ABSTRACT

A transition between rectangular waveguide and circular groove guide is described. The composite transition consists of two sections. It is theoretically designed to provide both mode matching as well as low reflection coefficient. The performance of the transducer is plotted.

INTRODUCTION

Circular groove guide has the attractive features of large dimensions relative to the wavelength, single mode transmission, low dispersion, wide operating frequency range, high power handling and a loss which is very low compared with rectangular guide. It can operate as a millimeter and submillimeter wave transmission medium\(^{(1)}\)\(^{(2)}\). There are no waveguide test bench and no oscillator

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either, which are based on circular groove guide. However, rectangular waveguide test bench and equipments are well found in many laboratories. It is convenient to use conventional rectangular waveguide test bench and equipments for measuring the performances of circular groove guide components or circuits. Therefore a mode transducer from rectangular waveguide to circular groove guide is required.

The transducer can be used for different purposes: 1) to transform the main mode from one waveguide into the other waveguide; 2) to transform the main mode of one waveguide into a predetermined higher order mode of the other waveguide; 3) to transform a certain higher order mode of one waveguide into a predetermined higher order mode of the other waveguide.

This paper describes a transition from $\text{TE}_{01}^0$ main mode of rectangular waveguide into $\text{TE}_{31}^0$ main mode of circular groove guide. The theoretical analysis and design method are given. The performance of this transducer is plotted.

**ANALYSIS AND DESIGN**

A direct transition from $\text{TE}_{01}^0$ main mode of rectangular waveguide to $\text{TE}_{31}^0$ main mode of circular groove guide is a complex process. Because the cross section of the transducer at any point along $z$ axis is gradually varying, the irregular groove guide will be met. It is so difficult to analyse that we may not readily calculate the performance of this guide.

The transducer suggested here consists of two sections as shown in Fig. 1. The first part is a transition from main mode $\text{TE}_{01}^0$ of rectangular waveguide ($15.8\text{mm} \times 7.9\text{mm}$) to main mode $\text{TE}_{11}^0$. 