



Attracting Tomorrow

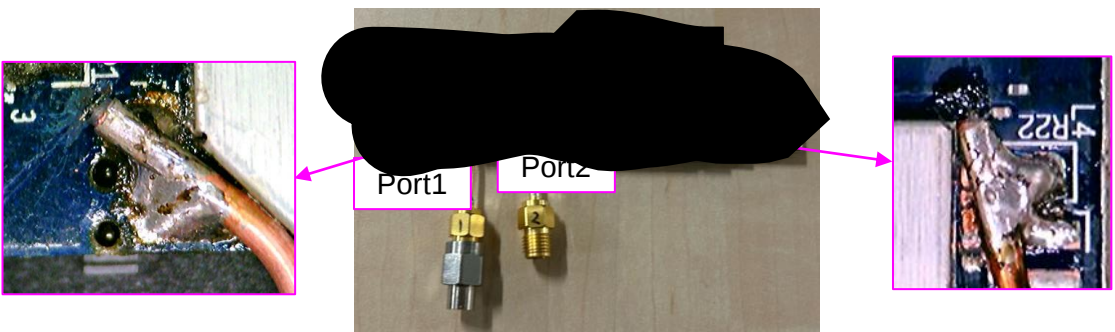


Antenna Measurement

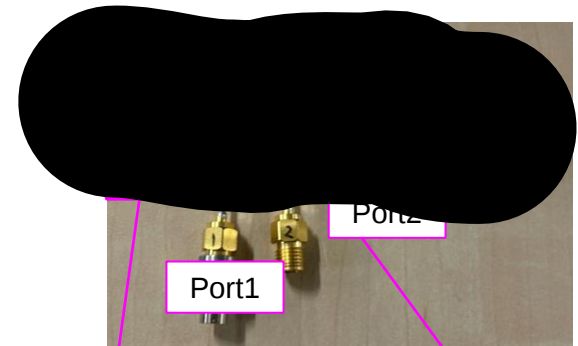
Measurement Setup

► MEASUREMENT SETUP

Cable setup



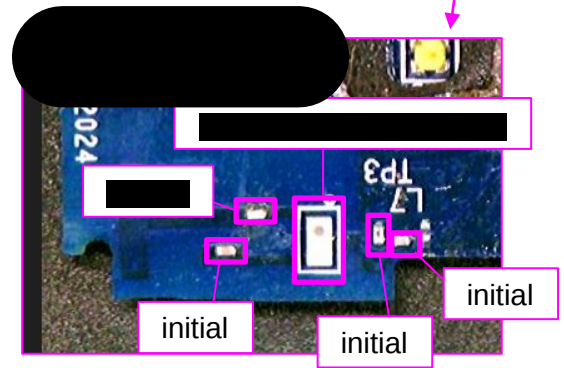
Element value after tuning



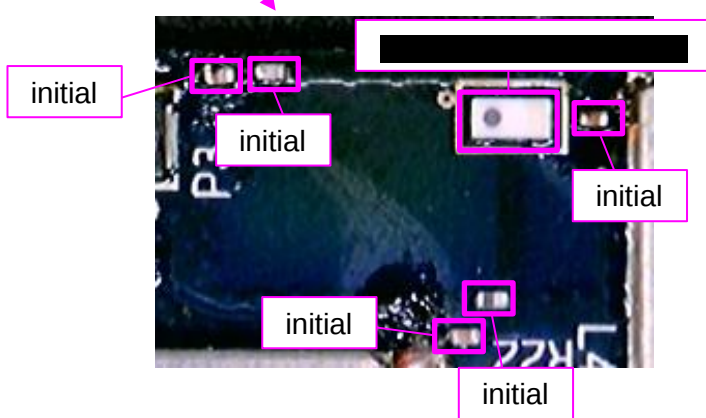
Measurement setup



Port1

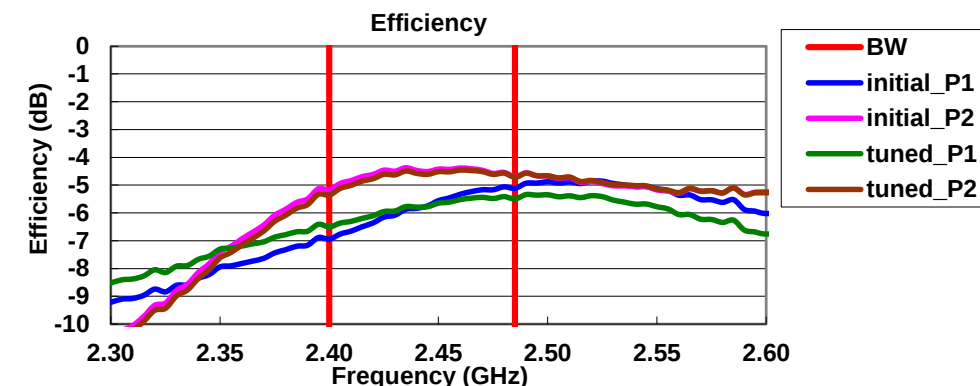
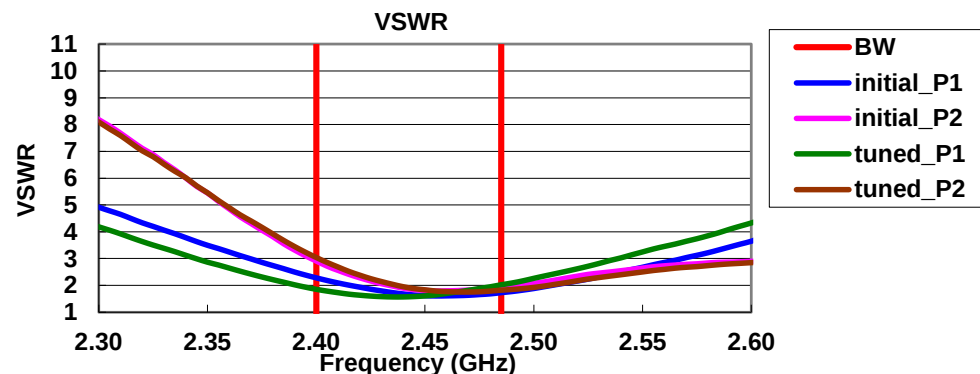


Port2

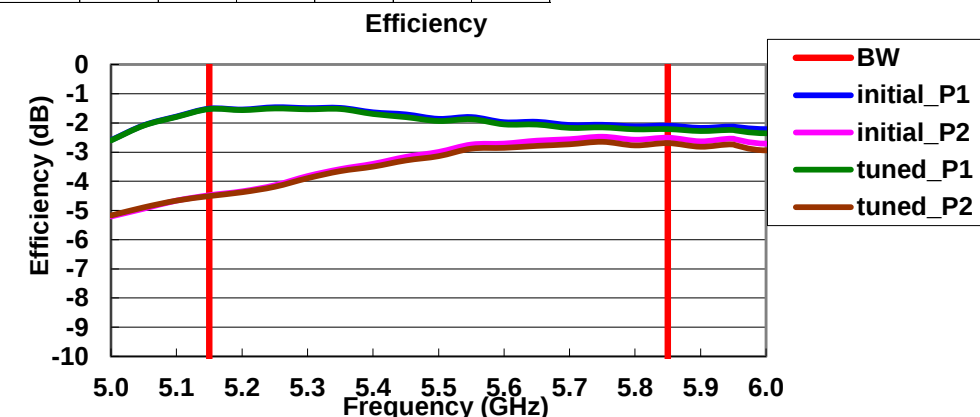
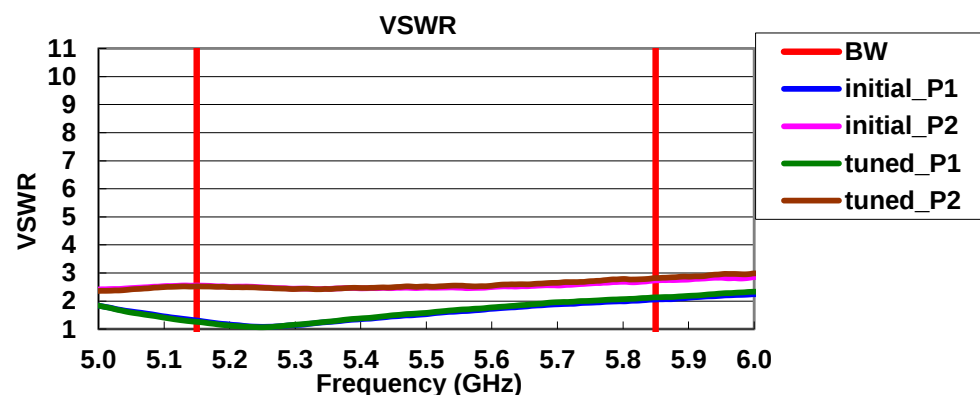


Measurement Results

► VSWR & Efficiency



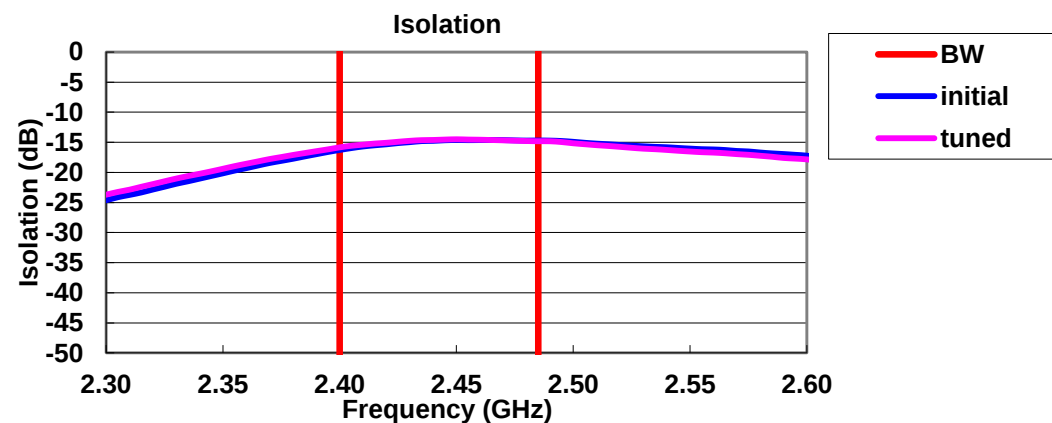
	initial_P1			initial_P2			tuned_P1			tuned_P2		
Frequency[GHz]	2.4	2.442	2.485	2.4	2.442	2.485	2.4	2.442	2.485	2.4	2.442	2.485
VSWR	2.28	1.68	1.72	2.90	1.89	1.94	1.85	1.56	2.02	3.04	1.95	1.83
Efficiency[dB]	-6.94	-5.83	-5.12	-5.17	-4.47	-4.70	-6.50	-5.79	-5.50	-5.35	-4.58	-4.72



