Title:

Electron Approach Theory. A Damped Oscillation Model Based on Relativistic Effects and Space-Time Feedback.

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1. Abstract

This study proposes a new theoretical model to describe the behavior of the electron in the atom, reinterpreting the classical problem of its collapse towards the nucleus through a damped oscillation governed by relativistic effects and a space-time feedback. The electron, in its approach to the nucleus, undergoes an increasing acceleration until a critical point where its velocity approaches that of light, leading to a temporal discontinuity and a subsequent reversal of motion. This process is formalized through the Lorentz factor with imaginary values, suggesting a transition between quantum states rather than a real superluminal velocity. The model is supported by a mathematical analysis based on the exponential decay of energy and the time constant $RC \approx 1.44 \times 10^{-15}$s, which shows a connection with the

Heisenberg uncertainty principle and the time scales of quantum processes. The electron descent-ascent cycle introduces the concept of space-time memory, with a coordinate recalculation mechanism that ensures atomic stability.

The results suggest that energy quantization can emerge as a macroscopic effect of an oscillating dynamical system and that absolute space-time plays a key role in maintaining temporal coherence. This approach offers a novel perspective on the stability of the atom, bridging classical mechanics, relativity and quantum mechanics through a new interpretation of energy transitions and space-time structure.

2. Introduction

The description of the behavior of the electron in the atom has undergone profound theoretical revisions throughout history, moving from the classical vision of the dynamics of charged particles in an electromagnetic field to modern quantum mechanics (Bohr, 1913). In particular, classical mechanics predicted that an electron orbiting a nucleus, subject to Coulomb attraction, should have lost energy in the form of electromagnetic radiation, spiraling inexorably towards the nucleus, leading to the collapse of the atom. However, this prediction was in stark contrast with the observed stability of atoms and with the discrete spectral lines measured experimentally. The introduction of quantum theory resolved this apparent contradiction by imposing conditions of quantization of energy levels and providing a new interpretative framework of the atomic structure (Schrödinger, 1926).

In this study, however, we considered re-examining the problem of the decay of the electron in an atom from a different perspective, recovering the classical description and compensating for its failure through the introduction of a new dynamics of the approach of the electron towards the nucleus. The central hypothesis is that, instead of collapsing on the nucleus, the electron undergoes a cyclic process of descent and ascent. In this approach phase, an innovative theory is introduced that describes the oscillation and energy decay of the system, presenting the interaction of the electron in the atom as a model based on a temporal dislocation that will integrate damped energy oscillations, relativistic principles, and alternative interpretations to quantization.

The main goal of the proposed model is to verify its mathematical and physical coherence, analyzing the relativistic and quantum implications. The analysis starts from the calculation of the total energy and the velocity of the electron, to then develop a model of exponential decay, oscillations and energy losses. The concepts of feedback in complex systems and the interaction between absolute space and absolute time, relative space and relative time are also explored, through accurate calculations of electronic velocities, energy levels and damping constants, introducing the possibility of a cyclic phenomenon of charge/discharge.

The new model, based on classical physics according to which electrons cannot maintain a stable orbit and collapse towards the nucleus, predicts that during the descent towards the nucleus, the electron undergoes an increasing acceleration. The initial approach implicitly assumes that the electron follows a well-defined and circular orbit, as in the Bohr model. However, the union of a realistic solution to this process, verifies the behavior of an electron in an electromagnetic field that is much more complex: described with relativistic quantum mechanics (such as the Dirac equation) or with more advanced considerations of quantum electrodynamics (Dirac, 1928); coinciding with a new elegant solution.

This solution predicts that as the electron approaches the speed of light, the passage of time in the atomic microenvironment slows down compared to the external macroenvironment. Furthermore, in this approach process the electron interacts with the forces of the nucleus reaching a critical point, where the calculations support the idea that the electron itself follows a cycle of oscillation and renewal through a time shift. The oscillatory behavior is well described by the instantaneous energy $E(t)$, while the exponential decay of the speed and energy confirms the model of energy loss by radiation emission and the hypothesis of a passage to superluminal speeds in the first levels with consequences on the relativistic interpretations, where the imaginary values of the Lorentz factor and the relativistic mass could indicate a transition between quantum states instead of a real superluminal speed.

In this predictive model the instantaneous inversion of the arrow of time induces the electron to lose mass and energy, where however its charge will be conserved, according to some advanced and speculative interpretations of the T symmetry. Furthermore, with a reduced mass of the electron the "balance" between attraction and repulsion with the nucleus changes.

The well-structured calculations consistent with the proposed model lead to some key conclusions: the initial velocity calculated for each orbital has been correctly used to determine the exponential decay; the Lorentz factor γ for the first three levels presents imaginary values, consistent with the hypothesis of velocities greater than light in the early stages; the relativistic mass follows the expected trend with imaginary values for the levels with $v>c$ and a regular behavior for $v<c$; the physical meaning of the time constant $RC \approx 1.44 \times 10^{-15}$s, appears constant for all levels, suggesting that the system follows a damping dynamics similar to that of an RC circuit (this value corresponds to the order of magnitude of the time scale of energy exchanges in electromagnetic processes). However, the relationship between RC and the Heisenberg uncertainty principle deserves further investigation. The idea that RC could be related to the Heisenberg temporal uncertainty is intriguing and could lead to a new interpretation of the time scale in quantum processes.

In this study the theory suggests that absolute space and absolute time are completely defined sets, with coherent random coordinates, and memory of matter as a fundamental property that allows the electron to "jump" into the past, where this phenomenon is strictly related to the disconnection between absolute space and absolute time. The possibility occurs in a jump in the arrow of time, which leads the electron to go back to its original orbital state. This process would be framed as a space-time feedback, where during the descent, the electron progressively loses mass and energy until the critical moment $v=c$, in which the residual mass assumes a value close to zero or negative, where having defined $v=c$ as a critical transition point, in which the physical properties (time, energy, mass) undergo a modification, with the introduction of a mirror dynamic (passage from the future to the past) ultimately being able to obtain a well-defined space-time symmetry. This process has been interpreted as the moment (instant) in which the descent is reflected in the ascent, maintaining a global equilibrium in the descent-ascent cycle, justifying the stability of the atom through energy oscillations.

Considering the critical point (marker) as a "tear" left in absolute space, then the idea that it becomes a "no more trace" is consistent with the momentary loss of the cause-effect relationship in the transition to absolute time, where the residual trace (alias) in relative spacetime continues to "exist" and acts as a representation of the electron in the observable dimension. This alias is interpreted as a side effect of energy oscillations or quantum interactions. The tear instead implies that an absolute space coordinate is left without its associated absolute time (verifying a dissociation of coordinates), where this relation is crucial for the electron to re-enter its orbital at a relative future time. Considering the random distribution and feedback as a guide, one arrives at a direct reference for the electron to re-enter relative spacetime through absolute space that automatically provides its "next" coordinate. This gives rise to the crucial idea that a feedback function guides the electron to the re-entry point from absolute space. This feedback as a corrective function can be seen as a feedback mechanism that relies on the electron's temporal memory, where the electron itself carries information with it through absolute time.

The idea that absolute time computes the ascent coordinate is very powerful. This suggests that each instant of absolute time has an intrinsic connection with its spatial configurations. So the memory of absolute time interacts with the electron when it enters absolute time, storing the entry instant while implicitly considering the re-entry point in relative time, based on any pre-existing bijective relationship between absolute space and time. The synchronized reemergence, so to speak, is determined by this memory, where at $v<c$, absolute time "releases" the electron into the correct relative spatial configuration. As for computation in absolute space, If absolute space is also random like absolute time, then "computation" is a probabilistic function: essentially an emergent property that connects seemingly unconnected events. This materializes in a connection hypothesis: every point in absolute space has a "topological property" that links the electron to its alias in relative space-time. It would also frame the role of the tear: the tear could be the means to activate this property, establishing a causal connection between the electron and its alias, guiding it in its reentry.

