APPROVAL SHEET

Prepared By	Checked By	Reviewed By	Approved By
8/11		8/11	8/11

TITLE	Triple band Built – in Antenna	Model	RAP_MAIN	CUSTOMER	Pantech

DOCUMENT

	CONTENTS	SHEETS
1	APPROVAL SHEET	1
2	ANTENNA SPECIFICATION	25

We submit the sheet for approval.

Date of August 11th, 2008

ANTENNA SPECIFICATION

CONTENTS

1. Approval Check List

Approval Check Lost				
NO	DATE	CHANGE CONTENTS	CHANGE CAUSE	REV
1	2008-08-11	-	New approval sheet	A
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

2. Technical Specifications

2.1 Electrical Specifications.

Frequency Range	CDMA (824 ~ 894 MHz)		GPS (1575MHz)	US-PCS (1850MHz ~ 1990MHz)	
(Peak GAIN) E2-Plane,Min	Tx	Rx	Rx	Tx	Rx
	-2.0dBi	-3.0dBi	-1.5dBi	-2.0dBi	-2.0dBi
Average GAIN H-Plane, Min	Tx	Rx	Rx	Tx	Rx
	-3.0dBi	-2.0dBi	-2.0dBi	-4.0dBi	-4.0dBi
V.S.W.R	824MHz	894MHz	1575MHz	1850MHz	1990MHz
	2.5:1	3.5:1	2.5:1	3.0:1	3.0:1
Input Impedance	50Ω				
Polarization	Vertical				
Radiation Pattern	Omni Direction				
MaxImum Power	2Watts				

2.2 Mechanical Specifications

Mechanical Spec.	
Connector	Contact pin type
Overall length	See drawing
Operating Temperature	-30℃ ~ 80℃
Weight	1.62g (Unit)

2.3 Packing Specifications

Packing Spec.		
PRODUCT	QUANTITY (Antenna)	MATERIAL
TRAY	80 EA	P.V.C
TRAY INNER PAD	2 EA	SW 2 type (B corrugated paper)
CARTON BOX	1600 EA	DW 2 type (AB corrugated paper)

3. Test Equipment

The equipment for antenna test is as follows,

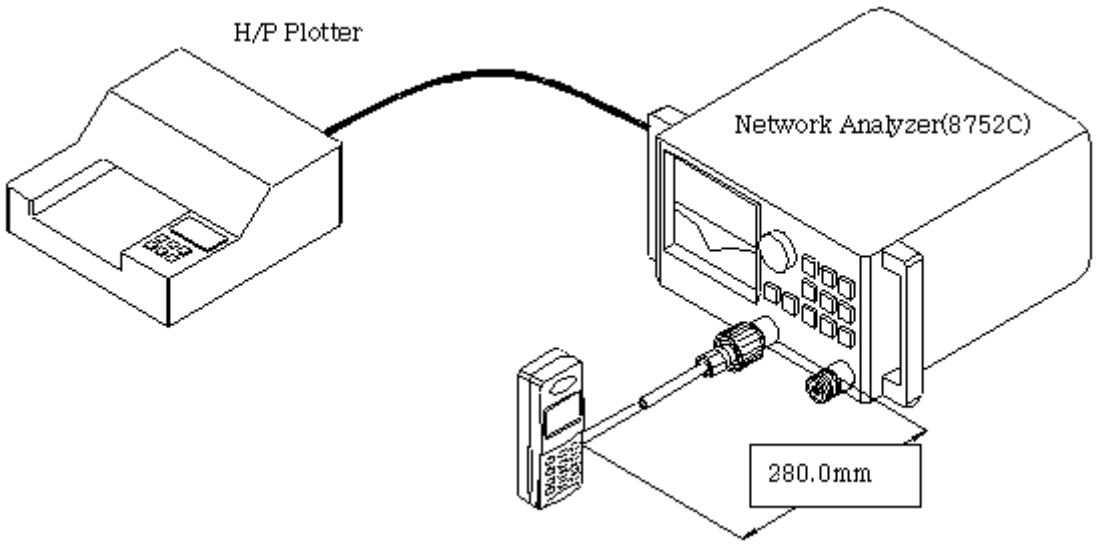
- ♦ Network Analyzer (Agilent E5071B) to measure the V.S.W.R., Standing wave ratio(SWR) and Impedance bandwidth of antenna
- ♦ Standard horn antennas adjustable to the US-PCS bands
- ♦ Anechoic Chamber installed the cables, connectors and equipments for measurements
- ♦ Digital Caliper to measure the dImensions
- ♦ Torque Driver to measure the torque force of the helix
- ♦ Push/Pull gauge to measure the pulling forces
- ♦ CIImatic Chamber for environmental tests

4. Electrical Demands

4.1 V.S.W.R

The V.S.W.R characteristics must be satisfied the electrical demands in the below table.

Frequency Range	CDMA (824 ~ 894 MHz)		GPS (1575.0MHz)	US-PCS (1850MHz ~ 1990MHz)	
V.S.W.R	824MHz	894MHz	1575MHz	1850MHz	1990MHz
	2.5:1	3.5:1	2.5:1	3.0:1	3.0:1



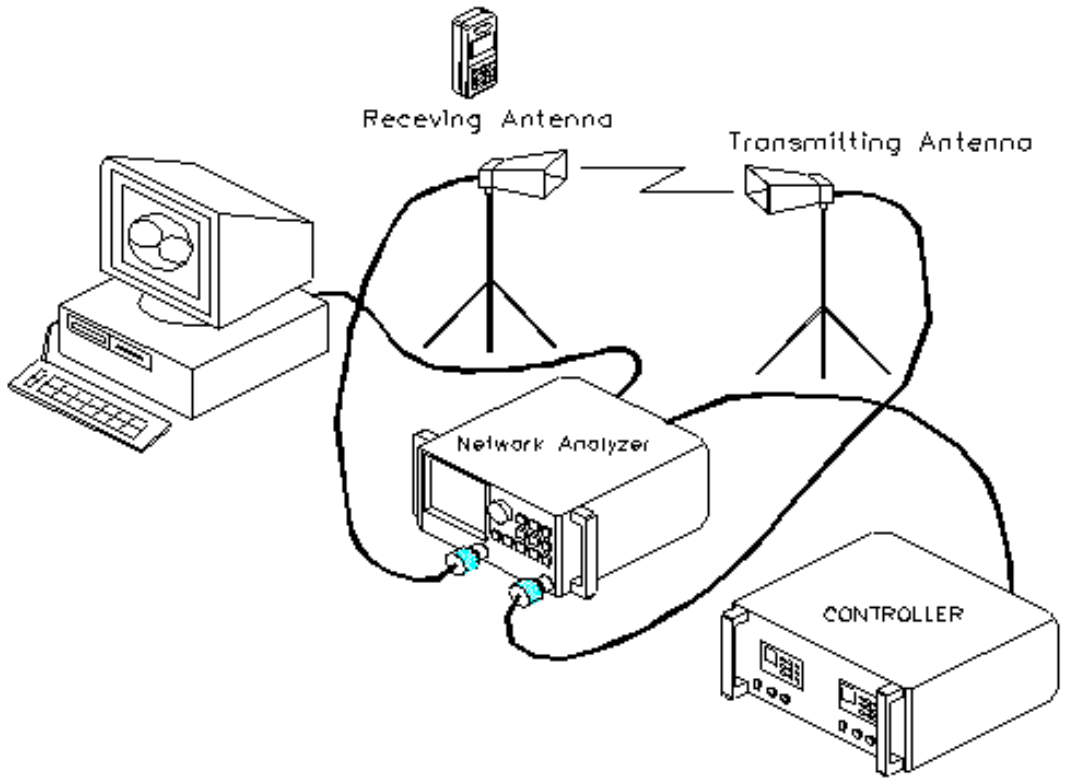
4.2 Radiation Pattern

The radiation pattern must have the omni-directional characteristic in US-PCS Band.

