



Attracting Tomorrow

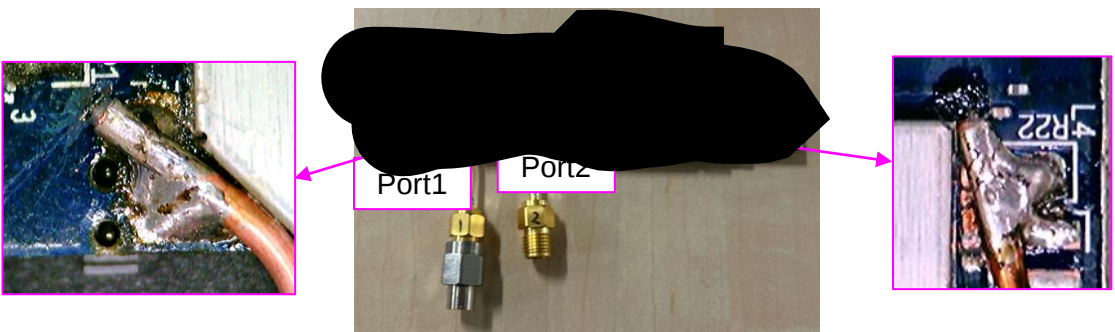


# Antenna Measurement

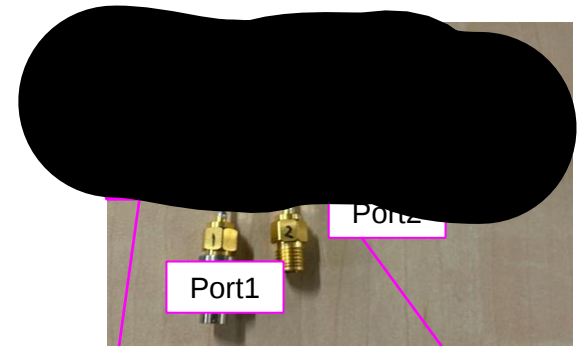
# Measurement Setup

► MEASUREMENT SETUP

Cable setup



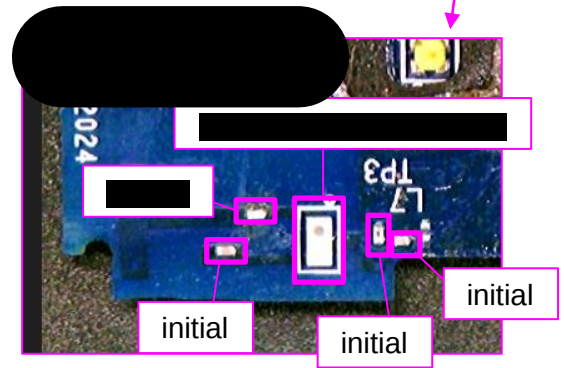
Element value after tuning



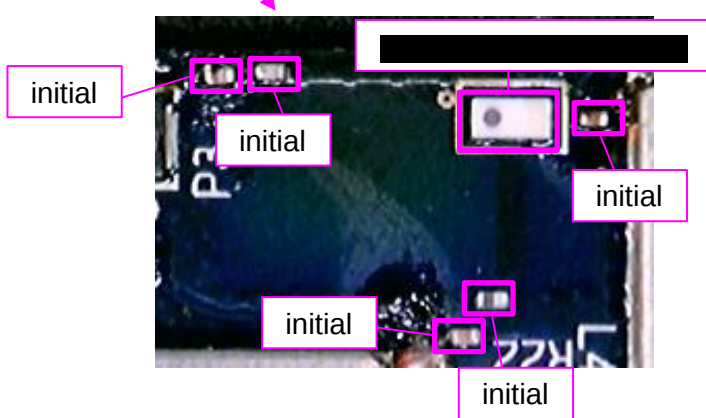
Measurement setup



Port1

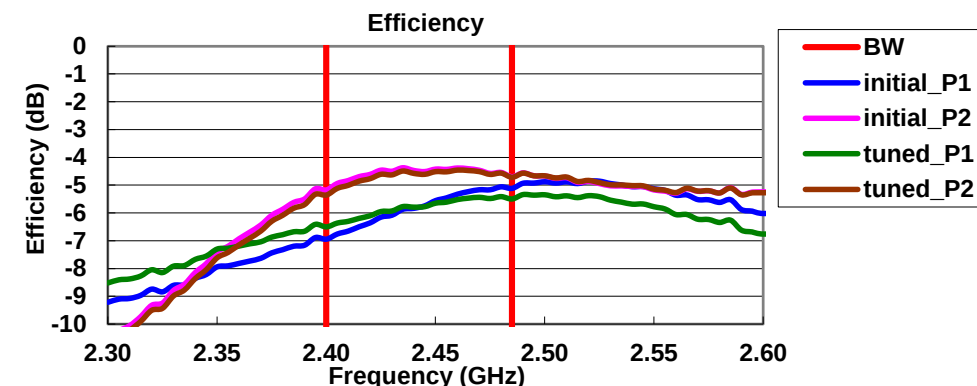
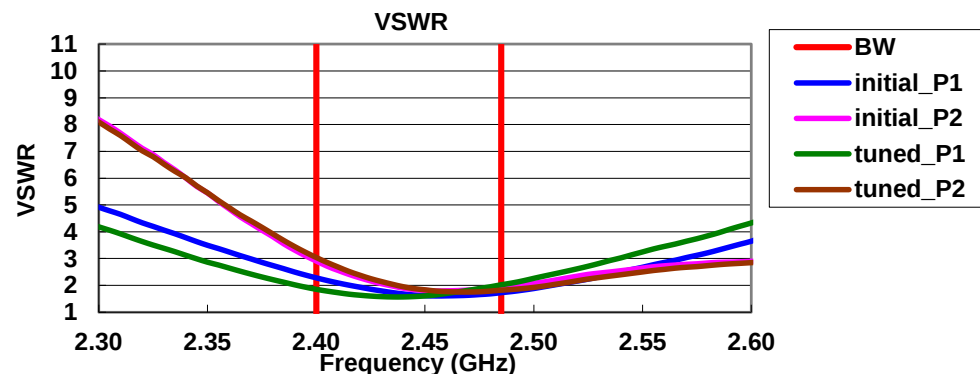


Port2

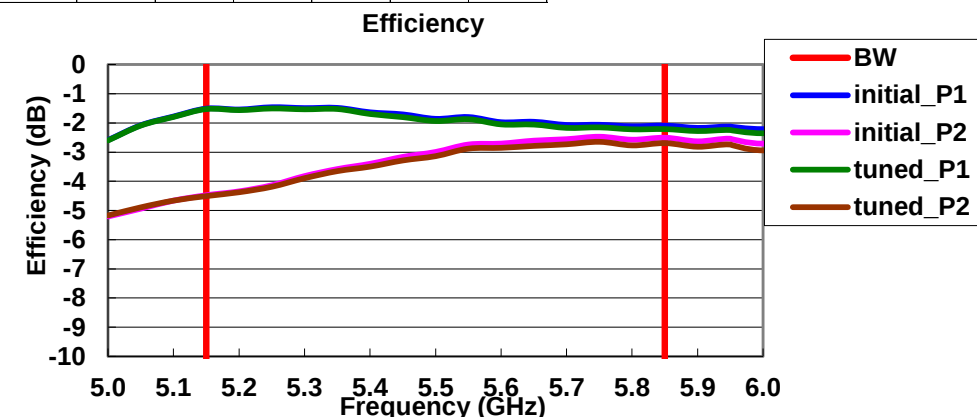
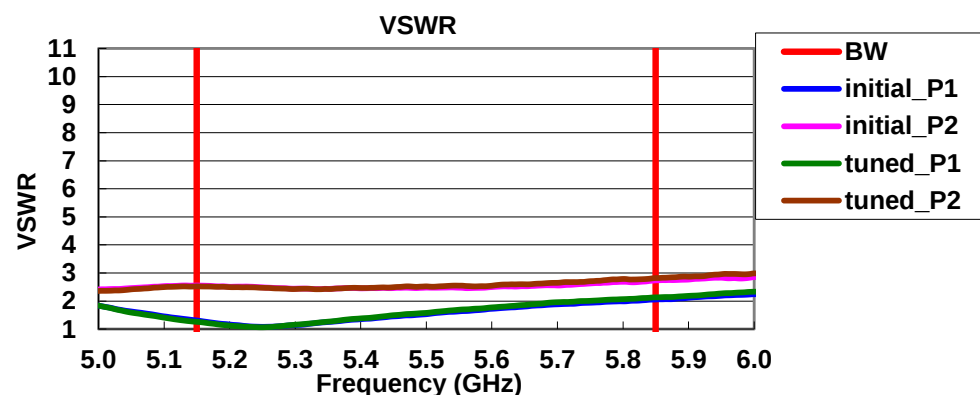


# Measurement Results

## ► VSWR & Efficiency



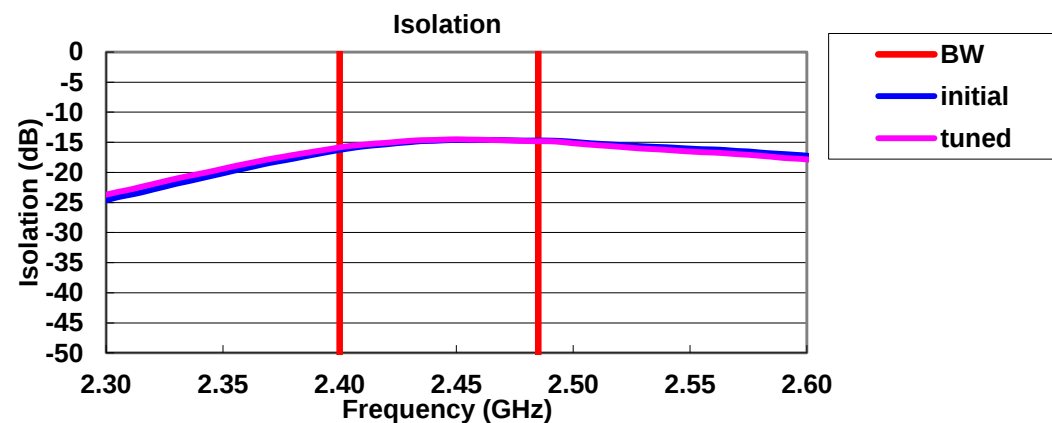
|                | initial_P1 |       |       | initial_P2 |       |       | tuned_P1 |       |       | tuned_P2 |       |       |
|----------------|------------|-------|-------|------------|-------|-------|----------|-------|-------|----------|-------|-------|
| Frequency[GHz] | 2.4        | 2.442 | 2.485 | 2.4        | 2.442 | 2.485 | 2.4      | 2.442 | 2.485 | 2.4      | 2.442 | 2.485 |
| VSWR           | 2.28       | 1.68  | 1.72  | 2.90       | 1.89  | 1.94  | 1.85     | 1.56  | 2.02  | 3.04     | 1.95  | 1.83  |
| Efficiency[dB] | -6.94      | -5.83 | -5.12 | -5.17      | -4.47 | -4.70 | -6.50    | -5.79 | -5.50 | -5.35    | -4.58 | -4.72 |



