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  - PCB overview
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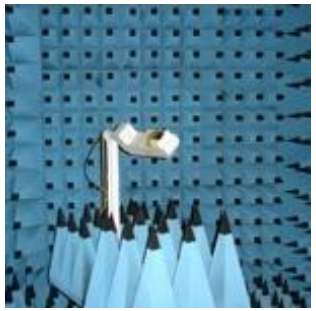
Test & Lab. Information

Outside the chamber



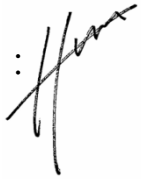
Inside the chamber

Inside the chamber

Network Analyzer

EQUIPMENT	Model	Maker	Calibration date	Cal. Expiration Date
Network Analyzer	5071B ENA	Agilent	2022.10.24	2023.10.24
Anechoic Chamber	3m *3m * 6m	MTG	2023.9.28	2024.9.27

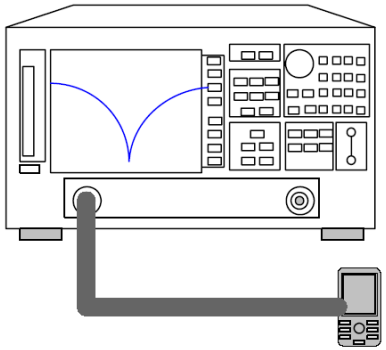
- **Measurement location** : INPAQ Korea R&D Center
- **Address** : #102-610, 36, Bucheon-ro 198beon-gil, Bucheon-si, Gyeonggi-do
- **Test S/W** : MTG / VWM ver.21
- **Test date** : 2023/10/5
- **Tester** : Jee-Hun.Seo **Sign** :



Measuring Process

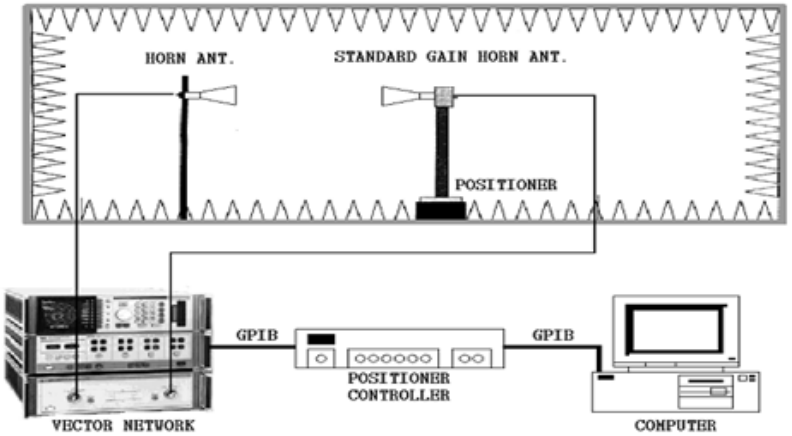
DUT test method

1. After attaching the antenna to the DUT, connect the coaxial cable to the DUT.
2. After calibration the Network analyzer, connect the coaxial cable connected to the DUT to the Port. (The DUT shall be tested on a nonconductive table when measured.)
3. Connect the coaxial cable connected to the DUT to the Port of the Network Analyst.
4. Set the point marker to the corresponding frequency band.



Chamber test method

1. The antenna is tested with the DUT mounted.
2. Antenna is tested in an anechoic chamber.
3. A dipole antenna or horn antenna is installed in the chamber system to face each other.
4. Run software to perform calibration.
5. Remove the dipole antenna or horn antenna on the positioner side and fix the terminal to be measured there.
6. Measure by running the chamber software.
7. Check the gain data after the measurement based IEEE std 149-2021.



PCB Overview

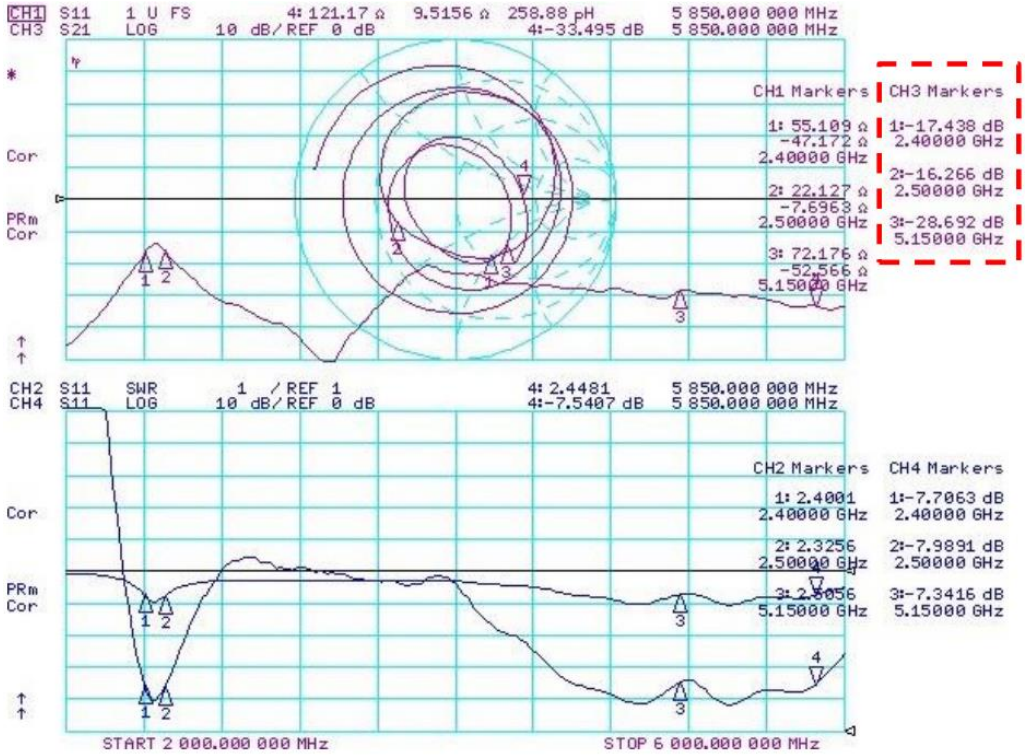
Please refer to Supplement photos for Antenna report

Test setup photo

Please refer to Supplement photos for Antenna report

Smith Chart & VSWR / 3D Gain Data _ ANT 0_PCB Only

[Smith Chart & VSWR]



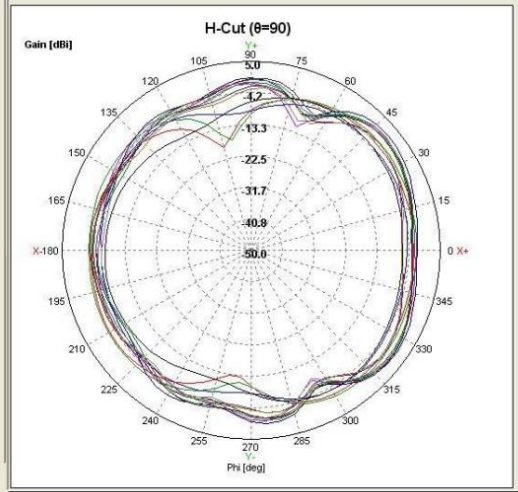
[3D Gain data]

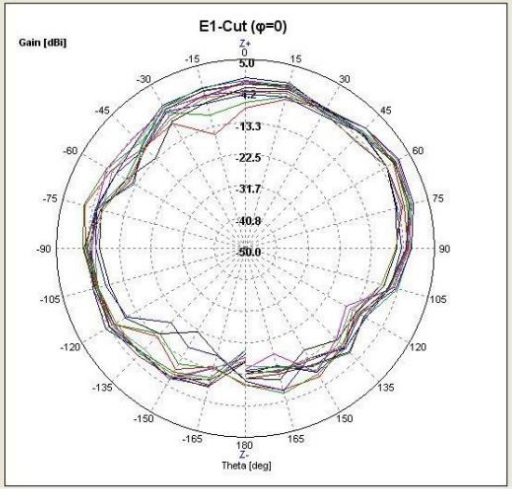
Freq.[MHz]	Eff.[%]	Avg.[dBi]	Peak[dBi]
2400	33.93	**-4.69**	0.17
2425	40.2	**-3.96**	0.85
2450	25.93	**-5.86**	-1.67
2485	23.55	**-6.28**	-1.18
5150	51.58	**-2.88**	1.82
5250	45.36	**-3.43**	1.08
5350	62.79	**-2.02**	2.54
5450	46.05	**-3.37**	1.27
5550	52.89	**-2.77**	1.73
5650	52.14	**-2.83**	1.57
5750	34.03	**-4.68**	-0.7
5850	31.62	**-5**	-0.84
5925	30.02	**-5.23**	1.12
6525	19.06	**-7.2**	-1.07
7125	15.26	**-8.16**	-2.06

