

All-Silicon Meeting

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22.01.2026

Ansys (HFSS) Simulations of Differential Line



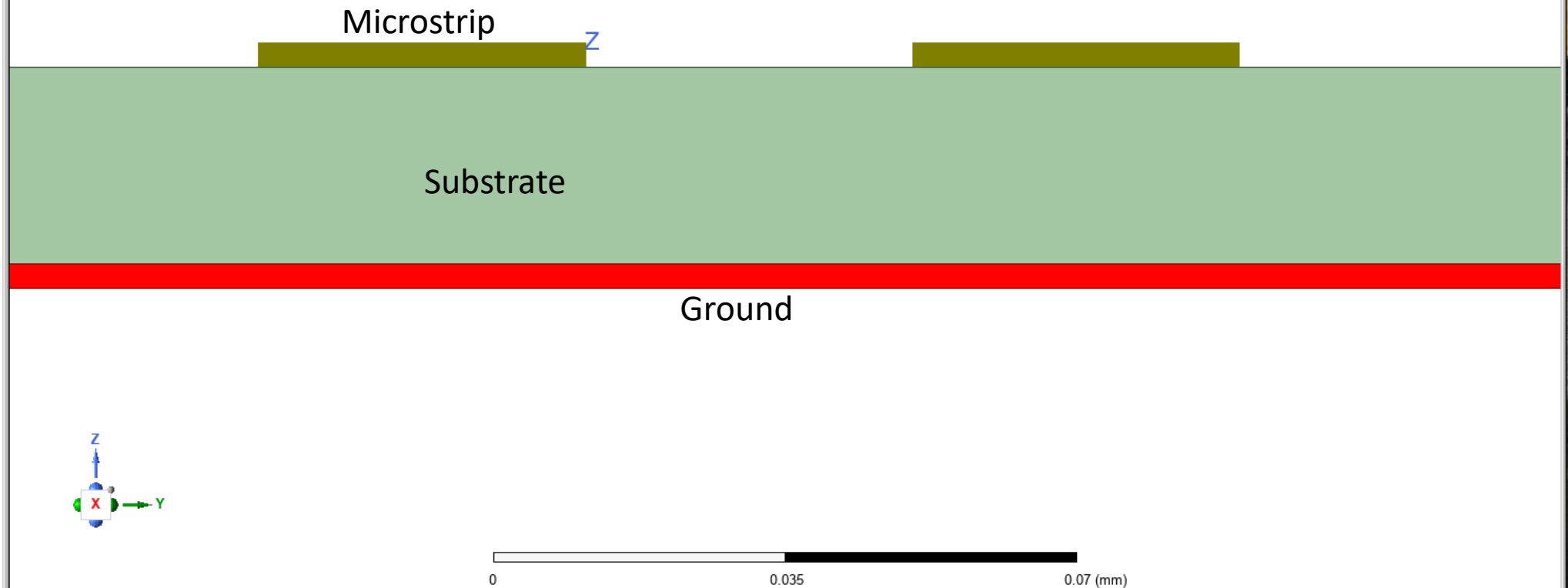
Microstrip Width : $40\mu\text{m}$
Microstrip length : 10mm
Microstrip Height : $3\mu\text{m}$
Separation : $40\mu\text{m}$

Substrate Height : $24\mu\text{m}$
Differential mode Impedance : 100.07Ω
Common mode Impedance : 55.4Ω
Dielectric Constant : 3.5

