# Cabin Radar Antenna Realized Gain simulations

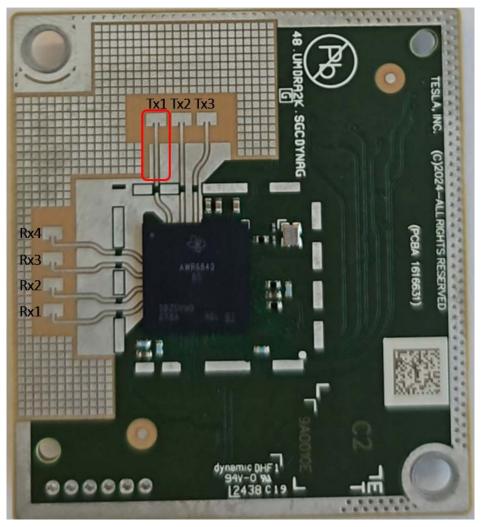
For Certification

Anand Konanur

## Methodology

- Simplified model for antennas are used and whole of L1 and L2 layers along with Top Layer Substrate is simulated.
- Signal path : Transceiver BGA-> Microstrip->Antenna
- Microstrip trace losses and antenna realized gain are simulated. BGA to microstrip transition loss is not modelled here.

#### Antenna gains

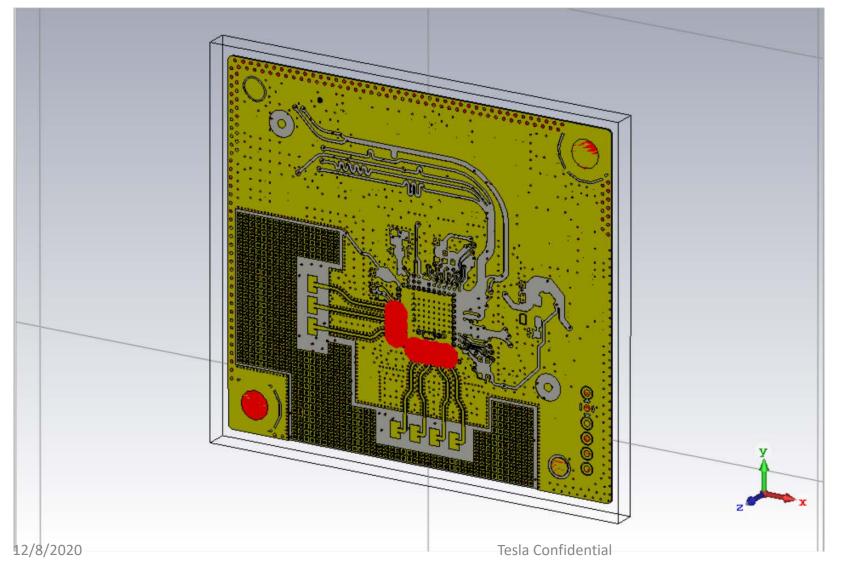


Antenna	Realized Gain(dBi)
Tx1	8.6
Tx2	9.2
Tx3	7.5
Rx1	6.8
Rx2	6.5
Rx3	7.5
Rx4	6.4

