APPROVAL SPECIFICATION

Prepared By	Reviewed By	Checked By	Approved By

TITLE	Antenna	Model	OVAL	CUSTOMER	Pantech&Curitel

DOCUMENT

NO.	CONTENTS	SHEETS
1	APPROVAL SPECIFICATION	1
2	ANTENNA SPECIFICATION	1

We want to approval the submitted product.

Apporved date : March. 14. 2007.

ANTENNA SPECIFICATION

CONTENTS

8. Antenna Data

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

8.2. Antenna Drawing

8.3. Packing Spec Drawing

8.4. Reliability Test

8.5. Environment test report

1. Approval Check List

Approval Check Lost				
NO	DATE	CHANGE CONTENTS	CHANGE CAUSE	REV
1	2007.03.14	ANTENNA SPECIFICATION		IR
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

2. The quality of the material certification

NO	Part material	Raw material	processing	finishing	EA	Raw material company	Processing plant	etc
1	FRAME	PC(141R-701)	MOLD	-	1	G.E	종일테크노	-
2	SLOT	STS301	PRESS	-	1	세인금속	대진 산업	-
3								
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3. Technical Specifications

3.1 Electrical Specifications.

Electrical Spec.	BAND				
Frequency Range (MHz)	Cellular		GPS	PCS	
V.S.W.R (Max.)	824 MHz	894 MHz	1575 MHz	1850 MHz	1990 MHz
	4.2:1below	1.7:1 below	2.7:1 below	7.5:1 below	2.5:1 below
PEAK GAIN	Tx	Rx	Rx	Tx	Rx
(Min., E2-Plane)	(824~849)	(869~894)	(1575)	(1850~1910)	(1930~1990)
	-2.5dBi	-1dBi	-6.5dBi	-10dBi	-10dBi
AVERAGE GAIN	Tx	Rx	Tx	Tx	Rx
(Min., H-Plane)	(824~849)	(869~894)	(1575)	(1850~1910)	(1930~1990)
	-3.28dBi	-3.05dBi	-6.79dBi	-11.1.0dBi	-6.38.0dBi
Impedance(Nominal)	50 ohms				
Polarization	VERTICAL				
Radiation Pattern	OMNI-DIRECTIONAL				
Maximum Power	2 W				

3.2 Mechanical Specifications

Connector	Board contact pin type
Overall length	See drawing
Operating Temperature	-30°C ~ +80°C
Weight	1.07g

3.3 Packing Specifications

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

4. Test Equipment

The equipment for antenna test is as follows,

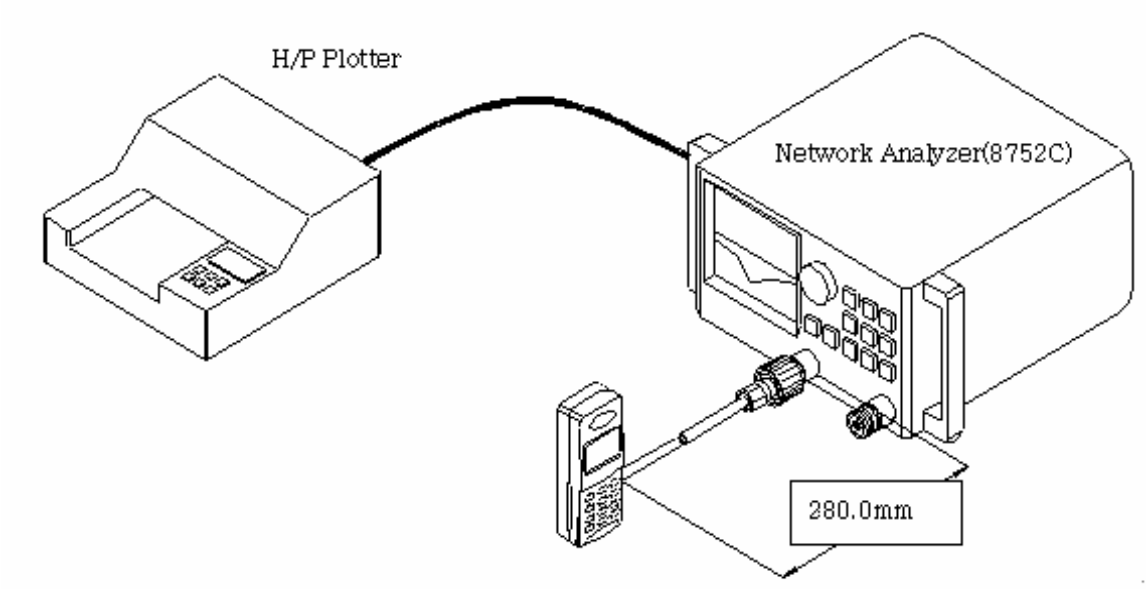
- Network Analyzer (HP8752C) to measure the V.S.W.R., Standing wave ratio(SWR) and impedance bandwidth of antenna
- Standard horn antennas adjustable to the GSM bands
- Standard horn antennas adjustable to the DCS bands
- Standard horn antennas adjustable to the PCS bands
- Standard horn antennas adjustable to the UMTS 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

5. Electrical Demands

5.1 V.S.W.R

The V.S.W.R characteristics must be satisfied the electrical demands with folder open and closed state in the below table.