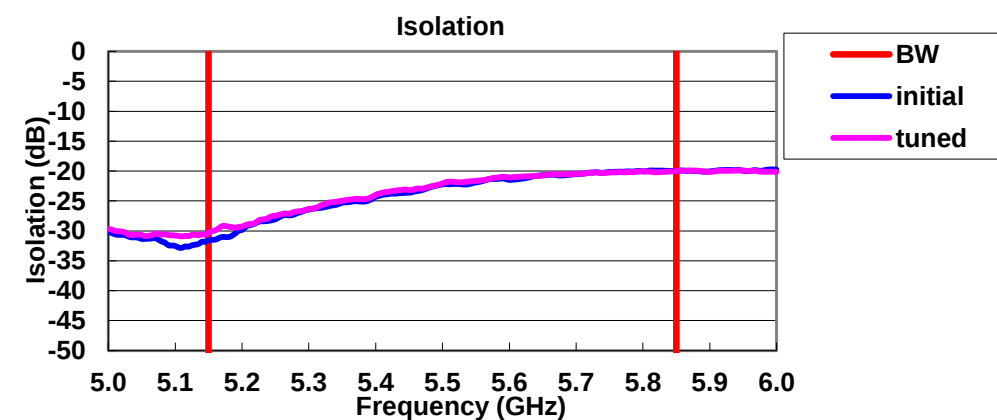
|                | initial_P1 |       |       | initial_P2 |       |       | tuned_P1 |       |       | tuned_P2 |       |       |
|----------------|------------|-------|-------|------------|-------|-------|----------|-------|-------|----------|-------|-------|
| Frequency[GHz] | 5.15       | 5.5   | 5.85  | 5.15       | 5.5   | 5.85  | 5.15     | 5.5   | 5.85  | 5.15     | 5.5   | 5.85  |
| VSWR           | 1.30       | 1.53  | 2.05  | 2.55       | 2.48  | 2.73  | 1.26     | 1.57  | 2.13  | 2.52     | 2.52  | 2.82  |
| Efficiency[dB] | -1.51      | -1.86 | -2.09 | -4.47      | -2.99 | -2.50 | -1.52    | -1.93 | -2.20 | -4.51    | -3.14 | -2.69 |

# Measurement Results

## ► Isolation



|                | initial |        |        | tuned  |        |        |
|----------------|---------|--------|--------|--------|--------|--------|
| Frequency[GHz] | 2.4     | 2.442  | 2.485  | 2.4    | 2.442  | 2.485  |
| Isolation[dB]  | -16.26  | -14.76 | -14.70 | -15.85 | -14.62 | -14.83 |



|                | initial |        |        | tuned  |        |        |
|----------------|---------|--------|--------|--------|--------|--------|
| Frequency[GHz] | 5.15    | 5.5    | 5.85   | 5.15   | 5.5    | 5.85   |
| Isolation[dB]  | -31.60  | -22.23 | -19.99 | -30.31 | -22.08 | -20.01 |

# Comments

- ◆ We measured the antenna before & after matching.
- ◆ Please see page2 of this report to know the suitable element value.

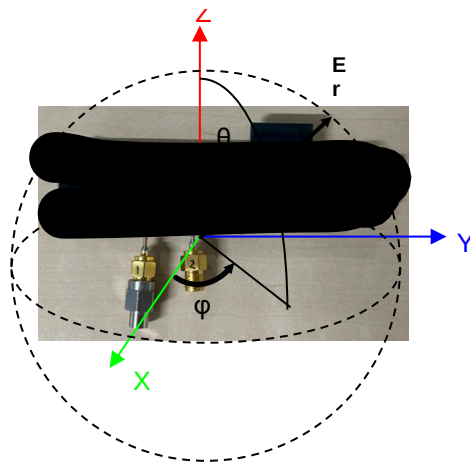
Now “antenna simulation tool” is published on TDK Web site. Please give it a try.

- Selection Guide 
-  
-  
-  

# Radiation Pattern

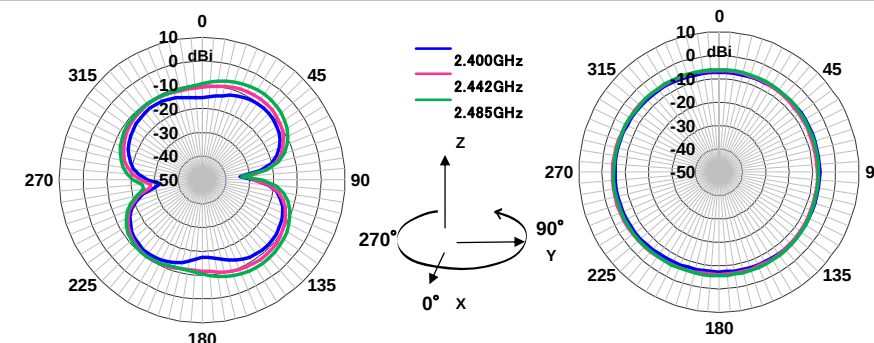
# Radiation Pattern (2.4GHz Band)

## PRODUCT ORIENTATIONS



## initial\_P1

## X-Y PLANE



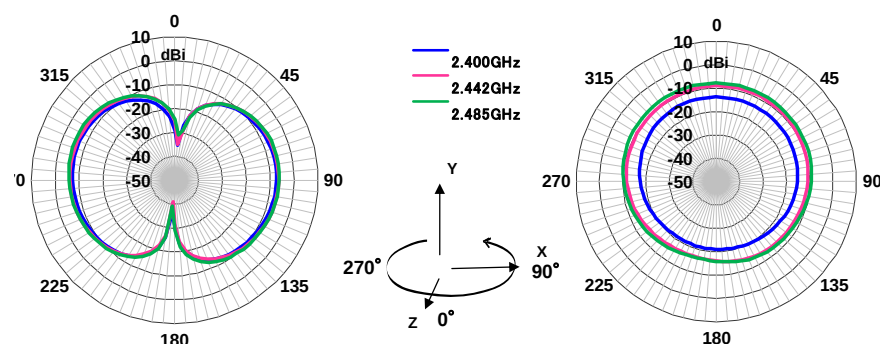
### Horizontal Polarization

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -13.9    | -11.3    | -9.7     |
| Maximum[dBi] | -10.3    | -8.0     | -5.5     |
| Minimum[dBi] | -33.9    | -31.1    | -33.3    |

### Vertical Polarization

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -6.5     | -6.0     | -5.9     |
| Maximum[dBi] | -5.4     | -4.2     | -4.8     |
| Minimum[dBi] | -7.3     | -8.0     | -7.5     |

## X-Z PLANE



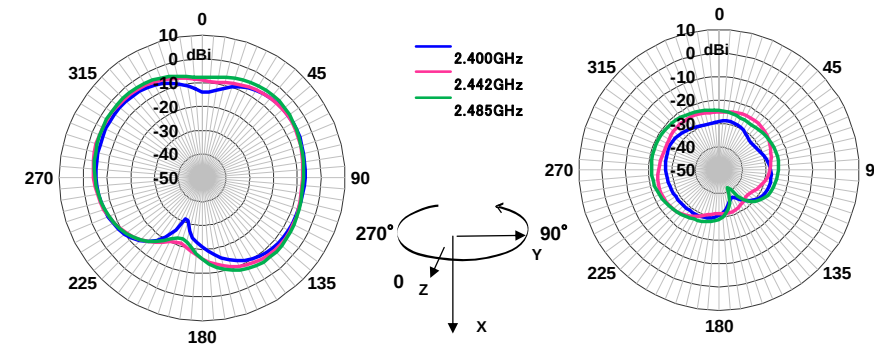
### Horizontal Polarization

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -10.1    | -9.2     | -8.7     |
| Maximum[dBi] | -7.0     | -6.0     | -5.2     |
| Minimum[dBi] | -36.2    | -40.8    | -39.2    |

### Vertical Polarization

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -16.12   | -11.27   | -9.95    |
| Maximum[dBi] | -13.73   | -8.85    | -7.74    |
| Minimum[dBi] | -21.21   | -16.74   | -16.39   |

## Y-Z PLANE



### Horizontal Polarization

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -7.6     | -6.8     | -6.2     |
| Maximum[dBi] | -4.4     | -3.0     | -2.7     |
| Minimum[dBi] | -31.4    | -21.0    | -23.2    |

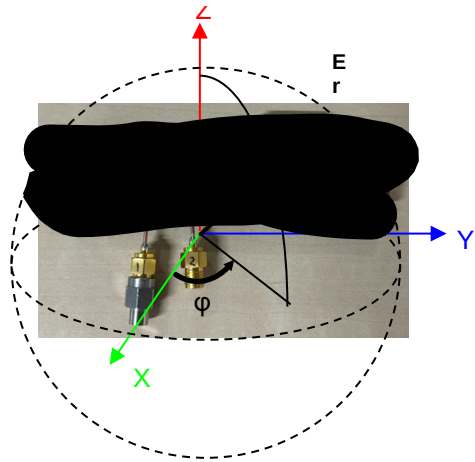
### Vertical Polarization

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -28.9    | -25.9    | -24.3    |
| Maximum[dBi] | -26.6    | -23.4    | -20.9    |
| Minimum[dBi] | -37.1    | -33.7    | -41.8    |

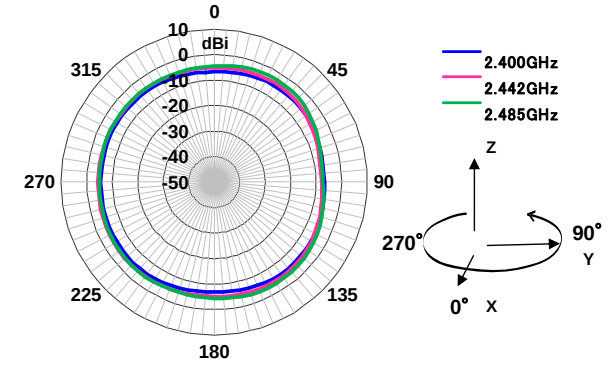
# Total Power (2.4GHz Band)

initial\_P1

PRODUCT ORIENTATIONS

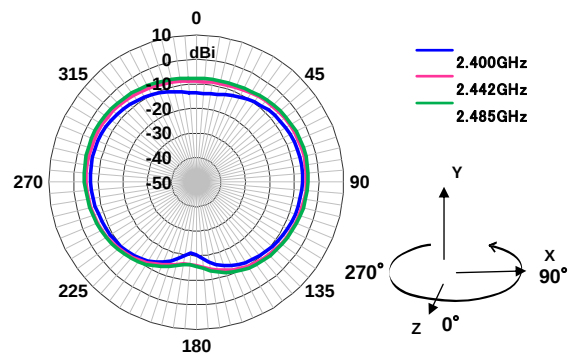


X-Y PLANE



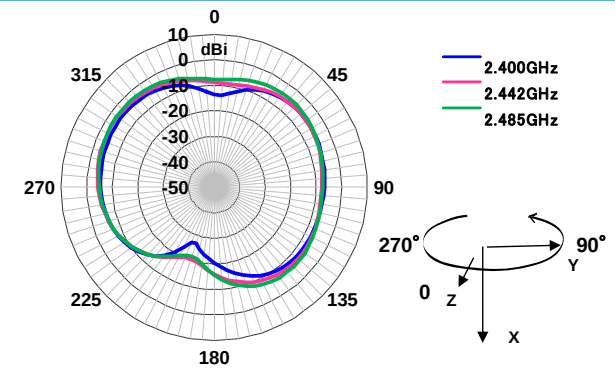
| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 2.400GHz | 2.442GHz | 2.485GHz |
| Average[dBi] | -5.8     | -4.9     | -4.4     |
| Maximum[dBi] | -5.1     | -3.9     | -2.9     |
| Minimum[dBi] | -6.9     | -7.9     | -7.4     |

