Dynamic wave geometry concept

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Abstract

The starting point for the concept is the idea that what we use as clocks don't measure the true time. Based on this idea, we can define time as absolute and think that clocks don't measure the absolute time, but they have a tick rate that depends on the speed relative to the flat absolute space. The idea is what I think is a natural interpretation of what happens in the very popular thought experiment of Einstein's relativistic train. If the light beam is a light clock, it becomes clear that the trajectory of the light beam is the only thing that makes the tick rate change. The idea is that the same thing happens with all the clocks we use. Following this idea we can construct a whole theory closely following the empirical evidence we already have. This model suggests that space doesn't have a variable geometry, instead complex particles inner geometry changes what we call time and space.

The strong point of this concept is that it predicts a particle / wave construct model that perfectly matches the behaviour of internal OAM light beams.

This concept is only intended to be a starting point for a proper theory. It only contains few principles that are intended to give a better and more natural explanation how the universe works.

1. Space geometry

For this concept to work, we need to define a **flat space geometry**. This flat geometry space-time cannot be changed by definition. We will define an absolute reference frame with an origin for x, y and z axis. We will refer to this frame with flat space as the **alpha frame *(AF).*** *AF* will use alpha meters and time. This *AF* can be real if we can prove the electromagnetic waves need a medium to propagate, only the origins are arbitrarily chosen. Otherwise, empty space is an absolute void and flat geometry is the way to tell that the structure of space and time does not change.

2. Time and space definition

Before Special Relativity it was thought space and time were absolute and we also measured them as absolute. Based on this, units of time and space were defined. Once Special Relativity (SR) was accepted by the mainstream, these definitions remained the same but they were not absolute anymore. Instead, speed of light became absolute which apparently made things work surprisingly well and equations had a remarkable symmetry. Moreover, since the idea of an Aether was not necessary

anymore, only the speed of light could remain absolute and constant in every reference frame. This points to the idea of a space that has a dynamic structure and it is real. However, we can define an absolute space and time and speed of light will be observer dependent in the AF frame. A medium for waves like the electromagnetic waves to propagate is no longer necessary in this context but the concept doesn't exclude it.

When time was viewed as absolute, clocks were made and thought to measure this time (absolute). Clocks accuracy improved over time, but they kept measuring the same thing, namely relative time. We though clocks were measuring absolute time, but they were measuring the relative time. If we define **alpha time** as absolute, we can see that our clocks will not be able to measure measure alpha time. Their tick rate will indicate **alpha speed of the clock.**

An object like an atom, for example, that is stationary in **AF** will have the highest oscillating frequency compared to the frequency in any other reference frame we choose. In other words, **a clock at rest in AF will have zero time dilation factor**. Any other reference frame we choose will have clocks at rest at a lower tick rate.

Another property of time is that along the time axis the total amount of information in the universe should be conserved. On any other dimension that doesn't happen. This is the essence of time and it is how true time should be defined.

3. Alpha dimensions

In the **alpha reference frame** we will define alpha time and alpha length and relative alpha speed of light (observer dependent):

x_α , t_α, $c_{r\alpha}$

$c_{r\alpha}$ is a relative speed of light seen in *AF*, as the difference between *c* and object speed in *AF.*

In any other reference frame, *c* will be measured will not vary because those frames use clocks that have variable tick rates in *AF.*

Figure 1, represents 2 regions of space viewed from *alpha frame.*

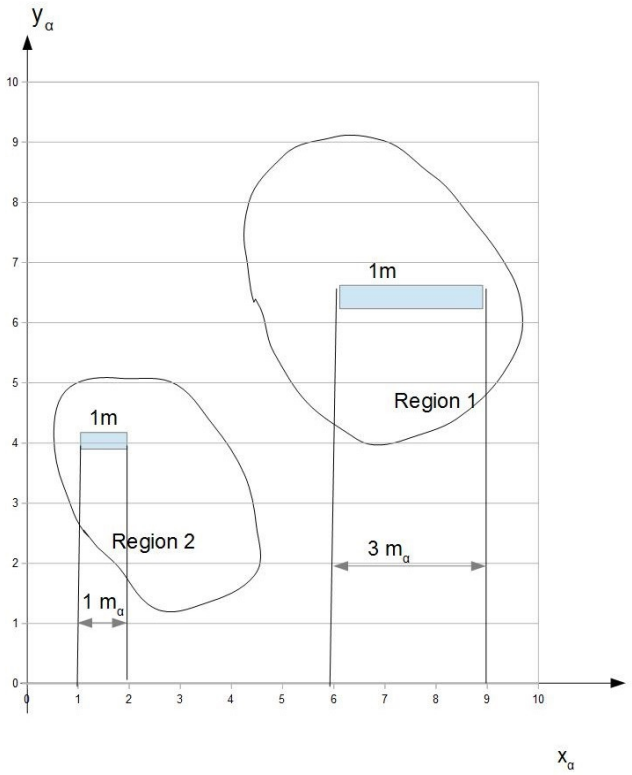


Fig. 1. Alpha frame 2d space

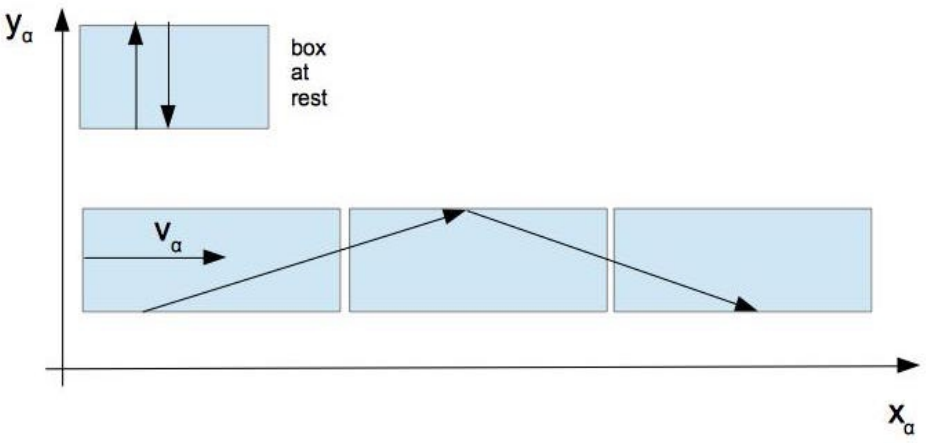


Fig. 2. Simple SR diagram for *AF,* the arrows represent flashes of light travelling from the floor to the ceiling and back. Notice that the box needs to expand on x axis to explain the experimental evidence. This is explained in chapter 6.

4. From SR to Alpha Space-time

Figure 1, shows a basic SR diagram. An observer at rest in the AF (obviously it works for any reference frame we choose), will measure light as constant no matter how fast the box is moving. If trying to measure the speed of light (two way) in the moving box you get the same value for c. SR conclusion is that something must be happening with time in the moving box and that is time dilation. However, there is another possibility I think can answer more questions. We assume that clocks measure time as absolute, then SR demonstrated time was relative. If we define time as absolute then the new idea is that our clocks we use don't measure time but their tick rate depend on speed. In other words, they don't measure alpha time, but relative time. A clock in the moving box (fig. 2), is in fact the light clock. The light clock will complete a cycle in a longer time viewed for AF. The tick rate is reduced by Lorentz factor γ. Any other clock we used would do the same thing. It is as if time dilates but the true alpha time doesn't change. If we put the problem this way, we will be able to explain the mechanics contained in this paper. For the idea to work we need to take into account the length extension (not contraction) as shown in chapter 9.

5. The illusion of Matter

If the mechanism of clocks (which applies to the most accurate atomic clocks available), holds to any clock, it means we need a theory to unify all the fields we know, including gravitational into a single fundamental field. This points to the idea that, everything in the universe is only made only of waves in the electromagnetic field. Nicola Tesla said "Everything is light" and I agree. The waves corresponding to this field interacts in such a manner that they create structures like particles we identify as matter and also all force effects. In figure 2, I've used a light flash as a clock. If you sent a beam of electrons instead, it wouldn't work correctly . **It becomes clear that the particle geometry matters.** If we take for example quarks that are supposed to consist of different matter, despite all the evidence, no one has actually seen a bare quark. Instead, we observe clusters of known particles with ½ spin origin. The spin indicates a complex geometry particle that is a wave propagating probably following a helical trajectory and not a straight line.

This model suggests that s**pace doesn't have a variable geometry (the term is usually curved geometry)**. Complex particles inner geometry changes what we call time and space. An atom moving faster changes geometry and its internal tick rate changes. Because the same thing happens to electrons, it means they also have an internal cycle, you could use as a clock. When travelling faster the geometry of the electron changes and makes it complete the cycles in a longer time. Most probably it is a spiral (when viewed relatively) or helix motion. But this is more of a speculation. Careful studies must be carried to confirm the geometry. What is obvious is that **moving at c transforms any geometry trajectory into a single line trajectory** (in reality perfect straight trajectories do not exist because of all sorts of interactions). At rest the wave orbits around its centre. Orbits can have a precession as well or can stabilize. However, waves are never at rest in AF, only the centre the wave is

oscillating around can be at rest. The electron particle also has a wavelength associated with it (de Broglie). This wavelength experiences Doppler effect. Hence the moving electron will be measured with higher frequency / lower wavelength. However the Doppler effect is a different aspect. The clock tick rate is not the same thing as the associated wavelength. This has only to do with what a wave detector reads. The Doppler effect is like an illusion. It is like when you move toward pulses the appear to increase frequency. If a particle is accelerated the deBroglie frequency increases (whether is only relatively or in AF needs to be demonstrated) and the orbits frequency is reduced in AF . This is the advantage of using the absolute reference frame. There are many other advantages. The reality might not be possible to describe correctly without an absolute space and time.

