



10-way power combiner simulation

1. Description

We present in this example validated results of a 10-way power combiner. The model and dimensions of the structure have been set according to [1]. The simulation results show great agreement with the measurements shown in the same reference. The following figure indicates the main input port (red arrows) and one output port (green arrows).

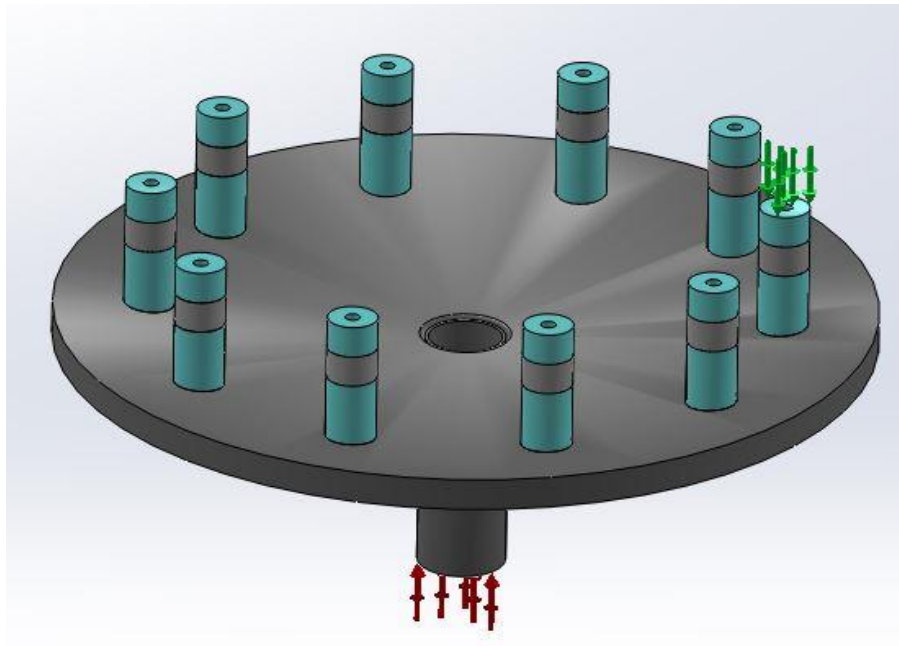


Figure 1: the structure's 3D view in SolidWorks

2. Simulation

The Scattering Parameters solver is the most suitable analyzer for such a structure as it offers the aimed variables and frequency responses: Return Loss, Insertion loss, Isolation between the output ports, relative phase shifting between input and output signals... etc. The applied mesh is fine near the discontinuities. The transition faces are the most crucial areas to the solver: They are in origin of an impedance and geometrical distribution change. Therefore, we must apply a finer mesh to them.



3. Loads/ Restraints

The ports are all applied to the circular dielectrics' faces. We can indicate that the propagation is in TEM mode to the solver for refined results. The structure presented above is considered as a vacuum cavity; its outer surfaces are treated as Perfect Electric conductor surfaces.

HFWorks gives the possibility to view the electric or magnetic field in different format choosing which port to excite.

