Description of the photon experiments with a quantum mechanical wave or a physical wave Description attempt of particles with physical waves
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Claude Wanecque. Description of the photon experiments with a quantum mechanical wave or a physical wave Description attempt of particles with physical waves. Half wordy, the text is full of descriptions and inferences to focus your attention on the possib.. 2018. <hal-01740410v3>
Abstract: Photon propagation is usually described through a quantum mechanical wave. The energy of a photon is supposedly distributed on this wave according to the law of probability. This means that it is not localized precisely at a point, except when the wave encounters an obstacle, realized by a phenomenon called the “wave packet collapse,” which leaves the energy on the obstacle at a location determined by an unknown process. We show here that this description of the photon causes weak to no interference in a Young’s double slit experiment (p5-6). We also show that complete interference is possible if the photon is composed of a particle and a physical wave (p7-8). The proposed experiment needs to produce two photons that follow each other, and whose possible interferences are studied when the optical paths in the interferometer are equal or unequal (p9). The ensuing discussion suggests that the wave is generated by the particle, has an impact on local time when interference occurs, and it becomes necessary to introduce an orthogonal wave. The energy of the photon would be the component that keeps the wave sources localized. Experiments are proposed to constrain the existence of these waves. Built on an oscillation base and relativity considerations, a model of particles is then proposed and discussed (p10-20) and studied under observable constraints on the photon through the entanglement behavior (p22-26), and on the electron through the electrical attraction with the positon (p26-28). The properties of interaction will give a new interpretation of cosmological results with a different prediction from the ΩCDM model (p28-34).
1. Introduction

We have performed a few experiments to describe the behavior of a photon [1], [2]. As a result, a phenomenon as described in Fig. 1, suggests that the photon behaves as a wave if an interferometer is placed in its path, and a particle otherwise.

At the present time, one describes the photon nowadays as a quantum mechanical wave and give it a super-property called the “wave packet reduction.” [3], [4], [5], as a quantum phenomenon to mimic a particle, such that when a “wave packet” from the same photon and composed of two waves, as in Fig. 1, reaches two photon detectors, this double packet is reduced to a point, where only one detector detects the photon as if it were a single particle.

Furthermore, the wave has a quantum description: the energy of the photon is not localized on this wave, but can be found somewhere on the wave according to the law of probability described by quantum mechanics. Consequently, we obtain a quantum wave with non-localized energy, and with the ability to “reduce this energy” to a point on a screen.

M. De Broglie and Bohm have tried to explain Young’s double slit experiment [6], [7], Fig. 43, with a wave called as the “pilot wave” guiding the photon [8], [9], [10], [11], [12], [13]. When two such waves interfere, the particle is guided by the resulting wave (described as a quantum potential), and its trajectory is therefore deflected as illustrated in Fig. 2. The authors [12] notice that the simulated photon trajectories do not group correctly in the high probability regions, especially at the central bright spot. Therefore, while the wave and particle consideration appears to be an hypothesis, which is still under study, it cannot be ignored that the wave and particle consideration is not well described by Bohmian mechanics and needs improvements.

A particle and wave consideration implies that energy is carried by the particle that is accompanied by a wave with no energy. This wave is actually qualified as a quantum mechanical wave and carries information such as the wavelength and the polarization of the photon. For interaction between two such waves, we consider “quantum interference” which involves studying the trajectory of the photon between the slits and the screen in Young’s double slit experiment, as shown in Fig. 2.

Fig. 1. Interference experiment for the case where the wave is quantized and allows the wave packet reduction.

The waves are drawn as if they are independent but they are in fact a single wave packet, a probability cloud of the presence of the photon.

The evolution of the path taken by the waves is described in four steps at time $t' < t'' < t''' < t''''$. At time $t''''$, a photon is detected in detector 1 or 2.

In a), the second beam splitter is present to allow the waves to interfere constructively on detector 1. The photon behaves as a wave.

In b), the second beam splitter is removed. The wave packet reduces with a single detector; detector 1 or 2 is illuminated with the same probability, as if the photon were a particle and takes the path 1 or 2 (Fig. 7). The photon behaves as a particle.

The trajectory of the photons is statistically defined in the analysis of the light flow, by gradually increasing the distance of the screen from the slits to obtain the tomography of the light flow arriving on the screen. The same effect can be obtained by considering that the electron [14] (see Figs. 44, 45) and atom [15] has a wave companion. We infer the model that we will discuss to be common to photon, electron, atoms and any kind of particles.
Let us perform the interference experiment shown in Fig. 1 with the particle+wave consideration for the photon. First, the wave and the particle are not supposed to be independent or interdependent. As described in Fig. 3, sometimes the photon behaves as a wave, (a and b cases) and sometimes as a particle (c and d cases), which is the same conclusion as that achieved in the wave consideration (Fig. 1).

We are still performing some strange experiments [16] stating that a future event could have an impact on a past event: the removal of the second beam splitter, which the photons have not yet reached, could have some impact on the state of these photons propagating along the path of the interferometer. I believe that we still do not understand the interference experiment and I propose an experiment that predicts different observations in the quantum mechanical wave and in the quantum mechanical or physical wave+particle considerations. The particle consideration is included in the wave+particle consideration in the case where the super-property of the particle is that of being the source of the wave, as illustrated in Fig. 4, which is therefore not independent of the photon.
To prevent confusion, there are different considerations: the classical wave consideration, quantum wave consideration, classical particle consideration, and quantum wave+particle consideration. The wave+particle consideration discussed here will receive a more precise appellation, considering physical waves carrying no energy.

Fig. 4. In the particle consideration, the particle must have a super-property such as being the source of the wave generated by the particle in motion (discussed later). This (naive) drawing is motivated by the idea that nothing can travel faster than the speed of photons, and is inspired from the image of a plane traveling at the speed of sound.

2. State of the art in the description of photon behavior

2.1 Quantum wave consideration

A photon at present supposed has a wave description in quantum mechanics. In a wave consideration, the photon leaves two waves when it travels through a beam splitter (see Fig. 5). To describe this phenomenon, quantum mechanics states that the waves are identical, forming a single wave packet so that when one of the two waves “decides” to reduce to a point on an obstacle, the other wave must disappear “instantly.” This is a macro description from the observer and we have no explanation to describe this phenomenon: when it happens, all the energy of the double wave packet is concentrated at this point, irrespective of the obstacles between these two waves. Energy neither crosses obstacles, nor retreats instantly to a point, as it is a part of a quantum phenomenon responding only to the law of probability. In this description, the wave and wave packet definitions are intermingled and both are called a “packet.”

Fig. 5. In the wave consideration, the evolution of the wave is described through a beam splitter, at times t'<t". If the wave is classical and carries energy, two detectors placed in the path of the waves 1 and 2 would both be illuminated even if the initial wave were quantified. Thus, this classic wave consideration is wrong, which means that a wave consideration does not work with classical waves.

When a photon passes through the beam splitter, the two packets at the output are identical and can be switched without any change in the results.

To prevent confusion with a simple wave consideration, a wave consideration in quantum mechanics will be called a “quantum wave consideration,” where waves 1 and 2 are not supposed to be independent. As described shortly, this wave consideration is accepted as a macro description, considering the wave packet reduction.

2.1.1 Experiment with two interacting photons

Let two photons arrive at the beam splitter one after the other. Of the two paths out of the beam splitter, which opens on a screen, one is longer than the other one, to allow a packet of
the first photon to be mixed with a packet of the second photon. To describe what we expect
during the experiment, which is not described by any known phenomenon but a quantum
phenomenon, we will use a macro description from the observer as the reduction wave packet.

As shown in Fig. 6, the first packet from the first photon, \( w_{11} \), leaves from the short path
at time \( t_1 \). Then, at time \( t_2 \), the first packet from the second photon, \( w_{22} \), leaves from the short
path and the second packet from the first photon, \( w_{12} \), leaves from the long path. Therefore, the
two packets, \( w_{22} \) and \( w_{12} \), coming from two different photons, will intersect on a screen
through a geometrical interferometer as in Young’s double slit (both short and long paths are
directed to their respective slits) or thin optic fibers as paths. At time \( t_3 \), the last packet, \( w_{23} \),
coming from the second photon, leaves from the long path. To achieve good statistics, one
must consider or detect that photons hit the slits or miss the input of the optic fibers, rather
than the screen.

2.1.2 Expectations

If there are two photons from the photon source, as in Fig. 6, we have the following
scenarios (R for wave packet reduction, N for no reduction) of packet arrivals on the screen:

<table>
<thead>
<tr>
<th></th>
<th>( t_1 )</th>
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<tbody>
<tr>
<td>( S_1 )</td>
<td>R</td>
<td>NR</td>
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<tr>
<td>( S_2 )</td>
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<tr>
<td>( S_3 )</td>
<td>N</td>
<td>RR</td>
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<tr>
<td>( S_4 )</td>
<td>N</td>
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In scenario \( S_1 \) (R-NR-N), a packet of the first photon arrives at time \( t_1 \) and is reduced (R)
to a point detected on the screen. As it is the only packet present coming from one slit, there
cannot be any interference. At time \( t_2 \), because of this reduction, no second packet of the first
photon arrives (N), but only the first packet of the second photon hits the screen reducing (R)
to a point detected on the screen: thus, there cannot be any interference. At time \( t_3 \), the second
packet of the second photon does not arrive (N) because the first packet has already reduced at
time \( t_2 \).

In scenario \( S_2 \) (R-NN-R), no reduction occurs at time \( t_2 \) because the reductions occur at
time \( t_1 \) and \( t_3 \). We infer that there is no interference at \( t_2 \).

In scenario \( S_3 \) (N-RR-N), two reductions occurs at \( t_3 \) and we expect interference.
However, if we consider these reductions as independent, there is no interference.

In scenario \( S_4 \) (N-RN-R), there can be no interference at time \( t_2 \) because the second packet
reduces at time \( t_1 \). If interference is desired, a part of the photon energy would be used at time
\( t_2 \) and remaining energy at time \( t_3 \), which is impossible because the energy of a photon is a
quantum of energy, and is thus indivisible.

Accordingly, at time \( t_2 \), we expect to obtain 25% interference statistically, even 0% if one
considers that two independent wave packet reductions cannot interfere. Through the Young’s
double slit, 25% (or 0%) interference should be packed into fringes, with 50% (or 100%) into
simple diffraction distributions.

When the path lengths are equal, the scenario should be RR and RR: at time \( t_1 \) or \( t_3 \), 100%
interference would occur because both packets coming from the same photon are supposed to
“reduce together.” Therefore, the manner of mixing of the packets changes the results: 0% or 100% fringe interference.

2.2 Particle consideration

We know that a photon is not a particle, thanks to the Young’s double slits experiment.

![Particle consideration](image)

The beam splitter is known by another name, which is “semi-reflecting mirror”. At its output, the particle takes path 1 when the photon passes through this mirror or path 2 when it is reflected from the reflecting material, as shown in Fig. 7. When the thickness of the reflecting material is sufficient, the probability of the photon taking path 1 is the same as that of taking path 2. In a particle consideration, we obtain no interference, but only diffused impacts through two slits.

If this consideration were used to explain the interference, it would mean that the particle has a “super-property” that has to be invented to mimic the wave behavior. If it considers the photon to be the source of the wave as shown in Fig. 4, the preferable consideration is a wave+particle consideration.

2.3 Wave+particle consideration

Let us use the description of the wave from Fig. 8.

![Wave+particle consideration](image)

We do not know if the photon is a wave and a particle, as illustrated in Fig. 9.
In the description given in Fig. 9, when a wave and a particle \((w+p)\) passes through the first beam splitter, the wave \(w\) goes through the two paths while the particle \(p\) goes through one path as described in the preceding considerations: the wave consideration (see Fig. 5) and the particle consideration (see Fig. 7) are combined here; we do not assume anything else or know anything about the wave or the particle, except that the particle is localized energy, and the wave is supposed to propagate as a wave with or without super-properties. This is a macro description from the observer and we discuss later how such a wave+particle consideration is physically possible, especially if the wave does not carry energy.

If these two paths are directed to two Young’s slits, in addition to experiencing gravity while traveling along the path and diffraction caused by the slits, we assume that the trajectory of the particle is influenced by interference between these waves from the slits to the screen. This description is sufficient for obtaining the results in the interference experiment without requiring any super-property such as the packet reduction phenomenon, although the description needs improvements. However, one could say that the ability of the wave to have no energy (we assume that the energy of the photon is embedded in the particle), and the ability of the interference to deflect the particle trajectory are super-properties.

It is not possible to give a complete description of the wave using the present experiment. However, if this experiment fails to show a wave+particle configuration, it would have been useless to describe such a wave, although it is discussed after the description of this experiment. Here it is not important whether the particle is carrying the wave as a super-property as in Fig. 4, whether the particle is guided by a pilot wave such as that described by Bohmian mechanics [4], or whether they are independent. Both relativity and quantum mechanics cannot be merged together to describe the reduction phenomenon because the energy of the photon is not localized on the wave in the quantum mechanical wave consideration and, in a quantum wave+particle consideration, a quantum wave without energy does not experience gravity and therefore cannot be considered only as a pilot wave, as described by Bohm and De Broglie, because the particle experiences gravity, in addition to the wave guidance). In the wave+particle consideration discussed here, this issue does not occur and it is the first step toward going further by considering special relativity as discussed later.

2.3.1 Experiment with two interacting photons

Now, let us reconsider the interference experiment with the wave+particle consideration, using Figs. 9, 10 and a Young’s double slit, at the exits of the path to allow waves to possibly interfere. The word “packet” will not be used to describe the wave to prevent confusion with the quantum mechanical wave, and the wave packet reduction will not be assumed to occur anymore. While quantum mechanics induce the wave to “disappears instantly” when the particle hits an obstacle, we expect the wave to continue its way in the following physical consideration. These two points are critical to distinct a quantum mechanical wave consideration and a wave+particle consideration.

2.3.2 Expectations

Let us describe a photon with a particle \(P\), and a wave \(W\). A particle is necessary to illuminate a detector.
In scenario S\textsubscript{1} (W-PWW-PW), a wave (W), from the first photon, arrives at time \( t_1 \) without any particle, and nothing appears on the detector. At time \( t_2 \), a particle (P) hits the screen and two waves (WW) interfere during their propagation along path between the slits and the screen. This interference deflects the particle trajectory, which is expected to achieve an impact on the screen to be localized into an interference fringe. At time \( t_3 \), a combination of a wave (W) with a particle (P), i.e. a photon, hits the screen. Between the path and the screen, the trajectory of the particle, which is a straight line, is not deflected by any interference except if we consider that there is a reflected waves coming from the screen, as we will discuss. The direction of movement of the particle is determined when it is in the slit because of a diffraction effect in the slit, as discussed later. To explain the trajectory of the particle, there are several interferences to consider, the one due to reflection before the slits, the one in the slit, the one between the slit and the screen, and the one due to reflection on the screen; fringes are expected on the screen when two slits are illuminated by a light flow.

In scenario S\textsubscript{2}, at time \( t_2 \) (PWPW), two particles (PP) hits two waves (WW), with two interferences detected on the screen (two PWW).

In scenario S\textsubscript{3}, at time \( t_2 \) (PWW), one interference (WW) occurs in the presence of a particle (P), as in scenario S\textsubscript{1}.

In scenario S\textsubscript{4}, at time \( t_2 \) (WW), two waves interfere without any particle: nothing is detected at time \( t_2 \).

Accordingly, at time \( t_2 \), we expect to obtain 100% fringe interference statistically. When the path lengths are equal, the scenarios should be PWW and WPW: at time \( t_1 \) or \( t_3 \), we also expect to obtain 100% interference.

In the two cases, the result does not change, and we expect to obtain 100% fringe interference. The interference visibility is thus different when compared with the quantum wave consideration: when the packets are mixed, we expect to obtain less than 25% fringe interference, and when the paths are equal, we expect to obtain 100% fringe interference.

3. Description of the experiment

We require a camera with single photon detection capability, a fine-tuned single-photon source, and an interferometer showing geometrical distribution such as Young's double slits output of thin optic fibers or a Fresnel biprism. If the production time between two photons is \( t_p \) (calculated with the frame rate of the camera), one path of the interferometer is \( c.t_p \) longer than the other path. The impacts will be recorded only at time \( t_2 \). Because of a lack of knowledge regarding the wave, it should be necessary to realize the experiment with several values of \( t_p \), depending on the speed of the camera and the extent to which one path is longer than the other path. In Young’s experiment, we can determine the nature of the photon with a comparison between two experiments, where path lengths are equal and where they are not, as shown in Fig. 11.

Fig. 11. \( \Delta x \) must be adjusted with the time between the two photons. If \( \Delta x \) fits the distance between the photons, interference is as much as expected with \( \Delta x=0 \) and \( \Delta x\neq0 \), which cannot be explained by quantum mechanics. Depending on the unknown speed of the waves, the distance between the photons must be small.

For the case in which the “particle” state continues to be a possibility, the particle has a super property, which would act as the source of the wave. To test if the wave exists physically and connected to the particle, we have to check if a physical object can stop it, as described in Fig. 12.
Fig 12. Doors in A have to be opened just before a photon enters the first beam splitter and doors in B and C have to be closed just after this photon exits this beam splitter: fringe interference will be destroyed because the wave emitted by the photon when it travels one path to reach one slit, cannot reach the other slit anymore, which cannot be explained by quantum mechanics. I think that this theory will go to the bin if closing the doors after the photon in B and C do not alter or destroy the fringes.

If the photon emission timing is aleatory, consider that half of the emitted photons will reach the screen and the remaining half will hit the doors.

Consider that the speed of the wave is unknown: a path has to be (far?) longer than the other to give the time to the wave to vanish, and then the visibility of fringe interference is expected to be less than 100% (100% is obtained with doors opened).

Another solution is to find out a wave-absorbent material. If it exists, no diffraction will appear on a screen made with such material.

In [17] Fig 2, at 2240 nm (--2320 nm), waves are not completely stopped by the matter of the slits-wall. The matter of the mask blocks more the wave on the right (left) than on the left (right). If a door is expected to block the wave, it will probably need the matter of the slits-wall to be thick (dense?). Double slits experiments depending on the thickness of the walls-slits should be achieved to determine the impact of this thickness on interference.

4. Discussion

We discuss the wave now as a physical wave rather than the mathematical wave considered in quantum mechanics. A new interpretation of the interference phenomenon is given with some calculations and experimental questions, and we will try to use these waves to link several problems and properties in physics.

4.1 Description of the wave

Two different laser sources at the same wavelength are known to produce interference on a screen, even in a short time interval, depending on the laser quality. Hence, we infer that a photon does not need its own wave to interfere; this has a greater similarity with a wave + particle consideration than the quantum mechanical wave consideration. Furthermore, interference between two light flows can be achieved even if the paths do not have the same lengths; we expect the interference to occur between two waves from two different photons. Moreover, in [18] Fig 4 b), we understand that interference is observed one-quarter of the time, which means that the element in the lower path is necessary different from the element in the upper path. This implies that a wave + particle consideration is expected for the photon. This prediction leads us to work with a particle that carries the energy of the photon, and a wave companion. Let us discuss this wave.

We know that the photon always takes the shortest path and we speculate how it determines its path. The only solution is to say that matter has influence on the time flow during this path. We know indeed that the time flow is not isotropic: if we stay at the same distance from a mass, the passage of (outside) time is slower than at a closer distance and faster than at a larger distance, and we could draw a map on the time gradient. Consequently, the trajectory of the photon is deflected in this manner to follow time geodesics. We infer that any kind of particle incurs the time gradient at its position. Reciprocally, this time gradient is produced by the particles (through the known forces) and a medium is needed to induce this time gradient from the particles to their environment. The model “particle generating a wave” will be preferred in this scope: we infer that any kind of particle generates a wave that influences the time gradient and then influences the behavior of other particles. This idea will find some parallels in theories that try to describe a particle through a field, as in quantum field theory literature. To generate a wave, a particle is supposed to oscillate. We refer to the phenomenon between such a wave and the oscillation of the particle as interference. Therefore
the trajectory of the photon incurs interference. In Young's double slit experiment, the trajectory of the photon is deflected by an interference with its proper wave.

The Feynman’s path integral formalism that talks about interference between quantum waves is a statistically good description of the behavior of the photon when this particle hits an obstacle. However, it is insufficient for describing its trajectory precisely. We will say that the path integral is made of the wave and the result is set by the energy of the studied particle, at the position of the particle, having traveled through interference with other waves. Here the work trail leads us to consider the wave as a physical wave (as long as time is “physical”), not a pure mathematical object (the quantum wave), with impacts on the time flow, especially on its direction. We consider first that the companion wave of the photon is a “time wave” instead of a quantum wave, and it evolves in our space-time instead of the quantum space. The time interference between two such waves should be taken into consideration to describe the trajectory of a photon instead of quantum interference, as defined by quantum mechanics to describe the cloud probability of the position of a photon. We have to describe this wave through experiments, and investigate how it induces the “time distortion” in our space, which is expected to act as a space-time distortion by the particles.

We will represent the particle as a wave generator.

Fig. 13. Representation of a particle at rest. The particle is at the center and oscillates. The liquid represents the space-time. This is what we should see if we take a “2D space-time photo” of any particle and environment near it.

Let us perform the following thought experiment: because the propagation on a water surface is slow, let us look the water surface ahead a boat with a magnifier or imagine that the speed of the wave propagation is faster. We will observe an oscillation source beside the hull (Fig. 14).

Fig. 14. Water waves created by the movement of a boat at low speed, if the boat were reduced to the tiny element B. The wave precedes the boat in its movement direction.

The height at point A that we define to be the “height of the particle” will increase with the speed of the boat B and the oscillation will increase ahead of the boat. Fig. 13 and Fig. 14 are distinct because in the former, the wave is created by the vertical movement of the source while the boat needs to move, but the result is the same. To model a wave as in Fig. 14, we will use a wave generator as in Fig. 13 and check physical laws as a case of special relativity. This notion of “height”, linked to the volume of the hull, is mainly a result of multiple particles. Linked also to the frequency (increasing together), we may expect non redundant information in a same particle and then we may expect to set the height of a native and alone particle to 1, as if the envelope of its oscillation were unitary. Finally, we expect to compare two particles and their relative behavior relatively to their oscillations.

As a symmetry, we understand that two compensating waves are a solution to propagation waves without energy consumption. We thus assume they are two oscillations: a time oscillation and a space oscillation. Therefore, we assume that our real world has somewhat six dimensions where time and space are strictly symmetric entities linked by an improved metric of special relativity.

Many experiments have done in the past where one concludes some effects from one point of view, actually from particles with no oscillations. We will now discuss these effects from the point of view of the particles, depending on their oscillation, time, space or both.
4.2 Time relativity

We define $dt_x$, $dt_y$, and $dt_t$ to be the time flows in the $Ox$, $Oy$, and $Ot$ time directions related to the arbitrary $Ox$, $Oy$, $Oz$ directions of our space, respectively, and the following metrics for each directions:

$$ds^2 = dt_x^2 + dt_y^2 + dt_t^2 - dx^2 - dy^2 - dz^2,$$

with

$$ds_x^2 = ds_y^2 + ds_z^2,$$
$$ds_x^2 = c_x^2 dt^2 - dx^2,$$
$$ds_y^2 = c_y^2 dt^2 - dy^2,$$
$$ds_z^2 = c_z^2 dt^2 - dz^2,$$

and

$$c_x^2 + c_y^2 + c_z^2 = C^2. \quad (2)$$

Considering the speed of light, we infer $C = 1$. We write the evolution of time as:

$$\left(dt_x , dt_y , dt_z \right) \rightarrow \left(c_x , c_y , c_z \right) dt, \quad dt^2 = dt_x^2 + dt_y^2 + dt_z^2 = \left(c_x^2 + c_y^2 + c_z^2 \right) dt^2$$

and

$$ds^2 = dt^2 - dx^2 - dy^2 - dz^2. \quad (3)$$

In this equation, we understand that the direction of time, or more precisely its variation $dt$, considered as a constant “flow” whose direction may evolve in the three directions, is oriented through the vector $(c_x, c_y, c_z)$. Eq.(3) defines the time constraint $C$ of Eq.(2). We call the space related to the coordinates $t_x$, $t_y$, and $t_z$, the “time space”, and we write $\vec{t} \rightarrow (t_x, t_y, t_z)$; correspondingly, our space is related to the variable $r \rightarrow (x, y, z)$.

To avoid confusion between $(dr)^2 = (dx)^2 + (dy)^2 + (dz)^2$ and $(dt)^2 = (dx, dy, dz)(dx, dy, dz) = dx^2 + dy^2 + dz^2$ where $r = (x, y, z)$, we say that we are studying the oscillation through the speed coordinates $cx, cy, cz$ of a particle at speed 1 in the direction $Ox$, $Oy$, $Oz$ respectively, and we should now write the equations with the vector $r = (x, y, z)$ and its norm $|r| = \sqrt{x^2 + y^2 + z^2}$ (we get $r^2 = |r|^2$). However, the vector is not used but its norm and we write abusively $r = \sqrt{x^2 + y^2 + z^2}$ and $dr^2 = dx^2 + dy^2 + dz^2$. The same note has to be applied to the variable $t$. Accordingly, Eq.(1) is preferred to the shortcut “$ds^2=dt^2-dr^2$” that leads to confusion.

This result comes from the fact that the variation of a speed does not depend directly to the variation of a traveled distance $\left(|r| = \sqrt{x^2 + y^2 + z^2}\right)$ but the variation of its component (on $Ox$, $Oy$ and $Oz$). Then, studying a particle through its speed, we may interpret that we are studying a “speed particle” (and we will conclude that it will remain as a strictly equivalence with an oscillating particle), through a metric designed to accept only duration and length rather than instant and position, respectively, though duration and length are settled by such or such instant and position. In this “speed” space, a particle cannot go further than 1, and stays on the 3D 1-sphere where two dimensions are expected to define it. We will state that the oscillation in this space defines the particle, as if we were studying the internal space-time substructure of our usual particle. Through this definition, every particles of our space travel at the time 1, and we will see that they only differ from their speed of oscillation and phase. To understand that, we will do this process: we choose the reference of a particle and we set the time start to every other particles at 0 and a distance $r_0$ depending on the distance from such or such particle. Time will evolve in another particle relatively to the difference of oscillation between that of the reference and the other particle, meaning that particles are studied on the 1-sphere, as “speed particles” separated by a distance that is expected to be time and space dependent.

When a photon travels in the $Ox$ direction and changes direction to $Oy$ direction, the idea is to say that the particle changes its reference from $ds^2 = dt_x^2 - dx^2$ to $ds^2 = dt_y^2 - dy^2$ via a “transition metric” $ds^2 = dt_x^2 + dt_y^2 - dx^2 - dy^2$ with the constraint $dt_x^2 + dt_y^2 = c_x^2 dt^2 + c_y^2 dt^2 = C^2 dt^2$, with $c_x^2 (t) + c_y^2 (t) = 1$. The functions $cx$ and $cy$ are determined by the phenomenon that creates the direction change of the photon.

4.3 Space relativity, space-time relativity

Symmetrically, if we consider a space relativity in the time space, as the time relativity in our space, we may work with the space flow $dr$ such that $\left(dx, dy, dz\right) = \left(l_x, l_y, l_z\right)dr$ and the space metric:

$$ds^2 = dx^2 + dy^2 + dz^2 - dt_x^2 - dt_y^2 - dt_z^2 = dr^2 - dt_x^2 - dt_y^2 - dt_z^2. \quad (4)$$
where $r$ is the space flow, as the time flow $t$ related to our space. First we assume $dr=dt$ to study the propagation of a spherical emission and we strictly should write $ds=0$. However we will continue to write $ds$ to later generalize equations to the particles.

Here we would talk about “space particles” and if we choose the reference of such a particle, we will set seemingly the space variable to every other particles at 0 and a time distance $t$.

Finally, we should work with the following space-time metric:

$$ds^2 = dt_x^2 + dt_y^2 + dt_z^2 - dx^2 - dy^2 - dz^2,$$  
with 

$$ds_x^2 = l_x^2 dr^2 - dx^2,$$  
$$ds_y^2 = l_y^2 dr^2 - dy^2,$$  
$$ds_z^2 = l_z^2 dr^2 - dz^2,$$

and 

$$l_x^2 + l_y^2 + l_z^2 = L^2.$$  

Considering a wave traveling at the speed of light, with $ds^2 = 0 = ds_x^2 = ds_y^2 = ds_z^2$, we get $dr/dt = \pm t$ if $c_x = \pm l_x$, $c_y = \pm l_y$, $c_z = \pm l_z$, thus $C = L = \pm t$. We get

$$dx/dt_x = dy/dt_y = dz/dt_z = \pm 1,$$

that leads to $dx/dt = \pm c_x$, $dy/dt = \pm c_y$, $dz/dt = \pm c_z$. Reciprocally, that leads to $dr/dt = \pm t$.