To summarise, it is the complex particles geometry (this refers to any particle that has mass) that give the illusion of changing the geometry of spacetime.

6. A particle model that explains zero versus non zero rest mass /energy particles

The photons as electromagnetic waves, travel in straight line always. All other particles are waves that describe circular or spiral patterns, thus the lead wave speed is reduced. Fig. 3. Mass or energy are a question of frequency and total length of the wave like radiation (photons) does.

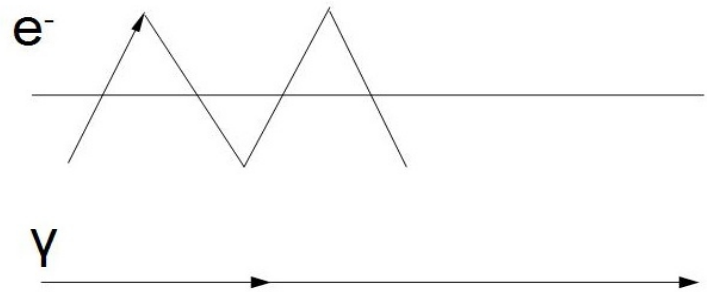


Fig. 3. An example of a hypothetical
Electron vs.a Photon

The electron goes on a different trajectory probably because of the interference between fields. In the case of electron the propagation happens is such a way it forms a helical trajectory. In AF the trajectory it can form a helix (Fig.4) but viewed from a moving reference frame it can be seen as a 2d moving spiral.

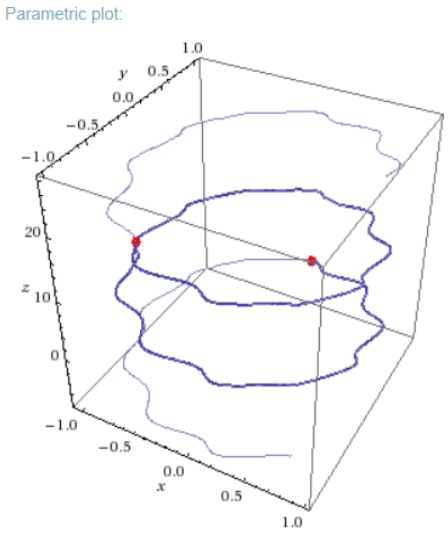


Fig.4 .An electron trajectory in *AF.*
The electron is moving in the z direction,
but the waves follow a helix

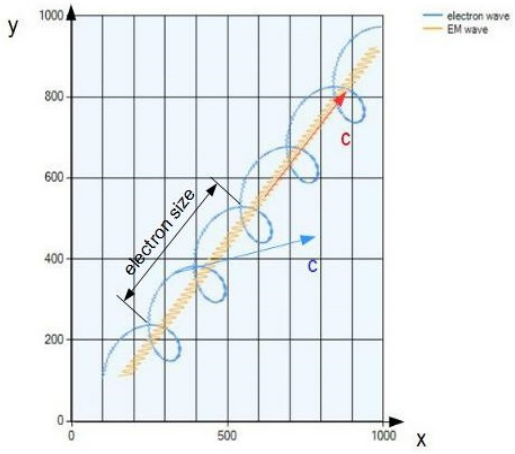


Fig.5 .A free electron and a photon
trajectory in a reference frame attached
to a moving object in *AF.* In this diagram
the electron is travelling at approximately *0.7c*
*frequencies are not representative.
The idea is the electron wave frequency is higher than a frequency
of a sub gamma photon. The Doppler shift is not taken into consideration here.

There seems to be a consistency between my idea and de Broglie discoveries and opinions.

"*Thus to describe the properties of matter as well as those of light, waves and corpuscles have to be referred to at one and the same time. The electron can no longer be conceived as a single, small granule of electricity; it must be associated with a wave and this wave is no myth; its wavelength can be measured and its*

interferences predicted. It has thus been possible to predict a whole group of phenomena without their actually having been discovered. And it is on this concept of the duality of waves and corpuscles in Nature, expressed in a more or less abstract form, that the whole recent development of theoretical physics has been founded and that all future development of this science will apparently have to be founded." De Broglie

Helix or spiral motion are speculation only, but the idea is some kind a loop motion must exist in order to experience these effects. However, these patterns seem the most likely to occur. We can also see why the speed of the particle can appear to be slower. The front wave speed is always slower than c . As the particle slows down, the helix pitch reduces.

Particles like electrons at rest can aslo be viewed as circles or loops. The wave still propagates at c. That is how they can have rest mass / energy.

The same effect can be applied to more complex entities like atoms, since they are composed of elements like electrons and quarks since these follow spiral trajectories.

7.**Gravitational effect of particles**

Looking at what happens to an electron while moving, the idea of curved spacetime is not very convincing anymore. The gravitational field effect has a unique property. It is always attractive.

Analysing the studies made on gravitational effects and experimental data available, we can realise that the gravitational effects cannot simply be attributed to a simple gravitational field around the matter. The spacetime concept is a step forward form newtonian gravity, but it seems to me it cannot explain all the effect that appear in the real world.

For understanding gravity, in this context, we will use the term particle will describe to a wave that is **either a straight or a spiral / helix like trajectory** and **not spheres or point like entities (singularity is not accepted in this context).**

The gravitational effect, I think, is best described using a about what photons are and how the gravity between them is generated. That is because this alpha space concept treats matter as field waves of different trajectory patterns. Understanding how gravity works for photons is crucial. The original paper is **Tolman, R.C., Ehrenfest, P., and Podolsky, B. Phys. Rev. (1931) 37, 602.** The idea was studied in the paper "Gravitational interaction for light-like motion in classical and quantum theory" Nikolai V. Mitskievich. **The study concludes that two photons moving in parallel will not experience any gravitational effect**. If they travel antiparallel the experience a gravitational effect, but twice as big as it would be judging the relativistic masses (using a quasinewtonian model).

Using the ideas expressed in this paper, we can analyze a case of two hypothetical particles, as in figure 6.

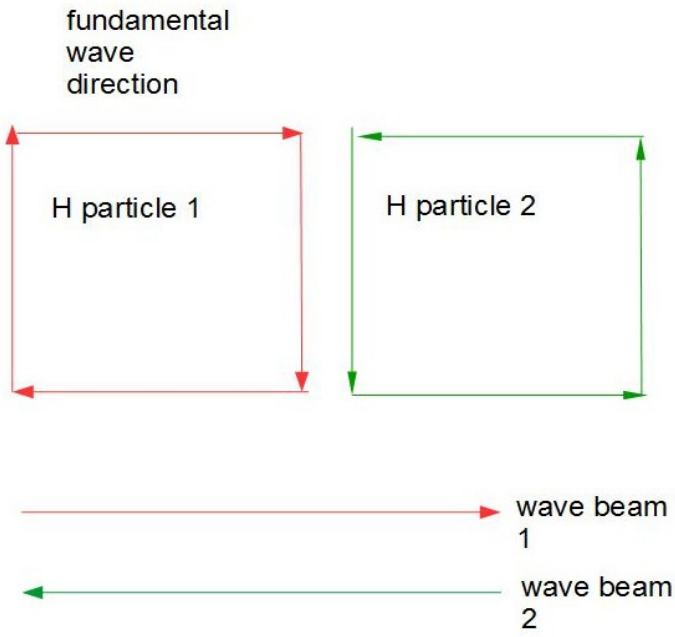


Fig.6. This diagram represents two hypothetical particles at rest in *AF* and two wave beams of the same properties and the same length as the H particles

In the case of the anti-parallel wave beams the gravitational effect should be maximum. For the H particles, it is clear that the gravitational effect will be smaller. For simplification instead of a circular trajectory I have used a squared pattern, but the gravitational total effect should be the same. We can see that in the case of H particles, only **half** of the fundamental waves travel anti-parallel. Those are the vertical lines. This explains the effects seen in Tolman experiment.

An interesting fact that can be seen looking at this diagram is that a gravitational effect will be produced within the particle itself as long as the absolute speed in AF is not comparable to c (the effect should be reduced at 'relativistic' speeds). The magnitude of the gravitational effect is twice as big as it is between the H particles. If the radius of the particle is small, the gravitational effect will be considerable and could help keeping the integrity of the particle.

The most important idea is that in order to understand gravity, **we need to understand how gravitational effects occur between photons** only. Then we can extrapolate it to all particles.

8. Rest mass hypothesis

Looking at the electron model explained by this concept the idea of kinetic energy doesn't have the same importance as in classical theories like newtonian mechanics. That is because electrons are waves are not point particles, hence the energy of the wave has a single form and it is neither kinetic nor potential. (fig. 5) The electron size in AF should be thought in terms of the length of the spiral. We can see that the energy of the electron in alpha frame doesn't change if viewed by a moving observer. It is only the apparent energy that the observer sees, that changes. An observer that uses a normal clock will measure the electron moving at different speeds thinking it must have different speeds, thus different kinetic energy.

I will use electron as a wave structure with rest mass. If the electron is a wave just like electromagnetic waves, the mass of it is equivalent to the energy. This means that in this theory, mass unit is redundant. The relativistic mass formula is $m=m_0 \gamma$. Combined with the model described in fig.5, this means, for an electron to get more mass / energy, it needs an additional length of the spiral or simply an increase in the deBroglie frequency. If you give energy to an electron it increases its deBroglie frequency. This is a way of increasing true energy of the electron and it is what happens during acceleration.

The absolute mass/energy for a fixed helical length (multiple of wavelength), would be :

$E_\alpha = E_e n$, where $n = x_\alpha / \lambda_\alpha$ *is the number of oscillations of the electron wave.*

x_α *is a helical length (length dimension is in AF)*

λ_α *is the wavelength of the electron in AF*

E_e *is the energy within a single oscillation*

$m_a = E_a / c^2$

Notice that m_a is thought to be the absolute total mass of an electron. The oscillation has the same frequency as the internal deBroglie frequency of the electron.

An apparent increase of energy can happen due to observer speed. In a moving reference frame, when the speed of the electron increases, the internal frequency will increase due to Doppler shift. Although in the case of moving observer the energy of the wave remains constant in *AF*, the effect on the observer is the same as an increase of energy due to source motion in *AF* because of the frequency at which the waves hit the observer. A clock at rest in the moving reference frame will also be influenced by the relative speed. Fig.6

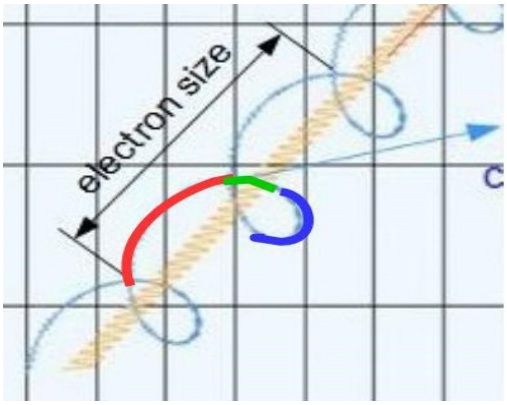


Fig.6. Electron red-shift from a moving reference frame

The red region represents a redshift and the blue portion a blue shift as a Doppler shift effect. The equation is different from relativistic formula and has a greater effect. Otherwise in case of a moving observer, if the clocks were slowed down in the case of the redshift by the same amount the effect would've been null. The equation for Doppler shift for a source travelling towards the observer at rest in AF is:

$$f = \frac{c}{c - v_\alpha} f_\alpha$$

Eq. 1

f is the frequency perceived and f_α is the absolute frequency.
If the observer is moving the equation (corresponding to a moving observer) should be corrected with the Lorentz factor.

For redshift, in the classical Doppler effect, the same thing happens, the frequency of the source is not modified, but the recessional motion causes the illusion of a lower frequency.

We can have an equation between absolute mass and the mass seen from a reference frame using gamma correction. If we look at a proton, the constituents (quarks and electrons) obey the same rule in my opinion. The mass of an electron is generated by the wave energy. For example an orbiting photon like hypothetical particle (H) can have a huge "mass" at rest if we consider the centre of the orbit as the particle position. I think this is the principle of rest mass.

A quark at rest has a small mass. However, within a proton, if quarks move at a higher speed the relativistic mass increases up to the total mass of the proton. Gravitational effect cannot hold the proton together though. Strong nuclear force must be an effect of the way quarks interact with each other. Also strong interaction is an electromagnetic interaction between quarks that are also electromagnetic structures. The interaction creates an appearance of a stronger force. (These statements however remains to be proved).The proton mass is not composed of its constituents rest mass. . String theory also treats particle as vibrating strings. That means *particles* constituents are never at rest, but travel at c. It is obvious since

electromagnetic waves travel at c, electron waves excite the same fields and must propagate at the same speed.

Mass doesn't seem to have a meaning as an intrinsic property of a wave other than energy. We can measure mass through gravity force or inertia, but can a body have mass without exerting any gravity force? Two parallel photons do not interact gravitationally. If we can understand how light waves interfere with other waves, creating a trajectory deviation we call gravity, then we can understand what gravity is. I think we should focus on this.

A black hole is an object that behaves like a particle. It is possible to simulate a black hole made entirely of light waves. If BH were tiny as atoms we would think of them as new particles with rest mass. The centre of the BH would be the particle position. Simply because they are big, they can capture all sorts of particles and extreme amounts of energy.

Energetically if we compare a photon and the hypothetical particle, when you push energy into a photon, it increases its frequency. The H particle will do the same as the centre of the orbit accelerates. The speed limit for the H particle is obviously c. The frequency increase of the H particle is explained by the electromagnetic frequency increase.

A scenario of accelerating particles at c in the context of my concept

We can start with a pair of an electron and a positron that fall in a gravitational field, supposing that they don't loose energy by emitting radiation . The deBroglie wavelength will gradually reduce as they gain energy and speed. We can monitor a similar pair made of two photons of the same initial wavelength as the e- / e+ pair. As the e- / e+ pair descents the speed increases, thus the helix pitch increases and the deBroglie frequency increases. For the photon pair only the frequency increases obviously at the same rate. No mater how long they fall, the helix pitch will continue to increase but the helix never becomes a straight line and the deBroglie frequency will go extreme. If the pairs are on a slightly convergent way at some point the e- / e+ pair will merge and decay into two pair of photons. These photons will be the same frequency as the pair of photons that started the journey with the electrons and will have the same energy.

9. Equations for transition between AF and a reference frame

Since by definition clock we use don't measure absolute time means in *AF* a normal second, cannot be compared to alpha seconds. In other words, alpha time is not measured in seconds but in a different unit of measurement we can call alpha second.

We will consider an example where a particle has a speed of $v_\alpha = 1\ m_\alpha / s_\alpha$

For explaining the principles of conversion we will define a hypothetical non zero mass (orbital trajectory pattern) like particle called *H particle* that has certain properties.

For the *alpha second* definition we will use the time for a free, **stable (integer number of wavelengths)** *H particle* to complete a single loop when stationary in *AF.*

The loop will be of a radius of *1* m_α in *alpha space*. Hence the definition of an *alpha meter* will be the radius of a *H particle*.

The wavelength of an *H particle* in *AF* will be defined as $\lambda_H = 1\ nm$. We can now say that the *H particle* number of oscillations per a complete loop (if you take a snapshot of the particle) is:

$$n_H = 2\pi\frac{r}{\lambda_H} = 2\pi\cdot 10^9$$

Eq.2

No matter how an observer is seeing it, this number will remain constant in *AF.*

The energy of the particle can have the form:

$$E_H = n_H\frac{c}{\lambda_H}h = 6.54\ 10^{-7}\ J_\alpha$$

Eq.3

where h is the Planck constant and c is the speed of light. Notice that the joule unit of measurement it only applies to absolute space-time (*AF)*.

To simplify the model further instead of a circle we can think of the *H* particle as oscillating on a single axis. When moving perpendicular to the axis it makes a zig zag pattern like in fig.3. For this the width of the particle will be:

$l_H = \pi r = \pi\ [m_\alpha]$, no matter the speed.

That means the speed of light is:

$$c = \pi\ [\ m_\alpha / s_\alpha\ ] = 3\ 10^8\ [m / s]$$

If the particle is moving a v_H in *AF*, then we can measure the length of the particle in the travelling direction:

$$x_v = 1 \bullet v_H$$

An observer will see a moving particle or extrapolating this, an object, in *AF,* increasing its size in the direction of travel.

If the absolute time increase for a particle to to complete a loop is t at rest.

If the H particle has a length x_H at speed v_H and a length x_H' at speed v_H' the relation between them is the following:

$$x_H' = x_H \cdot \sqrt{\frac{1-\frac{v_H^2}{c^2}}{1-\frac{v_H'^2}{c^2}}}$$

Eq.4

The equation shows that with increasing speed the length in the absolute space-time (*AF)* is increasing and **not contracting as SR says.**

If the oscillation period of the H particle (also measured as tick rate in case of an atomic clock) is T_H at v_H and a period of T_H' at a speed v_H' the relation between them in the following equation:

$$T_H' = T_H \frac{v_H}{v_H'} \sqrt{\frac{1-\frac{v_H^2}{c^2}}{1-\frac{v_H'^2}{c^2}}}$$

Eq.5

As speed in *AF* increases the time for a fundamental wave within a particle to complete an orbit increases. That is what we take as the tick rate of the clock or tick rate of a clock. It is clear that time itself does not change.

10. A possible dark matter scenario

The idea is, in a classical world the only thing it can make elements like photons or electrons have a fixed value of energy for a fixed wavelength is a multiple of a wavelength. In the case of an electron, when it is attached to an atom its energy level stabilizes at number multiple of its wavelength. But this doesn't necessarily mean that when it is travelling freely after other interactions it keeps the same number. It can be any number, but when is absorbed the atom gets the length it can accommodate. The same thing may happen to photons. If a wave of a certain length hits the electron wave, it gives its energy to the electron. Part of the light wave can still travel further if it is not entirely absorbed.

This seems to contradict the photoelectric effect. However, since the source of photons is the electron transition between orbitals, a possible explanation is, they are usually (if not always) emitted with the same length (same number of oscillations) for the same wavelength.

The truncated parts of photons or possibly other particles can manifest as black

matter / energy and cannot be detected directly.

Another possible source of DM can be related to the electromagnetic interferences. Waves that cancel each other the *E* or *H* field, might become undetectable.

In any case, any source of dark matter should have an electromagnetic origin.

11. Two way speed of light

For this theory to work speed of light needs to be constant only when measured between a point A and a point B and back. The speed from A to B will not be equal to the speed from B to A in a particular reference frame we chose to measure it.

It is interesting to see what we should actually measure if one way speed of light could be measured.

Consider a box within the measurement of the speed of light is done. A light beam is sent from a source to a mirror and then it comes back. If we ignore the length extension I've mentioned in chapter 9, we get

$$c_{mF} = (c-v)\cdot\Upsilon$$

$$c_{mR} = (c+v)\cdot\Upsilon$$

Eq.6,7

where c_{mF} is the speed measured forward and c_{mR} is the speed measured when the light returns from the mirror. γ is the Lorentz factor.

$$c_{mF} = (c-v)\cdot\Upsilon = \frac{d'}{t_F} = \frac{d\cdot\Upsilon}{t_F}$$

$$\frac{d}{t_F} = c-v = c^{r}_{mF}$$

Eq.8,9

However the box will increase in size by Lorentz factor and we get:

c^{r}_{mF} is the real measurement after length correction.

Hence the real measurements should show:

$c^{r}_{mF} = c\text{-}v$ and $c^{r}_{mR} = c+v$

These seems to confirm the conclusions of *Stephan J.G in his paper,* ***GPS and the One-Way Speed of Light*** **.**

This concept is supported by the evidence we have about the speed of light as

a constant when measured both ways just like relativity. However the only experiment claiming to have achieved the correct measurement for the one way speed of light supports this concept and indicate the same results.

Reginald T. Cahill in his paper, One Way Speed of Light Measurements Without Clock Synchronisation, concludes:

"The absence of the Fresnel drag in RF coaxial cables enables 1st order in v/c measurements of the anisotropy of the speed of light. "

12. A photon classical model hypothesis

I'm going to make a very synthetic description of a model of photon, that seems to be consistent with QM and experimental evidence. It might not be very precise, but it will cover the essential ideas. A photon is an energy pulse that contains a packet of electromagnetic waves of approximately the same frequency. The structure of the waves within the photon is generated by electron transitions. That is the reason why a photon is not a simple EM wave, but a collection of waves in a single pulse.

In Quantum Mechanics, the square root of the orbital angular momentum of a photon is zero in the m = 0 state. The orbital angular momentum itself has strong fluctuations and it is zero only on average. Just like in QM where a photon is in a superposition of all possible states, the photon wave contains an infinity of electric field vectors (E), disposed on all directions perpendicular to the direction of travel at once.

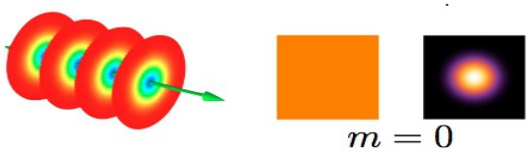


Fig. 6.Photon OAM, m=0,
source:wikipedia.com

For |m| > 0, these vectors rotate, all at the same time. The helical modes are characterized by an integer number m, positive or negative.

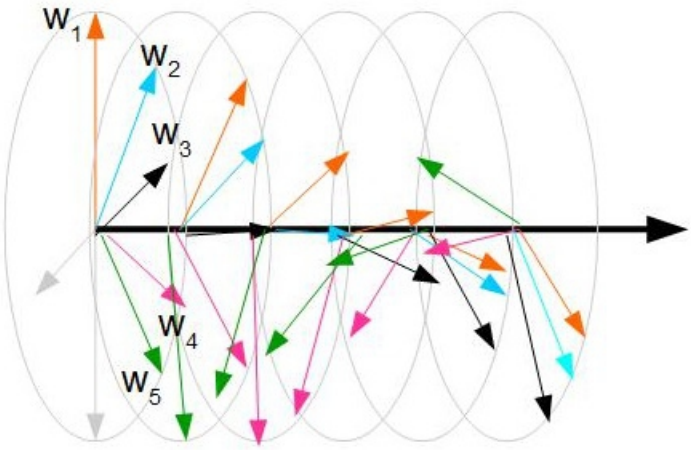


Fig. 7. A reduced model of a classical representation of a clockwise spin
photon electric field. The w_i symbols are separate electric field vectors corresponding to 5 waves

In figure 7, we have a representation of photon electric field vectors that compose the particle. The diagram only shows 5 electromagnetic waves rotating clockwise (CW), but in reality a photon should contain an infinity of E vectors, covering half a circle, thus, 180° directions, rotating at the same time. You can see that the photon just like in QM, contains all directions at the same time in a simple classical superposition.

We can see that a photon is a little bit more than a simple EM wave. However, each wave it contains (as a classical superposition) has exactly the same behaviour as a classical radio wave. That is very important because in that case, two photons can combine amplitudes while travelling and form a photon with inner EM waves of higher amplitudes. However, when the new photon is absorbed by an electron, the electron only absorbs energies corresponding to the energies the electron can emit. These energies are related to the orbital numbers when the electron is attached to an atom. This means part of the photon can pass through. For a photon to be absorbed it needs a frequency threshold, but also an amplitude threshold. If the amplitude threshold is not met the energy will be re-emitted as the electron will be unable to change orbital state. If the frequency threshold is not met the photon will not interact and simply pass through.

In figure 8, there is a simple representation of the electric field within a high amplitude photon when passing through a vertical filter. The high amplitude photon is a combination of amplitudes of a limited amount of photons. This corresponds to a thin, light beam The circle is in the *x-z* axis and motion is in *y* axis. The diagram shows a slice through the *y* axis. I is clear that, if we place another V filter nothing changes in that pattern. The diagram doesn't follow natural proportions. The area of the petal of vectors should be $\pi r^2/2$ (half of a circle area). The total amplitude of the photon will be half the original amplitude. The combined magnitude of the transmitted amplitude will be $E_o / 2$.

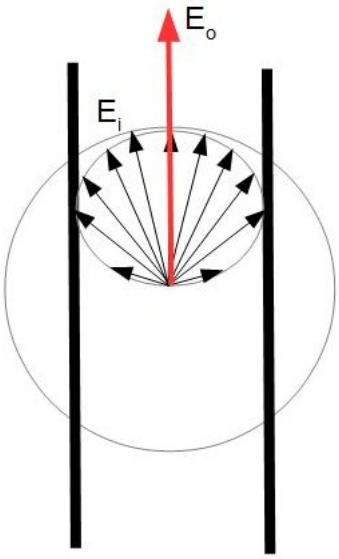


Fig.8. A photon passing through a linear polarization filter. E represents the E_i vectors summation

If we then let the linearly polarized photon pass through a CW circular polarizing filter (fig. 7) , the waves get arranged so that the electric fields will point in all 360º directions again, but also spinning CW all at the same time. There will be a 90 degrees phase difference from B field. A better picture is in fact the original diagram in figure 7, with the only difference that the new photon is now half the amplitude of the linearly polarized photon.

Now it becomes clear that if placing a horizontal filter will allow 50% of the amplitude of the photon to pass through. Also, it is clear that if we remove the circular filter, the light beam will be almost completely blocked. How much it is blocked depend on the material used. A perfect filter should be impossible to build (Fig.10).

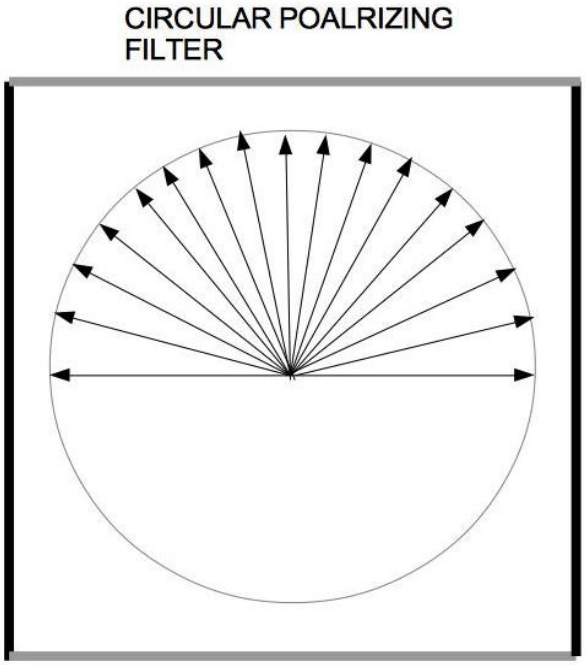


Fig.9 Circular filter. All vectors are rotating CW

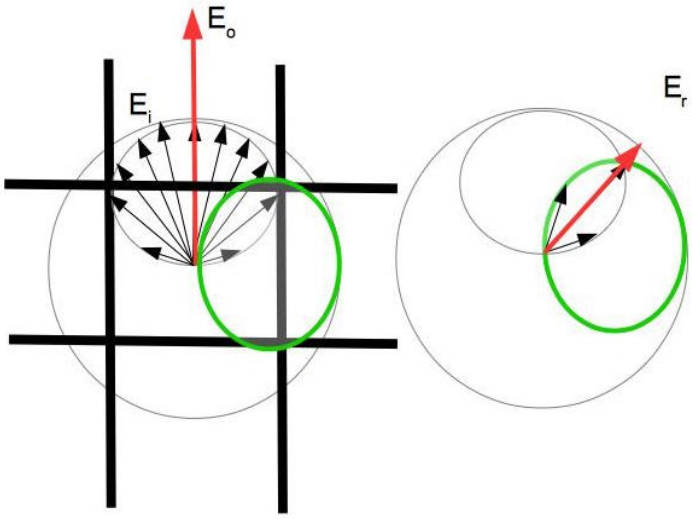


Fig. 10. The diagram shows a circularly polarized photon passing through a linear filter. Only a small fraction of the amplitude of the photon will be able to pass through. The red line is the petal corresponding to the horizontal filter, $E_r << E_0$

Note. The diagram doesn't respect proportions, it only presents the idea.

