Einstein-VED Theory: Solving the mysteries of quantum mechanics

Complementary clarifications to the Einstein-VED theory

This document provides additional explanations and extensions to the original Einstein-VED theory, emphasizing geometric interpretations, proper time, and mass-related effects.
It serves as a complement to the original work documented in Zenodo:

The theory that will reconcile Quantum Mechanics with Einstein's Relativity (PDF in Spanish)

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Introduction

The Einstein-VED theory proposes a geometric and relativistic interpretation of quantum phenomena, based on the principles of Einstein's relativity and on a **global wavefront** shared by all particles involved. Unlike quantum mechanics (QM), Einstein-VED does not postulate fundamental probabilities or wave function collapse: the observed indeterminacy is only a consequence of projecting the complete structure of the system onto the space-time parameters of a limited observer.

Shared proper time and correlations

- All particles of a wavefront generated at t_0 share a **common proper time** τ.
- This proper time does not depend on the observer's time or space.
- Correlations between entangled particles emerge **naturally and deterministically** from the coherence of the wavefront.

Implications

1. **No superluminal communication:** correlations do not require information transmission between separated particles.
2. **No local hidden variables:** correlation arises from the global structure of the wavefront, not from hidden parameters.
3. **The apparent non-locality of quantum mechanics** is explained as the projection of a continuous geometric reality onto the observer's reference systems.

Critique of quantum probability

Quantum mechanics interprets the wave function as a fundamental probabilistic object. Einstein-VED clarifies:

- **Classical probability:** quantifies what we do not know.
- **Quantum probability:** applies even when the state is completely defined (Ψ known), generating an epistemological contradiction.
- **Einstein-VED solution:** the observed indeterminacy is simply the observer's lack of information about the complete structure in τ.

- The collapse of the wave function is not a physical process: it is an update of the observer's knowledge when reflecting coherence with the global geometry.

Quantum correlations without collapse or signaling

Consider a pair of particles with outcomes $A, B \in \{+1, -1\}$ and measurement orientations a, b:

$$P(A, B \mid a, b, \tau) = \frac{1}{4}(1 + C(a, b, \tau)AB)$$

- Marginalizing over B or A gives:

$$P_A(A \mid a) = \sum_B P(A, B \mid a, b) = \frac{1}{2}, \quad P_B(B \mid b) = \frac{1}{2}$$

- The observed correlations are:

$$E(a, b) = \langle AB \rangle = \int d\mu(\tau) C(a, b, \tau)$$

If we choose $C(a, b, \tau) = -\cos(\alpha - \beta)$, we obtain exactly the singlet state correlation, **without violating causality or introducing collapse**.

Conceptual advantages of Einstein-VED

1. Naturally explains quantum correlations that for quantum mechanics are "magic".
2. Eliminates the need for hidden variables and collapse.
3. Maintains relativistic covariance: predictions do not depend on the observer's space-time foliation.
4. Allows falsifiable predictions: deviations from correlations can arise if shared proper time is manipulated or wavefront coherence is altered.

Conclusion

Einstein-VED provides a deterministic and geometric interpretation of quantum phenomena, respecting relativity and eliminating conceptual contradictions of quantum mechanics.
The theory transforms apparent indeterminacy into **observational ignorance**, and turns entanglement and non-locality into **natural consequences of the geometric continuity** of physical systems.

Expansion of proper time and mass in the Einstein-VED theory

Context

Within the Einstein-VED theory, all particles of a wavefront generated at t_0 share a common proper time τ.
This naturally explains quantum correlations without resorting to hidden variables or wave function collapse.

A new aspect arises when considering the **presence of mass and particle velocity**.

Velocity limit and proper time

- For moving particles, it holds: $v = \frac{ds}{dt}$
- In the relativistic limit $v \to c = 1$ (in our units), the proper time differential tends to zero: $dt^{'} \to 0$
- However, **the presence of mass guarantees** that $v < 1$, ensuring a proper time $\tau > 0$.
- Mass also implies acceleration in the environment: $\frac{d^2 s}{dt^2} \neq 0$

Expanded proper time field

Due to finite velocity and the acceleration associated with mass, the **observed proper time "expands"** as a function of velocity and acceleration:

$d\tau = F(v, a)$

where:

- $v = ds / dt$ is the particle's velocity,
- $a = d^2 s / dt^2$ is the acceleration in the environment,
- F is a **scalar field** defined on the wavefront that describes the local evolution of proper time.

This field can be considered a **new object of study**, connecting mass, motion, and wavefront geometry.

Consequences

1. **No absolute time:** proper time depends locally on each particle's velocity and acceleration.
2. **Emergent relativistic effects:** time dilation and other phenomena associated with velocity and mass are naturally derived from wavefront geometry.
3. **Influence on correlations:** particles with mass and acceleration modify their wavefront propagation, which can dynamically affect correlations without need for superluminal interaction.
4. **Continuous observational field:** this approach allows describing the evolution of proper time and its effects on entangled systems in a deterministic and geometric way, without resorting to ontological probabilities.

Future directions

The study of $F(v, a)$ opens possibilities such as:

- Quantitatively deriving how acceleration affects wavefront coherence.
- Establishing predictions for deviations in quantum correlations for accelerated particles.
- Exploring connections with relativistic and cosmological phenomena from a unified framework.

This development naturally integrates **mass, velocity, and acceleration** into the Einstein-VED theory, extending its scope beyond quantum correlations.