Specification No.	Description		
	PN-320 - Antenna Product Specification		
Customer	Date	Rev	Reference
CURITEL Co.,Ltd., Korea Communications,	MAR ,17, 2006	1,0	

Antenna Specifications

(PN-320)

F							
E							
D							
C							
B							
A	06/03/17	Initial Release	BH				
Rev.	**Date**	**Changes**	**Initiator**	**RF approval**	**ME approval**	**Approval**	**Approval**

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1 GENERAL

1.1 PRODUCT DESCRIPTION

A stuby antenna system.

1.2 PRODUCT NUMBER

Centurion Product Number
Customer Product Number PN-320 Antenna

1.3 PRINT ACCEPTANCE

Samples and a Page one drawing was sent to customer. When they are approved, the approval form should be completed, signed, and sent back to Centurion before further mass production batches can be delivered.

1.4 UNITS, DEFINITIONS, AND ABBREVIATIONS

Unless otherwise stated, SI units are used.

Tx	Transmit Band
Rx	Receive Band
PCB	Printed Circuit Board
VSWR	Voltage Standing Wave Ratio
dBi	Antenna gain in dB (Isotropic)
CW	Continuous Wave
g	Acceleration of gravity (approx. 9.8 m/s^2)
RH	Relative Humidity

1.4.1 "Without mechanical damage"

Implies full mechanical functionality according to specification and compliance with visual requirements according to specification drawing.

1.4.2 "Without permanent mechanical damage"

As above but allows reversible misalignment or deformation and minor visual damage (no through-cuts or holes).

1.4.3 "Unimpaired functionality"

Implies full mechanical functionality according to specification but allows visual damage (no through-cuts or holes).

1.5 INTERFACE

All properties are guaranteed under the condition that antenna/handset interface is designed in accordance with instructions provided by Centurion. The hole interface should be included in the specification.

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Functionality with other equipment (such as couplers etc.) is not guaranteed unless this has been agreed upon separately.

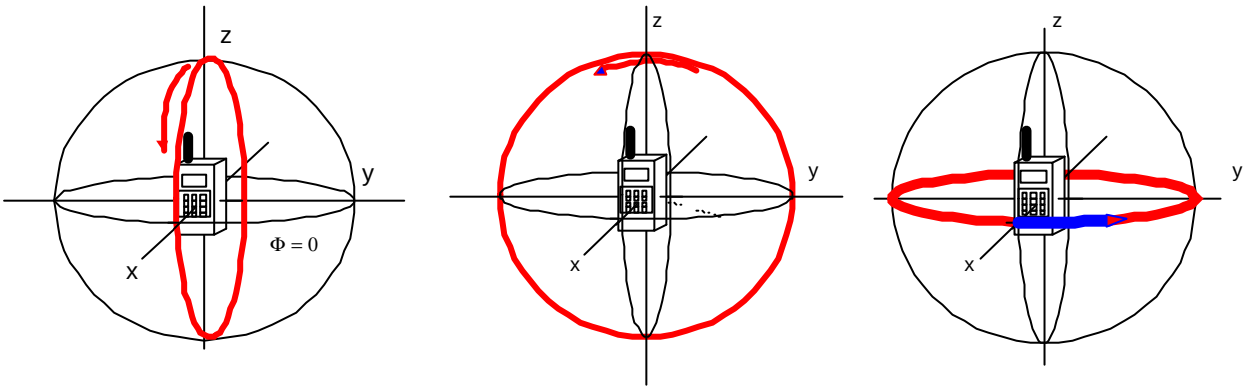
1.6 CONDITIONS

Unless otherwise stated all temperature tolerances are ±3°C and all RH tolerances are ±5 percentage units.
Unless otherwise stated all values are valid at +20°C and 50% RH.
Unless otherwise stated all va lues are valid for the radio defined in 2.4

1.7 COORDINATE SYSTEM

The coordinate system for the phone is defined as follows:

- Origin in center of gravity.
- Positive X axis is perpendicular to, and directed from, front plane.
- Positive Y axis is perpendicular to, and directed from, right side plane (as seen from front).
- Positive Z axis is perpendicular to, and directed from, top plane.



a) b) c)

Figure 1-1: a) E2-plane b) E1-plane c) H-plane

2 ELECTRICAL PROPERTIES

2.1 SAMPLES SIZE

All the tests will be conducted as below:

- The VSWR will be measured for 30 samples and a Cpk analysis will be conducted,
- The radiation patterns will be measured on one sample,
- The Power rating test will be conducted on 5 samples.

2.2 FREQUENCY BANDS

CDMA/:	Tx:	824 – 849 MHz
AMPS	Rx:	869 – 894 MHz
GPS:	Rx:	1575 MHz
PCS :	Tx:	1850 – 1910 MHz
	Rx:	1930 – 1990 MHz

2.3 IMPEDANCE

2.3.1 Nominal Value

50 Ohms

2.3.2 Method

Centurion will supply engineering assistance to ensure that the impedance over the frequency bands is as close to 50 ohms as possible after matching, both in flip open and flip close status and in extended and retracted modes.

2.4 THE RADIO (PHONE / HANDSET)

2.4.1 Radio Revision

Customer chassis I.D. number CURITEL PN-320

2.5 VSWR

Typical value of VSWR tested with engineering samples.

2.5.1 VSWR Value (Free Space) - Specifications

See below table

Mode	Band	Freq. f in MHz	CLOSE	OPEN
CDMA	Tx	824< f <849	5.3	2.7
	Rx	869< f <894	3.2	2.3
GPS	Rx	f = 1575	3.3	3.0
PCS	Tx	1850< f <1910	2.7	3.0
	Rx	1930< f <1990	2.7	2.5

2.5.2 Method of Measurement

A 50 ohms coaxial cable is connected (soldered) to the 50 ohms feeding point on the PCB. The connection of the coaxial cable is done so as to introduce a minimum of mismatch. In the other end, the coaxial cable is connected to a network analyzer. The analyzer is calibrated so that the reference plane is at the 50 ohms feeding point. The radio, including the PCB must not in any significant way differ from the mass produced radio, e.g. the antenna feeding parts have to be equivalent to the parts in mass production.
Free space means that the radio is attached to a nonconductive surface.

2.5.3 Electrical Performance Assurance

In order to guarantee the specified electrical performance in mass production the following procedure is used (example given for a single band antenna). During the development phase, two antennas are selected; one defining the lowest allowable resonance frequency (when measured on the handset), marked "low freq.", and one defining the highest allowable resonance frequency, marked "high freq.", see Figure 2-1.
These antennas are reference antennas. These antennas are then measured on a ground plane used in mass production and define the highest and lowest allowable resonance frequencies on this ground plane and each produced antenna is automatically tested on this ground plane.

Only the retracted mode is considered when finding the reference antennas, since the production variation of the extended mode is negligible.

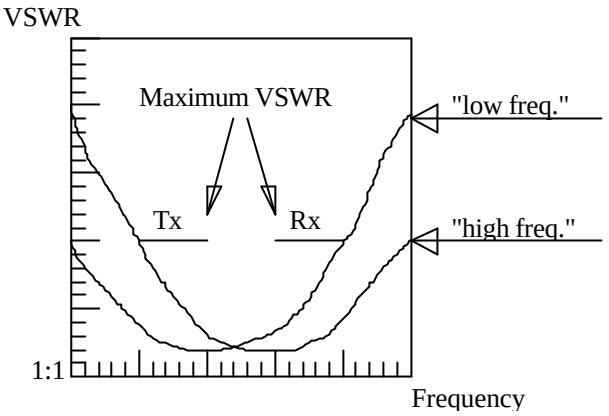


Figure 2-1: Reference antennas defining the lowest and highest allowable resonance frequencies for a single band antenna

2.5.4 VSWR Plots (Free Space)

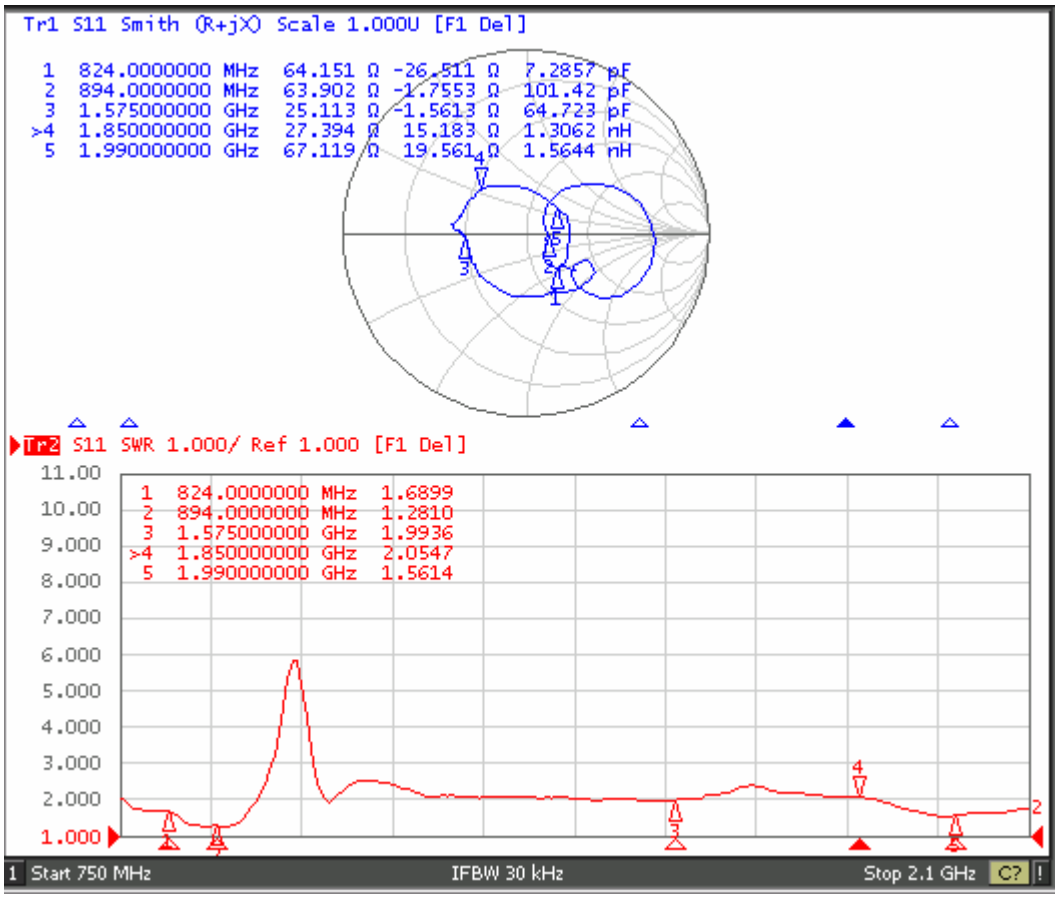


Figure 2-2: VSWR Plot – Open

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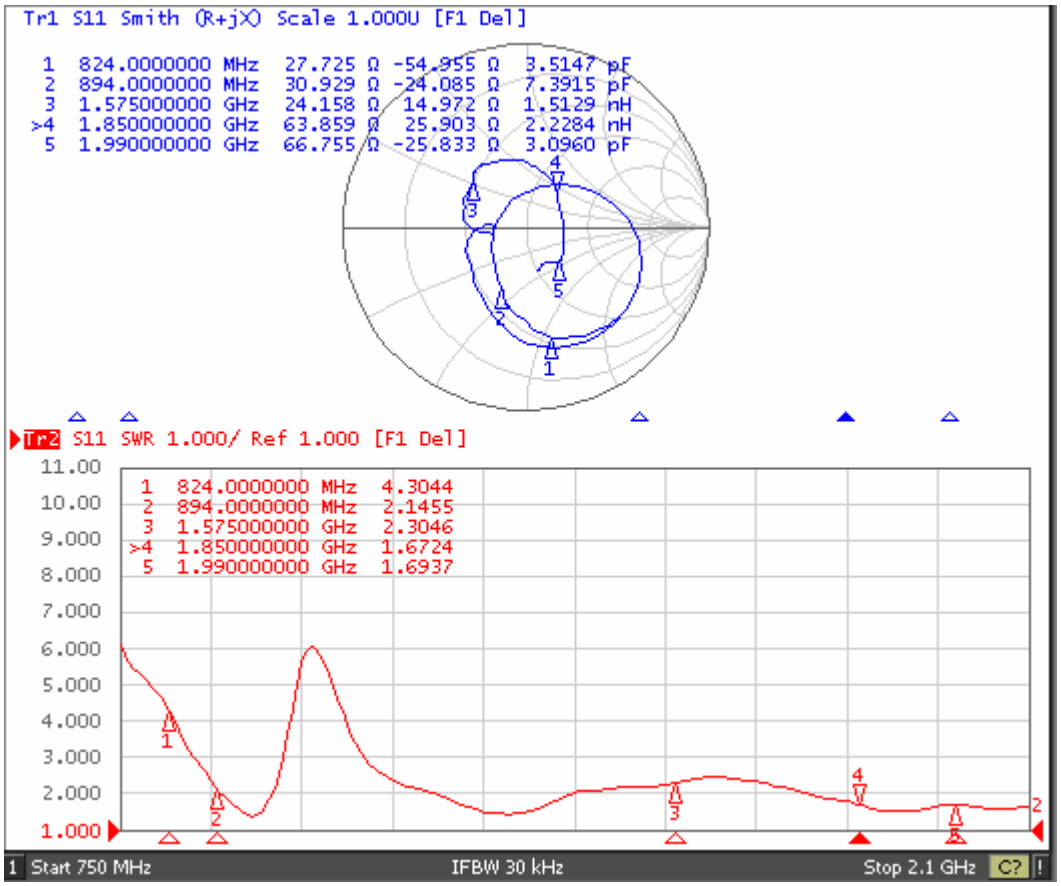