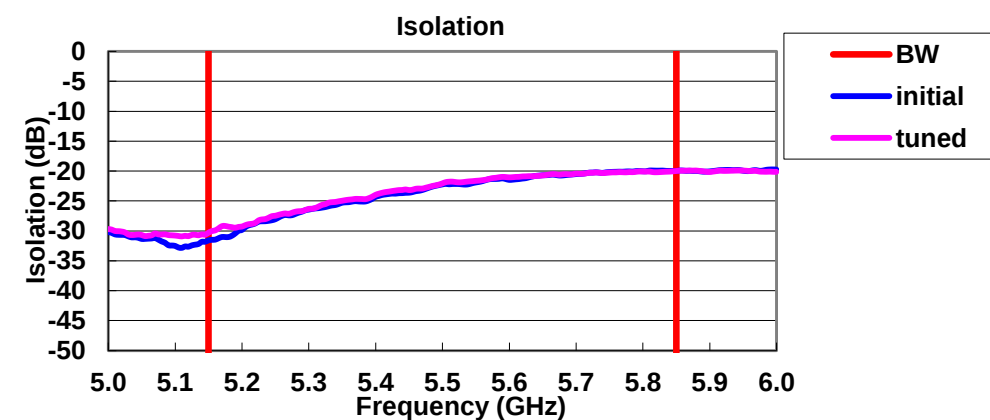
	initial_P1			initial_P2			tuned_P1			tuned_P2		
Frequency[GHz]	5.15	5.5	5.85	5.15	5.5	5.85	5.15	5.5	5.85	5.15	5.5	5.85
VSWR	1.30	1.53	2.05	2.55	2.48	2.73	1.26	1.57	2.13	2.52	2.52	2.82
Efficiency[dB]	-1.51	-1.86	-2.09	-4.47	-2.99	-2.50	-1.52	-1.93	-2.20	-4.51	-3.14	-2.69

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.

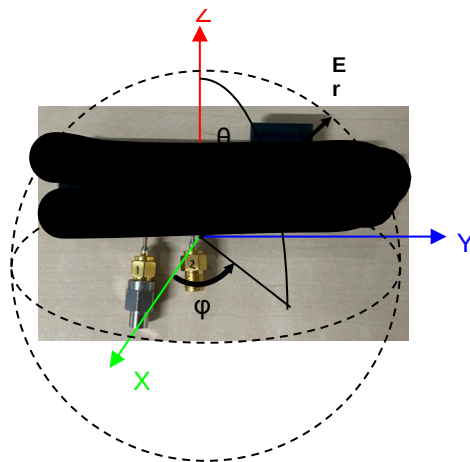
Now “antenna simulation tool” is published on TDK Web site. Please give it a try.

- Selection Guide 
-  
-  
-  

Radiation Pattern

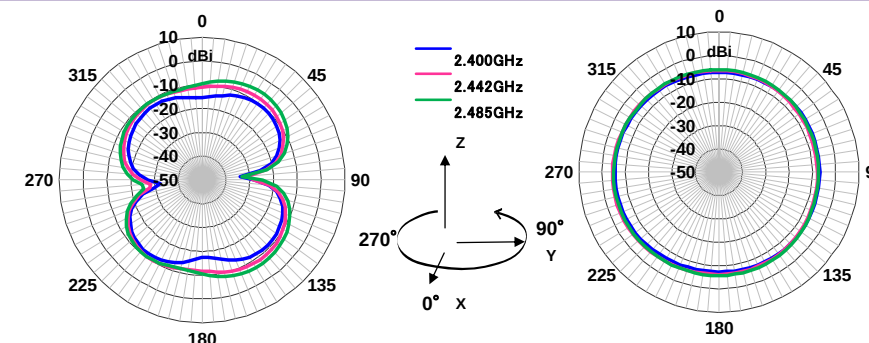
Radiation Pattern (2.4GHz Band)

PRODUCT ORIENTATIONS



initial_P1

X-Y PLANE



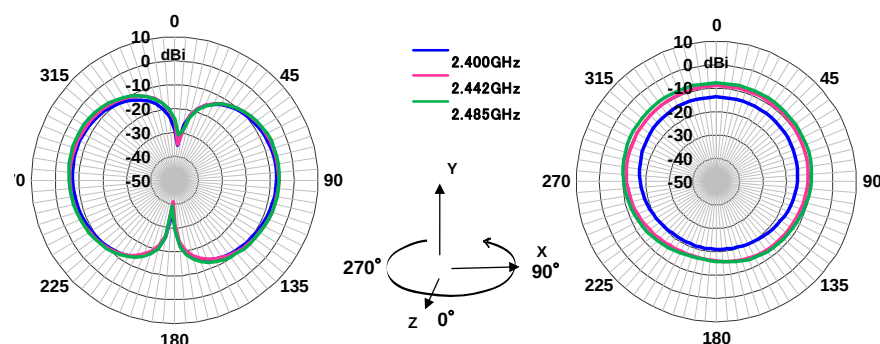
Horizontal Polarization

	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



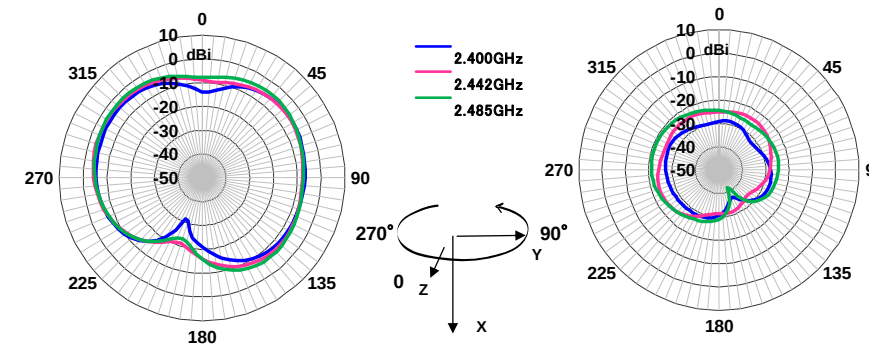
Horizontal Polarization

	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

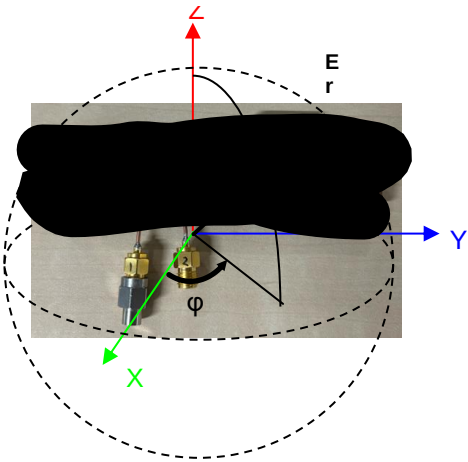
Vertical Polarization

	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

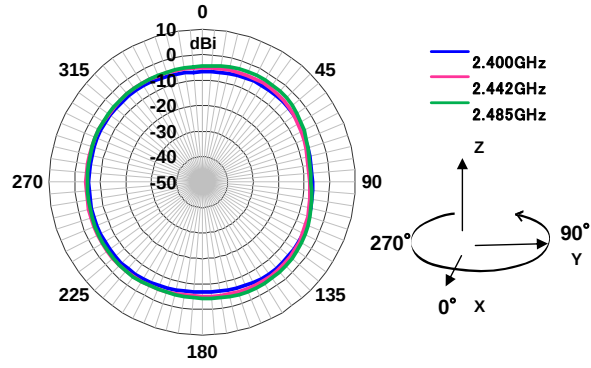
Total Power (2.4GHz Band)

initial_P1

PRODUCT ORIENTATIONS

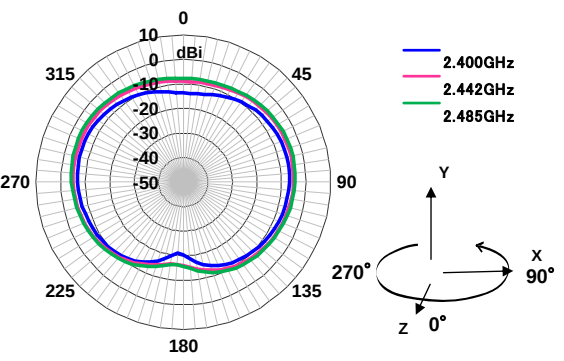


X-Y PLANE



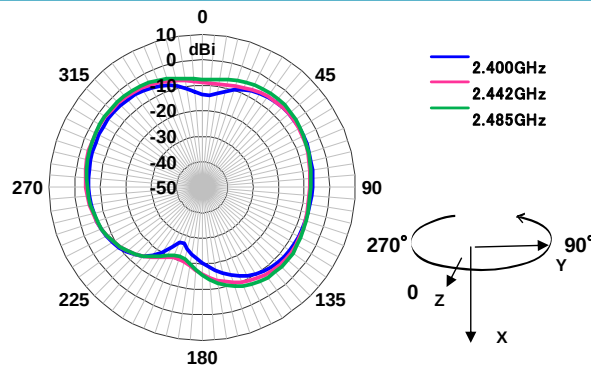
Total Power			
	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-5.8	-4.9	-4.4
Maximum[dBi]	-5.1	-3.9	-2.9
Minimum[dBi]	-6.9	-7.9	-7.4

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

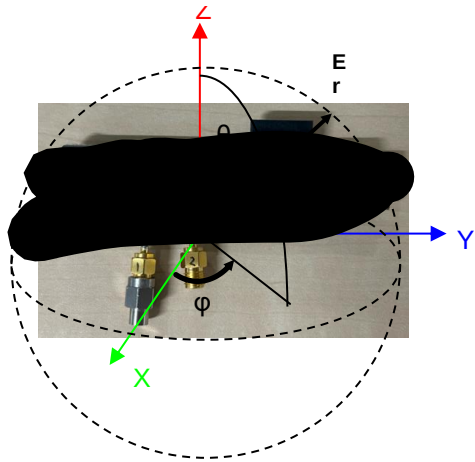
Y-Z PLANE



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

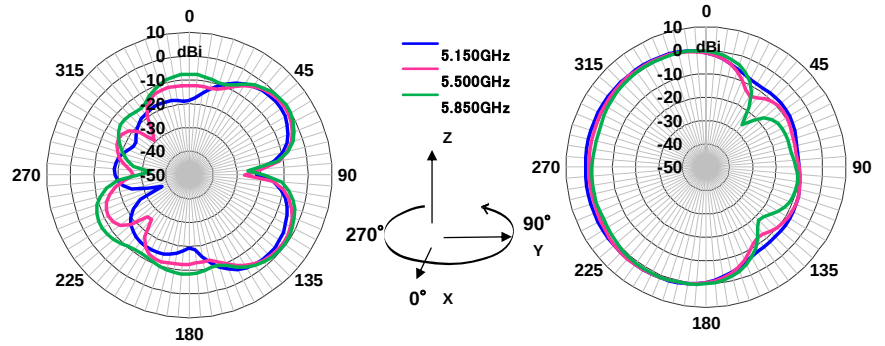
Radiation Pattern (5GHz Band)

PRODUCT ORIENTATIONS



initial_P1

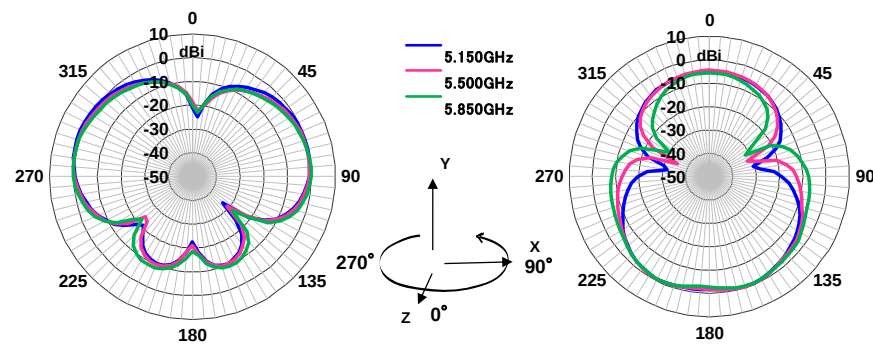
X-Y PLANE



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

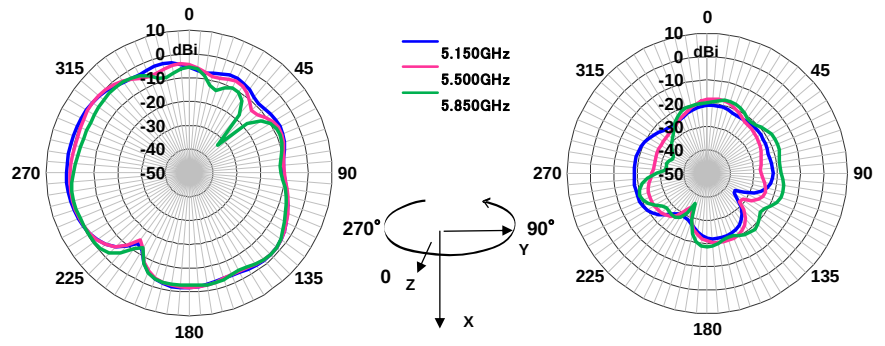
X-Z PLANE



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



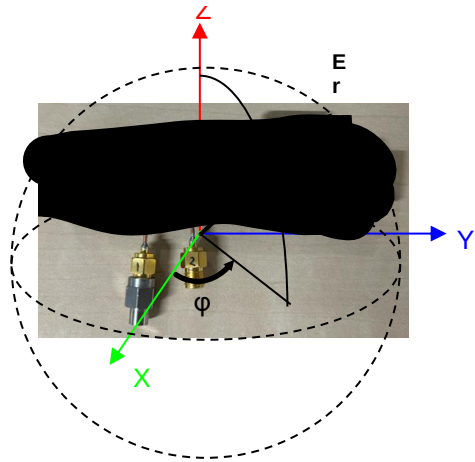
Horizontal Polarization			
	5.150GHz	5.500GHz	5.850GHz
Average[dBi]	-2.6	-3.3	-4.1
Maximum[dBi]	1.6	0.6	0.0
Minimum[dBi]	-13.5	-15.1	-33.3

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

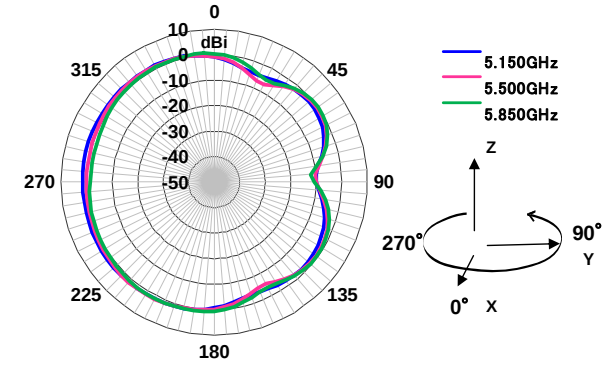
Total Power (5GHz Band)

initial_P1

PRODUCT ORIENTATIONS

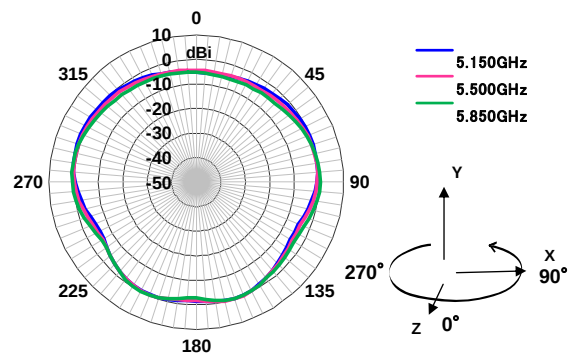


X-Y PLANE



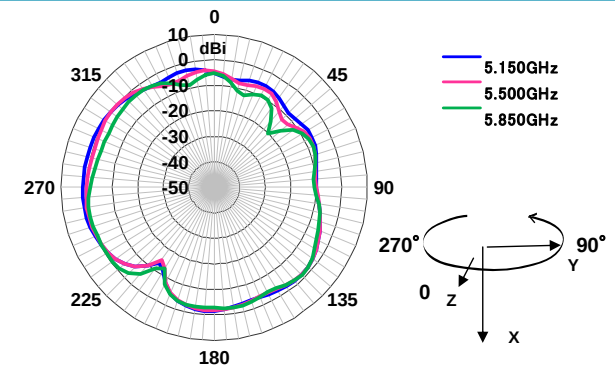
Total Power			
	5.150GHz	5.500GHz	5.850GHz
Average[dBi]	-0.3	-0.6	-0.7
Maximum[dBi]	1.9	1.7	1.3
Minimum[dBi]	-10.0	-10.1	-12.0

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

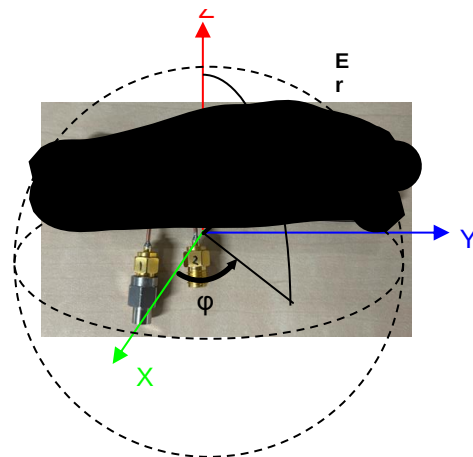
Y-Z PLANE



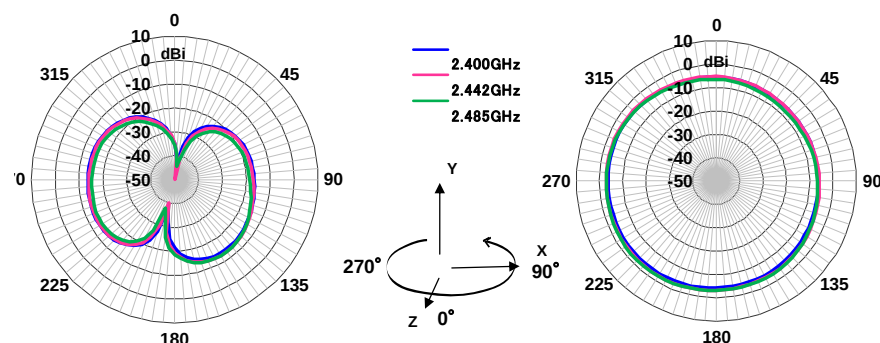
Total Power			
	5.150GHz	5.500GHz	5.850GHz
Average[dBi]	-2.6	-3.2	-4.0
Maximum[dBi]	1.7	0.6	0.0
Minimum[dBi]	-13.3	-14.8	-20.4

Radiation Pattern (2.4GHz Band)

