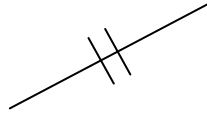


APPROVAL SHEET

고 객 명	한빛전자		
업 체 명	KARAM SOLUTION		
제 품 명	KRS-COMBO-WA		
모 델 명	MR50001WF		
제 출 일 자	2011 년 07 월 26 일		
제 품 사 진			
	길이: 166.21mm 직경: 9.20mm		
부 서	담 당	검 토	승인
회 로			
	손호철 / 전임	정창우 / 책임	
기 구			
	김종남 / 선임	김진석 / 책임	
품 질			
	이윤석 / 전임		이진우 / 수석

본사 : 경기도 시흥시 은행동 249 신창테크노타운

TEL: 031)312-9577 / FAX: 031)312-9670

연구소 : 서울시 금천구 가산동 448 대륭테크노타운3차 905호

TEL: 02)1661-9577 / FAX: 02)2107-7299



안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	1

Contents

1. 제품사양 변경 이력	2
1.1 승인원 이력 List	2
2. 회로 사항	3
2.1 전기적 요구 사항	3
2.1.1 Set 전기적 사양	3
2.1.3 복사패턴	5
2.1.4 안테나 이득	5
2.2 시험 조건	7
2.2.1 시험환경(조건/방법)	7
2.2.2 시험장비	7
3. 기구 사항	8
3.1 재질 증명서	8
3.2 기구적 요구 사항	9
3.2.1 기구도면	9
3.2.2 포장 사양 및 도면	10
3.2.3 비틀림 시험	12
3.2.4 인장 시험	12
3.2.5 낙하 시험	13
3.2.6 BENDING 시험	13
3.2.7 외관 시험	14
4. 품질 사항	15
4.1 품질 요구 사항	15
4.1.1 치수(CTQ 포함)	15
4.1.2 제조공정도	16
4.1.3 열충격	17
4.1.4 고온고습	17
4.1.5 고온저장	18
4.1.6 저온저장	18
4.1.7 염수분무	18
4.2 ROHS 성적서	19
4.2.1 유해물질 성분 분석표	57

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	2

1.1 승인원 이력 LIST

승인원 이력 LIST								
NO	REV	한빛전자	개정 전 REV (날짜)	개정 후 REV (날짜)	상세개정 및 변경 내용	수량	요청 부서	진행 단계
1	00			2011-07-26	승인용	30EA	개발	
2								
3								
4								
5								
6								
7								
8								
9								
10								

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	3

2.1전기적 요구 사항

2.1.1 Set 전기적 사양(정재파비 포함)

안테나는 전기적 사양에 명시되어 있는 정재파비 요구 사항을 만족해야 한다.

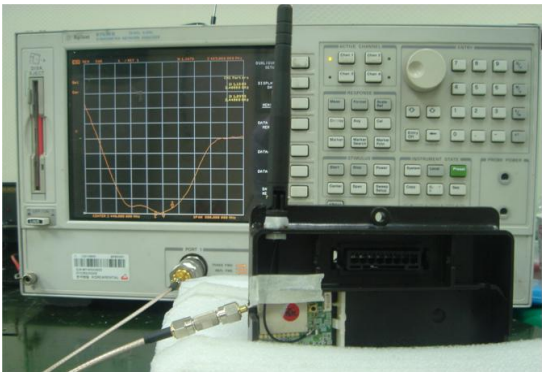
- SET 거치 상태

Electrical Spec.			
주파수 (Frequency Range)	WiFi		
	2400MHz	2440MHz	2485MHz
정재파(V.S.W.R)	3.0 이하	3.0 이하	3.0 이하
이득 (Peak GAIN) E2-Plane 기준	1.0dBi 이상	0.0dBi 이상	-0.5dBi 이상
이득 (Average GAIN) H-Plane 기준	-6.5dBi 이상	-7.0dBi 이상	-6.0dBi 이상
공칭 임피던스	50 ohms		
편파	수직		
복사 패턴	OMNI DIRECTIONAL		
최대 입력 전력	2 Watts		

