What is the magnetic moment of electron spin?

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Abstract. According to the unified theory[1,2] of dynamic space the inductive-inertial phenomenon[3] has been developed, forming the grouping[3] units (namely electric charges or forms of the electric field). Moreover, with the surface electric charges[4] of the electron cortex its inverse electric fields[5] are formed. By the above phenomena the actual theoretical value of the magnetic dipole moment of electron spin[4] is proved as equal to the experimental measurement.[6]

Keywords: Inductive phenomenon; grouping units; inverse electric field.

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1. Bohr's magneton

The magnetic dipole moment of the orbital electron

$$\mu_B = \frac{e\hbar}{2m}, \tag{1}$$

the so called Bohr's magneton,[6] has been calculated from

$$\mu = IA, \tag{2}$$

where

$$I = \frac{e}{T} = i \tag{3}$$

is the electric intensity,

$$A = \pi r^2 \tag{4}$$

the circle area, e the electric charge of the electron, r its orbital radius and T its orbital period (Fig. 1a). Therefore, due to Eq. 3, the Eq. 2 becomes

$$\mu = IA = iA = \frac{A}{T}e \Rightarrow \mu = \frac{A}{T}e. \tag{5}$$

The orbital momentum of the electron is

$$L = pr = mur \Rightarrow L = mur, \tag{6}$$

where p its impulse momentum, m its mass and

$$u = \frac{2\pi r}{T} \tag{7}$$

its peripheral speed. Therefore, due to Eqs 4 and 7, the Eq. 6 becomes

$$L = mur = m\frac{2\pi r}{T}r = 2m\frac{\pi r^2}{T} = 2m\frac{A}{T} \Rightarrow \frac{A}{T} = \frac{L}{2m} \tag{8}$$

and replacing in Eq. 5 it is

$$\mu = \frac{eL}{2m}. \tag{9}$$

However, the quantum orbital momentum is

$$L = \hbar = \frac{h}{2\pi}, \tag{10}$$

where h is the Planck's constant. Therefore, Eq. 9 becomes $\mu_B = e\hbar/2m$ (Eq. 1), which is the quantum magnetic dipole moment of the orbital electron (Bohr's magneton).

2. Magnetic dipole moment of electron spin

For calculation[6] of the magnetic dipole moment of the electron spin, it has been considered that its electric charge e is the sum of elementary electric values q_i ($e = \Sigma q_i$) with elementary mass m_i ($m = \Sigma m_i$) and elementary spin momentum L_i ($S = \Sigma L_i$). So, due to Eq. 9, it is

$$\mu_i = \frac{q_i L_i}{2m_i}. \tag{11}$$

Therefore,

$$\mu_s = \Sigma\mu_i = \frac{eS}{2m} \Rightarrow \mu_s = \frac{eS}{2m} \tag{12}$$

is the theoretical magnetic dipole moment of the electron spin, according to the modern Physics.[6]

However, the experimental measurement of the magnetic dipole moment of electron spin was found twice the above theoretical value and equal to

$$\mu_s = \frac{eS}{m}, \tag{13}$$

namely without the number 2 in the denominator, the so called g-factor.[6]

3. Theoretical proof the magnetic dipole moment of electron spin

The unified theory[1,2] of dynamic space proves the experimental value the magnetic dipole moment of the electron spin as follows:

The magnetic dipole moment of the electron spin[4] is interpreted with the surface electric charges of the electron cortex,[7] which are naturally present in its cortex as an electric charges. These electric charges form inverse electric fields,[5] whose the polar diagrams are shown in Fig. 1b. So, the negative poles $-2/3e$ of electron have near them the positive electric units[8] of the inverse electric field and beyond them the negative units of the external (common) field. The opposite occurs with the positive zone $+1/3e$ of electron, whereby the electric fields are alternated. This alternate of positive and negative fields, which occurs during the electron spin and its passage from a place C, creates the magnetism[3] of the dipole moment.

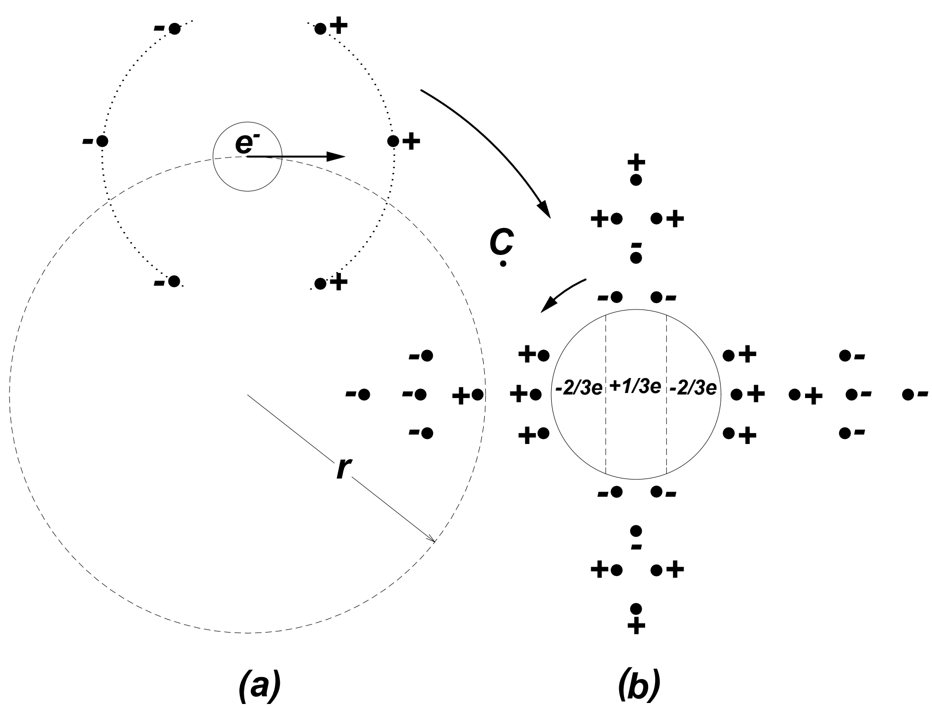

Figure 1. Interpretation of the magnetic dipole moment of the electron spin,[4] with its grouping units[3] of the orbital electron (a) and with its inverse[5] electric fields of its surface electric charges[7] (b)

Moreover, by the above theory the experimental measurement ($\mu_s = eS/m$, Eq. 13) is interpreted as a result of the magnetism phenomenon created by the grouping units.[3] As the grouping units of the orbital electron rotate around the atomic nucleus (Fig. 1a) pass once from a place C to the time period T, when the opposite electric fields of the electron spin (Fig. 1b) pass twice from the same place C. Therefore, their passage time is $T/2$, namely they are rotated with a twice frequency, which implies a double magnetism for the electron spin.

However, the magnetic dipole moment of the orbital electron is equal to $\mu = eA/T$ (Eq. 5). The e/T ratio corresponds to the electric intensity i of the orbital electron, which at the electron spin is twice the above intensity (due to the above passage time $T/2$) and due to $I = e/T = i$ (Eq. 3) we have

$$I = \frac{e}{T/2} = 2i. \tag{14}$$

Therefore, the magnetic dipole moment $\mu = IA$ (Eq. 2) for electron spin, due to respective equation $A/T = S/2m$ (Eq. 8), becomes

$$\mu_s = IA = 2iA = \frac{A}{T/2}e = \frac{2A}{T}e \Rightarrow \mu_s = \frac{eS}{m}. \tag{15}$$

So, we are found that the actual theoretical value (Eq. 15) of the magnetic dipole moment of electron spin, is equal to the experimental measurement (Eq. 13).

4. The E/M wave has not magnetic dipole moment

The fundamental E/M wave[9] (Fig. 2) is constituted of two rotational spindle with electric charges[10]

$$Q = \pm e \tag{16}$$

for each spindle with a total spin

$$s = \pm 1, \tag{17}$$

of a constant photon length[9,11]

$$L = 3000m = 10^{58} L_0 \tag{18}$$

and a constant helix length[9,11]

$$\pi L = \pi 3000m = \pi L_0 10^{58}, \tag{19}$$

where

$$L_0 = 10^{-54} m \tag{20}$$

the length of the electric dipole.[8] In this helix length one or more forces talantonion[12]

$$f_\tau = 10^{26} N \tag{21}$$

can be accumulated that determine the number of the fundamental E/M waves and the wavelength λ of the photon.

Therefore, all fundamental E/M waves, which are derived from the motion meridians[9,12] of the electron and have a constant photon length L and a wave length λ, compose the autonomous motion of E/M waves,[9] the so called photon. These fundamental E/M waves (Fig. 2), which compose the photon, have a interchangeable spin ($s = +1$ or $s = -1$) and depending on their number (odd or even) the photon spin becomes $s = \pm 1$ (Eq. 17) or

$$s = 0. \tag{22}$$

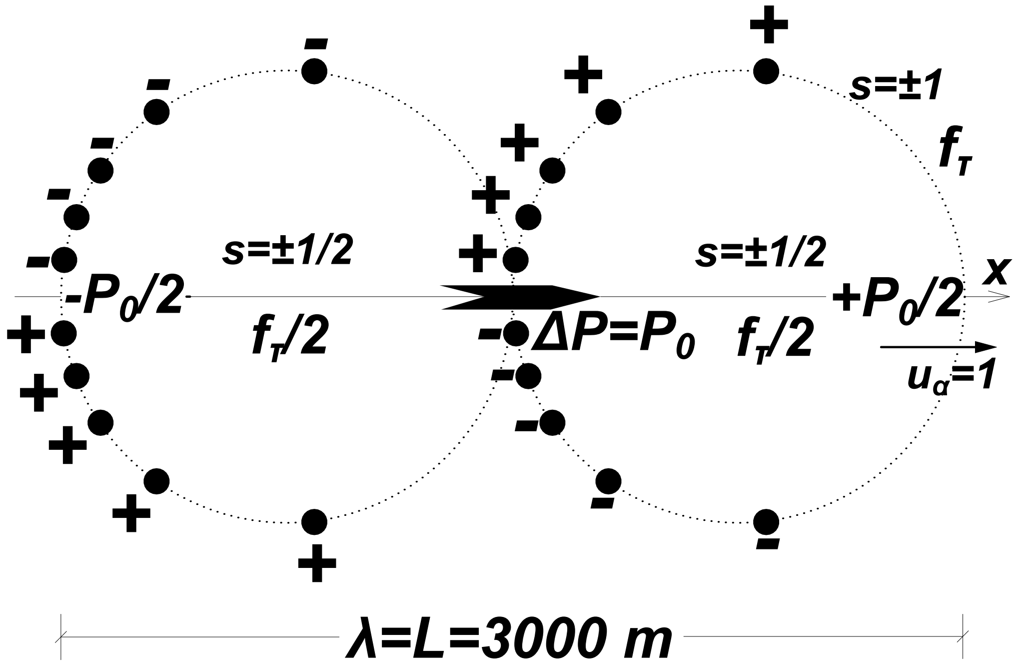

Figure 2. The two E/M formations compose the fundamental E/M wave[9] with electric charges[10] $Q = \pm e$, a spin $s = +1/2{+}1/2 = +1$ or $s = -1/2{-}1/2 = -1$, an accumulated force of one talantonion[9,12] ($f_\tau = f_\tau/2 + f_\tau/2$) and a wavelength[9] $\lambda = L = 3000$m

So, the E/M wave is constituted of rotational spindles, whose the opposite electric charges ($Q = \pm e$, Eq. 16) give zero magnetic dipole moment. Therefore, the E/M wave is the only formation that has a spin and not magnetic dipole moment, but it has the extra spin value $s = 0$ (Eq. 22).

5. References

[1] N.I.Gosdas, *The Unified Theory of Dynamic Space*, Greek Edition (Trohalia, Athens, 1999).

[2] M.Tzoumpas, *Hubble's Law and antigravity - Higgs boson and gravity*, http://viXra.org/abs/1710.0082 [Quantum Gravity and String Theory].

[3] M.Tzoumpas, *What is de Broglie's wave-particle?*, http://viXra.org/abs/1806.0248 (section 1) [Quantum Gravity and String Theory].

[4] M.Tzoumpas, *What is the spin of the particles?*, http://viXra.org/abs/1810.0281 [High Energy Particle Physics].

[5] M.Tzoumpas, *Inverse (inner) and outer electric field of electrically charged particles as fourth and fifth space deformation*, http://viXra.org/abs/1503.0210 (section 1) [Quantum Gravity and String Theory].

[6] R.A.Serway, C.J.Moses, C.A.Moyer, *Modern Physics*, English Edition (Saunders College Publishing, 1989).

[7] M.Tzoumpas, *Time as motion phenomenon - Physics Laws do not apply to inertial systems*, http://viXra.org/abs/1802.0372 (section 2) [Relativity and Cosmology].

[8] M.Tzoumpas, *Hubble's Law and antigravity - Higgs boson and gravity*, http://viXra.org/abs/1710.0082 (subsection 2.1) [Quantum Gravity and String Theory].

[9] M. Tzoumpas, *The structure of autonomous motion - E/M waves*, http://viXra.org/abs/1511.0025 (section 1) [Quantum Gravity and String Theory].

[10] M.Tzoumpas, *The alternative Schrödinger's equation*, http://viXra.org/abs/1812.0313 (section 2) [Quantum Gravity and String Theory].

[11] M.Tzoumpas, *What is de Broglie's wave-particle?*, http://viXra.org/abs/1806.0248 (section 2) [Quantum Gravity and String Theory].

[12] M.Tzoumpas, *Time as motion phenomenon - Physics Laws do not apply to inertial systems*, http://viXra.org/abs/1802.0372 (sections 3 and 4) [Relativity and Cosmology].