Galilean relativity with the relativistic gamma factor.

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This paper is an extract of [8] listed in section Bibliography.

Abstract

Special Relativity derived by Einstein presents time and space distortions and paradoxes. This paper presents an approach where the Lorenz transformations are build on equations with speed variables instead of space and time variables as done by Einstein. The result are transformation rules between inertial frames that are free of time dilation and length contraction. Particles move according to Galilei relativity also for relativistic speeds. The transformed speeds (virtual speeds) describe the non linearity of the physical magnitudes relative to the Galilei speeds. All the transformation equations already existent for the electric and magnetic fields, deduced on the base of the invariance of the Maxwell wave equations are still valid. The present work shows the importance of including the characteristics of the measuring equipment in the chain of physical interactions to avoid unnatural conclusions like time dilation and length contraction.

1 Introduction.

Space and time are variables of our physical world that are intrinsically linked together. Laws that are mathematically described as independent of time, like the Coulomb and gravitation laws, are the result of repetitive actions of the *time variations* of linear momenta [8].

To arrive to the transformation equations Einstein made abstraction of the physical interactions that make that light speed is the same in all inertial frames. The result of the abstraction are transformation rules that show time dilation and length contraction.

The physical interactions omitted by Einstein are given in the authors "Emission & Regeneration" UFT [8] and are:

- photons are emitted with light speed c relative to their source
- photons emitted with c in one frame that moves with the speed v relative to a second frame, arrive to the second frame with speed $c \pm v$.

- photons with speed $c \pm v$ are reflected with c relative to the reflecting surface
- photons refracted into a medium with $n = 1$ move with speed c independent of the speed they had in the first medium with $n \neq 1$.

The concept is shown in Fig. 1

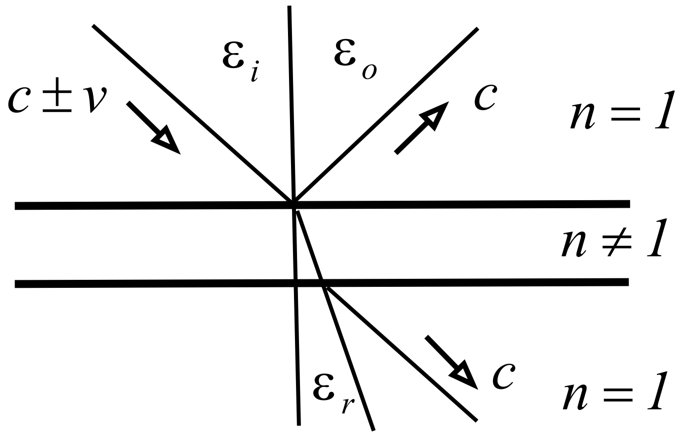

Figure 1: Light speed at reflections and refractions

The Lorenz transformation applied on speed variables, as shown in the proposed approach, is formulated with absolute time and space for all frames and takes into account the physical interactions that produces the constancy of light speed in all inertial frames.

2 Lorenz transformation based on speed variables.

The general Lorentz Transformation (LT) in orthogonal coordinates is described by the following equation and conditions for the coefficients [2]:

$$\sum_{i=1}^{4}(\theta^i)^2 = \sum_{i=1}^{4}(\bar{\theta}^i)^2 \qquad \sum_{i=1}^{4} \bar{a}^i_k \bar{a}^i_l = \delta_{kl} \qquad \sum_{i=1}^{4} \bar{a}^k_i \bar{a}^l_i = \delta^{kl} \tag{1}$$

with

$$\bar{\Theta}^i = \bar{a}^i_k \Theta^k \; + \; \bar{b}^i \tag{2}$$

The transformation represents a relative displacement $\bar{b}^i$ and a rotation of the frames and conserves the distances $\Delta\Theta$ between two points in the frames.

Before we introduce the LT based on speed variables we have a look at Einstein's formulation of the Lorentz equation with space-time variables as shown in Fig. 2.

$$x^2 + y^2 + z^2 + (ic_o\, t)^2 = \bar{x}^2 + \bar{y}^2 + \bar{z}^2 + (ic_o\, \bar{t})^2 \tag{3}$$

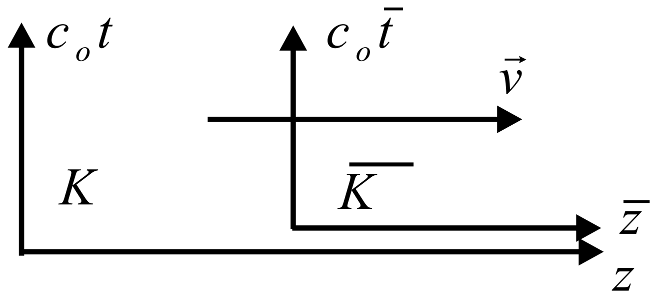

Figure 2: Transformation frames for **space-time** variables

For distances between two points eq. (3) writes now

$$(\Delta x)^2 + (\Delta y)^2 + (\Delta z)^2 + (ic_o\, \Delta t)^2 = (\Delta \bar{x})^2 + (\Delta \bar{y})^2 + (\Delta \bar{z})^2 + (ic_o\, \Delta \bar{t})^2 \tag{4}$$

The fact of equal light speed in all inertial frames is basically a speed problem and not a space-time problem. Therefor, in the proposed approach, the Lorentz equation is formulated with speed variables and absolut time and space dividing eq. (4) through the **absolute time** $(\Delta t)^2$ and introducing the forth speed v_c.

$$v_x^2 + v_y^2 + v_z^2 + (iv_c)^2 = \bar{v}_x^2 + \bar{v}_y^2 + \bar{v}_z^2 + (i\bar{v}_c)^2 \tag{5}$$

The forth speed v_c introduced is the speed of Fundamental Particles (FPs) that move radially through a focus in space, according to a new representation of basic subatomic particles like the electron or positron, as defined in the approach "Emission & Regeneration" Unified Field Theory [8] from the author. The FPs store the energy of the subatomic particles as rotations defining longitudinal and transversal angular momenta. The speed v_c is independent of the speeds v_x, v_y and v_z, forming together a four dimensional speed frame.

