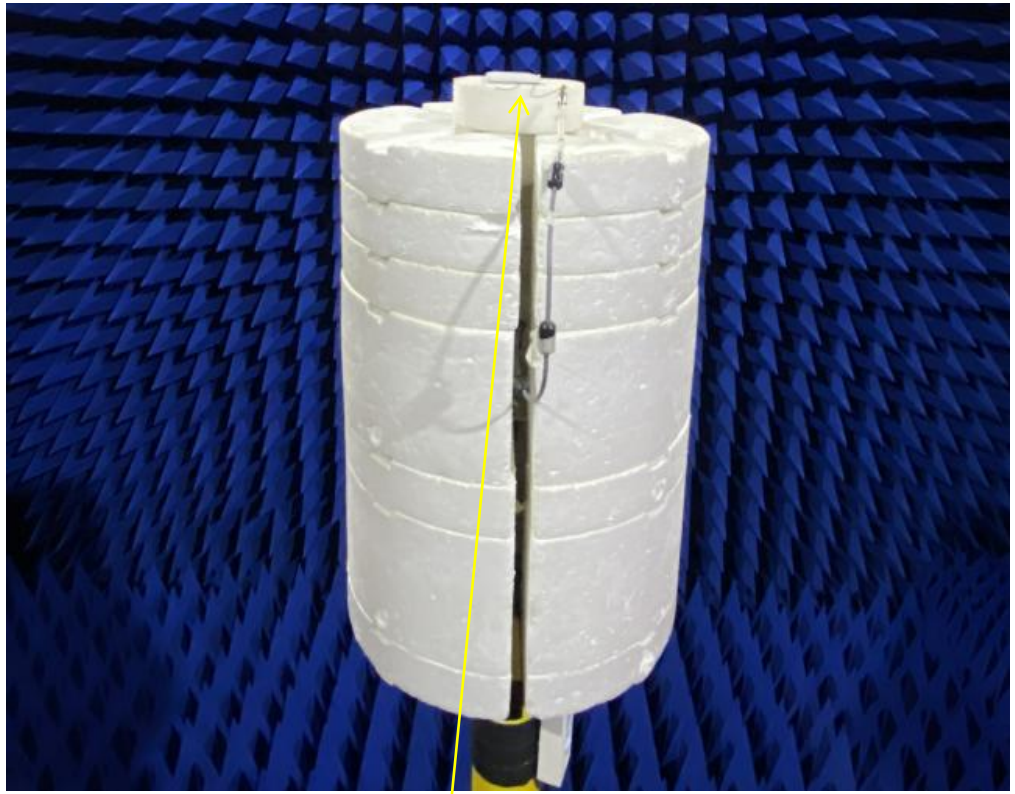
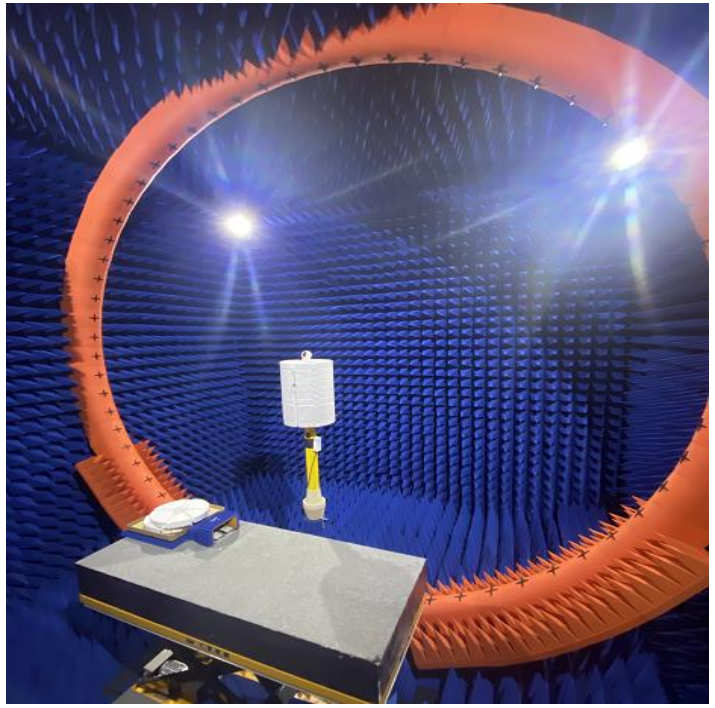
Antenna Study

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

PCB Antenna



Testing environment



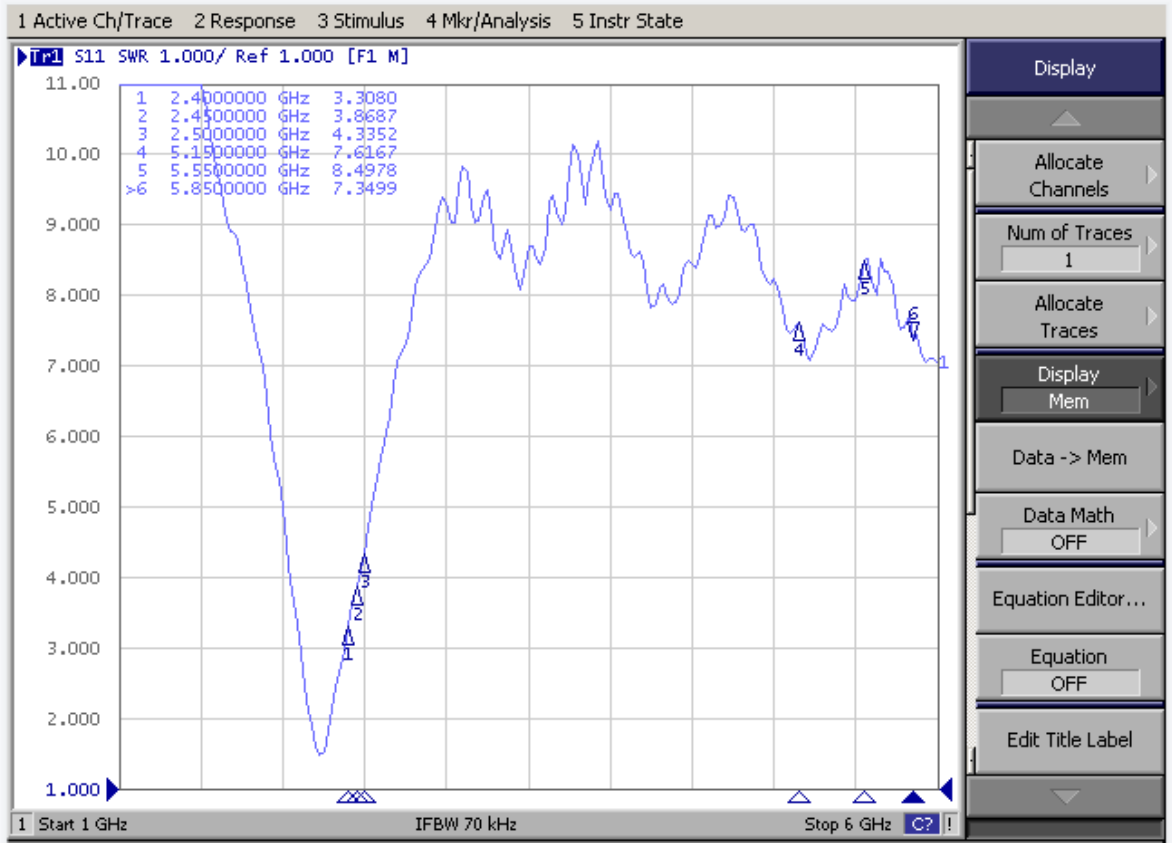
Testing 3D microwave darkroom(6m*6m*6m)

