Roku Brewster Roku DVT2 Antenna Performance Report

2022-0102

Prepared By: Delroy Rebello

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Introduction

- An Antenna System concept is proposed by Airgain for the Roku Brewster
  - Airgain received a unit from Roku (BRT-D1-0114)
- Antenna configuration
  - 2x2 @ WiFi Dual Band for 2.4GHz + 5GHz
  - 1x1 @ Single Band for 2.4GHz ZigBee/BLE/THREAD (3 IOT protocols)

- All antennas are PCBA feed stamp metal antenna with matching circuit
- This report shows passive measured results for all antennas

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Antenna Specification – Passive Requirements

Basic Passive Requirements

RL for each antennas > 10dB

Isolation (coupling between all antennas) ≥ 20dB

Efficiency (including cable losses)

>60% (for 2.4GHz band)

>60% (for 5GHz band)

Peak Gain (including cable losses)

<6dBi @2.4GHz

<6dBi @5GHz

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Antenna System Proposal

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Airgain Antenna System

Antenna #	Airgain Part Numbers (PNs)	Cable length [mm]
Ant1_BT	M2450LNTSU2	NA
Ant2_DB	M2450LNTSU2	NA
Ant3_DB	M2450LNTSU2	NA

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S-Parameters Return Loss, Isolation

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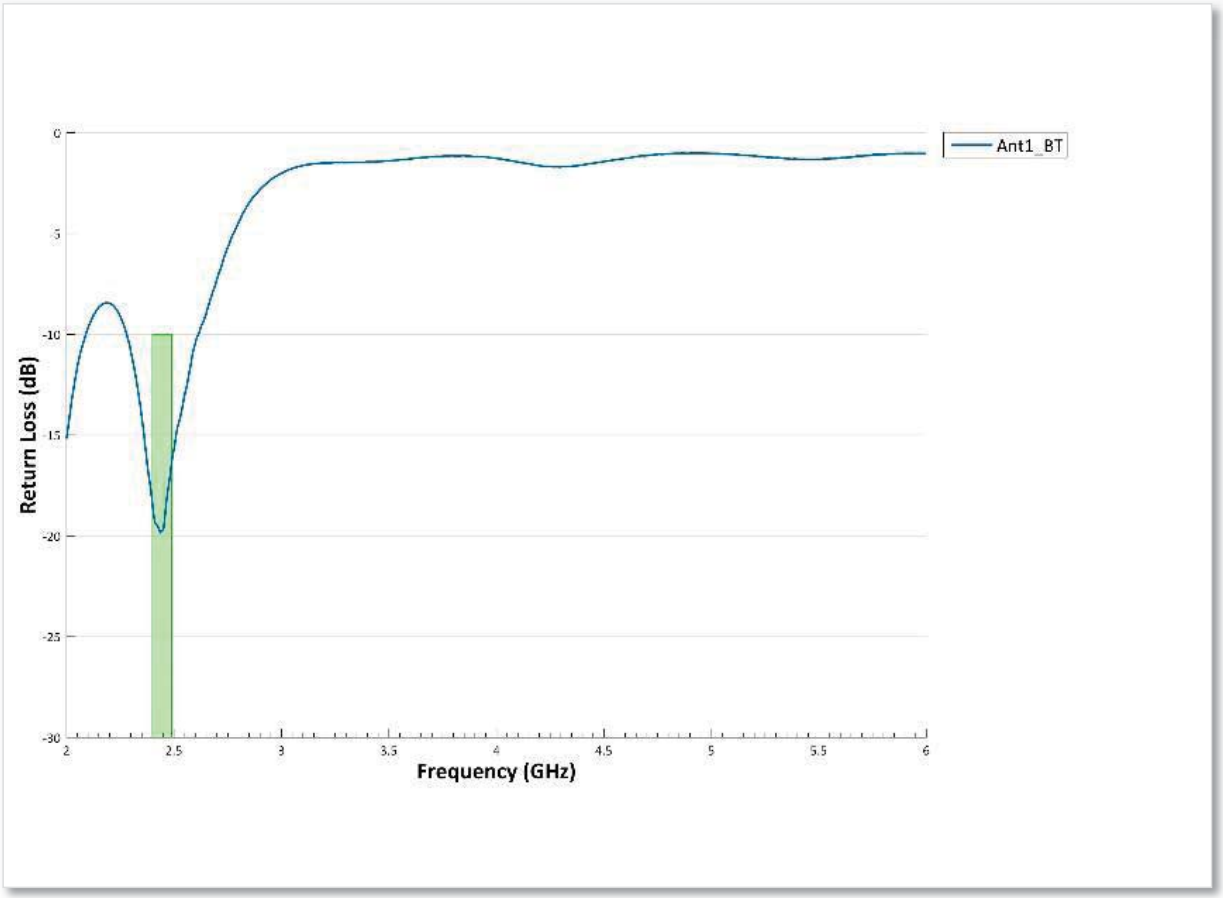
S-Parameter – Return Loss for Ant1_BT



KEY OBSERVATIONS

Antenna	Return Loss (dB)	
	2.4 GHz	2.49 GHz
Ant1_BT	-18.4	-16.2

The matching network is good as implemented

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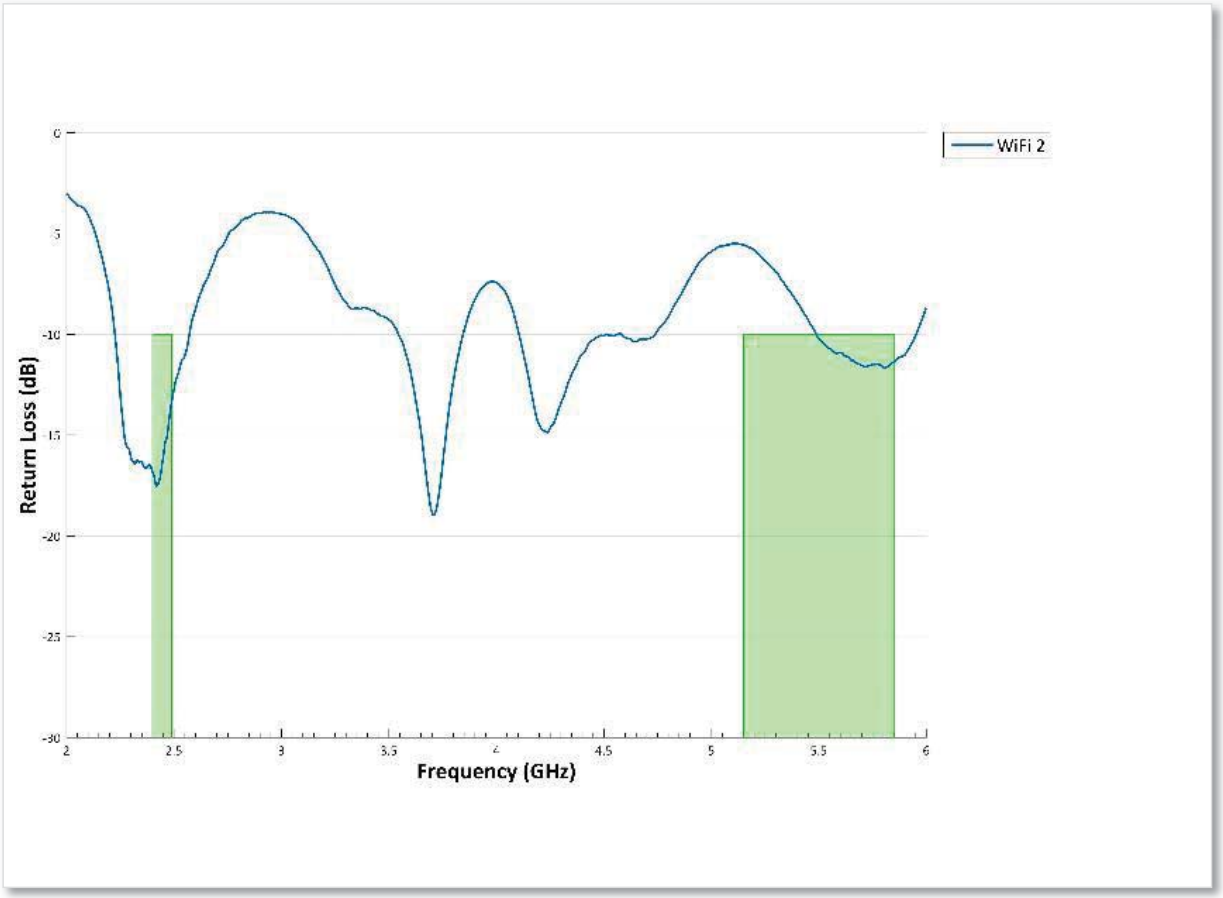
S-Parameter – Return Loss for Ant3_WiFi 2



