



好天线 · 优比造

东莞市优比电子有限公司

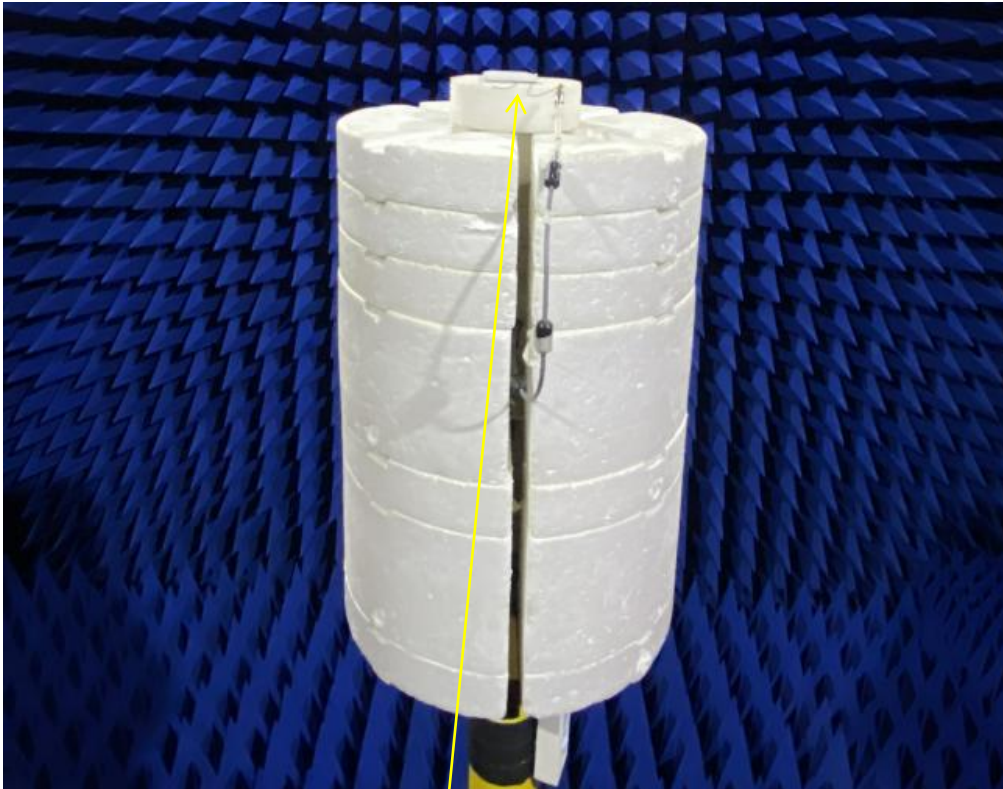
Dongguan UB Electronics Co., Ltd

Antenna Study

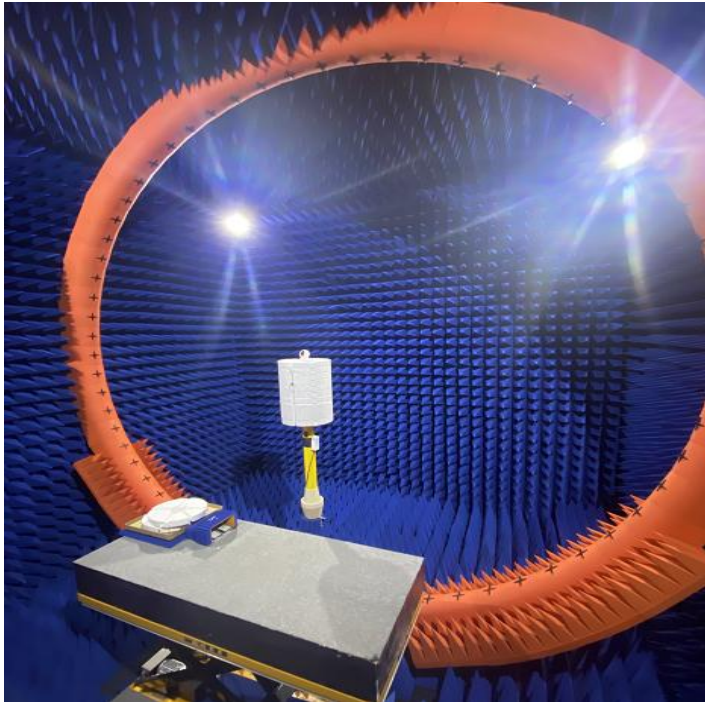
- **Client Name: 34ED LLC, DBA Centegix**
- **Project Name: CE-BDG-02**
- **Debugging frequency band: 915/2400/2500MHz**
- **Valuation date: 2023.06.14**

PCB Antenna

Dongguan UB Electronics Co., Ltd



Testing environment



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

PCB Antenna

Dongguan UB Electronics Co., Ltd

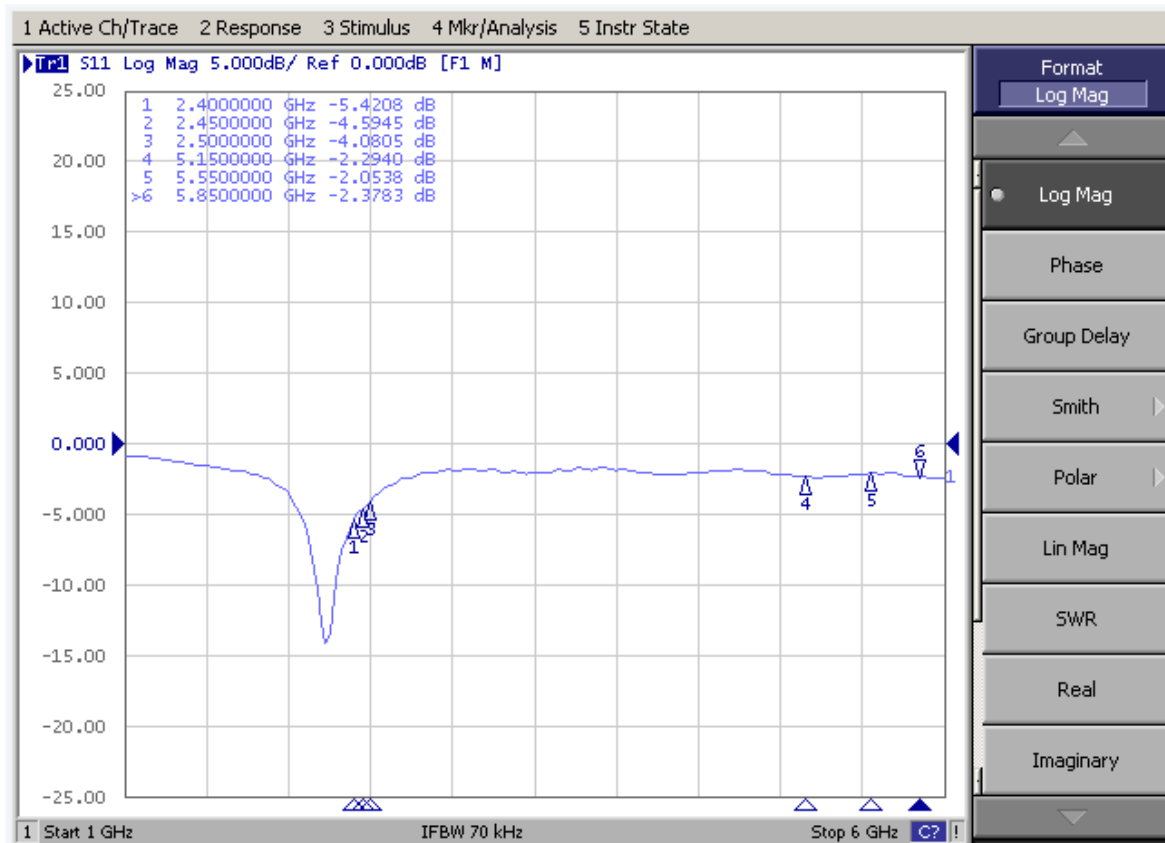
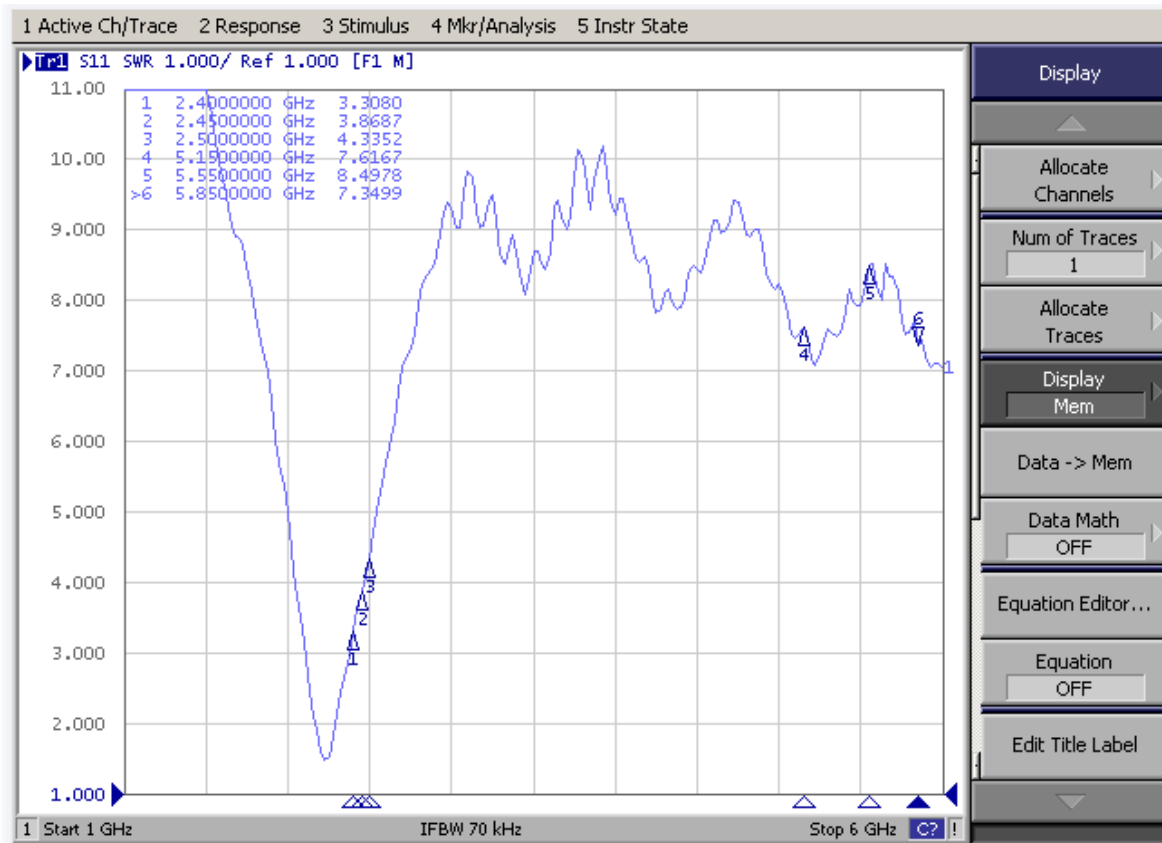


Antenna

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

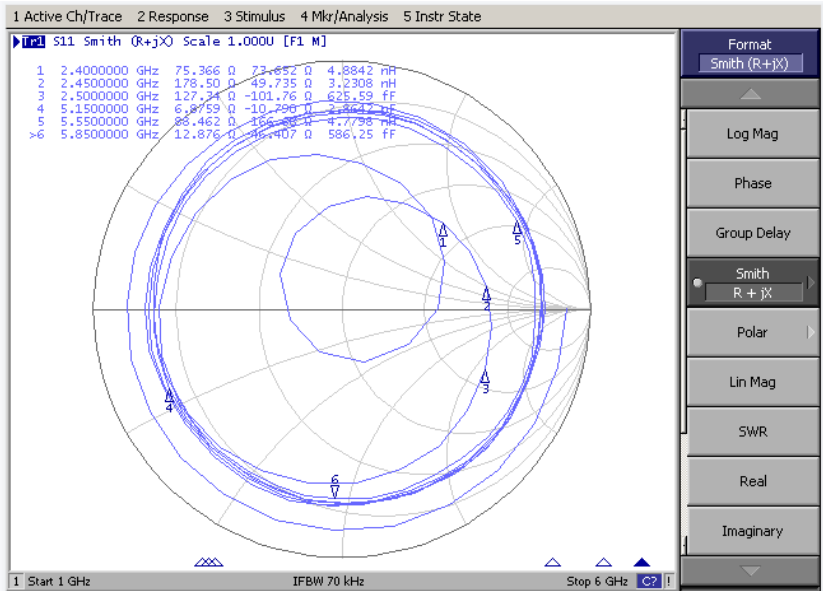
S Parameter_Return Loss&VSWR (2.4G)

Dongguan UB Electronics Co., Ltd



Efficiency and Gain-Smith (2.4G)

