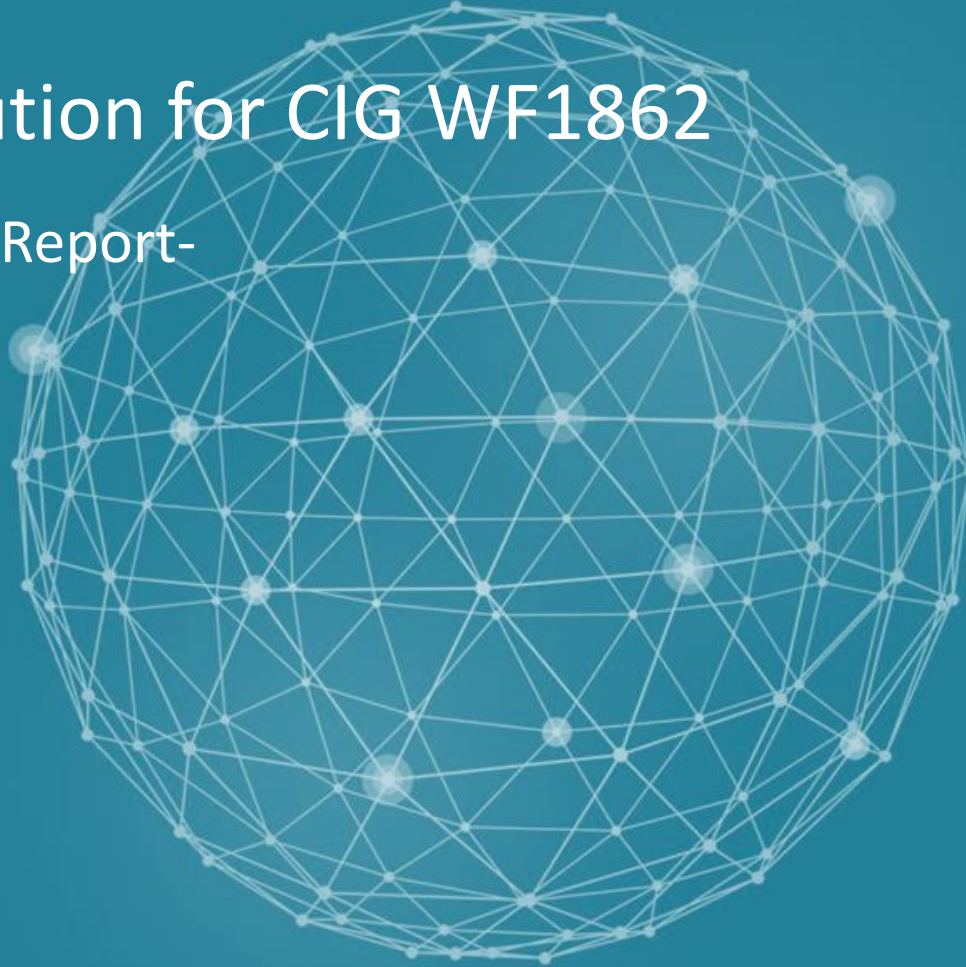


AoT Antenna Solution for CIG WF1862

-Passive Measurement Report-

Date: July 06, 2023

Prepared by: RD



INTRODUCE

- **Brief Project Description:**
 - Project Name: CIG WF1861
 - Category: AP Router
- **Antenna Configuration:**
 - 2 x WiFi Dual Band Antennas



Requirements Review

- **Basic Requirement**
 - Return Loss
 - >10dB for All Band Antennas
 - Isolation
 - >20dB between WIFI Dual bands antennas
 - >30dB between WIFI Dual band & Senser Dual band bands antennas

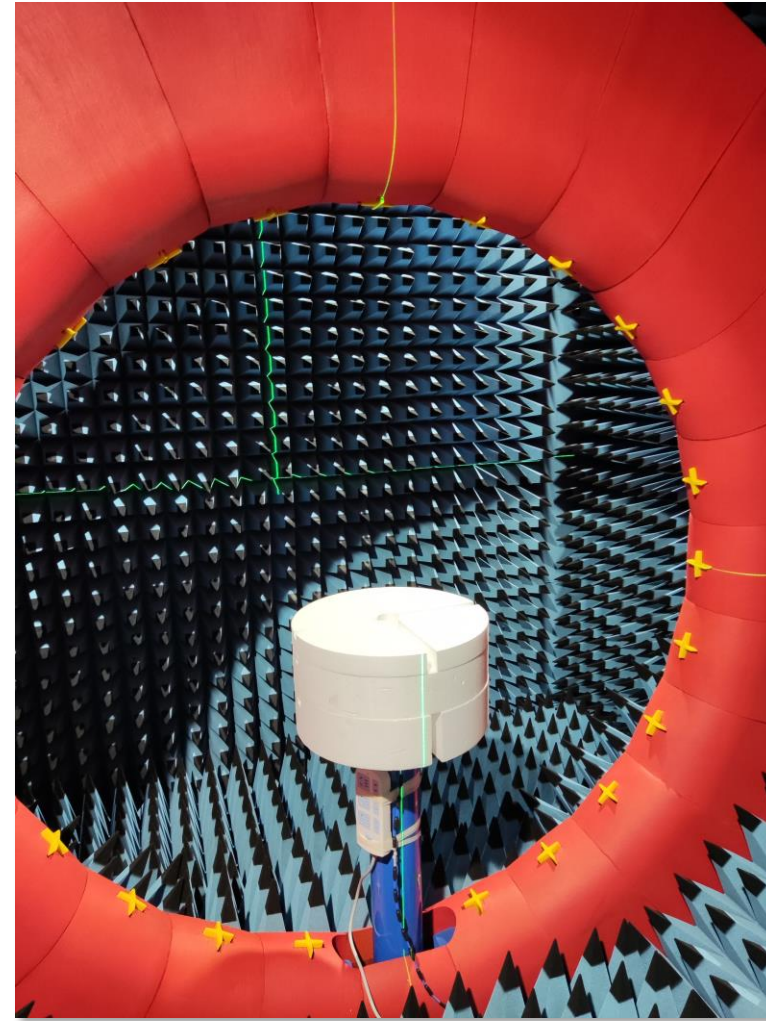
Measurement Information

Instrument	Manufacturer	Model No.	Calibrate. Interval	Calibrate. Due Date
ENA Network Analyzer	Keysight	E5071C	1 Year	2024.03.09
EMT24 Chamber	EMT-Testing	EMT24-S	1 Year	2024.03.09
Horn Antenna	EMT-Testing	EMT800	1 Year	2024.03.09
Logarithmic Periodic Antenna	EMT-Testing	LOG400	1 Year	2024.03.09

Measurement Configuration



Measurement Instrument



Chamber

Test Method

- The “great circle” cut method, whereby the Measurement Antenna remains fixed and the EUT is rotated about two axes in sequential order. The radiated RF performance of the Equipment Under Test (EUT) is measured by sampling the radiated transmit power of the mobile at various locations surrounding the device. A three-dimensional characterization of the 'transmit' performance of the EUT is pieced together by analyzing the data from the spatially distributed measurements.
- Data points taken every 2 degrees in the theta and in the phi axes are deemed sufficient to fully characterize the EUT's Far-Field radiation pattern and total radiated power All of the measured power values will be integrated.

Test Condition	Test Engineer	Test Environment (C %)	Test Date
Radiated	Changgang Lai	20-24 / 45-60	20230704-20230705
Band (MHz)		Test Frequency (MHz)	
2400-2500		2400/2450/2480	
5150-5850		5200/5500/5800	
Test Location			
Company Name: AoT Corp		Address: 289 Jinghua Road,Shipai, Bacheng Town, Kunshan City, Jiangsu Province	

Test Method

- Because the antennas are fixed in location within the device the directional antenna gain for MIMO is calculated over a sphere using the raw spatial data taken at 15 degree steps of theta and phi for each antenna using the equations from KDB 662911 D01. The raw antenna data is located in the appendix of this report.
- The correlated antenna gain was calculated using KDB 662911 D01, F(2)(d)(). The uncorrelated antenna gain was calculated using KDB 662911 D01, F(2)(d)(ii).
- The uncorrelated and correlated gains were calculated for each point in the spatial data, and the highest values reported.

