

Test Report for Antenna Specifications for 5CCEA2

Product details:

FCC-ID: 2AEUPBHASC0111

Product Model Number: 5CCEA2

Date (Report): 5/2/2025

Test Date: 4/28/2025

Entity / Grantee Name:

OTA Engineer: Yohannes Samuel (Amazon Lab126)

Address: 1100 Enterprise Way, Sunnyvale, CA. 94089

Antenna Specification:

Operating Frequency Range:

LoRa Antenna: 860 MHz – 930 MHz

BLE Antenna: 2400 MHz – 2480 MHz

WiFi Antenna: 2400 MHz – 2480 MHz; 5180 MHz – 5825 MHz

24G Radar 24.05~24.25 GHz

Antenna Type:

LoRa/BLE/WiFi: Stamped metal antenna.

24G Radar: Patch

Peak Antenna Gain:

Technology	Frequency (MHz)	Peak Gain (dBi)		
		LoRa Antenna	BLE Antenna	WiFi Antenna
LoRa	860	1	X	X
	900	1	X	X
	930	1	X	X
BLE	2402	X	2	X

	2440	X	2	X
	2480	X	2	X
WiFi	2412	X	X	2.8
	2436	X	X	2.8
	2462	X	X	2.8
	5180	X	X	2
	5260	X	X	3
	5320	X	X	3
	5500	X	X	4
	5825	X	X	3.2

24G Radar peak gain: 2dBi

Antenna Gain Measurement:

Measurement Test Method:

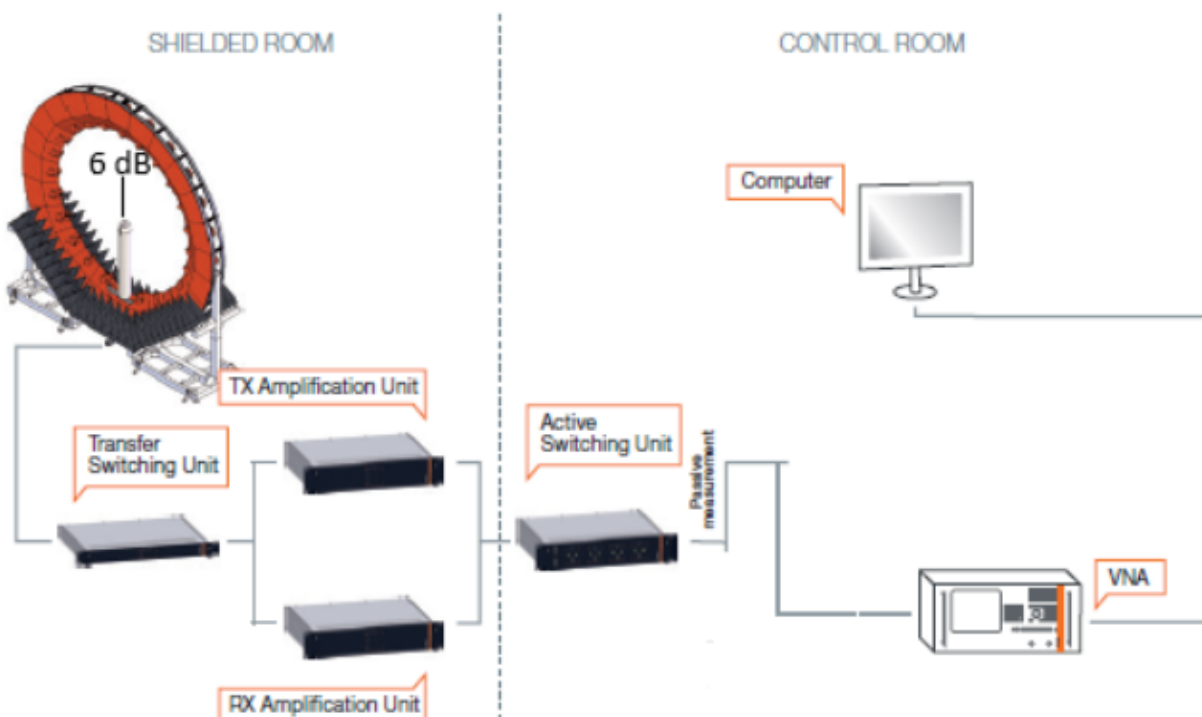
Center antenna in chamber phase center with antenna cable through foam block to device, and measure passive antenna performance by VNA and OTA chamber system, and the measurement was done at device level.

