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Sources of disorder in double-gated graphene-insulator-graphene tunneling devices[1] SERGIO DE LA BARRERA, Carnegie Mellon University, Department of Physics, TANIA ROY, Georgia Institute of Technology, School of Materials Science and Engineering, RANDALL FEENSTRA, Carnegie Mellon University, Department of Physics, ERIC VOGEL, Georgia Institute of Technology, School of Materials Science and Engineering — We demonstrate vertical tunneling through layered graphene / hexagonal boron nitride / graphene heterostructures and investigate the resulting non-linear current-voltage characteristics and gated operation of this device. Some devices show negative differential resistance and steep switching due to a novel resonant tunneling mechanism caused by the graphene density of states, while other devices lack this intriguing feature. We explain the differences in experimental findings by modeling the dominant forms of disorder that can occur in these devices. While certain aspects of current experimental results can be explained in terms of finite-size effects and charge impurities in the surrounding materials and substrate, it is evident that additional forms of disorder remain to be understood.

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