Figure 2-3: VSWR Plot – Close

2.6 GAIN

Below are typical maximum peak gain values for flip close and open and for extracted and retracted positions.

2.6.1 Typical Peak Values (in dBi) – E2 plan

		OPEN	CLOSE
CDMA	Tx	-0.5	-4.0
	Rx	0.0	-1.5
GPS	1575 MHz	0.5	-3.0
PCS	Tx	-2.0	-3.0
	Rx	-1.5	-3.5

2.6.2 Typical Peak Values (in dBi) – E1 plan

		OPEN	CLOSE
CDMA	Tx	-0.5	-2.0
	Rx	-1.5	-3.0
GPS	1575 MHz	0.0	-0.5
PCS	Tx	-0.5	-0.5
	Rx	-1.0	-1.5

2.6.3 Typical Average Values (in dBi) – H plan

		EXT / OP	RET / CL
CDMA	Tx	0.5	-4.0
	Rx	-1.5	-3.0
GPS	1575 MHz	-5.0	-5.5
PCS	Tx	-9.0	-6.5
	Rx	-11.0	-6.0

2.6.4 Method of Measurement and Radiation Patterns

The connection is done according to 2.5.2, Radiation patterns are measured at the Tx and Rx band edges for each band defined in 2.2. The measurements are performed so as to minimize the influence of the cables. The total electric field is measured, i.e. the vector sum of two orthogonal polarization. 3 orthogonal planes in free space, according to Figure 1-1. The gain is also measured in a horizontal plan. Calibration for absolute measurements is done with a reference antenna, which is in turn calibrated by a certified calibration company.

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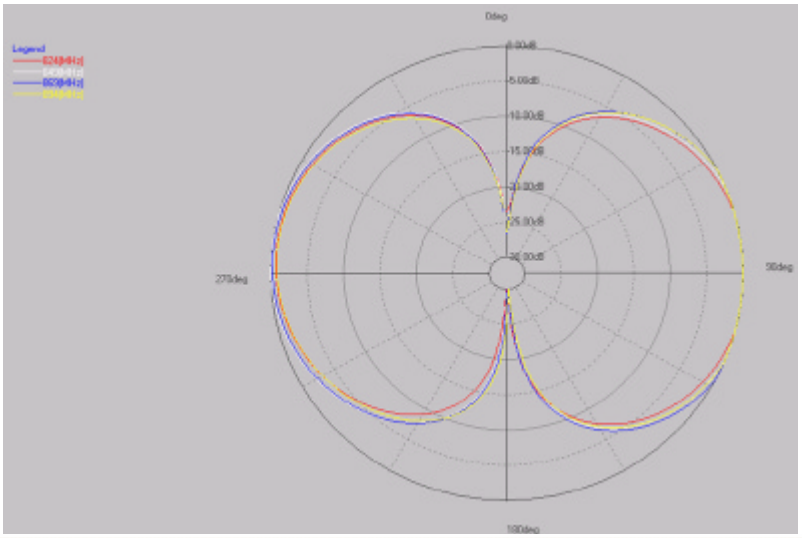
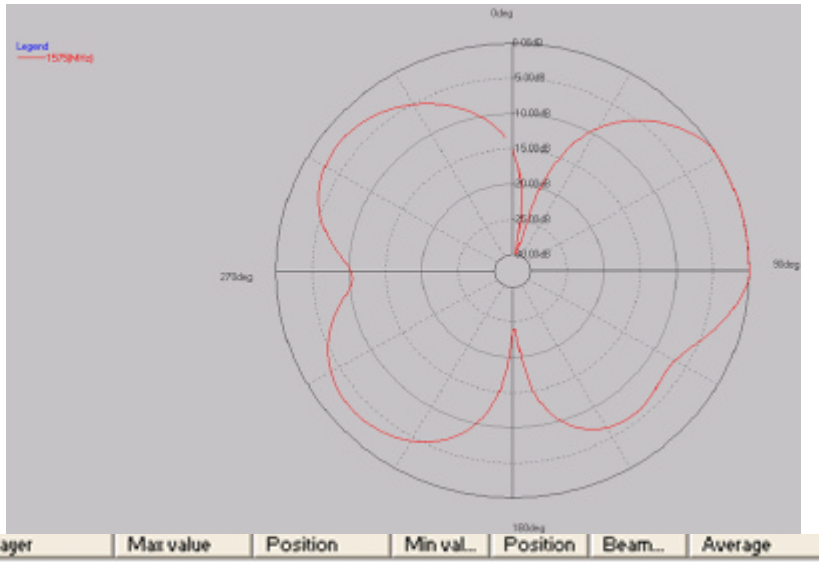
2.6.5 Radiation Patterns



Layer	Max value	Position	Min val...	Position	Beam...	Average
824(MHz)	0.46 dB	90.00 deg	-41.02 dB	180.00 d...	77.43 d...	-4.56 dB
849(MHz)	0.98 dB	90.01 deg	-34.50 d...	177.22 d...	77.75 d...	-3.90 dB
869(MHz)	1.54 dB	90.01 deg	-33.29 d...	177.18 d...	77.06 d...	-3.73 dB
894(MHz)	1.23 dB	87.18 deg	-33.70 d...	177.18 d...	78.10 deg	-4.16 dB

Figure 2-4: OPEN CDMA – E2



Layer	Max value	Position	Min val...	Position	Beam...	Average
1575(MHz)	1.50 dB	75.94 deg	-38.27 d...	11.24 deg	49.17 deg	-5.29 dB

Figure 2-5: OPEN GPS – E2

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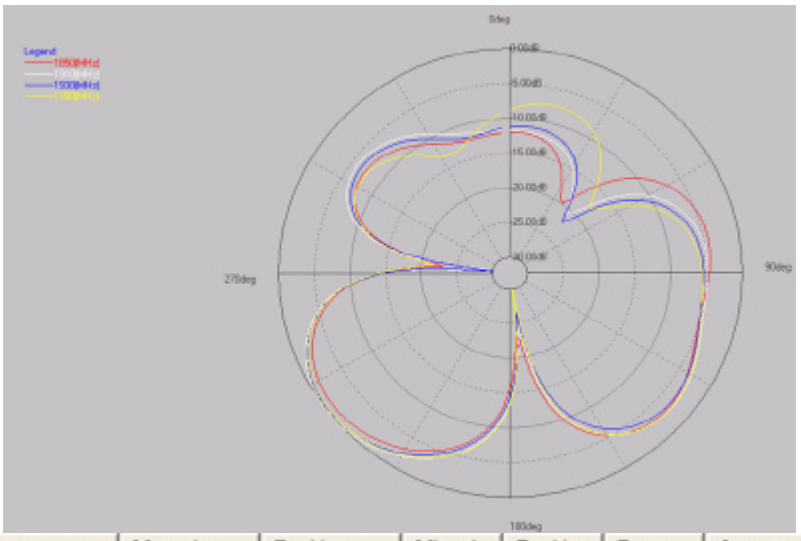
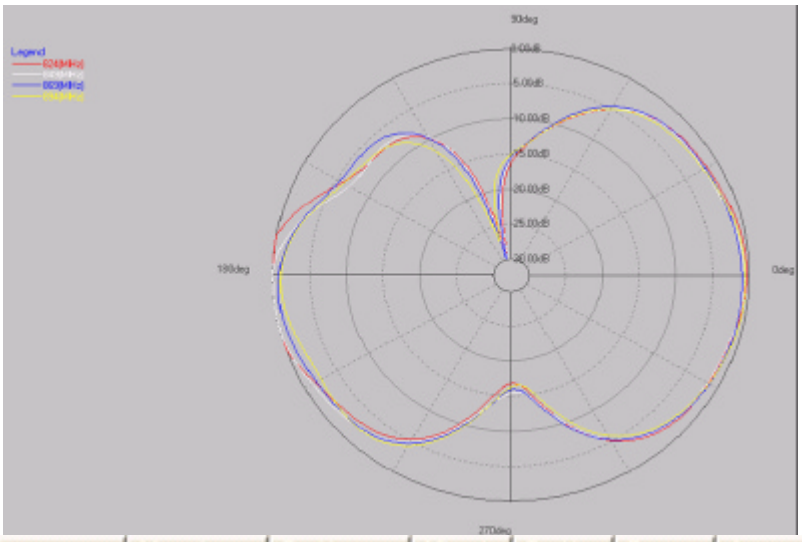


Layer	Max value	Position	Min val...	Position	Beam...	Average
1850(MHz)	-1.11 dB	233.42 deg	-23.48 d...	174.36 d...	49.00 d...	-7.24 dB
1910(MHz)	0.08 dB	230.65 deg	-49.42 d...	275.64 ...	48.03 d...	-6.77 dB
1930(MHz)	-0.19 dB	230.65 deg	-33.10 dB	275.64 ...	46.93 d...	-7.26 dB
1990(MHz)	-0.25 dB	230.64 deg	-33.66 d...	171.58 d...	49.08 d...	-6.91 dB

Figure 2-6: OPEN PCS-E2



Layer	Max value	Position	Min val...	Position	Beam...	Average
824(MHz)	1.52 dB	-177.14 deg	-33.07 d...	102.84 d...	----	-4.25 dB
849(MHz)	0.52 dB	-174.29 deg	-45.22 d...	102.87 d...	----	-4.49 dB
869(MHz)	-0.59 dB	-174.29 deg	-30.76 d...	105.69 d...	----	-4.54 dB
894(MHz)	-0.47 dB	-5.71 deg	-27.48 d...	108.55 d...	100.90 d...	-4.81 dB

Figure 2-7: OPEN CDMA-E1

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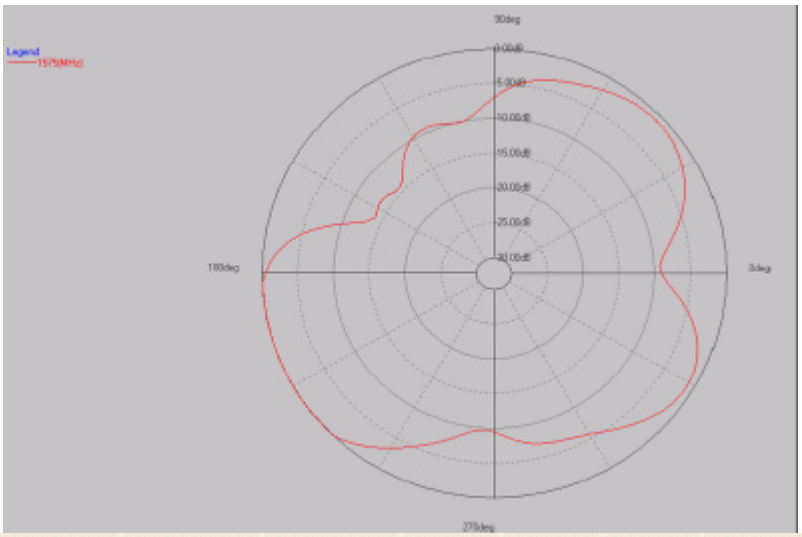
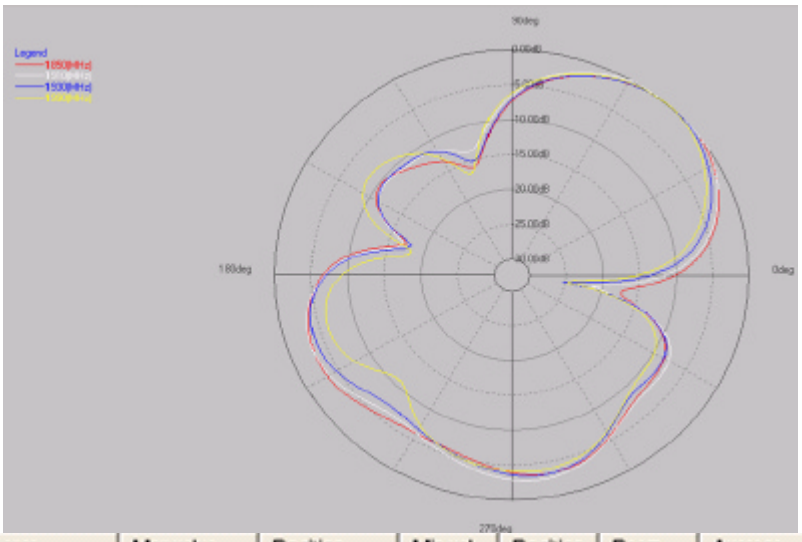


