

## 【TN0022A】 Wi-Fi/Bluetooth Antenna

### 1.Specification

Antenna Type : Inverted F Antenna  
Part No. ANT1 : ANT2312-A3.0-W/U-185-W  
ANT2 : ANT2312-A3.0-W/U-333-A  
Antenna Gain(Peak) : ANT1 Wi-Fi 2.4GHz -1.25dBi  
ANT1 Wi-Fi 5GHz 3.09dBi  
ANT2 Bluetooth -1.74dBi  
ANT2 Wi-Fi 5GHz 2.08dBi

Frequency Band : Wi-Fi 2.4GHz 2412 - 2462 MHz  
Wi-Fi 5GHz(W52) 5180 - 5240 MHz  
Wi-Fi 5GHz(W58) 5745 - 5825 MHz  
Bluetooth 2402 - 2480 MHz

### 2.Appearance / Dimension

See fig.1 on another Document.(TN0022A\_Antenna Photo)

### Measurement content

#### 1.Measurement condition

- Measurement ANT : ETS-LINDGREN 3115 (1-18GHz)
- Reference ANT : ETS-LINDGREN 3160-03 (1.7-2.6GHz) / 3160-05 (3.95-5.85GHz)
- Measuring instrument : P9372A (Keysight network analyzer)
- Measured distance : 3m (1.5m high)
- Range of measurement : 360 degree/5 degree step
- Measurement layout : The measurement environment is measured with the following layout.

See fig2 on another Document.(TN0022A\_Antenna Photo)

#### 2.Measurement direction

See fig3 on another Document.(TN0022A\_Antenna Photo)

- Test dates : 2023/4/4
- Names of test personnel : Toshiaki Hirose(NISSEI ELECTRIC CO.,LTD.)
- Names of commercial test software being used : Antenna gain measurement system(NISSEI ELECTRONICS CO.,LTD.)

### 3. Antenna gain

#### 3-1. Antenna2-Left (2.4GHz-Band)

| frequency<br>[MHz] | Plane | plane of<br>polarization | $\pm 100^\circ$<br>Average<br>[dBi] | $\pm 100^\circ$<br>true mean | Composite<br>true value | Composite<br>[dBi] | DIP[dBi] | DIP-AVE<br>[dB] |
|--------------------|-------|--------------------------|-------------------------------------|------------------------------|-------------------------|--------------------|----------|-----------------|
| 2402               | XY    | HOR.                     | -7.32                               | 0.19                         | 0.26                    | -5.92              | -14.33   | 9.48            |
|                    |       | VER.                     | -11.50                              | 0.07                         |                         |                    |          |                 |
|                    | XZ    | HOR.                     | -8.80                               | 0.13                         | 0.39                    | -4.11              | -6.84    | 1.99            |
|                    |       | VER.                     | -5.92                               | 0.26                         |                         |                    |          |                 |
| 2441               | XY    | HOR.                     | -7.63                               | 0.17                         | 0.28                    | -5.53              | -12.92   | 8.07            |
|                    |       | VER.                     | -9.71                               | 0.11                         |                         |                    |          |                 |
|                    | XZ    | HOR.                     | -9.52                               | 0.11                         | 0.36                    | -4.45              | -8.05    | 3.21            |
|                    |       | VER.                     | -6.07                               | 0.25                         |                         |                    |          |                 |
| 2480               | XY    | HOR.                     | -6.91                               | 0.20                         | 0.31                    | -5.14              | -8.66    | 3.81            |
|                    |       | VER.                     | -9.90                               | 0.10                         |                         |                    |          |                 |
|                    | XZ    | HOR.                     | -7.76                               | 0.17                         | 0.38                    | -4.24              | -8.25    | 3.40            |
|                    |       | VER.                     | -6.79                               | 0.21                         |                         |                    |          |                 |

