

All-Silicon Meeting

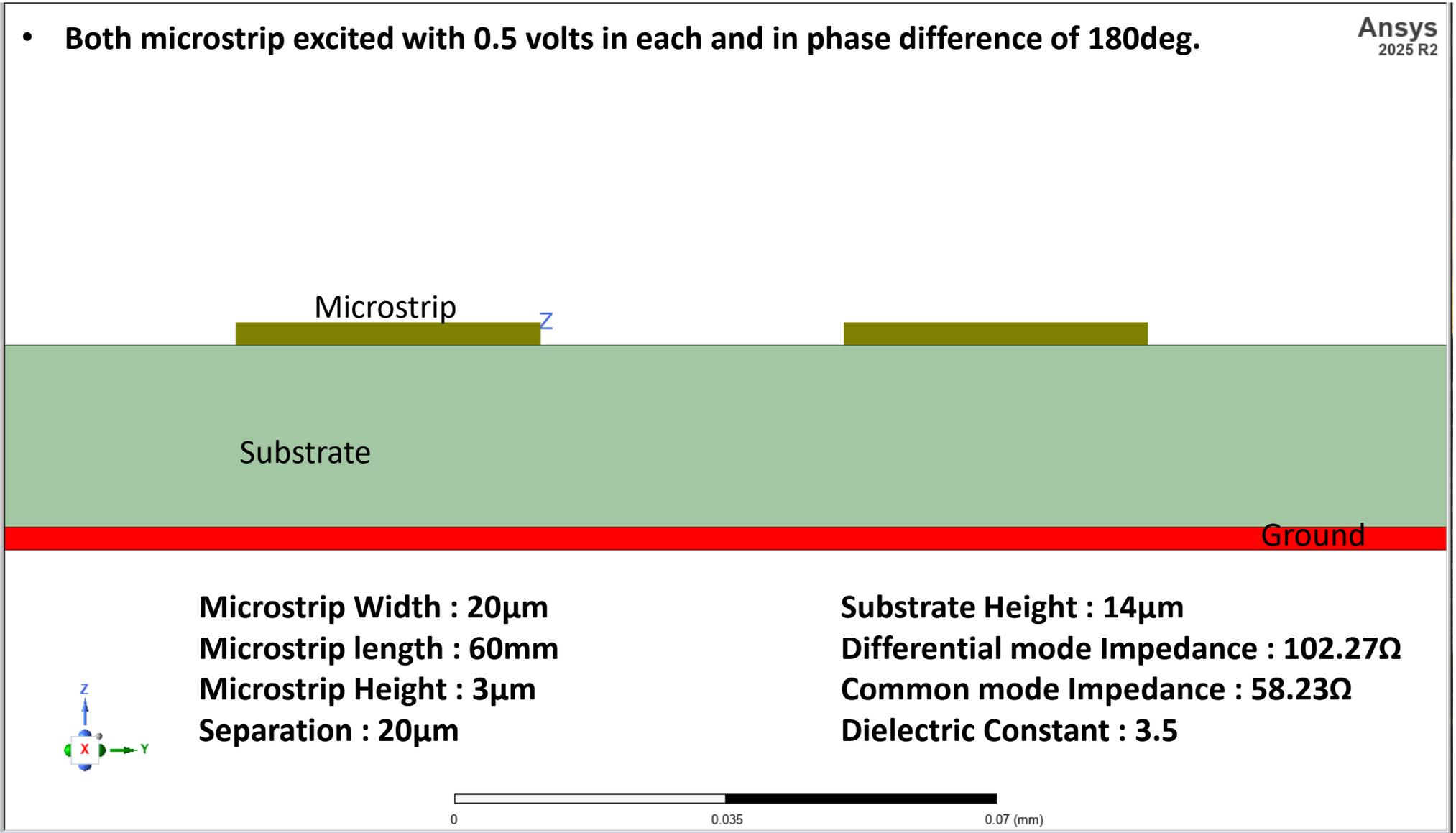
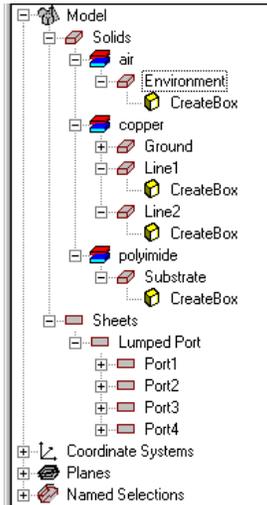
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19.02.2026