4.3 Gain

The gain is expressed as dBi. with condition (E2-Plane), the minImum Gain of antenna must be satisfied the electrical demands in the below table.

Frequency Range	CDMA (824 ~ 894 MHz)		GPS (1575MHz)	US-PCS (1850MHz ~ 1990MHz)	
(Peak GAIN) E2-Plane,Min	Tx	Rx	Rx	Tx	Rx
	-2.0dBi	-3.0dBi	-1.5dBi	-2.0dBi	-2.0dBi
Average GAIN H-Plane, Min	Tx	Rx	Rx	Tx	Rx
	-3.0dBi	-2.0dBi	-2.0dBi	-4.0dBi	-4.0dBi

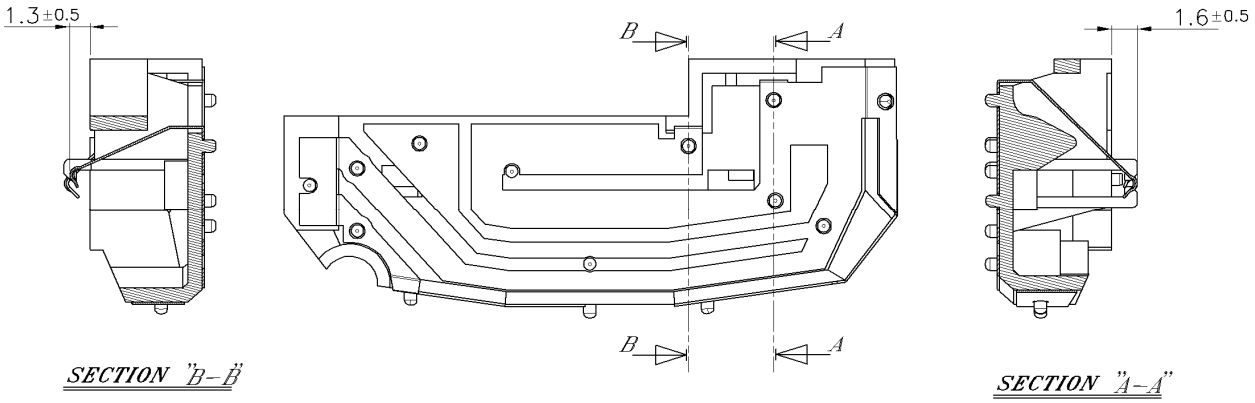


5. Mechanical Demands

5.1 Contact Part Operate Force Test

The antenna Contact Pin from inside (tolerance inclusion) working distance 50~300 g/f must maintain.

(The working distance of the antenna is with the lower part plan together 0.0mm~1.8mm, 0.0mm~ 2.1mm.)



5.2 Drop Test

The antenna is attached to the handset. The handset is dropped with the antenna downward onto a concrete surface at 1.5 m height and angle D(45°). The number of drop is 2 tlmes.

After the test, the original shape shall be possible to restore. The antenna shall satisfy the electrical demands.

5.3 Salt spray Test

In salt fog chamber, expose test antennas to a 35℃, 5% salt fog atmosphere for 48 hours. After the test, the antenna shall be continued. The antenna shall satisfy the electrical demands.

6.Environmental Demands

6.1 Operation Temperature Test

- Test A: Place the antennas for testing in chamber. The chamber condition should be as follows: 1hours at -20℃.
- Final measurements: The antenna shall be visually inspected and electrically and also mechanically checked as required by products standard.
- Test B: Place the antennas for testing in chamber. The chamber condition should be as follows: 1hours at 70℃.
- Final measurements: The antenna shall be visually inspected and electrically and also mechanically checked as required by products standard.

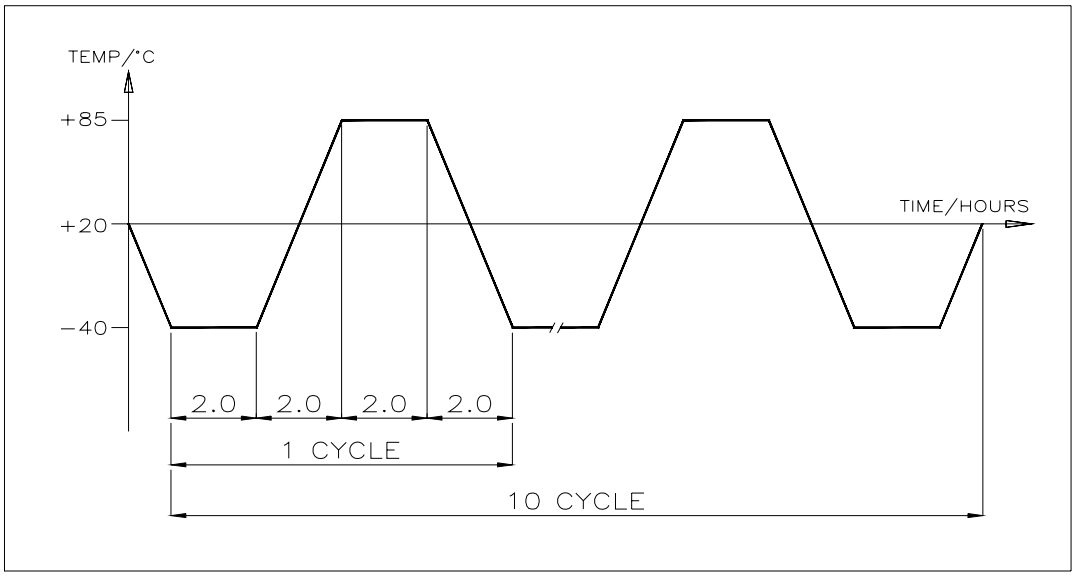
6.2 Temperature Change Test

The object of temperature test is to evaluate the reliability of antenna component at temperature change.

- Test: Temperature cycle is as follows. 2 hours at -40℃.
  2 hours at +85℃.
  Temperature increase/decrease tIme (Temperature change tIme) is
  2 hours. 10 cycles.
- Final measurements: The antenna shall be visually inspected and electrically and mechanically checked as required by products standard.

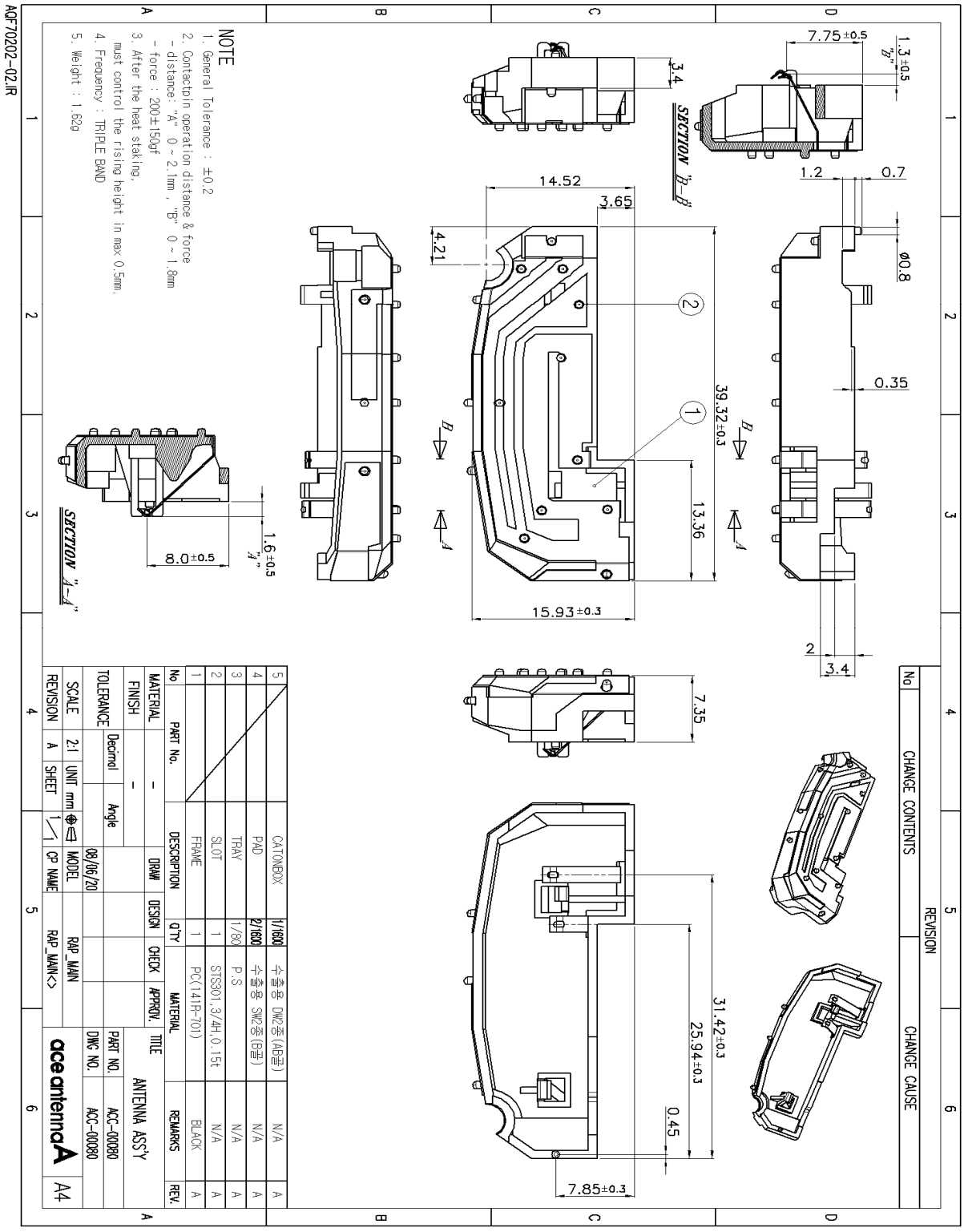
6.3 High Humidity Test

- Test: Place the antennas for testing in chamber. The chamber condition should be as follows: 24hours at +55℃, Relative humidity is 95%.
- Final measurements: The antenna shall be visually inspected and electrically and also mechanically checked as required by products standard.

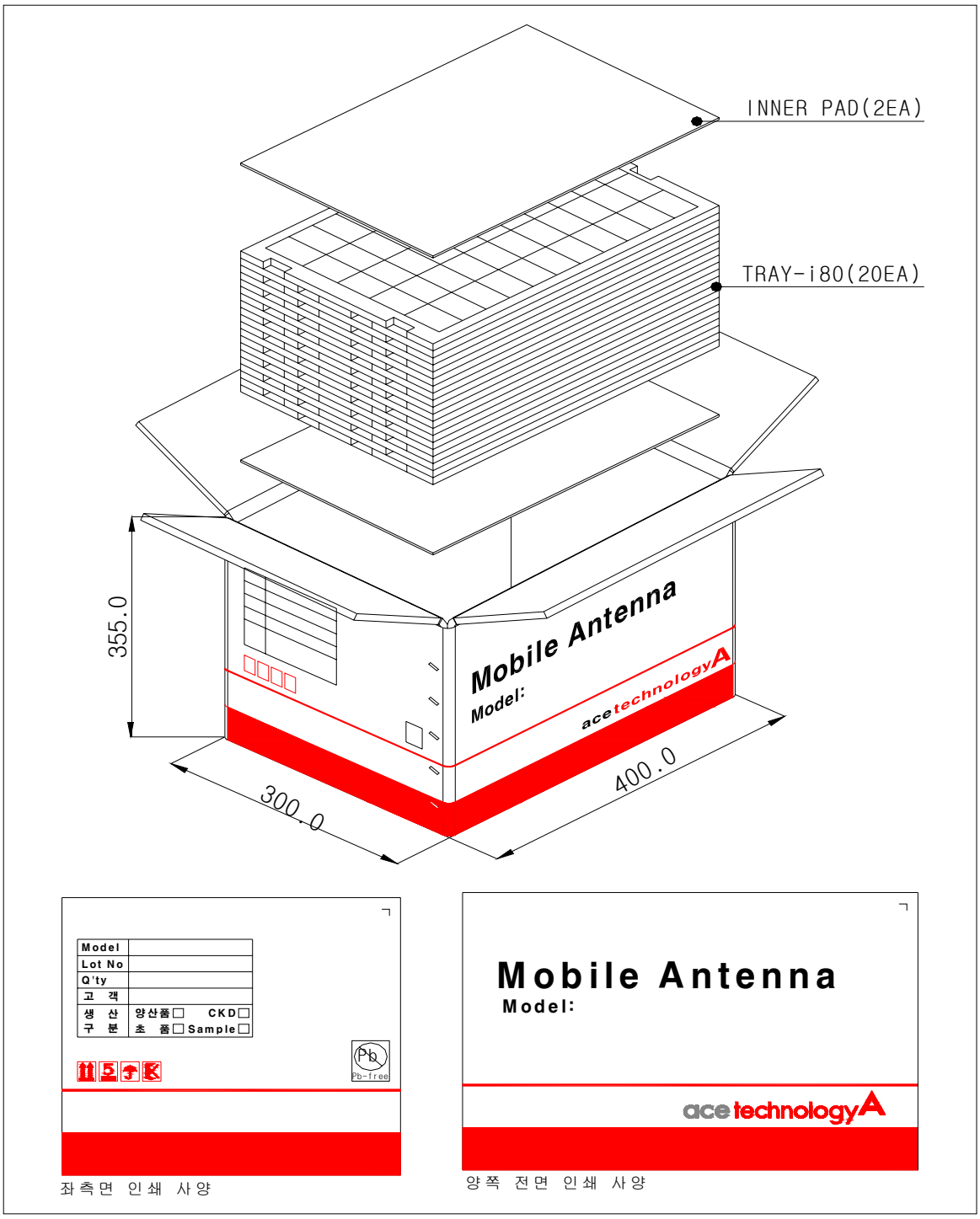


7. Antenna data

7.1. Antenna Drawing



7.2 Packing Spec Drawing.



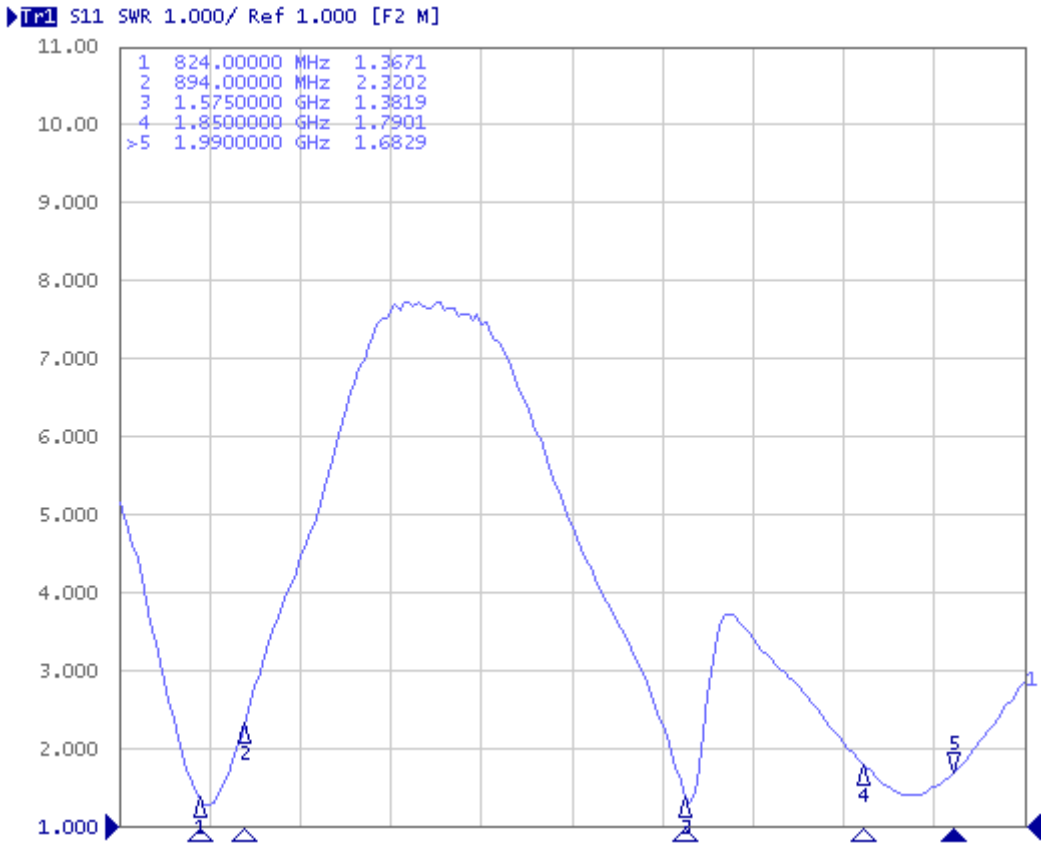
좌측면 인쇄 사양

양쪽 전면 인쇄 사양

7.3 Electrical data (V.S.W.R, GAIN & Matching Circuit Diagram).

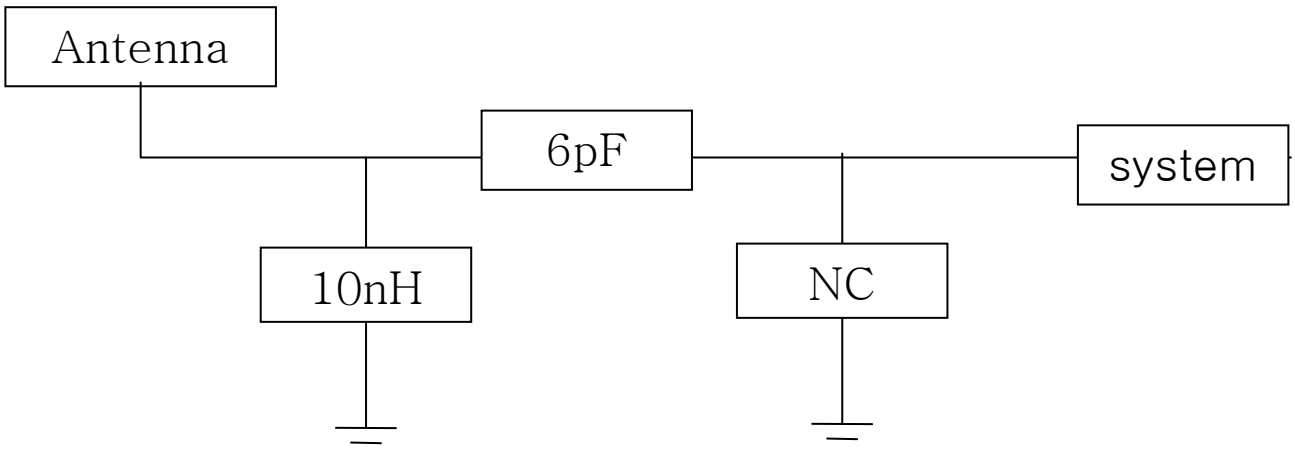
7.3.1 V.S.W.R.