If we emit a single photon, it will not be detected because the combined amplitudes of the EM waves that composes it will be less than the threshold amplitude for an electron transition. However a high amplitude photon will be able to pass through.

In QM you can't combine photons or split them. However, nothing prevents that in reality. Only emissions and absorptions (after stabilization on an orbital) are quantized. Classical EM waves can easily do that.

13. Paradoxes in SR and GR

General Relativity limits the particle speed justifying that to accelerate a particle to c you need infinite energy and sometimes people ask what would happen if you exceed this limit. Some even think that would mean going back in time. My model seems more natural to me. Exceeding c is clearly impossible and also there is no reason to think of going back in time.

Because in AF time is absolute, there are no paradoxes, no problems with the moment “now”. What is *now* here it is *now* everywhere in AF. The popular twin paradox is not a matter of time any more. The twin that returns younger than his brother does that because the particles he is made of experiences slower cycles.

Time travelling is not possible here because it is in contradiction to the way alpha time is defined.

This theory allows the possibility of taking a snapshot of the universe (a single line through the space axis) and containing all the information in the universe. Thus, the next frame can be generated. However, quantum effects, could prevent knowing the hypothetical “next” frame and an infinity of possible next frame can exist, the one that follows is not known until it happens. If we imagine a random number RN that is either 1 or 2 and an event E that can generate two possible outcomes O1 and O2, then these outcomes are equally valid. Which one follows in impossible to know. This means the universe will certainly generate only one of these outcomes. The generation of a random outcome is subject of controversy.

There is a thought experiment we can think of. Imagine two circles of equal radius approaching each other from opposite directions. The path they describe is a straight line and the circles move so as the centres of the both circles are on the line. After they collide, we assume they will bounce in opposite directions. The question is if the trajectory of both circles will not follow the same line, how can we predict which side of the line they will go ? No matter how much we zoom in we will always see continuous lines and not points. But the circles are made of points and spaces between points that are also infinitesimal. That is a sort of a mechanical RN generator. If we can zoom in and ultimately we see the points, then nothing is random here.

14. **Black Holes Dynamics Interpretation**

First of all this model does not allow any singularity neither point particles.

It is very likely that strong / weak forces to have a fundamentally electromagnetic origin. In that case it is a single shell of the BH, comprising all sorts particles orbiting at near c (elongated helical trajectories). Most of these particles are turned into various extreme high frequency EM waves (photon geometry). This is the optimum way to compress energy. This way the shell becomes very thin and gravitational effect is maximum.

The gravity produced is the same gravity planets produce, but different structure bodies produce different effects on close objects trajectories.

What differs from a planet in case of the BH are the "relativistic" and a stronger frame dragging effects.

I think it is important to take into account "relativistic" increase in "masses". The phenomenon that can also be explained by relativity (however, only if using infinitesimal mass particles instead of photons) is that photons moving in parallel do not attract but those traveling anti-parallel do. This has been confirmed experimentally. In case of other particles a similar thing happens. If moving parallel the gravity does not increase.

All particles approaching the black hole horizon are accelerated by extreme frame dragging at near c, on the outer shell and begin to orbit along with the orbiting radiation.

Most probably the greatest amount of gravity is produced by the relativistic motion of electro-magnetic waves while orbiting and not by their value of rest mass.

There is not reason for any particles inside the black hole. All particles and photons are concentrated on the shell that corresponds to what is called event horizon in General Relativity.

Fast jets and fireworks

By analyzing the model, it is clear that particles or radiation cannot escape tangentially to the surface of rotation. In order to escape, light or extreme speed particles should precess and exit through poles transforming the orbital trajectory into an elongated spiral trajectory. The idea is that light cannot be stopped and can only be deviated. The poles are the only way to escape without being deviated back into the BH.

According to data available, BH are relatively stable, but especially during collisions with massive objects, part of the particles are destabilized and can escape the BH.

15. The universe boundaries

Presumably the universe is not infinite, we can use this model to predict how the universe boundaries would look like. These will be similar to a black hole boundary. Gravitational effects will keep the waves in an orbit around the universe. Eventually all particles will establish on an orbit around the centre of symmetry.

16.The electron as a helically-circulating spin-1/2 charged photon generating the de Broglie wavelength

This model is found in the paper *The electron is a helically-circulating spin-1/2 charged photon generating the de Broglie wavelength written by Gauthier R.* Although the author says his approach is relativistic, it perfectly fits my concept.

"My approach [1] is to model the relativistic electron as a helically-circulating double-looping charged photon. The photon carries the electron's charge and has spin Sz = ±ħ/ 2 , the same as that of an electron, rather than spin Sz = ±1 ħ

of an uncharged photon. By equating the moving electron's relativistic energy E = γ mc2 with the photon's energy E = hν , the charged photon is found to have a relativistic frequency ν = γ mc2 / h and a relativistic wavelength λ = h / γ mc . While this relativistic frequency ν = γ mc2 / h was used by de Broglie to derive the electron's de Broglie wavelength, the relativistic wavelength λ = h / γ mc of a hypothesized photon that models a relativistic electron has never to my knowledge previously been utilized in describing the electron, neither by de Broglie nor by others (including other electron modelers.)"Gauthier R.

"This spin 1/2 charged photon model of the electron is a generic model of the photon because it does not present a more detailed model of a photon that may compose an electron. This generic model of the charged photon could be used with a variety of more detailed photon models that also have the basic photon characteristics of light speed, frequency, wavelength, energy and momentum listed above.

In a more detailed charged photon model, the charged photon's spin Sz = ±ħ/ 2 must remain constant at all velocities to give the electron model a spin of ħ */ 2 at all velocities. " R.Gauthier*

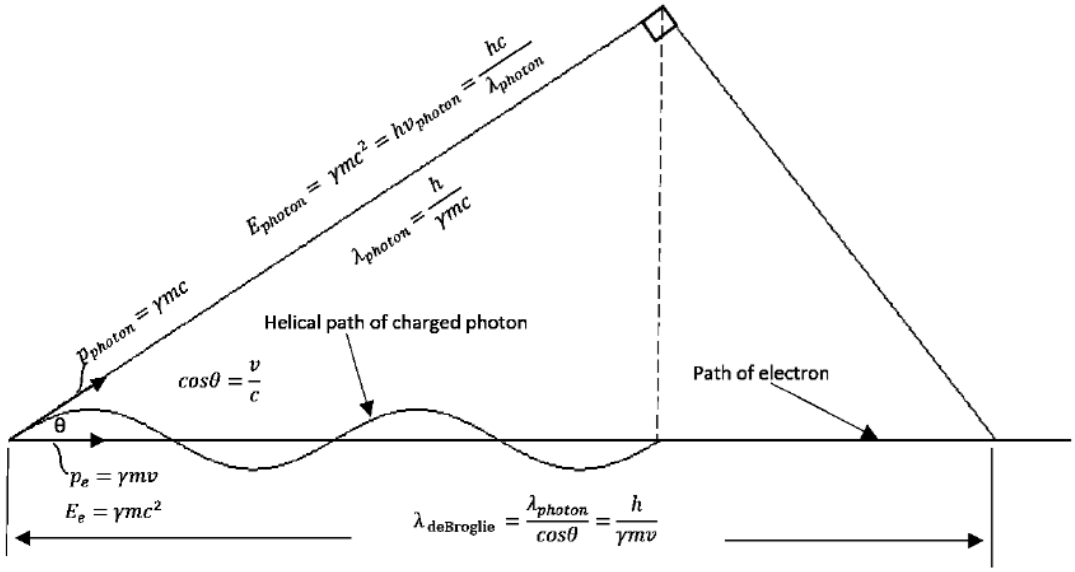


Figure 1. The electron's de Broglie wavelength is generated from the spin ½ charged photon model of electron. The electron is moving to the right with speed v . The charged photon modeling the electron is moving helically to the right with speed c along its helical trajectory. The helical trajectory for one wavelength of the double-looping charged photon is mathematically unrolled to show the geometrical relations more clearly. Each wavelength of the double-looping charged photon along its helical trajectory generates the electron's de Broglie wavelength along the helical axis of the charged photon. As the electron moves to the right with speed v , the de Broglie waves move to the right with speed $v_{phase} = c^2 / v$.

Fig.11. A diagram in R. Gauthier paper showing the model of an electron.

"An objection to the spin 1/2 charged photon model of the electron is that an electron has spin Sz = ±ħ / 2 and is a fermion while a photon has spin Sz = ±1ħand is a boson, so an electron cannot be a charged photon. But if a circulating photon carries the electron's charge and has spin / 2 , it is not a boson but a fermion. In other words, I am proposing that photons may be of two varieties: 1) uncharged and moving linearly with spin 1 (a boson) with no rest mass, and 2) charged and moving helically with spin 1/2 (a fermion) and having a rest mass. " Gauthier R.