Ansys (HFSS) Simulations of Differential Line

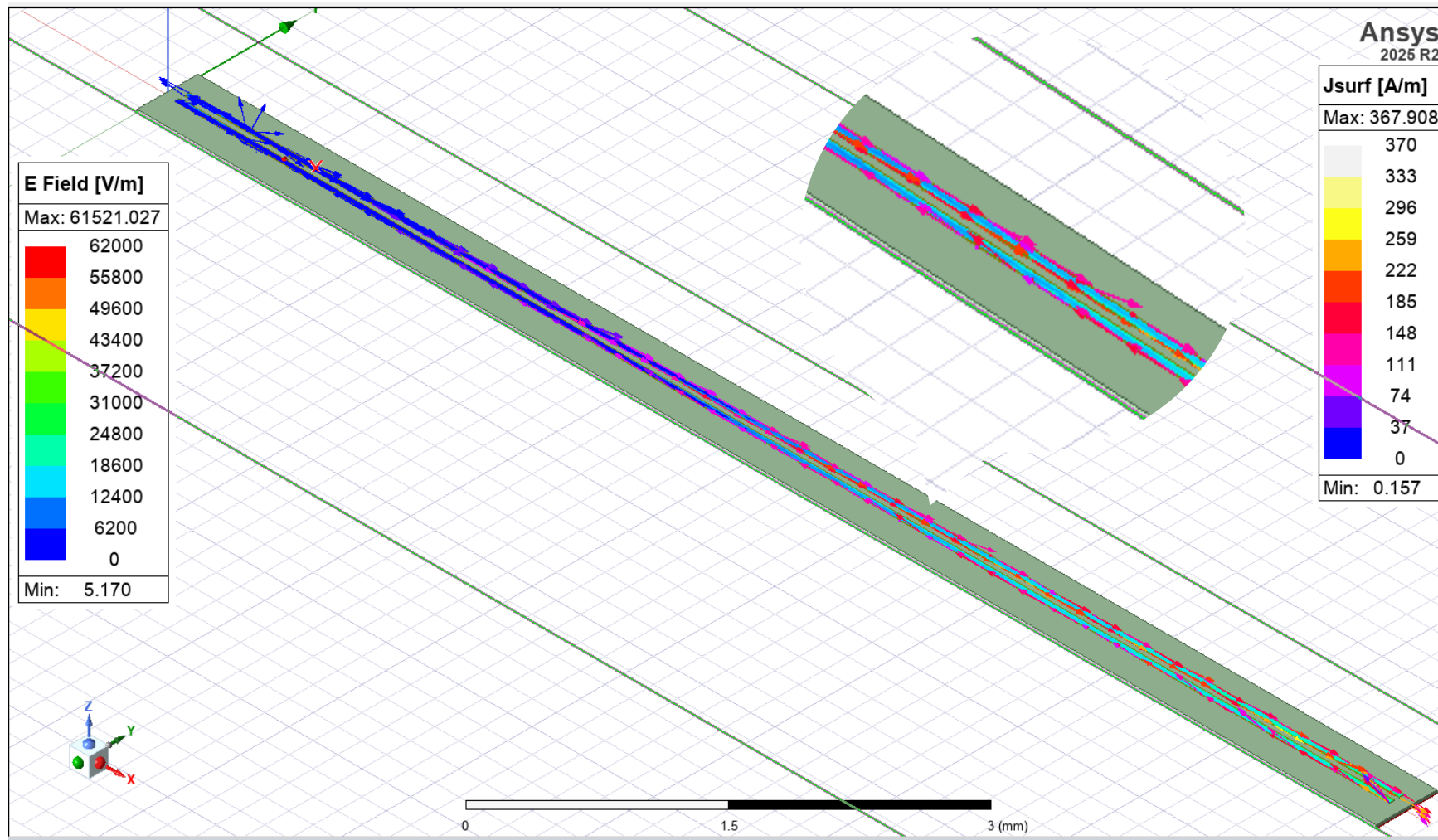
- Both microstrip excited with 0.5 volts in each and in phase difference of 180deg.

