

# APPROVAL SHEET

<b>Customer</b>	:	PANTECH
<b>Item</b>	:	P8000 [MOON]
<b>Description</b>	:	Inverted F Antenna
<b>Customer p/no</b>	:	53C03000337
<b>Date</b>	:	2010. 11. 01

## CUSTOMER'S APPROVED

A p p r o v e d			
	EN'GR	CHKD	APPD
<b>M7 SYSTEM</b>			
	<b>Approval Date</b>		
	<b>Approval No.</b>		
	<b>DESC</b>		




Rev No ;

	Cuit.	Mech.	Safety	EMI
<b>Chkd</b>				
<b>Appd</b>				

Document No.	KAT-1010-IN034P	Rev. No.	IR
Model Name	KIN-QN5-PC1020	Date	2010.11.01
Application System	GSM850/GSM900/GSM1800/GSM1900 W850/W1900	Customer	PANTECH
Notice			
<p><b>DONGNAM Co., Ltd.</b>  [R&amp;D Center]  Address : 102-103, Bucheon-technopark, 364, Samjung-Dong, Ojung-Gu, Bucheon-city,  Kyounggi-Do, Korea  Tel : +82-32-621-1666 / Fax : +82-32-621-1670</p>			

## DongNam's Approved

**Project Manager : Min Kyu KIM**

Investigation	Verification	Approval
		
Approval No.		
Approval Date		



DONGNAM Co., Ltd.

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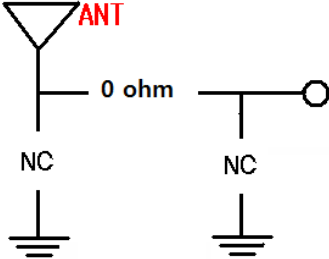
**1. Revision History**

Rev No.	Rev Date	Des.	Page	History	Drafter	Remarks
IR	2010.11.01					



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## 2. Electrical And Mechanical Specifications

Electrical Specifications			
Frequency Range		824 MHz ~ 894 MHz / 880 MHz ~ 960 MHz 1710 MHz ~ 1880 MHz / 1850 MHz ~ 1990 MHz	
V.S.W.R	Slide Down	EGSM900	≤ 6.5
		GSM850	≤ 3.0
		DCS1800	≤ 3.0
		PCS1900	≤ 3.0
	Slide Up	EGSM900	≤ 4.5
		GSM850	≤ 4.5
		DCS1800	≤ 2.5
		PCS1900	≤ 2.5
Gain(Avg.)	Slide Down	EGSM900	≥ -9.0 dBi
		GSM850	≥ -9.0 dBi
		DCS1800	≥ -14.5 dBi
		PCS1900	≥ -6.5 dBi
	Slide Up	EGSM900	≥ -7.5 dBi
		GSM850	≥ -8.5 dBi
		DCS1800	≥ -12.5 dBi
		PCS1900	≥ -5.5 dBi
Nominal Impedance		50 ohm	
Radiation Pattern		Omni – Directional	
Polarization		Linear	
Power Handling		3 watts (max)	
Matching Value			

Mechanical Specifications	
Dimensions	51.59X13.48X5.4mm
Weight	1.4g
Radiator	STS304 / 0.15t
Operating Temp	-20 ~ 90 °C
Operating Humidity	0 ~ 95 %



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### 3 Measurement Setup

#### 3.1 Test Equipments

Network Analyzer            HP8753E  
Calibration Kit                HP85033E  
Adaptor                         SMA Type Female ↔ SMA male

#### 3.2 Test Equipments Setting

Split display                 On  
Sweep setup                  Number of points : 401  
Test port power                0 dBm  
Measure                        Channel 1 : S11

#### 3.3 Calibration

Calibration                    Cal. Kit : 3.5mmD/E  
Calibration menu              → S11 1-Port  
Open → Short → Load  
Done



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#### 4. Test Procedures

##### 4.1 VSWR.

Step 1. Connect ANT port with cable included adaptor to port1 of Network analyzer.

Step 2. Point out markers on network analyzer display at

Step 3. Measurement Inspect VSWR

Step 1. Network analyzer에 측정 Cable이 달린 시료를 연결한다.

Step 2. Network analyzer에 측정하고자 하는 주파수를 display하도록 marker 한다

Step 3. 정재파 비(VSWR)를 측정한다

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### 4.2 Radiation pattern and Gain

Step 1. Calibrate chamber system for gain measurement using horn antenna. At the same time set up software program for chamber system control.

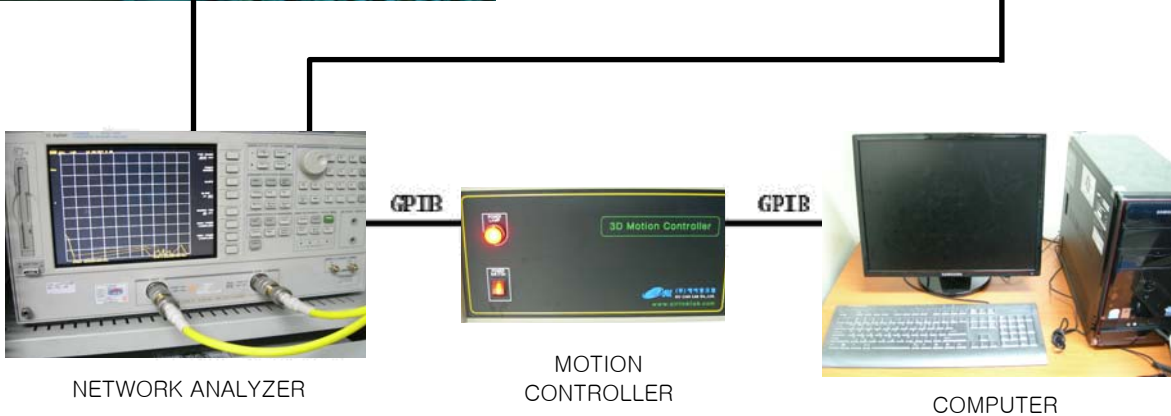
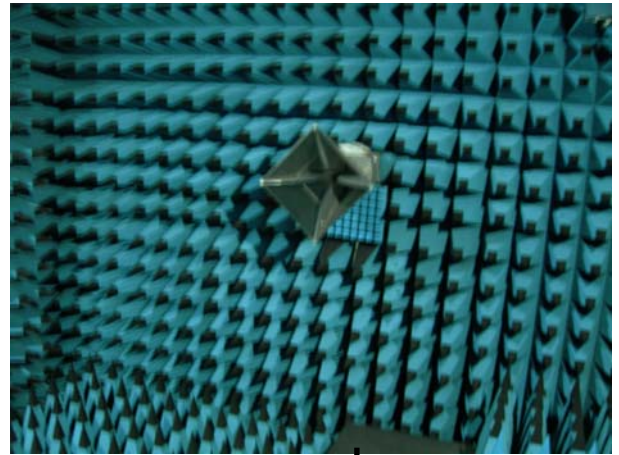
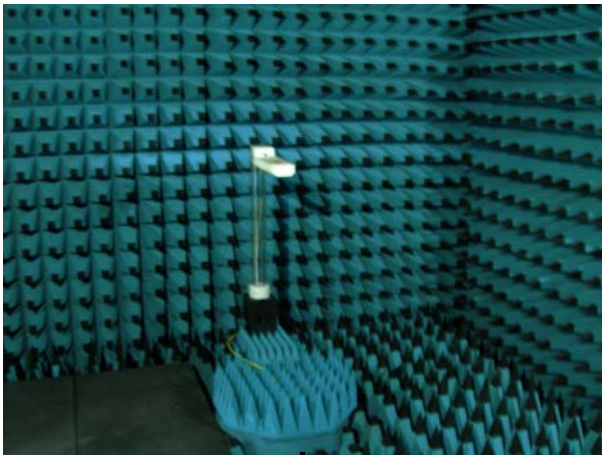
Step 2. Change over from a horn antenna to measuring antenna on target positioner.