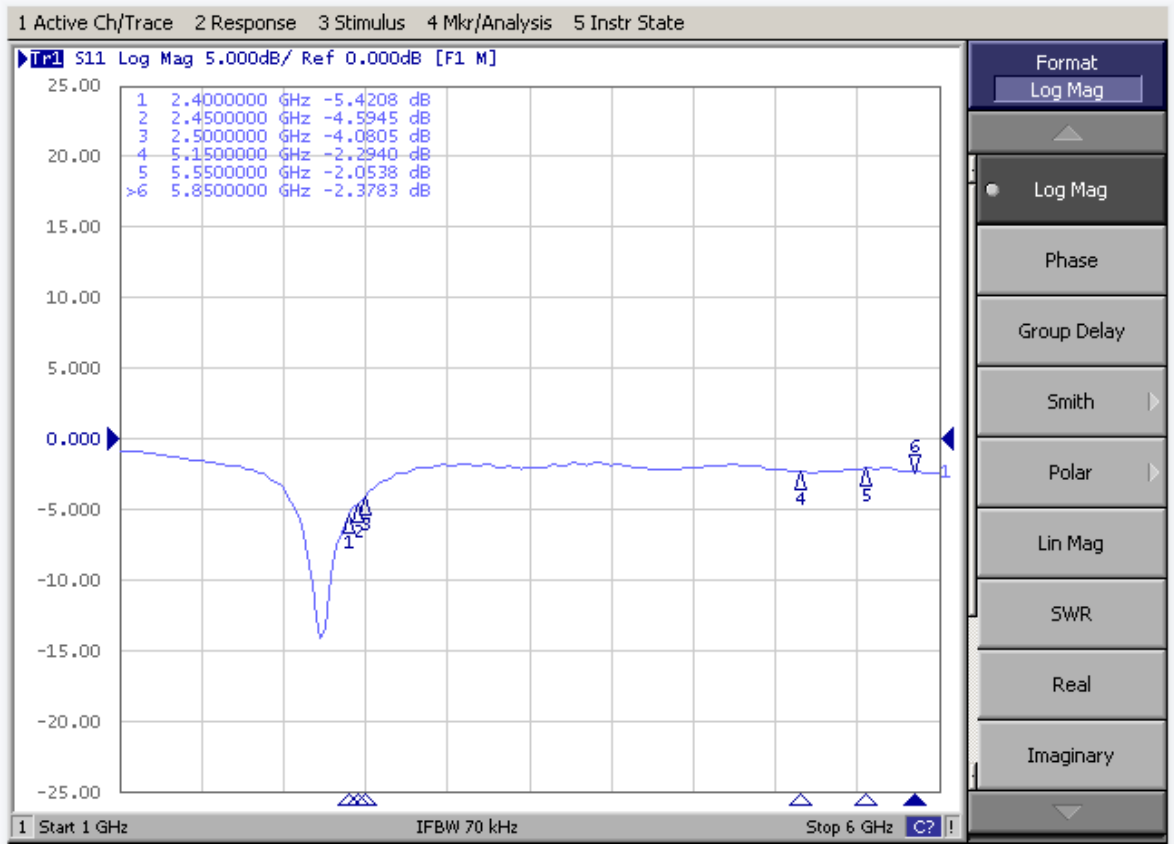
PCB Antenna

Antenna

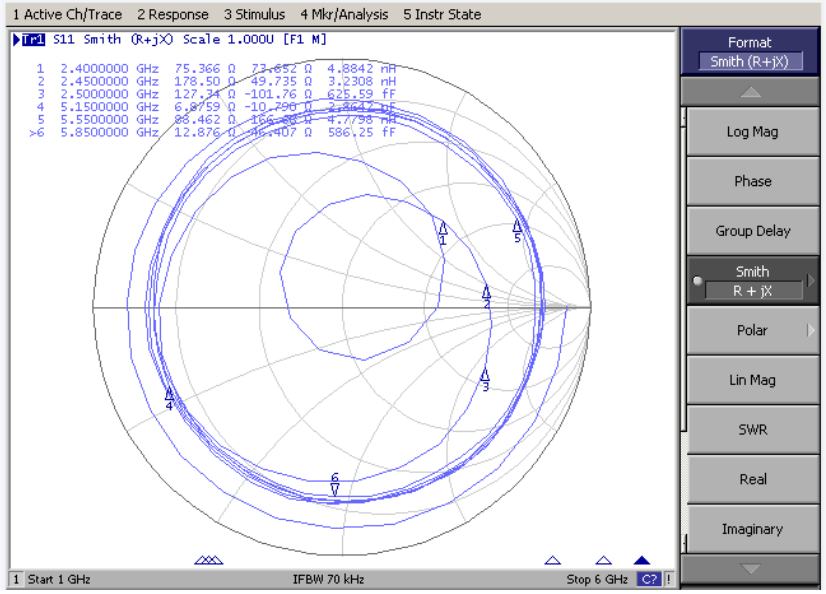
- Antenna name: 2.4G/LoRa
- Antenna Type： PIFA
- Covers ： 915/2400/2500MHz

S Parameter_Return Loss&VSWR（2.4G）



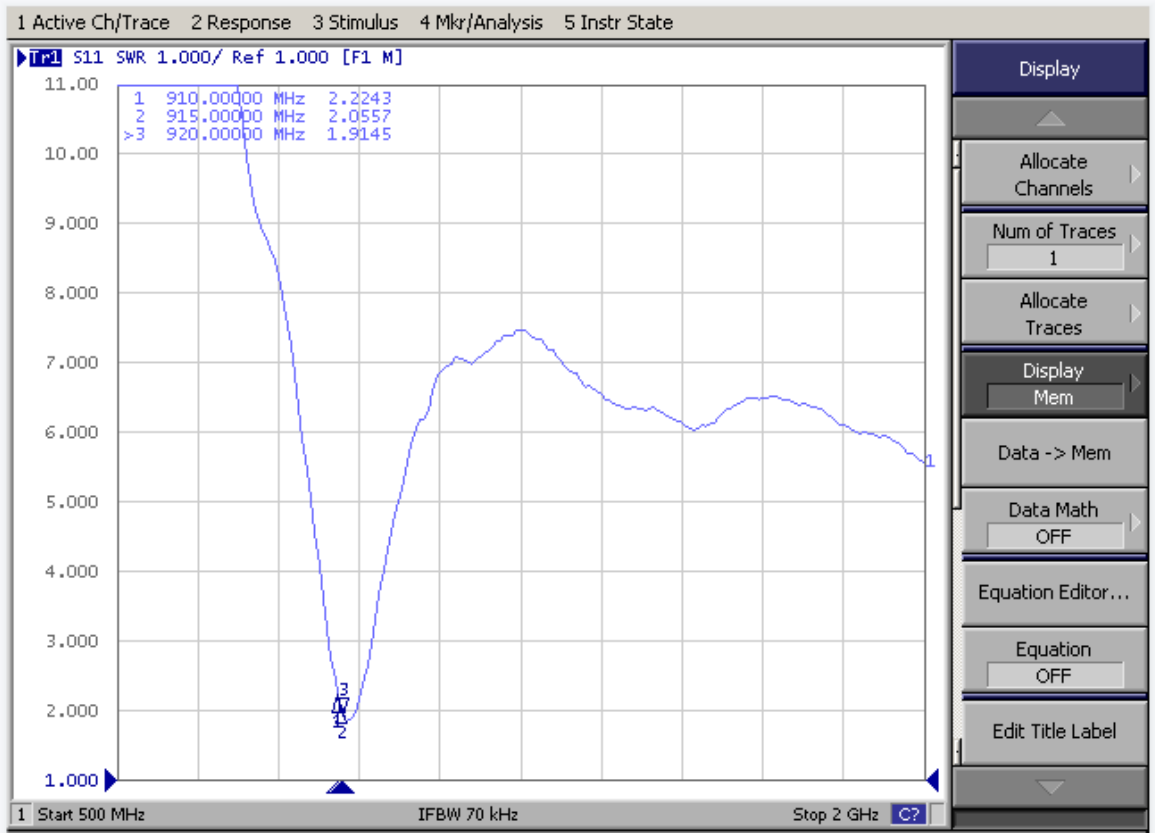


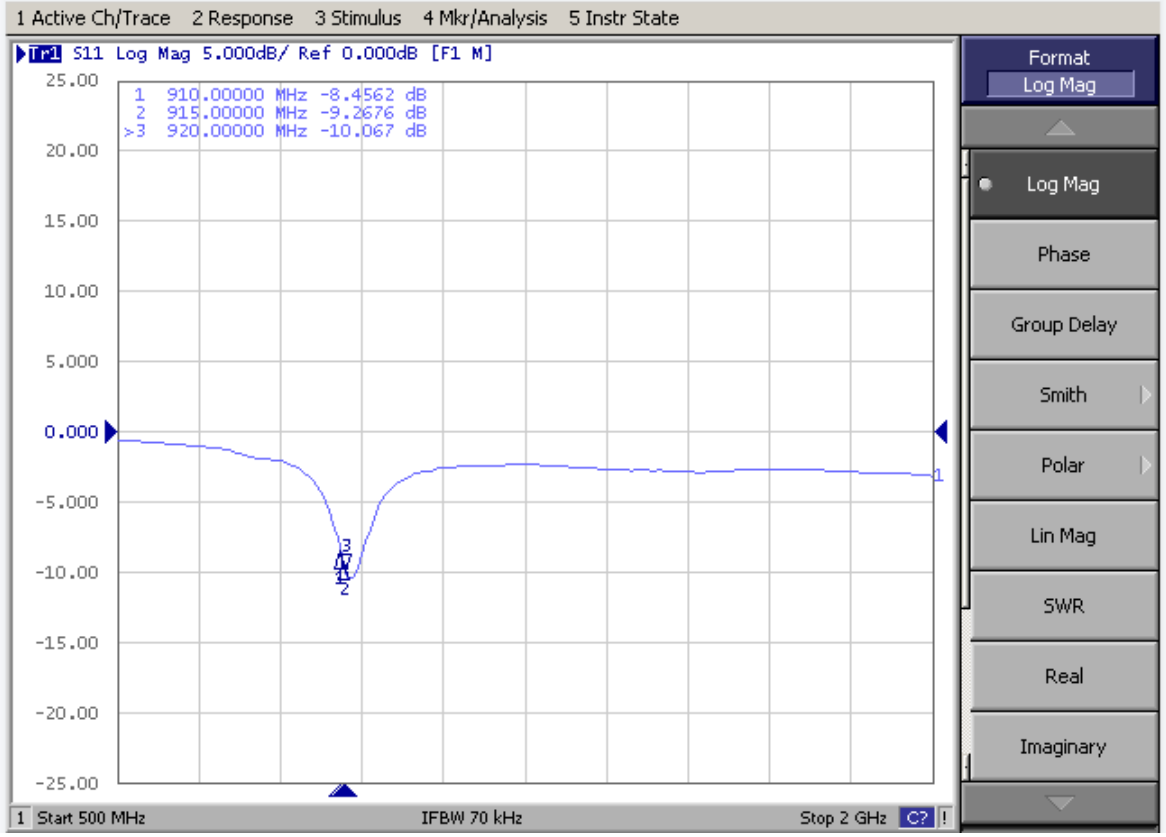
Efficiency and Gain-Smith（2.4G）



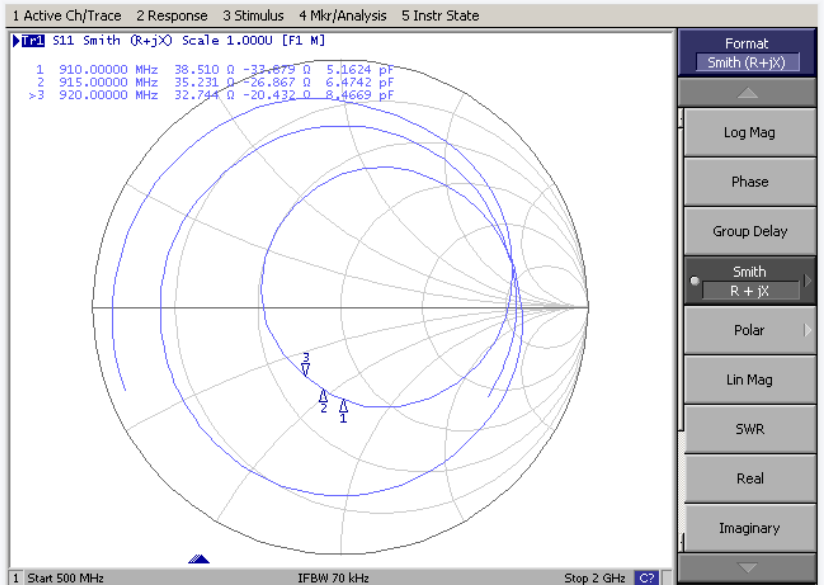
Frequency ID	1	2	3	4	5	6	7	8	9	10	11
Frequency (MHz)	**2400.0**	**2410.0**	**2420.0**	**2430.0**	**2440.0**	**2450.0**	**2460.0**	**2470.0**	**2480.0**	**2490.0**	**2500.0**
Gain (dBi)	0.08	0.04	-0.38	-0.83	-1.04	-1.12	-1.20	-1.16	-1.31	-1.43	-1.74
Efficiency (%)	**26.87**	**25.90**	**24.57**	**23.38**	**22.37**	**21.76**	**21.45**	**20.74**	**19.49**	**18.81**	**18.14**

S Parameter_Return Loss&VSWR（LoRa）



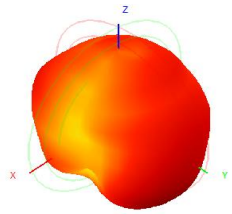


Efficiency and Gain-Smith（LoRa）

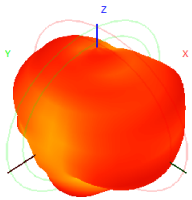


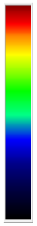
Frequency ID	1	2	3	4	5	6	7	8	9	10	11
Frequency (MHz)	**910.0**	**911.0**	**912.0**	**913.0**	**914.0**	**915.0**	**916.0**	**917.0**	**918.0**	**919.0**	**920.0**
Gain (dBi)	2.71	2.76	2.81	2.85	2.89	2.92	2.96	2.99	3.02	3.02	3.02
Efficiency (%)	**49.15**	**49.37**	**49.61**	**49.94**	**50.21**	**50.35**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

910.0MHz H+V, Eff: 49.2%

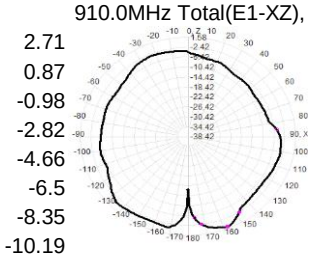


Back View

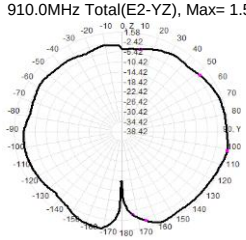




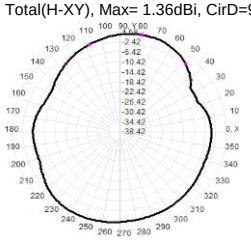
910.0MHz Total(E1-XZ), Max= 0.58dBi



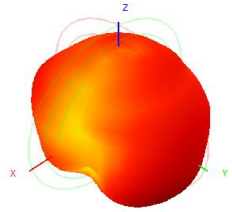
910.0MHz Total(E2-YZ), Max= 1.58dBi



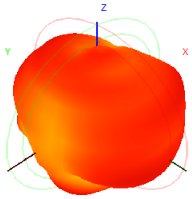
Total(H-XY), Max= 1.36dBi, CirD=9.79

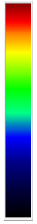


911.0MHz H+V, Eff: 49.4%

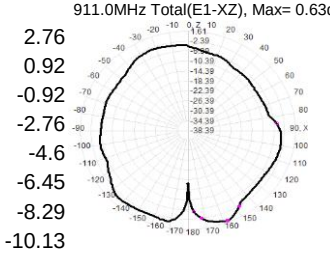


Back View

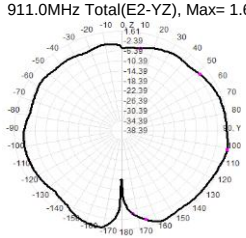




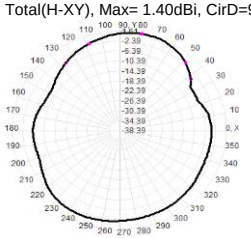
911.0MHz Total(E1-XZ), Max= 0.63dBi



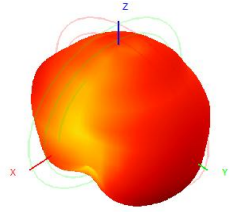
911.0MHz Total(E2-YZ), Max= 1.61dBi



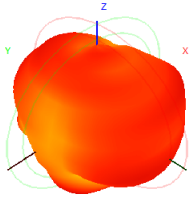
Total(H-XY), Max= 1.40dBi, CirD=9.84

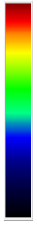


912.0MHz H+V, Eff: 49.6%

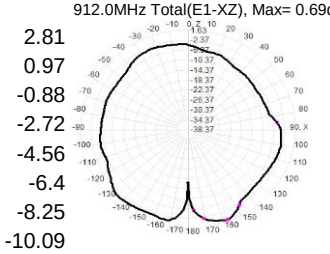


Back View

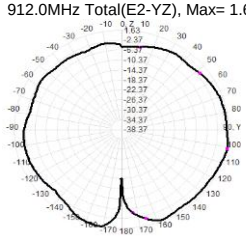




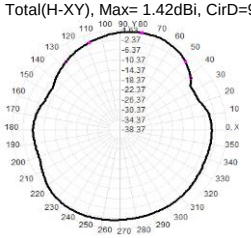
912.0MHz Total(E1-XZ), Max= 0.69dBi



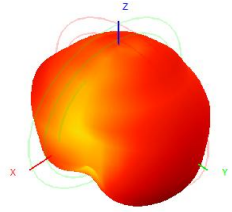
912.0MHz Total(E2-YZ), Max= 1.63dBi



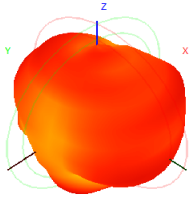
Total(H-XY), Max= 1.42dBi, CirD=9.89

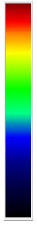


913.0MHz H+V, Eff: 49.9%

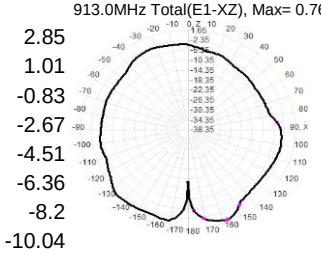


Back View

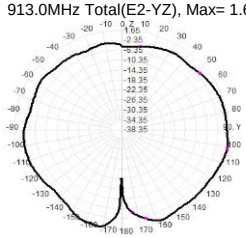




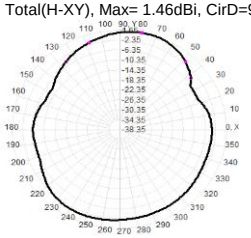
913.0MHz Total(E1-XZ), Max= 0.76dBi



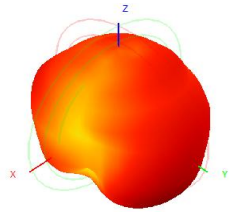
913.0MHz Total(E2-YZ), Max= 1.65dBi



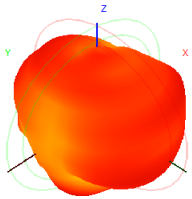
Total(H-XY), Max= 1.46dBi, CirD=9.93

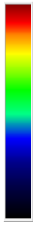


914.0MHz H+V, Eff: 50.2%

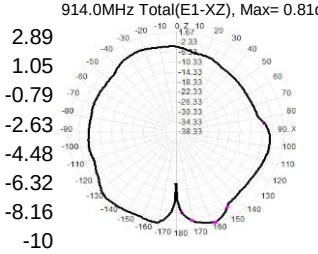


Back View

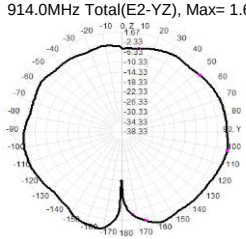




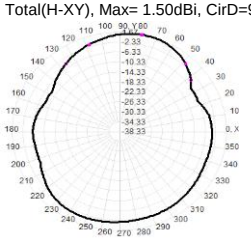
914.0MHz Total(E1-XZ), Max= 0.81dBi



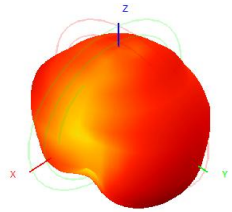
914.0MHz Total(E2-YZ), Max= 1.67dBi



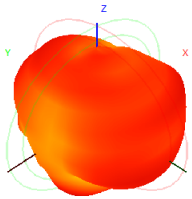
Total(H-XY), Max= 1.50dBi, CirD=9.98

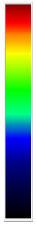


915.0MHz H+V, Eff: 50.3%

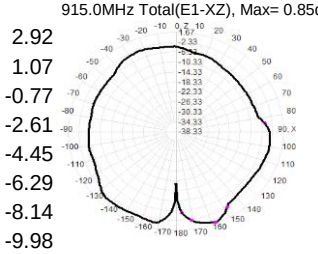


Back View

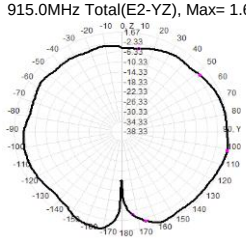




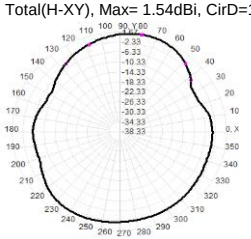
915.0MHz Total(E1-XZ), Max= 0.85dBi