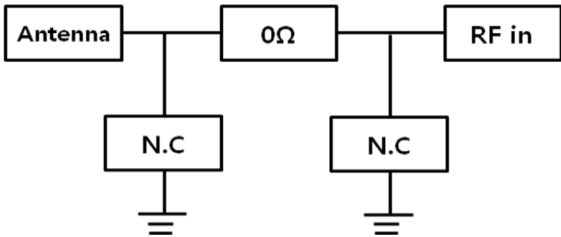
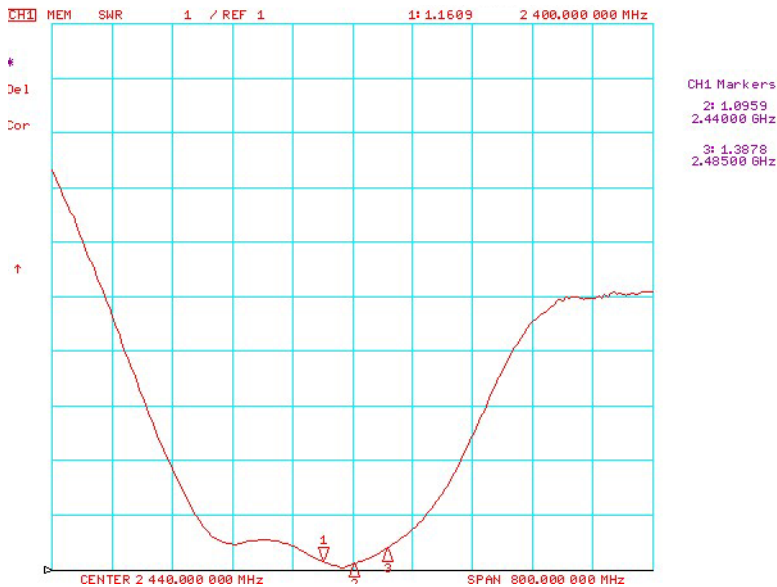
안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	4

- SET 거치 상태

구 분	WiFi		
	2400MHz	2440MHz	2485MHz
정재 파비(V.S.W.R)	3.0 이하	3.0 이하	3.0 이하



- 전기적 특성 VSWR



안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	5

2.1.2 복사 패턴

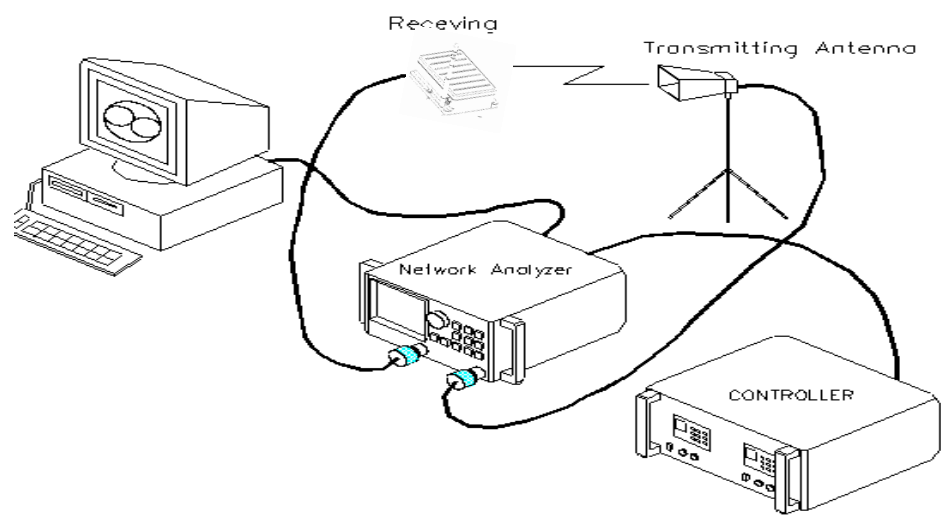
이 안테나의 복사 패턴은 H-Plane에서 무지향성 특성을 갖는다.

2.1.3 안테나 이득

안테나의 이득은 WiFi 대역의 STANDARD HORN 안테나를 이용하여 Calibration 한 후,
E2-Plane에서 측정한 Peak Gain 값으로서 단위는[dBi]이며, 아래의 사양을 만족하여야 한다.

- Set 거치 상태

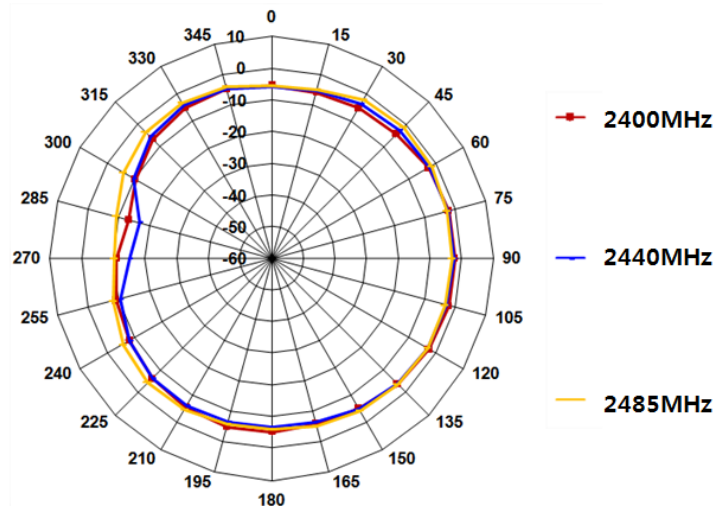
주파수 (Frequency Range)	WiFi		
	2400MHz	2440MHz	2485MHz
이득 (Peak GAIN) E2-Plane 기준	1.0dBi 이상	0.0dBi 이상	-0.5dBi 이상
이득 (Average GAIN) H-Plane 기준	-6.5dBi 이상	-7.0dBi 이상	-6.0dBi 이상



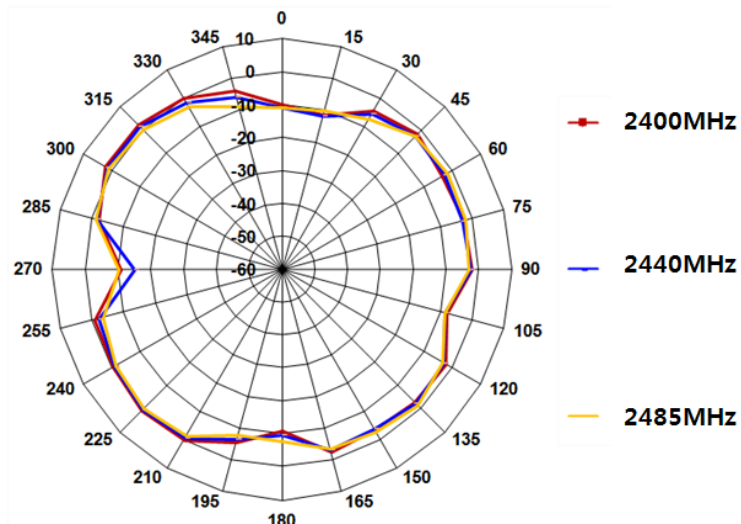
안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	6

- GAIN

Frequency(MHz)		2400	2440	2485
H	AVG (dBi)	-4.6	-5.1	-4.2
	Peak (dBi)	-1.4	-2.3	-1.2
	Min (dBi)	-11.8	-16.4	-10.1



Frequency(MHz)		2400	2440	2485
E2	AVG (dBi)	-2.1	-2.7	-3.0
	Peak (dBi)	2.5	1.7	1.2
	Min (dBi)	-11.5	-15.0	-10.9



안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	7

2.2 시험 조건

2.2.1 시험 환경 조건

전기, 기구적 및 환경시험은 표준상태를 기준으로 전처리를 한 후 시험한다.

표준상태란 온도 15℃ ~ 25℃와 상대습도 25% ~ 80%, 기압 86 ~ 106kPa를 의미하며, 전처리의 목적은 시험 전 이력의 영향을 제거하거나 또는 부분적으로 중화하거나 하는 목적으로 시험품을 처리한다. 이것은 시험방법의 최초의 과정을 의미하며, 시험품의 특성을 측정 및 시험 전에 안정상태로 하기 위함을 목적으로 한다.

(표준상태 기준: 20℃ , 대기압)

- 기구적 시험은 전처리 과정을 1시간으로 한다.
- 환경 시험 후 기구적 시험은 전처리 과정을 2시간으로 한다.
- 단, 전처리 과정 진행 후 시험 전 이력이 있을 시 전처리 과정을 연장한다.

2.2.2 시험 장비

이 안테나의 시험을 위해 아래의 장비가 필요하다.

- 안테나의 정재파비 및 임피던스 측정을 위한 Network Analyzer.
- 송신 안테나를 상.하 이동시키는 상.하 이송부와 수신 안테나를 회전 시키는 Positioner, 이를 제어하는 Controller.
- WiFi 대역에서 사용하는 STANDARD HORN 안테나.
- 케이블, 콘넥터 및 측정 장비가 구비된 전파 무반사실.
- 치수 측정을 위한 디지털 버니어캘리퍼스.
- 환경 시험을 하기 위한 온도 챔버.
- 진동 시험기.
- 염수 분무 시험기.

