0^2}{c_0^2}}} = 1.3841555 \cdot 10^{-23}\, JK$
- $t = 1.08708234 \cdot 10^{-34}\, s^2 \quad \Rightarrow \quad 1 \text{ second } = 9.19893516 \cdot 10^{33}\, Hz$

Here we have the smallest possibly time *t* for a quantum, relative a reflection of amplitude *J*. Ludwig Boltzmann [1844-1906] constant *k* if take Magnetic Flux Quantum Φ into reflection. If take both the constants of Magnetic flux quantum and electron charge into reflection, then we get Plack's constant *h*, and it shows how the small building stones are working in action.

- $t_0 = \frac{2 \cdot J}{c_0 \cdot \beta_1} = 1.08708234 \cdot 10^{-34}\, s^2 \qquad \text{If: } \beta_1 \approx \beta_0$
- $t' = t_0 \cdot \Re_f = 1.08708234 \cdot 10^{-34} \cdot 3.26785624 \cdot 10^{15} = 3.55242883 \cdot 10^{-19}\, s$
- $c_1 = \frac{R}{t'} = \frac{3.32491847 \cdot 10^{-10}}{3.55242883 \cdot 10^{-19}} = 2.979241724 \cdot 10^{8}\, ms^{-1}$
- $l = \sqrt{a^2 - x^2} \quad \Rightarrow \quad c_1 = \sqrt{c_0^2 - v_0^2} \quad \Leftrightarrow \quad c_1 = c_0 \cdot \beta_1$

With the special model of the Michelson -Morley experiment from year 1897 to only 1 Hertz or one revolution, we have here proofed the sunlight speed. It shows that the frequency of the proton amplitude or a_0 has been transformed to the top polar radii R_1 and with time t_1 to a lap.

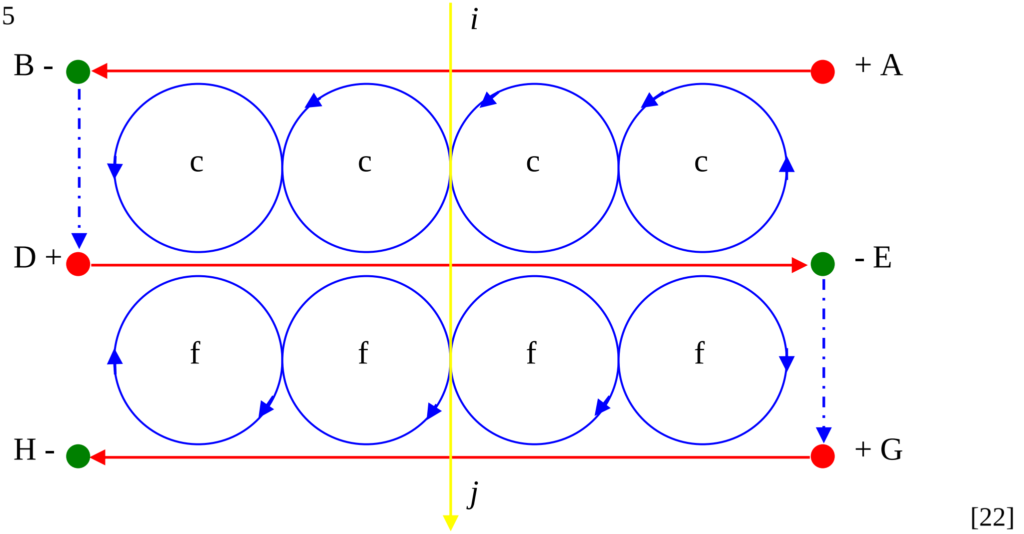
$$c_0 = \sqrt{\frac{\pi \cdot J \cdot c_2}{\sqrt{2 \cdot \hbar}}} = 2.979320975 \cdot 10^{8}\, ms^{-1}$$

The electromagnetic speed c_0 at first orbital in Hydrogen to the π-electron, it's amplitude and speed c_2, but at Hydrogen surface the light speed c_1 could look different, because measured in one linear vector path from dot *i* to dot *j*. The energy position in neutral Hydrogen atom is also given by the delta length of time *t* to top surface. If only *know how* the proton amplitude frequency of a_n when the electron will be ejected from the atoms surface, then it's possibly to estimated the Ionizations Potential and the light speed at surface through the photon radiation.

Hendrik Anton Lorentz (1853-1928), Dutch physician and professor in mathematical physics at Leiden (1878). His most important work is probably that electrics' are distributed through very small electrons, which are the basic modern theory for elementary quantum. The name on electron (greek bernstein) introduced 1891 from Helmholtz & Johnstone. Loretz came through his theory to the simple conclusion that magnetism could exercise influence on one body of light emission. This could later (1898) P. Zeeman experimental proofed, why they shared the Noble Prize in physics for 1902. Other important works were of optical bodies in movement. This led him (1897) to the conclusion that bodies in movement will be reduced in the linear path direction, which later where accepted from the relativity principles. His paper "Sichtbare und unsichtbare Bewegungen" (1902), "Abhandlungen über theoretische Physik" 1907, where other famous works from him. In relativity the time t transformation are named after him selves. H. Lorentz discovered the factor β of any moving object in three spaces like the electron with relativistic speed, where the velocity v_0 is the speed of the magnetic vector and c_0 is the speed of electromagnetic light or its energy. As the quantum theory applies to very small system, the relativity theory applies to very large speeds. This makes that we need instrument with relativistic precision and interactions in the nature to mass, length and speed.

Hermann von Helmholtz (1821-1894). German professor in medicine and physics in Königsberg, Bonn, Heidelberg and Berlin. In his essay "Ûber die Erhaltung der Kraft" from 1847, he could independent from Mayer and Joule stated the energy principles. His work together with Michael Faraday (1791-1867) discoveries over the induction of electricity from 1831, gives the electromagnetic light magnetism. Helmholtz pointed out that electrical current could have possibilities to oscillation, and W. Thomson and Kirchhoff calculated out how to bring about.

Figure 10.4:5



This diagram shows if a positively (red) ball A^+ has connection to a negatively (green) ball B^- the current will go from electrostatic unit A^+ to electrostatic unit B^-. This work will caused electromagnetic field between these points (blue circles c), when this happen, the positively charge A has then neutralized the negatively charge B and now there is no source that could support the current. When this happen, the magnetic field circles fall down and transformed to electric current at positively (red) ball D^+, because through induction the magnetism has now introduced the blue circles f, when the positively electrostatic unit D has connection to unit E. And again, if the negatively ball E^- (green) will be neutralized from the positively D^+ unit, then will the magnetic blue circles f transformed to electric current at positively electrostatic unit G and throughout a induction the current will have connection to negatively electrostatic unit H. Throughout induction principles over light magnetism, we have proofed the oscillating wave, and the light speed most then be from i to j. This makes it to a candidate.

The energy that correspond to the atomic radius are probably the kinetic energy, because the release of potential energy are the real photon energy, and the γ -electron amplitude energy correspond to the kinetic energy electron has to its atomic radius in there pathways up to final orbit. These makes that we have one speed c to the energy in the electron amplitude path, and one other speed that correspond to the energy of that lambda. This makes speed omega i to j. Thus, there must be a polar trajectory helix path for all charges inside atoms. If take 2π to the radius, then we have the orbit length of the second orbital n of one π -revolution in Hydrogen.

According to the standard model, kinetic energy should be equal the potential energy at first orbital, at Hydrogen ground level, because free unbounded electron with rest mass. If inserted the radius to first orbital with formula and switch from kinetic energy to potential energy, then we get potential speed c_0, the electromagnetic speed c_0 on the electron orbital surface. But outside the atom the electromagnetic light c travels with probably one conserved energy technique according to induction principles, this make that the photon γ can travel to infinity.

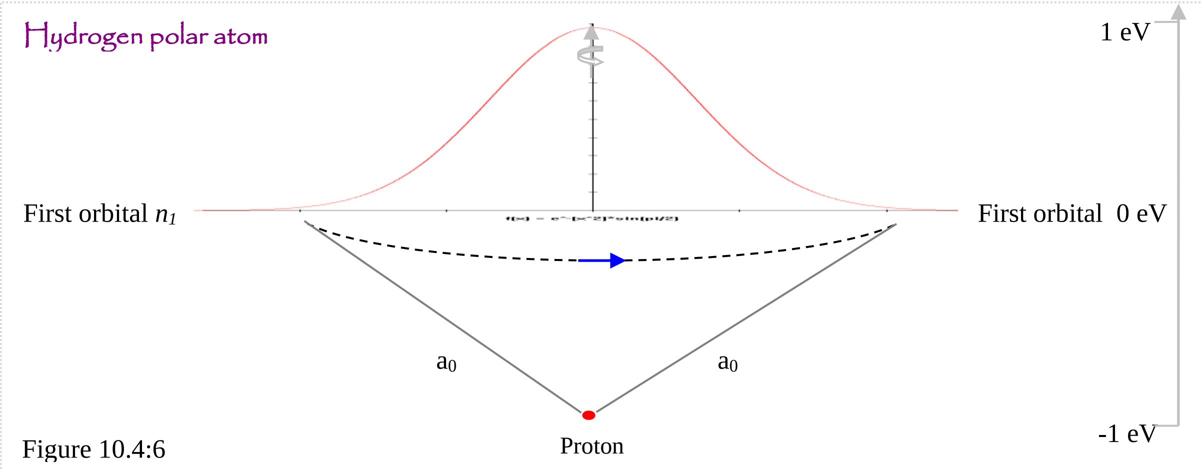
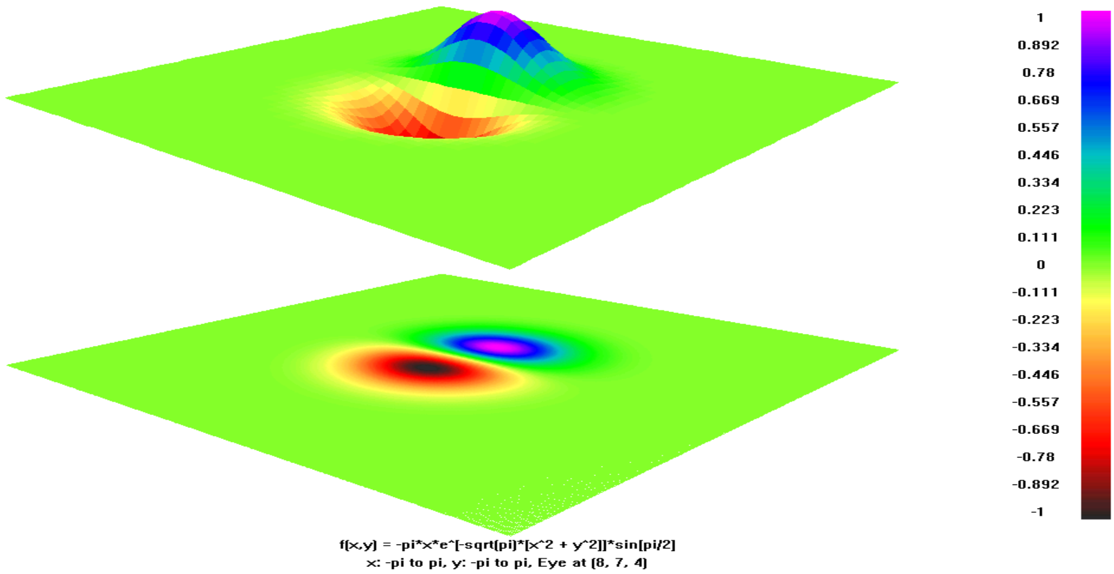


Figure 10.4:6

This diagram shows that at first orbital n_1, the electron is in a neutral position, but at surface it has the value one electron volt. The proton has here one negatively value of one electron volt.

The radii in the orbit to energy release are probably same radius to the orbital pathway up to orbit level, this make that the atomic radius is a factor 2π to the formulas of radius distance R.



This diagram show how the polar atom could look like with the proton in the potential cavity.

10.5 **The value of fundamental constants**

It can be possibly to show that the fundamental constants in modern quantum mechanics arise from only three constants namely alpha α, beta β and the Ionization Potential in Hydrogen IP.

$$\therefore\ e = \frac{\pi^5 \cdot u_0^2 \cdot \alpha_0 \cdot \beta_1^2}{2 \cdot IP_H} = 1.60675660 \cdot 10^{-19}\,J \qquad \text{If: } c_0 = \frac{2\cdot\alpha_0}{\pi^3 \cdot u_0^2}$$

$$\therefore\ \frac{\pi^5 \cdot u_0^2 \cdot \alpha_0 \cdot \beta_1^2}{2 \cdot IP_H} = r_1 \cdot 2\pi^6 \cdot u_0^2 \quad \Rightarrow \quad r_1 = \frac{\alpha_0 \cdot \beta_1^2}{4\pi \cdot IP_H} = 5.29177209 \cdot 10^{-11}\,m \qquad \text{If: } e = e$$

One of this essays most fundamental value concepts to the first orbital radius r_1 in Hydrogen.

$$\therefore\ \frac{\pi^5 \cdot u_0^2 \cdot \alpha_0 \cdot \beta_1^2}{2 \cdot IP_H} = \frac{2\cdot\alpha_0^2 \cdot m_e}{\pi^5 \cdot u_0^3} \qquad \frac{m_p}{m_e} = \frac{1}{\sqrt{2}\cdot\pi^5 \cdot u_0}$$

$$\therefore\ m_e = \frac{\pi^{10} \cdot u_0^5 \cdot \beta_1^2}{4 \cdot IP_H \cdot \alpha_0} = 9.17034684 \cdot 10^{-31}\,kg \qquad \text{Hint: } \frac{e}{m_e} = \frac{2\cdot\alpha_0^2}{\pi^5 \cdot u_0^3}$$

$$\therefore\ \frac{\pi^{10} \cdot u_0^5 \cdot \beta_1^2}{4 \cdot IP_H \cdot \alpha_0} = \frac{2\cdot\pi^5 \cdot u_0 \cdot m_p}{\sqrt{2}} \qquad \text{If: } m_e = m_e$$

$$\therefore\ m_p = \frac{\pi^5 \cdot u_0^4 \cdot \beta_1^2}{\sqrt{2}\cdot 4 \cdot \alpha_0 \cdot IP_H} = 1.68620952 \cdot 10^{-27}\,kg \qquad \text{Hint: } \frac{e}{m_p} = \frac{4\cdot\alpha_0^2}{\sqrt{2}\cdot u_0^2}$$

Here we have expression for both the electron and proton mass in *kg*, with only the ref of IP_H.

$$\therefore\ \frac{\pi^{10} \cdot u_0^4 \cdot \alpha_0^2 \cdot \beta_1^4}{4 \cdot IP_H^2} = h \cdot \pi^3 \cdot u_0 \qquad \text{If: } e^2 = e^2$$

$$\therefore\ h = \frac{\pi^7 \cdot u_0^3 \cdot \alpha_0^2 \cdot \beta_1^4}{4 \cdot IP_H^2} = 6.62583628 \cdot 10^{-34}\,Js \qquad \text{Hint: } h = \frac{e^2}{\pi^3 \cdot u_0}$$

Here the exact value of Planck's constant, the most fundamental of any constants of quantum action. Only the speed of light corresponding to the value in vacuum of nature is more proper.

$$\therefore\ c_0 = \frac{4 \cdot e \cdot IP_H}{\pi^8 \cdot u_0^4 \cdot \beta_1^2} \qquad \text{If: } \varepsilon_0 = \frac{\pi^6 \cdot u_0^3}{4\cdot\alpha_0^2} \ \text{ and } \ \varepsilon_0 = \frac{1}{u_0 \cdot c_0^2} \quad \Rightarrow \quad c_0 = \frac{2\cdot\alpha_0}{\pi^3 \cdot u_0^2}$$

Here we have one of the fundamental speed if light formula with only one alpha α constant.

$$\therefore\ IP_H = 10967876.3381 m^{-1}$$

This is the energy value of Ionization potential of Hydrogen IP_H, and the inverse value is the length of lambda that could be measured on the Hydrogen surface if wanted to shoot out the electron from the Hydrogen atom. For this event it needs kinetic energy, which together with the Ionization potential gives the Rydbergs value of energy and it's the value the electron has when it's circulating around in the first orbital. The value of the Ionization potential IP_H have been measured and calculating in Excel Office through weighting values with formulas from photon reference of Hydrogen lambda λ from laboratory spectroscopy at atomic institute [1]. The error of the energy in the Hydrogen atom should not be greater than interval of ± 2 m^{-1}. It's also confirmed with reference from: CRC's "*Handbook of Physics and Chemistry*" 73$^{\text{rd}}$.

11. Magic Square of Order n = 4

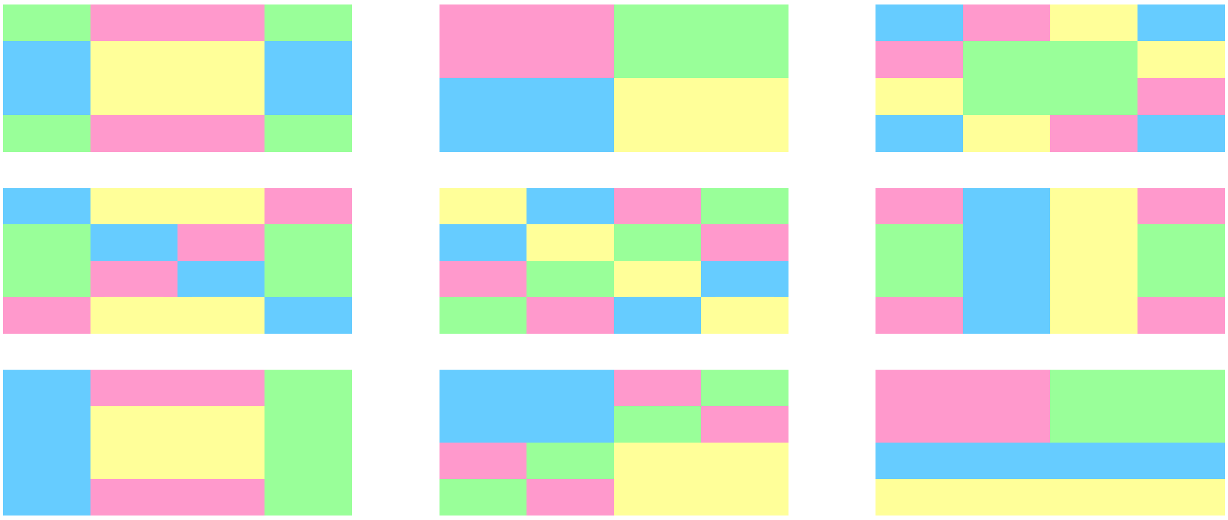
There exist two houses of Magic Square with order n = 4. They give 144 combinations each.

A1	B3	C4	D2
D4	C2	B1	A3
B2	A4	D3	C1
C3	D1	A2	B4

$$\Sigma = \frac{n\left(n^2+1\right)}{2} = \frac{4\left(4^2+1\right)}{2} = 34$$

A1	B4	C2	D3
C3	D2	A4	B1
D4	C1	B3	A2
B2	A3	D1	C4

If only use integer in the Magic square of order n = 4, then the lowest possibly sum of y is 34. The two houses of tropic square are building up from, that, the first row are going from left to right with the letters A, B, C, D, thus, the diagonal from left to right are going with 1, 2, 3, 4.



These are nine flag with four colours each, and every colour should give the sum of y = 34 in the two houses with integer of order n = 4, then there exist 288 x 9 = 2592 true combinations of MS. Each flag has a pattern of colour, and then it's possibly to taken colour combinations of each pattern of flag, which are not shown in this essay. The flag it selves should also have the possibility to rotate and still have the sum y of horizontal, vertical line and both diagonals.

The Key

A1	=	1
A2	=	2
A3	=	3
A4	=	4
B1	=	5
B2	=	6
B3	=	7
B4	=	8
C1	=	9
C2	=	10
C3	=	11
C4	=	12
D1	=	13
D2	=	14
D3	=	15
D4	=	16

Magic Square of order n = 4 with the key into the tropic house of MS, are probably possibly to use in image sensor in modern technique of photographing. These through the key of Magic Square estimate the true pattern of colours with the combinations of nature. Probably it's possibly to streaming music and film with the MS key-technique through Internet to a computer and mobile phone. Probably also possibly to use into semi-conductor device with storage memo.

It's probably possibly to take the *Inertia* of system like the fine structure in Hydrogen atom. Through taking the mass and length to the centre of the atom, we normal n = 5.

Magic Square of Order *n* = 4

Left Tropic of Square (TL)

A1	B3	C4	D2	A1	B4	C3	D2	A1	B2	C4	D3	A1	B4	C2	D3
D4	C2	B1	A3	D3	C2	B1	A4	D4	C3	B1	A2	D2	C3	B1	A4
B2	A4	D3	C1	B2	A3	D4	C1	B3	A4	D2	C1	B3	A2	D4	C1
C3	D1	A2	B4	C4	D1	A2	B3	C2	D1	A3	B4	C4	D1	A3	B2

A1	B2	C3	D4	A1	B3	C2	D4	A1	B3	D4	C2	A1	B4	D3	C2
D3	C4	B1	A2	D2	C4	B1	A3	C4	D2	B1	A3	C3	D2	B1	A4
B4	A3	D2	C1	B4	A2	D3	C1	B2	A4	C3	D1	B2	A3	C4	D1
C2	D1	A4	B3	C3	D1	A4	B2	D3	C1	A2	B4	D4	C1	A2	B3

A1	B2	D4	C3	A1	B4	D2	C3	A1	B2	D3	C4	A1	B3	D2	C4
C4	D3	B1	A2	C2	D3	B1	A4	C3	D4	B1	A2	C2	D4	B1	A3
B3	A4	C2	D1	B3	A2	C4	D1	B4	A3	C2	D1	B4	A2	C3	D1
D2	C1	A3	B4	D4	C1	A3	B2	D2	C1	A4	B3	D3	C1	A4	B2

A1	C3	B4	D2	A1	C4	B3	D2	A1	C2	B4	D3	A1	C4	B2	D3
D4	B2	C1	A3	D3	B2	C1	A4	D4	B3	C1	A2	D2	B3	C1	A4
C2	A4	D3	B1	C2	A3	D4	B1	C3	A4	D2	B1	C3	A2	D4	B1
B3	D1	A2	C4	B4	D1	A2	C3	B2	D1	A3	C4	B4	D1	A3	C2

A1	C2	B3	D4	A1	C3	B2	D4	A1	C3	D4	B2	A1	C4	D3	B2
D3	B4	C1	A2	D2	B4	C1	A3	B4	D2	C1	A3	B3	D2	C1	A4
C4	A3	D2	B1	C4	A2	D3	B1	C2	A4	B3	D1	C2	A3	B4	D1
B2	D1	A4	C3	B3	D1	A4	C2	D3	B1	A2	C4	D4	B1	A2	C3

A1	C2	D4	B3	A1	C4	D2	B3	A1	C2	D3	B4	A1	C3	D2	B4
B4	D3	C1	A2	B2	D3	C1	A4	B3	D4	C1	A2	B2	D4	C1	A3
C3	A4	B2	D1	C3	A2	B4	D1	C4	A3	B2	D1	C4	A2	B3	D1
D2	B1	A3	C4	D4	B1	A3	C2	D2	B1	A4	C3	D3	B1	A4	C2

A1	D3	B4	C2	A1	D4	B3	C2	A1	D2	B4	C3	A1	D4	B2	C3
C4	B2	D1	A3	C3	B2	D1	A4	C4	B3	D1	A2	C2	B3	D1	A4
D2	A4	C3	B1	D2	A3	C4	B1	D3	A4	C2	B1	D3	A2	C4	B1
B3	C1	A2	D4	B4	C1	A2	D3	B2	C1	A3	D4	B4	C1	A3	D2

A1	D2	B3	C4	A1	D3	B2	C4	A1	D3	C4	B2	A1	D4	C3	B2
C3	B4	D1	A2	C2	B4	D1	A3	B4	C2	D1	A3	B3	C2	D1	A4
D4	A3	C2	B1	D4	A2	C3	B1	D2	A4	B3	C1	D2	A3	B4	C1
B2	C1	A4	D3	B3	C1	A4	D2	C3	B1	A2	D4	C4	B1	A2	D3

A1	D2	C4	B3	A1	D4	C2	B3	A1	D2	C3	B4	A1	D3	C2	B4
B4	C3	D1	A2	B2	C3	D1	A4	B3	C4	D1	A2	B2	C4	D1	A3
D3	A4	B2	C1	D3	A2	B4	C1	D4	A3	B2	C1	D4	A2	B3	C1
C2	B1	A3	D4	C4	B1	A3	D2	C2	B1	A4	D3	C3	B1	A4	D2

1:4

The key: A1=1, A2=2, A3=3, A4=4, B1=5, B2=6, B3=7, B4=8, C1=9, C2=10, C3=11, C4=12, D1=13, D2=14, D3=15, D4=16

Magic Square of Order *n* = 4
Left Tropic of Square (TL)

B1	A3	C4	D2	B1	A4	C3	D2	B1	A2	C4	D3	B1	A4	C2	D3
D4	C2	A1	B3	D3	C2	A1	B4	D4	C3	A1	B2	D2	C3	A1	B4
A2	B4	D3	C1	A2	B3	D4	C1	A3	B4	D2	C1	A3	B2	D4	C1
C3	D1	B2	A4	C4	D1	B2	A3	C2	D1	B3	A4	C4	D1	B3	A2

B1	A2	C3	D4	B1	A3	C2	D4	B1	A3	D4	C2	B1	A4	D3	C2
D3	C4	A1	B2	D2	C4	A1	B3	C4	D2	A1	B3	C3	D2	A1	B4
A4	B3	D2	C1	A4	B2	D3	C1	A2	B4	C3	D1	A2	B3	C4	D1
C2	D1	B4	A3	C3	D1	B4	A2	D3	C1	B2	A4	D4	C1	B2	A3

B1	A2	D4	C3	B1	A4	D2	C3	B1	A2	D3	C4	B1	A3	D2	C4
C4	D3	A1	B2	C2	D3	A1	B4	C3	D4	A1	B2	C2	D4	A1	B3
A3	B4	C2	D1	A3	B2	C4	D1	A4	B3	C2	D1	A4	B2	C3	D1
D2	C1	B3	A4	D4	C1	B3	A2	D2	C1	B4	A3	D3	C1	B4	A2

B1	C3	A4	D2	B1	C4	A3	D2	B1	C2	A4	D3	B1	C4	A2	D3
D4	A2	C1	B3	D3	A2	C1	B4	D4	A3	C1	B2	D2	A3	C1	B4
C2	B4	D3	A1	C2	B3	D4	A1	C3	B4	D2	A1	C3	B2	D4	A1
A3	D1	B2	C4	A4	D1	B2	C3	A2	D1	B3	C4	A4	D1	B3	C2

B1	C2	A3	D4	B1	C3	A2	D4	B1	C3	D4	A2	B1	C4	D3	A2
D3	A4	C1	B2	D2	A4	C1	B3	A4	D2	C1	B3	A3	D2	C1	B4
C4	B3	D2	A1	C4	B2	D3	A1	C2	B4	A3	D1	C2	B3	A4	D1
A2	D1	B4	C3	A3	D1	B4	C2	D3	A1	B2	C4	D4	A1	B2	C3

B1	C2	D4	A3	B1	C4	D2	A3	B1	C2	D3	A4	B1	C3	D2	A4
A4	D3	C1	B2	A2	D3	C1	B4	A3	D4	C1	B2	A2	D4	C1	B3
C3	B4	A2	D1	C3	B2	A4	D1	C4	B3	A2	D1	C4	B2	A3	D1
D2	A1	B3	C4	D4	A1	B3	C2	D2	A1	B4	C3	D3	A1	B4	C2

B1	D3	A4	C2	B1	D4	A3	C2	B1	D2	A4	C3	B1	D4	A2	C3
C4	A2	D1	B3	C3	A2	D1	B4	C4	A3	D1	B2	C2	A3	D1	B4
D2	B4	C3	A1	D2	B3	C4	A1	D3	B4	C2	A1	D3	B2	C4	A1
A3	C1	B2	D4	A4	C1	B2	D3	A2	C1	B3	D4	A4	C1	B3	D2

B1	D2	A3	C4	B1	D3	A2	C4	B1	D3	C4	A2	B1	D4	C3	A2
C3	A4	D1	B2	C2	A4	D1	B3	A4	C2	D1	B3	A3	C2	D1	B4
D4	B3	C2	A1	D4	B2	C3	A1	D2	B4	A3	C1	D2	B3	A4	C1
A2	C1	B4	D3	A3	C1	B4	D2	C3	A1	B2	D4	C4	A1	B2	D3

B1	D2	C4	A3	B1	D4	C2	A3	B1	D2	C3	A4	B1	D3	C2	A4
A4	C3	D1	B2	A2	C3	D1	B4	A3	C4	D1	B2	A2	C4	D1	B3
D3	B4	A2	C1	D3	B2	A4	C1	D4	B3	A2	C1	D4	B2	A3	C1
C2	A1	B3	D4	C4	A1	B3	D2	C2	A1	B4	D3	C3	A1	B4	D2

2:4

The key: A1=1, A2=2, A3=3, A4=4, B1=5, B2=6, B3=7, B4=8, C1=9, C2=10, C3=11, C4=12, D1=13, D2=14, D3=15, D4=16

Magic Square of Order *n* = 4

Left Tropic of Square (TL)

C1	A3	B4	D2	C1	A4	B3	D2	C1	A2	B4	D3	C1	A4	B2	D3
D4	B2	A1	C3	D3	B2	A1	C4	D4	B3	A1	C2	D2	B3	A1	C4
A2	C4	D3	B1	A2	C3	D4	B1	A3	C4	D2	B1	A3	C2	D4	B1
B3	D1	C2	A4	B4	D1	C2	A3	B2	D1	C3	A4	B4	D1	C3	A2

C1	A2	B3	D4	C1	A3	B2	D4	C1	A3	D4	B2	C1	A4	D3	B2
D3	B4	A1	C2	D2	B4	A1	C3	B4	D2	A1	C3	B3	D2	A1	C4
A4	C3	D2	B1	A4	C2	D3	B1	A2	C4	B3	D1	A2	C3	B4	D1
B2	D1	C4	A3	B3	D1	C4	A2	D3	B1	C2	A4	D4	B1	C2	A3

C1	A2	D4	B3	C1	A4	D2	B3	C1	A2	D3	B4	C1	A3	D2	B4
B4	D3	A1	C2	B2	D3	A1	C4	B3	D4	A1	C2	B2	D4	A1	C3
A3	C4	B2	D1	A3	C2	B4	D1	A4	C3	B2	D1	A4	C2	B3	D1
D2	B1	C3	A4	D4	B1	C3	A2	D2	B1	C4	A3	D3	B1	C4	A2

C1	B3	A4	D2	C1	B4	A3	D2	C1	B2	A4	D3	C1	B4	A2	D3
D4	A2	B1	C3	D3	A2	B1	C4	D4	A3	B1	C2	D2	A3	B1	C4
B2	C4	D3	A1	B2	C3	D4	A1	B3	C4	D2	A1	B3	C2	D4	A1
A3	D1	C2	B4	A4	D1	C2	B3	A2	D1	C3	B4	A4	D1	C3	B2

C1	B2	A3	D4	C1	B3	A2	D4	C1	B3	D4	A2	C1	B4	D3	A2
D3	A4	B1	C2	D2	A4	B1	C3	A4	D2	B1	C3	A3	D2	B1	C4
B4	C3	D2	A1	B4	C2	D3	A1	B2	C4	A3	D1	B2	C3	A4	D1
A2	D1	C4	B3	A3	D1	C4	B2	D3	A1	C2	B4	D4	A1	C2	B3

C1	B2	D4	A3	C1	B4	D2	A3	C1	B2	D3	A4	C1	B3	D2	A4
A4	D3	B1	C2	A2	D3	B1	C4	A3	D4	B1	C2	A2	D4	B1	C3
B3	C4	A2	D1	B3	C2	A4	D1	B4	C3	A2	D1	B4	C2	A3	D1
D2	A1	C3	B4	D4	A1	C3	B2	D2	A1	C4	B3	D3	A1	C4	B2

C1	D3	A4	B2	C1	D4	A3	B2	C1	D2	A4	B3	C1	D4	A2	B3
B4	A2	D1	C3	B3	A2	D1	C4	B4	A3	D1	C2	B2	A3	D1	C4
D2	C4	B3	A1	D2	C3	B4	A1	D3	C4	B2	A1	D3	C2	B4	A1
A3	B1	C2	D4	A4	B1	C2	D3	A2	B1	C3	D4	A4	B1	C3	D2

C1	D2	A3	B4	C1	D3	A2	B4	C1	D3	B4	A2	C1	D4	B3	A2
B3	A4	D1	C2	B2	A4	D1	C3	A4	B2	D1	C3	A3	B2	D1	C4
D4	C3	B2	A1	D4	C2	B3	A1	D2	C4	A3	B1	D2	C3	A4	B1
A2	B1	C4	D3	A3	B1	C4	D2	B3	A1	C2	D4	B4	A1	C2	D3

C1	D2	B4	A3	C1	D4	B2	A3	C1	D2	B3	A4	C1	D3	B2	A4
A4	B3	D1	C2	A2	B3	D1	C4	A3	B4	D1	C2	A2	B4	D1	C3
D3	C4	A2	B1	D3	C2	A4	B1	D4	C3	A2	B1	D4	C2	A3	B1
B2	A1	C3	D4	B4	A1	C3	D2	B2	A1	C4	D3	B3	A1	C4	D2

3:4

The key: A1=1, A2=2, A3=3, A4=4, B1=5, B2=6, B3=7, B4=8, C1=9, C2=10, C3=11, C4=12, D1=13, D2=14, D3=15, D4=16

Magic Square of Order *n* = 4

Left Tropic of Square (TL)

D1	A3	B4	C2	D1	A4	B3	C2	D1	A2	B4	C3	D1	A4	B2	C3
C4	B2	A1	D3	C3	B2	A1	D4	C4	B3	A1	D2	C2	B3	A1	D4
A2	D4	C3	B1	A2	D3	C4	B1	A3	D4	C2	B1	A3	D2	C4	B1
B3	C1	D2	A4	B4	C1	D2	A3	B2	C1	D3	A4	B4	C1	D3	A2

D1	A2	B3	C4	D1	A3	B2	C4	D1	A3	C4	B2	D1	A4	C3	B2
C3	B4	A1	D2	C2	B4	A1	D3	B4	C2	A1	D3	B3	C2	A1	D4
A4	D3	C2	B1	A4	D2	C3	B1	A2	D4	B3	C1	A2	D3	B4	C1
B2	C1	D4	A3	B3	C1	D4	A2	C3	B1	D2	A4	C4	B1	D2	A3

D1	A2	C4	B3	D1	A4	C2	B3	D1	A2	C3	B4	D1	A3	C2	B4
B4	C3	A1	D2	B2	C3	A1	D4	B3	C4	A1	D2	B2	C4	A1	D3
A3	D4	B2	C1	A3	D2	B4	C1	A4	D3	B2	C1	A4	D2	B3	C1
C2	B1	D3	A4	C4	B1	D3	A2	C2	B1	D4	A3	C3	B1	D4	A2

D1	B3	A4	C2	D1	B4	A3	C2	D1	B2	A4	C3	D1	B4	A2	C3
C4	A2	B1	D3	C3	A2	B1	D4	C4	A3	B1	D2	C2	A3	B1	D4
B2	D4	C3	A1	B2	D3	C4	A1	B3	D4	C2	A1	B3	D2	C4	A1
A3	C1	D2	B4	A4	C1	D2	B3	A2	C1	D3	B4	A4	C1	D3	B2

D1	B2	A3	C4	D1	B3	A2	C4	D1	B3	C4	A2	D1	B4	C3	A2
C3	A4	B1	D2	C2	A4	B1	D3	A4	C2	B1	D3	A3	C2	B1	D4
B4	D3	C2	A1	B4	D2	C3	A1	B2	D4	A3	C1	B2	D3	A4	C1
A2	C1	D4	B3	A3	C1	D4	B2	C3	A1	D2	B4	C4	A1	D2	B3

D1	B2	C4	A3	D1	B4	C2	A3	D1	B2	C3	A4	D1	B3	C2	A4
A4	C3	B1	D2	A2	C3	B1	D4	A3	C4	B1	D2	A2	C4	B1	D3
B3	D4	A2	C1	B3	D2	A4	C1	B4	D3	A2	C1	B4	D2	A3	C1
C2	A1	D3	B4	C4	A1	D3	B2	C2	A1	D4	B3	C3	A1	D4	B2

D1	C3	A4	B2	D1	C4	A3	B2	D1	C2	A4	B3	D1	C4	A2	B3
B4	A2	C1	D3	B3	A2	C1	D4	B4	A3	C1	D2	B2	A3	C1	D4
C2	D4	B3	A1	C2	D3	B4	A1	C3	D4	B2	A1	C3	D2	B4	A1
A3	B1	D2	C4	A4	B1	D2	C3	A2	B1	D3	C4	A4	B1	D3	C2

D1	C2	A3	B4	D1	C3	A2	B4	D1	C3	B4	A2	D1	C4	B3	A2
B3	A4	C1	D2	B2	A4	C1	D3	A4	B2	C1	D3	A3	B2	C1	D4
C4	D3	B2	A1	C4	D2	B3	A1	C2	D4	A3	B1	C2	D3	A4	B1
A2	B1	D4	C3	A3	B1	D4	C2	B3	A1	D2	C4	B4	A1	D2	C3

D1	C2	B4	A3	D1	C4	B2	A3	D1	C2	B3	A4	D1	C3	B2	A4
A4	B3	C1	D2	A2	B3	C1	D4	A3	B4	C1	D2	A2	B4	C1	D3
C3	D4	A2	B1	C3	D2	A4	B1	C4	D3	A2	B1	C4	D2	A3	B1
B2	A1	D3	C4	B4	A1	D3	C2	B2	A1	D4	C3	B3	A1	D4	C2

4:4

The key: A1=1, A2=2, A3=3, A4=4, B1=5, B2=6, B3=7, B4=8, C1=9, C2=10, C3=11, C4=12, D1=13, D2=14, D3=15, D4=16

Magic Square of Order *n* = 4

Right Tropic of Square (TR)

A1	B4	C2	D3	A1	B3	C2	D4	A1	B4	C3	D2	A1	B2	C3	D4
C3	D2	A4	B1	C4	D2	A3	B1	C2	D3	A4	B1	C4	D3	A2	B1
D4	C1	B3	A2	D3	C1	B4	A2	D4	C1	B2	A3	D2	C1	B4	A3
B2	A3	D1	C4	B2	A4	D1	C3	B3	A2	D1	C4	B3	A4	D1	C2

A1	B3	C4	D2	A1	B2	C4	D3	A1	B4	D2	C3	A1	B3	D2	C4
C2	D4	A3	B1	C3	D4	A2	B1	D3	C2	A4	B1	D4	C2	A3	B1
D3	C1	B2	A4	D2	C1	B3	A4	C4	D1	B3	A2	C3	D1	B4	A2
B4	A2	D1	C3	B4	A3	D1	C2	B2	A3	C1	D4	B2	A4	C1	D3

A1	B4	D3	C2	A1	B2	D3	C4	A1	B3	D4	C2	A1	B2	D4	C3
D2	C3	A4	B1	D4	C3	A2	B1	D2	C4	A3	B1	D3	C4	A2	B1
C4	D1	B2	A3	C2	D1	B4	A3	C3	D1	B2	A4	C2	D1	B3	A4
B3	A2	C1	D4	B3	A4	C1	D2	B4	A2	C1	D3	B4	A3	C1	D2

A1	C4	B2	D3	A1	C3	B2	D4	A1	C4	B3	D2	A1	C2	B3	D4
B3	D2	A4	C1	B4	D2	A3	C1	B2	D3	A4	C1	B4	D3	A2	C1
D4	B1	C3	A2	D3	B1	C4	A2	D4	B1	C2	A3	D2	B1	C4	A3
C2	A3	D1	B4	C2	A4	D1	B3	C3	A2	D1	B4	C3	A4	D1	B2

A1	C3	B4	D2	A1	C2	B4	D3	A1	C4	D2	B3	A1	C3	D2	B4
B2	D4	A3	C1	B3	D4	A2	C1	D3	B2	A4	C1	D4	B2	A3	C1
D3	B1	C2	A4	D2	B1	C3	A4	B4	D1	C3	A2	B3	D1	C4	A2
C4	A2	D1	B3	C4	A3	D1	B2	C2	A3	B1	D4	C2	A4	B1	D3

A1	C4	D3	B2	A1	C2	D3	B4	A1	C3	D4	B2	A1	C2	D4	B3
D2	B3	A4	C1	D4	B3	A2	C1	D2	B4	A3	C1	D3	B4	A2	C1
B4	D1	C2	A3	B2	D1	C4	A3	B3	D1	C2	A4	B2	D1	C3	A4
C3	A2	B1	D4	C3	A4	B1	D2	C4	A2	B1	D3	C4	A3	B1	D2

A1	D4	B2	C3	A1	D3	B2	C4	A1	D4	B3	C2	A1	D2	B3	C4
B3	C2	A4	D1	B4	C2	A3	D1	B2	C3	A4	D1	B4	C3	A2	D1
C4	B1	D3	A2	C3	B1	D4	A2	C4	B1	D2	A3	C2	B1	D4	A3
D2	A3	C1	B4	D2	A4	C1	B3	D3	A2	C1	B4	D3	A4	C1	B2

A1	D3	B4	C2	A1	D2	B4	C3	A1	D4	C2	B3	A1	D3	C2	B4
B2	C4	A3	D1	B3	C4	A2	D1	C3	B2	A4	D1	C4	B2	A3	D1
C3	B1	D2	A4	C2	B1	D3	A4	B4	C1	D3	A2	B3	C1	D4	A2
D4	A2	C1	B3	D4	A3	C1	B2	D2	A3	B1	C4	D2	A4	B1	C3

A1	D4	C3	B2	A1	D2	C3	B4	A1	D3	C4	B2	A1	D2	C4	B3
C2	B3	A4	D1	C4	B3	A2	D1	C2	B4	A3	D1	C3	B4	A2	D1
B4	C1	D2	A3	B2	C1	D4	A3	B3	C1	D2	A4	B2	C1	D3	A4
D3	A2	B1	C4	D3	A4	B1	C2	D4	A2	B1	C3	D4	A3	B1	C2

1:4

The key: A1=1, A2=2, A3=3, A4=4, B1=5, B2=6, B3=7, B4=8, C1=9, C2=10, C3=11, C4=12, D1=13, D2=14, D3=15, D4=16

Magic Square of Order *n* = 4
Right Tropic of Square (TR)

B1	A4	C2	D3	B1	A3	C2	D4	B1	A4	C3	D2	B1	A2	C3	D4
C3	D2	B4	A1	C4	D2	B3	A1	C2	D3	B4	A1	C4	D3	B2	A1
D4	C1	A3	B2	D3	C1	A4	B2	D4	C1	A2	B3	D2	C1	A4	B3
A2	B3	D1	C4	A2	B4	D1	C3	A3	B2	D1	C4	A3	B4	D1	C2

B1	A3	C4	D2	B1	A2	C4	D3	B1	A4	D2	C3	B1	A3	D2	C4
C2	D4	B3	A1	C3	D4	B2	A1	D3	C2	B4	A1	D4	C2	B3	A1
D3	C1	A2	B4	D2	C1	A3	B4	C4	D1	A3	B2	C3	D1	A4	B2
A4	B2	D1	C3	A4	B3	D1	C2	A2	B3	C1	D4	A2	B4	C1	D3

B1	A4	D3	C2	B1	A2	D3	C4	B1	A3	D4	C2	B1	A2	D4	C3
D2	C3	B4	A1	D4	C3	B2	A1	D2	C4	B3	A1	D3	C4	B2	A1
C4	D1	A2	B3	C2	D1	A4	B3	C3	D1	A2	B4	C2	D1	A3	B4
A3	B2	C1	D4	A3	B4	C1	D2	A4	B2	C1	D3	A4	B3	C1	D2

B1	C4	A2	D3	B1	C3	A2	D4	B1	C4	A3	D2	B1	C2	A3	D4
A3	D2	B4	C1	A4	D2	B3	C1	A2	D3	B4	C1	A4	D3	B2	C1
D4	A1	C3	B2	D3	A1	C4	B2	D4	A1	C2	B3	D2	A1	C4	B3
C2	B3	D1	A4	C2	B4	D1	A3	C3	B2	D1	A4	C3	B4	D1	A2

B1	C3	A4	D2	B1	C2	A4	D3	B1	C4	D2	A3	B1	C3	D2	A4
A2	D4	B3	C1	A3	D4	B2	C1	D3	A2	B4	C1	D4	A2	B3	C1
D3	A1	C2	B4	D2	A1	C3	B4	A4	D1	C3	B2	A3	D1	C4	B2
C4	B2	D1	A3	C4	B3	D1	A2	C2	B3	A1	D4	C2	B4	A1	D3

B1	C4	D3	A2	B1	C2	D3	A4	B1	C3	D4	A2	B1	C2	D4	A3
D2	A3	B4	C1	D4	A3	B2	C1	D2	A4	B3	C1	D3	A4	B2	C1
A4	D1	C2	B3	A2	D1	C4	B3	A3	D1	C2	B4	A2	D1	C3	B4
C3	B2	A1	D4	C3	B4	A1	D2	C4	B2	A1	D3	C4	B3	A1	D2

B1	D4	A2	C3	B1	D3	A2	C4	B1	D4	A3	C2	B1	D2	A3	C4
A3	C2	B4	D1	A4	C2	B3	D1	A2	C3	B4	D1	A4	C3	B2	D1
C4	A1	D3	B2	C3	A1	D4	B2	C4	A1	D2	B3	C2	A1	D4	B3
D2	B3	C1	A4	D2	B4	C1	A3	D3	B2	C1	A4	D3	B4	C1	A2

B1	D3	A4	C2	B1	D2	A4	C3	B1	D4	C2	A3	B1	D3	C2	A4
A2	C4	B3	D1	A3	C4	B2	D1	C3	A2	B4	D1	C4	A2	B3	D1
C3	A1	D2	B4	C2	A1	D3	B4	A4	C1	D3	B2	A3	C1	D4	B2
D4	B2	C1	A3	D4	B3	C1	A2	D2	B3	A1	C4	D2	B4	A1	C3

B1	D4	C3	A2	B1	D2	C3	A4	B1	D3	C4	A2	B1	D2	C4	A3
C2	A3	B4	D1	C4	A3	B2	D1	C2	A4	B3	D1	C3	A4	B2	D1
A4	C1	D2	B3	A2	C1	D4	B3	A3	C1	D2	B4	A2	C1	D3	B4
D3	B2	A1	C4	D3	B4	A1	C2	D4	B2	A1	C3	D4	B3	A1	C2

2:4

The key: A1=1, A2=2, A3=3, A4=4, B1=5, B2=6, B3=7, B4=8, C1=9, C2=10, C3=11, C4=12, D1=13, D2=14, D3=15, D4=16

Magic Square of Order *n* = 4

Right Tropic of Square (TR)

C1	A4	B2	D3	C1	A3	B2	D4	C1	A4	B3	D2	C1	A2	B3	D4
B3	D2	C4	A1	B4	D2	C3	A1	B2	D3	C4	A1	B4	D3	C2	A1
D4	B1	A3	C2	D3	B1	A4	C2	D4	B1	A2	C3	D2	B1	A4	C3
A2	C3	D1	B4	A2	C4	D1	B3	A3	C2	D1	B4	A3	C4	D1	B2

C1	A3	B4	D2	C1	A2	B4	D3	C1	A4	D2	B3	C1	A3	D2	B4
B2	D4	C3	A1	B3	D4	C2	A1	D3	B2	C4	A1	D4	B2	C3	A1
D3	B1	A2	C4	D2	B1	A3	C4	B4	D1	A3	C2	B3	D1	A4	C2
A4	C2	D1	B3	A4	C3	D1	B2	A2	C3	B1	D4	A2	C4	B1	D3

C1	A4	D3	B2	C1	A2	D3	B4	C1	A3	D4	B2	C1	A2	D4	B3
D2	B3	C4	A1	D4	B3	C2	A1	D2	B4	C3	A1	D3	B4	C2	A1
B4	D1	A2	C3	B2	D1	A4	C3	B3	D1	A2	C4	B2	D1	A3	C4
A3	C2	B1	D4	A3	C4	B1	D2	A4	C2	B1	D3	A4	C3	B1	D2

C1	B4	A2	D3	C1	B3	A2	D4	C1	B4	A3	D2	C1	B2	A3	D4
A3	D2	C4	B1	A4	D2	C3	B1	A2	D3	C4	B1	A4	D3	C2	B1
D4	A1	B3	C2	D3	A1	B4	C2	D4	A1	B2	C3	D2	A1	B4	C3
B2	C3	D1	A4	B2	C4	D1	A3	B3	C2	D1	A4	B3	C4	D1	A2

C1	B2	A4	D3	C1	B3	A4	D2	C1	B4	D2	A3	C1	B3	D2	A4
A3	D4	C2	B1	A2	D4	C3	B1	D3	A2	C4	B1	D4	A2	C3	B1
D2	A1	B3	C4	D3	A1	B2	C4	A4	D1	B3	C2	A3	D1	B4	C2
B4	C3	D1	A2	B4	C2	D1	A3	B2	C3	A1	D4	B2	C4	A1	D3

C1	B4	D3	A2	C1	B2	D3	A4	C1	B3	D4	A2	C1	B2	D4	A3
D2	A3	C4	B1	D4	A3	C2	B1	D2	A4	C3	B1	D3	A4	C2	B1
A4	D1	B2	C3	A2	D1	B4	C3	A3	D1	B2	C4	A2	D1	B3	C4
B3	C2	A1	D4	B3	C4	A1	D2	B4	C2	A1	D3	B4	C3	A1	D2

C1	D4	A2	B3	C1	D3	A2	B4	C1	D4	A3	B2	C1	D2	A3	B4
A3	B2	C4	D1	A4	B2	C3	D1	A2	B3	C4	D1	A4	B3	C2	D1
B4	A1	D3	C2	B3	A1	D4	C2	B4	A1	D2	C3	B2	A1	D4	C3
D2	C3	B1	A4	D2	C4	B1	A3	D3	C2	B1	A4	D3	C4	B1	A2

C1	D3	A4	B2	C1	D2	A4	B3	C1	D4	B2	A3	C1	D3	B2	A4
A2	B4	C3	D1	A3	B4	C2	D1	B3	A2	C4	D1	B4	A2	C3	D1
B3	A1	D2	C4	B2	A1	D3	C4	A4	B1	D3	C2	A3	B1	D4	C2
D4	C2	B1	A3	D4	C3	B1	A2	D2	C3	A1	B4	D2	C4	A1	B3

C1	D4	B3	A2	C1	D2	B3	A4	C1	D3	B4	A2	C1	D2	B4	A3
B2	A3	C4	D1	B4	A3	C2	D1	B2	A4	C3	D1	B3	A4	C2	D1
A4	B1	D2	C3	A2	B1	D4	C3	A3	B1	D2	C4	A2	B1	D3	C4
D3	C2	A1	B4	D3	C4	A1	B2	D4	C2	A1	B3	D4	C3	A1	B2

3:4

The key: A1=1, A2=2, A3=3, A4=4, B1=5, B2=6, B3=7, B4=8, C1=9, C2=10, C3=11, C4=12, D1=13, D2=14, D3=15, D4=16

Magic Square of Order *n* = 4
Right Tropic of Square (TR)

D1	A4	B2	C3	D1	A3	B2	C4	D1	A4	B3	C2	D1	A2	B3	C4
B3	C2	D4	A1	B4	C2	D3	A1	B2	C3	D4	A1	B4	C3	D2	A1
C4	B1	A3	D2	C3	B1	A4	D2	C4	B1	A2	D3	C2	B1	A4	D3
A2	D3	C1	B4	A2	D4	C1	B3	A3	D2	C1	B4	A3	D4	C1	B2

D1	A3	B4	C2	D1	A2	B4	C3	D1	A4	C2	B3	D1	A3	C2	B4
B2	C4	D3	A1	B3	C4	D2	A1	C3	B2	D4	A1	C4	B2	D3	A1
C3	B1	A2	D4	C2	B1	A3	D4	B4	C1	A3	D2	B3	C1	A4	D2
A4	D2	C1	B3	A4	D3	C1	B2	A2	D3	B1	C4	A2	D4	B1	C3

D1	A4	C3	B2	D1	A2	C3	B4	D1	A3	C4	B2	D1	A2	C4	B3
C2	B3	D4	A1	C4	B3	D2	A1	C2	B4	D3	A1	C3	B4	D2	A1
B4	C1	A2	D3	B2	C1	A4	D3	B3	C1	A2	D4	B2	C1	A3	D4
A3	D2	B1	C4	A3	D4	B1	C2	A4	D2	B1	C3	A4	D3	B1	C2

D1	B4	A2	C3	D1	B3	A2	C4	D1	B4	A3	C2	D1	B2	A3	C4
A3	C2	D4	B1	A4	C2	D3	B1	A2	C3	D4	B1	A4	C3	D2	B1
C4	A1	B3	D2	C3	A1	B4	D2	C4	A1	B2	D3	C2	A1	B4	D3
B2	D3	C1	A4	B2	D4	C1	A3	B3	D2	C1	A4	B3	D4	C1	A2

D1	B3	A4	C2	D1	B2	A4	C3	D1	B4	C2	A3	D1	B3	C2	A4
A2	C4	D3	B1	A3	C4	D2	B1	C3	A2	D4	B1	C4	A2	D3	B1
C3	A1	B2	D4	C2	A1	B3	D4	A4	C1	B3	D2	A3	C1	B4	D2
B4	D2	C1	A3	B4	D3	C1	A2	B2	D3	A1	C4	B2	D4	A1	C3

D1	B4	C3	A2	D1	B2	C3	A4	D1	B3	C4	A2	D1	B2	C4	A3
C2	A3	D4	B1	C4	A3	D2	B1	C2	A4	D3	B1	C3	A4	D2	B1
A4	C1	B2	D3	A2	C1	B4	D3	A3	C1	B2	D4	A2	C1	B3	D4
B3	D2	A1	C4	B3	D4	A1	C2	B4	D2	A1	C3	B4	D3	A1	C2

D1	C4	A2	B3	D1	C3	A2	B4	D1	C4	A3	B2	D1	C2	A3	B4
A3	B2	D4	C1	A4	B2	D3	C1	A2	B3	D4	C1	A4	B3	D2	C1
B4	A1	C3	D2	B3	A1	C4	D2	B4	A1	C2	D3	B2	A1	C4	D3
C2	D3	B1	A4	C2	D4	B1	A3	C3	D2	B1	A4	C3	D4	B1	A2

D1	C3	A4	B2	D1	C2	A4	B3	D1	C4	B2	A3	D1	C3	B2	A4
A2	B4	D3	C1	A3	B4	D2	C1	B3	A2	D4	C1	B4	A2	D3	C1
B3	A1	C2	D4	B2	A1	C3	D4	A4	B1	C3	D2	A3	B1	C4	D2
C4	D2	B1	A3	C4	D3	B1	A2	C2	D3	A1	B4	C2	D4	A1	B3

D1	C4	B3	A2	D1	C2	B3	A4	D1	C3	B4	A2	D1	C2	B4	A3
B2	A3	D4	C1	B4	A3	D2	C1	B2	A4	D3	C1	B3	A4	D2	C1
A4	B1	C2	D3	A2	B1	C4	D3	A3	B1	C2	D4	A2	B1	C3	D4
C3	D2	A1	B4	C3	D4	A1	B2	C4	D2	A1	B3	C4	D3	A1	B2

4:4

The key: A1=1, A2=2, A3=3, A4=4, B1=5, B2=6, B3=7, B4=8, C1=9, C2=10, C3=11, C4=12, D1=13, D2=14, D3=15, D4=16

12. Magic Square of Order *n* = 5

There exist 37 houses with order *n* = 5. They give about 888 combinations of Magic Squares.

A1	B5	C4	D3	E2
C3	D2	E1	A5	B4
E5	A4	B3	C2	D1
B2	C1	D5	E4	A3
D4	E3	A2	B1	C5

$$\Sigma = \frac{n\left(n^2+1\right)}{2} = \frac{5\left(5^2+1\right)}{2} = 65$$

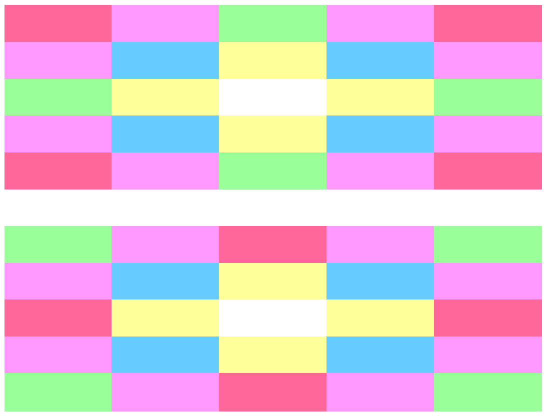
(5:1)

A1	B3	C5	D2	E4
D5	E2	A4	B1	C3
B4	C1	D3	E5	A2
E3	A5	B2	C4	D1
C2	D4	E1	A3	B5

If only use integer in the magic square of order *n* = 5, then the lowest possibly sum of *y* is 65. The 37 houses of Tropic Square are building up from, that, the first row are going from left to right with the letters A, B, C, D, E. The diagonal from left to right are going with 1, 2, 3, 4, 5. The two tropic houses above are named (5:1) and (13:1) in this essay, and on the Excel sheet.

The Key

A1	=	1
A2	=	2
A3	=	3
A4	=	4
A5	=	5
B1	=	6
B2	=	7
B3	=	8
B4	=	9
B5	=	10
C1	=	11
C2	=	12
C3	=	13
C4	=	14
C5	=	15
D1	=	16
D2	=	17
D3	=	18
D4	=	19
D5	=	20
E1	=	21
E2	=	22
E3	=	23
E4	=	24
E5	=	25



Proposal of the flag with ***constant*** to *n* = 5.

1	10	14	18	22
13	17	21	5	9
25	4	8	12	16
7	11	20	24	3
19	23	2	6	15

1	8	15	17	24
20	22	4	6	13
9	11	18	25	2
23	5	7	14	16
12	19	21	3	10

Four colour in the two flags above should give the sum of *y* = 65, if count the centre square to every colour. The Σ-sum should also be at each lines horizontal, vertical and in both diagonal. These flag is then designed to rotate around the centre square and the four colours gives then always the sum 65 if only use smallest possibly integer. There are about 4!·888 ≈ 21312 MS.

Magic Square of order *n* = 5 with The Key into the tropic house of MS, are probably possibly to use in image sensor in modern high technique of photographing. Probably also possibly to use into semi-conductor device with store concept, and to estimate the fine structure of *J* – coupling in Lyman and Ballmer series in the Hydrogen atom, and that to all MS combination.

Magic Square of Order *n* = 5

Tropic of Square (nr: 1)

A1	D5	B4	C3	E2	A1	D4	B5	C3	E2	A1	D5	B3	C4	E2
B3	C2	E1	A5	D4	B3	C2	E1	A4	D5	B4	C2	E1	A5	D3
E5	A4	D3	B2	C1	E4	A5	D3	B2	C1	E5	A3	D4	B2	C1
D2	B1	C5	E4	A3	D2	B1	C4	E5	A3	D2	B1	C5	E3	A4
C4	E3	A2	D1	B5	C5	E3	A2	D1	B4	C3	E4	A2	D1	B5

A1	D3	B5	C4	E2	A1	D4	B3	C5	E2	A1	D3	B4	C5	E2
B4	C2	E1	A3	D5	B5	C2	E1	A4	D3	B5	C2	E1	A3	D4
E3	A5	D4	B2	C1	E4	A3	D5	B2	C1	E3	A4	D5	B2	C1
D2	B1	C3	E5	A4	D2	B1	C4	E3	A5	D2	B1	C3	E4	A5
C5	E4	A2	D1	B3	C3	E5	A2	D1	B4	C4	E5	A2	D1	B3

A1	D5	B4	C2	E3	A1	D4	B5	C2	E3	A1	D5	B2	C4	E3
B2	C3	E1	A5	D4	B2	C3	E1	A4	D5	B4	C3	E1	A5	D2
E5	A4	D2	B3	C1	E4	A5	D2	B3	C1	E5	A2	D4	B3	C1
D3	B1	C5	E4	A2	D3	B1	C4	E5	A2	D3	B1	C5	E2	A4
C4	E2	A3	D1	B5	C5	E2	A3	D1	B4	C2	E4	A3	D1	B5

A1	D2	B5	C4	E3	A1	D4	B2	C5	E3	A1	D2	B4	C5	E3
B4	C3	E1	A2	D5	B5	C3	E1	A4	D2	B5	C3	E1	A2	D4
E2	A5	D4	B3	C1	E4	A2	D5	B3	C1	E2	A4	D5	B3	C1
D3	B1	C2	E5	A4	D3	B1	C4	E2	A5	D3	B1	C2	E4	A5
C5	E4	A3	D1	B2	C2	E5	A3	D1	B4	C4	E5	A3	D1	B2

A1	D5	B3	C2	E4	A1	D3	B5	C2	E4	A1	D5	B2	C3	E4
B2	C4	E1	A5	D3	B2	C4	E1	A3	D5	B3	C4	E1	A5	D2
E5	A3	D2	B4	C1	E3	A5	D2	B4	C1	E5	A2	D3	B4	C1
D4	B1	C5	E3	A2	D4	B1	C3	E5	A2	D4	B1	C5	E2	A3
C3	E2	A4	D1	B5	C5	E2	A4	D1	B3	C2	E3	A4	D1	B5

A1	D2	B5	C3	E4	A1	D3	B2	C5	E4	A1	D2	B3	C5	E4
B3	C4	E1	A2	D5	B5	C4	E1	A3	D2	B5	C4	E1	A2	D3
E2	A5	D3	B4	C1	E3	A2	D5	B4	C1	E2	A3	D5	B4	C1
D4	B1	C2	E5	A3	D4	B1	C3	E2	A5	D4	B1	C2	E3	A5
C5	E3	A4	D1	B2	C2	E5	A4	D1	B3	C3	E5	A4	D1	B2

A1	D4	B3	C2	E5	A1	D3	B4	C2	E5	A1	D4	B2	C3	E5
B2	C5	E1	A4	D3	B2	C5	E1	A3	D4	B3	C5	E1	A4	D2
E4	A3	D2	B5	C1	E3	A4	D2	B5	C1	E4	A2	D3	B5	C1
D5	B1	C4	E3	A2	D5	B1	C3	E4	A2	D5	B1	C4	E2	A3
C3	E2	A5	D1	B4	C4	E2	A5	D1	B3	C2	E3	A5	D1	B4

A1	D2	B4	C3	E5	A1	D3	B2	C4	E5	A1	D2	B3	C4	E5
B3	C5	E1	A2	D4	B4	C5	E1	A3	D2	B4	C5	E1	A2	D3
E2	A4	D3	B5	C1	E3	A2	D4	B5	C1	E2	A3	D4	B5	C1
D5	B1	C2	E4	A3	D5	B1	C3	E2	A4	D5	B1	C2	E3	A4
C4	E3	A5	D1	B2	C2	E4	A5	D1	B3	C3	E4	A5	D1	B2

1:1

Magic Square of Order *n* = 5

Tropic of Square (nr: 1)

A1	E3	D2	B5	C4	A1	E3	D2	B4	C5	A1	E4	D2	B5	C3
B4	C2	E5	D1	A3	B5	C2	E4	D1	A3	B3	C2	E5	D1	A4
C5	D4	B3	A2	E1	C4	D5	B3	A2	E1	C5	D3	B4	A2	E1
D3	A5	C1	E4	B2	D3	A4	C1	E5	B2	D4	A5	C1	E3	B2
E2	B1	A4	C3	D5	E2	B1	A5	C3	D4	E2	B1	A3	C4	D5

A1	E4	D2	B3	C5	A1	E5	D2	B4	C3	A1	E5	D2	B3	C4
B5	C2	E3	D1	A4	B3	C2	E4	D1	A5	B4	C2	E3	D1	A5
C3	D5	B4	A2	E1	C4	D3	B5	A2	E1	C3	D4	B5	A2	E1
D4	A3	C1	E5	B2	D5	A4	C1	E3	B2	D5	A3	C1	E4	B2
E2	B1	A5	C4	D3	E2	B1	A3	C5	D4	E2	B1	A4	C5	D3

A1	E2	D3	B5	C4	A1	E2	D3	B4	C5	A1	E4	D3	B5	C2
B4	C3	E5	D1	A2	B5	C3	E4	D1	A2	B2	C3	E5	D1	A4
C5	D4	B2	A3	E1	C4	D5	B2	A3	E1	C5	D2	B4	A3	E1
D2	A5	C1	E4	B3	D2	A4	C1	E5	B3	D4	A5	C1	E2	B3
E3	B1	A4	C2	D5	E3	B1	A5	C2	D4	E3	B1	A2	C4	D5

A1	E4	D3	B2	C5	A1	E5	D3	B4	C2	A1	E5	D3	B2	C4
B5	C3	E2	D1	A4	B2	C3	E4	D1	A5	B4	C3	E2	D1	A5
C2	D5	B4	A3	E1	C4	D2	B5	A3	E1	C2	D4	B5	A3	E1
D4	A2	C1	E5	B3	D5	A4	C1	E2	B3	D5	A2	C1	E4	B3
E3	B1	A5	C4	D2	E3	B1	A2	C5	D4	E3	B1	A4	C5	D2

A1	E2	D4	B5	C3	A1	E2	D4	B3	C5	A1	E3	D4	B5	C2
B3	C4	E5	D1	A2	B5	C4	E3	D1	A2	B2	C4	E5	D1	A3
C5	D3	B2	A4	E1	C3	D5	B2	A4	E1	C5	D2	B3	A4	E1
D2	A5	C1	E3	B4	D2	A3	C1	E5	B4	D3	A5	C1	E2	B4
E4	B1	A3	C2	D5	E4	B1	A5	C2	D3	E4	B1	A2	C3	D5

A1	E3	D4	B2	C5	A1	E5	D4	B3	C2	A1	E5	D4	B2	C3
B5	C4	E2	D1	A3	B2	C4	E3	D1	A5	B3	C4	E2	D1	A5
C2	D5	B3	A4	E1	C3	D2	B5	A4	E1	C2	D3	B5	A4	E1
D3	A2	C1	E5	B4	D5	A3	C1	E2	B4	D5	A2	C1	E3	B4
E4	B1	A5	C3	D2	E4	B1	A2	C5	D3	E4	B1	A3	C5	D2

A1	E2	D5	B4	C3	A1	E2	D5	B3	C4	A1	E3	D5	B4	C2
B3	C5	E4	D1	A2	B4	C5	E3	D1	A2	B2	C5	E4	D1	A3
C4	D3	B2	A5	E1	C3	D4	B2	A5	E1	C4	D2	B3	A5	E1
D2	A4	C1	E3	B5	D2	A3	C1	E4	B5	D3	A4	C1	E2	B5
E5	B1	A3	C2	D4	E5	B1	A4	C2	D3	E5	B1	A2	C3	D4

A1	E3	D5	B2	C4	A1	E4	D5	B3	C2	A1	E4	D5	B2	C3
B4	C5	E2	D1	A3	B2	C5	E3	D1	A4	B3	C5	E2	D1	A4
C2	D4	B3	A5	E1	C3	D2	B4	A5	E1	C2	D3	B4	A5	E1
D3	A2	C1	E4	B5	D4	A3	C1	E2	B5	D4	A2	C1	E3	B5
E5	B1	A4	C3	D2	E5	B1	A2	C4	D3	E5	B1	A3	C4	D2

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Magic Square of Order n = 5

Tropic of Square (nr: 2)

A1	C5	B4	D3	E2
B3	D2	E1	A5	C4
E5	A4	C3	B2	D1
C2	B1	D5	E4	A3
D4	E3	A2	C1	B5

A1	C4	B5	D3	E2
B3	D2	E1	A4	C5
E4	A5	C3	B2	D1
C2	B1	D4	E5	A3
D5	E3	A2	C1	B4

A1	C5	B3	D4	E2
B4	D2	E1	A5	C3
E5	A3	C4	B2	D1
C2	B1	D5	E3	A4
D3	E4	A2	C1	B5

A1	C3	B5	D4	E2
B4	D2	E1	A3	C5
E3	A5	C4	B2	D1
C2	B1	D3	E5	A4
D5	E4	A2	C1	B3

A1	C4	B3	D5	E2
B5	D2	E1	A4	C3
E4	A3	C5	B2	D1
C2	B1	D4	E3	A5
D3	E5	A2	C1	B4

A1	C3	B4	D5	E2
B5	D2	E1	A3	C4
E3	A4	C5	B2	D1
C2	B1	D3	E4	A5
D4	E5	A2	C1	B3

A1	C5	B4	D2	E3
B2	D3	E1	A5	C4
E5	A4	C2	B3	D1
C3	B1	D5	E4	A2
D4	E2	A3	C1	B5

A1	C4	B5	D2	E3
B2	D3	E1	A4	C5
E4	A5	C2	B3	D1
C3	B1	D4	E5	A2
D5	E2	A3	C1	B4

A1	C5	B2	D4	E3
B4	D3	E1	A5	C2
E5	A2	C4	B3	D1
C3	B1	D5	E2	A4
D2	E4	A3	C1	B5

A1	C2	B5	D4	E3
B4	D3	E1	A2	C5
E2	A5	C4	B3	D1
C3	B1	D2	E5	A4
D5	E4	A3	C1	B2

A1	C4	B2	D5	E3
B5	D3	E1	A4	C2
E4	A2	C5	B3	D1
C3	B1	D4	E2	A5
D2	E5	A3	C1	B4

A1	C2	B4	D5	E3
B5	D3	E1	A2	C4
E2	A4	C5	B3	D1
C3	B1	D2	E4	A5
D4	E5	A3	C1	B2

A1	C5	B3	D2	E4
B2	D4	E1	A5	C3
E5	A3	C2	B4	D1
C4	B1	D5	E3	A2
D3	E2	A4	C1	B5

A1	C3	B5	D2	E4
B2	D4	E1	A3	C5
E3	A5	C2	B4	D1
C4	B1	D3	E5	A2
D5	E2	A4	C1	B3

A1	C5	B2	D3	E4
B3	D4	E1	A5	C2
E5	A2	C3	B4	D1
C4	B1	D5	E2	A3
D2	E3	A4	C1	B5

A1	C2	B5	D3	E4
B3	D4	E1	A2	C5
E2	A5	C3	B4	D1
C4	B1	D2	E5	A3
D5	E3	A4	C1	B2

A1	C3	B2	D5	E4
B5	D4	E1	A3	C2
E3	A2	C5	B4	D1
C4	B1	D3	E2	A5
D2	E5	A4	C1	B3

A1	C2	B3	D5	E4
B5	D4	E1	A2	C3
E2	A3	C5	B4	D1
C4	B1	D2	E3	A5
D3	E5	A4	C1	B2

A1	C4	B3	D2	E5
B2	D5	E1	A4	C3
E4	A3	C2	B5	D1
C5	B1	D4	E3	A2
D3	E2	A5	C1	B4

A1	C3	B4	D2	E5
B2	D5	E1	A3	C4
E3	A4	C2	B5	D1
C5	B1	D3	E4	A2
D4	E2	A5	C1	B3

A1	C4	B2	D3	E5
B3	D5	E1	A4	C2
E4	A2	C3	B5	D1
C5	B1	D4	E2	A3
D2	E3	A5	C1	B4

A1	C2	B4	D3	E5
B3	D5	E1	A2	C4
E2	A4	C3	B5	D1
C5	B1	D2	E4	A3
D4	E3	A5	C1	B2

A1	C3	B2	D4	E5
B4	D5	E1	A3	C2
E3	A2	C4	B5	D1
C5	B1	D3	E2	A4
D2	E4	A5	C1	B3

A1	C2	B3	D4	E5
B4	D5	E1	A2	C3
E2	A3	C4	B5	D1
C5	B1	D2	E3	A4
D3	E4	A5	C1	B2

2:1

Magic Square of Order *n* = 5

Tropic of Square (nr: 2)

A1	E3	C2	B5	D4
B4	D2	E5	C1	A3
D5	C4	B3	A2	E1
C3	A5	D1	E4	B2
E2	B1	A4	D3	C5

A1	E3	C2	B4	D5
B5	D2	E4	C1	A3
D4	C5	B3	A2	E1
C3	A4	D1	E5	B2
E2	B1	A5	D3	C4

A1	E4	C2	B5	D3
B3	D2	E5	C1	A4
D5	C3	B4	A2	E1
C4	A5	D1	E3	B2
E2	B1	A3	D4	C5

A1	E4	C5	B3	D2
B4	D2	E3	C1	A5
D3	C5	B4	A2	E1
C2	A3	D1	E5	B4
E5	B1	A2	D4	C3

A1	E5	C2	B4	D3
B3	D2	E4	C1	A5
D4	C3	B5	A2	E1
C5	A4	D1	E3	B2
E2	B1	A3	D5	C4

A1	E5	C2	B3	D4
B4	D2	E3	C1	A5
D3	C4	B5	A2	E1
C5	A3	D1	E4	B2
E2	B1	A4	D5	C3

A1	E2	C3	B5	D4
B4	D3	E5	C1	A2
D5	C4	B2	A3	E1
C2	A5	D1	E4	B3
E3	B1	A4	D2	C5

A1	E2	C3	B4	D5
B5	D3	E4	C1	A2
D4	C5	B2	A3	E1
C2	A4	D1	E5	B3
E3	B1	A5	D2	C4

A1	E4	C3	B5	D2
B2	D3	E5	C1	A4
D5	C2	B4	A3	E1
C4	A5	D1	E2	B3
E3	B1	A2	D4	C5

A1	E4	C3	B2	D5
B5	D3	E2	C1	A4
D2	C5	B4	A3	E1
C4	A2	D1	E5	B3
E3	B1	A5	D4	C2

A1	E5	C3	B4	D2
B2	D3	E4	C1	A5
D4	C2	B5	A3	E1
C5	A4	D1	E2	B3
E3	B1	A2	D5	C4

A1	E5	C3	B2	D4
B4	D3	E2	C1	A5
D2	C4	B5	A3	E1
C5	A2	D1	E4	B3
E3	B1	A4	D5	C2

A1	E2	C4	B5	D3
B3	D4	E5	C1	A2
D5	C3	B2	A4	E1
C2	A5	D1	E3	B4
E4	B1	A3	D2	C5

A1	E2	C4	B3	D5
B5	D4	E3	C1	A2
D3	C5	B2	A4	E1
C2	A3	D1	E5	B4
E4	B1	A5	D2	C3

A1	E3	C4	B5	D2
B2	D4	E5	C1	A3
D5	C2	B3	A4	E1
C3	A5	D1	E2	B4
E4	B1	A2	D3	C5

A1	E3	C4	B2	D5
B5	D4	E2	C1	A3
D2	C5	B3	A4	E1
C3	A2	D1	E5	B4
E4	B1	A5	D3	C2

A1	E5	C4	B3	D2
B2	D4	E3	C1	A5
D3	C2	B5	A4	E1
C5	A3	D1	E2	B4
E4	B1	A2	D5	C3

A1	E5	C4	B2	D3
B3	D4	E2	C1	A5
D2	C3	B5	A4	E1
C5	A2	D1	E3	B4
E4	B1	A3	D5	C2

A1	E2	C5	B4	D3
B3	D5	E4	C1	A2
D4	C3	B2	A5	E1
C2	A4	D1	E3	B5
E5	B1	A3	D2	C4

A1	E2	C5	B3	D4
B4	D5	E3	C1	A2
D3	C4	B2	A5	E1
C2	A3	D1	E4	B5
E5	B1	A4	D2	C3

A1	E3	C5	B4	D2
B2	D5	E4	C1	A3
D4	C2	B3	A5	E1
C3	A4	D1	E2	B5
E5	B1	A2	D3	C4

A1	E3	C5	B2	D4
B4	D5	E2	C1	A3
D2	C4	B3	A5	E1
C3	A2	D1	E4	B5
E5	B1	A4	D3	C2

A1	E4	C5	B3	D2
B2	D5	E3	C1	A4
D3	C2	B4	A5	E1
C4	A3	D1	E2	B5
E5	B1	A2	D4	C3

A1	E4	C5	B2	D3
B3	D5	E2	C1	A4
D2	C3	B4	A5	E1
C4	A2	D1	E3	B5
E5	B1	A3	D4	C2

2:2

Magic Square of Order *n* = 5

Tropic of Square (nr: 3)