We note that the solution ($-l_x$, $-l_y$, $-l_z$) will be “$\pi$-phase-shifted” to the ($l_x$, $l_y$, $l_z$) solution. As a first approach, we infer that particles having a space and a time behaviors belong to both spaces.

We infer that the special relativity is a “special” case of the space-time relativity, reduced to its most simple writing $ds^2 = dt^2 - dr^2$. We will infer special relativity to be a tool that does not take into account the wave of the particles. We will infer that studying waves will induce the results of quantum mechanics through relativity.

Let us discuss separately the time and the space metrics. We will conclude about the space-time metric.

### 4.4 Time distortion of a particle

We define a wavefront traveling in vacuum as a spherical object growing at the speed of light ($\pm t$), using the result $0 = dt^2 - dr^2$, which is the equation of a sphere growing at the speed of light. Any point on its surface goes straight ahead from the source to infinity in the same direction $Ox$ with the speed of light ($0 = dt_x^2 - dx^2$). Because a wavefront is spherical by definition, these points are at the same distance from the source. Deploying the inner reference of two points (for example $0 = dt_x^2 - dx^2$ and $0 = dt_y^2 - dy^2$), we easily conclude that each points on a wavefront share the same time. We would conclude that the geometry of time in the reference of a particle will sound like to growing spheres from the particle, separated by space.

![Fig. 15. Representation of a wavefront, emitted in every direction of space, as a spherical emission. A possible interpretation is to say that a wavefront is a point-particle in a space where the three directions are mingled to one.](image)

We now want the particle to oscillate and to emit a wave in every direction of space as shown in Fig.16.
Now let us imagine the space in which the particle oscillates.

We interpret the writing of the time metric considering \( c_x, c_y, c_z \) as “time distortion factors” on the time direction \( Ot_1, Ot_2, Ot_3 \), recalling that the time gradient is oriented by the time distortion vector \( \zeta = (c_x, c_y, c_z) \). If \( c_z = 0 \), a particle cannot go in the \( O_z \) direction, as if \( t \) does not evolve in the \( O_t \) direction, saying that the time distortion is necessary on an orthogonal direction. In other terms, \( \zeta \) indicates to the particle the direction to travel in our space. If \( c_z < 0 \), the particle has to “go back” in the \( O_1 \) direction (\( dx = c_x dt \)). We have to accept that as a mathematical fact, and we will define what we call particle and time more precisely.

Recall the definition of interference: it is the result of interaction between several waves or between waves and the oscillation of a particle. We infer that the time distortion on the trajectory of the particle is the result of this interference. Because we want to stay in the relativity framework, we infer that the time distortion resulting from interference always verifies Eq. (3).

We define \( \alpha, \beta \) such as the result of an interference:

\[
(c_x, c_y, c_z) = (\sin \alpha \cdot \cos \beta, \sin \alpha \cdot \sin \beta, \cos \alpha)
\]

(6)

If there were no interference, \( \alpha, \beta \) become the own “time phases” of a particle. This vector indicates also the direction of movement of the particle. We now consider that the particle is traveling in straight line and oscillates. We have to model a wave generator and verify (3), the simplest equation is:

\[
\begin{align*}
c_x(t) &= \sin(\psi_1(t) + \alpha) \cdot \cos(\Theta_1(t) + \beta) \\
c_y(t) &= \sin(\psi_1(t) + \alpha) \cdot \sin(\Theta_1(t) + \beta) \\
c_z(t) &= \cos(\psi_1(t) + \alpha)
\end{align*}
\]

(7)

Where \( \psi_1(0) = \Theta_1(0) = 0 \) \( . \) \( t = 0 \) is the birth of the particle.

We say that a particle is such a wave generator, and oscillates while distorting the time around it: the oscillation of the particle, or simply the particle, is described by the variation of the time distortion factor. Then we will say that this oscillation propagates in our space (we will have to take into account the spatial distance to the particle) with three time distortion factors at every point of any space wavefront (where each point shares the same time) of the wave.

If we choose \( \psi_1, \Theta_1 \) as the time rotation of the “speed particle”, this “speed particle” moves in a circle and this circular time “speed trajectory” (on the 1-sphere) will induce a circular space trajectory (in our space). If we want the particle to go straight, we have to consider the time space to be rotating (as a clock, finally) in the reverse sense of the rotation sense of the particle, with rotation \(-\psi_1, -\Theta_1\) in relation to our space, or our space to be rotating with the particle, with the rotation \( \psi_1, \Theta_1 \) in relation to the time space. We choose the first representation, as illustrated in Fig. 17.

We will say that when the energy oscillates and travel in one direction, the time space oscillates in the opposite direction, as if the energy (the particle) leans on it. If there were a postulate to formulate in this paper, here it is, as a characteristic of the energy in a particle: as an action/contra-reaction principle, the oscillation of the energy is compensated by the opposite oscillation of the space where there is this oscillation. We may find an analogy when one holds a horizontal rotating wheel, sitting on a chair that will rotate in the opposite sens.

In the case of a particle, when one currently writes \( dr = vdt \) and then \( dr^2-dt^2 = ds^2 \neq 0 \), where \( v \) \( < c \) is the speed of the usual particle, we expect here, depending on the relative frequency of oscillation and phase, that the relative effects between two particles will induce effects that will be perceived as the mass, a relative speed and interactions.

We consider the following metric.

\[
ds^2 = dt_x^2 + dt_y^2 + dt_z^2 - (dr^2 + r^2 \cdot d\psi_1^2 + r^2 \cdot \sin^2(\psi_1) d\Theta_1^2)
\]

(8)
The “spherical part” of the metric in Eq. (9) is due to the fact that we consider that the time space is rotating in relation to our space. We may interpret this equation as the measure of the time deformation $d_s$ occurred by the oscillating particle $(c_x, c_y, c_z)$ and the generation of the wave $(dr^2 + r^2.d\psi^2 + r^2.sin^2\psi .d\Theta^2)$ where we use the spherical representation $dr^2 = (d\sqrt{x^2+y^2+z^2})^2$.

With Eq.(8), the particle oscillates while rotating in a contra-rotating time frame and is able to oscillate and, as we are going to understand how, to generate a wave while traveling in the $(\alpha, \beta)$ direction (in the spherical geometry) with the speed $1$. For the wave ($ds=0$), $r$ becomes a variable as the radius of a wavefront of the wave, carrying informations from $r_0=t_0$.

The state of the particle is determined by $t$.

Fig. 17. Time deformation when $c_x$ oscillates between -1 and 1, $c_y$ and $c_z$ follow eq. (3), see evolution from a) to e).

From a') to c''), we consider the particle to rotate in a contra-rotating time space.

From a' to e'), it is a macro description from the observer: the particle emits a wave when traveling.
The wave (red) is generated by the movement of the particle (green).

Consider that

\[
\begin{align*}
   dr & = d\sqrt{(x^2+y^2+z^2)} , \\
   r \cdot d\psi & = \frac{\cos\psi \cdot dr - dz}{\sin(\psi)} , \\
   r \cdot \sin\psi \cdot d\Theta & = \frac{(r \cdot \cos\psi \cdot d\psi + \sin\psi \cdot dr) \cdot \cos\Theta - dx}{\sin\Theta} ,
\end{align*}
\]

we will find

\[
\begin{align*}
   ds_x^2 & = \sin^2(\psi) \cdot \cos(\Theta) \cdot dt^2 - f_x dx^2 - f_{xy} dxdy - f_{xz} dxdz , \\
   ds_y^2 & = \sin^2(\psi) \cdot \sin^2(\Theta) \cdot dt^2 - f_y dy^2 - f_{yz} dydz - f_{yz} dydz , \\
   ds_z^2 & = \cos^2(\psi) \cdot dt^2 - f_z dz^2 - f_{xz} dxdz - f_{yz} dydz ,
\end{align*}
\]

where $f_x, f_y, f_z, f_{xy}, f_{xz}, f_{yz}$ are functions of $x, y, z$. We find:

\[
\begin{align*}
   ds_t^2 & = dt_x^2 + dt_y^2 + dt_z^2 .
\end{align*}
\]
Consider the following space-time metric, composed with the metric constraint because of the compensation.

where

\[
\begin{align*}
\frac{1}{r^2} \left( \frac{4x^2}{\sin^2 \psi \cdot \sin^2 \Theta} - 4x \cdot r \cdot \cos \psi (\frac{1 + \cot^2 \Theta}{\sin^2 \psi}) + \frac{\cot^2 \Theta}{\cot \psi} r^2 \right) dx^2 + \\
\frac{4y^2}{r^2 \cdot \sin^2 \psi \cdot \sin^2 \Theta} - 4y \cdot \frac{\cot \Theta}{r \cdot \sin \psi} \cdot \sin \Theta + \frac{1}{\sin^2 \Theta} dy^2 + \\
\frac{4z^2}{r^2 \cdot \sin^2 \psi \cdot \sin^2 \Theta} dz^2 + \\
(4xy + 2 \cos \psi (\frac{2x \cdot \cos \psi}{r} - 1)) \cdot \frac{2y \cdot \cos \psi}{r} + \\
\frac{\cot \Theta}{\sin \psi} (\frac{2x \cdot \cos \psi}{r} - \cos \psi) dy + \\
(4xz + 2 \cos \psi (\frac{2x \cdot \cos \psi}{r} - 1)) \cdot \frac{2z \cdot \cos \psi}{r} + 2 \frac{2z \cdot \cos \Theta}{r^2 \cdot \sin^2 \psi} (\frac{2x \cdot \cos \psi}{r} - \cos \psi) dx + \\
(4yz + 2 \cos \psi (\frac{2x \cdot \cos \psi}{r} - 1)) \cdot \frac{2z \cdot \cos \psi}{r} + \frac{2y \cdot \cot \Theta}{r \cdot \sin \psi} - \frac{1}{\sin \Theta} \cdot \frac{2z \cdot \cot \Theta}{r^2 \cdot \sin \psi} dy dz
\end{align*}
\]

\[4.5 \text{ Space distortion}\]

We infer the frequency of a particle to be the rotation speed of its oscillation. It is surprising to consider that the particle could emit a wave without consuming energy. We infer that there is a compensation for this emission. Moreover, since physics loves symmetry and contra reaction, and hates preference or bias, we infer that the distortion of the time wave is compensated by a symmetrical and similar effect and that there is a space oscillation that creates a space wave in the time space, as the time oscillation creates a time wave in our space. We infer a particle to be composed of two wave oscillators (as a time and a space particles), each compensating the other.

We may consider the space wave, we do the same job as the previous and write the space metric:

\[
ds_s^2 = dt_s^2 + ds_x^2 + ds_y^2 + ds_z^2 = (dx^2 + dy^2 + dz^2)
\]

with

\[
ds_s^2 = ds_x^2 + ds_y^2 + ds_z^2,

d_s^2 = dt_s^2 - l_x^2 dr^2,

d_s^2 = dt_s^2 - l_y^2 dr^2,

d_s^2 = dt_s^2 - l_z^2 dr^2,
\]

where

\[
l_x(r) = \sin(\psi_x(r) + \gamma) \cdot \cos(\Theta_x(r) + \delta),

l_y(r) = \sin(\psi_y(r) + \gamma) \cdot \sin(\Theta_y(r) + \delta),

l_z(r) = \cos(\psi_z(r) + \gamma).
\]

and finally, we will consider the space metric as:

\[
ds_s^2 = dt^2 + t^2 d \psi_s^2 + t^3 \cdot \sin^2(\psi_s^2) d \Theta_s^2 = (dx^2 + dy^2 + dz^2)
\]

with

\[
ds_s^2 = g_x dt^2 + g_{xy} dt_x dt_y + g_{xz} dt_x dz + \sin^2(\psi_x) \cdot \cos^2(\Theta_x) dr^2,

d_s^2 = g_y dt^2 + g_{yx} dt_y dt_x + g_{yz} dt_y dz + \sin^2(\psi_y) \cdot \sin^2(\Theta_y) dr^2,

d_s^2 = g_z dt^2 + g_{xz} dt_x dz + g_{yz} dt_y dz - \cos^2(\psi_z) dr^2.
\]

where \( g_x, g_y, g_z, g_{xy}, g_{xz}, g_{yz} \) have similar expressions as \( f_x, f_y, f_z, f_{xy}, f_{xz}, f_{yz} \).

Consider that the space constraint \( l_x^2 + l_y^2 + l_z^2 = L^2 \) will be determined via the time constraint because of the compensation.

We infer that the time space and our space are rotating around each other, and should consider the following space-time metric, composed with the metrics \( ds_s \) and \( ds_s \):
\[ ds^2 = ds_x^2 + ds_y^2 + ds_z^2 = dt^2 + t^2 \cdot d\psi_\perp^2 + t^2 \cdot \sin^2(\psi_\perp) d\Theta_t^2 - (dx^2 + dy^2 + dz^2) + dt_x^2 + dt_y^2 + dt_z^2 - (dr^2 + r^2 d\psi_t^2 + r^2 \cdot \sin^2(\psi_t) d\Theta_r^2) , \]

with

\[ ds_x^2 = c_x^2 dt^2 - l_x^2 dr^2 + g_x dt_x^2 + g_{yx} dt_x dt_y + g_{xz} dt_x dt_z - f_x dx dy - f_{xz} dx dz - f_{xy} dy dx - f_{yz} dy dz , \]

\[ ds_y^2 = c_y^2 dt^2 - l_y^2 dr^2 + g_y dt_y^2 + g_{yx} dt_y dt_x + g_{yz} dt_y dt_z - f_y dy dx - f_{yz} dy dz - f_{xy} dx dy - f_{xz} dz dx , \]

\[ ds_z^2 = c_z^2 dt^2 - l_z^2 dr^2 + g_z dt_z^2 + g_{xz} dt_z dt_x + g_{yz} dt_z dt_y - f_z dz dx - f_{yz} dz dy - f_{xz} dy dz , \]

with \( c_x^2 + c_y^2 + c_z^2 = C^2 \), \( l_x^2 + l_y^2 + l_z^2 = L^2 \).

This metric leads to the space-time metric Eq. (5) when \( t = r, \psi_\perp = \pm \pi, d\Theta_t = \pm d\Theta_r \).

We consider the linear rotation as the simplest case of rotation. We cannot consider the waves to compensate if these rotations have different linear factor and \( L \neq 1 \). We infer \( L = 1 \) and define \( \psi_\perp \) such as \( \psi_\perp = \psi_\perp, t \) and \( \psi_\perp = \psi_\perp, r \) and \( \Theta \) such as \( \Theta_t = \Theta_t, t \) and \( \Theta_r = \Theta_r, r \).

The resulting transition metric given by Eq. (11) is not easy to manipulate.

Using the metric \( ds^2 = dr^2 - dt_x^2 - dt_y^2 - dt_z^2 \), we infer that there are “space particles”, called “particles”, as the time oscillators traveling in our space, as a symmetry with the metric \( ds^2 = dt^2 - dx^2 - dy^2 - dz^2 \) considering the space oscillators travelling in the time space, called “tarpicles”. The particle and the tarpicle are two “speed particles” living in two euclidean spaces and their association in the space-time is called “supparticle” centered at its barycentre \( O \). We define the reference of a particle as \((O_{ox}, O_{oy}, O_{oz})\) when \( t = 0 \) (start of the time oscillation), in which the direction of the speed is \((\alpha, \beta)\), and the reference of the tarpicle as \((O_{ox}, O_{oy}, O_{oz})\) when \( r = 0 \) (start of the space oscillation), in which the direction of the speed will be \((\gamma, \delta)\). We choose the static orientation \((O_{ox}, O_{oy}, O_{oz})\); \((O_{ox}, O_{oy}, O_{oz})\) and the mental representation

\[ O_{ox} \parallel O_{ox}, O_{oy} \parallel O_{oz}, O_{oz} \parallel O_{oz} , \]

Although \((O_{ox}, O_{oy}, O_{oz})\) and \((O_{ox}, O_{oy}, O_{oz})\) are orthogonal in the Minkowski representation, this mental representation is allowed as long as we consider the metrics \( ds_x^2 = dt_x^2 - dx^2 \), \( ds_y^2 = dt_y^2 - dy^2 \), and \( ds_z^2 = dt_z^2 - dz^2 \) that will allow us to give a representation of the oscillations. \((O_{ox}, O_{ox}, O_{oz})\) and \((O_{ox}, O_{oy}, O_{oz})\) are the rotating spaces (in fact, we only retain the respective 1-sphere of these spaces) of the particle and the tarpicle in relation to \((O_{ox}, O_{oy}, O_{oz})\) and \((O_{ox}, O_{oy}, O_{oz})\) respectively. In other words, at \( t = 0 \), \((O_{ox}, O_{ox}, O_{oz})\), \((O_{ox}, O_{oy}, O_{oz})\), \((O_{ox}, O_{oz}, O_{oz})\) and \((O_{ox}, O_{oz}, O_{oz})\) are mingled. When a supparticle moves, \((O_{ox}, O_{ox}, O_{oz})\) and \((O_{ox}, O_{ox}, O_{oz})\) rotate (depending on the rotation speed \( \psi_\perp \) and \( \Theta \)) and we will keep \((O_{ox}, O_{oz}, O_{oz})\) mingled with \((O_{ox}, O_{oz}, O_{oz})\) as the “reference start” of a particle to determine the space-time travel of the studied supparticle. Therefore, we will be able to apply relativity through the rotation of the particle \((\psi, t, \Theta_\psi)\) or the tarpicle \((\psi, r, \Theta_\psi)\). In the reference of the supparticle, we consider that the particle and the tarpicle are born at \( t_0 = r_0 = 0 \). Finally, a conclusion could emerge, saying that there are six dimensions of space and time, and 2x2=4 “rotating dimensions”. For all, we get 10 dimensions. We may reduce the number of dimensions saying that there are two kind of particles (space and time) sharing the same 3D space: each of them incurs the classic scalar product \( t^2 \) and \( r^2 \), and the pseudo-norm between them is \( t^2 + r^2 \). However, it appears difficult to define “speed particles” in a static space and the question of time, as the phenomenon that induces the oscillations of supparticles, still remains. A solution would be to consider that we live in a “speed space” where particles are “speed particles”, where their relative behaviors will let us to fall in a 3D classic but animated space. A description of such a “speed space” is suggested further. The “time appearance” is an effect of the virtuous or vicious circle “oscillation induces movement and vice-versa”.

We follow now an information bias, considering that our sens and apparatus have only access to interaction between particles, and have to interpret the behavior of particle, tarpicle or supparticle, via different change of reference.
We may also consider the rotating reference frame linked to the space oscillator, we get:

\[
d s^2 = d (t-r)^2 + (t-r)^2 d (\psi_s - \psi_t)^2 + (r-t)^2 \sin^2 (\psi_s - \psi_t) d (\Theta_s - \Theta_t)^2 - (dx^2 + dy^2 + dz^2) ,
\]

\[
(14)
\]

with

\[
c_s = \sin (\psi_s - \psi_t) \cos (\Theta_s - \Theta_t) = \sin (\psi_t \cdot (t-r)) \cos (\Theta_t \cdot (t-r)) ,
\]

\[
c_y = \sin (\psi_s - \psi_t) \sin (\Theta_s - \Theta_t) = \sin (\psi_t \cdot (t-r)) \sin (\Theta_t \cdot (t-r)) ,
\]

\[
c_z = \cos (\psi_s - \psi_t) = \cos (\psi_t \cdot (t-r)) .
\]

Writing “t-r”, we understand “t-r/c”. With this equation, we recognize the equation of a wave. Considering the sign in front of the variables \( r \) and \( t \), we understand that the wave is “r propagating” (propagating considering the variable \( r \)) and “t-contra-propagating” (contra-propagating considering the variable \( t \)), called a “time wave”. If the consideration “be the reference of the space oscillator” sounds like a trick or an incantation, we however note that both oscillations are inside a supraparticle and then we should state that the “relative speed” between a particle and a tarpicle is null. This singular result should allow us to consider the relative phase oscillation \( \psi_s | r-t | \) between them, without needing a more complex consideration than in \([19] \). However, we should expect to a deeper study when we will consider the oscillation of two different sources, especially if they are not resonant. Therefore, the simplest study would be that of two similar photons or two electrons or an electron and a positron, where resonance or anti-resonance (meaning not an arbitrary interference) is expected.

If we consider the rotating reference frame linked to the space oscillator, we get:

\[
d s^2 = d (t-r)^2 + (t-r)^2 d (\psi_s - \psi_t)^2 + (r-t)^2  \sin^2 (\psi_s - \psi_t) d (\Theta_s - \Theta_t)^2 - (dx^2 + dy^2 + dz^2) ,
\]

\[
(15)
\]

with

\[
l_s = \sin (\psi_s - \psi_t) \cos (\Theta_s - \Theta_t) = \sin (\psi_t \cdot (t-r)) \cos (\Theta_t \cdot (t-r)) ,
\]

\[
l_y = \sin (\psi_s - \psi_t) \sin (\Theta_s - \Theta_t) = \sin (\psi_t \cdot (t-r)) \sin (\Theta_t \cdot (t-r)) ,
\]

\[
l_z = \cos (\psi_s - \psi_t) = \cos (\psi_t \cdot (t-r)) .
\]

Writing “r-t”, we understand “r-t,c”. With this equation and considering the sign in front of the variables \( t \) and \( r \), we understand that the wave is \( t \)-propagating and \( r \)-contra-propagating, called a “space wave”.

Because the waves are expected to compensate, we consider that the contra-propagation is here the feedback of the propagation, as if the time wave were bouncing on the first wavefront \( (t-r) \) or its \( 2\pi \)-phase shifted wavefront \( (|t-r| = 2\pi GCD(\psi, \Theta)) \). Therefore, it becomes possible to consider a possible interaction and even a feedback between distant particles. Because of this feedback, it becomes necessary to consider two orthogonal oscillations in the element currently known as “particle”.

We infer that our usual reference frame to be composed both with the references of the time oscillator and the space oscillator, as a space-time reference centered at the barycentre \( (t,r) \) of the oscillators couple. In other terms, while one eye is looking one oscillator, the other eyes is looking the other oscillator, and what we will see is a unique entity. We get the same Eq.(5):

\[
d s^2 = dt_s^2 + ds^2 - (dx^2 + dy^2 + dz^2)
\]

\[
(16)
\]

with

\[
ds^2 = ds_x^2 + ds_y^2 + ds_z^2 ,
\]

\[
d s_x^2 = c_s^2 dt^2 - l_x^2 dr^2 ,
\]

\[
d s_y^2 = c_y^2 dt^2 - l_y^2 dr^2 ,
\]

\[
d s_z^2 = c_z^2 dt^2 - l_z^2 dr^2 ,
\]

where

\[
c_s = \sin (\psi_s - \psi_s) \cos (\Theta_s - \Theta_s) = \sin (\psi_t \cdot (t-r)) \cos (\Theta_t \cdot (t-r)) .
\]
Because \( t = r \) for each supparticle, the result is an entity traveling in straight line (or a “speed particle” staying at the same position) in the space-time with spherical geometry:

\[
\begin{align*}
    c_x &= \sin \psi, \\
    c_y &= \cos \psi,
\end{align*}
\]

(17)

There is no more spherical part and the result suits to the desired metric Eq.(5). This representation is allowed as long as we consider an alone supparticle, with no interaction around it. While we consider two oscillations in two orthogonal spaces linked with the pseudo norm \( ds^2 = dt^2 - dr^2 \), equivalent to \( t^2 - r^2 = 0 \) for massless or non-interacting particle as interpreted further, we get a couple of two orthogonal and constant speeds (equal to 1) in the space-time, while the substructure of the supparticles is composed by two oscillating particles. Because of these properties, we expect to see supparticles with a wave behavior.

**If there is interaction with other supparticles, we expect that a resulting behavior of some supparticles will be a relative speed different to 1 between particles in our reference. Among these properties, we expect to see supparticles with a wave behavior.**

![Fig.18](image)

- Left: Representation of our space-time.
- Middle: A classical representation of orthogonal waves in euclidean space.
- Right: The waves are still orthogonal, in the space-time. They are in opposite sense of propagation and depend on the sign of \( \psi \), in case of a supparticle or an anti-supparticle (see further Def. (27)).
oscillation space” faster than a third particle P3 oscillating at $\nu_3$ because P3 travels less than the wavelength $\lambda_1$ within an oscillation U, and P2 travels further than P1 within the oscillation U, meaning that P3 has oscillated less than an oscillation while P1 has oscillated one time, while P2 has oscillated more than one time. This is not an expected result if we say that these three particles share the same time (as currently assumed in standard physics when particles are at rest) though it oscillates. Does the assumption of different evolution of time of different particle at rest, with different oscillation, has ever been done? Time should not evolve at the same rate in supparticles if they oscillate differently. However, to compare the behavior of particles, it should be interesting to say that they share the same time. In this case, the consideration of such a “speed space” becomes necessary and is only possible in the reference of only one particle. We expect that the critical speed of light to be a consequence of the properties of such a space: through this time geometry, the unity of an oscillation should appear to describe the same thing as the speed of light in our space-time.

We will say that time evolves at $\nu_1 t$ in a particle oscillating at $\nu_1$: say that the reference of P1 is a space composed with the unity of a complete and unique oscillation, which sounds like the definition of the wave emitted by P1, whose evolution in space depends on a number of this oscillation. In this reference, a particle P2 travels less or more this unity, depending on the ratio $\nu_1/\nu_2$. If this ratio is negative, we will say that they travel in the opposite direction than in the case of a positive ratio. Consider that the frequency of P2 increases because of a phenomenon; while its own evolution is constant in its reference, the other particles will be seen through an increasing oscillation: P1 is seen with a frequency $v_1 - v_2$ and its evolution is $v_1 - v_2 - (v_2 + k.v)$ which evolves with k. In this manner, we will state the relativity result: the faster a particle oscillates $(v_2 + k.v)$ the faster the time flow relatively increases outside $(k.v.t)$: this is how we could consider an effect on a particle, considering its evolution relatively to the others. We will have to see if this description leads to a good interpretation of the reality, considering interaction between plenty of supparticles and we expect that, depending on their numbers, a relative speed may become negligible (isotropic interaction, coming from everywhere) or important (imbalance between interactions) in our current 3D-space.

Even if these interpretations were naïve, we however will find interest in the study of a relative behavior between oscillators through interference, which is known not to be spatially homogeneous, see the representation of interference between charged particles, Fig. 19, where the resonance may be interpreted as spatially localized outside or between the particles.

![Fig. 19](image.png)

**Fig. 19.** The sense of propagation of the waves of two different charges appears to be opposite.

The synchronization can be obtained with the movement of the wave sources.

There is no destructive or constructive effect outside the supparticles when the constructive effect is between.

There is no destructive or constructive effect between the supparticles when the constructive effect is outside.

The particles travel in the way where a constructive interference occurs, inspired effect from the results in the double slit experiment of a single photon or electron.

The interaction between “charged” particles no needs a mediator as the photon. On another way, photon and electron may interact because they are both oscillators and the Doppler effect is expected to play a role in their interaction.

The ratio $\nu_1/\nu_2$ appears to be positive when particles travel relatively backward.

Looking a particle through the eyes of a tarpicle is more appropriate than looking a particle through a particle. In the first case, the reference is built in our space-time, which is more familiar to us, while the other is built only in the time space. ($O_{ox}, O_{oy}, O_{oz}$; $O_{tox}, O_{toy}, O_{toz}$) will be called “the reference of the supparticle”. The image here is to say that we would study one wheel of a bicycle in the reference of a bicycle, as if we were riding a bicycle with two motorized wheels (the flows $r$ and $t$). One wheel is riding on a time road, the other is riding on a space road. The bicycle would ride even if the wheels were orthogonal and the metric allows us to ride on a bicycle with “parallel” wheels in each of the three directions: we are riding an hexacycle, whose speeds in the three directions are controlled by Eqs.(10). If the
wheels are mingled in a 3D world, we would get a “space-time doubled motorized” monocycle riding on a mingled space-time road. From this image, we will remember that the travel on the time road could be different to the travel on the space road (possible different speed, different orientation, different sens) while the mechanical structure (the ~cycle) between the two wheels is always the same, and we expect that the phases $\alpha, \beta, \gamma, \delta$ and the oscillation speeds $\psi, \Theta$ define the supparticles with properties depending on their value: we expect different behaviors between ~cycles depending on their way of riding. If the mechanical structure of the ~cycle is solicited by an interference, for example when there may be a difference between the speed, orientation and sens of the wheels, we expect to a behavior that will alter the movement or the stability of the considered supparticle.

