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In-gap transport in random-gap grapheme: metallic and insulating phases VAGHARSH MKHITARYAN, MIKHAIL RAIKH, Department of Physics and Astronomy, University of Utah, Salt Lake City, UT 84112, USA — 1D-like counter-propagating states at a gap center of graphene with random gap constitute two chiral networks. In the absence of intervalley scattering, transport over each network is either metallic or insulating, depending on the gap randomness. We demonstrate that properties of both phases as well as transitions between them are accurately captured within a simple real-space renormalization group approach. The most striking feature of this network transport is that it can be metallic even when the neighboring plaquettes are weakly coupled. We show that randomness in local gap signs reflected in randomness in signs of local transmission coefficients, gives rise to resonant transmission of the RG superblock. Delocalization occurs by proliferation of these resonances to larger scales. As the disorder exceeds a critical value, the RG flow towards insulator switches to a flow towards metallic fixed point. Evolution of the conductance distribution to metallic fixed point is synchronized with evolution of transmission coefficient signs, so that delocalization is accompanied with sign percolation.

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