

Antenna Report

FCC ID: A4RGVU6C

11/20/2022

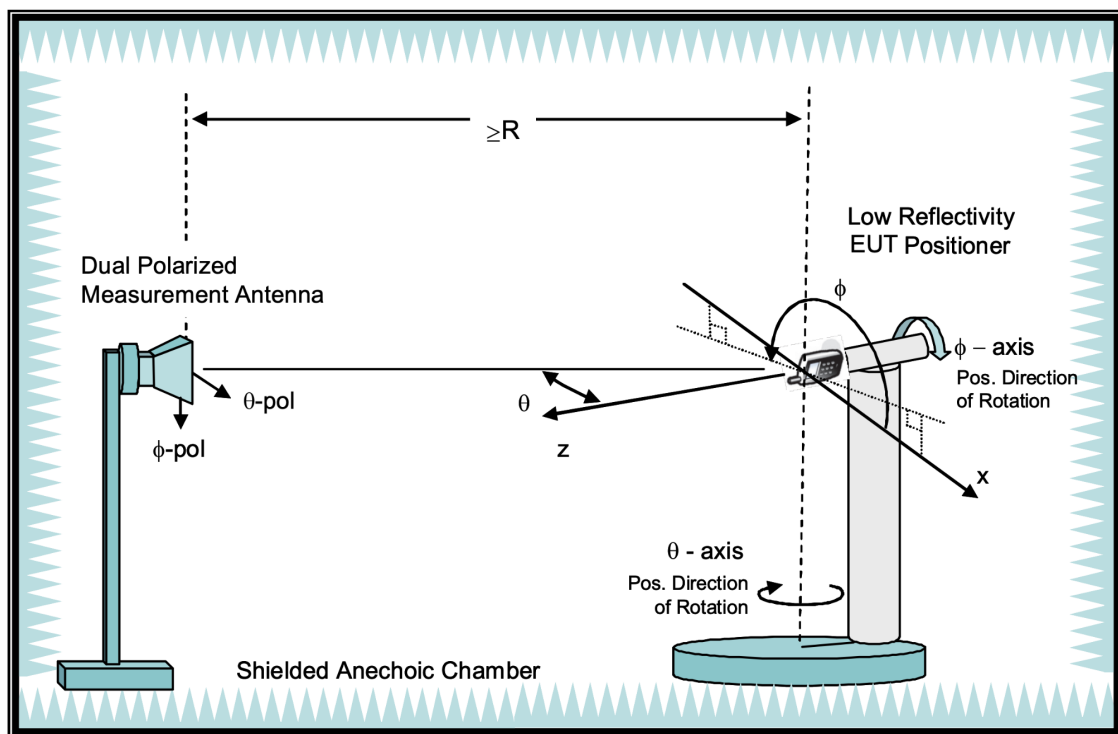
Google LLC

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 (SigaChen@fih-foxconn.com) | |
| 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 |

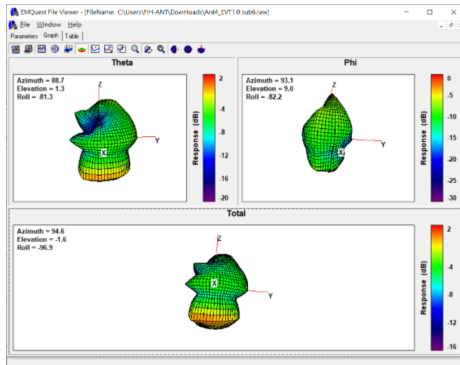
5. WLAN/BT Antennas

| Ant | Band | Frequency Band | Peak Gain(dBi) |
|-------------|-----------------|----------------|----------------|
| Ant4 | WiFi/BT 2.4 GHz | 2402 MHz | 0.2 |
| | | 2412 MHz | 0.9 |
| | | 2437 MHz | 1.6 |
| | | 2462 MHz | 0.8 |
| | | 2480 MHz | -0.3 |
| 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 | -5.2 |
| | UNII-2A | 5280 MHz | -3.9 |
| | UNII-2C | 5500 MHz | -4.3 |
| | UNII-3 | 5820 MHz | -3.7 |
| | UNII-4 | 5887 MHz | -0.5 |
| | UNII-5 | 6175 MHz | -0.5 |
| | UNII-6 | 6475 MHz | -0.4 |
| | UNII-7 | 6700 MHz | -2.5 |
| | UNII-8 | 7000 MHz | -3.6 |
| 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 |

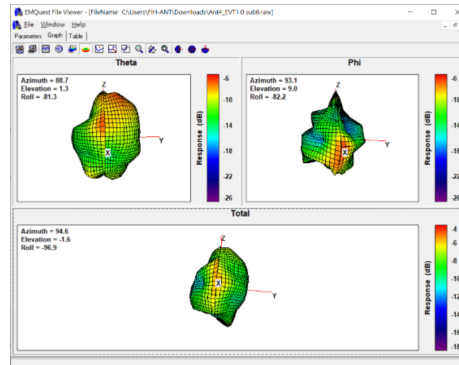
Appendix: Radiation Plots

Ant4:

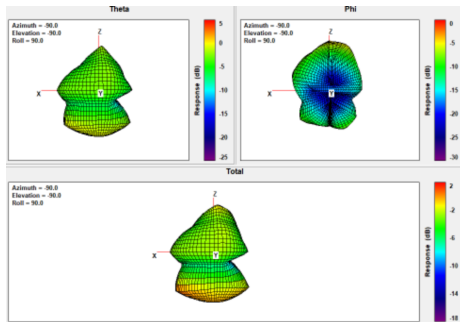
Ant4 Freq. 2412 MHz:



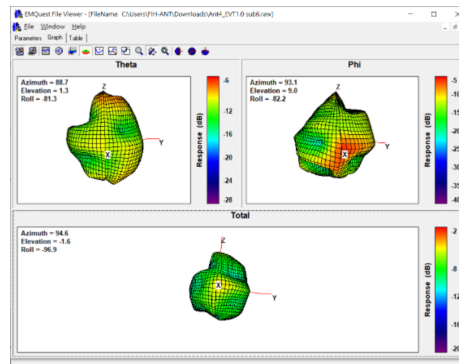
Ant4 Freq. 5180 MHz:



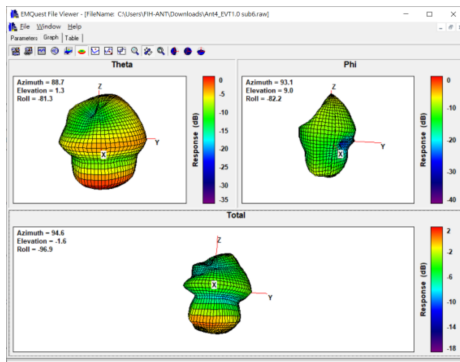
Ant4 Freq. 2437 MHz:



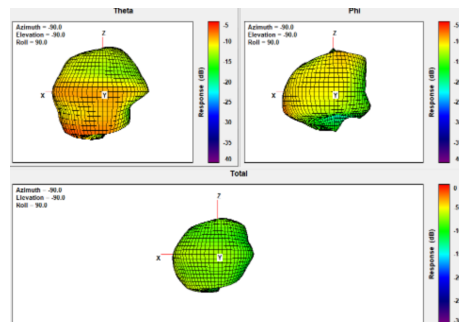
Ant4 Freq. 5280 MHz:



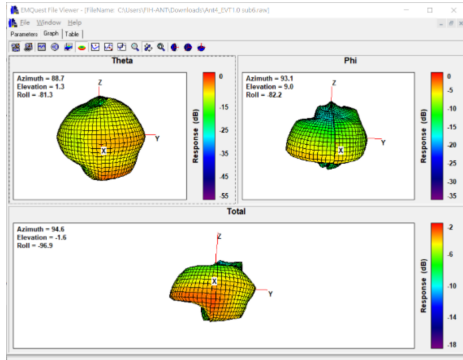
Ant4 Freq. 2462 MHz:



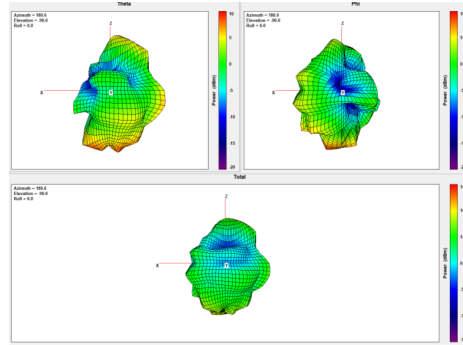
Ant4 Freq. 5500 MHz:



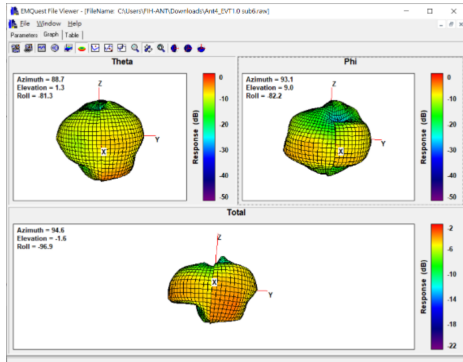
Ant4 Freq. 5820 MHz:



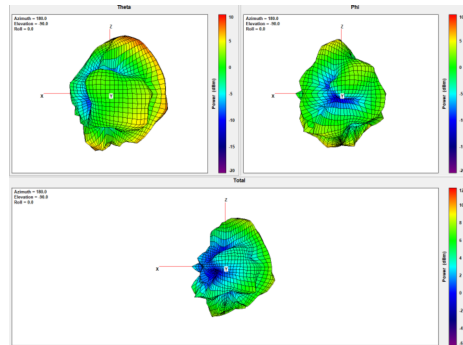
Ant4 Freq. 6475 MHz:



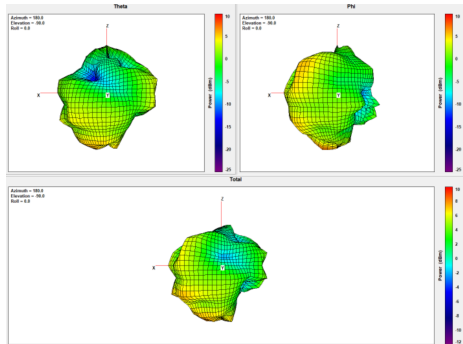
Ant4 Freq. 5887 MHz:



Ant4 Freq. 6700 MHz:



Ant4 Freq. 6175 MHz:



Ant4 Freq. 7000 MHz:

