Altair

HyperWorks

Altair HyperStudy 2019 Tutorials

HS-1615: Setting Up a FEKO Model

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The purpose of this tutorial is to illustrate the information and steps required to setup a FEKO model in HyperStudy.

The model used in this tutorial is a waveguide transmission line that is being fed with a coaxial cable.

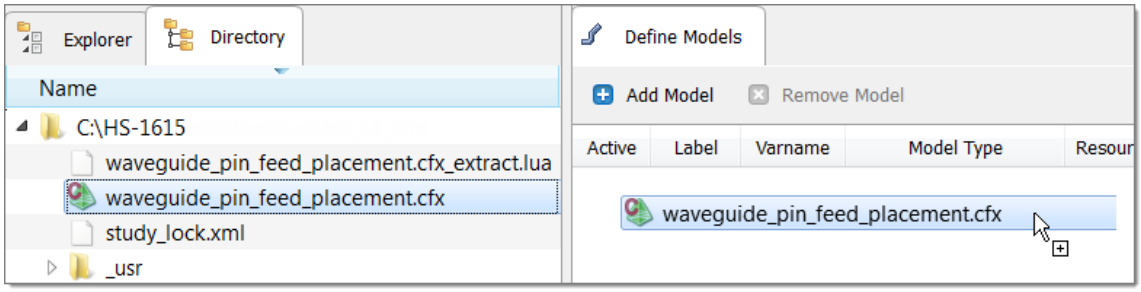
The effect of the cable's pin position on input impedence is studied. When the impedence is reduced, this leads to improved power transmission.

The files used in this tutorial can be found in `<hst.zip>/HS-1615/`. Copy the tutorial files from this directory to your working directory. The tutorial directory includes the following files:

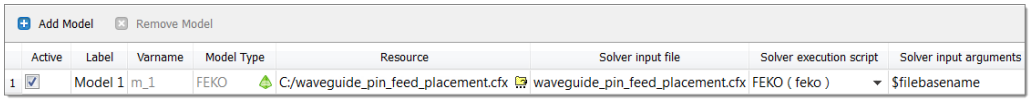
- `waveguide_pin_feed_placement.cfx`
- `waveguide_pin_feed_placement.cfx_extract.lua`

Step 1: Perform the Study Setup

1. Start HyperStudy.
2. To start a new study, click ***File*** > ***New*** from the menu bar, or click on the toolbar.
3. In the **HyperStudy – Add** dialog, enter a study name, select a location for the study, and click ***OK***.
4. Go to the **Define models** step.
5. Add a FEKO model by dragging-and-dropping the `waveguide_pin_feed_placement.cfx` from the **Directory** into the work area.



The **Resource**, **Solver input file**, and **Solver input arguments** fields become populated.



6. Click ***Import Variables***. Ten input variables are imported from the `waveguide_pin_feed_placement.cfx` file.
7. Go to the **Define Input Variables** step, and review the input variables.

	Active	Label	Varname	Lower Bound	Initial	Upper Bound	Comment
1	☑	freq	dv_1	9.00e+09	1.00e+10	1.10e+10	Centre frequency
2	☑	lambda	dv_2	26.981321	29.979246	32.977170	Free space wavelength in millimitres
3	☑	n	dv_3	5.4000000	6.0000000	6.6000000	Feed pin position index
4	☑	pin_length	dv_4	6.0707973	6.7453303	7.4198633	Length of pin feed monopole
5	☑	pin_offset	dv_5	5.0589977	5.6211086	6.1832194	Pin offset from waveguide tip
6	☑	pin_step_size	dv_6	0.8431663	0.9368514	1.0305366	Distance between pin positions
7	☑	radius	dv_7	0.0900000	0.1000000	0.1100000	Radius of pin wires
8	☑	waveguide_length	dv_8	53.962642	59.958492	65.954341	Length of waveguide section
9	☑	wr90_height	dv_9	9.1440000	10.160000	11.176000	Waveguide height for WR90 (X-Band)
10	☑	wr90_width	dv_10	20.574000	22.860000	25.146000	Waveguide width for WR90 (X-Band)

