Universität Siegen

HEP Experimental High Energy Physics

All-Silicon Meeting

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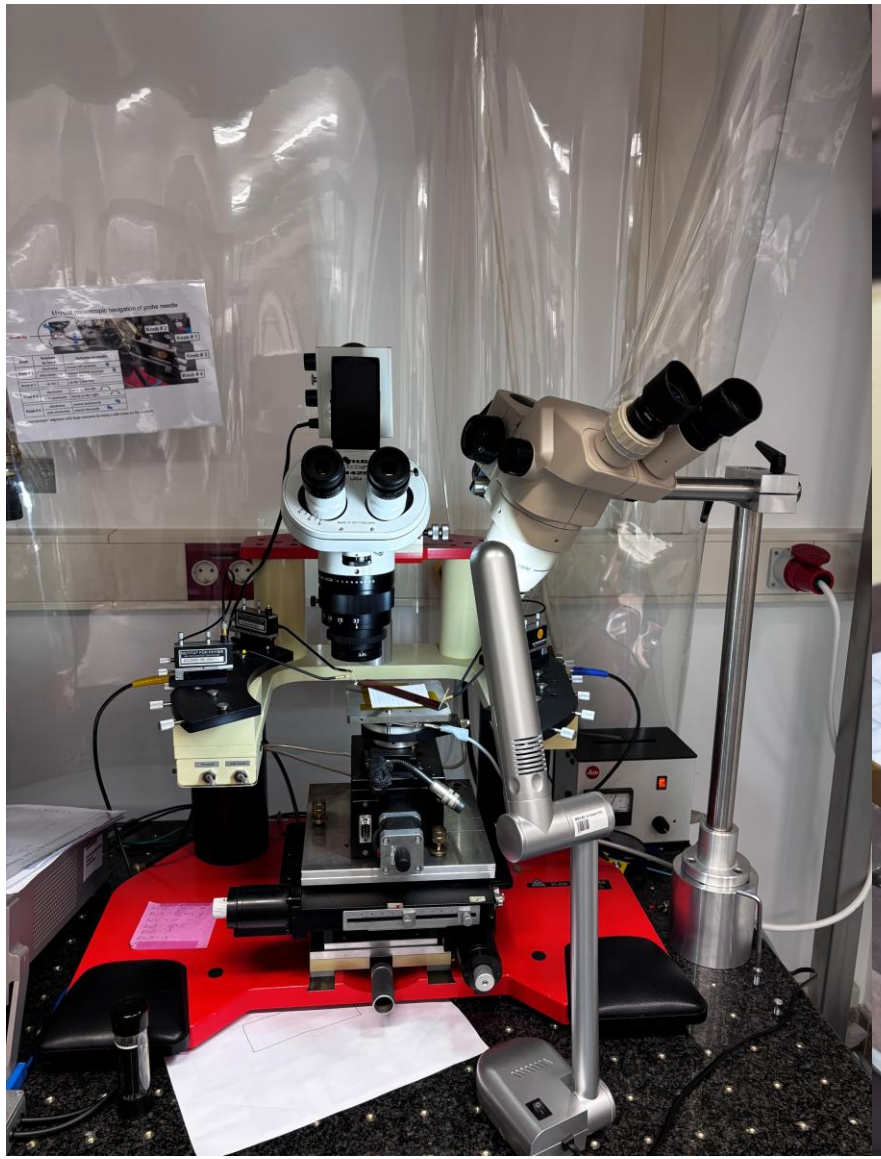
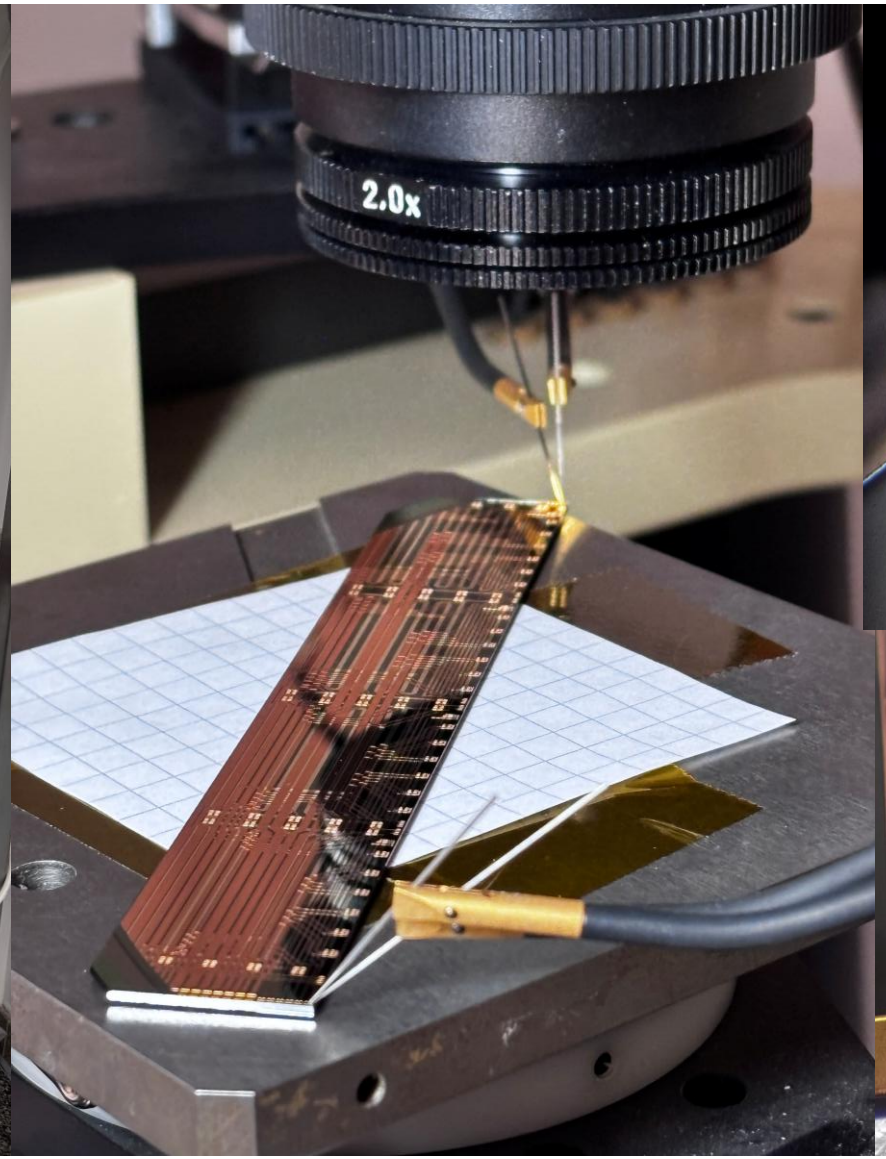
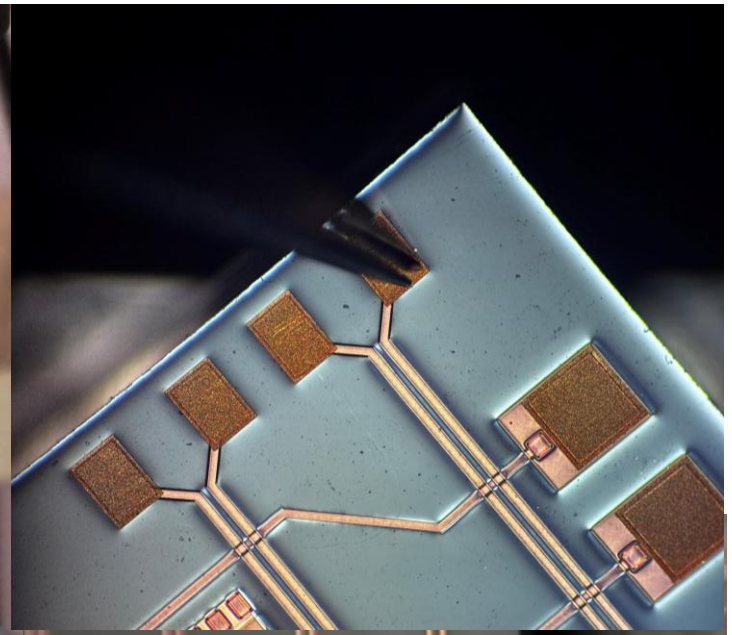
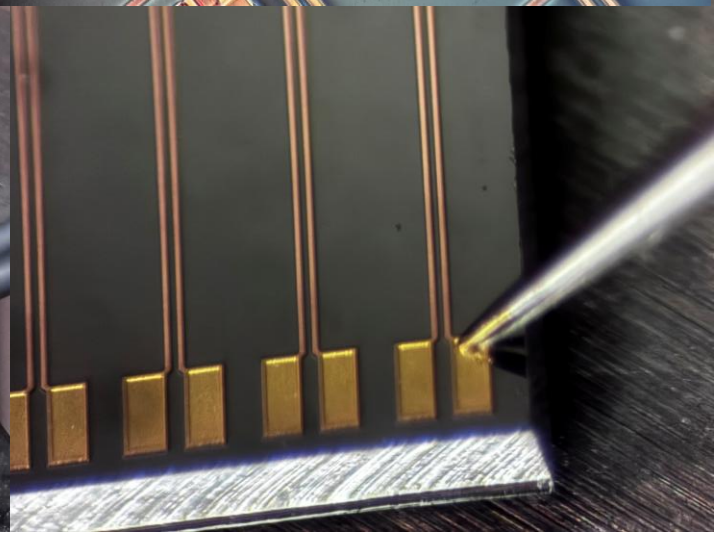
11.12.2025