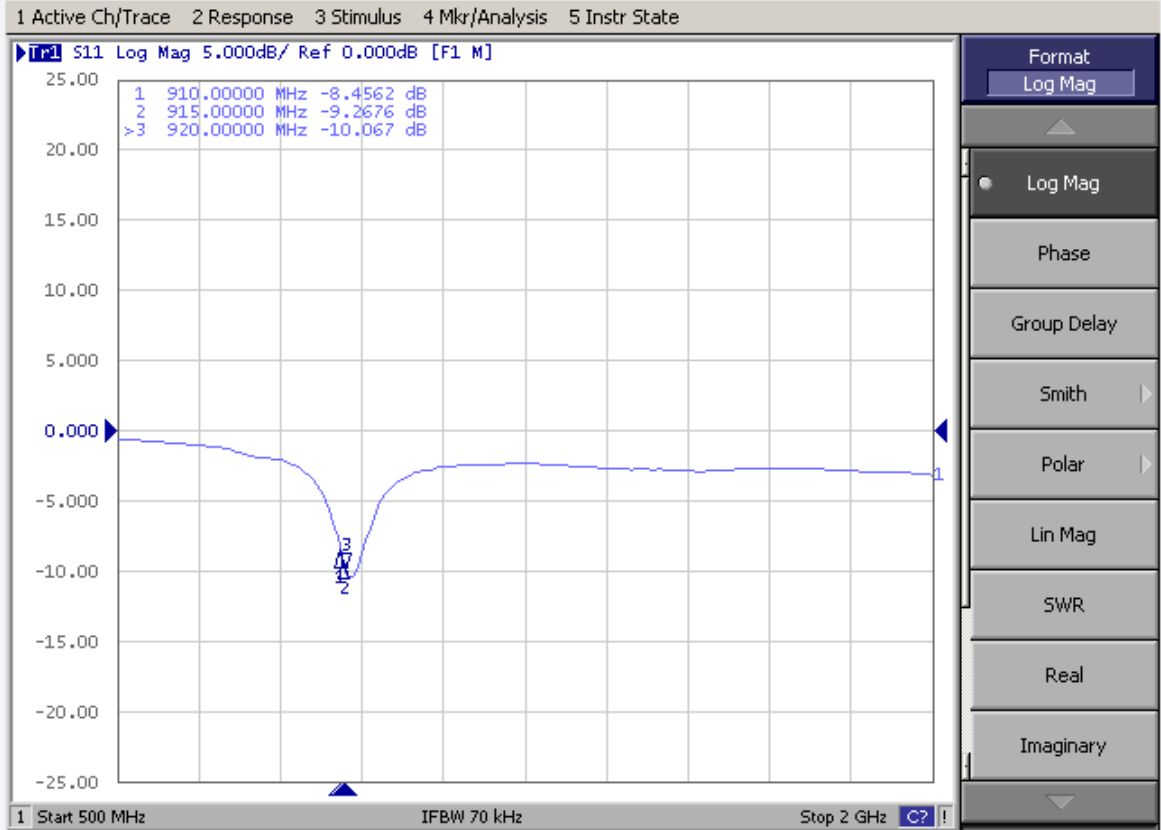
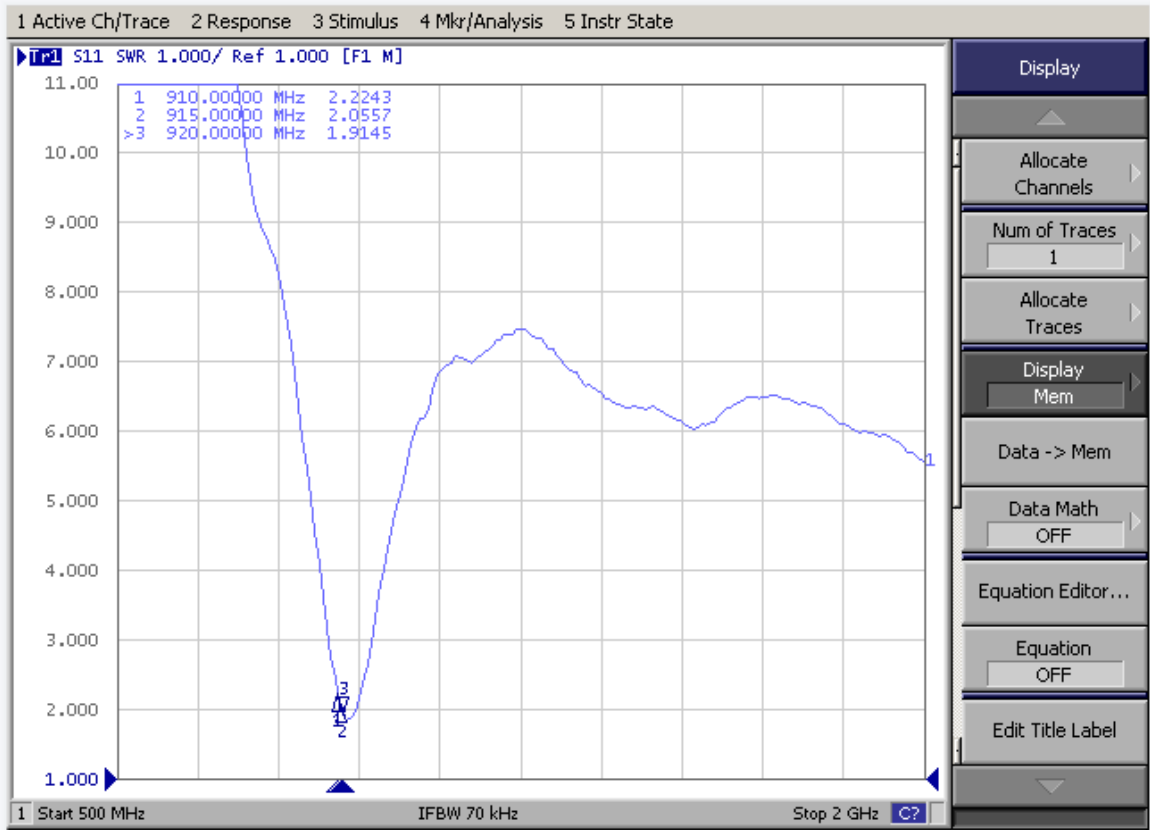
Dongguan UB Electronics Co., Ltd



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)	0.08	0.04	-0.38	-0.83	-1.04	-1.12	-1.20	-1.16	-1.31	-1.43	-1.74
Efficiency (%)	26.87	25.90	24.57	23.38	22.37	21.76	21.45	20.74	19.49	18.81	18.14

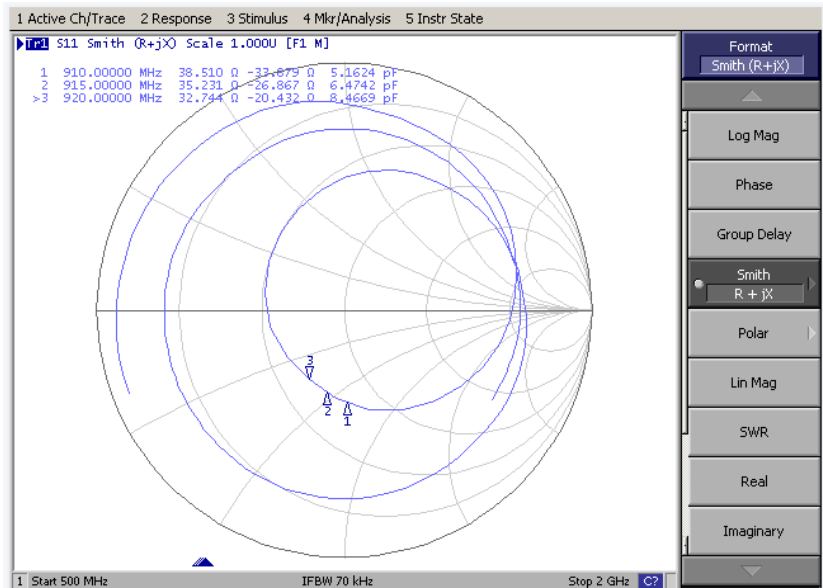
S Parameter_Return Loss&VSWR (LoRa)

Dongguan UB Electronics Co., Ltd



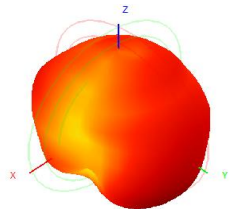
Efficiency and Gain-Smith (LoRa)

Dongguan UB Electronics Co., Ltd

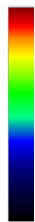
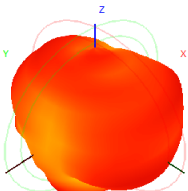


Frequency ID	1	2	3	4	5	6	7	8	9	10	11
Frequency (MHz)	910.0	911.0	912.0	913.0	914.0	915.0	916.0	917.0	918.0	919.0	920.0
Gain (dBi)	2.71	2.76	2.81	2.85	2.89	2.92	2.96	2.99	3.02	3.02	3.02
Efficiency (%)	49.15	49.37	49.61	49.94	50.21	50.35	50.63	50.72	50.72	50.58	50.35

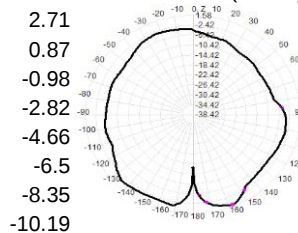
910.0MHz H+V, Eff: 49.2%



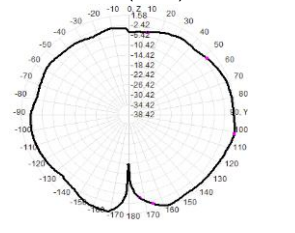
Back View



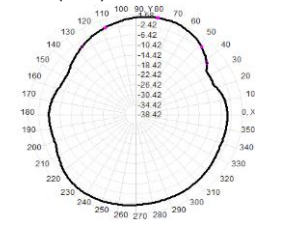
910.0MHz Total(E1-XZ), Max= 0.58dBi



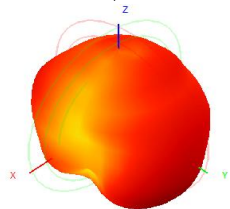
910.0MHz Total(E2-YZ), Max= 1.58dBi



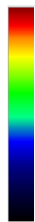
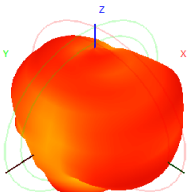
Total(H-XY), Max= 1.36dBi, CirD=9.79



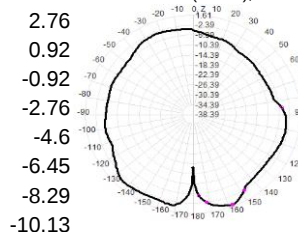
911.0MHz H+V, Eff: 49.4%



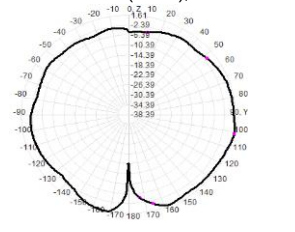
Back View



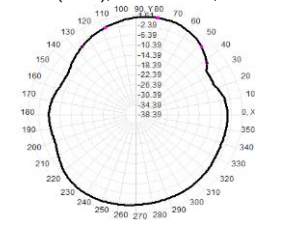
911.0MHz Total(E1-XZ), Max= 0.63dBi



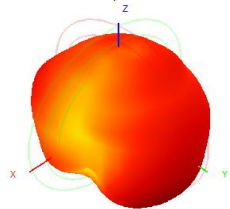
911.0MHz Total(E2-YZ), Max= 1.61dBi



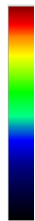
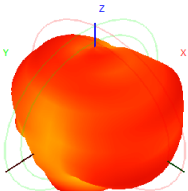
Total(H-XY), Max= 1.40dBi, CirD=9.84



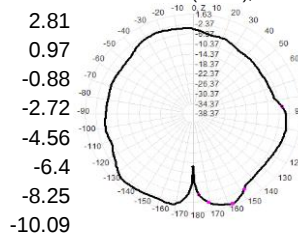
912.0MHz H+V, Eff: 49.6%



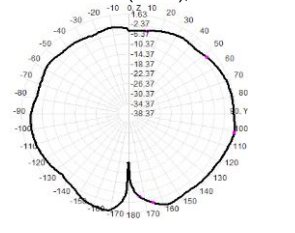
Back View



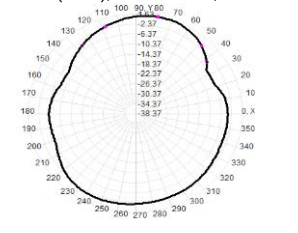
912.0MHz Total(E1-XZ), Max= 0.69dBi



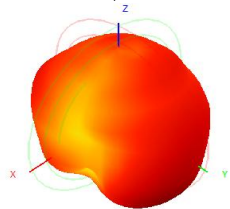
912.0MHz Total(E2-YZ), Max= 1.63dBi



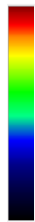
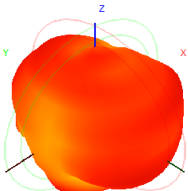
Total(H-XY), Max= 1.42dBi, CirD=9.89



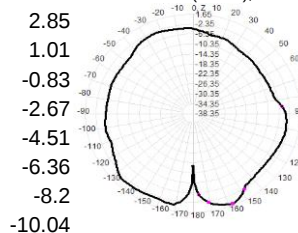
913.0MHz H+V, Eff: 49.9%



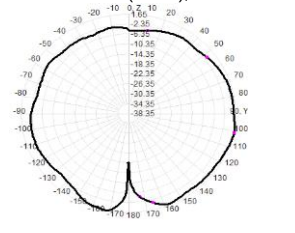
Back View



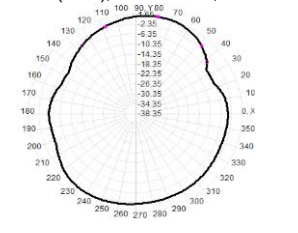
913.0MHz Total(E1-XZ), Max= 0.76dBi



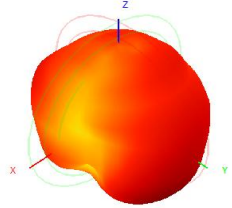
913.0MHz Total(E2-YZ), Max= 1.65dBi



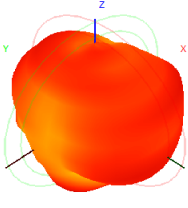
Total(H-XY), Max= 1.46dBi, CirD=9.93



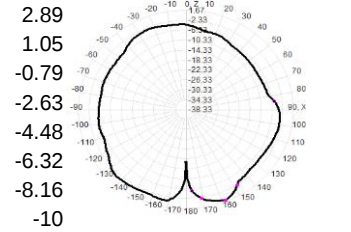
914.0MHz H+V, Eff: 50.2%



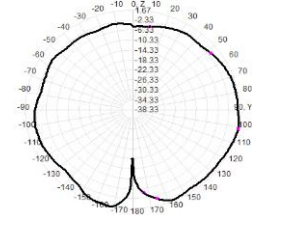
Back View



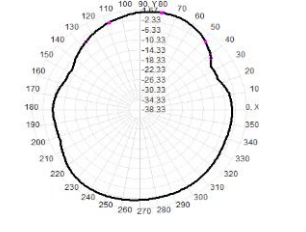
914.0MHz Total(E1-XZ), Max= 0.81dBi



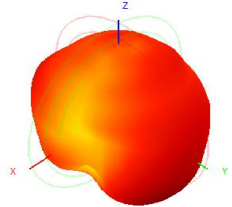
914.0MHz Total(E2-YZ), Max= 1.67dBi



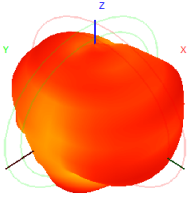
Total(H-XY), Max= 1.50dBi, CirD=9.98



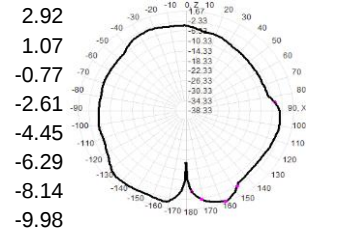
915.0MHz H+V, Eff: 50.3%



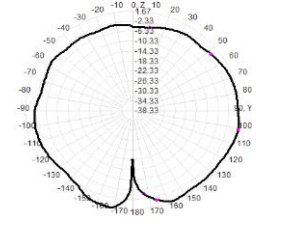
Back View



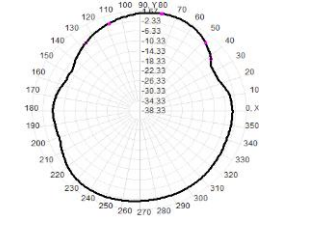
915.0MHz Total(E1-XZ), Max= 0.85dBi



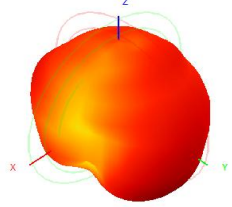
915.0MHz Total(E2-YZ), Max= 1.67dBi



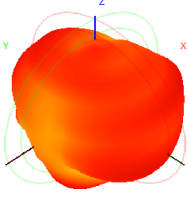
Total(H-XY), Max= 1.54dBi, CirD=10.02



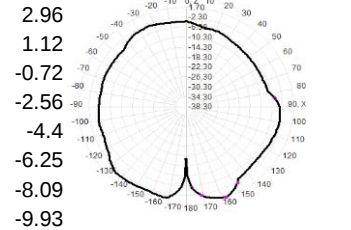
916.0MHz H+V, Eff: 50.6%



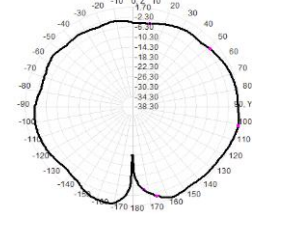
Back View



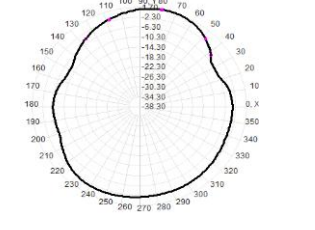
916.0MHz Total(E1-XZ), Max= 0.91dBi



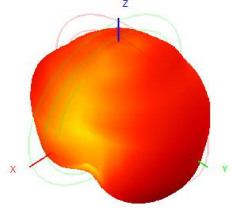
916.0MHz Total(E2-YZ), Max= 1.70dBi



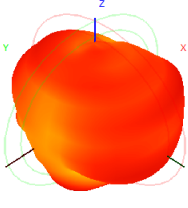
Total(H-XY), Max= 1.57dBi, CirD=10.04



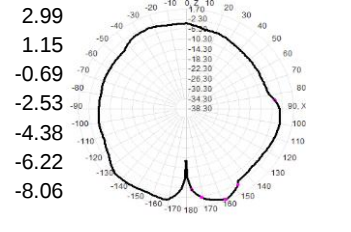
917.0MHz H+V, Eff: 50.7%



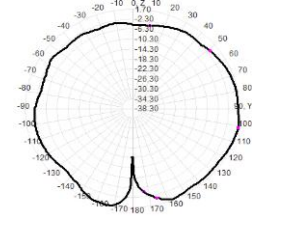
Back View



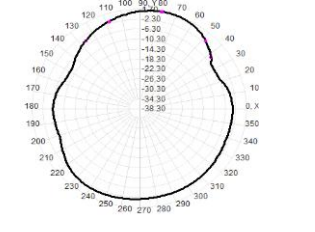
917.0MHz Total(E1-XZ), Max= 0.95dBi



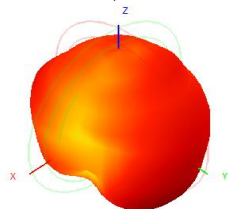
917.0MHz Total(E2-YZ), Max= 1.70dBi



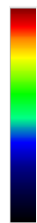
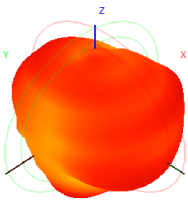
Total(H-XY), Max= 1.59dBi, CirD=10.06



