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GRAVITATION FIELD AS ANNULED ELECTROMAGNETIC FIELD, I.E. GRAVITONS AS ENTAGLED PHOTONS

Abstract

The text has intention to show that gravitational field is special case of electromagnetic field, i.e. that gravitational field can be produced by annulments of two light beams. Regarding the theory it means that gravitons are nothing more then entangled photons where each photons couple makes a graviton.

It means that gravitational field is just a result of two entangled electric fields.

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1. EXPERIMENTAL EVIDENCE THAT GRAVITATIONAL FIELD IS JUST A SPECIAL CASE OF ELECTROMAGNETICAL FIELD

We all know that energy cannot be produced or destroyed. Consequently, there is a question what happened to light beams energy when two light beams start with mutual cancellation. Regarding Energy Conservation law, Magnetic induction and Hooper¹ coils' effect we can conclude that the lights cannot be annulled and that during the path of annulments the lights transmutes into something else. Consequently it is presumed that the light is able to transmute into gravitational field.

Basic principle of Hooper coils operation is shown on the following picture:

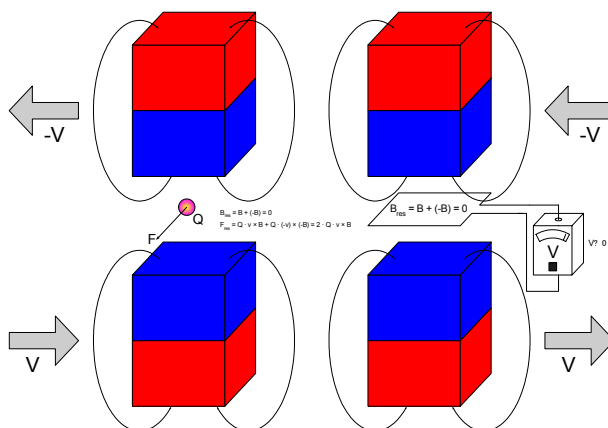


Fig. 1

¹ W. J. Hooper, U.S. Pat 3610971 & U.S. Pat 3656013, patented in 1972

Hooper had clearly showed that induction exists although there is no magnetic field on the level of non-moveable test contour, due to $\vec{E}_{\text{total}} = \vec{v} \times \vec{B} + (-\vec{v}) \times (-\vec{B})$, although it is $\vec{B}_{\text{total}} = \vec{B} + (-\vec{B}) = 0$.

2. SEMI ENTAGLED PHOTONS

If we have two sinusoidal light waves with slightly different frequencies, than resulting wave will have significant areas of low and high intensity. We are interested in those ones with low intensity.

Let we observe these two Laser's light beams:

$$I_1 = I_0 \cdot \text{SIN} \left(\omega \cdot \left(t - \frac{\ell}{c} \right) \right) \quad (1)$$

And

$$I_2 = I_0 \cdot \text{SIN} \left((\omega + \Delta\omega) \cdot \left(t - \frac{\ell}{c} \right) \right) \quad (2)$$

Superposition of these two beams is defined by the following formula:

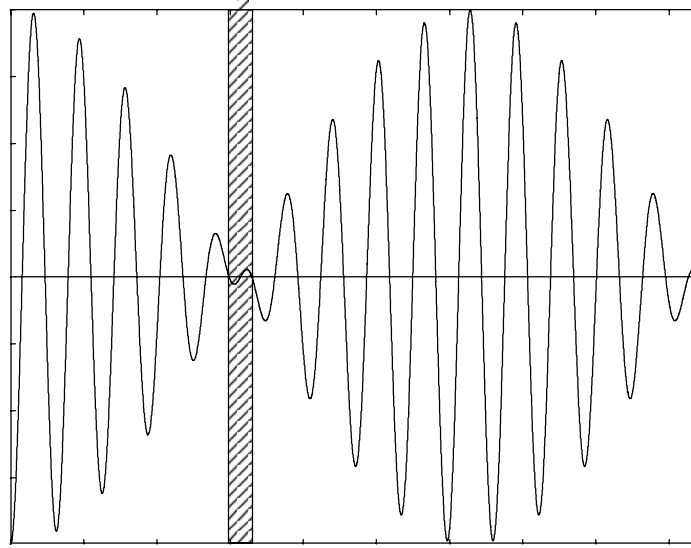
$$I_{1,2} = I_1 + I_2 = I_0 \cdot \left(\text{SIN} \left(\omega \cdot \left(t - \frac{\ell}{c} \right) \right) + \text{SIN} \left((\omega + \Delta\omega) \cdot \left(t - \frac{\ell}{c} \right) \right) \right) \quad (3)$$

Formula (3) could be simplified:

$$I_{1,2} = -2 \cdot \text{COS} \left(\omega \cdot \left(t - \frac{\ell}{c} \right) \right) \cdot \text{SIN} \left(\Delta\omega \cdot \left(t - \frac{\ell}{c} \right) \right) \quad (4)$$

If the difference between these two beams is small enough we will obtain the following wave intensity:

Fig. 2



We have to keep in mind that this is not function of transmutation of electric into magnetic field and vice versa, this is function of light beam intensity. Interaction with opaque barrier is extremely small on the low intensity intervals.

Photons belong to Fermions and thus they cannot fall in mutual interaction, neither two photons can collide each other regarding Pauli² principle of exclusion. Consequently there cannot be influence to any beam caused by overlapping. During the interval magnetic components of the beams and also their electric components are attenuated. Their energies cannot be lost also because the beams again appear immediately after the interval of annulments or after intersection region.

It is obvious that these two beams during interval of annulments must be transmuted into some other field.

