2-III B4

SPECIAL SOLUTION METHODS FOR WAVE PROPAGATION IN THE CASE OF CERTAIN WAVEGUIDE INHOMOGENEITIES

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Abstract

1. Problems and Solution Methods

Fig. 1 shows a typical abrupt eccentric transition between an elliptical and a rectangular waveguide. This problem can be solved by introducing a two-dimensional "Zwischenmedium" as shown in Fig.1, whose eigenfunctions are known. Fig.2 shows the transition from the rectangular waveguide to the tapering-down circular-sector horn with its two interfaces. The two media overlap in this case. For this reason an exact solution of this problem calls for continuity to be maintained at one interface only. Fig.3 shows the transition from a homogeneous stripline to a hyperbolical stripline and, as a limiting case, the homogeneous stripline followed by a plane shield. Here only one interface is present. The problem can also be solved, however, by introducing a three-dimensional "Zwischenmedium" for instance by a circular cylinder.

2. Example: Rectangular Waveguide with Abrupt Bend

Fig.5 shows the arrangement with the interfaces. Basically this problem corresponds to that shown in Fig.2. Note that plane interfaces might here have been chosen as well. The medium with the interface whose cross-section is a circular arc in Fig.5, can here also be termed a three-dimensional "Zwischenmedium". The advantage of the interfaces here introduced resides, among other things, in the fact that the infinite set of equations converges well. Fig.5 finally shows some numerical results of the reflection and transmission coefficients of the H_{10}-mode when a H_{10}-mode comes in according to[4].

It should be noted that the introduction of a three-dimensional "Zwischenmedium" offers particular advantage in the case of transitions with conical horns as shown in Fig.6. A sphere is here shown as a typical three-dimensional "Zwischenmedium"; it contains the two interfaces which result from the geometry of the problem. Note that the media given in advance by the problem do not overlap, but that the "Zwischenmedium" contains part of the two media.

Reference

[4] Reisdorf, F., Reflexion und Transmission im abgecknickten Rechteckhohlleiter bei Einfall einer H_{10}-Welle. Diplom-Arbeit am Lehrstuhl fuer Theoretische Elektrotechnik der Technischen Hochschule Darmstadt, Januar 1970, nicht veroeffentlicht.

Fig. 1.

Abrupt eccentric transition from the elliptical to the rectangular waveguide with a circular waveguide as 'Zwischenmedium'

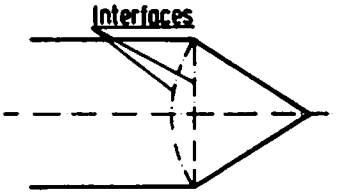


Fig. 2

Transition from the rectangular waveguide to the circular sector horn with its two interfaces

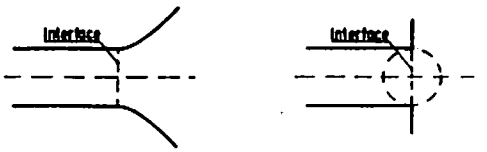


Fig. 3

Transition from the homogeneous stripline to the hyperbolical stripline and, as a limiting case, the homogeneous stripline with plane shield

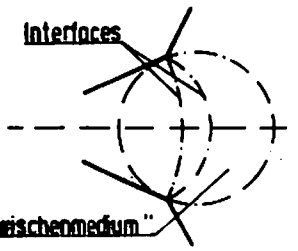
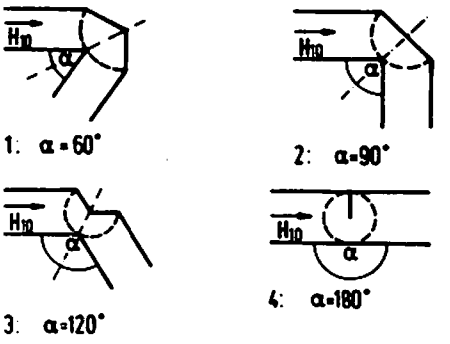


Fig. 6

Transition between two conical horns, with a sphere as a 'Zwischenmedium'.



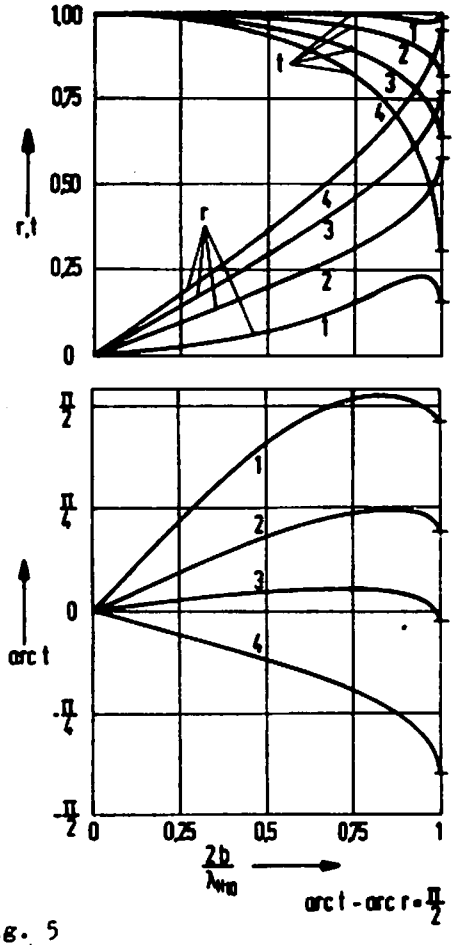


Fig. 5

The bent-off rectangular waveguide with the diaphragm as a limiting case. Reflection coefficient r and transmission coefficient t of the H_{10}-mode when it comes in according to (4). λ_{H10} cutoff wavelength of the H_{10}-mode.