

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. 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 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. This model assumes, by definition that space doesn't have a variable geometry and takes the other possibility, hence, complex particles inner geometry changes what we measure as 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. Analysing these waves, in this context, leads to a proper development of the concept.

1. Introduction

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 mathematically, define an absolute space and time and speed of light will be observer dependent in an absolute frame of reference. 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, and that is relative time. We though clocks were measuring absolute time, but we can also say they were measuring the relative time.

2. Space geometry

For this concept to work, we will define a **flat space geometry**. This flat geometry space-time cannot be changed (since it is defined as flat). We will define an absolute reference frame with an origin for x, y and z axes of a Euclidean space. For simplicity, 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.

We can see the space as an *electromagnetic-superfluid* with permittivity and permeability properties that enables the propagation of electromagnetic field. This way, in the AF, the fluid is at rest. However, the present concept, fundamentally, doesn't support the idea of motion relative to a space, other than **in a mathematical form**. We **can define this motion mathematically** (as in chapter 3), using the Euclidean space and a constant time flow, but this motion is never real. Instead, it strongly suggests, that nothing really moves and only values of fields propagate at a constant speed, as waves.

3. Time and space definition

If we **define alpha time** as absolute, we can see that our clocks will not be able to 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 absolute 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.

4. Defining Alpha dimensions

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

$$x_\alpha, t_\alpha, c_{r\alpha}$$

$c_{r\alpha}$ 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*.

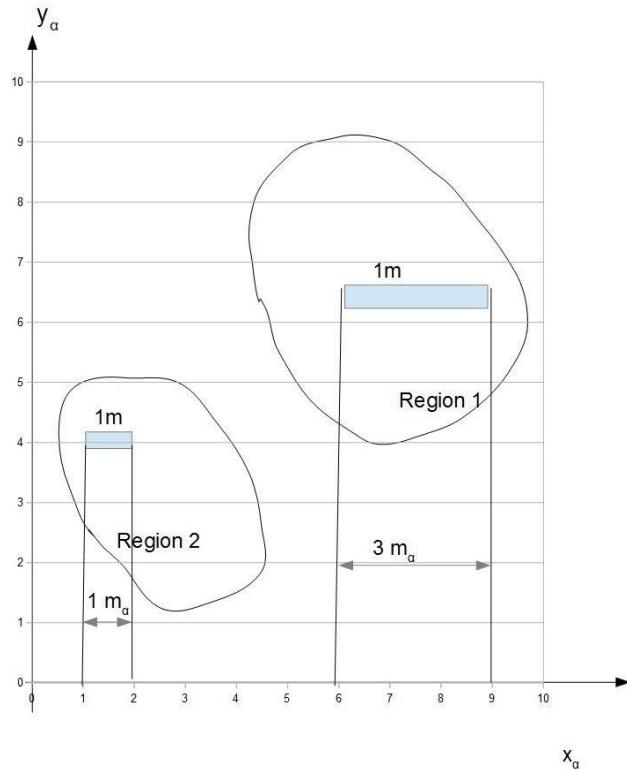


Fig. 1. Alpha frame 2d space

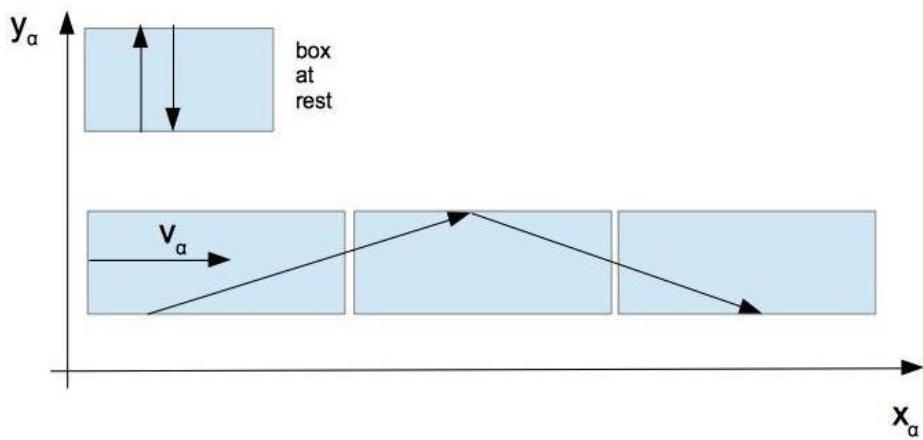


Fig. 2. Simple SR diagram for AF ,
the arrows represent flashes of
light travelling from the floor to
the ceiling and back. Notice that
the box needs to expand on x axis
to explain the experimental evidence.
This is explained in chapter 7.

5. 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 that can answer more questions. We assumed that clocks measure time as absolute, then SR demonstrated time was relative. When we define time as absolute the new idea is since our clocks we use don't measure time anymore 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 a length extension (not contraction) as shown in chapter 10.

6. The illusion of Matter

If the mechanism of clocks (which applies to the most accurate atomic clocks available), holds to any clock, it implies the unification of 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 philosophically says “Everything is light” and I agree. The waves corresponding to this field interfere 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 $\frac{1}{2}$ spin origin* [7]. The spin indicates a complex geometry particle that is a superposition of waves propagating, following a helical trajectory and not a straight line.

According to this concept **space doesn't have a variable geometry (the term is usually curved geometry).** **Waves helical geometry changes what we measure as time and space.** An atom as a more advanced construction, moving faster, changes its geometry and its internal tick rate changes (basically the oscillation frequency we use as a reference in atomic clocks). When travelling faster the geometry of a $\frac{1}{2}$ spin wave, assumed as a particle, changes and makes it complete the cycles in a longer time. Careful studies must be carried to confirm the geometry. At rest the wave orbits around its centre. The analogy with the OAM light beams works very well. The internal local beams of an OAM $|m|=1$ light beam, are never at rest in AF, only the wavefront can be at rest at an instant of time. Following this concept, a particle has a wavelength that is equal to the step length of the helical surface. *It is interesting that if we look at an OAM*

beam, the helical surfaces are 2d objects not 3d. The entropy of a system is proportional to the surface of the volume that engulfs the system, hence it might be a connection between these facts. This wavelength experiences Doppler effect. Hence the moving particle will be measured with higher frequency / lower wavelength. However, the Doppler effect is a different aspect. This has only to do with what a wave detector reads. The Doppler effect is only an illusion. When you move toward pulses a detector reads an increase frequency. If a $\frac{1}{2}$ spin particle is accelerated, then the wavelength increases but surprisingly the frequency increases as well. That is because the wave-front speed also increases. In this case, $f=v/\lambda$ and not c/λ .

To summarise, it is the helical mode geometry (this refers to any $\frac{1}{2}$ spin particle that has “rest mass”) that gives the *illusion* of changing the geometry of spacetime.

7. A classical model for a photon and a particle for the purpose of explaining this concept

For this concept, to make an analogy with the particles in The Standard Model, I will define the term particle, in a classical way, ignoring the quantum behaviour. I will study the behaviour of this particle in a flat space Euclidean space ignoring Lorentz transformations. What is also important to note is that, since we cannot use Lorentz transformations and Minkowski spacetime concept, gravity will be considered as a consequence of a gravitational field rather than a space-time curvature. In my other paper [1], I have presented a hypothesis that shows gravity as a consequence of electromagnetic interference, but that statement needs to be considered very carefully. I will show below that, gravity doesn’t modify the energy of the particle model described this paper. Thus, the concept of gravity can be reconsidered.

For in this concept, I will define a photon is a classical electromagnetic wave as a packet of a **fixed number of oscillations** (Fig. 1), and a fixed amplitude. I will refer to this model as *pulse photon (P photon)*. I will also consider the arrangement of classical local momentum vectors to describe a spin 1 (*P photon*) and spin $\frac{1}{2}$ for a helical mode $|m| = 1$. For the latter, I will use the name *omega particle (Ω particle)*.

In the figure 1, the energy density across the *pulse #1* is greater than the energy density of the *pulse #2*, therefore, the total energy of a pulse can be written as:

$$E=E_0 n \quad [1]$$

where, k is proportional to the amplitude which here is constant, and n is the number of oscillations.

Since the helical mode is $m=0$, the wave-front velocity is constant (c) and it is equal to the propagation speed of light in a vacuum, therefore we can define the velocity of the *P photon* as c . For the helical mode 1, the velocity of the wavefront will be defined as the velocity of the *Ω particle*. When calculating the frequency of the particle we need to be careful, as the frequency seen by a stationary observer will be $f = v/\lambda$, therefore the velocity of the wavefront will have a critical significance.

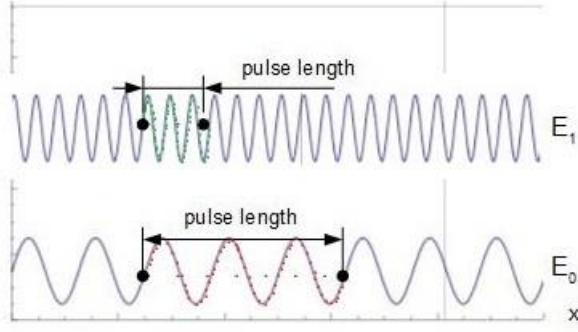


Fig.1. A representation of a classical wave packet, helical mode $m=0$, on a spatial x axis having linear polarisation. Only the electric field is depicted here. The energy of the whole packet (pulse) E_1 is equal to E_0 , however, the energy density is greater for pulse #1.

When sending a pulse in the direction of a gravitational field, it is known that the frequency of the wave increases. However, there is no reason for the number of oscillations to increase, therefore, if the energy density increases and the total energy of the pulse (P photon), remains constant. This behaviour seems surprising because, according to General Relativity the frequency of a photon should increase, hence, when we use $E_\gamma = h\nu_\gamma$ formula for the energy of a photon, the energy should increase when falling in a gravitational field. It is clear that this classical photon model looks very different from the quantum mechanical model.

A more careful analysis of the structure, tells us that when we scan across the whole helical structure of the particle and choose a section plane perpendicular to the direction of travel, the *local wavefront* velocity will obviously vary across the helical structure. Therefore, as a whole, the Ω particle never has a definite velocity like a simple object, but since here is defined as the velocity of the front end (wave front) of the particle, we can use it as a reference. Even if the wavefront at an instant of time stops, the structure of the particle will continue to propagate following it.

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

Usually, photons as electromagnetic waves (OAM mode 0), travel in a straight line always (in an isolated system – no gravity). 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 (or helical surface, for OAM mode 1) of the wave like radiation (photons) does.

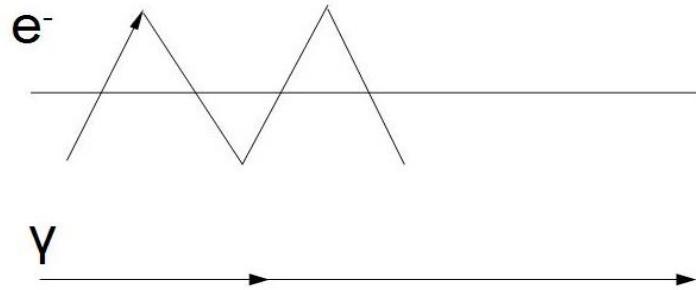


Fig. 3. An example of a hypothetical Electron vs.a Photon

The electron energy wave goes on a different trajectory because of the interference between fields just like OAM photons do. In AF the trajectory it can form a helix (Fig.4) but viewed from a moving reference frame the trajectory can be seen differently.

Here is a an explanation made by De Broglie after his findings:

“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.” [2].

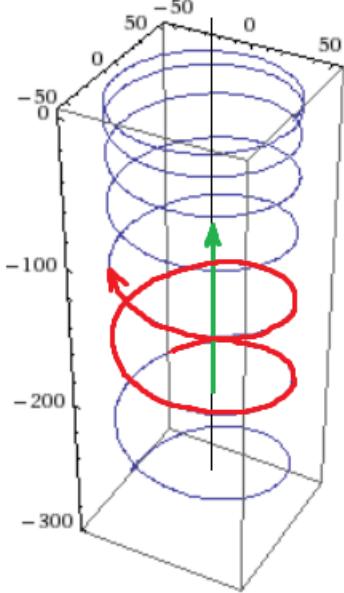


Fig. 4. A wave-front of a $\frac{1}{2}$ spin Ω particle decelerating in a constant gravitational field. The blue plot represents a local beam momentum trajectory. The red arrow is the particle. The plot is on an 3d space. Time dimension is not depicted here.

For other particles we know from The Standard Model, helical mode $|m|=1$ must exist in order to experience these effects.

Particles like electrons at rest can also be viewed as circles or loops. The internal beams still propagate 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 and the waves they are made of have the c velocity local beams following spiral trajectories. The clue that all particles travel as if following these trajectories, is the OAM $|m|=1$ spin photons. In my paper, ***Slowing down OAM light beams using a gravitational field [17]***, I have shown that OAM $|m|=1$ photons behave, under gravity, like a $\frac{1}{2}$ spin uncharged particle (fig.4).

Defining a particle model and analyzing consequences

Using the properties of OAM photons, I will use the definition of the Ω *particle* defined as a $\frac{1}{2}$ spin noncharged particle as identical to an OAM mode 1 *P photon*. I have defined an OAM mode $|m|=1$ *P photon* as pulse containing a constant integer number of wavelengths. The definition of an Ω noncharged particle is now identical to a OAM mode 1 *P photon* defined here. In other words a OAM $|m|=1$ *P photon* is an Ω photon.

Looking at the particle model explained here, the idea of kinetic energy doesn't have the same importance as in classical theories like newtonian mechanics. That is

because particles are waves similar to the *P photon* and the *Ω particle*, not point particles, hence the energy of the wave has a single form and it is neither kinetic nor potential. The particle size in AF should be thought in terms of the unrolled length of the spiral. We can see that the energy of the particle in alpha frame doesn't depend on speed of the wavefront. An observer that uses a normal clock will measure the electron moving at different speeds thinking it must have different energies, thus different kinetic energy. Only the **energy density** changes.

