



好天线 · 优比造

东莞市优比电子有限公司

Dongguan UB Electronics Co., Ltd

Antenna Study

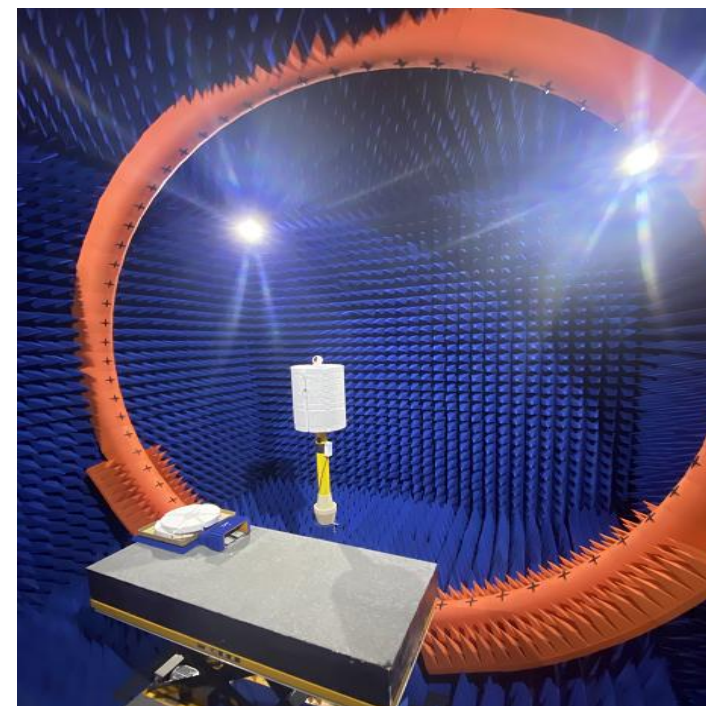
- **Client Name:** 34ED LLC, DBA Centegix
- **Project Name:** CE-BEA-02
- **Debugging frequency band:** 915/2400/2500MHz
- **Valuation date:** 2023.06.14

PCB Antenna

Dongguan UB Electronics Co., Ltd



Testing environment



Testing 3D microwave darkroom(6m*6m*6m)

PCB Antenna

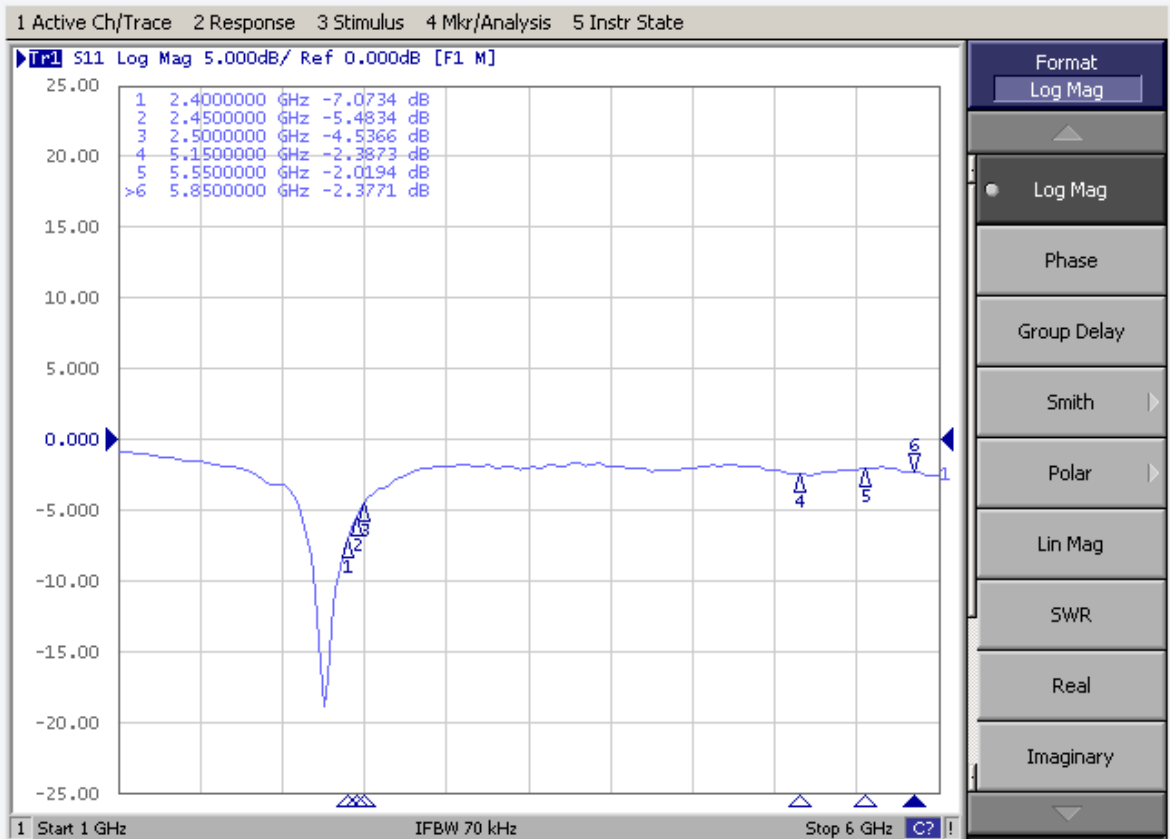
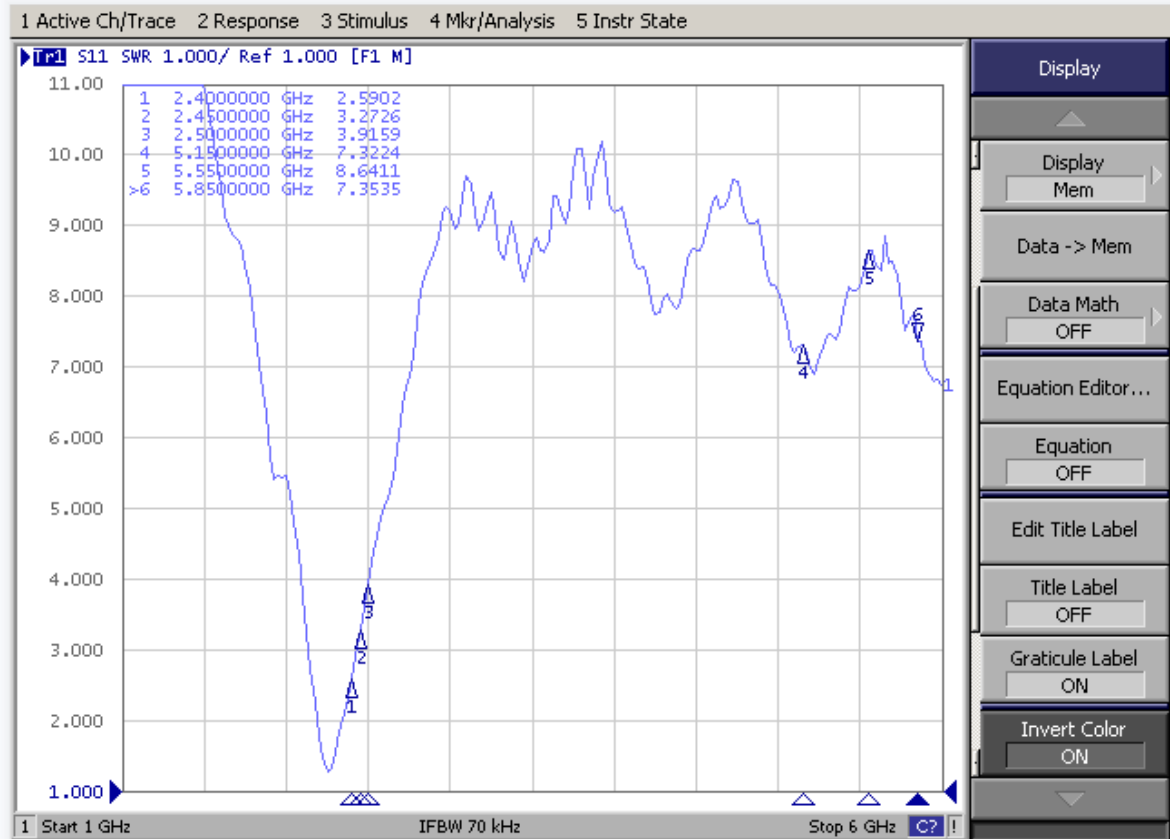
Dongguan UB Electronics Co., Ltd