**-4.85 dBi Ave**

**-1.74 dBi Max Peak**

#### 3-2. Antenna2-Left (5GHz-Band1)

| frequency<br>[MHz] | Plane | plane of<br>polarization | $\pm 100^\circ$<br>Average<br>[dBi] | $\pm 100^\circ$<br>true mean | Composite<br>true value | Composite<br>[dBi] | DIP[dBi] | DIP-AVE<br>[dB] |
|--------------------|-------|--------------------------|-------------------------------------|------------------------------|-------------------------|--------------------|----------|-----------------|
| 5170               | XY    | HOR.                     | -8.30                               | 0.15                         | 0.63                    | -1.98              | -16.45   | 13.66           |
|                    |       | VER.                     | -3.14                               | 0.49                         |                         |                    |          |                 |
|                    | XZ    | HOR.                     | -7.21                               | 0.19                         | 0.32                    | -4.98              | -10.40   | 7.60            |
|                    |       | VER.                     | -8.93                               | 0.13                         |                         |                    |          |                 |
| 5210               | XY    | HOR.                     | -7.56                               | 0.18                         | 0.73                    | -1.35              | -16.18   | 13.39           |
|                    |       | VER.                     | -2.54                               | 0.56                         |                         |                    |          |                 |
|                    | XZ    | HOR.                     | -7.61                               | 0.17                         | 0.33                    | -4.83              | -10.46   | 7.67            |
|                    |       | VER.                     | -8.08                               | 0.16                         |                         |                    |          |                 |
| 5250               | XY    | HOR.                     | -7.34                               | 0.18                         | 0.77                    | -1.15              | -13.90   | 11.10           |
|                    |       | VER.                     | -2.35                               | 0.58                         |                         |                    |          |                 |
|                    | XZ    | HOR.                     | -7.35                               | 0.18                         | 0.37                    | -4.30              | -12.13   | 9.34            |
|                    |       | VER.                     | -7.28                               | 0.19                         |                         |                    |          |                 |

**-2.80 dBi Ave**

**2.08 dBi Max Peak**

### 3-3. Antenna2-Left (5GHz-Band4)

| frequency<br>[MHz] | Plane | plane of<br>polarization | ± 100°<br>Average<br>[dBi] | ± 100°<br>true mean | Composite<br>true value | Composite<br>[dBi] | DIP[dBi] | DIP-AVE<br>[dB] |
|--------------------|-------|--------------------------|----------------------------|---------------------|-------------------------|--------------------|----------|-----------------|
| 5735               | XY    | HOR.                     | -9.24                      | 0.12                | 0.50                    | -2.97              | -15.41   | 11.01           |
|                    |       | VER.                     | -4.14                      | 0.39                |                         |                    |          |                 |
|                    | XZ    | HOR.                     | -8.47                      | 0.14                | 0.25                    | -5.95              | -11.36   | 6.95            |
|                    |       | VER.                     | -9.52                      | 0.11                |                         |                    |          |                 |
| 5785               | XY    | HOR.                     | -9.19                      | 0.12                | 0.50                    | -2.99              | -14.39   | 9.99            |
|                    |       | VER.                     | -4.18                      | 0.38                |                         |                    |          |                 |
|                    | XZ    | HOR.                     | -8.90                      | 0.13                | 0.24                    | -6.23              | -10.43   | 6.02            |
|                    |       | VER.                     | -9.61                      | 0.11                |                         |                    |          |                 |
| 5835               | XY    | HOR.                     | -9.93                      | 0.10                | 0.45                    | -3.44              | -12.45   | 8.04            |
|                    |       | VER.                     | -4.55                      | 0.35                |                         |                    |          |                 |
|                    | XZ    | HOR.                     | -9.41                      | 0.11                | 0.23                    | -6.47              | -10.89   | 6.49            |
|                    |       | VER.                     | -9.56                      | 0.11                |                         |                    |          |                 |