A1	D3	C5	B2	E4
B5	E2	A4	D1	C3
D4	C1	B3	E5	A2
E3	A5	D2	C4	B1
C2	B4	E1	A3	D5

A1	D3	C4	B2	E5
B4	E2	A5	D1	C3
D5	C1	B3	E4	A2
E3	A4	D2	C5	B1
C2	B5	E1	A3	D4

A1	D4	C5	B2	E3
B5	E2	A3	D1	C4
D3	C1	B4	E5	A2
E4	A5	D2	C3	B1
C2	B3	E1	A4	D5

A1	D4	C3	B2	E5
B3	E2	A5	D1	C4
D5	C1	B4	E3	A2
E4	A3	D2	C5	B1
C2	B5	E1	A4	D3

A1	D5	C4	B2	E3
B4	E2	A3	D1	C5
D3	C1	B5	E4	A2
E5	A4	D2	C3	B1
C2	B3	E1	A5	D4

A1	D5	C3	B2	E4
B3	E2	A4	D1	C5
D4	C1	B5	E3	A2
E5	A3	D2	C4	B1
C2	B4	E1	A5	D3

A1	D2	C5	B3	E4
B5	E3	A4	D1	C2
D4	C1	B2	E5	A3
E2	A5	D3	C4	B1
C3	B4	E1	A2	D5

A1	D2	C4	B3	E5
B4	E3	A5	D1	C2
D5	C1	B2	E4	A3
E2	A4	D3	C5	B1
C3	B5	E1	A2	D4

A1	D4	C5	B3	E2
B5	E3	A2	D1	C4
D2	C1	B4	E5	A3
E4	A5	D3	C2	B1
C3	B2	E1	A4	D5

A1	D4	C2	B3	E5
B2	E3	A5	D1	C4
D5	C1	B4	E2	A3
E4	A2	D3	C5	B1
C3	B5	E1	A4	D2

A1	D5	C4	B3	E2
B4	E3	A2	D1	C5
D2	C1	B5	E4	A3
E5	A4	D3	C2	B1
C3	B2	E1	A5	D4

A1	D5	C2	B3	E4
B2	E3	A4	D1	C5
D4	C1	B5	E2	A3
E5	A2	D3	C4	B1
C3	B4	E1	A5	D2

A1	D2	C5	B4	E3
B5	E4	A3	D1	C2
D3	C1	B2	E5	A4
E2	A5	D4	C3	B1
C4	B3	E1	A2	D5

A1	D2	C3	B4	E5
B3	E4	A5	D1	C2
D5	C1	B2	E3	A4
E2	A3	D4	C5	B1
C4	B5	E1	A2	D3

A1	D3	C5	B4	E2
B5	E4	A2	D1	C3
D2	C1	B3	E5	A4
E3	A5	D4	C2	B1
C4	B2	E1	A3	D5

A1	D3	C2	B4	E5
B2	E4	A5	D1	C3
D5	C1	B3	E2	A4
E3	A2	D4	C5	B1
C4	B5	E1	A3	D2

A1	D5	C3	B4	E2
B3	E4	A2	D1	C5
D2	C1	B5	E3	A4
E5	A3	D4	C2	B1
C4	B2	E1	A5	D3

A1	D5	C2	B4	E3
B2	E4	A3	D1	C5
D3	C1	B5	E2	A4
E5	A2	D4	C3	B1
C4	B3	E1	A5	D2

A1	D2	C4	B5	E3
B4	E5	A3	D1	C2
D3	C1	B2	E4	A5
E2	A4	D5	C3	B1
C5	B3	E1	A2	D4

A1	D2	C3	B5	E4
B3	E5	A4	D1	C2
D4	C1	B2	E3	A5
E2	A3	D5	C4	B1
C5	B4	E1	A2	D3

A1	D3	C4	B5	E2
B4	E5	A2	D1	C3
D2	C1	B3	E4	A5
E3	A4	D5	C2	B1
C5	B2	E1	A3	D4

A1	D3	C2	B5	E4
B2	E5	A4	D1	C3
D4	C1	B3	E2	A5
E3	A2	D5	C4	B1
C5	B4	E1	A3	D2

A1	D4	C3	B5	E2
B3	E5	A2	D1	C4
D2	C1	B4	E3	A5
E4	A3	D5	C2	B1
C5	B2	E1	A4	D3

A1	D4	C2	B5	E3
B2	E5	A3	D1	C4
D3	C1	B4	E2	A5
E4	A2	D5	C3	B1
C5	B3	E1	A4	D2

3:1

Magic Square of Order *n* = 5

Tropic of Square (nr: 4)

A1	C4	E5	D3	B2
B3	E2	D4	A5	C1
D2	B5	C3	E1	A4
C5	D1	A2	B4	E3
E4	A3	B1	C2	D5

A1	C5	E4	D3	B2
B3	E2	D5	A4	C1
D2	B4	C3	E1	A5
C4	D1	A2	B5	E3
E5	A3	B1	C2	D4

A1	C3	E5	D4	B2
B4	E2	D3	A5	C1
D2	B5	C4	E1	A3
C5	D1	A2	B3	E4
E3	A4	B1	C2	D5

A1	C5	E3	D4	B2
B4	E2	D5	A3	C1
D2	B3	C4	E1	A5
C3	D1	A2	B5	E4
E5	A4	B1	C2	D3

A1	C3	E4	D5	B2
B5	E2	D3	A4	C1
D2	B4	C5	E1	A3
C4	D1	A2	B3	E5
E3	A5	B1	C2	D4

A1	C4	E3	D5	B2
B5	E2	D4	A3	C1
D2	B3	C5	E1	A4
C3	D1	A2	B4	E5
E4	A5	B1	C2	D3

A1	C4	E5	D2	B3
B2	E3	D4	A5	C1
D3	B5	C2	E1	A4
C5	D1	A3	B4	E2
E4	A2	B1	C3	D5

A1	C5	E4	D2	B3
B2	E3	D5	A4	C1
D3	B4	C2	E1	A5
C4	D1	A3	B5	E2
E5	A2	B1	C3	D4

A1	C2	E5	D4	B3
B4	E3	D2	A5	C1
D3	B5	C4	E1	A2
C5	D1	A3	B2	E4
E2	A4	B1	C3	D5

A1	C5	E2	D4	B3
B4	E3	D5	A2	C1
D3	B2	C4	E1	A5
C2	D1	A3	B5	E4
E5	A4	B1	C3	D2

A1	C2	E4	D5	B3
B5	E3	D2	A4	C1
D3	B4	C5	E1	A2
C4	D1	A3	B2	E5
E2	A5	B1	C3	D4

A1	C4	E2	D5	B3
B5	E3	D4	A2	C1
D3	B2	C5	E1	A4
C2	D1	A3	B4	E5
E4	A5	B1	C3	D2

A1	C3	E5	D2	B4
B2	E4	D3	A5	C1
D4	B5	C2	E1	A3
C5	D1	A4	B3	E2
E3	A2	B1	C4	D5

A1	C5	E3	D2	B4
B2	E4	D5	A3	C1
D4	B3	C2	E1	A5
C3	D1	A4	B5	E2
E5	A2	B1	C4	D3

A1	C2	E5	D3	B4
B3	E4	D2	A5	C1
D4	B5	C3	E1	A2
C5	D1	A4	B2	E3
E2	A3	B1	C4	D5

A1	C5	E2	D3	B4
B3	E4	D5	A2	C1
D4	B2	C3	E1	A5
C2	D1	A4	B5	E3
E5	A3	B1	C4	D2

A1	C2	E3	D5	B4
B5	E4	D2	A3	C1
D4	B3	C5	E1	A2
C3	D1	A4	B2	E5
E2	A5	B1	C4	D3

A1	C3	E2	D5	B4
B5	E4	D3	A2	C1
D4	B2	C5	E1	A3
C2	D1	A4	B3	E5
E3	A5	B1	C4	D2

A1	C3	E4	D2	B5
B2	E5	D3	A4	C1
D5	B4	C2	E1	A3
C4	D1	A5	B3	E2
E3	A2	B1	C5	D4

A1	C4	E3	D2	B5
B2	E5	D4	A3	C1
D5	B3	C2	E1	A4
C3	D1	A5	B4	E2
E4	A2	B1	C5	D3

A1	C2	E4	D3	B5
B3	E5	D2	A4	C1
D5	B4	C3	E1	A2
C4	D1	A5	B2	E3
E2	A3	B1	C5	D4

A1	C4	E2	D3	B5
B3	E5	D4	A2	C1
D5	B2	C3	E1	A4
C2	D1	A5	B4	E3
E4	A3	B1	C5	D2

A1	C2	E3	D4	B5
B4	E5	D2	A3	C1
D5	B3	C4	E1	A2
C3	D1	A5	B2	E4
E2	A4	B1	C5	D3

A1	C3	E2	D4	B5
B4	E5	D3	A2	C1
D5	B2	C4	E1	A3
C2	D1	A5	B3	E4
E3	A4	B1	C5	D2

4:1

Magic Square of Order *n* = 5

Tropic of Square (nr: 4)

A1	D3	C2	B5	E4	A1	D3	C2	B4	E5	A1	D4	C2	B5	E3
B4	E2	D5	C1	A3	B5	E2	D4	C1	A3	B3	E2	D5	C1	A4
E5	C4	B3	A2	D1	E4	C5	B3	A2	D1	E5	C3	B4	A2	D1
C3	A5	E1	D4	B2	C3	A4	E1	D5	B2	C4	A5	E1	D3	B2
D2	B1	A4	E3	C5	D2	B1	A5	E3	C4	D2	B1	A3	E4	C5

A1	D4	C2	B3	E5	A1	D5	C2	B4	E3	A1	D5	C2	B3	E4
B5	E2	D3	C1	A4	B3	E2	D4	C1	A5	B4	E2	D3	C1	A5
E3	C5	B4	A2	D1	E4	C3	B5	A2	D1	E3	C4	B5	A2	D1
C4	A3	E1	D5	B2	C5	A4	E1	D3	B2	C5	A3	E1	D4	B2
D2	B1	A5	E4	C3	D2	B1	A3	E5	C4	D2	B1	A4	E5	C3

A1	D2	C3	B5	E4	A1	D2	C3	B4	E5	A1	D4	C3	B5	E2
B4	E3	D5	C1	A2	B5	E3	D4	C1	A2	B2	E3	D5	C1	A4
E5	C4	B2	A3	D1	E4	C5	B2	A3	D1	E5	C2	B4	A3	D1
C2	A5	E1	D4	B3	C2	A4	E1	D5	B3	C4	A5	E1	D2	B3
D3	B1	A4	E2	C5	D3	B1	A5	E2	C4	D3	B1	A2	E4	C5

A1	D4	C3	B2	E5	A1	D5	C3	B4	E2	A1	D5	C3	B2	E4
B5	E3	D2	C1	A4	B2	E3	D4	C1	A5	B4	E3	D2	C1	A5
E2	C5	B4	A3	D1	E4	C2	B5	A3	D1	E2	C4	B5	A3	D1
C4	A2	E1	D5	B3	C5	A4	E1	D2	B3	C5	A2	E1	D4	B3
D3	B1	A5	E4	C2	D3	B1	A2	E5	C4	D3	B1	A4	E5	C2

A1	D2	C4	B5	E3	A1	D2	C4	B3	E5	A1	D3	C4	B5	E2
B3	E4	D5	C1	A2	B5	E4	D3	C1	A2	B2	E4	D5	C1	A3
E5	C3	B2	A4	D1	E3	C5	B2	A4	D1	E5	C2	B3	A4	D1
C2	A5	E1	D3	B4	C2	A3	E1	D5	B4	C3	A5	E1	D2	B4
D4	B1	A3	E2	C5	D4	B1	A5	E2	C3	D4	B1	A2	E3	C5

A1	D3	C4	B2	E5	A1	D5	C4	B3	E2	A1	D5	C4	B2	E3
B5	E4	D2	C1	A3	B2	E4	D3	C1	A5	B3	E4	D2	C1	A5
E2	C5	B3	A4	D1	E3	C2	B5	A4	D1	E2	C3	B5	A4	D1
C3	A2	E1	D5	B4	C5	A3	E1	D2	B4	C5	A2	E1	D3	B4
D4	B1	A5	E3	C2	D4	B1	A2	E5	C3	D4	B1	A3	E5	C2

A1	D2	C5	B4	E3	A1	D2	C5	B3	E4	A1	D3	C5	B4	E2
B3	E5	D4	C1	A2	B4	E5	D3	C1	A2	B2	E5	D4	C1	A3
E4	C3	B2	A5	D1	E3	C4	B2	A5	D1	E4	C2	B3	A5	D1
C2	A4	E1	D3	B5	C2	A3	E1	D4	B5	C3	A4	E1	D2	B5
D5	B1	A3	E2	C4	D5	B1	A4	E2	C3	D5	B1	A2	E3	C4

A1	D3	C5	B2	E4	A1	D4	C5	B3	E2	A1	D4	C5	B2	E3
B4	E5	D2	C1	A3	B2	E5	D3	C1	A4	B3	E5	D2	C1	A4
E2	C4	B3	A5	D1	E3	C2	B4	A5	D1	E2	C3	B4	A5	D1
C3	A2	E1	D4	B5	C4	A3	E1	D2	B5	C4	A2	E1	D3	B5
D5	B1	A4	E3	C2	D5	B1	A2	E4	C3	D5	B1	A3	E4	C2

4:2

Magic Square of Order *n* = 5

Tropic of Square (nr: 5)

A1	B5	C4	D3	E2
C3	D2	E1	A5	B4
E5	A4	B3	C2	D1
B2	C1	D5	E4	A3
D4	E3	A2	B1	C5

A1	B4	C5	D3	E2
C3	D2	E1	A4	B5
E4	A5	B3	C2	D1
B2	C1	D4	E5	A3
D5	E3	A2	B1	C4

A1	B5	C3	D4	E2
C4	D2	E1	A5	B3
E5	A3	B4	C2	D1
B2	C1	D5	E3	A4
D3	E4	A2	B1	C5

A1	B3	C5	D4	E2
C4	D2	E1	A3	B5
E3	A5	B4	C2	D1
B2	C1	D3	E5	A4
D5	E4	A2	B1	C3

A1	B4	C3	D5	E2
C5	D2	E1	A4	B3
E4	A3	B5	C2	D1
B2	C1	D4	E3	A5
D3	E5	A2	B1	C4

A1	B3	C4	D5	E2
C5	D2	E1	A3	B4
E3	A4	B5	C2	D1
B2	C1	D3	E4	A5
D4	E5	A2	B1	C3

A1	B2	C5	D4	E3
C4	D3	E1	A2	B5
E2	A5	B4	C3	D1
B3	C1	D2	E5	A4
D5	E4	A3	B1	C2

A1	B4	C5	D2	E3
C2	D3	E1	A4	B5
E4	A5	B2	C3	D1
B3	C1	D4	E5	A2
D5	E2	A3	B1	C4

A1	B5	C2	D4	E3
C4	D3	E1	A5	B2
E5	A2	B4	C3	D1
B3	C1	D5	E2	A4
D2	E4	A3	B1	C5

A1	B2	C5	D4	E3
C4	D3	E1	A2	B5
E2	A5	B4	C3	D1
B3	C1	D2	E5	A4
D5	E4	A3	B1	C2

A1	B4	C2	D5	E3
C5	D3	E1	A4	B2
E4	A2	B5	C3	D1
B3	C1	D4	E2	A5
D2	E5	A3	B1	C4

A1	B2	C4	D5	E3
C5	D3	E1	A2	B4
E2	A4	B5	C3	D1
B3	C1	D2	E4	A5
D4	E5	A3	B1	C2

A1	B5	C3	D2	E4
C2	D4	E1	A5	B3
E5	A3	B2	C4	D1
B4	C1	D5	E3	A2
D3	E2	A4	B1	C5

A1	B3	C5	D2	E4
C2	D4	E1	A3	B5
E3	A5	B2	C4	D1
B4	C1	D3	E5	A2
D5	E2	A4	B1	C3

A1	B5	C2	D3	E4
C3	D4	E1	A5	B2
E5	A2	B3	C4	D1
B4	C1	D5	E2	A3
D2	E3	A4	B1	C5

A1	B2	C5	D3	E4
C3	D4	E1	A2	B5
E2	A5	B3	C4	D1
B4	C1	D2	E5	A3
D5	E3	A4	B1	C2

A1	B3	C2	D5	E4
C5	D4	E1	A3	B2
E3	A2	B5	C4	D1
B4	C1	D3	E2	A5
D2	E5	A4	B1	C3

A1	B2	C3	D5	E4
C5	D4	E1	A2	B3
E2	A3	B5	C4	D1
B4	C1	D2	E3	A5
D3	E5	A4	B1	C2

A1	B4	C3	D2	E5
C2	D5	E1	A4	B3
E4	A3	B2	C5	D1
B5	C1	D4	E3	A2
D3	E2	A5	B1	C4

A1	B3	C4	D2	E5
C2	D5	E1	A3	B4
E3	A4	B2	C5	D1
B5	C1	D3	E4	A2
D4	E2	A5	B1	C3

A1	B4	C2	D3	E5
C3	D5	E1	A4	B2
E4	A2	B3	C5	D1
B5	C1	D4	E2	A3
D2	E3	A5	B1	C4

A1	B2	C4	D3	E5
C3	D5	E1	A2	B4
E2	A4	B3	C5	D1
B5	C1	D2	E4	A3
D4	E3	A5	B1	C2

A1	B3	C2	D4	E5
C4	D5	E1	A3	B2
E3	A2	B4	C5	D1
B5	C1	D3	E2	A4
D2	E4	A5	B1	C3

A1	B2	C3	D4	E5
C4	D5	E1	A2	B3
E2	A3	B4	C5	D1
B5	C1	D2	E3	A4
D3	E4	A5	B1	C2

5:1

Magic Square of Order *n* = 5

Tropic of Square (nr: 5)

A1	B4	D5	E3	C2	A1	B5	D4	E3	C2	A1	B3	D5	E4	C2
C3	D2	E4	A5	B1	C3	D2	E5	A4	B1	C4	D2	E3	A5	B1
E2	C5	B3	D1	A4	E2	C4	B3	D1	A5	E2	C5	B4	D1	A3
B5	E1	A2	C4	D3	B4	E1	A2	C5	D3	B5	E1	A2	C3	D4
D4	A3	C1	B2	E5	D5	A3	C1	B2	E4	D3	A4	C1	B2	E5

A1	B5	D3	E4	C2	A1	B3	D4	E5	C2	A1	B4	D3	E5	C2
C4	D2	E5	A3	B1	C5	D2	E3	A4	B1	C5	D2	E4	A3	B1
E2	C3	B4	D1	A5	E2	C4	B5	D1	A3	E2	C3	B5	D1	A4
B3	E1	A2	C5	D4	B4	E1	A2	C3	D5	B3	E1	A2	C4	D5
D5	A4	C1	B2	E3	D3	A5	C1	B2	E4	D4	A5	C1	B2	E3

A1	B4	D5	E2	C3	A1	B5	D4	E2	C3	A1	B2	D5	E4	C3
C2	D3	E4	A5	B1	C2	D3	E5	A4	B1	C4	D3	E2	A5	B1
E3	C5	B2	D1	A4	E3	C4	B2	D1	A5	E3	C5	B4	D1	A2
B5	E1	A3	C4	D2	B4	E1	A3	C5	D2	B5	E1	A3	C2	D4
D4	A2	C1	B3	E5	D5	A2	C1	B3	E4	D2	A4	C1	B3	E5

A1	B5	D2	E4	C3	A1	B2	D4	E5	C3	A1	B4	D2	E5	C3
C4	D3	E5	A2	B1	C5	D3	E2	A4	B1	C5	D3	E4	A2	B1
E3	C2	B4	D1	A5	E3	C4	B5	D1	A2	E3	C2	B5	D1	A4
B2	E1	A3	C5	D4	B4	E1	A3	C2	D5	B2	E1	A3	C4	D5
D5	A4	C1	B3	E2	D2	A5	C1	B3	E4	D4	A5	C1	B3	E2

A1	B3	D5	E2	C4	A1	B5	D3	E2	C4	A1	B2	D5	E3	C4
C2	D4	E3	A5	B1	C2	D4	E5	A3	B1	C3	D4	E2	A5	B1
E4	C5	B2	D1	A3	E4	C3	B2	D1	A5	E4	C5	B3	D1	A2
B5	E1	A4	C3	D2	B3	E1	A4	C5	D2	B5	E1	A4	C2	D3
D3	A2	C1	B4	E5	D5	A2	C1	B4	E3	D2	A3	C1	B4	E5

A1	B5	D2	E3	C4	A1	B2	D3	E5	C4	A1	B3	D2	E5	C4
C3	D4	E5	A2	B1	C5	D4	E2	A3	B1	C5	D4	E3	A2	B1
E4	C2	B3	D1	A5	E4	C3	B5	D1	A2	E4	C2	B5	D1	A3
B2	E1	A4	C5	D3	B3	E1	A4	C2	D5	B2	E1	A4	C3	D5
D5	A3	C1	B4	E2	D2	A5	C1	B4	E3	D3	A5	C1	B4	E2

A1	B3	D4	E2	C5	A1	B4	D3	E2	C5	A1	B2	D4	E3	C5
C2	D5	E3	A4	B1	C2	D5	E4	A3	B1	C3	D5	E2	A4	B1
E5	C4	B2	D1	A3	E5	C3	B2	D1	A4	E5	C4	B3	D1	A2
B4	E1	A5	C3	D2	B3	E1	A5	C4	D2	B4	E1	A5	C2	D3
D3	A2	C1	B5	E4	D4	A2	C1	B5	E3	D2	A3	C1	B5	E4

A1	B4	D2	E3	C5	A1	B2	D3	E4	C5	A1	B3	D2	E4	C5
C3	D5	E4	A2	B1	C4	D5	E2	A3	B1	C4	D5	E3	A2	B1
E5	C2	B3	D1	A4	E5	C3	B4	D1	A2	E5	C2	B4	D1	A3
B2	E1	A5	C4	D3	B3	E1	A5	C2	D4	B2	E1	A5	C3	D4
D4	A3	C1	B5	E2	D2	A4	C1	B5	E3	D3	A4	C1	B5	E2

5:2

Magic Square of Order *n* = 5

Tropic of Square (nr: 5)

A1	E3	B2	C5	D4
C4	D2	E5	B1	A3
D5	B4	C3	A2	E1
B3	A5	D1	E4	C2
E2	C1	A4	D3	B5

A1	E3	B2	C4	D5
C5	D2	E4	B1	A3
D4	B5	C3	A2	E1
B3	A4	D1	E5	C2
E2	C1	A5	D3	B4

A1	E4	B2	C5	D3
C3	D2	E5	B1	A4
D5	B3	C4	A2	E1
B4	A5	D1	E3	C2
E2	C1	A3	D4	B5

A1	E4	B2	C3	D5
C5	D2	E3	B1	A4
D3	B5	C4	A2	E1
B4	A3	D1	E5	C2
E2	C1	A5	D4	B3

A1	E5	B2	C4	D3
C3	D2	E4	B1	A5
D4	B3	C5	A2	E1
B5	A4	D1	E3	C2
E2	C1	A3	D5	B4

A1	E5	B2	C3	D4
C4	D2	E3	B1	A5
D3	B4	C5	A2	E1
B5	A3	D1	E4	C2
E2	C1	A4	D5	B3

A1	E2	B3	C5	D4
C4	D3	E5	B1	A2
D5	B4	C2	A3	E1
B2	A5	D1	E4	C3
E3	C1	A4	D2	B5

A1	E2	B3	C4	D5
C5	D3	E4	B1	A2
D4	B5	C2	A3	E1
B2	A4	D1	E5	C3
E3	C1	A5	D2	B4

A1	E4	B3	C5	D2
C2	D3	E5	B1	A4
D5	B2	C4	A3	E1
B4	A5	D1	E2	C3
E3	C1	A2	D4	B5

A1	E4	B3	C2	D5
C5	D3	E2	B1	A4
D2	B5	C4	A3	E1
B4	A2	D1	E5	C3
E3	C1	A5	D4	B2

A1	E5	B3	C4	D2
C2	D3	E4	B1	A5
D4	B2	C5	A3	E1
B5	A4	D1	E2	C3
E3	C1	A2	D5	B4

A1	E5	B3	C2	D4
C4	D3	E2	B1	A5
D2	B4	C5	A3	E1
B5	A2	D1	E4	C3
E3	C1	A4	D5	B2

A1	E2	B4	C5	D3
C3	D4	E5	B1	A2
D5	B3	C2	A4	E1
B2	A5	D1	E3	C4
E4	C1	A3	D2	B5

A1	E2	B4	C3	D5
C5	D4	E3	B1	A2
D3	B5	C2	A4	E1
B2	A3	D1	E5	C4
E4	C1	A5	D2	B3

A1	E3	B4	C5	D2
C2	D4	E5	B1	A3
D5	B2	C3	A4	E1
B3	A5	D1	E2	C4
E4	C1	A2	D3	B5

A1	E3	B4	C2	D5
C5	D4	E2	B1	A3
D2	B5	C3	A4	E1
B3	A2	D1	E5	C4
E4	C1	A5	D3	B2

A1	E5	B4	C3	D2
C2	D4	E3	B1	A5
D3	B2	C5	A4	E1
B5	A3	D1	E2	C4
E4	C1	A2	D5	B3

A1	E5	B4	C2	D3
C3	D4	E2	B1	A5
D2	B3	C5	A4	E1
B5	A2	D1	E3	C4
E4	C1	A3	D5	B2

A1	E2	B5	C4	D3
C3	D5	E4	B1	A2
D4	B3	C2	A5	E1
B2	A4	D1	E3	C5
E5	C1	A3	D2	B4

A1	E2	B5	C3	D4
C4	D5	E3	B1	A2
D3	B4	C2	A5	E1
B2	A3	D1	E4	C5
E5	C1	A4	D2	B3

A1	E3	B5	C4	D2
C2	D5	E4	B1	A3
D4	B2	C3	A5	E1
B3	A4	D1	E2	C5
E5	C1	A2	D3	B4

A1	E3	B5	C2	D4
C4	D5	E2	B1	A3
D2	B4	C3	A5	E1
B3	A2	D1	E4	C5
E5	C1	A4	D3	B2

A1	E4	B5	C3	D2
C2	D5	E3	B1	A4
D3	B2	C4	A5	E1
B4	A3	D1	E2	C5
E5	C1	A2	D4	B3

A1	E4	B5	C2	D3
C3	D5	E2	B1	A4
D2	B3	C4	A5	E1
B4	A2	D1	E3	C5
E5	C1	A3	D4	B2

5:3

Magic Square of Order $n = 5$

Tropic of Square (nr: 6)

A1	B4	C5	E3	D2	A1	B5	C4	E3	D2	A1	B3	C5	E4	D2
D3	C2	E4	A5	B1	D3	C2	E5	A4	B1	D4	C2	E3	A5	B1
E2	D5	B3	C1	A4	E2	D4	B3	C1	A5	E2	D5	B4	C1	A3
B5	E1	A2	D4	C3	B4	E1	A2	D5	C3	B5	E1	A2	D3	C4
C4	A3	D1	B2	E5	C5	A3	D1	B2	E4	C3	A4	D1	B2	E5

A1	B5	C3	E4	D2	A1	B3	C4	E5	D2	A1	B4	C3	E5	D2
D4	C2	E5	A3	B1	D5	C2	E3	A4	B1	D5	C2	E4	A3	B1
E2	D3	B4	C1	A5	E2	D4	B5	C1	A3	E2	D3	B5	C1	A4
B3	E1	A2	D5	C4	B4	E1	A2	D3	C5	B3	E1	A2	D4	C5
C5	A4	D1	B2	E3	C3	A5	D1	B2	E4	C4	A5	D1	B2	E3

A1	B4	C5	E2	D3	A1	B5	C4	E2	D3	A1	B2	C5	E4	D3
D2	C3	E4	A5	B1	D2	C3	E5	A4	B1	D4	C3	E2	A5	B1
E3	D5	B2	C1	A4	E3	D4	B2	C1	A5	E3	D5	B4	C1	A2
B5	E1	A3	D4	C2	B4	E1	A3	D5	C2	B5	E1	A3	D2	C4
C4	A2	D1	B3	E5	C5	A2	D1	B3	E4	C2	A4	D1	B3	E5

A1	B5	C2	E4	D3	A1	B2	C4	E5	D3	A1	B4	C2	E5	D3
D4	C3	E5	A2	B1	D5	C3	E2	A4	B1	D5	C3	E4	A2	B1
E3	D2	B4	C1	A5	E3	D4	B5	C1	A2	E3	D2	B5	C1	A4
B2	E1	A3	D5	C4	B4	E1	A3	D2	C5	B2	E1	A3	D4	C5
C5	A4	D1	B3	E2	C2	A5	D1	B3	E4	C4	A5	D1	B3	E2

A1	B3	C5	E2	D4	A1	B5	C3	E2	D4	A1	B2	C5	E3	D4
D2	C4	E3	A5	B1	D2	C4	E5	A3	B1	D3	C4	E2	A5	B1
E4	D5	B2	C1	A3	E4	D3	B2	C1	A5	E4	D5	B3	C1	A2
B5	E1	A4	D3	C2	B3	E1	A4	D5	C2	B5	E1	A4	D2	C3
C3	A2	D1	B4	E5	C5	A2	D1	B4	E3	C2	A3	D1	B4	E5

A1	B5	C2	E3	D4	A1	B2	C3	E5	D4	A1	B3	C2	E5	D4
D3	C4	E5	A2	B1	D5	C4	E2	A3	B1	D5	C4	E3	A2	B1
E4	D2	B3	C1	A5	E4	D3	B5	C1	A2	E4	D2	B5	C1	A3
B2	E1	A4	D5	C3	B3	E1	A4	D2	C5	B2	E1	A4	D3	C5
C5	A3	D1	B4	E2	C2	A5	D1	B4	E3	C3	A5	D1	B4	E2

A1	B3	C4	E2	D5	A1	B4	C3	E2	D5	A1	B2	C4	E3	D5
D2	C5	E3	A4	B1	D2	C5	E4	A3	B1	D3	C5	E2	A4	B1
E5	D4	B2	C1	A3	E5	D3	B2	C1	A4	E5	D4	B3	C1	A2
B4	E1	A5	D3	C2	B3	E1	A5	D4	C2	B4	E1	A5	D2	C3
C3	A2	D1	B5	E4	C4	A2	D1	B5	E3	C2	A3	D1	B5	E4

A1	B4	C2	E3	D5	A1	B2	C3	E4	D5	A1	B3	C2	E4	D5
D3	C5	E4	A2	B1	D4	C5	E2	A3	B1	D4	C5	E3	A2	B1
E5	D2	B3	C1	A4	E5	D3	B4	C1	A2	E5	D2	B4	C1	A3
B2	E1	A5	D4	C3	B3	E1	A5	D2	C4	B2	E1	A5	D3	C4
C4	A3	D1	B5	E2	C2	A4	D1	B5	E3	C3	A4	D1	B5	E2

6:1

Magic Square of Order *n* = 5

Tropic of Square (nr: 6)

A1	B5	D4	C3	E2
D3	C2	E1	A5	B4
E5	A4	B3	D2	C1
B2	D1	C5	E4	A3
C4	E3	A2	B1	D5

A1	B4	D5	C3	E2
D3	C2	E1	A4	B5
E4	A5	B3	D2	C1
B2	D1	C4	E5	A3
C5	E3	A2	B1	D4

A1	B5	D3	C4	E2
D4	C2	E1	A5	B3
E5	A3	B4	D2	C1
B2	D1	C5	E3	A4
C3	E4	A2	B1	D5

A1	B3	D5	C4	E2
D4	C2	E1	A3	B5
E3	A5	B4	D2	C1
B2	D1	C3	E5	A4
C5	E4	A2	B1	D3

A1	B4	D3	C5	E2
D5	C2	E1	A4	B3
E4	A3	B5	D2	C1
B2	D1	C4	E3	A5
C3	E5	A2	B1	D4

A1	B3	D4	C5	E2
D5	C2	E1	A3	B4
E3	A4	B5	D2	C1
B2	D1	C3	E4	A5
C4	E5	A2	B1	D3

A1	B5	D4	C2	E3
D2	C3	E1	A5	B4
E5	A4	B2	D3	C1
B3	D1	C5	E4	A2
C4	E2	A3	B1	D5

A1	B4	D5	C2	E3
D2	C3	E1	A4	B5
E4	A5	B2	D3	C1
B3	D1	C4	E5	A2
C5	E2	A3	B1	D4

A1	B5	D2	C4	E3
D4	C3	E1	A5	B2
E5	A2	B4	D3	C1
B3	D1	C5	E2	A4
C2	E4	A3	B1	D5

A1	B2	D5	C4	E3
D4	C3	E1	A2	B5
E2	A5	B4	D3	C1
B3	D1	C2	E5	A4
C5	E4	A3	B1	D2

A1	B4	D2	C5	E3
D5	C3	E1	A4	B2
E4	A2	B5	D3	C1
B3	D1	C4	E2	A5
C2	E5	A3	B1	D4

A1	B2	D4	C5	E3
D5	C3	E1	A2	B4
E2	A4	B5	D3	C1
B3	D1	C2	E4	A5
C4	E5	A3	B1	D2

A1	B5	D3	C2	E4
D2	C4	E1	A5	B3
E5	A3	B2	D4	C1
B4	D1	C5	E3	A2
C3	E2	A4	B1	D5

A1	B3	D5	C2	E4
D2	C4	E1	A3	B5
E3	A5	B2	D4	C1
B4	D1	C3	E5	A2
C5	E2	A4	B1	D3

A1	B5	D2	C3	E4
D3	C4	E1	A5	B2
E5	A2	B3	D4	C1
B4	D1	C5	E2	A3
C2	E3	A4	B1	D5

A1	B2	D5	C3	E4
D3	C4	E1	A2	B5
E2	A5	B3	D4	C1
B4	D1	C2	E5	A3
C5	E3	A4	B1	D2

A1	B3	D2	C5	E4
D5	C4	E1	A3	B2
E3	A2	B5	D4	C1
B4	D1	C3	E2	A5
C2	E5	A4	B1	D3

A1	B2	D3	C5	E4
D5	C4	E1	A2	B3
E2	A3	B5	D4	C1
B4	D1	C2	E3	A5
C3	E5	A4	B1	D2

A1	B4	D3	C2	E5
D2	C5	E1	A4	B3
E4	A3	B2	D5	C1
B5	D1	C4	E3	A2
C3	E2	A5	B1	D4

A1	B3	D4	C2	E5
D2	C5	E1	A3	B4
E3	A4	B2	D5	C1
B5	D1	C3	E4	A2
C4	E2	A5	B1	D3

A1	B4	D2	C3	E5
D3	C5	E1	A4	B2
E4	A2	B3	D5	C1
B5	D1	C4	E2	A3
C2	E3	A5	B1	D4

A1	B2	D4	C3	E5
D3	C5	E1	A2	B4
E2	A4	B3	D5	C1
B5	D1	C2	E4	A3
C4	E3	A5	B1	D2

A1	B3	D2	C4	E5
D4	C5	E1	A3	B2
E3	A2	B4	D5	C1
B5	D1	C3	E2	A4
C2	E4	A5	B1	D3

A1	B2	D3	C4	E5
D4	C5	E1	A2	B3
E2	A3	B4	D5	C1
B5	D1	C2	E3	A4
C3	E4	A5	B1	D2

6:2

Magic Square of Order n = 5

Tropic of Square (nr: 6)

A1	E3	B2	D5	C4
D4	C2	E5	B1	A3
C5	B4	D3	A2	E1
B3	A5	C1	E4	D2
E2	D1	A4	C3	B5

A1	E3	B2	D4	C5
D5	C2	E4	B1	A3
C4	B5	D3	A2	E1
B3	A4	C1	E5	D2
E2	D1	A5	C3	B4

A1	E4	B2	D5	C3
D3	C2	E5	B1	A4
C5	B3	D4	A2	E1
B4	A5	C1	E3	D2
E2	D1	A3	C4	B5

A1	E4	B2	D3	C5
D5	C2	E3	B1	A4
C3	B5	D4	A2	E1
B4	A3	C1	E5	D2
E2	D1	A5	C4	B3

A1	E5	B2	D4	C3
D3	C2	E4	B1	A5
C4	B3	D5	A2	E1
B5	A4	C1	E3	D2
E2	D1	A3	C5	B4

A1	E5	B2	D3	C4
D4	C2	E3	B1	A5
C3	B4	D5	A2	E1
B5	A3	C1	E4	D2
E2	D1	A4	C5	B3

A1	E2	B3	D5	C4
D4	C3	E5	B1	A2
C5	B4	D2	A3	E1
B2	A5	C1	E4	D3
E3	D1	A4	C2	B5

A1	E2	B3	D4	C5
D5	C3	E4	B1	A2
C4	B5	D2	A3	E1
B2	A4	C1	E5	D3
E3	D1	A5	C2	B4

A1	E4	B3	D5	C2
D2	C3	E5	B1	A4
C5	B2	D4	A3	E1
B4	A5	C1	E2	D3
E3	D1	A2	C4	B5

A1	E4	B3	D2	C5
D5	C3	E2	B1	A4
C2	B5	D4	A3	E1
B4	A2	C1	E5	D3
E3	D1	A5	C4	B2

A1	E5	B3	D4	C2
D2	C3	E4	B1	A5
C4	B2	D5	A3	E1
B5	A4	C1	E2	D3
E3	D1	A2	C5	B4

A1	E5	B3	D2	C4
D4	C3	E2	B1	A5
C2	B4	D5	A3	E1
B5	A2	C1	E4	D3
E3	D1	A4	C5	B2

A1	E2	B4	D5	C3
D3	C4	E5	B1	A2
C5	B3	D2	A4	E1
B2	A5	C1	E3	D4
E4	D1	A3	C2	B5

A1	E2	B4	D3	C5
D5	C4	E3	B1	A2
C3	B5	D2	A4	E1
B2	A3	C1	E5	D4
E4	D1	A5	C2	B3

A1	E3	B4	D5	C2
D2	C4	E5	B1	A3
C5	B2	D3	A4	E1
B3	A5	C1	E2	D4
E4	D1	A2	C3	B5

A1	E3	B4	D2	C5
D5	C4	E2	B1	A3
C2	B5	D3	A4	E1
B3	A2	C1	E5	D4
E4	D1	A5	C3	B2

A1	E5	B4	D3	C2
D2	C4	E3	B1	A5
C3	B2	D5	A4	E1
B5	A3	C1	E2	D4
E4	D1	A2	C5	B3

A1	E5	B4	D2	C3
D3	C4	E2	B1	A5
C2	B3	D5	A4	E1
B5	A2	C1	E3	D4
E4	D1	A3	C5	B2

A1	E2	B5	D4	C3
D3	C5	E4	B1	A2
C4	B3	D2	A5	E1
B2	A4	C1	E3	D5
E5	D1	A3	C2	B4

A1	E2	B5	D3	C4
D4	C5	E3	B1	A2
C3	B4	D2	A5	E1
B2	A3	C1	E4	D5
E5	D1	A4	C2	B3

A1	E3	B5	D4	C2
D2	C5	E4	B1	A3
C4	B2	D3	A5	E1
B3	A4	C1	E2	D5
E5	D1	A2	C3	B4

A1	E3	B5	D2	C4
D4	C5	E2	B1	A3
C2	B4	D3	A5	E1
B3	A2	C1	E4	D5
E5	D1	A4	C3	B2

A1	E4	B5	D3	C2
D2	C5	E3	B1	A4
C3	B2	D4	A5	E1
B4	A3	C1	E2	D5
E5	D1	A2	C4	B3

A1	E4	B5	D2	C3
D3	C5	E2	B1	A4
C2	B3	D4	A5	E1
B4	A2	C1	E3	D5
E5	D1	A3	C4	B2

6:3

Magic Square of Order *n* = 5

Tropic of Square (nr: 7)

A1	B3	D5	C2	E4	A1	B3	D4	C2	E5	A1	B4	D5	C2	E3
C5	E2	A4	B1	D3	C4	E2	A5	B1	D3	C5	E2	A3	B1	D4
B4	D1	C3	E5	A2	B5	D1	C3	E4	A2	B3	D1	C4	E5	A2
E3	A5	B2	D4	C1	E3	A4	B2	D5	C1	E4	A5	B2	D3	C1
D2	C4	E1	A3	B5	D2	C5	E1	A3	B4	D2	C3	E1	A4	B5

A1	B4	D3	C2	E5	A1	B5	D4	C2	E3	A1	B5	D3	C2	E4
C3	E2	A5	B1	D4	C4	E2	A3	B1	D5	C3	E2	A4	B1	D5
B5	D1	C4	E3	A2	B3	D1	C5	E4	A2	B4	D1	C5	E3	A2
E4	A3	B2	D5	C1	E5	A4	B2	D3	C1	E5	A3	B2	D4	C1
D2	C5	E1	A4	B3	D2	C3	E1	A5	B4	D2	C4	E1	A5	B3

A1	B2	D5	C3	E4	A1	B2	D4	C3	E5	A1	B4	D5	C3	E2
C5	E3	A4	B1	D2	C4	E3	A5	B1	D2	C5	E3	A2	B1	D4
B4	D1	C2	E5	A3	B5	D1	C2	E4	A3	B2	D1	C4	E5	A3
E2	A5	B3	D4	C1	E2	A4	B3	D5	C1	E4	A5	B3	D2	C1
D3	C4	E1	A2	B5	D3	C5	E1	A2	B4	D3	C2	E1	A4	B5

A1	B4	D2	C3	E5	A1	B5	D4	C3	E2	A1	B5	D2	C3	E4
C2	E3	A5	B1	D4	C4	E3	A2	B1	D5	C2	E3	A4	B1	D5
B5	D1	C4	E2	A3	B2	D1	C5	E4	A3	B4	D1	C5	E2	A3
E4	A2	B3	D5	C1	E5	A4	B3	D2	C1	E5	A2	B3	D4	C1
D3	C5	E1	A4	B2	D3	C2	E1	A5	B4	D3	C4	E1	A5	B2

A1	B2	D5	C4	E3	A1	B2	D3	C4	E5	A1	B3	D5	C4	E2
C5	E4	A3	B1	D2	C3	E4	A5	B1	D2	C5	E4	A2	B1	D3
B3	D1	C2	E5	A4	B5	D1	C2	E3	A4	B2	D1	C3	E5	A4
E2	A5	B4	D3	C1	E2	A3	B4	D5	C1	E3	A5	B4	D2	C1
D4	C3	E1	A2	B5	D4	C5	E1	A2	B3	D4	C2	E1	A3	B5

A1	B3	D2	C4	E5	A1	B5	D3	C4	E2	A1	B5	D2	C4	E3
C2	E4	A5	B1	D3	C3	E4	A2	B1	D5	C2	E4	A3	B1	D5
B5	D1	C3	E2	A4	B2	D1	C5	E3	A4	B3	D1	C5	E2	A4
E3	A2	B4	D5	C1	E5	A3	B4	D2	C1	E5	A2	B4	D3	C1
D4	C5	E1	A3	B2	D4	C2	E1	A5	B3	D4	C3	E1	A5	B2

A1	B2	D4	C5	E3	A1	B2	D3	C5	E4	A1	B3	D4	C5	E2
C4	E5	A3	B1	D2	C3	E5	A4	B1	D2	C4	E5	A2	B1	D3
B3	D1	C2	E4	A5	B4	D1	C2	E3	A5	B2	D1	C3	E4	A5
E2	A4	B5	D3	C1	E2	A3	B5	D4	C1	E3	A4	B5	D2	C1
D5	C3	E1	A2	B4	D5	C4	E1	A2	B3	D5	C2	E1	A3	B4

A1	B3	D2	C5	E4	A1	B4	D3	C5	E2	A1	B4	D2	C5	E3
C2	E5	A4	B1	D3	C3	E5	A2	B1	D4	C2	E5	A3	B1	D4
B4	D1	C3	E2	A5	B2	D1	C4	E3	A5	B3	D1	C4	E2	A5
E3	A2	B5	D4	C1	E4	A3	B5	D2	C1	E4	A2	B5	D3	C1
D5	C4	E1	A3	B2	D5	C2	E1	A4	B3	D5	C3	E1	A4	B2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 7)

A1	D3	B5	C2	E4	A1	D3	B4	C2	E5	A1	D4	B5	C2	E3
C5	E2	A4	D1	B3	C4	E2	A5	D1	B3	C5	E2	A3	D1	B4
D4	B1	C3	E5	A2	D5	B1	C3	E4	A2	D3	B1	C4	E5	A2
E3	A5	D2	B4	C1	E3	A4	D2	B5	C1	E4	A5	D2	B3	C1
B2	C4	E1	A3	D5	B2	C5	E1	A3	D4	B2	C3	E1	A4	D5

A1	D4	B3	C2	E5	A1	D5	B4	C2	E3	A1	D5	B3	C2	E4
C3	E2	A5	D1	B4	C4	E2	A3	D1	B5	C3	E2	A4	D1	B5
D5	B1	C4	E3	A2	D3	B1	C5	E4	A2	D4	B1	C5	E3	A2
E4	A3	D2	B5	C1	E5	A4	D2	B3	C1	E5	A3	D2	B4	C1
B2	C5	E1	A4	D3	B2	C3	E1	A5	D4	B2	C4	E1	A5	D3

A1	D2	B5	C3	E4	A1	D2	B4	C3	E5	A1	D4	B5	C3	E2
C5	E3	A4	D1	B2	C4	E3	A5	D1	B2	C5	E3	A2	D1	B4
D4	B1	C2	E5	A3	D5	B1	C2	E4	A3	D2	B1	C4	E5	A3
E2	A5	D3	B4	C1	E2	A4	D3	B5	C1	E4	A5	D3	B2	C1
B3	C4	E1	A2	D5	B3	C5	E1	A2	D4	B3	C2	E1	A4	D5

A1	D4	B2	C3	E5	A1	D5	B4	C3	E2	A1	D5	B2	C3	E4
C2	E3	A5	D1	B4	C4	E3	A2	D1	B5	C2	E3	A4	D1	B5
D5	B1	C4	E2	A3	D2	B1	C5	E4	A3	D4	B1	C5	E2	A3
E4	A2	D3	B5	C1	E5	A4	D3	B2	C1	E5	A2	D3	B4	C1
B3	C5	E1	A4	D2	B3	C2	E1	A5	D4	B3	C4	E1	A5	D2

A1	D2	B5	C4	E3	A1	D2	B3	C4	E5	A1	D3	B5	C4	E2
C5	E4	A3	D1	B2	C3	E4	A5	D1	B2	C5	E4	A2	D1	B3
D3	B1	C2	E5	A4	D5	B1	C2	E3	A4	D2	B1	C3	E5	A4
E2	A5	D4	B3	C1	E2	A3	D4	B5	C1	E3	A5	D4	B2	C1
B4	C3	E1	A2	D5	B4	C5	E1	A2	D3	B4	C2	E1	A3	D5

A1	D3	B2	C4	E5	A1	D5	B3	C4	E2	A1	D5	B2	C4	E3
C2	E4	A5	D1	B3	C3	E4	A2	D1	B5	C2	E4	A3	D1	B5
D5	B1	C3	E2	A4	D2	B1	C5	E3	A4	D3	B1	C5	E2	A4
E3	A2	D4	B5	C1	E5	A3	D4	B2	C1	E5	A2	D4	B3	C1
B4	C5	E1	A3	D2	B4	C2	E1	A5	D3	B4	C3	E1	A5	D2

A1	D2	B4	C5	E3	A1	D2	B3	C5	E4	A1	D3	B4	C5	E2
C4	E5	A3	D1	B2	C3	E5	A4	D1	B2	C4	E5	A2	D1	B3
D3	B1	C2	E4	A5	D4	B1	C2	E3	A5	D2	B1	C3	E4	A5
E2	A4	D5	B3	C1	E2	A3	D5	B4	C1	E3	A4	D5	B2	C1
B5	C3	E1	A2	D4	B5	C4	E1	A2	D3	B5	C2	E1	A3	D4

A1	D3	B2	C5	E4	A1	D4	B3	C5	E2	A1	D4	B2	C5	E3
C2	E5	A4	D1	B3	C3	E5	A2	D1	B4	C2	E5	A3	D1	B4
D4	B1	C3	E2	A5	D2	B1	C4	E3	A5	D3	B1	C4	E2	A5
E3	A2	D5	B4	C1	E4	A3	D5	B2	C1	E4	A2	D5	B3	C1
B5	C4	E1	A3	D2	B5	C2	E1	A4	D3	B5	C3	E1	A4	D2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 8)

A1	B3	D2	C5	E4
C4	E2	B5	D1	A3
E5	D4	C3	A2	B1
D3	A5	E1	B4	C2
B2	C1	A4	E3	D5

A1	B3	D2	C4	E5
C5	E2	B4	D1	A3
E4	D5	C3	A2	B1
D3	A4	E1	B5	C2
B2	C1	A5	E3	D4

A1	B4	D2	C5	E3
C3	E2	B5	D1	A4
E5	D3	C4	A2	B1
D4	A5	E1	B3	C2
B2	C1	A3	E4	D5

A1	B4	D2	C3	E5
C5	E2	B3	D1	A4
E3	D5	C4	A2	B1
D4	A3	E1	B5	C2
B2	C1	A5	E4	D3

A1	B5	D2	C4	E3
C3	E2	B4	D1	A5
E4	D3	C5	A2	B1
D5	A4	E1	B3	C2
B2	C1	A3	E5	D4

A1	B5	D2	C3	E4
C4	E2	B3	D1	A5
E3	D4	C5	A2	B1
D5	A3	E1	B4	C2
B2	C1	A4	E5	D3

A1	B2	D3	C5	E4
C4	E3	B5	D1	A2
E5	D4	C2	A3	B1
D2	A5	E1	B4	C3
B3	C1	A4	E2	D5

A1	B2	D3	C4	E5
C5	E3	B4	D1	A2
E4	D5	C2	A3	B1
D2	A4	E1	B5	C3
B3	C1	A5	E2	D4

A1	B4	D3	C5	E2
C2	E3	B5	D1	A4
E5	D2	C4	A3	B1
D4	A5	E1	B2	C3
B3	C1	A2	E4	D5

A1	B4	D3	C2	E5
C5	E3	B2	D1	A4
E2	D5	C4	A3	B1
D4	A2	E1	B5	C3
B3	C1	A5	E4	D2

A1	B5	D3	C4	E2
C2	E3	B4	D1	A5
E4	D2	C5	A3	B1
D5	A4	E1	B2	C3
B3	C1	A2	E5	D4

A1	B5	D3	C2	E4
C4	E3	B2	D1	A5
E2	D4	C5	A3	B1
D5	A2	E1	B4	C3
B3	C1	A4	E5	D2

A1	B2	D4	C5	E3
C3	E4	B5	D1	A2
E5	D3	C2	A4	B1
D2	A5	E1	B3	C4
B4	C1	A3	E2	D5

A1	B2	D4	C3	E5
C5	E4	B3	D1	A2
E3	D5	C2	A4	B1
D2	A3	E1	B5	C4
B4	C1	A5	E2	D3

A1	B3	D4	C5	E2
C2	E4	B5	D1	A3
E5	D2	C3	A4	B1
D3	A5	E1	B2	C4
B4	C1	A2	E3	D5

A1	B3	D4	C2	E5
C5	E4	B2	D1	A3
E2	D5	C3	A4	B1
D3	A2	E1	B5	C4
B4	C1	A5	E3	D2

A1	B5	D4	C3	E2
C2	E4	B3	D1	A5
E3	D2	C5	A4	B1
D5	A3	E1	B2	C4
B4	C1	A2	E5	D3

A1	B5	D4	C2	E3
C3	E4	B2	D1	A5
E2	D3	C5	A4	B1
D5	A2	E1	B3	C4
B4	C1	A3	E5	D2

A1	B2	D5	C4	E3
C3	E5	B4	D1	A2
E4	D3	C2	A5	B1
D2	A4	E1	B3	C5
B5	C1	A3	E2	D4

A1	B2	D5	C3	E4
C4	E5	B3	D1	A2
E3	D4	C2	A5	B1
D2	A3	E1	B4	C5
B5	C1	A4	E2	D3

A1	B3	D5	C4	E2
C2	E5	B4	D1	A3
E4	D2	C3	A5	B1
D3	A4	E1	B2	C5
B5	C1	A2	E3	D4

A1	B3	D5	C2	E4
C4	E5	B2	D1	A3
E2	D4	C3	A5	B1
D3	A2	E1	B4	C5
B5	C1	A4	E3	D2

A1	B4	D5	C3	E2
C2	E5	B3	D1	A4
E3	D2	C4	A5	B1
D4	A3	E1	B2	C5
B5	C1	A2	E4	D3

A1	B4	D5	C2	E3
C3	E5	B2	D1	A4
E2	D3	C4	A5	B1
D4	A2	E1	B3	C5
B5	C1	A3	E4	D2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 8)

A1	D5	C4	E3	B2	A1	D4	C5	E3	B2	A1	D5	C3	E4	B2
C3	E2	B1	A5	D4	C3	E2	B1	A4	D5	C4	E2	B1	A5	D3
B5	A4	D3	C2	E1	B4	A5	D3	C2	E1	B5	A3	D4	C2	E1
D2	C1	E5	B4	A3	D2	C1	E4	B5	A3	D2	C1	E5	B3	A4
E4	B3	A2	D1	C5	E5	B3	A2	D1	C4	E3	B4	A2	D1	C5

A1	D3	C5	E4	B2	A1	D4	C3	E5	B2	A1	D3	C4	E5	B2
C4	E2	B1	A3	D5	C5	E2	B1	A4	D3	C5	E2	B1	A3	D4
B3	A5	D4	C2	E1	B4	A3	D5	C2	E1	B3	A4	D5	C2	E1
D2	C1	E3	B5	A4	D2	C1	E4	B3	A5	D2	C1	E3	B4	A5
E5	B4	A2	D1	C3	E3	B5	A2	D1	C4	E4	B5	A2	D1	C3

A1	D5	C4	E2	B3	A1	D4	C5	E2	B3	A1	D5	C2	E4	B3
C2	E3	B1	A5	D4	C2	E3	B1	A4	D5	C4	E3	B1	A5	D2
B5	A4	D2	C3	E1	B4	A5	D2	C3	E1	B5	A2	D4	C3	E1
D3	C1	E5	B4	A2	D3	C1	E4	B5	A2	D3	C1	E5	B2	A4
E4	B2	A3	D1	C5	E5	B2	A3	D1	C4	E2	B4	A3	D1	C5

A1	D2	C5	E4	B3	A1	D4	C2	E5	B3	A1	D2	C4	E5	B3
C4	E3	B1	A2	D5	C5	E3	B1	A4	D2	C5	E3	B1	A2	D4
B2	A5	D4	C3	E1	B4	A2	D5	C3	E1	B2	A4	D5	C3	E1
D3	C1	E2	B5	A4	D3	C1	E4	B2	A5	D3	C1	E2	B4	A5
E5	B4	A3	D1	C2	E2	B5	A3	D1	C4	E4	B5	A3	D1	C2

A1	D5	C3	E2	B4	A1	D3	C5	E2	B4	A1	D5	C2	E3	B4
C2	E4	B1	A5	D3	C2	E4	B1	A3	D5	C3	E4	B1	A5	D2
B5	A3	D2	C4	E1	B3	A5	D2	C4	E1	B5	A2	D3	C4	E1
D4	C1	E5	B3	A2	D4	C1	E3	B5	A2	D4	C1	E5	B2	A3
E3	B2	A4	D1	C5	E5	B2	A4	D1	C3	E2	B3	A4	D1	C5

A1	D2	C5	E3	B4	A1	D3	C2	E5	B4	A1	D2	C3	E5	B4
C3	E4	B1	A2	D5	C5	E4	B1	A3	D2	C5	E4	B1	A2	D3
B2	A5	D3	C4	E1	B3	A2	D5	C4	E1	B2	A3	D5	C4	E1
D4	C1	E2	B5	A3	D4	C1	E3	B2	A5	D4	C1	E2	B3	A5
E5	B3	A4	D1	C2	E2	B5	A4	D1	C3	E3	B5	A4	D1	C2

A1	D4	C3	E2	B5	A1	D3	C4	E2	B5	A1	D4	C2	E3	B5
C2	E5	B1	A4	D3	C2	E5	B1	A3	D4	C3	E5	B1	A4	D2
B4	A3	D2	C5	E1	B3	A4	D2	C5	E1	B4	A2	D3	C5	E1
D5	C1	E4	B3	A2	D5	C1	E3	B4	A2	D5	C1	E4	B2	A3
E3	B2	A5	D1	C4	E4	B2	A5	D1	C3	E2	B3	A5	D1	C4

A1	D2	C4	E3	B5	A1	D3	C2	E4	B5	A1	D2	C3	E4	B5
C3	E5	B1	A2	D4	C4	E5	B1	A3	D2	C4	E5	B1	A2	D3
B2	A4	D3	C5	E1	B3	A2	D4	C5	E1	B2	A3	D4	C5	E1
D5	C1	E2	B4	A3	D5	C1	E3	B2	A4	D5	C1	E2	B3	A4
E4	B3	A5	D1	C2	E2	B4	A5	D1	C3	E3	B4	A5	D1	C2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 8)

A1	D4	E5	B3	C2
C3	E2	B4	A5	D1
B2	C5	D3	E1	A4
D5	B1	A2	C4	E3
E4	A3	C1	D2	B5

A1	D5	E4	B3	C2
C3	E2	B5	A4	D1
B2	C4	D3	E1	A5
D4	B1	A2	C5	E3
E5	A3	C1	D2	B4

A1	D3	E5	B4	C2
C4	E2	B3	A5	D1
B2	C5	D4	E1	A3
D5	B1	A2	C3	E4
E3	A4	C1	D2	B5

A1	D5	E3	B4	C2
C4	E2	B5	A3	D1
B2	C3	D4	E1	A5
D3	B1	A2	C5	E4
E5	A4	C1	D2	B3

A1	D3	E4	B5	C2
C5	E2	B3	A4	D1
B2	C4	D5	E1	A3
D4	B1	A2	C3	E5
E3	A5	C1	D2	B4

A1	D4	E3	B5	C2
C5	E2	B4	A3	D1
B2	C3	D5	E1	A4
D3	B1	A2	C4	E5
E4	A5	C1	D2	B3

A1	D4	E5	B2	C3
C2	E3	B4	A5	D1
B3	C5	D2	E1	A4
D5	B1	A3	C4	E2
E4	A2	C1	D3	B5

A1	D5	E4	B2	C3
C2	E3	B5	A4	D1
B3	C4	D2	E1	A5
D4	B1	A3	C5	E2
E5	A2	C1	D3	B4

A1	D2	E5	B4	C3
C4	E3	B2	A5	D1
B3	C5	D4	E1	A2
D5	B1	A3	C2	E4
E2	A4	C1	D3	B5

A1	D5	E2	B4	C3
C4	E3	B5	A2	D1
B3	C2	D4	E1	A5
D2	B1	A3	C5	E4
E5	A4	C1	D3	B2

A1	D2	E4	B5	C3
C5	E3	B2	A4	D1
B3	C4	D5	E1	A2
D4	B1	A3	C2	E5
E2	A5	C1	D3	B4

A1	D4	E2	B5	C3
C5	E3	B4	A2	D1
B3	C2	D5	E1	A4
D2	B1	A3	C4	E5
E4	A5	C1	D3	B2

A1	D3	E5	B2	C4
C2	E4	B3	A5	D1
B4	C5	D2	E1	A3
D5	B1	A4	C3	E2
E3	A2	C1	D4	B5

A1	D5	E3	B2	C4
C2	E4	B5	A3	D1
B4	C3	D2	E1	A5
D3	B1	A4	C5	E2
E5	A2	C1	D4	B3

A1	D2	E5	B3	C4
C3	E4	B2	A5	D1
B4	C5	D3	E1	A2
D5	B1	A4	C2	E3
E2	A3	C1	D4	B5

A1	D5	E2	B3	C4
C3	E4	B5	A2	D1
B4	C2	D3	E1	A5
D2	B1	A4	C5	E3
E5	A3	C1	D4	B2

A1	D2	E3	B5	C4
C5	E4	B2	A3	D1
B4	C3	D5	E1	A2
D3	B1	A4	C2	E5
E2	A5	C1	D4	B3

A1	D3	E2	B5	C4
C5	E4	B3	A2	D1
B4	C2	D5	E1	A3
D2	B1	A4	C3	E5
E3	A5	C1	D4	B2

A1	D3	E4	B2	C5
C2	E5	B3	A4	D1
B5	C4	D2	E1	A3
D4	B1	A5	C3	E2
E3	A2	C1	D5	B4

A1	D4	E3	B2	C5
C2	E5	B4	A3	D1
B5	C3	D2	E1	A4
D3	B1	A5	C4	E2
E4	A2	C1	D5	B3

A1	D2	E4	B3	C5
C3	E5	B2	A4	D1
B5	C4	D3	E1	A2
D4	B1	A5	C2	E3
E2	A3	C1	D5	B4

A1	D4	E2	B3	C5
C3	E5	B4	A2	D1
B5	C2	D3	E1	A4
D2	B1	A5	C4	E3
E4	A3	C1	D5	B2

A1	D2	E3	B4	C5
C4	E5	B2	A3	D1
B5	C3	D4	E1	A2
D3	B1	A5	C2	E4
E2	A4	C1	D5	B3

A1	D3	E2	B4	C5
C4	E5	B3	A2	D1
B5	C2	D4	E1	A3
D2	B1	A5	C3	E4
E3	A4	C1	D5	B2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 9)

A1	B5	C4	E3	D2	A1	B4	C5	E3	D2	A1	B5	C3	E4	D2
C3	E2	D1	A5	B4	C3	E2	D1	A4	B5	C4	E2	D1	A5	B3
D5	A4	B3	C2	E1	D4	A5	B3	C2	E1	D5	A3	B4	C2	E1
B2	C1	E5	D4	A3	B2	C1	E4	D5	A3	B2	C1	E5	D3	A4
E4	D3	A2	B1	C5	E5	D3	A2	B1	C4	E3	D4	A2	B1	C5

A1	B3	C5	E4	D2	A1	B4	C3	E5	D2	A1	B3	C4	E5	D2
C4	E2	D1	A3	B5	C5	E2	D1	A4	B3	C5	E2	D1	A3	B4
D3	A5	B4	C2	E1	D4	A3	B5	C2	E1	D3	A4	B5	C2	E1
B2	C1	E3	D5	A4	B2	C1	E4	D3	A5	B2	C1	E3	D4	A5
E5	D4	A2	B1	C3	E3	D5	A2	B1	C4	E4	D5	A2	B1	C3

A1	B5	C4	E2	D3	A1	B4	C5	E2	D3	A1	B5	C2	E4	D3
C2	E3	D1	A5	B4	C2	E3	D1	A4	B5	C4	E3	D1	A5	B2
D5	A4	B2	C3	E1	D4	A5	B2	C3	E1	D5	A2	B4	C3	E1
B3	C1	E5	D4	A2	B3	C1	E4	D5	A2	B3	C1	E5	D2	A4
E4	D2	A3	B1	C5	E5	D2	A3	B1	C4	E2	D4	A3	B1	C5

A1	B2	C5	E4	D3	A1	B4	C2	E5	D3	A1	B2	C4	E5	D3
C4	E3	D1	A2	B5	C5	E3	D1	A4	B2	C5	E3	D1	A2	B4
D2	A5	B4	C3	E1	D4	A2	B5	C3	E1	D2	A4	B5	C3	E1
B3	C1	E2	D5	A4	B3	C1	E4	D2	A5	B3	C1	E2	D4	A5
E5	D4	A3	B1	C2	E2	D5	A3	B1	C4	E4	D5	A3	B1	C2

A1	B5	C3	E2	D4	A1	B3	C5	E2	D4	A1	B5	C2	E3	D4
C2	E4	D1	A5	B3	C2	E4	D1	A3	B5	C3	E4	D1	A5	B2
D5	A3	B2	C4	E1	D3	A5	B2	C4	E1	D5	A2	B3	C4	E1
B4	C1	E5	D3	A2	B4	C1	E3	D5	A2	B4	C1	E5	D2	A3
E3	D2	A4	B1	C5	E5	D2	A4	B1	C3	E2	D3	A4	B1	C5

A1	B2	C5	E3	D4	A1	B3	C2	E5	D4	A1	B2	C3	E5	D4
C3	E4	D1	A2	B5	C5	E4	D1	A3	B2	C5	E4	D1	A2	B3
D2	A5	B3	C4	E1	D3	A2	B5	C4	E1	D2	A3	B5	C4	E1
B4	C1	E2	D5	A3	B4	C1	E3	D2	A5	B4	C1	E2	D3	A5
E5	D3	A4	B1	C2	E2	D5	A4	B1	C3	E3	D5	A4	B1	C2

A1	B4	C3	E2	D5	A1	B3	C4	E2	D5	A1	B4	C2	E3	D5
C2	E5	D1	A4	B3	C2	E5	D1	A3	B4	C3	E5	D1	A4	B2
D4	A3	B2	C5	E1	D3	A4	B2	C5	E1	D4	A2	B3	C5	E1
B5	C1	E4	D3	A2	B5	C1	E3	D4	A2	B5	C1	E4	D2	A3
E3	D2	A5	B1	C4	E4	D2	A5	B1	C3	E2	D3	A5	B1	C4

A1	B2	C4	E3	D5	A1	B3	C2	E4	D5	A1	B2	C3	E4	D5
C3	E5	D1	A2	B4	C4	E5	D1	A3	B2	C4	E5	D1	A2	B3
D2	A4	B3	C5	E1	D3	A2	B4	C5	E1	D2	A3	B4	C5	E1
B5	C1	E2	D4	A3	B5	C1	E3	D2	A4	B5	C1	E2	D3	A4
E4	D3	A5	B1	C2	E2	D4	A5	B1	C3	E3	D4	A5	B1	C2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 9)

A1	D3	B2	C5	E4	A1	D3	B2	C4	E5	A1	D4	B2	C5	E3
C4	E2	D5	B1	A3	C5	E2	D4	B1	A3	C3	E2	D5	B1	A4
E5	B4	C3	A2	D1	E4	B5	C3	A2	D1	E5	B3	C4	A2	D1
B3	A5	E1	D4	C2	B3	A4	E1	D5	C2	B4	A5	E1	D3	C2
D2	C1	A4	E3	B5	D2	C1	A5	E3	B4	D2	C1	A3	E4	B5

A1	D4	B2	C3	E5	A1	D5	B2	C4	E3	A1	D5	B2	C3	E4
C5	E2	D3	B1	A4	C3	E2	D4	B1	A5	C4	E2	D3	B1	A5
E3	B5	C4	A2	D1	E4	B3	C5	A2	D1	E3	B4	C5	A2	D1
B4	A3	E1	D5	C2	B5	A4	E1	D3	C2	B5	A3	E1	D4	C2
D2	C1	A5	E4	B3	D2	C1	A3	E5	B4	D2	C1	A4	E5	B3

A1	D2	B3	C5	E4	A1	D2	B3	C4	E5	A1	D4	B3	C5	E2
C4	E3	D5	B1	A2	C5	E3	D4	B1	A2	C2	E3	D5	B1	A4
E5	B4	C2	A3	D1	E4	B5	C2	A3	D1	E5	B2	C4	A3	D1
B2	A5	E1	D4	C3	B2	A4	E1	D5	C3	B4	A5	E1	D2	C3
D3	C1	A4	E2	B5	D3	C1	A5	E2	B4	D3	C1	A2	E4	B5

A1	D4	B3	C2	E5	A1	D5	B3	C4	E2	A1	D5	B3	C2	E4
C5	E3	D2	B1	A4	C2	E3	D4	B1	A5	C4	E3	D2	B1	A5
E2	B5	C4	A3	D1	E4	B2	C5	A3	D1	E2	B4	C5	A3	D1
B4	A2	E1	D5	C3	B5	A4	E1	D2	C3	B5	A2	E1	D4	C3
D3	C1	A5	E4	B2	D3	C1	A2	E5	B4	D3	C1	A4	E5	B2

A1	D2	B4	C5	E3	A1	D2	B4	C3	E5	A1	D3	B4	C5	E2
C3	E4	D5	B1	A2	C5	E4	D3	B1	A2	C2	E4	D5	B1	A3
E5	B3	C2	A4	D1	E3	B5	C2	A4	D1	E5	B2	C3	A4	D1
B2	A5	E1	D3	C4	B2	A3	E1	D5	C4	B3	A5	E1	D2	C4
D4	C1	A3	E2	B5	D4	C1	A5	E2	B3	D4	C1	A2	E3	B5

A1	D3	B4	C2	E5	A1	D5	B4	C3	E2	A1	D5	B4	C2	E3
C5	E4	D2	B1	A3	C2	E4	D3	B1	A5	C3	E4	D2	B1	A5
E2	B5	C3	A4	D1	E3	B2	C5	A4	D1	E2	B3	C5	A4	D1
B3	A2	E1	D5	C4	B5	A3	E1	D2	C4	B5	A2	E1	D3	C4
D4	C1	A5	E3	B2	D4	C1	A2	E5	B3	D4	C1	A3	E5	B2

A1	D2	B5	C4	E3	A1	D2	B5	C3	E4	A1	D3	B5	C4	E2
C3	E5	D4	B1	A2	C4	E5	D3	B1	A2	C2	E5	D4	B1	A3
E4	B3	C2	A5	D1	E3	B4	C2	A5	D1	E4	B2	C3	A5	D1
B2	A4	E1	D3	C5	B2	A3	E1	D4	C5	B3	A4	E1	D2	C5
D5	C1	A3	E2	B4	D5	C1	A4	E2	B3	D5	C1	A2	E3	B4

A1	D3	B5	C2	E4	A1	D4	B5	C3	E2	A1	D4	B5	C2	E3
C4	E5	D2	B1	A3	C2	E5	D3	B1	A4	C3	E5	D2	B1	A4
E2	B4	C3	A5	D1	E3	B2	C4	A5	D1	E2	B3	C4	A5	D1
B3	A2	E1	D4	C5	B4	A3	E1	D2	C5	B4	A2	E1	D3	C5
D5	C1	A4	E3	B2	D5	C1	A2	E4	B3	D5	C1	A3	E4	B2

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Magic Square of Order n = 5

Tropic of Square (nr: 10)

A1	B3	D5	E2	C4	A1	B3	D4	E2	C5	A1	B4	D5	E2	C3
E5	C2	A4	B1	D3	E4	C2	A5	B1	D3	E5	C2	A3	B1	D4
B4	D1	E3	C5	A2	B5	D1	E3	C4	A2	B3	D1	E4	C5	A2
C3	A5	B2	D4	E1	C3	A4	B2	D5	E1	C4	A5	B2	D3	E1
D2	E4	C1	A3	B5	D2	E5	C1	A3	B4	D2	E3	C1	A4	B5

A1	B4	D3	E2	C5	A1	B5	D4	E2	C3	A1	B5	D3	E2	C4
E3	C2	A5	B1	D4	E4	C2	A3	B1	D5	E3	C2	A4	B1	D5
B5	D1	E4	C3	A2	B3	D1	E5	C4	A2	B4	D1	E5	C3	A2
C4	A3	B2	D5	E1	C5	A4	B2	D3	E1	C5	A3	B2	D4	E1
D2	E5	C1	A4	B3	D2	E3	C1	A5	B4	D2	E4	C1	A5	B3

A1	B2	D5	E3	C4	A1	B2	D4	E3	C5	A1	B4	D5	E3	C2
E5	C3	A4	B1	D2	E4	C3	A5	B1	D2	E5	C3	A2	B1	D4
B4	D1	E2	C5	A3	B5	D1	E2	C4	A3	B2	D1	E4	C5	A3
C2	A5	B3	D4	E1	C2	A4	B3	D5	E1	C4	A5	B3	D2	E1
D3	E4	C1	A2	B5	D3	E5	C1	A2	B4	D3	E2	C1	A4	B5

A1	B4	D2	E3	C5	A1	B5	D4	E3	C2	A1	B5	D2	E3	C4
E2	C3	A5	B1	D4	E4	C3	A2	B1	D5	E2	C3	A4	B1	D5
B5	D1	E4	C2	A3	B2	D1	E5	C4	A3	B4	D1	E5	C2	A3
C4	A2	B3	D5	E1	C5	A4	B3	D2	E1	C5	A2	B3	D4	E1
D3	E5	C1	A4	B2	D3	E2	C1	A5	B4	D3	E4	C1	A5	B2

A1	B2	D5	E4	C3	A1	B2	D3	E4	C5	A1	B3	D5	E4	C2
E5	C4	A3	B1	D2	E3	C4	A5	B1	D2	E5	C4	A2	B1	D3
B3	D1	E2	C5	A4	B5	D1	E2	C3	A4	B2	D1	E3	C5	A4
C2	A5	B4	D3	E1	C2	A3	B4	D5	E1	C3	A5	B4	D2	E1
D4	E3	C1	A2	B5	D4	E5	C1	A2	B3	D4	E2	C1	A3	B5

