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Interference of electronic states between the two misoriented crossed graphene nanoribbons[1] K.M. MASUM HABIB, ROGER LAKE, Dept of Electrical Engineering, Univ of California Riverside — In a twisted bilayer graphene, where one layer is rotated with respect to the other one, for rotation angles more than 20 degrees each layer remains electronically decoupled even though they are vertically separated by only a fraction of a nanometer. A relative rotation between two graphene nanoribbons (GNRs), with one place on top of the other, creates a crossed GNR (xGNR) with an overlap region that is neither AA nor AB stacking. The geometry of the overlap region of the xGNR is that of a twisted bilayer graphene. Calculations, based on the extended Huckel theory and the non-equilibrium Green's function formalism, show that the electronic states of the individual GNRs of an unbiased xGNR are decoupled from each other similar to the decoupling that occurs in a twisted bilayer graphene. The decoupling occurs due to the quantum mechanical interference between the electronic states of the individual GNRs. This results in a strong suppression of inter-GNR transmission over a large energy of window. The transmission is, however, a strong function of the potential difference between the GNRs and the atomistic geometry of the overlap region which depends on relative translation and rotation angle between the GNRs. Thus, a bias can be used to control the inter-GNR current.

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