Regarding reasons exposed further in the text (equations (12) to (39)) we can compose following equations of complex Electromagnetic wave:

$$i \cdot c \cdot \vec{\nabla} \times \vec{E}_c = - \frac{\partial \vec{E}_c^*}{\partial t} \quad (5)$$

Formula for gravitational wave is:

$$i \cdot c \cdot \vec{\nabla} \times \vec{G} = \frac{\partial \vec{G}^*}{\partial t} \quad (6)$$

Regarding law of energy conservation we have (see (98) to (105)):

$$\rho_{U_E} = \varepsilon \cdot \varphi_E \cdot \Delta \varphi_E = \varepsilon \cdot \vec{E}_c \cdot \vec{E}_c^* \quad (7)$$

² Wolfgang Pauli, 1900–1958

And

$$\rho_{U_{\vec{G}}} = 4 \cdot \pi \cdot \gamma \cdot \varphi_{\vec{G}} \cdot \Delta \varphi_{\vec{G}} = 4 \cdot \pi \cdot \gamma \cdot \vec{G} \cdot \vec{G}^* \quad (8)$$

While energy density must stay constant along the ray, we have to have:

$$\varepsilon \cdot \vec{E}_c \cdot \vec{E}_c^* = 4 \cdot \pi \cdot \gamma \cdot \vec{G} \cdot \vec{G}^* \quad (9)$$

Analysis of graviton's waves and energy production from originating photons is extremely difficult under presumption that maximal speed of propagation is constant and equal to c . Although two photons cannot interact after their annulments, their joined manifestation has to have greater speed than speed of light due to preservation of momentums:

$$|\vec{P}| = \frac{h}{\lambda} = \frac{h \cdot \nu}{c} \quad (10)$$

And

$$E = h \cdot \nu \quad (11)$$

Whereas:

- h = plank constant,
- c = speed of light,
- ν = photon's frequency or of other particle moving with light speed.

3. THE EXPERIMENT

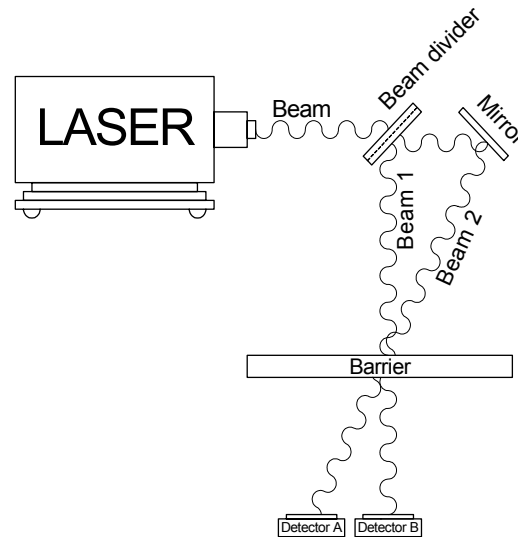
Experiment is very simple and it can be performed either with the beam divider or diffraction grid. Only the beam divider will be treated here.

4. LASER BEAM DIVIDER

Laser emits single beam into the crystal beam divider. One beam is routed directly to opaque barrier and the other beam (i.e. the second fraction of originating beam) is routed to the barrier, but in contra phase regarding the first beam. Every single beam is not able to penetrate the barrier. But if the beams were annulled at the lever of barrier than they both would be able to penetrate deeper into the barrier.

When either Beam 1 or Beam 2 is cut, the other one would not pass the barrier.

Fig. 3



Explanation of the phenomenon follows: In volume of light beams' annulments, both electromagnetic beams transmute into gravitational one that is able to pass through barrier because barrier is transparent for the new beam, i.e. for this new kind of radiation.

5. LIGHT BEAMS EQUALISER

The passed light beams are attenuated and also completely equal. Their unequal parts are thermally absorbed by barrier.

This device can be used as AND logic gate in optical computers and also like analog optic mirror of two light or microwave beams on thin opaque barrier as it is case with Widlerr current mirror.

6. MEDICAL LASER WITH DEFINET PATH OF TERMAL INTERACTION

It should be based on the presumptions exposed in the above text and thus it is a light LASER device that is able to produce light only on a certain length of path, i.e. it is possible for light to be emitted in a beam that will appear 5cm from the device and disappear 10cm from the device. If we apply trigonometric exposition to periodic pulse function we can made light beam with such characteristic by superposition of appropriate light's frequencies. On the first 5cm the light is actually a gravity beam regarding the hypothesis.

7. MAIN HYPOTHESIS

The main question is: what is going on with light energy when two light beams are annulled at the level of the opaque barrier. The only solution is that the lights are transmuted into some other kind of energy, and a few microns

deeper the new energy beam transmutes back to light again. Then the light can be absorbed by barrier. If the barrier is thin enough then the light is able to penetrate with small or negligible interaction.

Also annulments of two gravitational beams would lead us to originating field, i.e. back to electromagnetic waves. So, there is an iterative question whether the gravitational field is consisted of two canceled electric fields or electric field is consisted of two canceled gravitational fields.

8. GRAVITATIONAL EQUATION OBTAINED FROM MODIFIED MAXWELL FORMULAS

In the article it will be obtained an equation of gravitational field which is completely derived from the Maxwell³ ones.

Electric field attracts empty space and Gravity field rejects it on the same way the Magnetic one does, all regarding Meissner⁴ effect. The kind of the field's pole (+ or -) does not have influence to direction of the force acting on the empty space. It depends on the type of field only.