A1	B3	D2	E4	C5	A1	B5	D3	E4	C2	A1	B5	D2	E4	C3
E2	C4	A5	B1	D3	E3	C4	A2	B1	D5	E2	C4	A3	B1	D5
B5	D1	E3	C2	A4	B2	D1	E5	C3	A4	B3	D1	E5	C2	A4
C3	A2	B4	D5	E1	C5	A3	B4	D2	E1	C5	A2	B4	D3	E1
D4	E5	C1	A3	B2	D4	E2	C1	A5	B3	D4	E3	C1	A5	B2

A1	B2	D4	E5	C3	A1	B2	D3	E5	C4	A1	B3	D4	E5	C2
E4	C5	A3	B1	D2	E3	C5	A4	B1	D2	E4	C5	A2	B1	D3
B3	D1	E2	C4	A5	B4	D1	E2	C3	A5	B2	D1	E3	C4	A5
C2	A4	B5	D3	E1	C2	A3	B5	D4	E1	C3	A4	B5	D2	E1
D5	E3	C1	A2	B4	D5	E4	C1	A2	B3	D5	E2	C1	A3	B4

A1	B3	D2	E5	C4	A1	B4	D3	E5	C2	A1	B4	D2	E5	C3
E2	C5	A4	B1	D3	E3	C5	A2	B1	D4	E2	C5	A3	B1	D4
B4	D1	E3	C2	A5	B2	D1	E4	C3	A5	B3	D1	E4	C2	A5
C3	A2	B5	D4	E1	C4	A3	B5	D2	E1	C4	A2	B5	D3	E1
D5	E4	C1	A3	B2	D5	E2	C1	A4	B3	D5	E3	C1	A4	B2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 10)

A1	D3	B5	E2	C4
E5	C2	A4	D1	B3
D4	B1	E3	C5	A2
C3	A5	D2	B4	E1
B2	E4	C1	A3	D5

A1	D3	B4	E2	C5
E4	C2	A5	D1	B3
D5	B1	E3	C4	A2
C3	A4	D2	B5	E1
B2	E5	C1	A3	D4

A1	D4	B5	E2	C3
E5	C2	A3	D1	B4
D3	B1	E4	C5	A2
C4	A5	D2	B3	E1
B2	E3	C1	A4	D5

A1	D4	B3	E2	C5
E3	C2	A5	D1	B4
D5	B1	E4	C3	A2
C4	A3	D2	B5	E1
B2	E5	C1	A4	D3

A1	D5	B4	E2	C3
E4	C2	A3	D1	B5
D3	B1	E5	C4	A2
C5	A4	D2	B3	E1
B2	E3	C1	A5	D4

A1	D5	B3	E2	C4
E3	C2	A4	D1	B5
D4	B1	E5	C3	A2
C5	A3	D2	B4	E1
B2	E4	C1	A5	D3

A1	D2	B5	E3	C4
E5	C3	A4	D1	B2
D4	B1	E2	C5	A3
C2	A5	D3	B4	E1
B3	E4	C1	A2	D5

A1	D2	B4	E3	C5
E4	C3	A5	D1	B2
D5	B1	E2	C4	A3
C2	A4	D3	B5	E1
B3	E5	C1	A2	D4

A1	D4	B5	E3	C2
E5	C3	A2	D1	B4
D2	B1	E4	C5	A3
C4	A5	D3	B2	E1
B3	E2	C1	A4	D5

A1	D4	B2	E3	C5
E2	C3	A5	D1	B4
D5	B1	E4	C2	A3
C4	A2	D3	B5	E1
B3	E5	C1	A4	D2

A1	D5	B4	E3	C2
E4	C3	A2	D1	B5
D2	B1	E5	C4	A3
C5	A4	D3	B2	E1
B3	E2	C1	A5	D4

A1	D5	B2	E3	C4
E2	C3	A4	D1	B5
D4	B1	E5	C2	A3
C5	A2	D3	B4	E1
B3	E4	C1	A5	D2

A1	D2	B5	E4	C3
E5	C4	A3	D1	B2
D3	B1	E2	C5	A4
C2	A5	D4	B3	E1
B4	E3	C1	A2	D5

A1	D2	B3	E4	C5
E3	C4	A5	D1	B2
D5	B1	E2	C3	A4
C2	A3	D4	B5	E1
B4	E5	C1	A2	D3

A1	D3	B5	E4	C2
E5	C4	A2	D1	B3
D2	B1	E3	C5	A4
C3	A5	D4	B2	E1
B4	E2	C1	A3	D5

A1	D3	B2	E4	C5
E2	C4	A5	D1	B3
D5	B1	E3	C2	A4
C3	A2	D4	B5	E1
B4	E5	C1	A3	D2

A1	D5	B3	E4	C2
E3	C4	A2	D1	B5
D2	B1	E5	C3	A4
C5	A3	D4	B2	E1
B4	E2	C1	A5	D3

A1	D5	B2	E4	C3
E2	C4	A3	D1	B5
D3	B1	E5	C2	A4
C5	A2	D4	B3	E1
B4	E3	C1	A5	D2

A1	D2	B4	E5	C3
E4	C5	A3	D1	B2
D3	B1	E2	C4	A5
C2	A4	D5	B3	E1
B5	E3	C1	A2	D4

A1	D2	B3	E5	C4
E3	C5	A4	D1	B2
D4	B1	E2	C3	A5
C2	A3	D5	B4	E1
B5	E4	C1	A2	D3

A1	D3	B4	E5	C2
E4	C5	A2	D1	B3
D2	B1	E3	C4	A5
C3	A4	D5	B2	E1
B5	E2	C1	A3	D4

A1	D3	B2	E5	C4
E2	C5	A4	D1	B3
D4	B1	E3	C2	A5
C3	A2	D5	B4	E1
B5	E4	C1	A3	D2

A1	D4	B3	E5	C2
E3	C5	A2	D1	B4
D2	B1	E4	C3	A5
C4	A3	D5	B2	E1
B5	E2	C1	A4	D3

A1	D4	B2	E5	C3
E2	C5	A3	D1	B4
D3	B1	E4	C2	A5
C4	A2	D5	B3	E1
B5	E3	C1	A4	D2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 11)

A1	B3	D2	E5	C4
E4	C2	B5	D1	A3
C5	D4	E3	A2	B1
D3	A5	C1	B4	E2
B2	E1	A4	C3	D5

A1	B3	D2	E4	C5
E5	C2	B4	D1	A3
C4	D5	E3	A2	B1
D3	A4	C1	B5	E2
B2	E1	A5	C3	D4

A1	B4	D2	E5	C3
E3	C2	B5	D1	A4
C5	D3	E4	A2	B1
D4	A5	C1	B3	E2
B2	E1	A3	C4	D5

A1	B4	D2	E3	C5
E5	C2	B3	D1	A4
C3	D5	E4	A2	B1
D4	A3	C1	B5	E2
B2	E1	A5	C4	D3

A1	B5	D2	E4	C3
E3	C2	B4	D1	A5
C4	D3	E5	A2	B1
D5	A4	C1	B3	E2
B2	E1	A3	C5	D4

A1	B5	D2	E3	C4
E4	C2	B3	D1	A5
C3	D4	E5	A2	B1
D5	A3	C1	B4	E2
B2	E1	A4	C5	D3

A1	B2	D3	E5	C4
E4	C3	B5	D1	A2
C5	D4	E2	A3	B1
D2	A5	C1	B4	E3
B3	E1	A4	C2	D5

A1	B2	D3	E4	C5
E5	C3	B4	D1	A2
C4	D5	E2	A3	B1
D2	A4	C1	B5	E3
B3	E1	A5	C2	D4

A1	B4	D3	E5	C2
E2	C3	B5	D1	A4
C5	D2	E4	A3	B1
D4	A5	C1	B2	E3
B3	E1	A2	C4	D5

A1	B4	D3	E2	C5
E5	C3	B2	D1	A4
C2	D5	E4	A3	B1
D4	A2	C1	B5	E3
B3	E1	A5	C4	D2

A1	B5	D3	E4	C2
E2	C3	B4	D1	A5
C4	D2	E5	A3	B1
D5	A4	C1	B2	E3
B3	E1	A2	C5	D4

A1	B5	D3	E2	C4
E4	C3	B2	D1	A5
C2	D4	E5	A3	B1
D5	A2	C1	B4	E3
B3	E1	A4	C5	D2

A1	B2	D4	E5	C3
E3	C4	B5	D1	A2
C5	D3	E2	A4	B1
D2	A5	C1	B3	E4
B4	E1	A3	C2	D5

A1	B2	D4	E3	C5
E5	C4	B3	D1	A2
C3	D5	E2	A4	B1
D2	A3	C1	B5	E4
B4	E1	A5	C2	D3

A1	B3	D4	E5	C2
E2	C4	B5	D1	A3
C5	D2	E3	A4	B1
D3	A5	C1	B2	E4
B4	E1	A2	C3	D5

A1	B3	D4	E2	C5
E5	C4	B2	D1	A3
C2	D5	E3	A4	B1
D3	A2	C1	B5	E4
B4	E1	A5	C3	D2

A1	B5	D4	E3	C2
E2	C4	B3	D1	A5
C3	D2	E5	A4	B1
D5	A3	C1	B2	E4
B4	E1	A2	C5	D3

A1	B5	D4	E2	C3
E3	C4	B2	D1	A5
C2	D3	E5	A4	B1
D5	A2	C1	B3	E4
B4	E1	A3	C5	D2

A1	B2	D5	E4	C3
E3	C5	B4	D1	A2
C4	D3	E2	A5	B1
D2	A4	C1	B3	E5
B5	E1	A3	C2	D4

A1	B2	D5	E3	C4
E4	C5	B3	D1	A2
C3	D4	E2	A5	B1
D2	A3	C1	B4	E5
B5	E1	A4	C2	D3

A1	B3	D5	E4	C2
E2	C5	B4	D1	A3
C4	D2	E3	A5	B1
D3	A4	C1	B2	E5
B5	E1	A2	C3	D4

A1	B3	D5	E2	C4
E4	C5	B2	D1	A3
C2	D4	E3	A5	B1
D3	A2	C1	B4	E5
B5	E1	A4	C3	D2

A1	B4	D5	E3	C2
E2	C5	B3	D1	A4
C3	D2	E4	A5	B1
D4	A3	C1	B2	E5
B5	E1	A2	C4	D3

A1	B4	D5	E2	C3
E3	C5	B2	D1	A4
C2	D3	E4	A5	B1
D4	A2	C1	B3	E5
B5	E1	A3	C4	D2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 11)

A1	D4	C5	B3	E2	A1	D5	C4	B3	E2	A1	D3	C5	B4	E2
E3	C2	B4	A5	D1	E3	C2	B5	A4	D1	E4	C2	B3	A5	D1
B2	E5	D3	C1	A4	B2	E4	D3	C1	A5	B2	E5	D4	C1	A3
D5	B1	A2	E4	C3	D4	B1	A2	E5	C3	D5	B1	A2	E3	C4
C4	A3	E1	D2	B5	C5	A3	E1	D2	B4	C3	A4	E1	D2	B5

A1	D5	C3	B4	E2	A1	D3	C4	B5	E2	A1	D4	C3	B5	E2
E4	C2	B5	A3	D1	E5	C2	B3	A4	D1	E5	C2	B4	A3	D1
B2	E3	D4	C1	A5	B2	E4	D5	C1	A3	B2	E3	D5	C1	A4
D3	B1	A2	E5	C4	D4	B1	A2	E3	C5	D3	B1	A2	E4	C5
C5	A4	E1	D2	B3	C3	A5	E1	D2	B4	C4	A5	E1	D2	B3

A1	D4	C5	B2	E3	A1	D5	C4	B2	E3	A1	D2	C5	B4	E3
E2	C3	B4	A5	D1	E2	C3	B5	A4	D1	E4	C3	B2	A5	D1
B3	E5	D2	C1	A4	B3	E4	D2	C1	A5	B3	E5	D4	C1	A2
D5	B1	A3	E4	C2	D4	B1	A3	E5	C2	D5	B1	A3	E2	C4
C4	A2	E1	D3	B5	C5	A2	E1	D3	B4	C2	A4	E1	D3	B5

A1	D5	C2	B4	E3	A1	D2	C4	B5	E3	A1	D4	C2	B5	E3
E4	C3	B5	A2	D1	E5	C3	B2	A4	D1	E5	C3	B4	A2	D1
B3	E2	D4	C1	A5	B3	E4	D5	C1	A2	B3	E2	D5	C1	A4
D2	B1	A3	E5	C4	D4	B1	A3	E2	C5	D2	B1	A3	E4	C5
C5	A4	E1	D3	B2	C2	A5	E1	D3	B4	C4	A5	E1	D3	B2

A1	D3	C5	B2	E4	A1	D5	C3	B2	E4	A1	D2	C5	B3	E4
E2	C4	B3	A5	D1	E2	C4	B5	A3	D1	E3	C4	B2	A5	D1
B4	E5	D2	C1	A3	B4	E3	D2	C1	A5	B4	E5	D3	C1	A2
D5	B1	A4	E3	C2	D3	B1	A4	E5	C2	D5	B1	A4	E2	C3
C3	A2	E1	D4	B5	C5	A2	E1	D4	B3	C2	A3	E1	D4	B5

A1	D5	C2	B3	E4	A1	D2	C3	B5	E4	A1	D3	C2	B5	E4
E3	C4	B5	A2	D1	E5	C4	B2	A3	D1	E5	C4	B3	A2	D1
B4	E2	D3	C1	A5	B4	E3	D5	C1	A2	B4	E2	D5	C1	A3
D2	B1	A4	E5	C3	D3	B1	A4	E2	C5	D2	B1	A4	E3	C5
C5	A3	E1	D4	B2	C2	A5	E1	D4	B3	C3	A5	E1	D4	B2

A1	D3	C4	B2	E5	A1	D4	C3	B2	E5	A1	D2	C4	B3	E5
E2	C5	B3	A4	D1	E2	C5	B4	A3	D1	E3	C5	B2	A4	D1
B5	E4	D2	C1	A3	B5	E3	D2	C1	A4	B5	E4	D3	C1	A2
D4	B1	A5	E3	C2	D3	B1	A5	E4	C2	D4	B1	A5	E2	C3
C3	A2	E1	D5	B4	C4	A2	E1	D5	B3	C2	A3	E1	D5	B4

A1	D4	C2	B3	E5	A1	D2	C3	B4	E5	A1	D3	C2	B4	E5
E3	C5	B4	A2	D1	E4	C5	B2	A3	D1	E4	C5	B3	A2	D1
B5	E2	D3	C1	A4	B5	E3	D4	C1	A2	B5	E2	D4	C1	A3
D2	B1	A5	E4	C3	D3	B1	A5	E2	C4	D2	B1	A5	E3	C4
C4	A3	E1	D5	B2	C2	A4	E1	D5	B3	C3	A4	E1	D5	B2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 11)

A1	D5	E4	C3	B2	A1	D4	E5	C3	B2	A1	D5	E3	C4	B2
E3	C2	B1	A5	D4	E3	C2	B1	A4	D5	E4	C2	B1	A5	D3
B5	A4	D3	E2	C1	B4	A5	D3	E2	C1	B5	A3	D4	E2	C1
D2	E1	C5	B4	A3	D2	E1	C4	B5	A3	D2	E1	C5	B3	A4
C4	B3	A2	D1	E5	C5	B3	A2	D1	E4	C3	B4	A2	D1	E5

A1	D3	E5	C4	B2	A1	D4	E3	C5	B2	A1	D3	E4	C5	B2
E4	C2	B1	A3	D5	E5	C2	B1	A4	D3	E5	C2	B1	A3	D4
B3	A5	D4	E2	C1	B4	A3	D5	E2	C1	B3	A4	D5	E2	C1
D2	E1	C3	B5	A4	D2	E1	C4	B3	A5	D2	E1	C3	B4	A5
C5	B4	A2	D1	E3	C3	B5	A2	D1	E4	C4	B5	A2	D1	E3

A1	D5	E4	C2	B3	A1	D4	E5	C2	B3	A1	D5	E2	C4	B3
E2	C3	B1	A5	D4	E2	C3	B1	A4	D5	E4	C3	B1	A5	D2
B5	A4	D2	E3	C1	B4	A5	D2	E3	C1	B5	A2	D4	E3	C1
D3	E1	C5	B4	A2	D3	E1	C4	B5	A2	D3	E1	C5	B2	A4
C4	B2	A3	D1	E5	C5	B2	A3	D1	E4	C2	B4	A3	D1	E5

A1	D2	E5	C4	B3	A1	D4	E2	C5	B3	A1	D2	E4	C5	B3
E4	C3	B1	A2	D5	E5	C3	B1	A4	D2	E5	C3	B1	A2	D4
B2	A5	D4	E3	C1	B4	A2	D5	E3	C1	B2	A4	D5	E3	C1
D3	E1	C2	B5	A4	D3	E1	C4	B2	A5	D3	E1	C2	B4	A5
C5	B4	A3	D1	E2	C2	B5	A3	D1	E4	C4	B5	A3	D1	E2

A1	D5	E3	C2	B4	A1	D3	E5	C2	B4	A1	D5	E2	C3	B4
E2	C4	B1	A5	D3	E2	C4	B1	A3	D5	E3	C4	B1	A5	D2
B5	A3	D2	E4	C1	B3	A5	D2	E4	C1	B5	A2	D3	E4	C1
D4	E1	C5	B3	A2	D4	E1	C3	B5	A2	D4	E1	C5	B2	A3
C3	B2	A4	D1	E5	C5	B2	A4	D1	E3	C2	B3	A4	D1	E5

A1	D2	E5	C3	B4	A1	D3	E2	C5	B4	A1	D2	E3	C5	B4
E3	C4	B1	A2	D5	E5	C4	B1	A3	D2	E5	C4	B1	A2	D3
B2	A5	D3	E4	C1	B3	A2	D5	E4	C1	B2	A3	D5	E4	C1
D4	E1	C2	B5	A3	D4	E1	C3	B2	A5	D4	E1	C2	B3	A5
C5	B3	A4	D1	E2	C2	B5	A4	D1	E3	C3	B5	A4	D1	E2

A1	D4	E3	C2	B5	A1	D3	E4	C2	B5	A1	D4	E2	C3	B5
E2	C5	B1	A4	D3	E2	C5	B1	A3	D4	E3	C5	B1	A4	D2
B4	A3	D2	E5	C1	B3	A4	D2	E5	C1	B4	A2	D3	E5	C1
D5	E1	C4	B3	A2	D5	E1	C3	B4	A2	D5	E1	C4	B2	A3
C3	B2	A5	D1	E4	C4	B2	A5	D1	E3	C2	B3	A5	D1	E4

A1	D2	E4	C3	B5	A1	D3	E2	C4	B5	A1	D2	E3	C4	B5
E3	C5	B1	A2	D4	E4	C5	B1	A3	D2	E4	C5	B1	A2	D3
B2	A4	D3	E5	C1	B3	A2	D4	E5	C1	B2	A3	D4	E5	C1
D5	E1	C2	B4	A3	D5	E1	C3	B2	A4	D5	E1	C2	B3	A4
C4	B3	A5	D1	E2	C2	B4	A5	D1	E3	C3	B4	A5	D1	E2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 12)

A1	B4	C5	D3	E2
E3	C2	D4	A5	B1
D2	E5	B3	C1	A4
B5	D1	A2	E4	C3
C4	A3	E1	B2	D5

A1	B5	C4	D3	E2
E3	C2	D5	A4	B1
D2	E4	B3	C1	A5
B4	D1	A2	E5	C3
C5	A3	E1	B2	D4

A1	B3	C5	D4	E2
E4	C2	D3	A5	B1
D2	E5	B4	C1	A3
B5	D1	A2	E3	C4
C3	A4	E1	B2	D5

A1	B5	C3	D4	E2
E4	C2	D5	A3	B1
D2	E3	B4	C1	A5
B3	D1	A2	E5	C4
C5	A4	E1	B2	D3

A1	B3	C4	D5	E2
E5	C2	D3	A4	B1
D2	E4	B5	C1	A3
B4	D1	A2	E3	C5
C3	A5	E1	B2	D4

A1	B4	C3	D5	E2
E5	C2	D4	A3	B1
D2	E3	B5	C1	A4
B3	D1	A2	E4	C5
C4	A5	E1	B2	D3

A1	B4	C5	D2	E3
E2	C3	D4	A5	B1
D3	E5	B2	C1	A4
B5	D1	A3	E4	C2
C4	A2	E1	B3	D5

A1	B5	C4	D2	E3
E2	C3	D5	A4	B1
D3	E4	B2	C1	A5
B4	D1	A3	E5	C2
C5	A2	E1	B3	D4

A1	B2	C5	D4	E3
E4	C3	D2	A5	B1
D3	E5	B4	C1	A2
B5	D1	A3	E2	C4
C2	A4	E1	B3	D5

A1	B5	C2	D4	E3
E4	C3	D5	A2	B1
D3	E2	B4	C1	A5
B2	D1	A3	E5	C4
C5	A4	E1	B3	D2

A1	B2	C4	D5	E3
E5	C3	D2	A4	B1
D3	E4	B5	C1	A2
B4	D1	A3	E2	C5
C2	A5	E1	B3	D4

A1	B4	C2	D5	E3
E5	C3	D4	A2	B1
D3	E2	B5	C1	A4
B2	D1	A3	E4	C5
C4	A5	E1	B3	D2

A1	B3	C5	D2	E4
E2	C4	D3	A5	B1
D4	E5	B2	C1	A3
B5	D1	A4	E3	C2
C3	A2	E1	B4	D5

A1	B5	C3	D2	E4
E2	C4	D5	A3	B1
D4	E3	B2	C1	A5
B3	D1	A4	E5	C2
C5	A2	E1	B4	D3

A1	B2	C5	D3	E4
E3	C4	D2	A5	B1
D4	E5	B3	C1	A2
B5	D1	A4	E2	C3
C2	A3	E1	B4	D5

A1	B5	C2	D3	E4
E3	C4	D5	A2	B1
D4	E2	B3	C1	A5
B2	D1	A4	E5	C3
C5	A3	E1	B4	D2

A1	B2	C3	D5	E4
E5	C4	D2	A3	B1
D4	E3	B5	C1	A2
B3	D1	A4	E2	C5
C2	A5	E1	B4	D3

A1	B3	C2	D5	E4
E5	C4	D3	A2	B1
D4	E2	B5	C1	A3
B2	D1	A4	E3	C5
C3	A5	E1	B4	D2

A1	B3	C4	D2	E5
E2	C5	D3	A4	B1
D5	E4	B2	C1	A3
B4	D1	A5	E3	C2
C3	A2	E1	B5	D4

A1	B4	C3	D2	E5
E2	C5	D4	A3	B1
D5	E3	B2	C1	A4
B3	D1	A5	E4	C2
C4	A2	E1	B5	D3

A1	B2	C4	D3	E5
E3	C5	D2	A4	B1
D5	E4	B3	C1	A2
B4	D1	A5	E2	C3
C2	A3	E1	B5	D4

A1	B4	C2	D3	E5
E3	C5	D4	A2	B1
D5	E2	B3	C1	A4
B2	D1	A5	E4	C3
C4	A3	E1	B5	D2

A1	B2	C3	D4	E5
E4	C5	D2	A3	B1
D5	E3	B4	C1	A2
B3	D1	A5	E2	C4
C2	A4	E1	B5	D3

A1	B3	C2	D4	E5
E4	C5	D3	A2	B1
D5	E2	B4	C1	A3
B2	D1	A5	E3	C4
C3	A4	E1	B5	D2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 12)

A1	B5	E4	C3	D2	A1	B4	E5	C3	D2	A1	B5	E3	C4	D2
E3	C2	D1	A5	B4	E3	C2	D1	A4	B5	E4	C2	D1	A5	B3
D5	A4	B3	E2	C1	D4	A5	B3	E2	C1	D5	A3	B4	E2	C1
B2	E1	C5	D4	A3	B2	E1	C4	D5	A3	B2	E1	C5	D3	A4
C4	D3	A2	B1	E5	C5	D3	A2	B1	E4	C3	D4	A2	B1	E5

A1	B3	E5	C4	D2	A1	B4	E3	C5	D2	A1	B3	E4	C5	D2
E4	C2	D1	A3	B5	E5	C2	D1	A4	B3	E5	C2	D1	A3	B4
D3	A5	B4	E2	C1	D4	A3	B5	E2	C1	D3	A4	B5	E2	C1
B2	E1	C3	D5	A4	B2	E1	C4	D3	A5	B2	E1	C3	D4	A5
C5	D4	A2	B1	E3	C3	D5	A2	B1	E4	C4	D5	A2	B1	E3

A1	B5	E4	C2	D3	A1	B4	E5	C2	D3	A1	B5	E2	C4	D3
E2	C3	D1	A5	B4	E2	C3	D1	A4	B5	E4	C3	D1	A5	B2
D5	A4	B2	E3	C1	D4	A5	B2	E3	C1	D5	A2	B4	E3	C1
B3	E1	C5	D4	A2	B3	E1	C4	D5	A2	B3	E1	C5	D2	A4
C4	D2	A3	B1	E5	C5	D2	A3	B1	E4	C2	D4	A3	B1	E5

A1	B2	E5	C4	D3	A1	B4	E2	C5	D3	A1	B2	E4	C5	D3
E4	C3	D1	A2	B5	E5	C3	D1	A4	B2	E5	C3	D1	A2	B4
D2	A5	B4	E3	C1	D4	A2	B5	E3	C1	D2	A4	B5	E3	C1
B3	E1	C2	D5	A4	B3	E1	C4	D2	A5	B3	E1	C2	D4	A5
C5	D4	A3	B1	E2	C2	D5	A3	B1	E4	C4	D5	A3	B1	E2

A1	B5	E3	C2	D4	A1	B3	E5	C2	D4	A1	B5	E2	C3	D4
E2	C4	D1	A5	B3	E2	C4	D1	A3	B5	E3	C4	D1	A5	B2
D5	A3	B2	E4	C1	D3	A5	B2	E4	C1	D5	A2	B3	E4	C1
B4	E1	C5	D3	A2	B4	E1	C3	D5	A2	B4	E1	C5	D2	A3
C3	D2	A4	B1	E5	C5	D2	A4	B1	E3	C2	D3	A4	B1	E5

A1	B2	E5	C3	D4	A1	B3	E2	C5	D4	A1	B2	E3	C5	D4
E3	C4	D1	A2	B5	E5	C4	D1	A3	B2	E5	C4	D1	A2	B3
D2	A5	B3	E4	C1	D3	A2	B5	E4	C1	D2	A3	B5	E4	C1
B4	E1	C2	D5	A3	B4	E1	C3	D2	A5	B4	E1	C2	D3	A5
C5	D3	A4	B1	E2	C2	D5	A4	B1	E3	C3	D5	A4	B1	E2

A1	B4	E3	C2	D5	A1	B3	E4	C2	D5	A1	B4	E2	C3	D5
E2	C5	D1	A4	B3	E2	C5	D1	A3	B4	E3	C5	D1	A4	B2
D4	A3	B2	E5	C1	D3	A4	B2	E5	C1	D4	A2	B3	E5	C1
B5	E1	C4	D3	A2	B5	E1	C3	D4	A2	B5	E1	C4	D2	A3
C3	D2	A5	B1	E4	C4	D2	A5	B1	E3	C2	D3	A5	B1	E4

A1	B2	E4	C3	D5	A1	B3	E2	C4	D5	A1	B2	E3	C4	D5
E3	C5	D1	A2	B4	E4	C5	D1	A3	B2	E4	C5	D1	A2	B3
D2	A4	B3	E5	C1	D3	A2	B4	E5	C1	D2	A3	B4	E5	C1
B5	E1	C2	D4	A3	B5	E1	C3	D2	A4	B5	E1	C2	D3	A4
C4	D3	A5	B1	E2	C2	D4	A5	B1	E3	C3	D4	A5	B1	E2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 13)

A1	B3	C5	D2	E4	A1	B3	C4	D2	E5	A1	B4	C5	D2	E3
D5	E2	A4	B1	C3	D4	E2	A5	B1	C3	D5	E2	A3	B1	C4
B4	C1	D3	E5	A2	B5	C1	D3	E4	A2	B3	C1	D4	E5	A2
E3	A5	B2	C4	D1	E3	A4	B2	C5	D1	E4	A5	B2	C3	D1
C2	D4	E1	A3	B5	C2	D5	E1	A3	B4	C2	D3	E1	A4	B5

A1	B4	C3	D2	E5	A1	B5	C4	D2	E3	A1	B5	C3	D2	E4
D3	E2	A5	B1	C4	D4	E2	A3	B1	C5	D3	E2	A4	B1	C5
B5	C1	D4	E3	A2	B3	C1	D5	E4	A2	B4	C1	D5	E3	A2
E4	A3	B2	C5	D1	E5	A4	B2	C3	D1	E5	A3	B2	C4	D1
C2	D5	E1	A4	B3	C2	D3	E1	A5	B4	C2	D4	E1	A5	B3

A1	B2	C5	D3	E4	A1	B2	C4	D3	E5	A1	B4	C5	D3	E2
D5	E3	A4	B1	C2	D4	E3	A5	B1	C2	D5	E3	A2	B1	C4
B4	C1	D2	E5	A3	B5	C1	D2	E4	A3	B2	C1	D4	E5	A3
E2	A5	B3	C4	D1	E2	A4	B3	C5	D1	E4	A5	B3	C2	D1
C3	D4	E1	A2	B5	C3	D5	E1	A2	B4	C3	D2	E1	A4	B5

A1	B4	C2	D3	E5	A1	B5	C4	D3	E2	A1	B5	C2	D3	E4
D2	E3	A5	B1	C4	D4	E3	A2	B1	C5	D2	E3	A4	B1	C5
B5	C1	D4	E2	A3	B2	C1	D5	E4	A3	B4	C1	D5	E2	A3
E4	A2	B3	C5	D1	E5	A4	B3	C2	D1	E5	A2	B3	C4	D1
C3	D5	E1	A4	B2	C3	D2	E1	A5	B4	C3	D4	E1	A5	B2

A1	B2	C5	D4	E3	A1	B2	C3	D4	E5	A1	B3	C5	D4	E2
D5	E4	A3	B1	C2	D3	E4	A5	B1	C2	D5	E4	A2	B1	C3
B3	C1	D2	E5	A4	B5	C1	D2	E3	A4	B2	C1	D3	E5	A4
E2	A5	B4	C3	D1	E2	A3	B4	C5	D1	E3	A5	B4	C2	D1
C4	D3	E1	A2	B5	C4	D5	E1	A2	B3	C4	D2	E1	A3	B5

A1	B3	C2	D4	E5	A1	B5	C3	D4	E2	A1	B5	C2	D4	E3
D2	E4	A5	B1	C3	D3	E4	A2	B1	C5	D2	E4	A3	B1	C5
B5	C1	D3	E2	A4	B2	C1	D5	E3	A4	B3	C1	D5	E2	A4
E3	A2	B4	C5	D1	E5	A3	B4	C2	D1	E5	A2	B4	C3	D1
C4	D5	E1	A3	B2	C4	D2	E1	A5	B3	C4	D3	E1	A5	B2

A1	B2	C4	D5	E3	A1	B2	C3	D5	E4	A1	B3	C4	D5	E2
D4	E5	A3	B1	C2	D3	E5	A4	B1	C2	D4	E5	A2	B1	C3
B3	C1	D2	E4	A5	B4	C1	D2	E3	A5	B2	C1	D3	E4	A5
E2	A4	B5	C3	D1	E2	A3	B5	C4	D1	E3	A4	B5	C2	D1
C5	D3	E1	A2	B4	C5	D4	E1	A2	B3	C5	D2	E1	A3	B4

A1	B3	C2	D5	E4	A1	B4	C3	D5	E2	A1	B4	C2	D5	E3
D2	E5	A4	B1	C3	D3	E5	A2	B1	C4	D2	E5	A3	B1	C4
B4	C1	D3	E2	A5	B2	C1	D4	E3	A5	B3	C1	D4	E2	A5
E3	A2	B5	C4	D1	E4	A3	B5	C2	D1	E4	A2	B5	C3	D1
C5	D4	E1	A3	B2	C5	D2	E1	A4	B3	C5	D3	E1	A4	B2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 13)

A1	C3	B5	D2	E4	A1	C3	B4	D2	E5	A1	C4	B5	D2	E3
D5	E2	A4	C1	B3	D4	E2	A5	C1	B3	D5	E2	A3	C1	B4
C4	B1	D3	E5	A2	C5	B1	D3	E4	A2	C3	B1	D4	E5	A2
E3	A5	C2	B4	D1	E3	A4	C2	B5	D1	E4	A5	C2	B3	D1
B2	D4	E1	A3	C5	B2	D5	E1	A3	C4	B2	D3	E1	A4	C5

A1	C4	B3	D2	E5	A1	C5	B4	D2	E3	A1	C5	B3	D2	E4
D3	E2	A5	C1	B4	D4	E2	A3	C1	B5	D3	E2	A4	C1	B5
C5	B1	D4	E3	A2	C3	B1	D5	E4	A2	C4	B1	D5	E3	A2
E4	A3	C2	B5	D1	E5	A4	C2	B3	D1	E5	A3	C2	B4	D1
B2	D5	E1	A4	C3	B2	D3	E1	A5	C4	B2	D4	E1	A5	C3

A1	C2	B5	D3	E4	A1	C2	B4	D3	E5	A1	C4	B5	D3	E2
D5	E3	A4	C1	B2	D4	E3	A5	C1	B2	D5	E3	A2	C1	B4
C4	B1	D2	E5	A3	C5	B1	D2	E4	A3	C2	B1	D4	E5	A3
E2	A5	C3	B4	D1	E2	A4	C3	B5	D1	E4	A5	C3	B2	D1
B3	D4	E1	A2	C5	B3	D5	E1	A2	C4	B3	D2	E1	A4	C5

A1	C4	B2	D3	E5	A1	C5	B4	D3	E2	A1	C5	B2	D3	E4
D2	E3	A5	C1	B4	D4	E3	A2	C1	B5	D2	E3	A4	C1	B5
C5	B1	D4	E2	A3	C2	B1	D5	E4	A3	C4	B1	D5	E2	A3
E4	A2	C3	B5	D1	E5	A4	C3	B2	D1	E5	A2	C3	B4	D1
B3	D5	E1	A4	C2	B3	D2	E1	A5	C4	B3	D4	E1	A5	C2

A1	C2	B5	D4	E3	A1	C2	B3	D4	E5	A1	C3	B5	D4	E2
D5	E4	A3	C1	B2	D3	E4	A5	C1	B2	D5	E4	A2	C1	B3
C3	B1	D2	E5	A4	C5	B1	D2	E3	A4	C2	B1	D3	E5	A4
E2	A5	C4	B3	D1	E2	A3	C4	B5	D1	E3	A5	C4	B2	D1
B4	D3	E1	A2	C5	B4	D5	E1	A2	C3	B4	D2	E1	A3	C5

A1	C3	B2	D4	E5	A1	C5	B3	D4	E2	A1	C5	B2	D4	E3
D2	E4	A5	C1	B3	D3	E4	A2	C1	B5	D2	E4	A3	C1	B5
C5	B1	D3	E2	A4	C2	B1	D5	E3	A4	C3	B1	D5	E2	A4
E3	A2	C4	B5	D1	E5	A3	C4	B2	D1	E5	A2	C4	B3	D1
B4	D5	E1	A3	C2	B4	D2	E1	A5	C3	B4	D3	E1	A5	C2

A1	C2	B4	D5	E3	A1	C2	B3	D5	E4	A1	C3	B4	D5	E2
D4	E5	A3	C1	B2	D3	E5	A4	C1	B2	D4	E5	A2	C1	B3
C3	B1	D2	E4	A5	C4	B1	D2	E3	A5	C2	B1	D3	E4	A5
E2	A4	C5	B3	D1	E2	A3	C5	B4	D1	E3	A4	C5	B2	D1
B5	D3	E1	A2	C4	B5	D4	E1	A2	C3	B5	D2	E1	A3	C4

A1	C3	B2	D5	E4	A1	C4	B3	D5	E2	A1	C4	B2	D5	E3
D2	E5	A4	C1	B3	D3	E5	A2	C1	B4	D2	E5	A3	C1	B4
C4	B1	D3	E2	A5	C2	B1	D4	E3	A5	C3	B1	D4	E2	A5
E3	A2	C5	B4	D1	E4	A3	C5	B2	D1	E4	A2	C5	B3	D1
B5	D4	E1	A3	C2	B5	D2	E1	A4	C3	B5	D3	E1	A4	C2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 14)

A1	B3	C2	D5	E4	A1	B3	C2	D4	E5	A1	B4	C2	D5	E3
D4	E2	B5	C1	A3	D5	E2	B4	C1	A3	D3	E2	B5	C1	A4
E5	C4	D3	A2	B1	E4	C5	D3	A2	B1	E5	C3	D4	A2	B1
C3	A5	E1	B4	D2	C3	A4	E1	B5	D2	C4	A5	E1	B3	D2
B2	D1	A4	E3	C5	B2	D1	A5	E3	C4	B2	D1	A3	E4	C5

A1	B4	C2	D3	E5	A1	B5	C2	D4	E3	A1	B5	C2	D3	E4
D5	E2	B3	C1	A4	D3	E2	B4	C1	A5	D4	E2	B3	C1	A5
E3	C5	D4	A2	B1	E4	C3	D5	A2	B1	E3	C4	D5	A2	B1
C4	A3	E1	B5	D2	C5	A4	E1	B3	D2	C5	A3	E1	B4	D2
B2	D1	A5	E4	C3	B2	D1	A3	E5	C4	B2	D1	A4	E5	C3

A1	B2	C3	D5	E4	A1	B2	C3	D4	E5	A1	B4	C3	D5	E2
D4	E3	B5	C1	A2	D5	E3	B4	C1	A2	D2	E3	B5	C1	A4
E5	C4	D2	A3	B1	E4	C5	D2	A3	B1	E5	C2	D4	A3	B1
C2	A5	E1	B4	D3	C2	A4	E1	B5	D3	C4	A5	E1	B2	D3
B3	D1	A4	E2	C5	B3	D1	A5	E2	C4	B3	D1	A2	E4	C5

A1	B4	C3	D2	E5	A1	B5	C3	D4	E2	A1	B5	C3	D2	E4
D5	E3	B2	C1	A4	D2	E3	B4	C1	A5	D4	E3	B2	C1	A5
E2	C5	D4	A3	B1	E4	C2	D5	A3	B1	E2	C4	D5	A3	B1
C4	A2	E1	B5	D3	C5	A4	E1	B2	D3	C5	A2	E1	B4	D3
B3	D1	A5	E4	C2	B3	D1	A2	E5	C4	B3	D1	A4	E5	C2

A1	B2	C4	D5	E3	A1	B2	C4	D3	E5	A1	B3	C4	D5	E2
D3	E4	B5	C1	A2	D5	E4	B3	C1	A2	D2	E4	B5	C1	A3
E5	C3	D2	A4	B1	E3	C5	D2	A4	B1	E5	C2	D3	A4	B1
C2	A5	E1	B3	D4	C2	A3	E1	B5	D4	C3	A5	E1	B2	D4
B4	D1	A3	E2	C5	B4	D1	A5	E2	C3	B4	D1	A2	E3	C5

A1	B3	C4	D2	E5	A1	B5	C4	D3	E2	A1	B5	C4	D2	E3
D5	E4	B2	C1	A3	D2	E4	B3	C1	A5	D3	E4	B2	C1	A5
E2	C5	D3	A4	B1	E3	C2	D5	A4	B1	E2	C3	D5	A4	B1
C3	A2	E1	B5	D4	C5	A3	E1	B2	D4	C5	A2	E1	B3	D4
B4	D1	A5	E3	C2	B4	D1	A2	E5	C3	B4	D1	A3	E5	C2

A1	B2	C5	D4	E3	A1	B2	C5	D3	E4	A1	B3	C5	D4	E2
D3	E5	B4	C1	A2	D4	E5	B3	C1	A2	D2	E5	B4	C1	A3
E4	C3	D2	A5	B1	E3	C4	D2	A5	B1	E4	C2	D3	A5	B1
C2	A4	E1	B3	D5	C2	A3	E1	B4	D5	C3	A4	E1	B2	D5
B5	D1	A3	E2	C4	B5	D1	A4	E2	C3	B5	D1	A2	E3	C4

A1	B3	C5	D2	E4	A1	B4	C5	D3	E2	A1	B4	C5	D2	E3
D4	E5	B2	C1	A3	D2	E5	B3	C1	A4	D3	E5	B2	C1	A4
E2	C4	D3	A5	B1	E3	C2	D4	A5	B1	E2	C3	D4	A5	B1
C3	A2	E1	B4	D5	C4	A3	E1	B2	D5	C4	A2	E1	B3	D5
B5	D1	A4	E3	C2	B5	D1	A2	E4	C3	B5	D1	A3	E4	C2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 14)

A1	C5	D4	E3	B2	A1	C4	D5	E3	B2	A1	C5	D3	E4	B2
D3	E2	B1	A5	C4	D3	E2	B1	A4	C5	D4	E2	B1	A5	C3
B5	A4	C3	D2	E1	B4	A5	C3	D2	E1	B5	A3	C4	D2	E1
C2	D1	E5	B4	A3	C2	D1	E4	B5	A3	C2	D1	E5	B3	A4
E4	B3	A2	C1	D5	E5	B3	A2	C1	D4	E3	B4	A2	C1	D5

A1	C3	D5	E4	B2	A1	C4	D3	E5	B2	A1	C3	D4	E5	B2
D4	E2	B1	A3	C5	D5	E2	B1	A4	C3	D5	E2	B1	A3	C4
B3	A5	C4	D2	E1	B4	A3	C5	D2	E1	B3	A4	C5	D2	E1
C2	D1	E3	B5	A4	C2	D1	E4	B3	A5	C2	D1	E3	B4	A5
E5	B4	A2	C1	D3	E3	B5	A2	C1	D4	E4	B5	A2	C1	D3

A1	C5	D4	E2	B3	A1	C4	D5	E2	B3	A1	C5	D2	E4	B3
D2	E3	B1	A5	C4	D2	E3	B1	A4	C5	D4	E3	B1	A5	C2
B5	A4	C2	D3	E1	B4	A5	C2	D3	E1	B5	A2	C4	D3	E1
C3	D1	E5	B4	A2	C3	D1	E4	B5	A2	C3	D1	E5	B2	A4
E4	B2	A3	C1	D5	E5	B2	A3	C1	D4	E2	B4	A3	C1	D5

A1	C2	D5	E4	B3	A1	C4	D2	E5	B3	A1	C2	D4	E5	B3
D4	E3	B1	A2	C5	D5	E3	B1	A4	C2	D5	E3	B1	A2	C4
B2	A5	C4	D3	E1	B4	A2	C5	D3	E1	B2	A4	C5	D3	E1
C3	D1	E2	B5	A4	C3	D1	E4	B2	A5	C3	D1	E2	B4	A5
E5	B4	A3	C1	D2	E2	B5	A3	C1	D4	E4	B5	A3	C1	D2

A1	C5	D3	E2	B4	A1	C3	D5	E2	B4	A1	C5	D2	E3	B4
D2	E4	B1	A5	C3	D2	E4	B1	A3	C5	D3	E4	B1	A5	C2
B5	A3	C2	D4	E1	B3	A5	C2	D4	E1	B5	A2	C3	D4	E1
C4	D1	E5	B3	A2	C4	D1	E3	B5	A2	C4	D1	E5	B2	A3
E3	B2	A4	C1	D5	E5	B2	A4	C1	D3	E2	B3	A4	C1	D5

A1	C2	D5	E3	B4	A1	C3	D2	E5	B4	A1	C2	D3	E5	B4
D3	E4	B1	A2	C5	D5	E4	B1	A3	C2	D5	E4	B1	A2	C3
B2	A5	C3	D4	E1	B3	A2	C5	D4	E1	B2	A3	C5	D4	E1
C4	D1	E2	B5	A3	C4	D1	E3	B2	A5	C4	D1	E2	B3	A5
E5	B3	A4	C1	D2	E2	B5	A4	C1	D3	E3	B5	A4	C1	D2

A1	C4	D3	E2	B5	A1	C3	D4	E2	B5	A1	C4	D2	E3	B5
D2	E5	B1	A4	C3	D2	E5	B1	A3	C4	D3	E5	B1	A4	C2
B4	A3	C2	D5	E1	B3	A4	C2	D5	E1	B4	A2	C3	D5	E1
C5	D1	E4	B3	A2	C5	D1	E3	B4	A2	C5	D1	E4	B2	A3
E3	B2	A5	C1	D4	E4	B2	A5	C1	D3	E2	B3	A5	C1	D4

A1	C2	D4	E3	B5	A1	C3	D2	E4	B5	A1	C2	D3	E4	B5
D3	E5	B1	A2	C4	D4	E5	B1	A3	C2	D4	E5	B1	A2	C3
B2	A4	C3	D5	E1	B3	A2	C4	D5	E1	B2	A3	C4	D5	E1
C5	D1	E2	B4	A3	C5	D1	E3	B2	A4	C5	D1	E2	B3	A4
E4	B3	A5	C1	D2	E2	B4	A5	C1	D3	E3	B4	A5	C1	D2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 14)

A1	C4	E5	B3	D2
D3	E2	B4	A5	C1
B2	D5	C3	E1	A4
C5	B1	A2	D4	E3
E4	A3	D1	C2	B5

A1	C5	E4	B3	D2
D3	E2	B5	A4	C1
B2	D4	C3	E1	A5
C4	B1	A2	D5	E3
E5	A3	D1	C2	B4

A1	C3	E5	B4	D2
D4	E2	B3	A5	C1
B2	D5	C4	E1	A3
C5	B1	A2	D3	E4
E3	A4	D1	C2	B5

A1	C5	E3	B4	D2
D4	E2	B5	A3	C1
B2	D3	C4	E1	A5
C3	B1	A2	D5	E4
E5	A4	D1	C2	B3

A1	C3	E4	B5	D2
D5	E2	B3	A4	C1
B2	D4	C5	E1	A3
C4	B1	A2	D3	E5
E3	A5	D1	C2	B4

A1	C4	E3	B5	D2
D5	E2	B4	A3	C1
B2	D3	C5	E1	A4
C3	B1	A2	D4	E5
E4	A5	D1	C2	B3

A1	C4	E5	B2	D3
D2	E3	B4	A5	C1
B3	D5	C2	E1	A4
C5	B1	A3	D4	E2
E4	A2	D1	C3	B5

A1	C5	E4	B2	D3
D2	E3	B5	A4	C1
B3	D4	C2	E1	A5
C4	B1	A3	D5	E2
E5	A2	D1	C3	B4

A1	C2	E5	B4	D3
D4	E3	B2	A5	C1
B3	D5	C4	E1	A2
C5	B1	A3	D2	E4
E2	A4	D1	C3	B5

A1	C5	E2	B4	D3
D4	E3	B5	A2	C1
B3	D2	C4	E1	A5
C2	B1	A3	D5	E4
E5	A4	D1	C3	B2

A1	C2	E4	B5	D3
D5	E3	B2	A4	C1
B3	D4	C5	E1	A2
C4	B1	A3	D2	E5
E2	A5	D1	C3	B4

A1	C4	E2	B5	D3
D5	E3	B4	A2	C1
B3	D2	C5	E1	A4
C2	B1	A3	D4	E5
E4	A5	D1	C3	B2

A1	C3	E5	B2	D4
D2	E4	B3	A5	C1
B4	D5	C2	E1	A3
C5	B1	A4	D3	E2
E3	A2	D1	C4	B5

A1	C5	E3	B2	D4
D2	E4	B5	A3	C1
B4	D3	C2	E1	A5
C3	B1	A4	D5	E2
E5	A2	D1	C4	B3

A1	C2	E5	B3	D4
D3	E4	B2	A5	C1
B4	D5	C3	E1	A2
C5	B1	A4	D2	E3
E2	A3	D1	C4	B5

A1	C5	E2	B3	D4
D3	E4	B5	A2	C1
B4	D2	C3	E1	A5
C2	B1	A4	D5	E3
E5	A3	D1	C4	B2

A1	C2	E3	B5	D4
D5	E4	B2	A3	C1
B4	D3	C5	E1	A2
C3	B1	A4	D2	E5
E2	A5	D1	C4	B3

A1	C3	E2	B5	D4
D5	E4	B3	A2	C1
B4	D2	C5	E1	A3
C2	B1	A4	D3	E5
E3	A5	D1	C4	B2

A1	C3	E4	B2	D5
D2	E5	B3	A4	C1
B5	D4	C2	E1	A3
C4	B1	A5	D3	E2
E3	A2	D1	C5	B4

A1	C4	E3	B2	D5
D2	E5	B4	A3	C1
B5	D3	C2	E1	A4
C3	B1	A5	D4	E2
E4	A2	D1	C5	B3

A1	C2	E4	B3	D5
D3	E5	B2	A4	C1
B5	D4	C3	E1	A2
C4	B1	A5	D2	E3
E2	A3	D1	C5	B4

A1	C4	E2	B3	D5
D3	E5	B4	A2	C1
B5	D2	C3	E1	A4
C2	B1	A5	D4	E3
E4	A3	D1	C5	B2

A1	C2	E3	B4	D5
D4	E5	B2	A3	C1
B5	D3	C4	E1	A2
C3	B1	A5	D2	E4
E2	A4	D1	C5	B3

A1	C3	E2	B4	D5
D4	E5	B3	A2	C1
B5	D2	C4	E1	A3
C2	B1	A5	D3	E4
E3	A4	D1	C5	B2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 15)

A1	B3	C5	E2	D4	A1	B3	C4	E2	D5	A1	B4	C5	E2	D3
E5	D2	A4	B1	C3	E4	D2	A5	B1	C3	E5	D2	A3	B1	C4
B4	C1	E3	D5	A2	B5	C1	E3	D4	A2	B3	C1	E4	D5	A2
D3	A5	B2	C4	E1	D3	A4	B2	C5	E1	D4	A5	B2	C3	E1
C2	E4	D1	A3	B5	C2	E5	D1	A3	B4	C2	E3	D1	A4	B5

A1	B4	C3	E2	D5	A1	B5	C4	E2	D3	A1	B5	C3	E2	D4
E3	D2	A5	B1	C4	E4	D2	A3	B1	C5	E3	D2	A4	B1	C5
B5	C1	E4	D3	A2	B3	C1	E5	D4	A2	B4	C1	E5	D3	A2
D4	A3	B2	C5	E1	D5	A4	B2	C3	E1	D5	A3	B2	C4	E1
C2	E5	D1	A4	B3	C2	E3	D1	A5	B4	C2	E4	D1	A5	B3

A1	B2	C5	E3	D4	A1	B2	C4	E3	D5	A1	B4	C5	E3	D2
E5	D3	A4	B1	C2	E4	D3	A5	B1	C2	E5	D3	A2	B1	C4
B4	C1	E2	D5	A3	B5	C1	E2	D4	A3	B2	C1	E4	D5	A3
D2	A5	B3	C4	E1	D2	A4	B3	C5	E1	D4	A5	B3	C2	E1
C3	E4	D1	A2	B5	C3	E5	D1	A2	B4	C3	E2	D1	A4	B5

A1	B4	C2	E3	D5	A1	B5	C4	E3	D2	A1	B5	C2	E3	D4
E2	D3	A5	B1	C4	E4	D3	A2	B1	C5	E2	D3	A4	B1	C5
B5	C1	E4	D2	A3	B2	C1	E5	D4	A3	B4	C1	E5	D2	A3
D4	A2	B3	C5	E1	D5	A4	B3	C2	E1	D5	A2	B3	C4	E1
C3	E5	D1	A4	B2	C3	E2	D1	A5	B4	C3	E4	D1	A5	B2

A1	B2	C5	E4	D3	A1	B2	C3	E4	D5	A1	B3	C5	E4	D2
E5	D4	A3	B1	C2	E3	D4	A5	B1	C2	E5	D4	A2	B1	C3
B3	C1	E2	D5	A4	B5	C1	E2	D3	A4	B2	C1	E3	D5	A4
D2	A5	B4	C3	E1	D2	A3	B4	C5	E1	D3	A5	B4	C2	E1
C4	E3	D1	A2	B5	C4	E5	D1	A2	B3	C4	E2	D1	A3	B5

A1	B3	C2	E4	D5	A1	B5	C3	E4	D2	A1	B5	C2	E4	D3
E2	D4	A5	B1	C3	E3	D4	A2	B1	C5	E2	D4	A3	B1	C5
B5	C1	E3	D2	A4	B2	C1	E5	D3	A4	B3	C1	E5	D2	A4
D3	A2	B4	C5	E1	D5	A3	B4	C2	E1	D5	A2	B4	C3	E1
C4	E5	D1	A3	B2	C4	E2	D1	A5	B3	C4	E3	D1	A5	B2

A1	B2	C4	E5	D3	A1	B2	C3	E5	D4	A1	B3	C4	E5	D2
E4	D5	A3	B1	C2	E3	D5	A4	B1	C2	E4	D5	A2	B1	C3
B3	C1	E2	D4	A5	B4	C1	E2	D3	A5	B2	C1	E3	D4	A5
D2	A4	B5	C3	E1	D2	A3	B5	C4	E1	D3	A4	B5	C2	E1
C5	E3	D1	A2	B4	C5	E4	D1	A2	B3	C5	E2	D1	A3	B4

A1	B3	C2	E5	D4	A1	B4	C3	E5	D2	A1	B4	C2	E5	D3
E2	D5	A4	B1	C3	E3	D5	A2	B1	C4	E2	D5	A3	B1	C4
B4	C1	E3	D2	A5	B2	C1	E4	D3	A5	B3	C1	E4	D2	A5
D3	A2	B5	C4	E1	D4	A3	B5	C2	E1	D4	A2	B5	C3	E1
C5	E4	D1	A3	B2	C5	E2	D1	A4	B3	C5	E3	D1	A4	B2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 15)

A1	C3	B5	E2	D4	A1	C3	B4	E2	D5	A1	C4	B5	E2	D3
E5	D2	A4	C1	B3	E4	D2	A5	C1	B3	E5	D2	A3	C1	B4
C4	B1	E3	D5	A2	C5	B1	E3	D4	A2	C3	B1	E4	D5	A2
D3	A5	C2	B4	E1	D3	A4	C2	B5	E1	D4	A5	C2	B3	E1
B2	E4	D1	A3	C5	B2	E5	D1	A3	C4	B2	E3	D1	A4	C5

A1	C4	B3	E2	D5	A1	C5	B4	E2	D3	A1	C5	B3	E2	D4
E3	D2	A5	C1	B4	E4	D2	A3	C1	B5	E3	D2	A4	C1	B5
C5	B1	E4	D3	A2	C3	B1	E5	D4	A2	C4	B1	E5	D3	A2
D4	A3	C2	B5	E1	D5	A4	C2	B3	E1	D5	A3	C2	B4	E1
B2	E5	D1	A4	C3	B2	E3	D1	A5	C4	B2	E4	D1	A5	C3

A1	C2	B5	E3	D4	A1	C2	B4	E3	D5	A1	C4	B5	E3	D2
E5	D3	A4	C1	B2	E4	D3	A5	C1	B2	E5	D3	A2	C1	B4
C4	B1	E2	D5	A3	C5	B1	E2	D4	A3	C2	B1	E4	D5	A3
D2	A5	C3	B4	E1	D2	A4	C3	B5	E1	D4	A5	C3	B2	E1
B3	E4	D1	A2	C5	B3	E5	D1	A2	C4	B3	E2	D1	A4	C5

A1	C4	B2	E3	D5	A1	C5	B4	E3	D2	A1	C5	B2	E3	D4
E2	D3	A5	C1	B4	E4	D3	A2	C1	B5	E2	D3	A4	C1	B5
C5	B1	E4	D2	A3	C2	B1	E5	D4	A3	C4	B1	E5	D2	A3
D4	A2	C3	B5	E1	D5	A4	C3	B2	E1	D5	A2	C3	B4	E1
B3	E5	D1	A4	C2	B3	E2	D1	A5	C4	B3	E4	D1	A5	C2

A1	C2	B5	E4	D3	A1	C2	B3	E4	D5	A1	C3	B5	E4	D2
E5	D4	A3	C1	B2	E3	D4	A5	C1	B2	E5	D4	A2	C1	B3
C3	B1	E2	D5	A4	C5	B1	E2	D3	A4	C2	B1	E3	D5	A4
D2	A5	C4	B3	E1	D2	A3	C4	B5	E1	D3	A5	C4	B2	E1
B4	E3	D1	A2	C5	B4	E5	D1	A2	C3	B4	E2	D1	A3	C5

A1	C3	B2	E4	D5	A1	C5	B3	E4	D2	A1	C5	B2	E4	D3
E2	D4	A5	C1	B3	E3	D4	A2	C1	B5	E2	D4	A3	C1	B5
C5	B1	E3	D2	A4	C2	B1	E5	D3	A4	C3	B1	E5	D2	A4
D3	A2	C4	B5	E1	D5	A3	C4	B2	E1	D5	A2	C4	B3	E1
B4	E5	D1	A3	C2	B4	E2	D1	A5	C3	B4	E3	D1	A5	C2

A1	C2	B4	E5	D3	A1	C2	B3	E5	D4	A1	C3	B4	E5	D2
E4	D5	A3	C1	B2	E3	D5	A4	C1	B2	E4	D5	A2	C1	B3
C3	B1	E2	D4	A5	C4	B1	E2	D3	A5	C2	B1	E3	D4	A5
D2	A4	C5	B3	E1	D2	A3	C5	B4	E1	D3	A4	C5	B2	E1
B5	E3	D1	A2	C4	B5	E4	D1	A2	C3	B5	E2	D1	A3	C4

A1	C3	B2	E5	D4	A1	C4	B3	E5	D2	A1	C4	B2	E5	D3
E2	D5	A4	C1	B3	E3	D5	A2	C1	B4	E2	D5	A3	C1	B4
C4	B1	E3	D2	A5	C2	B1	E4	D3	A5	C3	B1	E4	D2	A5
D3	A2	C5	B4	E1	D4	A3	C5	B2	E1	D4	A2	C5	B3	E1
B5	E4	D1	A3	C2	B5	E2	D1	A4	C3	B5	E3	D1	A4	C2

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Magic Square of Order *n* = 5

Tropic of Square (nr: 16)

A1	B3	C2	E5	D4	A1	B3	C2	E4	D5	A1	B4	C2	E5	D3
E4	D2	B5	C1	A3	E5	D2	B4	C1	A3	E3	D2	B5	C1	A4
D5	C4	E3	A2	B1	D4	C5	E3	A2	B1	D5	C3	E4	A2	B1
C3	A5	D1	B4	E2	C3	A4	D1	B5	E2	C4	A5	D1	B3	E2
B2	E1	A4	D3	C5	B2	E1	A5	D3	C4	B2	E1	A3	D4	C5

A1	B4	C2	E3	D5	A1	B5	C2	E4	D3	A1	B5	C2	E3	D4
E5	D2	B3	C1	A4	E3	D2	B4	C1	A5	E4	D2	B3	C1	A5
D3	C5	E4	A2	B1	D4	C3	E5	A2	B1	D3	C4	E5	A2	B1
C4	A3	D1	B5	E2	C5	A4	D1	B3	E2	C5	A3	D1	B4	E2
B2	E1	A5	D4	C3	B2	E1	A3	D5	C4	B2	E1	A4	D5	C3

A1	B2	C3	E5	D4	A1	B2	C3	E4	D5	A1	B4	C3	E5	D2
E4	D3	B5	C1	A2	E5	D3	B4	C1	A2	E2	D3	B5	C1	A4
D5	C4	E2	A3	B1	D4	C5	E2	A3	B1	D5	C2	E4	A3	B1
C2	A5	D1	B4	E3	C2	A4	D1	B5	E3	C4	A5	D1	B2	E3
B3	E1	A4	D2	C5	B3	E1	A5	D2	C4	B3	E1	A2	D4	C5

A1	B4	C3	E2	D5	A1	B5	C3	E4	D2	A1	B5	C3	E2	D4
E5	D3	B2	C1	A4	E2	D3	B4	C1	A5	E4	D3	B2	C1	A5
D2	C5	E4	A3	B1	D4	C2	E5	A3	B1	D2	C4	E5	A3	B1
C4	A2	D1	B5	E3	C5	A4	D1	B2	E3	C5	A2	D1	B4	E3
B3	E1	A5	D4	C2	B3	E1	A2	D5	C4	B3	E1	A4	D5	C2

A1	B2	C4	E5	D3	A1	B2	C4	E3	D5	A1	B3	C4	E5	D2
E3	D4	B5	C1	A2	E5	D4	B3	C1	A2	E2	D4	B5	C1	A3
D5	C3	E2	A4	B1	D3	C5	E2	A4	B1	D5	C2	E3	A4	B1
C2	A5	D1	B3	E4	C2	A3	D1	B5	E4	C3	A5	D1	B2	E4
B4	E1	A3	D2	C5	B4	E1	A5	D2	C3	B4	E1	A2	D3	C5

A1	B3	C4	E2	D5	A1	B5	C4	E3	D2	A1	B5	C4	E2	D3
E5	D4	B2	C1	A3	E2	D4	B3	C1	A5	E3	D4	B2	C1	A5
D2	C5	E3	A4	B1	D3	C2	E5	A4	B1	D2	C3	E5	A4	B1
C3	A2	D1	B5	E4	C5	A3	D1	B2	E4	C5	A2	D1	B3	E4
B4	E1	A5	D3	C2	B4	E1	A2	D5	C3	B4	E1	A3	D5	C2

A1	B2	C5	E4	D3	A1	B2	C5	E3	D4	A1	B3	C5	E4	D2
E3	D5	B4	C1	A2	E4	D5	B3	C1	A2	E2	D5	B4	C1	A3
D4	C3	E2	A5	B1	D3	C4	E2	A5	B1	D4	C2	E3	A5	B1
C2	A4	D1	B3	E5	C2	A3	D1	B4	E5	C3	A4	D1	B2	E5
B5	E1	A3	D2	C4	B5	E1	A4	D2	C3	B5	E1	A2	D3	C4

A1	B3	C5	E2	D4	A1	B4	C5	E3	D2	A1	B4	C5	E2	D3
E4	D5	B2	C1	A3	E2	D5	B3	C1	A4	E3	D5	B2	C1	A4
D2	C4	E3	A5	B1	D3	C2	E4	A5	B1	D2	C3	E4	A5	B1
C3	A2	D1	B4	E5	C4	A3	D1	B2	E5	C4	A2	D1	B3	E5
B5	E1	A4	D3	C2	B5	E1	A2	D4	C3	B5	E1	A3	D4	C2

16:1

Magic Square of Order *n* = 5

Tropic of Square (nr: 16)

A1	C4	D5	B3	E2
E3	D2	B4	A5	C1
B2	E5	C3	D1	A4
C5	B1	A2	E4	D3
D4	A3	E1	C2	B5

A1	C5	D4	B3	E2
E3	D2	B5	A4	C1
B2	E4	C3	D1	A5
C4	B1	A2	E5	D3
D5	A3	E1	C2	B4

A1	C3	D5	B4	E2
E4	D2	B3	A5	C1
B2	E5	C4	D1	A3
C5	B1	A2	E3	D4
D3	A4	E1	C2	B5

A1	C5	D3	B4	E2
E4	D2	B5	A3	C1
B2	E3	C4	D1	A5
C3	B1	A2	E5	D4
D5	A4	E1	C2	B3

A1	C3	D4	B5	E2
E5	D2	B3	A4	C1
B2	E4	C5	D1	A3
C4	B1	A2	E3	D5
D3	A5	E1	C2	B4

A1	C4	D3	B5	E2
E5	D2	B4	A3	C1
B2	E3	C5	D1	A4
C3	B1	A2	E4	D5
D4	A5	E1	C2	B3

A1	C4	D5	B2	E3
E2	D3	B4	A5	C1
B3	E5	C2	D1	A4
C5	B1	A3	E4	D2
D4	A2	E1	C3	B5

A1	C5	D4	B2	E3
E2	D3	B5	A4	C1
B3	E4	C2	D1	A5
C4	B1	A3	E5	D2
D5	A2	E1	C3	B4

A1	C2	D5	B4	E3
E4	D3	B2	A5	C1
B3	E5	C4	D1	A2
C5	B1	A3	E2	D4
D2	A4	E1	C3	B5

A1	C5	D2	B4	E3
E4	D3	B5	A2	C1
B3	E2	C4	D1	A5
C2	B1	A3	E5	D4
D5	A4	E1	C3	B2

A1	C2	D4	B5	E3
E5	D3	B2	A4	C1
B3	E4	C5	D1	A2
C4	B1	A3	E2	D5
D2	A5	E1	C3	B4

A1	C4	D2	B5	E3
E5	D3	B4	A2	C1
B3	E2	C5	D1	A4
C2	B1	A3	E4	D5
D4	A5	E1	C3	B2

A1	C3	D5	B2	E4
E2	D4	B3	A5	C1
B4	E5	C2	D1	A3
C5	B1	A4	E3	D2
D3	A2	E1	C4	B5

A1	C5	D3	B2	E4
E2	D4	B5	A3	C1
B4	E3	C2	D1	A5
C3	B1	A4	E5	D2
D5	A2	E1	C4	B3

A1	C2	D5	B3	E4
E3	D4	B2	A5	C1
B4	E5	C3	D1	A2
C5	B1	A4	E2	D3
D2	A3	E1	C4	B5

A1	C5	D2	B3	E4
E3	D4	B5	A2	C1
B4	E2	C3	D1	A5
C2	B1	A4	E5	D3
D5	A3	E1	C4	B2

A1	C2	D3	B5	E4
E5	D4	B2	A3	C1
B4	E3	C5	D1	A2
C3	B1	A4	E2	D5
D2	A5	E1	C4	B3

A1	C3	D2	B5	E4
E5	D4	B3	A2	C1
B4	E2	C5	D1	A3
C2	B1	A4	E3	D5
D3	A5	E1	C4	B2

A1	C3	D4	B2	E5
E2	D5	B3	A4	C1
B5	E4	C2	D1	A3
C4	B1	A5	E3	D2
D3	A2	E1	C5	B4

A1	C4	D3	B2	E5
E2	D5	B4	A3	C1
B5	E3	C2	D1	A4
C3	B1	A5	E4	D2
D4	A2	E1	C5	B3

A1	C2	D4	B3	E5
E3	D5	B2	A4	C1
B5	E4	C3	D1	A2
C4	B1	A5	E2	D3
D2	A3	E1	C5	B4

A1	C4	D2	B3	E5
E3	D5	B4	A2	C1
B5	E2	C3	D1	A4
C2	B1	A5	E4	D3
D4	A3	E1	C5	B2

A1	C2	D3	B4	E5
E4	D5	B2	A3	C1
B5	E3	C4	D1	A2
C3	B1	A5	E2	D4
D2	A4	E1	C5	B3

A1	C3	D2	B4	E5
E4	D5	B3	A2	C1
B5	E2	C4	D1	A3
C2	B1	A5	E3	D4
D3	A4	E1	C5	B2

16:2

Magic Square of Order *n* = 5

Tropic of Square (nr: 16)

A1	C5	E4	D3	B2	A1	C4	E5	D3	B2	A1	C5	E3	D4	B2
E3	D2	B1	A5	C4	E3	D2	B1	A4	C5	E4	D2	B1	A5	C3
B5	A4	C3	E2	D1	B4	A5	C3	E2	D1	B5	A3	C4	E2	D1
C2	E1	D5	B4	A3	C2	E1	D4	B5	A3	C2	E1	D5	B3	A4
D4	B3	A2	C1	E5	D5	B3	A2	C1	E4	D3	B4	A2	C1	E5

A1	C3	E5	D4	B2	A1	C4	E3	D5	B2	A1	C3	E4	D5	B2
E4	D2	B1	A3	C5	E5	D2	B1	A4	C3	E5	D2	B1	A3	C4
B3	A5	C4	E2	D1	B4	A3	C5	E2	D1	B3	A4	C5	E2	D1
C2	E1	D3	B5	A4	C2	E1	D4	B3	A5	C2	E1	D3	B4	A5
D5	B4	A2	C1	E3	D3	B5	A2	C1	E4	D4	B5	A2	C1	E3

A1	C5	E4	D2	B3	A1	C4	E5	D2	B3	A1	C5	E2	D4	B3
E2	D3	B1	A5	C4	E2	D3	B1	A4	C5	E4	D3	B1	A5	C2
B5	A4	C2	E3	D1	B4	A5	C2	E3	D1	B5	A2	C4	E3	D1
C3	E1	D5	B4	A2	C3	E1	D4	B5	A2	C3	E1	D5	B2	A4
D4	B2	A3	C1	E5	D5	B2	A3	C1	E4	D2	B4	A3	C1	E5

A1	C2	E5	D4	B3	A1	C4	E2	D5	B3	A1	C2	E4	D5	B3
E4	D3	B1	A2	C5	E5	D3	B1	A4	C2	E5	D3	B1	A2	C4
B2	A5	C4	E3	D1	B4	A2	C5	E3	D1	B2	A4	C5	E3	D1
C3	E1	D2	B5	A4	C3	E1	D4	B2	A5	C3	E1	D2	B4	A5
D5	B4	A3	C1	E2	D2	B5	A3	C1	E4	D4	B5	A3	C1	E2

A1	C5	E3	D2	B4	A1	C3	E5	D2	B4	A1	C5	E2	D3	B4
E2	D4	B1	A5	C3	E2	D4	B1	A3	C5	E3	D4	B1	A5	C2
B5	A3	C2	E4	D1	B3	A5	C2	E4	D1	B5	A2	C3	E4	D1
C4	E1	D5	B3	A2	C4	E1	D3	B5	A2	C4	E1	D5	B2	A3
D3	B2	A4	C1	E5	D5	B2	A4	C1	E3	D2	B3	A4	C1	E5

A1	C2	E5	D3	B4	A1	C3	E2	D5	B4	A1	C2	E3	D5	B4
E3	D4	B1	A2	C5	E5	D4	B1	A3	C2	E5	D4	B1	A2	C3
B2	A5	C3	E4	D1	B3	A2	C5	E4	D1	B2	A3	C5	E4	D1
C4	E1	D2	B5	A3	C4	E1	D3	B2	A5	C4	E1	D2	B3	A5
D5	B3	A4	C1	E2	D2	B5	A4	C1	E3	D3	B5	A4	C1	E2

A1	C4	E3	D2	B5	A1	C3	E4	D2	B5	A1	C4	E2	D3	B5
E2	D5	B1	A4	C3	E2	D5	B1	A3	C4	E3	D5	B1	A4	C2
B4	A3	C2	E5	D1	B3	A4	C2	E5	D1	B4	A2	C3	E5	D1
C5	E1	D4	B3	A2	C5	E1	D3	B4	A2	C5	E1	D4	B2	A3
D3	B2	A5	C1	E4	D4	B2	A5	C1	E3	D2	B3	A5	C1	E4

A1	C2	E4	D3	B5	A1	C3	E2	D4	B5	A1	C2	E3	D4	B5
E3	D5	B1	A2	C4	E4	D5	B1	A3	C2	E4	D5	B1	A2	C3
B2	A4	C3	E5	D1	B3	A2	C4	E5	D1	B2	A3	C4	E5	D1
C5	E1	D2	B4	A3	C5	E1	D3	B2	A4	C5	E1	D2	B3	A4
D4	B3	A5	C1	E2	D2	B4	A5	C1	E3	D3	B4	A5	C1	E2

16:3

13. Arithmetic progression of the key

Through an arithmetic progression into the key it is possibly to solve *n = 4* solutions on MS.

Arithmetic progression if: *a = 1* and *d = 1*

A1	=	a	+	0*d	=	1	+	0*1	=	1
A2	=	a	+	1×d	=	1	+	1*1	=	2
A3	=	a	+	2*d	=	1	+	2*1	=	3
A4	=	a	+	3*d	=	1	+	3*1	=	4
B1	=	a	+	4*d	=	1	+	4*1	=	5
B2	=	a	+	5*d	=	1	+	5*1	=	6
B3	=	a	+	6*d	=	1	+	6*1	=	7
B4	=	a	+	7*d	=	1	+	7*1	=	8
C1	=	a	+	8*d	=	1	+	8*1	=	9
C2	=	a	+	9*d	=	1	+	9*1	=	10
C3	=	a	+	10*d	=	1	+	10*1	=	11
C4	=	a	+	11*d	=	1	+	11*1	=	12
D1	=	a	+	12*d	=	1	+	12*1	=	13
D2	=	a	+	13*d	=	1	+	13*1	=	14
D3	=	a	+	14*d	=	1	+	14*1	=	15
D4	=	a	+	15*d	=	1	+	15*1	=	16

The Key

A1	=	1
A2	=	2
A3	=	3
A4	=	4
B1	=	5
B2	=	6
B3	=	7
B4	=	8
C1	=	9
C2	=	10
C3	=	11
C4	=	12
D1	=	13
D2	=	14
D3	=	15
D4	=	16

Put only in an Integer in *a* and *d*.

	Integer ↓	
a =	1	a = 0,1,2,3…
	Integer ↓	
d =	1	d = 1,2,3,4…
Σ=	34	Σ = Σ(A1:D4)/n
Σ=	34	Σ (n:a,d) →

$$\Sigma = (n : a.d) = \frac{1}{2}\cdot n\cdot\left[2\cdot a + d\cdot\left(n^2 - 1\right)\right]$$

This formula is named: "Hunter & Madachy" formula first published in an American math paper, 1975.