KEY OBSERVATIONS

Antenna	Return Loss (dB)			
	2.4 GHz	2.49 GHz	5.15 GHz	5.85 GHz
Ant2_WiFi1	-16.8	-13.3	-5.5	-11.4

The matching network needs to be updated

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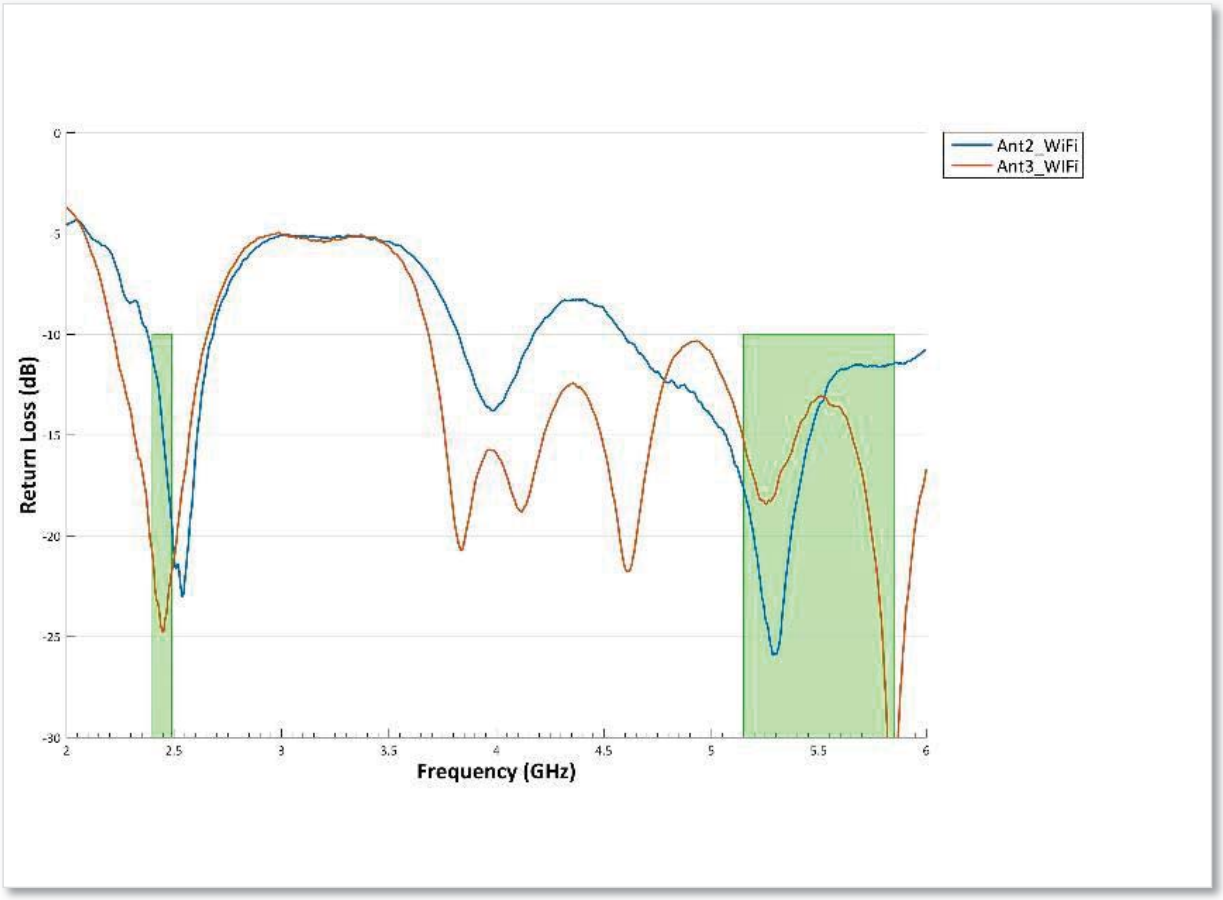
AFTER MATCHING CHANGE: S-Parameter – Return Loss for Wi-Fi Antennas



KEY OBSERVATIONS

Antenna	Return Loss (dB)			
	2.4 GHz	2.49 GHz	5.15 GHz	5.85 GHz
Ant2_DB	-11.2	-19.5	-16.0	-11.5
Ant3_DB	-20.9	-21.7	-13.4	-38.7