**-4.40 dBi Ave**  
**1.59 dBi Max Peak**

### 3-4. Antenna1-Right (2.4GHz-Band)

| frequency<br>[MHz] | Plane | plane of<br>polarization | ± 100°<br>Average<br>[dBi] | ± 100°<br>true mean | Composite<br>true value | Composite<br>[dBi] | DIP[dBi] | DIP-AVE<br>[dB] |
|--------------------|-------|--------------------------|----------------------------|---------------------|-------------------------|--------------------|----------|-----------------|
| 2402               | XY    | HOR.                     | -9.72                      | 0.11                | 0.17                    | -7.60              | -12.75   | 7.93            |
|                    |       | VER.                     | -11.73                     | 0.07                |                         |                    |          |                 |
|                    | XZ    | HOR.                     | -6.91                      | 0.20                | 0.41                    | -3.87              | -8.26    | 3.44            |
|                    |       | VER.                     | -6.84                      | 0.21                |                         |                    |          |                 |
| 2441               | XY    | HOR.                     | -9.04                      | 0.12                | 0.21                    | -6.79              | -12.06   | 7.24            |
|                    |       | VER.                     | -10.72                     | 0.08                |                         |                    |          |                 |
|                    | XZ    | HOR.                     | -5.71                      | 0.27                | 0.51                    | -2.96              | -8.25    | 3.42            |
|                    |       | VER.                     | -6.25                      | 0.24                |                         |                    |          |                 |
| 2480               | XY    | HOR.                     | -5.95                      | 0.25                | 0.38                    | -4.23              | -8.02    | 3.20            |
|                    |       | VER.                     | -9.09                      | 0.12                |                         |                    |          |                 |
|                    | XZ    | HOR.                     | -7.93                      | 0.16                | 0.30                    | -5.24              | -10.48   | 5.66            |
|                    |       | VER.                     | -8.60                      | 0.14                |                         |                    |          |                 |

**-4.82 dBi Ave**  
**-1.25 dBi Max Peak**

### 3-4. Antenna1-Right (5GHz-Band1)

| frequency [MHz] | Plane | plane of polarization | ± 100° Average [dBi] | ± 100° true mean | Composite true value | Composite [dBi] | DIP[dBi] | DIP-AVE [dB] |
|-----------------|-------|-----------------------|----------------------|------------------|----------------------|-----------------|----------|--------------|
| 5170            | XY    | HOR.                  | -7.27                | 0.19             | 0.88                 | -0.54           | -15.97   | 14.34        |
|                 |       | VER.                  | -1.57                | 0.70             |                      |                 |          |              |
|                 | XZ    | HOR.                  | -5.50                | 0.28             | 0.44                 | -3.53           | -7.91    | 6.28         |
|                 |       | VER.                  | -7.91                | 0.16             |                      |                 |          |              |
| 5210            | XY    | HOR.                  | -6.76                | 0.21             | 0.90                 | -0.46           | -16.31   | 14.67        |
|                 |       | VER.                  | -1.63                | 0.69             |                      |                 |          |              |
|                 | XZ    | HOR.                  | -5.85                | 0.26             | 0.46                 | -3.39           | -8.05    | 6.42         |
|                 |       | VER.                  | -7.05                | 0.20             |                      |                 |          |              |
| 5250            | XY    | HOR.                  | -6.54                | 0.22             | 0.94                 | -0.26           | -10.65   | 9.02         |
|                 |       | VER.                  | -1.42                | 0.72             |                      |                 |          |              |
|                 | XZ    | HOR.                  | -5.48                | 0.28             | 0.49                 | -3.08           | -8.16    | 6.52         |
|                 |       | VER.                  | -6.79                | 0.21             |                      |                 |          |              |