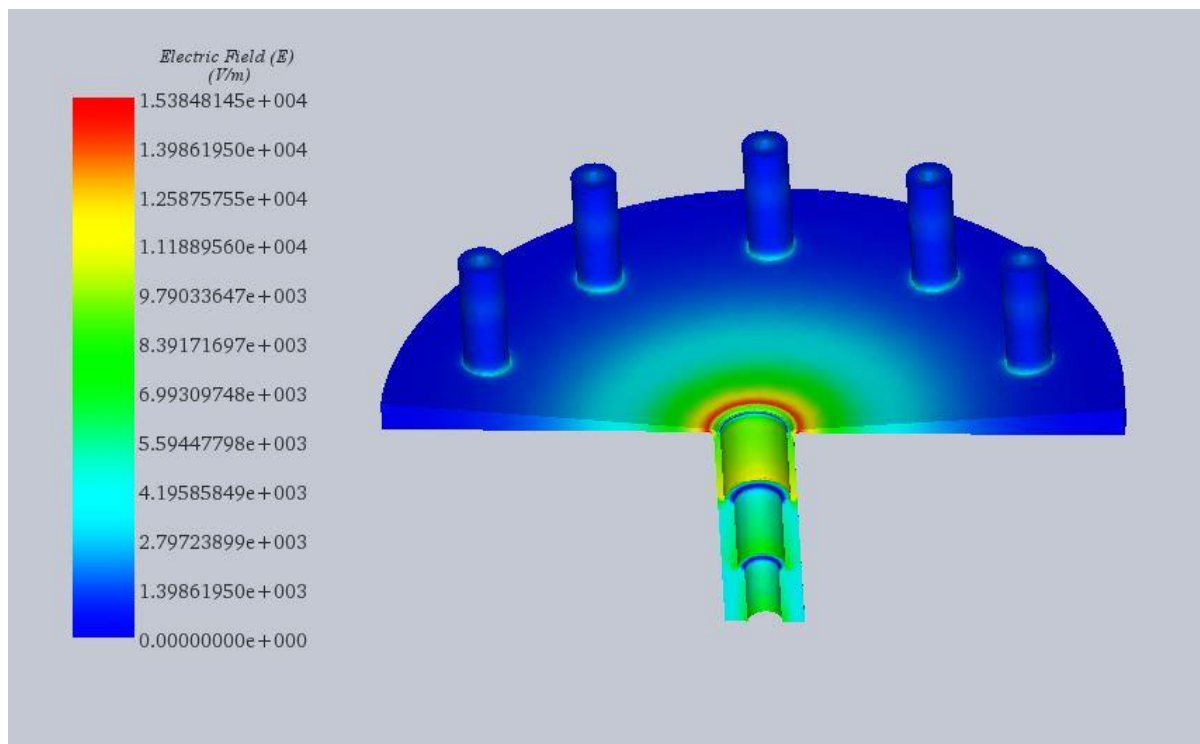


Figure 2: 3D Electric field distribution (Main Central Port is excited)

3. Results

To validate the precision of the HFWorks simulator, we ought to compare the simulations' results to measurements. The following figures show the insertion and return losses of the structure from 2 to 20 GHz.

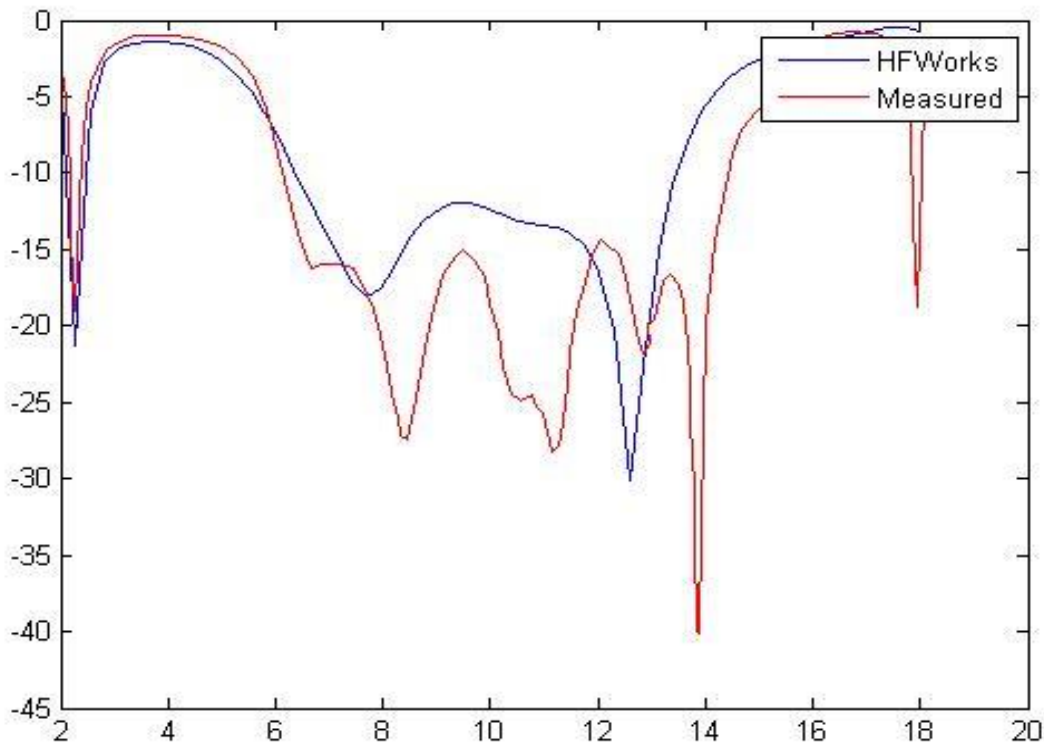


Figure 3: A comparison of the simulated and measured reflection coefficients at the central output port

