Complex-scaling method for the complex plasmonic resonances of particles with corners

Florian Monteghetti*

*Inria Saclay

This talk will present recent results on the existence and computation of complex plasmonic (CP) resonances $\varepsilon_n \in \mathbb{C}\backslash\mathbb{R}$ for planar particles whose boundaries are smooth except for a finite number of straight corners.

CP resonances are associated with strongly-oscillating fields that do not belong to H^1_{loc}, which prevents from directly using H^1-conforming 2D finite element (FE) approximations. However we show that CP resonances can be computed as eigenvalues of a *modified* plasmonic eigenvalue problem, obtained using a corner complex scaling, whose FE discretization yields a complex-symmetric linear generalized eigenvalue problem of the form $AU = \varepsilon BU$ [1]. Numerical results corroborate the study [2], which proved the existence of embedded plasmonic eigenvalues and discussed the construction of particles that exhibit CP resonances.

[1] A.-S. Bonnet-Ben Dhia, C. Hazard, and F. Monteghetti, Complex-scaling method for the complex plasmonic resonances of planar subwavelength particles with corners, *Journal of Computational Physics* **440** (2021). doi:10.1016/j.jcp.2021.110433.

[2] W. Li and S. P. Shipman, Embedded eigenvalues for the Neumann-Poincaré operator, *Journal of Integral Equations and Applications* **31** (4) (2019). doi:10.1216/JIE-2019-31-4-505.