For the Lorentz transformation with speed variables we get the following transformation rules between the source frame K and the virtual frame $\bar{K}$:

a) $\bar{v}_x = v_x$ $\qquad v_x = \bar{v}_x$

b) $\bar{v}_y = v_y$ $\qquad v_y = \bar{v}_y$

c) $\bar{v}_z = \dfrac{v_z - v}{\sqrt{1 - v^2/v_c^2}} = (v_z - v)\,\gamma$ $\qquad v_z = (\bar{v}_z + v)\,\gamma$

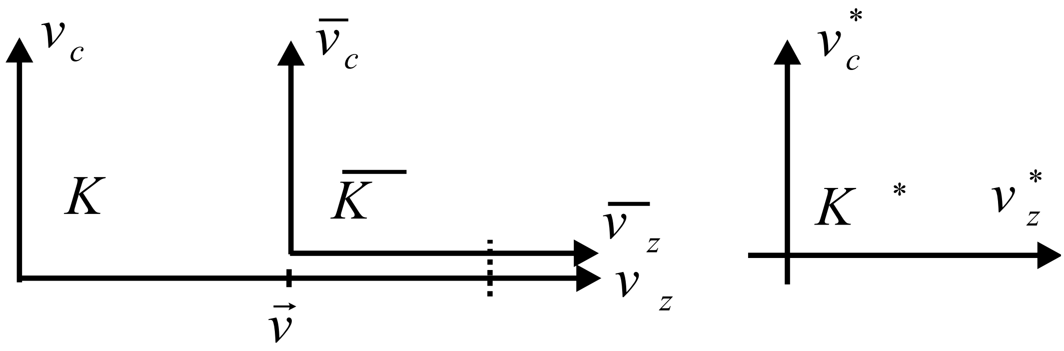

Figure 3: Transformation frames for **speed** variables

$$\text{d)} \qquad \bar{v}_c = \frac{v_c - \dfrac{v}{v_c}\, v_z}{\sqrt{1 - v^2/v_c^2}} = (v_c - \frac{v}{v_c}\, v_z)\,\gamma \qquad v_c = (\bar{v}_c + \frac{v}{\bar{v}_c}\, \bar{v}_z)\,\gamma$$

The factor

$$\gamma = \left(1 - \frac{v^2}{v_c^2}\right)^{-1/2} = 1 + \frac{1}{2}\,\frac{v^2}{v_c^2} + \frac{1\cdot 3}{2\cdot 4}\left(\frac{v^2}{v_c^2}\right)^2 + \frac{1\cdot 3\cdot 5}{2\cdot 4\cdot 6}\left(\frac{v^2}{v_c^2}\right)^3 + \cdots \tag{6}$$

gives the non-linearity of the variables (linear momentum, energy, etc.) with the relative speed v of the frames, as will be shown for each case.

Note: With time and space absolute variables, particles move according Galilean relativity. The frame $\bar{K}$ is a *virtual* frame because the speeds calculated with the Lorentz transformation equations for this frame are virtual speeds and not the real Galilean speeds of the particles, which are $\bar{v}_{r_z} = v_z \pm v$. The frame $\bar{K}$ gives the virtual velocities that allow the calculation of the values of the momentum, acceleration, energy and energy density current, which are not linear functions of the real Galilean speed $\bar{v}_{r_z}$. The virtual speeds are obtained by the product of the real Galilean speeds with the factor γ.

Between the frames K and $\bar{K}$ the Galilean relativity is valid.

$$\Delta\bar{z} = z_o \pm v\,\Delta t \qquad with \qquad \Delta\bar{t} = \Delta t \quad for\ all\ speeds \quad v \tag{7}$$

If we start counting time when the origin of all frames coincide so that it is

$$z = \bar{z} = z^* = 0 \qquad for \qquad t = 0 \tag{8}$$

we get for the different types of measurements

Measurement	**K**	$\bar{\mathbf{K}}$	$\overset{*}{\mathbf{K}}$

ideal	$z = z_o$	$\bar{z} = z_o \pm v\ t$	$z^* = z_o \pm v\ t$
non destructive	$z = z_o$	$\bar{z} = z_o \pm v\ t$	$z^* \approx z_o \pm v\ t$
destructive	$z = z_o$	$\bar{z} = z_o \pm v\ t$	$z^* = z_o \pm v\ t_{meas}$

where t_{meas} is the time the destructive measurement took place at the instrument placed in K^*. As time is an absolute variable it is

$$\Delta t = \Delta \bar{t} = \Delta t^* \tag{9}$$

Note: The Lorentz transformation equations a),b) and c) are independent equations with the variables v_x, v_y and v_z; there is no cross-talking between them. Not so equation b) where $\bar{v}_c$ is a function of v_c and v_z; v_z is modifying $\bar{v}_c$.

2.1 Transformations for electromagnetic waves at measuring instruments .

According to the approach "Emission & Regeneration" Unified Field Theory [8] from the author, electromagnetic waves that arrive from moving frames with speeds different than light speed to measuring instruments like optical lenses or electric antennas, are absorbed by their atoms and subsequently emitted with light speed c_o in their own frames. To take account of the behaviour of light in measuring instruments an additional transformation is necessary.

In Fig 3 the instruments are placed in the frame K^* which is linked rigidly to the *virtual* frame $\bar{K}$. Electromagnetic waves from the source frame K move with the real speed $\bar{v}_{r_z} = c_o \pm v$ in the *virtual* frame $\bar{K}$. The real velocity $\bar{v}_{r_z}$ can take values that are bigger than the light speed c_o.

The links between the frames for an electromagnetic wave that moves with c_o in the frame K are:

	K	$\bar{\mathbf{K}}$	$\overset{*}{\mathbf{K}}$
e)	λ_z	$\bar{\lambda} = \lambda_z$	
f)	$v_z = c_o$	$\bar{v}_{r_z} = c_o \pm v$	$v_z^* = c_o$
g)	$f_z = c_o/\lambda_z$	$\bar{f}_{r_z} = \bar{v}_{r_z}/\lambda_z$	
h)		$\bar{f}_z = \bar{f}_{r_z}\,\gamma$	$f_z^* = \bar{f}_z$
i)	$E = h\,f_z$	$\bar{E} = h\,\bar{f}_z$	$E_z^* = h\,f_z^*$

e) shows the link between the frames K and $\bar{K}$. The wavelengths $\lambda_z = \bar{\lambda}_z$ because there is **no length contraction**.
f) shows the real Galilean speed $\bar{v}_{r_z}$ in frame $\bar{K}$.
g) shows the real frequency $\bar{f}_{r_z}$ in the frame $\bar{K}$.
h) shows the virtual frequency $\bar{f}_z$ in the frame $\bar{K}$ and the link to the frequency f^* of the frame K^*.
i) shows the equation for the energy of a photon for each frame.

Note: Also for electromagnetic waves the frame $\bar{K}$ gives the virtual velocity that allows the calculation of the values of the momentum, energy and frequency, which are not linear functions of the real speed $\bar{v}_{r_z}$. The virtual speeds in frame $\bar{K}$ are obtained through the product of the real (Galilean) speeds in frame $\bar{K}$ with the factor γ.

