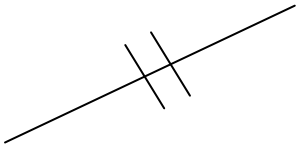
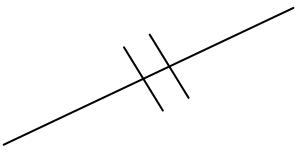
APPROVAL SHEET

Customer	PANTECH		
Supplier	KARAM SOLUTION		
Product Name	Main Antenna		
Model Name	C781		
Part No			
Maker Code	KRS-C781-MA		
Date	April 29 , 2011		
Sample Picture	TOP	Bottom	
			
	Width: 42.62mm Length: 15.31mm		
	Engineer	Review	Approved
Circuit			
	Kavin		
Mechanism			
	Aion	James	
Quality			
	Colt		Allen

Headquarters : Shin Chang-gu, Gyeonggi-Siheung Eunhaeng Technotown 249, 4 th Floor Seoul, 429-836 Korea
TEL : 82-31-312-9577, FAX : 82-31-312-9670

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REVISION LIST

REVISION	DATE	CHANGE CONTENTS	CHANGE CAUSE	REMARK
ISSUE 1	2011.04.29		FIRST APPROVAL SPECIFICATION	
FROM ISSUE TO	2011. . .			
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1. Technical Items

1.1 Electrical Spec.

Electrical Spec.								
Frequency Range	Cellular/GSM850/GSM900				US-PCS/DCS1800/DCS1900			
	Tx		Rx		Tx		Rx	
	824~915MHz		869~960MHz		1710~1910MHz		1805~1990MHz	
Folder Position	Open	Close	Open	Close	Open	Close	Open	Close
V.S.W.R (MAX)	4.5	5.0	5.5	5.0	3.5	3.5	5.0	5.5
PEAK GAIN E2-Plane (Min. dBi)	-5.0	-4.5	-6.5	-6.0	0.0	-0.5	-1.5	-2.0
PEAK GAIN E1-Plane (Min. dBi)	-6.0	-5.5	-4.0	-4.0	-1.5	-1.5	-1.5	-2.0
Average GAIN H-Plane (Min. dBi)	-7.0	-7.0	-11.0	-8.5	-10.0	-12.0	-9.5	-11.5
Impedance (Nominal)	50 ohms							
Polarization	Vertical							
Radiation Pattern	Omni-Directional							
Maximum Power	2 Watts							

1.2 Mechanical Spec.

Mechanical Spec.	
Connector	Contact Pin Type
Overall length	See drawing
Operation Temperature	-30℃ ~ +80℃
Weight	1.7 g

1.3 Material Spec

NO	Part Name	Material	Processing	Post	Quantity	Material manufacturers	Processing manufacturers	Other
1	Carrier	PC (SC1004A-KPA1)	Injection		1	LG Chemistry	Polyhitech	
2	Pattern	SUS301 0.15T	Press		1	POONGSAN	Micron Tech	
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								

2. Test Equipment

The test equipments for antenna are as follows

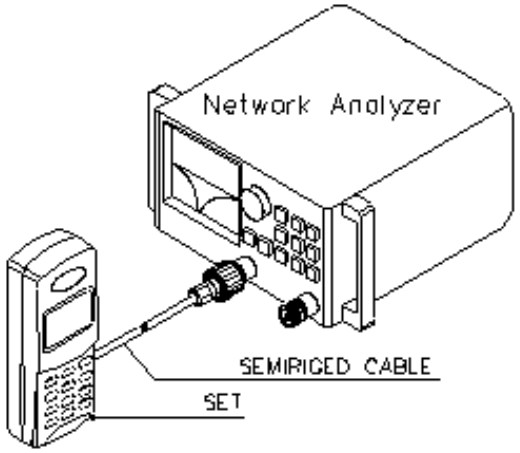
- ♦ Network Analyzer to measure the V.S.W.R and impedance of antenna
- ♦ Spectrum Analyzer to measure the receiving signal intensity
- ♦ Standard Horn antenna that is adjustable in Cellular/GSM850/GSM900, US-PCS/DCS1800/DCS1900 band
- ♦ Anechoic Chamber installed the cables, connectors and equipments for measurement
- ♦ Dogmatic Caliper to measure the dimensions
- ♦ Torque Driver to measure the torque force of the helix
- ♦ Push/Pull gauge to measure the pulling force
- ♦ Climatic Chamber for environmental test

3. Electrical Demands

3.1 V.S.W.R

The V.S.W.R characteristics must satisfy the electrical demands. With Built-in Antenna mounted on a handset, the V.S.W.R of antenna must be less than 5.5:1 at Cellular/GSM850/GSM900 band (824 ~ 960MHz) and

5.5:1at US-PCS/DCS1800/DCS1900 Band (1710 ~ 1990MHz) on the free space.



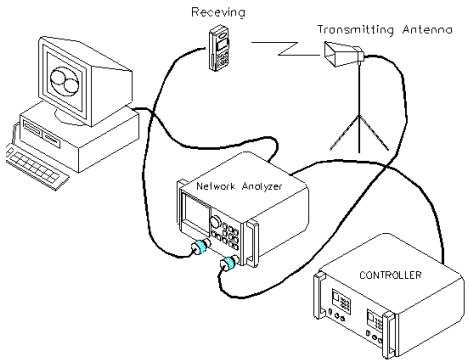
3.2 Radiation Pattern

The radiation pattern must have the Omni-directional characteristic

in Cellular/GSM850/GSM900, US-PCS/DCS1800/DCS1900 band and H-plane.

3.3 Gain

The gain is expressed as dBi that standardizes the half-wave length dipole antenna. Built-in antenna mounted on a handset condition (E2-Plane), the minimum peak Gain of antenna must be bigger than –6.5dBi at Cellular/GSM850/GSM900 band (824~960 MHz) & -2.0 dBi at US-PCS/DCS1800/DCS1900 band (1710 ~ 1990MHz).

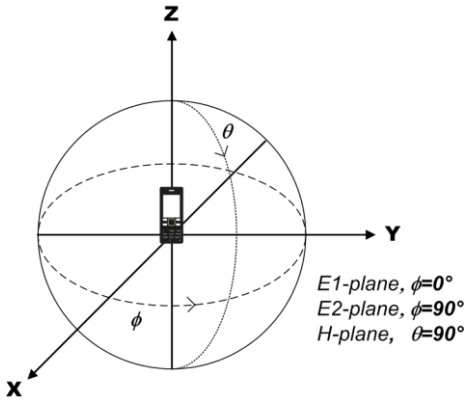


3.4 Test Method

The antenna is tested while mounted on handset with the correct matching circuit in free space.

The antenna is measured for 2 elevation cuts at two different azimuth positions (Φ = 0, Φ = 90).

The results of the test will be correlated to the customer handset and the Measurement environment.



4. Mechanical Specifications

4.1 DROP TEST

The antenna assembled to the mobile phone provided by Pantech, should withstand 2 drops(per each slide open & close=Total 40times x 5pcs) / 3drops for bar type(30times x 5pcs) per every each 10 sides(added below 4corner surfaces) from 1.5m heights onto a steel plate 500×500mm with thickness of 20mm. The antenna should function mechanically after the test. Electrical characteristics should be within the specified range.

5. Environmental Demands

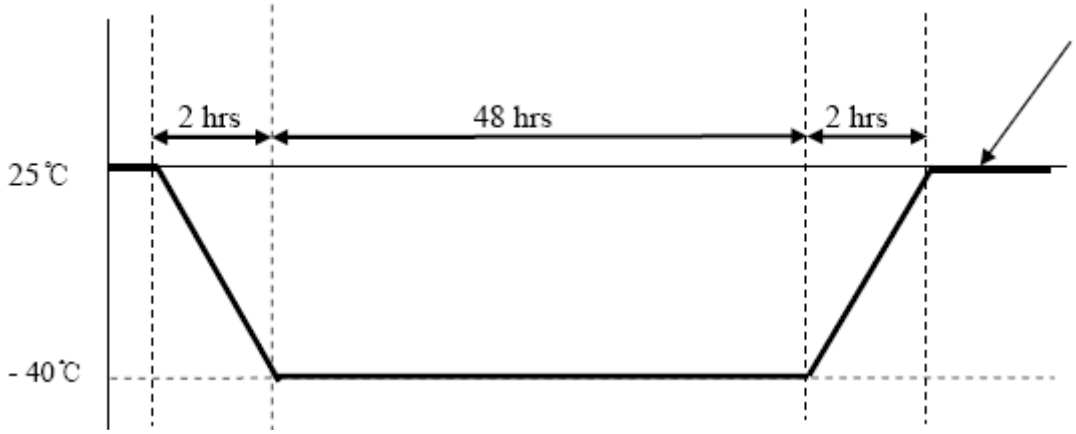
5.1 LOW TEMPERATURE SOAKING

The antenna should be placed in an environmental chamber at -40°C for 48 hours.

Soak antenna at ambient temperature at least 1 hour after the test.

After test is complete, there shall be no visual deterioration or damage.

The antenna should function mechanically. Electrical characteristics should be within the specified range.



Low Temperature soaking

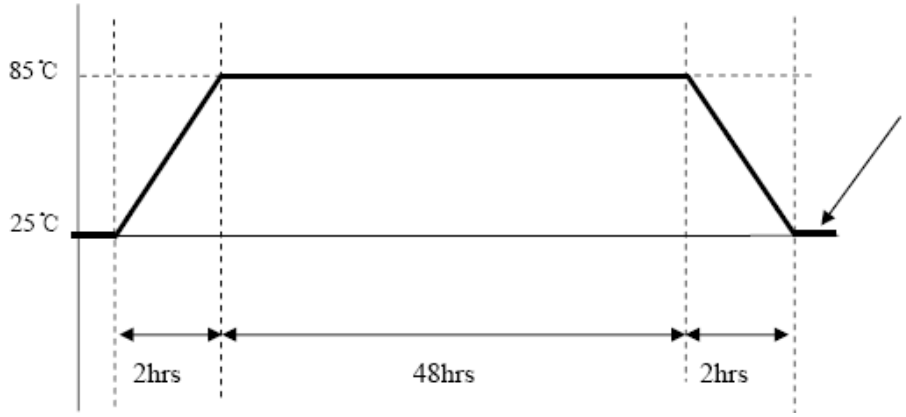
5.2 HIGH TEMPERATURE SOAKING

The antenna should be placed in an environmental chamber at +85°C for 48 hours.

Soak antenna at ambient temperature at least 1 hour after the test.

After test is complete, there shall be no visual deterioration or damage.

The antenna should function mechanically. Electrical characteristics should be within the specified range



High Temperature soaking

5.3 THERMAL SHOCK TEST

Place the antenna in an environmental chamber at +25°C . Then expose antenna at temperature T1= -40°C during 45 minutes. Then expose antenna at temperature T2=+85°C during 45 minutes. Transfer time is 5 min. Repeat this cycle 27 times. After test is complete, there shall be no visual deterioration or damage.

The antenna should function mechanically. Electrical characteristics should be within the specified range

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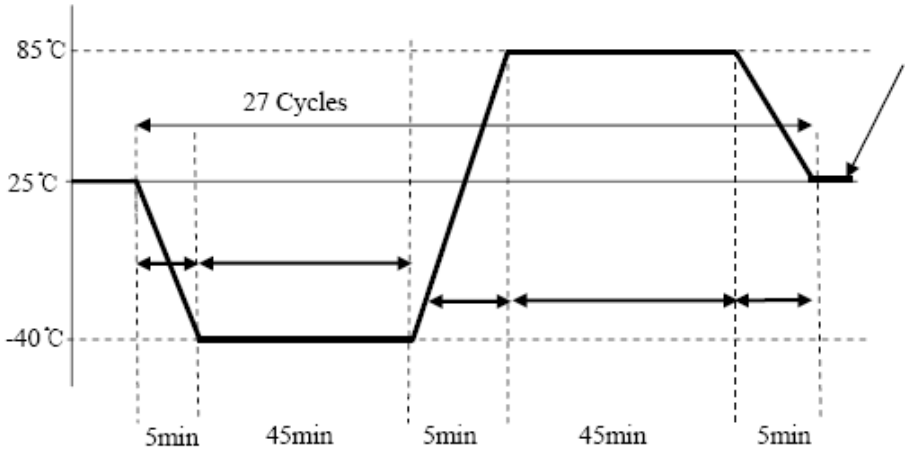


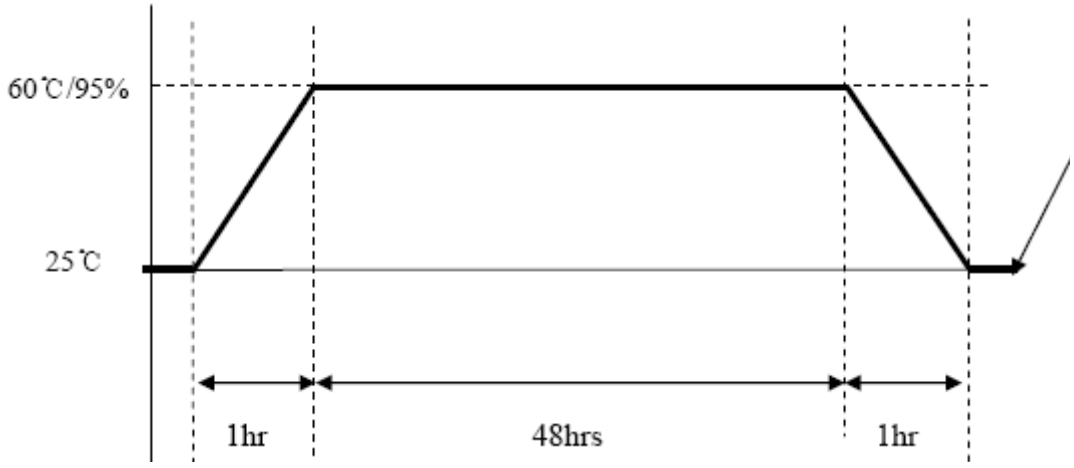
Thermal Shock Test

5.4 STATIC HUMIDITY TEST

Place the complete in an environmental chamber at +25°C. Then increase temperature during 1 hour to +60° C with humidity increasing to 95% RH during 1 hours. Soak antenna with these parameters for 48 hours. After the finish initial ambient parameters should be achieved during 1 hour.