**-1.63 dBi Ave**  
**3.09 dBi Max Peak**

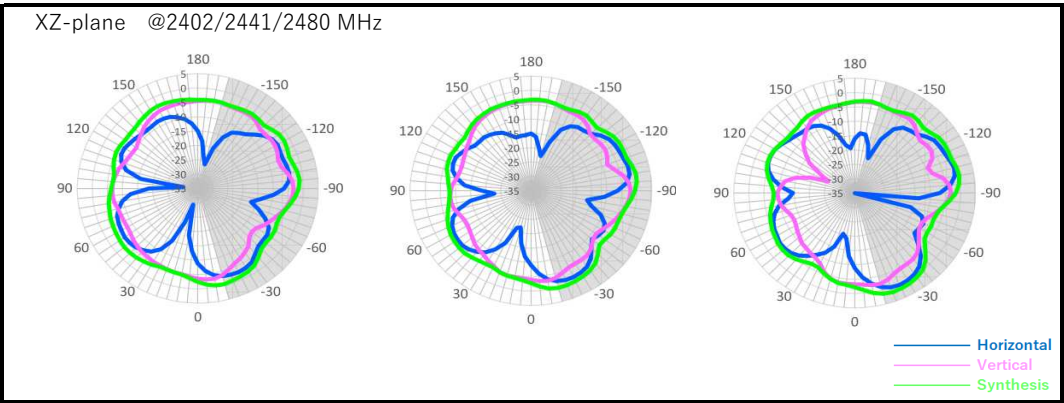
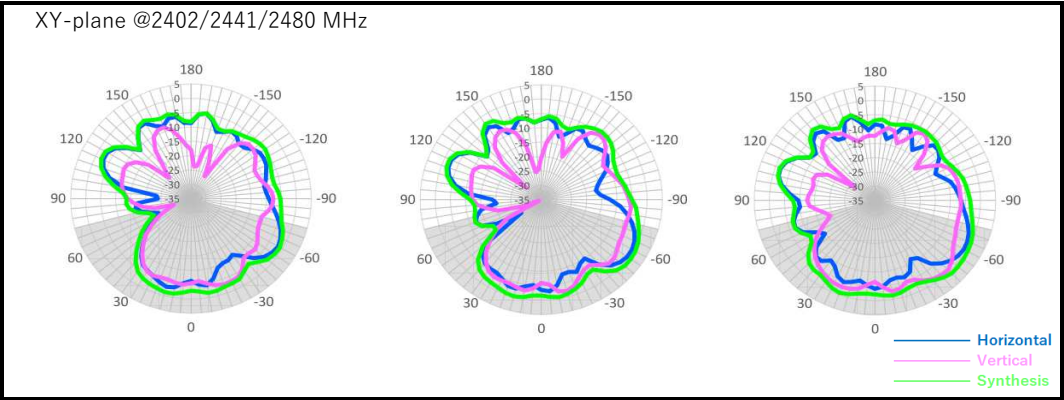
### 3-5. Antenna1-Right (5GHz-Band4)

| frequency [MHz] | Plane | plane of polarization | ± 100° Average [dBi] | ± 100° true mean | Composite true value | Composite [dBi] | DIP[dBi] | DIP-AVE [dB] |
|-----------------|-------|-----------------------|----------------------|------------------|----------------------|-----------------|----------|--------------|
| 5735            | XY    | HOR.                  | -7.62                | 0.17             | 0.54                 | -2.70           | -15.12   | 11.09        |
|                 |       | VER.                  | -4.38                | 0.36             |                      |                 |          |              |
|                 | XZ    | HOR.                  | -8.73                | 0.13             | 0.24                 | -6.23           | -11.42   | 7.39         |
|                 |       | VER.                  | -9.82                | 0.10             |                      |                 |          |              |
| 5785            | XY    | HOR.                  | -6.53                | 0.22             | 0.57                 | -2.41           | -12.01   | 7.99         |
|                 |       | VER.                  | -4.54                | 0.35             |                      |                 |          |              |
|                 | XZ    | HOR.                  | -8.57                | 0.14             | 0.25                 | -5.99           | -12.24   | 8.22         |
|                 |       | VER.                  | -9.47                | 0.11             |                      |                 |          |              |
| 5835            | XY    | HOR.                  | -6.52                | 0.22             | 0.55                 | -2.60           | -13.03   | 9.00         |
|                 |       | VER.                  | -4.86                | 0.33             |                      |                 |          |              |
|                 | XZ    | HOR.                  | -9.27                | 0.12             | 0.22                 | -6.48           | -13.65   | 9.63         |
|                 |       | VER.                  | -9.73                | 0.11             |                      |                 |          |              |

