Analysis of Electromagnetic Scattering from Dielectrically Coated Conducting Cylinders Using a Multifilament Current Model

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Abstract—**A method of moments solution is presented for the problem of transverse magnetic (TM) scattering from dielectrically coated conducting cylinders. The solution uses fictitious filamentary electric sources of yet unknown currents to simulate both the field scattered by the cylinder and the field inside the dielectric coating. So constructed, the simulated fields are forced to obey the boundary conditions, namely, the continuity of the tangential components of the electric and magnetic fields across the air-dielectric interface and the vanishing of the tangential component of the electric field at the perfect conductor, at selected sets of points on these respective surfaces. The result is a matrix equation which is readily solved for the unknown current. These currents can in turn be used to determine approximate values for the fields and field-related parameters of interest. The procedure is simple to implement and is general in that cylinders of smooth but otherwise arbitrary shape and coatings of arbitrary complex permittivity can be handled. A few illustrative examples are finally considered and compared with available data. The results demonstrate the efficiency of the suggested solution.**

the main advantage is that there is no longer need to integrate surface current when computing the fields. So constructed, the simulated fields are required to obey the continuity conditions at a selected set of point on the cylinder surface. The result is a matrix equation which is solved for the unknown filamentary currents. These currents are then used to determine approximate fields and field-related quantities of interest in the various regions. The procedure in [1] is thus very simple and applicable to cylinders of smooth but otherwise arbitrary shape and of arbitrary complex permittivity. The objective of this paper is to extend the solution developed in [1] to encompass the case of scattering by dielectrically coated conducting cylinders of arbitrary smooth cross section.

The suggested technique is applied to the problem of a circular cylinder comprising a perfectly conducting core surrounded by a dielectric sleeve illuminated by a TM plane