



ANTENNA OF THINGS

AOT ANTENNA REPORT

Antenna Solution for CIG WF-189

-Passive Measurement Report-

Prepared by: RD

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ANTENNA REQUIREMENTS

Project Introduce

- **Brief Project Description:**
 - Project Name: CIG WF-189
 - Category: AP Router
- **Antenna Configuration:**
 - 2 x WiFi Dual Band Antennas
 - 2 x WiFi 6G Band Antennas
 - 1 x BLE Band Antennas
- **Antennas in AOT proposal are:**
 - 4 x off-board antennas and 1 x on-board antenna
 - Stamped Metal Type
 - Cable-fed and Trace-fed



Requirements Review

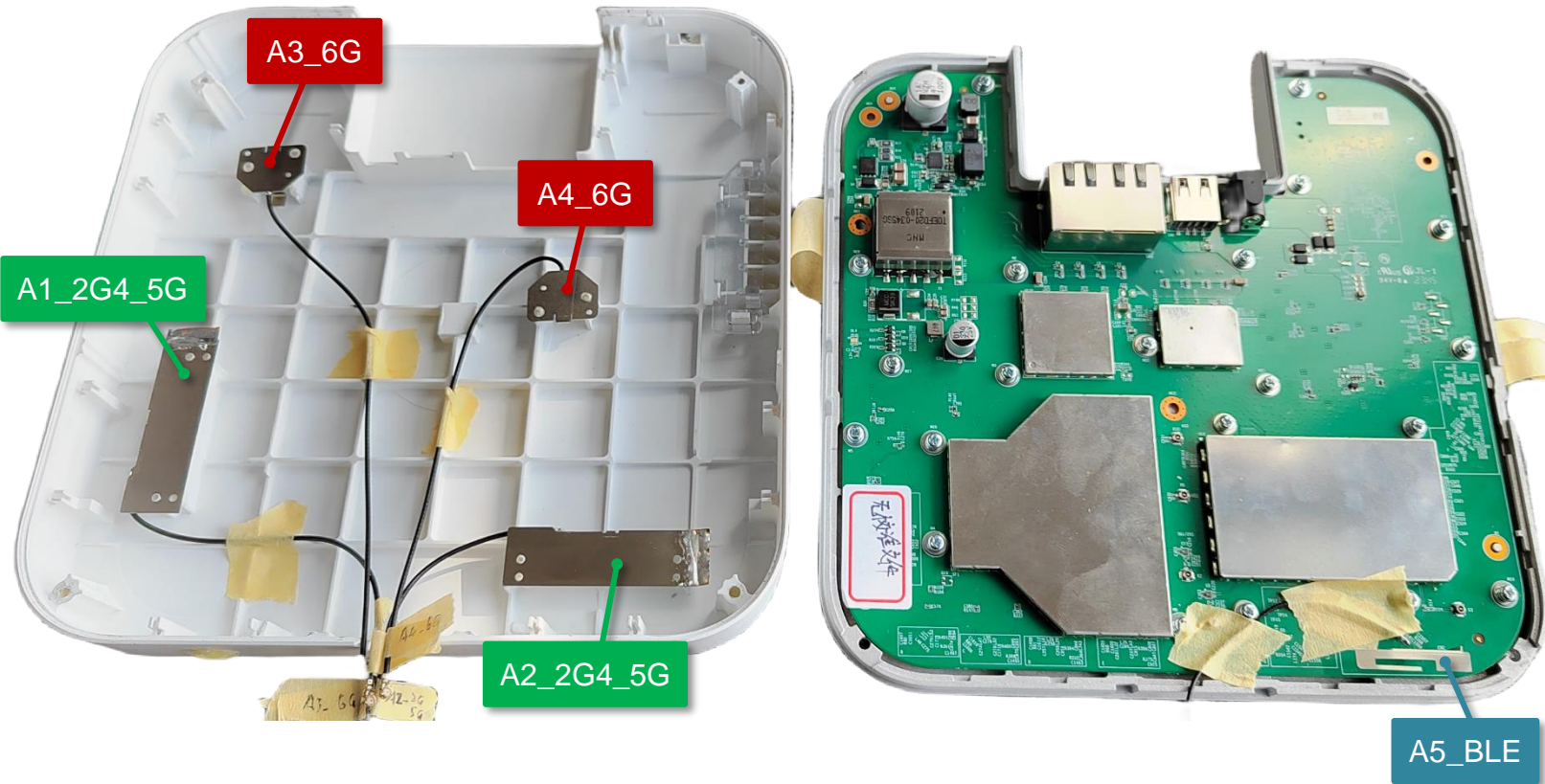
- **Basic Requirement**

- Frequency Range
 - Dual Band Antennas
 - 2400-2484MHz/5170-5835MHz
 - 6G Band Antennas
 - 5945-7125MHz
 - BLE Band Antenna
 - 2400-2500MHz
- Return Loss
 - >10dB for all Band Antennas
- Isolation
 - >20dB between same band antennas
 - >28dB between 5GHz and 6GHz
- Efficiency
 - >70% for all Band Antennas
- Peak Gain
 - 3-5dBi for all Band Antennas





AOT ANTENNA SOLUTIONS



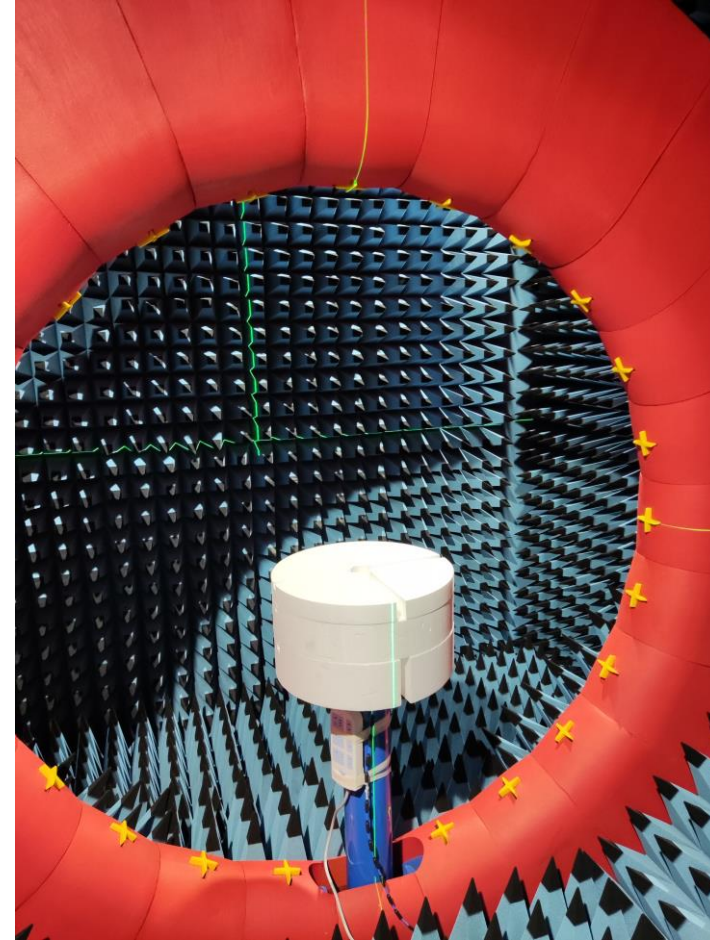
SIDE NOTES

- A1,A2 are for 2G4_5G Band Antennas
- A3,A4 are for 6G Band Antennas
- A5 is for BLE Band Antenna
- WIFI Antennas are installed on the top cover
- BLE Antenna is installed on the PCB

Measurement Configuration



Measurement Instrument



Chamber

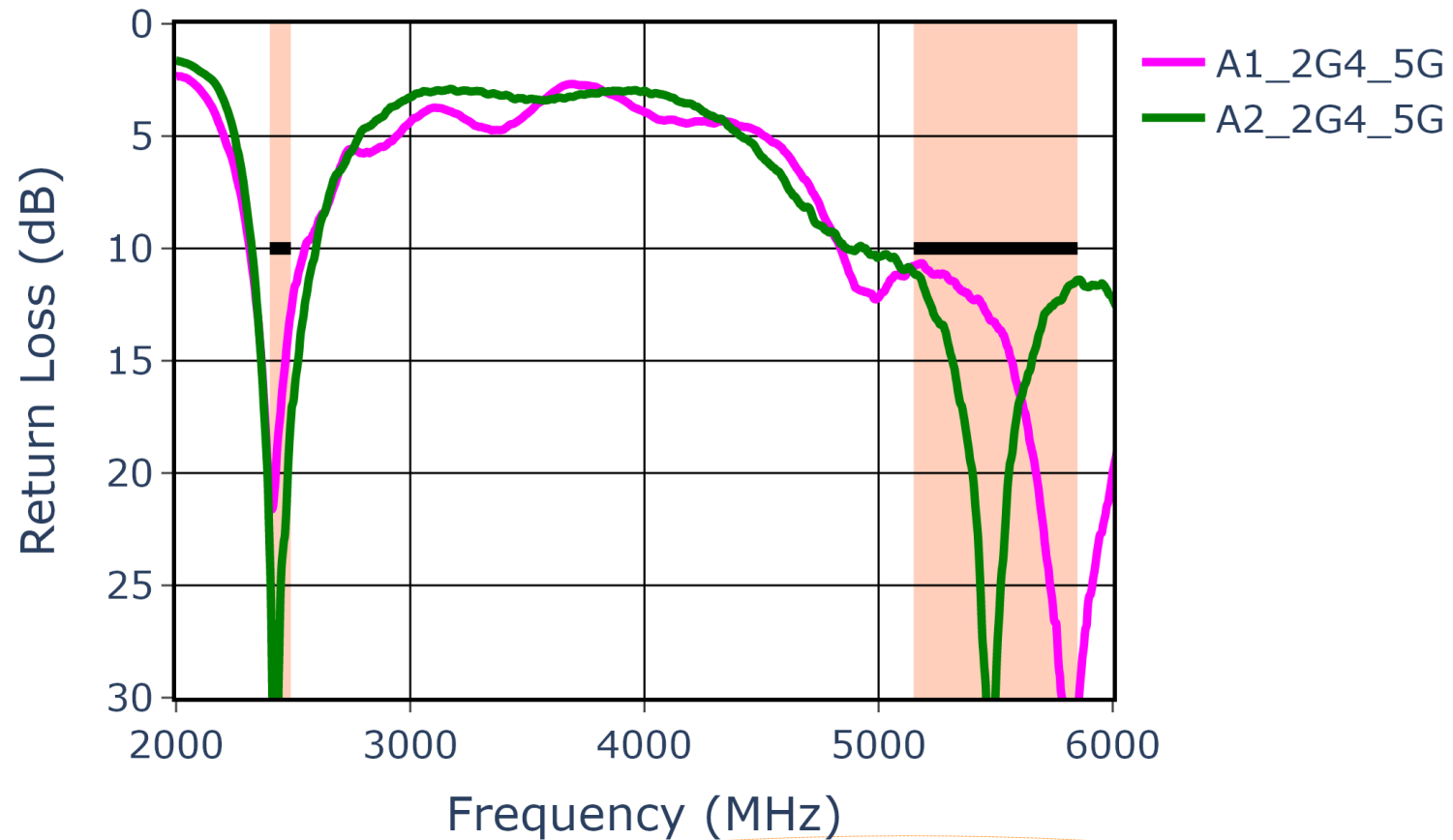
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Antenna Return Loss & Isolation

