

# A3LSMA236U Main RF & BT/WIFI Ant Specification

Main Ant A/B , Sub Ant C/D/E/F/G

- Antenna Type : MFA
- Antenna Manufacturer : Galtronics

Gain value is measured by Galtronics.

Gain Value is measured in active call & Antenna selection.

Antenna gain is measured in MTG Chamber.

\* MTG Chamer

Anechoic chamber is available for Over The Air Test per CTIA, WiFi and WiMAX RPT Test. Also it is available for antenna pattern measurement for design and development. It's important to RF shielding, absorbing material, absorber layout, precision mechanical alignment and positioner accuracy, when anechoic chamber is designed and installed. MTG can provide the design and construction of anechoic chamber for customer requirements. MTG has a series of positioners, microwave transmit and receive instruments and measurement data acquisition and analysis software. We have the experience to offer anechoic chamber of any size; from the smallest unit for simple RF test to the largest and most complex custom-build for a research and development laboratory.

\*Test Equipment list

| Description      | Manufacturer         | Model  | S/N       | Cal Due     |
|------------------|----------------------|--------|-----------|-------------|
| Network Analyzer | Agilent Technologies | E5071B | MY4230186 | 2022.02.11. |

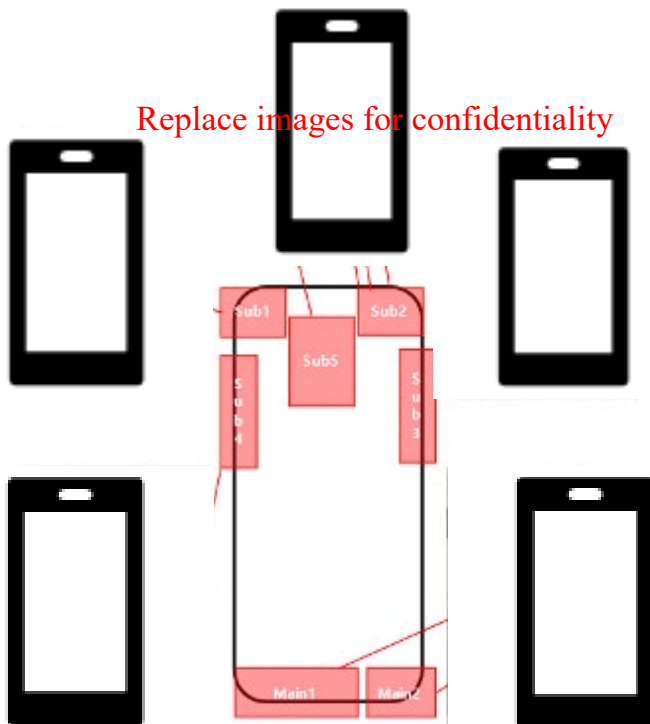
## ● Return Loss & VSWR Test

The VSWR measurement of antennas assembled into a fully operating SM-A236U phone handset is measured on the Network Analyzer. The handset is set up with a 50 Ohm coaxial cable connected to the 50 Ohm point. Calibration is done at the end of the 50 Ohm coaxial cable connection. The other end of the 50 Ohm coaxial cable is connected to a network analyzer. The handset is positioned on a non-conductive table for free space measurements.



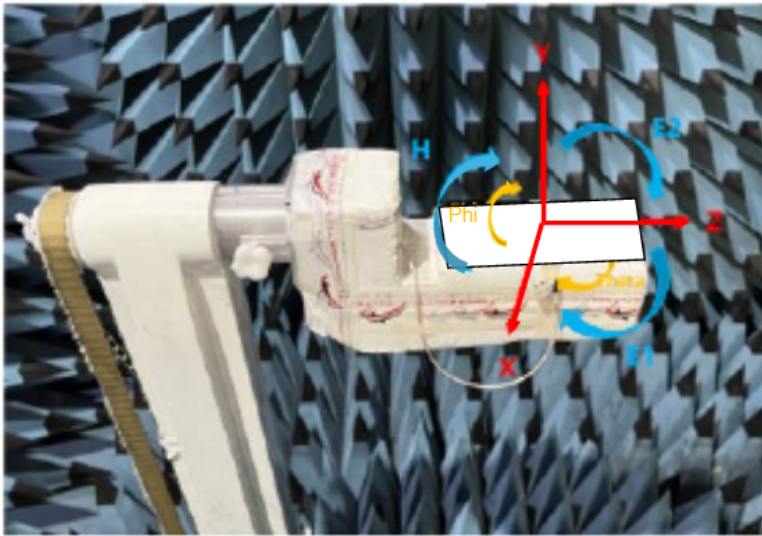
- Return Loss & VSWR Test

Galtronics has a system that can measure VSWR using MTG chamber and E5071B network analyzer for passive measurement. In order to measure the VSWR of each antenna, the lab connects the coaxial cable to the point in contact with the antenna on the main board. The VSWR is measured through the coaxial cable connected in the set. At this time, SM-A236U is assembled in the same state as the user environment



- Radiation Pattern Test

Antennas tested for Gain and Efficiency must be assembled into the enclosure and tested in the fully assembled and operating SM-A236U 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.



- Test Method (Manufacturing)

All measurements are done with SM-A236U fully assembled. Measure in consideration of the Customer's usage environment. Use a fully shielded chamber environment to prevent any noise-induced errors. Typically. The electrical properties of antenna are measured using a jig that Can hold the set.

# SM-A236U

## Main RF Antenna Gain

### Antenna A(Main1)

- MFA

- Manufacturer : Galtronics.

|              |                 |         |         |       |       |       |       |       |
|--------------|-----------------|---------|---------|-------|-------|-------|-------|-------|
| Antenna<br>A | Band            | B71/N71 | B12/N12 | B29   | B28   | B13   | B14   | B26   |
|              | Peak gain (dBi) | -3.52   | -3.98   | -3.7  | -3.85 | -3.92 | -3.68 | -4.31 |
|              | Ave. gain (dBi) | -6.83   | -7.62   | -7.56 | -7.71 | -7.13 | -6.82 | -7.42 |
|              | Band            | B5/N5   | B20     | B8    |       |       |       |       |
|              | Peak gain (dBi) | -4.05   | -4.41   | -3.46 |       |       |       |       |
|              | Ave. gain (dBi) | -7.26   | -7.58   | -7.06 |       |       |       |       |

### Antenna B(Main2)

- MFA

- Manufacturer : Galtronics.

|              |                 |         |         |         |       |         |         |       |
|--------------|-----------------|---------|---------|---------|-------|---------|---------|-------|
| Antenna<br>B | Band            | B70     | B4      | B66/N66 | B3    | B2/N2   | B25/N25 | B39   |
|              | Peak gain (dBi) | -1.96   | -0.83   | -0.55   | -0.64 | 0.55    | 0.66    | 1.07  |
|              | Ave. gain (dBi) | -6.22   | -5.12   | -5.07   | -5.16 | -4.44   | -4.37   | -4.2  |
|              | Band            | B1      | B30/N30 | B40     | B7    | B41/N41 | B38     | N78   |
|              | Peak gain (dBi) | 0.54    | 0.37    | -0.57   | 0.03  | 0.12    | 0.11    | -3.61 |
|              | Ave. gain (dBi) | -5.28   | -5.31   | -5.97   | -4.07 | -3.98   | -4.01   | -8.67 |
|              | Band            | B48/N48 | N77     |         |       |         |         |       |
|              | Peak gain (dBi) | -4.04   | -4.78   |         |       |         |         |       |
|              | Ave. gain (dBi) | -9.5    | -9.79   |         |       |         |         |       |

## Antenna C(Sub1)

- MFA

- Manufacturer : Galtronics.

|              |                 |        |       |       |       |       |        |
|--------------|-----------------|--------|-------|-------|-------|-------|--------|
| Antenna<br>G | Band            | B1     | B2    | B3    | B4    | B5    | B7     |
|              | Peak gain (dBi) | 0.33   | -0.76 | -2.1  | 0.27  | -5.26 | -5.04  |
|              | Ave. gain (dBi) | -4.64  | -6.92 | -7.23 | -4.69 | -8.36 | -7.71  |
|              | Band            | B8     | B12   | B13   | B14   | B20   | B25    |
|              | Peak gain (dBi) | -6.63  | -5.66 | -5.26 | -4.81 | -6.5  | -0.78  |
|              | Ave. gain (dBi) | -10.08 | -9.03 | -8.67 | -8.13 | -9.02 | -7     |
|              | Band            | B26    | B28   | B29   | B30   | B66   | B71    |
|              | Peak gain (dBi) | -5.48  | -5.27 | -5.17 | -4.02 | 0.34  | -15.96 |
|              | Ave. gain (dBi) | -8.45  | -8.17 | -8.5  | -7.54 | -4.7  | -18.77 |
|              | Band            | B38    | B39   | B40   | B41   | N70   |        |
|              | Peak gain (dBi) | -2.69  | -1.46 | -4.12 | -2.73 | -0.87 |        |
|              | Ave. gain (dBi) | -5.8   | -6.17 | -7.58 | -5.84 | -6.94 |        |

## Antenna D(Sub2)

- MFA

- Manufacturer : Galtronics.

|              |                 |       |       |       |       |       |       |
|--------------|-----------------|-------|-------|-------|-------|-------|-------|
| Antenna<br>D | Band            | B2    | B4    | B25   | B48   | N70   | N77   |
|              | Peak gain (dBi) | -3.47 | -3.1  | -3.24 | -1.09 | -2.66 | -0.06 |
|              | Ave. gain (dBi) | -9.96 | -8.34 | -9.78 | -7.24 | -7.45 | -5.96 |
|              | Band            | N78   | GPS   |       |       |       |       |
|              | Peak gain (dBi) | -1.27 | -0.32 |       |       |       |       |
|              | Ave. gain (dBi) | -7.63 | -4.85 |       |       |       |       |

### Antenna E(Sub3)

- MFA

- Manufacturer : Galtronics.

|              |                 |         |         |       |       |         |       |
|--------------|-----------------|---------|---------|-------|-------|---------|-------|
| Antenna<br>E | Band            | B2/N2   | B25/N25 | N70   | B4    | B66/N66 | N78   |
|              | Peak gain (dBi) | -0.18   | -0.11   | 0.3   | -0.37 | -0.05   | 0.28  |
|              | Ave. gain (dBi) | -6      | -5.95   | -5.26 | -4.88 | -4.72   | -4.43 |
|              | Band            | B48/N48 | N77     |       |       |         |       |
|              | Peak gain (dBi) | -0.36   | -0.63   |       |       |         |       |
|              | Ave. gain (dBi) | -5.16   | -5.77   |       |       |         |       |

### Antenna F(Sub4)

- MFA

- Manufacturer : Galtronics.

|              |                 |       |
|--------------|-----------------|-------|
| Antenna<br>F | Band            | B41   |
|              | Peak gain (dBi) | -0.72 |
|              | Ave. gain (dBi) | -6.13 |

### Antenna G(Sub5)

- MFA

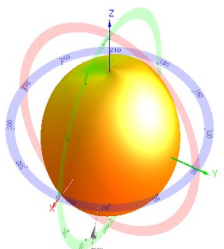
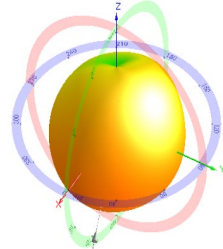
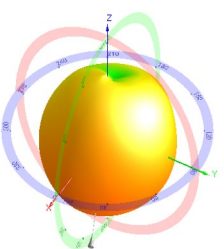
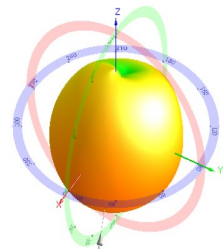
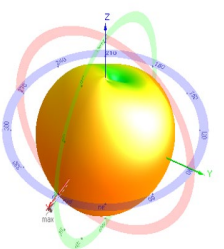
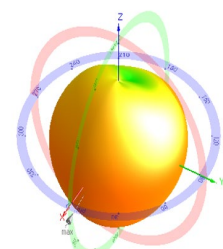
- Manufacturer : Galtronics.

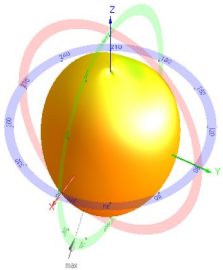
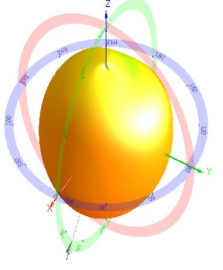
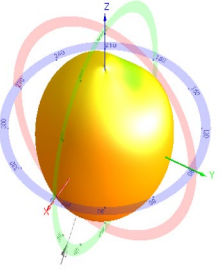
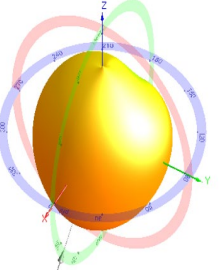
|              |                 |        |       |       |       |         |         |
|--------------|-----------------|--------|-------|-------|-------|---------|---------|
| Antenna<br>G | Band            | B41    | B48   | N77   | N78   | WiFi 2G | WiFi 5G |
|              | Peak gain (dBi) | -7.5   | -3.63 | -3.53 | -2.44 | -4.7    | -3.9    |
|              | Ave. gain (dBi) | -11.75 | -7.33 | -7.38 | -6.18 | -6.7    | -4.6    |

## ● Radiation Pattern

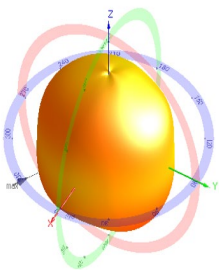
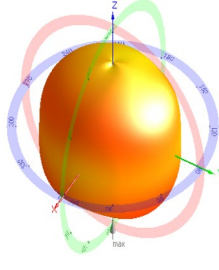
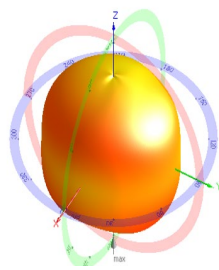
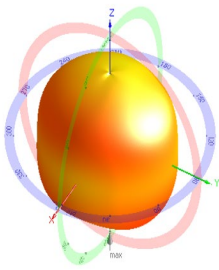
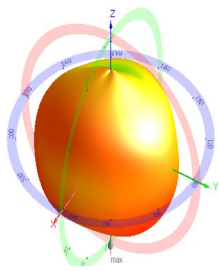
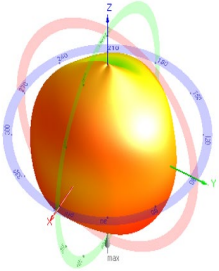
There is Radiation Pattern due to passive measurement with MTG chamber.

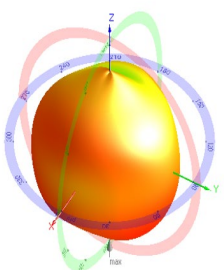
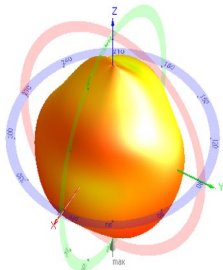
### Antenna A(Main1)

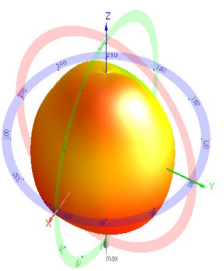
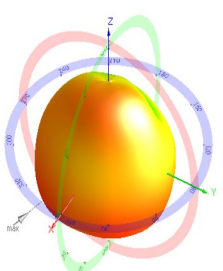
| 주파수 대역                  | Main1                                                                                                 |                                                                                                        |
|-------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B71/N71                                                                                               | B12/N12                                                                                                |
| 3D<br>Radiation Pattern | <b>680.500MHz</b>    | <b>707.500MHz</b>    |
|                         | Avg Gain [dBi]                                                                                        | -6.83                                                                                                  |
|                         | Efficiency[%]                                                                                         | 20.77                                                                                                  |
|                         | Peak Gain [dBi]                                                                                       | -3.52                                                                                                  |
|                         |                                                                                                       |                                                                                                        |
| 주파수 대역                  | Main1                                                                                                 |                                                                                                        |
| (Frequency Band)        | B29                                                                                                   | B28                                                                                                    |
| 3D<br>Radiation Pattern | <b>722.500MHz</b>  | <b>725.500MHz</b>  |
|                         | Avg Gain [dBi]                                                                                        | -7.56                                                                                                  |
|                         | Efficiency[%]                                                                                         | 17.55                                                                                                  |
|                         | Peak Gain [dBi]                                                                                       | -3.7                                                                                                   |
|                         |                                                                                                       |                                                                                                        |
| 주파수 대역                  | Main1                                                                                                 |                                                                                                        |
| (Frequency Band)        | B13                                                                                                   | B14                                                                                                    |
| 3D<br>Radiation Pattern | <b>782.000MHz</b>  | <b>793.000MHz</b>  |
|                         | Avg Gain [dBi]                                                                                        | -7.13                                                                                                  |
|                         | Efficiency[%]                                                                                         | 19.38                                                                                                  |
|                         | Peak Gain [dBi]                                                                                       | -3.92                                                                                                  |

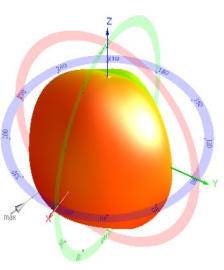
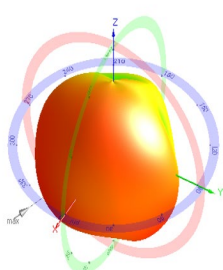
| 주파수 대역                  | Main1                                                                                                |                                                                                                        |
|-------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B26                                                                                                  | B5/N5                                                                                                  |
| 3D<br>Radiation Pattern | <b>831.500MHz</b>   | <b>836.500MHz</b>   |
|                         | Avg Gain [dBi]                                                                                       | -7.42                                                                                                  |
|                         | Efficiency[%]                                                                                        | 18.12                                                                                                  |
|                         | Peak Gain [dBi]                                                                                      | -4.31                                                                                                  |
|                         |                                                                                                      |                                                                                                        |
| 주파수 대역                  | Main1                                                                                                |                                                                                                        |
| (Frequency Band)        | B20                                                                                                  | B8                                                                                                     |
| 3D<br>Radiation Pattern | <b>847.000MHz</b>  | <b>897.500MHz</b>  |
|                         | Avg Gain [dBi]                                                                                       | -7.58                                                                                                  |
|                         | Efficiency[%]                                                                                        | 17.44                                                                                                  |
|                         | Peak Gain [dBi]                                                                                      | -4.41                                                                                                  |

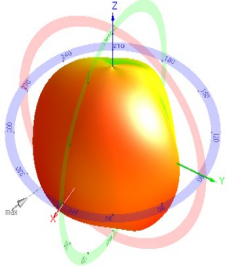
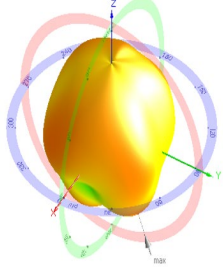
## Antenna B(Main2)

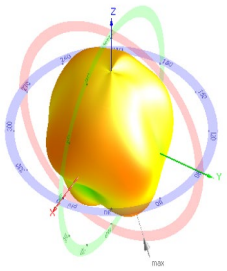
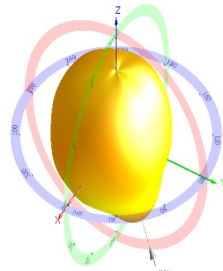
| 주파수 대역               | Main2                                                                                                  |                                                                                                         |
|----------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| (Frequency Band)     | B70                                                                                                    | B4                                                                                                      |
| 3D Radiation Pattern | <b>1702.500MHz</b>    | <b>1732.500MHz</b>    |
| Avg Gain [dBi]       | -6.22                                                                                                  | -5.12                                                                                                   |
| Efficiency[%]        | 23.89                                                                                                  | 30.77                                                                                                   |
| Peak Gain [dBi]      | -1.96                                                                                                  | -0.83                                                                                                   |
|                      |                                                                                                        |                                                                                                         |
| 주파수 대역               | Main2                                                                                                  |                                                                                                         |
| (Frequency Band)     | B66/N66                                                                                                | B3                                                                                                      |
| 3D Radiation Pattern | <b>1745.000MHz</b>  | <b>1747.500MHz</b>  |
| Avg Gain [dBi]       | -5.07                                                                                                  | -5.16                                                                                                   |
| Efficiency[%]        | 31.14                                                                                                  | 30.47                                                                                                   |
| Peak Gain [dBi]      | -0.55                                                                                                  | -0.64                                                                                                   |
|                      |                                                                                                        |                                                                                                         |
| 주파수 대역               | Main2                                                                                                  |                                                                                                         |
| (Frequency Band)     | B2/N2                                                                                                  | B25/N25                                                                                                 |
| 3D Radiation Pattern | <b>1880.000MHz</b>  | <b>1882.500MHz</b>  |
| Avg Gain [dBi]       | -4.44                                                                                                  | -4.37                                                                                                   |
| Efficiency[%]        | 36.01                                                                                                  | 36.54                                                                                                   |
| Peak Gain [dBi]      | 0.55                                                                                                   | 0.66                                                                                                    |

| 주파수 대역               | Main2                                                                                                |                                                                                                       |
|----------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| (Frequency Band)     | B39                                                                                                  | B1                                                                                                    |
| 3D Radiation Pattern | <b>1900.000MHz</b>  | <b>1950.000MHz</b>  |
| Avg Gain [dBi]       | -4.2                                                                                                 | -5.28                                                                                                 |
| Efficiency[%]        | 37.99                                                                                                | 29.64                                                                                                 |
| Peak Gain [dBi]      | 1.07                                                                                                 | 0.54                                                                                                  |

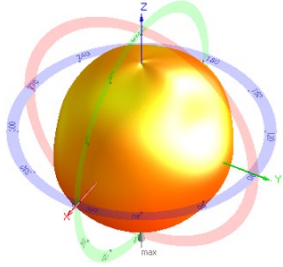
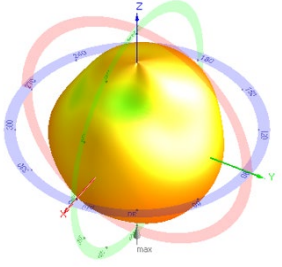
| 주파수 대역               | Main2                                                                                                 |                                                                                                        |
|----------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| (Frequency Band)     | B30/N30                                                                                               | B40                                                                                                    |
| 3D Radiation Pattern | <b>2310.000MHz</b>  | <b>2350.000MHz</b>  |
| Avg Gain [dBi]       | -5.31                                                                                                 | -5.97                                                                                                  |
| Efficiency[%]        | 29.45                                                                                                 | 25.29                                                                                                  |
| Peak Gain [dBi]      | 0.37                                                                                                  | -0.57                                                                                                  |

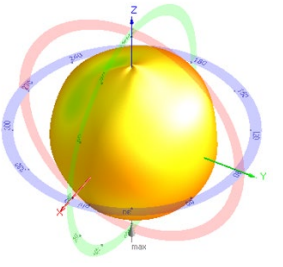
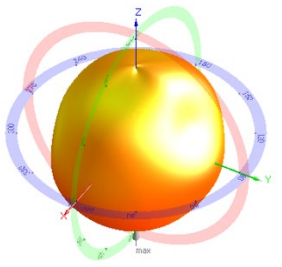
| 주파수 대역               | Main2                                                                                                  |                                                                                                         |
|----------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| (Frequency Band)     | B7                                                                                                     | B41/N41                                                                                                 |
| 3D Radiation Pattern | <b>2535.000MHz</b>  | <b>2593.000MHz</b>  |
| Avg Gain [dBi]       | -4.07                                                                                                  | -3.98                                                                                                   |
| Efficiency[%]        | 39.15                                                                                                  | 40                                                                                                      |
| Peak Gain [dBi]      | 0.03                                                                                                   | 0.12                                                                                                    |