# Cabin Radar Simulations

Antenna Pattern simulations

### Setup



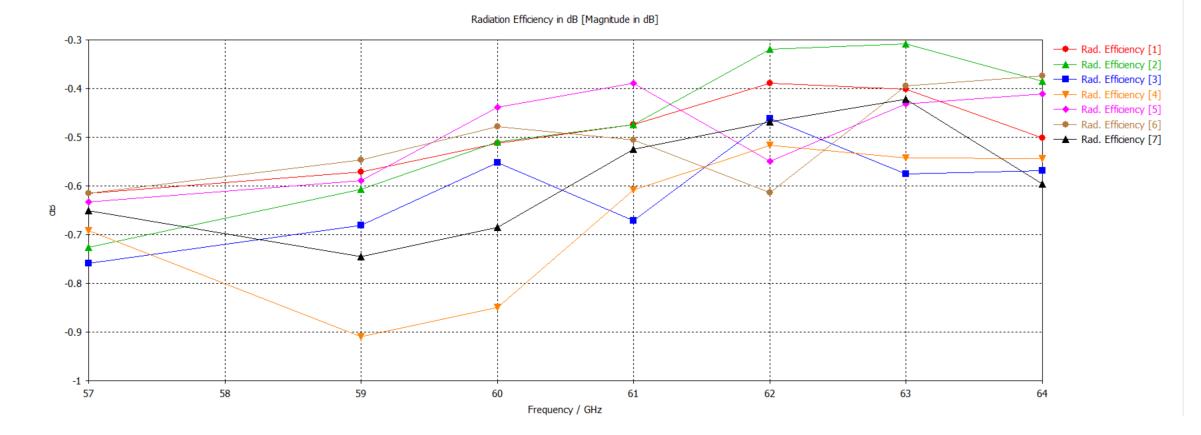
#### IPC 2581 import from Altium

Using only L1 and dielectric1

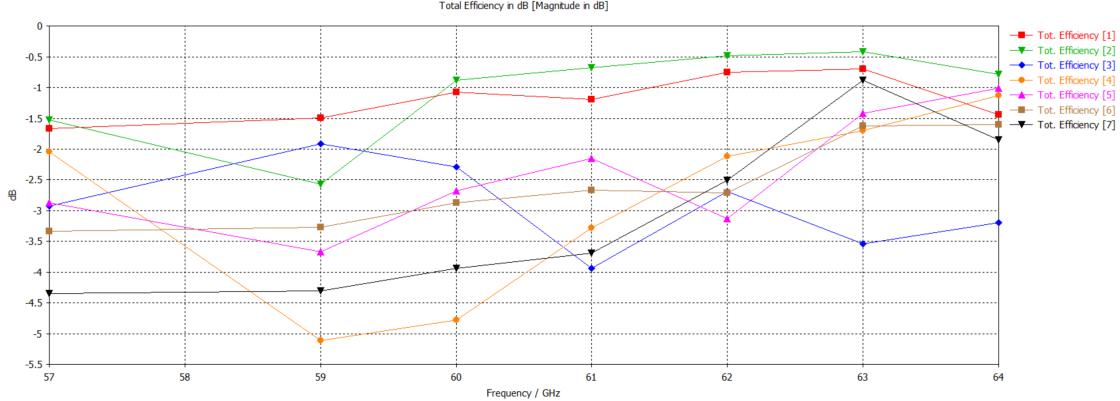
Created solid L2 layer ( 0.1905 mm thickness)

