

BLE and Wi-Fi Antenna Test Report

Product details:

Report Date: 08/27/2025

Entity / Grantee Name: Ring, LLC

OTA Engineer: Sumitra Dey (Amazon Lab126)

Address: 1100 Enterprise Way, Sunnyvale, CA. 94089

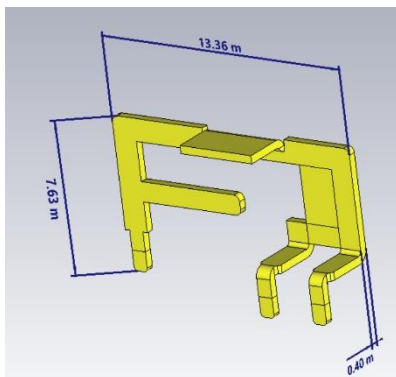
Antenna Specification:

1 x BLE antenna: 2.4 GHz

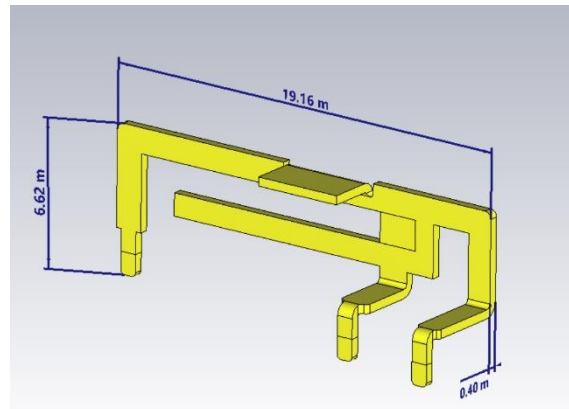
1 x WIFI Antenna: 2.4 GHz / 5 GHz

Antenna Type:

BLE Antenna: Stamped metal IFA



WIFI Antenna: Stamped metal IFA



Antenna Efficiency and Peak Gain:

BLE antenna		
BLE Frequency Bands (MHz)	Efficiency (dB)	Peak Gain (dBi)
2402	-3	2
2440	-3	2
2480	-3	2

Wi-Fi Antenna		
Wi-Fi Frequency Bands (MHz)	Efficiency (dB)	Peak Gain (dBi)
1 (2412)	-4	3
6 (2437)	-3	4
11 (2462)	-4.5	2.5
36 (5180)	-3.5	2
48 (5240)	-2.5	2.5
100 (5500)	-2	4
165 (5825)	-2	5

Antenna Gain Measurement:

Measurement Test Method:

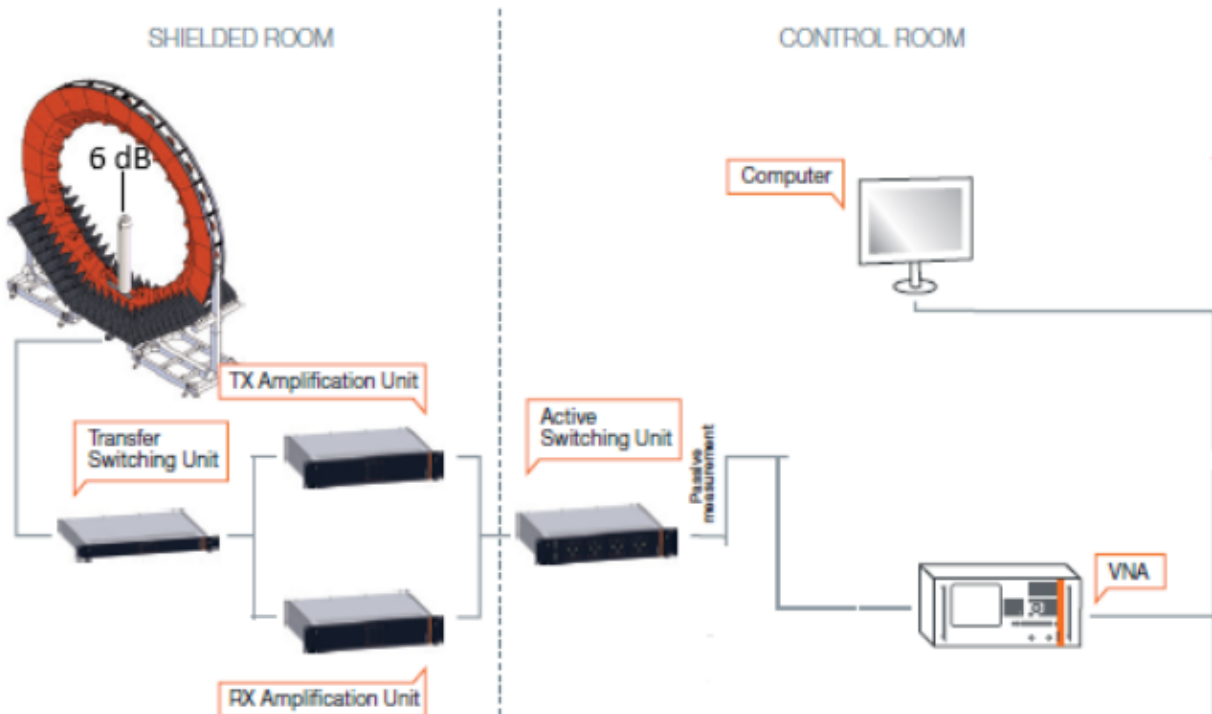
Center antenna in chamber phase center with antenna cable through foam block to device, and measure passive antenna performance by VNA and OTA chamber system, and measurement was done at device level.