X-Z PLANE



| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 2.400GHz | 2.442GHz | 2.485GHz |
| Average[dBi] | -9.1     | -7.1     | -6.3     |
| Maximum[dBi] | -6.5     | -4.8     | -3.6     |
| Minimum[dBi] | -21.0    | -16.3    | -16.1    |

Y-Z PLANE

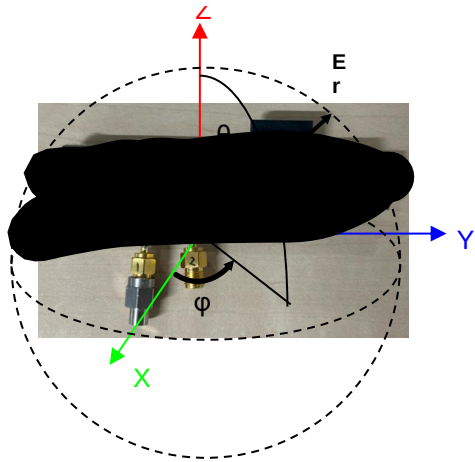


| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 2.400GHz | 2.442GHz | 2.485GHz |
| Average[dBi] | -7.6     | -6.8     | -6.2     |
| Maximum[dBi] | -4.4     | -3.0     | -2.6     |
| Minimum[dBi] | -26.8    | -20.5    | -21.7    |

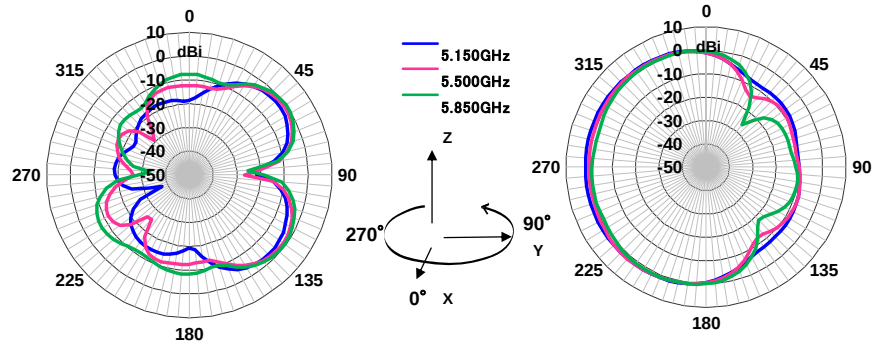
# Radiation Pattern (5GHz Band)

initial\_P1

## PRODUCT ORIENTATIONS



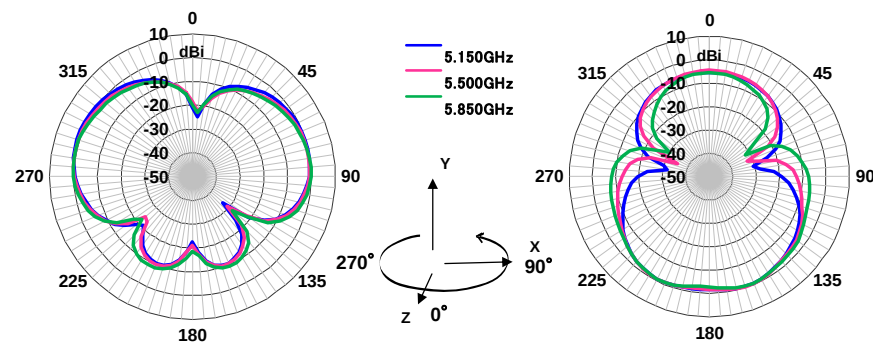
## X-Y PLANE



| Horizontal Polarization |          |          |          |
|-------------------------|----------|----------|----------|
|                         | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi]            | -8.7     | -7.5     | -6.0     |
| Maximum[dBi]            | -2.3     | -0.8     | 0.2      |
| Minimum[dBi]            | -37.5    | -29.3    | -33.2    |

| Vertical Polarization |          |          |          |
|-----------------------|----------|----------|----------|
|                       | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi]          | -1.0     | -1.6     | -2.3     |
| Maximum[dBi]          | 1.9      | 1.7      | 1.1      |
| Minimum[dBi]          | -10.3    | -14.2    | -26.1    |

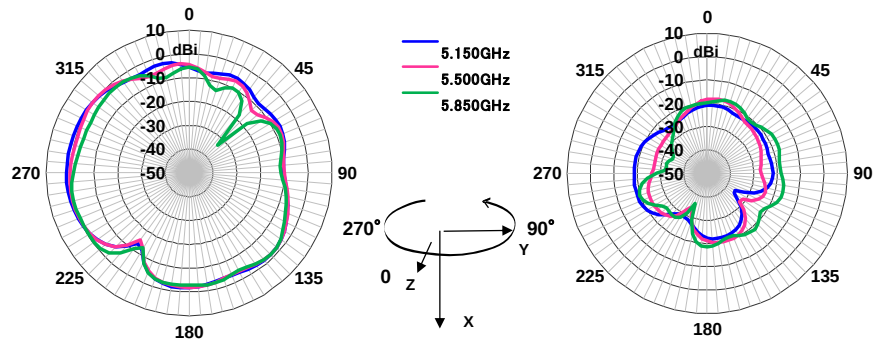
## X-Z PLANE



| Horizontal Polarization |          |          |          |
|-------------------------|----------|----------|----------|
|                         | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi]            | -4.1     | -4.6     | -4.6     |
| Maximum[dBi]            | 1.0      | 0.5      | 0.5      |
| Minimum[dBi]            | -33.1    | -31.0    | -28.1    |

| Vertical Polarization |          |          |          |
|-----------------------|----------|----------|----------|
|                       | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi]          | -5.30    | -5.03    | -5.18    |
| Maximum[dBi]          | -0.51    | -0.28    | -0.62    |
| Minimum[dBi]          | -31.89   | -35.20   | -31.95   |

## Y-Z PLANE



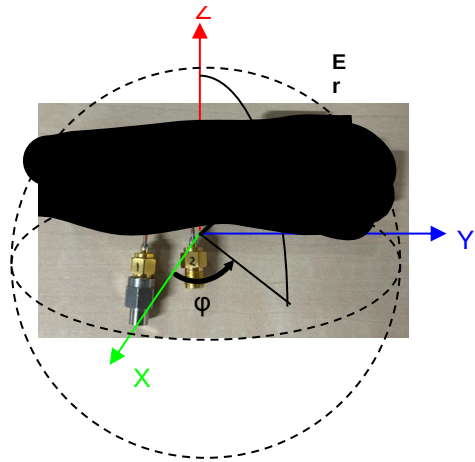
| Horizontal Polarization |          |          |          |
|-------------------------|----------|----------|----------|
|                         | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi]            | -2.6     | -3.3     | -4.1     |
| Maximum[dBi]            | 1.6      | 0.6      | 0.0      |
| Minimum[dBi]            | -13.5    | -15.1    | -33.3    |

| Vertical Polarization |          |          |          |
|-----------------------|----------|----------|----------|
|                       | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi]          | -22.1    | -23.1    | -20.5    |
| Maximum[dBi]          | -18.6    | -17.8    | -16.5    |
| Minimum[dBi]          | -36.1    | -33.6    | -36.2    |

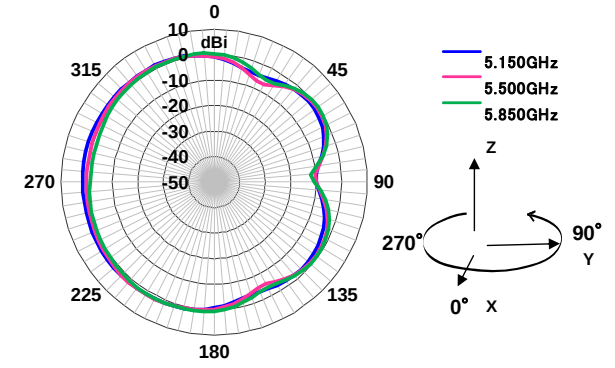
# Total Power (5GHz Band)

initial\_P1

PRODUCT ORIENTATIONS

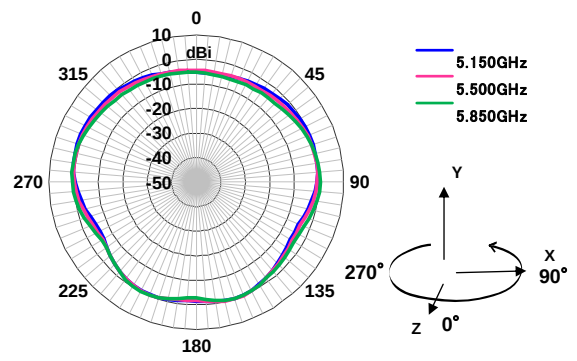


X-Y PLANE



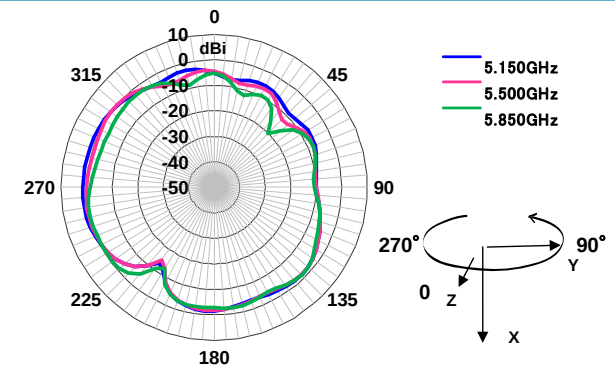
| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi] | -0.3     | -0.6     | -0.7     |
| Maximum[dBi] | 1.9      | 1.7      | 1.3      |
| Minimum[dBi] | -10.0    | -10.1    | -12.0    |

X-Z PLANE



| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi] | -1.7     | -1.8     | -1.8     |
| Maximum[dBi] | 1.0      | 0.6      | 0.9      |
| Minimum[dBi] | -5.8     | -5.1     | -5.7     |

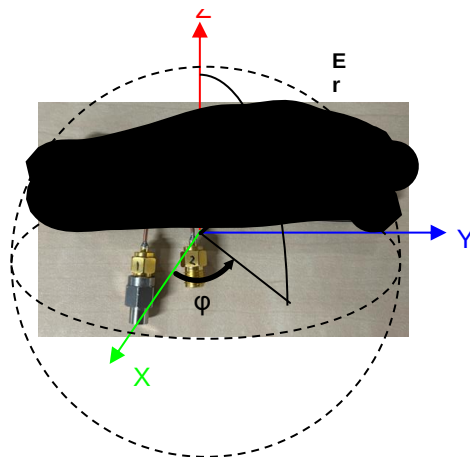
Y-Z PLANE



| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi] | -2.6     | -3.2     | -4.0     |
| Maximum[dBi] | 1.7      | 0.6      | 0.0      |
| Minimum[dBi] | -13.3    | -14.8    | -20.4    |

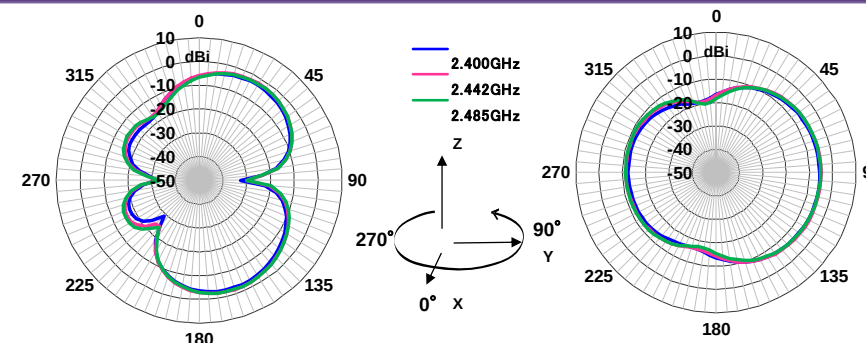
# Radiation Pattern (2.4GHz Band)

