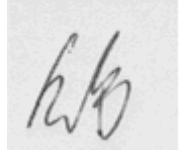


ANTENNA SPECIFICATION		DATE	2009-11-16	REV.	A
MODEL	BREEZE3(MAIN)	TYPE	Main antenna	PAGE	1/33

ANTENNA SPECIFICATION

	Prepared by	Reviewed by	Check by	Approved by
R F				
	11/16			
R & D				
	11/16			11/16

ANTENNA SPECIFICATION		DATE	2009-11-16	REV.	A
MODEL	BREEZE3(MAIN)	TYPE	Main antenna	PAGE	2/33

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2. Material Certification.
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4. Test Equipments
5. Electrical Demands
 - 5.1 V.S.W.R.
 - 5.2 Radiation Pattern
 - 5.3 Gain
6. Mechanical Demands
 - 6.1 Contact Pin Force Test.
 - 6.2 Contact Pin Resistance Test.
 - 6.3 Drop Test.
7. Environmental demands
 - 7.1 Operation Temperature Test
 - 7.2 Temperature Change Test
 - 7.3 High Humidity Test
 - 7.4 Vibration test
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8. Antenna Data

- 8.1. Electrical Data (V.S.W.R & GAIN)
- 8.2. Antenna Drawing
- 8.3. Packing Spec Drawing
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1. Approval Check List

Approval Check List				
No	Date	Change Contents	Change Cause	Rev
1	2009.11.16	ANTENNA SPECIFICATION		A
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

ANTENNA SPECIFICATION			DATE	2009-11-16	REV.	A
MODEL	BREEZE3(MAIN)		TYPE	Main antenna	PAGE	5/33

2. Material Certification

No	Part material	Raw material	Processing	Finishing	EA	Raw material company	Processing Plant	Etc
1	CARRIER	PC(141R-701)	MOLD	-	1	GE	SINA	-
2	PATTERN	STS301(0.15t)	PRESS	-	1	YENAN	YUHAN Precision Co.	-
3								
4								
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11								
12								
13								
14								
15								

ANTENNA SPECIFICATION			DATE	2009-11-16	REV.	A
MODEL	BREEZE3(MAIN)		TYPE	Main antenna	PAGE	6/33

3. Technical Specifications

3.1 Electrical Specifications.

– Folder Open

Electrical Spec.										
Frequency Range (MHz)	GSM850 / GSM900 (824~960MHz)				DCS / PCS / WCDMA (1710~2170MHz)					
V.S.W.R (Max.)	824 MHz		960 MHz		1710 MHz			2170 MHz		
	4.7:1 below		4.7:1 below		6.2:1 below			5.4:1 below		
PEAK GAIN (Min., E2-Plane)	GSM850		GSM900		DCS		PCS		WCDMA	
	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx
AVERAGE GAIN (Min., H-Plane)	-5.9 dBi	-2.5 dBi	-2.5 dBi	-3.8 dBi	-9.1d Bi	-6.0 dBi	-5.2 dBi	-5.2 dBi	-4.8 dBi	-14.5 dBi
	GSM850		GSM900		DCS		PCS		WCDMA	
	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx
	-5.7 dBi	-4.5 dBi	-4.5 dBi	-8.0 dBi	-13.8 dBi	-9.5 dBi	-7.1 dBi	-8.0 dBi	-7.9 dBi	-13.2 dBi

Impedance(Nominal)	50 ohms									
Polarization	VERTICAL									
Radiation Pattern	OMNI-DIRECTIONAL									
Maximum Power	2 W									

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MODEL	BREEZE3(MAIN)	TYPE	Main antenna	PAGE	7/33

3.2 Mechanical Specifications

Mechanical Spec.	
Connector	Board contact pin type
Overall length	See drawing
Operating Temperature	-40°C ~+85 °C
Weight	About 1.12g (Unit)

3.3 Packing Specifications

Packing Spec.		
PRODUCT	QUANTITY (Antenna)	MATERIAL
TRAY	1/80EA	P.S (0.8t)
TRAY INNER PAD	2/1600EA	SW 2 type (B corrugated paper)
CARTON BOX	1600EA/1BOX	DW 2 type (AB corrugated paper)

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4. Test Equipment

The equipment for antenna test is as follows,

- ◆ Network Analyzer (E5071C) to measure the V.S.W.R., Standing wave ratio(SWR) and impedance bandwidth of antenna
- ◆ Standard horn antennas adjustable to the GSM850/GSM900/DCS/PCS/WCDMA 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
- ◆ Climatic Chamber for environmental tests

ANTENNA SPECIFICATION		DATE	2009-11-16	REV.	A
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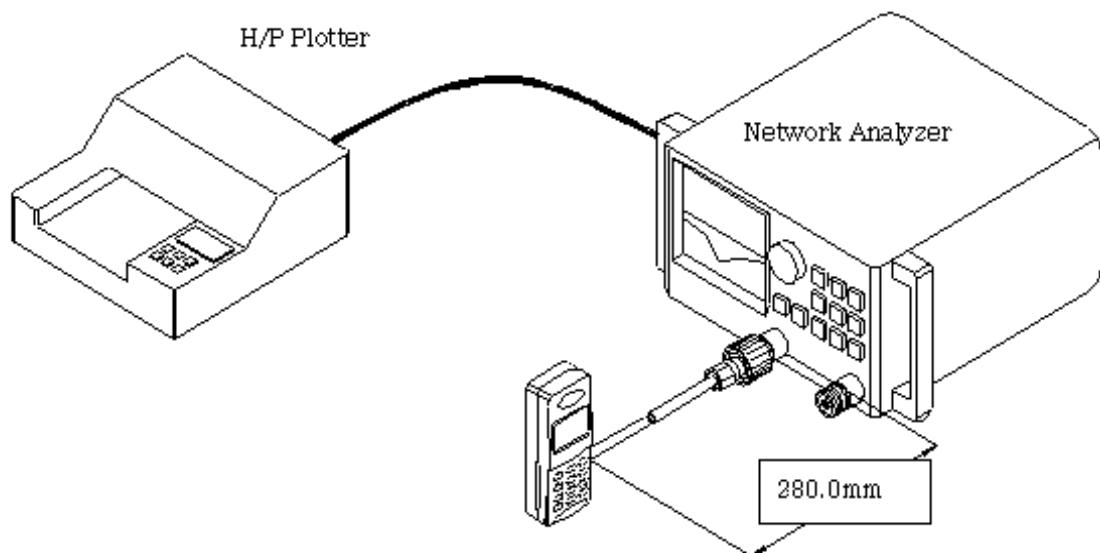
5. Electrical Demands

5.1 V.S.W.R

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

– Folder Open

Frequency Range (MHz)	GSM850 / GSM900 (824~960MHz)		DCS / PCS / WCDMA (1710~2170MHz)	
V.S.W.R	824 MHz	960 MHz	1710 MHz	2170 MHz
	4.7:1 below	4.7:1 below	6.2:1 below	5.4:1 below



ANTENNA SPECIFICATION		DATE	2009-11-16	REV.	A
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5.2 Radiation Pattern

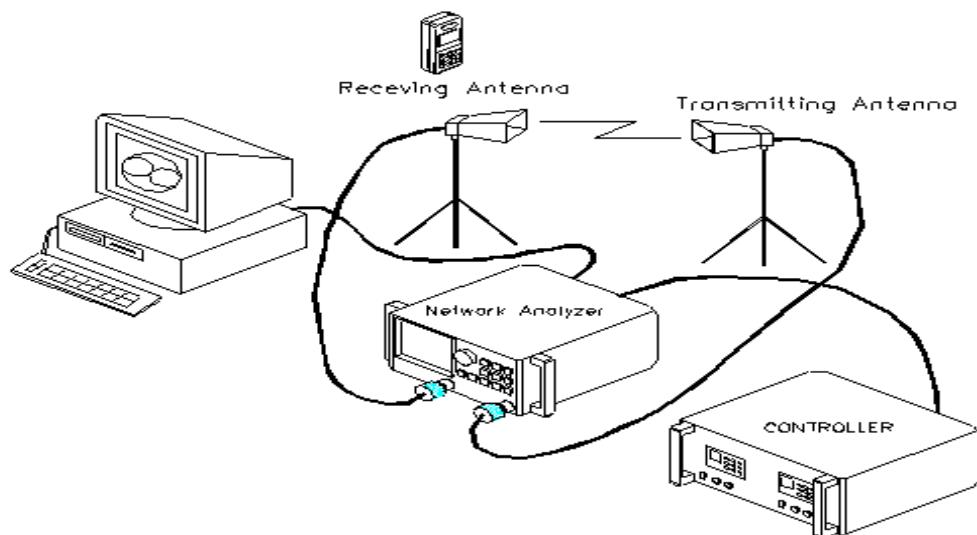
The radiation pattern must have the omni-directional characteristic in GSM850/GSM900/DCS/PCS/WCDMA band.