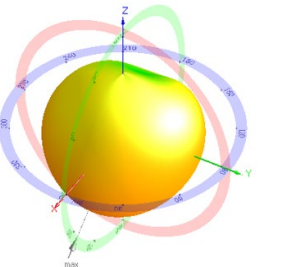
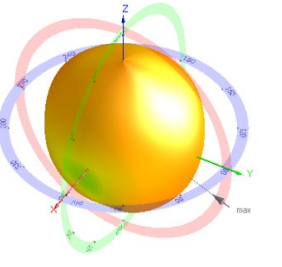
| 주파수 대역                  | Main2                                                                                                |                                                                                                       |
|-------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B38                                                                                                  | N78                                                                                                   |
| 3D<br>Radiation Pattern | <b>2595.000MHz</b>  | <b>3550.000MHz</b>  |
|                         | Avg Gain [dBi]                                                                                       | -4.01                                                                                                 |
|                         | Efficiency[%]                                                                                        | 39.74                                                                                                 |
|                         | Peak Gain [dBi]                                                                                      | 0.11                                                                                                  |

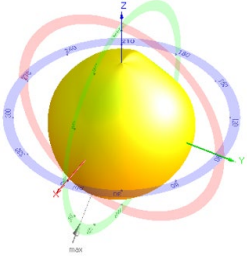
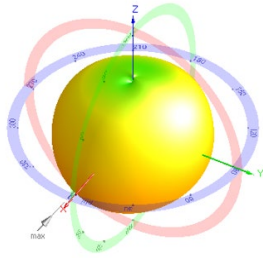
| 주파수 대역                  | Main2                                                                                                 |                                                                                                        |
|-------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B48/N48                                                                                               | N77                                                                                                    |
| 3D<br>Radiation Pattern | <b>3625.000MHz</b>  | <b>3750.000MHz</b>  |
|                         | Avg Gain [dBi]                                                                                        | -9.5                                                                                                   |
|                         | Efficiency[%]                                                                                         | 11.23                                                                                                  |
|                         | Peak Gain [dBi]                                                                                       | -4.04                                                                                                  |

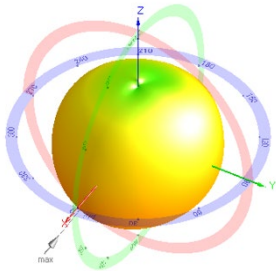
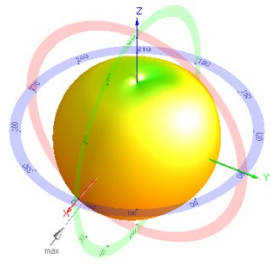
## Antenna C(Sub1)

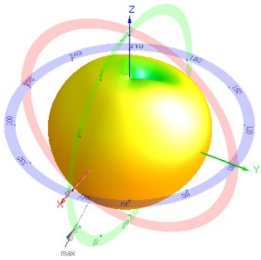
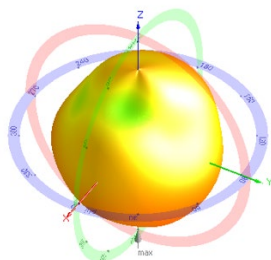
| 주파수 대역                  | Sub1                                                                                             |                                                                                                    |
|-------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B1                                                                                               | B2                                                                                                 |
| 3D<br>Radiation Pattern | 2140.000MHz<br> | 1960.000MHz<br> |
|                         | Efficiency[%]                                                                                    | 34.33                                                                                              |
|                         | Avg Gain [dBi]                                                                                   | -4.64                                                                                              |
|                         | Peak Gain [dBi]                                                                                  | 0.33                                                                                               |

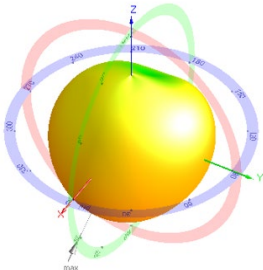
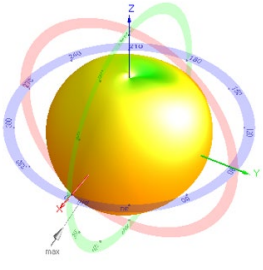
| 주파수 대역                  | Sub1                                                                                               |                                                                                                      |
|-------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B3                                                                                                 | B4                                                                                                   |
| 3D<br>Radiation Pattern | 1842.500MHz<br> | 2132.500MHz<br> |
|                         | Efficiency[%]                                                                                      | 18.94                                                                                                |
|                         | Avg Gain [dBi]                                                                                     | -7.23                                                                                                |
|                         | Peak Gain [dBi]                                                                                    | -2.1                                                                                                 |

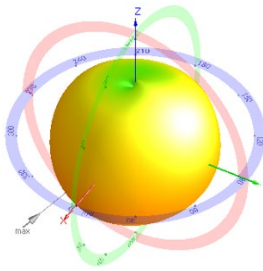
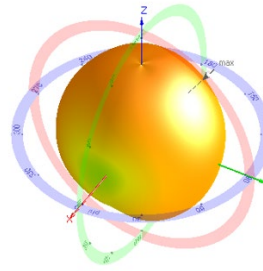
| 주파수 대역                  | Sub1                                                                                              |                                                                                                      |
|-------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B5                                                                                                | B7                                                                                                   |
| 3D<br>Radiation Pattern | 881.500MHz<br> | 2655.000MHz<br> |
|                         | Efficiency[%]                                                                                     | 14.85                                                                                                |
|                         | Avg Gain [dBi]                                                                                    | -8.36                                                                                                |
|                         | Peak Gain [dBi]                                                                                   | -5.26                                                                                                |

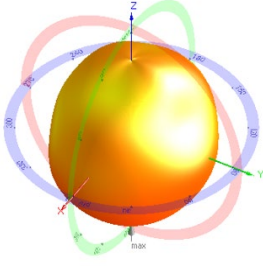
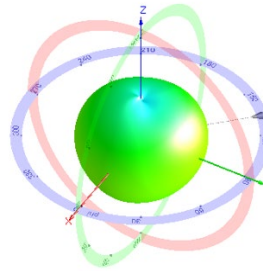
| 주파수 대역                  | Sub1                                                                                            |                                                                                                   |
|-------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B8                                                                                              | B12                                                                                               |
| 3D<br>Radiation Pattern | 942.500MHz<br> | 737.500MHz<br> |
|                         | Efficiency[%]                                                                                   | 12.51                                                                                             |
|                         | Avg Gain [dBi]                                                                                  | -9.03                                                                                             |
|                         | Peak Gain [dBi]                                                                                 | -5.66                                                                                             |

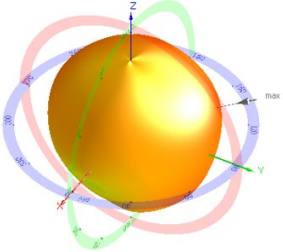
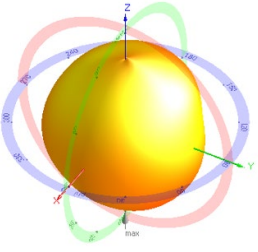
| 주파수 대역                  | Sub1                                                                                             |                                                                                                    |
|-------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B13                                                                                              | B14                                                                                                |
| 3D<br>Radiation Pattern | 751.000MHz<br> | 763.000MHz<br> |
|                         | Efficiency[%]                                                                                    | 15.39                                                                                              |
|                         | Avg Gain [dBi]                                                                                   | -8.13                                                                                              |
|                         | Peak Gain [dBi]                                                                                  | -4.81                                                                                              |

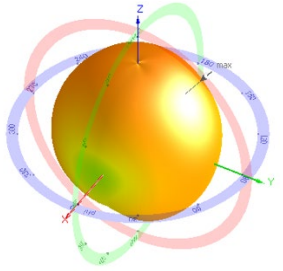
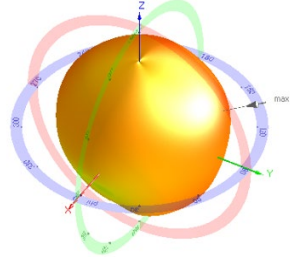
| 주파수 대역                  | Sub1                                                                                              |                                                                                                      |
|-------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B20                                                                                               | B25                                                                                                  |
| 3D<br>Radiation Pattern | 806.000MHz<br> | 1962.500MHz<br> |
|                         | Efficiency[%]                                                                                     | 19.95                                                                                                |
|                         | Avg Gain [dBi]                                                                                    | -7                                                                                                   |
|                         | Peak Gain [dBi]                                                                                   | -0.78                                                                                                |

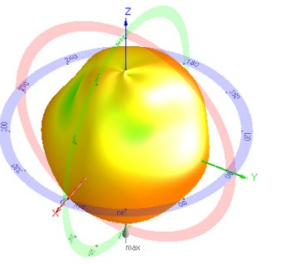
| 주파수 대역                  | Sub1                                                                                            |                                                                                                   |
|-------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B26                                                                                             | B28                                                                                               |
| 3D<br>Radiation Pattern | 876.500MHz<br> | 780.500MHz<br> |
|                         | Efficiency[%]                                                                                   | 14.3                                                                                              |
|                         | Avg Gain [dBi]                                                                                  | -8.45                                                                                             |
|                         | Peak Gain [dBi]                                                                                 | -5.48                                                                                             |

| 주파수 대역                  | Sub1                                                                                             |                                                                                                     |
|-------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B29                                                                                              | B30                                                                                                 |
| 3D<br>Radiation Pattern | 722.500MHz<br> | 2355.000MHz<br> |
|                         | Efficiency[%]                                                                                    | 14.14                                                                                               |
|                         | Avg Gain [dBi]                                                                                   | -8.5                                                                                                |
|                         | Peak Gain [dBi]                                                                                  | -5.17                                                                                               |

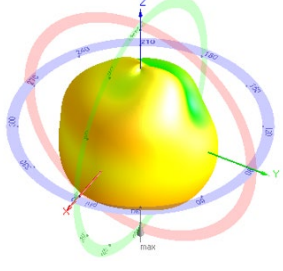
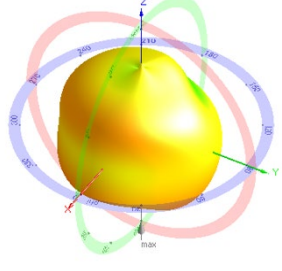
| 주파수 대역                  | Sub1                                                                                               |                                                                                                     |
|-------------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B66                                                                                                | B71                                                                                                 |
| 3D<br>Radiation Pattern | 2155.000MHz<br> | 634.500MHz<br> |
|                         | Efficiency[%]                                                                                      | 33.88                                                                                               |
|                         | Avg Gain [dBi]                                                                                     | -4.7                                                                                                |
|                         | Peak Gain [dBi]                                                                                    | 0.34                                                                                                |

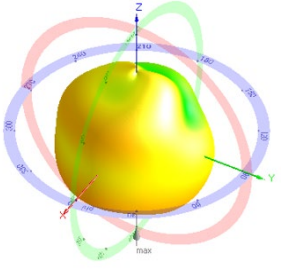
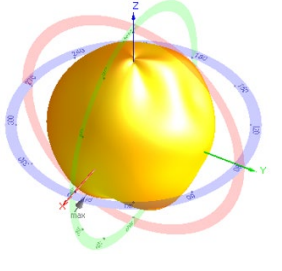
| 주파수 대역                  | Sub1                                                                                             |                                                                                                    |
|-------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B38                                                                                              | B39                                                                                                |
| 3D<br>Radiation Pattern | 2595.000MHz<br> | 1900.000MHz<br> |
|                         | Efficiency[%]                                                                                    | 26.33                                                                                              |
|                         | Avg Gain [dBi]                                                                                   | -5.8                                                                                               |
|                         | Peak Gain [dBi]                                                                                  | -2.69                                                                                              |

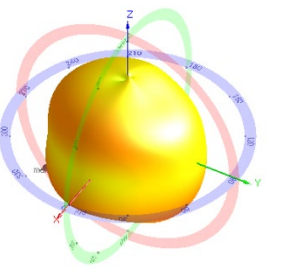
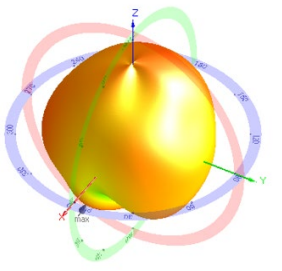
| 주파수 대역                  | Sub1                                                                                              |                                                                                                     |
|-------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B40                                                                                               | B41                                                                                                 |
| 3D<br>Radiation Pattern | 2350.000MHz<br> | 2593.000MHz<br> |
|                         | Efficiency[%]                                                                                     | 17.45                                                                                               |
|                         | Avg Gain [dBi]                                                                                    | -7.58                                                                                               |
|                         | Peak Gain [dBi]                                                                                   | -4.12                                                                                               |