Added lumped element ports

#### **Radiation Efficiency**

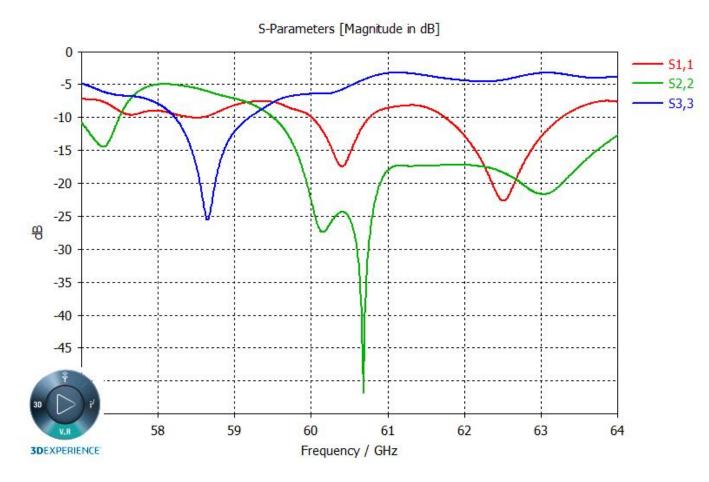


## Total Efficiency

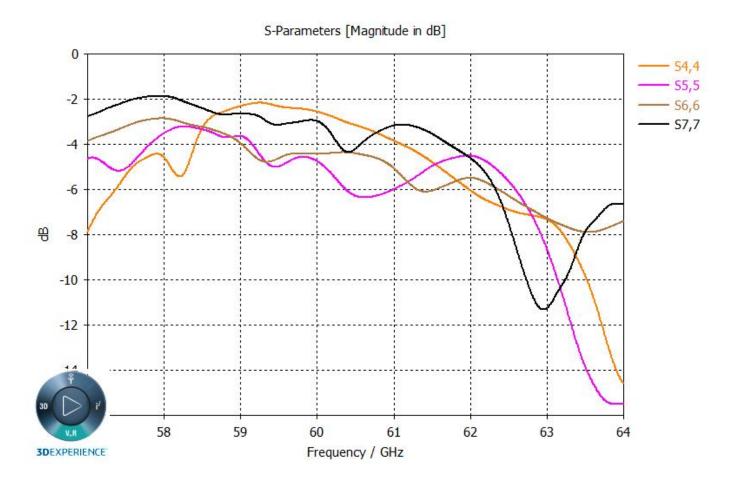


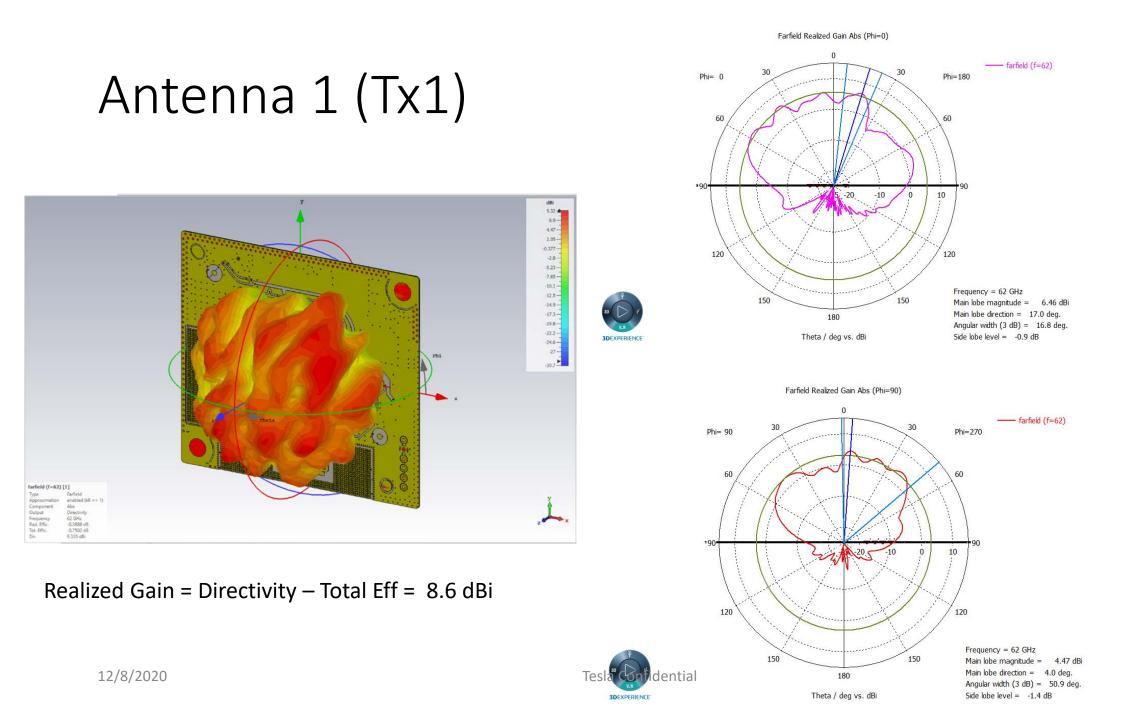
Total Efficiency in dB [Magnitude in dB]