Note :

KDB 662911 D01, F(2)(d)(i)

$$\text{Correlated Gain} = 10 \log \left[\left(10^{\frac{G_1}{20}} + 10^{\frac{G_2}{20}} + \dots + 10^{\frac{G_n}{20}} \right)^2 / N_{Ant.} \right] \text{ dBi}$$

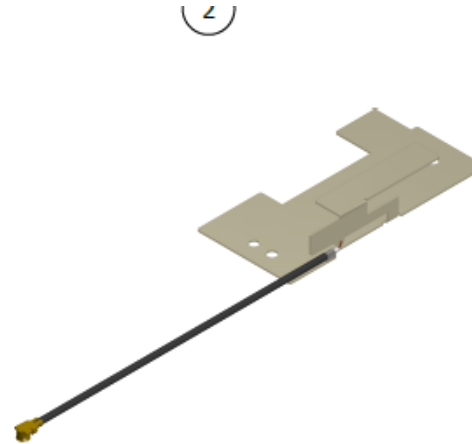
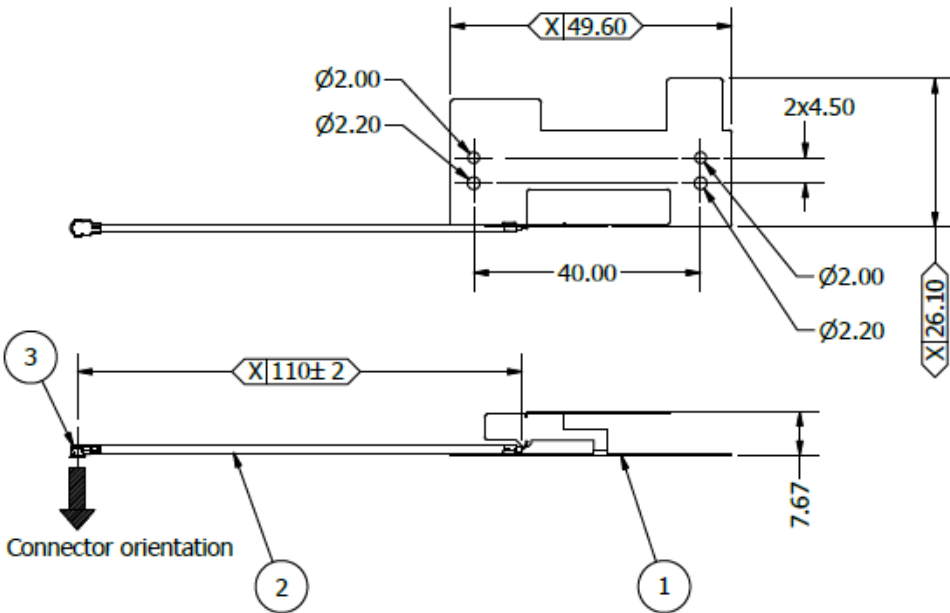
KDB 662911 D01, F(2)(d)(ii)

$$\text{Uncorrelated Gain} = 10 \log \left[\left(10^{\frac{G_1}{10}} + 10^{\frac{G_2}{10}} + \dots + 10^{\frac{G_n}{10}} \right) / N_{Ant.} \right] \text{ dBi}$$

$N_{Ant.}$: Number of antenna

G_n : Gain of antenna

AoT Antenna Solution



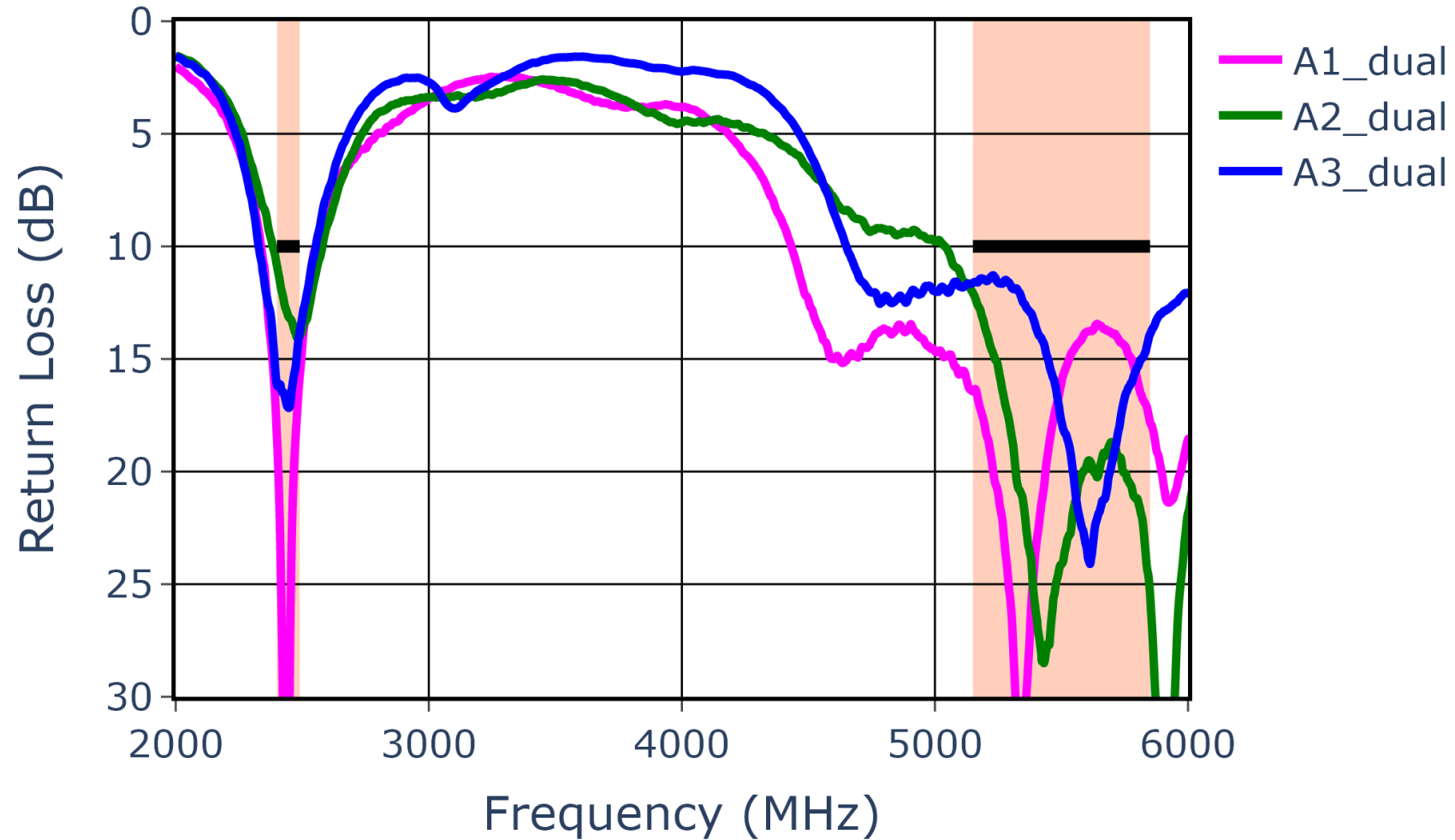
Antenna Description

Antenna	Part Number	Manufacturer
A1_Dual	ANT-M2458-C02	AoT Corp
A2_Dual	ANT-M2458-C01	AoT Corp