## PRODUCT ORIENTATIONS



## initial\_P2

## X-Y PLANE



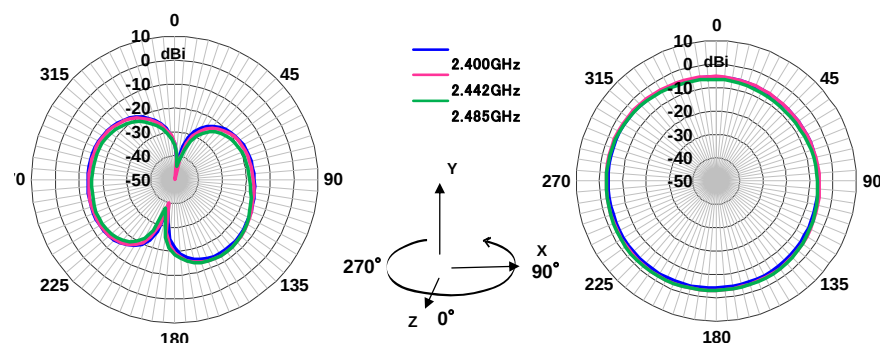
### Horizontal Polarization

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -7.5     | -6.7     | -6.9     |
| Maximum[dBi] | -2.6     | -1.8     | -1.8     |
| Minimum[dBi] | -32.5    | -32.6    | -33.4    |

### Vertical Polarization

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -9.6     | -9.0     | -9.2     |
| Maximum[dBi] | -5.5     | -5.0     | -5.2     |
| Minimum[dBi] | -19.2    | -19.1    | -20.2    |

## X-Z PLANE



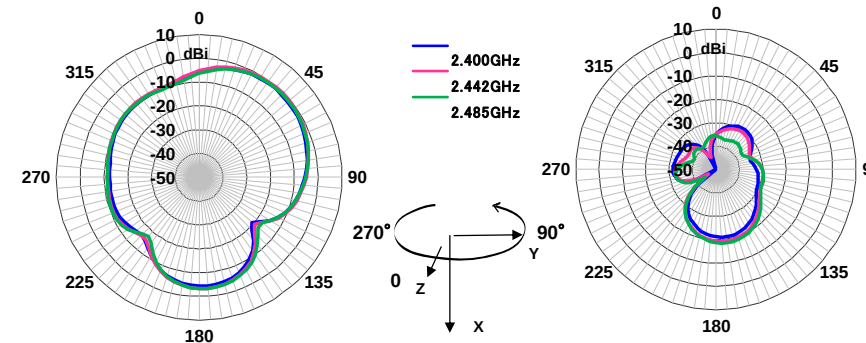
### Horizontal Polarization

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -16.4    | -16.4    | -17.2    |
| Maximum[dBi] | -13.2    | -12.7    | -12.7    |
| Minimum[dBi] | -42.0    | -51.1    | -44.2    |

### Vertical Polarization

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -4.68    | -3.98    | -4.27    |
| Maximum[dBi] | -3.28    | -2.32    | -2.08    |
| Minimum[dBi] | -6.58    | -6.54    | -8.00    |

## Y-Z PLANE



### Horizontal Polarization

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -6.1     | -5.4     | -5.7     |
| Maximum[dBi] | -0.8     | -0.2     | -0.5     |
| Minimum[dBi] | -20.7    | -19.4    | -17.5    |

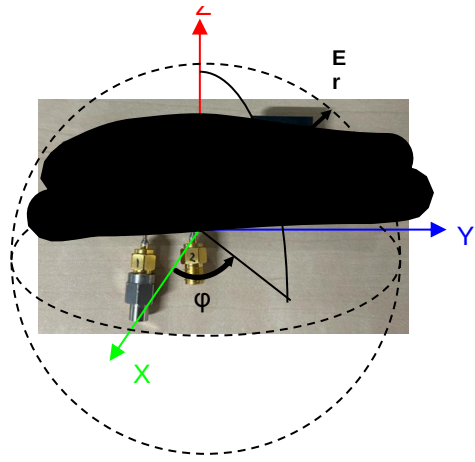
### Vertical Polarization

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -27.8    | -26.4    | -25.9    |
| Maximum[dBi] | -20.9    | -19.0    | -18.2    |
| Minimum[dBi] | -51.1    | -46.1    | -44.1    |

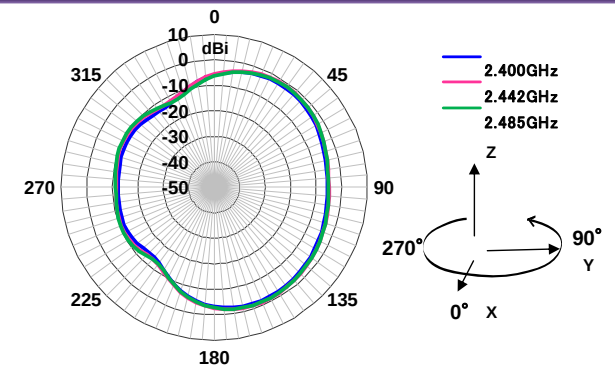
# Total Power (2.4GHz Band)

initial\_P2

## PRODUCT ORIENTATIONS



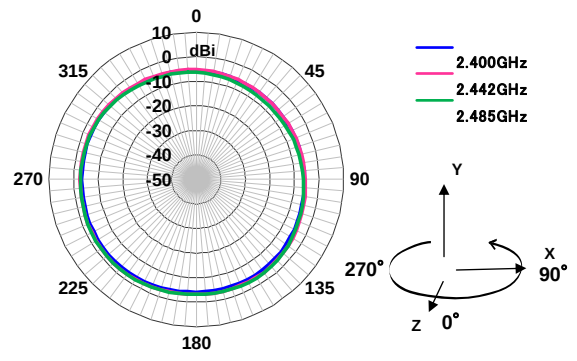
## X-Y PLANE



**Total Power**

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -5.4     | -4.7     | -4.9     |
| Maximum[dBi] | -1.8     | -1.1     | -1.2     |
| Minimum[dBi] | -13.9    | -12.9    | -12.7    |

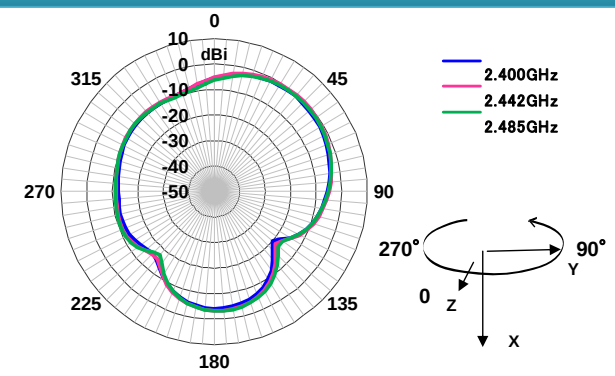
## X-Z PLANE



**Total Power**

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -4.4     | -3.7     | -4.1     |
| Maximum[dBi] | -2.9     | -2.1     | -1.9     |
| Minimum[dBi] | -6.4     | -6.3     | -7.9     |

## Y-Z PLANE



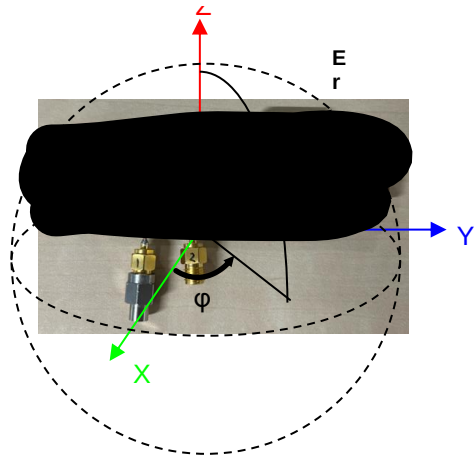
**Total Power**

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -6.0     | -5.4     | -5.7     |
| Maximum[dBi] | -0.8     | -0.2     | -0.5     |
| Minimum[dBi] | -19.9    | -18.5    | -17.2    |

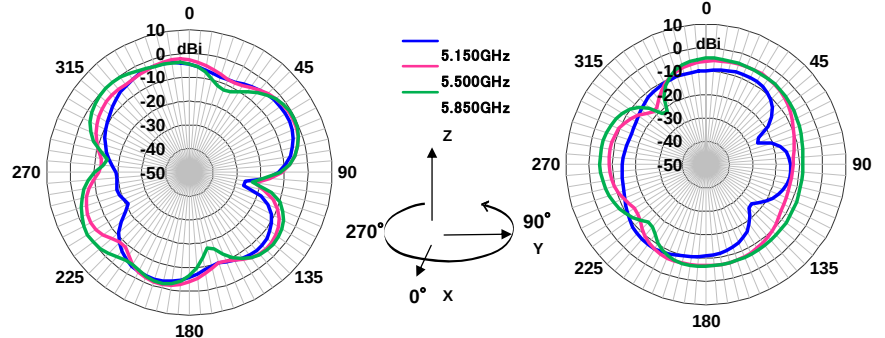
# Radiation Pattern (5GHz Band)

initial\_P2

## PRODUCT ORIENTATIONS



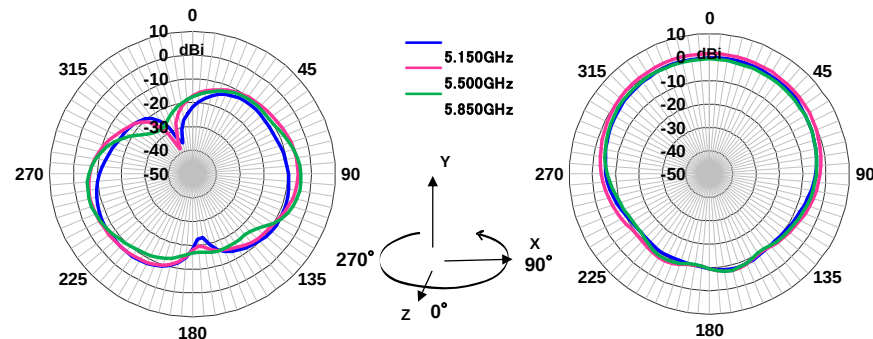
## X-Y PLANE



| Horizontal Polarization |          |          |          |
|-------------------------|----------|----------|----------|
|                         | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi]            | -6.5     | -4.8     | -3.9     |
| Maximum[dBi]            | -2.5     | -0.8     | 0.1      |
| Minimum[dBi]            | -26.6    | -22.0    | -23.3    |

| Vertical Polarization |          |          |          |
|-----------------------|----------|----------|----------|
|                       | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi]          | -11.7    | -8.3     | -6.9     |
| Maximum[dBi]          | -7.8     | -4.4     | -4.3     |
| Minimum[dBi]          | -25.9    | -18.1    | -21.9    |