- Return Loss
- Isolation

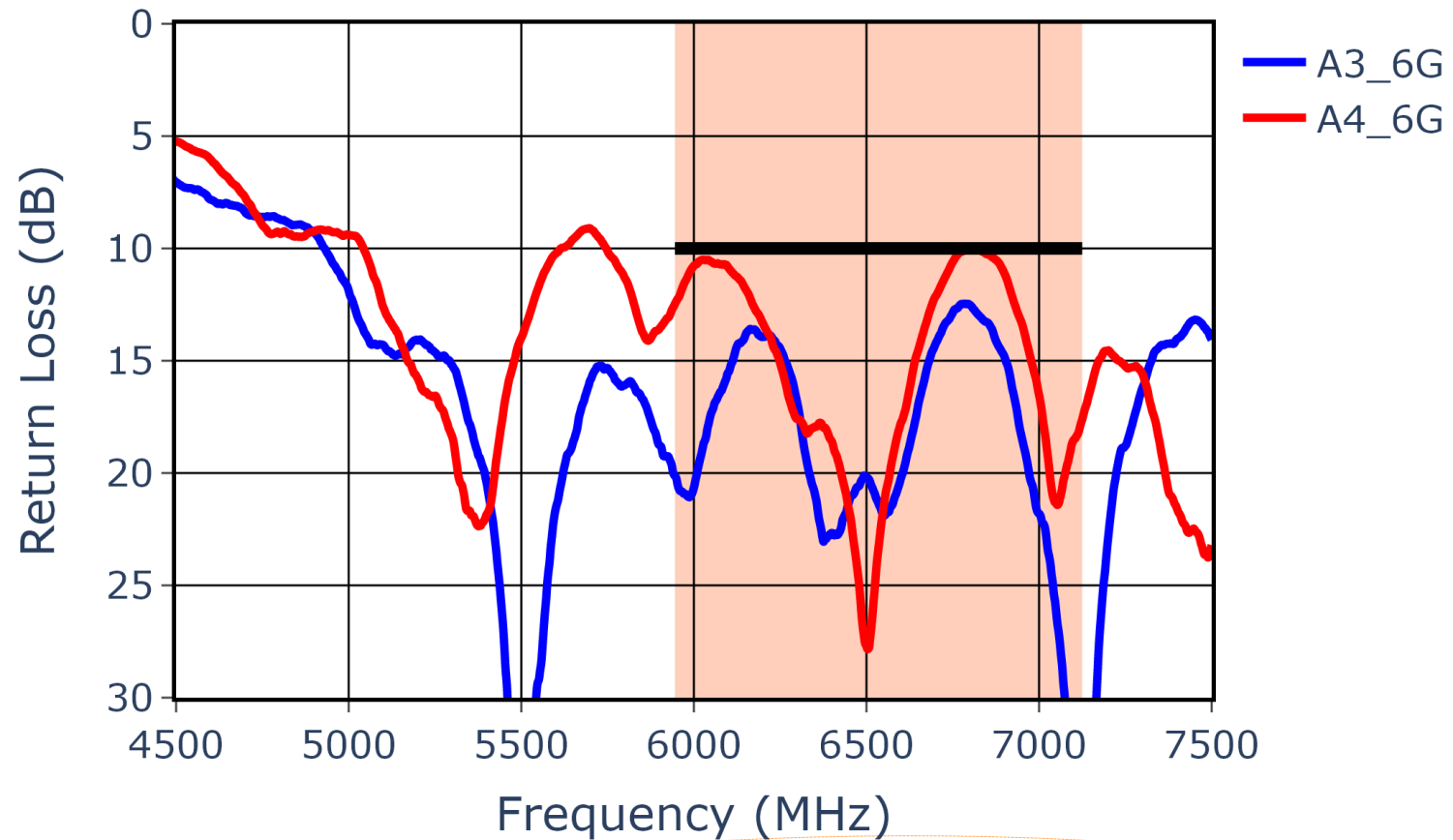


Return Loss of Dual Band Antennas



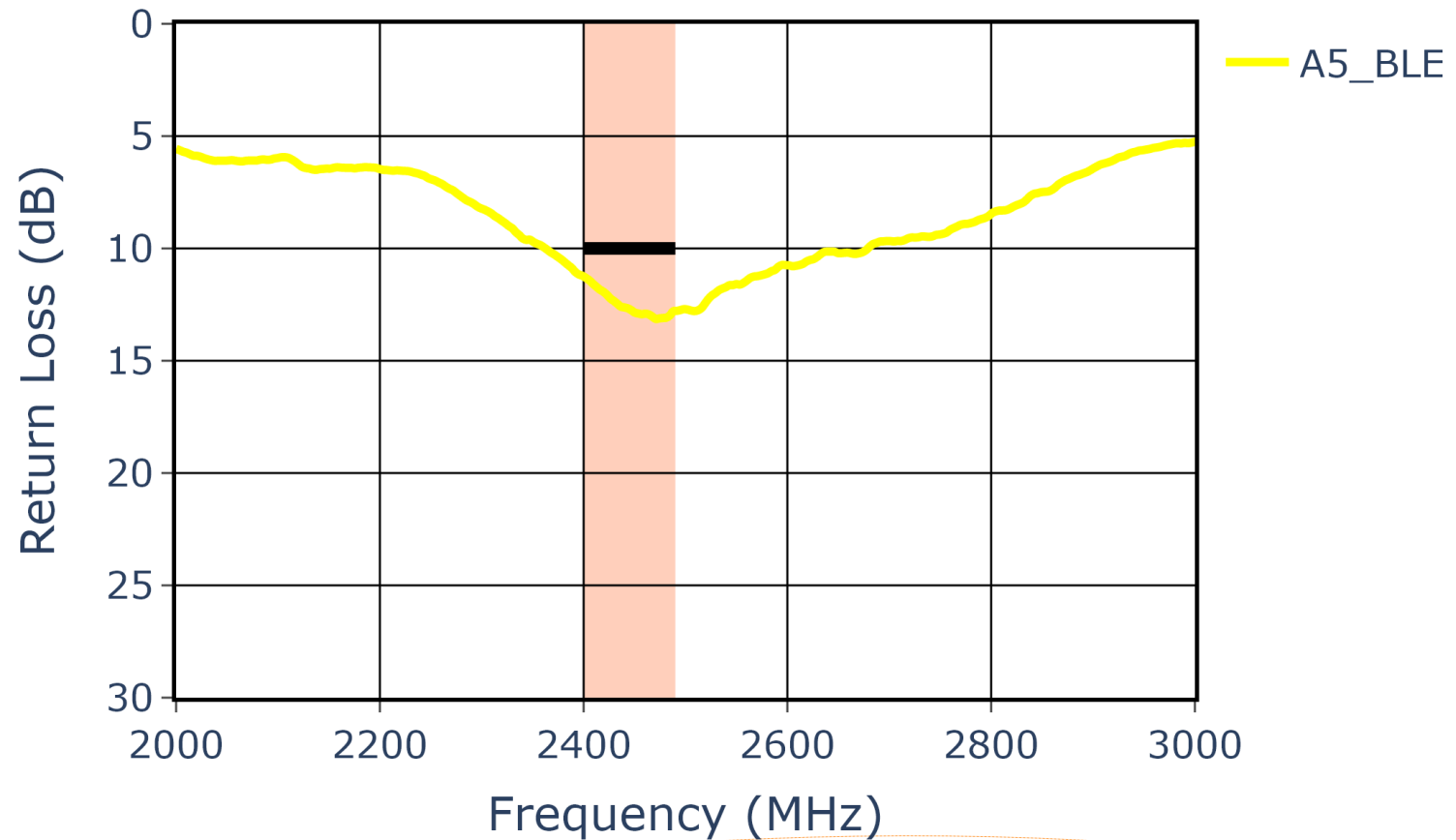


Return Loss of 6G Band Antennas

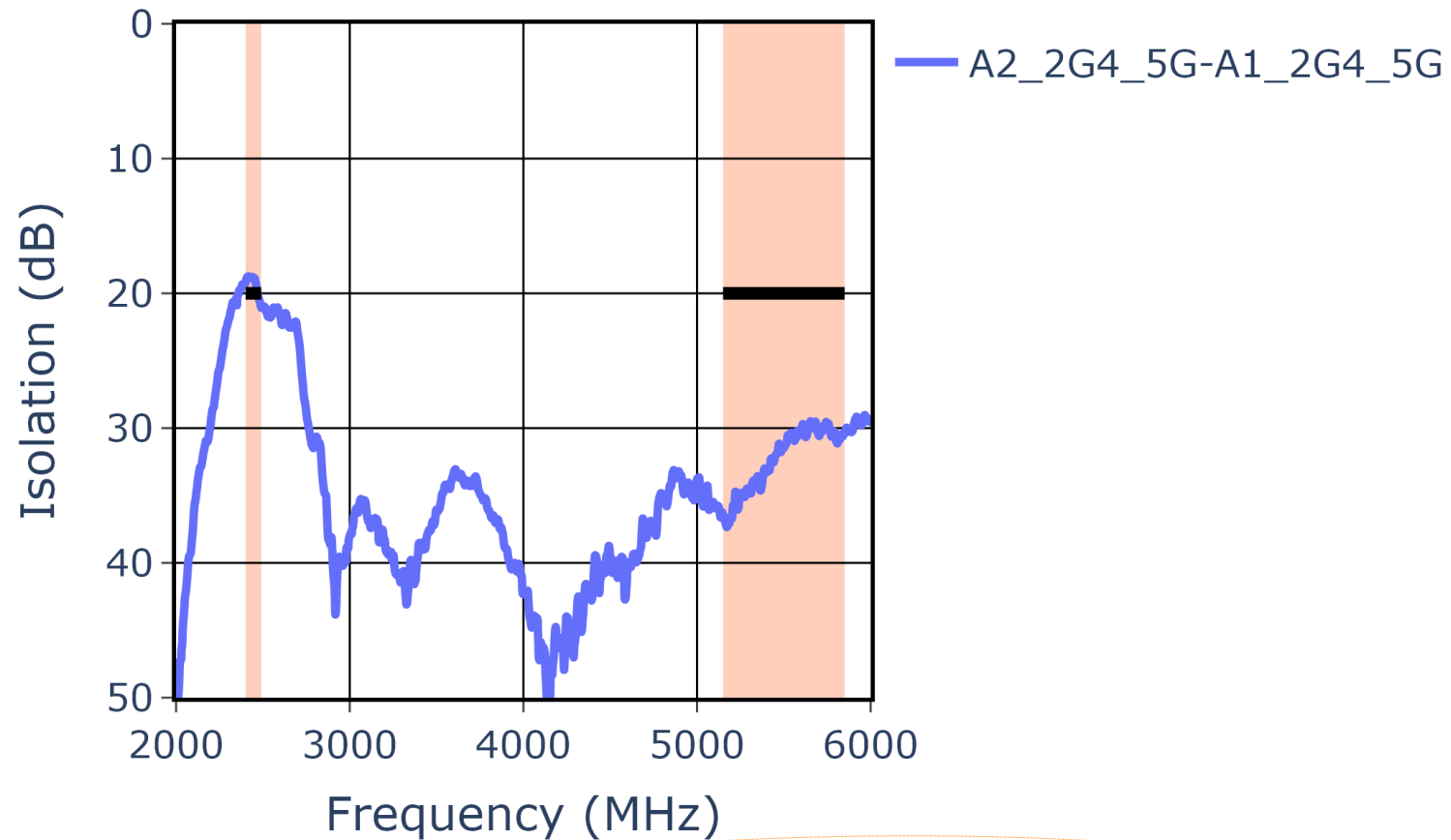




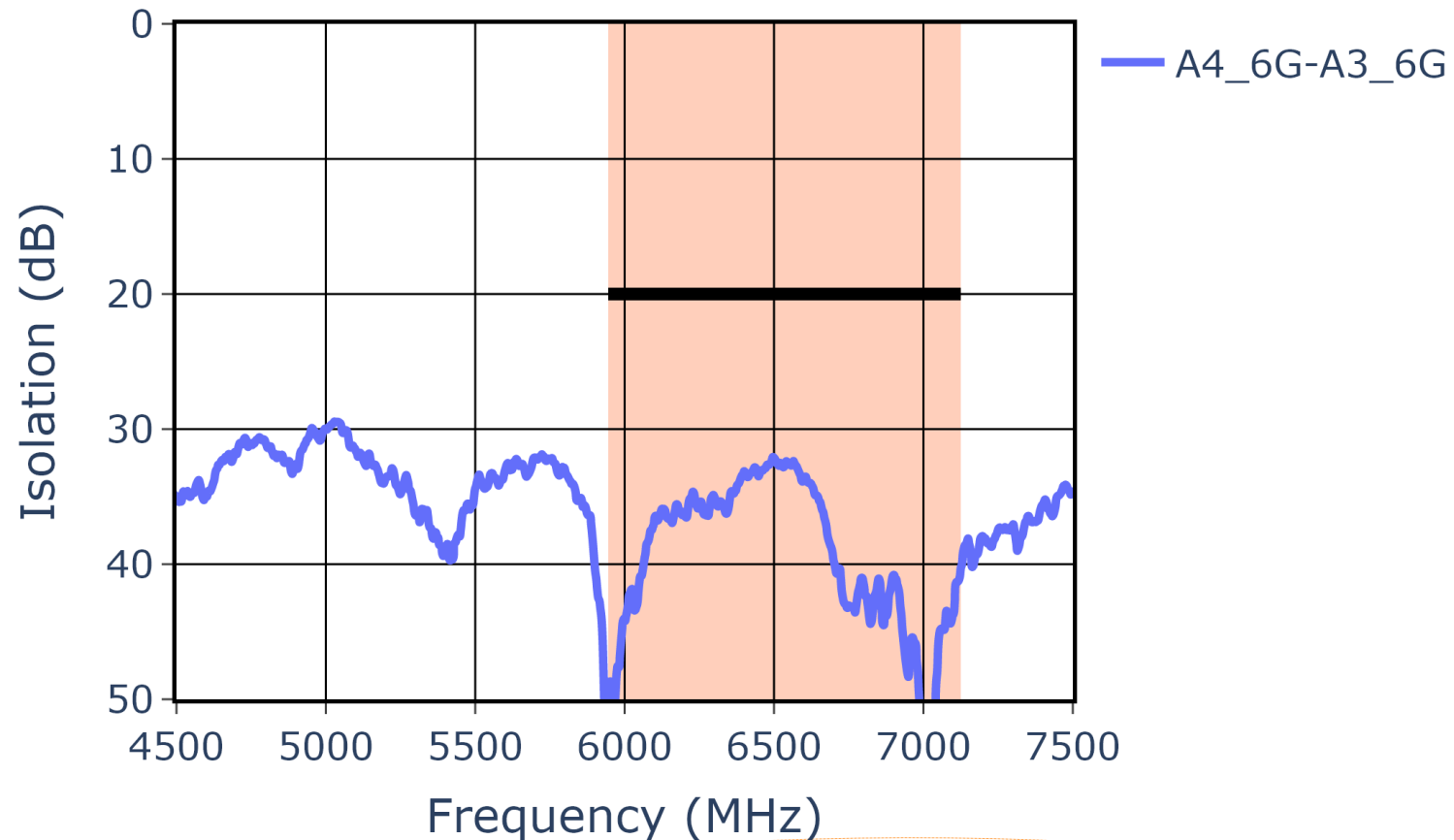
Return Loss of BLE Band Antenna



Isolation Between Dual Band Antennas

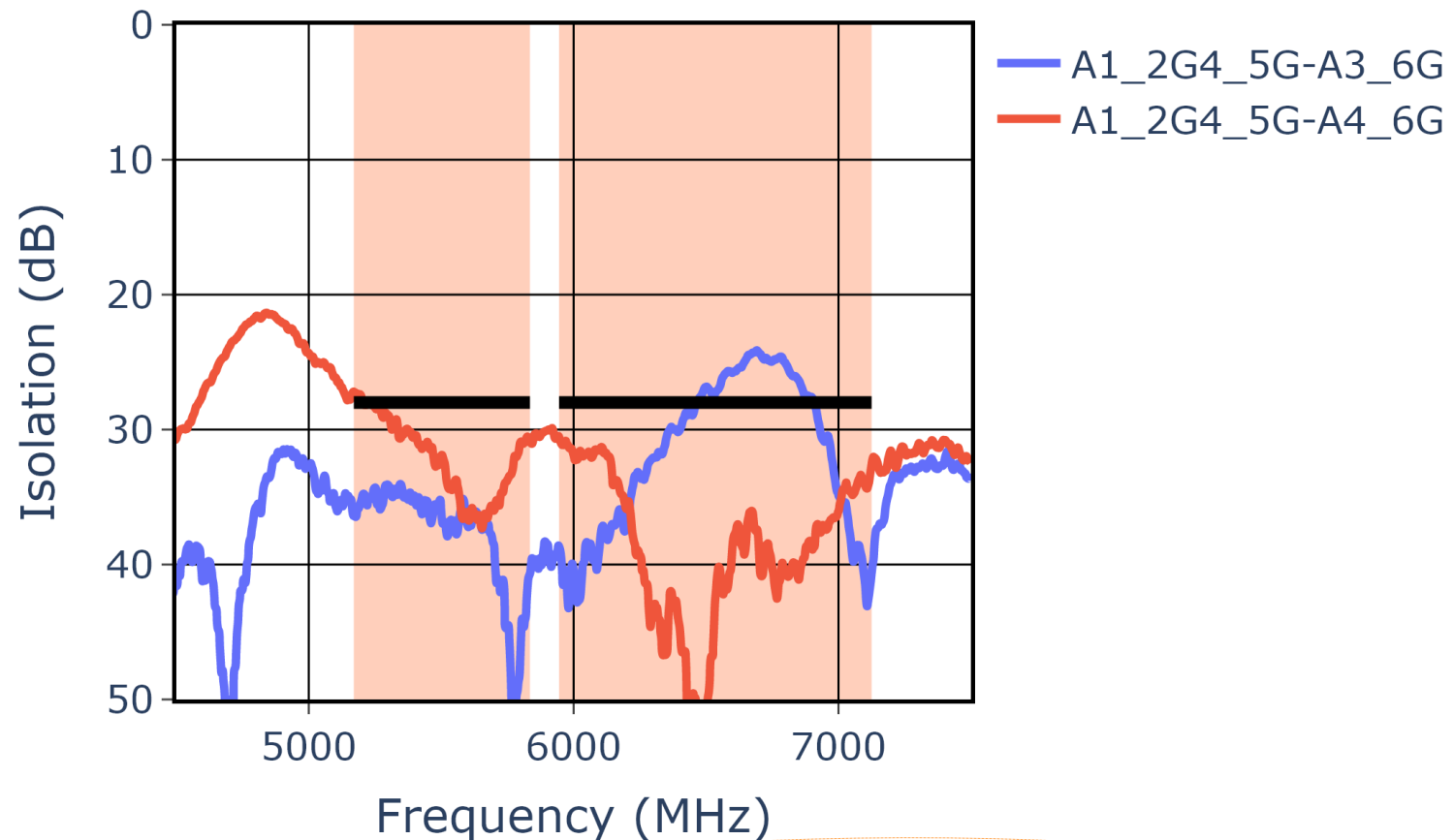


Isolation Between 6G Band Antennas



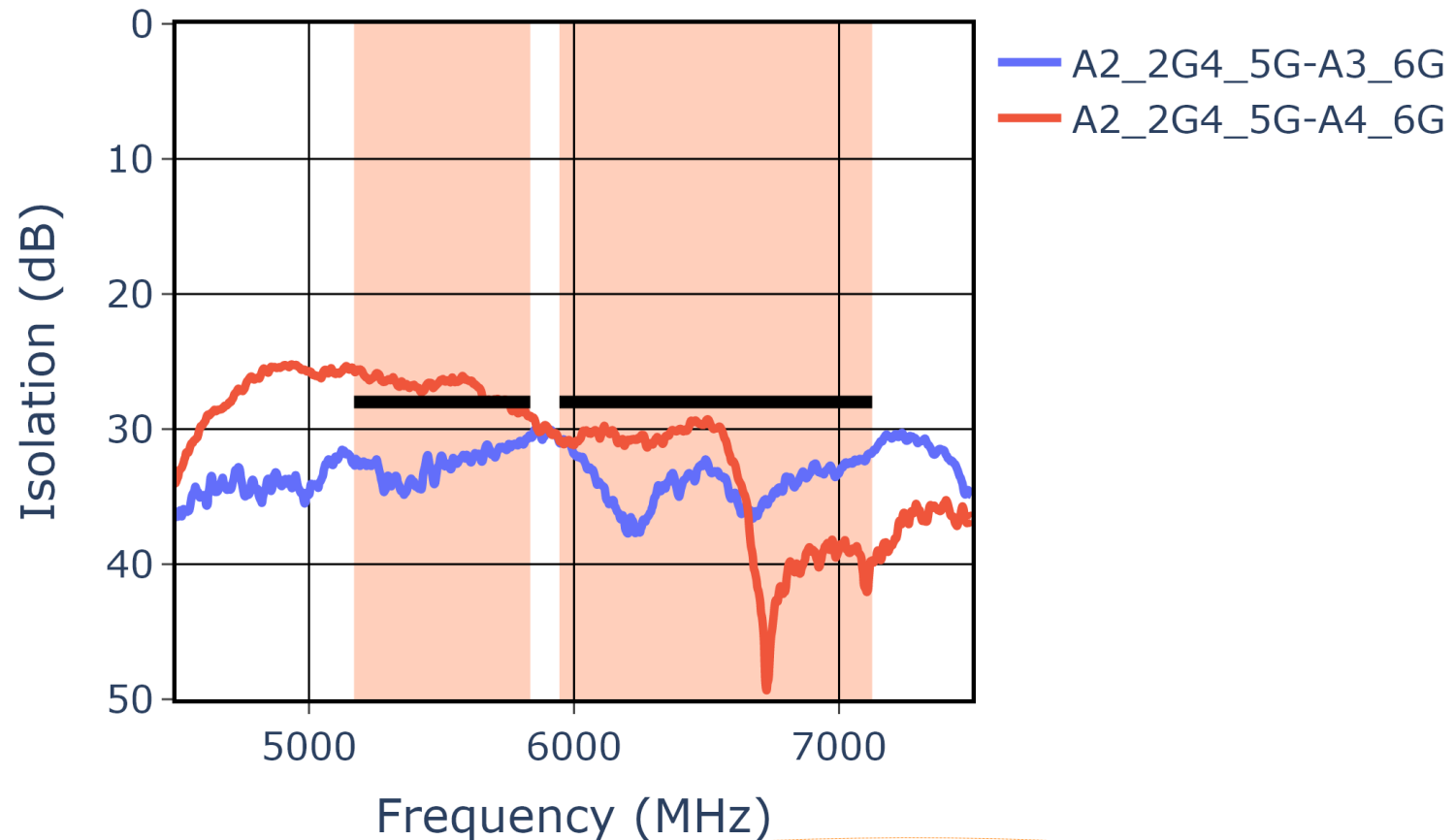


Isolation Between A1_2G4_5G and Remaining Antennas



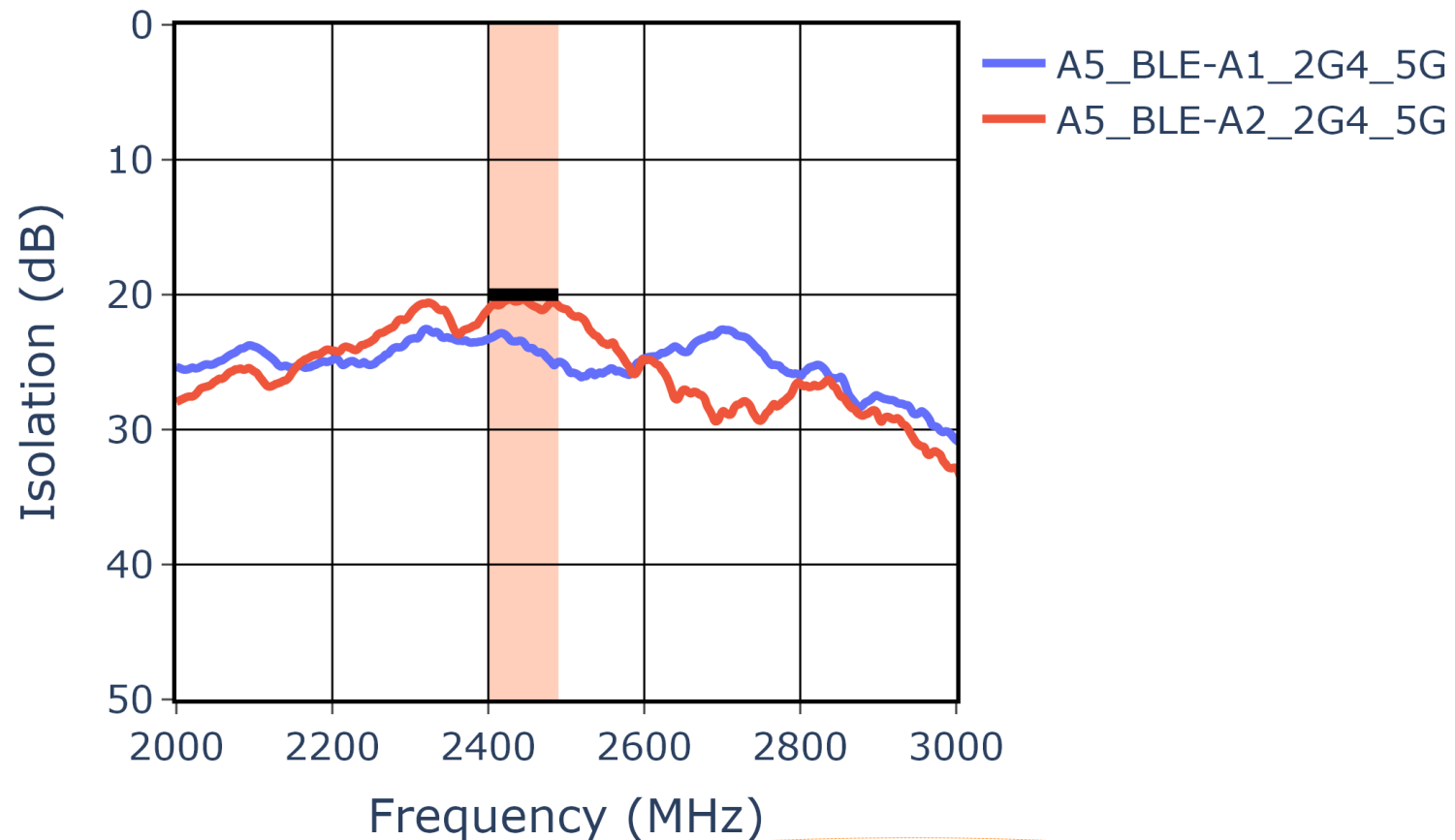


Isolation Between A2_2G4_5G and Remaining Antennas





Isolation Between A5_BLE and Remaining Antennas



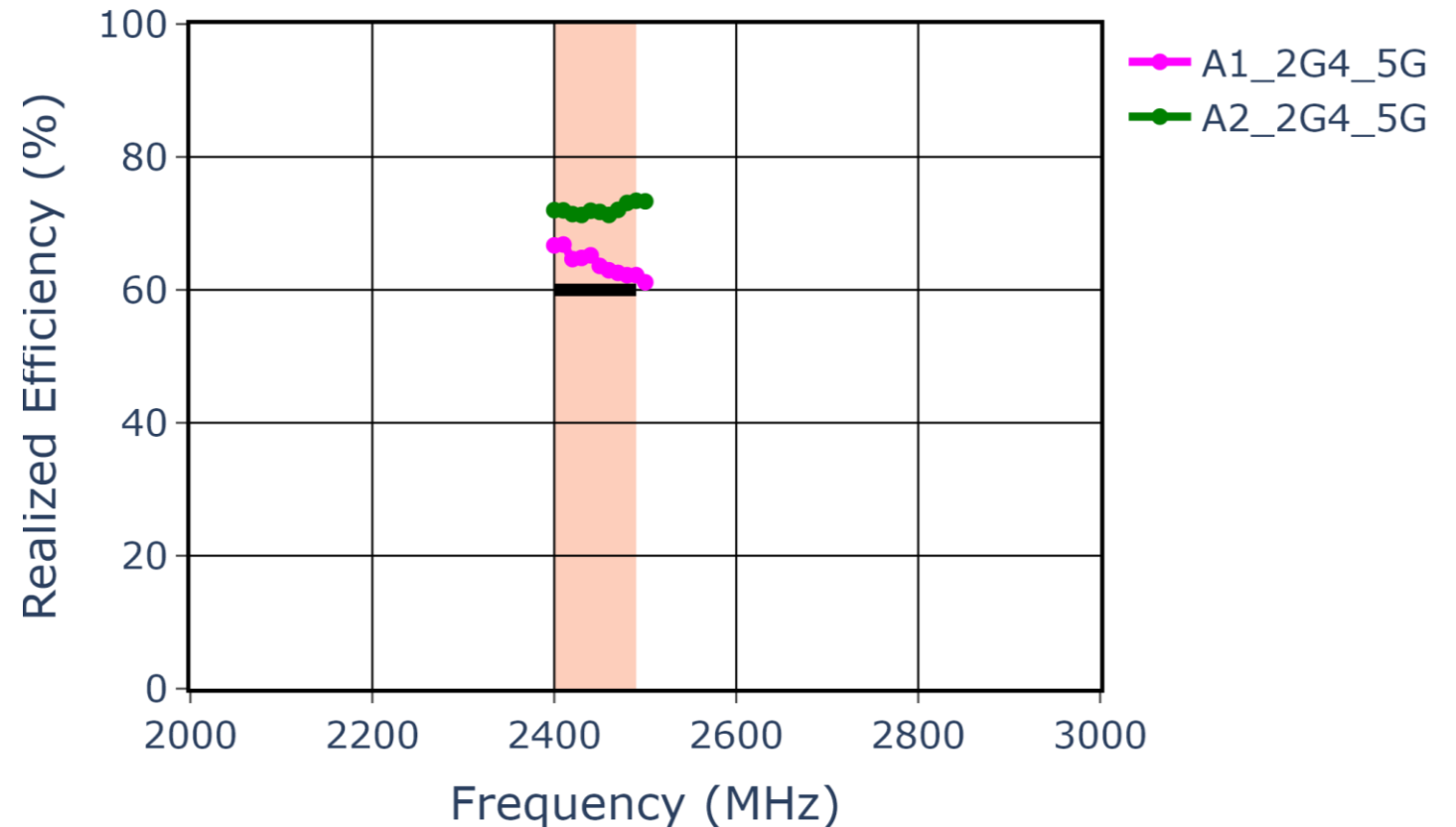
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Radiated Performance: Grouped by Antennas, Polarization: Total

- Realized Efficiency
- Peak Realized Gain

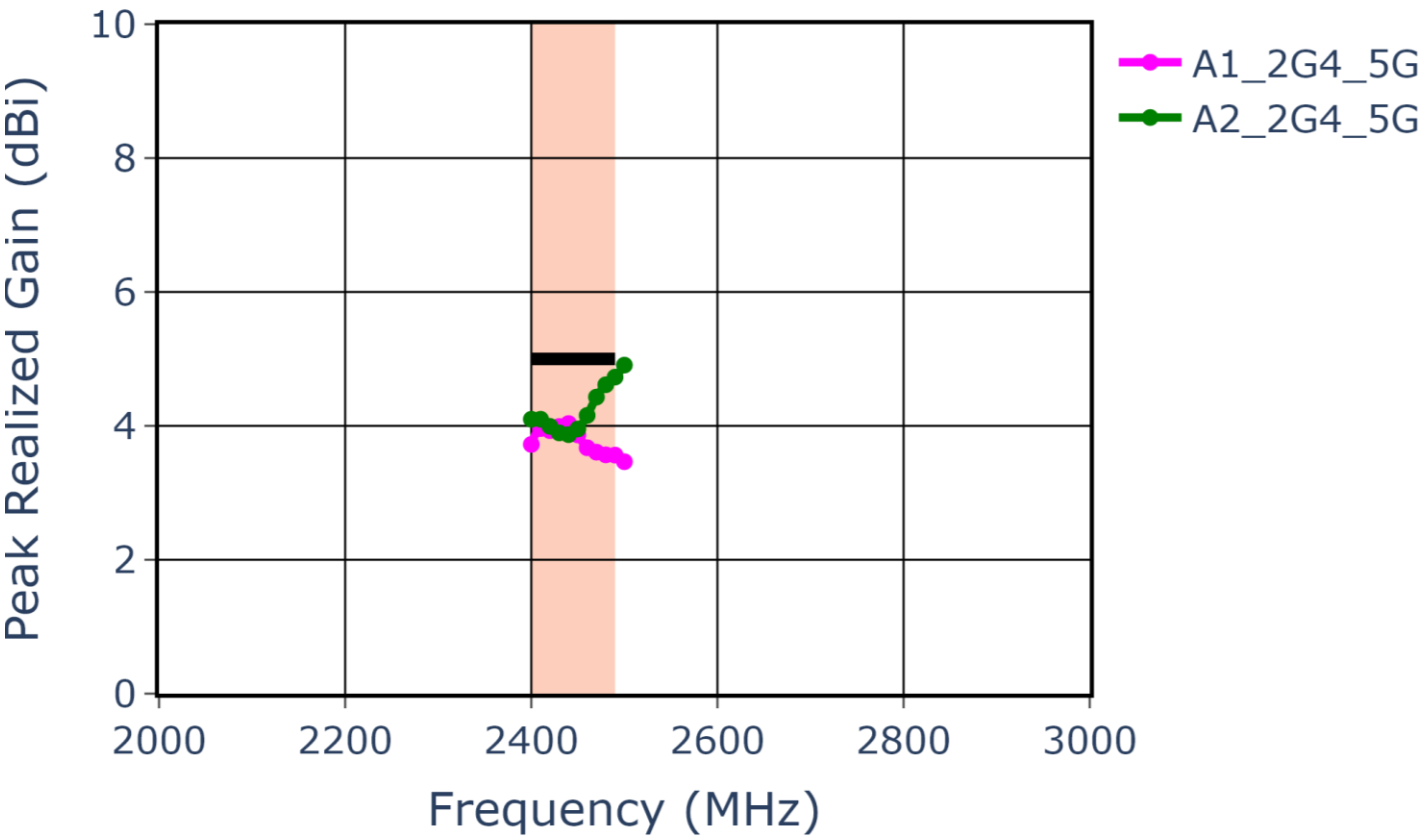
Realized Efficiency of Antennas in 2G4 Band

Frequency (MHz)	A1_2G4_5G (%)	A2_2G4_5G (%)
2400	67	72
2409	67	72
2417	65	72
2425	65	71
2433	65	71
2441	65	72
2450	64	72
2458	63	71
2466	63	72
2474	62	72
2482	62	73
2490	62	73



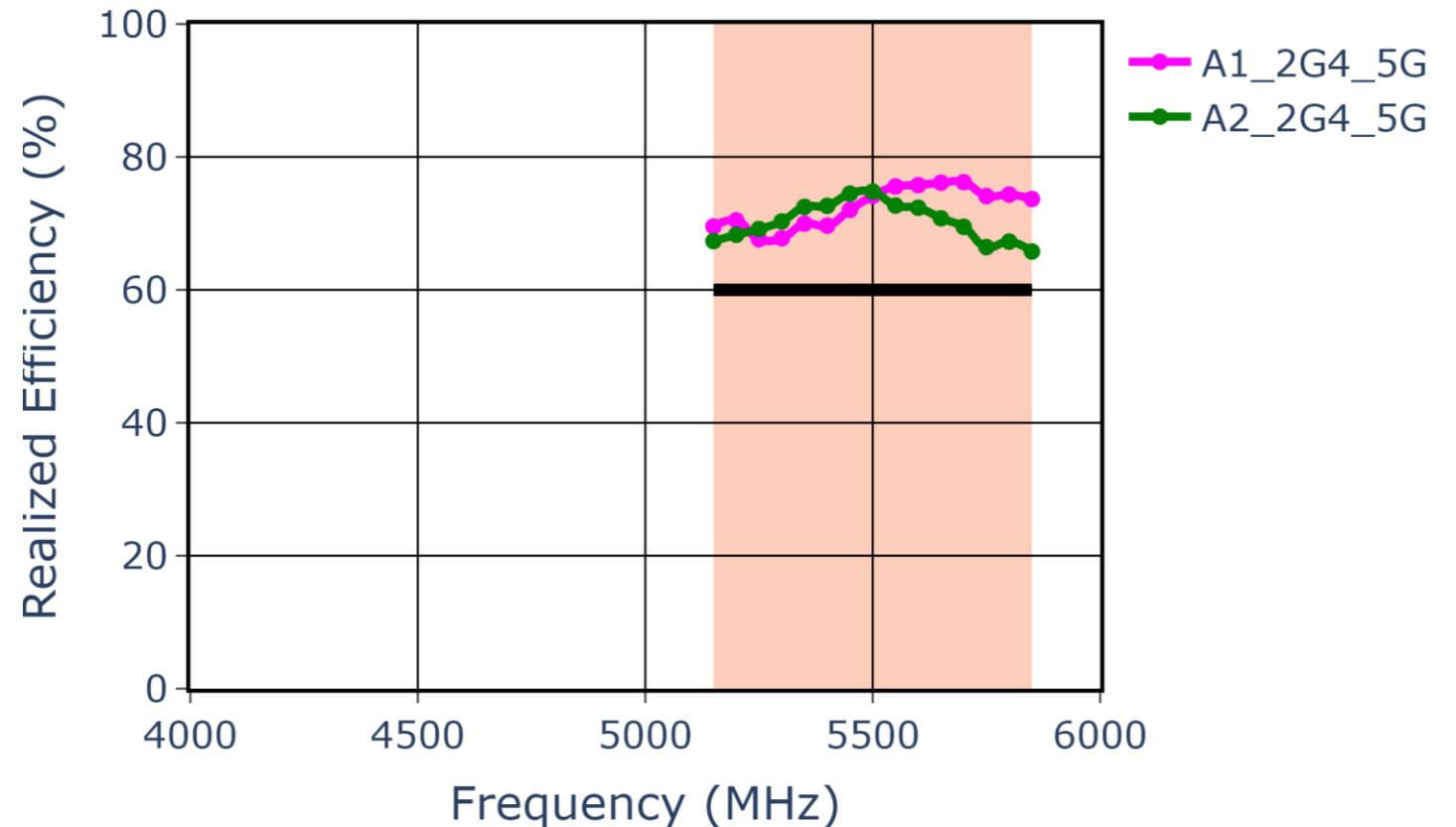
Peak Realized Gain of Antennas in 2G4 Band

Frequency (MHz)	A1_2G4_5G (dBi)	A2_2G4_5G (dBi)
2400	3.7	4.1
2409	3.9	4.1
2417	3.9	4.0
2425	4.0	3.9
2433	4.0	3.9
2441	4.0	3.9
2450	3.9	4.0
2458	3.7	4.1
2466	3.6	4.3
2474	3.6	4.5
2482	3.6	4.6
2490	3.6	4.7



Realized Efficiency of Antennas in 5G Band

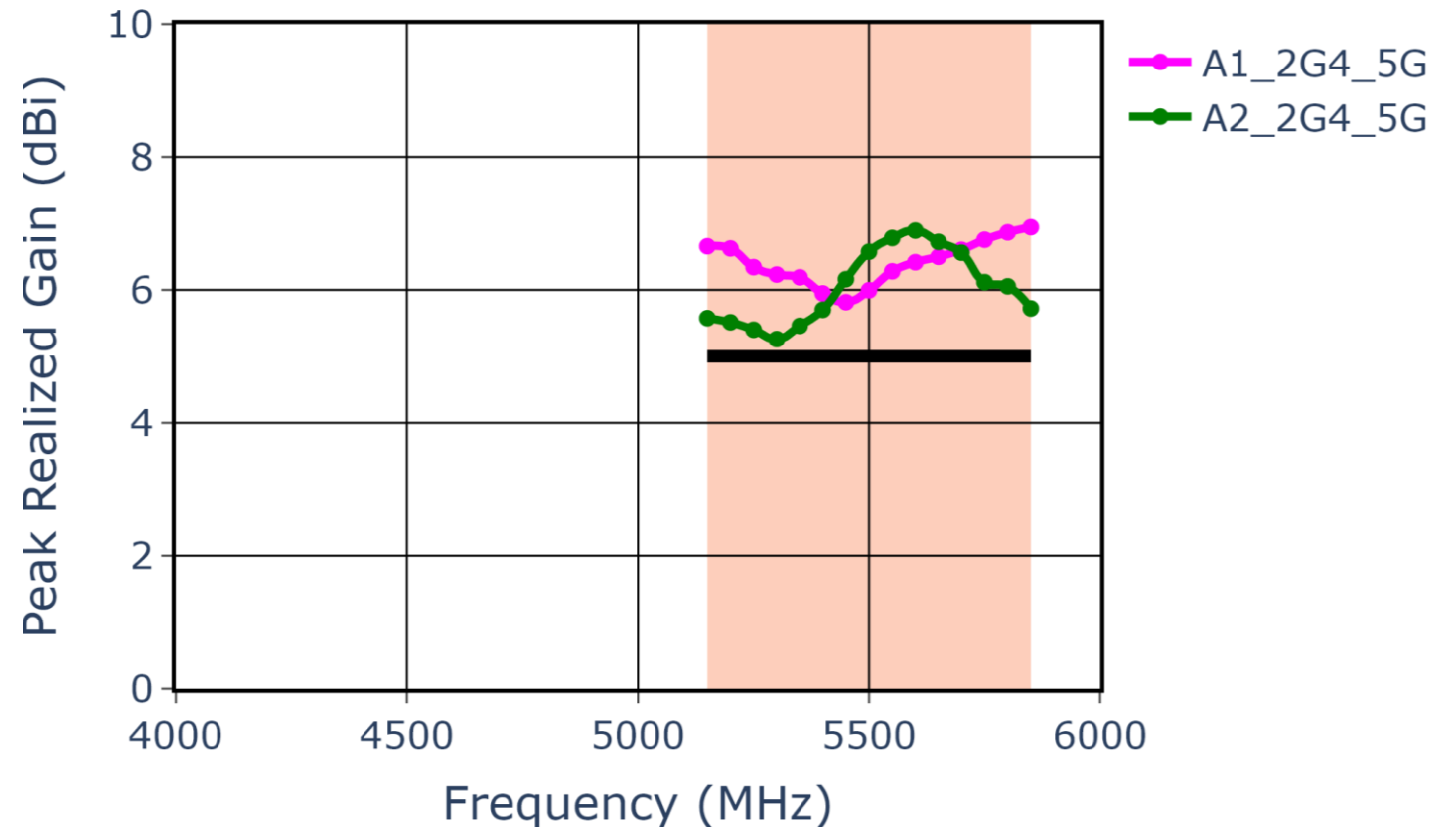
Frequency (MHz)	A1_2G4_5G (%)	A2_2G4_5G (%)
5150	70	67
5214	70	69
5278	68	70
5341	70	72
5405	70	73
5469	73	75
5532	75	73
5596	76	72
5660	76	71
5723	75	68
5787	74	67
5850	74	66





