To Luis y \mathcal{A} ngeles

They will never die, for their hearts remain awake, and we know their name.

The Unified Quantum Wave Formulation and the Relativistic Quantum Mechanical Recalibration

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1. A General Overview

This work, titled *The Unified Quantum Wave Formulation and the Relativistic Quantum Mechanical Recalibration*, is the first of two papers aimed at establishing the principles of **relativistic gravitational or cosmological quantum mechanics**, which is developed in the second paper entitled: *Gravitational or Cosmological Quantum Relativism*.

The second work, for its viable development, has prompted the subtle modifications and changes included in the unified quantum wave formulation and the relativistic quantum mechanical recalibration of this first manuscript. Without these adjustments, it would not be possible to achieve the necessary harmony and balance between relativistic mechanics and wave quantum mechanics required for the development of gravitational or cosmological quantum relativism.

This first paper is fundamental and independent in itself, and of great significance, as it paves the way, simplifies, and lays the foundations for the path toward gravitational quantum relativism.

In this paper, I briefly outline the current landscape of "relativistic mechanical physics" and "wave quantum physics" and argue for the subtle conceptual changes necessary for both disciplines to "couple" in harmony, leading to the development of the fundamental principles of "relativistic quantum mechanical physics" applicable to the gravitational quantum relativism developed in the second manuscript.

Next, I briefly and generally present the structure and content of this first paper:

The Unified Quantum Wave Formulation and the Relativistic Quantum Mechanical Recalibration

2. The Unification of the Formulation of Wave Quantum Theory

As I have mentioned, the research incursion into the field of gravitational quantum relativity leads us to the observation that modifying certain gauges or scales assigned to quantum wave energies and frequencies simplifies relativistic quantum coupling and paves the way for gravitational quantum relativity. Therefore, we have understood that the first step in this powerful development lies in structuring these gauges through the unification of the formulation of wave quantum theory

In a general and far-reaching observation of wave quantum mechanics, the possibility is suggested or intuited of making certain changes that unify or generalize its formulation, regardless of the nature of the waves expressed, providing the coherence, symmetry, and

consistency that should be expected from wave quantum formulation at a logical level, while also paving and simplifying the path toward gravitational quantum relativism.

Wave quantum mechanics arises from the identification of photon particles with electromagnetic waves, proposed by Planck and confirmed by Einstein through the photoelectric effect.

Later, de Broglie extends the wave-particle identity to any material particle in motion, whether they are photons, electrons, protons, tennis balls, planets, or galaxies.

It is not my purpose to go into detail about wave quantum theory, so, as a general summary, I formulate how for the motion of a body, particle, or photon, its electromagnetic or associated wave links its physical quantities to energy.

$$E_c = h.f = c^2.m - c^2.m_0 \qquad h = m.v.\Lambda \qquad => \qquad E_c = m.v.\Lambda.f \qquad => \qquad \Lambda.f = \frac{E_c}{m.v}$$

In this case, the kinetic energy $E_c = h. f$ whether total, at rest, or relativistic, is linked with the frequency f whether total, at rest, or relativistic, through Planck's constant h

And Planck's constant $h = m. v. \Lambda$ according to de Broglie is related to the mass m whether total, at rest, or relativistic, with the relativistic velocity v and the wavelength Λ whether total, at rest, or relativistic, depending on the case of the particle or photon.

Also, and very importantly, is the relation: $f \cdot \Lambda = \frac{E_c}{m.v}$

Furthermore: $E_c = h.f = c^2.m - c^2.m_0$ it is the link or nexus between Einstein's relativistic mechanics and wave quantum mechanics, which I call the wave quantum-mechanical coupling.

Next, we will relate, for a body with relativistic velocity v and mass m, the magnitudes of Einstein's relativistic mechanics with the magnitudes of the wave quantum mechanics of its associated wave, as established by Einstein–de Broglie.