After test is complete, there shall be no visual deterioration or damage.

The antenna should function mechanically. Electrical characteristics should be within the specified range



Static Humidity Test

5.5 SALT SPRAY (CORROSION) TEST

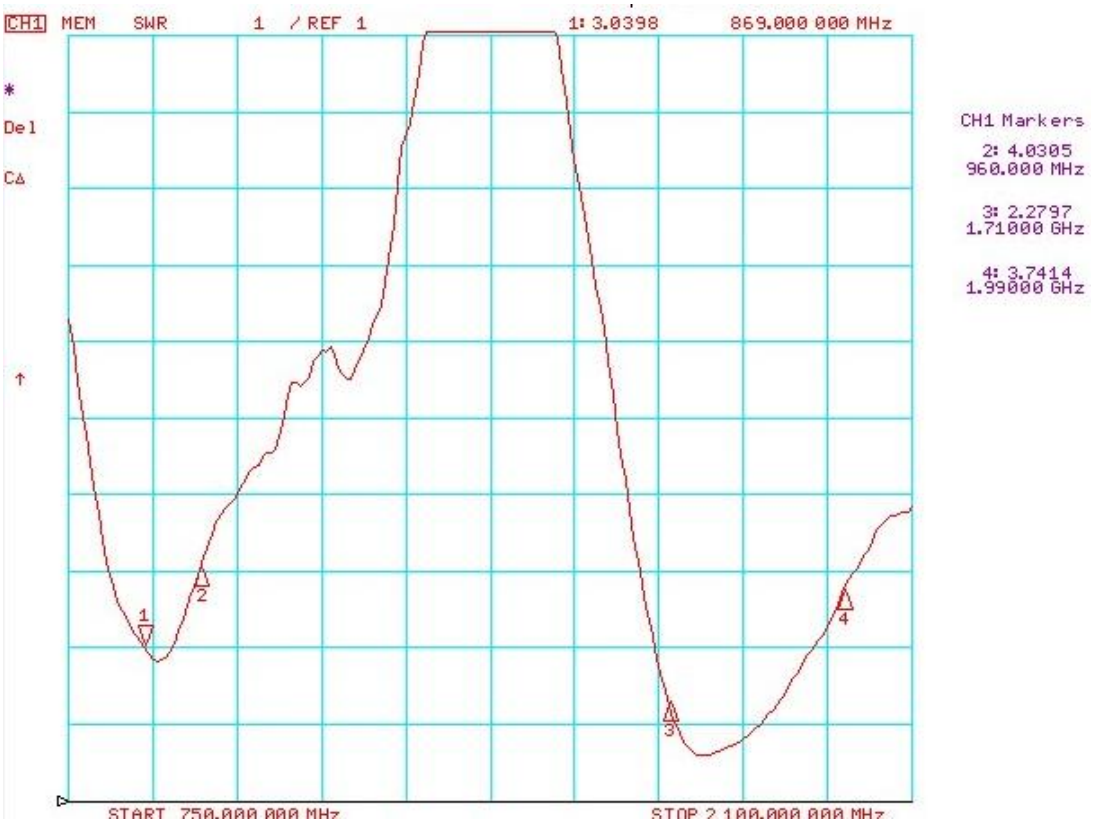
Place complete antenna in Salt Spray Cabinet at temperature +35°C with the salt fog of NaCl solution (5%); soak time - 48 hours.

After test is complete, there shall be no visual deterioration or damage.

The antenna should function mechanically. Electrical characteristics should be within the specified range

6. Electrical data

6.1 Built-in antenna mounted on a handset V.S.W.R



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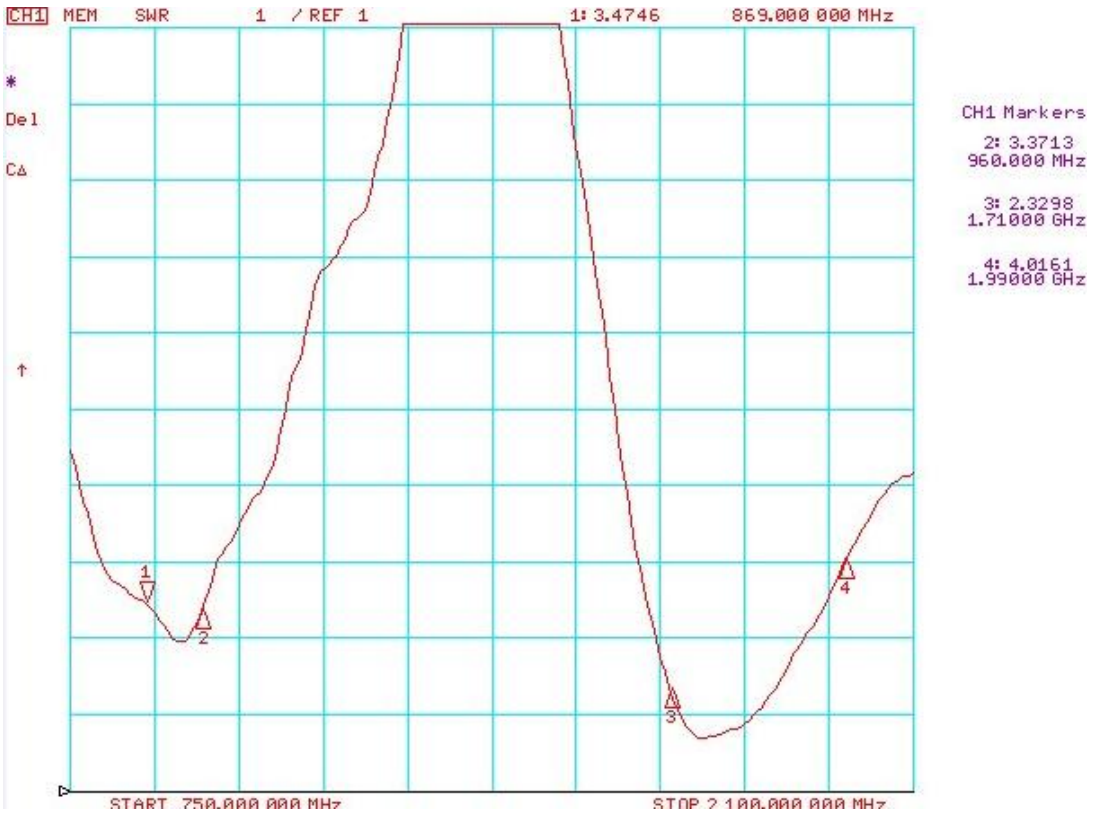

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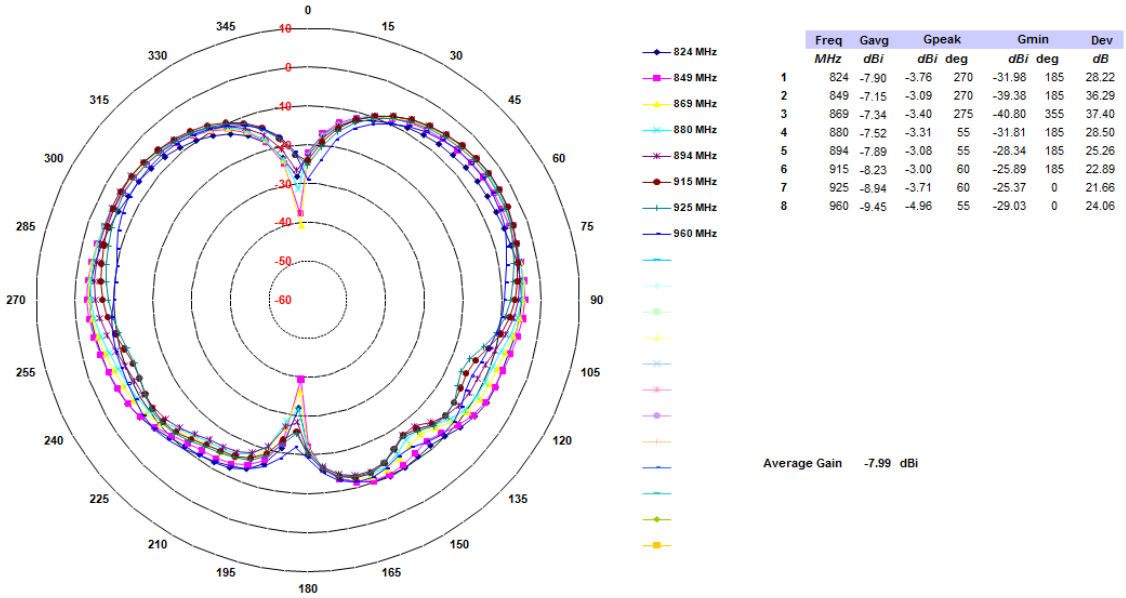
6.2 GAIN

→ Radiation pattern

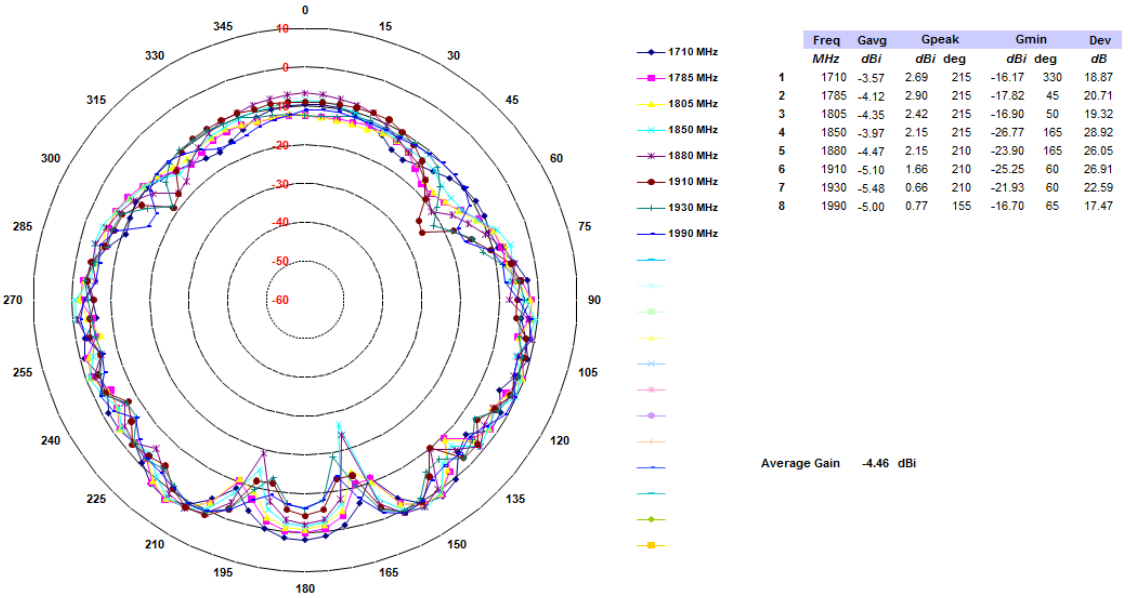
[E2-plane]



	Freq	Gavg	Gpeak		Gmin		Dev
	MHz	dBi	dBi	deg	dBi	deg	dB
1	824	-7.90	-3.76	270	-31.98	185	28.22
2	849	-7.15	-3.09	270	-39.38	185	36.29
3	869	-7.34	-3.40	275	-40.80	355	37.40
4	880	-7.52	-3.31	55	-31.81	185	28.50
5	894	-7.89	-3.08	55	-28.34	185	25.26
6	915	-8.23	-3.00	60	-25.89	185	22.89
7	925	-8.94	-3.71	60	-25.37	0	21.66
8	960	-9.45	-4.96	55	-29.03	0	24.06

Average Gain -7.99 dBi

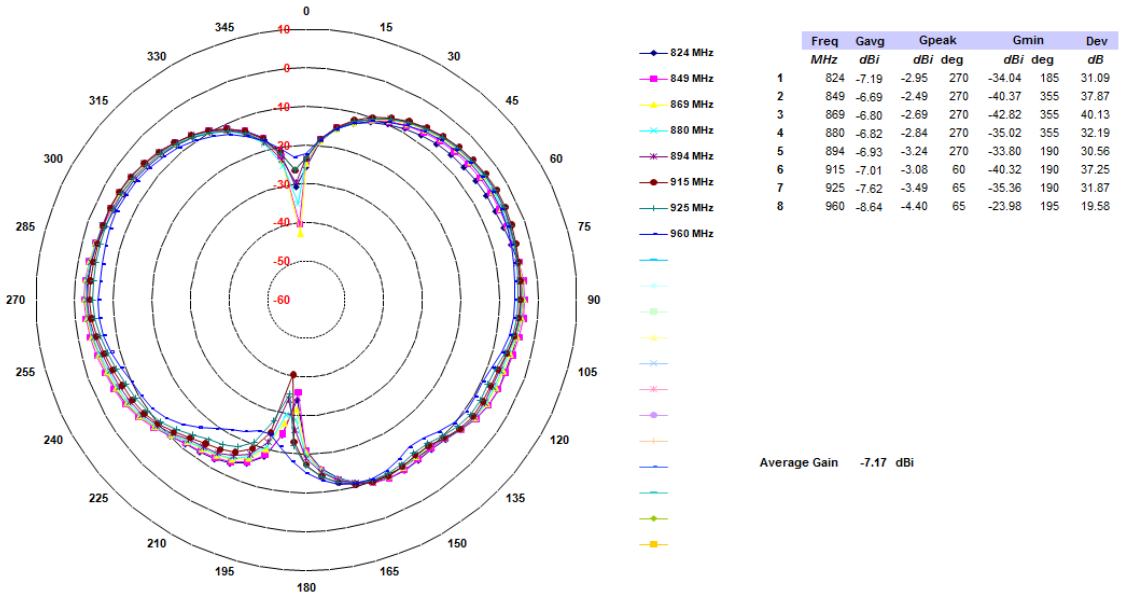
[Folder open _ Cellular/GSM850/GSM900 band]



	Freq	Gavg	Gpeak		Gmin		Dev
	MHz	dBi	dBi	deg	dBi	deg	dB
1	1710	-3.57	2.69	215	-16.17	330	18.87
2	1785	-4.12	2.90	215	-17.82	45	20.71
3	1805	-4.35	2.42	215	-16.90	50	19.32
4	1850	-3.97	2.15	215	-26.77	165	28.92
5	1880	-4.47	2.15	210	-23.90	165	26.05
6	1910	-5.10	1.66	210	-25.25	60	26.91
7	1930	-5.48	0.66	210	-21.93	60	22.59
8	1990	-5.00	0.77	155	-16.70	65	17.47

Average Gain -4.46 dBi

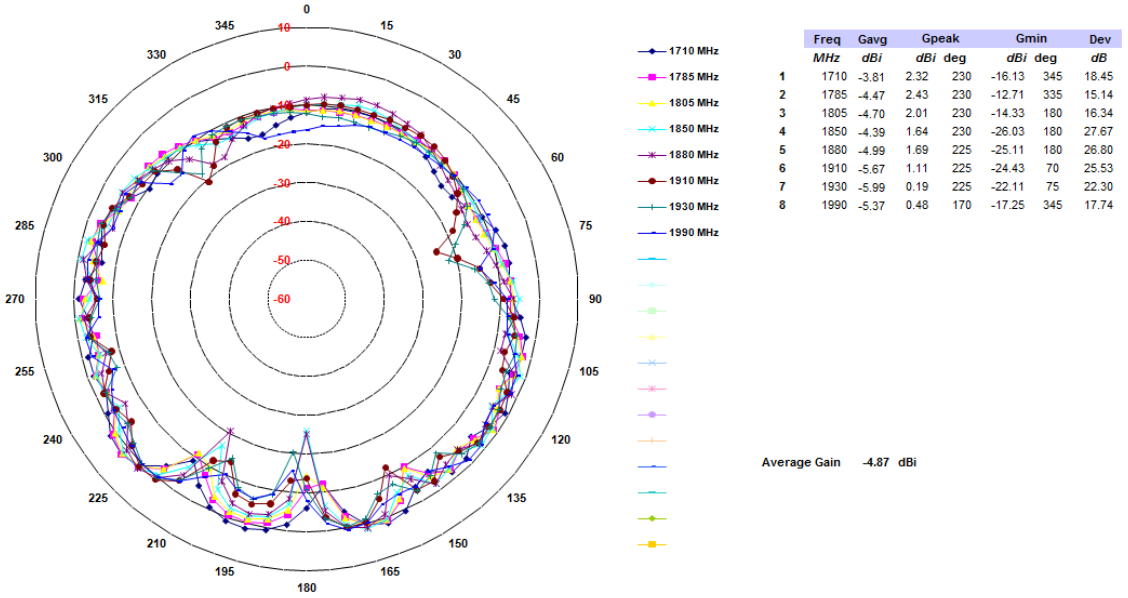
[Folder-open _ US-PCS/DCS1800/DCS1900 band]



	Freq	Gavg	Gpeak		Gmin		Dev
	MHz	dBi	dBi	deg	dBi	deg	dB
1	824	-7.19	-2.95	270	-34.04	185	31.09
2	849	-6.69	-2.49	270	-40.37	355	37.87
3	869	-6.80	-2.69	270	-42.82	355	40.13
4	880	-6.82	-2.84	270	-35.02	355	32.19
5	894	-6.93	-3.24	270	-33.80	190	30.56
6	915	-7.01	-3.08	60	-40.32	190	37.25
7	925	-7.62	-3.49	65	-35.36	190	31.87
8	960	-8.64	-4.40	65	-23.98	195	19.58

Average Gain -7.17 dBi

[Folder close _ Cellular/GSM850/GSM900 band]

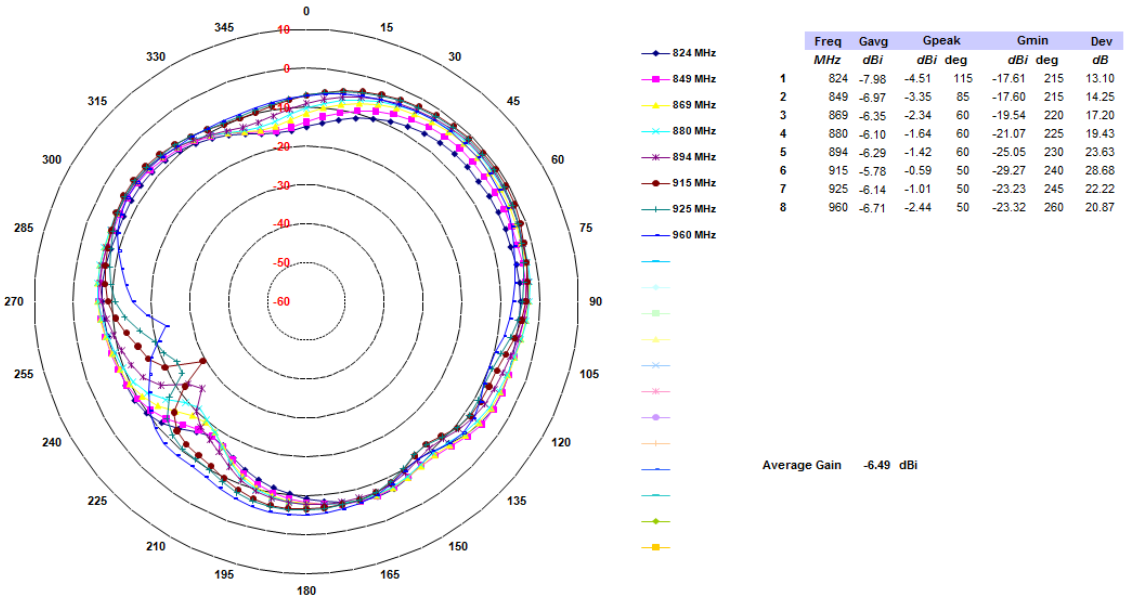


	Freq	Gavg	Gpeak		Gmin		Dev
	MHz	dBi	dBi	deg	dBi	deg	dB
1	1710	-3.81	2.32	230	-16.13	345	18.45
2	1785	-4.47	2.43	230	-12.71	335	15.14
3	1805	-4.70	2.01	230	-14.33	180	16.34
4	1850	-4.39	1.64	230	-26.03	180	27.67
5	1880	-4.99	1.69	225	-25.11	180	26.80
6	1910	-5.67	1.11	225	-24.43	70	25.53
7	1930	-5.99	0.19	225	-22.11	75	22.30
8	1990	-5.37	0.48	170	-17.25	345	17.74

Average Gain -4.87 dBi

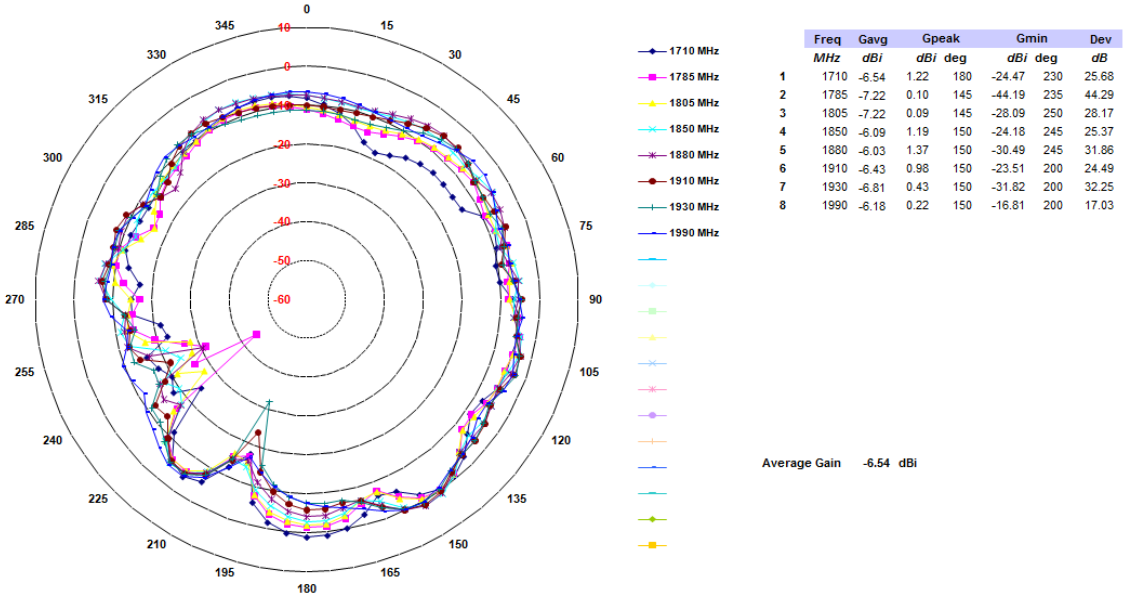
[Folder-close _ US-PCS/DCS1800/DCS1900 band]

[E1-plane]



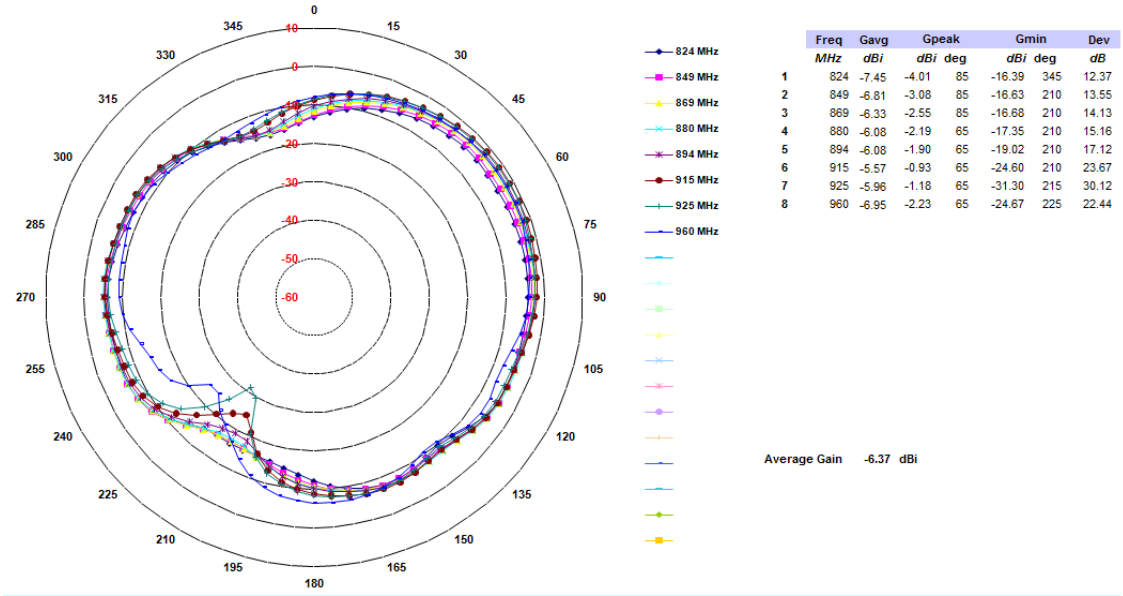
	Freq	Gavg	Gpeak		Gmin		Dev
	MHz	dBi	dBi	deg	dBi	deg	dB
1	824	-7.98	-4.51	115	-17.61	215	13.10
2	849	-6.97	-3.35	85	-17.60	215	14.25
3	869	-6.35	-2.34	60	-19.54	220	17.20
4	880	-6.10	-1.64	60	-21.07	225	19.43
5	894	-6.29	-1.42	60	-25.05	230	23.63
6	915	-5.78	-0.59	50	-29.27	240	28.68
7	925	-6.14	-1.01	50	-23.23	245	22.22
8	960	-6.71	-2.44	50	-23.32	260	20.87

[Folder open _ Cellular/GSM850/GSM900 band]



	Freq	Gavg	Gpeak		Gmin		Dev
	MHz	dBi	dBi	deg	dBi	deg	dB
1	1710	-6.54	1.22	180	-24.47	230	25.68
2	1785	-7.22	0.10	145	-44.19	235	44.29
3	1805	-7.22	0.09	145	-28.09	250	28.17
4	1850	-6.09	1.19	150	-24.18	245	25.37
5	1880	-6.03	1.37	150	-30.49	245	31.86
6	1910	-6.43	0.98	150	-23.51	200	24.49
7	1930	-6.81	0.43	150	-31.82	200	32.25
8	1990	-6.18	0.22	150	-16.81	200	17.03

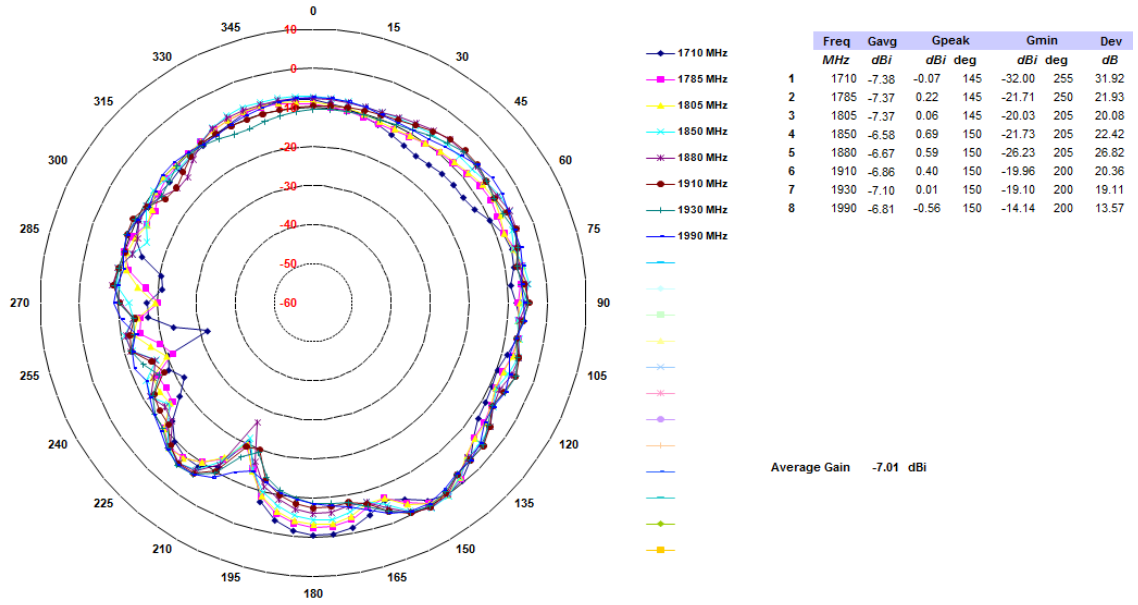
[Folder-open _ US-PCS/DCS1800/DCS1900 band]



	Freq	Gavg	Gpeak		Gmin		Dev
	MHz	dBi	dBi	deg	dBi	deg	dB
1	824	-7.45	-4.01	85	-16.39	345	12.37
2	849	-6.81	-3.08	85	-16.63	210	13.55
3	869	-6.33	-2.55	85	-16.68	210	14.13
4	880	-6.08	-2.19	65	-17.35	210	15.16
5	894	-6.08	-1.90	65	-19.02	210	17.12
6	915	-5.57	-0.93	65	-24.60	210	23.67
7	925	-5.96	-1.18	65	-31.30	215	30.12
8	960	-6.95	-2.23	65	-24.67	225	22.44

Average Gain -6.37 dBi

[Folder close _ Cellular/GSM850/GSM900 band]

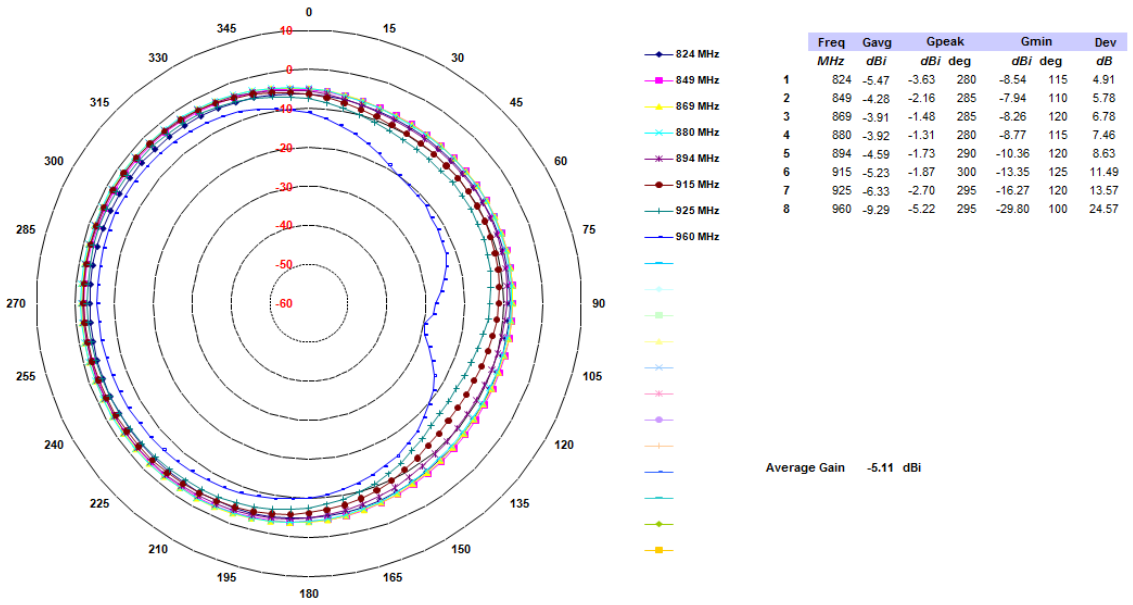


	Freq	Gavg	Gpeak		Gmin		Dev
	MHz	dBi	dBi	deg	dBi	deg	dB
1	1710	-7.38	-0.07	145	-32.00	255	31.92
2	1785	-7.37	0.22	145	-21.71	250	21.93
3	1805	-7.37	0.06	145	-20.03	205	20.08
4	1850	-6.58	0.69	150	-21.73	205	22.42
5	1880	-6.67	0.59	150	-26.23	205	26.82
6	1910	-6.86	0.40	150	-19.96	200	20.36
7	1930	-7.10	0.01	150	-19.10	200	19.11
8	1990	-6.81	-0.56	150	-14.14	200	13.57

Average Gain -7.01 dBi

[Folder-close _ US-PCS/DCS1800/DCS1900 band]

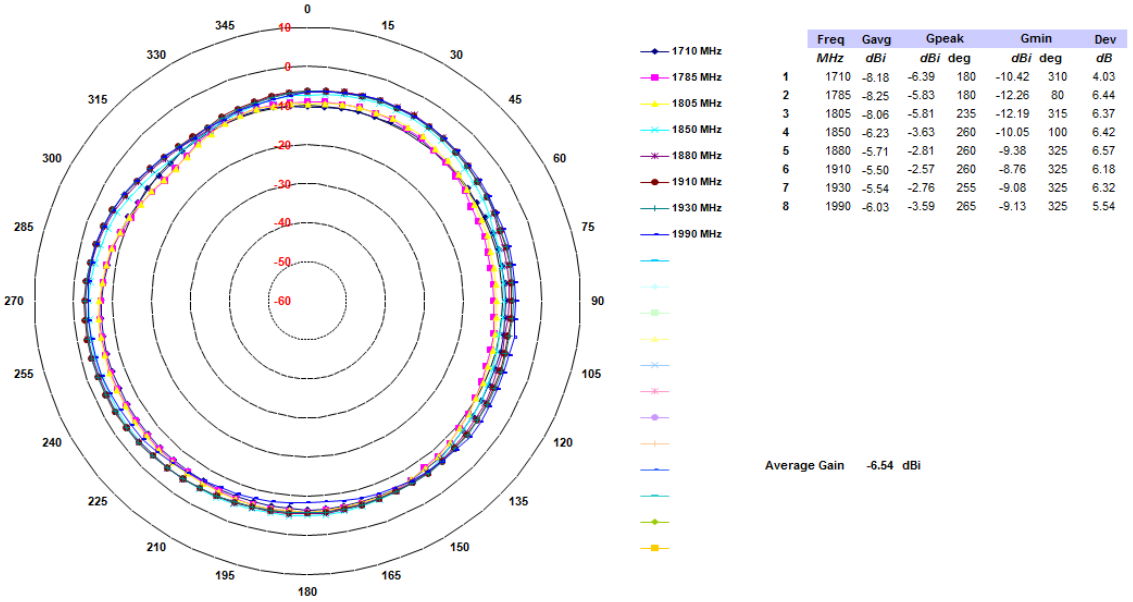
[H-plane]



	Freq	Gavg	Gpeak		Gmin		Dev
	MHz	dBi	dBi	deg	dBi	deg	dB
1	824	-5.47	-3.63	280	-8.54	115	4.91
2	849	-4.28	-2.16	285	-7.94	110	5.78
3	869	-3.91	-1.48	285	-8.26	120	6.78
4	880	-3.92	-1.31	280	-8.77	115	7.46
5	894	-4.59	-1.73	290	-10.36	120	8.63
6	915	-5.23	-1.87	300	-13.35	125	11.49
7	925	-6.33	-2.70	295	-16.27	120	13.57
8	960	-9.29	-5.22	295	-29.80	100	24.57