For electromagnetic waves we have the following real speeds for the different types of measurements:

Measurement	**K**	$\bar{\mathbf{K}}$	$\overset{*}{\mathbf{K}}$	**Refraction**
ideal	$v_z = c_o$	$\bar{v}_{r_z} = c_o \pm v$	$v_z^* = c_o$	$n = 1$
non destructive	$v_z = c_o$	$\bar{v}_{r_z} = c_o \pm v$	$v_z^* < c_o$	$n > 1$
destructive	$v_z = c_o$	$\bar{v}_{r_z} = c_o \pm v$	$v_z^* = 0$	$n \Rightarrow \infty$

with n the optical refraction index $n = c_o/v_z^*$.

3 Equations for particles with rest mass $m \neq 0$.

Following, equations are derived for particles with rest mass $m \neq 0$ that are observed from an inertial frame that moves with constant speed v. For this case the transformation equations a), b), c) and d) from K to $\bar{K}$ are used. The transfomation from $\bar{K}$ to K^* is the **unit** transformation because of conservations of momentum, acceleration, energy and energy density current between rigid linked frames.

3.1 Linear momentum.

To calculate the linear momentum in the virtual frame $\bar{K}$ of a particle moving in the source frame K with v_z and $v_x = v_y = 0$ we use the equation c) of sec 2, with $v_c = c_o$. The speed $v_c = c_o$ describes the speed of the Fundamental Particles (FP) [8] emitted continuously by electrons and positrons and which continuously regenerate them, also when they are in rest in the frame K ($v_x = v_y = v_z = 0$). We get

$$\bar{v}_z = \frac{v_z - v}{\sqrt{1 - v^2/v_c^2}} = (v_z - v)\gamma = \bar{v}_{r_z}\,\gamma \tag{10}$$

The linear momentum $\bar{p}_z$ we get multiplying $\bar{v}_z$ with the rest mass m of the particle.

$$\bar{p}_z = m\,\bar{v}_z = m\,(v_z - v)\gamma = p_z^* \tag{11}$$

where $m\,(v_z - v)$ is the Galilean momentum in the frame $\bar{K}$.

Because of momentum conservation the momentum we measure in K^* is equal to the momentum calculated for $\bar{K}$, expressed mathematically $p_z^* = \bar{p}_z$.

The momentum in the frames $\bar{K}$ and K^* is equal to the Galilean momentum in these frames multiplied with γ.

With eq. (6) we can write the linear momentum in the frames $\bar{K}$ and K^* with $\bar{v}_{r_z} = v_z \pm v$ as

$$m\,\bar{v}_{r_z}\,\gamma = m\,\bar{v}_{r_z} + m\,\bar{v}_{r_z}\,\left\{\frac{1}{2}\,\frac{v^{\,2}}{v_c^2} + \frac{1\cdot 3}{2\cdot 4}\,\left(\frac{v^{\,2}}{v_c^2}\right)^2 + \frac{1\cdot 3\cdot 5}{2\cdot 4\cdot 6}\,\left(\frac{v^{\,2}}{v_c^2}\right)^3 + \cdots\right\} \tag{12}$$

where the first term of the right side is the linear part of the momentum due to the real speed $v_z \pm v$ in $\bar{K}$, and the second term the contribution due to the non-linearity with the relative speed v between the frames.

Note: The rest mass is simply a proportionality factor which is not a function of the speed and is invariant for all frames. The quotient $v/\sqrt{1 - v^2/v_o^2}$ describes the dynamic of the particle.

3.2 Acceleration.

To calculate the acceleration in the virtual frame $\bar{K}$ we start with

$$\bar{a}_z = \frac{d\bar{v}_z}{dt} \qquad with \qquad \bar{v}_z = \frac{v_z - v}{\sqrt{1 - v^2/c_o^2}} \tag{13}$$

what gives

$$\bar{a}_z = \frac{d\bar{v}_z}{dt} = \frac{dv_z/dt}{\sqrt{1 - v^2/c_o^2}} = \frac{a_z}{\sqrt{1 - v^2/c_o^2}} \tag{14}$$

From momentum conservation $p_z^* = \bar{p}_z$ we have that $v_z^* = \bar{v}_z$ and get

$$\bar{a}_z = a_z^* = \frac{a_z}{\sqrt{1 - v^2/c_o^2}} = a_z\,\gamma \tag{15}$$

The acceleration in the frames K^* and $\bar{K}$ is equal to the Galilean acceleration in these frames multiplied with γ.

3.3 Energy density current.

The rest energy of one electron or positron, the energy density and the energy density current in the frame K are

$$E = m\,c_o^2 \qquad \rho_E = \frac{N}{dV}\,m\,c_o^2 \qquad J_E = \rho_E\,v_z = \frac{N}{dV}\,m\,c_o^2\,v_z \tag{16}$$

with N the number of electrons or positrons in the volumen dV.

To get the **energy density current** in the frames $\bar{K}$ and K^* we must multiply the energy density ρ_E with the transformed speed of v_z which is $\bar{v}_z$.

$$J_E^* = \bar{J}_E = \rho_E\,\bar{v}_z = \frac{N}{dV}\,m\,c_o^2\,(v_z \pm v)\gamma = \frac{J_E \pm \rho_E\,v}{\sqrt{1 - v^2/c_o^2}} \tag{17}$$

with

$$J_E = \frac{N}{dV}\,m\,c_o^2\,v_z \qquad and \qquad \rho_E = \frac{N}{dV}\,m\,c_o^2 \tag{18}$$

where J_E is the energy density current and ρ_E the energy density, both in the frame K.

Note: The number N of particles, the volume dV and the particle density are equal in all frames (no length contraction). As particles in the frames K^* and $\bar{K}$ move with $v_z \pm v$ relative to the frame K they have different energies, resulting different energy density currents $J_E^* \neq J_E$.

The energy density current in the frames K^* and $\bar{K}$ is equal to the Galilean energy density current in these frames multiplied with γ.

3.4 Energy.

To calculate the energy in the virtual frame $\bar{K}$ for a particle that moves with v_z in the frame K we use the equation $d)$ of sec 2, with $v_c = c_o$. The equation $d)$ is used because it gives the speeds of the FPs where the energy of the subatomic particles is stored.

$$\bar{v}_c = \frac{v_c - \dfrac{v}{v_c}\, v_z}{\sqrt{1 - v^2/v_c^2}} = (v_c - \frac{v}{v_c}\, v_z)\gamma = \bar{v}_{r_c}\,\gamma \qquad with \qquad \bar{v}_{r_c} = v_c - \frac{v}{v_c}\, v_z \tag{19}$$

We now define that $\bar{v}_{r_c} = v_c - \frac{v}{v_c}\, v_z$ is the Galilean speed of the FPs in the frames $\bar{K}$ and K^*.

