# New Newtonian Theory

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**Abstract**

New equations for the motion of bodies are derived. The previsions of the theory are: a) if the galaxy is a spiral, the plane galaxy is moving in direction of the CMB, like our Milk Way galaxy. b) dark matter calculated from rotation curves in spiral galaxies is less than the actual theory and can be zero. This theory use some equations of Special relativity and the concept of non-instantaneous force.

## 1. Introduction

In table 1 we have a comparative between the equations of special relativity (SR) and this theory that we call New Newtonian Theory (NNT).

Equations (1) to (4), (25) and (53) are the same than SR. Coulomb (47) and gravitational forces are different than 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 Newtonian concepts. Equations (25), (47) and (53) are derived in this paper.

So, NNT is a theory that uses Newtonian concepts, a preferred frame (CMB) and non-instantaneous force.

| Experiment | Special Relat. | New 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 | $E = mc^2$ | same | (3) | 4 |
| Force | $\mathbf{F} = m\dfrac{d\mathbf{v}}{dt} + \dfrac{\mathbf{v}(\mathbf{F}.\mathbf{v})}{c^2}$ | same | (4) | 5 |
| Time dilation | $\Delta t = \Delta t_0\gamma$ | same | (25) | 8.2 |
| Transv. Doppler eff. | $f = f^o / \gamma$ | same | (53) | 10 |
| Transformations: position, veloc., time | Lorentz | Galilean | xx | 7, 8, 9.2 |
| Coulomb force transf. | $F_y' = F_y\gamma$ | different | (47) | 7, 9.2.3 |
| Force propagation | xxx | non-instantaneous | xx | 7, 8 |
| Michelson-Morley | $\delta = 0$ | open question | xx | 11 |

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

## 2. Previsions of the theory

The previsions of NNT are:

a) If the galaxy is a spiral, the plane galaxy is moving in direction of the CMB, like our Milk Way galaxy. From [2] we have: "It is in a direction aligned with the flattened disk of our galaxy and…"

Let us suppose particle $M$ with velocity $V$ in relation to CMB. Particle $m$ at position 1 has velocity $u$ in relation to $M$ and tangential to a circle of radius $r$, $V > u$, $c >> V$ and $M >> m$. For others positions of the circle from 2 to 6 with same velocity $u$ and radius $r$ we have Fig.1.

The gravitational forces in $m$ from positions 1 to 6 are: $F_1 < F_2 < F_3 < F_4 < F_5 < F_6$. The equations of forces are in sections (5), (7) and (8).

So, the movement is a spiral, see Fig. 2.

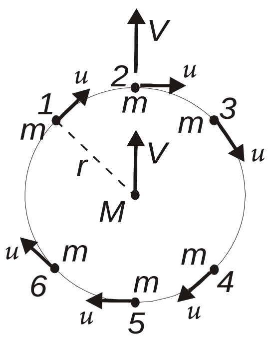


Fig. 1 – Particle $M$ with velocity $V$ in relation to CMB and particle $m$ with rotational velocity $u$ in relation to $M$

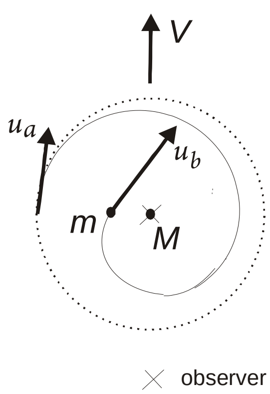


Fig. 2 – Rotation velocity $u_b > u_a$ in spiral galaxy.

b) Dark matter calculated from rotation curves of spiral galaxy.

From sections (7) and (8) we have $u_b > u_a$, see Fig. 2, where $u$ is the rotational velocity in relation to M and from section 7 we have $\mathbf{v} = \mathbf{V} + \mathbf{u}$.

An observer measures $u_{ay}$ and $u_{by}$. From Fig. 2 we have $u_{ay} \cong u_a$ and $u_{by}^2 = u_b^2 - u_{bx}^2$. So, dark matter is smaller than the actual theory or can be zero.

## 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 earth with respect to the CMB is approximately 390 km/s (0.0013c).
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 is generated by an electric wave. A gravitational force is generated by a gravitational wave. The electric 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 the concepts of Newtonian physics, 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”.