Frequency Range	Cellular:824 ~ 894 MHz		GPS : 1575 MHz	PCS:1850MHz ~ 1990MHz	
V.S.W.R	824MHz	894MHz	1575MHz	1850MHz	1990MHz
	4.2:1below	1.7:1 below	2.7:1 below	7.5:1 below	2.5:1 below



5.2 Radiation Pattern

The radiation pattern must have the omni-directional characteristic in GSM Band and DCS Band and PCS Band and UMTS 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.

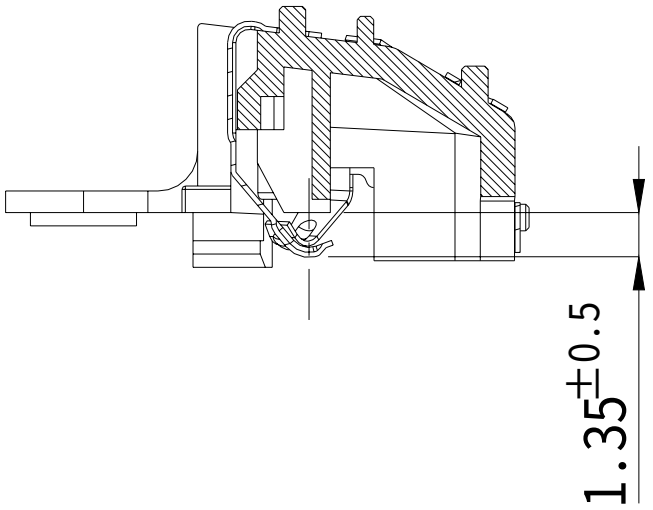
Electrical Spec.	BAND				
Frequency Range (MHz)	Cellular		GPS	PCS	
V.S.W.R (Max.)	824 MHz	894 MHz	1575 MHz	1850 MHz	1990 MHz
	4.2:1below	1.7:1 below	2.7:1 below	7.5:1 below	2.5:1 below
PEAK GAIN	Tx	Rx	Rx	Tx	Rx
(Min., E2-Plane)	(824~849)	(869~894)	(1575)	(1850~1910)	(1930~1990)
	-2.5dBi	-1dBi	-6.5dBi	-10dBi	-10dBi
AVERAGE GAIN	Tx	Rx	Tx	Tx	Rx
(Min., H-Plane)	(824~849)	(869~894)	(1575)	(1850~1910)	(1930~1990)
	-3.28dBi	-3.05dBi	-6.79dBi	-11.1.0dBi	-6.38.0dBi

6. Mechanical Demands

6.1. CONTACT PIN FORCE TEST

Contact pin of antenna must keep 200g/f ±150 in operation distance.

(Operation distance of antenna is same to under drawing. / PCB over rap : 0mm~1.85mm)



6.2. CONTACT PIN RESISTENCE test.

After assemble antenna to test equipment, Contact pins are pressed to nominal assembly position 500 times.

After 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 angle D(45°). The number of drop is 3 times.

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

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.

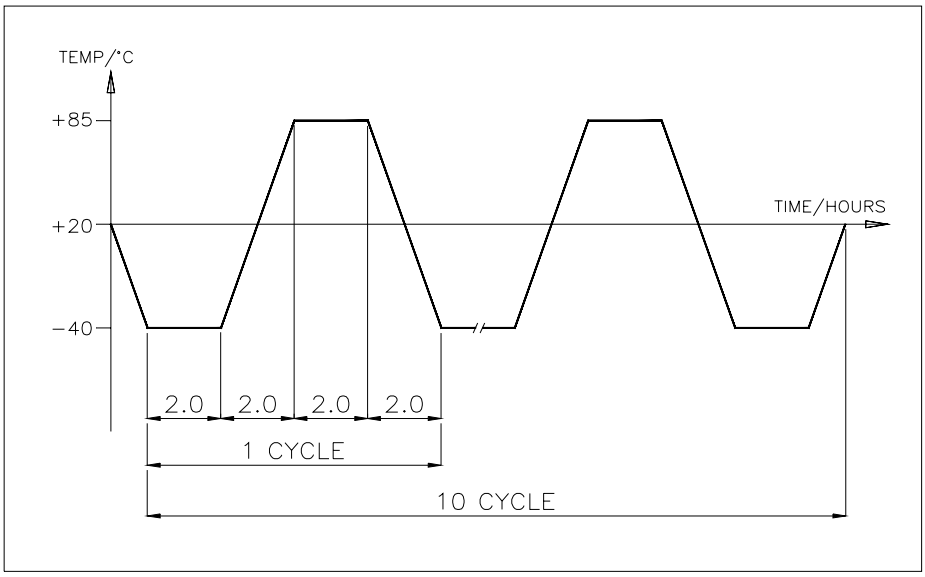
Test: Temperature cycle is as follows. 2 hours at -40°C.

2 hours at +85°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.



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

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 %.