Setup of Resistance measurement of Copper Trace on IZM Structure









Resistance measurement of Copper Trace on IZM Structure

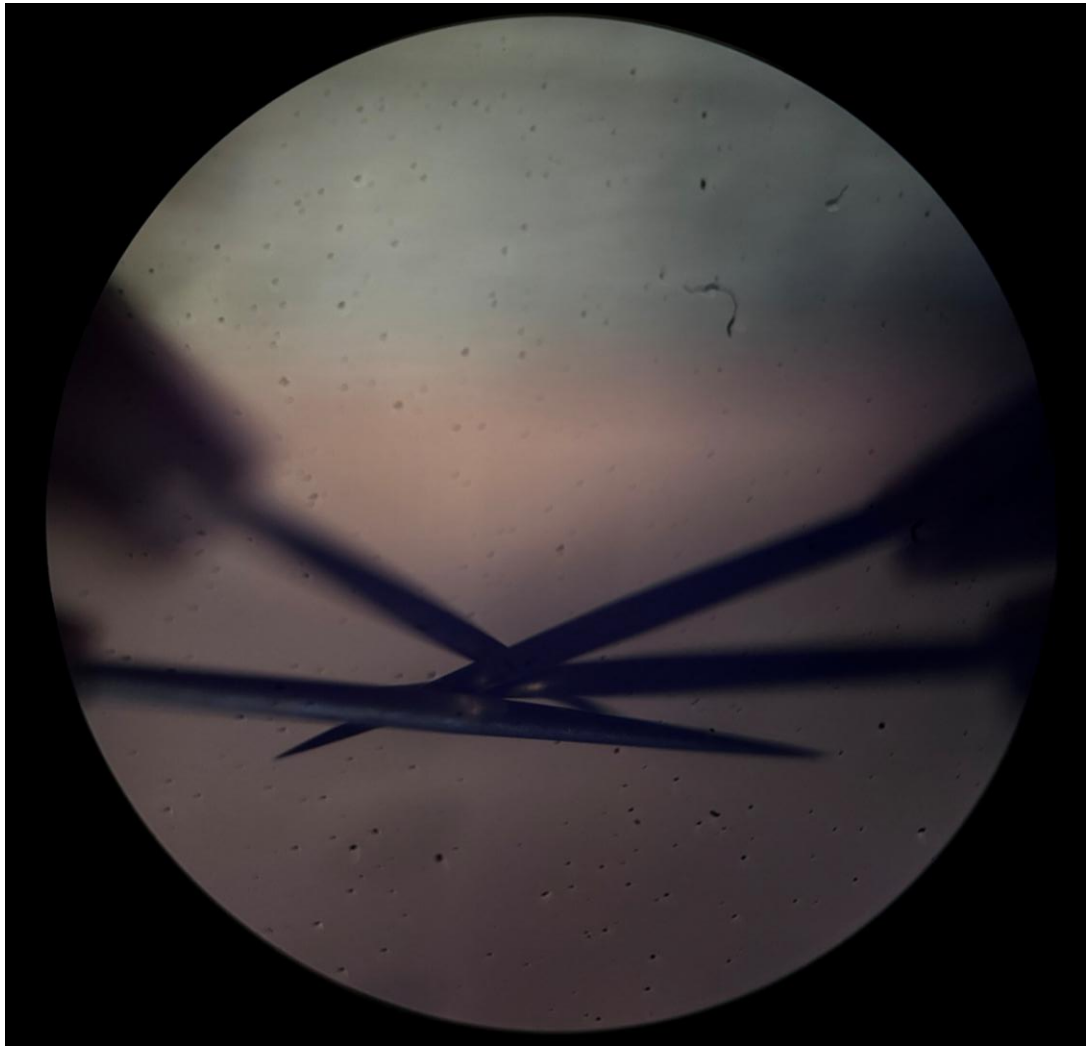
- Input current = 2mA
- Max voltage limit = 1V
- Average voltage drop -> In range from 33-34mV (In calculation the range was 37-39mV)
- Standard deviation -> In order of 10^{-2} - 10^{-3}
- 100 samples for each measurement
- Take about 5-7 seconds to complete 1 measurement.

	Cut-1 (Ohm)	Cut-2 (Ohm)	Cut-3 (Ohm)
Pad1	16.4524 ± 0.0597	16.0330 ± 0.0539	16.9274 ± 0.0019
Pad2	16.2841 ± 0.0061	16.0039 ± 0.0467	16.8494 ± 0.1101
Pad3	16.4600 ± 0.0700	16.0264 ± 0.0796	17.0020 ± 0.0596
Pad4	16.2505 ± 0.0272	16.1059 ± 0.9627	16.8285 ± 0.0028

Resistance measurement of Copper Trace on IZM Structure

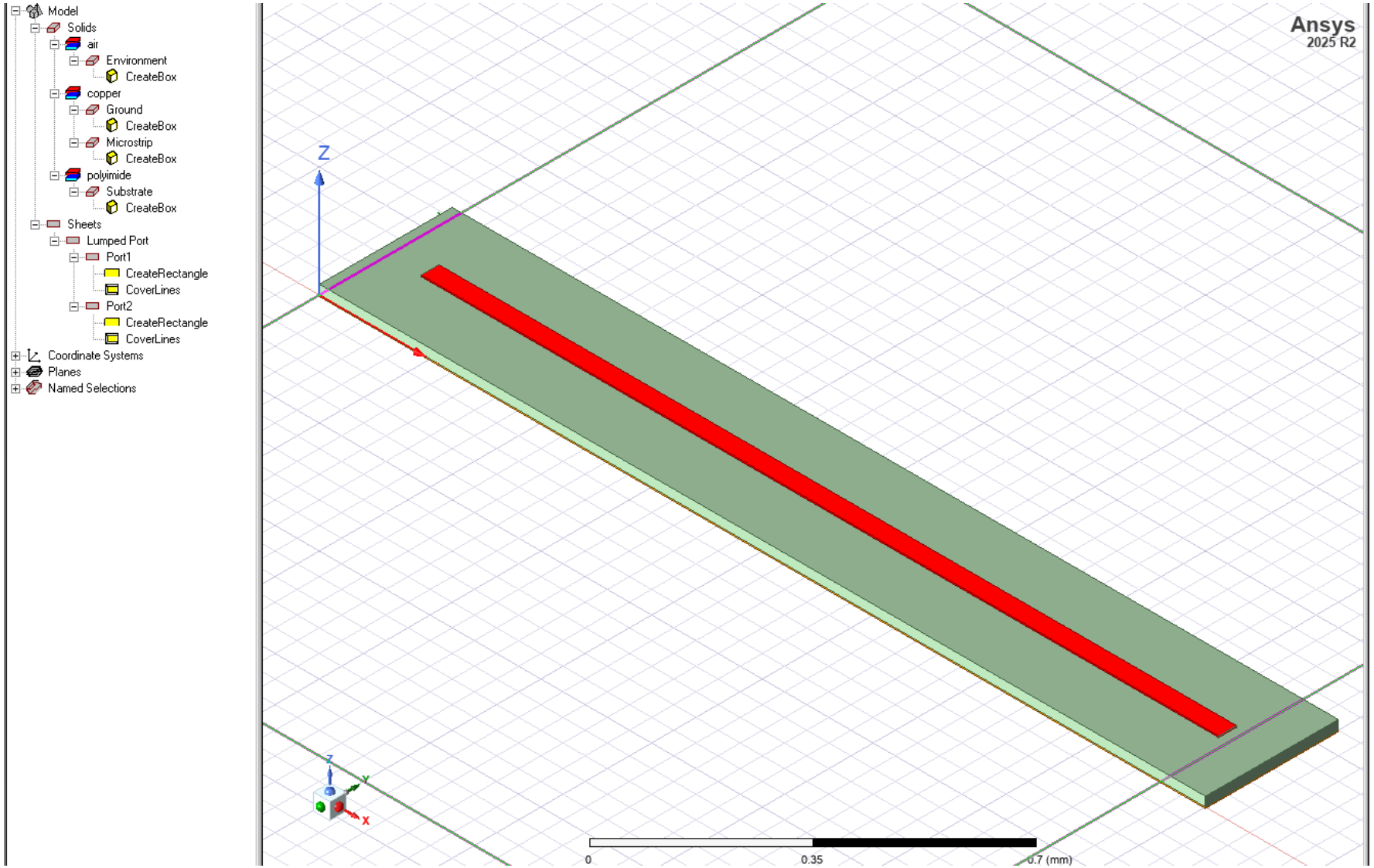
- **Systematic Uncertainty in measurements are**

1. **Due to resistance of needle itself**
   - Systematic error = 15.454 ± 1.944 mOhm
2. **Due to heat generation**
   - Temperature rise due to power P = I^2R is ΔT is 0.0092K.
   - Systematic error = $\alpha_{Cu}\Delta T$ = 0.00393*0.0092 = $3.6*10^{-5}$ ohm



Ansys (HFSS) Simulations for 3D Microstrip

- **Step 1** : Create Geometry of your choice using Modeler tool and define materials



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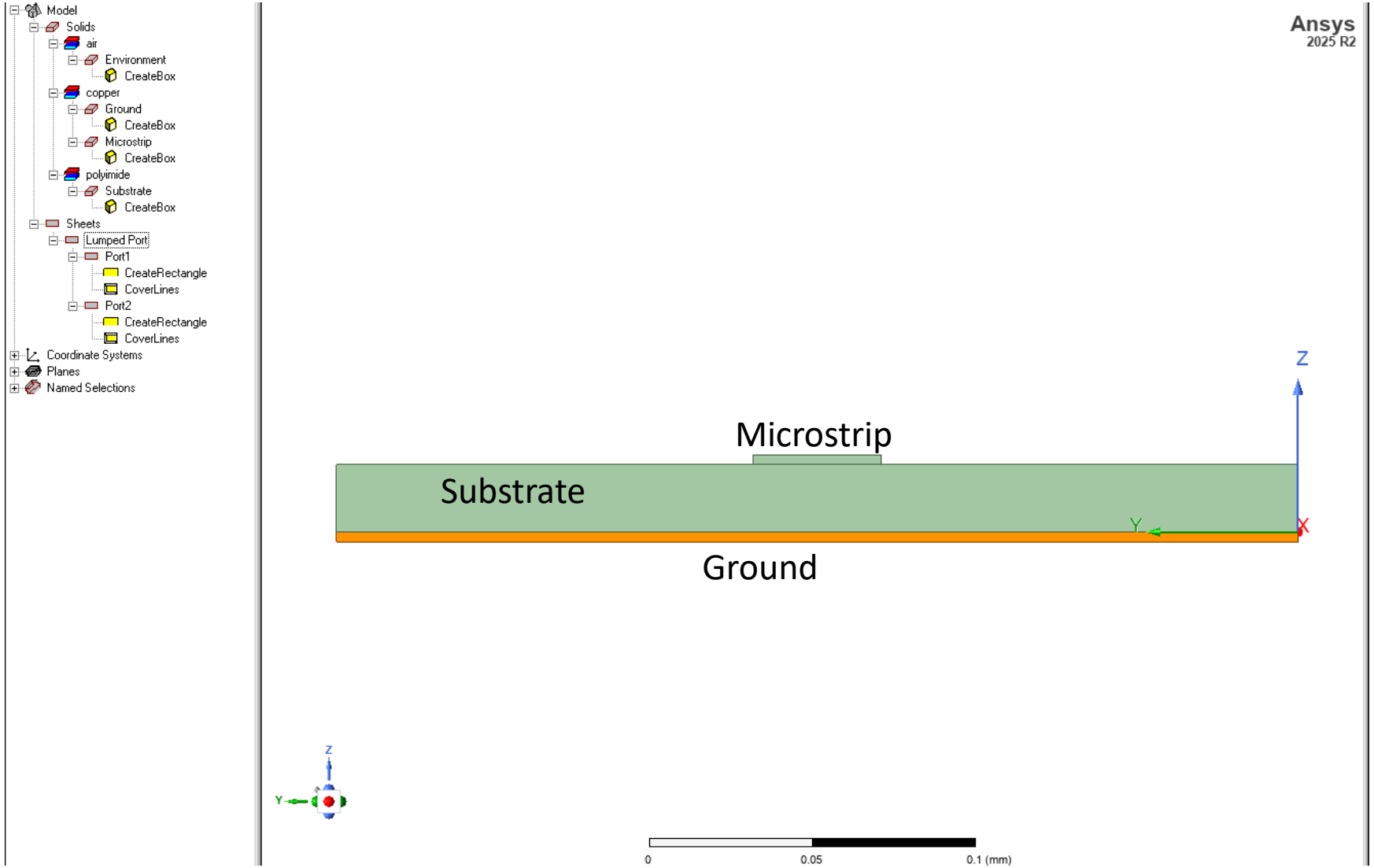
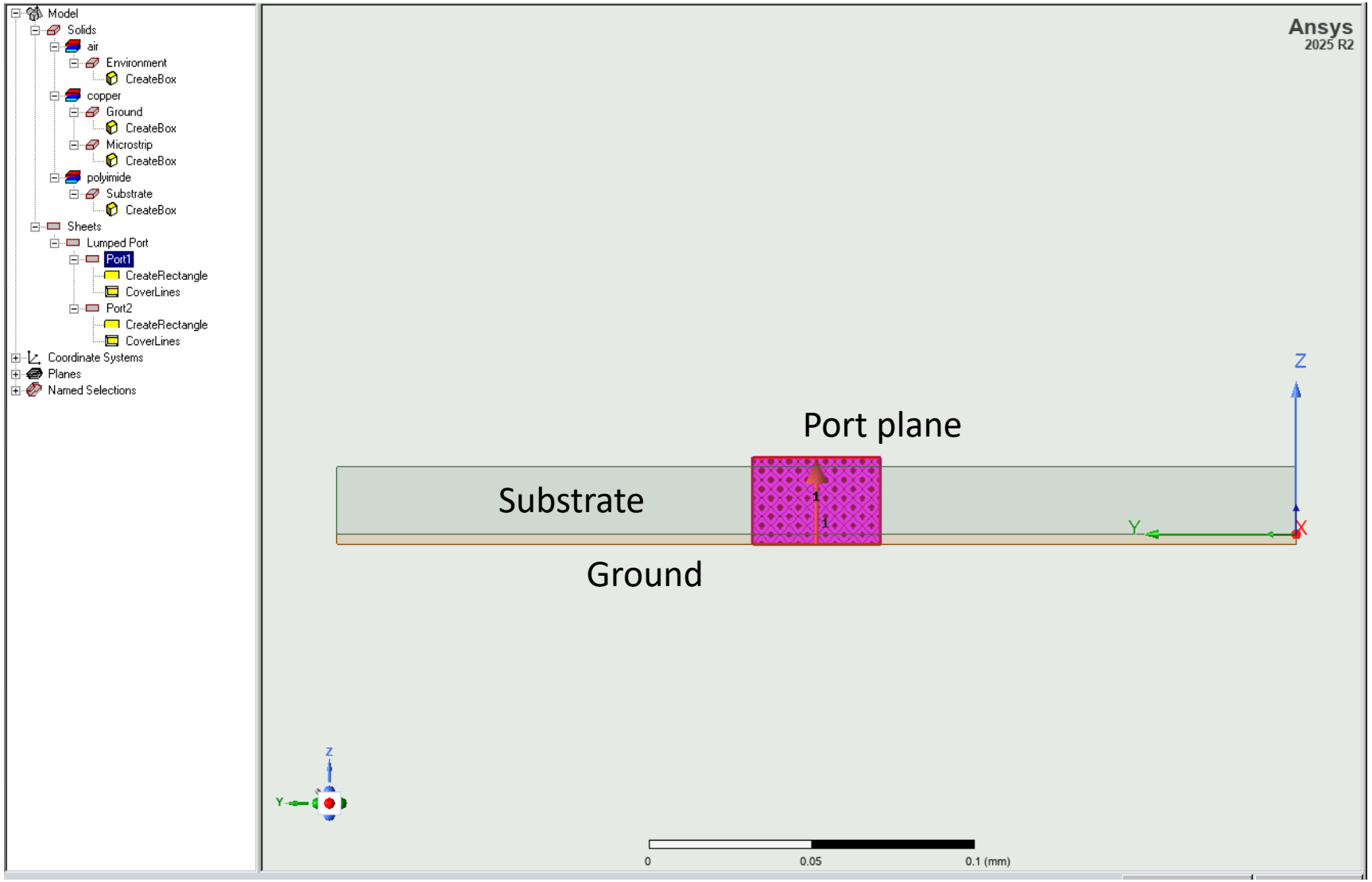


