

Problem Set #4:

1. Starting with the MATLAB code provided on Canvas for the 2D TE cavity problem, modify the code in order to handle the TM-to-z case for a cavity with PEC walls. This requires that (1) the primary unknown field be E_z instead of H_z and (2) that a zero Dirichlet boundary condition of the form

$$E_z|_{\partial\Gamma} = 0$$

be imposed around the entire boundary of the cavity. Thus fields at boundary nodes will be specified by the boundary condition and not be treated as unknowns in the eigenvalue problem. The differential equation is the same, but the code will need to be modified to read in the number of boundary nodes with the mesh (you may assume that the boundary nodes are all at the end of the node list) and not include boundary nodes when filling the system of equations.

Generate numerical results for a coaxial cavity with inner dimension $a = 1.0$ and outer dimension $b = 4.0$, using the same coax mesh software from Problem Set #3 (coaxmesh.m). Produce a table showing at least the 3 lowest resonant nonzero wavenumbers obtained with three different meshes.

If you would like to debug your code on a rectangular cavity, use the mesh generation code “rectmesh.m” from Canvas to do so.