## 5. Force

From equations (1), (2) and (3), we derive the equation of force:

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

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

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

Substituting (1), we have:

$$F_x = m_o \gamma\gamma_x^2 \frac{dv_x}{dt} \tag{6}$$

$$F_y = m_o \gamma\gamma_y^2 \frac{dv_y}{dt},$$

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

The earth has velocity $V = 0.0013c$ in relation to the preferred frame, the mass of the electron measured in earth is $m_o^{'} = 9.1093897x10^{-31}$ Kg and $m_o = m_o^{'}/\sqrt{1-V^2/c^2} =$ $= 9.1093973x10^{-31}$ Kg.

**6. Inertial and non-inertial frames**

From (1) to (6), Galilean transformations, non-instantaneous force, preferred frame $S$ (cosmic microwave- background) and frame $S'$, we can obtain the equations for the motions of bodies.

**7. Inertial frames and non-instantaneous 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. The velocity of $q$ is **v** in relation to $S$.

Charge $Q$ is at rest in $S'$ (it is an approach for $M >> m$ and $Q \geq q$ or $Q >> q$ and $M \geq m$); the frames and particles are illustrated in Figure 3.

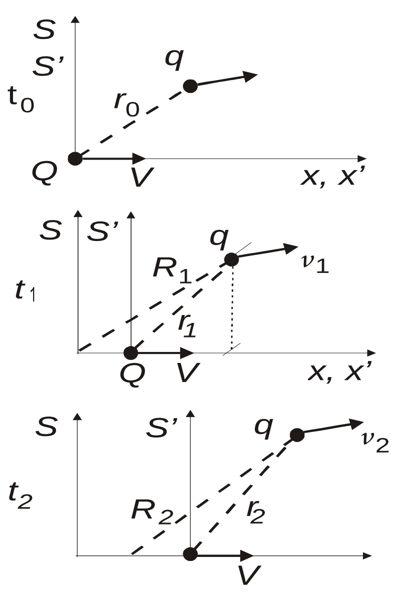


Figure 3 – Inertial frames $S$, $S^{'}$ and particles $q, Q$.

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 $S$.

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

$$x = Vt + x'$$
$$y = y' \qquad (7)$$
$$t = t'$$ (see discussion of time dilation in Section 8.2, Equation (25)),

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

where $\Delta t$ is the time interval in which the force 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 folowing 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 $dx'$, and from $dv_x = dv_{x'}$, we have:

$$m_0\gamma\gamma_x^2\int v'_x dv'_x = \pm\frac{qQ}{4\pi\varepsilon_o}\int\frac{R_x}{R^3}dx' \qquad (13)$$

$$m_0\gamma\gamma_y^2\int v'_y dv'_y = \pm\frac{qQ}{4\pi\varepsilon_o}\int\frac{R_y}{R^3}dy',$$

where (+) is a repulsive force and (-) is an attractive force.

The differential equation is second-order and requires two integrations.

In the first integration, we have:

$$v'_x = f(x') \qquad (14)$$

$$v'_y = f(y').$$

In the second integration, we have:

$$x' = f(t) \qquad (15)$$

$$y' = y = f(t).$$

**7.1 - Gravitational force**

The non-instantaneous gravitational force in $q$, from (12) substituting $qQ/4\pi\varepsilon_o$ for $GmM$ where $m = m_o\gamma$, $M = M_o\gamma_V$, $\gamma = 1/\sqrt{1-v^2/c^2}$ and $\gamma_V = 1/\sqrt{1-V^2/c^2}$ is:

$$m_0\gamma\gamma_x^2\frac{dv_x}{dt} = Gm_0\gamma M_0\gamma_V\frac{R_x}{R^3} \qquad (16)$$

and

$$\gamma_x^2\frac{dv_x}{dt} = GM_0\gamma_V\frac{R_x}{R^3} \qquad (17)$$

where $\gamma_V = 1/\sqrt{1-V^2/c^2}$ .

For $V = 0$, we have an instantaneous force ( $R = r$ ). From (9) and (10), we have:

$$R_x = x = x'$$

$$R = \sqrt{x'^2 + y'^2} \qquad (18)$$

$$\gamma_x^2\frac{dv_x}{dt} = GM_0\frac{R_x}{R^3}.$$

### 8. Non-inertial frame and non-instantaneous forces

a) We have one preferred frame ($S$) and one non-inertial frame ($S'$). Particle $Q$ is at rest in $S'$, and $q$ is accelerating in relation to $S'$.

b) Let us suppose the particular case of repulsive forces between two equal particles (same mass $m$ and same charge $q$). We can make a mathematical construct with: two inertial frames ($S, S'$) and two particles $q$ with acceleration between them. The particles have velocity equal in modulus but with inverse $y$ directions.

Thus, cases a) and b) are similar and mathematically equal; the calculated values of $R, v, F, t$ and others are the same when calculated in relation to $S$.

The velocity of $S'$ in relation to $S$ is constant, and $V > 0$. We consider only the Coulomb force. (Fig. 4).

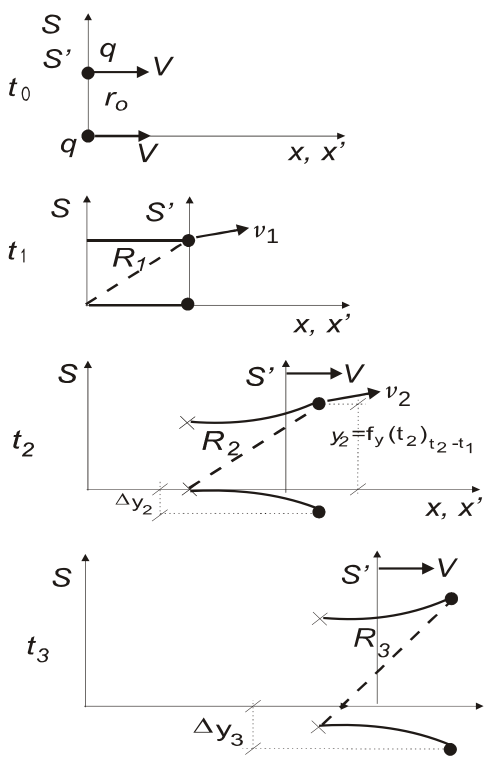


Figure 4 – Non inertial frame - Mathematical construct using two inertial frames ($S$ ,$S'$) and two particles $q$ with acceleration between them. The particles have velocity equal in modulus but with inverse y directions. For $t_o$ to $t_1$, the particles haves no acceleration; for $t > t_1$, the particles accelerate in relation to $S$ and $S'$.

#### 8.1 From $t_o$ to $t_1$ - First sequence

In this time interval, the particles have no acceleration, and the trajectories are parallel.
This is an approach, see Fig. 5.

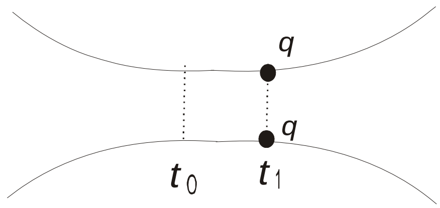


Figure 5 – Trajectories of the two particles $q$. In the time interval time $t_o$ to $t_1$, the trajectories are approximately parallel.

The initial velocity of the particles $q$ are $V$, which is parallel to $x$, $x'$.
From Galilean transformations, we have:

$$x = Vt$$
$$y = y' \qquad (19)$$
$$t = t'$$ (see discussion of time dilation in Section 8.2, Equation (25)).

From Fig. 4, we have:

$$R = c\Delta t, \qquad (20)$$

where $\Delta t = t_1 - t_o$ is the time interval in which the force travels distance $R$.

$$R_x = V\Delta t \qquad (21)$$
$$R_y = y = y',$$

$$R = \frac{y'}{\sqrt{1-B^2}} \qquad (22)$$

$$R_1 = \frac{y_1'}{\sqrt{1-B^2}},$$

and

$$R_{x1} = BR_1 \qquad (23)$$
$$R_{y1} = y_1.$$

**8.2 Time dilation**

From (22) and dividing both terms by $c$, we have:

$$\frac{R_1}{c} = \frac{y_1'}{c}\frac{1}{\sqrt{1-B^2}} \qquad (24)$$

and

$$\frac{R_1}{c} = t_1 - t_o = \frac{t_a}{\sqrt{1-B^2}} \, . \qquad (25)$$

Equation (25) expresses time dilation, where $t_a = y_1'/c$ (for $V = 0$). The equation is only applicable to the first sequence. For the others sequences, the time dilation differs from equation (25). This subject should be further explored. Thus, time dilation in new Newtonian physics is due to the variation of forces (inside the atom) in relation to the velocity of the atom ($v$). For the example above, we have $t_1 - t_o = t_a \big/ \sqrt{1-\beta^2}$ and $\beta = v/c$ .