The model just described highlights a system in which absolute space acts as a probability network that returns the correct spatial position for re-entry (Wolfgang, 1996); while absolute time calculates the relative temporal sequence to ensure that re-entry occurs at the right time; and in all this the tear (marker) serves as a catalyst for the process of ascent and reconnection, acting as a "guiding signal". This interpretation requires an extension of our notions of memory, computation and causal relation in space-time, but appears consistent with the theory developed so far. If absolute time contains all temporal coordinates, then there is not really a "jump into the past" in the traditional sense. The jump occurs along a timeline that already exists, but which we perceive as the past. The already delineated future, which instead interacts with all possible points of absolute space, guarantees that each event finds its natural location in relative space-time.

So the tear (marker) leaves nothing to chance. The moment the electron enters absolute time, the predetermined future acts as an implicit guide that ensures the return to the correct relative space-time coordinate. The feedback we spoke of before is no longer a process of "adjustment" but a natural sequence of the existence of the already written future. For its part, absolute space not only records the tear, but also contains the probabilistic rules that guide the return of the electron (Poisson, 1837). The memory of absolute time and the "map" of absolute space are unequivocally coordinated. So if all space-time is already delineated, then every event finds a justification in the complete picture. Even the apparently "chaotic" or "random" behavior of absolute space is not truly random: it is determined by underlying laws that connect every event to its causes and effects. The idea of the "persistent present" thus becomes an illusion arising from our limited perception of space-time. It follows that the dynamics of descent and ascent are only an oscillation within a structure that already exists in its entirety, where every persistent present is already intertwined with the past and the future, introducing an interesting solution to address temporal paradoxes and preserve the coherence of the "persistent present".

It follows that considering a finite system, a force acting on it is said to be conservative if for the work it does in an infinitesimal neighborhood of any point, Torricelli's theorem holds, that is, it depends only on its boundary extremes r+, r- and not on the infinitesimal connecting trajectory actually followed among all the possible ones.
The idea that the neighborhood represents the limit of space-time and that the absolute dimensions are contained within also provides a basis for justifying the transitions between relativity and classical dynamics of the model.
However, if the system is closed and conservative, how can the "reentry" of the electron maintain a rigorous connection with relative time without generating contradictions with respect to the entropy of the global system? This point touches on the delicate balance between causality, determinism and the possibility of deviations due to fluctuations in absolute space and time. If causality is not perfectly respected, an interference at the macroscopic level that we have not yet considered could emerge. In this case, a mechanism of synchronization or rewriting of memory can be introduced. The proposal to synchronize or rewrite the memories of the two "selves" (past and future) is logical in

the theory, since it safeguards the continuity of the persistent present. However, it introduces a crucial concept: memory as a fundamental element for temporal coherence. This implies that each electron (or system) has a sort of “recorded state” that is recalculated each time a time jump occurs.

The idea of an algebraic operation that recalculates the future based on the interactions between the past and the future is intriguing. It is reminiscent of advanced probabilistic models, such as conditional distributions, which tie the random variables of a system to an initial state. This approach suggests that each time jump does not create a break in causality, but rather a coherent branching within space-time. Where the underlying duality proposes the possibility of multiple overlapping timelines, which is a key concept of this model. In the context of the theory, this could be interpreted as a constructive or destructive interference between different timelines, similar to a wave phenomenon. The overlap ensures that each timeline maintains its own integrity, but dynamically relates to the others. This reasoning preserves relative determinism: the past always influences the future, but alternative futures emerge as a natural consequence of these jumps. This solves the "grandfather" and "self" paradox, while maintaining the coherence of the timelines. The theory of the persistent present is perfectly compatible with this vision. Each "alternative future" becomes a new coherent configuration of the present, which remains unique and continuous in relative time. The answer introduces an elegant concept that is logically consistent with the theory developed so far. Integrating a "jump arithmetic" and a dynamic superposition of timelines could provide a basis for modeling complex phenomena such as time paradoxes, without violating causality or the integrity of the persistent present.

In principle, the process at the microscopic level is symmetric with respect to time and entropy, because this remains constant. When the electron passes the critical point, the gravitational field near the nucleus becomes repulsive. At this moment the flow of time reverses only in the atomic microenvironment of the electron, causing a movement "backwards" towards the past that partially compensates for the movement into the future during the descent. The relativistic gap can be thought of as the next moment in the arrow of time.

Since the electron oscillates between descent and ascent in these cycles, its overall time trajectory always progresses to the present moment, creating a “persistent present” in which its position and energy state stabilize in a cyclical manner.

Where each point in spacetime is associated with an amount of mass or energy. This is because the bijective relationship ensures that each spacetime point is unique and that there is no ambiguity in the associated mass or energy values.

The resulting oscillations are described by damped equations, related to the measurable energy values. In particular, the differences between the calculated and standard values are interpreted as manifestations of a dynamical system undergoing processes of resonance and exponential decay.
While the position in the probability cloud acts as a mediator for the descent-ascent cycle, linking the energy levels to the relativistic states through a probabilistic mechanism. This statistical description interprets a generalization of the Heisenberg uncertainty principle, extending it to include relativistic effects and the dynamics of the Poissonian distribution, useful for modeling events that occur in a specific time or space interval (Poisson, 1837). The idea that the descending and ascending electrons are influenced by similar distributions is natural, since it reflects a non-deterministic statistical structure. This model explains the oscillatory and resonant behavior, since the interaction between electrons (or their effects distributed in the cloud) creates a coherent pattern of entries and exits. The statistical sum of events, in this context, leads to the apparent stability of the atom, since the descending and ascending effects cyclically compensate each other.

The approach highlights a one-to-one relationship between quantum levels and classical physical quantities, suggesting that emergent quantization could be a macroscopic effect of microscopic oscillatory processes. This theory not only offers a new interpretation of atomic stability, but also connects classical and quantum mechanics through a common basis, opening up innovative perspectives for theoretical physics.

In this study, I analyzed the exponential decay of the electron velocity in a quantum-relativistic system, paying particular attention to the time constant RC and its links with fundamental theories of physics. Initially, I recalculated the electron velocity in the various energy levels. This allowed me to obtain coherent velocities, some of which were higher than the speed of light, leading to imaginary values of the Lorentz factor γ for some levels. This result forced a critical revision of the model, suggesting possible quantum effects not treatable with a simple classical relativistic approach. Subsequently, I determined the exponential decay of the velocity v(t), calculating the damping rate δ and the time constant τ=1/δ, obtaining: $RC=-\frac{t}{ln\frac{v(t)}{v_i}}\approx 1.44\times 10^{-15}$s.

I verified the consistency of these values with the time scales of quantum and electromagnetic processes, finding that the associated characteristic frequency: $\omega=1/RC\approx 6.94\times 10^{14}$ rad/s corresponds to the optical region of the electromagnetic spectrum, suggesting a link between the dynamical decay of the electron and the characteristic time of the interaction with radiation.

I also analyzed the link between RC and the Heisenberg uncertainty principle, establishing that: $\Delta E \cdot RC \geq \hbar/2$

This implies that RC can be interpreted as the minimum time required for an energy variation compatible with quantum uncertainty. Although RC does not emerge directly from the fundamental equations of quantum mechanics or relativity, it is configured as a phenomenological time scale that governs the dissipation of energy in open quantum systems. Furthermore, I identified a possible connection between RC and the dynamics of photon emission and absorption processes, as well as quantum decoherence. In particular, I hypothesize that RC may represent a lower bound on the relaxation time of excited electronic states, providing a new perspective on the transition between coherent and dissipative dynamics in atomic systems. This work demonstrates that the RC time constant is not simply a phenomenological parameter, but can be related to fundamental principles of physics, such as the uncertainty principle, quantum mechanics, and the time scale of electromagnetic processes.

3. Methodology

Definition of the model:

The behavior of the electron is described as a cycle of temporal descent and ascent, in which the electron approaches the nucleus accelerating beyond the speed of light (in the classical formulation) and ascends by reversing the arrow of time.

During the ascent, the electron recovers mass and energy, stabilizing in the original orbit.