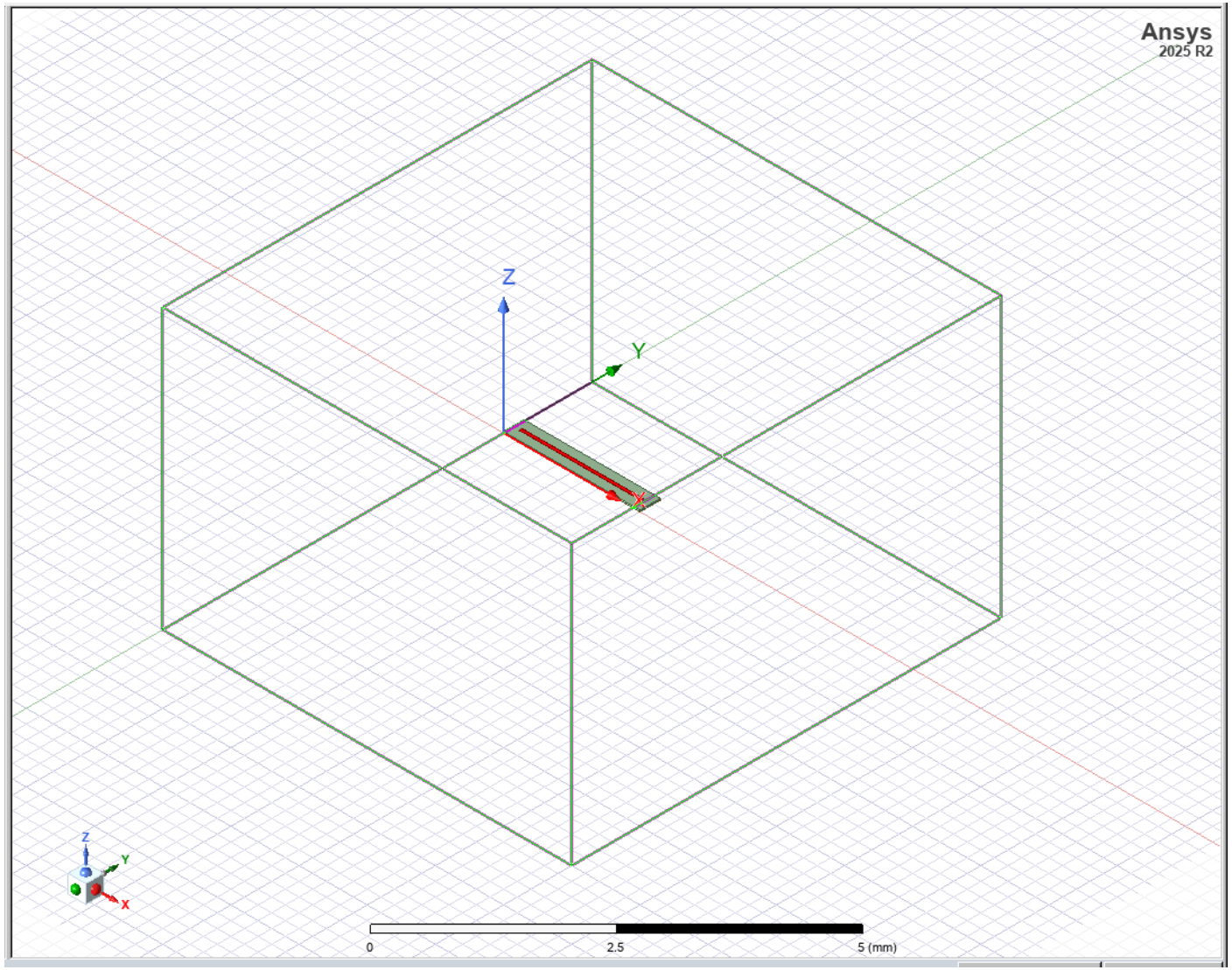
Ansys (HFSS) Simulations for 3D Microstrip

- **Step 2** : Create Port plane perpendicular to Microstrip on both ends.



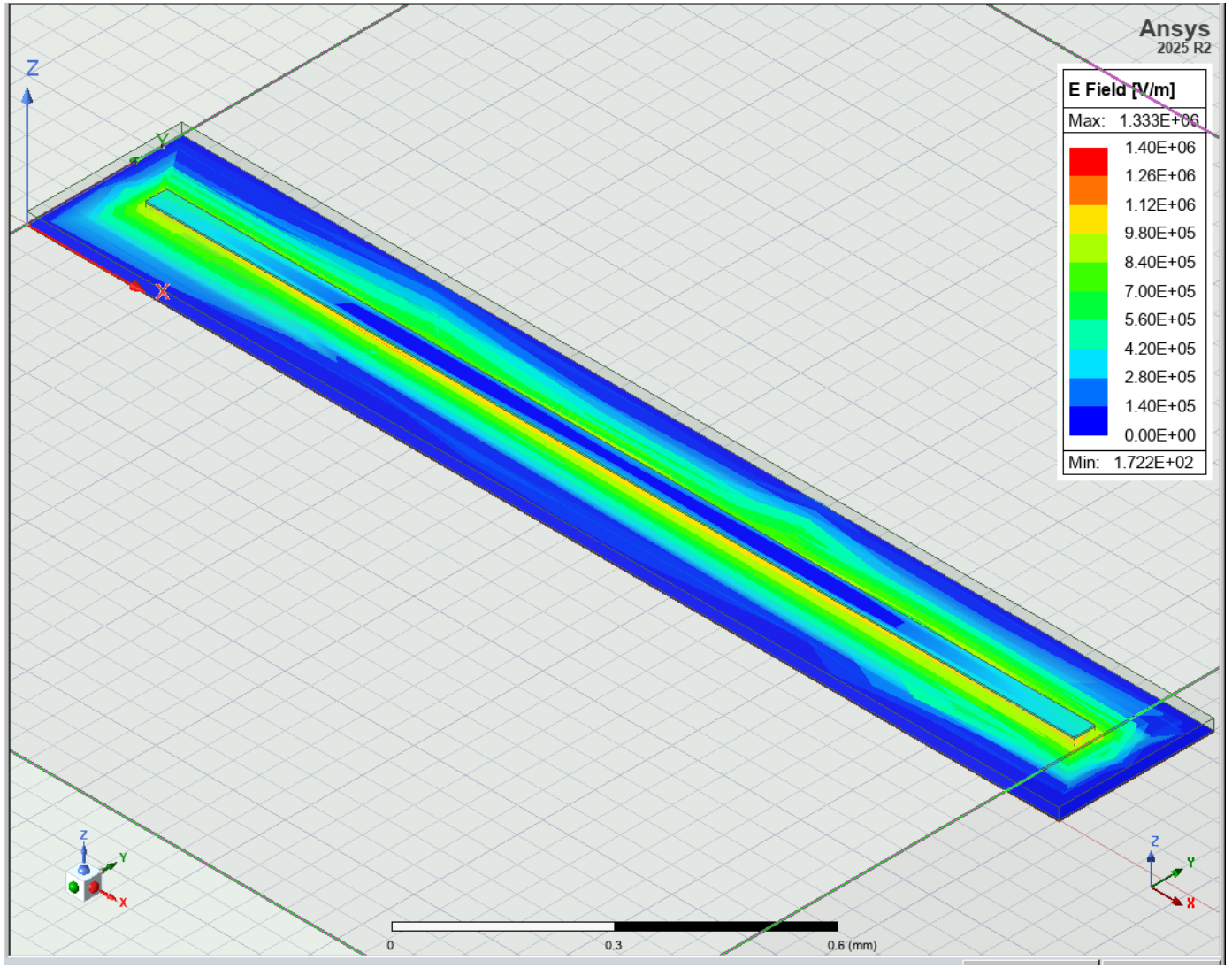
Ansys (HFSS) Simulations for 3D Microstrip

- **Step 3** : Create Box around design and assign it as Radiation box(Environment).