The total energy <i>E</i>	$E = h. f = c^2. m$	$h = m. c. \Lambda$	=>	$\Lambda, f = c$
The relativistic mass m	The total frequency f	The total wavelength ${\it \Lambda}$		
The total rest energy E_0	$E_0 = h.f_0 = c^2.m_0$	$h = m. c. \Lambda_0$	=>	$\Lambda_0, f_0 = c$
The rest mass $m_{ m 0}$	The total rest frequency f_0	The total rest wavelength Λ_0		
The kinetic energy E_c	$E_c = h. f_r$	$h = m. v. \Lambda_r$	=>	$\Lambda_r.f_r = \frac{E_c}{m.v}$
The relativistic mass m	The relativistic frequency f_r	The rela	ativistic	wavelength Λ_{i}

Once the relationships are established, we focus on what we need to observe:

The total energy
$$E$$
 $E = h, f = c^2, m$ $h = m, c, \Lambda => \Lambda, f = c$

The total rest energy E_0 $E_0 = h. f_0 = c^2. m_0$ $h = m. c. \Lambda_0$ => $\Lambda_0, f_0 = c$ The kinetic energy E_c $E_c = h. f_r$ $h = m. v. \Lambda_r$ => $\Lambda_r. f_r = \frac{E_c}{m.v}$

We aim to find a unified formulation for the wave quantum-mechanical relations such as

The total energy E $E = h. f = c^2.m$ $h = m. c. \Lambda$ => $\Lambda, f = c$ The total rest energy E_0 $E_0 = h. f_0 = c^2.m_0$ $h = m. c. \Lambda_0$ => $\Lambda_0, f_0 = c$ The kinetic energy E_c $E_c = h. f_r = v^2.m$ $h = m. v. \Lambda_r$ => $\Lambda_r. f_r = v$

We see that the associated relativistic material wave differs from the desired formalism, as the value of: Λ_r . $f_r = \frac{E_c}{m.v}$ And it should be: Λ_r . $f_r = v$ to unify the formulation.

Moreover, the relativistic kinetic energy E_c just like with the total energy waves, its value should be: $E_c = v^2 \cdot m$ to equalize the formulation identity.

Therefore, we make sure that: $\Lambda_r \cdot f_r = \frac{E_c}{m.v} = v$ Therefore, automatically: $E_c = v^2 \cdot m$

We have deduced the "conjecture for the unified or generalized formulation" of wave quantum mechanics, as well as the unified formulation for energy, since in general:

 f_r . $\Lambda_r = v$ The relativistic velocity of the wave

 $E_c = v^2 \cdot m$ The quantum kinetic energy

Now all waves, whether electromagnetic or material, generally conform to:

The material wave: f_r . $\Lambda_r = v$ The electromagnetic wave: f. $\Lambda = c$

The material wave: $E_c = v^2 \cdot m$ The electromagnetic wave: $E_c = c^2 \cdot m$

The table of the formalized or unified wave quantum-mechanical relations is thus:

The total energy <i>E</i>	$E = h.f = c^2.m$	$h = m. c. \Lambda$	=>	$\Lambda, f = c$
The total rest energy E_0	$E_0 = h. f_0 = c^2. m_0$	$h = m. c. \Lambda_0$	=>	$\Lambda_0, f_0 = c$
The kinetic energy E_c	$E_c = h. f_r = v^2. m$	$h = m. v. \Lambda_r$	=>	$\Lambda_r.f_r=v$

3. Einstein's Wave-Mechanical Quantum Conjecture.

However, what has been stated stands in conflict with Einstein's wave quantum-mechanical conjecture, which defines relativistic kinetic energy as the difference between total energies of systems in relative motion—a notion widely known, but which I nonetheless recall here:

The Einstein conjecture: $E_c = E - E_0 = c^2 \cdot m - c^2 \cdot m_0 *$

The conjecture of unifying formulation: $E_c = v^2 \cdot m$

* We see that both conjectures are incompatible in terms of the mechanical formulation of kinetic energy E_c although only slightly, as if we equalize them, we obtain that:

The relativistic mass
$$m = \frac{m_0}{1 - \frac{v^2}{c^2}}$$
 But we know from relativistic geometry that: $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$

This small difference is fundamental and is what tests the ideas. **

We recall that the total energy of a body in motion E is in the inertial system S while the total rest energy E_0 is in the rest system S_0 and both systems move relative to each other with velocity v. Therefore, subtracting them linearly without any relativistic factor is striking, as other relativistic magnitudes like space, time, velocity, momentum, or force require a relativistic factor due to belonging to different reference frames.