5.3 Gain

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

– Folder Open

Electrical Spec.	BAND									
	GSM850		GSM900		DCS		PCS		WCDMA	
Frequency Range (MHz)	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx
PEAK GAIN (Min., E2-Plane)	-5.9 dBi	-2.5 dBi	-2.5 dBi	-3.8 dBi	-9.1 dBi	-6.0 dBi	-5.2 dBi	-5.2 dBi	-4.8 dBi	-14.5 dBi
AVERAGE GAIN (Min., H-Plane)	-5.7 dBi	-4.5 dBi	-4.5 dBi	-8.0 dBi	-13.8 dBi	-9.5 dBi	-7.1 dBi	-8.0 dBi	-7.9 dBi	-13.2 dBi



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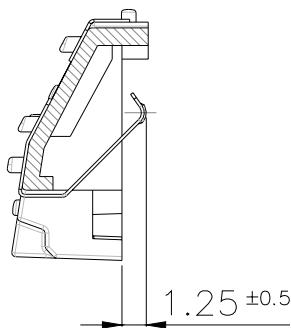
6. Mechanical Demands

6.1. Contact Pin Force Test

Contact pin of antenna must keep $200\text{g}/\text{f} \pm 150$ in operation distance.

(Operation distance of antenna is same to under drawing.

(PCB overlap : 0mm~1.83mm)



6.2. Contact Pin Resistance Test.

After assemble antenna to test equipment, Contact pins are pressed to nominal assembly position 500 times. The antenna contact force must satisfy of (6.1) operation force. (Cycle time: 60 times/min)

6.3 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 6 plane.

The number of drop is 2 times.

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

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7. Environmental Demands

7.1 Operation Temperature Test

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

7.2 Temperature Change Test

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

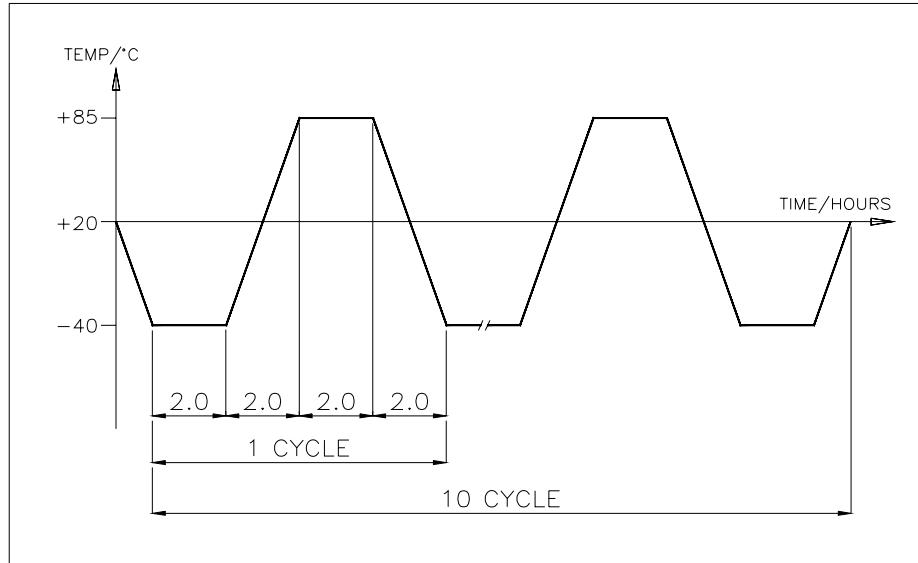
Test: Temperature cycle is as follows. 2 hours at -40°C .

2 hours at $+85^{\circ}\text{C}$.

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.

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7.3 High Humidity Test

Test: Place the antennas for testing in chamber. The chamber condition should be as follows: 24hours at +55°C, Relative humidity is 95%.

Final measurements: The antenna shall be visually inspected and electrically and also mechanically checked as required by products standard.

7.4 Vibration Test

After assemble antenna to test equipment, Do test in X, Z direction per 1hour as a under spec. The antenna shall be visually inspected and electrically and mechanically checked as required by products standard. The test must satisfy to IEC 68-2-6 spec

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Vibration frequency	F=5~55~5Hz(1cycle)
Sweeping Rate	0.5 octave/min
Maximum displacement	1.5mm
Maximum acceleration	2 g
Crossover Frequency	18.0Hz

7.5 Salt spray Test

Sprayed with the salt spray solution for a period of 96 hours at a temperature of +35°C.

The antenna shall be visually inspected and electrically and mechanically checked as required by products standard. The test must satisfy to IEC 68-2-11 spec .

7.6 Storage temperature Test

After antenna are stored for a period of 96 hours at a temperature of -30 °C and a relative humidity of 95 %. Stored for a period of 96 hours at a temperature of +80 °C and a relative humidity of 95 % (total: 192 hour)

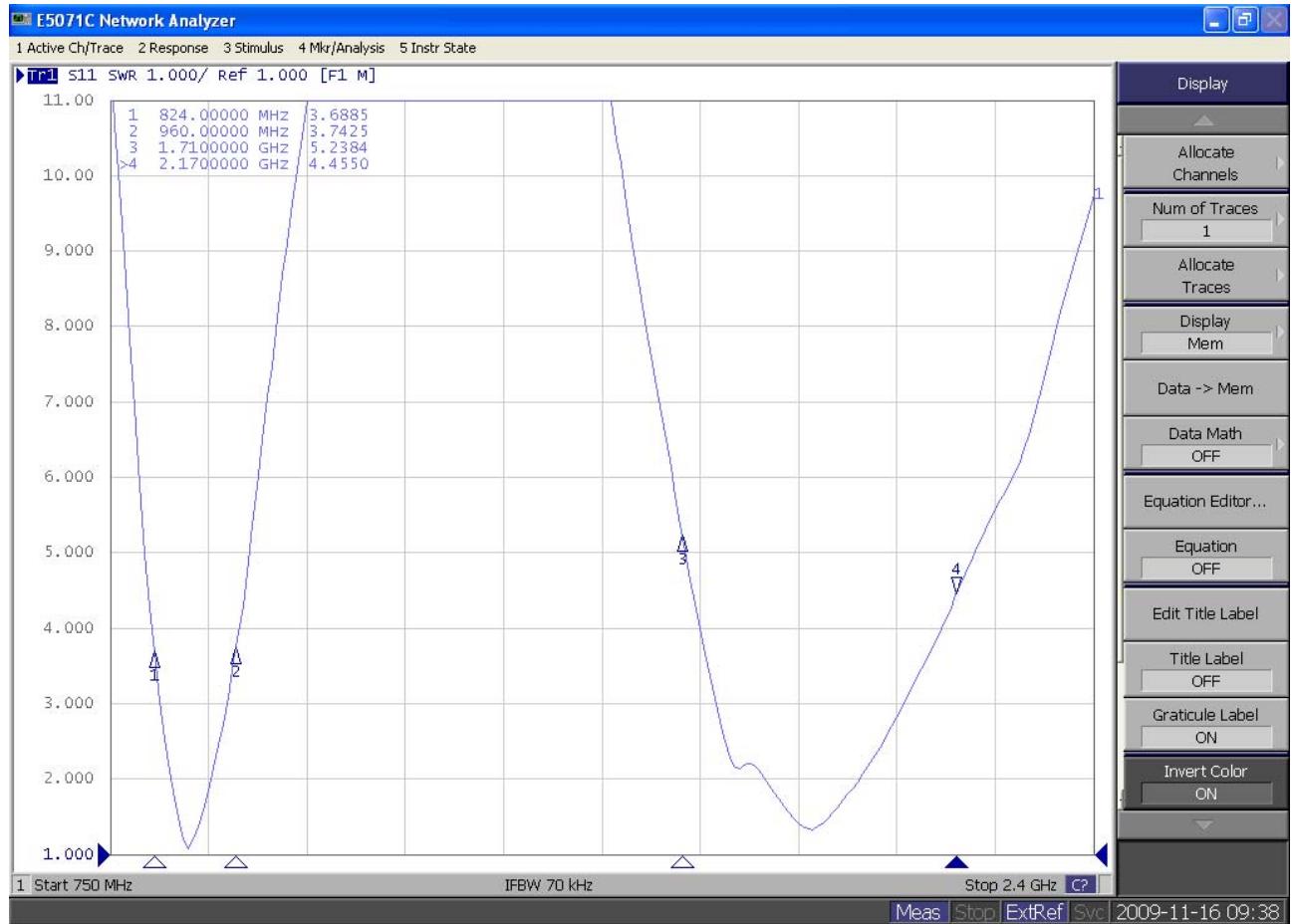
The antenna shall be visually inspected and electrically and mechanically checked as required by products standard.

