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Superconducting-to-Normal State Switching Experiments using Graphene-based Josephson Junctions JOSEPH LAMBERT, STEVEN CARABELLO, ROBERTO RAMOS, Department of Physics, Drexel University — We report results of ongoing superconductor-to-normal state switching experiments using graphene-based Josephson junctions. These devices consist of a single-layer graphene flake contacted by two superconducting parallel leads separated by a few hundred nanometers. Through the proximity effect, the superconducting state is induced in the graphene region below the leads and the Josephson supercurrent is mediated through the normal graphene region by multiple Andreev reflections. The Josephson effect has been firmly demonstrated in these devices, where supercurrents in the hysteretic current-voltage characteristic, Shapiro steps, the Fraunhofer-like diffraction pattern in the critical current versus external magnetic field, and the current-phase relationship have been observed. We report on work in progress, in measuring I-V characteristics, thermal activation and microwave resonant activation in graphene-based junctions, at various temperatures below 1 Kelvin. We modulate the density of charge carriers using a back-gate voltage, which tunes the critical current. This provides another knob for studying these state switching properties.

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