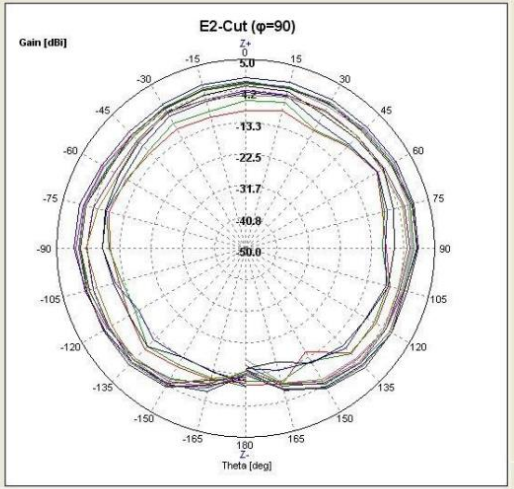
2D Radiation Pattern & Gain _ ANT 0_PCB Only

Summary | **Multiple Frequency** | Multiple Cut | 3D-View | Reserved

No.	Freq.	PwrSum Eff.[%]	H(θ=90) Avg.[dBi]	H(θ=90) Peak[dBi]	H(θ=90) θ[deg]	H(θ=90) φ[deg]	H(θ=90) Avg.[dBi]	H(θ=90) Peak[dBi]	H(θ=90) φ[deg]	H(θ=90) BW[deg]	E1(φ=0) Avg.[dBi]	E1(φ=0) Peak[dBi]	E1(φ=0) θ[deg]	E1(φ=0) BW[deg]	E2(φ=90) Avg.[dBi]	E2(φ=90) Peak[dBi]	E2(φ=90) θ[deg]	E2(φ=90) BW[deg]
1	2400.000	33.93	-4.69	0.17	60.00	40.00	-3.83	-1.22	310.00	999.00	-5.18	-0.30	60.00	64.48	-9.06	-5.85	60.00	36.47
2	2425.000	40.20	-3.96	0.85	75.00	45.00	-2.98	-0.56	315.00	999.00	-4.44	0.16	60.00	64.71	-8.73	-5.61	60.00	37.75
3	2450.000	25.93	-5.86	-1.67	75.00	45.00	-5.13	-2.75	310.00	999.00	-6.49	-2.46	45.00	100.24	-8.11	-4.03	15.00	67.42
4	2485.000	23.55	-6.28	-1.18	60.00	55.00	-6.06	-3.00	305.00	999.00	-6.72	-1.98	45.00	87.99	-6.72	-2.77	15.00	118.40
5	5150.000	51.58	-2.88	1.82	105.00	45.00	-2.40	1.02	325.00	46.90	-3.98	1.12	60.00	48.15	-2.61	-0.11	60.00	165.00
6	5250.000	45.36	-3.43	1.08	75.00	330.00	-3.07	0.50	325.00	45.70	-4.61	0.68	60.00	44.70	-3.07	-0.83	60.00	244.88
7	5350.000	62.79	-2.02	2.54	75.00	330.00	-1.62	2.03	40.00	44.75	-3.37	1.60	60.00	47.52	-1.49	0.63	75.00	255.46
8	5450.000	46.05	-3.37	1.27	75.00	325.00	-2.95	0.69	325.00	39.88	-4.76	0.02	60.00	46.70	-2.87	-0.50	75.00	176.43
9	5550.000	52.89	-2.77	1.73	75.00	330.00	-2.24	1.11	325.00	37.55	-4.10	0.45	60.00	47.53	-2.19	0.28	75.00	176.80
10	5650.000	52.14	-2.83	1.57	75.00	330.00	-2.17	1.34	325.00	36.86	-4.39	-0.07	60.00	53.74	-2.28	-0.02	90.00	187.10
11	5750.000	34.03	-4.66	-0.70	105.00	320.00	-3.97	-0.91	320.00	34.93	-6.10	-2.40	60.00	41.21	-4.24	-2.23	75.00	195.65
12	5850.000	31.62	-5.00	-0.84	105.00	320.00	-4.08	-1.34	320.00	36.08	-6.41	-2.65	60.00	110.66	-4.80	-2.61	75.00	191.73



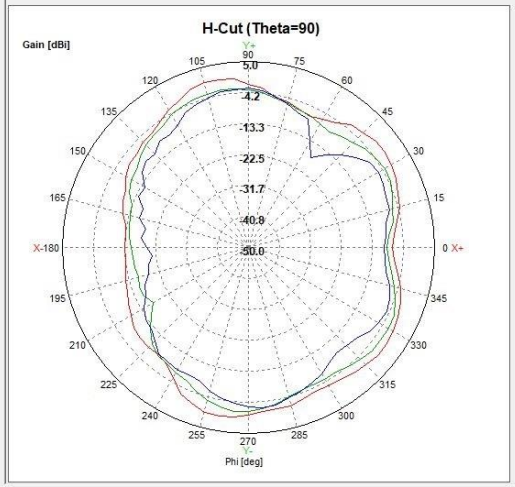


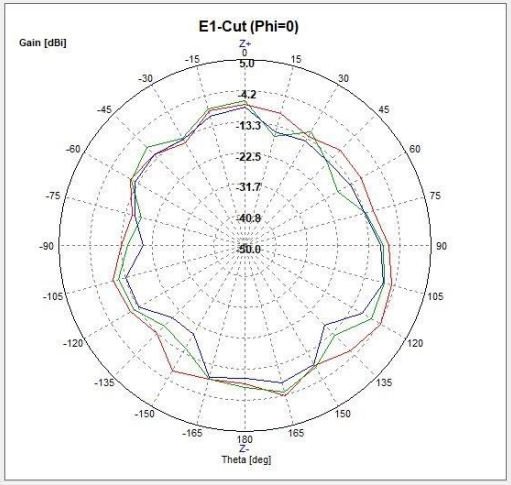


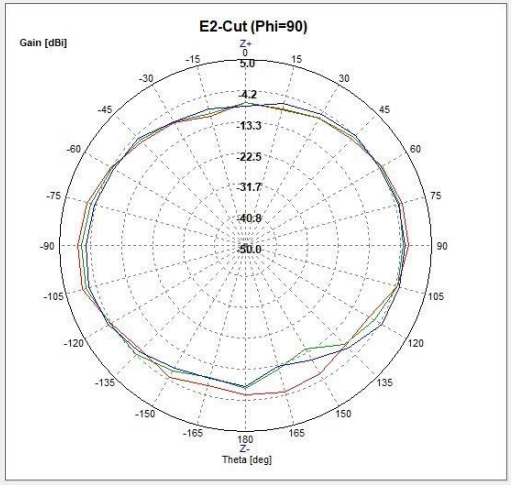
2D Radiation Pattern & Gain _ ANT 0_PCB Only