Arithmetic progression if: *a = 1* and *d = 1*

A1	=	a	+	0*d	=	1	+	0*1	=	1
A2	=	a	+	1×d	=	1	+	1*1	=	2
A3	=	a	+	2*d	=	1	+	2*1	=	3
A4	=	a	+	3*d	=	1	+	3*1	=	4
A5	=	a	+	4*d	=	1	+	4*1	=	5
B1	=	a	+	5*d	=	1	+	5*1	=	6
B2	=	a	+	6*d	=	1	+	6*1	=	7
B3	=	a	+	7*d	=	1	+	7*1	=	8
B4	=	a	+	8*d	=	1	+	8*1	=	9
B5	=	a	+	9*d	=	1	+	9*1	=	10
C1	=	a	+	10*d	=	1	+	10*1	=	11
C2	=	a	+	11*d	=	1	+	11*1	=	12
C3	=	a	+	12*d	=	1	+	12*1	=	13
C4	=	a	+	13*d	=	1	+	13*1	=	14
C5	=	a	+	14*d	=	1	+	14*1	=	15
D1	=	a	+	15*d	=	1	+	15*1	=	16
D2	=	a	+	16*d	=	1	+	16*1	=	17
D3	=	a	+	17*d	=	1	+	17*1	=	18
D4	=	a	+	18*d	=	1	+	18*1	=	19
D5	=	a	+	19*d	=	1	+	19*1	=	20
E1	=	a	+	20*d	=	1	+	20*1	=	21
E2	=	a	+	21*d	=	1	+	21*1	=	22
E3	=	a	+	22*d	=	1	+	22*1	=	23
E4	=	a	+	23*d	=	1	+	23*1	=	24
E5	=	a	+	24*d	=	1	+	24*1	=	25

Arithmetic progression if: *a = 2* and *d = 2*

A1	=	a	+	0*d	=	2	+	0*2	=	2
A2	=	a	+	1×d	=	2	+	1*2	=	4
A3	=	a	+	2*d	=	2	+	2*2	=	6
A4	=	a	+	3*d	=	2	+	3*2	=	8
A5	=	a	+	4*d	=	2	+	4*2	=	10
B1	=	a	+	5*d	=	2	+	5*2	=	12
B2	=	a	+	6*d	=	2	+	6*2	=	14
B3	=	a	+	7*d	=	2	+	7*2	=	16
B4	=	a	+	8*d	=	2	+	8*2	=	18
B5	=	a	+	9*d	=	2	+	9*2	=	20
C1	=	a	+	10*d	=	2	+	10*2	=	22
C2	=	a	+	11*d	=	2	+	11*2	=	24
C3	=	a	+	12*d	=	2	+	12*2	=	26
C4	=	a	+	13*d	=	2	+	13*2	=	28
C5	=	a	+	14*d	=	2	+	14*2	=	30
D1	=	a	+	15*d	=	2	+	15*2	=	32
D2	=	a	+	16*d	=	2	+	16*2	=	34
D3	=	a	+	17*d	=	2	+	17*2	=	36
D4	=	a	+	18*d	=	2	+	18*2	=	38
D5	=	a	+	19*d	=	2	+	19*2	=	40
E1	=	a	+	20*d	=	2	+	20*2	=	42
E2	=	a	+	21*d	=	2	+	21*2	=	44
E3	=	a	+	22*d	=	2	+	22*2	=	46
E4	=	a	+	23*d	=	2	+	23*2	=	48
E5	=	a	+	24*d	=	2	+	24*2	=	50

The Magic Constant for an n:th order Magic Square started with an Integer *a* and with entire in an increasing/decreasing of arithmetic series with difference *d* between terms could look like above for the arithmetic progression of order *n = 5*. The key will convert Magic Squares into Magic Constant sum. On the Excel sheet it will be possibly to master the Magic Squares with only to know the value of *a* and *d*. The computer can then compute out the rest and find the magic constant in a micro second and that to all combination of the order *n = 4* and *n = 5*. Arithmetic progression will also be possibly to use into the 64-bit code, and the 125-bit code.

14. The Genetic Code on Magic Square

There exist 2 special houses to order n = 4 and they give the combination of the genetic code.

Tropic One

A1	B3	C4	D2
D4	C2	B1	A3
B2	A4	D3	C1
C3	D1	A2	B4

Tropic Two

A1	B4	C2	D3
C3	D2	A4	B1
D4	C1	B3	A2
B2	A3	D1	C4

α = β = γ = δ =

The coloured MS above corresponds to the letter α (red), β (green), γ (blue) and δ (yellow).

1st base	2nd base 1 (U)	2 (C)	3 (A)	4 (G)	3rd base
A (U)	Phenylalanine	Serine	Tyrosine	Cysteine	α (U)
	Phenylalanine	Serine	Tyrosine	Cysteine	β (C)
	Leucine	Serine	Stop	Stop	γ (A)
	Leucine	Serine	Stop	Tryptophan	δ (G)
B (C)	Leucine	Proline	Histidine	Arginine	α (U)
	Leucine	Proline	Histidine	Arginine	β (C)
	Leucine	Proline	Glutamine	Arginine	γ (A)
	Leucine	Proline	Glutamine	Arginine	δ (G)
C (A)	Isoleucine	Threonine	Asparagine	Serine	α (U)
	Isoleucine	Threonine	Asparagine	Serine	β (C)
	Isoleucine	Threonine	Lysine	Arginine	γ (A)
	Methionine	Threonine	Lysine	Arginine	δ (G)
D (G)	Valine	Alanine	Aspartic acid	Glycine	α (U)
	Valine	Alanine	Aspartic acid	Glycine	β (C)
	Valine	Alanine	Glutamic acid	Glycine	γ (A)
	Valine	Alanine	Glutamic acid	Glycine	δ (G)

This is the international Genetic Code [19], where every amino acid gives a specific codon. The amino acid Methionine (AUG) is the start codon on the Genetic Code and where three stop cordon are named UAA, UGA and UAG. This could explain the genetic DNA-molecule. In DNA and mRNA there exist about n^3 codon, if $n = 4$, then 64-bit, which each correspond to a specific amino acid, which can translate into the protein synthesis through the ribosomes. DNA is found in bacteria, in the nuclei of eukaryotic cells, and in mitochondria. It is made up of two extremely long nucleotide chains containing the four bases adenine (A), guanine (G), thymine (T) and cytosine (C). In mRNA are the base thymine (T) replaced with uracil (U). There exist several formations of messenger RNA (mRNA), transfer RNA (tRNA) and the ribosomes RNA (rRNA). In the bacteria *Escherichia coli* it will or can be possibly mapping out the DNA-structure within magic square and this makes probably the super strong bacteria and it shows how the 3D-structure are build up in the nature. Within the Magic Squares of order $n=5$ it can probably be possibly to study 3D-Crystallography pattern of DNA-molecule through X-ray diffraction. This pattern will then be similar to the 3D-structure of order $n = 5$.

The key to RNA-codon converts the 1st base, 2nd base and 3rd base into a 3D-arrays structure.

A1α	=	UUU	B1α	=	CUU	C1α	=	AUU	D1α	=	GUU
A1β	=	UUC	B1β	=	CUC	C1β	=	AUC	D1β	=	GUC
A1γ	=	UUA	B1γ	=	CUA	C1γ	=	AUA	D1γ	=	GUA
A1δ	=	UUG	B1δ	=	CUG	C1δ	=	AUG	D1δ	=	GUG
A2α	=	UCU	B2α	=	CCU	C2α	=	ACU	D2α	=	GCU
A2β	=	UCC	B2β	=	CCC	C2β	=	ACC	D2β	=	GCC
A2γ	=	UCA	B2γ	=	CCA	C2γ	=	ACA	D2γ	=	GCA
A2δ	=	UCG	B2δ	=	CCG	C2δ	=	ACG	D2δ	=	GCG
A3α	=	UAU	B3α	=	CAU	C3α	=	AAU	D3α	=	GAU
A3β	=	UAC	B3β	=	CAC	C3β	=	AAC	D3β	=	GAC
A3γ	=	UAA	B3γ	=	CAA	C3γ	=	AAA	D3γ	=	GAA
A3δ	=	UAG	B3δ	=	CAG	C3δ	=	AAG	D3δ	=	GAG
A4α	=	UGU	B4α	=	CGU	C4α	=	AGU	D4α	=	GGU
A4β	=	UGC	B4β	=	CGC	C4β	=	AGC	D4β	=	GGC
A4γ	=	UGA	B4γ	=	CGA	C4γ	=	AGA	D4γ	=	GGA
A4δ	=	UGG	B4δ	=	CGG	C4δ	=	AGG	D4δ	=	GGG

The key pattern above gives the 3D-structure of the mRNA and DNA-molecule, if replaced Uracil (U) into Thymine (T), where the coloured squares correspond to the letter α (red), β (green), γ (blue), and δ (yellow). This makes the three dimensional system. Now it's possibly to only put the genetic codon in a system of magic squares of order *n=4*, into the key. Magic squares are arrays of number that have the property that all rows can store data structure. Then it needs only one algorithm to take out the collected data structure from a Magic Square rows cell. This compute process makes nature when the DNA transcription occurs into RNA code. Then it's possibly that the amino acids codon follows the pattern of the key and if put the key codon into magic squares, they will have the magic constant. This could explain why it exist true pattern of DNA that coded to the protein synthesis and nonsense pattern of DNA.

One 2

A1	B3	C4	D2	34
D4	C2	B1	A3	34
B2	A4	D3	C1	34
C3	D1	A2	B4	34
34	34	34	34	34
34	34	34	34	34

Two 2

A1	B3	C4	D2	34
D4	C2	B1	A3	34
B2	A4	D3	C1	34
C3	D1	A2	B4	34
34	34	34	34	34
34	34	34	34	34

One 3

Row 1	UUU	CAU	AGU	GCC	34
Row 2	GGU	ACU	CUC	UAC	34
Row 3	CCA	UGA	GAG	AUG	34
Row 4	AAA	GUA	UCG	CGG	34
	34	34	34	34	34
	34	34	34	34	34

Two 3

Row 1	UUU	CGU	ACC	GAC	34
Row 2	AAU	GCU	UGC	CUC	34
Row 3	GGA	AUA	CAG	UCG	34
Row 4	CCA	UAA	GUG	AGG	34
	34	34	34	34	34
	34	34	34	34	34

One 4

Row 1	UUU	CAU	AGC	GCC	0
	| | |	| | |	| | |	| | |	0
	| | |	| | |	| | |	| | |	0
Row 4	AAA	GUA	UCG	CGG	0
	0	0	0	0	0
					0

Two 4

Row 1	UUU	CGU	ACC	GAC	0
	| | |	| | |	| | |	| | |	0
	| | |	| | |	| | |	| | |	0
Row 2	AAU	GCU	UGC	CUC	0
	0	0	0	0	0
					0

One 5

Row 2	GGU	ACU	CUC	UAC	0
	| | |	| | |	| | |	| | |	0
	| | |	| | |	| | |	| | |	0
Row 3	CCA	UGA	GAG	AUG	0
	0	0	0	0	0
					0

Two 5

Row 3	GGA	AUA	CAG	UCG	0
	| | |	| | |	| | |	| | |	0
	| | |	| | |	| | |	| | |	0
Row 4	CCA	UAA	GUG	AGG	0
	0	0	0	0	0
					0

15. The 64-bit code on Magic Square

There exist 2 special houses to order n = 4. They give about 2304 true combinations of MS.

Tropic Left

A1α	C4δ	D2β	B3γ
D3γ	B2β	A4δ	C1α
B4δ	D1α	C3γ	A2β
C2β	A3γ	B1α	D4δ

Tropic Right

A1α	D3δ	B4β	C2γ
C4γ	B2β	D1δ	A3α
D2δ	A4α	C3γ	B1β
B3β	C1γ	A2α	D4δ

In both houses the diagonals are going from left to right with both A, B, C, D and 1, 2, 3, 4. This make that it only exist two true house of Magic Square, if the diagonal letter will not be changed. If change the combination of integer 1, 2, 3, 4, then it will exist about 48 true combination of Magic Square house, and if added the Greek letter α, β, γ, δ [26] then there are about 2 × 24 × 48 ≈ 2 304 Magic Squares. These could be of importance if trying to mapping out DNA-sequences in bacteria like *Escherichia coli* with the 3D-structure of Magic Squares.

The Key to 64-bit code

A1α	=	1	C1α	=	33
A1β	=	2	C1β	=	34
A1γ	=	3	C1γ	=	35
A1δ	=	4	C1δ	=	36
A2α	=	5	C2α	=	37
A2β	=	6	C2β	=	38
A2γ	=	7	C2γ	=	39
A2δ	=	8	C2δ	=	40
A3α	=	9	C3α	=	41
A3β	=	10	C3β	=	42
A3γ	=	11	C3γ	=	43
A3δ	=	12	C3δ	=	44
A4α	=	13	C4α	=	45
A4β	=	14	C4β	=	46
A4γ	=	15	C4γ	=	47
A4δ	=	16	C4δ	=	48
B1α	=	17	D1α	=	49
B1β	=	18	D1β	=	50
B1γ	=	19	D1γ	=	51
B1δ	=	20	D1δ	=	52
B2α	=	21	D2α	=	53
B2β	=	22	D2β	=	54
B2γ	=	23	D2γ	=	55
B2δ	=	24	D2δ	=	56
B3α	=	25	D3α	=	57
B3β	=	26	D3β	=	58
B3γ	=	27	D3γ	=	59
B3δ	=	28	D3δ	=	60
B4α	=	29	D4α	=	61
B4β	=	30	D4β	=	62
B4γ	=	31	D4γ	=	63
B4δ	=	32	D4δ	=	64

First letter	Second letter 1	2	3	4	Third letter
A	1	5	9	13	α
	2	6	10	14	β
	3	7	11	15	γ
	4	8	12	16	δ
B	17	21	25	29	α
	18	22	26	30	β
	19	23	27	31	γ
	20	24	28	32	δ
C	33	37	41	45	α
	34	38	42	46	β
	35	39	43	47	γ
	36	40	44	48	δ
D	49	53	57	61	α
	50	54	58	62	β
	51	55	59	63	γ
	52	56	60	64	δ

$$bit = n^3 = 4^3 = 64$$

$$\Sigma = (n : a, d) = \frac{1}{2} \cdot n \cdot \left[2 \cdot a + d \cdot \left(n^3 - 1\right)\right] = 130$$

If use the smallest possibly integer with the start value $a = 1$ and with entires in an increasing of arithmetic series with difference $d = 1$ between terms, the sum in a 64-bit code will be 130. The 64-bit code are build up approximately same like the genetic code with its 3D-structure in nature. Probably is the 64-bit code Magic Square better useable for high-tech development.

The 64-bit code on Magic Square

Tropic Left (1-30)

A1α	C4δ	D2β	B3γ	A1α	C4γ	D2β	B3δ	A1α	C4δ	D2γ	B3β
D3γ	B2β	A4δ	C1α	D3δ	B2β	A4γ	C1α	D3β	B2γ	A4δ	C1α
B4δ	D1α	C3γ	A2β	B4γ	D1α	C3δ	A2β	B4δ	D1α	C3β	A2γ
C2β	A3γ	B1α	D4δ	C2β	A3δ	B1α	D4γ	C2γ	A3β	B1α	D4δ

A1α	C4β	D2γ	B3δ	A1α	C4γ	D2δ	B3β	A1α	C4β	D2δ	B3γ
D3δ	B2γ	A4β	C1α	D3β	B2δ	A4γ	C1α	D3γ	B2δ	A4β	C1α
B4β	D1α	C3δ	A2γ	B4γ	D1α	C3β	A2δ	B4β	D1α	C3γ	A2δ
C2γ	A3δ	B1α	D4β	C2δ	A3β	B1α	D4γ	C2δ	A3γ	B1α	D4β

A1β	C4δ	D2α	B3γ	A1β	C4γ	D2α	B3δ	A1β	C4δ	D2γ	B3α
D3γ	B2α	A4δ	C1β	D3δ	B2α	A4γ	C1β	D3α	B2γ	A4δ	C1β
B4δ	D1β	C3γ	A2α	B4γ	D1β	C3δ	A2α	B4δ	D1β	C3α	A2γ
C2α	A3γ	B1β	D4δ	C2α	A3δ	B1β	D4γ	C2γ	A3α	B1β	D4δ

A1β	C4α	D2γ	B3δ	A1β	C4γ	D2δ	B3α	A1β	C4α	D2δ	B3γ
D3δ	B2γ	A4α	C1β	D3α	B2δ	A4γ	C1β	D3γ	B2δ	A4α	C1β
B4α	D1β	C3δ	A2γ	B4γ	D1β	C3α	A2δ	B4α	D1β	C3γ	A2δ
C2γ	A3δ	B1β	D4α	C2δ	A3α	B1β	D4γ	C2δ	A3γ	B1β	D4α

A1γ	C4δ	D2α	B3β	A1γ	C4β	D2α	B3δ	A1γ	C4δ	D2β	B3α
D3β	B2α	A4δ	C1γ	D3δ	B2α	A4β	C1γ	D3α	B2β	A4δ	C1γ
B4δ	D1γ	C3β	A2α	B4β	D1γ	C3δ	A2α	B4δ	D1γ	C3α	A2β
C2α	A3β	B1γ	D4δ	C2α	A3δ	B1γ	D4β	C2β	A3α	B1γ	D4δ

A1γ	C4α	D2β	B3δ	A1γ	C4β	D2δ	B3α	A1γ	C4α	D2δ	B3β
D3δ	B2β	A4α	C1γ	D3α	B2δ	A4β	C1γ	D3β	B2δ	A4α	C1γ
B4α	D1γ	C3δ	A2β	B4β	D1γ	C3α	A2δ	B4α	D1γ	C3β	A2δ
C2β	A3δ	B1γ	D4α	C2δ	A3α	B1γ	D4β	C2δ	A3β	B1γ	D4α

A1δ	C4γ	D2α	B3β	A1δ	C4β	D2α	B3γ	A1δ	C4γ	D2β	B3α
D3β	B2α	A4γ	C1δ	D3γ	B2α	A4β	C1δ	D3α	B2β	A4γ	C1δ
B4γ	D1δ	C3β	A2α	B4β	D1δ	C3γ	A2α	B4γ	D1δ	C3α	A2β
C2α	A3β	B1δ	D4γ	C2α	A3γ	B1δ	D4β	C2β	A3α	B1δ	D4γ

A1δ	C4α	D2β	B3γ	A1δ	C4β	D2γ	B3α	A1δ	C4α	D2γ	B3β
D3γ	B2β	A4α	C1δ	D3α	B2γ	A4β	C1δ	D3β	B2γ	A4α	C1δ
B4α	D1δ	C3γ	A2β	B4β	D1δ	C3α	A2γ	B4α	D1δ	C3β	A2γ
C2β	A3γ	B1δ	D4α	C2γ	A3α	B1δ	D4β	C2γ	A3β	B1δ	D4α

2

A1α	C3δ	D2β	B4γ	A1α	C3γ	D2β	B4δ	A1α	C3δ	D2γ	B4β
D4γ	B2β	A3δ	C1α	D4δ	B2β	A3γ	C1α	D4β	B2γ	A3δ	C1α
B3δ	D1α	C4γ	A2β	B3γ	D1α	C4δ	A2β	B3δ	D1α	C4β	A2γ
C2β	A4γ	B1α	D3δ	C2β	A4δ	B1α	D3γ	C2γ	A4β	B1α	D3δ

A1α	C3β	D2γ	B4δ	A1α	C3γ	D2δ	B4β	A1α	C3β	D2δ	B4γ
D4δ	B2γ	A3β	C1α	D4β	B2δ	A3γ	C1α	D4γ	B2δ	A3β	C1α
B3β	D1α	C4δ	A2γ	B3γ	D1α	C4β	A2δ	B3β	D1α	C4γ	A2δ
C2γ	A4δ	B1α	D3β	C2δ	A4β	B1α	D3γ	C2δ	A4γ	B1α	D3β

The 64-bit code on Magic Square

Tropic Left (31-60)

A1β	C3δ	D2α	B4γ	A1β	C3γ	D2α	B4δ	A1β	C3δ	D2γ	B4α
D4γ	B2α	A3δ	C1β	D4δ	B2α	A3γ	C1β	D4α	B2γ	A3δ	C1β
B3δ	D1β	C4γ	A2α	B3γ	D1β	C4δ	A2α	B3δ	D1β	C4α	A2γ
C2α	A4γ	B1β	D3δ	C2α	A4δ	B1β	D3γ	C2γ	A4α	B1β	D3δ

A1β	C3α	D2γ	B4δ	A1β	C3γ	D2δ	B4α	A1β	C3α	D2δ	B4γ
D4δ	B2γ	A3α	C1β	D4α	B2δ	A3γ	C1β	D4γ	B2δ	A3α	C1β
B3α	D1β	C4δ	A2γ	B3γ	D1β	C4α	A2δ	B3α	D1β	C4γ	A2δ
C2γ	A4δ	B1β	D3α	C2δ	A4α	B1β	D3γ	C2δ	A4γ	B1β	D3α

A1γ	C3δ	D2α	B4β	A1γ	C3β	D2α	B4δ	A1γ	C3δ	D2β	B4α
D4β	B2α	A3δ	C1γ	D4δ	B2α	A3β	C1γ	D4α	B2β	A3δ	C1γ
B3δ	D1γ	C4β	A2α	B3β	D1γ	C4δ	A2α	B3δ	D1γ	C4α	A2β
C2α	A4β	B1γ	D3δ	C2α	A4δ	B1γ	D3β	C2β	A4α	B1γ	D3δ

A1γ	C3α	D2β	B4δ	A1γ	C3β	D2δ	B4α	A1γ	C3α	D2δ	B4β
D4δ	B2β	A3α	C1γ	D4α	B2δ	A3β	C1γ	D4β	B2δ	A3α	C1γ
B3α	D1γ	C4δ	A2β	B3β	D1γ	C4α	A2δ	B3α	D1γ	C4β	A2δ
C2β	A4δ	B1γ	D3α	C2δ	A4α	B1γ	D3β	C2δ	A4β	B1γ	D3α

A1δ	C3γ	D2α	B4β	A1δ	C3β	D2α	B4γ	A1δ	C3γ	D2β	B4α
D4β	B2α	A3γ	C1δ	D4γ	B2α	A3β	C1δ	D4α	B2β	A3γ	C1δ
B3γ	D1δ	C4β	A2α	B3β	D1δ	C4γ	A2α	B3γ	D1δ	C4α	A2β
C2α	A4β	B1δ	D3γ	C2α	A4γ	B1δ	D3β	C2β	A4α	B1δ	D3γ

A1δ	C3α	D2β	B4γ	A1δ	C3β	D2γ	B4α	A1δ	C3α	D2γ	B4β
D4γ	B2β	A3α	C1δ	D4α	B2γ	A3β	C1δ	D4β	B2γ	A3α	C1δ
B3α	D1δ	C4γ	A2β	B3β	D1δ	C4α	A2γ	B3α	D1δ	C4β	A2γ
C2β	A4γ	B1δ	D3α	C2γ	A4α	B1δ	D3β	C2γ	A4β	B1δ	D3α

A1α	C4δ	D3β	B2γ	A1α	C4γ	D3β	B2δ	A1α	C4δ	D3γ	B2β
D2γ	B3β	A4δ	C1α	D2δ	B3β	A4γ	C1α	D2β	B3γ	A4δ	C1α
B4δ	D1α	C2γ	A3β	B4γ	D1α	C2δ	A3β	B4δ	D1α	C2β	A3γ
C3β	A2γ	B1α	D4δ	C3β	A2δ	B1α	D4γ	C3γ	A2β	B1α	D4δ

A1α	C4β	D3γ	B2δ	A1α	C4γ	D3δ	B2β	A1α	C4β	D3δ	B2γ
D2δ	B3γ	A4β	C1α	D2β	B3δ	A4γ	C1α	D2γ	B3δ	A4β	C1α
B4β	D1α	C2δ	A3γ	B4γ	D1α	C2β	A3δ	B4β	D1α	C2γ	A3δ
C3γ	A2δ	B1α	D4β	C3δ	A2β	B1α	D4γ	C3δ	A2γ	B1α	D4β

A1β	C4δ	D3α	B2γ	A1β	C4γ	D3α	B2δ	A1β	C4δ	D3γ	B2α
D2γ	B3α	A4δ	C1β	D2δ	B3α	A4γ	C1β	D2α	B3γ	A4δ	C1β
B4δ	D1β	C2γ	A3α	B4γ	D1β	C2δ	A3α	B4δ	D1β	C2α	A3γ
C3α	A2γ	B1β	D4δ	C3α	A2δ	B1β	D4γ	C3γ	A2α	B1β	D4δ

A1β	C4α	D3γ	B2δ	A1β	C4γ	D3δ	B2α	A1β	C4α	D3δ	B2γ
D2δ	B3γ	A4α	C1β	D2α	B3δ	A4γ	C1β	D2γ	B3δ	A4α	C1β
B4α	D1β	C2δ	A3γ	B4γ	D1β	C2α	A3δ	B4α	D1β	C2γ	A3δ
C3γ	A2δ	B1β	D4α	C3δ	A2α	B1β	D4γ	C3δ	A2γ	B1β	D4α

The 64-bit code on Magic Square

Tropic Left (61-90)

A1γ	C4δ	D3α	B2β	A1γ	C4β	D3α	B2δ	A1γ	C4δ	B3β	B2α
D2β	B3α	A4δ	C1γ	D2δ	B3α	A4β	C1γ	D2α	B3β	A4δ	C1γ
B4δ	D1γ	C2β	A3α	B4β	D1γ	C2δ	A3α	B4δ	D1γ	C2α	A3β
C3α	A2β	B1γ	D4δ	C3α	A2δ	B1γ	D4β	C3β	A2α	B1γ	D4δ

A1γ	C4α	D3β	B2δ	A1γ	C4β	D3δ	B2α	A1γ	C4α	D3δ	B2β
D2δ	B3β	A4α	C1γ	D2α	B3δ	A4β	C1γ	D2β	B3δ	A4α	C1γ
B4α	D1γ	C2δ	A3β	B4β	D1γ	C2α	A3δ	B4α	D1γ	C2β	A3δ
C3β	A2δ	B1γ	D4α	C3δ	A2α	B1γ	D4β	C3δ	A2β	B1γ	D4α

A1δ	C4γ	D3α	B2β	A1δ	C4γ	D3α	B2β	A1δ	C4γ	D3β	B2α
D2β	B3α	A4γ	C1δ	D2β	B3α	A4γ	C1δ	D2α	B3β	A4γ	C1δ
B4γ	D1δ	C2β	A3α	B4γ	D1δ	C2β	A3α	B4γ	D1δ	C2α	A3β
C3α	A2β	B1δ	D4γ	C3α	A2β	B1δ	D4γ	C3β	A2α	B1δ	D4γ

A1δ	C4α	D3β	B2γ	A1δ	C4β	D3γ	B2α	A1δ	C4α	D3γ	B2β
D2γ	B3β	A4α	C1δ	D2α	B3γ	A4β	C1δ	D2β	B3γ	A4α	C1δ
B4α	D1δ	C2γ	A3β	B4β	D1δ	C2α	A3γ	B4α	D1δ	C2β	A3γ
C3β	A2γ	B1δ	D4α	C3γ	A2α	B1δ	D4β	C3γ	A2β	B1δ	D4α

4

A1α	C2δ	D3β	B4γ	A1α	C2γ	D3β	B4δ	A1α	C2δ	D3γ	B4β
D4γ	B3β	A2δ	C1α	D4δ	B3β	A2γ	C1α	D4β	B3γ	A2δ	C1α
B2δ	D1α	C4γ	A3β	B2γ	D1α	C4δ	A3β	B2δ	D1α	C4β	A3γ
C3β	A4γ	B1α	D2δ	C3β	A4δ	B1α	D2γ	C3γ	A4β	B1α	D2δ

A1α	C2β	D3γ	B4δ	A1α	C2γ	D3δ	B4β	A1α	C2β	D3δ	B4γ
D4δ	B3γ	A2β	C1α	D4β	B3δ	A2γ	C1α	D4γ	B3δ	A2β	C1α
B2β	D1α	C4δ	A3γ	B2γ	D1α	C4β	A3δ	B2β	D1α	C4γ	A3δ
C3γ	A4δ	B1α	D2β	C3δ	A4β	B1α	D2γ	C3δ	A4γ	B1α	D2β

A1β	C2δ	D3α	B4γ	A1β	C2γ	D3α	B4δ	A1β	C2δ	D3γ	B4α
D4γ	B3α	A2δ	C1β	D4δ	B3α	A2γ	C1β	D4α	B3γ	A2δ	C1β
B2δ	D1β	C4γ	A3α	B2γ	D1β	C4δ	A3α	B2δ	D1β	C4α	A3γ
C3α	A4γ	B1β	D2δ	C3α	A4δ	B1β	D2γ	C3γ	A4α	B1β	D2δ

A1β	C2α	D3γ	B4δ	A1β	C2γ	D3δ	B4α	A1β	C2α	D3δ	B4γ
D4δ	B3γ	A2α	C1β	D4α	B3δ	A2γ	C1β	D4γ	B3δ	A2α	C1β
B2α	D1β	C4δ	A3γ	B2γ	D1β	C4α	A3δ	B2α	D1β	C4γ	A3δ
C3γ	A4δ	B1β	D2α	C3δ	A4α	B1β	D2γ	C3δ	A4γ	B1β	D2α

A1γ	C2δ	D3α	B4β	A1γ	C2β	D3α	B4δ	A1γ	C2δ	D3β	D4α
D4β	B3α	A2δ	C1γ	D4δ	B3α	A2β	C1γ	D4α	B3β	A2δ	C1γ
B2δ	D1γ	C4β	A3α	B2β	D1γ	C4δ	A3α	B2δ	D1γ	C4α	A3β
C3α	A4β	B1γ	D2δ	C3α	A4δ	B1γ	D2β	C3β	A4α	B1γ	D2δ

A1γ	C2α	D3β	B4δ	A1γ	C2β	D3δ	B4α	A1γ	C2α	D3δ	B4β
D4δ	B3β	A2α	C1γ	D4α	B3δ	A2β	C1γ	D4β	B3δ	A2α	C1γ
B2α	D1γ	C4δ	A3β	B2β	D1γ	C4α	A3δ	B2α	D1γ	C4β	A3δ
C3β	A4δ	B1γ	D2α	C3δ	A4α	B1γ	D2β	C3δ	A4β	B1γ	D2α

The 64-bit code on Magic Square

Tropic Left (91-120)

A1δ	C2γ	D3α	B4β	A1δ	C2β	D3α	B4γ	A1δ	C2γ	D3α	B4β
D4β	B3α	A2γ	C1δ	D4γ	B3α	A2β	C1δ	D4α	B3β	A2γ	C1δ
B2γ	D1δ	C4β	A3α	B2β	D1δ	C4γ	A3α	B2γ	D1δ	C4α	A3β
C3α	A4β	B1δ	D2γ	C3α	A4γ	B1δ	D2β	C3β	A4α	B1α	D2γ

A1δ	C2α	D3β	B4γ	A1δ	C2β	D3γ	B4α	A1δ	C2α	D3γ	B4β
D4γ	B3β	A2α	C1δ	D4α	B3γ	A2β	C1δ	D4β	B3γ	A2α	C1δ
B2α	D1δ	C4γ	A3β	B2β	D1δ	C4α	A3γ	B2α	D1δ	C4β	A3γ
C3β	A4γ	B1δ	D2α	C3γ	A4α	B1δ	D2β	C3γ	A4β	B1β	D2α

A1α	C3δ	D4β	B2γ	A1α	C3γ	D4β	B2δ	A1α	C3δ	D4γ	B2β
D2γ	B4β	A3δ	C1α	D2δ	B4β	A3γ	C1α	D2β	B4γ	A3δ	C1α
B3δ	D1α	C2γ	A4β	B3γ	D1α	C2δ	A4β	B3δ	D1α	C2β	A4γ
C4β	A2γ	B1α	D3δ	C4β	A2δ	B1α	D3γ	C4γ	A2β	B1α	D3δ

A1α	C3β	D4γ	B2δ	A1α	C3γ	D4δ	B2β	A1α	C3β	D4δ	B2γ
D2δ	B4γ	A3β	C1α	D2β	B4δ	A3γ	C1α	D2γ	B4δ	A3β	C1α
B3β	D1α	C2δ	A4γ	B3γ	D1α	C2β	A4δ	B3β	D1α	C2γ	A4δ
C4γ	A2δ	B1α	D3β	C4δ	A2β	B1α	D3γ	C4δ	A2γ	B1α	D3β

A1β	C3δ	D4α	B2γ	A1β	C3γ	D4α	B2δ	A1β	C3δ	D4γ	B2α
D2γ	B4α	A3δ	C1β	D2δ	B4α	A3γ	C1β	D2α	B4γ	A3δ	C1β
B3δ	D1β	C2γ	A4α	B3γ	D1β	C2δ	A4α	B3δ	D1β	C2α	A4γ
C4α	A2γ	B1β	D3δ	C4α	A2δ	B1β	D3γ	C4γ	A2α	B1β	D3δ

A1β	C3δ	D4γ	B2α	A1β	C3γ	D4δ	B2α	A1β	C3α	D4δ	B2γ
D2α	B4γ	A3δ	C1β	D2α	B4δ	A3γ	C1β	D2γ	B4δ	A3α	C1β
B3δ	D1β	C2α	A4γ	B3γ	D1β	C2α	A4δ	B3α	D1β	C2γ	A4δ
C4γ	A2α	B1β	D3δ	C4δ	A2α	B1β	D3γ	C4δ	A2γ	B1β	D3α

A1γ	C3δ	D4α	B2β	A1γ	C3β	D4α	B2δ	A1γ	C3δ	D4β	B2α
D2β	B4α	A3δ	C1γ	D2δ	B4α	A3β	C1γ	D2α	B4β	A3δ	C1γ
B3δ	D1γ	C2β	A4α	B3β	D1γ	C2β	A4α	B3δ	D1γ	C2α	A4β
C4α	A2β	B1γ	D3δ	C4α	A2δ	B1γ	D3β	C4β	A2α	B1γ	D3δ

A1γ	C3α	D4β	B2δ	A1γ	C3β	D4δ	B2α	A1γ	C3α	D4δ	B2β
D2δ	B4β	A3α	C1γ	D2α	B4δ	A3β	C1γ	D2β	B4δ	A3α	C1γ
B3α	D1γ	C2δ	A4β	B3β	D1γ	C2α	A4δ	B3α	D1γ	C2β	A4δ
C4β	A2δ	B1γ	D3α	C4δ	A2α	B1γ	D3β	C4δ	A2β	B1γ	D3α

A1δ	C3γ	D4α	B2β	A1δ	C3β	D4α	B2γ	A1δ	C3γ	D4β	B2α
D2β	B4α	A3γ	C1δ	D2γ	B4α	A3β	C1δ	D2α	B4β	A3γ	C1δ
B3γ	D1δ	C2β	A4α	B3β	D1δ	C2γ	A4α	B3γ	D1δ	C2α	A4β
C4α	A2β	B1δ	D3γ	C4α	A2γ	B1δ	D3β	C4β	A2α	B1α	D3γ

A1δ	C3α	D4β	B2γ	A1δ	C3β	D4γ	B2α	A1δ	C3α	D4γ	B2β
D2γ	B4β	A3α	C1δ	D2α	B4γ	A3β	C1δ	D2β	B4γ	A3α	C1δ
B3α	D1δ	C2γ	A4β	B3β	D1δ	C2α	A4γ	B3α	D1δ	C2β	A4γ
C4β	A2γ	B1δ	D3α	C4γ	A2α	B1δ	D3β	C4γ	A2β	B1δ	D3α

The 64-bit code on Magic Square

Tropic Left (121-150)

A1α	C2δ	D4β	B3γ	A1α	C2γ	D4β	B3δ	A1α	C2δ	D4γ	B3β
D3γ	B4β	A2δ	C1α	D3δ	B4β	A2γ	C1α	D3β	B4γ	A2δ	C1α
B2δ	D1α	C3γ	A4β	B2γ	D1α	C3δ	A4β	B2δ	D1α	C3β	A4γ
C4β	A3γ	B1α	D2δ	C4β	A3δ	B1α	D2γ	C4γ	A3β	B1α	D2δ

A1α	C2β	D4γ	B3δ	A1α	C2β	D4δ	B3α	A1α	C2γ	D4δ	B3β
D3δ	B4γ	A2β	C1α	D3α	B4δ	A2β	C1α	D3β	B4δ	A2γ	C1α
B2β	D1α	C3δ	A4γ	B2β	D1α	C3α	A4δ	B2γ	D1α	C3β	A4δ
C4γ	A3δ	B1α	D2β	C4δ	A3α	B1α	D2β	C4δ	A3β	B1α	D2γ

A1β	C2δ	D4α	B3γ	A1β	C2γ	D4α	B3δ	A1β	C2δ	D4γ	B3α
D3γ	B4α	A2δ	C1β	D3δ	B4α	A2γ	C1β	D3α	B4γ	A2δ	C1β
B2δ	D1β	C3γ	A4α	B2γ	D1β	C3δ	A4α	B2δ	D1β	C3α	A4γ
C4α	A3γ	B1β	D2δ	C4α	A3δ	B1β	D2γ	C4γ	A3α	B1β	D2δ

A1β	C2α	D4γ	B3δ	A1β	C2γ	D4δ	B3α	A1β	C2α	D4δ	B3γ
D3δ	B4γ	A2α	C1β	D3α	B4δ	A2γ	C1β	D3γ	B4δ	A2α	C1β
B2α	D1β	C3δ	A4γ	B2γ	D1β	C3α	A4δ	B2α	D1β	C3γ	A4δ
C4γ	A3δ	B1β	D2α	C4δ	A3α	B1β	D2γ	C4δ	A3γ	B1β	D2α

A1γ	C2δ	D4α	B3β	A1γ	C2β	D4α	B3δ	A1γ	C2δ	D4β	B3α
D3β	B4α	A2δ	C1γ	D3δ	B4α	A2β	C1γ	D3α	B4β	A2δ	C1γ
B2δ	D1γ	C3β	A4α	B2β	D1γ	C3δ	A4α	B2δ	D1γ	C3α	A4β
C4α	A3β	B1γ	D2δ	C4α	A3δ	B1γ	D2β	C4β	A3α	B1γ	D2δ

A1γ	C2α	D4β	B3δ	A1γ	C2β	D4δ	B3α	A1γ	C2α	D4δ	B3β
D3δ	B4β	A2α	C1γ	D3α	B4δ	A2β	C1γ	D3β	B4δ	A2α	C1γ
B2α	D1γ	C3δ	A4β	B2β	D1γ	C3α	A4δ	B2α	D1γ	C3β	A4δ
C4β	A3δ	B1γ	D2α	C4δ	A3α	B1γ	D2β	C4δ	A3β	B1γ	D2α

A1δ	C2γ	D4α	B3β	A1δ	C2β	D4α	B3γ	A1δ	C2γ	D4β	B3α
D3β	B4α	A2γ	C1δ	D3γ	B4α	A2β	C1δ	D3α	B4β	A2γ	C1δ
B2γ	D1δ	C3β	A4α	B2β	D1δ	C3γ	A4α	B2γ	D1δ	C3α	A4β
C4α	A3β	B1δ	D2γ	C4α	A3γ	B1δ	D2β	C4β	A3α	B1δ	D2γ

A1δ	C2α	D4β	B3γ	A1δ	C2β	D4γ	B3α	A1δ	C2α	D4γ	B3β
D3γ	B4β	A2α	C1δ	D3α	B4γ	A2β	C1δ	D3β	B4γ	A2α	C1δ
B2α	D1δ	C3γ	A4β	B2β	D1δ	C3α	A4γ	B2α	D1δ	C3β	A4γ
C4β	A3γ	B1δ	D2α	C4γ	A3α	B1δ	D2β	C4γ	A3β	B1δ	D2α

A2α	C4δ	D1β	B3γ	A2α	C4γ	D1β	B3δ	A2α	C4δ	D1γ	B3β
D3γ	B1β	A4δ	C2α	D3δ	B1β	A4γ	C2α	D3β	B1γ	A4δ	C2α
B4δ	D2α	C3γ	A1β	B4γ	D2α	C3δ	A1β	B4δ	D2α	C3β	A1γ
C1β	A3γ	B2α	D4δ	C1β	A3δ	B2α	D4γ	C1γ	A3β	B2α	D4δ

A2α	C4β	D1γ	B3δ	A2α	C4γ	D1δ	B3β	A2α	C4β	D1δ	B3γ
D3δ	B1γ	A4β	C2α	D3β	B1δ	A4γ	C2α	D3γ	B1δ	A4β	C2α
B4β	D2α	C3δ	A1γ	B4γ	D2α	C3β	A1δ	B4β	D2α	C3γ	A1δ
C1γ	A3δ	B2α	D4β	C1δ	A3β	B2α	D4γ	C1δ	A3γ	B2α	D4β

The 64-bit code on Magic Square

Tropic Left (151-180)

A2β	C4δ	D1α	B3γ	A2β	C4γ	D1α	B3δ	A2β	C4δ	D1γ	B3α
D3γ	B1α	A4δ	C2β	D3δ	B1α	A4γ	C2β	D3α	B1γ	A4δ	C2β
B4δ	D2β	C3γ	A1α	B4γ	D2β	C3δ	A1α	B4δ	D2β	C3α	A1γ
C1α	A3γ	B2β	D4δ	C1α	A3δ	B2β	D4γ	C1γ	A3α	B2β	D4δ

A2β	C4α	D1γ	B3δ	A2β	C4γ	D1δ	B3α	A2β	C4α	D1δ	B3γ
D3δ	B1γ	A4α	C2β	D3α	B1δ	A4γ	C2β	D3γ	B1δ	A4α	C2β
B4α	D2β	C3δ	A1γ	B4γ	D2β	C3α	A1δ	B4α	D2β	C3γ	A1δ
C1γ	A3δ	B2β	D4α	C1δ	A3α	B2β	D4γ	C1δ	A3γ	B2β	D4α

A2γ	C4δ	D1α	B3β	A2γ	C4β	D1α	B3δ	A2γ	C4δ	D1β	B3α
D3β	B1α	A4δ	C2γ	D3δ	B1α	A4β	C2γ	D3α	B1β	A4δ	C2γ
B4δ	D2γ	C3β	A1α	B4β	D2γ	C3δ	A1α	B4δ	D2γ	C3α	A1β
C1α	A3β	B2γ	D4δ	C1α	A3δ	B2γ	D4β	C1β	A3α	B2γ	D4δ

A2γ	C4α	D1β	B3δ	A2γ	C4β	D1δ	B3α	A2γ	C4α	D1δ	B3β
D3δ	B1β	A4α	C2γ	D3α	B1δ	A4β	C2γ	D3β	B1δ	A4α	C2γ
B4α	D2γ	C3δ	A1β	B4β	D2γ	C3α	A1δ	B4α	D2γ	C3β	A1δ
C1β	A3δ	B2γ	D4α	C1δ	A3α	B2γ	D4β	C1δ	A3β	B2γ	D4α

A2δ	C4γ	D1α	B3β	A2δ	C4β	D1α	B3γ	A2δ	C4γ	D1β	B3α
D3β	B1α	A4γ	C2δ	D3γ	B1α	A4β	C2δ	D3α	B1β	A4γ	C2δ
B4γ	D2δ	C3β	A1α	B4β	D2δ	C3γ	A1α	B4γ	D2δ	C3α	A1β
C1α	A3β	B2δ	D4γ	C1α	A3γ	B2δ	D4β	C1β	A3α	B2δ	D4γ

A2δ	C4α	D1β	B3γ	A2δ	C4β	D1γ	B3α	A2δ	C4α	D1γ	B3β
D3γ	B1β	A4α	C2δ	D3α	B1γ	A4β	C2δ	D3β	B1γ	A4α	C2δ
B4α	D2δ	C3γ	A1β	B4β	D2δ	C3α	A1γ	B4α	D2δ	C3β	A1γ
C1β	A3γ	B2δ	D4α	C1γ	A3α	B2δ	D4β	C1γ	A3β	B2δ	D4α

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A2α	C3δ	D1β	B4γ	A2α	C3γ	D1β	B4δ	A2α	C3δ	D1γ	B4β
D4γ	B1β	A3δ	C2α	D4δ	B1β	A3γ	C2α	D4β	B1γ	A3δ	C2α
B3δ	D2α	C4γ	A1β	B3γ	D2α	C4δ	A1β	B3δ	D2α	C4β	A1γ
C1β	A4γ	B2α	D3δ	C1β	A4δ	B2α	D3γ	C1γ	A4β	B2α	D3δ

A2α	C3β	D1γ	B4δ	A2α	C3γ	D1δ	B4β	A2α	C3β	D1δ	B4γ
D4δ	B1γ	A3β	C2α	D4β	B1δ	A3γ	C2α	D4γ	B1δ	A3β	C2α
B3β	D2α	C4δ	A1γ	B3γ	D2α	C4β	A1δ	B3β	D2α	C4γ	A1δ
C1γ	A4δ	B2α	D3β	C1δ	A4β	B2α	D3γ	C1δ	A4γ	B2α	D3β

A2β	C3δ	D1α	B4γ	A2β	C3γ	D1α	B4δ	A2β	C3δ	D1γ	B4α
D4γ	B1α	A3δ	C2β	D4δ	B1α	A3γ	C2β	D4α	B1γ	A3δ	C2β
B3δ	D2β	C4γ	A1α	B3γ	D2β	C4δ	A1α	B3δ	D2β	C4α	A1γ
C1α	A4γ	B2β	D3δ	C1α	A4δ	B2β	D3γ	C1γ	A4α	B2β	D3δ

A2β	C3α	D1γ	B4δ	A2β	C3γ	D1δ	B4α	A2β	C3α	D1δ	B4γ
D4δ	B1γ	A3α	C2β	D4α	B1δ	A3γ	C2β	D4γ	B1δ	A3α	C2β
B3α	D2β	C4δ	A1γ	B3γ	D2β	C4α	A1δ	B3α	D2β	C4γ	A1δ
C1γ	A4δ	B2β	D3α	C1δ	A4α	B2β	D3γ	C1δ	A4γ	B2β	D3α

The 64-bit code on Magic Square

Tropic Left (181-210)

A2γ	C3δ	D1α	B4β
D4β	B1α	A3δ	C2γ
B3δ	D2γ	C4β	A1α
C1α	A4β	B2γ	D3δ

A2γ	C3β	D1α	B4δ
D4δ	B1α	A3β	C2γ
B3β	D2γ	C4δ	A1α
C1α	A4δ	B2γ	D3β

A2γ	C3δ	D1β	B4α
D4δ	B1β	A3δ	C2γ
B3δ	D2γ	C4α	A1β
C1β	A4α	B2γ	D3δ

A2γ	C3α	D1β	B4δ
D4δ	B1β	A3α	C2γ
B3α	D2γ	C4δ	A1β
C1β	A4δ	B2γ	D3α

A2γ	C3β	D1δ	B4α
D4α	B1δ	A3β	C2γ
B3β	D2γ	C4α	A1δ
C1δ	A4α	B2γ	D3β

A2γ	C3α	D1δ	B4β
D4β	B1δ	A3α	C2γ
B3α	D2γ	C4β	A1δ
C1δ	A4β	B2γ	D3α

A2δ	C3γ	D1α	B4β
D4β	B1α	A3γ	C2δ
B3γ	D2δ	C4β	A1α
C1α	A4β	B2δ	D3γ

A2δ	C3β	D1α	B4γ
D4γ	B1α	A3β	C2δ
B3β	D2δ	C4γ	A1α
C1α	A4γ	B2δ	D3β

A2δ	C3γ	D1β	B4α
D4α	B1β	A3γ	C2δ
B3γ	D2δ	C4α	A1β
C1β	A4α	B2δ	D3γ

A2δ	C3α	D1β	B4γ
D4γ	B1β	A3α	C2δ
B3α	D2δ	C4γ	A1β
C1β	A4γ	B2δ	D3α

A2δ	C3β	D1γ	B4α
D4α	B1γ	A3β	C2δ
B3β	D2δ	C4α	A1γ
C1γ	A4α	B2δ	D3β

A2δ	C3α	D1γ	B4β
D4β	B1γ	A3α	C2δ
B3α	D2δ	C4β	A1γ
C1γ	A4β	B2δ	D3α

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A2α	C4δ	D3β	B1γ
D1γ	B3β	A4δ	C2α
B4δ	D2α	C1γ	A3β
C3β	A1γ	B2α	D4δ

A2α	C4γ	D3β	B1δ
D1δ	B3β	A4γ	C2α
B4γ	D2α	C1δ	A3β
C3β	A1δ	B2α	D4γ

A2α	C4δ	D3γ	B1β
D1β	B3γ	A4δ	C2α
B4δ	D2α	C1β	A3γ
C3γ	A1β	B2α	D4δ

A2α	C4β	D3γ	B1δ
D1δ	B3γ	A4β	C2α
B4β	D2α	C1δ	A3γ
C3γ	A1δ	B2α	D4β

A2α	C4γ	D3δ	B1β
D1β	B3δ	A4γ	C2α
B4γ	D2α	C1β	A3δ
C3β	A1β	B2α	D4γ

A2α	C4β	D3δ	B1γ
D1γ	B3δ	A4β	C2α
B4β	D2α	C1γ	A3δ
C3δ	A1γ	B2α	D4β

A2β	C4δ	B3α	B1γ
D1γ	B3α	A4δ	C2β
B4δ	D2β	C1γ	A3α
C3α	A1γ	B2β	D4δ

A2β	C4δ	D3α	B1γ
D1γ	B3α	A4δ	C2β
B4δ	D2β	C1γ	A3α
C3α	A1γ	B2β	D4δ

A2β	C4δ	D3γ	B1α
D1α	B3γ	A4δ	C2β
B4δ	D2β	C1α	A3γ
C3γ	A1α	B2β	D4δ

A2β	C4α	D3γ	B1δ
D1δ	B3γ	A4α	C2β
B4α	D2β	C1δ	A3γ
C3γ	A1δ	B2β	D4α

A2β	C4γ	D3δ	B1α
D1α	B3δ	A4γ	C2β
B4γ	D2β	C1α	A3δ
C3δ	A1α	B2β	D4γ

A2β	C4α	D3δ	B1γ
D1γ	B3δ	A4α	C2β
B4α	D2β	C1γ	A3δ
C3δ	A1γ	B2β	D4α

A2γ	C4δ	D3α	B1β
D1β	B3α	A4δ	C2γ
B4δ	D2γ	C1β	A3α
C3α	A1β	B2γ	D4δ

A2γ	C4β	D3α	B1δ
D1δ	B3α	A4β	C2γ
B4β	D2γ	C1δ	A3α
C3α	A1δ	B2γ	D4β

A2γ	C4δ	D3β	B1α
D1α	B3β	A4δ	C2γ
B4δ	D2γ	C1α	A3β
C3β	A1α	B2γ	D4δ

A2γ	C4α	D3β	B1δ
D1δ	B3β	A4α	C2γ
B4α	D2γ	C1δ	A3β
C3β	A1δ	B2γ	D4α

A2γ	C4β	D3δ	B1α
D1α	B3δ	A4β	C2γ
B4β	D2γ	C1α	A3δ
C3δ	A1α	B2γ	D4β

A2γ	C4α	D3δ	B1β
D1β	B3δ	A4α	C2γ
B4α	D2γ	C1β	A3δ
C3δ	A1β	B2γ	D4α

The 64-bit code on Magic Square

Tropic Left (211-240)

A2δ	C4γ	D3α	B1β	A2δ	C4β	D3α	B1γ	A2δ	C4γ	D3β	B1α
D1β	B3α	A4γ	C2δ	D1γ	B3α	A4β	C2δ	D1α	B3β	A4γ	C2δ
B4γ	D2δ	C1β	A3α	B4β	D2δ	C1γ	A3α	B4γ	D2δ	C1α	A3β
C3α	A1β	B2δ	D4γ	C3α	A1γ	B2δ	D4β	C3β	A1α	B2δ	D4γ

A2δ	C4α	D3β	B1γ	A2δ	C4β	D3γ	B1α	A2δ	C4α	D3γ	B1β
D1γ	B3β	A4α	C2δ	D1α	B3γ	A4β	C2δ	D1β	B3γ	A4α	C2δ
B4α	D2δ	C1γ	A3β	B4β	D2δ	C1α	A3γ	B4α	D2δ	C1β	A3γ
C3β	A1γ	B2δ	D4α	C3γ	A1α	B2δ	D4β	C3γ	A1β	B2δ	D4α

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A2α	C1δ	D3β	B4γ	A2α	C1γ	D3β	B4δ	A2α	C1δ	D3γ	B4β
D4γ	B3β	A1δ	C2α	D4δ	B3β	A1γ	C2α	D4β	B3γ	A1δ	C2α
B1δ	D2α	C4γ	A3β	B1γ	D2α	C4δ	A3β	B1δ	D2α	C4β	A3γ
C3β	A4γ	B2α	D1δ	C3β	A4δ	B2α	D1γ	C3γ	A4β	B2α	D1δ

A2α	C1β	D3γ	B4δ	A2α	C1γ	D3δ	B4β	A2α	C1β	D3δ	B4γ
D4δ	B3γ	A1β	C2α	D4β	B3δ	A1γ	C2α	D4γ	B3δ	A1β	C2α
B1β	D2α	C4δ	A3γ	B1γ	D2α	C4β	A3δ	B1β	D2α	C4γ	A3δ
C3γ	A4δ	B2α	D1β	C3δ	A4β	B2α	D1γ	C3δ	A4γ	B2α	D1β

A2β	C1δ	D3α	B4γ	A2β	C1δ	D3α	B4γ	A2β	C1δ	D3γ	B4α
D4γ	B3α	A1δ	C2β	D4γ	B3α	A1δ	C2β	D4α	B3γ	A1δ	C2β
B1δ	D2β	C4γ	A3α	B1δ	D2β	C4γ	A3α	B1δ	D2β	C4α	A3γ
C3α	A4γ	B2β	D1δ	C3α	A4γ	B2β	D1δ	C3γ	A4α	B2β	D1δ

A2β	C1α	D3γ	B4δ	A2β	C1γ	D3δ	B4α	A2β	C1α	D3δ	B4γ
D4δ	B3γ	A1α	C2β	D4α	B3δ	A1γ	C2β	D4γ	B3δ	A1α	C2β
B1α	D2β	C4δ	A3γ	B1γ	D2β	C4α	A3δ	B1α	D2β	C4γ	A3δ
C3γ	A4δ	B2β	D1α	C3δ	A4α	B2β	D1γ	C3δ	A4γ	B2β	D1α

A2γ	C1δ	D3α	B4β	A2γ	C1β	D3α	B4δ	A2γ	C1δ	D3β	B4α
D4β	B3α	A1δ	C2γ	D4δ	B3α	A1β	C2γ	D4α	B3β	A1δ	C2γ
B1δ	D2γ	C4β	A3α	B1β	D2γ	C4δ	A3α	B1δ	D2γ	C4α	A3β
C3α	A4β	B2γ	D1δ	C3α	A4δ	B2γ	D1β	C3β	A4α	B2γ	D1δ

A2γ	C1α	D3β	B4δ	A2γ	C1β	D3δ	B4α	A2γ	C1α	D3δ	B4β
D4δ	B3β	A1α	C2γ	D4α	B3δ	A1β	C2γ	D4β	B3δ	A1α	C2γ
B1α	D2γ	C4δ	A3β	B1β	D2γ	C4α	A3δ	B1α	D2γ	C4β	A3δ
C3β	A4δ	B2γ	D1α	C3δ	A4α	B2γ	D1β	C3δ	A4β	B2γ	D1α

A2δ	C1γ	D3α	B4β	A2δ	C1β	D3α	B4γ	A2δ	C1γ	D3β	B4α
D4β	B3α	A1γ	C2δ	D4γ	B3α	A1β	C2δ	D4α	B3β	A1γ	C2δ
B1γ	D2δ	C4β	A3α	B1β	D2δ	C4γ	A3α	B1γ	D2δ	C4α	A3β
C3α	A4β	B2δ	D1γ	C3α	A4γ	B2δ	D1β	C3β	A4α	B2δ	D1γ

A2δ	C1α	D3β	B4γ	A2δ	C1β	D3γ	B4α	A2δ	C1α	D3γ	B4β
D4γ	B3β	A1α	C2δ	D4α	B3γ	A1β	C2δ	D4β	B3γ	A1α	C2δ
B1α	D2δ	C4γ	A3β	B1β	D2δ	C4α	A3γ	B1α	D2δ	C4β	A3γ
C3β	A4γ	B2δ	D1α	C3γ	A4α	B2δ	D1β	C3γ	A4β	B2δ	D1α

The 64-bit code on Magic Square

Tropic Left (241-270)

A2α	C3δ	D4β	B1γ	A2α	C3γ	D4β	B1δ	A2α	C3δ	D4γ	B1β
D1γ	B4β	A3δ	C2α	D1δ	B4β	A3γ	C2α	D1β	B4γ	A3δ	C2α
B3δ	D2α	C1γ	A4β	B3γ	D2α	C1δ	A4β	B3δ	D2α	C1β	A4γ
C4β	A1γ	B2α	D3δ	C4β	A1δ	B2α	D3γ	C4γ	A1β	B2α	D3δ

A2α	C3β	D4γ	B1δ	A2α	C3γ	D4δ	B1β	A2α	C3β	D4δ	B1γ
D1δ	B4γ	A3β	C2α	D1β	B4δ	A3γ	C2α	D1γ	B4δ	A3β	C2α
B3β	D2α	C1δ	A4γ	B3γ	D2α	C1β	A4δ	B3β	D2α	C1γ	A4δ
C4γ	A1δ	B2α	D3β	C4δ	A1β	B2α	D3γ	C4δ	A1γ	B2α	D3β

A2β	C3δ	D4α	B1γ	A2β	C3γ	D4α	B1δ	A2β	C3δ	D4γ	B1α
D1γ	B4α	A3δ	C2β	D1δ	B4α	A3γ	C2β	D1α	B4γ	A3δ	C2β
B3δ	D2β	C1γ	A4α	B3γ	D2β	C1δ	A4α	B3δ	D2β	C1α	A4γ
C4α	A1γ	B2β	D3δ	C4α	A1δ	B2β	D3γ	C4γ	A1α	B2β	D3δ

A2β	C3α	D4γ	B1δ	A2β	C3γ	D4δ	B1α	A2β	C3α	D4δ	B1γ
D1δ	B4γ	A3α	C2β	D1α	B4δ	A3γ	C2β	D1γ	B4δ	A3α	C2β
B3α	D2β	C1δ	A4γ	B3γ	D2β	C1α	A4β	B3α	D2β	C1γ	A4δ
C4γ	A1δ	B2β	D3α	C4δ	A1α	B2β	D3γ	C4δ	A1γ	B2β	D3α

A2γ	C3δ	D4α	B1β	A2γ	C3β	D4α	B1δ	A2γ	C3δ	D4β	B1α
D1β	B4α	A3δ	C2γ	D1δ	B4α	A3β	C2γ	D1α	B4β	A3δ	C2γ
B3δ	D2γ	C1β	A4α	B3β	D2γ	C1δ	A4α	B3δ	D2γ	C1α	A4β
C4α	A1β	B2γ	D3δ	C4α	A1δ	B2γ	D3β	C4β	A1α	B2γ	D3δ

A2γ	C3α	D4β	B1δ	A2γ	C3β	D4δ	B1α	A2γ	C3α	D4δ	B1β
D1δ	B4β	A3α	C2γ	D1α	B4δ	A3β	C2γ	D1β	B4δ	A3α	C2γ
B3α	D2γ	C1δ	A4β	B3β	D2γ	C1α	A4δ	B3α	D2γ	C1β	A4δ
C4β	A1δ	B2γ	D3α	C4δ	A1α	B2γ	D3β	C4δ	A1β	B2γ	D3α

A2δ	C3γ	D4α	B1β	A2δ	C3β	D4α	B1γ	A2δ	C3γ	D4β	B1α
D1β	B4α	A3γ	C2δ	D1γ	B4α	A3β	C2δ	D1α	B4β	A3γ	C2δ
B3γ	D2δ	C1β	A4α	B3β	D2δ	C1γ	A4α	B3γ	D2δ	C1α	A4β
C4α	A1β	B2δ	D3γ	C4α	A1γ	B2δ	D3β	C4β	A1α	B2δ	D3γ

A2δ	C3α	D4β	B1γ	A2δ	C3β	D4γ	B1α	A2δ	C3α	D4γ	B1β
D1γ	B4β	A3α	C2δ	D1α	B4γ	A3β	C2δ	D1β	B4γ	A3α	C2δ
B3α	D2δ	C1γ	A4β	B3β	D2δ	C1α	A4γ	B3α	D2δ	C1β	A4γ
C4β	A1γ	B2δ	D3α	C4γ	A1α	B2δ	D3β	C4γ	A1β	B2δ	D3α

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A2α	C1δ	D4β	B3γ	A2α	C1γ	D4β	B3δ	A2α	C1δ	D4γ	B3β
D3γ	B4β	A1δ	C2α	D3δ	B4β	A1γ	C2α	D3β	B4γ	A1δ	C2α
B1δ	D2α	C3γ	A4β	B1γ	D2α	C3δ	A4β	B1δ	D2α	C3β	A4γ
C4β	A3γ	B2α	D1δ	C4β	A3δ	B2α	D1γ	C4γ	A3β	B2α	D1δ

A2α	C1β	D4γ	B3δ	A2α	C1γ	D4δ	B3β	A2α	C1β	D4δ	B3γ
D3α	B4γ	A1β	C2α	D3β	B4δ	A1γ	C2α	D3γ	B4δ	A1β	C2α
B1β	D2α	C3δ	A4γ	B1γ	D2α	C3β	A4δ	B1β	D2α	C3γ	A4δ
C4γ	A3δ	B2α	D1β	C4δ	A3β	B2α	D1γ	C4δ	A3γ	B2α	D1β

The 64-bit code on Magic Square

Tropic Left (271-300)

A2β	C1δ	D4α	B3γ	A2β	C1γ	D4α	B3δ	A2β	C1δ	D4γ	B3α
D3γ	B4α	A1δ	C2β	D3δ	B4α	A1γ	C2β	D3α	B4γ	A1δ	C2β
B1δ	D2β	C3γ	A4α	B1γ	D2β	C3δ	A4α	B1δ	D2β	C3α	A4γ
C4α	A3γ	B2β	D1δ	C4α	A3δ	B2β	D1γ	C4γ	A3α	B2β	D1δ

A2β	C1α	D4γ	B3δ	A2β	C1γ	D4δ	B3α	A2β	C1α	D4δ	B3γ
D3δ	B4γ	A1α	C2β	D3α	B4δ	A1γ	C2β	D3γ	B4δ	A1α	C2β
B1α	D2β	C3δ	A4γ	B1γ	D2β	C3α	A4δ	B1α	D2β	C3γ	A4δ
C4γ	A3δ	B2β	D1α	C4δ	A3α	B2β	D1γ	C4δ	A3γ	B2β	D1α

A2γ	C1δ	D4α	B3β	A2γ	C1β	D4α	B3δ	A2γ	C1δ	D4β	B3α
D3β	B4α	A1δ	C2γ	D3δ	B4α	A1β	C2γ	D3α	B4β	A1δ	C2γ
B1δ	D2γ	C3β	A4α	B1β	D2γ	C3δ	A4α	B1δ	D2γ	C3α	A4β
C4α	A3β	B2γ	D1δ	C4α	A3δ	B2γ	D1β	C4β	A3α	B2γ	D1δ

A2γ	C1α	D4β	B3δ	A2γ	C1β	D4δ	B3α	A2γ	C1α	D4δ	B3β
D3δ	B4β	A1α	C2γ	D3α	B4δ	A1β	C2γ	D3β	B4δ	A1α	C2γ
B1α	D2γ	C3δ	A4β	B1β	D2γ	C3α	A4δ	B1α	D2γ	C3β	A4δ
C4β	A3δ	B2γ	D1α	C4δ	A3α	B2γ	D1β	C4δ	A3β	B2γ	D1α

A2δ	C1γ	D4α	B3β	A2δ	C1β	D4α	B3γ	A2δ	C1γ	D4β	B3α
D3β	B4α	A1γ	C2δ	D3γ	B4α	A1β	C2δ	D3α	B4β	A1γ	C2δ
B1γ	D2δ	C3β	A4α	B1β	D2δ	C3γ	A4α	B1γ	D2δ	C3α	A4β
C4α	A3β	B2δ	D1γ	C4α	A3γ	B2δ	D1β	C4β	A3α	B2δ	D1γ

A2δ	C1α	D4β	B3γ	A2δ	C1β	D4γ	B3α	A2δ	C1α	D4γ	B3β
D3γ	B4β	A1α	C2δ	D3α	B4γ	A1β	C2δ	D3β	B4γ	A1α	C2δ
B1α	D2δ	C3γ	A4β	B1β	D2δ	C3α	A4γ	B1α	D2δ	C3β	A4γ
C4β	A3γ	B2δ	D1α	C4γ	A3α	B2δ	D1β	C4γ	A3β	B2δ	D1α

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A3α	C4δ	D1β	B2γ	A3α	C4γ	D1β	B2δ	A3α	C4δ	D1γ	B2β
D2γ	B1β	A4δ	C3α	D2δ	B1β	A4γ	C3α	D2β	B1γ	A4δ	C3α
B4δ	D3α	C2γ	A1β	B4γ	D3α	C2δ	A1β	B4δ	D3α	C2β	A1γ
C1β	A2γ	B3α	D4δ	C1β	A2δ	B3α	D4γ	C1γ	A2β	B3α	D4δ

A3α	C4β	D1γ	B2δ	A3α	C4γ	D1δ	B2β	A3α	C4β	D1δ	B2γ
D2δ	B1γ	A4β	C3α	D2β	B1δ	A4γ	C3α	D2γ	B1δ	A4β	C3α
B4β	D3α	C2δ	A1γ	B4γ	D3α	C2β	A1δ	B4β	D3α	C2γ	A1δ
C1γ	A2δ	B3α	D4β	C1δ	A2β	B3α	D4γ	C1δ	A2γ	B3α	D4β

A3β	C4δ	D1α	B2γ	A3β	C4γ	D1α	B2δ	A3β	C4δ	D1γ	B2α
D2γ	B1α	A4δ	C3β	D2δ	B1α	A4γ	C3β	D2α	B1γ	A4δ	C3β
B4δ	D3β	C2γ	A1α	B4γ	D3β	C2δ	A1α	B4δ	D3β	C2α	A1γ
C1α	A2γ	B3β	D4δ	C1α	A2δ	B3β	D4γ	C1γ	A2α	B3β	D4δ

A3β	C4α	D1γ	B2δ	A3β	C4γ	D1δ	B2α	A3β	C4α	D1δ	B2γ
D2δ	B1γ	A4α	C3β	D2α	B1δ	A4γ	C3β	D2γ	B1δ	A4α	C3β
B4α	D3β	C2δ	A1γ	B4γ	D3β	C2α	A1δ	B4α	D3β	C2γ	A1δ
C1γ	A2δ	B3β	D4α	C1δ	A2α	B3β	D4γ	C1δ	A2γ	B3β	D4α

The 64-bit code on Magic Square

Tropic Left (301-330)

A3γ	C4δ	D1α	B2β
D2β	B1α	A4δ	C3γ
B4δ	D3γ	C2β	A1α
C1α	A2β	B3γ	D4δ

A3γ	C4β	D1α	B2δ
D2δ	B1α	A4β	C3γ
B4β	D3γ	C2δ	A1α
C1α	A2δ	B3γ	D4β

A3γ	C4δ	D1β	B2α
D2α	B1β	A4δ	C3γ
B4δ	D3γ	C2α	A1β
C1β	A2α	B3γ	D4δ

A3γ	C4α	D1β	B2δ
D2δ	B1β	A4α	C3γ
B4α	D3γ	C2δ	A1β
C1β	A2δ	B3γ	D4α

A3γ	C4β	D1δ	B2α
D2α	B1δ	A4β	C3γ
B4β	D3γ	C2α	A1δ
C1δ	A2α	B3γ	D4β

A3γ	C4α	D1δ	B2β
D2β	B1δ	A4α	C3γ
B4α	D3γ	C2β	A1δ
C1δ	A2β	B3γ	D4α

A3δ	C4γ	D1α	B2β
D2β	B1α	A4γ	C3δ
B4γ	D3δ	C2β	A1α
C1α	A2β	B3δ	D4γ

A3δ	C4β	D1α	B2γ
D2γ	B1α	A4β	C3δ
B4β	D3δ	C2γ	A1α
C1α	A2γ	B3δ	D4β

A3δ	C4γ	D1β	B2α
D2α	B1β	A4γ	C3δ
B4γ	D3δ	C2α	A1β
C1β	A2α	B3δ	D4γ

A3δ	C4α	D1β	B2γ
D2γ	B1β	A4α	C3δ
B4α	D3δ	C2γ	A1β
C1β	A2γ	B3δ	D4α

A3δ	C4β	D1γ	B2α
D2α	B1γ	A4β	C3δ
B4β	D3δ	C2α	A1γ
C1γ	A2α	B3δ	D4β

A3δ	C4α	D1γ	B2β
D2β	B1γ	A4α	C3δ
B4α	D3δ	C2β	A1γ
C1γ	A2β	B3δ	D4α

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A3α	C2δ	D1β	B4γ
D4γ	B1β	A2δ	C3α
B2δ	D3α	C4γ	A1β
C1β	A4γ	B3α	D2δ

A3α	C2γ	D1β	B4δ
D4δ	B1β	A2γ	C3α
B2γ	D3α	C4δ	A1β
C1β	A4δ	B3α	D2γ

A3α	C2δ	D1γ	B4β
D4β	B1γ	A2δ	C3α
B2δ	D3α	C4β	A1γ
C1γ	A4β	B3α	D2δ

A3α	C2β	D1γ	B4δ
D4δ	B1γ	A2β	C3α
B2β	D3α	C4δ	A1γ
C1γ	A4δ	B3α	D2β

A3α	C2γ	D1δ	B4β
D4β	B1δ	A2γ	C3α
B2γ	D3α	C4β	A1δ
C1δ	A4β	B3α	D2γ

A3α	C2β	D1δ	B4γ
D4γ	B1δ	A2β	C3α
B2β	D3α	C4γ	A1δ
C1δ	A4γ	B3α	D2β

A3β	C2δ	D1α	B4γ
D4γ	B1α	A2δ	C3β
B2δ	D3β	C4γ	A1α
C1α	A4γ	B3β	D2δ

A3β	C2γ	D1α	B4δ
D4δ	B1α	A2γ	C3β
B2γ	D3β	C4δ	A1α
C1α	A4δ	B3β	D2γ

A3β	C2δ	D1γ	B4α
D4α	B1γ	A2δ	C3β
B2δ	D3β	C4α	A1γ
C1γ	A4α	B3β	D2δ

A3β	C2α	D1γ	B4δ
D4δ	B1γ	A2α	C3β
B2α	D3β	C4δ	A1γ
C1γ	A4δ	B3β	D2α

A3β	C2γ	D1δ	B4α
D4α	B1δ	A2γ	C3β
B2γ	D3β	C4α	A1δ
C1δ	A4α	B3β	D2γ

A3β	C2α	D1δ	B4γ
D4γ	B1δ	A2α	C3β
B2α	D3β	C4γ	A1δ
C1δ	A4γ	B3β	D2α

A3γ	C2δ	D1α	B4β
D4β	B1α	A2δ	C3γ
B2δ	D3γ	C4β	A1α
C1α	A4β	B3γ	D2δ

A3γ	C2β	D1α	B4δ
D4δ	B1α	A2β	C3γ
B2β	D3γ	C4δ	A1α
C1α	A4δ	B3γ	D2β

A3γ	C2δ	D1β	B4α
D4α	B1β	A2δ	C3γ
B2δ	D3γ	C4α	A1β
C1β	A4α	B3γ	D2δ

A3γ	C2α	D1β	B4δ
D4δ	B1β	A2α	C3γ
B2α	D3γ	C4δ	A1β
C1β	A4δ	B3γ	D2α

A3γ	C2β	D1δ	B4α
D4α	B1δ	A2β	C3γ
B2β	D3γ	C4α	A1δ
C1δ	A4α	B3γ	D2β

A3γ	C2α	D1δ	B4β
D4β	B1δ	A2α	C3γ
B2α	D3γ	C4β	A1δ
C1δ	A4β	B3γ	D2α

The 64-bit code on Magic Square

Tropic Left (331-360)

A3δ	C2γ	D1α	B4β	A3δ	C2β	D1α	B4γ	A3δ	C2γ	D1β	B4α
D4β	B1α	A2γ	C3δ	D4γ	B1α	A2β	C3δ	D4α	B1β	A2γ	C3δ
B2γ	D3δ	C4β	A1α	B2β	D3δ	C4γ	A1α	B2γ	D3δ	C4α	A1β
C1α	A4β	B3δ	D2γ	C1α	A4γ	B3δ	D2β	C1β	A4α	B3δ	D2γ

A3δ	C2α	D1β	B4γ	A3δ	C2β	D1γ	B4α	A3δ	C2α	D1γ	B4β
D4γ	B1β	A2α	C3δ	D4α	B1γ	A2β	C3δ	D4β	B1γ	A2α	C3δ
B2α	D3δ	C4γ	A1β	B2β	D3δ	C4α	A1γ	B2α	D3δ	C4β	A1γ
C1β	A4γ	B3δ	D2α	C1γ	A4α	B3δ	D2β	C1γ	A4β	B3δ	D2α

A3α	C4δ	D2β	B1γ	A3α	C4γ	D2β	B1δ	A3α	C4δ	D2γ	B1β
D1γ	B2β	A4δ	C3α	D1δ	B2β	A4γ	C3α	D1β	B2γ	A4δ	C3α
B4δ	D3α	C1γ	A2β	B4γ	D3α	C1δ	A2β	B4δ	D3α	C1β	A2γ
C2β	A1γ	B3α	D4δ	C2β	A1δ	B3α	D4γ	C2γ	A1β	B3α	D4δ

A3α	C4β	D2γ	B1δ	A3α	C4γ	D2δ	B1β	A3α	C4β	D2δ	B1γ
D1δ	B2γ	A4β	C3α	D1β	B2δ	A4γ	C3α	D1γ	B2δ	A4β	C3α
B4β	D3α	C1δ	A2γ	B4γ	D3α	C1β	A2δ	B4β	D3α	C1γ	A2δ
C2γ	A1δ	B3α	D4β	C2δ	A1β	B3α	D4γ	C2δ	A1γ	B3α	D4β

A3β	C4δ	D2α	B1γ	A3β	C4γ	D2α	B1δ	A3β	C4δ	D2γ	B1α
D1γ	B2α	A4δ	C3β	D1δ	B2α	A4γ	C3β	D1α	B2γ	A4δ	C3β
B4δ	D3β	C1γ	A2α	B4γ	D3β	C1δ	C3β	B4δ	D3β	C1α	A2γ
C2α	A1γ	B3β	D4δ	C2α	A1δ	B3β	D4γ	C2γ	A1α	B3β	D4δ

A3β	C4α	D2γ	B1δ	A3β	C4γ	D2δ	B1α	A3β	C4α	D2δ	B1γ
D1δ	B2γ	A4α	C3β	D1α	B2δ	A4γ	C3β	D1γ	B2δ	A4α	C3β
B4α	D3β	C1δ	A2γ	B4γ	D3β	C1α	A2δ	B4α	D3β	C1γ	A2δ
C2γ	A1δ	B3β	D4α	C2δ	A1α	B3β	D4γ	C2δ	A1γ	B3β	D4δ

A3γ	C4δ	D2α	B1β	A3γ	C4β	D2α	B1δ	A3γ	C4δ	D2β	B1α
D1β	B2α	A4δ	C3γ	D1δ	B2α	A4β	C3γ	D1α	B2β	A4δ	C3γ
B4δ	D3γ	C1β	A2α	B4δ	D3γ	C1δ	A2α	B4δ	D3γ	C1α	A2β
C2α	A1β	B3γ	D4δ	C2α	A1δ	B3γ	D4β	C2β	A1α	B3γ	D4δ

