An effective tunneling description

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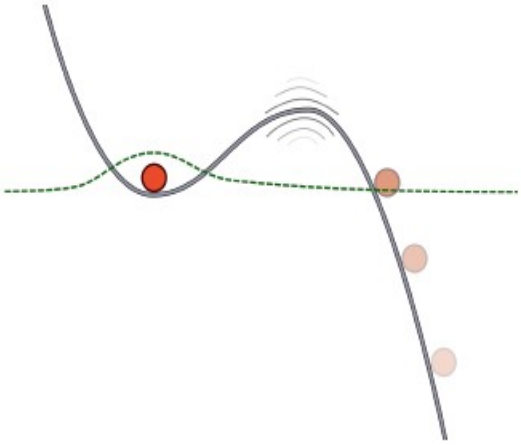

We propose to use a time dependent imaginary potential to describe quantum mechanical tunnelling through time dependent potential barriers. We use Gamow vector solutions to the stationary problem to justify our choice of potential, and we apply our ansatz to describe voltage switching in a driven current-biased Josephson Junction.

The Josephson Junction phase variable experiences a tilted washboard potential with metastable trapped states (see figure above), and our description reproduces a number of features associated with the switching dynamics of the phase variable from trapped to running states, in particular the dependence on bias current and driving field parameters.

This method produces results (see eg. figure below) that have previously been explored, but this it is the first method capable of producing the tunneling behaviour for any dynamics of a CBJJ. Furthermore we are able to identify the wave function of the phase conditioned upon no tunneling, which might be of great interest for quantum information purposes. Our results are also promising for the application of the fixed current-biased Josephson junction as a field amplitude detector.