SUPPLEMENTARY MATERIAL

Physical phenomena observed during electric discharges into layered Y123 superconducting devices at 77K

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Reproduced Abstract :
Electric discharges of several megawatts were applied, at 77 K, to propelling devices made of Y123 superconducting layers and thin insulating layers. During the discharges, the devices were strongly pushed in the direction opposed to the electron flow. The layered devices were apparently propelled by their emission of a momentum-bearing flux of an unknown nature. This flux weakly accelerated distant irradiated matter and created several physical effects not yet reported. The emitted beam had no electric charge, and traveled through materials without apparent absorption or dispersion, at a speed much greater than 1% the speed of light. The kinetic energy transferred by the propelling momentum of the devices to external masses, were proportional to the square of the electric energy of the discharges. No known effects were found which could explain these phenomena.

Links to Content

Video movies of seven discharges

(One into a metallic conductor, Six into layered emitters)

(Two options)

The movie files sizes are 12.8 Mb in .mov format and 27.3 Mb in .avi format, therefore they take some time to load. These identical movies show seven discharges experiments recorded by the same camera situated at the same distance of three meters from the emitter, but with a different objective field of view.

These two identical movies have a much higher resolution than the one available on the journal website which size is only 3.7 Mb but shows the same events.

The first discharge (2555 Volts - 668 Joules) was done into a false emitter (control) made of a stack of two copper disks of the same size as the other Y123 layered emitters. The metallic conductor stack was also bathing in liquid nitrogen. No “schlack“ sound was heard during this discharge and the horizontal pendulum did not move. The discharge instant was indicated by switching on the bright led on the left side

The next six discharges were done into Y123 layered emitters, bathing in liquid nitrogen. The corresponding discharge voltages were successively 3066, 2555, 2555, 2248, 1995 and 1200 Volts. Therefore, the momentum transferred to the long horizontal pendulum and, through it, to the upper linear alternator, increased as the square of the discharge voltage. A lot of liquid nitrogen was ejected during the most energetic discharges. The “schlack“ sound recorded by the video camera microphone was heard during all discharges.

The compressed format of these movies did not allow seeing the flashes of light emitted at those six discharges instants.

Please click here to load and see the QuickTime Player movie

Please click here to load and see the .avi format movie

SUPPLEMENTARY ANNEX 0

HYPOTHESES ABOUT THE ROLE OF SPECIFIC LAYERED EMITTERS IN OUR EXPERIMENTS

Claude POHER

We propose a first hypothesis : the propelling flux emitted by our specific layered emitters during our experiments is supposed quantized, and we called "*Universons*" those quanta. Therefore we suggest the other following hypotheses, based on the Universons model (See Annex 1), in order to explain the experimental facts we reported.

In this context, the propelling flux appears simply to be an *anisotropic flux of Universons* created by the strong acceleration of electrons inside the emitter.

According to the Universons model, this flux is systematically emitted in the direction of the electrons acceleration, and its intensity is the vectorial sum of the intensities of the fluxes emitted by each individual accelerated electron. This is the inertia phenomenon.

The flux bears a momentum transferred to it by the accelerated electrons inside the emitter during Universons re-emission. This momentum moves up the emitter, because the electrons are tied to it by the strong electromagnetic field of atomic nuclei, and the emitter support is pushed up.

The emitted flux is not absorbed by matter, because the value of the capture time τ of the Universons is quite small (apparently 7.8. 10^{-14} s $\pm$ 10 %.).

The anisotropic flux accelerates irradiated matter, because Universons interact weakly with all particles of matter bearing a mass. So the momentum transferred to matter is anisotropic, and proportional to the number of captured Universons, which is proportional to the mass of matter. Thus, the pushing force is proportional to the mass of matter. This is an acceleration.

The acceleration should theoretically be the same for any kind of matter, and it should also be the same for the electrons of this matter. This is effectively what is observed experimentally.

All the effects we observed experimentally were predicted by the Universons model.

Why is such a specific layered emitter necessary to create the propelling flux ?

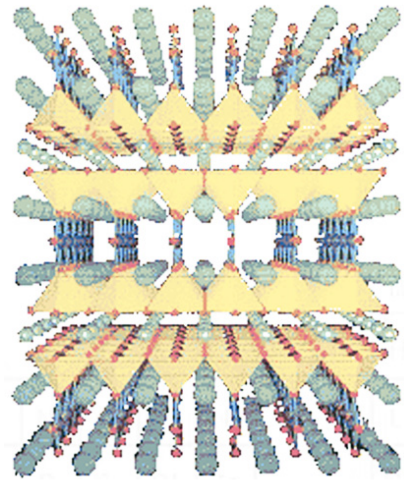
When an electric field is applied to a metallic conductor, free electrons jump from atom to atom, moving relatively slowly towards the positive end of the conductor. During each jump, electrons are submitted to the low average electric field existing inside this conductor, and they are also submitted to the strong electric field of the atomic nuclei. So electrons are successively accelerated and decelerated. Their average speed is constant, and none average macroscopic anisotropic Universons flux is emitted by the electrons in a metallic conductor.

The anisotropic emission exists only when electrons are accelerated.

Therefore, theoretically, a metallic conductor cannot emit an anisotropic Universons flux.

Fig. 1 — *Alignment of atoms inside a superconducting grain, in the superconductive layers. When electrons Cooper's pairs move along the vacuum tunnels, atomic nuclei vibrate perpendicularly to the electrons direction of movement. This is the BCS theory of superconductivity.*

In superconducting films of our layered emitters, about 0.6 % of the grains have their vacuum tunnels aligned along the axis of the external electrical field.



That is experimentally confirmed by our discharges into a false emitter made of a stack of copper discs.

In grains of the superconductive layers of our specific emitter, free electrons move by Cooper's pairs, inside vacuum "tunnels" (Fig. 1). Thus there is a proportion of "useful" longitudinal "vacuum tunnels" inside the superconductive grains, almost aligned along the average electric field.

The theory of high temperature superconductivity is not yet completely clear, however, for our purpose, we are going to use the BCS theory as it seems to explain what we observe.

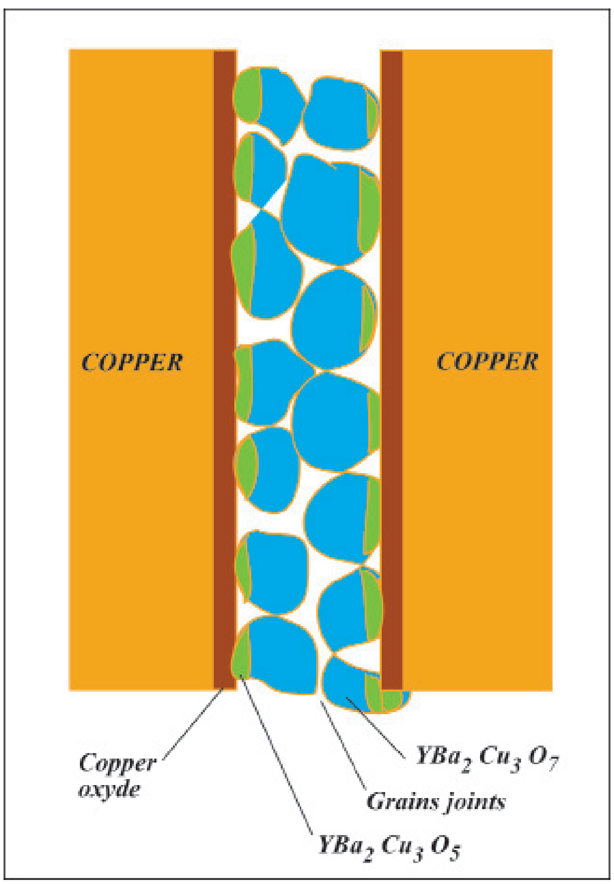


Figure 2 — Cutaway view of the composition of our specific thin films emitters (not to scale)

According to BCS theory of superconduction, the arrival of the first electron attracts the atomic nuclei in a direction perpendicular to the displacement of the electron. Then the second electron is accelerated by the atomic nuclei electric field. There is a quantum exchange of phonons between the two electrons of the Cooper's pair, via crystal lattice vibrations. The result is a nil electric resistance. That phenomenon exists only in superconductors crystals.

