High-order FEM implementation of PML in the study of plasmonic particles in layered media

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Numerical analysis of layered media is demanding task due to the unique wave types that can be observed only in layered geometries, such as guided waves and leaky waves [1]. In this work, such a layered medium will be analyzed by comparing the results obtained from different implementations of FEM with the reference results obtained by Multiple Multipole Program (MMP) [2] using layered medium Green's functions.

We apply high-order curvilinear finite elements for plasmonic particle in layered media with Perfectly Matched Layers (PMLs) [3]. The PMLs are implemented by the C++ finite element code CONCEPTS [4], which has many valuable features, such as high-order curvilinear elements and *hp*-adaptivity. Benefited by these features, we are able to perform high performance computing for the problem. The benchmark solution is validated by MMP results and has good agreement. A further comparison with commercial FEM package shows the advantage to use high order finite elements. Finally, a tentative *hp*-strategy is proposed to enhance the computational efficiency.

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