The coordinates of the speed of supparticles are defined by $(l_x, l_y, l_z; x, y, z)$. If the representation $(l_x, l_y, l_z; x, y, z)$ is desired, we have to consider that a particle travels in our space and the tarpicle in the time space and, as we choose the representation $O_{ox} // O_{ox}, O_{oy} // O_{oy}, O_{oz} // O_{oz}$, these “relative trajectories” may be different, one in our space, one in the time space. We have to keep in mind that a supparticle does not travel in two different directions in the same space but its “coordinates”, which is a mathematical representation that will match to what we see: we, detectors, observed entities are composed of supparticles that are composed with tarpicles and particles. We expect to see both with our current detectors, and the analyze of their behaviors will exhibit their characteristics. Depending on the consideration (speed or position), we will deal with the supparticle via its speed coordinates, or via its representation $(l_x, l_y, l_z; x, y, z)$; the supparticle will be seen through the behavior of the particle and the tarpicle.

Another analogy: consider an apple with a speed $\vec{v} = a \vec{i} + b \vec{j}$: the apple travels in the Ox direction at the speed $a$, and in the Oy direction at the speed $b$, as if we were dealing with two apples traveling in two orthogonal directions. This is the same scenario here: a supparticle has two coordinates that we call the particle and the tarpicle. Is the apple $\vec{v} = a \vec{i} + b \vec{j}$ aging and another apple $\vec{v} = a \vec{i} - b \vec{j}$ rejuvenating? No, the time flow is common for both, they just travel in the opposite direction in the time space.

We will discuss the integrity of the supparticles saying that if there were communication between the particle and the tarpicle, it will take a path inside the supparticle as if it were an apple composed of two halves of an apple. However, we understand that we do not give a better description of the substructure of the supparticles, but as an association of a time oscillator and a space oscillator. These properties will turn out to be very useful in the interpretation of entanglement.

We define the oscillating particle $P(\alpha + \psi t, \beta + \Theta t)$ through its speed coordinates:

\[
\begin{align*}
c_x &= \sin(\psi \cdot t + \alpha) \cos(\Theta \cdot t + \beta) \\
c_y &= \sin(\psi \cdot t + \alpha) \sin(\Theta \cdot t + \beta) \\
c_z &= \cos(\psi \cdot t + \alpha)
\end{align*}
\]  

(18)

and the tarpicle $T(\gamma + \psi r, \delta + \Theta r)$:

\[
\begin{align*}
l_x &= \sin(\psi \cdot r + \gamma) \cos(\Theta \cdot r + \delta) \\
l_y &= \sin(\psi \cdot r + \gamma) \sin(\Theta \cdot r + \delta) \\
l_z &= \cos(\psi \cdot t + \gamma)
\end{align*}
\]  

(19)

An observer, though composed with supparticles, would see supparticles in the reference $(P(0,0); T(0,0))$ as if he had no interaction with the observed supparticles. Moreover, if there were no interaction between particles and tarpicles around the observer, he would see them at the speed 1 traveling in any directions. We expect to describe any kind of phenomenons through interactions between particles and tarpicles, and a completely neutral analyze will consider that, for example, our eyes and detectors have interaction with the photons that hit them. In this scope, the observer $(P(0,0); T(0,0))$ is not sufficient to conclude to a pertinent result. Every supparticles that may interact with some observed supparticles have to be considered, through a study of their relative behavior in their reference. However, we mostly expect here to give a definition of supparticles when there is no interaction around it because the way to the comprehension of the interaction between two particles needs that foreign interactions are known to be at least well interpreted or neglected. A complete and neutral analysis of a unique supparticle will state the impact of the whole (observable) universe on it.
(that will probably lead to its mass and oscillations at rest in our reference, and its native oscillations when it is alone in the universe), the impact that can be neglected by not far way “neutral matter” (earth or the lab environment) and the strong impact of a near or imbalanced interaction (resonance between oscillation). In this scope, different Lorentz factors should be considered for different supparticles, even if the were considered at rest, depending on their oscillation speed. Proton and electron are expected to have different “Lorentz factors at rest”, inducing a relative speed and mass when they interact each other and/or under constraints from foreign interactions.

Doing the operation $\psi, \Theta \rightarrow -\psi, -\Theta$, we will consider that the waves switch their behavior, the propagating property being transformed into a contra-propagating property, and vice-versa. Because the study of supparticles needs the studies of the tarpicle in the reference of its particle and vice-versa ($\psi \rightarrow -\psi$ or $(-\psi) \rightarrow (\psi)$) we note that the particle $P(\alpha-\psi.t, \beta-\Theta.t)$ may be confused with a tarpicle $T(\gamma+\psi.r, \delta + \Theta.r)$ and vice-versa.

Let us study the meaning of the phases.

![Fig. 20. Representation of a particle in its reference.](image)

**We would state about the phases of a supparticle. The “longitudinal phase” $\Omega_\alpha$ indicates the inner oscillation of the substructure of a supparticle:**

$$\Omega_\alpha = ((\psi - \Theta).t + \alpha - \beta, (\psi - \Theta).r + \gamma - \delta)$$

**We may also consider the “transverse phase” of the supparticle:**

$$\Omega_\beta = (\psi(t-r) + \gamma - \alpha, \Theta(t-r) + \delta - \beta)$$

It indicates the relative deformation $(\gamma - \alpha, \delta - \beta)$ and the apparent movement between the particle and the tarpicle (remind that they are both described by the space or time coordinates of the speed of the supparticle), as if they were both in the same 3D space and there were no rotation of their space. We understand that the particle and the tarpicle travel along two straight lines, phased by $(\gamma - \alpha, \delta - \beta)$. Mentally, we could represent a supparticle with a tarpicle and the particle traveling in two “different directions”, but we have to keep in mind that this image is wrong because they do not travel in the same space. Depending of the evolution of the two phases $(\gamma - \alpha, \delta - \beta)$, we will say that they are apparently and relatively veering away or not. The problem of this representation is that we see two entities traveling in different directions, instead of an entity which has 6 coordinates, half of them being linked to the other half through the pseudo norm $dr^2$-$dt^2$. In accordance to the existence of the metrics $ds^2 - dt^2 = dx^2$, $ds^2 = dt^2 - dy^2$, and $ds^2 = dt^2 - dz^2$, we may represent the space-time as a doubled and parallel 3D world, we choose the space and the time references of a couple of particle and tarpicle to be mingled, with a spherical representation where the relative direction of movement between a particle and a tarpicle is oriented by $(\phi, \psi) = (\gamma - \alpha, \delta - \beta)$. In this space-time representation, the distance traveled by a supparticle is $(t, r)$ with $t=r$ (in the case of a supparticle at rest, with no interaction with other supparticles: a supparticle in an empty universe).
A trail work could be also the study of the particle through another definition of the supparticle: \((\Omega, \theta)\).

Particles \(P_1(\varphi_1 t + \alpha_1, \Theta_1 t + \beta_1)\) and \(P_2(\varphi_2 t + \alpha_2, \Theta_2 t + \beta_2)\) travel in two different directions and oscillate together at the same time modulo \(2\pi / \text{GCD}(\varphi, \Theta)\). However, because we assume that there is no absolute reference, these particles have not started emitting a wave together, but within a phase delta. Therefore we introduce a phase \((\Omega, \theta)\) between the references of \(P_1\) and \(P_2\) (Fig. 22).

To consider two different particles, we assume that there is \(t_2, t_1\) and \(r_2, r_1\) such as \(\varphi . (t_2 - t_1) = \Omega t\) and \(\Theta . (t_2 - t_1) = \theta t\). We will consider that \(P_1\) is a particle born at \(t_1\) and \(P_2\) at \(t_2\). This abstract result needs enhancement because the conditions that lead to the birth of particles needs to be precised and a scenario has to be proposed. However, the distance between two particles is determined by the time needed by a wave emitted by one particle to reach the other. This distance calculation needs probably relativity consideration because time evolution depends on the oscillation of the considered particles. The movement of a particle is induced by its speed and position, relatively to the others.

More generally, a particle \(P_1(\varphi_1 t + \psi_1 t, \Theta_1 t + \Omega_1 t)\) will see \(P_2(\varphi_2 t + \psi_2 t, \Theta_2 t + \Omega_2 t)\) as \(P_2(\varphi_2 + \psi_2 t - \psi_1 t, \Theta_2 t + \Omega_2 t - \Omega_1 t)\). In other terms, we get the uncertainty principle: if we consider that time evolves step by step \((\Delta t)\), the oscillation of \(P_2\) relatively to \(P_1\) is not known lower than the phase differences \(\Theta_2 t - \Theta_1 t\) and \(\psi_2 t - \psi_1 t\), where \(\psi_2 - \psi_1 = 2\pi / \varphi_1\), \(\Theta_2 - \Theta_1 = 2\pi / \Omega_1\). Then, we need that frequencies are quantized by \(\Delta \nu\) to set the very minima \(\Delta \nu\) that is expected to be related to the Planck’s constant. If the particles are resonant (same oscillation speeds, \(\psi_2 - \psi_1\)
= \theta), we expect that their relative position, speed and behavior are precisely known. This appears to be the case between a particle ($\psi$) and its anti-particle ($-\psi$), as we will see.

A photon is known to have no mass. We made the assumption that the mass is due to the transverse oscillation which is expected to prevent a particle to travel at 1. Such a description of a photon may occur if we settle $\psi=0$ and $\alpha=0 [\pi]$.

Photons have no more oscillations but a rotation on this movement direction Oz or -Oz:

\[
P(0, \beta+\Theta t) = \sin(\alpha) \cos(\Theta t+\beta)
\]

\[
\frac{c_y}{c_z} = \sin(\alpha) \sin(\Theta t+\beta)
\]

\[
\frac{c_z}{c_y} = \cos(\alpha)
\]

In the reference of the photon $P(0, \beta+\Theta t)$, particle $P_1(\alpha 1+\psi 1 t , \beta 1+\Theta 1 t)$ will be seen as $P_1(\alpha 1+\psi 1 t , \beta 1+\Theta 1 t-\Theta t)$ (as a first approach, we will see if it needs improvement) which will have ever an oscillation along Ozt, and then along the orthogonal plane to the movement of the photon. In this manner, the particle will never overtake the photon, even if both particle and photon oscillates at speed 1.

![Fig. 23. Interference depending of the polarization of photons.](image)

As in this case, we understand that there are two kinds of photons and they are $\pi$-phase shifted. (The interference phenomenon described in the diffraction-reflexion section will lead to this conclusion).

If a wave is desired, we have to assume the existence of a “half-wave”. In usual case, we deal with transverse or longitudinal transmission. Here the wave would be “rotational”, in the meaning of the rotation of the photon being transmitted through this wave. In a relativity consideration, we will say that a photon sees another photon at a rotation frequency depending on the two photon frequencies. If we assume that the wave travels at 1, we must assume that the photon cannot emit a wave ahead of itself. However we may assume that a photon will incur the wave of another photon if it is in the wake of the other.

In the reference of a photon, it travels straight in the Oz direction ($\alpha=0$) or backward, in the opposite direction ($\alpha=\pi$). One may be disturbed by the “reference of the photon” because part of the direction of the photon does not depend on t; however, considering the spin of the photon which actually depends on time, we consider that we are still able to do the job of relativity, through the single rotation ($\theta, \Theta t$).

Nevertheless, these two assumptions look more like to two strong hypothesis and we will rarely consider the reference of the photon, or its (half-)wave. We will preferentially use the reference of the particles that may interact with the photon and we will only consider that it will be the job of their waves. This is motivated by the fact that a photon is expected to travel at the same speed of its wave and cannot be overtaken by it, unless if the photon behaves as a massive supparticle ($\psi \neq 0$) as described further. In other terms, though the sphere of interaction of a photon does not include the supparticles that are ahead of it, the photon is in the sphere of interaction of the supparticles that are on its path. In the reference of the particle $A(\alpha 1+\psi 1 t, \beta 1+\Theta 1 t)$, the photon $P(0, \beta+\Theta t)$ will be seen as the particle $PA(\psi 1 t, \beta+\Theta t-\Theta 1 t)$, as if it were the particle $PA(\psi 1 t, \beta-\Theta 1 t)$ oscillating transversely with the speed $\Theta$. We will see that this result fits to the description of mass: the more a particle oscillates transversely, the more it is slowed down in its straight movement, the more it gets mass, relatively to other particles oscillating slower transversely to their straight movement. In other terms, a photon will behave as a massive particle in a material where interaction sources are resonant or (probably as an integer multiple between frequencies and taking in account relative speeds). This interpretation appears to fit to the fact that light travels slower when it passes through material. As another postulate, we say that the mass of a supparticle is given by the field of distant
particles. As in the electromagnetism case, there is no need of a particle mediator like the Higgs Boson.

\[ P(0, \beta+\Theta t) \] may be confused with \[ P(\pi, \beta-\Theta t) \] and we will say that a photon is its own anti-particle if \( \beta=0 \).

We do the same job for the photon-tarpicle \( T(\gamma, \delta+\Theta r) \) and we get (\( \psi = 0, \gamma=\theta \[\pi] \)):

\[
\begin{align*}
    l_x &= \sin(\gamma) \cos(\Theta r + \delta), \\
    l_y &= \sin(\gamma) \sin(\Theta r + \delta), \\
    l_z &= \cos(\gamma).
\end{align*}
\]

To determine the parameters, we have to describe the behavior of the photon. Entanglement appears to be the most helpful in this labor. In the KDP experiment, two entangled photons \( \text{Ph}_1=\{P_1, T_1\} \) and \( \text{Ph}_2=\{P_2, T_2\} \) are expected to travel in the opposite direction (say that we take into account the pump photon and some interaction between the photons, which probably has to be determined with the direction of the pump photon and a phase, spin and oscillation speed conservation) with opposite spins. However, the simplest case is to consider actually only one photon, when \( \alpha=0 \) and \( \gamma=\pi \), or \( \alpha=\pi \) and \( \gamma=0 \).

In other terms -we always need a reference to settle the phases-, in the reference of \( \text{P}_1 \) (\( \text{T}_1 \)), one is traveling in the \( \text{O}_{1z} \) (\( \text{O}_{1x} \)) direction, the other in the \( \text{O}_{2z} \) (\( \text{O}_{2x} \)) direction, indicating in which time and space directions the supparticles \( \text{Ph}_1 \) travels. Because every photon travel at the speed of light, we get \( dt^2-dr^2=0 \), and we interpret that \( \text{P}_1 \) and \( \text{T}_1 \) travel in opposite direction at the speed of light in the reference of \( \text{P}_1 \) (\( \text{T}_1 \)) (their relative speed is then 2 in our reference). While traveling in the time space, \( \text{T}_1 \) (\( \text{P}_1 \)) will meet the tarpicles (particles) of the supparticles of detectors and then we expect that has an impact on the trajectory of \( \text{P}_1 \) (\( \text{T}_1 \)). \( \text{Ph}_1 \) stops or alters its time travel while \( \text{P}_1 \) (\( \text{T}_1 \)) continues to travel in our space (the time space, resp.). That is what is observed in experiments (ghost interference \[21\], \[22\]): the paths to two space opposite detectors may have different lengths while \( \text{P}_1 \) and \( \text{T}_1 \) are detected with time correlation. However, the question is then to consider the tarpicle as the anti-particle or not. The interaction between a photon and its anti-photon is not known so we cannot state here, except if they interact through material \[18\]. We assume that the tarpicle of the photon will not “collide” its particle, recall that these entities are in separate space, as the coordinates of the photon-supparticle. In this scope, nothing happens when they “collide”. However, entangled photons may have different frequencies \[23\]. We thus assume that this interpretation of entanglement is not the good one, except if we consider that when one of them hits the detectors, the other incurs an interference at a distance, through the substructure of their supparticle, which may have an impact on its frequency because if the first detected photon is re-emitted by the detector with a lack of energy (and frequency), its frequency is altered. If there is no correlation, we may consider two photons:

Be \( \text{Ph}_1 \) and \( \text{Ph}_2 \) two entangled photons.
If $\alpha_1=\gamma_1=0$ and $\alpha_2=\gamma_2=\pi$, tarpicle and particle of a photon travel in the same direction and sens in the representation (Fig. 26). The mental representation of our space-time gives two “not cut apples” ($\{T_1, P_1\}$ and $\{T_2, P_2\}$) going in opposite directions. We get:

$$
\begin{align*}
\text{Ph}_1 &= \{P_1(0, \beta_1 + \Theta \cdot t); T_1(0, \delta_1 + \Theta \cdot r)\} \\
\text{Ph}_2 &= \{P_2(\pi, \beta_2 + \Theta \cdot t); T_2(\pi, \delta_2 + \Theta \cdot r)\} \\
&\quad \text{or} \quad \{P_2(0, \beta_2-\Theta \cdot t); T_2(0, \delta_2 - \Theta \cdot r)\}.
\end{align*}
$$

Fig. 26. $\alpha_1=\gamma_1=0$ and $\alpha_2=\gamma_2=\pi$ (or $\alpha_2=\gamma_2=0$ with the opposite oscillation). We may interpret this behavior saying that two such photons are $\pi$-phase-shifted and then a destructive interference between the photons separate them, which is a possible clue of a wave action (but not an interaction because of their relative speed, except if the speed of the wave is faster than the photon: in this case, a closed door between them will allow the wave to overtake them, inducing their decoherence after a delay after closing the door) between them.

In the reference of $T_1$, $\text{Ph}_2 = \{P_2(\pi, \beta_2+\Theta \cdot (t-r)); T_1(\pi, \delta_1)\} \text{ or } \{P_1(0, \beta_1-\Theta \cdot (t+r)); T_1(0, \delta_1 - 2\Theta \cdot r)\}$. In the second case, the rotation of $\text{Ph}_1$ is doubled in appearance and that may be a clue (red and green photons are obtained in entanglement experiments) that there is an interaction between them. If entanglement is desired in this case, we have to assume that there is an interacting (half-)wave between the two photons, and we need also their (half-)waves to be resonant. We may also that the photon behaves as a massive particle in the crystal and then emits a wave at its emission. If we want to test this assumption, we have to close a door between them, the eventual entanglement (and correlation) is expected to be destroyed if there were a wave between them. Another clue is the phenomenon called decoherence that could be the result of interference with the environment, which would act as a closed door between the photons. Does the dissipation of one photon hitting a detector have an impact on the oscillation of the other? More than two photons may be entangled on the same wavefront.

If $\alpha_1 = \gamma_2 = \pi$ and $\alpha_2 = \gamma_1 = 0$, tarpicle and particle of a photon travel in the same direction and in the opposite sens, fig 27. The representation is two halves of apples going in opposite directions, the upper piece (the particle) of one of the two apples (photons) traveling with the lower piece (the tarpicle) of the other apple (the other photon). We get the system $\{\{T_1, P_2\}, \{T_2, P_1\}\}$. $\text{Ph}_1$ and $\text{Ph}_2$ do not need any more the space between them to communicate because
1) the (eventual) communication between $T_1$ and $P_1$ ($T_2$ and $P_2$) follows a -very short- path in the substructure of photon $P_1$ ($P_2$);
2) the (eventual) communication between $T_1$ and $P_2$ ($T_2$ and $P_1$) follows a -very short- path in the space-time (because of the metrics $ds^2 = dt^2 - dx^2 = 0$ for the photon and because they travel “together”).

As a compromise with relativity (the hidden parameter is real, which is the internal communication via the substructure of the photon through the space-time structure) and quantum mechanics (measurement of the state of a photon has an impact of the state of the other), we understand that this possibility becomes probable.

Moreover, $P_1$ and $P_2$ have opposite spins and the same frequency $\Theta$. Then we can write

$$
\begin{align*}
\text{Ph}_1 &= \{P_1(0, \beta_1 + \Theta \cdot t); T_1(\pi, \delta_1 + \Theta \cdot r)\} \\
\text{Ph}_2 &= \{P_2(\pi, \beta_2 + \Theta \cdot t); T_2(0, \delta_2 + \Theta \cdot r)\}.
\end{align*}
$$

We get the pseudo photons

$$
\begin{align*}
\text{Ph}_1' &= \{P_2(\pi, \beta_2 + \Theta \cdot t); T_1(\pi, \delta_1 + \Theta \cdot r)\} \\
\text{Ph}_2' &= \{P_1(0, \beta_1 + \Theta \cdot t); T_2(0, \delta_2 + \Theta \cdot r)\}.
\end{align*}
$$

Fig. 27. $\alpha_1 = \gamma_2 = \pi$ and $\alpha_2 = \gamma_1 = 0$. Because of the phase, these photons appears to be more stable than the original photon; the pseudo photons may share the energy of the original photons: we may state that half or part of the energy of $\text{Ph}_1$ ($\text{Ph}_2$) is shared with $\text{Ph}_1'$ ($\text{Ph}_2'$). Is it a way to obtain entangled photons with different wavelengths?
Two entangled photons are known to have possibly different wavelengths so a question needs to be asked about the stability of these hybrid photons. This is another trick of entanglement because, while their coordinates are “mixed” and travel together, the supparticles do not travel together: \((a, b) = (c, d)\) when \(a = c\) and \(b = d\).

With this scenario, it becomes possible to entangle more than two photons \((n)\), we just have to say that \(P2\) travels with \(T1\), \(P1\) with \(T3\), \(P3\) with \(T4\), \(P4\) with \(T5\), … \(Pn\) with \(T2\). In this scope, we expect a scenario where two photons may exchange a particle or a tarpicle.

![Fig. 28. Same scenario as Fig. 24, with two superposed photons.](image)

There is a third case: \(\alpha_1 = \alpha_2 = \gamma_1 = 0\) and \(\gamma_2 = \pi\):

\[
\begin{align*}
Ph1' &= \{P1(0, \beta_1 + \Theta. t); T1(0, \delta_1 + \Theta. r); P2(0, \beta_2 + \Theta. t)\}, \\
&= \{P1(0, \beta_1 + \beta_2 + 2\Theta. t); T1(0, \delta_1 + \Theta. r)\}, \\
Ph2' &= \{T2(\pi, \delta_2 + \Theta. r)\}.
\end{align*}
\]

And the last case: \(\alpha_1 = \gamma_1 = \gamma_2 = 0\) and \(\alpha_2 = \pi\):

\[
\begin{align*}
Ph1' &= \{P1(0, \beta_1 + \Theta. t); T1(0, \delta_1 + \Theta. r); P2(0, \delta_2 + \Theta. r)\}, \\
&= \{P1(0, \beta_1 + \Theta. t); T2(0, \delta_1 + \delta_2 + 2\Theta. r)\}, \\
Ph2' &= \{P2(\pi, \beta_2 + \Theta. t)\}.
\end{align*}
\]

Are these situations stable? It is possible, as long as we could consider \(T12\) (\(P12\)) as a bridge between \(P1\) and \(P2\) (\(T1\) and \(T2\)), with a share of the energy of both photons.

If we consider the photon \(Ph2\{P(\{\pi\}, \beta_2 - \Theta. t), T(\{\pi\}, \delta_2 - \Theta. r)\}\), we get some other results, distinguished by a phase \(\pi\) and no oscillation instead doubled oscillation. Subtleties in the results of entanglement effect should allow us to determine what kind of photon (phases 0 or \(\pi\), couple of phases, spin as the sign of \(\Theta\)) is measured, and what kind interaction is allowed between two entangled photons.

To explain the phenomenon of the “creation of a pair of entangled photons, traveling in the opposite directions with opposite spin” when a photon hits an electron in the KDP crystal, we need to formalize what happens. We need the parameters that define the electron. Electron has a mass, so we settle \(\psi \neq 0\) and \(\alpha = \pi\) \([\pi]\). It is known that a “rotation” of \(2\pi\) of an electron about changes its state, and a \(4\pi\) rotation is needed to restore it, so \(\Theta = \psi/2\) or \(2\psi\), depending on the state that we choose for reference (\(\psi. t_0 = 2\pi\) \([2\pi]\) and \(\Theta. t_0 = \pi\) \([2\pi]\) or \(\psi. t_0 = \pi\) \([2\pi]\) and \(\Theta. t_0 = 2\pi\) \([2\pi]\)). To define the phases of the electron, we have to understand their meaning.

![Fig. 30. An electron (yellow) and positron (red) in a magnetic field. Because they are at low energy, they travel in spirals in ALEPH’s magnetic field (and (left) probably an electric field). When the magnetic field is out of the paper, the electron goes in circle and loses energy through ionization.](image)
In Fig. 31, a), b), d), as electron and positon have the same rotation speeds in absolute (depending on initial conditions), we assume that they are resonant, and that we will allow to consider a common reference. In the reference of the positon (the electron), the electron (the positon) must be seen with a relative phase $\pm \pi/2$. In this manner, we say that electron and positon travel in $\pi/2$ phase-shifted directions in a common reference. To define the positon, we say that when an electron superposes a positon, we should get a strange supparticle. A good candidate would be to say that an anti-particle is $P^+(\alpha_1-\psi t, \beta_1+\Theta t)$. The resulting supparticle should be $P(\alpha_1+\alpha_2, \beta_1+\beta_2)$, as ‘pure energy’ with no oscillation. We expect that is an annihilation of the resulting supparticle, leading here to the creation of an electron and a positon. The most probable result is that the resulted phase direction leads to a phase conservation (probably also including the third entity) in relation to the reference ($\alpha=0$): $\alpha_1 + \alpha_2=0, \beta_1 + \beta_2=0$. We get two possibilities: $\alpha_1 = \pi/4$ and $\alpha_2 = -\pi/4$ or $\alpha_1 = 3\pi/4$ and $\alpha_2 = -3\pi/4$. If these trajectories are planar, we get $\beta_1 = \beta_2=0$.

Therefore, we will write an electron as $E(\pm \pi/4+\psi t, 2\psi t)$ and a positon as $E(\pm 3\pi/4+\psi t, -2\psi t)$ and $E^-(\pm 3\pi/4+\psi t, 2\psi t)$ and $E^-(\pm \pi/4+\psi t, -2\psi t)$.

The electron is known to have two opposite spins and we would set that they are discriminated by the sign of $\psi$ and/or $\Theta$. However, an electron with a different spin from another is not known to be its anti-particle. We need to avoid the confusion between a phase $\pi$ and an oscillation speed $-\psi$: if the electron travels backward ($\pi$-phase shifted) we expect that its apparent rotation would be opposite. We would get $E(3\pi/4+\psi t, 2\psi t)$ and $E(3\pi/4+\psi t, \pi+2\psi t)$ as electrons and their opposite spin $E(-3\pi/4+\psi t, 2\psi t)$ and $E(-\pi/4+\psi t, 2\psi t)$, traveling in the opposite direction.

From this analysis, we state that the anti-particle of $P(\alpha+\psi t, \beta+\Theta t)$ is $P^-(\alpha-\psi t, -\beta+\Theta t)$.

The phase between the spiraling particles of Fig. 31 appears to be $\pm \pi/2$, never $\pm \pi$. We expect that there is a phenomenon at their creation that induces their phase. On the contrary to the analyze on the photon, we may state that the tarpicle is not the anti-particle because an electron is expected to collide with a positon. Because P and P’ are two “particles”, two tarpicles must have born with them. We expect that the third entity to be composed by the two tarpicles. The third particle is part of the creation phenomenon and we may infer that it is composed with the tarpicles. Though their respective particle is expected to annihilate, the tarpicles appear to associate to give a new tarpicle. That may be understood if we consider that two supparticles collide when their respective particles meet and when their respective tarpicles meet: an apple with coordinates $(a,b)$ will meet another apple $(c,d)$ when $a=c$ and $b=d$. 

![Fig. 31. Bubble chamber experiments. We see one electron and one positon and a third entity emerging from nothing (probable interaction including a ray). We note a remnant displacement, which remains in a trend to travel in a relative orthogonal way. In a) and d) (maybe the same events) this effect is not induced by the magnetic field: while spiraling, a positon goes down when traveling to the left. The direction in red is opposite: if we assume that the positon is “at rest” at the end of the spiraling movement, then it is attracted by the electron and travels left and up.](image)
Fig. 32. A particle and its anti-particle in a common reference. In the case of $P$ is the electron, $\alpha=\pm\pi/4$ or $\pm3\pi/4$. This two possibilities exhibit the effect from the spin. They appear to attract each other. In our reference, the magnetic field of the bubble experiment will move up or down the reference, depending on its sens.

