Extended Newtonian Theory

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PACS number: 95.30.Sf   Relativity and gravitation

Abstract

New equations for the motion of the bodies are derived using concepts of Newton and Maxwell, a preferred frame (CMB), and the light and force fields with velocity c in relation to CMB. And we have a theory that explain the relativistics experiments like mass variation, time dilation, transverse Doppler effect, etc. An experiment is proposed to test this theory.

1. Introduction

In table 1 we have a comparative between the equations of special relativity (SR) and extended Newtonian theory (ENT).
Equations (1) to (4), (61) and (64) are the same as special relativity. Coulomb, magnetic and gravitational (14) forces are different from the SR.
All equations are derived and explaineds in next next sections. Equations (1) to (4) was derived by Lewis (who received 35 nominations for the Nobel prize in chemistry) [1] using concepts of Newton and Maxwell. Equations (14), (61) and (64) are derived in this paper.

Experiment	Special Relat.	Ext. Newton. Th.	Equ.	Sect.
Mass variation	$m = m_0\gamma$	same	(1)	4
Kinetic energy	$k = m_0c^2(\gamma - 1)$	same	(2)	4
Relation mass-energy	$E = m_0c^2$	same	(3)	4
Inertial force	$\mathbf{F} = m\frac{d\mathbf{v}}{dt} + \frac{\mathbf{v}(\mathbf{F}.\mathbf{v})}{c^2}$	same	(4)	5
Time dilation	$\Delta t = \Delta t_0\gamma$	same	(61)	14.1
Transv. Doppler eff.	$f = f_0/\gamma$	same	(64)	14.2
Transformations: position, veloc., time	Lorentz	Galilean	xx	3, 6
Force transformation	$F'_y = F_y\gamma$	different	(14)	6.1
Force propagation	non-instantaneous	non-instantaneous	xx	3, 6
Michelson-Morley	$\delta = 0$	open question	xx	15

Table 1 - Comparison between equations of special relativity and extended Newtonian theory.

2. ENT experimental test

To test extended Newtonian theory we can make a mass spectrograph with electric and magnetic sector with a special geometry.

From the movement of the earth we measure the mass variation of $\approx 1 ppm$ and compare with theoretical ENT value and the position of the spectrograph in relation of the CMB, see Section 7.2 and 13.

3. Postulates and work assumptions

a) The velocity of light is a constant c with respect to the preferred frame, independent of the direction of propagation, and of the velocity of the emitter.
b) An observer in motion with respect to the preferred frame will measure a different velocity of light, according to Galilean velocity addition.
c) The preferred frame is the cosmic microwave background (CMB), and the velocity of the sun with respect to the CMB is approximately 370 km/s (0.00123c).
d) According to Zeldovich, at every point in the Universe, there is an observer in relation to which microwave radiation appears to be isotropic.
e) A Coulomb force, magnetic force and gravitational force are generated respectively by an electric, magnetic and gravitational wave. The electric magnetic and gravitational waves have constant velocities c with respect to the preferred frame, independent of the direction of propagation, and of the velocity of the emitter.

4. Mass variation, kinetic energy and mass-energy relation

Using concepts of Newton and Maxwell, Lewis (who received 35 nominations for the Nobel prize in chemistry) [1] derived the equations for mass variation, kinetic energy and mass-energy.

Equations (1), (2) and (3) are, respectively, equations (15), (16) and (18) in [1].

The following is from [1]: “Recent publications of Einstein and Comstock on the relation of mass to energy has emboldened me to publish certain views which I have entertained on the subject and which a fews years ago appeared purely speculative, but which have been so far corroborated by recent advances in experimental and theoretical physics… In the following pages I shall attempt to show that we may construct a simples system of mechanics which is consistent with all known experimental facts, and which rests upon the assumption of the truth of the three great conservation laws, namely, the law of conservation of energy, the law of conservation of mass, and the law of conservation of momentum. To these we may add, the law of conservation of electricity”.

5. Inertial force

For the preferred frame S and from equations (1), (2) and (3), we derive the equation of inertial force:

$$\mathbf{F} = \frac{d(m\mathbf{v})}{dt} = m\frac{d\mathbf{v}}{dt} + \frac{\mathbf{v}(\mathbf{F}\cdot\mathbf{v})}{c^2}, \qquad (4)$$

$$F_x = m\frac{dv_x}{dt} + \frac{v_x^2 F_x}{c^2}, \qquad (5)$$

$$F_y = m\frac{dv_y}{dt} + \frac{v_y^2 F_y}{c^2},$$

Substituting (1), we have:

$$F_x = m_o \gamma \gamma_x^2 \frac{dv_x}{dt} \qquad (6)$$
$$F_y = m_o \gamma \gamma_y^2 \frac{dv_y}{dt},$$

Where m, v are respectively the mass and velocity of the particle in relation to the preferred frame, $\beta = v/c$, $\gamma = 1\big/\sqrt{1-\beta^2}$, $\gamma_x = 1\big/\sqrt{1-\beta_x^2}$ and $\gamma_y = 1\big/\sqrt{1-\beta_y^2}$ and m_0 is the particle rest mass in relation to preferred frame.

