Departmental Colloquia

Department of Mathematics
香港城市大學
City University of Hong Kong

DEPARTMENT OF MATHEMATICS

City University of Hong Kong

Generation of Giant Electromagnetic Fields Using All-Dieletric Nanoresonators

by

Prof. Mourad Sini

RICAM, Austrian Academy of Sciences, Austria

Date: 28 February 2024 (Wednesday)
Time: 2:30 – 3:30pm
Venue: 1507, Li Dak Sum Yip Yio Chin Academic Building

ABSTRACT

The wave fields propagating in the presence of small-scaled particles are usually approximated via linear combinations of interacting point-sources (as poles and dipoles). Such approximations, called point-interactions or Foldy-Lax approximations, are widely used in the waves propagation community whenever multiple scattering is involved. In this talk, we focus on the time-harmonic electromagnetic fields propagating in the presence of a cluster nano-particles which can be passive (i.e. with moderately contrasting permittivity/permeability) or active (i.e. resonating). We derive the dominant Foldy-Lax fields under quite general regimes. These Foldy-Lax fields provide us with the natural effective media that capture the macroscopic behaviour of the cluster. In particular, we derive the electromagnetic medium equivalent to a cluster of all-dielectric nanoparticles (i.e. enjoying high refractive indices), distributed in a finite and smooth domain. This effective medium is an alteration of the magnetic permeability that keeps the electric permittivity unchanged. We provide regimes under which the effective permeability can be positive or negative valued. In addition, in the latter case, we show that the cluster of all-dielectric nanoresonators behaves as an extended quasi-static plasmonic resonator which creates giant electromagnetic fields in its surrounding.

~ALL ARE WELCOME~