Workshop 4.1: Coax Tee S-Parameters and Fields

HFSS Getting Started

Release 2020 R2

Outline - Coaxial Tee S-Parameters and Field Plotting

This first workshop on HFSS post-processing focuses on rectangular plots of S-parameters and fields plots on geometries. The workshop starts with the HFSS FEM project **CoaxTee0.aedtz**. Below is the outline of steps in this workshop.

Part 1: Plot S-Parameters

- Create S-Parameter rectangular report for **CoaxTee1.aedt** - all three ports.
- Look at ***Profile*** from the ***Analysis > Setup*** for simulation time and mesh size.
- Look at S11 to see resonance.

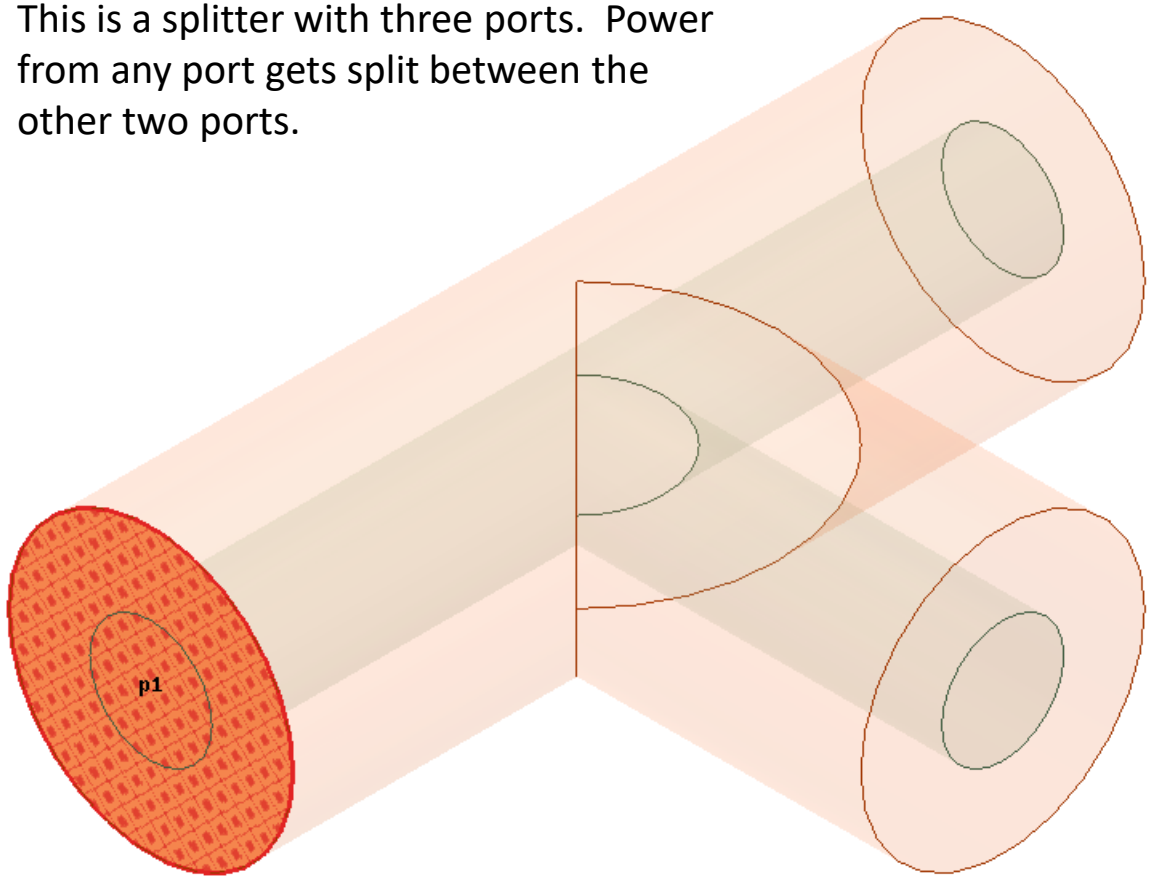
Part 2: Plot Fields

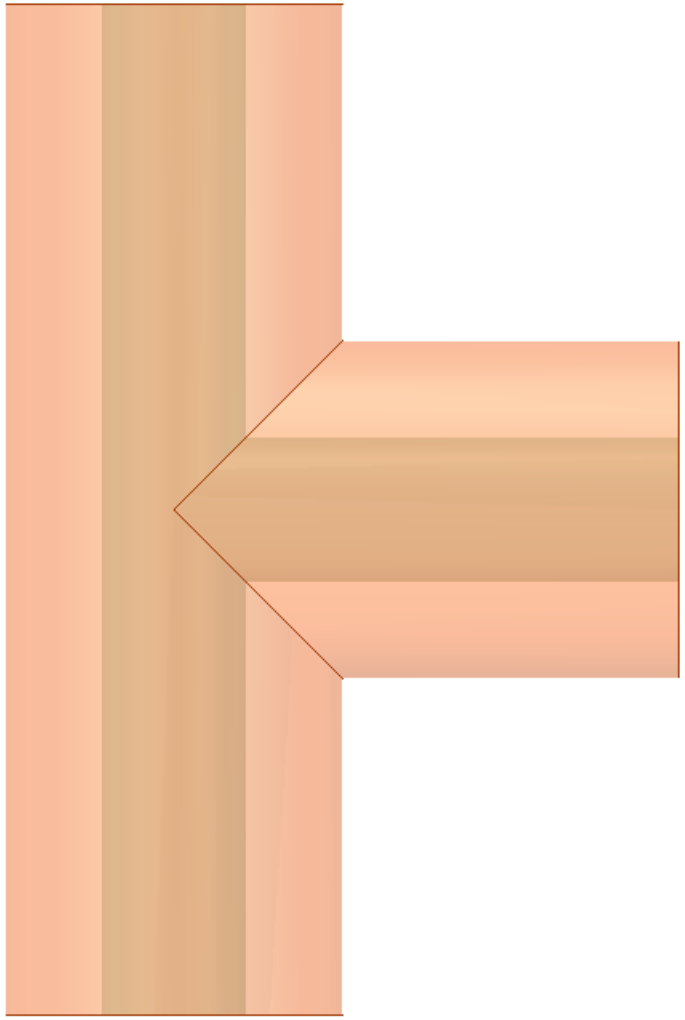
- Select geometry
- Plot E-field
- Change scale

This workshop uses a file provided: **CoaxTee0.aedt.**
The ending HFSS project file name will be: **CoaxTee2.aedt.**

Part 1: S-Parameters on a Coaxial Tee

This is a splitter with three ports. Power from any port gets split between the other two ports.





Open HFSS Project File: CoaxTee0.aedt

– Select ***File > Open***, browse the files provided, and open HFSS project file: ***CoaxTee0.aedtz***

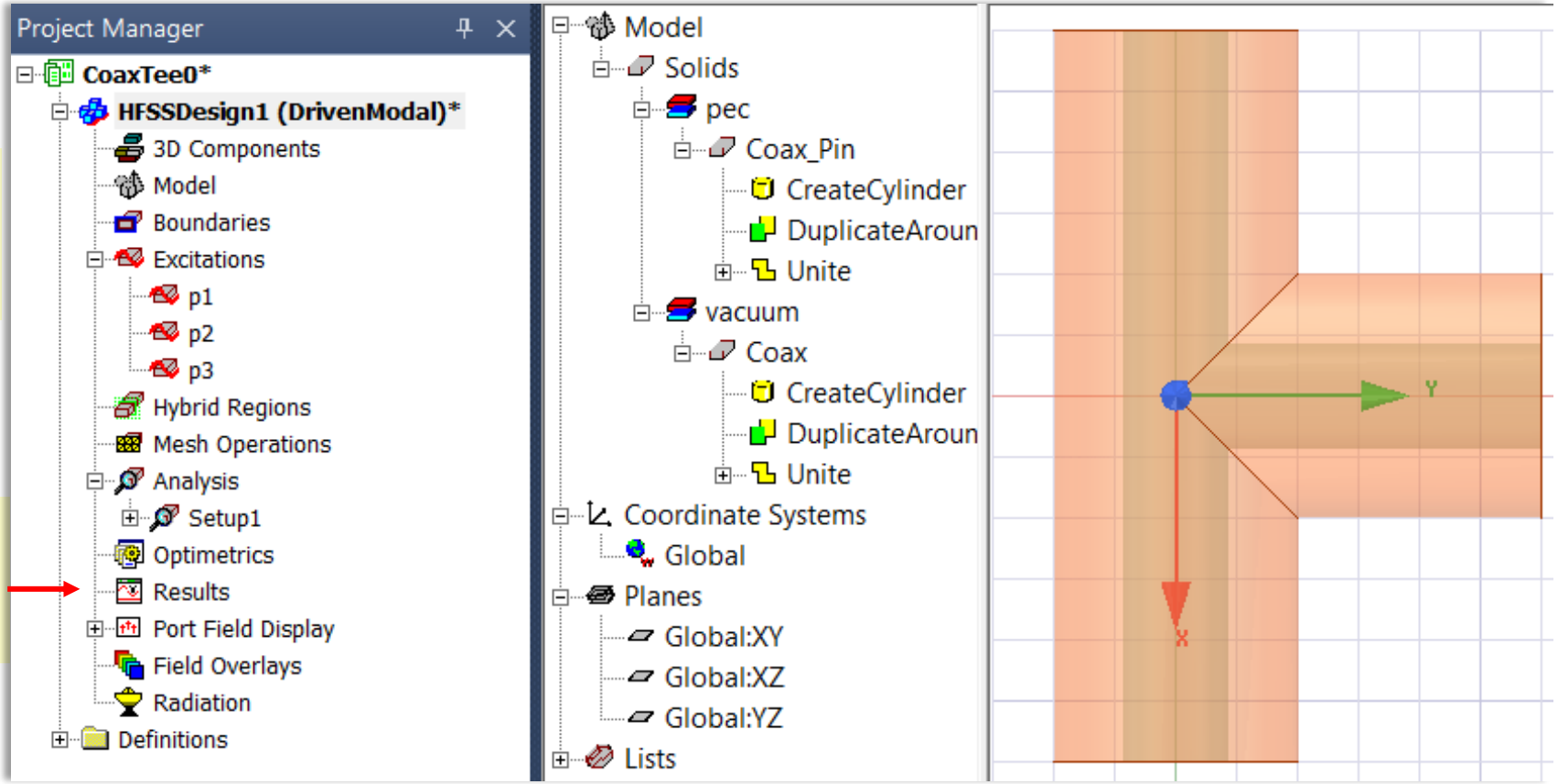
– Select ***File > Save As*** and save project to a working directory renaming file as: ***CoaxTee1.aedt***

Keep all HFSS workshop simulation files; future workshops continue with these files.