Ansys (HFSS) Simulations of Differential Line

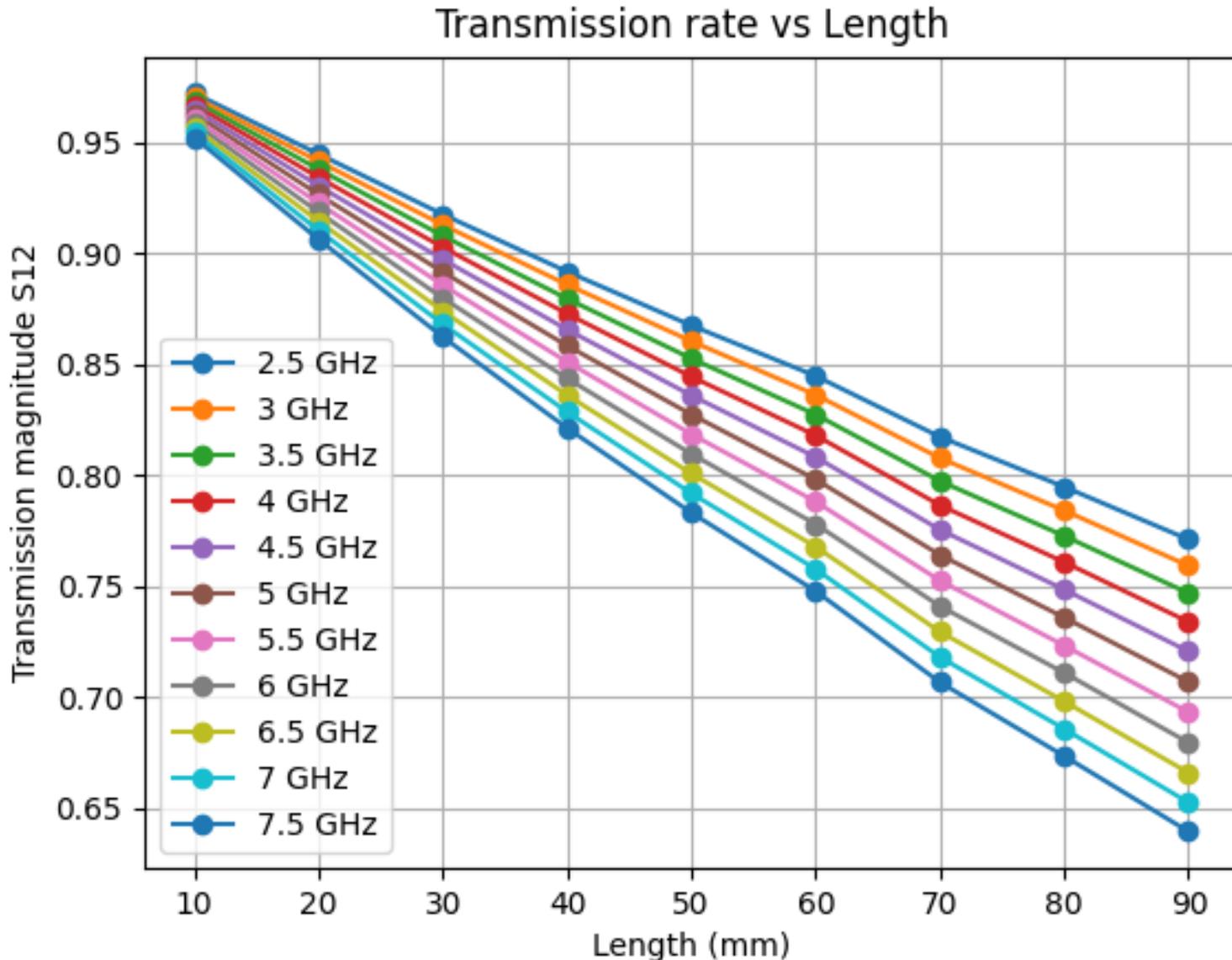
Ansys
2025 R2

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



Results of Ansys (HFSS) Simulations of Differential Line

Study of Transmission rate as a function of length

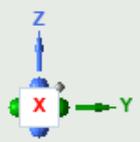
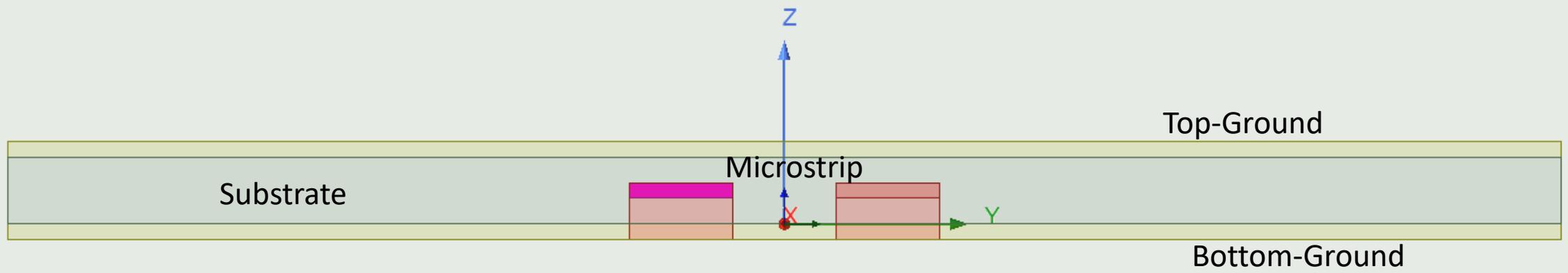


- Frequency range is set to 2.5GHz to 7.5GHz.
- Length of differential line varies from 10mm to 90mm.
- All other parameters for all this lengths are fixed.
- Such as input voltage(0.5V), input impedance(100.07Ω) and load resistance(100Ω).
- It is observed that with increasing length Transmission rate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

Ansys (HFSS) Simulations of Differential Line Embedded In Substrate

Microstrip Width : 20 μ m
Microstrip length : 20mm
Microstrip Height : 3 μ m
Separation : 20 μ m

Substrate Height : 13 μ m
Differential mode Impedance : 16.46 Ω
Common mode Impedance : 8.41 Ω
Dielectric Constant : 3.5

