Abstract Submitted
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Inter-valley scattering and spin transport in graphene[1] SERGIO E. ULLOA, MAHMOUD M. ASMAR, Ohio University — Electron scattering in graphene is characterized by a highly anisotropic behavior due to the helical nature of its charged carriers. This anisotropy has been experimentally verified in [1], as the ratio of transport to elastic times is found to take a constant value of 2, consistent with the single valley Dirac equation description at low energies. It was also shown theoretically in [2] that the presence of spin orbit interactions (SOIs) transforms the intra-valley scattering process to be increasingly isotropic for stronger SOI. In this work we analyze the effects of inter-valley scattering on the electronic and spin transport of electrons in graphene. By considering the most relevant terms allowed by time reversal symmetry in the Dirac Hamiltonian, and using partial wave decomposition, we obtain full spin-dependent scattering amplitudes in the system. Here, we present the scattering in the absence and presence of SOIs, where we extract critical strengths of the inter-valley mixing terms that could lead to drastic changes in previous results [1,2]. We also obtain estimates of the critical parameter features of impurities for which the single valley description of graphene fails. [1] M. Monteverde, et al., PRL 104, 126801 (2010).[2] M. M. Asmar and S. E. Ulloa, arXiv:1311.1271

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Mahmoud M. Asmar
Ohio University

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