Summary | **Multiple Frequency** | Multiple Cut | 3D-View | Reserved

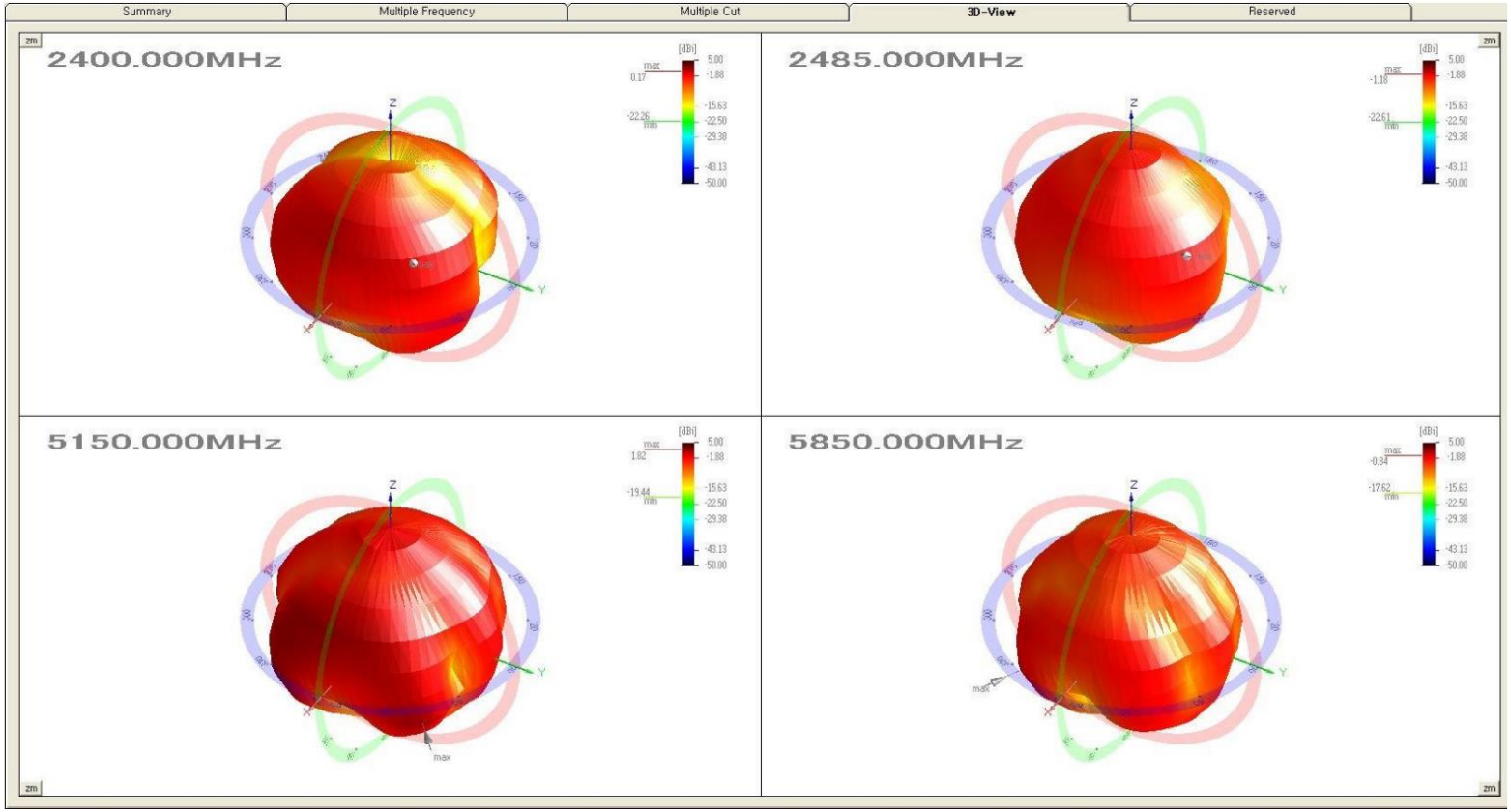
No.	Freq.	PwrSum Eff.[%]	H(Theta=90) Avg.[dBi]	Peak[dBi]	Theta[	Phi[deg	E1(Phi=0) Avg.[dBi]	Peak[dBi]	Phi[deg	BW[deg]	E2(Phi=90) Avg.[dBi]	Peak[dBi]	Theta[deg]	BW[deg]
13	5925.000	30.02	-5.23	1.12	105.00	260.00	-3.31	0.56	260.00	46.30	-8.51	-3.65	120.00	44.40	-4.38	-0.06	-105.00	50.42
14	6525.000	19.06	-7.20	-1.07	105.00	270.00	-5.53	-1.40	265.00	34.41	-10.13	-5.25	165.00	999.00	-5.10	-1.07	-105.00	67.39
15	7125.000	15.26	-8.16	-2.06	105.00	265.00	-7.28	-2.37	275.00	36.15	-11.81	-7.51	105.00	33.92	-5.11	-2.06	-105.00	82.94



