



Material or Methods Specification

Number: AN000163A
Issue: B
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Date: NOV 03, 2016

TITLE: APX8500 GPS/BT/WIFI ANTENNA

ISSUE	ORIGINATOR	DETAIL SPEC CHANGES	DATE
A	HAMMEL, BRANDON; CALHOUN, ALEC; GRADA, SAMUEL	PRODUCTION RELEASE	NOV 03, 2016
B	HAMMEL, BRANDON; CALHOUN, ALEC; GRADA, SAMUEL	UPDATE CABLE TO PFP-195 ON AN000163A02 ADDED PN: AN000163A05	JAN 17, 2017

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1. SCOPE

This document contains specifications pertinent to the AXP8500 GPS/BT/WIFI antenna for use in mobile radios. It includes General, Mechanical and Electrical Requirements, VQA/Final tests, and Qualification tests.

2. APPLICABLE DOCUMENTS

- 12M02897W18 Controlled and Reportable Materials Disclosure
- 12M05022A87 Motorola Quality Procedure Outsourced Assembled Kits
- 12M05041A30 Motorola Barcode and Label Applications Standard
- 12M80967A78 Motorola Vendor Material Quality Control
- 12S10601A Motorola Packaging Rules for Vendors
- 12S10616A Motorola Marking and Containers for Consumer Products Division
- 12G13933A01 Motorola Receiving Bar Code Specification for Vendors

3. REQUIREMENTS

3.1 General

Manufacturer needs to report any change in process/ material that would affect the electrical/ mechanical performance of the antenna.

GPS/BT/WIFI ANTENNA DEFINED IN THIS DOCUMENT	
Part Number	Description
AN000163A01	GPS/BT/WIFI Vehicle Mount Antenna 17ft Low Loss Cable
AN000163A02	GPS/BT/WIFI Motorcycle Mount Antenna 6ft Flexible Cable
AN000163A05	GPS/BT/WIFI Vehicle Mount Antenna 17ft Flexible Cable

3.1.1 Application: This antenna is used with vehicle mount and motorcycle mount mobile radios.

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3.1.2 Mechanical Requirements: Table 1. See Antenna diagram on page 8.

Part Number	Description	WIFI Antenna Cable	GNSS Antenna Cable	Install Manual
AN000163A01	GPS/BT/WIFI Vehicle Mount	PVC Free PFP-240 17ft QMA Plug (QMA Plug: Amphenol 134104 or Motorola Approved Equivalent)	PVC Free PFP-100A 17ft QMA Plug (QMA Plug: Amphenol 930-129-51S or Motorola Approved Equivalent)	PD003891A01: Install Manual GPS/BT/WIFI Vehicle Mount
AN000163A02	GPS/BT/WIFI Motorcycle Mount	PVC Free PFP-195 6ft QMA Plug (QMA Plug: Amphenol 930-120P-51S) or Motorola Approved Equivalent)	PVC Free PFP-100A 6ft QMA Plug (QMA Plug: Amphenol 930-129-51S or Motorola Approved Equivalent)	PD003891A02: Install Manual GPS/BT/WIFI Motorcycle Mount
AN000163A05	GPS/BT/WIFI Vehicle Mount	PVC Free PFP-195 17ft QMA Plug (QMA Plug: Amphenol 930-120P-51S or Motorola Approved Equivalent)	PVC Free PFP-100A 17ft QMA Plug (QMA Plug: Amphenol 930-129-51S or Motorola Approved Equivalent)	PD003891A01: Install Manual GPS/BT/WIFI Vehicle Mount

Table 1: Mechanical Requirements

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3.1.2 Mechanical:

Random Vibration Test: Per MIL-STD-810E, Method 514.4, Procedure I-3.3

Temperature Cycle Test: In temperature/humidity chamber and perform 5 contiguous cycles of the following temperature cycle:

- a. Begin test at room temperature (+23°C).
- b. Ramp up to 70°C in 94 + 15/-0 minutes (0.5°C/min).
- c. Soak at 70°C for 60 +30/-0 minutes.
- d. Ramp down to -40°C in 220 + 15 minutes/-0 (0.5°C/min).
- e. Soak at -40°C for 60 +30/-0 minutes.
- f. Ramp back to room temperature in 126 + 15 minutes/-0 (0.5°C/min).

Humidity Cycle Test: In temperature/humidity chamber and perform the following 24-hour temperature/humidity profile:

- a. Begin test at 25°C/50% relative humidity.
- b. Ramp temperature to 40°C + 5°C and relative humidity to 95% + 5% in 3 hours + 30 minutes/-0.
- c. Hold at 40°C + 5°C and 95% + 5% relative humidity for 6 hours + 30 minutes/-0.
- d. Ramp temperature to 25°C + 5°C and relative humidity to 80% + 5% in 3 hours + 30 minutes/-0.
- e. Ramp relative humidity to 95% + 5% while maintaining temperature at 25°C + 5°C in 3 hours + 30 minutes/-0.
- f. Soak at 25°C + 5°C and 95% + 5% relative humidity for 6 hours.
- g. Ramp temperature to 40°C + 5°C while maintaining relative humidity at 95% + 5% in 3 hours + 30 minutes/-0.
- h. Repeat steps c through g for a total of 6 cycles.

Salt Spray (Fog) Test: Per MIL-STD-810E, Procedure I, Method 509.3

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3.1.3 Electrical Requirements:

Table 2: BT/WLAN Specifications

Motorola P/N	Freq Range (GHz)	Nominal Impedance (Ohms)	Max. Power (Watts)	Peak Gain (dBi)	Nominal VSWR (over 90 %BW)	MAX. VSWR
AN000163A01	2.40- 2.50	50	1	2.5 – 3.5 ³	< 1.6:1 ¹	< 2.0:1 ¹
	4.9-5.9			(-0.3) – 3.3 ³	< 1.5:1 ¹	<2.0:1 ¹
AN000163A02	2.40- 2.50	50	1	4.0 – 5.0 ³	< 2.1:1 ²	< 2.5:1 ²
	4.9 – 5.9			2.0 – 5.25 ³	< 2.0:1 ²	< 2.5:1 ²
AN000163A05	2.40- 2.50	50	1	1.5– 2.5 ³	< 1.5:1 ⁴	< 2.0:1 ⁴
	4.9-5.9			(-1.9) – 1.6 ³	< 1.4:1 ⁴	<2.0:1 ⁴

¹ Measured in an anechoic setup/ open space with no interference, with the antenna mounted on a 36”diameter ground plane. A 17-foot PFP-240 cable from the antenna mount was connected to a male N-type connector.

² Measured in an anechoic setup/ open space with no interference, with the antenna mounted on a 36”diameter ground plane. A 6-foot PFP-240 cable from the antenna mount was connected to a male N-type connector. Theoretical values were then calculated, taking into account the difference in cable loss between LMR-240 and LMR195.

³ Measured in an anechoic setup/ open space with no interference, with the antenna mounted on a 36”diameter ground plane. Measured gain is corrected for the appropriate cable loss.

⁴ Using setup from note (1) above, theoretical values were then calculated, taking into account the difference in cable loss between LMR-240 and LMR195.