We know that Einstein subtracts the total energies $E - E_0$ linearly and conjectures that this difference is the kinetic energy E_0 from this conjecture he derives relativistic physics between force and energy, which fits very well with few adjustments to the Newtonian concepts of force and kinetic energy, and even leaves them intact in some cases. For this reason, and only for this reason, the conjecture is elevated to the status of a law, and furthermore, the most famous of physical laws.

* For us, the 'wave quantum-mechanical conjecture of Einstein' for the definition of kinetic energy E_c through the linear subtraction of total energies, without the mediation of a relativistic factor \mathcal{A} such as:

$$E_c = E - E_0 = c^2 \cdot m - c^2 \cdot m_0$$

It is not relativistic, just a reasonable approximation. ****** And we propose that:

$$E_c = \frac{E - E_0}{\mathcal{A}} = \frac{c^2 \cdot m - c^2 \cdot m_0}{\mathcal{A}}$$
 The relativistic coupling factor \mathcal{A}

Moreover, we know that general relativity theory clashes with quantum physics, not only due to the determinism of one and the indeterminism of the other, but more so because of the so-called singularities where the values of physical magnitudes become unacceptably infinite, and the physics of the microcosm loses its full meaning. For us, Einstein's conjecture is one of the causes of these serious problems, but not the only one.

Regarding the finiteness of physical magnitudes and the return to sanity, in the second topic, "Gravitational Quantum Relativism," we will discuss the remedies. But here, we begin to pave the way.

The reader should perceive that we have changed the gauge or scale of kinetic energy E_c which now takes its true quantum value $E_c = h$. $f_r = v^2$. m deduced from the unification of the formulation of wave quantum mechanics.

And this brings the need for relevant subtle adjustments of negligible numerical magnitude.

4. The relativistic subtraction of Energy and Frequency and the Relativistic Coupling Factor ${\cal A}$

The problem can be naturally resolved by postulating a new relativistic definition for the subtraction of total energies in motion and at rest between the relativistic systems S and S_0 as well as for the frequencies.

This new postulate, as we have been discussing, relativizes the subtraction of energies and frequencies between systems in the same way it does with any other relativistic magnitude:

The kinetic energy
$$E_c = \frac{E - E_0}{\mathcal{A}} = \frac{c^2 \cdot m - c^2 \cdot m_0}{\mathcal{A}} = \frac{h \cdot f - h \cdot f_0}{\mathcal{A}} = v^2 \cdot m = h \cdot f_r$$

The relativistic coupling factor of quantum mechanics ${\cal A}$

$$E = c^2 \cdot m = h \cdot f$$
 $E_0 = c^2 \cdot m_0 = h \cdot f_0$ $E_c = v^2 \cdot m = h \cdot f_r$

Now, the relativistic kinetic energy E_c the relativistic frequency f_r are truly relativistic as they are mediated by a relativistic–quantum–mechanical factor \mathcal{A} that couples the relativistic mechanical magnitudes with the wave quantum magnitudes.

In this way, the relativistic kinetic energy E_c and the relativistic frequency f_r between the moving and rest systems S and S_0 are also relativistic, and therefore, through the wave quantum relations, quantum mechanics will also be relativistic.

I have called the relativistic factor \mathcal{A} the quantum-mechanical coupling because its value, currently unknown, depends on the relativistic quantum relations and, in fact, ensures that the mechanical energy values of a body or particle match the energy values of the associated wave given by its frequency in the same scale or gauge and in a fully relativistic manner.