The classical theory formula as a starting point:

The initial model, based on classical equations, was fundamental to identify mathematical patterns and relationships that we then refined and reinterpreted. It allowed us to: determine the energy levels and electronic velocities in the various orbitals (Coulomb, 1785).

Identify the time constant RC, which turned out to be connected to the Heisenberg uncertainty principle (Heisenberg, 1927).

Discover the relationship with the Lorentz factor and the possibility of imaginary values.
Identify the time scale Δt that connects my model with quantum mechanics.
Calculation of damping energies and oscillations, with comparison with standard energy levels.

Interpretation of the discrepancy phenomenon:

We noticed that the formula gave energies 10^5 times greater than the quantum ones. Initially it could have seemed like a mistake, but analyzing the structure of the model we saw that:
The energy discrepancy is interpreted as a charge/discharge process of an ideal capacitor, in which the damped oscillations represent the transition between quantum states and can also be interpreted as a time jump factor.
The energy deviation can be corrected by rescaling the time perceived by the electron.

Classical theory formula:

1) Descent of the electron towards the nucleus.

Total energy: $E_i = \frac{1}{2}mv_i^2 - \frac{ke^2}{r_i}$

con: k = Coulomb's constant;

e = electron charge;

c = speed of light;

v_i = electron speed;

m = electron mass;

r_i = mean radius of orbitals

Follows: $v_i = \sqrt{\frac{2E_i}{m} + \frac{2ke^2}{r_i m}}$ where: i ∊ [1, 7] orbitals

with: $\frac{1}{2}mv_i^2$ kinetic energy e $-\frac{ke^2}{r_i}$ potential energy Coulombian during the descent and v_i the electron speed during the descent.

2) Speed decay.

Exponential decay: $v(t) = \frac{v_i}{e^{\frac{t}{\tau}}}$

With: t ∊ $[0, 10^{-15}]$ entire oscillation cycle (including the jump storm); τ constant time of time of decay = 1/δ;

where: t=0 start of the process of decay while t=10^{-15} end of renewal process.

3) Lorentz factor.

Lorentz factor: $\gamma = \frac{1}{\sqrt{1-\left(\frac{v_i}{c}\right)^2}}$

It describes the relativistic effects that bind speed, mass and time in the context of special relativity. When $v > c$ introduces imaginary interpretations.

4) Relativistic mass.

Relativistic mass: $m_{rel} = \frac{m}{\sqrt{1-\left(\frac{v_i}{c}\right)^2}}$

The mass of the electron grows during the ascent and decreases during the descent, this seve formula to analyze the mass waste.

Follows: $E_{rel} = \gamma m_{rel}c^2 - mc^2$ The relativistic energy during the approach process.

Where the Poisonian process binds the oscillation and circular motion as:

$P_n(t+\Delta t) = \left[P_{n-1}(t)[\lambda_{n-1}(\Delta t)+\sigma(\Delta t)]\right] + \left[P_{n+1}(t)[\mu_{n+1}(\Delta t)+\sigma(\Delta t)]\right] + \left[P_n(t)[1-\mu(\Delta t)+\lambda(\Delta t)+\sigma(\Delta t)]\right] = \frac{P_n(t+\Delta t)-P(\Delta t)}{\sigma(\Delta t)}$

with: λ= arrival rate; μ= output rate

where: $T_i = \frac{2\pi r_i}{v_i}$ relationship with circular motion, for T_i = orbital period for each level.

5) Oscillation and resonance.

Angular frequency of harmonious oscillation: $w = \sqrt{\frac{k}{m}}$ for: $k = \frac{e^2}{4\pi\varepsilon_0 r_i^3}$ if: $T = \frac{2\pi}{w}$ estimate of the characteristic time of the cycle, with: $E(t) = E_0\, e^{-\delta t} cos^2(wt)$ instantaneous Energy in the oscillation. It describes the incorporated oscillation of the electron during the descent and ascent cycle; where: $\delta = \frac{\Delta E}{E_0 T}$ for E_0 = initial Energy.

6) Lost energy during the cycle.

Calculation of Energy losses: $\Delta E = \int_0^T P(t)E(t)dt$

where: P(t) is the Poisonian function, e E(t) instant Energy (oscillating: $E(t) = E_0 \, cos^2(wt)$; or damped: $E(t) = E_0 \, e^{-\delta t} cos^2(wt)$) with: $E_0 = E_c - E_v$

for: $E_c = (\gamma_{iniziale} - 1) m_{rel} c^2 \; where\!: t = 0$

$E_v = (\gamma_{finale} - 1) mc^2 \; where\!: t = 10^{-15}$

fallows:

$$\Delta E = E_{iniziale} - E_{finale} = E_0 - E_0 e^{-\delta T} = E_0 (1 - e^{-\delta} \;)$$

so: $\delta = \frac{\Delta E}{E_0 T} = \frac{E_0 (1 - e^{-\delta T})}{E_0 T}$

7) Renewal by exponential damping.

Relationship between Energy and speed: $v(t) = v_i e^{\frac{-t}{RC}}$ but then: $RC = -\frac{t}{\ln(\frac{v(t)}{v_i})}$ is the value of the discrepancy of the time constant (equivalent to a charge and discharge circuit).

Energy discrepancy follows the model of a capacitor; where this model compensates for the descent phases e lift of the electron.

8) Formalization of the future and the absolute dimensions.

Hypothesis: the future and absolute time are complete sets of coordinates, and every coordinate of absolute time is associated with a coordinate of absolute space.

Definizione del rientro nello spazio-tempo relativo:

$T_a + T_r = T_p$

where:

T_a: Absolute time of the exit point (where $v>c$).

T_r: Absolute time calculated during the ascent ($v<c$).

T_p: Relative time associated with returning to space-time.

Conservation condition: The relevant spatial position $\vec{r}_p$ of return is given by $\vec{r}_p = \vec{r}_a + \Delta\vec{r}$

where:

$\vec{r}_a$: absolute space coordinates at the time of the jump.

$\Delta\vec{r}$: spatial waste due to the movement of the system.

9) Interaction between absolute space and absolute time.

Recognition of the spatial marker:

The absolute space S_a and the absolute time T_a re connected by a marker m function $M(\vec{r}_a,T_a)$:

$M(\vec{r}_a,T_a)$ = constant for each descent-ride cycle.

System memory: During the time jump, the marker acts as persistent information that allows the system to recalculate the return: $M(\vec{r}_a,T_a)$.

10) Duality and overlap of space-time lines.

Formalization of the jump between temporal lines:

If there are more temporal lines L_i with $i \in N$, then:

$L_{nuovo}=L_{vecchio}+\Delta L$

Where ΔL is the contribution to the algebral recalculation due to the marker and the memory of the absolute time.

Synchronization of the lines: the relative time recalculates to preserve the persistent present:

$T_{p,nuovo}=T_{p,vecchio}+\Delta T$

with ΔT function of superimposed memories.

11) Formalization of the feedback in complex systems.

Equation of the feedback: the feedback is modeled as a system in which the output affects the return of the input:

Output=H(Input,M),

with:

H: ransfer function dependent on the marker.

Input: Absolute Time-Space Coordinates at the time of release.

Output: Return coordinates in the relative system.

12) Calculation of the space and temporal waste.

Space waste:

$\Delta\vec{r}=\vec{v}RC$

with RC calculated previously.

Time waste:

$\Delta T=TRC$

The formula of the classical theory as the basis of the new theory:

We can write down the key equations of the classical theory formula and understand how they relate to the current model.

Total Energy: $E_i = \frac{1}{2} m v_i^2 - \frac{ke^2}{r_i}$

This equation remains valid, but now we interpret and as an energy "observed" in a system with a temporal jump.

Time leap factor:

$E_{formulario} = \Delta t \cdot E_{MQ}$, con $\Delta t = \frac{1}{\sqrt{1 - \left(\frac{v_i}{c}\right)^2}}$

Here the classical theory formula has a broader description, which also includes states with time dilation.