The gravitational and electrostatic fields both have similar formulas for their magnitudes. The formula for general field surrounding pole in E^3 space is:

$$\vec{A}_{t_p} = k \cdot \frac{p_2 \cdot (1 + (i-1) \cdot \delta_{1,t_p})}{\vec{r}^2} \cdot \frac{\vec{r}}{|\vec{r}|} \quad (12)$$

The general formula for mutual force acting to these two poles in E^3 space is:

$$\vec{F} = k \cdot \frac{(p_1 \cdot (1 + (i-1) \cdot \delta_{1,t_{p1}})) \cdot (p_2 \cdot (1 + (i-1) \cdot \delta_{1,t_{p2}}))}{\vec{r}^2} \cdot \frac{\vec{r}}{|\vec{r}|} \quad (13)$$

Whereas:

- p = quantity value of the pole charge,
- k = constant of the field,
- t_p = type of field and it is 0 or 1: the 0 is value for electrostatic, and the 1 is value for the magnetic and gravitational fields,
- r = radius between poles,
- i = $\sqrt{-1}$, i.e. imaginary unit,
- $\delta_{x,y} = \begin{cases} 1, & x = y \\ 0, & x \neq y \end{cases}$

³ James Clerk Maxwell, 1831-1879

⁴ Meissner-Ochsenfeld effect is discovered by Walter Meissner and Robert Ochsenfeld in 1933.

Using Archimedes⁵ force formula it can be derived a force of repulsion of globe without the field from the pole:

$$\vec{F} = \oint_S \vec{P} \cdot d\vec{S} = \int_V \vec{\nabla} P \cdot dV = \int_V \vec{\nabla} \left(\frac{dU}{dV} \right) \cdot dV = \int_V \vec{\nabla} \left(\frac{\left(k \cdot \frac{p \cdot (1 + (i-1) \cdot \delta_{1,t_p})}{r^2} \right)^2}{8 \cdot \pi \cdot k} \right) \cdot dV \quad (14)$$

Whereas:

- p = the charge of the field's pole,
- t_p = type of the field, $t_p \in [0, 1]$,
- d = the distance from the center of vacuum globe to field's pole,
- r = radius of the vacuum globe.

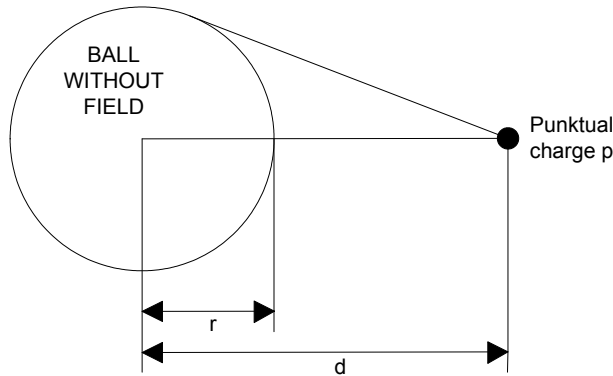
Solution of equation (14) is:

$$F = k \cdot \frac{p^2 \cdot (-1)^{t_p}}{4} \cdot \left(\frac{r \cdot (d^2 + r^2)}{d \cdot (d^2 - r^2)^2} - \frac{\text{Ln} \left(\frac{d+r}{d-r} \right)}{2 \cdot d^2} \right) \quad (15)$$

With an observation to formulas for mechanics, changing direction of time would be identical to change of sign of t_p in formula (15).

If we imagine two equally charged poles that are mutually rambling due to their repulsing force of interaction and after a while we change time arrow, situation becomes identical to interaction of two masses – these two charges would start with mutual attraction, just as they are gravitational masses.

Fig. 4



Now, we can form the Maxwell equations that deal with gravitational field by changing direction of time's axe only.

First Maxwell equation is:

$$\vec{\nabla} \times \vec{E} = - \frac{\partial \vec{B}}{\partial t} \quad (16)$$

⁵ Archimedes, 287 BC – 212 BC

The second one is:

$$\vec{\nabla} \times \vec{B} = \frac{1}{c^2} \cdot \frac{\partial \vec{E}}{\partial t} \quad (17)$$

For the case of electromagnetic field, connection between energy density and the magnitude of field officially are given by:

$$\rho_{U_E} = \frac{\epsilon \cdot \vec{E}^2}{2} \quad (18)$$

And

$$\rho_{U_B} = \frac{\vec{B}^2}{2 \cdot \mu} \quad (19)$$

Although there are some evidences indicating that equations (103) and (105) are valid instead of (18) and (19) ones.

If we change direction of time in (16) and (17) we will obtain the case of gravitation field:

$$\vec{\nabla} \times \vec{G} = \frac{\partial \vec{D}}{\partial t} \quad (20)$$

And

$$\vec{\nabla} \times \vec{D} = -\frac{1}{c_\gamma^2} \cdot \frac{\partial \vec{G}}{\partial t} \quad (21)$$

Whereas c_γ is speed of gravity field that does not necessarily have to be equal to speed of light c although there exists strong physical reasons to be so.

An additional equation is:

$$\vec{\nabla} \cdot \vec{G} = -4 \cdot \pi \cdot \gamma \cdot \rho \quad (22)$$

Whereas ρ is mass density and γ is gravitational constant.

Formula for gravitational field's energy density is analogous to (18) and (19) and it has to be:

$$\rho_{U_G} = 2 \cdot \pi \cdot \gamma \cdot \vec{G}^2 \quad (23)$$

If we choose the same ratio of energy density, we obtain:

$$4 \cdot \pi \cdot \gamma \cdot \zeta = \frac{1}{c_\gamma^2} \quad (24)$$

Now we have:

$$\rho_{U_D} = \frac{\vec{D}^2}{2 \cdot \zeta} \quad (25)$$

The dynamic gravitational field is not defined yet, so any unite could be chosen for it. More convenient form is the one where dynamic gravity field has

same energy density as static gravity field because the case leads us right to symmetric (20) and (21) equations:

$$\vec{\nabla} \times \vec{G} = \frac{1}{c_\gamma} \cdot \frac{\partial \vec{D}_a}{\partial t} \quad (26)$$

And

$$\vec{\nabla} \times \vec{D}_a = -\frac{1}{c_\gamma} \cdot \frac{\partial \vec{G}}{\partial t} \quad (27)$$

Whereas:

$$\vec{D} = \frac{1}{c_\gamma} \cdot \vec{D}_a \quad (28)$$

Equation (25) becomes:

$$\rho_{U_{\vec{D}_a}} = \frac{\vec{D}_a^2}{2 \cdot c_\gamma^2 \cdot \zeta} = \frac{\vec{D}_a^2}{2 \cdot \zeta_a} \quad (29)$$

Equation (24) becomes:

$$4 \cdot \pi \cdot \gamma \cdot \zeta_a = 1 \quad (30)$$

Regarding formula (30), equation (29) should be written in the following form:

$$\rho_{U_{\vec{D}_a}} = \frac{\vec{D}_a^2}{2 \cdot \zeta_a} = 2 \cdot \pi \cdot \gamma \cdot \vec{D}_a^2 \quad (31)$$

And that is the same form as equation (23). If we assume that dynamic part of gravitational field $\vec{D}_a$ is only an imaginary part of complete field, i.e. that is:

$$\vec{G}_{im} = \vec{D}_a \quad (32)$$

Then equations (26) and (27) can be written in following forms:

$$\vec{\nabla} \times \vec{G}_{re} = \frac{1}{c_\gamma} \cdot \frac{\partial \vec{G}_{im}}{\partial t} \quad (33)$$

And

$$\vec{\nabla} \times \partial \vec{G}_{im} = -\frac{1}{c_\gamma} \cdot \frac{\partial \vec{G}_{re}}{\partial t} \quad (34)$$

After equation (34) is multiplied with imaginary unit i and then added to equation (33), we obtain the final equation of gravitation wave:

$$\boxed{i \cdot c_\gamma \cdot \vec{\nabla} \times \vec{G} = \frac{\partial \vec{G}}{\partial t}} \quad (35)$$

Approximation of above equation for moving mass is:

$$\mathbf{c}_\gamma \cdot \vec{\mathbf{G}} = \mathbf{i} \cdot \vec{\mathbf{G}} \times \vec{\mathbf{v}} \quad (36)$$

Regarding (23) and (31) formula for total energy density is:

$$\rho_U = 2 \cdot \pi \cdot \gamma \cdot (\vec{\mathbf{G}}_{\text{re}}^2 + \vec{\mathbf{G}}_{\text{im}}^2) = 2 \cdot \pi \cdot \gamma \cdot \vec{\mathbf{G}} \cdot \text{CONJ}(\vec{\mathbf{G}}) = 2 \cdot \pi \cdot \gamma \cdot \vec{\mathbf{G}} \cdot \vec{\mathbf{G}}^* \quad (37)$$

I.e.:

$$\rho_U = 2 \cdot \pi \cdot \gamma \cdot \vec{\mathbf{G}} \cdot \text{CONJ}(\vec{\mathbf{G}}) \quad (38)$$

Formula (22) becomes:

$$\boxed{\vec{\nabla} \cdot \vec{\mathbf{G}} = -4 \cdot \pi \cdot \gamma \cdot (\rho_{\text{re}} + \mathbf{i} \cdot \rho_{\text{im}})} \quad (39)$$

This shows that there are no existing monopoles of dynamic gravitational field for all speeds less than c_γ free in nature, just as it is the case with electrostatic and magnetic monopoles (see reference 3).

9. INFLUENCE OF POSSIBLY WRONG SIGN IN A MAXWELL EQUATION TO GRAVITATIONAL EQUATION

If we accept that Maxwell equation (5) has wrong sign, than correct forms of Maxwell equations are:

$$\vec{\nabla} \times \vec{\mathbf{E}} = \frac{\partial \vec{\mathbf{B}}}{\partial t} \quad (40)$$

And:

$$\mathbf{c}^2 \cdot \vec{\nabla} \times \vec{\mathbf{B}} = \frac{\partial \vec{\mathbf{E}}}{\partial t} \quad (41)$$

After the same procedure used for derivation of equation (35) is applied to (40) and (41), following formula for complex gravitational field is obtained:

$$\boxed{\mathbf{i} \cdot \mathbf{c} \cdot \vec{\nabla} \times \vec{\mathbf{G}} = \frac{\partial \vec{\mathbf{G}}^*}{\partial t}} \quad (42)$$

Whereas $\vec{\mathbf{G}}^* = \text{CONJ}(\vec{\mathbf{G}})$.

The difference between equations (35) and (48) is in their right parts: equation (48) has its right part conjugated. The conjugation is more acceptable in physical sense because conjugation exists in Poynting formula too, and thus Poynting⁶ vector has following form:

$$\vec{P}_\gamma = \frac{dW}{d\vec{S}} = \frac{4 \cdot \pi \cdot \gamma \cdot i}{c_\gamma^3} \cdot \vec{G} \times \vec{G}^* \quad (43)$$

Where are:

- W = energy,
- $\vec{S}$ = surface,
- γ = gravitational constant,
- c_γ = speed of gravity, probably equal to speed of c.
- i = imaginary unit,
- $\vec{G}$ = complex gravitational field.

Otherwise Poynting vector would be identically equal to zero in case of “right” sign of the Maxwell’s equation.

Energy density is given by the following equation:

$$\rho_{U_\vec{G}} = 4 \cdot \pi \cdot \gamma \cdot \varphi_{\vec{G}} \cdot \Delta \varphi_{\vec{G}} = 4 \cdot \pi \cdot \gamma \cdot \vec{G} \cdot \text{CONJ}(\vec{G}) \quad (44)$$

Above equation is derived in regards with equation (103).

