Midterm Project

Introduction to ANSYS HFSS Tools & 3D Modeling

Fields and Wave Propagation

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Course: ECE 4703-001

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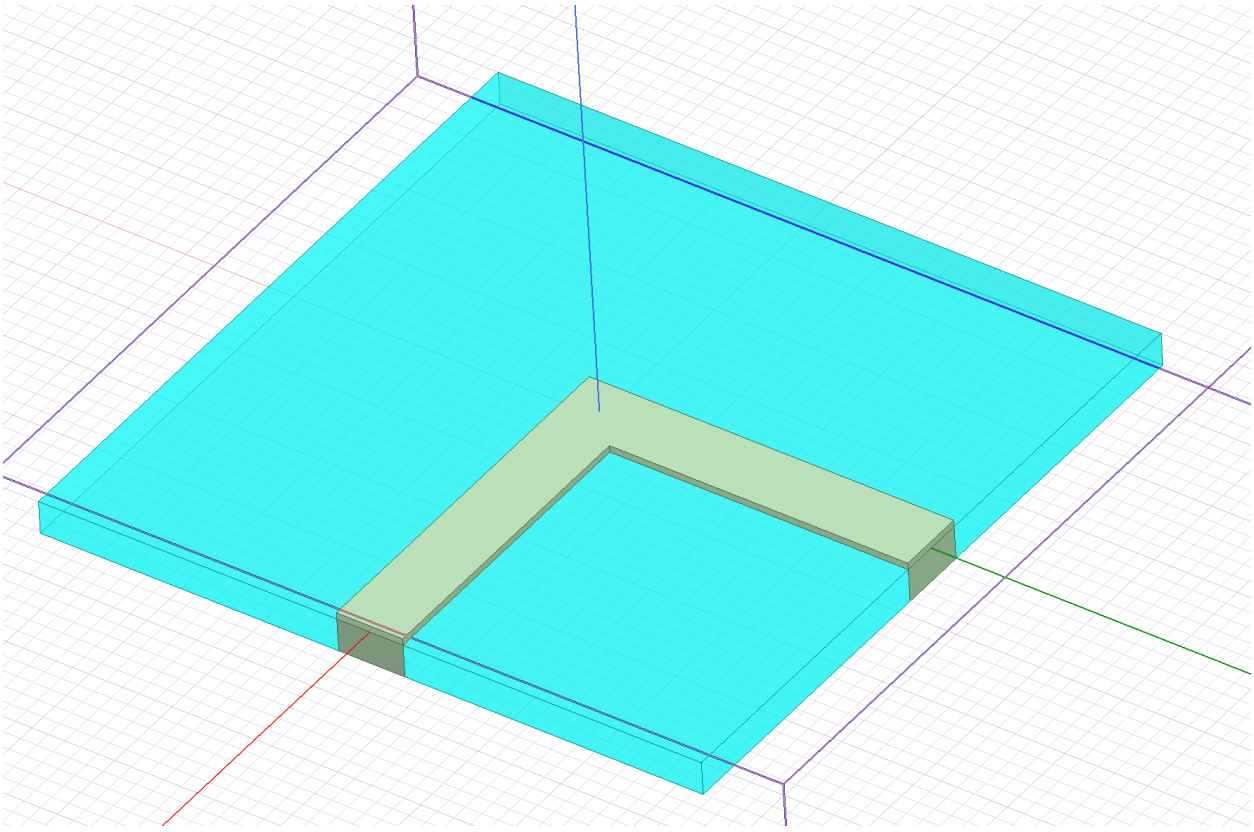
Introduction:

An introduction to ANSYS HFSS by creating two 3D designs and applying software electromagnetic analysis tools to the objects. Data generated by the software's field simulations can then be used to create data plots that assist optimization of the design. Part one delineates a copper "Microstrip" in a thin surface. Electromagnetic properties are then applied to the microstrip and ground plate. Terminal S parameters plots and EM density simulations were produced. Part two is of a board with a trace and coax connector. The electromagnetic properties of the board tracer and coax connector were the analyzed. A simulation and plots of the data were produced. Lastly, an analysis method was demonstrated. This being, cutting the 3D model in half to greatly reduce the simulation time while maintaining data accuracy.

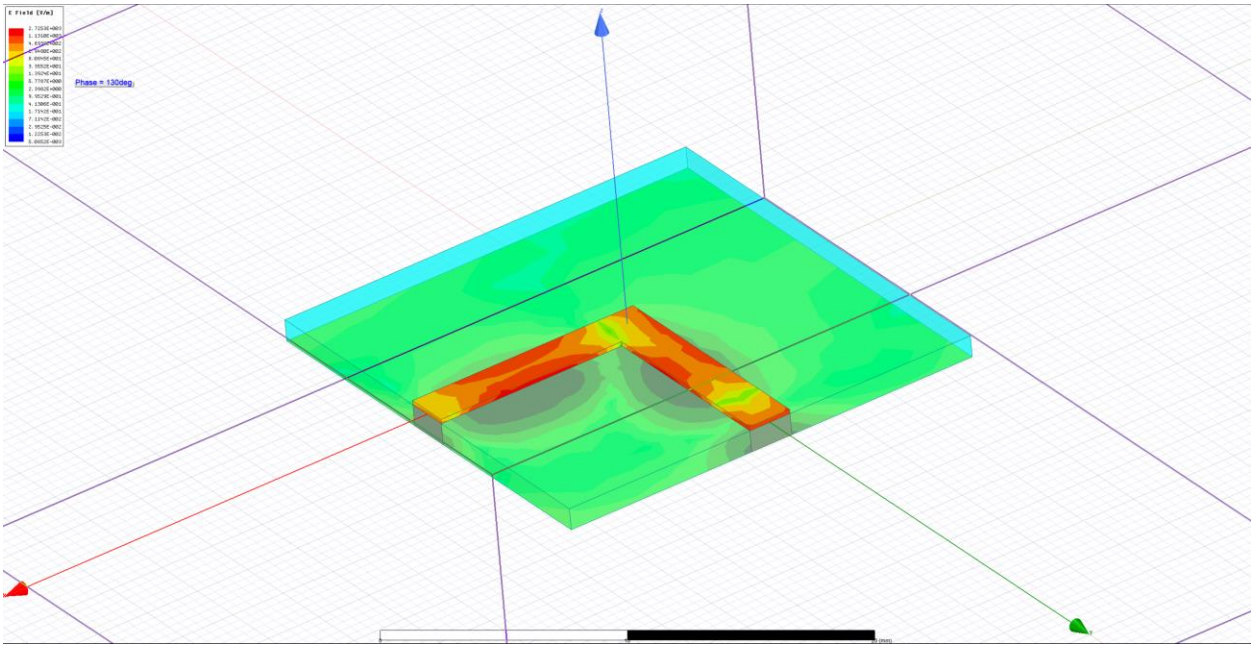
Part One:

Figure 1.1



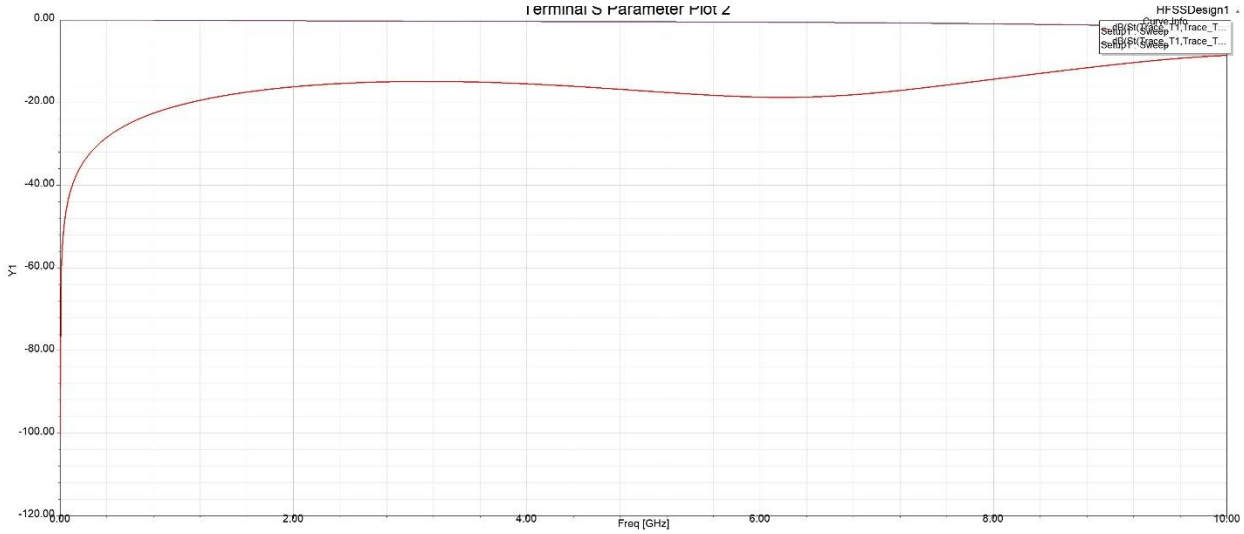
Microstrip with 90˚ bend copper tracer.

Figure 1.2



Microstrip with 90˚ bend copper tracer under phase simulation.

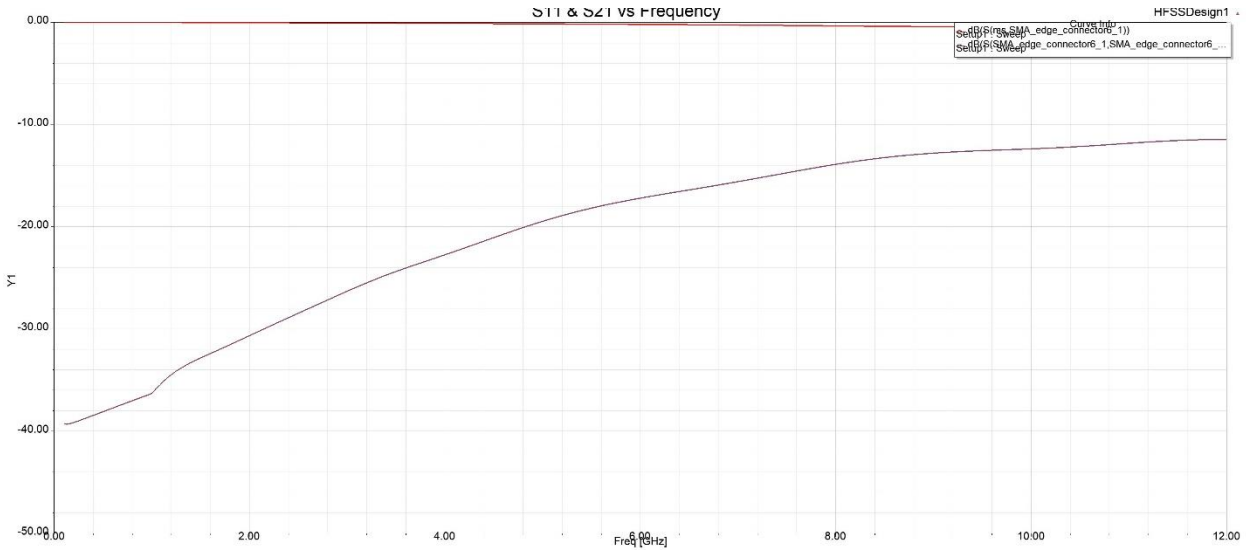
Figure 1.3



Microstrip Terminal S Parameter Plot.

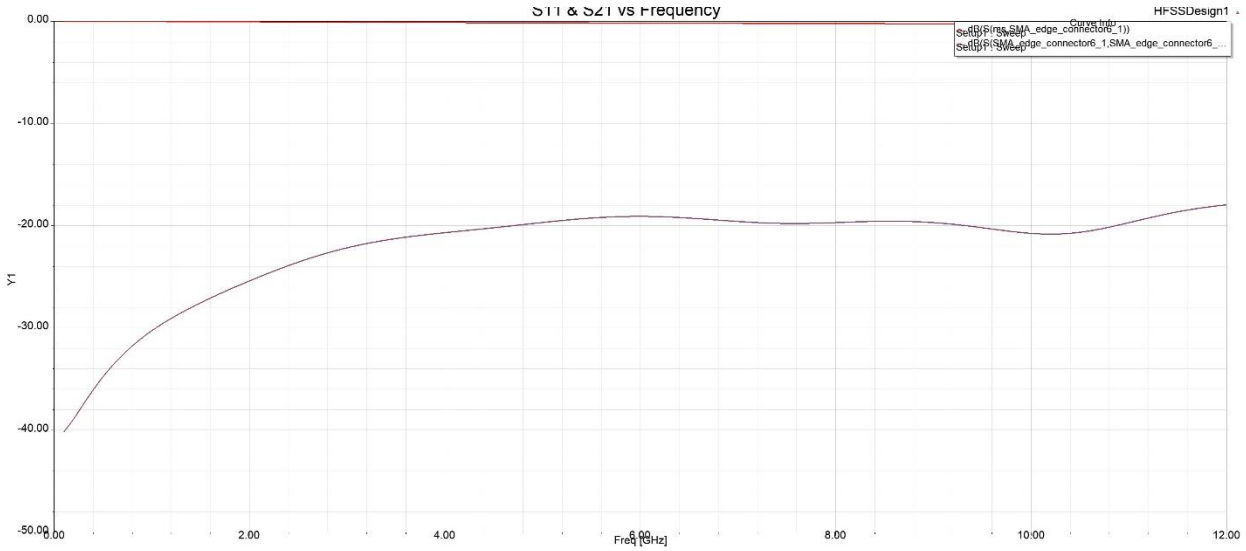
Part 2:

Figure 2.1



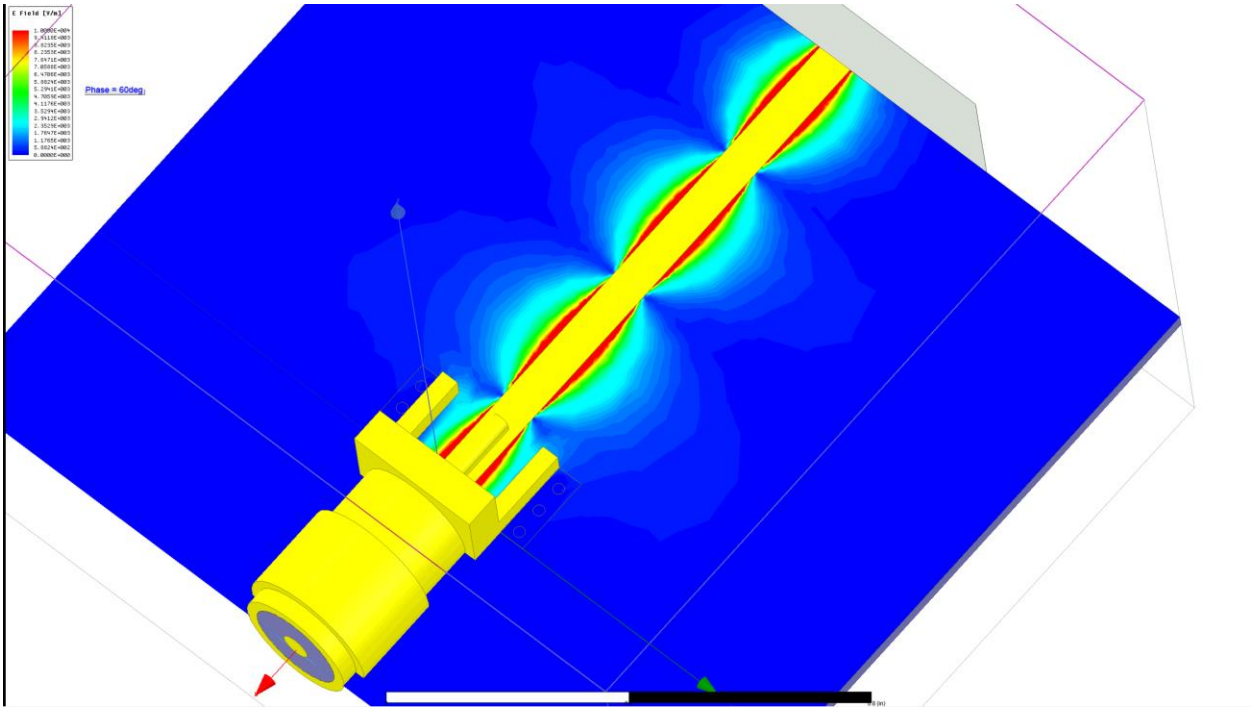
Plot of unoptimized coax cable S-parameters.

