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# Project brief

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School: Electronic and Communication Engineering

Title: Mixed Finite Element Analysis of Real and Complex Magnetodielectrical Waveguide Waves

Objective: To create an application which allows analysing dispersion characteristics of magnetodielectrical waveguide waves

Prerequisites:

Description: This project was completed as a part of collaboration program between DIT(Dublin Institute of Technology) and MSTU MIREA(Moscow State Technical University Institute of Radioengineering Electronics and Automation).

1. Project description
   1. Introduction

The purpose of this project is to implement an application which allows calculating dispersion characteristics and critical values of multilayer waveguide waves.

This application is implemented with combining of resources of Visual Studio 2010 and Matlab 7.0. These two systems are powerful enough to do calculations of this project and suitable to work with complicated structures.

The interface suitable for the user that is easy to use must be implemented in this project. The system should work in combination with Matlab 7.0+. The user should be able to use system without special preparation.

* 1. Project rationale

Waveguides are one of the means that are used to transmit the waves. According to critical wavelength, which is twice bigger than waveguide’s diameter, they are suitable for microwaves.

Power loss is small enough relatively to other types of transmission lines – that is their obvious advantage.

For more efficient usage of waveguide is a chance to improve its capacity. To do that waveguides are created with a variable index of refraction. To solve the problem of synthesis of multilayer waveguide it is necessary to calculate the dispersion curves with given refractive index. From mathematical point of view, the problem lies in the solution of Maxwell’s equations in a cylinder with variable index of refraction, which varies along the radios of cylinder.

During solving the problem can appear non-physical solutions and finite elements method helps to get rid of them.

* 1. Design approach
  2. Layout of the project

1. Finite elements method
   1. Common scheme
   2. Problem statement
   3. Variational functional of the problem
   4. Mixed finite elements nethod
2. Application
3. Testing
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