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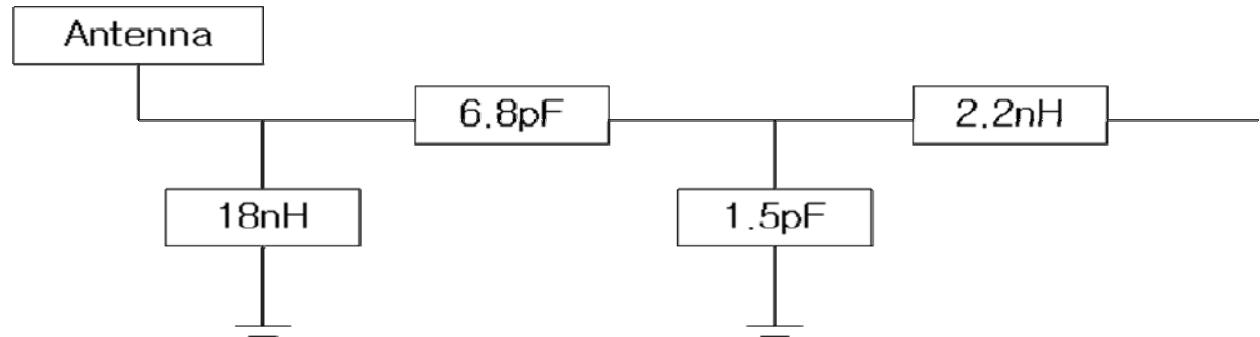
8. Antenna data

8.1. Electrical data(V.S.W.R & GAIN)

→ V.S.W.R



→ Matching Circuit Diagram

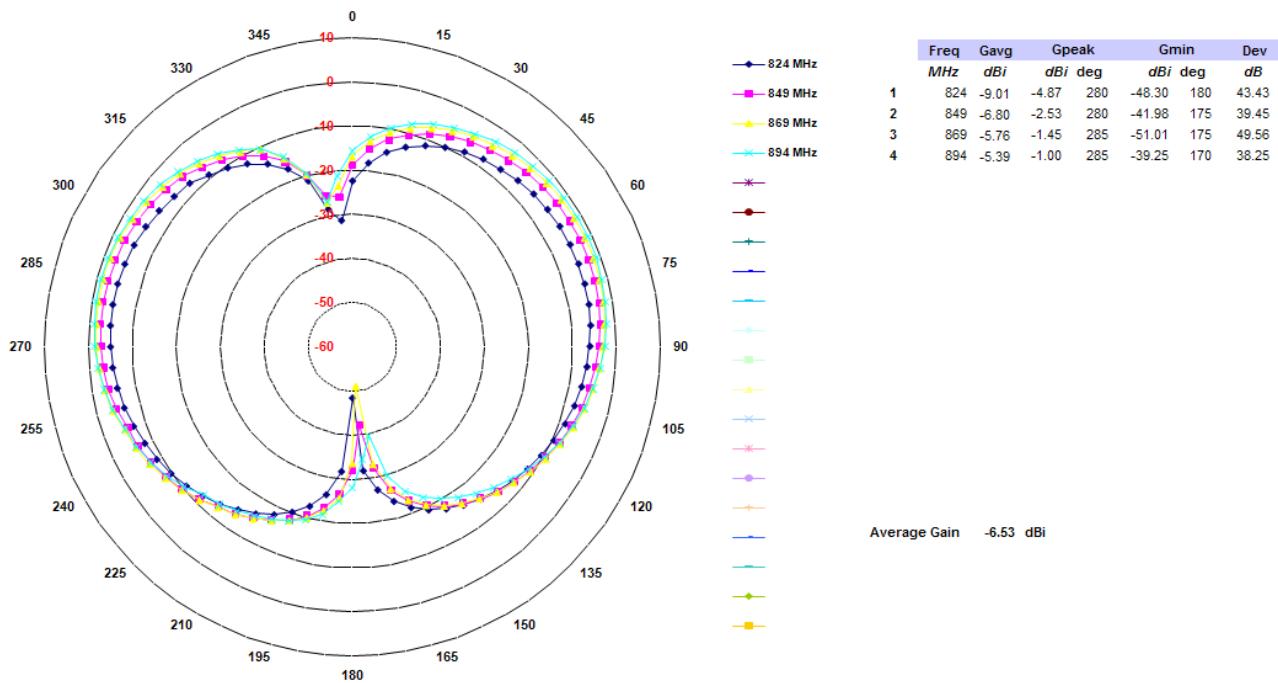


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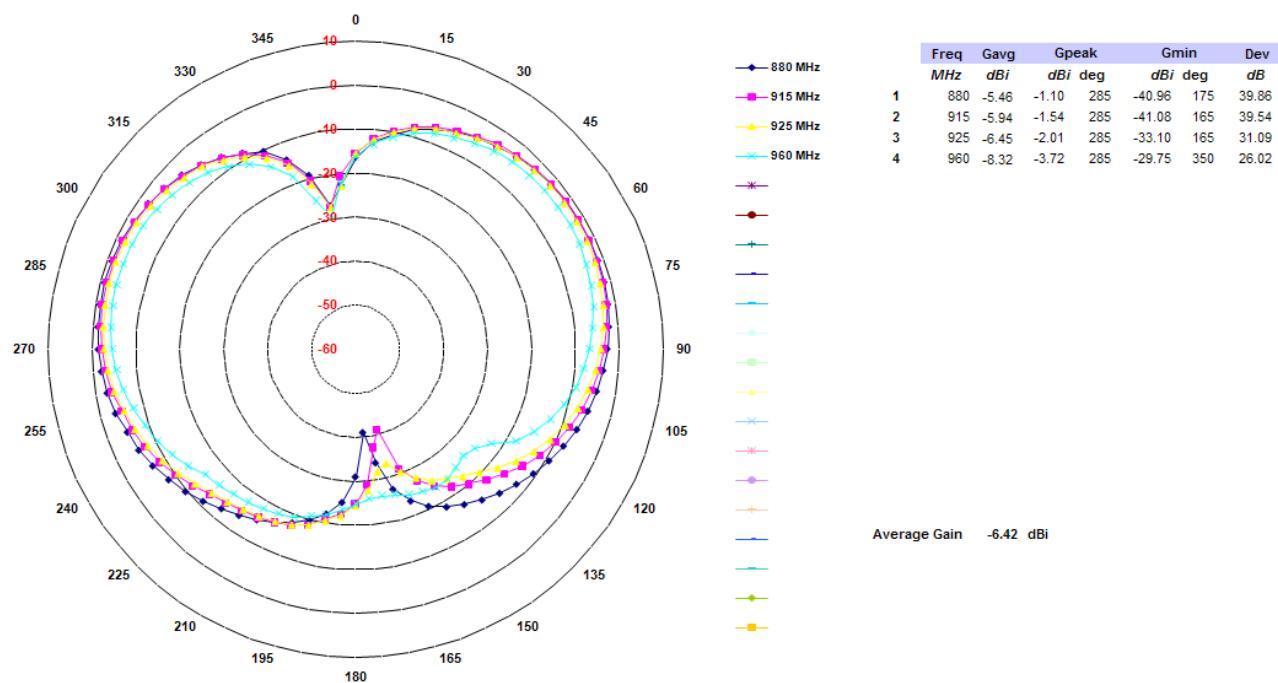
→ GAIN (with Matching Circuit)