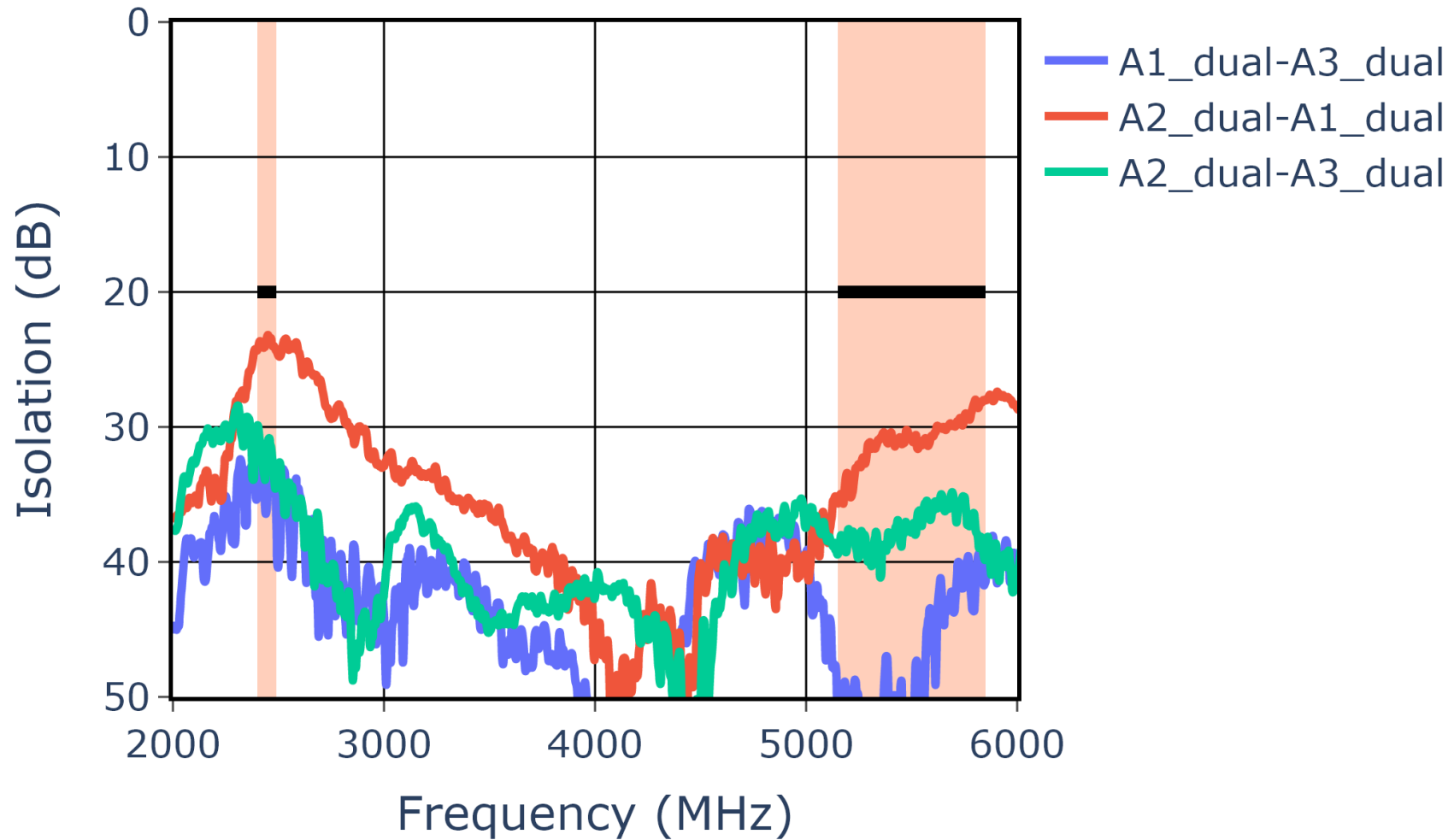
S-parameters

- Calibration plane is at the locations of Antenna Cable Connector

Return Loss of Dual Band Antennas



Isolation Between Dual Band Antennas

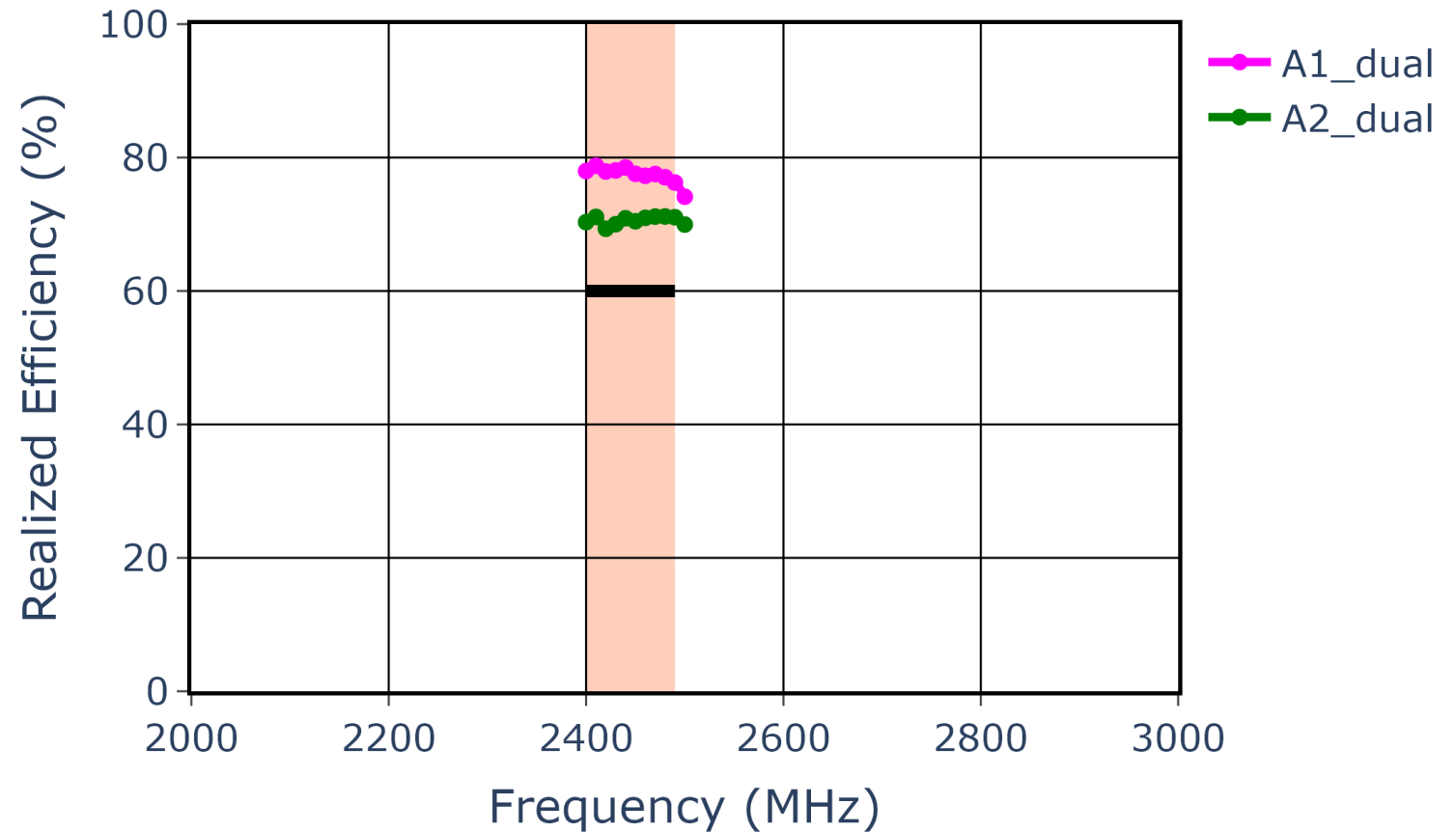


Radiation Performance

- Calibration plane is at the locations of Antenna Cable Connector
 - Realized Efficiency
 - Peak Realized Gain

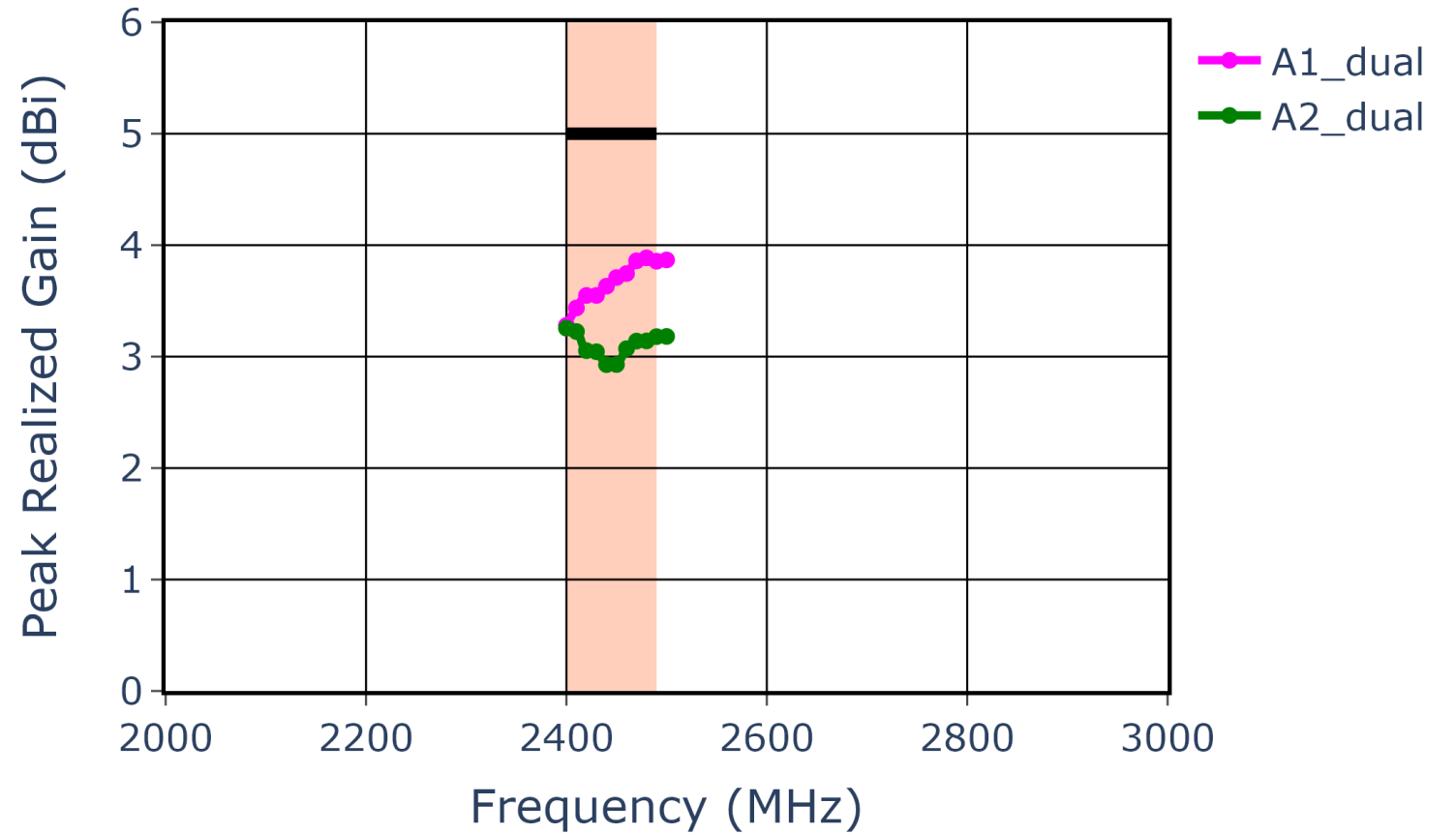
Realized Efficiency of Antennas in 2G4 Band