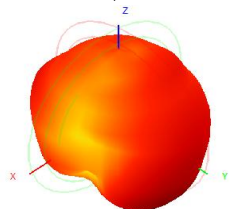
918.0MHz H+V, Eff: 50.7%



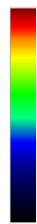
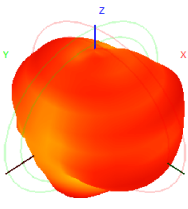
Back View



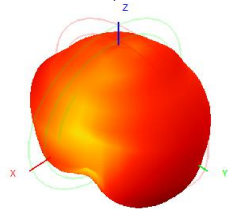
919.0MHz H+V, Eff: 50.6%



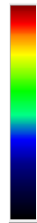
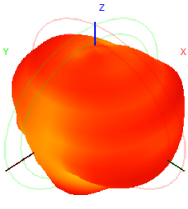
Back View



920.0MHz H+V, Eff: 50.3%

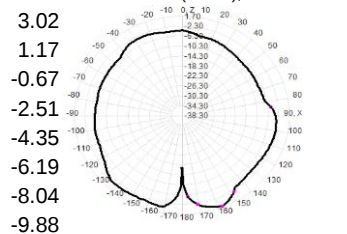


Back View

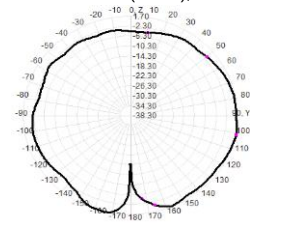


-9.9

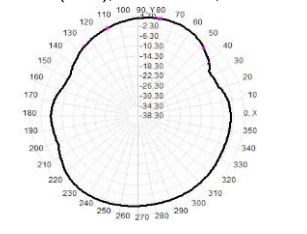
918.0MHz Total(E1-XZ), Max= 0.98dBi



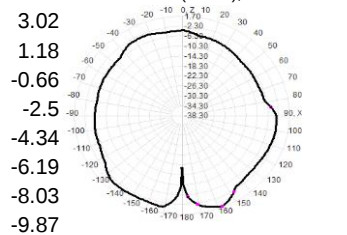
918.0MHz Total(E2-YZ), Max= 1.70dBi



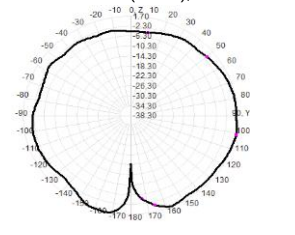
Total(H-XY), Max= 1.63dBi, CirD=10.06



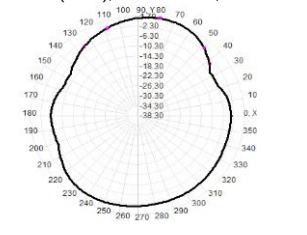
919.0MHz Total(E1-XZ), Max= 1.00dBi



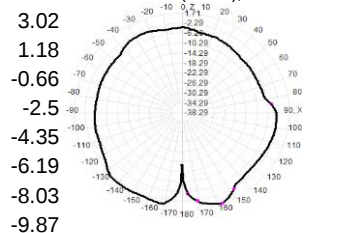
919.0MHz Total(E2-YZ), Max= 1.70dBi



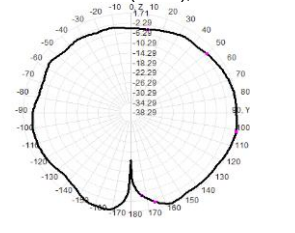
Total(H-XY), Max= 1.67dBi, CirD=10.10



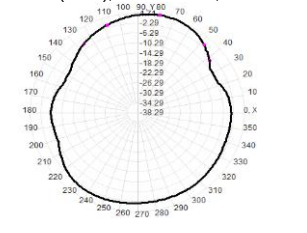
920.0MHz Total(E1-XZ), Max= 1.00dBi



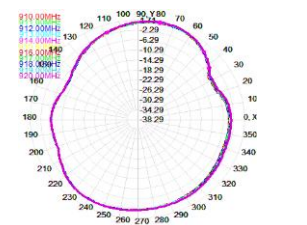
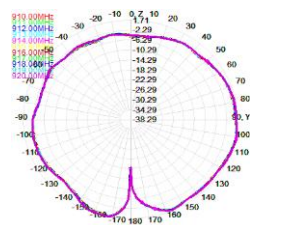
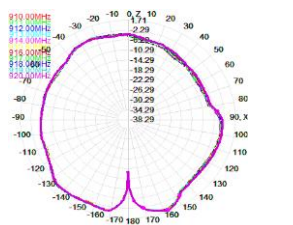
920.0MHz Total(E2-YZ), Max= 1.67dBi



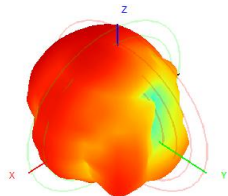
Total(H-XY), Max= 1.71dBi, CirD=10.13



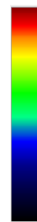
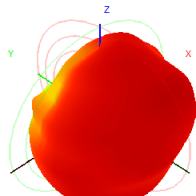
-11.71



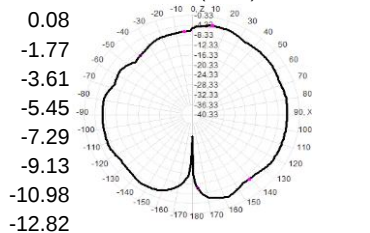
2400.0MHz H+V, Eff: 26.9%



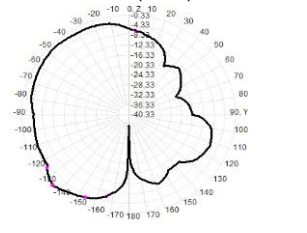
Back View



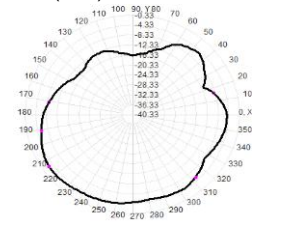
2400.0MHz Total(E1-XZ), Max= -3.85dBi



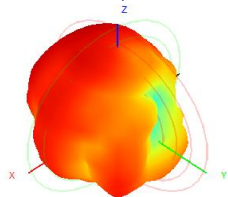
2400.0MHz Total(E2-YZ), Max= -0.33dBi



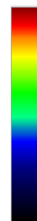
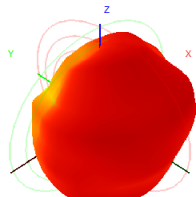
Total(H-XY), Max= -2.85dBi, CirD=13.76