10. ORIGIN OF GRAVITATIONAL FIELD

As it is already said, the basic premise in the article is that gravitational field has origin in annullments of electrostatic ones. It is based on hypothesis that fields of real poles cannot be annulled – only effect that can be achieved is annullments of resulting force produced by sum of fields from various sources acting to a particular charge.

Further theoretical examination shows that the real origin of gravitational field may have origin in the cinematic energy of rotation because part of potential energy of ionization is spent to a mechanical work of rotation and the rest is transformed into potential energy and radiation quant, i.e. in a photon.

Regarding the Hooper coil’s experiments, we can conclude that those annullments fields can produce secondary effects although their forces are annulled when there exists nontrivial curl solutions of the fields – and that is just a case with rotating fields. It should be true because we have same effect in electromagnetic induction caused by electrically neutral conductors: in the area of induction there is no electric field due to electrically neutral conductors, but certainly there is magnetic field, indeed.

This theory predicts that free charged particles does not have gravitational field. The research done on Stanford University showed that electron in Penning trap is not influenced by the gravitational field at all.

⁶ John Poynting, 1852 – 1914.

11. CORRECTIONS OF MAXWELL EQUATIONS

In the previous chapter it is assumed that one Maxwell equation has wrong sign. In the further text the hypothesis will be checked by reversal derivation of Maxwell equations from the Faraday⁷ law of electromagnetic induction, Biot⁸-Savart⁹ law and Coulomb¹⁰ law.

Faraday's law is given by the following equation:

$$U = - \frac{\partial \Phi}{\partial t} \quad (45)$$

Whereas:

- U = electrical potential,
- Φ = magnetic flux,
- t = time.

Formula of Biot-Savart law is:

$$d\vec{B} = \frac{\mu}{4 \cdot \pi} \cdot \frac{I \cdot d\vec{\ell} \times \hat{r}}{r^2} \quad (46)$$

Whereas:

- $\vec{B}$ = magnetic field,
- μ = magnetic permeability,
- I = electrical current,
- ℓ = length,
- $\vec{r}$ = radius vector,
- $\hat{r}$ = normalized radius vector, i.e. $\frac{\vec{r}}{|\vec{r}|}$.

Coulomb law is:

$$\vec{F}_{1,2} = - \frac{1}{4 \cdot \pi \cdot \varepsilon} \cdot \frac{Q_1 \cdot Q_2}{r^2} \cdot \hat{r} \quad (47)$$

Whereas:

- $\vec{F}_{1,2}$ = force between two charged bodies,
- Q_1 = first charge,
- Q_2 = second charge,
- ε = electrostatic permeability,
- $\vec{r}$ = distance vector,
- $\hat{r}$ = normalized distance vector – unit vector, i.e. $\hat{r} = \frac{\vec{r}}{|\vec{r}|}$.

⁷ Michael Faraday, 1791-1867

⁸ Jean-Baptiste Biot, 1774-1862

⁹ Felix Savart, 1791-1841

¹⁰ Charles Coulomb, 1736-1806

Regarding formula (47) we can derive following formula for electric field from the definition of field intensity:

$$\vec{E}_1 = \frac{\vec{F}_{1,2}}{Q_2} = -\frac{1}{4 \cdot \pi \cdot \varepsilon} \cdot \frac{Q_1}{\vec{r}^2} \cdot \hat{r} \quad (48)$$

Whereas:

- $\vec{F}_{1,2}$ = force between two charged bodies,
- $\vec{E}_1$ = electric field of the first body,
- Q_1 = first charge given in coulombs,
- ε = electrostatic permeability of medium,
- $\vec{r}$ = distance vector,
- $\hat{r}$ = normalized distance vector – unit vector, i.e. $\frac{\vec{r}}{|\vec{r}|}$.

Finally:

$$\vec{E} = -\frac{1}{4 \cdot \pi \cdot \varepsilon} \cdot \frac{Q}{\vec{r}^2} \cdot \hat{r} \quad (49)$$

Connection between voltage potential U and electric field $\vec{E}$ is given by the following equation:

$$\vec{E} = -\vec{\nabla}U \quad (50)$$

I.e.

$$U_{a,b} = U_b - U_a = \int_a^b \vec{E} \cdot d\vec{\ell} \quad (51)$$

Definition's formula of magnetic flux is:

$$\Phi = \iint_S \vec{B} \cdot d\vec{S} \quad (52)$$

Regarding (45), (50) and (52) we can compute circular integral over the contour:

$$\oint_{\ell} \vec{E} \cdot d\vec{\ell} = -\frac{\partial}{\partial t} \iint_S \vec{B} \cdot d\vec{S} \quad (53)$$

The following transformation is always possible:

$$\oint_{\ell} \vec{E} \cdot d\vec{\ell} = \iint_S \vec{\nabla} \times \vec{E} \cdot d\vec{S} \quad (54)$$

Regarding (53) and (54) is obtained:

$$\iint_S \vec{\nabla} \times \vec{E} \cdot d\vec{S} = -\frac{\partial}{\partial t} \iint_S \vec{B} \cdot d\vec{S} \quad (55)$$

If we assume that there is no relativistic transformation of surface perpendicular to velocity we can move derivation into integral, than we are able to directly obtain first Maxwell equation:

$$\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t} \quad (56)$$

It means that Faraday's equation is completely identical to the incomplete form of first Maxwell's equation.

