

EE 321: Numerical Methods for Electromagnetics
Spring 2015
Project

Assigned: March 19, 2015

Due: May 5, 2015

Task:

Develop an FDTD code for computing electromagnetic field interactions on a perfect electrically conducting (PEC) cylinder under plane-wave excitation.

Assumptions:

Medium extends from $-\infty$ to ∞ in z direction

There is no variation in z direction

TM plane-wave excitation: The only non-zero component of the exciting plane-wave's electric field is E_z

Steps and Grading:

- (a) **(2.5 points)** Derive the 2-D Maxwell equations
- (b) **(2.5 points)** Derive the 2-D Maxwell equations in stretched coordinates for PML formulation and implementation.
- (c) **(2.5 points)** Derive the boundary conditions on the PEC surface
- (d) **(2.5 points)** Derive the FDTD discretization for the equations in (a), (b), and (c) using 2-D Yee cell
- (e) **(2.5 points)** Derive the formulation for the TF/SF implementation of the plane-wave excitation
- (f) **(20 points)** Implement (d) and (e) using a programming language of your choice
- (g) **(7.5 points)** Visualize your results to show that there are no reflections from the computation domain boundaries
- (i) **(10 points)** Show convergence

Total: 50 points