6. Inertial frames and non-instantaneous Coulomb force

Suppose two inertial frames (S and S'), one particle without acceleration (charge Q, mass M) and one particle with acceleration (charge q, mass m).

S is the preferred frame (CMB) and S' has constant velocity V in relation to S and parallel to the x axis, $V = V_x$. The velocity of q is $\mathbf{v} = \mathbf{v}' + \mathbf{V}$ in relation to S.

Charge Q is at rest in S' (it is an approach for $M >> m$ and/or $Q >> q$); the frames and particles are illustrated in Figure 1.

At time t_0, charge Q emits an electric wave front that reaches charge q at time t_1. At time t_1, charge Q emits an electric wave front that reaches charge q at time t_2, and so forth. The electric wave has velocity c in relation to S. r is the distance travelled by the electric field from Q to q in frame S. r' is the distance between Q and q in frame S'.

For constant $V > 0$, from Galilean transformations, we have:

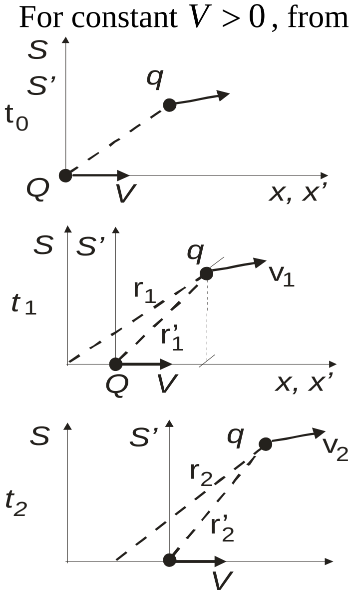

Figure 1 – Inertial frames S, S' and particles q, Q.

$$x = Vt + x'$$
$$y = y' \qquad (7)$$
$$t = t'$$ (see discussion of time dilation in Section 14.1, Equation (61)),

$$r_x = V\Delta t + x', \qquad (8)$$

where Δt is the time interval in which the electric wave travels distance r and $r = c\Delta t$,

$$r_y = y = y' \qquad (9)$$
$$r_x = V\frac{r}{c} + x' = Br + x',$$

and

$$r = \frac{Bx' \pm \sqrt{x'^2 + y'^2(1 - B^2)}}{1 - B^2}, \qquad (10)$$

where $B = V / c$.

The non-instantaneous Coulomb force in q is:

$$F_x = \frac{qQ}{4\pi\varepsilon_o}\frac{r_x}{r^3} \qquad (11)$$
$$F_y = \frac{qQ}{4\pi\varepsilon_o}\frac{r_y}{r^3}.$$

Equating (6) and (11) yields the following differential equations:

$$m_0\gamma\gamma_x^2\frac{dv_x}{dt} = \frac{qQ}{4\pi\varepsilon_o}\frac{r_x}{r^3} \qquad (12)$$
$$m_0\gamma\gamma_y^2\frac{dv_y}{dt} = \frac{qQ}{4\pi\varepsilon_o}\frac{r_y}{r^3}$$

Multiplying and dividing the first term of (12) for dx' we have:

$$m_0\gamma\gamma_x^2 dv_x v_x' = \frac{qQ}{4\pi\varepsilon_o}\frac{r_x}{r^3}dx' \qquad (13)$$

$$m_0\gamma\gamma_x^2 dv_x\left(v_x - V\right) = \frac{qQ}{4\pi\varepsilon_o}\frac{r_x}{r^3}dx'$$

$$m_0\gamma\gamma_x^2 dv_y v_y = \frac{qQ}{4\pi\varepsilon_o}\frac{r_y}{r^3}dy^{'}$$

Where $\beta = v/c$, $B = V/c$, $\beta^{'} = v^{'}/c$, $\mathbf{v} = \mathbf{v}^{'} + \mathbf{V}$, $\gamma = 1/\sqrt{1-\beta^2}$, $\gamma_x = 1/\sqrt{1-\beta_x^2}$, $\gamma_y = 1/\sqrt{1-\beta_y^2}$ and m_0 is the particle rest mass in relation to S.

6.1 Comparative of forces between ENT and SR

The Coulomb force for ENT and SR, from (12) is:

$$F_x(ENT) = m_0\gamma\gamma_x^2\frac{dv_x}{dt} = \frac{qQ}{4\pi\varepsilon_o}\frac{r_x}{r^3} \qquad (14)$$

$$F_x(SR) = m_0\gamma^{'}\gamma^{'2}_x\frac{dv^{'}_x}{dt} = \frac{qQ}{4\pi\varepsilon_o}\frac{r^{'}_x}{r^{'3}}$$

The gravitational force for ENT and SR is:

$$F_x(ENT) = m_0\gamma\gamma_x^2\frac{dv_x}{dt} = GM_0\gamma_B m_0\gamma\frac{r_x}{r^3} \qquad (15)$$

$$F_x(SR) = m_0\gamma^{'}\gamma^{'2}_x\frac{dv^{'}_x}{dt} = GM_0 m_0\gamma^{'}\frac{r^{'}_x}{r^{'3}}$$

Where $\gamma_B = 1/\sqrt{1-B^2}$, $r = \dfrac{Bx'\pm\sqrt{x'^2+y'^2(1-B^2)}}{1-B^2}$, $r_x = Br + x'$ and $dv_x = dv^{'}_x$.

