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Theoretical Study for Some Physical Concept

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Abstract: This study aims to verify the possibility of converting the charge into energy as is the case in converting the mass into a charge according to the law of the relationship between the charge and the mass of Einstein, as well as calculating the wavelength accompanying the charge carried by the moving charged body, as well as studying the phenomenon of producing a pair more deeply.

Keywords: Charge; wavelength; Energy; pair production.

Introduction

The interpretation of pair production phenomenon by depending upon Einstein's relation is $E=mc^2$ which is obviously that couldn't take into consideration the charge of electron and positron (i.e., there is no explicit mathematical relation between energy and charge) to this phenomenon or generality. In this paper; we derive a relation that binds a charge with the energy to give us a mathematical competence form to get an exact description of this phenomenon [1-4].

Theory

Let us suppose that, there are two particles as shown in figure (1), each of them has a mass (m), and a charge (q), the distance (r) is the distance between the two particles. In such way that the magnitude of this charge makes the force between the two mass, gravitational forces (F_g) and electrical force (F_e) is equalizations].



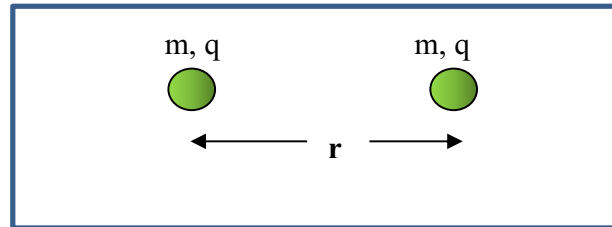


Figure (1): Two charged particles

Gravitational force is [5-8]:

$$F_g = \frac{G(m.m)}{r^2} \quad \dots \quad (1)$$

The electrical force is [9, 10]:

$$F_e = \frac{K(q.q)}{r^2} \quad \dots \quad (2)$$

As we assumed before:

$$F_g = F_e$$

Then:

$$\frac{G(m.m)}{r^2} = \frac{K(q.q)}{r^2} \quad \dots \quad (3)$$

$$Gm^2 = Kq^2$$

$$\therefore m = \pm \left(\sqrt{K/G} \right) \cdot q$$

Or:

$$m = \pm A \cdot q \quad \dots \quad (4),$$

$$A = \left(\sqrt{K/G} \right) = 1.16 \times 10^{10} \text{ kg/Coul.} \quad \dots \quad (5)$$

Energy and charge

Equation (4) shows an equivalence of the charge (q) with the mass (m) to act the same force, when the force is found that means ability to make a work, by Einstein's equation ($E=mc^2$) which means equivalent between energy and mass and opposite, like what happened in pair production (e^+ , e^-). Since the charge and mass has an equivalent relation ($m= \pm Aq$), then that

means the charge can change to mass and vice versa, or that means the charge can change to energy and vice versa as shown in equation (6).

By replacing we obtain: -

$$E=\pm Bq \quad \dots (6), \quad B=Ac^2 = 1.04 \times 10^{27} \text{ J/Coul.}$$

Equation (6) can explain the pair production (e^+ , e^-) phenomenon regarding the charge, which shows transform the energy to two charges of positron and electron (e^+ , e^-).

The energy transformation produced two equivalent different charges, energy to produce positron charge ($E_+=+Bq$) and energy for electron charge ($E_- = -Bq$), which clear by: -

$$E_+=+Bq \quad (\text{for positron}), \quad E_- = -Bq \quad (\text{for electron})$$

Hence: $E_+ + E_- = +Bq - Bq = 0$

The Pair production phenomenon produced two masses of the two particles, positron, and electron according to Einstein's relation ($E=2m_0 c^2$). But when we write [11]: -

$$E=2m_0 c^2 + Bq - Bq \quad \dots (7)$$

$$E = (m_0 c^2 - Bq)_e + (m_0 c^2 + Bq)_p \quad \dots (8)$$

There is nothing will change for Einstein's relation ($E=2m_0 c^2$), but the relation (8) gives more accurately describe the pair production phenomenon.

Which leads us to the question: - "Why the energy didn't change to two particles without charges...? or to one particle ...?" Hence that not protest with the meaning of the relation ($E=mc^2$). Equation (8) is the real form for pair production phenomenon which it is shown that reason. Hence the photons have an equivalent charge not doesn't have a charge.

When we try to explain the relation ($E=+Bq$), we can say that the positive charge can transform into energy when it is free. But this energy may be a different nature from the energy which we know, because the gamma photon in pair production produced by meeting two different charges, positive and negative together, but in ($E=+Bq$) the charge is positive.

((The kinetic energy of electron and positron (T) didn't take because it's not necessary for our subject, so the general relation is ($E = (m_0 c^2 + T - Bq)_e + (m_0 c^2 + T + Bq)_p$) where the first part is to the electron, and the another part is to the positron)).

When we can free or transform the positive charge to energy by that way, then that may mean obtaining on positive photons or positive nature photons.

If we suppose the energy relations applicable to these positive photons, then: -

$$E = hf, \quad E = Bq, \quad hf = Bq$$

$$\frac{hc}{\lambda} = Bq$$

$$\lambda = \frac{hc}{Bq} \quad \dots (9)$$

$$\lambda = \frac{1.9 \times 10^{-52}}{q} \quad \dots (10)$$

Relation (10) can help us to find the positive charge part of electromagnetic waves, which is equal to the value of the negative charge part, which it means the total charge equal to zero.