– The ***Project Manager*** shows that no ***Results*** have been set up.

Click on + symbols to expand.

No *Results* have been setup.



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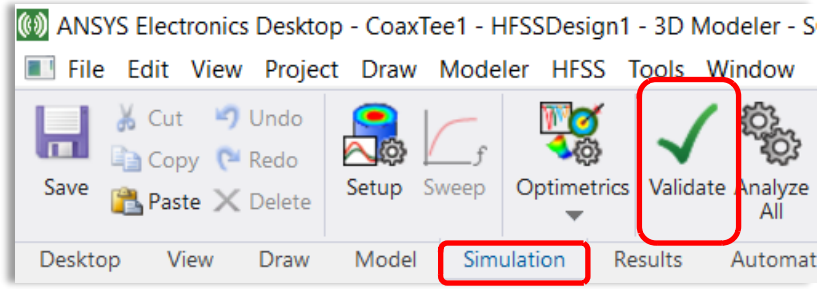
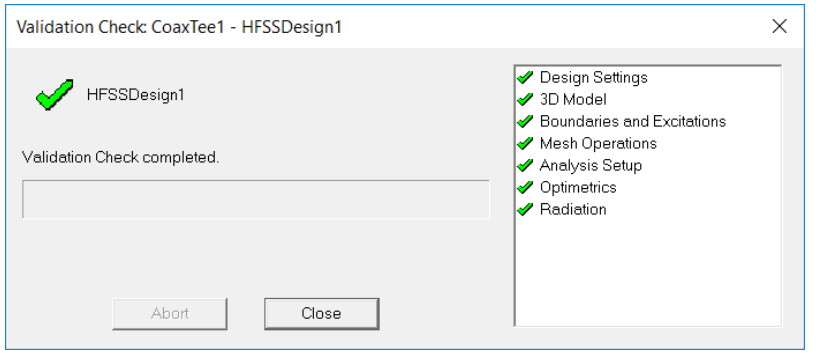
Save, *Validate*, and *Analyze* HFSS Project CoaxTee1.aedt

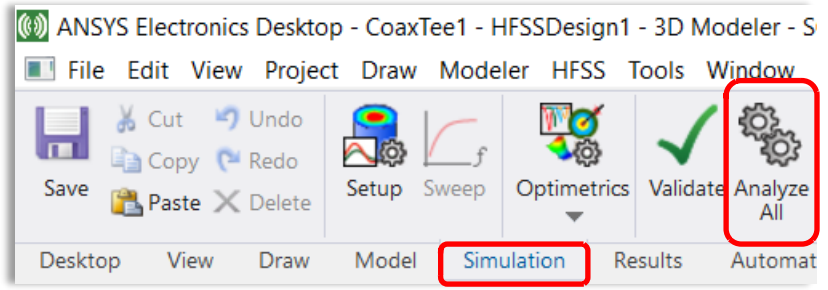
- Click the ***Validate*** green check mark in the ribbon (with Simulation chosen) to validate the project.
- Select ***File > Save*** and save project

  Keep all HFSS workshop simulation files; future workshops continue with these files.
- Click on ***Analyze All*** in the ribbon to start the HFSS simulation.

  The ***Validation Check*** and ***Analyze All*** operations are also available from the ***HFSS*** pull-down at the top of the graphical user interface.
- Save ***CoaxTee1.aedt*** when the simulation finishes.







Click on ***Show Messages*** and ***Show Progress*** in the bottom right of the GUI in order to see the simulation progress.

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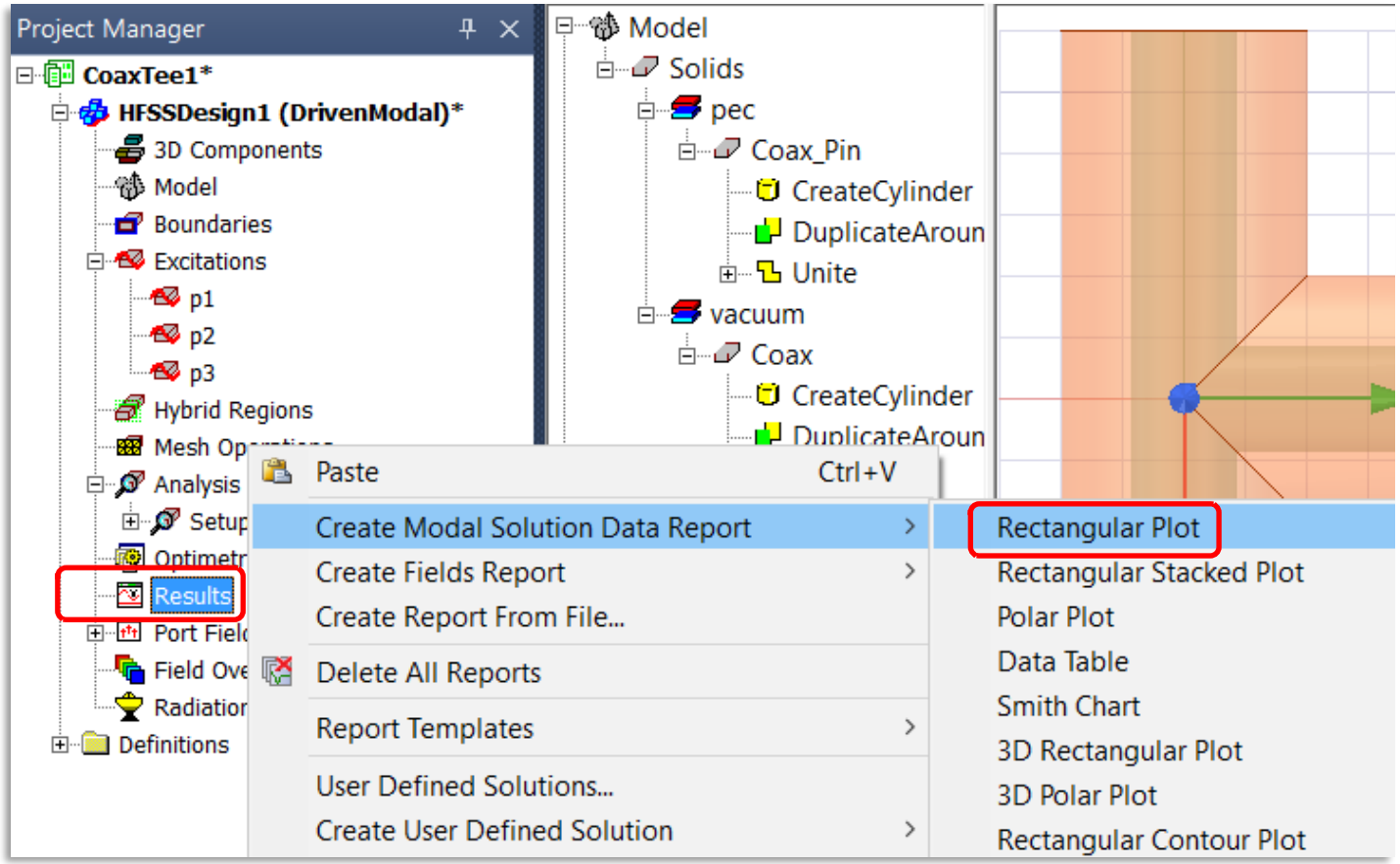
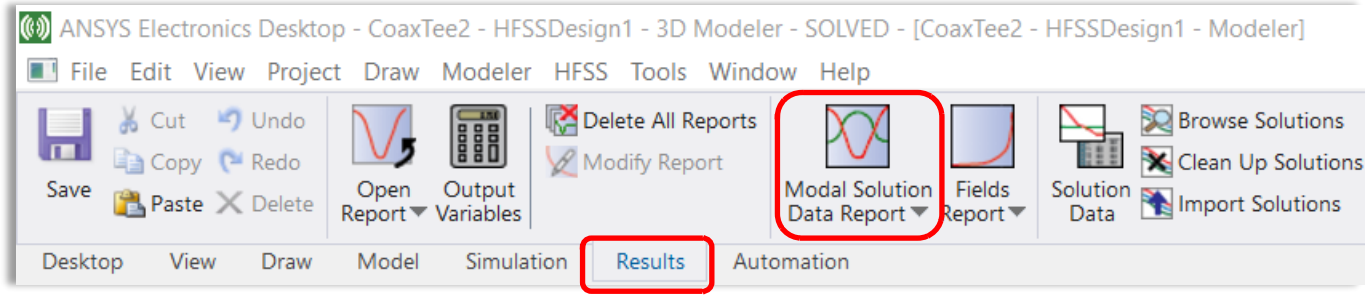
Access S-Parameter Graph Reports from *Project Manager > Results*

In the ***Project Manager*** right-click on ***Results*** and select ***Create Modal Solution Data Report > Rectangular Plot*** to bring up the ***New Report*** dialog box.

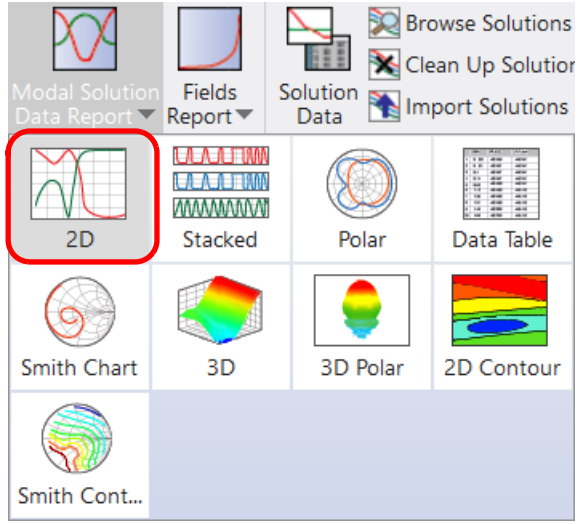


Rectangular Plot for S-parameters is also available from the top pull-down menus: ***HFSS > Results > Create Modal Solution Data Report > Rectangular Plot***.

Access S-Parameter 2D Graph Reports from *Results* Ribbon



Rectangular Plot for S-parameters is also available from the ***Results*** tab of the ribbon:
HFSS > Results > Create Modal Solution Data Report > Rectangular Plot.



