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Contact resistances, transfer lengths, and spin transport in graphene structures Z. G. YU, J. BAKER, S. KRISHNAMURTHY, SRI International — In graphene device structures, electric current is usually injected from a 3-dimensional (3D) metal electrode to a 2D graphene layer. The contact resistance, which is present in structures even without an oxide layer between the electrode and graphene, can be characterized by the transfer length, which measures the length required for a current changes from lateral in graphene to vertical in the electrode. Different transfer lengths with respect to the electrode size can give rise to different spin injection and transport behaviors. Here we study spin transport in nonlocal graphene device structures by solving the spin drift-diffusion equations with boundary conditions that take into account finite spin-dependent transfer lengths. Our theory can consistently explain measured nonlocal resistances and their bias-current dependences in structures with and without an Al_2O_3 layer between Co electrodes and graphene.

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