7. Mass and frames S, $S^{'}$

Let us suppose two inertial frames S and $S^{'}$ with relative velocity V. m_0 is the particle mass at rest in S and from (1) we have:

$$m = \frac{m_0}{\sqrt{1-\beta^2}} = \gamma m_0 \qquad (16)$$

Where m is the particle mass in relation to S and velocity $v^{'}$ in relation to $S^{'}$, $\mathbf{v} = \mathbf{v}^{'} + \mathbf{V}$, $\beta = v/c$, $\beta^{'} = v^{'}/c$ and $B = V/c$.

7.1 Earth mass

Let us suppose the earth at rest in $S^{'}$. The mass of the earth in relation to S, from (16) is

$$M = \frac{M_0}{\sqrt{1-B^2}} = \gamma_B M_0 \qquad (17)$$

Where M_0 is the earth mass at rest in S, M is the earth mass in relation to S and at rest in S' and $\gamma_B = 1/\sqrt{1-B^2}$. The velocity of the earth in relation to CMB is $V \cong 370 \pm 30$ Km/s, 370 km/s is the velocity of the sun in relation to CMB and 30 Km/s is the orbital velocity of the earth.

7.2 Experimental particle mass in earth

The experimental mass of a particle at rest in earth is

$$m_{0\exp} = \frac{m_0}{\sqrt{1-B^2}} = \gamma_B m_0 \qquad (18)$$

Where $m_{0\exp}$ is the particle mass in relation to S and at rest in earth (S').

The experimental mass is dependent of the position of the experimental equipment in relation to CMB (see Section 13) and the measurements in the earth gives the limits of error between $m_{0\exp(\min)} = m_0$ and $m_{0\exp(\max)} = m_0 / \sqrt{1-B^2} = 1.00000076 m_0$, so $(1.00000076 - 1) = 0.76\,ppm$ (parts per million) and we have:

$$m_{0\exp} = (m_0 + 0.38\,ppm) \pm 0.38\,ppm \qquad (19)$$

The particle rest mass $m_{0\exp}$ measured in earth with mass spectrograph using magnetic and electric sector (Nier-Johnson 1953, Hintenberger-Konig 1959, Takeshita 1967, Matsuda 1974 and 1981) has high accuracy and limits of error of $\approx 1\,ppm$. This value is in agreement with the CMB, see Section 13.

For instruments with accuracy $<< 1\,ppm$ there are used other methods and it is necessary an individual study for each one, but these instruments usually use oscillation methods that measure a constant medium value. For example, in measurement of the speed of the light it is used the two way method, that is, the light goes, return and and the medium velocity is exactly $c = 0.5[(c+V)+(c-V)]$, b) a particle and measurer at rest in earth, the frequency measured is f_0 and constant, $f = f_0 + \Delta f - \Delta f = f_0$, see Fig. 2.

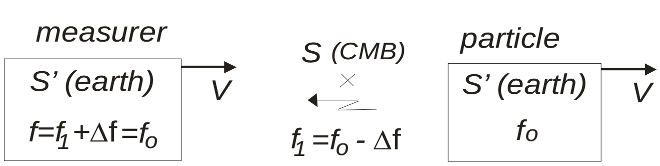

Figure 2 – Particle and measurer at rest in earth. The frequency measured is f_0 and constant.

8. Electric field of a point charge

Substituting the charge q of Fig. 1 for a point P' at rest in S', the electric field at P' is:

8.1 Electric field of a point charge for $V = 0$.

$$E = \frac{Q}{4\pi\varepsilon_0}\frac{1}{r^{'2}} \qquad (20)$$

Where $r^{'2} = x^{'2} + y^{'2}$.

8.2 Electric field of a point charge for $V > 0$ and $V = V_x$.

$$E = \frac{Q}{4\pi\varepsilon_0}\frac{1}{r^2} \qquad (21)$$

Where from (10), $r = \dfrac{Bx' \pm \sqrt{x'^2 + y'^2 (1 - B^2)}}{1 - B^2}$

9. Electric field of a uniformly charged plane

Consider a plane which carries the uniform charge per unit area σ. The plane is at rest in S' and parallel to $y'z'$ plane. S' has velocity V parallel to x' axis, see Fig. 3.

