

Abstract Submitted
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Observation of the Quantum-Classical Transition via Electron Diffraction PETER BEIERLE, HERMAN BATELAAN, University of Nebraska-Lincoln — A collimated electron beam with an energy ranging from .5 keV- 5 keV is passed over a 1 cm long conducting surface. The electrons are diffracted from a 100 nm periodic SiN free-standing grating. The surface is placed within the electron near-field diffraction distance. The loss of visibility of the far-field diffraction pattern is measured, which indicates the amount of decoherence that the electrons experienced as they passed over the surface. It has been determined through the visibility as a function of the height with respect to the surface that a) one can observe the transition of the electron's behavior between classical and quantum mechanics, b) that our experiment can be used to rule out a classical theoretical model of the surface decohering mechanism (consistent with Hasselbach's work), and c) this experimental setup is simpler than the use of an interferometer. Comparing a silicon to a gold surface, we are in the process of testing a wider array of theoretical models for the mechanism of decoherence. This work is supported by the National Science Foundation under award number 1306565.

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