# Electromagnetic Scattering by Three Unevenly Spaced Parallel Half-planes Truncated by a Metal Plane

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This work considers an electromagnetic plane wave obliquely incident on three unevenly spaced parallel metallic half planes truncated by a metallic plane. The incident field is E-polarized, that is, the component of the magnetic field parallel to the edges of the half-planes is zero. The scattering structure is analyzed in the phasor domain with the time dependence factor $\exp(+j\omega t)$ omitted throughout.

The analysis is carried out by first considering an incident field with a direction of propagation vector that is normal to the edges of the parallel plates. Analysis of this geometry is carried out using the Wiener-Hopf technique and numerical results are obtained using the Friedholm factorization method detailed in [1]. This analysis is then generalized to the case of oblique incidence using the operator detailed in [2]. Lastly, surface currents and total fields are obtained and discussed for the region between the parallel plates using residue calculus. Similar work has been utilized successfully to generate results for the case of three evenly spaced plates [3].

Particular attention is paid to the surface current at the junction between the parallel plates and the truncating plane. Specifically, it is shown that the surface currents parallel to the junction vanish and the currents across the junction are continuous to avoid a buildup of charge on the junction. One advantage of this method is the ability to resolve the surface currents near the edge singularities located at the intersection between the edges of the parallel plates and the truncating plane. These edge singularities are a particularly difficult facet for computational electromagnetic solvers and for this reason this work may prove useful in the validation of computer codes.

1. V.G. Daniele and R.S. Zich, *The Wiener-Hopf Method in Electromagnetics,* Edison, NJ, USA: SciTech Publishing (IET), 2014.

2. P.L.E. Uslenghi, "Electromagnetic scattering by metallic cylinders perpendicularly truncated by a metal plane," *IEEE Trans. Antennas Propag.,* vol. 63, no. 5, pp. 2228-2236, May 2015.

3. M.D. Poort, V.G. Daniele and P.L.E. Uslenghi, "Scattering by three parallel half-planes perpendicularly truncated by a metal plane," in *2017 Int. Conf. on Electromagnetics in Advanced Applications (ICEAA)*, pp. 350-355, Verona, Italy, Aug. 2017.