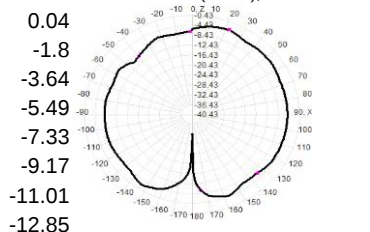
2410.0MHz H+V, Eff: 25.9%



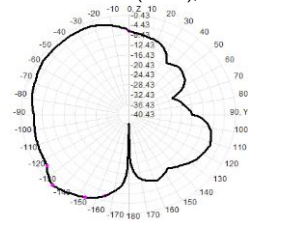
Back View



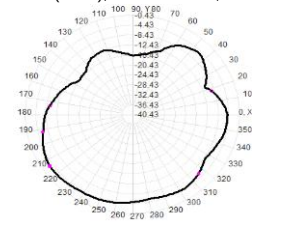
2410.0MHz Total(E1-XZ), Max= -3.71dBi



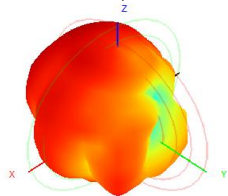
2410.0MHz Total(E2-YZ), Max= -0.43dBi



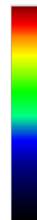
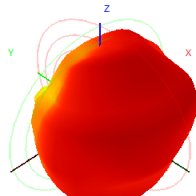
Total(H-XY), Max= -3.32dBi, CirD=13.39



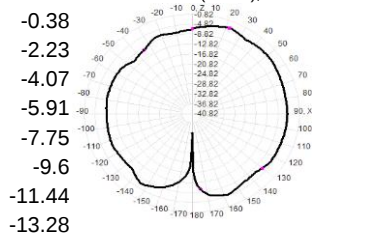
2420.0MHz H+V, Eff: 24.6%



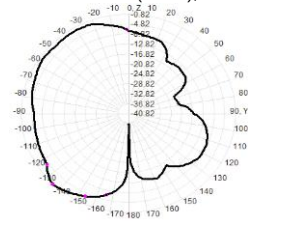
Back View



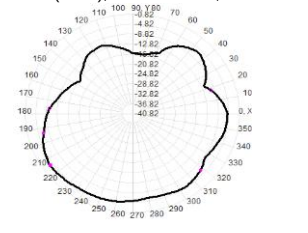
2420.0MHz Total(E1-XZ), Max= -3.71dBi



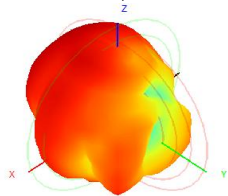
2420.0MHz Total(E2-YZ), Max= -0.82dBi



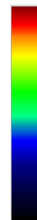
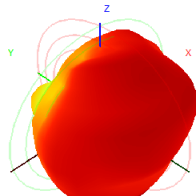
Total(H-XY), Max= -3.85dBi, CirD=13.43



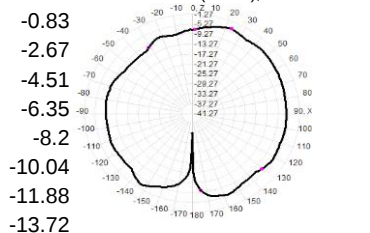
2430.0MHz H+V, Eff: 23.4%



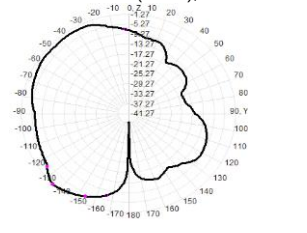
Back View



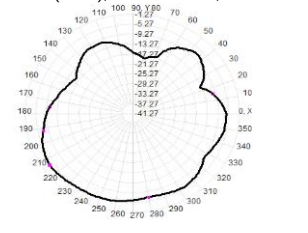
2430.0MHz Total(E1-XZ), Max= -4.22dBi



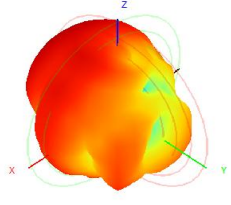
2430.0MHz Total(E2-YZ), Max= -1.27dBi



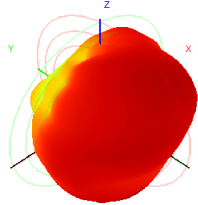
Total(H-XY), Max= -4.16dBi, CirD=14.44



2440.0MHz H+V, Eff: 22.4%

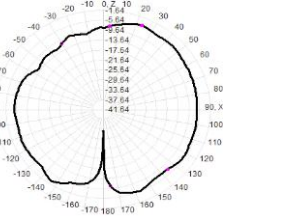


Back View

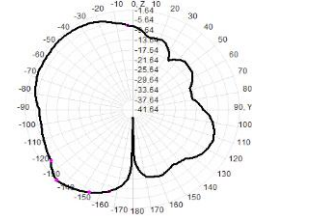


2440.0MHz Total(E1-XZ), Max= -4.87dBi

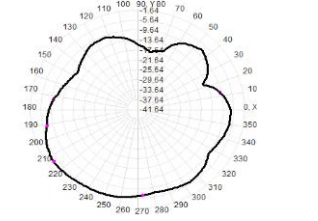
-1.04
-2.88
-4.72
-6.56
-8.41
-10.25
-12.09
-13.93



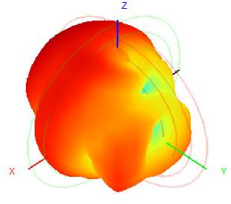
2440.0MHz Total(E2-YZ), Max= -1.64dBi



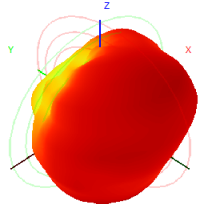
Total(H-XY), Max= -4.11dBi, CirD=13.85



2450.0MHz H+V, Eff: 21.8%

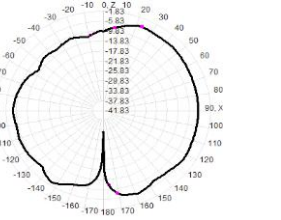


Back View

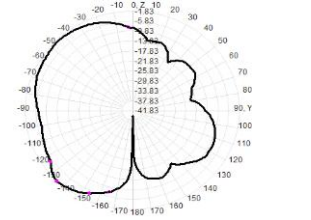


2450.0MHz Total(E1-XZ), Max= -5.14dBi

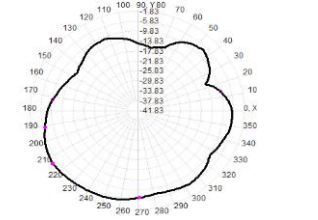
-1.12
-2.96
-4.8
-6.64
-8.49
-10.33
-12.17
-14.01