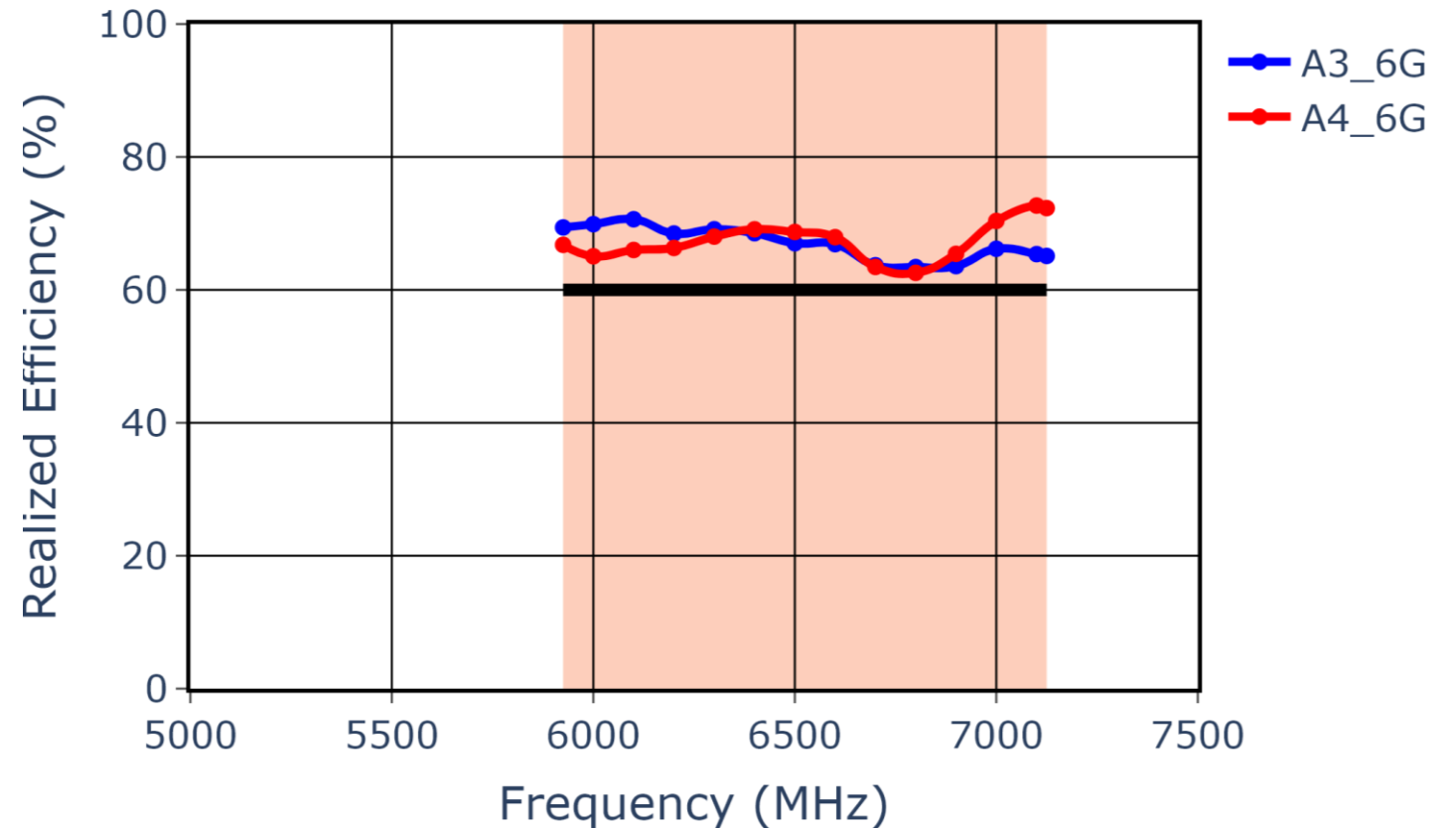
Peak Realized Gain of Antennas in 5G Band

Frequency (MHz)	A1_2G4_5G (dBi)	A2_2G4_5G (dBi)
5150	6.7	5.6
5214	6.5	5.5
5278	6.3	5.3
5341	6.2	5.4
5405	5.9	5.7
5469	5.9	6.3
5532	6.2	6.7
5596	6.4	6.9
5660	6.5	6.7
5723	6.7	6.4
5787	6.8	6.1
5850	6.9	5.7



Realized Efficiency of Antennas in 6G Band

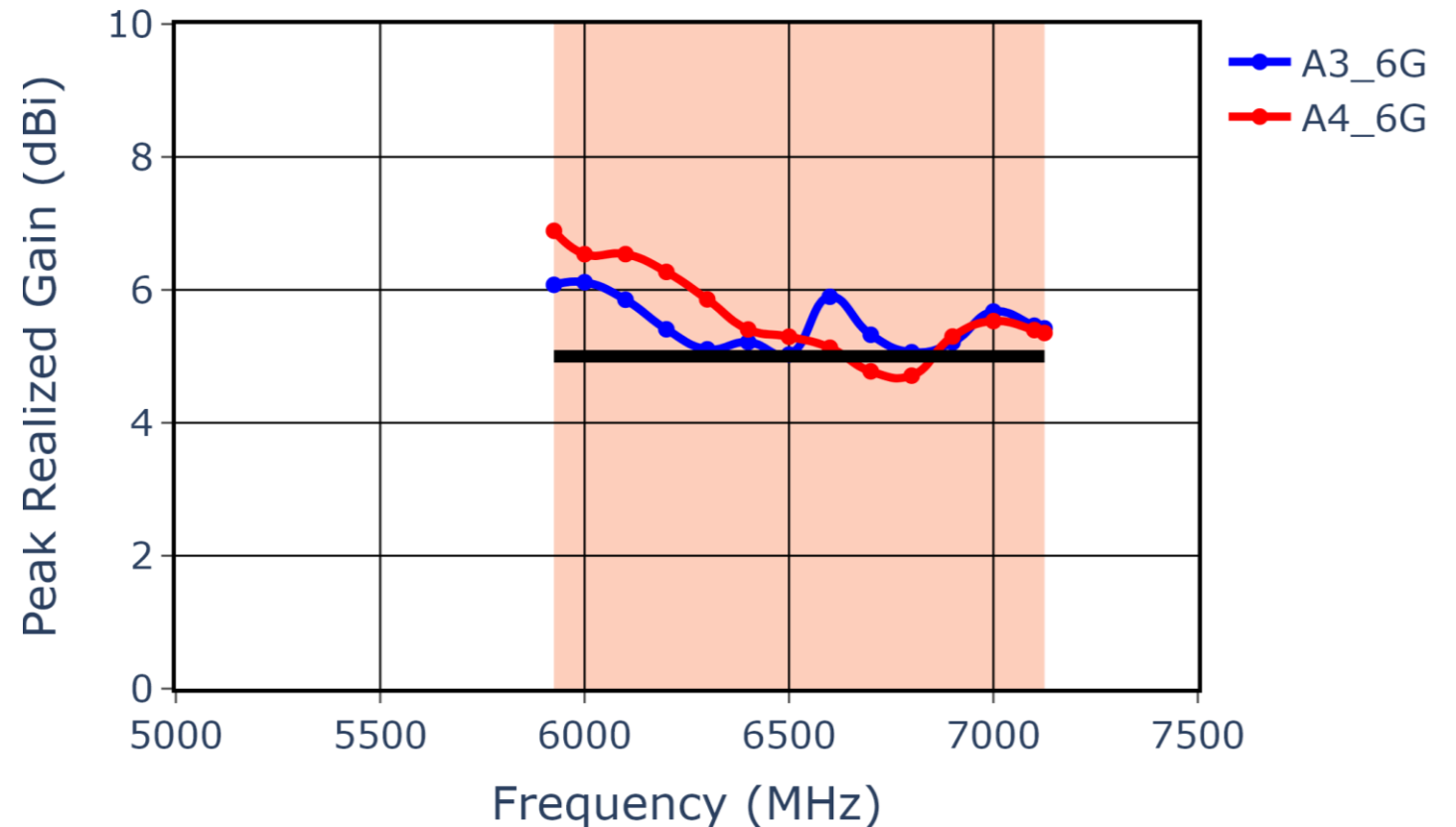
Frequency (MHz)	A3_6G (%)	A4_6G (%)
5925	69	67
6035	70	65
6144	70	66
6253	69	67
6362	69	69
6471	67	69
6580	67	68
6689	64	64
6798	63	63
6907	64	66
7016	66	71
7125	65	72





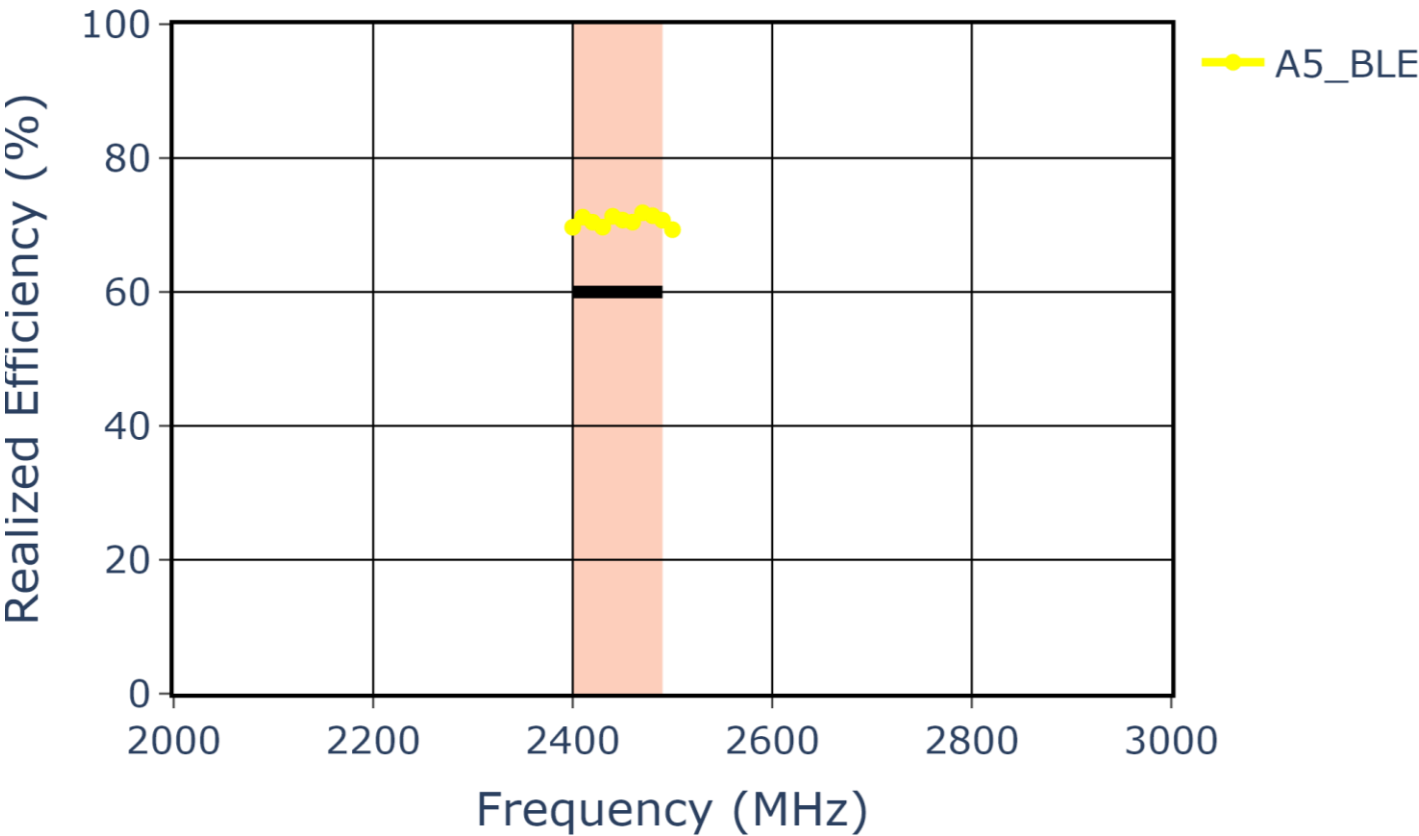
Peak Realized Gain of Antennas in 6G Band

Frequency (MHz)	A3_6G (dBi)	A4_6G (dBi)
5925	6.1	6.9
6035	6.0	6.5
6144	5.7	6.4
6253	5.2	6.1
6362	5.2	5.6
6471	5.1	5.3
6580	5.7	5.2
6689	5.4	4.8
6798	5.1	4.7
6907	5.2	5.3
7016	5.6	5.5
7125	5.4	5.4



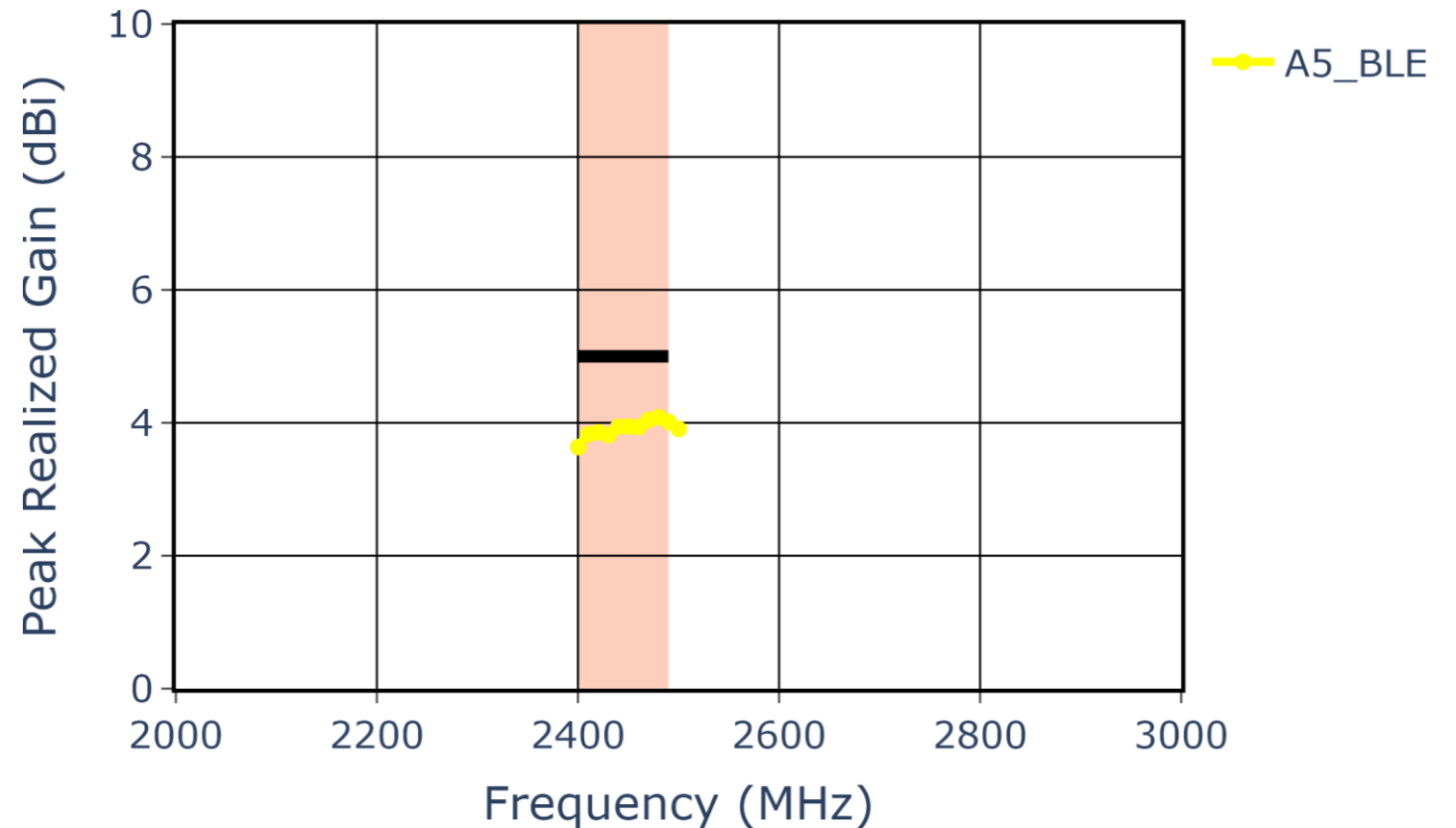
Realized Efficiency of Antennas in BLE Band

Frequency (MHz)	A5_BLE (%)
2400	70
2409	71
2417	71
2425	70
2433	70
2441	71
2450	71
2458	70
2466	71
2474	72
2482	71
2490	71



Peak Realized Gain of Antennas in BLE Band

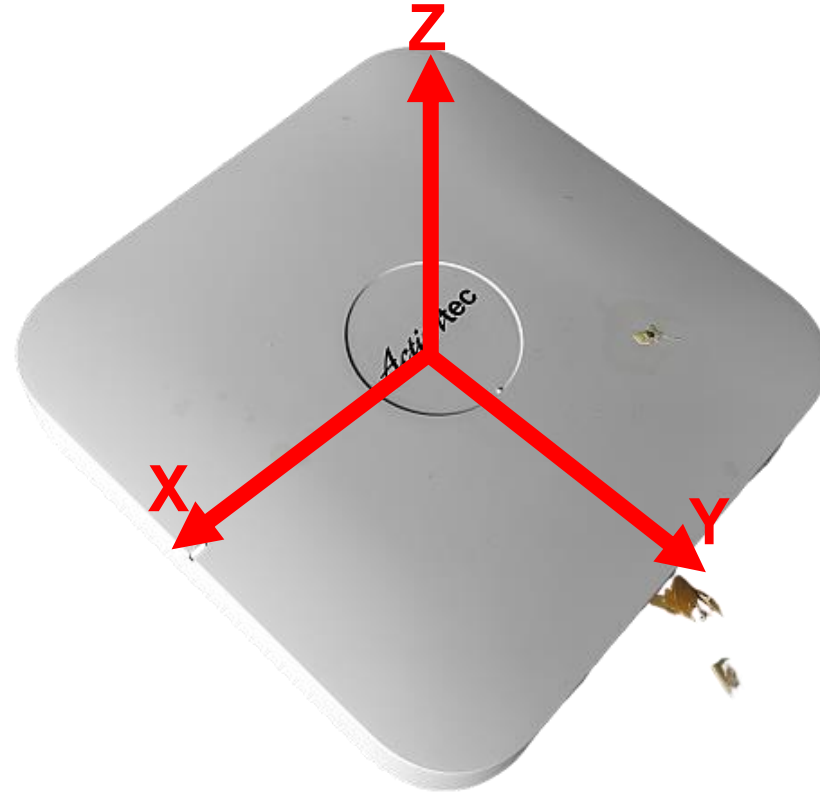
Frequency (MHz)	A5_BLE (dBi)
2400	3.6
2409	3.8
2417	3.8
2425	3.8
2433	3.9
2441	3.9
2450	3.9
2458	3.9
2466	4.0
2474	4.1
2482	4.1
2490	4.0