The mass of the particle is equivalent to its energy. This means that using this model, mass doesn't change either therefore, mass unit is redundant. The relativistic mass formula is $|m| = m_0 \gamma$. Combined with the model described in fig.4, this means, for a particle to get more mass / energy, it needs an additional length of the spiral. If you give energy to an electron it increases its frequency but the wavelength, surprisingly, increases as well as shown in ***Slowing down OAM light beams using a gravitational field*** [17]. The spiral length should remain unchanged. This shows that it is not the energy that is increasing, but the Energy density. This will be useful for a better description of the photoelectric effect.

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

$E_a = E_e n$, 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. This mass is invariant and also the energy is invariant, only energy density is variable. According to these result, the energy conservation follow completely different rules.

An increase of energy density can happen due to observer speed. In a moving reference frame, when the speed of the particle increases, the internal frequency will increase due to Doppler shift. Although in the case of moving observer the energy density increases, it remains constant in AF. The effect on the observer is the same as an increase of energy density due to a 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.

The equation for Doppler shift for a source travelling towards the observer at rest in AF is:

$$f = \frac{c}{c-v_a} f_a \quad (2)$$

f is the frequency perceived and f_a 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.

If we look at a proton, the constituents (quarks and electrons) obey the same rule. 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 when the wavefront has infinitesimal velocity.

Gravitational effect cannot hold the proton together though. Strong nuclear force must be an interference effect between quarks. The interference creates an appearance of a stronger force. (These statements however remain to be proved). The proton mass is not composed of its constituents' rest mass. As an analogy, string theory also treats particles as vibrating strings.

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 consider it a simple interference between fields because an OAM $|m|=1$ light beam spirals as if attracted by a force in the middle of the spiral. However, in this case we know that fundamentally, there is no such a force.

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 (not particles) we would think of them as new atoms 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 wavefront accelerates. The speed limit for the H particle is obviously c.

The frequency of the H particle is given by the equation:

$$f = \frac{c}{D\gamma} \quad (2)$$

D is the diameter of the outer side of the helical momentum surface of the particle, γ is the Lorentz factor in absolute space and time. The equation is explained by using the helical model, Fig 4.

9. Gravitational effects generated by particles

Looking at what happens to an uncharged particle while moving, the idea of curved spacetime doesn't hold anymore. It is known that 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 from 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, I will use the term particle which will describe a pulse beam that propagates **either in a straight line or in a helical mode** $|m|=1$ and **not spheres or point like entities (singularity is not accepted in this context)**.

The gravitational effect, I think, is best described by selecting two beams of light and watch how the gravity between them is generated. That is because this alpha space concept treats matter as helical mode 1 beam pulses. Understanding how gravity works for light is crucial. The original paper that presents such an experiment 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 pencils of light moving in parallel will not experience any gravitational effect.** If they travel antiparallel they experience a gravitational effect, but it is twice as big as it would be by judging the relativistic masses (using a quasineutronian model).

Using the ideas expressed in this paper, we can analyse a case of two hypothetical particles, as in figure 6. The arrows represent the local momentum.

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 helical mode, I have used a squared pattern to express the local momentum, but the gravitational total effect should be the same. We can see that in the case of H particles, only **half** of the local momentum lines travel anti-parallel. Those are the vertical lines. This explains the effects seen in Tolman experiment.

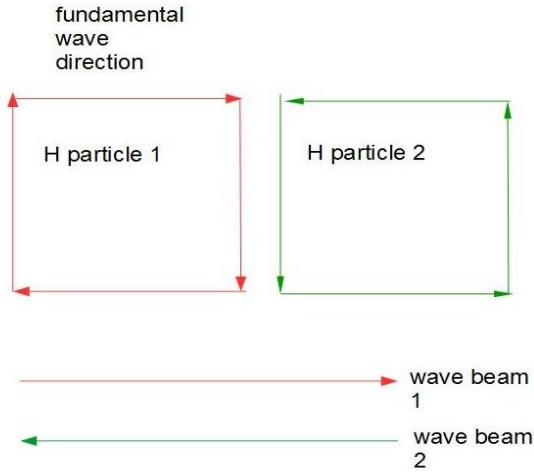


Fig.6. This diagram represents two hypothetical particles at rest (only the front wave briefly reaches zero velocity) in the AF and two wave beams of the same properties and the same length as the H particles

An interesting fact that can be seen looking at this diagram is that a gravitational effect can 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.

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.

Another important thing to note is that the local momentum trajectory is produced only through electromagnetic interference, although it might look like the trajectory is deviated by a force towards the centre of the helix. It is clear that there is no real force but only an illusion. By understanding the propagation of these waves, I can conclude that gravity must be also a consequence of fields interference. According to this concept, the gravitational field doesn't exist and gravity is not curved spacetime either. Also, there are no forces needed to explain interactions between entities (wave structures).

10. Equations for transition between the 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 $v_\alpha = 1 \text{ m}_\alpha / s_\alpha$

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, *H particle* to complete a single oscillation when stationary in AF. The helix radius 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 $\lambda_H = 1 \text{ nm}$. Equation number 2 gives the frequency of a clock that uses the frequency of the particle to measure time. The radius is $D/2$.

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

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 to an object, in *AF*, increasing its size in the direction of travel.

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:

$$x'_H = x_H \sqrt{\frac{1 - \frac{v_H^2}{c^2}}{1 - \frac{v'^2_H}{c^2}}} \quad (3)$$

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:

$$T'_H = T_H \frac{v_H}{v'_H} \sqrt{\frac{1 - \frac{v_H^2}{c^2}}{1 - \frac{v'^2_H}{c^2}}} \quad (4)$$

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

11. Two-way speed of light

For this concept to work speed of light needs to be constant only when we measure the total time 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. However, in AF, it is always constant.

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 10, we get

$$c_{m_F} = (c - v)\gamma \quad (5)$$

$$c_{m_F} = (c + v)\gamma \quad (6)$$

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.

$$c_{m_F} = (c - v)\gamma = \frac{d'}{t_F} = \frac{d\gamma}{t_F} \quad (7)$$

$$\frac{d}{t_F} = C - v = C'_{mF} \quad (8)$$

However, the box will increase in size by Lorentz factor, flowing the rule in the particle mode, which says that particles get elongated in the direction of motion. Therefore, we get:

C'_{mF} is the real measurement after length correction.

Hence the real measurements should show:

$$C'_{mF} = c - v \quad \text{and} \quad C'_{mR} = c + v$$

These seems to confirm the conclusions of Stephan J.G in his paper, **GPS and the One-Way Speed of Light** although the experimental results haven't been accepted by the mainstream.

The DGW 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. “[13]

12. 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, because it is easier to predict the consequences. 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 issues 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, experience 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, is 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.

We can imagine the following experiment. 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. This is a sort of a mechanical RN generator.

13. Black Holes Dynamics Hypothesis

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 travelling anti-parallel do. This has been studied in the experiment conducted by Tolman [5]. 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

According to this model, scenarios about polar jets can be easily accepted. It is possible that high frequency radiation including, spin $\frac{1}{2}$ particles, are ejected through the poles, due to high values and high fluctuations of electromagnetic fields produced by the spinning electromagnetic waves and spin $\frac{1}{2}$ particles.

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

14. Generating a net electric field using light beams

Regarding the classical way of net electric field generation, there is a mechanism that can explain it. A better explanation, that enabled this model, is made by Ph.D. H. Shantz in chapter 15. 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. This case is equivalent to not generating the wave at all. In mechanics, this is equivalent to trying to pinch a string from both sides. Obviously, there will be no release of energy. You can think of the energy stored as a superposition of vectors. QM has a more elegant way of solving this, though. It is known as *two-photon interference*.

By overlapping two electromagnetic waves it becomes possible to create a net

electric field. 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 field amplitude ranges from $+ E_{\max}$ to $- E_{\max}$.

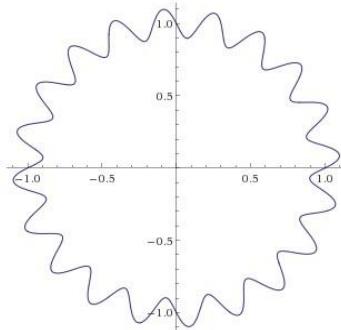


Fig. 12. The plot represents two slow speed, OAM mode 0 light beams, travelling in opposite directions like in Fig 13, around a heavy nucleus.
This can appear like a charged entity or like a stream of spinning electrons if using OAM mode 1/-1 light beams

Using circularly polarized 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. 12.



Fig. 13. Generating a net electric field

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

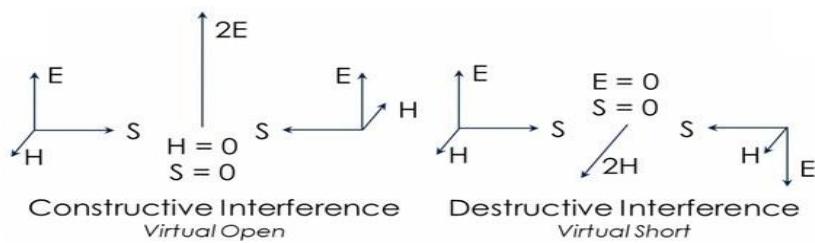
15. Electromagnetic waves vector summation

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 $S = E \times H$.

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?”](#) [12]

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 14.

16. 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 and permeability. These properties define the speed of light. 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.

17. Time definition aspects

In his paper, Time Invariance of the Fundamental Physical Constants, the author Mugur B. Răuț 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. [14]

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

18. A classical hypothesis on the photoelectric effect

The ideas in this chapter are speculations only. However, according to the P photon model , when analysing the behaviour of photons and interactions with atoms and electron, we get different results. That is because the power delivered to the atom seems to be important but also the total energy of the photon. 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 seems a rational conclusion. However, I think it is not the case. The theory probably makes wrong assumption. Apparently, the detectors cannot detect 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 could be wrong. The probability could be **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.

In chapter 7, I have shown, that if we send a pulse of a fixed number of oscillations, its energy density changes not the total energy, when we accelerate it (using gravity for example).

The following explanations relies on the a hypothesis that an electron bound to an atom can acquire some energy if hit by a photon.

Let's suppose we have a photon with energy E_Y . After it passes the slits we assume we obtain two waves of E_{YL} and E_{YR} . 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_{YL} hits the atom on the x screen detector, it will energise the electron, but the atom will not release the photoelectron yet. Since the energised electron state does not correspond to a stable electron orbital, it will quickly lose energy. However, if the wave E_{YR} comes quickly enough and in phase, 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 been 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 make the assumption that for a photon to interfere with an electron, it needs also 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:

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

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 is the radiation power of the electron in the energised unstable state.

$E_Y = P_Y \cdot t_A$

t_A is the emission time of an electromagnetic wave.

E_Y is the energy produced by an electromagnetic wave.

We can also write:

$$E_Y(t) = P_Y t$$

P_Y - power produced by an electromagnetic wave

Since this model is classical, this power depends on the frequency only:

$$P_Y = k\nu$$

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

We can now write:

$$E_Y(t) = k\nu t$$

To produce a photo-electron, the energy E_A needs to reach E_e .

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

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

$$\nu \geq \frac{P_A}{k}$$

These equations need to be viewed in an absolute time. Applying relativistic equations to them will generate wrong results in certain situations, because the relativistic effect is 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 loses energy until it reaches the stable state. This depends on the temperature of the system. It can do that in a continuous mode. However, it is more likely that it loses energy by releasing a single oscillation, 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 possess point charges but the charge is evenly spread out throughout the entire wave structure.

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 having an amplitude corresponding to the energy difference between states.**

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, like in the double slit experiment) then this pulse can

exceed the work function and trigger a photoelectron release. 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 a 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 (probably a ring) depending of the energy level.

The lowest level is the ground state which happens below the temperature of 10K. Above 10K, when two atoms share an electron, they share this wave that surrounds both nuclei.

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.

As I said at the beginning of the explanation, I assumed that an electron bound to an atom can acquire some energy if hit by a photon. The consequences that result from this assumption lead to the conclusion that the assumption could be wrong. Therefore, just like the behaviour of photons in a gravitational field, it is possible that electrons do not acquire any energy. An electron bound to atom, could be either in a helical mode or not. If it is in a helical mode if accelerated, the wavefronts

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.

19. 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".

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.

The $\frac{1}{2}$ spin particle model described in this concept, works in accordance with this explanation.

20. Gravity as a consequence of electromagnetic field interference hypothesis

In chapter 15 I have shown how the energy conservation mechanism works for the electric and magnetic field vectors. The cross product of the electric field over the magnetic field yields 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 field 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 in 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 make the local momentum to follow a spiral rather than travelling in a straight line creating the illusion of a force that points to the centre of the spiral.

Analysing how photons described in this model behave under gravity, supports the hypothesis. As pointed out in chapter 7, if we have an EM pulse of fixed number of oscillations, in the direction of a gravitational field, it will increase its frequency and energy density, but the **total energy remains constant**. It is interesting that the same thing happens to any particle. The concept of potential energy is not necessary anymore. Therefore, gravity doesn't exist as a separate field.

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

In chapter 7, 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 ($m=0$).

For a beam of light of internal OAM helical mode $|m| = 1$ or greater there is experimental evidence that the wave-front speed is reduced [reference 16]. Because of electromagnetic waves interferences the local momentum, 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.

22. 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 given by the gravitational field, either being in an accelerating vehicle or in the gravitational field, the two clocks will behave absolutely the same way. This is called the *equivalence principle*. I will now use this concept to explain why we get these effects. To show how this happens using the mechanism provided by this concept, we can use the Ω particle concept described in chapter 7. If the particle is at a distance H_1 from a massive object M as it travels towards it, it has λ_1 wavelength equal to the step length of the helical path. After it gets closer and reaches a distance H_0 from M the energy density becomes higher. The same thing happens if you accelerate a particle using a different method (other than gravity) – the energy density becomes

higher. Because the wavefront velocity increases, the wavelength of the beam (and hence the pitch helix) increases, $\lambda_0 > \lambda_1$. Since the wave front travels now at a higher velocity, I have shown that the **frequency increases** (the frequency measured by a stationary observer). A higher frequency means that the **energy density** of the wave is higher.