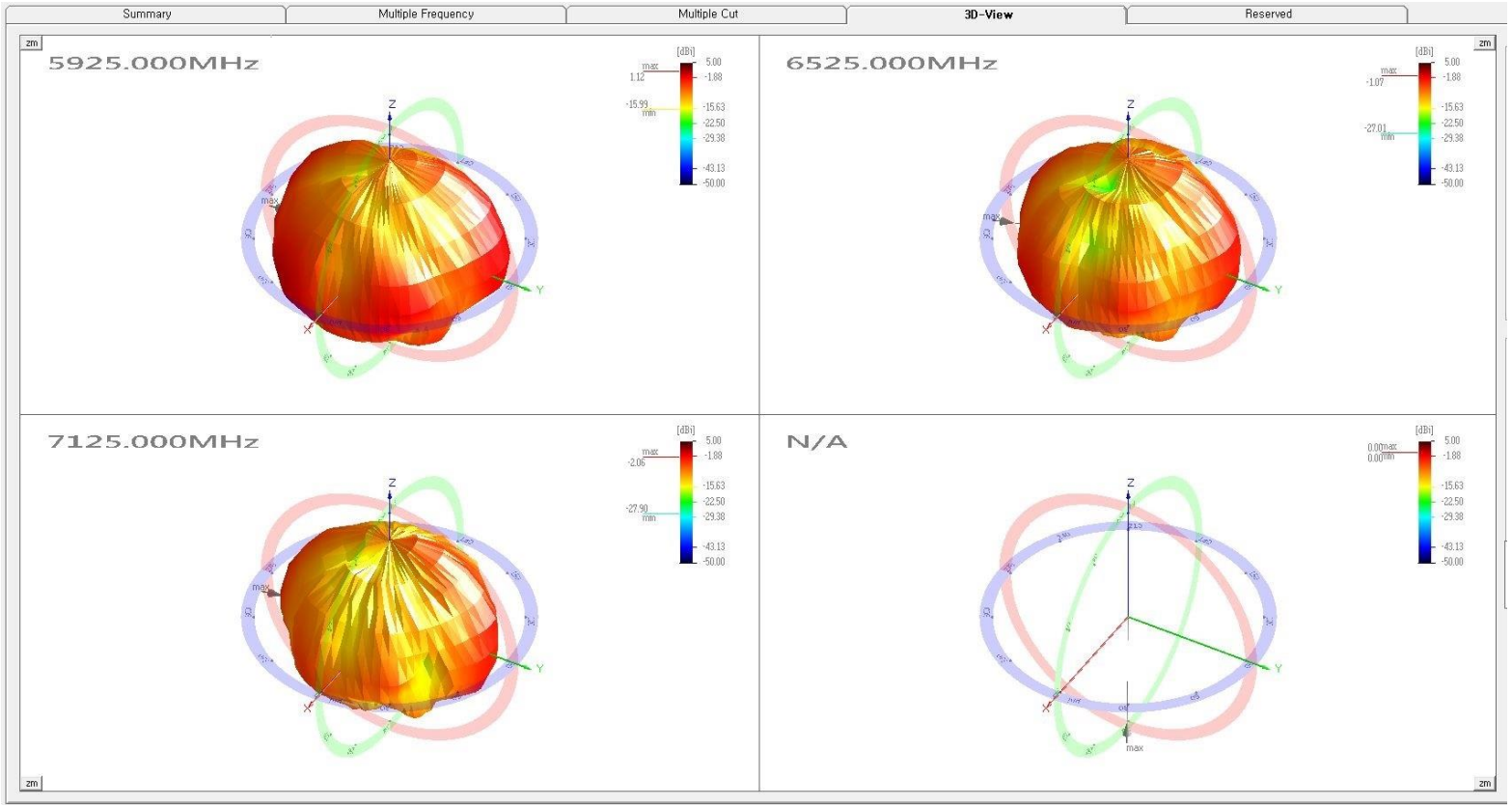




3D Radiation Pattern _ ANT 0_PCB Only

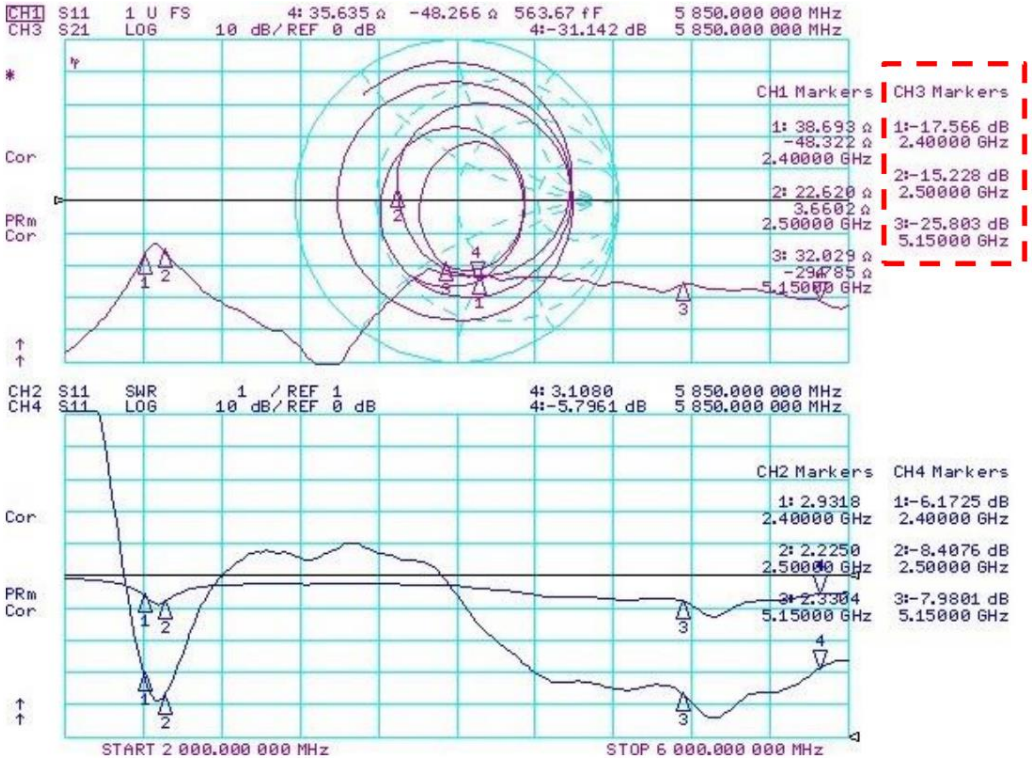


3D Radiation Pattern _ ANT 0_PCB Only



Smith Chart & VSWR / 3D Gain Data _ ANT 1_PCB Only

[Smith Chart & VSWR]



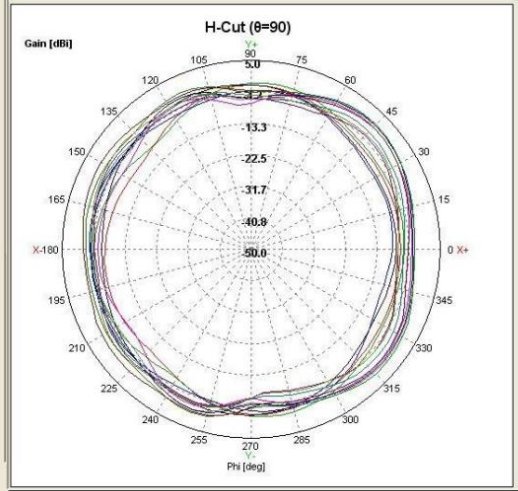
[3D Gain data]

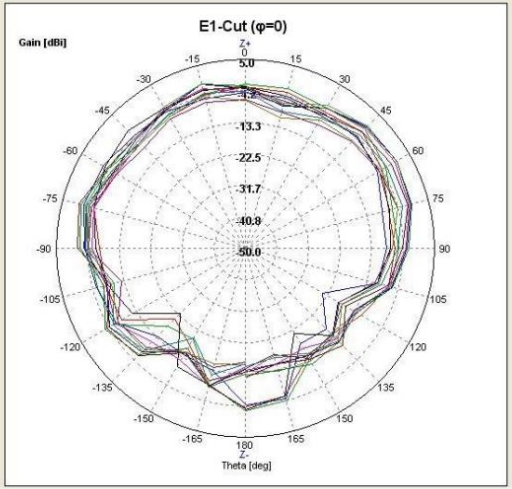
Freq.[MHz]	Eff.[%]	Avg.[dBi]	Peak[dBi]
2400	31.22	**-5.06**	-1.17
2425	38.4	**-4.16**	0.07
2450	29.64	**-5.28**	-1.42
2485	34.62	**-4.61**	-1.49
5150	38.81	**-4.11**	0.4
5250	49.26	**-3.07**	1.28
5350	47.54	**-3.23**	0.98
5450	57.64	**-2.39**	1.41
5550	31.61	**-5**	-1.52
5650	49.89	**-3.02**	0.42
5750	23.89	**-6.22**	-2.18
5850	27.48	**-5.61**	-1.39
5925	21.25	**-6.73**	-0.37
6525	24.56	**-6.1**	-0.57
7125	19.25	**-7.16**	-0.84

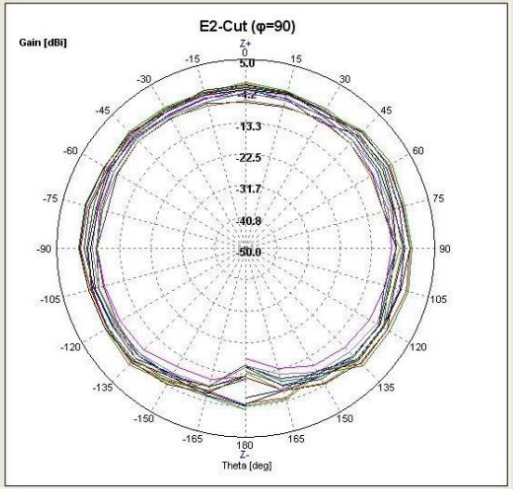
2D Radiation Pattern & Gain _ ANT 1_PCB Only

Summary | **Multiple Frequency** | Multiple Cut | 3D-View | Reserved

No.	Freq.	PwrSum Eff.[%]	H(θ=90) Avg.[dBi]	H(θ=90) Peak[dBi]	H(θ=90) θ[deg]	H(θ=90) φ[deg]	E1(φ=0) Avg.[dBi]	E1(φ=0) Peak[dBi]	E1(φ=0) φ[deg]	E1(φ=0) BW[deg]	E2(φ=90) Avg.[dBi]	E2(φ=90) Peak[dBi]	E2(φ=90) θ[deg]	E2(φ=90) BW[deg]
1	2400.000	31.22	-5.06	-1.17	60.00	75.00	-5.19	-1.88	275.00	62.30	-5.98	-2.05	45.00	88.93	-3.22	-1.50	105.00	284.48
2	2425.000	38.40	-4.16	0.07	60.00	70.00	-4.15	-0.99	280.00	59.68	-4.79	-1.07	45.00	86.62	-2.59	-0.92	60.00	108.12
3	2450.000	29.64	-5.28	-1.42	75.00	175.00	-4.72	-2.37	285.00	249.41	-5.83	-1.47	-75.00	76.80	-4.54	-2.85	60.00	104.24
4	2485.000	34.62	-4.61	-1.49	45.00	135.00	-4.35	-1.65	265.00	88.40	-5.69	-1.85	-45.00	134.28	-3.28	-1.77	-90.00	167.90
5	5150.000	38.81	-4.11	0.40	90.00	45.00	-3.05	0.40	45.00	54.94	-5.04	0.11	60.00	57.27	-7.01	-4.68	-15.00	210.39
6	5250.000	49.26	-3.07	1.28	90.00	45.00	-1.94	1.28	45.00	53.30	-4.01	0.99	60.00	57.67	-5.70	-3.59	-30.00	237.67
7	5350.000	47.54	-3.23	0.98	90.00	45.00	-1.97	0.98	45.00	53.66	-4.23	0.79	60.00	51.87	-5.38	-3.51	15.00	243.95
8	5450.000	57.64	-2.39	1.41	75.00	330.00	-0.96	1.36	45.00	55.86	-3.60	0.88	60.00	53.84	-4.12	-1.99	-45.00	215.12
9	5550.000	31.61	-5.00	-1.52	90.00	45.00	-3.49	-1.52	45.00	55.57	-6.17	-2.23	-75.00	36.00	-6.33	-4.60	-45.00	230.29
10	5650.000	49.89	-3.02	0.42	90.00	150.00	-1.31	0.42	150.00	166.96	-4.45	0.03	-75.00	31.43	-4.10	-2.62	120.00	316.56
11	5750.000	23.89	-6.22	-2.18	90.00	150.00	-4.26	-2.18	150.00	167.46	-7.90	-3.60	-75.00	32.93	-6.97	-5.23	120.00	86.51
12	5850.000	27.48	-5.61	-1.39	90.00	145.00	-3.63	-1.39	145.00	167.47	-7.29	-2.96	-75.00	36.27	-6.33	-3.75	135.00	54.79



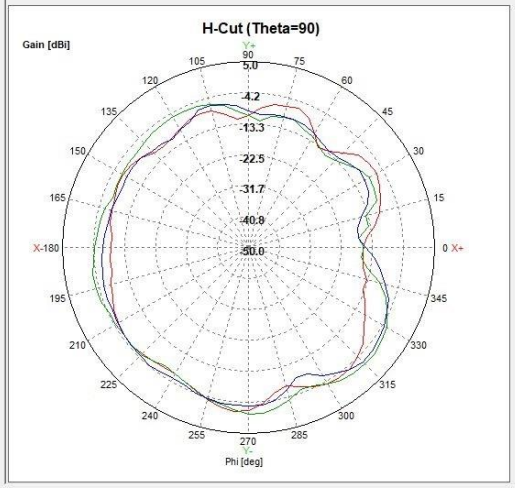


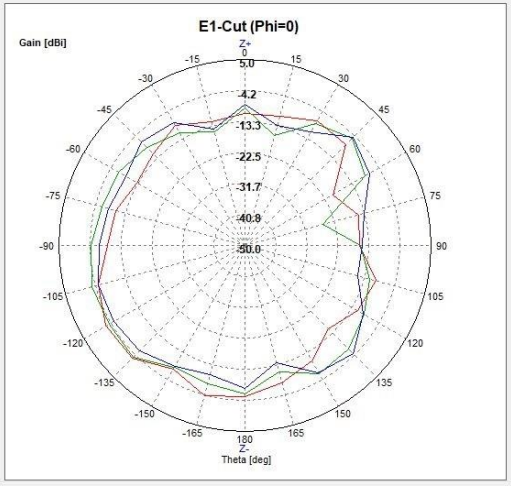


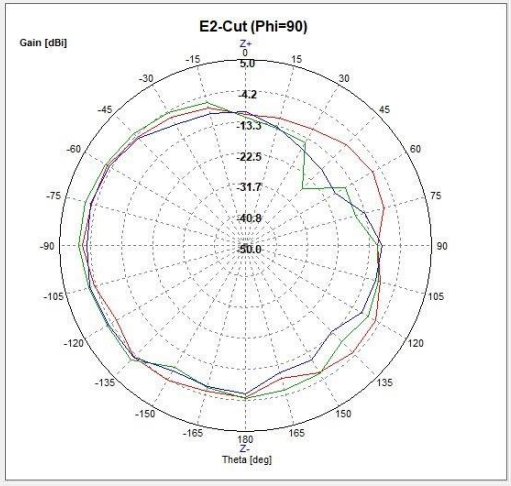
2D Radiation Pattern & Gain _ ANT 1_PCB Only

Summary | **Multiple Frequency** | Multiple Cut | 3D-View | Reserved

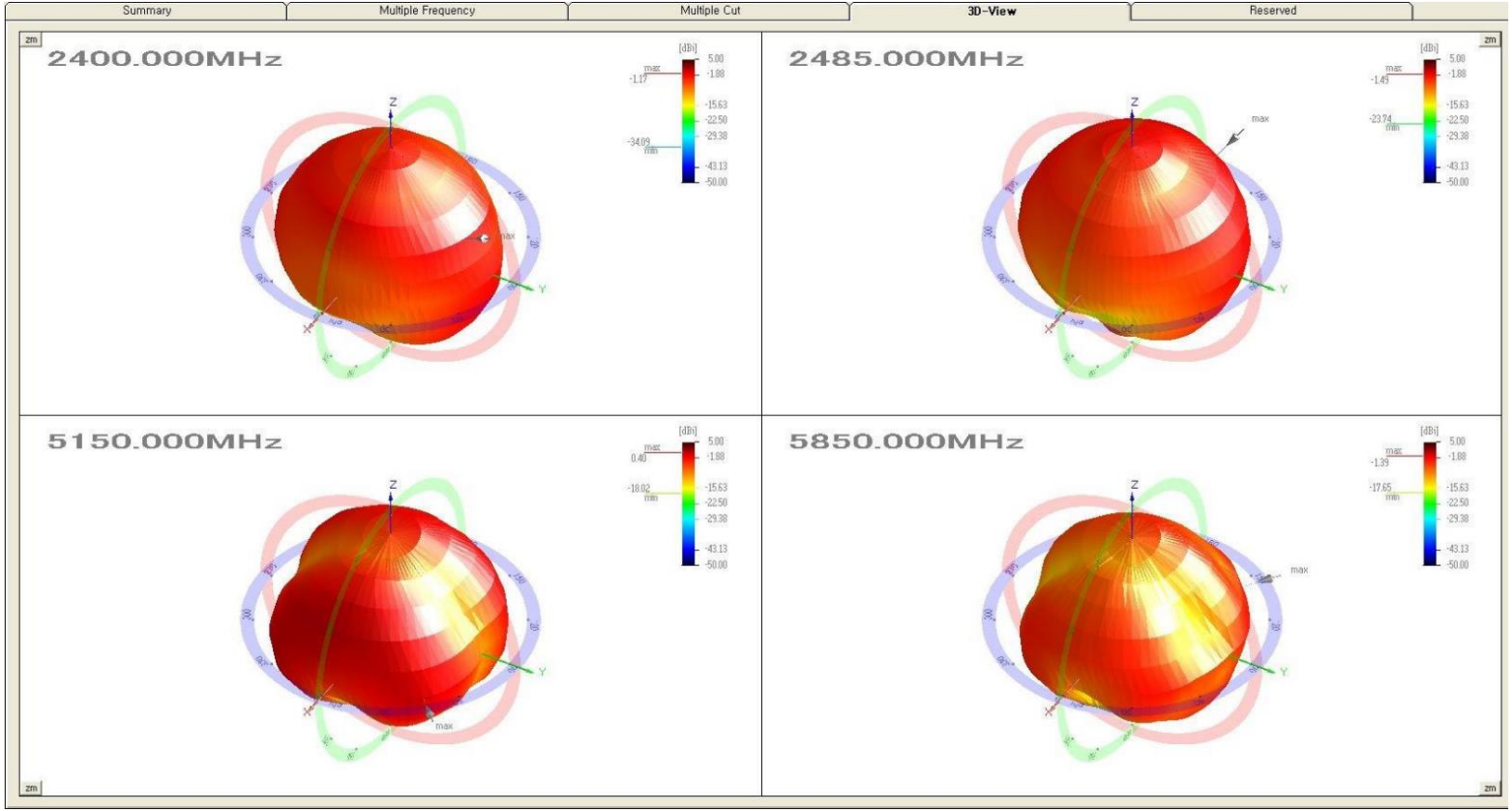
No.	Freq.	PwrSum Eff.[%]	Avg.[dBi]	Peak[dBi]	Theta[	Phi[deg	H(Theta=9 Avg.[dBi]	Peak[dBi]	Phi[deg	BW[deg]	E1(Phi=0) Avg.[dBi]	Peak[dBi]	Theta[	BW[deg]	E2(Phi=90 Avg.[dBi]	Peak[dBi]	Theta[	BW[deg]
13	5925.000	21.25	-6.73	-0.37	120.00	155.00	-6.96	-1.39	265.00	25.47	-8.03	-2.59	-120.00	40.04	-5.66	-1.72	-90.00	66.50
14	6525.000	24.56	-6.10	-0.57	75.00	275.00	-5.47	-0.68	275.00	31.17	-7.33	-3.15	-135.00	67.34	-5.37	-0.78	-90.00	100.93
15	7125.000	19.25	-7.16	-0.84	105.00	315.00	-6.67	-2.28	315.00	34.19	-8.13	-4.78	45.00	22.43	-6.89	-2.43	-105.00	99.14



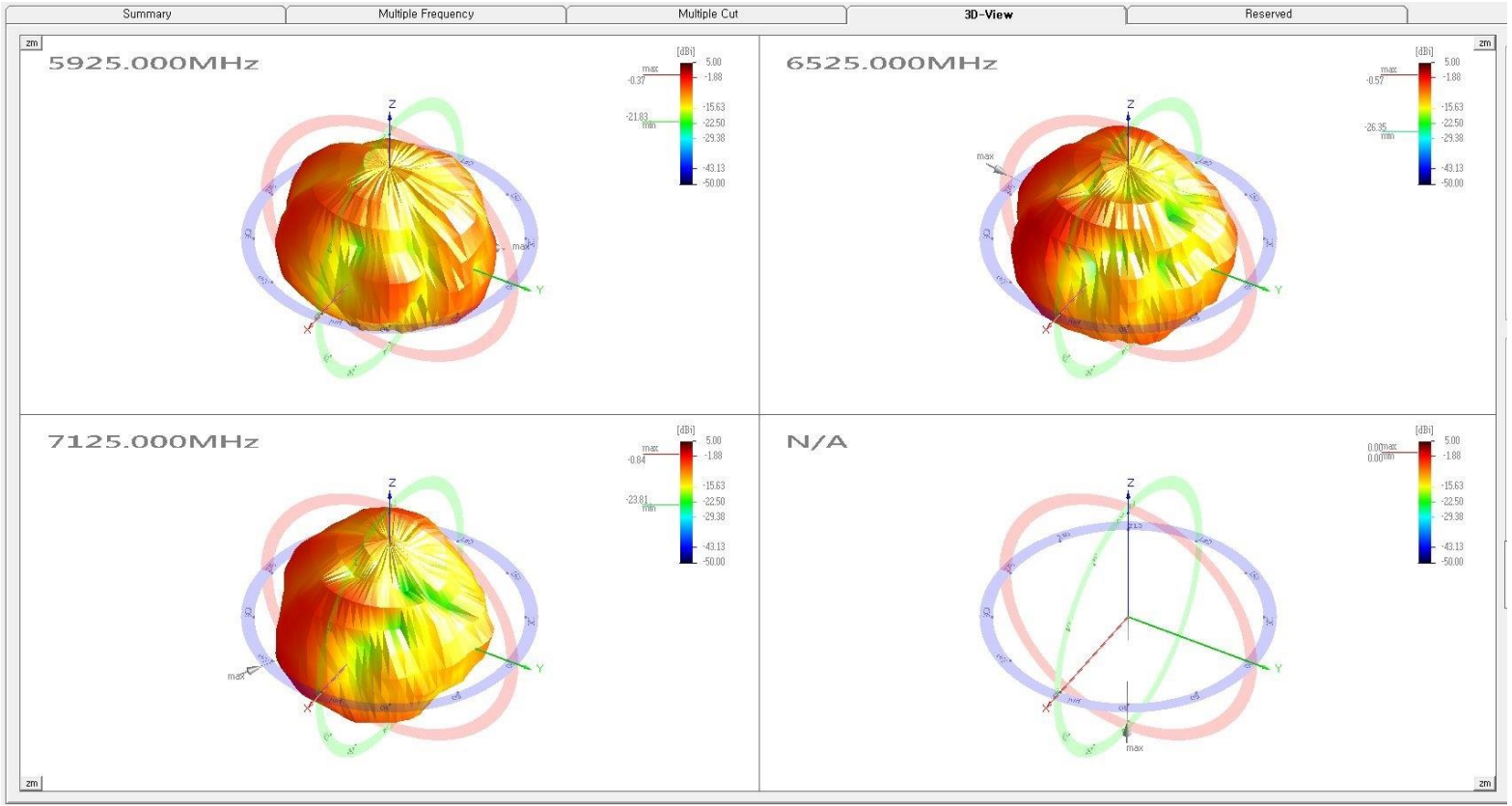




3D Radiation Pattern _ ANT 1_PCB Only

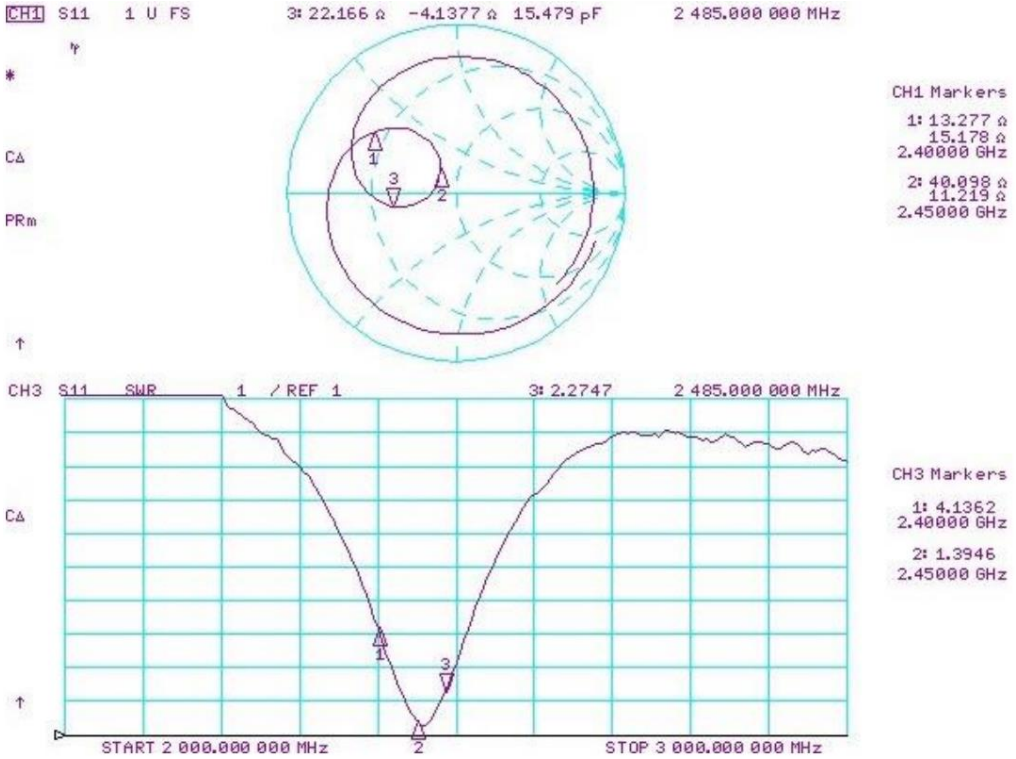


3D Radiation Pattern _ ANT 1_PCB Only



Smith Chart & VSWR / 3D Gain Data _ BT0_PCB Only

[Smith Chart & VSWR]



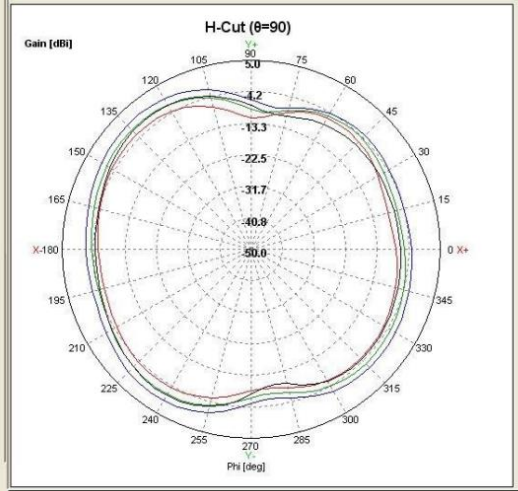
[3D Gain data]

