

Antenna Report

FCC ID: A4RGHL1X

11/17/2022

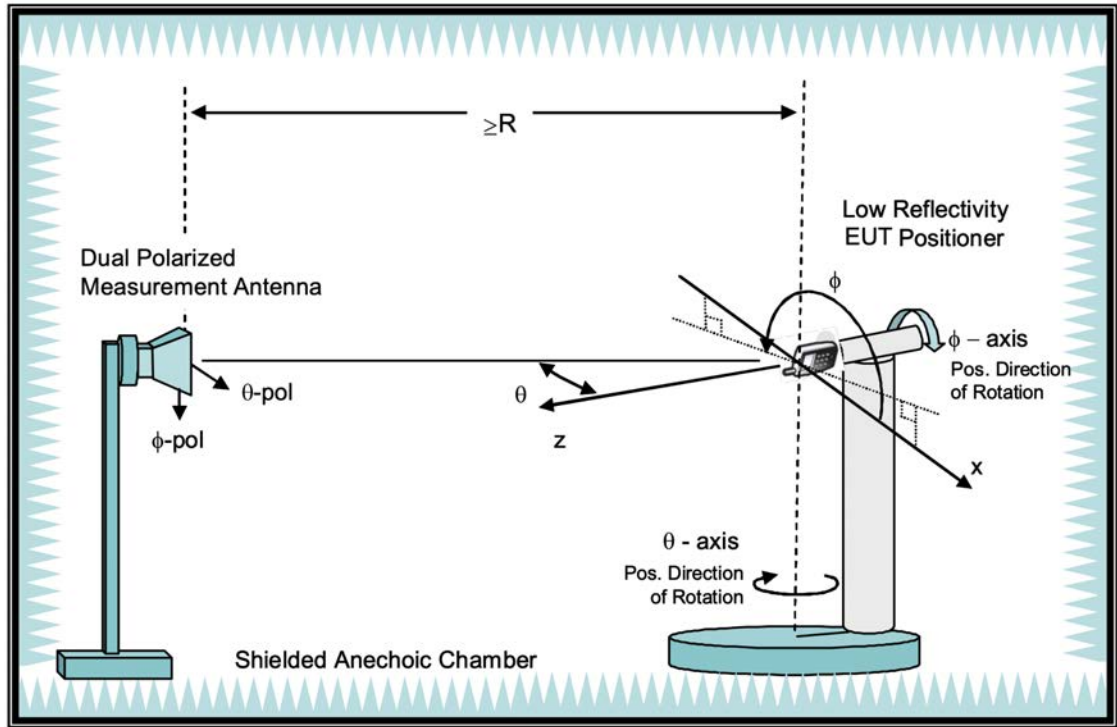
Google LLC

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	WAVEPRO	Fully Anechoic
Software Version	g.OTA Ver:1.0.80	
Site location:	9F, No. 6-3, Baoqiang Rd., Xindian Dist., New Taipei City	
Test Engineer	Mike Lee / Jack Lu	
Date	Aug. 23, 2022	

Description	Manufacturer	Model	Calibration Date	Due Date
Network Analyzer	Agilent	E5071C	Feb. 17, 2022	Feb. 17, 2023
Spectrum Analyze	Rohde & Schwarz	FSV7	Sep. 21, 2021	Sep 21, 2023

3. **Test Setup**

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

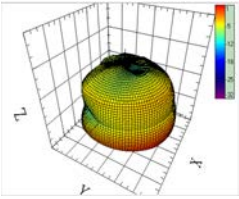
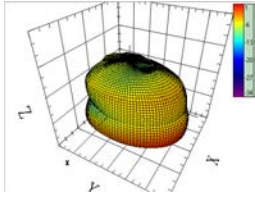
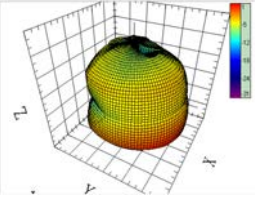
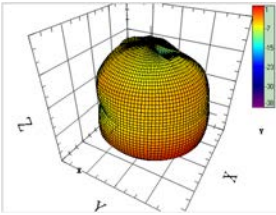
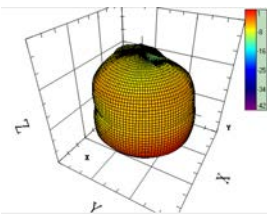
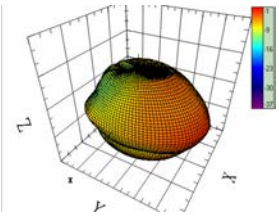
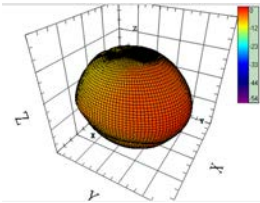
4. **Antenna Type**