Layer	Max value	Position	Min val...	Position	Beam...	Average
1575(MHz)	1.33 dB	-148.57 deg	-14.44 dB	107.16 d...	----	-4.21 dB

Figure 2-8: OPEN GPS-E1



Layer	Max value	Position	Min val...	Position	Beam...	Average
1850(MHz)	0.25 dB	45.71 deg	-17.27 dB	162.84 d...	55.77 d...	-5.84 dB
1910(MHz)	0.65 dB	45.71 deg	-21.49 dB	-8.57 deg	54.00 d...	-5.59 dB
1930(MHz)	0.06 dB	48.57 deg	-25.30 d...	-8.56 deg	52.74 d...	-6.28 dB
1990(MHz)	0.01 dB	48.57 deg	-24.74 d...	-8.56 deg	51.26 deg	-6.85 dB

Figure 2-9: OPEN PCS-E1

Specification No.	Description		
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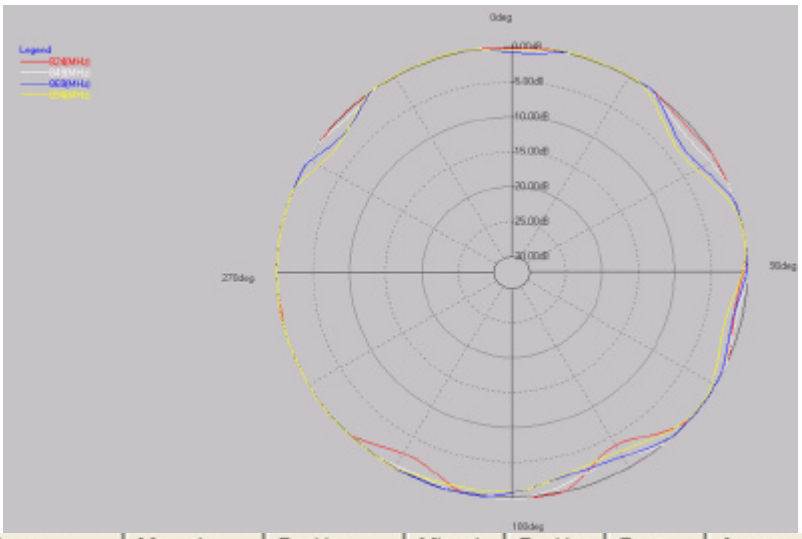
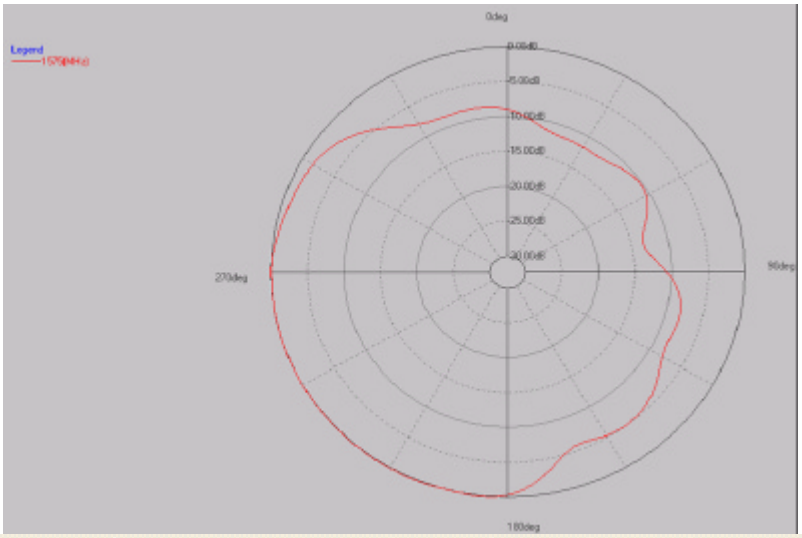


Layer	Max value	Position	Min val...	Position	Beam...	Average
824(MHz)	2.28 dB	-71.43 deg	-3.75 dB	151.42 d...	231.66 d...	0.15 dB
849(MHz)	2.00 dB	-122.86 deg	-2.19 dB	154.28 d...	----	0.23 dB
869(MHz)	2.64 dB	-125.71 deg	-2.84 dB	54.29 d...	116.73 d...	0.23 dB
894(MHz)	2.22 dB	-125.71 deg	-3.62 dB	54.29 d...	98.36 d...	-0.35 dB

Figure 2-10: OPEN CDMA-H



Layer	Max value	Position	Min val...	Position	Beam...	Average
1575(MHz)	1.74 dB	-131.43 deg	-13.42 dB	77.15 deg	----	-4.03 dB