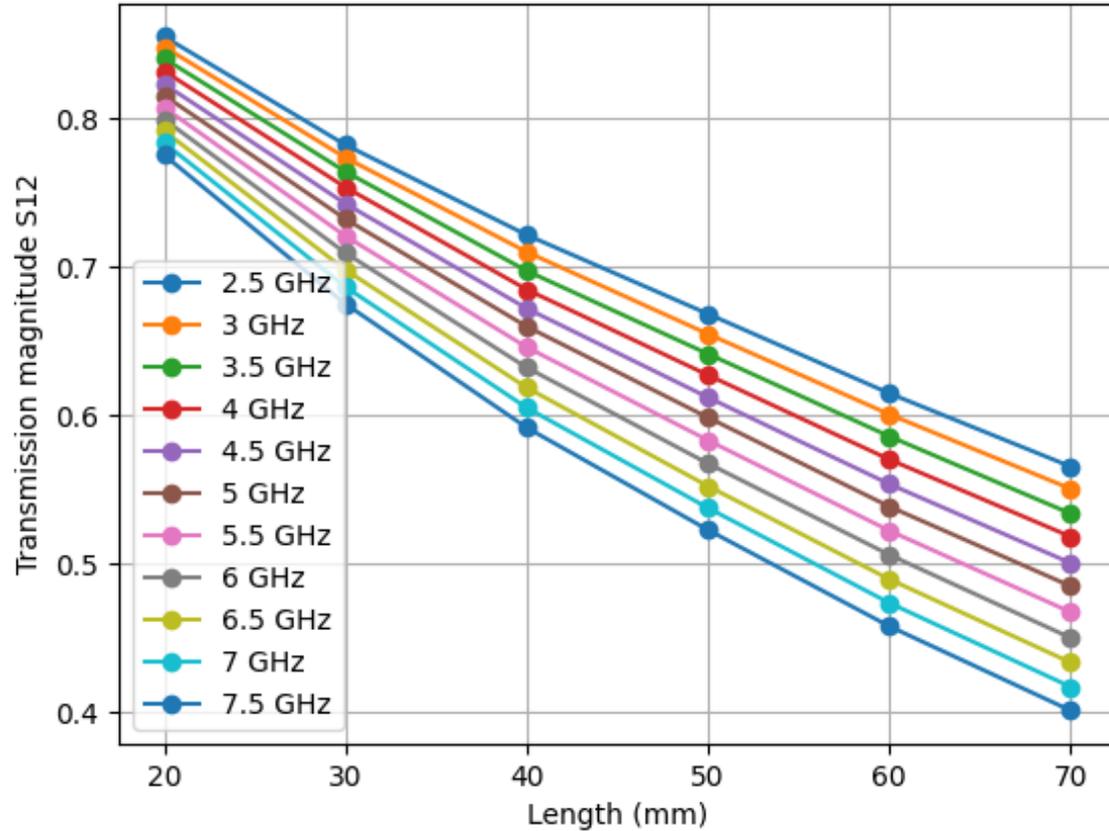


- Both microstrip excited with 0.5 volts in each and in phase difference of 180deg.