This paper assumes that, instead of a dilation of time itself, when moving faster in an absolute flat space, only the clock frequencies reduce and the defined absolute time rate does not. If we look at the Ω particle model described in this paper, we can build a clock that indicates time by measuring the frequency of the H particle using a frequency detector. When both the particle and the detector are at rest in AF, the frequency is greater than when they both move in the same direction. If the particles travel at a velocity v towards the detector, then, I have shown that the frequency increases (Eq.2). $f_v > f_0$.

$$f_v = \frac{c}{D\gamma}$$

where, f_v is the frequency detected when the source is moving towards the detector at speed v which appears in the gamma factor.

The interesting part is to see what frequency is a detector, that moves in the same direction and at the same speed with the particle, is going to measure. In this case, in the reference frame where the detector is at rest, the oscillator (the source) is also at rest. That is what happens when we measure time using an atomic clock: both the detector and the atom that is measured, are moving at the same speed, being in the same frame of reference. Because the velocity difference between the wavefront and the detector is zero, the detector will only see an increase in wavelength. Therefore, the clock rate will be reduced by the following formula:

$$t_v = t_0 \gamma$$

We now need to go into further investigation of the gravitational influence on clock rates. For this purpose, I will use the Ω particle model to construct a simplified atom model which I will call, Ω atom. This atom consists of a neutral nucleus that has a certain mass which makes the Ω particle orbit around it. Real atoms rely on charge to do this but the model of an electron is more complicated as the helical structures can reach even 200 units of oscillations per helical revolution.

We can look at figure 1 to see what happens to an Ω atom in a gravitational field. from $H1$ to $H0$.

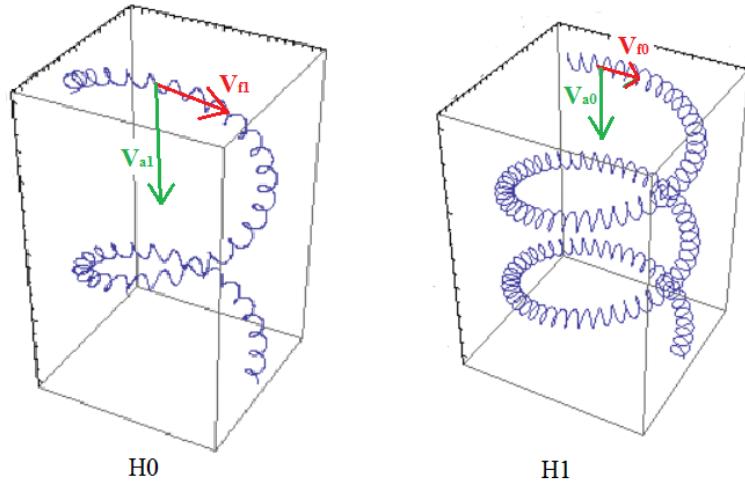


Fig.14. An Ω atom descending in a constant gravitational field, confined on a circular trajectory. The gravitational field is pointing downward. In the left side the atom is at a lower height D_0 and in the right side the atom is at the initial position D_1

The *wave 1* on the left side, is lower in the gravitational field. Velocities V_{a1} and V_{a2} are the velocities of the atoms. V_{f1} and V_{f0} are the wave-front velocities of the Ω particles. 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 $|V_{a1}| < |V_{f1}|$ and $|V_{a1}| < |V_{f0}|$).

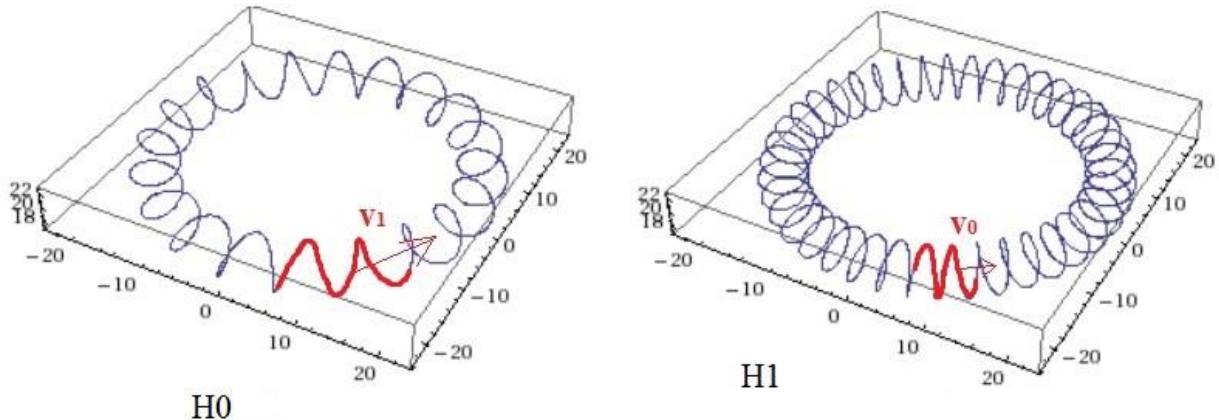


Fig. 15. Two Ω atoms at rest. The atom on the left is at a lower altitude (H0)

In figure 15, we have represented an Ω atom at “rest”. The wave-front speed of

the atom at H_0 is higher than the wave-front of the atom at H_1 . However, the wavelength λ_{a1} of the atom at H_0 is greater than the wavelength λ_{a1} of the atom at H_1 . We measure the frequency f_1 of the atom at H_1 , using a detector. This detector should incorporate an oscillator that oscillates the same way as the Ω atom. This oscillator will have a wavelength λ_{o1} at the altitude H_1 . When both the atom and the detector get to a lower altitude H_0 , the λ_o and λ_a will increase by the same factor and hence it will show the same value. However, if we use two counters that count the number of oscillations (like a clock does), in a certain amount of time, the counter at the higher altitude H_1 , will obviously read a higher value than the counter at H_0 .

This simple to understand mechanism clearly explains why clocks at different altitudes measure time differently.

23. Charged particles

In this paper, I have studied the behaviour of charged particles models deducted from an OAM $|m|=1$ photon model.

“Electron vortices are unusual quantum states that have only recently been predicted [10] and produced in transmission electron microscopy (TEM) experiments [11,12]. Electron vortex beams have the same geometrical properties as their optical counterparts, being characterized by an $\exp(il\phi)$ angular dependence related to $l\hbar$ units of OAM, but they also produce features that have no analogue in optics. In particular the circulation of charge in an electron vortex beam gives rise to an arbitrarily large orbital magnetic moment (figure 2), distinct from the magnetic moment due to spin [10, 13]. Hence electron vortices can couple to electronic degrees of freedom through dipole selection rules forbidden to optical vortices [14]. Given the analogies (and differences) between optical and electron vortices, the question arises: do electron vortex waves undergo something analogous to an optical Faraday effect? Here we show that there is indeed a Faraday rotation (compare figure 1(b)) arising through Zeeman interaction from propagation parallel to a uniform, external magnetic field (i.e. in a geometry where there is no Lorentz force).”[1]

Modelling charged particles becomes more complicated and it will not be covered in this version.

24. The origin of OAM beams

Here is a good classical description of the phenomenon

The optical Faraday effect and its generalization for electron waves Michael Faraday reported in 1845 that the polarization of light can be affected by magnetic fields, an effect that now bears his name. Since then, the Faraday effect has found numerous metrological and research applications, including the ultra-sensitive detection of magnetic fields, [1, 2], or of fields generated by electron plasmas in interstellar space and the ionosphere [3, 4]. Faraday noted that the polarization

direction of light is rotated after passing through ‘heavy glass’ exposed to a longitudinal magnetic field. We now understand that the Faraday effect arises from the different speed of propagation of right and left handed circularly polarized light through an optically active medium. The associated difference in accumulated phase between the circular components of linearly polarized light results in a rotation of the polarization direction, shown in figure 1(a). One of the intriguing properties of light is that it can carry angular momentum: a spin contribution associated with circular polarization ($\pm \hbar$), but also orbital angular momentum (OAM) [5, 6]. While circular polarization describes a rotation of the electric field vector upon propagation, the OAM is a feature of ‘twisted’ light beams. The OAM can take on arbitrary multiples of \hbar depending on how tightly wound the phase fronts are. These so-called ‘vortex beams’ have a rotational intensity pattern and are associated with a phase dependence $\exp(il\phi)$, where l is a non-zero integer and ϕ the azimuthal angle. Strictly speaking, Faraday rotation is not a relevant concept for optical OAM. The reason is that there is no intrinsic mechanism in a gyromagnetic medium to produce the required OAM state dependent dispersion, because selection rules forbid coupling of the OAM to the atomic electron degrees of freedom. This is consistent with results from a recent experiment in which no rotation was observed for a superposition of right and left handed OAM states (a Hermite–Gauss mode) propagating through cholesteric liquid crystals [7]. We note that a relative phase shift between right and left handed OAM components will appear as a rotation of the intensity pattern [8]. Such phase shifts can be induced by spinning the medium through which the light propagates, inducing a ‘mechanical’ Faraday rotation, as demonstrated recently in a slow light medium [9]. [18]

Internal OAM appears when a paraxial light beam is in a "helical mode". Helical modes of the electromagnetic field are characterized by a wavefront that is shaped as a helix, with an optical vortex in the center, at the beam axis [10]. The helical modes are characterized by an integer number m , positive or negative.

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 $\frac{1}{2}$ 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 and 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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