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	8

3. 기구사항

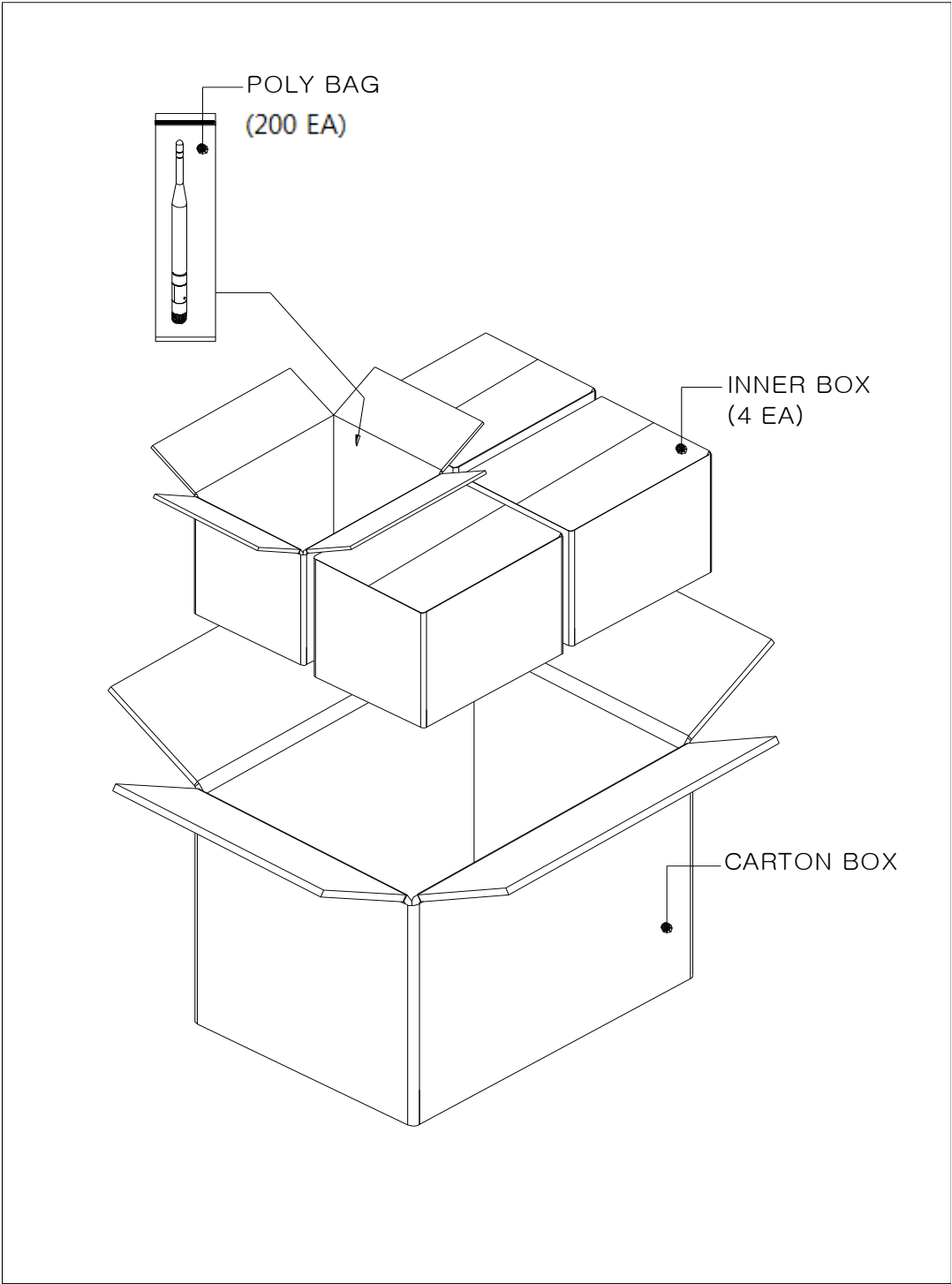
3.1 재질 증명서

NO	부품명	원소재명	수량	원소재 업체	가공 업체	비고
1	PCB	원판 (DS-7402)	1	DOOSAN	써킷라인	
		PSR Ink (DPR700BLACK)	1	DOZENTECH	써킷라인	
		Marking Ink (DPR700WHITE)	1	DOZENTECH	써킷라인	
		OSP	1	INSOL	써킷라인	
2	Cable	CABLE (FCM SH H1372 BLACK)	1	SHINDIN	ECT	
3	JOINT-1	POLYMER (KN126)	1	KOLON PLASTIC	가람솔루션	
4	JOINT-2	POLYMER (KN126)	1	KOLON PLASTIC	가람솔루션	
5	COVER	KEYFLEX (BT1040D-NP)	1	LG 화학	가람솔루션	
6	BOND	LOCTITE401	1	HENKEL	가람솔루션	
7						
8						
9						
10						

