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Multiple Scattering of Dirac Fermions in Two Dimensions[1] MAHMOUD M. ASMAR, SERGIO E. ULLOA, Ohio University — The low energy dispersion of electrons in graphene-as well as surface states of three dimensional topological insulators- are characterized by a linear dispersion, leading to interesting dynamical properties. The presence of potential scattering centers, such as impurities in real samples or artificially created gated regions, also reflect the "massless" nature of electrons in these materials. The study of Dirac fermion scattering from single potential obstacles is made possible through partial wave methods. In the case of closely-spaced potential obstacles (high defect concentration), one should consider multiple scattering effects. Using separation of variables, Graf's addition rules, and far field matching, one can generalize the partial wave method to the case of many scatterers, and obtain physical observables for such problem. We present our study of the scattering problem of Dirac fermions from multiple potential obstacles, with focus on the two-center problem. We discuss the dependence of the differential cross section on the separation, and different potential shifts caused by these obstacles, and compare these results with the differential cross section for a single scattering center. We also study the minimal conditions that allow the observation of Klein tunneling.

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