- E2-Plane

→ [GSM850]

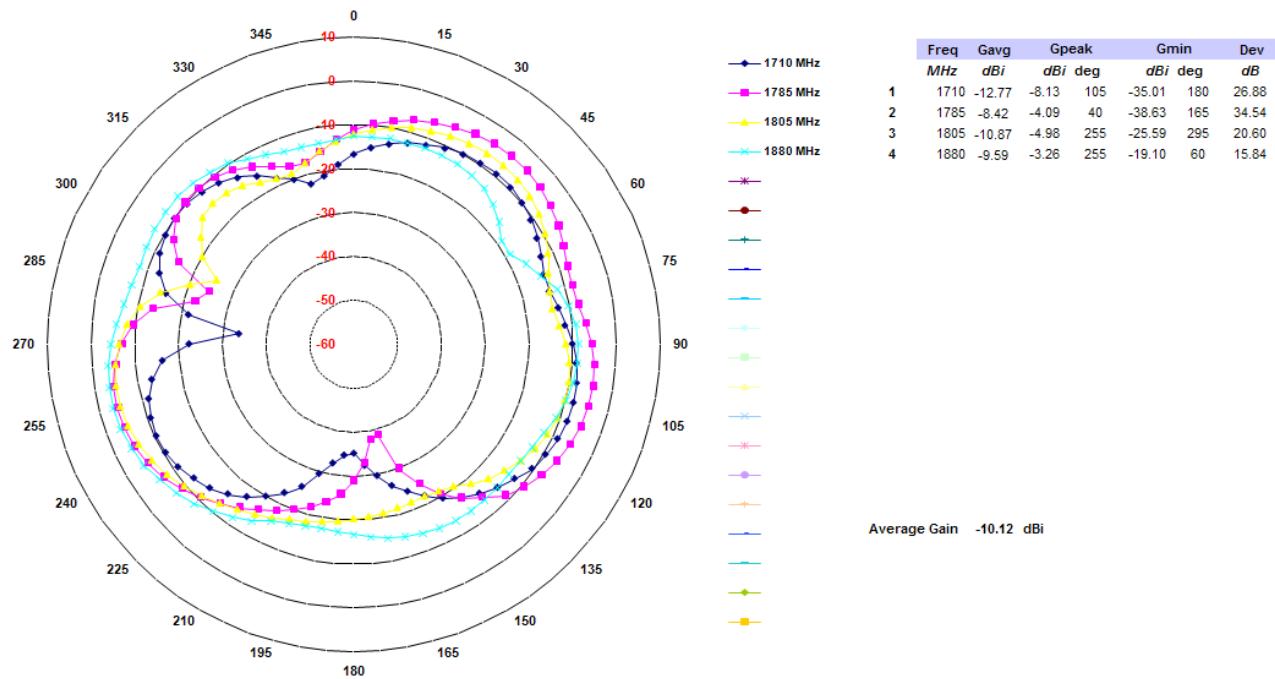


→ [GSM900]

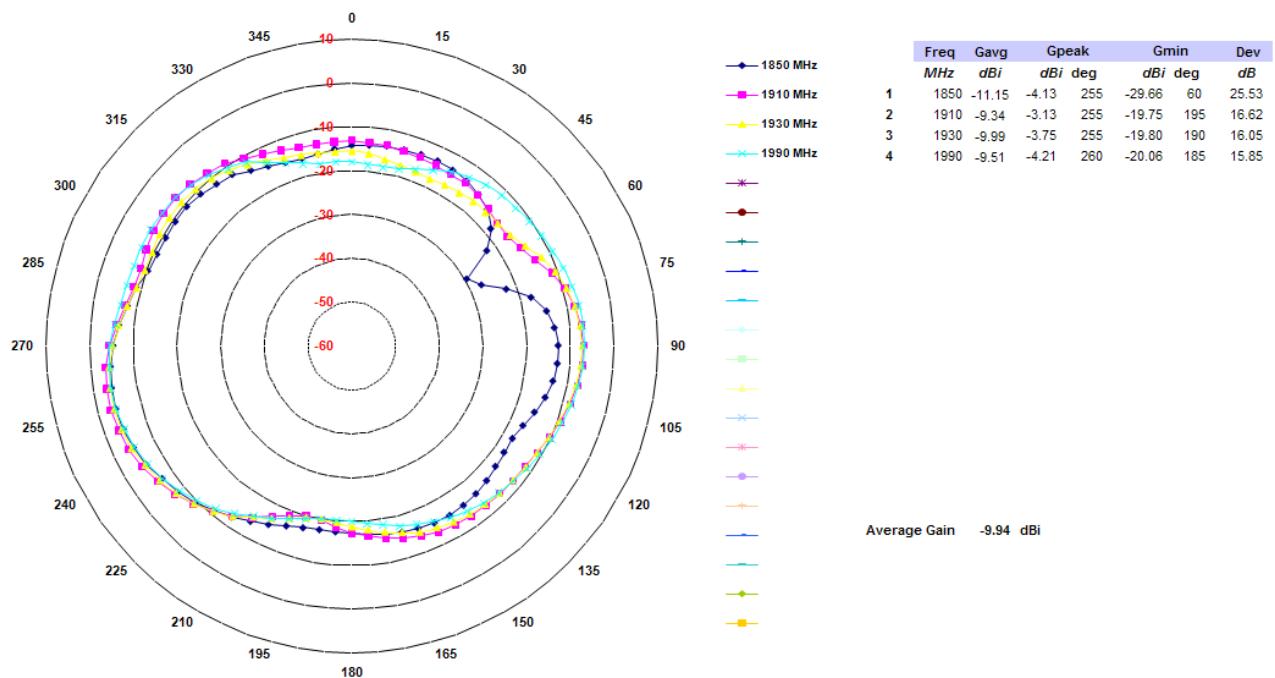


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→ [DCS]

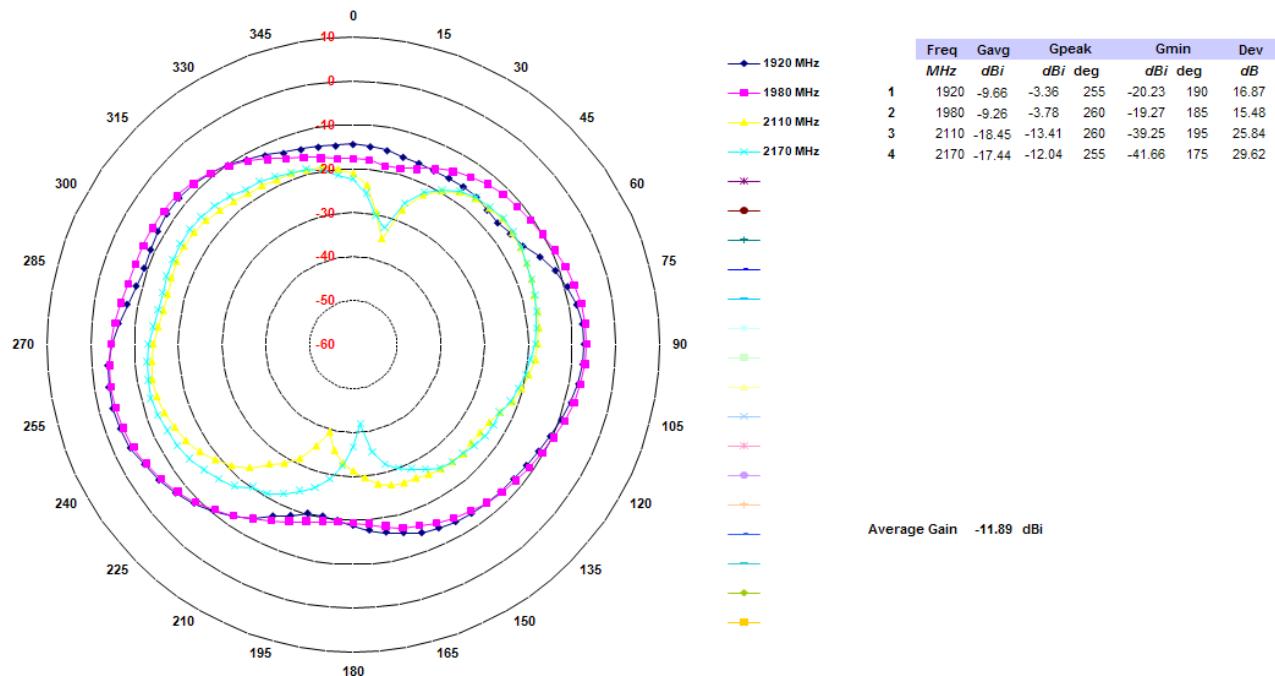


→ [PCS]



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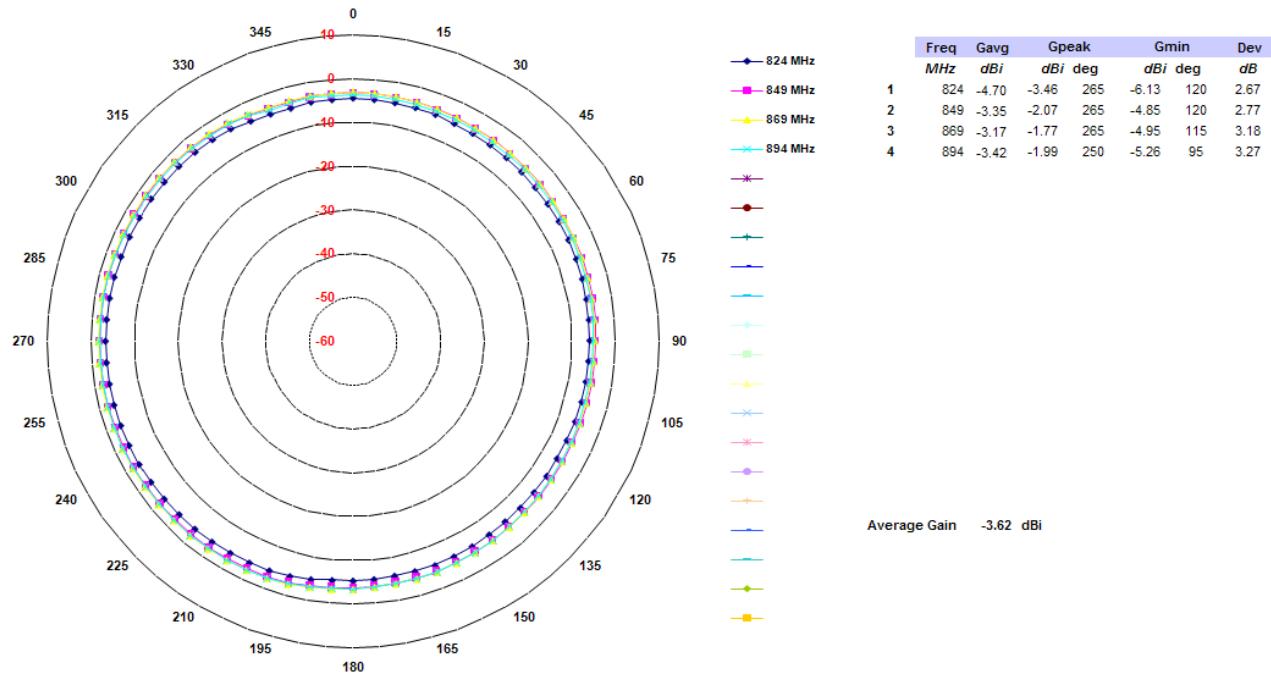
→ [WCDMA]



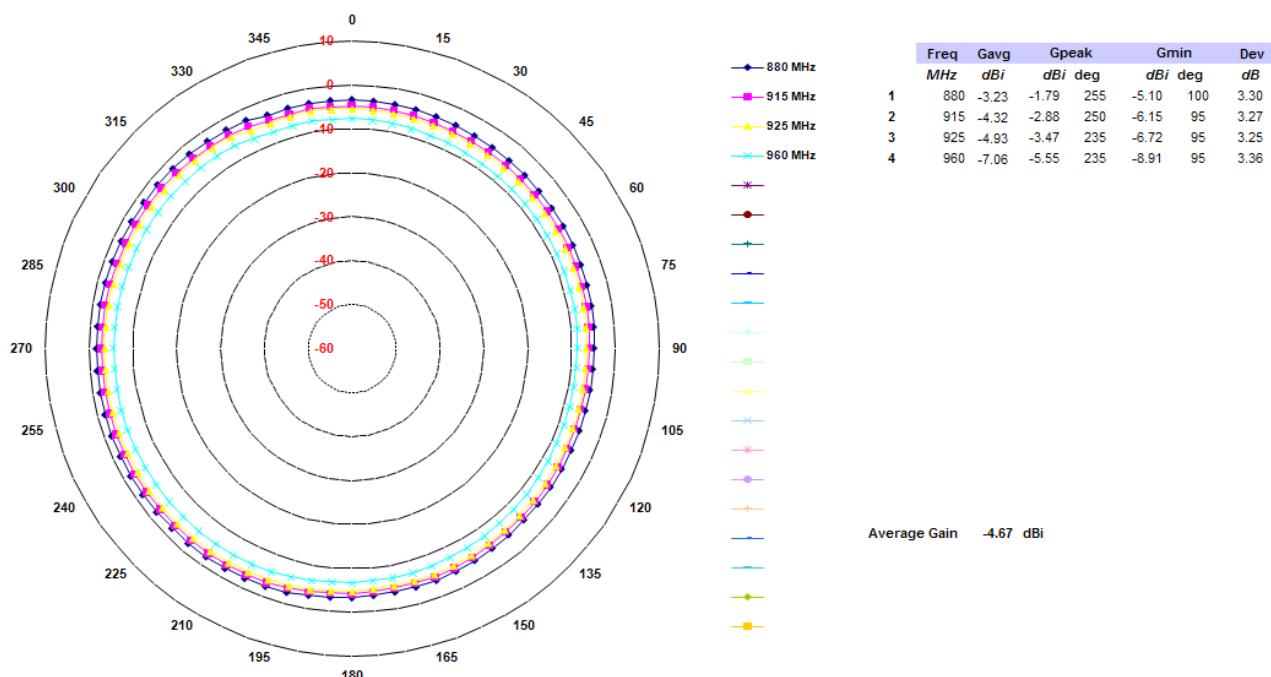
ANTENNA SPECIFICATION		DATE	2009-11-16		REV.	A
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– H-Plane

→ [GSM850]

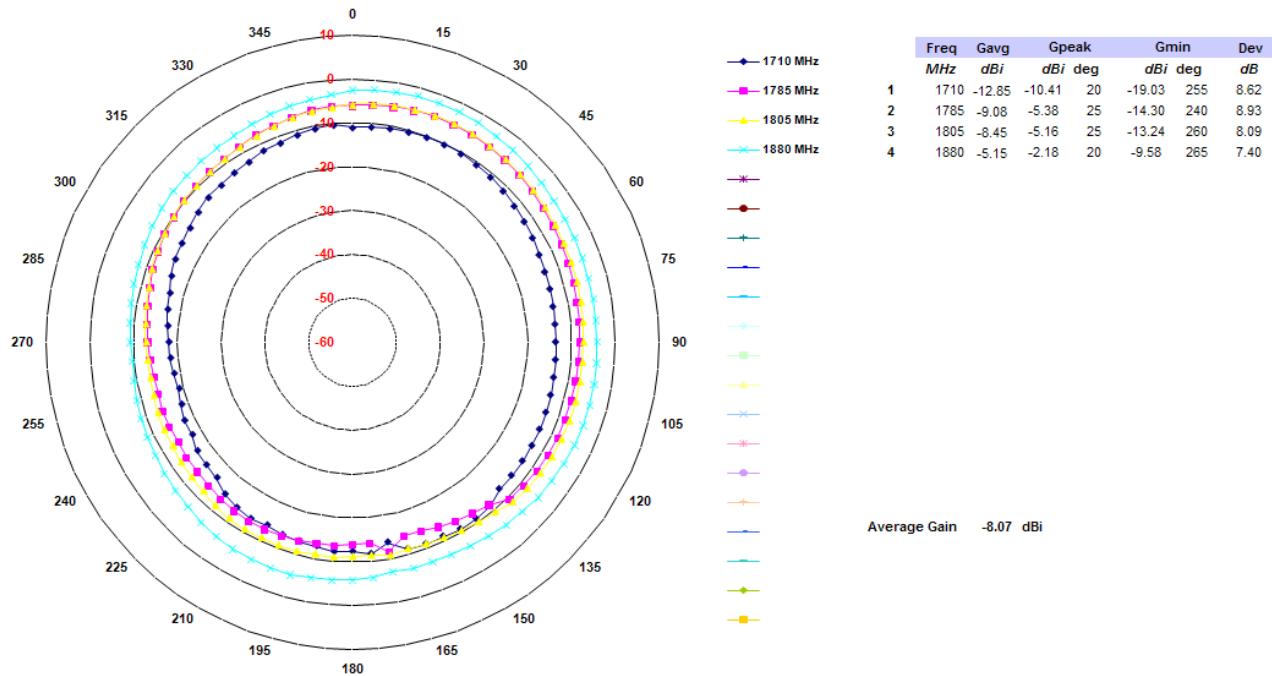


→ [GSM900]

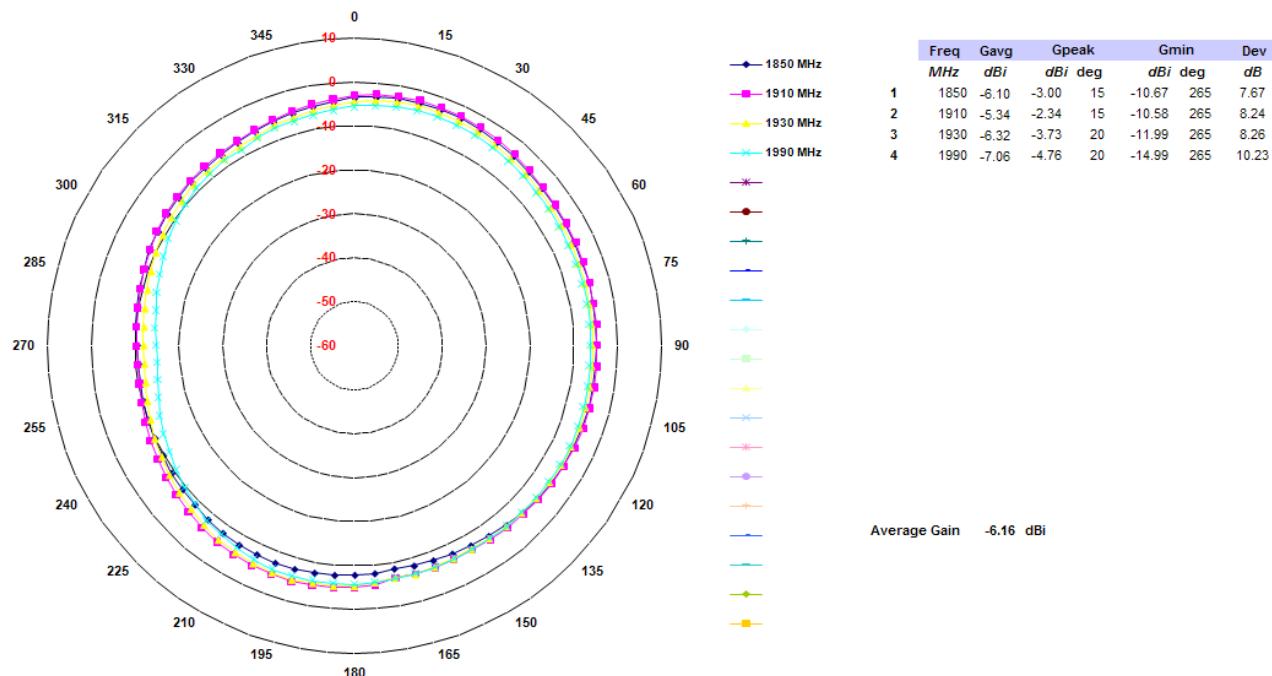


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→ [DCS]

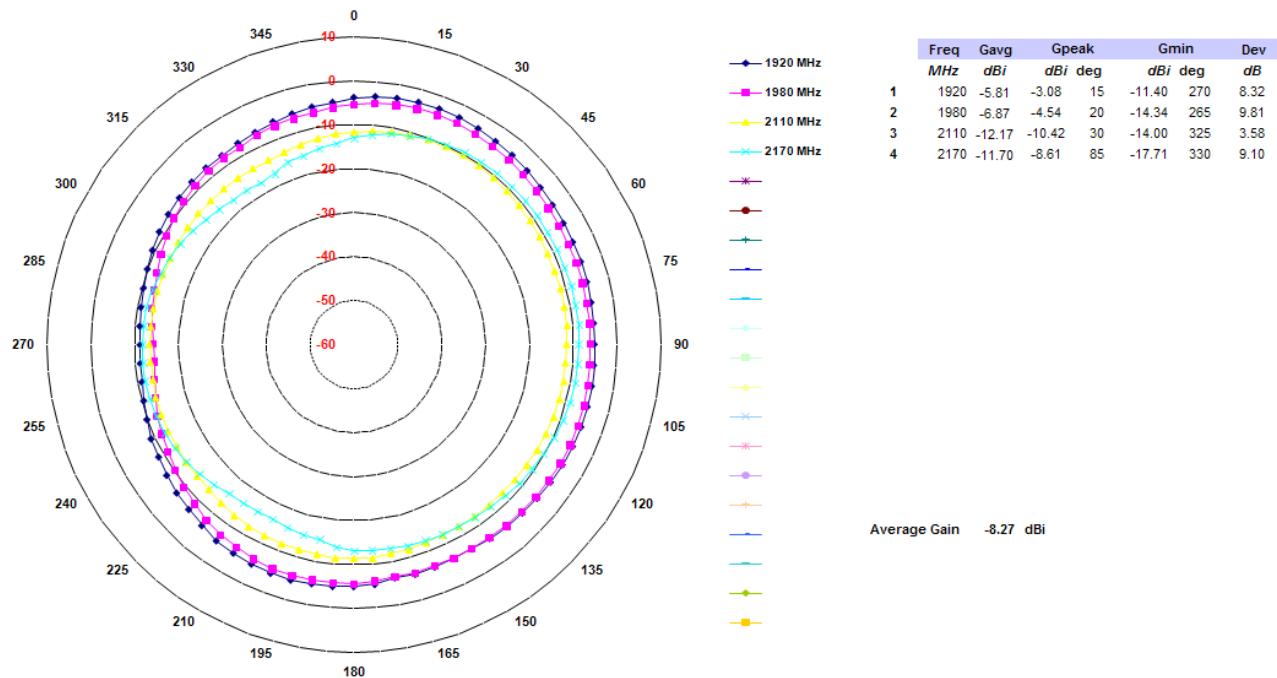


→ [PCS]