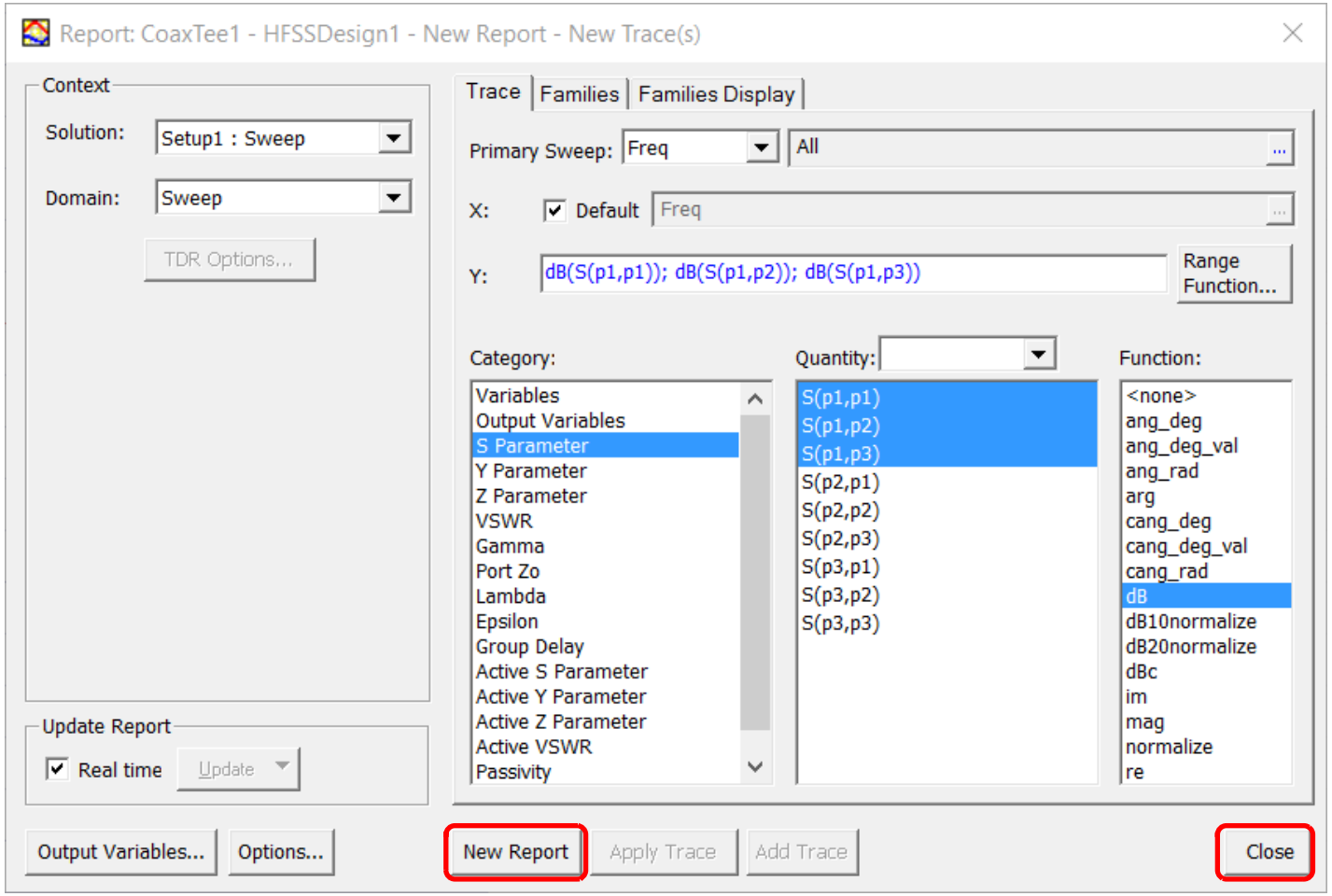
Specify S-Parameters in *New Report* Dialog Box

- Set the ***Category*** to ***S Parameter.***
- Using shift key or ***Ctrl-A*** where needed, select/highlight the signals ***S(p1,p1), S(p1,p2),*** and ***S(p1,p3).***
- Set the ***Function*** to ***dB.***

- Leave the ***Primary Sweep:*** set to ***Freq*** and ***X: Default***

- In the ***Context*** area on the left:
  - Leave ***Solution:*** as the default name ***Setup1: Sweep.***
  - Leave ***Domain:*** as the default name ***Sweep.***
  - Verify ***Real time*** is ☑ **Checked**

- Click ***New Report*** and then ***Close*** when finished.



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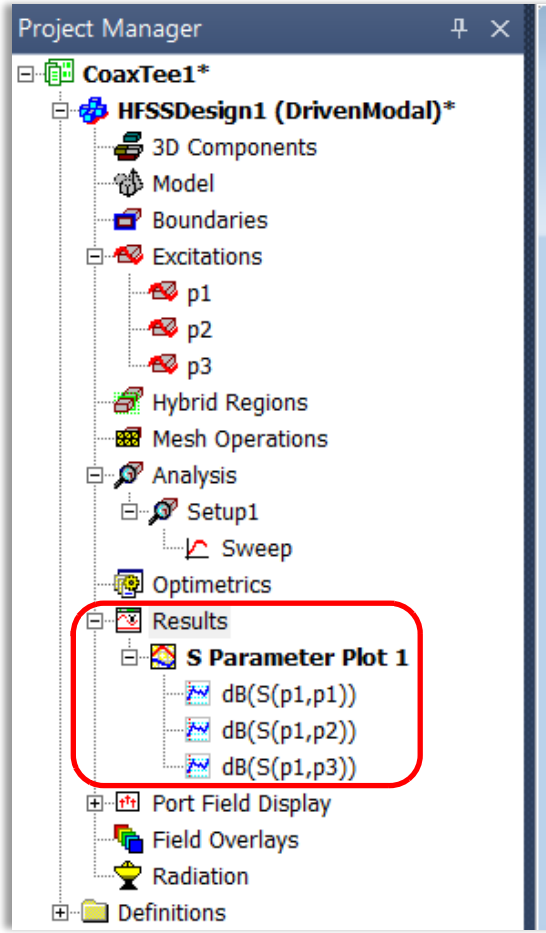
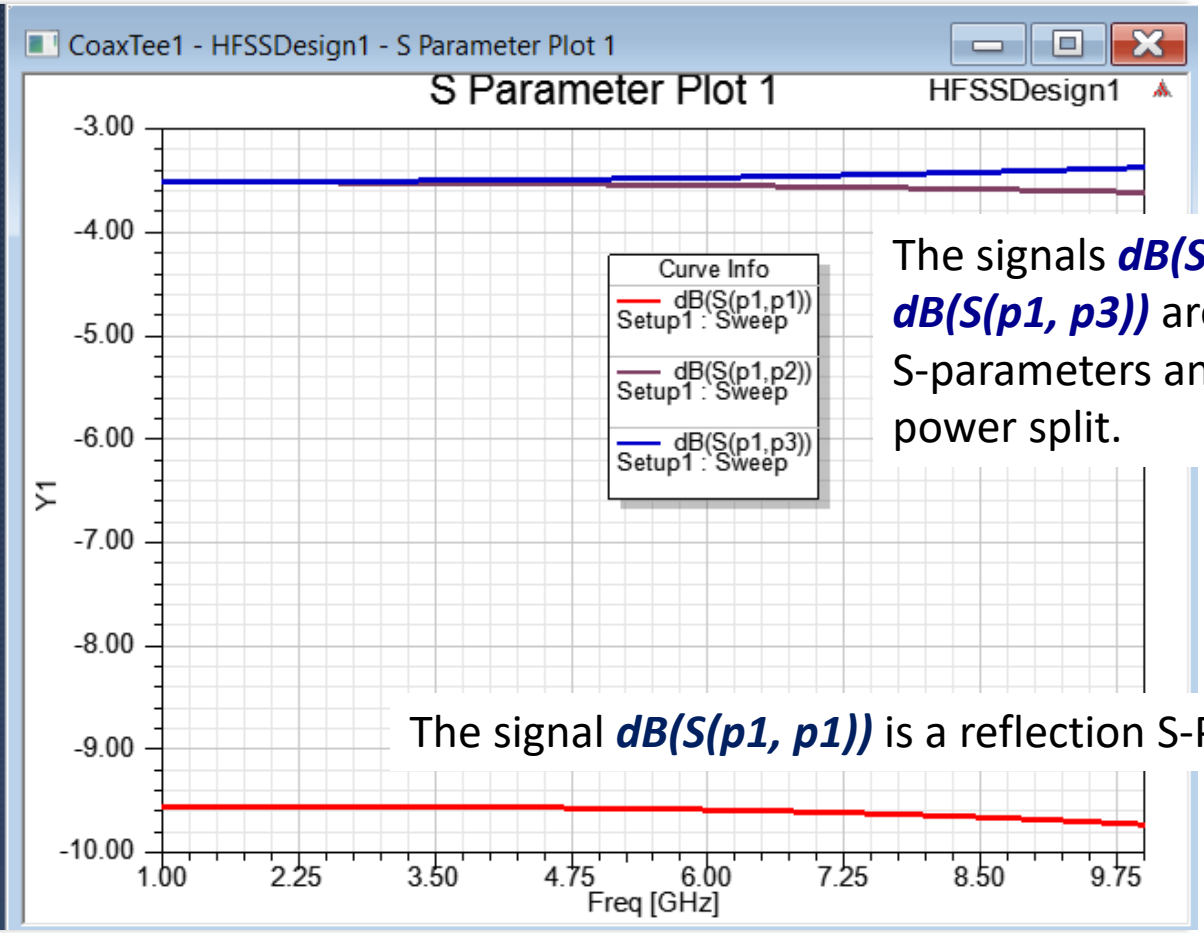
View Coaxial Tee S-Parameter Simulation Results

– In the ***Project Manager***, double-click on the first plot ***S Parameter Plot 1*** if it doesn't already appear.





The signals ***dB(S(p1, p2))*** and ***dB(S(p1, p3))*** are transmission S-parameters and indicate a power split.

The signal ***dB(S(p1, p1))*** is a reflection S-Parameter.