-



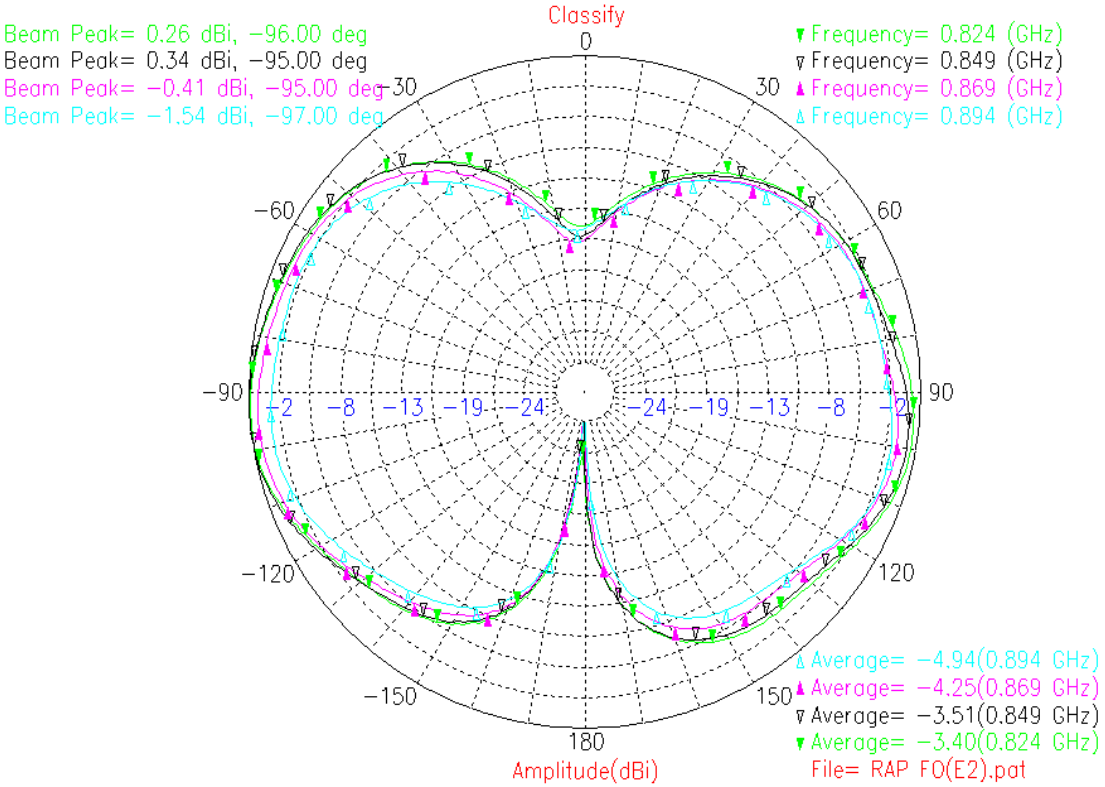
(Folder Open)

7.3.2 Matching Circuit Diagram

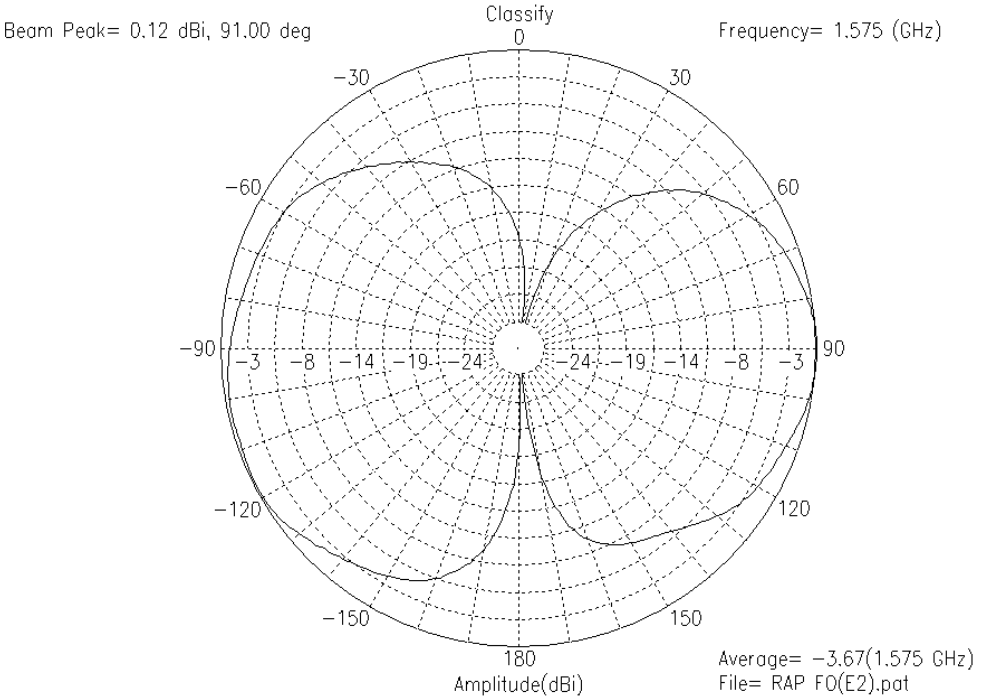


RADIATION PATTERN (E2-Plane)

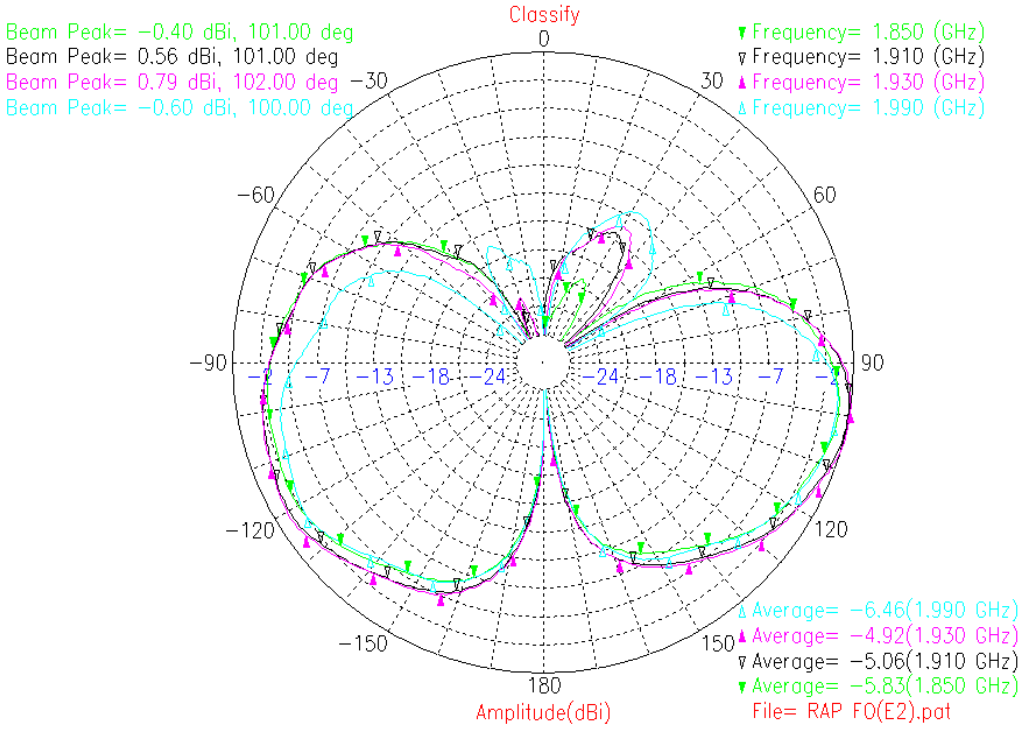
→ [CDMA]



→ [GPS]

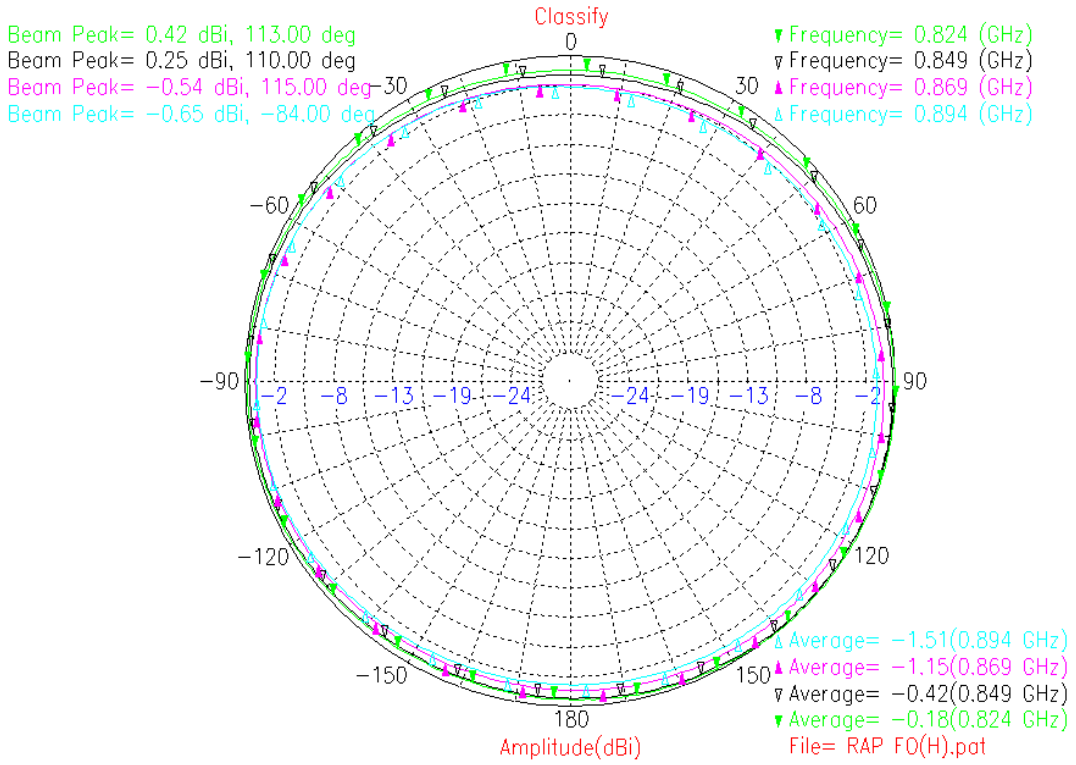


→ [US-PCS]