Figure 2.2



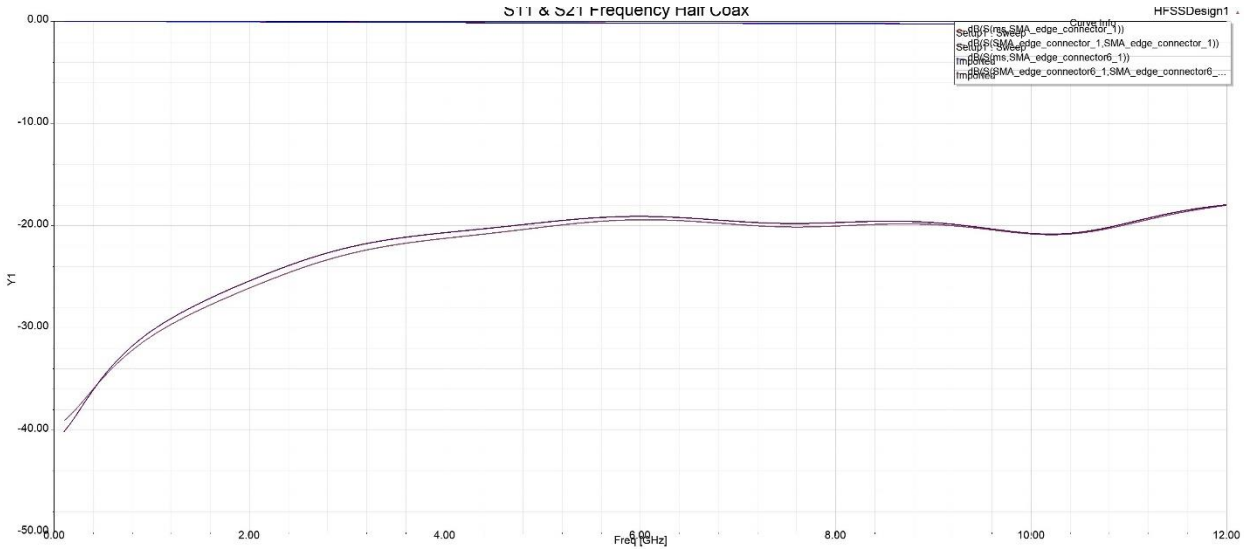
Plot of optimized coax cable S-paramters.