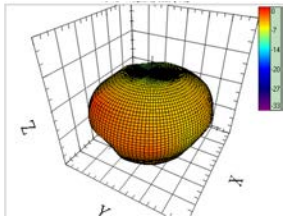
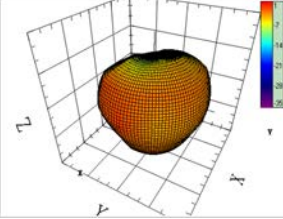
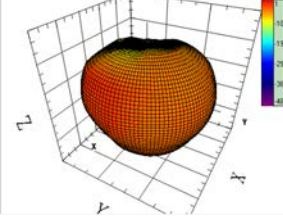
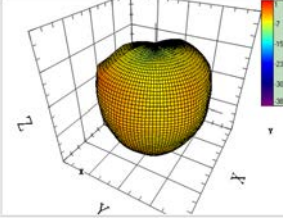
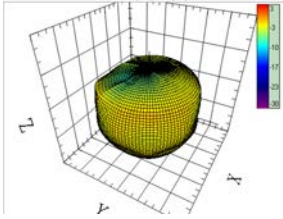
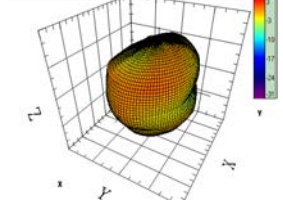
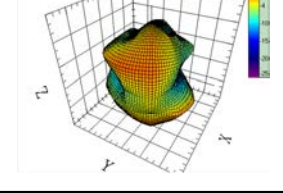
Antenna	Type
Ant3	IFA
Ant4	ILA

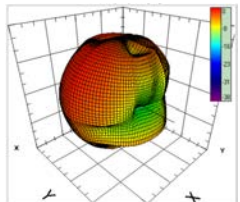
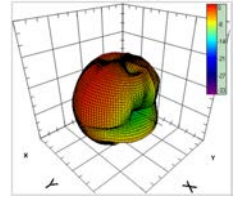
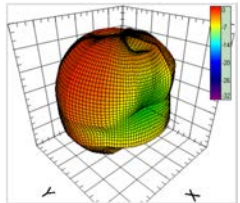
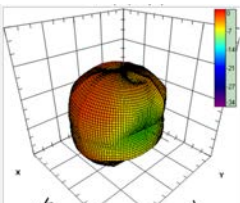
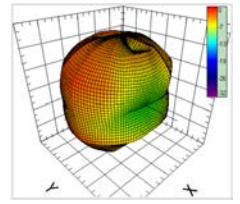
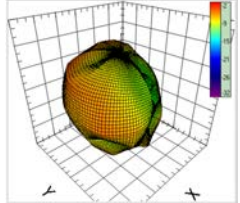
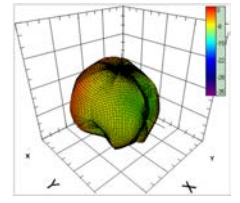
5. **WLAN/BT Antenna Test Data**

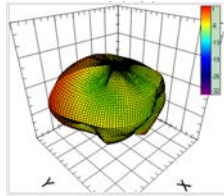
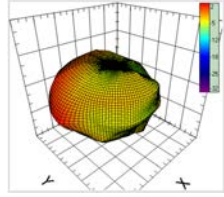
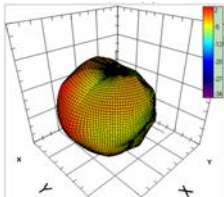
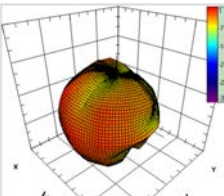
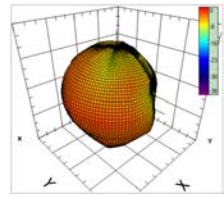
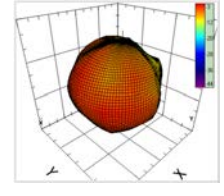
Ant	Band	Frequency Band	Peak Gain(dBi)
Ant 4	WiFi/BT 2.4 GHz	2402 MHz	-1.6
		2412 MHz	-1.8
		2437 MHz	-2.0
		2462 MHz	-1.3
		2480 MHz	-1.4
Ant 3	WiFi/BT 2.4 GHz	2402 MHz	0.6
		2412 MHz	0.8
		2437 MHz	0.6
		2462 MHz	0.5
		2480 MHz	0.2
Ant 4	UNII-1	5180 MHz	-3.7
	UNII-2A	5280 MHz	-2.0
	UNII-2C	5500 MHz	0.1
	UNII-3	5820 MHz	1.2
	UNII-4	5887 MHz	1.4
	UNII-5	6175 MHz	-1.6
	UNII-6	6475 MHz	-3.1
	UNII-7	6700 MHz	-6.0
Ant 3	UNII-8	7000 MHz	-4.6
	UNII-1	5180 MHz	-3.3
	UNII-2A	5280 MHz	-3.0
	UNII-2C	5500 MHz	-1.1
	UNII-3	5820 MHz	-0.7
	UNII-4	5887 MHz	-0.4
	UNII-5	6175 MHz	0.3
	UNII-6	6475 MHz	2.4
UNII-7	6700 MHz	2.5	
	UNII-8	7000 MHz	-0.3

6. Radiation Plots for Max Gain Plane

ANT	Frequency	Pattern
ANT 3	2402 MHz	
ANT 3	2412 MHz	
ANT 3	2437 MHz	
ANT 3	2462 MHz	
ANT 3	2480 MHz	
ANT 3	5180 MHz	
Ant 3	5280 MHz	

ANT 3	5500 MHz	
Ant 3	5820 MHz	
ANT 3	5887 MHz	
Ant3	6175 MHz	
ANT 3	6475 MHz	
ANT 3	6700 MHz	
ANT 3	7000 MHz	

ANT 4	2402 MHz	
ANT 4	2412 MHz	
ANT 4	2437 MHz	
ANT 4	2462 MHz	
ANT 4	2480 MHz	
ANT 4	5180 MHz	
ANT 4	5280 MHz	

ANT 4	5500 MHz	
ANT 4	5820 MHz	
ANT 4	5887 MHz	
ANT 4	6175 MHz	
ANT 4	6475 MHz	
ANT 4	6700 MHz	
ANT 4	7000 MHz	