

Decoherence of electron waves - quantitative continuous quantum Zeno effect

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Abstract:

When an electron beam is guided in nearest vicinity over a metallic or semiconducting plate it is highly sensitive to suffering energy loss through interaction with the plate. The mass less interaction and dissipation with the plate affects the phase coherence of the electron, even for a single electron experiment [1]. The latter can be explained as continuous quantum Zeno effect. Quantitative results for the silicon waver prove a much weaker decoherence than the results for a perfect gold plate and are hopefully proven soon in the experiment.

[1] Peter Sonnentag and Franz Hasselbach, "Measurement of Decoherence of Electron Waves and Visualization of the Quantum-Classical Transition", Phys. Rev. Lett. 98, 200402 (2007)