The fact of modifying the relativistic kinetic energy gauge E_c to:

$$E_c = v^2 \cdot m = h \cdot f_r$$

Due to the unified formulation of wave quantum mechanics, its value is quantum or absolute and fundamental for gravitational quantum relativism when assigning the reference quantum energy of the orbital velocity of any gravitating particle or body. Without a true quantization of the energy of orbital velocity, the quantization of gravitational relativism is not possible.

5. The Value of the Relativistic Quantum-Mechanical Coupling Factor ${\mathcal A}$

We saw that Einstein's conjecture prevents the possibility of a unified quantum formulation.

However, inspired by the simplicity and harmony of the 'relativistic quantum-formulation unification conjecture,' we have been motivated to reformulate the relativistic subtraction of energies and frequencies by including a relativistic coupling factor \mathcal{A} .

Relativistic Kinetic Energy
$$E_c = \frac{c^2 \cdot m - c^2 \cdot m_0}{\mathcal{A}} = \frac{h \cdot f - h \cdot f_0}{\mathcal{A}} = v^2 \cdot m = h \cdot f_r$$

The value of the relativistic factor \mathcal{A} is calculated, at least within the scope of special relativity, according to the previous expression:

$$\mathcal{A}=rac{c^2.m-c^2.m_0}{v^2.m}$$
 And since: $m_0=m.\sqrt{1-rac{v^2}{c^2}}$ Then:

The relativistic quantum-mechanical coupling factor $\mathcal{A} = \frac{c^2}{v^2} \cdot \left(1 - \sqrt{1 - \frac{v^2}{c^2}}\right)$

The relativistic quantum-mechanical coupling factor \mathcal{A} in "Gravitational Quantum Relativism" is slightly more complicated and is presented in the second paper.

The factor \mathcal{A} serves as the substitute for the "curvature tensor" in Einstein's general relativity, but it is entirely quantum and relativistic, thus providing a measure for the deduced relativistic quantum physics and, as a result, eliminating the singularities inherent to the curvature tensor.

It is worth anticipating that "Gravitational Quantum Relativism" as we develop it, considers "gravity" as the result or direct cause of a fundamental force in itself, otherwise it would not be quantum, and "mediated" by a particle that should be called the graviton, rather than by a curvature of space-time as in Einstein's General Theory of Relativity (GTR). Even so, our "Gravitational Quantum Relativism" extends some of its solutions into the field of imaginary geometry, which opens the door to being considered or interpreted in some of its effects in hyperspace. However, this is not at all its primary purpose, but it is inevitable to make comparisons with such a relevant theory as the GTR. As we have mentioned, there is a parallelism between the relativistic quantum-mechanical coupling factor \mathcal{A} and the curvature tensor of space-time.

The relativistic coupling factor ${\mathcal A}$ serves two purposes:

1st: It serves as a relativistic factor for the relativistic subtraction of total energies or frequencies in motion and at rest $E = c^2$. m = h. f and $E_0 = c^2$. $m_0 = h$. f_0 in the systems S y S_0 and as a consequence relativize particles and waves.

$$E_{c} = \frac{E - E_{0}}{\mathcal{A}} = \frac{c^{2} \cdot m - c^{2} \cdot m_{0}}{\mathcal{A}} = h \cdot \frac{f - f_{0}}{\mathcal{A}} = v^{2} \cdot m = h \cdot f_{r} \qquad \qquad \mathcal{A} = \frac{c^{2}}{v^{2}} \cdot \left(1 - \sqrt{1 - \frac{v^{2}}{c^{2}}}\right)$$

2nd: It establishes the quantum calibration or gauge for kinetic energy E_c and the relativistic frequency f_r in an absolute, not arbitrary, manner, as it now respects the necessary identity in the formulation.

The value of \mathcal{A} is a measured value since for: v = 0 y $\mathcal{A} = 1/2$ And for: v = c y $\mathcal{A} = 1$

We see that the relativistic kinetic energy E_c of the particle or body and the relativistic frequency f_r of the wave at low speeds is twice that assigned by Newton and Einstein, and for speeds close to the speed of light, they remain the same.

This increase in the assignment of value to the relativistic kinetic energy E_c and the relativistic frequency f_r is merely a change in scale, calibration, or gauge with respect to the calibration or

gauge imposed by Newton for reasons, which we deduce to be simplicity, and which Einstein took up when imposing his non-relativistic conjecture on the mentioned energy difference. Let us not forget that Einstein always compares his relativistic kinetic energy E_c with Newton's E_c when Newton's is, as we mentioned, simple, practical, but arbitrary.

Now, with the new gauge, the orbital velocity v_t of a body with mass m will have twice the kinetic energy E_c making it equal and opposite in sign to its potential energy E_p

 $E_c = -E_p \implies E_m = 0$ The circular orbit for $E_c = v_t^2 \cdot m = h \cdot f_r$ The orbital velocity v_t

And the purely gravitational radial fall of the same body with mass m.

 $E_c = -E_p \implies E_m = 0$ The orbital velocity v_r

We see that now both trajectories are quantum mechanically equivalent.

Both trajectories the orbital and the purely gravitational radial fall at the same position \vec{r} have the same velocity $v_t = v_t$ and the same energies: $E_c = -E_p \implies E_m = 0$ so they are quantum mechanically equivalent.

We make this observation, though off-topic, so that the reader keeps in mind the significance of the gauge change, as we can see that it can even quantum-mechanically equate the circular orbit with the purely gravitational radial fall, that is, without initial kinetic energy at $\vec{r} = \infty$. This implies a major unification in cosmological terms of energies and trajectories, and opens the door to quantum cosmology, as we will glimpse in this work.

The value of the calibration is no longer arbitrary and fulfills the purpose of ensuring that the kinetic energy of a body or particle matches the quantum energy of the frequency of its wave, or vice versa, while also raising it on the quantum or absolute scale.

6. The Recalibration or Gauge ${\cal R}$ between the Kinetic Energy E_c and the Force $ec{F}$

The fact of having introduced the relativistic coupling factor \mathcal{A} which has relativized, coupled, and raised the scale or gauge to the relativistic energy and frequency of the wave-particle, requires the classical reformulation between kinetic energy E_c and force \vec{F}

In classical physics and in special relativity, force \vec{F} and kinetic energy E_c are related through the following fundamental relationship:

 $dE_c = \vec{F} \cdot d\vec{r}$

And the force is defined by: $\vec{F} = \frac{d\vec{\rho}}{dt}$ And the momentum $\vec{\rho} = m. \vec{v}$ Then:

$$dE_c = \frac{d\vec{p}}{dt} \cdot d\vec{r} \qquad \text{And as: } \vec{v} = \frac{d\vec{r}}{dt} \qquad \text{Then:}$$
$$dE_c = \vec{v} \cdot d(m, \vec{v}) = v \cdot d(m, v) \quad (1)$$

However, due to the unification in the formulation, we have obtained that:

The kinetic energy $E_c = v^2 \cdot m$ Differentiating $d(v^2 \cdot m)$ we get:

$$dE_c = 2. v.m. dv + v^2. dm = v. (2.m. dv + v. dm) = v. (d(m.v) + m. dv)$$
(2)

Equalizing both identities: (2) and (1) we see that they are different.

$$v.(d(m.v) + m.dv) \neq v.d(m.v)$$

Therefore, assuming that the value of the kinetic energy E_c is its quantum value $E_c = v^2 \cdot m$ we are forced to recalibrate its mechanical definition, maintaining that:

$$dE_c = \vec{F} \cdot d\vec{r}$$

And we recalibrate the force \vec{F} so that it becomes: $\vec{F} = \mathcal{R} \cdot \frac{d\vec{\rho}}{dt}$