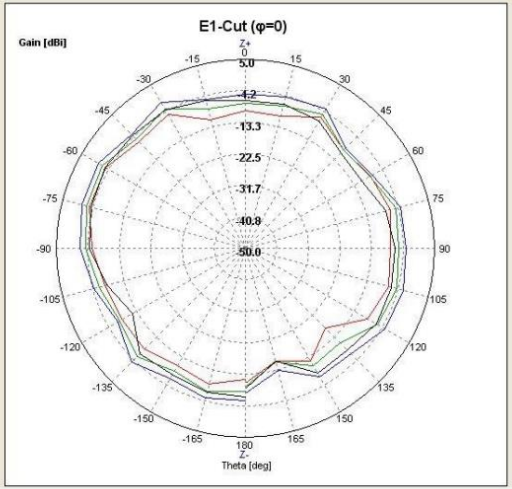
Freq.[MHz]	Eff.[%]	Avg.[dBi]	Peak[dBi]
2400	20.52	**-6.88**	-2.08
2425	30.58	**-5.15**	-0.66
2450	47.74	**-3.21**	1.15
2485	28.34	**-5.48**	-0.88

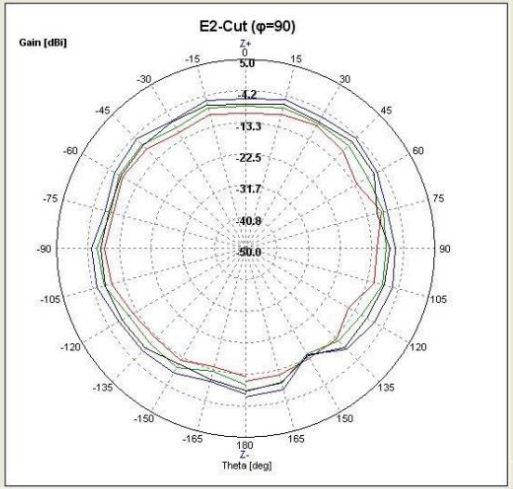
2D Radiation Pattern & Gain _ BT0_PCB Only

Summary | **Multiple Frequency** | Multiple Cut | 3D-View | Reserved

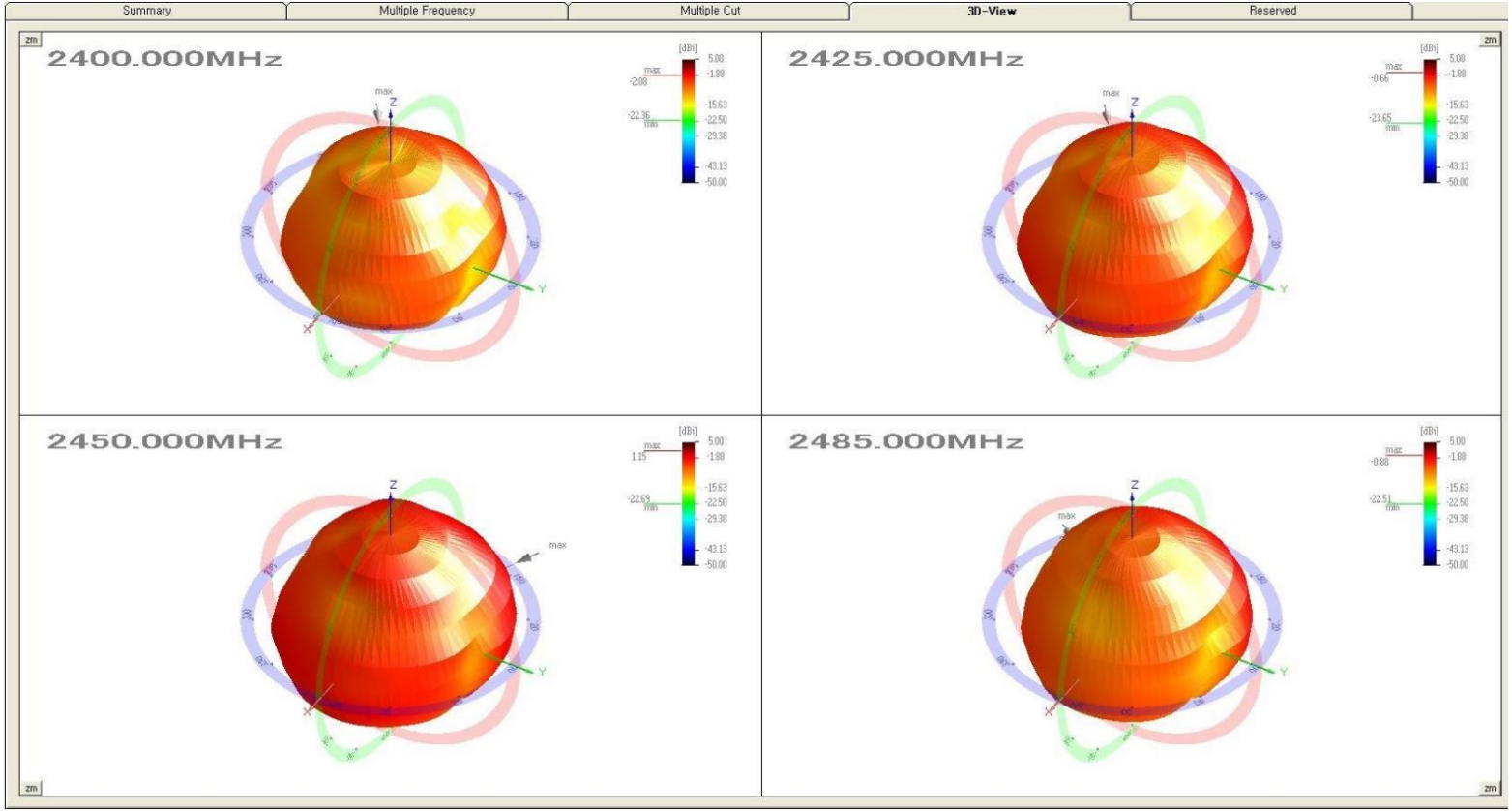
No.	Freq.	PwrSum Eff.[%]	H(θ=90) Avg.[dBi]	H(θ=90) Peak[dBi]	H(θ=90) θ[deg]	H(θ=90) φ[deg]	E1(φ=0) Avg.[dBi]	E1(φ=0) Peak[dBi]	E1(φ=0) φ[deg]	E1(φ=0) BW[deg]	E2(φ=90) Avg.[dBi]	E2(φ=90) Peak[dBi]	E2(φ=90) θ[deg]	E2(φ=90) BW[deg]
1	2400.000	20.52	-6.88	-2.08	75.00	215.00	-5.59	-2.78	140.00	77.50	-7.59	-3.13	-75.00	67.35	-10.82	-8.58	-60.00	171.27
2	2425.000	30.58	-5.15	-0.66	75.00	220.00	-3.64	-0.91	135.00	81.93	-5.85	-2.01	-60.00	74.57	-8.99	-6.84	-90.00	227.20
3	2450.000	47.74	-3.21	1.15	75.00	140.00	-1.81	1.09	130.00	75.01	-3.93	-0.60	-60.00	78.96	-6.63	-4.87	45.00	268.14
4	2485.000	28.34	-5.48	-0.88	90.00	235.00	-4.39	-0.88	235.00	54.89	-6.37	-2.76	-60.00	82.32	-8.35	-6.34	45.00	208.94





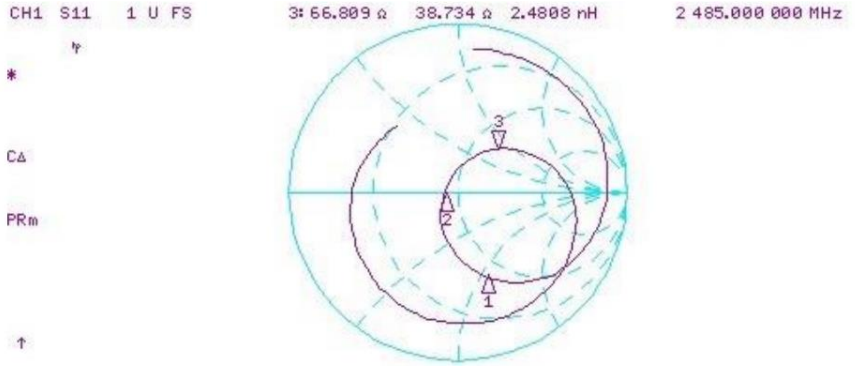


3D Radiation Pattern _ BT0_PCB Only



Smith Chart & VSWR / 3D Gain Data _ BT1_PCB Only

[Smith Chart & VSWR]



