A fast solver for multi-particle scattering in a layered medium

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In this talk, we consider acoustic or electromagnetic scattering in two dimensions from an infinite three-layer medium with thousands of wavelength-size dielectric particles embedded in the middle layer. Such geometries are typical of microstructured composite materials, and the evaluation of the scattered field requires a suitable fast solver for either a single configuration or for a sequence of configurations as part of a design or optimization process. We have developed an algorithm for problems of this type by combining the Sommerfeld integral representation, high order integral equation discretization, the fast multipole method and classical multiple scattering theory. The efficiency of the solver is illustrated with several numerical experiments.