

# Antenna Report

FCC ID: A4RGQML3

11/20/2022

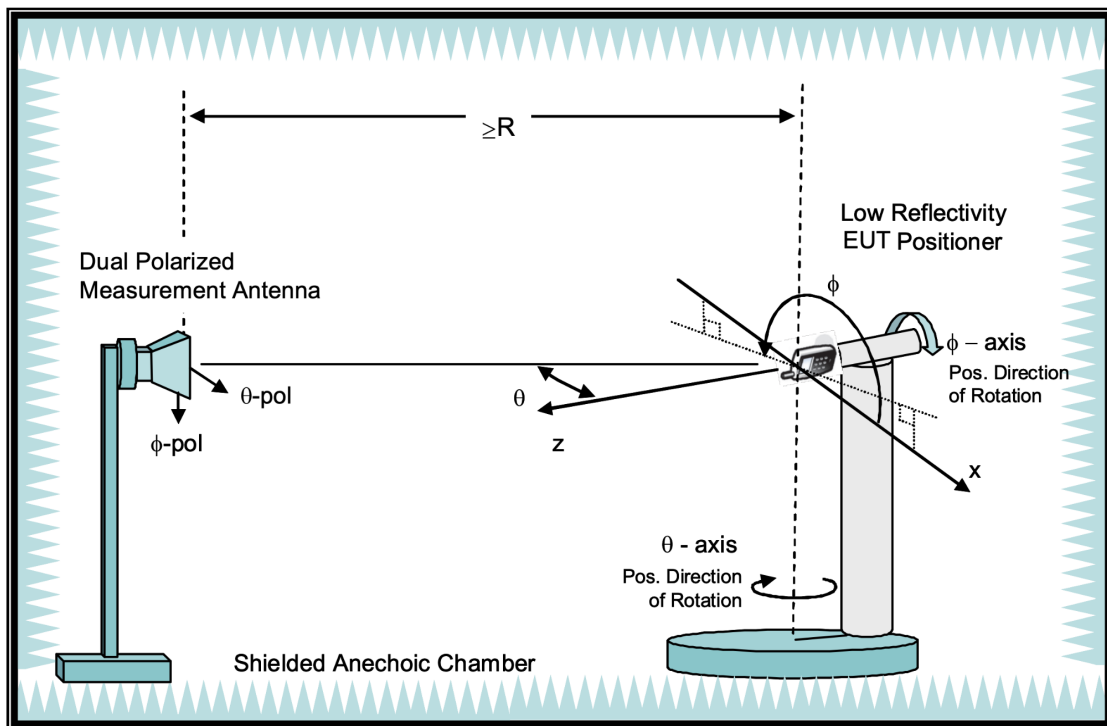
Google LLC

## 1. Test Method

The antenna gains are obtained through measurements in a fully anechoic OTA chamber with a 3D positioner.

Measurements are taken in discrete steps in theta and phi direction, data is being recorded using a network analyzer (passive) for both theta and phi polarizations at each position resulting in a 3D gain pattern. Step size is <30deg along both axes.

Gain is derived directly through spatial averaging of VNA S21 measurements (passive measurement).



R=4.9m

## 2. Test Equipment

Site Description	Chamber Manufacturer	Type
AMS-8500	ETS-Lindgren	Fully Anechoic
Site location	No. 4, Minsheng St., Tucheng Dist., New Taipei City , Taiwan (R.O.C.)	
Test Engineer	Siga Chen	
Date	July 14, 2022	

Description	Manufacturer	Model	Calibration Date	Due Date
Network Analyzer	Keysight	E5071C	-	-
Spectrum Analyzer	Rohde & Schwarz	FSP7	Mar. 15, 2021	Mar. 15, 2023

## 3. Test Setup

See separate appendix document for pictures of the test setup in this filing.

## 4. Antenna Type

Antenna #	Type
Ant4	IFA
Ant3	Loop

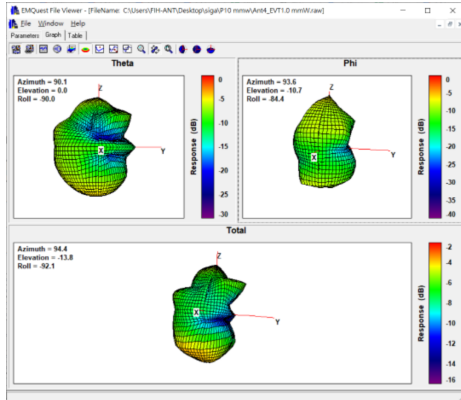
## 5. WLAN/BT Antenna Test Data

Ant	Band	Frequency Band	Peak Gain(dBi)
Ant4	WiFi/BT 2.4 GHz	2402 MHz	-2.9
		2412 MHz	-2.1
		2437 MHz	-0.5
		2462 MHz	-0.8
		2480 MHz	-1.5
Ant3	WiFi/BT 2.4 GHz	2402 MHz	-2.3
		2412 MHz	-2.1
		2437 MHz	-1.5
		2462 MHz	-1.6
		2480 MHz	-2.2
Ant4	UNII-1	5180 MHz	-4.7
	UNII-2A	5280 MHz	-6.1
	UNII-2C	5500 MHz	-4.0
	UNII-3	5820 MHz	-2.5
	UNII-4	5887 MHz	-0.5
	UNII-5	6175 MHz	-1.1
	UNII-6	6475 MHz	-1.1
	UNII-7	6700 MHz	0.7
	UNII-8	7000 MHz	-0.8
Ant3	UNII-1	5180 MHz	-1.7
	UNII-2A	5280 MHz	-2.2
	UNII-2C	5500 MHz	-2.8
	UNII-3	5820 MHz	-3.8
	UNII-4	5887 MHz	-2.1
	UNII-5	6175 MHz	-2.5
	UNII-6	6475 MHz	-2.8
	UNII-7	6700 MHz	-2.8
	UNII-8	7000 MHz	-2.4

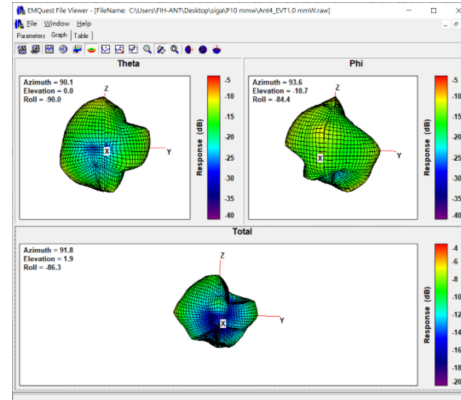
# Appendix: Radiation Plots

## Ant4:

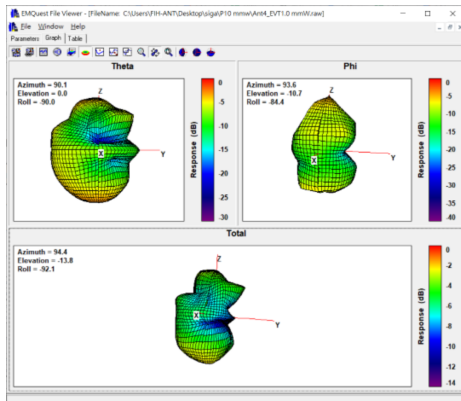
### Ant4 Freq. 2412 MHz:



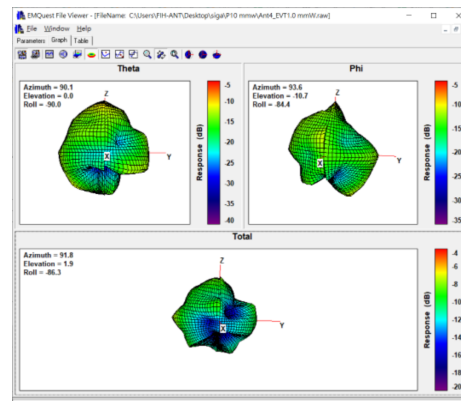
### Ant4 Freq. 5180 MHz:



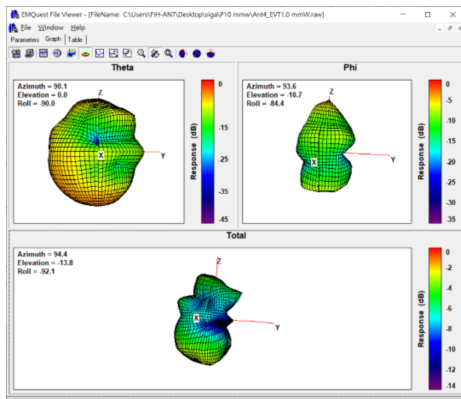
### Ant4 Freq. 2437 MHz:



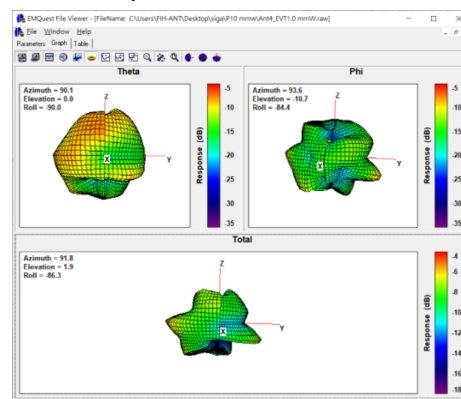
### Ant4 Freq. 5280 MHz:



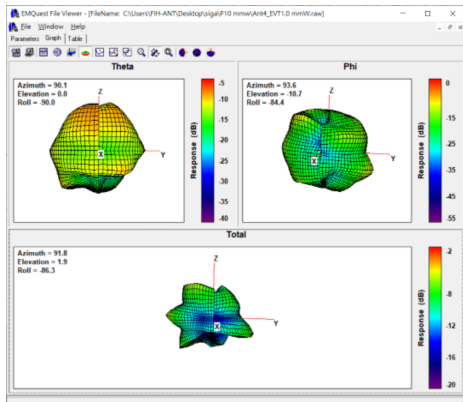
### Ant4 Freq. 2462 MHz:



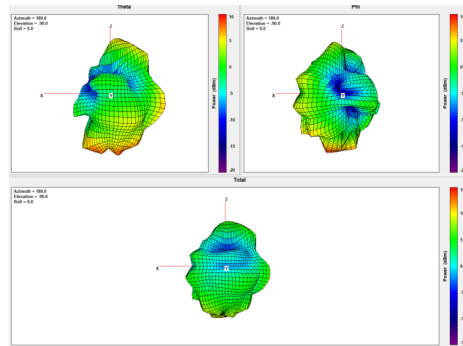
### Ant4 Freq. 5500 MHz:



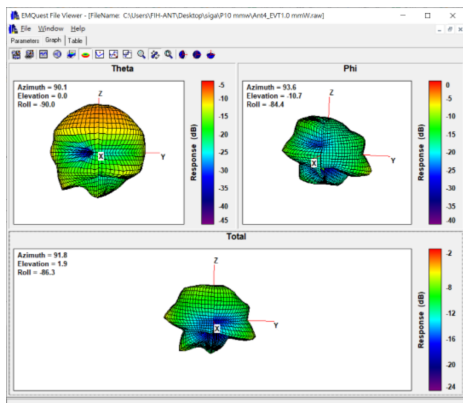
### Ant4 Freq. 5820 MHz:



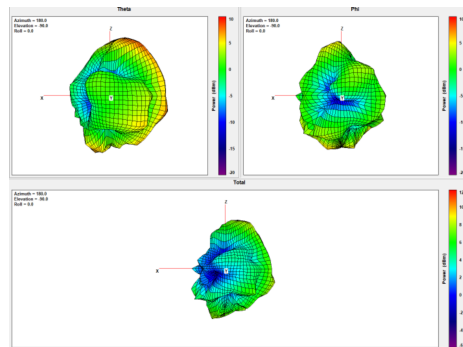
### Ant4 Freq. 6475 MHz:



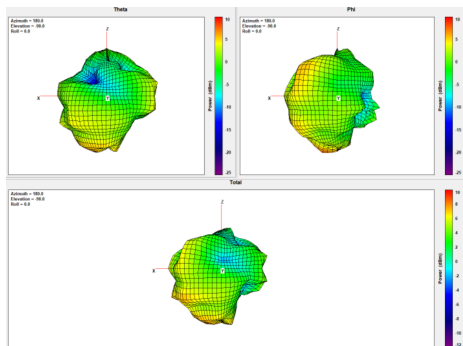
### Ant4 Freq. 5887 MHz:



### Ant4 Freq. 6700 MHz:



### Ant4 Freq. 6175 MHz:



### Ant4 Freq. 7000 MHz:

