



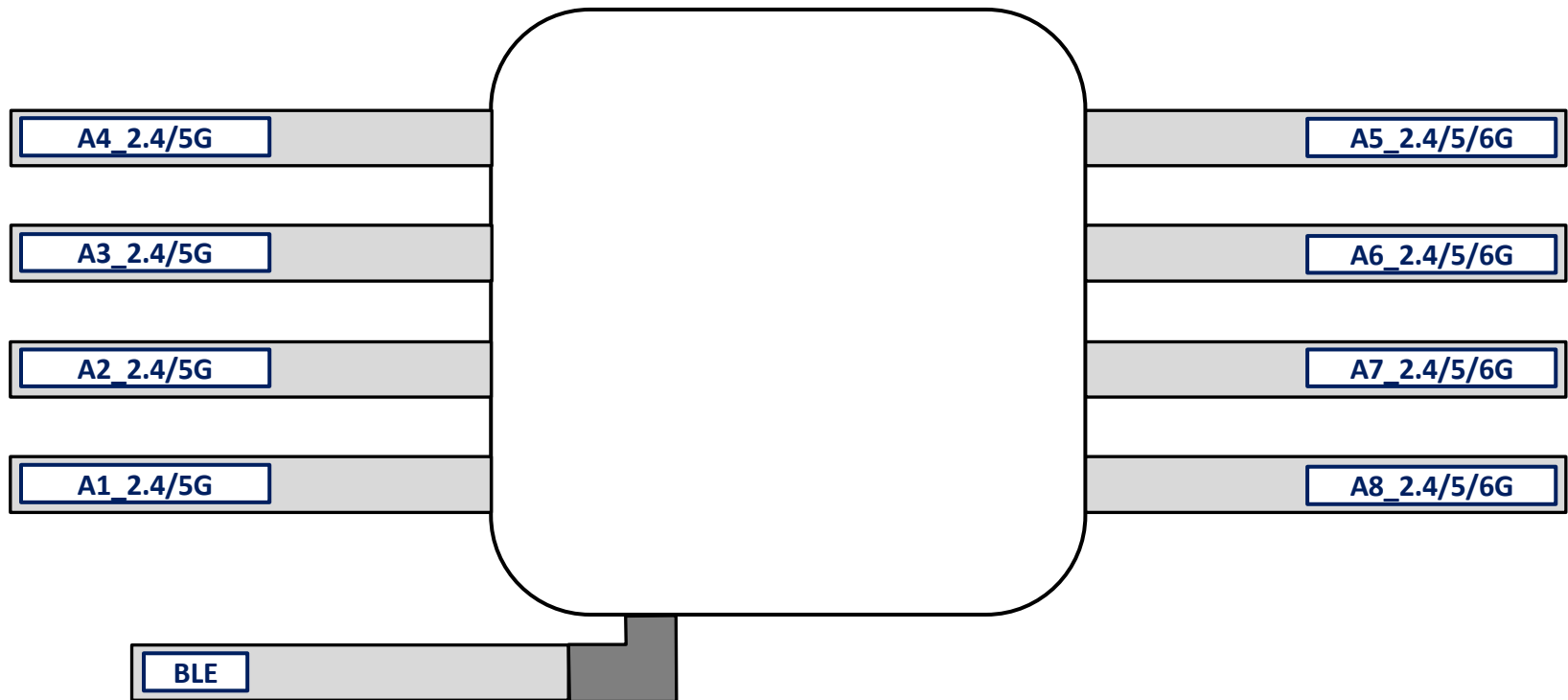
# FAP-432G

## Antenna Test Report

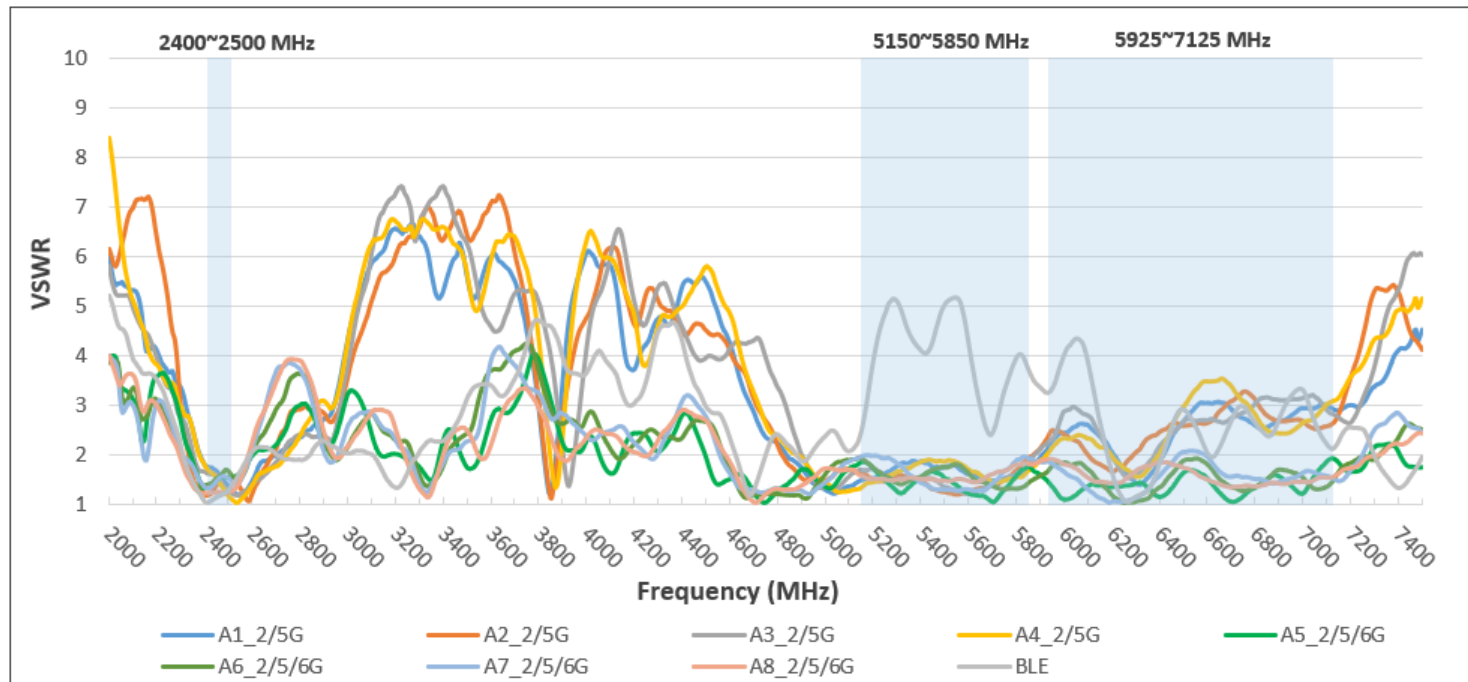
Senao Networks, Inc.

|                     |                                                  |
|---------------------|--------------------------------------------------|
| Customer            | Fortinet                                         |
| Project             | FAP-432G                                         |
| Project Description | Dual antenna*4<br>Tri antenna*4<br>BLE antenna*1 |
| Date                | 2023/11/15                                       |
| Prepared by         | Tony                                             |
| Report Version      | A02                                              |

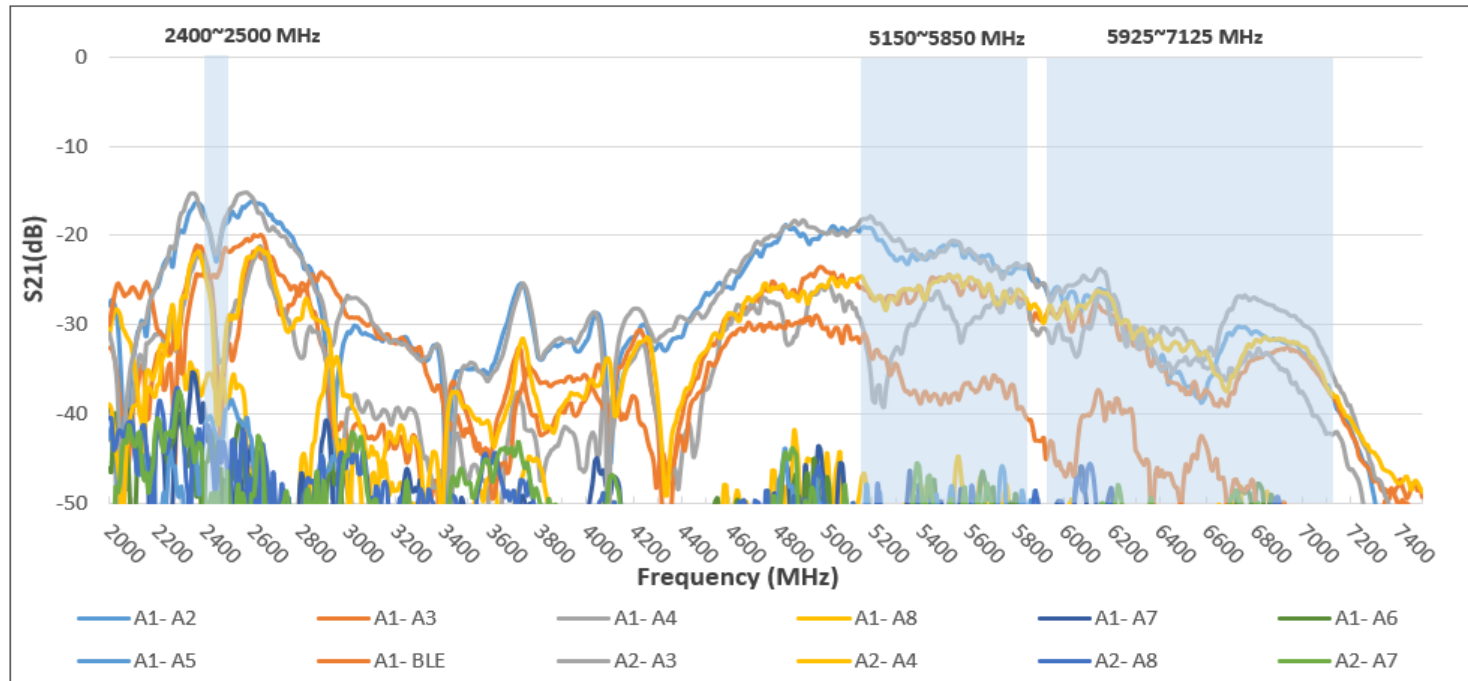
- **Agenda**
  - Placement and Specification
  - S11 & Isolation
  - Radiation Pattern
  - Combine Pattern
  - Efficiency and Gain



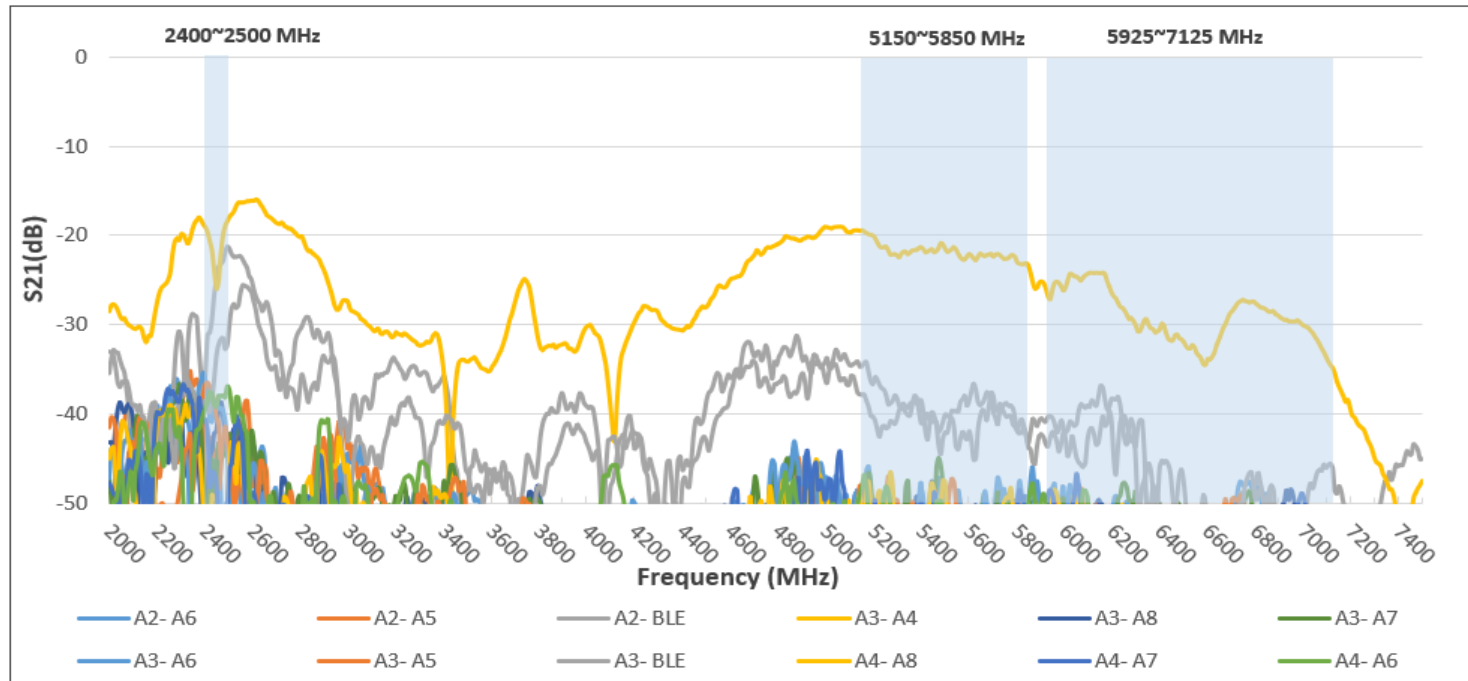
| Ant No. | Brand | Description  | Antenna P/N  | Operating Band     | Gain (dBi) | Efficiency (%) | Ant Type | Feeding |
|---------|-------|--------------|--------------|--------------------|------------|----------------|----------|---------|
| A 1~4   | Senao | 5718A0729300 | 7102A0827000 | 2400MHz ~ 2500 MHz | 5.03@2G    | 69.51@2G       | Dipole   | Cable   |
|         |       |              |              | 5150MHz ~ 5850 MHz | 6.40@5G    | 72.77@5G       |          |         |
| A 5~8   | Senao | 5718A0727300 | 7102A0826000 | 2400MHz ~ 2500 MHz | 4.86@2G    | 69.95@2G       | Dipole   | Cable   |
|         |       |              |              | 5150MHz ~ 5850 MHz | 5.75@5G    | 69.43@5G       |          |         |
|         |       |              |              | 5925MHz ~ 7125 MHz | 5.95@6G    | 64.29@6G       |          |         |
| BLE     | Senao | 5718A0748300 | 7102A1221000 | 2400MHz ~ 2500 MHz | 4.71       | 69.34          | Dipole   | Cable   |



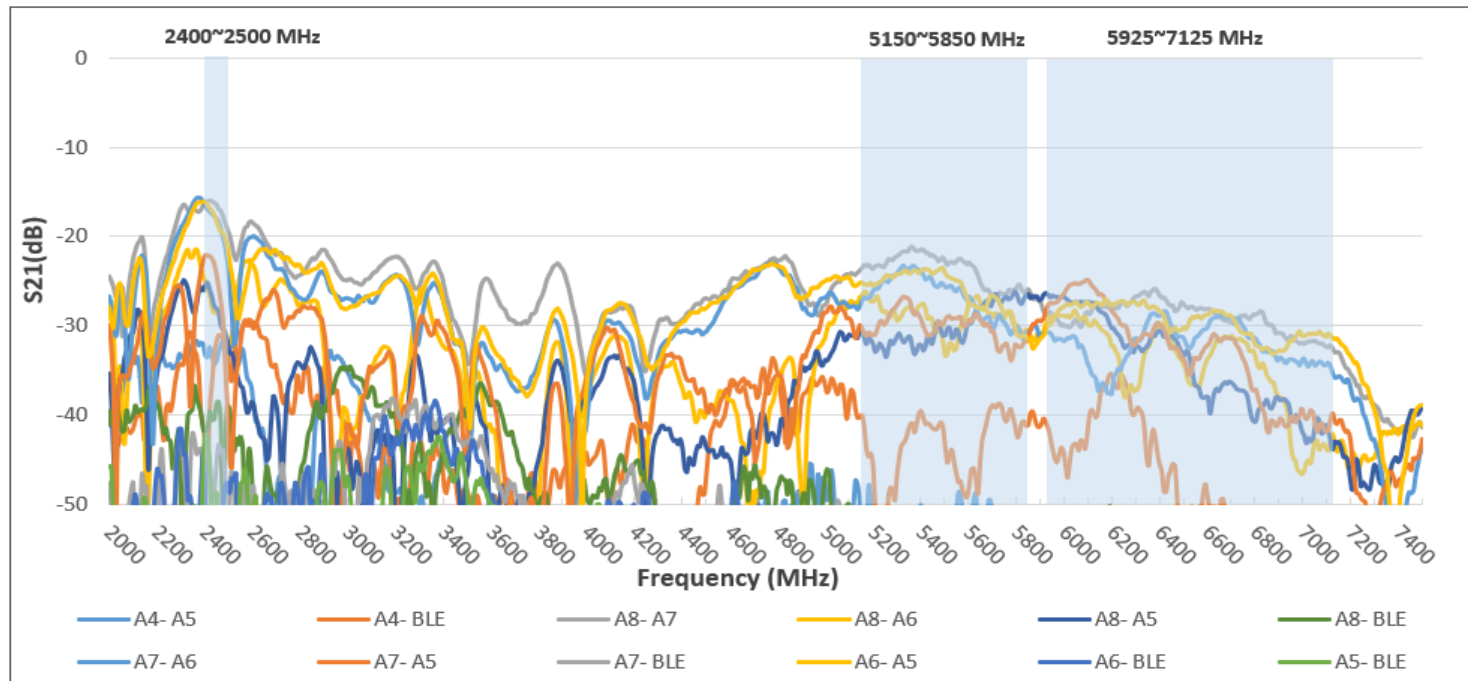
| VSWR        |         |         |         |         |           |           |           |           |      |
|-------------|---------|---------|---------|---------|-----------|-----------|-----------|-----------|------|
| Freq. (MHz) | A1_2/5G | A2_2/5G | A3_2/5G | A4_2/5G | A5_2/5/6G | A6_2/5/6G | A7_2/5/6G | A8_2/5/6G | BLE  |
| 2400        | 1.76    | 1.16    | 1.63    | 1.76    | 1.32      | 1.37      | 1.31      | 1.22      | 1.03 |
| 2450        | 1.66    | 1.36    | 1.59    | 1.53    | 1.46      | 1.51      | 1.44      | 1.24      | 1.13 |
| 2500        | 1.38    | 1.52    | 1.27    | 1.20    | 1.54      | 1.68      | 1.52      | 1.23      | 1.26 |
| 5150        | 1.47    | 1.61    | 1.67    | 1.35    | 1.85      | 1.91      | 1.96      | 1.57      | 2.52 |
| 5500        | 1.76    | 1.18    | 1.26    | 1.86    | 1.38      | 1.80      | 1.26      | 1.50      | 5.17 |
| 5850        | 1.73    | 1.91    | 1.79    | 1.68    | 1.75      | 1.42      | 1.91      | 1.81      | 3.72 |
| 5925        | 2.11    | 2.34    | 2.25    | 2.03    | 1.45      | 1.66      | 1.84      | 1.91      | 3.24 |
| 6500        | 2.66    | 2.56    | 2.66    | 2.97    | 1.63      | 1.87      | 2.04      | 1.73      | 2.91 |
| 7125        | 2.92    | 2.61    | 2.81    | 3.08    | 1.92      | 1.45      | 1.51      | 1.54      | 2.11 |



| Isolation   |        |        |        |        |        |        |        |         |        |        |        |        |
|-------------|--------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|
| Freq. (MHz) | A1- A2 | A1- A3 | A1- A4 | A1- A8 | A1- A7 | A1- A6 | A1- A5 | A1- BLE | A2- A3 | A2- A4 | A2- A8 | A2- A7 |
| 2400        | -18.03 | -22.70 | -23.22 | -36.47 | -41.69 | -45.62 | -41.00 | -24.60  | -18.29 | -24.64 | -41.39 | -52.57 |
| 2450        | -22.89 | -32.38 | -31.99 | -37.78 | -55.55 | -45.22 | -42.45 | -24.75  | -22.10 | -40.45 | -48.69 | -48.83 |
| 2500        | -18.52 | -32.38 | -32.16 | -38.95 | -50.07 | -47.83 | -39.45 | -21.77  | -17.67 | -29.63 | -46.78 | -46.42 |
| 5150        | -19.08 | -25.76 | -30.10 | -47.19 | -55.56 | -67.38 | -61.74 | -31.59  | -18.21 | -24.59 | -63.45 | -54.34 |
| 5550        | -21.01 | -25.38 | -29.75 | -45.86 | -55.06 | -52.38 | -53.42 | -37.71  | -20.66 | -24.53 | -61.27 | -56.10 |
| 5850        | -23.87 | -28.12 | -27.96 | -57.07 | -59.09 | -55.25 | -52.27 | -40.67  | -23.25 | -27.78 | -54.59 | -55.78 |
| 5925        | -25.94 | -29.01 | -30.55 | -55.17 | -70.08 | -57.21 | -51.07 | -45.03  | -25.65 | -29.25 | -65.16 | -57.51 |
| 6500        | -36.39 | -37.03 | -34.02 | -56.07 | -61.60 | -59.64 | -59.85 | -47.41  | -31.14 | -32.97 | -58.59 | -55.10 |
| 7125        | -37.86 | -38.02 | -42.37 | -60.15 | -67.09 | -62.37 | -67.58 | -53.97  | -35.62 | -37.74 | -60.25 | -60.20 |

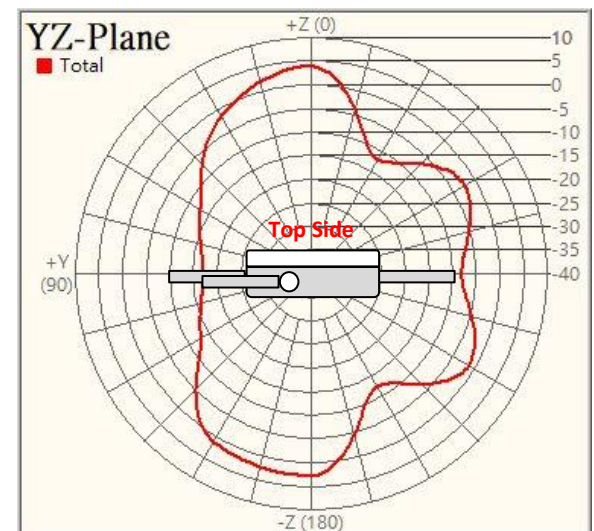
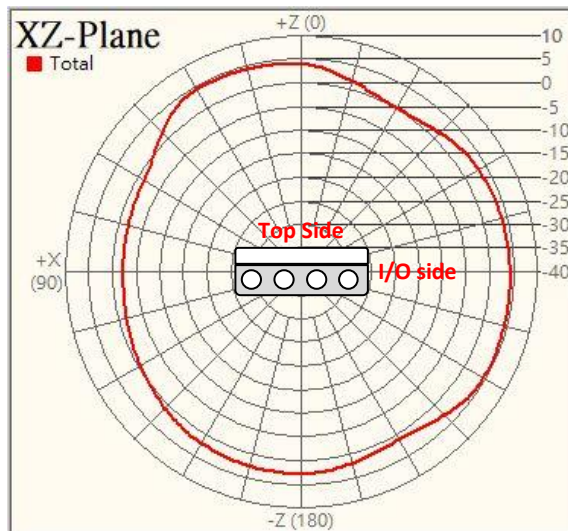
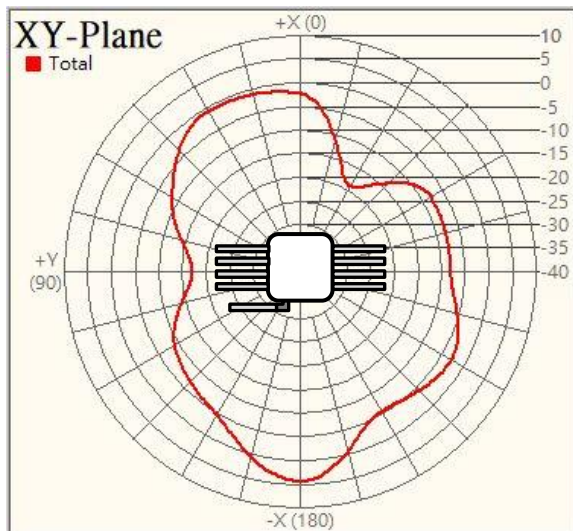
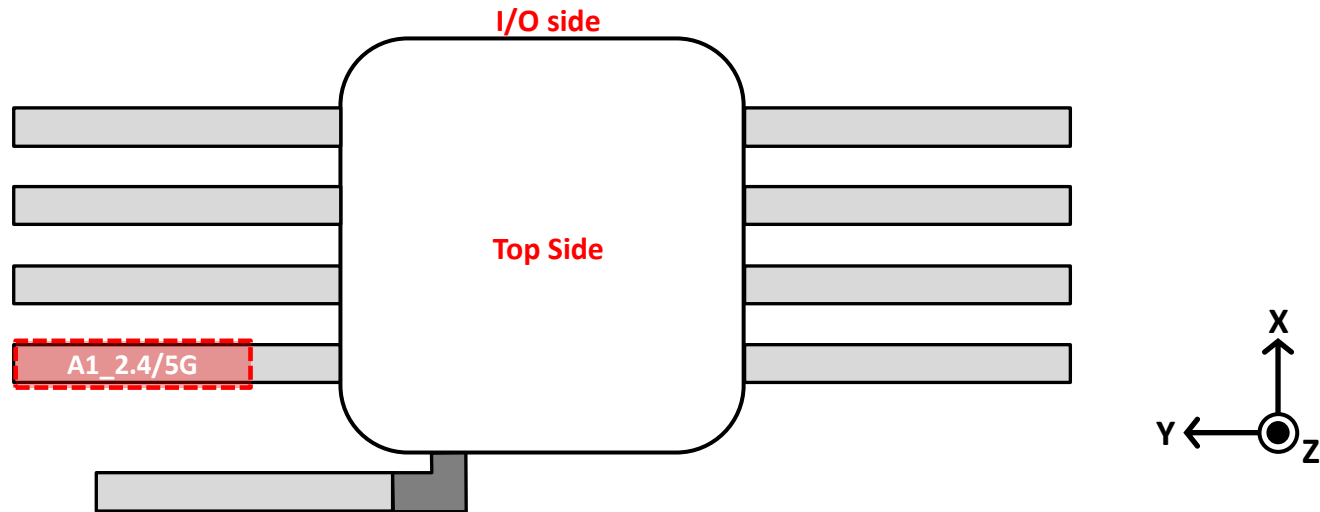


| Isolation   |        |        |         |        |        |        |        |        |         |        |        |        |
|-------------|--------|--------|---------|--------|--------|--------|--------|--------|---------|--------|--------|--------|
| Freq. (MHz) | A2- A6 | A2- A5 | A2- BLE | A3- A4 | A3- A8 | A3- A7 | A3- A6 | A3- A5 | A3- BLE | A4- A8 | A4- A7 | A4- A6 |
| 2400        | -56.89 | -49.13 | -35.33  | -19.16 | -57.15 | -51.08 | -36.29 | -36.70 | -39.17  | -52.61 | -40.64 | -39.21 |
| 2450        | -50.77 | -44.13 | -25.00  | -26.05 | -41.89 | -47.18 | -38.84 | -40.34 | -33.52  | -49.75 | -47.81 | -39.13 |
| 2500        | -49.85 | -43.77 | -21.33  | -18.47 | -43.83 | -43.76 | -43.87 | -43.02 | -32.18  | -50.50 | -50.14 | -36.85 |
| 5150        | -60.12 | -57.21 | -34.69  | -19.48 | -55.92 | -57.78 | -60.09 | -48.36 | -37.83  | -51.75 | -52.57 | -48.16 |
| 5550        | -65.33 | -50.14 | -39.69  | -21.67 | -54.03 | -64.76 | -50.35 | -50.24 | -43.70  | -55.15 | -68.53 | -52.46 |
| 5850        | -50.57 | -64.36 | -43.33  | -23.41 | -56.70 | -50.45 | -57.00 | -57.30 | -43.73  | -53.96 | -52.29 | -50.00 |
| 5925        | -51.61 | -52.42 | -40.90  | -25.98 | -66.84 | -52.52 | -55.23 | -61.78 | -43.37  | -54.65 | -51.94 | -50.57 |
| 6500        | -55.22 | -59.02 | -53.77  | -31.99 | -61.46 | -53.59 | -51.36 | -59.29 | -47.66  | -57.28 | -54.66 | -64.49 |
| 7125        | -63.43 | -54.14 | -46.04  | -34.87 | -61.80 | -64.47 | -64.05 | -66.84 | -55.67  | -63.76 | -58.82 | -63.28 |

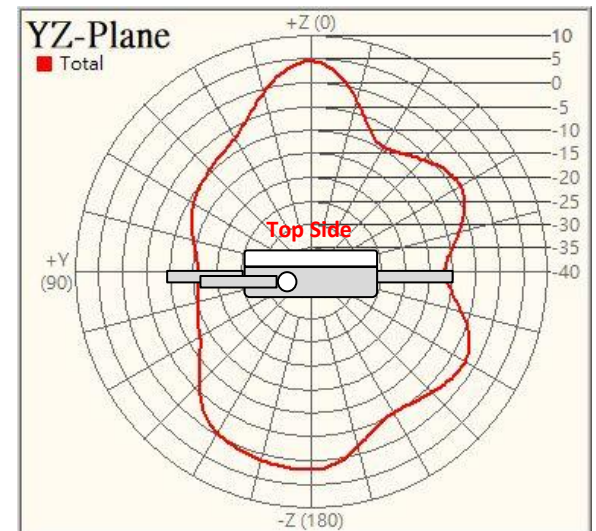
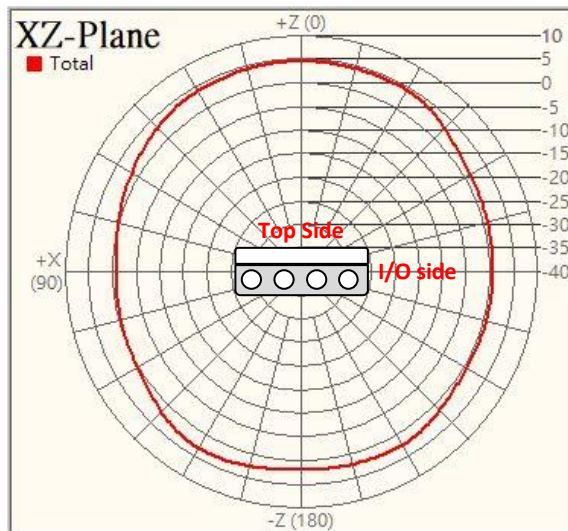
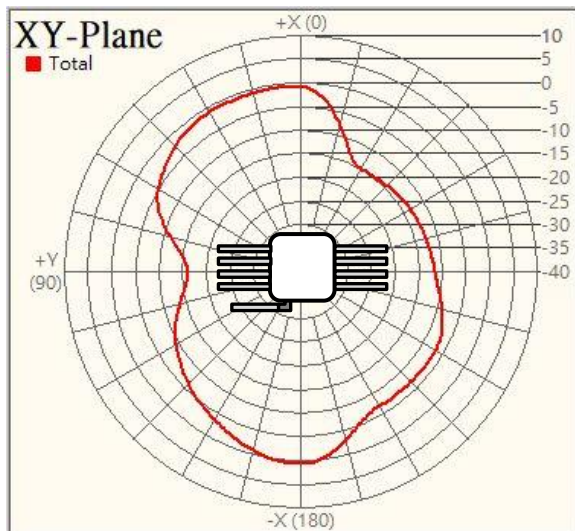
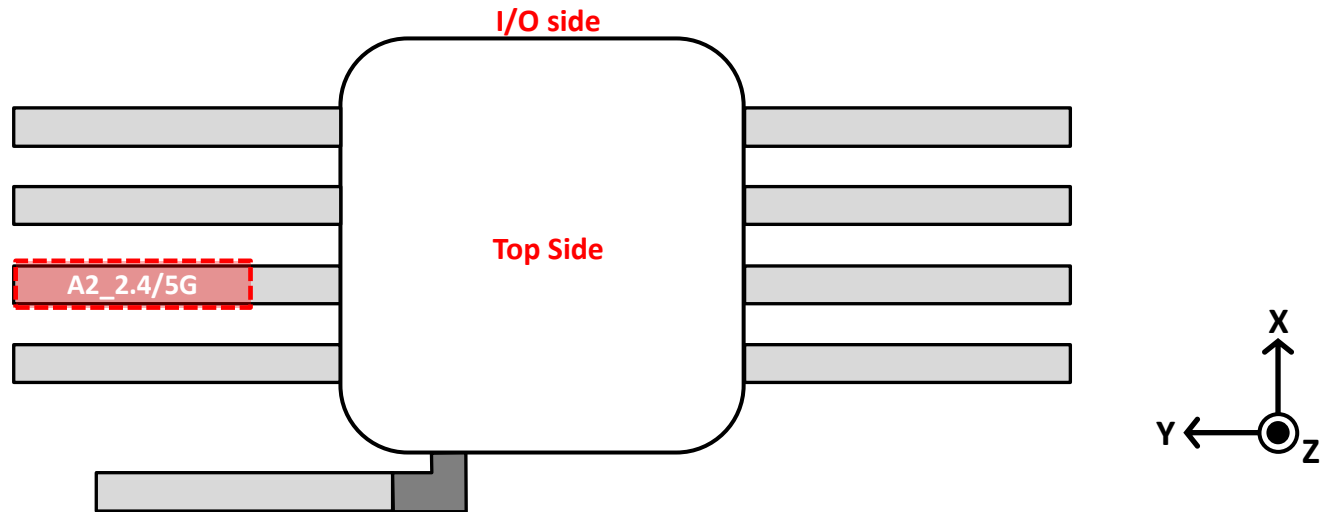


| Isolation   |        |         |        |        |        |         |        |        |         |        |         |         |
|-------------|--------|---------|--------|--------|--------|---------|--------|--------|---------|--------|---------|---------|
| Freq. (MHz) | A4- A5 | A4- BLE | A8- A7 | A8- A6 | A8- A5 | A8- BLE | A7- A6 | A7- A5 | A7- BLE | A6- A5 | A6- BLE | A5- BLE |
| 2400        | -33.30 | -43.55  | -16.11 | -25.06 | -25.54 | -41.88  | -16.61 | -22.05 | -49.64  | -16.14 | -49.64  | -42.29  |
| 2450        | -33.94 | -31.88  | -16.41 | -28.40 | -28.08 | -38.83  | -18.05 | -24.12 | -45.84  | -18.18 | -51.09  | -48.82  |
| 2500        | -32.19 | -32.42  | -19.20 | -32.15 | -31.71 | -38.97  | -22.80 | -39.18 | -53.38  | -21.25 | -47.66  | -57.58  |
| 5150        | -55.65 | -40.11  | -23.57 | -26.67 | -30.47 | -55.53  | -27.29 | -30.22 | -66.43  | -25.13 | -54.77  | -57.67  |
| 5550        | -51.17 | -46.49  | -22.86 | -32.60 | -30.43 | -55.54  | -26.17 | -29.15 | -60.28  | -24.90 | -60.10  | -74.09  |
| 5850        | -52.00 | -41.15  | -25.97 | -30.59 | -26.52 | -58.47  | -30.73 | -31.06 | -72.00  | -31.43 | -58.87  | -61.86  |
| 5925        | -53.78 | -40.92  | -28.75 | -29.90 | -26.35 | -61.75  | -30.65 | -28.33 | -55.74  | -30.56 | -59.92  | -73.10  |
| 6500        | -62.45 | -55.87  | -27.65 | -34.39 | -33.37 | -52.20  | -31.47 | -33.74 | -62.63  | -30.18 | -70.46  | -65.24  |
| 7125        | -59.02 | -56.26  | -32.56 | -42.18 | -43.87 | -51.64  | -35.34 | -39.77 | -61.29  | -31.39 | -69.40  | -66.30  |

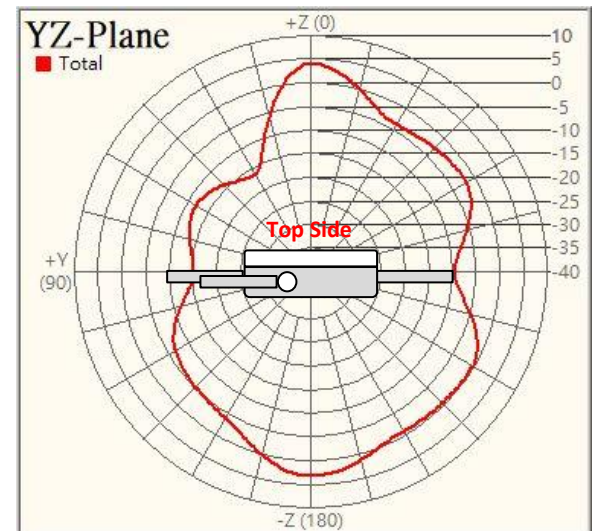
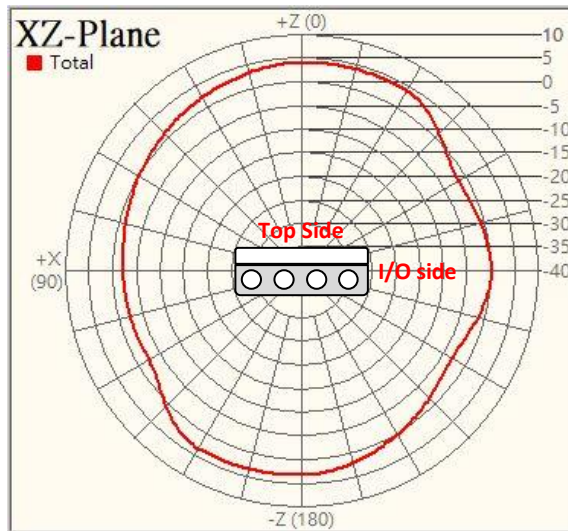
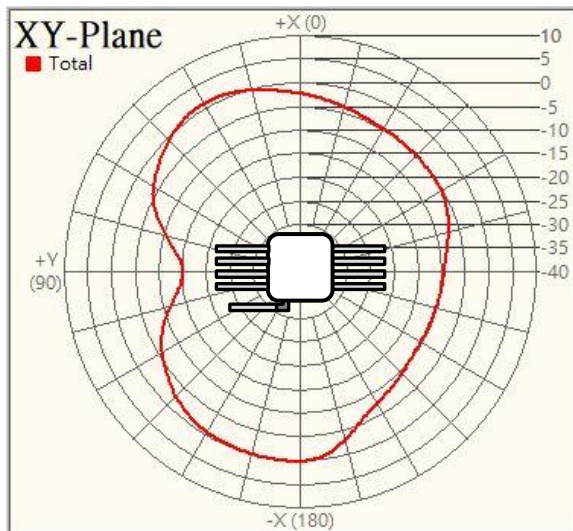
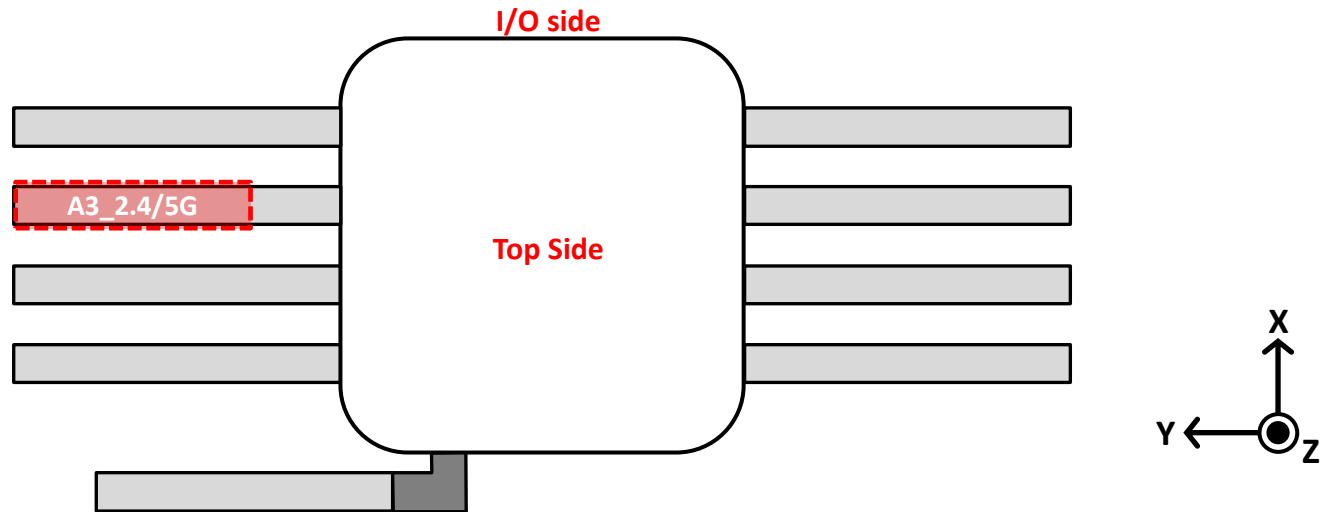
# 2D Radiation Pattern – A1 2.4/5G @ 2.45GHz