Figure 2-14: OPEN GPS-H

Specification No.	Description		
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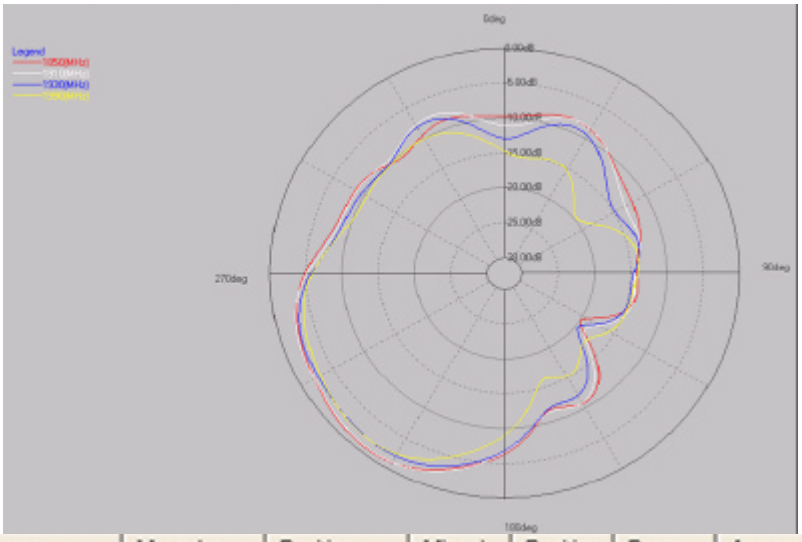
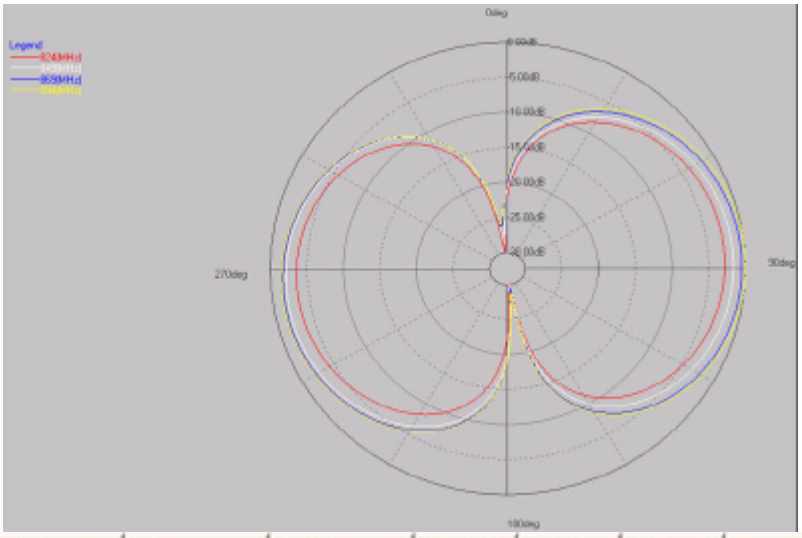


Lager	Max value	Position	Min val...	Position	Beam...	Average
1850(MHz)	-0.84 dB	-142.86 deg	-20.01 dB	122.85 d...	71.46 deg	-7.78 dB
1910(MHz)	-1.00 dB	-142.86 deg	-18.79 dB	125.70 d...	73.82 d...	-7.82 dB
1930(MHz)	-2.08 dB	-142.86 deg	-19.69 dB	128.56 d...	78.99 d...	-8.59 dB
1990(MHz)	-2.07 dB	-140.00 deg	-19.79 dB	51.43 deg	70.17 deg	-9.80 dB

Figure 2-15: OPEN PCS-H



Lager	Max value	Position	Min val...	Position	Beam...	Average
824(MHz)	-2.73 dB	84.40 deg	-36.60 d...	174.36 d...	82.55 d...	-7.30 dB
849(MHz)	-1.58 dB	87.18 deg	-35.69 d...	171.58 d...	82.28 d...	-5.97 dB
869(MHz)	-0.41 dB	90.00 deg	-29.70 d...	171.58 d...	81.20 deg	-5.19 dB
894(MHz)	0.09 dB	87.18 deg	-28.84 d...	171.59 d...	80.40 d...	-4.88 dB

Figure 2-16: CLOSE CDMA – E2

Specification No.	Description		
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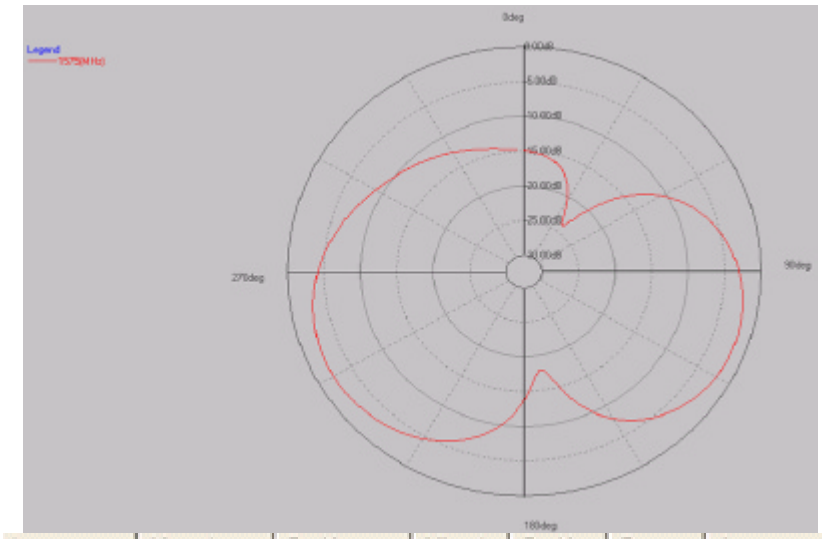
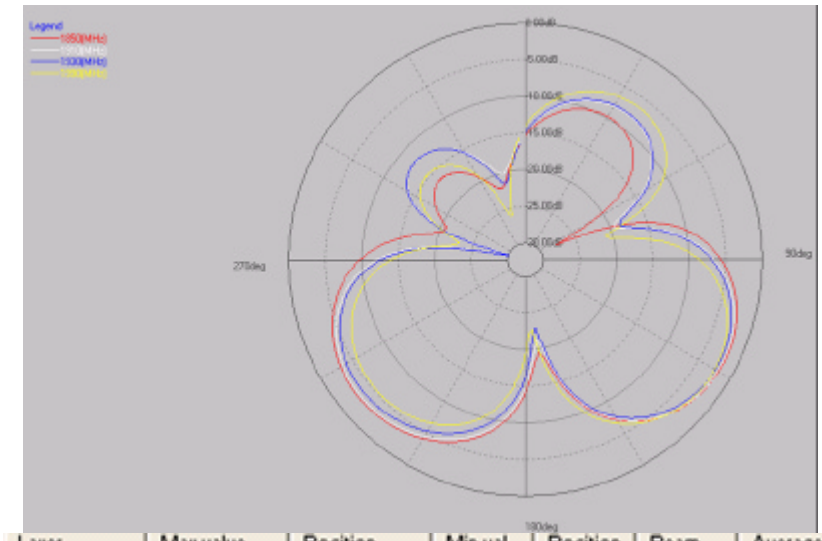