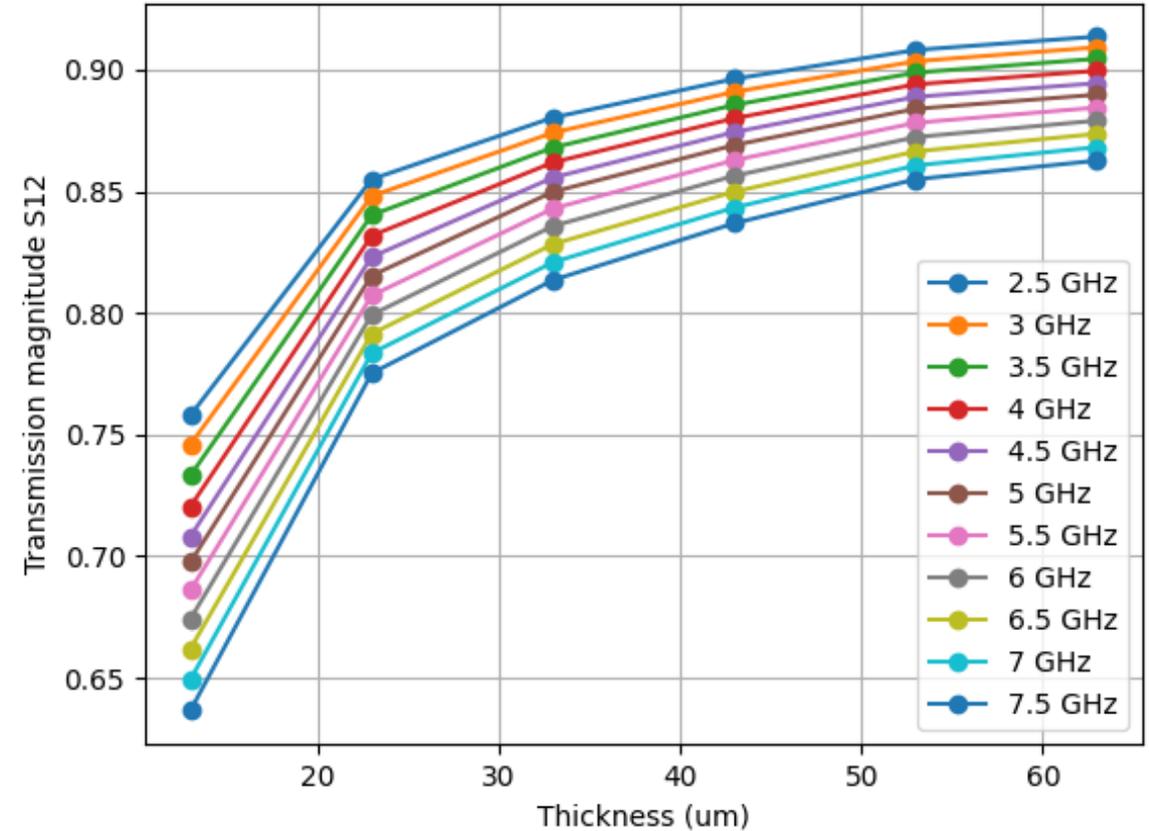
Results of Ansys Simulations of Differential Line Embedded In Substrate