Wave and charge: -

As we know there is a wave caused by a moving mass of De-Broglie's equation [12-15]: -

$$\lambda_m = \frac{h}{mv}$$

By replacing eq.1 in De-Broglie's equation: -

$$\lambda = \frac{h}{Aqv}$$

Or

$$\lambda_q = \frac{5.7 \times 10^{-44}}{qv}$$

That means any moving charged particle must have two waves, one of them with it is mass ($\lambda_m = h/mv$), and another with it is charge $\lambda_q = \frac{5.7 \times 10^{-44}}{qv}$.

For example, the relation between them for an electron at any velocity is: ($\frac{\lambda_m}{\lambda_q} = 2 \times 10^{21}$), since the velocity of the charge wave is equal to the velocity of De-Broglie ($w = c^2/v$). The charge wave has no relation with the quantity of angular momentum ($mvr = h/2$), since (q) means the equivalent charge to the mass (m), not means the electron charge, and when we suppose ($Aqv = h/2$) then we will obtain the same results of Bohr.

Electric current and mass: -

As we know that a movement charge means an electric current, then can a movement mass make an electric current according to the relation ($m = Aq$) ..?

Hence: -

$$I = \frac{q}{t}$$

$$\text{Or: } I = \frac{m}{At}, \frac{1}{A} = 8.6 \times 10^{-11}$$

$$I = m \frac{8.6 \times 10^{-11}}{t}$$

This relation may be clear making an electric current that can be caused by a moving mass. But its very small, for example for an electric current if we calculate it for a million Ampere, which means one coulomb per a second, so we can calculate the No. of electrons by (total charge) =(electron charge).(No. of electrons)

$$\therefore \text{No. of electrons} = 6.25 \times 10^{24} \text{ electrons}$$

The total mass for that electrons = (mass of electron). (No. of electrons)

$$\therefore \text{The total mass of electrons} = 5.68 \times 10^{-6} \text{ kg}$$

By equation (6) we find the current of the total mass of electrons equal (4.88×10^{-16}) Amp. Which it's very small with respect to the electric current (10^6 Amp.).

So that:

The total electrical current (I) = electric current (I_q) + mass current (I_m)

$$\text{Or: } I = I_q + I_m$$

Then:

$$I = \frac{q}{t} + m \frac{8.6 \times 10^{-11}}{t}$$

That means the magnetic field for a moved charge particle (B) equal: ($B = B_q + B_m$),
Where: ($B_q = \mu \frac{I_q}{2\pi r}$), then:

$$B = \mu \frac{I_q}{2\pi r} + \mu \frac{I_m}{2\pi r}$$

$$\text{From equation (7): } I_m = m \frac{8.6 \times 10^{-11}}{t}$$

$$B = \mu \frac{I_q}{2\pi r} + \mu \cdot m \frac{8.6 \times 10^{-11}}{2\pi r t}$$

Conclusions:

- 1- The positive charge can transform into energy when it is free.
- 2- Einstein's relation ($E=2m_0 c^2$) must be taken as an equation ($((E= (m_0c^2+T-Bq)_e+(m_0c^2+T+Bq)_p))$).
- 3- Any moving charged particle must have two waves, one of them with it is mass ($\lambda_m=h/mv$), and another with it is charge $\lambda_q = \frac{5.7 \times 10^{-44}}{qv}$.
- 4- The total electrical current (I) =electric current (I_q) + mass current (I_m).

References

- 1 Ordin S. V., "Global Journal of Science Frontier Research: A Physics and Space Science", Vol. 19 Issue 1 Version 1.0 Year 2019.
- 2 Roberto D. L., Marco D. M., Salvatore E., Adele N.,", arXiv:1902.05799v1 [physics.hist-ph] 15 Feb 2019.
- 3 V. A. Etkin," Modified Coulomb law", WSN 87, 163-174, 2017.
- 4 G Spavieri, G T Gillies and M Rodriguez," Physical implications of Coulomb's Law", Institute Of Physics Publishing Metrologia, 41, S159–S170, 2004.
- 5 Jiro M. and Saki T., " Review of short-range gravity experiments in the LHC era", arXiv:1408.3588v2 [hep-ex] 19 Aug 2014.
- 6 Liang-Cheng T. and Jun L., " Experimental tests of Coulomb's Law and the photon rest mass", Institute of Physics Publishing Metrologia, 41, S136–S146, (2004).
- 7 Rodolfo A. Frino," Newton's Law of Universal Gravitation and the Scale Principle", 2014.
- 8 Piero B., "Mathematical Theory of Electromagnetism", University of Rome, "La Sapienza" Rome, Italy, Vol. 2 , 2009.
- 9 Stef V., Search for particles with fractional charges in Ice Cube based on anomalous energy loss", Chent University, 2018.
- 10 Robert J. Buenker," Exponentially Damped Breit-Pauli Hamiltonian for the Description of Positronium Decay and Other High-energy Processes", Molec. Phys. 77, 1095 , 1992.
- 11 A. PAzs, " Relative Parity of Charged and Neutral X-Particles", PH YSI CAL REVIEW Vol. 112, No. 2 October, 1958.
- 12 Alessandro De Angelis," Particle Physics: a First Course", IST Lisboa, 2011/12.
- 13 Carl. W Akerlof, Electron-positron pair production, 2012.
- 14 Young, H. D., University physics, 8yh.ed. Addison Wesley, reading, 1992.
- 15 F. Bucche, principles of physics, 1995.