In this paper Gauthier is using a relativistic formula. In the absolute space the electron velocity v, becomes the absolute velocity. If we assume the photon moves in the absolute space or more precisely in an electromagnetic medium then the relativistic effects occur naturally. It is clear how the electron propagation speed is limited by c. As the electron accelerates, the helix pitch is increasing. The helix pitch is proportional to angle θ. That is what in fact happens to clocks, the tick rate is given by the pitch of the helix and an increase in pitch is a corresponds to a time dilation in Relativity. In reality clocks rates are reduced. This happens to any particle. Obviously, if this mechanism applies to all waves and in fact it's very likely to happen, biological clocks, for example, will follow the same principle.

Regarding the classical way of charge generation, there is a mechanism that can explain it. A better explanation is made by Ph.D. H. Shantz in chapter 17. Sending two electro-magnetic waves one toward each other, depending on the phase, the electric and magnetic fields will interact. If the amplitudes overlap the resultant will be doubled. If the electric fields values cancel each other, the magnetic field values will double and vice-versa. This way it becomes clear that the energy is

conserved. However, if you think about sending two waves in the same direction, in that case the waves would be cancelled completely. However, this case is equivalent to not generating the wave at all. In mechanics, this is equivalent to trying to pitch a string from both sides. Obviously there will be no release of energy.

By overlapping two electromagnetic waves it becomes possible to create a charge. For example, if two electromagnetic waves are forced to travel in a circle, in opposite directions with a phase shift of 180 degrees between electric field amplitudes, the magnetic field will be cancelled. The way to confine the wave can be, for example, gravity. In fig. 12 the wave is linearly polarized. The electric filed amplitude ranges from + E_{max} to – E_{max} .

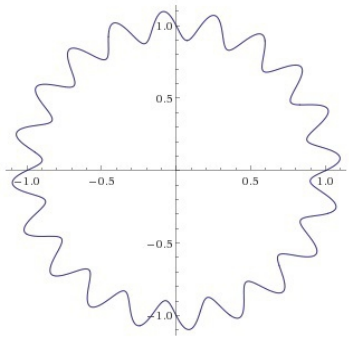


Fig.12. The plot represents the Electric field amplitude of two EM waves confined on a circle travelling in opposite directions

Using OAM helical mode m=1 waves we can overlap two opposite waves so that the magnetic field cancels the same way, we obtain a net electric field pointing outwards like in fig. 13.

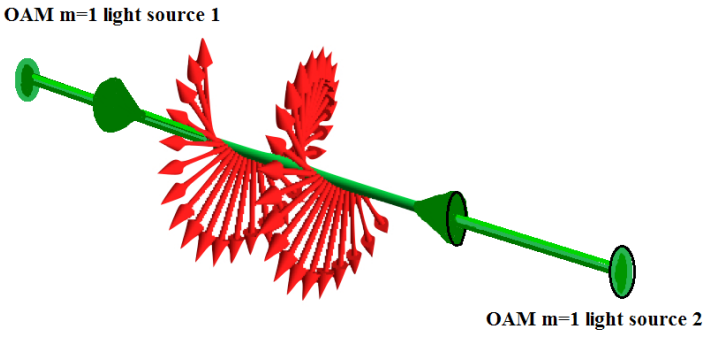


Fig. 13. Electric field vector summation

The electric field is oriented towards the exterior and it will act like a positive charge.

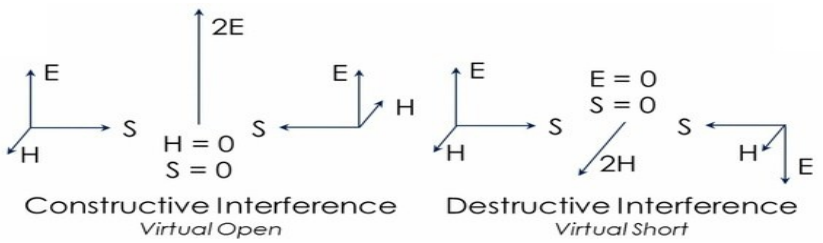
17. Electromagnetic waves vector summation

For explaining the electromagnetic interference I will use the *H.G. Schantz's* paper as a reference. He manages to explain this in the most elegant and logical way which reveals a perfect energy / information conservation principle.

Dirac concluded in his paper, that two photons can never interfere with each other (P.A.M. Dirac, *The Principles of Quantum Mechanics*, 4th ed. (revised), 1967, p. 9.).

" I believe Dirac was wrong.

Interference is defined with respect to the electric field. But when two photons interfere, a very interesting thing happens. Electric energy transforms to magnetic energy, but conservation of total energy holds. The figure below illustrates how this works for constructive interference (left) and destructive interference (right).



In "destructive interference," magnetic fields (H) add while electric fields (E) cancel. In "constructive" interference, electric fields add while magnetic fields cancel. Energy is always conserved, merely transitioning between the electric and magnetic forms. The "S" is showing the Poynting vector, the local flux of EM energy, given by S = E x H.

The truly fascinating aspect of this is that when one field or the other goes to zero, the energy comes to a rest, even though the waves keep propagating through each other. Some of the energy is exchanged between the two, so some of the forward propagating energy becomes backwards propagating energy and vice versa.

*I discuss this at greater length in a blog post, "*Dirac's Big Mistake: What EM Tells us About QM*."*

So in summary, in a destructive interference, energy is conserved because the cancelled E-Field generates an enhanced H-Field and the "missing" electric energy transforms to magnetic energy.

*You'll find Princeton physics professor Kirk McDonald offers an excellent analysis here, as well: "*Does Destructive Interference Destroy Energy?*" H.G. Schantz*

If this explanation for waves interference hold, then it can explain how it is possible to create apparent charges using electromagnetic waves only, as seen in chapter 16.

18. The electro-magnetic medium

If you can explain the electromagnetic waves propagation without using a medium, then waves propagate in an absolute frame of reference. However, if the medium is necessary to provide this propagation, then I can say that this medium needs to have constant permittivity/permeability. There is no definite motion of this medium. Even if it had, it wouldn't have had absolutely any effect on the propagation of waves.

19. **Time definition aspects**

In his paper, Time Invariance of the Fundamental Phisical Constants*, the author Mugur B. Răuţ concludes:*

This paper shows that the variation of certain fundamental constants is practically impossible in a physical time frame of reference. We can have as many time frames of reference we want but when we transform them all into physical time frames of reference, with time as a measure of movement, physical equations retain their form and meaning and values of certain physical quantities and fundamental constants are the same. Therefore the question of variation of certain fundamental constants is only possible for those frames of reference other than physical time.

I've defined space and time as absolute, so that they can become frame independent. The absolute time is not physical. By proposing a special particle geometry, I have shown that causally is constant in absolute time and space (which is not physical) but the measured time and lengths vary from frame to frame. This way there seems to be no contradiction between my model an the ideas expressed in the M. Raut's paper.

20. A classical hypothesis on the photoelectric effect

In the double slit experiments, in terms of Quantum Mechanics (QM) , it is often said that the measurement collapses the wave-function or more exactly, the measurement destroys the interference. However, we can also think, that is not the measurement that destroys the interference (except for some experiments). The delayed choice quantum eraser can be used as a proof. People developed the DCQE (Delayed Choice Quantum Eraser) experiment, where there is no measurement involved at the slits, but they went forward with QM believing that even simply watching the results destroys the interference. If QM is all correct concerning this aspect, this is a rational conclusion. However, I think it is not the case. The theory probably makes wrong assumption. Apparently, the detectors cannot detect the energy of a photon, if the energy that reaches the detector is by a certain degree less than the work-function . QM says, that there is a significant probability of detection when the wave passes through both slits to have a photo-electron release on either detector A or B. That must be wrong. The probability is **almost** zero. Unless the other part of the wave hits the orbiting electron that still holds the energy from the previous electromagnetic wave in a very short time, the atom will not release the electron.

Let's suppose we have a photon with energy E_{γ}. After it passes the slits we get two waves of $E_{\gamma L}$ and $E_{\gamma R}$. Say, the energy required for an atom in the ground state to release an electron is E_{e^-} (this is the work-function) . If a wave with energy $E_{\gamma L}$ hits the atom, it will energise the electron, but the atom will not release the electron yet. Since the energised electron state does not correspond to a stable electron orbital, it will quickly lose energy. However, if the wave $E_{\gamma R}$ comes quickly enough, there will still be enough energy left in the excited atom and $E_R+E_L>E_{e^-}$. Hence the electron will be released.

Notice, that the energy of a photon when it was just released will always exceed the work-function(will always have more energy than E_{e^-}) otherwise the frequency of the wave is not enough to trigger a photo-electron release.

We can, then say that this mechanism should work at any frequency of the photon. More exactly, a wave of any frequency could trigger an electron release, because photons can add up energies to the electron until it gets released. It is clear that it doesn't since the experiments show that the frequency matters. However, we can then understand that for a photon to interfere with an electron, it needs a minimum frequency. It is possible to explain how this happens. A low frequency wave interferes with an electron attached to an atom as well, just like a high frequency does. However an energised electron, looses energy quicker than the low frequency wave is able to provide the energy for releasing an electron.

Supposing we have a Hydrogen atom. We can write:

$E_A(t)=E_{A0}+E_{\gamma} - P_A*t$

where, E_{A0} is the energy of the atom when the electron is a stable configuration, ground state.

t is measured in absolute seconds, according to this concept. All symbols for time denote absolute time

$E(t)$ is the energy stored in the orbiting electron, which is a function of time.

E_A is the energy received from an electromagnetic wave.

P_A I.s the radiation power of the electron in the energised unstable state.

$E_{\gamma} = P_{\gamma} t_A$

t_A is the emission time of an electromagnetic wave.

E_{γ} is the energy produced by an electromagnetic wave.

We can also write:

$E_{\gamma}(t) = P_{\gamma} t$

P_{γ}- power produced by an electromagnetic wave

This power depends on the frequency:

$P_{\gamma}=k\upsilon$

k is a constant and υ is the frequency of the wave.

We can now write:

$E_{\gamma}(t) = k\upsilon t$

To produce a photo-electron, the energy E_A needs to reach E_{e-}

$E_A(t)=E_{A0}+ k\upsilon\, t - P_A t$

In conclusion, to produce photo-electron, the electromagnetic wave must have a frequency that satisfies the following inequality:

$$\upsilon >= P_A/k$$

These equations need to be expressed in absolute time. Applying relativistic equations to them will generate wrong results in certain situations, because the relativistic effect are generated automatically by the wave behaviour of all particles.

Supposing we have a hydrogen atom. There is another option for this mechanism or more precisely the energy release mathematical function (not the work function) can be more accurately described. The energised electron looses energy until it reaches the ground state.
It can do that is a continuous mode. However it is more likely that it looses energy by releasing a single pulse, like when accelerating a charge (this case a single movement – positive acceleration and then negative acceleration to stop the motion). This is only an analogy since the electrons do not posses point charges but the charge is evenly spread out throughout the entire wave structure.

An energised electron orbiting around the nucleus (as a wave), acquires energy by increasing its frequency (deBroglie). Also the orbiting radius should increase. I've shown that a free electron in terms of shape, is a wave travelling at c in a helical motion. If this motion is preserved within an atom, when the electron gets energised the pitch of the helix increases the deBroglie wavelength reduces and the electron front wave speed is increasing.

If the electron creates a **single pulse** as it settles to the stable state (which depends on temperature/background radiation) then **photons are single wavelength electromagnetic waves.**

For the electron to be energised, a short pulse (small wavelength) can deliver the energy quicker than a long wavelength pulse. A minimum amplitude is also required but since the emissions of photons are at fixed amplitudes the energy of a photon *apparently* doesn't depend of amplitude. This is not correct, because if you split the wave, the energies left in each half may reduce below the workfunction. When you increase the intensity of a beam, it doesn't mean the amplitude of the waves increases instead, the number of pulse emissions in a given time increases. However, if there is a constructive interference, of two waves (usually originated from the same photon emission) then this pulse can exceed the work function and trigger a photoelectron release. As expected, this has been observed experimentally and it is called TPA (https://en.m.wikipedia.org/wiki/Two-photon_absorption). This demonstrates photons behave like classical waves from this point of view and not as QM says. The *virtual state* in the TPA concept is real.

It is interesting that in the ground state corresponding to 0 K temperature, the

atoms behave differently. For example, if we have few atoms they start to behave like a single one.

In an normal environment the electron seems to be permanently energised by the background radiation and regularly emits EM waves to try to go to ground state. It is clear that a world without this background radiation (which in fact dictates the temperature) would be completely different.

In the case of an atom, the electron is literally orbiting the atom, but not as a point charge particle. This interpretation is flawed. It is a continuous orbiting wave around the nucleus describing certain patterns depending of the energy level.
The lowest level is the ground state which happens below the temperature of 10K.
When two atoms share an electron, they share this wave that again forms a continuous structure like a cloud.

Based on this mechanism for the photoelectric effect we can analyse the double slit experiment.

I suspect that if we use special detectors based on atoms that emit photoelectrons at half the work-function(for example 2eV instead of 4eV) of the original detectors, we can detect the photons that cause the interference pattern without destroying it.

In the Delayed Choice Quantum Eraser experiment by Kim et. al, we can replace d1 and d2 with the special detectors. If the d4 or d3 get a detection, the special d1 and d2 detectors should be triggered simultaneously as well. This should confirm that the electromagnetic pulse was split when passed through the slits.

In conclusion, even though the mechanism presented above is not correct my suggestion is that instead of using energy packets to model the photon – electron interactions, we can analyse the waves also by their power delivery in a dynamical way because a higher frequency wave can deliver more power. A classical wave **power output** depends on frequency unlike the total energy that depends also on the length of the wave. Therefore in the case of an atom it is probably important how quickly the energy is delivered and how quickly the energy is lost by decay.

21. The connection between the speed limit and wave propagation

You can imagine the universe as an inert homogeneous medium (liquid), frictionless, lake and matter / energy as waves. Imagine waves propagating at a constant speed, in a single direction, not radially in all directions. Particles would travel in variable zig-zag patterns and light beams of helical mode m = 0 would travel straight. My concept allows a hypothetical observer that can "watch" the lake from above and describe what it sees. That is the absolute observer and it can define an absolute frame where it is at rest. Clocks rates depend now on the distance between the peaks of the zig-zags and not on the wavelengths. A hypothetical observer from above can have a clear picture of the lake, but an observer made of waves itself will find difficult to visualise it. Even the observer above the lake can have trouble finding

a frame where the medium (the liquid in this case) is at rest because there are no floating objects, but having the whole picture you can have an idea of what is your speed relative to the medium. There are already experiments that claim to have found the aether drift. The one way speed of light experiment is also a proof that there is an absolute frame which must be the frame in which the medium is at rest. Just like relativity says about things that don't have a definite state of motion, here, the medium doesn't have a definite state of motion and even if it had it would have no effect.

Viewing the world from above becomes the general case.

The propagation of light is constant relative to the medium. This medium does all this weird apparent "time dilation".
It is all about waves. Sound waves cannot exceed the speed of sound just like light cannot exceed the speed of light. This is not a coincidence. The wave behaviour of light is responsible for the speed limit.

22. Gravity as a consequence of electromagnetic filed interference hypothesis

In chapter 17 I have shown how the energy conservation mechanism works for the electric an magnetic field vectors. The cross product of the electric field over the magnetic field yelds the poynting vector which gives the propagation direction vector. Cancelling the E field energy doubles the energy H field energy. If we introduce a third filed as the gravitational it could disturb this equilibrium. Therefore, it is possible that gravity is a simple consequence of the electric and magnetic fields interference. Since this concept says the world is made of this EM field and the propagation of their values in the direction of the poynting vector, all forces we experience become consequences of these interferences, including electromagnetic forces, inertia and gravity. If two beams of light appear to attract each other or a beam seems to be attracted by a massive body, in reality, electromagnetic interference could be responsible for an apparent change the propagation direction.
A very interesting and powerful example that can support this idea are OAM beams of light. If we look at a beam of light carrying internal OAM with helical mode $m > 1$ then we can see that the superposition of waves can create a poynting vector that follows a spiral rather than travelling in a straight line creating the illusion of a force that points to the centre of the spiral.

23. The connection between the helical modes of light beams and the particle model predicted by this concept

In chapter 6, I have shown how a particle that has rest mass / energy, propagates.

If we look at an OAM helical mode $m = 0$ beam of light, the propagation speed of the wave front is maximum and it is equal to the speed given by the permittivity

and permeability of the medium. In this case the poynting vector follows a straight line. This corresponds to an integer spin particle like normal photons *(m=0),* electrons, neutrinos, muons, etc.

For a beam of light of internal OAM helical mode *m>0*, there is experimental evidence that the wave-front speed is reduced [reference 16]. Because of electromagnetic waves interferences the poynting vector, instead of following a straight trajectory, it follows a helical one. The vector speed is still the same, c. However the front wave velocity is slower.

24. How gravity slows down time

According to General Relativity, it is the Gravitational Potential that influences a clock frequency. This is equivalent to measuring two clock rates that are placed one at the front and one towards the rear at a certain distance, in a moving vehicle. If the distance is the same and the proper acceleration is the same as the g, either being in the vehicle or in the gravitational field, the two clocks will behave absolutely the same.

To show how this happens using the mechanism provided by this concept, we can use a hypothetical *OAM m = 1* wave equivalent to a ½ spin particle.

If the particle is at a distance *D1* from a massive object M as it travels towards it, it has λ_1 wavelength and a helix pitch of p_1. After it reaches a distance D0 from M, the energy of the particle gets higher. The same thing happens if you accelerate a particle – the energy becomes higher. This means that the wavelength of the beam and the pitch helix increase ($\lambda_0 > \lambda_1$ and $p_0 > p_1$) .A higher frequency means that the energy of the wave is higher and the longer helix pitch means that the if we build a clock that uses the distance between coils of the helix to measure time, clock rate will be slower because it will take a longer time between pulses, like the light clock, fig.2. If we assume that the concept of the light clock presented in chapter 4 holds, then the clocks we use, follow exactly the same mechanism.

25. Equations for relationship between frequency, energy, mass and velocity of a particle and their meaning in absolute space-time

For this purpose, we will use a entity model that can be thought as a helically circulating electromagnetic wave of a fixed total energy, like in chapter 16. The difference is that in this case we don't care about charge and we consider the motion in absolute space and time. This entity corresponds to what we call particles. The poyniting vector of this particle will follow a helical trajectory. This particle perfectly described by a OAM light pulse having helical mode m = 1.