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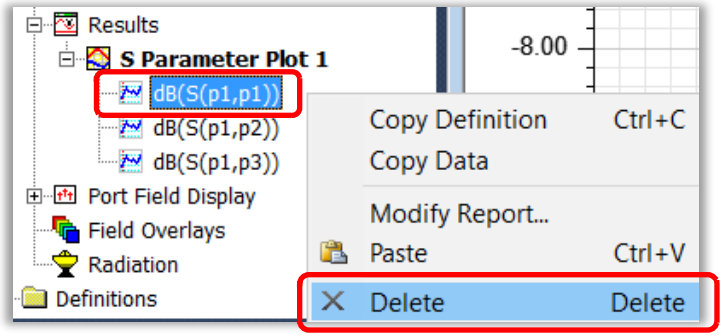
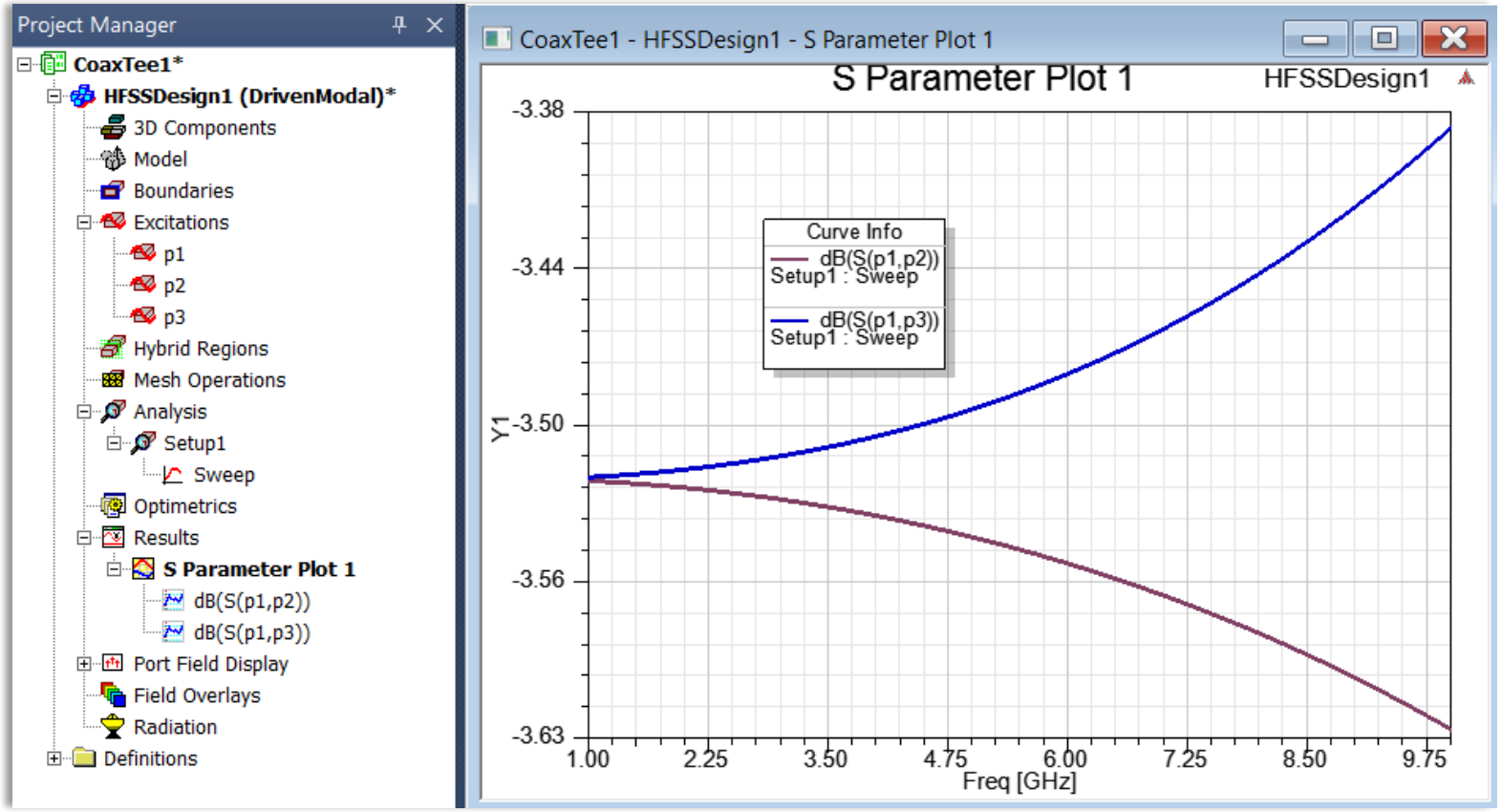
Delete Reflection S-Parameter

In the ***Project Manager***, right-click on the first signal ***dB(S(p1,p1)*** and select ***Delete.***



The resulting report will now have only two signals and the plot shows high frequency divergence.



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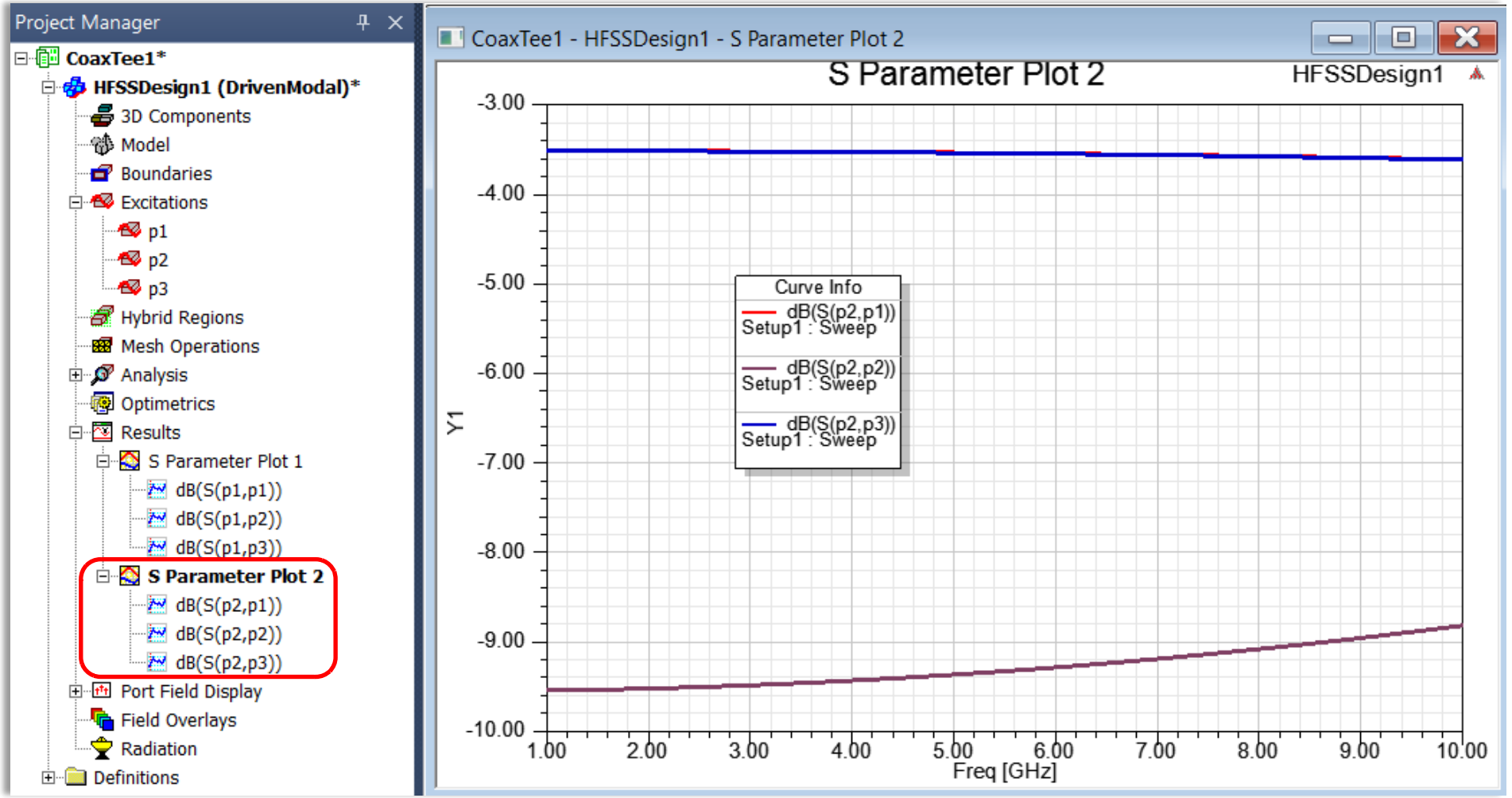
Optional: Port 2 S-Parameters on CoaxTee1.aedt

Create a second S-parameter report plotting the signals looking into port 2.



To get back to the ***3D Modeler*** view, in the ***Project Manager*** double-click on the design name **HFSSDesign1**.

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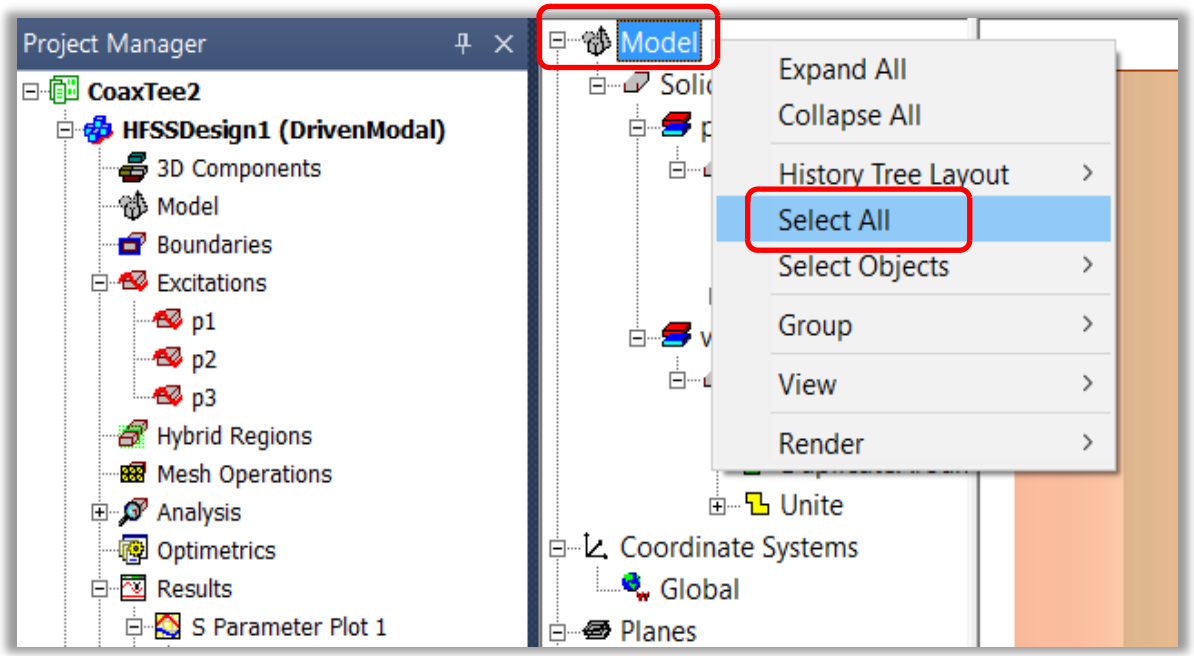
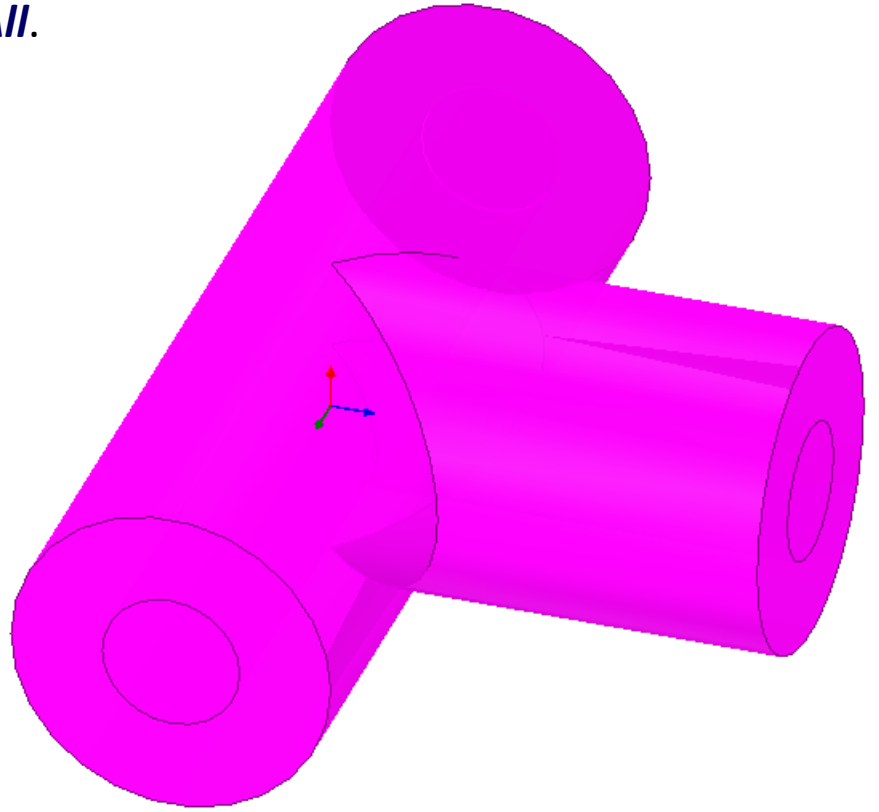
Part 2: Select Geometry to Plot E-Fields on CoaxTee2.aedt