Step 3. Start a software program for chamber system control & measuring

Step 1. Horn 안테나를 이용하여 Chamber system를 Calibration함과 동시에 Chamber system을 Control 하기 위한 software를 setup한다.

Step 2. Horn 안테나를 측정할 안테나로 교체한다.

Step 3. Gain과 효율을 측정한다.







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**5. Measurement Data**

<b>Model Name</b>	<b>KIN-QN5-PC1020</b>		
<b>Written by</b>	<b>Min Kyu KIM</b>	<b>Authorized by</b>	<b>YOUNGCHUN AHN</b>
<b>Instrument</b>	<b>Network Analyzer: 8753ES (HP)</b>		
<b>Subject</b>	<b>Inverted F Antenna</b>		
<b>Frequency</b>	824 MHz ~ 894 MHz / 880 MHz ~ 960 MHz 1710 MHz ~ 1880 MHz / 1850 MHz ~ 1990 MHz		

Items		Spec		Test Result (#1)
Frequency		<b>824 MHz ~ 894 MHz / 880 MHz ~ 960 MHz</b> <b>1710 MHz ~ 1880 MHz / 1850 MHz ~ 1990 MHz</b>		<b>O.K</b>
<b>V.S.W.R</b>	<b>Slide Down</b>	EGSM900	≤ 6.5	<b>O.K</b>
		GSM850	≤ 3.0	<b>O.K</b>
		DCS1800	≤ 3.0	<b>O.K</b>
		PCS1900	≤ 3.0	<b>O.K</b>
	<b>Slide Up</b>	EGSM900	≤ 4.5	<b>O.K</b>
		GSM850	≤ 4.5	<b>O.K</b>
		DCS1800	≤ 2.5	<b>O.K</b>
		PCS1900	≤ 2.5	<b>O.K</b>
<b>Gain(Avg.)</b>	<b>Slide Down</b>	EGSM900	≥ -9.0 dBi	<b>O.K</b>
		GSM850	≥ -9.0 dBi	<b>O.K</b>
		DCS1800	≥ -14.5 dBi	<b>O.K</b>
		PCS1900	≥ -6.5 dBi	<b>O.K</b>
	<b>Slide Up</b>	EGSM900	≥ -7.5 dBi	<b>O.K</b>
		GSM850	≥ -8.5 dBi	<b>O.K</b>
		DCS1800	≥ -12.5 dBi	<b>O.K</b>
		PCS1900	≥ -5.5 dBi	<b>O.K</b>
<b>Polarization</b>		<b>Linear</b>		<b>Linear</b>