Transmission rate of 23um thick ECM vs Length



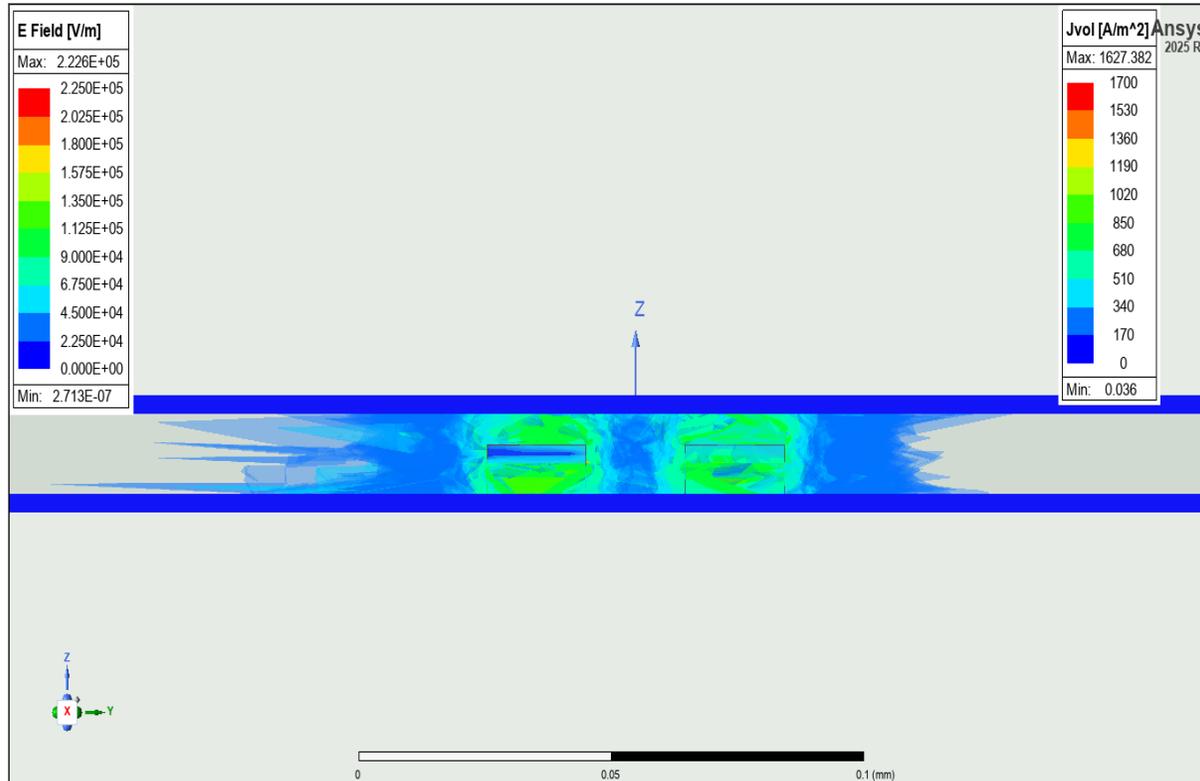
- With increasing length of substrate transmission rate is decreasing linearly.
- Microstrip length varies from 20mm to 70mm in step of 10mm.
- At length = 60mm, Transmission rate is approx. 30% lower @ 7.5GHz compared to surface differential line.