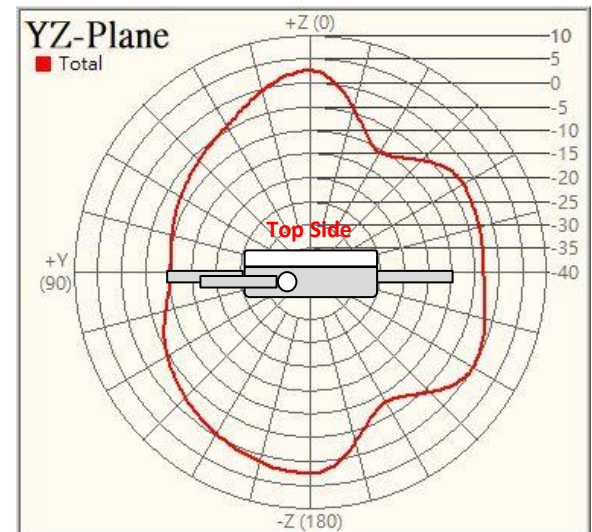
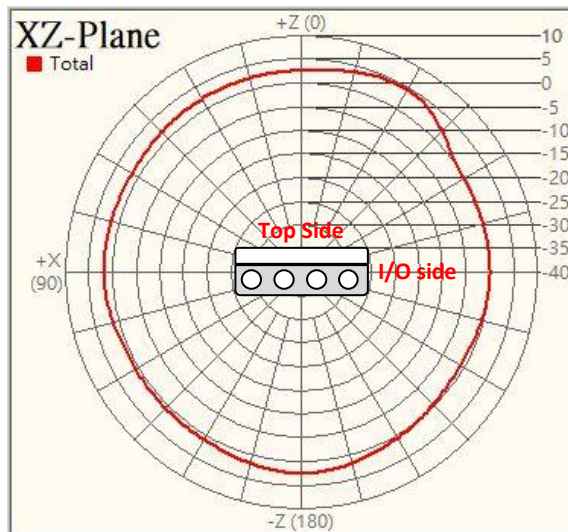
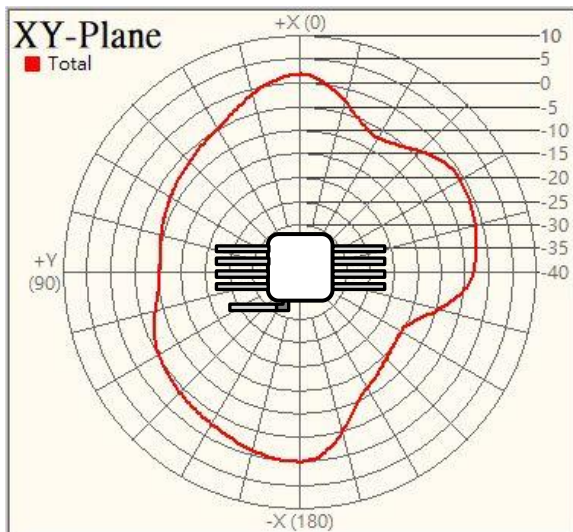
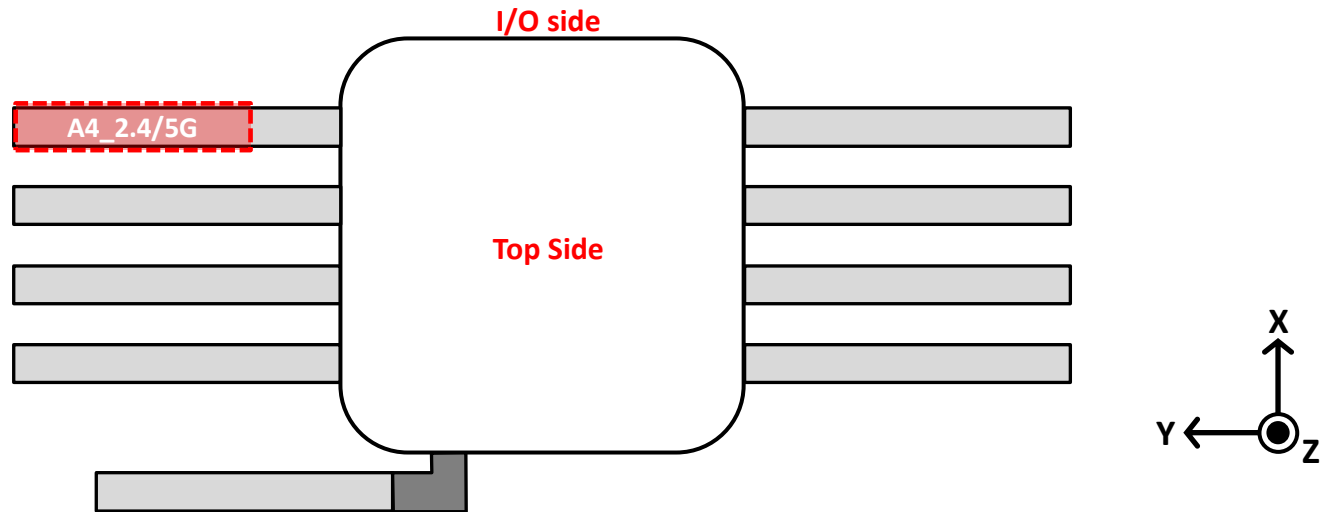
# 2D Radiation Pattern – A2 2.4/5G @ 2.45GHz



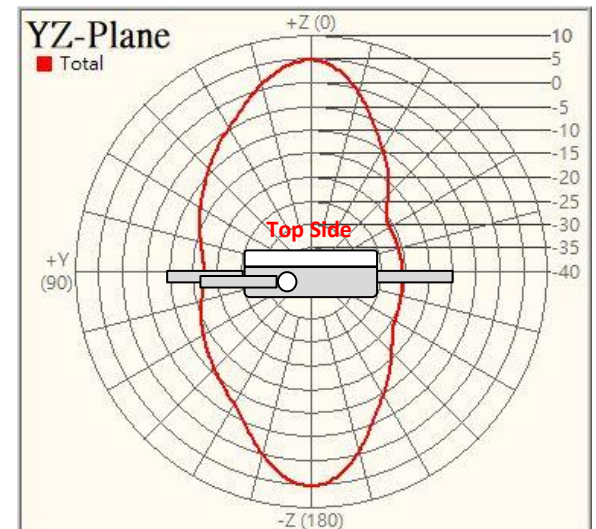
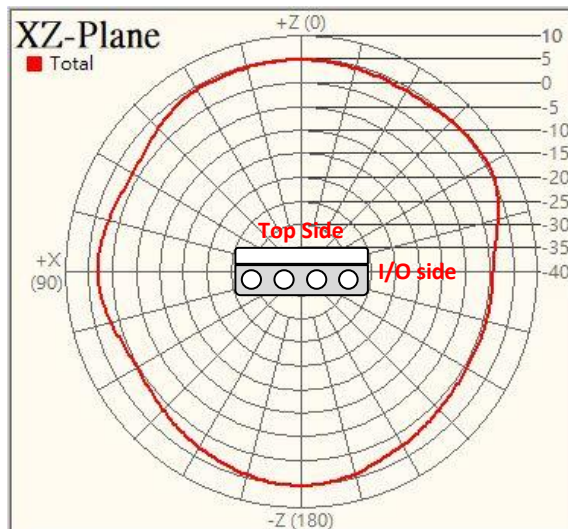
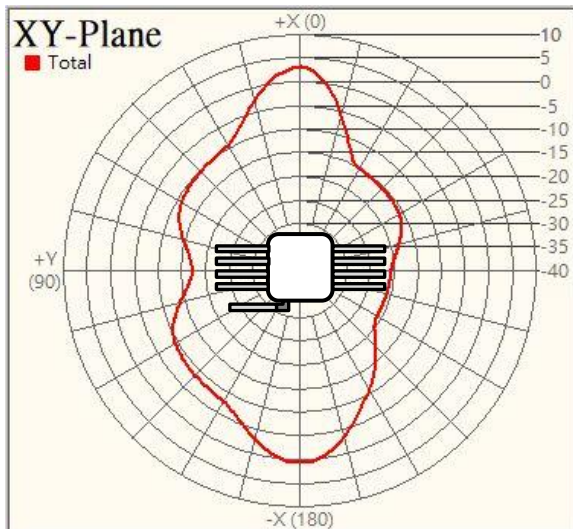
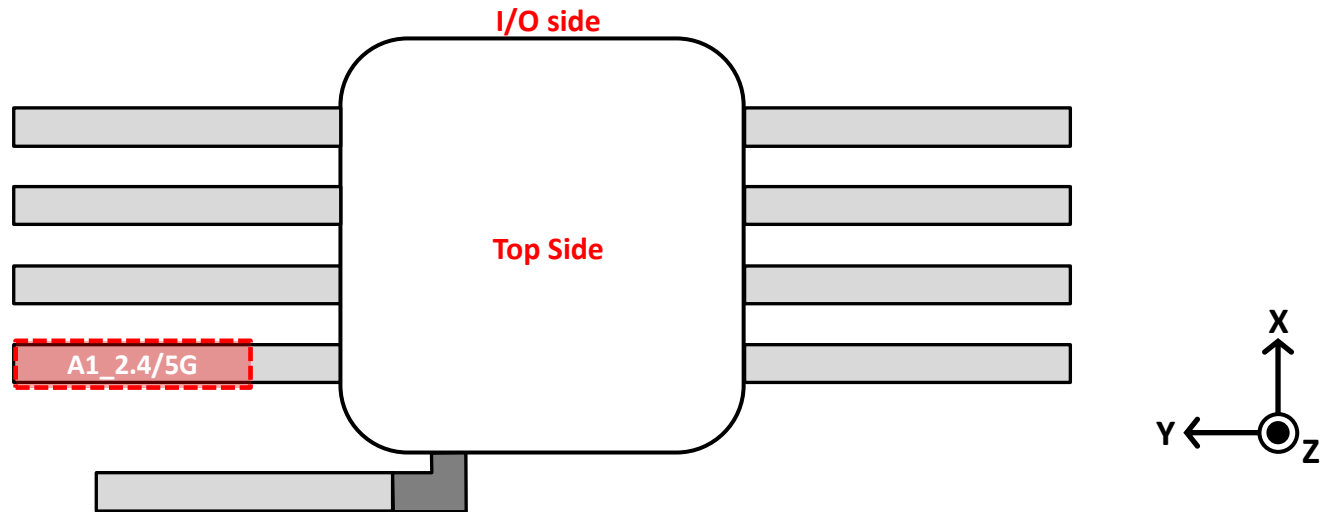
# 2D Radiation Pattern – A3 2.4/5G @ 2.45GHz



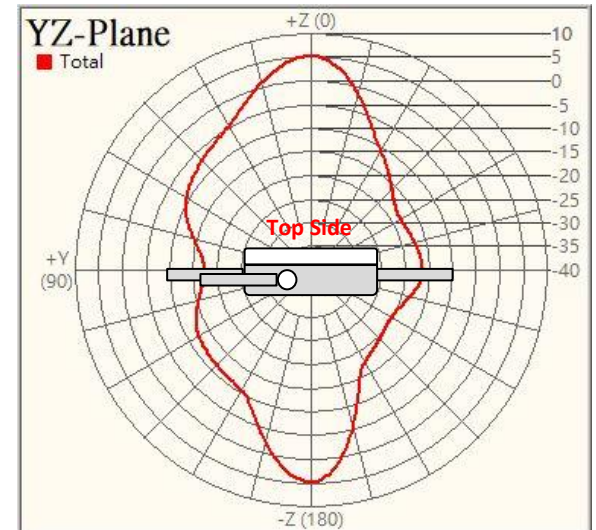
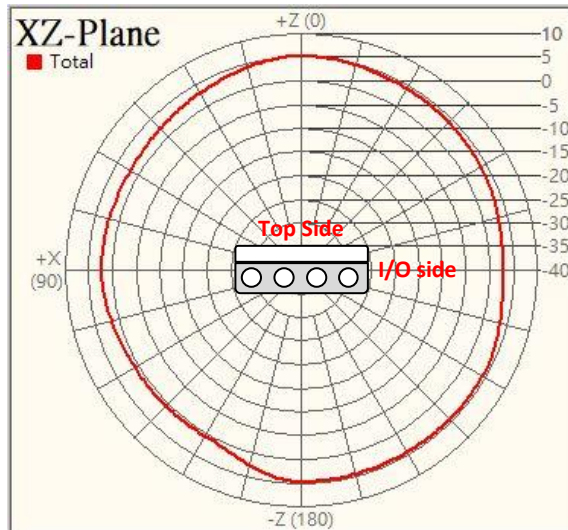
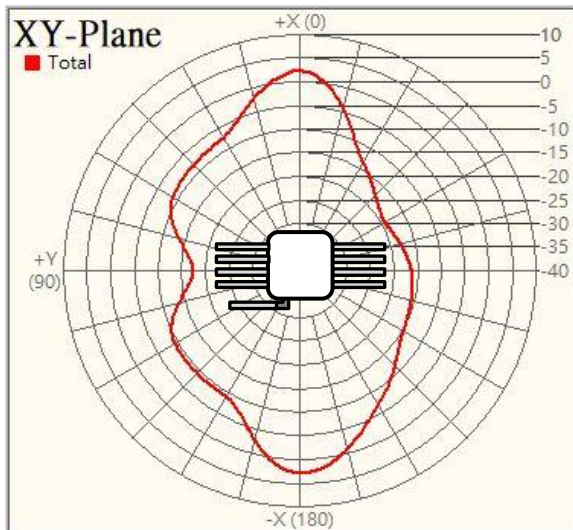
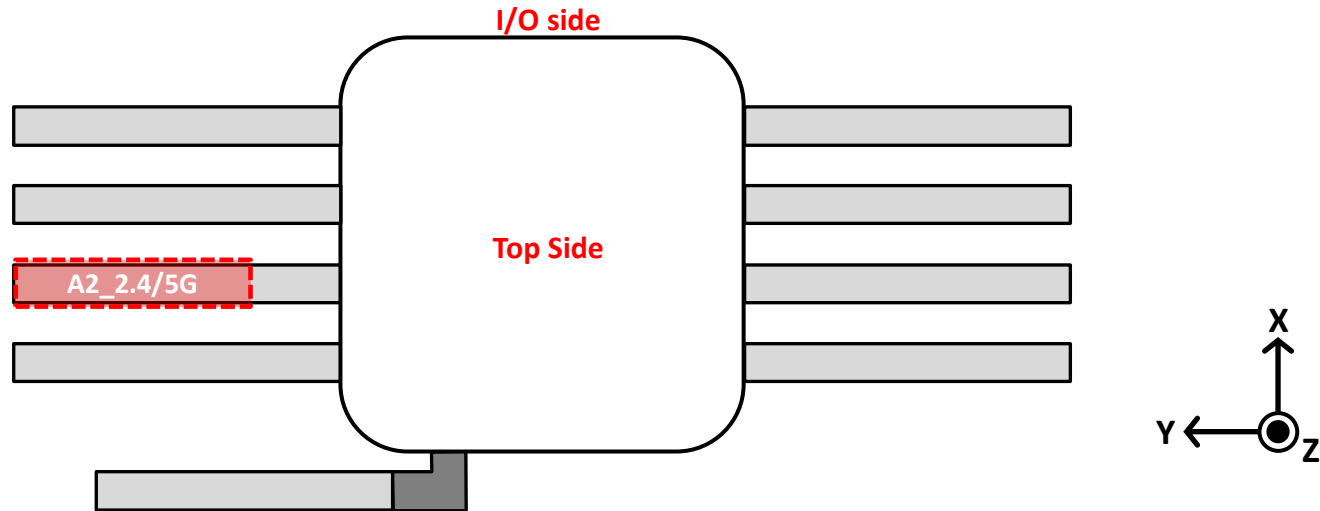
# 2D Radiation Pattern – A4 2.4/5G @ 2.45GHz



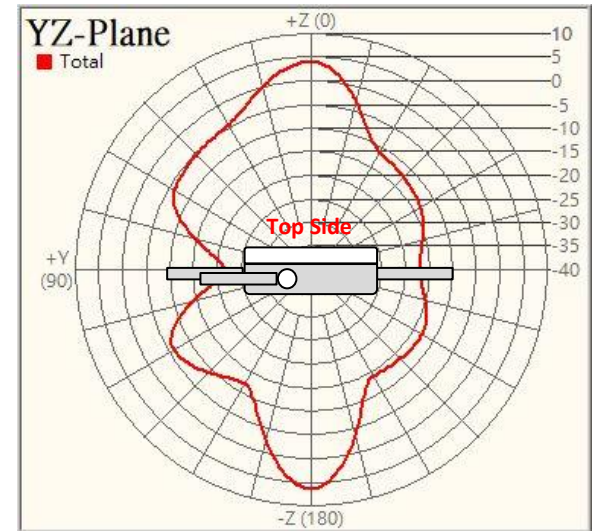
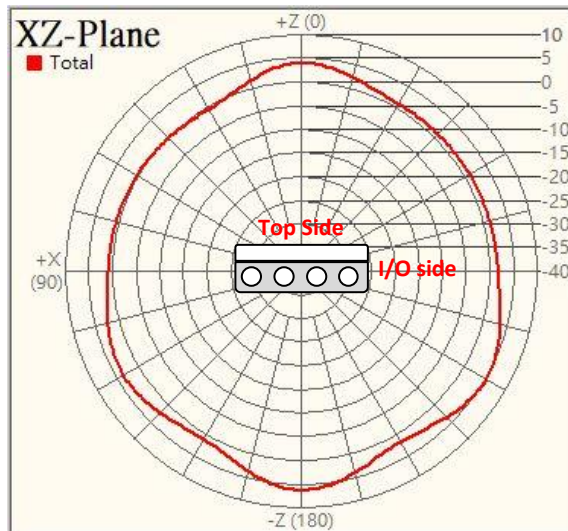
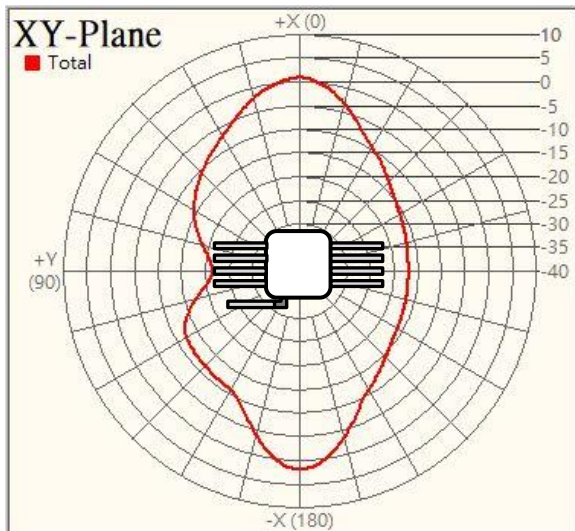
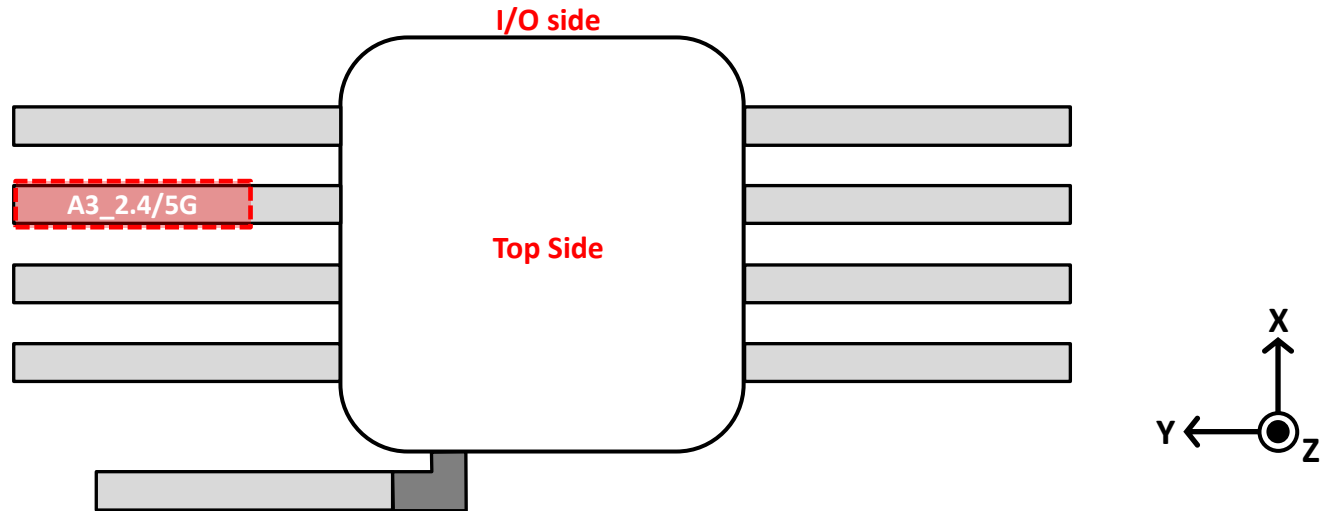
# 2D Radiation Pattern – A1 2.4/5G @ 5.55GHz



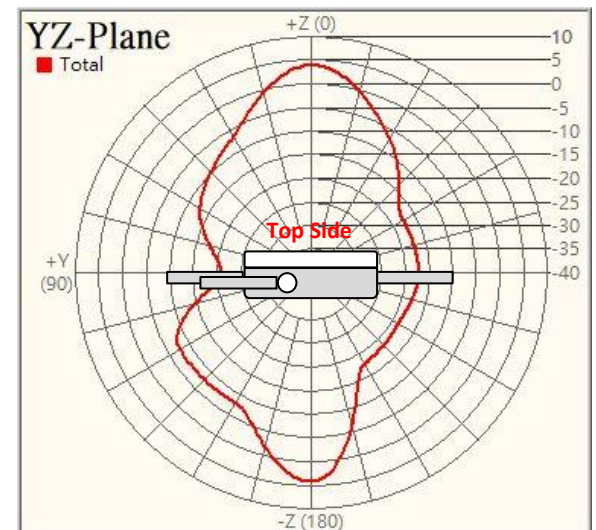
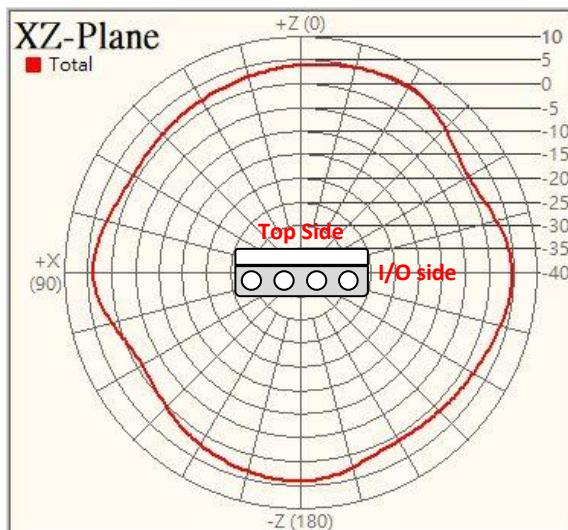
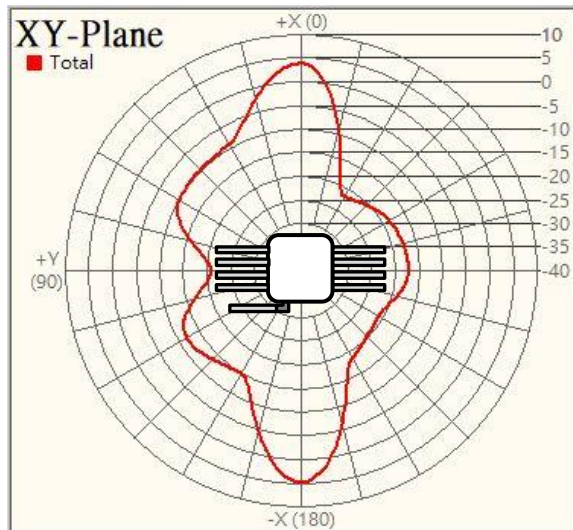
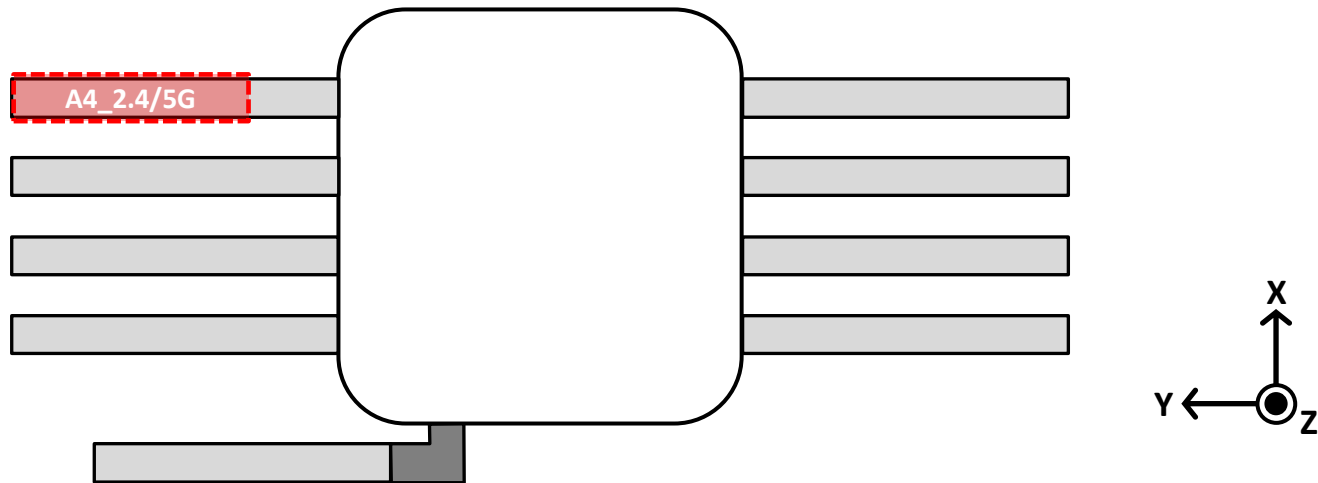
# 2D Radiation Pattern – A2 2.4/5G @ 5.55GHz



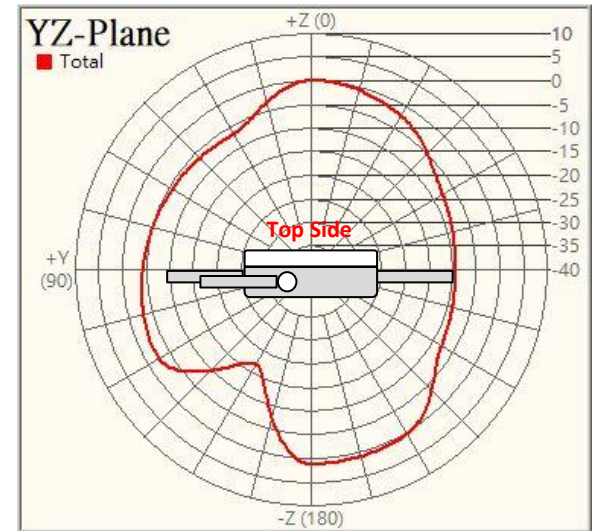
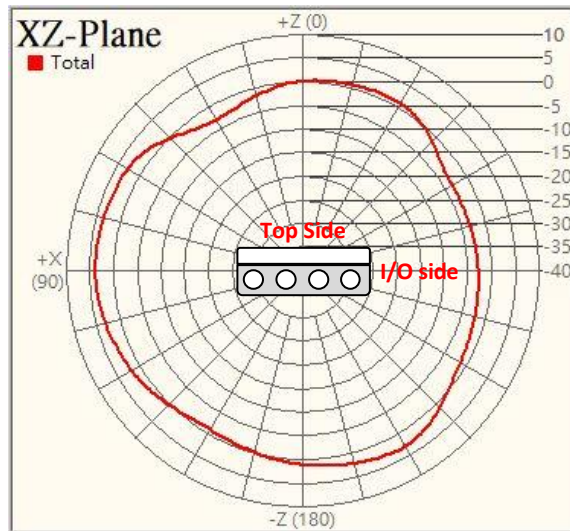
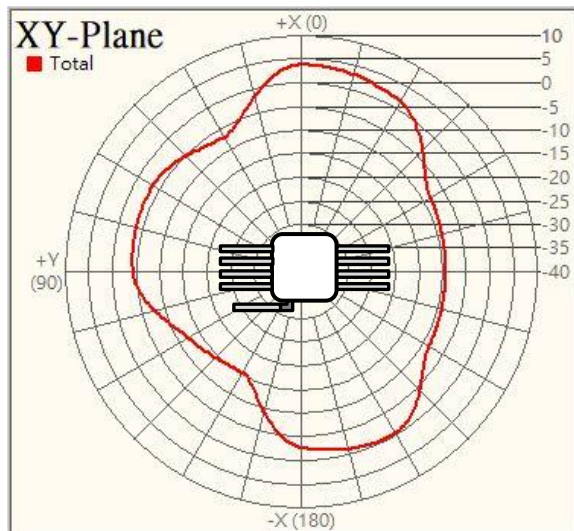
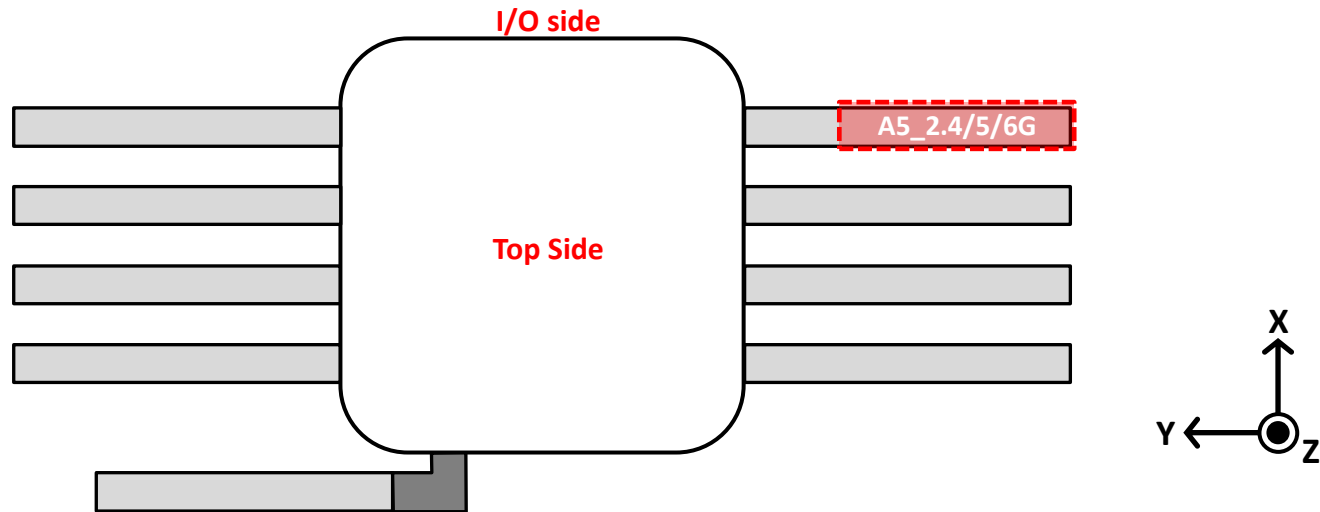
# 2D Radiation Pattern – A3 2.4/5G @ 5.55GHz



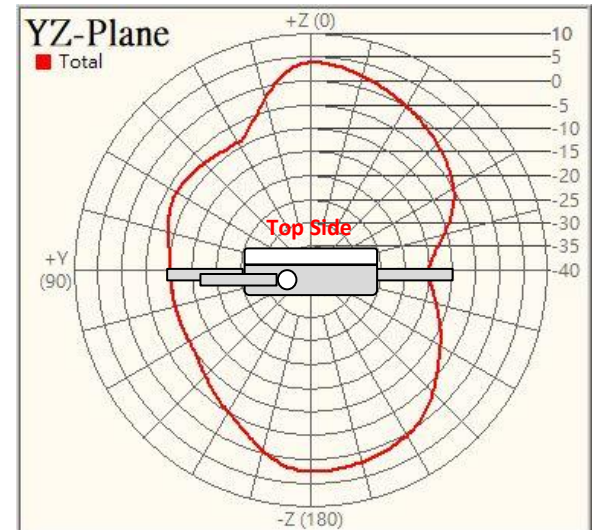
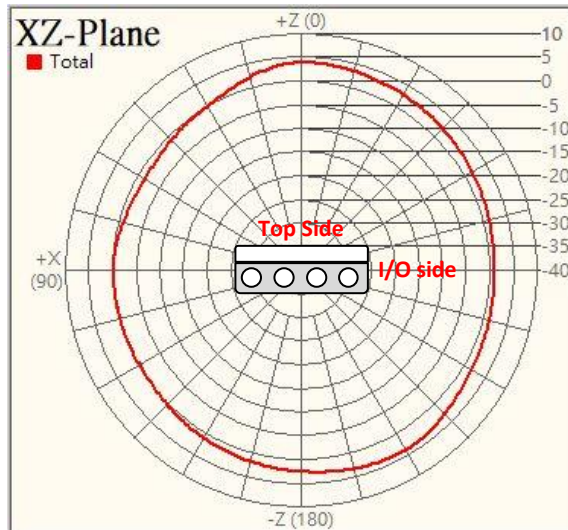
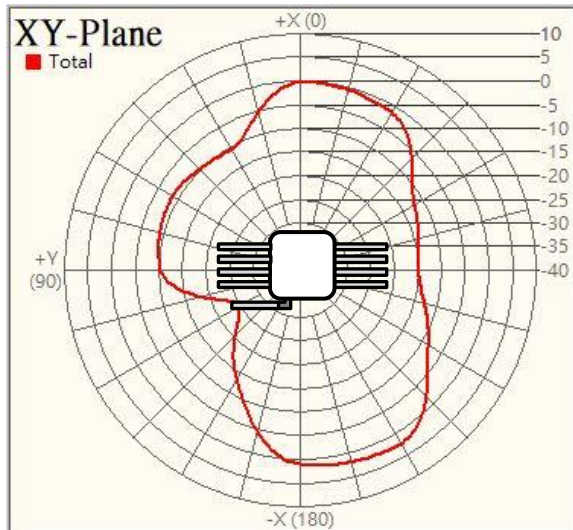
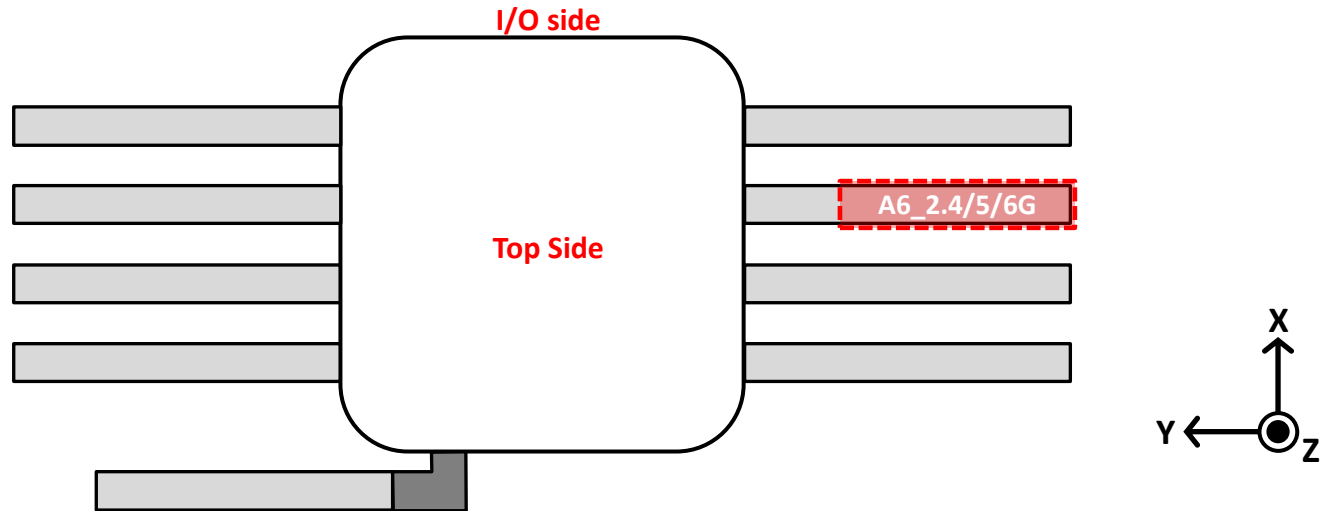
# 2D Radiation Pattern – A4 2.4/5G @ 5.55GHz



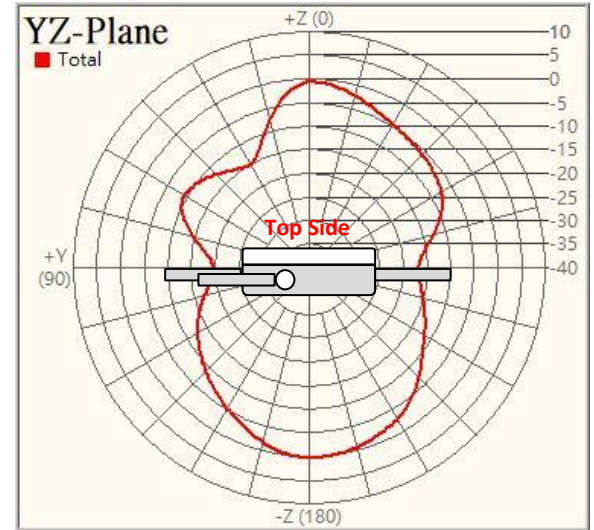
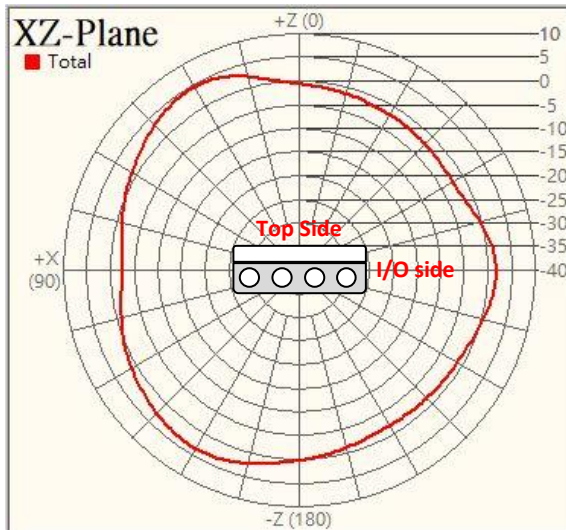
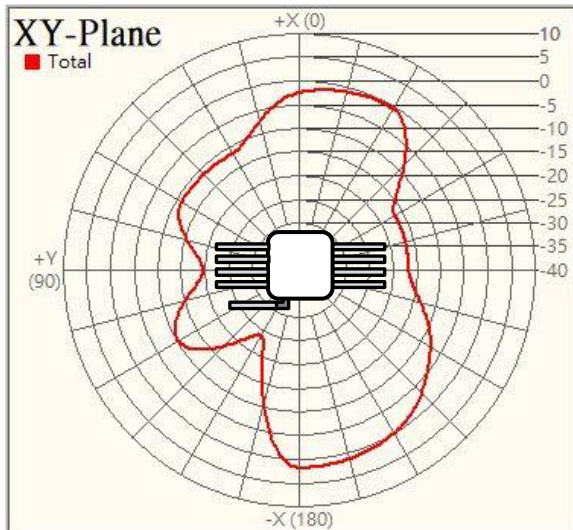
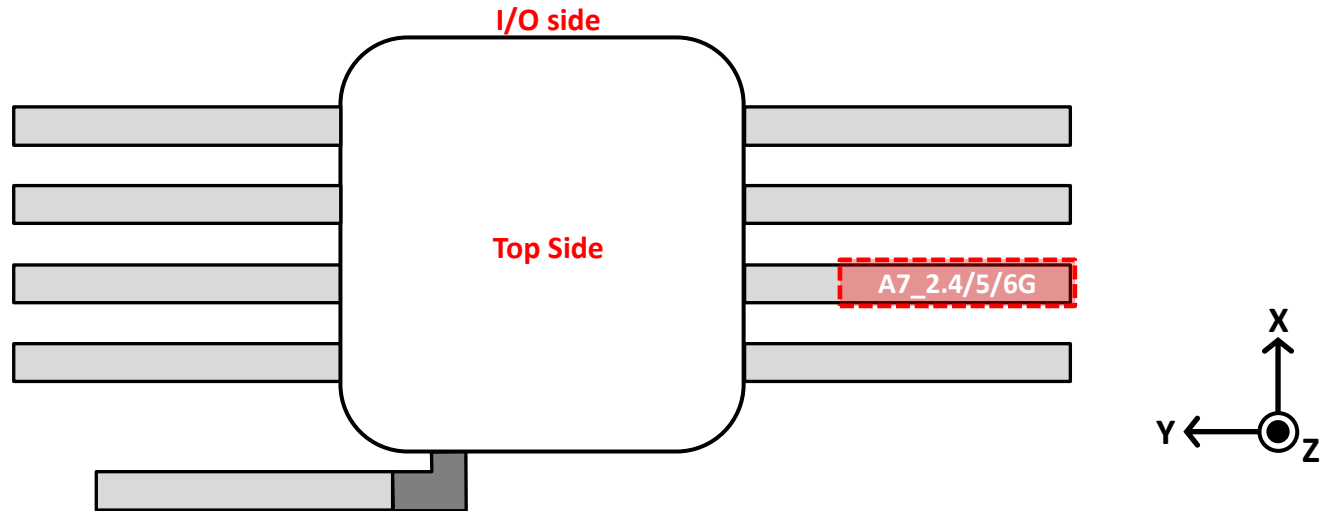
# 2D Radiation Pattern – A5 2.4/5/6G @ 2.45GHz



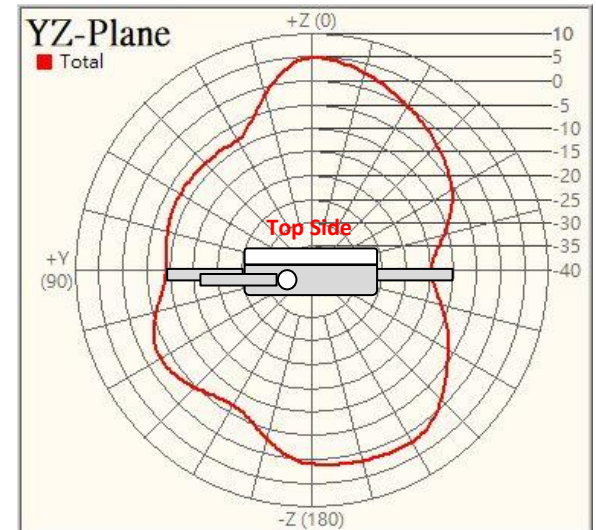
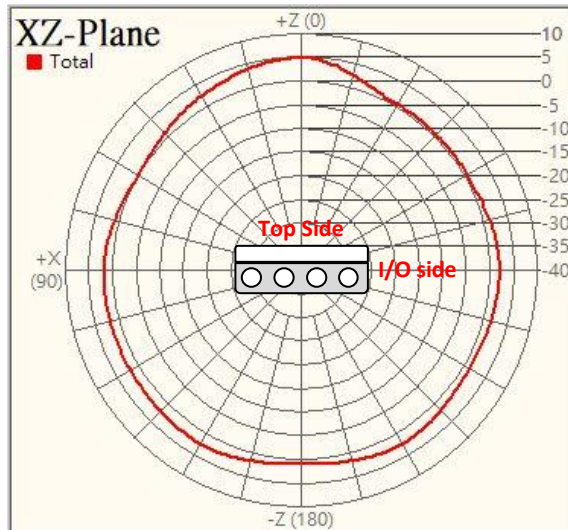
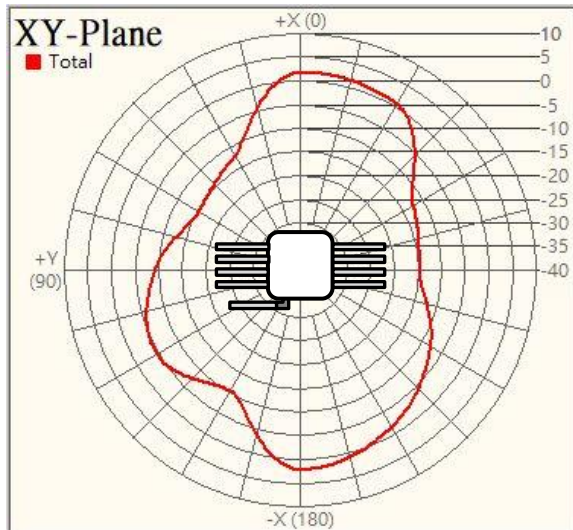
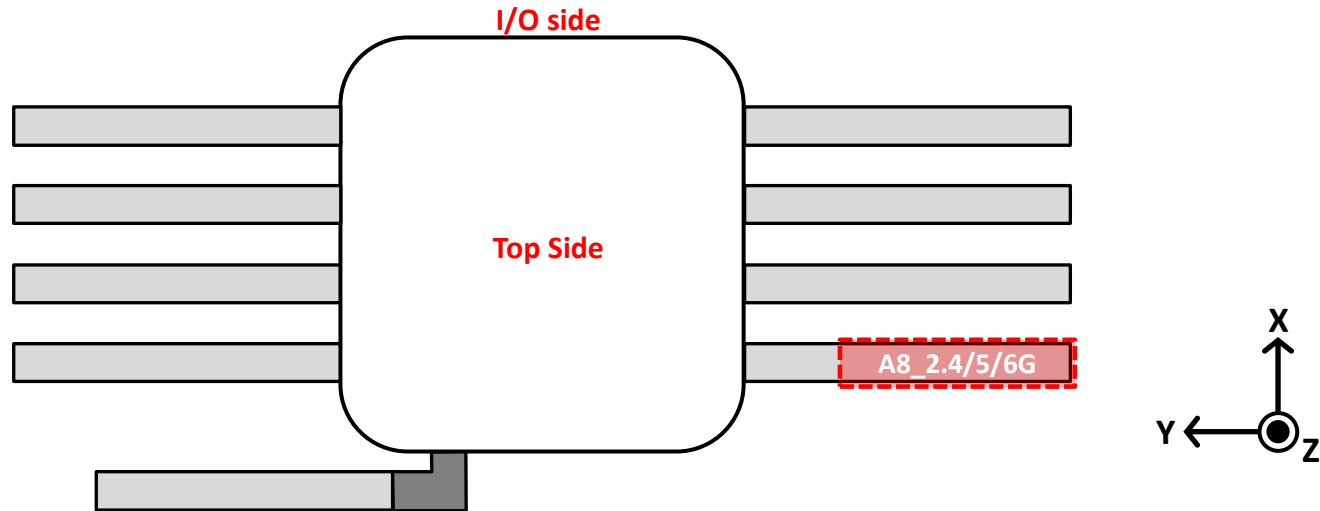
# 2D Radiation Pattern – A6 2.4/5/6G @ 2.45GHz



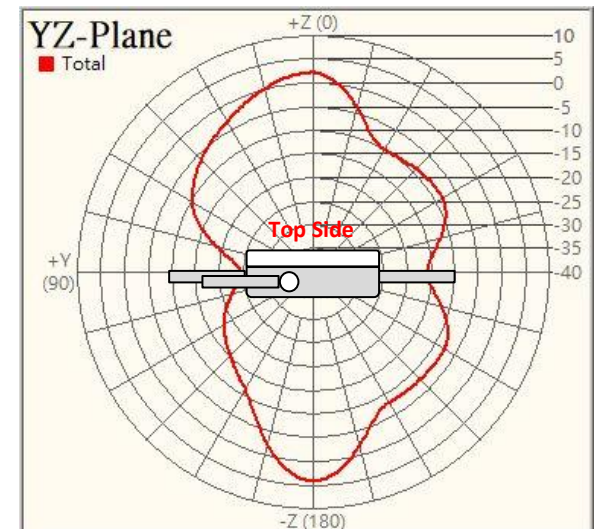
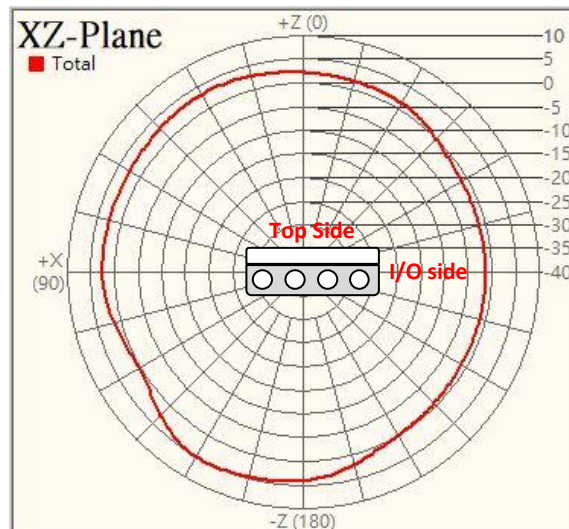
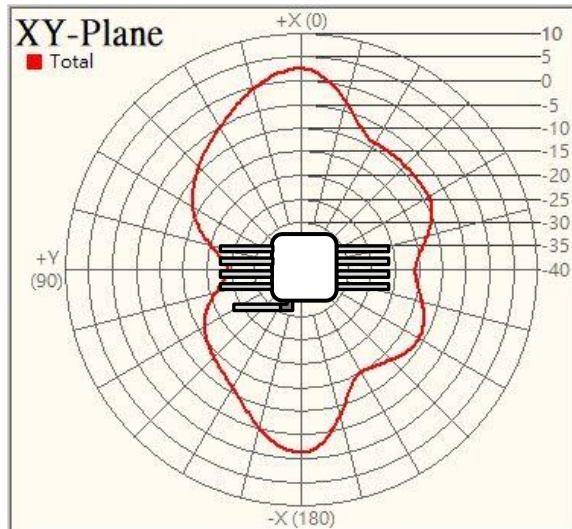
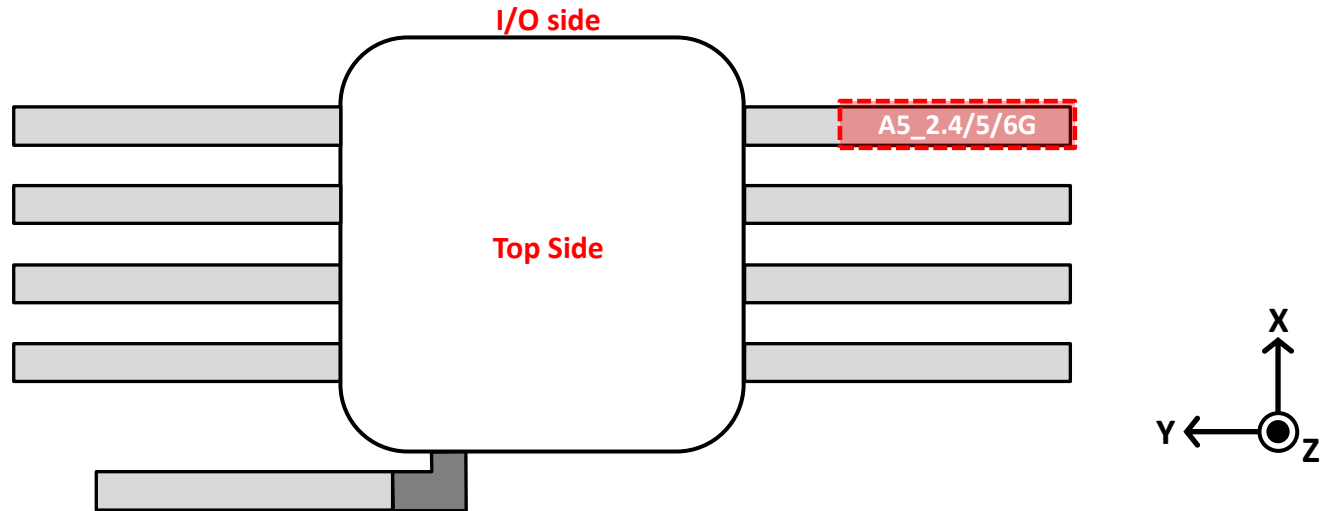
# 2D Radiation Pattern – A7 2.4/5/6G @ 2.45GHz



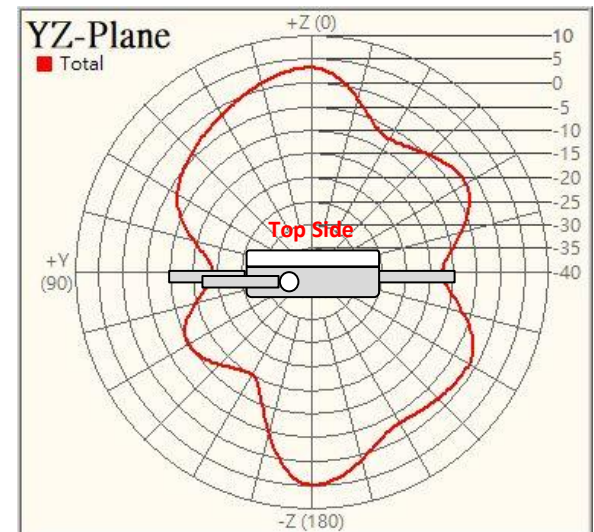
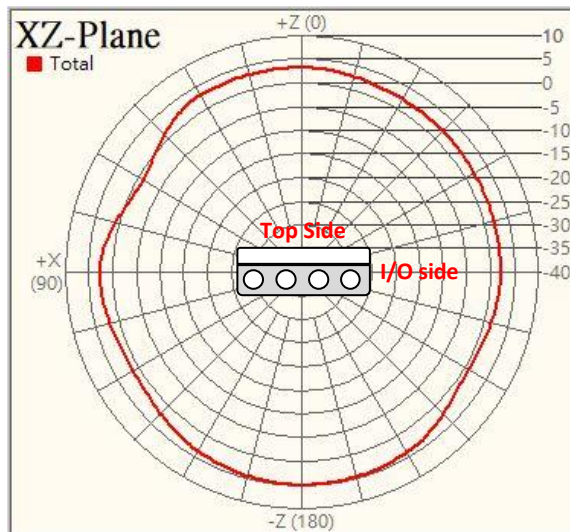
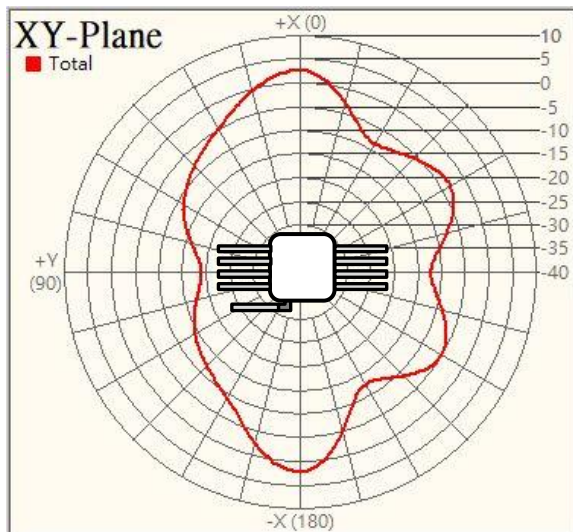
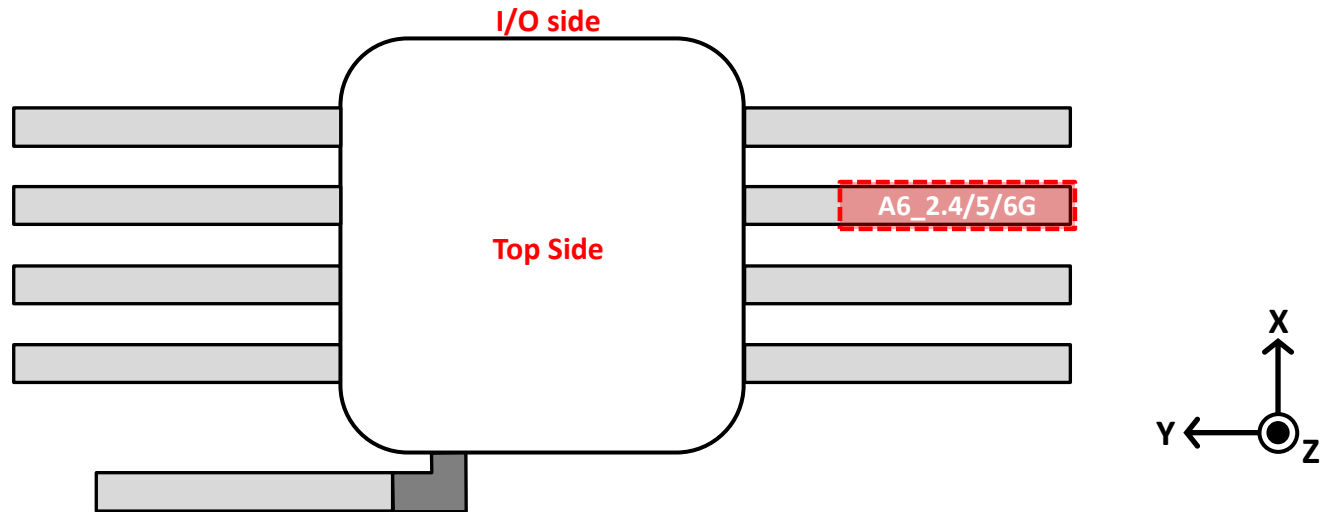
# 2D Radiation Pattern – A8 2.4/5/6G @ 2.45GHz