REALIZED GAIN RADIATION PATTERNS

Orientation Of Dut For Radiation Pattern Visualization

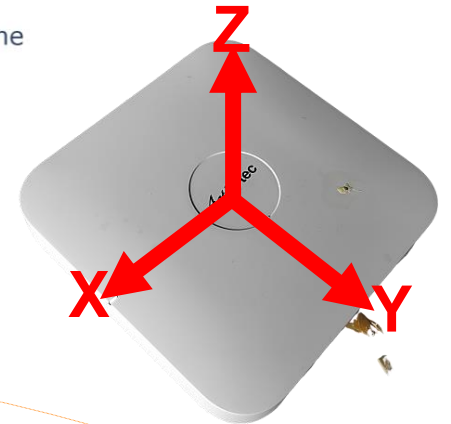
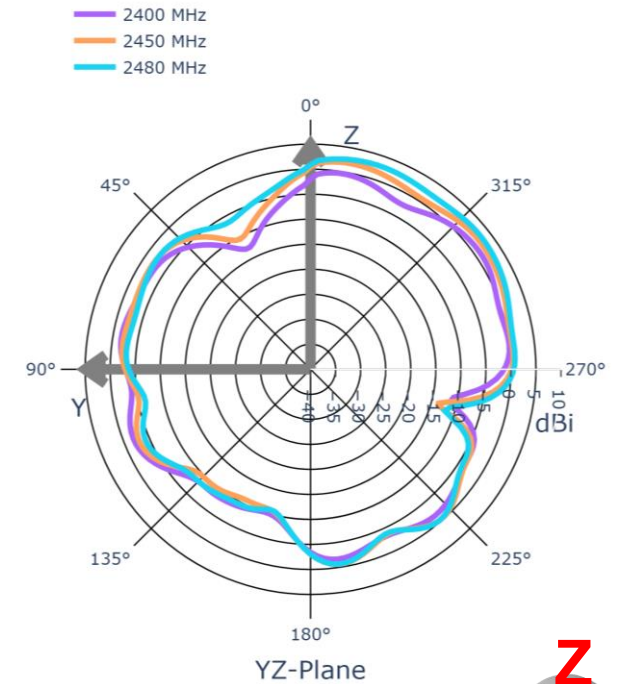
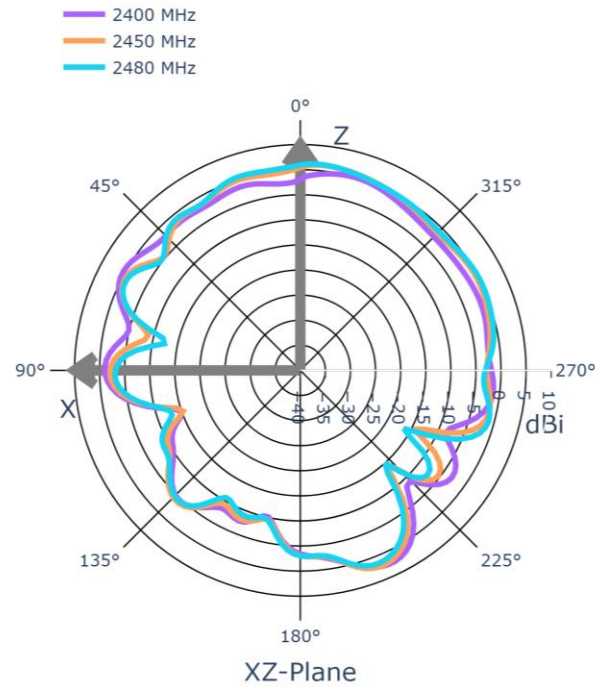
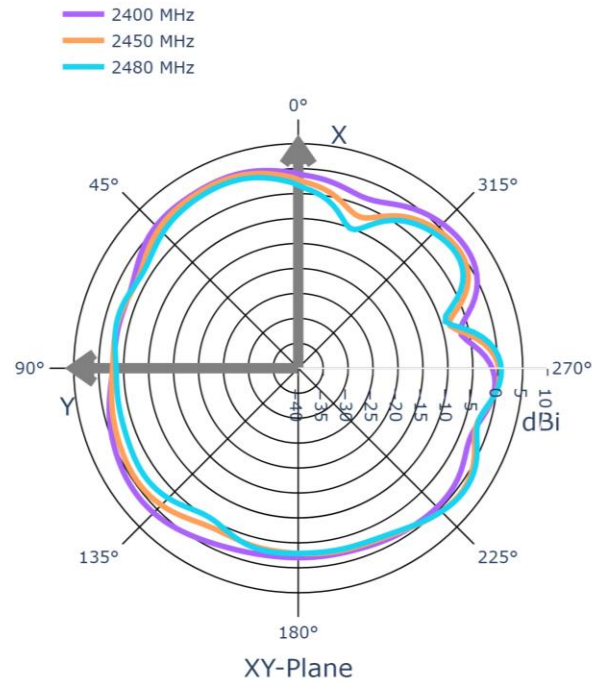




Realized Gain Radiation Patterns of A1_2G4_5G Antenna in 2G4 Band: Total Polarization



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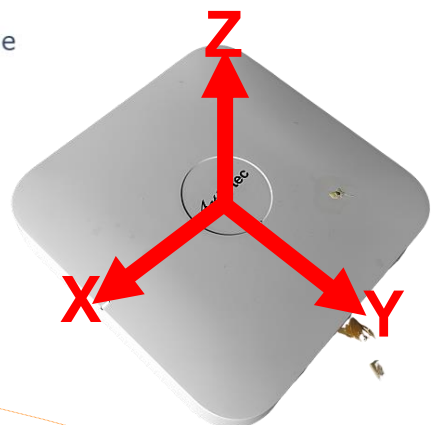
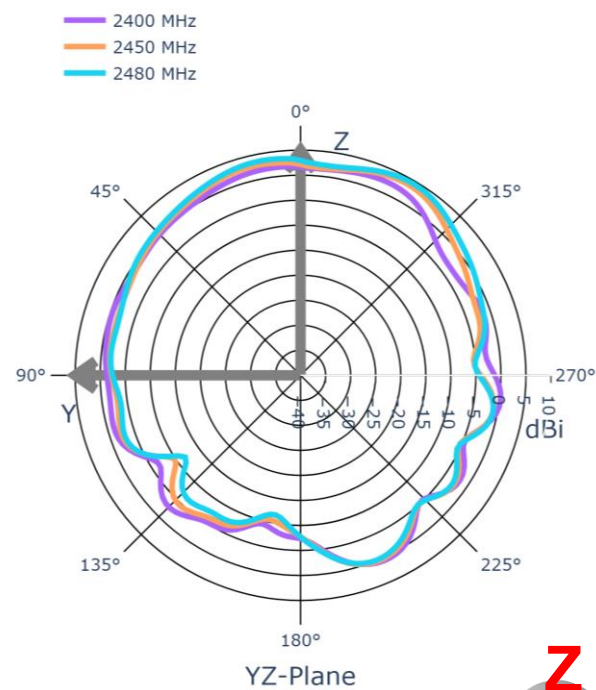
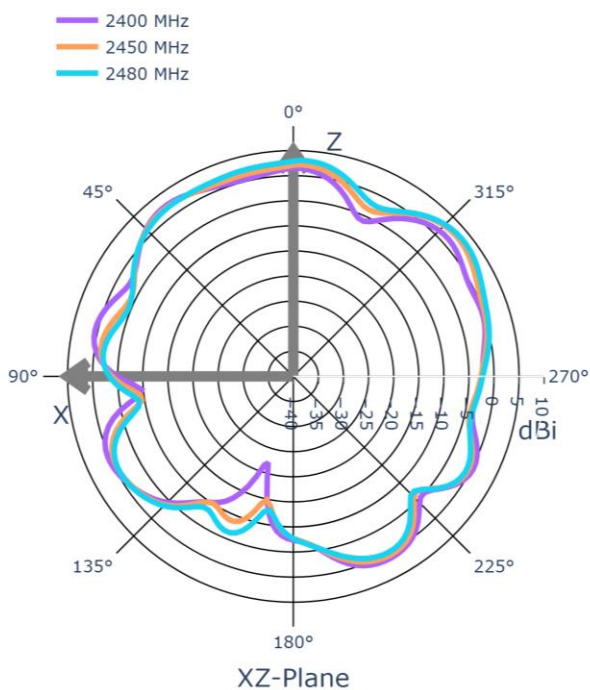
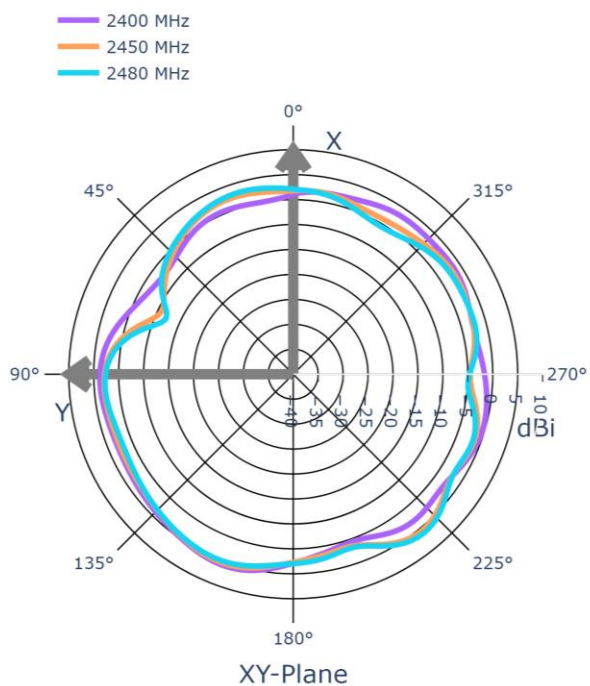




Realized Gain Radiation Patterns of A2_2G4_5G Antenna in 2G4 Band: Total Polarization



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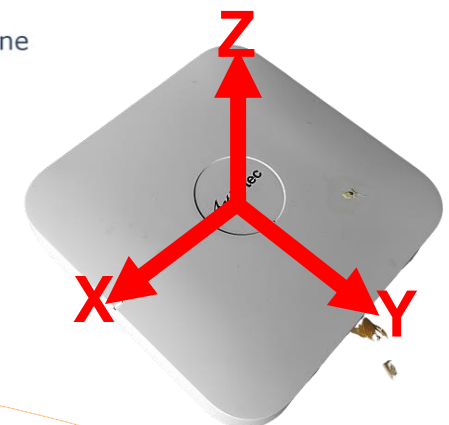
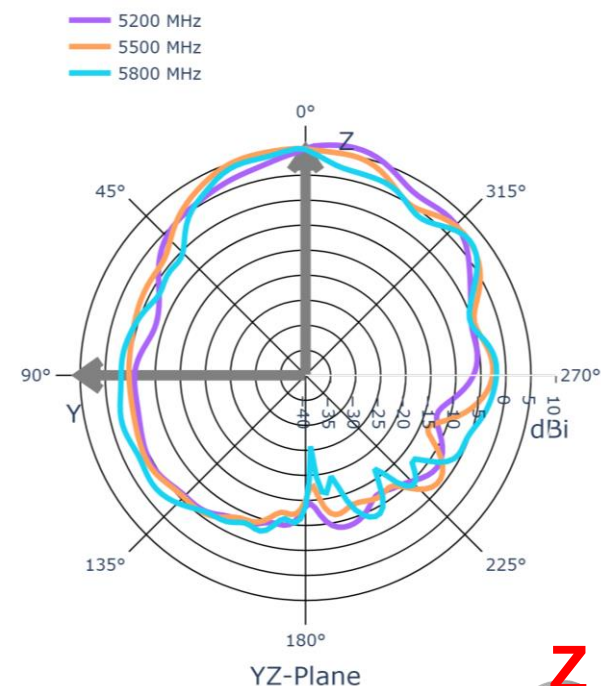
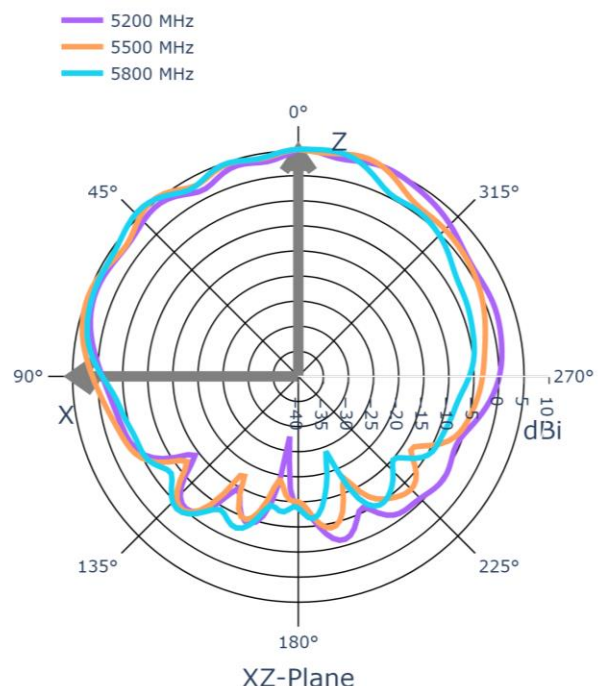
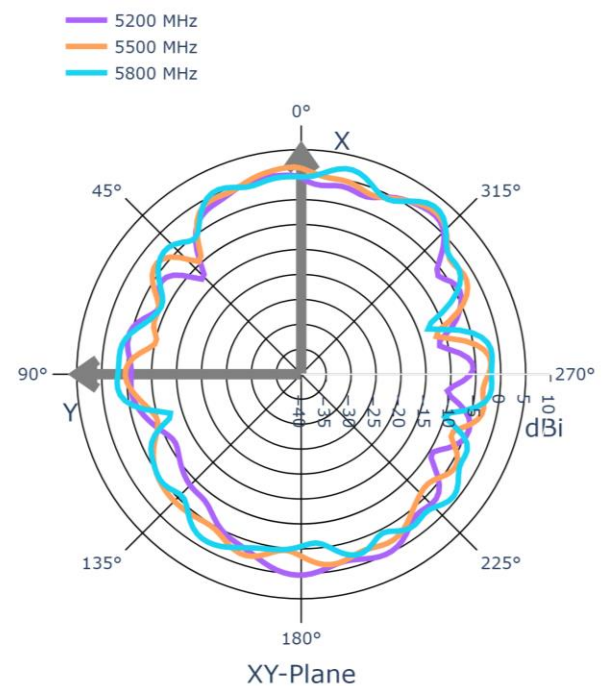




Realized Gain Radiation Patterns of A1_2G4_5G Antenna in 5G Band: Total Polarization



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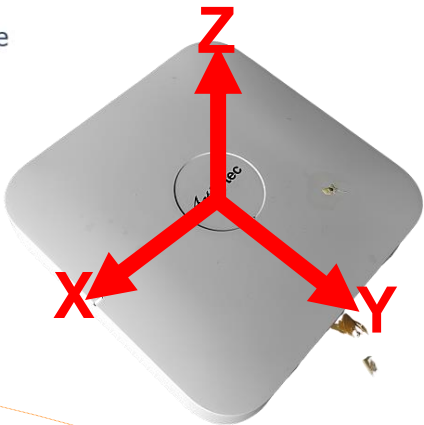
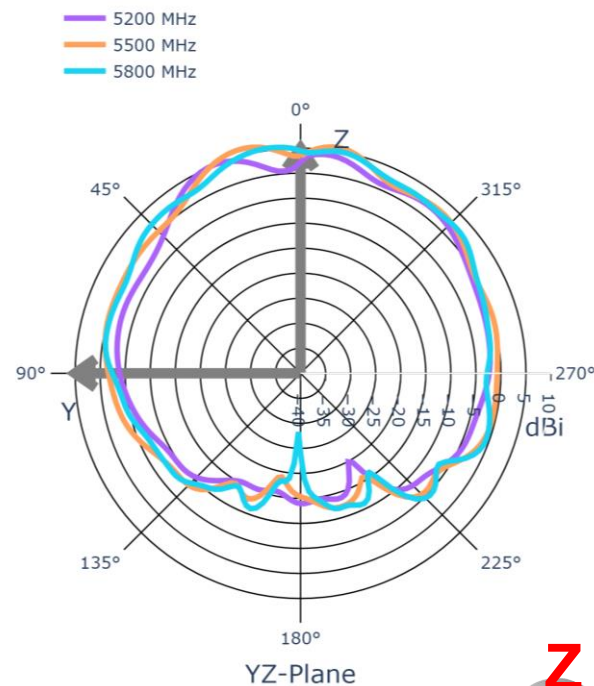
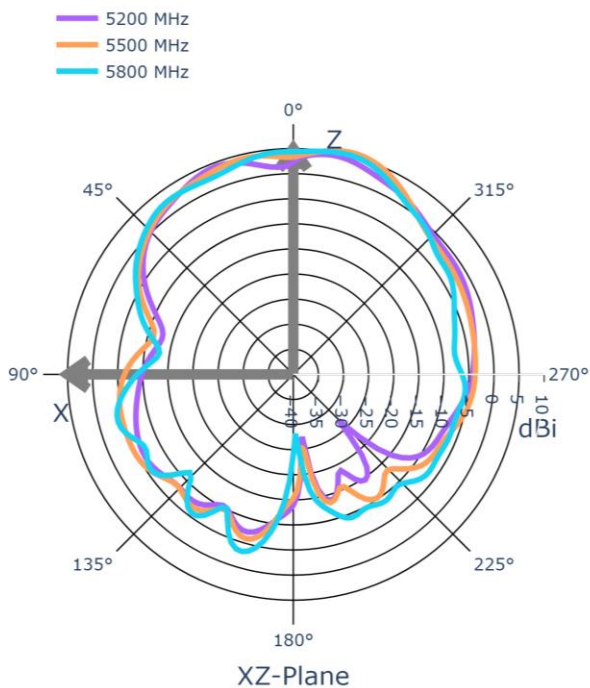
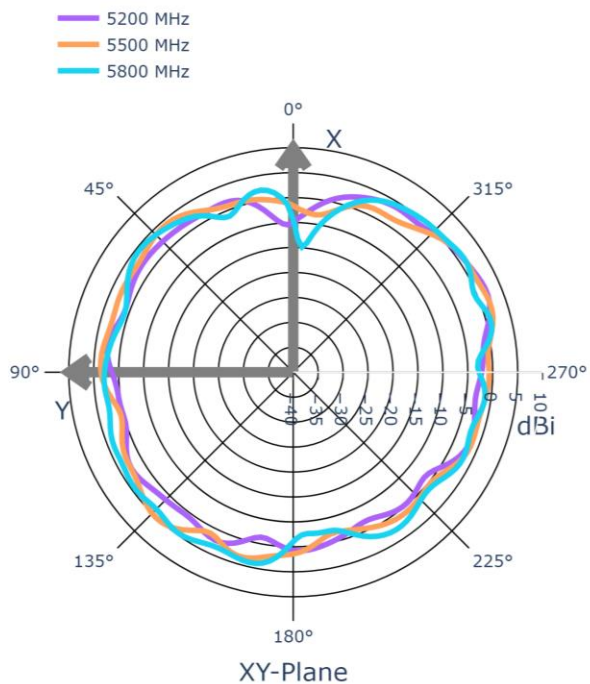