This reformulation keeps the angular momentum *L* unchanged, which remains $L = m. v_t. r$ in its classical form, a crucial aspect for quantum cosmology. Therefore:

$$dE_c = \vec{F} \cdot d\vec{r} = \mathcal{R} \cdot \frac{d\vec{\rho}}{dt} \cdot d\vec{r} = \mathcal{R} \cdot \vec{v} \cdot d(m, \vec{v}) = \mathcal{R} \cdot v \cdot d(m, v) = \mathcal{R} \cdot v \cdot (dm, v + m, dv) \quad (3)$$

Now, the new expression for dE_c with the recalibrated force \vec{F} concerning the variation of the momentum $\vec{\rho}$ with respect to dt is compatible with the quantum definition of dE_c as shown by: (3) = (2)

 $\mathcal{R}.v.(dm.v + m.dv) = v.(2.m.dv + v.dm) \implies \mathcal{R}.(dm.v + m.dv) = 2.m.dv + v.dm$

For the force, the recalibration or gauge $\mathcal{R} = \frac{2 \cdot \frac{dv}{v} + \frac{dm}{m}}{\frac{dv}{v} + \frac{dm}{m}}$

It is confirmed that for low speeds $v \le c$ the mass $m \approx m_0 = cte$ and $dm \approx 0$ so the recalibration is: $\mathcal{R} = 2$ as expected, since we have approximately doubled the energy scale. It's as if a newton from before is now called 2 newton but it's only a change in scale, as the values of the acting or felt forces are the same. It's like putting a 2 on the dynamometer where there was once a 1.

The reality and the world remain the same, only our scale of force has increased its calibration \mathcal{R} with respect to $d\vec{\rho} / dt$ and now it is no longer an arbitrary value, but a quantum or absolute one, coupling the relativistic mechanical values with the wave quantum values, thus configuring wave-mechanical quantum theory, capable of structuring the fundamental cosmological quantum theory for gravitational quantum relativism.

Furthermore, within the framework of special relativity:

The relativistic mass
$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$
 The rest mass $m_0 = cte$ Differentiating m we get:

$$\frac{dm}{m} = \frac{\frac{v}{c}\frac{dv}{c}}{1 - \frac{v^2}{c^2}} \qquad \text{Therefore: } \mathcal{R} = \frac{2\cdot\frac{dv}{v} + \frac{dm}{m}}{\frac{dv}{v} + \frac{dm}{m}} = \frac{2\cdot\left(1 - \frac{v^2}{c^2}\right) + \frac{v}{c}}{1 - \frac{v^2}{c^2} + \frac{v}{c}}$$

We see that for special relativity:

The relativistic factor of recalibrated force-momentum $\mathcal{R} = \frac{2 \cdot \left(1 - \frac{v^2}{c^2}\right) + \frac{v}{c}}{1 - \frac{v^2}{c^2} + \frac{v}{c}}$

For low velocities: $v \leq c$ $\mathcal{R} \approx 2$ $dE_c \approx 2. \vec{F}. d\vec{r}$

For high velocities: $v \approx c$ $\mathcal{R} \approx 1$ $dE_c \approx \vec{F}.d\vec{r}$

It can be said that $\mathcal R$ is the *re-calibrator* of the *force-momentum* scale or gauge.

The scope of relativism in the gravitational field ϕ will be addressed later, but generally, everything discussed is extendable to this domain, except for those relationships confined exclusively to the realm of special relativity where there is no field $\phi = 0$ or it is constant, as in circular orbits.

7. Summary and Expectations

The table of wave-mechanical quantum relationships formalized as follows:

Total energy	$E = c^2 \cdot m = h \cdot f$	$h = m. c. \Lambda \implies f$	$f \cdot \Lambda = c$	
Total energy at rest	$E_0 = c^2 \cdot m_0 = h \cdot f_0$	$h = m_0. c. \Lambda_0 \Longrightarrow f$	$\zeta_0. \Lambda_0 = c$	
Relativistic energy	$E_c = v^2 \cdot m = h \cdot f_r$	$h = m. v. \Lambda_r \implies h$	$\Lambda_r \cdot f_r = v$	
Total mass m	Rest mass m_0			
Total frequency <i>f</i>	Rest frequency f_0	Relativistic frequency f_r		
Total wavelength ${\it \Lambda}$	Rest wavelength Λ_0	Relativistic wavelength K_{r}		

The relativistic subtraction of energies:

The kinetic energy
$$E_c = v^2$$
. $m = \frac{E - E_0}{\mathcal{A}} = \frac{c^2 \cdot m - c^2 \cdot m_0}{\mathcal{A}}$

The relativistic subtraction of frequencies:

The relativistic frequency
$$f_r = rac{f - f_0}{\mathcal{A}}$$

The relationship between relativistic mechanical energy and quantum wave energy:

The kinetic energy
$$E_c = \frac{E - E_0}{\mathcal{A}} = \frac{c^2 \cdot m - c^2 \cdot m_0}{\mathcal{A}} = \frac{h \cdot f - h \cdot f_0}{\mathcal{A}} = v^2 \cdot m = h \cdot f_r$$

The relativistic coupling factor of wave-mechanical quantum $\mathcal{A} = \frac{c^2}{v^2} \cdot \left(1 - \sqrt{1 - \frac{v^2}{c^2}}\right)$

The differential of kinetic energy $dE_c = \vec{F} \cdot d\vec{r}$

The relativistic force $\vec{F} = \mathcal{R}. \frac{d(m.\vec{v})}{dt}$

The relativistic factor of recalibrated force-momentum $\mathcal{R} = \frac{2 \cdot \frac{dv}{v} + \frac{dm}{m}}{\frac{dv}{w} + \frac{dm}{m}}$

In the field of special relativity $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$

The relativistic recalibration factor of force-momentum $\mathcal{R} = \frac{2 \cdot \left(1 - \frac{v^2}{c^2}\right) + \frac{v}{c}}{1 - \frac{v^2}{c^2} + \frac{v}{c}}$

These are the starting foundations for the development of *Quantum Gravitational Relativism*, which I will present in the following work.

8. Glimpses of Quantum Cosmology

Quantum cosmology will be addressed within the framework of quantum gravitational relativism, following the necessary groundwork laid by the conceptual path developed in this work:

The unified wave quantum formulation and the relativistic quantum-mechanical recalibration

Without which the coupling between relativistic and quantum magnitudes cannot be ensured, leading to chaos when attempting to harmonize both physical disciplines.

However, we must glimpse or discern the final purpose as a preview of what awaits us in quantum gravitational relativism — or, if preferred, in cosmological quantum theory — now including the microcosm, since in the great fractal, above is as below, and the small reflects the large.

Let the reader consider this chapter — which perhaps should not exist — as a flash, a glimpse, a hint, a fleeting shimmer, or a cosmic perfume that, for an instant, transports them to the majestic realm of cosmological quantum theory, leaving them astonished, unsettled, expectant, and suspended in the ecstasy of a crystalline spark that intuits all, while awaiting the dawn of quantum gravitational relativism.

I have commented on the recalibration or gauge between force \vec{F} and momentum $\vec{\rho}$ emphasizing the need to consider the necessary modification for the force $\vec{F} = \mathcal{R} \cdot \frac{d\vec{\rho}}{dt}$ to conserve angular momentum *L* in its classical form:

The angular momentum or quantum cosmological action $L = m. v_t. r$

I have referred to the angular momentum L as quantum cosmological action because it truly represents this, as its units are those of action: (kg.m²)/s.

The Planck constant also has units of action h = m. v. r

Indeed, it is the minimal possible action; therefore, the angular momentum, seen as cosmological quantum action $L = m. v_t. r$ tells us the number of times the minimal action is contained in the orbital motion of a body — even in its purely gravitational free fall — due to the proposed quantum unification of both trajectories and energies, made possible by the new formulation of quantum or absolute kinetic energy.

$$n^{\underline{o}} = \frac{L}{h} = \frac{m.v_t.r}{m.v_t.\Lambda} = \frac{r}{\Lambda}$$

If we take the cosmological quantum action $L = m. v_t. r$ and manipulate it, we get: $\frac{L}{r} = m. v_t$

Multiplying both sides by the relativistic wavelength Λ of the material wave of the body in circular orbit, we get:

$$\frac{L}{r}$$
. $\Lambda = m$. v_t . Λ And as: $h = m$. v_t . Λ $h =$ Cte. de *Planck* Then: $h = \frac{L}{r}$. Λ
The wavelength $\Lambda = \frac{h}{L}$. r

Additionally, according to the unified formulation of wave quantum mechanics $f \cdot \Lambda = v_t$ Where f is the relativistic frequency of the matter wave of the body in circular orbit, then: The relativistic frequency $f = \frac{v_t}{\Lambda}$ And since the kinetic energy of the matter wave is $E_c = h \cdot f$

Then, as: $\Lambda = \frac{h.r}{L}$ $f = \frac{v_t}{\Lambda}$ and $L = m. v_t. r$

The kinetic energy $E_c = h.f = h.\frac{v_t}{\Lambda} = h.\frac{v_t.L}{h.r} = h.\frac{v_t.m.v_t.r}{h.r} = m.v_t^2$

For the Earth in its orbit around the Sun

 $n^{\underline{o}} = \frac{L}{h} = 4.02.10^{73}$ Minimum action units

The relativistic wavelength ${\it \Lambda}=\,\frac{h.r}{L}=\,3.725.\,10^{-\,66}~m$

The relativistic kinetic energy $E_c = h. f = 5.297. 10^{33} j$

The orbital velocity $v_t = f. \Lambda = 2.978.10^4 m/s$

We see the great conceptual and physical simplicity adopted by cosmological quantum theory. In fact, we believe that the path to future physical unifications and cosmological quantum laws, including quantum gravitational relativism, lies in extreme simplicity rather than in cumulative complexity.

The quantum unification of the orbital velocity v_t and the purely gravitational free fall velocity v_r of a body at the same position \vec{r} with both trajectories having the same energy

 $E_c = -Ep$ Em = 0 Y $v_t = v_r$

It suggests to us that cosmologically, mechanical energy seeks to be zero as much as possible $E_{mU} = 0$ and creates the quantum equivalence of these elementary motions with Em = 0

This leads us to sense the greatest of rational mysteries — the unanswered question of life itself: Where did all this come from that we gaze upon in rapture — the infinity of the barren spaces of overwhelming beauty in the great fractal?. Barren?

The idea that the universal mechanical energy is equal to zero $E_{mU} = 0$ points toward the notion that, when taken to its cosmological stratospheric extreme, by reduction the total mechanical energy of the universe is zero $E_{mU} = 0$

However, the physical quantities derived from $E_{mU} = 0 = E_{cU} + E_{pU}$ create the universe by filling it with space, time, motion and mass, and they fill that mass with life into which consciousness is incorporated.

If that were not the case, the universe would have the same E_{mU} before and after the Big Bang, meaning that energy would be eternal in time, unchanged by the Big Bang or by time itself. However, under the cosmological quantum conceptualization, the universe generates and destroys itself completely with each Big Bang, since its E_{mU} and thus all derived physical quantities — including space and time, mass and energy, life and consciousness — are canceled out and reborn fresh, clean, and new.

If anything is eternal, it is the love of awakened hearts.

9. Connection with other manuscripts by this author and contact information

1. This manuscript partially modifies the recalibration \mathcal{R} of the manuscript "The Relativistic Quantum Mechanical Recalibration and Its Unified Formulation," published at <u>https://zenodo.org/records/15105457</u>.

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