– Save the project as **CoaxTee2**.

– In the ***3D Modeler Tree***, right-click on ***Model*** and choose ***Select All***.





Objects show pink/**magenta** color when selected.

An object or a plane needs to be selected in order to plot fields overlaid on geometry.

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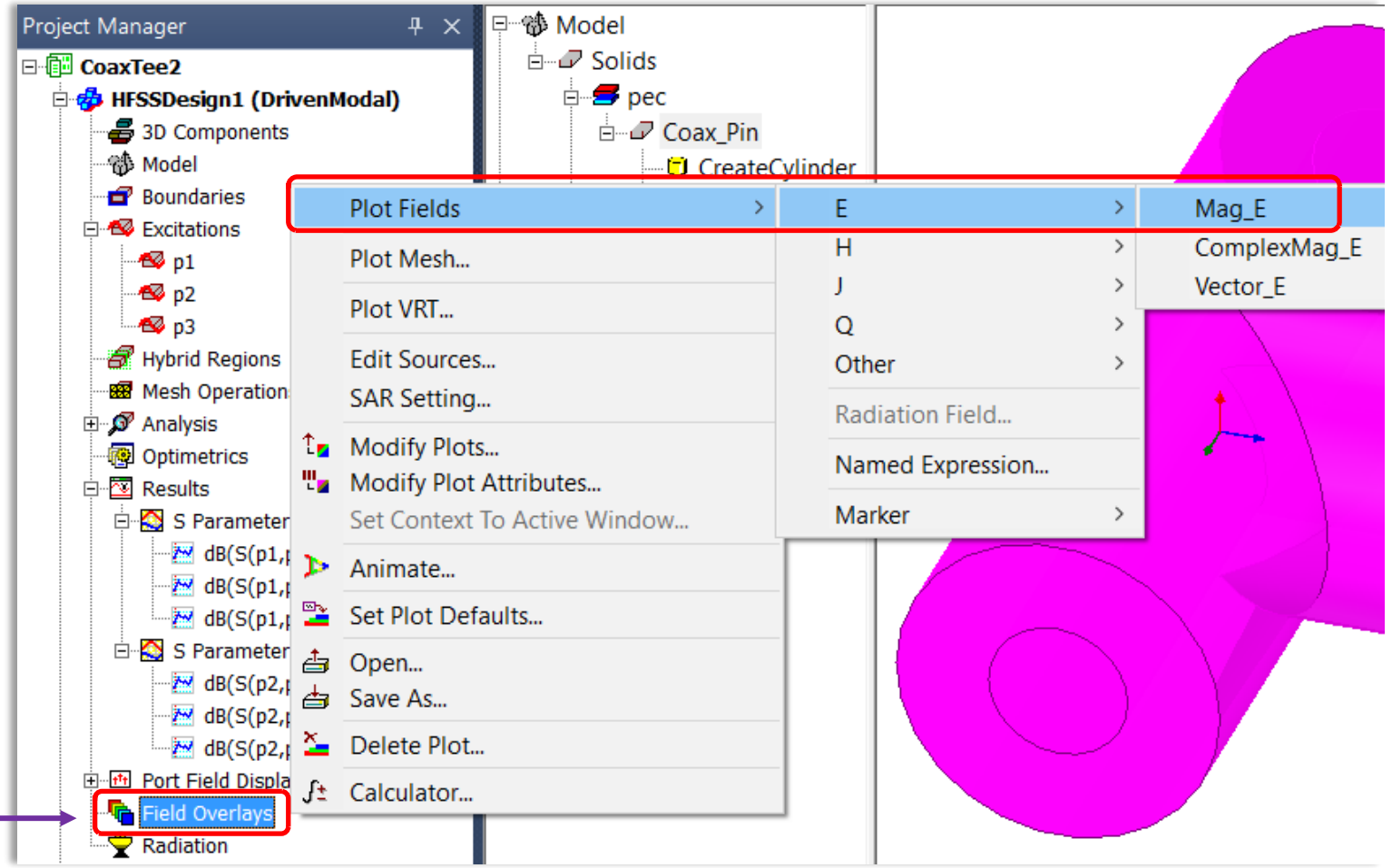
Part 2: Plot E-Fields on CoaxTee2.aedt

In the ***Project Manager,*** right-click on ***Field Overlays*** and select ***Plot Fields > E > Mag_E*** to bring up the ***Create Field Plot*** dialog box.



Field Overlays

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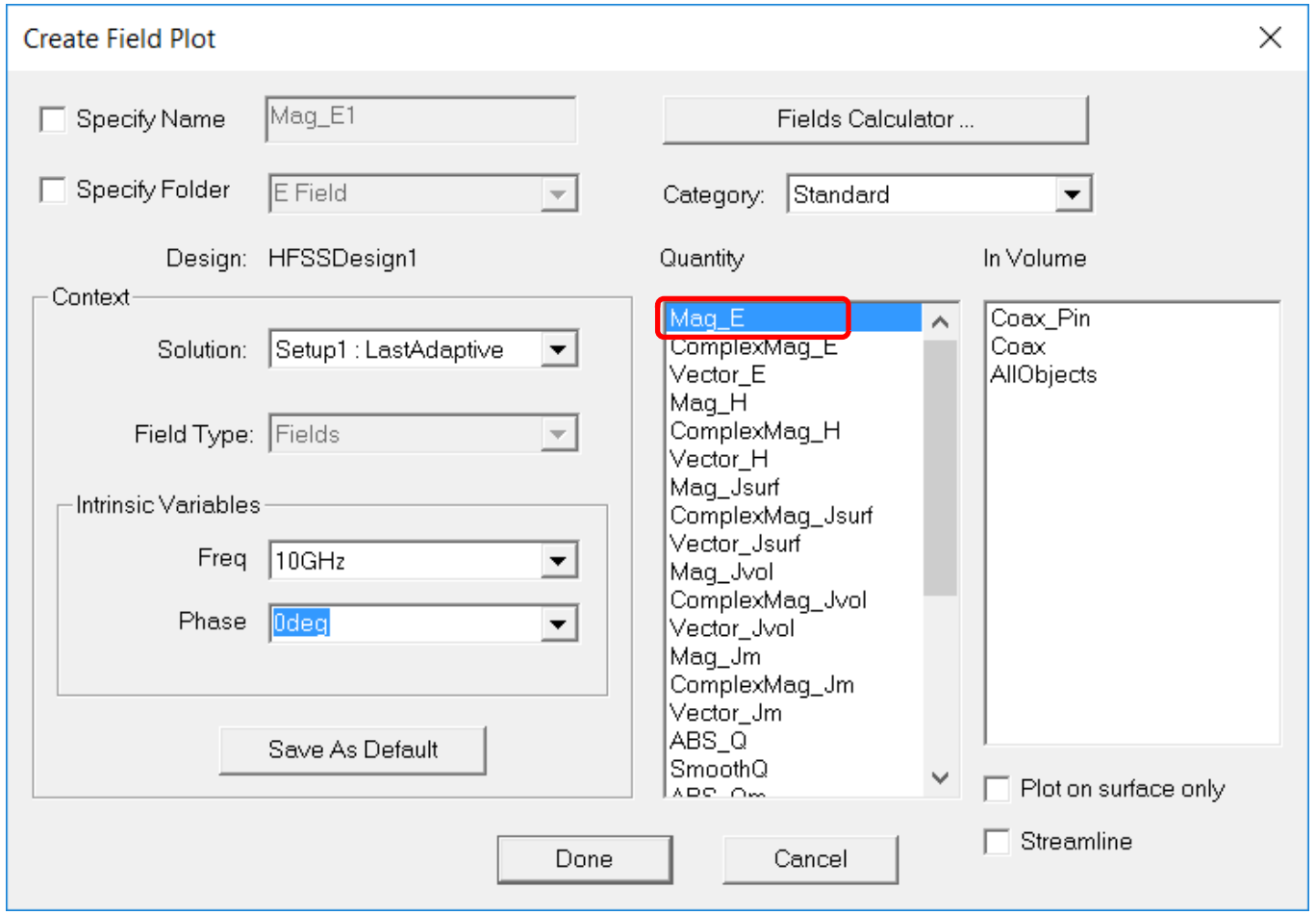
The *Create Field Plot* Dialog Box at 10 GHz

- We should be able to use the settings that appear in the ***Create Field Plot*** window.
- Verify under ***Quantity*** that ***Mag_E*** is selected.
- ***All Objects*** may not show as selected under ***In Volume***.
- Click on ***Done*** to complete the field plot.
- If not already saved to new file name, in the ***Project Manager***, right-click on the project name **CoaxTee1.aedt** and choose ***File > Save As*** **CoaxTee2.aedt**.