We can do that with an additional operator's relation that is always valid in E^3 space:

$$\frac{d}{dt} = \frac{\partial}{\partial t} + (\vec{v} \cdot \vec{\nabla}) \quad (57)$$

I.e.

$$\frac{\partial}{\partial t} = \frac{d}{dt} - (\vec{v} \cdot \vec{\nabla}) \quad (58)$$

Whereas $\vec{v}$ is velocity vector. Regarding (58) equation (56) becomes:

$$\vec{\nabla} \times \vec{E} = (\vec{v} \cdot \vec{\nabla}) \cdot \vec{B} - \frac{d\vec{B}}{dt} \quad (59)$$

There is also a general vector identity:

$$\vec{\nabla} \times (\vec{A} \times \vec{B}) = \vec{A} \cdot \vec{\nabla} \vec{B} - \vec{B} \cdot \vec{\nabla} \vec{A} + (\vec{B} \cdot \vec{\nabla}) \cdot \vec{A} - (\vec{A} \cdot \vec{\nabla}) \cdot \vec{B} \quad (60)$$

The above equation could be transformed into more suitable form:

$$(\vec{B} \cdot \vec{\nabla}) \cdot \vec{A} = -\vec{A} \cdot \vec{\nabla} \vec{B} + \vec{B} \cdot \vec{\nabla} \vec{A} + (\vec{A} \cdot \vec{\nabla}) \cdot \vec{B} + \vec{\nabla} \times (\vec{A} \times \vec{B}) \quad (61)$$

Regarding equation (61), the equation (59) could be written in the following form:

$$\vec{\nabla} \times \vec{E} = \vec{\nabla} \times (\vec{B} \times \vec{v}) + (\vec{B} \cdot \vec{\nabla}) \cdot \vec{v} + (\vec{v} \cdot \vec{\nabla}) \cdot \vec{B} - \vec{B} \cdot (\vec{v} \cdot \vec{\nabla}) - \frac{d\vec{B}}{dt} \quad (62)$$

When $\vec{B}$ field is homogenous and $\vec{v}$ is constant in time, equation (62) becomes:

$$\vec{\nabla} \times \vec{E} = \vec{\nabla} \times (\vec{B} \times \vec{v}) \quad (63)$$

⇒

$$\vec{E} = \vec{B} \times \vec{v} = -\vec{v} \times \vec{B} \quad (64)$$

This is well known formula of macroscopic effect and it shows that signs in equation (45) may not be fully correct. It indicates on possibility that equations (45) and (56) have wrong sign. It is logically correct that arising of magnetic field's magnitude causes increase of induced potential in the contour (see equation (45)).

We cannot derive the second Maxwell equation (65) from (46) so simply as we derived (56) from (45) because formula (46) seems to be only a good approximation of second Maxwell equation. Thus we have to make a temporary assumption that following second Maxwell equation is correct:

$$\vec{\nabla} \times \vec{B} = \frac{1}{c^2} \cdot \frac{\partial \vec{E}}{\partial t} \quad (65)$$

Definition of electrical current is:

$$I = \frac{dQ}{dt} \quad (66)$$

For now, let us take for granted that is:

$$c = \frac{1}{\sqrt{\mu \cdot \varepsilon}} \quad (67)$$

Equation (65) by involvement of (58) becomes:

$$\vec{\nabla} \times \vec{B} = \frac{1}{c^2} \cdot \left(\frac{d}{dt} \vec{E} - (\vec{v} \cdot \vec{\nabla}) \cdot \vec{E} \right) \quad (68)$$

Applying (61) to the (68) we obtain:

$$\vec{\nabla} \times \vec{B} = \frac{1}{c^2} \cdot \left(\frac{d}{dt} \vec{E} - \vec{v} \cdot \vec{\nabla} \vec{E} + \vec{E} \cdot \vec{\nabla} \vec{v} - (\vec{E} \cdot \vec{\nabla}) \cdot \vec{v} \right) - \frac{1}{c^2} \cdot (\vec{\nabla} \times (\vec{E} \times \vec{v})) \quad (69)$$

If the $\vec{E}$ is homogenous and $\vec{v}$ is constant in time than we have:

$$\vec{\nabla} \times \vec{B} \approx -\frac{1}{c^2} \cdot (\vec{\nabla} \times (\vec{E} \times \vec{v})) \quad (70)$$

⇒

$$\vec{B} \approx -\frac{1}{c^2} \cdot (\vec{E} \times \vec{v}) = \frac{\vec{v} \times \vec{E}}{c^2} \quad (71)$$

After differentiation on $\mathbf{t}$ is applied, all regarding with (49) and (71) we obtain:

$$d\vec{B} \approx \mu \cdot \varepsilon \cdot \vec{v} \times d\vec{E} = \mu \cdot \varepsilon \cdot \frac{d\vec{\ell}}{dt} \times \frac{1}{4 \cdot \pi \cdot \varepsilon} \cdot \frac{dQ}{\vec{r}^2} \cdot \hat{r} \quad (72)$$

Also regarding (66) we have:

$$d\vec{B} \approx \frac{\mu}{4 \cdot \pi} \cdot \frac{I \cdot d\vec{\ell} \times \hat{r}}{\vec{r}^2} \quad (73)$$

Formula (46) and (73) are identical now. It is clearly shown that equation (46) is correct approximation of equation (65).

In regards with formula (49), (66) and (67), formula (73) can be rearranged on the following way:

$$d\vec{B} = \frac{\mu}{4 \cdot \pi} \cdot \frac{I \cdot d\vec{\ell} \times \hat{r}}{\vec{r}^2} = \frac{\mu}{4 \cdot \pi} \cdot \frac{\frac{dQ}{dt} \cdot d\vec{\ell} \times \hat{r}}{\vec{r}^2} = \frac{\varepsilon}{\varepsilon} \cdot \frac{\mu}{4 \cdot \pi} \cdot \frac{dQ}{\vec{r}^2} \cdot \frac{d\vec{\ell}}{dt} \times \hat{r} \quad (74)$$

After integration we obtain:

$$\vec{B} = \frac{1}{c^2} \cdot \vec{v} \times \vec{E} \quad (75)$$

Above formula is equal to (71). This is formula of a macroscopic effect that shows us that formula (65) has all signs correct because its sign is in concordance with the sign of macroscopic effect's formula (73), i.e. (46).

Formulas (64) and (70) are interesting because they act from right to left, i.e. on the right side is real field and on the left side is effective one noticed by the observer.

Let we imagine a rotating ring with a charge in its center. After formula (71) is involved into formula (64), it is obtained:

$$\vec{E}_{\text{ind}} = \vec{E}_{\parallel} + \vec{E}_{\perp} = \frac{(\vec{v} \times \vec{E}) \times \vec{v}}{c^2} = \frac{\vec{v}^2 \cdot \vec{E}}{c^2} - \frac{(\vec{v} \cdot \vec{E}) \cdot \vec{v}}{c^2} \quad (76)$$

Induced electric field is consisted of two components: one parallel with velocity and other one parallel to field.

Let us start from the equation (49). After integration over the sphere containing the charge we:

$$\oint_S \vec{E} \cdot d\vec{S} = -\frac{1}{4 \cdot \pi \cdot \varepsilon} \cdot \oint_S \frac{Q}{\vec{r}^2} \cdot \hat{r} \cdot d\vec{S} \quad (77)$$

$\Rightarrow$

$$\iiint_V (\vec{v} \cdot \vec{E}) \cdot dV = -\frac{1}{4 \cdot \pi \cdot \varepsilon} \cdot \frac{Q}{\vec{r}^2} \cdot 4 \cdot \pi \cdot \vec{r}^2 \quad (78)$$

⇒

$$\iiint_V (\vec{\nabla} \cdot \vec{E}) \cdot dV = -\frac{Q}{\varepsilon} \quad (79)$$

⇒

$$\vec{\nabla} \cdot \vec{E} = -\frac{\rho_Q}{\varepsilon} \quad (80)$$

Whereas:

$\vec{E}$ = Electric field,

ρ_Q = Density of electric charge,

ε = Electric permeability of medium.

12. IF THE SIGN IS REALLY WRONG

If we accept that equation (56) has wrong sign regarding above conclusions, than correct pair of main Maxwell equations becomes:

$$\vec{\nabla} \times \vec{E} = \frac{\partial \vec{B}}{\partial t} \quad (81)$$

And:

$$c^2 \cdot \vec{\nabla} \times \vec{B} = \frac{\partial \vec{E}}{\partial t} \quad (82)$$

Lets $\vec{K}$ is defined with:

$$\vec{K} = c \cdot \vec{B} \quad (83)$$

After equation (83) is involved into (81) and (82) it is obtained:

$$c \cdot \vec{\nabla} \times \vec{E} = \frac{\partial \vec{K}}{\partial t} \quad (84)$$

And:

$$c \cdot \vec{\nabla} \times \vec{K} = \frac{\partial \vec{E}}{\partial t} \quad (85)$$

Energetic equalization between magnetic and electric fields based on $\vec{K}$ transformation yields us above set of symmetrical equation. If equation (85) is multiplied with imaginary unit i , this leads us up to the following electromagnetic field's equation:

$$i \cdot c \cdot \vec{\nabla} \times \vec{K} = i \cdot \frac{\partial \vec{E}}{\partial t} \quad (86)$$

Let we define a new complex electromagnetic field as:

$$\vec{E}_c = \vec{E} + i \cdot \vec{K} \quad (87)$$

After addition of (84) and (86) it is obtained:

$$\mathbf{c} \cdot \vec{\nabla} \times (\mathbf{i} \cdot \vec{E} + \vec{K}) = \frac{\partial \vec{E}}{\partial t} + \mathbf{i} \cdot \frac{\partial \vec{K}}{\partial t} \quad (88)$$

$\Rightarrow$

$$\mathbf{i} \cdot \mathbf{c} \cdot \vec{\nabla} \times (\vec{E} - \mathbf{i} \cdot \vec{K}) = \frac{\partial}{\partial t} (\vec{E} + \mathbf{i} \cdot \vec{K}) \quad (89)$$

$\Rightarrow$

$$\mathbf{i} \cdot \mathbf{c} \cdot \vec{\nabla} \times (\vec{E} + \mathbf{i} \cdot \vec{K}) = \frac{\partial}{\partial t} (\vec{E} + \mathbf{i} \cdot \vec{K})^* \quad (90)$$

Regarding equation (87) we have finally:

$$\boxed{\mathbf{i} \cdot \mathbf{c} \cdot \vec{\nabla} \times \vec{E}_c = \frac{\partial \vec{E}_c^*}{\partial t}} \quad (91)$$

If there is no wrong sign in the Maxwell equations, than we have:

$$\boxed{\mathbf{i} \cdot \mathbf{c} \cdot \vec{\nabla} \times \vec{E}_c = \frac{\partial \vec{E}_c}{\partial t}} \quad (92)$$

There is no conjugation at right side of equation, and thus Poynting vector is identically equal to zero. Such radiation cannot transfer energy – it is one more evidence that equation (56) has wrong sign.

This is equation of complex electromagnetic field. Regarding present Electromagnetic theory energy density is given by the following formulas:

$$\rho_{W_E} = \frac{\epsilon}{2} \cdot \vec{E}^2 \quad (93)$$

And:

$$\rho_{W_K} = \frac{\vec{B}^2}{2 \cdot \mu} = \frac{\epsilon \cdot c^2 \cdot \vec{B}^2}{2} = \frac{\epsilon}{2} \cdot \vec{K}^2 \quad (94)$$

Formulas (93) and (94) are equal because energy density is same for both fields in vacuum. Now it is obvious that both of these ones belong to unique single complex field.

Regarding (87), (93) and (94) it can be concluded that is:

$$\rho_{W_M} = \frac{\epsilon}{2} \cdot \vec{E}_c \cdot \vec{E}_c^* \quad (95)$$

Whereas $\vec{E}_c^* = \text{CONJ}(\vec{E}_c)$.

It is more likely that following formula is valid one:

$$\rho_{W_M} = \varepsilon \cdot \vec{E}_c \cdot \vec{E}_c^* \quad (96)$$

Pointing vector for $\vec{M}$ electromagnetic field is given by:

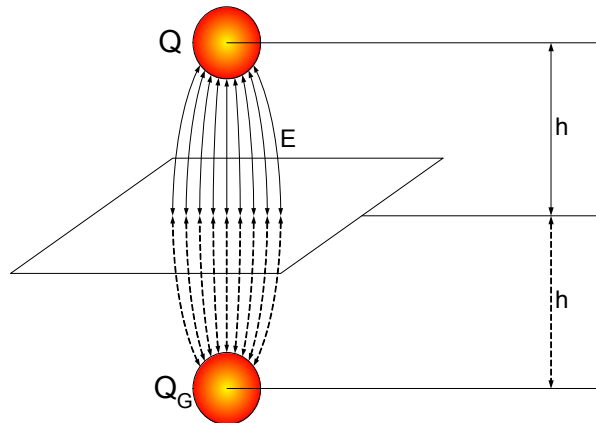
$$\vec{P} = \frac{dW}{d\vec{S}} = \frac{i}{\varepsilon \cdot c^3} \cdot \vec{E}_c \times \vec{E}_c^* \quad (97)$$

13. ENERGY DENSITY AND THE IMAGE ELECTROSTATIC THEORY

Let we check whether the energy density equation (93) for electric field is completely correct regarding the electrostatic image theory.

Let we imagine a charge over infinite conductive plain on altitude h , as it is shown on the picture below:

Fig. 5



Regarding electrostatic image theory formula of force between charge Q and superconductive plane is given by the following formula:

$$F = \frac{1}{4 \cdot \pi \cdot \varepsilon} \cdot \frac{Q^2}{(2 \cdot h)^2} = \frac{Q^2}{16 \cdot \pi \cdot h^2} \quad (98)$$

Formula can be obtained also by the formula of energy density as electrostatic pressure to the plain:

$$d\vec{F} = P \cdot d\vec{S} = U_w \cdot d\vec{S} = \frac{\varepsilon \cdot \vec{E}^2}{2} \cdot d\vec{S} = \frac{\varepsilon}{2} \cdot \frac{Q^2}{(4 \cdot \pi \cdot \varepsilon)^2} \cdot \frac{d\vec{S}}{d^4} \quad (99)$$

Wheras:

$$d = \sqrt{h^2 + x^2 + y^2} \quad (100)$$

And:

$$d\vec{S} = d\vec{x} \times d\vec{y} \quad (101)$$

Final formula for force computation is:

$$F = \frac{\varepsilon}{2} \cdot \frac{Q^2}{(4 \cdot \pi \cdot \varepsilon)^2} \cdot \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \frac{dx \cdot dy}{(h^2 + x^2 + y^2)^2} = \frac{\varepsilon}{2} \cdot \frac{Q^2}{(4 \cdot \pi \cdot \varepsilon)^2} \cdot \frac{\pi}{r^2} = \frac{Q^2}{32 \cdot \pi \cdot \varepsilon \cdot r^2} \quad (102)$$

There is obvious discrepancy between equation (98) and (102) because equation (98) yields twice bigger result than equation (102).

For concordance between electrostatic image theory and electrostatic energy density theory equation (93) shall be:

$$\rho_{W_{\vec{E}}} = \varepsilon \cdot \varphi_{\vec{E}} \cdot \Delta \varphi_{\vec{E}} = \varepsilon \cdot \vec{E}^2 \quad (103)$$

Whereas:

$$\vec{E} = -\vec{\nabla} \varphi_{\vec{E}} \quad (104)$$

Consequently is can be shown that is:

$$\rho_{W_{\vec{E}}} = \frac{\vec{B}^2}{\mu} \quad (105)$$

14. CONCLUSION ABOUT CORRECTION OF THE MAXWELL EQUATION SIGN AND ENERGY DENSITY FORMULA

One of equations (45), (56) or (64) must have wrong sing. Only equation that is more abstract than other ones in the set is Maxwell equation, i.e. equation (56) could be wrong. The other two ones deal with macroscopic phenomena, and there is small chance for equation (45) or (64) to have wrong sign because it should have to be already noticed in numerous experiments done all over the world in past centuries.

Equation (93) could be wrong too. It is small chance that electrostatic image theory is wrong and an experimental verification has to show which theory is correct. The experiment is so simply that there is no reason for waste words further on the topic. Personally I believe that equation (93) is wrong one although Nikola Tesla¹¹ believed that electrostatic image theory is wrong and that grounded antenna actually does not have its image in the earth's mirror but that it rather produces terrestrial currents instead of image forming. He also claimed that he proved that in his laboratory in Colorado Springs in series of experiments performed during 1899-1900.

The observation connected to equations (56) and (96) is crucial for correct derivation of equation (42). Otherwise we would have a physical wave that is not capable to carry energy and such thing could not exist in nature except as a catalyst.

¹¹ Nika Tesla, 1856-1943

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