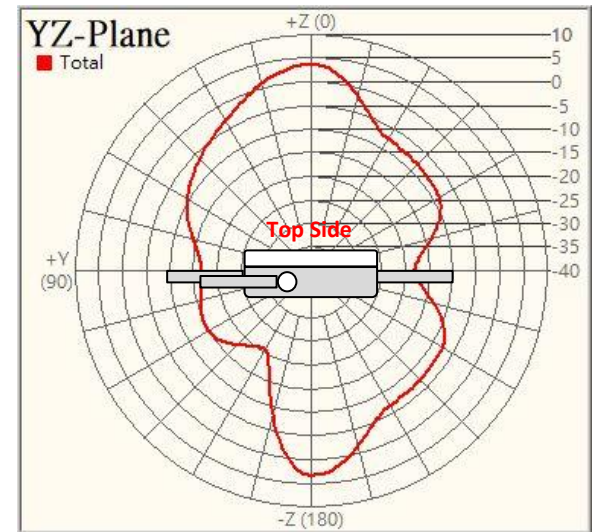
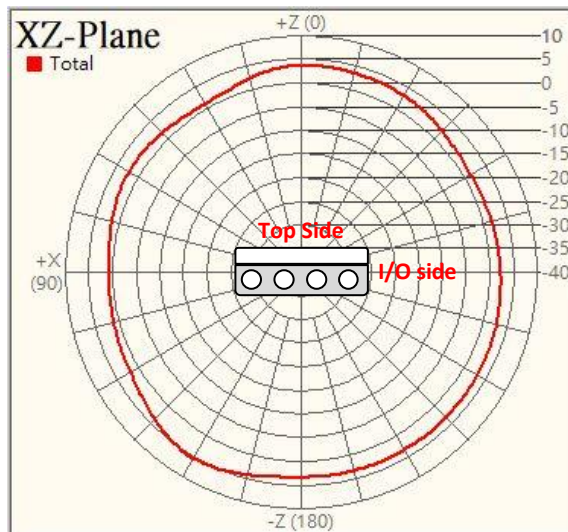
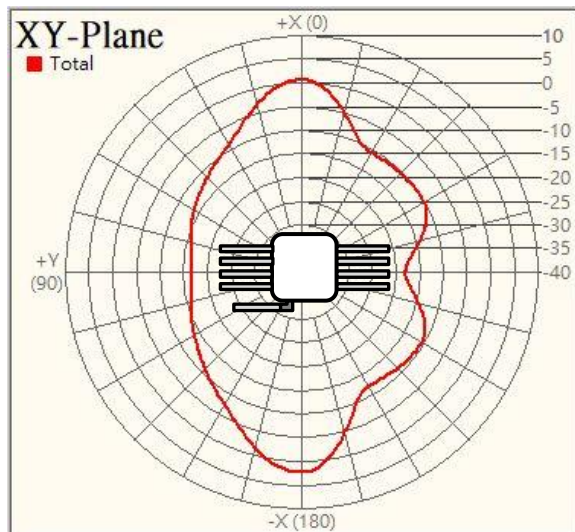
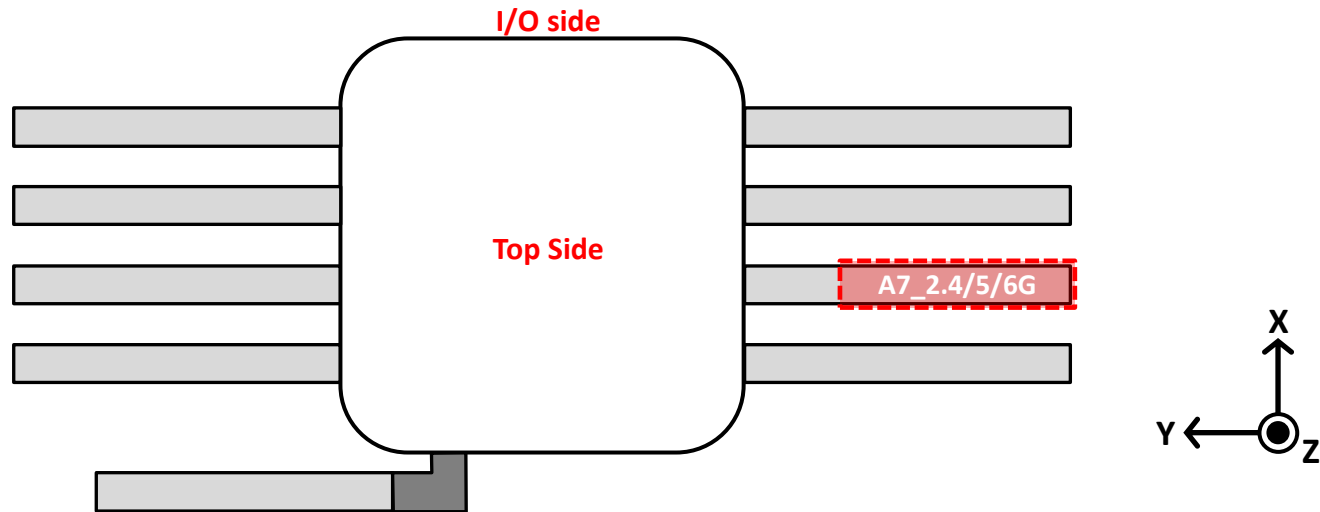
# 2D Radiation Pattern – A5 2.4/5/6G @ 5.55GHz



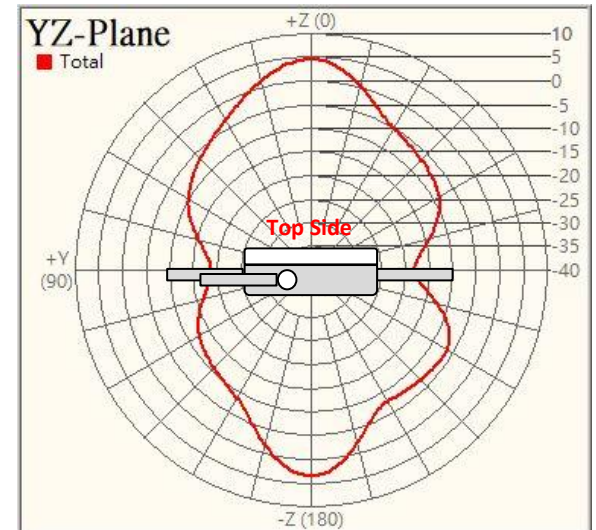
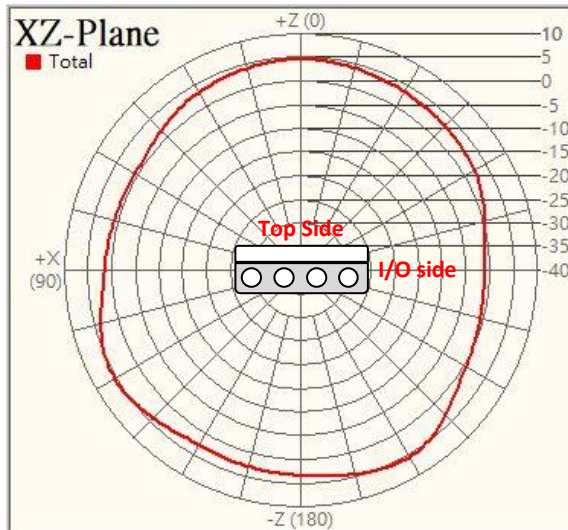
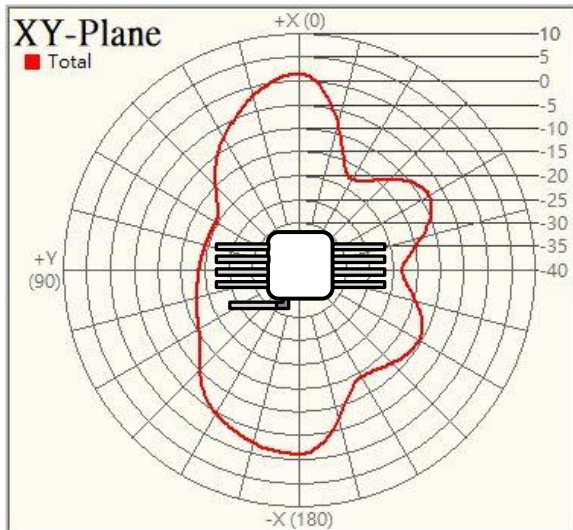
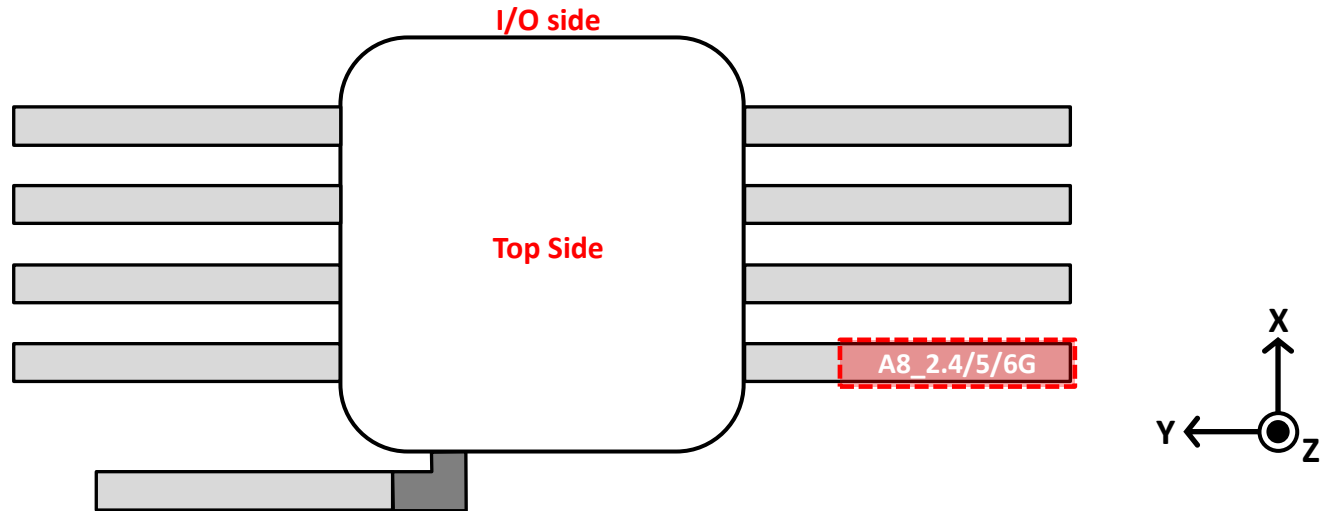
# 2D Radiation Pattern – A6 2.4/5/6G @ 5.55GHz



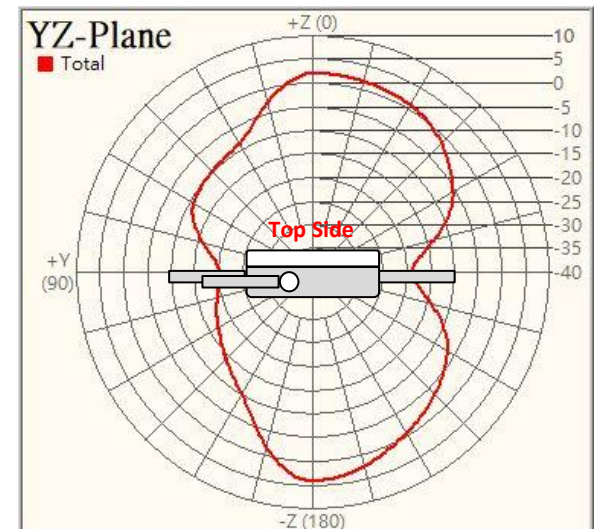
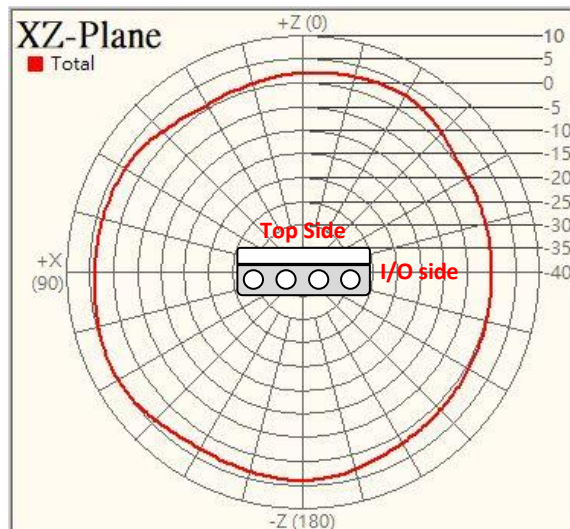
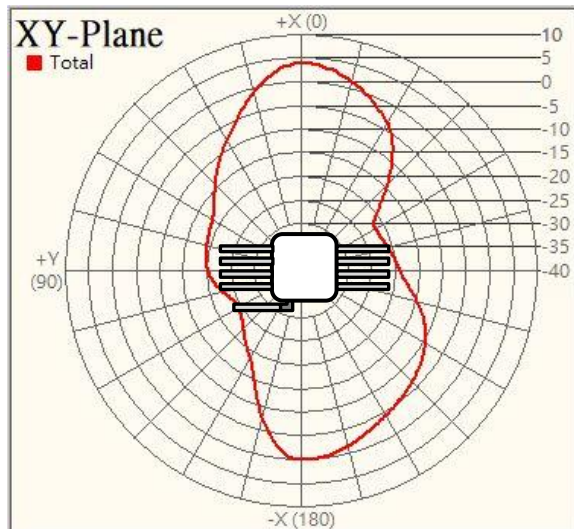
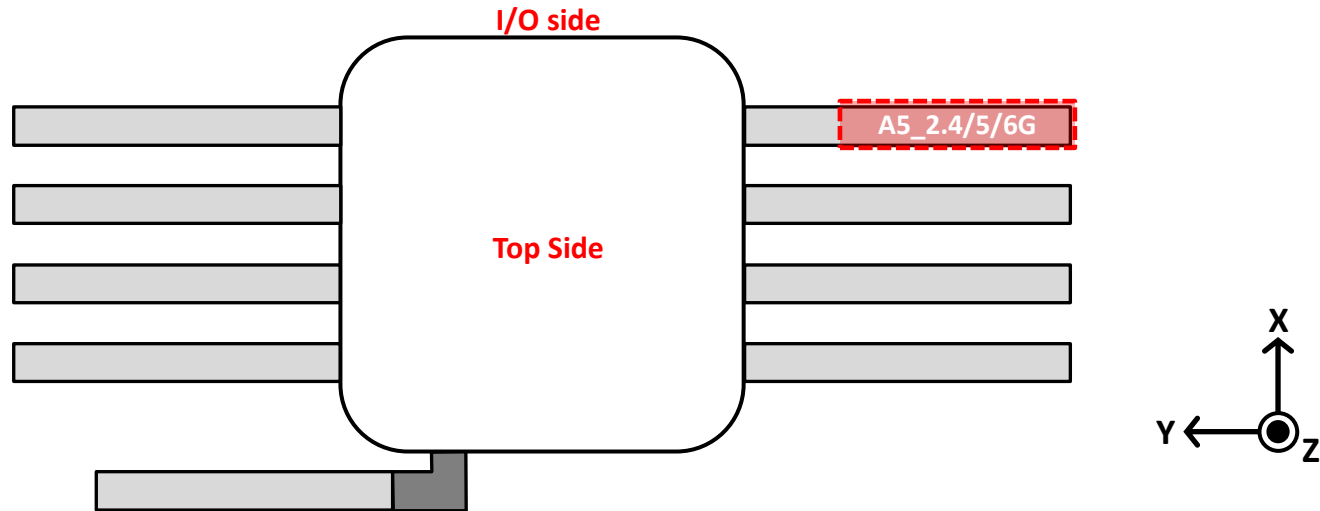
# 2D Radiation Pattern – A7 2.4/5/6G @ 5.55GHz



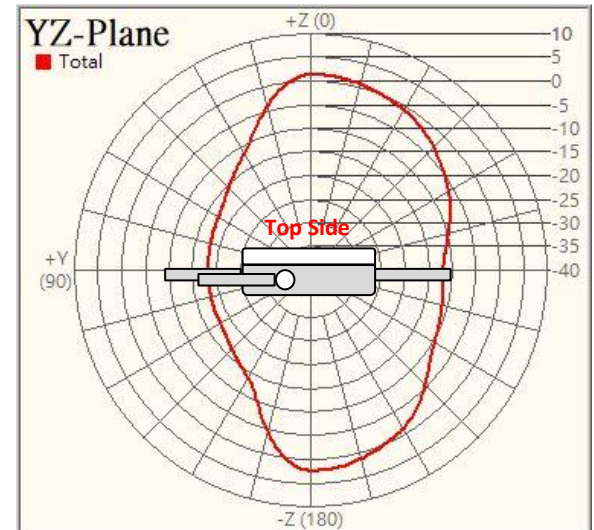
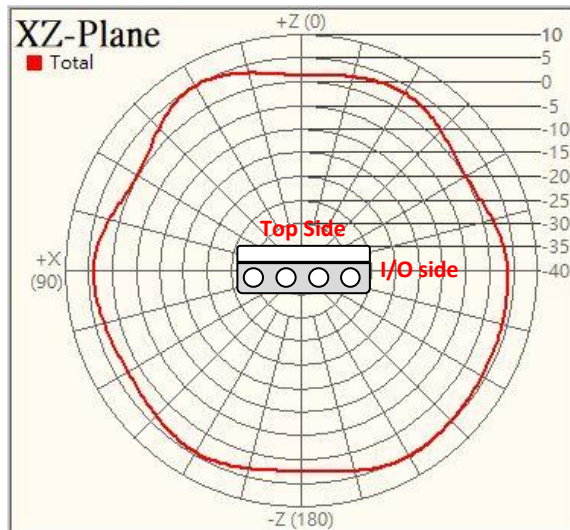
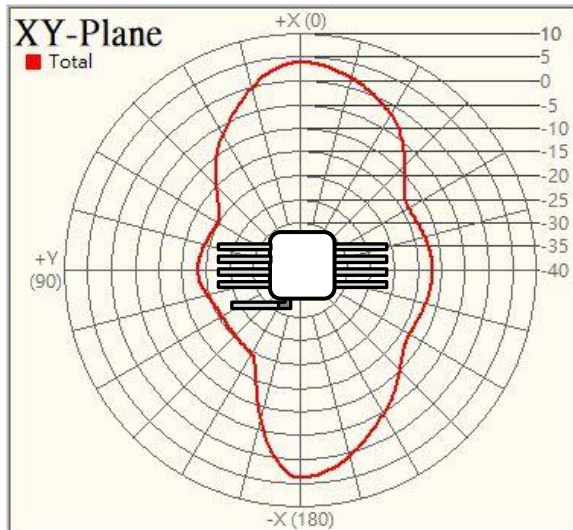
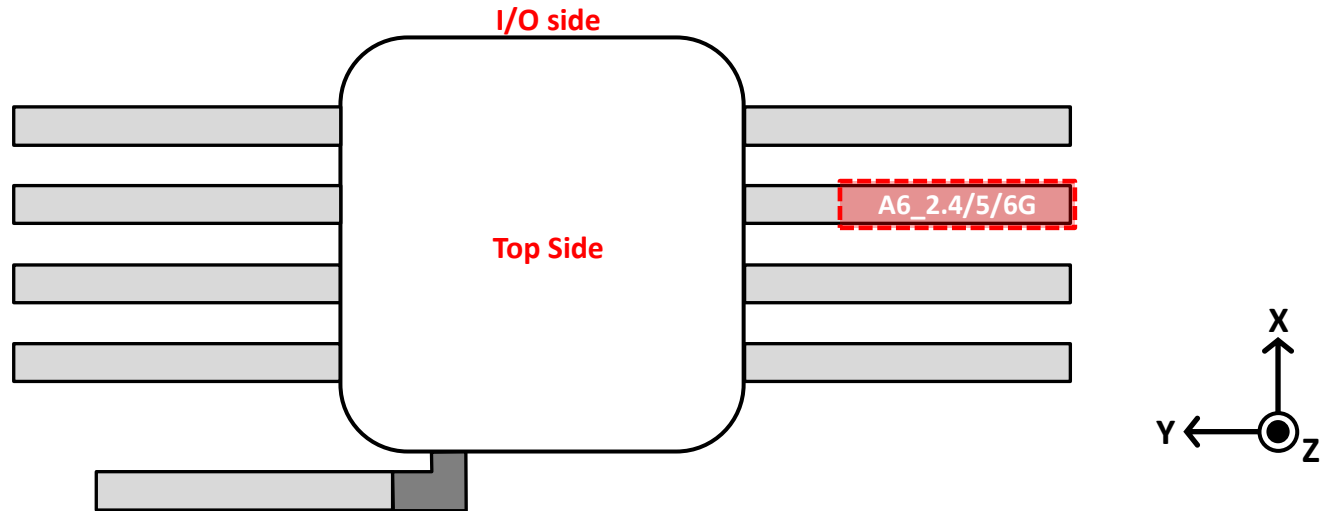
# 2D Radiation Pattern – A8 2.4/5/6G @ 5.55GHz



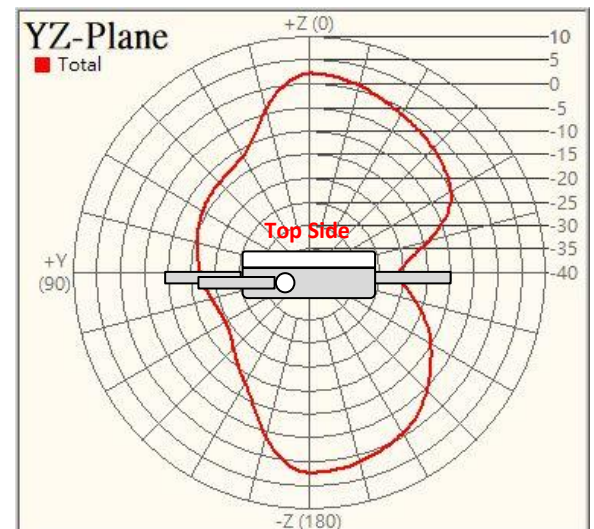
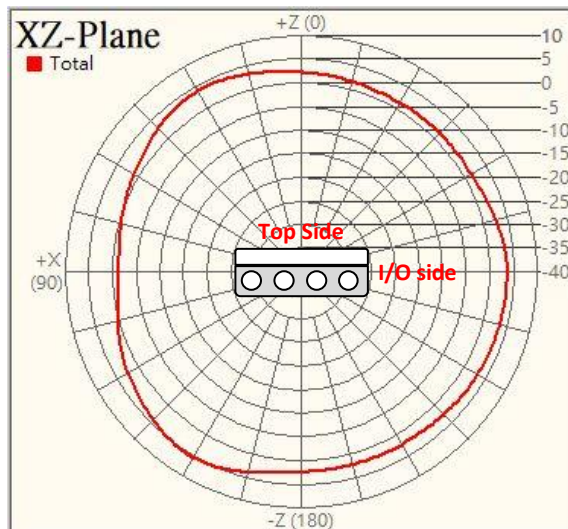
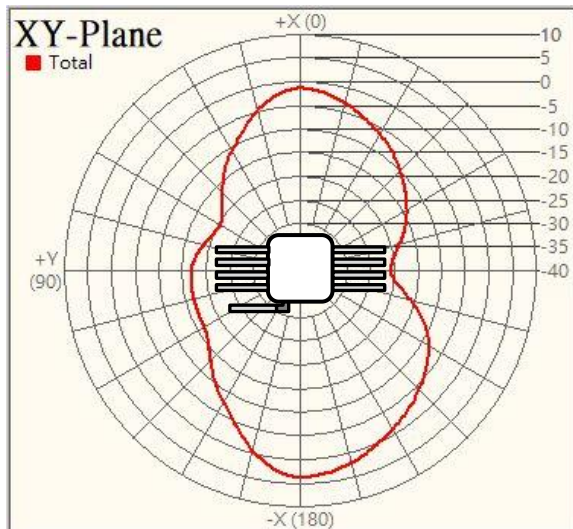
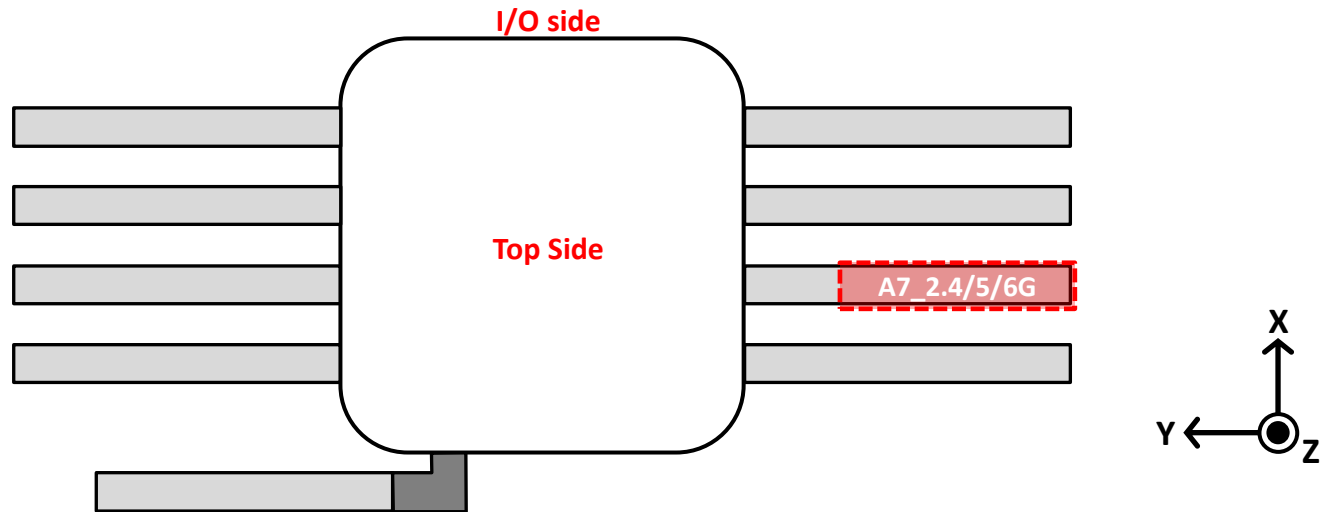
# 2D Radiation Pattern – A5 2.4/5/6G @ 6.5GHz



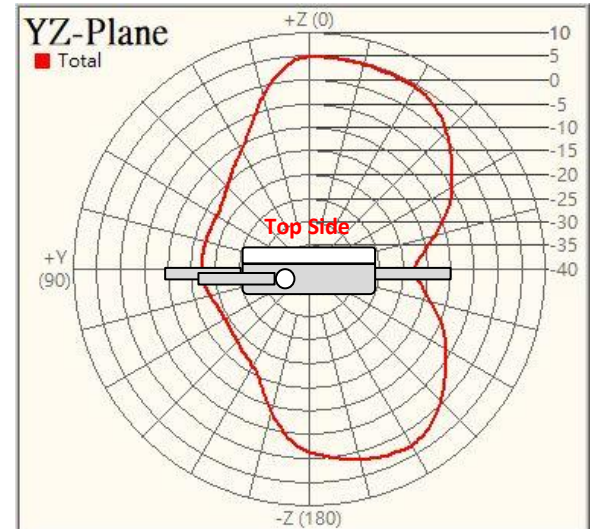
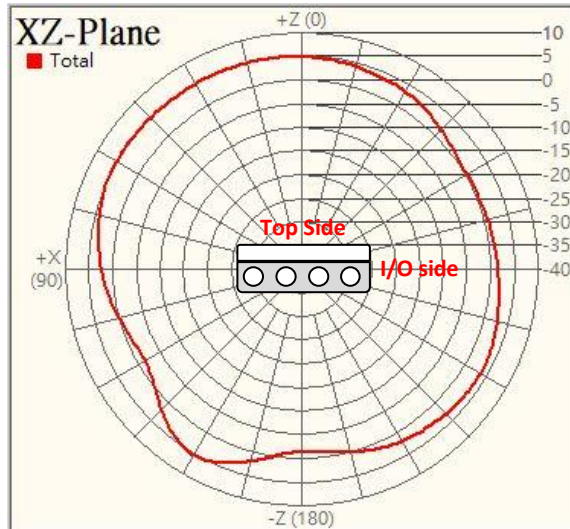
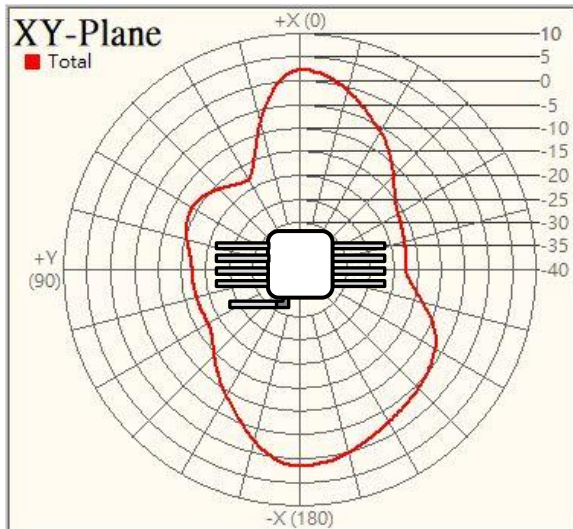
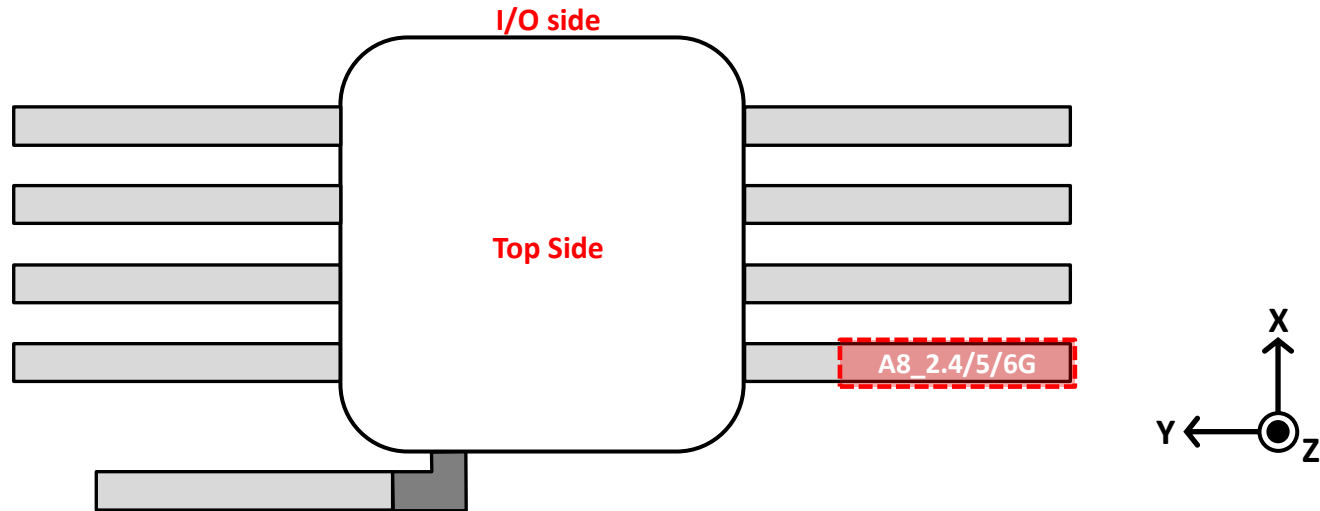
# 2D Radiation Pattern – A6 2.4/5/6G @ 6.5GHz



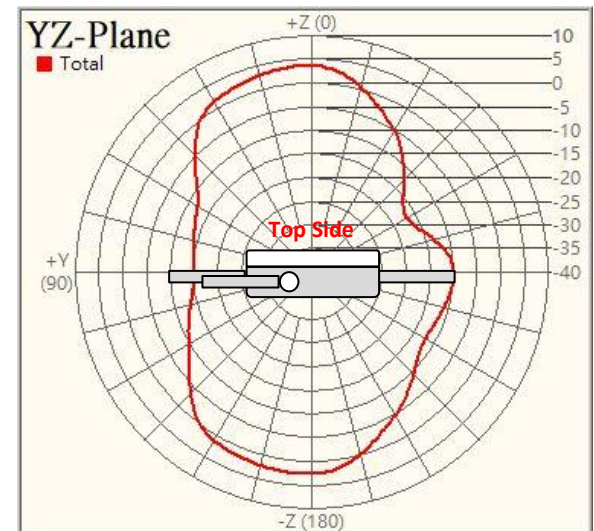
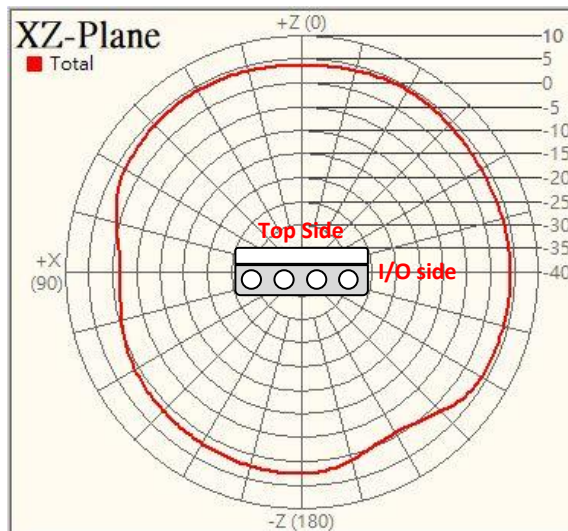
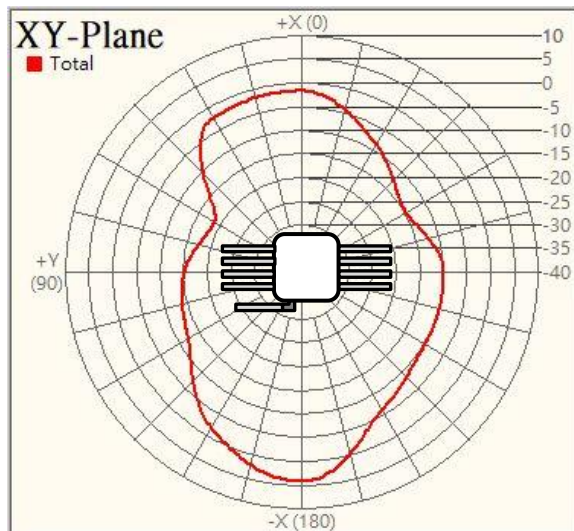
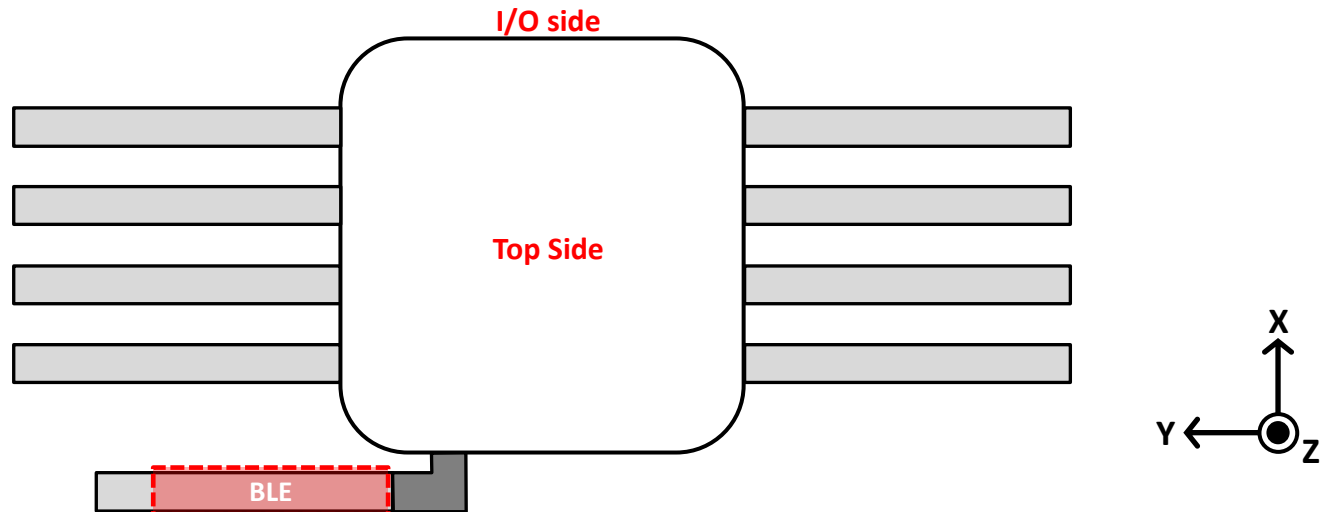
# 2D Radiation Pattern – A7 2.4/5/6G @ 6.5GHz



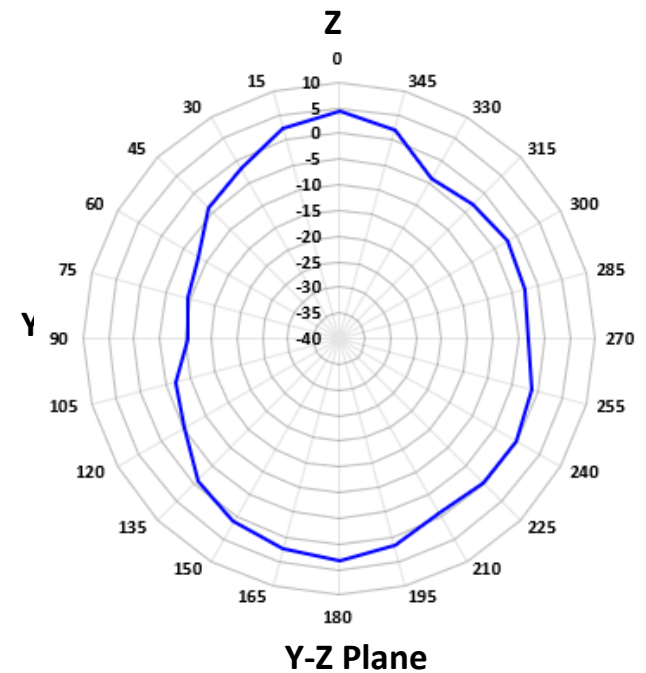
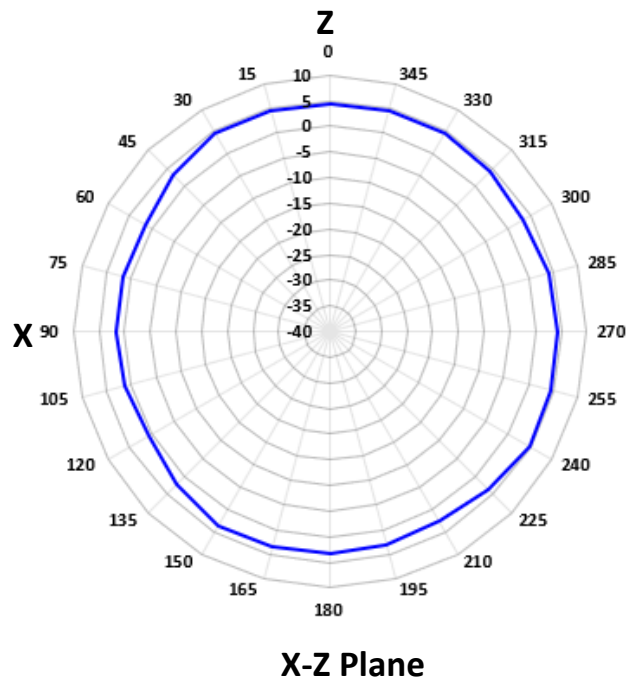
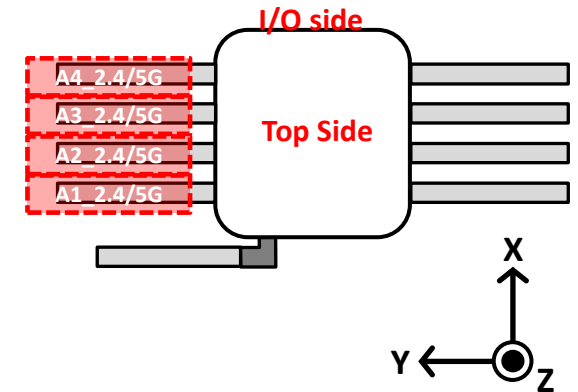
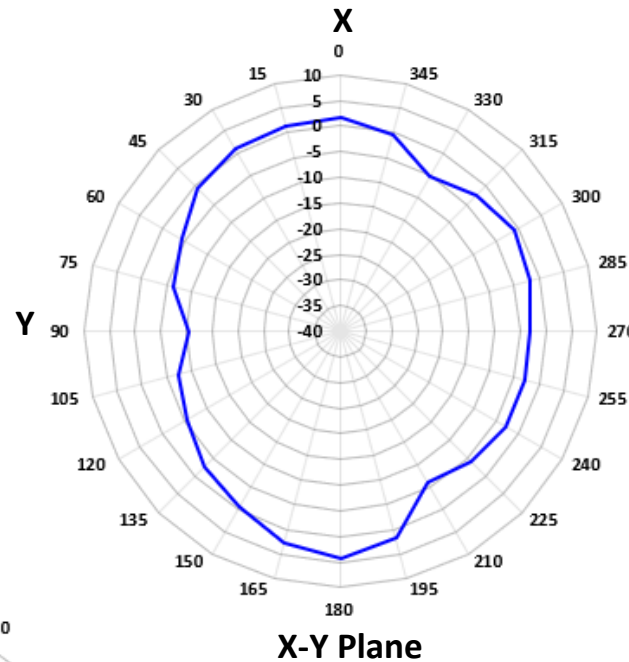
# 2D Radiation Pattern – A8 2.4/5/6G @ 6.5GHz



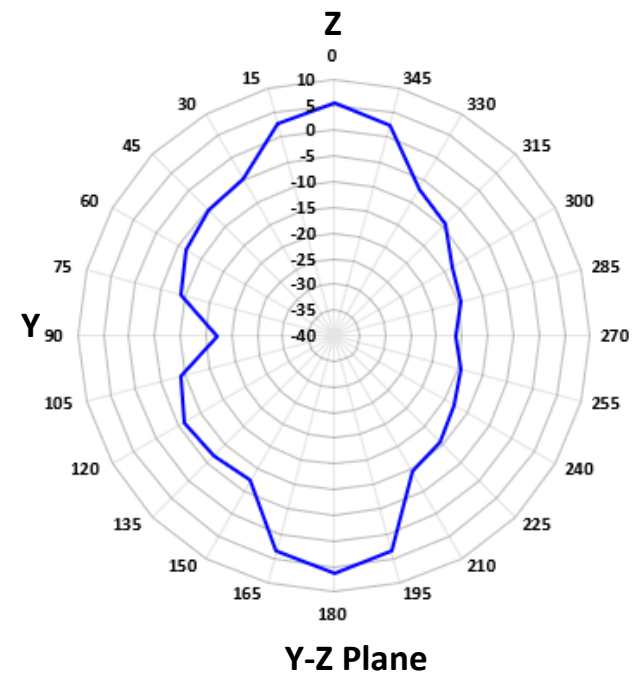
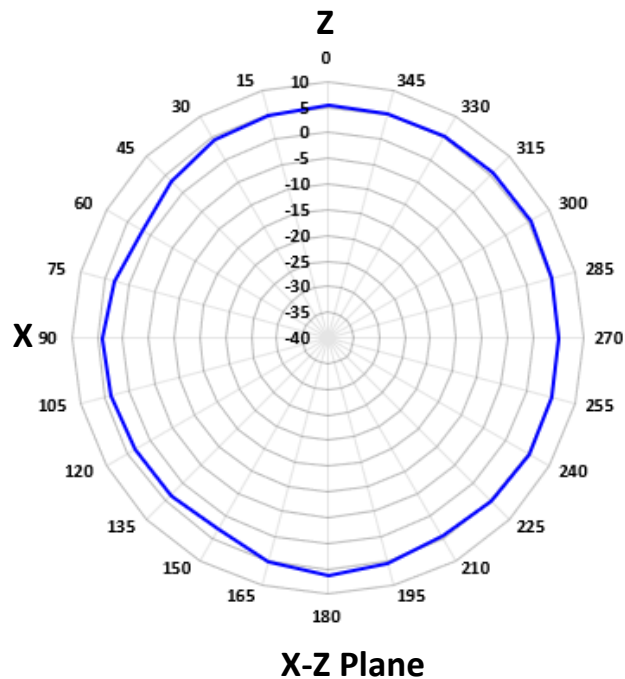
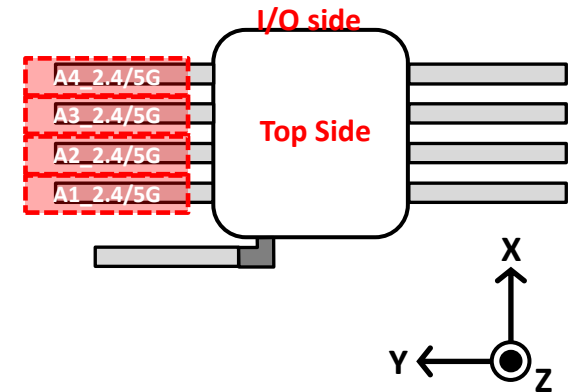
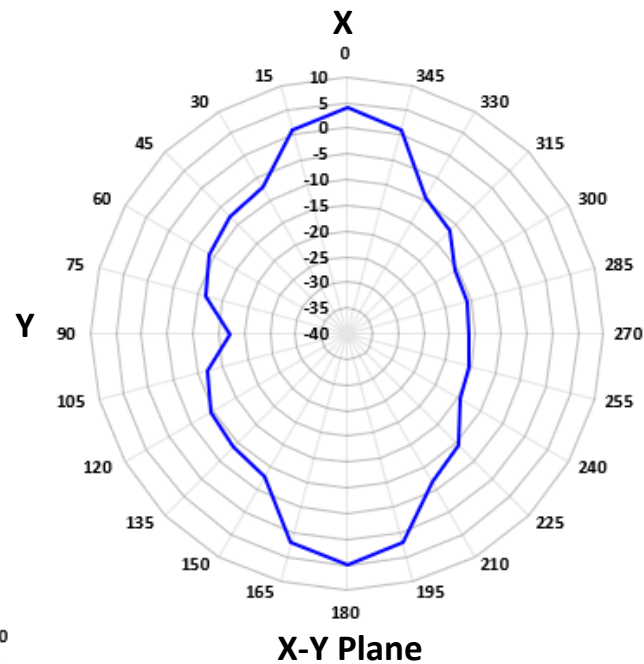
# 2D Radiation Pattern – BLE @ 2.45GHz



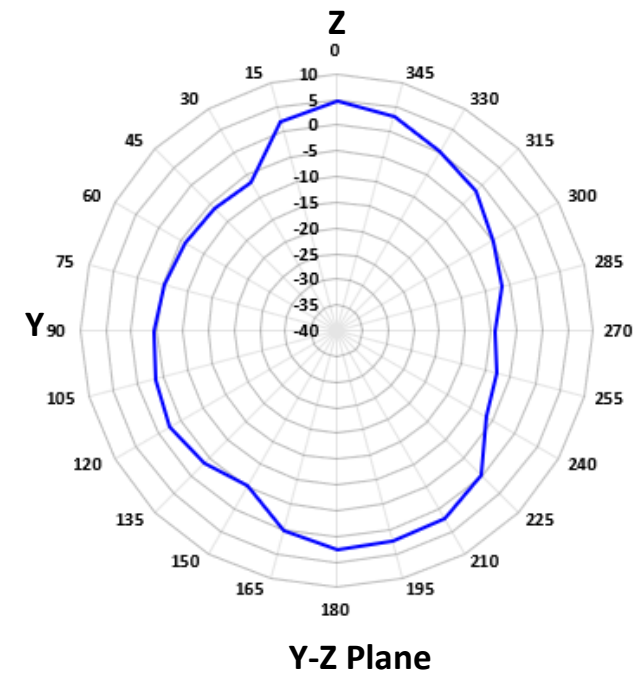
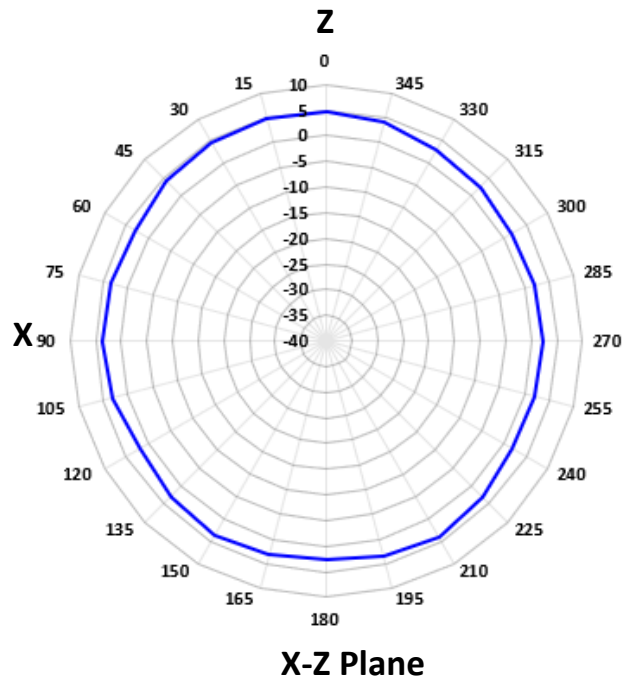
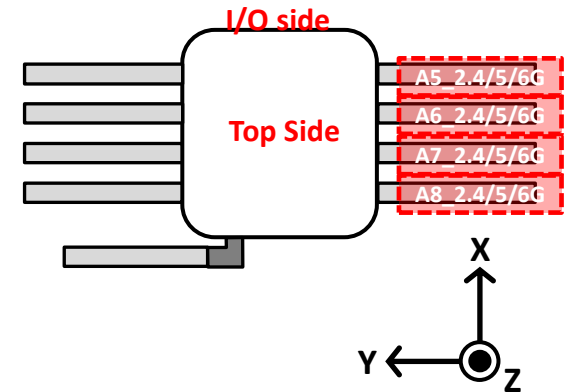
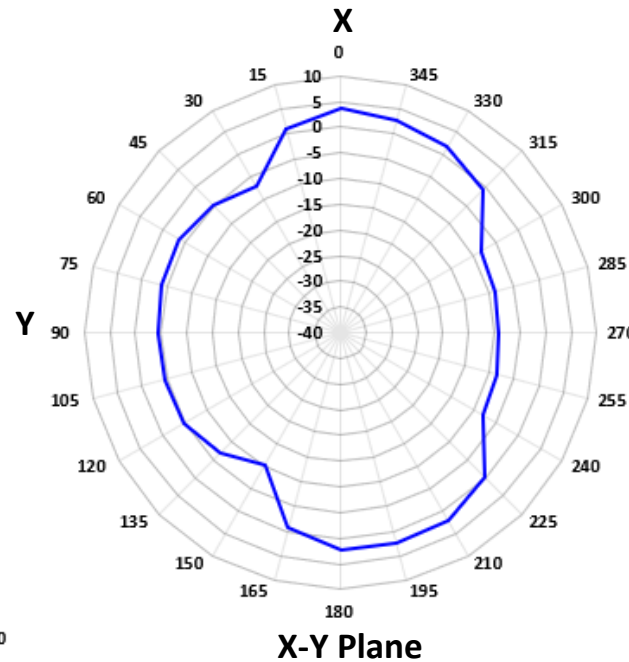
# Combine pattern – Radio 1 @2.45 GHz



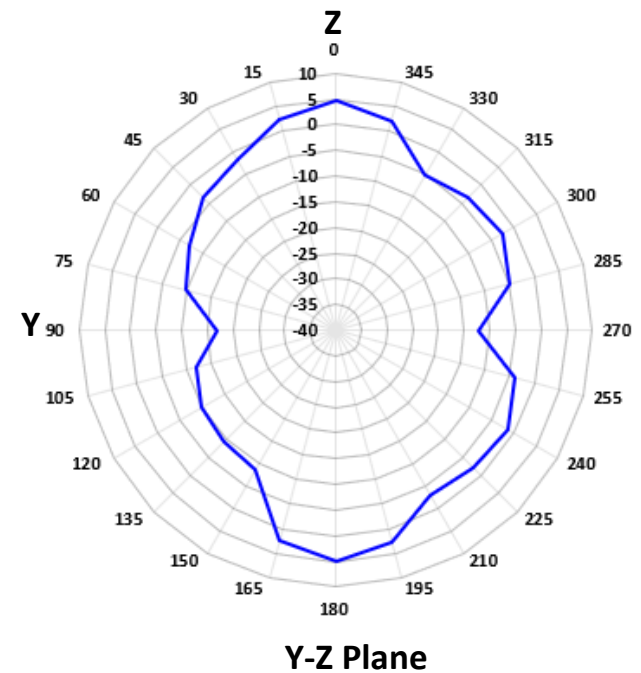
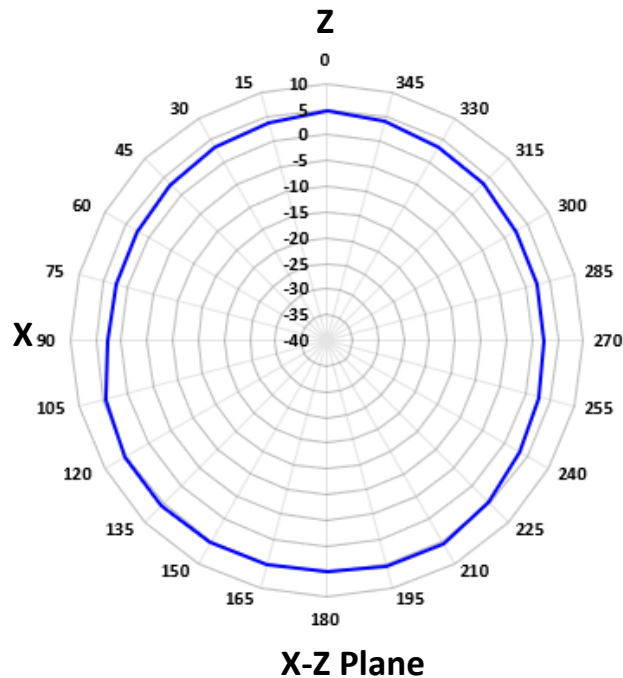
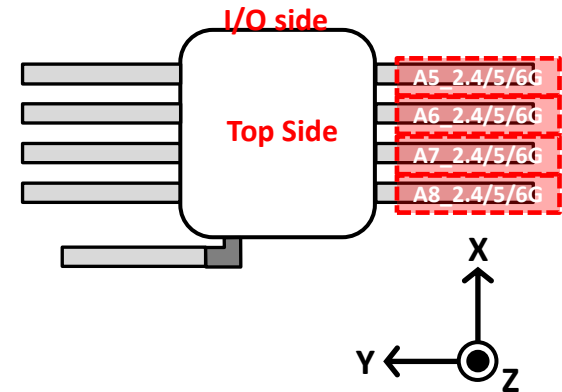
# Combine pattern – Radio 2 @5.55 GHz



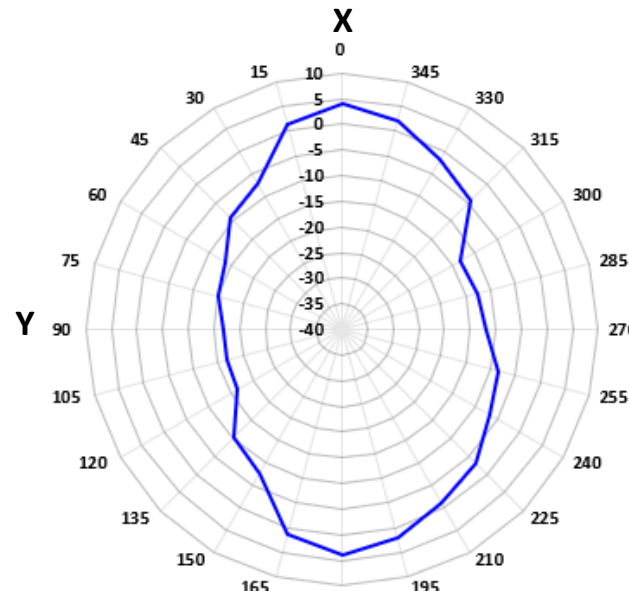
# Combine pattern – Radio 3 @2.45 GHz



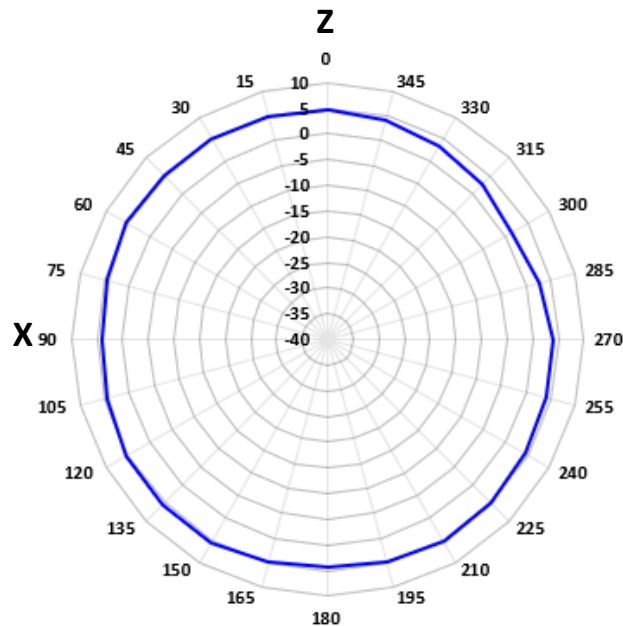
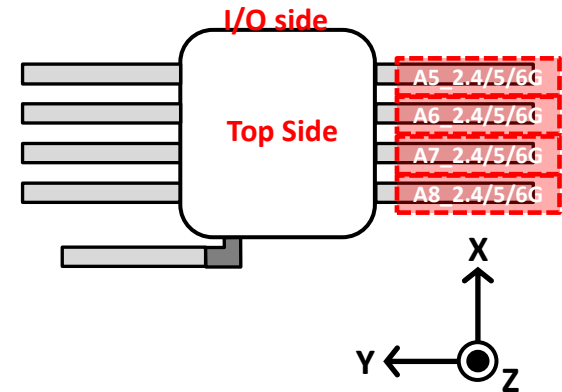
# Combine pattern – Radio 3 @5.55 GHz



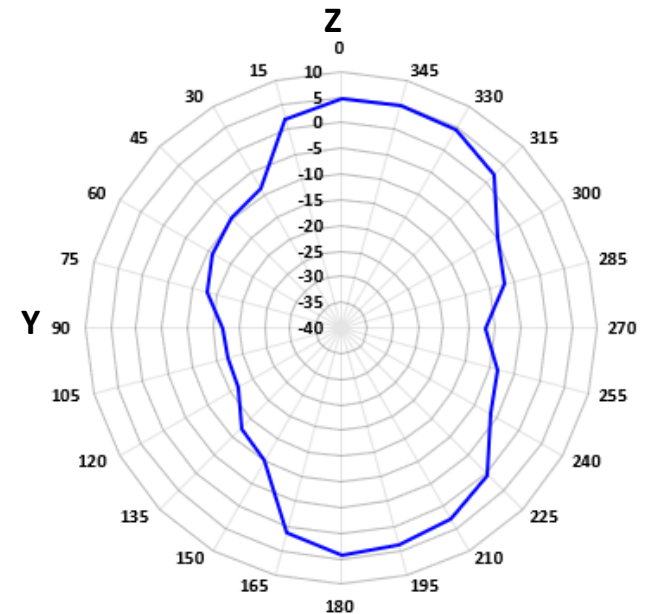
# Combine pattern – Radio 3 @6.5 GHz



X-Y Plane



X-Z Plane



Y-Z Plane

# Antenna Efficiency and Gain

| Antenna Performance |                |                 |                |                 |                |                 |                |                 |
|---------------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| Freq. (MHz)         | A1_2.4/5G      |                 | A2_2.4/5G      |                 | A3_2.4/5G      |                 | A4_2.4/5G      |                 |
|                     | Efficiency (%) | Peak Gain (dBi) | Efficiency (%) | Peak Gain (dBi) | Efficiency (%) | Peak Gain (dBi) | Efficiency (%) | Peak Gain (dBi) |
| 2400                | 64.68          | 4.22            | 64.96          | 4.76            | 63.10          | 3.80            | 68.19          | 4.59            |
| 2450                | 69.51          | 4.82            | 61.07          | 4.52            | 61.70          | 4.18            | 64.62          | 4.74            |
| 2500                | 65.19          | 4.64            | 62.96          | 4.65            | 63.45          | 5.03            | 63.55          | 4.78            |
| 5150                | 58.80          | 5.41            | 69.78          | 6.01            | 60.65          | 6.40            | 66.02          | 6.14            |
| 5500                | 62.94          | 5.79            | 66.59          | 5.21            | 59.72          | 6.37            | 62.39          | 5.53            |
| 5850                | 63.16          | 5.89            | 72.77          | 5.86            | 67.69          | 5.97            | 63.82          | 5.45            |

| Antenna Performance |                |                 |                |                 |                |                 |                |                 |
|---------------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| Freq. (MHz)         | A5_2.4/5/6G    |                 | A6_2.4/5/6G    |                 | A7_2.4/5/6G    |                 | A8_2.4/5/6G    |                 |
|                     | Efficiency (%) | Peak Gain (dBi) | Efficiency (%) | Peak Gain (dBi) | Efficiency (%) | Peak Gain (dBi) | Efficiency (%) | Peak Gain (dBi) |
| 2400                | 58.69          | 4.10            | 62.54          | 4.37            | 60.24          | 4.81            | 62.01          | 4.50            |
| 2450                | 66.80          | 4.24            | 68.51          | 3.98            | 61.53          | 4.75            | 69.61          | 4.86            |
| 2500                | 61.85          | 4.26            | 69.95          | 4.45            | 57.86          | 4.40            | 63.99          | 4.65            |
| 5150                | 61.09          | 5.04            | 66.47          | 5.13            | 66.35          | 5.39            | 67.74          | 5.38            |
| 5500                | 56.15          | 5.16            | 69.43          | 5.05            | 65.78          | 5.50            | 67.26          | 5.72            |
| 5850                | 61.45          | 5.75            | 61.46          | 5.54            | 61.57          | 5.24            | 66.98          | 5.31            |
| 5925                | 62.74          | 5.80            | 59.51          | 5.95            | 62.66          | 5.65            | 59.05          | 5.00            |
| 6500                | 59.38          | 5.21            | 61.47          | 5.44            | 50.99          | 5.52            | 64.29          | 5.47            |
| 7125                | 60.29          | 4.25            | 62.39          | 5.59            | 59.92          | 4.56            | 61.41          | 5.80            |

| Antenna Performance |                |                 |
|---------------------|----------------|-----------------|
| Freq. (MHz)         | BLE            |                 |
|                     | Efficiency (%) | Peak Gain (dBi) |
| 2400                | 66.82          | 4.71            |
| 2450                | 67.77          | 4.61            |
| 2500                | 69.34          | 4.61            |