Analysis of Scattering from Cylinders with a Periodically Corrugated Periphery Using a Current-Model Technique

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Abstract—**A novel solution is presented for the problem of two-dimensional electromagnetic scattering from a circular cylinder with periodically corrugated circumference. The application of the Floquet formalism is effected by representing the incident field as a sum of fields, each one obeying a Floquet periodicity condition involving a different phase factor. Respective sets of fictitious sources, comprising rotationally periodic and properly phase-modulated electric current distributions, are used to simulate the scattered field and the field in the cylinder region. Spectral and spatial formulations are presented. The solution procedure is simple to implement and is applicable to cylinders with corrugations of arbitrary profile. The accuracy of the method has been demonstrated. It has also been shown that in the limiting case of low corrugation the results of our numerical solution agree with results obtained by an approximate analytic solution.**

ical boundaries. In many cases these simple sources are spatially impulsive sources [3]. However, when treating problems of scattering from periodic structures, there are preferences for other sources, which are slightly more spatially diffused and whose fields can also be derived analytically. In the class of problems involving periodic structures, this technique has been applied successfully to analyze two-dimensional scattering from gratings [4]. Subsequently, the method has been extended to treat doubly periodic structures [5]. Recently, the method has been further extended to handle scattering from linear periodic arrays [6]. It may be remarked that the fields due to the periodic strip currents used in [4] and due to the doubly periodic patch currents used in [5] have a representation