Test Equipment Used:

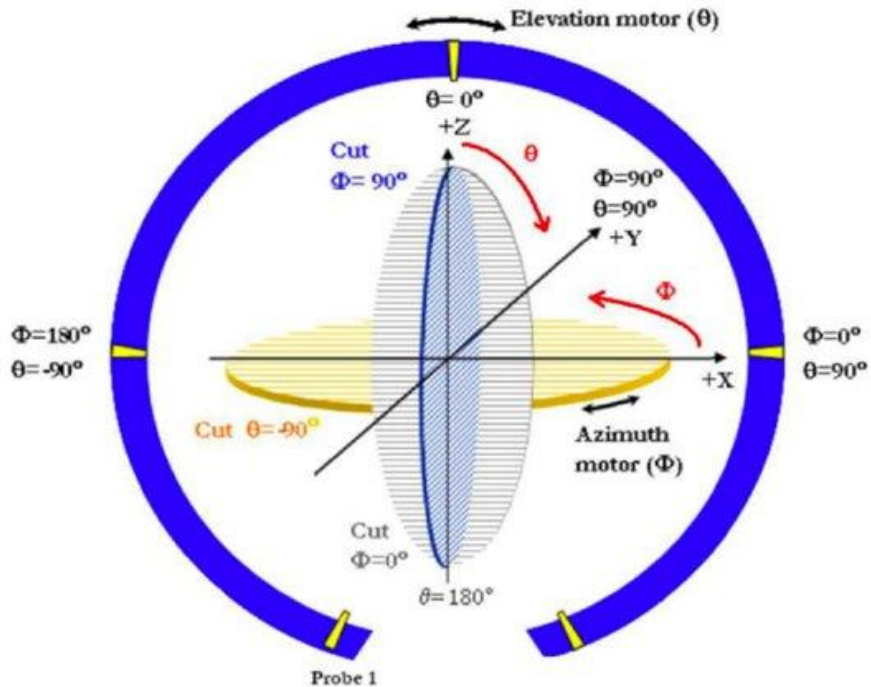
Description	Manufacturer	Model	Serial Number	Cal from	Cal Due
Test Chamber	Satimo-MVG	Star Gate 24	ATL541S	Feb 2025	1 year
Vector Network Analyzer	Rohde & Schwarz	ZNB 8	1311.6010K44-102143-Wv	10/16/2024	1 year

Test Setup:

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



2. Turn table angle definition



2D Radiation Pattern:

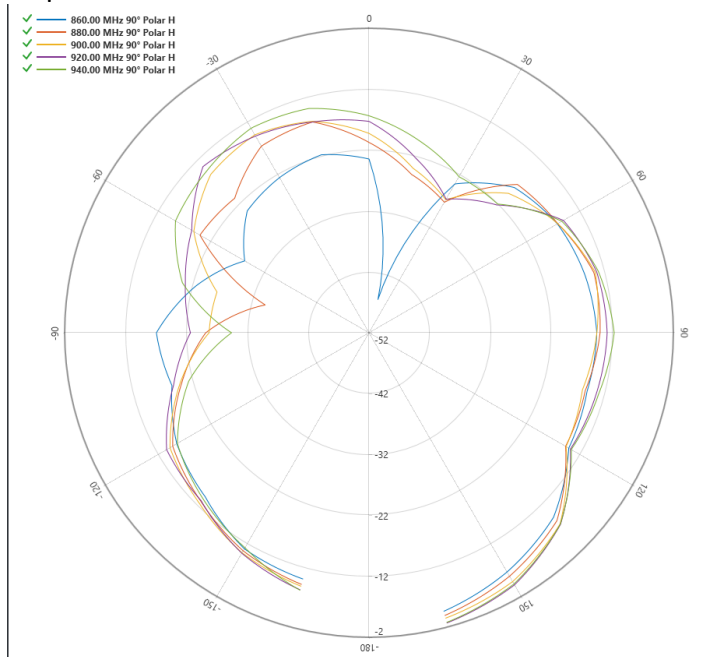
LoRa/BLE/WiFi antenna radiation pattern:

Stamped Metal Antennas:

LoRa Bands (860 MHz – 940 MHz)

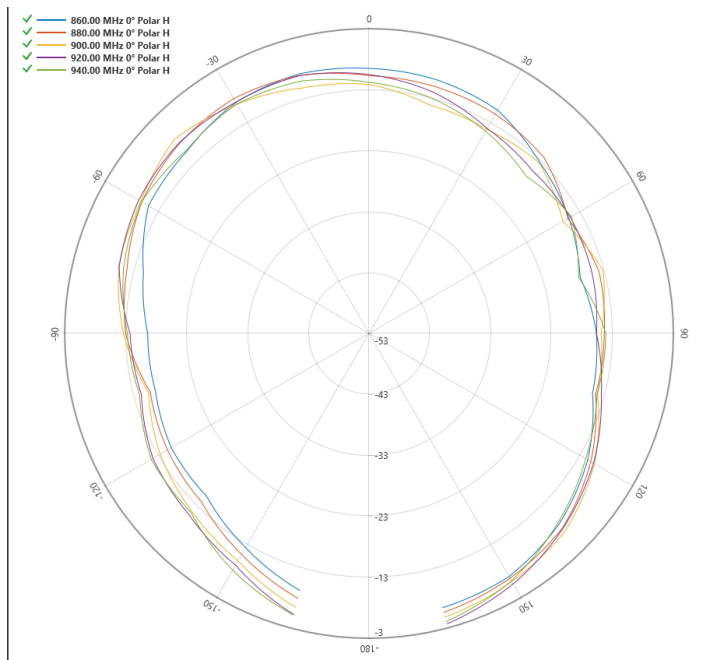
[Gain] Elevation cut (90 deg)

XZ plane



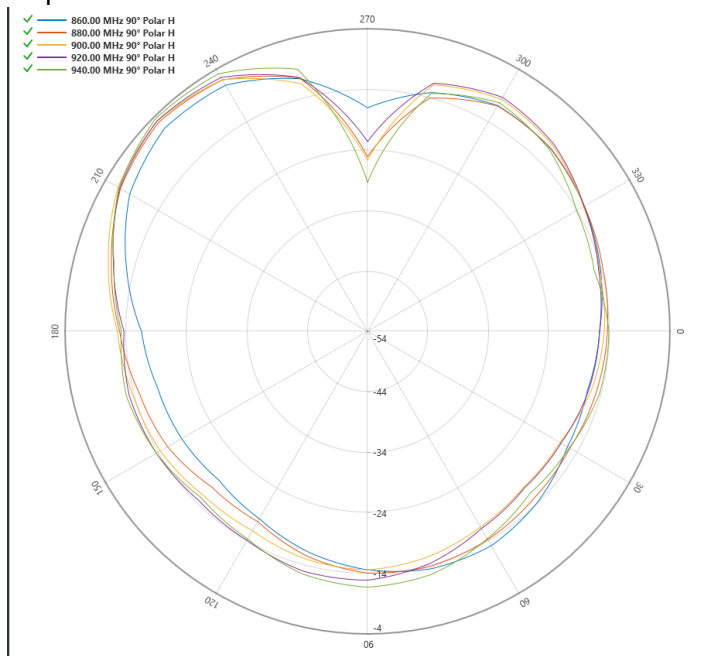
[Gain] Elevation cut (0 deg)

XY plane



[Gain] Azimuth cut (90 deg)

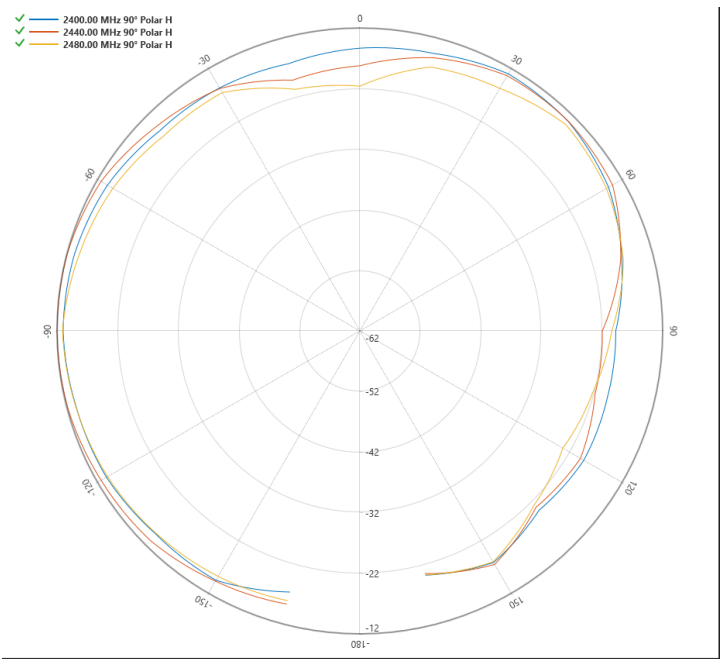
YZ plane



BLE Bands (2400 MHz – 2480 MHz)

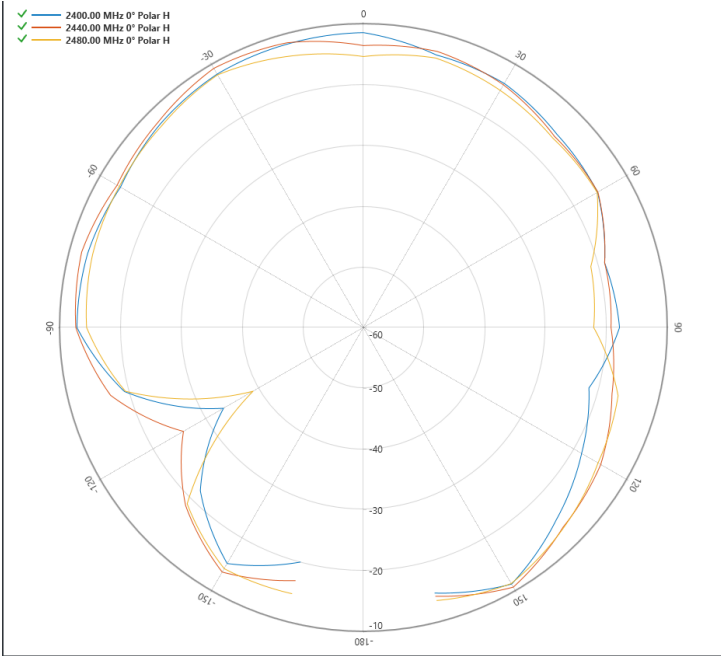
[Gain] Elevation cut (90 deg)

XZ plane



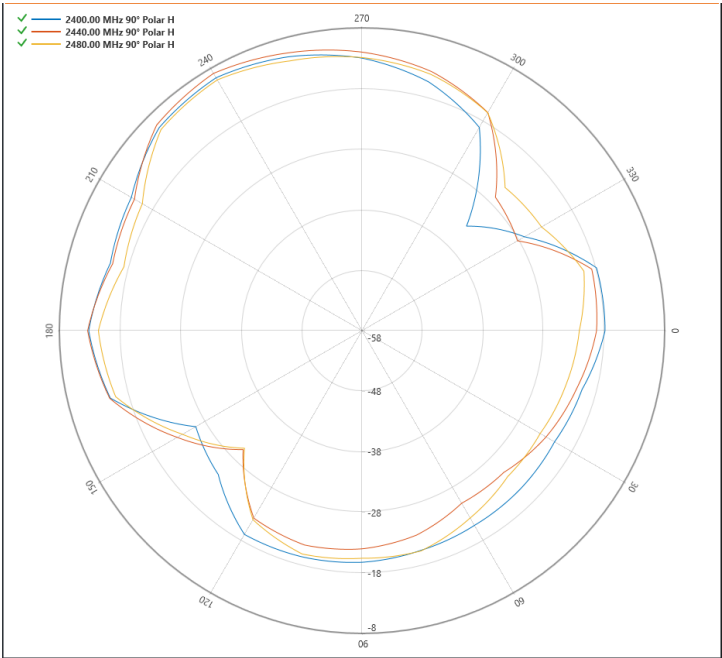
[Gain] Elevation cut (0 deg)

XY plane



[Gain] Azimuth cut (90 deg)

YZ plane

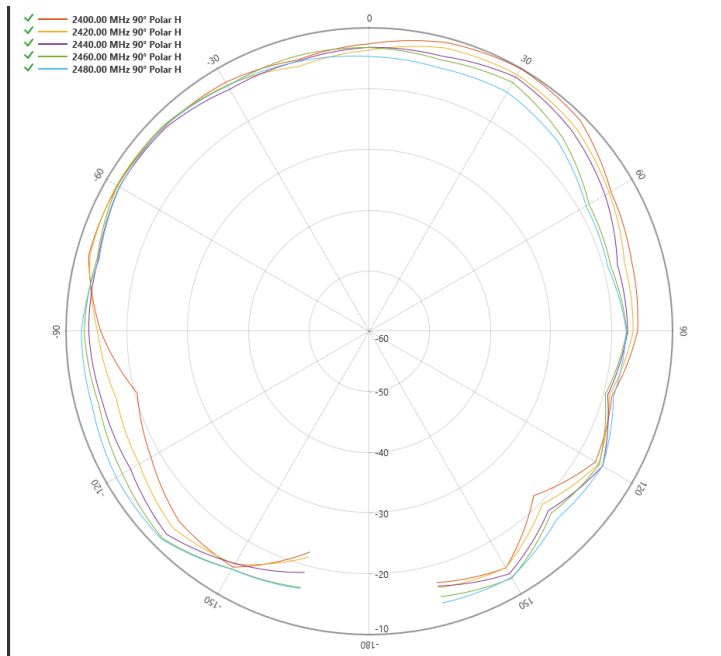


WiFi Bands (2400 MHz – 2480 MHz; 5180 MHz – 6000 MHz)

2G Bands:

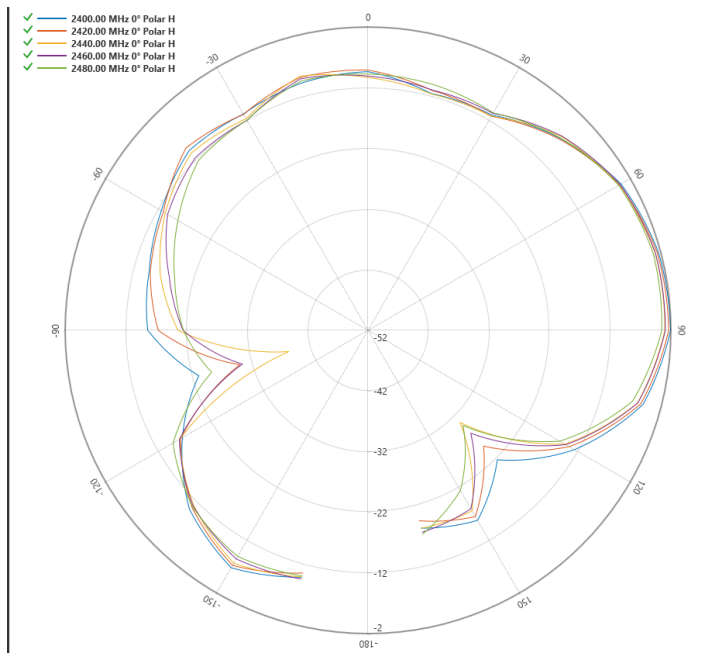
[Gain] Elevation cut (90 deg)

