Theory of Events, Space and Time
a neoclassical relativity

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Abstract

The Theory of Relativity [1], conceived in 1905 by A. Einstein and now universally applied, involves some theoretical problems as well as some difficulties in the interpretation of experimental facts. Theoretical issues have long been debated [2,4] but have not found a sufficiently good explanation, indeed many interpretations [3,24] appear forceful and prejudicial. The many paradoxes expressed and debated and never clarified are still unresolved. The consequences of adopting a radical point of view, such as the relativistic one, also appear in the Quantum Field Theory, where the Lorentz-covariance formulation of the theory results, with careful analysis, the cause of many of the problems [54, 78].

The experimental point of view, contrary to what is commonly stated, does not undoubtedly support the theory; actually several results [5,42, 78] appear of difficult interpretation and others [6, 75] even in sharp contrast to the theory itself [23, 76].

The analysis of these inconsistencies leads to the assumption that the theory is spoiled by its foundations, that is the postulates, from defective origins that can not be eliminated [40, 77]. An alternative hypothesis, based on different premises, is therefore elaborated in this paper to reach a number of conclusions [81].

Such a different theoretical context recovers certain concepts of classical, mechanical and electrodynamic physics, which are however extended in a relativistic sense. Modifications are introduced in current kinematic, dynamic, electrodynamic and Quantum field theory. The theory thus developed is devoid of paradoxical aspects, adhering to experimental facts and free of divergence problems; superluminary motions are especially possible. Electrodynamic equations are extended into a new invariant form, compatible with Newtonian mechanics. Lorentz's force law is rewritten as a force variable with speed while the mass remains constant. A generalization of the equation of the waves is introduced, from which the equations of the superluminal motion and the equations of the material waves (Schrodinger and Klein-Gordon) can be obtained.

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1) Symbols

MM - Michelson – Morley Experiment

QM - quantum mechanics

GTR - general theory of relativity

STR - special theory of relativity

AF - absolute frame

IF - inertial frame

NIF - non inertial frame

OI - observer, inertial

ET - ether theory

TEST - Theory of Events Space and Time

GT - Galileian transformations

LT - Lorentz transformations

QFT - quantum field theory

12) The Special Theory of Relativity

Relativity [1] was born as a response to the problems of electrodynamics of the nineteenth century, in particular the difficult interpretation of the experiments of Fizeau [7], Bradley [8], Michelson-Morley [9], as well as theoretical problems raised by ether theories. It also develops on the basis of A. Einstein's philosophical reflections on the concepts of space and time, the concept of measurement and the main electrodynamic phenomena. Several attempts at theoretical framing of the facts had been tempted by various physicists [11,14], first of all A.H.Lorentz [12], but only with Einstein has the emergence of a unitary theory able to explain coherently the various phenomena . The various theoretical arrangements, while providing similar results, differed in some places deeply. Lorentz's theory in particular explicitly and positively laid down a particular substrate, the ether, the seat of electromagnetic phenomena, which is quite absent in the Einsteinian formulation.

The revolution brought by Einstein to the physics of the nineteenth century is based on two postulates, the first of which affirms the equivalence, valid in principle, of all inertial observers, while the latter affirms the constancy of the speed of light, always with reference to inertial observers. The Newtonian concepts of absolute space and time are completely abolished, while the theory is developed in a covariant form [22], that is valid for all observers.

The principle of the constancy of light velocity, at first sight somewhat paradoxical, is the basis of the theoretical difficulties that relativity has encountered over the years, including paradoxical situations [13, 75], asymmetries of difficult understanding, presence of infinite in the theory and more that have stimulated various reflections [2,4, 78] and heavy criticism [15,57, 77].

The initial successes in the explanation of experimental facts over the years have been supercede by doubts, both for the observation of phenomena [5,59], which are framed with difficulties in the relativistic context and by the presence of other [6, 58] that seem openly contradictory to theory.

The abolition of the concept of ether, on the other hand, turned out to be somehow improvised [16,17] or even as deleterious as the developments in QFT [18] or GTR [19]. On several occasions [20] [21] the concept of ether has been re-evaluated and deepened, with remarkable results in various fields of physics [35]. Many of the attempts made, however, are an unfortunate compromise that tries to save a little bit of everything, failing to satisfy anyone fully, sometimes leading to the introduction of obscure or extremely questionable concepts [24,25, 76].

The review of the concepts of space and time proposed by Einstein appears to the eyes of modern critics [26] spoiled by prejudices, as well as the "apparent" cinematic phenomena of contraction of the lengths and dilation of times, which sometimes seem unconvincing and sometimes even surprisingly unlikely [27]; The disagreements with the QM appear to be related to the well-known problems of non-local interactions [68,69,70,71].

The adoption of the Lorentz-invariance concept has led to major theoretical problems both in QFT and RG.

In the first case there are well-known problems of the presence of infinites and problems of renormalization [18,54], while in the latter there is difficulty in the elaboration of cosmological models [28], which is, moreover, obviated by abolishing the pseudo- Euclidean minkovskian metric [19,22].

The exceptional development of STR [29] and its application in almost all fields of physics have, however, curbed the enthusiasm of critics, since abandoning or replacing it with new concepts inevitably leads to a titanic reconstruction work of almost all physics. If, however, it is understood the conceptual and practical difficulties the theory has created over time can also be understood as such unwise task is almost inevitable and indeed necessary.

23) Ether theories

The first attempts for a mechanical or hydrodynamic description of the background space date back to the newtonian era and over the years the various models and different interpretations of electromagnetic phenomena have multiplied. The most promising attempt was the one by A.H.Lorentz's relating to an immobile ether, tied to absolute space. This conception was however criticized [30,62] because of the introduction of some auxiliary hypotheses, including that of contraction, which seemed unlikely, if not opportunistic,

And was then overcome by the limited relativity that avoided the use of additional hypotheses, based only on two postulates.

The theoretical and experimental problems encountered in STR have led several authors to re-evaluate the concept of ether, both in relativistic form [31,32] and/or in a new lorentzian way [33,34]. The theoretical debate has also been extensively deepened, both with STR and ET criticism, and with new theoretical proposals. The concept of ether was also implicitly adopted in quantum mechanics [63], gravitation theory [19], field theory, and various other fields [61].

In QM and QFT in particular, a complex dynamic quantum vacuum structure [64] is evident, which can obviously be taken as the basis for a modern conception of the ether concept.

In the simple and yet complete elaboration of Lorentz the ether is the seat of electromagnetic phenomena, in particular of the light phenomena, and constitutes the propagation medium of e/m waves. Such waves propagate at constant speed with respect to that medium, which therefore constitutes a privileged reference, regardless of the state of motion of the source. The velocity of the waves is constant only in a SR at rest with respect to the ether and not for a uniform moving observer (OI). The difference is evident from the relativistic point of view, but the results obtained are perfectly consistent with the premise and the concepts of classical physics.

In fact, let's have a spherical wave propagating in the bottom space with velocity c, it describes a radius sphere r = ct and equation

$$c^2 t^2 = x^2 \qquad (3.1)$$

In a reference in motion in the ***x*** direction the wave seems propagating in a modified shape, in fact transforming according to galileo

$$x' = x - vt, t' = t; x^{\square} = x' + vt', t^{\square} = t' \qquad (3.2)$$

(3.1) becomes

$$c^2 t'^2 = (x' + vt')^2 = x'^2 \quad + \qquad v^2 t'^2 + 2x'vt' \qquad (3.3)$$

$$(\ c^2 - v^2 ¿ t'^2 - 2x'vt' - x'^2 = 0$$

And the propagation speed results, for a motion along one of the axes

$$u = c' = \frac{-2v \pm \sqrt{4v^2 + 4c^2 - 4v^2}}{2} \qquad (3.4)$$

that is

c' = c-v $\qquad$ c'= - (c+v)

depending on whether the observer moves away or approaches the source.
The speed of light c is connected to the two quantities ε_0 and μ_0 from Maxwell's relation

$$c = \frac{1}{\sqrt{\varepsilon_0 \mu_0}} \qquad (3.5)$$

Which is here interpreted in a modeling sense, with ε_0 and μ_0 characteristic magnitudes of the ether. The concept of ether is here to coincide with that of the absolute space of Newtonian physics, coupled with particular physical properties. The equations of Newtonian mechanics apply to all OIs, ie those in straight-run motion with respect to the privileged reference. Maxwellian electrodynamic equations are valid only in the rest frame of the ether, while for OIs need to be appropriately modified (§5.1). This explains the constancy of the speed of light, holding only in absolute reference systems, being the velocity of propagation of a wave and as such dependent on the characteristics of the medium.

The mechanical description of the ether had already been tried in the past centuries [30], with different models, especially elastic. These descriptions encountered various problems and were therefore abandoned, maybe prematurely.

3.1) Michelson and Morley Experiment

A.A.Michelson and E.W.Morley's interferometric experimentation is generally regarded as crucial in the development of modern scientific thinking and as a mile stone in the crisis of classical physics. A model interpretation of the effect was given by A.H.Lorentz almost immediately, linked to his theory of ether, and was based on a dynamic contraction effect (the famous "Lorentz-Fitzgerald contraction"), a real effect due to dynamic phenomena associated with the structure of the ether.

The cancellation of the effect of the second order is far from fortuitous or surprising, but perfectly consistent in the new description of the electrodynamic phenomena.

Therefore turning the apparatus slowly or quickly can not in any case be seen as a second-order effect. The possibility of a residual effect of the third order remains open. Even in the long debated [42] Miller results there is a residual effect of the same order of magnitude, compatible with current knowledge of the state of the Earth's motion [72]. The subsequent repetitions of the interferometric experiments also show the presence of the effect, remaining silent though and still without explanation.

It has been said [15] that the total effect may depend on the details of the experiment, where there are multiple reflections, slightly unequal arms, reflection angles not exactly equal and not exaggerated equal to $\pi / 2$ and $\pi / 4$, adjustment Mirrors and other details. A complete calculation of the optical paths in the real apparatus however shows that this conjecture is to be rejected and that the effects considered are erased exactly, at least to the the second order.

3.2) Sagnac and Michelson-Gale Experiments

A variant of the MM experiment is based on the use of a rotating interferometer, first made by M.G.Sagnac [43] and, in a large-scale variant, by Michelson himself along with H.G.Gale [44]. The results obtained were immediately and clearly interpreted in full agreement with the hypothesis of the stationary ether, both by Sagnac and Michelson, while the relativistic explanation appeared immediately more difficult. The first attempts [45] of explanation have followed many controversies [46,55,60] between relativists and opponents and the heated debate still rages today.
In view of the new theory of the ether, the effect seems completely natural, if not trivial. Sagnac calculation provides:

$$\Delta t = (t_1 - t_2) = 2\pi r/(c+ \omega r)+2\pi r/(c- \omega r) \tag{3.12}$$

$$\Delta t \sim 4\omega A/c^2 \qquad \text{(A=path area, } \omega\text{=angular velocity)}$$

Note in particular how Langevin's (relativistic) computation [45] does not require the use of STR but GTR, and hides the (ab)use of an absolute reference and a Galilean transformation, implicitly contradicting the Principle of Relativity. The calculation is compatible with what is developed in the follow-up of this theory, in an euclidean hyperspace (§4.1).

In the case of a rectangular path such as that of the Michelson-Gale experiment, as well as for other possible paths, the result obtained [44] is always given by (3.12) which is therefore generally valid.
In the rotating (non-inertial) system, the calculation is not much more complex and, using the appropriate transformations (§4.1), the same final result is obtained. The speed of light is obviously not constant in the Einsteinian sense, but only in a narrower sense, ie relative to the reference frame of the propagation medium of the e/m waves.
A generalization of (3.12) is possible to include other earthly motions (revolution around the Sun, rotation of the Galaxy, etc ...)

$$\Delta t \sim 4(\omega_{rot} + \omega_{riv} + \omega_{galactic} + \ldots)A/c^2 \qquad (3.13)$$

but, as we see immediately, the additional terms are negligible compared to the one due to the Earth's rotation as the result depends on the angular velocity and not the absolute one. The situation is opposed to that of MM type experiments, where the dominant term is due to the global motion of the Earth relative to the CBR, see also §3.4.

3.3) Cosmic Background Radiation

A crucial aspect in the analysis of theories of ether lies in the study of the fundamental cosmic radiation. The radiation appears from the Earth slightly anisotropic, with a simple sinusoidal pattern. The explanation of the effect is surprisingly trivial, it is due to the motion of our planet with respect to the ether, with a speed of about 370 km/s [6]. Such an explanation is, however, inadmissible in the relativistic context where there is no privileged reference, and often attempts at reconciliation between theory and experiment overcome ridicule [15,25].
In the new theoretical context, the very presence of the background radiation, which can be understood as a "thermal" effect of the ether, is quite natural.

3.4) More tests

The original MM type interferometric experiments with incoherent light have been replaced in modern times with the use of Maser [48] or Laser [49] devices. Accuracy and sensitivity are steadily increasing, as well as the sophistication of the equipment. Even in these cases, however, there are residual effects of the type referred to above (§3.1), which can be explained by the dynamic effects of the ether.

Of great importance in this context are the works of H.A.Munera, who, in addition to having shown remarkable subtleties from a theoretical point of view [72], also realized a modern variant of the experiment with a non-rotating interferometer that gave a full effect! The greatest care in detecting the causes of error and modern data analysis procedures allowed Munera to succeed where Michelson had failed [73].

34) Dynamics

One of the highlights of STR is the use of a four-dimensional space-time description due mainly to H.Minkovsky [50]. In this description, a wide-ranging use of four-dimensional notation, 4-vectors and tensors is made. The use of a pseudo-euclidean metric is also essential

$$g^{\mu\nu} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix} \tag{4.1}$$

and the Lorentz's transformations are

$$x' = \gamma(x + \beta ct) \qquad t' = \gamma(t + \beta x/c) \tag{4.2}$$

Since the second postulated, ie the constancy of c, requires the invariance of D'Alembert's equation

$$\frac{\partial^2}{c^2 \partial t^2} \phi = \Delta \phi \tag{4.3}$$

In T.E.S.T. the constancy of velocity c is interpreted in a completely different way, so Galileian transformation laws and the use of an euclidean metric tensor in 4-dimensional hyperspace are appropriate. The wave equation is not invariant according to (4.3) but in an extended form.
Maxwell's equations are also invariant in an extended form.
With these considerations, the four dimensional formalism can be maintained, with minimal modifications.
Three types of references will be used in what follows:

- Absolute frames, at rest with respect to the ether
- Inertial frames, in rectilinear motion with respect to the ether and relative to each other
- Non-inertial references, otherwise.