PRODUCT ORIENTATIONS



X-Z PLANE



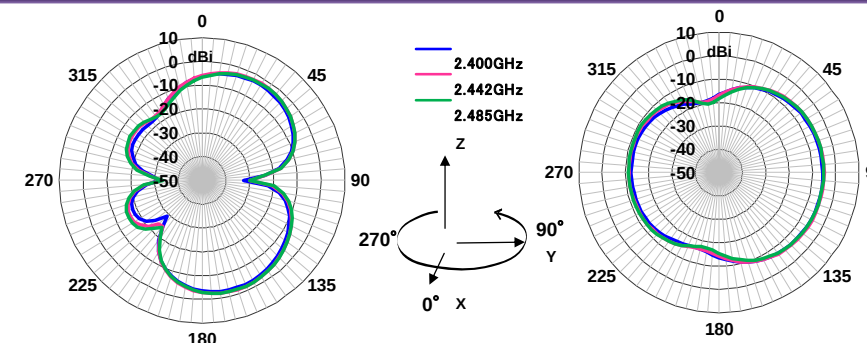
Horizontal Polarization

	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

X-Y PLANE



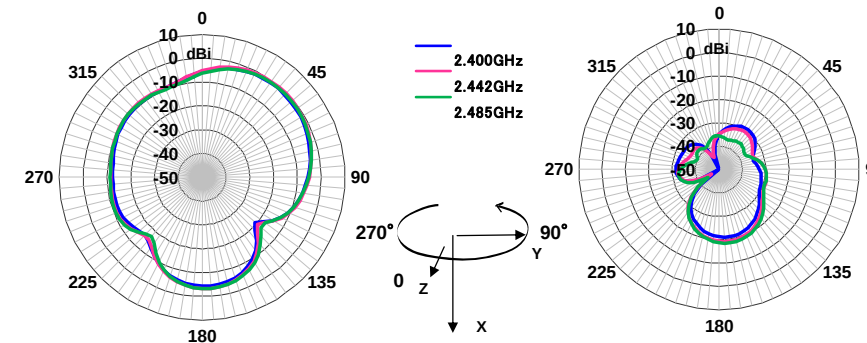
Horizontal Polarization

	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

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

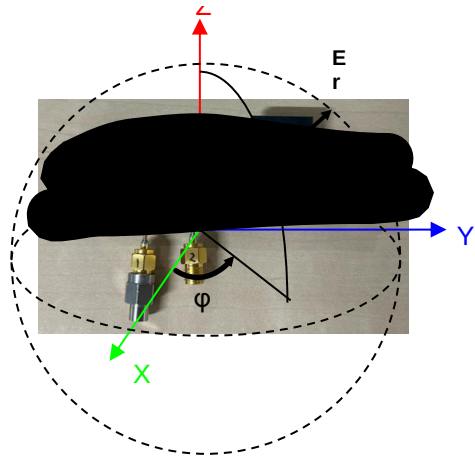
Vertical Polarization

	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

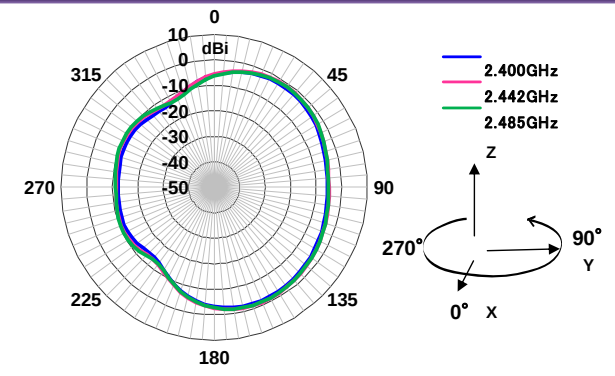
Total Power (2.4GHz Band)

initial_P2

PRODUCT ORIENTATIONS



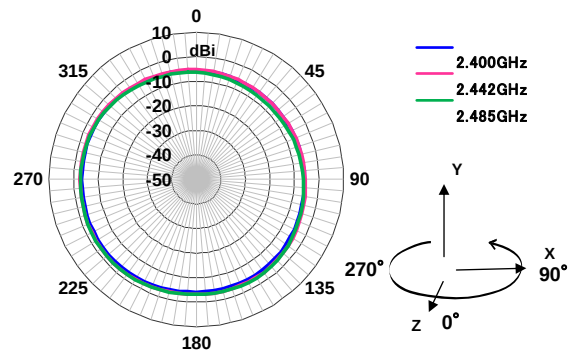
X-Y PLANE



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

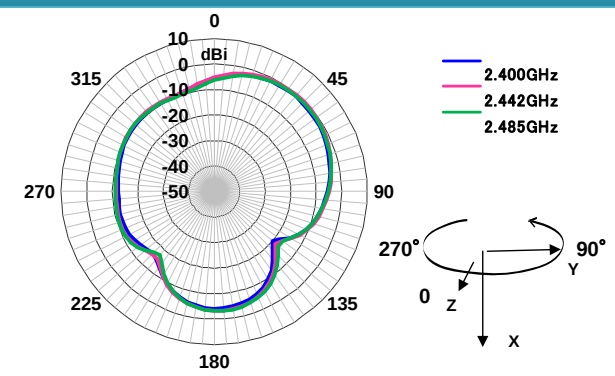
X-Z PLANE



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

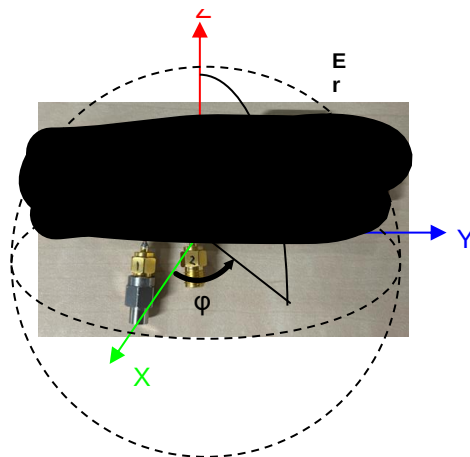


Total Power

	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

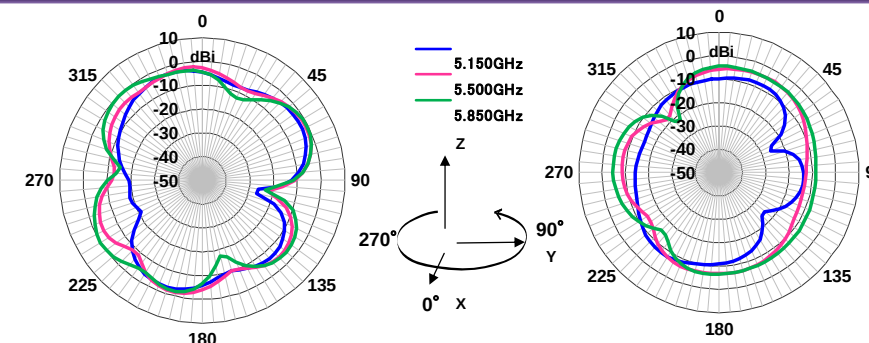
Radiation Pattern (5GHz Band)

PRODUCT ORIENTATIONS



initial_P2

X-Y PLANE



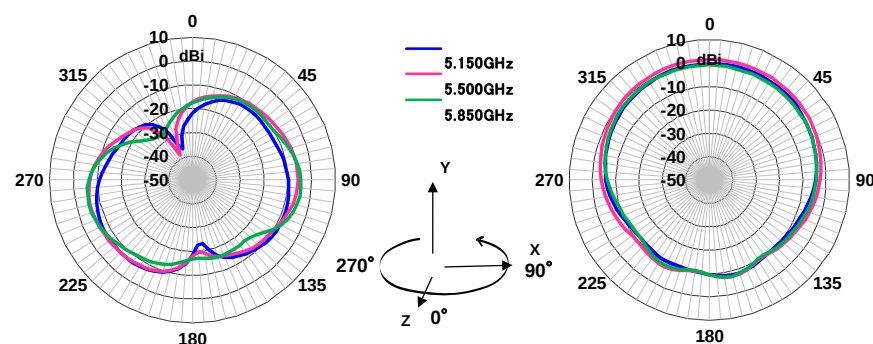
Horizontal Polarization

	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



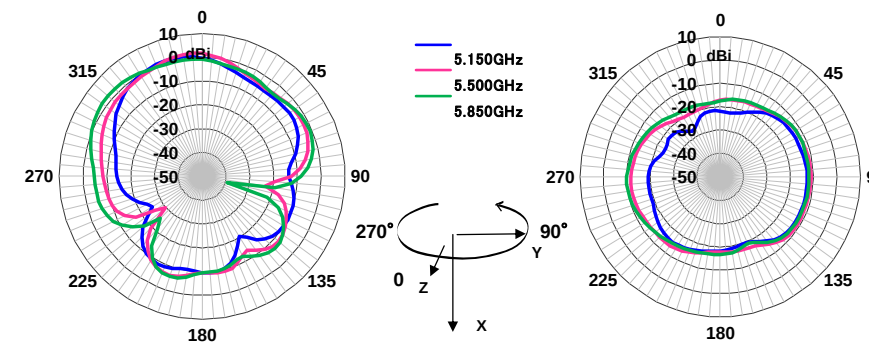
Horizontal Polarization

	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

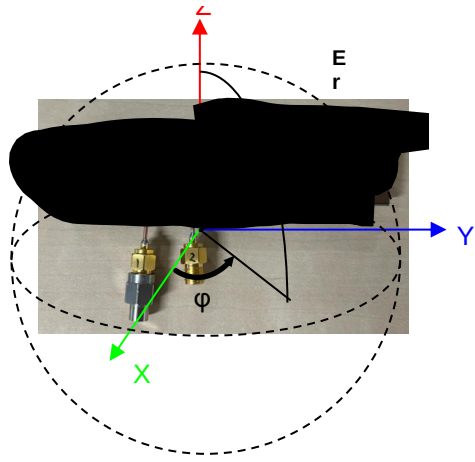
Vertical Polarization

	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

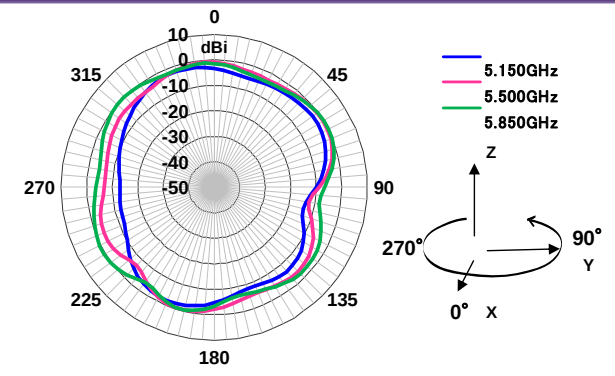
Total Power (5GHz Band)

initial_P2

PRODUCT ORIENTATIONS



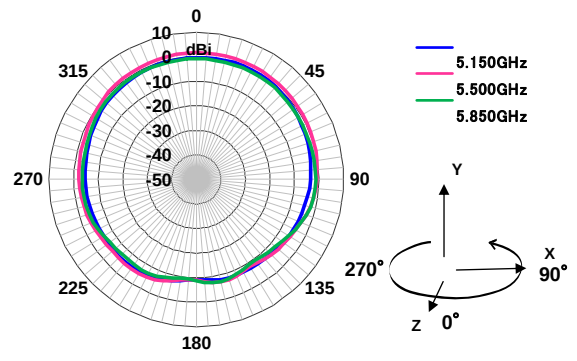
X-Y PLANE



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

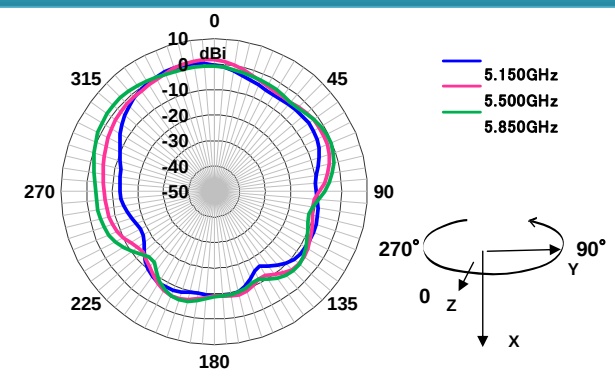
X-Z PLANE



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

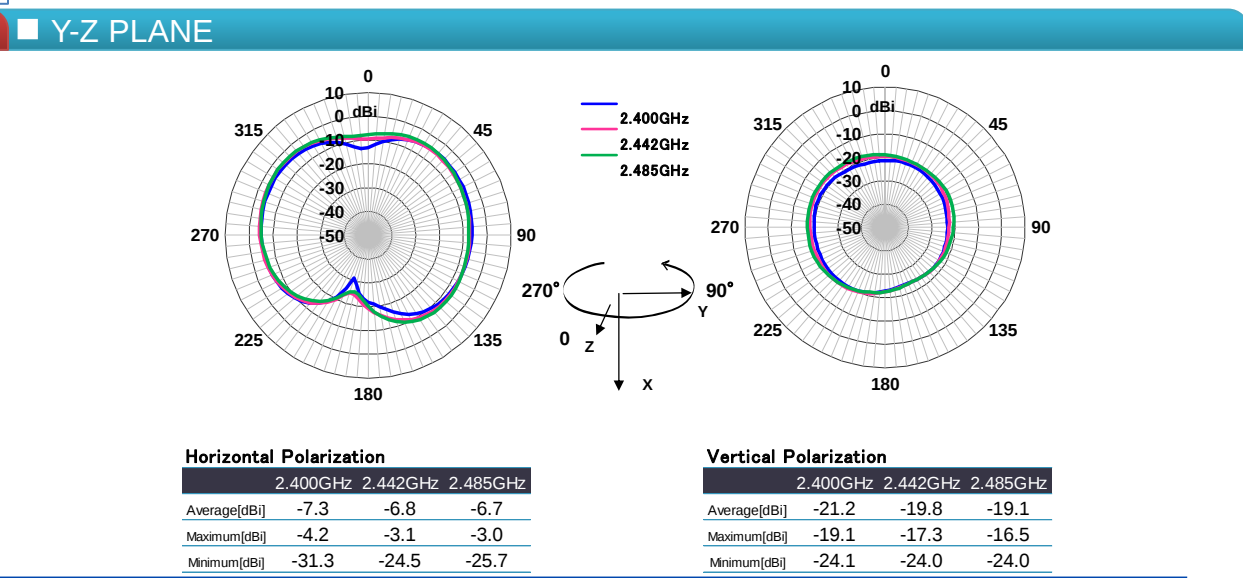
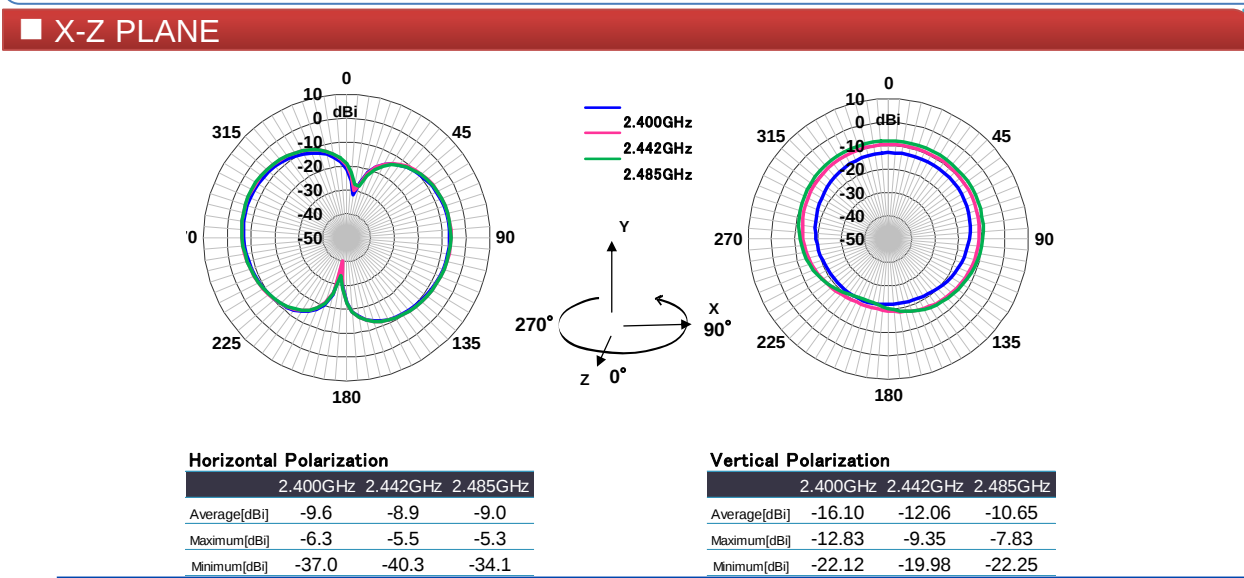
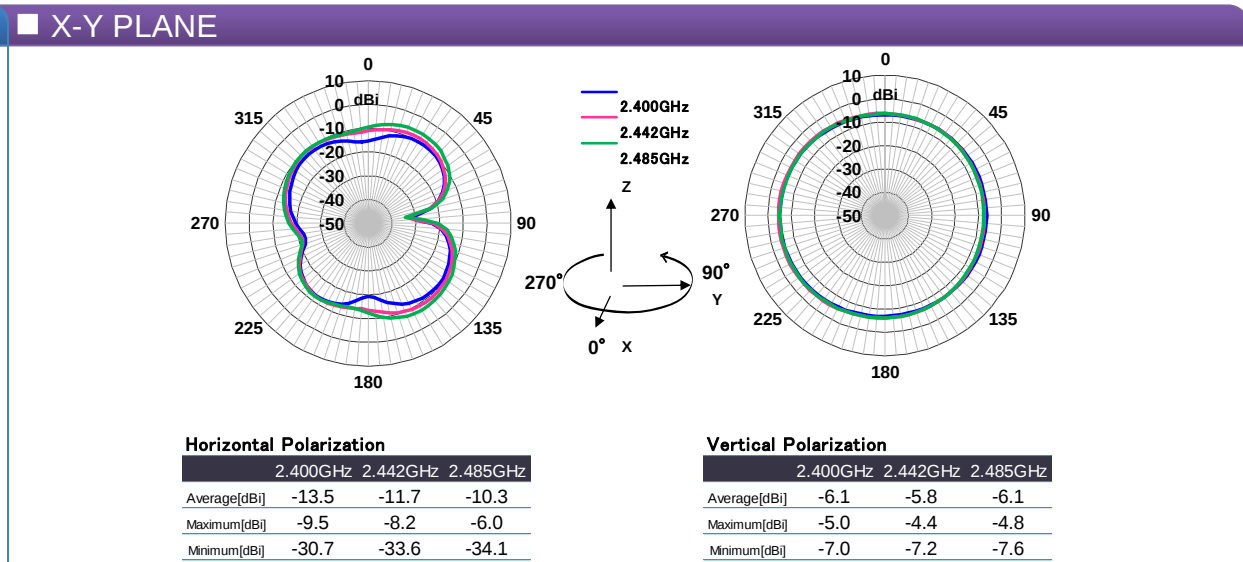
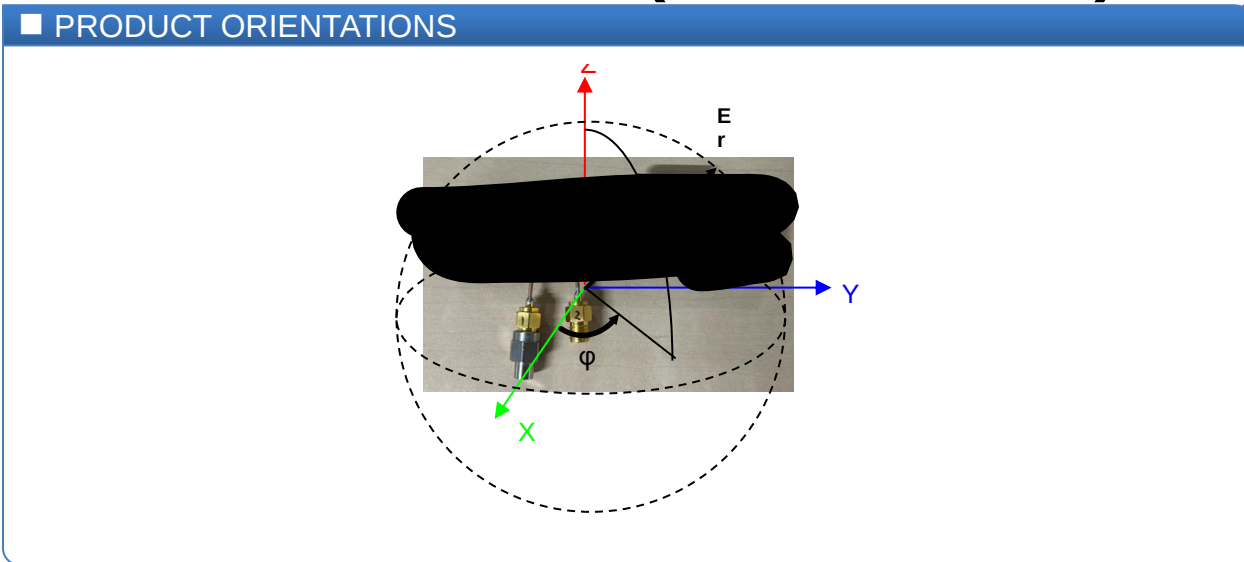


Total Power

	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)

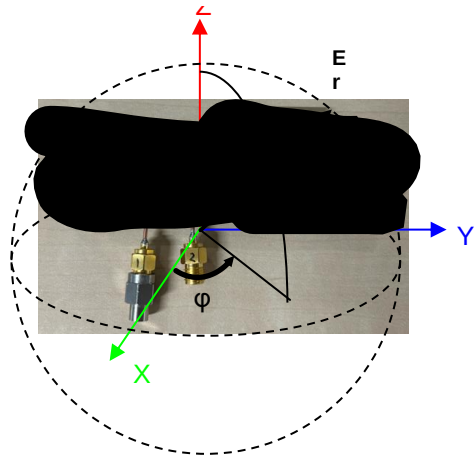
tuned_P1



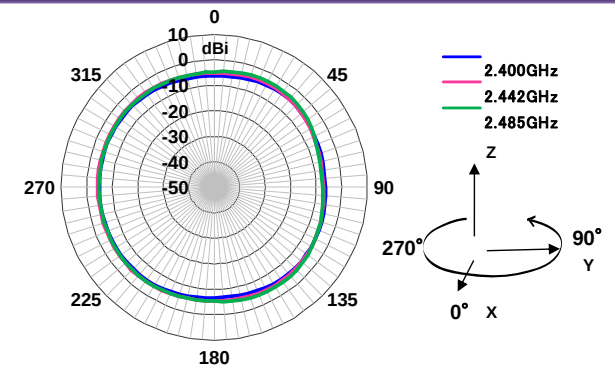
Total Power (2.4GHz Band)

tuned_P1

PRODUCT ORIENTATIONS



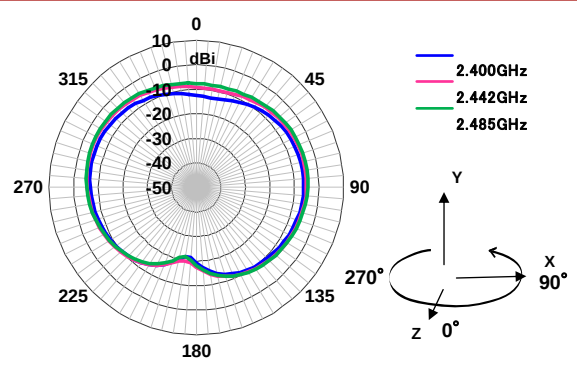
X-Y PLANE



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

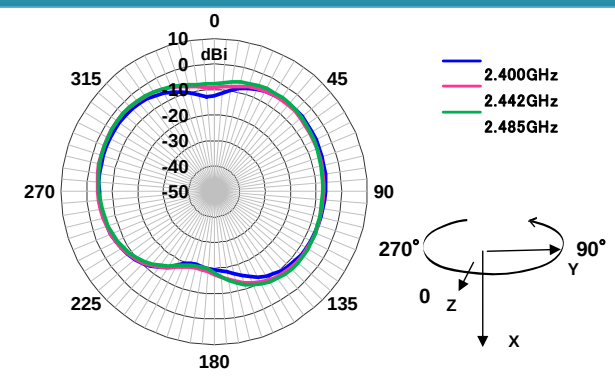
X-Z PLANE



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

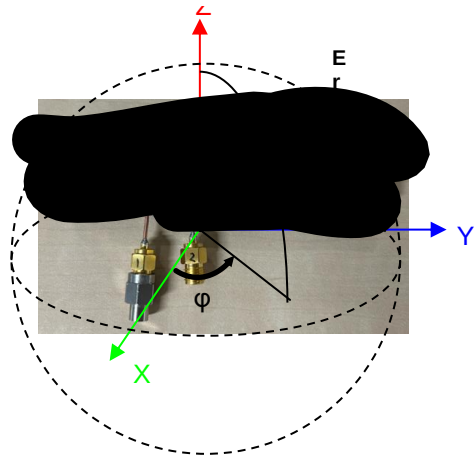


Total Power

	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

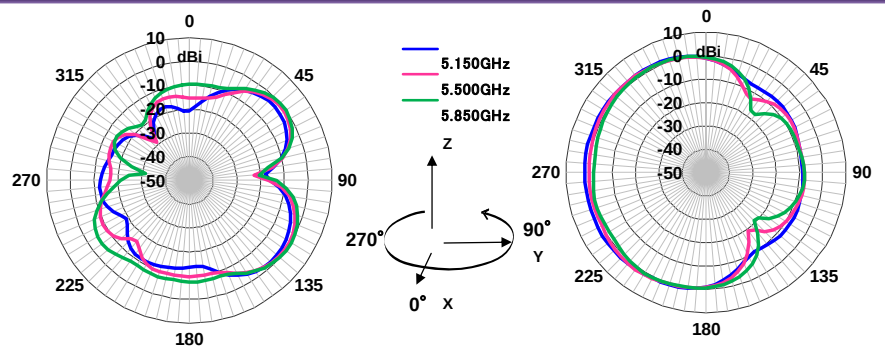
Radiation Pattern (5GHz Band)

PRODUCT ORIENTATIONS



tuned_P1

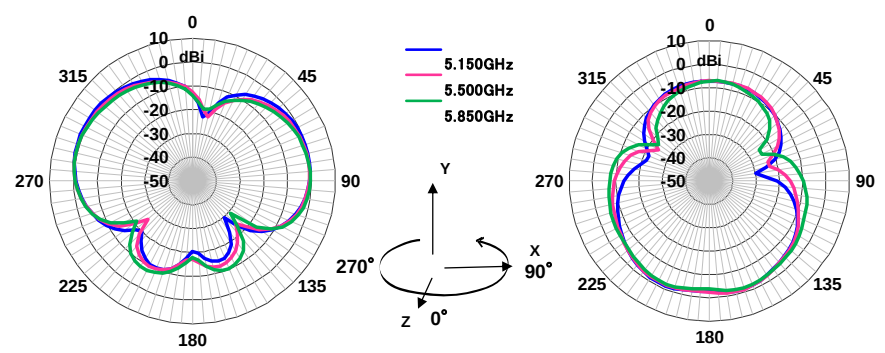
X-Y PLANE



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

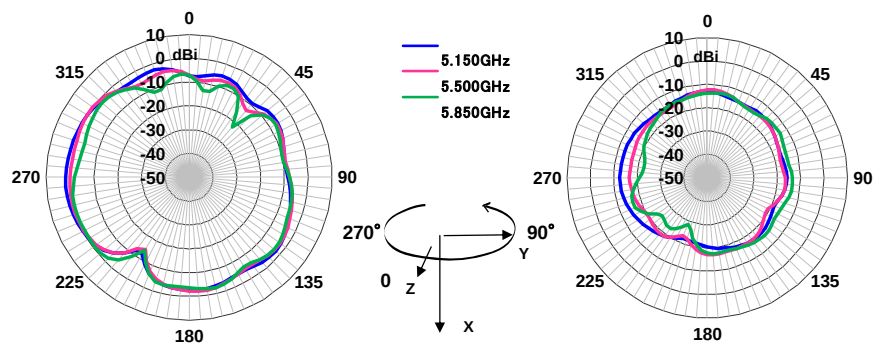
X-Z PLANE



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



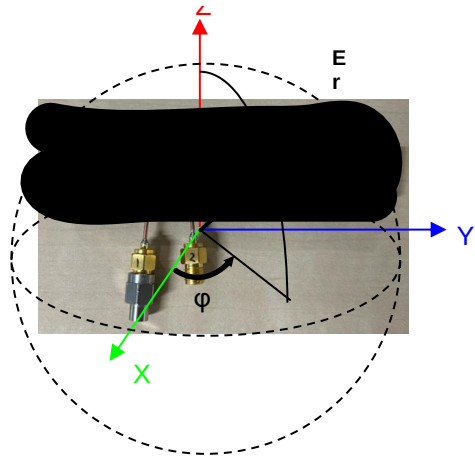
Horizontal Polarization			
	5.150GHz	5.500GHz	5.850GHz
Average[dBi]	-2.7	-3.4	-4.4
Maximum[dBi]	2.0	0.5	-0.2
Minimum[dBi]	-12.3	-14.6	-22.2

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

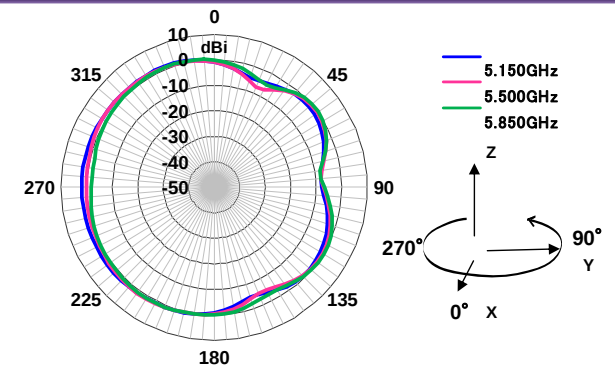
Total Power (5GHz Band)

tuned_P1

PRODUCT ORIENTATIONS

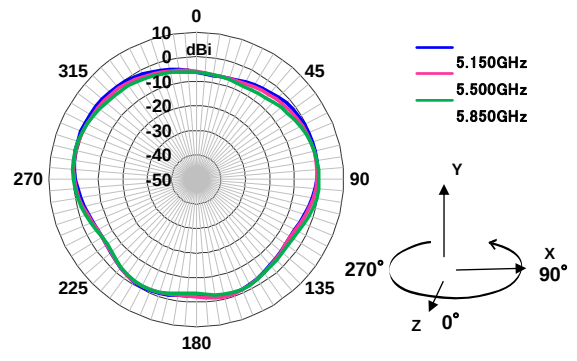


X-Y PLANE



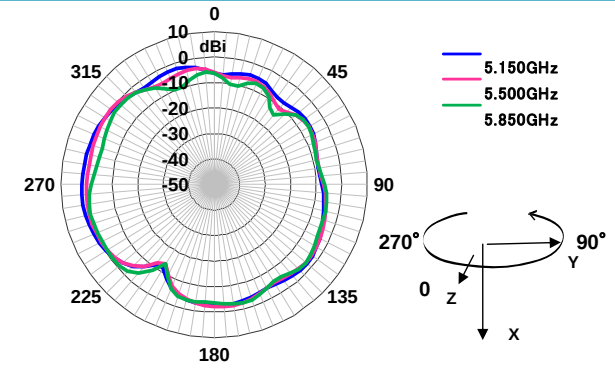
Total Power			
	5.150GHz	5.500GHz	5.850GHz
Average[dBi]	-0.2	-0.5	-0.7
Maximum[dBi]	2.1	1.5	1.0
Minimum[dBi]	-8.2	-7.8	-7.9

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

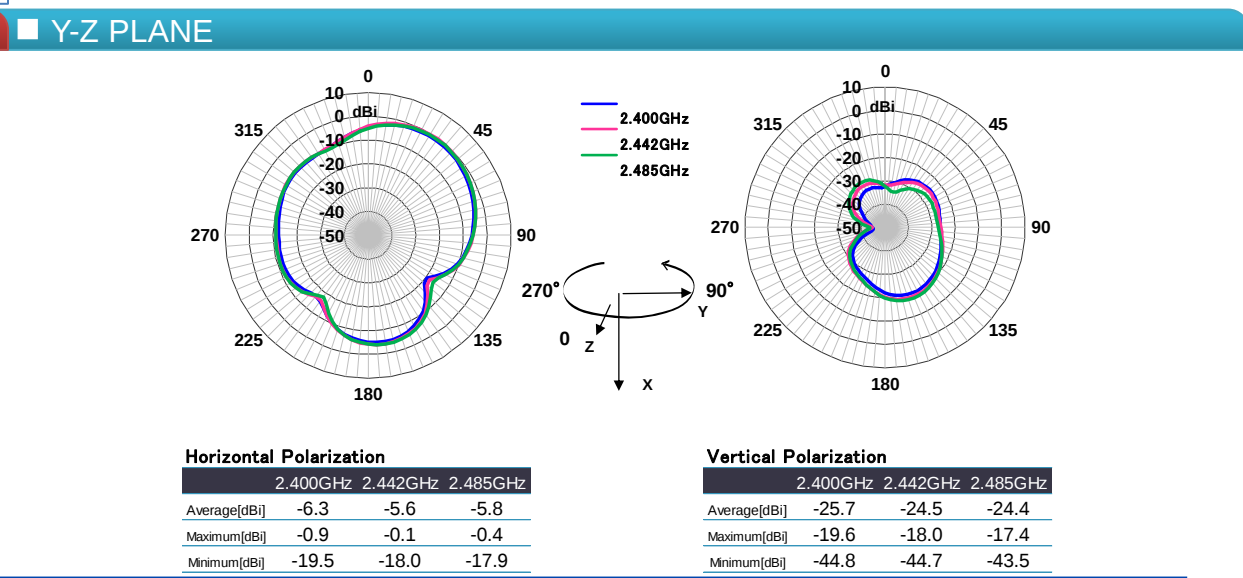
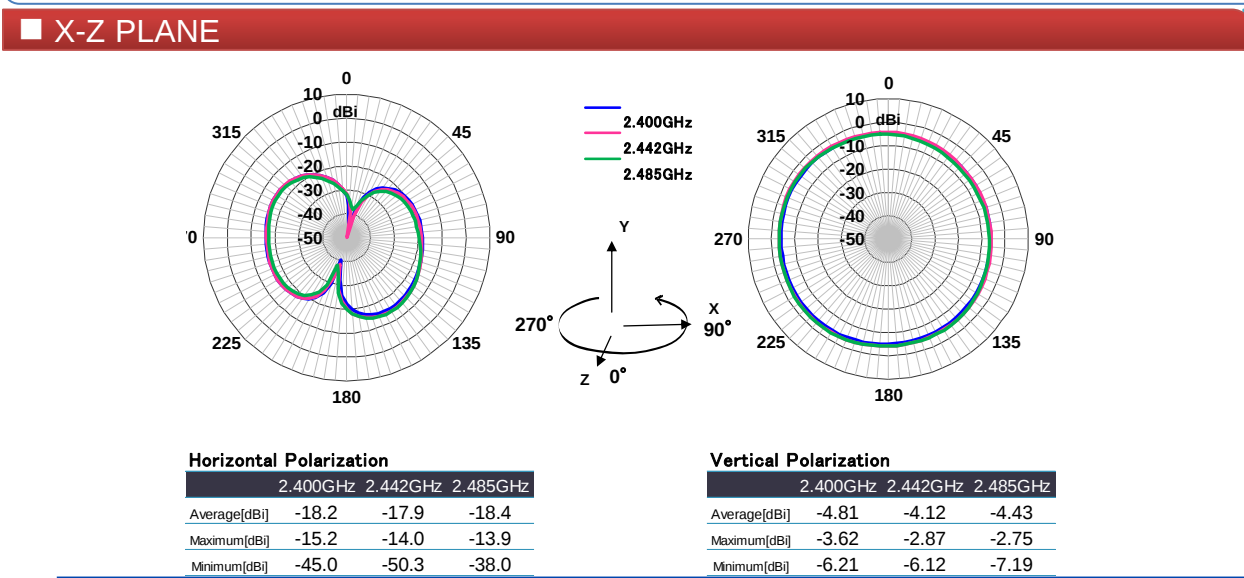
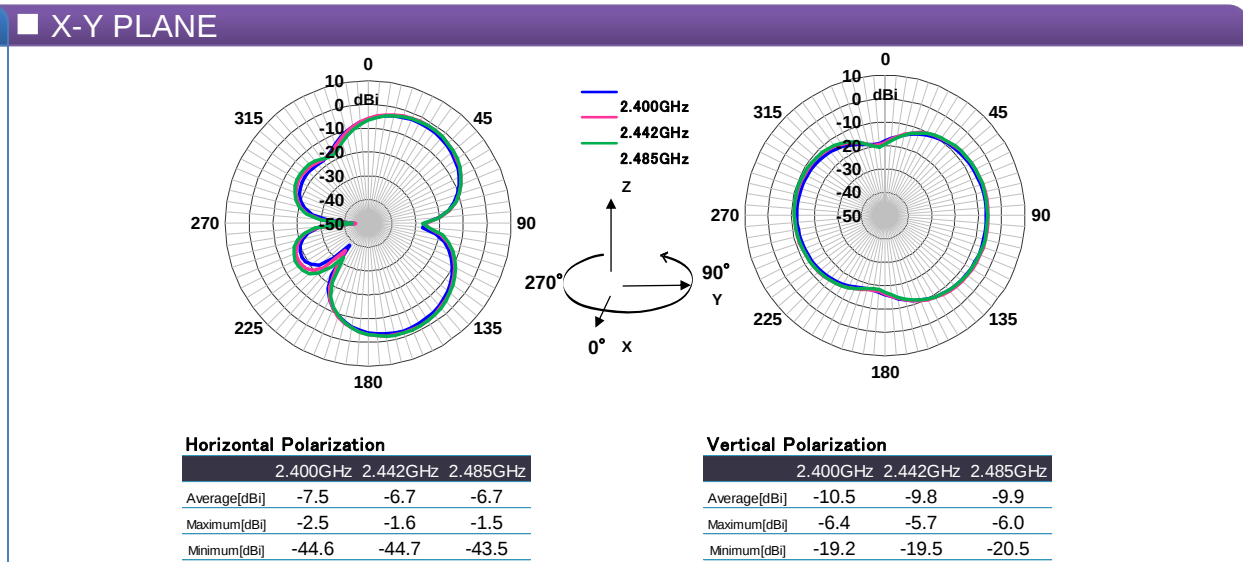
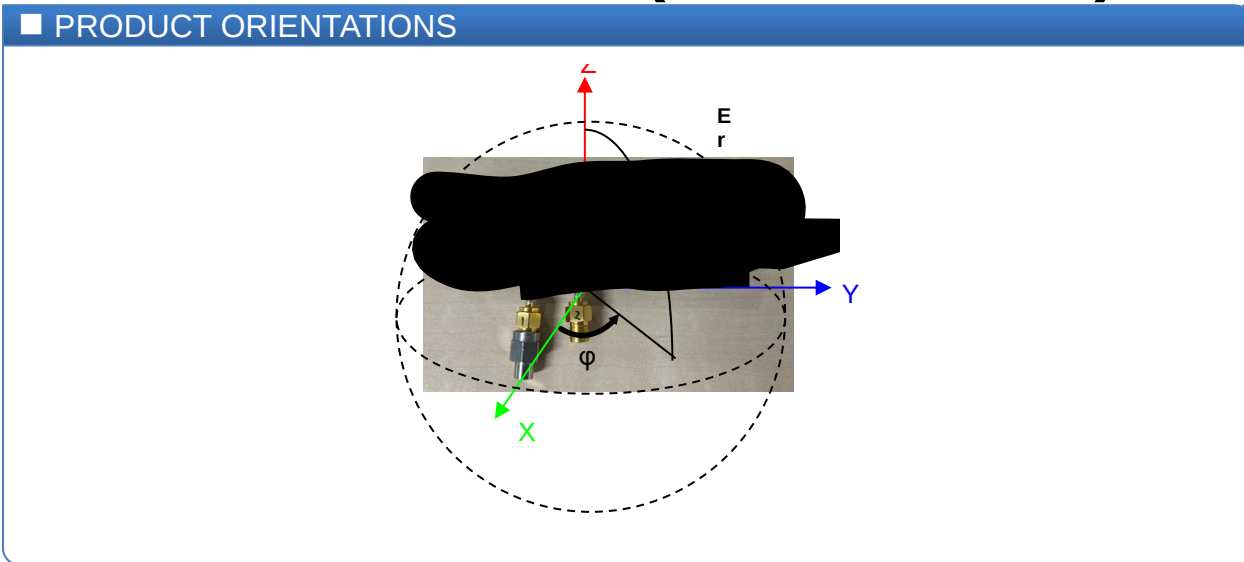
Y-Z PLANE



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)