We multiply now $\bar{v}_c$ with the momentum $p_c = m\, c_o$ and make $v_c = c_o$ and get

$$\bar{E} = p_c\, \bar{v}_c = m\, c_o\, \bar{v}_c = m\, c_o\, \bar{v}_{r_c}\,\gamma = m\, c_o\, (v_c - \frac{v}{v_c}\, v_z)\gamma = m\, c_o^2\,\gamma - m\, v\, v_z\,\gamma \tag{20}$$

We define $\bar{E}_r = m\, c_o\, \bar{v}_{r_c}$ as the Galilean energy in the frames $\bar{K}$ and K^*.

With $v_z = 0$ we get

$$\bar{E} = \frac{m\, c_o^2}{\sqrt{1 - v^2/c_o^2}} = \sqrt{E_o^2\; +\; \bar{E}_p^2} \tag{21}$$

with

$$\bar{E}_p = m\, |\bar{v}_z|\, c_o = |\bar{p}_z|\, c_o \qquad and \qquad E_o = m\, c_o^2 \tag{22}$$

To calculate the energy $\bar{E}_p = m\, \bar{v}_z\, c_o$ we must calculate $\bar{v}_z$ as explained in sec. 3.1 with $v_z = 0$. We get

$$\bar{v}_z = \frac{v_z - v}{\sqrt{1 - v^2/c_o^2}} = \frac{-v}{\sqrt{1 - v^2/c_o^2}} \qquad resulting \qquad \bar{p}_z = \frac{-v\, m}{\sqrt{1 - v^2/c_o^2}} \tag{23}$$

The energy E_o is part of the energy in the frame $\bar{K}$ and invariant, because if we make $v = 0$ we get E_o as the rest energy of the particle in the frame K.

Because of energy conservation between frames without speed difference the energy E^* in the frame K^* is equal to the energy $\bar{E}$ in the frame $\bar{K}$.

The energy in the frames K^* and $\bar{K}$ is equal to the Galilean energy in these frames multiplied with γ.

With eq. (6) we can write the energy as

$$m\, c_o^2\,\gamma = m\, c_o^2 + \frac{1}{2}\, m\, v^2 + m\, c_o^2\, \left\{ \frac{1\cdot 3}{2\cdot 4}\, \left(\frac{v^2}{c_o^2}\right)^2 + \frac{1\cdot 3\cdot 5}{2\cdot 4\cdot 6}\, \left(\frac{v^2}{c_o^2}\right)^3 + \cdots \right\} \tag{24}$$

where the first term of the right side gives the rest energy in frame K and the following terms the kinetic energy which is not linear with the speed v.

4 Equations for particles with rest mass $m = 0$.

In this section the equations for electromagnetic waves observed from an inertial frame that moves with the relative speed v are derived. A comparison between the proposed approach and the Standard Model is made.

4.1 Relativistic Doppler effect.

The speed $v_c = c_o$ describes the speed of the Fundamental Particles (FP) [8] emitted continuously by electrons and positrons and which continuously regenerate them, also when they are in rest in frame K ($v_x = v_y = v_z = 0$). In the case of the photon no emission and regeneration exist. The photon can be seen as a particle formed by only two parallel rays of FPs carrying each ray the FPs with the opposed transversal angular momenta of the other. At each ray FPs exist only along the length L of the photon which forms a focus that moves with light speed.

The concept is shown in Fig. 4

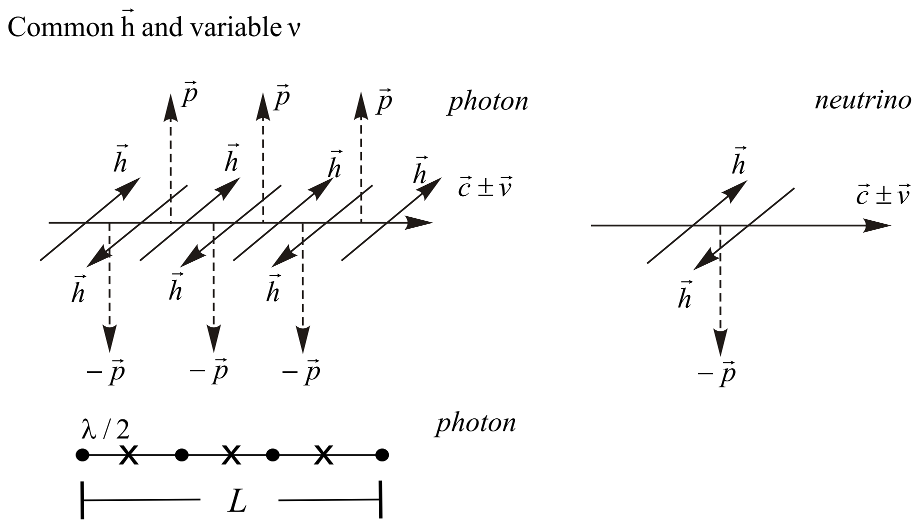

Figure 4: Photon and neutrino

To calculate the energy of a photon in the virtual frame $\bar{K}$ that moves with $v_z = c_o$ in the frame K we use the same equation d) of sec 2 used for particles with $m \neq 0$, with $v_z = c_o$ and $v_c = c_o$. We use equation d) because the energy is stored in FPs. We get

$$\bar{v}_c = \frac{v_c - \dfrac{v}{v_c}\, v_z}{\sqrt{1 - v^2/v_c^2}} = (c_o - v)\gamma \tag{25}$$

The momentum of a photon in the frame K is $p_c = E_{ph}/c_o$ which we multiply with $\bar{v}_c$ to get the energy of the photon in the frame $\bar{K}$. The transformation of the energy between the frames $\bar{K}$ and K^* is $E^* = \bar{E}$ and we get

$$\bar{E} = p_c\, \bar{v}_c = \frac{E_{ph}}{c_o}\, (c_o - v)\, \gamma = E_{ph}\, \frac{\sqrt{c_o - v}}{\sqrt{c_o + v}} = E^* = h\, f^* \tag{26}$$

We define $\bar{E}_r = \frac{E_{ph}}{c_o}\, (c_o - v)$ the Galilean energy in the frame $\bar{K}$.