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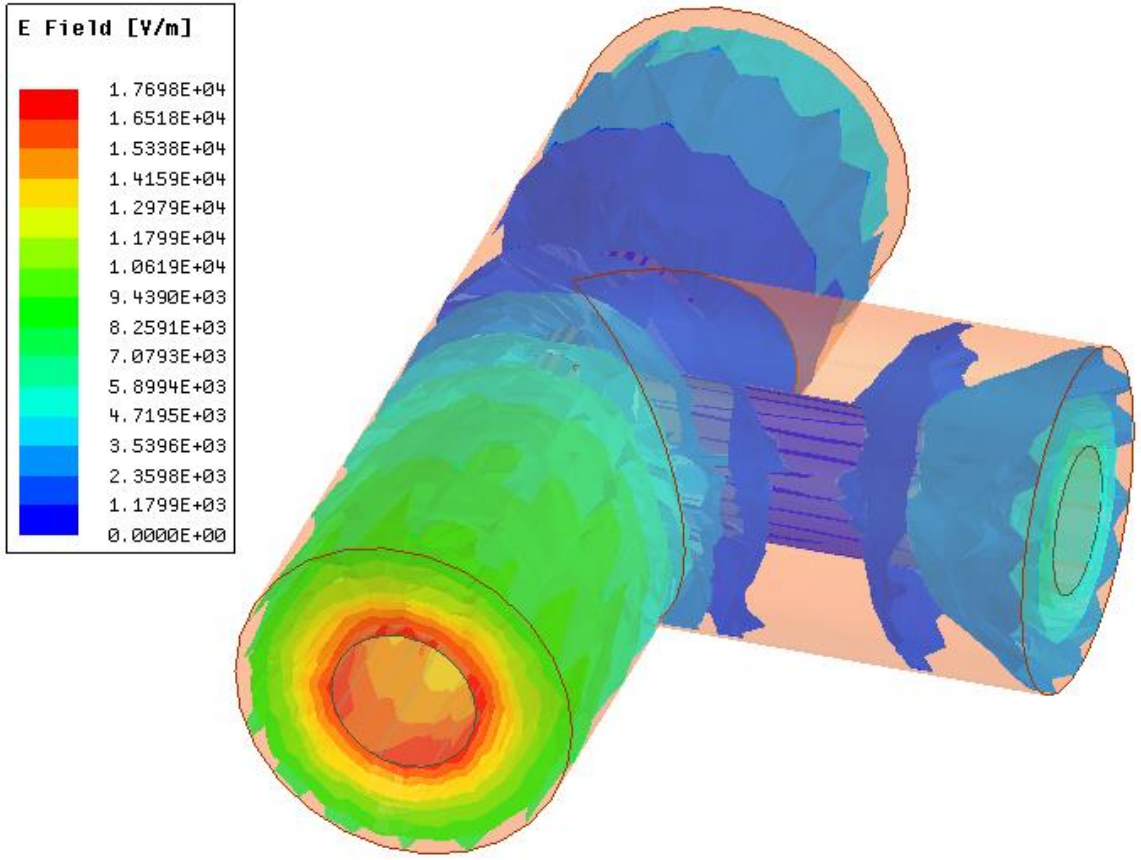
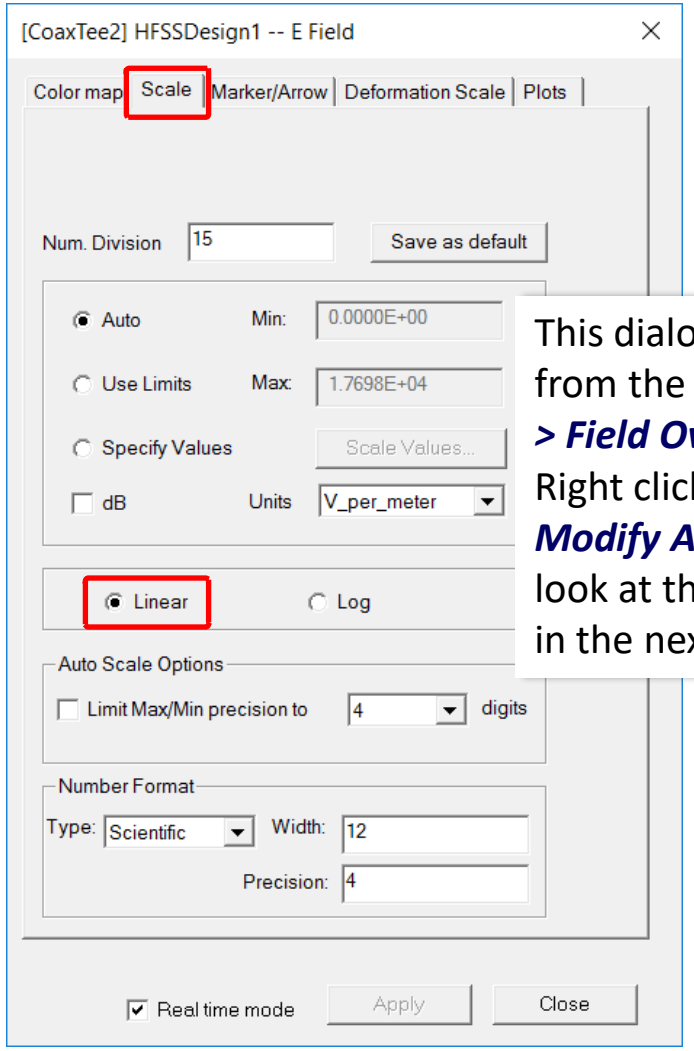
CoaxTee2 E-Field Magnitude on All Objects *Linear* Scale



This E-field magnitude plot corresponds to the settings on the right. In the next slides we'll change them. Notice that the scale is linear.



This dialog box comes from the ***Project Manager > Field Overlays > E Field***. Right click and choose ***Modify Attributes***. We'll look at this more closely in the next slide.

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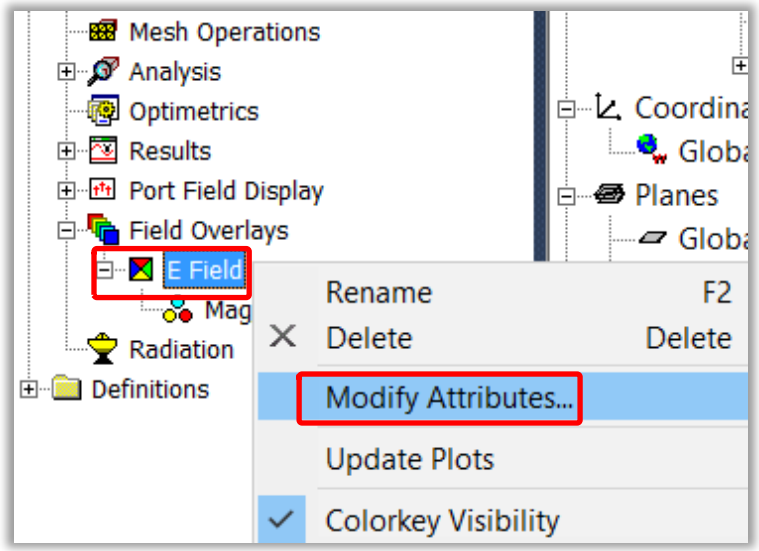
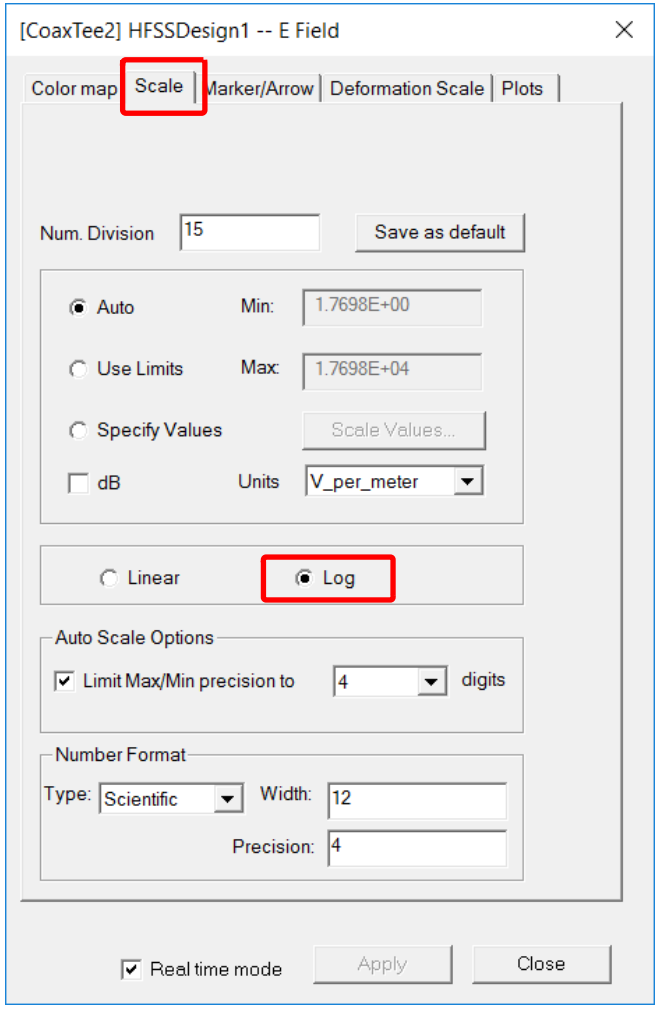
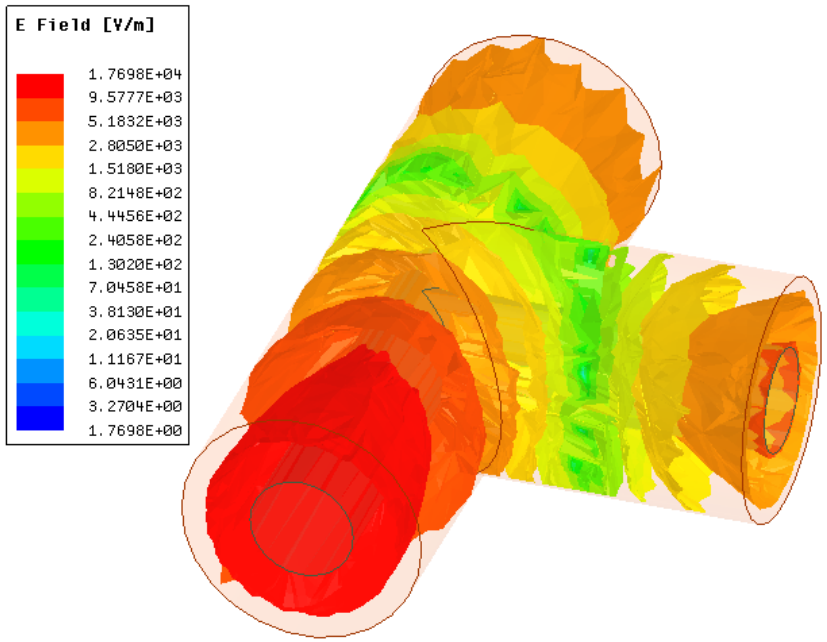
CoaxTee2 E-Field Magnitude on *All Objects Log* Scale



To adjust the field plot, in the ***Project Manager*** right-click on ***E Field*** and select ***Modify Attributes…*** to bring up the tab dialog box.