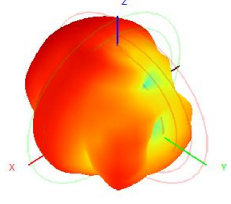
2450.0MHz Total(E2-YZ), Max= -1.83dBi



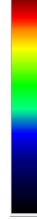
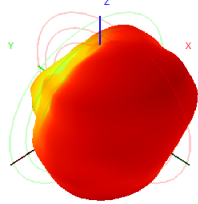
Total(H-XY), Max= -3.83dBi, CirD=12.21



2460.0MHz H+V, Eff: 21.5%

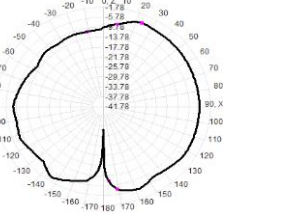


Back View

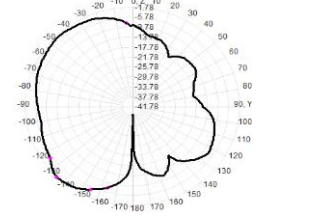


2460.0MHz Total(E1-XZ), Max= -5.15dBi

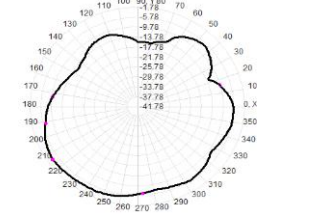
-1.2
-3.04
-4.88
-6.72
-8.56
-10.41
-12.25
-14.09



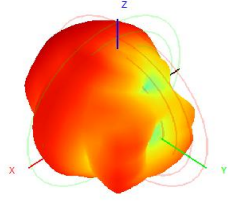
2460.0MHz Total(E2-YZ), Max= -1.78dBi



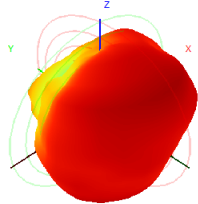
Total(H-XY), Max= -3.80dBi, CirD=12.03



2470.0MHz H+V, Eff: 20.7%

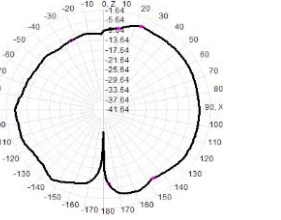


Back View

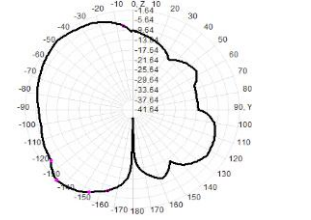


2470.0MHz Total(E1-XZ), Max= -5.43dBi

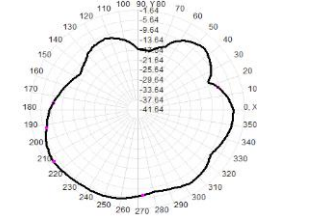
-1.16
-3
-4.84
-6.68
-8.53
-10.37
-12.21
-14.05



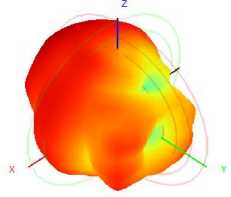
2470.0MHz Total(E2-YZ), Max= -1.64dBi



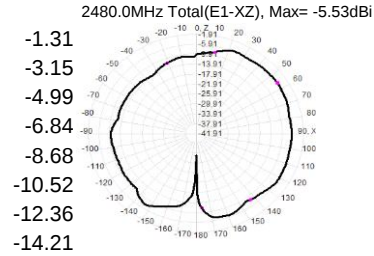
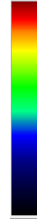
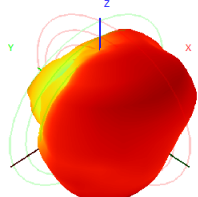
Total(H-XY), Max= -4.09dBi, CirD=13.74



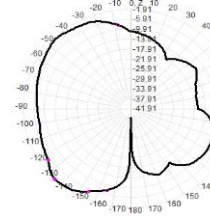
2480.0MHz H+V, Eff: 19.5%



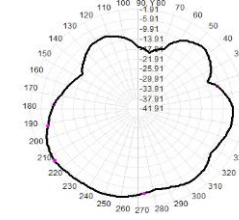
Back View



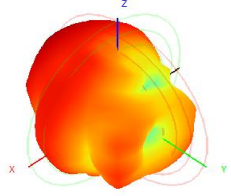
2480.0MHz Total(E2-YZ), Max= -1.91dBi



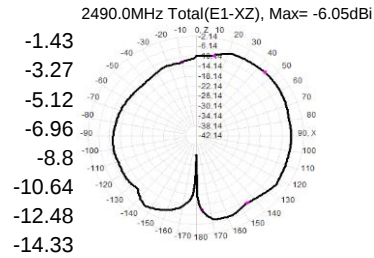
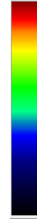
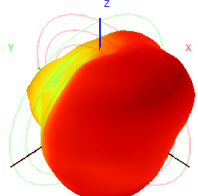
Total(H-XY), Max= -4.66dBi, CirD=14.27



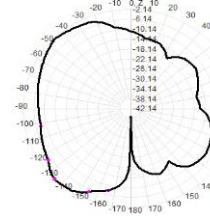
2490.0MHz H+V, Eff: 18.8%



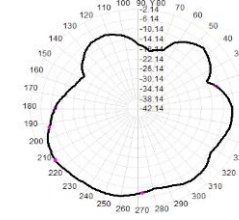
Back View



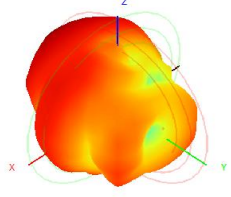
2490.0MHz Total(E2-YZ), Max= -2.14dBi



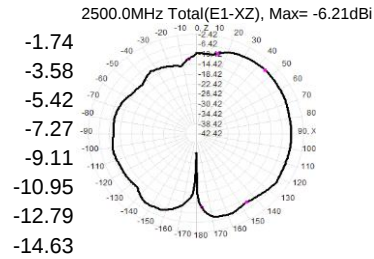
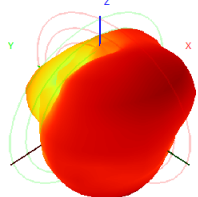
Total(H-XY), Max= -5.22dBi, CirD=13.25



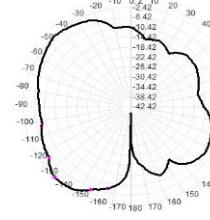
2500.0MHz H+V, Eff: 18.1%



Back View



2500.0MHz Total(E2-YZ), Max= -2.42dBi



Total(H-XY), Max= -5.52dBi, CirD=12.99