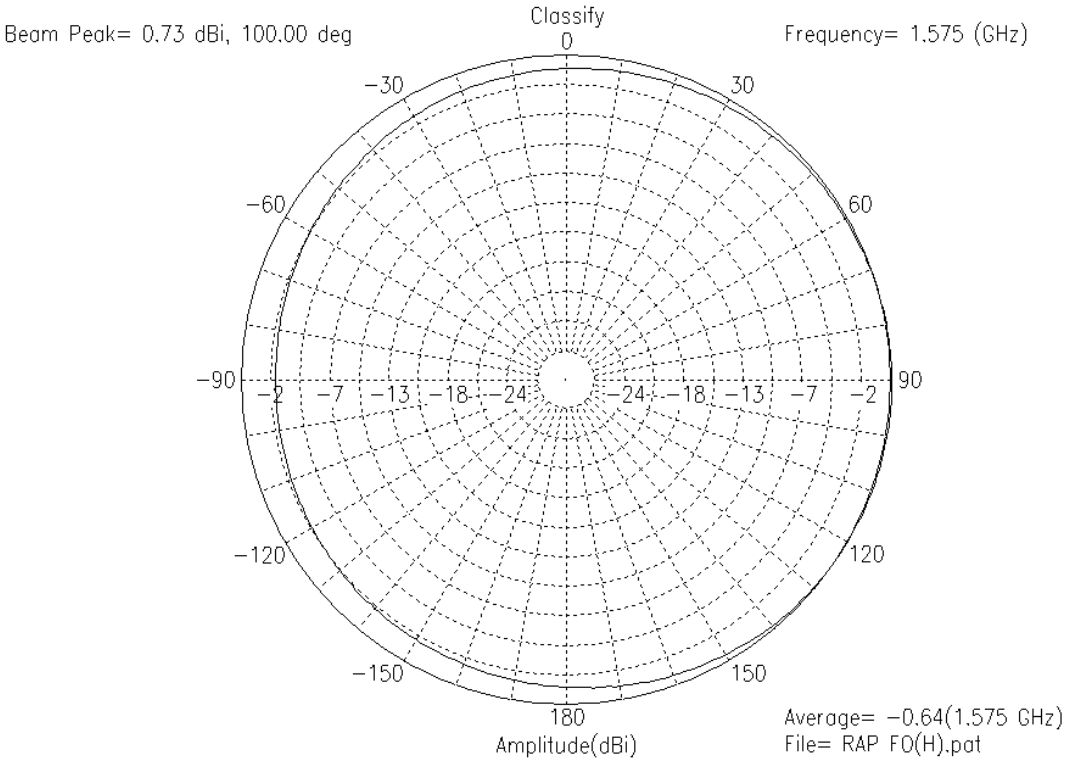


- H-Plane

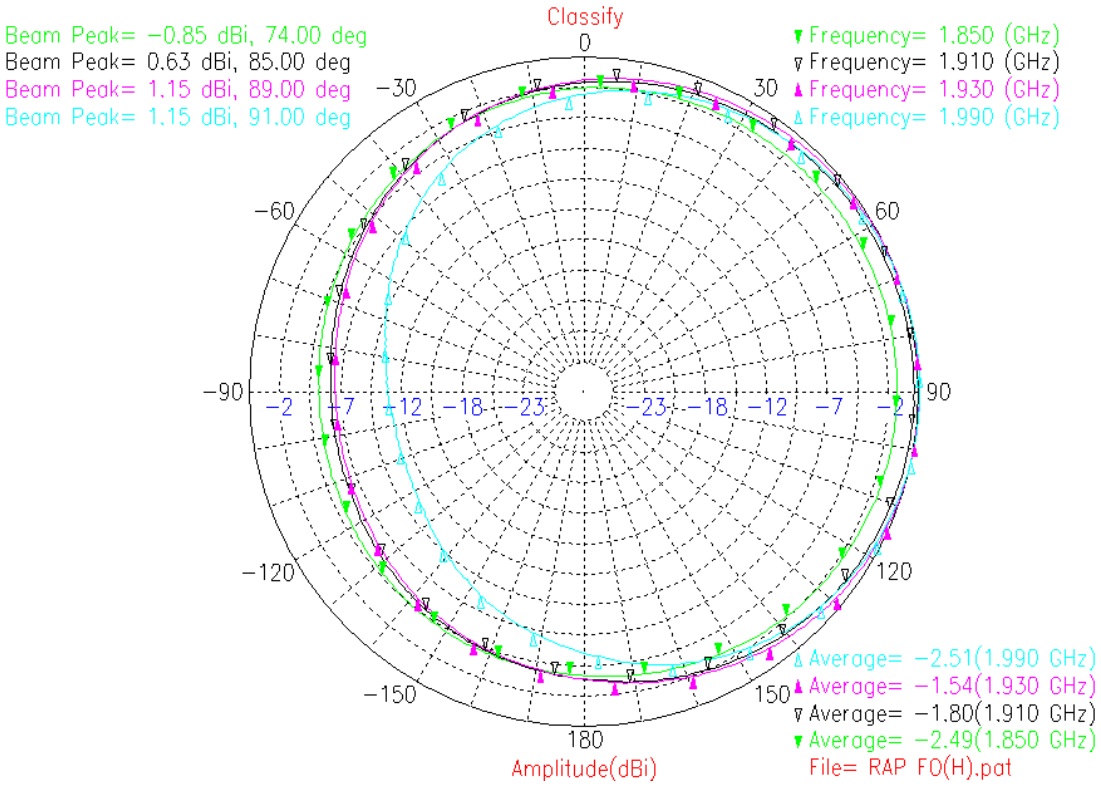
→ [CDMA]



→ [GPS]


Beam Peak= 0.73 dBi, 100.00 deg
Classify
Frequency= 1.575 (GHz)
0
30
60
90
120
150
180
-30
-60
-90
-120
-150
-2
-7
-13
-18
-24
-24
-18
-13
-7
-2
Average= -0.64(1.575 GHz)
File= RAP FO(H).pat
Amplitude(dBi)

→ [US-PCS]


Beam Peak= -0.85 dBi, 74.00 deg
Beam Peak= 0.63 dBi, 85.00 deg
Beam Peak= 1.15 dBi, 89.00 deg
Beam Peak= 1.15 dBi, 91.00 deg
Classify
Frequency= 1.850 (GHz)
Frequency= 1.910 (GHz)
Frequency= 1.930 (GHz)
Frequency= 1.990 (GHz)
0
30
60
90
120
150
180
-30
-60
-90
-120
-150
-2
-7
-12
-18
-23
-23
-18
-12
-7
-2
Average= -2.51(1.990 GHz)
Average= -1.54(1.930 GHz)
Average= -1.80(1.910 GHz)
Average= -2.49(1.850 GHz)
File= RAP FO(H).pat
Amplitude(dBi)

7.4 Environmental Material Test Report

7.4.1 FRAME [141R-701]

Intertek

TEST REPORT

Applicant : SABIC Innovative Plastics Korea
Address : 240-18, Mokhaeong-Dong, Chungju-City,
Chungbuk, 380-240 Korea

Page: 1 of 5

Report No. RT08R-2464 Date: Mar. 07, 2008

Sample Description	: The following submitted sample(s) said to be:-	
Name/Type of Product	: 141R-701	
Sample ID No.	: RT08R-2464	
Manufacturer/Vender	: SABIC Innovative Plastics Korea	
Sample received	: Mar. 05, 2008	
Testing Date	: Mar. 05, 2008 ~ Mar. 07, 2008	
Testing Laboratory	: Intertek Testing Center	
Testing Environment	: Temperature : (22 ~ 26) ℃	Relative Humidity: (55 ~ 65) %
Test Method(s)	: Please see the following page(s).	
Test Result(s)	: Please see the following page(s).	

* Note 1 : The test results presented in this report relate only to the object tested.
* Note 2 : This report shall not be reproduced except in full without the written approval of the testing laboratory.

Tested by,

E.Y.Lee / Chemist

Authorized by,

H.W.Yoo / Lab Manager

Intertek Testing Center

Seoul Office : Tel : 02-2109-1250 Fax : 02-2109-1259 Gumi Office : Tel : 054-462-7647 Fax : 054-462-7657 Web Site : www.Intertek.co.kr
Seoul Lab. : #709, 7Fl, Ace Techno Tower V, 197-22, Guro-3Dong, Guro-Gu, Seoul 152-766 Korea Tel : 02-2109-1260 Fax : 02-2109-1258
Ulsan Lab. : #340-2, Yongam-Ri, Chongryang-Myun, Ulju-Gun, Ulsan 689-865 Korea Tel : 052-257-6754 Fax : 052-276-6792

Intertek

TEST REPORT

Report No. RT08R-2464 Date: Mar. 07, 2008

Sample ID No. : RT08R-2464
Sample Description : 141R-701

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	With reference to BS EN 1122, by acid digestion and determined by ICP-OES	0.5	N.D.
Lead (Pb)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	5	N.D.
Mercury (Hg)	mg/kg	With reference to US EPA 3052, by acid digestion and determined by ICP-OES	2	N.D.
Hexavalent Chromium (Cr^{6+})	mg/kg	US EPA 3060A and determined by UV-visible	1	N.D.
Polybrominated Biphenyl (PBBs)				
Monobromobiphenyl	mg/kg	With reference to US EPA 3540C, by solvent extraction and determined by GC/MS Analysis	5	N.D.
Dibromobiphenyl	mg/kg		5	N.D.
Tribromobiphenyl	mg/kg		5	N.D.
Tetrabromobiphenyl	mg/kg		5	N.D.
Pentabromobiphenyl	mg/kg		5	N.D.
Hexabromobiphenyl	mg/kg		5	N.D.
Heptabromobiphenyl	mg/kg		5	N.D.
Octabromobiphenyl	mg/kg		5	N.D.
Nonabromobiphenyl	mg/kg		5	N.D.
Decabromobiphenyl	mg/kg		5	N.D.
Polybrominated Diphenyl Ether (PBDEs)				
Monobromodiphenyl ether	mg/kg	With reference to US EPA 3540C, by solvent extraction and determined by GC/MS Analysis	5	N.D.
Dibromodiphenyl ether	mg/kg		5	N.D.
Tribromodiphenyl ether	mg/kg		5	N.D.
Tetrabromodiphenyl ether	mg/kg		5	N.D.
Pentabromodiphenyl ether	mg/kg		5	N.D.
Hexabromodiphenyl ether	mg/kg		5	N.D.
Heptabromodiphenyl ether	mg/kg		5	N.D.
Octabromodiphenyl ether	mg/kg		5	N.D.
Nonabromodiphenyl ether	mg/kg		5	N.D.
Decabromodiphenyl ether	mg/kg		5	N.D.