Frequency (MHz)	A1_dual (%)	A2_dual (%)
2400	78	70
2409	79	71
2417	78	70
2425	78	70
2433	78	70
2441	78	71
2450	78	70
2458	77	71
2466	77	71
2474	77	71
2482	77	71
2490	76	71



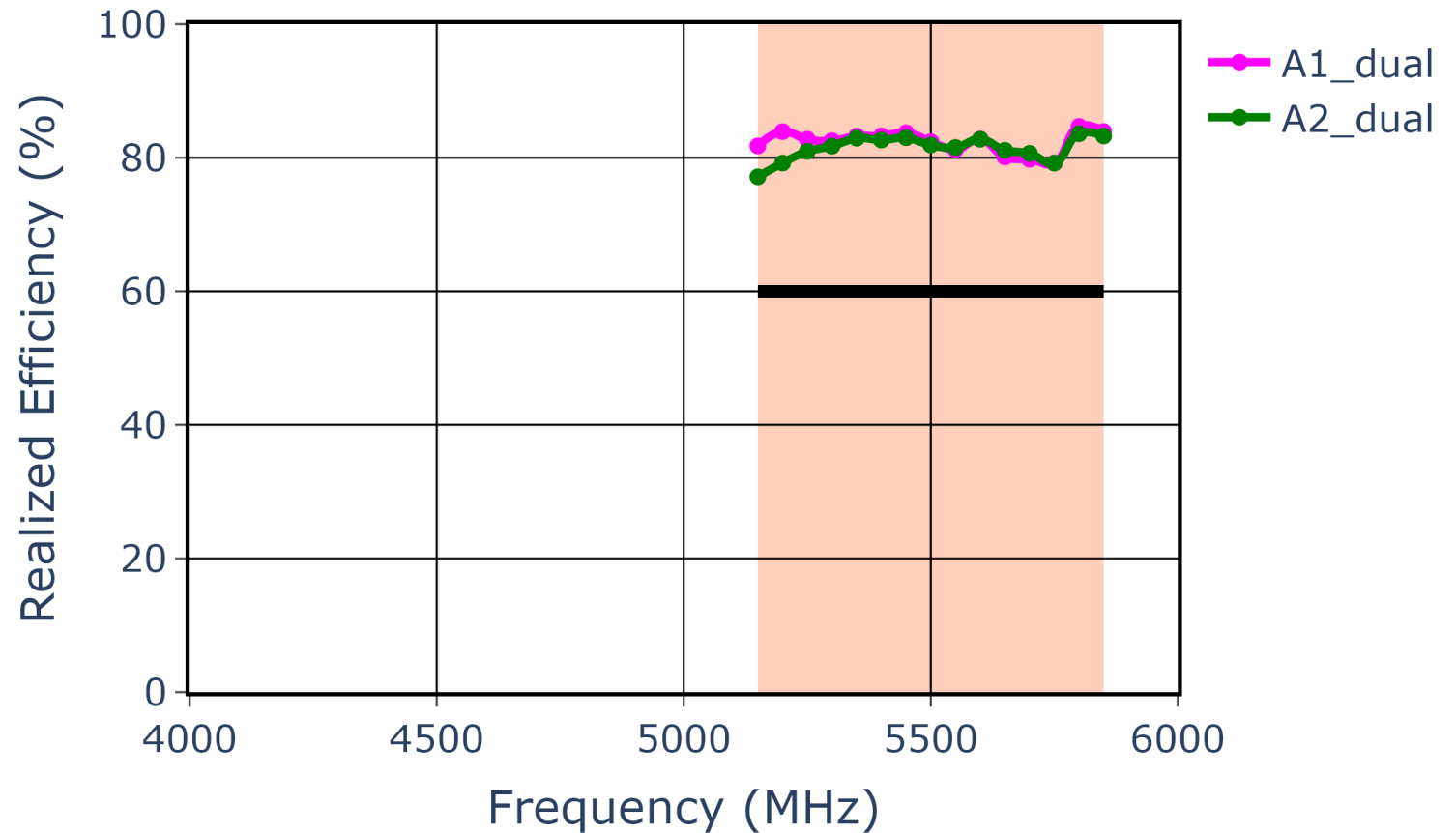
Peak Realized Gain of Antennas in 2G4 Band

Frequency (MHz)	A1_dual (dBi)	A2_dual (dBi)
2400	3.3	3.3
2409	3.4	3.2
2417	3.5	3.1
2425	3.5	3.0
2433	3.6	3.0
2441	3.6	2.9
2450	3.7	2.9
2458	3.7	3.0
2466	3.8	3.1
2474	3.9	3.1
2482	3.9	3.1
2490	3.9	3.2



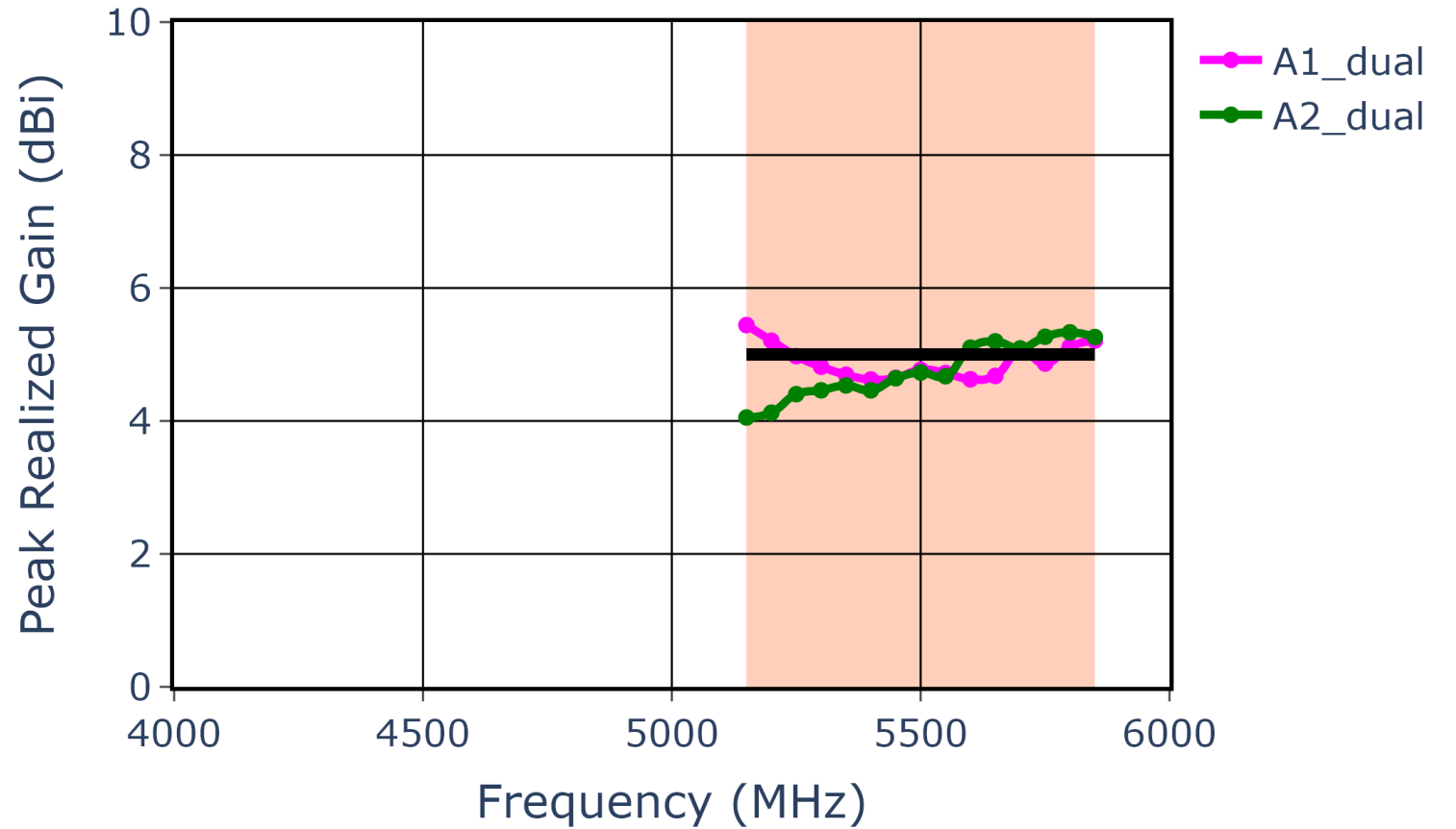
Realized Efficiency of Antennas in 5G Band

