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Finite Element Modeling of Open Domain Quantum Scattering[1]
A.V. ILYASHENKO, A.G. GIANFRANCESCO, C.R. BOUCHER, L.R. RAMMOHAN, Worcester Polytechnic Institute — We study quantum scattering in the open domain in 2D using the finite element method. We solve the Schrödinger equation in a circular region using an arbitrary triangular mesh with a plane wave source and an arbitrary (finite) scattering potential. We employ perfectly matched layers (PML) around the region of interest to simplify the derivative Cauchy BCs to Dirichlet BCs. With PML, fewer resources are needed to account for the open domain without going to the asymptotic region as is usually done, while obtaining the "near-field" evanescent solutions when they are present. The scattering total cross-section, the differential cross-section, and the phase shifts can be determined by performing a partial wave analysis on the computed solution. Examples of this technique and results on multi-component, spin dependent scattering for spintronics will be presented.

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