

▶ strictly confidential

Attracting Tomorrow

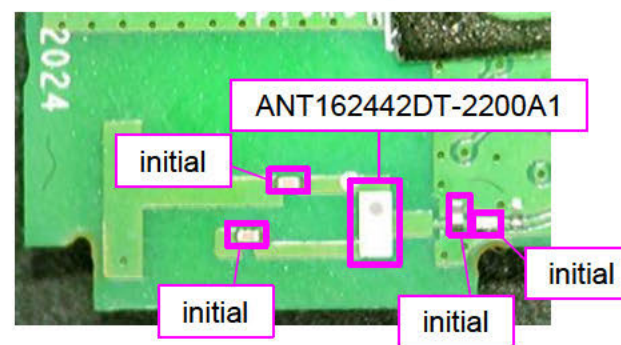


TDK Antenna Measurement

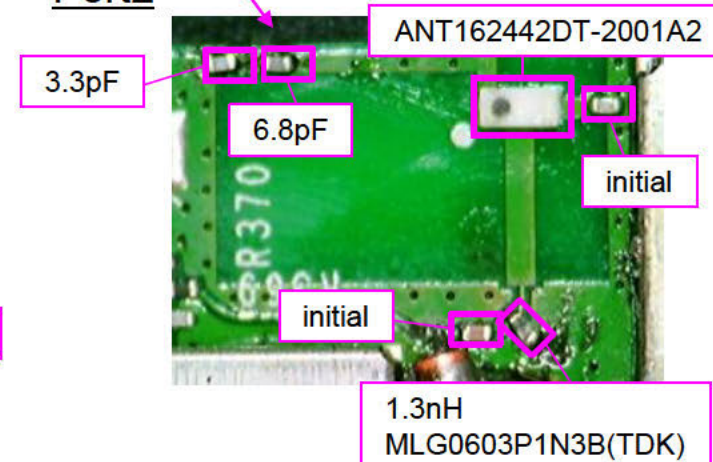
Measurement Setup

► MEASUREMENT SETUP

Port1

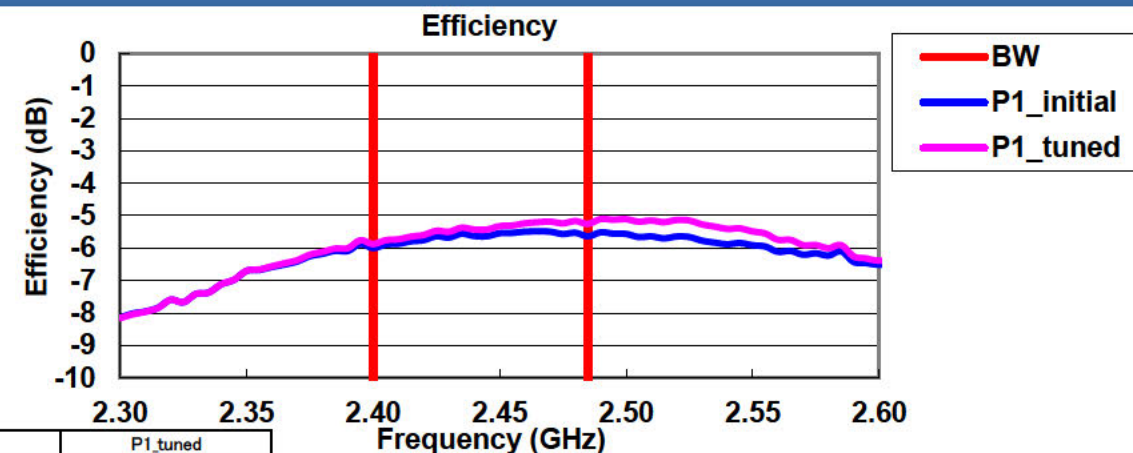
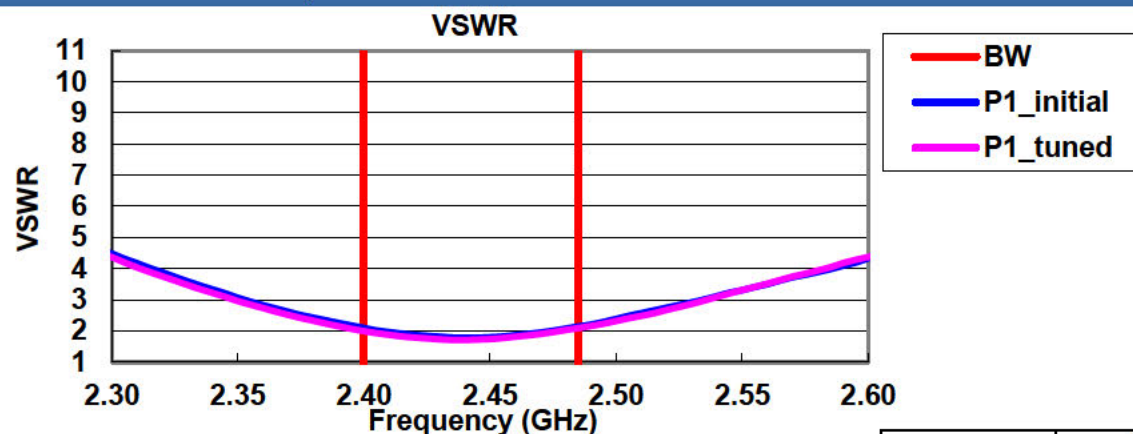


Port2

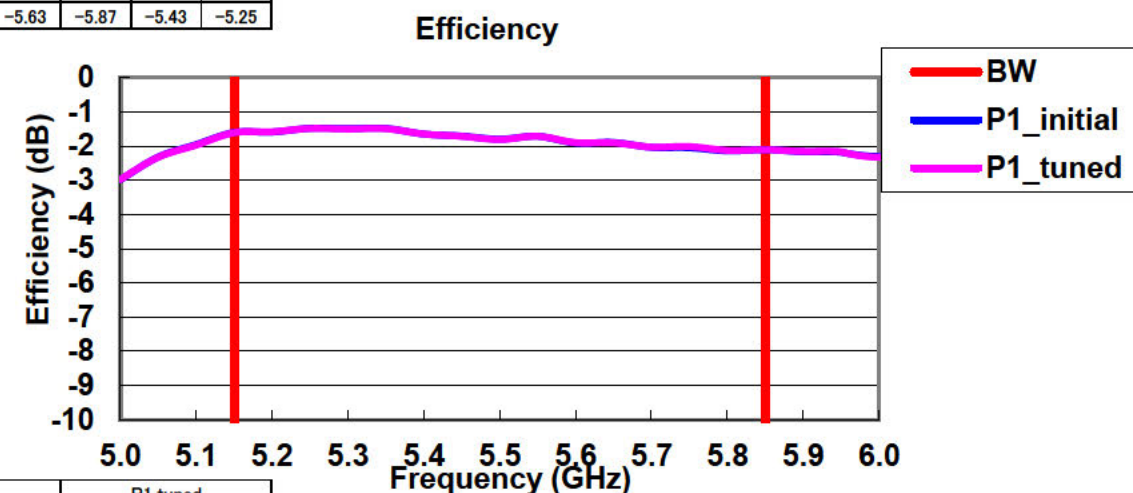
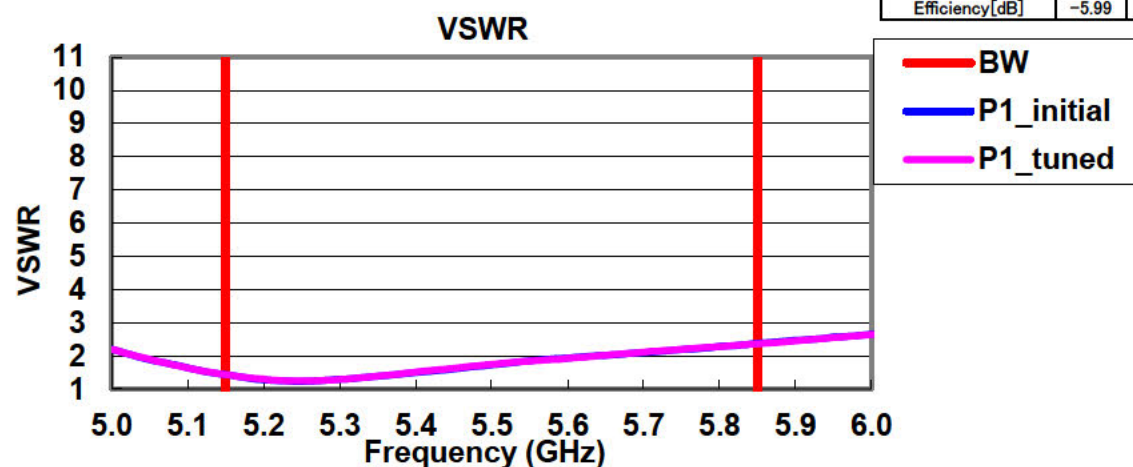


Measurement Results

► VSWR & Efficiency



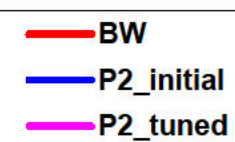
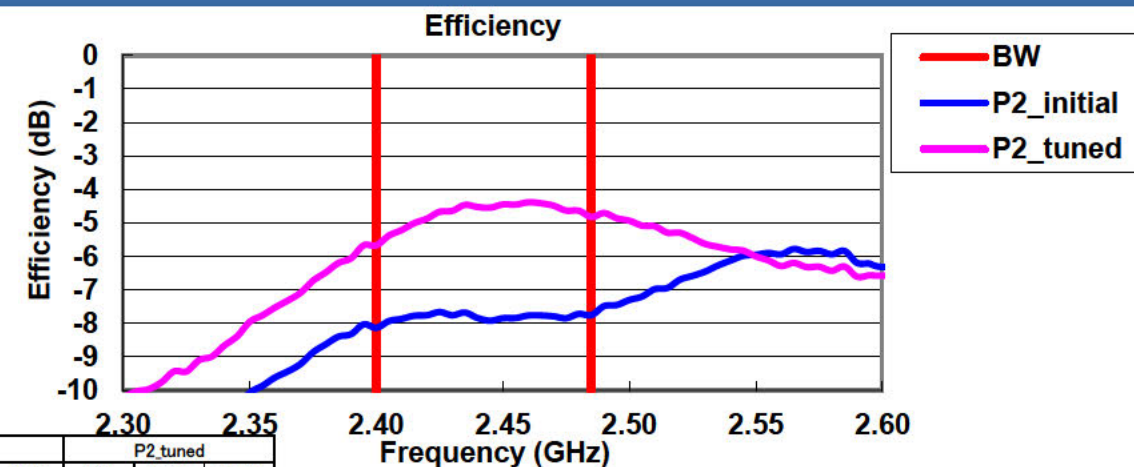
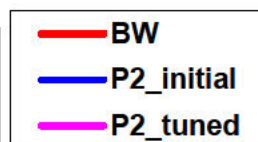
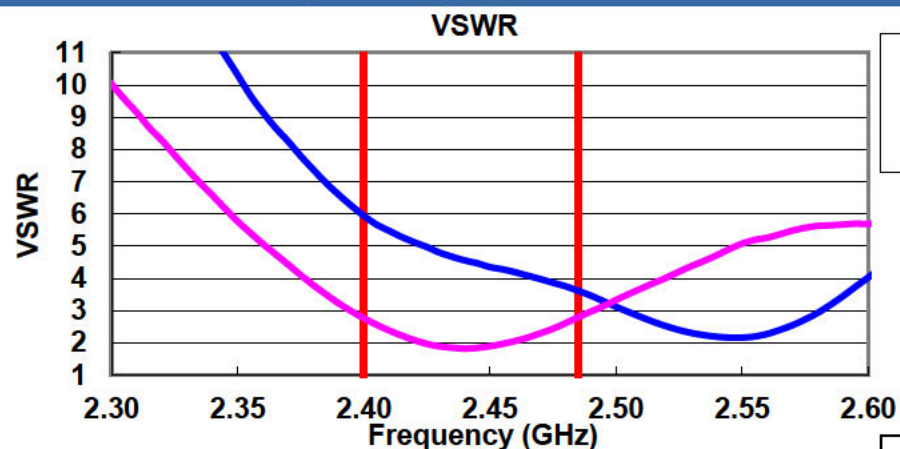
	P1_initial			P1_tuned		
Frequency[GHz]	2.4	2.442	2.485	2.4	2.442	2.485
VSWR	2.09	1.77	2.13	1.99	1.71	2.09
Efficiency[dB]	-5.99	-5.62	-5.63	-5.87	-5.43	-5.25



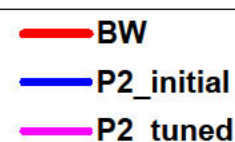
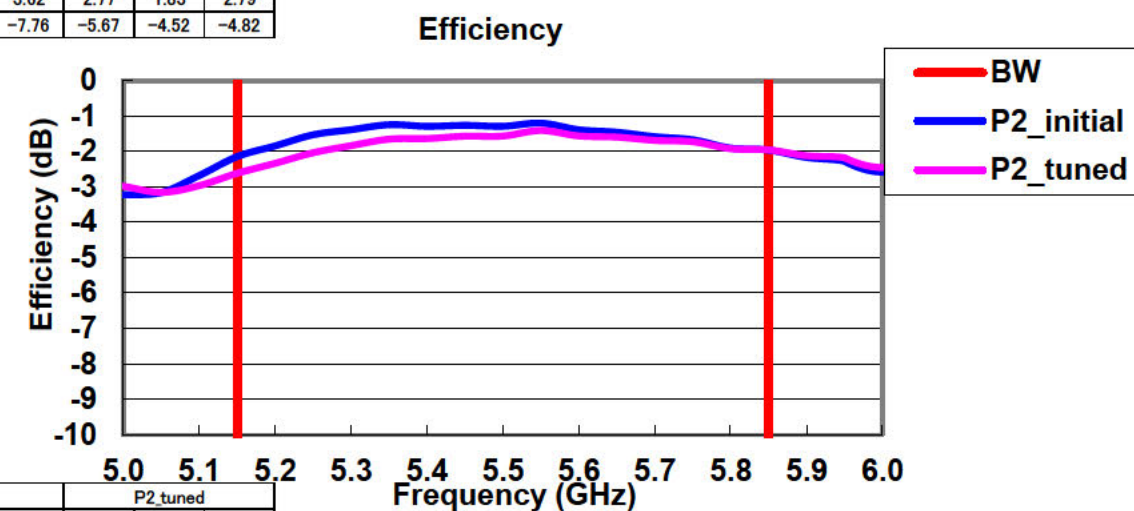
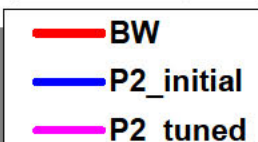
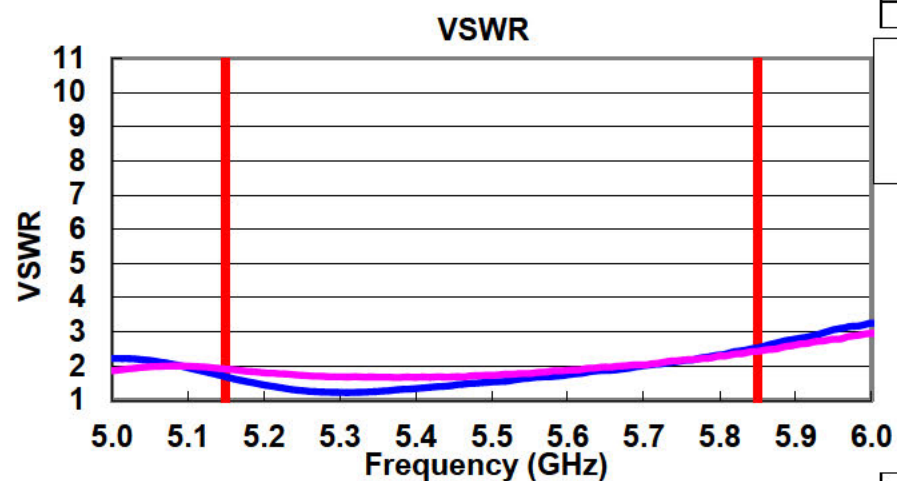
	P1_initial			P1_tuned		
Frequency[GHz]	5.15	5.5	5.85	5.15	5.5	5.85
VSWR	1.44	1.73	2.38	1.43	1.75	2.36
Efficiency[dB]	-1.61	-1.80	-2.11	-1.61	-1.81	-2.11

Measurement Results

► VSWR & Efficiency



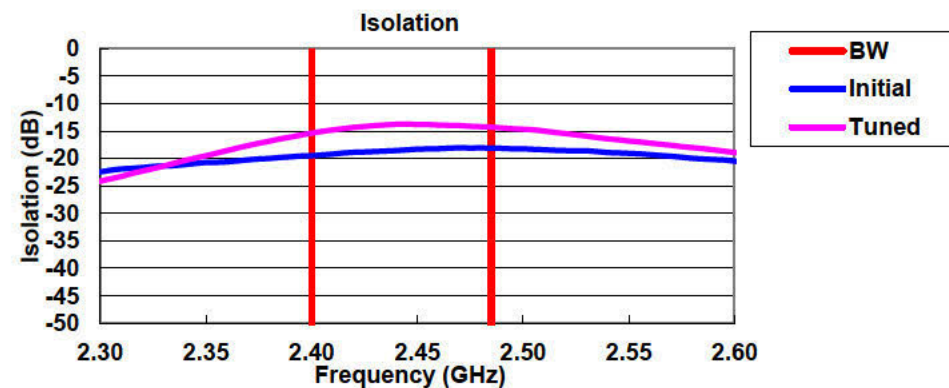
	P2_initial			P2_tuned		
Frequency[GHz]	2.4	2.442	2.485	2.4	2.442	2.485
VSWR	5.95	4.57	3.62	2.77	1.83	2.79
Efficiency[dB]	-8.14	-7.84	-7.76	-5.67	-4.52	-4.82



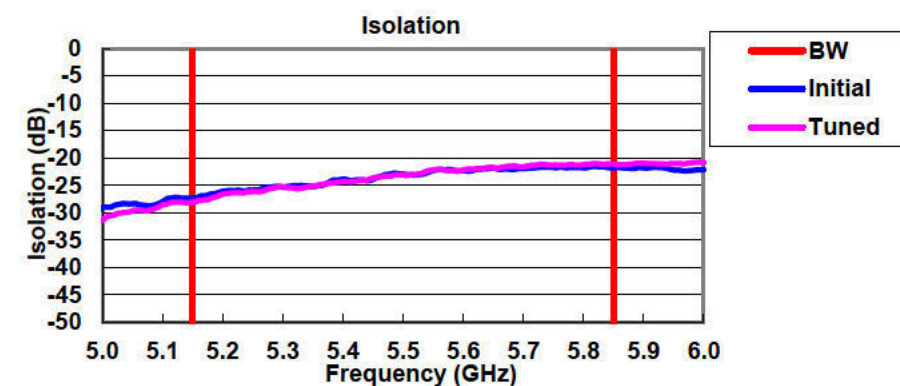
	P2_initial			P2_tuned		
Frequency[GHz]	5.15	5.5	5.85	5.15	5.5	5.85
VSWR	1.69	1.53	2.53	1.91	1.73	2.43
Efficiency[dB]	-2.15	-1.29	-1.97	-2.62	-1.57	-1.96

Measurement Results

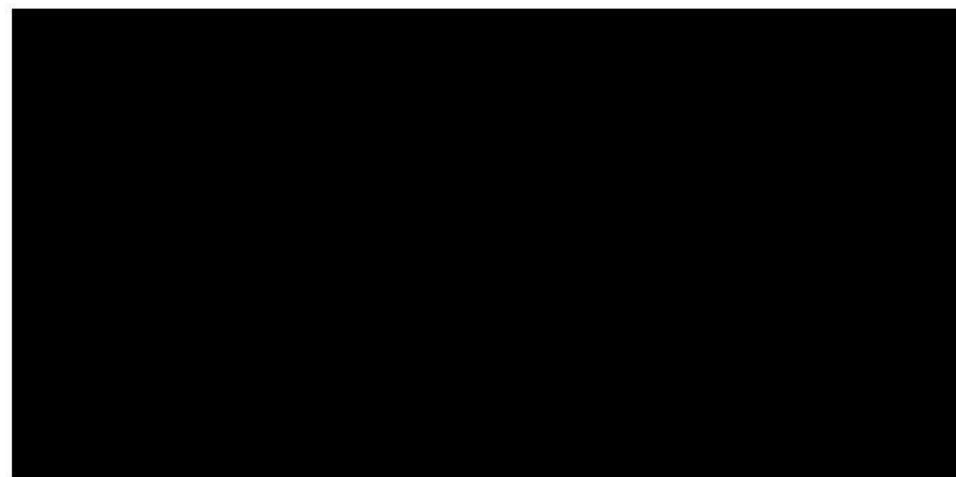
► Isolation



	Initial			Tuned		
Frequency[GHz]	2.4	2.442	2.485	2.4	2.442	2.485
Isolation[dB]	-19.50	-18.57	-18.13	-15.37	-13.75	-14.26



	Initial			Tuned		
Frequency[GHz]	5.15	5.5	5.85	5.15	5.5	5.85
Isolation[dB]	-27.38	-22.95	-21.78	-28.09	-23.13	-21.20



Comments

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

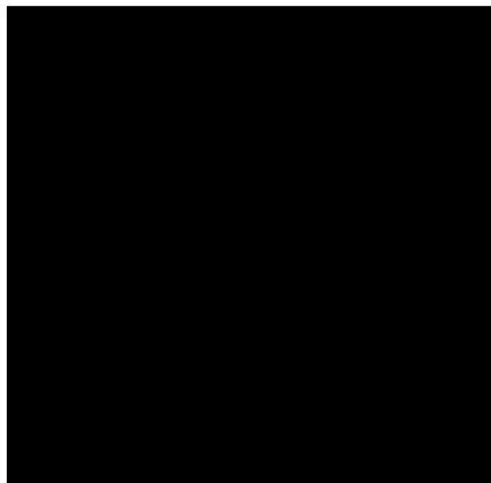
Now “antenna simulation tool” is published on TDK Web site. Please give it a try.

- Selection Guide <https://product.tdk.com/info/en/products/rf/rf/antenna/technote/selection-guide.html>
- Instant Simulator <https://product.tdk.com/en/search/rf/rf/antenna/simulation>
- Design Guide <https://product.tdk.com/info/en/products/rf/rf/antenna/technote/designnote.html>
- HFSS model https://product.tdk.com/info/en/technicalsupport/tvcl/ansys_hfss/antenna/index.html

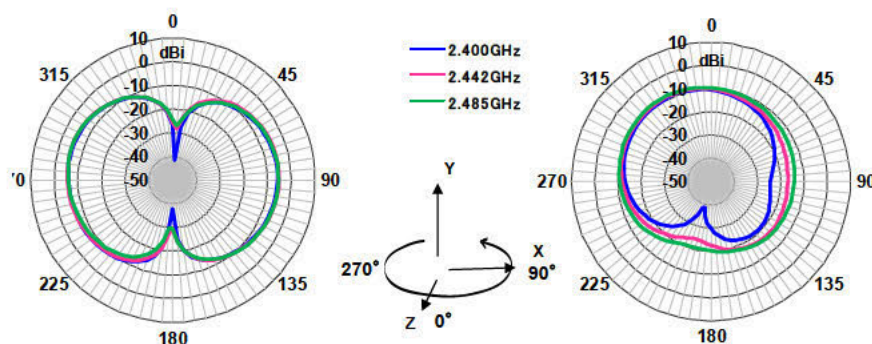
Radiation Pattern

Radiation Pattern (2.4GHz Band)

PRODUCT ORIENTATIONS



X-Z PLANE



Horizontal Polarization

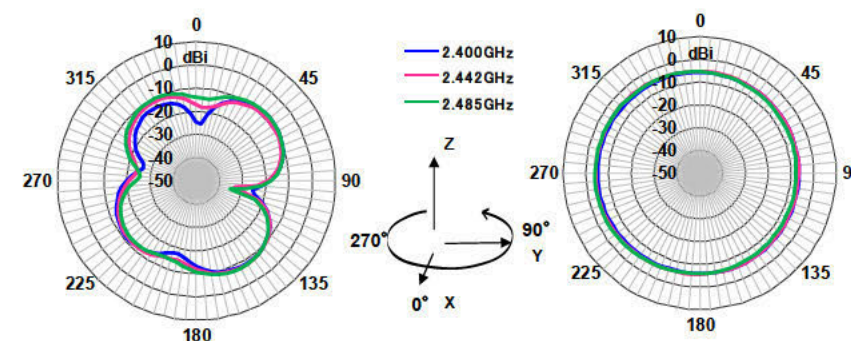
	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-8.6	-8.2	-8.5
Maximum[dBi]	-5.5	-5.1	-5.2
Minimum[dBi]	-41.8	-29.7	-30.1

Vertical Polarization

	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-14.38	-13.12	-12.01
Maximum[dBi]	-9.37	-8.83	-8.26
Minimum[dBi]	-38.35	-24.37	-20.74

P1_initial

X-Y PLANE



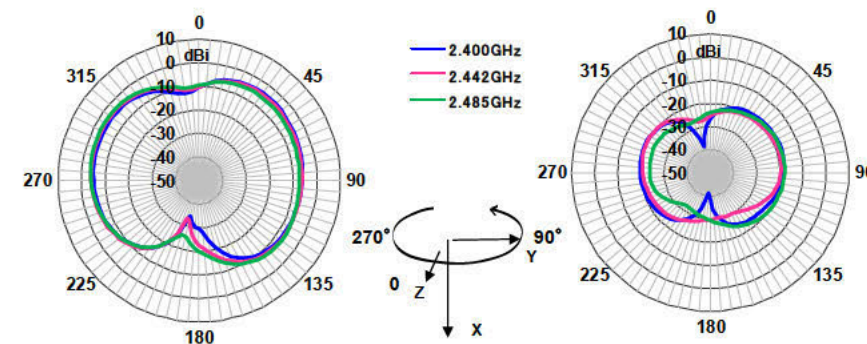
Horizontal Polarization

	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-12.6	-12.4	-11.7
Maximum[dBi]	-8.2	-8.0	-7.7
Minimum[dBi]	-26.5	-33.2	-35.3

Vertical Polarization

	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-5.7	-5.3	-5.5
Maximum[dBi]	-5.1	-4.2	-4.0
Minimum[dBi]	-6.4	-6.5	-7.6

Y-Z PLANE



Horizontal Polarization

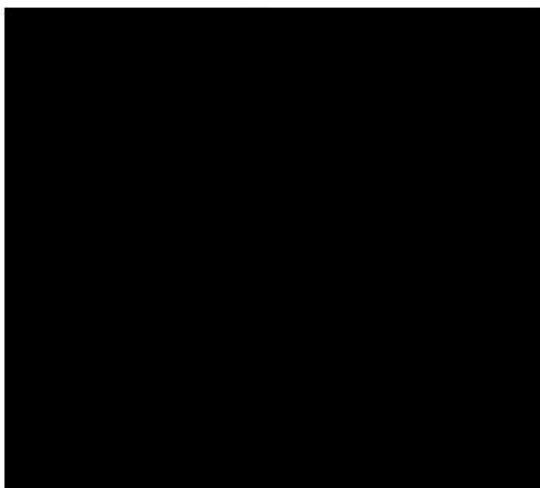
	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-7.0	-6.7	-6.8
Maximum[dBi]	-4.0	-3.3	-2.8
Minimum[dBi]	-34.7	-33.5	-26.0

Vertical Polarization

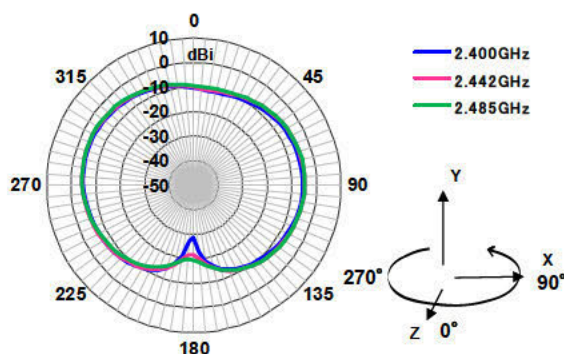
	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-21.1	-22.2	-22.0
Maximum[dBi]	-17.6	-18.9	-17.6
Minimum[dBi]	-41.2	-30.1	-32.4

Total Power (2.4GHz Band)

PRODUCT ORIENTATIONS



X-Z PLANE

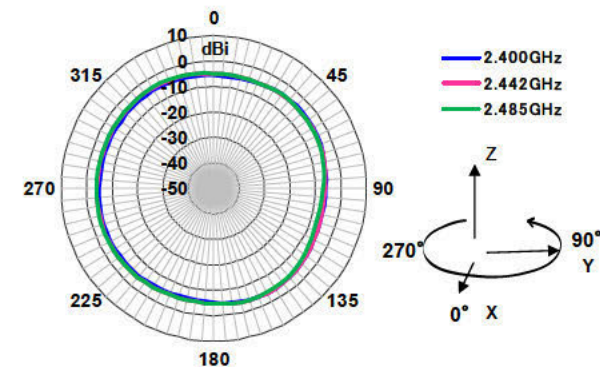


Total Power

	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-7.6	-7.0	-6.9
Maximum[dBi]	-4.5	-4.0	-3.8
Minimum[dBi]	-29.0	-21.8	-19.9

P1_initial

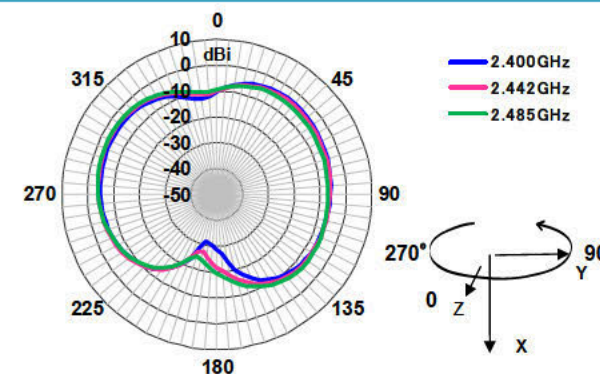
X-Y PLANE



Total Power

	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-4.9	-4.5	-4.6
Maximum[dBi]	-3.9	-3.8	-3.6
Minimum[dBi]	-6.3	-6.4	-7.6

Y-Z PLANE

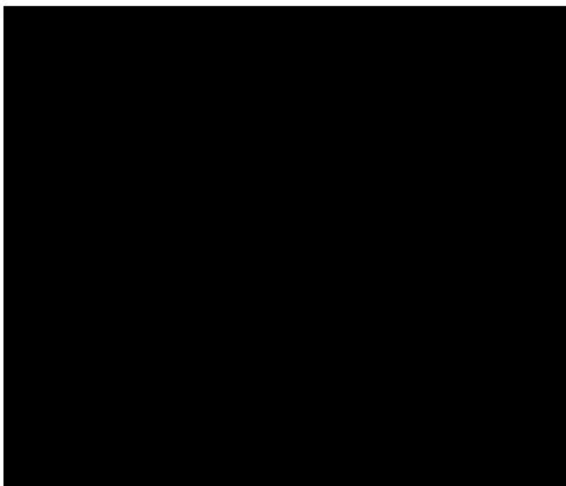


Total Power

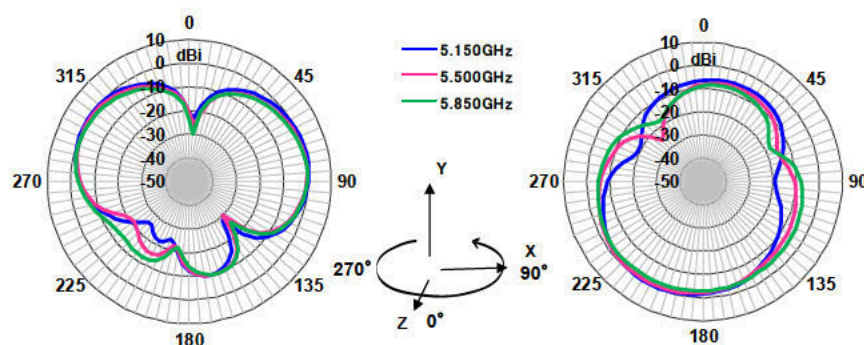
	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-6.9	-6.5	-6.6
Maximum[dBi]	-3.8	-3.2	-2.8
Minimum[dBi]	-31.4	-27.2	-24.9

Radiation Pattern (5GHz Band)

PRODUCT ORIENTATIONS

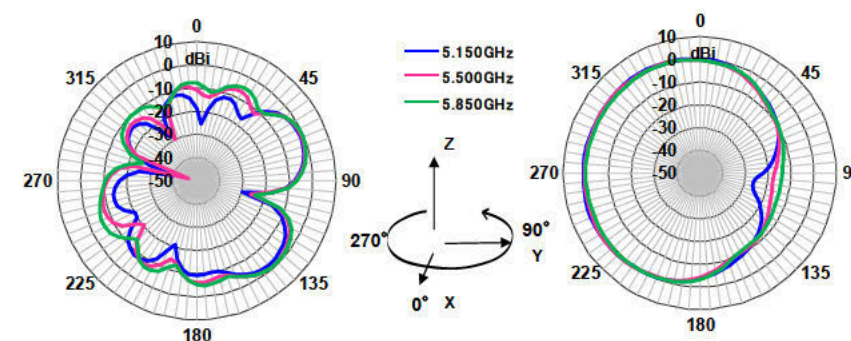


X-Z PLANE

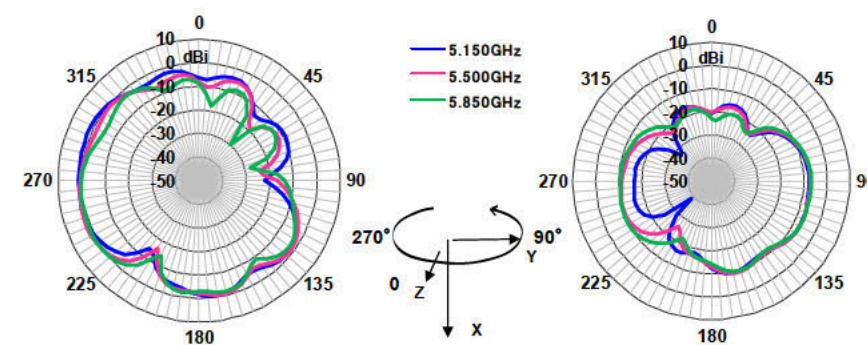


P1_initial

X-Y PLANE

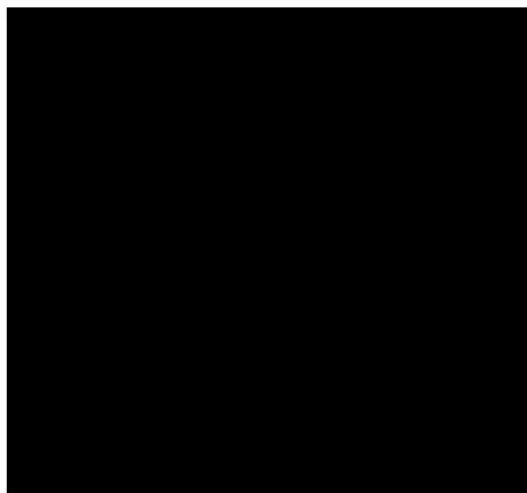


Y-Z PLANE

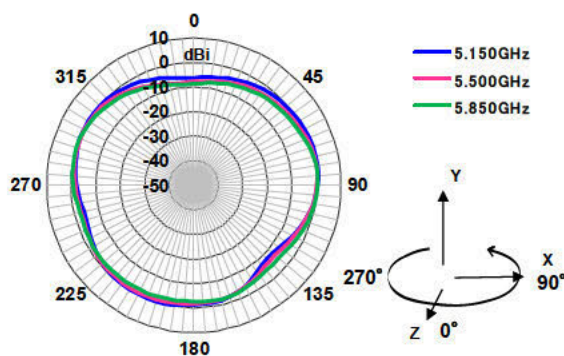


Total Power (5GHz Band)

PRODUCT ORIENTATIONS



X-Z PLANE

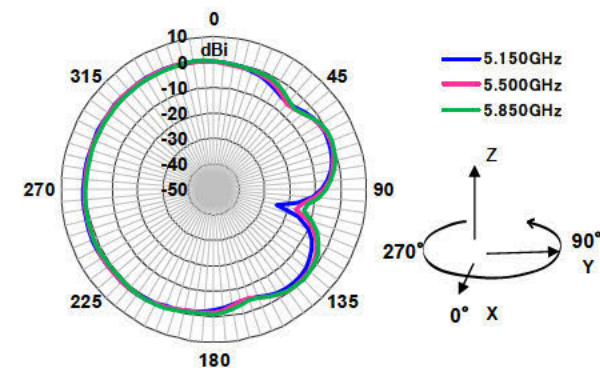


Total Power

	5.150GHz	5.500GHz	5.850GHz
Average[dBi]	-1.6	-2.2	-2.4
Maximum[dBi]	1.1	0.5	0.6
Minimum[dBi]	-7.8	-7.9	-8.7

P1_initial

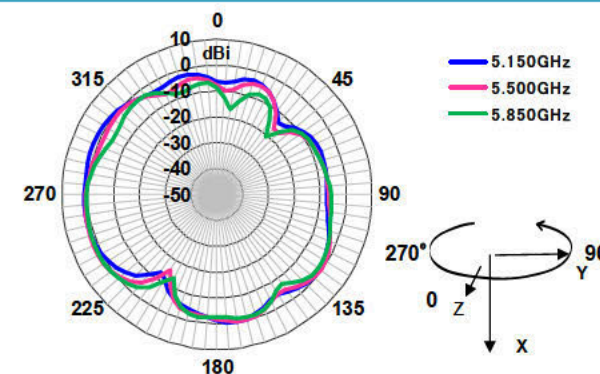
X-Y PLANE



Total Power

	5.150GHz	5.500GHz	5.850GHz
Average[dBi]	-0.7	-0.7	-0.6
Maximum[dBi]	1.6	1.3	1.1
Minimum[dBi]	-24.5	-16.8	-13.6

