What is the magnetic moment of electron spin?

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Abstract. According to the unified theory\textsuperscript{1,2} of dynamic space the inductive-inertial phenomenon\textsuperscript{3} has been developed, forming the grouping\textsuperscript{3} units (namely electric charges or forms of the electric field). Moreover, with the surface electric charges\textsuperscript{4} of the electron cortex its inverse electric fields\textsuperscript{5} are formed. By the above phenomena the actual theoretical value of the magnetic dipole moment of electron spin\textsuperscript{3} is proved as equal to the experimental measurement.\textsuperscript{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
\[ \mu_B = \frac{e\hbar}{2m}, \]
the so called Bohr’s magneton,\textsuperscript{6} has been calculated from
\[ \mu = IA, \]
where
\[ I = \frac{e}{T} = i \]
is the electric intensity,
\[ A = \pi r^2 \]
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
\[ \mu = IA = iA = \frac{A}{T}e \Rightarrow \mu = \frac{A}{T}e. \]
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The orbital momentum of the electron is

$$L = pr = mur \Rightarrow L = mur,$$  \hspace{1cm} (6)

where $p$ its impulse momentum, $m$ its mass and

$$u = \frac{2\pi r}{T}.$$  \hspace{1cm} (7)

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

$$L = mur = m \frac{2\pi r}{T} = 2m \frac{\pi r^2}{T} = 2m \frac{A}{T} \Rightarrow \frac{A}{T} = \frac{L}{2m}$$  \hspace{1cm} (8)

and replacing in Eq. 5 it is

$$\mu = \frac{eL}{2m}.$$  \hspace{1cm} (9)

However, the quantum orbital momentum is

$$L = \hbar = \frac{\hbar}{2\pi},$$  \hspace{1cm} (10)

where $\hbar$ 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 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

$$\mu_i = \frac{q_i L_i}{2m_i}.$$  \hspace{1cm} (11)

Therefore,

$$\mu_s = \Sigma \mu_i = \frac{eS}{2m} \Rightarrow \mu_s = \frac{eS}{2m}$$  \hspace{1cm} (12)

is the theoretical magnetic dipole moment of the electron spin, according to the modern Physics.  \hspace{1cm} (12)

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

$$\mu_s = \frac{eS}{m},$$  \hspace{1cm} (13)

namely without the number 2 in the denominator, the so called g-factor.  \hspace{1cm} (13)
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 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\(^3\) 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](image.png)

**Figure 1.** Interpretation of the magnetic dipole moment of the electron spin,\(^3\) with its grouping units\(^3\) of the orbital electron (a) and with its inverse 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.
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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

$$I = \frac{e}{T/2} = 2i.$$  \hspace{1cm} (14)

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

$$\mu_s = IA = 2iA = \frac{A}{T/2}e = \frac{2A}{T}e \Rightarrow \mu_s = \frac{eS}{m}.$$  \hspace{1cm} (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\(^10\)

$$Q = \pm e$$  \hspace{1cm} (16)

for each spindle with a total spin

$$s = \pm 1,$$  \hspace{1cm} (17)

of a constant photon length\(^9,11\)

$$L = 3000m = 10^{58}L_0$$  \hspace{1cm} (18)

and a constant helix length\(^9,11\)

$$\pi L = \pi 3000m = \pi L_010^{58},$$  \hspace{1cm} (19)

where

$$L_0 = 10^{-54}m$$  \hspace{1cm} (20)

the length of the electric dipole.\(^8\) In this helix length one or more forces talantonion\(^12\)

$$f_r = 10^{26}N$$  \hspace{1cm} (21)

can be accumulated that determine the number of the fundamental E/M waves and the wavelength $\lambda$ 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 $\lambda$, 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

$$s = 0.$$  \hspace{1cm} (22)
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\[
\Delta P = P_0 f_{\tau}/2
\]

\[
\lambda = L = 3000 \, m
\]

**Figure 2.** The two E/M formations compose the fundamental E/M wave with electric charges \( Q = \pm e \), a spin \( s = +1/2 + 1/2 = +1 \) or \( s = -1/2 - 1/2 = -1 \), an accumulated force of one talantonion \( \lambda = L = 3000 \, m \) and a wavelength \( \lambda = L = 3000 \, m \)

So, the E/M wave is constituted of rotational spindles, whose the opposite electric charges \( (Q = \pm e, \text{Eq. 16}) \) 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

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