

Antenna Report for TP2 LHTP2-2000

1. Test Date and Test Person

Test date: 17 Oct 2023

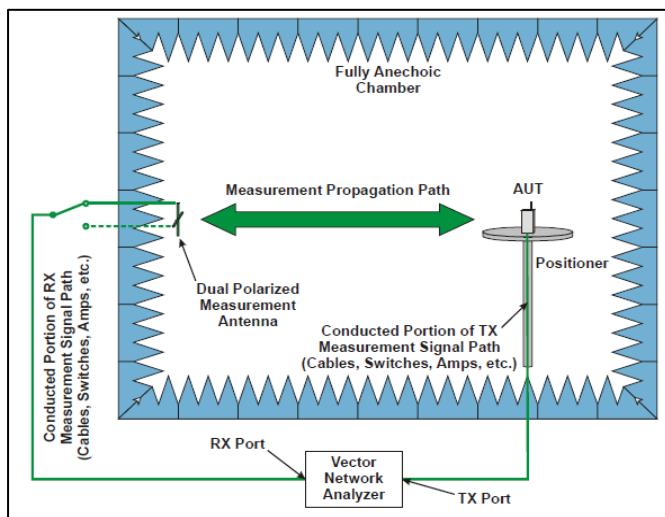
Test person: Pei Chee TAN

2. Test setup and Equipment

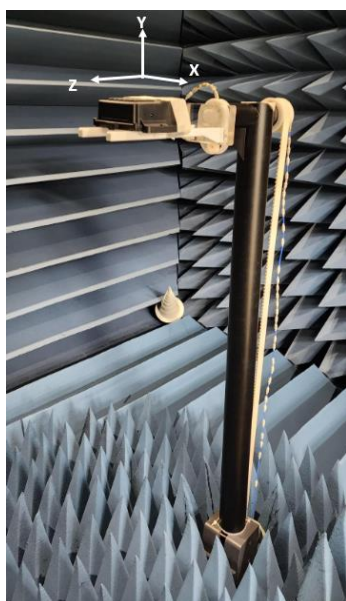
| Equipment | Manufacturer | Model | Last Calibration |
|--------------------------------|--------------|---------|------------------|
| ENA Series Network Analyzer | Keysight | E5063A | 07 Sep 2023 |
| PCI antenna measurement system | ETS-Lindgren | AMS8500 | 10 Dec 2021 |
| EMQuest test software | ETS-Lindgren | V1.13 | Not applicable |

Note: The calibration interval of the above test instruments is 24 months.

Setup Overview of Antenna Measurement System (AMS 8500) for Gain, Total Efficiency, and Radiation Pattern

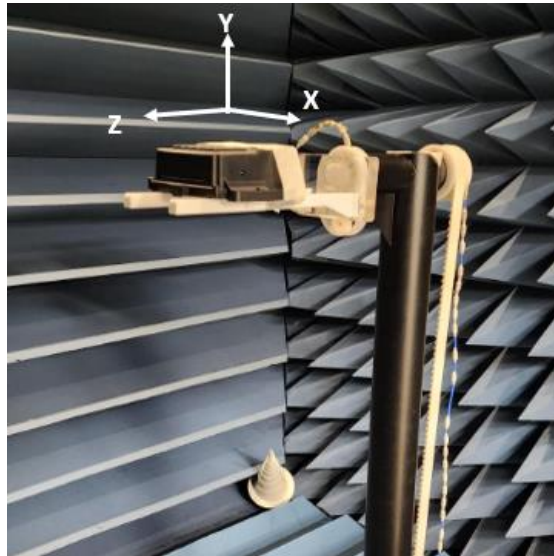


Sample Setup in Anechoic Chamber



Setup Description:

Step 1: Fix the DUT on the bracket in the center of the anechoic chamber.



Step 2: The antenna of interest is connected to the coaxial line at the transmitter end of the anechoic chamber.

