

SEMINAIRE D'ANALYSE

➤ **VENDREDI 14 OCTOBRE 2016 à 14h15 - salle MA A3 31**



Professeur Eric Bonnetier (Université de Grenoble, Fr) donnera une conférence sur le thème:

« Homogenization and the Neumann-Poincaré operator »

Abstract The Neumann Poincaré operator is an integral operator that allows the representation of the solutions to elliptic PDE's with piecewise constant coefficients using layer potentials. Its spectral properties are of interest in particular in the study of plasmonic resonances of metallic particles.

We discuss the spectrum of that integral operator, when one considers a periodic distribution of inclusions made of metamaterials in a dielectric background medium.

We show that under the assumption that the inclusions are fully embedded in the periodicity cells, the spectra σ_{ε} of the NP operators associated to a distribution of period ε converge to a limiting set composed of 2 parts : the union of the Bloch spectra of NP operators defined over periodicity cells with quasi-periodic boundary conditions and a boundary spectrum associated with eigenfunctions which spend a not too small part of their energy near the boundary.

If the conductivity inside the inhomogeneities lies outside the spectrum of the periodic NP operator, we show that bounded sequences of solutions of the corresponding PDE weakly converge to a homogenized limit, whose effective matrix is defined by a cell-problem of the usual form, albeit the non-elliptic setting. Conversely, if the homogenized source problem is not well-posed, then the conductivity inside the inclusions must lie in $\lim_{\varepsilon \rightarrow 0} \sigma_{\varepsilon}$. This cannot happen when the inclusions are strictly contained in the periodicity cells and if the absolute value of their conductivity is sufficiently large.

This is joint work with Charles Dapogny and Faouzi Triki.

Lausanne, le 6 octobre 2016
BD/HMN/MM