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Table 3: GNSS Specifications

Characteristics	Minimum Value	Typical Value	Maximum Value	Units
Operating Temperature	-40	-	+85	C
Frequency	1565	Fc=1586	1608	MHz
Polarization	-	Right Hand Circular	-	-
Bandwidth (3dB)	36	43		MHz
Attenuation, Fc-25MHz	NA	NA	-	dB
Attenuation, Fc-45MHz	56	65	-	dB
Attenuation, Fc-70MHz	60	60	-	dB
Attenuation, Fc-200MHz	60	60	-	dB
Attenuation, Fc-600MHz	65	65	-	dB
Attenuation, Fc-1000MHz	70	70	-	dB
Noise Figure	-	2.0	4.5	-
Output VSWR	-	1.5	2.5	-
Output Return Loss	-	-	-10	dB
Power Supply	2.8	5	6	V
Current	-	23	26	mA

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Current Over Temperature	-	25	30	mA
LNA Gain (without Antenna Element and Cable)	24	26	28	dB
Gain variation over temperature	-4	-	3	dB
1 dB Input Compression Point	-23	-	-	dBm

4. EXCEPTIONS AND WAIVERS

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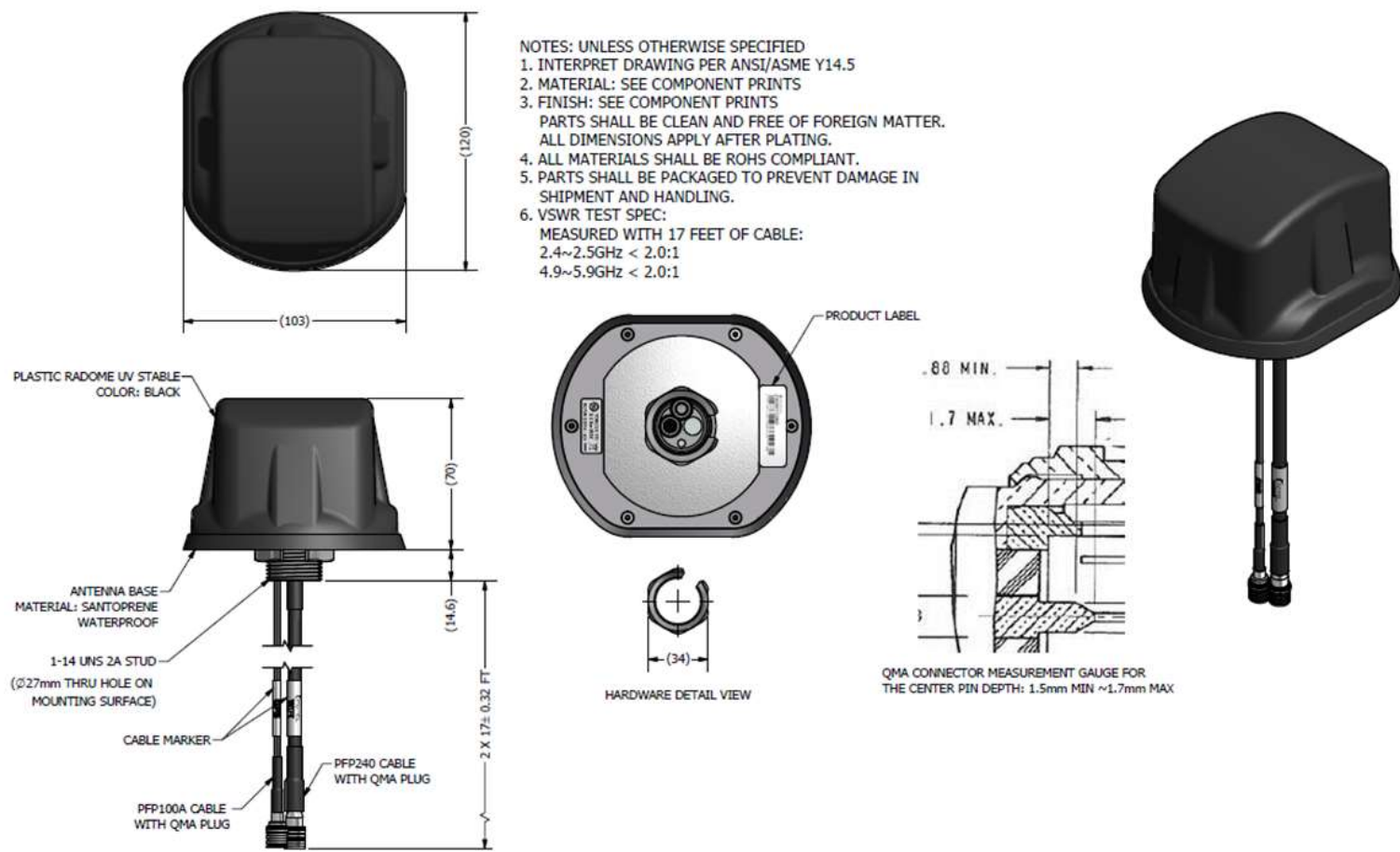
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5. ANTENNA DIAGRAM

AN000163A01

Note: Dimensions in Millimeters



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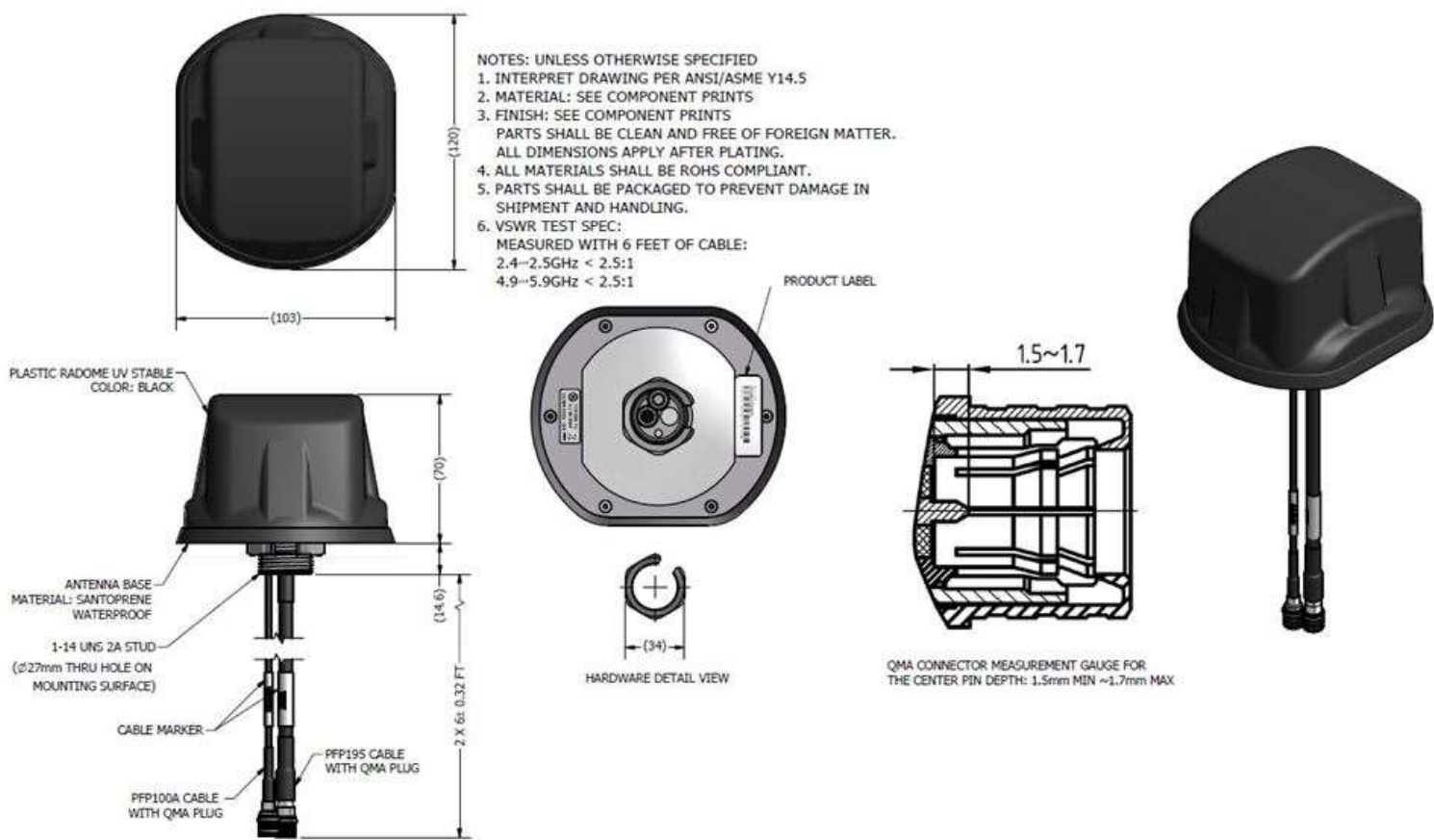
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AN000163A02