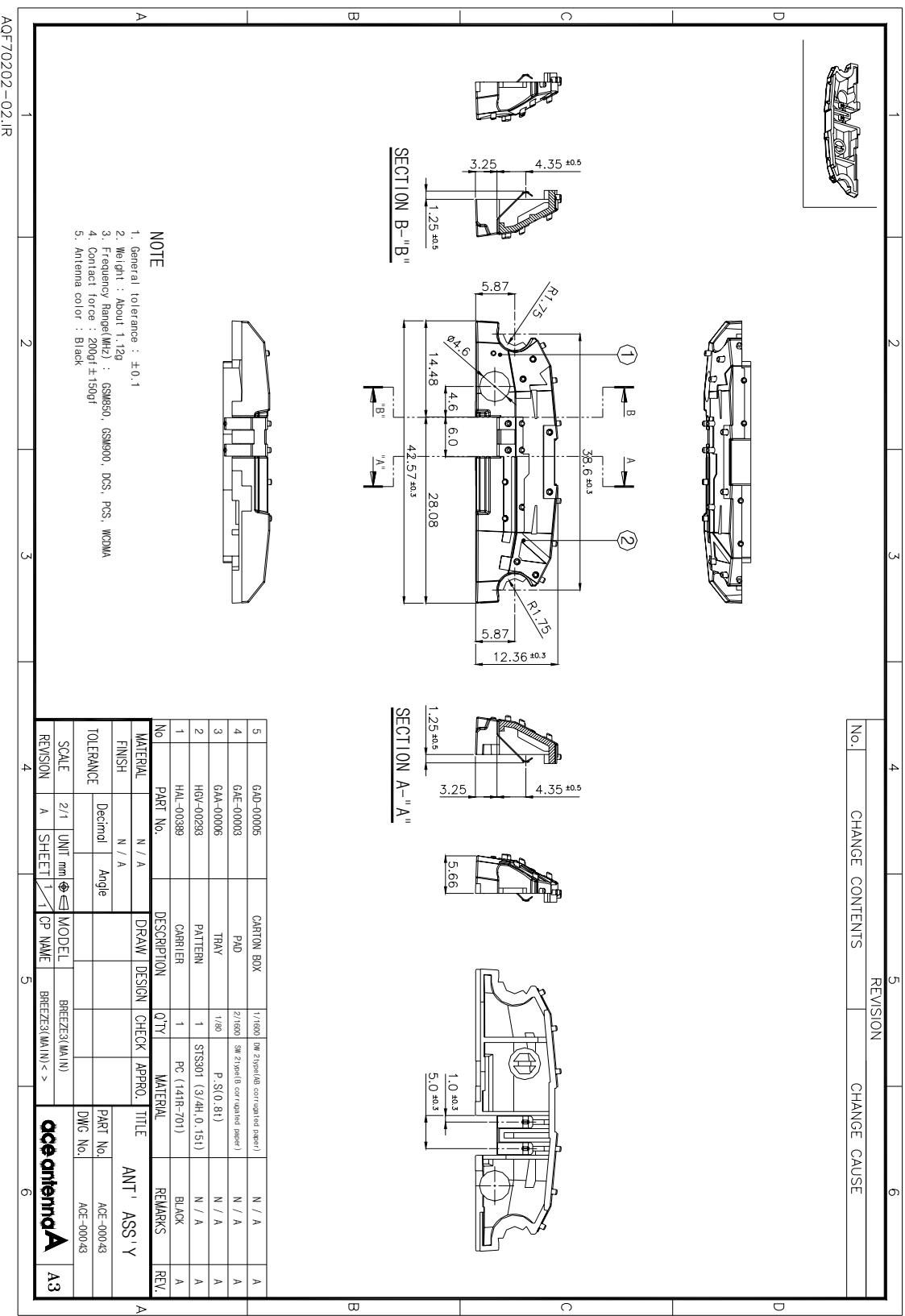
ANTENNA SPECIFICATION		DATE	2009-11-16	REV.	A
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→ [WCDMA]



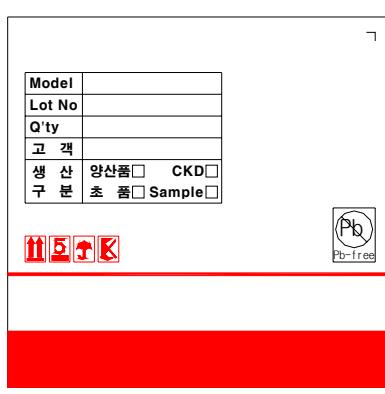
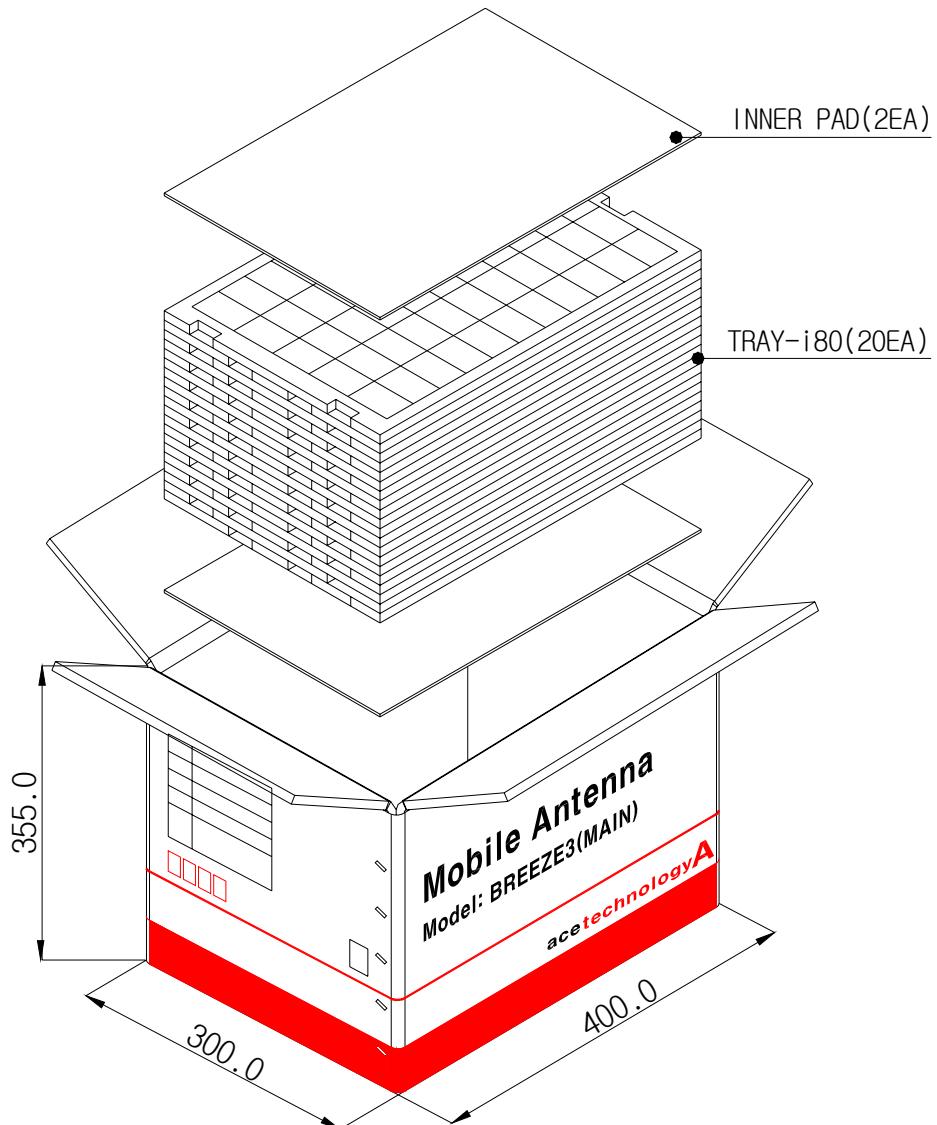
ANTENNA SPECIFICATION		DATE	2009-11-16	REV.	A
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8.2. Antenna Drawing



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8.3. Packing Spec Drawing.



좌측면 인쇄 사양



양쪽 전면 인쇄 사양

ANTENNA SPECIFICATION		DATE	2009-11-16	REV.	A
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8.4 Reliability Test.