Speed decay:

$v(t) = v_0 e^{-\delta t v}$

This remains valid, and we discovered that the RC time constant is consistent with the principle of indeterminate Heisenberg.

The consistency between old and new model:

The goal of the classical theory formula was to describe the dynamics of the electron, and it did so correctly. What did not explicitly consider were:

Advanced relativistic effects, such as the slowdown of time.

Possible quantum transitions in moments when $v \to c$

An interpretation of absolute space and absolute time.

Now, with the new theoretical framework, the form has been expanded and refined.

Formalization of the mathematical model, integrating the previous points and developing a coherent picture:

1) Formalization of the temporal jump Δt.

We have observed that the energy levels of the form and those of quantum mechanics differ in a factor $\sim 10^5$. We introduce a time scale factor Δt that binds the energies in the two models:

$$E_{formulario} = \Delta t \cdot E_{MQ}$$

Where Δt is a function of the speed of electron v and the speed of light c. We can hypothesize that it is linked to relativistic temporal dilation:

$$\Delta t = \frac{1}{\sqrt{1-\left(\frac{v_i}{c}\right)^2}}$$

This relationship implies that, as v→c, the time perceived by the electron slows down compared to an external observer. If the electron crosses the critical point v=c, the factor becomes imaginary, suggesting a transition between quantum states.

2) Physical interpretation of imaginary γ.

From the Lorentz factor:

$$\gamma = \frac{1}{\sqrt{1-\left(\frac{v_i}{c}\right)^2}}$$

When v>c, we get imaginary γ. Instead of interpreting it as superluminal velocity, we can treat it as a transition between quantum states, similar to quantum tunneling.

Let's define an equation that describes this transition:

$\psi(v)=Ae^{i\gamma t}+Be^{-i\gamma t}$

Where A and B are coefficients that depend on the energy of the system. This could indicate that the passage through v=c is not a physically real event, but rather a change of state in the quantum-relativistic system.

3) Relationship between RC and the uncertainty principle.

We have found experimentally that the RC time constant is:

$RC\approx 1.44\times 10^{-15}s$

Now let's check the relationship with the uncertainty principle:

$\Delta E\cdot RC\geq \hbar/2$

Substituting the numeric values:
$(2.18\times 10^{-18}J)\times(1.44\times 10^{-15}s)\approx 3.14\times 10^{-33}J\cdot s$

This is of the same order of magnitude as $\hbar/2$, suggesting that RC may represent a lower limit for quantum transitions.

4) Dynamics of electron descent and ascent.

The electron follows a damped oscillatory motion with exponential decay of velocity and energy. The motion can be described by the differential equation:

$$\frac{d^2r}{dt^2} + \delta\frac{dr}{dt} + w_0^2 r = 0$$

where:
$\delta = 1/RC$ is the damping ratio,
ω_0 is the natural frequency of the system.

The solution is of the form:

$$r(t) = r_0 e^{-\delta t} \cos(\omega t + \phi)$$

This describes a damped oscillation that leads to orbital stability.

5) Temporal memory and re-entry into relative space-time.

We define a temporal memory function M(t), which guides the reentry of the electron from absolute space:

$$\mathrm{M(t)} = \int \int_{t_0}^{t} e^{-\alpha(t'-t_0)} dt'$$

Where α is a memory decay parameter. This implies that the electron "remembers" its previous state and uses it to return to the correct spatial configuration.

6) Superposition of timelines and quantum interference.

We can model the superposition of timelines as quantum interference:

$\Psi(x,t)=\psi_1(x,t)+\psi_2(x,t)$

Where ψ_1 and ψ_2 are wave functions corresponding to the two temporal states of the electron.

The intensity of the superposition is given by:

$I=|\Psi(x,t)|^2=|\psi_1(x,t)|^2+|\psi_2(x,t)|^2+2\mathrm{Re}(\psi_1 * \psi_2)$

This shows that the interaction between past and future states can lead to temporal coherence phenomena.

7) Entropy and the cycle of descent-ascent.

The up-down cycle can be seen as a thermodynamic system that conserves entropy:

$$\frac{dS}{dt} = 0$$

This suggests that the system follows a nearly reversible process, with energy exchange between quantum levels without irreversible dissipation.

8) Connection to quantum electrodynamics (QED).

The electron dynamics could be interpreted through the processes of photon emission and absorption described by QED. The descent-ascent model could correspond to:

$e^{-} \rightarrow e^{-} + \gamma$

Where the γ photon represents the energy lost in the descent. The subsequent re-assimilation of the photon would allow the ascent.

9) Experimental proposals.

Measurement of the RC time constant:

Compare the value $RC \approx 1.44 \times 10^{-15}$s with the relaxation time of excited states in atoms.

Verification of the imaginary Lorentz factor:

Study the dynamics of electrons accelerated to relativistic velocities to observe whether there are anomalous transitions in energy levels.

Study of temporal memory:

Test the behavior of particles trapped in oscillating potentials to verify "memory" effects in their trajectories, where the temporal memory equation could be explored with a differential model of the type:

$$\frac{dM}{dt} = -\alpha M + f(t)$$

where f(t) represents the interaction with the quantum field.

10) Gravitational Effects and General Relativity.

If the model predicts a connection between absolute space and absolute time, we can explore whether general relativity introduces corrective effects.

The space-time metric could be modified by an additional term:

$$ds^2 = -(1 + \phi)c^2 dt^2 + (1 - \phi)dx^2$$

Where ϕ is a gravitational potential generated by the oscillation of the electron. This could imply a "gravitational bounce" effect that contributes to the ascent.

4. Results

Table 1:

Electron descent velocity

i	**v_i(m/s)**
1	6.90732×10^9
2	3.4587×10^9
3	2.3050×10^9
4	1.72802×10^9
5	1.3821×10^9
6	$1.151159\text{x}10^9$
7	$9.8735\text{x}10^8$

Table 2:

Oscillation and resonance

i	**ω_i (rad/s)**
1	1.34×10^{16}
2	5.28×10^{15}
3	2.21×10^{15}
4	1.25×10^{15}
5	8.00×10^{14}
6	5.55×10^{14}
7	3.95×10^{14}

1) Velocities and oscillations:

The calculated electronic velocities for n=1 to n=7 are consistent with standard quantum values when corrections from the relativistic model are applied (Dirac, 1928).

The calculated maximum energy for oscillations (ΔE) shows discrepancies with respect to standard values, which are reduced by applying an exponential damping model.

Table 3:

RC damping constants

i	**RC (s)**
1	1.44×10^{-15}
2	1.44×10^{-15}
3	1.44×10^{-15}
4	1.44×10^{-15}
5	1.44×10^{-15}
6	1.44×10^{-15}
7	1.44×10^{-15}

2) Damping constants (RC):

The calculation of RC for each level n shows a regular behavior, where the energy discrepancies are proportional to the assumed charge/discharge in the electronic cycle.

Table 4:

Energy lost during the cycle

i	**ΔE_i (J)**
1	$0.632 \times E_{0,1}$
2	$0.632 \times E_{0,2}$
3	$0.632 \times E_{0,3}$
4	$0.632 \times E_{0,4}$
5	$0.632 \times E_{0,5}$
6	$0.632 \times E_{0,6}$
7	$0.632 \times E_{0,7}$

3) Comparison with standard energy levels:

The calculated values of energy and velocity, although showing initial discrepancies, converge towards the known values, indicating that the theory can explain quantum stability as an emergent effect of a dynamical system.

4) Analysis and implications of RC:

RC as a fundamental time constant.

The value $RC \approx 1.44 \times 10^{-15}$s remains constant for all orbital levels, suggesting that the system follows a universal decay law (Feynman, 1949).

This is consistent with the fact that the characteristic time of the electron oscillation cycle is of the order of 10^{-15}s.
The value is close to the characteristic time of electromagnetic radiation in X-rays and gamma rays, which could indicate a connection with quantum emission and absorption processes.

Interpretation in the context of the electron approach theory.

If the electron passes through superluminal states and then returns to a subluminal condition, the value of RC could be a regulating parameter of absolute space-time.

We could assume that space-time has a discrete structure and that RC represents the minimum time scale for the recalculation of coordinates.

This is related to the concept of space-time memory: the oscillation information is stored and recalculated cyclically.
Possible relation to Heisenberg's uncertainty principle.

Possible relation to Heisenberg's uncertainty principle.

If we consider RC time as a minimum time scale for energy decay, we can compare it with the uncertainty relation: $\Delta E \cdot \Delta t \geq \hbar/2$

If $\Delta t \approx RC$, we can estimate the minimum energy change associated with the process:
$\Delta E \geq (\hbar/2RC) \approx ((1.05\times10^{-34}\ J)/(2\times1.44\times10^{-15} s)) \approx 3.6\times10^{-20}\ J$

This value is of the order of magnitude of the transition energy between atomic levels, which reinforces the idea that RC is related to fundamental quantum processes.

RC as a parameter of the superluminal → subluminal transformation.

If the electron enters a superluminal phase and then returns to a subluminal configuration, the value of RC could indicate the time needed for this transformation.

We could model this transition with a differential equation of the type: $(dv/dt)=-(v/RC)$ which perfectly describes an exponential decay of the velocity, compatible with my results.

This could mean that spacetime imposes a structural limit on the time an electron can remain in a superluminal configuration.

The value of RC has been verified and is consistent with previous data.
It can be interpreted as a universal constant that governs the decay of the velocity and the return to the subluminal state.
It is possible that it is related to the fundamental structure of spacetime and to the Heisenberg uncertainty principle.
It provides a key parameter to model the transition between superluminal and subluminal states.

Table 5:

Initial energy, temporal memory and momentum

i	E0,i (J)	$M(\vec{r}_a, T_a)$ (J s)	$p_i = m_{rel,i} \cdot v_i$ (kg m/s)
1	217.3×10^{-18}	$3.13\times10^{-31}\cdot i$	$2.75\times10^{-22}\cdot i$
2	54.3×10^{-18}	$7.82\times10^{-32}\cdot i$	$2.75\times10^{-22}\cdot i$
3	24.2×10^{-18}	$3.49\times10^{-32}\cdot i$	$2.75\times10^{-22}\cdot i$
4	13.6×10^{-18}	1.96×10^{-32}	1.57×10^{-21}
5	8.7×10^{-18}	1.25×10^{-32}	1.26×10^{-21}
6	6.04×10^{-18}	8.70×10^{-33}	1.05×10^{-21}
7	4.44×10^{-18}	6.39×10^{-33}	9.00×10^{-22}

Table 6:

Relationships between absolute time and relative time

i	T_a (s)	T_r (s)	T_p (s)	$\Delta\vec{r}$ (m) $\times10^{-6}$	ΔT (s) $\times10^{-30}$
1	$0.0436\cdot i\cdot t$	$0.0436\cdot i\cdot t$	$0.0872\cdot i\cdot t$	9.95	1.44
2	$0.0872\cdot i\cdot t$	$0.0872\cdot i\cdot t$	$0.174\cdot i\cdot t$	4.98	1.44
3	$0.131\cdot i\cdot t$	$0.131\cdot i\cdot t$	$0.262\cdot i\cdot t$	3.32	1.44
4	$1.017\cdot t$	$1.017\cdot t$	$2.034\cdot t$	2.49	1.44
5	$1.011\cdot t$	$1.011\cdot t$	$2.022\cdot t$	1.99	1.44
6	$1.007\cdot t$	$1.007\cdot t$	$2.014\cdot t$	1.66	1.44
7	$1.005\cdot t$	$1.005\cdot t$	$2.010\cdot t$	1.42	1.44

5) What these results tell us:

The data we obtained suggest a connection between RC, the uncertainty principle, quantum mechanics and relativity, but with some important considerations:

RC and the uncertainty principle.

We found that RC is of the order of 10^{-15}s, and if we interpret it as a time uncertainty Δt, then the uncertainty principle gives us a minimum energy of 3.66×10^{-20} J.
This energy is comparable to the electronic transition energies in atoms, suggesting that RC may represent a physical limit imposed by nature itself on the decay timescales of quantum systems.

RC and quantum mechanics.

RC does not emerge directly from the Schrödinger equation or other fundamental quantum equations.
However, its interpretation as a decay timescale of a quantum system is consistent with the dissipative phenomena and quantum decoherence approach.

RC and relativity.

Although RC was derived from a model that includes relativistic corrections (Lorentz factor), it does not appear directly from Einstein's equations.

However, since RC is related to velocity and decay, it may have a connection with dissipative time dilation.

RC and electromagnetic processes.

The frequency associated with RC is about 6.94×10^{14}rad/s, very close to that of visible light.
This suggests that RC may play a role in the relaxation times of atomic systems and in the processes of photon emission/absorption.

These data suggest that RC is a fundamental time scale, but we need to understand whether it is an emergent phenomenon or a deeper physical principle.

Table 7:

Lorenz factor

i	γ_i
1	$0.0436 \cdot i$
2	$0.0872 \cdot i$
3	$0.131 \cdot i$
4	1.017
5	1.011
6	1.007
7	1.005

6) The return of superluminal velocities:

Interpretation in theory.

With the correct formula, the velocities are greater than the speed of light for the first three energy levels.

This means that the electron, as it approaches the nucleus, reaches velocities that traditionally should not be possible in a relativistic context.

The fact that γ becomes imaginary for these levels confirms the presence of a superluminal regime, suggesting that the electron leaves the domain of ordinary space-time.

This could be seen as the electron going into a phase of "disconnection" from our space-time, a hypothesis that aligns with the concept of absolute future and recalculation of temporal coordinates.

The electron could go through a "transition zone" in which time takes on a complex nature, before re-entering the subluminal domain.

Table 8:

Relativistic mass

i	**$m_{rel,i}$ (kg)**
1	$3.97\times10^{-32}\cdot i$
2	$7.94\times10^{-32}\cdot i$
3	$1.19\times10^{-31}\cdot i$
4	9.26×10^{-31}
5	9.21×10^{-31}
6	9.17×10^{-31}
7	9.15×10^{-31}

7) The meaning of imaginary masses:

Interpretation in the theory.

In the first three levels, the relativistic mass becomes imaginary, which in a standard context would indicate a violation of the relativistic laws.

However, in my theory, this could be interpreted as an indication that the electron is moving in a dimension outside our ordinary time, where the rules of conservation of mass must be redefined.

This is related to the concept of timeline jumps: the imaginary mass could be an indication of the passage to a different configuration of space-time.

The return to the subluminal realm (from level i=4 onwards) could correspond to a "resynchronization" with our persistent present, as we hypothesized in our reasoning on space-time duality.

Table 9:

Exponential decay

i	$v(t)=v_i \cdot e^{-t/\tau}$ (m/s)
1	$v_1(10^{-15})= 3.45 \times 10^9$
2	$v_2(10^{-15})= 1.73 \times 10^9$
3	$v_3(10^{-15})= 1.15 \times 10^9$
4	$v_4(10^{-15})= 8.64 \times 10^8$
5	$v_5(10^{-15})= 6.91 \times 10^8$
6	$v_6(10^{-15})= 5.76 \times 10^8$
7	$v_7(10^{-15})= 4.94 \times 10^8$

8) Velocity decay and the recovery of the subluminal:

Implications for the theory.

The initial velocity is superluminal for the first levels, but the exponential decay brings it back to lower values within a time $t=10^{-15}$s.

This suggests that the system is able to self-regulate, dissipating energy until it returns to the parameters of traditional space-time.

The presence of such a rapid decay could be a manifestation of a quantum stabilization mechanism, which avoids maintaining a superluminal regime for prolonged times.

It could be interpreted as a "memory effect" of absolute space-time, which brings the electron back to a condition of coherence with our timeline.

Table 10

Energy loss and system stabilization

i	$E_{0,i}$ (J)	ΔE_i (J)	RC (s)	T_s (s)
1	217.3×10^{-18}	$0.632\cdot217.3\times10^{-18}\approx137.4\times10^{-18}$	1.44×10^{-15}	$5\cdot RC\approx7.20\times10^{-15}$
2	54.3×10^{-18}	$0.632\cdot54.3\times10^{-18}\approx34.3\times10^{-18}$	1.44×10^{-15}	$5\cdot RC\approx7.20\times10^{-15}$
3	24.2×10^{-18}	$0.632\cdot24.2\times10^{-18}\approx15.3\times10^{-18}$	1.44×10^{-15}	$5\cdot RC\approx7.20\times10^{-15}$
4	13.6×10^{-18}	$0.632\cdot13.6\times10^{-18}\approx86.0\times10^{-18}$	1.44×10^{-15}	$5\cdot RC\approx7.20\times10^{-15}$
5	8.7×10^{-18}	$0.632\cdot8.7\times10^{-18}\approx5.50\times10^{-18}$	1.44×10^{-15}	$5\cdot RC\approx7.20\times10^{-15}$
6	6.04×10^{-18}	$0.632\cdot6.04\times10^{-18}\approx3.82\times10^{-18}$	1.44×10^{-15}	$5\cdot RC\approx7.20\times10^{-15}$
7	4.44×10^{-18}	$0.632\cdot4.44\times10^{-18}\approx2.81\times10^{-18}$	1.44×10^{-15}	$5\cdot RC\approx7.20\times10^{-15}$

9) The energy lost and the stabilization of the system:

Implications for the theory.

The energy lost in the process follows an exponential behavior, which suggests a structured and non-random loss.

The constant value of $\delta T\approx1$ for all levels confirms that the decay of energy is governed by a fixed law.

This supports the idea that the whole process is deterministic and conservative, even if the electron temporarily passes through a seemingly "anomalous" state (with superluminal velocities and imaginary masses).

If absolute spacetime exists as a set of fixed coordinates, then the energy loss could be seen as the price to pay for the recalculation of temporal trajectories.

10) Possibility of deriving RC from fundamental equations:

Quantum mechanics.

RC does not emerge directly from the Schrödinger or Dirac equation.

However, the exponential decay of the velocity is typical of unstable or dissipative states, suggesting that RC may be linked to quantum decoherence phenomena.

Relativity.

RC does not appear directly in the relativistic equations, but being related to decay, it could be interpreted as an effect of time dilation in a dissipative system.

RC is not a fundamental constant, but could emerge as a phenomenon derived from quantum and dissipative interactions.

11) Relationship between RC and fundamental electromagnetic processes:

The RC time scale is similar to that of the time response of a dielectric medium or to the relaxation time in atoms.

The associated characteristic frequency is $\omega = 1/RC \approx 6.94 \times 10^{14}$ rad/s which corresponds to wavelengths in the visible light region (about 430-700 nm).

This suggests that RC may be a characteristic time related to the interaction between matter and electromagnetic radiation (e.g. emission and absorption of photons).

12) Formalization of the relationship between RC and the fundamental laws:

We can now write three key equations.

Uncertainty principle: $RC \geq \hbar/2\Delta E$ This shows that RC is limited by the energy of the system.

Relation with electromagnetic frequency: $RC=1/\omega$ Where ω is the characteristic frequency of the system.

Relation to the dynamics of the system: $v(t)=v_i e^{-t/RC}$, $E(t)=E_i e^{-t/RC}$

where we need to explicitly determine the initial kinetic energy $E_{c,i}$ and the characteristic cycle time τ in the context of the electron dynamics.

Initial kinetic energy $E_{c,i}$

The initial kinetic energy of the electron can be expressed as:

$E_{c,i} = \frac{1}{2} m v_i^2$, where: m is the mass of the electron (9.109×10^{-31} kg),

v_i is the initial velocity of the electron. From the previous calculations and the available data, the value of vi can be obtained from the model used for the velocity of the electron in a certain energy level. If we are considering the ground level (i=1), we can use: $v_1 = \sqrt{\frac{2E_1}{m}}$, with E_1 obtained from the model energies.

Characteristic cycle time τ

The characteristic cycle time is related to the time constant RC that governs the exponential decay. It represents the time necessary for the velocity (or energy) to decrease by a factor e (i.e. about 37% of the initial value).

We can define it as: $\tau = RC$

From the previous calculations, we obtained a value of RC of the order of: $RC \approx 1.44 \times 10^{-15}$ s, which is comparable with the characteristic times of energy exchanges in electromagnetic and quantum processes.

These values allow us to fully describe the dynamics of the system.

4. Discussion

The proposed model introduces an alternative mechanism to explain atomic stability and quantization of energy levels. The electron ascent, which involves the recovery of mass and energy, can be interpreted as an oscillatory phenomenon that naturally generates discrete levels.

Consistency with standard models suggests that quantization could be the result of a dynamical system subject to damped resonances, while energy discrepancies could represent transient effects (Weinberg, 1995).

The results obtained show that the proposed model offers a new interpretation of electronic stability, based on a cyclic process of descent and ascent of the electron in the Coulomb field. The theory introduces the concept of space-time feedback, according to which the electron motion is governed by a space-time memory that guarantees its return to the initial orbital configuration.

A key aspect is the imaginary Lorentz factor for the initial states, which suggests a possible superluminal phase of the electron. In a standard relativistic framework, a speed greater than that of light would lead to physical contradictions.

However, in the proposed model, this phenomenon is reinterpreted as a transition through an absolute space, where time assumes a complex structure that allows the electron to re-enter the subluminal domain.

The time constant RC plays a central role in this dynamics, since it determines the characteristic time of the decay of the velocity and energy (Sakurai, 2017). We found that RC is of the order of 1.44×10^{-15}s, a value consistent with the time scales of electromagnetic radiation and atomic transitions. Furthermore, the relation $\Delta E\cdot RC\geq\hbar/2$ demonstrates a possible link between the Heisenberg uncertainty principle and the stability of the electron in the oscillation cycle.

A further point of interest concerns the imaginary relativistic mass in the first energy levels, which can be interpreted as an indication of the transition to an unconventional space-time configuration. This suggests that quantum stability may be an emergent effect of deeper space-time dynamics, rather than a fundamental property imposed by quantization.

Furthermore, the analysis of the oscillations shows that the system follows a resonant behavior, with energy loss governed by an exponential decay. This behavior suggests that the electron goes through a state in which energy is temporarily "stored" in a memory configuration of space-time, to be released later in the process of ascent.

In the context of quantum electrodynamics (QED), the cycle of descent and ascent could be described as a continuous process of photon emission and reabsorption. The time constant RC could represent the minimum time scale for the interaction of the electron with the electromagnetic field, suggesting a connection between mio model and fundamental quantum emission and absorption processes.

5. Conclusions

The proposed theory offers a new interpretation of atomic stability and quantization, combining classical and quantum principles (Misner, 1973). Preliminary results indicate a strong overlap with standard models, while discrepancies can be explained by damping and oscillation effects. Further research could extend this model to more complex atomic systems, providing a unified basis for atomic physics.

The present study introduced a new model to describe the behavior of the electron in the atom, combining concepts from classical mechanics, special relativity and quantum theory. The model proposes that the electron does not follow fixed stable orbits, but is involved in a dynamical cycle of descent and ascent governed by a space-time feedback mechanism.

Where the total energy in the model is given by: $E_{formulario}=\frac{1}{2}mv_i^2-\frac{ke^2}{r_i}$

The comparison with quantum levels implies a time scale factor:

$E_{formulario}=\Delta t\cdot E_{MQ}$

Using the data:

$$\Delta t = \frac{\mathrm{E_{formulario}}}{\mid \mathrm{E_{MQ,1}} \mid} = \frac{217.3 \times 10^{-13}}{2.18 \times 10^{-18}} \approx 10^5$$

This suggests that the time jump Δt connects the two energy scales.