**8.3 From $t_1$ to $t_2$ - Second sequence**

$$\begin{aligned} x &= Vt + x' \\ y &= y' \\ t &= t' \end{aligned} \qquad (26)$$

From Fig. 4, we have:

$$R = c\Delta t \, , \qquad (27)$$

$$\begin{aligned} R_x &= V\Delta t + x' \\ R_y &= y = y' \, , \end{aligned} \qquad (28)$$

where $\Delta t = t_2 - t_1$, and

$$R = \frac{Bx' \pm \sqrt{x'^2 + y'^2 (1-B^2)}}{1-B^2} \, . \qquad (29)$$

From (29) and differential equation (13), in the first integration, we have:

$$v'_x = f(x')_{t_2 - t_1} \qquad (30)$$

$$v'_y = f(y')_{t_2 - t_1} \, '$$

In the second integration, we have:

$$x' = f_x(t)_{t_2 - t_1} \qquad (31)$$

$$y' = f_y(t)_{t_2 - t_1} \, ,$$

and, at time $t_2$, we have:

$$x_2' = f_x(t_2)_{t_2 - t_1}$$

$$y_2' = f_y(t_2)_{t_2 - t_1}$$

$$x_2 = Vt_2 + x_2' \qquad (32)$$

$$y_2 = y_2'$$

$$R_{x2} = BR_2 + x_2'$$

$$R_{y2} = y_2 .$$

**8.4 From $t_2$ to $t_3$ - Third sequence**

$$\begin{aligned} x &= Vt + x' \\ y &= y' \\ t &= t' \end{aligned} \qquad (33)$$

From Fig. 4, we have:

$$R = c\Delta t , \qquad (34)$$

where $\Delta t = t_3 - t_2$,

$$R_x = V\Delta t + x' - x_2' \qquad (35)$$

$$R_y = y + f_y(t - \frac{R}{c})_{t_2 - t_1} - y_1 .$$

For example, for $R_{2.1}$ (Figure 6), we have:

$$R_{y2.1} = y_{2.1} + \Delta y_{1.1} = y_{2.1} + y_{1.1} - y_1 , \qquad (36)$$

where $y_{1.1} = f_y\left(t_{2.1} - \frac{R_{2.1}}{c}\right)_{t_2 - t_1}$ .

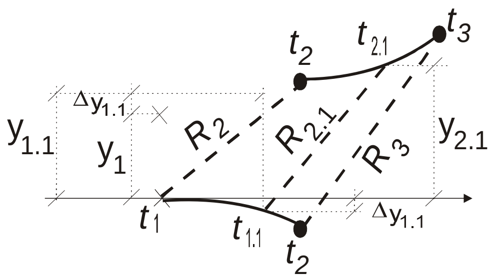


Figure 6 - Function $f_y\left(t_{2.1} - R_{2.1}/c\right)_{t_2 - t_1}$

$$R = \frac{Bx' - Bx'_2 \pm \sqrt{\left(-2Bx' + 2Bx'_2\right)^2 - \left(1 - B^2\right)\left(-x'^2 - 2x'x'_2 + x'^2_2 - y'^2 - 2y'\left(f_y(t - R/c)_{t_2 - t_1} - y_1\right) + \left(f_y(t - R/c)_{t_2 - t_1} - y_1\right)^2\right)}}{1 - B^2}$$

(37)

From (37) and differential equation (13), in the first integration, we have:

$$v'_x = f(x')_{t_3 - t_2} \qquad (38)$$

$$v'_y = f(y')_{t_3 - t_2},$$

In the second integration, we have:

$$x' = f_x(t)_{t_3 - t_2} \qquad (39)$$

$$y' = f_y(t)_{t_3 - t_2},$$

and, at time $t_3$, we have:

$$x'_3 = f_x(t_3)_{t_3 - t_2}$$

$$y'_3 = f_y(t_3)_{t_3 - t_2}$$

$$x_3 = Vt_3 + x'_3 \qquad (40)$$

$$y_3 = y'_3$$

$$R_{x3} = BR_3 + x'_3 - x'_2$$

$R_{y3} = y_3 + y_2 - y_1.$

**8.5 From $t_3$ to $t_4$ - Fourth sequence**

$$R_x = V\Delta t + x' - x'_3 \qquad (41)$$
$$R_y = y + f_y(t - R/c)_{t_3 - t_2} - y_1,$$

and, at time $t_4$, we have:

$$x'_4 = f_x(t_4)_{t_4 - t_3}$$

$$y'_4 = f_y(t_4)_{t_4 - t_3}$$

$$x_4 = Vt_4 + x'_4 \qquad (42)$$

$$y_4 = y'_4$$

$$R_{x4} = BR_4 + x'_4 - x'_3$$

$$R_{y4} = y_4 + y_3 - y_1.$$

The same calculations can be repeated for the following sequences.

## 9. Coulomb force – comparative between SR and NNT

We compared the simple cases of Coulomb forces betweem SR and NNT.

### 9.1 SR transformation of Coulomb force

Let us suppose two inertial frames $S$ , $S'$, two charged particles $q$ with velocity $V$ constant in relation to $S$ and at rest in relation to $S'$, where $x$ is parallel to $x'$, see Fig.7.

The SR transformation of forces for this simple case are:

$$F_x = F'_x = 0 \qquad (43)$$

$$F_y = \frac{F'_y}{\gamma_V} = \frac{qq}{4\pi\varepsilon_o}\frac{1}{r^2}\sqrt{1-B^2}$$

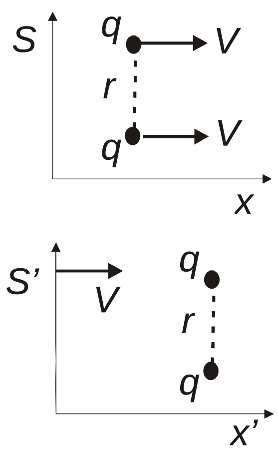


Fig. 7 – SR force transformation. Two charges $q$ with velocity $V$ in frame $S$ and at rest in frame $S'$

**9.2 NNT transformation of Coulomb force**

In the NNT the Coulomb force is calculated in the preferred frame $S$ and we use the Galilean transformations to calculate in another frame the position $(x, y, z)$, velocity, etc.
The simplest cases are described below.

**9.2.1 – The more simple example:** $V = 0$

Suppose particle $Q$ at rest in CMB ($V = 0$) and particle $q$ with rotational velocity $v$ in relation to $Q$.
The force is instantaneous because $r = R$ where $r$ is the distance between the particles and $R$ is the distance travelled by the Coulomb wave.

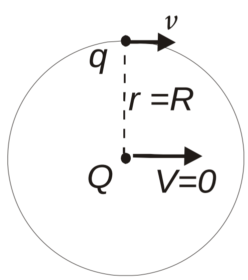


Fig. 8 – Particle $Q$ at rest in CMB and $q$ with rotational velocity $v$ in relation to $Q$

$$F = \frac{qQ}{4\pi\varepsilon_o}\frac{1}{r^2} \tag{44}$$

**9.2.2 -** $V > 0$

Let us suppose $S'$ with velocity $V > 0$ and constant in relation to $S$, particle $Q$ at rest in $S'$, $q$ with rotational velocity $v'$ in relation to $Q$ and $\mathbf{v} = \mathbf{v}' + \mathbf{V}$, see Fig. 9.

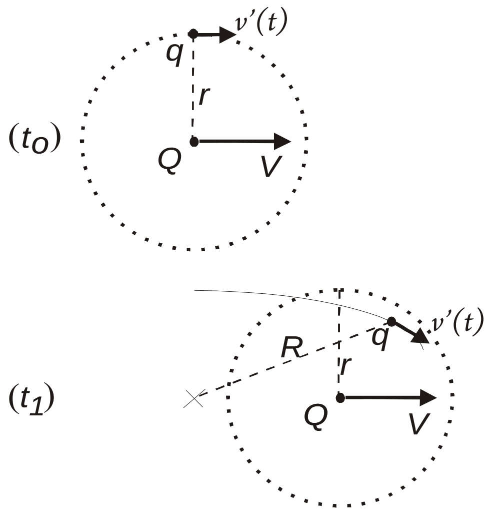


Fig. 9 – Particle $Q$ at rest in frame $S'$, $S'$ with velocity V in relation to $S$ and particle $q$ with rotational velocity $v'$ in relation to $Q$.

The force in $q$ is:

$$F = \frac{qQ}{4\pi\varepsilon_o}\frac{1}{R^2} \tag{45}$$

where $R$ comes from (10).

$$R = \frac{Bx' \pm \sqrt{x'^2 + y'^2(1-B^2)}}{1-B^2} \tag{46}$$

### 9.2.3 – Coulomb force between two frames

Let us suppose the case studied in the Section 9.1 and where $S$ is the CMB.
From Fig. 10 and Section 8.1 for time $t_1$ we have:

$$F = \frac{qq}{4\pi\varepsilon_o}\frac{1}{R^2} = \frac{qq}{4\pi\varepsilon_o}\frac{1}{r^2}\left(1-B^2\right) \tag{47}$$

$$F_y = F\sin\varphi = F\sqrt{1-B^2}$$

$$F_x = F\cos\varphi = FB$$

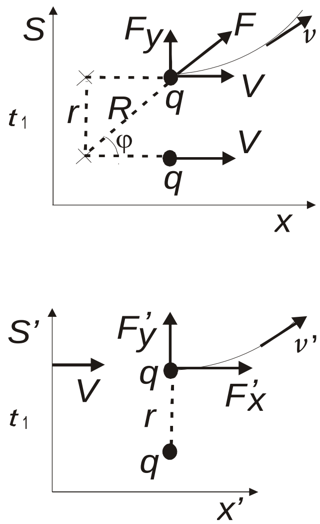


Fig. 10 – NNT Coulomb force – two particles $q$ with velocity $V$ (at time $t_1$) in frame $S$ and at rest in $S'$.

The forces are calculated in frame $S$ and we transfom to $S'$ the velocity, position, etc., see Sect. 8.

For NNT we have the forces $F_x$, $F_x^{'}$, $F_y$ and $F_y^{'}$ different from zero and for SR we have $F_x = F_x^{'} = 0$, see Sect. 9.1.

## 10. Doppler effect

### 10.1 Transverse Doppler effect

From section 8.2 we have: " time dilation in new Newtonian physics 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 the preferred frame $S$ (CMB), the internal Coulomb potential energy is:

$$U_o = \frac{qQ}{4\pi\varepsilon_o}\frac{1}{r_o} \tag{48}$$

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 at rest in $S'$ and $S'$ is with velocity $V$ in relation to $S$, from (22) we have:

$$U = \frac{qQ}{4\pi\varepsilon_o}\frac{1}{R} = U_o\sqrt{1-B^2} \tag{49}$$

And we have the frequency proportional to the Coulomb potential energy. Substituting $U$ by $f$ in (49) we have:

$$f_{\perp} = f_o\sqrt{1-B^2} \tag{50}$$

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

The longitudinal Doppler effect in $S$ is:

$$f_{\ell} = \frac{f_{\perp}}{1 \pm B} = \frac{f_o\sqrt{1-B^2}}{1 \pm B} \tag{51}$$

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

If we have another frame $S''$ with same velocity $\mathbf{V}$ that $S'$ we have the longitudinal frequency measured in $S''$:

$$f_{\ell}'' = f_{\ell}(1 \pm B) = f_o\frac{\sqrt{1-B^2}}{1 \pm B}(1 \pm B) = f_o\sqrt{1-B^2} \tag{52}$$

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

The situation of $S'$ and $S''$ is the same because the atom and observer are at rest in relation to $S'$ and $S''$. So, the frequency measured by the observer at rest in $S'$ for any position (transverrsal, longitudinal, etc) from (52) is:

$$f_o' = f_o\sqrt{1-B^2} \tag{53}$$

where $f_o'$ is the frequency measured by the observer and atom at rest in $S'$ (for any position of the observer in relation to atom) and $f_o$ is the frequency measured by the observer and atom at rest in $S$.

## 10.2 Longitudinal Doppler effect

Let us suppose a distant star source with velocity $v$ away from CMB and emitts from hydrogen atom. The observer is at rest in earth and in direction of the star with velocity $V$ towards from CMB. $S$, $S'$ and $S''$ are respectively the CMB, earth and star, see Fig. 11.

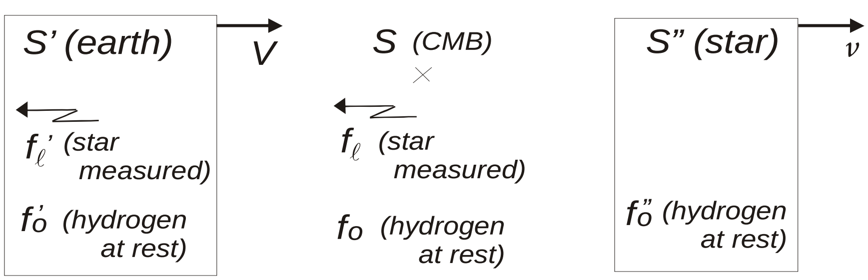


Fig. 11 – Longitudinal Doppler effect. Star frequency measured by an observer at rest in earth.

From (53) we have:

$$f_o^{'} = f_o\sqrt{1-B^2} \quad (54)$$

$$f_o^{''} = f_o\sqrt{1-\beta^2} \quad (55)$$

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:

$$f_\ell = \frac{f_o^{''}}{1+\beta} \quad (56)$$

The longitudinal star frequency measured in earth is:

$$f_\ell^{'} = f_\ell(1+B) \quad (57)$$

Substituting (54), (55) and (56) in (57) we have:

$$f_\ell^{'} = f_o^{'}\frac{\sqrt{1-\beta}}{\sqrt{1+\beta}}\frac{1+B}{\sqrt{1-B^2}} \quad (58)$$

$f_\ell^{'}$ 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.

## 11. Michelson-Morley experiment and new Newtonian physics

The Michelson-Morley experiment [3] 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. 12.

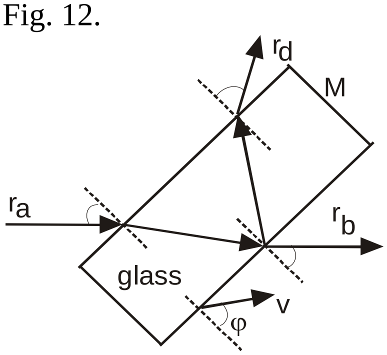

Figure 12 - Semitransparent mirror $M$ with velocity $V$ as well as, incident ray ($r_a$), the refracted-reflected-refracted ray ($r_d$) and refracted-refracted ray ($r_b$).

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.

### 11.1 Reflection in vacuum

In the Supplement of the MM paper [3], the equations of ray reflections in a moving mirror are shown in relation to a preferred frame. The equations in relation to the CMB are the same.

From [3]:

"Let $ab$ (Fig. 13) 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 $\varphi$ 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 $d$."

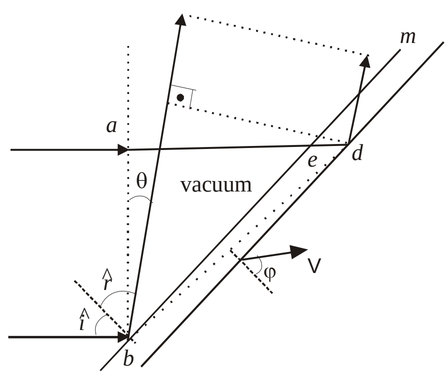


Fig. 13 – Reflection in vacuum. Incident and reflection plane waves

Michelson and Morley also demonstrated the following equation:

$$\tan\left(45° - \frac{\theta}{2}\right) = \frac{ae}{ad} = 1 - \frac{V\sqrt{2}\cos\varphi}{c} \quad . \qquad (59)$$

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 [4], we have:

$$\tan\hat{r} = \frac{1 - B^2\cos^2\varphi}{1 + B^2\cos^2\varphi \pm 2B\cos\varphi\sec\hat{i}}\tan\hat{i} \, , \qquad (60)$$

where $\hat{i}$ and $\hat{r}$ are respectively, the angles of incidence and reflection in relation to the normal of the mirror. Additionally, $B = V/c$, where $V$ is the velocity of the mirror in relation to the CMB, and $\varphi$ 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.

### 11.2 Reflection in glass

For $V = 0$:

$$u = \frac{c}{1.52} = 0.658c \,, \tag{61}$$

where $u$ is the velocity of light inside the glass in relation to the CMB and glass with $V = 0$.

For $V > 0$:

$$\mathbf{u}_{CMB} = \mathbf{u} + \mathbf{V}\left(1 - \frac{u^2}{c^2}\right) \tag{62}$$

and

$$u_{CMB}^2 = \left[u_x + V_x\left(1 - \frac{u^2}{c^2}\right)\right]^2 + \left[u_y + V_y\left(1 - \frac{u^2}{c^2}\right)\right]^2 , \tag{63}$$

where $u_{CMB}$ is the velocity of light inside the glass in relation to the CMB, $V$ is the velocity of glass in relation to the CMB and $V\left(1 - u^2/c^2\right)$ is the Fresnel drag.