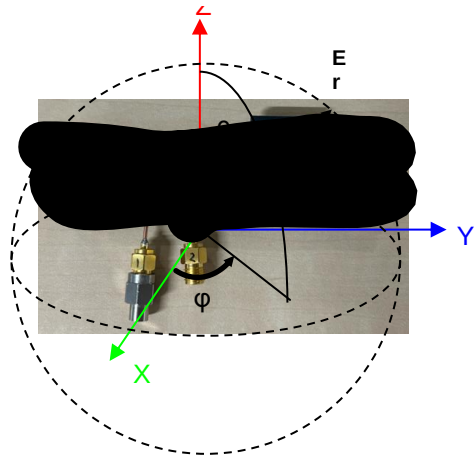
tuned_P2



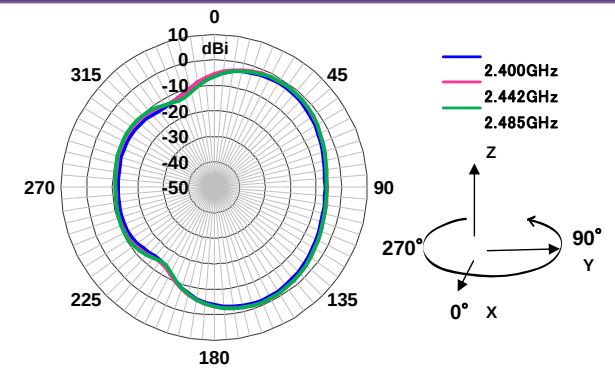
Total Power (2.4GHz Band)

tuned_P2

PRODUCT ORIENTATIONS

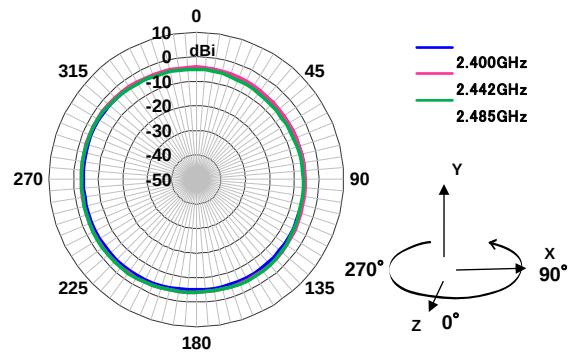


X-Y PLANE



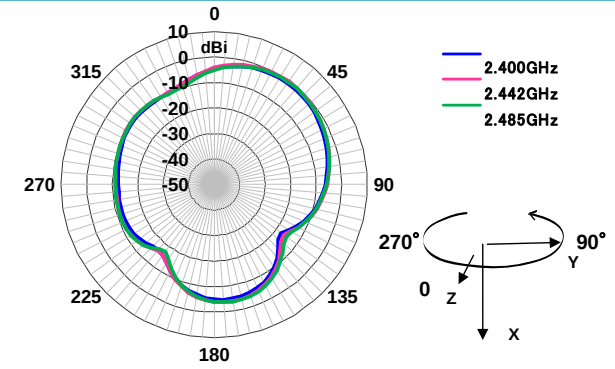
Total Power			
	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-5.7	-5.0	-5.0
Maximum[dBi]	-1.9	-1.1	-1.0
Minimum[dBi]	-14.5	-13.9	-14.1

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

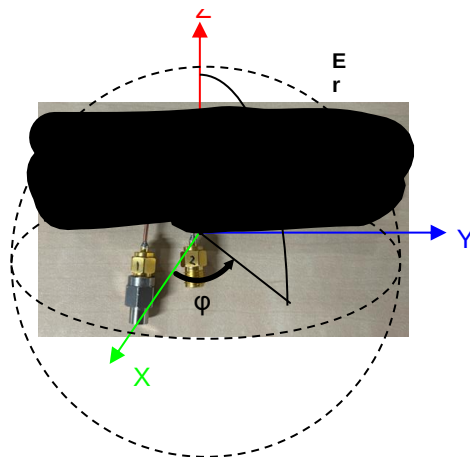
Y-Z PLANE



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

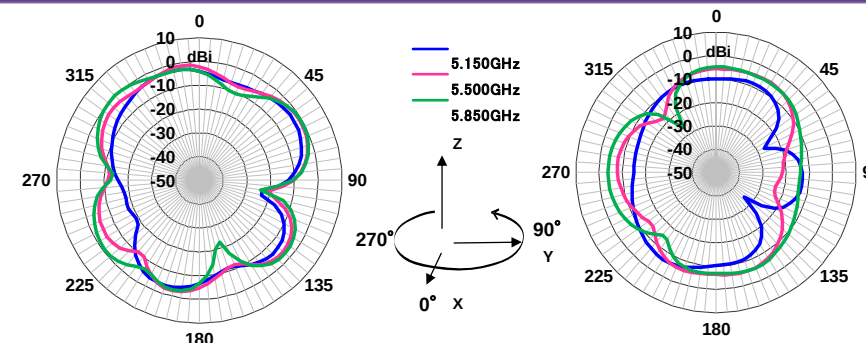
Radiation Pattern (5GHz Band)

PRODUCT ORIENTATIONS



tuned_P2

X-Y PLANE



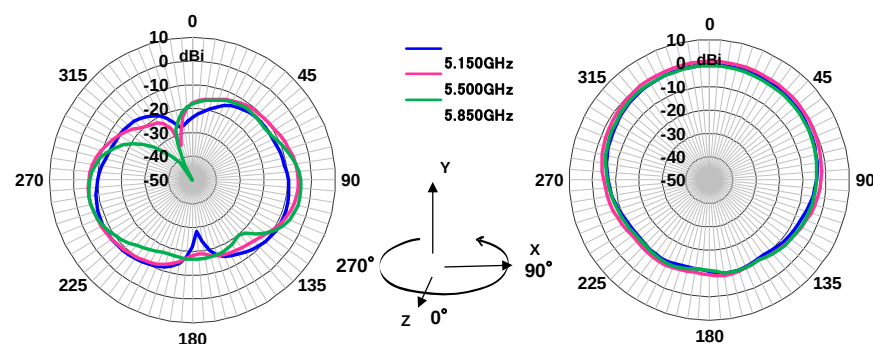
Horizontal Polarization

	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



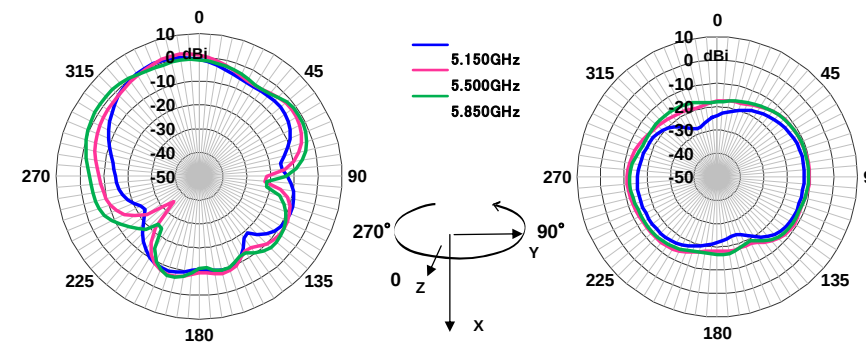
Horizontal Polarization

	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

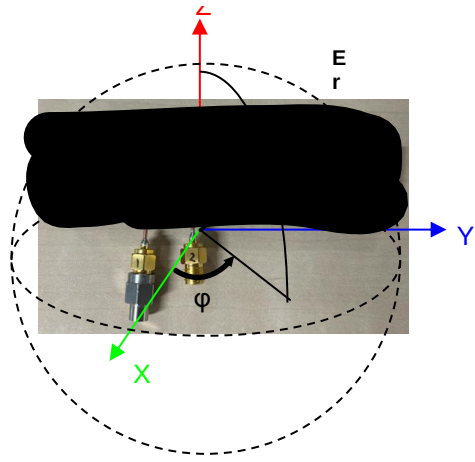
Vertical Polarization

	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

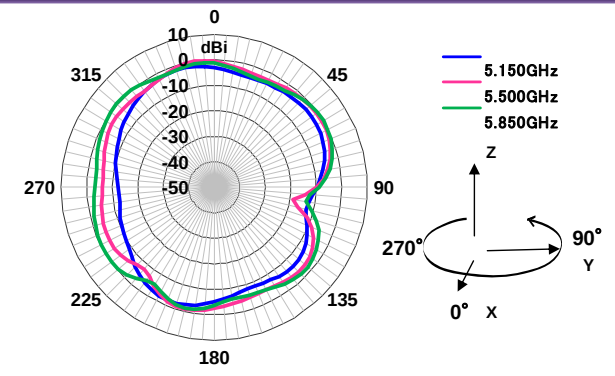
Total Power (5GHz Band)

tuned_P2

PRODUCT ORIENTATIONS

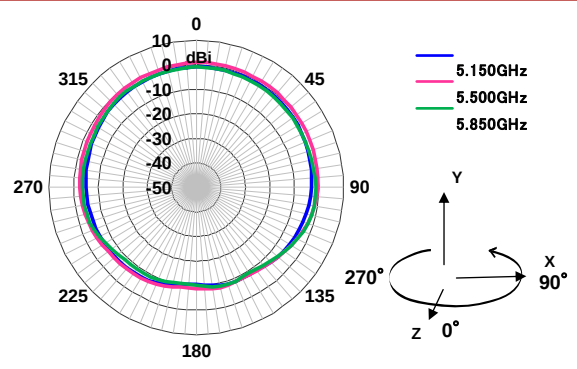


X-Y PLANE



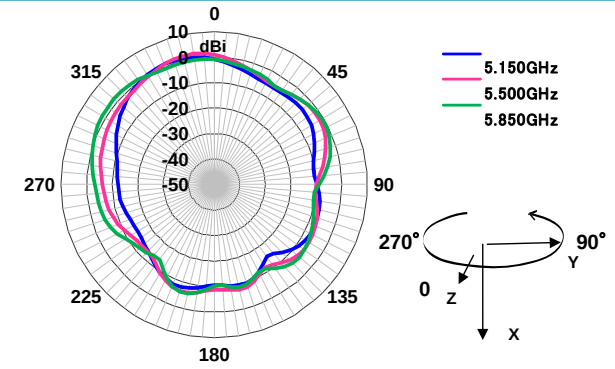
Total Power			
	5.150GHz	5.500GHz	5.850GHz
Average[dBi]	-5.2	-3.2	-2.2
Maximum[dBi]	-1.7	0.0	0.4
Minimum[dBi]	-12.8	-18.7	-13.6

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

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

