Emission & Absorption of Photons (Part II)[1]

(Electric Charge & Speed of the Extended Electron in Magnetic Field)

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Abstract

In this part II , we will discuss the influence of the emission & absorption of photons on the electric charge and speed of the extended electron when it is subject to an applying magnetic field **B** .

1/ Where does the factor b come from ?

First let's recall [2] that when the extended electron moves normally to the magnetic field **B** , two magnetic forces **F** and **F'** are produced on the electron as shown in Fig.1 :

$$\mathbf{F} = (\mu - 1)\, q\, \mathbf{V}\, \mathbf{B} \sum_{i=1}^{n} \sin\alpha_i \sin\beta_i \cos\gamma_i \quad , \quad \mu > 1 \qquad (1)$$

is the net force produced on **n surface dipoles** of the electron ; **F** points to the right of the observer as shown in Fig.1 , hence it is regarded as a positive force ; and thus ,

the sum $\sum_{i=1}^{n} \sin\alpha_i \sin\beta_i \cos\gamma_i > 0$

$$\mathbf{F'} = -\mu\, q_0\, \mathbf{V}\, \mathbf{B} \qquad (2)$$

is the force produced on the core $-q_0$: **F'** is always negative , i.e., **F'** points to the left of the observer as shown in Fig.1

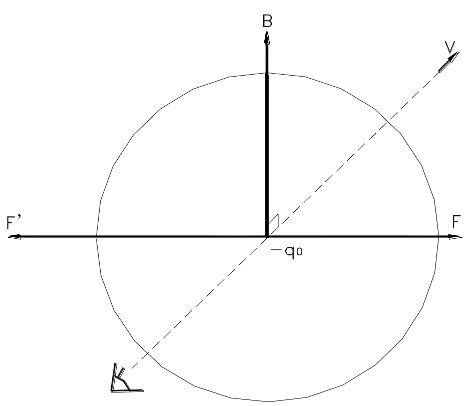

Fig.1 : $\mathbf{V} \perp \mathbf{B}$; $\mu > 1$

F is positive and **F'** is negative .

Fm = F + F' is the net magnetic force produced on the electron .

So , the net magnetic force **Fm** produced on the extended electron when it moves normally to the magnetic field **B** is the sum **Fm = F + F'** .

$$Fm = F + F' = (\mu - 1)\, q\, V\, B \sum_{i}^{n} \sin\alpha_i \sin\beta_i \cos\gamma_i - \mu\, q_0\, V\, B \qquad (3)$$

or
$$Fm = [\, (\mu - 1)\, (q / q_0) \sum_{i}^{n} \sin\alpha_i \sin\beta_i \cos\gamma_i - \mu \,]\, q_0\, V\, B \qquad (4)$$

In Eq.(4) we set
$$\boxed{b \equiv (q / q_0) \sum_{i}^{n} \sin\alpha_i \sin\beta_i \cos\gamma_i} \qquad (5)$$

b is thus a dimensionless , positive number because the sum $\sum_{i}^{n} \sin\alpha_i \sin\beta_i \cos\gamma_i > 0$;

b represents the **physical structure** of the extended electron in the magnetic field **B** .

Eq.(1) becomes $F = (\mu - 1)\, b\, q_0\, V\, B$ (6)

Eq.(4) becomes $Fm = [\, \mu\, (b-1) - b\,]\, q_0\, V\, B$ (7)

Since **F** and **F'** depend on μ , when $\mu = b / (b-1)$: **F = - F'** $= [\, b / (b-1)\,]\, q_0\, V\, B$
or **Fm = F + F'** = 0 . Since $\mu > 1$, $\mu = b / (b-1)$ means $b > 1$ (8)

In the part I [1] we have accepted the idea that **when the electron emits photons , it loses some of its electric dipoles ; and when it absorbs photons , it gains more electric dipoles from the irradiating source . Since the factor b contains n surface dipoles (or photons) , it can be related to the emission & absorption of photons of the electron as demonstrated below .**

2/ How does the factor b change in the emission & absorption of photons

From Eq.(7) the effective electric charge Q of the extended electron can be deduced as

$$Q = [\, \mu\, (b-1) - b\,]\, q_0 \qquad \text{since} \quad Fm = Q\, V B \qquad (9)$$