Transmission rate vs Thickness

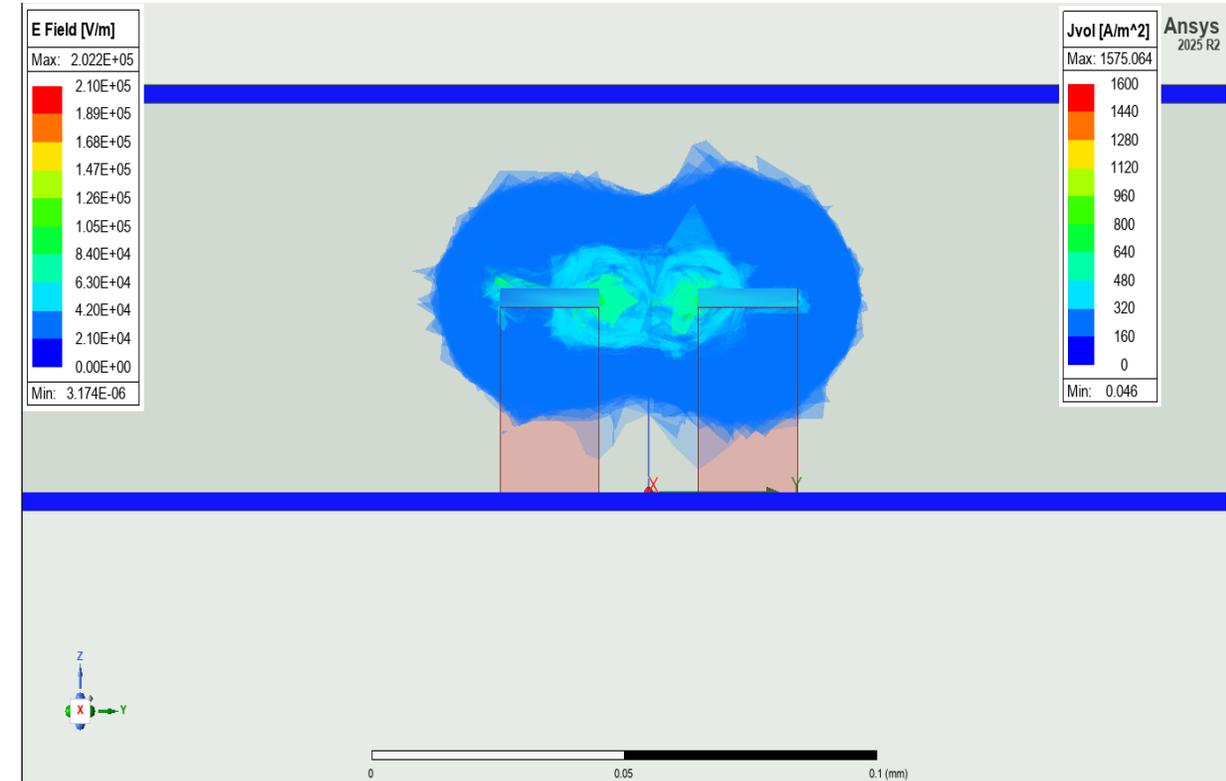


- Length = 20mm for all measurements
- With increasing thickness of substrate transmission rate is increasing till certain point then only little increase in transmission rate.
- Substrate thickness varies from 13um to 63um in step of 10um.