In addition,

$$\mathbf{u}_{glass} = \mathbf{u}_{CMB} - \mathbf{V} \,, \tag{64}$$

where $u_{glass}$ is the velocity of light inside the glass in relation to glass.

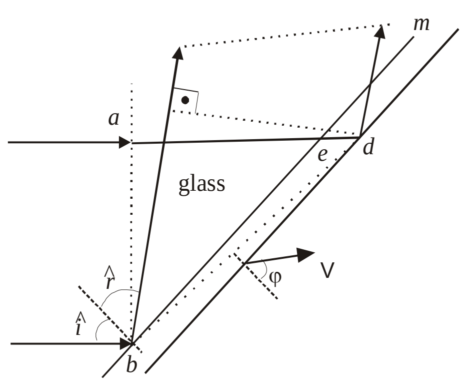


Figure 14 – Reflection in glass. Incident plane wave and reflected non-plane wave.

As shown in Fig. 14, after reflection, we have a non-plane wave.
The equations of reflection in glass must be further developed.

### 11.3 Refraction in vacuum-glass for V = 0

From Snell's law of refraction we have:

$$\sin \hat{i} = \frac{c}{u} \sin \hat{f}_0 = 1.52 \sin \hat{f}_0 . \qquad (65)$$

### 11.4 Refraction in vacuum-glass for V > 0

Additionally,

$$\sin \hat{i} = \frac{c}{u_{CMB}} \sin \hat{f} , \qquad (66)$$

where $\hat{i}$ , $\hat{f}_0$ and $\hat{f}$ are the angles, respectively, of incidence, refraction for $V = 0$ and refraction for $V > 0$. The angles are in relation to the normal of the glass (Fig. 12).

### 11.5 The Michelson-Morley experiment

The Michelson-Morley experiment requires one semi-transparent mirror, 16 mirrors, a lens and a telescope. In Fig. 15, we substitute 2 mirrors for 15 mirrors.

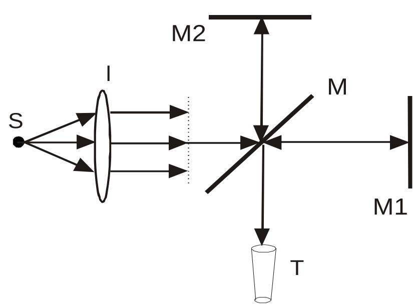


Figure 15 – Michelson-Morley experiment with one semi-transparent mirror, 2 mirrors, a lens and a telescope.

In Fig. 15, S, l, M, M1, M2 and T are, the light source, lens, semi-transparent mirror, mirror 1, mirror 2 and telescope, respectively.

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 [5-7].

For the telescope, we substitute screen B, as shown in Fig. 16.

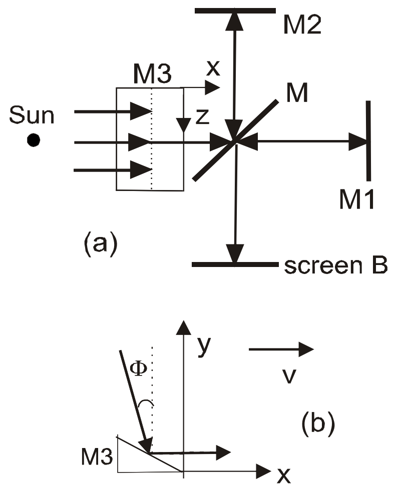


Figure 16 – Michelson-Morley experiment with sun light and secreen B. Panel (a) shows the x-z plane, while (b) shows the x-y plane.

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.
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**Conclusion**

New equations for the motions of bodies are derived for inertial and non-inertial frames using:
a) some special relativity equations (but derived from Newtonian physics)
b) non-instantaneous forces
a) Galilean transformations and a preferred frame (the cosmic microwave background).

The previsions of the theory are: a) if the galaxy is a spiral, the plane galaxy is moving in direction of the CMB, like our Milk Way galaxy. b) dark matter calculated from rotation curves in spiral galaxies is less than the actual theory and can be zero.

The same special relativity equations of mass variation, kinetic energy and mass-energy relations are derived by Lewis (who received 35 nominations for the Nobel prize in chemistry) using Newtonian concepts and the laws of conservation of mass, energy and momentum.

Time dilation and transverse Doppler effect are the same that the SR and are derived by our new Newtonian theory.

Coulomb and gravitational forces are different from the SR and are derived again, by our new Newtonian theory.

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