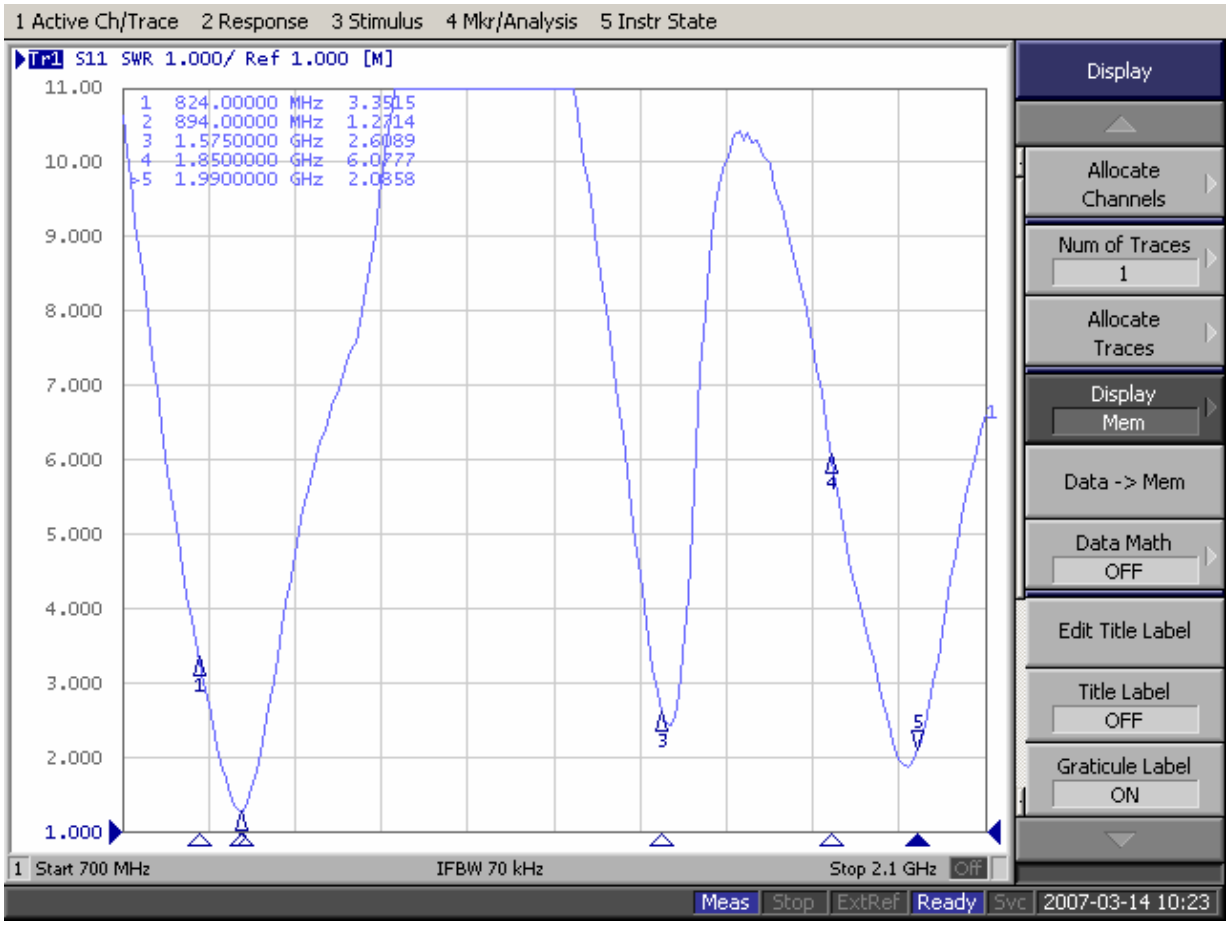
stored for a period of 96 hours at a temperature of +80 °C and a relative humidity of 95 % (total: 192 hour)

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

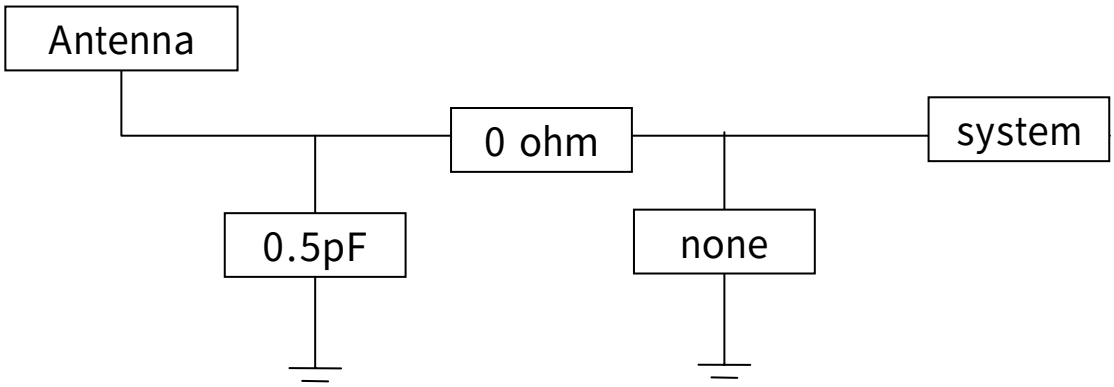
8. Antenna data

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

→ V.S.W.R

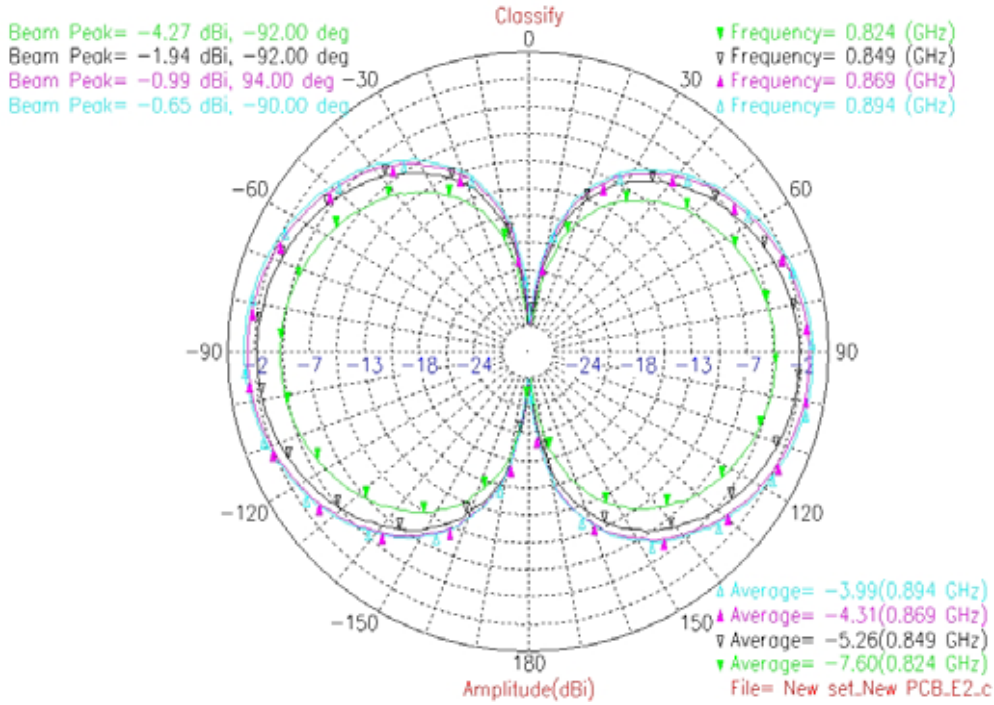


→ Matching Circuit Diagram

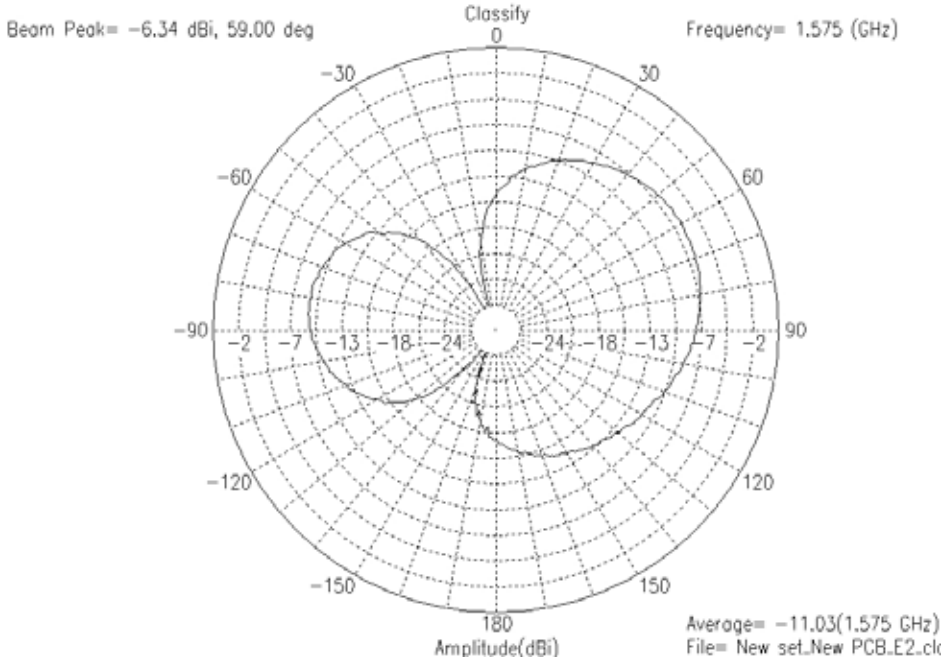


→ GAIN (with Matching Circuit)

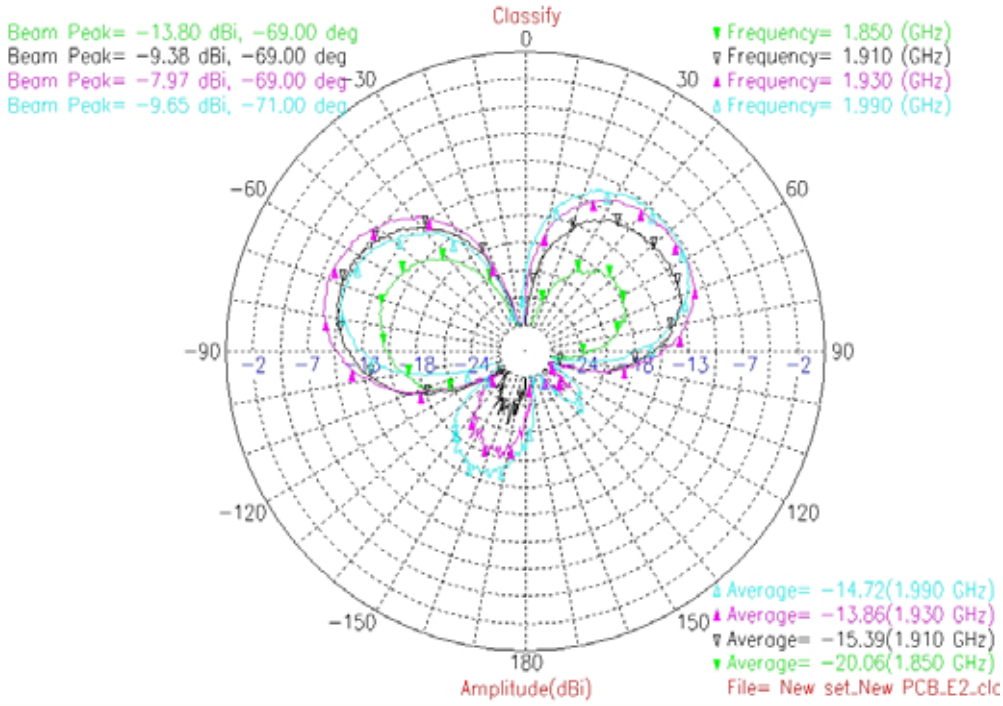
Cellular - E2 _ PLANE PATTERN



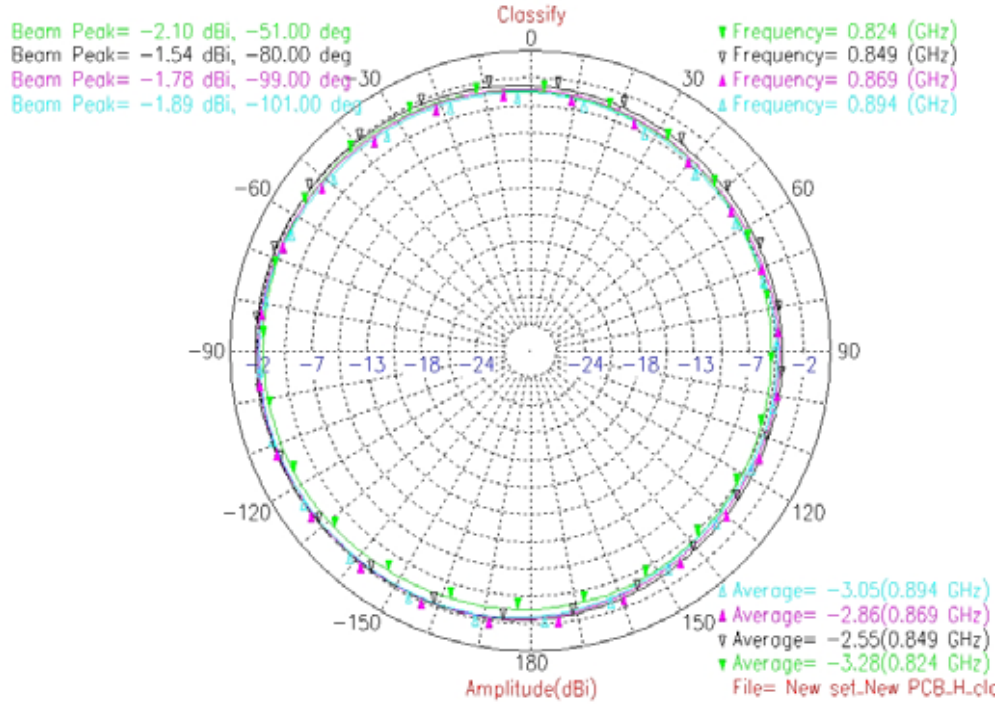
GPS - E2 _ PLANE PATTERN



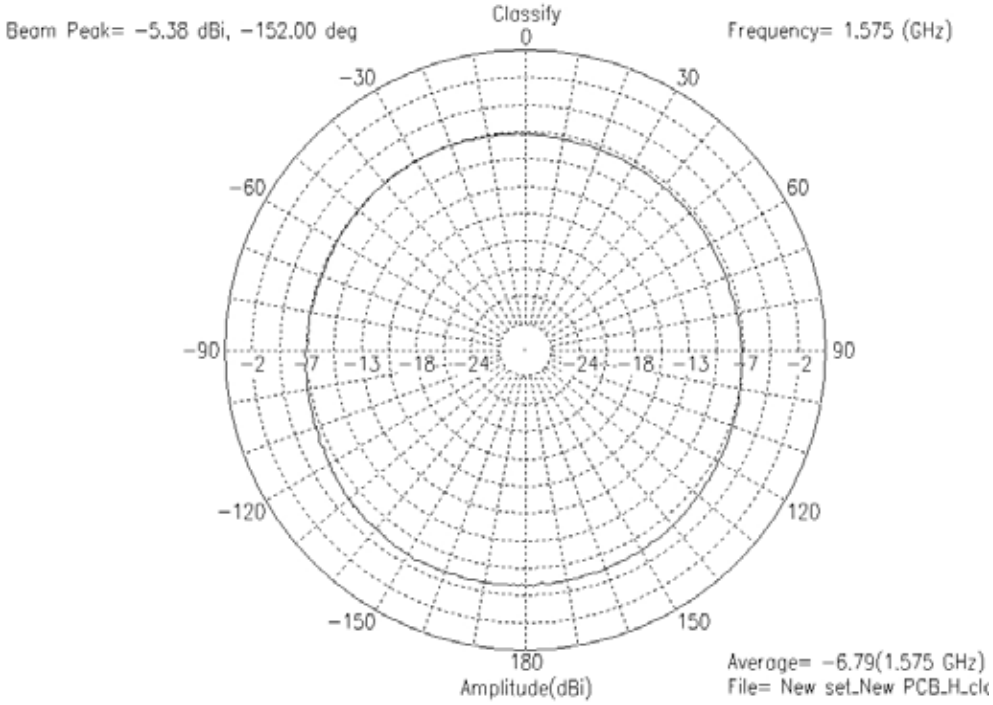
PCS - E2 _ PLANE PATTERN



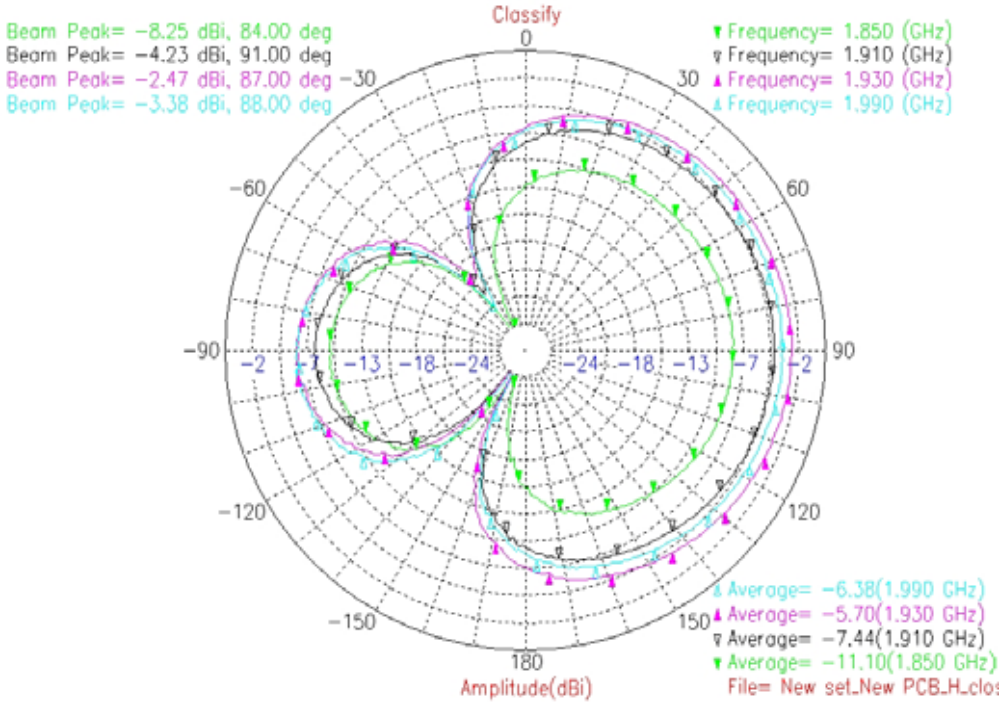