With $E_{ph} = h\, f$ we get the well known equation for the relativistic Doppler effect

$$f^* = f\, \frac{\sqrt{c_o - v}}{\sqrt{c_o + v}} \qquad or \qquad \frac{f}{f^*} = \frac{\sqrt{1 + v/c_o}}{\sqrt{1 - v/c_o}} \tag{27}$$

and with $c_o = \lambda\, f$ and $c_o = \lambda^*\, f^*$ we get the other well known equation for the relativistic Doppler effect

$$\frac{\lambda}{\lambda^*} = \frac{\sqrt{1 - v/c_o}}{\sqrt{1 + v/c_o}} \tag{28}$$

No transversal relativistic Doppler effect exists.

Note: The real frequency $\bar{f}_{r_z}$ in the frame $\bar{K}$ is given by the Galilean speed $\bar{v}_{r_z} = c_o \pm v$ divided by the wavelength $\bar{\lambda} = \lambda$. The energy of a photon in the frame $\bar{K}$ is given by the equation $\bar{E}_{ph}= h\, \bar{f}_z$ where $\bar{f}_z = \bar{f}_{r_z}\, \gamma$, with $\bar{f}_{r_z} = (c_o \pm v)/\lambda_z$ the real frequency of particles in the frame $\bar{K}$.

Note: All information about events in frame K are passed to the frames $\bar{K}$ and K^* exclusively through the electromagnetic fields E and B that come from frame K. Therefore all transformations between the frames must be described as transformations of these fields, what is achieved through the invariance of the Maxwell wave equations.

The energy in the frames K^* and $\bar{K}$ is equal to the Galilean energy in the frame $\bar{K}$ multiplied with γ.

5 Resume of Galilean relativity with the gamma factor.

Relativity is a velocity problem in a space where time and length are absolute variables.

Particles move according Galilean relativity for velocities $v << c$. For velocities where $v \approx c$ the γ factor cannot be neglected. The relativity equations are:

Particles with $m \neq 0$

1) *Linear momentum* $p_z^* = m(v_z - v)\,\gamma$
2) *Acceleration* $a_z^* = \frac{d}{dt}\,(v_z - v)\,\gamma$
3) *Energy density current* $J_E^* = \rho\,(v_z - v)\,\gamma$
4) *Energy* $E^* = m\,c\,(c - \frac{v}{c}\,v_z)\,\gamma$

For $v_z = 0$ we get for the energy

$$E^* = m\,c^2\,\gamma = \sqrt{E_o^2 + E_p^2} \tag{29}$$

Particles with $m = 0$ (Electromagnetic waves)

$$\frac{\lambda}{\lambda^*} = \frac{\sqrt{1 - v/c_o}}{\sqrt{1 + v/c_o}} \qquad or \qquad \frac{f}{f^*} = \frac{\sqrt{1 + v/c_o}}{\sqrt{1 - v/c_o}} \tag{30}$$

No transversal relativistic Doppler effect exists.

Note: Einstein's Special relativity is the product of a mathematical approach where abstarction is made of the physical concecuences which are time and length distorsions. To make the model consistent Einstein introduced his unphysical second postulate which states that photons move with light speed independent of its source.

5.1 Transformation steps for photons from emitter to receiver.

Electromagnetic signals (photons) have to pass an interface at the receiver until a measurement can be made. The interface is an optical lense, a mirror or an antenna. The signals undergo two transformations when travelling from the emitter to the receiver. The first transformation occurs before the interface and the second behind the interface.

The concept is shown in Fig.5

If we assume that the emitter's signal in the K frame is

$$c = \lambda\,f \tag{31}$$

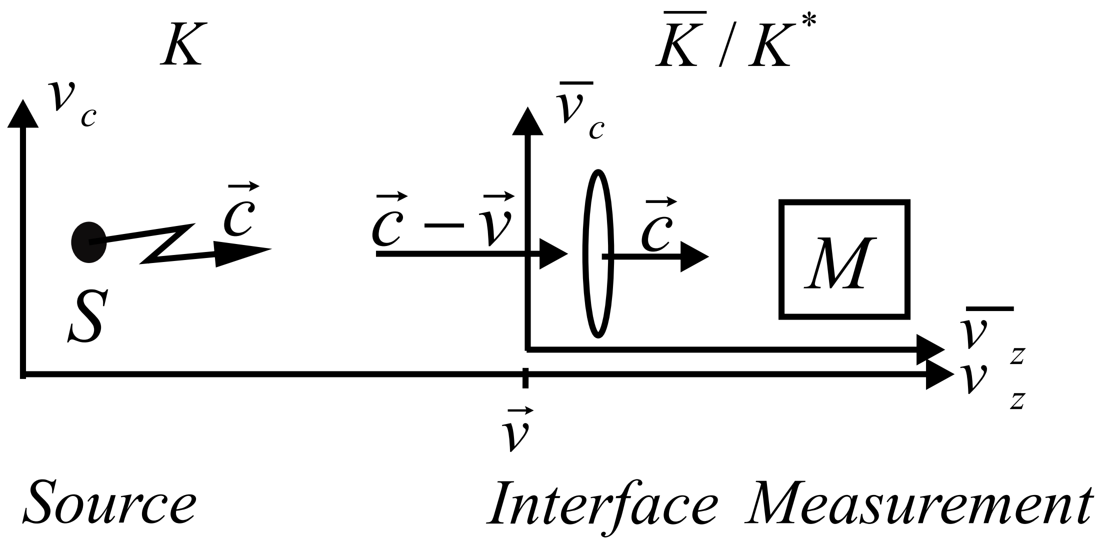

Figure 5: Transformation at measuring equipment's interface

the signal befor the interface of the receiver in the $\bar{K}$ frame is

$$\bar{f}= f \, \frac{\sqrt{c+v}}{\sqrt{c-v}} \qquad and \qquad \bar{\lambda}= \lambda \qquad and \qquad \bar{v_z}= c \pm v \tag{32}$$

At the output of the interface we get the signal in the K^* frame that is finally processed by the receiver.

$$f^* = f \, \frac{\sqrt{c+v}}{\sqrt{c-v}} \qquad and \qquad \lambda^* = \lambda \, \frac{\sqrt{c-v}}{\sqrt{c+v}} \qquad and \qquad v_z^* = c \tag{33}$$

At the first transformation the wavelength doesn't transform (absolute space) and at the second transformation the frequency (absolute time).

The speed before the interface $\bar{v_z}= c \pm v$ is the galilean speed which changes to $v_z^* = c$, the speed of light, before the processing in the receiver. This explains why always c is measured in all relative moving frames.