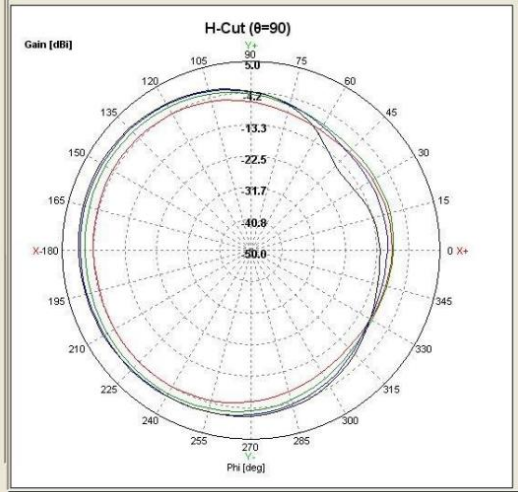
[3D Gain data]

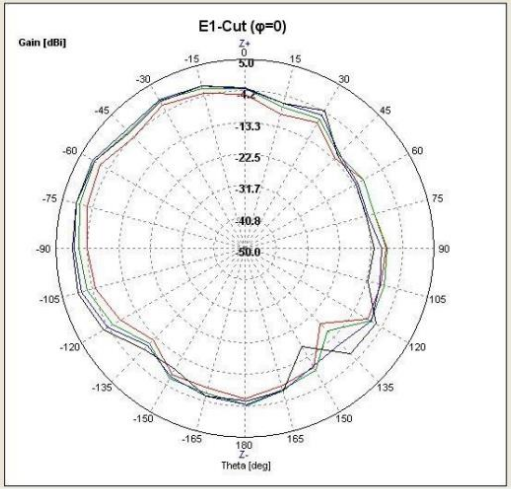
Freq.[MHz]	Eff.[%]	Avg.[dBi]	Peak[dBi]
2400	23.6	**-6.27**	-1.07
2425	36.08	**-4.43**	0.63
2450	42.44	**-3.72**	1.33
2485	44.25	**-3.54**	1.3

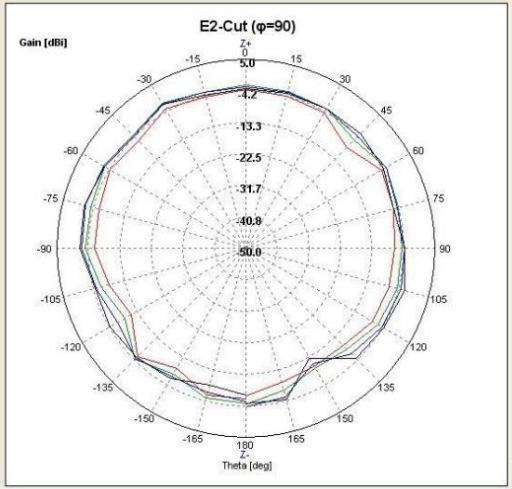
2D Radiation Pattern & Gain _ BT1_PCB Only

Summary | **Multiple Frequency** | Multiple Cut | 3D-View | Reserved

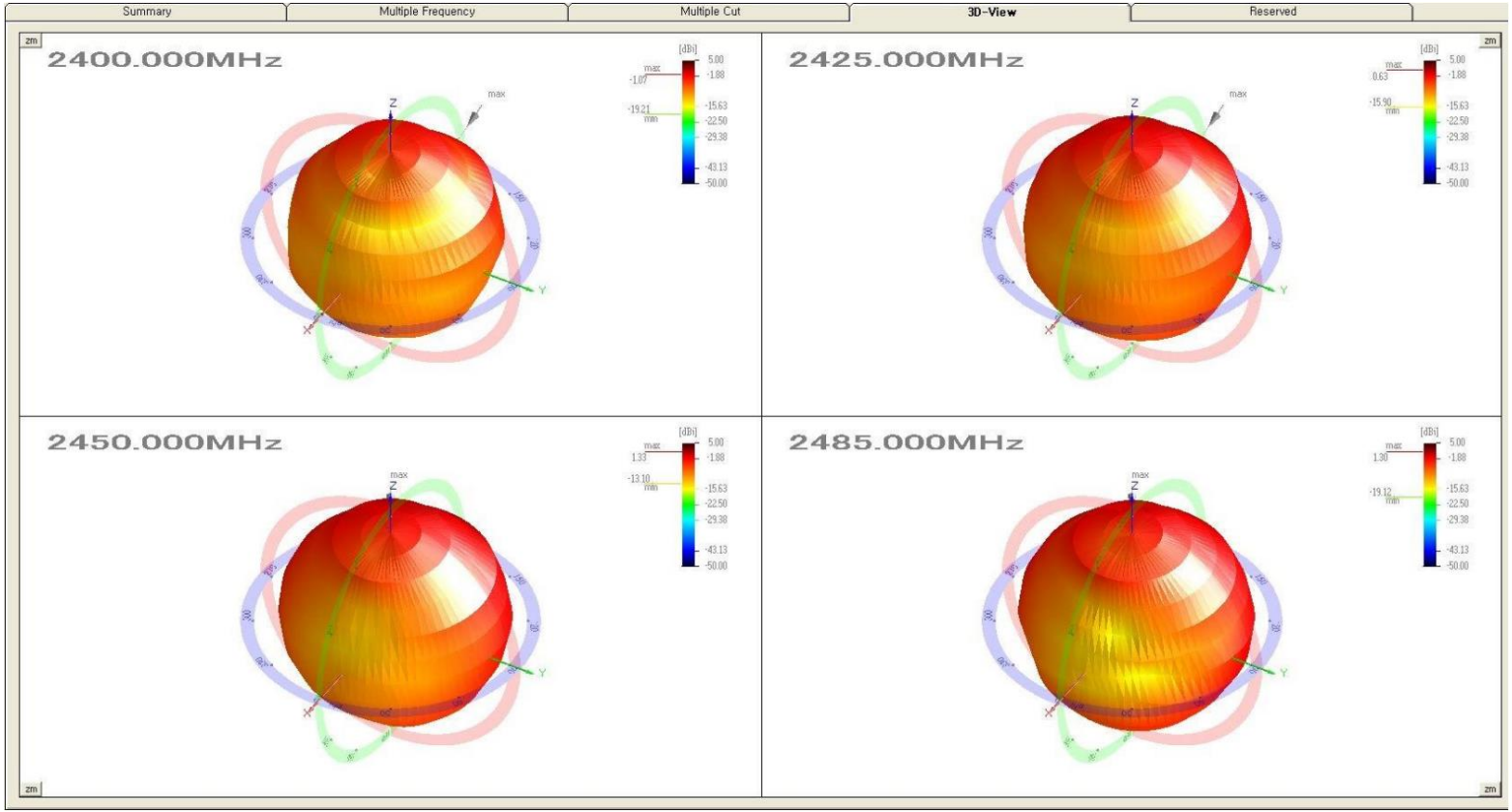
No.	Freq.	PwrSum Eff.[%]	H(θ=90) Avg.[dBi]	Peak[dBi]	θ[deg]	φ[deg]	E1(φ=0) Avg.[dBi]	Peak[dBi]	φ[deg]	BW[deg]	E2(φ=90) Avg.[dBi]	Peak[dBi]	θ[deg]	BW[deg]
1	2400.000	23.60	-6.27	-1.07	60.00	170.00	-5.92	-3.45	150.00	183.65	-6.20	-1.21	-60.00	45.96
2	2425.000	36.08	-4.43	0.63	60.00	170.00	-3.76	-1.09	150.00	184.34	-4.42	0.60	-60.00	95.14
3	2450.000	42.44	-3.72	1.33	75.00	210.00	-2.89	0.12	160.00	181.66	-3.79	1.15	-60.00	99.79
4	2485.000	44.25	-3.54	1.30	75.00	210.00	-2.73	0.54	160.00	181.64	-3.74	0.85	-75.00	73.10







3D Radiation Pattern _ BT1_PCB Only



WiFi Ant0/1 Isolation_PCB Only