EN_1: Axiomatic Critique of Heisenberg's Uncertainty Principle

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1. Fundamental Postulate

It is established that **velocity expresses the fundamental dependence between space and time**:

- For $v = 0$: space and time are independent and orthogonal.
- For $v \neq 0$: space and time are structurally dependent and non-orthogonal.
- Velocity is strictly defined as $v = ds / dt$, understood as a measure of this dependence.
- For $v = c$: the dependence is total ($ds = dt$ in natural units), and space and time **are no longer separable in any sense**.

Note: In this framework, there is no structural separation between space and time when velocity is non-zero. The limiting case $v = c$ represents a **complete unification of space and time**.

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2. Structural Consequences

Given the postulate of space-time dependence:

- Position cannot be treated as an independent variable.
- Momentum, as a quantity linked to temporal evolution, is inseparable from position.
- There are **no two independent observables** that can be defined ontologically.

This non-separability is **structural**, not epistemological. It arises from the nature of space-time itself, not from measurement limitations or instrumental error.

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3. Revision of the Uncertainty Principle

In standard quantum mechanics, Heisenberg's uncertainty principle is based on:

- The assumed **independence** of position and momentum.
- The formalism of operators and their commutation relations.

Within that framework:

1. The principle assumes two independent observables.
2. Time is treated as external and independent.
3. Uncertainty is interpreted as a **fundamental property of reality**.

Critical point: In a framework where space and time are dependent, these assumptions **cannot hold**.

4. Axiomatic Contradiction

Applying the postulate of space-time dependence:

- The independence of position and momentum **does not exist ontologically**.
- Any formal relation derived from assuming independence **loses conceptual validity**.
- Therefore, the uncertainty principle, in its original rigorous meaning, **cannot be formulated**.

This is an **axiomatic contradiction**, not an experimental or interpretative problem.

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5. Conclusion

- Heisenberg's uncertainty principle **is not a fundamental limit of nature**, but a consequence of a formalism that **presupposes separable space and time**.
- When space-time dependence is recognized ($v \neq 0$, up to $v = c$), the principle loses its applicability.
- This critique is **rigorous, coherent, and independent**: it stands solely on the axioms of the space-time structure.
- Probabilistic reasoning can still be used as a **tool to manage ignorance**, but **should never be interpreted as an intrinsic property of reality**.

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