Frequency (MHz)	A1_dual (%)	A2_dual (%)
5150	82	77
5214	84	80
5278	83	81
5341	83	83
5405	83	83
5469	83	83
5532	82	82
5596	83	83
5660	80	81
5723	80	80
5787	83	82
5850	84	83



Peak Realized Gain of Antennas in 5G Band

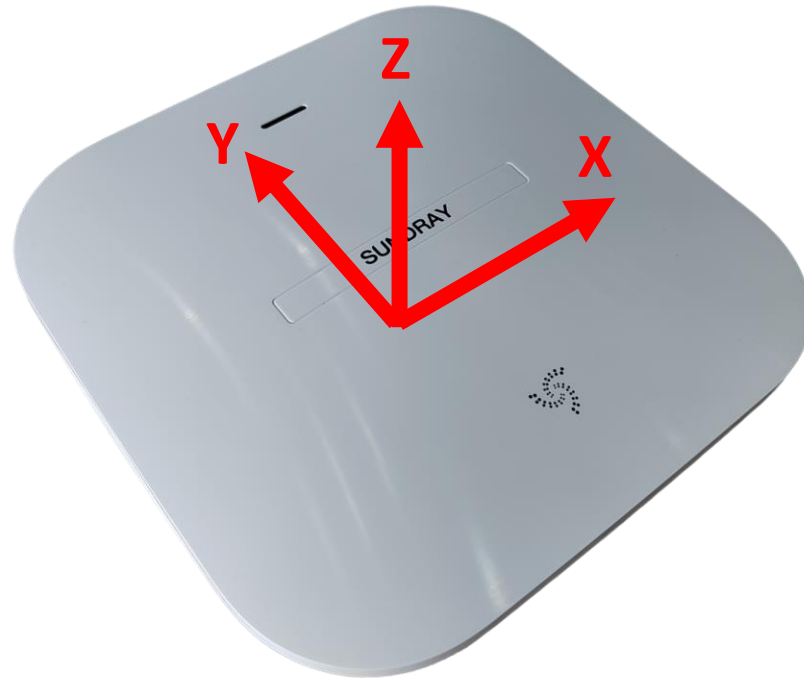
Frequency (MHz)	A1_dual (dBi)	A2_dual (dBi)
5150	5.4	4.1
5214	5.1	4.2
5278	4.9	4.4
5341	4.7	4.5
5405	4.6	4.5
5469	4.7	4.7
5532	4.7	4.7
5596	4.6	5.1
5660	4.8	5.2
5723	5.0	5.2
5787	5.1	5.3
5850	5.2	5.3



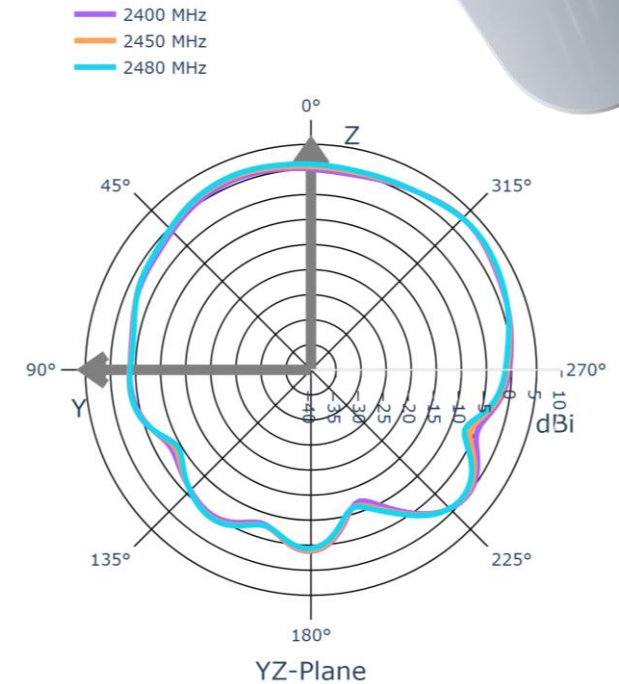
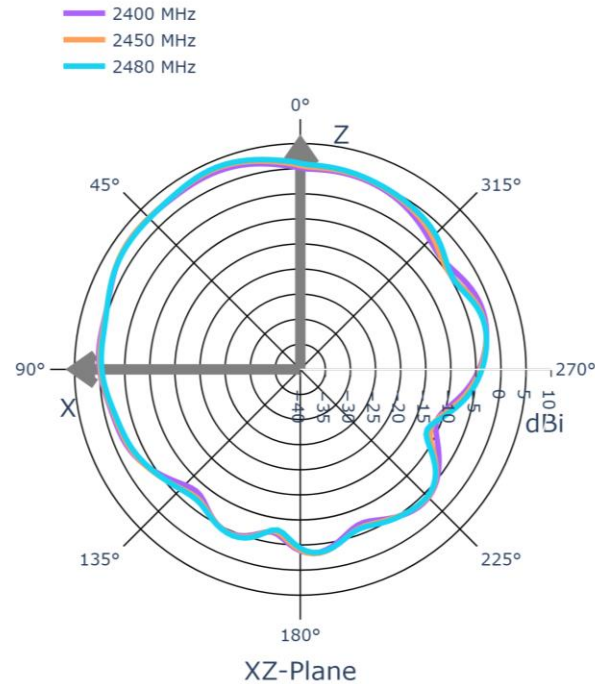
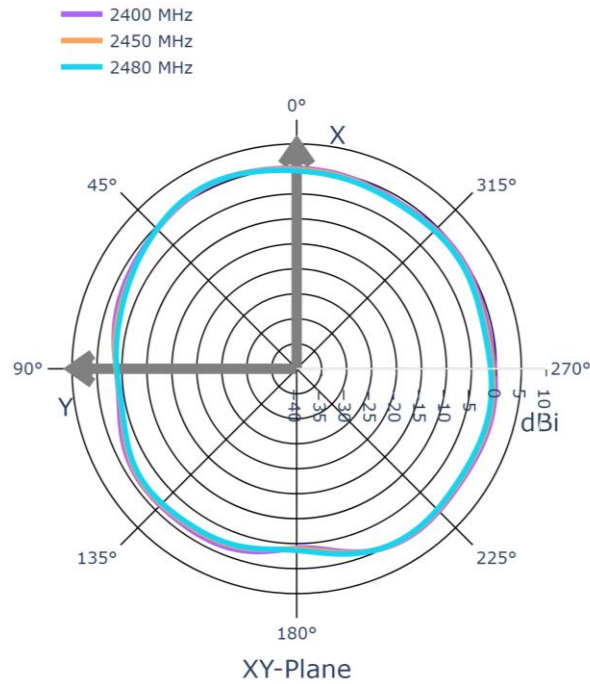
Radiation Patterns

- Calibration plane is at the locations of Antenna Cable Connector
 - Realized Gain Radiation Patterns in Specified Frequency Bands
 - 3D Gain Patterns in Specified Frequency Bands

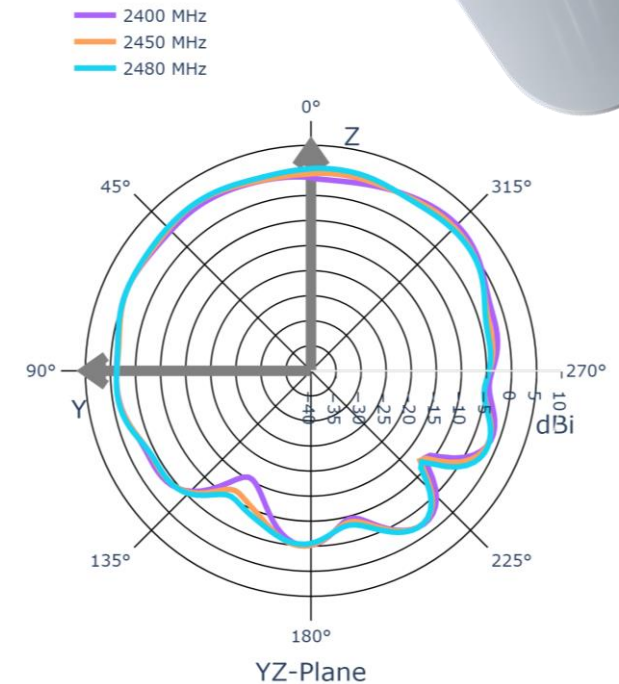
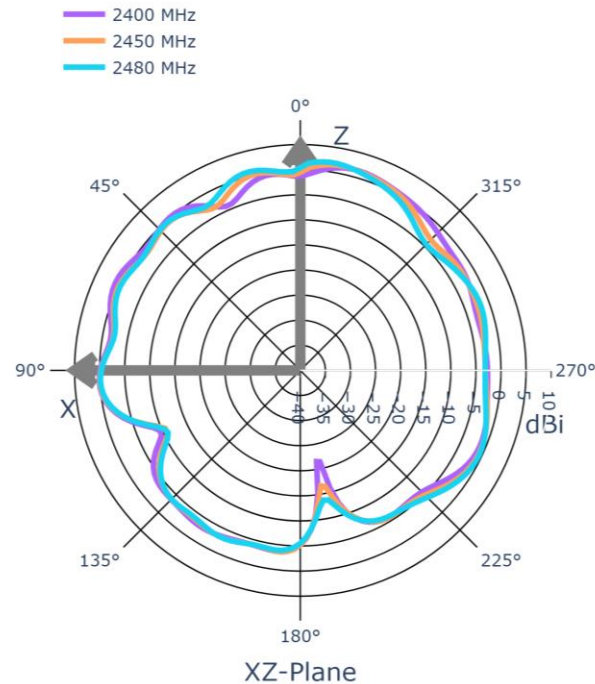
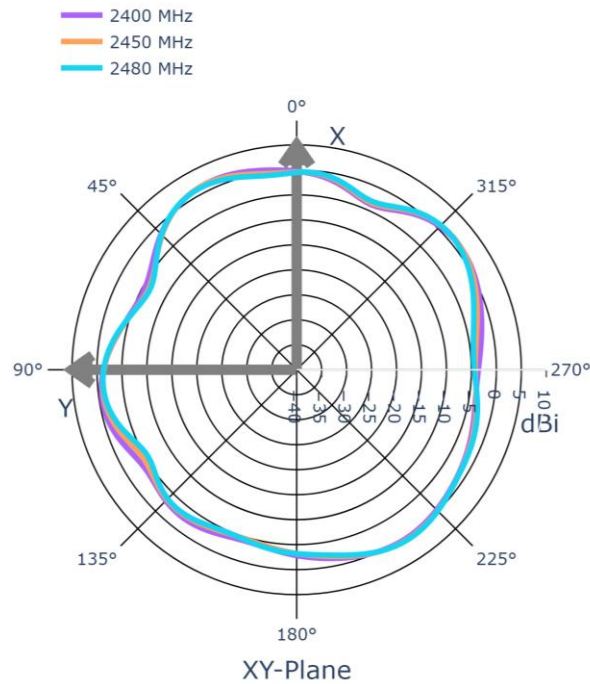
Orientation of DUT for Radiation Pattern Visualization



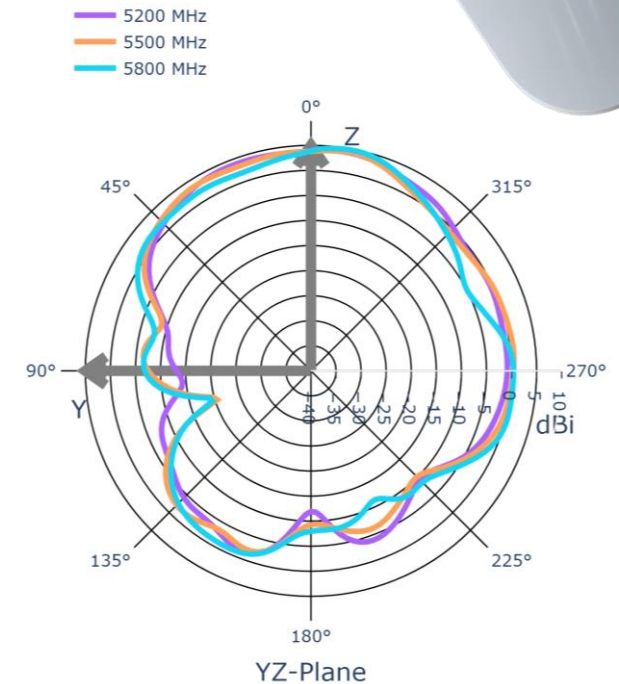
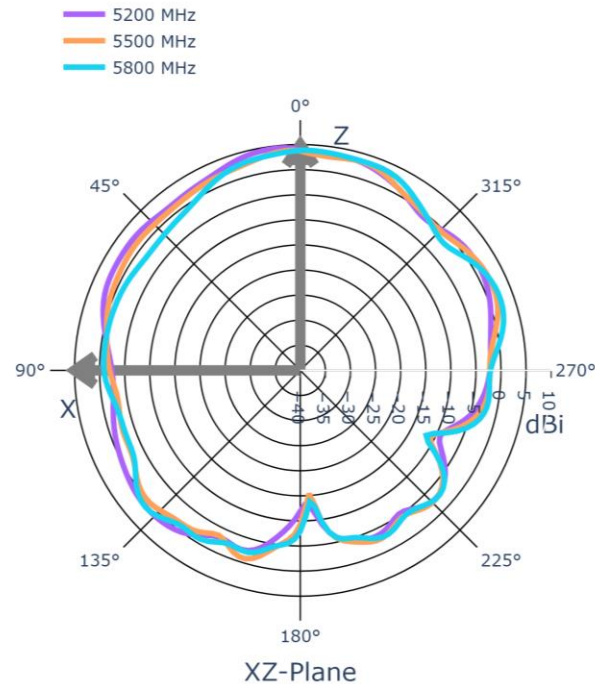
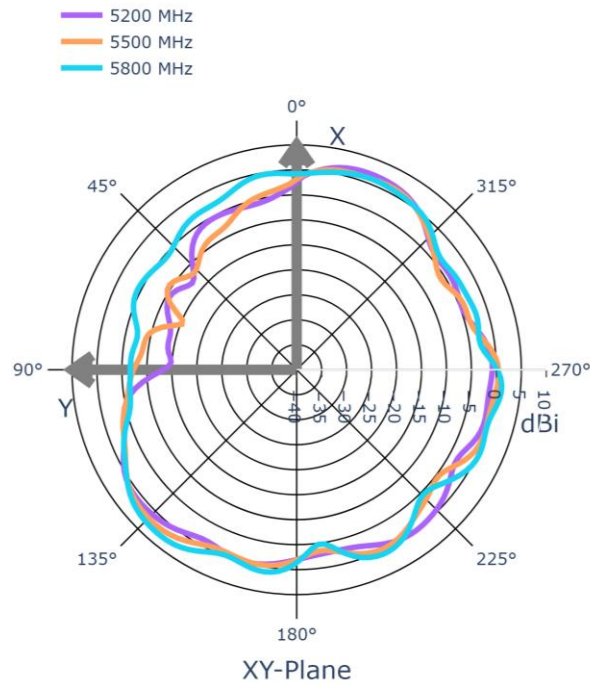
Realized Gain Radiation Patterns of A1_dual Antenna in 2G4 Band: Total Polarization



