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BACKSCATTERING OF PLANE WAVE PULSES BY LOW-DENSITY DIELECTRIC BODIES

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In recent years, several studies have been published on scattering of pulses by perfectly conducting scatterers. However, little work of a similar nature exists for dielectric scatterers. In this investigation we will concentrate on the far-field backscattering of plane wave pulses by low-density dielectrics. The nature of the cw solution for low-density cylinders implies that primarily optics fields contribute to the backscatter.[1] This is as expected since it can be shown[2] that backscattered fields due to surface waves on the scattering body vanish as the relative index of refraction $\varepsilon \to 1$. Furthermore, for bodies which are large in terms of λ the cw solution can be identified with an optics return from the front and back of the object. These two scattering centers will also be the main contributions in the case of pulse scattering. As particular examples, results for pulse scattering from spheres and cylinders will be shown and discussed. These two shapes are of particular interest, since their geometry provides cw solutions whose Laplace transform are tractable. It is hoped that the study of pulse solutions for low-density dielectric objects will eventually lead to a theory for dielectric objects of any density as was the case in the study of the cw solution of the low density sphere[3] which afterwards led to a general thoery for dielectric spheres of any density.[4,5]

References

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