Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Relativistic quantum Darwinism in Dirac fermion and graphene systems XUAN NI, Arizona State University, LIANG HUANG, Arizona State University; Lanzhou University, Gansu, China, YING-CHENG LAI, Arizona State University, LOUIS PECORA, Naval Research Laboratory — We solve the Dirac equation in two spatial dimensions in the setting of resonant tunneling, where the system consists of two symmetric cavities connected by a finite potential barrier. The shape of the cavities can be chosen to yield both regular and chaotic dynamics in the classical limit. We find that certain pointer states about classical periodic orbits can exist, which are signatures of relativistic quantum Darwinism (RQD). These localized states suppress quantum tunneling, and the effect becomes less severe as the underlying classical dynamics in the cavity is chaotic, leading to regularization of quantum tunneling. Qualitatively similar phenomena have been observed in graphene. A physical theory is developed to explain relativistic quantum Darwinism and its effects based on the spectrum of complex eigenenergies of the non-Hermitian Hamiltonian describing the open cavity system.

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Date submitted: 07 Nov 2011 Electronic form version 1.4