Test Equipment Used:

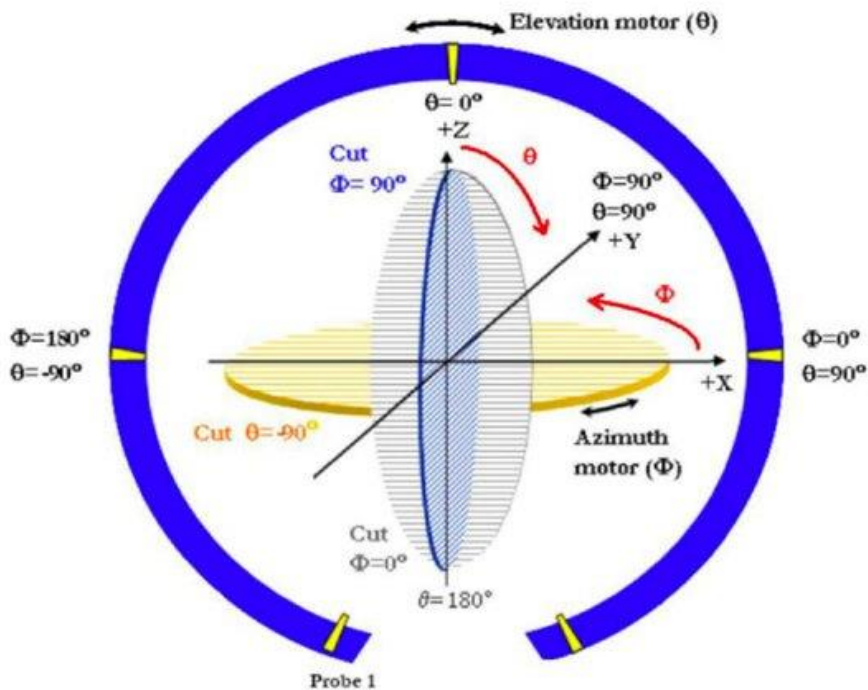
Description	Manufacturer	Model	Serial Number	Cal from	Cal Due
Test Chamber	Satimo-MVG	Star Gate 24	ATL541S	Feb 2025	1 year
Vector Network Analyzer	Rohde & Schwarz	ZNB 8	1311.6010K44-102143-Wv	10/16/2024	1 year

Test Setup:

1. Below is a block diagram of the antenna measurement setup.



2. Turn table angle definition



Antenna Location:

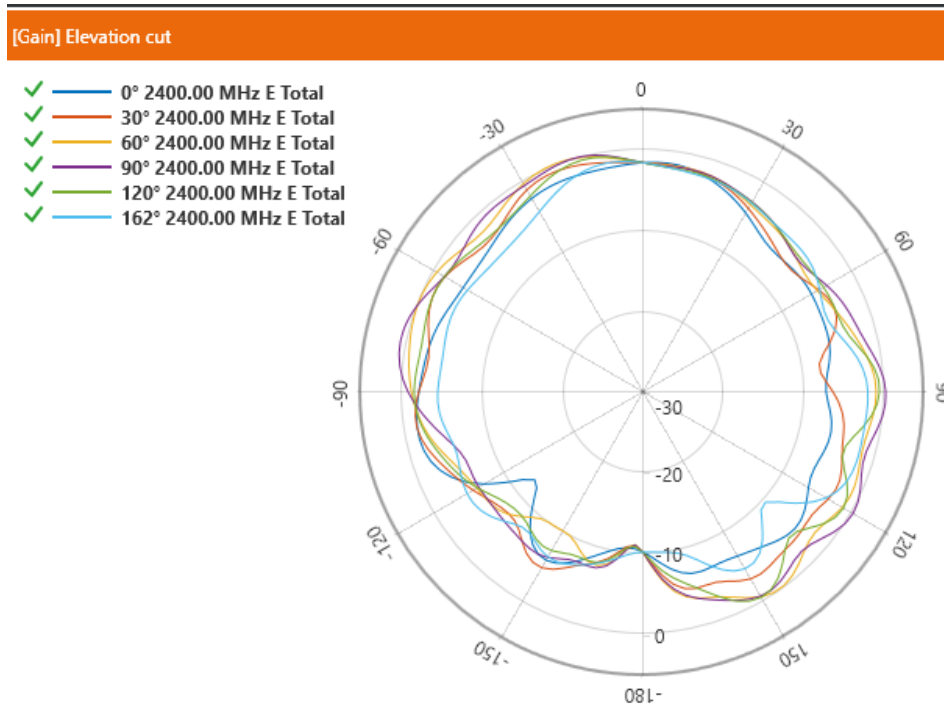
Laser pointer on camera lens

2D Radiation Pattern:

$\phi = 0^\circ \rightarrow$ XZ plane

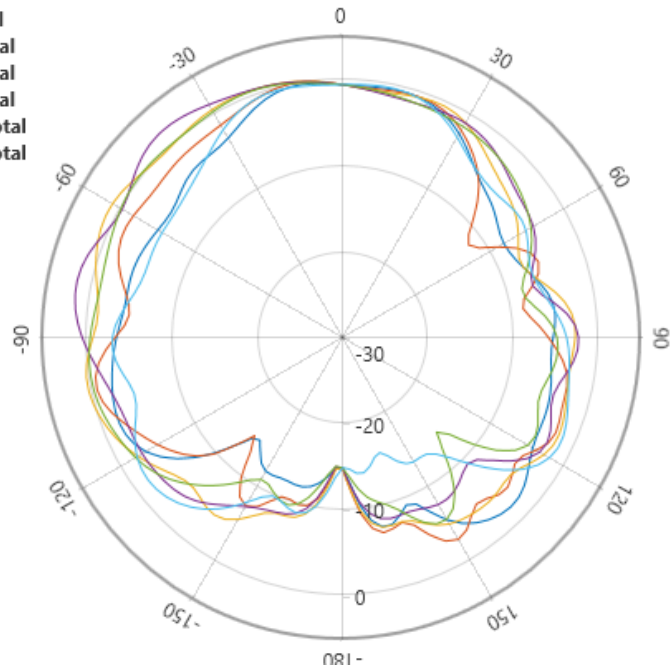
$\phi = 90^\circ \rightarrow$ YZ plane

BLE antenna radiation pattern:



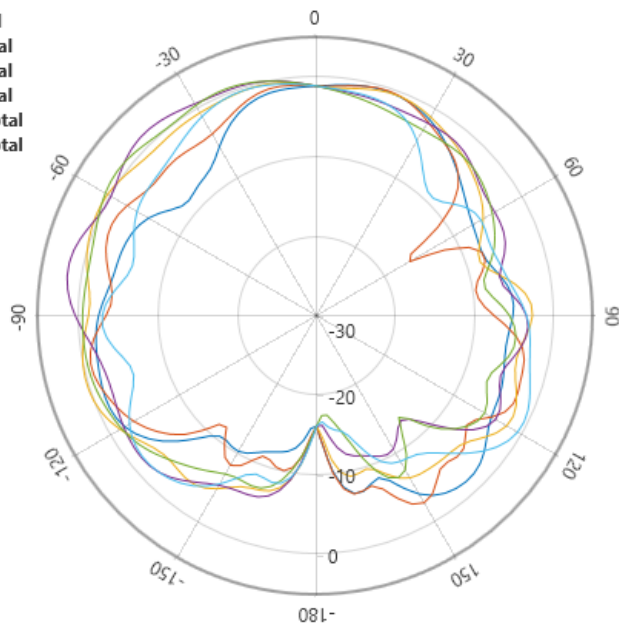
[Gain] Elevation cut

- ✓ 0° 2450.00 MHz E Total
- ✓ 30° 2450.00 MHz E Total
- ✓ 60° 2450.00 MHz E Total
- ✓ 90° 2450.00 MHz E Total
- ✓ 120° 2450.00 MHz E Total
- ✓ 162° 2450.00 MHz E Total



[Gain] Elevation cut

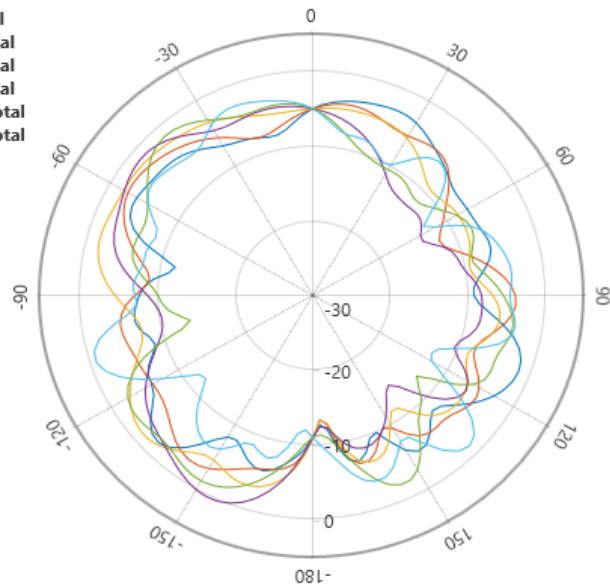
- ✓ 0° 2480.00 MHz E Total
- ✓ 30° 2480.00 MHz E Total
- ✓ 60° 2480.00 MHz E Total
- ✓ 90° 2480.00 MHz E Total
- ✓ 120° 2480.00 MHz E Total
- ✓ 162° 2480.00 MHz E Total



Wi-Fi antenna radiation pattern:

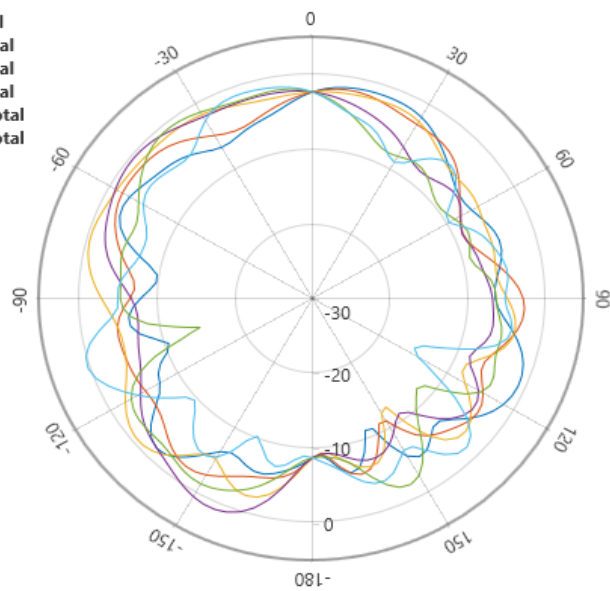
[Gain] Elevation cut

- ✓ 0° 2400.00 MHz E Total
- ✓ 30° 2400.00 MHz E Total
- ✓ 60° 2400.00 MHz E Total
- ✓ 90° 2400.00 MHz E Total
- ✓ 120° 2400.00 MHz E Total
- ✓ 162° 2400.00 MHz E Total



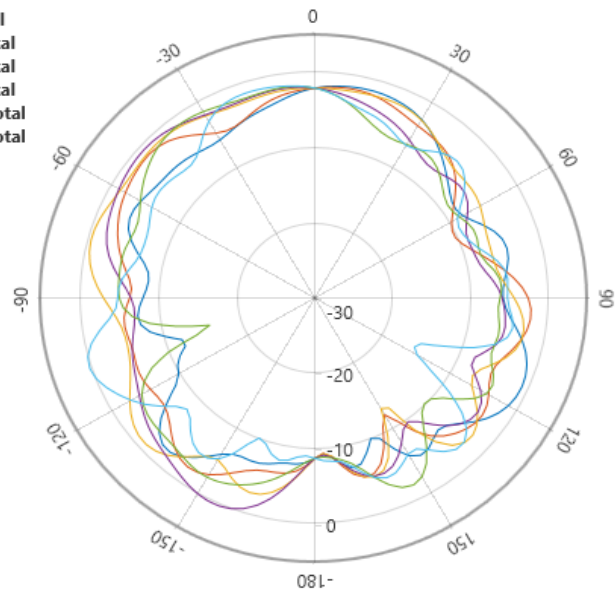
[Gain] Elevation cut

- ✓ 0° 2450.00 MHz E Total
- ✓ 30° 2450.00 MHz E Total
- ✓ 60° 2450.00 MHz E Total
- ✓ 90° 2450.00 MHz E Total
- ✓ 120° 2450.00 MHz E Total
- ✓ 162° 2450.00 MHz E Total



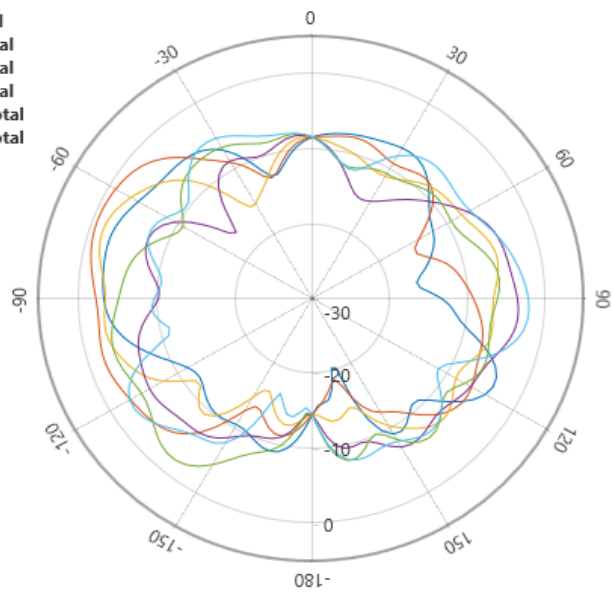
[Gain] Elevation cut

- ✓ 0° 2480.00 MHz E Total
- ✓ 30° 2480.00 MHz E Total
- ✓ 60° 2480.00 MHz E Total
- ✓ 90° 2480.00 MHz E Total
- ✓ 120° 2480.00 MHz E Total
- ✓ 162° 2480.00 MHz E Total



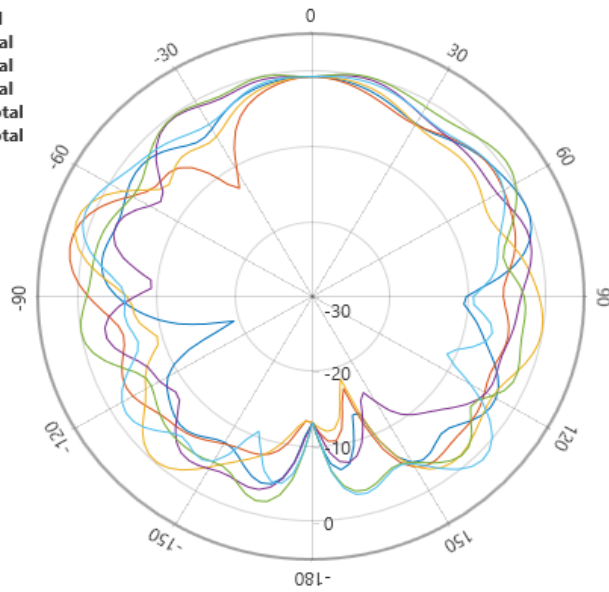
[Gain] Elevation cut

- ✓ 0° 5180.00 MHz E Total
- ✓ 30° 5180.00 MHz E Total
- ✓ 60° 5180.00 MHz E Total
- ✓ 90° 5180.00 MHz E Total
- ✓ 120° 5180.00 MHz E Total
- ✓ 162° 5180.00 MHz E Total



