The Precession of Mercury's Perihelion and the Free Fall

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Abstract

In this paper I study the precession of Mercury's perihelion and the free fall from the point of view of the field theory and retardation. SRT and GR do not support the field theory and retardation, that is because They consider the reality in physics is observer independent according to the Minkowski Geometry of space-time continuum. According to that SRT and GR must be understood from the point of view of the field theory and thus the reality must be observer dependent and in this case the mathematics that describe the physical reality will be different.

Theory

Kepler's law can be defined as

$$dA = \int_0^R dr(rd\theta) = \int_0^R rdrd\theta = \frac{R^2}{2}d\theta$$

The Kepler's second law is defined as

$$\frac{dA}{dt} = \frac{R^2}{2}\frac{d\theta}{dt} = constant$$

In my paper [1] I have reached to new transformations

$$x = \gamma^2(x' - vt')$$
$$t = \gamma^2\left(t' - \frac{vx'}{c^2}\right)$$
$$y = \gamma y'$$
$$z = \gamma z'$$

1. A. Almosallami, Physics Essays, Volume 29: Pages 387-401, 2016

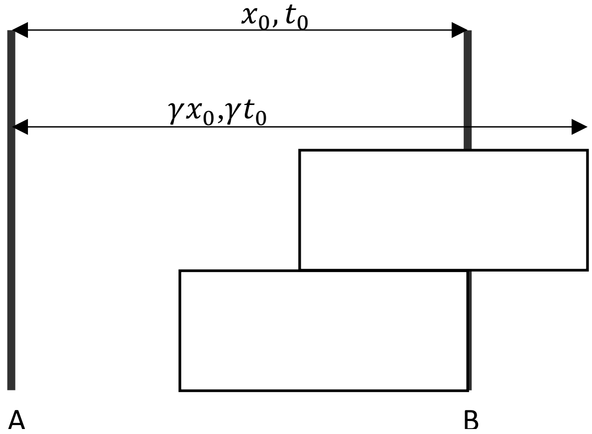

Figure 1: illustrates the location of the moving train during the motion for the observer stationary on the ground and for the observer stationary on the moving train

My transformations express about the clock retardation, by the invariance of the energy momentum by the entanglement. That will lead to the wave-particle duality and the uncertainty principle.

When the moving train arrives pylon B for the observer stationary on the moving train where in this case we get for him

$$t' = t_0 \text{ and } x' = x_0$$

for the observer stationary on the ground, the front of the moving train passed pylon B and the moving train is at distance from pylon A

$$x = \gamma x_0 = \gamma x' and\ t = \gamma t_0 = \gamma t'$$

In this case if we considered a null vector, the term $\frac{vx\prime}{c^2}$ will be equal to zero.

Here L is the length of the moving train which is invariant for the both the two observers on the ground and the observer stationary on the moving. In my theory space is invariant. That means both the two observers will agree at the length of the moving train to be L during the motion same as if the train is stationary.

In this case the clock of the object is reading time t' as a result of the retardation that is explained in fig. (1) when leaving the boundaries of the moving train

$$t' = \gamma^{-1} t$$

and in this case when the object starts to leave the boundaries of the moving train from the front and when we make a localization at this moment, the object will be at distance on the ground

$$x' = \gamma x_0 = \gamma L \qquad (1)$$

not at a distance $x' = x_0$ because at this moment, the object left the boundaries of the moving train.

Now by considering the length of the moving train is invariant for both the two observers stationary on the ground and stationary on the moving train, in this case we get for the observer on the moving train, the speed of light is c where in this case we have according to his clock locally

$$c'_{ob-train} = \frac{L}{t'} = \frac{L}{t_0} = \frac{x_0}{t_0} = c$$

For the observer stationary on the ground there are two velocities, the phase and group measured globally as a result of the retardation

$$c'_{ob-ground-phase} = \frac{L}{t} = \gamma^{-1}\frac{L}{t'} = \gamma^{-1}\frac{L}{t_0} = \gamma^{-1}c$$

And the group velocity in this case is given as

$$c'_{ob-ground-group} = \gamma^{-2}c$$

My transformations are transformations of acceleration by the vacuum fluctuations as the retardation and in this case the uncertainty principle plays the rule according to the phase and the group velocities. According to my paper in my equivalence principle I have reached to the relativistic escape velocity of the free fall object under the gravitational field. The relativistic escape velocity locally of the free object is given according to the equation

$$v_{escape-locally} = \sqrt{\frac{2GM}{r} - \frac{G^2M^2}{c^2r^2}}$$

Globally the escape velocity is defined according to the phase velocity and the group velocity. When we make a localization, in this case it is equivalent to the particle is moving in a linear dispersion, and when the particle leaves the boundaries of the moving train, in this case the vacuum fluctuates which is equivalent to nonlinear dispersion. That is how during the free fall the vacuum fluctuates depending on the gravitational potential which is equivalent to nonlinear dispersion. In case of nonlinear dispersion so even if we start with a fairly localized "particle", it will soon loose this localization, and that what happened for the free fall object under the gravitational field. In this case the group velocity is not equal to the phase velocity, and the classical velocity is defined according to the group velocity in this case. According to that the phase velocity of the free fall object according to my transformations and my equivalence principle is given as

$$v_{es-globally-phase} = \left(1 - \frac{GM}{c^2r}\right)\sqrt{\frac{2GM}{r} - \frac{G^2M^2}{c^2r^2}}$$

And the group velocity in this case is given as

$$v_{es-globally-group} = (1 - \frac{GM}{c^2r})^2\sqrt{\frac{2GM}{r} - \frac{G^2M^2}{c^2r^2}}$$

Also we can compute the decrease in the speed of light in the gravitational field globally according to the vacuum polarization as

$$c'_{phase-global} = (1 - \tfrac{GM}{c^2r})\mathrm{c}$$

$$c'_{group-global} = (1 - \tfrac{GM}{c^2r})^2\mathrm{c}$$

Where here the decrease in the speed of light is depending on the gravitational potential, and here $\gamma^{-1} = (1 - \frac{GM}{c^2r})$

The Precession of Mercury's Perihelion

We can compute the Mercury precession when we make a localization, in this case we get depending on gravitational potential from eq. (1)

$$dr' = \frac{dr}{(1 - \frac{GM}{c^2 r})}$$

From that we get from Kepler's law the area element by the distortion in radius according to the group velocity is given as

$$dA' = \int_0^R dr'(rd\theta) = \int_0^R \frac{r\,dr\,d\theta}{(1 - \frac{GM}{c^2 r})}$$

That's how the length of the moving train is invariant, and instead we considered the dispersion relation according to the phase by translating the retardation. Thus by doing the integration in this case we get

$$dA' = \frac{R^2}{2}\left(1 + \frac{2GM}{c^2 R}\right) d\theta \qquad (2)$$

Equation (2) represents the relativistic form of the element of area of the free falling object in case of nonlinear dispersion. The classical form is given according

$$dA = \frac{R^2}{2} d\theta = \int_0^R dr(rd\theta)$$

The relativistic kinetic energy of the free fall object is resulted in my equivalence principle from a part of the rest mass of the free fall object changing to kinetic energy. This energy accounts for the vacuum polarization depending on the gravitational potential. The relativistic mass locally is always equal to the rest mass. From that from my equivalence principle we get

$$dt' = \left(1 - \frac{GM}{c^2 R}\right) dt \qquad (3)$$

Thus by dividing eq. (2) by dt' we get

$$\frac{dA'}{dt'} = \frac{R^2}{2}\left(1 + \frac{2GM}{c^2 R}\right)\frac{d\theta}{dt'}$$

By substituting from eq. (3)

$$\frac{1}{dt'} = \frac{1}{\left(1 - \frac{GM}{c^2 R}\right) dt} \approx \frac{\left(1 + \frac{GM}{c^2 R}\right)}{dt}$$

we get

$$\frac{dA'}{dt'} = \frac{R^2}{2}\left(1 + \frac{2GM}{c^2R}\right)\left(1 + \frac{GM}{c^2R}\right)\frac{d\theta}{dt}$$