# Tx matching

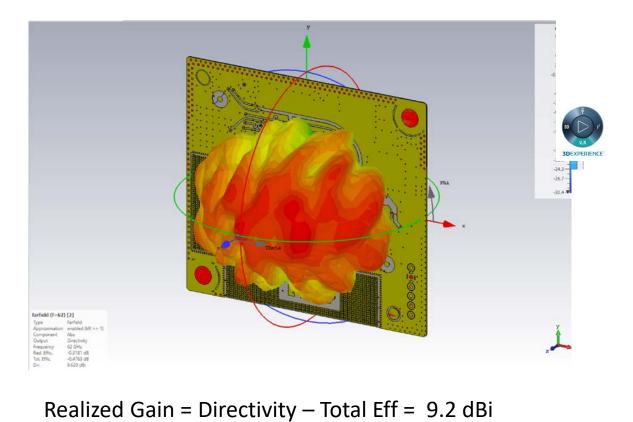


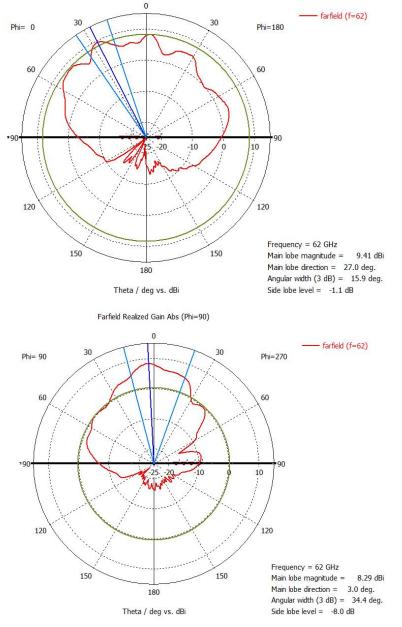
# Rx Matching





# Antenna 2 (Tx2)

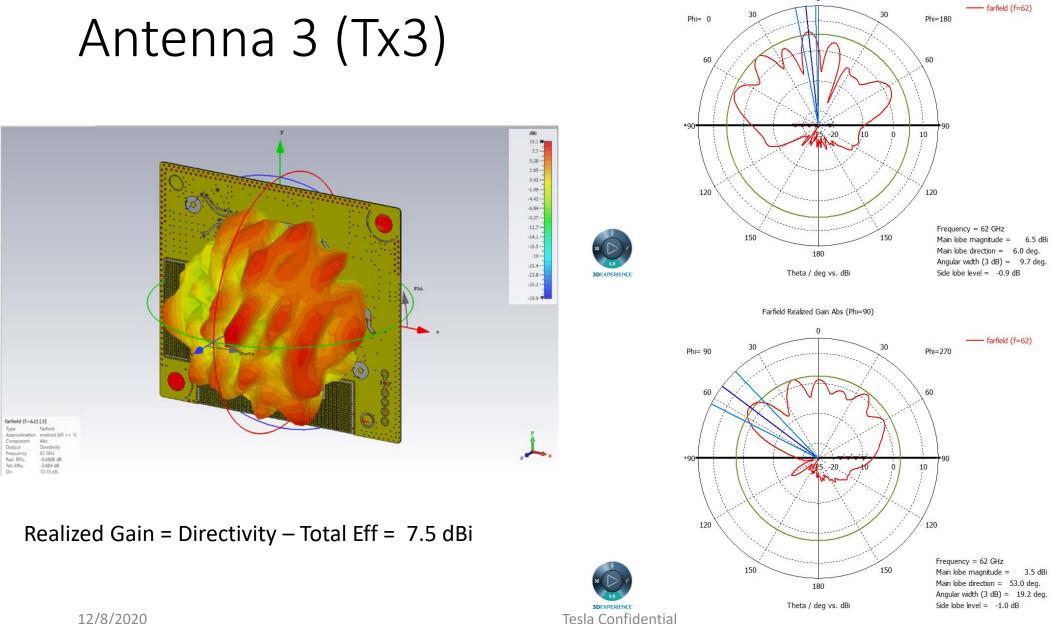




Farfield Realized Gain Abs (Phi=0)

