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Polarization Resonances at Backscattering by Multiple Spherical Particles

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The electromagnetic scattering by two interacting spherical particles, i.e., a bisphere, is the most fundamental problem of multiple scattering.

Our recent simulations of electromagnetic scattering by clusters of spheres show a systematic structure in the orientation-averaged backscattering efficiency and the polarization ratio (linear and circular) as a function of the refractive index and the size parameter due to resonance effects of spheres [1].

We explain the mechanics behind the resonance phenomena of bispheres with an emphasis on the polarization by, for example, presenting the scattering properties of bispheres in fixed orientations and varying the angle of incident radiation. Also, we show how the structure by orientation-averaged clusters of spheres changes as the number of spheres increases. For example, in the circular and linear-polarization ratios, the structure remains similar independent of number of spheres, which implies that the structure is a robust polarization phenomenon in terms of multiple scattering.

[1] A. Virkki, K. Muinonen, A. Penttilä, Circular polarization of spherical-particle aggregates at backscattering JQSRT 126 (2013) 150-159.