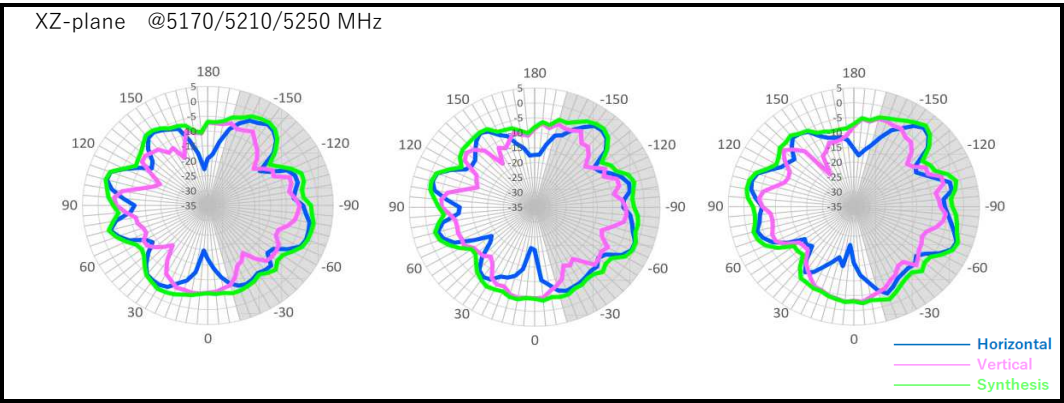
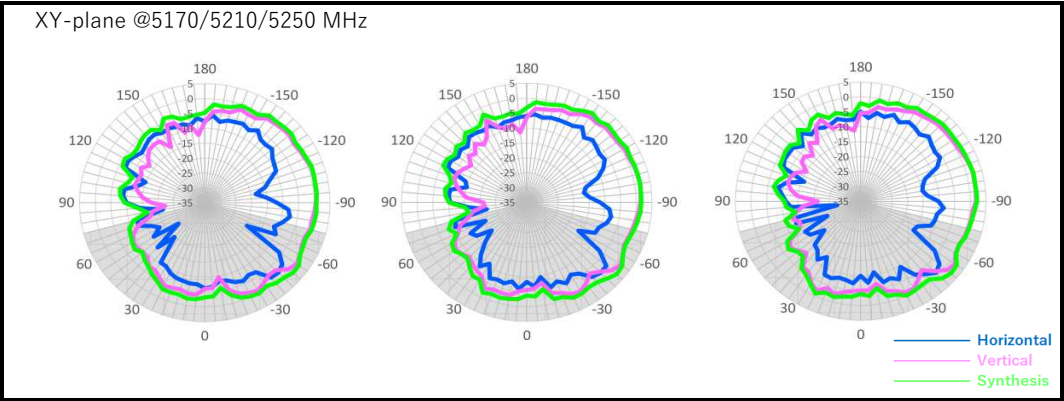
**-4.03 dBi Ave**  
**0.53 dBi Max Peak**

4. Radio wave radiation pattern (directivity graph)

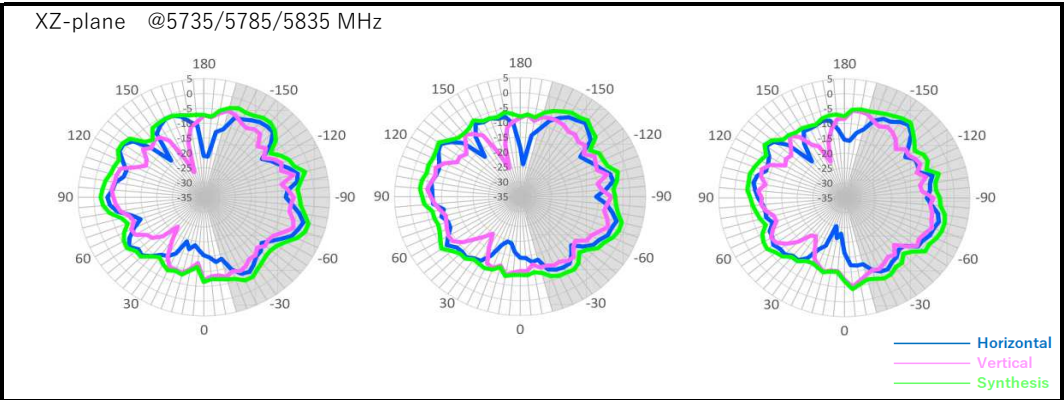
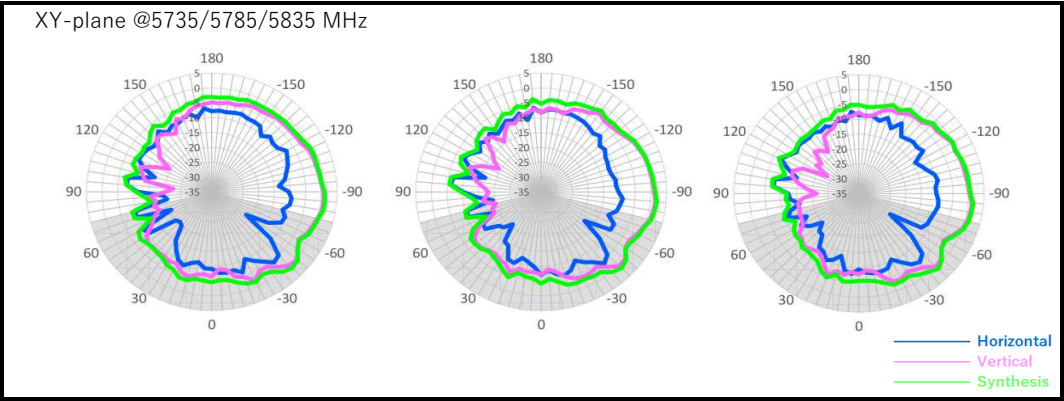
4-1. Antenna2-Left (2.4GHzBand)



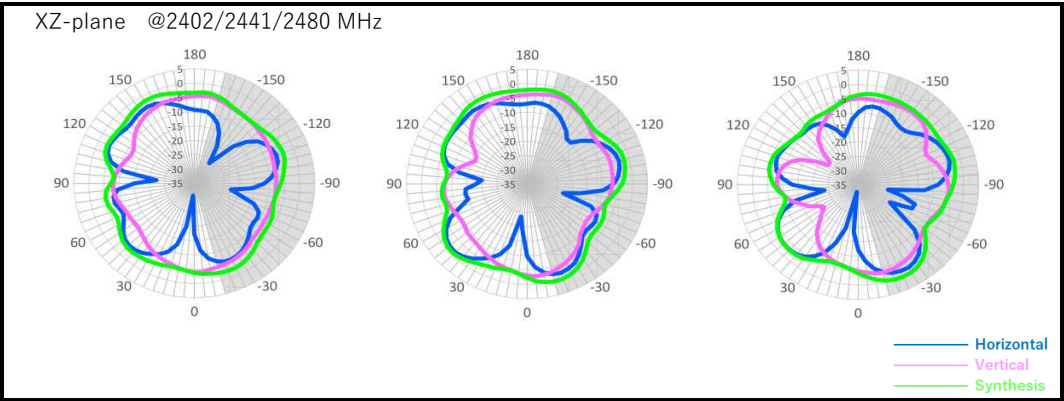
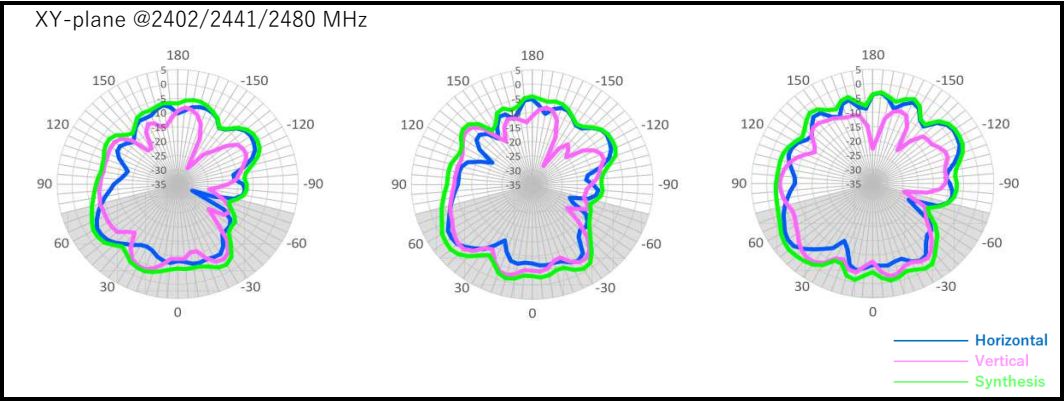
4-2. Antenna2-Left (5GHz-Band1)



