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Anomalous conductivity noise in gapped bilayer graphene heterostructure MOHAMMED ALI AAMIR, PARITOSH KARNATAK, T. PHANINDRA SAI, ARINDAM GHOSH, Department of Physics, Indian Institute of Science, Bangalore - 560012, India — Bilayer graphene has unique electronic properties it has a tunable band gap and also, valley symmetry and pseudospin degree of freedom like its single layer counterpart. In this work, we present a study of conductance fluctuations in dual gated bilayer graphene heterostructures by varying the Fermi energy and the band gap independently. At a fixed band gap, we find that the conductance fluctuations obtained by Fermi energy ensemble sampling increase rapidly as the Fermi energy is tuned to charge neutrality point (CNP) whereas the time-dependent conductance fluctuations diminish rapidly. This discrepancy is completely absent at higher number densities, where the transport is expected to be through the 2D bulk of the bilayer system. This observation indicates that near the CNP, electrical transport is highly sensitive to Fermi energy, but becomes progressively immune to time-varying disorder. A possible explanation may involve transport via edge states which becomes the dominant conduction mechanism when the bilayer graphene is gapped and Fermi energy is situated close to the CNP, thereby causing a dimensional crossover from 2D to 1D transport. Our experiment outlines a possible experimental protocol to probe intrinsic topological states in gapped bilayer graphene.

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