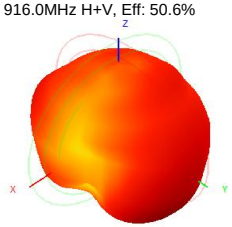
915.0MHz Total(E2-YZ), Max= 1.67dBi



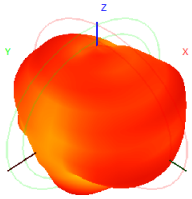
Total(H-XY), Max= 1.54dBi, CirD=10.02

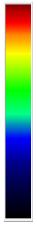


916.0MHz H+V, Eff: 50.6%

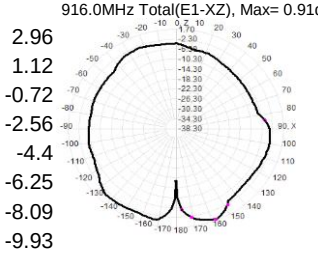


Back View

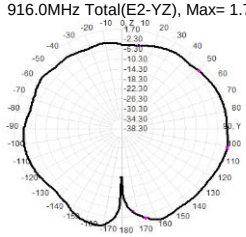




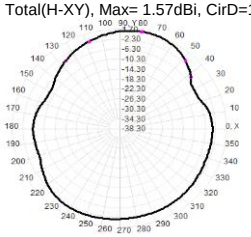
916.0MHz Total(E1-XZ), Max= 0.91dBi



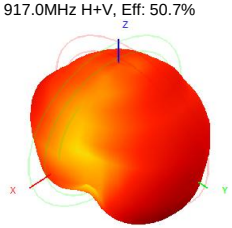
916.0MHz Total(E2-YZ), Max= 1.70dBi



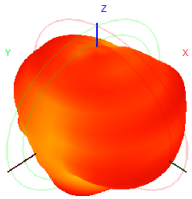
Total(H-XY), Max= 1.57dBi, CirD=10.04

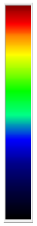


917.0MHz H+V, Eff: 50.7%

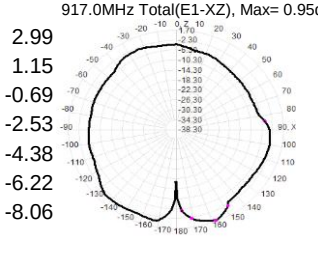


Back View

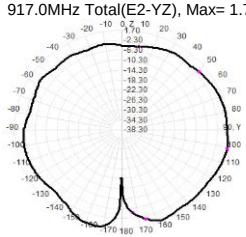




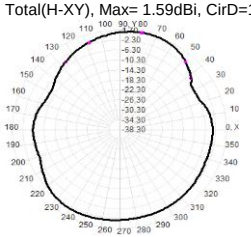
917.0MHz Total(E1-XZ), Max= 0.95dBi



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

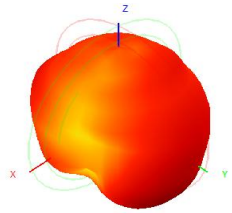


Total(H-XY), Max= 1.59dBi, CirD=10.06

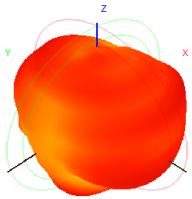


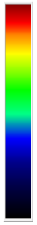
-9.9

918.0MHz H+V, Eff: 50.7%



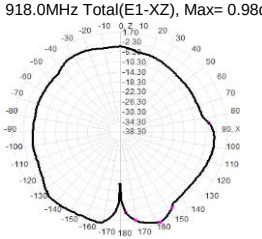
Back View



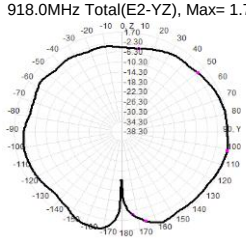


918.0MHz Total(E1-XZ), Max= 0.98dBi

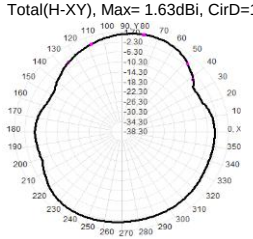
3.02
1.17
-0.67
-2.51
-4.35
-6.19
-8.04
-9.88



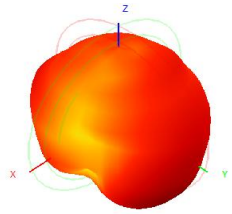
918.0MHz Total(E2-YZ), Max= 1.70dBi



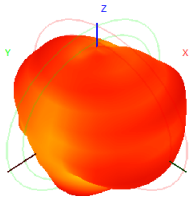
Total(H-XY), Max= 1.63dBi, CirD=10.06

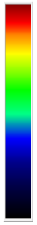


919.0MHz H+V, Eff: 50.6%



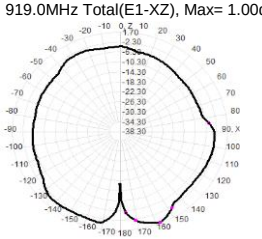
Back View



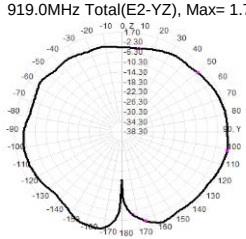


919.0MHz Total(E1-XZ), Max= 1.00dBi

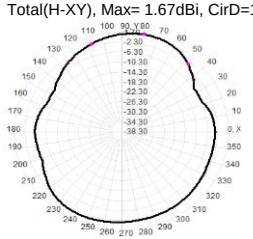
3.02
1.18
-0.66
-2.5
-4.34
-6.19
-8.03
-9.87



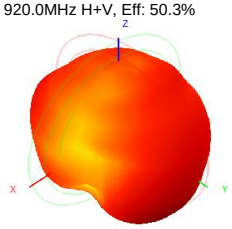
919.0MHz Total(E2-YZ), Max= 1.70dBi



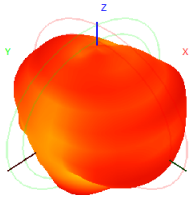
Total(H-XY), Max= 1.67dBi, CirD=10.10

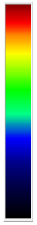


920.0MHz H+V, Eff: 50.3%



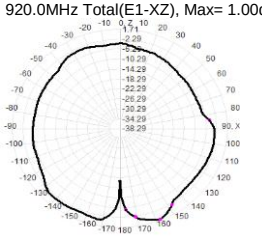
Back View



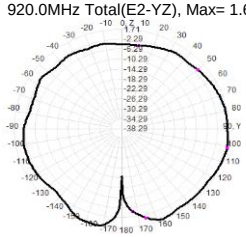


920.0MHz Total(E1-XZ), Max= 1.00dBi

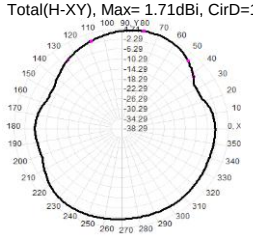
3.02
1.18
-0.66
-2.5
-4.35
-6.19
-8.03
-9.87
-11.71

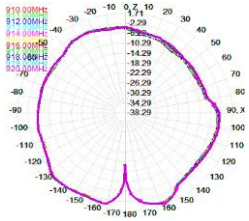


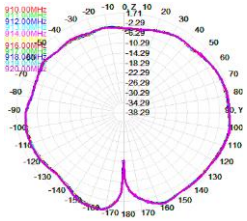
920.0MHz Total(E2-YZ), Max= 1.67dBi

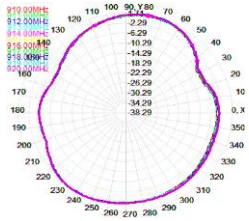


Total(H-XY), Max= 1.71dBi, CirD=10.13

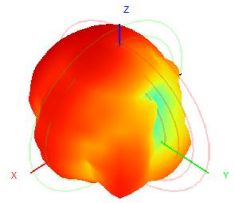




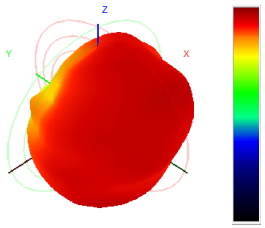




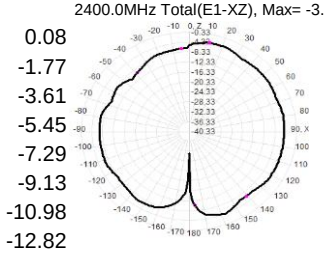
2400.0MHz H+V, Eff: 26.9%



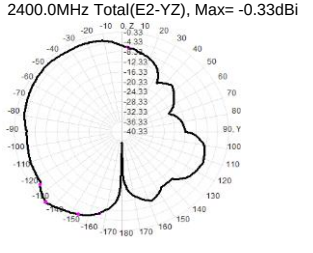
Back View



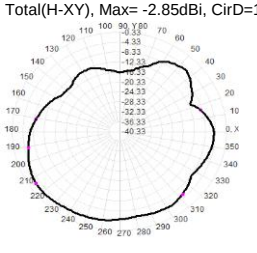
2400.0MHz Total(E1-XZ), Max= -3.85dBi



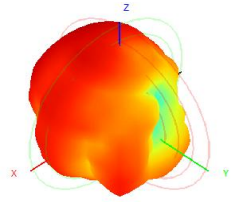
2400.0MHz Total(E2-YZ), Max= -0.33dBi



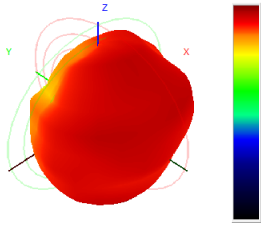
Total(H-XY), Max= -2.85dBi, CirD=13.76



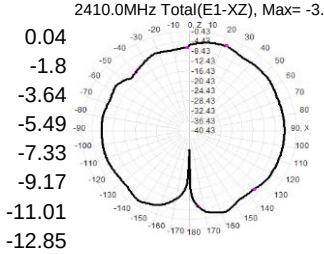
2410.0MHz H+V, Eff: 25.9%



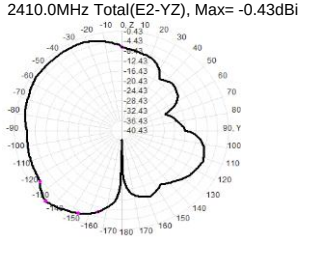
Back View



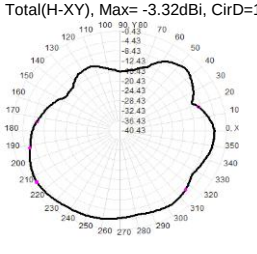
2410.0MHz Total(E1-XZ), Max= -3.71dBi



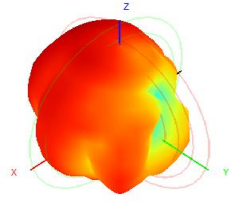
2410.0MHz Total(E2-YZ), Max= -0.43dBi



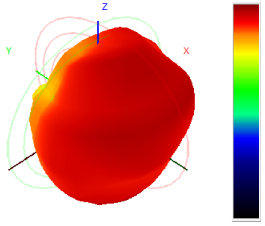
Total(H-XY), Max= -3.32dBi, CirD=13.39



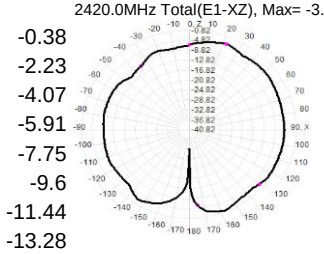
2420.0MHz H+V, Eff: 24.6%



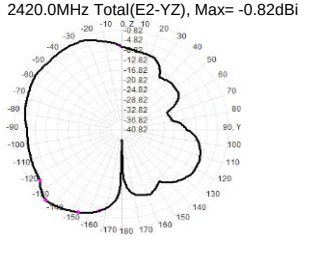
Back View



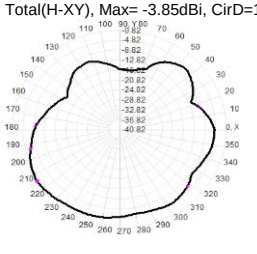
2420.0MHz Total(E1-XZ), Max= -3.71dBi



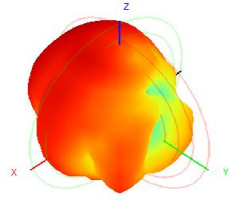
2420.0MHz Total(E2-YZ), Max= -0.82dBi



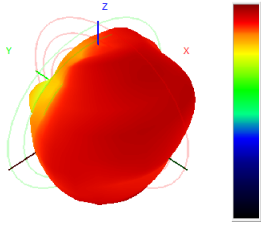
Total(H-XY), Max= -3.85dBi, CirD=13.43



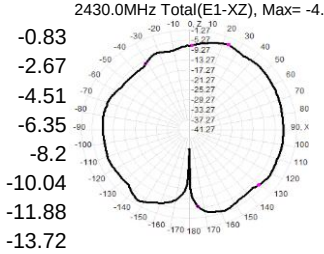
2430.0MHz H+V, Eff: 23.4%



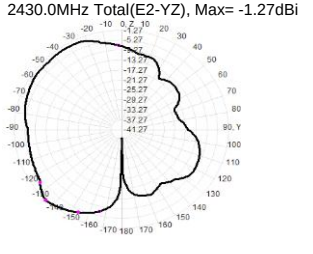
Back View



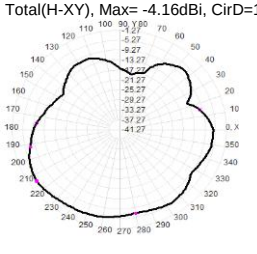
2430.0MHz Total(E1-XZ), Max= -4.22dBi



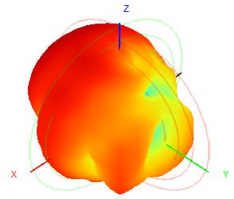
2430.0MHz Total(E2-YZ), Max= -1.27dBi



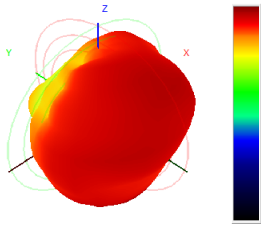
Total(H-XY), Max= -4.16dBi, CirD=14.44



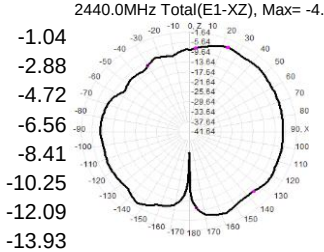
2440.0MHz H+V, Eff: 22.4%



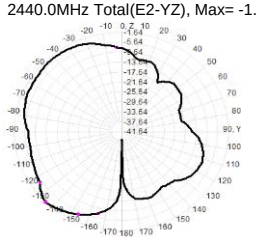
Back View



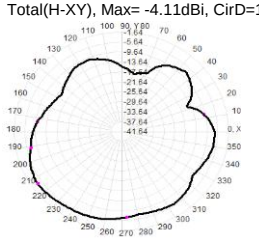
2440.0MHz Total(E1-XZ), Max= -4.87dBi



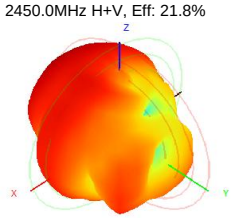
2440.0MHz Total(E2-YZ), Max= -1.64dBi



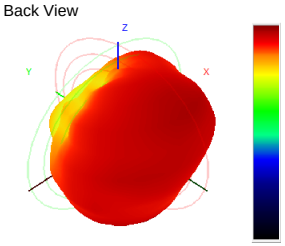
Total(H-XY), Max= -4.11dBi, CirD=13.85



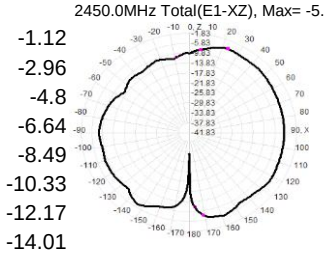
2450.0MHz H+V, Eff: 21.8%



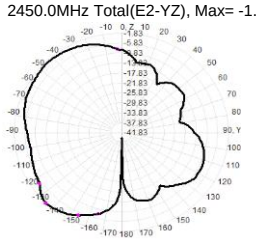
Back View



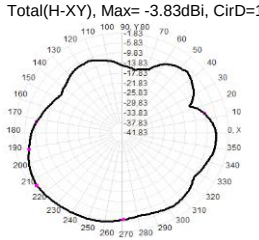
2450.0MHz Total(E1-XZ), Max= -5.14dBi



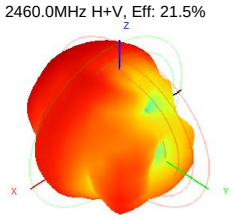
2450.0MHz Total(E2-YZ), Max= -1.83dBi



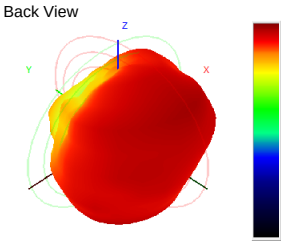
Total(H-XY), Max= -3.83dBi, CirD=12.21



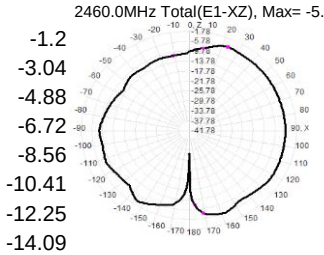
2460.0MHz H+V, Eff: 21.5%



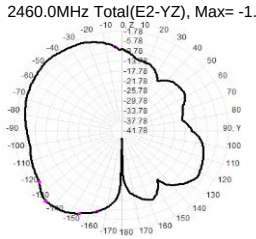
Back View



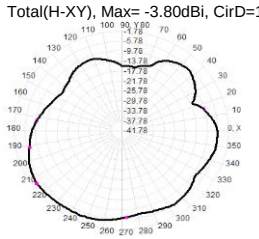
2460.0MHz Total(E1-XZ), Max= -5.15dBi



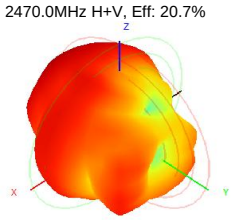
2460.0MHz Total(E2-YZ), Max= -1.78dBi



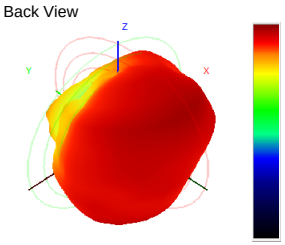
Total(H-XY), Max= -3.80dBi, CirD=12.03



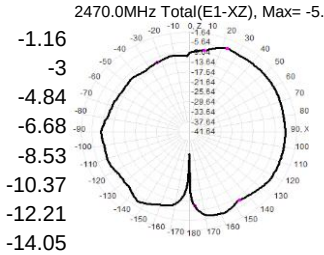
2470.0MHz H+V, Eff: 20.7%



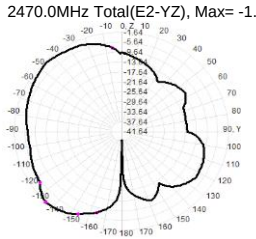
Back View



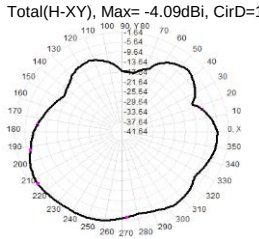
