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Ballistic graphene Josephson junctions from the short to the long regime ANDREW SEREDINSKI, Duke University, IVAN BORZENETS, University of Tokyo, FRANCOIS AMET, Appalachian State University, CHUNG TING KE, ANNE DRAELOS, MING-TSO WEI, Duke University, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Materials Sceince, YURIY BOMZE, Duke University, MICHIHISA YAMAMOTO, SEIGO TARUCHA, University of Tokyo, GLEB FINKELSTEIN, Duke University — We explore the critical current (I_C) temperature scaling of ballistic Josephson junctions. Using encapsulated graphene/boron-nitride heterostructure devices, we vary device length from the short to the long junction regime. We extract the carrier-density-independent energy δE by calculating the ballistic cavity level spacing through the Fabry-Perot oscillations of the normal resistance. In the long and intermediate junction regimes, we find I_C scales as exp(-k_BT/ δE) at higher temperatures. For short junctions, we find strong agreement with theoretically predicted I_C behavior. In the zero temperature limit, I_C of a long (short) junction saturates at a magnitude determined only by the product of δE (Δ) and the number of transversal modes in the junction.

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