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Electric charge and potential distribution in twisted multilayer graphene[1] NATALYA ZIMBOVSKAYA, University of Puerto Rico-Humacao, EUGENE MELE, University of Pennsylvania — The specifics of charge screening and electrostatic potential spatial distribution in rotationally faulted multilayered graphene films with decoupled layers placed in between charged substrates is theoretically analyzed. The analysis is carried out using a nonlinear Thomas -Fermi approach. It is shown that by varying the areal charge densities on the substrates and/or the thickness of the graphene pack one may tune the screening length in the graphene pack. When the charge densities on the substrates are weak, the screening length is of the same order as the pack thickness, which agrees with semimetallic properties of graphene. When the amount of the donated charge is sufficiently large the screening length reduces indicating the transition to a metallic-like behavior of the graphene layers. The transition is shown to turn on rather quickly, and in occurs when the charge on the substrates/external electric field reaches a certain crossover magnitude. The possibilities for experimental observation of the predicted transition are discussed.

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