Layer	Max value	Position	Min val...	Position	Beam...	Average
1575(MHz)	-1.74 dB	109.70 deg	-23.96 d...	39.36 d...	59.39 d...	-7.24 dB

Figure 2-17: CLOSE GPS – E2



Layer	Max value	Position	Min val...	Position	Beam...	Average
1850(MHz)	-1.78 dB	118.12 deg	-27.92 d...	64.70 d...	49.64 d...	-8.69 dB
1910(MHz)	-1.93 dB	118.12 deg	-34.56 d...	284.06 ...	47.69 d...	-8.59 dB
1930(MHz)	-2.33 dB	118.12 deg	-33.17 dB	284.06 ...	47.65 d...	-8.99 dB
1990(MHz)	-2.42 dB	120.94 deg	-26.12 dB	343.12 d...	47.71 deg	-9.42 dB

Figure 2-18: CLOSE PCS-E2

Specification No.	Description		
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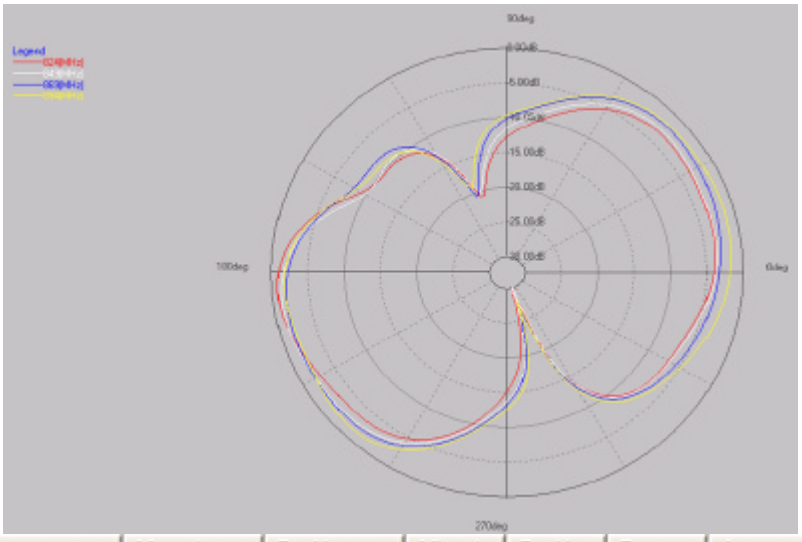
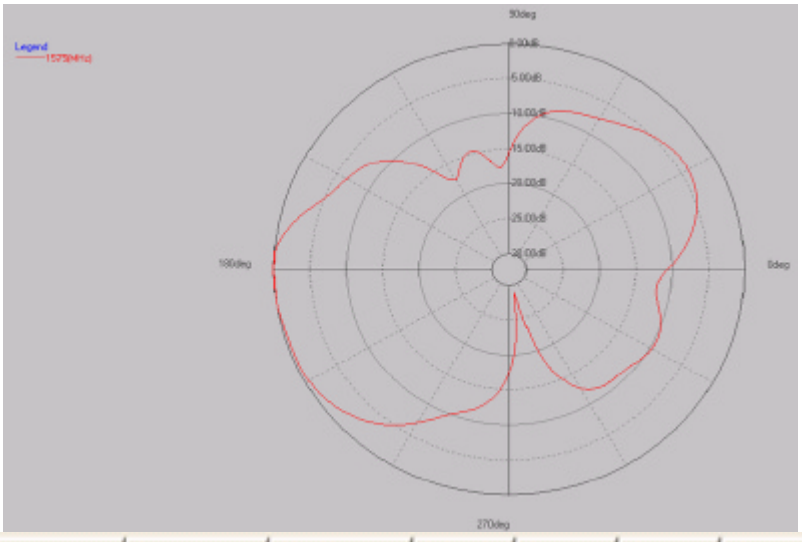
CURITEL Co.,Ltd., Korea Communications,	MAR ,17, 2006	1,0	



Lager	Max value	Position	Min val...	Position	Beam...	Average
824(MHz)	-0.71 dB	-174.29 deg	-36.33 d...	-71.43 d...	----	-6.62 dB
849(MHz)	-1.10 dB	-171.43 deg	-32.23 d...	-71.43 d...	----	-6.31 dB
869(MHz)	-1.72 dB	-168.57 deg	-27.22 d...	-71.43 d...	----	-5.77 dB
894(MHz)	-1.31 dB	17.14 deg	-28.28 d...	-71.43 d...	89.71 deg	-5.27 dB

Figure 2-19: CLOSE CDMA-E1



Lager	Max value	Position	Min val...	Position	Beam...	Average
1575(MHz)	0.47 dB	-177.14 deg	-29.06 d...	-77.17 d...	----	-7.20 dB