8. Go to the **Specifications** step.

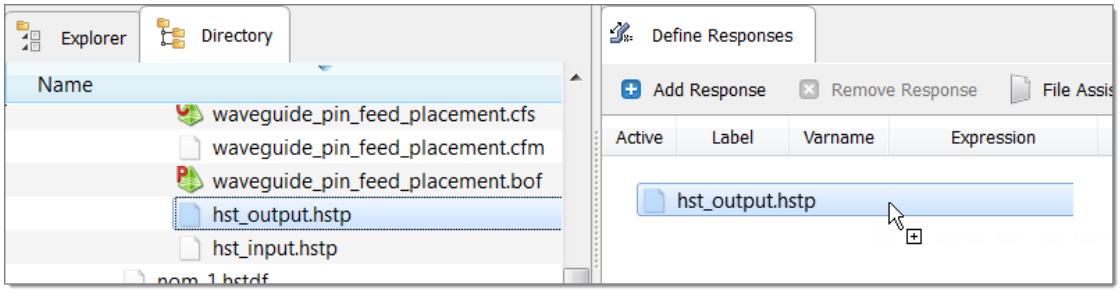
Step 2: Perform the Nominal Run

1. In the work area, set the **Mode** to ***Nominal Run***.
2. Click ***Apply***.
3. Go to the **Evaluate** step.
4. Click ***Evaluate Tasks***. An `approaches/nom_1/` directory is created inside the study directory.
5. Go to the **Define Output Responses** step.

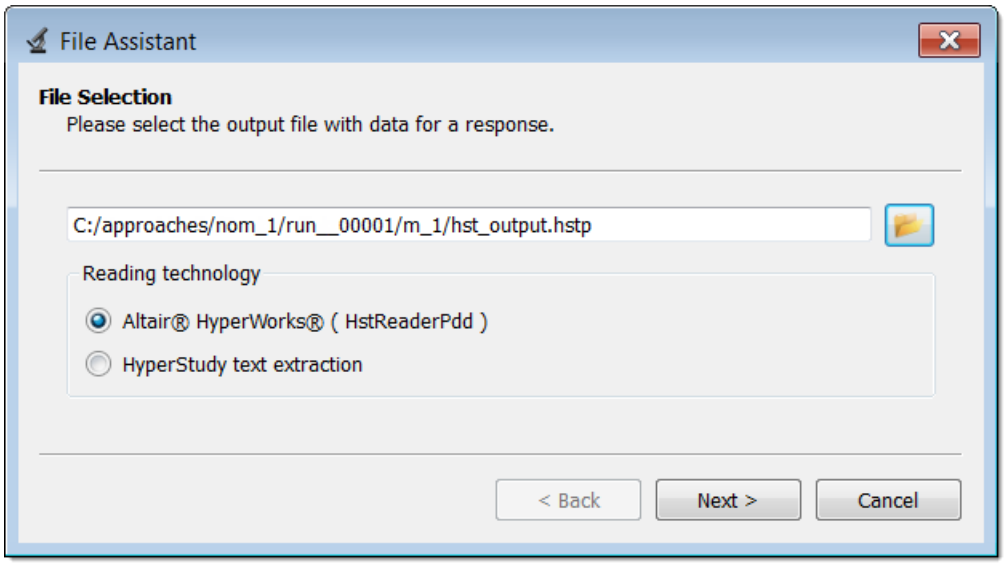
Step 3: Create and Define Output Responses

In this step you will create two output responses.

1. Create output response 1.
   a. From the **Directory**, drag-and-drop the `hst_output.hstp` file, located in `approaches/nom_1/run_00001/m_1`, into the work area.



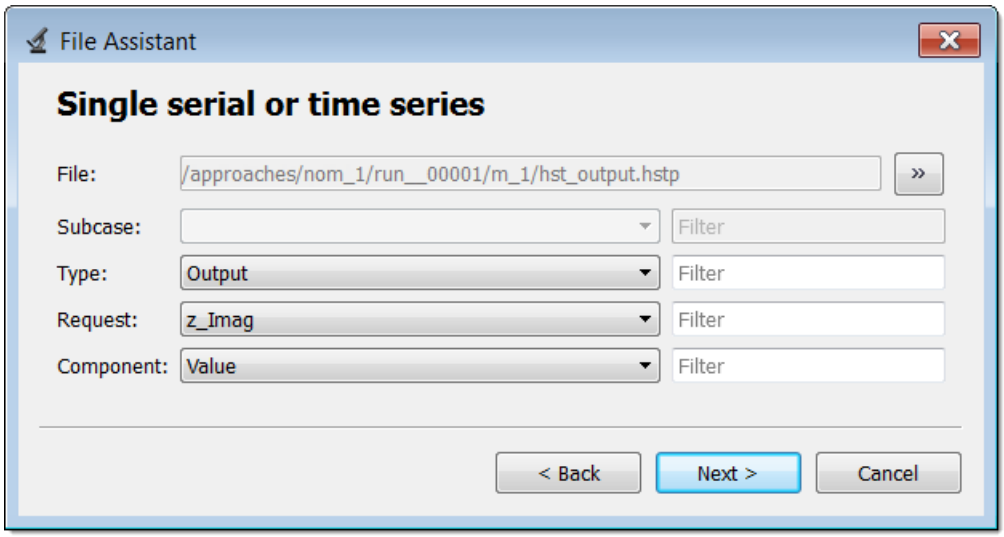
   b. In the **File Assistant** dialog, click ***Next***.



c. Select ***Single item in a time series***, then click ***Next***.

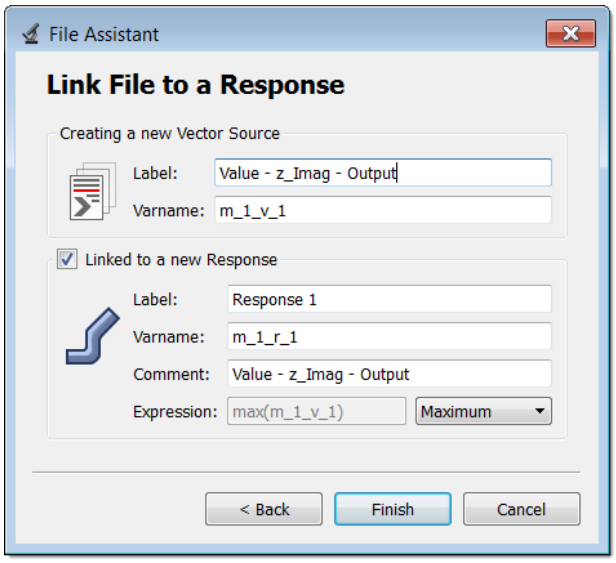
d. Define the following, then click ***Next***.

- Set **Type** to ***Output***.
- Set **Request** to ***z_Imag***.
- Set **Component** to ***Value***.



e. Optional. Enter labels for the data source and output response.

f. Set the output response **Expression** to ***Maximum***.



g. Click ***Finish***. Output response 1 is added to the work area.

2. Create output response 2 by repeating step 1. Except, set **Request** to ***z_Real***.

	Active	Label	Varname	Expression	Value	Comment
1	☑	Response 1	m_1_r_1	max(m_1_v_1) ...	Not_Extracted	Value - z_Imag - Output ...
2	☑	Response 2	m_1_r_2	max(m_1_v_2) ...	Not_Extracted	Value - z_Real - Output ...

Step 4: Run a DOE Sweep Study

1. In the **Explorer**, right-click and select ***Add*** from the context menu.
2. In the **Add - HyperStudy** dialog, add a **Doe**.
3. Go to the **Select Input Variables** step.
4. This tutorial is only studying the effects from the variation of the pin position index, therefore deactivate all input variables except **n**.

	Active	Label	Varname	Lower
1	☐	freq	dv_1	9.00e+
2	☐	lambda	dv_2	26.981
3	☑	n	dv_3	5.4000
4	☐	pin_length	dv_4	6.0707
5	☐	pin_offset	dv_5	5.0589
6	☐	pin_step_size	dv_6	0.8431
7	☐	radius	dv_7	0.0900
8	☐	waveguide_le...	dv_8	53.962
9	☐	wr90_height	dv_9	9.1440
10	☐	wr90_width	dv_10	20.574

5. Go to the **Specifications** step.
6. In the work area, set the **Mode** to ***Hammersley***.
7. In the **Settings** tab, change the **Number of runs** to `21`.
8. Click ***Apply***.
9. Go to the **Evaluate** step.
10. Click ***Evaluate Tasks*** to execute all 21 runs.

Step 5: Run a Fit Study

1. In the **Explorer**, right-click and select ***Add*** from the context menu.
2. In the **Add - HyperStudy** dialog, add a **Fit**.
3. Go to the **Select matrices** step.
4. Click ***Add Matrix***.
5. In the **Add - HyperStudy** dialog, add one matrix.
6. Set **Matrix Source** to ***Doe 1 (doe_1)***.

	Active	Label	Varname	Type	Matrix Source	Matrix Origin	Status
1	☑	FitMatrix 1	fitmatrix_1	Input	Doe 1 (doe_1)	DoeDoe 1	Import Pending

7. Click ***Import Matrix***.
8. Go to the **Specifications** step.
9. In the work area, set the **Mode** to ***Radial Basis Function***.
10. Click ***Apply***.
11. Go to the **Evaluate step**.
12. Click ***Evaluate Tasks***.
13. Go to the **Post-Processing** step.
14. Click the **Trade-Off** tab to plot the response surface.