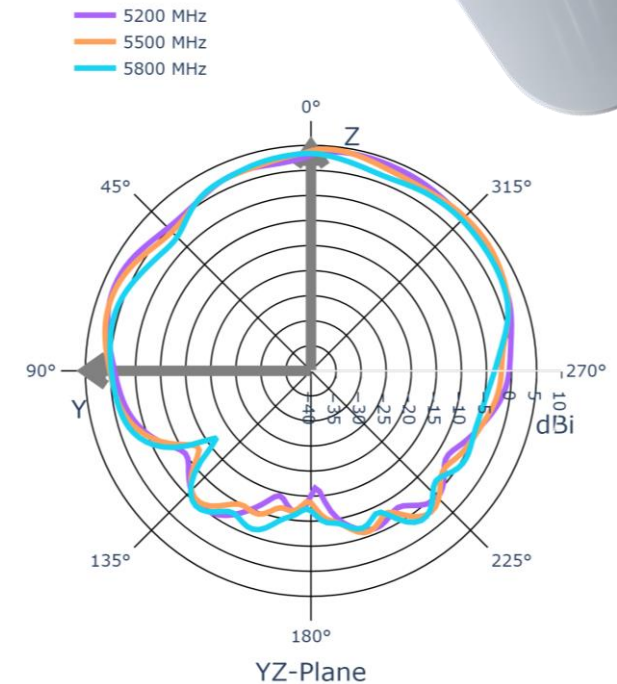
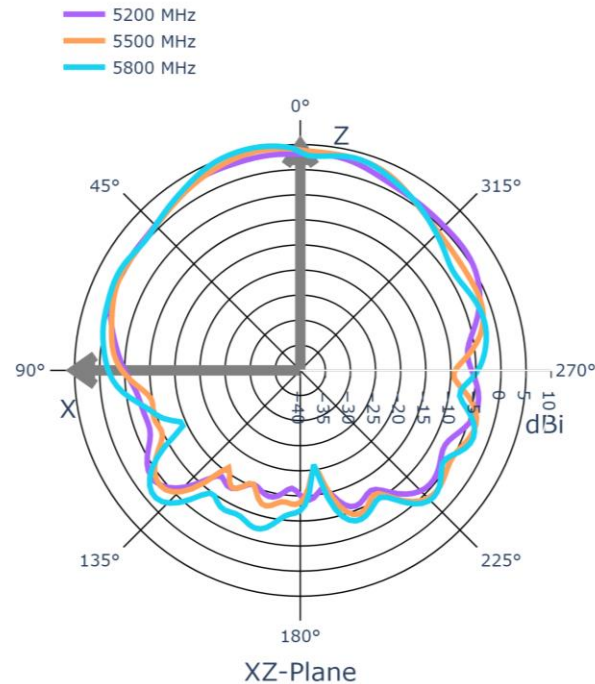
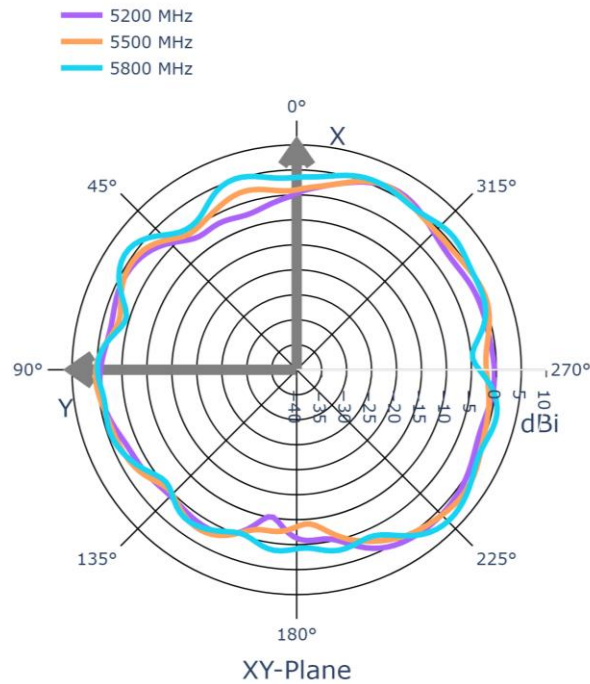
Realized Gain Radiation Patterns of A2_dual Antenna in 2G4 Band: Total Polarization



Realized Gain Radiation Patterns of A1_dual Antenna in 5G Band: Total Polarization



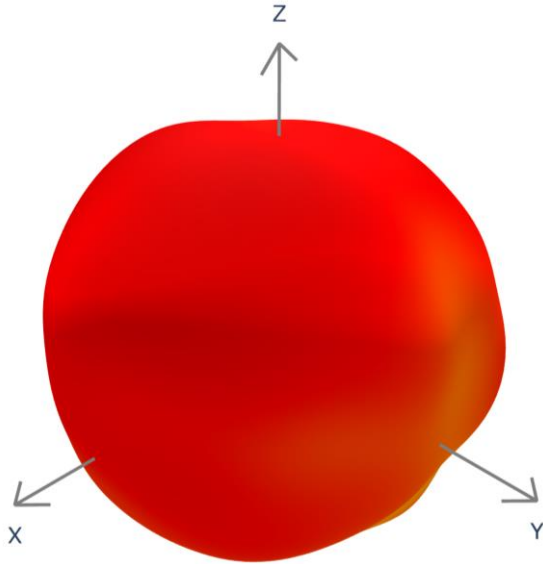
Realized Gain Radiation Patterns of A2_dual Antenna in 5G Band: Total Polarization



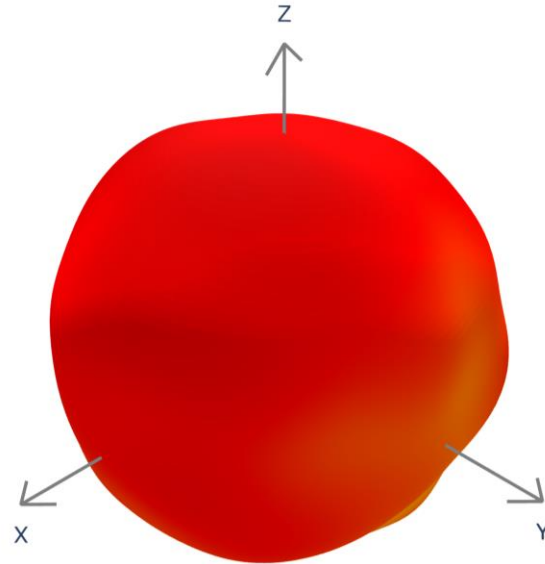
Realized Gain Radiation Patterns of A1_dual Antenna in 2G4 Band: Total Polarization



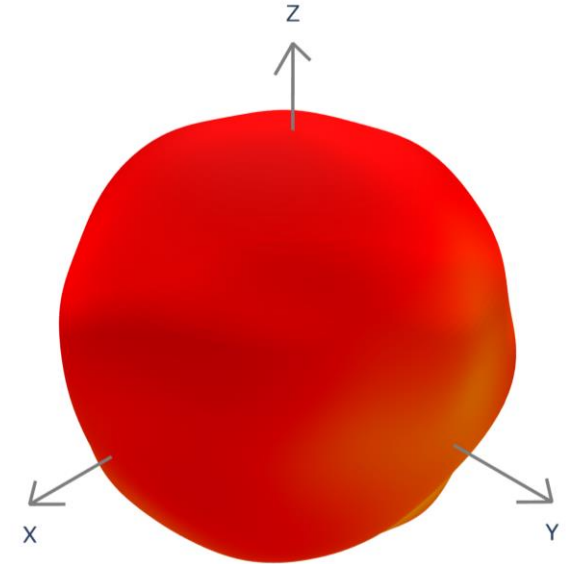
2400 MHz



2450 MHz



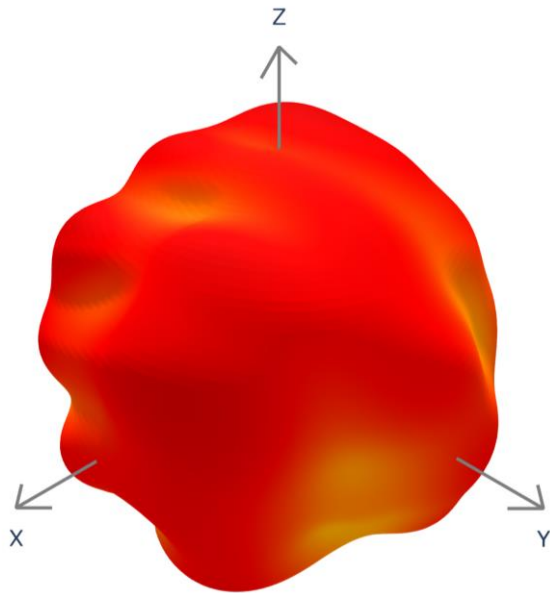
2480 MHz



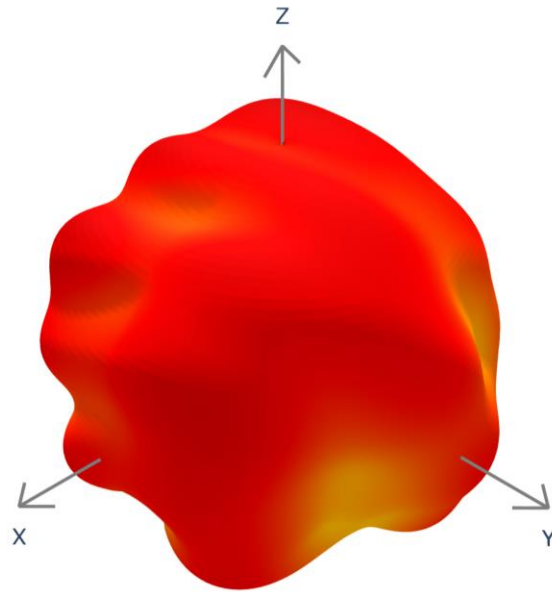
Realized Gain Radiation Patterns of A2_dual Antenna in 2G4 Band: Total Polarization