Which is equal to

$$\frac{dA'}{dt'} = \frac{R^2}{2}\left(1 + \frac{3GM}{c^2R}\right)\frac{d\theta}{dt}$$

Comparing the classical form of Kepler’s second law

$$\frac{dA}{dt} = \frac{R^2}{2}\frac{d\theta}{dt}$$

We can conclude from the relativistic form that

$$d\theta' = \left(1 + \frac{3GM}{c^2R}\right)d\theta \qquad (4)$$

By considering

$$R = \frac{a(1-\varepsilon^2)}{1-\varepsilon\, cos\theta}$$

And by substituting the value of R in eq. (4) we get

$$\Delta\theta' = \int_0^{2\pi} d\theta + \frac{3GM}{c^2a(a-\varepsilon^2)}\int_0^{2\pi} d\theta - \frac{3GM}{c^2a(a-\varepsilon^2)}\varepsilon\int_0^{2\pi} cos\theta d\theta$$

By computing this integration we get

$$\delta = \frac{6\pi GM}{c^2a(1-\varepsilon^2)}$$

Sagnac effect

Sagnac effect can be explained according to my transformations by considering the t-term in my transformations.

$$t = \gamma^2\left(t' - \frac{vx'}{c^2}\right)$$

If we considered $t^- = \gamma^2\left(t' - \frac{vx'}{c^2}\right)$ and $t^+ = \gamma^2\left(t' + \frac{vx'}{c^2}\right)$, in this case we get

$$\Delta t = \gamma^2\left(\frac{2x'v}{c^2}\right)$$

And since L is invariant and by considering $x' = L$, then we get

$$\Delta t = \gamma^2\left(\frac{2Lv}{c^2}\right)$$

This result is exactly the same result which derived by Prof W. Engelhardt in explaining Sagnac effect in the framework of the ether theory in his paper https://arxiv.org/abs/1404.4075 .

According to that we can understand what is the main problem in SRT in the synchronization of clocks, where in this case relativists trying to work in the uncertainty principle which is a part of nature in micro and macro world which is exist between the group velocity and the phase velocity in case of nonlinear dispersion. In this case the group velocity in case of classical motion does not account any time dilation by the vacuum fluctuations, where in this case the classical velocity is defined according to the group velocity, not the phase velocity. The time dilation in this case is defined according to the decrease of the speed of light according to the phase which accounts for the clock the retardation in this case. That explains also why Newton's Mechanics can't account in this case for the relativistic mass measured in LHC. Also why Newton's Mechanics can't account for Mercury precession and light bending by gravity, dark matter and dark energy. That illustrates also why in SRT the relativistic mass is considered as virus as described by Okun. Also that is why GR can't explain dark matter, dark energy and CMB anisotropy in this case and the other observations in COSMOS. That's also the main problem in GR which is related to the conservation of energy momentum, and why infinities resulted in GR.

The theory of field required the reality in physics to be observer dependent, while in SRT the reality is formed according to mathematics to be observer independent as in Minkowski Geometry of the space-time continuum. As Minkowski said;

"The views of space and time which I wish to lay before you have sprung from the soil of experimental physics, and therein lies their strength. They are radical. henceforth, space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality.

Now how the relativistic quantum mechanics is working in macro world!!?? As we know energy is quantized...right!!?? E=hv, and from SRT E=mc^2 which means it must according to the quantization of energy E=mc^2=hv.
Now let's take the moving train locally on the ground, and thus we consider the retardation and the entanglement by the invariance which is leading to the wave-particle duality and the uncertainty principle. Now locally for an observer stationary on the ground the relativistic momentum of the moving train is given as
P=(mH)c(n^2+(2nn0))^0.5 Here (mH) is constant where (mH)=H/c^2 where H is Planck constant energy 6.62607004 × 10^-34 J.. n here is the number of H equivalent to kinetic energy where here we get hv=nH and n0 is the number of H energy equivalent of the rest mass. Now if the rest mass is zero where n0=0, in this case we get
P=n(mH)c=(nHc)/c^2=hv/c which is the momentum of the photon.
Now the classical kinetic energy can be derived simply if n is much less than n0 and here we get
P^2=(mH)^2c^2(2nn0) and thus
P^2/(2(mH)n0)=n(mH)c2=nH=hv thus from that we get
P^2/2m0=hv where n0(mH)=m0 which is related to the Hamiltonian in Schreodinger equation.

In classical mechanics, Newton's second law (F = ma) is used to make a mathematical prediction as to what path a given system will take following a set of known initial conditions. In quantum mechanics, the analogue of Newton's law is Schrödinger's equation for a quantum system (usually atoms, molecules, and subatomic particles whether free, bound, or localised). It is not a simple algebraic equation, but in general a linear partial differential equation, describing the time-evolution of the system's wave function (also called a "state function").

Now some one will ask why you considered H= 6.62607004 × 10^-34 J. That is very simple because the energy of the photon locally on the ground for the observer stationary on the ground is the same of the energy of same photon inside the moving train locally for the observer stationary on the moving train as a result of the invariance. Where here Locally we get t'=t, but globally It leads to t' not=t as a result of retardation and thus leads to Feynman theory and time is moving forward not backward which is QFT as a result of the wave-particle duality and the uncertainty principle by the vacuum fluctuations. Now constants are constants and G remains constant not variable. Now globally the energy of the photon will be different when it leaves the moving train relative to the observer stationary on the ground as a result of the retardation (clock retardation) which is related to the uncertainty principle by the vacuum fluctuation as a result of the wave-particle duality. That's how the classical treatment of time is deeply intertwined with the Copenhagen interpretation of quantum mechanics, and, thus, with the conceptual foundations of quantum theory: all measurements of observables are made at certain instants of time and probabilities are only assigned to such measurements.

That explains the result in this paper "Will a Decaying Atom Feel a Friction Force? Matthias Sonnleitner, Nils Trautmann, and Stephen M. Barnett, Phys. Rev. Lett. 118, 053601 – Published 3 February 2017" The authors say "We show how a simple calculation leads to the surprising result that an excited two-level atom moving through a vacuum sees a tiny friction force of first order in v/c.", and the Pioneer anomaly and dark energy.

And that explains also how Schr¨odinger showed that the emission of a light quantum by a (flying) atom is regulated by the conservation laws of energy and linear momentum. Therefore, the Doppler effect for photons is the consequence of the energy and momentum exchange between the atom and the photon: a central role is played by the quantum energy jump ΔE of the transition (a relativistic invariant). https://arxiv.org/pdf/1502.05736.pdf

Now by the equivalence principle, the relativistic escape velocity locally Vescape=(2GM/r - G^2M^2/c^2r^2)^0.5. Now at weak gravitational field G^2M^2/c^2r^2 much less than 2GM/r and in this case Vescape=(2GM/r)^0.5 which is classical. Now at strong gravitational field at quantum Schwarzschild radius at rs=GM/c^2 we get locally

Vescape=c, and at rs all the rest mass of the free fall object changes to energy (photons), where here m0=0 which means n0=0.

Now globally we get c'=0 which is equivalent to the probability of exactly Zero, but in quantum mechanics as a result of the treatment of matter in quantum mechanics as having properties of waves and particles. One interpretation of this duality involves the Heisenberg uncertainty principle, which defines a limit on how precisely the position and the momentum of a particle can be known at the same time. This implies that there are no solutions with a probability of exactly zero (or one), though a solution may approach infinity if, for example, the calculation for its position was taken as a probability of 1, the other, i.e. its speed, would have to be infinity. Hence, the probability of a given particle's existence on the opposite side of an intervening barrier is non-zero, and such particles will appear on the 'other' (a semantically difficult word in this instance) side with a relative frequency proportional to this probability.