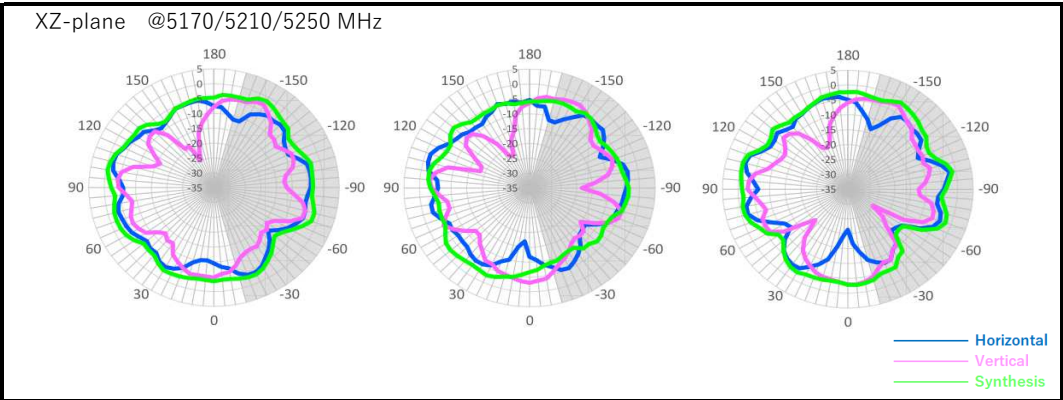
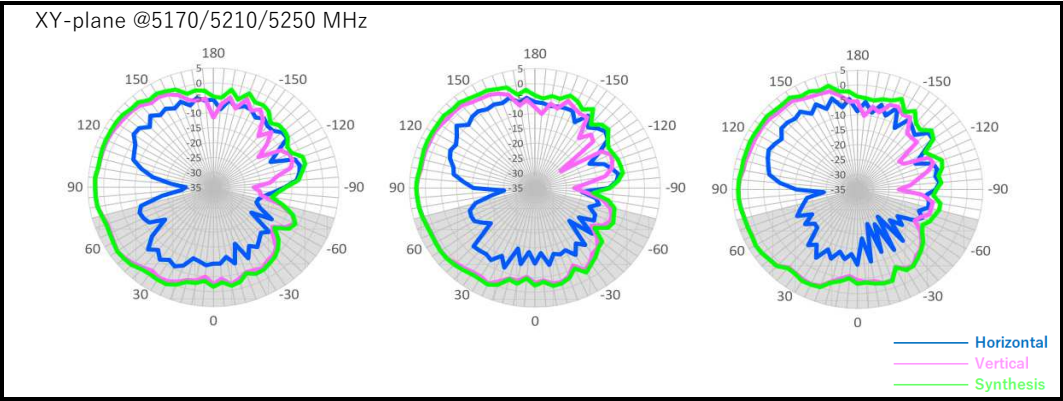
4-3. Antenna2-Left (5GHz-Band4)



4-4. Antenna1-Right (2.4GHzBand)



4-5. Antenna1-Right (5GHz-Band1)



4-6. Antenna1-Right (5GHz-Band4)

