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Analysis of Electromagnetic Scattering from a Slot-Perforated Conducting Cylindrical Shell Using a Multifilament Current Model

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Abstract– The problem of TM (transverse-magnetic) electromagnetic interaction with a slot-perforated conducting cylindrical shell is expressed in a generalized formulation and solved by the method of moments. The cylindrical shell is situated in free space and, in the general case, encloses a homogeneous material core. The solution uses two sets of fictitious filamentary electric current sources, with adjustable constant complex amplitudes, to simulate the fields in the two distinct regions of the problem. One set is used to simulate the field scattered by the cylindrical structure, while the other set is used to simulate the field penetrated the metallic enclosure through the slot. So constructed, the simulated fields produced by the filamentary sources are analytically derivable everywhere in space. We require these fields to obey the boundary conditions in the point-matching sense. This requirement is cast into a matrix equation which is in turn solved for the amplitudes of the filamentary currents. Once these filamentary currents are known, approximate values for the fields and field-related parameters of interest can be determined in a straightforward manner. The procedure is simple and general. A selection of illustrative examples is considered and compared with available data.