Y-Z PLANE

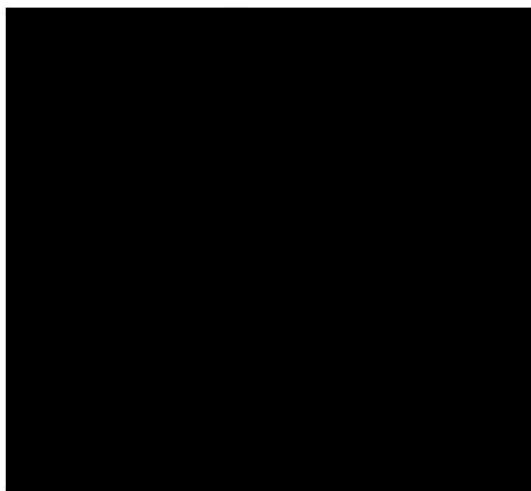


Total Power

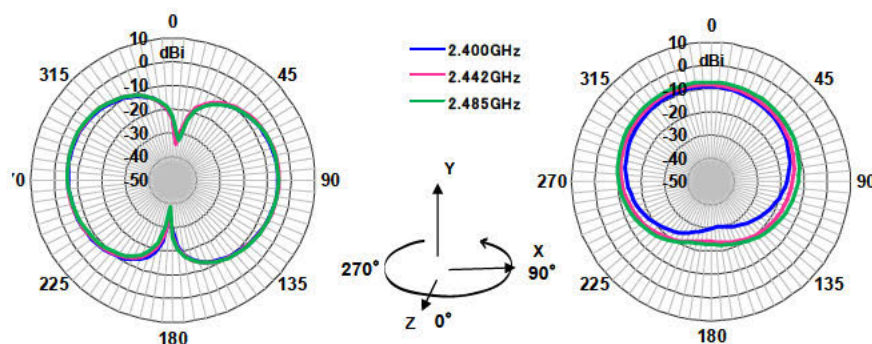
	5.150GHz	5.500GHz	5.850GHz
Average[dBi]	-2.3	-2.6	-3.3
Maximum[dBi]	1.6	1.8	1.3
Minimum[dBi]	-13.3	-16.4	-20.8

Radiation Pattern (2.4GHz Band)

PRODUCT ORIENTATIONS



X-Z PLANE



Horizontal Polarization

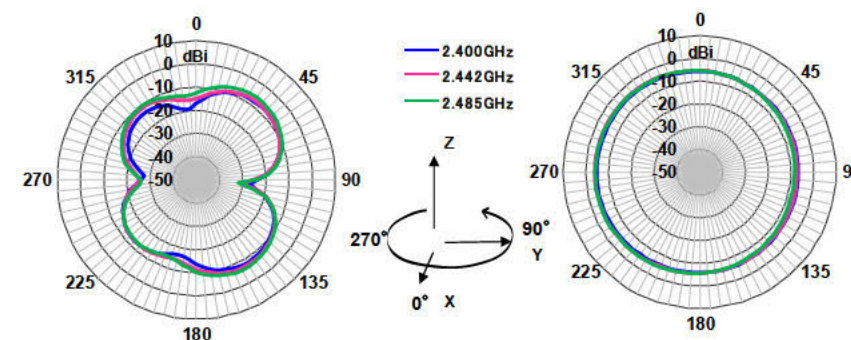
	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-8.5	-8.2	-8.3
Maximum[dBi]	-5.4	-5.1	-5.0
Minimum[dBi]	-34.5	-35.3	-38.6

Vertical Polarization

	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-13.35	-11.86	-10.49
Maximum[dBi]	-8.86	-7.87	-6.80
Minimum[dBi]	-30.20	-24.10	-23.03

P1_tuned

X-Y PLANE



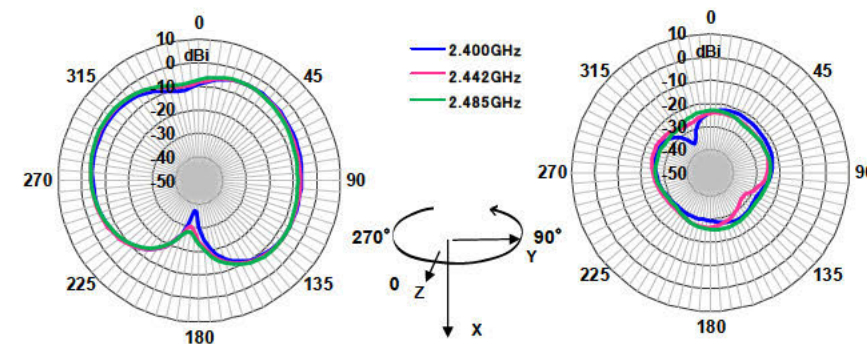
Horizontal Polarization

	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-12.3	-11.5	-10.5
Maximum[dBi]	-7.7	-7.1	-6.1
Minimum[dBi]	-27.3	-30.5	-32.1

Vertical Polarization

	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-5.6	-5.3	-5.5
Maximum[dBi]	-4.7	-3.9	-4.0
Minimum[dBi]	-6.7	-7.2	-8.3

Y-Z PLANE



Horizontal Polarization

	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-6.9	-6.5	-6.5
Maximum[dBi]	-3.8	-2.8	-2.6
Minimum[dBi]	-37.0	-30.1	-27.7

Vertical Polarization

	2.400GHz	2.442GHz	2.485GHz
Average[dBi]	-25.5	-25.9	-25.4
Maximum[dBi]	-21.9	-23.7	-22.9
Minimum[dBi]	-35.9	-32.4	-29.2