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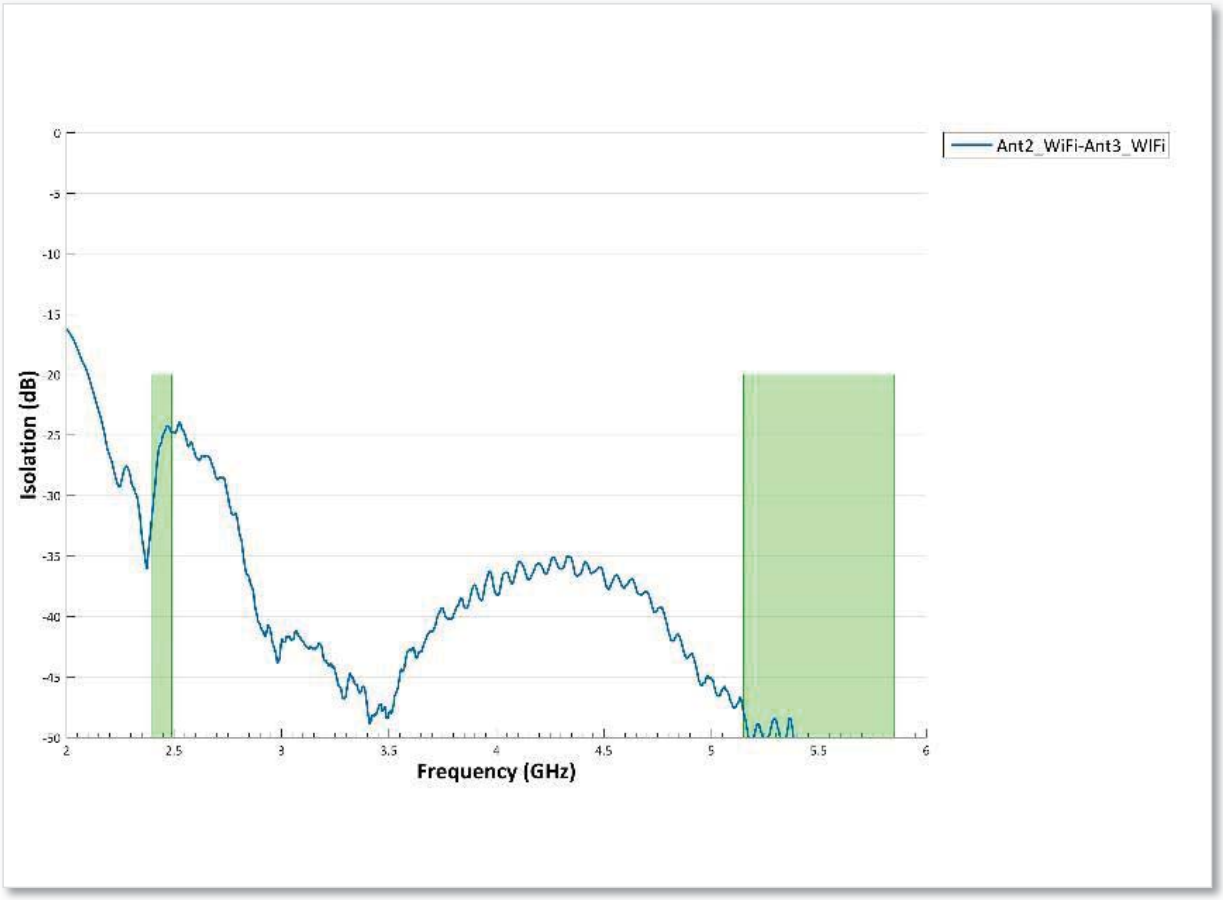
S-Parameter – Isolation for Wi-Fi Antennas



KEY OBSERVATIONS

Antenna	Minimum Isolation (dB)	
	2.4GHz band	5GHz Band
Ant2_DB-Ant3_DB	-23.5	-45.4

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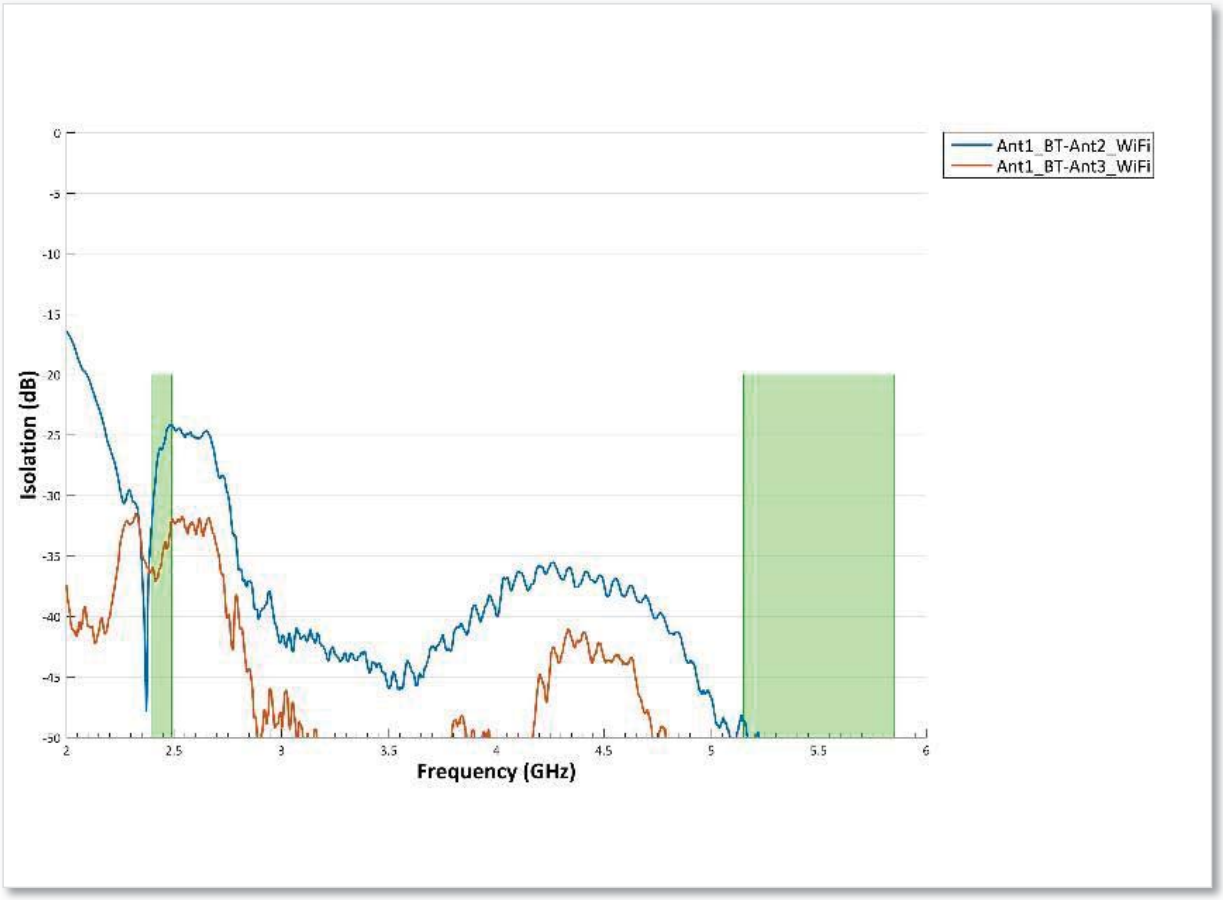
S-Parameter – Isolation between BT and Wi-Fi Antennas



KEY OBSERVATIONS

Antenna	Minimum Isolation (dB)	
	2.4GHz band	5GHz Band
Ant1_BT-Ant2_DB	-24.2	-48.1
Ant1_BT-Ant3_DB	-31.9	-50.9

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Efficiency and Peak Gain

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Antenna Efficiency (%) and Peak Gain(dBi) – 2.4 GHz

Frequency (MHz)	Ant1_BT (%)	Ant2_DB (%)	Ant3_DB (%)
2400	60	61	74
2410	61	65	78
2420	60	61	71
2430	63	68	78
2440	65	71	80
2450	60	64	71
2460	66	74	79
2470	67	76	80
2480	63	72	75
2490	66	77	79
Average	**63**	**69**	**77**