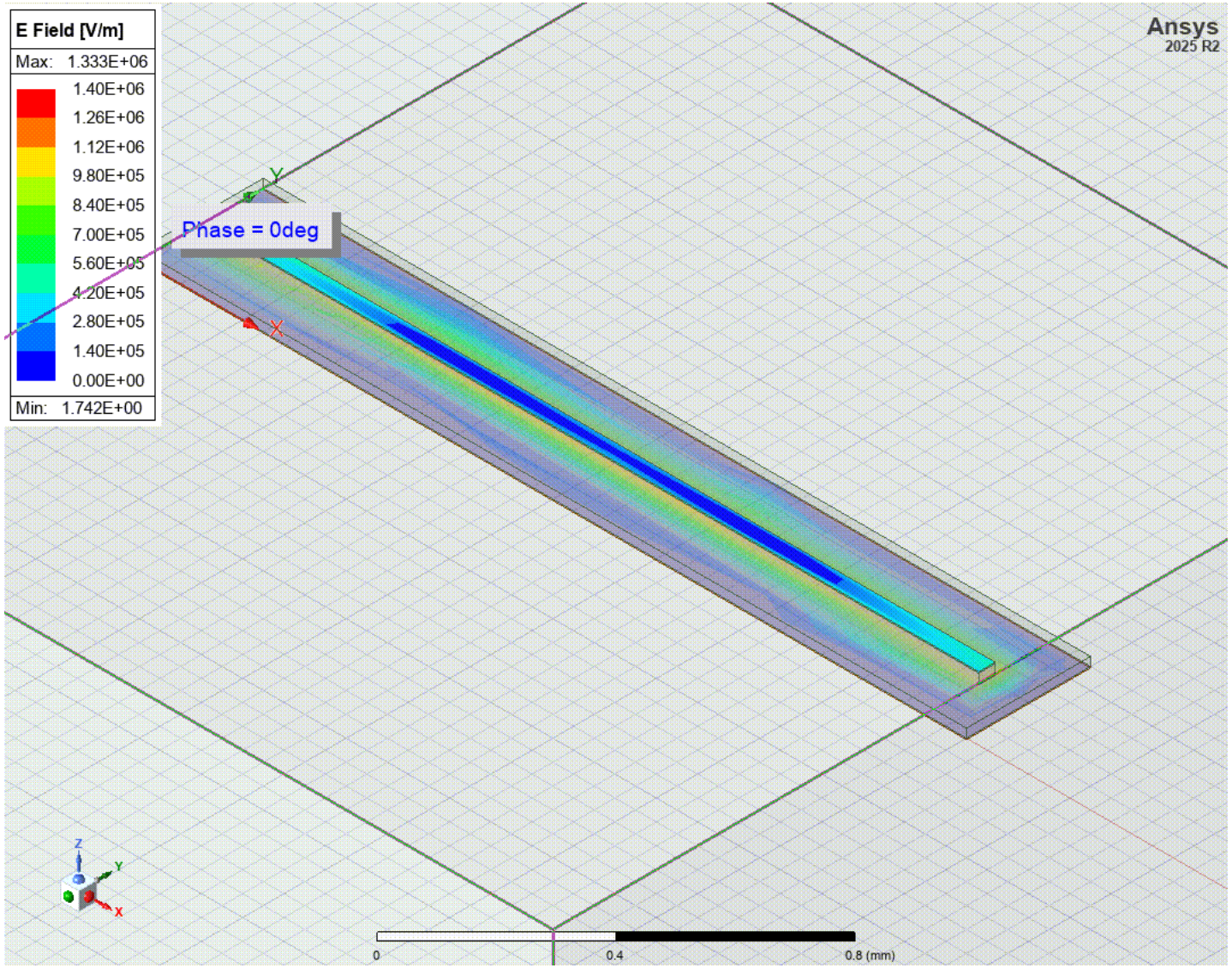
Ansys (HFSS) Simulations for 3D Microstrip

- **Step 4** : Define solution setup, validate your design and run simulation.