The most noteworthy difference to the relativistic paradigm, but also to Newtonian physics, is the introduction of absolute references. It is understood that references that are at rest in relation to Maxwell's ether, that do observe an isotropic CBR, that coincide with the Absolute Space of Newton, or that coincide with the Einstein Cronotope in the GTR are one and the same. These different definitions are hereby supposed to be equivalent, at least for the time being, by reserving to better define the meaning if new experimental observations allow or suggest some difference between the four above-mentioned realities or indicate the preference of a definition with respect to another.

We anticipate that Maxwell's equations, in their simplest and traditional form, are valid only in absolute references; corrections are introduced in the other references.
In an absolute reference system (AF) the metric tensor in empty space is given by (see also [74])

$$g^{\mu\nu} = g_{\mu\nu} = ¿ \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \quad (4.4)$$

So the space-time interval results

$$ds^2 = g_{\mu\nu}\, dx^\mu\, dx^\nu \quad (4.5)$$

The wave equation (4.3) is expressed by the wave tensor

$$\Delta^{\mu\nu} = \Delta_{\mu\nu} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{pmatrix} \quad (4.6)$$

So that

$$\Delta\, \mu\nu\, \partial_\mu \partial_\nu^{\square} \varphi = 0 \quad (4.7)$$

And the speed and acceleration 4-vectors of a moving particle are defined as

$$u^\mu = (c, v) \qquad ; \qquad a^\mu = (0, a) \quad (4.8)$$

From which the 4-force (of Newton)

$$f^\mu = m\, a^\mu \quad (4.9)$$

Note that in this reference the covariant components coincide with the contravariant ones.
Momentum and energy are given by

$$p^\mu = \left(\frac{E}{c}; m\, v\right) \quad (4.10)$$

$$\frac{p^\mu p_\mu}{m} = m\, c^2 \sqrt{1+\beta^2} \quad (4.11)$$

and the usual limits hold $\beta \rightarrow 0 \quad E = m\, c^2 + \frac{1}{2} m\, v^2$

$\beta \rightarrow \infty \quad E = mcv = pc$

Turning to a moving system (IF) according to Galileo

$$x^{'}=x-v\,t\,,t^{'}=t\,;x^{□}=x'+v\,t\,',t^{□}=t\,' \quad (4.12)$$

translate into

$$\Lambda^{\mu\nu}=\begin{pmatrix}1&0&0&0\\ \beta&1&0&0\\ 0&0&1&0\\ 0&0&0&1\end{pmatrix} \quad (4.13)$$

$$x^{'\mu}=\Lambda^{\mu}_{\nu}x^{\nu} \quad (4.14)$$

The 4-velocity becomes

$u^{'\mu}=\Lambda^{\mu}_{\nu}u^{\nu}$ = (c; ***u* - *v***)
(4.15)

And the 4-force is invariant

$$f^{'\mu}=\frac{dp^{\mu}}{dt}=(0\,;a) \quad (4.16)$$

The derivative 4-vectors are

$$\partial_{\mu}=(\frac{\partial}{c\,\partial t}-\frac{v}{c}\frac{\partial}{\partial x};\frac{\partial}{\partial x}) \qquad \partial^{\mu}=(\frac{\partial}{c\,\partial t};\frac{\partial}{c\,\partial t}+\frac{v}{c}\frac{\partial}{\partial x}) \quad (4.17)$$

The wave tensor transforms according to

$$\Delta^{\mu\nu}=\begin{pmatrix}1-\beta^{2}&-\beta&0&0\\ -\beta&-1&0&0\\ 0&0&-1&0\\ 0&0&0&-1\end{pmatrix} \quad (4.18)$$

and yelds the generalized wave equation

$$\left((1-\beta^{2})\frac{\partial^{2}}{c^{2}\partial t^{2}}-2\beta\frac{\partial}{\partial x}\frac{\partial}{c\,\partial t}-\frac{\partial^{2}}{\partial x^{2}}\right)\phi=0 \quad (4.19)$$

To be compared to (3.3).

(4.19) is the generalization of (4.3) and still admits solutions in the form of waves of the type Φ (x + ut + k), Ψ (x-ut + h) with u given by

$$c\ (\beta \pm 1) \qquad (4.20)$$

In accordance with what is stated in §3.1. Specifically (4.19) is valid for a motion with a higher speed than c where there is propagation of superluminal waves. The velocity c in particular, in this exposition, is no longer a theoretical limit, nor is there any magnitudes that diverge when v tends to c.

4.1) Length contraction

The explanation of the null effect in the experiment of MM recalls the phenomenon of contraction [65], however in the theory of ether this loses its hypothetical aspect, to become a dynamic phenomenon connected to electromagnetic interaction between electrons and protons . We know today that matter is held together by electrodynamic forces and that they are responsible for the shapes and dimensions of the bodies. The behavior of atomic systems is governed by the Schrodinger equation, in which both dynamic terms and terms of electromagnetic interaction appear. As mentioned, however, and as you will see (§5.1), Maxwell's equations are valid in their classical and simpler form only in Absolute Frames, while in Inertial Frames they are invalid. Therefore (small) corrections should be introduced in the Schrodinger equation, in the LCAO, MLV and in the rest of quantum formalism, when referring to bodies in motion. This is why (§5.3) an anisotropic expression for Lorentz's force is acting on a moving body that involves anisotropy in the wave function. In particular, there is a crush in the direction of motion.
As a result, a spherical orbital crushes into a rotational ellipsoid of sort.
The cancellation of the effects, of course certainly dynamic, loses its character of artificiality and looks completely natural, with different effects having the same cause at its origin. It is evident that the effect is neither apparent nor introduced 'ad hoc'. It does not even seem appropriate to insert it into the transformations of coordinates, which remain simply galileian formulas (4.12) [53].

4.2) Time dilation

The dilation/contraction of time is seen here as a real (and not apparent) physical phenomenon but belonging to the measuring instrument, not to the physical time. In fact, if you use an interferometric system or a Laser or any other device that uses electromagnetic waves, the above effects are encountered. For example, a light-clock in an IF, due to the anisotropic propagation phenomena of waves measures a time given by

$$t'=l'/c_m \qquad (4.24)$$

on the longitudinal arm where c_m is the average speed of light

$$c_m=c_0\,(1-\beta^2)\ \text{(longitudinal arm)} \qquad (4.25)$$

Similar results are obtained for the transverse arm, which coincides at least to the second order.

4.3) The γ factor

The coefficient $\gamma=\sqrt{1+\beta^2}$ of (4.11) in what follows will sometimes go replacing the one used in STR, $\gamma=\frac{1}{\sqrt{1-\beta^2}}$ assuming the same values (except for β), but with the remarkable difference that the new one has no divergence problems and superluminal speeds become an absolutely common factor. The factor $\gamma=\sqrt{1+\beta^2}$ together with a revised Lorentz Force formula (§ 5.3) allows to re-interpret many experiments or facts (average life, *or rather average path*, of muons; synchrotron frequency, etc ...) without introducing any divergence in the equations.

45) Electrodynamics

One of the fundamental requirements in STR is the invariance of the electrodynamic equations in the form given to them by J.C.Maxwell. This need is purely theoretical and reflects the search for a *symmetry* that is imagined in nature itself. Since these equations are not invariant to Galileo's transformations, they have led to the introduction of Lorentz's transformations. However, there is no guarantee that there are no other and different ways of describing the phenomena. By developing Galilean formalism and it's own invariance, we will naturally be brought to different conclusions, including the extension and generalization of the Maxwell Equations, the generalization of the D'Alembert equation, the extension of quantum formalism. All this in perfect consistency with the premises and in accordance with classical physics, so there is no need for any changes as it happens in RR.

In practice, while in relativity it has been made to modify the mechanics to make it compatible with electrodynamics, we will see that in the present scenario is the electrodynamics that is modified, in a completely natural way, to put it in agreement with the mechanics, always guided by the same desire, that of a unified description of physical phenomena [52] [41].

5.1) Maxwell Equations in invariant form

Let starts with the 4-dimensional potential as usual

$$A^{\mu} = (\varphi; \mathbf{A})$$

From which the E and B fields are derived

$$\mathbf{E} = -\nabla\varphi - \frac{\partial}{\partial t}A \qquad \mathbf{B} = \nabla \times A$$

Let’s compute the E/M tensor

$$F^{\alpha\beta} = \begin{pmatrix} 0 & -Ex & -Ey & -Ez \\ Ex & 0 & -Bz & By \\ Ey & Bz & 0 & -Bx \\ Ez & -By & Bx & 0 \end{pmatrix} \tag{5.1}$$

The Lorentz Force yields

$$f^{\mu} = (0; \mathbf{a}) \tag{5.2}$$

In a moving inertial frame the E/M tensor transforms as

$F'^{\alpha\beta} = \Lambda^{\alpha}{}_{\mu}\,\Lambda^{\beta}{}_{\nu}\,F^{\mu\nu}$ =

$$\begin{pmatrix} 0 & -Ex & -Ey & -Ez \\ Ex & 0 & -Bz+\beta xEy-\beta yEx & By+\beta xEz-\beta zEx \\ Ey & Bz-\beta xEy+\beta yEx & 0 & -Bx+\beta yEz-\beta zEy \\ Ez & -By-\beta xEz+\beta zEx & Bx-\beta yEz+\beta zEy & 0 \end{pmatrix} \qquad (5.3)$$