Note: Dimensions in Millimeters



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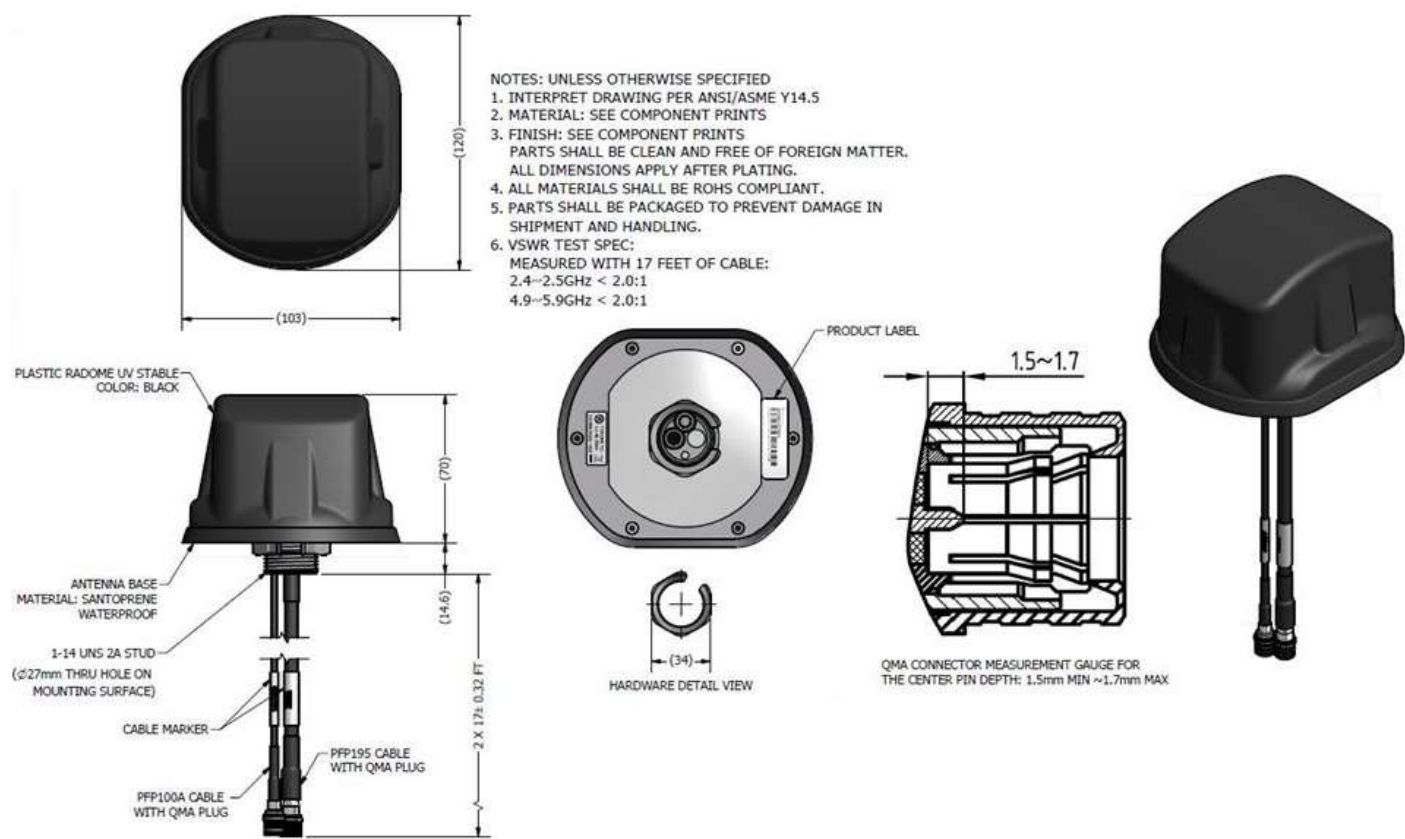
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AN000163A05

Note: Dimensions in Millimeters



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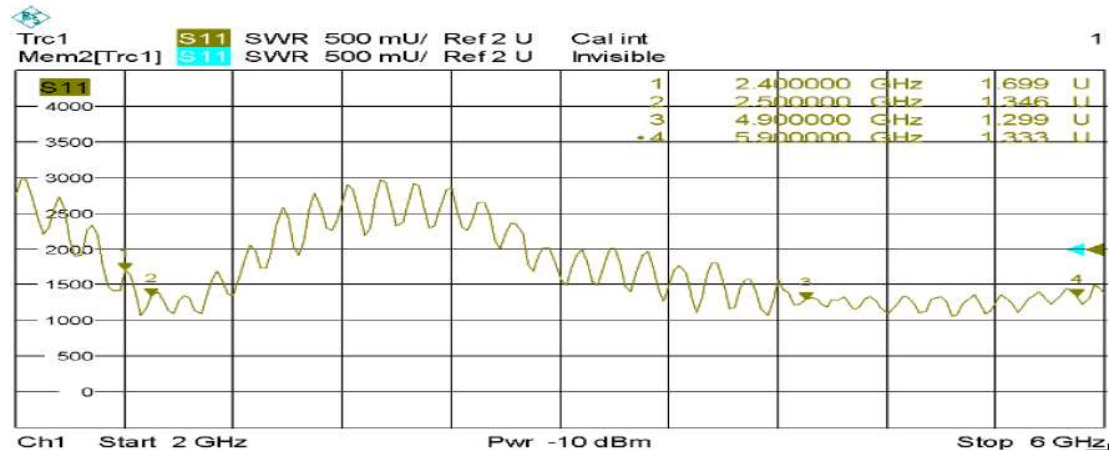


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6. TYPICAL VSWR FOR REFERENCE, (with 17ft Cable)



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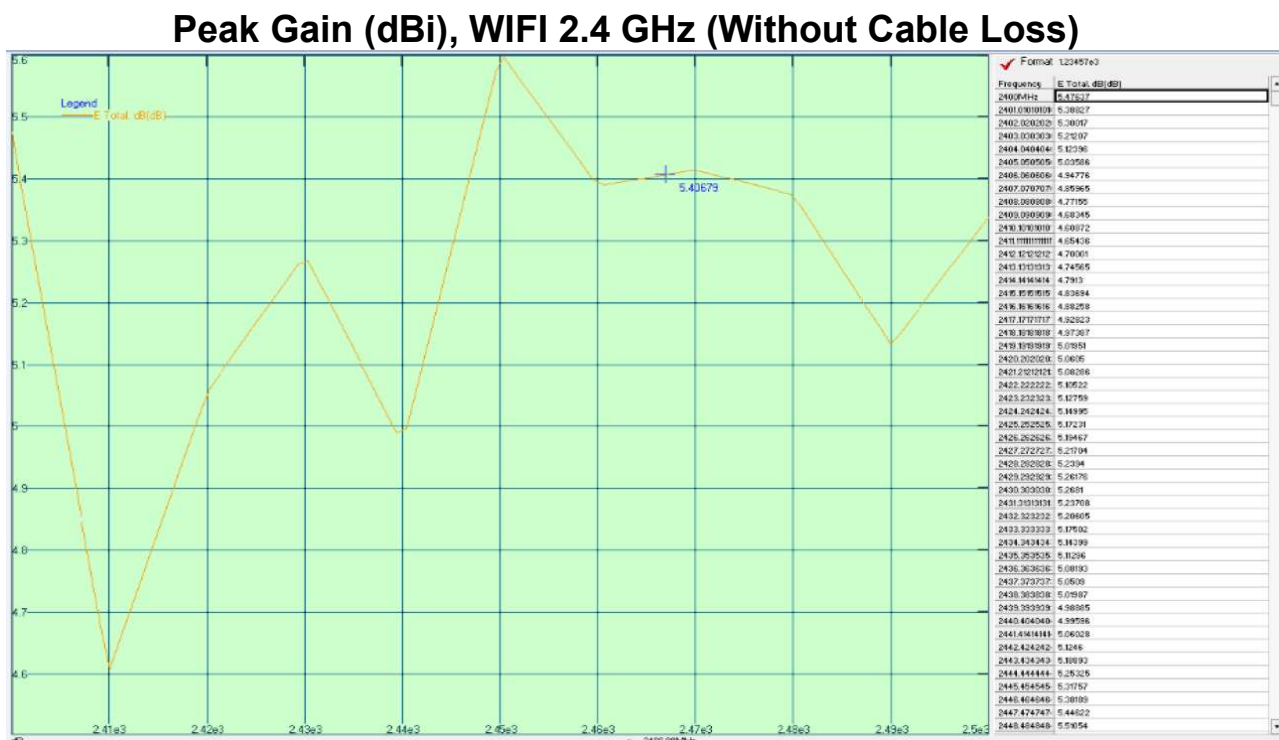


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7. TYPICAL PEAK GAIN FOR REFERENCE



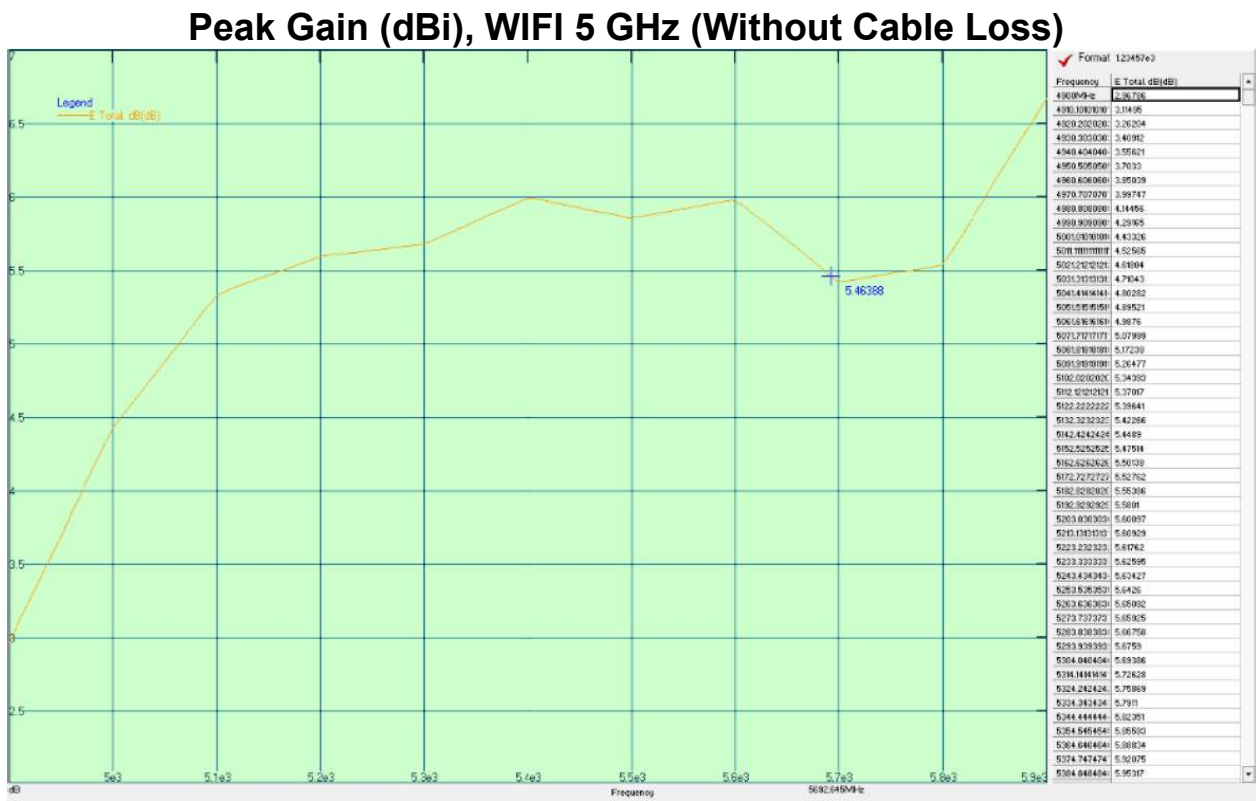
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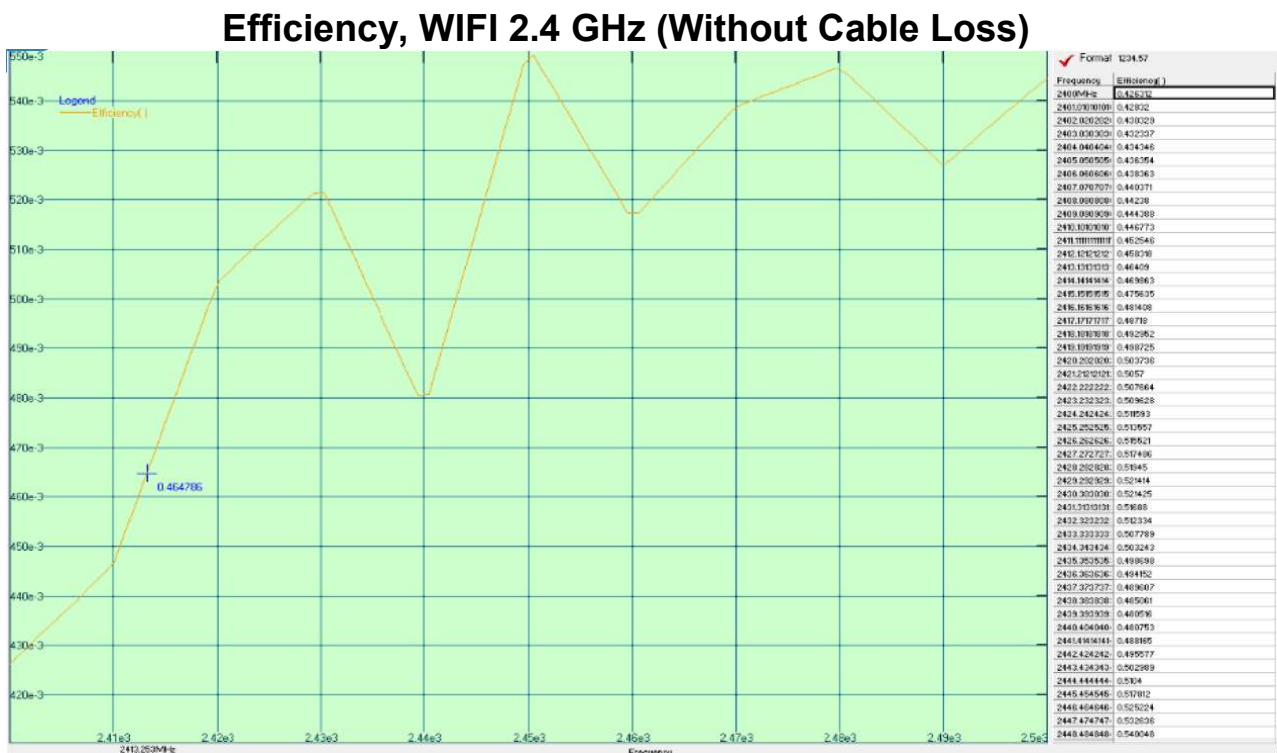


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8. TYPICAL EFFICIENCY FOR REFERENCE

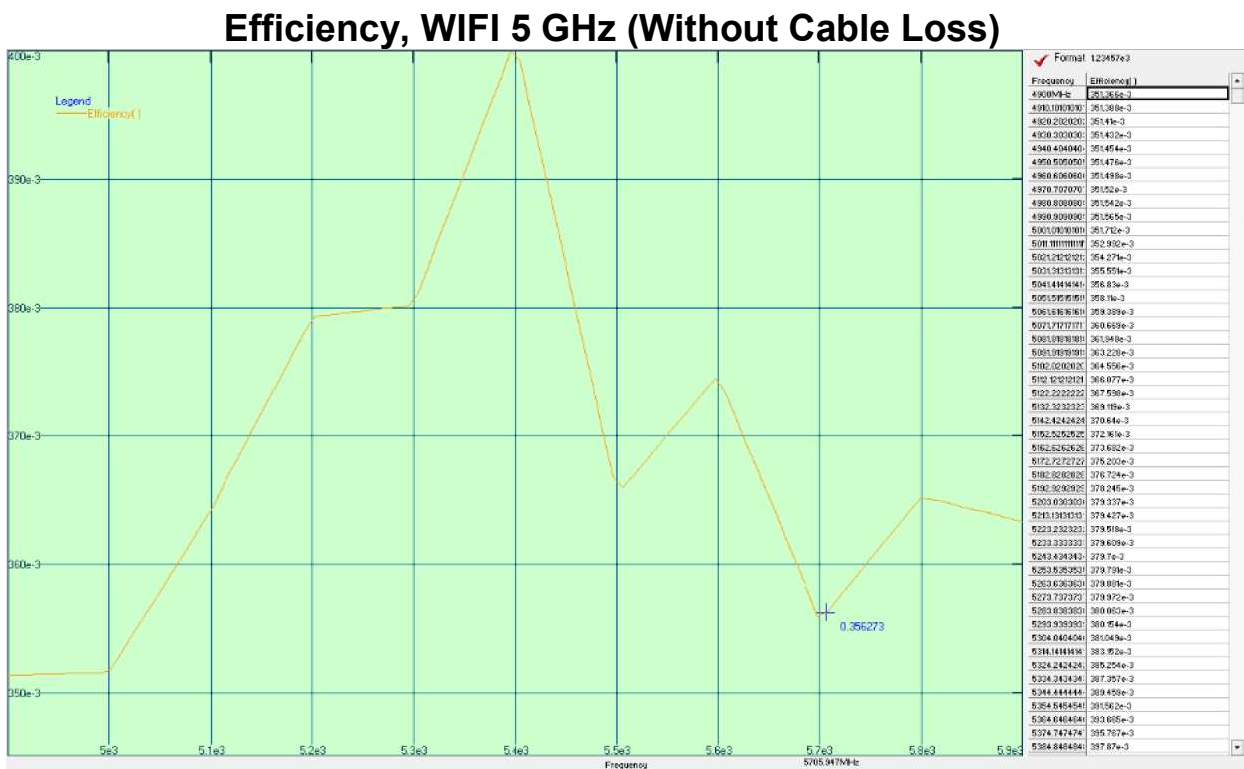




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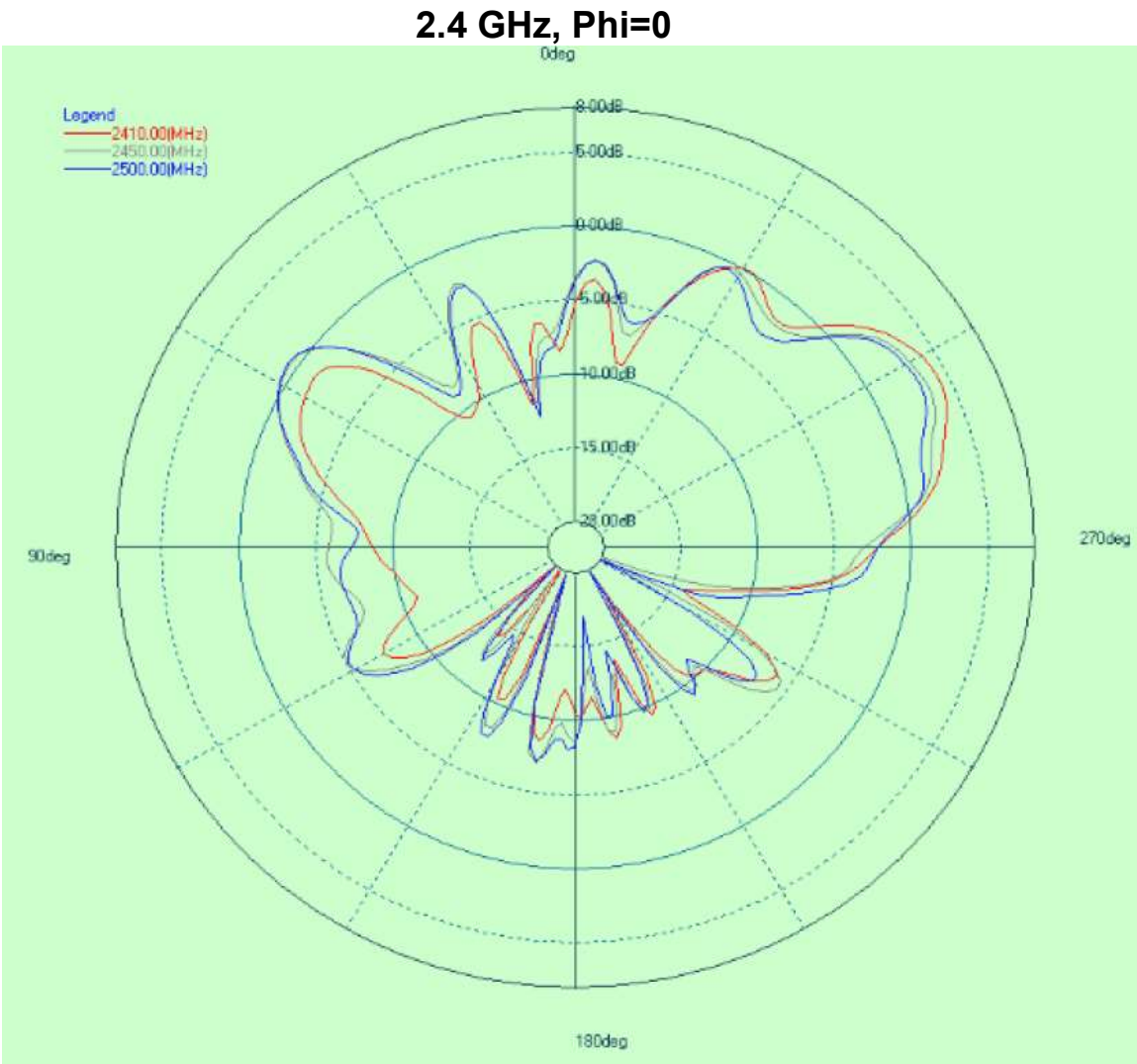