While reference of $P$ and $P^+$ are in opposite sens, we have to take precaution when we will see $P^+$ through the eyes of $P$. Because of the resonance of the waves between $P$ and $P^+$ (see the description of interference between two opposite or similar charged particles, Fig. 19), we expect to see $P^+$ as $PP^+ (\pm\alpha, 0)$ in the reference of $P$.

If the magnetic field of the bubble experiment results on the oscillation $(A t, B t)$, $P(\alpha + \psi t, \beta + \Theta t)$ becomes $P(\alpha + A t + \psi t, \beta + \Theta t + B t)$. In a common reference, we expect that $A$ (B) will be canceled by $-A$ (-B), meaning that we will see the spiral circles converging (because of ionization) to the phase-direction of the particles. We expect this effect to be more noticed when these circles are small, when the particles approach their rest state, relatively to the interaction with other particles.

In Fig. 31 c), one of the “spiraling” particle travels backward, in opposite directions on their respective phase direction. We set aside the question of their initial speed (one spiral is far bigger than the other one and we consider that a relativity calculation of the phase taking into account the relative speed of the particles will lead to the previous phases: $\pm\pi/4$ or $\pm3\pi/4$). One of them will probably be written as $P(-\pi/4 + \psi t, 2\psi t)$ and the other spiraling particle $P(-3\pi/4 - \psi t, -2\psi t)$, traveling backward ($\pi$).

Fig. 34. Interpretation of Fig. 31 c). These particles will not collide. Have they been categorized by the standard model?

These particles appear to escape from each other and we donnot know what happens when they "collide": is there a couple particle-tarcipie, or a particle and an anti-particle? There is also a third entity, but with a heavier trace in the bubble chamber than in the other cases, where we assumed it is an association of two tarpicles. We may infer in Fig. 31 c) that the third particle is an entire supparticle, composed with a tarcipie and a particle. Thus we would conclude that the two spiraling entities are a couple particle-tarcipie that will not annihilate if they meet (actually not). We mean that is an example of a confusion between a tarcipie and a particle.

Fig. 35. Left: Because of the mass of the proton (faster oscillation than that of the electron), its speed is lower regarding the speed of the electron. In this manner, depending on its energy and the presence of other electrons, the electron will rotate around the proton on a straight line, as Earth rotates around the sun on a straight line of the space-time with no “acceleration”. Therefore, we say that the electron is not expected to send any photon because the reference of the proton and electron are resonant, taking account their relative speed (depending on the orbital of the electron). A photon is expected to be sent when the structure of the electron (as a “phase stretching”) is altered. We expect that the rotation frequency plus the oscillation of the electron will fit the oscillation(s) of the (quarks of the) proton. To explain why the electron does not fall on the proton, we may also infer that, locally, the phase of the proton is oscillating between $-\pi/4$ and $\pi/4$ because of the quarks. If between $3\pi/4$ and $5\pi/4$, we expect the electron to rotate in the other way), meaning that the electron could oscillate between attraction and repulsion when rotating around the proton.
If there is a position instead of the proton, they will meet and annihilate by definition. Right: if several electrons attract a position, the mean reference will be found between them (yellow). Although unitary attraction is “askey”, the result is a “straight attraction”.

In their common reference (electron and positon), they travel at the speed of light. Because of their mass, they travel at a lower speed in our reference, as if their reference had a mass, the mass of the two particles. Recall that the interference between their oscillation and the oscillation coming from their environment (not necessary close...) gives to the particles a mass. We say that the representation of the attraction between an electron and a positon in Fig. 19 is isolated from the rest of the universe. Therefore, in a bubble chamber, we may determine the speed at rest of the electron (distance traveled by the photon, divided by the time of the photo exposure), and then the “lorentz factor at rest” of the electron and we infer that the mass and frequency $\nu$ are inversely linked to it.

To understand and validate this concept, we have to compare our current supparticles, which incurs interaction together, to supparticles without any interaction. The best way is to open a parenthesis about the CMB and cosmological results. A fundamental result will emerge (p33).

First of all, we have to criticize the interpretation of expansion. In the following, we analyze what indicates that this phenomenon may be wrong and we propose about different interpretations with their weakness or pertinence. The most probable interpretation is directly linked to the properties of the supparticles.

The engine of the universe is currently accepted to be an “expanding low-density zone” engine, but it might also be a “contracting high-density zone” engine, working with gravitation and time: the first should show similar observations as the second. Consider an expanding balloon on which ants are walking: this current image of our universe is similar to the image of a static balloon on which ants are reducing in size. It suggests that the global expansion could be apparent and in fact due to a local space-time contraction effect. If one assumes that the galaxies are not contracting because of the assumption that there is no contraction but the natural collapse due to gravitation, one will measure an excess of mass, which is another way of saying that the density of matter increases in galaxies with time. If one assumes that there is no space-time contraction in dense areas, although it exists, a possible conclusion will be to deduce that expansion and dark matter exist, and to even conclude that one cannot exist without the other.

Fig. 36. In the expansion model, the redshift is settled by the stretching empty flat space between galaxies, becoming increasingly more flat with time: the redshift is not settled by a differential between a blueshift within the first half of the distance (of a galaxy from us) and a redshift within the second half. This current hypothesis suffers from the fact that the expansion rate is too “binary” in its definition: in high-density area, the rate is null; otherwise, it equals to 70km/s/Mpc. As long as the expansion rate is not measured as a function of density, the expansion model may be wrong. Therefore, a model where the cosmological redshift does not depends or few on density along a line of sight should be desired, the Okham’s razor said.

To understand how the expansion model of universe may be wrong, we have to consider how the cosmological redshift evolves, as described in Fig. 36. If a universe with expanding vacuum zones is desired, we should observe some differences of redshift measurements when the line of sight is full of matter or full of vacuum. If we look a galaxy in the first case, we should obtain a low redshift because the expansion is slowed down and even stopped because of matter. In the second case, a galaxy at the same distance should be observed with more redshift. However, the cosmological redshift is currently known to depend only on the distance, not on the density of matter all through this distance. We infer that a better reading of the cosmological redshift has to refer to Fig. 37 where there is no flat space between galaxies. We could state that the redshift actually depends on distance through the time evolution.
We infer the scaling factor added with hands in the FLRW metric to be a wrong idea. In the past, Occam’s Razor has suggested the hypothesis of expansion. Now, there are too much incomprehensible phenomenons since this hypothesis that we have to reconsider it. Some tests of the viability of the expansion model may be found in [24], where the hypothesis of “tired light” could be combined with the hypothesis of dark matter to be interpreted as a time effect. No expansion means no big bang, we have to assume that the universe is flat since its birth.

To continue this study, we have to assume the following mechanism of gravitation.

If we consider that the interactions between particles and their environment, starting from 0 at the beginning of the universe, are more and more increasing (while the sphere of interaction is growing with time and space at the speed 1), the oscillation of new born particles will increase “chaotically” (globally or locally null, depending on the considered interactions), then they gain mass (recall that mass is seen as the effect due to a transverse oscillation to the movement) while time evolves as a function of the increasing oscillation. This could define the gravitation effect: the accumulation of waves -seen as a space-time deformation- emitted by distant particles could appear as a space-time deformation at their meeting. This effect is tiny (at a $10^{-34}$ scale) because it represents the globally quasi-null total interactions of distant oscillation sources, which are not expected to be resonant all together because of their number. If we consider that the frame of space is discrete, we expect to a resonance at the same scale (a resonance is expected when particles are at precise distance), and we assume it is the gravitation effect. If we assume that any particle has a mass depending on the interaction with others in their sphere of interaction, the same particle somewhere in the universe will have the same mass if we suppose the universe to be homogeneous and isotropic in the sphere of interaction of the two considered particles. The definition given by Einstein appears to fit to the fact that the matter curves the space-time, and that gravitation is not an interaction but a space-time deformation by the mass. If we assume that gravitation represents the “weight of interactions” between particles in their sphere of interaction, we need to say that gravitation increases with time and space, and starts from 0. In this assertion, the Mach principle, saying that the inertia -strictly linked to the gravitational mass- depends on the mass of the universe, appears to be pertinent. The inertia is expected to be similar as an increase of the “lorentz factor at rest” of a considered mass.

We infer that the less a particle has interactions with other particles, the less is oscillates. We expect that the decrease of one interaction from one particle depends on the evolution of the height, the frequency and/or the curvature of its sphere of interaction, growing at speed 1. Accordingly, it appears here that we may get a new interpretation of the cosmological redshift, saying that the less interaction particles have (with far away particles), the nearer the apparent oscillation to unity (the rest position of a particle), till the limits of our observable universe which is the birth of the universe, where particles are expected to have a “unity” oscillation at their rest position. These particles are part of the CMB, as the furthest particles that we ever see. As they have no interactions with others at the very birth of universe, we infer that they are being born and there is no interaction between them at this instant. No electromagnetism, nothing: any interactions start at 0 and will increase with time and space. This is another clue of the existence of the wave: the interaction between a particle and the others takes time and space. Because of interaction with others, the oscillation of these new born particles will increase from $t=0$. From our point of view, we see decreasing oscillations, as if signals of events were redshifted with the distance. Therefore, the expansion of the universe appears to be only apparent, relative to the growing sphere of interaction of each particle in the universe: the universe is no more expanding than contracting, it is static. At $t=0$, it is impossible to choose the reference of a particle because there is no interaction with others, or we have to just say that particles travel straight in their only reference, at the speed of light.
On another way, consider a photon traveling in a high density zone. When it is far away from this zone, far from its interaction, it would be not altered anymore and would recover its previous oscillation, before entering the density, compensating the blueshift at the entrance with the redshift at the exit. However, we may consider the evolution of galaxies crossed during a journey of the photon: if the mass of a galaxy increases with time because of its growing sphere of interaction, a supplementary redshift is produced at the exit, explained by the Einstein shift or gravitational shift.

Fig. 38. The Einstein shift: while outcoming signals are redshifted, incoming signals are blueshifted.

However, the Einstein shift cannot produce the observed redshift of far away galaxies, because they are expected to have less interaction with the universe than our near galaxies (bigger sphere of interaction), then would be less massive and we would see it with a blueshift signal. In this case, we conclude that the cosmological redshift depends sparsely on the density of matter between a far away event and us, unlike the expansion effect, clearly expected to depend on density (Fig. 36), but not measured as a function of the density rate.

As a result, we have to say that the observed redshift of a distant galaxy is no more impacted by the Einstein shift than a hypothetical expansion.

Fig. 39. While the cosmological redshift is desired to be produced by the gravitation well, the Einstein shift (middle) will produce a redshift in a far away galaxy: the unity of length is greater at the bottom, in the same way of a picnic blanket where a mass is lying and whose regular pane is stretched from the mass: this is how the cosmological redshift is currently explained, through the stretching of space. However, our older galaxy is expected to produce a more important blueshift and we would see galaxies with a blueshift increasing with distance.

A solution would be to say that the unity of length is actually decreasing from the bottom (left, opposite to the effect described on middle). There is one or two ways to say that: the density in the well is such that it prevents its increasing and/or we may consider that a Lense-Thirring effect is working as a finger rotating on the surface of a balloon and regular pane of the picnic blanket would be stretched from the vaccum zone. Therefore, the lecture of the cosmological redshift becomes on increasing blueshift of outcoming signals from galaxies with increasing time (right: $z_0 \rightarrow z(t)$ diagram made with the Hubble diagram ($z(t)$, [25]), taking into account an unknown inner blueshift $z_0$ of the Milky-Way): because of the redshift of incoming signals by our galaxie, we would see galaxies with an increasing redshift with distance. The lecture of the cosmological redshift would become a lecture between two opposite shifts.

In Fig. 39, the hypothesis of the Lense-Thirring Effect appears to be a potential explanation of the cosmological redshift but the suggestion that this effect could be responsible of a hypothetical reversal of the stretching frame of the space-time tissue from the mass is clearly far-fetched. Moreover, the Einstein shift is a weak effect and a galaxy density is that of paper. However the Lense-Thirring effect appears to be an interesting idea to explain the dark matter effect. Let us open a parenthesis about dark matter.

To understand why there is no dark matter in our solar system, we have to conclude the space-time curve due to the “dark matter” to be flat in our solar system, and thus the scale of the curve is greater than the scale of the curve due to gravitation. A solution could be to say that dark matter is a Lense-Thirring effect supposedly currently neglected, and increasing with time (Fig. 40), whose scale of space-time curve is expected to be galactic because the considered rotation is the rotation of galaxies.
This solution could be interesting because this effect is outrageous: while gravitation attracts two masses along a straight line, this effect attracts with rotation: a (fast) rotating mass induces a rotation around it while the mass would be not sufficient to gravitationally act, as if the rotating mass were heavier than the mass at rest; unlike gravitation, the center of mass of a two masses system incurring a Lense-Thirring effect is rotating (ie: moving by itself) in a fixed reference: may we consider that the hypothesis of a growing with distance and time Lense-Thirring effect in galaxies to be responsible of the dark matter? If we consider an interaction between an arbitrary inner disc with its outer disc, we even may expect to an exponential effect, expected to become not negligible, as weak as it is basically. Could we see the dark matter effect as a similar effect that happens to an oscillation or a rotation in a field of oscillation, behaving as a mass effect?

A difference between gravitation and dark matter could be analyzed in the variability of strength of the dark matter effect, depending on the time passed in a galaxy since its creation: the older a galaxy, the more we expect to detect the dark matter effect inside. Moreover, where there is the gravitation effect (actually everywhere), there is not necessary the dark matter effect, see [28], [29]. In [29], time passed in the galaxy has not started with the birth of the universe but 10billions years ago: the dark matter effect should be an effect that takes time from the beginning of the formation of a structure, while gravitation is acting from the beginning of the universe. If 10by is not actually a short period, we may speculate that the dark matter effect should be however observed in this galaxy. If dark matter is explained by a Lense-Thirring effect, do we consider this effect to be altered in a diffuse galaxy? Anyway, while gravitation is an unconditional effect, the Lense-Thirring effect is conditional. Such a phenomenon may be linked to the integrity of the rotating structure of the considered galaxy.

A Lense-Thirring effect in a galaxy would be seen as a finger rotating at the surface of a balloon (the space-time tissue) and a torsion of the space-time tissue could be representing an excess of mass. There are some clues of torsion in the study of the magnetic field in galaxies [30], which is currently not explained but through an unclear dynamo theory. While the turbulent field and its intensity may be explained by high-density energy [31] inside the stars, its curve is related to the rotation speed of the galaxy [32]. Therefore, a question is asked: is the rotation responsible of this curve, as in a dynamo theory, or are rotation and curve due to a torsion? As this deformation of the magnetic field is even observed between interacting galaxies, Fig.39, we infer the curve of magnetic field and the rotation speed to be the result of a space-time torsion and this torsion to be linked to the dark matter effect.
This attempt of a dark matter description, if not true, is a proposition to make us not forget that a phenomenon is not necessary a question of particle nor wave. There may be a phenomenon, still not understood, or not studied, as the real behavior of a galaxy, still studied under Newton’s laws but not studied under laws of general relativity. Consideration taking account of gravitational waves (the further a star is away from the center of a galaxy, the more it incurs gravitational waves emitted by stars in its inner disc: this could be also a potential explanation of the dark matter but its “cumulative” effect is not as clear as in the case of a Lense-Thirring effect), supermassive central black hole may be a product of these waves (is there a possibility that a revolutionizing and rotating mass will emit two unphased waves as in Fig.42?). Potentially, the Lense-Thirring effect may explain also the central black hole. This effect is so strange that it would be not surprising.

Fig. 42. Left: Scheme of the emission of gravitational waves between two gravitationally linked masses: gravitational waves are emitted by the mass, not the barycentre. Note that the bottom of the well of a galaxy is flat. It would lead the center of the well to be linked to t=0 (no interaction). Are central supermassive black holes a result of the lack of gravitational waves from revolutionizing stars?
From left to right: evolution of a possible “inner wave” between two mass (only one represented). May we consider a resonant effect at the center of mass, responsible of massive black hole at the center of galaxies?
May this second wave has to be considered in particles? The two waves appears to be $\pi$-phase-shifted.

The interpretation of the cosmological redshift in Fig. 39 right (as an improbable association between the Einstein shift and a hypothetical reversal frame stretching) appears to fit to the suggested interpretation of dark matter (as a Lense-Thirring effect). As there are galaxies without dark matter and low redshift, we cannot stand this common explanation and we have to state that the cosmological redshift is not produced through an imbalance between the emitted blueshift signal and the incoming redshift signal. The redshift, not any more produced between galaxies by the hypothetical expansion, is then necessary “produced” at the source, through a phenomenon, as increasing oscillations with time, that may be induced by the growing sphere of interaction of the particles from the birth of the universe, also suggested to be the gravitation effect. One currently describes the cosmological redshift as the decreasing of the oscillation of the photon traveling expanding space. Actually, depending on the distance where a photon is emitted, its oscillation is lower than if it were emitted near or in our galaxy: we will see photons with a redshift increasing as a function of the distance.

A consistent interpretation (gravitation as the weight of interactions, dark matter as a Lense-Thirring effect, cosmological redshift as the oscillation of interacting particles in their growing sphere of interaction, and supermassive black holes as a resonance of gravitational waves) would conclude that the fluctuation of the CMB represents the Einstein shift of the very first photons, crossing density zone whose mass increases with time. In other terms: the CMB could be born at the very beginning at 2.7K with no fluctuation. That is a clue of the pure black body radiation of the CMB: see the original CMB as a heating plate and the universe as a saucepan, in which the galaxies are “heating” as onions. What we see (far from it) is the current CMB, whose fluctuations would be a pure Einstein shift product of the increasing mass of densities (due to gravitation and probably the dark matter effect), incurred by the traveling photons between its birth and us. There is no fluctuation at the very beginning, we have to speculate about how matter collapses after this birth: while energy, phase (and so on) conservation is expected for each bunch of born supparticles at each point of universe, the relative phase between similar particles at different points (thus no interaction) may be aleatory, and naively, we have to state that is not completely aleatory but, as long as we expect that the birth of universe follows some “rules” (that have to be explained among the reasons that allowed the birth of the universe), as the law of a black body radiation at 2.7K. Some mechanism explaining such a radiation have been studied in the past, assuming that it is not a birth emission. Combined to the fact that the speed is 1 at $t=0$, we may expect fast interactions (any resonances -as in Figs. 32, 35- evolve at the speed of light; while the mass increases quickly from 0, the ratio between the mass of the electron and proton is expected to
be the same as today) inducing local fluctuation through gravitational collapse since the first times. This interpretation, may be “easily” checked, once the mechanism of gravitation and dark matter effect will be understood, even if it does not give the fundamental reasons of the birth of the universe, but a better vision of what happens than in a big-bang case where physics is unachievable for us. As a trail work for dark energy, we would like to say that the matter content in the growing sphere of interaction of supparticles may depend on density of matter, becoming more and more homogeneous with time. In this manner, we would state that the universe is even not homogeneous at the scale of our observable universe: nearer galaxies have too much redshift, which may mean that their spheres of interactions meet less matter than before. We may also say that dark energy represents a higher order of the gravitation effect, saying that we incur the come back of our sphere of interaction: only the nearest (from half of the observable universe, 7 billion years) galaxies return our interaction (then we should talk about the sphere of interaction, twice bigger than the first sphere of backreaction, four times bigger than the sphere of the second order of interaction...). Let us wait the later surveys of galaxies, a possible better consistent interpretation of cosmological results may be found than presented here.

In any case, what remains is that the later particles that will emerge from the CMB are expected to have the same measured redshift than the previous very first particles that we see now (the born new galaxies). Because the sphere of interaction of these previous very first particles is growing, their rest speed decreases, which means that they have more oscillation, which means less measured redshift, unlike the prediction of the current cosmological model that expects to observe the increasing of the apparent speed of far away galaxies (via an increasing of their measured redshift as a function of time) that we currently see, because of the hypothetical expansion, which is even expected to accelerate. This prediction needs no calculation: these attempted results are opposite and clearly discriminate the present model from the current one (ΛCDM). Future surveys should include such measurements.

The present interpretations of cosmological results are not, in appearance, in contradiction with each other, and part of them is directly linked to the description of the supparticles; we assume it has a sufficient consistency that they may constitute a model that has to be at least confirmed with “easy” calculations (Einstein shift) and observations (cosmological redshift).

Exercise! Determine the mass of the Sun, assuming that it is in an early or old galaxy, or alone in the universe.

In our reference, paradoxically, we will say that we have to increase an interaction to, relatively, decrease the other interactions that occurs on a particle. Then it can travel trying to reach arbitrary speed, in a direction that depends on its phase: to achieve the mimic of a “cancellation of interaction”, a condition is necessary: the moving particle must be resonant with the increasing interaction. This is this behavior that we expect to interpret as a free falling under gravitation or in a particle accelerator (by considering that their “ground” that maintained the accelerated particles in their considered “rest position” is suppressed, or becoming negligible), and we would conclude that any kind of acceleration is due to a strong interaction tending to relatively decrease other interactions. If we compare two particles, we should conclude that the relative oscillation $\psi_1 - \psi_2$ between them will be translated into a relative speed (say that the mass effect due to their different oscillation will induce different speed, depending on the occurred phenomenon by the particle). If we consider mounts of arbitrary particles (no “strong interaction” in such or such direction) that interact in any directions with a particle, this one is expected to dramatically slow down its relative speed to 0 (in our reference for example), because of chaotic and resonant oscillations with distant particles and can be considered to be at “a rest position”. Thus, if we want to know the known behavior of the electron in our space-time to get the assessment of its mass, we need the description of the other particles, in particular the proton and the neutron. Not an easy task. One word about the neutron: the weak force may be interpreted as a resonance and a phase match between neutron and proton. A neutron would stay between two protons, so that the protons interfere constructively. We expect the neutron to act as a phase-shifting operator of the interaction between protons. In a nucleus, neutron are necessary and, reciprocally, protons are necessary to keep neutrons together, so we expect that neutrons act as a necessary and sufficient link between protons. If atoms are desired to be neutral, the phase of the neutron is expected to be linked to the phase of the association of a proton and an electron, probably $\pi/2$, or an oscillating phase between $\pi/4$ and $3\pi/4$ because of the quarks, as a similar scenario in the proton (between $-\pi/4$ and $\pi/4$). Even if its phase is different from the neutron’s and its movement (an oscillation along its phase direction $\pi/2$) probably prevents it to get similar relative speeds as the proton with resonant supparticles, we expect to a possible scenario that
will allow the acceleration of a neutron, once the behavior of the neutron and its phase gets a better comprehension: for example, $\alpha\text{He}$, $\beta\text{Be}$, $\gamma\text{C}$ and $\delta\text{N}$ isotopes have more protons than neutrons, all unstable, except Helium-3. These examples may help us to determine the evolution of the phase and the relative speed of (the components of) neutrons and protons in a nucleus.

In the case of the photon, some resonant interactions will occur with particles whose relative behavior (notably their relative speed that expects to give them a different apparent oscillation) may vary when photons are very near to particles, in particular when photon travels through material: the “ground” of the photon is altered, in the meaning of that a massless particle has no ground by definition but gets one by interacting with other particles, as tiny as the interaction may be. The ground here refers to our ground, saying that when this one is suppressed, we are in a free falling state.

To understand the refraction effect of light in material, we have to compare two situations: when the light passes away a material, we understand that the interaction from the material is lower than the case when the light passes through. The distance of the interaction sources (the material) is then important. The number of interactions from the material depends on its density (depending on electron and quark densities and their relative localization in the material) because the material is composed with many sources of interaction, globally electrically neutral, but not gravitationally neutral as we know. When the light passes through the material, the effect is however stronger and we expect that light is interacting more strongly with the interaction sources of the material, because it is known that light travels slowly in material (its Lorentz factor is considered as falling dramatically from infinity).

We expect this phenomenon when a photon travels through a slit: we expect the photon to incur oscillation because of interaction with the material of the slit. During a very short time, the photons will behave as a massive supparticle and is then expected to slow down and emit a wave (instead a “rotational wave”) because of its oscillation, composed with the oscillation $\psi I$ and $\Theta I$ of the oscillation sources of the material and the rotation $\Theta$ of the photon, which will somwhat oscillates at $(\pm\psi I, \pm\Theta I)$. After the slit, the photon will behave as a photon again (its trajectory is just deflected by the slit: we will say that the photon behaves as a massive supparticle during the “stretching” process of its phase, from 0 or $\pi$ to its new “phase-motion” at the exit of the slit), overtaken and surrounded by the wave it has emitted in the slit. This wave will be reflected by the screen, supposedly in the form of the rotational wave $(0, \Theta)$ because emitted by the same particles of the screen than the particles of the slit, probably the electrons, in pro-rata of absorbance due to their energy state in their respective atoms. Some experiments should be done considering that the material of the slit may have some impacts on the interference fringe. A screen with absorbent material (very “black”? Reflected photons on the screen would become thermal) may alter the fringe if it absorbs the wave without reflection. We have to combine properties of absorption and reflection of a material to propose a scenario that will exhibit a particle behavior even if the photon has passed through two slits. Some experiments have been achieved in the past to determine which slit that the photon has passed through, preventing systematically the fringe interference. Has the interpretation of these experiments to be revisited to determine some properties of the waves, instead of the undefined but classically helpful “decoherence phenomenon”?

The reflection of the wave would be as short as the delay between the photon and the screen may be. Then, this reflected wave will interfere with the photon and the diffraction effect will occur. This delay is so short that the last movement of the photon before hitting the screen is currently described as its “collapse”. A rotating and orthogonal screen, synchronized with the arrival of photons, may alter the fringes, as if we were catching a photon on its sideway. However, the photon is expected to be surrounded by its wave (not only ahead) and it is not obvious to do a prediction. The properties of the waves need a deeper theoretical study.

**Fig. 43.** If there is a resonance (similar oscillation speed $\psi$ and $\Theta$, relatively to the speed of the interaction sources) between a photon and the particle of the material, we may consider a common reference and a strong interaction.

Left: the photon is outside a material. When there are several interaction sources away the photon, the mean interaction is suggested in yellow in case of resonant oscillation with every atoms.
Right: the photon is inside a material. Because of the resonance due to the relative speed, the mean interaction is chaotic when the photon is inside the material. We expect that the photon will move in a chaotic movement and will finally hit an interaction source.

We infer that the more a photon is transmitted by a material, the less the sources and the photon are resonant. In the study of absorbance or transmittance by varying the wavelength of the light (that is the rotation speed of the photons), we conclude that we are studying the speed oscillation of the sources in the material.

Among the reasons why the resonance is stronger in the material as observed (absorption or refraction), we invoke the only rotation $(\theta, \varphi)$ of the photon, different from the oscillators in the material $(\varphi \neq 0)$, and the “neutral wave” from atom. We expect that the journey in a material, near electrons and even inside their orbitals, leads to a far more probable resonance “because of the relative speed”.

A not surprising result could be to state that the height of the wave does not depend on the distance from the emission and is constant, considering that the only characteristic that will depend on the distance is the curve of the sphere of interaction, which tends to 0 with the distance (a planar wave is expected to globally have less effect, within a period, than a wave with more “transverse curve”). The intensity of the wave will relatively tend to 0 with the distance because of the number of interactions with others particles, growing with distance, whose curve of their sphere of interaction is higher. In this scope, the movement of a particle needs a study of interactions within the period of the interacting sources, taking in account this curve. However, the intensity of the wave will be studied to know if the hypothesis of the constancy of the height of the wave is consistent.

Well well well, these work trails appear to be not completely inconsistent even if it probably needs some clean and improvements…

The contradictions of the model are perhaps not to find out in this way. Defining the mass is expected to be a hard point and we should test a definition of mass of this new born of particle that is the expected electron. The main idea to define the mass would let us to consider that the transverse oscillation would slow down a particle in a straight movement of direction. I think now it is a problem of relativity. Will the “speed space” give some results? We should conclude that the natural “speed at rest” (a reference is allowed to travel at constant speed) of a particle (a tarpicle, a supparticle…) will define its inertia depending on its oscillation, probably as a function of somewhat a Lorentz factor. The photon has no transverse oscillations but a rotation, that is why it travels at speed 1 with no “mass”, while it may behave as a massive particle, depending on its interaction with its environment. There is a question about the reference of a photon (depending on its rotation, and its instant) and there are several ideas using changes of reference.