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### 5.1 SWR

#### Slide Down



#### Slide Up

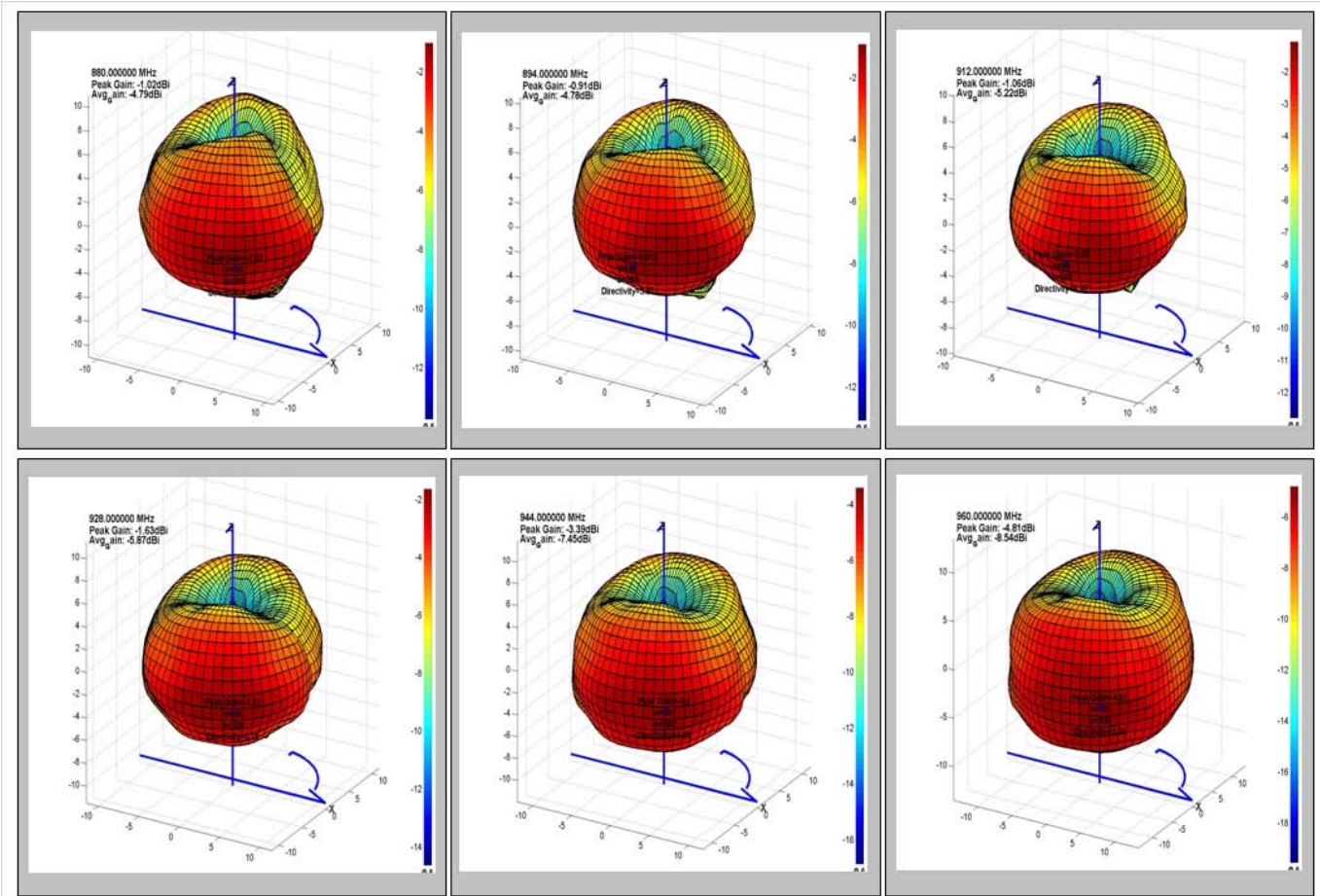


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## 5.2 Gain & Pattern

Slide Down

EGSM900

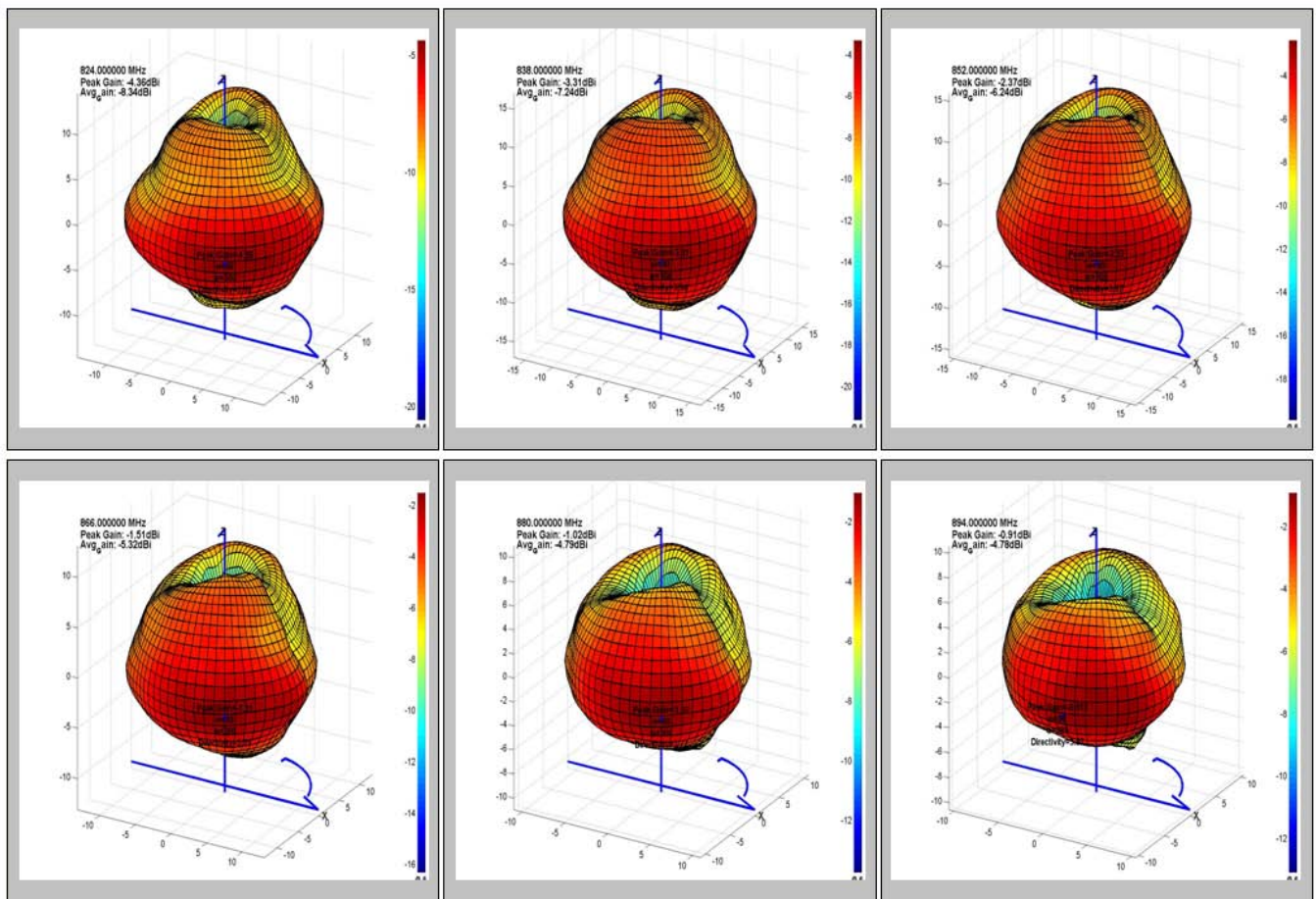


Frequency	Efficiency	Average Gain			Max Gain			Max Position	Directivity
		Ver	Hor	Total	Ver	Hor	Total		
880.000000 MHz	33.2 %	-15.2 dBi	-5.2 dBi	-4.8 dBi	-8.9 dBi	-1.6 dBi	-1.0 dBi	Theta90/Pie300	3.77 dB
894.000000 MHz	33.2 %	-15.4 dBi	-5.2 dBi	-4.8 dBi	-10.3 dBi	-1.4 dBi	-0.9 dBi	Theta90/Pie285	3.87 dB
896.000000 MHz	34.2 %	-15.2 dBi	-5.1 dBi	-4.7 dBi	-10.0 dBi	-1.1 dBi	-0.7 dBi	Theta90/Pie285	4.00 dB
912.000000 MHz	30.0 %	-16.0 dBi	-5.6 dBi	-5.2 dBi	-10.9 dBi	-1.5 dBi	-1.1 dBi	Theta90/Pie285	4.16 dB
928.000000 MHz	25.8 %	-16.9 dBi	-6.2 dBi	-5.9 dBi	-11.8 dBi	-2.0 dBi	-1.6 dBi	Theta90/Pie300	4.25 dB
944.000000 MHz	18.0 %	-18.9 dBi	-7.8 dBi	-7.5 dBi	-13.5 dBi	-3.7 dBi	-3.4 dBi	Theta90/Pie300	4.06 dB
960.000000 MHz	14.0 %	-20.3 dBi	-8.8 dBi	-8.5 dBi	-15.2 dBi	-5.1 dBi	-4.8 dBi	Theta90/Pie300	3.74 dB



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**GSM850**

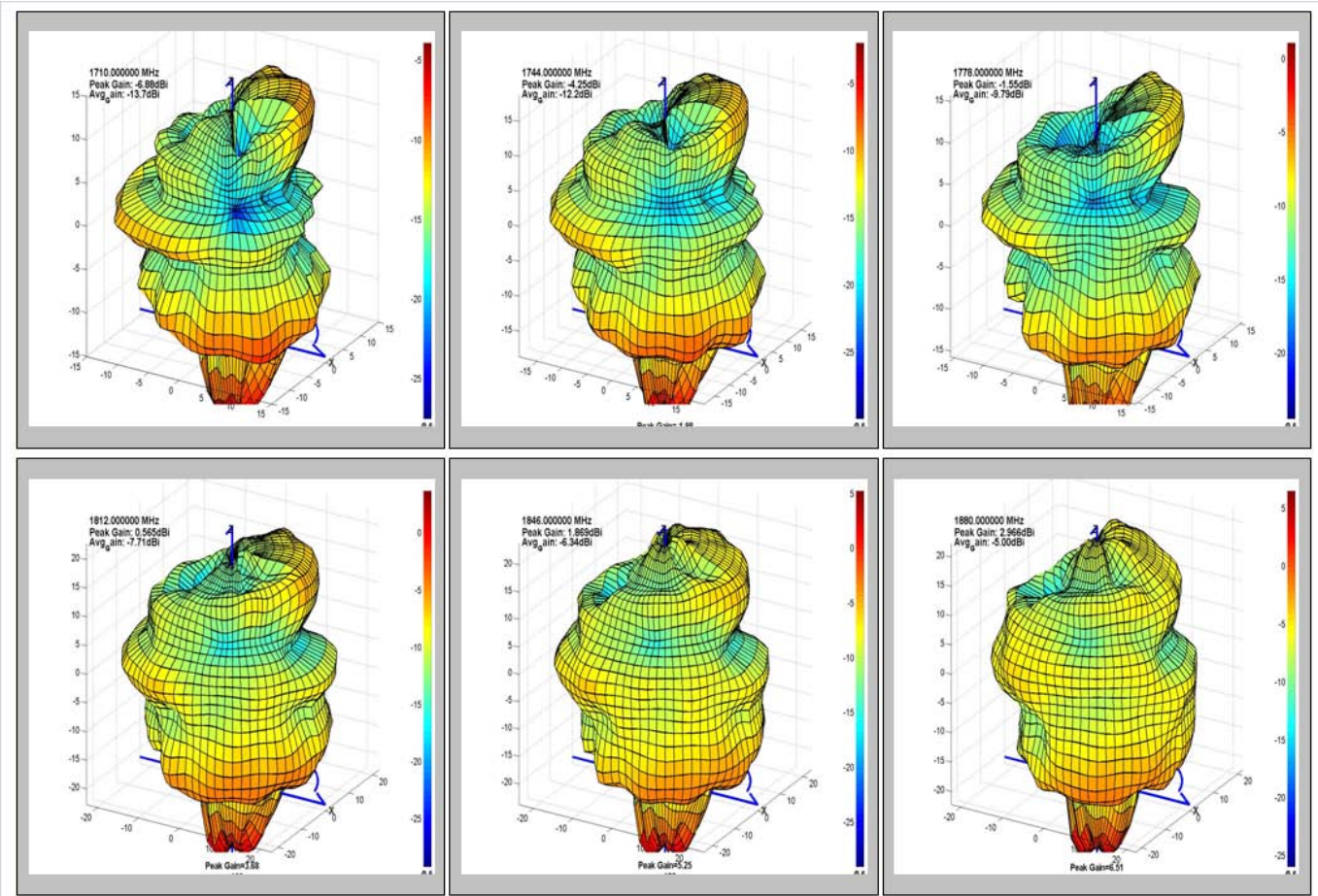


Frequency	Efficiency	Average Gain			Max Gain			Max Position	Directivity
		Ver	Hor	Total	Ver	Hor	Total		
824.000000 MHz	14.6 %	-19.1 dBi	-8.7 dBi	-8.3 dBi	-11.1 dBi	-4.8 dBi	-4.4 dBi	Theta90/Pie300	3.98 dB
838.000000 MHz	18.9 %	-18.1 dBi	-7.6 dBi	-7.2 dBi	-9.6 dBi	-3.7 dBi	-3.3 dBi	Theta90/Pie300	3.94 dB
852.000000 MHz	23.8 %	-16.9 dBi	-6.6 dBi	-6.2 dBi	-8.7 dBi	-2.8 dBi	-2.4 dBi	Theta90/Pie300	3.87 dB
866.000000 MHz	29.4 %	-15.7 dBi	-5.7 dBi	-5.3 dBi	-8.3 dBi	-2.0 dBi	-1.5 dBi	Theta90/Pie300	3.81 dB
880.000000 MHz	33.2 %	-15.2 dBi	-5.2 dBi	-4.8 dBi	-8.9 dBi	-1.6 dBi	-1.0 dBi	Theta90/Pie300	3.77 dB
894.000000 MHz	33.2 %	-15.4 dBi	-5.2 dBi	-4.8 dBi	-10.3 dBi	-1.4 dBi	-0.9 dBi	Theta90/Pie285	3.87 dB



