OBPP

One-Billion-Particle electromagnetic Scattering Problem

Consider one billion spherical particles (radius r) randomly located in a finite, spherical medium (radius R) in free space in an incident electromagnetic plane wave field (wavelength , wave number $k=2/$). Show the ensemble-averaged 4×4 Mueller scattering matrix interrelating the four Stokes parameters ($I = (I, Q, U, V)$) of the incident field and the scattered field when the size parameter ($x=kr$) and complex refractive index (m) of the individual spherical particles are x=1.76 and m=1.50+i10^{-4} and when the volume fraction of the spherical particles in the spherical medium is v=20%.

You may consider an exact or an approximate solution, or a measurement. If the one-billion-particle challenge cannot be met, compute or measure the scattering matrix for a finite medium composed of the maximum number of spherical particles accessible for your method.

Workshop

The problem and the solution attempts will be discussed at a one-day workshop on Friday, August 19th, 2016. The workshop is organized as a part of the E MTS 2016 conference and its Multiple Scattering session. The workshop is open and free of charge. If interested to join, please e-mail tentative registration to Dr. Antti Penttilä. The workshop will be held at the University of Helsinki and organized by the ERC SAEMPL project.

Program

Kumpula Campus, Physicum lobby

- 09:30 Coffee

Kumpula Campus, Physicum, room E207

- 10:00 *Antti Penttilä*, Opening
- 10:05 *Daniel Mackowski*, Multi-sphere *T*-matrix method and its capabilities
- 10:20 *Johannes Markkanen*, FMM-accelerated *T*-matrix implementation
- 10:35 *Dimitrios Tzarouchis*, TBA
- 10:50 *Xavier Faget*, TBA
- 11:05 *Jukka Räbinä*, Exact solution with the Discrete Exterior Calculus for a limited problem
- 11:20 *Maxim Yurkin*, Exact solution, capabilities of discrete-dipole approximation code ADDA
- 11:35 *Karri Muinonen*, Radiative-transfer solution with incoherent scattering
- 11.50 *Antti Penttilä*, Exact solutions for reduced problems vs. approximate radiative-transfer solutions

12.15-13.30, lunch, Kumpula Campus, Dynamicum

- 13:30 Open discussion
    - future prospects
    - joint article for Radio Science

End by 15:00

Venue

The Helsinki University Faculty of Science is located at the Kumpula Campus. It can be reached by several bus lines from the Helsinki or Pasila railway stations, by tram lines 6 and 8, or by bus number 506 from Otaniemi. Please see the Journey Planner for details, the street address for the campus is "Gustaf Hällströmin katu 2a".