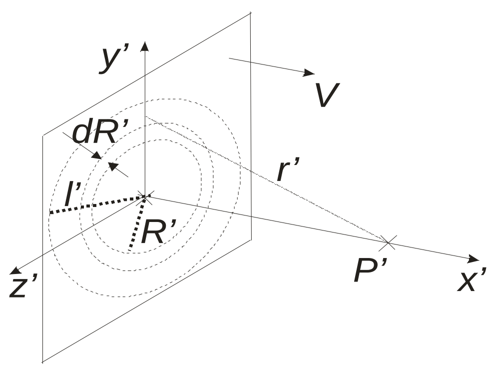

Fig. 3 – Electric field of a uniformly charged plane at point P' at rest in S'

9.1 Electric field of a charged plane for $V = 0$

For $V = 0$ we have $r = r'$. The electric field at point P' at rest in S' is:

$$E = \int dE_x = \frac{\sigma x'}{4\varepsilon_0}\int_0^{l'} \left(x^{'2} + R^{'2}\right)^{-3/2}\left(2R'\right)dR' \qquad (22)$$

Substituting $R' = y'$:

$$E = \frac{\sigma x'}{4\varepsilon_0}\int_0^{l'} \left(x^{'2} + y^{'2}\right)^{-3/2}\left(2y'\right)dy' \qquad (23)$$

Integrating we have:

$$E = \frac{\sigma}{2\varepsilon_0}\left(1 - \frac{x^{'}}{\sqrt{x^{'2} + l^{'2}}}\right) \tag{24}$$

This equation is valid only for $x^{'} > 0$. For $l^{'} >> x^{'}$ we have:

$$E = \frac{\sigma}{2\varepsilon_0} \tag{25}$$

9.2 Electric field of a charged plane for $V > 0$ and $V = V_x$

For $V = V_x$, $y = y^{'}$, $l = l^{'}$, $dy = dy^{'}$ and from (10) we have:

$$r = \frac{Bx' \pm \sqrt{x'^2 + y'^2 (1 - B^2)}}{1 - B^2} \tag{26}$$

The electric field at point $P^{'}$ at rest in S' is:

$$E = \frac{\sigma}{4\varepsilon_0}\int_0^l x\left(x^2 + y^2\right)^{-3/2}(2y)dy \tag{27}$$

Where $r^2 = x^2 + y^2$ and we have:

$$E = \frac{\sigma}{2\varepsilon_0}\int_0^{l^{'}} \frac{\sqrt{r^2 - y^{'2}}}{r^3} y^{'} dy^{'} \tag{28}$$

9.3 Electric field of a charged plane for $V > 0$ and $V = V_y$

For $V = V_y$ and $x = x^{'}$ we have:

$$E = \frac{\sigma}{2\varepsilon_0} \tag{29}$$

10. Capacitor

Let us suppose a capacitor with charge, parallel planes (left and right) and at rest in $S^{'}$. The capacitor plane is parallel to y’z’ plane. $S^{'}$ has velocity V parallel to $x^{'}$ axis. The distance between the capacitor planes is $d^{'} = x_l^{'} + x_r^{'}$ where $x_l^{'}$ and $x_r^{'}$ is respectively the distance between the point $P^{'}$ and the left and right capacitor plane, see Fig. 4. $V = V_x$.

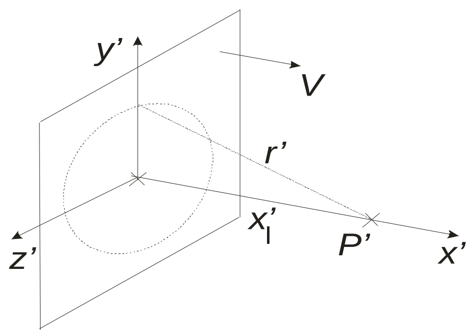

Fig. 4 – Capacitor left plane at rest in $S^{'}$ and with velocity V in relation to S

10.1 Capacitor for $V = 0$

From (25) we have:

$$E = \frac{\sigma}{\varepsilon_0} \tag{30}$$

10.2 Capacitor for $V > 0$ **and** $V = V_x$

For the left plane from (10) we have:

$$r_l = \frac{Bx_l^{'} \pm \sqrt{x_l^{'2} + y^{'2}(1-B^2)}}{1-B^2} \tag{31}$$

and for the right plane we have:

$$r_r = \frac{-Bx_r^{'} \pm \sqrt{x_r^{'2} + y^{'2}(1-B^2)}}{1-B^2} \tag{32}$$

The total electric field from the left and right capacitor planes at point $P^{'}$ at rest in S' is:

$$E = \frac{\sigma}{2\varepsilon_0}\left(\int_{0^{'}}^{l^{'}} \frac{\sqrt{r_l^2 - y^{'2}}}{r_l^3} y^{'} dy^{'} + \int_{0}^{l^{'}} \frac{\sqrt{r_r^2 - y^{'2}}}{r_r^3} y^{'} dy^{'}\right) \tag{33}$$

10.3 Capacitor for $V > 0$ **and** $V = V_y$

For $S^{'}$ with velocity V parallel to $y^{'}$ axis ($V = V_y$), the electric field at point $P^{'}$ at rest in S' is:

$$E = \frac{\sigma}{\varepsilon_0}. \tag{34}$$

10.4 Eletric field and kinetic energy

For the capacitor with $V = V_y$ we have $E = E_0$. For an electron between the charged planes with velocity $\mathbf{v}$ we have the force:

$$F_x = qE_0 = m_o \gamma\gamma_x^2 \frac{dv_x}{dt} \qquad (35)$$

$$F_y = 0$$

And the kinetic energy is:

$$k = m_0 c^2 (\gamma - 1) \qquad (36)$$

For the capacitor with $V = V_x$ we have E not constant and it is necessary to calculate the kinetic energy of the electron by numeric calculation.