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**DCS1800**

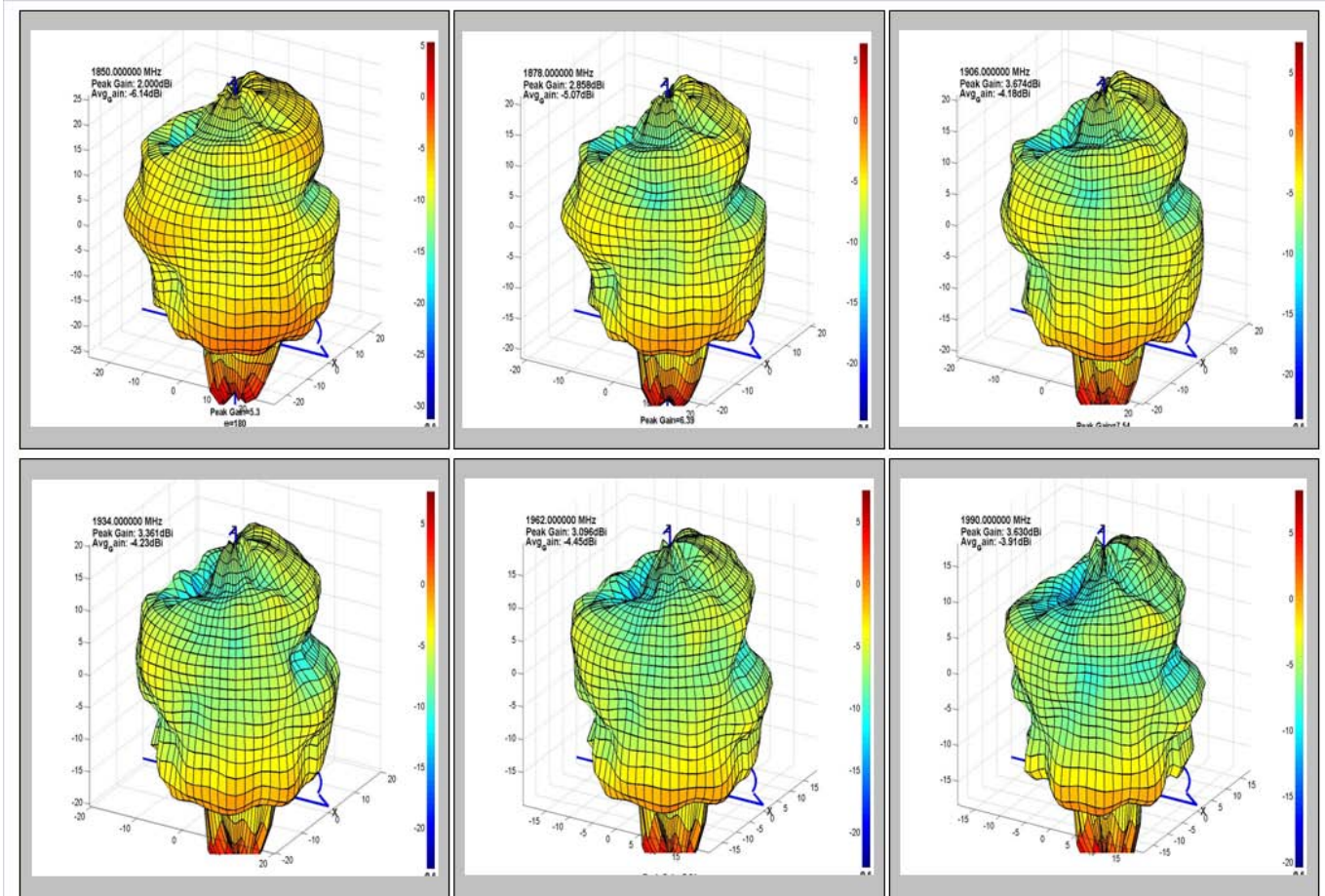


Frequency	Efficiency	Average Gain			Max Gain			Max Position	Directivity
		Ver	Hor	Total	Ver	Hor	Total		
1710.000000 MHz	4.2 %	-17.8 dBi	-16.0 dBi	-13.8 dBi	-6.9 dBi	-6.9 dBi	-6.9 dBi	Theta180/Pie0	6.89 dB
1744.000000 MHz	5.9 %	-16.3 dBi	-14.5 dBi	-12.3 dBi	-5.0 dBi	-5.0 dBi	-4.3 dBi	Theta180/Pie0	8.02 dB
1778.000000 MHz	10.5 %	-13.8 dBi	-12.0 dBi	-9.8 dBi	-1.9 dBi	-1.9 dBi	-1.6 dBi	Theta180/Pie0	8.25 dB
1812.000000 MHz	16.9 %	-11.5 dBi	-10.0 dBi	-7.7 dBi	0.6 dBi	0.7 dBi	0.6 dBi	Theta180/Pie0	8.28 dB
1846.000000 MHz	23.2 %	-10.0 dBi	-8.8 dBi	-6.3 dBi	2.2 dBi	2.2 dBi	1.9 dBi	Theta180/Pie0	8.21 dB
1880.000000 MHz	31.6 %	-8.3 dBi	-7.7 dBi	-5.0 dBi	3.5 dBi	3.5 dBi	3.0 dBi	Theta180/Pie0	7.97 dB



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PCS1900



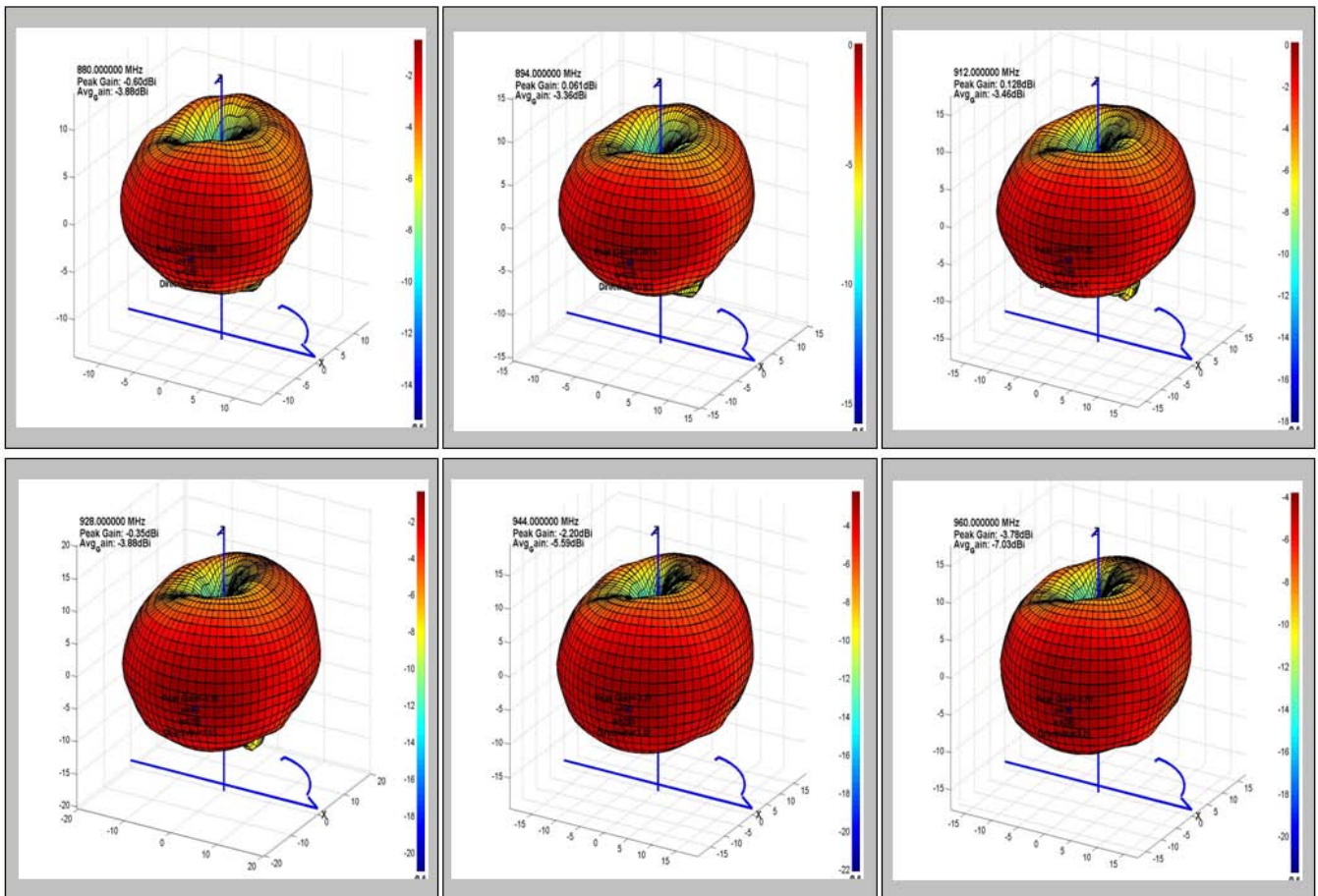
Frequency	Efficiency	Average Gain			Max Gain			Max Position	Directivity
		Ver	Hor	Total	Ver	Hor	Total		
1850.000000 MHz	24.3 %	-9.8 dBi	-8.6 dBi	-6.1 dBi	2.3 dBi	2.3 dBi	2.0 dBi	Theta180/Pie0	8.14 dB
1878.000000 MHz	31.1 %	-8.5 dBi	-7.7 dBi	-5.1 dBi	3.4 dBi	3.4 dBi	2.9 dBi	Theta180/Pie0	7.93 dB
1906.000000 MHz	38.1 %	-7.5 dBi	-6.9 dBi	-4.2 dBi	4.5 dBi	4.5 dBi	3.7 dBi	Theta180/Pie0	7.86 dB
1934.000000 MHz	37.7 %	-7.5 dBi	-7.0 dBi	-4.2 dBi	4.6 dBi	4.6 dBi	3.4 dBi	Theta180/Pie0	7.59 dB
1962.000000 MHz	35.9 %	-7.7 dBi	-7.3 dBi	-4.5 dBi	4.5 dBi	4.5 dBi	3.1 dBi	Theta180/Pie0	7.55 dB
1990.000000 MHz	40.6 %	-7.1 dBi	-6.7 dBi	-3.9 dBi	5.2 dBi	5.2 dBi	3.6 dBi	Theta180/Pie0	7.54 dB