Moreover, thanks to the very high value of the charge to mass ratio of electrons (176 billions), there is a very high acceleration of an electron by a modest electric field, in vacuum.

However, *the electric field is nil deep inside a thick superconducting material*. Therefore, a ceramic made of only one superconductor material layer cannot theoretically emit an anisotropic flux of Universons.

That was experimentally confirmed.

In our thin films emitters, there are different materials, with a similar chemical composition and a different electric behaviour. When immersed in liquid nitrogen, the two very thin layers, made of molecules of $YBa_2Cu_3O_5$, are almost insulators, the other thick layers made of $Yba_2Cu_3O_7$ are superconductive. (Fig. 2).

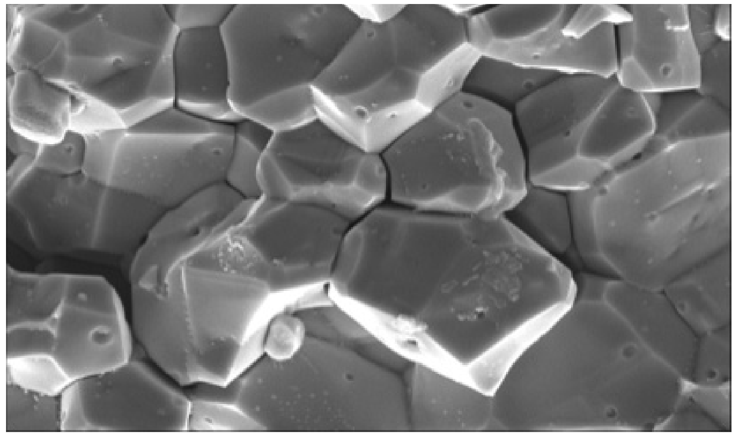


***Fig. 3** — Electron micrograph of the emitter ceramic. Grain joints are irregular and narrow (0.1 to 0.4 microns). Electric field is concentrated at these joints.*
Scale : the two upper central smaller grains have a diameter of about 10 microns.

There are also vacuum joints between the grains of superconductive layers (Figure 3). The strongest electric fields exists at the thin insulating layers and in joints between superconductive grains.

For example, during a 3000 volts discharge, there is an average electric field of about 3.6 millions V/m along a 0.1 micron distance in joints or in insulating layers.

However, this electric field of 3.6 millions V/m ***does no stop abruptly at the layers or joints boundaries, it spreads largely inside the adjacent superconductive grains***.

This fact is crucial. Electrons are accelerated very strongly inside superconductive grains boundaries, close to the insulating layers and close to the joints space, and that acceleration occurs partly inside relatively long vacuum tunnels.

These highly accelerated electrons emit the anisotropic flux of Universons inside the emitter. Moreover, the anisotropic flux is then able to accelerate itself slightly the internal electrons Cooper's pairs in the roughly aligned grains of the superconductive layer of the emitter, without any electric field. There is a small auto-amplification of the emitted flux intensity.

This hypothesis was supported by the experimental emitter radiance diagram.

During a 3000 amperes discharge, where 75 % of the stored energy was flowing in 12 microseconds, electrons moved about 1,2 nm in copper electrodes, and less than 1,2 nm inside the emitter, where the current density was lower. Therefore, the behaviour of electrons, inside the superconducting layers of about 60 microns total width, dominated the macroscopic effect.

Electrons acceleration A by an electric field $E = 3.6.10^{6}$ V/m is given by expression (1) where e is the electron charge and m the electron mass :

$$A = e\,E / m = 6.3\,.\,10^{17}\ m/s^2 \qquad (1)$$

That is a very high acceleration. Moreover, there are $8.7\,.10^{12}$ electrons per square millimeter of the emitters films, in a 3000 amperes current. Therefore even if only 0.6 % of them are accelerated along the aligned vacuum tunnels of the superconducting grains, that creates a quite strong anisotropic flux of Universons.

The flux intensity Φ emitted by a discharge voltage U in a circuit of resistance R is given by expression (2) in the Universons model, where D is the average distance where voltage U is applied, Eu is the energy of one Universon and c is the speed of light :

$$\Phi = U^2\,c / (\,2\,R\,D\,Eu) \qquad (2)$$

This flux, emitted during an average duration of 12 microseconds, should theoretically bear a total momentum P given by expression (3), as each Universon has an Eu / c momentum :

$$P = 12 \,.\, 10^{-6} \; U^2 / (2 R D) \qquad (3)$$

Our experiments confirmed that the auto-propulsive momentum P was effectively proportional to the square of the discharge voltage U, as predicted by expression (3).

Moreover, $12 \,.\, 10^{-6} \; U^2 / R$ is simply the electric energy transferred to the layered emitter during the discharge, so P is proportional to this energy.

And according to (3), the intensity and direction of P should not change when the voltage U is reversed. Those facts were also experimentally confirmed.

Our hypotheses are therefore supported by the phenomenological behaviour of superconducting films emitters during electric discharges.

It is however actually difficult to check the numeric exactitude of expression (3) for several reasons :

(i) — We have not yet been able to confirm experimentally the value of the energy Eu of an Universon because our accelerometers are not yet enough sensitive, and they do not have yet a sufficient bandpass.

(ii) — Distance D, where the electric field is created, varies strongly from place to place inside the layered emitters, and we have actually no way to get statistics about an “average” distance D.

(iii) — Voltage U and resistance R are measured indirectly, far from the emitter itself, during discharges with a very high $\partial I/\partial t$ (> 1 billion amperes per second). So the effect of the low distributed inductance perturbs measurements accuracy of those parameters.

However, by using plausible values for those parameters, we obtained an acceptable confirmation of expressions (2) and (3) in our experiments.

Our point of view is that the Universons model, presented succinctly in Annex I, appears to predict all the experimental phenomena we observed, and much more.

Therefore, this model should be considered benevolently as being the possible skeleton of a more elaborated theoretical model. It should possibly be improved by quantum physicists, but it should not be ignored because its simplicity does not imply it is entirely false.

That model has effectively contributed strongly to the invention and to the improvement of our patented emitters that are clearly able to propel with a demonstrated force of tens of thousands Newtons.

Experimental facts, particularly when they seem astonishing, are the basis of scientific progress, this should always be considered when looking at hypotheses.

SUPPLEMENTARY ANNEX I

THE UNIVERSONS MODEL HYPOTHESES

Claude POHER

We propose the following hypothetical model, based on special Relativity, in order to try explaining the experimental facts we reported here, and particularly the energetic field supposed to exist around our experimental system.

Several authors have proposed, since long, models of gravitation where an isotropic flux of fast moving particles travel in the Universe and interact with matter. The apparently first to have built such a model was Nicolas Fatio de Duillier (1664 - 1753) who was in contact with Isaac NEWTON. This model was formalized later by the Swiss physicist Georges-Louis Lesage in 1758.

