3.2 Shielded microstrip tranmission lines

Matlab program

The presented program serves to the computation of electric-field intensity of modes, which propagate along the shielded microstrip transmission line. The shielding waveguide is of the dimensions 12.700 mm x 12.705 mm and is fabricated from the perfect-electric conductor. At the bottom of the waveguide, a dielectric substrate is placed (lossless dielectrics of the relative permittivity ε_r = 4.2 and height h = 1.27 mm). At the center of the upper side, a microstrip of the width w = 1.27 mm and of the negligible thickness t ≈ 0 mm is etched; a perfect electric conductivity of the microstrip is assumed again. Above the substrate, vacuum is expected. Thanks to the symmetry of the structure, a half of the transmission line is analyzed only. Plane of symmetry is replaced by perfect electric conductor is odd modes are computed, and by perfect magnetic conductor if even modes are investigated. The term even (odd) mode is related to such modes, which electric-field intensity distribution is even (odd) function with respect to the plane of the symmetry.
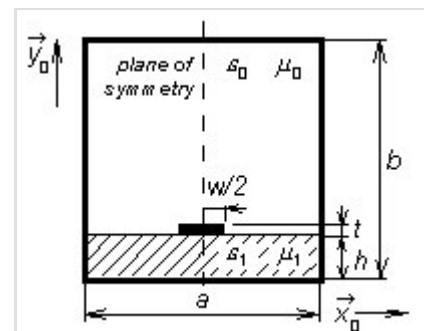

Fig. 3.2C.1 *Shielded microstrip transmission line*

The program `microstrip` can be found (including all the necessary m-files) here. Hence, we have to run Matlab and have to set the path to the folder **Microstrip**. Typing `microstrip` to the command window of Matlab, the program is started. The next steps follow:
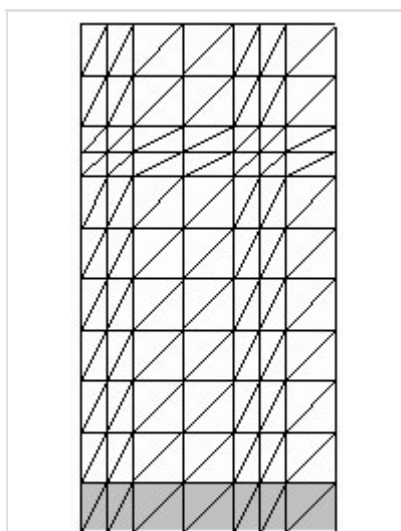

Fig. 3.2C.2 *Finite-element mesh for the analysis of shielded microstrip transmission line*

1. We type ε_{r1} (see fig. **1**) to the input line **relative permittivity of substrate**, we type tan δ to the input line **dissipation factor of substrate** and we type the frequency, on which the analysis is performed, to the input line **frequency [GHz]**. Then, we select modes (buttons Even modes , Odd modes) we want to compute. Then, the program performs analysis of the transmission line using the finite-element mesh, which is depicted in fig. **2**.

2. When the selected type of the analysis is finished, a dialog containing the line **Mode number** is opened. The lowest mode is of number 1, higher modes are numbered sequentially according to the magnitude of the phase constant. Requested mode can be chosen by the scrollbar. Only modes, which can propagate along the transmission line on a given frequency, are available. Pressing the button Draw , two results are displayed: the first one shows the distribution of the transversal components of electric-field intensity, the second one shows the distribution of the longitudinal component.

3. Pressing the button End , the program is terminated.

The program `microstrip` is described from the programmer's point of view in the layer D.