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**Slide Up**

**EGSM900**



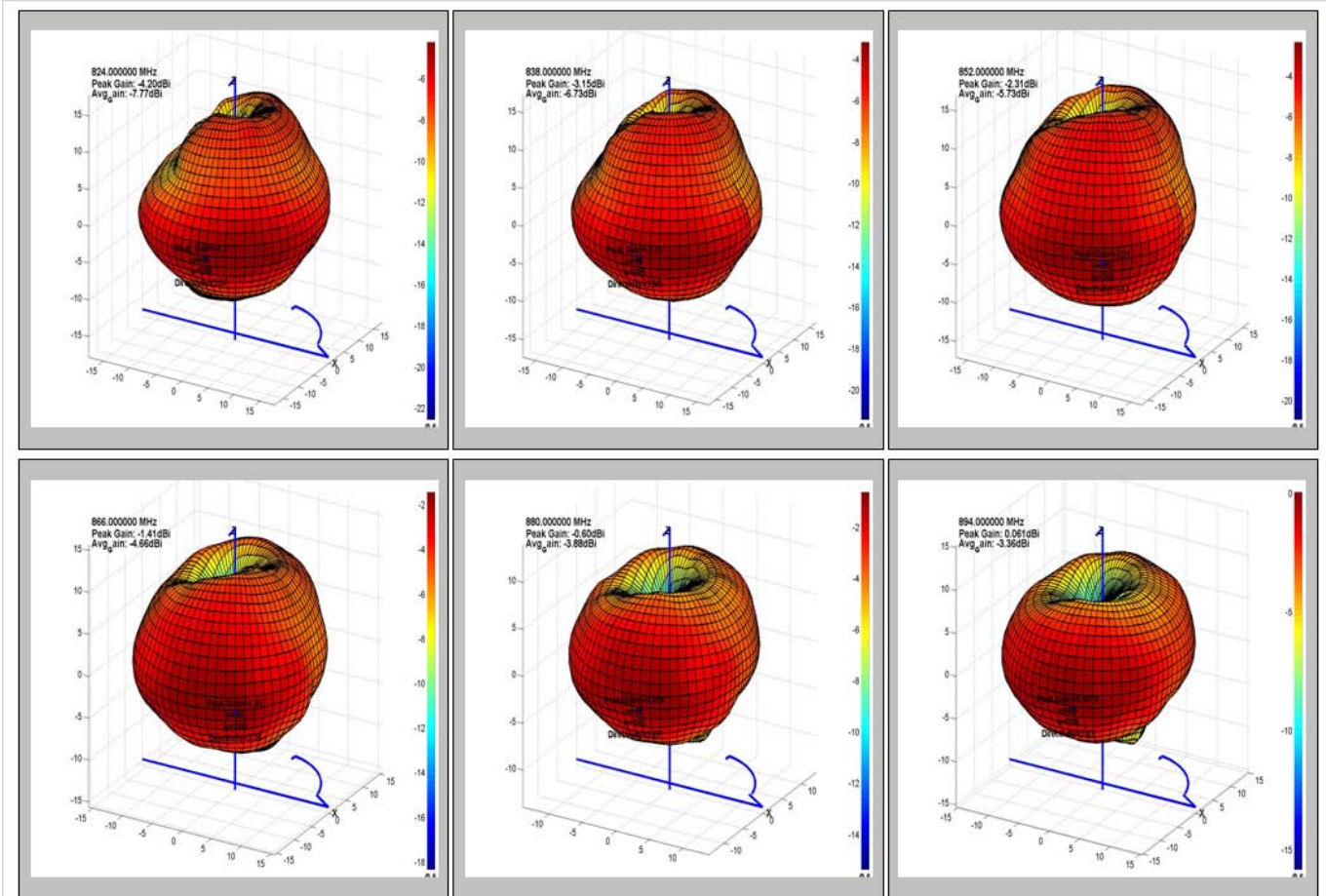
Frequency	Efficiency	Average Gain			Max Gain			Max Position	Directivity
		Ver	Hor	Total	Ver	Hor	Total		
880.000000 MHz	40.9 %	-16.8 dBi	-4.1 dBi	-3.9 dBi	-10.1 dBi	-0.8 dBi	-0.6 dBi	Theta90/Pie285	3.27 dB
894.000000 MHz	46.1 %	-17.2 dBi	-3.5 dBi	-3.4 dBi	-12.6 dBi	0.0 dBi	0.1 dBi	Theta90/Pie285	3.43 dB
896.000000 MHz	48.6 %	-17.1 dBi	-3.3 dBi	-3.1 dBi	-12.3 dBi	0.3 dBi	0.4 dBi	Theta90/Pie285	3.52 dB
912.000000 MHz	45.0 %	-17.5 dBi	-3.6 dBi	-3.5 dBi	-12.6 dBi	0.1 dBi	0.1 dBi	Theta90/Pie285	3.60 dB
928.000000 MHz	40.8 %	-17.8 dBi	-4.1 dBi	-3.9 dBi	-12.2 dBi	-0.4 dBi	-0.4 dBi	Theta90/Pie285	3.53 dB
944.000000 MHz	27.6 %	-19.3 dBi	-5.8 dBi	-5.6 dBi	-12.9 dBi	-2.3 dBi	-2.2 dBi	Theta90/Pie285	3.38 dB
960.000000 MHz	19.8 %	-20.5 dBi	-7.2 dBi	-7.0 dBi	-13.8 dBi	-3.8 dBi	-3.8 dBi	Theta90/Pie285	3.25 dB