Experiments have showed that when the electron is injected normally to the magnetic field **B ,** the electron is deflected to the left of the observer (who stands in the direction of **B** and looks at the electron in the direction of **V** as shown in Fig.1) . This means that Q in Eq.(9) is a negative number . And hence the magnitude |Q| is :

$$|Q| = [\, b - \mu\, (b-1)\,]\, q_0 \quad , \text{where} \quad [\, b - \mu\, (b-1)\,] > 0 \qquad (10)$$

Let us recall that in the previous article [3] we have obtained the general expression for the effective electric charge $|Q|$ of the electron when it is subject to an applying field that is represented by the real number $N \geq 0$.

$$|Q| = (1 - v^2 / c^2)^{N/2} q_0 \tag{11}$$

From Eq.(10) and Eq.(11) we get

$$[b - \mu (b-1)] = (1 - v^2 / c^2)^{N/2} \tag{12}$$

and hence

$$v^2 / c^2 = 1 - [b - \mu (b-1)]^{2/N} \tag{13}$$

Now from Eq.(13) let 's take derivative of v^2 / c^2 with respect to b , we get

$$d (v^2 / c^2) /db = (- 2 / N) [b - \mu (b-1)]^{(2/N) - 1} (1 - \mu) \tag{14}$$

Since $(- 2 / N)$ and $(1 - \mu)$ are negative , $[b - \mu (b-1)]^{(2/N) - 1} > 0$, we get

$$d (v^2 / c^2) /db > 0 \tag{15}$$

Expression (15) proves that v^2 / c^2 **is monotonic increasing with respect to** b **;** this means that if b increases , v^2 / c^2 increases ; and conversely , if b decreases , v^2 / c^2 decreases .

Physicists have long known that electrons **slow down** when they radiate in the accelerators like cyclotron or synchrotron ; and they **speed up** when they are irradiated in photoelectric effect . So , by combining this experimental evidence about the speed of the electron with the factor b , we come up with the following result :

- in the emission of photons (radiation) : electrons slow down , and b decreases . (16)

- in the absorption of photons : electrons speed up , and b increases . (17)

3/ How does the electric charge |Q| change in the emission & absorption of photons ?

With the intermediary of the factor b we can determine the change of $|Q|$:
From Eq.(10) let ' s take derivative of $|Q|$ with respect to b , we get :

$$d |Q| / db = q_0 (1 - \mu) < 0 \quad \text{since} \quad \mu > 1 \tag{18}$$

Eq.(18) proves that $|Q|$ **is monotonic decreasing with respect to the factor b** . This means that , if b decreases , $|Q|$ increases ; and conversely , if b increases , $|Q|$ decreases . (19)

Now , let 's combine three statements (16) , (17) and (19) , we get the final result :

- in the emission of photons (radiation) : n decreases , electrons slow down , b decreases , and $|Q|$ increases (in the direction to q_0) . (20)

- in the absorption of photons : n increases , electrons speed up , b increases , and $|Q|$ decreases (in the direction to zero) . (21)

What are limits of $|Q|$ in the emission & absorption of photons ?
Since v varies in the interval (0 , c) , Eq.(11) gives the limits of $|Q|$:
when $v = 0$, $|Q| = q_0$
when $v \rightarrow c$, $|Q| \rightarrow 0$
So , $0 < |Q| < q_0$ (22)

The changeability of the electric charge Q of the electron in external fields and in the radiation & absorption is a new concept that the theory of the extended electron is trying to demonstrate .

Conclusion

Electrons are enigmatic particles , their emission & absorption of photons forever remain as secrets of the Nature . We absolutely have no hope of really understanding those phenomena by our theory , no matter how sophisticated it may be . Our speculations can only guess and describe the superficial cover of those secrets : this is the definite limitation of the human mind .

References

[1] Part I : " Emission & Absorption of Photons (Electric Charge & Speed of the Extended Electron in Electric Field) " . vixra : 2202.0135

[2] " Extended Electron in Constant Magnetic Field " . vixra : 1309.0105

[3] " Electron's mass and electric charge, which one changes with velocity ? ". vixra :1304.0066