Ansys
2025 R2

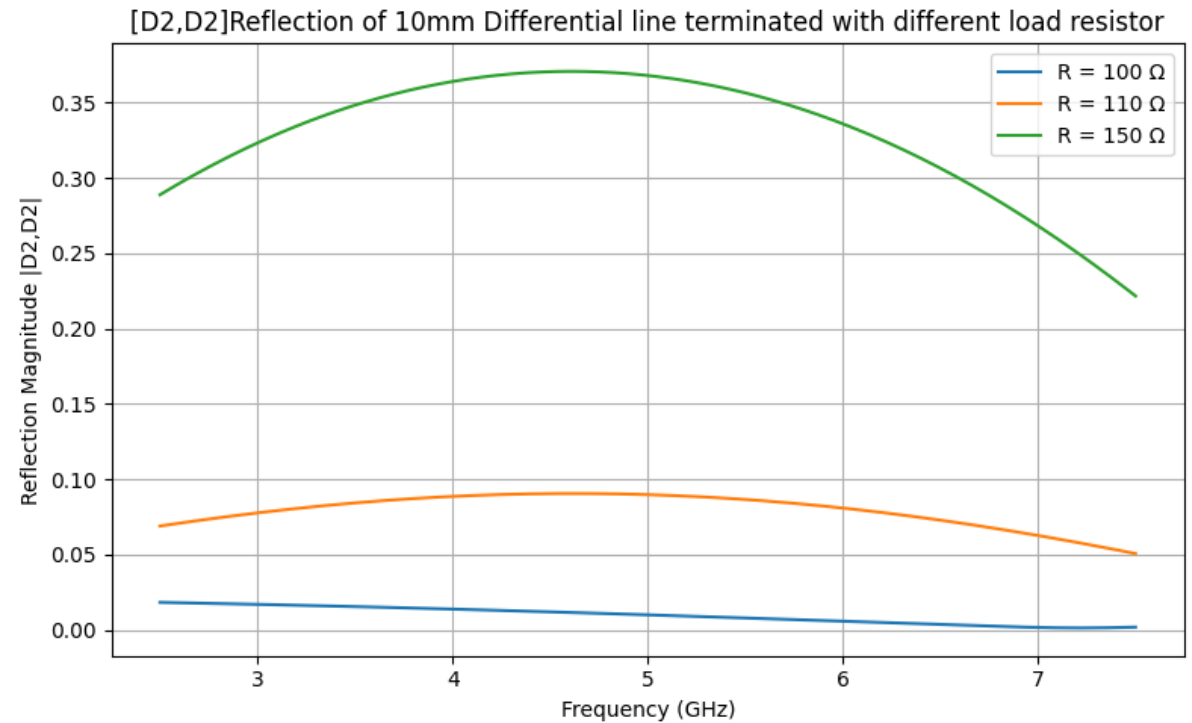
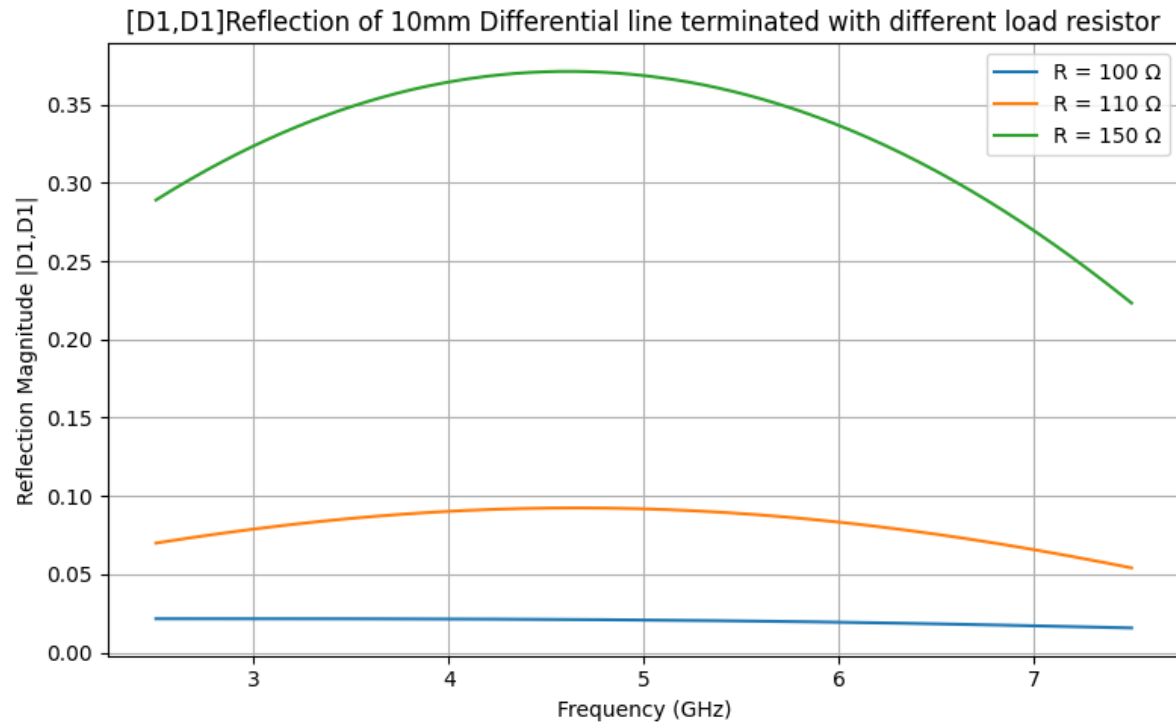