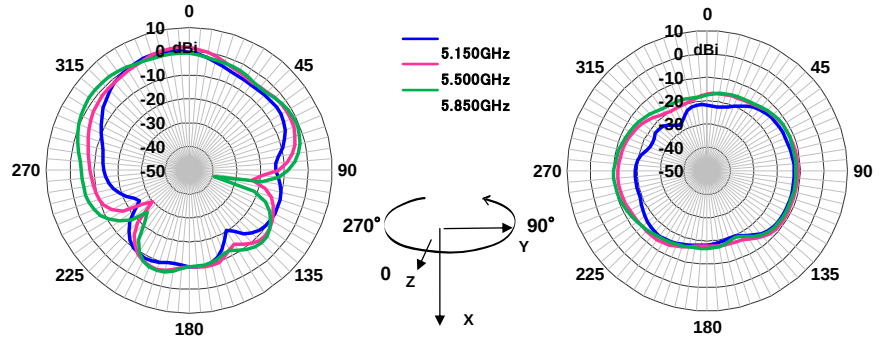
## X-Z PLANE



| Horizontal Polarization |          |          |          |
|-------------------------|----------|----------|----------|
|                         | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi]            | -11.2    | -9.5     | -9.8     |
| Maximum[dBi]            | -7.0     | -5.7     | -4.3     |
| Minimum[dBi]            | -36.2    | -38.2    | -27.3    |

| Vertical Polarization |          |          |          |
|-----------------------|----------|----------|----------|
|                       | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi]          | -3.78    | -1.94    | -3.92    |
| Maximum[dBi]          | -0.07    | 1.67     | -0.76    |
| Minimum[dBi]          | -11.42   | -10.60   | -11.64   |

## Y-Z PLANE



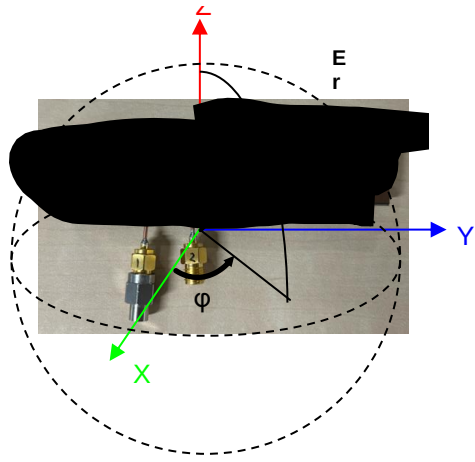
| Horizontal Polarization |          |          |          |
|-------------------------|----------|----------|----------|
|                         | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi]            | -5.8     | -4.3     | -3.3     |
| Maximum[dBi]            | 1.0      | 1.9      | 2.1      |
| Minimum[dBi]            | -25.4    | -29.8    | -39.4    |

| Vertical Polarization |          |          |          |
|-----------------------|----------|----------|----------|
|                       | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi]          | -16.5    | -13.7    | -13.5    |
| Maximum[dBi]          | -12.4    | -11.0    | -9.9     |
| Minimum[dBi]          | -27.1    | -20.2    | -19.0    |

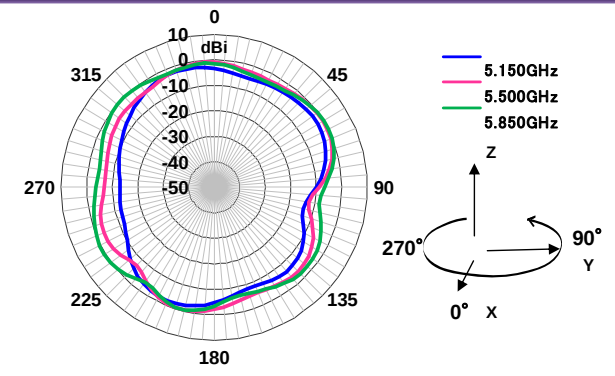
# Total Power (5GHz Band)

initial\_P2

PRODUCT ORIENTATIONS

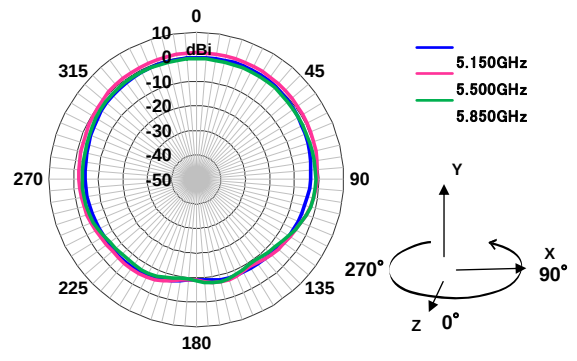


X-Y PLANE



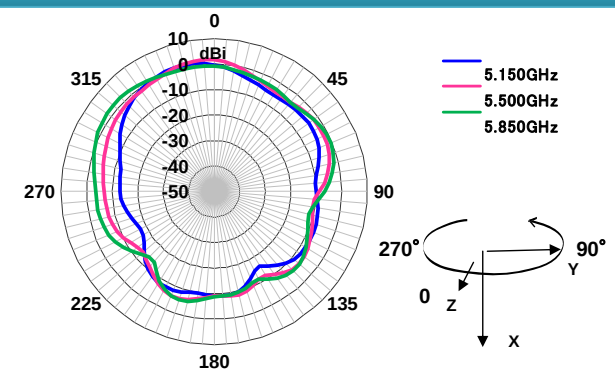
| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi] | -5.3     | -3.2     | -2.1     |
| Maximum[dBi] | -1.7     | 0.0      | 0.5      |
| Minimum[dBi] | -14.1    | -12.5    | -8.3     |

X-Z PLANE



| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi] | -3.1     | -1.2     | -2.9     |
| Maximum[dBi] | 0.1      | 1.8      | -0.7     |
| Minimum[dBi] | -9.0     | -9.1     | -9.4     |

Y-Z PLANE

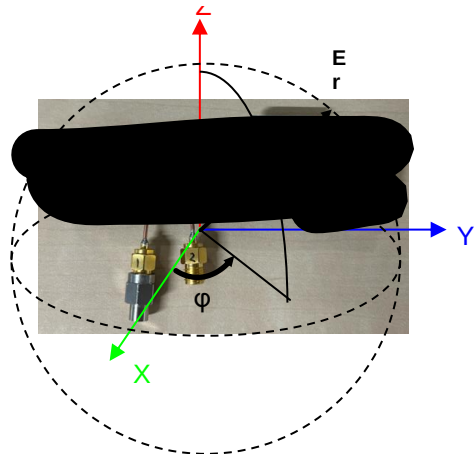


| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi] | -5.4     | -3.8     | -2.9     |
| Maximum[dBi] | 1.1      | 1.9      | 2.2      |
| Minimum[dBi] | -17.5    | -13.2    | -13.7    |

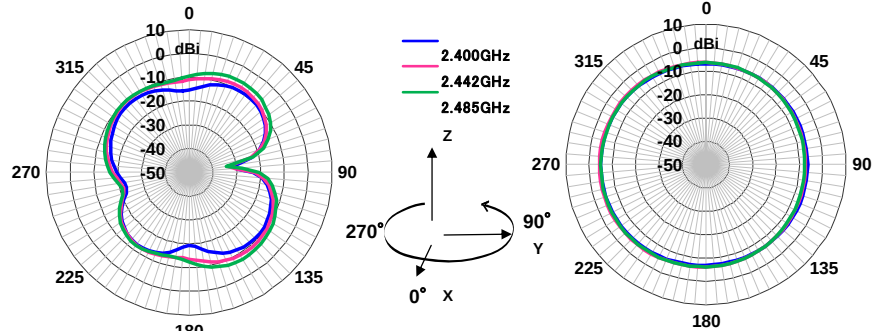
# Radiation Pattern (2.4GHz Band)

tuned\_P1

■ PRODUCT ORIENTATIONS



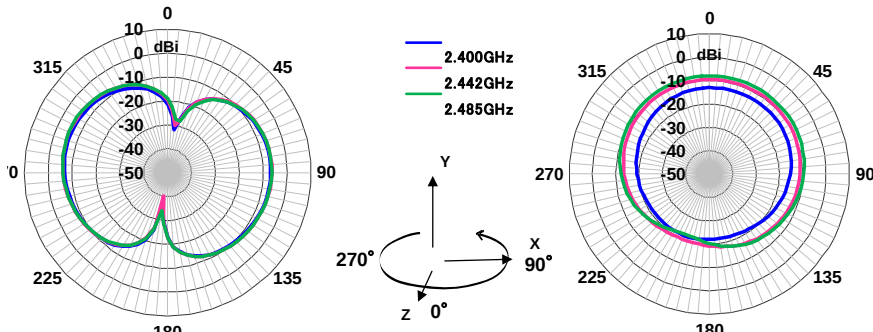
■ X-Y PLANE



|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -13.5    | -11.7    | -10.3    |
| Maximum[dBi] | -9.5     | -8.2     | -6.0     |
| Minimum[dBi] | -30.7    | -33.6    | -34.1    |

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -6.1     | -5.8     | -6.1     |
| Maximum[dBi] | -5.0     | -4.4     | -4.8     |
| Minimum[dBi] | -7.0     | -7.2     | -7.6     |

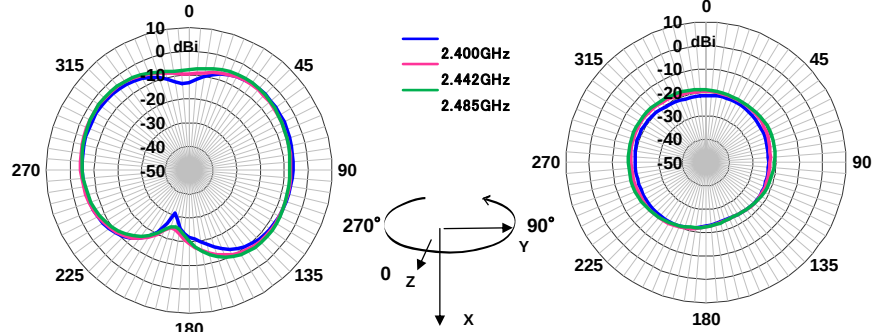
■ X-Z PLANE



|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -9.6     | -8.9     | -9.0     |
| Maximum[dBi] | -6.3     | -5.5     | -5.3     |
| Minimum[dBi] | -37.0    | -40.3    | -34.1    |

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -16.10   | -12.06   | -10.65   |
| Maximum[dBi] | -12.83   | -9.35    | -7.83    |
| Minimum[dBi] | -22.12   | -19.98   | -22.25   |

■ Y-Z PLANE



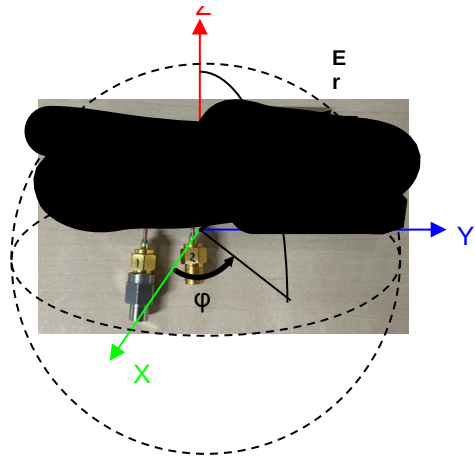
|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -7.3     | -6.8     | -6.7     |
| Maximum[dBi] | -4.2     | -3.1     | -3.0     |
| Minimum[dBi] | -31.3    | -24.5    | -25.7    |

|              | 2.400GHz | 2.442GHz | 2.485GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -21.2    | -19.8    | -19.1    |
| Maximum[dBi] | -19.1    | -17.3    | -16.5    |
| Minimum[dBi] | -24.1    | -24.0    | -24.0    |

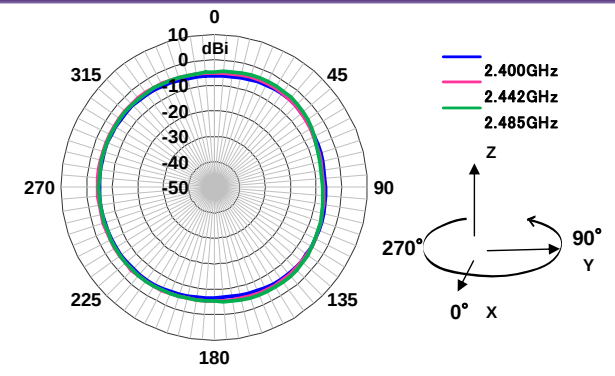
# Total Power (2.4GHz Band)

tuned\_P1

## PRODUCT ORIENTATIONS

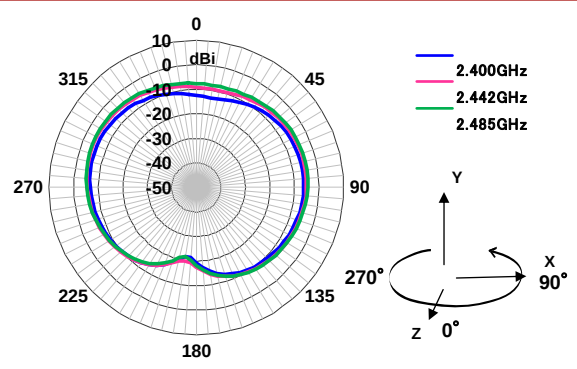


## X-Y PLANE



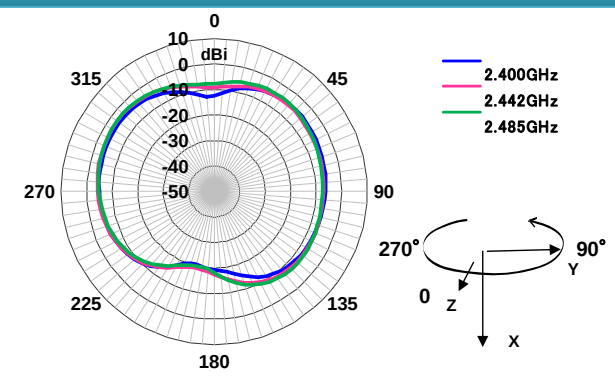
| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 2.400GHz | 2.442GHz | 2.485GHz |
| Average[dBi] | -5.4     | -4.8     | -4.7     |
| Maximum[dBi] | -4.6     | -3.9     | -3.3     |
| Minimum[dBi] | -6.7     | -7.2     | -7.5     |

## X-Z PLANE



| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 2.400GHz | 2.442GHz | 2.485GHz |
| Average[dBi] | -8.7     | -7.2     | -6.7     |
| Maximum[dBi] | -6.0     | -4.5     | -4.0     |
| Minimum[dBi] | -21.7    | -19.7    | -21.3    |

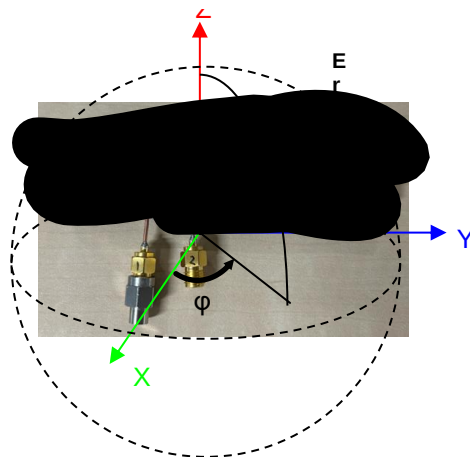
## Y-Z PLANE



| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 2.400GHz | 2.442GHz | 2.485GHz |
| Average[dBi] | -7.1     | -6.6     | -6.5     |
| Maximum[dBi] | -4.0     | -3.0     | -2.9     |
| Minimum[dBi] | -20.6    | -19.3    | -20.1    |

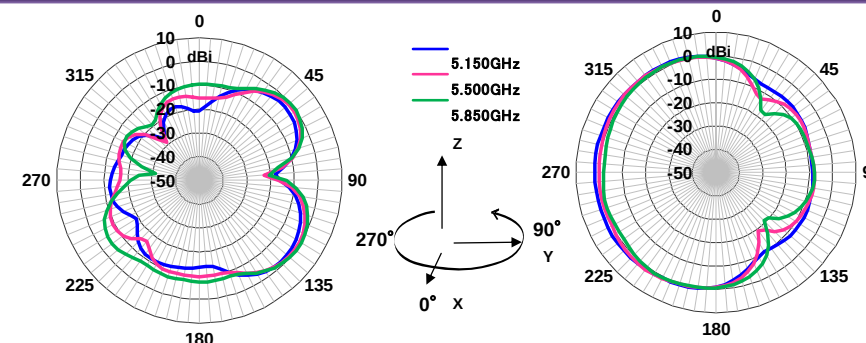
# Radiation Pattern (5GHz Band)

## PRODUCT ORIENTATIONS



tuned\_P1

## X-Y PLANE



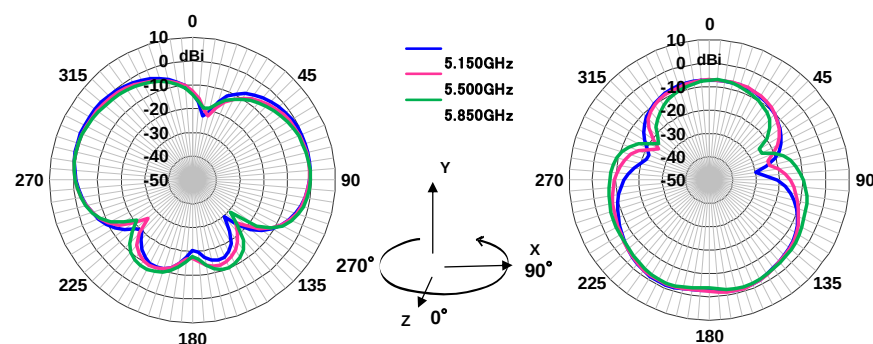
### Horizontal Polarization

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -8.0     | -6.8     | -5.5     |
| Maximum[dBi] | -1.5     | -0.5     | 0.2      |
| Minimum[dBi] | -27.0    | -29.1    | -31.5    |

### Vertical Polarization

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -1.0     | -1.7     | -2.4     |
| Maximum[dBi] | 2.0      | 1.4      | 0.7      |
| Minimum[dBi] | -10.2    | -19.1    | -21.0    |

## X-Z PLANE



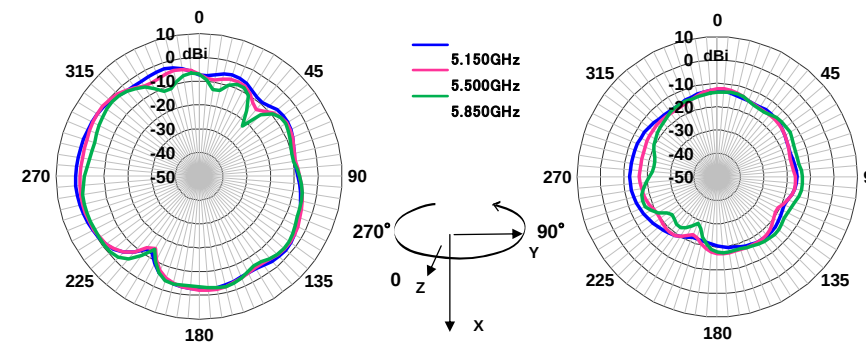
### Horizontal Polarization

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -4.0     | -4.6     | -4.7     |
| Maximum[dBi] | 0.9      | 0.4      | 0.4      |
| Minimum[dBi] | -29.6    | -25.2    | -28.9    |

### Vertical Polarization

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -6.18    | -6.03    | -6.23    |
| Maximum[dBi] | -1.36    | -1.25    | -1.99    |
| Minimum[dBi] | -29.79   | -24.41   | -24.81   |

## Y-Z PLANE



### Horizontal Polarization

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -2.7     | -3.4     | -4.4     |
| Maximum[dBi] | 2.0      | 0.5      | -0.2     |
| Minimum[dBi] | -12.3    | -14.6    | -22.2    |

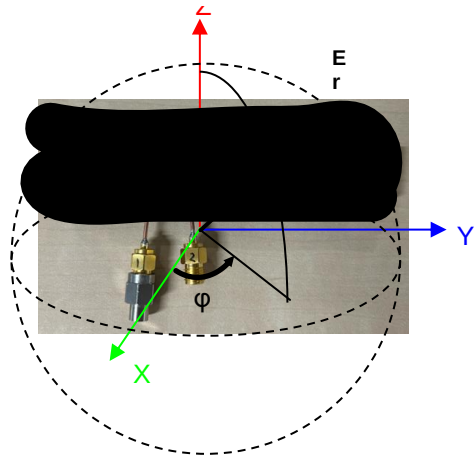
### Vertical Polarization

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -15.4    | -16.5    | -16.2    |
| Maximum[dBi] | -12.6    | -12.3    | -13.3    |
| Minimum[dBi] | -22.2    | -23.1    | -28.4    |

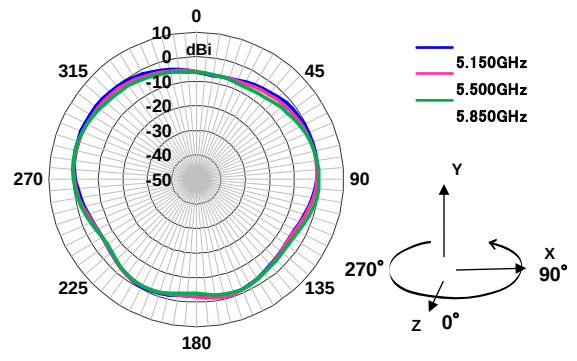
# Total Power (5GHz Band)

tuned\_P1

## PRODUCT ORIENTATIONS

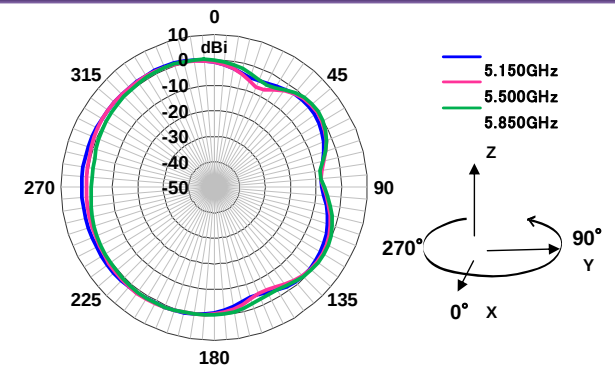


## X-Z PLANE



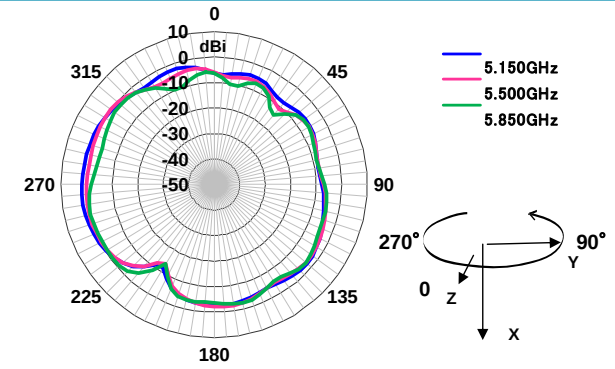
| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi] | -2.0     | -2.2     | -2.4     |
| Maximum[dBi] | 1.0      | 0.6      | 0.8      |
| Minimum[dBi] | -7.1     | -6.9     | -7.4     |

## X-Y PLANE



| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi] | -0.2     | -0.5     | -0.7     |
| Maximum[dBi] | 2.1      | 1.5      | 1.0      |
| Minimum[dBi] | -8.2     | -7.8     | -7.9     |

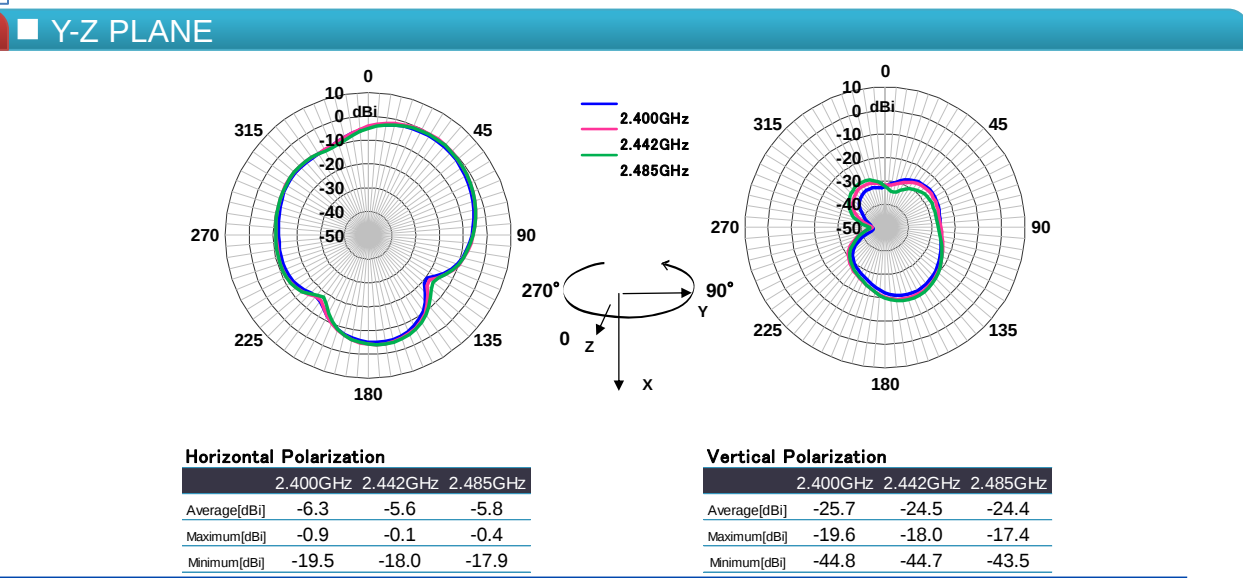
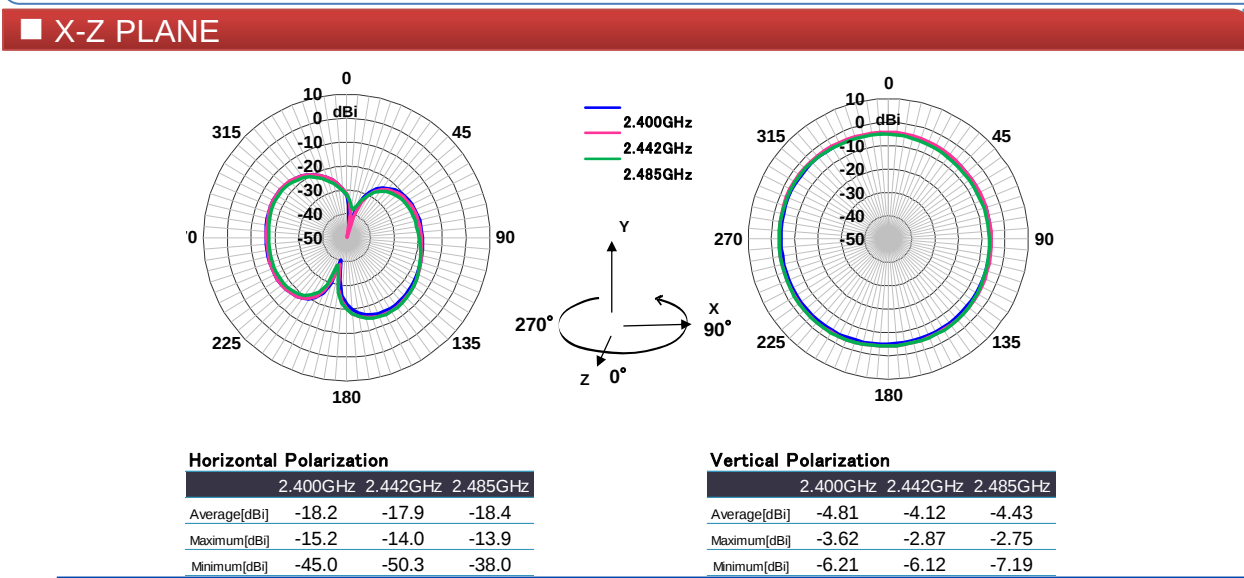
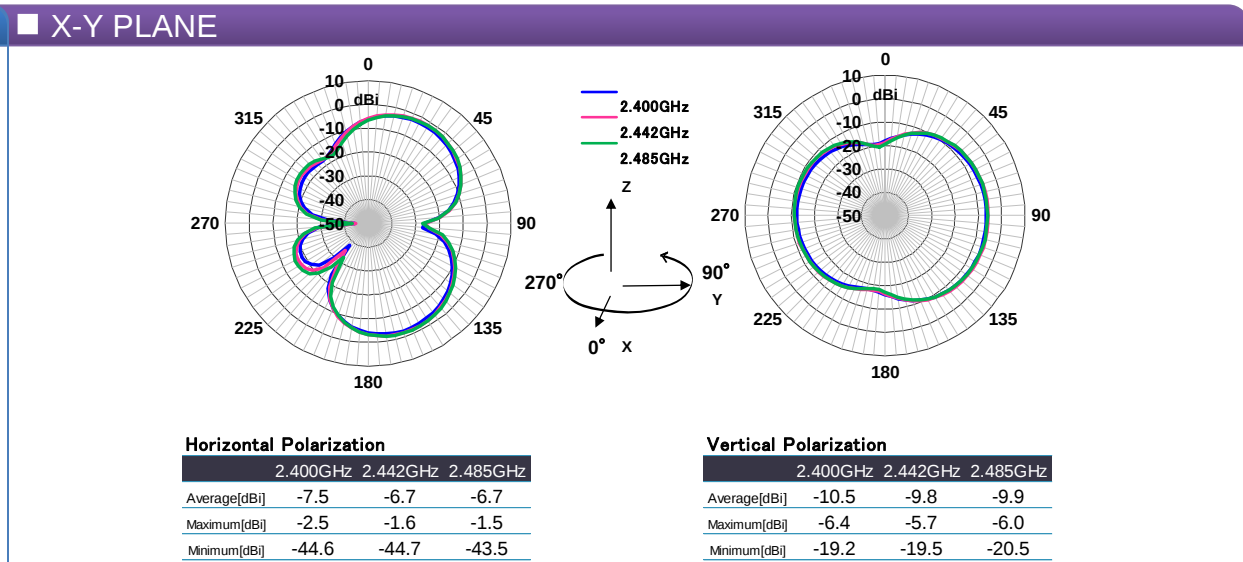
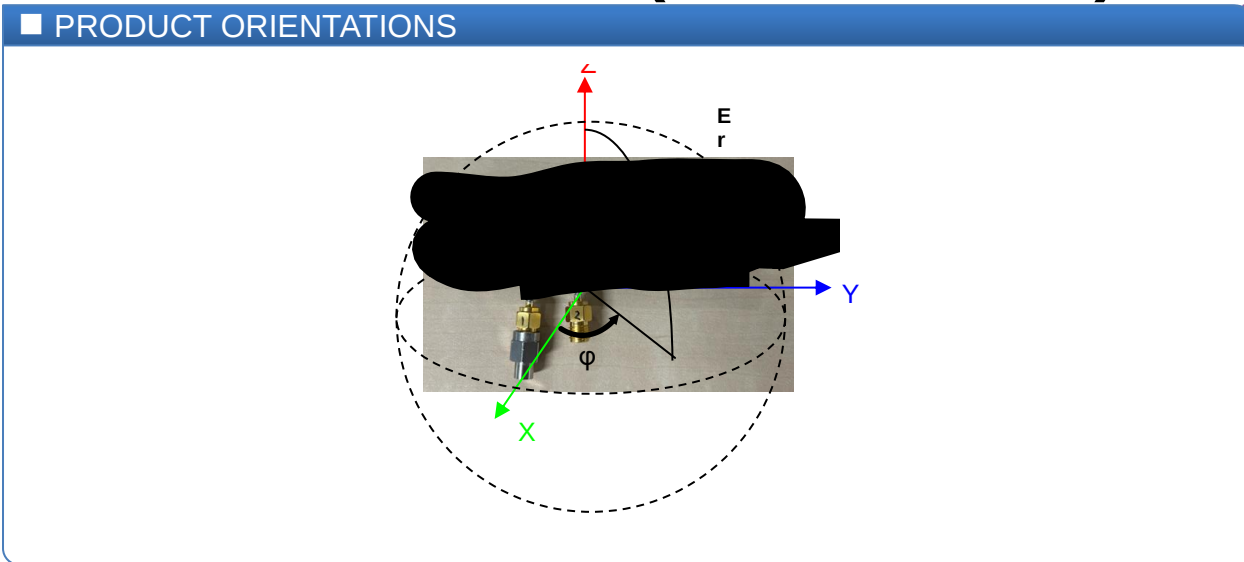
## Y-Z PLANE



| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 5.150GHz | 5.500GHz | 5.850GHz |
| Average[dBi] | -2.5     | -3.2     | -4.1     |
| Maximum[dBi] | 2.2      | 0.5      | -0.1     |
| Minimum[dBi] | -11.7    | -13.6    | -14.2    |

# Radiation Pattern (2.4GHz Band)

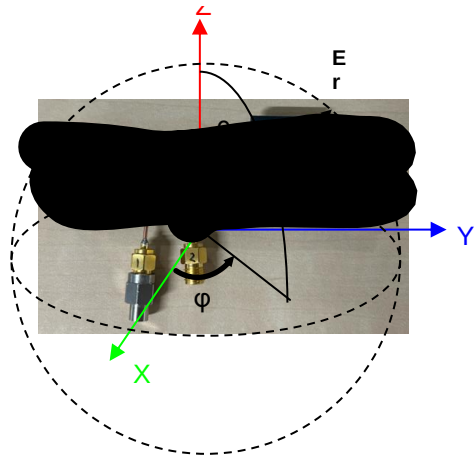
tuned\_P2



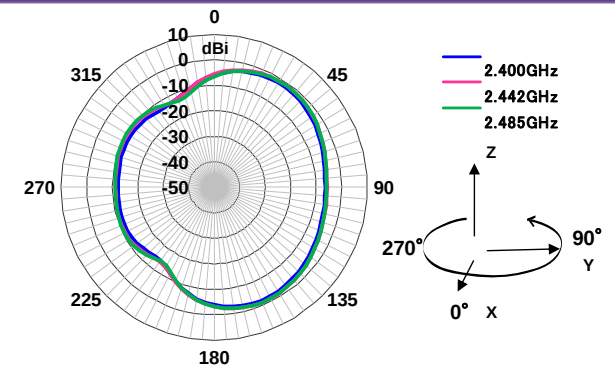
# Total Power (2.4GHz Band)

tuned\_P2

## PRODUCT ORIENTATIONS

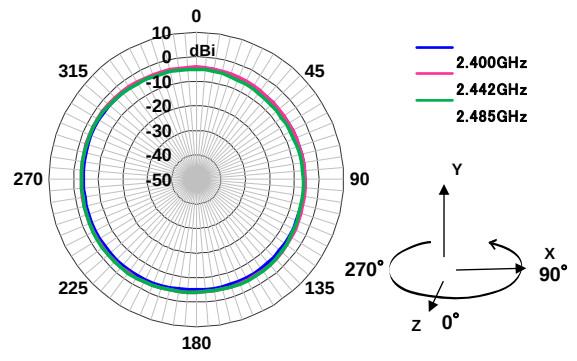


## X-Y PLANE



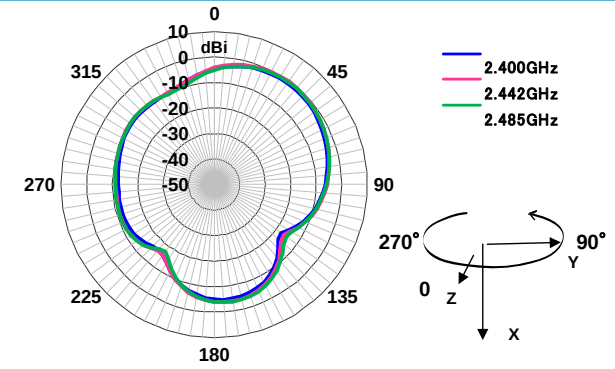
| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 2.400GHz | 2.442GHz | 2.485GHz |
| Average[dBi] | -5.7     | -5.0     | -5.0     |
| Maximum[dBi] | -1.9     | -1.1     | -1.0     |
| Minimum[dBi] | -14.5    | -13.9    | -14.1    |

## X-Z PLANE



| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 2.400GHz | 2.442GHz | 2.485GHz |
| Average[dBi] | -4.6     | -3.9     | -4.3     |
| Maximum[dBi] | -3.3     | -2.6     | -2.6     |
| Minimum[dBi] | -6.0     | -5.9     | -7.1     |

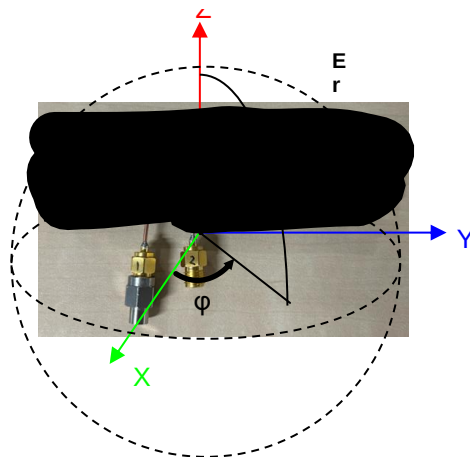
## Y-Z PLANE



| Total Power  |          |          |          |
|--------------|----------|----------|----------|
|              | 2.400GHz | 2.442GHz | 2.485GHz |
| Average[dBi] | -6.2     | -5.5     | -5.7     |
| Maximum[dBi] | -0.9     | -0.1     | -0.4     |
| Minimum[dBi] | -17.6    | -16.2    | -17.4    |

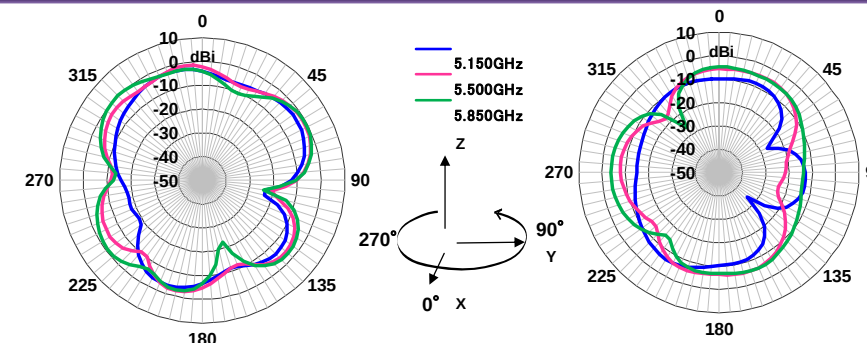
# Radiation Pattern (5GHz Band)

## PRODUCT ORIENTATIONS



## tuned\_P2

## X-Y PLANE



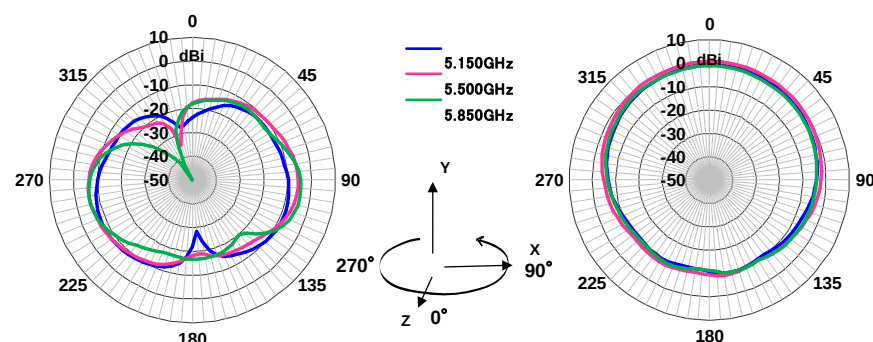
### Horizontal Polarization

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -6.5     | -4.7     | -3.8     |
| Maximum[dBi] | -2.5     | -0.7     | 0.3      |
| Minimum[dBi] | -23.2    | -20.7    | -24.0    |

### Vertical Polarization

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -11.1    | -8.5     | -7.2     |
| Maximum[dBi] | -6.5     | -4.8     | -3.8     |
| Minimum[dBi] | -33.9    | -23.8    | -26.3    |

## X-Z PLANE



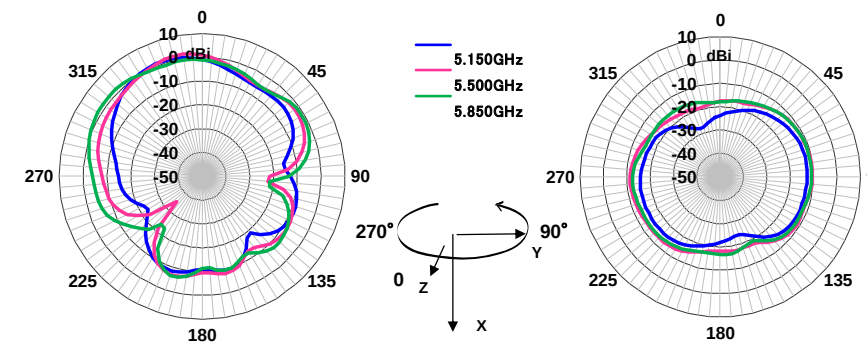
### Horizontal Polarization

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -11.7    | -10.1    | -10.6    |
| Maximum[dBi] | -7.7     | -5.5     | -4.2     |
| Minimum[dBi] | -28.3    | -34.5    | -50.9    |

### Vertical Polarization

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -4.27    | -2.52    | -4.20    |
| Maximum[dBi] | -0.82    | 0.99     | -0.95    |
| Minimum[dBi] | -11.69   | -9.97    | -11.72   |

## Y-Z PLANE



### Horizontal Polarization

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -5.8     | -4.4     | -3.5     |
| Maximum[dBi] | 1.2      | 1.9      | 1.7      |
| Minimum[dBi] | -23.2    | -34.8    | -23.6    |

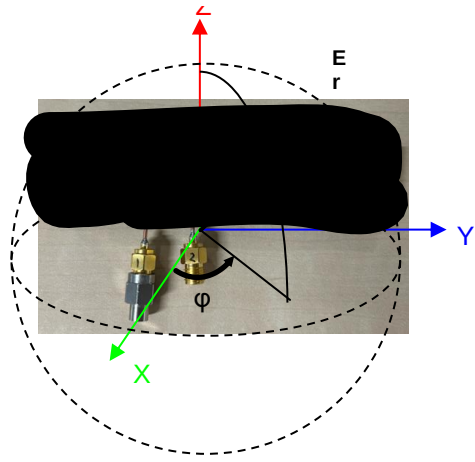
### Vertical Polarization

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -16.4    | -13.5    | -13.8    |
| Maximum[dBi] | -12.5    | -10.3    | -10.7    |
| Minimum[dBi] | -27.6    | -19.1    | -19.1    |

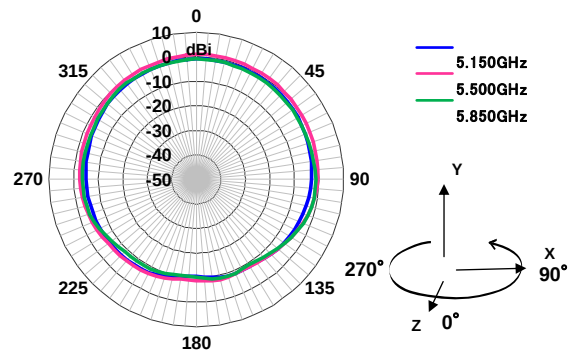
# Total Power (5GHz Band)

tuned\_P2

## PRODUCT ORIENTATIONS



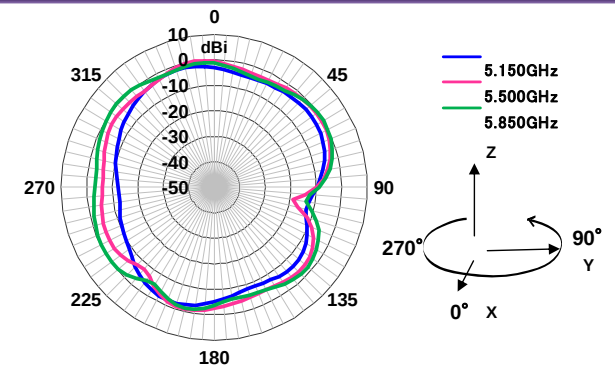
## X-Z PLANE



**Total Power**

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -3.5     | -1.8     | -3.3     |
| Maximum[dBi] | -0.8     | 1.1      | -0.9     |
| Minimum[dBi] | -10.5    | -9.0     | -10.5    |

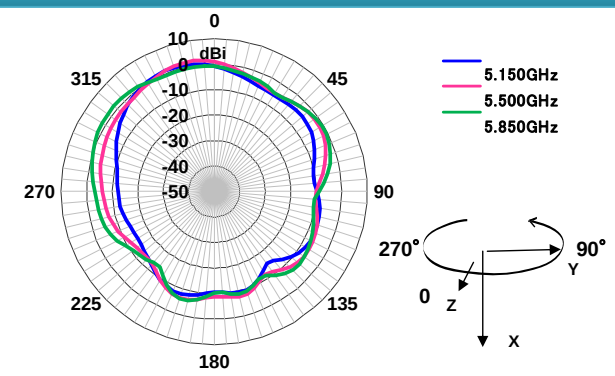
## X-Y PLANE



**Total Power**

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -5.2     | -3.2     | -2.2     |
| Maximum[dBi] | -1.7     | 0.0      | 0.4      |
| Minimum[dBi] | -12.8    | -18.7    | -13.6    |

## Y-Z PLANE



**Total Power**

|              | 5.150GHz | 5.500GHz | 5.850GHz |
|--------------|----------|----------|----------|
| Average[dBi] | -5.4     | -3.9     | -3.1     |
| Maximum[dBi] | 1.2      | 1.9      | 1.8      |
| Minimum[dBi] | -15.0    | -13.0    | -13.6    |

