

Exercise 13:

(Using ports as BCs): A parallel plate wave guide, as shown in Fig.1, will be analyzed by the FE method in TE mode ($H_z = 0$). Answer the following questions:

- Determine the cut-off frequency (i.e. the minimum value of the frequency of the EM wave, so that there will be transmission of guided waves inside the waveguide) as a function of the geometrical parameters.
- Implement the structure in COMSOL. What happens when the structure is fed by a wave less than the cut-off frequency
- Analytically determine the wave number of the guided wave as a function of frequency.
- Analyze the results obtained in Figs.2-5. Which one(s) is the correct mode for the question and what is wrong with the remaining solutions?

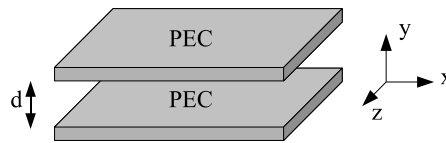


Figure 1: The parallel plate wave guide. The metallic walls can be taken as PEC.

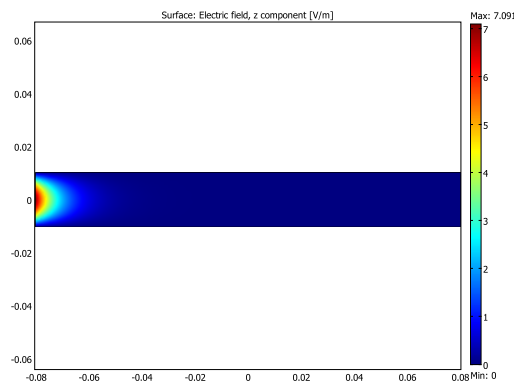


Figure 2: Solution 1 by Comsol

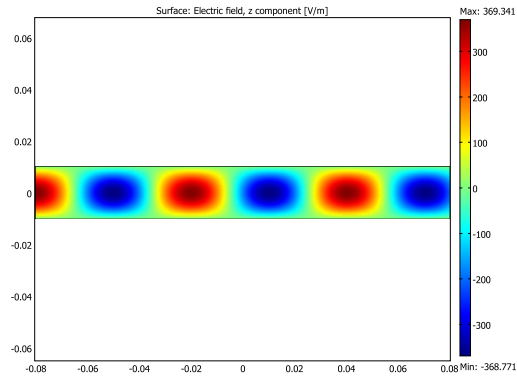


Figure 3: Solution 2 by Comsol

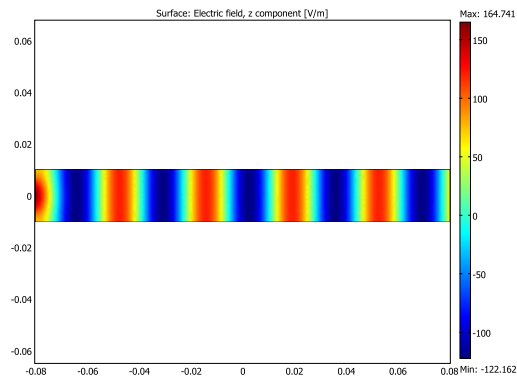


Figure 4: Solution 3 by Comsol

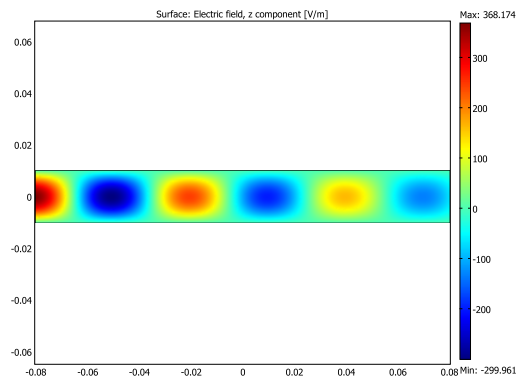


Figure 5: Solution 4 by Comsol

Exercise 14:

(Using Periodic Boundary conditions): In this exercise, a plane wave travels in a 3-layered geometry as shown in Fig.6. Build up a model by Comsol to be able to analyze this problem, for any values of constitutive parameters for the different layers (Hint: To match the phase information of the waves, use *Periodic BCs*).

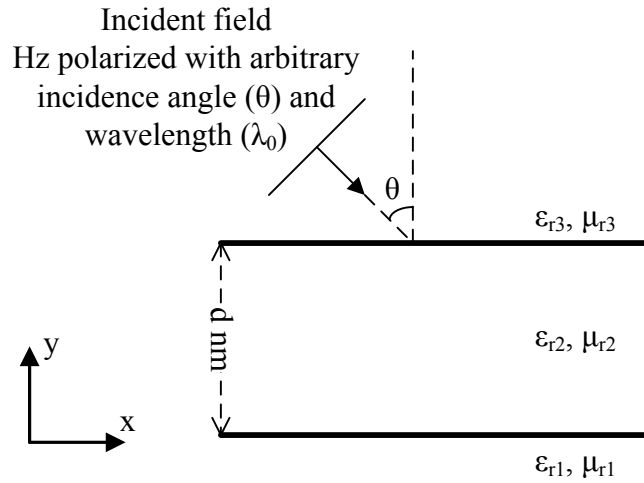


Figure 6: The schematic of the layered geometry and the incident field.