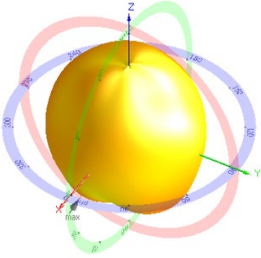
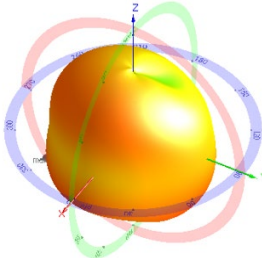
| 주파수 대역                  | Sub1                                                                                               |       |
|-------------------------|----------------------------------------------------------------------------------------------------|-------|
| (Frequency Band)        | N70                                                                                                |       |
| 3D<br>Radiation Pattern | 2007.500MHz<br> |       |
|                         | Efficiency[%]                                                                                      | 20.23 |
|                         | Avg Gain [dBi]                                                                                     | -6.94 |
|                         | Peak Gain [dBi]                                                                                    | -0.87 |

## Antenna D(Sub2)

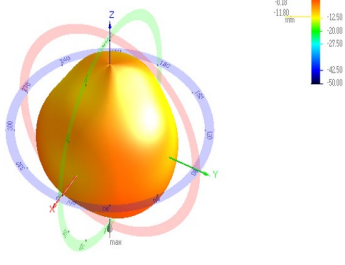
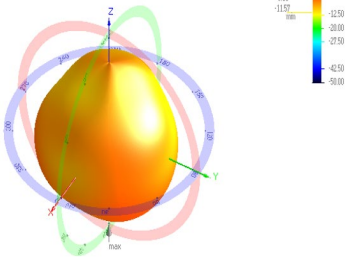
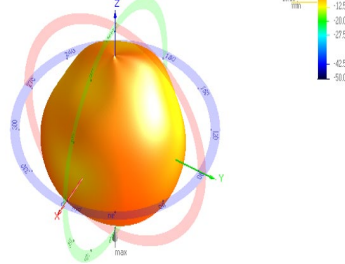
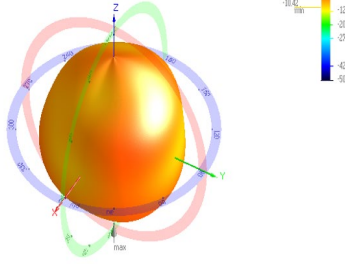
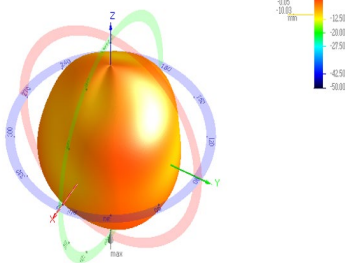
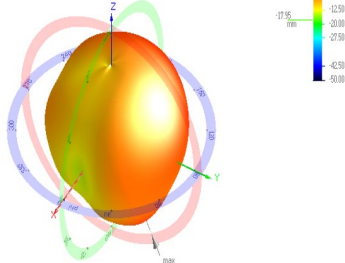
| 주파수 대역                  | Sub2                                                                                             |                                                                                                    |
|-------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B2                                                                                               | B4                                                                                                 |
| 3D<br>Radiation Pattern | 1880.000MHz<br> | 1732.500MHz<br> |
|                         | Efficiency[%]                                                                                    | 10.1                                                                                               |
|                         | Avg Gain [dBi]                                                                                   | -9.96                                                                                              |
|                         | Peak Gain [dBi]                                                                                  | -3.47                                                                                              |
|                         |                                                                                                  |                                                                                                    |

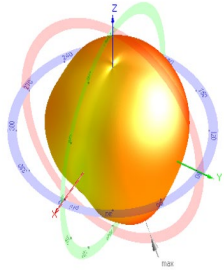
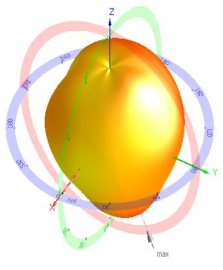
| 주파수 대역                  | Sub2                                                                                               |                                                                                                      |
|-------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B25                                                                                                | B48                                                                                                  |
| 3D<br>Radiation Pattern | 1882.500MHz<br> | 3625.000MHz<br> |
|                         | Efficiency[%]                                                                                      | 10.52                                                                                                |
|                         | Avg Gain [dBi]                                                                                     | -9.78                                                                                                |
|                         | Peak Gain [dBi]                                                                                    | -3.24                                                                                                |
|                         |                                                                                                    |                                                                                                      |

| 주파수 대역                  | Sub2                                                                                               |                                                                                                      |
|-------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| (Frequency Band)        | N70                                                                                                | N77                                                                                                  |
| 3D<br>Radiation Pattern | 1702.500MHz<br> | 3750.000MHz<br> |
|                         | Efficiency[%]                                                                                      | 18.01                                                                                                |
|                         | Avg Gain [dBi]                                                                                     | -7.45                                                                                                |
|                         | Peak Gain [dBi]                                                                                    | -2.66                                                                                                |
|                         |                                                                                                    |                                                                                                      |

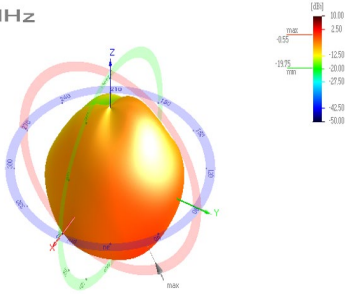
| 주파수 대역                  | Sub2                                                                                                    |                                                                                                           |
|-------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| (Frequency Band)        | N78                                                                                                     | GPS                                                                                                       |
| 3D<br>Radiation Pattern | <b>3550.000MHz</b><br> | <b>1575.000MHz</b><br> |
|                         | Efficiency[%]                                                                                           | 17.26                                                                                                     |
|                         | Avg Gain [dBi]                                                                                          | -7.63                                                                                                     |
|                         | Peak Gain [dBi]                                                                                         | -1.27                                                                                                     |
|                         |                                                                                                         | 32.74                                                                                                     |
|                         |                                                                                                         | -4.85                                                                                                     |
|                         |                                                                                                         | -0.32                                                                                                     |