11. Magnetic field

Suppose two inertial frames (S , S') and a wire carrying electric current i. The wire is at rest in S'. S' is with velocity V in relation to S in x direction. $y = y'$ and $V = V_x$.
The magnetic field has velocity c in relation to S and for a point P' (out the wire) at rest in S' we have:

11.1 Magnetic field - wire parallel to y' axis and $V = 0$

$$d\mathbf{H} = \frac{\mu_0 i}{4\pi} \frac{d\mathbf{y}' \times \mathbf{r}'}{r'^3} \qquad (37)$$

$$dH = \frac{\mu_0 i}{4\pi} \frac{x'}{r'^3} dy' \qquad (38)$$

$$H = \frac{\mu_0 i}{4\pi} \int_{-\infty}^{+\infty} \frac{x'}{\left(x'^2 + y'^2\right)^{3/2}} dy' \qquad (39)$$

$$H = \frac{\mu_0 i}{2\pi x'} \qquad (40$$

11.2 Magnetic field - wire parallel to y' axis and $V > 0$, $V = V_x$

$$d\mathbf{H} = \frac{\mu_0 i}{4\pi} \frac{d\mathbf{y} \times \mathbf{r}}{r^3} \qquad (41)$$

Where $y = y'$, $dy = dy'$, $r^2 = x^2 + y^2$ and from (10) $r = \dfrac{Bx' \pm \sqrt{x'^2 + y'^2 (1 - B^2)}}{1 - B^2}$.

$$dH = \frac{\mu_0 i}{4\pi} \frac{x}{r^3} dy \qquad (42)$$

$$H = \frac{\mu_0 i}{4\pi} \int_{-\infty}^{+\infty} \frac{\sqrt{r^2 - y'^2}}{r^3} dy' \qquad (43)$$

11.3 Magnetic field - wire parallel to x' axis and $V > 0, V = V_x$

$$H = \frac{\mu_0 i}{2\pi y'} \qquad (44)$$

12. Magnetic field – spire

Let us suppose a spire at rest in S', with radius r', electric current i and the spire plane is parallel to x'y' plane. S' is with velocity V in relation to S in x direction. $y = y'$ and $V = V_x$.

12.1 Magnetic field – spire with $V = 0$

The magnetic field at the center of the plane of the spire at point P' is:

$$H = \frac{\mu_0 i}{2r'} \qquad (45)$$

12.2 Magnetic field – spire with $V > 0$ and $V = V_x$

For the left size of the spire the medium radius (approximately) from (31) for ($x' = r', y' = 0$) and ($x' = 0', y' = r'$) is:

$$\overline{r_l} = \frac{1}{2}\left(\frac{r'}{1-B} + \frac{r'}{\sqrt{1-B^2}} \right) \qquad (46)$$

For the right size of the spire the medium radius (approximately) from (32) for ($x' = r', y' = 0$) and ($x' = 0', y' = r'$) is:

$$\overline{r_r} = \frac{1}{2}\left(\frac{r'}{1+B} + \frac{r'}{\sqrt{1-B^2}} \right) \qquad (47)$$

The magnetic field (approximately) at the center of the plane of the spire at point P' is:

$$H = \frac{\mu_0 i}{2\overline{r}} \qquad (48)$$

Where $\bar{r} = \frac{\bar{r}_l + \bar{r}_r}{2}$

For a more exact calculation of the medium radius ($\bar{r}$) we can make a numeric program using equations (31), (32) and more points of the spire.

12.3 Magnetic field – spire with $V > 0$ and $V = V_y$

The magnetic field at the center of the plane of the spire at point $P^{'}$ is:

$$H = \frac{\mu_0 i}{2r^{'}} \tag{49}$$

12.4 Magnetic field – solenoid

For a solenoid with N spires the magnetic field at the center of the solenoid is the magnetic field of the spire multiplied by N.

12.5 Magnetic field - permanent magnetic

Let us suppose a permanent magnetic, parallel planes (left and right) and at rest in $S^{'}$. The permanent magnetic plane is parallel to y'z' plane. $S^{'}$ has velocity V parallel to $x^{'}$ axis. The distance between the permanent magnetic planes is $d^{'} = x_l^{'} + x_r^{'}$ where $x_l^{'}$ and $x_r^{'}$ is respectively the distance between the point $P^{'}$ and the left and right permanent magnetic plane, see Fig. 5. $V = V_x$.

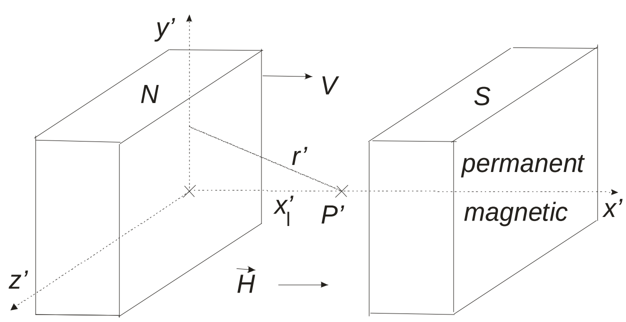

Fig. 5 – Permanent magnetic at rest in $S^{'}$

For $V = 0$ the magnetic field between the planes is constant H_0.