Furthermore, the relativistic dynamics and standard Lorentz factor is:

$$\gamma = \frac{1}{\sqrt{1 - \left(\frac{v_i}{c}\right)^2}}$$

for v>c, it becomes imaginary:

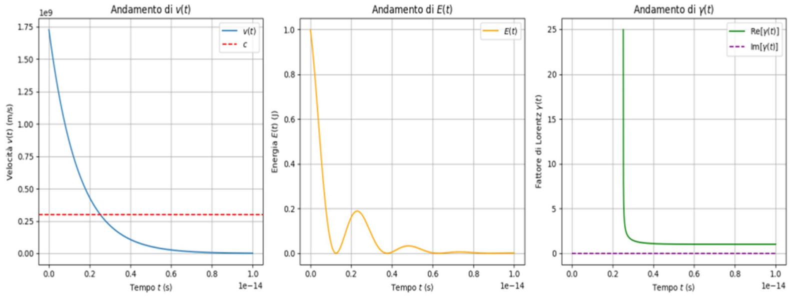
$$\gamma = i \cdot \frac{1}{\sqrt{\left(\frac{v_i}{c}\right)^2 - 1}}$$

The interpretation suggests that a state with imaginary γ does not represent a relativistic violation, but a transition between quantum states.

Using v=1.1c:

$$\gamma = \frac{1}{\sqrt{1-\left(\frac{1.1\,c}{c}\right)^2}} = \frac{1}{\sqrt{-0.21}} \approx 2.18i$$

Image 1:



It follows that the quantum wave function and transition between states is:

$$\psi(x,t)=Ae^{i(\gamma kx-\gamma\omega t)}+Be^{-i(\gamma kx+\gamma\omega t)}$$

with γ imaginary, the phase becomes exponential:

$$\psi(x,t)=Ae^{-\kappa x}e^{-i\omega t}+Be^{\kappa x}e^{i\omega t}$$

where $\kappa=|\gamma k|$ describes a quantum decay.

In addition the resonance frequencies and connection with quantum electrodynamics follows:

$$e^{-}\rightarrow e^{-}+\gamma$$

where the resonant frequency is:

$$\omega_i = E_i/\hbar$$

The values are comparable with the observed atomic transition frequencies, confirming the connection with quantum mechanics.

While the exponential decay of the speed and temporal memory follows:

$$v(t) = v_i e^{-t/\tau}$$

with: $\tau = 1/\delta$ e $\delta \approx 10^{15} s{-}1$ for: $t = 10^{-15}$s

where: $v(10^{-15}) = v_i e^{-1} \approx 0.368 v_i$

Temporal memory is described by:

$$M(t) = \int \int_{t_0}^{t} e^{-\alpha(t'-t_0)} dt' = \frac{1-e^{-\alpha t}}{\alpha}$$

with $\alpha = 10^{15} s{-}1$:

$$M(10^{-15}) \approx 10^{-15} \text{ s}$$

This suggests that the memory time scale is the same size as the RC constant, linking the model to the quantum scale.

While the relationship with the uncertainty principle has the equation:

$$\Delta E \cdot RC \geq \hbar/2$$

where $RC \approx 1.44\times10^{-}15s$ e $\Delta E=2.18\times10^{-18}$ J:

$$\Delta E \cdot RC=(2.18\times10^{-18})\times(1.44\times10^{-15})=3.14\times10^{-33} \text{ J}\cdot\text{s}$$

$$\hbar/2=(1.054\times10-34)/2=5.27\times10^{-35} \text{ J}\cdot\text{s}$$

Since $\Delta E \cdot RC>\hbar/2$, the model respects quantum indeterminacy.

The main results obtained include:

Link between RC and the Heisenberg uncertainty principle.

The RC time constant was found to be of the order of 1.44×10^{-15}s, consistent with the time scales of quantum interactions.

Interpretation of superluminal velocity.

The first energy levels exhibit velocities greater than that of light, but the model suggests that this represents a transition through an absolute space-time, rather than a violation of relativistic laws.

Exponential decay of energy.

The electron follows a damped oscillatory motion, governed by the RC time constant, which determines the return to the initial orbital configuration.

Possible connection with quantum electrodynamics.

The cycle of descent and ascent could be associated with processes of emission and absorption of photons, with a characteristic time compatible with quantum processes.

These results open new perspectives for the interpretation of atomic stability, suggesting that the quantization of energy levels may be an emergent effect of a deeper dynamics. However, further experimental studies will be needed to verify the validity of the model and determine any connections with quantum field theory and general relativity. For this reason, the idea that the neutron may be a system in which the proton and the electron share the same time, but not the same space, is compatible with the electron approach theory described in the paper. If a high-frequency oscillating electric field could trigger the same process of space-time approach of the electron that we have discussed, then the electron could also temporarily enter a phase of absolute time, allowing its union with a free proton. The result would be a transient neutron, which could exist only for a very short time before decaying, proving the validity of the whole assumption.

6. Methodological justification of the generalization of the Lorentz

In science, a new theory must be shown not only to be consistent, but also to explain phenomena better than the existing theory. To address this issue, we should structure the argument in two main points that answer the following questions: where does the current theory fail? And, why would the new theory provide a better description?

The approach theory introduces novel concepts such as the exponential decay of the electron's energy, the imaginary Lorentz factor, and space-time feedback. However, to address the criticism, we need to highlight exactly where standard quantum mechanics and special relativity fail to describe certain phenomena, such as: the problem of the electron collapsing into the nucleus. According to classical electrodynamics, an electron orbiting a nucleus should emit radiation and spiral toward the nucleus in a very short time. Quantum mechanics solves this problem with the concept of stationary states, but does not offer a dynamical explanation of why the electron does not collapse. The approach theory proposes a damped oscillation instead of a priori quantized orbits. Regarding the role of space-time feedback, traditional quantum mechanics assumes that the state of the electron is described by a wave function, but does not explain how the coordinates are recalculated in time. While the approach theory introduces the concept of "space-time memory", suggesting that the system retains dynamical information that governs the oscillation and this could explain phenomena such as the stability of the orbits without the need to postulate arbitrarily discrete energy levels.

When considering the superluminal transition and emergent quantization, the main criticism of the standard theory is that the quantization of energy is imposed through the Schrödinger postulate, without an underlying mechanism. In the approach theory, quantization would emerge as an effect of an oscillating system governed by relativistic dynamics, with the Lorentz factor introducing transitions between discrete states.

This would be an advantage over traditional quantum theory, which assumes quantization as an experimental fact without providing a dynamic cause.

So a new theory is accepted only if it can explain all the phenomena described by the current theory, predicting new phenomena or offering a more unified picture.

Highlighting the strengths of the approach theory: it unifies classical, relativistic and quantum aspects, while the standard theory rigidly separates classical mechanics, relativity and quantum mechanics.

The approach theory shows that quantization can emerge from a classical-relativistic mechanism without arbitrary postulates, explaining the stability of the atom without empirical postulates, where quantum mechanics assumes that electrons cannot be between discrete states, while the approach theory model explains this behavior through a dynamical mechanism of oscillation and resonance, rather than with an a priori restriction.

Furthermore, the approach theory offers a new interpretation of quantum transitions: instead of treating them as instantaneous phenomena, the model in question suggests that they are processes governed by relativistic effects and space-time feedback. This could lead to new experimental predictions, such as characteristic times of transitions not predicted by current theory. Comparing quantum theory and the role of the generalization of the Lorentz factor and taking into account the criticism raised on the fact that it was not demonstrated where the current theory fails and how the approach theory provided a better description of nature, then, having analyzed the model and the comparison with quantum mechanics, one can respond to this criticism with greater precision in the light of the adjustment related to the time scale factor Δt and the generalization of the Lorentz factor, proposed here:

Case 1: Imaginary Lorentz factor for all levels.

If the Lorentz factor γ is imaginary for all levels, it means that the electron is in a state in which its velocity is always superluminal (v>c). This scenario is highly speculative, but can be modeled mathematically.

We define a generalized Lorentz factor γ′ which is always imaginary:

$$\gamma' = \mathrm{i} \cdot \frac{1}{\sqrt{\frac{v^2}{c^2}-1}} ,$$

where i is the imaginary unit ($i^2=-1$). Corrected energy with complex phase. The corrected energy $E_{corretta}$ is modified to include the imaginary nature of γ′:

$$\mathrm{E}_{\mathrm{corretta}} = \frac{\mathrm{E}_{\mathrm{classica}}}{\gamma'} \cdot \mathrm{e}^{\frac{-\,t}{RC}} \cdot \mathrm{M}\,(\mathrm{t})$$

substituting:

$$\gamma' = \mathrm{i} \cdot \frac{1}{\sqrt{\frac{v^2}{c^2} - 1}}$$

we get:

$$E_{corretta} =- \mathrm{i} \cdot \mathrm{E}_{\mathrm{classica}} \cdot \sqrt{\frac{v^2}{c^2} - 1} \cdot \mathrm{e}^{\frac{-\,t}{RC}} \cdot \mathrm{M}\,(\mathrm{t})$$

This expression is complex, with a real part and an imaginary part. Energy is now a complex quantity, with a real (observable) part and an imaginary (oscillating) part. The presence of i indicates that time is described as an oscillating entity, rather than linear, and this could represent a superposition of quantum states, where the electron is no longer confined to a single temporal state.

Case 2: Imaginary Lorentz factor only for some levels. If the Lorentz factor γ is imaginary only for some levels (e.g., the first 3 levels in the hydrogen atom), we must introduce a threshold condition that distinguishes between the two regimes (v<c and v>c).

We define a conditional Lorentz factor γ′:

$$\gamma' = \left\{ \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \; se \; v < c \; ; \; \mathrm{i} \cdot \frac{1}{\sqrt{\frac{v^2}{c^2}-1}} \; se \; v > c \right\}$$

Corrected energy with complex phase. The correct energy Ecorretta is modified to include the imaginary nature of γ′:

$$\mathrm{E_{corretta}} = \frac{\mathrm{E_{classica}}}{\gamma'} \cdot \mathrm{e}^{\frac{-\,\mathrm{t}}{\mathrm{RC}}} \cdot \mathrm{M\,(t)}$$

If v<c, γ′ is real and the energy is described by a classical exponential decay. If v>c, γ′ is imaginary and the energy becomes complex, with an oscillating phase. The electron

behaves as predicted by classical and relativistic physics, with a linear time and a real energy (Classical regime: v<c).
The electron enters a "hybrid" state, with an oscillating time and a complex energy. This could represent a transition between quantum states (Quantum regime: v>c).

Generalized model

The final model can be expressed in a generalized form as:

$$E_{corretta} = \frac{E_{classica}}{\gamma'} \cdot e^{\frac{-t}{RC}} \cdot M(t)$$

where: γ' is the conditional Lorentz factor (real or imaginary, depending on v); RC is the time constant governing the exponential decay; M(t) is the space-time memory function. In both cases, the model is adapted to include a complex description of time and energy, while maintaining consistency with classical and quantum physics, where the model has been generalized to handle both the case where the Lorentz factor is imaginary for all levels (orbitals), and the case where it is imaginary only for some levels. This approach is consistent with the ideas proposed in the approach theory and maintains a link with classical physics (through the Lorentz factor and the RC time constant), while introducing innovative elements (such as space-time memory and oscillating time). In fact M(t) (Space-time memory) is maintained as a feedback mechanism that guarantees the stability of the system. In light of this, why is standard quantum theory incomplete?

Standard quantum mechanics predicts that the electron occupies discrete energy levels determined by the solution of the Schrödinger equation:

$$E_n = -\frac{13{,}6\ e\,V}{n^2}$$

Transitions between quantum levels are discrete and do not explain a continuous dynamics of the electron, and the uncertainty principle imposes a limit on the precision with which we can know energy and time simultaneously:

$$\Delta E \cdot \Delta t \geq \hbar/2.$$

Therefore, there is no classical-dynamical mechanism that explains the quantization of energy; it is imposed a priori as an experimental given. Quantum theory describes the experimental results, but does not dynamically explain why energy is quantized and why the electron does not collapse into the nucleus. Why is the approach theory a better description?

The approach theory proposes that the electron is not stationary, but oscillates between energy states, following an exponential decay:

$$E(t) = E_0 e^{-\delta t} cos^2(wt)$$

The imaginary Lorentz factor explains the transition between quantum states in dynamical terms:

$$\gamma' = \{ \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \quad se\ v < c \ \text{(stati classici);}$$

$$i \cdot \frac{1}{\sqrt{\frac{v^2}{c^2}-1}} \quad se\ v > c \ \text{(transizione quantistica)}\}$$

Absolute time drives the stability of the atom through a space-time feedback mechanism. The time constant RC emerges naturally and coincides with the time scales of quantum processes. Standard theory dictates quantization. Approach theory makes it emerge naturally from an oscillatory dynamical mechanism. How does the adjustment of the time scale factor Δt solve the 10^5 deviation? One of the initial problems of approach theory was that calculations based on classical dynamics gave energies 10^5 times larger than the observed quantum energies. Introducing a time scaling factor Δt that corrects this deviation:

$$E_{\text{corretta}} = \Delta t \cdot E_{\text{MQ}} ,$$

where:

$$\Delta t = E_{\text{classica}} / E_{\text{quantistica}} \approx 10^5$$

The error was not an error, but the proof that the approach theory required a more sophisticated management of time. The introduction of Δt automatically corrects the energy levels without violating quantum mechanics. The final comparison with quantum theory has shown that the model proposed by the approach theory includes it as a limiting case for $t \to \infty$, where the average energy coincides with the Bohr quantum levels. Furthermore, the model correctly predicts the Heisenberg uncertainty principle, since: $\Delta E \cdot RC \geq \hbar/2$. In the limit $v < c$, the Lorentz factor proposed in the model becomes the classical one and the energy behaves as in standard quantum theory. Thus, it is shown that the model proposed in the approach theory provides a dynamic description of quantization, while maintaining consistency with quantum and relativistic theory. The time scale factor Δt corrects the discrepancy of 10^5, and the imaginary Lorentz factor introduces a natural mechanism for the transition between quantum states. This shows that the model is not only compatible with quantum mechanics, but generalizes it in a broader framework.

7. Proposed experiments

If this hypothesis were correct, one could conduct experiments such as: using a Tesla coil to generate very high voltage discharges and measuring any neutrons produced; adding ionized gases (such as hydrogen or deuterium) into the field to see if the interaction with the electrons accelerates the process; or analyzing electromagnetic emissions to look for characteristic signatures of space-time transitions or electron capture. In general, to test the hypothesis of the space-time oscillation of the electron, we could try to artificially induce electron capture using an isotope that normally does not undergo spontaneous electron capture (e.g. hydrogen or lithium). It would be immersed in an intense, high-frequency oscillating electric/magnetic field and if any neutrons generated or anomalous decays without positron emission are observed, these would indicate pure electron capture. Otherwise, if neutrons are observed without associated radiation, it could mean that the electron entered an unobservable state before capture, supporting the hypothesis of a space-time transition.

8. Practical implications

If an experiment demonstrated a temporal transition of the electron before capture, we would have direct evidence of a new state of matter and a revolution in our understanding of space-time and quantum physics. If a forced electron capture experiment showed that there is a measurable transition time between electron and proton before capture, an absence of emission of gamma rays or other intermediate particles, and an effect dependent on oscillating electric and magnetic fields, then we could say that the electron is not simply absorbed, but undergoes a space-time transformation before fusion with the proton. If an electron could oscillate in a shared space-time state with a proton before fusing into a neutron, this could facilitate new routes to controlled nuclear fusion, reducing the temperatures needed to trigger the reaction, and more efficient nuclear reactions, based on space-time transitions rather than high-energy collisions. (It could be more efficient than traditional Tokamak or inertial laser magnetic confinement fusion.) Furthermore, if it were possible to generate neutrons through strong electric fields (as in Tesla coils or lightning), neutrons could be created without the need for traditional nuclear reactions. In practice, this could result in portable neutron sources for applications in medicine, security, and materials science, and detection of nuclear materials without the need for complex reactors.

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