2470.0MHz Total(E1-XZ), Max= -5.43dBi



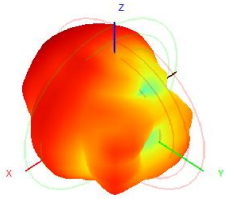
2470.0MHz Total(E2-YZ), Max= -1.64dBi



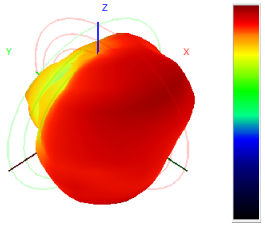
Total(H-XY), Max= -4.09dBi, CirD=13.74



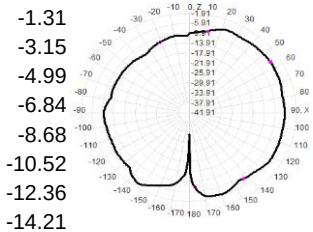
2480.0MHz H+V, Eff: 19.5%



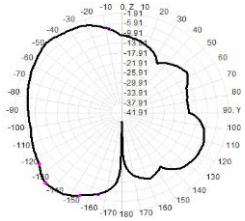
Back View



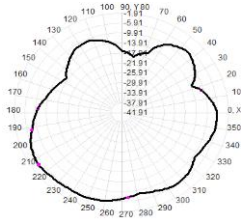
2480.0MHz Total(E1-XZ), Max= -5.53dBi



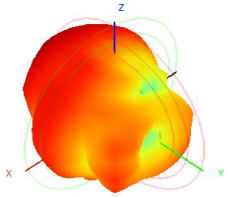
2480.0MHz Total(E2-YZ), Max= -1.91dBi



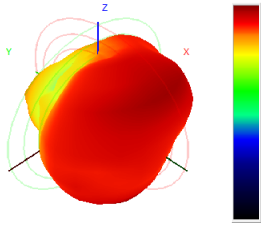
Total(H-XY), Max= -4.66dBi, CirD=14.27



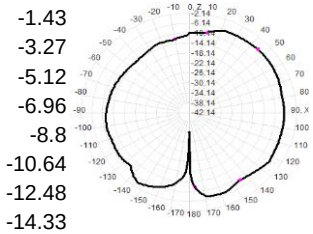
2490.0MHz H+V, Eff: 18.8%



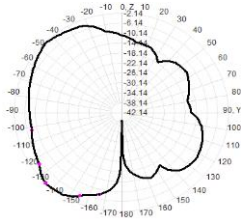
Back View



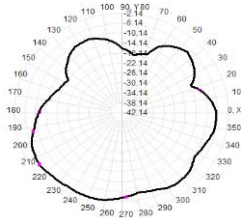
2490.0MHz Total(E1-XZ), Max= -6.05dBi



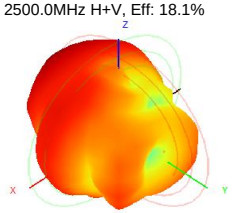
2490.0MHz Total(E2-YZ), Max= -2.14dBi



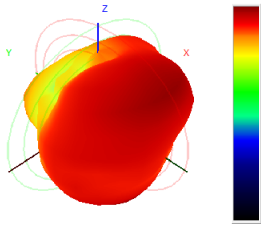
Total(H-XY), Max= -5.22dBi, CirD=13.25



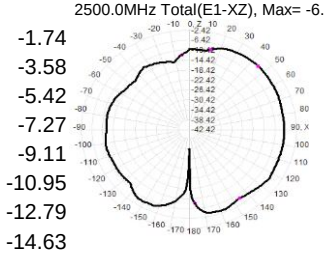
2500.0MHz H+V, Eff: 18.1%



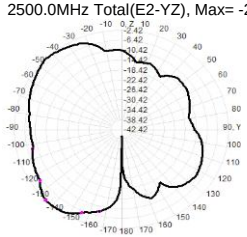
Back View



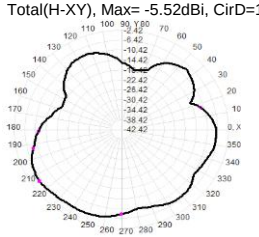
2500.0MHz Total(E1-XZ), Max= -6.21dBi

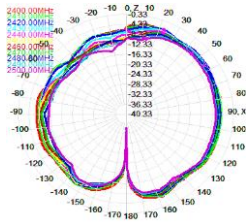


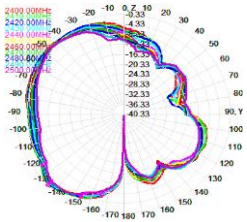
2500.0MHz Total(E2-YZ), Max= -2.42dBi

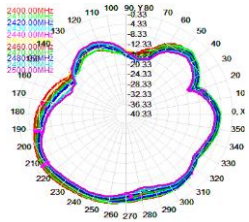


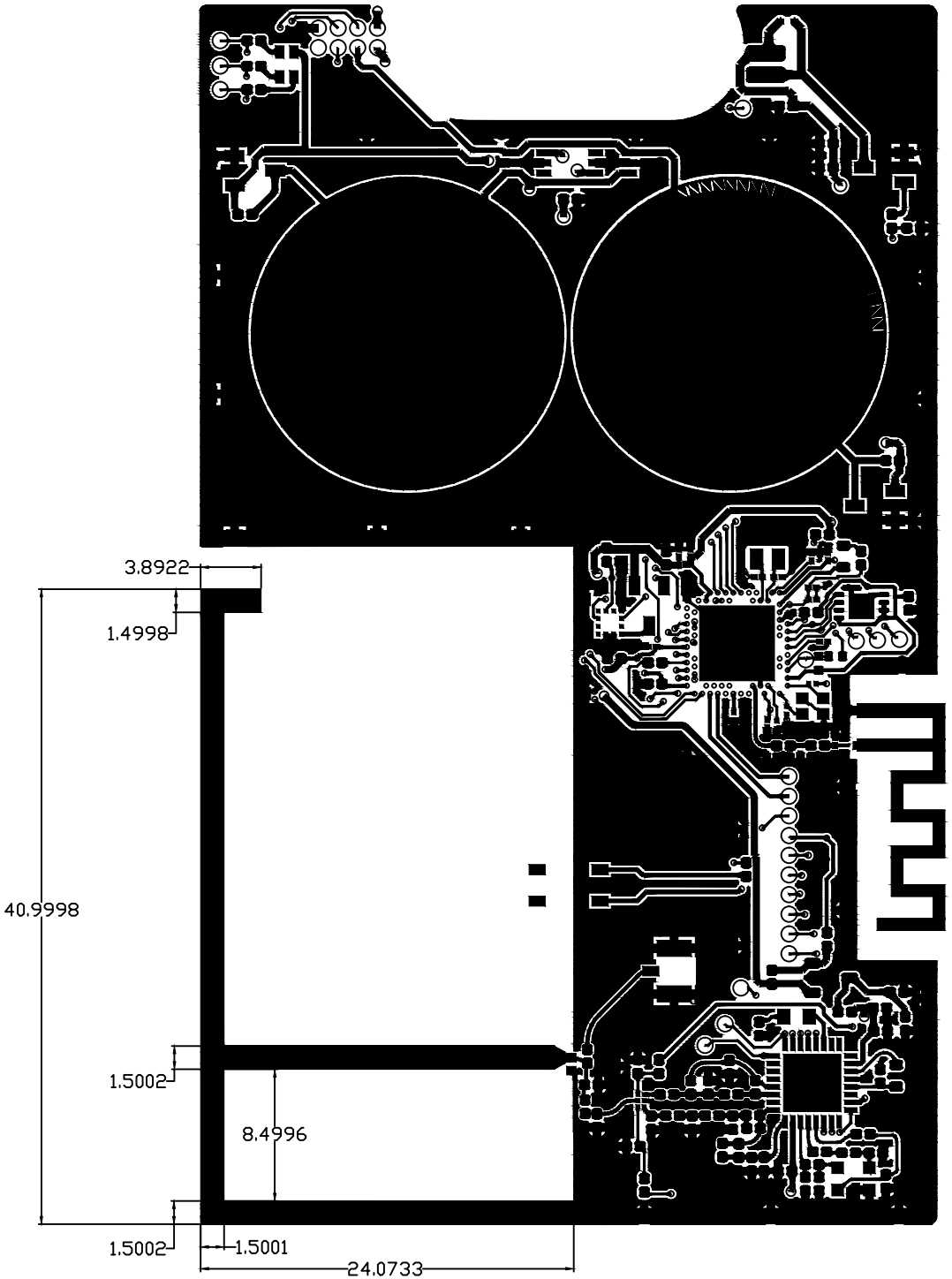
Total(H-XY), Max= -5.52dBi, CirD=12.99







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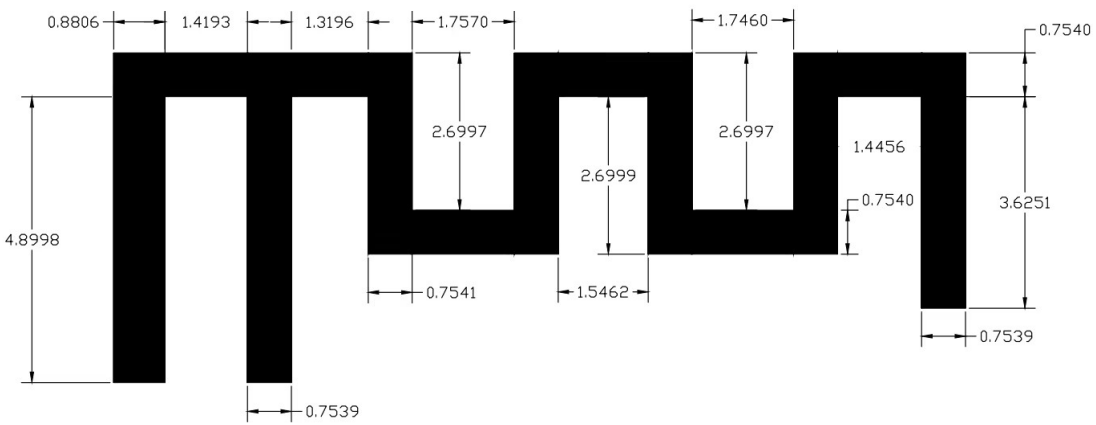
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