However these models are not considered acceptable mostly because the interaction of the moving particles with matter was supposed to be an elastic collision. Effectively, with such a collision, the Inertia principle of Newton would not exist.

Nevertheless we propose here such a model where an isotropic flux of moving quanta named **Universons** is acting, but ***with a new type of interaction with matter particles***.

Effectively, the interaction of our hypothetical quanta named Universons with elementary particles of matter ***cannot be a classical collision***, such as in the Compton effect for example.

A very different kind of interaction should be supposed.

This new type of interaction must be closer to an absorption followed by a re-emission, like the behaviour of photons and atoms in an excitation interaction.

Duillier and Le Sage ignored, in 1758, that interactions of this type do exist in Nature.

The Universons interaction with matter ***MUST be temporary***, with no energy transfer on average.

The Universons may exchange their momentum P with matter, but ***this momentum must be taken back a little later***.

There can be a not nil interaction (or capture) time τ of the Universons by matter, but this capture time must be as small as allowed by the Heisenberg's uncertainty principle.

About the ***travel speed of the Universons***, according to Le Sage's model, it must be as high as possible. But this speed cannot be larger than the speed of light c. As gravitation propagates at the speed of light, according to Einstein's theory, let us choose speed c for the Universons while they do not interact with matter. The speed of the Universons must be c *in all reference frames*.

According to special relativity theory an Universon bears a certain linear momentum P, corresponding to a rest mass energy E such that :

$$P = E / c$$

If the Universon comes to rest when interacting with a particle of matter, its rest mass m should then be equal to :

$$m = E / c^2$$

Evidently, we will have to consider only the interaction of Universons with elementary particles of matter bearing a mass, as such an interaction cannot be considered macroscopically. This imposes that *the rest mass m of each Universon must be much smaller than the rest mass of the less massive known particles of matter*.

We do not named «*Gravitons*» our Universons because there might be confusions with unproven past hypotheses.

Let us summarize the concept of Universons we are going to study :

There is supposed to be an interaction of matter with a flux of Universons existing everywhere in the Universe.

These Universons travel at the speed of light when they do not interact with matter, and they come from all directions of space with the average same intensity.

This means that the natural (cosmological) flux of Universons is supposed isotropic.

Each free (moving) Universon bears a momentum, and this momentum is, on average, the same for all Universons of the natural flux.

Certain Universons interact momentarily with particles of matter bearing a mass.

During this weak interaction, the Universon comes to rest, and transfers its momentum to the particle of matter.

But this is apparently not a stable situation, and after a very short time, the particle of matter spits back out the Universon in accordance with the conservation principles.

QUANTUM PHYSICS ?

A priori, the study of the Universons hypothesis should use the methods of quantum physics where the treatment of electromagnetic and Louis de Broglie's waves is the rule.

That is indeed needed when those waves manifest interference, diffraction, and dispersion. These phenomena exist because the wavelengthes considered in classical quanta physics are always much smaller than the sizes of matter particles.

Here, with the Universons hypothesis, the situation is completely different, because the wavelength associated with a moving Universon is considerably larger than the size of matter particles. This because of the Universon proper energy we determined ($8.58 \,.\, 10^{-21}$ Joule).

This will not be discussed into more detail in this annex. Let us only say that the Nesvizhevsky experiments in Grenoble suggest that the energy associated with one Universon is of the order of 0.05 electronvolt, so the wavelength of the Louis de Broglie's wave associated with an Universon should be of the order of tens of micrometers.

This does not allow interferences, diffractions, or dispersions when Universons interact with particles of matter, characteristic dimensions of which are about ten billion times smaller.

This fact justifies a model limited to the momentum and energy exchanges of the captured Universons with matter, using only special relativity relations.

However, a study of quantum fluctuations associated with the natural flux of Universons, in the frame of Heisenberg uncertainty principle, has confirmed a Louis de Broglie's publication in the late 1960's. We found that the average rest energy E of a captured Universon, and its average capture time τ should be narrowly dependent of the Planck's constant h :

$$E\ \tau = h \qquad (0)$$

RELATIVISTIC NOTATIONS WE USE HERE :

Let us consider two parallel reference frames #1 and #2 (Fig.4). They are classical, with 3 perpendicular axes. Frame #1 is the one of a virtual observer at rest. He looks at the arrival of one incident Universon, from the natural flux. Frame #2 is tied to an elementary particle of matter, of mass M, and speed v in frame #1, along the Ox axis of frame #1. The speed of light c is the Universons speed in the two reference frames. We define the two classical relativistic quantities :

$$\beta = v / c \tag{1}$$

$$\gamma = (1 - v^2 / c^2)^{-1/2} \tag{2}$$

The momentum P of the Universon, or the one of the matter particle, will have subscript 1 or 2, according to the frame from where this momentum is observed. Moreover, this momentum, which is a vector, will be represented by its components along the 3 axes of each frame. So there will be one more subscript, x, y or z in order to show this.
The rest energy of the Universon will be represented by E in each frame, with the corresponding subscript.
The direction of the positive constant speed v of the particle of matter is supposed parallel to the Ox axis of each of the two frames. So, the transformation of the momentum observed in the two frames will use the following Lorentz's relativistic physics relations :

$$P_{x2} = \gamma (P_{x1} - \beta E_1 / c) \tag{3}$$

$$P_{y2} = P_{y1} \tag{4}$$

$$P_{z2} = P_{z1} \tag{5}$$

$$E_2 = \gamma (E_1 - c \beta P_{x1}) \tag{6}$$

The interaction time τ_2 of the Universon, in frame #2, is not the same when observed in frame #1 :

$$\tau_1 = \gamma \tau_2 \tag{7}$$

Moreover, as free Universons travel at constant speed c in the two frames, one can say necessarily :

$$P_1 = E_1 / c \tag{8}$$

The 3 components of the momentum P_1 of the Universon in frame #1 are tied to the incident trajectory of the Universon. Let us suppose that the Universon trajectory is in the xOy plane of frame #1, as shown in Figure 4, with an angle ϕ between the Universon trajectory and the Ox axis, we can write :

$$P_{x1} = (E_1 / c) \cos \phi \tag{9}$$

$$P_{y1} = (E_1 / c) \sin \phi \tag{10}$$

$$P_{z1} = 0 \tag{11}$$

INTERACTION OF THE UNIVERSONS WITH MATTER IN UNIFORM MOVEMENT :

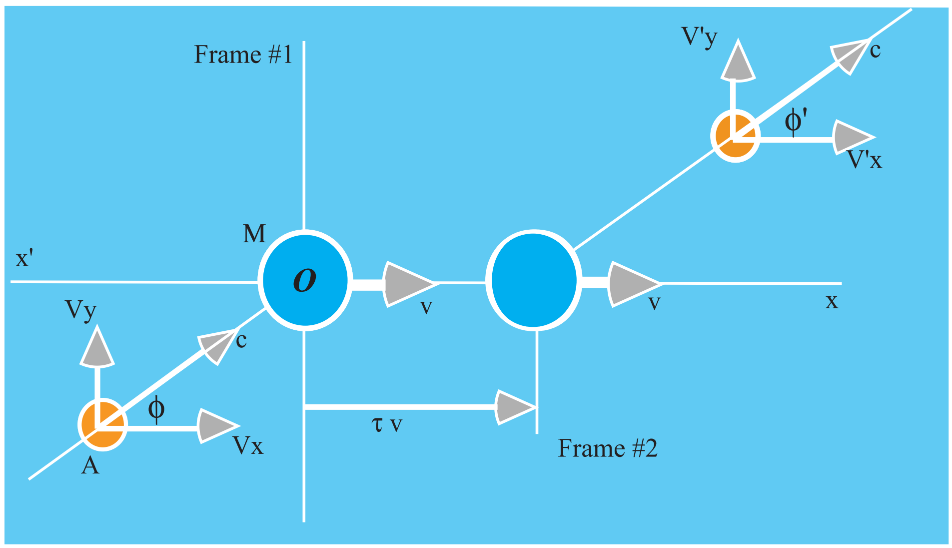
The first verification we need to do is evidently the compatibility of the behaviour of Universons with the Inertia principle.

