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Phonon bottleneck in graphene-based Josephson junctions at millikelvin temperatures.[1] IVAN BORZENETS[2], ULAS COSKUN, HENOK MEBRAHTU[3], YURIY BOMZE, Duke University, ALEX SMIRNOV, North Carolina State University, GLEB FINKELSTEIN, Duke University — We examine the nature of the transitions between the normal and the superconducting branches of superconductor-graphene-superconductor Josephson junctions. We attribute the hysteresis between the switching (superconducting to normal) and retrapping (normal to superconducting) transitions to electron overheating. In particular, we demonstrate that the retrapping current corresponds to the critical current at a higher temperature, where the heating is caused by the retrapping current itself. The superconducting gap in the leads suppresses the hot electron outflow, allowing us to further study electron thermalization by phonons at low temperatures ($T < 1$K). The relationship between the applied power and the electron temperature was found to be $P \propto T^3$, which we argue is consistent with cooling due to electron-phonon interactions.

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