Results of Ansys Simulations of Differential Line Embedded In Substrate



- In 13um thick substrate field is tightly confined between two ground planes, because of this current density is high and it increases the resistance. This occurs as loss in transmission rate.



- In 63um thick substrate field is less constrained compared to 13um thick substrate, because of this current density is low and it decreases the resistance. This occurs as increase in transmission rate.
- However, from previous plot(slide no. 5) after 33um substrate thickness field has enough space to propagate, that's why after that point there is no significant increase in transmission rate.

Ansys (HFSS) Simulations of Differential Line

Ansys
2025 R2

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

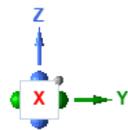
Microstrip

Substrate

Ground

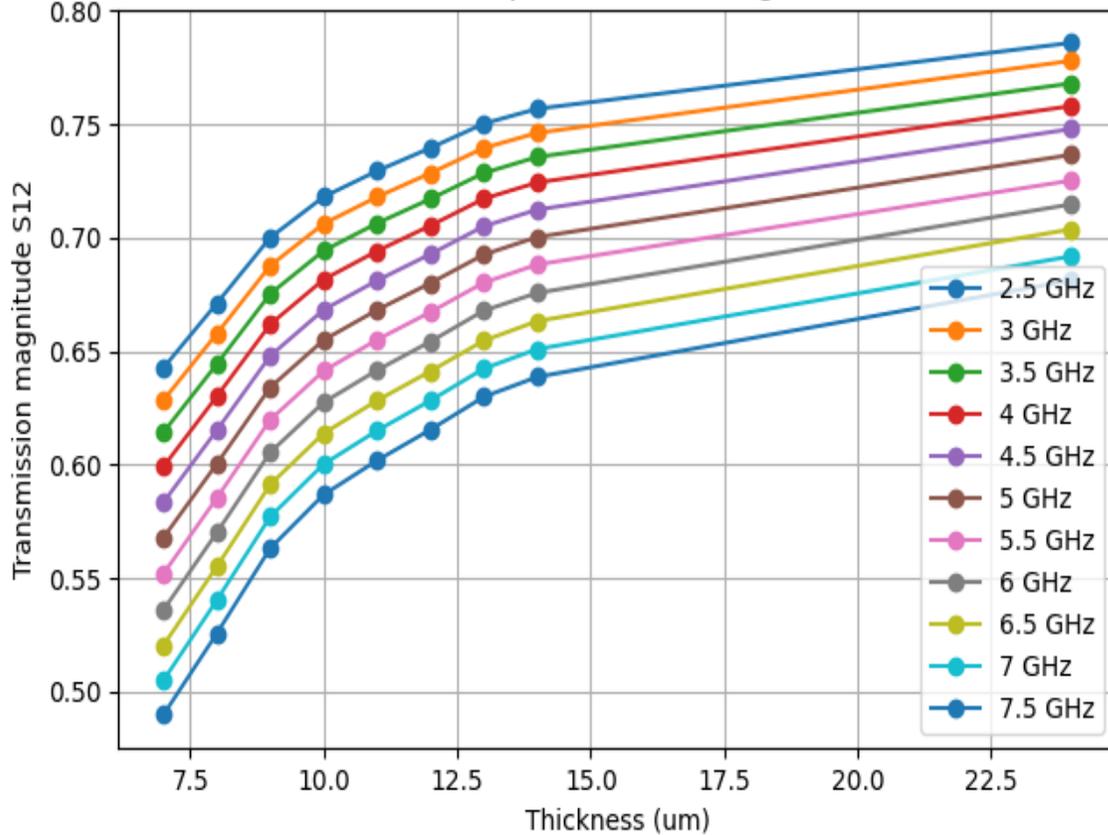
Microstrip Width : $20\mu\text{m}$
Microstrip length : 60mm
Microstrip Height : $3\mu\text{m}$
Separation : $20\mu\text{m}$

Substrate Height : $14\mu\text{m}$
Differential mode Impedance : 102.27Ω
Common mode Impedance : 58.23Ω
Dielectric Constant : 3.5

