Finite Element Analysis of Helicoidal Waveguides.

André Nicolet
Institut Fresnel, UMR CNRS 6133, Université Paul Cézanne,
Domaine Universitaire de Saint-Jérôme, case 162
F13397 Marseille cedex 20 France
Tel: +33 4 91 28 87 73
Fax: +33 4 91 67 44 28
E-mail: andre.nicolet@fresnel.fr

Frédéric Zolla
Institut Fresnel, UMR CNRS 6133, Université de Provence,
Domaine Universitaire de Saint-Saint-Jérôme, case 161
F13397 Marseille cedex 20 France
Tel: +33 4 91 28 87 79
Fax: +33 4 91 67 44 28
E-mail: frederic.zolla@fresnel.fr

Abstract

The purpose of this paper is to propose an efficient method to compute propagation modes in helicoidal waveguides. An helicoidal system of co-ordinates is introduced to define the structure and to set up the problem. These co-ordinates, albeit non-orthogonal, preserve the translational invariance in a way that allows a two-dimensional finite element model similar to the one of classical straight waveguides via equivalent (anisotropic and inhomogeneous) material properties involving a matrix representing the metric and independent of the co-ordinate associated with the axis of the twist. The evolution of the frequency and of the propagation constant of the modes with respect to the torsion of the guide is presented in the case of a rectangular metallic waveguide.

Topic: C6 Microwave/Optical Circuits