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9. TYPICAL RADIATION PATTERNS



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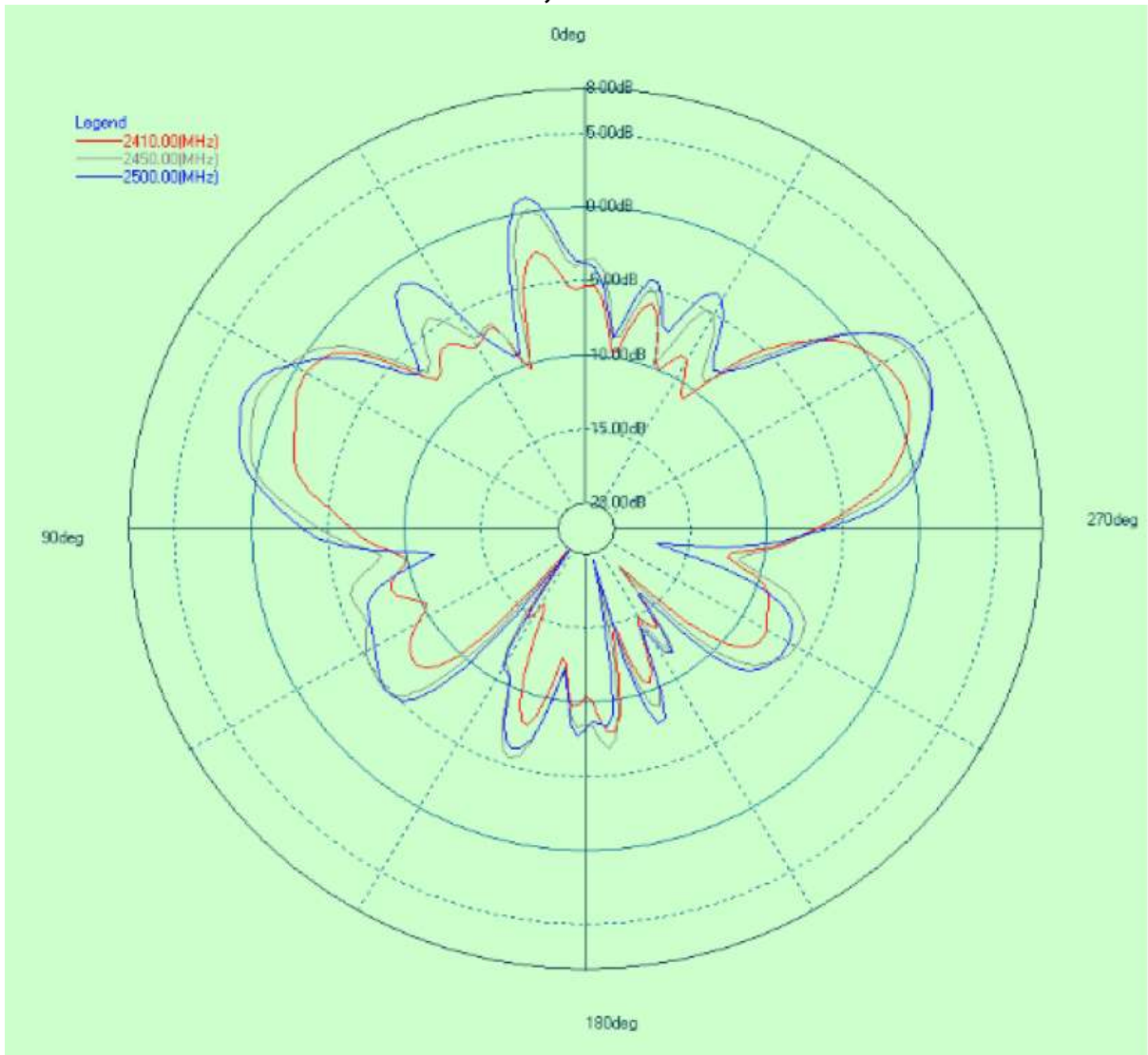