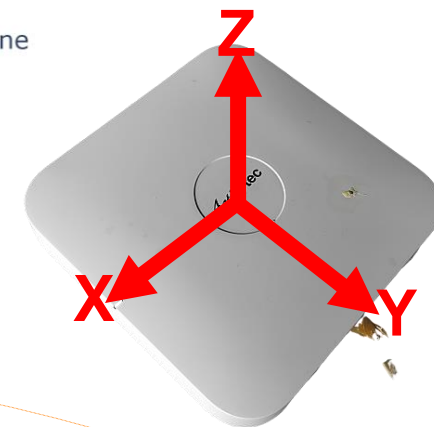
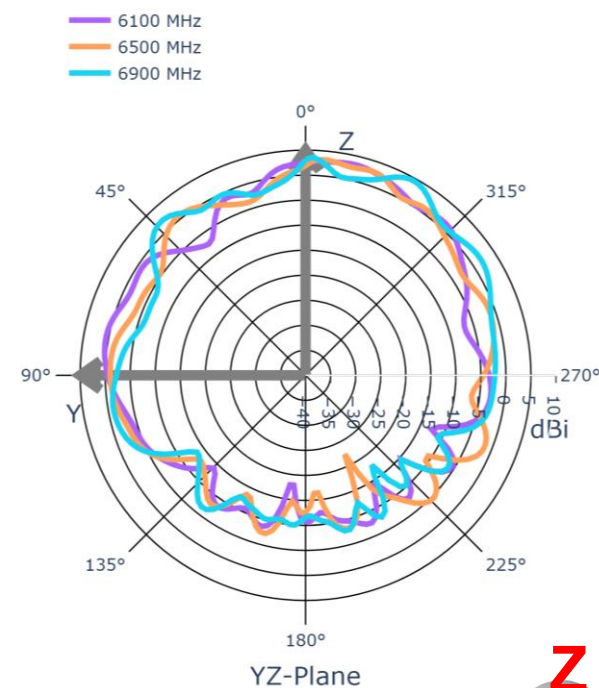
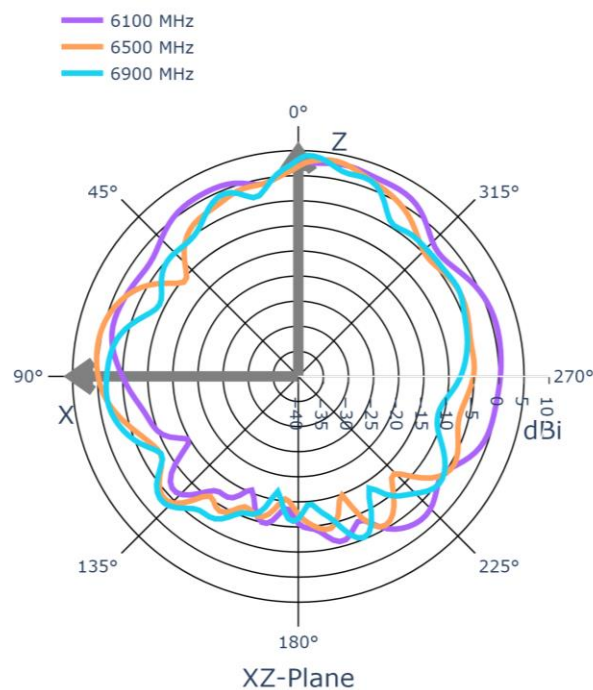
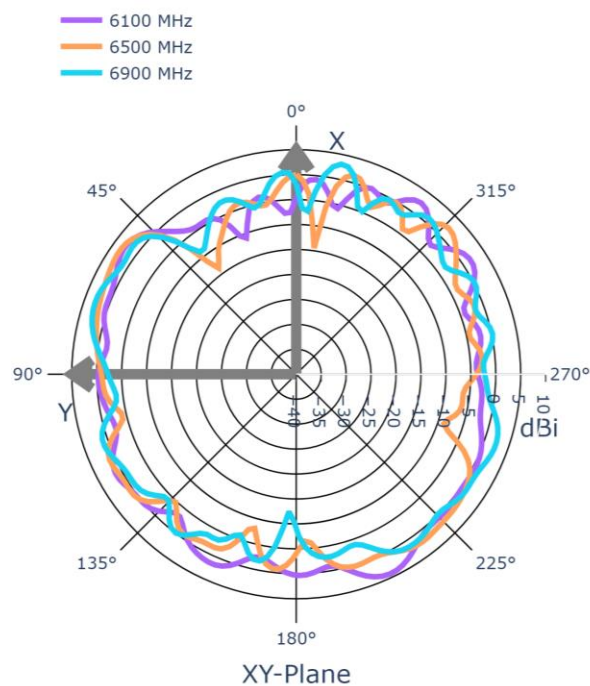
Realized Gain Radiation Patterns of A2_2G4_5G Antenna in 5G Band: Total Polarization



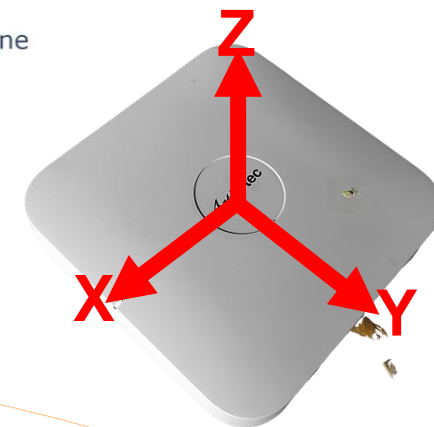
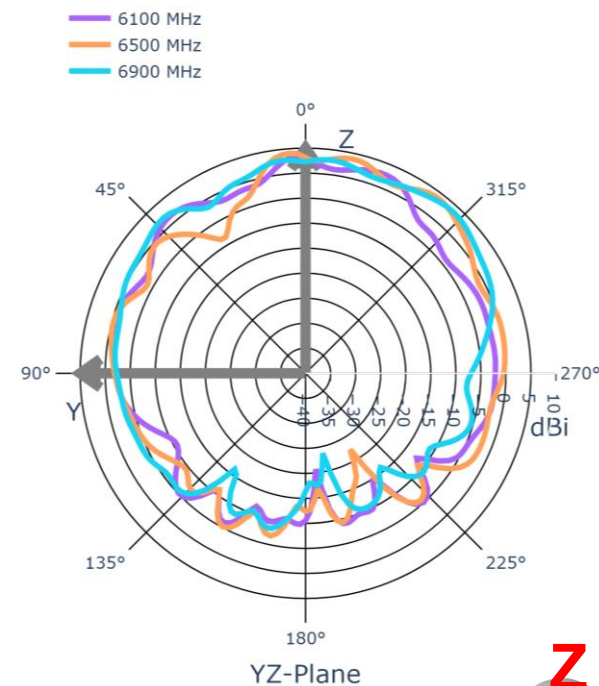
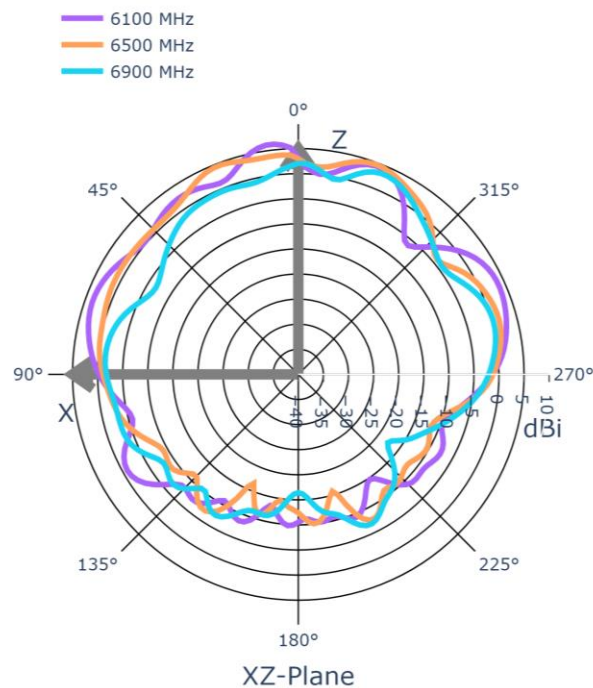
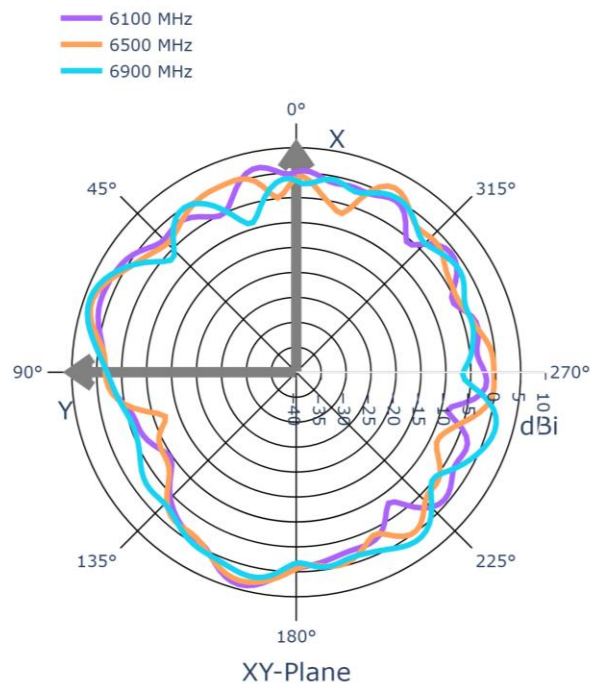
ANTENNA OF THINGS



Realized Gain Radiation Patterns of A3_6G Antenna in 6G Band: Total Polarization



Realized Gain Radiation Patterns of A4_6G Antenna in 6G Band: Total Polarization

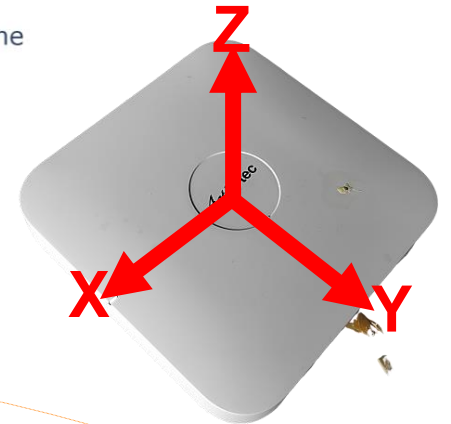
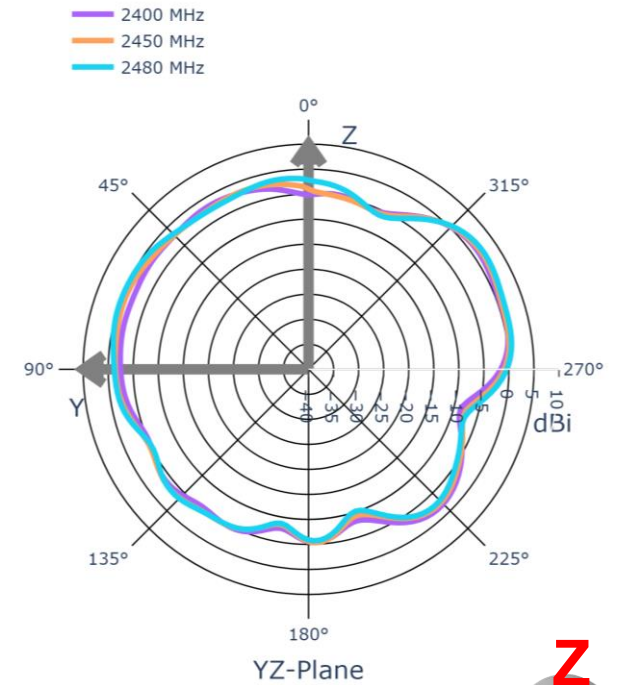
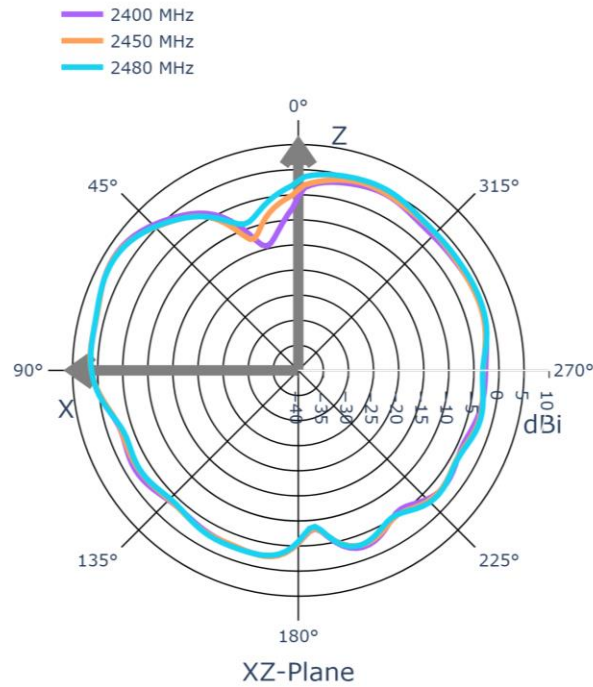
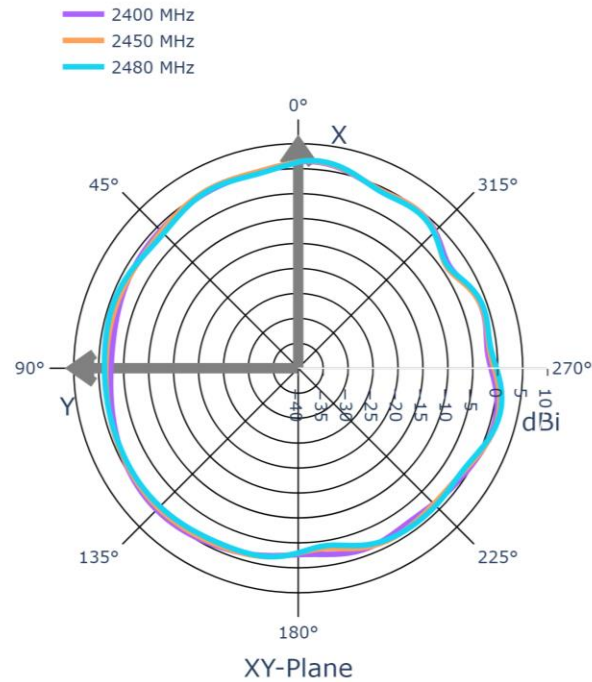




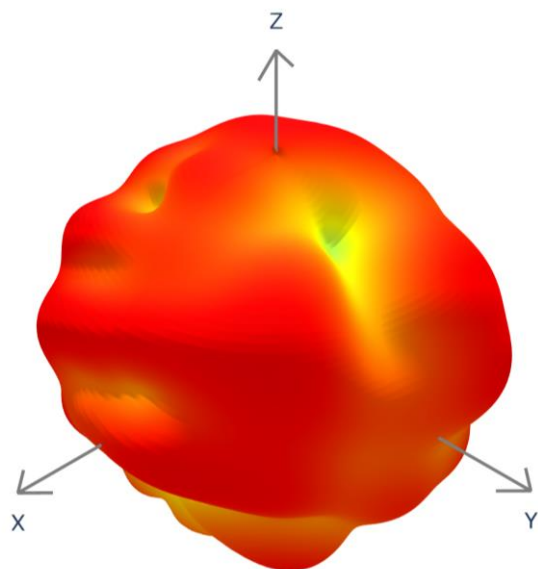
Realized Gain Radiation Patterns of A5_BLE Antenna in BLE Band: Total Polarization



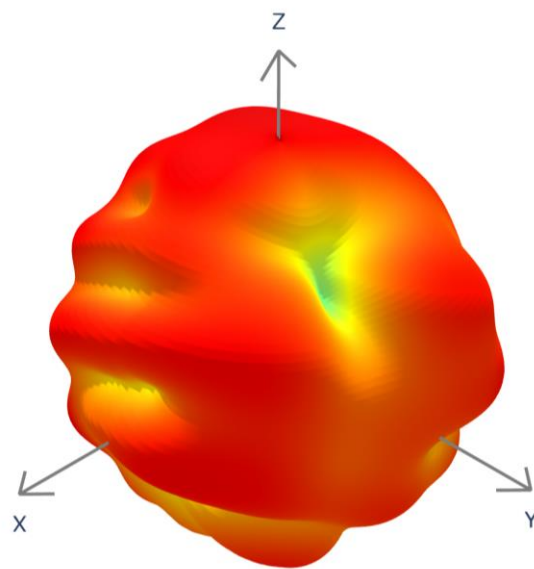
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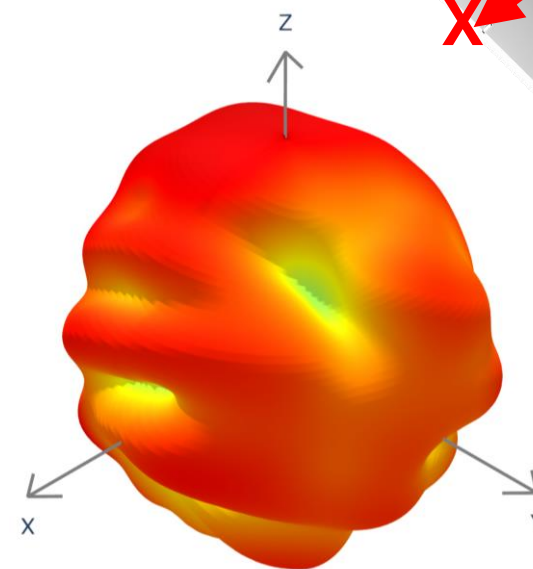
Realized Gain Radiation Patterns of A1_2G4_5G Antenna in 2G4 Band: Total Polarization