Results of Ansys (HFSS) Simulations of Differential Line

- As our both lines are at the 180deg out of phase in compare to each other, it could be visualize by surface current density.

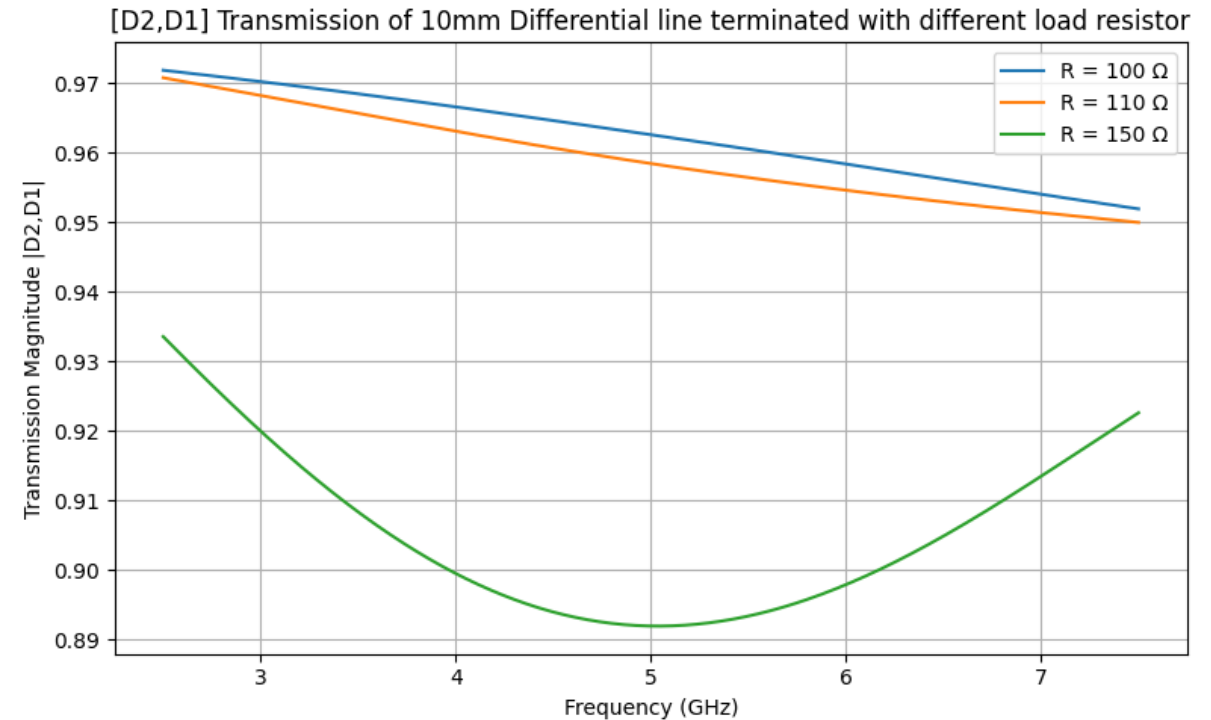
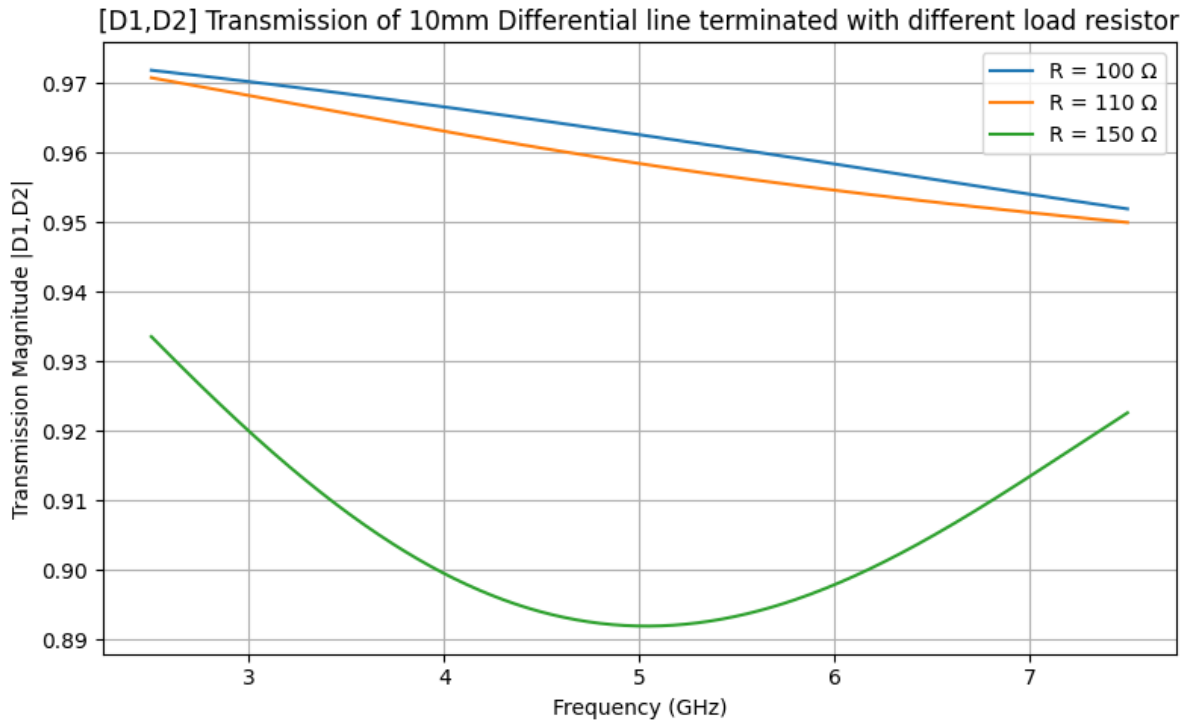


Results of Ansys (HFSS) Simulations of Differential Line



- [D1,D1] : It quantifies how much of a differential-mode signal injected into differential port D1 is reflected back to the same differential port.
- Here both lines are excited with 0.5V in each and phase difference of 180deg.
- Error in S-parameters are <1% was set in simulation.
- As we change the load resistor, S-parameter change accordingly.
- Higher mismatch of load resistor results into higher reflections of input signal.