Figure 2.3



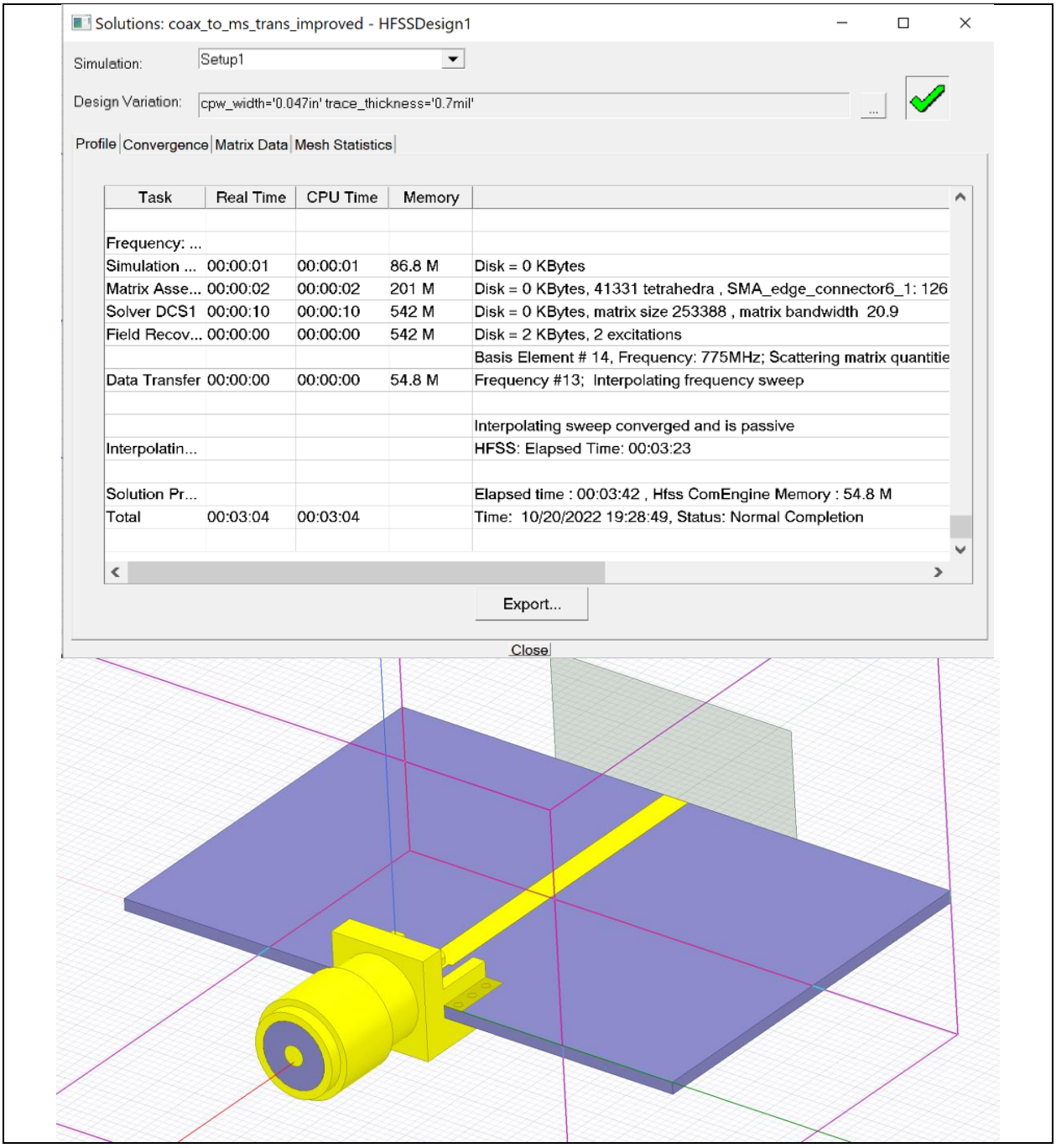
Simulation of electromagnetic field through the coax connector and board trace.