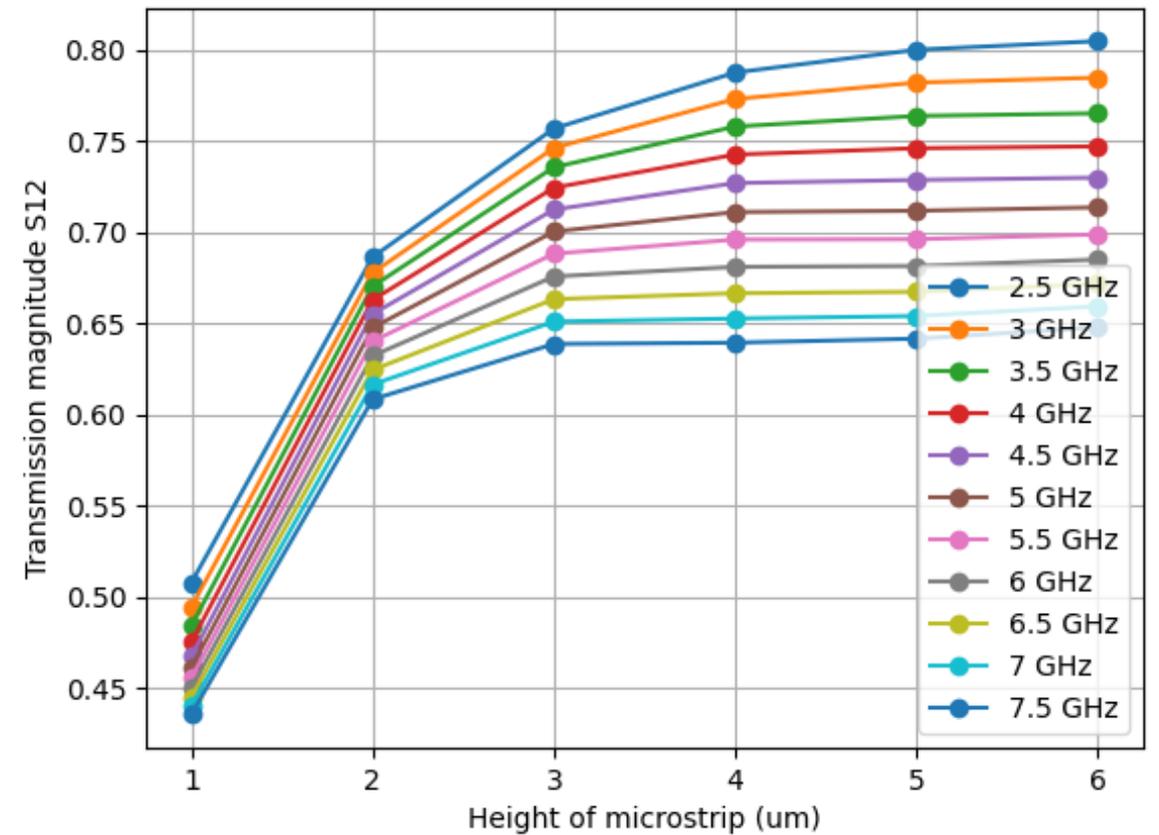


Results of Ansys (HFSS) Simulations of Differential Line

Transmission rate vs Thickness plot of 60mm long 20um wide Differential Line



Transmission rate vs Microstrip height plot of Differential Line



- In this study height of microstrip = 3um, length = 60mm, width = 20um, substrate thickness varies from 7um to 14um in step of 1um and 24um.
- With increasing substrate thickness transmission rate is increasing.

- In this study, length = 60mm, width = 20um, height of microstrip varies from 1um to 6um in step of 1um.
- With increasing substrate thickness transmission rate is increasing.

Next steps :

- Manipulate microstrip width and separation between them.
- Manipulate Ground height.
- Simulations with other materials as well.
- Wire-bonding and TDR.
- Simulations of vias.

Thank you