Notes : mg/kg = ppm = parts per million
< = Less than
N.D. = Not detected (<MDL)
MDL = Method detection limit

Intertek

TEST REPORT

Report No. RT08R-2464 Date: Mar. 07, 2008

Sample ID No. : RT08R-2464

Sample Description : 141R-701

* View of sample as received;-

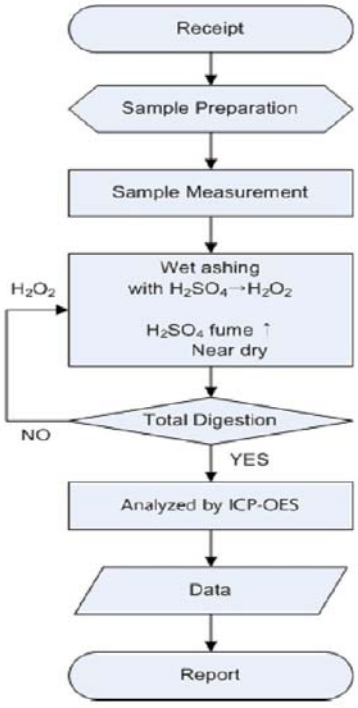
Intertek

TEST REPORT

Report No. RT08R-2464 Date: Mar. 07, 2008

Sample ID No. : RT08R-2464
Sample Description : 141R-701

Flow Chart Of Digestion (EN 1122 For Cd)



** Remarks : The samples were dissolved totally by pre-conditioning method according to above flow chart.

Intertek

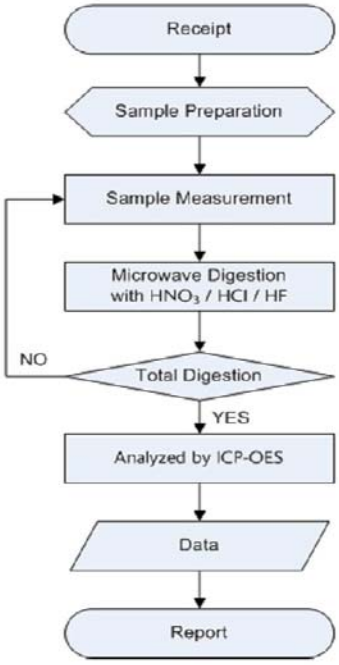
TEST REPORT

Report No. RT08R-2464 Date: Mar. 07, 2008

Sample ID No. : RT08R-2464

Sample Description : 141R-701

Flow Chart Of Digestion (EPA 3052 For Pb)



** Remarks : The samples were dissolved totally by pre-conditioning method according to above flow chart.

Prepared by Eung Yong Lee, Chemist

Confirmed by Sang Chul Park, Senior Researcher

7.4.2 SLOT [STS301]

SGS

Test Report No. F690501/LF-CTSAYA07-25043 Issued Date: November 14, 2007 Page 1 of 4

To: TAIHAN STAINLESS STEEL CO., LTD
603 Seonggok-dong
Danwon-gu
Ansan-city
GYEONGGI-DO
Korea

The following merchandise was submitted and identified by the client as :

Product Name	: STS301
SGS File No.	: AYA07-25043
Received Date	: November 08, 2007
Test Performing Date	: November 09, 2007
Test Performed	: SGS Testing Korea tested the sample(s) selected by applicant with following results
Test Results	: For further details, please refer to following page(s)
Buyer(s)	: LG,SAMSUNG

Pluto Kim
Monet Jeong
Billy Oh / Testing Person

SGS Testing Korea Co. Ltd.

Jeff Jang

Jeff Jang / Chemical Lab Mgr

SGS

Test Report No. F690501/LF-CTSAYA07-25043 Issued Date: November 14, 2007 Page 2 of 4

Sample No. : AYA07-25043.001

Sample Description : STS301

Style/Item No. : N/A

Comments : Material is stainless steel.

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	US EPA 3060A(1996), US EPA 7196A(1992), UV	1	N.D.

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Monobromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tribromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Monobromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tribromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.

NOTE: (1) N.D. = Not detected.(<MDL)
(2) mg/kg = ppm
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) ** = Qualitative analysis (No Unit)
(6) Negative = Undetectable / Positive = Detectable

SGS

Test Report No. F690501/LF-CTSAYA07-25043 Issued Date: November 14, 2007 Page 3 of 4

Picture of Sample as Received:

Sample Color : Silver

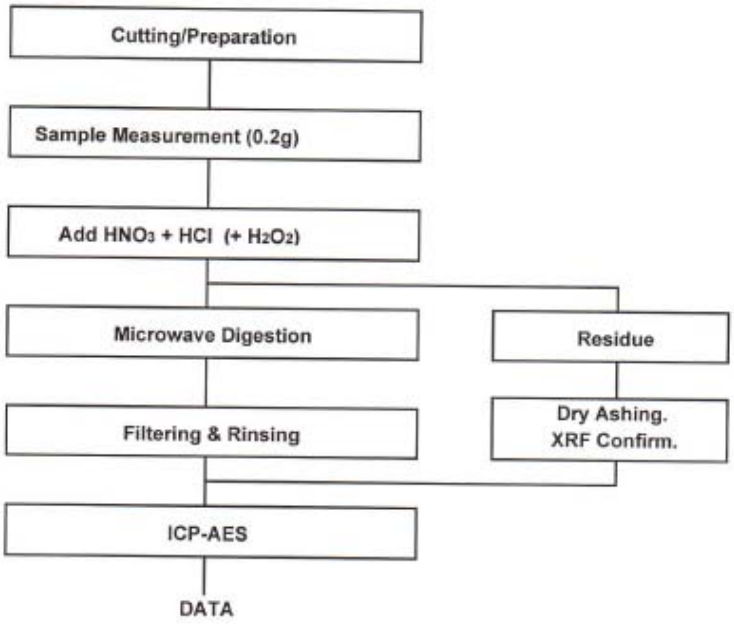
NOTE:
(1) N.D. = Not detected.(<MDL)
(2) mg/kg = ppm
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) ** = Qualitative analysis (No Unit)
(6) Negative = Undetectable / Positive = Detectable

SGS

Test Report No. F690501/LF-CTSAYA07-25043 Issued Date: November 14, 2007 Page 4 of 4

Flow Chart of Digestion

(EPA 3052 for Cd, Pb)



The samples were dissolved totally by pre-conditioning method according to above flow chart.

Operator Dami Yeom

Section Chief Jeff Jang

*** End ***

NOTE: (1) N.D. = Not detected.(<MDL)
(2) mg/kg = ppm
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) ** = Qualitative analysis (No Unit)
(6) Negative = Undetectable / Positive = Detectable