Average Gain -5.11 dBi

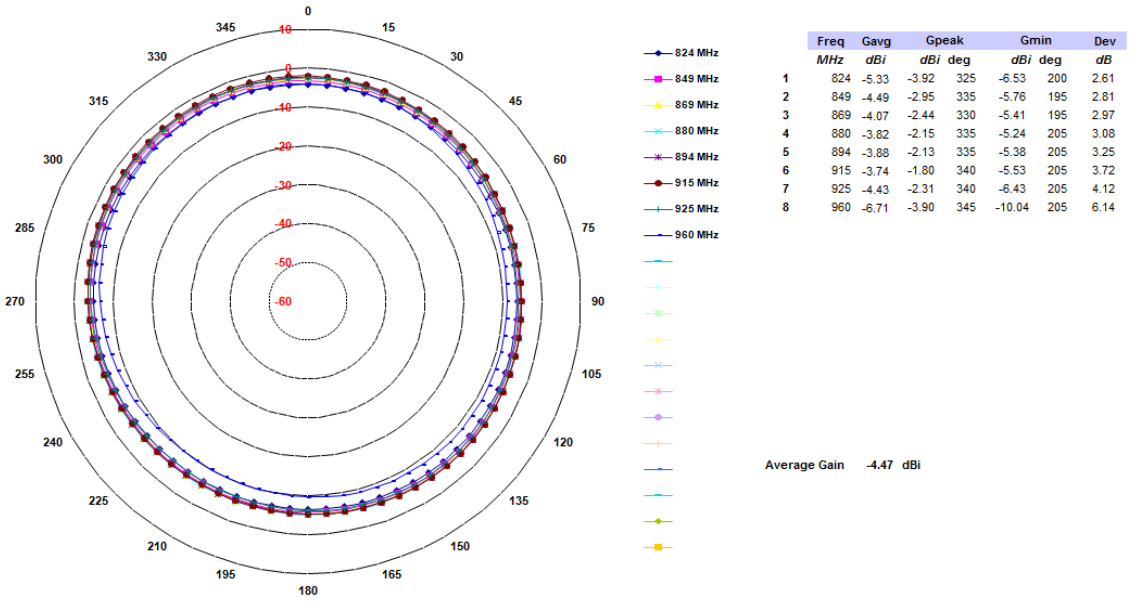
[Folder open _ Cellular/GSM850/GSM900 band]



	Freq	Gavg	Gpeak		Gmin		Dev
	MHz	dBi	dBi	deg	dBi	deg	dB
1	1710	-8.18	-6.39	180	-10.42	310	4.03
2	1785	-8.25	-5.83	180	-12.26	80	6.44
3	1805	-8.06	-5.81	235	-12.19	315	6.37
4	1850	-6.23	-3.63	260	-10.05	100	6.42
5	1880	-5.71	-2.81	260	-9.38	325	6.57
6	1910	-5.50	-2.57	260	-8.76	325	6.18
7	1930	-5.54	-2.76	255	-9.08	325	6.32
8	1990	-6.03	-3.59	265	-9.13	325	5.54

Average Gain -6.54 dBi

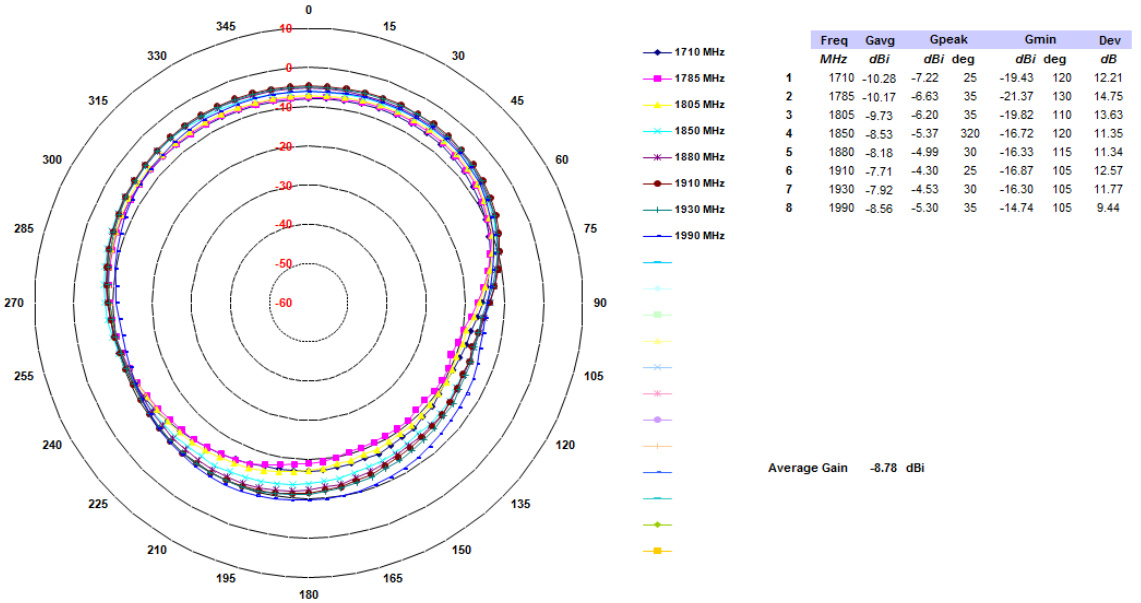
[Folder-open _ US-PCS/DCS1800/DCS1900 band]



	Freq	Gavg	Gpeak		Gmin		Dev
	MHz	dBi	dBi	deg	dBi	deg	dB
1	824	-5.33	-3.92	325	-6.53	200	2.61
2	849	-4.49	-2.95	335	-5.76	195	2.81
3	869	-4.07	-2.44	330	-5.41	195	2.97
4	880	-3.82	-2.15	335	-5.24	205	3.08
5	894	-3.88	-2.13	335	-5.38	205	3.25
6	915	-3.74	-1.80	340	-5.53	205	3.72
7	925	-4.43	-2.31	340	-6.43	205	4.12
8	960	-6.71	-3.90	345	-10.04	205	6.14

Average Gain -4.47 dBi

[Folder close _ Cellular/GSM850/GSM900 band]



	Freq	Gavg	Gpeak		Gmin		Dev
	MHz	dBi	dBi	deg	dBi	deg	dB
1	1710	-10.28	-7.22	25	-19.43	120	12.21
2	1785	-10.17	-6.63	35	-21.37	130	14.75
3	1805	-9.73	-6.20	35	-19.82	110	13.63
4	1850	-8.53	-5.37	320	-16.72	120	11.35
5	1880	-8.18	-4.99	30	-16.33	115	11.34
6	1910	-7.71	-4.30	25	-16.87	105	12.57
7	1930	-7.92	-4.53	30	-16.30	105	11.77
8	1990	-8.56	-5.30	35	-14.74	105	9.44

Average Gain -8.78 dBi

[Folder-close _ US-PCS/DCS1800/DCS1900 band]