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2.4 GHz, Phi=90



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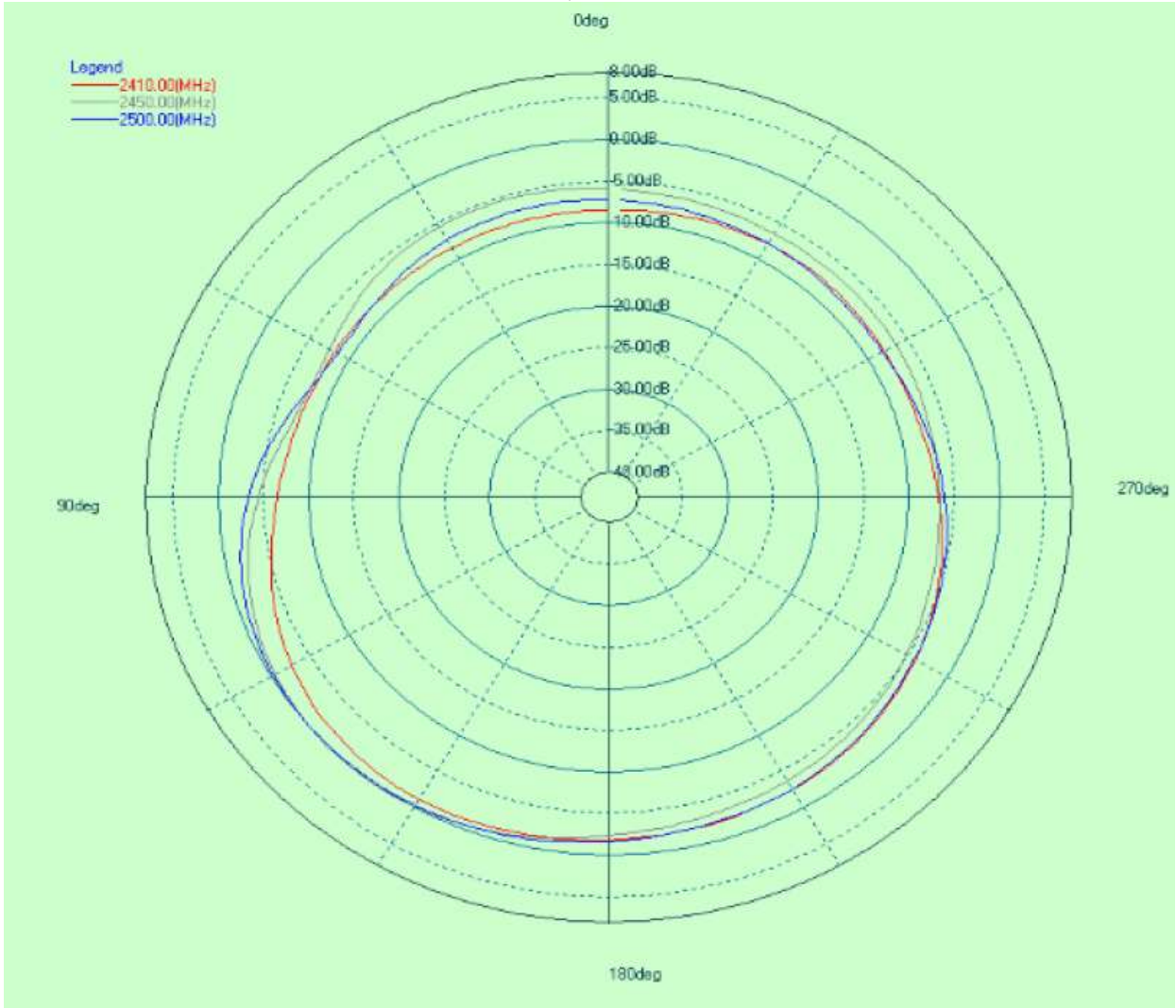


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2.4 GHz, Theta=90



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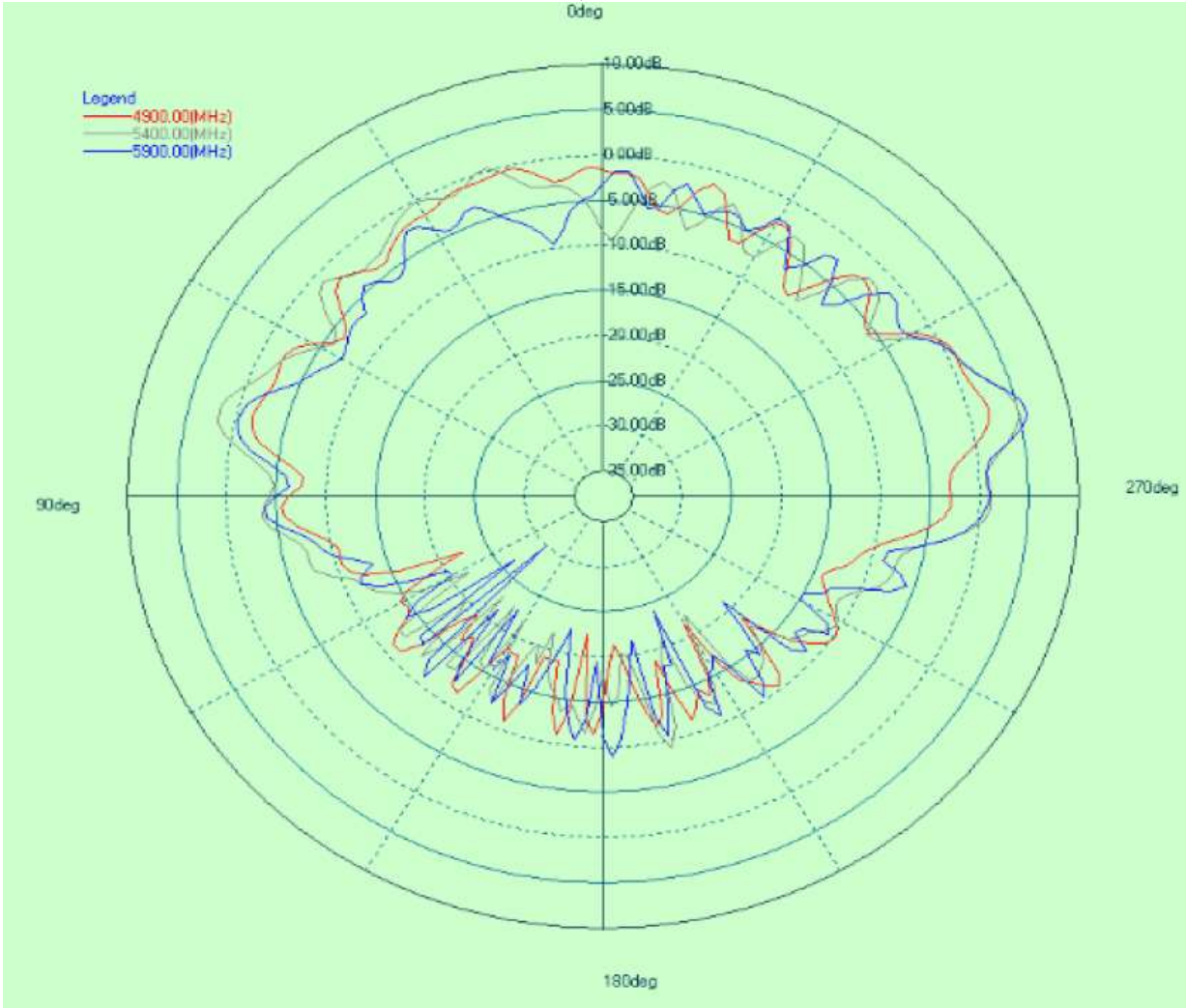