## Antenna E(Sub3)

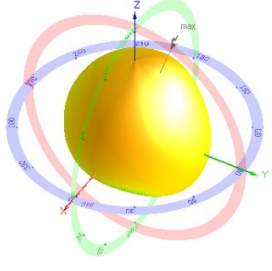
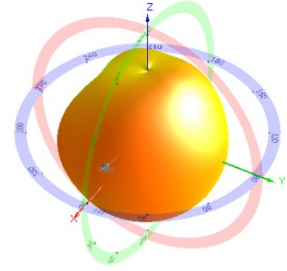
| 주파수 대역               | Sub3                                                                                                   |                                                                                                         |
|----------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| (Frequency Band)     | B2/N2                                                                                                  | B25/N25                                                                                                 |
| 3D Radiation Pattern | <b>1960.000MHz</b>    | <b>1962.500MHz</b>    |
| Avg Gain [dBi]       | -6                                                                                                     | -5.95                                                                                                   |
| Efficiency[%]        | 25.11                                                                                                  | 25.43                                                                                                   |
| Peak Gain [dBi]      | -0.18                                                                                                  | -0.11                                                                                                   |
|                      |                                                                                                        |                                                                                                         |
| 주파수 대역               | Sub3                                                                                                   |                                                                                                         |
| (Frequency Band)     | N70                                                                                                    | B4                                                                                                      |
| 3D Radiation Pattern | <b>2007.500MHz</b>  | <b>2132.500MHz</b>  |
| Avg Gain [dBi]       | -5.26                                                                                                  | -4.88                                                                                                   |
| Efficiency[%]        | 29.79                                                                                                  | 32.53                                                                                                   |
| Peak Gain [dBi]      | 0.3                                                                                                    | -0.37                                                                                                   |
|                      |                                                                                                        |                                                                                                         |
| 주파수 대역               | Sub3                                                                                                   |                                                                                                         |
| (Frequency Band)     | B66/N66                                                                                                | N78                                                                                                     |
| 3D Radiation Pattern | <b>2155.000MHz</b>  | <b>3550.000MHz</b>  |
| Avg Gain [dBi]       | -4.72                                                                                                  | -4.43                                                                                                   |
| Efficiency[%]        | 33.74                                                                                                  | 36.07                                                                                                   |
| Peak Gain [dBi]      | -0.05                                                                                                  | 0.28                                                                                                    |

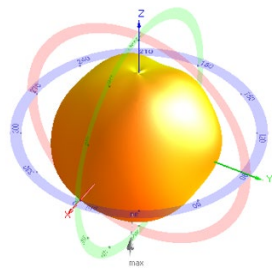
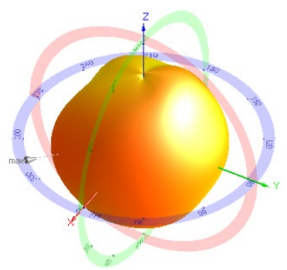
| 주파수 대역                  | Sub3                                                                                                     |                                                                                                            |
|-------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B48/N48                                                                                                  | N77                                                                                                        |
| 3D<br>Radiation Pattern | <div>3625.000MHz</div>  | <div>3750.000MHz</div>  |
|                         | Avg Gain [dBi]                                                                                           | -5.16                                                                                                      |
|                         | Efficiency[%]                                                                                            | 30.45                                                                                                      |
|                         | Peak Gain [dBi]                                                                                          | -0.36                                                                                                      |

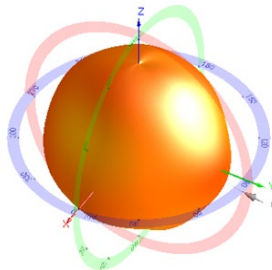
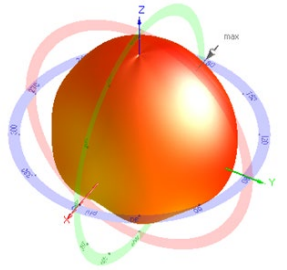
Antenna F(Sub4)

|                         |                                                                                                          |  |
|-------------------------|----------------------------------------------------------------------------------------------------------|--|
| 주파수 대역                  | Sub4                                                                                                     |  |
| (Frequency Band)        | B41                                                                                                      |  |
| 3D<br>Radiation Pattern | <div>2593.000MHz</div>  |  |
| Avg Gain [dBi]          | -6.13                                                                                                    |  |
| Efficiency[%]           | 24.36                                                                                                    |  |
| Peak Gain [dBi]         | -0.72                                                                                                    |  |

## Antenna G(Sub5)

| 주파수 대역                  | Sub5                                                                                             |                                                                                                    |
|-------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| (Frequency Band)        | B41                                                                                              | B48                                                                                                |
| 3D<br>Radiation Pattern | 2593.000MHz<br> | 3625.000MHz<br> |
|                         | Efficiency[%]                                                                                    | 6.68                                                                                               |
|                         | Avg Gain [dBi]                                                                                   | -11.75                                                                                             |
|                         | Peak Gain [dBi]                                                                                  | -7.51                                                                                              |

| 주파수 대역                  | Sub5                                                                                              |                                                                                                     |
|-------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| (Frequency Band)        | N77                                                                                               | N78                                                                                                 |
| 3D<br>Radiation Pattern | 3750.000MHz<br> | 3550.000MHz<br> |
|                         | Efficiency[%]                                                                                     | 18.28                                                                                               |
|                         | Avg Gain [dBi]                                                                                    | -7.38                                                                                               |
|                         | Peak Gain [dBi]                                                                                   | -3.53                                                                                               |

| 주파수 대역                  | Sub5                                                                                               |                                                                                                      |
|-------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| (Frequency Band)        | WiFi 2G                                                                                            | WiFi 5G                                                                                              |
| 3D<br>Radiation Pattern | 2436.000MHz<br> | 5500.000MHz<br> |
|                         | Efficiency[%]                                                                                      | 21.52                                                                                                |
|                         | Avg Gain [dBi]                                                                                     | -6.7                                                                                                 |
|                         | Peak Gain [dBi]                                                                                    | -4.7                                                                                                 |