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	10

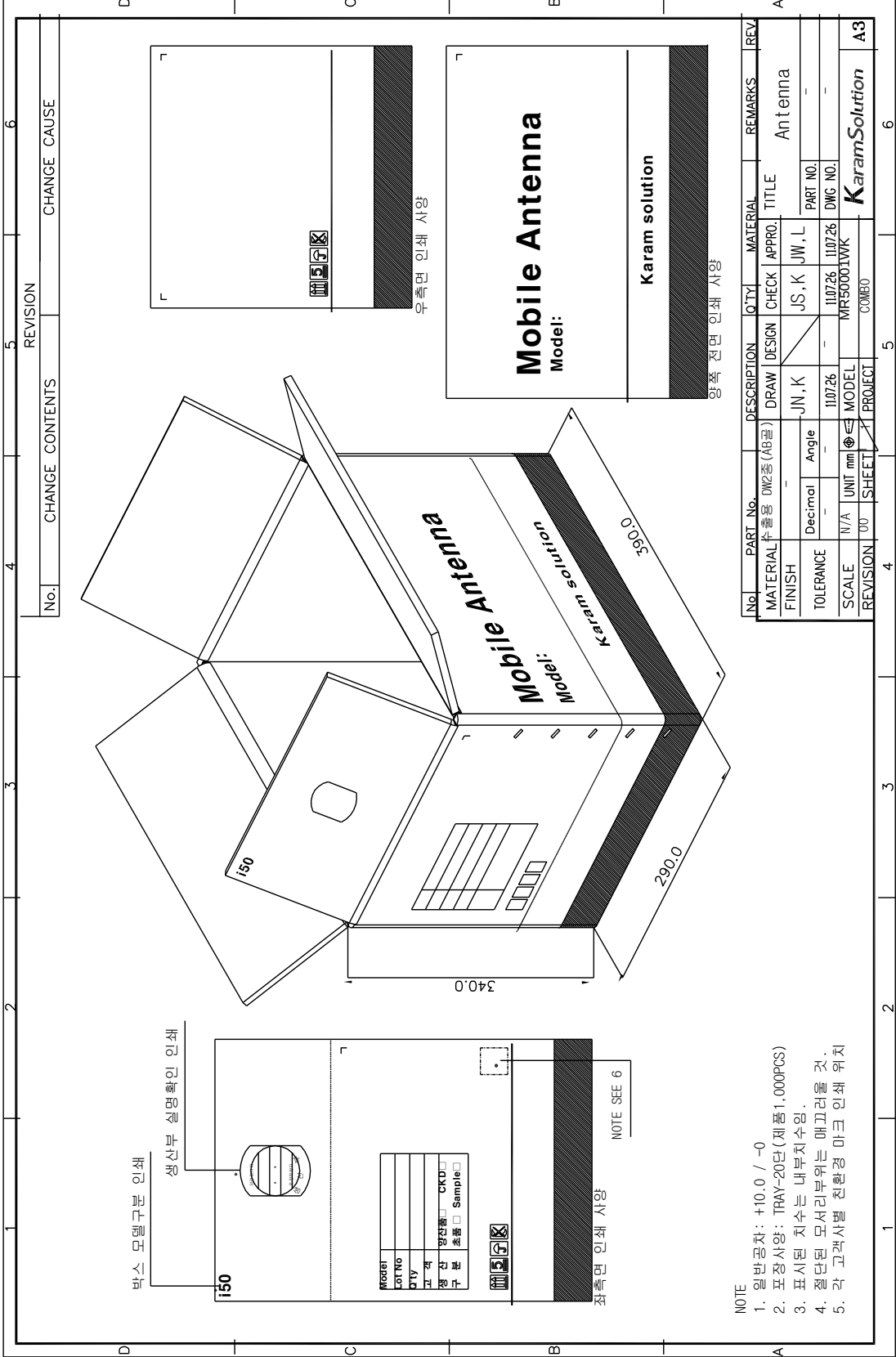
3.2.2 포장 사양 및 도면

품 명	수 량	비 고
POLY BAG	1/200 EA	
CARTON BOX	800 PCS	



안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	11

- BOX 도면

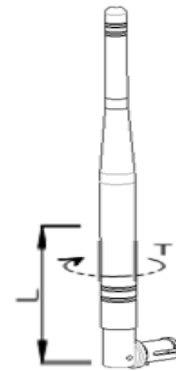


안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	12

3.2.3 비틀림 시험

안테나를 시험 장비에 조립한 후 시계 방향으로 밑 단에서 위쪽 L인 지점에서 T의 힘으로 가하여 비틀림 시험을 한다. 시험 후 외관상 결함이 없어야 하며, 기구적으로 결합되어 있어야 한다. 안테나는 시험 후 전기적 요구 사항을 만족해야 한다.

T (Kg/f)	3
L (mm)	2/3
비 고	-

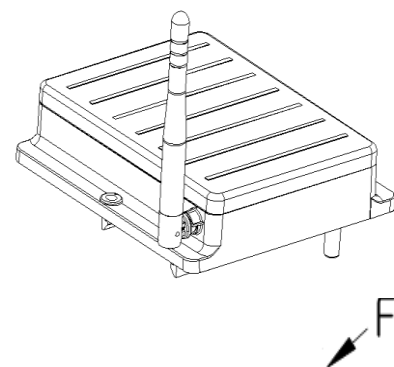


3.2.4 인장 시험

안테나를 시험 장비에 조립 후 F(kg/f)의 지정된 힘을 시간(s)동안 가한다. 시험 후 외관상 결함이 없어야 하며,상대기구물과 조인트가 기구적으로 결합되어 있어야 한다.

안테나는 시험 후 전기적 요구 사항을 만족해야 한다

F (kg/f)	7
시 간(s)	30
비 고	-



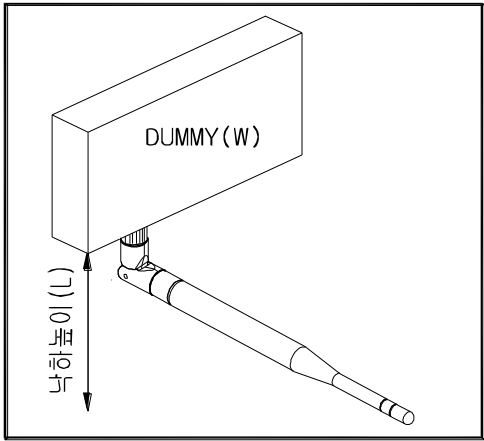
안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	13

3.2.5 낙하 시험

안테나를 시험 지정된 무게 W(g) DUMMY에 조립 후 L(Cm)의 지정된 높이에서 나무판 표면에 ANTENNA 방향으로 1회 자유낙하 시킨다.

시험 후 안테나는 외관상 결함이 없어야 하며 전기적 SPEC을 만족해야 한다.

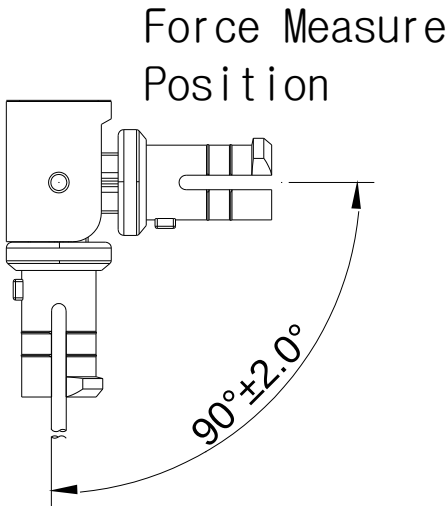
W (g)	SET 중량
L(Cm)	100
비 고	-



3.2.6 BENDING 시험

안테나의 BENDING력은 지정된 F (Kgf) 이상의 힘을 가져야 한다.

W (kgf)	0.5
비 고	-



안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	14

3.2.7 외관 검사

검사내용	검사(판정)기준	측정도구/방법	검사방식	기록
흑점 백점 이물질	직경이 0.35mm 이하, (동일면상에 3점 이하)	흠집, 이물 기준게이지 (or 한도건본)와 비교 검사	G-11 AQL-0.65	검사성적서

※검사 환경: 400 ±50 Lux이상의 조도에서 대상물과 40cm 떨어져 육안검사.

※동일면상: 제품 고정시 육안으로 보이는 면

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	15

4. 품질사항

4.1 품질 요구사항

4.1.1 치수 DATA

치수측정 data

Technical drawing of a probe with dimension callouts 1 through 7. The drawing shows a side view of the probe with a dashed centerline. The dimensions are as follows:

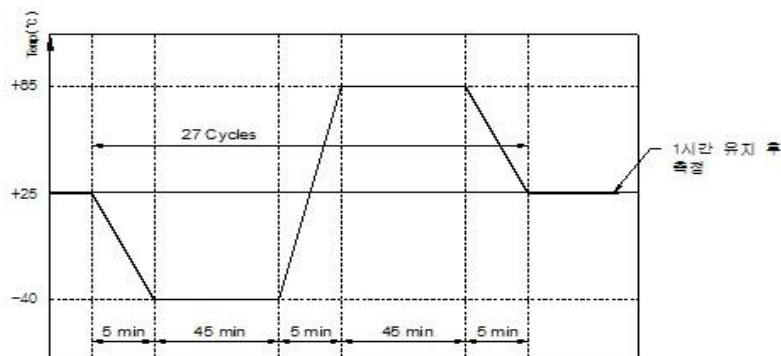
- 1: Total length 101.21 ± 0.2
- 2: Distance from tip to mounting hole 65 ± 3.0
- 3: Distance from tip to center of mounting hole 13.46 ± 0.2
- 4: Distance from center of mounting hole to start of taper 11.2 ± 0.2
- 5: Length of tapered section 76.4 ± 0.2
- 6: Diameter of mounting hole $\phi 6.5 \pm 0.2$
- 7: Diameter of tapered section $\phi 9.2 \pm 0.2$

치수측정 Data											
Dimension (단위 : mm)								외관	판정		
No.	CTQ Dimension										
	1	2	3	4	5	6	7				
Spec	101.21±0.20	65.00±3.00	13.46±0.20	11.20±0.20	76.40±0.20	φ6.50±0.20	φ9.20±0.20				
X1	101.09	64.85	13.54	11.18	76.42	6.52	9.18	OK	합격		
X2	101.13	65.19	13.52	11.16	76.41	6.48	9.22	OK	합격		
X3	101.08	64.79	13.49	11.21	76.48	6.53	9.19	OK	합격		
X4	101.19	65.02	13.56	11.15	76.41	6.49	9.17	OK	합격		
X5	101.08	64.93	13.52	11.13	76.52	6.51	9.19	OK	합격		
X6	101.07	64.96	13.58	11.18	76.51	6.46	9.22	OK	합격		
X7	101.11	65.02	13.51	11.17	76.53	6.49	9.18	OK	합격		
X8	101.07	65.07	13.56	11.12	76.52	6.52	9.19	OK	합격		
X9	101.11	64.99	13.52	11.16	76.49	6.47	9.23	OK	합격		
X10	101.06	65.02	13.55	11.18	76.51	6.52	9.17	OK	합격		
Max	101.19	65.19	13.58	11.21	76.53	6.53	9.23				
Min	101.06	64.79	13.49	11.12	76.41	6.46	9.17				
Avg	101.10	64.98	13.54	11.16	76.48	6.50	9.19				
StDev	0.04	0.11	0.03	0.03	0.05	0.02	0.02				

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	17

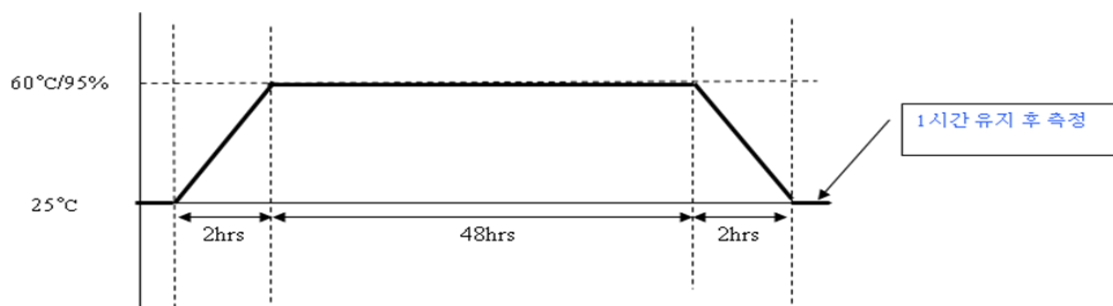
4.1.3 열 충격 시험

안테나를 챔버에 놓는다. 온도를 다음과 같이 순환시킨다. 온도를 5분 동안 -40°C 로 감소시키고 45분 동안 -40°C 로 유지시키고, 5분 동안 $+85^{\circ}\text{C}$ 로 증가시킨 다음 45분 동안 $+85^{\circ}\text{C}$ 로 유지시킨다. 이 과정을 27회 반복하고 $+25^{\circ}\text{C}$ 에서 끝낸다. 1시간 동안 $+25^{\circ}\text{C}$ 를 유지 후, 안테나를 꺼내어 VSWR을 측정한다. 외관상 결함이 발생해서는 안되고, 시험 후 측정하는 동안 전기적 요구 사항을 만족해야 한다.