The wavelength of the particle is:

$$\lambda_p = \frac{h}{\Upsilon m v}$$

Eq.10

where v is the absolute speed of the particle.

Here m is the rest mass.

It is important to note that this rest mass is proportional to the energy stored in the electromagnetic field if we consider the helically-circulating photon travelling at a very low speed (infinitesimal). This mass is used for conversion to the newtonian concept of mass. This mass is a constant in this case. If we consider the particle to be an electron or a muon, this mass is the rest mass from the Standard Model.

The energy is:

$$E_p = \Upsilon mc^2$$

Eq.11

Here, Υ contains the absolute velocity c and absolute velocity v of the front wave of the particle.

This particle has a ½ spin. If if decays in a spin 1 particle it will continue as a helical mode m=0, with a straight line trajectory poynting vector.

In a gravitational field this particle will have at a height h_1, an energy E_{p1}. If it travels towards the object that generates gravity at a height h_0, the energy will increase to E_{po} . It is clear that is is not the strength of the field that generates the energy difference.

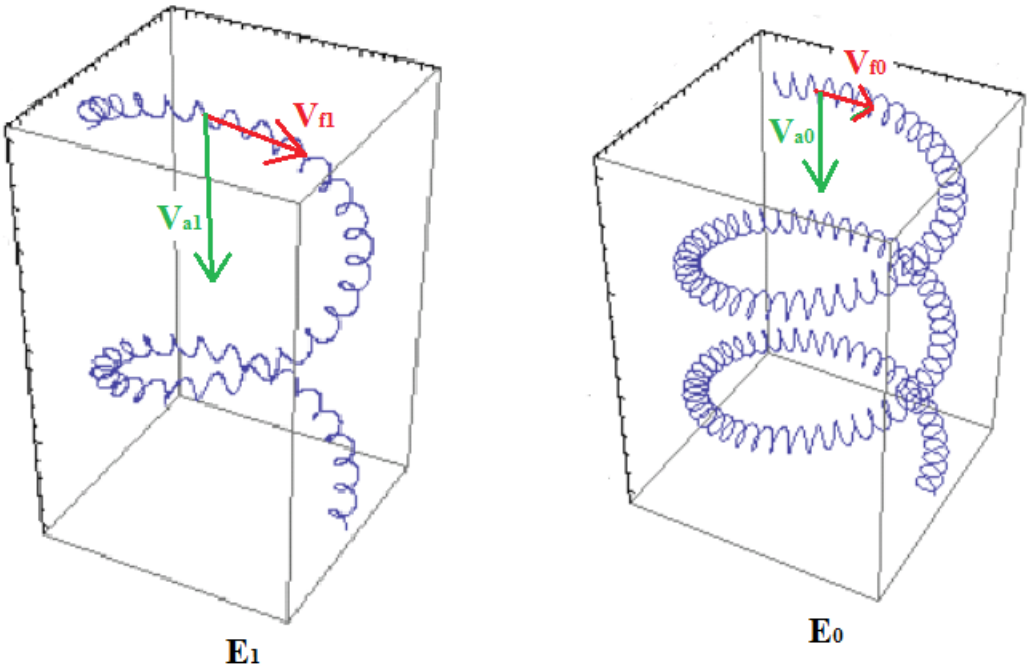


Fig.14. Two OAM, m=1 photons descending in a constant gravitational field, confined on a circular trajectory

In fig. 14, the wave 1 is lower in the gravitational field and therefore it has a higher energy stored in the electromagnetic filed. Velocities V_{a1} and V_{a2} are the velocities of the objects that causes the wave to circle around it. This can be for

example the nucleus of an atom. V_{f1} and V_{f0} are the wave-front velocities. V_{f1} and V_{f0} are the vertical components of $V_{a1}$and V_{a0} (note that for comparison, in the picture the green vectors lengths are longer, but these lengths, here do not signify the vector strength, but the colour red signifies a stronger vector, therefore always $|Va1| < |Vf1|$).

Since the $E_{p0} > E_{p1}$, m is constant, then the only term that changes is Υ. A higher Υ corresponds to a higher wave front speed of the particle. This means that a particle wave front accelerates as it descends in a gravitational field. But it also means that if the particle is part of a structure like an atomic structure object, even if the object stops, the particle keeps it energy and continues to travel at the same speed (higher than that at height h_1) but only changes trajectory within the structure. For example, if the whole helically-circulating particle was orbiting around a centre at h_1 and at h_0 it can continue to orbit, but the wave-front is going to have a higher speed. This corresponds to a OAM m=1 wave orbiting around a centre that can be either imaginary or real. If the wave is OAM m=0 then the particle wave-front cannot increase and it only blue shifts its frequency.

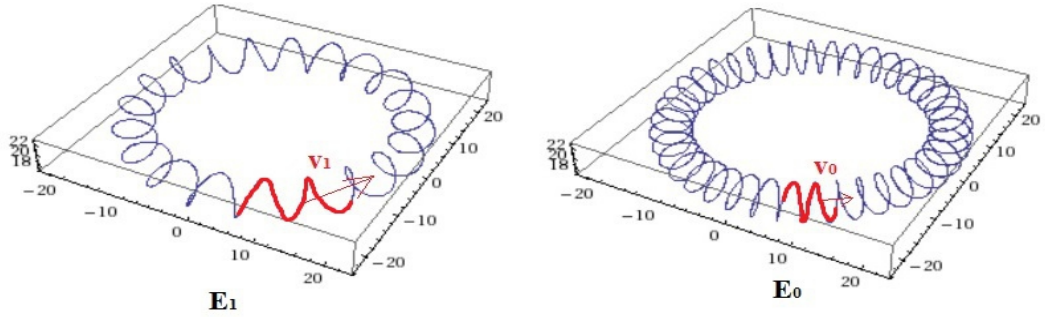


Fig. 15. Two particles at "rest"

In figure 15, we have represented two particles at "rest" (the centre of the circle doesn't move in *AF*) made of two electromagnetic waves that move in a circle. The energies are E_1 *and* E_2 , with $E_1 > E_2$ although, it might look from the picture it is the other way round. The wave-front speed of the particle 1 is higher than the wave-front of particle 0 and therefore the frequency of the electromagnetic wave is higher. The helix pitch is also higher. In this diagram, I have only represented the poynting vector trajectory. The whole wave doesn't actually form a complete circle, and it is represented by the red line.

The potential energy of a particle can be approximated using the formula $E = mgh$. Therefore:

$$E_0 = mgh_0 = \Upsilon_0 mc^2$$

We can write:

$gh_0 = \Upsilon_0 c^2$ for particle *#1* and

$gh_1 = \Upsilon_1 c^2$ for particle *#2.*

If, $\Upsilon_0 = g/c^2 h_0$ and $\Upsilon_1 = g/c^2 h_1$ then we can find the velocity of the wave-fronts of the particles (this corresponds to the velocity of the particle).

For a difference in height we can then find out the difference in the velocities of the wave-fronts and then the wavelength difference:

$\Delta\Upsilon = g/c^2 \, \Delta h$

For wavelength difference we use Eq. 10

Conclusions:

The paper shows that the propagation of values (waves) of electromagnetic field happens at the same constant speed in absolute space and time as defined. The concept predicts that the particles geometry are similar to the light helical modes. Light waves of helical mode $m = 0$, travel straight and thus the forward speed is c. Waves associated to particles with ½ spin travel in a helix / spiral and thus the front-wave speed is reduced, but the internal field propagation is at the same constant speed c. Thus, c limit becomes obvious for non zero rest mass particles. The c limit of light is the natural propagation speed of EM waves and it is not a really a limit, but the speed the propagation it always happens. It feels natural for fields to travel at a certain speed rather than at an infinite speed. Infinite speed would be unimaginable and a universe like that wouldn't work. The value $2.999 \cdot 10^8$ *m/s* is because the conventions we use when defining dimensions. This constant is dictated by the permittivity an permeability properties of the vacuum. The only important thing is that is constant and non infinite.

The reason why c is not variable is because the propagation environment and propagation mechanics don't change. There seems to be no reason for the vacuum properties to change. The fundamental waves that compose other particles propagate the same way. In other words, there is a single fundamental speed in the universe. Speeds below c, are apparent. If you send a light beam through a channel with mirrors like a optic-fibre, it goes in a zigzag pattern and it reaches the observer slower but the wave poynting vector has travelled the same speed. The apparent speed is lower. Otherwise, you would say only c is constant and other particles travel at various speeds. According to this concept, that is not the case.

Analysing this concept, one could say that these mechanisms I have presented are the result of Relativity. My opinion is that relativistic effects like reduced frequencies of clocks are the result of the mechanics I have presented in this paper. Before creating this concept, I was expecting that Relativity will explain the wave behaviour of particles and the connection to the speed limit, but apparently it is the wave behaviour responsible for generating the relativistic effects.

GR limits the particle speed justifying that to accelerate a particle to c, you need infinite energy and sometimes people ask what would happen if you exceed this limit. Some even think that would mean going back in time. My model seems more natural. Exceeding c is clearly impossible and also there is no reason to think of going back in time.

Usually theories start from simple concepts. If the concept is wrong, then mathematics can't do anything to fix it, unless you accept the mathematical predictions are irrational. Mathematics can be used to further develop the theory and to make sophisticated predictions. My opinion is, both Quantum Mechanics and General Relativity theories, at some point make irrational predictions.

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