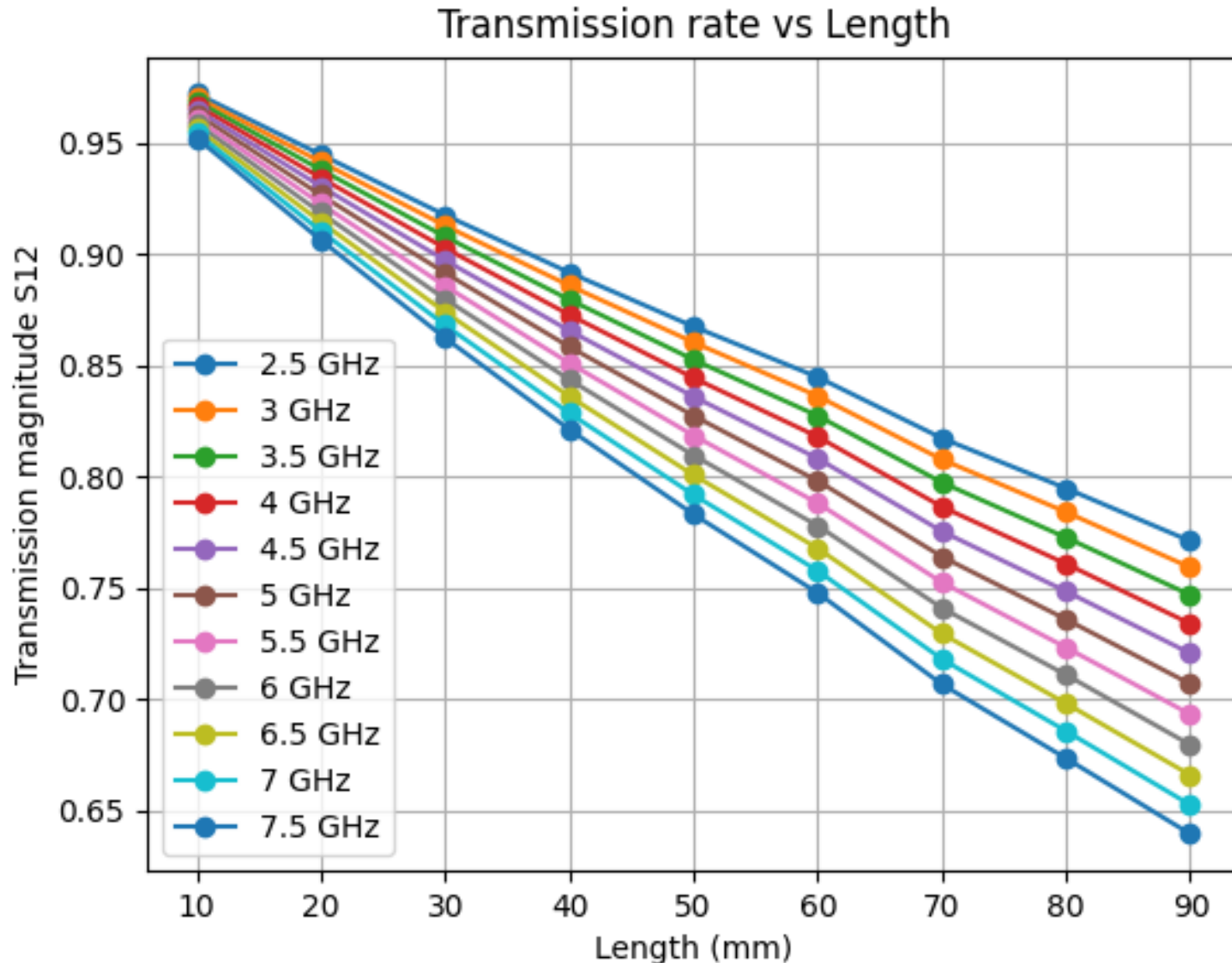
Results of Ansys (HFSS) Simulations of Differential Line



- [D1, D2]: It quantifies how much of a differential-mode signal injected into differential port D1 is transmitted to differential port D2.
- Higher load mismatch results in reduced transmission rate and increased reflections of the input signal.

Results of Ansys (HFSS) Simulations of Differential Line

Study of Transmission rate as a function of length



- Frequency range is set to 2.5GHz to 7.5GHz.
- Length of differential line varies from 10mm to 90mm.
- All other parameters for all this lengths are fixed.
- Such as input voltage(0.5V), input impedance(100.07Ω) and load resistance(100Ω).
- It is observed that with increasing length Transmission rate is decreasing.
- Possible reasons are :
 1. Frequency-Dependent Conductor Loss
 2. Dielectric Loss in the Substrate
 3. Radiation and Coupling Loss