Cellular - H _ PLANE PATTERN



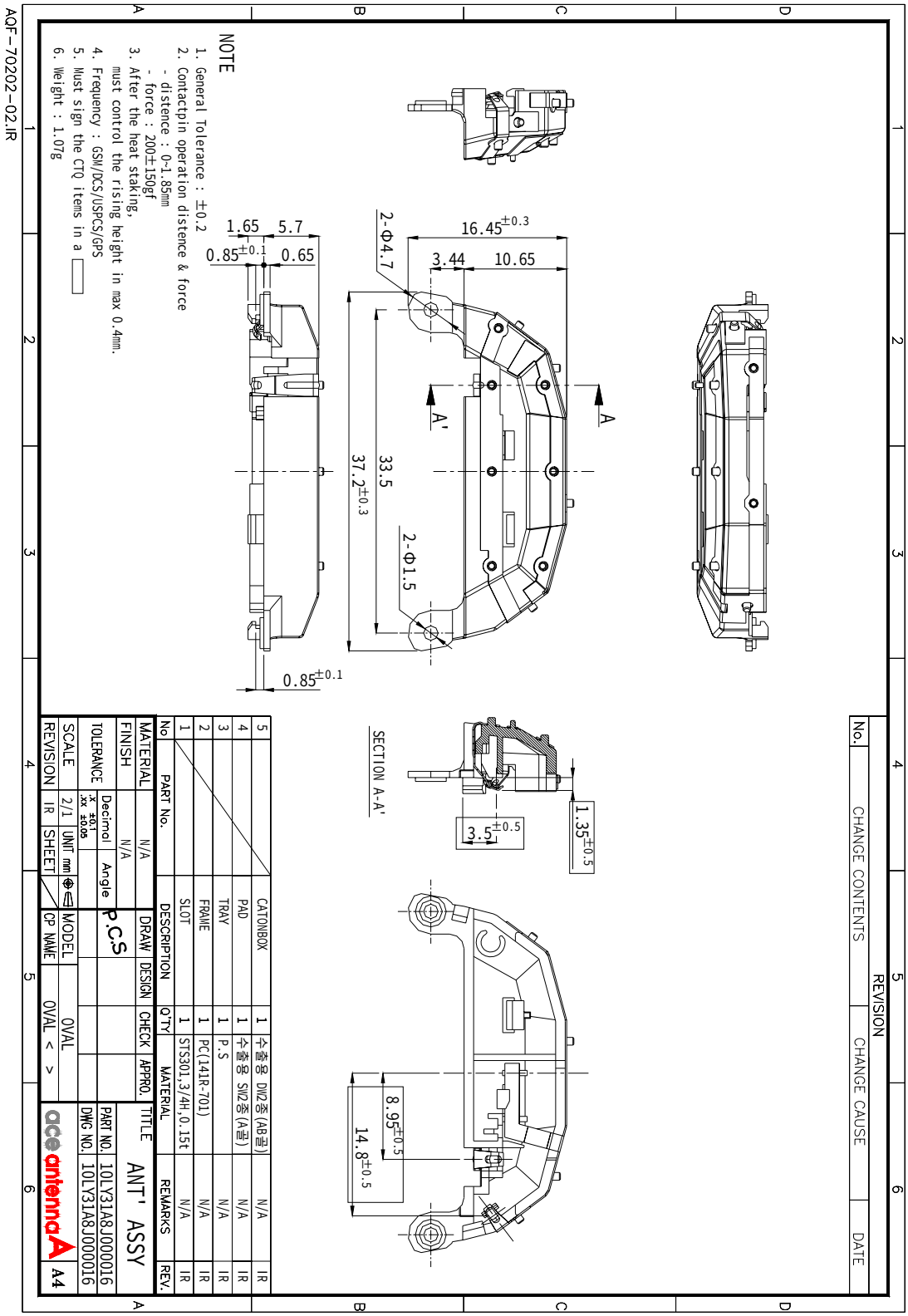
GPS – H _ PLANE PATTERN



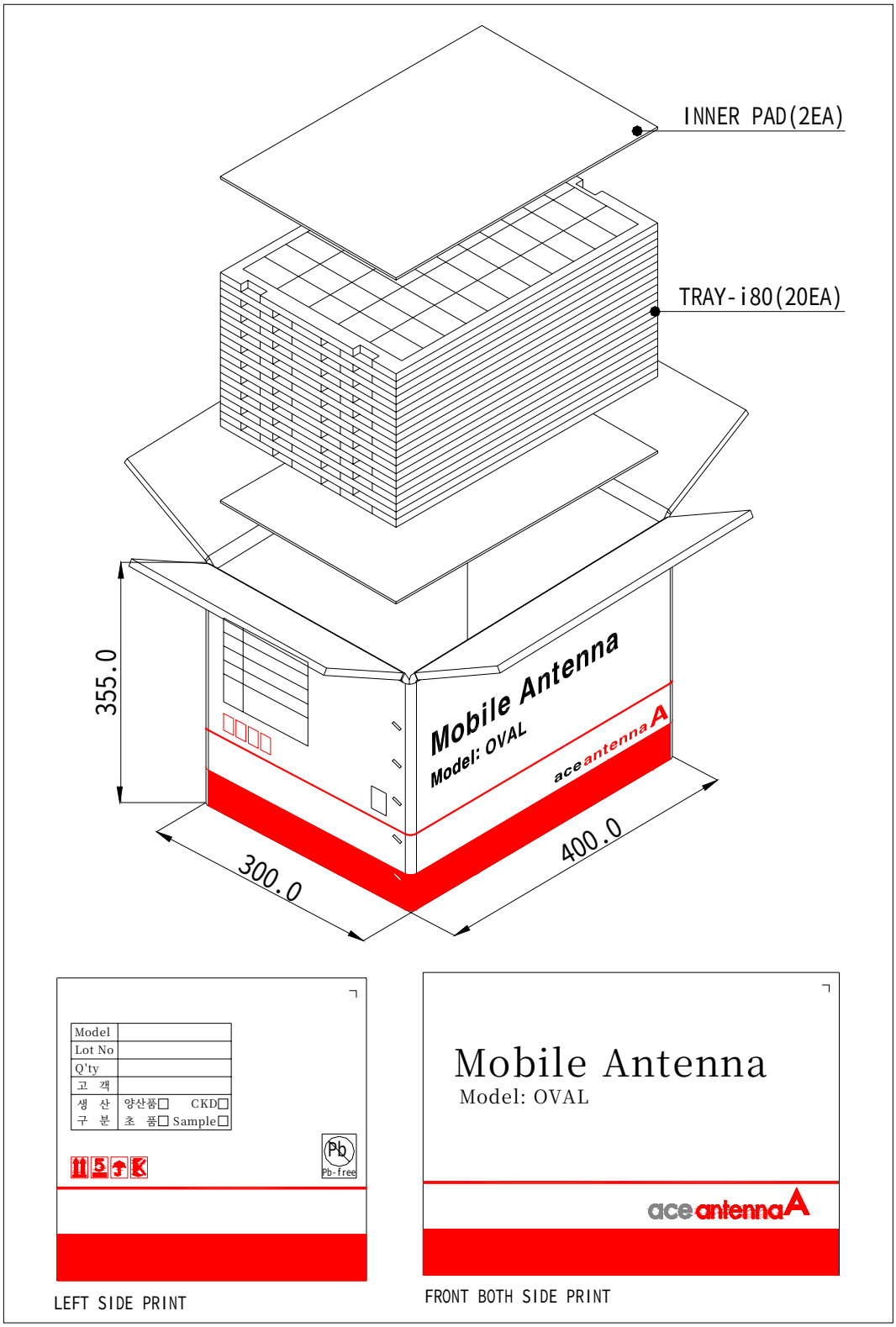
PCS – H _ PLANE PATTERN



8.2. Antenna Drawing



8.3. Packing Spec Drawing.



8.4 Reliability Test.

ace antenna

신뢰성 시험 성적서(1/1) (Reliability Test Report)	결재	담 당	검 토	확 인	승 인
		2/22	/	/	2/22

시 험 항 목	하기 참조	시험일자(기간)	07.02.16~07.02.22	시 험 자	이연환
품명(Model)	OVAL	P&C P/NO.		접수번호	R070220-1
시 료 수	30 개	적 용 규 격	하기 참조	시험 의뢰자	박창신 / 연구팀