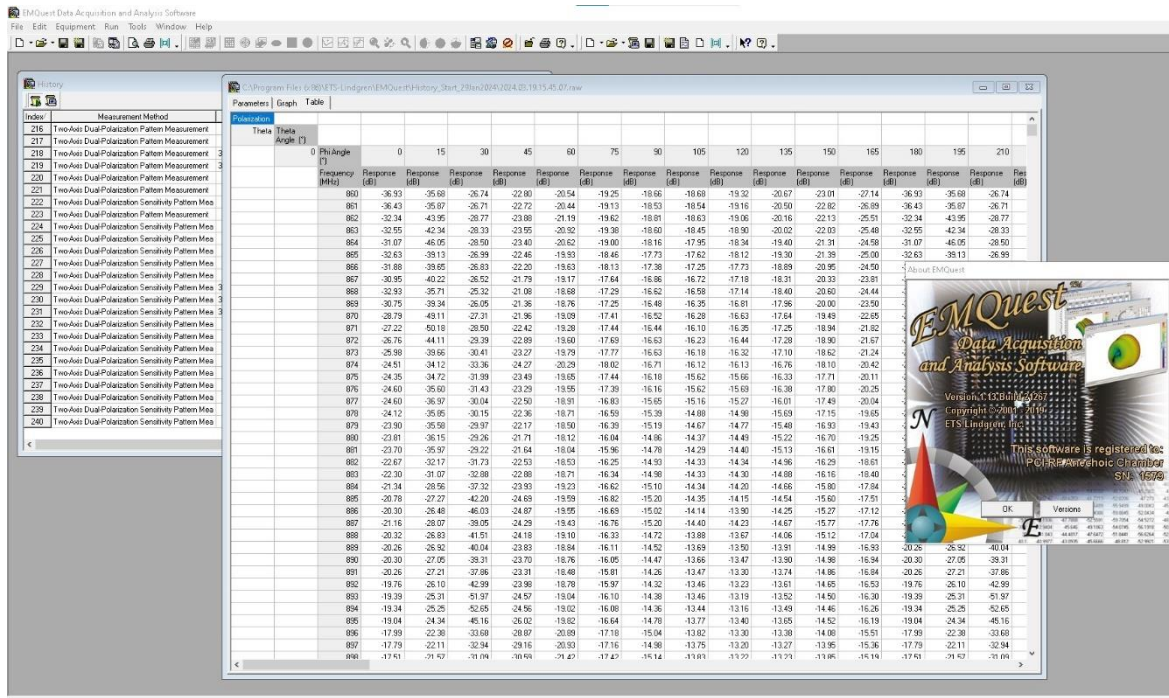
Step 3: Close the anechoic chamber door to avoid external signal interference.



Step 4: Open EM-Quest test software and power on network analyser, select frequency range to test.



Step 5: Total efficiency, gain and radiation pattern can be seen in EM-Quest test software.



Step 6: Repeat steps 1-6 for all the antenna and record the results obtained.

3. Antenna Specifications

3.1. Bluetooth and Wi-Fi Dual-Band Antenna

Antenna type: FPC antenna (internal)

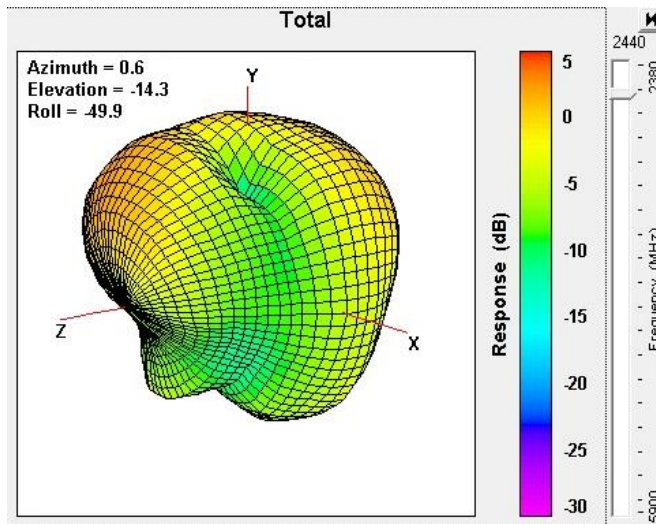
Antenna manufacturer name & address:

Green Antenna Pte Ltd

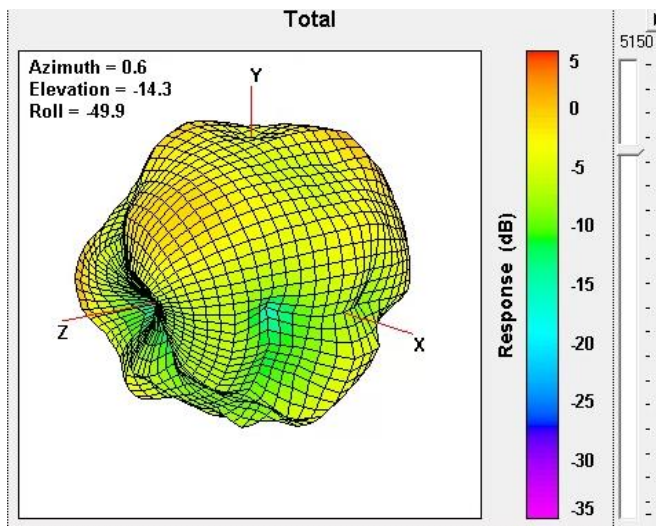
29 Mandai Estate #07-09, Singapore 729932

Radiation Pattern:

f=2440MHz



f=5150MHz

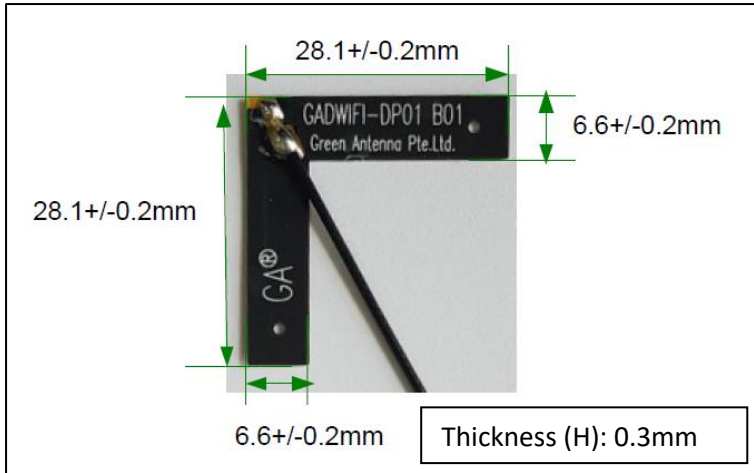


Electrical and Mechanical Specifications:

| Electrical | |
|------------------|------------------------------------|
| Frequency | 2.4 – 2.485 GHz; 5.15 – 5.85 GHz |
| S11 | < -7dB; <-10dB |
| Maximum Gain | 2.96dBi@2.485GHz; 4.53dBi@5.705GHz |
| Total Efficiency | ~50%@2.4GHz; ~50%@5GHz |

| Mechanical | |
|------------------------|------------------------------|
| Dimension L1, L2, H, W | 28.1mm, 28.1mm, 0.3mm, 6.6mm |
| Cable length, Diameter | 110mm, 1.37mm |
| Connector | MMCX Right Angle Plug |

Antenna Dimension:



3.2. GPS Antenna

Antenna type: Patch antenna (internal)

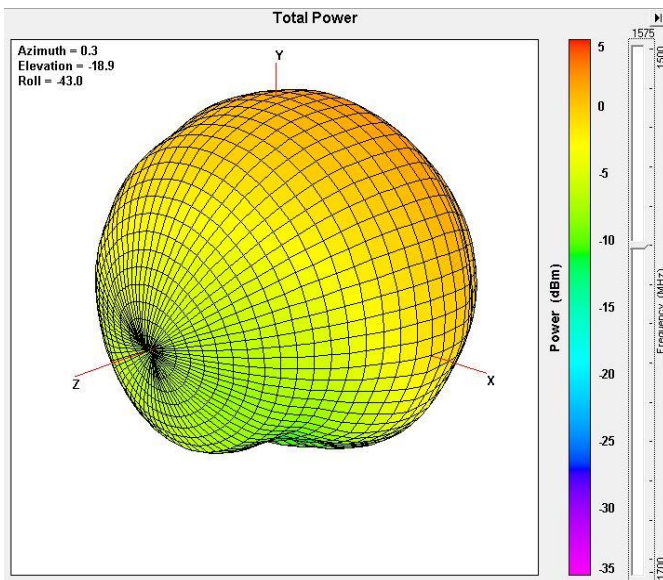
Antenna manufacturer name & address:

Green Antenna Pte Ltd

29 Mandai Estate #07-09, Singapore 729932

Radiation pattern:

f=1575MHz



Electrical and mechanical specifications:

| Electrical | |
|------------------|-------------------------------|
| Frequency | 1.559 GHz, 1.575GHz, 1.606GHz |
| S11 | -3.58dB, -7.31dB, -4.42dB |
| Maximum Gain | 2.69dBi@1.585GHz |
| Total Efficiency | ~41%, ~55.2%, ~35.7% |
| Mechanical | |
| Dimension | 25mm x 25mm x4.0 mm |
| Weight | 10g |

Antenna Dimension:



Dimension: 25mmx25mmx4.0mm

3.3 LTE Antenna

Antenna type: Metal stamp (internal)

Antenna manufacturer name & address:

Green Antenna Pte Ltd

29 Mandai Estate #07-09, Singapore 729932

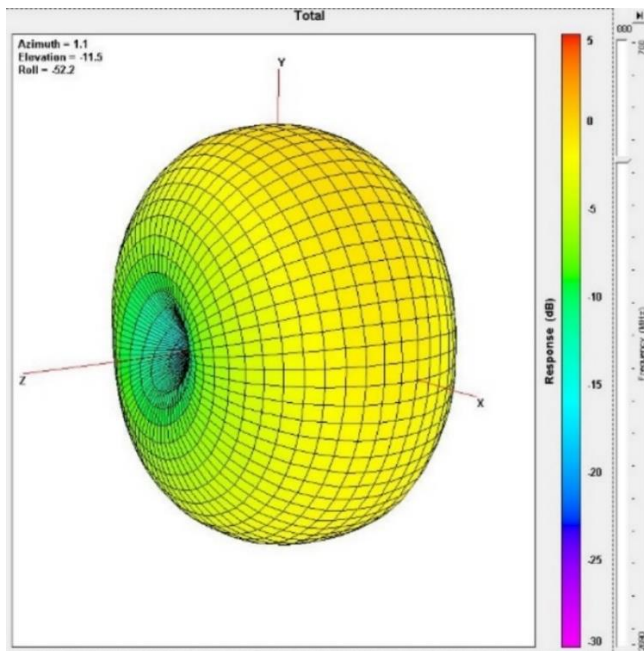
Peak Gain:

| Bands | Transmit Frequency (MHz) | Peak Gain (dBi) |
|------------|--------------------------|-----------------|
| GSM 850 | 824-849 | 0.15 |
| GSM 900 | 880-915 | -0.14 |
| GSM 1800 | 1710-1785 | 2.78 |
| GSM 1900 | 1850-1910 | 2.61 |
| WCDMA B1 | 1920-1980 | 2.61 |
| WCDMA B2 | 1850-1910 | 2.61 |
| WCDMA B4 | 1710-1755 | 2.75 |
| WCDMA B5 | 824-849 | 0.15 |
| WCDMA B6 | 830-840 | 0.11 |
| WCDMA B8 | 880-915 | -0.14 |
| WCDMA B19 | 830-845 | -0.14 |
| LTE FDD B1 | 1920-1980 | 2.61 |
| LTE FDD B2 | 1850-1910 | 2.60 |
| LTE FDD B3 | 1710-1785 | 2.78 |
| LTE FDD B4 | 1710-1755 | 2.78 |