A3γ	C4α	D2β	B1δ	A3γ	C4β	D2δ	B1α	A3γ	C4α	D2δ	B1β
D1δ	B2β	A4α	C3γ	D1α	B2δ	A4β	C3γ	D1β	B2δ	A4α	C3γ
B4γ	D3γ	C1δ	A2β	B4β	D3γ	C1α	A2δ	B4α	D3γ	C1β	A2δ
C2β	A1δ	B3γ	D4α	C2δ	A1α	B3γ	D4β	C2δ	A1β	B3γ	D4α

A3δ	C4γ	D2α	B1β	A3δ	C4β	D2α	B1γ	A3δ	C4γ	D2β	B1α
D1β	B2α	A4γ	C3δ	D1γ	B2α	A4β	C3δ	D1α	B2β	A4γ	C3δ
B4γ	D3δ	C1β	A2α	B4β	D3δ	C1γ	A2α	B4γ	D3δ	C1α	A2β
C2α	A1β	B3δ	D4γ	C2α	A1γ	B3δ	D4β	C2β	A1α	B3δ	D4γ

A3δ	C4α	D2β	B1γ	A3δ	C4β	D2γ	B1α	A3δ	C4α	D2γ	B1β
D1γ	B2β	A4α	C3δ	D1α	B2γ	A4β	C3δ	D1β	B2γ	A4α	C3δ
B4α	D3δ	C1γ	A2β	B4β	D3δ	C1α	A2γ	B4α	D3δ	C1β	A2γ
C2β	A1γ	B3δ	D4α	C2γ	A1α	B3δ	D4β	C2γ	A1β	B3δ	D4α

The 64-bit code on Magic Square

Tropic Left (361-390)

A3α	C1δ	D2β	B4γ	A3α	C1γ	D2β	B4δ	A3α	C1δ	D2γ	B4β
D4γ	B2β	A1δ	C3α	D4δ	B2β	A1γ	C3α	D4β	B2γ	A1δ	C3α
B1δ	D3α	C4γ	A2β	B1γ	D3α	C4δ	A2β	B1δ	D3α	C4β	A2γ
C2β	A4γ	B3α	D1δ	C2β	A4δ	B3α	D1γ	C2γ	A4β	B3α	D1δ

A3α	C1β	D2γ	B4δ	A3α	C1γ	D2δ	B4β	A3α	C1β	D2δ	B4γ
D4δ	B2γ	A1β	C3α	D4β	B2δ	A1γ	C3α	D4γ	B2δ	A1β	C3α
B1β	D3α	C4δ	A2γ	B1γ	D3α	C4β	A2δ	B1β	D3α	C4γ	A2δ
C2γ	A4δ	B3α	D1β	C2δ	A4β	B3α	D1γ	C2δ	A4γ	B3α	D1β

A3β	C1δ	D2α	B4γ	A3β	C1γ	D2α	B4δ	A3β	C1δ	D2γ	B4α
D4γ	B2α	A1δ	C3β	D4δ	B2α	A1γ	C3β	D4α	B2γ	A1δ	C3β
B1δ	D3β	C4γ	A2α	B1γ	D3β	C4δ	A2α	B1δ	D3β	C4α	A2γ
C2α	A4γ	B3β	D1δ	C2α	A4δ	B3β	D1γ	C2γ	A4α	B3β	D1δ

A3β	C1α	D2γ	B4δ	A3β	C1γ	D2δ	B4α	A3β	C1α	D2δ	B4γ
D4δ	B2γ	A1α	C3β	D4α	B2δ	A1γ	C3β	D4γ	B2δ	A1α	C3β
B1α	D3β	C4δ	A2γ	B1γ	D3β	C4α	A2δ	B1α	D3β	C4γ	A2δ
C2γ	A4δ	B3β	D1α	C2δ	A4α	B3β	D1γ	C2δ	A4γ	B3β	D1α

A3γ	C1δ	D2α	B4β	A3γ	C1β	D2α	B4δ	A3γ	C1δ	D2β	B4α
D4β	B2α	A1δ	C3γ	D4δ	B2α	A1β	C3γ	D4α	B2β	A1δ	C3γ
B1δ	D3γ	C4β	A2α	B1β	D3γ	C4δ	A2α	B1δ	D3γ	C4α	A2β
C2α	A4β	B3γ	D1δ	C2α	A4δ	B3γ	D1β	C2β	A4α	B3γ	D1δ

A3γ	C1α	D2β	B4δ	A3γ	C1β	D2δ	B4α	A3γ	C1α	D2δ	B4β
D4δ	B2β	A1α	C3γ	D4α	B2δ	A1β	C3γ	D4β	B2δ	A1α	C3γ
B1α	D3γ	C4δ	A2β	B1β	D3γ	C4α	A2δ	B1α	D3γ	C4β	A2δ
C2β	A4δ	B3γ	D1α	C2δ	A4α	B3γ	D1β	C2δ	A4β	B3γ	D1α

A3δ	C1γ	D2α	B4β	A3δ	C1β	D2α	B4γ	A3δ	C1γ	D2β	B4α
D4β	B2α	A1γ	C3δ	D4γ	B2α	A1β	C3δ	D4α	B2β	A1γ	C3δ
B1γ	D3δ	C4β	A2α	B1β	D3δ	C4γ	A2α	B1γ	D3δ	C4α	A2β
C2α	A4β	B3δ	D1γ	C2α	A4γ	B3δ	D1β	C2β	A4α	B3δ	D1γ

A3δ	C1α	D2β	B4γ	A3δ	C1β	D2γ	B4α	A3δ	C1α	D2γ	B4β
D4γ	B2β	A1α	C3δ	D4α	B2γ	A1β	C3δ	D4β	B2γ	A1α	C3δ
B1α	D3δ	C4γ	A2β	B1β	D3δ	C4α	A2γ	B1α	D3δ	C4β	A2γ
C2β	A4γ	B3δ	D1α	C2γ	A4α	B3δ	D1β	C2γ	A4β	B3δ	D1α

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A3α	C2δ	D4β	B1γ	A3α	C2γ	D4β	B1δ	A3α	C2δ	D4γ	B1β
D1γ	B4β	A2δ	C3α	D1δ	B4β	A2γ	C3α	D1β	B4γ	A2δ	C3α
B2δ	D3α	C1γ	A4β	B2γ	D3α	C1δ	A4β	B2δ	D3α	C1β	A4γ
C4β	A1γ	B3α	D2δ	C4β	A1δ	B3α	D2γ	C4γ	A1β	B3α	D2δ

A3α	C2β	D4γ	B1δ	A3α	C2γ	D4δ	B1β	A3α	C2β	D4δ	B1γ
D1δ	B4γ	A2β	C3α	D1β	B4δ	A2γ	C3α	D1γ	B4δ	A2β	C3α
B2β	D3α	C1δ	A4γ	B2γ	D3α	C1β	A4δ	B2β	D3α	C1γ	A4δ
C4γ	A1δ	B3α	D2β	C4δ	A1β	B3α	D2γ	C4δ	A1γ	B3α	D2β

The 64-bit code on Magic Square

Tropic Left (391-420)

A3β	C2δ	D4α	B1γ	A3β	C2γ	D4α	B1δ	A3β	C2δ	D4γ	B1α
D1γ	B4α	A2δ	C3β	D1δ	B4α	A2γ	C3β	D1α	B4γ	A2δ	C3β
B2δ	D3β	C1γ	A4α	B2γ	D3β	C1δ	A4α	B2δ	D3β	C1α	A4γ
C4α	A1γ	B3β	D2δ	C4α	A1δ	B3β	D2γ	C4γ	A1α	B3β	D2δ

A3β	C2α	D4γ	B1δ	A3β	C2γ	D4δ	B1α	A3β	C2α	D4δ	B1γ
D1δ	B4γ	A2α	C3β	D1α	B4δ	A2γ	C3β	D1γ	B4δ	A2α	C3β
B2α	D3β	C1δ	A4γ	B2γ	D3β	C1α	A4δ	B2α	D3β	C1γ	A4δ
C4γ	A1δ	B3β	D2α	C4δ	A1α	B3β	D2γ	C4δ	A1γ	B3β	D2α

A3γ	C2δ	D4α	B1β	A3γ	C2β	D4α	B1δ	A3γ	C2δ	D4β	B1α
D1β	B4α	A2δ	C3γ	D1δ	B4α	A2β	C3γ	D1α	B4β	A2δ	C3γ
B2δ	D3γ	C1β	A4α	B2β	D3γ	C1δ	A4α	B2δ	D3γ	C1α	A4β
C4α	A1β	B3γ	D2δ	C4α	A1δ	B3γ	D2β	C4β	A1α	B3γ	D2δ

A3γ	C2α	D4β	B1δ	A3γ	C2β	D4δ	B1α	A3γ	C2α	D4δ	B1β
D1δ	B4β	A2α	C3γ	D1α	B4δ	A2β	C3γ	D1β	B4δ	A2α	C3γ
B2α	D3γ	C1δ	A4β	B2β	D3γ	C1α	A4δ	B2α	D3γ	C1β	A4δ
C4β	A1δ	B3γ	D2α	C4δ	A1α	B3γ	D2β	C4δ	A1β	B3γ	D2α

A3δ	C2γ	D4α	B1β	A3δ	C2β	D4α	B1γ	A3δ	C2γ	D4β	B1α
D1β	B4α	A2γ	C3δ	D1γ	B4α	A2β	C3δ	D1α	B4β	A2γ	C3δ
B2γ	D3δ	C1β	A4α	B2β	D3δ	C1γ	A4α	B2γ	D3δ	C1α	A4β
C4α	A1β	B3δ	D2γ	C4α	A1γ	B3δ	D2β	C4β	A1α	B3δ	D2γ

A3δ	C2α	D4β	B1γ	A3δ	C2β	D4γ	B1α	A3δ	C2α	D4γ	B1β
D1γ	B4β	A2α	C3δ	D1α	B4γ	A2β	C3δ	D1β	B4γ	A2α	C3δ
B2α	D3δ	C1γ	A4β	B2β	D3δ	C1α	A4γ	B2α	D3δ	C1β	A4γ
C4β	A1γ	B3δ	D2α	C4γ	A1α	B3δ	D2β	C4γ	A1β	B3δ	D2α

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A3α	C1δ	D4β	B2γ	A3α	C1γ	D4β	B2δ	A3α	C1δ	D4γ	B2β
D2γ	B4β	A1δ	C3α	D2δ	B4β	A1γ	C3α	D2β	B4γ	A1δ	C3α
B1δ	D3α	C2γ	A4β	B1γ	D3α	C2δ	A4β	B1δ	D3α	C2β	A4γ
C4β	A2γ	B3α	D1δ	C4β	A2δ	B3α	D1γ	C4γ	A2β	B3α	D1δ

A3α	C1β	D4γ	B2δ	A3α	C1γ	D4δ	B2β	A3α	C1β	D4δ	B2γ
D2δ	B4γ	A1β	C3α	D2β	B4δ	A1γ	C3α	D2γ	B4δ	A1β	C3α
B1β	D3α	C2δ	A4γ	B1γ	D3α	C2β	A4δ	B1β	D3α	C2γ	A4δ
C4γ	A2δ	B3α	D1β	C4δ	A2β	B3α	D1γ	C4δ	A2γ	B3α	D1β

A3β	C1δ	D4α	B2γ	A3β	C1γ	D4α	B2δ	A3β	C1δ	D4γ	B2α
D2γ	B4α	A1δ	C3β	D2δ	B4α	A1γ	C3β	D2α	B4γ	A1δ	C3β
B1δ	D3β	C2γ	A4α	B1γ	D3β	C2δ	A4α	B1δ	D3β	C2α	A4γ
C4α	A2γ	B3β	D1δ	C4α	A2δ	B3β	D1γ	C4γ	A2α	B3β	D1δ

A3β	C1α	D4γ	B2δ	A3β	C1γ	D4δ	B2α	A3β	C1α	D4δ	B2γ
D2δ	B4γ	A1α	C3β	D2α	B4δ	A1γ	C3β	D2γ	B4δ	A1α	C3β
B1α	D3β	C2δ	A4γ	B1γ	D3β	C2α	A4δ	B1α	D3β	C2γ	A4δ
C4γ	A2δ	B3β	D1α	C4δ	A2α	B3β	D1γ	C4δ	A2γ	B3β	D1α

The 64-bit code on Magic Square

Tropic Left (421-450)

A3γ	C1δ	D4α	B2β
D2β	B4α	A1δ	C3γ
B1δ	D3γ	C2β	A4α
C4α	A2β	B3γ	D1δ

A3γ	C1β	D4α	B2δ
D2δ	B4α	A1β	C3γ
B1β	D3γ	C2δ	A4α
C4α	A2δ	B3γ	D1β

A3γ	C1δ	D4β	B2α
D2α	D4β	A1δ	C3γ
B1δ	D3γ	C2α	A4β
C4β	A2α	B3γ	D1δ

A3γ	C1α	D4β	B2δ
D2δ	D4β	A1α	C3γ
B1α	D3γ	C2δ	A4β
C4β	A2δ	B3γ	D1α

A3γ	C1β	D4δ	B2α
D2α	B4δ	A1β	C3γ
B1β	D3γ	C2α	A4δ
C4δ	A2α	B3γ	D1β

A3γ	C1α	D4δ	B2β
D2β	B4δ	A1α	C3γ
B1α	D3γ	C2β	A4δ
C4δ	A2β	B3γ	D1γ

A3δ	C1γ	D4α	B2β
D2β	B4α	A1γ	C3δ
B1γ	D3δ	C2β	A4α
C4α	A2β	B3δ	D1γ

A3δ	C1β	D4α	B2γ
D2γ	B4α	A1β	C3δ
B1β	D3δ	C2γ	A4α
C4α	A2γ	B3δ	D1β

A3δ	C1γ	D4β	B2α
D2α	B4β	A1γ	C3δ
B1γ	D3δ	C2α	A4β
C4β	A2α	B3δ	D1γ

A3δ	C1α	D4β	B2γ
D2γ	B4β	A1α	C3δ
B1α	D3δ	C2γ	A4β
C4β	A2γ	B3δ	D1α

A3δ	C1β	D4γ	B2α
D2α	B4γ	A1β	C3δ
B1β	D3δ	C2α	A4γ
C4γ	A2α	B3δ	D1β

A3δ	C1α	D4γ	B2β
D2β	B4γ	A1α	C3δ
B1α	D3δ	C2β	A4γ
C4γ	A2β	B3δ	D1α

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A4α	C3δ	D1β	B2γ
D2γ	B1β	A3δ	C4α
B3δ	D4α	C2γ	A1β
C1β	A2γ	B4α	D3δ

A4α	C3γ	D1β	B2δ
D2δ	B1β	A3γ	C4α
B3γ	D4α	C2δ	A1β
C1β	A2δ	B4α	D3γ

A4α	C3δ	D1γ	B2β
D2β	B1γ	A3δ	C4α
B3δ	D4α	C2β	A1γ
C1γ	A2β	B4α	D3δ

A4α	C3β	D1γ	B2δ
D2δ	B1γ	A3β	C4α
B3β	D4α	C2δ	A1γ
C1γ	A2δ	B4α	D3β

A4α	C3γ	D1δ	B2β
D2β	B1δ	A3γ	C4α
B3γ	D4α	C2β	A1δ
C1δ	A2β	B4α	D3γ

A4α	C3β	D1δ	B2γ
D2γ	B1δ	A3β	C4α
B3β	D4α	C2γ	A1δ
C1δ	A2γ	B4α	D3β

A4β	C3δ	D1α	B2γ
D2γ	B1α	A3δ	C4β
B3δ	D4β	C2γ	A1α
C1α	A2γ	B4β	D3δ

A4β	C3γ	D1α	B2δ
D2δ	B1α	A3γ	C4β
B3γ	D4β	C2δ	A1α
C1α	A2δ	B4β	D3γ

A4β	C3δ	D1γ	B2α
D2α	B1γ	A3δ	C4β
B3δ	D4β	C2α	A1γ
C1γ	A2α	B4β	D3δ

A4β	C3α	D1γ	B2δ
D2δ	B1γ	A3α	C4β
B3α	D4β	C2δ	A1γ
C1γ	A2δ	B4β	D3α

A4β	C3γ	D1δ	B2α
D2α	B1δ	A3γ	C4β
B3γ	D4β	C2α	A1δ
C1δ	A2α	B4β	D3γ

A4β	C3α	D1δ	B2γ
D2γ	B1δ	A3α	C4β
B3α	D4β	C2γ	A1δ
C1δ	A2γ	B4β	D3α

A4γ	C3δ	D1α	B2β
D2β	B1α	A3δ	C4γ
B3δ	D4γ	C2β	A1α
C1α	A2β	B4γ	D3δ

A4γ	C3β	D1α	B2δ
D2δ	B1α	A3β	C4γ
B3β	D4γ	C2δ	A1α
C1α	A2δ	B4γ	D3β

A4γ	C3δ	D1β	B2α
D2α	B1β	A3δ	C4γ
B3δ	D4γ	C2α	A1β
C1β	A2α	B4γ	D3δ

A4γ	C3α	D1β	B2δ
D2δ	B1β	A3α	C4γ
B3α	D4γ	C2δ	A1β
C1β	A2δ	B4γ	D3α

A4γ	C3β	D1δ	B2α
D2α	B1δ	A3β	C4γ
B3β	D4γ	C2α	A1δ
C1δ	A2α	B4γ	D3β

A4γ	C3α	D1δ	B2β
D2β	B1δ	A3α	C4γ
B3α	D4γ	C2β	A1δ
C1δ	A2β	B4γ	D3α

The 64-bit code on Magic Square

Tropic Left (451-480)

A4δ	C3γ	D1α	B2β	A4δ	C3β	D1α	B2γ	A4δ	C3γ	D1β	B2α
D2β	B1α	A3γ	C4δ	D2γ	B1α	A3β	C4δ	D2α	B1β	A3γ	C4δ
B3γ	D4δ	C2β	A1α	B3β	D4δ	C2γ	A1α	B3γ	D4δ	C2α	A1β
C1α	A2β	B4δ	D3γ	C1α	A2γ	B4δ	D3β	C1β	A2α	B4δ	D3γ

A4δ	C3α	D1β	B2γ	A4δ	C3β	D1γ	B2α	A4δ	C3α	D1γ	B2β
D2γ	B1β	A3α	C4δ	D2α	B1γ	A3β	C4δ	D2β	B1γ	A3α	C4δ
B3α	D4δ	C2γ	A1β	B3β	D4δ	C2α	A1γ	B3α	D4δ	C2β	A1γ
C1β	A2γ	B4δ	D3α	C1γ	A2α	B4δ	D3β	C1γ	A2β	B4δ	D3α

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A4α	C2δ	D1β	B3γ	A4α	C2γ	D1β	B3δ	A4α	C2δ	D1γ	B3β
D3γ	B1β	A2δ	C4α	D3δ	B1β	A2γ	C4α	D3β	B1γ	A2δ	C4α
B2δ	D4α	C3γ	A1β	B2γ	D4α	C3δ	A1β	B2δ	D4α	C3β	A1γ
C1β	A3γ	B4α	D2δ	C1β	A3δ	B4α	D2γ	C1γ	A3β	B4α	D2δ

A4α	C2β	D1γ	B3δ	A4α	C2γ	D1δ	B3β	A4α	C2β	D1δ	B3γ
D3δ	B1γ	A2β	C4α	D3β	B1δ	A2γ	C4α	D3γ	B1δ	A2β	C4α
B2β	D4α	C3δ	A1γ	B2γ	D4α	C3β	A1δ	B2β	D4α	C3γ	A1δ
C1γ	A3δ	B4α	D2β	C1δ	A3β	B4α	D2γ	C1δ	A3γ	B4α	D2β

A4β	C2δ	D1α	B3γ	A4β	C2γ	D1α	B3δ	A4β	C2δ	D1γ	B3α
D3γ	B1α	A2δ	C4β	D3δ	B1α	A2γ	C4β	D3α	B1γ	A2δ	C4β
B2δ	D4β	C3γ	A1α	B2γ	D4β	C3δ	A1α	B2δ	D4β	C3α	A1γ
C1α	A3γ	B4β	D2δ	C1α	A3δ	B4β	D2γ	C1γ	A3α	B4β	D2δ

A4β	C2α	D1γ	B3δ	A4β	C2γ	D1δ	B3α	A4β	C2α	D1δ	B3γ
D3δ	B1γ	A2α	C4β	D3α	B1δ	A2γ	C4β	D3γ	B1δ	A2α	C4β
B2α	D4β	C3δ	A1γ	B2γ	D4β	C3α	A1δ	B2α	D4β	C3γ	A1δ
C1γ	A3δ	B4β	D2α	C1δ	A3α	B4β	D2γ	C1δ	A3γ	B4β	D2α

A4γ	C2δ	D1α	B3β	A4γ	C2β	D1α	B3δ	A4γ	C2δ	D1β	B3α
D3β	B1α	A2δ	C4γ	D3δ	B1α	A2β	C4γ	D3α	B1β	A2δ	C4γ
B2δ	D4γ	C3β	A1α	B2β	D4γ	C3δ	A1α	B2δ	D4γ	C3α	A1β
C1α	A3β	B4γ	D2δ	C1α	A3δ	B4γ	D2β	C1β	A3α	B4γ	D2δ

A4γ	C2α	D1β	B3δ	A4γ	C2β	D1δ	B3α	A4γ	C2α	D1δ	B3β
D3δ	B1β	A2α	C4γ	D3α	B1δ	A2β	C4γ	D3β	B1δ	A2α	C4γ
B2α	D4γ	C3δ	A1β	B2β	D4γ	C3α	A1δ	B2α	D4γ	C3β	A1δ
C1β	A3δ	B4γ	D2α	C1δ	A3α	B4γ	D2β	C1δ	A3β	B4γ	D2α

A4δ	C2γ	D1α	B3β	A4δ	C2β	D1α	B3γ	A4δ	C2γ	D1β	B3α
D3β	B1α	A2γ	C4δ	D3γ	B1α	A2β	C4δ	D3α	B1β	A2γ	C4δ
B2γ	D4δ	C3β	A1α	B2β	D4δ	C3γ	A1α	B2γ	D4δ	C3α	A1β
C1α	A3β	B4δ	D2γ	C1α	A3γ	B4δ	D2β	C1β	A3α	B4δ	D2γ

A4δ	C2α	D1β	B3γ	A4δ	C2β	D1γ	B3α	A4δ	C2α	D1γ	B3β
D3γ	B1β	A2α	C4δ	D3α	B1γ	A2β	C4δ	D3β	B1γ	A2α	C4δ
B2α	D4δ	C3γ	A1β	B2β	D4δ	C3α	A1γ	B2α	D4δ	C3β	A1γ
C1β	A3γ	B4δ	D2α	C1γ	A3α	B4δ	D2β	C1γ	A3β	B4δ	D2α

The 64-bit code on Magic Square

Tropic Left (481-510)

A4α	C3δ	D2β	B1γ	A4α	C3γ	D2β	B1δ	A4α	C3δ	D2γ	B1β
D1γ	B2β	A3δ	C4α	D1δ	B2β	A3γ	C4α	D1β	B2γ	A3δ	C4α
B3δ	D4α	C1γ	A2β	B3γ	D4α	C1δ	A2β	B3δ	D4α	C1β	A2γ
C2β	A1γ	B4α	D3δ	C2β	A1δ	B4α	D3γ	C2γ	A1β	B4α	D3δ

A4α	C3β	D2γ	B1δ	A4α	C3γ	D2δ	B1β	A4α	C3β	D2δ	B1γ
D1δ	B2γ	A3β	C4α	D1β	B2δ	A3γ	C4α	D1γ	B2δ	A3β	C4α
B3β	D4α	C1δ	A2γ	B3γ	D4α	C1β	A2δ	B3β	D4α	C1γ	A2δ
C2γ	A1δ	B4α	D3β	C2δ	A1β	B4α	D3γ	C2δ	A1γ	B4α	D3β

A4β	C3δ	D2α	B1γ	A4β	C3γ	D2α	B1δ	A4β	C3δ	D2γ	B1α
D1γ	B2α	A3δ	C4β	D1δ	B2α	A3γ	C4β	D1α	B2γ	A3δ	C4β
B3δ	D4β	C1γ	A2α	B3γ	D4β	C1δ	A2α	B3δ	D4β	C1α	A2γ
C2α	A1γ	B4β	D3δ	C2α	A1δ	B4β	D3γ	C2γ	A1α	B4β	D3δ

A4β	C3α	D2γ	B1δ	A4β	C3γ	D2δ	B1α	A4β	C3α	D2δ	B1γ
D1δ	B2γ	A3α	C4β	D1α	B2δ	A3γ	C4β	D1γ	B2δ	A3α	C4β
B3α	D4β	C1δ	A2γ	B3γ	D4β	C1α	A2δ	B3α	D4β	C1γ	A2δ
C2γ	A1δ	B4β	D3α	C2δ	A1α	B4β	D3γ	C2δ	A1γ	B4β	D3α

A4γ	C3δ	D2α	B1β	A4γ	C3β	D2α	B1δ	A4γ	C3δ	D2β	B1α
D1β	B2α	A3δ	C4γ	D1δ	B2α	A3β	C4γ	D1α	B2β	A3δ	C4γ
B3δ	D4γ	C1β	A2α	B3β	D4γ	C1δ	A2α	B3δ	D4γ	C1α	A2β
C2α	A1β	B4γ	D3δ	C2α	A1δ	B4γ	D3β	C2β	A1α	B4γ	D3δ

A4γ	C3α	D2β	B1δ	A4γ	C3β	D2δ	B1α	A4γ	C3α	D2δ	B1β
D1δ	B2β	A3α	C4γ	D1α	B2δ	A3β	C4γ	D1β	B2δ	A3α	C4γ
B3α	D4γ	C1δ	A2β	B3β	D4γ	C1α	A2δ	B3α	D4γ	C1β	A2δ
C2β	A1δ	B4γ	D3α	C2δ	A1α	B4γ	D3β	C2δ	A1β	B4γ	D3α

A4δ	C3γ	D2α	B1β	A4δ	C3β	D2α	B1γ	A4δ	C3γ	D2β	B1α
D1β	B2α	A3γ	C4δ	D1γ	B2α	A3β	C4δ	D1α	B2β	A3γ	C4δ
B3γ	D4δ	C1β	A2α	B3β	D4δ	C1γ	A2α	B3γ	D4δ	C1α	A2β
C2α	A1β	B4δ	D3γ	C2α	A1γ	B4δ	D3β	C2β	A1α	B4δ	D3γ

A4δ	C3α	D2β	B1γ	A4δ	C3β	D2γ	B1α	A4δ	C3α	D2γ	B1β
D1γ	B2β	A3α	C4δ	D1α	B2γ	A3β	C4δ	D1β	B2γ	A3α	C4δ
B3α	D4δ	C1γ	A2β	B3β	D4δ	C1α	A2γ	B3α	D4δ	C1β	A2γ
C2β	A1γ	B4δ	D3α	C2γ	A1α	B4δ	D3β	C2γ	A1β	B4δ	D3α

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A4α	C1δ	D2β	B3γ	A4α	C1γ	D2β	B3δ	A4α	C1δ	D2γ	B3β
D3γ	B2β	A1δ	C4α	D3δ	B2β	A1γ	C4α	D3β	B2γ	A1δ	C4α
B1δ	D4α	C3γ	A2β	B1γ	D4α	C3δ	A2β	B1δ	D4α	C3β	A2γ
C2β	A3γ	B4α	D1δ	C2β	A3δ	B4α	D1γ	C2γ	A3β	B4α	D1δ

A4α	C1β	D2γ	B3δ	A4α	C1γ	D2δ	B3β	A4α	C1β	D2δ	B3γ
D3δ	B2γ	A1β	C4α	D3β	B2δ	A1γ	C4α	D3γ	B2δ	A1β	C4α
B1β	D4α	C3δ	A2γ	B1γ	D4α	C3β	A2δ	B1β	D4α	C3γ	A2β
C2γ	A3δ	B4α	D1β	C2δ	A3β	B4α	D1γ	C2δ	A3γ	B4α	D1β

The 64-bit code on Magic Square

Tropic Left (511-540)

A4β	C1δ	D2α	B3γ	A4β	C1γ	D2α	B3δ	A4β	C1δ	D2γ	B3α
D3γ	B2α	A1δ	C4β	D3δ	B2α	A1γ	C4β	D3α	B2γ	A1δ	C4β
B1δ	D4β	C3γ	A2α	B1γ	D4β	C3δ	A2α	B1δ	D4β	C3α	A2γ
C2α	A3γ	B4β	D1δ	C2α	A3δ	B4β	D1γ	C2γ	A3α	B4β	D1δ

A4β	C1α	D2γ	B3δ	A4β	C1γ	D2δ	B3α	A4β	C1α	D2δ	B3γ
D3δ	B2γ	A1α	C4β	D3α	B2δ	A1γ	C4β	D3γ	B2δ	A1α	C4β
B1α	D4β	C3δ	A2γ	B1γ	D4β	C3α	A2δ	B1α	D4β	C3γ	A2δ
C2γ	A3δ	B4β	D1α	C2δ	A3α	B4β	D1γ	C2δ	A3γ	B4β	D1α

A4γ	C1δ	D2α	B3β	A4γ	C1β	D2α	B3δ	A4γ	C1δ	D2β	B3α
D3β	B2α	A1δ	C4γ	D3δ	B2α	A1β	C4γ	D3α	B2β	A1δ	C4γ
B1δ	D4γ	C3β	A2α	B1β	D4γ	C3δ	A2α	B1δ	D4γ	C3α	A2β
C2α	A3β	B4γ	D1δ	C2α	A3δ	B4γ	D1β	C2β	A3α	B4γ	D1δ

A4γ	C1α	D2β	B3δ	A4γ	C1β	D2δ	B3α	A4γ	C1α	D2δ	B3β
D3δ	B2β	A1α	C4γ	D3α	B2δ	A1β	C4γ	D3β	B2δ	A1α	C4γ
B1α	D4γ	C3δ	A2β	B1β	D4γ	C3α	A2δ	B1α	D4γ	C3β	A2δ
C2β	A3δ	B4γ	D1α	C2δ	A3α	B4γ	D1β	C2δ	A3β	B4γ	D1α

A4δ	C1γ	D2α	B3β	A4δ	C1β	D2α	B3γ	A4δ	C1γ	D2β	B3α
D3β	B2α	A1γ	C4δ	D3γ	B2α	A1β	C4δ	D3α	B2β	A1γ	C4δ
B1γ	D4δ	C3β	A2α	B1β	D4δ	C3γ	A2α	B1γ	D4δ	C3α	A2β
C2α	A3β	B4δ	D1γ	C2α	A3γ	B4δ	D1β	C2β	A3α	B4δ	D1γ

A4δ	C1α	D2β	B3γ	A4δ	C1β	D2γ	B3α	A4δ	C1α	D2γ	B3β
D3γ	B2β	A1α	C4δ	D3α	B2γ	A1β	C4δ	D3β	B2γ	A1α	C4δ
B1α	D4δ	C3γ	A2β	B1β	D4δ	C3α	A2γ	B1α	D4δ	C3β	A2γ
C2β	A3γ	B4δ	D1α	C2γ	A3α	B4δ	D1β	C2γ	A3β	B4δ	D1α

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A4α	C2δ	D3β	B1γ	A4α	C2γ	D3β	B1δ	A4α	C2δ	D3γ	B1β
D1γ	B3β	A2δ	C4α	D1δ	B3β	A2γ	C4α	D1β	B3γ	A2δ	C4α
B2δ	D4α	C1γ	A3β	B2γ	D4α	C1δ	A3β	B2δ	D4α	C1β	A3γ
C3β	A1γ	B4α	D2δ	C3β	A1δ	B4α	D2γ	C3γ	A1β	B4α	D2δ

A4α	C2β	D3γ	B1δ	A4α	C2γ	D3δ	B1β	A4α	C2β	D3δ	B1γ
D1δ	B3γ	A2β	C4α	D1β	B3δ	A2γ	C4α	D1γ	B3δ	A2β	C4α
B2β	D4α	C1δ	A3γ	B2γ	D4α	C1β	A3δ	B2β	D4α	C1γ	A3δ
C3γ	A1δ	B4α	D2β	C3δ	A1β	B4α	D2γ	C3δ	A1γ	B4α	D2β

A4β	C2δ	D3α	B1γ	A4β	C2γ	D3α	B1δ	A4β	C2δ	D3γ	B1α
D1γ	B3α	A2δ	C4β	D1δ	B3α	A2γ	C4β	D1α	B3γ	A2δ	C4β
B2δ	D4β	C1γ	A3α	B2γ	D4β	C1δ	A3α	B2δ	D4β	C1α	A3γ
C3α	A1γ	B4β	D2δ	C3α	A1δ	B4β	D2γ	C3γ	A1α	B4β	D2δ

A4β	C2α	D3γ	B1δ	A4β	C2γ	D3δ	B1α	A4β	C2α	D3δ	B1γ
D1δ	B3γ	A2α	C4β	D1α	B3δ	A2γ	C4β	D1γ	B3δ	A2α	C4β
B2α	D4β	C1δ	A3γ	B2γ	D4β	C1α	A3δ	B2α	D4β	C1γ	A3δ
C3γ	A1δ	B4β	D2α	C3δ	A1α	B4β	D2γ	C3δ	A1γ	B4β	D2α

The 64-bit code on Magic Square

Tropic Left (541-570)

A4γ	C2δ	D3α	B1β
D1β	B3α	A2δ	C4γ
B2δ	D4γ	C1β	A3α
C3α	A1β	B4γ	D2δ

A4γ	C2β	D3α	B1δ
D1δ	B3α	A2β	C4γ
B2β	D4γ	C1δ	A3α
C3α	A1δ	B4γ	D2β

A4γ	C2δ	D3β	B1α
D1α	B3β	A2δ	C4γ
B2δ	D4γ	C1α	A3β
C3β	A1α	B4γ	D2δ

A4γ	C2α	D3β	B1δ
D1δ	B3β	A2α	C4γ
B2α	D4γ	C1δ	A3β
C3β	A1δ	B4γ	D2α

A4γ	C2β	D3δ	B1α
D1α	B3δ	A2β	C4γ
B2β	D4γ	C1α	A3δ
C3δ	A1α	B4γ	D2β

A4γ	C2α	D3δ	B1β
D1β	B3δ	A2α	C4γ
B2α	D4γ	C1β	A3δ
C3δ	A1β	B4γ	D2α

A4δ	C2γ	D3α	B1β
D1β	B3α	A2γ	C4δ
B2γ	D4δ	C1β	A3α
C3α	A1β	B4δ	D2γ

A4δ	C2β	D3α	B1γ
D1γ	B3α	A2β	C4δ
B2β	D4δ	C1γ	A3α
C3α	A1γ	B4δ	D2β

A4δ	C2γ	D3β	B1α
D1α	B3β	A2γ	C4α
B2γ	D4δ	C1α	A3β
C3β	A1α	B4δ	D2γ

A4δ	C2α	D3β	B1γ
D1γ	B3β	A2α	C4δ
B2α	D4δ	C1γ	A3β
C3β	A1γ	B4δ	D2α

A4δ	C2β	D3γ	B1α
D1α	B3γ	A2β	C4δ
B2β	D4δ	C1α	A3γ
C3γ	A1α	B4δ	D2β

A4δ	C2α	D3γ	B1β
D1β	B3γ	A2α	C4δ
B2α	D4δ	C1β	A3γ
C3γ	A1β	B4δ	D2α

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A4α	C1δ	D3β	B2γ
D2γ	B3β	A1δ	C4α
B1δ	D4α	C2γ	A3β
C3β	A2γ	B4α	D1δ

A4α	C1γ	D3β	B2δ
D2δ	B3β	A1γ	C4α
B1γ	D4α	C2δ	A3β
C3β	A2δ	B4α	D1γ

A4α	C1δ	D3γ	B2β
D2β	B3γ	A1δ	C4α
B1δ	D4α	C2β	A3γ
C3γ	A2β	B4α	D1δ

A4α	C1β	D3γ	B2δ
D2δ	B3γ	A1β	C4α
B1β	D4α	C2δ	A3γ
C3γ	A2δ	B4α	D1β

A4α	C1γ	D3δ	B2β
D2β	B3δ	A1γ	C4α
B1γ	D4α	C2β	A3δ
C3δ	A2β	B4α	D1γ

A4α	C1β	D3δ	B2γ
D2γ	B3δ	A1β	C4α
B1β	D4α	C2γ	A3δ
C3δ	A2γ	B4α	D1β

A4β	C1δ	D3α	B2γ
D2γ	B3α	A1δ	C4β
B1δ	D4β	C2γ	A3α
C3α	A2γ	B4β	D1δ

A4β	C1γ	D3α	B2δ
D2δ	B3α	A1γ	C4β
B1γ	D4β	C2δ	A3α
C3α	A2δ	B4β	D1γ

A4β	C1δ	D3γ	B2α
D2α	B3γ	A1δ	C4β
B1δ	D4β	C2α	A3γ
C3γ	A2α	B4β	D1δ

A4β	C1α	D3γ	B2δ
D2δ	B3γ	A1α	C4β
B1α	D4β	C2δ	A3γ
C3γ	A2δ	B4β	D1α

A4β	C1γ	D3δ	B2α
D2α	B3δ	A1γ	C4β
B1γ	D4β	C2α	A3δ
C3δ	A2α	B4β	D1γ

A4β	C1α	D3δ	B2γ
D2γ	B3δ	A1α	C4β
B1α	D4β	C2γ	A3δ
C3δ	A2γ	B4β	D1α

A4γ	C1δ	D3α	B2β
D2β	B3α	A1δ	C4γ
B1δ	D4γ	C2β	A3α
C3α	A2β	B4γ	D1δ

A4γ	C1β	D3α	B2δ
D2δ	B3α	A1β	C4γ
B1β	D4γ	C2δ	A3α
C3α	A2δ	B4γ	D1β

A4γ	C1δ	D3β	B2α
D2α	B3β	A1δ	C4γ
B1δ	D4γ	C2α	A3β
C3β	A2α	B4γ	D1δ

A4γ	C1α	D3β	B2δ
D2δ	B3β	A1α	C4γ
B1α	D4γ	C2δ	A3β
C3β	A2δ	B4γ	D1α

A4γ	C1β	D3δ	B2α
D2α	B3δ	A1β	C4γ
B1β	D4γ	C2α	A3δ
C3δ	A2α	B4γ	D1β

A4γ	C1α	D3δ	B2β
D2β	B3δ	A1α	C4γ
B1α	D4γ	C2β	A3δ
C3δ	A2β	B4γ	D1α

The 64-bit code on Magic Square

Tropic Left (571-576)

A4δ	C1γ	D3α	B2β	A4δ	C1β	D3α	B2γ	A4δ	C1γ	D3β	B2α
D2β	B3α	A1γ	C4δ	D2γ	B3α	A1β	C4δ	D2α	B3β	A1γ	C4δ
B1γ	D4δ	C2β	A3β	B1β	D4δ	C2γ	A3α	B1γ	D4δ	C2α	A3β
C3α	A2β	B4δ	D1γ	C3α	A2γ	B4δ	D1β	C3β	A2α	B4δ	D1γ

A4δ	C1α	D3β	B2γ	A4δ	C1β	D3γ	B2α	A4δ	C1α	D3γ	B2β
D2γ	B3β	A1α	C4δ	D2α	B3γ	A1β	C4δ	D2β	B3γ	A1α	C4δ
B1α	D4δ	C2γ	A3β	B1β	D4δ	C2α	A3γ	B1α	D4δ	C2β	A3γ
C3β	A2γ	B4δ	D1α	C3γ	A2α	B4δ	D1β	C3γ	A2β	B4δ	D1α

16. The Genetic 64-bit Code on Magic Squares

The key to genetic 64-bit code

A1α	=	UUU	C1α	=	AUU
A1β	=	UUC	C1β	=	AUC
A1γ	=	UUA	C1γ	=	AUA
A1δ	=	UUG	C1δ	=	AUG
A2α	=	UCA	C2α	=	ACU
A2β	=	UCC	C2β	=	ACC
A2γ	=	UCA	C2γ	=	ACA
A2δ	=	UCG	C2δ	=	ACG
A3α	=	UAU	C3α	=	AAU
A3β	=	UAC	C3β	=	AAC
A3γ	=	UAA	C3γ	=	AAA
A3δ	=	UAG	C3δ	=	AAG
A4α	=	UGU	C4α	=	AGU
A4β	=	UGC	C4β	=	AGC
A4γ	=	UGA	C4γ	=	AGA
A4δ	=	UGG	C4δ	=	AGG
B1α	=	CUU	D1α	=	GUU
B1β	=	CUC	D1β	=	GUC
B1γ	=	CUA	D1γ	=	GUA
B1δ	=	CUG	D1δ	=	GUG
B2α	=	CCU	D2α	=	GCU
B2β	=	CCC	D2β	=	GCC
B2γ	=	CCA	D2γ	=	GCA
B2δ	=	CCG	D2δ	=	GCG
B3α	=	CAU	D3α	=	CAU
B3β	=	CAC	D3β	=	CAC
B3γ	=	CAA	D3γ	=	CAA
B3δ	=	CAG	D3δ	=	CAG
B4α	=	CGU	D4α	=	GGU
B4β	=	CGC	D4β	=	GGC
B4γ	=	CGA	D4γ	=	GGA
B4δ	=	CGG	D4δ	=	GGG

First letter — Second letter — Third letter

	1	2	3	4	
A	UUU	UCA	UAU	UGU	α
	UUC	UCC	UAC	UGC	β
	UUA	UCA	UAA	UGA	γ
	UUG	UCG	UAG	UGG	δ
B	CUU	CCU	CAU	CGU	α
	CUC	CCC	CAC	CGC	β
	CUA	CCA	CAA	CGA	γ
	CUG	CCG	CAG	CGG	δ
C	AUU	ACU	AAU	AGU	α
	AUC	ACC	AAC	AGC	β
	AUA	ACA	AAA	AGA	γ
	AUG	ACG	AAG	AGG	δ
D	GUU	GCU	CAU	GGU	α
	GUC	GCC	CAC	GGC	β
	GUA	GCA	CAA	GGA	γ
	GUG	GCG	CAG	GGG	δ

$$\Sigma = \frac{1}{2}\cdot n\left(n^3+1\right) \qquad bit = n^3 = 4^3 = 64$$

$$\Sigma = \left(n:a,d\right) = \frac{1}{2}\cdot n\cdot\left[2\cdot a + d\cdot\left(n^3-1\right)\right]$$

If use the start value of *a = 36* in the 64-bit code, the start codon will be C1δ = AUG in the genetic code, which correspond to the amino acid Methionine, and with an entire increasing with integer difference *d = 1* between terms of codon, then the magic constant sum is Σ =306. The genetic code by which DNA stores the genetic information in forms of genes, and which the genetic code converts into the protein synthesis with codons of three nucleotides and with four possible bases. The three nucleotides can give 4^3 = 64 different possibilities of codons.

The 64-bit code on Magic Square

Tropic Right (1-30)

A1α	D3δ	B4β	C2γ	A1α	D3γ	B4β	C2δ	A1α	D3δ	B4γ	C2β
C4γ	B2β	D1δ	A3α	C4δ	B2β	D1γ	A3α	C4β	B2γ	D1δ	A3α
D2δ	A4α	C3γ	B1β	D2γ	A4α	C3δ	B1β	D2δ	A4α	C3β	B1γ
B3β	C1γ	A2α	D4δ	B3β	C1δ	A2α	D4γ	B3γ	C1β	A2α	D4δ

A1α	D3β	B4γ	C2δ	A1α	D3γ	B4δ	C2β	A1α	D3β	B4δ	C2γ
C4δ	B2γ	D1β	A3α	C4β	B2δ	D1γ	A3α	C4γ	B2δ	D1β	A3α
D2β	A4α	C3δ	B1γ	D2γ	A4α	C3β	B1δ	D2β	A4α	C3γ	B1δ
B3γ	C1δ	A2α	D4β	B3δ	C1β	A2α	D4γ	B3δ	C1γ	A2α	D4β

A1β	D3δ	B4α	C2γ	A1β	D3γ	B4α	C2δ	A1β	D3δ	B4γ	C2α
C4γ	B2α	D1δ	A3β	C4δ	B2α	D1γ	A3β	C4α	B2γ	D1δ	A3β
D2δ	A4β	C3γ	B1α	D2γ	A4β	C3δ	B1α	D2δ	A4β	C3α	B1γ
B3α	C1γ	A2β	D4δ	B3α	C1δ	A2β	D4γ	B3γ	C1α	A2β	D4δ

A1β	D3α	B4γ	C2δ	A1β	D3γ	B4δ	C2α	A1β	D3α	B4δ	C2γ
C4δ	B2γ	D1α	A3β	C4α	B2δ	D1γ	A3β	C4γ	B2δ	D1α	A3β
D2α	A4β	C3δ	B1γ	D2γ	A4β	C3α	B1δ	D2α	A4β	C3γ	B1δ
B3γ	C1δ	A2β	D4α	B3δ	C1α	A2β	D4γ	B3δ	C1γ	A2β	D4α

A1γ	D3δ	B4α	C2β	A1γ	D3β	B4α	C2δ	A1γ	D3δ	B4β	C2α
C4β	B2α	D1δ	A3γ	C4δ	B2α	D1β	A3γ	C4α	B2β	D1δ	A3γ
D2δ	A4γ	C3β	B1α	D2β	A4γ	C3δ	B1α	D2δ	A4γ	C3α	B1β
B3α	C1β	A2γ	D4δ	B3α	C1δ	A2γ	D4β	B3β	C1α	A2γ	D4δ

A1γ	D3α	B4β	C2δ	A1γ	D3β	B4δ	C2α	A1γ	D3α	B4δ	C2β
C4δ	B2β	D1α	A3γ	C4α	B2δ	D1β	A3γ	C4β	B2δ	D1α	A3γ
D2α	A4γ	C3δ	B1β	D2β	A4γ	C3α	B1δ	D2α	A4γ	C3β	B1δ
B3β	C1δ	A2γ	D4α	B3δ	C1α	A2γ	D4β	B3δ	C1β	A2γ	D4α

A1δ	D3γ	B4α	C2β	A1δ	D3β	B4α	C2γ	A1δ	D3γ	B4β	C2α
C4β	B2α	D1γ	A3δ	C4γ	B2α	D1β	A3δ	C4α	B2β	D1γ	A3δ
D2γ	A4δ	C3β	B1α	D2β	A4δ	C3γ	B1α	D2γ	A4δ	C3α	B1β
B3α	C1β	A2δ	D4γ	B3α	C1γ	A2δ	D4β	B3β	C1α	A2δ	D4γ

A1δ	D3α	B4β	C2γ	A1δ	D3β	B4γ	C2α	A1δ	D3α	B4γ	C2β
C4γ	B2β	D1α	A3δ	C4α	B2γ	D1β	A3δ	C4β	B2γ	D1α	A3δ
D2α	A4δ	C3γ	B1β	D2β	A4δ	C3α	B1γ	D2α	A4δ	C3β	B1γ
B3β	C1γ	A2δ	D4α	B3γ	C1α	A2δ	D4β	B3γ	C1β	A2δ	D4α

2

A1α	D4δ	B3β	C2γ	A1α	D4γ	B3β	C2δ	A1α	D4δ	B3γ	C2β
C3γ	B2β	D1δ	A4α	C3δ	B2β	D1γ	A4α	C3β	B2γ	D1δ	A4α
D2δ	A3α	C4γ	B1β	D2γ	A3α	C4δ	B1β	D2δ	A3α	C4β	B1γ
B4β	C1γ	A2α	D3δ	B4β	C1δ	A2α	D3γ	B4γ	C1β	A2α	D3δ

A1α	D4β	B3γ	C2δ	A1α	D4γ	B3δ	C2β	A1α	D4β	B3δ	C2γ
C3δ	B2γ	D1β	A4α	C3β	B2δ	D1γ	A4α	C3γ	B2δ	D1β	A4α
D2β	A3α	C4δ	B1γ	D2γ	A3α	C4β	B1δ	D2β	A3α	C4γ	B1δ
B4γ	C1δ	A2α	D3β	B4δ	C1β	A2α	D3γ	B4δ	C1γ	A2α	D3β

The 64-bit code on Magic Square

Tropic Right (31-60)

A1β	D4δ	B3α	C2γ	A1β	D4γ	B3α	C2δ	A1β	D4δ	B3γ	C2α
C3γ	B2α	D1δ	A4β	C3δ	B2α	D1γ	A4β	C3α	B2γ	D1δ	A4β
D2δ	A3β	C4γ	B1α	D2γ	A3β	C4δ	B1α	D2δ	A3β	C4α	B1γ
B4α	C1γ	A2β	D3δ	B4α	C1δ	A2β	D3γ	B4γ	C1α	A2β	D3δ

A1β	D4α	B3γ	C2δ	A1β	D4γ	B3δ	C2α	A1β	D4α	B3δ	C2γ
C3δ	B2γ	D1α	A4β	C3α	B2δ	D1γ	A4β	C3γ	B2δ	D1α	A4β
D2α	A3β	C4δ	B1γ	D2γ	A3β	C4α	B1δ	D2α	A3β	C4γ	B1δ
B4γ	C1δ	A2β	D3α	B4δ	C1α	A2β	D3γ	B4δ	C1γ	A2β	D3α

A1γ	D4δ	B3α	C2β	A1γ	D4β	B3α	C2δ	A1γ	D4δ	B3β	C2α
C3β	B2α	D1δ	A4γ	C3δ	B2α	D1β	A4γ	C3α	B2β	D1δ	A4γ
D2δ	A3γ	C4β	B1α	D2β	A3γ	C4δ	B1α	D2δ	A3γ	C4α	B1β
B4α	C1β	A2γ	D3δ	B4α	C1δ	A2γ	D3β	B4β	C1α	A2γ	D3δ

A1γ	D4α	B3β	C2δ	A1γ	D4β	B3δ	C2α	A1γ	D4α	B3δ	C2β
C3δ	B2β	D1α	A4γ	C3α	B2δ	D1β	A4γ	C3β	B2δ	D1α	A4γ
D2α	A3γ	C4δ	B1β	D2β	A3γ	C4α	B1δ	D2α	A3γ	C4β	B1δ
B4β	C1δ	A2γ	D3α	B4δ	C1α	A2γ	D3β	B4α	C1β	A2γ	D3α

A1δ	D4γ	B3α	C2β	A1δ	D4β	B3α	C2γ	A1δ	D4γ	B3β	C2α
C3β	B2α	D1γ	A4δ	C3γ	B2α	D1β	A4δ	C3α	B2β	D1γ	A4δ
D2γ	A3δ	C4β	B1α	D2β	A3δ	C4γ	B1α	D2γ	A3δ	C4α	B1β
B4α	C1β	A2δ	D3γ	B4α	C1γ	A2δ	D3β	B4β	C1α	A2δ	D3γ

A1δ	D4α	B3β	C2γ	A1δ	D4β	B3γ	C2α	A1δ	D4α	B3γ	C2β
C3γ	B2β	D1α	A4δ	C3α	B2γ	D1β	A4δ	C3β	B2γ	D1α	A4δ
D2α	A3δ	C4γ	B1β	D2β	A3δ	C4α	B1γ	D2α	A3δ	C4β	B1γ
B4β	C1γ	A2δ	D3α	B4γ	C1α	A2δ	D3β	B4γ	C1β	A2δ	D3α

3

A1α	D2δ	B4β	C3γ	A1α	D2γ	B4β	C3δ	A1α	D2δ	B4γ	C3β
C4γ	B3β	D1δ	A2α	C4δ	B3β	D1γ	A2α	C4β	B3γ	D1δ	A2α
D3δ	A4α	C2γ	B1β	D3γ	A4α	C2δ	B1β	D3δ	A4α	C2β	B1γ
B2β	C1γ	A3α	D4δ	B2β	C1δ	A3α	D4γ	B2γ	C1β	A3α	D4δ

A1α	D2β	B4γ	C3δ	A1α	D2γ	B4δ	C3β	A1α	D2β	B4δ	C3γ
C4δ	B3γ	D1β	A2α	C4β	B3δ	D1γ	A2α	C4γ	B3δ	D1β	A2α
D3β	A4α	C2δ	B1γ	D3γ	A4α	C2β	B1δ	D3β	A4α	C2γ	B1δ
B2γ	C1δ	A3α	D4β	B2δ	C1β	A3α	D4γ	B2δ	C1γ	A3α	D4β

A1β	D2δ	B4α	C3γ	A1β	D2γ	B4α	C3δ	A1β	D2δ	B4γ	C3α
C4γ	B3α	D1δ	A2β	C4δ	B3α	D1γ	A2β	C4α	B3γ	D1δ	A2β
D3δ	A4β	C2γ	B1α	D3γ	A4β	C2δ	B1α	D3δ	A4β	C2α	B1γ
B2α	C1γ	A3β	D4δ	B2α	C1δ	A3β	D4γ	B2γ	C1α	A3β	D4δ

A1β	D2α	B4γ	C3δ	A1β	D2γ	B4δ	C3α	A1β	D2α	B4δ	C3γ
C4δ	B3γ	D1α	A2β	C4α	B3δ	D1γ	A2β	C4γ	B3δ	D1α	A2β
D3α	A4β	C2δ	B1γ	D3γ	A4β	C2α	B1δ	D3α	A4β	C2γ	B1δ
B2γ	C1δ	A3β	D4α	B2δ	C1α	A3β	D4γ	B2δ	C1γ	A3β	D4α

The 64-bit code on Magic Square

Tropic Right (61-90)

A1γ	D2δ	B4α	C3β	A1γ	D2β	B4α	C3δ	A1γ	D2δ	B4β	C3α
C4β	B3α	D1δ	A2γ	C4δ	B3α	D1β	A2γ	C4α	B3β	D1δ	A2γ
D3δ	A4γ	C2β	B1α	D3β	A4γ	C2δ	B1α	D3δ	A4γ	C2α	B1β
B2α	C1β	A3γ	D4δ	B2α	C1δ	A3γ	D4β	B2β	C1α	A3γ	D4δ

A1γ	D2α	B4β	C3δ	A1γ	D2β	B4δ	C3α	A1γ	D2α	B4δ	C3β
C4δ	B3β	D1α	A2γ	C4α	B3δ	D1β	A2γ	C4β	B3δ	D1α	A2γ
D3α	A4γ	C2δ	B1β	D3β	A4γ	C2α	B1δ	D3α	A4γ	C2β	B1δ
B2β	C1δ	A3γ	D4α	B2δ	C1α	A3γ	D4β	B2δ	C1β	A3γ	D4α

A1δ	D2γ	B4α	C3β	A1δ	D2β	B4α	C3γ	A1δ	D2γ	B4β	C3α
C4β	B3α	D1γ	A2δ	C4γ	B3α	D1β	A2δ	C4α	B3β	D1γ	A2δ
D3γ	A4δ	C2β	B1α	D3β	A4δ	C2γ	B1α	D3γ	A4δ	C2α	B1β
B2α	C1β	A3δ	D4γ	B2α	C1γ	A3δ	D4β	B2β	C1α	A3δ	D4γ

A1δ	D2α	B4β	C3γ	A1δ	D2β	B4γ	C3α	A1δ	D2α	B4γ	C3β
C4γ	B3β	D1α	A2δ	C4α	B3γ	D1β	A2δ	C4β	B3γ	D1α	A2δ
D3α	A4δ	C2γ	B1β	D3β	A4δ	C2α	B1γ	D3α	A4δ	C2β	B1γ
B2β	C1γ	A3δ	D4α	B2γ	C1α	A3δ	D4β	B2γ	C1β	A3δ	D4α

4

A1α	D4δ	B2β	C3γ	A1α	D4γ	B2β	C3δ	A1α	D4δ	B2γ	C3β
C2γ	B3β	D1δ	A4α	C2δ	B3β	D1γ	A4α	C2β	B3γ	D1δ	A4α
D3δ	A2α	C4γ	B1β	D3γ	A2α	C4δ	B1β	D3δ	A2α	C4β	B1γ
B4β	C1γ	A3α	D2δ	B4β	C1δ	A3α	D2γ	B4γ	C1β	A3α	D2δ

A1α	D4β	B2γ	C3δ	A1α	D4γ	B2δ	C3β	A1α	D4β	B2δ	C3γ
C2δ	B3γ	D1β	A4α	C2β	B3δ	D1γ	A4α	C2γ	B3δ	D1β	A4α
D3β	A2α	C4δ	B1γ	D3γ	A2α	C4β	B1δ	D3β	A2α	C4γ	B1δ
B4γ	C1δ	A3α	D2β	B4δ	C1β	A3α	D2γ	B4δ	C1γ	A3α	D2β

A1β	D4δ	B2α	C3γ	A1β	D4γ	B2α	C3δ	A1β	D4δ	B2γ	C3α
C2γ	B3α	D1δ	A4β	C2δ	B3α	D1γ	A4β	C2α	B3γ	D1δ	A4β
D3δ	A2β	C4γ	B1α	D3γ	A2β	C4δ	B1α	D3δ	A2β	C4α	B1γ
B4α	C1γ	A3β	D2δ	B4α	C1δ	A3β	D2γ	B4γ	C1α	A3β	D2δ

A1β	D4α	B2γ	C3δ	A1β	D4γ	B2δ	C3α	A1β	D4α	B2δ	C3γ
C2δ	B3γ	D1α	A4β	C2α	B3δ	D1γ	A4β	C2γ	B3δ	D1α	A4β
D3α	A2β	C4δ	B1γ	D3γ	A2β	C4α	B1δ	D3α	A2β	C4γ	B1δ
B4γ	C1δ	A3β	D2α	B4δ	C1α	A3β	D2γ	B4δ	C1γ	A3β	D2α

A1γ	D4δ	B2α	C3β	A1γ	D4β	B2α	C3δ	A1γ	D4δ	B2β	C3α
C2β	B3α	D1δ	A4γ	C2δ	B3α	D1β	A4γ	C2α	B3β	D1δ	A4γ
B3δ	A2γ	C4β	B1α	D3β	A2γ	C4δ	B1α	D3δ	A2γ	C4α	B1β
B4α	C1β	A3γ	D2δ	B4α	C1δ	A3γ	D2β	B4β	C1α	A3γ	D2δ

A1γ	D4α	B2β	C3δ	A1γ	D4β	B2δ	C3α	A1γ	D4α	B2δ	C3β
C2δ	B3β	D1α	A4γ	C2α	B3δ	D1β	A4γ	C2β	B3δ	D1α	A4γ
D3α	A2γ	C4δ	B1β	D3β	A2γ	C4α	B1δ	D3α	A2γ	C4β	B1δ
B4β	C1δ	A3γ	D2α	B4δ	C1α	A3γ	D2β	B4δ	C1β	A3γ	D2α

The 64-bit code on Magic Square

Tropic Right (91-120)

A1δ	D4γ	B2α	C3β	A1δ	D4β	B2α	C3γ	A1δ	D4γ	B2β	C3α
C2β	B3α	D1γ	A4δ	C2γ	B3α	D1β	A4δ	C2α	B3β	D1γ	A4δ
D3γ	A2δ	C4β	B1α	D3β	A2δ	C4γ	B1α	D3γ	A2δ	C4α	B1β
B4α	C1β	A3δ	D2γ	B4α	C1γ	A3δ	D2β	B4β	C1α	A3δ	D2γ

A1δ	D4α	B2β	C3γ	A1δ	D4β	B2γ	C3α	A1δ	D4α	B2γ	C3β
C2γ	B3β	D1α	A4δ	C2α	B3γ	D1β	A4δ	C2β	B3γ	D1α	A4δ
D3α	A2δ	C4γ	B1β	D3β	A2δ	C4α	B1γ	D3α	A2δ	C4β	B1γ
B4β	C1γ	A3δ	D2α	B4γ	C1α	A3δ	D2β	B4γ	C1β	A3δ	D2α

A1α	D2δ	B3β	C4γ	A1α	D2γ	B3β	C4δ	A1α	D2δ	B3γ	C4β
C3γ	B4β	D1δ	A2α	C3δ	B4β	D1γ	A2α	C3β	B4γ	D1δ	A2α
D4δ	A3α	C2γ	B1β	D4γ	A3α	C2δ	B1β	D4δ	A3α	C2β	B1γ
B2β	C1γ	A4α	D3δ	B2β	C1δ	A4α	D3γ	B2γ	C1β	A4α	D3δ

A1α	D2β	B3γ	C4δ	A1α	D2γ	B3δ	C4β	A1α	D2β	B3δ	C4γ
C3δ	B4γ	D1β	A2α	C3β	B4δ	D1γ	A2α	C3γ	B4δ	D1β	A2α
D4β	A3α	C2δ	B1γ	D4γ	A3α	C2β	B1δ	D4β	A3α	C2γ	B1δ
B2γ	C1δ	A4α	D3β	B2δ	C1β	A4α	D3γ	B2δ	C1γ	A4α	D3β

A1β	D2δ	B3α	C4γ	A1β	D2γ	B3α	C4δ	A1β	D2δ	B3γ	C4α
C3γ	B4α	D1δ	A2β	C3δ	B4α	D1γ	A2β	C3α	B4γ	D1δ	A2β
D4δ	A3β	C2γ	B1α	D4γ	A3β	C2δ	B1α	D4δ	A3β	C2α	B1γ
B2α	C1γ	A4β	D3δ	B2α	C1δ	A4β	D3γ	B2γ	C1α	A4β	D3δ

A1β	D2α	B3γ	C4δ	A1β	D2γ	B3δ	C4α	A1β	D2α	B3δ	C4γ
C3δ	B4γ	D1α	A2β	C3α	B4δ	D1γ	A2β	C3γ	B4δ	D1α	A2β
D4α	A3β	C2δ	B1γ	D4γ	A3β	C2α	B1δ	D4α	A3β	C2γ	B1δ
B2γ	C1δ	A4β	D3α	B2δ	C1α	A4β	D3γ	B2δ	C1γ	A4β	D3α

A1γ	D2δ	B3α	C4β	A1γ	D2β	B3α	C4δ	A1γ	D2δ	B3β	C4α
C3β	B4α	D1δ	A2γ	C3δ	B4α	D1β	A2γ	C3α	B4β	D1δ	A2γ
D4δ	A3γ	C2β	B1α	D4β	A3γ	C2δ	B1α	D4δ	A3γ	C2α	B1β
B2α	C1β	A4γ	D3δ	B2α	C1δ	A4γ	D3β	B2β	C1α	A4γ	D3δ

A1γ	D2α	B3β	C4δ	A1γ	D2β	B3δ	C4α	A1γ	D2α	B3δ	C4β
C3δ	B4β	D1α	A2γ	C3α	B4δ	D1β	A2γ	C3β	B4δ	D1α	A2γ
D4α	A3γ	C2δ	B1β	D4β	A3γ	C2α	B1δ	D4α	A3γ	C2β	B1δ
B2β	C1δ	A4γ	D3α	B2δ	C1α	A4γ	D3β	B2δ	C1β	A4γ	D3α

A1δ	D2γ	B3α	C4β	A1δ	D2β	B3α	C4γ	A1δ	D2γ	B3β	C4α
C3β	B4α	D1γ	A2δ	C3γ	B4α	D1β	A2δ	C3α	B4β	D1γ	A2δ
D4γ	A3δ	C2β	B1α	D4β	A3δ	C2γ	B1α	D4γ	A3δ	C2α	B1β
B2α	C1β	A4δ	D3γ	B2α	C1γ	A4δ	D3β	B2β	C1α	A4δ	D3γ

A1δ	D2α	B3β	C4γ	A1δ	D2β	B3γ	C4α	A1δ	D2α	B3γ	C4β
C3γ	B4β	D1α	A2δ	C3α	B4γ	D1β	A2δ	C3β	B4γ	D1α	A2δ
D4α	A3δ	C2γ	B1β	D4β	A3δ	C2α	B1γ	D4α	A3δ	C2β	B1γ
B2β	C1γ	A4δ	D3α	B2γ	C1α	A4δ	D3β	B2γ	C1β	A4δ	D3α

The 64-bit code on Magic Square

Tropic Right (121-150)

A1α	D3δ	B2β	C4γ	A1α	D3γ	B2β	C4δ	A1α	D3δ	B2γ	C4β
C2γ	B4β	D1δ	A3α	C2δ	B4β	D1γ	A3α	C2β	B4γ	D1δ	A3α
D4δ	A2α	C3γ	B1β	D4γ	A2α	C3δ	B1β	D4δ	A2α	C3β	B1γ
B3β	C1γ	A4α	D2δ	B3β	C1δ	A4α	D2γ	B3γ	C1β	A4α	D2δ

A1α	D3β	B2γ	C4δ	A1α	D3γ	B2δ	C4β	A1α	D3β	B2δ	C4γ
C2δ	B4γ	D1β	A3α	C2β	B4δ	D1γ	A3α	C2γ	B4δ	D1β	A3α
D4β	A2α	C3δ	B1γ	D4γ	A2α	C3β	B1δ	D4β	A2α	C3γ	B1δ
B3γ	C1δ	A4α	D2β	B3δ	C1β	A4α	D2γ	B3δ	C1γ	A4α	D2β

A1β	D3δ	B2α	C4γ	A1β	D3γ	B2α	C4δ	A1β	D3δ	B2γ	C4α
C2γ	B4α	D1δ	A3β	C2δ	B4α	D1γ	A3β	C2α	B4γ	D1δ	A3β
D4δ	A2β	C3γ	B1α	D4γ	A2β	C3δ	B1α	D4δ	A2β	C3α	B1γ
B3α	C1γ	A4β	D2δ	B3α	C1δ	A4β	D2γ	B3γ	C1α	A4β	D2δ

A1β	D3α	B2γ	C4δ	A1β	D3γ	B2δ	C4α	A1β	D3α	B2δ	C4γ
C2δ	B4γ	D1α	A3β	C2α	B4δ	D1γ	A3β	C2γ	B4δ	D1α	A3β
D4α	A2β	C3δ	B1γ	D4γ	A2β	C3α	B1δ	D4α	A2β	C3γ	B1δ
B3γ	C1δ	A4β	D2α	B3δ	C1α	A4β	D2γ	B3δ	C1γ	A4β	D2α

A1γ	D3δ	B2α	C4β	A1γ	D3β	B2α	C4δ	A1γ	D3δ	B2β	C4α
C2β	B4α	D1δ	A3γ	C2δ	B4α	D1β	A3γ	C2α	B4β	D1δ	A3γ
D4δ	A2γ	C3β	B1α	D4β	A2γ	C3δ	B1α	D4δ	A2γ	C3α	B1β
B3α	C1β	A4γ	D2δ	B3α	C1δ	A4γ	D2β	B3β	C1α	A4γ	D2δ

A1γ	D3α	B2β	C4δ	A1γ	D3β	B2δ	C4α	A1γ	D3α	B2δ	C4β
C2δ	B4β	D1α	A3γ	C2α	B4δ	D1β	A3γ	C2β	B4δ	D1α	A3γ
D4α	A2γ	C3δ	B1β	D4β	A2γ	C3α	B1δ	D4α	A2γ	C3β	B1δ
B3β	C1δ	A4γ	D2α	B3δ	C1α	A4γ	D2β	B3δ	C1β	A4γ	D2α

A1δ	D3γ	B2α	C4β	A1δ	D3β	B2α	C4γ	A1δ	D3γ	B2β	C4α
C2β	B4α	D1γ	A3δ	C2γ	B4α	D1β	A3δ	C2α	B4β	D1γ	A3δ
D4γ	A2δ	C3β	B1α	D4β	A2δ	C3γ	B1α	D4γ	A2δ	C3α	B1β
B3α	C1β	A4δ	D2γ	B3α	C1γ	A4δ	D2β	B3β	C1α	A4δ	D2γ

A1δ	D3α	B2β	C4γ	A1δ	D3β	B2γ	C4α	A1δ	D3α	B2γ	C4β
C2γ	B4β	D1α	A3δ	C2α	B4γ	D1β	A3δ	C2β	B4γ	D1α	A3δ
D4α	A2δ	C3γ	B1β	D4β	A2δ	C3α	B1γ	D4α	A2δ	C3β	B1γ
B3β	C1γ	A4δ	D2α	B3γ	C1α	A4δ	D2β	B3γ	C1β	A4δ	D2α

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A1α	D3δ	B4β	C1γ	A1α	D3δ	B4β	C1γ	A1α	D3δ	B4γ	C1β
C4γ	B1β	D2δ	A3α	C4γ	B1β	D2δ	A3α	C4β	B1γ	D2δ	A3α
D1δ	A4α	C3γ	B2β	D1δ	A4α	C3γ	B2β	D1δ	A4α	C3β	B2γ
B3β	C2γ	A1α	D4δ	B3β	C2γ	A1α	D4δ	B3γ	C2β	A1α	D4δ

A1α	D3β	B4γ	C1δ	A1α	D3γ	B4δ	C1β	A1α	D3β	B4δ	C1γ
C4δ	B1γ	D2β	A3α	C4β	B1δ	D2γ	A3α	C4γ	B1δ	D2β	A3α
D1β	A4α	C3δ	B2γ	D1γ	A4α	C3β	B2δ	D1β	A4α	C3γ	B2δ
B3γ	C2δ	A1α	D4β	B3δ	C2β	A1α	D4γ	B3δ	C2γ	A1α	D4β

The 64-bit code on Magic Square

Tropic Right (151-180)

A1β	D3δ	B4α	C1γ	A1β	D3γ	B4α	C1δ	A1β	D3δ	B4γ	C1α
C4γ	B1α	D2δ	A3β	C4δ	B1α	D2γ	A3β	C4α	B1γ	D2δ	A3β
D1δ	A4β	C3γ	B2α	D1γ	A4β	C3δ	B2α	D1δ	A4β	C3α	B2γ
B3α	C2γ	A1β	D4δ	B3α	C2δ	A1β	D4γ	B3γ	C2α	A1β	D4δ

A1β	D3α	B4γ	C1δ	A1β	D3γ	B4δ	C1α	A1β	D3γ	B4δ	C1α
C4δ	B1γ	D2α	A3β	C4α	B1δ	D2γ	A3β	C4α	B1δ	D2γ	A3β
D1α	A4β	C3δ	B2γ	D1γ	A4β	C3α	B2δ	D1γ	A4β	C3α	B2δ
B3γ	C2δ	A1β	D4α	B3δ	C2α	A1β	D4γ	B3δ	C2α	A1β	D4γ

A1γ	D3β	B4α	C1δ	A1γ	D3β	B4α	C1δ	A1γ	D3δ	B4β	C1α
C4β	B1α	D2δ	A3γ	C4δ	B1α	D2β	A3γ	C4α	B1β	D2δ	A3γ
D1δ	A4γ	C3β	B2α	D1β	A4γ	C3δ	B2α	D1δ	A4γ	C3α	B2β
B3α	C2β	A1γ	D4δ	B3α	C2δ	A1γ	D4β	B3β	C2α	A1γ	D4δ

A1γ	D3α	B4β	C1δ	A1γ	D3β	B4δ	C1δ	A1γ	D3α	B4δ	C1β
C4δ	B1β	D2α	A3γ	C4α	B1δ	D2β	A3γ	C4β	B1δ	D2α	A3γ
D1α	A4γ	C3δ	B2β	D1β	A4γ	C3α	B2δ	D1α	A4γ	C3β	B2δ
B3β	C2δ	A1γ	D4α	B3δ	C2α	A1γ	D4β	B3δ	C2β	A1γ	D4α

A1δ	D3γ	B4α	C1β	A1δ	D3β	B4α	C1γ	A1δ	D3γ	B4β	C1α
C4β	B1α	D2γ	A3δ	C4γ	B1α	D2β	A3δ	C4α	B1β	D2γ	A3δ
D1γ	A4δ	C3β	B2α	D1β	A4δ	C3γ	B2α	D1γ	A4δ	C3α	B2β
B3α	C2β	A1δ	D4γ	B3α	C2γ	A1δ	D4β	B3β	C2α	A1δ	D4γ

A1δ	D3α	B4β	C1γ	A1δ	D3β	B4γ	C1α	A1δ	D3α	B4γ	C1β
C4γ	B1β	D2α	A3δ	C4α	B1γ	D2β	A3δ	C4β	B1γ	D2α	A3δ
D1α	A4δ	C3γ	B2β	D1β	A4δ	C3α	B2γ	D1α	A4δ	C3β	B2γ
B3β	C2γ	A1δ	D4α	B3γ	C2α	A1δ	D4β	B3γ	C2β	A1δ	D4α

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A2α	D4δ	B3β	C1γ	A2α	D4γ	B3β	C1δ	A2α	D4δ	B3γ	C1β
C3γ	B1β	D2δ	A4α	C3δ	B1β	D2γ	A4α	C3β	B1γ	D2δ	A4α
D1δ	A3α	C4γ	B2β	D1γ	A3α	C4δ	B2β	D1δ	A3α	C4β	B2γ
B4β	C2γ	A1α	D3δ	B4β	C2δ	A1α	D3γ	B4γ	C2β	A1α	D3δ

A2α	D4β	B3γ	C1δ	A2α	D4γ	B3δ	C1β	A2α	D4β	B3δ	C1γ
C3δ	B1γ	D2β	A4α	C3β	B1δ	D2γ	A4α	C3γ	B1δ	D2β	A4α
D1β	A3α	C4δ	B2γ	D1γ	A3α	C4β	B2δ	D1β	A3α	C4γ	B2δ
B4γ	C2δ	A1α	D3β	B4δ	C2β	A1α	D3γ	B4δ	C2γ	A1α	D3β

A2β	D4δ	B3α	C1γ	A2β	D4γ	B3α	C1δ	A2β	D4δ	B3γ	C1α
C3γ	B1α	D2δ	A4β	C3δ	B1α	D2γ	A4β	C3α	B1γ	D2δ	A4β
D1δ	A3β	C4γ	B2α	D1γ	A3β	C4δ	B2α	D1δ	A3β	C4α	B2γ
B4α	C2γ	A1β	D3δ	B4α	C2δ	A1β	D3γ	B4γ	C2α	A1β	D3δ

A2β	D4α	B3γ	C1δ	A2β	D4γ	B3δ	C1α	A2β	D4γ	B3δ	C1α
C3δ	B1γ	D2α	A4β	C3α	B1δ	D2γ	A4β	C3α	B1δ	D2γ	A4β
D1α	A3β	C4δ	B2γ	D1γ	A3β	C4α	B2δ	D1γ	A3β	C4α	B2δ
B4γ	C2δ	A1β	D3α	B4δ	C2α	A1β	D3γ	B4δ	C2α	A1β	D3γ

The 64-bit code on Magic Square

Tropic Right (181-210)

A2γ	D4δ	B3α	C1β
C3β	B1α	D2δ	A4γ
D1δ	A3γ	C4β	B2α
B4α	C2β	A1γ	D3δ

A2γ	D4β	B3α	C1δ
C3δ	B1α	D2β	A4γ
D1β	A3γ	C4δ	B2α
B4α	C2δ	A1γ	D3β

A2γ	D4δ	B3β	C1α
C3α	B1β	D2δ	A4γ
D1δ	A3γ	C4α	B2β
B4β	C2α	A1γ	D3δ

A2γ	D4α	B3β	C1δ
C3δ	B1β	D2α	A4γ
D1α	A3γ	C4δ	B2β
B4β	C2δ	A1γ	D3α

A2γ	D4β	B3δ	C1α
C3α	B1δ	D2β	A4γ
D1β	A3γ	C4α	B2δ
B4δ	C2α	A1γ	D3β

A2γ	D4α	B3δ	C1β
C3β	B1δ	D2α	A4γ
D1α	A3γ	C4β	B2δ
B4δ	C2β	A1γ	D3α

A2δ	D4γ	B3α	C1β
C3β	B1α	D2γ	A4δ
D1γ	A3δ	C4β	B2α
B4α	C2β	A1δ	D3γ

A2δ	D4β	B3α	C1γ
C3γ	B1α	D2β	A4δ
D1β	A3δ	C4γ	B2α
B4α	C2γ	A1δ	D3β

A2δ	D4γ	B3β	C1α
C3α	B1β	D2γ	A4δ
D1γ	A3δ	C4α	B2β
B4β	C2α	A1δ	D3γ

A2δ	D4α	B3β	C1γ
C3γ	B1β	D2α	A4δ
D1α	A3δ	C4γ	B2β
B4β	C2γ	A1δ	D3α

A2δ	D4β	B3γ	C1α
C3α	B1γ	D2β	A4δ
D1β	A3δ	C4α	B2γ
B4γ	C2α	A1δ	D3β

A2δ	D4α	B3γ	C1β
C3β	B1γ	D2α	A4δ
D1α	A3δ	C4β	B2γ
B4γ	C2β	A1δ	D3α

A2α	D1δ	B4β	C3γ
C4γ	B3β	D2δ	A1α
D3δ	A4α	C1γ	B2β
B1β	C2γ	A3α	D4δ

A2α	D1γ	B4β	C3δ
C4δ	B3β	D2γ	A1α
D3γ	A4α	C1δ	B2β
B1β	C2δ	A3α	D4γ

A2α	D1δ	B4γ	C3β
C4β	B3γ	D2δ	A1α
D3δ	A4α	C1β	B2γ
B1γ	C2β	A3α	D4δ

A2α	D1β	B4γ	C3δ
C4δ	B3γ	D2β	A1α
D3β	A4α	C1δ	B2γ
B1γ	C2δ	A3α	D4β

A2α	D1γ	B4δ	C3β
C4β	B3δ	D2γ	A1α
D3γ	A4α	C1β	B2δ
B1δ	C2β	A3α	D4γ

A2α	D1β	B4δ	C3γ
C4γ	B3δ	D2β	A1α
D3β	A4α	C1γ	B2δ
B1δ	C2γ	A3α	D4β

A2β	D1δ	B4α	C3γ
C4γ	B3α	D2δ	A1β
D3δ	A4β	C1γ	B2α
B1α	C2γ	A3β	D4δ

A2β	D1γ	B4α	C3δ
C4δ	B3α	D2γ	A1β
D3γ	A4β	C1δ	B2α
B1α	C2δ	A3β	D4γ

A2β	D1δ	B4γ	C3α
C4α	B3γ	D2δ	A1β
D3δ	A4β	C1α	B2γ
B1γ	C2α	A3β	D4δ

A2β	D1α	B4γ	C3δ
C4δ	B3γ	D2α	A1β
D3α	A4β	C1δ	B2γ
B1γ	C2δ	A3β	D4α

A2β	D1γ	B4δ	C3α
C4α	B3δ	D2γ	A1β
D3γ	A4β	C1α	B2δ
B1δ	C2α	A3β	D4γ

A2β	D1α	B4δ	C3γ
C4γ	B3δ	D2α	A1β
D3α	A4β	C1γ	B2δ
B1δ	C2γ	A3β	D4α

A2γ	D1δ	B4α	C3β
C4β	B3α	D2δ	A1γ
D3δ	A4γ	C1β	B2α
B1α	C2β	A3γ	D4δ

A2γ	D1β	B4α	C3δ
C4δ	B3α	D2β	A1γ
D3β	A4γ	C1δ	B2α
B1α	C2δ	A3γ	D4β

A2γ	D1δ	B4β	C3α
C4α	B3β	D2δ	A1γ
D3δ	A4γ	C1α	B2β
B1β	C2α	A3γ	D4δ

A2γ	D1α	B4β	C3δ
C4δ	B3β	D2α	A1γ
D3α	A4γ	C1δ	B2β
B1β	C2δ	A3γ	D4α

A2γ	D1β	B4δ	C3α
C4α	B3δ	D2β	A1γ
D3β	A4γ	C1α	B2δ
B1δ	C2α	A3γ	D4β

A2γ	D1α	B4δ	C3β
C4β	B3δ	D2α	A1γ
D3α	A4γ	C1β	B2δ
B1δ	C2β	A3γ	D4α

The 64-bit code on Magic Square

Tropic Right (211-240)

A2δ	D1γ	B4α	C3β	A2δ	D1β	B4α	C3γ	A2δ	D1γ	B4β	C3α
C4β	B3α	D2γ	A1δ	C4γ	B3α	D2β	A1δ	C4α	B3β	D2γ	A1δ
D3γ	A4δ	C1β	B2α	D3β	A4δ	C1γ	B2α	D3γ	A4δ	C1α	B2β
B1α	C2β	A3δ	D4γ	B1α	C2γ	A3δ	D4β	B1β	C2α	A3δ	D4γ

A2δ	D1α	B4β	C3γ	A2δ	D1β	B4γ	C3α	A2δ	D1α	B4γ	C3β
C4γ	B3β	D2α	A1δ	C4α	B3γ	D2β	A1δ	C4β	B3γ	D2α	A1δ
D3α	A4δ	C1γ	B2β	D3β	A4δ	C1α	B2γ	D3α	A4δ	C1β	B2γ
B1β	C2γ	A3δ	D4α	B1γ	C2α	A3δ	D4β	B1γ	C2β	A2δ	D4α

A2α	D4δ	B1β	C3γ	A2α	D4γ	B1β	C3δ	A2α	D4δ	B1γ	C3β
C1γ	B3β	D2δ	A4α	C1δ	B3β	D2γ	A4α	C1β	B3γ	D2δ	A4α
D3δ	A1α	C4γ	B2β	D3γ	A1α	C4δ	B2β	D3δ	A1α	C4β	B2γ
B4β	C2γ	A3α	D1δ	B4β	C2δ	A3α	D1γ	B4γ	C2β	A3α	D1δ

A2α	D4β	B1γ	C3δ	A2α	D4γ	B1δ	C3β	A2α	D4β	B1δ	C3γ
C1δ	B3γ	D2β	A4α	C1β	B3δ	D2γ	A4α	C1γ	B3δ	D2β	A4α
D3β	A1α	C4δ	B2γ	D3γ	A1α	C4β	B2δ	D3β	A1α	C4γ	B2δ
B4γ	C2δ	A3α	D1β	B4δ	C2β	A3α	D1γ	B4δ	C2γ	A3α	D1β

A2β	D4δ	B1α	C3γ	A2β	D4γ	B1α	C3δ	A2β	D4δ	B1γ	C3α
C1γ	B3α	D2δ	A4β	C1δ	B3α	D2γ	A4β	C1α	B3γ	D2δ	A4β
D3δ	A1β	C4γ	B2α	D3γ	A1β	C4δ	B2α	D3δ	A1β	C4α	B2γ
B4α	C2γ	A3β	D1δ	B4α	C2δ	A3β	D1γ	B4γ	C2α	A3β	D1δ

A2β	D4α	B1γ	C3δ	A2β	D4γ	B1δ	C3α	A2β	D4α	B1δ	C3γ
C1δ	B3γ	D2α	A4β	C1α	B3δ	D2γ	A4β	C1γ	B3δ	D2α	A4β
D3α	A1β	C4δ	B2γ	D3γ	A1β	C4α	B2δ	D3α	A1β	C4γ	B2δ
B4γ	C2δ	A3β	D1α	B4δ	C2α	A3β	D1γ	B4δ	C2γ	A3β	D1α

A2γ	D4δ	B1α	C3β	A2γ	D4β	B1α	C3δ	A2γ	D4δ	B1β	C3α
C1β	B3α	D2δ	A4γ	C1δ	B3α	D2β	A4γ	C1α	B3β	D2δ	A4γ
D3δ	A1γ	C4β	B2α	D3β	A1γ	C4δ	B2α	D3δ	A1γ	C4α	B2β
B4α	C2β	A3γ	D1δ	B4α	C2δ	A3γ	D1β	B4β	C2α	A3γ	D1δ

A2γ	D4α	B1β	C3δ	A2γ	D4β	B1δ	C3α	A2γ	D4α	B1δ	C3β
C1δ	B3β	D2α	A4γ	C1α	B3δ	D2β	A4γ	C1β	B3δ	D2α	A4γ
D3α	A1γ	C4δ	B2β	D3β	A1γ	C4α	B2δ	D3α	A1γ	C4β	B2δ
B4β	C2δ	A3γ	D1α	B4δ	C2α	A3γ	D1β	B4δ	C2β	A3γ	D1α

A2δ	D4γ	B1α	C3β	A2δ	D4β	B1α	C3γ	A2δ	D4γ	B1β	C3α
C1β	B3α	D2γ	A4δ	C1γ	B3α	D2β	A4δ	C1α	B3β	D2γ	A4δ
D3γ	A1δ	C4β	B2α	D3β	A1δ	C4γ	B2α	D3γ	A1δ	C4α	B2β
B4α	C2β	A3δ	D1γ	B4α	C2γ	A3δ	D1β	B4β	C2α	A3δ	D1γ

A2δ	D4α	B1β	C3γ	A2δ	D4β	B1γ	C3α	A2δ	D4α	B1γ	C3β
C1γ	B3β	D2α	A4δ	C1α	B3γ	D2β	A4δ	C1β	B3γ	D2α	A4δ
D3α	A1δ	C4γ	B2β	D3β	A1δ	C4α	B2γ	D3α	A1δ	C4β	B2γ
B4β	C2γ	A3δ	D1α	B4γ	C2α	A3δ	D1β	B4γ	C2β	A3δ	D1α

The 64-bit code on Magic Square

Tropic Right (241-270)

A2α	D1δ	B3β	C4γ	A2α	D1γ	B3β	C4δ	A2α	D1δ	B3γ	C4β
C3γ	B4β	D2δ	A1α	C3δ	B4β	D2γ	A1α	C3β	B4γ	D2δ	C4β
D4δ	A3α	C1γ	B2β	D4γ	A3α	C1δ	B2β	D4δ	A3α	C1β	B2γ
B1β	C2γ	A4α	D3δ	B1β	C2δ	A4α	D3γ	B1γ	C2β	A4α	D3δ

A2α	D1β	B3γ	C4δ	A2α	D1γ	B3δ	C4β	A2α	D1β	B3δ	C4γ
C3δ	B4γ	D2β	A1α	C3β	B4δ	D2γ	A1α	C3γ	B4δ	D2β	A1α
D4β	A3α	C1δ	B2γ	D4γ	A3α	C1β	B2δ	D4β	A3α	C1γ	B2δ
B1γ	C2δ	A4α	D3β	B1δ	C2β	A4α	D3γ	B1δ	C2γ	A4α	D3β

A2β	D1δ	B3α	C4γ	A2β	D1γ	B3α	C4δ	A2β	D1δ	B3γ	C4α
C3γ	B4α	D2δ	A1β	C3δ	B4α	D2γ	A1β	C3α	B4γ	D2δ	A1β
D4δ	A3β	C1γ	B2α	D4γ	A3β	C1δ	B2α	D4δ	A3β	C1α	B2γ
B1α	C2γ	A4β	D3δ	B1α	C2δ	A4β	D3γ	B1γ	C2α	A4β	D3δ

A2β	D1δ	B3γ	C4α	A2β	D1γ	B3δ	C4α	A2β	D1α	B3δ	C4γ
C3α	B4γ	D2δ	A1β	C3α	B4δ	D2γ	A1β	C3γ	B4δ	D2α	A1β
D4δ	A3β	C1α	B2γ	D4γ	A3β	C1α	B2δ	D4α	A3β	C1γ	B2δ
B1γ	C2α	A4β	D3δ	B1δ	C2α	A4β	D3γ	B1δ	C2γ	A4β	D3α

A2γ	D1δ	B3α	C4β	A2γ	D1β	B3α	C4δ	A2γ	D1δ	B3β	C4α
C3β	B4α	D2δ	A1γ	C3δ	B4α	D2β	A1γ	C3α	B4β	D2δ	A1γ
D4δ	A3γ	C1β	B2α	D4β	A3γ	C1δ	B2α	D4δ	A3γ	C1α	B2β
B1α	C2β	A4γ	D3δ	B1α	C2δ	A4γ	D3β	B1β	C2α	A4γ	D3δ

A2γ	D1α	B3β	C4δ	A2γ	D1β	B3δ	C4α	A2γ	D1α	B3δ	C4β
C3δ	B4β	D2α	A1γ	C3α	B4δ	D2β	A1γ	C3β	B4δ	D2α	A1γ
D4α	A3γ	C1δ	B2β	D4β	A3γ	C1α	B2δ	D4α	A3γ	C1β	B2δ
B1β	C2δ	A4γ	D3α	B1δ	C2α	A4γ	D3β	B1δ	C2β	A4γ	D3α

A2δ	D1γ	B3α	C4β	A2δ	D1β	B3α	C4γ	A2δ	D1γ	B3β	C4α
C3β	B4α	D2γ	A1δ	C3γ	B4α	D2β	A1δ	C3α	B4β	D2γ	A1δ
D4γ	A3δ	C1β	B2α	D4β	A3δ	C1γ	B2α	D4γ	A3δ	C1α	B2β
B1α	C2β	A4δ	D3γ	B1α	C2γ	A4δ	D3β	B1β	C2α	A4δ	D3γ

A2δ	D1α	B3β	C4γ	A2δ	D1β	B3γ	C4α	A2δ	D1α	B3γ	C4β
C3γ	B4β	D2α	A1δ	C3α	B4γ	D2β	A1δ	C3β	B4γ	D2α	A1δ
D4α	A3δ	C1γ	B2β	D4β	A3δ	C1α	B2γ	D4α	A3δ	C1β	B2γ
B1β	C2γ	A4δ	D3α	B1γ	C2α	A4δ	D3β	B1γ	C2β	A4δ	D3α

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A2α	D3δ	B1β	C4γ	A2α	D3γ	B1β	C4δ	A2α	D3δ	B1γ	C4β
C1γ	B4β	D2δ	A3α	C1δ	B4β	D2γ	A3α	C1β	B4γ	D2δ	A3α
D4δ	A1α	C3γ	B2β	D4γ	A1α	C3δ	B2β	D4δ	A1α	C3β	B2γ
B3β	C2γ	A4α	D1δ	B3β	C2δ	A4α	D1γ	B3γ	C2β	A4α	D1δ

A2α	D3β	B1γ	C4δ	A2α	D3γ	B1δ	C4β	A2α	D3β	B1δ	C4γ
C1δ	B4γ	D2β	A3α	C1β	B4δ	D2γ	A3α	C1γ	B4δ	D2β	A3α
D4β	A1α	C3δ	B2γ	D4γ	A1α	C3β	B2δ	D4β	A1α	C3γ	B2δ
B3γ	C2δ	A4α	D1β	B3δ	C2β	A4α	D1γ	B3δ	C2γ	A4α	D1β

The 64-bit code on Magic Square

Tropic Right (271-300)

A2β	D3δ	B1α	C4γ	A2β	D3γ	B1α	C4δ	A2β	D3δ	B1γ	C4α
C1γ	B4α	D2δ	A3β	C1δ	B4α	D2γ	A3β	C1α	B4γ	D2δ	A3β
D4δ	A1β	C3γ	B2α	D4γ	A1β	C3δ	B2α	D4δ	A1β	C3α	B2γ
B3α	C2γ	A4β	D1δ	B3α	C2δ	A4β	D1γ	B3γ	C2α	A4β	D1δ

A2β	D3α	B1γ	C4δ	A2β	D3γ	B1δ	C4α	A2β	D3α	B1δ	C4γ
C1δ	B4γ	D2α	A3β	C1α	B4δ	D2γ	A3β	C1γ	B4δ	D2α	A3β
D4α	A1β	C3δ	B2γ	D4γ	A1β	C3α	B2δ	D4α	A1β	C3γ	B2δ
B3γ	C2δ	A4β	D1α	B3δ	C2α	A4β	D1γ	B3δ	C2γ	A4β	D1α

A2γ	D3δ	B1α	C4β	A2γ	D3β	B1α	C4δ	A2γ	D3δ	B1β	C4α
C1β	B4α	D2δ	A3γ	C1δ	B4α	D2β	A3γ	C1α	B4β	D2δ	A3γ
D4δ	A1γ	C3β	B2α	D4β	A1γ	C3δ	B2α	D4δ	A1γ	C3α	B2β
B3α	C2β	A4γ	D1δ	B3α	C2δ	A4γ	D1β	B3β	C2α	A4γ	D1δ

A2γ	D3α	B1β	C4δ	A2γ	D3β	B1δ	C4α	A2γ	D3α	B1δ	C4β
C1δ	B4β	D2α	A3γ	C1α	B4δ	D2β	A3γ	C1β	B4δ	D2α	A3γ
D4α	A1γ	C3δ	B2β	D4β	A1γ	C3α	B2δ	D4α	A1γ	C3β	B2δ
B3β	C2δ	A4γ	D1α	B3δ	C2α	A4γ	D1β	B3δ	C2β	A4γ	D1α

A2δ	D3γ	B1α	C4β	A2δ	D3β	B1α	C4γ	A2δ	D3γ	B1β	C4α
C1β	B4α	D2γ	A3δ	C1γ	B4α	D2β	A3δ	C1α	B4β	D2γ	A3δ
D4γ	A1δ	C3β	B2α	D4β	A1δ	C3γ	B2α	D4γ	A1δ	C3α	B2β
B3α	C2β	A4δ	D1γ	B3α	C2γ	A4δ	D1β	B3β	C2α	A4δ	D1γ

A2δ	D3α	B1β	C4γ	A2δ	D3β	B1γ	C4α	A2δ	D3α	B1γ	C4β
C1γ	B4β	D2α	A3δ	C1α	B4γ	D2β	A3δ	C1β	B4γ	D2α	A3δ
D4α	A1δ	C3γ	B2β	D4β	A1δ	C3α	B2γ	D4α	A1δ	C3β	B2γ
B3β	C2γ	A4δ	D1α	B3γ	C2α	A4δ	D1β	B3γ	C2β	A4δ	D1α

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A3α	D2δ	B4β	C1γ	A3α	D2γ	B4β	C1δ	A3α	D2δ	B4γ	C1β
C4γ	B1β	D3δ	A2α	C4δ	B1β	D3γ	A2α	C4β	B1γ	D3δ	A2α
D1δ	A4α	C2γ	B3β	D1γ	A4α	C2δ	B3β	D1δ	A4α	C2β	B3γ
B2β	C3γ	A1α	D4δ	B2β	C3δ	A1α	D4γ	B2γ	C3β	A1α	D4δ

A3α	D2β	B4γ	C1δ	A3α	D2γ	B4δ	C1β	A3α	D2β	B4δ	C1γ
C4δ	B1γ	D3β	A2α	C4β	B1δ	D3γ	A2α	C4γ	B1δ	D3β	A2α
D1β	A4α	C2δ	B3γ	D1γ	A4α	C2β	B3δ	D1β	A4α	C2γ	B3δ
B2γ	C3δ	A1α	D4β	B2δ	C3β	A1α	D4γ	B2δ	C3γ	A1α	D4β

A3β	D2δ	B4α	C1γ	A3β	D2γ	B4α	C1δ	A3β	D2δ	B4γ	C1α
C4γ	B1α	D3δ	A2β	C4δ	B1α	D3γ	A2β	C4α	B1γ	D3δ	A2β
D1δ	A4β	C2γ	B3α	D1γ	A4β	C2δ	B3α	D1δ	A4β	C2α	B3γ
B2α	C3γ	A1β	D4δ	B2α	C3δ	A1β	D4γ	B2γ	C3α	A1β	D4δ

A3β	D2α	B4γ	C1δ	A3β	D2γ	B4δ	C1α	A3β	D2α	B4δ	C1γ
C4δ	B1γ	D3α	A2β	C4α	B1δ	D3γ	A2β	C4γ	B1δ	D3α	A2β
D1α	A4β	C2δ	B3γ	D1γ	A4β	C2α	B3δ	D1α	A4β	C2γ	B3δ
B2γ	C3δ	A1β	D4δ	B2δ	C3α	A1β	D4γ	B2δ	C3γ	A1β	D4α

The 64-bit code on Magic Square

Tropic Right (301-330)

A3γ	D2δ	B4α	C1β	A3γ	D2β	B4α	C1δ	A3γ	D2δ	B4β	C1α
C4β	B1α	D3δ	A2γ	C4δ	B1α	D3β	A2γ	C4α	B1β	D3δ	A2γ
D1δ	A4γ	C2β	B3α	D1β	A4γ	C2δ	B3α	D1δ	A4γ	C2α	B3β
B2α	C3β	A1γ	D4δ	B2α	C3δ	A1γ	D4β	B2β	C3α	A1γ	D4δ

A3γ	D2α	B4β	C1δ	A3γ	D2β	B4δ	C1α	A3γ	D2α	B4δ	C1β
C4δ	B1β	D3α	A2γ	C4α	B1δ	D3β	A2γ	C4β	B1δ	D3α	A2γ
D1α	A4γ	C2δ	B3β	D1β	A4γ	C2α	B3δ	D1α	A4γ	C2β	B3δ
B2β	C3δ	A1γ	D4α	B2δ	C3α	A1γ	D4β	B2δ	C3β	A1γ	D4α

A3δ	D2γ	B4α	C1β	A3δ	D2β	B4α	C1γ	A3δ	D2γ	B4β	C1α
C4β	B1α	D3γ	A2δ	C4γ	B1α	D3β	A2δ	C4α	B1β	D3γ	A2δ
D1γ	A4δ	C2β	B3α	D1β	A4δ	C2γ	B3α	D1γ	A4δ	C2α	B3β
B2α	C3β	A1δ	D4γ	B2α	C3γ	A1δ	D4β	B2β	C3α	A1δ	D4γ

A3δ	D2α	B4β	C1γ	A3δ	D2β	B4γ	C1α	A3δ	D2α	B4γ	C1β
C4γ	B1β	D3α	A2δ	C4α	B1γ	D3β	A2δ	C4β	B1γ	D3α	A2δ
D1α	A4δ	C2γ	B3β	D1β	A4δ	C2α	B3γ	D1α	A4δ	C2β	B3γ
B2β	C3γ	A1δ	D4α	B2γ	C3α	A1δ	D4β	B2γ	C3β	A1δ	D4α

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A3α	D4δ	B2β	C1γ	A3α	D4γ	B2β	C1δ	A3α	D4δ	B2γ	C1β
C2γ	B1β	D3δ	A4α	C2δ	B1β	D3γ	A4α	C2β	B1γ	D3δ	A4α
D1δ	A2α	C4γ	B3β	D1γ	A2α	C4δ	B3β	D1δ	A2α	C4β	B3γ
B4β	C3γ	A1α	D2δ	B4β	C3δ	A1α	D2γ	B4γ	C3β	A1α	D2δ

A3α	D4β	B2γ	C1δ	A3α	D4γ	B2δ	C1β	A3α	D4β	B2δ	C1γ
C2δ	B1γ	D3β	A4α	C2β	B1δ	D3γ	A4α	C2γ	B1δ	D3β	A4α
D1β	A2α	C4δ	B3γ	D1γ	A2α	C4β	B3δ	D1β	A2α	C4γ	B3δ
B4γ	C3δ	A1α	D2β	B4δ	C3β	A1α	D2γ	B4δ	C3γ	A1α	D2β

A3β	D4δ	B2α	C1γ	A3β	D4γ	B2α	C1δ	A3β	D4δ	B2γ	C1α
C2γ	B1α	D3δ	A4β	C2δ	B1α	D3γ	A4β	C2α	B1γ	D3δ	A4β
D1δ	A2β	C4γ	B3α	D1γ	A2β	C4δ	B3α	D1δ	A2β	C4α	B3γ
B4α	C3γ	A1β	D2δ	B4α	C3δ	A1β	D2γ	B4γ	C3α	A1β	D2δ

A3β	D4α	B2γ	C1δ	A3β	D4γ	B2δ	C1α	A3β	D4α	B2δ	C1γ
C2δ	B1γ	D3α	A4β	C2α	B1δ	D3γ	A4β	C2γ	B1δ	D3α	A4β
D1α	A2β	C4δ	B3γ	D1γ	A2β	C4α	B3δ	D1α	A2β	C4γ	B3δ
B4γ	C3δ	A1β	D2α	B4δ	C3α	A1β	D2γ	B4δ	C3γ	A1β	D2α

A3γ	D4δ	B2α	C1β	A3γ	D4β	B2α	C1δ	A3γ	D4δ	B2α	C1β
C2β	B1α	D3δ	A4γ	C2δ	B1α	D3β	A4γ	C2β	B1α	D3δ	A4γ
D1δ	A2γ	C4β	B3α	D1β	A2γ	C4δ	B3α	D1δ	A2γ	C4β	B3α
B4α	C3β	A1γ	D2δ	B4α	C3δ	A1γ	D2β	B4α	C3β	A1γ	D2δ

A3γ	D4β	B2α	C1δ	A3γ	D4β	B2δ	C1α	A3γ	D4α	B2δ	C1β
C2δ	B1α	D3β	A4γ	C2α	B1δ	D3β	A4γ	C2β	B1δ	D3α	A4γ
D1β	A2γ	C4δ	B3α	D1β	A2γ	C4α	B3δ	D1α	A2γ	C4β	B3δ
B4α	C3δ	A1γ	D2β	B4δ	C3α	A1γ	D2β	B4α	C3β	A1γ	D2α

The 64-bit code on Magic Square

Tropic Right (331-360)

A3δ	D4γ	B2α	C1β
C2β	B1α	D3γ	A4δ
D1γ	A2δ	C4β	B3α
B4α	C3β	A1δ	D2γ

A3δ	D4β	B2α	C1γ
C2γ	B1α	D3β	A4δ
D1β	A2δ	C4γ	B3α
B4α	C3γ	A1α	D2β

A3δ	D4γ	B2β	C1α
C2α	B1β	D3γ	A4δ
D1γ	A2δ	C4α	B3β
B4β	C3α	A1δ	D2γ

A3δ	D4α	B2β	C1γ
C2γ	B1β	D3α	A4δ
D1α	A2δ	C4γ	B3β
B4β	C3γ	A1δ	D2α

A3δ	D4β	B2γ	C1α
C2α	B1γ	D3β	A4δ
D1β	A2δ	C4α	B3γ
B4γ	C3α	A1δ	D2β

A3δ	D4α	B2γ	C1β
C2β	B1γ	D3α	A4δ
D1α	A2δ	C4β	B3γ
B4γ	C3β	A1δ	D2α

A3α	D1δ	B4β	C2γ
C4γ	B2β	D3δ	A1α
D2δ	A4α	C1γ	B3β
B1β	C3γ	A2α	D4δ

A3α	D1γ	B4β	C2δ
C4δ	B2β	D3γ	A1α
D2γ	A4α	C1δ	B3β
B1β	C3δ	A2α	D4γ

A3α	D1δ	B4γ	C2β
C4β	B2γ	D3δ	A1α
D2δ	A4α	C1β	B3γ
B1γ	C3β	A2α	D4δ

A3α	D1β	B4γ	C2δ
C4δ	B2γ	D3β	A1α
D2β	A4α	C1δ	B3γ
B1γ	C3δ	A2α	D4β

A3α	D1γ	B4δ	C2β
C4β	B2δ	D3γ	A1α
D2γ	A4α	C1β	B3δ
B1δ	C3β	A2α	D4γ

A3α	D1β	B4δ	C2γ
C4γ	B2δ	D3β	A1α
D2β	A4α	C1γ	B3δ
B1δ	C3γ	A2α	D4β

A3β	D1γ	B4α	C2γ
C4γ	B2α	D3δ	A1β
D2δ	A4β	C1γ	B3α
B1α	C3γ	A2β	D4δ

A3β	D1γ	B4α	C2δ
C4δ	B2α	D3γ	A1β
D2γ	A4β	C1δ	B3α
B1α	C3δ	A2β	D4γ

A3β	D1δ	B4γ	C2α
C4α	B2γ	D3δ	A1β
D2δ	A4β	C1α	B3γ
B1γ	C3α	A2β	D4δ

A3β	D1α	B4γ	C2δ
C4δ	B2γ	D3α	A1β
D2α	A4β	C1δ	B3γ
B1γ	C3δ	A2β	D4α

A3β	D1γ	B4δ	C2α
C4α	B2δ	D3γ	A1β
D2γ	A4β	C1α	B3δ
B1δ	C3α	A2β	D4γ

A3β	D1α	B4δ	C2γ
C4γ	B2δ	D3α	A1β
D2α	A4β	C1γ	B3δ
B1δ	C3γ	A2β	D4α

A3γ	D1δ	B4α	C2β
C4β	B2α	D3δ	A1γ
D2δ	A4γ	C1β	B3α
B1α	C3β	A2γ	D4δ

A3γ	D1β	B4α	C2δ
C4δ	B2α	D3β	A1γ
D2β	A4γ	C1δ	B3α
B1α	C3δ	A2γ	D4β

A3γ	D1δ	B4β	C2α
C4α	B2β	D3δ	A1γ
D2δ	A4γ	C1α	B3β
B1β	C3α	A2γ	D4δ

A3γ	D1α	B4β	C2δ
C4δ	B2β	D3α	A1γ
D2α	A4γ	C1δ	B3β
B1β	C3δ	A2γ	D4α

A3γ	D1β	B4δ	C2α
C4α	B2δ	D3β	A1γ
D2β	A4γ	C1α	B3δ
B1δ	C3α	A2γ	D4β

A3γ	D1α	B4δ	C2β
C4β	B2δ	D3α	A1γ
D2α	A4γ	C1β	B3δ
B1δ	C3β	A2γ	D4α

A3δ	D1γ	B4α	C2β
C4β	B2α	D3γ	A1δ
D2γ	A4δ	C1β	B3α
B1α	C3β	A2δ	D4γ

A3δ	D1β	B4α	C2γ
C4γ	B2α	D3β	A1δ
D2β	A4δ	C1γ	B3α
B1α	C3γ	A2δ	D4β

A3δ	D1γ	B4β	C2α
C4α	B2β	D3γ	A1δ
D2γ	A4δ	C1α	B3β
B1β	C3α	A2δ	D4γ

A3δ	D1α	B4β	C2γ
C4γ	B2β	D3α	A1δ
D2α	A4δ	C1γ	B3β
B1β	C3γ	A2δ	D4α

A3δ	D1β	B4γ	C2α
C4α	B2γ	D3β	A1δ
D2β	A4δ	C1α	B3γ
B1γ	C3α	A2δ	D4β

A3δ	D1α	B4γ	C2β
C4β	B2γ	D3α	A1δ
D2α	A4δ	C1β	B3γ
B1γ	C3β	A2δ	D4α

The 64-bit code on Magic Square

Tropic Right (361-390)

A3α	D4δ	B1β	C2γ	A3α	D4γ	B1β	C2δ	A3α	D4δ	B1γ	C2β
C1γ	B2β	D3δ	A4α	C1δ	B2β	D3γ	A4α	C1β	B2γ	D3δ	A4α
D2δ	A1α	C4γ	B3β	D2γ	A1α	C4δ	B3β	D2δ	A1α	C4β	B3γ
B4β	C3γ	A2α	D1δ	B4β	C3δ	A2α	D1γ	B4γ	C3β	A2α	D1δ

A3α	D4β	B1γ	C2δ	A3α	D4γ	B1δ	C2β	A3α	D4β	B1δ	C2γ
C1δ	B2γ	D3β	A4α	C1β	B2δ	D3γ	A4α	C1γ	B2δ	D3β	A4α
D2β	A1α	C4δ	B3γ	D2γ	A1α	C4β	B3δ	D2β	A1α	C4γ	B3δ
B4γ	C3δ	A2α	D1β	B4δ	C3β	A2α	D1γ	B4δ	C3γ	A2α	D1β

A3β	D4δ	B1α	C2γ	A3β	D4γ	B1α	C2δ	A3β	D4δ	B1γ	C2α
C1γ	B2α	D3δ	A4β	C1δ	B2α	D3γ	A4β	C1α	B2γ	D3δ	A4β
D2δ	A1β	C4γ	B3α	D2γ	A1β	C4δ	B3α	D2δ	A1β	C4α	B3γ
B4α	C3γ	A2β	D1δ	B4α	C3δ	A2β	D1γ	B4γ	C3α	A2β	D1δ

A3β	D4α	B1γ	C2δ	A3β	D4γ	B1δ	C2α	A3β	D4α	B1δ	C2γ
C1δ	B2γ	D3α	A4β	C1α	B2δ	D3γ	A4β	C1γ	B2δ	D3α	A4β
D2α	A1β	C4δ	B3γ	D2γ	A1β	C4α	B3δ	D2α	A1β	C4γ	B3δ
B4γ	C3δ	A2β	D1α	B4δ	C3α	A2β	D1γ	B4δ	C3γ	A2β	D1α

A3γ	D4δ	B1α	C2β	A3γ	D4β	B1α	C2δ	A3γ	D4δ	B1β	C2α
C1β	B2α	D3δ	A4γ	C1δ	B2α	D3β	A4γ	C1α	B2β	D3δ	A4γ
D2δ	A1γ	C4β	B3α	D2β	A1γ	C4δ	B3α	D2δ	A1γ	C4α	B3β
B4α	C3β	A2γ	D1δ	B4α	C3δ	A2γ	D1β	B4β	C3α	A2γ	D1δ

A3γ	D4α	B1β	C2δ	A3γ	D4β	B1δ	C2α	A3γ	D4α	B1δ	C2β
C1δ	B2β	D3α	A4γ	C1α	B2δ	D3β	A4γ	C1β	B2δ	D3α	A4γ
D2α	A1γ	C4δ	B3β	D2β	A1γ	C4α	B3δ	D2α	A1γ	C4β	B3δ
B4β	C3δ	A2γ	D1α	B4δ	C3α	A2γ	D1β	B4δ	C3β	A2γ	D1α

A3δ	D4γ	B1α	C2β	A3δ	D4β	B1α	C2γ	A3δ	D4γ	B1β	C2α
C1β	B2α	D3γ	A4δ	C1γ	B2α	D3β	A4δ	C1α	B2β	D3γ	A4δ
D2γ	A1δ	C4β	B3α	D2β	A1δ	C4γ	B3α	D2γ	A1δ	C4α	B3β
B4α	C3β	A2δ	D1γ	B4α	C3γ	A2δ	D1β	B4β	C3α	A2δ	D1γ

A3δ	D4α	B1β	C2γ	A3δ	D4β	B1γ	C2α	A3δ	D4α	B1γ	C2β
C1γ	B2β	D3α	A4δ	C1α	B2γ	D3β	A4δ	C1β	B2γ	D3α	A4δ
D2α	A1δ	C4γ	B3β	D2β	A1δ	C4α	B3γ	D2α	A1δ	C4β	B3γ
B4β	C3γ	A2δ	D1α	B4γ	C3α	A2δ	D1β	B4γ	C3β	A2δ	D1α

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A3α	D1δ	B2β	C4γ	A3α	D1γ	B2β	C4δ	A3α	D1δ	B2γ	C4β
C2γ	B4β	D3δ	A1α	C2δ	B4β	D3γ	A1α	C2β	B4γ	D3δ	A1α
D4δ	A2α	C1γ	B3β	D4γ	A2α	C1δ	B3β	D4δ	A2α	C1β	B3γ
B1β	C3γ	A4α	D2δ	B1β	C3δ	A4α	D2γ	B1γ	C3β	A4α	D2δ

A3α	D1β	B2γ	C4δ	A3α	D1γ	B2δ	C4β	A3α	D1β	B2δ	C4γ
C2δ	B4γ	D3β	A1α	C2β	B4δ	D3γ	A1α	C2γ	B4δ	D3β	A1α
D4β	A2α	C1δ	B3γ	D4γ	A2α	C1β	B3δ	D4β	A2α	C1γ	B3δ
B1γ	C3δ	A4α	D2β	B1δ	C3β	A4α	D2γ	B1δ	C3γ	A4α	D2β

The 64-bit code on Magic Square

Tropic Right (391-420)

A3β	D1δ	B2α	C4γ	A3β	D1γ	B2α	C4δ	A3β	D1δ	B2γ	C4α
C2γ	B4α	D3δ	A1β	C2δ	B4α	D3γ	A1β	C2α	B4γ	D3δ	A1β
D4δ	A2β	C1γ	B3α	D4γ	A2β	C1δ	B3α	D4δ	A2β	C1α	B3γ
B1α	C3γ	A4β	D2δ	B1α	C3δ	A4β	D2γ	B1γ	C3α	A4β	D2δ

A3β	D1α	B2γ	C4δ	A3β	D1γ	B2δ	C4α	A3β	D1α	B2δ	C4γ
C2δ	B4γ	D3α	A1β	C2α	B4δ	D3γ	A1β	C2γ	B4δ	D3α	A1β
D4α	A2β	C1δ	B3γ	D4γ	A2β	C1α	B3δ	D4α	A2β	C1γ	B3δ
B1γ	C3δ	A4β	D2α	B1δ	C3α	A4β	D2γ	B1δ	C3γ	A4β	D2α

A3γ	D1δ	B2α	C4β	A3γ	D1β	B2α	C4δ	A3γ	D1δ	B2β	C4α
C2β	B4α	D3δ	A1γ	C2δ	B4α	D3β	A1γ	C2β	B4β	D3δ	A1γ
D4δ	A2γ	C1β	B3α	D4β	A2γ	C1δ	B3α	D4δ	A2γ	C1α	B3β
B1α	C3β	A4γ	D2δ	B1α	C3δ	A4γ	D2β	B1β	C3α	A4γ	D2δ

A3γ	D1α	B2β	C4δ	A3γ	D1β	B2δ	C4α	A3γ	D1α	B2δ	C4β
C2δ	B4β	D3α	A1γ	C2α	B4δ	D3β	A1γ	C2β	B4δ	D3α	A1γ
D4α	A2γ	C1δ	B3β	D4β	A2γ	C1α	B3δ	D4α	A2γ	C1β	B3α
B1β	C3δ	A4γ	D2α	B1δ	C3α	A4γ	D2β	B1δ	C3β	A4γ	D2α

A3δ	D1γ	B2α	C4β	A3δ	D1β	B2α	C4γ	A3δ	D1γ	B2β	C4α
C2β	B4α	D3γ	A1δ	C2γ	B4α	D3β	A1δ	C2α	B4β	D3γ	A1δ
D4γ	A2δ	C1β	B3α	D4β	A2δ	C1γ	B3α	D4γ	A2δ	C1α	B3β
B1α	C3β	A4δ	D2γ	B1α	C3γ	A4δ	D2β	B1β	C3α	A4δ	D2γ

A3δ	D1α	B2β	C4γ	A3δ	D1β	B2γ	C4α	A3δ	D1α	B2γ	C4β
C2γ	B4β	D3α	A1δ	C2α	B4γ	D3β	A1α	C2β	B4γ	D3α	A1δ
D4α	A2δ	C1γ	B3β	D4β	A2δ	C1α	B3γ	D4α	A2δ	C1β	B3γ
B1β	C3γ	A4δ	D2α	B1γ	C3α	A4δ	D2β	B1γ	C3β	A4δ	D2α

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A3α	D2δ	B1β	C4γ	A3α	D2γ	B1β	C4δ	A3α	D2γ	B1γ	C4β
C1γ	B4β	D3δ	A2α	C1δ	B4β	D3γ	A2α	C1β	B4γ	D3δ	A2α
D4δ	A1α	C2γ	B3β	D4γ	A1γ	C2δ	B3β	D4δ	A1α	C2β	B3γ
B2β	C3γ	A4α	D1δ	B2β	C3δ	A4α	D1γ	B2γ	C3β	A4α	D1δ

A3δ	D2β	B1γ	C4δ	A3α	D2γ	B1δ	C4β	A3α	D2β	B1δ	C4γ
C1δ	B4γ	D3β	A2α	C1β	B4δ	D3γ	A2α	C1γ	B4δ	D3β	A2α
D4β	A1α	C2δ	B3γ	D4γ	A1α	C2β	B3δ	D4β	A1α	C2γ	B3δ
B2γ	C3δ	A4α	D1β	B2δ	C3β	A4α	D1γ	B2δ	C3γ	A4α	D1β

A3β	D2δ	B1α	C4γ	A3β	D2γ	B1α	C4δ	A3β	D2δ	B1γ	C4α
C1γ	B4α	D3δ	A2β	C1δ	B4α	D3γ	A2β	C1α	B4γ	D3δ	A2β
D4δ	A1β	C2γ	B3α	D4γ	A1β	C2δ	B3α	D4δ	A1β	C2α	B3γ
B2α	C3γ	A4β	D1δ	B2α	C3δ	A4β	D1γ	B2γ	C3α	A4β	D1δ

A3β	D2α	B1γ	C4δ	A3β	D2γ	B1δ	C4α	A3β	D2α	B1δ	C4γ
C1δ	B4γ	D3α	A2β	C1α	B4δ	D3γ	A2β	C1γ	B4δ	D3α	A2β
D4α	A1β	C2δ	B3γ	D4γ	A1β	C2α	B3δ	D4α	A1β	C2γ	B3δ
B2γ	C3δ	A4β	D1α	B2δ	C3α	A4β	D1γ	B2δ	C3γ	A4β	D1α

The 64-bit code on Magic Square

Tropic Right (421-450)

A3γ	D2δ	B1α	C4β	A3γ	D2β	B1α	C4δ	A3γ	D2δ	B1β	C4α
C1β	B4α	D3δ	A2γ	C1δ	B4α	D3β	A2γ	C1α	B4β	D3δ	A2γ
D4δ	A1γ	C2β	B3α	D4β	A1γ	C2δ	B3α	D4δ	A1γ	C2α	B3β
B2α	C3β	A4γ	D1δ	B2α	C3δ	A4γ	D1β	B2β	C3α	A4γ	D1δ

A3γ	D2α	B1β	C4δ	A3γ	D2β	B1δ	C4α	A3γ	D2α	B1δ	C4β
C1δ	B4β	D3α	A2γ	C1α	B4δ	D3β	A2γ	C1β	B4δ	D3α	A2γ
D4α	A1γ	C2δ	B3β	D4β	A1γ	C2α	B3δ	D4α	A1γ	C2β	B3δ
B2β	C3δ	A4γ	D1α	B2δ	C3α	A4γ	D1β	B2δ	C3β	A4γ	D1α

A3δ	D2γ	B1α	C4β	A3δ	D2β	B1α	C4γ	A3δ	D2γ	B1β	C4α
C1β	B4α	D3γ	A2δ	C1γ	B4α	D3β	A2δ	C1α	B4β	D3γ	A2δ
D4γ	A1δ	C2β	B3α	D4β	A1δ	C2γ	B3α	D4γ	A1δ	C2α	B3β
B2α	C3β	A4δ	D1γ	B2α	C3γ	A4δ	D1β	B2β	C3α	A4δ	D1γ

A3δ	D2α	B1β	C4γ	A3δ	D2β	B1γ	C4α	A3δ	D2α	B1γ	C4β
C1γ	B4β	D3α	A2δ	C1α	B4γ	D3β	A2δ	C1β	B4γ	D3α	A2δ
D4α	A1δ	C2γ	B3β	D4β	A1δ	C2α	B3γ	D4α	A1δ	C2β	B3γ
B2β	C3γ	A4δ	D1α	B2γ	C3α	A4δ	D1β	B2γ	C3β	A4δ	D1α

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A4α	D2δ	B3β	C1γ	A4α	D2γ	B3β	C1δ	A4α	D2δ	B3γ	C1β
C3γ	B1β	D4δ	A2α	C3δ	B1β	D4γ	A2α	C3β	B1γ	D4δ	A2α
D1δ	A3α	C2γ	B4β	D1γ	A3α	C2δ	B4β	D1δ	A3α	C2β	B4γ
B2β	C4γ	A1α	D3δ	B2β	C4δ	A1α	D3γ	B2γ	C4β	A1α	D3δ

A4α	D2β	B3γ	C1δ	A4α	D2γ	B3δ	C1β	A4α	D2β	B3δ	C1γ
C3δ	B1γ	D4β	A2α	C3β	B1δ	D4γ	A2α	C3γ	B1δ	D4β	A2α
D1β	A3α	C2δ	B4γ	D1γ	A3α	C2β	B4δ	D1β	A3α	C2γ	B4δ
B2γ	C4δ	A1α	D3β	B2δ	C4β	A1α	D3γ	B2δ	C4γ	A1α	D3β

A4β	D2δ	B3α	C1γ	A4β	D2γ	B3α	C1δ	A4β	D2δ	B3γ	C1α
C3γ	B1α	D4δ	A2β	C3δ	B1α	D4γ	A2β	C3α	B1γ	D4δ	A2β
D1δ	A3β	C2γ	B4α	D1γ	A3β	C2δ	B4α	D1δ	A3β	C2α	B4γ
B2α	C4γ	A1β	D3δ	B2α	C4δ	A1β	D3γ	B2γ	C4α	A1β	D3δ

A4β	D2α	B3γ	C1δ	A4β	D2γ	B3δ	C1α	A4β	D2α	B3δ	C1γ
C3δ	B1γ	D4α	A2β	C3α	B1δ	D4γ	A2β	C3γ	B1δ	D4α	A2β
D1α	A3β	C2δ	B4γ	D1γ	A3β	C2α	B4δ	D1α	A3β	C2γ	B4δ
B2γ	C4δ	A1β	D3α	B2δ	C4α	A1β	D3γ	B2δ	C4γ	A1β	D3α

A4γ	D2δ	B3α	C1β	A4γ	D2β	B3α	C1δ	A4γ	D2δ	B3β	C1α
C3β	B1α	D4δ	A2γ	C3δ	B1α	D4β	A2γ	C3α	B1β	D4δ	A2γ
D1δ	A3γ	C2β	B4α	D1β	A3γ	C2δ	B4α	D1δ	A3γ	C2α	B4β
B2α	C4β	A1γ	D3δ	B2α	C4δ	A1γ	D3β	B2β	C4α	A1γ	D3δ

A4γ	D2α	B3β	C1δ	A4γ	D2β	B3δ	C1α	A4γ	D2α	B3δ	C1β
C3δ	B1β	D4α	A2γ	C3α	B1δ	D4β	A2γ	C3β	B1δ	D4α	A2γ
D1α	A3γ	C2δ	B4β	D1β	A3γ	C2α	B4δ	D1α	A3γ	C2β	B4δ
B2β	C4δ	A1γ	D3α	B2δ	C4α	A1γ	D3β	B2δ	C4β	A1γ	D3α

The 64-bit code on Magic Square

Tropic Right (451-480)

A4δ	D2γ	B3α	C1β
C3β	B1α	D4γ	A2δ
D1γ	A3δ	C2β	B4α
B2α	C4β	A1δ	D3γ

A4δ	D2β	B3α	C1γ
C3γ	B1α	D4δ	A2δ
D1β	A3δ	C2γ	B4α
B2α	C4γ	A1δ	D3β

A4δ	D2γ	B3β	C1α
C3α	B1β	D4γ	A2δ
D1γ	A3δ	C2α	B4β
B2β	C4α	A1δ	D3γ

A4δ	D2α	B3β	C1γ
C3γ	B1β	D4α	A2δ
D1α	A3δ	C2γ	B4β
B2β	C4γ	A1δ	D3α

A4δ	D2β	B3γ	C1α
C3α	B1γ	D4β	A2δ
D1β	A3δ	C2α	B4γ
B2γ	C4α	A1δ	D3β

A4δ	D2α	B3γ	C1β
C3β	B1γ	D4α	A2δ
D1α	A3δ	C2β	B4γ
B2γ	C4β	A1δ	D3α

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A4α	D3δ	B2β	C1γ
C2γ	B1β	D4δ	A3α
D1δ	A2α	C3γ	B4β
B3β	C4γ	A1α	D2δ

A4α	D3γ	B2β	C1δ
C2δ	B1β	D4γ	A3α
D1γ	A2α	C3δ	B4β
B3β	C4δ	A1α	D2γ

A4α	D3δ	B2γ	C1β
C2β	B1γ	D4δ	A3α
D1δ	A2α	C3β	B4γ
B3γ	C4β	A1α	D2δ

A4α	D3β	B2γ	C1δ
C2δ	B1γ	D4β	A3α
D1β	A2α	C3δ	B4γ
B3γ	C4δ	A1α	D2β

A4α	D3γ	B2δ	C1β
C2β	B1δ	D4γ	A3α
D1γ	A2α	C3β	B4δ
B3δ	C4β	A1α	D2γ

A4α	D3β	B2δ	C1γ
C2γ	B1δ	D4β	A3α
D1β	A2α	C3γ	B4δ
B3δ	C4γ	A1α	D2β

A4β	D3δ	B2α	C1γ
C2γ	B1α	D4δ	A3β
D1δ	A2β	C3γ	B4α
B3α	C4γ	A1β	D2γ

A4β	D3γ	B2α	C1δ
C2δ	B1α	D4γ	A3β
D1γ	A2β	C3δ	B4α
B3α	C4δ	A1β	D2γ

A4β	D3γ	B2α	C1δ
C2δ	B1α	D4γ	A3β
D1γ	A2β	C3δ	B4α
B3α	C4δ	A1β	D2γ

A4β	D3δ	B2α	C1γ
C2γ	B1α	D4δ	A3β
D1δ	A2β	C3γ	B4α
B3α	C4γ	A1β	D2δ

A4β	D3δ	B2γ	C1α
C2α	B1γ	D4δ	A3β
D1δ	A2β	C3α	B4γ
B3γ	C4α	A1β	D2δ

A4β	D3α	B2γ	C1δ
C2δ	B1γ	D4α	A3β
D1α	A2β	C3δ	B4γ
B3γ	C4δ	A1β	D2α

A4γ	D3δ	B2α	C1β
C2β	B1α	D4δ	A3γ
D1δ	A2γ	C3β	B4α
B3α	C4β	A1γ	D2δ

A4γ	D3β	B2α	C1δ
C2δ	B1α	D4β	A3γ
D1β	A2γ	C3δ	B4α
B3α	C4δ	A1γ	D2β

A4γ	D3δ	B2β	C1α
C2α	B1β	D4δ	A3γ
D1δ	A2γ	C3α	B4β
B3β	C4α	A1γ	D2δ

A4γ	D3α	B2β	C1δ
C2δ	B1β	D4α	A3γ
D1α	A2γ	C3δ	B4β
B3β	C4δ	A1γ	D2α

A4γ	D3β	B2δ	C1α
C2α	B1δ	D4β	A3γ
D1β	A2γ	C3α	B4δ
B3δ	C4α	A1γ	D2β

A4γ	D3α	B2δ	C1β
C2β	B1δ	D4α	A3γ
D1α	A2γ	C3β	B4δ
B3δ	C4β	A1γ	D2α

A4δ	D3γ	B2α	C1β
C2β	B1α	D4γ	A3δ
D1γ	A2δ	C3β	B4α
B3α	C4β	A1δ	D2γ

A4δ	D3β	B2α	C1γ
C2γ	B1α	D4β	A3δ
D1β	A2δ	C3γ	B4α
B3α	C4γ	A1δ	D2β

A4δ	D3γ	B2β	C1α
C2α	B1β	D4γ	A3δ
D1γ	A2δ	C3α	B4β
B3β	C4α	A1δ	D2γ

A4δ	D3α	B2β	C1γ
C2γ	B1β	D4α	A3δ
D1α	A2δ	C3γ	B4β
B3β	C4γ	A1δ	D2α

A4δ	D3β	B2γ	C1α
C2α	B1γ	D4β	A3δ
D1β	A2δ	C3α	B4γ
B3γ	C4α	A1δ	D2β

A4δ	D3α	B2γ	C1β
C2β	B1γ	D4α	A3δ
D1α	A2δ	C3β	B4γ
B3γ	C4β	A1δ	D2α

The 64-bit code on Magic Square

Tropic Right (481-510)

A4α	D1δ	B3β	C2γ	A4α	D1γ	B3β	C2δ	A4α	D1δ	B3γ	C2β
C3γ	B2β	D4δ	A1α	C3δ	B2β	D4γ	A1α	C3β	B2γ	D4δ	A1α
D2δ	A3α	C1γ	B4β	D2γ	A3α	C1δ	B4β	D2δ	A3α	C1β	B4γ
B1β	C4γ	A2α	D3δ	B1β	C4δ	A2α	D3γ	B1γ	C4β	A2α	D3δ

A4α	D1β	B3γ	C2δ	A4α	D1γ	B3δ	C2β	A4α	D1β	B3δ	C2γ
C3δ	B2γ	D4β	A1α	C3β	B2δ	D4γ	A1α	C3γ	B2δ	D4β	A1α
D2β	A3α	C1δ	B4γ	D2γ	A3α	C1β	B4δ	D2β	A3α	C1γ	B4δ
B1γ	C4δ	A2α	D3β	B1δ	C4β	A2α	D3γ	B1δ	C4γ	A2α	D3β

A4β	D1δ	B3α	C2γ	A4β	D1γ	B3α	C2δ	A4β	D1δ	B3γ	C2α
C3γ	B2α	D4δ	A1β	C3δ	B2α	D4γ	A1β	C3α	B2γ	D4δ	A1β
D2δ	A3β	C1γ	B4α	D2γ	A3β	C1δ	B4α	D2δ	A3β	C1α	B4γ
B1α	C4γ	A2β	D3δ	B1α	C4δ	A2β	D3γ	B1γ	C4α	A2β	D3δ

A4β	D1α	B3γ	C2δ	A4β	D1γ	B3δ	C2α	A4β	D1α	B3δ	C2γ
C3δ	B2γ	D4α	A1β	C3α	B2δ	D4γ	A1β	C3γ	B2δ	D4α	A1β
D2α	A3β	C1δ	B4γ	D2γ	A3β	C1α	B4δ	D2α	A3β	C1γ	B4δ
B1γ	C4δ	A2β	D3α	B1δ	C4α	A2β	D3γ	B1δ	C4γ	A2β	D3α

A4γ	D1δ	B3α	C2β	A4γ	D1β	B3α	C2δ	A4γ	D1δ	B3β	C2α
C3β	B2α	D4δ	A1γ	C3δ	B2α	D4β	A1γ	C3α	B2β	D4δ	A1γ
D2δ	A3γ	C1β	B4α	D2β	A3γ	C1δ	B4α	D2δ	A3γ	C1α	B4β
B1α	C4β	A2γ	D3δ	B1α	C4δ	A2γ	D3β	B1β	C4α	A2γ	D3δ

A4γ	D1α	B3β	C2δ	A4γ	D1β	B3δ	C2α	A4γ	D1α	B3δ	C2β
C3δ	B2β	D4α	A1γ	C3α	B2δ	D4β	A1γ	C3β	B2δ	D4α	A1γ
D2α	A3γ	C1δ	B4β	D2β	A3γ	C1α	B4δ	D2α	A3γ	C1β	B4δ
B1β	C4δ	A2γ	D3α	B1δ	C4α	A2γ	D3β	B1δ	C4β	A2γ	D3α

A4δ	D1γ	B3α	C2β	A4δ	D1β	B3α	C2γ	A4δ	D1γ	B3β	C2α
C3β	B2α	D4γ	A1δ	C3γ	B2α	D4β	A1δ	C3α	B2β	D4γ	A1δ
D2γ	A3δ	C1β	B4α	D2β	A3δ	C1γ	B4α	D2γ	A3δ	C1α	B4β
B1α	C4β	A2δ	D3γ	B1α	C4γ	A2δ	D3β	B1β	C4α	A2δ	D3γ

A4δ	D1α	B3β	C2γ	A4δ	D1β	B3γ	C2α	A4δ	D1α	B3γ	C2β
C3γ	B2β	D4α	A1δ	C3α	B2γ	D4β	A1δ	C3β	B2γ	D4α	A1δ
D2α	A3δ	C1γ	B4β	D2β	A3δ	C1α	B4γ	D2α	A3δ	C1β	B4γ
B1β	C4γ	A2δ	D3α	B1γ	C4α	A2δ	B3β	B1γ	C4β	A2δ	D3α

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A4α	D3δ	B1β	C2γ	A4α	D3γ	B1β	C2δ	A4α	D3δ	B1γ	C2β
C1γ	B2β	D4δ	A3α	C1δ	B2β	D4γ	A3α	C1β	B2γ	D4δ	A3α
D2δ	A1α	C3γ	B4β	D2γ	A1α	C3δ	B4β	D2δ	A1α	C3β	B4γ
B3β	C4γ	A2α	D1δ	B3β	C4δ	A2α	D1γ	B3γ	C4β	A2α	D1δ

A4α	D3β	B1γ	C2δ	A4α	D3γ	B1δ	C2β	A4α	D3β	B1δ	C2γ
C1δ	B2γ	D4β	A3α	C1β	B2δ	D4γ	A3α	C1γ	B2δ	D4β	A3α
D2β	A1α	C3δ	B4γ	D2γ	A1α	C3β	B4δ	D2β	A1α	C3γ	B4δ
B3γ	C4δ	A2α	D1β	B3δ	C4β	A2α	D1γ	B3δ	C4γ	A2α	D1β

The 64-bit code on Magic Square

Tropic Right (511-540)

A4β	D3δ	B1α	C2γ	A4β	D3γ	B1α	C2δ	A4β	D3δ	B1γ	C2α
C1γ	B2α	D4δ	A3β	C1δ	B2α	D4γ	A3β	C1α	B2γ	D4δ	A3β
D2δ	A1β	C3γ	B4α	D2γ	A1β	C3δ	B4α	D2δ	A1β	C3α	B4γ
B3α	C4γ	A2β	D1δ	B3α	C4δ	A2β	D1γ	B3γ	C4α	A2β	D1δ

A4β	D3α	B1γ	C2δ	A4β	D3γ	B1δ	C2α	A4β	D3α	B1δ	C2γ
C1δ	B2γ	D4α	A3β	C1α	B2δ	D4γ	A3β	C1γ	B2δ	D4α	A3β
D2α	A1β	C3δ	B4γ	D2γ	A1β	C3α	B4δ	D2α	A1β	C3γ	B4δ
B3γ	C4δ	A2β	D1α	B3δ	C4α	A2β	D1γ	B3δ	C4γ	A2β	D1α

A4γ	D3δ	B1α	C2β	A4γ	D3β	B1α	C2δ	A4γ	D3δ	B1β	C2α
C1β	B2α	D4δ	A3γ	C1δ	B2α	D4β	A3γ	C1α	B2β	D4δ	A3γ
D2δ	A1γ	C3β	B4α	D2β	A1γ	C3δ	B4α	D2δ	A1γ	C3α	B4β
B3α	C4β	A2γ	D1δ	B3α	C4δ	A2γ	D1β	B3β	C4α	A2γ	D1δ

A4γ	D3α	B1β	C2δ	A4γ	D3β	B1δ	C2α	A4γ	D3α	B1δ	C2β
C1δ	B2β	D4α	A3γ	C1α	B2δ	D4β	A3γ	C1β	B2δ	D4α	A3γ
D2α	A1γ	C3δ	B4β	D2β	A1γ	C3α	B4δ	D2α	A1γ	C3β	B4δ
B3β	C4δ	A2γ	D1α	B3δ	C4α	A2γ	D1β	B3δ	C4β	A2γ	D1α

A4δ	D3γ	B1α	C2β	A4δ	D3β	B1α	C2γ	A4δ	D3γ	B1β	C2α
C1β	B2α	D4γ	A3δ	C1γ	B2α	D4β	A3δ	C1α	B2β	D4γ	A3δ
D2γ	A1δ	C3β	B4α	D2β	A1δ	C3γ	B4α	D2γ	A1δ	C3α	B4β
B3α	C4β	A2δ	D1γ	B3α	C4γ	A2δ	D1β	B3β	C4α	A2δ	D1γ

A4δ	D3α	B1β	C2γ	A4δ	D3β	B1γ	C2α	A4δ	D3α	B1γ	C2β
C1γ	B2β	D4α	A3δ	C1α	B2γ	D4β	A3δ	C1β	B2γ	D4α	A3δ
D2α	A1δ	C3γ	B4β	D2β	A1δ	C3α	B4γ	D2α	A1δ	C3β	B4γ
B3β	C4γ	A2δ	D1α	B3γ	C4α	A2δ	D1β	B3γ	C4β	A2δ	D1α

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A4α	D1δ	B2β	C3γ	A4α	D1γ	B2β	C3δ	A4α	D1δ	B2γ	C3β
C2γ	B3β	D4δ	A1α	C2δ	B3β	D4γ	A1α	C2β	B3γ	D4δ	A1α
D3δ	A2α	C1γ	B4β	D3γ	A2α	C1δ	B4β	D3δ	A2α	C1β	B4γ
B1β	C4γ	A3α	D2δ	B1β	C4δ	A3α	D2γ	B1γ	C4β	A3α	D2δ

A4α	D1γ	B2δ	C3β	A4α	D1γ	B2δ	C3β	A4α	D1β	B2δ	C3γ
C2β	B3δ	D4γ	A1α	C2β	B3δ	D4γ	A1α	C2γ	B3δ	D4β	A1α
D3γ	A2α	C1β	B4δ	D3γ	A2α	C1β	B4δ	D3β	A2α	C1γ	B4δ
B1δ	C4β	A3α	D2γ	B1δ	C4β	A3α	D2γ	B1δ	C4γ	A3α	D2β

A4β	D1δ	B2α	C3γ	A4β	D1γ	B2α	C3δ	A4β	D1δ	B2γ	C3α
C2γ	B3α	D4δ	A1β	C2δ	B3α	D4γ	A1β	C2α	B3γ	D4δ	A1β
D3δ	A2β	C1γ	B4α	D3γ	A2β	C1δ	B4α	D3δ	A2β	C1α	B4γ
B1α	C4γ	A3β	D2δ	B1α	C4δ	A3β	D2γ	B1γ	C4α	A3β	D2δ

A4β	D1α	B2γ	C3δ	A4β	D1γ	B2δ	C3α	A4β	D1α	B2δ	C3γ
C2δ	B3γ	D4α	A1β	C2α	B3δ	D4γ	A1β	C2γ	B3δ	D4α	A1β
D3α	A2β	C1δ	B4γ	D3γ	A2β	C1α	B4δ	D3α	A2β	C1γ	B4δ
B1γ	C4δ	A3β	D2α	B1δ	C4α	A3β	D2γ	B1δ	C4γ	A3β	D2α

The 64-bit code on Magic Square

Tropic Right (541-570)

A4γ	D1δ	B2α	C3β
C2β	B3α	D4δ	A1γ
D3δ	A2γ	C1β	B4α
B1α	C4β	A3γ	D2δ

A4γ	D1β	B2α	C3δ
C2δ	B3α	D4β	A1γ
D3β	A2γ	C1δ	B4α
B1α	C4δ	A3γ	D2β

A4γ	D1δ	B2β	C3α
C2α	B3β	D4δ	A1γ
D3δ	A2γ	C1α	B4β
B1β	C4α	A3γ	D2δ

A4γ	D1α	B2β	C3δ
C2δ	B3β	D4α	A1γ
D3α	A2γ	C1δ	B4β
B1β	C4δ	A3γ	D2α

A4γ	D1β	B2δ	C3α
C2α	B3δ	D4β	A1γ
D3β	A2γ	C1α	B4δ
B1δ	C4α	A3γ	D2β

A4γ	D1α	B2δ	C3β
C2β	B3δ	D4α	A1γ
D3α	A2γ	C1β	B4δ
B1δ	C4β	A3γ	D2α

A4δ	D1γ	B2α	C3β
C2β	B3α	D4γ	A1δ
D3γ	A2δ	C1β	B4α
B1α	C4β	A3δ	D2γ

A4δ	D1β	B2α	C3γ
C2γ	B3α	D4β	A1δ
D3β	A2δ	C1γ	B4α
B1α	C4γ	A3δ	D2β

A4δ	D1γ	B2β	C3α
C2α	B3β	D4γ	A1δ
D3γ	A2δ	C1α	B4β
B1β	C4α	A3δ	D2γ

A4δ	D1α	B2β	C3γ
C2γ	B3β	D4α	A1δ
D3α	A2δ	C1γ	B4β
B1β	C4γ	A3δ	D2α

A4δ	D1β	B2γ	C3α
C2α	B3γ	D4β	A1δ
D3β	A2δ	C1α	B4γ
B1γ	C4α	A3δ	D2β

A4δ	D1α	B2γ	C3β
C2β	B3γ	D4α	A1δ
D3α	A2δ	C1β	B4γ
B1γ	C4β	A3δ	D2α

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A4α	D2δ	B1β	C3γ
C1γ	B3β	D4δ	A2α
D3δ	A1α	C2γ	B4β
B2β	C4γ	A3α	D1δ

A4α	D2γ	B1β	C3δ
C1δ	B3β	D4γ	A2α
D3γ	A1α	C2δ	B4β
B2β	C4δ	A3α	D1γ

A4α	D2δ	B1γ	C3β
C1β	B3γ	D4δ	A2α
D3δ	A1α	C2β	B4γ
B2γ	C4β	A3α	D1δ

A4α	D2β	B1γ	C3δ
C1δ	B3γ	D4β	A2α
D3β	A1α	C2δ	B4γ
B2γ	C4δ	A3α	D1β

A4α	D2γ	B1δ	C3β
C1β	B3δ	D4γ	A2α
D3γ	A1α	C2β	B4δ
B2δ	C4β	A3α	D1γ

A4α	D2β	B1δ	C3γ
C1γ	B3δ	D4β	A2α
D3β	A1α	C2γ	B4δ
B2δ	C4γ	A3α	D1β

A4β	D2δ	B1β	C3γ
C1γ	B3α	D4δ	A2β
D3δ	A1β	C2γ	B4α
B2α	C4γ	A3β	D1δ

A4β	D2γ	B1α	C3δ
C1δ	B3α	D4γ	A2β
D3γ	A1β	C2δ	B4α
B2α	C4δ	A3β	D1γ

A4β	D2δ	B1γ	C3α
C1α	B3γ	D4δ	A2β
D3δ	A1β	C2α	B4γ
B2γ	C4α	A3β	D1δ

A4β	D2α	B1γ	C3δ
C1δ	B3γ	D4α	A2β
D3α	A1β	C2δ	B4γ
B2γ	C4δ	A3β	D1α

A4β	D2γ	B1δ	C3α
C1α	B3δ	D4γ	A2β
D3γ	A1β	C2α	B4δ
B2δ	C4α	A3β	D1γ

A4β	D2α	B1δ	C3γ
C1γ	B3δ	D4α	A2β
D3α	A1β	C2γ	B4δ
B2δ	C4γ	A3β	D1α

A4γ	D2δ	B1α	C3β
C1β	B3α	D4δ	A2γ
D3δ	A1γ	C2β	B4α
B2α	C4β	A3γ	D1δ

A4γ	D2β	B1α	C3δ
C1δ	B3α	D4β	A2γ
D3β	A1γ	C2δ	B4α
B2α	C4δ	A3γ	D1β

A4γ	D2δ	B1β	C3α
C1α	B3β	D4δ	A2γ
D3δ	A1γ	C2α	B4β
B2β	C4α	A3γ	D1δ

A4γ	D2α	B1β	C3δ
C1δ	B3β	D4α	A2γ
D3α	A1γ	C2δ	B4β
B2β	C4δ	A3γ	D1α

A4γ	D2β	B1δ	C3α
C1α	B3δ	D4β	A2γ
D3β	A1γ	C2α	B4δ
B2δ	C4α	A3γ	D1β

A4γ	D2α	B1δ	C3β
C1β	B3δ	D4α	A2γ
D3α	A1γ	C2β	B4δ
B2δ	C4β	A3γ	D1α

The 64-bit code on Magic Square

Tropic Right (571-576)

A4δ	D2γ	B1α	C3β
C1β	B3α	D4γ	A2δ
D3γ	A1δ	C2β	B4α
B2α	C4β	A3δ	D1γ

A4δ	D2β	B1α	C3γ
C1γ	B3α	D4β	A2δ
D3β	A1δ	C2γ	B4α
B2α	C4γ	A3δ	D1β

A4δ	D2γ	B1β	C3α
C1α	B3β	D4γ	A2δ
D3γ	A1δ	C2α	B4β
B2β	C4α	A3δ	D1γ

A4δ	D2γ	B1β	C3α
C1α	B3β	D4γ	A2δ
D3γ	A1δ	C2α	B4β
B2β	C4α	A3δ	D1γ

A4δ	D2β	B1γ	C3α
C1α	B3γ	D4β	A2δ
D3β	A1δ	C2α	B4γ
B2γ	C4α	A3δ	D1β

A4δ	D2α	B1γ	C3β
C1β	B3γ	D4α	A2δ
D3α	A1δ	C2β	B4γ
B2γ	C4β	A3δ	D1α

17. Hydrogen Ionization Potential on Magic Square

The Key to 64-bit code

A1α	=	λ_1	C1α	=	λ_1
A1β	=	λ_2	C1β	=	λ_2
A1γ	=	λ_3	C1γ	=	λ_3
A1δ	=	λ_4	C1δ	=	λ_4
A2α	=	λ_5	C2α	=	λ_5
A2β	=	λ_6	C2β	=	λ_6
A2γ	=	λ_7	C2γ	=	λ_7
A2δ	=	λ_8	C2δ	=	λ_8
A3α	=	λ_9	C3α	=	λ_9
A3β	=	λ_{10}	C3β	=	λ_{10}
A3γ	=	λ_{11}	C3γ	=	λ_{11}
A3δ	=	λ_{12}	C3δ	=	λ_{12}
A4α	=	λ_{13}	C4α	=	λ_{13}
A4β	=	λ_{14}	C4β	=	λ_{14}
A4γ	=	λ_{15}	C4γ	=	λ_{15}
A4δ	=	λ_{16}	C4δ	=	λ_{16}
B1α	=	λ_1	D1α	=	λ_1
B1β	=	λ_2	D1β	=	λ_2
B1γ	=	λ_3	D1γ	=	λ_3
B1δ	=	λ_4	D1δ	=	λ_4
B2α	=	λ_5	D2α	=	λ_5
B2β	=	λ_6	D2β	=	λ_6
B2γ	=	λ_7	D2γ	=	λ_7
B2δ	=	λ_8	D2δ	=	λ_8
B3α	=	λ_9	D3α	=	λ_9
B3β	=	λ_{10}	D3β	=	λ_{10}
B3γ	=	λ_{11}	D3γ	=	λ_{11}
B3δ	=	λ_{12}	D3δ	=	λ_{12}
B4α	=	λ_{13}	D4α	=	λ_{13}
B4β	=	λ_{14}	D4β	=	λ_{14}
B4γ	=	λ_{15}	D4γ	=	λ_{15}
B4δ	=	λ_{16}	D4δ	=	λ_{16}

First letter	Second letter 1	2	3	4	Third letter
	λ_1	λ_5	λ_9	λ_{13}	α
Lymann	λ_2	λ_6	λ_{10}	λ_{14}	β
	λ_3	λ_7	λ_{11}	λ_{15}	γ
	λ_4	λ_8	λ_{12}	λ_{16}	δ
	λ_1	λ_5	λ_9	λ_{13}	α
Ballmer	λ_2	λ_6	λ_{10}	λ_{14}	β
	λ_3	λ_7	λ_{11}	λ_{15}	γ
	λ_4	λ_8	λ_{12}	λ_{16}	δ
	λ_1	λ_5	λ_9	λ_{13}	α
Pasche	λ_2	λ_6	λ_{10}	λ_{14}	β
	λ_3	λ_7	λ_{11}	λ_{15}	γ
	λ_4	λ_8	λ_{12}	λ_{16}	δ
	λ_1	λ_5	λ_9	λ_{13}	α
Bracket	λ_2	λ_6	λ_{10}	λ_{14}	β
	λ_3	λ_7	λ_{11}	λ_{15}	γ
	λ_4	λ_8	λ_{12}	λ_{16}	δ

$$bit = n^3 = 4^3 = 64$$

$$\Sigma = \frac{\Sigma(A1\alpha : A4\delta + B1\alpha : B4\delta + C1\alpha : C4\delta + D1\alpha : D4\delta)}{n^2}$$

If use the inverse start value of lambda (λ) in the Lymann series in Hydrogen $A1\alpha = 1 \div \lambda_1$ the sum in a 64-bit code will be the Ionization Potential in Hydrogen IP_H. The method in a 64-bit code of magic square will be built up approximately with the same method like in the genetic code with its 3D-structure in nature. The first letter (A, B, C, D) are build up from lambdas of Lymann series, Ballmer series, Pasche series and Bracket series in Hydrogen atom. Optimum will be the 125-bit code, because a centre square, where the other squares can rotate around.

18. Applications in Business and Life Sciences

Two matrices of the same order *n* of Magic Squares can be added by adding corresponding entries, and they are then said to be conformable for addition, because commutative property.

Tropic Left

A1α	C4δ	D2β	B3γ
D3γ	B2β	A4δ	C1α
B4δ	D1α	C3γ	A2β
C2β	A3γ	B1α	D4δ

Tropic Right

A1α	D3δ	B4β	C2γ
C4γ	B2β	D1δ	A3α
D2δ	A4α	C3γ	B1β
B3β	C1γ	A2α	D4δ

These two Magic Squares have the same 64-bit code and of the Magic Constant sum Σ = 130.

$$\begin{bmatrix} 1 & 48 & 54 & 27 \\ 59 & 22 & 16 & 33 \\ 32 & 49 & 43 & 6 \\ 38 & 11 & 17 & 64 \end{bmatrix} + \begin{bmatrix} 1 & 60 & 30 & 39 \\ 47 & 22 & 52 & 9 \\ 56 & 13 & 43 & 18 \\ 26 & 35 & 5 & 64 \end{bmatrix} = \begin{bmatrix} (1+1) & (48+60) & (54+30) & (27+39) \\ (59+47) & (22+22) & (16+52) & (33+9) \\ (32+56) & (49+13) & (43+43) & (6+18) \\ (38+26) & (11+35) & (17+5) & (64+64) \end{bmatrix} = \begin{bmatrix} 2 & 108 & 84 & 66 \\ 106 & 44 & 68 & 42 \\ 88 & 62 & 86 & 24 \\ 64 & 46 & 22 & 128 \end{bmatrix}$$

In matrices addition the Magic Constant are of: TL + TR = TR + TL, which will say Σ = 260.

A Magic Cube consists of n^3 numbers, arranged so that each row, column, and main diagonal, that will say from left to right, give the same sum. In the case, the magic constant for cubes is

$$\Sigma = \frac{n\left(n^3+1\right)}{2} \qquad \Rightarrow \qquad \Sigma = \frac{4\cdot\left(4^3+1\right)}{2} = 130$$

When treated out as matrices, Magic Squares and Magic Square in a 64-bit version also serve as exceptional examples of some advanced linear algebra theorems. The magic constant for an n^{th} order magic square of 64-bit or 125-bit squares starting with an integer *a*, and with an entire increasing/decreasing of an arithmetic series with integer difference *d* between terms is

$$\Sigma = \left(n : a, d\right) = \frac{1}{2}\cdot n\cdot\left[2\cdot a + d\cdot\left(n^3-1\right)\right] \qquad a = 0.1.2.3....\left[-\infty \le a \le \infty\right] \qquad d = 1.2.3.4....\left[d \ne 0\right]$$

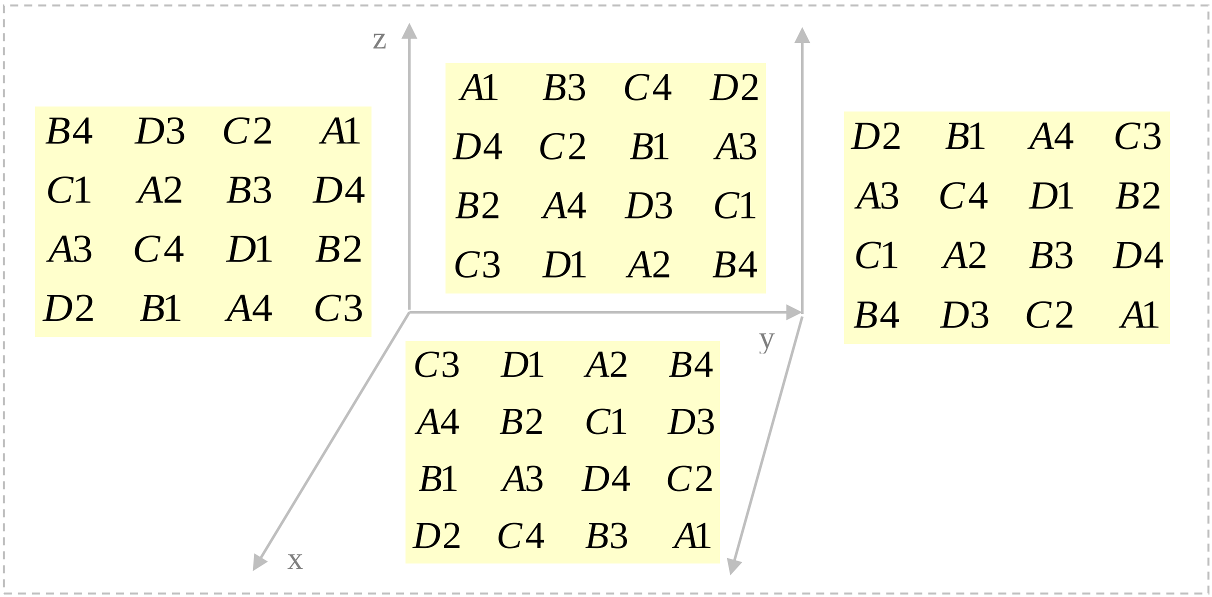
$$\Sigma = \frac{1}{2}\cdot 4\cdot\left[2\cdot 2 + 2\cdot\left(4^3-1\right)\right] = 260$$

This Magic Constant formula gives the sum of the additive matrices sum, if *a = 2* and *d = 2.*

The order *n = 4* of Magic Square is the 64-bit matrix where the first letter of letter A, B, C, D and second letter of integer 1, 2, 3, 4 are going on the main diagonal from left to right in both tropic left and tropic right. The third letter of letter α, β, γ, δ are going to the main diagonal of integer in the tropic left, and into the letter in the tropic right, in this essay. These will then corresponds to about 1 × 24 × 48 = 1 152 true combination of 3D-structure in the nature. One proof for this statement is the Genetic Code on the 64-bit code with protein synthesis into the key cordon of Magic Squares converting into magic constants, and estimating the Hydrogen fine structure and ionization potential with the 125-bit code of magic squares. These precision of the Hydrogen atom fine structure *know how* is of importance if wanted success in a fusion process. Other application in business and life science is now in the modern photographing industries, where some advanced linear algebra theorems are used with matrices equation into Magic Squares and that to estimating the true colours of nature into the camera. The identity of magic constants with same value of arrays, rows and diagonals are probably very useful in the modern high-tech industries with 3D NAND flash memories and 3D X-point technology.

18.1 **Cubic Magic Square of order *n = 4***

To make a cube magic, it needs six magic squares with pattern that each one fit into another.



This diagram illustrate the 3D-structure of one cubic Magic Square of order *n = 4*, where row zy fit to row of xy, the column zy fit to column of zx and the row zx fitted to column xy.

Front magic square

B4	A2	D1	C3
C1	D3	A4	B2
A3	B1	C2	D4
D2	C4	B3	A1

Cover magic square

A1	B3	C4	D2
C2	D4	A3	B1
D3	C1	B2	A4
B4	A2	D1	C3

With these two Magic Squares, the cubic 3D-structure of Magic Square construction will be complete. The Key will convert the Magic Constant to each six squares of the Magic Square.

The Key

A1	=	1
A2	=	2
A3	=	3
A4	=	4
B1	=	5
B2	=	6
B3	=	7
B4	=	8
C1	=	9
C2	=	10
C3	=	11
C4	=	12
D1	=	13
D2	=	14
D3	=	15
D4	=	16

The magic constant for an n^{th} order magic square starting with an integer *a*, and with an entire increasing / decreasing of an arithmetic series with integer difference *d* between terms is: $a = 0.1.2.3....[-\infty \le a \le \infty]$ and $d = 1.2.3.4....[d \ne 0]$

$$\Sigma = a \cdot n + d \cdot \left(\frac{n \cdot (n^2 + 1)}{2} - n \right) \quad \Rightarrow \quad \Sigma = \frac{1}{2} \cdot n \cdot \left[2 \cdot a + d \cdot (n^2 - 1) \right]$$

This sum formula is true for every Integer *a*. *d*. This is shown on Excel sheet.

$$\Sigma = \frac{(1+n^2) \times (n^2 \div 2)}{n} = \frac{(1+4^2) \times (4^2 \div 2)}{4} = 34 \quad \Leftrightarrow \quad \Sigma = \frac{sum(A1:D4)}{n} = \frac{136}{4} = 34$$

A progression of the smallest possibly numerical integer is called arithmetic, if and only if, the half sum before integer n and the half sum after integer n together is equivalent of integer n in the key, then it's a arithmetic algorithm. Example; if n are B2 = 6 in The Key to the left, then; (5 + 7) ÷2 = 6 = B2.

19. The 125-bit code on Magic Square

There exist two special houses with order *n* = *5* and they give about 240 combinations of MS.

Tropic Left

A1	E3	D5	C2	B4
C5	B2	A4	E1	D3
E4	D1	C3	B5	A2
B3	A5	E2	D4	C1
D2	C4	B1	A3	E5

$$bit = n^3 = 5^3 = 125$$

$$\Sigma = \frac{1}{2} \cdot n\left(n^3 + 1\right) = 315$$

Tropic Right

A1	D3	E2	C5	B4
C4	B2	D5	E1	A3
B5	E4	C3	A2	D1
E3	A5	B1	D4	C2
D2	C1	A4	B3	E5

In both houses the diagonals are going from left to right with A, B, C, D, E and 1, 2, 3, 4, 5. This make that it can only exist two true house of Magic Square, if the diagonal letter will not be changed. If change the combination of integer 1, 2, 3, 4, 5 then it will exist about 240 true

A1α	E3γ	D5ε	C2β	B4δ
C5ε	B2β	A4δ	E1α	D3γ
E4δ	D1α	C3γ	B5ε	A2β
B3γ	A5ε	E2β	D4δ	C1α
D2β	C4δ	B1α	A3γ	E5ε

A1α	D3γ	E2β	C5ε	B4δ
C4δ	B2β	D5ε	E1α	A3γ
B5ε	E4δ	C3γ	A2β	D1α
E3γ	A5ε	B1α	D4δ	C2β
D2β	C1α	A4δ	B3γ	E5ε

combination of Magic Square, and if added the colour letter α, β, γ, δ, ε there are about 240 × 240 ≈ 57600 MS. In this essay it will only be showed the first 240 in 125-bit Magic Squares.

The Key to 125-bit code on MS

A1α	=	1	B1α	=	26	C1α	=	51	D1α	=	76	E1α	=	101
A1β	=	2	B1β	=	27	C1β	=	52	D1β	=	77	E1β	=	102
A1γ	=	3	B1γ	=	28	C1γ	=	53	D1γ	=	78	E1γ	=	103
A1δ	=	4	B1δ	=	29	C1δ	=	54	D1δ	=	79	E1δ	=	104
A1ε	=	5	B1ε	=	30	C1ε	=	55	D1ε	=	80	E1ε	=	105
A2α	=	6	B2α	=	31	C2α	=	56	D2α	=	81	E2α	=	106
A2β	=	7	B2β	=	32	C2β	=	57	D2β	=	82	E2β	=	107
A2γ	=	8	B2γ	=	33	C2γ	=	58	D2γ	=	83	E2γ	=	108
A2δ	=	9	B2δ	=	34	C2δ	=	59	D2δ	=	84	E2δ	=	109
A2ε	=	10	B2ε	=	35	C2ε	=	60	D2ε	=	85	E2ε	=	110
A3α	=	11	B3α	=	36	C3α	=	61	D3α	=	86	E3α	=	111
A3β	=	12	B3β	=	37	C3β	=	62	D3β	=	87	E3β	=	112
A3γ	=	13	B3γ	=	38	C3γ	=	63	D3γ	=	88	E3γ	=	113
A3δ	=	14	B3δ	=	39	C3δ	=	64	D3δ	=	89	E3δ	=	114
A3ε	=	15	B3ε	=	40	C3ε	=	65	D3ε	=	90	E3ε	=	115
A4α	=	16	B4α	=	41	C4α	=	66	D4α	=	91	E4α	=	116
A4β	=	17	B4β	=	42	C4β	=	67	D4β	=	92	E4β	=	117
A4γ	=	18	B4γ	=	43	C4γ	=	68	D4γ	=	93	E4γ	=	118
A4δ	=	19	B4δ	=	44	C4δ	=	69	D4δ	=	94	E4δ	=	119
A4ε	=	20	B4ε	=	45	C4ε	=	70	D4ε	=	95	E4ε	=	120
A5α	=	21	B5α	=	46	C5α	=	71	D5α	=	96	E5α	=	121
A5β	=	22	B5β	=	47	C5β	=	72	D5β	=	97	E5β	=	122
A5γ	=	23	B5γ	=	48	C5γ	=	73	D5γ	=	98	E5γ	=	123
A5δ	=	24	B5δ	=	49	C5δ	=	74	D5δ	=	99	E5δ	=	124
A5ε	=	25	B5ε	=	50	C5ε	=	75	D5ε	=	100	E5ε	=	125

$$\Sigma = \frac{\Sigma\left(A1\alpha : A5\varepsilon + B1\alpha : B5\varepsilon + C1\alpha : C5\varepsilon + D1\alpha : D5\varepsilon + E1\alpha : E5\varepsilon\right)}{n^2} = 315$$

The 125-bit code on Magic Square

Tropic Left (1-24)

A1	E3	D5	C2	B4
C5	B2	A4	E1	D3
E4	D1	C3	B5	A2
B3	A5	E2	D4	C1
D2	C4	B1	A3	E5

A1	E3	D4	C2	B5
C4	B2	A5	E1	D3
E5	D1	C3	B4	A2
B3	A4	E2	D5	C1
D2	C5	B1	A3	E4

A1	E4	D5	C2	B3
C5	B2	A3	E1	D4
E3	D1	C4	B5	A2
B4	A5	E2	D3	C1
D2	C3	B1	A4	E5

A1	E4	D3	C2	B5
C3	B2	A5	E1	D4
E5	D1	C4	B3	A2
B4	A3	E2	D5	C1
D2	C5	B1	A4	E3

A1	E5	D4	C2	B3
C4	B2	A3	E1	D5
E3	D1	C5	B4	A2
B5	A4	E2	D3	C1
D2	C3	B1	A5	E4

A1	E5	D3	C2	B4
C3	B2	A4	E1	D5
E4	D1	C5	B3	A2
B5	A3	E2	D4	C1
D2	C4	B1	A5	E3

A1	E2	D5	C3	B4
C5	B3	A4	E1	D2
E4	D1	C2	B5	A3
B2	A5	E3	D4	C1
D3	C4	B1	A2	E5

A1	E2	D4	C3	B5
C4	B3	A5	E1	D2
E5	D1	C2	B4	A3
B2	A4	E3	D5	C1
D3	C5	B1	A2	E4

A1	E4	D5	C3	B2
C5	B3	A2	E1	D4
E2	D1	C4	B5	A3
B4	A5	E3	D2	C1
D3	C2	B1	A4	E5

A1	E4	D2	C3	B5
C2	B3	A5	E1	D4
E5	D1	C4	B2	A3
B4	A2	E3	D5	C1
D3	C5	B1	A4	E2

A1	E5	D4	C3	B2
C4	B3	A2	E1	D5
E2	D1	C5	B4	A3
B5	A4	E3	D2	C1
D3	C2	B1	A5	E4

A1	E5	D2	C3	B4
C2	B3	A4	E1	D5
E4	D1	C5	B2	A3
B5	A2	E3	D4	C1
D3	C4	B1	A5	E2

A1	E2	D5	C4	B3
C5	B4	A3	E1	D2
E3	D1	C2	B5	A4
B2	A5	E4	D3	C1
D4	C3	B1	A2	E5

A1	E2	D3	C4	B5
C3	B4	A5	E1	D2
E5	D1	C2	B3	A4
B2	A3	E4	D5	C1
D4	C5	B1	A2	E3

A1	E3	D5	C4	B2
C5	B4	A2	E1	D3
E2	D1	C3	B5	A4
B3	A5	E4	D2	C1
D4	C2	B1	A3	E5

A1	E3	D2	C4	B5
C2	B4	A5	E1	D3
E5	D1	C3	B2	A4
B3	A2	E4	D5	C1
D4	C5	B1	A3	E2

A1	E5	D3	C4	B2
C3	B4	A2	E1	D5
E2	D1	C5	B3	A4
B5	A3	E4	D2	C1
D4	C2	B1	A5	E3

A1	E5	D2	C4	B3
C2	B4	A3	E1	D5
E3	D1	C5	B2	A4
B5	A2	E4	D3	C1
D4	C3	B1	A5	E2

A1	E2	D4	C5	B3
C4	B5	A3	E1	D2
E3	D1	C2	B4	A5
B2	A4	E5	D3	C1
D5	C3	B1	A2	E4

A1	E2	D3	C5	B4
C3	B5	A4	E1	D2
E4	D1	C2	B3	A5
B2	A3	E5	D4	C1
D5	C4	B1	A2	E3

A1	E3	D4	C5	B2
C4	B5	A2	E1	D3
E2	D1	C3	B4	A5
B3	A4	E5	D2	C1
D5	C2	B1	A3	E4

A1	E3	D2	C5	B4
C3	B5	A4	E1	D2
E4	D1	C3	B2	A5
B3	A2	E5	D4	C1
D5	C4	B1	A3	E2

A1	E4	D3	C5	B2
C3	B5	A2	E1	D4
E2	D1	C4	B3	A5
B4	A3	E5	D2	C1
D5	C2	B1	A4	E3

A1	E4	D2	C5	B3
C2	B5	A3	E1	D4
E3	D1	C4	B2	A5
B4	A2	E5	D3	C1
D5	C3	B1	A4	E2

The colour letter α, β, γ, δ, ε combination are not shown, only the 240 solutions of 2D MS.

The 125-bit code on Magic Square

Tropic Left (25-48)

A2	E3	D5	C1	B4	A2	E3	D4	C1	B5	A2	E4	D5	C1	B3
C5	B1	A4	E2	D3	C4	B1	A5	E2	D3	C5	B1	A3	E2	D4
E4	D2	C3	B5	A1	E5	D2	C3	B4	A1	E3	D2	C4	B5	A1
B3	A5	E1	D4	C2	B3	A4	E1	D5	C2	B4	A5	E1	D3	C2
D1	C4	B2	A3	E5	D1	C5	B2	A3	E4	D1	C3	B2	A4	E5

A2	E4	D3	C1	B5	A2	E5	D4	C1	B3	A2	E5	D3	C1	B4
C3	B1	A5	E2	D4	C4	B1	A3	E2	D5	C3	B1	A4	E2	D5
E5	D2	C4	B3	A1	E3	D2	C5	B4	A1	E4	D2	C5	B3	A1
B4	A3	E1	D5	C2	B5	A4	E1	D3	C2	B5	A3	E1	D4	C2
D1	C5	B2	A4	E3	D1	C3	B2	A5	E4	D1	C4	B2	A5	E3

A2	E1	D5	C3	B4	A2	E1	D4	C3	B5	A2	E4	D5	C3	B1
C5	B3	A4	E2	D1	C4	B3	A5	E2	D1	C5	B3	A1	E2	D4
E4	D2	C1	B5	A3	E5	D2	C1	B4	A3	E1	D2	C4	B5	A3
B1	A5	E3	D4	C2	B1	A4	E3	D5	C2	B4	A5	E3	D1	C2
D3	C4	B2	A1	E5	D3	C5	B2	A1	E4	D3	C1	B2	A4	E5

A2	E4	D1	C3	B5	A2	E5	D4	C3	B1	A2	E5	D1	C3	B4
C1	B3	A5	E2	D4	S4	B3	A1	E2	D5	C1	B3	A4	E2	D5
E5	D2	C4	B1	A3	E1	D2	C5	B4	A3	E4	D2	C5	B1	A3
B4	A1	E3	D5	C2	B5	A4	E3	D1	C2	B5	A1	E3	D4	C2
D3	C5	B2	A4	E1	D3	C1	B2	A5	E4	D3	C4	B2	A5	E1

A2	E1	D5	C4	B3	A2	E1	D3	C4	B5	A2	E3	D5	C4	B1
C5	B4	A3	E2	D1	C3	B4	A5	E2	D1	C5	B4	A1	E2	D3
E3	D2	C1	B5	A4	E5	D2	C1	B3	A4	E1	D2	C3	B5	A4
B1	A5	E4	D3	C2	B1	A3	E4	D5	C2	B3	A5	E4	D1	C2
D4	C3	B2	A1	E5	D4	C5	B2	A1	E3	D4	C1	B2	A3	E5

A2	E3	D1	C4	B5	A2	E5	D3	C4	B1	A2	E5	D1	C4	B3
C1	B4	A5	E2	D3	C3	B4	A1	E2	D5	C1	B4	A3	E2	D5
E5	D2	C3	B1	A4	E1	D2	C5	B3	A4	E3	D2	C5	B1	A4
B3	A1	E4	D5	C2	B5	A3	E4	D1	C2	B5	A1	E4	D3	C2
D4	C5	B2	A3	E1	D4	C1	B2	A5	E3	D4	C3	B2	A5	E1

A2	E1	D4	C5	B3	A2	E1	D3	C5	B4	A2	E3	D4	C5	B1
C4	B5	A3	E2	D1	C3	B5	A4	E2	D1	C4	B5	A1	E2	D3
E3	D2	C1	B4	A5	E4	D2	C1	B3	A5	E1	D2	C3	B4	A5
B1	A4	E5	D3	C2	B1	A3	E5	D4	C2	B3	A4	E5	D1	C2
D5	C3	B2	A1	E4	D5	C4	B2	A1	E3	D5	C1	B2	A1	E4

A2	E3	D1	C5	B4	A2	E4	D3	C5	B1	A2	E4	D1	C5	B3
C1	B5	A4	E2	D3	C3	B5	A1	E2	D4	C1	B5	A3	E2	D4
E4	D2	C3	B1	A5	E1	D2	C4	B3	A5	E3	D2	C4	B1	C2
B3	A1	E5	D4	C2	B4	A3	E5	D1	C2	B4	A1	E5	D3	C2
D5	C4	B2	A3	E1	D5	C1	B2	A4	E3	D5	C3	B2	A4	E1

The colour letter α, β, γ, δ, ε combination are not shown, only the 240 solutions of 2D MS.

The 125-bit code on Magic Square

Tropic Left (49-72)

A3	E2	D5	C1	B4	A3	E2	D4	C1	B5	A3	E4	D5	C1	B2
C5	B1	A4	E3	D2	C4	B1	A5	E3	D2	C5	B1	A2	E3	D4
E4	D3	C2	B5	A1	E5	D3	C2	B4	A1	E2	D3	C4	B5	A1
B2	A5	E1	D4	C3	B2	A4	E1	D5	C3	B4	A5	E1	D2	C3
D1	C4	B3	A2	E5	D1	C5	B3	A2	E4	D1	C2	B3	A4	E5

A3	E4	D2	C1	B5	A3	E5	D4	C1	B2	A3	E5	D2	C1	B4
C2	B1	A5	E3	D4	C4	B1	A2	E3	D5	C2	B1	A4	E3	D5
E5	D3	C4	B2	A1	E2	D3	C5	B4	A1	E4	D3	C5	B2	A1
B4	A2	E1	D5	C3	B5	A4	E1	D2	C3	B5	A2	E1	D4	C3
D1	C5	B2	A4	E2	D1	C2	B3	A5	E4	D1	C4	B3	A5	E2

A3	E1	D5	C2	B4	A3	E1	D4	C2	B5	A3	E4	D5	C2	B1
C5	B2	A4	E3	D1	C4	B2	A5	E3	D1	C5	B2	A1	E3	D4
E4	D3	C1	B5	A2	E5	D3	C1	B4	A2	E1	D3	C4	B5	A2
B1	A5	E2	D4	C3	B1	A4	E2	D5	C3	B4	A5	E2	D1	C3
D2	C4	B3	A1	E5	D2	C5	B3	A1	E4	D2	C1	B3	A4	E5

A3	E4	D1	C2	B5	A3	E5	D4	C2	B1	A3	E5	D1	C2	B4
C1	B2	A5	E3	D4	C4	B2	A1	E3	D5	C1	B2	A4	E3	D5
E5	D3	C4	B1	A2	E1	D3	C5	B4	A2	E4	D3	C5	B1	A2
B4	A1	E2	D5	C3	B5	A4	E2	D1	C3	B5	A1	E2	D4	C3
D2	C5	B3	A4	E1	D2	C1	B3	A5	E4	D2	C4	B3	A5	E1

A3	E1	D5	C4	B2	A3	E1	D2	C4	B5	A3	E2	D5	C4	B1
C5	B4	A2	E3	D1	C2	B4	A5	E3	D1	C5	B4	A1	E3	D2
E2	D3	C1	B5	A4	E5	D3	C1	B2	A4	E1	D3	C2	B5	A4
B1	A5	E4	D2	C3	B1	A2	E4	D5	C3	B2	A5	E4	D1	C3
D4	C2	B3	A1	E5	D4	C5	B3	A1	E2	D4	C1	B3	A2	E5

A3	E2	D1	C4	B5	A3	E5	D2	C4	B1	A3	E5	D1	C4	B2
C1	B4	A5	E3	D2	C2	B4	A1	E3	D5	C1	B4	A2	E3	D5
E5	D3	C2	B1	A4	E1	D3	C5	B2	A4	E2	D3	C5	B1	A4
B2	A1	E4	D5	C3	B5	A2	E4	D1	C3	B5	A1	E4	D2	C3
D4	C5	B3	A2	E1	D4	C1	B3	A5	E2	D4	C2	B3	A5	E1

A3	E1	D4	C5	B2	A3	E1	D2	C5	B4	A3	E2	D4	C5	B1
C4	B5	A2	E3	D1	C2	B5	A4	E3	D1	C4	B5	A1	E3	D2
E2	D3	C1	B4	A5	E4	D3	C1	B2	A5	E1	D3	C2	B4	A5
B1	A4	E5	D2	C3	B1	A2	E5	D4	C3	B2	A4	E5	D1	C3
D5	C2	B3	A1	E4	D5	C4	B3	A1	E2	D5	C1	B3	A2	E4

A3	E2	D1	C5	B4	A3	E4	D2	C5	B1	A3	E4	D1	C5	B2
C1	B5	A4	E3	D2	C2	B5	A1	E3	D4	C1	B5	A2	E3	D4
E4	D3	C2	B1	A5	E1	D3	C4	B2	A5	E2	D3	C4	B1	A5
B2	A1	E5	D4	C3	B4	A2	E5	D1	C3	B4	A1	E5	D2	C3
D5	C4	B3	A2	E1	D5	C1	B3	A4	E2	D5	C2	B3	A4	E1

The colour letter α, β, γ, δ, ε combination are not shown, only the 240 solutions of 2D MS.

The 125-bit code on Magic Square

Tropic Left (73-96)

A4	E2	D5	C1	B3	A4	E2	D3	C1	B5	A4	E3	D5	C1	B2
C5	B1	A3	E4	D2	C3	B1	A5	E4	D2	C5	B1	A2	E4	D3
E3	D4	C2	B5	A1	E5	D4	C2	B3	A1	E2	D4	C3	B5	A1
B2	A5	E1	D3	C4	B2	A3	E1	D5	C4	B3	A5	E1	D2	C4
D1	C3	B4	A2	E5	D1	C5	B4	A2	E3	D1	C2	B4	A3	E5

A4	E3	D2	C1	B5	A4	E5	D3	C1	B2	A4	E5	D2	C1	B3
C2	B1	A5	E4	D3	C3	B1	A2	E4	D5	C2	B1	A3	E4	D5
E5	D4	C3	B2	A1	E2	D4	C5	B3	A1	E3	D4	C5	B2	A1
B3	A2	E1	D5	C4	B5	A3	E1	D2	C4	B5	A2	E1	D3	C4
D1	C5	B4	A3	E2	D1	C2	B4	A5	E3	D1	C3	B4	A5	E2

A4	E1	D5	C2	B3	A4	E1	D3	C2	B5	A4	E3	D5	C2	B1
C5	B2	A3	E4	D1	C3	B2	A5	E4	D1	C5	B2	A1	E4	D3
E3	D4	C1	B5	A2	E5	D4	C1	B3	A2	E1	D4	C3	B5	A2
B1	A5	E2	D3	C4	B1	A3	E2	D5	C4	B3	A5	E2	D1	C4
D2	C3	B4	A1	E5	D2	C5	B4	A1	E3	D2	C1	B4	A3	E5

A4	E3	D1	C2	B5	A4	E5	D3	C2	B1	A4	E5	D1	C2	B3
C1	B2	A5	E4	D3	C3	B2	A1	E4	D5	C1	B2	A3	E4	D5
E5	D4	C3	B1	A2	E1	D4	C5	B3	A2	E3	D4	C5	B1	A2
B3	A1	E2	D5	C4	B5	A3	E2	D1	C4	B5	A1	E2	D3	C4
D2	C5	B4	A3	E1	D2	C1	B4	A5	E3	D2	C3	B4	A5	E1

A4	E1	D5	C3	B2	A4	E1	D2	C3	B5	A4	E2	D5	C3	B1
C5	B3	A2	E4	D1	C2	B3	A5	E4	D1	C5	B3	A1	E4	D2
E2	D4	C1	B5	A3	E5	D4	C1	B2	A3	E1	D4	C2	B5	A3
B1	A5	E3	D2	C4	B1	A2	E3	D5	C4	B2	A5	E3	D1	C4
D3	C2	B4	A1	E5	D3	C5	B4	A1	E2	D3	C1	B4	A2	E5

A4	E2	D1	C3	B5	A4	E5	D2	C3	B1	A4	E5	D1	C3	B2
C1	B3	A5	E4	D2	C2	B3	A1	E4	D5	C1	B3	A2	E4	D5
E5	D4	C2	B1	A3	E1	D4	C5	B2	A3	E2	D4	C5	B1	A3
B2	A1	E3	D5	C4	B5	A2	E3	D1	C4	B5	A1	E3	D2	C4
D3	C5	B4	A2	E1	D3	C1	B4	A5	E2	D3	C2	B4	A5	E1

A4	E1	D3	C5	B2	A4	E1	D2	C5	B3	A4	E2	D3	C5	B1
C3	B5	A2	E4	D1	C2	B5	A3	E4	D1	C3	B5	A1	E4	D2
E2	D4	C1	B3	A5	E3	D4	C1	B2	A5	E1	D4	C2	B3	A5
B1	A3	E5	D2	C4	B1	A2	E5	D3	C4	B2	A3	E5	D1	C4
D5	C2	B4	A1	E3	D5	C3	B4	A1	E2	D5	C1	B4	A2	E3

A4	E2	D1	C5	B3	A4	E3	D2	C5	B1	A4	E3	D1	C5	B2
C1	B5	A3	E4	D2	C2	B5	A1	E4	D3	C1	B5	A2	E4	D3
E3	D4	C2	B1	A5	E1	D4	C3	B2	A5	E2	D4	C3	B1	A5
B2	A1	E5	D3	C4	B3	A2	E5	D1	C4	B3	A1	E5	D2	C4
D5	C3	B4	A2	E1	D5	C1	B4	A3	E2	D5	C2	B4	A3	E1

The colour letter α, β, γ, δ, ε combination are not shown, only the 240 solutions of 2D MS.

The 125-bit code on Magic Square

Tropic Left (97-120)

A5	E2	D4	C1	B3	A5	E2	D3	C1	B4	A5	E3	D4	C1	B2
C4	B1	A3	E5	D2	C3	B1	A4	E5	D2	C4	B1	A2	E5	D3
E3	D5	C2	B4	A1	E4	D5	C2	B3	A1	E2	D5	C3	B4	A1
B2	A4	E1	D3	C5	B2	A3	E1	D4	C5	B3	A4	E1	D2	C5
D1	C3	B5	A2	E4	D1	C4	B5	A2	E3	D1	C2	B5	A3	E4

A5	E3	D2	C1	B4	A5	E4	D3	C1	B2	A5	E4	D2	C1	B3
C2	B1	A4	E5	D3	C3	B1	A2	E5	D4	C2	B1	A3	E5	D4
E4	D5	C3	B2	A1	E2	D5	C4	B3	A1	E3	D5	C4	B2	A1
B3	A2	E1	D4	C5	B4	A3	E1	D2	C5	B4	A2	E1	D3	C5
D1	C4	B5	A3	E2	D1	C2	B5	A4	E3	D1	C3	B5	A4	E2

A5	E1	D4	C2	B3	A5	E1	D3	C2	B4	A5	E3	D4	C2	B1
C4	B2	A3	E5	D1	C3	B2	A4	E5	D1	C4	B2	A1	E5	D3
E3	D5	C1	B4	A2	E4	D5	C1	B3	A2	E1	D5	C3	B4	A2
B1	A4	E2	D3	C5	B1	A3	E2	D4	C5	B3	A4	E2	D1	C5
D2	C3	B5	A1	E4	D2	C4	B5	A1	E3	D2	C1	B5	A3	E4

A5	E3	D1	C2	B4	A5	E4	D3	C2	B1	A5	E4	D1	C2	B3
C1	B2	A4	E5	D3	C3	B2	A1	E5	D4	C1	B2	A3	E5	D4
E4	D5	C3	B1	A2	E1	D5	C4	B3	A2	E3	D5	C4	B1	A2
B3	A1	E2	D4	C5	B4	A3	E2	D1	C5	B4	A1	E2	D3	C5
D2	C4	B5	A3	E1	D2	C1	B5	A4	E3	D2	C3	B5	A4	E1

A5	E1	D4	C3	B2	A5	E1	D2	C3	B4	A5	E2	D4	C3	B1
C4	B3	A2	E5	D1	C2	B3	A4	E5	D1	C4	B3	A1	E5	D2
E2	D5	C1	B4	A3	E4	D5	C1	B2	A3	E1	D5	C2	B4	A3
B1	A4	E3	D2	C5	B1	A2	E3	D4	C5	B2	A4	E3	D1	C5
D3	C2	B5	A1	E4	D3	C4	B5	A1	E2	D3	C1	B5	A2	E4

A5	E2	D1	C3	B4	A5	E4	D2	C3	B1	A5	E4	D1	C3	B2
C1	B3	A4	E5	D2	C2	B3	A1	E5	D4	C1	B3	A2	E5	D4
E4	D5	C2	B1	A3	E1	D5	C4	B2	A3	E2	D5	C4	B1	A3
B2	A1	E3	D4	C5	B4	A2	E3	D1	C5	B4	A1	E3	D2	C5
D3	C4	B5	A2	E1	D3	C1	B5	A4	E2	D3	C2	B5	A4	E1

A5	E1	D3	C4	B2	A5	E1	D2	C4	B3	A5	E2	D3	C4	B1
C3	B4	A2	E5	D1	C2	B4	A3	E5	D1	C3	B4	A1	E5	D2
E2	D5	C1	B3	A4	E3	D5	C1	B2	A4	E1	D5	C2	B3	A4
B1	A3	E4	D2	C5	B1	A2	E4	D3	C5	B2	A3	E4	D1	C5
D4	C2	B5	A1	E3	D4	C3	B5	A1	E2	D4	C1	B5	A2	E3

A5	E2	D1	C4	B3	A5	E3	D2	C4	B1	A5	E3	D1	C4	B2
C1	B4	A3	E5	D2	C2	B4	A1	E5	D3	C1	B4	A2	E5	D3
E3	D5	C2	B1	A4	E1	D5	C3	B2	A4	E2	D5	C3	B1	A4
B2	A1	E4	D3	C5	B3	A2	E4	D1	C5	B3	A1	E4	D2	C5
D4	C3	B5	A2	E1	D4	C1	B5	A3	E2	D4	C2	B5	A3	E1

The colour letter α, β, γ, δ, ε combination are not shown, only the 240 solutions of 2D MS.

The 125-bit code on Magic Square

Tropic Right (1-24)

A1	D3	E2	C5	B4	A1	D3	E2	C4	B5	A1	D4	E2	C5	B3
C4	B2	D5	E1	A3	C5	B2	D4	E1	A3	C3	B2	D5	E1	A4
B5	E4	C3	A2	D1	B4	E5	C3	A2	D1	B5	E3	C4	A2	D1
E3	A5	B1	D4	C2	E3	A4	B1	D5	C2	E4	A5	B1	D3	C2
D2	C1	A4	B3	E5	D2	C1	A5	B3	E4	D2	C1	A3	B4	E5

A1	D4	E2	C3	B5	A1	D5	E2	C4	B3	A1	D5	E2	C3	B4
C5	B2	D3	E1	A4	C3	B2	D4	E1	A5	C4	B2	D3	E1	A5
B3	E5	C4	A2	D1	B4	E3	C5	A2	D1	B3	E4	C5	A2	D1
E4	A3	B1	D5	C2	E5	A4	B1	D3	C2	E5	A3	B1	D4	C2
D2	C1	A5	B4	E3	D2	C1	A3	B5	E4	D2	C1	A4	B5	E3

A1	D2	E3	C5	B4	A1	D2	E3	C4	B5	A1	D4	E3	C5	B2
C4	B3	D5	E1	A2	C5	B3	D4	E1	A2	C2	B3	D5	E1	A4
B5	E4	C2	A3	D1	B4	E5	C2	A3	D1	B5	E2	C4	A3	D1
E2	A5	B1	D4	C3	E2	A4	B1	D5	C3	E4	A5	B1	D2	C3
D3	C1	A4	B2	E5	D3	C1	A5	B2	E4	D3	C1	A2	B4	E5

A1	D4	E3	C2	B5	A1	D5	E3	C4	B2	A1	D5	E3	C2	B4
C5	B3	D2	E1	A4	C2	B3	D4	E1	A5	C4	B3	D2	E1	A5
B2	E5	C4	A3	D1	B4	E2	C5	A3	D1	B2	E4	C5	A3	D1
E4	A2	B1	D5	C3	E5	A4	B1	D2	C3	E5	A2	B1	D4	C3
D3	C1	A5	B4	E2	D3	C1	A2	B5	E4	D3	C1	A4	B5	E2

A1	D2	E4	C5	B3	A1	D2	E4	C3	B5	A1	D3	E4	C5	B2
C3	B4	D5	E1	A2	C5	B4	D3	E1	A2	C2	B4	D5	E1	A3
B5	E3	C2	A4	D1	B3	E5	C2	A4	D1	B5	E2	C3	A4	D1
E2	A5	B1	D3	C4	E2	A3	B1	D5	C4	E3	A5	B1	D2	C4
D4	C1	A3	B2	E5	D4	C1	A5	B2	E3	D4	C1	A2	B3	E5

A1	D3	E4	C2	B5	A1	D5	E4	C3	B2	A1	D5	E4	C2	B3
C5	B4	D2	E1	A3	C2	B4	D3	E1	A5	C3	B4	D2	E1	A5
B2	E5	C3	A4	D1	B3	E2	C5	A4	D1	B2	E3	C5	A4	D1
E3	A2	B1	D5	C4	E5	A3	B1	D2	C4	E5	A2	B1	D3	C4
D4	C1	A5	B3	E2	D4	C1	A2	B5	E3	D4	C1	A3	B5	E2

A1	D2	E5	C4	B3	A1	D2	E5	C3	B4	A1	D3	E5	C4	B2
C3	B5	D4	E1	A2	C4	B5	D3	E1	A2	C2	B5	D4	E1	A3
B4	E3	D4	E1	A2	B3	E4	C2	A5	D1	B4	E2	C3	A5	D1
E2	A4	B1	D3	C5	E2	A3	B1	D4	C5	E3	A4	B1	D2	C5
D5	C1	A3	B2	E4	D5	C1	A4	B2	E3	D5	C1	A2	B3	E4

A1	D3	E5	C2	B4	A1	D4	E5	C3	B2	A1	D4	E5	C2	B3
C4	B5	D2	E1	A3	C2	B5	D3	E1	A4	C3	B5	D2	E1	A4
B2	E4	C3	A5	D1	B3	E2	C4	A5	D1	B2	E3	C4	A5	D1
E3	A2	B1	D4	C5	E4	A3	B1	D2	C5	E4	A2	B1	D3	C5
D5	C1	A4	B3	E2	D5	C1	A2	B4	E3	D5	C1	A3	B4	E2

The colour letter α, β, γ, δ, ε combination are not shown, only the 240 solutions of 2D MS.

The 125-bit code on Magic Square

Tropic Right (25-48)

A2	D3	E1	C5	B4	A2	D3	E1	C4	B5	A2	D4	E1	C5	B3
C4	B1	D5	E2	A3	C5	B1	D4	E2	A3	C3	B1	D5	E2	A4
B5	E4	C3	A1	D2	B4	E5	C3	A1	D2	B5	E3	C4	A1	D2
E3	A5	B2	D4	C1	E3	A4	B2	D5	C1	E4	A5	B2	D3	C1
D1	C2	A4	B3	E5	D1	C2	A5	B3	E4	D1	C2	A3	B4	E5

A2	D4	E1	C3	B5	A2	D5	E1	C4	B3	A2	D5	E1	C3	B4
C5	B1	D3	E2	A4	C3	B1	D4	E2	A5	C4	B1	D3	E2	A5
B3	E5	C4	A1	D2	B4	E3	C5	A1	D2	B3	E4	C5	A1	D2
E4	A3	B2	D5	C1	E5	A4	B2	D3	C1	E5	A3	B2	D4	C1
D1	C2	A5	B4	E3	D1	C2	A3	B5	E4	D1	C2	A4	B5	E3

A2	D1	E3	C5	B4	A2	D1	E3	C4	B5	A2	D4	E3	C5	B1
C4	B3	D5	E2	A1	C5	B3	D4	E2	A1	C1	B3	D5	E2	A4
B5	E4	C1	A3	D2	B4	E5	C1	A3	D2	B5	E1	C4	A3	D2
E1	A5	B2	D4	C3	E1	A4	B2	D5	C3	E4	A5	B2	D1	C3
D3	C2	A4	B1	E5	D3	C2	A5	B1	E4	D3	C2	A1	B4	E5

A2	D4	E3	C1	B5	A2	D5	E3	C4	B1	A2	D5	E3	C1	B4
C5	B3	D1	E2	A4	C1	B3	D4	E2	A5	C4	B3	D1	E2	A5
B1	E5	C4	A3	D2	B4	E1	C5	A3	D2	B1	E4	C5	A3	D2
E4	A1	B2	D5	C3	E5	A4	B2	D1	C3	E5	A1	B2	D4	C3
D3	C2	A5	B4	E1	D3	C2	A1	B5	E4	D3	C2	A4	B5	E1

A2	D1	E4	C5	B3	A2	D1	E4	C3	B5	A2	D3	E4	C5	B1
C3	B4	D5	E2	A1	C5	B4	D3	E2	A1	C1	B4	D5	E2	A3
B5	E3	C1	A4	D2	B3	E5	C1	A4	D2	B5	E1	C3	A4	D2
E1	A5	B2	D3	C4	E1	A3	B2	D5	C4	E3	A5	B2	D1	C4
D4	C2	A3	B1	E5	D4	C2	A5	B1	E3	D4	C2	A1	B3	E5

A2	D3	E4	C1	B5	A2	D5	E4	C3	B1	A2	D5	E4	C1	B3
C5	B4	D1	E2	A3	C1	B4	D3	E2	A5	C3	B4	D1	E2	A5
B1	E5	C3	A4	D2	B3	E1	C5	A4	D2	B1	E3	C5	A4	D2
E3	A1	B2	D5	C4	E5	A3	B2	D1	C4	E5	A1	B2	D3	C4
D4	C2	A5	B3	E1	D4	C2	A1	B2	E3	D4	C2	A3	B5	E1

A2	D1	E5	C4	B3	A2	D1	E5	C3	B4	A2	D3	E5	C4	B1
C3	B5	D4	E2	A1	C4	B5	D3	E2	A1	C1	B5	D4	E2	A3
B4	E3	C1	A5	D2	B3	E4	C1	A5	D2	B4	E1	C3	A5	D2
E1	A4	B2	D3	C5	E1	A3	B2	D4	C5	E3	A4	B2	D1	C5
D5	C2	A3	B1	E4	D5	C2	A4	B1	E3	D5	C2	A1	B3	E4

A2	D3	E5	C1	B4	A2	D4	E5	C3	B1	A2	D4	E5	C1	B3
C4	B5	D1	E2	A3	C1	B5	D3	E2	A4	C3	B5	D1	E2	A4
B1	E4	C3	A5	D2	B3	E1	C4	A5	D2	B1	E3	C4	A5	D2
E3	A1	B2	D4	C5	E4	A3	B2	D1	C5	E4	A1	B2	D3	C5
D5	C2	A4	B3	E1	D5	C2	A1	B2	E3	D5	C2	A3	B4	E1

The colour letter α, β, γ, δ, ε combination are not shown, only the 240 solutions of 2D MS.

The 125-bit code on Magic Square

Tropic Right (49-72)

A3	D2	E1	C5	B4	A3	D2	E1	C4	B5	A3	D4	E1	C5	B2
C4	B1	D5	E3	A2	C5	B1	D4	E3	A2	C2	B1	D5	E3	A1
B5	E4	C2	A1	D3	B4	E5	C2	A1	D3	B5	E2	C4	A1	D3
E2	A5	B3	D4	C1	E2	A4	B3	D5	C1	E1	A5	B3	D2	C4
D1	C3	A4	B2	E5	D1	C3	A5	B2	E4	D1	C3	A2	B4	E5

A3	D4	E1	C2	B5	A3	D5	E1	C4	B2	A3	D5	E1	C2	B4
C5	B1	D2	E3	A4	C2	B1	D4	E3	A5	C4	B1	D2	E3	A5
B2	E5	C4	A1	D3	B4	E2	C5	A1	D3	B2	E4	C5	A1	D3
E4	A2	B3	D5	C1	E5	A4	B3	D2	C1	E5	A2	B3	D4	C1
D1	C3	A5	B4	E2	D1	C3	A2	B5	E4	D1	C3	A4	B5	E2

A3	D1	E2	C5	B4	A3	D1	E2	C4	B5	A3	D4	E2	C5	B1
C4	B2	D5	E3	A1	C5	B2	D4	E3	A1	C1	B2	D5	E3	A4
B5	E4	C1	A2	D3	B4	E5	C1	A2	D3	B5	E1	C4	A2	D3
E1	A5	B3	D4	C2	E1	A4	B3	D5	C2	E4	A5	B3	D1	C2
D2	C3	A4	B1	E5	D2	C3	A5	B1	E4	D2	C3	A1	B4	E5

A3	D4	E2	C1	B5	A3	D5	E2	C4	B1	A3	D5	E2	C1	B4
C5	B2	D1	E3	A4	C1	B2	D4	E3	A5	C4	B2	D1	E3	A5
B1	E5	C4	A2	D3	B4	E1	C5	A2	D3	B1	E4	C5	A2	D3
E4	A1	B3	D5	C2	E5	A4	B3	D1	C2	E5	A1	B3	D4	C2
D2	C3	A5	B4	E1	D2	C3	A1	B5	E4	D2	C3	A4	B5	E1

A3	D1	E4	C5	B2	A3	D1	E4	C2	B5	A3	D2	E4	C5	B1
C2	B4	D5	E3	A1	C5	B4	D2	E3	A1	C1	B4	D5	E3	A2
B5	E2	C1	A4	D3	B2	E5	C1	A4	D3	B5	E1	C2	A4	D3
E1	A5	B3	D2	C4	E1	A2	B3	D5	C4	E2	A5	B3	D1	C4
D4	C3	A2	B1	E5	D4	C3	A5	B1	E2	D4	C3	A1	B2	E5

A3	D2	E4	C1	B5	A3	D5	E4	C2	B1	A3	D5	E4	C1	B2
C5	B4	D1	E3	A2	C1	B4	D2	E3	A5	C2	B4	D1	E3	A5
B1	E5	C2	A4	D3	B2	E1	C5	A4	D3	B1	E2	C5	A4	D3
E2	A1	B3	D5	C4	E5	A2	B3	D1	C4	E5	A1	B3	D2	C4
D4	C3	A5	B2	E1	D4	C3	A1	B5	E2	D4	C3	A2	B5	E1

A3	D1	E5	C4	B2	A3	D1	E5	C2	B4	A3	D2	E5	C4	B1
C2	B5	D4	E3	A1	C4	B5	D2	E3	A1	C1	B5	D4	E3	A2
B4	E2	C1	A5	D3	B2	E4	C1	A5	D3	B4	E1	C2	A5	D3
E1	A4	B3	D2	C5	E1	A2	B3	D4	C5	E2	A4	B3	D1	C5
D5	C3	A2	B1	E4	D5	C3	A4	B1	E2	D5	C3	A1	B2	E4

A3	D2	E5	C1	B4	A3	D4	E5	C2	B1	A3	D4	E5	C1	B2
C4	B5	D1	E3	A2	C1	B5	D2	E3	A4	C2	B5	D1	E3	A4
B1	E4	C2	A5	D3	B2	E1	C4	A5	D3	B1	E2	D1	E3	A4
E2	A1	B3	D4	C5	E4	A2	B3	D1	C5	E4	A1	B3	D2	C5
D5	C3	A4	B2	E1	D5	C3	A1	B4	E2	D5	C3	A2	B4	E1

The colour letter α, β, γ, δ, ε combination are not shown, only the 240 solutions of 2D MS.

The 125-bit code on Magic Square

Tropic Right (73-96)

A4	D2	E1	C5	B3	A4	D2	E1	C3	B5	A4	D3	E1	C5	B2
C3	B1	D5	E4	A2	C5	B1	D3	E4	A2	C2	B1	D5	E4	A3
B5	E3	C2	A1	D4	B3	E5	C2	A1	D4	B5	E2	C3	A1	D4
E2	A5	B4	D3	C1	E2	A3	B4	D5	C1	E3	A5	B4	D2	C1
D1	C4	A3	B2	E5	D1	C4	A5	B2	E3	D1	C4	A2	B3	E5

A4	D3	E1	C2	B5	A4	D5	E1	C3	B2	A4	D5	E1	C2	B3
C5	B1	D2	E4	A3	C2	B1	D3	E4	A5	C3	B1	D2	E4	A5
B2	E5	C3	A1	D4	B3	E2	C5	A1	D4	B2	E3	C5	A1	D4
E3	A2	B4	D5	C1	E5	A3	B4	D2	C1	E5	A2	B4	D3	C1
D1	C4	A5	B3	E2	D1	C4	A2	B5	E3	D1	C4	A3	B5	E2

A4	D1	E2	C5	B3	A4	D1	E2	C3	B5	A4	D3	E2	C5	B1
C3	B2	D5	E4	A1	C5	B2	D3	E4	A1	C1	B2	D5	E4	A3
B5	E3	C1	A2	D4	B3	E5	C1	A2	D4	B5	E1	C3	A2	D4
E1	A5	B4	D3	C2	E1	A3	B4	D5	C2	E3	A5	B4	D1	C2
D2	C4	A3	B1	E5	D2	C4	A5	B1	E3	D2	C4	A1	B3	E5

A4	D3	E2	C1	B5	A4	D5	E2	C3	B1	A4	D5	E2	C1	B3
C5	B2	D1	E4	A3	C1	B2	D3	E4	A5	C3	B2	D1	E4	A5
B1	E5	C3	A2	D4	B3	E1	C5	A2	D4	B1	E3	C5	A2	D4
E3	A1	B4	D5	C2	E5	A3	B4	D1	C2	E5	A1	B4	D3	C2
D2	C4	A5	B3	E1	D2	C4	A1	B5	E3	D2	C4	A3	B5	E1

A4	D1	E3	C5	B2	A4	D1	E3	C2	B5	A4	D2	E3	C5	B1
C2	B3	D5	E4	A1	C5	B3	D2	E4	A1	C1	B3	D5	E4	A2
B5	E2	C1	A3	D4	B2	E5	C1	A3	D4	B5	E1	C2	A3	D4
E1	A5	B4	D2	C3	E1	A2	B4	D5	C3	E2	A5	B4	D1	C3
D3	C4	A2	B1	E5	D3	C4	A5	B1	E2	D3	C4	A1	B2	E5

A4	D2	E3	C1	B5	A4	D5	E3	C2	B1	A4	D5	E3	C1	B2
C5	B3	D1	E4	A2	C1	B3	D2	E4	A5	C2	B3	D1	E4	A5
B1	E5	C2	A3	D4	B2	E1	C5	A3	D4	B1	E2	C5	A3	D4
E2	A1	B4	D5	C3	E5	A2	B4	D1	C3	E5	A1	B4	D2	C3
D3	C4	A5	B2	E1	D3	C4	A1	B5	E2	D3	C4	A2	B5	E1

A4	D1	E5	C3	B2	A4	D1	E5	C2	B3	A4	D2	E5	C3	B1
C2	B5	D3	E4	A1	C3	B5	D2	E4	A1	C1	B5	D3	E4	A2
B3	E2	C1	A5	D4	B2	E3	C1	A5	D4	B3	E1	C2	A5	D4
E1	A3	B4	D2	C5	E1	A2	B4	D3	C5	E2	A3	B4	D1	C5
D5	C4	A2	B1	E3	D5	C4	A3	B1	E2	D5	C4	A1	B2	E3

A4	D2	E5	C1	B3	A4	D3	E5	C2	B1	A4	D3	E5	C1	B2
C3	B5	D1	E4	A2	C1	B5	D2	E4	A3	C2	B5	D1	E4	A3
B1	E3	C2	A5	D4	B2	E1	C3	A5	D4	B1	E2	C3	A5	D4
E2	A1	B4	D3	C5	E3	A2	B4	D1	C5	E3	A1	B4	D2	C5
D5	C4	A3	B2	E1	D5	C4	A1	B3	E2	D5	C4	A2	B3	E1

The colour letter α, β, γ, δ, ε combination are not shown, only the 240 solutions of 2D MS.

The 125-bit code on Magic Square

Tropic Right (97-120)

A5	D2	E1	C4	B3	A5	D2	E1	C3	B4	A5	D3	E1	C4	B2
C3	B1	D4	E5	A1	C4	B1	D3	E5	A2	C2	B1	D4	E5	A3
B4	E3	C2	A1	D5	B3	E4	C2	A1	D5	B4	E2	C3	A1	D5
E1	A4	B5	D3	C2	E2	A3	B5	D4	C1	E3	A4	B5	D2	C1
D1	C5	A3	B2	E4	D1	C5	A4	B2	E3	D1	C5	A2	B3	E4

A5	D3	E1	C2	B4	A5	D4	E1	C3	B2	A5	D4	E1	C2	B3
C4	B1	D2	E5	A3	C2	B1	D3	E5	A4	C3	B1	D2	E5	A4
B2	E4	C3	A1	D5	B3	E2	C4	A1	D5	B2	E3	C4	A1	D5
E3	A2	B5	D4	C1	E4	A3	B5	D2	C1	E4	A2	B5	D3	C1
D1	C5	A4	B3	E2	D1	C5	A2	B4	E3	D1	C5	A3	B4	E2

A5	D1	E2	C4	B3	A5	D1	E2	C3	B4	A5	D3	E2	C4	B1
C3	B2	D4	E5	A1	C4	B2	D3	E5	A1	C1	B2	D4	E5	A3
B4	E3	C1	A2	D5	B3	E4	C1	A2	D5	B4	E1	C3	A2	D5
E1	A4	B5	D3	C2	E1	A3	B5	D4	C2	E3	A4	B5	D1	C2
D2	C5	A3	B1	E4	D2	C5	A4	B1	E3	D2	C5	A1	B3	E4

A5	D3	E2	C1	B4	A5	D4	E2	C3	B1	A5	D4	E2	C1	B3
C4	B2	D1	E5	A3	C1	B2	D3	E5	A4	C3	B2	D1	E5	A4
B1	E4	C3	A2	D5	B3	E1	C4	A2	D5	B1	E3	C4	A2	D5
E3	A1	B5	D4	C2	E4	A3	B5	D1	C2	E4	A1	B5	D3	C2
D2	C5	A4	B3	E1	D2	C5	A1	B4	E3	D2	C5	A3	B4	E1

A5	D1	E3	C4	B2	A5	D1	E3	C2	B4	A5	D2	E3	C4	B1
C2	B3	D4	E5	A1	C4	B3	D2	E5	A1	C1	B3	D4	E5	A2
B4	E2	C1	A3	D5	B2	E4	C1	A3	D5	B4	E1	C2	A3	D5
E1	A4	B5	D2	C3	E1	A2	B5	D4	C3	E2	A4	B5	D1	C3
D3	C5	A2	B1	E4	D3	C5	A4	B1	E2	D3	C5	A1	B2	E4

A5	D2	E3	C1	B4	A5	D4	E3	C2	B1	A5	D4	E3	C1	B2
C4	B3	D1	E5	A2	C1	B3	D2	E5	A4	C2	B3	D1	E5	A4
B1	E4	C2	A3	D5	B2	E1	C4	A3	D5	B1	E2	C4	A3	D5
E2	A1	B5	D4	C3	E4	A2	B5	D1	C3	E4	A1	B5	D2	C3
D3	C5	A4	B2	E1	D3	C5	A1	B4	E2	D3	C5	A2	B4	E1

A5	D1	E4	C3	B2	A5	D1	E4	C2	B3	A5	D2	E4	C3	B1
C2	B4	D3	E5	A1	C3	B4	D2	E5	A1	C1	B4	D3	E5	A2
B3	E2	C1	A4	D5	B2	E3	C1	A4	D5	B3	E1	C2	A4	D5
E1	A3	B5	D2	C4	E1	A2	B5	D3	C4	E2	A3	B5	D1	C4
D4	C5	A2	B1	E3	D4	C5	A3	B1	E2	D4	C5	A1	B2	E3

A5	D2	E4	C1	B3	A5	D3	E4	C2	B1	A5	D3	E4	C1	B2
C3	B4	D1	E5	A2	C1	B4	D2	E5	A3	C2	B4	D1	E5	A3
B1	E3	C2	A4	D5	B2	E1	C3	A4	D5	B1	E2	C3	A4	D5
E2	A1	B5	D3	C4	E3	A2	B5	D1	C4	E3	A1	B5	D2	C4
D4	C5	A3	B2	E1	D4	C5	A1	B3	E2	D4	C5	A2	B3	E1

The colour letter α, β, γ, δ, ε combination are not shown, only the 240 solutions of 2D MS.

20. Magic Square of higher Order *n*

It will be possibly to show some simply example of Magic Squares of Order *n=7* and *n=8*.

E3	F1	G6	A4	B2	C7	D5
C2	D7	E5	F3	G1	A6	B4
A1	B6	C4	D2	E7	F5	G3
F7	G5	A3	B1	C6	D4	E2
D6	E4	F2	G7	A5	B3	C1
B5	C3	D1	E6	F4	G2	A7
G4	A2	B7	C5	D3	E1	F6

31	36	48	4	9	21	26
16	28	33	38	43	6	11
1	13	18	23	35	40	45
42	47	3	8	20	25	30
27	32	37	49	5	10	15
12	17	22	34	39	44	7
46	2	14	19	24	29	41

A1=1	B1=8	C1=15	D1=22	E1=29	F1=36	G1=43
A2=2	B2=9	C2=16	D2=23	E2=30	F2=37	G2=44
A3=3	B3=10	C3=17	D3=24	E3=31	F3=38	G3=45
A4=4	B4=11	C4=18	D4=25	E4=32	F4=39	G4=46
A5=5	B5=12	C5=19	D5=26	E5=33	F5=40	G5=47
A6=6	B6=13	C6=20	D6=27	E6=34	F6=41	G6=48
A7=7	B7=14	C7=21	D7=28	E7=35	F7=42	G7=49

Magic Square of order n = 7, where the magic constant are sum = 175, if use smallest Integer.

A2	E7	B3	F6	G4	C5	H1	D8
C8	G1	D5	H4	E6	A3	F7	B2
D1	H8	C4	G5	F3	B6	E2	A7
B7	F2	A6	E3	H5	D4	G8	C1
H6	D3	G7	C2	B8	F1	A5	E4
F4	B5	E1	A8	D2	H7	C3	G6
E5	A4	F8	B1	C7	G2	D6	H3
G3	C6	H2	D7	A1	E8	B4	F5

2	39	11	46	52	21	57	32
24	49	29	60	38	3	47	10
25	64	20	53	43	14	34	7
15	42	6	35	61	28	56	17
62	27	55	18	16	41	5	36
44	13	33	8	26	63	19	54
37	4	48	9	23	50	30	59
51	22	58	31	1	40	12	45

G8	A5	E3	H1	C2	B4	F6	D7
E1	C4	G6	F8	A7	D5	H3	B2
D2	F3	B5	C7	H8	E6	A4	G1
C3	E2	A8	D6	G5	F7	B1	H4
B7	H6	D4	A2	F1	G3	C5	E8
A6	G7	C1	B3	E4	H2	D8	F5
H5	B8	F2	G4	D3	A1	E7	C6
F4	D1	H7	E5	B6	C8	G2	A3

56	5	35	57	18	12	46	31
33	20	54	48	7	29	59	10
26	44	13	23	64	38	4	49
19	34	8	30	53	47	9	60
15	62	28	2	41	51	21	40
6	55	17	11	36	58	32	45
61	16	42	52	27	1	39	22
44	25	63	37	14	24	50	3

A1=1	B1=9	C1=17	D1=25	E1=33	F1=41	G1=49	H1=57
A2=2	B2=10	C2=18	D2=26	E2=34	F2=42	G2=50	H2=58
A3=3	B3=11	C3=19	D3=27	E3=35	F3=43	G3=51	H3=59
A4=4	B4=12	C4=20	D4=28	E4=36	F4=44	G4=52	H4=60
A5=5	B5=13	C5=21	D5=29	E5=37	F5=45	G5=53	H5=61
A6=6	B6=14	C6=22	D6=30	E6=38	F6=46	G6=54	H6=62
A7=7	B7=15	C7=23	D7=31	E7=39	F7=47	G7=55	H7=63
A8=8	B8=16	C8=24	D8=32	E8=40	F8=48	G8=56	H8=64

Bimagic Square of order *n=8* where the magic constant are sum = 260 if use smallest Integer.

Bimagic Square of order *n=9* are with multi symmetry. The colour combination will proof it.

	A3	I9	F2		E6	B8	G5	
E1		B6	H8		G3	D5		A7
D6	E2		G1		I5		B4	C3
H5	I1	E7				G9	F6	D2
F8	D4	C1				E3	A9	B5
G7	H6		A5		C9		E8	F4
I3		F5	C7		B2	H4		E9
	C5	H2	E4		D8	A1	I7	

I1	H5	G9	A2	B7	C6	F8	E3	D4
B3	A4	C8	F1	D9	E5	H7	G2	I6
D2	F6	E7	H3	I8	G4	A9	C1	B5
H8	G3	I4	C9	A5	B1	E6	D7	F2
F9	E1	D5	G7	H6	I2	C4	B8	A3
A7	C2	B6	E8	F4	D3	G5	I9	H1
E4	D8	F3	I5	G1	H9	B2	A6	C7
G6	I7	H2	B4	C3	A8	D1	F5	E9
C5	B9	A1	D6	E2	F7	I3	H4	G8

	3	81	47		42	17	59	
37		15	71		57	32		7
33	38		55		77		13	21
68	73	43				63	51	29
53	31	19				39	9	14
61	69		5		27		44	49
75		50	25		12	67		45
	23	65	40		35	1	79	

73	41	63	2	16	24	53	39	31
12	4	26	46	36	41	70	56	78
29	51	43	66	80	58	9	19	14
71	57	76	27	5	10	42	34	47
54	37	32	61	69	74	22	17	3
7	20	15	44	49	32	59	81	64
40	35	48	77	55	72	11	6	25
42	79	65	13	21	8	28	50	45
23	18	1	33	38	52	75	67	62

In G. Pfefferman puzzle, left above, and J. Hendricks, right above, with order n = 9 each row, column, both main diagonals and the colours should have the magic constant of sum $S_n=369$

- $S_n = ½ \cdot n \cdot \left(2 \cdot a + d\left(n^2 - 1\right)\right) = 369$

- $S_n^2 = \frac{\alpha}{6} \cdot n \cdot \left(2 \cdot a + d\left(n^2 - 1\right)\right) \cdot \left(2n^2 + 1\right) = 20049$ if $a = d$ then: $\alpha = \frac{2a + d}{3}$

Each colour in the matrix above should give the magic constant, if use the centre square E5 to every colour combination of yellow, blue, red and green. These MS are designed to have the possibility to rotating with the same centre square of E5. This phenomenon can happen inside the atom if wanted to measure the inertia of mass and length into the centre of the polar atom.

The Key

A1=1	B1=10	C1=19	D1=28	E1=37	F1=46	G1=55	H1=64	I1=73
A2=2	B2=11	C2=20	D2=29	E2=38	F2=47	G2=56	H2=65	I2=74
A3=3	B3=12	C3=21	D3=30	E3=39	F3=48	G3=57	H3=66	I3=75
A4=4	B4=13	C4=22	D4=31	E4=40	F4=49	G4=58	H4=67	I4=76
A5=5	B5=14	C5=23	D5=32	E5=41	F5=50	G5=59	H5=68	I5=77
A6=6	B6=15	C6=24	D6=33	E6=42	F6=51	G6=60	H6=69	I6=78
A7=7	B7=16	C7=25	D7=34	E7=43	F7=52	G7=61	H7=70	I7=79
A8=8	B8=17	C8=26	D8=35	E8=44	F8=53	G8=62	H8=71	I8=80
A9=9	B9=18	C9=27	D9=36	E9=45	F9=54	G9=63	H9=72	I9=81

With The Key it will be possibly lock up the Magic Square, where *a* are the start value into A1 in the Key and *d* are the increasing or decreasing of Integer between the terms A1 to I9 in The Key. With an arithmetic progression it will be possibly to make a program with The Key as tool to the Magic Squares and it will be possibly to rapidly change the magic constant with only input to *a* and *d*. If use letter combination into the squares, they are named Latin Square.

Bimagic Square of Order *n = 9*

Tropic of Square 1-8, where the colour combination of these bimagic squares not are shown.

1.

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	E3	F7	D5	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	H5	I3	A2	B9	C4	D6	E1	F8
A6	B1	C8	D7	E5	F3	G2	H9	I4
D2	E9	F4	G6	H1	I8	A7	B5	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	F5	D3	E7	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

2.

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	E3	F7	D5	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	E9	I3	A2	H1	C4	D6	B5	F8
A6	B1	C8	D7	E5	F3	G2	H9	I4
D2	H5	F4	G6	B9	I8	A7	E1	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	F5	D3	E7	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

3.

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	D5	F7	E3	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	H5	I3	A2	B9	C4	D6	E1	F8
A6	B1	C8	F3	E5	D7	G2	H9	I4
D2	E9	F4	G6	H1	I8	A7	B5	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	E7	D3	F5	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

4.

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	D5	F7	E3	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	E9	I3	A2	H1	C4	D6	B5	F8
A6	B1	C8	F3	E5	D7	G2	H9	I4
D2	H5	F4	G6	B9	I8	A7	E1	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	E7	D3	F5	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

5. (1:1)

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	F5	D3	E7	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	H5	I3	A2	B9	C4	D6	E1	F8
A6	B1	C8	D7	E5	F3	G2	H9	I4
D2	E9	F4	G6	H1	I8	A7	B5	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	E3	F7	D5	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

6. (1:2)

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	E3	F7	D5	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	E1	I3	A2	B9	C4	D6	H5	F8
A6	H9	C8	D7	E5	F3	G2	B1	I4
D2	B5	F4	G6	H1	I8	A7	E9	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	F5	D3	E7	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

7. (1:3)

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	F5	D3	E7	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	E1	I3	A2	B9	C4	D6	H5	F8
A6	H9	C8	D7	E5	F3	G2	B1	I4
D2	B5	F4	G6	H1	I8	A7	E9	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	E3	F7	D5	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

8. (5:1)

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	E7	D3	F5	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	H5	I3	A2	B9	C4	D6	E1	F8
A6	B1	C8	F3	E5	D7	G2	H9	I4
D2	E9	F4	G6	H1	I8	A7	B5	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	D5	F7	E3	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

$$S_n^2 = \frac{\alpha}{6} \cdot n \cdot \left(2 \cdot a + d\left(n^2 - 1\right)\right) \cdot \left(2n^2 + 1\right) = 20049 \qquad \text{if:} \quad \alpha = a = d$$

The bimagic constant for a Bimagic Square of n = 9 is sum = 20049 if start value into the key is *a=1* and *d=1*. These magic squares have additional properties and they are symmetric and self-complementary. These magic squares are said to be Bimagic Square if it is 2-multimagic. The first known bimagic square has order *n = 8* and magic constant sum = 260 and a bimagic constant of sum = 11180. Nontrivial bimagic square are now known for order 8 and higher order *n*. If check the diagonal *n=8*, then $\Sigma = A2^2+G1^2+C4^2+E3^2+B8^2+H7^2+D6^2+F5^2 = 11180$.

Bimagic Square of Order *n = 9*

Tropic of Square 9-16, where the colour combination of these bimagic squares not are shown.

9. (5:2)

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	F5	D3	E7	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	E9	I3	A2	H1	C4	D6	B5	F8
A6	B1	C8	D7	E5	F3	G2	H9	I4
D2	H5	F4	G6	B9	I8	A7	E1	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	E3	F7	D5	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

10. (5:3)

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	E7	D3	F5	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	E9	I3	A2	H1	C4	D6	B5	F8
A6	B1	C8	F3	E5	D7	G2	H9	I4
D2	H5	F4	G6	B9	I8	A7	E1	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	D5	F7	E3	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

11. (6:1)

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	D5	F7	E3	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	E1	I3	A2	B9	C4	D6	H5	F8
A6	H9	C8	F3	E5	D7	G2	B1	I4
D2	B5	F4	G6	H1	I8	A7	E9	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	E7	D3	F5	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

12. (6:2)

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	E3	F7	D5	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	B5	I3	A2	H1	C4	D6	E9	F8
A6	H9	C8	D7	E5	F3	G2	B1	I4
D2	E1	F4	G6	B9	I8	A7	H5	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	F5	D3	E7	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

13. (6:3)

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	D5	F7	E3	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	B5	I3	A2	H1	C4	D6	E9	F8
A6	H9	C8	F3	E5	D7	G2	B1	I4
D2	E1	F4	G6	B9	I8	A7	H5	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	E7	D3	F5	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

14. (7:1)

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	E7	D3	F5	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	E1	I3	A2	B9	C4	D6	H5	F8
A6	H9	C8	F3	E5	D7	G2	B1	I4
D2	B5	F4	G6	H1	I8	A7	E9	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	D5	F7	E3	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

15. (7:2)

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	F5	D3	E7	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	B5	I3	A2	H1	C4	D6	E9	F8
A6	H9	C8	D7	E5	F3	G2	B1	I4
D2	E1	F4	G6	B9	I8	A7	H5	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	E3	F7	D5	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

16. (7:3)

H3	I7	G5	B4	C2	A9	E8	F6	D1
B8	C6	A1	E7	D3	F5	H4	I2	G9
E4	F2	D9	H8	I6	G1	B3	C7	A5
G7	B5	I3	A2	H1	C4	D6	E9	F8
A6	H9	C8	F3	E5	D7	G2	B1	I4
D2	E1	F4	G6	B9	I8	A7	H5	C3
I5	G3	H7	C9	A4	B2	F1	D8	E6
C1	A8	B6	D5	F7	E3	I9	G4	H2
F9	D4	E2	I1	G8	H6	C5	A3	B7

$$S_n^2 = \frac{\alpha}{6}\cdot n\cdot\left(2\cdot a + d\left(n^2-1\right)\right)\cdot\left(2n^2+1\right) = 20049 \qquad \text{if:} \quad \alpha = a = d$$

The bimagic constant for a Bimagic Square of n = 9 is sum = 20049 if start value into the key is *a=1* and *d=1*. These magic squares have additional properties and they are symmetric and self-complementary. These magic squares are said to be Bimagic Square if it is 2-multimagic. Every bimagic square above has combinatory to additional 16 different new bimagic squares. However, constant for the power-squares *n = 9*, for the main diagonal from left to right, can be determined as follow (No1): $\Sigma = H3^2+C6^2+D9^2+A2^2+E5^2+I8^2+F1^2+G4^2+B7^2 = 20049$ [25]

The Key to Magic Square of $n^2 = 16$

Table one

A1	B3	C4	D2	D2	B1	A4	C3	C3	D1	A2	B4	B4	D3	C2	A1
D4	C2	B1	A3	A3	C4	D1	B2	B2	A4	D3	C1	C1	A2	B3	D4
B2	A4	D3	C1	C1	A2	B3	D4	D4	C2	B1	A3	A3	C4	D1	B2
C3	D1	A2	B4	B4	D3	C2	A1	A1	B3	C4	D2	D2	B1	A4	C3
C3	D1	A2	B4	B4	D3	C2	A1	A1	B3	C4	D2	D2	B1	A4	C3
B2	A4	D3	C1	C1	A2	B3	D4	D4	C2	B1	A3	A3	C4	D1	B2
D4	C2	B1	A3	A3	C4	D1	B2	B2	A4	D3	C1	C1	A2	B3	D4
A1	B3	C4	D2	D2	B1	A4	C3	C3	D1	A2	B4	B4	D3	C2	A1
A1	B3	C4	D2	D2	B1	A4	C3	C3	D1	A2	B4	B4	D3	C2	A1
D4	C2	B1	A3	A3	C4	D1	B2	B2	A4	D3	C1	C1	A2	B3	D4
B2	A4	D3	C1	C1	A2	B3	D4	D4	C2	B1	A3	A3	C4	D1	B2
C3	D1	A2	B4	B4	D3	C2	A1	A1	B3	C4	D2	D2	B1	A4	C3
C3	D1	A2	B4	B4	D3	C2	A1	A1	B3	C4	D2	D2	B1	A4	C3
B2	A4	D3	C1	C1	A2	B3	D4	D4	C2	B1	A3	A3	C4	D1	B2
D4	C2	B1	A3	A3	C4	D1	B2	B2	A4	D3	C1	C1	A2	B3	D4
A1	B3	C4	D2	D2	B1	A4	C3	C3	D1	A2	B4	B4	D3	C2	A1

Table two

A1	B4	C2	D3	D3	A4	C1	B2	B2	A3	D1	C4	C4	B3	D2	A1
C3	D2	A4	B1	B1	C2	A3	D4	D4	C1	B3	A2	A2	D1	B4	C3
D4	C1	B3	A2	A2	D1	B4	C3	C3	D2	A4	B1	B1	C2	A3	D4
B2	A3	D1	C4	C4	B3	D2	A1	A1	B4	C2	D3	D3	A4	C1	B2
B2	A3	D1	C4	C4	B3	D2	A1	A1	B4	C2	D3	D3	A4	C1	B2
D4	C1	B3	A2	A2	D1	B4	C3	C3	D2	A4	B1	B1	C2	A3	D4
C3	D2	A4	B1	B1	C2	A3	D4	D4	C1	B3	A2	A2	D1	B4	C3
A1	B4	C2	D3	D3	A4	C1	B2	B2	A3	D1	C4	C4	B3	D2	A1
A1	B4	C2	D3	D3	A4	C1	B2	B2	A3	D1	C4	C4	B3	D2	A1
C3	D2	A4	B1	B1	C2	A3	D4	D4	C1	B3	A2	A2	D1	B4	C3
D4	C1	B3	A2	A2	D1	B4	C3	C3	D2	A4	B1	B1	C2	A3	D4
B2	A3	D1	C4	C4	B3	D2	A1	A1	B4	C2	D3	D3	A4	C1	B2
B2	A3	D1	C4	C4	B3	D2	A1	A1	B4	C2	D3	D3	A4	C1	B2
D4	C1	B3	A2	A2	D1	B4	C3	C3	D2	A4	B1	B1	C2	A3	D4
C3	D2	A4	B1	B1	C2	A3	D4	D4	C1	B3	A2	A2	D1	B4	C3
A1	B4	C2	D3	D3	A4	C1	B2	B2	A3	D1	C4	C4	B3	D2	A1

$$\Sigma(n;a,d) = \frac{1}{2} \cdot n^2 \cdot \left[2 \cdot a + d \cdot (n^2 - 1)\right]$$

$$\Sigma(n;a,d) = 136$$

These tables will give the magic sum of 136, if only us the start values *n=4* and *a=1* and *d=1*. Table one and two are building up similar like the cubic magic square, which are included on the Excel sheet which belongs to this essay. This is possibly to see on the four magic squares in the centre of the table. Where the surrounding squares fit exact into the centre squares, and this make some cubic influence of the tables. The formula modified from its original version.

