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DIFFRACTION BY AN IMPEDANCE STRIP: A NEW PRESENTATION BASED ON PHYSICAL OPTICS APPROACH

Abstract

Diffraction of plane electomagnetic waves by an infinitely long strip having the same impedance on both faces is investigated. The solution for impedance surface with arbitrary value of the surface impedance is constructed as a linear combination of known solutions for perfectly electric conducting (PEC) *and perfect magnetic conducting* (PMC) *surfaces. Solutions for PEC and PMC strip of the same width are found numerically. The coefficients in the presentation for the radiation pattern for the impedance strip take into account losses which depend on the surface impedance. These coefficients are evaluated analytically in physical optics approximation when all solutions* (PEC,PMC and impedance strip) *can be obtained analytically. For other values of the wave length the resulting fields are examined numerically. It is necessary to solve once the diffraction problem by PEC and PMC strips numerically for a given strip width, after that the solution for an impedance strip is obtained as a simple superposition of both solutions for any value of the impedance. The method of solving considering diffraction problem is based on presenting the diffracted field in terms of the induced electric and magnetic current densities. The problem is formulated as simultaneous integral equations. Obtained integral equations allow to derive the high frequency asymptotic expressions of the far field radiation pattern.Utilizing the Fourier transform to the integral equations the unkown current density functions can be expanded into the infinite series containing the Chebyshev polynomials. Finally, the problem is reduced to infinite systems of linear algebraic equations satisfied by the expansion coefficients. Radiation pattern, radar cross section are plotted for different values of the impedance, the wave length and the incidence angle showing the comparison of the constructed solution and exact solution for impedance strip. It is showed that presented expression allows to obtain the solution for impedance strip with good accuracy for wide range of values of impedance and wave length.*