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**GSM850**



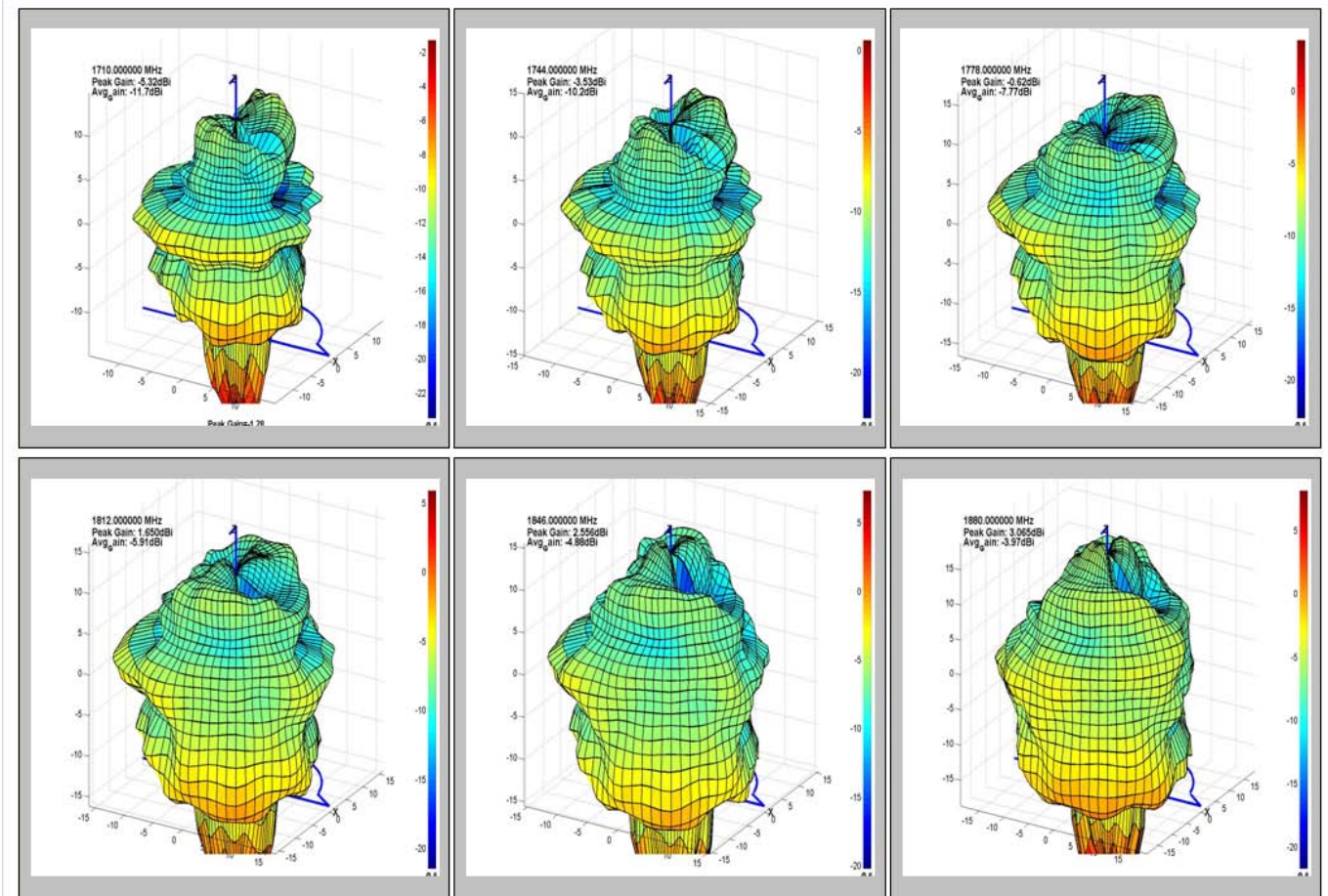
Frequency	Efficiency	Average Gain			Max Gain			Max Position	Directivity
		Ver	Hor	Total	Ver	Hor	Total		
824.000000 MHz	16.7 %	-17.6 dBi	-8.3 dBi	-7.8 dBi	-8.6 dBi	-4.8 dBi	-4.2 dBi	Theta90/Pie285	3.57 dB
838.000000 MHz	21.2 %	-17.1 dBi	-7.2 dBi	-6.7 dBi	-7.5 dBi	-3.6 dBi	-3.2 dBi	Theta90/Pie285	3.58 dB
852.000000 MHz	26.7 %	-16.8 dBi	-6.1 dBi	-5.7 dBi	-7.4 dBi	-2.6 dBi	-2.3 dBi	Theta90/Pie300	3.43 dB
866.000000 MHz	34.2 %	-16.4 dBi	-5.0 dBi	-4.7 dBi	-8.1 dBi	-1.7 dBi	-1.4 dBi	Theta90/Pie300	3.25 dB
880.000000 MHz	40.9 %	-16.8 dBi	-4.1 dBi	-3.9 dBi	-10.1 dBi	-0.8 dBi	-0.6 dBi	Theta90/Pie285	3.27 dB
894.000000 MHz	46.1 %	-17.2 dBi	-3.5 dBi	-3.4 dBi	-12.6 dBi	0.0 dBi	0.1 dBi	Theta90/Pie285	3.43 dB