Antenna

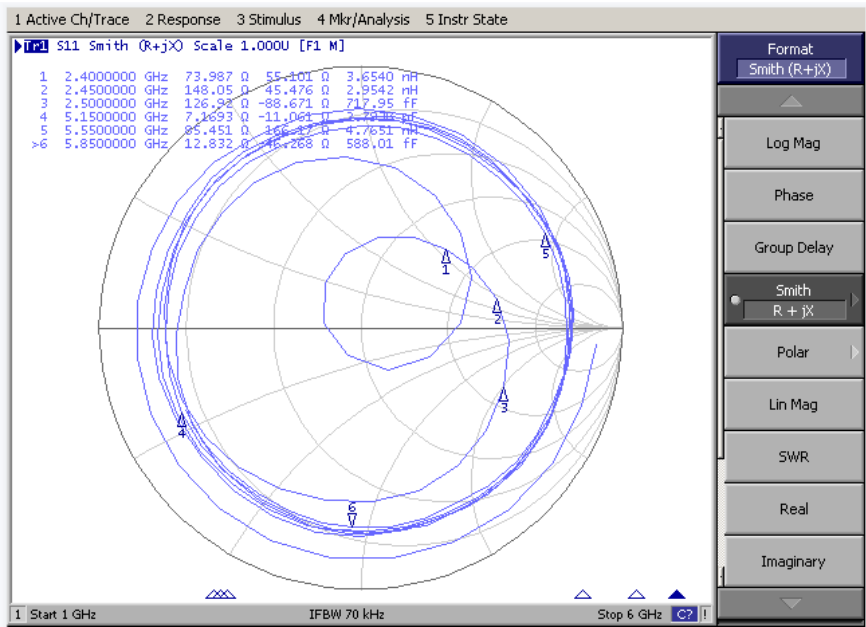
- Antenna name: 2.4G/LoRa
- Antenna Type: PCB Antenna
- Covers : 915/2400/2500MHz

S Parameter_Return Loss&VSWR (2.4G)



Efficiency and Gain-Smith (2.4G)

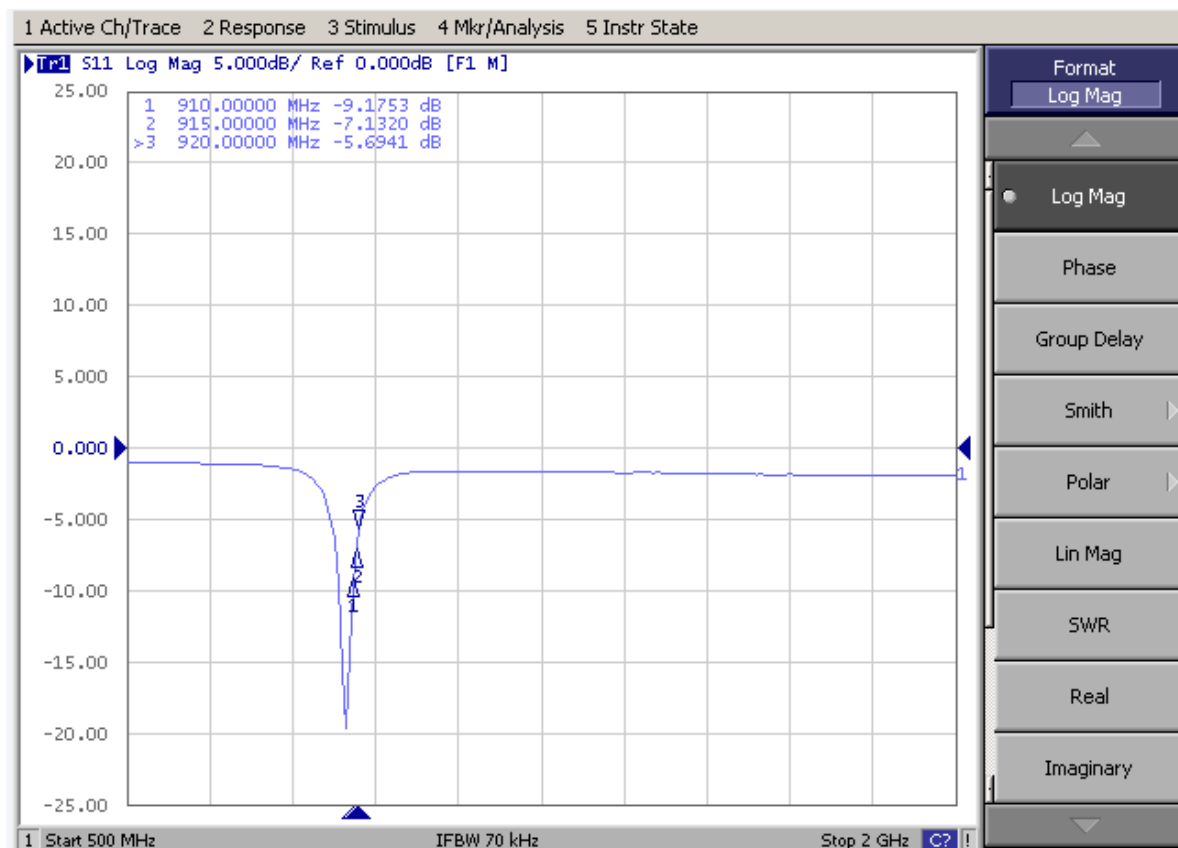
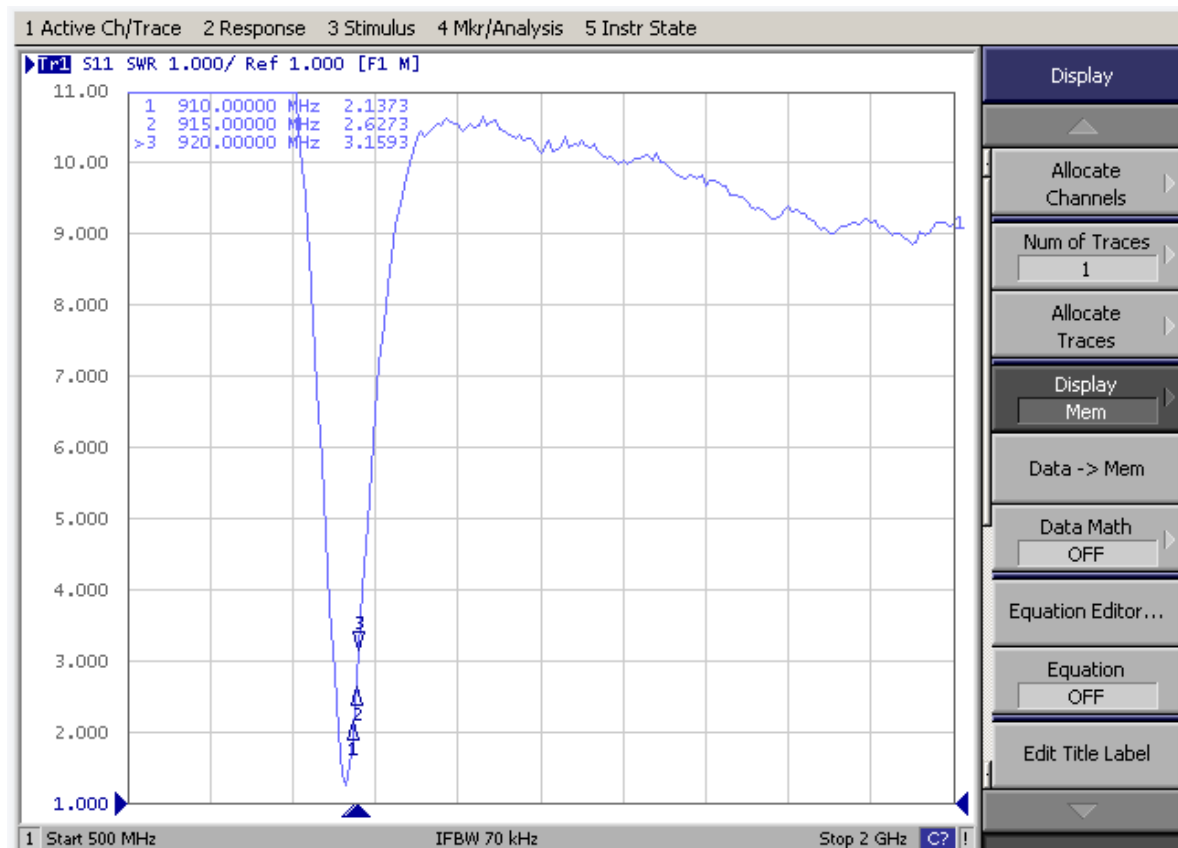
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Frequency ID	1	2	3	4	5	6	7	8	9	10	11
Frequency (MHz)	2400.0	2410.0	2420.0	2430.0	2440.0	2450.0	2460.0	2470.0	2480.0	2490.0	2500.0
Gain (dBi)	1.08	0.52	-0.03	-0.70	-0.74	-1.16	-0.90	-1.16	-1.78	-2.01	-2.16
Efficiency (%)	35.38	33.99	32.58	31.42	29.54	28.16	27.86	26.83	24.84	23.74	22.47

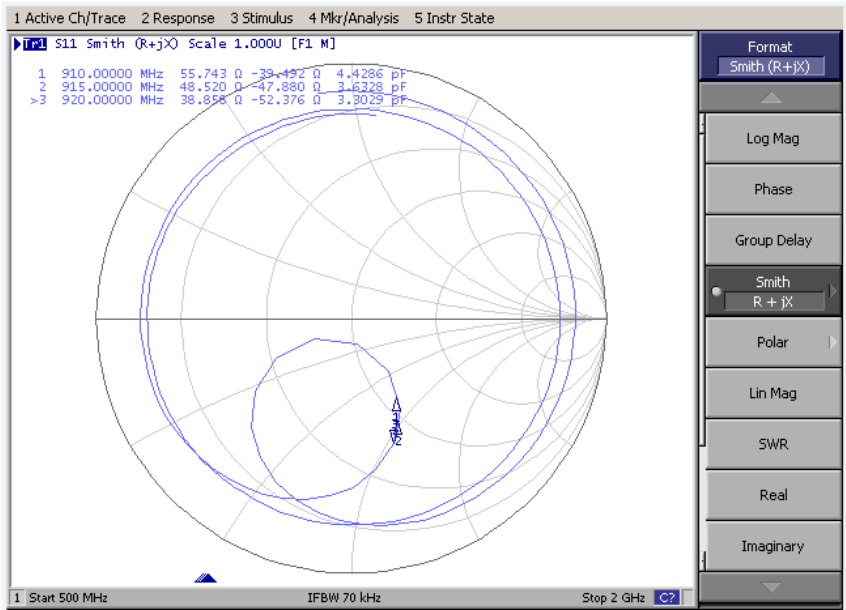
S Parameter_Return Loss&VSWR (LoRa)

Dongguan UB Electronics Co., Ltd



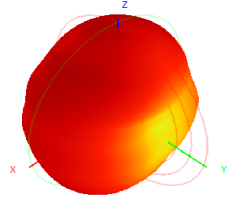
Efficiency and Gain-Smith (LoRa)

Dongguan UB Electronics Co., Ltd

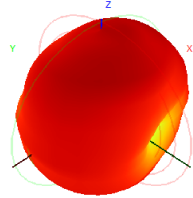


Frequency ID	1	2	3	4	5	6	7	8	9	10	11
Frequency (MHz)	910.0	911.0	912.0	913.0	914.0	915.0	916.0	917.0	918.0	919.0	920.0
Gain (dBi)	-0.67	-0.65	-0.62	-0.58	-0.55	-0.51	-0.45	-0.41	-0.37	-0.34	-0.32
Efficiency (%)	26.21	26.02	25.87	25.80	25.72	25.58	25.56	25.44	25.25	25.01	24.74

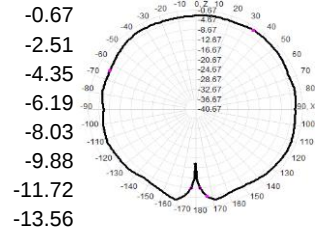
910.0MHz H+V, Eff: 26.2%



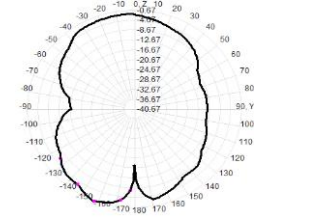
Back View



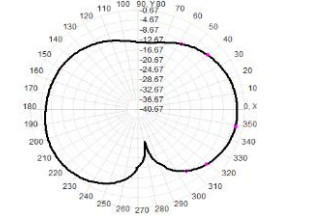
910.0MHz Total(E1-XZ), Max= -2.18dBi



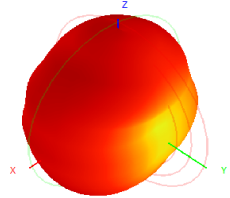
910.0MHz Total(E2-YZ), Max= -0.67dBi



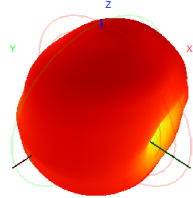
Total(H-XY), Max= -3.60dBi, CirD=23.75



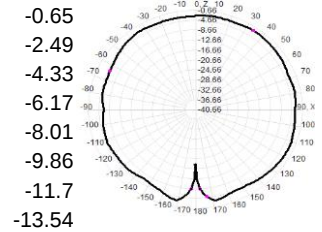
911.0MHz H+V, Eff: 26.0%



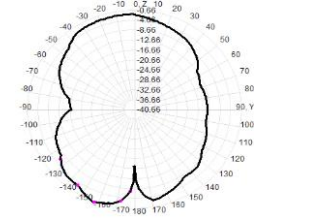
Back View



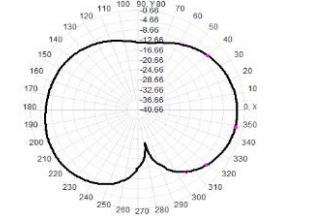
911.0MHz Total(E1-XZ), Max= -2.23dBi



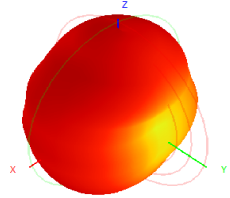
911.0MHz Total(E2-YZ), Max= -0.66dBi



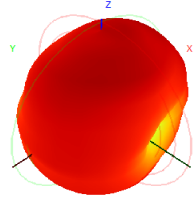
Total(H-XY), Max= -3.63dBi, CirD=23.52



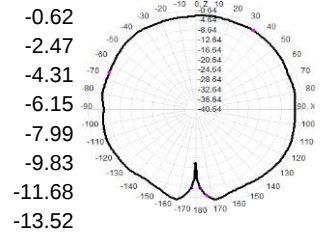
912.0MHz H+V, Eff: 25.9%



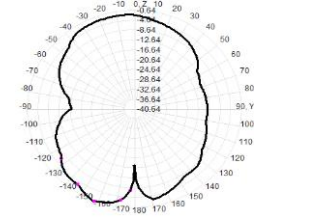
Back View



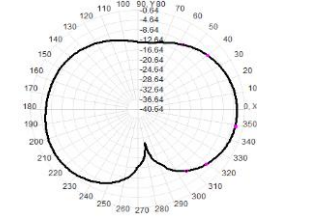
912.0MHz Total(E1-XZ), Max= -2.27dBi



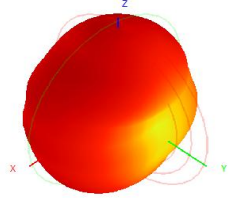
912.0MHz Total(E2-YZ), Max= -0.64dBi



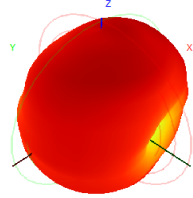
Total(H-XY), Max= -3.66dBi, CirD=23.14



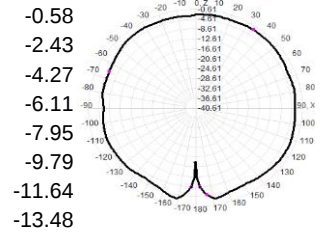
913.0MHz H+V, Eff: 25.8%



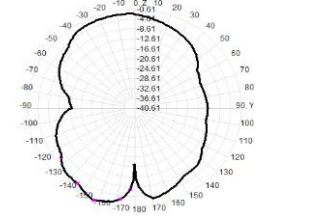
Back View



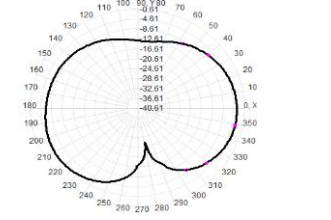
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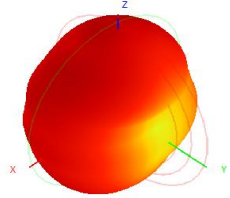
913.0MHz Total(E2-YZ), Max= -0.61dBi



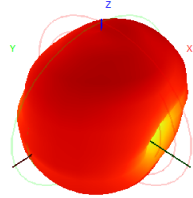
Total(H-XY), Max= -3.68dBi, CirD=22.84



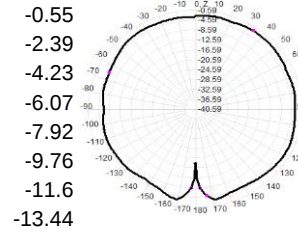
914.0MHz H+V, Eff: 25.7%



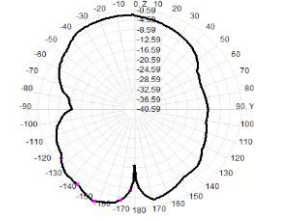
Back View



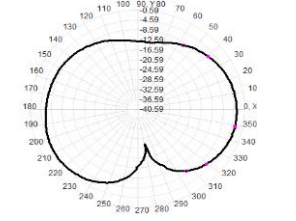
914.0MHz Total(E1-XZ), Max= -2.32dBi



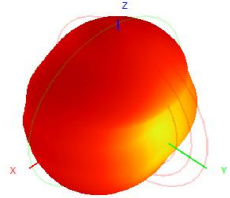
914.0MHz Total(E2-YZ), Max= -0.59dBi



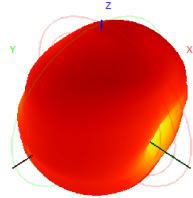
Total(H-XY), Max= -3.69dBi, CirD=22.45



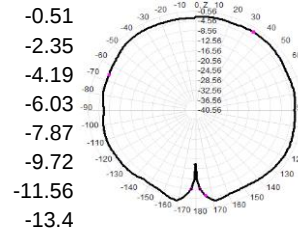
915.0MHz H+V, Eff: 25.6%



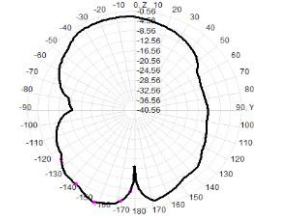
Back View



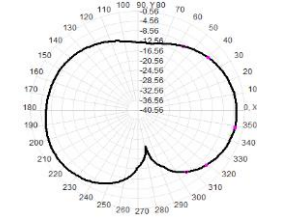
915.0MHz Total(E1-XZ), Max= -2.36dBi



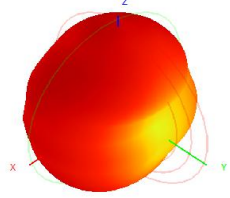
915.0MHz Total(E2-YZ), Max= -0.56dBi



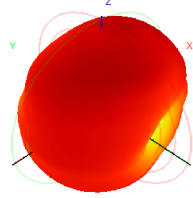
Total(H-XY), Max= -3.71dBi, CirD=22.10



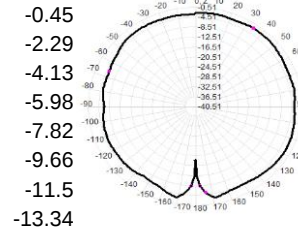
916.0MHz H+V, Eff: 25.6%



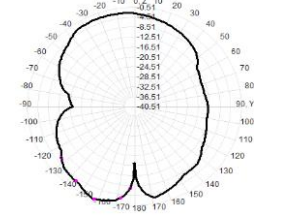
Back View



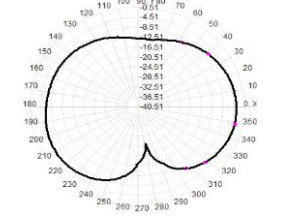
916.0MHz Total(E1-XZ), Max= -2.35dBi



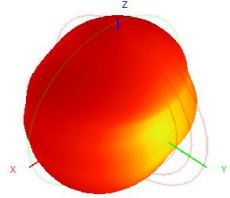
916.0MHz Total(E2-YZ), Max= -0.51dBi



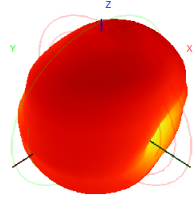
Total(H-XY), Max= -3.74dBi, CirD=21.74



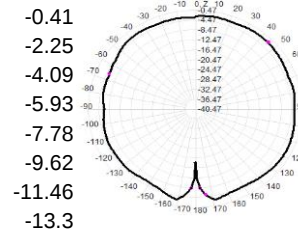
917.0MHz H+V, Eff: 25.4%



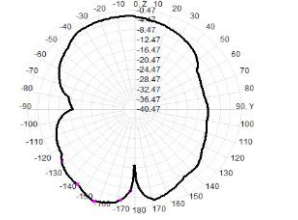
Back View



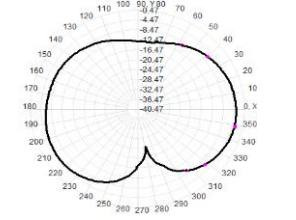
917.0MHz Total(E1-XZ), Max= -2.37dBi



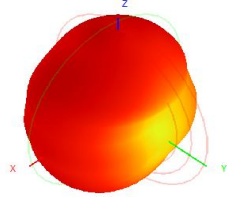
917.0MHz Total(E2-YZ), Max= -0.47dBi



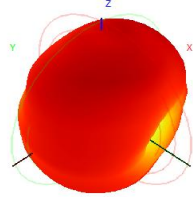
Total(H-XY), Max= -3.77dBi, CirD=21.35



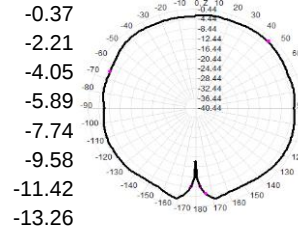
918.0MHz H+V, Eff: 25.3%



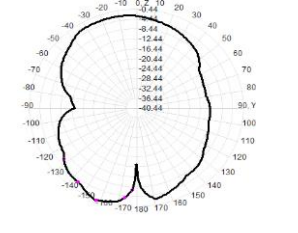
Back View



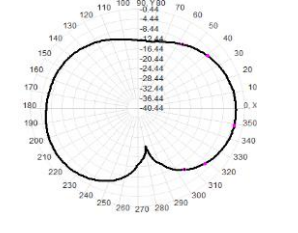
918.0MHz Total(E1-XZ), Max= -2.38dBi



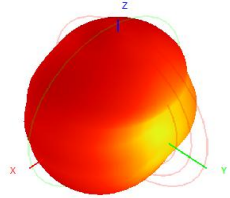
918.0MHz Total(E2-YZ), Max= -0.44dBi



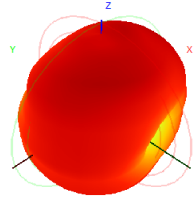
Total(H-XY), Max= -3.80dBi, CirD=20.97



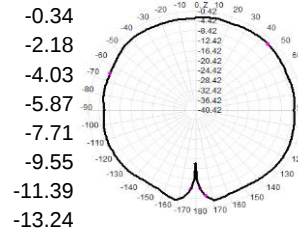
919.0MHz H+V, Eff: 25.0%



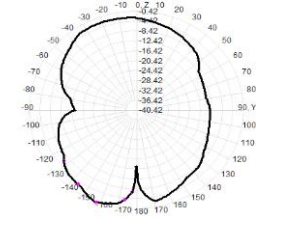
Back View



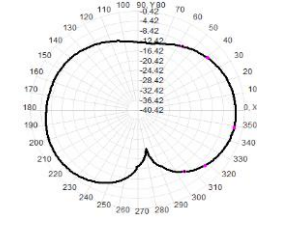
919.0MHz Total(E1-XZ), Max= -2.43dBi



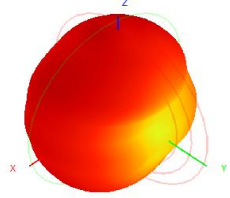
919.0MHz Total(E2-YZ), Max= -0.42dBi



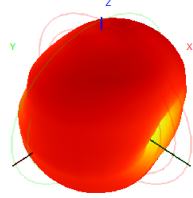
Total(H-XY), Max= -3.82dBi, CirD=20.61



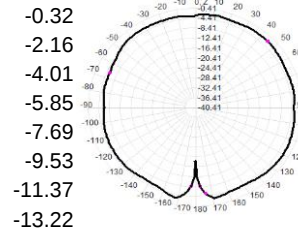
920.0MHz H+V, Eff: 24.7%



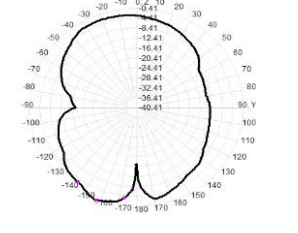
Back View



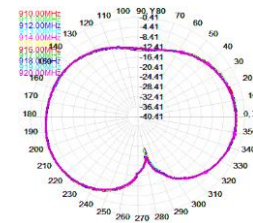
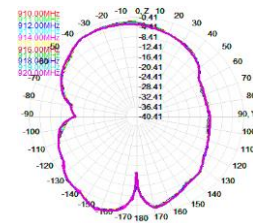
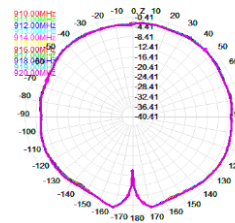
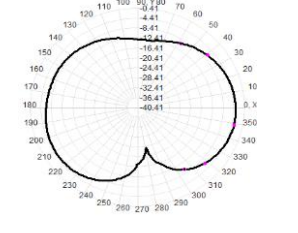
920.0MHz Total(E1-XZ), Max= -2.49dBi



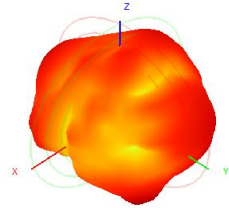
920.0MHz Total(E2-YZ), Max= -0.41dBi



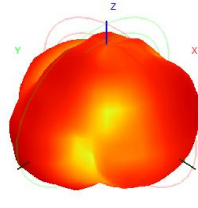
Total(H-XY), Max= -3.85dBi, CirD=20.21



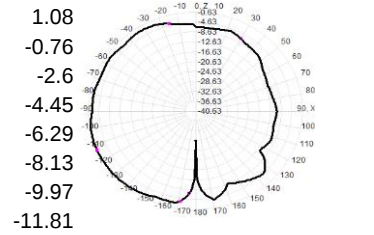
2400.0MHz H+V, Eff: 35.4%



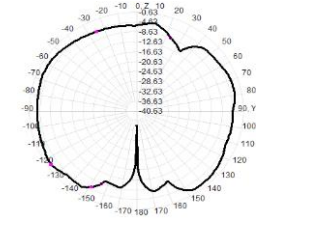
Back View



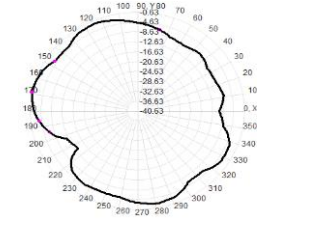
2400.0MHz Total(E1-XZ), Max=-0.81dBi



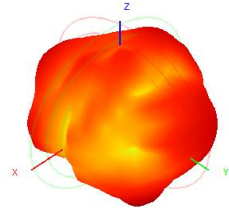
2400.0MHz Total(E2-YZ), Max=-2.25dBi



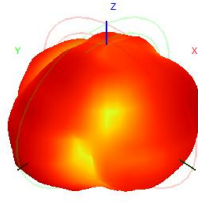
Total(H-XY), Max=-0.63dBi, CirD=13.38



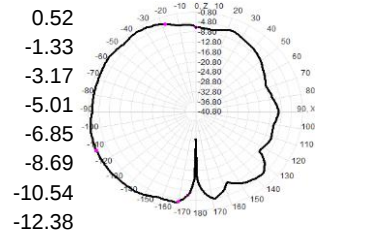
2410.0MHz H+V, Eff: 34.0%



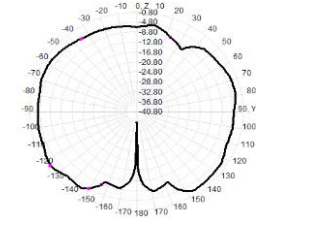
Back View



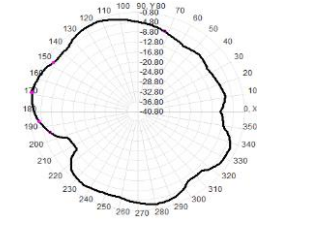
2410.0MHz Total(E1-XZ), Max=-0.83dBi



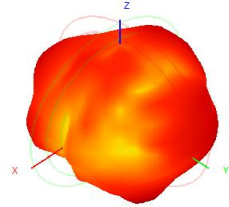
2410.0MHz Total(E2-YZ), Max=-2.12dBi



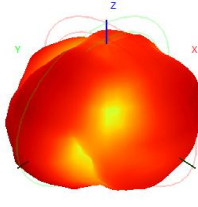
Total(H-XY), Max=-0.80dBi, CirD=13.04



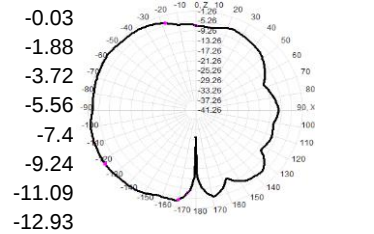
2420.0MHz H+V, Eff: 32.6%



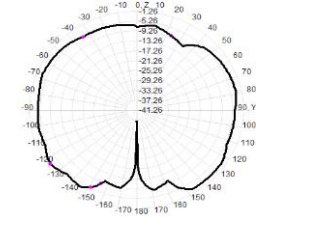
Back View



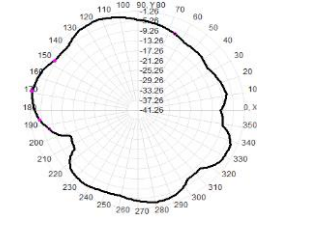
2420.0MHz Total(E1-XZ), Max=-1.26dBi



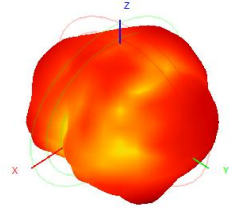
2420.0MHz Total(E2-YZ), Max=-2.54dBi



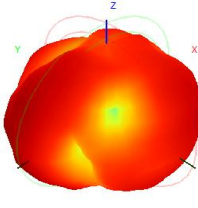
Total(H-XY), Max=-1.37dBi, CirD=13.01



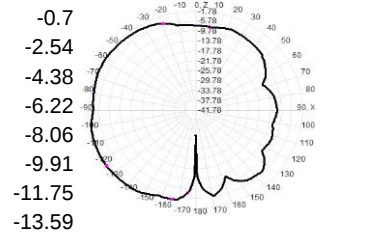
2430.0MHz H+V, Eff: 31.4%



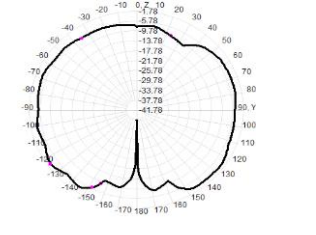
Back View



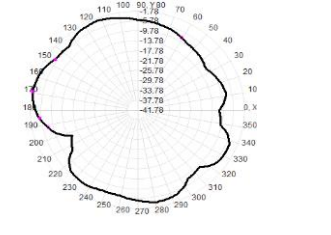
2430.0MHz Total(E1-XZ), Max=-1.78dBi



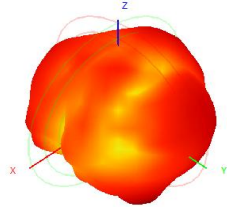
2430.0MHz Total(E2-YZ), Max=-3.11dBi



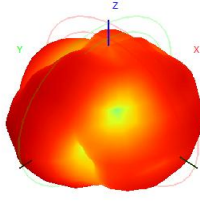
Total(H-XY), Max=-2.03dBi, CirD=13.30



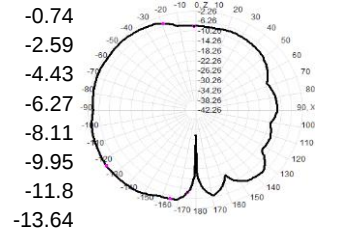
2440.0MHz H+V, Eff: 29.5%



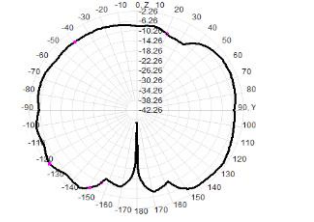
Back View



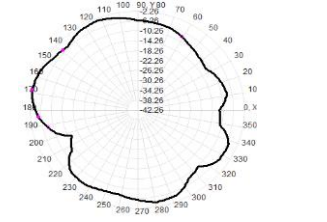
2440.0MHz Total(E1-XZ), Max= -2.26dBi



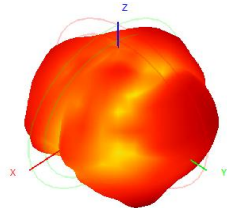
2440.0MHz Total(E2-YZ), Max= -3.40dBi



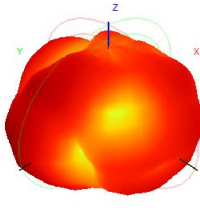
Total(H-XY), Max= -2.27dBi, CirD=13.50



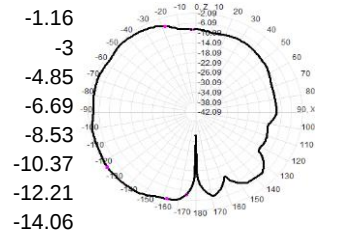
2450.0MHz H+V, Eff: 28.2%



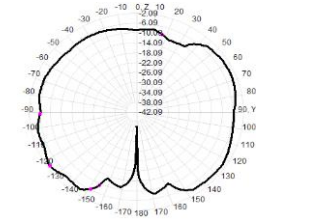
Back View



