PA 10:

YEE Cell

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1 Question 1

Downloaded Code.

2 Question 2

2.1 2.a & 2.b

After running the simulation, it was found that the code "SoftSimpleReg" was simulating a wave guide and producing the TE modes. This can be gathered from the mappings of E_z, H_x and H_y. If the TM modes were produced, then the mappings would have been of H_z, E_x and E_y.

2.2 2.c

The following line of code in SoftSimpleReg sets up the inclusion in the wave guide:

epi{1}(125:150,55:95)= c_eps_0*11.3;

By commenting this out, the inclusion will no longer appear in the wave guide and the solution will not include it.

The bc{} structure is used to perform work on the Perfectly Matched Layers (PML). The PML is a box that surrounds the sample space and is used to set conditions on the region, a "unit cell". This is comparable to setting up the master/slave boxes in HFSS. 'a' sets up the PML, 's' sets the PML to reflect all incident waves, 'e' sets an explicit metasurface (unknown), 'm' sets a magnetic wall (H = 0), and 'p' generates a periodic boundary.

bc{1}.s(1) sets the Source. It states where it is applied and its type..

bc{1}.xm/xp/ym/yp set the type of PML as described above. By changing these, you effectively change how the region interacts and responds to incident waves. When setting the PML to 'e', the simulation appeared to allow reflections of various angles within the unit cell. With 'a', the waves travelled through the space and left.

3   Question 3

I changed the gratings to be sized: epi{1}(x1:x2,25:125). I placed 4 in total in the region at first. I also set st = -0.05. This changes the beam width of the incident wave packet. Changing the frequency changes the response. The spacing of the gratings dictate what frequencies it can handle.

4   Question 4

The following structure was created for scattering and the resulting E/H fields are shown:
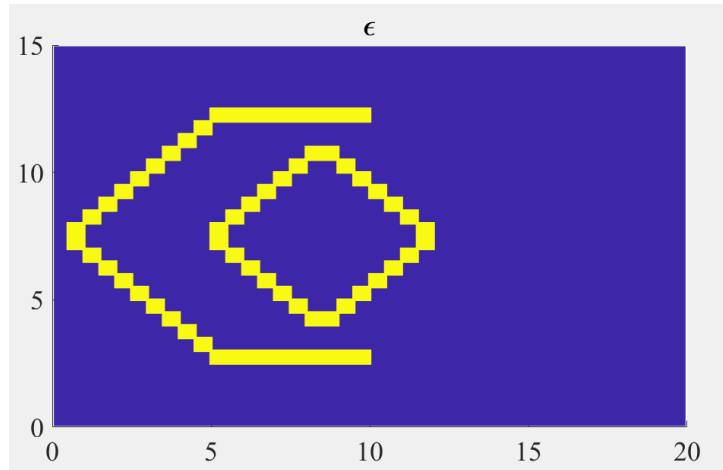
Figure 1: Scattering Structure [Shaun Hearn]
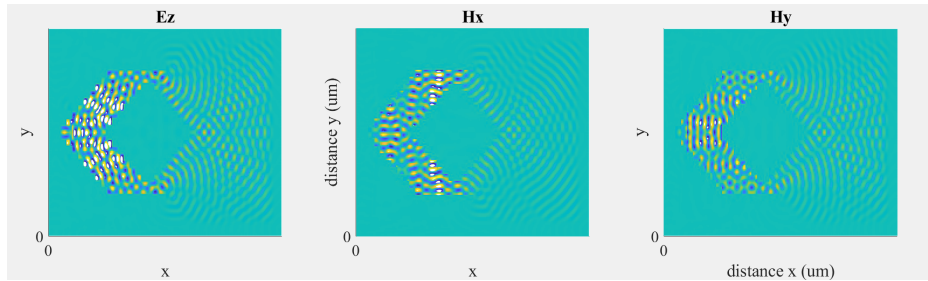
Figure 2: Scattering Structure E/H fields [Shaun Hearn]

To add a second source, the following code was added to SoftSimpleReg: bc{1}.s(2) where ever a bc{1}.s(1) (copied the code such that there existed a set of code for each source).