12.6 Permanent magnetic for $V > 0$ and $V = V_x$

The equations are similar for capacitor parallel planes. For the left plane from (31) we have:

$$r_l = \frac{Bx_l^{'} \pm \sqrt{x_l^{'2} + y^{'2}(1 - B^2)}}{1 - B^2} \tag{50}$$

and for the right plane from (32) we have:

$$r_r = \frac{-Bx_r^{'} \pm \sqrt{x_r^{'2} + y^{'2}(1-B^2)}}{1-B^2} \qquad (51)$$

The total magnetic field from the left and right permanent magnetic planes at point $P^{'}$ at rest in S' is:

$$H = H_0 \left(\int_{0^{'}}^{l^{'}} \frac{\sqrt{r_l^2 - y^{'2}}}{r_l^3} y^{'} dy^{'} + \int_{0}^{l^{'}} \frac{\sqrt{r_r^2 - y^{'2}}}{r_r^3} y^{'} dy^{'} \right) \qquad (52)$$

12.7 Permanent magnetic for $V > 0$ and $V = V_y$

For $S^{'}$ with velocity V parallel to $y^{'}$ axis ($V = V_y$), the magnetic field at point $P^{'}$ at rest in S' is:

$$H = H_0 . \qquad (53)$$

13. Calculations for earth

Below we have calculations for earth ($S^{'}$) using $V = 0.00123c$.
For the capacitor, from (33), an internet on-line integrator found an exact soluction and for the capacitor center, $d^{'} << l^{'}$ where $d^{'}$ is the distance between the capacitor planes, $l^{'} \times l^{'}$ is the area of the planes and we have:

$$E = 0.99999849 \frac{\sigma}{\varepsilon_0} = 0.99999849 E_0 \qquad (54)$$

For the capacitor the limits of error between $V = V_y$, (E_0) and $V = V_x$, (E) is $1 - 0.99999849 = 1.5 ppm$.
For the spire we make a numeric program (see Section 12.2) and approximately for the spire center we have $r = 1.00000114 r^{'}$.

$$H = \frac{\mu_0 i}{2r} = 0.99999886 \frac{\mu_0 i}{2r^{'}} = 0.99999886 H_0 \qquad (55)$$

For the spire the limits of error between $V = V_y$, (H_0) and $V = V_x$, (H) is $1 - 0.99999886 = 1.1 ppm$.
For the mass spectrograph using electric and magnetic sectors, the sectors are approximately semi circular, for example Nier-Johnson 1953, 90° electric sector, 60° magnetic sector, Matsuda 1974, 85° electric sector, 72.5° magnetic sector.
To test extended Newtonian theory we can make a mass spectrograph with electric and magnetic sector with a special geometry and to measure the mass variation of $\approx 1 ppm$ from a) fixed spectrograph and to measure the mass variation with the movement of the earth in relation to CMB or b) moving spectrograph (with similar movement to the Michelson Morley experiment).

14. Time dilation and Transverse Doppler effect

We make a initial study about time dilation and transverse Doppler effect. This subject needs more research for complete explanation.

14.1 Time dilation

Let us suppose two equal particles (same mass m and same charge q with repulsive forces. The particles have velocity v equal in modulus but with inverse y directions, see Fig. 6.

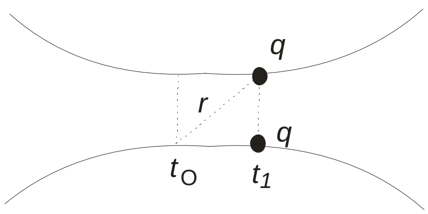

Figure 6 – Trajectories of the two particles q. In the time interval time t_o to t_1, the trajectories are approximately parallel.

For the time interval time t_o to t_1, the trajectories are approximately parallel and we have:

$$x = vt$$
$$y = constant \qquad (56)$$

From Fig. 6, we have:

$$r = c\Delta t, \qquad (57)$$

Where $\Delta t = t_1 - t_o$ is the time interval in which the wave force travels distance r.

$$r_x = v\Delta t \qquad (58)$$
$$r_y = y,$$

$$r = \frac{y}{\sqrt{1-\beta^2}} \qquad (59)$$

Dividing both terms by c, we have:

$$\frac{r}{c} = \frac{y}{c}\frac{1}{\sqrt{1-\beta^2}} \qquad (60)$$

and

$$\frac{r}{c} = \Delta t = \frac{\Delta t_0}{\sqrt{1-\beta^2}} . \qquad (61)$$

Equation (61) expresses time dilation, where $\Delta t_0 = y/c$ (for $v = 0$).

Thus, time dilation in extended Newtonian theory is due to the variation of forces (inside the atom) in relation to the velocity of the atom.

14.2 Transverse Doppler effect

From section 14.1 we have: " time dilation in extended Newtonian theory is due the variation of forces (inside the atom) in relation to the velocity of the atom".

If the atom and observer are at rest in frame S (CMB), the internal Coulomb potential energy is:

$$U_o = \frac{qQ}{4\pi\varepsilon_o}\frac{1}{r_o} \qquad (62)$$

where r_o is the distance between the nucleus and the electron (for example the hydrogen) and the emitted frequency is f_o.

If the atom is with velocity v in relation to S from (59) and (62) we have:

$$U = \frac{qQ}{4\pi\varepsilon_o}\frac{1}{r} = U_o\sqrt{1-\beta^2} \qquad (63)$$

And we have the frequency proportional to the Coulomb potential energy. Substituting U by f in (63) we have:

$$f_\perp = f_o\sqrt{1-\beta^2} \qquad (64)$$

where $f_\perp$ is the transverse Doppler effect measured by the observer at rest in S and perpendicular to the atom velocity and f_o is the observed frequency with the atom and observer at rest in S.

The longitudinal Doppler effect in S is:

$$f_\ell = \frac{f_\perp}{1 \pm B} = \frac{f_o\sqrt{1-\beta^2}}{1 \pm \beta} \qquad (65)$$

The sign is positive (negative) when S' (source) is moving away from (towards) S.

14.3 Longitudinal Doppler effect in earth

Let us suppose a distant star source (S'') with velocity v in relation to CMB (S) and emitts from hydrogen atom. The observer is at rest in earth (S'), S' is with velocity V in relation to S in direction of the star and V is parallel to v, see Fig. 7.

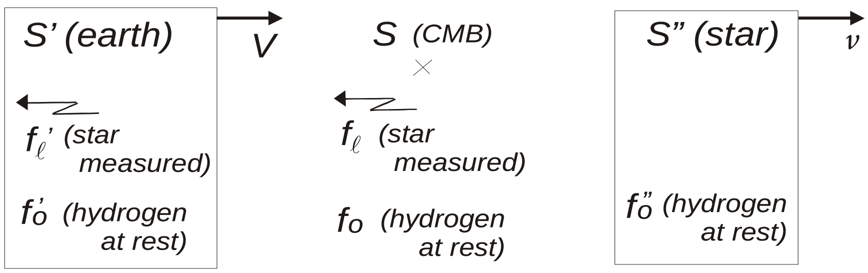

Fig. 7 – Longitudinal Doppler effect in earth. Star frequency measured by an observer at rest in earth.

From (64) we have:

$$f_o' = f_o\sqrt{1-B^2} \tag{66}$$

$$f_o'' = f_o\sqrt{1-\beta^2} \tag{67}$$

Where f_o, f_o' and f_o'' are the hydrogen frequency measured with the atom and observer at rest respectively in S (CMB), S' (earth) and S'' (star). The frequencies f_o' and f_o'' are the transverse Doppler effect.

The longitudinal star frequency at CMB is:

$$f_\ell = \frac{f_o''}{1+\beta} \tag{68}$$

The longitudinal star frequency measured in earth is:

$$f_\ell' = f_\ell(1+B) \tag{69}$$

Substituting (66), (67) and (68) in (69) we have:

$$f_\ell' = f_o' \frac{\sqrt{1-\beta}}{\sqrt{1+\beta}}\frac{\sqrt{1+B}}{\sqrt{1-B}} \tag{70}$$

f_ℓ' and f_o' are respectively the longitudinal star frequency measured in earth with observer at rest in earth and hydrogen frequency measured in earth with the atom and observer at rest in earth.

For $B = 0$ we have the same equation of SR longitudinal Doppler effect.

For $\beta = B$ we have $f_\ell' = f_o'$.

15. Michelson-Morley experiment and extended Newtonian theory

The Michelson-Morley experiment [2] involves one semi-transparent mirror (half-silvered) in which the incident ray r_a is refracted, reflected and divided into two rays (r_b and r_d), as shown in Fig. 8.

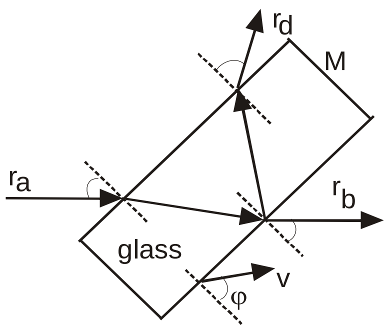

Figure 8 - Semitransparent mirror M with velocity V as well as, incident ray (r_a), the refracted-reflected-refracted ray (r_d) and refracted-refracted ray (r_b).

For complete calculations of the trajectory and displacement of the interference fringes, we must study the equations of refraction and reflection in vacuum and in glass.

The Michelson-Morley experiment requires one semi-transparent mirror, 16 mirrors, a lens and a telescope.

15.1 Reflection in vacuum

In the Supplement of the MM paper [2], the equations of ray reflections in a moving mirror are shown in relation to a preferred frame. Let us suppose a mirror at rest in S' and with velocity V in relation to S (CMB). The equations in relation to S are the same of MM paper.

From [2]:

"Let ab (Fig. 9) be a plane wave falling on the mirror m at an incidence of $45°$. If the mirror is at rest, the wave front after reflection will be ae. Now suppose the mirror to move in a direction which makes an angle φ with its normal, with velocity V. Let c be the velocity of light in the ether supposed stationary, and let ed be the increase in the distance the light has to travel to reach d."

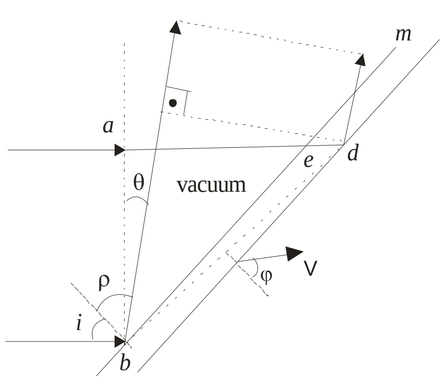

Fig. 9 – Reflection in vacuum. Incident and reflection plane waves

Michelson and Morley also demonstrated the following equation:

$$\tan\left(45^\circ - \frac{\theta}{2}\right) = \frac{ae}{ad} = 1 - \frac{V\sqrt{2}\cos\varphi}{c} \quad . \qquad (71)$$

Below, we have an equivalent and more general equation for any angle of incident rays. From Equations (5) and (6) in the work of Kohl [3], we have:

$$\tan\rho = \frac{1 - B^2\cos^2\varphi}{1 + B^2\cos^2\varphi \pm 2B\cos\varphi\sec i}\tan i \, , \qquad (72)$$

where i and ρ are respectively, the angles of incidence and reflection in relation to the normal of the mirror, $B = V/c$ and φ is the angle of V with respect to the normal of the mirror.

The sign is negative (positive) when the mirror is moving away from (towards) the incident ray.

15.2 Reflection in glass

Let us suppose a glass at rest in S' and S' with velocity V in relation to S (CMB).

For $V = 0$:

$$u_0 = \frac{c}{n} \qquad (73)$$

where u_0 is the velocity of light inside the glass in relation to S and S' with $V = 0$ and n is the index of refraction.

For $V > 0$:

$$\mathbf{u} = \mathbf{u}_0 + \mathbf{V}\left(1 - \frac{u_0^2}{c^2}\right) \qquad (74)$$

where u is the velocity of light inside the glass in relation to S and the glass at rest in S'.

$V\left(1 - u_0^2/c^2\right)$ is the Fresnel drag.

The equations of reflection in glass must be further developed.

15.3 Refraction in vacuum-glass

From Snell's law of refraction we have:

$$\sin i = \frac{c}{u}\sin\xi \qquad (75)$$

Where i and ξ are the angles, respectively, of incidence and refraction. The angles are in relation to the normal of the glass (Fig. 8).

15.4 The Michelson-Morley experiment

The Michelson-Morley experiment requires one semi-transparent mirror, 16 mirrors, a lens and a telescope. In Fig. 11, we substitute 16 mirrors for 2 mirrors.

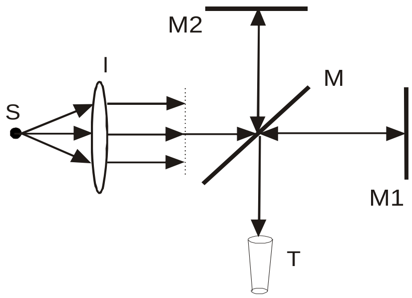

Figure 11 – Michelson-Morley experiment with one semi-transparent mirror, 2 mirrors, a lens and a telescope.

In Fig. 11, S, l, M, M1, M2 and T are respectively, the light source, lens, semi-transparent mirror, mirror 1, mirror 2 and telescope.

For calculus simplification, we substitute for lens l the sun or star light, which has wave front that is practically planare when reaching the earth. The interchange between sun or star lights and laboratory sources in no way alters the results [4-6].

For the telescope, we substitute screen B, as shown in Fig. 12.

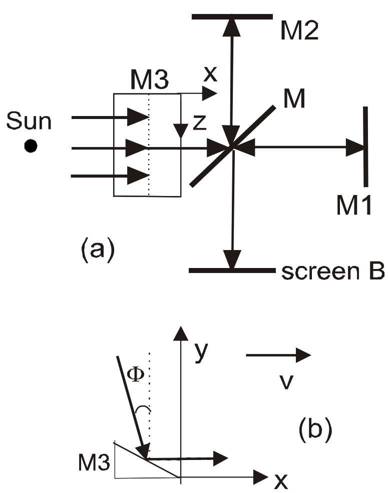

Figure 12 – Michelson-Morley experiment with sun light and secreen B. Panel (a) shows the x-z plane, while (b) shows the x-y plane.

M3 is a mirror to capture sun or star light.

The displacement of interference fringes must be calculated using the equations above and further development of the complete equations is needed. So, MM experiment is an open question for ENT.

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Conclusion

The basic equations of ENT (mass variation, time dilation, inertial force, kinetic energy, transverse Doppler effect and relation mass-energy) are the same as Relativity Theory and the difference between the theories are the gravitational, Coulomb and magnetic forces.

It is proposed an experimental to test ENT using mass spectrograph with electric and magnetic sectors with modified geometry that measures mass differences of $\cong 1 ppm$ when the earth moves in relation to CMB.

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