REFERENCES


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ABSTRACT
Proposed in this article is the use of a model comprising filamentary sources that are located, whenever applicable, according to guidelines based on image theory. The idea is applied to the analysis of two-dimensional scattering by a perfectly conducting nearby touching pair of circular cylinders excited by a TE-polarized plane wave. An effective analysis of this scattering problem is facilitated, as the trial-and-error stage, often required for selecting appropriate source locations, is significantly reduced. The numerical results are verified by internal checks, as well as by comparison against the results of a reference solution. © 1996 John Wiley & Sons, Inc.

I. INTRODUCTION
This article considers the problem of wave scattering by a pair of nearly touching two-dimensional circular cylinders. This scattering problem has been investigated by McPhedran and co-workers [1, 2]. Analysis tools for a problem of this type are still of interest today for the development of fast algorithms for the calculation of the scattering properties of agglomerates consisting of small scatterers [3]. They are also relevant for problems involving scattering by a cylinder placed near a planar reflecting surface [4].

Herein we seek an efficient source model solution for this problem of wave scattering by a pair of nearly touching cylinders. Fictitious source models [5, 6] have been applied recently to analyze scattering by objects of various sizes and shapes, as well as by objects characterized by a wide range of length-scale features. The latter case, for example, has been treated by allowing the coordinates of the source centers to assume complex values [7, 8]. The idea suggested here is to use models comprising sources whose locations are determined by rules deduced based on image theory. This idea facilitates the application of the source model approach, as the task of choosing suitable source locations becomes less cumbersome.

In the new approach, instead of using a distribution of sources whose locations are determined mostly by empirical rules, we determine the locations of the sources based on image theory knowledge [9]. Specifically, we determine the location of the singularities of the static solution related to the configuration under study and distribute the sources accordingly. Compared to previous choices of source locations, the present approach reduces the effort involved in the trial-and-error process of determining the optimal source locations. Moreover, the possibility of reducing the number of sources that are actually needed for a given configuration is facilitated.

The article is organized as follows. The geometry of the TE-wave-illuminated pair of cylinders under study is specified in Section II. The construction of the equivalence for the