5.2 Energy of Fundamental Particles.

A photon is a sequences of pairs of FPs with opposed angular momenta at the distance $\lambda/2$ as shown in Fig. 4. The potential linear moment p of a pair of FPs with opposed angular momenta is perpendicular to the plane that contains the opposed angular momenta. The potential linear moment of a pair of FPs with opposed angular momenta can take every direction in space relative to the moving direction of the pair.

The emission time of photons from **isolated** atoms is approximately $\tau = 10^{-8}\ s$ what gives a length for the train of waves of $L = c\ \tau = 3\ m$. The total energy of the emitted photon is $E_t = h\ \nu_t$ and the wavelength is $\lambda_t = c/\nu_t$. We have defined (see Fig. 4), that the photon is composed of a train of FPs with alternated opposed angular momenta where the distance between two consecutive FPs is equal $\lambda_t/2$. The number of FPs that build the photon is therefore $N_{\mathbf{FP}} = L/(\lambda_t/2)$ and we get for the energy of one FP

The concept is shown in Fig. 6

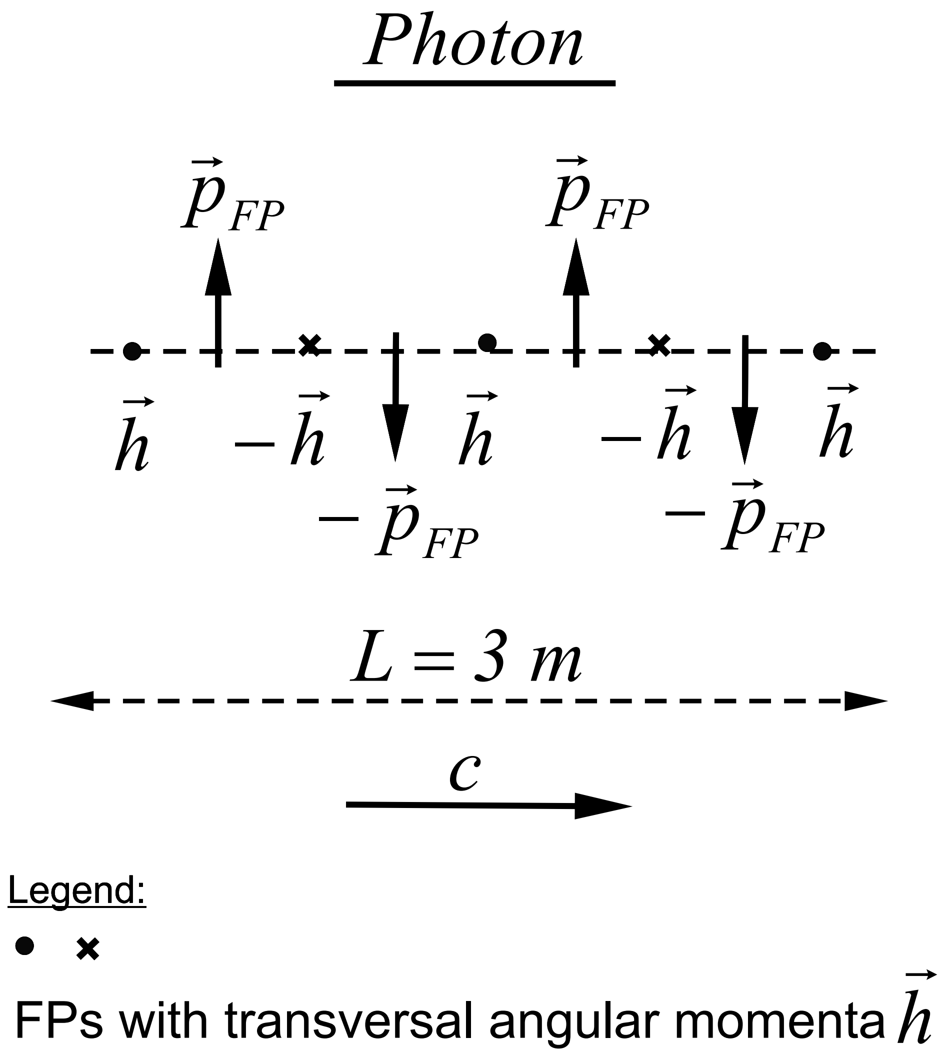

Figure 6: Photon as sequence of opposed angular momenta

$$E_{\mathbf{FP}} = \frac{E_t}{N_{\mathbf{FP}}} = \frac{E_t\ \lambda_t}{2\ L} = \frac{h}{2\ \tau} = 3.313 \cdot 10^{-26}\ J = 2.068 \cdot 10^{-7}\ eV \tag{34}$$

and for the angular frequency of the angular momentum h

$$\nu_{\mathbf{FP}} = \frac{E_{\mathbf{FP}}}{h} = \frac{1}{2\ \tau} = 5 \cdot 10^{7}\ s^{-1} \tag{35}$$

Finally we get

$$\nu_t = N_{\mathbf{FP}}\, \nu_{\mathbf{FP}} = \; 5 \cdot 10^7 \; N_{\mathbf{FP}} \; s^{-1} \qquad with \qquad N_{\mathbf{FP}} = \frac{c\,\tau}{\lambda_t/2} \tag{36}$$

Note: The frequency ν_t represents a linear frequency where the relation with the velocity v and the wavelength λ_t is given by $v = \lambda_t \; \nu_t$. The frequency $\nu_{\mathbf{FP}}$ represents the angular frequency of the angular momentum h.

The momentum generated by a pair of FPs with opposed angular momenta is

$$p_{\mathbf{FP}} = \frac{2\; E_{\mathbf{FP}}}{c} = 2.20866 \cdot 10^{-34} \; kg \; m \; s^{-1} \tag{37}$$

Fig. 4

Note: Isolated FPs have only angular momenta, they have no linear momenta and therefore cannot generate a force through the change of linear momenta . Linear momentum is generated only out of pairs of FPs with opposed angular momentum as shown in Fig. 4. It makes no sense to define a dynamic mass for FPs because they have no linear inertia, which is a product of the energy stored in FPs with opposed angular momenta. FPs that meet in space interact changing the orientation of their angular momenta but conserving each its energy $E_{FP} = 3.313 \cdot 10^{-26}\; J$.

The number N_{FP_o} of FPs of an resting BSP (electron or positron) is

$$N_{FP_o} = \frac{E_o}{E_{FP}} = 2.4746 \cdot 10^{12} \tag{38}$$

Note: Photons can be seen as a sequence of neutrinos with opposed potential linear momenta at the distance $\lambda/2$.

