Spin-dependent scattering from gated potential obstacles in graphene systems\textsuperscript{1} MAHMOUD ASMAR, SERGIO ULLOA, Ohio University — We study the scattering of Dirac fermions in a sheet of graphene from potential obstacles created by external gates in the presence of both intrinsic and extrinsic Spin-Orbit(SO) interactions \cite{KaneMele}. Obtaining an analytical solution in real-space representation for the eigenvectors allows us to calculate the phase shifts generated by a finite-size obstacle in the presence of SO interactions \cite{CastroNetoGuinea}. These states take into account the total angular momentum of the Hamiltonian, which includes spin, pseudo-spin and orbital angular momentum. We find an interesting interplay of both SO interactions, which results in oscillations of the spin-flip cross sections with energy; this also generates a difference between both cross sections for different interaction ranges. These results may open a possibility of obtaining spin-polarized currents that are of importance in the field of spintronics.

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\cite{KaneMele} C. L. Kane and E. J. Mele, PRL 95, 226801 (2005).