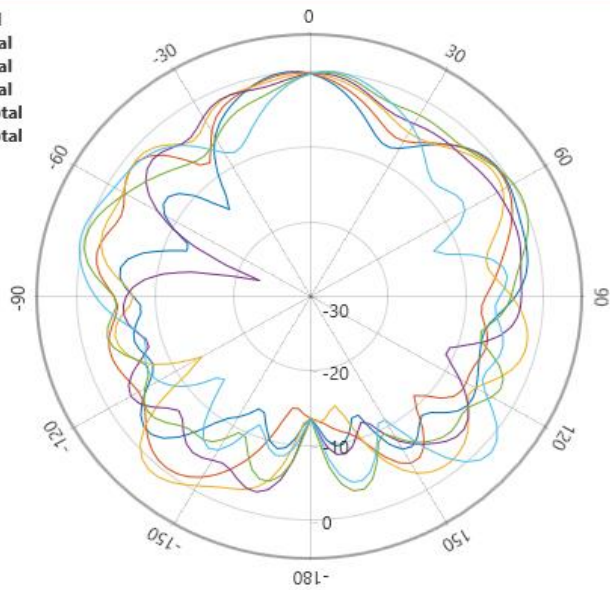
[Gain] Elevation cut

- ✓ 0° 5500.00 MHz E Total
- ✓ 30° 5500.00 MHz E Total
- ✓ 60° 5500.00 MHz E Total
- ✓ 90° 5500.00 MHz E Total
- ✓ 120° 5500.00 MHz E Total
- ✓ 162° 5500.00 MHz E Total



[Gain] Elevation cut

- ✓ 0° 5800.00 MHz E Total
- ✓ 30° 5800.00 MHz E Total
- ✓ 60° 5800.00 MHz E Total
- ✓ 90° 5800.00 MHz E Total
- ✓ 120° 5800.00 MHz E Total
- ✓ 162° 5800.00 MHz E Total



24G Radio

1. Antenna manufacturer: Socionext
2. Antenna type: Patch antenna
3. Antenna gain: 2dbi

2.4. Antenna configuration

Figure 2-3 shows an antenna configuration. This product has two receiver antennas. The center-to-center distance of receiver antennas is 5.76 mm.

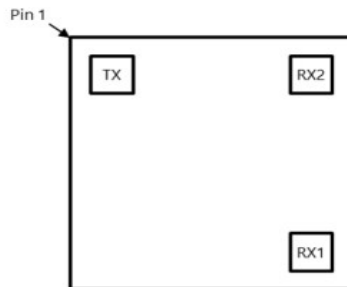


Figure 2-3 Top View Antenna configuration (Not to scale)

Table 3-11 Antenna Section

Parameter		Symbol	Conditions	Limits			Unit
				Min	Typ	Max	
E1	RX antenna Gain	Grxa	$f_{RF}=24.15\text{GHz}$		2		dBi
E2	TX antenna Gain	Gtxa	$f_{RF}=24.15\text{GHz}$		2		dBi

Table 3-15 Transmitter Section

Parameter		Symbol	Conditions	Limit			Unit
				Min	Typ	Max	
E21	RF transmit Frequency range	f_{TX}		24.06		24.24	GHz
E22	RF Transmit Power ^{Note 11)}	PAout	$f_{TX}=24.05\text{GHz}$ to 24.25GHz , $T_{jopr}=25^{\circ}\text{C}$	-1	2	3.7	dBm
E23	Transmit Power Variation ^{Note 11)}	PAvar	$f_{TX}=24.05\text{GHz}$ to 24.25GHz		0.7		dB

Note 11) These limit values are based on the measurement conditions defined by Socionext; a receiving antenna is placed in the zenith direction of the DUT and the distance is 3m. Socionext's conditions may differ from the conditions defined in the radio regulations of each country.

Antenna pattern (Reference)

