



## **Unlicensed Band Antenna Gain**

**Model: SM-S928U, SM-S928U1**

**FCC ID: A3LSMS928U**

# BT/WIFI #1\_2.4 / 5 / 6 GHz (SUB4)

| Freq. [Hz]       | Peak. [dBi] |
|------------------|-------------|
| 2,400,000,000 Hz | -4.56 dBi   |
| 2,412,000,000 Hz | -3.51 dBi   |
| 2,437,000,000 Hz | -2.48 dBi   |
| 2,442,000,000 Hz | -2.16 dBi   |
| 2,450,000,000 Hz | -1.54 dBi   |
| 2,462,000,000 Hz | -1.11 dBi   |
| 2,472,000,000 Hz | -1.05 dBi   |
| 2,484,000,000 Hz | -1.53 dBi   |
| 2,500,000,000 Hz | -1.68 dBi   |
| 5,150,000,000 Hz | -4.96 dBi   |
| 5,200,000,000 Hz | -3.9 dBi    |
| 5,220,000,000 Hz | -3.62 dBi   |
| 5,250,000,000 Hz | -3.74 dBi   |
| 5,280,000,000 Hz | -4.02 dBi   |
| 5,300,000,000 Hz | -3.35 dBi   |
| 5,350,000,000 Hz | -4.05 dBi   |
| 5,400,000,000 Hz | -3.44 dBi   |
| 5,500,000,000 Hz | -4.58 dBi   |
| 5,600,000,000 Hz | -2.89 dBi   |
| 5,700,000,000 Hz | -2.69 dBi   |
| 5,785,000,000 Hz | -3.12 dBi   |
| 5,800,000,000 Hz | -3.29 dBi   |
| 5,805,000,000 Hz | -3.08 dBi   |
| 5,850,000,000 Hz | -4.03 dBi   |
| 5,885,000,000 Hz | -3.76 dBi   |
| 5,895,000,000 Hz | -4.39 dBi   |
| 5,925,000,000 Hz | -5.76 dBi   |
| 6,025,000,000 Hz | -6.03 dBi   |
| 6,125,000,000 Hz | -5.66 dBi   |
| 6,225,000,000 Hz | -6.01 dBi   |
| 6,325,000,000 Hz | -5.88 dBi   |
| 6,425,000,000 Hz | -6.22 dBi   |
| 6,525,000,000 Hz | -6.52 dBi   |
| 6,625,000,000 Hz | -6.99 dBi   |
| 6,725,000,000 Hz | -6.85 dBi   |
| 6,825,000,000 Hz | -7.11 dBi   |
| 6,925,000,000 Hz | -7.51 dBi   |
| 7,025,000,000 Hz | -8.02 dBi   |
| 7,125,000,000 Hz | -8.41 dBi   |

## BT/WIFI #2\_2.4GHz (SUB6), WIFI #2\_5 / 6GHz (SUB1)

| Freq. [Hz]       | Peak. [dBi] |
|------------------|-------------|
| 2,400,000,000 Hz | -8.89 dBi   |
| 2,412,000,000 Hz | -6.46 dBi   |
| 2,437,000,000 Hz | -5.1 dBi    |
| 2,442,000,000 Hz | -4.68 dBi   |
| 2,450,000,000 Hz | -3.52 dBi   |
| 2,462,000,000 Hz | -4.07 dBi   |
| 2,472,000,000 Hz | -4.35 dBi   |
| 2,484,000,000 Hz | -4.58 dBi   |
| 2,500,000,000 Hz | -4.76 dBi   |
| 5,150,000,000 Hz | -5.11 dBi   |
| 5,200,000,000 Hz | -4.33 dBi   |
| 5,220,000,000 Hz | -4.19 dBi   |
| 5,250,000,000 Hz | -3.27 dBi   |
| 5,280,000,000 Hz | -2.71 dBi   |
| 5,300,000,000 Hz | -3.03 dBi   |
| 5,350,000,000 Hz | -2.68 dBi   |
| 5,400,000,000 Hz | -2.37 dBi   |
| 5,500,000,000 Hz | -2.72 dBi   |
| 5,600,000,000 Hz | -3.14 dBi   |
| 5,700,000,000 Hz | -1.51 dBi   |
| 5,785,000,000 Hz | -1.39 dBi   |
| 5,800,000,000 Hz | -2.06 dBi   |
| 5,805,000,000 Hz | -1.31 dBi   |
| 5,850,000,000 Hz | -1.55 dBi   |
| 5,885,000,000 Hz | -1.76 dBi   |
| 5,895,000,000 Hz | -2.55 dBi   |
| 5,925,000,000 Hz | -4.63 dBi   |
| 6,025,000,000 Hz | -4.46 dBi   |
| 6,125,000,000 Hz | -4.85 dBi   |
| 6,225,000,000 Hz | -4.57 dBi   |
| 6,325,000,000 Hz | -5.01 dBi   |
| 6,425,000,000 Hz | -4.77 dBi   |
| 6,525,000,000 Hz | -4.84 dBi   |
| 6,625,000,000 Hz | -5.23 dBi   |
| 6,725,000,000 Hz | -4.68 dBi   |
| 6,825,000,000 Hz | -4.36 dBi   |
| 6,925,000,000 Hz | -4.16 dBi   |
| 7,025,000,000 Hz | -4.27 dBi   |
| 7,125,000,000 Hz | -4.61 dBi   |

## A3LSMS928U UWB Antenna Gain

| Metal Antenna<br>(Ant I) |     | Frequency | Peak Gain |
|--------------------------|-----|-----------|-----------|
|                          |     |           | (dBi)     |
| NA                       | CH5 | 6.25 GHz  | -4.31     |
|                          |     | 6.50 GHz  | -4.65     |
|                          |     | 6.75 GHz  | -2.28     |
|                          | CH9 | 7.75 GHz  | -4.94     |
|                          |     | 8.00 GHz  | -4.84     |
|                          |     | 8.25 GHz  | -3.26     |

## UWB Patch Antenna gain

| Patch Antenna |     | Frequency | Peak Gain |
|---------------|-----|-----------|-----------|
|               |     |           | (dBi)     |
| NA            | CH5 | 6.25 GHz  | -8.91     |
|               |     | 6.50 GHz  | -0.84     |
|               |     | 6.75 GHz  | -7.59     |
|               | CH9 | 7.75 GHz  | -9.46     |
|               |     | 8.00 GHz  | -1.68     |
|               |     | 8.25 GHz  | -8.71     |

## Radiation Pattern Test

Antennas tested for Gain and Efficiency must be assembled into the enclosure and tested in the fully assembled and operating **SM-S928U** handset. The antenna is tested in free space in the anechoic chamber in the H, E1 and, E2 planes. The radiation patterns are measured at the center of transmit and receive bands.

A picture showing the geometry for this device is included in the test setup photos.

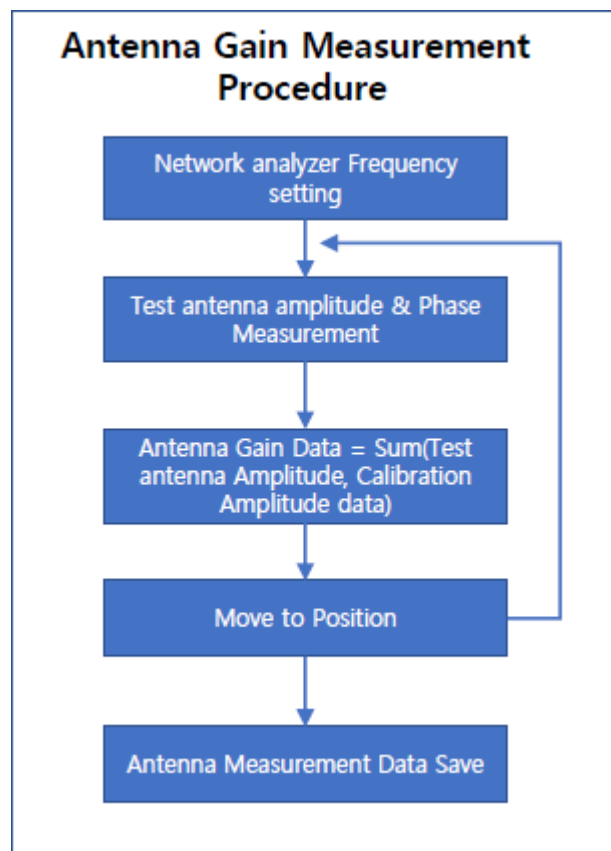
## Chamber Information



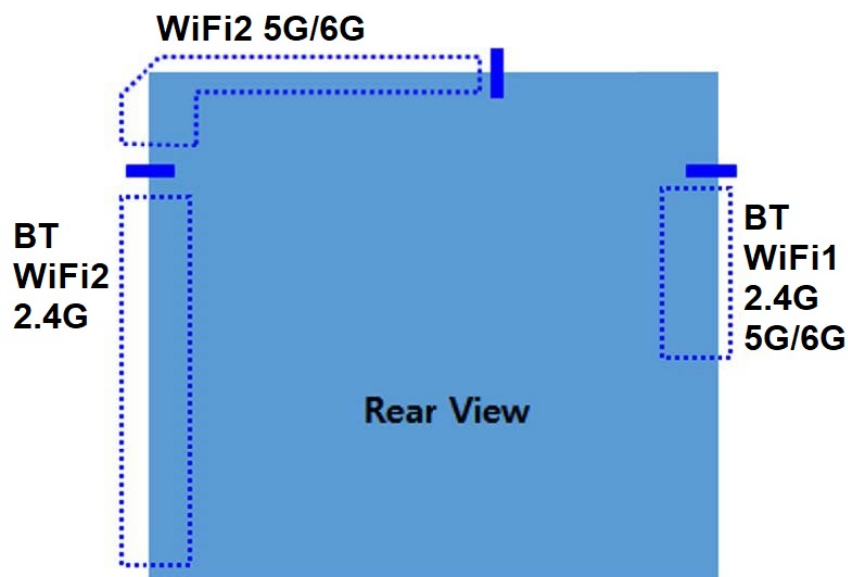
Figure 2: Geometry of Anechoic Chamber for Radiation patterns.

- ✓ Location : Samsung R&D Center R5 bld.
- ✓ Size : 4m x 2.5 x 2.5m (L x W x H)
- ✓ Frequency : 600 MHz -18GHz
- ✓ TX Antenna : 2GHz –18GHz Dual Polarization
- ✓ Quiet zone : 22cm @ 6GHz (Far-Field Length 2m)
- ✓ 2-axis DUT positioner -360°continuous rotation

## Antenna Gain Measurement Procedure

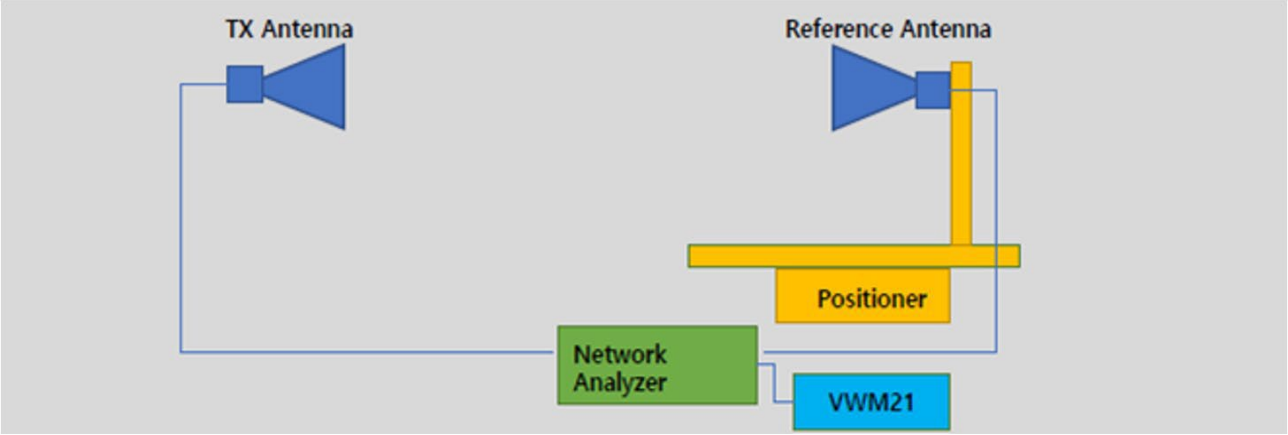


## Detail antenna description



The antennas can be seen in the internal photos.