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5 GHz, Phi=0



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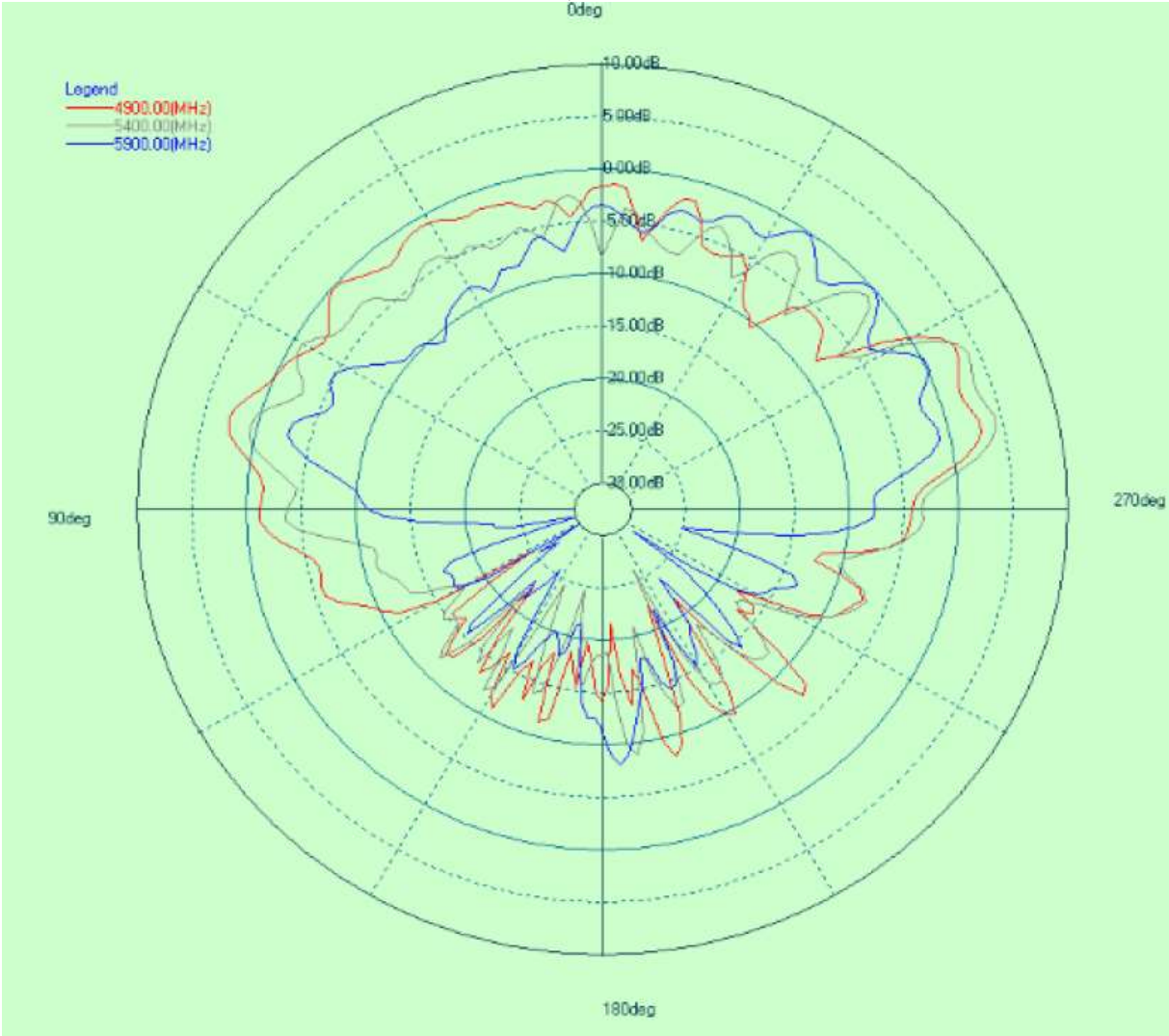


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5 GHz, Phi=90



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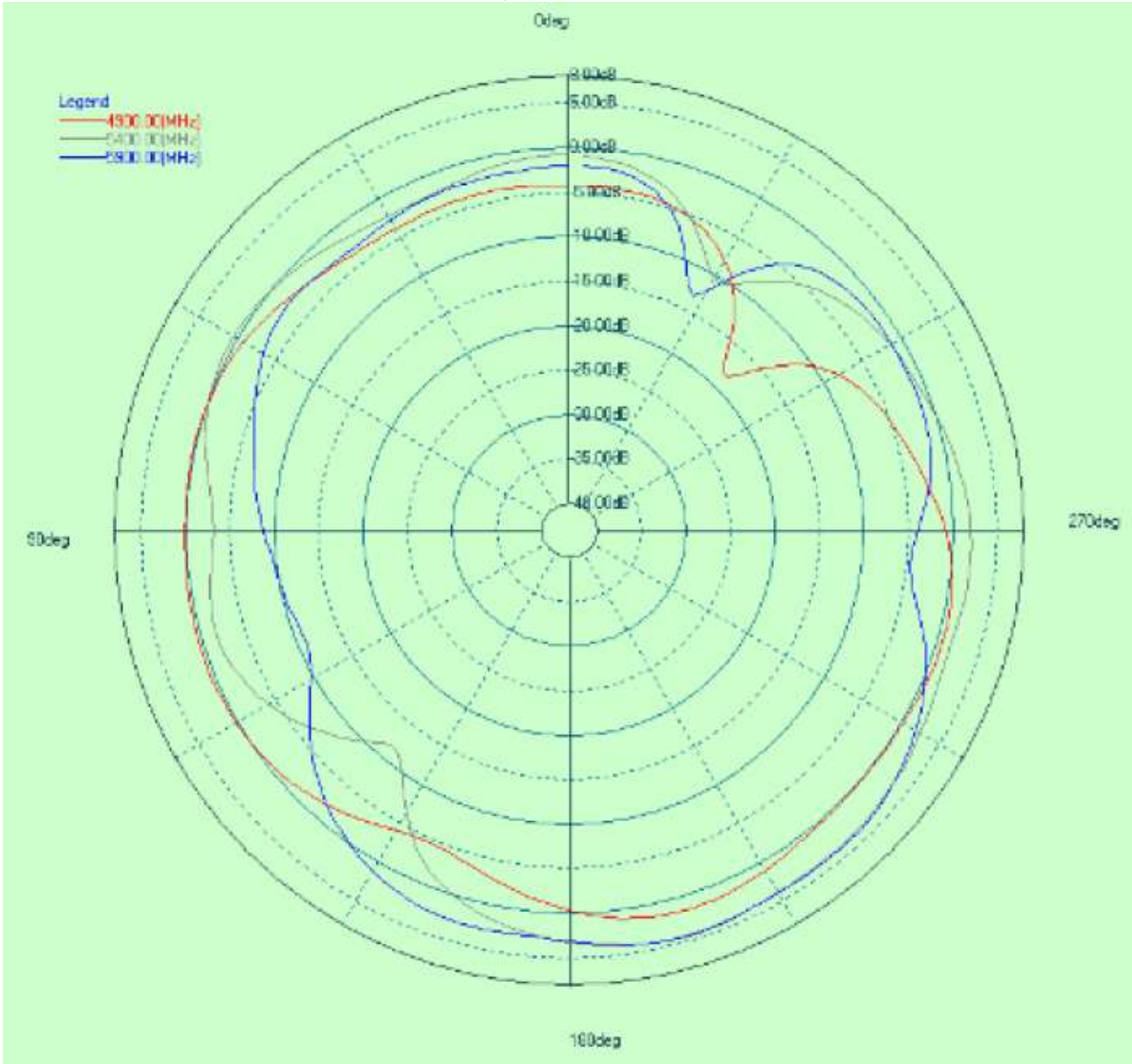


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5 GHz, Theta=90



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10. OTHER ANTENNA PARAMETERS

Band	Frequency (GHz)	3 dB Vertical Beamwidth (degrees)	Peak Gain Angle from Horizon (degrees)
2.4 GHz	2.45	20	27
5 GHz	5.85	18 typical	15 typical

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