Figure 2.4



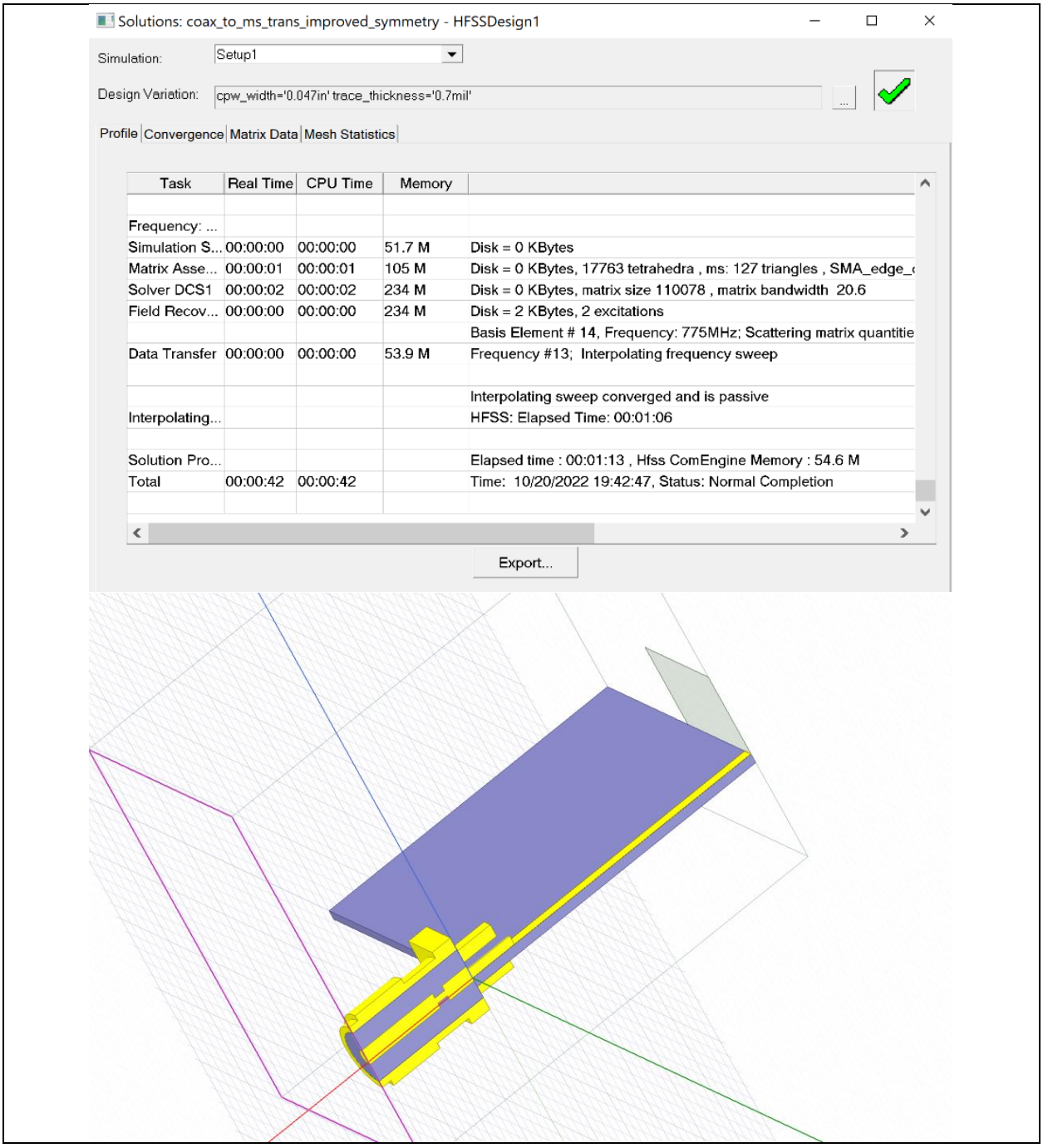
Plotted simulation data of half coax connector and full coax connector.

Figure 2.5



Full coax connector with associated simulation data.

Figure 2.6



Half coax connecter with associated simulation data.

Conclusion:

ANSYS HFSS software allows for users to effectively create 3D models and apply simulations to said models allowing users to model electromagnetic effects. Methods used to reduce simulation processing times were effective and had little impact on the accuracy of the data produced.