1. 시험 목적

■신규 개발 검토 [간이금형] □양산검토용 □양산보증 □변경점[ ] □기타

가승인원 data 첨부용

2. 시험 결과

■합격 □불합격 [불합격 내용 요약 :]

: 염수분무시험 제외 (Slot handmade 제품으로 양산 금형시 시험 예정)

3. 시험항목

□치수 □전기적 특성 ■기구 요구 사항 □환경 요구 사항 □표면코팅 요구 사항

4. 시험 DATA

□ 기구적 요구 사항

항 목	점 검 사 항	X1	X2	X3	X4	X5	결 과
Contact부 작동 Force	안테나 CONTACT PIN은 작동 거리 내에서 하기 FORCE를 유지하여야 한다. -.ANTENNA의 작동거리 : 0~1.85mm	288	296	278	269	295	OK
		287	281	269	277	286	OK
Contact부 반복 동작	안테나를 시험 장비에 조립 후 실제 작동 거리의 최대치 안을 500회 반복하여 누른다. 시험 후 Contact 작동 Force는 시험전 규격을 만족하여야 한다. (Cycle time: 60회/min)	274	287	273	265	288	OK
		269	273	271	260	272	OK
Drop Test	안테나를 단말기에 조립 후 1.5m 높이에서 쇠판(두께 20mm)에 단말기 각 면당(6면) 5회 낙하시킨다. 외관상 결함이 발생해서는 안되고 전기적, 기구적 요구사항을 만족 할 것	277	267	271	265	276	OK
		270	274	278	270	279	OK

배 포 처	

AQF-80500-03.1R

8.5. Environment test report

8.5.1 FRAME [141R-701]

Intertek Caleb Brett
Testing Center
240-2, Yongam-ri, Chongryang-myun,
Ulju-gun, Ulsan, 689-865 Korea
Tel : 052 257 6752 Fax : 052 276 6756

TEST REPORT

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

Report No. E06-12-134 Date: Jan. 02, 2007

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

Name/Type of Product : 141R-701
Sample ID No. : S06-12-134
Manufacturer/Vender : GE Plastics Korea
Country of Origin : Korea

Sample received : Dec. 29, 2006
Testing Date : Dec. 29, 2006~ Jan. 02, 2007
Testing Laboratory : Intertek Caleb Brett Testing Center
Testing Environment : Temperature : 24℃ 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 Caleb Brett Testing Center

Intertek Caleb Brett
Testing Center
240-2, Yongam-ri, Chongryang-myun,
Ulju-gun, Ulsan, 689-865 Korea
Tel : 052 257 6752 Fax : 052 276 6795

TEST REPORT

Report No. E06-12-134 Date: Jan. 09, 2007

Sample ID No. : S06-12-134
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	2	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	2	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 Caleb Brett Testing Center

Intertek Caleb Brett
Testing Center
240-2, Yongam-ri, Chongryang-myun,
Ulju-gun, Ulsan, 689-865 Korea
Tel : 052 257 6752 Fax : 052 276 6790

TEST REPORT

Report No. E06-12-134 Date: Jan. 02, 2007

Sample ID No. : S06-12-134
Sample Description : 141R-701

* View of sample as received;-

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

8.5.2 SLOT [STS 301]

SGS

Test Report No. F690501/LF-CTSGP06-32016 Date: December 22, 2006 Page 1 of 4

To: **TAIHAN ELECTRIC WIRE CO., LTD**
603, Seongkok-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.	: GP06-32016
Received Date	: December 18, 2006
Test Performing Date	: December 19, 2006
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)	: SAMSUNG ELECTRONICS, LG ELECTRONICS

Jade Jang
Patrick An
Monet Jeong
Jinee Song
/Testing Person

SGS Testing Korea Co. Ltd.
Jeff Jang
Jeff Jang / Chemical Lab Mgr

SGS

Test Report No. F690501/LF-CTSGP06-32016 Date: December 22, 2006 Page 2 of 4

Sample No. : GP06-32016.001
Sample Description : STS301
Style/Item No. : N/A
Comments : Material is stainless.
Silver metal

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3050B(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) ppm = mg/kg
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) ** = Qualitative analysis (No Unit)
(6) Negative = Undetectable / Positive = Detectable

SGS

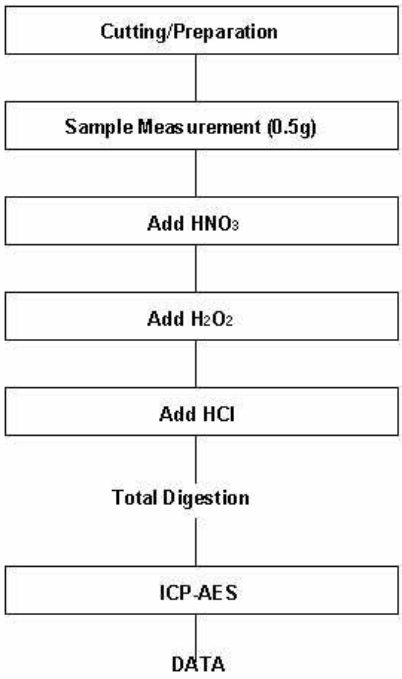
Test Report No. F690501/LF-CTSGP06-32016 Date: December 22, 2006 Page 3 of 4

Picture of Sample as Received:

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

Flow Chart of Digestion

(EPA 3050B for Cd, Pb)



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

Operator Lauren Kim

Section Chief Jeff Jang

*** End ***

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