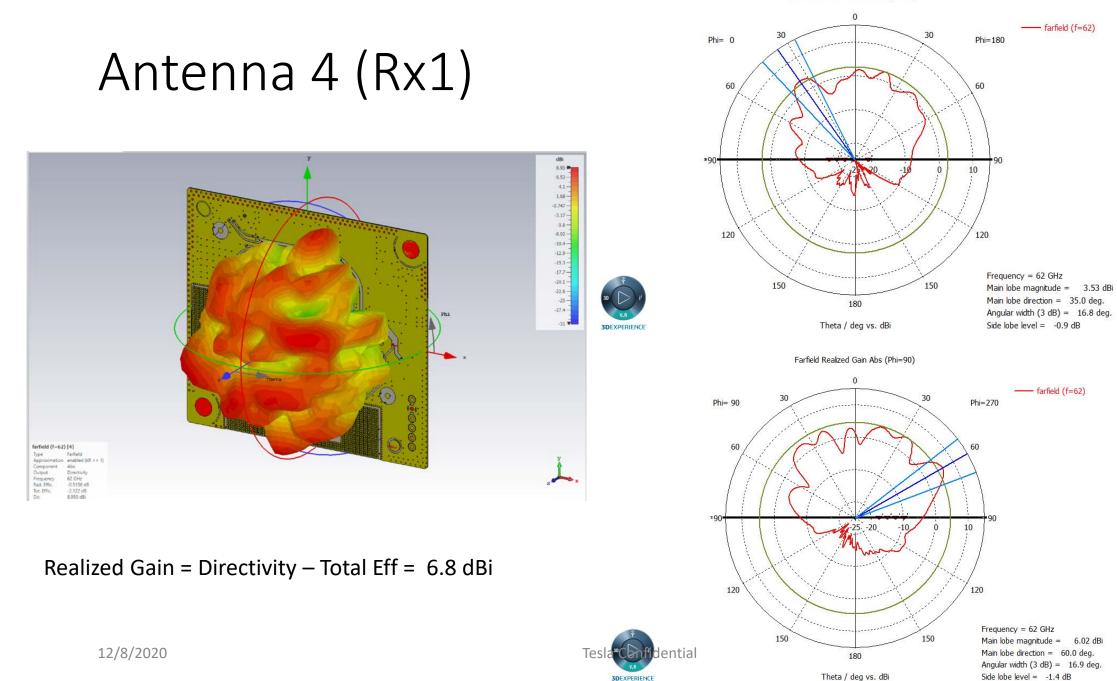
Tesla Confidential

**3DEXPERIENCE** 



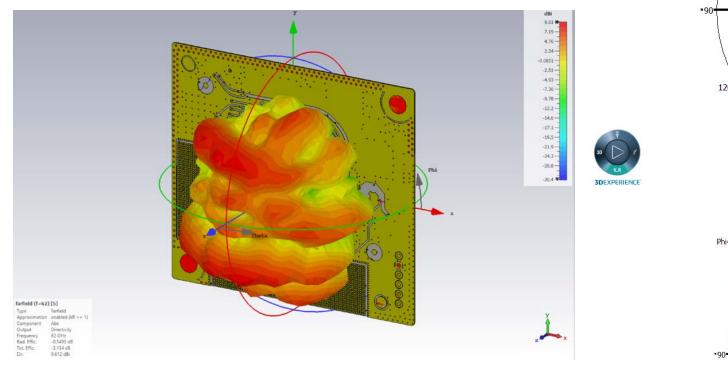
Farfield Realized Gain Abs (Phi=0)

Farfield Realized Gain Abs (Phi=0)

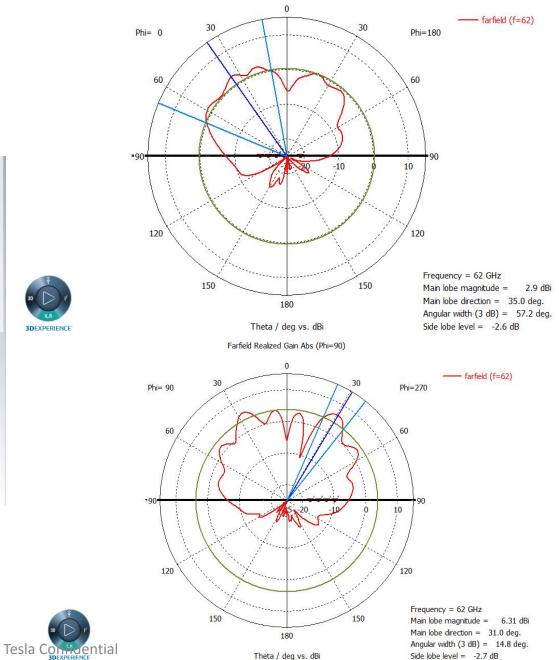


Farfield Realized Gain Abs (Phi=0)





Realized Gain = Directivity – Total Eff = 6.5 dBi



0 - farfield (f=62) 30 30 Phi= 0 Phi=180 Antenna 6 (Rx3) 60 60 -10 10 -20 dBi 10.2 # 7.73-5.31-2.88-0.458--1.97 -120 120 -4.39--6.81 ---9.24--11.7-Frequency = 62 GHz -14.1 -150 150 Main lobe magnitude = 6.46 dBi -16.5--18.9-Main lobe direction = 50.0 deg. 180 -21.4 -23.8 -26.2 Angular width (3 dB) = 46.1 deg.Theta / deg vs. dBi Side lobe level = -4.2 dB**3DEXPERIENCE** -29.8 Farfield Realized Gain Abs (Phi=90) 0 farfield (f=62) 30 Phi= 90 Phi=270 farfield (f=62) [6] Type Farfield Approximation enabled (kR >> 1 Component Output Frequency Rad, Effic, Tot, Effic, Dir, Abs Directivity 62 GHz -0.6133 dB -2.713 dB 10.15 dBi 10 -10 Realized Gain = Directivity – Total Eff = 7.5 dBi 120 120

Tesla C

**3DEXPERIENCE** 

Theta / deg vs. dBi

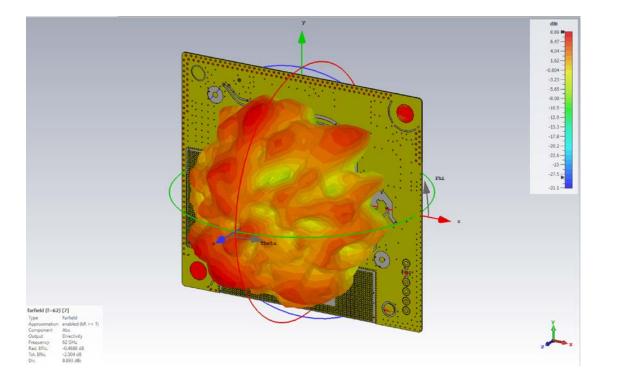
180

150

150

Farfield Realized Gain Abs (Phi=0)





Realized Gain = Directivity – Total Eff = 6.4 dBi

Tesla Conf