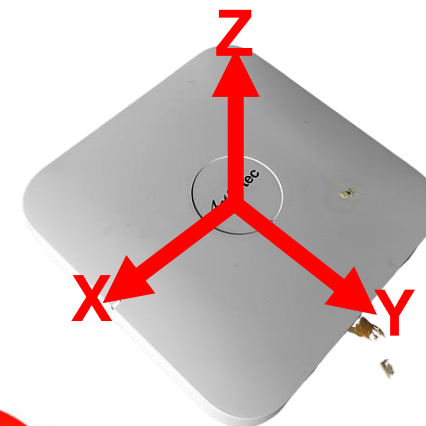
• 2400 MHz



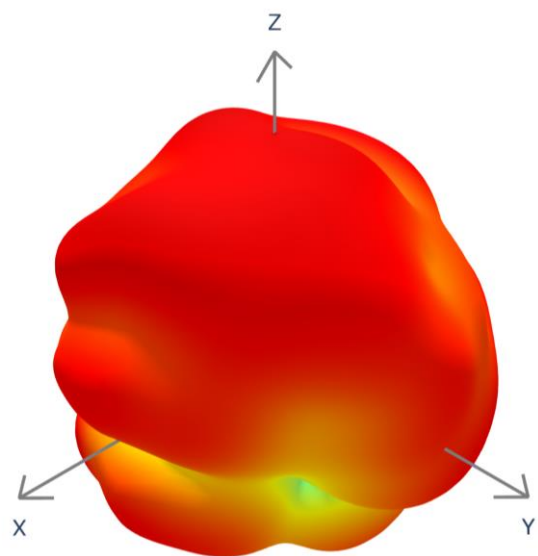
• 2450 MHz



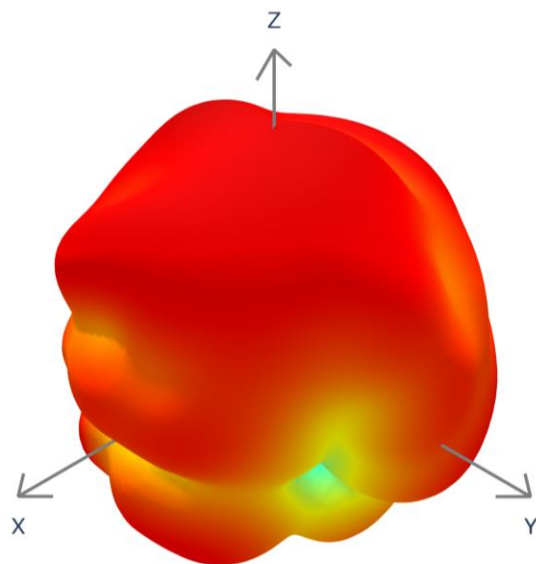
• 2480 MHz



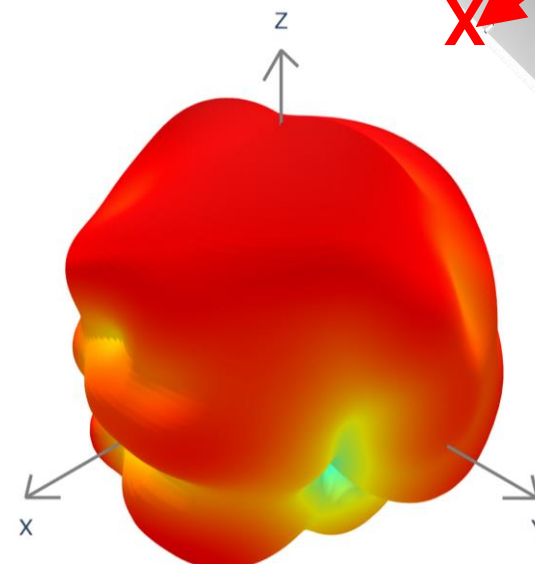
Realized Gain Radiation Patterns of A2_2G4_5G Antenna in 2G4 Band: Total Polarization



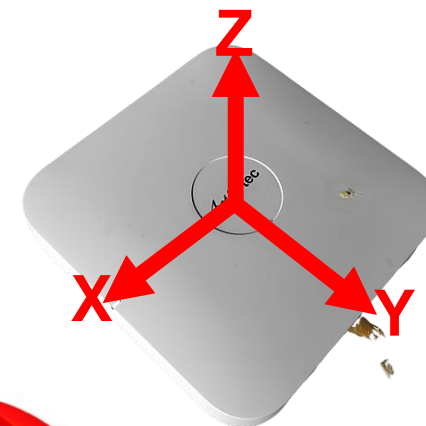
• 2400 MHz



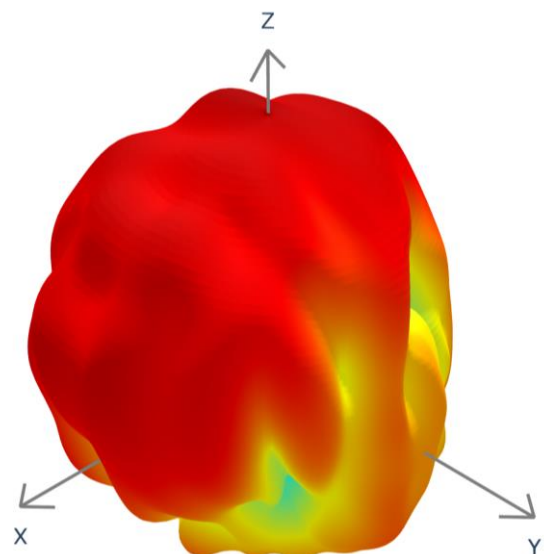
• 2450 MHz



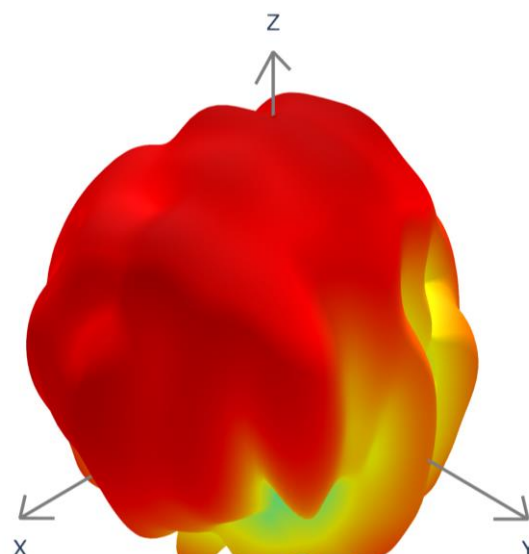
• 2480 MHz



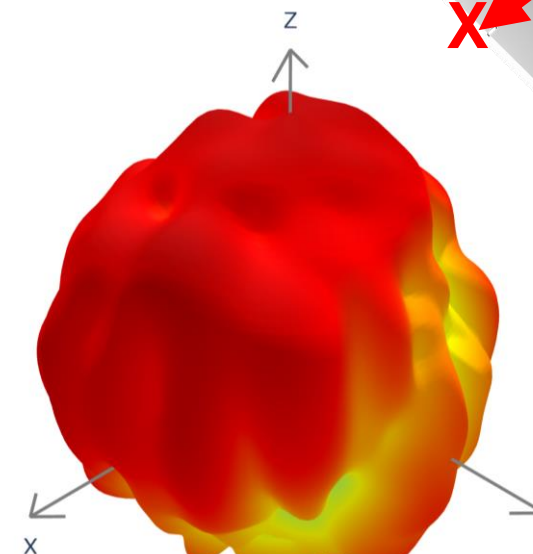
Realized Gain Radiation Patterns of A1_2G4_5G Antenna in 5G Band: Total Polarization



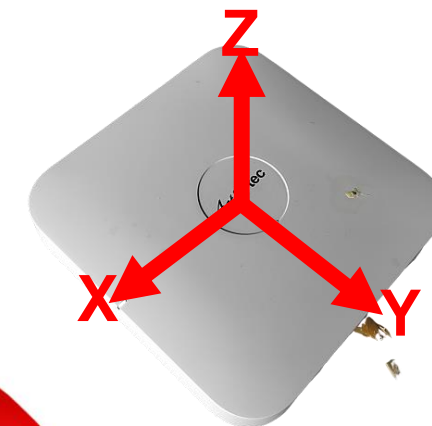
• 5200 MHz



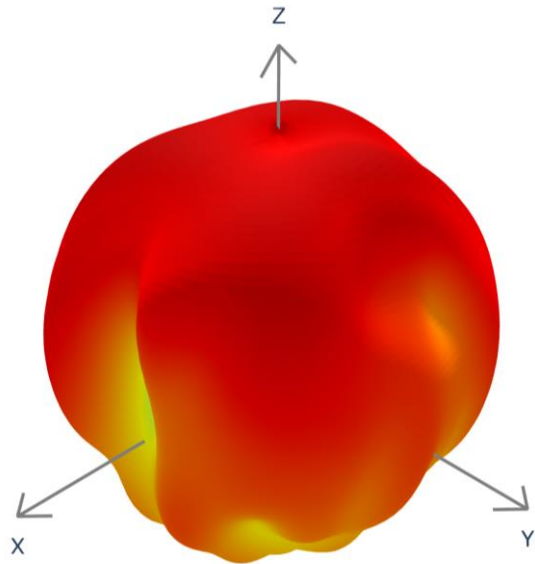
• 5500 MHz



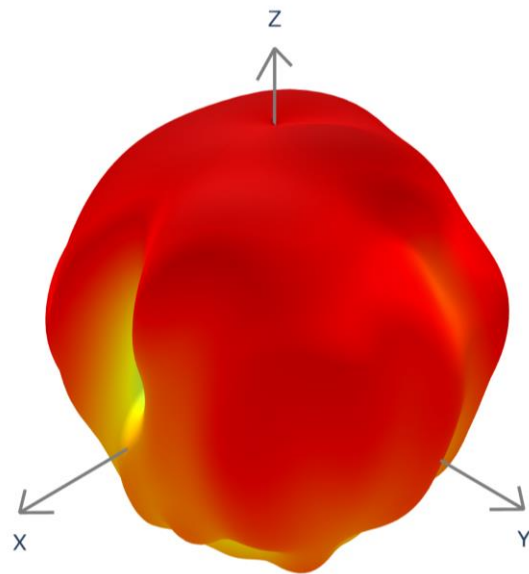
• 5800 MHz



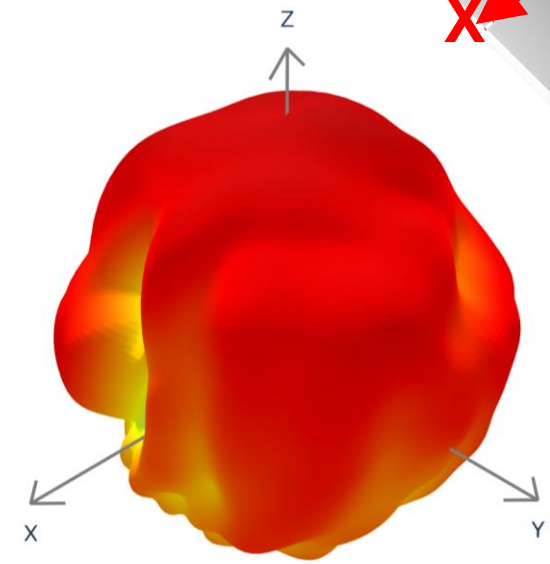
Realized Gain Radiation Patterns of A2_2G4_5G Antenna in 5G Band: Total Polarization



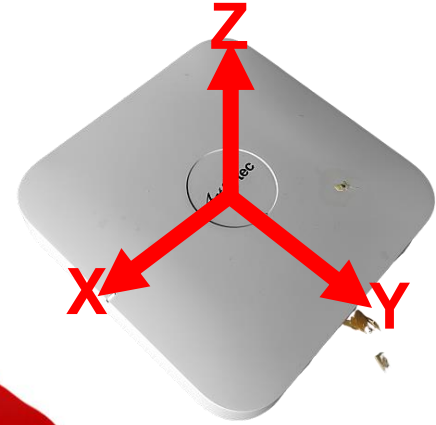
• 5200 MHz



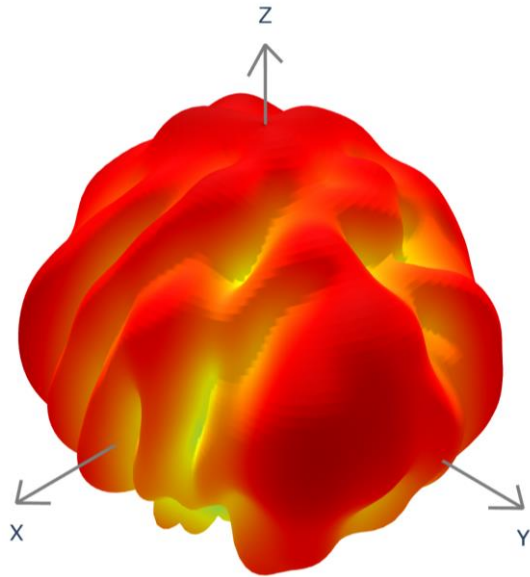
• 5500 MHz



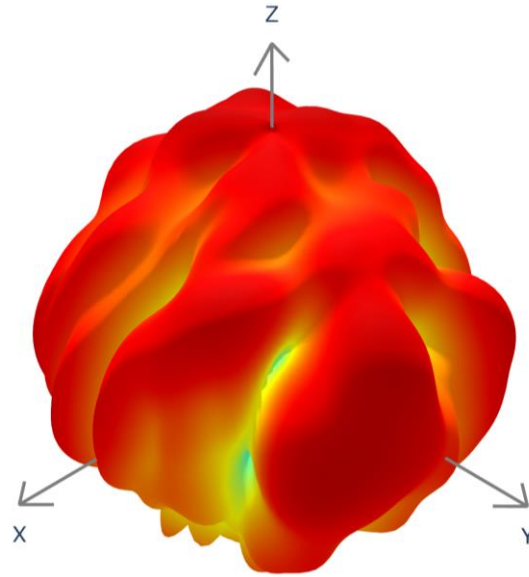
• 5800 MHz



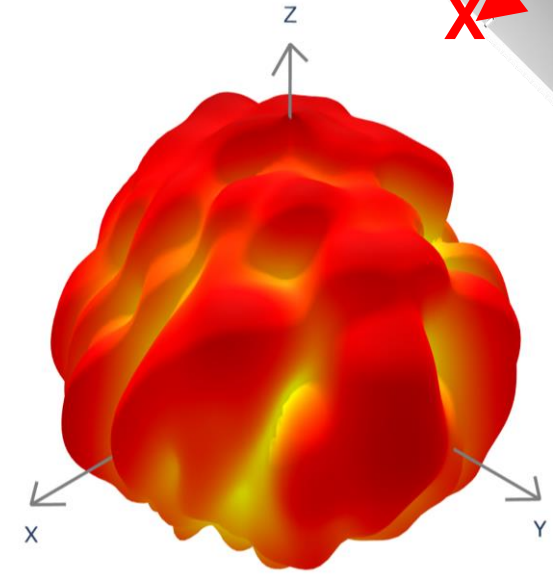
Realized Gain Radiation Patterns of A3_6G Antenna in 6G Band: Total Polarization



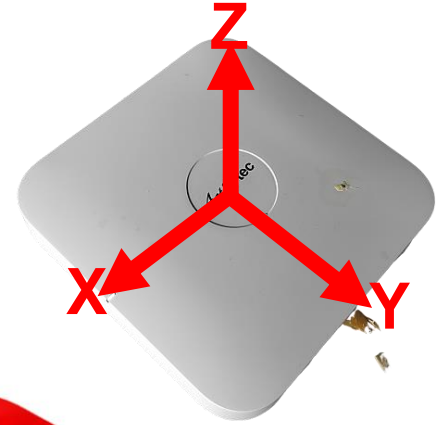
• 6100 MHz



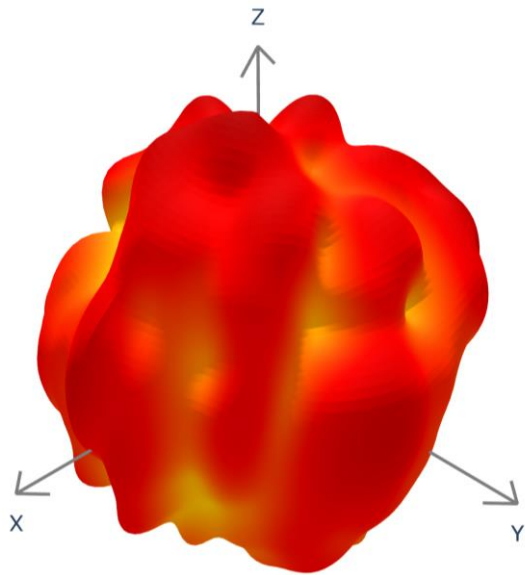
• 6500 MHz



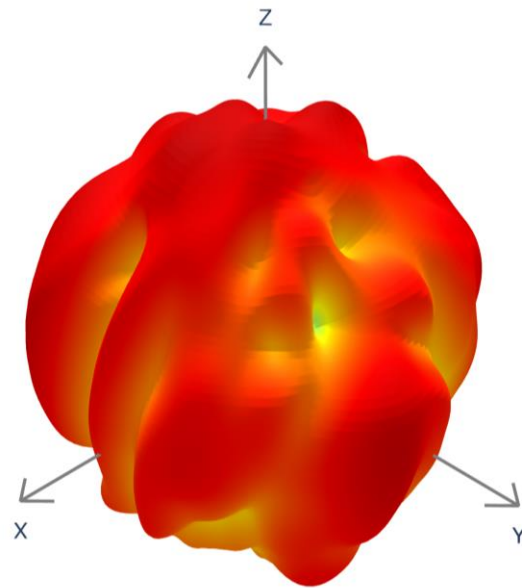
• 6900 MHz



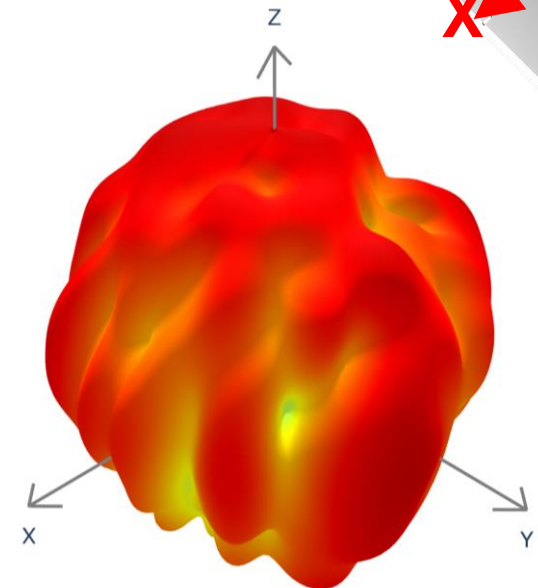
Realized Gain Radiation Patterns of A4_6G Antenna in 6G Band: Total Polarization