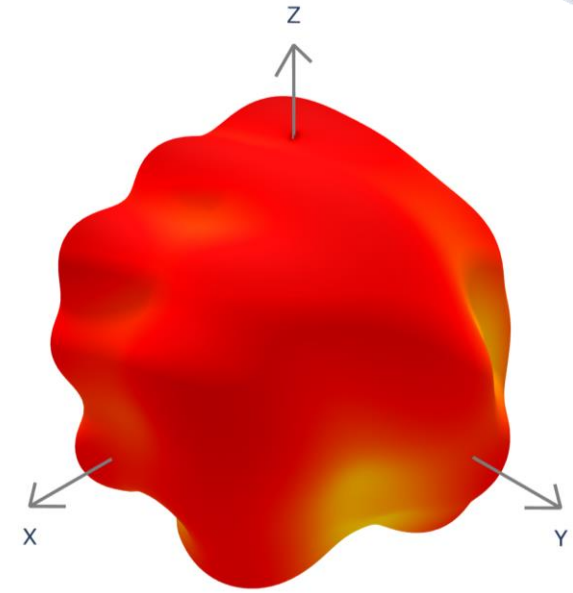
2400 MHz



2450 MHz



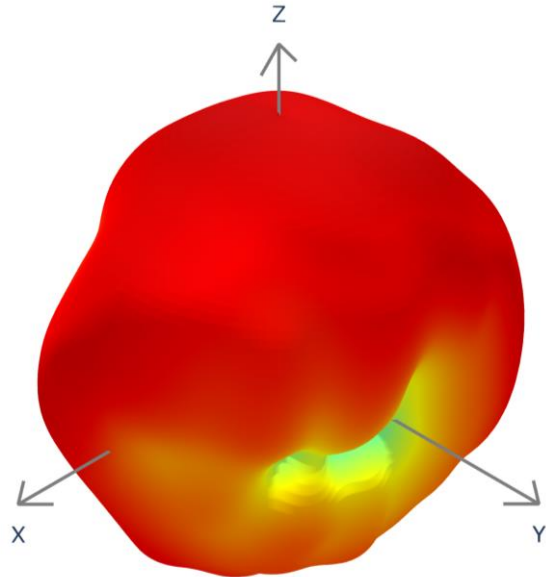
2480 MHz



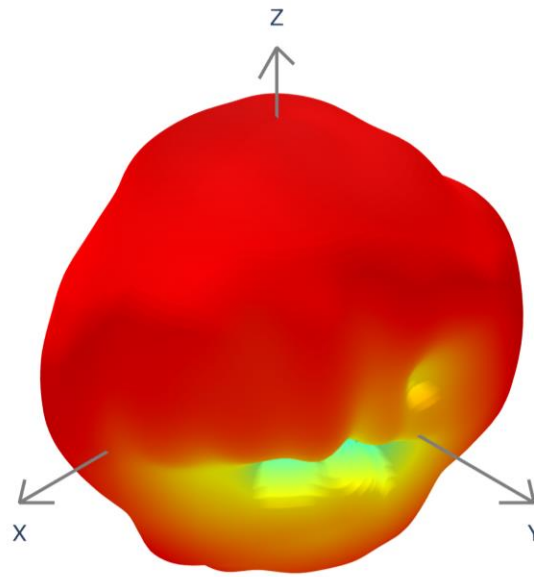
Realized Gain Radiation Patterns of A1_dual Antenna in 5G Band: Total Polarization



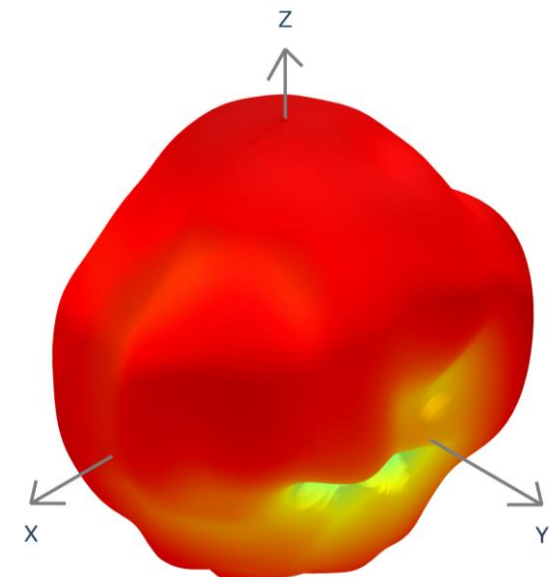
5200 MHz



5500 MHz



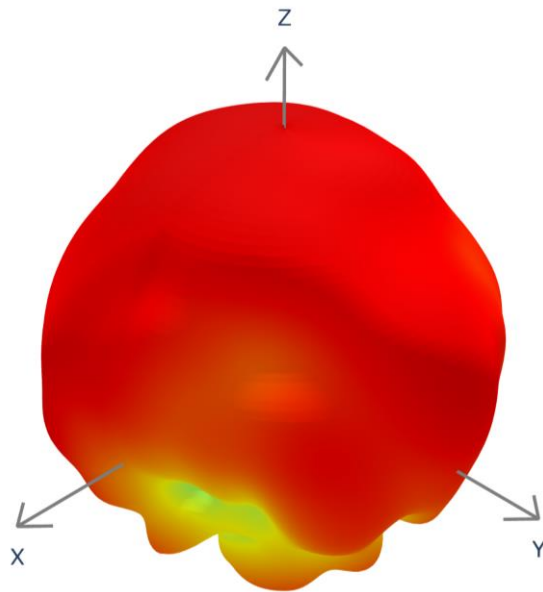
5800 MHz



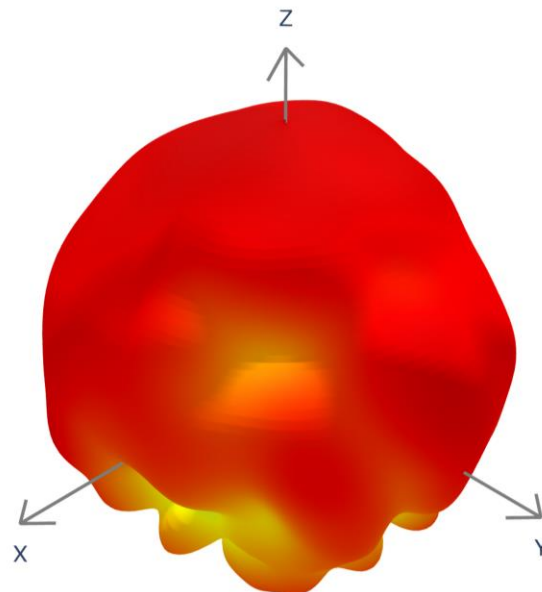
Realized Gain Radiation Patterns of A2_dual Antenna in 5G Band: Total Polarization



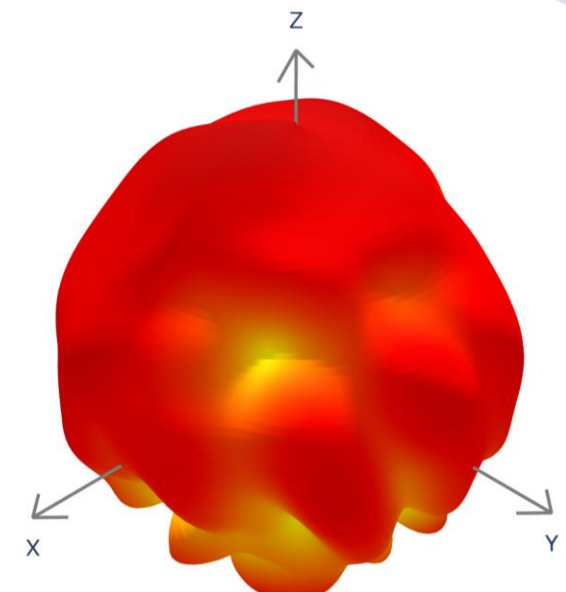
5200 MHz



5500 MHz



5800 MHz



Conclusion and Recommendations

- Passive Measurement results for AoT antenna system for CIG WF1862 were presented
- Passive Measurement include cable loss
- AoT antenna system exhibits
 - The Return Loss
 - All antennas $>10.9\text{dB}$ @ 2G4 Band Antennas
 - All antennas $>11.6\text{dB}$ @ 5G Band Antennas
 - The Isolation
 - $>23\text{dB}$ Between Dual Band Antennas
 - $>29\text{dB}$ Between Dual Band Antennas & Sensor Dual Band Antenna



ANTENNA OF THINGS

Thank you!