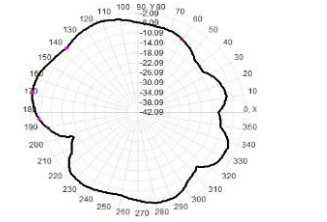
2450.0MHz Total(E1-XZ), Max= -2.52dBi



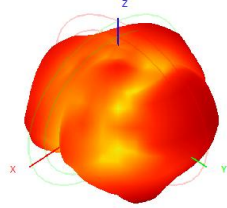
2450.0MHz Total(E2-YZ), Max= -3.24dBi



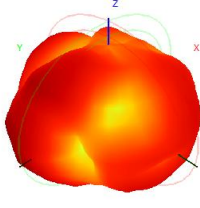
Total(H-XY), Max= -2.09dBi, CirD=14.28



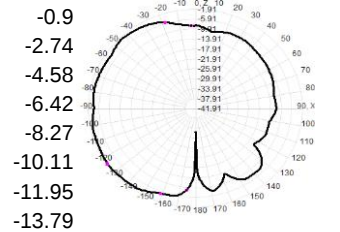
2460.0MHz H+V, Eff: 27.9%



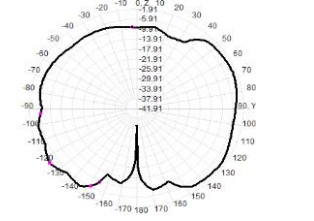
Back View



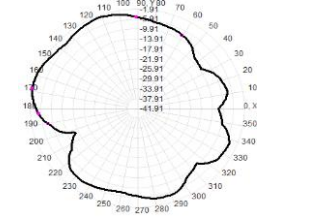
2460.0MHz Total(E1-XZ), Max= -2.42dBi



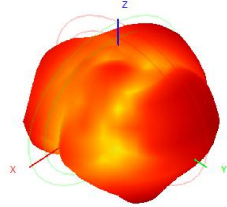
2460.0MHz Total(E2-YZ), Max= -3.01dBi



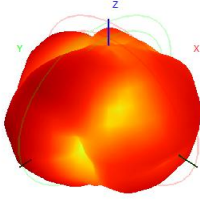
Total(H-XY), Max= -1.91dBi, CirD=15.19



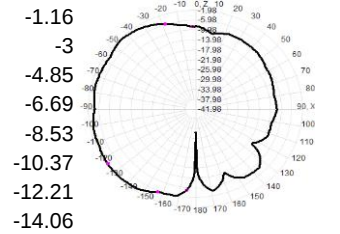
2470.0MHz H+V, Eff: 26.8%



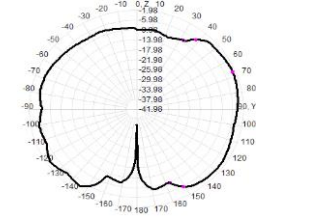
Back View



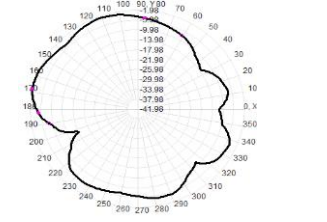
2470.0MHz Total(E1-XZ), Max= -2.59dBi



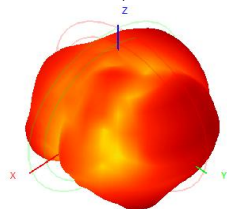
2470.0MHz Total(E2-YZ), Max= -3.19dBi



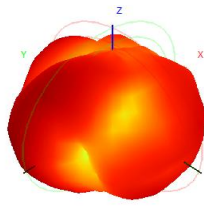
Total(H-XY), Max= -1.98dBi, CirD=16.36



2480.0MHz H+V, Eff: 24.8%

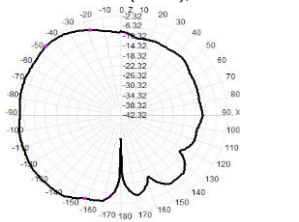


Back View

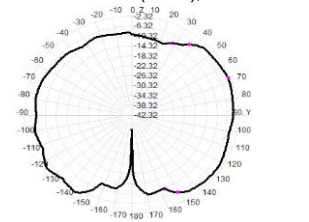


2480.0MHz Total(E1-XZ), Max= -3.06dBi

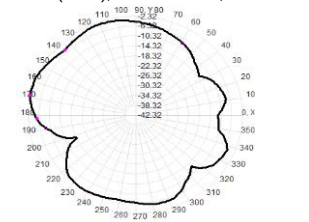
-1.78
-3.62
-5.46
-7.31
-9.15
-10.99
-12.83
-14.68



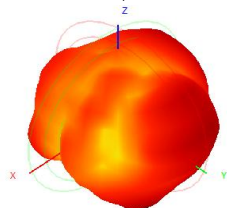
2480.0MHz Total(E2-YZ), Max= -3.43dBi



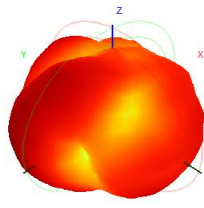
Total(H-XY), Max= -2.32dBi, CirD=16.42



2490.0MHz H+V, Eff: 23.7%

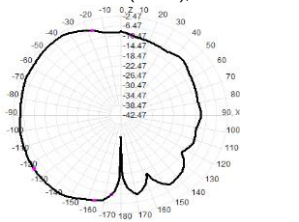


Back View

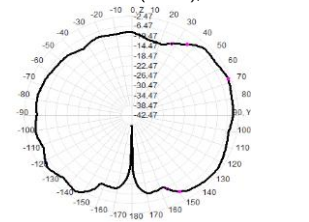


2490.0MHz Total(E1-XZ), Max= -3.65dBi

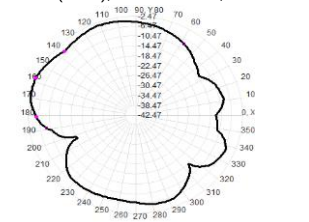
-2.01
-3.85
-5.69
-7.53
-9.38
-11.22
-13.06
-14.9



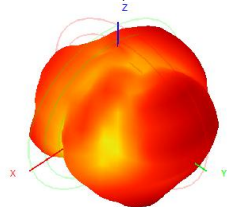
2490.0MHz Total(E2-YZ), Max= -3.75dBi



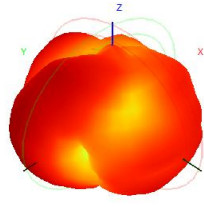
Total(H-XY), Max= -2.47dBi, CirD=16.62



2500.0MHz H+V, Eff: 22.5%

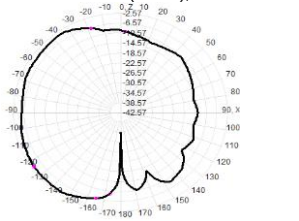


Back View

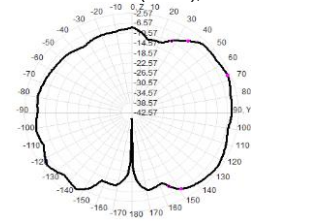


2500.0MHz Total(E1-XZ), Max= -3.83dBi

-2.16
-4
-5.84
-7.68
-9.53
-11.37
-13.21
-15.05



2500.0MHz Total(E2-YZ), Max= -3.85dBi



Total(H-XY), Max= -2.57dBi, CirD=17.14