This means that a constant speed particle of matter should not be perturbed by the existence of an isotropic, natural flux of Universons, interacting with it.

Let us consider the interaction of a single Universon with an elementary particle of matter bearing a mass. As previously, this particle has a constant speed v along axis Ox in frame #1. The particle is at rest in frame #2.

Figure 4 illustrates the situation in an imaginary manner.

Fig 4



The momentum and rest energy of the incident Universon, defined by expressions (8) to (11) in reference frame #1, do not have the same values when observed from the particle, in reference frame #2.

So, the particle of matter interacts with an incoming Universon **A** having different characteristics than the (8) to (11) ones. We have to use transformations (3) to (6) to know the values of the momentum and energy exchanged while the interaction is taking place :

$$P_{x2} = \gamma\{ (E_1 / c) \cos \phi - \beta E_1 / c \} \tag{12}$$

$$P_{y2} = (E_1 / c) \sin \phi \tag{13}$$

$$P_{z2} = 0 \tag{14}$$

$$E_2 = \gamma \{ E_1 - c \beta (E_1 / c) \cos \phi \} \tag{15}$$

Expression (12) can be written :

$$P_{x2} = (\gamma E_1 / c) (\cos \phi - \beta) \tag{16}$$

Expression (15) becomes :

$$E_2 = \gamma E_1 (1 - \beta \cos \phi) \tag{17}$$

At the very moment of the Universon capture by the particle of matter, we can suppose that its energy E_2 is changed into a mass increase m of the particle, in such a way that the relativistic equivalence of mass and energy is satisfied :

$$m = E_2 / c^2 \tag{18}$$

Or :

$$m = (\gamma E_1 / c^2)(1 - \beta \cos \phi) \tag{19}$$

Moreover, the particle of matter receives an increase of its momentum, because the impulses defined by (13), (14) and (16) are transferred to it integrally.

It is interesting to consider what should happen to the particle of matter if it would capture simultaneously another Universon, coming from a direction exactly opposed to the direction of the previous one. In this case we should consider the previous relations, but with an incidence angle $\phi + \pi$ instead of ϕ that would reverse the signs of $\sin\phi$ and of $\cos\phi$. So that for this second Universon we would observe :

$$P_{x2} = (\gamma E_1 / c)\,(- \cos\phi - \beta) \tag{20}$$

$$P_{y2} = -(E_1 / c)\sin\phi \tag{21}$$

$$P_{z2} = 0 \tag{22}$$

$$E_2 = \gamma E_1\,(1 + \beta\cos\phi) \tag{23}$$

$$m = (\gamma E_1 / c^2)(1 + \beta\cos\phi) \tag{24}$$

The momentum transferred to the particle of matter by the two interacting Universons, along axis Oy of reference frame #2, defined by (13) and (21) are opposed and they cancel each other when observed macroscopically. Effectively, the particle interacts with a large number of Universons from an isotropic flux, so there are numerous Universons interacting simultaneously from all the directions of space.

Expressions (17) and (23) tell us the value of the energy transferred to the particle of matter by two Universons with an opposed trajectory. Those energies are not equal.

However, if we consider the effect of these two Universons on the mass increase of the particle while they interact simultaneously, we have to add expressions (19) and (24), and then we get :

$$m_{(19)} + m_{(24)} = 2\gamma E_1 / c^2 \tag{25}$$

We observe that the total mass increase of the particle of matter is exactly the same as if two Universons of the same energy E_1 (the rest energy observed in frame #1), were interacting with the same particle, at rest, in frame #1. This is a curious but important result.

Let us stop for a moment our verification of the inertia principle compatibility, in order to consider the consequences of this fact.

THE PROPER MASS OF A PARTICLE OF MATTER :

Expression (25) demonstrates that the simultaneous capture of two incident Universons, with opposed trajectories, induces a total mass increase of the matter particle, equal, if we ignore the γ factor, to the mass increase induced by any two Universons captured when the particle is at rest. So, for the particle, being at rest or in uniform movement, does not change its mass increase, except by the γ factor, which is precisely a known result of the relativity theory.

Moreover, the interaction of one Universon with a particle of matter has a finite duration, which is a constant time τ_2 in frame #2.

Let us call F_u the intensity of the natural flux of free Universons. This intensity is measured in particular units : Universons per second, per square meter, coming from the 4 π steradians.

Let us call S the « *specific capture cross section* » of Universons by particles of matter. This is not a surface, but « *a surface per kilogram of matter particle mass* ». With these units, an elementary particle of matter of rest mass M_o interacts simultaneously with n Universons, during the capture time τ_2 of one of them :

$$n = \tau_2 S M_o F_u \qquad (26)$$

Each interacting pair of these n Universons, with an opposed trajectory, induces a mass increase of the matter particle given by expression (25).

So, the total mass increase M_2 caused by all the n Universons captured during time τ_2 will be the product of (25) by $n / 2$:

$$M_2 = \tau_2 S M_o F_u \ \gamma E_1 / c^2 \qquad (27)$$

Replacing τ_2 by its value (7), we get :

$$M_2 = \tau_1 S M_o F_u \ E_1 / c^2 \qquad (28)$$

Now, when the capture time τ_1 has elapsed, the first captured Universons are re-emitted, and immediately replaced by new interacting ones. So <u>the total number of permanently captured Universons remains constant</u> and equal to n. Finally, the total mass increase M_2 of the matter particle in reference frame #2 remains constant on average, and evidently it must be equal to the observed, permanent, and constant, rest mass M_o of the particle :

$$M_o = \tau_1 S M_o F_u \ E_1 / c^2 \qquad (29)$$

So, evidently :

$$\boldsymbol{\tau_1 \ S \ F_u \ E_1 / c^2 = 1} \qquad \textbf{\textit{(30)}}$$

Expression (30) is a ***fundamental relation*** of the Universons theory. It ties the parameters of the theory.

We might consider also that, with relation (0), we get another fundamental result :

$$\boldsymbol{S \ F_u = c^2 / h} \qquad (30\ \text{bis})$$

This expression tells us the total number of Universons permanently captured ***by a kilogram*** *of matter, and permanently replaced by new captured ones, as they are re-emitted. This number is gigantic :* $1.36 \, . \, 10^{50}$.

According to (18) & (26), relation (30) has an important signification : the rest mass of an Universon *captures only one Universon* during the capture time (itself).
More than that, from the previous relations, we see that, for matter at rest :

$$M_o = n \ E_1 / c^2 \qquad (31)$$

This means that ***the rest mass of any particle of matter is made of the total energy of the simultaneously captured Universons***.

These captured Universons are continuously replaced after being captured for a very short time.

Effectively, if the capture time τ was quite long, we should have already observed the fluctuations of the mass caused by the not perfect coincidence of capture and re-emission of the pairs of Universons.

This behaviour is only acceptable if the capture time is sufficiently small so as the uncertainty principle be macroscopically respected, concerning the conservation of the energy and momentum of matter and the Universons.

Nevertheless any rest mass M_o of any particle of matter is subject to tinny and very rapid *random fluctuations*. These fluctuations follow the Laplace-Gauss's statistics, as it is the case for all particles phenomena, with the corresponding properties. For example, about 99% of the time, the rest mass of a matter particle fluctuates between $M_o - 3\sigma$ and $M_o + 3\sigma$ with $\sigma = (M_o)^{1/2}$ and a frequency of these fluctuations proportional to n / τ .

Moreover, we have shown that the observed mass M_v of a particle of matter of rest mass M_o observed from reference frame #1, when the particle moves at constant speed v relative to this frame, is, according to relativity theory :

$$M_v = \gamma\, M_o \tag{32}$$

that is simply the result of the capture time transformation between the two frames (7) :

$$\tau_1 = \gamma\, \tau_2 \tag{7}$$

This shows that the theory is correct from the relativistic point of view.

But let us now return to the main verification process of the compatibility of the theory with the inertia principle.

RE-EMISSION OF CAPTURED UNIVERSONS BY THE MATTER PARTICLE IN UNIFORM MOVEMENT :

Now, we are considering a new reference frame #3, which is frame #2 moving at constant speed $-v$ along Ox axis. Evidently, frames #1 and #3 are identical, but this will avoid errors on the subscripts in our calculations.

Each captured Universon is re-emitted at the end of the capture time τ in such a way that the average particle mass remains constant. This means that, in frame #2, energy E_2 must be exchanged between the particle of matter and the re-emitted Universon. Consequently, the momentum defined by (13), (14) and (16) is transferred to the Universon, such that the average macroscopic movement of the particle of matter is not perturbed. Those are the necessary conditions imposed by the inertia principle.

These energy and momentum, transferred to the Universon will be observed from reference frame #3, so that we will be able to compare the characteristics of the incident and re-emitted Universon in the same frame #1. The transformation of these quantities from frame #2 to frame #3 uses expressions (3) to (6), with a reverted sign for β because speed v of frame #3 is negative :

$$P_{x3} = \gamma\,(P_{x2} + \beta E_2 / c) \tag{33}$$

$$P_{y3} = P_{y2} \tag{34}$$

$$P_{z3} = P_{z2} \tag{35}$$

$$E_3 = \gamma\,(E_2 + c\,\beta P_{x2}) \tag{36}$$

Replacing the terms defined by (13), (14) and (16) we obtain :

$$P_{x3} = \gamma\{(\gamma E_1 / c)(\cos\phi - \beta) + \beta\gamma E_1 (1 - \beta\cos\phi) / c\} \tag{37}$$

$$P_{y3} = (E_1 / c)\sin\phi \tag{38}$$

$$P_{z3} = 0 \tag{39}$$

$$E_3 = \gamma\{\gamma E_1 (1 - \beta\cos\phi) + c\,\beta(\gamma E_1 / c)(\cos\phi - \beta)\} \tag{40}$$

Simplifying (37), we get :

$$P_{x3} = (E_1 / c)\cos\phi \tag{41}$$

Simplifying (40) :

$$E_3 = E_1 \tag{42}$$

The trajectory of the re-emitted Universon is defined by a new angle ϕ' :

$$P_{x3} = (E_3 / c) \cos \phi' \tag{43}$$

$$P_{y3} = (E_3 / c) \sin \phi' \tag{44}$$

Considering the meaning of relations (38), (39) and (42) to (44), it becomes evident that :
— On the one hand, *the re-emitted Universon has the same energy as the incident one* in frames #1 and #3 that are strictly identical.
— On the other hand, *the incidence and re-emission angles ϕ et ϕ' are equal, which means that the Universon flux remains isotropic when interacting with matter moving at constant speed.*

We can affirm that the interaction of matter in uniform movement with the natural flux of Universons does not perturb the matter movement, and does not change the isotropy of the Universons flux.

So, we have verified that this Universons theory is not in conflict with the inertia principle.

This is not sufficient to prove that the theory is correct, because there must also be a compatibility of the theory with two more phenomena :

A — On the one hand, the behaviour with accelerated matter (Newton's Inertia law).

B — On the other hand, we should also look at the behaviour when two bodies of matter are acting on each other (Newton's gravitational law).

We will restrict ourselves here to demonstrations of behaviour A which concerns our emitters.

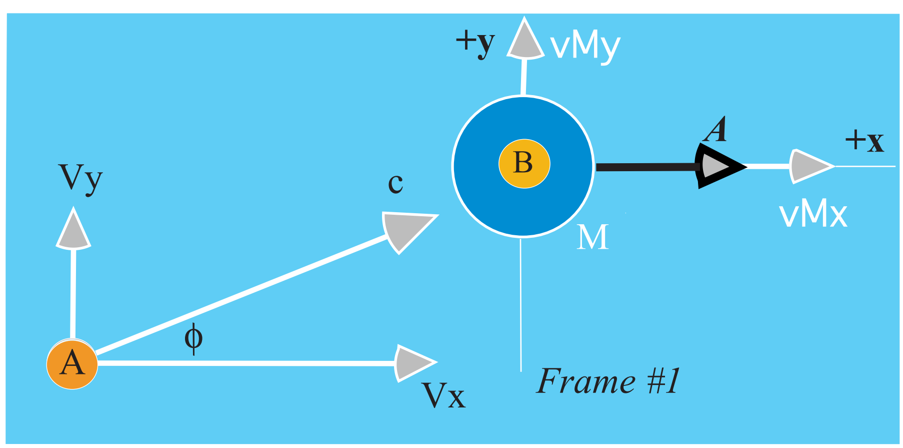
There is one important fact predicted by the Universons theory that must be taken into account for future verifications : *particles of matter are submitted to random fluctuations of their rest mass, and momentum, caused by their permanent interaction with the natural flux of Universons.* Louis de Broglie considered himself that hypothesis during the seventies.

INTERACTION OF UNIVERSONS WITH ACCELERATED MATTER :

Let us consider now the interaction of a single Universon with a particle of matter accelerated along the Ox axis of frame #1. The particle acceleration A is supposed constant, and frame #2, where the matter particle remains at rest, is supposed starting at frame #1 position at the instant of the Universon interaction.

The imaginary figure 5 helps understanding this situation, with the two frames superposed.

Fig. 5



The incident Universon A is captured in B at the start of the frame #2 acceleration with the particle M.

The incident Universon A has the following momentum components in reference frame #1 :

$$P_1 = E_1 / c \tag{45}$$

$$P_{x1} = (E_1 / c) \cos \phi \tag{46}$$

$$P_{y1} = (E_1 / c) \sin \phi \tag{47}$$

$$P_{z1} = 0 \tag{48}$$

When the Universon is captured in position B, its energy E_1 is changed into a mass increase m of the matter particle. In this capture process the relativistic equivalence of mass and energy is satisfied :

$$m = E_1 / c^2 \tag{49}$$

So the particle of matter recoils because the momentum defined by (46), (47) and (48) are integrally transferred to it.

It is interesting to consider what happens with another incident Universon, coming from a direction directly opposed to the direction of the previous one. In this case we should consider an incidence angle equal to $\phi + \pi$ instead of ϕ and this would reverse the signs of $\sin \phi$ and $\cos \phi$. In this case we would get :

$$P_{x1} = - (E_1 / c) \cos \phi \tag{50}$$

$$P_{y1} = - (E_1 / c) \sin \phi \tag{51}$$

$$P_{z1} = 0 \tag{52}$$

$$m = E_1 / c^2 \tag{53}$$

We observe that the momenta of the two Universons with opposed trajectories would compensate exactly so that the particle of matter would not move. This is true for any pair of Universons with opposed trajectories.

It is also interesting to consider what happens when two interacting Universons are simultaneously coming from symmetrical directions relatively to +x. In this case we should consider an incidence angle equal to $-\phi$ instead of ϕ and this would reverse only the sign of $\sin \phi$ and not the one of $\cos \phi$. Then we would get :

$$P_{x1} = (E_1 / c) \cos \phi \tag{54}$$

$$P_{y1} = - (E_1 / c) \sin \phi \tag{55}$$

We observe that the momenta transferred to matter by the two Universons with symmetrical trajectories would compensate exactly in the y direction, but would add in the x direction of the acceleration.

Exactly at the beginning of the capture time τ we suppose that an external cause creates the acceleration A of the particle of matter which begins to move along axis x.

The observer remains in frame #1. Effectively, the Lorentz's equations that we used previously are not adapted to accelerated frames.

So we are going to suppose that the capture time τ of the Universon by the matter particle is observed from this #1 frame.

The whole elementary particle of matter is supposed accelerated by an external cause, from the beginning of time count (time zero). And this is also supposed to be exactly the beginning of the Universon capture.

As soon as it is captured, the Universon disappears, and is changed into a part m of the matter particle mass. And we are going to consider that this mass element m is now the bearer of the energy and of the momentum of the captured Universon.

This is of course a purely pedagogical method for studying the interaction, because nothing distinguishes this mass element from others. This simple method gives correct results and is easy to understand.

Thus, the elementary matter particle mass element m has the following momentum and energy at instant t = 0, when the Universon has just been captured :

$$P_{x1} = (E_1 / c) \cos \phi$$

$$P_{y1} = (E_1 / c) \sin \phi \qquad \text{(previous relations 46 to 49)}$$

$$P_{z1} = 0$$

$$m = E_1 / c^2$$

The total energy E_{m0} of the mass element m is expressed by the following relation at instant zero :

$$E_{m0} = m c^2 \tag{56}$$

Then, during the capture time τ the matter particle and its mass element m are accelerated by an external cause along the x axis of frame #1.

Consequently, their speed increases versus time. And their momentum and kinetic energy increase accordingly.

Now let us consider instant $t = \tau$ in frame # 1, just before the Universon re-emission.

We are now going to look at the previous quantities at the end of capture time τ just ***before*** the Universon is re-emitted. The variables indices 1 become 1τ for clarity.

The matter particle is moving now at speed

$$v = A \tau \tag{57}$$

in frame #1, along the x axis.

In relativistic physics, the momentum P acquired by a matter particle of mass m moving at speed v is given by the expression :

$$P = m \gamma v \tag{57-1}$$

where the parameter γ has the value defined by expression (2). Moreover, according to (2), and (49) and (57) we can write :

$$P = (\beta \gamma) E_1 / c \tag{57-2}$$

The total energy E of this same matter particle is given by the following expression :

$$E = \gamma m c^2 \tag{57-3}$$

And the kinetic energy E_c of this particle is expressed by :

$$E_c = m c^2 (\gamma - 1) \tag{57-4}$$

In those expressions, let us recall that the mass m is the one caused by the Universon capture and defined by expression (49) :

$$m = E_1 / c^2 \tag{49}$$

So, the mass element m of the elementary particle of matter has the following components of its momentum, and the following total energy at the instant $t = \tau$ in frame # 1, just before the Universon re-emission :

$$P_{x1\tau} = (E_1 / c)\,(\cos\phi + \beta\gamma)$$
$$P_{y1\tau} = (E_1 / c)\sin\phi \qquad (58\text{-}1 \text{ to } 58\text{-}4)$$
$$P_{z1\tau} = 0$$
$$E_{m1\tau} = \gamma E_1$$

And exactly after this instant, the Universon is re-emitted and the mass increase m disappears.

But we must not forget that the matter particle captures and re-emits Universons *permanently*. And this is the reason why the matter particle mass remains constant on average. So the mass element m does not simply disappear, it is replaced by another one, created by the capture of another Universon, other mass element which is identical, and which is taking care of the momentum and kinetic energy.

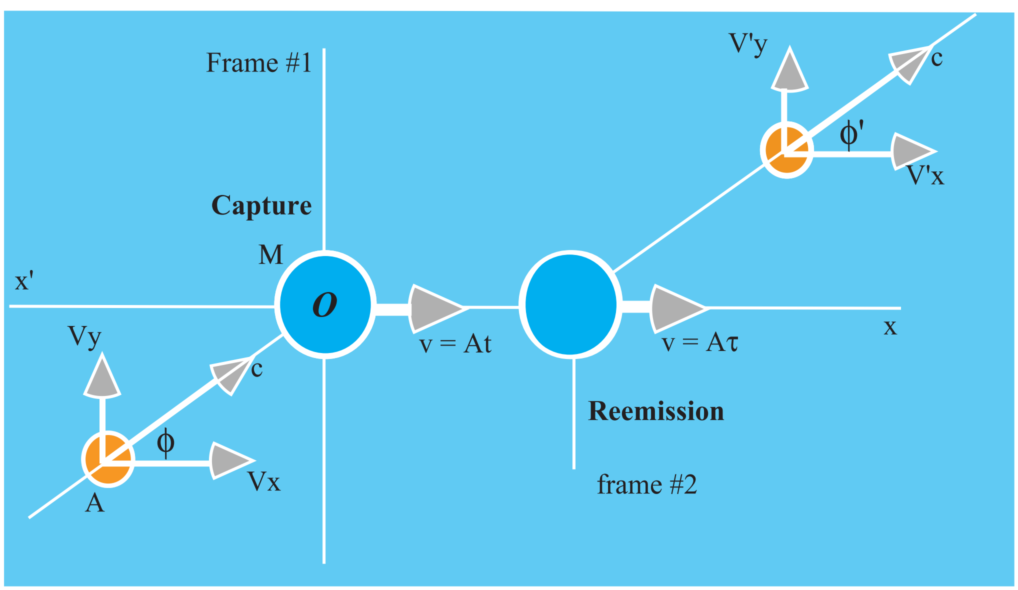
RE-EMISSION OF THE UNIVERSON BY THE ACCELERATED MATTER PARTICLE :

At the end of the capture time, the previously captured Universon recovers its freedom.

We know, by experiments, that the total average mass of the matter particle does not change, and that its average kinetic energy is the one predicted in the absence of interaction with Universons.

The Universon re-emission is represented on Figure 6. The observer remains in frame #1 as previously.

Fig. 6



As the Universon interaction with the matter particle does not change the average mass of matter, and does not change its final kinetic energy, it is essential that the re-emitted Universon energy E_τ be equal to :

$$E_\tau = E_{m1\tau} = \gamma E_1 \qquad (59\text{-}1)$$

The corresponding momentum P_τ is equal to :

$$P_\tau = E_\tau / c = \gamma \, E_1 / c \qquad (59 - 2)$$

Precisely, the Universons re-emission must not be the cause of a supplementary modification of the matter particle speed. This implies necessarily :

$$P_\tau = P_{x\,1\,\tau} = (E_1 / c) \, (\cos \phi + \beta \gamma) \qquad (59 - 3)$$

If we call ϕ' the re-emission angle of the Universon in frame #1, according to figure 31, we know that, by definition :

$$P_\tau = (E_\tau / c) \cos \phi' \qquad (59 - 4)$$

So, with (59 - 1) and (59 - 2) :

$$P_\tau = \gamma \, (E_1 / c) \, \cos \phi' = (E_1 / c) \, (\cos \phi + \beta \gamma) \qquad (59 - 5)$$

Which simplifies the following way :

$$\cos \phi' = (1 / \gamma) \cos \phi + \beta \qquad (59 - 6)$$

However, we know that $\beta = v / c$ with a speed $v = A \, \tau$ (57) which is always extremely small, whatever the value of the acceleration A because the capture time τ is extremely brief. In these conditions, the value of the parameter :

$$\gamma = (1 - v^2 / c^2)^{-1/2} \qquad (2)$$

is always equal to one with an error inferior to 10^{-39} and equation (59 - 6) can be simplified :

$$\cos \phi' = \cos \phi + A \, \tau / c \qquad (59 - 7)$$

The expressions system defining the Universon re-emission conditions becomes :

$$\begin{aligned} P_{x\,1\,\tau} &= (E_1 / c) \cos \phi' \\ P_{y\,1\,\tau} &= (E_1 / c) \sin \phi' \\ P_{z\,1\,\tau} &= 0 \\ E_{m\,1\,\tau} &= E_1 \end{aligned} \qquad (60 - 1 \text{ to } 60 - 4)$$

In frame #2, tied to the accelerated matter particle, the momentum and the kinetic energy of the particle are null.

Consequently, relations (60) represent the characteristics of the re-emitted Universon as seen by the observer situated in frame #1.

Let us examine the direction of the Universon re-emission by comparing the angles ϕ of capture and ϕ' of re-emission, both measured from the axis x in frame #1.

According to definition (59 - 7) let us recall that these angles are tied by expression :

$$\cos \phi' = \cos \phi + A \, \tau / c \qquad (59 - 7)$$

INTERPRETATION OF THESE RESULTS :

Interpretation of relations (59 - 7) and (60) reveals several facts :

1 — The angles of incidence ϕ and of re-emission ϕ' of the Universons are not equal. There exists an ***anisotropy of the re-emitted flux of captured Universons***.

2 — The momentum communicated to the accelerated particle of matter by the Universon interaction ***is, in the direction opposed to the acceleration***, ***different*** than in the acceleration direction.

It suffice effectively to compare expressions (46) and (60 -1) to draw this conclusion.

This explains the inertia effect, and the need to exert a force on matter in order to be able to accelerate it. More calculation about that below.

3 — This difference in capture and re-emission momentum manifests itself the same way in all space around the particle.

The anisotropy of the re-emitted flux of captured Universons, by accelerated matter, concerns all space around the particle of matter. This anisotropy has a revolution symmetry around the acceleration direction.

4 — The compensation of the momentum transferred to matter perpendicularly to the acceleration direction, by the interaction with the Universon flux, does not appear Universon by Universon, but from pairs of captured Universons with opposed or symmetric incident trajectories, according to the acceleration direction.

The conservation of energy, and the one of momentum, are only true at macroscopic scale, on average. The uncertainty principle authorizes this behaviour if the capture time of the Universons' pairs is sufficiently small, which is the case.

5 — Taking into account the fact that, for all practical acceleration values, $A\tau/c \lll 1$ which means that $\gamma = 1$, expression (62) becomes :

$$\cos \phi' = \cos \phi + A\tau/c \qquad (61)$$

Now, let us consider the solid angle Ω' defined by a cone with the half summit angle ϕ' because the interaction is symmetric around the direction of the acceleration. The axis of this cone is the acceleration direction.

When $\phi = \pi$ then, expression (63) can be written :

$$\cos \phi' = -1 + A\tau/c \qquad (62)$$

From definition of solid angle :

$$\Omega' = 2\pi\,(1 - \cos \phi') \qquad (63)$$

With (62) we obtain :

$$\Omega' = 4\pi - 2\pi A\tau / c \qquad (64)$$

This is the full sphere plus the solid angle :

$$\Omega' = -2\pi A\tau / c \qquad (65)$$

In this very small solid angle Ω', <u>situated in the opposite direction of the acceleration</u>, the accelerated particle of matter does not re-emit any captured Universon.

This explains how the re-emitted flux can be anisotropic.

6 — In expression (61), if $\phi = 0$ then :

$$cos\ \phi' = 1 + A\tau/c \tag{66}$$

But, as $A\tau/c$ is positive, this expression is impossible, because the cosine of the re-emission angle cannot be larger than one. Interpretation of this fact is evidently that, *in a very small solid angle :*

$$\Omega = 2\pi A\tau / c \tag{67}$$

Situated in the direction of the acceleration, around $\phi = 0$, ***the accelerated particle of matter does not capture any Universon coming from this solid angle***.

These un-captured Universons continue their trajectory, as if matter was not there. So, in the direction of the acceleration, entirely inside the solid angle Ω, the incident, natural flux of Universons, is not perturbed.

7 — We can write expression (63) the following way :

$$2\pi\ (1 - cos\ \phi') = 2\pi\ (1 - cos\ \phi) - 2\pi\ A\tau / c \tag{68}$$

Or, according to (63) :

$$\Omega' = \Omega - 2\pi A\tau / c \tag{69}$$

This expression shows that for an incident solid angle $\Omega = 4\pi A\tau / c$ the re-emission solid angle is only $\Omega' = 2\pi A\tau / c$ or two times less.

But we already know that, for all Universons coming in the solid angle $\Omega = 2\pi A\tau / c$ there is no capture. This means that they simply continue their trajectory and emerge in the solid angle $\Omega' = 2\pi A\tau/c$;

However in this same emergence solid angle, there are also the Universons re-emitted after capture in the periphery of the incident solid angle $\Omega = 4\pi A\tau/c$.

So the **OUTPUT flux** of Universons, from the accelerated particle of matter, ***in the direction of the acceleration***, and only in the solid angle $\Omega' = 2\pi A\tau/c$ ***is always LARGER, than in the opposite direction***, where the captured Universons are not re-emitted.

So, considering facts #5 and #7 about the anisotropy of the interaction with an accelerated particle of matter, *there are two particular, very small solid angles* $\Omega = 2\pi A\tau/c$, of the same value, to consider. Both solid angles have the same axis, which is the acceleration direction, but *they are opposed by their summit*. One of these two solid angles is opened towards the front, the other one towards the rear.

In the front solid angle, the output flux of Universons is increased. In the rear solid angle, incident Universons are not captured.

CALCULATION OF THE INERTIA FORCE :

According to (59 - 7) expression (60 - 1) can be written :

$$P_{x\,1\,\tau} = (E_1 / c)\ (cos\ \phi + A\ \tau / c\ ) \tag{70}$$

We know that this is the momentum transferred to the particle of matter by the re-emitted Universon, with a negative sign (in the direction —x).

Let us compare this momentum with the one transferred to the particle of matter, in the + x direction, by the captured Universon. It was given by expression (46) :

$$P_{x\,1\,0} = (E_1 / c) \cos \phi \qquad (46)$$

So now, by subtracting directly (46) from (70) we get the total momentum transferred to the matter particle, along the minus direction of the x axis, by the interaction of a single Universon :

$$\Delta P_x = (E_1 / c)\,(A\tau/c) \qquad (71)$$

The residual momentum (71) impedes the acceleration of the matter particle. This fact justifies the inertia effect, and the need to exert an external force in order to accelerate the matter particle.

The elementary force δf that must be applied to the element of mass m of the matter particle, in order to compensate the back momentum delivered by the interaction of a single Universon during time τ must be, in principle, such that :

$$\delta f = \Delta P_x / \tau = E_1 A / c^2 \qquad (72)$$

We are going to verify if this is correct.

In reality, we want to verify that this theory is compatible with the Newton's law of inertia.

So, we have to determine the value of the force, acting on the accelerated particle of matter by the difference in linear momenta induced by the Universons interaction. The particle of matter has a total rest mass M_0.

Let us call F_u the intensity of the natural Universons flux, as previously. This flux is again expressed in Universons per second, in the 4 π steradians.

This incident flux F_u is isotropic, so the partial flux $\delta F(\phi, \psi)$ per steradian, in a direction defined by angles ϕ and ψ is equal to :

$$\delta F(\phi, \psi) = F_u / 4\pi \qquad (73)$$

We will consider incident Universons, coming from direction ϕ, ψ where the angle ϕ is, as previously, measured in the xOy plane, and angle ψ in the yOz plane.

Again, let us call S the specific capture cross section of matter for the Universons interaction. So the flux $\delta F_c(\phi, \psi)$ of the captured Universons, coming in the direction ϕ,ψ is given by :

$$\delta F_c(\phi, \psi) = S\, M_0\, F_u / 4\pi \qquad (74)$$

This flux is expressed in captured Universons per second and per steradian, in the (ϕ, ψ) direction.

The number of Universons $\delta N(\phi, \psi)$ simultaneously captured, from this direction, during the capture time τ of one of them is equal to :

$$\delta N(\phi, \psi) = \tau\, \delta F_c(\phi, \psi) = \tau\, S\, M\, F_u / 4\pi \qquad (75)$$

Each one of these captured Universons transfers, to the particle of matter, when re-emitted, a supplementary momentum, in the direction opposed to the acceleration, which value is given by (71) copied here :

$$\Delta P_x = (E_1 / c)\,(A\tau/c) \qquad (76)$$

For each re-emitted Universon, the elementary force δf exerted on the particle of matter, at the end of time τ is simply equal to $\Delta P_x \,/\, \tau$:

$$\delta f = \Delta P_x \,/\, \tau = A\, E_1 / c^2 \tag{77}$$

So, the $\delta N(\phi, \psi)$ captured Universons during this time τ, coming from the direction (ϕ,ψ) are exerting a total force, which is given by the product : $\delta f \;\; \delta N(\phi, \psi)$.

The total force acting on the particle of matter for all the Universons coming from all the directions of space is obtained by integrating the value of this product in all space. This means that, by varying angle ϕ from 0 to π, and angle ψ from 0 to 2π, we get :

$$\text{Force} = (2/\pi) \int_{\phi=0}^{\phi=\pi} \int_{\psi=0}^{\psi=2\pi} \tau\, S\, M_0\, A\, E_1 F_u \;/\, (4\pi c^2)\;\; \delta\phi \;\; \delta\psi \tag{78}$$

Finally :

$$\text{Force} = \tau\, S\, M_0\, A\, E_1 F_u \;/\, c^2 \tag{79}$$

But, from (30) we already know that :

$$\tau\; S\; F_u \;\; E_1 \,/\, c^2 = 1 \tag{30}$$

So, expression (85) becomes :

$$\mathbf{Force = M_0\, A} \tag{80}$$

That is simply the well known Newton’s inertia law.

So, ***the Universons model is compatible with the Galileo’s Inertia principle AND with the Newton’s inertia law***.

A SIMPLER METHOD FOR THE FORCE DETERMINATION :

We have shown (76) that no Universon is re-emitted in a solid angle $\Omega' = — 2\pi A\tau/c$, opposed to the direction of the acceleration. Macroscopically speaking, this means that incident Universons, coming from the direction opposite to the acceleration direction, into this solid angle, transfer to the particle of matter, a momentum, opposed to the direction of the acceleration, which is not compensated.

Moreover, incident Universons coming in the direction of the acceleration, in a solid angle $\Omega = 2\pi A\tau/c$, which axis is the direction of the acceleration, are not captured. Macroscopically speaking, this means that the re-emitted Universons in the direction of the acceleration direction, into the same solid angle, transfer to the particle of matter, a momentum, opposed to the direction of the acceleration, which is not compensated.

So the solid angle value $\Omega = 2\pi A\tau/c$ *acts two times* on the momentum transferred macroscopically to matter, in the opposite direction of the acceleration.

Expression (75) gives the average number of Universons captured, per steradian, during time τ in the (ϕ, ψ) direction. So the product of expression (82) by **two times** the value of the solid angle $\Omega = 2\pi A\tau \,/\, c$, should be the average number N_Ω of Universons exchanging a momentum in these solid angles :

$$N_\Omega = 2\, \Omega\, \delta N(\phi, \psi) \tag{81}$$

$$N_\Omega = A\tau^2\, S\, M_0\, F_u \,/\, c \tag{82}$$

Each one of these Universons transfers to the particle of matter a momentum E_1 / c and the force is equal to the momentum divided by time duration τ so :

$$\text{Force} = N_\Omega E_1/c\,\tau = A\,\tau\, SE_1 M_0 F_u / c^2 \tag{83}$$

But, from (30) we know that :

$$\tau\, S\, F_u\, E_1 / c^2 = 1 \tag{30}$$

So :

$$\text{Force} = A\, M_0 \tag{84}$$

Which is as correct as (80).

This means that, in order to obtain the force acting on an accelerated particle of matter, it suffices, macroscopically, to determine the number of Universons captured in the solid angle $\Omega=2\pi A\tau/c$, and then to multiply this number by $2\, E_1 / \tau\, c$. And finally, take into account fundamental expression (30).

CONCLUSION OF ANNEX I :

Finally, we have demonstrated that :

A — The ***Universons model is compatible with the Galileo's Inertia principle AND with the Newton's inertia law***.

This is in fact sufficient to explain our experiments with our specific emitters.

However we have also concluded, from *demonstrations not reproduced here* that :

B — The ***Universons theory is also compatible with Newton's gravitation law***.

So we can hope that this model constitutes another possibility to understand these two fundamental natural phenomena.

Particularly because the predictions of this model are also corroborated by a large amount of observations. We are not going to include these long studies in this short publication of experimental results. However, let us summarize our point of view based on facts from these studies :

— The Universons model predicts new facts. And these facts are effectively observed. They are tied to the Universe expansion and to the random fluctuations associated with the Universons flux quantization.

— On the one hand, the Universe expansion introduces a very tinny supplementary constant acceleration Hc that adds to any acceleration in the Universe, whatever the cause of the main acceleration. H is the Hubble constant and c the speed of light.

— On the other hand, the quantization of gravitational acceleration implies random fluctuations, and a particular behaviour at very low acceleration levels is predicted, because of the presence of the acceleration Hc.

— Thanks to these predictions, quite old observation results, unexplained until now, found simple and evident justifications without calling for unobserved dark matter hypothesis.

These are the quasi constant orbital speed of the stars in spiral galaxies, the proper speed of galaxies in clusters, or the observed constant supplementary acceleration Hc of all distant interplanetary spacecrafts.

Evidently, these predictions have also important cosmological consequences, because they wipe out the existence of the dark matter hypothesis, concerning the main constituent of the Universe. Dark matter is replaced by the cosmological Universons flux which is isotropic.

This is, without doubt, one of the most important aspects of the Universons model, enhanced by the reality of its predictions in the experimentation with our specific emitters.

When considering the hypotheses at the root of this model we should think that there exists, everywhere in the Universe, a quantized flux of energy of an extraordinary power. Accelerated matter seems able to extract directly kinetic energy from this flux, and the flux appears to be the cause of the mass of matter in all the Universe.

This is a perspective that surpass quite largely the frame of the tentative done to explain our laboratory experiments with superconducting emitters.

Therefore, quantum physicists should not ignore those facts, and should seriously consider to exert their skills at the improvement of this model.