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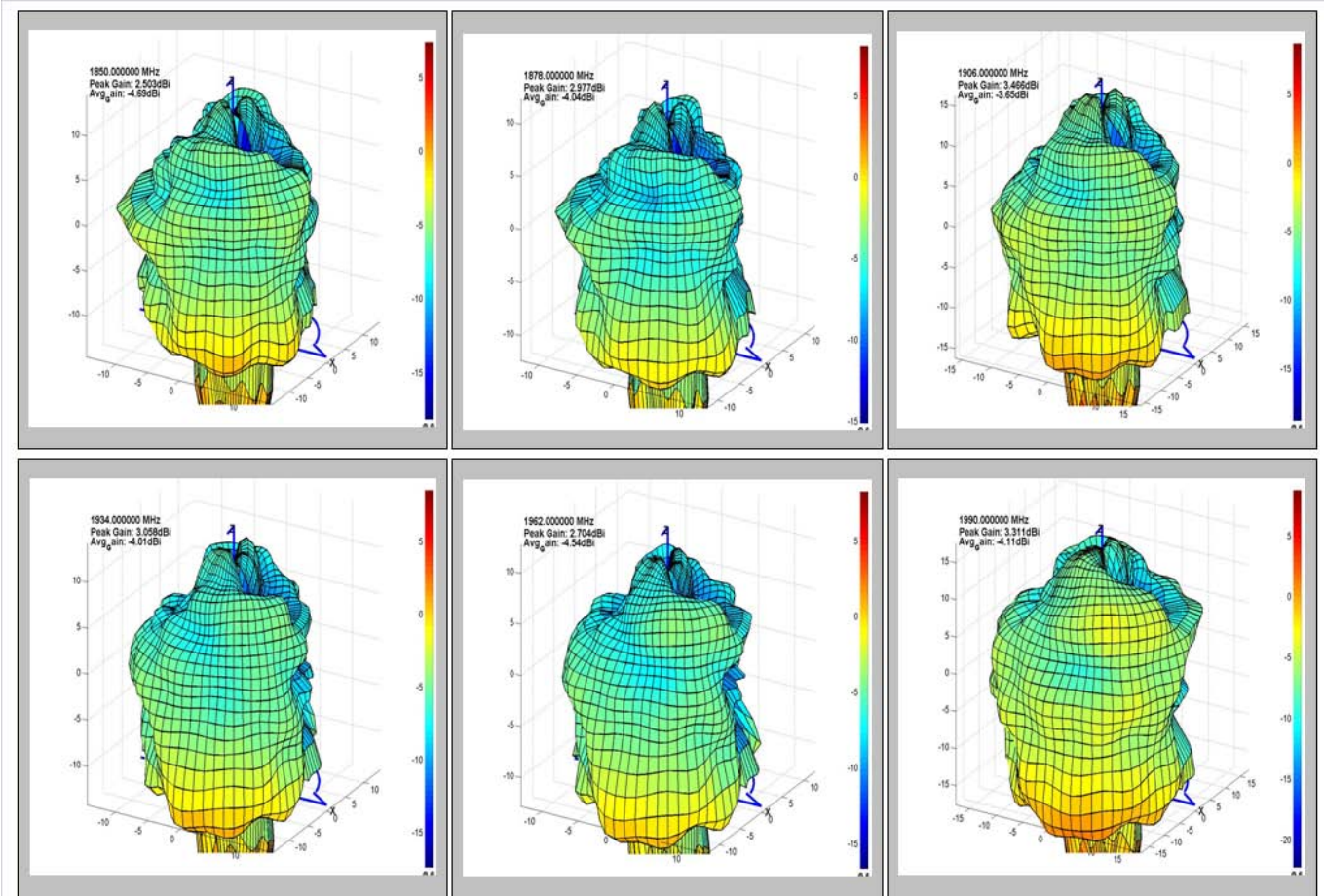
**DCS1800**



Frequency	Efficiency	Average Gain			Max Gain			Max Position	Directivity
		Ver	Hor	Total	Ver	Hor	Total		
1710.000000 MHz	6.7 %	-14.6 dBi	-14.9 dBi	-11.8 dBi	4.3 dBi	4.3 dBi	-5.3 dBi	Theta180/Pie0	6.45 dB
1744.000000 MHz	9.4 %	-13.2 dBi	-13.4 dBi	-10.3 dBi	-2.4 dBi	-2.4 dBi	-3.5 dBi	Theta180/Pie0	6.73 dB
1778.000000 MHz	16.7 %	-10.8 dBi	-10.7 dBi	-7.8 dBi	0.5 dBi	0.5 dBi	-0.6 dBi	Theta180/Pie0	7.15 dB
1812.000000 MHz	25.6 %	-8.9 dBi	-8.9 dBi	-5.9 dBi	2.9 dBi	2.9 dBi	1.7 dBi	Theta180/Pie0	7.56 dB
1846.000000 MHz	32.4 %	-7.7 dBi	-8.1 dBi	-4.9 dBi	4.3 dBi	4.3 dBi	2.6 dBi	Theta180/Pie0	7.45 dB
1880.000000 MHz	40.0 %	-6.5 dBi	-7.5 dBi	-4.0 dBi	5.1 dBi	5.2 dBi	3.1 dBi	Theta180/Pie0	7.04 dB

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**PCS1900**



Frequency	Efficiency	Average Gain			Max Gain			Max Position	Directivity
		Ver	Hor	Total	Ver	Hor	Total		
1850.000000 MHz	33.9 %	-7.4 dBi	-8.0 dBi	-4.7 dBi	4.4 dBi	4.4 dBi	2.5 dBi	Theta180/Pie0	7.20 dB
1878.000000 MHz	39.4 %	-6.6 dBi	-7.6 dBi	-4.0 dBi	5.1 dBi	5.1 dBi	3.0 dBi	Theta180/Pie0	7.02 dB
1906.000000 MHz	43.1 %	-6.1 dBi	-7.3 dBi	-3.7 dBi	5.7 dBi	5.7 dBi	3.5 dBi	Theta180/Pie0	7.12 dB
1934.000000 MHz	39.7 %	-6.4 dBi	-7.8 dBi	-4.0 dBi	5.5 dBi	5.5 dBi	3.1 dBi	Theta180/Pie0	7.08 dB
1962.000000 MHz	35.1 %	-6.9 dBi	-8.3 dBi	-4.5 dBi	5.3 dBi	5.2 dBi	2.7 dBi	Theta180/Pie0	7.25 dB
1990.000000 MHz	38.8 %	-6.4 dBi	-7.9 dBi	-4.1 dBi	5.8 dBi	5.8 dBi	3.3 dBi	Theta180/Pie0	7.42 dB