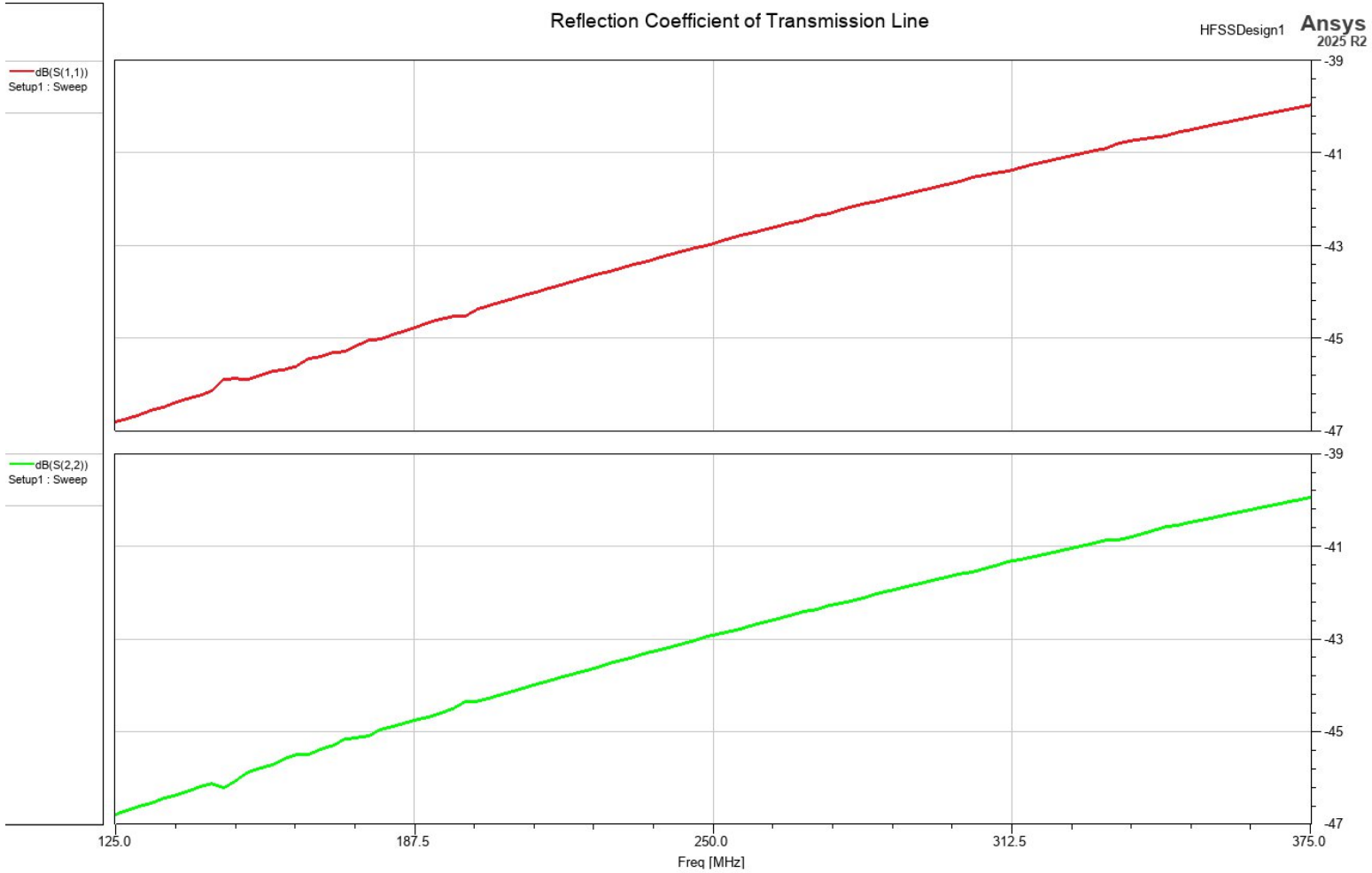


Ansys (HFSS) Simulations for 3D Microstrip

- **Step 5** : Plot E-field map and S-Parameter results.