Table of calibrated equipment



| Part                 | Model Name    | Specification     | Cal date                                                                                  | Serial number |
|----------------------|---------------|-------------------|-------------------------------------------------------------------------------------------|---------------|
| Tx Antenna           | QRH-006M-006G | 600MHz to 6GHz    | Calibrated date :2023.8.8 / Cal. Due : 2024.12.28                                         | -             |
|                      | QRH-002G-018G | 2GHz to 18GHz     | Calibrated date :2023.8.8 / Cal. Due : 2024.12.28                                         | -             |
| Reference Antenna    | BBHA9120LFA   | 680MHz to 6500MHz | Calibration Frequency(680MHzto 6GHz)<br>Calibrated date:2023.8.8 / Cal. Due : 2024.12.28  | 9120LF-365    |
|                      | BBHA9120C     | 2GHz to 18GHz     | Calibration Frequency(2GHz to 8.5GHz)<br>Calibrated date:2023.8.8 / Cal. Due : 2024.12.28 | BBHA9120C#714 |
| Network Analyzer     | Agilent 5071B | 300KHz to 8.5GHz  | Calibrated date :2023.8.8 / Cal. Due : 2024.12.28                                         | C000026236    |
| Measurement Software | VWM21         |                   | MTG Visual Wave-Mobile(Ver.2.1)                                                           | -             |

Test dates

2023.09.01

Names of test personnel

Hee-jun Lee, Myung-gu Kang, Byung-man Lim

Names of commercial test software being used

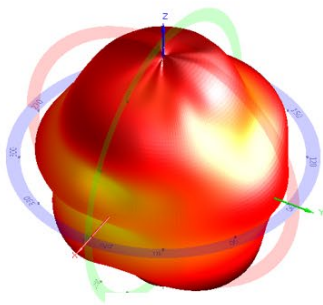
MTG Visual Wave-Mobile (Ver.2.1)

## Test setup photos

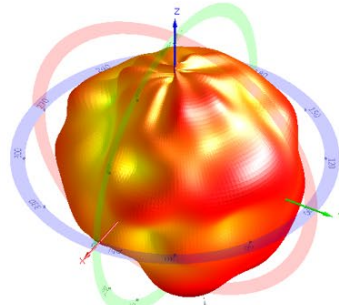
The antenna gain report test setup photos includes pictures of the measurement setup.

## Radiation plots for max gain plane (3D)

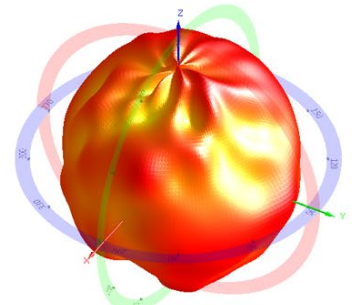
### WiFi1



2.4G

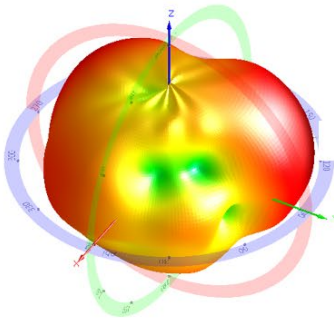


5G

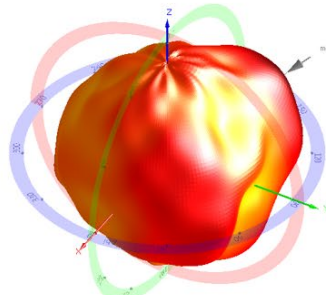


6G

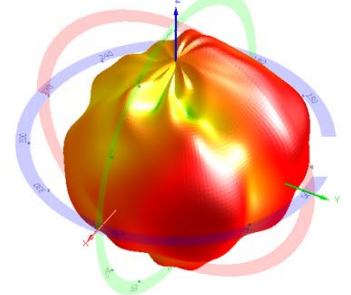
### WiFi2



2.4G



5G



6G