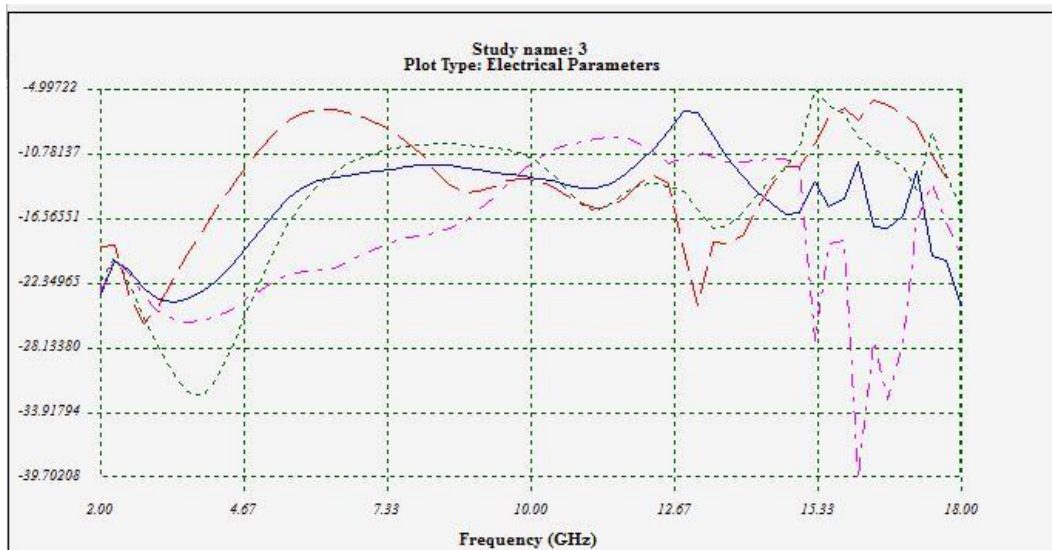


Figure 4: Isolation between the output ports (S23, S24, S25, S26)

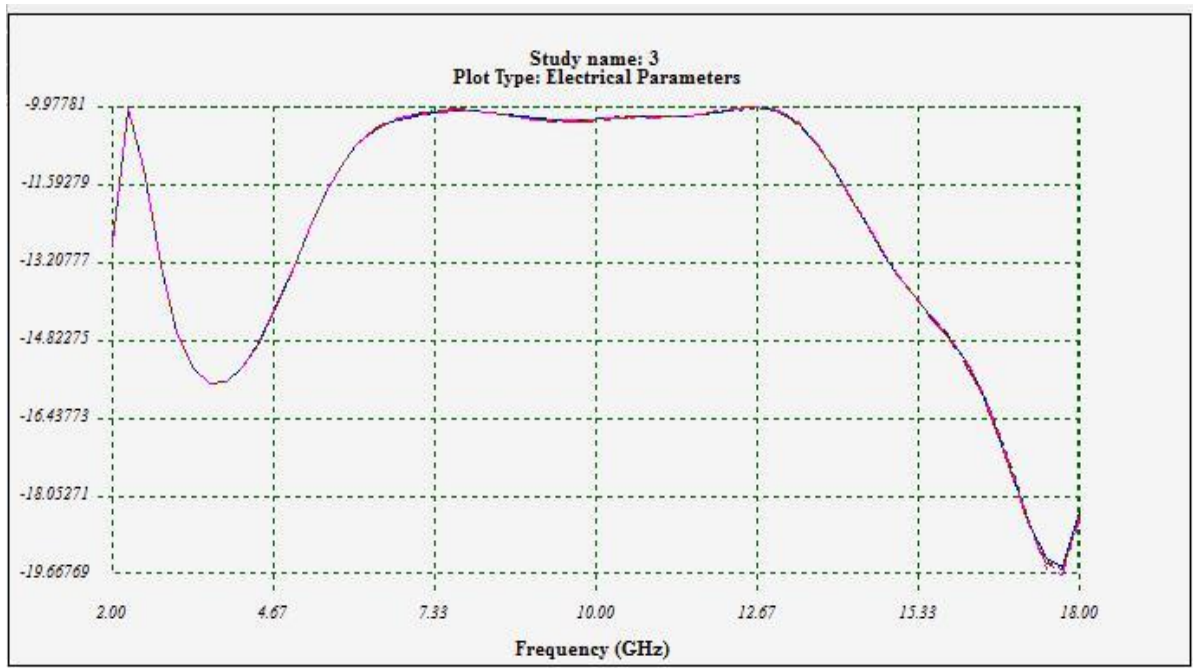


Figure 5: Insertion losses from the main input to port N

5. References

[1] Design of a Ten-Way Conical Transmission Line Power Combiner Dirk I. L. de Villiers, Student Member, IEEE, Pieter W. van der Walt, Senior Member, IEEE, and Petrie Meyer, Member, IEEE Feb. 2007.