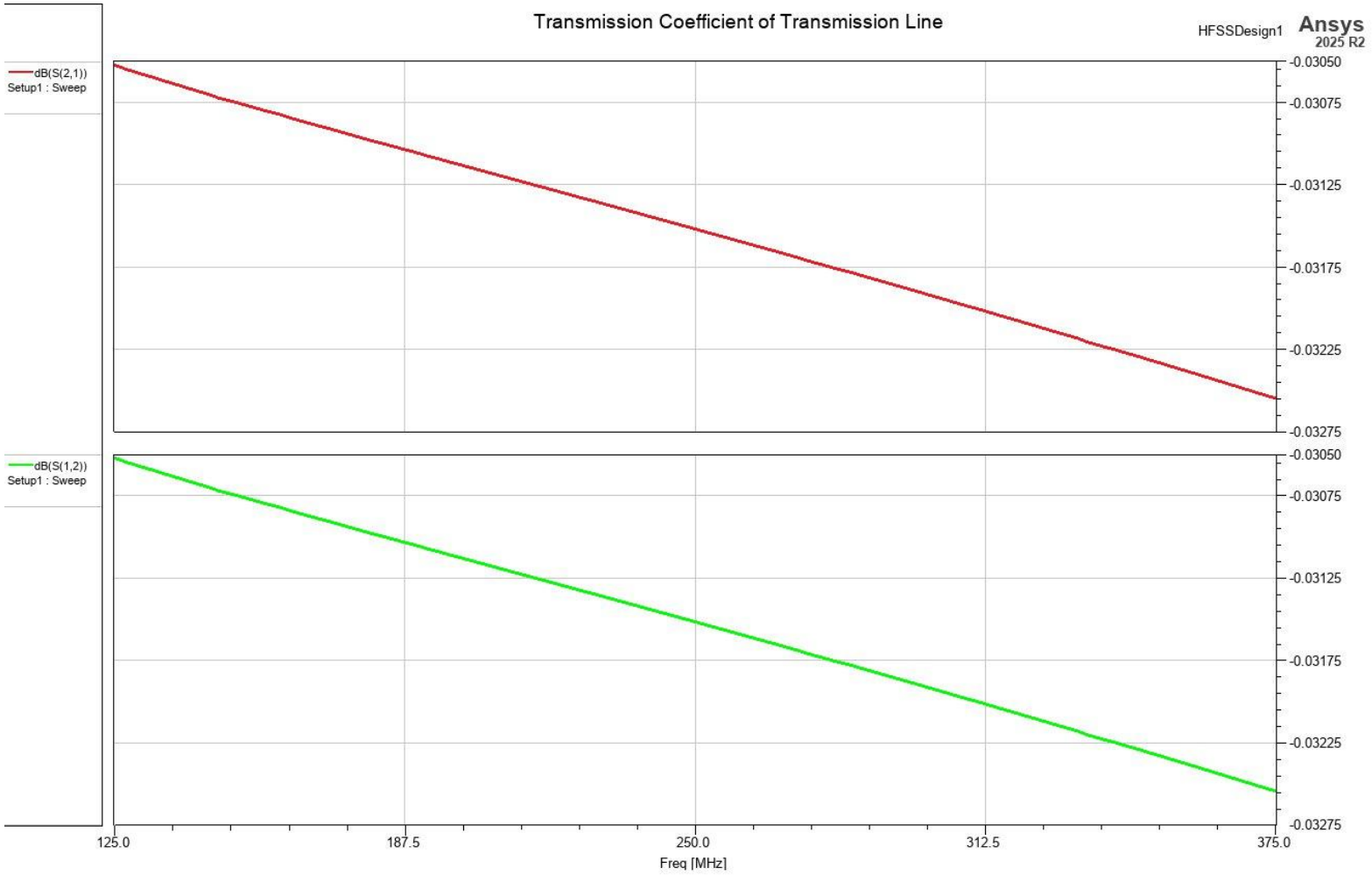


Results of Ansys (HFSS) Simulations for 3D Microstrip



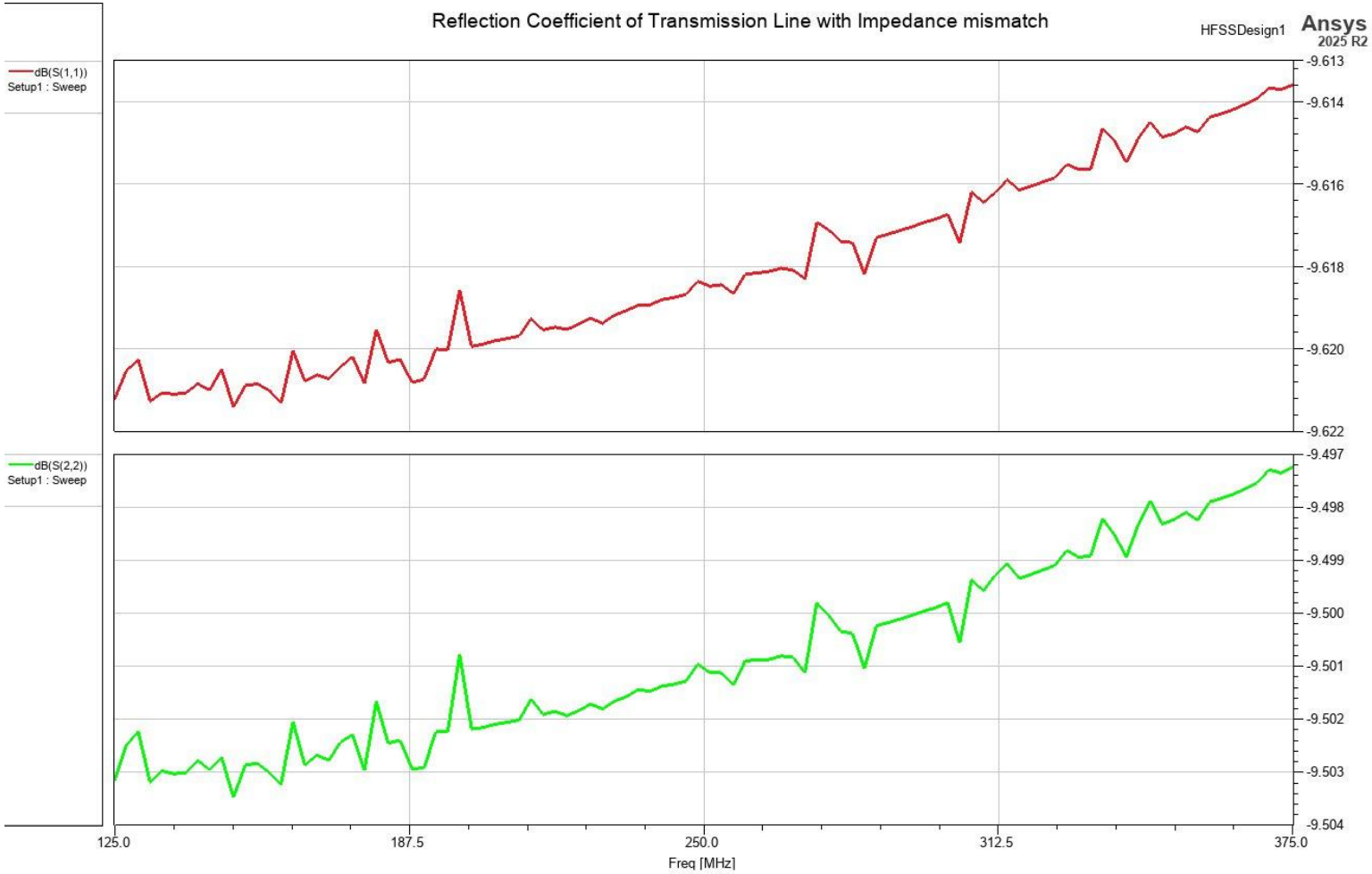
- S_{11} , S_{22} = -40dB => 0.01 that means 1% of input signal reflected on Port 1 and Port 2 respectively.

Results of Ansys (HFSS) Simulations for 3D Microstrip



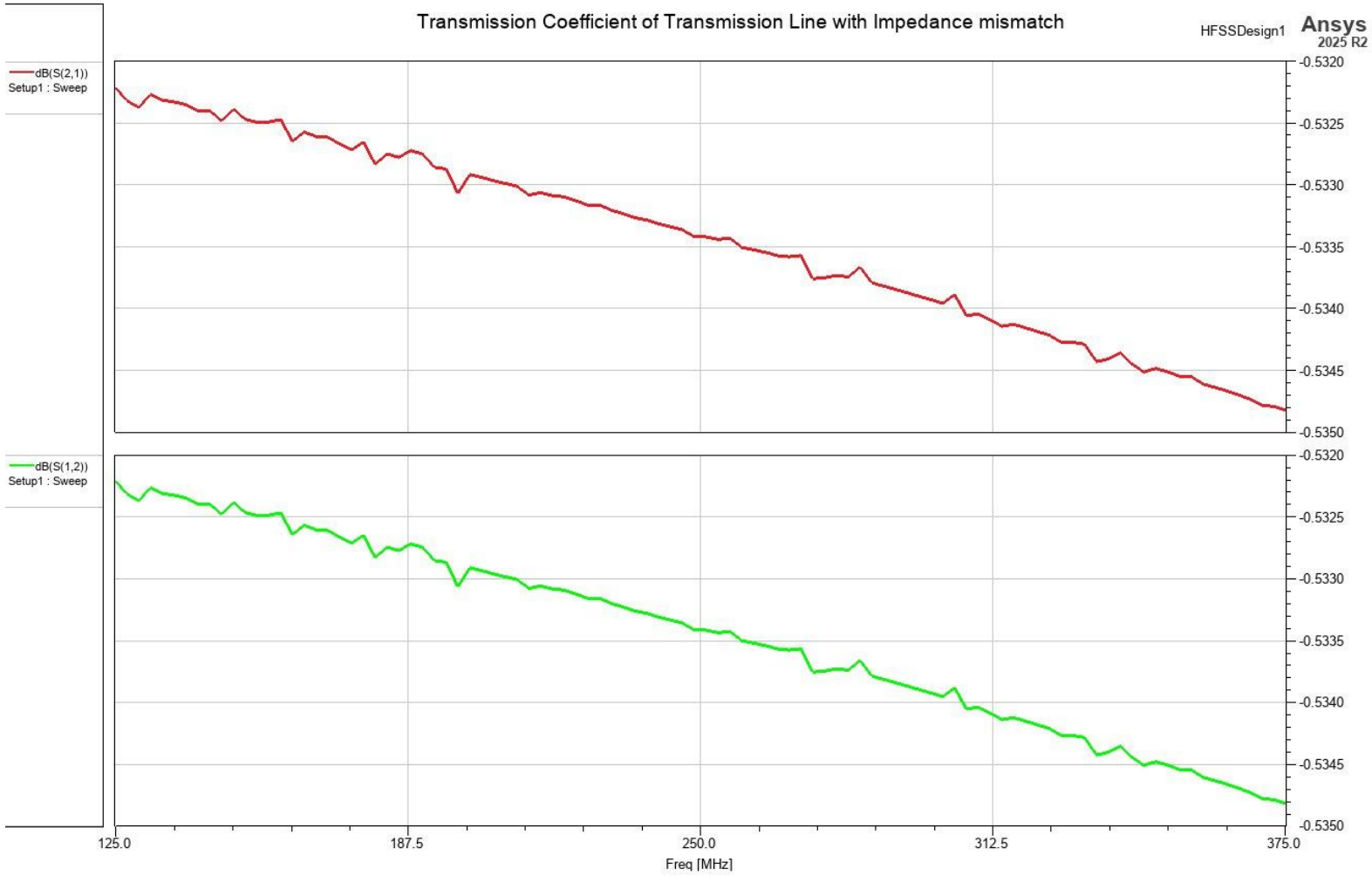
- S_{21} , S_{12} = -0.03250dB => 0.9962 that means 99.62% of input signal is transmitted from Port 2 to Port 1 and vice versa.

Results of Ansys (HFSS) Simulations for 3D Microstrip



- S_{21} , S_{12} = -0.03250dB => 0.3306 that means 33.06% of input signal reflected on Port 1 and Port 2 respectively.

Results of Ansys (HFSS) Simulations for 3D Microstrip



- S_{21} , S_{12} = -0.5340dB => 0.9404 that means 94.04% of input signal is transmitted from Port 2 to Port 1 and vice versa.