XZ plane



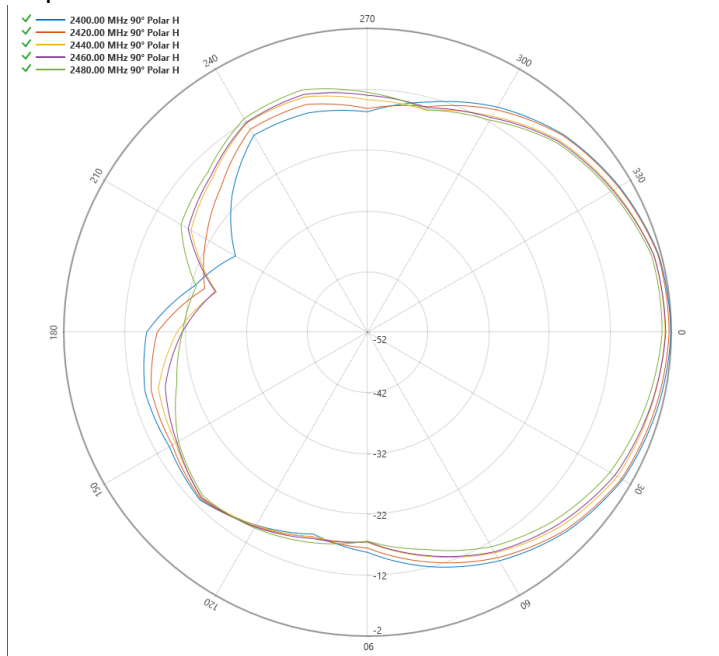
[Gain] Elevation cut (0 deg)

XY plane



[Gain] Azimuth cut (90 deg)

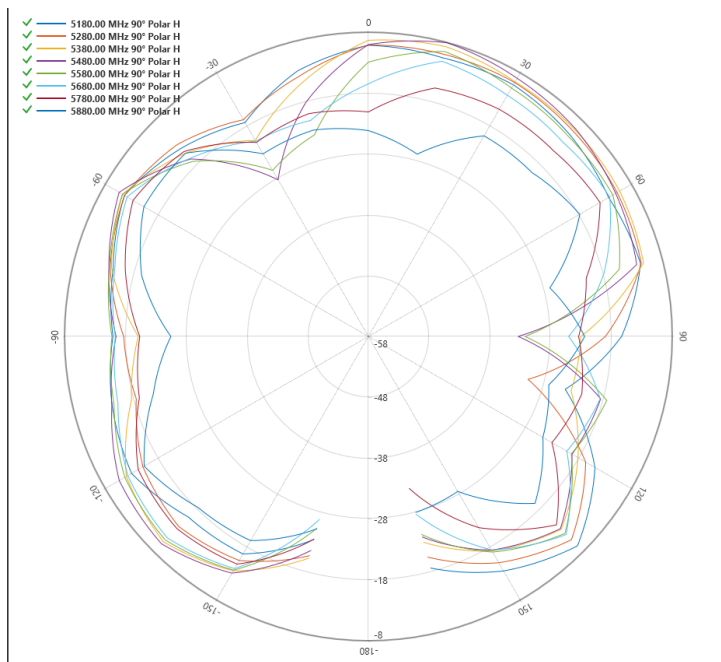
YZ plane



5G Bands:

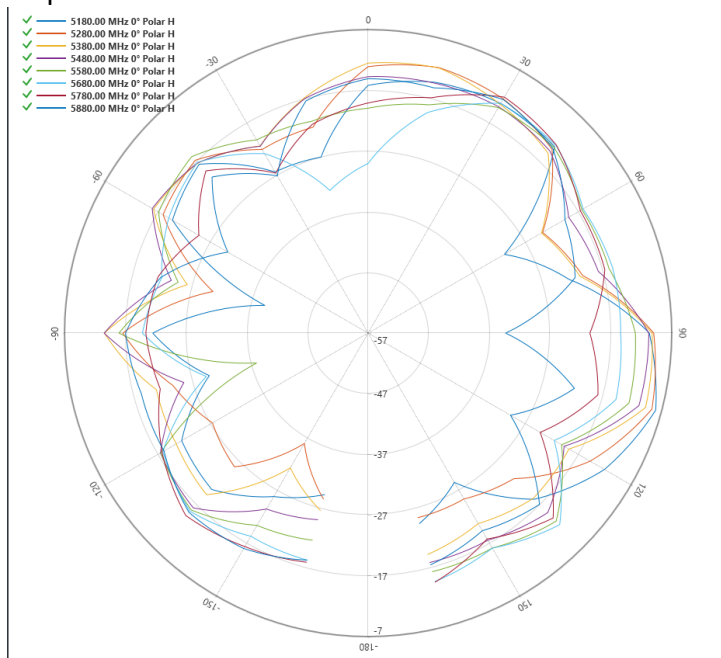
[Gain] Elevation cut (90 deg)

XZ plane



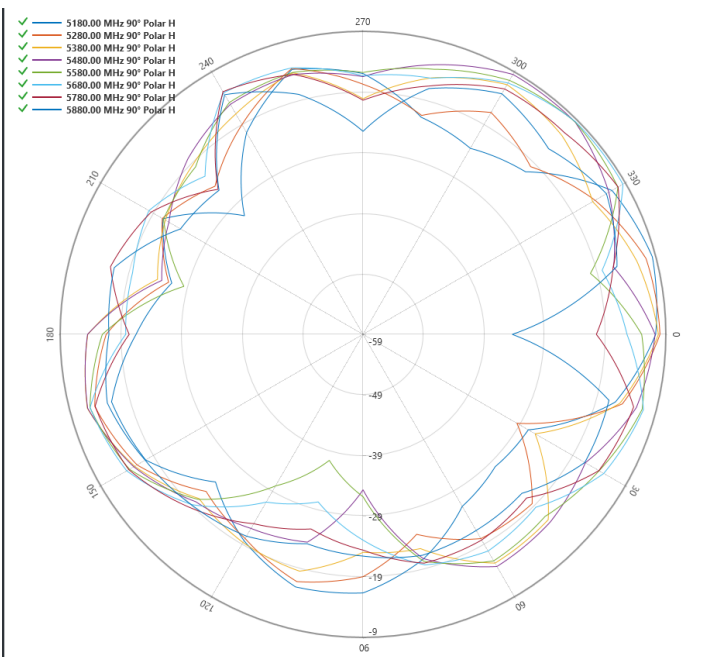
[Gain] Elevation cut (0 deg)

XY plane



[Gain] Azimuth cut (90 deg)

YZ plane



24G Radar

- 1. Radar antenna manufacturer: Socionext
- 2. Radar antenna type: Patch antenna

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.

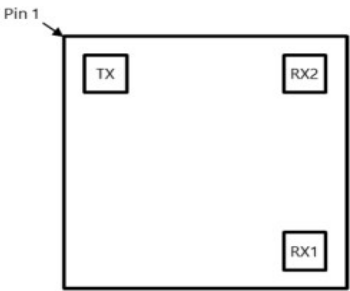


Figure 2-3 Top View Antenna configuration (Not to scale)

Table 3-11 Antenna Section

Parameter		Symbol	Conditions	Limits			Unit
				Min	Typ	Max	
E1	RX antenna Gain	Grxa	f _{RF} =24.15GHz		2		dBi
E2	TX antenna Gain	Gtxa	f _{RF} =24.15GHz		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} =24.05GHz to 24.25GHz, T _{jopr} =25°C	-1	2	3.7	dBm
E23	Transmit Power Variation ^{Note 11)}	PAvar	f _{TX} =24.05GHz to 24.25 GHz		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)