6 The proposed approach and the Standard Model.

The proposed approach [8] represents a photon as a package of a sequence of FPs with opposed angular momenta. Packages are emitted with the speed c_o relative to its source. A monochromatic source emitts packages with equal distances λ between FPs.

A package emitted with the speed c_o, the frequency f and the vawelength λ in the frame K will move in the virtual frame $\bar{K}$ with the real speed $\bar{v}_r = c_o \pm v$, will have the same vawelength $\bar{\lambda} = \lambda$ and a real frequency $\bar{f}_r = (c_o \pm v)/\lambda$. In the frame K^* the package is absorbed by the atoms of the measuring instruments and immediately reemitted with the speed c_o relative to K^*. The frequency f^* in the frame K^* is equal to the virtual frequency $\bar{f}$ in the frame $\bar{K}$ which is given by the product of the real frequency $\bar{f}_r$ and the factor γ.

The proposed approach unifies the frames $\bar{K}$ and K^* defining that the packages move from their source in frame K through space with the speed $c_o \pm v$ relative to the frame K^* of the instruments.

The Standard Model unifies the frames K and $\bar{K}$ to one frame defining that the packages (photons) move already from their source through space with the speed c_o relative to the frame K^* where the measuring instruments are located. This gives the impression that an absolute frame (aether) must exist for the photons to move always with ligth speed c_o independent of their sources.

For the Standard Model the length of a package in space (length of the wave train or coherence length) is $l = (c_o \pm v)\tau$ while for the present approach it is $l = c_o\ \tau$ (τ is the time needed for traversing the coherence length l), which is independent of the relative speed v .

Theories normally known as "Emission Theories" analysed by Willem de Sitter and Daniel Frost Camstock are theories that don't produce well defined spectroscopic lines for a star rotating around a neutron star (Astrometric binaries), contrary to what is observed. In the proposed approach packages with equal distances between their FPs (equal λ) but with different speeds $c_o \pm v$ from a star rotating around a neutron star (Astrometric binaries) produce well defined spectroscopic lines in accordance with experimental observations.

7 Interpretation of Data in a theoretical frame.

A theory like our Standard Model was improved over time to match with experimental data introducing fictious entities (particle wave, gluons, gravitons, dark matter, dark energy, time dilation, length contraction, Higgs particle, Quarks, Axions, etc.) and helpmates (duality principle, equivalent principle, uncertainty principle, violation of energy conservation, etc.) taking care that the theory is as consistent and free of paradoxes as possible. The concept is shown in Fig. 7. These improvements were integrated to the existing model trying to modify it as less as possible what led, with the time, to a model that resembles a monumental patchwork. To return to a mathematical consistent theory without paradoxes (contradictions) a completely new approach is required that starts from the basic picture we have from a particle. "E & R" UFT is such an approach representing particles as focal points in space of rays of FPs. This representation contains from the start the possibility to describe interactions between particles through their FPs, interactions that the SM with its particle representation attempts to explain with fictious entities.

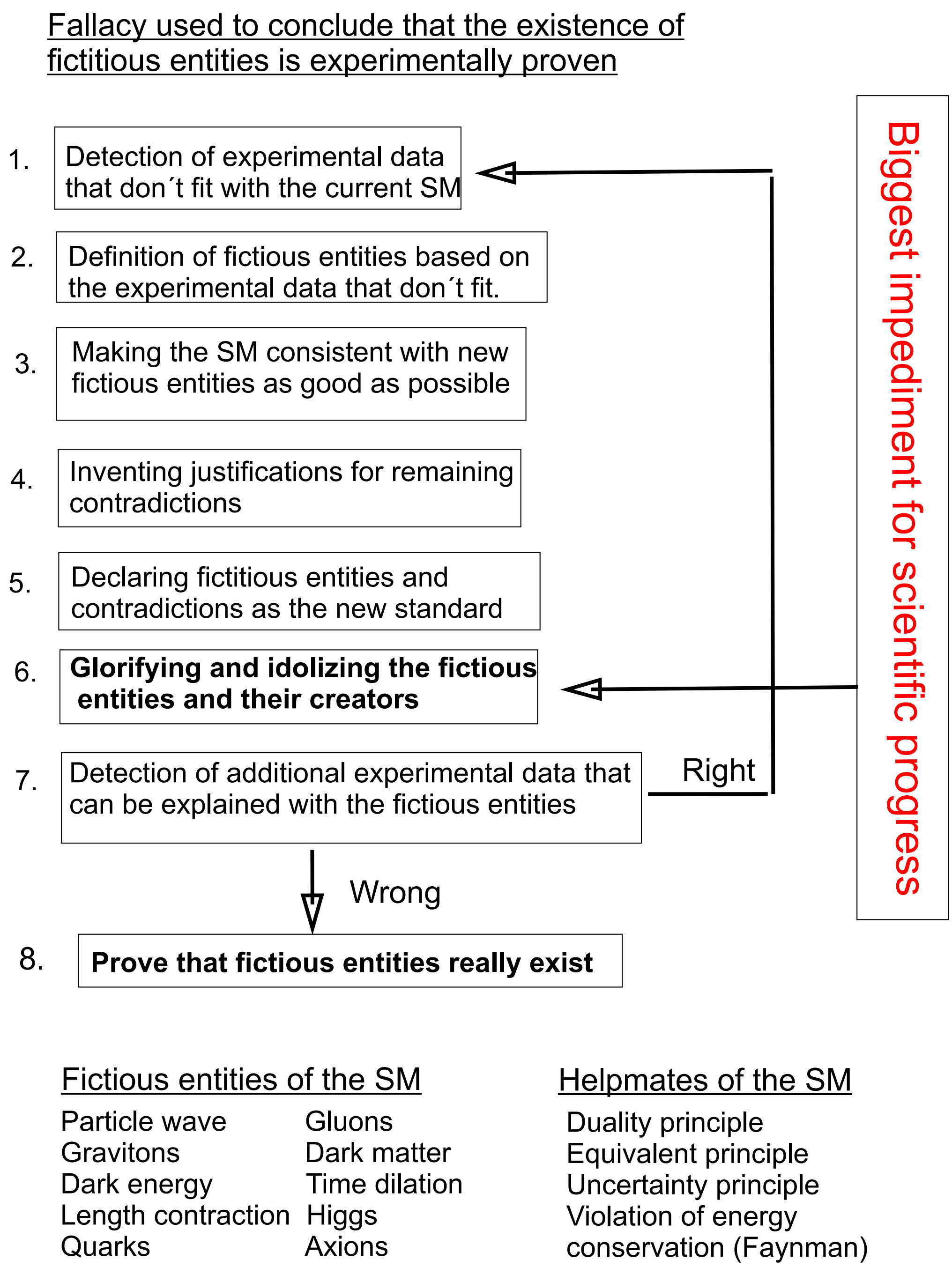

Figure 7: Fallacy used to conclude that fictious entities really exist

Fig. 7 is an organigram where the main steps of the integration of fictitious entities to a model are shown.