Frequency (MHz)	Ant1_BT (dBi)	Ant2_DB (dBi)	Ant3_dBi (dBi)
2400	2	1.2	2.3
2410	2.2	1.5	2.5
2420	2	1.2	2
2430	2.4	1.9	2.4
2440	2.5	2.1	2.5
2450	2	1.7	2.1
2460	2.5	2.4	2.7
2470	2.6	2.5	3
2480	2.4	2.3	2.8
2490	2.6	2.5	3.1

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Antenna Efficiency (%) and Peak Gain(dBi) – 5 GHz Band of Operation

Frequency (MHz)	Ant2_DB (%)	Ant3_DB (%)
5150	66	59
5250	69	60
5350	72	65
5550	68	61
5650	68	63
5750	67	65
5850	66	68
Average	**68**	**63**

Frequency (MHz)	Ant2_DB (dBi)	Ant3_dBi (dBi)
5150	2.2	1.4
5250	2.7	1.7
5350	4	2
5550	3	1.6
5650	2.9	1.8
5750	2.9	2
5850	2.8	2

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Radiation Patterns

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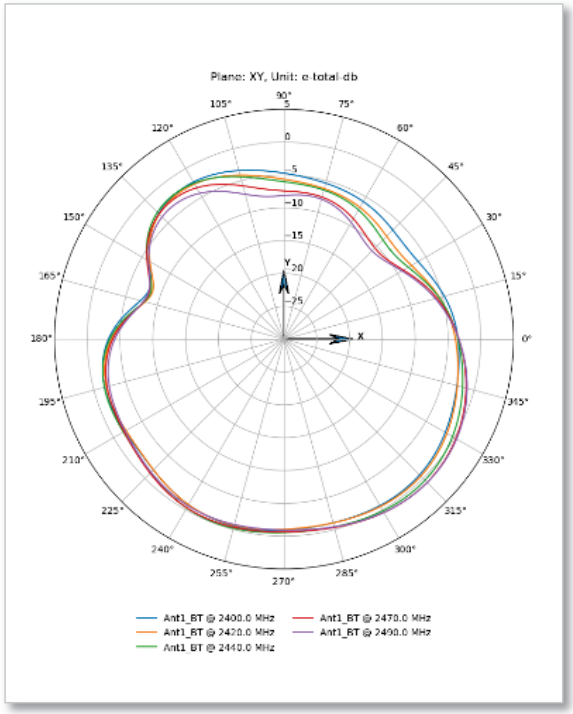
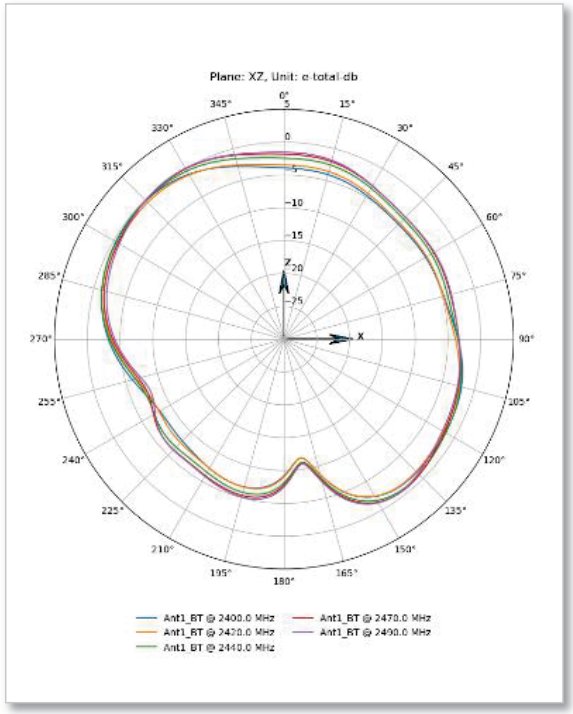
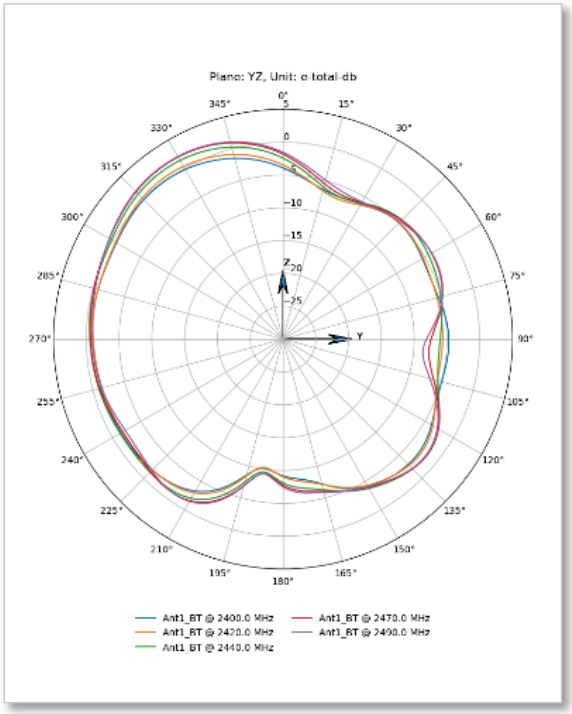
2D Patterns: Ant1 BT at 2.4 GHz Band