$f'^{\mu} = (0; \mathbf{a})$ (5.4)

with $\mathbf{E}' = \mathbf{E}$ $\mathbf{B}' = \mathbf{B} - \beta \times E/c$

the Lorentz Force (5.4) is generally anisotropic

$$\frac{\partial p^{\alpha}}{\partial t} = \frac{q}{c} F^{\alpha_{\beta}} u_{\beta}$$
(5.5)

The 4-potential becomes

(5.6) $A'^{\mu} = (\varphi; \mathbf{A}+\varphi \;\; \beta \;\;)$

And the 4-current is

$$J'^{\alpha} = ¿ \quad (\rho; \mathbf{J}+\rho\boldsymbol{\beta})$$
(5.7)

Finally, using formulas from chapter. 4, (∂_{μ} = ($\frac{\partial}{c\partial t}$ + $\boldsymbol{\beta}\cdot \;\nabla$; $\nabla ¿, etc\ldots$)

$$\partial_{\mu} J^{\mu} = 0 \vee explicitly \quad \frac{\partial \rho}{c\partial t} + \boldsymbol{\beta}\cdot \;\nabla\; \rho \;+\; \nabla \cdot J + \rho\beta\cdot\nabla \;= 0 \quad (5.8)$$

Maxwell Equations

$$\partial_{\mu} F^{\mu\rho} = \frac{1}{c} J^{\rho} \quad \text{together with} \quad \partial^{\mu} F^{\omega\rho} + \partial^{\omega} F^{\rho\mu} + \partial^{\rho} F^{\mu\omega} = 0 \qquad (5.9)$$

through (5.5)-(5.8) become [41],

in explicit notation in the four classical fields (E, B=μH, D=εE, H)

(5.10-12)

$$\frac{\partial B}{\partial t}+(v\cdot\nabla)B=-(\nabla\times E)+[(B\cdot\nabla)v-(\nabla\cdot v)B]$$

$$\frac{\partial D}{\partial t}+(v\cdot\nabla)D+J=(\nabla\times H)+[(D\cdot\nabla)v-(\nabla\cdot v)D]$$

$$\nabla\cdot B=0 \qquad\qquad \nabla\cdot D=\rho$$

The (5.10) contain *v*-dependent terms, however they are perfectly invariant in the most general sense, as their writing in tensorial notation shows.
Their solution [41] shows exactly the type of predictable behavior in an inertial motion system with speed *v* with respect to the ether.

55.2) Electromagnetic waves

The (5.10) in the case ρ = 0, J = 0, *v* = 0 represent the D'Alembert equation for the electromagnetic field. They are valid with respect to an AF and, as in Chapter 4, they are transformed according to (4.18) by carrying an IF into a type (4.19) equation

For a slow motion system ($\beta << 1$) terms in β and β^2 can be overlooked and the D'Alembert equation (4.3) is found.
For β = 1, that is, for a system in motion at the speed of light two terms cancel and the equation becomes

$$\frac{\partial}{\partial x}\left(-2\frac{\partial}{c\partial t}-\frac{\partial^{\square}}{\partial x^{\square}}\right)\phi=0$$

(5.13)

From which it is possible, among other things, to derive the phenomenon of the optical bang.
For superluminal velocities, terms in β are dominant and, with good approximation

$$\frac{\partial}{\partial t}\quad\left(-\beta\frac{\partial^{\square}}{c\,\partial t^{\square}}-2\frac{\partial}{\partial x}\right)\phi=0$$

(5.14)

which we will call the equation of superluminal waves.
Obviously it's not that electromagnetic waves propagate at a speed different than c, the speed of light is always the same in an AF, but how a fast-paced observer sees these waves. At no point is it forbidden to travel at speeds greater than c but it would seem (see

§4.1 and §5.3) that matter as we know it ceases to exist when approaching c, precisely because of spatial contraction phenomena. It can not be ruled out, however, that particular objects (particles, nuclei) held together by non-electromagnetic forces (nuclear, gravitational) can travel superluminally. The question of the propagation speed of non-electromagnetic interactions, such as gravitational interaction [64], as well as that of the existence of tachyons, pops up again.
65.3) The Lorentz force

The (5.5) calculated for a motion reference with velocity $v = \beta c$ with respect to the background space is, for a particle with velocity u

$$\frac{\partial p'^{\alpha}}{\partial t} = f'^{\alpha} = \frac{q}{c} F'^{\alpha\beta}_{\square} u'_{\beta}$$

$$(0;a) = \begin{pmatrix} 0 & -Ex & -Ey & -Ez \\ Ex & 0 & -Bz+\beta xEy-\beta yEx & By+\beta xEz-\beta zEx \\ Ey & Bz-\beta xEy+\beta yEx & 0 & -Bx+\beta yEz-\beta zEy \\ Ez & -By-\beta xEz+\beta zEx & Bx-\beta yEz+\beta zEy & 0 \end{pmatrix} \begin{pmatrix} c+\beta\cdot u \\ u_x \\ u_y \\ u_z \end{pmatrix}$$

that, writing down the spatial components of f^{α} yields:

$$f = \frac{q}{c}\left(c\,E + u\times B - (E\cdot u)\,\beta\right) \quad = \mathrm{m}\,\boldsymbol{a} \qquad (5.4)$$

A paradigm shift should be noted with respect to STR; it is not the mass that increases with speed but the force (electrodynamic) decreasing with it, see also [82].

as $v \rightarrow$ c one obtains $f_{el} \rightarrow 0$

The β correction term goes multiplying the force, not dividing the mass, freeing the equations from the presence of infinites. Bodies still can’t accelerate to the speed of light when pushed by electromagnetic forces alone.

6) Relativistic effects

The theory of relativity envisions and explains a whole series of phenomena that are usually brought as evidence of the goodness of the theory and the agreement between theory and experiment.
However, it is not ruled out that such phenomena can be framed in a different context and explained in a different conception.
Below is described the interpretation of some of the most important experimental facts on the basis of this theoretical setting. Effects can still be considered 'relativistic' but obviously the term's meaning is different from the ordinary.

6.1) Doppler effect and Ives and Stilwell experiment

The discovery of the relativistic formula of the Doppler effect including transverse effect is one of the results that A.Einstein obtains immediately and has been tested for the first time by H.E.Ives and G.R.Stilwell [8].
This effect is found in this conception, as well as the agreement with the experimental facts. First consider the case of a source of uniform straight motion with respect to the ether and a silent observer (AF).
Let O and O' be the AF points where two consecutive circular waves are emitted and indicate with

$t_1=$ time of emission of the first wave

$t_2=t_1+T$ time of emission of the second wave

$t_1'=$ time of arrival of the first wave

$t_2'=$ time of arrival of the second wave follows

$$t_1'=R/c+t_1 \qquad (6.1)$$

$$t_2'=t_1+T+R'/c$$

$$R'=(R\cos-vT)^2+r^2 sen^2 \qquad (6.2)$$

$$t_2'=t_1+T+R/c$$

a Taylor expantion gives

$$t_2'=t_1+T+R/c(1-vT/R\cos+v^2/2c^2 sen^2)+O(vT/R)^3 \qquad (6.3)$$

$$T'=t_2'-t_1'=t1+T+R/c(1-vT/R\cos+v^2/2c^2 sen^2)-t1-R/c \qquad (6.4)$$

$$=T(1-v/c\cos+v^2T/2cR sen^2)$$

Since by definition of wavelength R/T=c

$$T'=T(1-v/c\cos+v2/2c2 sen^2) \qquad (6.5)$$

The result

$=0 \quad T'T(1-v/c)$

$= \quad T'T(1+v/c)$

$=/2 \; T'T(1+v^2/2c^2)$

In the case of a source at rest and a moving observer, the formulas differ but the process is essentially the same.
Observing the radiation in two opposite directions as in the Ives and Stilwell experiments you get

$= \quad {}_1=(1-v/c \cos+v^2/2c^2 sen^2)$

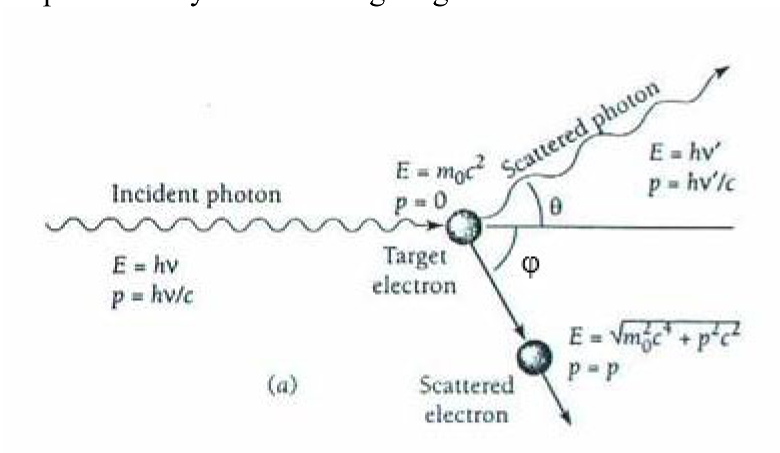
$=+ \quad {}_2=(1+v/c \cos+v^2/2c^2 sen^2)$

$${}_m=({}_1+{}_2)/2=(1+v^2/2c^2 sen^2) \qquad (6.6)$$

$=v^2/2c^2 sen^2$

6.2) Compton Scattering

The Compton effect is usually considered to be a relativistic effect, but it can also be derived within the scope of this formulation.
Collissions are represented by the following diagram



Energy and momentum conservation yields

$$h_{o}/c=h/ccos+m_{o}vcos \qquad (6.7)$$

$$0=h/csen-m_{o}vsen$$

$$h_{o}=h+m_{o}c^{2}(1+^{2} -1)$$

from which

$$(h/c)^{2}(_{o-}cos)^{2}=m_{o}v^{2}cos^{2}$$

and a few more computations

$$-2(h/c)(-o)^{m_{o}c}=(h/m_{o}c^{2})_{o}(1-cos)$$

Introducing wavelength

$$-_{o}=(h/m_{o}c)(1-cos) \qquad (6.8)$$

That is the usal formulation.
The kinetic energy of the electron is

$$T=h_{o}-h \qquad (6.9)$$

because

$=c/=c/(_o+h/m_oc(1-cos))$

results

$$T=h_o(h_o/m_oc^2)(1-cos)/(1+h_o(1-cos)/m_oc^2) \qquad (6.10)$$

verified for the first time in the Bless experiment.

6.4) The fine structure of the hydrogen atom

One of the classic and most persuasive applications of relativity theory is to calculate corrections to the structure of the spectral lines, highlighting a fine structure. The process uses perturbative methods by introducing corrections in the Hamiltonian system.
In this theory the method is equally applicable and although the kinetic energy expression slightly differs from the usual one, the energy-impulse relation is the same as in the relativistic case. The corrective terms are also the same.
Let’s consider a hydrogen atom with classic hamiltonian

$$H_0=p_1{}^2/2m_1+p_2{}^2/2m_2+V(|r_1-r_2|) \qquad (6.11)$$

In the center of mass frame

$$H0=r^2+V(r) \qquad \text{con } =m_1m_2/(m1+m2)$$

The hamiltonian is

$$H=m_1c^2(1+_1{}^2)+m_2c^2(1+_2{}^2)+V(|r_1-r_2|) \qquad (6.12)$$

From which a Taylor expansion gives

$$H=H_0-(1/8)(m_1v_1{}^4/c^2+m_2v_2{}^4/c^2)$$

$$H=r^2+V(r)-(1/8c^2)(1-3/(m1+m2))$$

That approximatly equals

$$H=H_0+H_1 \qquad \text{with} \quad H_1=-(P_r{}^4/8m^3c^2)$$

6.6) The Hafele-Keating Experiment

One of the most accurate examinations of the time dilation effect was performed by J.C.Hafele and R.E.Keating in 1971 [67]. The explanation based on the neo-relativistic theory of ether does not differ in the aspects of calculation from the usual one, except for the interpretation of the effect that must be considered due to the absolute motion of the watches and not the relative one (compare § 4.2). The effect due to the Earth's revolution and translational motion is, in fact, giving a minor contribution and only the effect of the rotation motion remains, in addition to the motion of the watches of course. The gravitational corrections used by the authors must also be considered in the new theory, in fact, as we will see in the theory of gravitation, only small adjustments appear and the calculation of many effects results in similar values to those already known.

Similar considerations can be made for the GPS localization system; The effect is interpreted as absolute and not relative, due to the motion of clocks with respect to the ether. The effect is also apparent, that is instrumental, the time magnitude does not undergo any real dilation, it is the drifting tool that does, however in a correctable manner as it is predictable.

Finally note how the Twins Paradox loses all its mystery in the present context; Since motion is no longer relative but absolute it is always possible to determine which twin ages faster (only an apparent effect?) or which clock slows down (real effect).

7) Schrodinger Wave equation

Equation (4.19) con be approximated for small speeds (β<<1) and slowly varying fields ($\frac{\partial^2}{c^2 \partial t^2}\phi=0$) as

$$\left(-2\beta \frac{\partial}{\partial x}\frac{\partial}{c\partial t}-\frac{\partial^2}{\partial x^2}\right)\phi=0$$

(7.1)

With the usual correspondences ($E \to ih\frac{\partial}{\partial t}; P \to -ih\nabla$) and computing the mixed term it provides the Material Wave Equation [64
]

$$\left(ih\frac{\partial}{\partial t}-\frac{h^2}{2m}\Delta\right)\phi=0$$

(7.2)

In this context, the interpretation is the following, taking also into account a subluminal group and superluminal phase velocity: the Schrodinger equation represents the "electron point of view" on the wave equation, that is, how a moving material particle "sees" the quantum substrate (ether) to evolve.

The "point of view of the photon" is instead that of D'Alembert's equation ($v_g = v_f$).

For high speeds (β> 1) from (4.19) it is obtained, neglecting a term,

$$\left(\frac{\partial^2}{c^2\partial t^2}-\beta^2\frac{\partial^2}{c^2\partial t^2}-\frac{\partial^2}{\partial x^2}\right)\phi=0 \qquad (7.3)$$

that again ($E \to ih\frac{\partial}{\partial t}; P \to -ih\nabla$) brings the Klein-Gordon equation.

$$\left(\frac{\partial^2}{c^2\partial t^2}+\frac{m^2c^4}{h^2}-\frac{\partial^2}{\partial x^2}\right)\phi=0$$

(7.4)

Dirac equation follows from (7.4) as usual.

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