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Investigating Classical and Quantum Behavior of Graphene-based Josephson Junctions JOSEPH LAMBERT, STEVEN CARABELLO, ZECHARIAH THRAILKILL, THILANKA GALWADUGE, ROBERTO RAMOS, Drexel University — We present work investigating the classical and quantum nature on the switching from the superconducting to the normal state in graphene Josephson junction devices. These devices consist of two parallel superconducting leads deposited onto single- and few-layer graphene flakes. In current-biased graphene Josephson junctions, we predict a potential similar to the tilted washboard potential in conventional Josephson junctions, which is a function of the gauge-invariant phase difference. A switching event can be thought of as the escape of a fictitious "phase particle" out of a local minimum. It can escape due to classical resonant activation over the potential barrier or by quantum tunneling through the potential barrier. The switching properties of these devices depend on many factors such as thermal and current noise. We explore these factors and consider the implications of ballistic versus diffusive charge carriers. We also present our ongoing experimental progress studying these devices.

Joseph Lambert
Drexel University

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