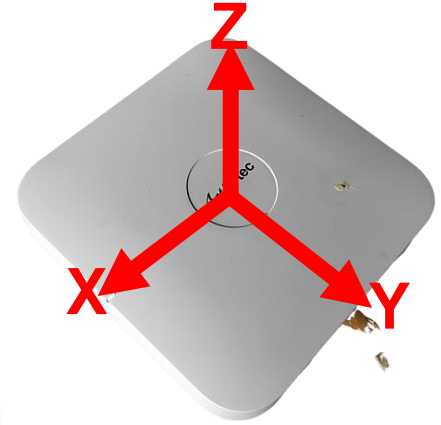
• 6100 MHz



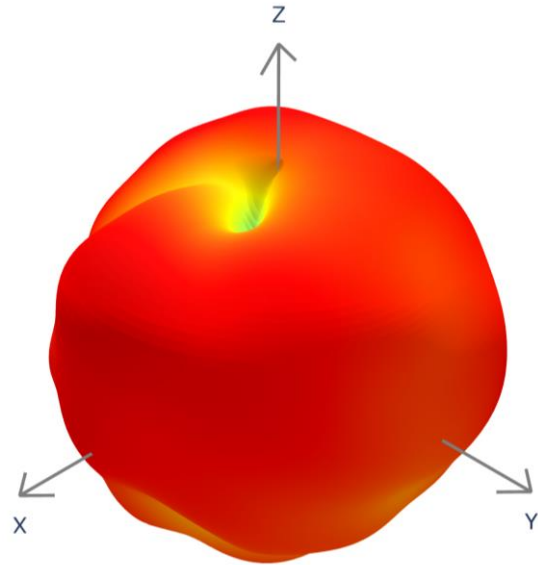
• 6500 MHz



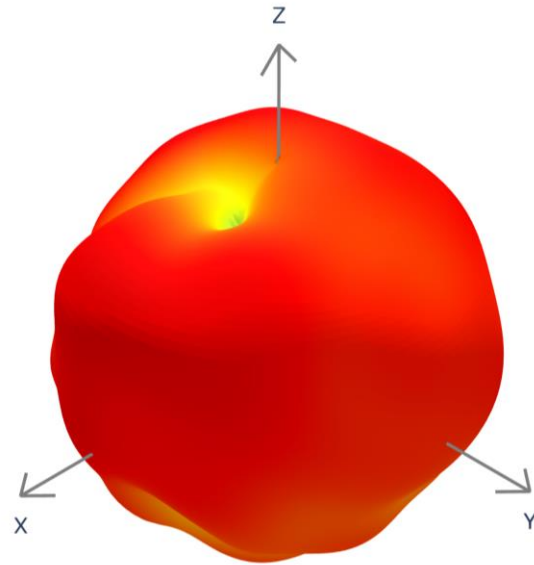
• 6900 MHz



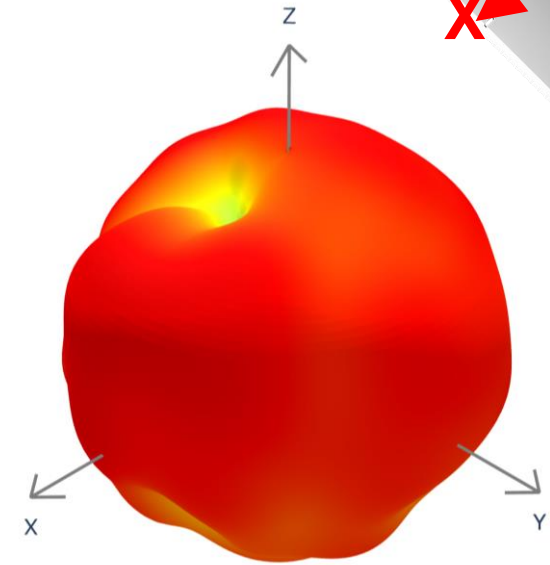
Realized Gain Radiation Patterns of A5_BLE Antenna in BLE Band: Total Polarization



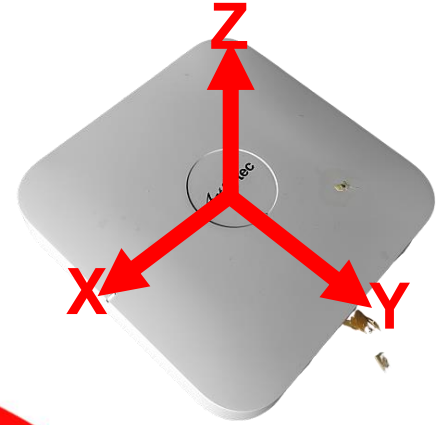
• 2400 MHz



• 2450 MHz



• 2480 MHz



6

Composite Gain

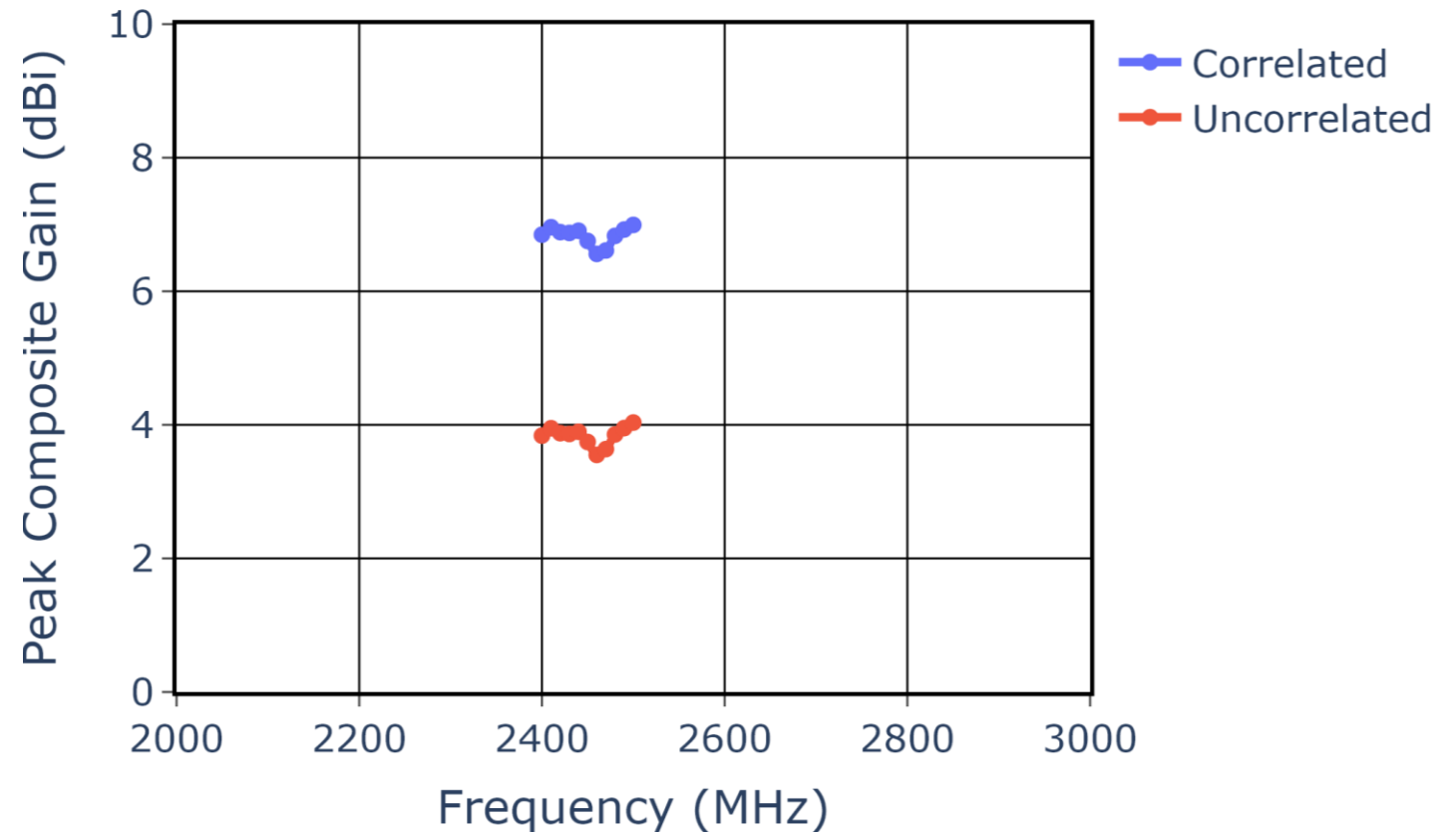
- Correlated Composite Gain
- Uncorrelated Composite Gain



Peak Composite Gain of Transmit Antennas in 2G4 Band



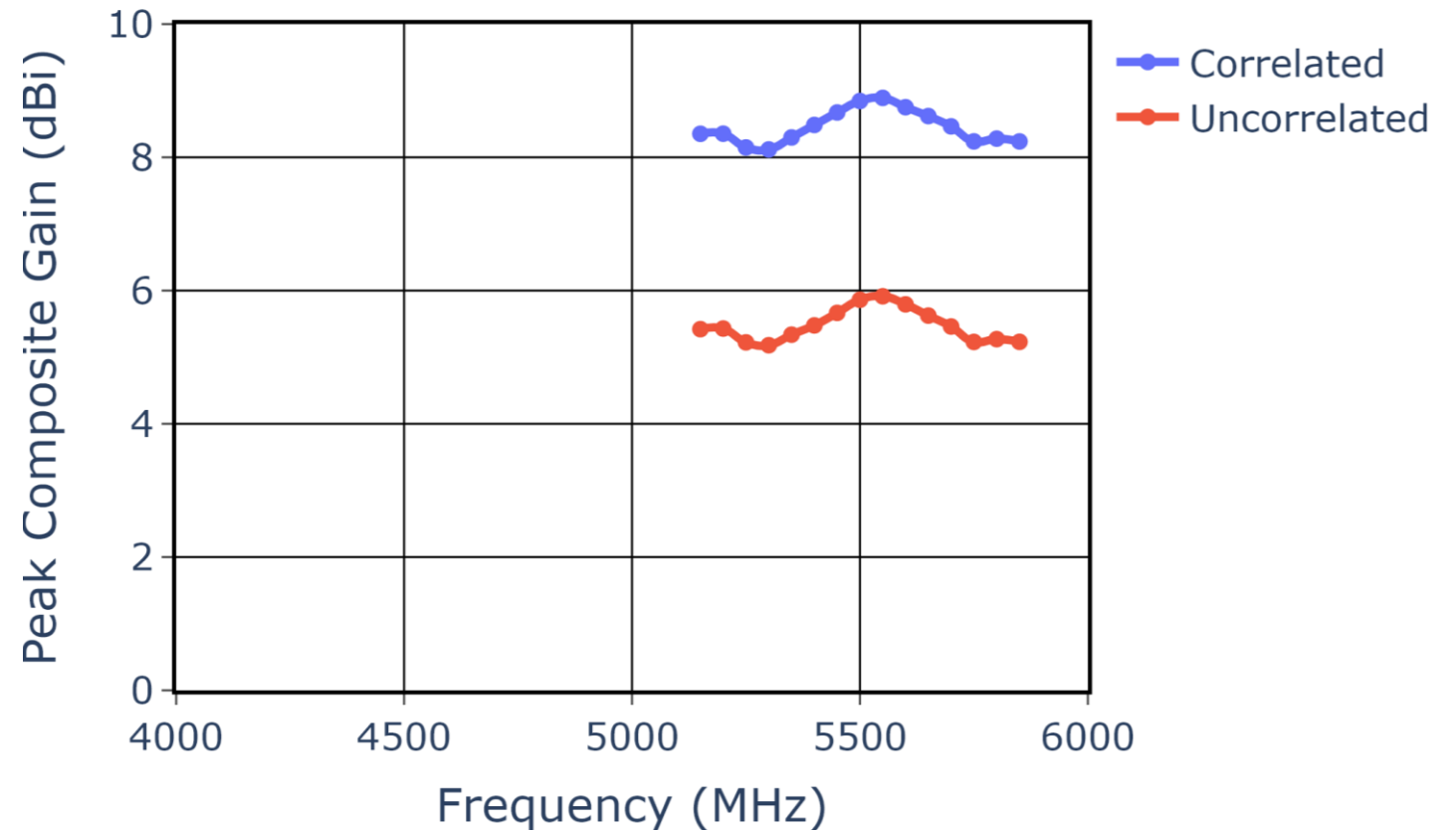
Frequency (MHz)	Correlated (dBi)	Uncorrelated (dBi)
2400	6.8	3.8
2410	7.0	3.9
2419	6.9	3.9
2428	6.9	3.9
2437	6.9	3.9
2446	6.8	3.8
2455	6.7	3.6
2464	6.6	3.6
2473	6.7	3.7
2482	6.8	3.9
2491	6.9	4.0
2500	7.0	4.0





Peak Composite Gain of Transmit Antennas in 5G Band

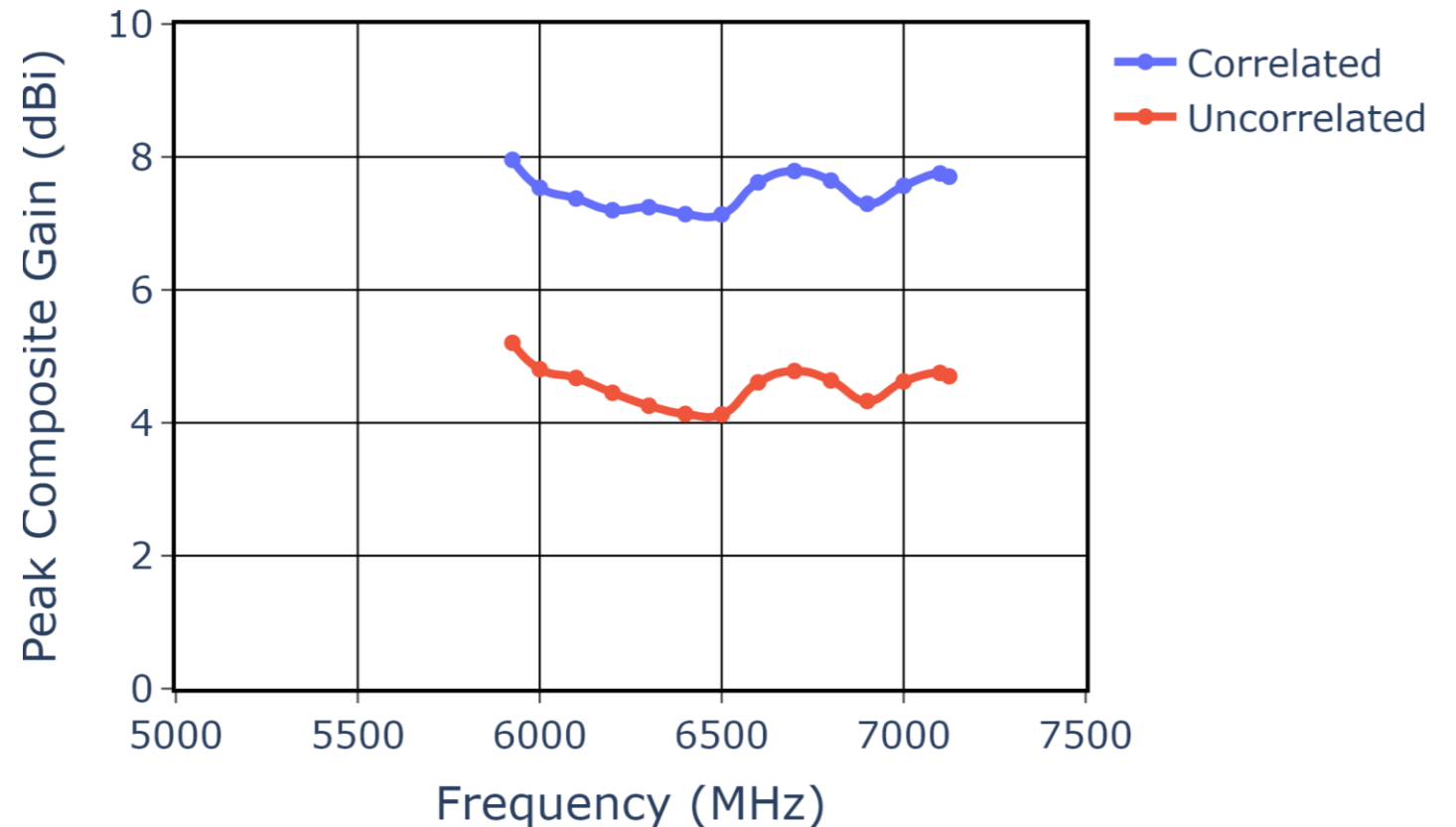
Frequency (MHz)	Correlated (dBi)	Uncorrelated (dBi)
5150	8.4	5.4
5214	8.3	5.4
5278	8.1	5.2
5341	8.3	5.3
5405	8.5	5.5
5469	8.7	5.7
5532	8.9	5.9
5596	8.8	5.8
5660	8.6	5.6
5723	8.4	5.4
5787	8.3	5.3
5850	8.2	5.2





Peak Composite Gain of Transmit Antennas in 6G Band

Frequency (MHz)	Correlated (dBi)	Uncorrelated (dBi)
5925	8.0	5.2
6035	7.5	4.8
6144	7.3	4.6
6253	7.2	4.3
6362	7.2	4.2
6471	7.1	4.1
6580	7.5	4.5
6689	7.8	4.8
6798	7.6	4.6
6907	7.3	4.3
7016	7.6	4.6
7125	7.7	4.7





Conclusion and Recommendations

Conclusion and Recommendations

- Passive Measurement results for AoT antenna system for CIG WF189 were presented
- AoT antenna system exhibits
 - The Return Loss
 - All antennas $>10\text{dB}$ @ All Band Antennas
 - The Isolation
 - $>18\text{dB}$ Between Dual Band Antennas @2G4 Band
 - $>29\text{dB}$ Between Dual Band Antennas @5G Band
 - $>30\text{dB}$ Between 6G Band Antennas @6G Band
 - $>25\text{dB}$ Between Dual Band Antennas&6G Band Antennas @5G/6G Band

THANK YOU!