The Key to Magic Square of $n^2 = 16$

Table three Where the Greek letter α = 1α and β = 2β and δ = 3δ and γ = 4γ

Aα	Bδ	Cγ	Dβ	Dβ	Bα	Aγ	Cδ	Cδ	Dα	Aβ	Bγ	Bγ	Dδ	Cβ	Aα
Dγ	Cβ	Bα	Aδ	Aδ	Cγ	Dα	Bβ	Bβ	Aγ	Dδ	Cα	Cα	Aβ	Bδ	Dγ
Bβ	Aγ	Dδ	Cα	Cα	Aβ	Bδ	Dγ	Dγ	Cβ	Bα	Aδ	Aδ	Cγ	Dα	Bβ
Cδ	Dα	Aβ	Bγ	Bγ	Dδ	Cβ	Aα	Aα	Bδ	Cγ	Dβ	Dβ	Bα	Aγ	Cδ
Cδ	Dα	Aβ	Bγ	Bγ	Dδ	Cβ	Aα	Aα	Bδ	Cγ	Dβ	Dβ	Bα	Aγ	Cδ
Bβ	Aγ	Dδ	Cα	Cα	Aβ	Bδ	Dγ	Dγ	Cβ	Bα	Aδ	Aδ	Cγ	Dα	Bβ
Dγ	Cβ	Bα	Aδ	Aδ	Cγ	Dα	Bβ	Bβ	Aγ	Dδ	Cα	Cα	Aβ	Bδ	Dγ
Aα	Bδ	Cγ	Dβ	Dβ	Bα	Aγ	Cδ	Cδ	Dα	Aβ	Bγ	Bγ	Dδ	Cβ	Aα
Aα	Bδ	Cγ	Dβ	Dβ	Bα	Aγ	Cδ	Cδ	Dα	Aβ	Bγ	Bγ	Dδ	Cβ	Aα
Dγ	Cβ	Bα	Aδ	Aδ	Cγ	Dα	Bβ	Bβ	Aγ	Dδ	Cα	Cα	Aβ	Bδ	Dγ
Bβ	Aγ	Dδ	Cα	Cα	Aβ	Bδ	Dγ	Dγ	Cβ	Bα	Aδ	Aδ	Cγ	Dα	Bβ
Cδ	Dα	Aβ	Bγ	Bγ	Dδ	Cβ	Aα	Aα	Bδ	Cγ	Dβ	Dβ	Bα	Aγ	Cδ
Cδ	Dα	Aβ	Bγ	Bγ	Dδ	Cβ	Aα	Aα	Bδ	Cγ	Dβ	Dβ	Bα	Aγ	Cδ
Bβ	Aγ	Dδ	Cα	Cα	Aβ	Bδ	Dγ	Dγ	Cβ	Bα	Aδ	Aδ	Cγ	Dα	Bβ
Dγ	Cβ	Bα	Aδ	Aδ	Cγ	Dα	Bβ	Bβ	Aγ	Dδ	Cα	Cα	Aβ	Bδ	Dγ
Aα	Bδ	Cγ	Dβ	Dβ	Bα	Aγ	Cδ	Cδ	Dα	Aβ	Bγ	Bγ	Dδ	Cβ	Aα

Table four

Aα	Bγ	Cβ	Dδ	Dδ	Aγ	Cα	Bβ	Bβ	Aδ	Dα	Cγ	Cγ	Bδ	Dβ	Aα
Cδ	Dβ	Aγ	Bα	Bα	Cβ	Aδ	Dγ	Dγ	Cα	Bδ	Aβ	Aβ	Dα	Bγ	Cδ
Dγ	Cα	Bδ	Aβ	Aβ	Dα	Bγ	Cδ	Cδ	Dβ	Aγ	Bα	Bα	Cβ	Aδ	Dγ
Bβ	Aδ	Dα	Cγ	Cγ	Bδ	Dβ	Aα	Aα	Bγ	Cβ	Dδ	Dδ	Aγ	Cα	Bβ
Bβ	Aδ	Dα	Cγ	Cγ	Bδ	Dβ	Aα	Aα	Bγ	Cβ	Dδ	Dδ	Aγ	Cα	Bβ
Dγ	Cα	Bδ	Aβ	Aβ	Dα	Bγ	Cδ	Cδ	Dβ	Aγ	Bα	Bα	Cβ	Aδ	Dγ
Cδ	Dβ	Aγ	Bα	Bα	Cβ	Aδ	Dγ	Dγ	Cα	Bδ	Aβ	Aβ	Dα	Bγ	Cδ
Aα	Bγ	Cβ	Dδ	Dδ	Aγ	Cα	Bβ	Bβ	Aδ	Dα	Cγ	Cγ	Bδ	Dβ	Aα
Aα	Bγ	Cβ	Dδ	Dδ	Aγ	Cα	Bβ	Bβ	Aδ	Dα	Cγ	Cγ	Bδ	Dβ	Aα
Cδ	Dβ	Aγ	Bα	Bα	Cβ	Aδ	Dγ	Dγ	Cα	Bδ	Aβ	Aβ	Dα	Bγ	Cδ
Dγ	Cα	Bδ	Aβ	Aβ	Dα	Bγ	Cδ	Cδ	Dβ	Aγ	Bα	Bα	Cβ	Aδ	Dγ
Bβ	Aδ	Dα	Cγ	Cγ	Bδ	Dβ	Aα	Aα	Bγ	Cβ	Dδ	Dδ	Aγ	Cα	Bβ
Bβ	Aδ	Dα	Cγ	Cγ	Bδ	Dβ	Aα	Aα	Bγ	Cβ	Dδ	Dδ	Aγ	Cα	Bβ
Dγ	Cα	Bδ	Aβ	Aβ	Dα	Bγ	Cδ	Cδ	Dβ	Aγ	Bα	Bα	Cβ	Aδ	Dγ
Cδ	Dβ	Aγ	Bα	Bα	Cβ	Aδ	Dγ	Dγ	Cα	Bδ	Aβ	Aβ	Dα	Bγ	Cδ
Aα	Bγ	Cβ	Dδ	Dδ	Aγ	Cα	Bβ	Bβ	Aδ	Dα	Cγ	Cγ	Bδ	Dβ	Aα

$$\Sigma(n;a,d) = \frac{1}{2}\cdot n^2 \cdot \left[2\cdot a + d\cdot\left(n^3 - 1\right)\right]$$

$$\Sigma(n;a,d) = 520$$

These tables will give the magic sum of 520, if only us the start values $n=4$ and $a=1$ and $d=1$. Table three and four are similar to the 64-bit and 125-bit magic squares. That will say the key will run away with the $n \times$ *64-bit* sum into the magic squares. It will also be possibly to have two different keys into table three and four. This make if wanted to have some additional computing between table three and four some more complex magic squares of higher order *n*.

21. Tropic Security Square

Square of order $n = 4\times3\times2$ (sum: $y = 102$, colour: $x = 204$)

A1	C4	D2	B3	A1	C3	D2	B4	A1	C4	D3	B2
D3	B2	A4	C1	D4	B2	A3	C1	D2	B3	A4	C1
B4	D1	C3	A2	B3	D1	C4	A2	B4	D1	C2	A3
C2	A3	B1	D4	C2	A4	B1	D3	C3	A2	B1	D4
A1	C2	D3	B4	A1	C3	D4	B2	A1	C2	D4	B3
D4	B3	A2	C1	D2	B4	A3	C1	D3	B4	A2	C1
B2	D1	C4	A3	B3	D1	C2	A4	B2	D1	C3	A4
C3	A4	B1	D2	C4	A2	B1	D3	C4	A3	B1	D2

This security square is colored, which gives the name Tropic Security Square to the matrices.

$$\begin{bmatrix} 1 & 12 & 14 & 7 \\ 15 & 6 & 4 & 9 \\ 8 & 13 & 11 & 2 \\ 10 & 3 & 5 & 16 \end{bmatrix} + \begin{bmatrix} 1 & 11 & 14 & 8 \\ 16 & 6 & 3 & 9 \\ 7 & 13 & 12 & 2 \\ 10 & 4 & 5 & 15 \end{bmatrix} + \begin{bmatrix} 1 & 12 & 15 & 6 \\ 14 & 7 & 4 & 9 \\ 8 & 13 & 10 & 3 \\ 11 & 2 & 5 & 16 \end{bmatrix} = \begin{bmatrix} 3 & 35 & 43 & 21 \\ 45 & 19 & 11 & 27 \\ 23 & 39 & 33 & 7 \\ 31 & 9 & 15 & 47 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 10 & 15 & 8 \\ 16 & 7 & 2 & 9 \\ 6 & 13 & 12 & 3 \\ 11 & 4 & 5 & 14 \end{bmatrix} + \begin{bmatrix} 1 & 11 & 16 & 6 \\ 14 & 8 & 3 & 9 \\ 7 & 13 & 10 & 4 \\ 12 & 2 & 5 & 15 \end{bmatrix} + \begin{bmatrix} 1 & 10 & 16 & 7 \\ 15 & 8 & 2 & 9 \\ 6 & 13 & 11 & 4 \\ 12 & 3 & 5 & 14 \end{bmatrix} = \begin{bmatrix} 3 & 31 & 47 & 21 \\ 45 & 23 & 7 & 27 \\ 19 & 39 & 33 & 11 \\ 35 & 9 & 15 & 43 \end{bmatrix}$$

Through the key it's possibly to give the magic square smallest possibly integer, and if added the three arrays of magic squares to new matrices, it will give the magic constant of the sum 102 in each row, column and diagonals. If added these two magic square to one new matrix:

$$\begin{bmatrix} 3 & 35 & 43 & 21 \\ 45 & 19 & 11 & 27 \\ 23 & 39 & 33 & 7 \\ 31 & 9 & 15 & 47 \end{bmatrix} + \begin{bmatrix} 3 & 31 & 47 & 21 \\ 45 & 23 & 7 & 27 \\ 19 & 39 & 33 & 11 \\ 35 & 9 & 15 & 43 \end{bmatrix} = \begin{bmatrix} 6 & 66 & 90 & 42 \\ 90 & 42 & 18 & 54 \\ 42 & 78 & 66 & 18 \\ 66 & 18 & 30 & 90 \end{bmatrix}$$

In the final matrices of magic square, the magic sum will be $\Sigma = 204$ in each row, column and diagonals. This magic constant sum of $y = 204$ correspond to the colored combination sum in the Tropic Security Squares. If sending information according to this concept, it's possibly with double check points, first with the colored sum in the Tropic Security Square and second to the additive final matrices of magic constant. Both should fit each other with the same sum of constant. If use arithmetic progression to The Key, it will be possibly to rapidly change the magic constant according to the formula from [Hunter and Madachy] with start value *a* and with integer difference *d* between terms. This will guarantee absolute cryptographic security.

A2	C4	D1	B3	A2	C3	D1	B4	A2	C4	D3	B1
D3	B1	A4	C2	D4	B1	A3	C2	D1	B3	A4	C2
B4	D2	C3	A1	B3	D2	C4	A1	B4	D2	C1	A3
C1	A3	B2	D4	C1	A4	B2	D3	C3	A1	B2	D4
A2	C1	D3	B4	A2	C3	D4	B1	A2	C1	D4	B3
D4	B3	A1	C2	D1	B4	A3	C2	D3	B4	A1	C2
B1	D2	C4	A3	B3	D2	C1	A4	B1	D2	C3	A4
C3	A4	B2	D1	C4	A1	B2	D3	C4	A3	B2	D1

Tropic Security Square

Square of order $n = 4×3×2$ (sum: $y = 102$, colour: $x = 204$)

A3	C4	D1	B2	A3	C2	D1	B4	A3	C4	D2	B1
D2	B1	A4	C3	D4	B1	A2	C3	D1	B2	A4	C3
B4	D3	C2	A1	B2	D3	C4	A1	B4	D3	C1	A2
C1	A2	B3	D4	C1	A4	B3	D2	C2	A1	B3	D4
A3	C1	D2	B4	A3	C2	D4	B1	A3	C1	D4	B2
D4	B2	A1	C3	D1	B4	A2	C3	D2	B4	A1	C3
B1	D3	C4	A2	B2	D3	C1	A4	B1	D3	C2	A4
C2	A4	B3	D1	C4	A1	B3	D2	C4	A2	B3	D1

A4	C3	D1	B2	A4	C2	D1	B3	A4	C3	D2	B1
D2	B1	A3	C4	D3	B1	A2	C4	D1	B2	A3	C4
B3	D4	C2	A1	B2	D4	C3	A1	B3	D4	C1	A2
C1	A2	B4	D3	C1	A3	B4	D2	C2	A1	B4	D3
A4	C1	D2	B3	A4	C2	D3	B1	A4	C1	D3	B2
D3	B2	A1	C4	D1	B3	A2	C4	D2	B3	A1	C4
B1	D4	C3	A2	B2	D4	C1	A3	B1	D4	C2	A3
C2	A3	B4	D1	C3	A1	B4	D2	C3	A2	B4	D1

A1	D3	B4	C2	A1	D4	B3	C2	A1	D2	B4	C3
C4	B2	D1	A3	C3	B2	D1	A4	C4	B3	D1	A2
D2	A4	C3	B1	D2	A3	C4	B1	D3	A4	C2	B1
B3	C1	A2	D4	B4	C1	A2	D3	B2	C1	A3	D4
A1	D4	B2	C3	A1	D2	B3	C4	A1	D3	B2	C4
C2	B3	D1	A4	C3	B4	D1	A2	C2	B4	D1	A3
D3	A2	C4	B1	D4	A3	C2	B1	D4	A2	C3	B1
B4	C1	A3	D2	B2	C1	A4	D3	B3	C1	A4	D2

A2	D3	B4	C1	A2	D4	B3	C1	A2	D1	B4	C3
C4	B1	D2	A3	C3	B1	D2	A4	C4	B3	D2	A1
D1	A4	C3	B2	D1	A3	C4	B2	D3	A4	C1	B2
B3	C2	A1	D4	B4	C2	A1	D3	B1	C2	A3	D4
A2	D4	B1	C3	A2	D1	B3	C4	A2	D3	B1	C4
C1	B3	D2	A4	C3	B4	D2	A1	C1	B4	D2	A3
D3	A1	C4	B2	D4	A3	C1	B2	D4	A1	C3	B2
B4	C2	A3	D1	B1	C2	A4	D3	B3	C2	A4	D1

A3	D2	B4	C1	A3	D4	B2	C1	A3	D1	B4	C2
C4	B1	D3	A2	C2	B1	D3	A4	C4	B2	D3	A1
D1	A4	C2	B3	D1	A2	C4	B3	D2	A4	C1	B3
B2	C3	A1	D4	B4	C3	A1	D2	B1	C3	A2	D4
A3	D4	B1	C2	A3	D1	B2	C4	A3	D2	B1	C4
C1	B2	D3	A4	C2	B4	D3	A1	C1	B4	D3	A2
D2	A1	C4	B3	D4	A2	C1	B3	D4	A1	C2	B3
B4	C3	A2	D1	B1	C3	A4	D2	B2	C3	A4	D1

A4	D2	B3	C1	A4	D3	B2	C1	A4	D1	B3	C2
C3	B1	D4	A2	C2	B1	D4	A3	C3	B2	D4	A1
D1	A3	C2	B4	D1	A2	C3	B4	D2	A3	C1	B4
B2	C4	A1	D3	B3	C4	A1	D2	B1	C4	A2	D3
A4	D3	B1	C2	A4	D1	B2	C3	A4	D2	B1	C3
C1	B2	D4	A3	C2	B3	D4	A1	C1	B3	D4	A2
D2	A1	C3	B4	D3	A2	C1	B4	D3	A1	C2	B4
B3	C4	A2	D1	B1	C4	A3	D2	B2	C4	A3	D1

Tropic Security Square

Square of order $n = 4\times3\times3$ (sum: $y = 102$, colour: $x = 306$)

A1	B3	C4	D2	A1	B4	C3	D2	A1	B2	C4	D3
D4	C2	B1	A3	D3	C2	B1	A4	D4	C3	B1	A2
B2	A4	D3	C1	B2	A3	D4	C1	B3	A4	D2	C1
C3	D1	A2	B4	C4	D1	A2	B3	C2	D1	A3	B4
A1	B4	C2	D3	A1	B2	C3	D4	A1	B3	C2	D4
D2	C3	B1	A4	D3	C4	B1	A2	D2	C4	B1	A3
B3	A2	D4	C1	B4	A3	D2	C1	B4	A2	D3	C1
C4	D1	A3	B2	C2	D1	A4	B3	C3	D1	A4	B2
A1	B3	D4	C2	A1	B4	D3	C2	A1	B2	D4	C3
C4	D2	B1	A3	C3	D2	B1	A4	C4	D3	B1	A2
B2	A4	C3	D1	B2	A3	C4	D1	B3	A4	C2	D1
D3	C1	A2	B4	D4	C1	A2	B3	D2	C1	A3	B4

A1	B4	D2	C3	A1	B2	D3	C4	A1	B3	D2	C4
C2	D3	B1	A4	C3	D4	B1	A2	C2	D4	B1	A3
B3	A2	C4	D1	B4	A3	C2	D1	B4	A2	C3	D1
D4	C1	A3	B2	D2	C1	A4	B3	D3	C1	A4	B2
A1	C3	B4	D2	A1	C4	B3	D2	A1	C2	B4	D3
D4	B2	C1	A3	D3	B2	C1	A4	D4	B3	C1	A2
C2	A4	D3	B1	C2	A3	D4	B1	C3	A4	D2	B1
B3	D1	A2	C4	B4	D1	A2	C3	B2	D1	A3	C4
A1	C4	B2	D3	A1	C2	B3	D4	A1	C3	B2	D4
D2	B3	C1	A4	D3	B4	C1	A2	D2	B4	C1	A3
C3	A2	D4	B1	C4	A3	D2	B1	C4	A2	D3	B1
B4	D1	A3	C2	B2	D1	A4	C3	B3	D1	A4	C2

A1	C3	D4	B2	A1	C4	D3	B2	A1	C2	D4	B3
B4	D2	C1	A3	B3	D2	C1	A4	B4	D3	C1	A2
C2	A4	B3	D1	C2	A3	B4	D1	C3	A4	B2	D1
D3	B1	A2	C4	D4	B1	A2	C3	D2	B1	A3	C4
A1	C4	D2	B3	A1	C2	D3	B4	A1	C3	D2	B4
B2	D3	C1	A4	B3	D4	C1	A2	B2	D4	C1	A3
C3	A2	B4	D1	C4	A3	B2	D1	C4	A2	B3	D1
D4	B1	A3	C2	D2	B1	A4	C3	D3	B1	A4	C2
A1	D3	B4	C2	A1	D4	B3	C2	A1	D2	B4	C3
C4	B2	D1	A3	C3	B2	D1	A4	C4	B3	D1	A2
D2	A4	C3	B1	D2	A3	C4	B1	D3	A4	C2	B1
B3	C1	A2	D4	B4	C1	A2	D3	B2	C1	A3	D4

A1	D4	B2	C3	A1	D2	B3	C4	A1	D3	B2	C4
C2	B3	D1	A4	C3	B4	D1	A2	C2	B4	D1	A3
D3	A2	C4	B1	D4	A3	C2	B1	D4	A2	C3	B1
B4	C1	A3	D2	B2	C1	A4	D3	B3	C1	A4	D2
A1	D3	C4	B2	A1	D4	C3	B2	A1	D2	C4	B3
B4	C2	D1	A3	B3	C2	D1	A4	B4	C3	D1	A2
D2	A4	B3	C1	D2	A3	B4	C1	D3	A4	B2	C1
C3	B1	A2	D4	C4	B1	A2	D3	C2	B1	A3	D4
A1	D4	C2	B3	A1	D2	C3	B4	A1	D3	C2	B4
B2	C3	D1	A4	B3	C4	D1	A2	B2	C4	D1	A3
D3	A2	B4	C1	D4	A3	B2	C1	D4	A2	B3	C1
C4	B1	A3	D2	C2	B1	A4	D3	C3	B1	A4	D2

(1:1)

Tropic Security Square

Square of order $n = 4{\times}3{\times}3$ (sum: $y = 102$, colour: $x = 306$)

B1	A3	C4	D2	B1	A4	C3	D2	B1	A2	C4	D3
D4	C2	A1	B3	D3	C2	A1	B4	D4	C3	A1	B2
A2	B4	D3	C1	A2	B3	D4	C1	A3	B4	D2	C1
C3	D1	B2	A4	C4	D1	B2	A3	C2	D1	B3	A4
B1	A4	C2	D3	B1	A2	C3	D4	B1	A3	C2	D4
D2	C3	A1	B4	D3	C4	A1	B2	D2	C4	A1	B3
A3	B2	D4	C1	A4	B3	D2	C1	A4	B2	D3	C1
C4	D1	B3	A2	C2	D1	B4	A3	C3	D1	B4	A2
B1	A3	D4	C2	B1	A4	D3	C2	B1	A2	D4	C3
C4	D2	A1	B3	C3	D2	A1	B4	C4	D3	A1	B2
A2	B4	C3	D1	A2	B3	C4	D1	A3	B4	C2	D1
D3	C1	B2	A4	D4	C1	B2	A3	D2	C1	B3	A4

B1	A4	D2	C3	B1	A2	D3	C4	B1	A3	D2	C4
C2	D3	A1	B4	C3	D4	A1	B2	C2	D4	A1	B3
A3	B2	C4	D1	A4	B3	C2	D1	A4	B2	C3	D1
D4	C1	B3	A2	D2	C1	B4	A3	D3	C1	B4	A2
B1	C3	A4	D2	B1	C4	A3	D2	B1	C2	A4	D3
D4	A2	C1	B3	D3	A2	C1	B4	D4	A3	C1	B2
C2	B4	D3	A1	C2	B3	D4	A1	C3	B4	D2	A1
A3	D1	B2	C4	A4	D1	B2	C3	A2	D1	B3	C4
B1	C4	A2	D3	B1	C2	A3	D4	B1	C3	A2	D4
D2	A3	C1	B4	D3	A4	C1	B2	D2	A4	C1	B3
C3	B2	D4	A1	C4	B3	D2	A1	C4	B2	D3	A1
A4	D1	B3	C2	A2	D1	B4	C3	A3	D1	B4	C2

B1	C3	D4	A2	B1	C4	D3	A2	B1	C2	D4	A3
A4	D2	C1	B3	A3	D2	C1	B4	A4	D3	C1	B2
C2	B4	A3	D1	C2	B3	A4	D1	C3	B4	A2	D1
D3	A1	B2	C4	D4	A1	B2	C3	D2	A1	B3	C4
B1	C4	D2	A3	B1	C2	D3	A4	B1	C3	D2	A4
A2	D3	C1	B4	A3	D4	C1	B2	A2	D4	C1	B3
C3	B2	A4	D1	C4	B3	A2	D1	C4	B2	A3	D1
D4	A1	B3	C2	D2	A1	B4	C3	D3	A1	B4	C2
B1	D3	A4	C2	B1	D4	A3	C2	B1	D2	A4	C3
C4	A2	D1	B3	C3	A2	D1	B4	C4	A3	D1	B2
D2	B4	C3	A1	D2	B3	C4	A1	D3	B4	C2	A1
A3	C1	B2	D4	A4	C1	B2	D3	A2	C1	B3	D4

B1	D4	A2	C3	B1	D2	A3	C4	B1	D3	A2	C4
C2	A3	D1	B4	C3	A4	D1	B2	C2	A4	D1	B3
D3	B2	C4	A1	D4	B3	C2	A1	D4	B2	C3	A1
A4	C1	B3	D2	A2	C1	B4	D3	A3	C1	B4	D2
B1	D3	C4	A2	B1	D4	C3	A2	B1	D2	C4	A3
A4	C2	D1	B3	A3	C2	D1	B4	A4	C3	D1	B2
D2	B4	A3	C1	D2	B3	A4	C1	D3	B4	A2	C1
C3	A1	B2	D4	C4	A1	B2	D3	C2	A1	B3	D4
B1	D4	C2	A3	B1	D2	C3	A4	B1	D3	C2	A4
A2	C3	D1	B4	A3	C4	D1	B2	A2	C4	D1	B3
D3	B2	A4	C1	D4	B3	A2	C1	D4	B2	A3	C1
C4	A1	B3	D2	C2	A1	B4	D3	C3	A1	B4	D2

(1:2)

Tropic Security Square

Square of order $n = 4\times3\times3$ (sum: $y = 102$, colour: $x = 306$)

C1	A3	B4	D2	C1	A4	B3	D2	C1	A2	B4	D3
D4	B2	A1	C3	D3	B2	A1	C4	D4	B3	A1	C2
A2	C4	D3	B1	A2	C3	D4	B1	A3	C4	D2	B1
B3	D1	C2	A4	B4	D1	C2	A3	B2	D1	C3	A4
C1	A4	B2	D3	C1	A2	B3	D4	C1	A3	B2	D4
D2	B3	A1	C4	D3	B4	A1	C2	D2	B4	A1	C3
A3	C2	D4	B1	A4	C3	D2	B1	A4	C2	D3	B1
B4	D1	C3	A2	B2	D1	C4	A3	B3	D1	C4	A2
C1	A3	D4	B2	C1	A4	D3	B2	C1	A2	D4	B3
B4	D2	A1	C3	B3	D2	A1	C4	B4	D3	A1	C2
A2	C4	B3	D1	A2	C3	B4	D1	A3	C4	B2	D1
D3	B1	C2	A4	D4	B1	C2	A3	D2	B1	C3	A4

C1	A4	D2	B3	C1	A2	D3	B4	C1	A3	D2	B4
B2	D3	A1	C4	B3	D4	A1	C2	B2	D4	A1	C3
A3	C2	B4	D1	A4	C3	B2	D1	A4	C2	B3	D1
D4	B1	C3	A2	D2	B1	C4	A3	D3	B1	C4	A2
C1	B3	A4	D2	C1	B4	A3	D2	C1	B2	A4	D3
D4	A2	B1	C3	D3	A2	B1	C4	D4	A3	B1	C2
B2	C4	D3	A1	B2	C3	D4	A1	B3	C4	D2	A1
A3	D1	C2	B4	A4	D1	C2	B3	A2	D1	C3	B4
C1	B4	A2	D3	C1	B2	A3	D4	C1	B3	A2	D4
D2	A3	B1	C4	D3	A4	B1	C2	D2	A4	B1	C3
B3	C2	D4	A1	B4	C3	D2	A1	B4	C2	D3	A1
A4	D1	C3	B2	A2	D1	C4	B3	A3	D1	C4	B2

C1	B3	D4	A2	C1	B4	D3	A2	C1	B2	D4	A3
A4	D2	B1	C3	A3	D2	B1	C4	A4	D3	B1	C2
B2	C4	A3	D1	B2	C3	A4	D1	B3	C4	A2	D1
D3	A1	C2	B4	D4	A1	C2	B3	D2	A1	C3	B4
C1	B4	D2	A3	C1	B2	D3	A4	C1	B3	D2	A4
A2	D3	B1	C4	A3	D4	B1	C2	A2	D4	B1	C3
B3	C2	A4	D1	B4	C3	A2	D1	B4	C2	A3	D1
D4	A1	C3	B2	D2	A1	C4	B3	D3	A1	C4	B2
C1	D3	A4	B2	C1	D4	A3	B2	C1	D2	A4	B3
B4	A2	D1	C3	B3	A2	D1	C4	B4	A3	D1	C2
D2	C4	B3	A1	D2	C3	B4	A1	D3	C4	B2	A1
A3	B1	C2	D4	A4	B1	C2	D3	A2	B1	C3	D4

C1	D4	A2	B3	C1	D2	A3	B4	C1	D3	A2	B4
B2	A3	D1	C4	B3	A4	D1	C2	B2	A4	D1	C3
D3	C2	B4	A1	D4	C3	B2	A1	D4	C2	B3	A1
A4	B1	C3	D2	A2	B1	C4	D3	A3	B1	C4	D2
C1	D3	B4	A2	C1	D4	B3	A2	C1	D2	B4	A3
A4	B2	D1	C3	A3	B2	D1	C4	A4	B3	D1	C2
D2	C4	A3	B1	D2	C3	A4	B1	D3	C4	A2	B1
B3	A1	C2	D4	B4	A1	C2	D3	B2	A1	C3	D4
C1	D4	B2	A3	C1	D2	B3	A4	C1	D3	B2	A4
A2	B3	D1	C4	A3	B4	D1	C2	A2	B4	D1	C3
D3	C2	A4	B1	D4	C3	A2	B1	D4	C2	A3	B1
B4	A1	C3	D2	B2	A1	C4	D3	B3	A1	C4	D2

(1:3)

Tropic Security Square

Square of order $n = 4\times3\times3$ (sum: $y = 102$, colour: $x = 306$)

D1	A3	B4	C2	D1	A4	B3	C2	D1	A2	B4	C3
C4	B2	A1	D3	C3	B2	A1	D4	C4	B3	A1	D2
A2	D4	C3	B1	A2	D3	C4	B1	A3	D4	C2	B1
B3	C1	D2	A4	B4	C1	D2	A3	B2	C1	D3	A4
D1	A4	B2	C3	D1	A2	B3	C4	D1	A3	B2	C4
C2	B3	A1	D4	C3	B4	A1	D2	C2	B4	A1	D3
A3	D2	C4	B1	A4	D3	C2	B1	A4	D2	C3	B1
B4	C1	D3	A2	B2	C1	D4	A3	B3	C1	D4	A2
D1	A3	C4	B2	D1	A4	C3	B2	D1	A2	C4	B3
B4	C2	A1	D3	B3	C2	A1	D4	B4	C3	A1	D2
A2	D4	B3	C1	A2	D3	B4	C1	A3	D4	B2	C1
C3	B1	D2	A4	C4	B1	D2	A3	C2	B1	D3	A4

D1	A4	C2	B3	D1	A2	C3	B4	D1	A3	C2	B4
B2	C3	A1	D4	B3	C4	A1	D2	B2	C4	A1	D3
A3	D2	B4	C1	A4	D3	B2	C1	A4	D2	B3	C1
C4	B1	D3	A2	C2	B1	D4	A3	C3	B1	D4	A2
D1	B3	A4	C2	D1	B4	A3	C2	D1	B2	A4	C3
C4	A2	B1	D3	C3	A2	B1	D4	C4	A3	B1	D2
B2	D4	C3	A1	B2	D3	C4	A1	B3	D4	C2	A1
A3	C1	D2	B4	A4	C1	D2	B3	A2	C1	D3	B4
D1	B4	A2	C3	D1	B2	A3	C4	D1	B3	A2	C4
C2	A3	B1	D4	C3	A4	B1	D2	C2	A4	B1	D3
B3	D2	C4	A1	B4	D3	C2	A1	B4	D2	C3	A1
A4	C1	D3	B2	A2	C1	D4	B3	A3	C1	D4	B2

D1	B3	C4	A2	D1	B4	C3	A2	D1	B2	C4	A3
A4	C2	B1	D3	A3	C2	B1	D4	A4	C3	B1	D2
B2	D4	A3	C1	B2	D3	A4	C1	B3	D4	A2	C1
C3	A1	D2	B4	C4	A1	D2	B3	C2	A1	D3	B4
D1	B4	C2	A3	D1	B2	C3	A4	D1	B3	C2	A4
A2	C3	B1	D4	A3	C4	B1	D2	A2	C4	B1	D3
B3	D2	A4	C1	B4	D3	A2	C1	B4	D2	A3	C1
C4	A1	D3	B2	C2	A1	D4	B3	C3	A1	D4	B2
D1	C3	A4	B2	D1	C4	A3	B2	D1	C2	A4	B3
B4	A2	C1	D3	B3	A2	C1	D4	B4	A3	C1	D2
C2	D4	B3	A1	C2	D3	B4	A1	C3	D4	B2	A1
A3	B1	D2	C4	A4	B1	D2	C3	A2	B1	D3	C4

D1	C4	A2	B3	D1	C2	A3	B4	D1	C3	A2	B4
B2	A3	C1	D4	B3	A4	C1	D2	B2	A4	C1	D3
C3	D2	B4	A1	C4	D3	B2	A1	C4	D2	B3	A1
A4	B1	D3	C2	A2	B1	D4	C3	A3	B1	D4	C2
D1	C3	B4	A2	D1	C4	B3	A2	D1	C2	B4	A3
A4	B2	C1	D3	A3	B2	C1	D4	A4	B3	C1	D2
C2	D4	A3	B1	C2	D3	A4	B1	C3	D4	A2	B1
B3	A1	D2	C4	B4	A1	D2	C3	B2	A1	D3	C4
D1	C4	B2	A3	D1	C2	B3	A4	D1	C3	B2	A4
A2	B3	C1	D4	A3	B4	C1	D2	A2	B4	C1	D3
C3	D2	A4	B1	C4	D3	A2	B1	C4	D2	A3	B1
B4	A1	D3	C2	B2	A1	D4	C3	B3	A1	D4	C2

(1:4)

Tropic Security Square

Square of order $n = 4 \times 3 \times 3$ (sum: $y = 102$, colour: $x = 306$)

A1	B4	C2	D3	A1	B3	C2	D4	A1	B4	C3	D2
C3	D2	A4	B1	C4	D2	A3	B1	C2	D3	A4	B1
D4	C1	B3	A2	D3	C1	B4	A2	D4	C1	B2	A3
B2	A3	D1	C4	B2	A4	D1	C3	B3	A2	D1	C4
A1	B2	C3	D4	A1	B3	C4	D2	A1	B2	C4	D3
C4	D3	A2	B1	C2	D4	A3	B1	C3	D4	A2	B1
D2	C1	B4	A3	D3	C1	B2	A4	D2	C1	B3	A4
B3	A4	D1	C2	B4	A2	D1	C3	B4	A3	D1	C2
A1	B4	D2	C3	A1	B3	D2	C4	A1	B4	D3	C2
D3	C2	A4	B1	D4	C2	A3	B1	D2	C3	A4	B1
C4	D1	B3	A2	C3	D1	B4	A2	C4	D1	B2	A3
B2	A3	C1	D4	B2	A4	C1	D3	B3	A2	C1	D4

A1	B2	D3	C4	A1	B3	D4	C2	A1	B2	D4	C3
D4	C3	A2	B1	D2	C4	A3	B1	D3	C4	A2	B1
C2	D1	B4	A3	C3	D1	B2	A4	C2	D1	B3	A4
B3	A4	C1	D2	B4	A2	C1	D3	B4	A3	C1	D2
A1	C4	B2	D3	A1	C3	B2	D4	A1	C4	B3	D2
B3	D2	A4	C1	B4	D2	A3	C1	B2	D3	A4	C1
D4	B1	C3	A2	D3	B1	C4	A2	D4	B1	C2	A3
C2	A3	D1	B4	C2	A4	D1	B3	C3	A2	D1	B4
A1	C2	B3	D4	A1	C3	B4	D2	A1	C2	B4	D3
B4	D3	A2	C1	B2	D4	A3	C1	B3	D4	A2	C1
D2	B1	C4	A3	D3	B1	C2	A4	D2	B1	C3	A4
C3	A4	D1	B2	C4	A2	D1	B3	C4	A3	D1	B2

A1	C4	D2	B3	A1	C3	D2	B4	A1	C4	D3	B2
D3	B2	A4	C1	D4	B2	A3	C1	D2	B3	A4	C1
B4	D1	C3	A2	B3	D1	C4	A2	B4	D1	C2	A3
C2	A3	B1	D4	C2	A4	B1	D3	C3	A2	B1	D4
A1	C2	D3	B4	A1	C3	D4	B2	A1	C2	D4	B3
D4	B3	A2	C1	D2	B4	A3	C1	D3	B4	A2	C1
B2	D1	C4	A3	B3	D1	C2	A4	B2	D1	C3	A4
C3	A4	B1	D2	C4	A2	B1	D3	C4	A3	B1	D2
A1	D4	B2	C3	A1	D3	B2	C4	A1	D4	B3	C2
B3	C2	A4	D1	B4	C2	A3	D1	B2	C3	A4	D1
C4	B1	D3	A2	C3	B1	D4	A2	C4	B1	D2	A3
D2	A3	C1	B4	D2	A4	C1	B3	D3	A2	C1	B4

A1	D2	B3	C4	A1	D3	B4	C2	A1	D2	B4	C3
B4	C3	A2	D1	B2	C4	A3	D1	B3	C4	A2	D1
C2	B1	D4	A3	C3	B1	D2	A4	C2	B1	D3	A4
D3	A4	C1	B2	D4	A2	C1	B3	D4	A3	C1	B2
A1	D4	C2	B3	A1	D3	C2	B4	A1	D4	C3	B2
C3	B2	A4	D1	C4	B2	A3	D1	C2	B3	A4	D1
B4	C1	D3	A2	B3	C1	D4	A2	B4	C1	D2	A3
D2	A3	B1	C4	D2	A4	B1	C3	D3	A2	B1	C4
A1	D2	C3	B4	A1	D3	C4	B2	A1	D2	C4	B3
C4	B3	A2	D1	C2	B4	A3	D1	C3	B4	A2	D1
B2	C1	D4	A3	B3	C1	D2	A4	B2	C1	D3	A4
D3	A4	B1	C2	D4	A2	B1	C3	D4	A3	B1	C2

(2:1)

Tropic Security Square

Square of order $n = 4\times3\times3$ (sum: $y = 102$, colour: $x = 306$)

B1	A4	C2	D3	B1	A3	C2	D4	B1	A4	C3	D2
C3	D2	B4	A1	C4	D2	B3	A1	C2	D3	B4	A1
D4	C1	A3	B2	D3	C1	A4	B2	D4	C1	A2	B3
A2	B3	D1	C4	A2	B4	D1	C3	A3	B2	D1	C4
B1	A2	C3	D4	B1	A3	C4	D2	B1	A2	C4	D3
C4	D3	B2	A1	C2	D4	B3	A1	C3	D4	B2	A1
D2	C1	A4	B3	D3	C1	A2	B4	D2	C1	A3	B4
A3	B4	D1	C2	A4	B2	D1	C3	A4	B3	D1	C2
B1	A4	D2	C3	B1	A3	D2	C4	B1	A4	D3	C2
D3	C2	B4	A1	D4	C2	B3	A1	D2	C3	B4	A1
C4	D1	A3	B2	C3	D1	A4	B2	C4	D1	A2	B3
A2	B3	C1	D4	A2	B4	C1	D3	A3	B2	C1	D4

B1	A2	D3	C4	B1	A3	D4	C2	B1	A2	D4	C3
D4	C3	B2	A1	D2	C4	B3	A1	D3	C4	B2	A1
C2	D1	A4	B3	C3	D1	A2	B4	C2	D1	A3	B4
A3	B4	C1	D2	A4	B2	C1	D3	A4	B3	C1	D2
B1	C4	A2	D3	B1	C3	A2	D4	B1	C4	A3	D2
A3	D2	B4	C1	A4	D2	B3	C1	A2	D3	B4	C1
D4	A1	C3	B2	D3	A1	C4	B2	D4	A1	C2	B3
C2	B3	D1	A4	C2	B4	D1	A3	C3	B2	D1	A4
B1	C2	A3	D4	B1	C3	A4	D2	B1	C2	A4	D3
A4	D3	B2	C1	A2	D4	B3	C1	A3	D4	B2	C1
D2	A1	C4	B3	D3	A1	C2	B4	D2	A1	C3	B4
C3	B4	D1	A2	C4	B2	D1	A3	C4	B3	D1	A2

B1	C4	D2	A3	B1	C3	D2	A4	B1	C4	D3	A2
D3	A2	B4	C1	D4	A2	B3	C1	D2	A3	B4	C1
A4	D1	C3	B2	A3	D1	C4	B2	A4	D1	C2	B3
C2	B3	A1	D4	C2	B4	A1	D3	C3	B2	A1	D4
B1	C2	D3	A4	B1	C3	D4	A2	B1	C2	D4	A3
D4	A3	B2	C1	D2	A4	B3	C1	D3	A4	B2	C1
A2	D1	C4	B3	A3	D1	C2	B4	A2	D1	C3	B4
C3	B4	A1	D2	C4	B2	A1	D3	C4	B3	A1	D2
B1	D4	A2	C3	B1	D3	A2	C4	B1	D4	A3	C2
A3	C2	B4	D1	A4	C2	B3	D1	A2	C3	B4	D1
C4	A1	D3	B2	C3	A1	D4	B2	C4	A1	D2	B3
D2	B3	C1	A4	D2	B4	C1	A3	D3	B2	C1	A4

B1	D2	A3	C4	B1	D3	A4	C2	B1	D2	A4	C3
A4	C3	B2	D1	A2	C4	B3	D1	A3	C4	B2	D1
C2	A1	D4	B3	C3	A1	D2	B4	C2	A1	D3	B4
D3	B4	C1	A2	D4	B2	C1	A3	D4	B3	C1	A2
B1	D4	C2	A3	B1	D3	C2	A4	B1	D4	C3	A2
C3	A2	B4	D1	C4	A2	B3	D1	C2	A3	B4	D1
A4	C1	D3	B2	A3	C1	D4	B2	A4	C1	D2	B3
D2	B3	A1	C4	D2	B4	A1	C3	D3	B2	A1	C4
B1	D2	C3	A4	B1	D3	C4	A2	B1	D2	C4	A3
C4	A3	B2	D1	C2	A4	B3	D1	C3	A4	B2	D1
A2	C1	D4	B3	A3	C1	D2	B4	A2	C1	D3	B4
D3	B4	A1	C2	D4	B2	A1	C3	D4	B3	A1	C2

(2:2)

Tropic Security Square

Square of order $n = 4 \times 3 \times 3$ (sum: $y = 102$, colour: $x = 306$)

C1	A4	B2	D3	C1	A3	B2	D4	C1	A4	B3	D2
B3	D2	C4	A1	B4	D2	C3	A1	B2	D3	C4	A1
D4	B1	A3	C2	D3	B1	A4	C2	D4	B1	A2	C3
A2	C3	D1	B4	A2	C4	D1	B3	A3	C2	D1	B4
C1	A2	B3	D4	C1	A3	B4	D2	C1	A2	B4	D3
B4	D3	C2	A1	B2	D4	C3	A1	B3	D4	C2	A1
D2	B1	A4	C3	D3	B1	A2	C4	D2	B1	A3	C4
A3	C4	D1	B2	A4	C2	D1	B3	A4	C3	D1	B2
C1	A4	D2	B3	C1	A3	D2	B4	C1	A4	D3	B2
D3	B2	C4	A1	D4	B2	C3	A1	D2	B3	C4	A1
B4	D1	A3	C2	B3	D1	A4	C2	B4	D1	A2	C3
A2	C3	B1	D4	A2	C4	B1	D3	A3	C2	B1	D4

C1	A2	D3	B4	C1	A3	D4	B2	C1	A2	D4	B3
D4	B3	C2	A1	D2	B4	C3	A1	D3	B4	C2	A1
B2	D1	A4	C3	B3	D1	A2	C4	B2	D1	A3	C4
A3	C4	B1	D2	A4	C2	B1	D3	A4	C3	B1	D2
C1	B4	A2	D3	C1	B3	A2	D4	C1	B4	A3	D2
A3	D2	C4	B1	A4	D2	C3	B1	A2	D3	C4	B1
D4	A1	B3	C2	D3	A1	B4	C2	D4	A1	B2	C3
B2	C3	D1	A4	B2	C4	D1	A3	B3	C2	D1	A4
C1	B2	A3	D4	C1	B2	A4	D3	C1	B3	A4	D2
A4	D3	C2	B1	A3	D4	C2	B1	A2	D4	C3	B1
D2	A1	B4	C3	D2	A1	B3	C4	D3	A1	B2	C4
B3	C4	D1	A2	B4	C3	D1	A2	B4	C2	D1	A3

C1	B4	D2	A3	C1	B3	D2	A4	C1	B4	D3	A2
D3	A2	C4	B1	D4	A2	C3	B1	D2	A3	C4	B1
A4	D1	B3	C2	A3	D1	B4	C2	A4	D1	B2	C3
B2	C3	A1	D4	B2	C4	A1	D3	B3	C2	A1	D4
C1	B2	D3	A4	C1	B3	D4	A2	C1	B2	D4	A3
D4	A3	C2	B1	D2	A4	C3	B1	D3	A4	C2	B1
A2	D1	B4	C3	A3	D1	B2	C4	A2	D1	B3	C4
B3	C4	A1	D2	B4	C2	A1	D3	B4	C3	A1	D2
C1	D4	A2	B3	C1	D3	A2	B4	C1	D4	A3	B2
A3	B2	C4	D1	A4	B2	C3	D1	A2	B3	C4	D1
B4	A1	D3	C2	B3	A1	D4	C2	B4	A1	D2	C3
D2	C3	B1	A4	D2	C4	B1	A3	D3	C2	B1	A4

C1	D2	A3	B4	C1	D3	A4	B2	C1	D2	A4	B3
A4	B3	C2	D1	A2	B4	C3	D1	A3	B4	C2	D1
B2	A1	D4	C3	B3	A1	D2	C4	B2	A1	D3	C4
D3	C4	B1	A2	D4	C2	B1	A3	D4	C3	B1	A2
C1	D4	B2	A3	C1	D3	B2	A4	C1	D4	B3	A2
B3	A2	C4	D1	B4	A2	C3	D1	B2	A3	C4	D1
A4	B1	D3	C2	A3	B1	D4	C2	A4	B1	D2	C3
D2	C3	A1	B4	D2	C4	A1	B3	D3	C2	A1	B4
C1	D2	B3	A4	C1	D3	B4	A2	C1	D2	B4	A3
B4	A3	C2	D1	B2	A4	C3	D1	B3	A4	C2	D1
A2	B1	D4	C3	A3	B1	D2	C4	A2	B1	D3	C4
D3	C4	A1	B2	D4	C2	A1	B3	D4	C3	A1	B2

(2:3)

Tropic Security Square

Square of order $n = 4\times3\times3$ (sum: $y = 102$, colour: $x = 306$)

D1	A4	B2	C3	D1	A3	B2	C4	D1	A4	B3	C2
B3	C2	D4	A1	B4	C2	D3	A1	B2	C3	D4	A1
C4	B1	A3	D2	C3	B1	A4	D2	C4	B1	A2	D3
A2	D3	C1	B4	A2	D4	C1	B3	A3	D2	C1	B4
D1	A2	B3	C4	D1	A3	B4	C2	D1	A2	B4	C3
B4	C3	D2	A1	B2	C4	D3	A1	B3	C4	D2	A1
C2	B1	A4	D3	C3	B1	A2	D4	C2	B1	A3	D4
A3	D4	C1	B2	A4	D2	C1	B3	A4	D3	C1	B2
D1	A4	C2	B3	D1	A3	C2	B4	D1	A4	C3	B2
C3	B2	D4	A1	C4	B2	D3	A1	C2	B3	D4	A1
B4	C1	A3	D2	B3	C1	A4	D2	B4	C1	A2	D3
A2	D3	B1	C4	A2	D4	B1	C3	A3	D2	B1	C4

D1	A2	C3	B4	D1	A3	C4	B2	D1	A2	C4	B3
C4	B3	D2	A1	C2	B4	D3	A1	C3	B4	D2	A1
B2	C1	A4	D3	B3	C1	A2	D4	B2	C1	A3	D4
A3	D4	B1	C2	A4	D2	B1	C3	A4	D3	B1	C2
D1	B4	A2	C3	D1	B3	A2	C4	D1	B4	A3	C2
A3	C2	D4	B1	A4	C2	D3	B1	A2	C3	D4	B1
C4	A1	B3	D2	C3	A1	B4	D2	C4	A1	B2	D3
B2	D3	C1	A4	B2	D4	C1	A3	B3	D2	C1	A4
D1	B2	A3	C4	D1	B3	A4	C2	D1	B2	A4	C3
A4	C3	D2	B1	A2	C4	D3	B1	A3	C4	D2	B1
C2	A1	B4	D3	C3	A1	B2	D4	C2	A1	B3	D4
B3	D4	C1	A2	B4	D2	C1	A3	B4	D3	C1	A2

D1	B4	C2	A3	D1	B3	C2	A4	D1	B4	C3	A2
C3	A2	D4	B1	C4	A2	D3	B1	C2	A3	D4	B1
A4	C1	B3	D2	A3	C1	B4	D2	A4	C1	B2	D3
B2	D3	A1	C4	B2	D4	A1	C3	B3	D2	A1	C4
D1	B2	C3	A4	D1	B3	C4	A2	D1	B2	C4	A3
C4	A3	D2	B1	C2	A4	D3	B1	C3	A4	D2	B1
A2	C1	B4	D3	A3	C1	B2	D4	A2	C1	B3	D4
B3	D4	A1	C2	B4	D2	A1	C3	B4	D3	A1	C2
D1	C4	A2	B3	D1	C3	A2	B4	D1	C4	A3	B2
A3	B2	D4	C1	A4	B2	D3	C1	A2	B3	D4	C1
B4	A1	C3	D2	B3	A1	C4	D2	B4	A1	C2	D3
C2	D3	B1	A4	C2	D4	B1	A3	C3	D2	B1	A4

D1	C2	A3	B4	D1	C3	A4	B2	D1	C2	A4	B3
A4	B3	D2	C1	A2	B4	D3	C1	A3	B4	D2	C1
B2	A1	C4	D3	B3	A1	C2	D4	B2	A1	C3	D4
C3	D4	B1	A2	C4	D2	B1	A3	C4	D3	B1	A2
D1	C4	B2	A3	D1	C3	B2	A4	D1	C4	B3	A2
B3	A2	D4	C1	B4	A2	D3	C1	B2	A3	D4	C1
A4	B1	C3	D2	A3	B1	C4	D2	A4	B1	C2	D3
C2	D3	A1	B4	C2	D4	A1	B3	C3	D2	A1	B4
D1	C2	B3	A4	D1	C3	B4	A2	D1	C2	B4	A3
B4	A3	D2	C1	B2	A4	D3	C1	B3	A4	D2	C1
A2	B1	C4	D3	A3	B1	C2	D4	A2	B1	C3	D4
C3	D4	A1	B2	C4	D2	A1	B3	C4	D3	A1	B2

(2:4)

Order *n* = *4* and the Magic Constants

If make statistic in tabular form over the Magic Constants which belongs to MS of order *n*=*4*.

a	**d**	**Σ**
0	1	30
0	2	60
0	3	90
0	4	120
0	5	150
0	6	180
0	7	210
0	8	240
0	9	270
0	10	300
0	11	330
0	12	360

a	**d**	**Σ**
1	1	34
1	2	64
1	3	94
1	4	124
1	5	154
1	6	184
1	7	214
1	8	244
1	9	274
1	10	304
1	11	334
1	12	364

a	**d**	**Σ**
2	1	38
2	2	68
2	3	98
2	4	128
2	5	158
2	6	188
2	7	218
2	8	248
2	9	278
2	10	308
2	11	338
2	12	368

a	**d**	**Σ**
3	1	42
3	2	72
3	3	102
3	4	132
3	5	162
3	6	192
3	7	222
3	8	252
3	9	282
3	10	312
3	11	342
3	12	372

a	**d**	**Σ**
4	1	46
4	2	76
4	3	106
4	4	136
4	5	166
4	6	196
4	7	226
4	8	256
4	9	286
4	10	316
4	11	346
4	12	376

a	**d**	**Σ**
5	1	50
5	2	80
5	3	110
5	4	140
5	5	170
5	6	200
5	7	230
5	8	260
5	9	290
5	10	320
5	11	350
5	12	380

a	**d**	**Σ**
6	1	54
6	2	84
6	3	114
6	4	144
6	5	174
6	6	204
6	7	234
6	8	264
6	9	294
6	10	324
6	11	354
6	12	384

a	**d**	**Σ**
7	1	58
7	2	88
7	3	118
7	4	148
7	5	178
7	6	208
7	7	238
7	8	268
7	9	298
7	10	328
7	11	358
7	12	388

a	**d**	**Σ**
8	1	62
8	2	92
8	3	122
8	4	152
8	5	182
8	6	212
8	7	242
8	8	272
8	9	302
8	10	332
8	11	362
8	12	392

a	**d**	**Σ**
9	1	66
9	2	96
9	3	126
9	4	156
9	5	186
9	6	216
9	7	246
9	8	276
9	9	306
9	10	336
9	11	366
9	12	396

a	**d**	**Σ**
10	1	70
10	2	100
10	3	130
10	4	160
10	5	190
10	6	220
10	7	250
10	8	280
10	9	310
10	10	340
10	11	370
10	12	400

a	**d**	**Σ**
11	1	74
11	2	104
11	3	134
11	4	164
11	5	194
11	6	224
11	7	254
11	8	284
11	9	314
11	10	344
11	11	374
11	12	404

Here are *a* start value in the key and *d* the increasing with integer *n* between terms in the key.

$$\Sigma = (n : a.d) = \frac{1}{2} \cdot n \cdot \left[2 \cdot a + d \cdot \left(n^2 - 1 \right) \right] \qquad [26]$$

This formula gives all the Magic Constants, where *n* stands for order of Magic Square. If use a system of different values of *a* and *d*, the magic constants are going to infinity. This make that the magic constant could rapidly changes if only have input of start value *a* and a system of values to *d* into the key. It's also possibly to work with all fundamental constants like pi to input values in the key. Now it only needs an algorithm for storage of data structure arrays of information to the rows on the Magic Squares and through the key make cryptogram security.

Order *n* = *5* and the Magic Constants

If make statistic in tabular form over the Magic Constants which belongs to MS of order *n*=*5*.

a	d	Σ
0	1	60
0	2	120
0	3	180
0	4	240
0	5	300
0	6	360
0	7	420
0	8	480
0	9	540
0	10	600
0	11	660
0	12	720

a	d	Σ
1	1	65
1	2	125
1	3	185
1	4	245
1	5	305
1	6	365
1	7	425
1	8	485
1	9	545
1	10	605
1	11	665
1	12	725

a	d	Σ
2	1	70
2	2	130
2	3	190
2	4	250
2	5	310
2	6	370
2	7	430
2	8	490
2	9	550
2	10	610
2	11	670
2	12	730

a	d	Σ
3	1	75
3	2	135
3	3	195
3	4	255
3	5	315
3	6	375
3	7	435
3	8	495
3	9	555
3	10	615
3	11	675
3	12	735

a	d	Σ
4	1	80
4	2	140
4	3	200
4	4	260
4	5	320
4	6	380
4	7	440
4	8	500
4	9	560
4	10	620
4	11	680
4	12	740

a	d	Σ
5	1	85
5	2	145
5	3	205
5	4	265
5	5	325
5	6	385
5	7	445
5	8	505
5	9	565
5	10	625
5	11	685
5	12	745

a	d	Σ
6	1	90
6	2	150
6	3	210
6	4	270
6	5	330
6	6	390
6	7	450
6	8	510
6	9	570
6	10	630
6	11	690
6	12	750

a	d	Σ
7	1	95
7	2	155
7	3	215
7	4	275
7	5	335
7	6	395
7	7	455
7	8	515
7	9	575
7	10	635
7	11	695
7	12	755

a	d	Σ
8	1	100
8	2	160
8	3	220
8	4	280
8	5	340
8	6	400
8	7	460
8	8	520
8	9	580
8	10	640
8	11	700
8	12	760

a	d	Σ
9	1	105
9	2	165
9	3	225
9	4	285
9	5	345
9	6	405
9	7	465
9	8	525
9	9	585
9	10	645
9	11	705
9	12	765

a	d	Σ
10	1	110
10	2	170
10	3	230
10	4	290
10	5	350
10	6	410
10	7	470
10	8	530
10	9	590
10	10	650
10	11	710
10	12	770

a	d	Σ
11	1	115
11	2	175
11	3	235
11	4	295
11	5	355
11	6	415
11	7	475
11	8	535
11	9	595
11	10	655
11	11	715
11	12	775

Here are *a* start value in the key and *d* the increasing with integer *n* between terms in the key.

$$\Sigma = (n : a.d) = \frac{1}{2} \cdot n \cdot \left[2 \cdot a + d \cdot \left(n^2 - 1 \right) \right] \qquad [26]$$

This formula gives all the Magic Constants, where *n* stands for order of Magic Square. To find a formula that works opposite are little harder, that will say, you start with a value of the magic constant and what will the letters *a* and *d* be? That's why it's good to make statistic in one tabular form. So if search after the Magic Constant 65 on Magic Square of order *n* = *5*, then the answer will be *a* = *1* and *d* = *1*. This system with the key and MS could be smart if wanted to reflect the colour of nature with small dots into one sensor of and then transform it.

Proof idea of Modern Quantum Mechanics

From Codata 2006 and 2010 reference material we have for some certainty formulas to take into consideration. The idea is to proof some new expression with accepted classical formula.

1) $a_0 = \dfrac{\varepsilon_0 \cdot h^2}{\pi \cdot m_e \cdot e^2}$ [14]

2) $e = \sqrt{\dfrac{2 \cdot \alpha_0 \cdot h}{u_0 \cdot c_0}}$ [24]

(2 in 1)

$$a_0 = \frac{h}{\alpha_0 \cdot m_e \cdot c_0} \qquad \Rightarrow \qquad \lambda_C = \frac{h}{m_e \cdot c_0}$$

Here we have the reference formula of Compton's wave length λ_C and formula of first orbital and electron charge fit each other exact. But now, we will try to proof some new expressions:

1) $e = \sqrt{\dfrac{2 \cdot \alpha_0 \cdot h}{u_0 \cdot c_0}}$ [24]

2) $c_0 = \dfrac{2 \cdot \alpha_0}{\pi^3 \cdot u_0}$

(2 in 1)

$$e = \sqrt{h \cdot \pi^3 \cdot u_0} \qquad \Rightarrow \qquad h = \frac{e^2}{\pi^3 \cdot u_0}$$

Here will it be possibly to see that the expression for both the speed of light c_0 and Planck's constant h are true formulas. If now trying to find one own expression for the alpha constant:

1) $\alpha_0 = \dfrac{v_{01eV} \cdot R_\infty \cdot h}{e}$

2) $v_{01eV} = \dfrac{2}{\pi^2 \cdot u_0}$

(2 in 1) $\alpha_0 = \dfrac{2 \cdot R_\infty \cdot h}{\pi^2 \cdot u_0 \cdot e}$ (21)

Here the classical velocity for only one electron volt input in the alpha constant α_0 formulas:

$$\therefore \quad e^2 = \frac{2 \cdot \alpha_0 \cdot h}{u_0 \cdot c_0} = \frac{4 \cdot R_\infty \cdot h^2}{\pi^2 \cdot u_0^2 \cdot c_0 \cdot e} \qquad \Rightarrow \qquad R_\infty = \frac{\pi^8 \cdot u_0^4 \cdot c_0}{4 \cdot e} = \frac{\Omega}{4\pi \cdot c_0}$$

$$\therefore \quad c_0 = \sqrt{\frac{e \cdot \Omega}{\pi^9 \cdot u_0^4}} = 2.979320975 \cdot 10^8 ms^{-1}$$

If take the alpha value (21) as input in the electron charge formulas from Codata reference, then we get Rydberg's formula, and if take this formula again equal, we get speed of light c_0.

If now take two speed of light formulas equal when they are in square, we get alpha constant:

$$\therefore \quad c_0^2 = \frac{e\cdot\Omega}{\pi^9\cdot u_0^4} = \frac{4\cdot\alpha_0^2}{\pi^6\cdot u_0^4} \qquad \Rightarrow \qquad \alpha_0 = \sqrt{\frac{e\cdot\Omega}{4\cdot\pi^3}} = 0.007293847$$

If now take to break out the omega frequency and put it in a formula of the inverse Rydberg's

1) $\frac{1}{R_\infty} = \frac{4\pi\cdot c_0}{\Omega}$

2) $\Omega = \frac{\alpha_0^2\cdot 4\pi^3}{e}$

(2 in 1) $\qquad \frac{1}{R_\infty} = \frac{c_0\cdot e}{\alpha_0^2\cdot\pi^2}$

Finally, we will get the Rydberg's formula and which will give the Rydberg's frequency, thus

$$R_\infty = \frac{\pi^2\cdot\alpha_0^2}{c_0\cdot e} = 1.096845983\cdot 10^7\, m^{-1} \qquad \Rightarrow \qquad \pi^2\cdot\alpha_0^2 = \Re_f\cdot e$$

The differential interaction of alpha constant in square into the electron pi-wave orbital, gives the frequency into charge, and/or the Rydberg's constant value. This is one of the proof ideas.

$$\frac{1}{\alpha_0^2}\cdot\Psi^2 = \alpha_0^{-1}\cdot\left(\iint_{R^2} e^{-(x^2+y^2)}dxdy\right)\cdot\alpha_0^{-1}\cdot\left(\iint_{R^2} e^{-(x^2+y^2)}dxdy\right) = \pi^2\cdot\alpha_0^2$$

$$\Psi_{E_k} = m_e\cdot c_0^2\cdot(\gamma-1) = 4.33045609\ \cdot 10^{-18}\, J \qquad \text{If: } \gamma = \frac{1}{\beta_1^2}$$

$$c_0 = \sqrt{\frac{\pi\cdot s_0\cdot c_2}{\sqrt{2}\cdot h}} = 2.979320975\cdot 10^8\, ms^{-1}$$

Here the speed of light c_0 formula and/or the speed of electric *Emax* formula that told us the speed of reflection of magnetic flux quantum and the electron charge into the pi-wave orbital and it's not the speed of pi-electron wave orbital. This is more the electron speed c_2 it selves. It's probably only the wave speed for electric max in a dot calculation around the pi-electron as it rises forward under its polar trajectory path between the lobes inside the Hydrogen atom.

1) $R_\infty = \frac{m_e\cdot\alpha_0^2\cdot c_0}{2\cdot h}$ [14, 24]

2) $\alpha_0 = \frac{u_0\cdot c_0\cdot e^2}{2\cdot h} \quad \Leftrightarrow \quad e^2 = \frac{2\cdot\alpha_0\cdot h}{u_0\cdot c_0} \quad \Rightarrow \quad e = \sqrt{\frac{2\cdot\alpha_0\cdot h}{u_0\cdot c_0}}$

(2 in 1)

$$\Re_f = \frac{m_e\cdot e^4}{8\cdot h^3\cdot\varepsilon_0^2} = 3.26785624\cdot 10^{15}\, Hz$$

The proof idea gives us one simply formula of Rydberg's frequency to Hydrogen first orbital.

22. Discussion – Modern Quantum Mechanics

In this essay of Modern Quantum Mechanics implies to explain through theoretically studies the energy, length and time of one quantum. That will say the energy, length and time of only one oscillation in 3-space. This will give us the light speed to electric max, magnetic max and electron speed in accordance with theories from; Albert Einstein and Erwin Schrödinger. The building stones of the π-electron letter where discovered from Niels H. Bohr at time he where practicing at Ernest Rutherford laboratory, which has exactly same letter in Modern Quantum Mechanics. The π-electron accelerates through circular orbits in a helix path into orbital since its direction of vector movement is constantly changing, and acts as a carrier to the charge q. The electron in Hydrogen has orbital angular momentum, which results from the electron's motion around the proton and spin angular momentum which give the total momentum of m_e.

The only one way to find the light speed c for photons in system of one electron - one proton, or the system in Hydrogen, are to find the radius length to the electron path up to surface and through this estimate the speed the electron has exact at this momentum. This gives the speed the electron has when the potential energy includes the delta kinetic energy. This makes that the π-electron are going in a polar trajectory path, which is one common path technique for a charged particles in magnetic fields. The difference of kinetic energy and potential energy at ground level in Hydrogen, correspond to the electron Ψ-amplitude energy. If this amplitude energy includes the Ionization Potential energy at first orbital r_1, then we have the kinetic energy in Hydrogen. If looking after tomorrow's source key of fusion energy it's necessary to understand better the speed of light and constants of electric max c_0, magnetic max c_1, and electron speed c_2. It will also be necessary to understand the fine structure in Hydrogen with precision, and that's why I have developed the 125-bit magic squares. How master the future challenge in high-tech industries when belongs to the believer that we didn't need to know more about; Modern Quantum Mechanics. How master out the process to one fusion from two Hydrogen of Deuterium atoms to one Helium $He^{\alpha 4}$-atom, that when not understand the structure of Hydrogen and Helium. This fusion process is going on in the plasma of our sun; it could be tomorrow's energy key if *know how* Hydrogen fine structure and sunlight speed.

If rapidly moving particle in action such as one electron, alpha particle or photon will collides with a gas atom in Hydrogen, Helium or Argon, an electron is ejected from the atom, leaving a charged ion. The amount of energy necessary needed to remove an electron from an atom is called the Ionization potential (IP), and it could now be measured very precisely in laboratory experiment. When gases are composed of ions nearly the equal number n of negatively and positively, are then called plasma. Gas becomes into plasma when the kinetic energies of the gas particles rises to equal the Ionization potential energies into the gas. When this level is reached, collisions of the gas particles will cause a rapid cascading Ionization, called Plasma.

According to classical mechanic, particles such as an electron with starting at a given location would still have exactly one location at each subsequent instant, and the sequence of all those location together will give its trajectory. Quantum computing theory describes it as traveling on a range of trajectories simultaneously. A particle behavior like the electron doing this is in a superposition of location. One application of quantum computing that are practical today is quantum cryptography which provides cryptographic systems whose absolute security, will never be compromised by future increases in computer power and/or mathematical ingenuity. The future research of advanced quantum computing will develop the quantum bits computer. These qubits can exist in multiple states simultaneously, unlike digital computers, which are based on transistors and require data to be encoded into binary digits. Quantum computer has the potential to compute larger number of calculations in parallel, speeding time to resolution.

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Standard Atomic Weights

Based on the assigned relative mass of $^{12}C=12$. Elements in colour (red) are discussed in Modern Quantum Mechanics. Elements in colour (red and purple) are solved on enclosed Excel sheet.

Name	Symbol	Atomic No.	Atomic Weight	Valence		Name	Symbol	Atomic No.	Atomic Weight	Valence
Actinium	Ac	89	227.028	…		Mercury	Hg	80	200.59	1,2
Aluminum	Al	13	26.9815	3		Molybdenum	Mo	42	95.94	3,4,6
Americium	Am	95	(243)	3,4,5,6		Neodymium	Nd	60	144.24	3
Antimony	Sb	51	121.75	3,5		Neon	Ne	10	20.1179	0
Argon	Ar	18	39.948	0		Neptunium	Np	93	237.048	4,5,6
Arsenic	As	33	74.9216	3,5		Nickel	Ni	28	58.69	2,3
Astatine	At	85	(210)	1,3,5,7		Niobium	Nb	41	92.9064	3,5
Barium	Ba	56	137.33	2		Nitrogen	N	7	14.0067	3,5
Berkelium	Bk	97	(247)	3,4		Nobelium	No	102	(259)	…
Beryllium	Be	4	9.0122	2		Osmium	Os	76	190.2	2,3,4,8
Bismuth	Bi	83	208.98	3,5		Oxygen	O	8	15.9994	2
Boron	B	5	10.81	3		Palladium	Pd	46	106.42	2,4,6
Bromine	Br	35	79.904	1,3,5,7		Phosphorus	P	15	30.9738	3,5
Cadmium	Cd	48	112.41	2		Platinum	Pt	78	195.08	2,4
Calcium	Ca	20	40.08	2		Plutonium	Pu	94	(244)	3,4,5,6
Californium	Cf	98	(251)	…		Polonium	Po	84	(209)	…
Carbon	C	6	12.011	2,4		Potassium	K	19	39.0983	1
Cerium	Ce	58	140.12	3,4		Praseodymium	Pr	59	140.908	3
Cesium	Cs	55	132.905	1		Promethium	Pm	61	(145)	3
Chlorine	Cl	17	35.453	1,3,5,7		Protoactinium	Pa	91	231.036	…
Chromium	Cr	24	51.996	2,3,6		Radium	Ra	88	226.025	2
Cobalt	Co	27	58.933	2,3		Radon	Rn	86	(222)	0
Copper	Cu	29	63.546	1,2		Rhenium	Re	75	186.207	…
Curium	Cm	96	(247)	3		Rhodium	Rh	45	102.906	3
Dysprosium	Dy	66	162.50	3		Rubidium	Rb	37	85.4678	1
Einsteinium	Es	99	(252)	…		Ruthenium	Ru	44	101.07	3,4,6,8
Erbium	Er	68	167.26	3		Samarium	Sm	62	150.36	2,3
Europium	Eu	63	151.96	2,3		Scandium	Sc	21	44.9559	3
Fermium	Fm	100	(257)	…		Selenium	Se	34	78.96	2,4,6
Fluorine	F	9	18.9984	1		Silicon	Si	14	28.0855	4
Francium	Fr	87	(223)	1		Silver	Ag	47	107.868	1
Gadolinium	Gd	64	157.25	3		Sodium	Na	11	22.9898	1
Gallium	Ga	31	69.72	2,3		(natrium)				
Germanium	Ge	32	72.59	4		Strontium	Sr	38	87.62	2
Gold	Au	79	196.967	1,3		Sulfur	S	16	32.06	2,4,6
Hafnium	Hf	72	178.49	4		Tantalum	Ta	73	180.948	5
Helium	He	2	4.0026	0		Technetium	Tc	43	(98)	6,7
Holmium	Ho	67	164.93	3		Tellurium	Te	52	127.60	2,4,6
Hydrogen	H	1	1.0079	1		Terbium	Tb	65	158.925	3
Indium	In	49	114.82	3		Thallium	Tl	81	204.383	1,3
Iodine	I	53	126.905	1,3,5,7		Thorium	Th	90	232.038	4
Iridium	Ir	77	192.22	3,4		Thulium	Tm	69	168.934	3
Iron	Fe	26	55.847	2,3		Tin	Sn	50	118.71	2,4
Krypton	Kr	36	83.80	0		Titanium	Ti	22	47.88	3,4
Lanthanum	La	57	138.906	3		Tungsten	W	74	183.85	6
Lawrencium	Lr	103	(260)	…		Uranium	U	92	238.029	4,6
Lead	Pb	82	207.2	2,4		Vanadium	V	23	50.9415	3,5
Lithium	Li	3	6.941	1		Xenon	Xe	54	131.29	0
Lutetium	Lu	71	174.967	3		Ytterbium	Yb	70	173.04	2,3
Magnesium	Mg	12	24.305	2		Yttrium	Y	39	88.9059	3
Manganese	Mn	25	54.938	2,3,4,6,7		Zinc	Zn	30	65.39	2
Medelevium	Md	101	(258)	…		Zirconium	Zr	40	91.224	4

Elements in parentheses around molar mass ($g \cdot mol^{-1}$) are the most stable radioactive isotopes. Reference [3 & 5] (Ganong, 2001)

Nobel Prize winner in Physics

Based on testament of Alfred Nobel (1833-1896), where the winners should have done the humanity most usefulness. Name in colour (red & purple) are discussed in Modern Quantum Mechanics.

Year	Name	Country	Physics		Year	Name	Country	Physics
1901	W. C. Röntgen	Germany	-		1940	-	-	-
1902	H. A. Lorentz	Holland	-		1941	-	-	-
	P. Zeeman	Holland	-		1942	-	-	-
1903	H. Becquerel	France	-		1943	O. Stern	United States	-
	P. Curie	France	-		1944	I. I. Rabi	United States	-
	M. Curie	France	-		1945	W. Pauli	Austria	-
1904	J. W. S. Rayleigh	Great Britain	-		1946	P. W. Bridgman	United States	-
1905	P. E. A. Lenard	Germany	-		1947	E. V. Appleton	Great Britain	-
1906	J. J. Thomson	Great Britain	-		1948	P. M. S. Blackett	Great Britain	-
1907	A.A. Michelson	United States	-		1949	H. Yukawa	Japan	-
1908	G. Lippmann	France	-		1950	C. F. Powell	Great Britain	-
	E. Rutherford	Great Britain	Chemistry		1951	J. Cockcroft	Great Britain	-
1909	G. Marconi	Italy	-			E.T.S. Walton	Ireland	-
	K. F. Braun	Germany	-		1952	F. Bloch	United States	-
1910	J.D. van der Waals	Holland	-			E. M. Purcell	United States	-
1911	W. Wien	Germany	-		1953	F. Zernike	Holland	-
	M. Curie	France	Chemistry		1954	M. Born	Great Britain	-
1912	G. Dalén	Sweden	-			W. Bothe	West-Germany	-
1913	Kamerlingh Onnes	Holland	-			L. C. Pauling	United States	Chemistry
1914	M. von Laue	Germany	-		1955	W. E. Lamb	United States	-
1915	W. Bragg	Great Britain	-			P. Kusch	United States	-
	L. Bragg	Great Britain	-		1956	W. Shockley	United States	-
1916	-	-	-			J. Bardeen	United States	-
1917	C. G. Barkla	Great Britain	-			W. H. Brattain	United States	-
1918	M. Planck	Germany	-		1957	C. N. Yang	China	-
1919	J. Stark	Germany	-			T. D. Lee	China	-
1920	C. É. Guillaume	Switzerland	-		1958	P. A. Tjerenkov	Soviet union	-
1921	A. Einstein	Germany/Swiss	-			I. Frank	Soviet union	-
1922	N. Bohr	Denmark	-			I. Tamm	Soviet union	-
1923	R. A. Millikan	United States	-		1959	E. Segré	United States	-
1924	M. Siegbahn	Sweden	-			O. Chamberlain	United States	-
1925	J. Franck	Germany	-		1960	D. A. Glaser	United States	-
	G. Hertz	Germany	-		1961	R. Hofstadter	United States	-
1926	J. B. Perrin	France	-			M. Mössbauer	West-Germany	-
1927	A. H. Compton	United States	-		1962	L. Landau	Soviet union	-
	C. T. R. Wilson	Great Britain	-			F. H. C. Crick	Great Britain	Medicine
1928	O. W. Richardson	Great Britain	-			J. D. Watson	United States	Medicine
1929	L. de Broglie	France	-		1963	E. Wigner	United States	-
1930	C. V. Raman	India	-			Goeppert-Mayer	United States	-
1931	-	-	-			H. D. Jensen	West-Germany	-
1932	W. Heisenberg	Germany	-		1964	Ch. H. Townes	United States	-
	I. Langmuir	United States	Chemistry			N. Basov	Soviet union	-
1933	E. Schrödinger	Austria	-			A. Prochorov	Soviet union	-
	P. A. M. Dirac	Great Britain	-		1965	S. Tomonaga	Japan	-
1934	-	-	-			J. Schwinger	United States	-
1935	J. Chadwick	Great Britain	-			R. P. Feynman	United States	-
1936	V. F. Hess	Austria	-		1966	A. Kastler	France	-
	C. D. Anderson	United States	-		1967	H. A. Bethe	United States	-
1937	C. Davisson	United States	-		1968	L. W. Alvarez	United States	-
	G. P. Thomson	Great Britain	-		1969	M. Gell-Mann	United States	-
1938	E. Fermi	Italy	-		1970	H. Alfvén	Sweden	-
1939	E. O. Lawrence	United States	-			L. Néel	France	-

Reference [13 & 23]

The description of the DNA–molecule (deoxyribo-nucleic-acid) and its structure where first discovered in year 1953 by James D. Watson and Francis Crick. The theory they had of the DNA-double-helix where later confirmed with experiment from Maurice Wilkins, which also made that they together shared the Noble Prize for year 1962 in medicine and/or physiology.