As an example we take the fictitious concept "time dilation and length contraction" from Special Relativity. The following enumeration referes to the flow diagram.

1. Experimental data that was detected that didn't fit with the prevailing model was that light speed was equal in all relative moving frames.

2. The fictitious entities that were introduced were time dilation and length contraction.

3. As emission theories are not compatible with the fictitious entities introduced, emission theories were simply declared as flawed theories.

4. Contradictions like the diferent aging of the twins were simply camouflaged as paradoxes.

5. Once the fictitious entities are declared part of the model, all other models that don't accept the fictitious entities are declared as wrong theories.

6. Instead of searching for a model without fictitious entities and contradictions, theorists glorify and idolize the creators of the flawed theories.

7. If additional experimental data is detected that can be explained with the fictitious entities like the life-time increase of moving muons, theorists conclude that that is the prove that the fictitious entities really exist, what is a fallacy. The right conclusion is that the model was correctly made consistent so that similar experimental data where time is involved don't need the additional introduction of new fictitious entities.

As a second example we take "dark matter"

1. Experimental data that was detected that didn't fit with the prevailing model was the flattening of Galaxies velocity curves.

2. The fictitious particle that was introduced was the dark matter.

3. Dark matter was conveniently placed in space to make the model consistent with the flattening.

4. Justifitions where invented to explain why dark matter is not visible.

5. Once dark matter was declared part of the model, all other models that don't accept the dark matter were declared as wrong theories.

6. Instead of searching for a model without the need of dark matter theorists glorify and idolize the creators of the flawed theory.

7. As additional experimental data based on gravitation can be explained with the arbitrarily placed dark matter, theorists conclude that that is the prove that dark matter really exist, what is a fallacy. The right conclusion is that the model was correctly made consistent so that similar experimental data based on gravitation don't need additional new fictitious entities.

If the experimental prove of a fictitious entity is a fallacy, the question that presents is which are the criteria to decide between two theories or models with fictitious entities..

1. The model that has the less number of fictitious entities
2. The model that has the less number of contradictions
3. The model that can explain the biggest number of experimetal data
4. The model that can predict new interactions

In the case of the "'Emission & Regeneration"' UFT only one fictitious entity is introduced, namely the Fundamental Particle.

8 Reference coordinate system.

The "'Emission & Regeneration"' UFT is based on the idea that Subatomic Particles (SPs) emit continously Fundamental Particles (FPs) and are continously regenerated by FPs. Regenerating FPs are those FPs that previously were emitted by other Subatomic Particles (SPs). All physical laws that were derived from measurements are laws that were obtained observing the behaviour of SPs in an enviroment of other SPs that provided the regenerating FPs for the particle in observation. This enviroment constitutes the reference for the laws. As the density of FPs emitted by a SP follows the inverse square distance law, the SPs that integrate the measuring equipment and the laboratory, and which are in the closer distance of the particle in observation, constitute the reference system for our physical laws. The mathematical describtion of the physical laws must contain the no-linear behaviour with the speed of the variables linear momentum, acceleration and energy through the gamma factor.

For an enviroment that moves with a constant speed "'v"' relative to the first one the same laws must be valid, now with a speed that is the simple addition of the speeds (Galilei speed), as long as the interactions between the particle in observation and the new enviroment don't modify the speed of the particle relative to the first enviroment.

9 Conclusions.

Einstein's SR is a perfect example of a classical theory that doesn't include physical interactions of the measuring instruments. The approach arrives to time dilation and length contraction, what is equivalent to say that time and length remain unchanged but that time unit (second) contract and length unit (meter) dilate. This violates fundamental principles of theoretical and experimental physics because units must be universally valid for all frames.

Based on the approach "Emission & Regeneration" Unified Field Theory [8], where electrons and positrons continuously emit and are regenerated by Fundamental Particles (FP), the following conclusions about relativity between inertial frames were deduced:

- The fact of equal light speed in all inertial frames is a speed problem and not a space and time problem. Time and space are absolute variables and equal for all frames according to Galilean relativity.

- Electromagnetic waves are emitted with light speed c_o relative to the frame of the emitting source.

- Electromagnetic waves that arrive at the interfaces of measuring instruments like mirrors, optical lenses or electric antennae are absorbed by the electrons of their atoms and subsequently emitted with light speed c_o relative to the nuclei of the atoms, independent of the speed they have when arriving to the measuring instruments. That explains why always light speed c_o is measured in the frame of the instruments.

- The transformation rules of *special relativity based on space-time variables* as done by Einstein describe the macroscopic results between frames, making abstraction of the physical cause (measuring instruments) of constant light speed in all frames and require therefore space and time distortions. The transformation rules of *Galilean relativity with virtual speeds based on speed variables*, as done in the proposed approach, take into consideration the physical cause (measuring instruments) of the constant light speed in all frames and therefore don't require space and time distortions.

- All relevant relativistic equations can be deduced with the proposed approach. The transformation rules have no transversal components, nor for the speeds neider for the Doppler effect.

- The speed v_c of the fourth orthogonal coordinate gives the speed of the FPs emitted continuously by electrons and positrons and which continuously regenerate them.

- Particles with rest mass are more stable when moving because of the interactions of their Fundamental Particles (FPs) with the FPs of the masses of real reference frames as explained in [8], and not because of time dilation .

The transformation equations based on speed variables are free of time dilation and length contraction and all the transformation rules already existent for the electric and magnetic fields, deduced on the base of the invariance of the Maxwell wave equations are still valid for the proposed approach.

The electric and magnetic fields have to pass two transformations on the way from the emitter to the receiver. The first transformation is between the relative moving frames while the second is the transformation that takes into account that measuring instruments convert the speed of the arriving electromagnetic waves to the speed of light c_o in their frames.

The present work shows how the measuring equipment must be integrated in the chain of interactions to avoid unnatural conclusions like time dilation and length contraction.

Note: General Relativity introduced by Einstein is based on time dilation and length contraction and is the gravitation theory of the Standard Model. With the abolition of time and length distortions General Relativity is not more valid and is replaced by the gravitation theory based on the "reintegration of migrated electrons and positrons to their nuclei" as explained in [8].

10 Bibliography.

Note: The present work is based on a completly new approach to explain the constancy of light speed in inertial frames and correspondingly no reference papers exist.

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