8.5. Environment test report

8.5.1 CARRIER [141R-701]



Intertek Testing Center

340-2, Yongam-ri, Chongryang-myeon,
Uliju-gu, Ulsan, 689-865 Korea
Tel : 052-257-6754, Fax : 052-276-6792

TEST REPORT

Applicant : GE Plastics Korea
Address : 240-18, Mokhong-Dong, Chungju-Si,
Chungcheongbuk-Do, Korea

Page: 1 of 5

Report No. UT07R-0872

Date: Jul. 13, 2007

Sample Description : The following submitted sample(s) said to be:-

 Name/Type of Product : 141R-701
 Sample ID No. : UT07R-0872
 Manufacturer/Vender : GE Plastics Korea

 Sample received : Jul. 11, 2007
 Testing Date : Jul. 11, 2007 ~ Jul. 13, 2007
 Testing Laboratory : Intertek Testing Center
 Testing Environment : Temperature : 22°C Relative Humidity: 51 %

 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

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Intertek Testing Center

340-2, Yongam-ri, Chongryang-myun,
Uiju-gun, Ulsan, 689-865 Korea
Tel : 052-257-6754, Fax : 052-276-6792

TEST REPORT

Report No. UT07R-0872

Page: 2 of 5
Date: Jul. 13, 2007

Sample ID No. : UT07R-0872

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 Testing Center

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ace antenna A

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MODEL	BREEZE3(MAIN)	TYPE	Main antenna	PAGE	26/33

Intertek

Intertek Testing Center

340-2, Yongam-ri, Chongryang-myeon,
Uijeongbu, Gyeonggi-do, 430-865 Korea
Tel : 031-257-6754, Fax : 031-276-6792

TEST REPORT

Report No. UT07R-0872

Page: 3 of 5
Date: Jul. 13, 2007

Sample ID No. : UT07R-0872

Sample Description : 141R-701

* View of sample as received:-



Intertek Testing Center

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ace antenna A

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Intertek

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Uiju-gun, Ulsan, 689-865 Korea
Tel : 052-257-6754, Fax : 052-276-6792

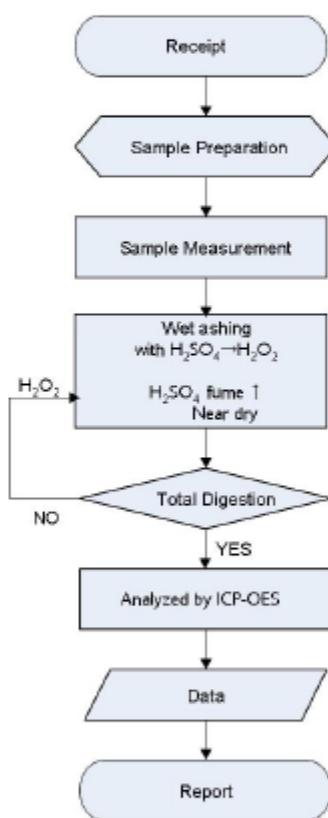
TEST REPORT

Report No. UT07R-0872

Page: 4 of 5
Date: Jul. 13, 2007

Sample ID No. : UT07R-0872
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 Testing Center

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Intertek

Intertek Testing Center

340-2, Yongam-ri, Chongryang-myun,
Uiju-gun, Ulsan, 689-865 Korea
Tel : 052-257-6754, Fax : 052-276-6792

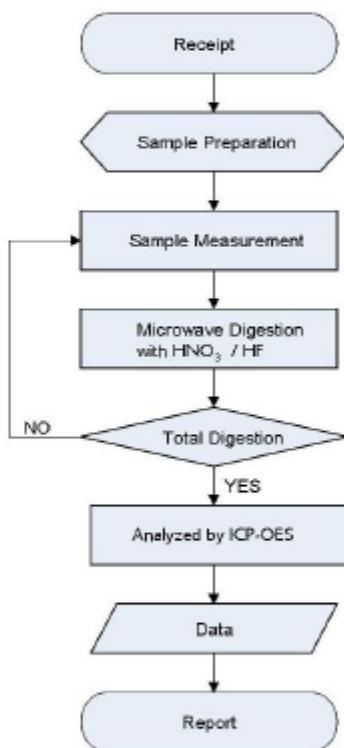
TEST REPORT

Report No. UT07R-0872

Page: 5 of 5
Date: Jul. 13, 2007

Sample ID No. : UT07R-0872
Sample Description : 141R-701

Flow Chart Of Digestion (EPA 3052 for Cd, 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

***** End of Report *****

Intertek Testing Center

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8.5.2 PATTERN [STS301]

ANTENNA SPECIFICATION		DATE	2009-11-16	REV.	A
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Test Report No. F690501/LF-CTSAYAA08-30908C

Issued Date: November 24, 2008 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 : STS 301
SGS File No. : AYAA08-30908C
Received Date : November 18, 2008
Test Performing Date : November 19, 2008
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)

SGS Testing Korea Co. Ltd.

Pluto Kim
 Monet Jeong
 Billy Oh / Testing Person

Jeff Jang / Chemical Lab Mgr

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Sample No. : AYAA08-30908C.001

Sample Description : STS 301

Item No./Part 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

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F052 Version 2

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ace antenna

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Picture of Sample as Received:



NOTE: (1) N.D. = Not detected.(<MDL)
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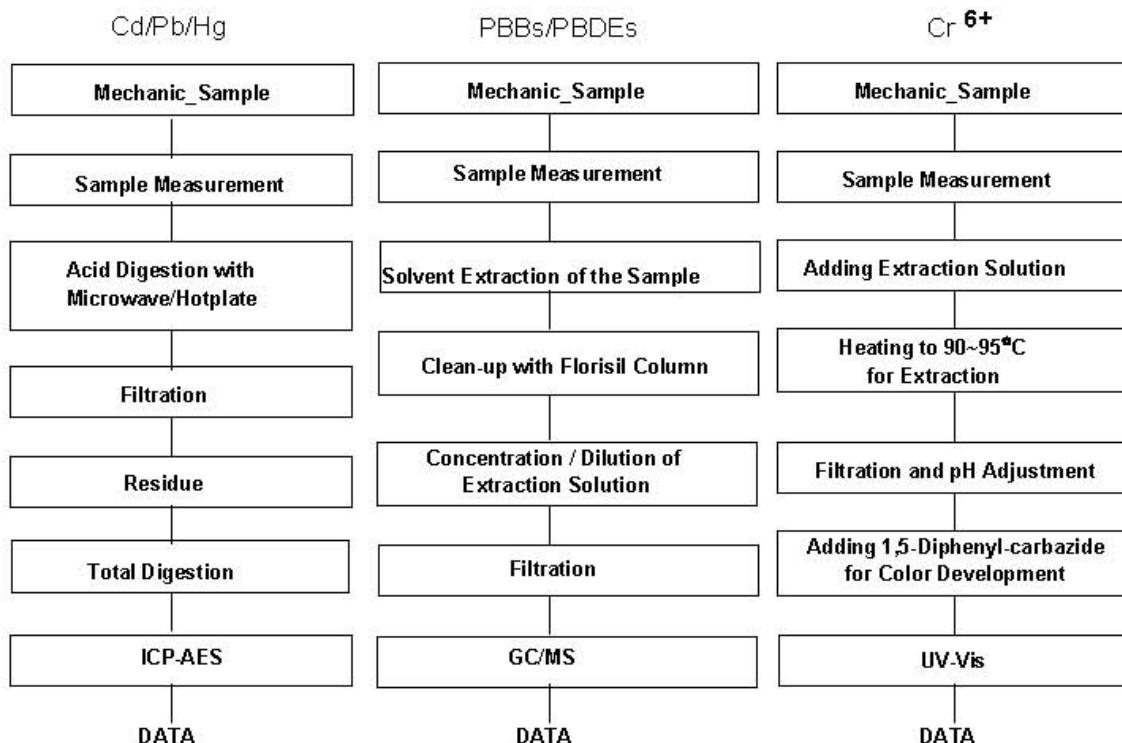
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Testing Flow Chart for RoHS: Cd/Pb/Hg/Cr⁶⁺/PBBs&PBDEs Testing



The samples were dissolved totally by pre-conditioning method according to above flow chart for Cd,Pb,Hg.

Operator Dami Yeom

Section Chief Jeff Jang

*** End ***

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