HFSS tips and hints

Procedure to obtain a time-integrated time-domain plot

1. In HFSS, perform a fast frequency sweep over a wide frequency range. Take many (> 500) frequency points. The lowest frequency should be low enough to show the behaviour of the device close to DC, while the highest frequency should be high enough to provide a good spatial resolution. In the example in this document, the range was 1-18 GHz. It is not desirable to go higher in frequency because of higher-order modes. One can expect a spatial resolution given by (speed of light)/bandwidth. In this example, that is 0.7 inch. This means that two reflections with an electrical distance of 0.7 inch can still be separated. The location of one single reflection may be determined with a higher accuracy than this.

2. In HFSS / Post Process / Matrix Plot, plot S11 or S22 as a function of time by checking "Time Domain". Save that plot in a data file with ".dat" extension in the file name. Exit from HFSS.

3. From the Maxwell toolbar (this is the row of buttons that comes up first when you start the Maxwell software), select "Utilities" and then "Plot Data".

4. In Plot Data, select "Plot / Open" and open the data file you produced earlier. Click "OK". The plot appears on the screen.

5. In Plot Data, select "Tools / Calculator". The signal calculator comes up.

6. The data file is already listed under "Loaded Signals". Select it and click "Copy".

7. The file appears in the "Calculator Stack". Select it and click the integration symbol. This is one of the buttons on the right-hand side.

8. The integrated signal appears in the "Calculator Stack". Select it and click "Load".

9. The integrated signal appears under "Loaded Signals". Click "Done" and leave the calculator.

10. Still in "Plot Data", select "Plot / New". Select the integrated signal and click "OK". The desired plot appears on the screen. If necessary, double-click in the plot and adjust the time axis.

Saving discrete frequency sweep field data

A discrete frequency sweep using e.g. 10 frequencies is similar to solving 10 separate projects. A complete solution is performed at each discrete frequency using the adapt frequency mesh. This can represent a lot of disk space usage, therefore the software only saves the field solution for the last frequency in the sweep. You can save the data for each frequency by using the **dsweep** program. It is easy to use.

Instructions:

Let's assume that your project directory is sweepme.pjt.

1. Perform an analysis at the adapt frequency.
2. Exit the project.
3. cd to the parent directory of sweepme.pjt (../sweepme.pjt)
4. Execute **dsweep**:

   [dsy-srv2] > **dsweep ~/Maxwell/sweepme start_freq stop_freq N_divisions**

This will create, within sweepme.pjt, directories prob1.pjt, prob2.pjt,..., probn.pjt where n is the number of points in the sweep. When the solution are done, each of these directories will have the solution files for its frequency point. From the project manager, you can cd into ~Maxwell/sweepme.pjt and pull up any of the probn.pjt and check out the solution.

Notes:

- Specify start_freq and stop_freq in the unit displayed on the button next to the frequency field in the Setup Solution Parameters window
- Be aware that the system adaptively refines the mesh only at the adapt frequency. It uses the resulting mesh without further refinement at all other frequency points.

Removing mesh files to save disk space

After performing adaptive refinement, the HFSS solver saves four set of mesh files:

1. **projectname.ext** (ext=adp, fac, hyd, lin, pnt, sld)
2. **current.ext** (ext=adp, fac, hyd, lin, pnt, sld)
3. **previous.ext** (ext=adp, fac, hyd, lin, pnt, sld)
4. **initial.ext** (ext=fac, hyd, lin, pnt, sld)

No initial.adp file exists. The *.apd files store the points used to generate the tetrahedra for the next adaptive pass.

Assuming that "Solution process is completed successfully", you can remove the initial.*, previous.* and current.* sets of files with the **doldmesh** script. A copy of the current mesh will be kept in the projectname.* mesh files.

It is very easy to use doldmesh:

1. [dsy-srv2] > **cd ~/Maxwell/projectname.pjt**
2. [dsy-srv2] > **doldmesh**

Also, when you solve a fast frequency problem, a large file with a .rfn extension is created. This file contains the fields solution versus frequency. If you are only interested in the S-parameters, you can remove this file. You will still be able to post-process the fields at the center frequency (which is stored in additional files).

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