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Analysis of beam scattering using clusters of filamentary sources located in complex space

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Abstract–The idea proposed in this paper is to use a model comprising clusters of filamentary sources centered in complex-coordinate space for a more systematic analysis of two-dimensional scattering problems. In this way, each portion of the body surface is illuminated by several beams each originating from a different cluster and hence arriving at a different angle. A better approximation of a general scattering by a large body is thus furnished. In addition, due to the nature of the fields radiated by the complex filamentary sources, the impedance matrix is localized and can, with appropriate thresholding operation be made sparse with almost no degradation in the solution accuracy. Moreover, the possibility of an *a priori* reduction in the number of sources needed for a given excitation is facilitated. The new approach is applied to analyze electromagnetic scattering by a perfectly conducting circular cylinder excited by a beam whose axis does not intersect the cylinder axis. The new approach makes the solution more general but still very efficient. The numerical results are tested against those of the analytical solution for the problem.