Azimuth



Side to Side Elevation



Front to Back Elevation

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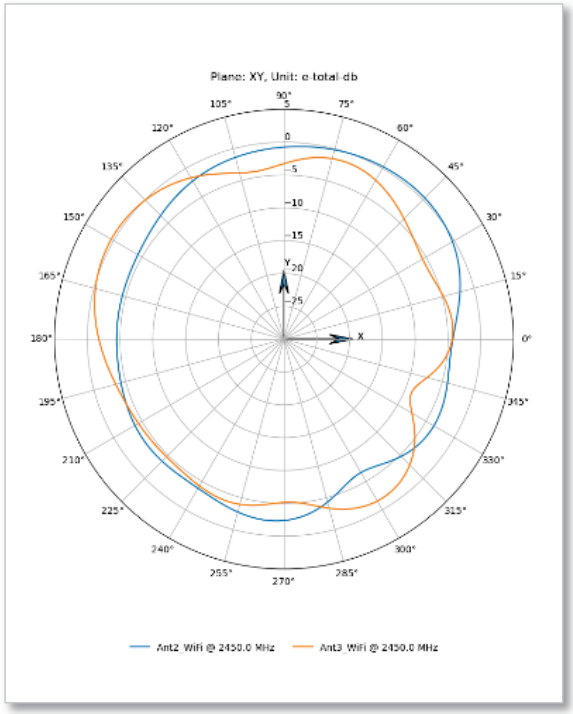
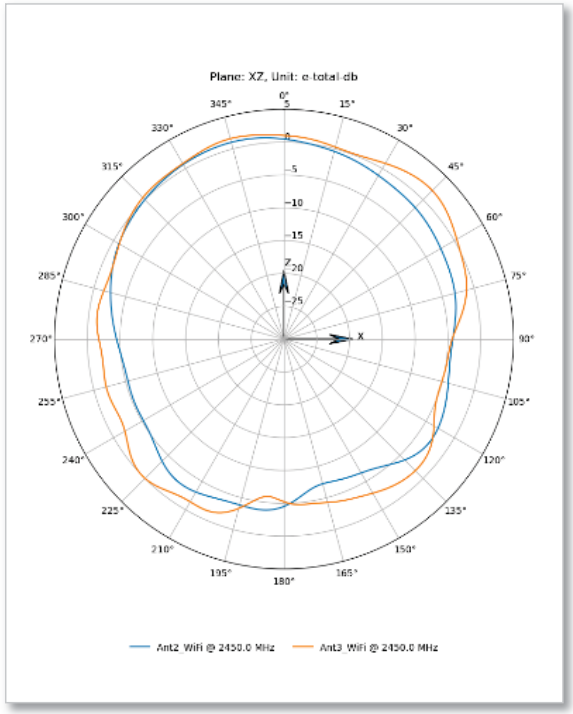
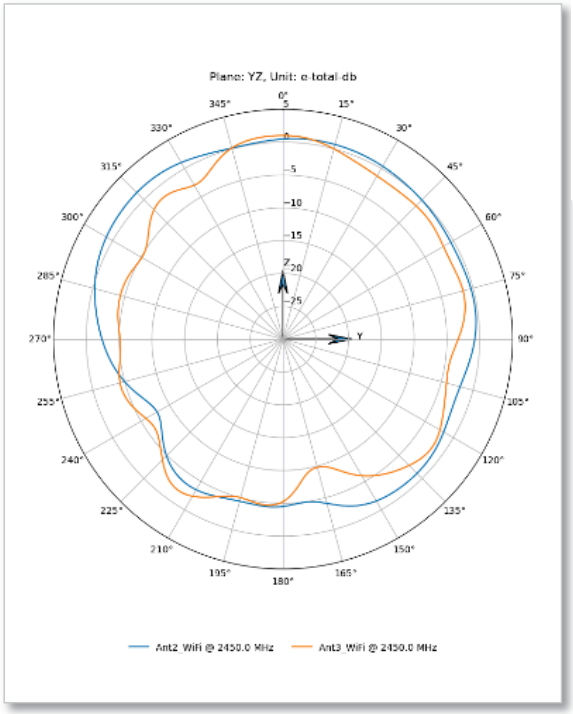
System Coverage: Wi-Fi at 2.4 GHz Band of operation



Azimuth



Side to Side Elevation



Front to Back Elevation

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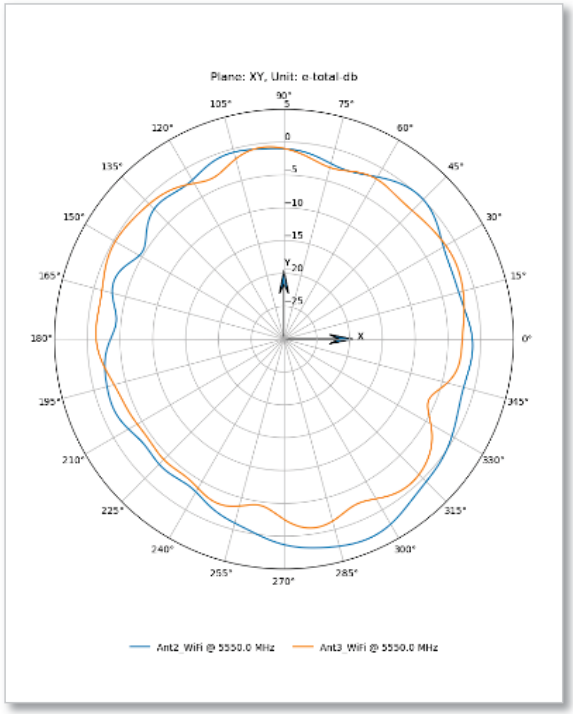
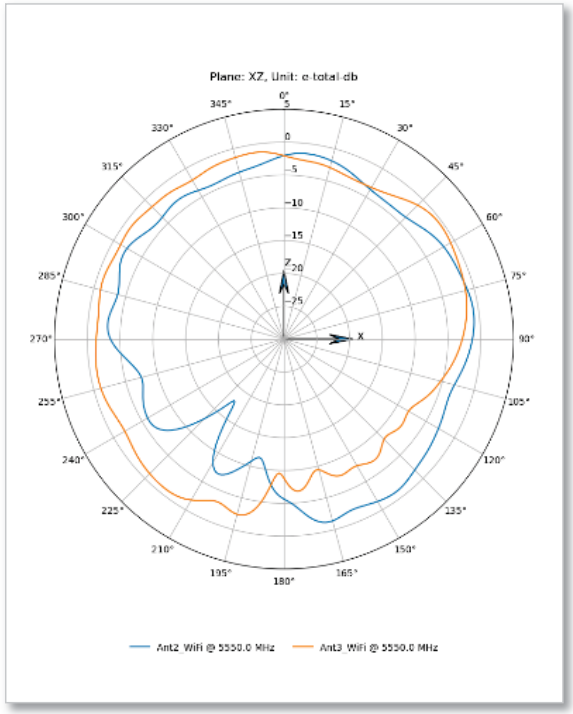
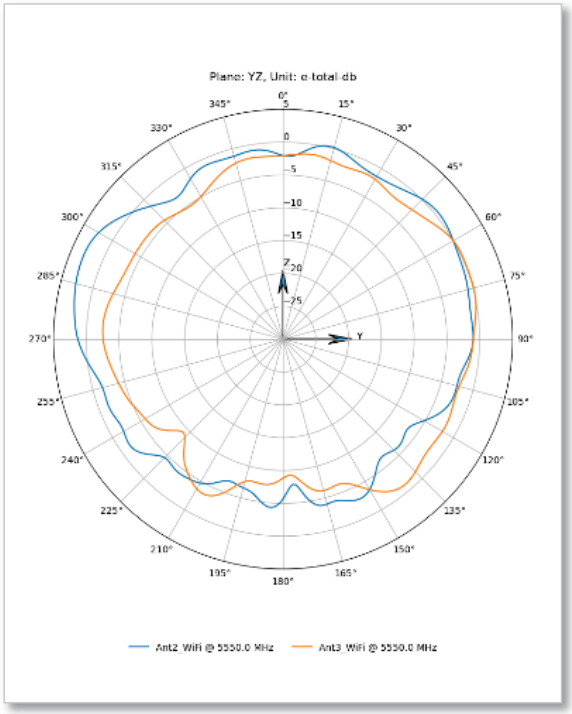
System Coverage: Wi-Fi at 5.5 GHz Band of operation



Azimuth



Side to Side Elevation



Front to Back Elevation

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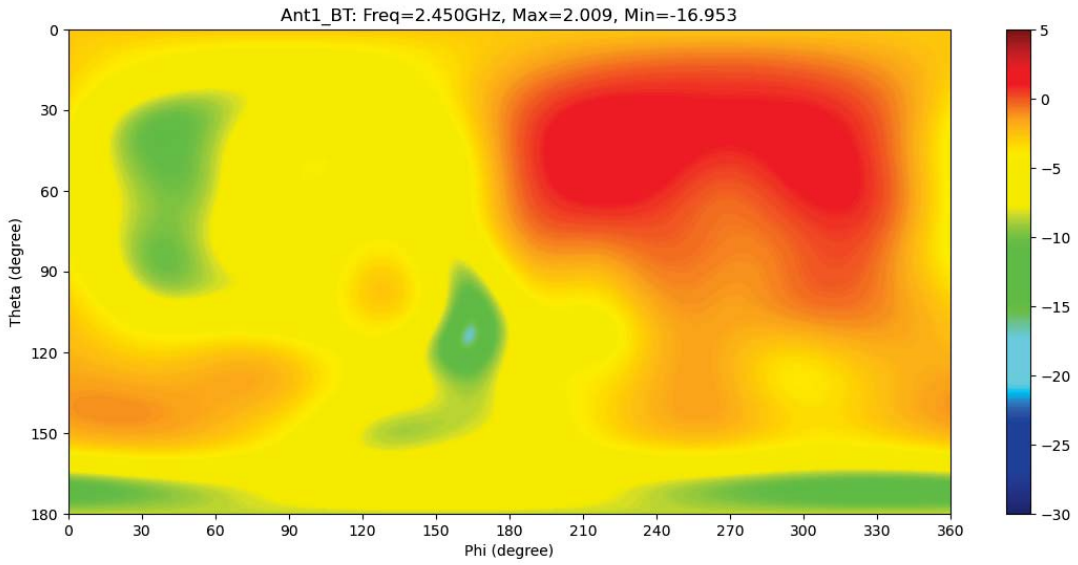
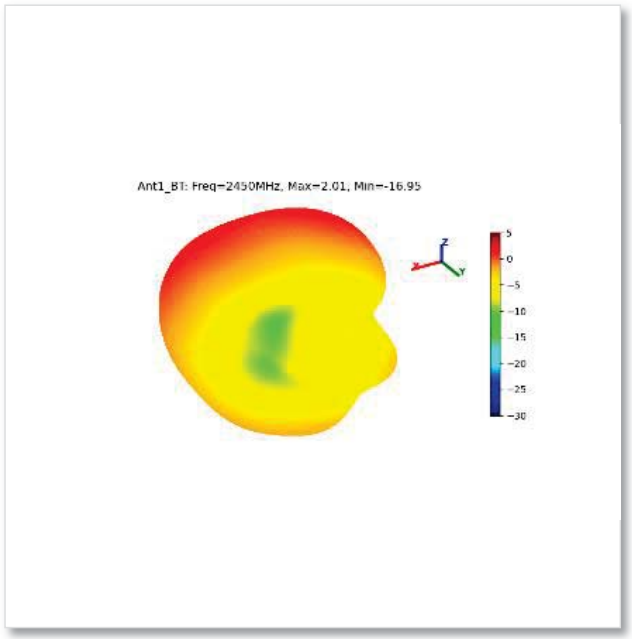
3D Pattern – Ant1_BT at 2.45 GHz





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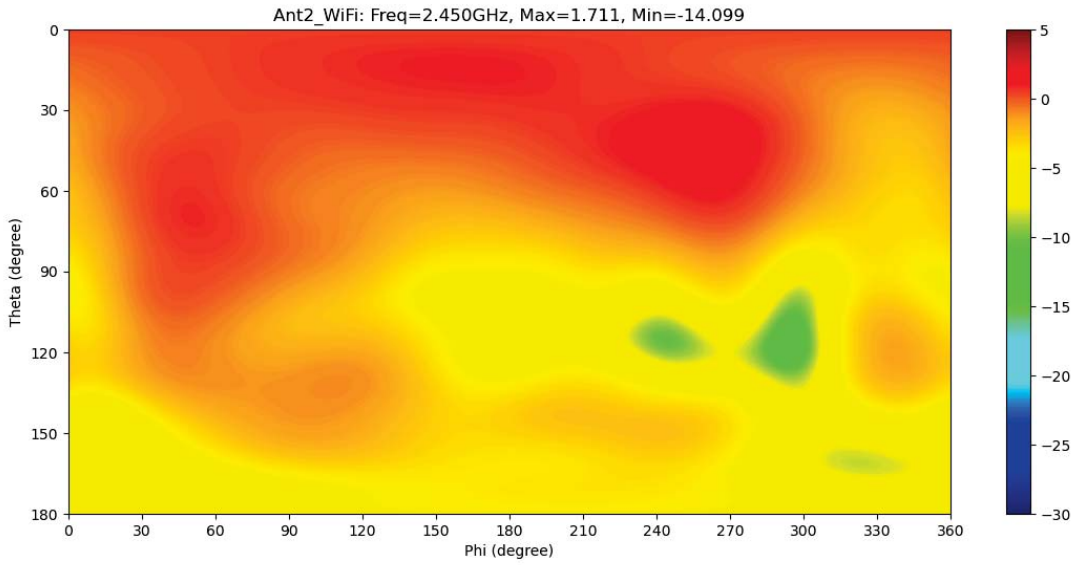
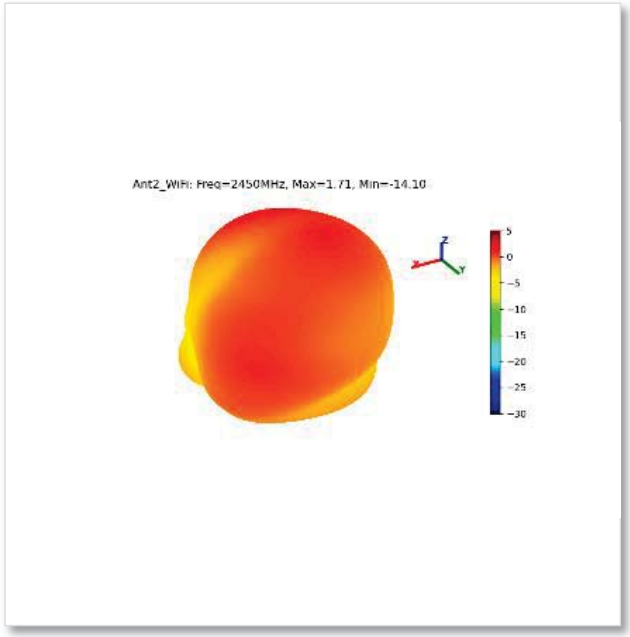
3D Pattern – Ant2_WiFi at 2.45GHz





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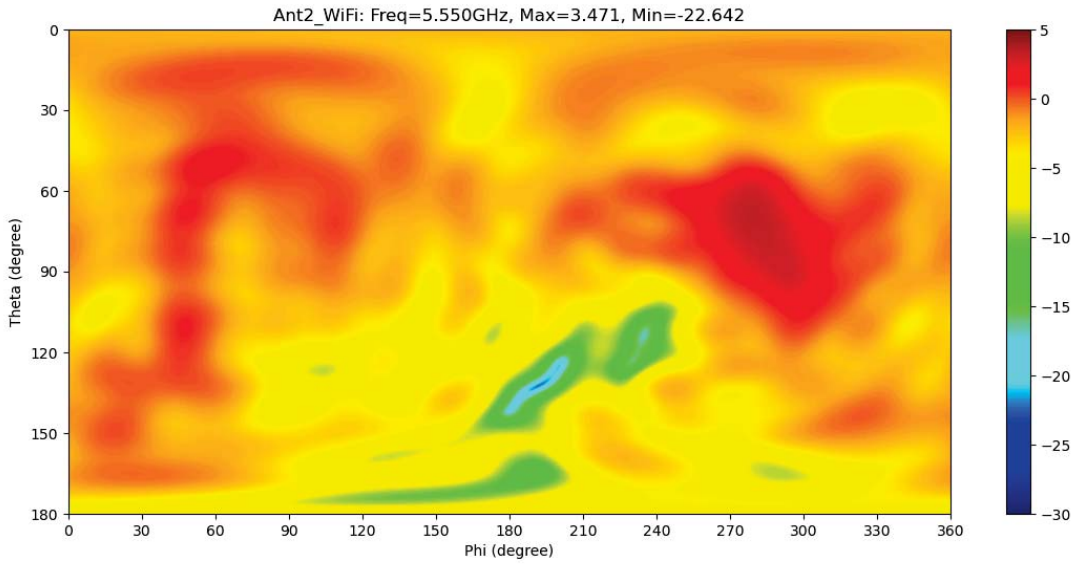
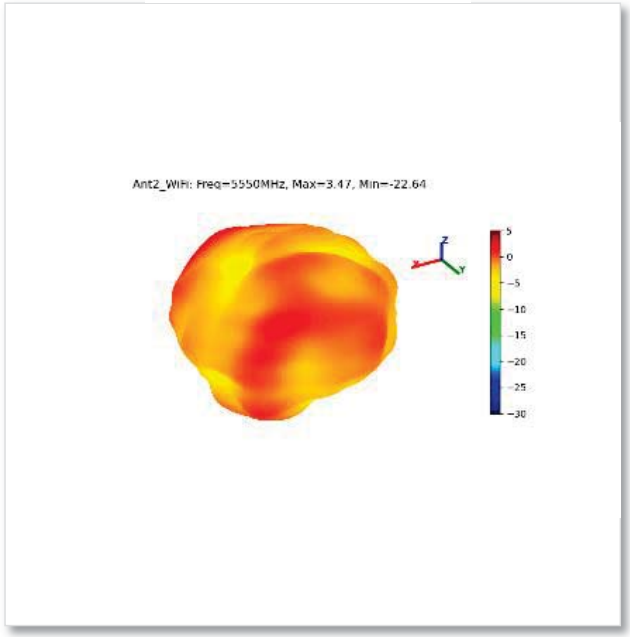
3D Pattern – Ant2_WiFi at 5.55 GHz





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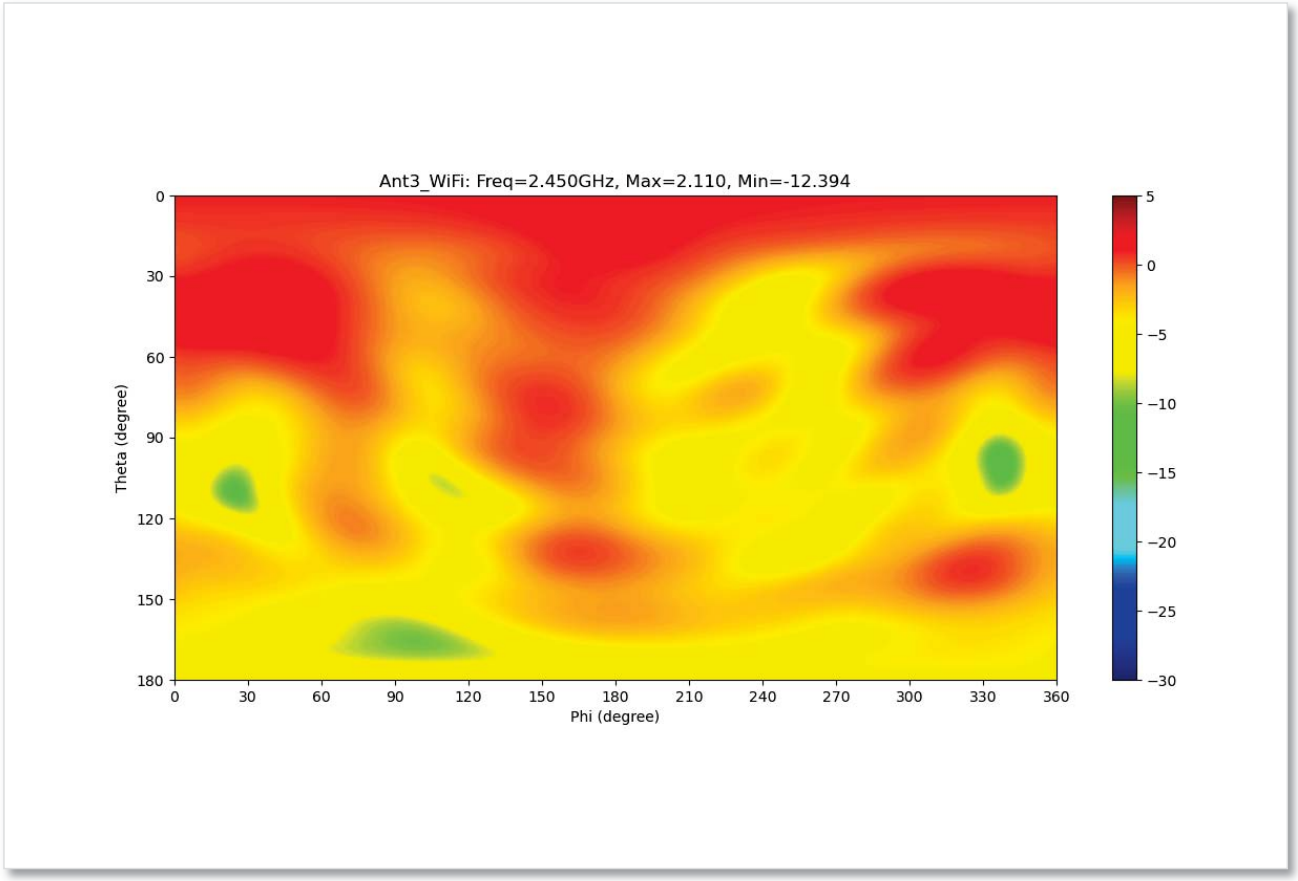
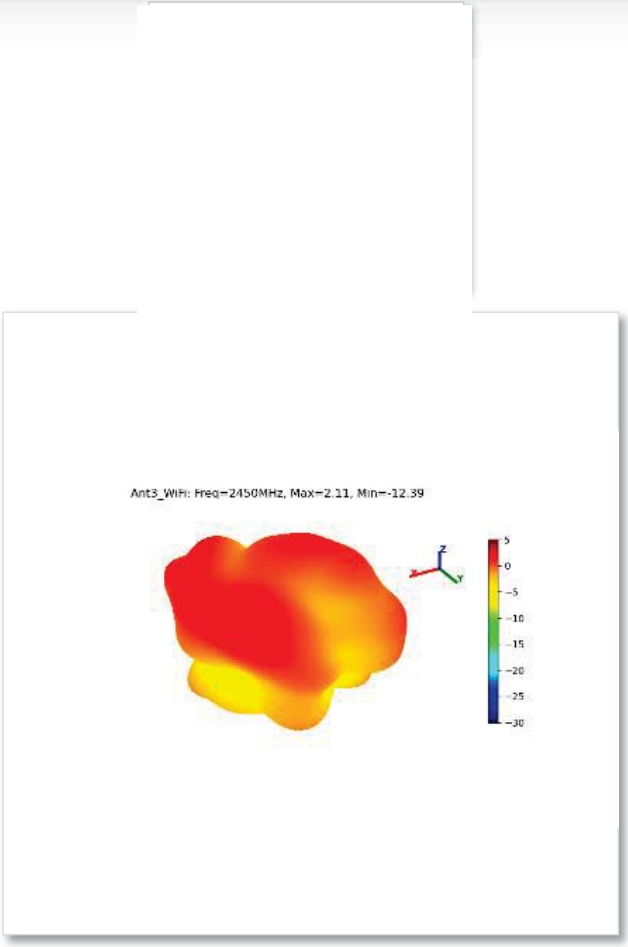
3D Pattern – Ant3_WiFi at 2.45 GHz





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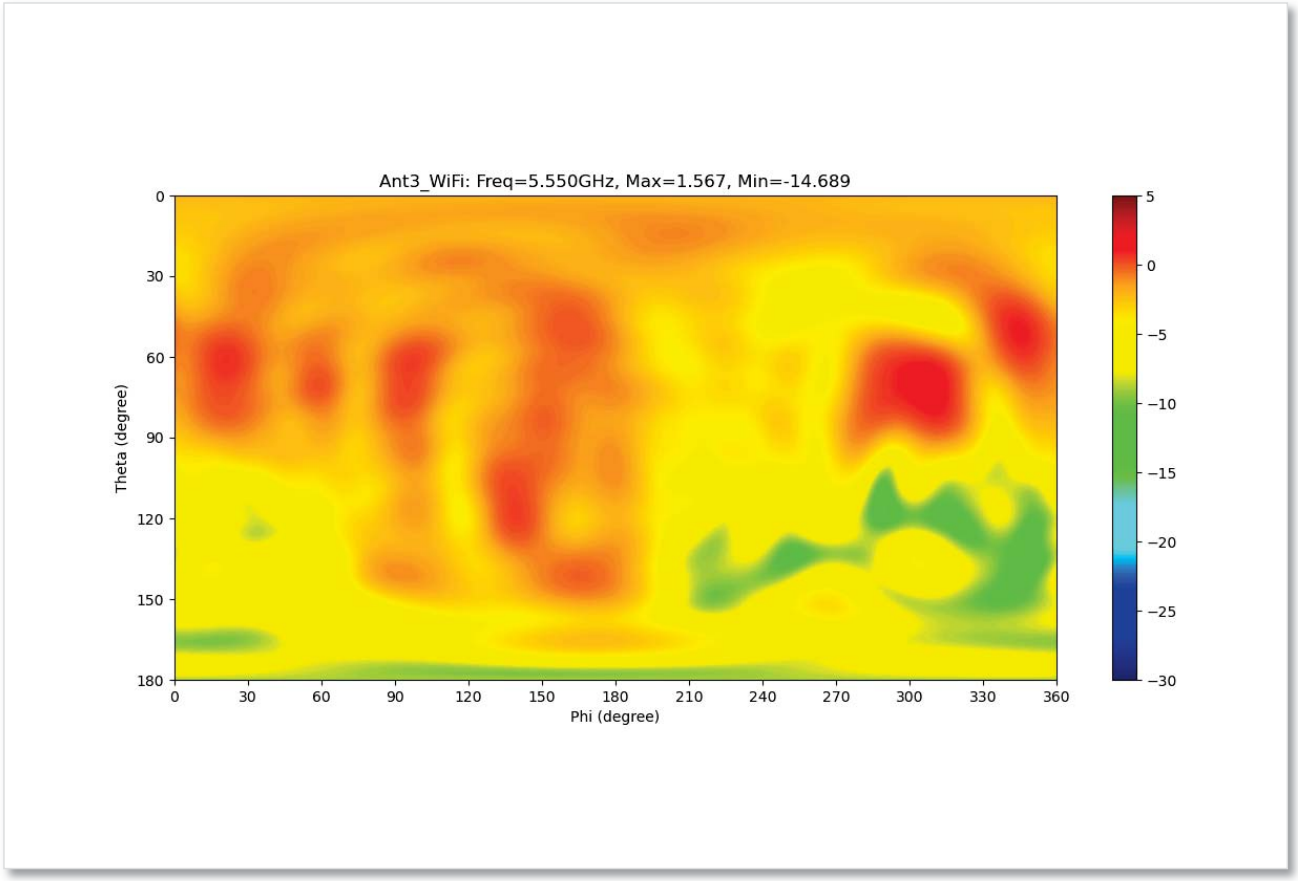
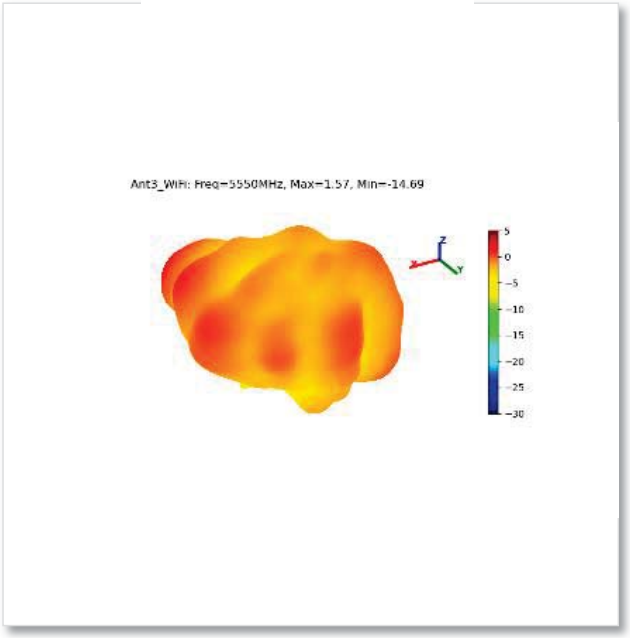
3D Pattern – Ant3_WiFi at 5.55 GHz





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Conclusion

- Return loss is better than -10dB specs for all bands
- Isolation between the WiFi band is -20dB or better
- Isolation between BT and WiFi is -20dB or better
- Antenna Efficiency is 60% or better on all Wi-Fi antennas

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