Mass appears a bit complicate to be determined “easily”. Hopefully, there are some other effects to be “easily” studied, we need to be more equipped to study interaction between massive particles. It is probably the time to introduce some classical results of euclidian space, special relativity considerations, change of accelerated reference and the relative speed between two oscillating particles is expected to vary under constraint, that is the addition of two relativistic speed, which is not linear… A first approach, probably too naive, has failed. It’s a bit “smoky” now, it should be clearer with the benefit of hindsight and knowledge about the behavior of particles, and obviously… if at least one prediction is checked!

The following is a previous draft of ideas (mainly from the version 2) and tools, (dunno which are wrong (mass of the photon?)), but some descriptions will be used, improved (ghost interference with a massless photon) or cleaned (gravitation as an asymmetry inside particles). We expect to meet, at the end, the “reference story” with the story of waves.
To study reflection, we have to improve the Huygens principle [35], saying that the diffraction effect may be understood by considering an emitted wave by the photon when it is passing near an obstacle before the screen. Because of the interaction with the elements in the atoms of the obstacle, the photon will indeed behave as a massive particle. This wave is then expected to be reflected by the screen to achieve an interference with the photon. The fringe are then appearing with several photons.

Be a photon \( P(0, \beta t + \theta t) \), and a particle \( A(\alpha\tau + \beta\sigma, \theta + \phi) \) of a mirror on the path of \( P \), with an angle \( M \) between 0 and \( \pi/2 \). Particle \( A \) will be seen in the reference of \( P \) as \( A(\alpha\tau + \beta\sigma, \theta + \phi) \). → Deeper analyze with relativity consideration

We consider an arbitrary moment when \( P \) emits a wave as a massive particle because of an arbitrary interaction with matter along its journey. Saying this, we infer that a photon is actually traveling at a mean speed smaller than 1, by carrying with itself some oscillations due to former matter met in its past. We conclude that a photon is overtaken by a wave which oscillations depending on its rotation and oscillations that tend to zero when density of interaction is homogeneous and isotropic around the photon. The only case where a photon travel with no wave ahead is an empty universe. In this case, its Lorentz factor is infinite.

A door is opened and a photon is now traveling in the direction of a mirror. We consider a virtual photon \( V \) at the other side of the mirror, emitting the same wave of photon \( P \). In this manner we model the reflection of the wave emitted by \( P \) on the mirror. Photon \( P \) and \( V \) have a symmetric behavior because of the mirror.

![Fig. Photon P and its virtual twin V. We only consider the wave emitted by V, matching to the reflected wave from P on the mirror. Because of the mirror, V is \((-\alpha, -\beta)\) shifted in its reference. The reflected wave will appear contra-propagating. The rotations of V are opposite to that of P.](image)

We write \( P(t, \psi, \Theta, \alpha, \beta, \chi) \) and \( V(t, -\psi, -\Theta, -\alpha, -\beta, \chi) \)

When photon \( P \) meets the first wavefront from the wave of photon \( V \), they are at a distance \( \delta \) from the mirror. This wavefront was emitted when \( t = t_0 - \tau \):

\[
P_1(t_0 + \tau, \psi, \Theta, \alpha, \beta, \chi) + W_2(t_0 - \tau, r - R, \psi, \Theta, \alpha + 2M, \beta + \nu, \chi) = P_3(t_0, 2\psi, 2\Theta, 2\alpha + 2M, 2\beta, \chi)
\]
if \( M = 0 \), we get \( P_3(t_0, 2\psi, 2\Theta, 2\alpha, 2\beta, \gamma) \). A photon is not known to double its frequency when it is reflected. The good equation for interference appears to be \( P_7(t_0 + \tau, \psi, \Theta, 2\alpha + \psi, 2\Theta, 2\beta, \gamma) \). Moreover, a photon is known to be reflected such as \( 2\alpha = 0 [2\pi], 2\beta = 0 [2\pi] \) when \( M = 0 \), which leads to \( \alpha = 0 [\pi], \beta = 0 [\pi] \).

We will consider that a photon is defined with \( \alpha = 0 [\pi], \beta = 0 [\pi] \).

We conclude also that the particle travels in the same direction of the former photon \( V \). \( V \) will change its direction (angle \( M \) instead of \( 2M \)) and then \( P_7 \) will travel in the direction of the mirror if the wave of \( V \) overtakes \( P \). But, it will takes more than the age of the universe because the celerity of the photon is near as fast as the speed of the wave.

When a wave meets a particle, the information given by the wave will be the direction of the deformation, through its own phase that will be added to the phase of the particle. Remind that a wave travels without energy, it deforms only the “shape of the particle-energy”, and does not increases or decrease its “volume”. That is why the coefficients in the previous metric has a sum squared equal to 1: the distant action between particles depends only on their phase, independently to their height. In the case of these particles are mingled, phases and heights are “shared to” the resulted particle.

When a particle emits a wavefront at time \( t \), if we consider its propagation in our space, it depends only on the variable \( r \) traveled by the wave.

1) In the eq. (\( \cdot \)), \( t \) is considered as constant. This is a known result: time does not evolve for massless elements that travel at the speed 1. To emphasize this result, we underline \( t \) to warn that \( t \) is constant:

\[
F_p(t, r, \psi, \Theta, \alpha, \beta) =
\]

\[
cF_x = \sin(\psi.(t-r)+\alpha)\cos(\Theta.(t-r)+\beta)
\]

\[
cF_y = \sin(\psi.(t-r)+\alpha)\sin(\Theta.(t-r)+\beta)
\]

\[
cF_z = \cos(\psi.(t-r)+\alpha)
\]

We will consider a wave when a particle emits continuously a wavefront within a duration \([t_0, t_0 + \tau]\) as, an integral of the wavefront, between \( t_0 \) and \( t_0 + \tau \):

\[
W_p(t_0<t0+\tau, r, \psi, \Theta, \alpha, \beta) =
\]

\[
cW_x = \int_{t_0}^{t_0+\tau} \sin(\psi.(t-r)+\alpha)\cos(\Theta.(t-r)+\beta) \, dt
\]

\[
cW_y = \int_{t_0}^{t_0+\tau} \sin(\psi.(t-r)+\alpha)\sin(\Theta.(t-r)+\beta) \, dt
\]

\[
cW_z = \int_{t_0}^{t_0+\tau} \cos(\psi.(t-r)+\alpha) \, dt
\]

We divide then \( c_x, c_y \) and \( c_z \) by \( c = \sqrt{c_x^2+c_y^2+c_z^2} \) to give a height 1 to the resulted wave. This calculation indicates the mean behavior of the wavefront within the period \([t_0, t_0 + \tau]\). It can be used when a wave interferes with another wave with a different wavelength, and it should be interesting to calculate the mean interference within a period of the shortest wavelength of the two waves.

Transmission of light in glass

speed of the wave
exp with a single photon should be achieved will and has passed the slit. 

On new phenomena of photon from modified double slit experiment

Haisheng Liu


4.14 The time particle, definition of time

We look for the anti-particles in universe, as the counterpart of the particles. We may explain the equilibrium between our space and the time space, saying that the anti-particles that we are looking for are in fact the time particles. However, we may wonder why matter with a phase inferior to $\pi$ has been privileged at the beginning of universe. We understand in this study that time particles are created when the time space rotates (from 0, not $\pi$) in the “orthogonal sense” of the rotation of our space that creates the space particles. A question still remains: what has initiated both these relative and orthogonal rotations?

Because space and time oscillators have opposite behaviors (they repulse each other as a well repulses a hill), we infer the total height of the space waves in our space equal (to the opposite of) the total height of the time waves in the time space. The total height ($=1$ if the universe is infinite) corresponds to the energy of the universe. However, we should infer that a positive energy creates wells, a negative energy creates hills, and conclude the total energy of universe to be zero, it depends how we define energy.

Maybe we will have to define time as the effect produced by the association between the particles of our space and the orthogonal time space, which needs another name. Let us call it the “other space”, and its time particles (the time oscillation) the “tarpicles”. We will call the space oscillation the “particle”. We could represent the space-time tissue as a plan, particles are in our side, tarpicles are in the other side. We would call the association of tarpicles and particles as “super-particles” or “supparticles” that are the nowadays known (space-time) particles. Using these terms, the term “time” disappears in calculation, but is replaced by the “other distance” $t$ (always positive) in the other space, using the pseudo norm $ds^2=dt^2-dr^2$. At any instant, the only position $(t, r)$ of each supparticle induces the apparent flow of the phenomenon that we call “time”: whatever the reference we choose, the effect of the tarpicles on the particles or the particles on the tarpicles induce time or space variations that induce movement. The other distance $t$ traveled by the supparticles is the engine that rotates the other space in relation to our space, which gives $t \geq r$. Reciprocally, the engine that rotates our space in relation to the other space is the space distance $r$ traveled by the supparticles. If we consider that the coordinates of our space are $t_0$, $t$ and $r$, we will conclude that the time flow is $r (r \geq t$ in this reference), which is not a problem but a variable changing. In other words, we are living in these two spaces, linked by the pseudo norm $ds^2=dt^2-dr^2$ (or $ds^2=dr^2-dt^2$, depending if we place in the other or our reference frame, except if we only consider coupled waves traveling together, where $dt^2 = dr^2$) and time is a perception by our brain, succeeding in the interpretation of the distance $t$ and $r$ of the supparticles of its strange environment.

In other terms, a question of vocabulary is asked.

4.6 A physical wave

The oscillation of the particle propagates; we define the longitudinal phase as $\varphi = \psi_0 - \psi_t$, and a transverse phase $\phi = \theta_0 - \theta_t$ between the two waves.

A particle has a speed $\chi$ and the propagating space wave in the time space will be:

$$\chi_x(t; r) = \chi \sin (\psi_x(t-r) + \psi_{t_0}) \cos (\theta_x(t-r) + \theta_{t_0})$$

$$\chi_y(t; r) = \chi \sin (\psi_y(t-r) + \psi_{t_0}) \sin (\theta_y(t-r) + \theta_{t_0})$$

$$\chi_z(t; r) = \chi \cos (\psi_z(t-r) + \psi_{t_0})$$

(15)

A particle has a speed $\Lambda$ and the propagating time wave in our space will be:
\begin{align*}
\Lambda_x(t; r) &= A \sin(\psi_s (r-t) + \psi_s \theta) \cos(\Theta_s (r-t) + \Theta_s \theta) \\
\Lambda_y(t; r) &= A \sin(\psi_s (r-t) + \psi_s \theta) \sin(\Theta_s (r-t) + \Theta_s \theta) \\
\Lambda_z(t; r) &= A \cos(\psi_s (r-t) + \psi_s \theta)
\end{align*} \tag{16}

Because of the phase, the waves do not compensate at each instant, even when \( r=t \). However, while the waves travel within a period, we will consider that there is compensation and the distance between the wave sources to oscillate. \( \psi \) is now called the longitudinal pulsation of the wave, and \( \Theta \) the transverse pulsation. We define the frequency of the wave as \( \nu \), such that \( \psi = 2\pi \nu \) because \( \psi \) is a rotation speed. At each instant and for every oscillation, this means that when \( t \) increases by the rotation period \( 1/\nu \), a new wave is pulsed with a low point between the new and the previous wave. We do not know the significance of \( \Theta \) and \( \phi \) and we could consider it as a physical rotation of the particle on itself. We infer that they are related to the known “spin of the particle”. The waves evolve in our space-time with six variables at every point on a wavefront: the time distortion factors \( \chi_x, \chi_y, \chi_z \) and the space distortion factors \( \Lambda_x, \Lambda_y, \Lambda_z \) as described in Fig.18. We define the wavelength \( \lambda \) as the distance between two phased wavefronts. The space and time waves escape from the particle with the speed of light and we get \( \lambda = c/\nu \). We infer that each parameter is determined when the particle is born.

If a particle does not change direction, we have to state that the values \( \psi, \theta \) do not change. Because we know that a particle may change its direction of movement, these values may change. Because the particle is supposed to be stable, we state that there is a relation between these values. The hypothesis of a constant phase between the waves would be interesting: \( \phi - \psi = \text{Cte} = \phi_0 - \psi_0 \). Necessarily, \( \psi = \Theta \). If \( \phi - \psi \neq \phi_0 - \psi_0 \), the direction of its movement is changed while there is no change in eqs. (15) (16) when we choose the initial reference frame rotated with the angle \( (\phi - \phi_0, \psi - \psi_0) \).

We say that the energy of the particle -the entity that we consider as a major characteristic of a particle- distorts the space-time without energy consumption, just as one says that mass distorts the space-time through gravity wells, without energy consumption because of a phenomenon called “gravitation” (while we have to consume energy when we want to distort an elastic canvas, even through a constant deformation). We infer that the energy of a particle at rest corresponds to the depth and size of the distortion. We consider the volume of a particle to be the mean volume of deformation of the wave generator, which is the volume of a well or a hill in the space-time tissue. Reciprocally, we infer the height of the wave to be also related to the energy of the particle, besides the speed and the mass of the particle. To understand a space-time canvas at the localization of a particle, we imagine an elastic canvas in the \((x, y)\) plan, alternatively and equally torn in the direction \( x \) and \(-x\) while the \( y \) direction is alternatively and equally torn with a phase. Here the canvas is the space-time vacuum where the particle is localized and the more we move away from the source, the more the local effects become invisible (as with three colored LED giving the “white color” when we are sufficiently away) for a non-oscillating element (there will be no interference, if such an element exists) although the two waves are present and influence time particles with interference via the oscillation of these particles.
The variation of the time vector generates a time wave.
The variation of the space vector generates a space wave.
The orientation of \( k \) and \( l \) have to be determined, in the aim that the two generated waves will compensate each other while traveling in the time space and in our space.

We represent the two oscillators at the same place, considering the reciprocal space and time deformation from one to the other.

The representation on the right indicates the constant phase between the oscillations, which will define the particles.

When a particle is perturbed by a foreign wave, the pulsation of the particle is locally impacted but the particle (the energy is still constant), if not destroyed by this event, not transformed into several particles (if it is possible), keeps the same constraints \( \chi, \Lambda \) and phase (more especially \( \phi - \Phi \) as we will see) that define it, when the foreign wave has moved away.

Note that the oscillation has no attenuation factor, which could be surprising for a physical wave. It will be discussed later.

We will call the combination of the time and space waves of a photon as the “photon-wave,” and the “photon-particle” to be the wave sources of the photon.

Considering the distortion vector \((c_x, c_y, c_z)\), we try to give a representation of its evolution while traveling, in Fig.19

As a final description, we understand that the wave shares the same properties as the particle, except its speed, mass and energy, and we expect that some behaviors of the wave are qualitatively similar to that of the particle (as reflection, diffraction, transmission) but not quantitatively (as its direction when passing a slit, the mass and energy effects). As an image, we can see the wave as a bunch of massless particles. Knowing if this image reflects reality is another story (discussed further) but could help in simulation.

While the energy can be absorbed by atoms (as in the photoelectric effect), we have to speculate about the absorption. The characteristics of these effects of the wave being or the particle being have to be distinguished to get out the wave-particle duality principle.

The amplitude of the waves does not decrease with the distance from its photon source. We have to keep in mind that the initial emission source does not consume energy to generate the time and space waves, and we infer that the waves oscillation is not attenuated while the waves propagate. We infer this strong property to be the reason why one has invented the particle responsible to interactions: we infer they do not exist and we have to re-interpret the experiments that have concluded to their existence.

**Twin paradox**

**4.7 The Doppler Effect**

The photon does not travel at the speed of light, equal to \( J \), but at a speed near to \( J \). The time constraint \( \chi = 1 \) is a limit that none of the particles reach; we will conclude that the photon-particle cannot go faster than the photon-wave and the definition of the speed of light will be reformulated as the speed of the photon-wave, as described in the comments of Fig. 14. We know that we need increasing amount of energy if we want a spaceship to reach a fraction of the speed of light. The same case applies to the photon. In this scope, we infer that a photon with higher frequency than another photon is a photon that travels faster than the other one and we can now compose Eq. (3) with the frequency of a photon. In other words, when a photon travels faster than another does, it has a higher frequency. This is the Doppler effect, with the usual relativistic consideration.
4.8 Particle stability

We call the wave generators as the “particle”. To differentiate from another localized oscillation (every \((t;x)\) position shares the same oscillation of the source with a delay, and could be seen as a wave generator, as in the Huygens-Fresnel principle [18]), the particle is what is maintained through the two wave sources with the energy (the energy of the particle) representing the “pulse” which has initiated the dynamical time and space contractions of the particle, as the pulse given to a spring without friction between two walls. If we could discuss again about the inner circular trajectory of the particle, we would say that a particle with high energy has a smaller trajectory and the walls would be nearer than in the case of a particle with low energy. The nearer the wave generators are to their space-time barycentre, the higher the energy of the particle is. This behavior leads us to state that the wave generators repulse each other with a strength as an inverse function of their distance to their barycentre. That what we could see in our space-time with gravity: while two wells in space-time attract each other, two hill (two “negative mass”) would attract each other also, and a hill and a well repulse each other (which is nothing else but the description about what we do here about destructive or constructive interference). In our case, the well is created by the “mean volume” occupied by the deformation of the space oscillation generator, and the hill is created by the “mean volume” occupied by the deformation of the time oscillation generator. However, this representation needs a better description because of the oscillation or the induced oscillation in a considered space: our space, the time space and the space-time.

When two particles collide, there is a mix between the oscillation generators that can be combined, creating different kinds of particles. We have inferred that the speed of the particles is linear (or affine as discussed later) to the height of the wave, we infer that the more particle has speed (and thus inertia), the more a height may be decomposed in several height leading to several particles. That is why the total energy of the incoming particle is the total energy of the random and different created particles that may be stable or not, after the collision.

Two localized particles at the same place but phase-shifted by \(\pi\) (depending on \(\Psi\) and \(\Theta\), the crossing duration and the phase \(\varphi - \phi\)) could form a particle oscillating with zero pulsation. If this case is possible (particle and anti-particle have to be at the same localization and they -and their components- oscillates identically within a \(\pi\) phase), we infer that the energy disappears (and the energy of the anti particles to be negative) or the total energy, added, is free to create “aleatory” particles (relations with phase, height have to be found). We have to wonder if the exact annihilation is possible (when energy disappears) and consider that the scenario is the same as when two particles collides where time waves oscillators will associate with space wave oscillators whatever the phase between them. However we have to discriminate the kinetic energy -which is expected to be positive- with the mass-energy, if this one could be negative (described as positive energy phase-shifted by \(\pi\)) for an anti-particle.

When a photon hits a detector, the detector intercepts the oscillations source, absorbing energy via its electron, which temporarily increases its speed and oscillates more; this perturbs the resonance between the waves of the constitutive particles of the atom: a phase between waves will induce an ejection of a local oscillation that is a photon or an electron. The resonance structure of the atom and its elementary particles must be determined to proceed further.

4.9 Thought exercise about interference

Imagine you are on a highway moving at 100km/h. If you throw the wheel W1 at 200km/h ahead of you, it will roll on the road at an absolute speed of 300km/h and at the relative speed of 200km/h ahead of you. If you throw the wheel W2 on a road sign behind you, it will bounce off it and follow you at the absolute speed of 100km/h and will never overtake you. Then you throw W3 on the highway just before turning to your right to drive on a parallel road sign and then rides on the highway at the absolute speed of 100km/h. You will see W1 road, always at 100km/h and you throw behind you your last wheel W4 that bounces off a moving ahead of you on the highway at the absolute speed of 300km/h, followed by W3 at 300km/h and then W4 and W2 at 100km/h. If the wheels bounce off once more from a road sign and then move in your direction, you will cross their path but after W1 has passed. If you pass the
slit to crash on the screen, you will be preceded by W4, and there will be interference if you turn left; if you turn right, you will precede W4 and there will not be interference. Because of the length of the “wave train” W1, W3, W4 and W2, your road does not need to be parallel to the highway to allow you to cross their pass before W1 or W3 has passed. This is the kind of consideration we have to proceed with now: we need to cross the road of the wave train between W1 and W3 or W4 or even W2 when we cross their road. We have to determine the angle between the secondary road and the highway to make us cross the direction of the wheels after W3 has passed. This is what could happen if we were in the photon reference frame and we have to take into account the fact that the wheels are now relativistic, that you have several rescue wheels that you send continuously on the road ahead and behind you and that a wheel changes its reference when it bumps against a sign.

We understand here that if we need interference in any case (you turn on your left or right whatever the slit you passed through), the speed of W1 is at least greater than yours. In other words, because of the uniformity of the visibility of the fringe interference, the hypothesis that the wave travels faster than the particle cannot be wrong, in the case of a physical wave of course, even if the wave is emitted by the photon or not, except if the photon is slowed down during at least a part of its travel.

The wave travels faster than the particle and the study needs relativistic considerations.

### 4.10 Representation of the photon

In our reference frame, everything happens as if the wave and the particle travel at speed $c$ but that is the wrong interpretation; we have to consider that the photon-wave travels faster than the photon-particle, as described in Fig. 20.

![Fig. 20. Representation of the photon as a space-time oscillation (Fig.14) in our reference (the photon has a non-zero mean speed $v$). The photon-wave (red) travels at a speed of 1 and the photon-particle (green) travels at a speed inferior to 1. The wave is “compressed” ahead of the photon-particle. We have to consider the accumulated wave ahead the photon-particle. Note the spiral form of the wave. The space-time trajectory of the particle as composed with its inner space-time trajectory and its mean space trajectory, is somewhat space-time helical around its mean space trajectory.](image)

This naive representation suffers from the fact that the usual wave is emitted through spherical wavefronts. Using spherical wavefronts, it would mean that the particle oscillates as a heart, which is not the description here. In our case, we cannot consider the direction of the time flow to be constant, so it is difficult to give a pure graphical representation. We have to recall that the time space is rotating, which explains how the wave travels back and ahead the particle. There is no problem with a description using spherical or elliptical wavefronts (when the photon moves) on which the distortion factors are constant.
We may speculate if the photon-particle creates two waves as described in Fig. 21. Because the second wave would travel at the low point of the first wave and vice-versa, the wave would disappear (destructive interference). We infer that this second wave does not exist, as if the photon-particle were a boat showing to the sea only the port side of its hull and sailed around in circles.

4.12 Space-time field

The photon-particle generates two orthogonal waves with the same frequency as the electromagnetic field but the amplitude of the oscillation does not depend on the distance to the source; hence, we infer the electromagnetic property of light to be an emergent property due to the flux of photon-particles as described in Fig. 24.

If we achieve a simulation with several sources, we expect a signal with a $1/r^2$ attenuation, as described in Fig. 25. A theory on the emergent property of such waves has to be developed.
Gordon theory where the energy of the particle is linked to the longitudinal pulsation through
the rotation speed $\vartheta$, with $\Theta=0$ and a spin $\theta$ (oscillation only on one distortion factor, which
contradicts Eq. 3); then, the parity operator by Dirac deals with negative transverse pulsation $\Theta$. This
field will have to take into account the spin of the particle as we are going to define.
Because we expect to be able to simply add fields generated by several particles, the study of
this field is necessary to build a theory considering more than one particle (we may do some
parallels with this proposal [20] with multi classical field). We expect the quantum field
theory to be merged with the particles physics through the field $\Sigma$.

In quantum mechanics, unitary is a sort of reference because it deals with probability.
Here the unitary designs the speed of light and we expect a bridge between these two
fundamental properties.

The equation of the waves appears to have similarities with the hamiltonian found in the
Schrödinger equation, as we can find in [21], using the Pauli matrices and the Bloch sphere.
The real and complex component may represent the time and space behavior of particles.

4.13 Reflection, diffraction

When there is only one punctual slit, the reflection of the wave on the screen generates a
somewhat planar wave, and we will see the diffraction pattern as described in Fig. 26.

![Diffraction Pattern](image)

Fig. 26. Interference between a planar wave and the wave from a punctual slit.

The planar wave is obtained when the source is at infinity; we have to consider that the
reflecting wave is obtained with a virtual source as described in Fig. 27, which is at the other
side of the screen at the same distance between the slit and the screen. Depending on this
distance, we may observe some changes in the ratio between the size of the spots of the
diffraction pattern. However, we have to consider that the wave takes time to reflect and travel
from the screen to the slit, and the photon-particle may not meet the waves all along its
propagation path but only for a part.

Moreover, the size of the diffraction spots are known to depend on the size of the slit.
The current explanation is to consider that the whole space in the slit emits a wave (Fig. 27).
That is what happens when the photon has not reached yet the slit but the wave. Besides the
emission by the slit, we may also use the behavior described in section 4.11, which is the
oscillation of the photon-particle because of the reflected wave from the environment of the
slit. Because of this oscillation, the photon-particle emits a wave from a source that can be
considered not to be punctual. Doing this, the photon looses time (the reference frame
oscillates because the propagation direction of the particle changes). Because of that, the wave
escapes from the particle faster in appearance and gets time to travel in the direction of the
screen and to be reflected in the direction of the particle. Because of the oscillation of the
photon in the slit, the frequency of the wave is also expected to be altered in the average of the
frequency of the photon, and that is why we may find some photons drooling in the dark
fringe, due to the interference between the photon-particle and the last waves that precede the
particle before it hits the screen.

We infer that the diffraction pattern will not be obtained if the screen is placed just when
the photons hit it. We may realize an experiment with gear wheels: the teeth of the wheel are
the screen and the rotation of the wheel is synchronized with the arrival of the photons on the
teeth, in order to prevent from the reflected waves. We should not observe the higher order of
diffraction.
When the photon-particle enters a slit not exactly at the center, the photon incurs a chaotic deflection of its trajectory due to some resonance between the wave-source (the particle), the accumulated wave ahead of it and the wave of the atom of the slit. If the photon had no inertia, its new direction would not be favored and the different orders of diffraction on the screen (the secondary spots that escort the main diffraction spot) would be equally split. As the photon has inertia, the mean trajectory is centered on the screen.

We know it is possible to slow down strongly particles and even photon in experiments with cold atoms; we infer that the reflected waves slow down the photons, not as strongly with cold atoms nut enough to conclude that this slowdown, combined to the diffraction effect explained with reflection, appears to give an explanation to the Huygens-Fresnel principle because the topography of a non-planar object (here the considered object is composed of two screens, where one screen has a slit) is expected to produce specific interference between the reflected photon-waves and the photon-particles.

=>weak range of the wave near the screen → “wave packet collapse”

We consider the following scenario: the photon has not passed through the slit, then the photon is in the slit, then the photon has passed the slit; at each step, the wave is emitted in the direction of a screen. First, we consider that the wave passed through the slit as planar wavefronts (the wave is emitted since the photon has been emitted), that is the classic configuration when we study a slit in which a wave is passing through. Then, when the photon is in the slit, the emitted wavefronts are no more planar and we consider that the wave source is punctual in the slit and has a possible lateral movement (oscillation of the photon because of the waves emitted by its near environment), before exiting the slit on a direction, probably phased \(\mathbf{Y}_s, \vartheta_s, \mathbf{Y}_t, \vartheta_t\) with the axis of the slit. Then the photon will travel on a straight line, before meeting a wave whose wavefronts are less and less planar. The constructive interference

We write the equation of the photon and we choose the example \(\mathbf{Y}_t=0, \vartheta_t=0, \mathbf{Y}_s=\alpha, \vartheta_s=\beta\)

We choose the reference frame of the supparticle at rest:

\[
\begin{align*}
\chi_x(t; r) &= \chi \sin(\mathbf{Y}_t (t)) \cos(\vartheta_s (t)) \\
\chi_y(t; r) &= \chi \sin(\mathbf{Y}_t (t)) \sin(\vartheta_s (t)) \\
\chi_z(t; r) &= \chi \cos(\mathbf{Y}_t (t)) \\
\Lambda_x(t; r) &= \Lambda \sin(\mathbf{Y}_s (r) + \alpha) \cos(\vartheta_s (r) + \beta) \\
\Lambda_y(t; r) &= \Lambda \sin(\mathbf{Y}_s (r) + \alpha) \sin(\vartheta_s (r) + \beta) \\
\Lambda_z(t; r) &= \Lambda \cos(\mathbf{Y}_s (r) + \alpha)
\end{align*}
\] (20)

Where \(t\) and \(r\) are the usual variables, from the moment ant localization of the emission of the photon, to the moment when it hits the screen.

As the reflected wave is emitted by the virtual source which is at the distance \(2\delta\), \(\delta\) is the distance between the photon and the screen, we write the equation of this wave. The first wavefront was emitted when the photon was emitted, so the virtual source was at the distance \(2L\), \(L\) is the distance between the photon source and the screen. So the distance to the virtual source starts at \(2L\) and ends at \(0\). The wave starts to be reflected on the screen when \(2\delta = 2\delta_i\) and the photon meets the first reflected wavefront when this distance is \(2\delta = 2\delta_i\).
this wave. The fringe indeed depends on the distance of D
and oscillates near the environment of the slit. The wave in the slit is emitted in the
expect the visibility of the fringe to be less important than with one slit.
and there will be only interference with the reflected waves responsible of the drooling. We
wave will have more time advance on the particle. The large first order of diffraction will
several following slits on the path of the photon. This slowing down will accumulate and the
than the photon-particle.
A simple experiment for finding out if this theory is not completely wrong is to find an
absorbent material (if it exists, recall the note about the photoelectric effect) or one with a
particular nanostructure that will destroy or scramble the reflecting wave.
Following the orientation of the experiment,

We have explained diffraction thanks to the fact that the photon(-supparticle) is slowed
down and oscillates near the environment of the slit. The wave in the slit is emitted in the
direction of D1 and D2 and we would infer that photon 2 is expected to incur interference with
this wave. The fringe indeed depends on the distance 2L2+L1, as if photon 2 had traveled from
the slit to D2.

4.15 Entanglement

Let us try to comment the experiment Fig. 28.

![Fig. 28. Photon 2 is diffracted as it had passed through the slit, and traveled the L1+2L2 distance to D2.][22]

We have explained diffraction thanks to the fact that the photon(-supparticle) is slowed
down and oscillates near the environment of the slit. The wave in the slit is emitted in the
direction of D1 and D2 and we would infer that photon 2 is expected to incur interference with
this wave. The fringe indeed depends on the distance 2L2+L1, as if photon 2 had traveled from
the slit to D2.

Following the orientation of the experiment, \( \Psi_2 = \pi/2, \Theta_2 = 0 \), \( \Psi_1 = \pi/2, \Theta_1 = \pi \), for the

\[
\begin{align*}
\chi_{11} (t; r) &= \chi \sin(\psi \cdot (t-r) + \pi/2) \cos(\Theta \cdot (t-r)) \\
\chi_{12} (t; r) &= \chi \sin(\psi \cdot (t-r) + \pi/2) \sin(\Theta \cdot (t-r)) \\
\chi_{21} (t; r) &= \chi \cos(\psi \cdot (t-r) + \pi/2) \\
\chi_{22} (t; r) &= \chi \cos(\psi \cdot (t-r) + \pi/2) \sin(\Theta \cdot (t-r)) \\
\end{align*}
\]
\[
\begin{align*}
\lambda_{11}(t;r) &= \Lambda \sin(\psi(t-r)+\pi/2) \sin(\Theta(t-r)) \\
\lambda_{22}(t;r) &= \Lambda \cos(\psi(t-r)+\pi/2)
\end{align*}
\]

(18)

For the photon 2, \( \chi_{11}(t;r) = \chi \sin(\psi(t-r)+\pi/2) \cos(\Theta(t-r)) \)

\[
\begin{align*}
\chi_{12}(t;r) &= \chi \sin(\psi(t-r)+\pi/2) \sin(\Theta(t-r)) \\
\chi_{21}(t;r) &= \chi \cos(\psi(t-r)+\pi/2) \\
\chi_{22}(t;r) &= \chi \cos(\psi(t-r)+\pi/2 + \pi/2) \cos(\Theta(t-r)) \\
\chi_{12}(t;r) &= \Lambda \sin(\psi(t-r)+\pi/2 + \pi/2) \sin(\Theta(t-r)) \\
\chi_{22}(t;r) &= \Lambda \cos(\psi(t-r)+\pi/2 + \pi)
\end{align*}
\]

(19)

To write \( \chi_{11} = 0, \chi_{12} = 0, \chi_{21} = 0, \chi_{22} = 0 \) and \( \chi_{11} = \pi, \chi_{12} = 0, \chi_{21} = \pi, \chi_{22} = 0 \), we have to switch the Oz direction with Ox.

Photon-tarpicles 1 and 2 travel in the same direction, while photon-particles 1 and 2 travel in the opposite direction. It looks strange! However, supparticles have six coordinates, and what we say is as if we were dealing with an apple with a speed \( \vec{v} = a \hat{i} + b \hat{j} \) : the apple goes in the Ox direction with the speed \( a \) and goes in the Oy direction with the speed \( b \), as if we were dealing with two apples traveling in two orthogonal directions. Moreover, we have no more problem when \( \vec{v} = a \hat{i} - b \hat{j} \). This is the same scenario here: photon 1 and 2 are supparticles with opposite direction in our space, and travel in the same direction in the time space. As they were emitted at the same position, they are mingled in the time space and are “space separate”. In the time space, the photon superpose to each other and their wave are resonant: the height of the tarpicle is now the double. In our representation, photon 2 appears to be split into two parts, but it is a wrong visualization: the supparticle is still a supparticle emitting compensating waves, as an apple with speed \( \vec{v} = a \hat{i} + b \hat{j} \) or \( \vec{v} = a \hat{i} - b \hat{j} \). It is just hard to represent an object with six dimensions, three of them being linked to the three others with the pseudo norm \( dt^2-dr^2 \). If the supparticle gives the impression that it is divided into two parts, remember the apple: there are not two apples traveling along two different directions, but one apple traveling in the mean direction. In our case, one could say that half of the apple travels in the opposite direction -in the time space- of the other half. Is one half aging and the other rejuvenating? No, the time flow is common for both, they just travel in the opposite direction in the time space.

We try to give a representation in Fig. 29. When we study the tarpicles, we use the reference of the time space, as the reference of our space when we study the particles.

First, we suppose that photon 1 is spin \( 0 \), and photon 2 is spin \( \pi \).

Fig. 29. left: Tarpicle and particle traveling in opposite space direction. This representation needs enhancement because the wave of the particle is orthogonal to the wave of the tarpicle.

If we mentally cut an apple into two parts, but we do not cut the apple, we will consider that we stretch the space between the two halves, as if we were studying the distance between these halves with a magnifier without cutting the apple: distance would be multiplied by the magnifier factor and the speed of the photon from one half to the other would be considered multiplied by the same factor. In our case, this is the same scenario and the representation of the wave from the tarpicle to the particle is stretched. If we close a door between these two halves, they become isolated as if we succeed in cutting supparticles.

right: mathematical representation of the two photon-supparticles. In this case, there is no time or space at the localization of the energy. The informations of the tarpicle, which are its three coordinates, impact instantly the information of the particle.

The representation on the left is preferred; energy is expected to give dimension of the supparticles in our and the time spaces.

In this representation, we understand that, in both cases, the information from the particle or the tarpicle to the particle or the tarpicle, respectively, appears to travels a tiny distance,
which is the dimension of the particle. This distance is constant, whatever the distance traveled by the supparticles.

The tarpicles of photons 1 and 2 are localized in our space because tarpicle 2 is resonant with tarpicle 1 which is localized through particle 1 (tarpicle 1 and particle 1 are the coordinates of supparticle 1), see Fig. 1.

If we suppose now that photon 1 is spin $\pi$, and photon 2 is spin $\theta$, we do the same job saying that the tarpicle 1 is impacted when the particle 1 reach the slit, even if tarpicle 1 is gathered by particle 2 through its resonance with tarpicle 2.

Now, it is time to reach the slit. The two tarpicles 1 and 2 and the particle 1 incur oscillations that creates the wave that will diffract photon 1 [23] on detector 1, as a classical diffraction, now described in section 4.13.

We stay in the reference frame of tarpicle 1 $(r=0)$ and introduce a phase $\phi I$, $\phi I$ because of the chaotic behavior in the slit:

$$\chi_{1x}(t; r) = \chi \sin(\psi_1(t) + \pi / 2 + \phi_1) \cos(\Theta_1(t) + \phi_1)$$
$$\chi_{1y}(t; r) = \chi \sin(\psi_1(t) + \pi / 2 + \phi_1) \sin(\Theta_1(t) + \phi_1)$$
$$\chi_{1z}(t; r) = \chi \cos(\psi_1(t) + \pi / 2 + \phi_1)$$
$$\Lambda_{1x}(t; r) = \Lambda \sin(\psi_1(0-t) + \pi / 2 + \phi_1) \cos(\Theta_1(0-t) + \phi_1)$$
$$\Lambda_{1y}(t; r) = \Lambda \sin(\psi_1(0-t) + \pi / 2 + \phi_1) \sin(\Theta_1(0-t) + \phi_1)$$
$$\Lambda_{1z}(t; r) = \Lambda \cos(\psi_1(0-t) + \pi / 2 + \phi_1)$$

Because tarpicle 1 is mingled to tarpicle 2, we get

$$\chi_{2x}(t; r) = \chi \sin(\psi_2(t) + \pi / 2 + \phi_2) \cos(\Theta_2(t) + \phi_2)$$
$$\chi_{2y}(t; r) = \chi \sin(\psi_2(t) + \pi / 2 + \phi_2) \sin(\Theta_2(t) + \phi_2)$$
$$\chi_{2z}(t; r) = \chi \cos(\psi_2(t) + \pi / 2 + \phi_2)$$
We will take the time of the communication is negligible. At last, because of the constant phase oscillators of the two photons are mingled, or superposed, the time oscillator of photon 2 is phase-shifted by \(\phi = \phi_1\) with a phase \(\phi = \phi_2 - 2L_2r\). The phase induced by particle 2 is function of the distance between tarpicle 2 and particle 2.

Because of the reflecting wave on detector 1, photon 1 will travel to a fringe, and we will consider a new phase \(\phi_2\), \(\phi_2\). We do the same job and we will find that particle 2 will be phase-shifted by \(\phi = \phi_2 - 2L_2r\). \(\psi\) and \(\phi\), \(\phi_2\) as if particle was

Let’s sum up: the space oscillator of photon 1 is impacted by its environment. Because of the constant phase \(\theta\) with the time oscillator, this one is also impacted. Because the two times oscillators of the two photons are mingled, or superposed, the time oscillator of photon 2 is also impacted. At last, because of the constant phase \(\pi\) with the space oscillator, this one is also impacted.

In the calculation we consider an instant communication between tarpicle 2 and particle 2 because the size of photon 2 is expected to be tiny, far smaller than the distance \(L_2\) or \(L_3\), so the time of the communication is negligible.

More precisely, we should write the equations as the following entangled system:

\[
\begin{align*}
\chi_{1x} (t; r) &= 2 \chi \sin(\psi_1 (t) + \pi/2 + \phi_1) \cos(\Theta_1 (t) + \phi_1) \\
\chi_{1y} (t; r) &= 2 \chi \sin(\psi_1 (t) + \pi/2 + \phi_1) \sin(\Theta_1 (t) + \phi_1) \\
\chi_{1z} (t; r) &= 2 \chi \cos(\psi_1 (t) + \pi/2 + \phi_1) \\
A_{1x} (t; r) &= A \sin(\psi_1 (t) - \delta) \cos(\Theta_1 (t) - \delta) \\
A_{1y} (t; r) &= A \sin(\psi_1 (t) - \delta) \sin(\Theta_1 (t) - \delta) \\
A_{1z} (t; r) &= A \cos(\psi_1 (t) - \delta)
\end{align*}
\]

We note that we may define photon 2 as photon 1 phase shifted by \(\pi\). If we had to analyze the photon in the case of a SPDC crystal with the Type I output, be \(\delta\) and \(-\delta\) the angle between the space direction of the photons and the Oz direction. We will take \(\Psi_{x} = 0, \Theta_1 = 0, \Psi_{y} = \phi, \Theta_2 = \delta, \Theta_2 = \delta_2\) for the photon 1:

\[
\begin{align*}
\chi_{x} (t; r) &= \chi \sin(\psi_1 (t-r)) \cos(\Theta_1 (t-r)) \\
\chi_{y} (t; r) &= \chi \sin(\psi_1 (t-r)) \sin(\Theta_1 (t-r)) \\
\chi_{z} (t; r) &= \chi \cos(\psi_1 (t-r)) \\
A_{x} (t; r) &= A \sin(\psi_1 (t-r) - \delta) \cos(\Theta_1 (r-t) - \delta) \\
A_{y} (t; r) &= A \sin(\psi_1 (t-r) - \delta) \sin(\Theta_1 (r-t) - \delta) \\
A_{z} (t; r) &= A \cos(\psi_1 (t-r) - \delta)
\end{align*}
\]

For the photon 2 (spin \(\pi\)), \(\Psi_{x} = 0, \Theta_1 = 0, \Psi_{y} = -\delta, \Theta_2 = -\delta + \pi, \) if we want to keep a phase \(\pi\) between the space waves and no phase between the time waves.

\[
\begin{align*}
\chi_{x} (t; r) &= \chi \sin(\psi_1 (t-r)) \cos(\Theta_1 (t-r)) \\
\chi_{y} (t; r) &= \chi \sin(\psi_1 (t-r)) \sin(\Theta_1 (t-r)) \\
\chi_{z} (t; r) &= \chi \cos(\psi_1 (t-r))
\end{align*}
\]
\[ \begin{align*}
\Lambda_x(t,r) &= \Lambda \sin(\psi \cdot (r-t) + \delta) \cos(\Theta \cdot (r-t) + \delta + \pi) \\
\Lambda_y(t,r) &= \Lambda \sin(\psi \cdot (r-t) + \delta) \sin(\Theta \cdot (r-t) + \delta + \pi) \\
\Lambda_z(t,r) &= \Lambda \cos(\psi \cdot (r-t) + \delta)
\end{align*} \] (21)

Photon 1 and 2 take two different space directions and the same direction in the time space.

In Fig. 29, the photons have two different wavelengths. We infer that they are not emitted at the same position, as described in Fig. 1 [23] and Fig. 2 [24], where two pumps target a Rb atom. The photon do not superpose although their waves are resonant, following the scenario between the photon and the anti-photon in section 4.20.

4.16 Young’s experiment

To explain what happens between the slit and the screen in Young’s experiment as described in Fig. 31, we analyze what happens before the supparticle reaches the slit, as in section 4.9. The photon generates a wave as soon as it has been emitted from the photon source and this wave is already in the path when the supparticle enters the first beam splitter (we have to consider a possible reflection of the wave on the beam splitter). We infer that the wave has passed the slits ahead of time. To determine the speed of the wave, we may close the path with a door placed before the beam splitter and increase the distance between the door and the beam splitter; we reduce the advance of the wave ahead of the supparticle when this distance is short. Then, the scenario will be deduced with that of diffraction in section 4.13.
Fig. 31. Two schemes to describe what happens just before the photons enter the slit. These would be two photos taken by us in our reference frame. In our reference frame, a supparticle cannot travel faster than the waves, traveling at the speed of light. Moreover, there is a reflection effect before the slits, which may slow down the photon-supparticle.

4.17 The spin of the photon

We have inferred that $\phi - \phi$ is related to the spin and we have described photons in section 4.15 with $\phi - \phi = 0 [\pi]$. As described in Fig. 17, time and space rotations are defined through an alternated oscillation in the three directions. We know that two entangled photons have spin in the opposite directions and we define the spin as shown in Fig. 32.

![Fig. 32. Two spin states of two entangled photon. $k_x$, $k_y$, $k_z$ are distortion factors, see fig. 17](image)

spin 1: when $k_z$ decreases, $k_x$ increases (see Fig. 17): $\phi - \phi = 0$.
spin -1: when $k_z$ decreases, $-k_x$ increases: $\phi - \phi = \pi$.

The orientation of $k_y$ is common to both representations of spin. See Fig. 29, we note that the spin is linked to the direction of movement. We may speculate when a photon meets a mirror: is the reference changed and does the new reference look in the opposite direction? Or does the photon changes its spin from 0 to $\pi$, or $\pi$ to 0?

If we wish to discuss the rotation $\theta$, it would be interesting to say that the deformation on $t_x$ is equal or linear on $t_x$, within a phase, during a space-time rotation of the supparticle. We should then state that $\theta$ is linked to $\psi$.

With section 4.15, we understand that the spin, direction of movement and entanglement are linked.

4.18 Definition of inertia and mass

A way to understand inertia is to analyze why accelerating a mass takes time. We have inferred that we have to take into account the height of the wave when we consider the collision of supparticles, creating new supparticles. So we have to consider the height of a supparticle at rest (when the time space and our space do not rotate but the supparticle) and the amount of the wave generators in the supparticle. We infer that the height of the electron is higher than that of the photon at the same speed. Because the height (limited by the critical height 1) of the electron at rest is not negligible (due to its energy that distorts the space-time), it is more difficult to increase this height (when it is close to 1) and thus its speed, and that is why the electron is considered to have more inertia than a photon, even if they were similar (both composed with two oscillators). In the proton, this is the same scenario: the height of the wave of the quarks at rest are higher than that of electrons and it is more difficult to increase their speed.

Therefore, we define the mass by the height of the supparticle at rest, when the time space does not rotate in relation to our space, and the inertia as part of the height which is related to movement of the supparticle, when the time space rotates as described previously. We infer that the height of the supparticle is $h_0 + k.v$ (or $h_0 + hv$), (see notes on Fig. 14, considering speed and frequency) where $v$ is the frequency and $h$ the Planck constant), where $h_0$ is the height at rest $v$ the speed of the supparticle. For the photon, $h_0=0$. In [25], we understand that $h_0$ is related to the “phase frequency”, which is the frequency of the rotation of the supparticle (no need to write the spherical part of the metrics), and $k.v$ is related to the “group frequency” which is the frequency of the rotation of the time space, or our space (where the spherical parts of the space metric and the time metric are inferred to cancel each other).

We wonder how the height of the supparticle discriminates mass as part of its height and inertia as the other part. Some answer will have to be found in the study of the neutrinos because the known oscillation of the neutrino implies an oscillation of its mass and we have to
infer that the limit $h_0$ defining the mass in the sum $h_0 + k \cdot v$ may be not constant. We infer that the neutrino modulates its mass with its inertia (if the current model of neutrino is good).

In section 4.10, we have described the wave evolution of the photon as spherical wavefronts. However, we consider that a supparticle at rest goes in circle because the time space does not rotate and the description of the wave evolution is not so clear because the wavefronts are not expected to have the same center because of the rotation of the supparticle. Pure spherical wavefronts with constant deformation factor on their surface cannot be desired because the supparticle has a mass. If the representation of spherical emitted wavefronts is desired, we have to describe how the deformation factors evolves on their surface.

As we have linked the speed of the supparticle to its height, we infer that the speed of a supparticle is quantized because when supparticles are created during a collision, the height is expected to be cut into quantized parts.

4.19 The quarks and the atoms

The quark model does not explain why the two positive up quarks ($q = + 2/3$) should be in the center of the neutron. It should rather be the opposite in view of their mutual repulsion. It appears more logical that the down quark ($q = - 1/3$) would be in the center and the two up quarks around it, in order to minimize their mutual repulsion.

Let us analyze the proton: it is not supposed to be elementary as the electron but composed of charged quark (and gluons with no charges): two up quarks (+), mass $m_u$, and a down quark(-), mass $m_d$. As a wrong but temporary hypothesis, we say that these quarks share the same place to consider that the proton emits only one pair of waves. This is wrong because these distinct supparticles are necessarily separated by space. The resulting wave of the three quarks must be composed by considering that it has the same height as the wave of the electron because proton and electron have the same absolute charge. In this scope, we can compute the heights of the down quark wave and the quark up waves. Because we have inferred that the inertia is the height of the supparticle $\chi$, we require that $2h_u - h_d = 2h_{u0} - h_{d0} + k(2v_u - v_d) = h_0 = h_{u0} + k v_u$. To obtain this equation, we need that up and down quarks are phase-shifted.

Quarks are not localized at the same place in the proton and so the three pairs of waves generated by these quarks are difficult to consider. The gluons may be a wave interaction like a resonance, considering the inner movement of the quarks and their oscillations. We could state that the three quarks of a proton are in fact the three oscillations (on $t$, $b$, $r$, or $x$, $y$, $z$) of an oscillator but a quark is supposedly to be associated with an anti-quark when there is enough energy to create such a pair. Then a quark is a whole supparticle and is composed with whole oscillators.

We know that it is difficult to separate quarks, as if there were a string between them and whose strength increases with the distance. We have inferred that a time oscillation generator repulses a space oscillation generator, and that the bigger is such a couple of supparticles (the size of the circular trajectory), the less it needs energy to stay together. Because the energy of the quark is constant (or increases because of collision), while its size increases because of the collision, the expected behavior is what is observed for the quark, and we infer that we try to separate time and space oscillators when we try to break quarks. We infer that the quarks are not separated supparticles but share a same oscillator, for example, the three quarks in a proton are space oscillators around a unique time oscillator and we infer that is the known strong interaction. At this point it is really difficult to infer anything more because we have to consider the effect of the movement of the quarks on the resulting wave of a proton, which has to be determined. For example, considering three RGB LEDs, the resulting color would depend on the speed of the LEDs. We infer that the color of the quark depends on their relative speed around the main oscillator.

If we consider that each proton and neutron in a 3D nucleus (a nucleus is not considered as a point) have a waves couple companion, there must be resonances and the resulting wave must have several pseudo periodicities, depending on the position and eventual movements of protons and neutrons; this would explain the quantified orbitals of the electrons. The most stable periodicities will match the magic numbers that correspond to the most stable orbitals. This prediction needs heavy computation [26] because of inner interference between the waves from the nuclei and interferences between these and the waves from the electrons. If we take into account that these pseudo-periodicities depend on the movements and positions of the components of the atoms, we infer that these components are continuously “searching”
their place, in a trajectory that minimizes the Hamiltonian. Does it occur when a neutron is ejected? Can we explain radioactivity (or weak interaction) with waves? We would infer that the resonance of these waves is impossible when the nuclei is too big. We infer the same scenario for the neutron: the resonance of the waves is impossible to be “found” by the quarks but when the neutron is associated with a proton, and that is why the alone neutron disintegrates. The idea of resonance is also found when low temperature authorizes the resonance of electrons or atoms.

Usually, electron orbitals are the probability distribution of an electron in an atom or molecule. These orbitals have been determined with the Schrödinger equation and, as mentioned earlier, we infer that these orbitals are the results of the interference of waves. If we can still discuss the probability of determining the position of an electron in an atom, its trajectory or position will be determined with the principle of least action.

Several scenarios has to be studied: one of the two oscillators of the electron merges with the same kind oscillator (time or space) of the proton. Therefore, the electron is not clearly revolving around a proton, but there is a synchronous effect with the quarks that prevents the electron to send a photon in its “movement” in the atom. This scenario has probably some similarities with the neutron behavior, needing a proton to be stable.

Positron, or anti-electron, are known to create not a stable supparticle when associated with an electron. We may infer two reasons of that: that is the proof that an electron is not revolving around the proton or atoms but is associated with the inner oscillators of the proton; or that is the proof of that the positron/electron oscillators are not resonant (and we may apply this reasoning with radioactivity) with the waves of the environment.

4.22 Electrical field and electron

We know from the previous study that the supparticles are expected to be driven by constructive interference and are tempted to escape from destructive interference. Let us investigate what kind of wave configuration may produce constructive interference to cause a possible movement.

Champs et photon

An idea is to reproduce the scheme in Fig. 33. In this configuration, there is a constructive interference which can occur and persist when two “electrical charges” are present. When the charges are opposite, a constructive interference may occur between the two supparticles when the waves synchronize and the two supparticles flow along the interference path and travel toward each other. When the charges are the same, a constructive interference occurs outside (opposite to “between” but in the direction of the two supparticles) the supparticles couple when the waves synchronize and the supparticles would escape from each other. Therefore, we no more need to discuss charges. The wave configuration that defines the two supparticles would allow this behavior.

We know that the common sense of propagation is unique from the supparticle to infinity, and not the other way. However, we may use the notes on the fact that the waves has a propagating behavior considering the variable $r$ or $t$, and a contra-propagating behavior considering the variable $t$ or $r$, respectively. The waves need to rotate together while electron and proton are facing each other: we will have to infer that $\Theta_p = -\Theta_e \ldots$. The same idea leads to $\Psi_p = -\Psi_e \ldots$. Then, we have to consider the interference between the time wave of the electron and the time wave of the proton, and the interference between the space wave of the electron, and the space wave of the proton.

Then we have to consider the phase between the waves because we infer that we need to have constructive interference. As for the rotation consideration, we infer the phases of electron and proton to be opposite.
Because we have inferred the transverse pulsation \( \Theta \) and the transverse phase \( \phi \) to be related to the spin, we now consider the phase \( \varphi - \phi \), which is more representative of the phase between two coupled waves. We know electron and proton to have two possible spins. Because electron and proton attract each other whatever their spin, we have to obtain a symmetry in the relations between the phases of each other. The most interesting couple of values for \( \varphi - \phi \) is \( \pi/4, 3\pi/4 \) for the electron, opposite to \( -\pi/4, -3\pi/4 \) for the proton as the resulting phase from the waves of its quarks. To give a description, we will say that the "\( \pi/4 \) electron" travels in the direction to the "\( \pi/4 \) proton", while it travels backward to the "\( -3\pi/4 \) proton".

At this point, \( \cos \) increases or decreases in the neighbor of \( \pi/4 \) with the same strength, and we cannot state that the waves interfere constructively or destructively when they synchronize. However, while the waves may interfere destructively, the synchronization is perturbed when the waves of the proton reaches the electron, and vice-versa, because the supparticles escape from destructive interference. We infer a movement of the supparticles so that the waves would synchronize constructively. Therefore the movement of the supparticles to synchronize constructively their waves outside or between them will be \( \pm \) a quarter of a wavelength. For example there will be no interference preference when an electron "sees" a neutral atom \( \text{H} \), composed of an electron and an proton. The movement of the supparticle can be a classical rotation, as a momentary increase of \( \Theta \) or \( \phi \), which leads to an impact on \( \varphi \) and \( \theta \) because of the stability of the supparticle, defined through relations between \( \Theta \), \( \phi \), \( \varphi \) and \( \theta \). The synchronization will be then obtained when the waves rotate together:

\[
|\Theta(t_e - r_e) - \phi_e| = |\Theta(t_p - r_p) - \phi_p| \quad \text{and} \quad |\psi(t_e - r_e) - \varphi_e| = |\psi(t_p - r_p) - \varphi_p|,
\]

which leads to

\[
\text{GCD}(\Theta, \psi)(\Delta t - \Delta r) \approx |\varphi_e - \phi_e| + |\varphi_p - \phi_p|.
\]  

(22)

Because we expect the two rotation speeds to be both related to the frequency of the waves, the time of synchronization is short and varies as the square and inverse of the frequency of the waves.

Thus this mimics mutual attraction or repulsion: the waves rotate together and synchronize between electrons and protons or synchronize outside the couple proton-proton or electron-electron.

Accordingly, we infer that the attraction (repulsion) of two different (identical) charges is due to the \( \pm \pi/4 \) or \( \pm 3\pi/4 \) difference phase between the time wave and the space wave.

It is known that a rotation of \( 2\pi \) of an electron about its 'spin' axis changes its state, and a \( 4\pi \) rotation is needed to restore it. Does it mean \( \Theta = \varphi/2 \)?

Such properties are not known for the photon but through a different behavior discussed further: \( \theta \) and \( \pi \) phase-shifted waves are sufficient for understanding the behavior of the photon. By default, we will assume that the spin of the photon is determined by \( \varphi - \phi = 0 \) [\( \pi \)].

Among the properties of the electromagnetic field is its behavior while crossing a wall; we infer that the waves of the electrons are in resonance (probably a multiple between frequency) with the oscillators (atoms, electrons, protons, and neutrons) in the wall materials and pass through the walls.

To explain how an electron may produce a photon when it changes direction, we have to write Eq.(15) and Eq.(16) as:

\[
\chi_x(t, r) \equiv \chi \sin(\varphi(t, r) + \psi_{16}) \cos(\Theta(t, r) + \Theta_{16})
\]

\[
\chi_y(t, r) \equiv \chi \sin(\varphi(t, r) + \psi_{16}) \sin(\Theta(t, r) + \Theta_{16})
\]

\[
\chi_z(t, r) \equiv \chi \cos(\varphi(t, r) + \psi_{16})
\]

Fig. 33. The sense of propagation of the waves of two different charges appears to be opposite. The synchronization can be obtained with the movement of the wave sources. There is no destructive or constructive effect outside the supparticles when the constructive effect is between. There is no destructive or constructive effect between the supparticles when the constructive effect is outside.
\[ A_x(t; r) = A \sin(\psi_x(t - r) + \psi_{s, o}) \cos(\Theta_x(t - r) + \Theta_{s, o}) \]
\[ A_y(t; r) = A \sin(\psi_y(t - r) + \psi_{s, o}) \sin(\Theta_y(t - r) + \Theta_{s, o}) \]
\[ A_z(t; r) = A \cos(\psi_z(t - r) + \psi_{s, o}) \]

(23)

We should next consider the space-time distance between the two oscillators of the particle (a foreign wave has not the same state at the two different positions of these oscillators) and consider \( \psi_{\Theta}, \Theta \rightarrow \psi_{\Theta}, \Theta \) evolving to \( \psi_{\Theta}, \Theta \rightarrow \psi_{\Theta}, \Theta \). The differences \( \psi_{\Theta} - \psi_{\Theta}, \Theta - \Theta \) are part of the informations that are transferred to the emitted photon. The mechanism that makes part of the height of the electron to be cut into the height of the photon has to be invented.

We know the movement of electrons in metal to produce the Joule effect, and we would infer that these movements induce the emission of photons in the metal. However, electron are not known to emit thermal photons. Moreover, the black body temperature does not depend on the nature of the material. We infer the Joule effect not to be linked to electron but indirectly through the back-reaction of its movement and we conclude that the photons are necessarily sent by the atoms.

To get \( |\Theta_p| = |\Theta_e| \) and \( |\psi_p| = |\psi_e| \) within phases, the waves need to synchronize through a Doppler effect allowed by the relative speed between proton and electron. If one of the movement is blocked by an arbitrary phenomenon, we have to consider the reference frame that incurs acceleration, as a torpedo caught in fishing nets and increasing the rotation speed of its motor to progress. In our case, the motor is the rotation speed of the time space. In any case, we infer two charged supparticles to embrace behaviors that guide them to a constructive interference between their oscillations and their waves. As a result, we need to consider the reference frame where proton and electron are able to synchronize.

### 4.11 Photon-particle and interference

Now, we consider a photon traveling in the \( x \) direction with a speed \( v \) (frequency \( f \)), it emits a wave in every direction with the same celerity. When this wave returns (due to reflection at an angle due to the relative speeds between the photon-particle and the photon-wave) from the \( y \) direction as represented in Fig. 22, it would oscillate between double amplitude and \( \Theta \); the height increases and decreases through a Lorentz factor. The height increases as long as the constructive interference occurs. The speed will increase and decrease within a period of the incoming wave, and we expect no total gain of the speed if the wave is planar. If the wave is spherical, we expect a gain or a deficiency, depending on the sens of propagation of the wave, because there will be a variation of the radius of the wave while the photon travels within a period of the wave.

This fact needs to be emphasized: a constructive interference tends to double the speed of the particle although it has a relativistic speed; this is a strong effect.

When the interference is destructive, the opposite is seen to occur, the frequency tends to decrease to zero and the speed decreases to zero. However it is impossible because of the inner structure of the photon: when \( c_r = 0 \), we get \( c_r^2 + c_r^2 = c^2 \). We infer that a photon-particle never enters a completely destructive interference and it will “slide on it” (when there is a complete destructive interference on \( t_s \), there is some constructive interference on \( t_r \) or \( t_l \) or penetrate it slightly, depending on its inertia). For example, when two facing waves meet, the photon-particle (whose one wave is the wave companion) will move in a transverse direction with the rotations \( \psi \) and \( \Theta \), actively “scanning for an exit” as a slipping soap in hands. We infer that two face-to-face laser beams will force the photons to oscillate between constructive and destructive interference around the mean direction (\( \psi_{\Theta}, \Theta \)). Considering that its speed successively increases and decreases, we have to speculate if the mean speed of the photon is lower or higher than the value before crossing a facing wave.

This fact needs to be emphasized: a destructive interference tends to annul the speed of the particle although it has a relativistic speed. This is a strong effect.

As a result, if we could know the instant behavior of a particle crossing a wave, we have to consider that the wave travels faster than the photon-particle and we expect to consider its mean behavior, between going alternatively faster and slower, considering that a distance traveled by a photon in this configuration is longer, as if the photon was slowed down. If the wave is planar (when the source of the wave is far away), we infer the travel of the photon-particle to be an oscillating travel around the straight line obtained when there is no wave. In intergalactic space, vacuum is full of waves from mounts of source and we infer the mean interference to be near to \( 0 \) but not \( 0 \) because photon trajectories are known to be deflected.
This result is not obvious for the time particle because we will see that the waves of proton and electron synchronize whatever their distance from each other.

We could see some parallels with this behavior in the study of droplets [19].

The splash observed when two water jets face each other appears to indicate that the interference between the waves of the water atoms is strong enough to deflect their trajectories. Mechanical actions could be explained with particle-waves and we have to speculate how the electromagnetic field may be interpreted using these waves.

In case of transverse interference, we have to determine the behavior of the particle.

Considering two time waves \((w_1, w_2)\) coming from two sources \((S_1, S_2)\), \(k_{1x}, k_{1y}, k_{1z}\) and \(k_{2x}, k_{2y}, k_{2z}\) are their respective time factors, and a particle \(P\) whose time wave is \(w_1\) (\(w_1\) is the companion wave of the particle). To know the resulting time factors \(k_{3x}, k_{3y}, k_{3z}\), we have to take into account the fact that the orientation of \((t_1, t_1, t_1)\) is not the same for the two waves. We take for \(t_1\), the direction \((S_1, P)\) and for \(t_2\), the direction \((S_2, P)\). Considering that interference results in an addition of amplitude of waves (that is why we have said that the waves travel with an amplitude less great than 1), we nevertheless have to consider \(\alpha\) and \(\beta\) as the usual angles of the spherical representation between the two time coordinate systems, we get:

\[
\begin{align*}
    k_{3x} &= k_{1x} + k_{2x} \sin \alpha \cos \beta + k_{2y} \cos \alpha \cos \beta + k_{2z} \sin \beta, \\
    k_{3y} &= k_{1y} + k_{2x} \sin \alpha \sin \beta + k_{2y} \cos \alpha \sin \beta - k_{2z} \cos \beta, \\
    k_{3z} &= k_{1z} - k_{2x} \cos \alpha + k_{2y} \sin \alpha. 
\end{align*}
\]

(18)

Be \(k = \sqrt{k_{3x}^2 + k_{3y}^2 + k_{3z}^2}\) the height of the resulting wave, and the time factors of the metric will be \(k_{3x}/k, k_{3y}/k, k_{3z}/k\).

We need to know when the sources have started to emit their waves. If there are no relations between them (such as reflection), it is impossible to find a time phase \(t_1 - t_2\). The results will need an hypothesis on the phases or consider probability on the values on the phases between the sources.

We infer the decoherence to be some effects related on waves coming from the environment of the experiments, or reflecting waves of the considered particles on the environment.

4.20 The anti-supparticles

We define the spin as a phase \(\phi - \phi\) in \([-\pi, \pi]\) (we will now discuss the spin as a phase) between the time and the space waves. To get a destructive interference between a supparticle and an anti-supparticle, we infer that the supparticles have a spin \(\phi - \phi\) in \([0, \pi]\) and the anti-supparticles have a spin in \([\pi, 2\pi]\) or \([-\pi, 0]\). Because the anti-electron attracts the electron
and the anti-proton attracts the proton, we expect the same scenario as in the interpretation of electromagnetism: their rotation $\Theta$ are opposite. The spin of the photons are $0$ and $\pi$, and the anti photons $0$ and $\pi$, the electrons $\pi/4$ and $3\pi/4$, and the anti-electron $-\pi/4$ and $-3\pi/4$; we infer that the proton has a $-\pi/4$ and $-3\pi/4$ phase because the relative wave due to the waves of the quarks of the proton is a mimic of the anti-electron wave. When a supparticle and an anti-supparticle collide, they systematically annihilate because they are phase shifted by $\pi$ and transformed into others supparticles.

We have to speculate why photons with different spin does not annihilate even when they have the same frequency. Maybe the reason is to be found in the size of a photon (contracted by the association of time and space generators) or consider that the photons incur interference and we may expect that, because they have few inertia, photons avoid each other when they approach closely.

However, there are two other possible scenarios. The first one would state that the supparticles keep in mind their history, their mass being constituted as an addition in the mass of the previous elementary supparticles that was needed during the “life” of the considered supparticle. When we try to destroy it, we try to destroy these components with their own phase. The second scenario would state that there is no memory in the addition of the final mass and the result of a collision gives aleatory supparticles (taking account the energy conservation) with aleatory phase (taking account that the total phase correspond to the phase of the initial supparticles). If we consider that an (anti-)photon collides an (anti-)photon, these scenarios leads to the same (anti-)photons (maybe they switch their phase) because photon is the most elementary supparticle. However a single photon may be produced without a pair with an aleatory movement of direction. Do we conclude this photon to be two superposed photons?

Then we have to consider the writing of $(\sin(\psi + \phi) \cos(\Theta + \phi), \sin(\psi + \phi) \sin(\Theta + \phi), \cos(\psi + \phi))$, or just consider $(\cos(\Theta + \phi - \phi), \sin(\Theta + \phi - \phi))$. With the phase $\Theta$ and $\pi$, we have to compare the behavior of the rotation of the photon through $(\cos \Theta, \sin \Theta)$, and $(\cos(-\Theta + \pi) = -\cos \Theta, \sin(-\Theta + \pi) = \sin \Theta)$ for the anti-photon. Compare to the relation between an electron and a positron, we note a particular behavior: while $(\cos(\Theta + \pi/4), \sin(\Theta + \pi/4))$ is clearly distinct to $(\cos(-\Theta + \pi/4 + \pi) = -\sin(\Theta + \pi/4), \sin(-\Theta + \pi/4 + \pi) = -\cos(\Theta + \pi/4))$, the photon and the anti-photon share half of their distortion oscillations $(\sin \Theta)$: we infer that a photon and an anti-photon repulse and attract each other within a period of $\Theta$. When an anti-photon meets a photon in a beam splitter $[27], [28]$, we infer that when the anti-photon is not attracted by the photon, the photon is attracted by the anti-photon and vice-versa within the period of $\Theta$, that is why we may infer the stability of the photon/anti-photon couple and its behavior when the couple leaves the beam splitter. In this scope, we infer two entangled photons to be a couple of an anti-photon and a photon, rather than a photon with a spin $0$ and a photon with a spin $\pi$. For a $\pi$-phase shifted photon, we get $(\cos(\Theta + \pi) = -\cos \Theta, \sin(\Theta + \pi) = -\sin \Theta)$, we have to consider the relative movement between the photons: if they travel in the same direction, they appear to repulse each other (same deformation in the direction and so possible synchronization but the deformation on the perpendicular plane is opposite); if they travel toward each other, they repulse (same deformation in the perpendicular plane and so possible synchronization but the deformation in their direction is opposite).

When two supparticles collide, the new supparticles are created with the dynamical energy, not with the energy contained in the mass. Indeed, when we try to destroy a proton, we get the same proton and other supparticles. We infer that the mass of a photon and an anti-photon is not transformed into new supparticles but into the same photon and anti-photon. We may infer that they switch their phase, $0$ and $\pi$.

We may speculate why the time rotated in the same sens for every particles throughout the birth of the universe, which explains that we see no anti-matter in the cosmos. However, this question appears here to be linked to the question why the current time flow stays always in the same direction, why there is no “time-reversal”, why a broken glass does not repair “itself”, although equations may actually allow a time reversal, simply writing “-t” instead of “t”. This problem is still present here, considering that matter would become anti-matter when we “inverse” the time. The only interpretation that we may do is to say that a glass of anti-matter will evolve to its previous state because of matter that will destroy it: broken till it becomes pure energy.

4.21 The speckle
The analysis of the speckle created by a laser beam must be achieved by gradually increasing the distance between the screen and the light source. The trajectory of the photons will be statistically defined by this tomography of the laser beam during its travel. The tiny spots in a speckled pattern are due to local interference of the waves of the photons in the beam.

In a laser beam, the relative speed between the photons and anti-photons (expected to be in equal number) is randomly negative or positive. As they are not all localized on a straight line (the direction of the beam), there is a phase between photons due to distance and the synchronization between the waves induces a transverse movement, that’s why we observe randomly and separate spots in a speckle. We expect that the temperature of the environment (which remains into random coupled waves) to have an impact on the size and shape of these spots, as described in [29].

4.23 The magnetic field

A possible explanation in a magnet is a particular resonance of the waves of its atoms, as described in Fig. 34, with a similar reasoning as in section 4.22. If two magnets are facing a north pole and a south pole, the resulting waves can synchronize a constructive interference between them (stronger than outside because of the size of the magnet and the $1/r^2$ law: a flat magnetic source cannot exist) so it mimics an effect of attraction. The repulsion is not easily explained as for attraction because there cannot be constructive interference anywhere when two same poles are face-to-face. However, in addition to this repulsion, there is also the rotation of the magnets that leads to the constructive interference. Then we recall the note about the classical rotation (section 4.22), that induces an impact on both phases $\varphi$ and $\phi$, that are related also to the direction of movement. Reciprocally, we infer that if we prevent the rotation of the magnets, then their movement are constrained in the way that is observed, which is the repulsion.

**Fig. 34.** In a magnet, the wave behaves as if they propagate in a single direction, from the north to the south pole. In the perpendicular plane, between the north and south poles, the waves interfere with themselves. We conclude that the magnetic field has an operating direction, N-S, as the apparent sens of propagation of the wave.

Because of the effect on electrical charges, we infer that the total spin of the atoms of magnets of the north pole is equal to $\pi/4$ and total spin of the atoms of the south pole is $-\pi/4$ (the reverse?) but it is difficult to infer about $\varphi$. The waves from one pole are stopped by the matter of the magnets and cannot interfere with the waves exiting from the other pole, that’s why we observe a single sens propagating wave in the direction north-south, and interference either.

Neutron has no overall electric charge, but it does have magnetic moment, i.e. behaves like a small magnet.

En effet, la masse d’un proton (938.2 MeV/c²) et d’un neutron (939.5 MeV/c²) étant sensiblement égale et dans le cas où la collision est « frontale » le proton emporte l’intégralité de l’énergie cinétique du neutron. Si la collision n’est pas frontale, le proton et le neutron forment un angle proche de 90° à l’issu de la collision.
We infer the material of a magnet to prevent the propagation of the waves in the magnet, as a superconductor does with the magnetism field of a magnet, which leads the magnetism to appear.

When an electric charge moves, we have to describe the evolution of the waves to understand how a magnetic field is obtained: in Fig. 36, we draw the resulting wave propagation when a positive charge moves (speed $v$) relatively to a negative charge.

The resulted direction of the propagation is then unique, and we do the same job changing the reference, when the negative charge moves (speed $-v$) relative to the positive charge. Because of this symmetry, we conclude that in the reference where the negative charge moves with the opposite speed ($v/2$) of that of the positive charge, we obtain the same behavior that matches the magnetic field description in Fig. 34, as if two magnets were present.

Thus, the electromagnetic theory could be explained as an emergent property of the space-time waves.

As a generality, we say that the constructive space-time distortion accelerates the supparticles, then the acceleration of supparticles distorting the space-time, considering the inducing effect on the frequency of the wave generated by the supparticle due to its increasing speed.

No magnetic monopole in this theory, two particles are needed

**4.24 The neutron**

The neutron has only one spin and is neutral; by symmetry, we may do the hypothesis that the neutron has a $\pi/2$ spin, or more precisely the resulting waves from its quarks has a $\pi/2$ spin. A relation between such a spin and the spin of electrons and protons has to be found, probably using the fact that $\pi/2$ has a privileged position between $-\pi/4$, $\pi/4$, $3\pi/4$ and $-3\pi/4$.

**4.25 Experiment considering the effect of spin**

We choose the experiment described in Fig. 37 and use the fact that two entangled photons have opposite spins.
We use the same arguments as in section 4.15. In the path of the photons, there is a tarpicle or particle traveling backward its relative particle or tarpicle. We infer this ghost to follow the idler or the signal photon. Depending of this consideration and the two Young’s slits experiment (waves are expected in any path and to be emitted since the emission of the photon and the entangled photons), we expect the desired behavior.

![Diagram](image)

*Fig. 37. In this experiment [30] (see also [31]), interference appears to be affected by the information "the photon idler will be detected by detector J or K, rather than G or H." The photons are represented for the case where the photon source takes the lower path.*

If this hypothesis on the spin leads to a possible explanation of an experiment which now apparently implies a “past impact by an event in the future,” we must test the ability of the wave to go faster than the supparticle, closing the path at doors after the first beam splitter and the crystals, to stop the waves in their propagation to the interferometer. We cannot block them completely but, as the photon-supparticle is “slow,” the waves have some time to vanish between the time to close the doors and the time of arrival of the photon in the interferometer. If the waves do not reach the interferometer at the time when the photon signal reaches it, there will be no interference, even if the photon idler reaches a detector at G or H.

### 4.6 A physical wave

We know that the speed of the photon is limited by an unknown phenomenon. The faster the boat, the higher is the wave at point A and if the boat were relativistic, its speed would increase in progressively smaller measures in our reference frame and cannot be higher than a critical speed called “the speed of light” (finite and set to 1). We infer that the height of the wave cannot be greater than a critical height. In the reference of a particle, we normalize its height to 1 and we expect that the height of other particles to be greater or lower than 1. We will have to analyze the height of the wave, its frequency and/or its curvature to determine how the intensity of a wave evolves as a function of the distance from the wave generator.

Because interference fringes are observed with different kind of particles, we apply this reasoning to each known particle, even the photon. The Einstein constant $C=1$ will be defined as the propagation speed of the waves generated by the particle and we will conclude that the particle travels not faster than the waves, even if, in our reference, the speed of the particle and the waves may appear similar. We will try to distinguish the speed of light from the Einstein constant when the photon will have mass, as small as it can be.

We will understand that the immersed volume of the boat hull represents the mass of the particle as its “space-time volume”. As long as it has a volume, the boat displaces water within a wave. If the hull was dimensionless, it could not create any wave. However, we expect that the number of dimensions of oscillation will fit the number of dimensions of the wave. When the boat is at rest, it has an immersed volume and it will induce a resistance when the boat moves. We infer that the height of oscillation of a particle at rest will be perceived as its mass at rest, as long as we consider that the oscillation that is transverse to the movement in a straight direction will necessary prevent the particle to travel at the speed 1 along the straight direction movement and we expect the frequency at rest to be linked to a Lorentz factor. We use the principle of equivalence: in our reference, be an oscillating particle $P_1$; in the reference of $P_1$, the other particles travel with a speed between -1 and 1 (0 and 1 in absolute) in arbitrary directions. In the reference of $P_1$, while its own evolution is constant whatever its speed, the other particles will be seen through an increasing oscillation: in the reference of $P_2$, $P_1$ is seen with a frequency $v_1-v_2$ and its evolution is $(v_2-(v_2+(k,v))) = k.v$ which evolves with $k$. We thus expect that the oscillation of a particle will interfere with the oscillation of the others.
through their relative frequency. In this manner, we will state the relativity result: the faster a particle oscillates \((v^2 + k.\nu)^2\), the faster the time flow relatively increases outside \((k.\nu.t)\).

Thus, as an analogy, the time oscillation will be responsible of the mass (the volume of the boat hull), and the propagation of this oscillation to be responsible of the momentum of the particle (the volume of the wave lifted by the hull). This point of view (which will result in a change of reference or “reference frame” of the time oscillation) is preferred to another (where a “space oscillation” is responsible of the mass) and we expect a similar but switched behavior if we choose the reference of a “space oscillation”.

Saying that the mass increases in such a way, we understand that the mass is a deformation of the space-time tissue, as if the boat hull of a particle gets volume, increasing the height of the considered particle and its wave.

We infer the energy of a particle to correspond to what maintains these wave sources together and we consider now that the space and time circular trajectories are the size of the particle, which has to be determined as a function of energy. In the absence of size, we infer the two wave sources to superpose and, depending on the phase between the sources, we expect a complete annihilation or a creation of a particle, depending on the phase between these sources (\(\pi\) is expected for annihilation as a destructive interference between synchronized signals. 0 would be the result in case of a phase balance).

\[
ds^2 = dt^2 - dr^2
\]
\[
dr = v dt
\]
Thus the time ‘t’ and the absolute time ‘s’ have following relationship: \(dt = ds/rac(1-v^2)\)

How could the oscillation emit a wave?

We cannot consider the “collapse” of the height \(\chi\) of the particle to the height 1 of the wave. A solution is to consider that the vacuum is full of elements with the same inertia \(\chi\) (the inertia of a whole wavefront). The movement of these elements is, as a wave, transverse to the (apparent) movement of the particle. That is an expected result because we cannot consider the vaccum to be empty; the image of water is still valid and desired; a medium is actually desired to explain the existence of “fields”. If we describe supparticles as space-time oscillations, the vaccum or the space-time tissue should be composed with space-time “subparticles”, probably linked together with strings (or waves...). However, the subparticle mass should be at a very low scale, so we are probably very far from any detection of it. Moreover, recall that we only see the space part of the time-space and the constitution of the space-time tissue will keep some mystery with itself for a while. We think the vaccum to be not empty and that we have given here possibly part of its description. Therefore, we consider thus wavefronts with a speed inferior to 1, very near to 1, and a height \(\chi\). If the speed of the supparticles (like photons) is desired equal to 1, we have to speculate that the space-time tissue is not perturbed and no waves are emitted, as if the supparticle could travel between the subparticles, without disturbing them. Such an image is found in the behavior of superconductors where electrons are assumed to slide on the atoms.

Rope

Wave interpretation
The sense of propagation of the waves of two different charges appears to be opposite. The synchronization can be obtained with the movement of the wave sources. There is no destructive or constructive effect outside the supparticles when the constructive effect is between. There is no destructive or constructive effect between the supparticles when the constructive effect is outside.

The de Broglie wavelength of a particle of momentum $p$ is

$$\lambda_s = \frac{h}{p}$$

In quantum particle-wave duality, if the size of an object of momentum $p$ is smaller than its de Broglie wavelength, then quantum wave interference will be measurable enough so that classical physics will fail to be a good description of the object's behavior.

If the height $1$ is chosen and frequency of the wave to stay constant along its propagation, the attenuation of the wave would be necessary seen through its curvature, decreasing as the inverse of the distance in two orthogonal directions, fig:

In the aim at determining the dimensions of a supparticle, we could determinate the total transverse displacement of the subparticles induced by the oscillation of the supparticle.

the rotation of the photon being transmitted by the rotation of the subparticles via this half-wave. In a relativity consideration, we will say that a photon sees another photon at a frequency rotation depending on the two photon frequencies.

As defined here, the substructure of the photon-particle has zero or one dimension, which is the direction of the movement. Added to the dimension of the photon-tarpicle, a photon has two dimensions at the most.

Le moment cinétique est une quantité physique qui caractérise la rotation d’un objet. Sa définition s’écrit comme

$$L=r\times p$$

the compton wavelength, typical range of the electron-photon interaction.

la fonction d’onde de De Broglie s’écrit: $\Psi(x,t)=e^{i(px-Et)/\hbar}$ pas normalisable car $|\Psi(x,t)|^2=1$

“coefficient de superposition” de deux fonctions d’ondes: $\int \psi(x,t)\phi^\ast(x,t)dx$
We define the height of a wavefront as its total inertia, equaling to the inertia of the particle, which is its height or volume (a relativistic tool needs probably to be developed to integrate $\chi \cos \psi$ between $-\pi/2$ and $\pi/2$ as long as the addition of two relativistic speeds $u, v$ is $(u+v)/(1+u\cdot v)$). Because the surface of the wavefront is $1/r^2$ growing, we infer that the inertia at a point on this surface is $\chi \cdot 4\pi r^2/4\pi r^2$ with $r \geq k$, $k$ corresponds to the radius of the volume of the moving supparticle, which is the volume of the space-time deformation induced by the energy of the supparticle, taking into account the size of the supparticle (the “width and depth of the hull”) and its speed. We write $k^2/r^2 = 1/k^2$. This idea comes from the fact that a balloon produces bigger waves than a marble when dropped into water from the same height: the volume displaced transversely by a ball is then displaced longitudinally trough a wave at the speed of the wave. In other terms, a punctual element cannot have the ability to create a wave and the bigger the particle, the greater its height. We probably have to amalgamate the size of its inner circular trajectory and its size. If the size of a supparticle is lower than the distance between subparticle, the supparticle will incure oscillations when the subparticles oscillate enough (more than half the distance between subparticles). If a substructure of space-time between subparticles is assumed, we avoid however its description and we assume here photons with no dimensions when not oscillating as the photon, or with so little dimension that it can travel in the medium between subparticles, as the photon. Only oscillations give them a volume, expected to describe the amount of energy in the supparticle. The usual contradiction is now a bit more tempered: or the photon has more than one dimension and its rotation prevents him to travel at the speed 1, or its dimensions are small enough not to disturb the space-time and to allow traveling at speed 1. To define the mass of a particle, we will consider its rotation ($\psi, \Theta$), occurring the height of the particle, except for the photon whose height is a dirac distribution (if photon is dimensionless; if a quasi-dirac distribution is desired, photons will have small dimensions enough and the height of the photon is a volume occupied between subparticles). This height increases with these rotation speeds and we expect that the particle starts with a height non null. Because of this height, a particle will ever travel lower than the photon. The image ball/marble is still valid, saying that the ball will occur a bigger wave than the marble’s to travel at the same speed.

We jump in the space $(O_x, O_y, O_z)$ and we study the particle $P_1((\alpha_1-\psi \cdot r, \beta_1-\Theta \cdot r), \chi)$. Through this equation, we see now a particle defined for any $r$, as if the particle were as big as the universe. In the current representation, we associate this equation of that a wave propagating in our non rotating reference, and thus the wave oscillates in the time space, while traveling in our space (following the variable $r$). At the surface of a wavefront of the wave, there are three informations: $c_x(r), c_y(r)$ and $c_z(r)$, which is a traveling space-time deformation. In the current representation, we expect interference between the wave and a particle $P_2$ in the reference of $P_1$. For example, if $\Omega=0$ or $\theta=0$ and $\alpha_1=\alpha_2$, $\beta_1=\beta_2$, we expect a constructive interference because (the particles have not been born at the same time) $t_2-t_1 = (r_2-r_1) = 2k\pi/GCD(\psi, \Theta)$. Recall that their birth are not analyzed here.

![Fig. Bohr model. Frequency of electron in different modes.](image)

Be two similar particles $P_1(\alpha_1, \beta_1, \chi)$, and $P_2(\alpha_2, \beta_2, \chi)$ traveling in the directions $(\alpha_1, \beta_1)$ and $(\alpha_2, \beta_2)$ respectively in their reference. In the reference of $P_1$, we write $P_2(\alpha_2+\Omega, \beta_2+\theta, \chi)$. They share the same time and emit a wavefront at the same time $t=0$ that will meet at the same traveled distance $r$. $(h_1x, h_1y, h_1z)$ and $(h_2x, h_2y, h_2z)$ are the height of $Fp_1((\psi, \Theta),(-r), \alpha_1, \beta_1, \chi)$ and $Fp_2((\psi, \Theta),(-r), \alpha_2+\Omega, \beta_2+\theta, \chi)$ respectively. Because they are
relativistic, we get the height \((h_{3x}, h_{3y}, h_{3z})\) of the resulted deformation at the meeting point (the strength from each wavefront of the local deformation is \(\chi/k^2\)):

\[
\begin{align*}
\frac{a}{1+h_{1x}h_{2x}} &= \frac{h_{1x}+h_{2x}}{1+h_{1x}h_{2x}}, \\
\frac{b}{1+h_{1y}h_{2y}} &= \frac{h_{1y}+h_{2y}}{1+h_{1y}h_{2y}}, \\
\frac{c}{1+h_{1z}h_{2z}} &= \frac{h_{1z}+h_{2z}}{1+h_{1z}h_{2z}},
\end{align*}
\]

\[
\begin{align*}
\frac{X}{4\pi r^2} + \frac{X}{4\pi r^2} &= \frac{1}{2\pi} \frac{X}{4\pi r^2},
\end{align*}
\]


\[
c = \frac{2 \cos \left( \frac{(\alpha_1+\alpha_2+\Omega_1)/2)}{r^2+\frac{X^2}{r^2}} \right) \sin \left( \frac{\chi}{r} \right) \cos \left( \frac{\chi}{r} \right)
\]

\[
a = \frac{\sin \left( \frac{\chi}{r} \right) \cos \left( \frac{\chi}{r} \right)}{r^2+\frac{X^2}{r^2}} \sin \left( \frac{\chi}{r} \right) \cos \left( \frac{\chi}{r} \right)
\]

\[
b = \frac{\sin \left( \frac{\chi}{r} \right) \sin \left( \frac{\chi}{r} \right)}{r^2+\frac{X^2}{r^2}} \sin \left( \frac{\chi}{r} \right) \sin \left( \frac{\chi}{r} \right)
\]

\[
\left( h_{3x}, h_{3y}, h_{3z} \right) = \frac{1}{2\pi} \frac{\chi}{r^2+\left( \frac{X}{4\pi r} \right)^2} \cdot \frac{1}{\sqrt{a^2+b^2+c^2}} \cdot (a,b,c)
\]

![Fig. 1. Evolution of a wavefront emitted by P1 and reaching P2. While the wavefront evolves according to the variable \(r\), particle P1 and P2 evolves according to the variable \(t\).](image)

When frontwave Fp1 meets particle P2, the distance traveled to P2 is \(r\). We write the meeting between Fp1 and P2:

\[
c = \frac{\cos \left( \frac{\chi}{r} \right) + r^2 \cos \left( \frac{\chi}{r} \right)}{r^2+\frac{X^2}{r^2}} \cos \left( \frac{\chi}{r} \right)
\]

\[
a = \frac{\sin \left( \frac{\chi}{r} \right) \cos \left( \frac{\chi}{r} \right) + r^2 \sin \left( \frac{\chi}{r} \right) \cos \left( \frac{\chi}{r} \right) \cos \left( \frac{\chi}{r} \right)}{r^2+\frac{X^2}{r^2}} \sin \left( \frac{\chi}{r} \right) \cos \left( \frac{\chi}{r} \right) \cos \left( \frac{\chi}{r} \right)
\]

\[
b = \frac{\sin \left( \frac{\chi}{r} \right) \sin \left( \frac{\chi}{r} \right) + r^2 \sin \left( \frac{\chi}{r} \right) \sin \left( \frac{\chi}{r} \right) \sin \left( \frac{\chi}{r} \right)}{r^2+\frac{X^2}{r^2}} \sin \left( \frac{\chi}{r} \right) \sin \left( \frac{\chi}{r} \right) \sin \left( \frac{\chi}{r} \right)
\]

\[
\chi + r^2 \frac{X}{r^2+\left( \frac{X}{4\pi r} \right)^2} \cdot \frac{1}{\sqrt{a^2+b^2+c^2}} \cdot (a,b,c)
\]

If we consider the size of the particle, we will state that a wavefront intercepts a section of the particle. If \(k\) is the radius of the particle, we will consider the inertia \(k^2\chi/r^2\) of the wavefront in the particle.

Then, we may calculate the resulted phase \((A,B)\):
There are two possibilities to finalize:

Similarly, we will get

The equation of the resulted particle is:

There is another interpretation of the equation of a particle. Rather than considering a wave traveling from a particle to another and interfering depending on the traveled distance and the ratio between the size of the particle and that of the frontwave, we now consider that the whole particle is interfering with a whole time particle. This interpretation should be better because, from the reference of the tarpice, we do not consider an oscillating particle (.), but a wave (.), as if we would consider the entire inertia of the wavefronts. In this interpretation, we do not have to consider the way how the information travels. Particle 1 = \( P_1((\psi, \Theta)_t, (\alpha_1-\psi r_1, \beta_1-\Theta r_1), \chi) \) interferes with Particle 2 = \( P_2((\psi, \Theta)_t, (\alpha_2+\Omega r_2, \beta_2+\Theta r_2), \chi) \) in the reference of \( T \). We forget for a moment the terms \( \psi r_1 \) and \( \Theta r_1 \). We get the resulted particle:

\[
\frac{2\chi}{1+\chi^2} \cdot \frac{1}{\sqrt{(a^2+b^2+c^2)}} (a, b, c)
\]

where

\[
a = \chi \frac{\sin(\alpha_1)\cos(\beta_1) + \sin(\alpha_2+\Omega r_1)\cos(\beta_2+\Theta r_1)}{1+\chi^2\sin(\alpha_1)\cos(\beta_1)\sin(\alpha_2+\Omega_2)\cos(\beta_2+\Theta_1)}
\]

\[
b = \chi \frac{\sin(\alpha_1)\sin(\beta_1) + \sin(\alpha_2+\Omega r_1)\sin(\beta_2+\Theta r_1)}{1+\chi^2\sin(\alpha_1)\sin(\beta_1)\cos(\alpha_2+\Omega_2)\sin(\beta_2+\Theta_1)}
\]

We will get the particle

\( P((\psi, \Theta)_t, (\alpha+\Theta-2\psi r, \beta+\Theta-2\Theta r), 2\chi/(1+\chi^2)) \)

We could finalize with

\( P((\psi, \Theta)_t(t-1), (\alpha+\Omega-\psi r, \beta+\Theta-\Theta r), 2\chi/(1+\chi^2)) \)

or

\( P((\psi, \Theta)_t(t-2), (\alpha+\Omega, \beta+\Theta), 2\chi/(1+\chi^2)) \)

In (), we understand that the space flow is twice faster, which is impossible. The final equation is then () and we conclude that the particle is now rotating following the variable \( r \). Similarly, we will get

\( T_1((\psi, \Theta)_t r, (\gamma+\Omega-2\psi t, \delta+\Theta-2\Theta t), 2\chi/(1+\chi^2)) \)

There is two possibilities to finalize:

\( T_2((\psi, \Theta)_t(t-1), (\gamma+\Omega-\psi t, \delta+\Theta-\Theta t), 2\chi/(1+\chi^2)) \)

\( T_2((\psi, \Theta)_t(t-2), (\gamma+\Omega, \delta+\Theta), 2\chi/(1+\chi^2)) \)

The resulted wave with a phased depending on the phase between the reference of the
We get the following orientation:

\[ \alpha = 0, \text{ whatever the value of } \beta, \text{ corresponds to the direction } Oz, \]
\[ \alpha = \pi/2, \beta = 0 \text{ corresponds to the direction } Ox, \]
\[ \alpha = \pi/2, \beta = \pi/2 \text{ corresponds to the direction } Ox, \]
\[ \alpha = \pi/2, \beta = \pi \text{ corresponds to the direction } -Oy, \]
\[ \alpha = \pi/2, \beta = 3\pi/2 \text{ corresponds to the direction } -Oy, \]
\[ \alpha = \pi, \text{ whatever the value of } \beta, \text{ corresponds to the direction } -Oz, \]

Let us study some cases:

if \( \Omega = \theta = 0 \), \( \alpha_1 = \alpha_2 = \alpha \) and \( \beta_1 = \beta_2 = \beta \), we get the particle

\[ c = \chi \frac{2 \cos(\alpha)}{1 + (\chi \cos(\alpha))^2}, \]
\[ a = \chi \frac{2 \sin(\alpha) \cos(\beta)}{1 + (\chi \sin(\alpha) \cos(\beta))^2}, \]
\[ b = \chi \frac{2 \sin(\alpha) \sin(\beta)}{1 + (\chi \sin(\alpha) \sin(\beta))^2}. \]

if \( \alpha = 0 \), we get

Whatever the value of \( \beta \),
if \( \alpha = 0 \), we get \( 2\alpha = 0 \), the two resulted particles travel in the same initial direction Oz.
if \( \alpha = \pi \), we get \( 2\alpha = 2\pi \), they both travel in the same direction, opposite to the initial direction Oz or -Oz.
if \( \alpha = \pi/2 \), we get \( 2\alpha = \pi \), they change their direction (composed of Ox and Oy) to the direction -Oz. That may appear unexpected because it may contradict the first case. However we have to keep in mind the spherical representation and we understand that we expect a different behavior when the particle travels along the axis of the rotation of the main phase \( \alpha \) or along its “plane of rotation”. In the writing of the equation of the spherical representation, we have to be careful that the phase \( \beta \) has not the same status that of \( \alpha \). We will have to be careful when we rotate a reference or a particle. The question will be asked in the case of reflection.

We have to speculate about the sum of two amplitudes. Does it occur instantly, within the speed of the wave?

énergie cinétique, \( E=12mv2 \)
liée à la vitesse ;
l’énergie potentielle électrostatique, \( E=kQ1Q2/d^2 \)
liée à la distance entre 2 charges électriques ;
l’énergie thermique, \( E=kT \)
liée à l’agitation/l’état microscopique d’un système ;
l’énergie de rayonnement, \( E=\nu \)
liée à la fréquence/pulsation de ce rayonnement ;
l’énergie de masse, \( E=mc2 \)
équation bien connu de la relativité, liée à la masse inerte du système ;
\[ E^2=p^2c^4+m^2c^4 \]
Pour une particule massive, on a \( p=\gamma m v \) où \( 1/\gamma^2=1-v^2/c^2 \) et l’équation se simplifie en \( E=\gamma mc \) ;
photon, on a donc \( m=0 \), et l’équation se simplifie en \( E=pc \). Pour un photon, son énergie d’impulsion est donc égale à son énergie de rayonnement \( E=h\nu/c \), soit \( p=h\nu/c \).

“Toute particule de masse (m) animée d'une vitesse (v) est associée à une onde de longueur \( [\lambda = h/\nu (m. v)] \)” où (v) est une fraction entière de (c)
4.26 Gravitation

Gravitation is known to be a very low attraction field when compared with the other fields. It is difficult to determine how the waves can be generated because mass is considered neutral. We infer that this field should not exist and it is due to a constructive interference on a residual effect of the supparticle-waves that has to be determined. We infer gravitation to be at least part of the compensation of another phenomenon that is necessarily asymmetric.

If we consider the quarks to be responsible of the waves of the proton and allow the waves of electron to interfere constructively with the waves of the proton, we have to expect that the proton not to produce the exact wave needed for an exact constructive interference with the waves of the electron: the mimicking of the waves of the positron, which is supposed to interfere constructively with the waves of the electron, is not exact.

The behavior of the electron when it orbits a positron is not stable and the electron falls finally on the positron. An unknown phenomenon has allowed an association of quarks to produce protons that generates waves that mimic the waves of the positron and this association allows the electron to join this association. The counterpart is that this mimicking could be not perfect and there is thus an asymmetry in the waves generated by protons. We use the term “not perfect” but we could infer that there is somewhere an hamiltonian that is minimal if this asymmetry leads to gravitation as we know. This hamiltonian would take into account the height at rest of photons, quarks, electron and other supparticles. The height of photon is unit (because any kind of phenomenon needs unit) and the others heights are a multiple of it and we expect to obtain relations with prime numbers so that supparticles such quarks with intermediate heights would lead to a bigger asymmetry in the proton. This sounds like a strong hypothesis because we need to suppose that the initial process (that we have to describe through a Hamiltonian) that created these supparticles with precise heights at the beginning of universe should be exceptional. Why not, the universe is exceptional.

Such an asymmetry could be a trail work to understand gravitation. We may do the assumption that the asymmetry leads to excess of time waves producing the known gravity wells in the space-time tissue. An asymmetry leading to an excess of space waves would produce gravity hills. A way to produce anti-gravitation? We need to understand the model of quarks in protons and neutrons and the GBAR experiment will give some clues about this asymmetry. We will infer in the description of anti-matter that their phase is the addition of the phase of the supparticle and \( \pi \), and the rotation \( \Theta \) to be opposite. If the asymmetry results in a phase \( \delta \), the asymmetry in the anti-supparticles will result in a phase \( \pi + \delta \). It may indicate that the anti-supparticle has an opposite asymmetry, relatively to the asymmetry of the supparticles and we may infer that the anti-supparticles induce anti-gravity. In an other consideration, we may say that the phase \( \pi \) and opposite rotation \( \Theta \) that distinguishes supparticles and anti-supparticles induce a switch between the time oscillator and the space oscillator (as if we consider supparticles with both opposite oscillations \( -\psi, -\Theta \)). The asymmetry in an anti-proton will be necessarily opposite to that of the proton. But this phenomenon is too weird and we make the hypothesis that the phase \( \pi \) affects only the wave as a classical phase, and we expect anti-supparticles to induce gravitation as supparticles do. To give a better comprehension, we would state that, because of an excess of phase, part of the time wave of the proton and part of the space wave of the electrons cannot synchronize and become in excess. While closely protons and electrons are already synchronized through the atomic structure, these excesses are perceived by far away protons and electrons. This proposal is put forward because of the similarities with electromagnetism (similar \( 1/r^2 \) attenuation), as if gravitation were a second order of the effect from the waves of atoms, as if electromagnetism were not perfect.

Considering a residual oscillation lost every instant by some kind of supparticles, we infer that a mass curves the space-time tissue without compensation. As a counterpart and as described in Fig. 38, we infer that the space-time is always contracting slightly from the masses, which means that the universe becomes increasingly less flat in high-density zone: a wrinkly sheet occupies less space than an iron sheet. We have compared the distortion of space-time with the energy of the supparticle, to the distortion by gravitation, saying that both do not consume energy. If gravitation is a residual effect of atoms, we infer in fact that gravitation consumes energy at a \( 10^{-35} \) scale and we infer that this distortion increases with time.
Fig. 38. In a), speed dispersion of galaxies is decreasing with time [32]. A possible interpretation is that the dark matter effects increase with time.

In b), the baryon fraction is detected, depending on the rotation speed [33]. A possible interpretation is that near-dwarf galaxies have considerable dark matter. Further spirals and elliptic galaxies have less dark matter and far away galaxies in clusters has even lesser dark matter (confirmed in [34]), confirming the precedent interpretation.

In c), the cosmological blueshift diagram $z_0 - z(t)$ is made with the Hubble diagram ($z(t)$, [35]), taking into account an unknown inner blueshift $z_i$ of the Milky-Way (e.g.: Andromeda has an age similar to the MW and is seen with a “clear” signal because its light is as blueshifted when emitted as reddshifted when entering in our galaxy, within the shift due to the Doppler effect taking in account the relative speed of the galaxies). A possible interpretation is a space-time contraction in galaxies, increasing with time. This curve has to be redrawn if a static universe is desired, and is expected to be linear with time.

Otherwise, we may find some clues in the current knowledge of gravitation and proceed by elimination to find a way where a $10^{-35}$ effect (which is the known ratio between electromagnetism and gravitation) could emerge. As discussed sooner, we should also consider the time at which the waves synchronize to get a constructive interference, and it may be not the same between electrons and protons or between electrons (because of inertia?). We may also consider that electrons and protons are in a discrete space and there cannot be exactly constructive or destructive interference because the wave sources are not at the exact distance from each other. Has a clue to be found in the spherical part of the metrics? We may also consider the size of the proton and the fact that a wave, for example emitted by electrons, that travels through the proton, is not uniform in the proton, and attraction between electrons and protons is thus not ‘pure’ (as in the case of positron/electron) but with the residual effect of gravitation. We may get inspiration in the atomic waves of a magnet, considering that its magnetic field is a result of an asymmetry in atoms, which is exploited in the processing of magnets. A final clue is to state that an atom is not an elementary neutral supparticle, that is why its waves will necessarily induce an effect that we want to assign to gravitation. As a last suggestion, the time frame could be larger or smaller than the space frame at the $10^{-35}$ scale, which would probably induce an imbalance between the related waves.

If the gravitation field is due to a residual oscillation from the oscillation generators, we infer the total gravitation attraction effect is proportional to the height of the wave (as the electromagnetism attraction), that is also related to the inertia (see the section 4.18). That is why we can explain the equality relation between inertial mass and gravitational mass, which is the equivalence principle. This leads to state that a supparticle is more attractive when it has inertia. If not, we have to discover how the supparticles discriminate mass and inertia in their height.

Such a distortion consideration could explain the dark matter effect. Let us consider a finger pushing the surface of the balloon to describe the gravity well of a galaxy using the balloon representation of the universe. This finger can also rotate and stretch this surface and that could explain that galaxies are found to have a more important mass than observed because the space-time tissue all around the galaxies is torn similar to the Lense-Thirring effect on a rotating mass. A torsion of the space-time tissue could be representing an excess of mass. There are some clues of torsion in the study of the magnetic field in galaxies [36], which is currently not explained but through an unclear dynamo theory. While the turbulent field and its intensity may be explained by high-density energy [37] inside the stars, its curve is related to the rotation speed of the galaxy [38]. Therefore, a question is asked: is the rotation responsible of this curve, as in a dynamo theory, or are rotation and curve due to a torsion? As this deformation of the magnetic field is even observed between interacting galaxies, Fig.39, we infer the curve of magnetic field and the rotation speed to be the result of a space-time torsion and this torsion to be linked to the dark matter effect. An explanation could be found considering the time wave excess as the desired asymmetry between the proton and the electron, and the fact that stars are revolving, inducing a phenomenon similar to the magnetism described in the section 4.23, involving the time wave excess and motion of the stars.
Independent of this study, we must conclude that the density of matter increases in galaxies at least apparently, in a universe described by a static balloon where galaxies (clusters) are the “space-time contracting engines.” If you assume that the galaxies are not contracting because of the assumption that there is no contraction but the natural collapse due to gravity, you will measure an excess of mass, which is another way of saying that the density of matter increases in galaxies with time. If you assume that there is no space-time contraction in dense areas, although it exists, a possible conclusion will be to deduce that expansion and dark matter exist, and to say that one cannot exist without the other.

We infer that the space-time distortion incurred by and occurred in galaxies is a spiral distortion because the time delay that separates us increases with the distance between stars and the center of the galaxy and between galaxies. At the very beginning of the universe, the space-time was pristine with no distortion, and we infer that this spiral distortion increases with time.

We must conclude that if another space exists, there is a possible time distortion involving gravity when time is passing. This is the space-time contraction described by the consistent interpretation of Fig. 37. This distortion misleads us to interpret the cosmological redshift that is supposed to be dependent on distance, instead of an astrophysical blueshift that is dependent on time, see Fig. 41 and 42.

In the proposed interpretation, the engine of the universe is not an “expanding low-density zone” engine, but a “contracting high-density zone” engine, working with gravity and time: the first should show similar observations as the second. Consider an expanding balloon on which ants are walking: this current image of our universe is similar to the image of a static balloon on which ants are reducing in size. It suggests that the global expansion could be apparent and in fact due to a local space-time contraction effect.

An idea, coming from the comments of Fig. 21, is to consider simply two identical masses rotating together around their barycentre as in Fig. 40.

We see them as two rotating elements and waves oscillators, mimicking the rotating time space: their waves compensate each other because one is at the low point of the other and vice-versa. It is a destructive interference that mimics the centrifugal force and we infer that the mass “wants” to escape from each other but are linked by the gravitational field.

Waves are expected to travel at the speed of light while a mass travels at a very low speed, and thus the wavelength becomes important. These waves appear similar to gravitational waves. If we adopt this hypothesis, we may estimate the mass of the photons because these waves from GW170817 have reached the LIGO instrument 1.7s before the arrival of the photons on the Fermi satellite. We do the hypothesis that gravitational waves are the space waves, they are alone and do not compensate with any time waves. We infer these space waves to loose their energy while traveling.
In this interpretation, the centrifugal force has nothing to do with the mass of the universe but the fact that the masses are at the low point of the wave created by the other mass. We infer that the Titus-Bode law that sounds like to exhibit a resonance (because we cannot consider an unstable system to exhibit a law), has something to say about this.

If a static universe is desired as described in Fig. 41, we may imagine that the residual waves (those corresponding to the scales lower than $10^{-35}$ and explaining gravitation) are time waves, that we call the “local time fluctuation”, and can interfere constructively and sometimes reach the $10^{-35}$ scale or more. If this interference meets an alone space wave (as gravitational waves), a supparticle may be born. In that way, the universe may be static thanks to this permanent creation; this would means this is an opposite phenomenon of the local contractions, which has an influence on the position of the galaxies, which leads to a probable correction to the natural sponge form of the structure of the universe as if the pure vacuum (the furthest area from galaxies) were pinned to the time reference $t=10^{-35}$ s (or $10^{-43}$ s, depending if we consider the space wave to be in excess, instead of the time wave). A static universe is far-fetched because a question remains of that: is there a process able to produce solitary space waves with frequencies that match to the local time fluctuation? The gravitational waves have an important wavelength but may gather harmonics with themselves because the waves are created by mass composed with atoms. If the “acceleration of low density expansion” (the dark energy) is confirmed, we may conclude there are more and more alone time waves and not enough black hole fusions to create space waves and compensate.

Pattern of an infinite and static universe. Note that the bottom of the well is flat. It would lead the center of the well to be linked to $t=0$. Are central supermassive black holes “time holes”? Recall (Fig. 38, the waves are emitted by the mass, not the barycentre) that the center of a galaxy is the area where there are the fewest waves from revolutionizing mass. The more we are away from the center of the galaxy, the more we occur the waves from revolutionizing mass between us and the center. We infer this differential to be responsible for an increasing Lense-Thirring effect from the center: this is a spiral deformation. Through the definition of the mass done here, we understand that the oscillations in supparticles are increasing in speed, as if the time is going faster and faster in high density areas.

To understand how the expansion model of universe may be wrong, we have to consider how the cosmological redshift evolves, as described in Fig. 42. If a universe with expansion is desired, we should observe difference of redshift measurement when the line of sight is full of matter or full of vacuum. If we look a galaxy in the first case, we should obtain a low redshift because the expansion is slowed down because of matter. In the second case, a galaxy at the same distance should be observed with more redshift. However, the cosmological redshift is known to depend only on the distance, not on the density of matter all through this distance. We infer that the redshift depends on distance through the time, more precisely the time passed in the observed galaxies (the light exiting a distant galaxy is less blueshifted than when exiting a near galaxy). We infer that a better reading of the cosmological redshift has to refer to Fig. 41 where there is no flat space between galaxies. We infer the scaling factor added with hands in the FLRW metric to be a wrong idea. In the past, Occam’s Razor has suggested the
hypothesis of expansion. Now, there are too much incomprehensible phenomenons since this hypothesis that we have to reconsider it, with the previous inferences in relation to the new space-time metric Eq.(5), considering that time has not only one dimension but three. Some tests of the viability of the expansion model may be found in [], where the hypothesis of “tired light” could be combined with the hypothesis of dark matter to be interpreted as a time effect.

Fig. 1. Interpretation of the cosmological redshift. The further a galaxy, the greater its apparent redshift. In this scope, a phenomenon is expected to increase -with time or distance- the curvature of space-time. With time, a galaxy incurs more and more interactions with others in the universe, because interactions travel at a finite speed, from the instant when the particles of the galaxy were born. Because we see the furthest matter at a speed near the speed 1, we conclude that there were no interaction between particles at the birth of our universe. However there is a misconception in this representation because two galaxies are drawn at two different epochs.

(Because of the Einstein or gravitational shift, this idea appears to be wrong. The cosmological redshift cannot be interpreted locally but relatively to a delta of interaction) Evolution of two similar and distant galaxies. The redshift of far away matter is due to the contraction of our local space-time. This contraction is due to the increasing interaction with the universe. The sphere of interaction is growing at the speed of light from us and from every matter in the universe. If the universe is homogeneous, every galaxy incur the same mean increasing interaction, which leads us to conclude that the redshift of an observed galaxy is constant and $dr=\beta$. In this interpretation, a static universe may have an evolution of the cosmological redshift as a function of the distance but not the time. The redshift is an indicator of the interaction density as a function of time: the relative density between two galaxies is ever constant. → to be cleaned

The universe is flat: the upper reference stays at $t=0$

We infer that the less a particle has interactions with another particle, the more this one is seen as a particle traveling at the speed 1 and, in this way, we have to assume that the interaction between two particles decrease with the distance. We expect that this decrease to depend on the evolution of the height, the frequency or the curvature of the sphere of the emission from a distant particle. Accordingly, it appears here that we may get a new interpretation of the cosmological redshift, saying that the further away particles, the less interaction they have with far away particles, the nearer the apparent speed of the far away particles are to 1, till the limits of our observable universe, beyond which particles travel at the speed 1. These ones are part of the CMB, the furthest particles that we ever see. As they have very few interactions with others, we infer that they are being born. This is another clue of the existence of the wave: the interaction between a particle and the others takes time and space.

The later particles that will emerge from the CMB are expected to have a greater speed than the particles that we could see now. We thus infer that these one have then a decreasing
speed, unlike the prediction of the cosmological model that expects to observe the increasing of the speed of far away galaxies because of the (accelerated) expansion.

At the very beginning of our universe, the time space and our space were flat: there were no waves. “No waves” has a mathematical translation: zero. Zero in not an option in a quantified universe, we infer there were tiny fluctuations via an unknown process, which we called a “wave splash” (an imbalance between space and time) everywhere in our flat and infinite universe that creates tiny waves that lead to the tiny elements that we know: electron, photons, quarks... We infer that the CMB (cosmic microwave background) is the result of this former “tiny splash”.

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It may also be the result of supparticles created by the permanent creation; in this case, we have to infer that a gravitational wave has an impact on the CMB, creating supparticles since the emission of such a wave when it meets time waves that emerge from the $10^{-35}$ scale: if we measure two different expansion rates (with the Planck satellite or the supernovae), perhaps the answer has to be found in the “dark energy”, which could be explained by an imbalance between space and time waves. This interpretation needs to explain how such a phenomenon can create a black body radiation. In this scope, a “full option universe” (infinite, born through a tiny splash, then static with local contractions and permanent creation) seems far-fetched but is a possible model of our universe.

Conclusion

As a result, we choose for the supparticle a model that looks like to a toy model which exhibits the substructure of the supparticles, and we allow to do so because nobody knows how to describe precisely what matter is, and everything about a model has to be attempted. Built on relativity considerations, this model leads to definitions about direction of movement, speed, energy, spin, different kind of supparticles, electromagnetism, weak and strong interactions, inertia and mass, time, trough the concept of interference (and resonance) and using three characteristics of supparticles: the height, the rotation speeds and the phases. Moreover, we find some analogies in [41] with the study of the solutions of the Schrödinger equation in the Hydrogene atom, and the representation of the spin of the electron, which seems to match to what is described here. In [42], the proposed solutions have similarities with the solutions to the Dirac equation, except that there are only four components, and there is no mention of any phase (the two solutions are indeed exclusive).

This essay is perhaps a wrong interpretation but invites us to find a model that matches to the behavior of supparticles, to discover what kind of physical waves that we need to replace the mathematical waves used by quantum mechanics. A strong result is that the time may fluctuate. Time reversal is nevertheless studied in thermodynamic considerations [43] and it is no longer till the time where we will consider that this reversal will fluctuate because of the strength of this reversal, and will depend on direction $x$, $y$ and $z$ because we cannot derive the time as a function of time, but necessarily as a function of its direction or as a phase of this direction.

The discussion, which is by now a theory, needs to be verified with the proposed experiments. The proposed ideas and models (about entanglement, proton and neutron, gravitation, dark matter) will next need large improvements to get bridges between them to go further. We have mainly inferred that gravitation to be the result of a tiny asymmetry in the relation between the electron and the proton. When this effect will be clearly understood, we will be able to determine the distortion factors and write the space-time metric relative to gravitation. However, we have to determine the field created by more than one supparticle. The resulting theory is expected to include the general relativity because gravitation is described through the interaction between at least two supparticles.

Finally, some questions are still opened and are mainly linked to questions of origins that had given the precise characteristics of the elementary supparticles in what sounds like a resonant universe that we expect hopefully to be stable. If the contracting high density will finish in a huge black hole, as bis as a new universe, we have to wonder if the story of life will end. If life needs to continue its story, we have to theorize what will happen when we will pass through the horizon because time coordinates are expected to be switched with space coordinates, as interpreted in the current use of the FLRW metric when studied in a black hole.
Can this transition be smooth when a black hole is as big as the universe, which is not exactly the same conclusion in []?

Appendix

Fig. 43. Young's double slits experiment with single photon.

Fig. 44. Bohmian mechanics explanation of Young’s double-slit experiment [3]. The electrons trajectories appear to incur deflection by interference of waves, as in the case of photons.
Fig. 45. Deflection of electron trajectory by interference. https://thequantumphysics.wordpress.com/interpretation-de-l-experience-des-fentes-de-young/

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Characterization of the 1S–2S transition in antihydrogen


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By the way, this is not obvious to find appropriate terms for these elements. I propose spirit for the supparticle, and poesy and music for the wave, tarpicles and particles, because the spirit rays poesy and music at the speed of life. Poesy (which is a “métrique” in French, clearly a time metric) influences the time, and music (with a “métrique” in French, which allows the sounds to be coherent and resonant) fills the space …