On the ***Scale*** tab, click on the radio button for ***Log.***





Optional: for further adjustments to field plot setup, see the Help/GSG installation directory and the document "**HFSS Coax Tee.pdf**"

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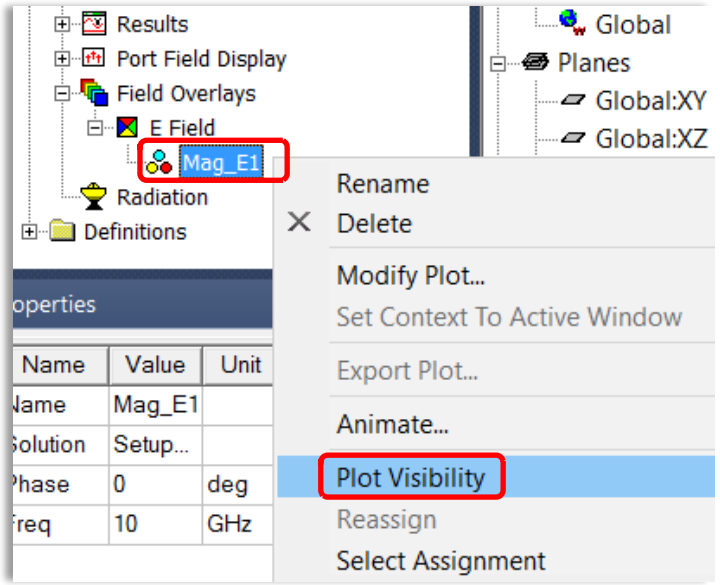
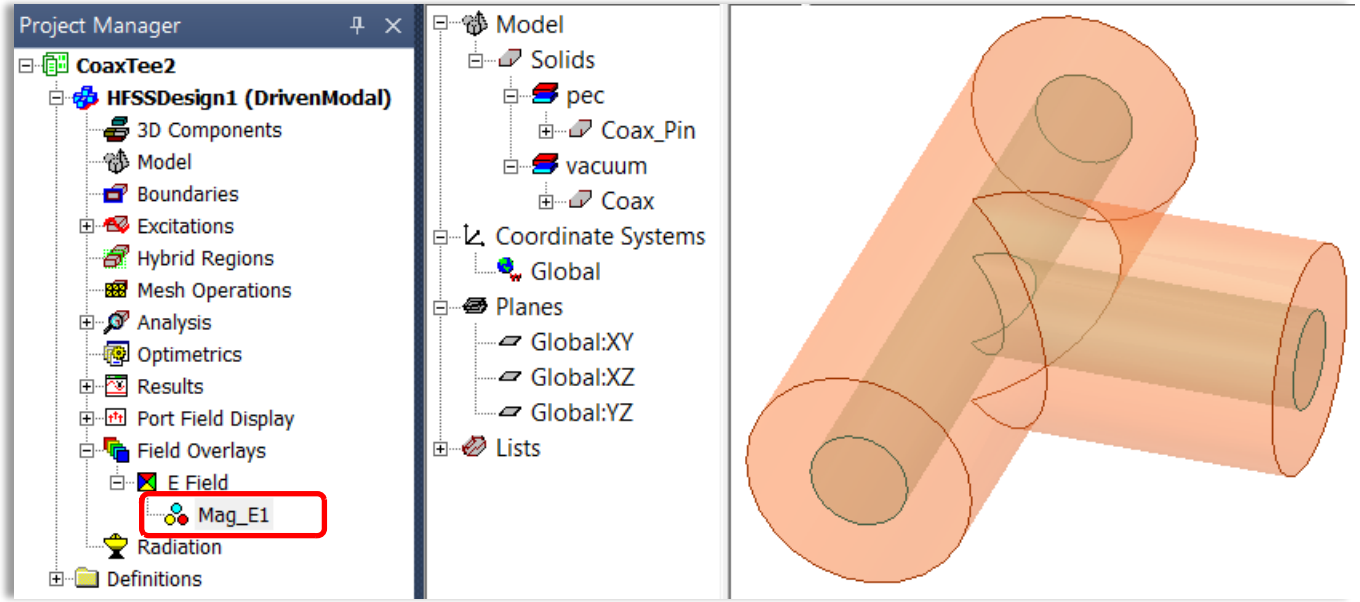
Turn Off Field *Plot Visibility* - *All Objects*

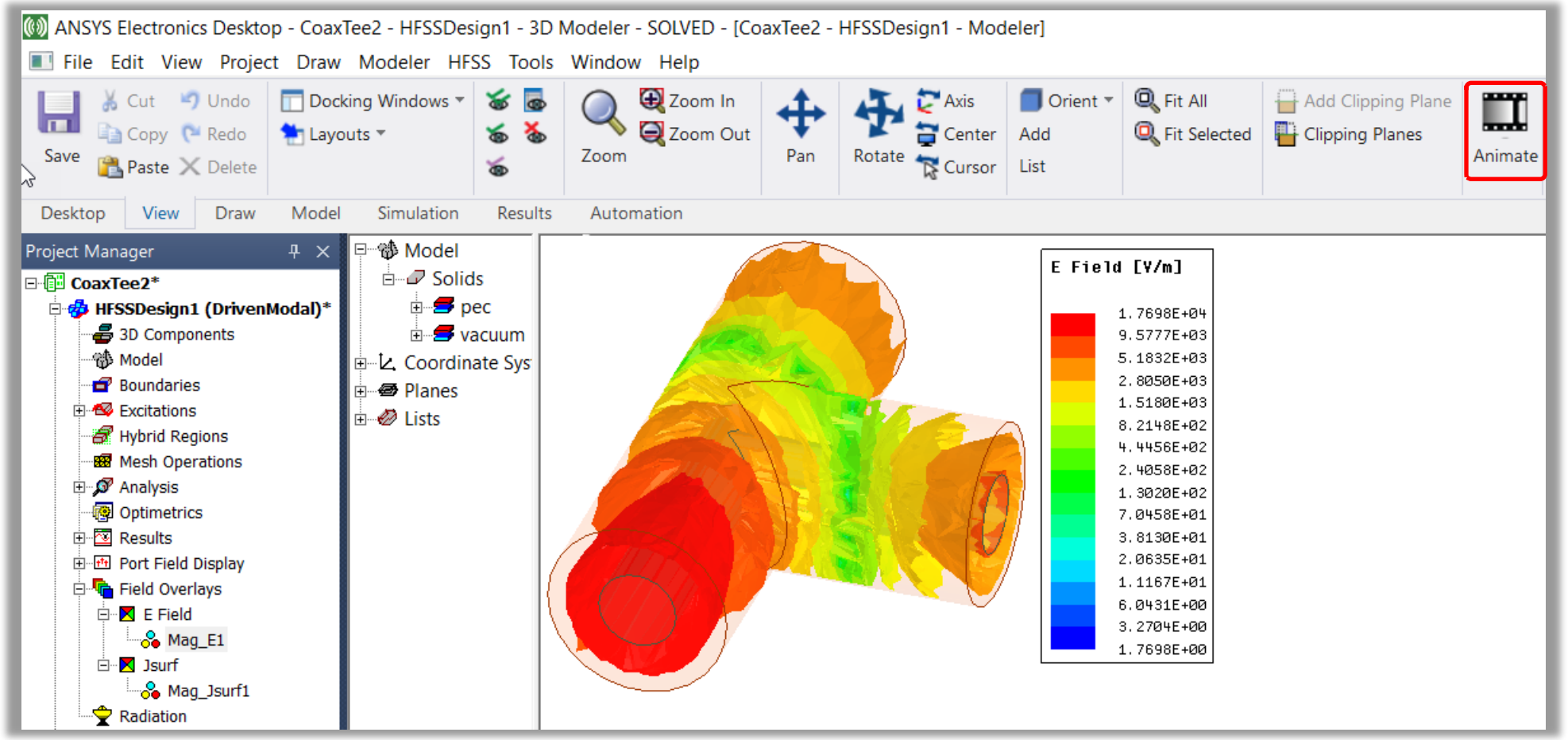


To turn the field plot visibility off, in the ***Project Manager*** right-click on ***Mag_E1 Field*** and select ***Plot Visibility*** to toggle (uncheck) the visibility of the E-field overlay. This does not remove nor delete the field overlay.



(With the field plot visibility turned off, selecting the ***Field Overlay Mag_E1*** in the ***Project Manager*** will make the field overlay appear.)

Optional: *Animate* CoaxTee2 E-Field Magnitude



This field plot can be animated as a function of phase.

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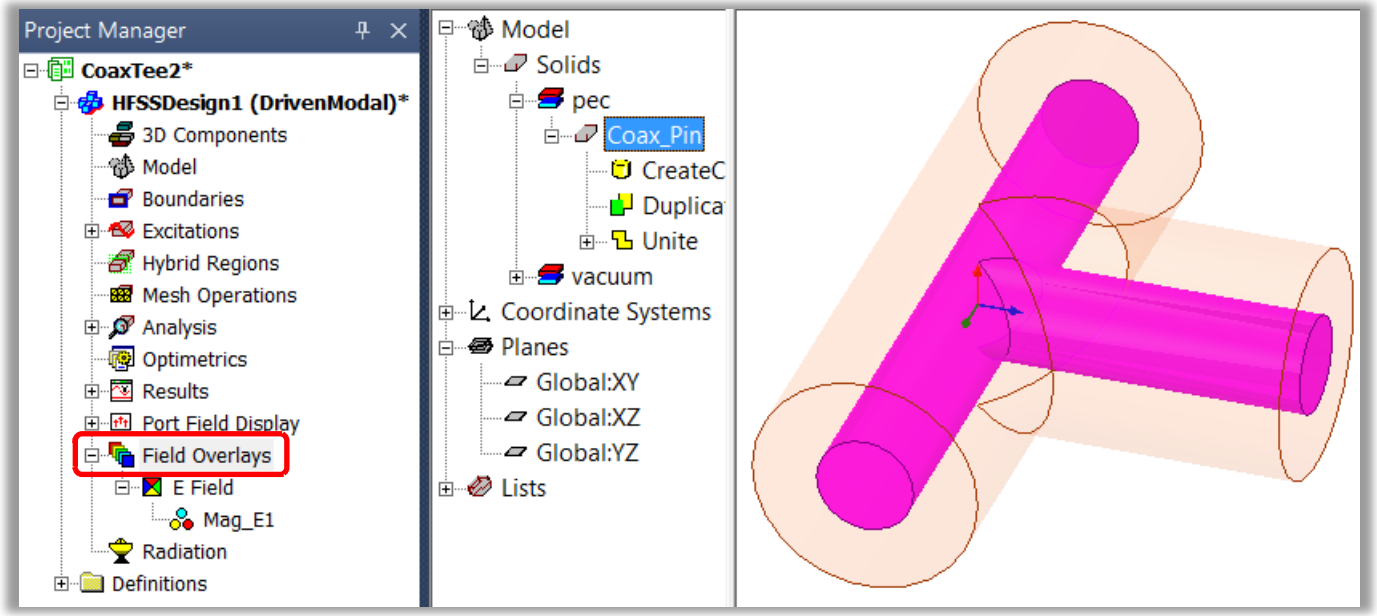
Optional: Show Current on Pins (Coaxial Conductors) - Coax_Pin