Figure 2-20: CLOSE GPS-E1

Specification No.	Description		
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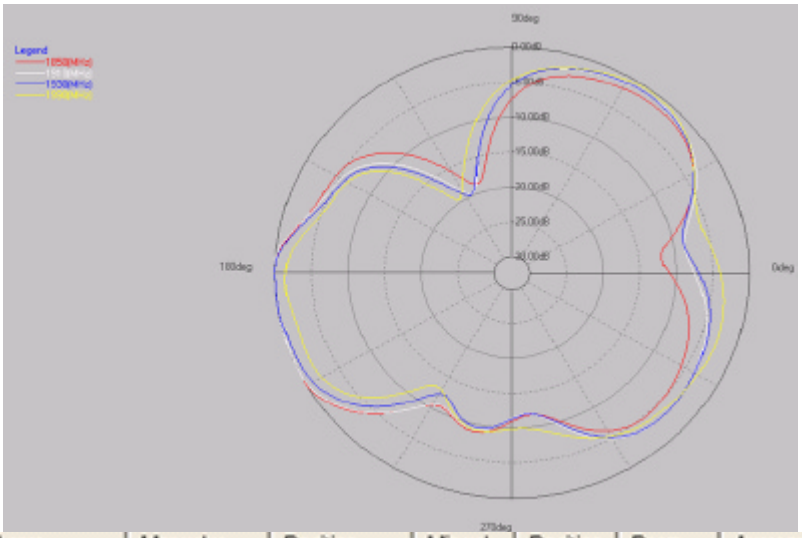
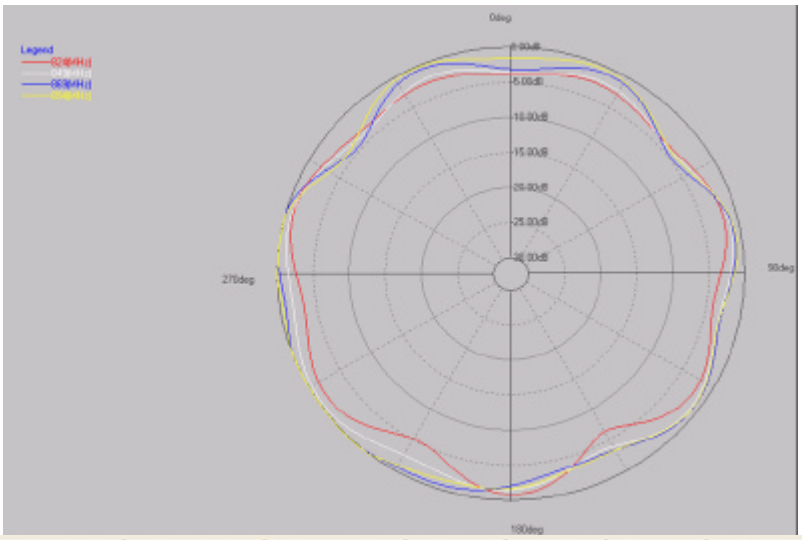


Layer	Max value	Position	Min val...	Position	Beam...	Average
1850(MHz)	0.35 dB	-177.14 deg	-18.80 dB	111.43 deg	----	-5.38 dB
1910(MHz)	0.75 dB	-174.29 deg	-19.84 dB	117.14 deg	----	-4.77 dB
1930(MHz)	0.37 dB	-177.14 deg	-20.00 d...	117.14 deg	----	-5.06 dB
1990(MHz)	-0.35 dB	51.43 deg	-19.73 dB	125.70 d...	53.13 deg	-5.05 dB

Figure 2-21: CLOSE PCS-E1



Layer	Max value	Position	Min val...	Position	Beam...	Average
824(MHz)	-0.96 dB	-180.00 deg	-6.39 dB	148.58 d...	----	-2.95 dB
849(MHz)	-0.33 dB	-122.86 deg	-4.30 dB	154.28 d...	----	-2.26 dB
869(MHz)	0.94 dB	-125.71 deg	-4.77 dB	54.29 d...	116.02 d...	-1.62 dB
894(MHz)	1.38 dB	-125.71 deg	-4.23 dB	54.29 d...	96.51 deg	-1.36 dB

Figure 2-22: CLOSE CDMA-H

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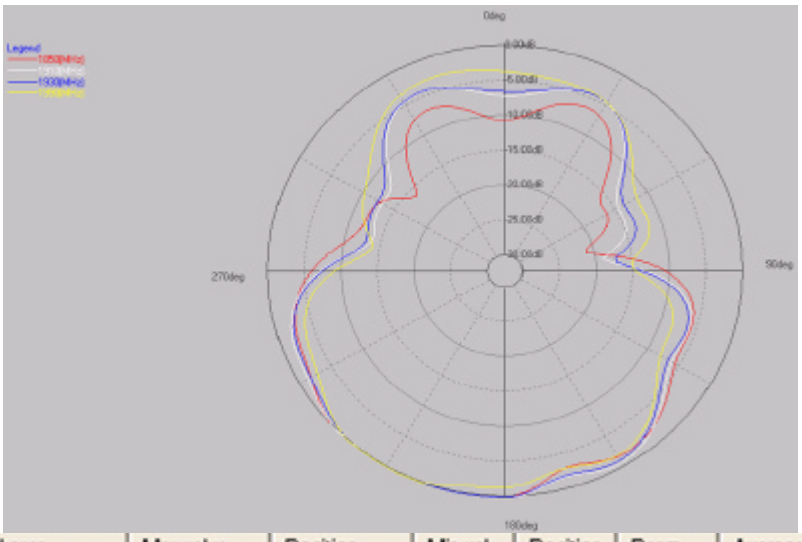
CURITEL Co.,Ltd., Korea Communications,	MAR ,17, 2006	1,0	

Layer	Max value	Position	Min val...	Position	Beam...	Average
1575(MHz)	0.52 dB	-177.14 deg	-14.91 dB	-28.55 d...	----	-4.35 dB

Figure 2-23: CLOSE GPS-H



Layer	Max value	Position	Min val...	Position	Beam...	Average
1850(MHz)	1.49 dB	-151.43 deg	-21.04 dB	77.11 deg	----	-5.26 dB
1910(MHz)	1.55 dB	-151.43 deg	-18.97 dB	82.86 d...	----	-4.53 dB
1930(MHz)	0.91 dB	-151.43 deg	-17.18 dB	82.86 d...	----	-4.73 dB
1990(MHz)	1.00 dB	-148.57 deg	-15.00 dB	88.56 d...	----	-4.86 dB

Figure 2-24: CLOSE PCS-H

2.7 POWER RATING

2.7.1 Maximum Value

P=2W (CW)

2.7.2 Post Test Requirements

Nor mechanical damage (ref. 1.4.1) neither electrical performance reduction (ref. 2.5.1) should be observed after the test.

2.7.3 Method of Measurement

The connection is done according to 2.5.2. The specified power, P, is applied for 10 minutes at the middle frequency of each Tx band defined in 2.2. Immediately after the test the VSWR is measured.

Specification No.	Description		
	PN-320 - Antenna Product Specification		
Customer	Date	Rev	Reference
CURITEL Co.,Ltd., Korea Communications,	MAR ,17, 2006	1,0	

3 SPECIFICATIONS DRAWING