ASYMPTOTIC ANALYSIS OF PERIODIC STRIPS ON SPHERICAL STRUCTURES

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Strip gratings are well known for their polarization properties. Incident waves with the electric field parallel to the strips are reflected, and incident waves with the electric field orthogonal to the strips pass through the strips. Strip-loaded substrates can be used among others as wave polarizers (e.g. in reflector antenna systems), in horn antennas to improve cross-polar and back-radiation characteristics, or as struts with smaller equivalent blockage width.

Strip-loaded surfaces can be rigorously analyzed by applying the moment method (MoM) to determine the unknown strip currents. The analysis of planar and circular-cylindrical strip-loaded surfaces can be simplified by using the periodical property of the structure, i.e. by expanding the E- and H-fields in Floquet modes. However, if the source excites a full spectrum of plane or cylindrical waves, such as a dipole, the Floquet-mode expansion/MoM is a laborious process. The implementation of asymptotic strip boundary conditions (ASBC) avoids complexity of MoM approach (P.-S. Kildal et.al, *Microwave and Optical Technology Letters*, Vol. 14, pp. 99-101, Feb. 1997). The accuracy of ASBC for planar and circular-cylindrical geometries is discussed in Z. Sipus et.al, *Microwave and Optical Technology Letters*, Vol. 7, No. 3, pp. 173-178, Feb. 1998, where it is shown that for small distance between strips (less than 0.2 λ) the agreement between ASBC and rigorous MoM results is good.

The purpose of this paper is to extend the previous work to spherical geometry, i.e. to implement the ASBC to spherical structures. The spectral-domain technique is used to expand the electromagnetic field in spherical modes. Since the problem is defined in the spherical coordinate system we apply the vector-Legendre transformation to the E- and H-fields (W.Y. Tam, K.M. Luk, *IEEE Trans. Microwave Theory Tech.*., Vol. 39, pp. 700-704, 1991.). The boundary conditions cannot be satisfied separately for each spherical mode, thus the ASBC are applied to the total field. As an example the scattered field from a strip-loaded dielectric sphere is calculated and compared with the scattered field from equivalent planar and cylindrical structures.