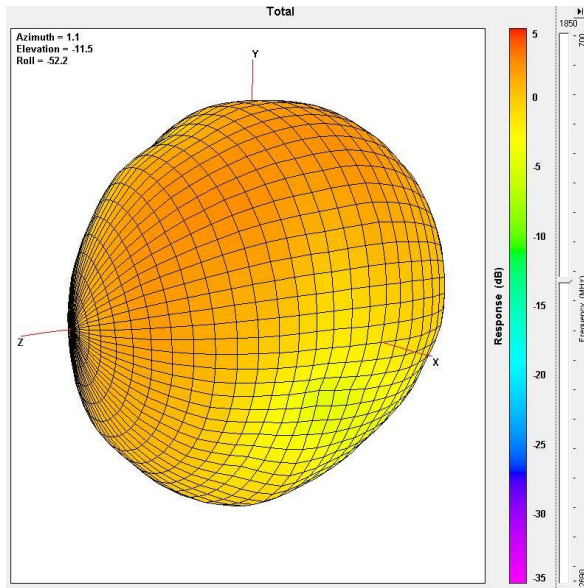
| | | |
|-------------|-----------|-------|
| LTE FDD B5 | 824-849 | 0.15 |
| LTE FDD B7 | 2500-2570 | 1.96 |
| LTE FDD B8 | 880-915 | -0.14 |
| LTE FDD B12 | 698-716 | -1.54 |
| LTE FDD B13 | 777-787 | 0.19 |
| LTE FDD B18 | 815-830 | 0.22 |
| LTE FDD B19 | 830-845 | -0.14 |
| LTE FDD B20 | 832-862 | 0.04 |
| LTE FDD B26 | 814-849 | 0.22 |
| LTE FDD B28 | 703-748 | -0.79 |
| LTE FDD B66 | 1710-1780 | 2.78 |
| LTE TDD B38 | 2570-2620 | 1.75 |
| LTE TDD B40 | 2300-2400 | 4.42 |
| LTE TDD B41 | 2496-2690 | 1.96 |

Radiation Pattern:

f=880MHz



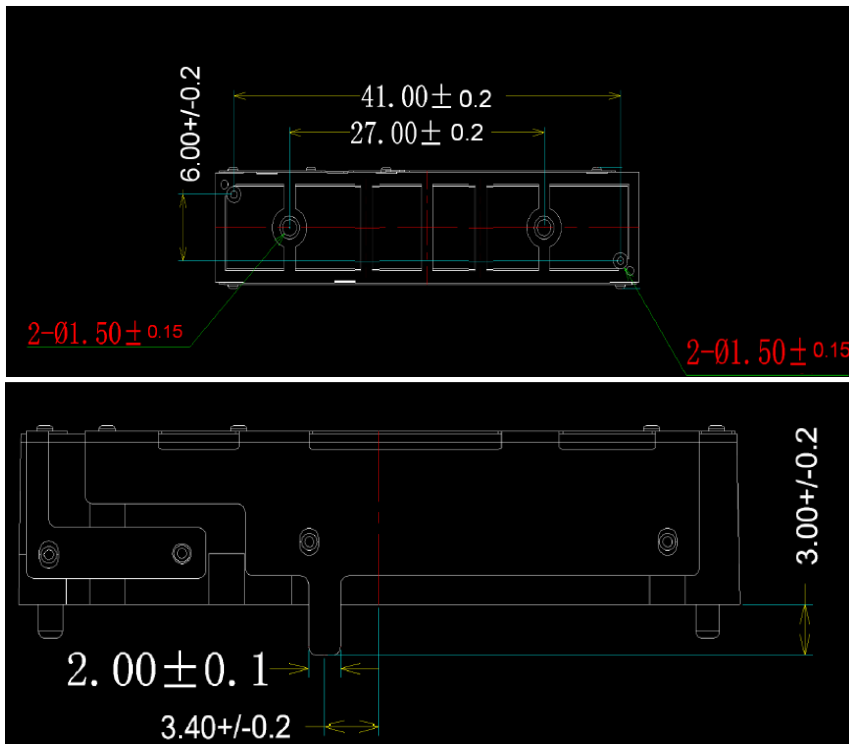
f=1850MHz:



Electrical and Mechanical Specifications:

| Electrical | |
|------------------|------------------------------------|
| Frequency | 0.699 - 0.96GHz, 1.71 - 2.69GHz |
| S11 | <-2.2dB, <-4dB |
| Maximum Gain | 0.48dBi@0.8GHz; 4.39dBi@2.32GHz |
| Total Efficiency | ~50%, ~67% |
| Mechanical | |
| Dimension | Please refer to the pictures below |

Antenna Dimensions:



Carrier:

