

## C-4-3

### A JUNCTION PROBLEM IN INHOMOGENEOUS WAVEGUIDE

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#### Abstract

The paper considers the problem of a TEM wave impinging on a dielectric step in a parallel plate waveguide. With the assumed polarization, the edge of the dielectric is parallel to the incident magnetic field; this is a considerably more difficult problem than for the opposite polarization, which has been solved by Lewin<sup>1</sup>. The formulation is a quasi-static one, based on the assumption that only a small number of modes are non-evanescent, hence the remainder fields approximately satisfy Laplace's equation. The boundary value problem is reduced to the solution of a singular integral equation, which is solved exactly. Expressions are obtained for the reflection and transmission coefficients.

We also calculate the exponent  $t$  which describes the electric field singularity at the dielectric edge. It is found that  $t$  agrees with the value obtained by Meixner<sup>2</sup>. As the underlying assumptions of Meixner's paper have sometimes been questioned, our results constitute strong support for their validity.

1. Lewin, J., "Theory of Waveguides", Butterworths, London, 1975.
2. Meixner, J., "The Behavior of Electromagnetic Fields at Edges", IEEE Trans. Antennas & Prop., AP-20, 442-446, 1972.