

From spheroidal function expansions to scattering by spheroids with non-confocal layer boundaries

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The problem of light scattering by a spheroid with non-confocal layers is still far from being solved satisfactorily. We present a new approach to its solution which is based on obtained relations between the spheroidal wave functions defined in different spheroidal coordinate systems. Expansions of these functions in terms of the spherical wave functions just allowed us to derive the coefficients of expansions of the spheroidal functions of any kind in terms of the spheroidal functions defined in another system. The relations can connect the functions in the prolate and oblate systems having the same origin and the symmetry axis. The applicability range of the relations is discussed. In particular cases, the results obtained are compared with those of earlier works. We obtained simple analytic equations for the spheroidal function expansion coefficients that are useful to control numerical calculations and present results of our computations of the spheroidal functions derived in different systems directly and from the relations. Using these results, we discuss good perspectives of the approach suggested when applied to solution of the light scattering problem for spheroids with non-confocal layers.