Tunneling of an energy eigenstate through a parabolic barrier viewed from Wigner phase space

We analyze the tunneling of a particle through a repulsive potential resulting from an inverted harmonic oscillator in the quantum mechanical phase space described by the Wigner function. In particular, we solve the partial differential equations in phase space determining the Wigner function of an energy eigenstate of the inverted oscillator. The reflection or transmission coefficients $R$ or $T$ are then given by the total weight of all classical phase-space trajectories corresponding to energies below, or above the top of the barrier given by the Wigner function.

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