Cognitive Signals Influencing Quantum Systems: A Biological Hypothesis

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Abstract

This study hypothesizes that human cognition emits subtle signals that perturb quantum systems, potentially explaining the observer effect. A double-slit experiment tests this by comparing photon interference patterns with and without a human subject. The research bridges quantum mechanics and cognitive science, offering new perspectives on consciousness.

1 Introduction

The observer effect in quantum mechanics, where measurement alters a system's state, has puzzled researchers for decades [1]. The double-slit experiment illustrates this: particles show wave-like interference when unobserved but particle-like behavior when measured. The role of human consciousness in this process remains debated [2]. This paper proposes that involuntary cognitive signals influence quantum outcomes, tested through a novel experiment. The study aims to connect quantum physics with cognitive science, with implications for both fields.

2 Theoretical Background

We propose the "cognitive radar hypothesis," inspired by biological signaling like bat echolocation [3]. Human cognition may emit quantum-level signals, distinct from electromagnetic waves, that perturb particle behavior. Neural activity, with its synchronized patterns, could generate a field-like effect, active during wakefulness but reduced in sleep. This hypothesis reframes the observer effect as a biological phenomenon, drawing on interdisciplinary insights from quantum mechanics and neuroscience.

3 Experimental Methodology

A double-slit experiment tests the hypothesis, detailed below.

3.1 Experimental Setup

A photon source emits paired particles via spontaneous parametric down-conversion. Two slits, 0.1 mm apart, are 1 m from a detector screen. A human subject, unaware of emission timing, is seated 2 m away. The setup is shielded to minimize noise.

3.2 Procedures and Controls

We compare:

- **Presence**: Subject is awake and present.
- **Absence**: No subject or subject in meditation.

Each condition runs 1000 trials. Errors (cognitive variability, environmental noise, fatigue) are mitigated by multiple subjects, shielding, and short sessions.

3.3 Data Analysis

Photon positions form a histogram. Fringe variance is computed, and a t-test compares conditions (p=0.05).

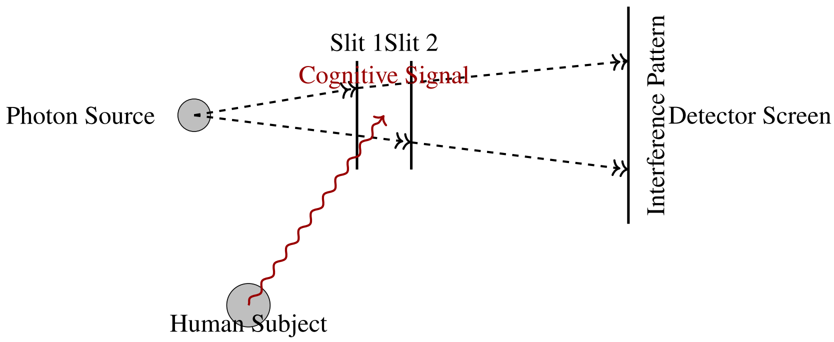

Figure 1: Experimental setup: a human subject's cognitive signals may influence photon interference patterns in a double-slit experiment.

4 Numerical Simulations

A numerical model simulates interference patterns, with a perturbation term for cognitive influence. Code is available at `https://github.com/DonMask/QuantumCognitiveRadar` (`simulation.py`), archived at Zenodo (DOI: 10.5281/zenodo.15458571). Figure 2 shows a shifted pattern with a subject present.

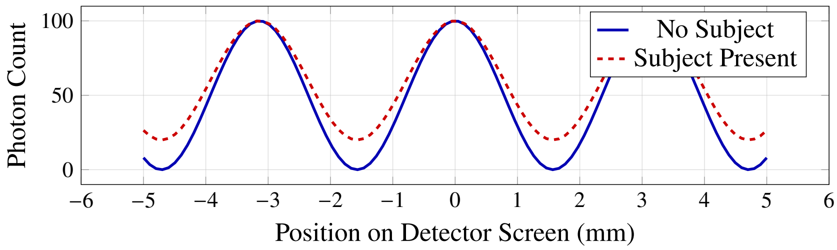

Figure 2: Simulated interference patterns: blue curve (no human subject), red dashed curve (human subject present).

5 Mathematical Model

The interference pattern is modeled as:

$$P(x) = |\psi_1(x) + \psi_2(x)|^2, \tag{1}$$

where $\psi_1(x)$, $\psi_2(x)$ are slit wavefunctions. A cognitive phase shift ϕ yields:

$$P'(x) = \left|\psi_1(x)e^{i\phi} + \psi_2(x)\right|^2. \tag{2}$$

This predicts measurable fringe shifts.

6 Discussions and Implications

If validated, the hypothesis could inform quantum sensor design and neuroscience [3]. Challenges include detecting subtle signals and isolating cognitive effects. Future studies could explore signal characteristics or different mental states, advancing quantum-cognitive research.

7 Conclusion

This study proposes that cognitive signals perturb quantum systems, tested via a double-slit experiment. Validation could bridge quantum mechanics and cognitive science, prompting new research directions.

References

[1] J. A. Wheeler, “The ‘law without law’,” in *Quantum Theory and Measurement*, J. A. Wheeler and W. H. Zurek, Eds., Princeton University Press, 1978.

[2] A. Zeilinger, “Foundations of quantum mechanics,” *Physics World*, vol. 12, no. 4, pp. 35–40, 1999.

[3] R. Penrose, *The Emperor’s New Mind*, Oxford University Press, 1989.