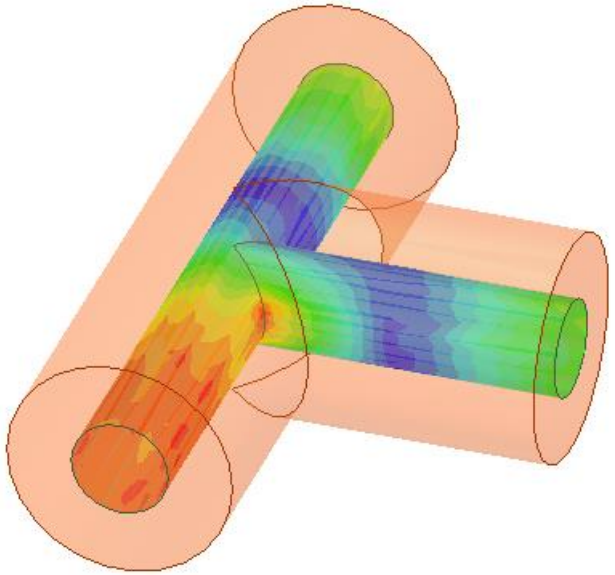
– In the ***3D Modeler Tree***, click on ***Coax_Pin*** to select it.



In the ***Project Manager,*** right-click on ***Field Overlays*** and select ***Plot Fields > J > Mag_Jsurf*** to bring up the ***Create Field Plot*** dialog box.

The default settings should work fine….10 GHz, Solution: Setup1 : LastAdaptive.

Click ***Done***.



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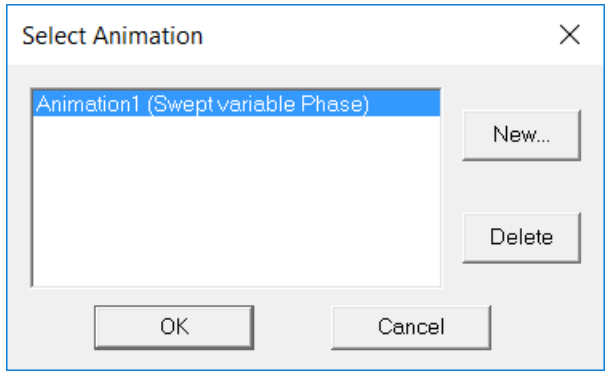
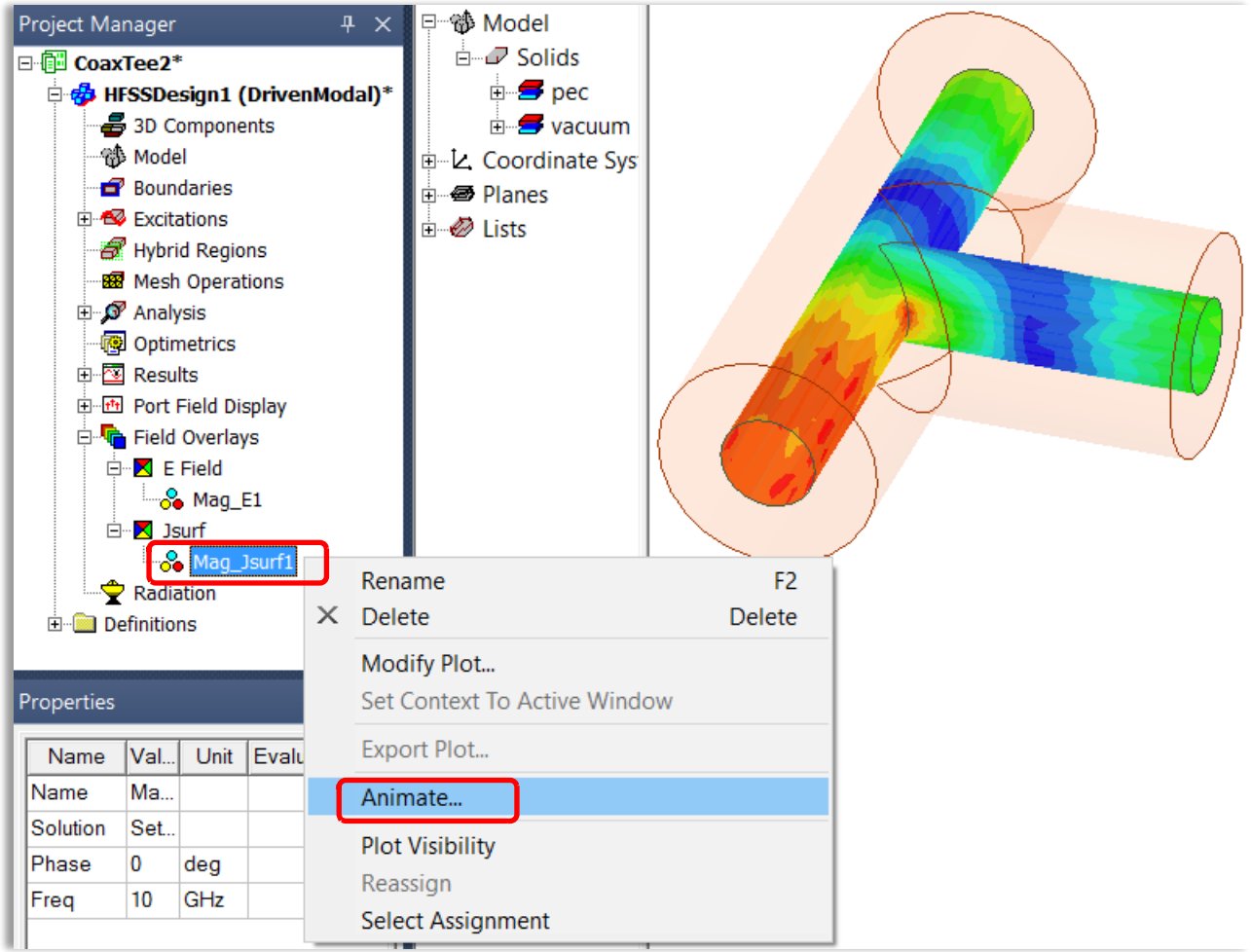
Optional: Set Up Animation of Surface Current on Pins Coax_Pin

In the ***Project Manager,*** under ***Field Overlays > Jsurf,*** right-click on ***Mag_Jsurf*** and select ***Animate.***



When the Select Animation dialog box appears, click on ***OK***.

This is for an animation of phase.



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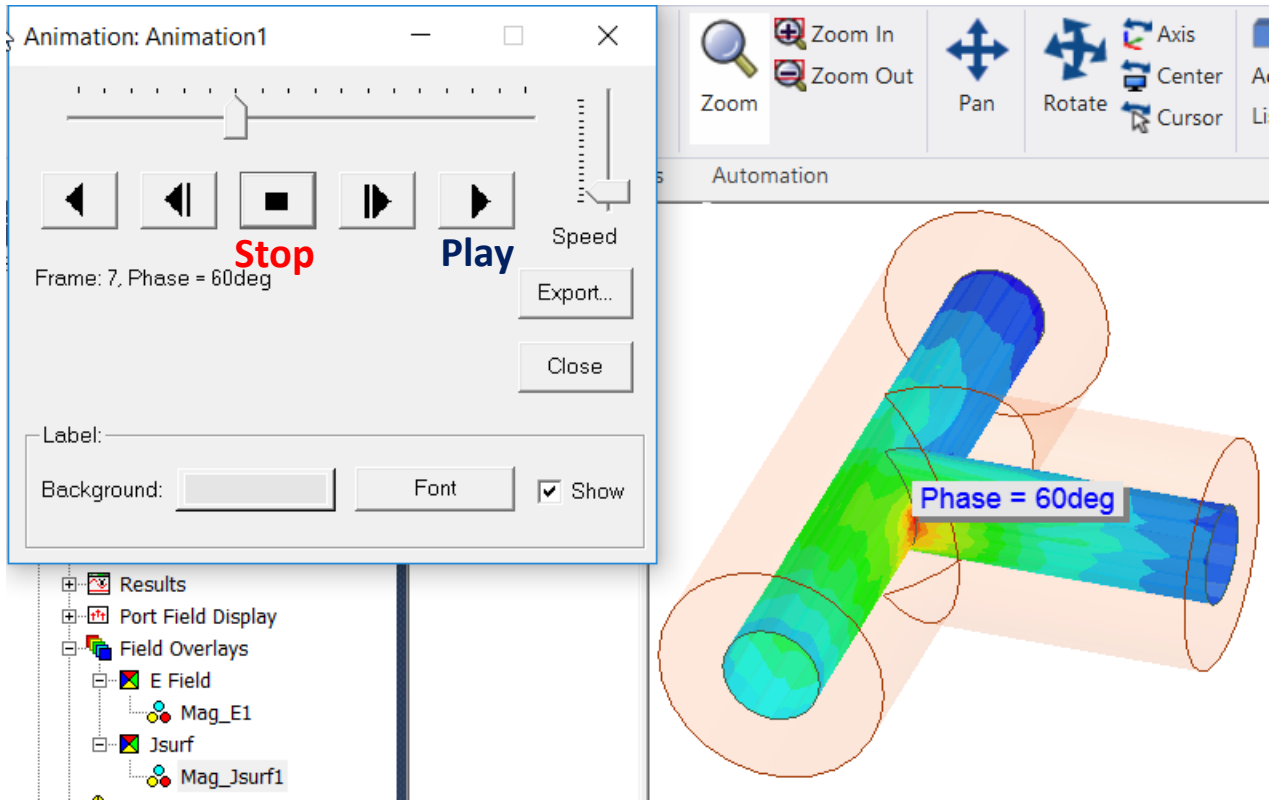
Optional: Animation of Surface Current on Pins *Coax_Pin*

When the ***Animation*** dialog box appears, use the buttons to play forward, play backward, and stop.



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End of Presentation