4.1.4 고습 저장 시험

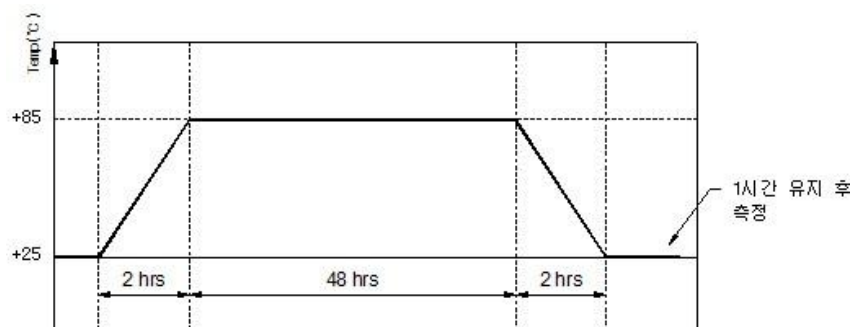
안테나를 챔버에 놓는다. 온도/습도를 2시간 동안 $+60^{\circ}\text{C}/95\%$ 로 증가시키고, 48시간 동안 유지시키고, 2시간 동안 $+25^{\circ}\text{C}/0\%$ 로 감소시키고, 1시간 동안 $+25^{\circ}\text{C}/0\%$ 를 유지 후, 안테나를 꺼내어 VSWR을 측정한다. 외관상 결함이 발생해서는 안되고, 측정하는 동안 전기적 요구 사항을 만족해야 한다.



안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	18

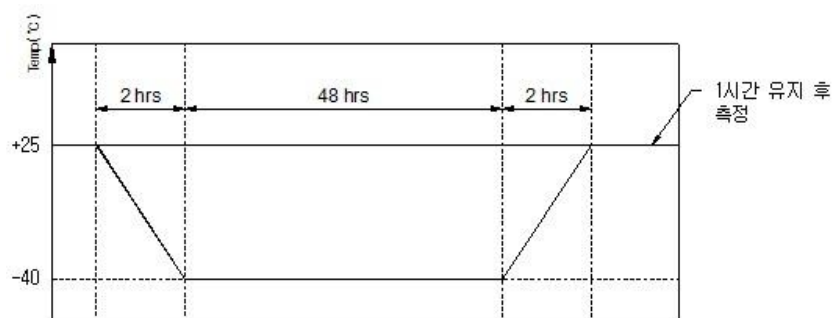
4.1.5 고온 저장 시험

안테나를 챔버에 놓는다. 온도를 2시간 동안 +85℃로 증가시키고, 48시간 동안 +85℃로 유지시킨, 다음 2시간 동안 25℃로 감소시키고, 1시간 동안 25℃를 유지 후, 안테나를 꺼내어 VSWR을 측정한다. 외관상 결함이 발생해서는 안되고, 시험 후 측정하는 동안 전기적 요구사항을 만족해야 한다.



4.1.6 저온 저장 시험

안테나를 챔버에 놓는다. 온도를 2시간 동안 -40℃로 감소시키고, 48시간 동안 -40℃로 유지시킨 다음 2시간 동안 25℃로 증가시키고, 1시간 동안 25℃를 유지 후, 안테나를 꺼내어 VSWR을 측정한다. 외관상 결함이 발생해서는 안되고, 시험 후 측정하는 동안 전기적 요구사항을 만족해야 한다.



4.1.7 염수 분무 시험(CORROSION)

안테나를 35℃에서 Sodium 5% 수용액으로 포화된 대기에 48시간 동안 방치한다.

시험 후에 기구적 손상이 없어야 하며, 전기적으로 만족해야 한다.

시험은 IEC 68-2-11의 규격을 만족해야 한다

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	19

4.1.6 ROHS 문서

▶ PCB 원판 [DS-7402]



TEST REPORT

Applicant : Doosan Corporation Electro-Materials BG
 Address : 5th Floor, Doosan Technical Center Bldg. 39-3 Sungbok-dong, Suji-gu,
 Yongin-si, Kyungki-do, Korea

Page: 1 of 4

Report No. RT11R-51374-001-E1 Date: Apr. 07, 2011

Sample Description : The following submitted sample(s) said to be:-
 Name/Type of Product : DS-7402
 Sample ID No. : RT11R-51374-001
 Manufacturer/Vender : Doosan Corporation Electro-Materials BG

Sample received : Apr. 06, 2011
 Testing Date : Apr. 06, 2011 ~ Apr. 07, 2011
 Testing Environment : Temperature : (24 ± 2) °C, Humidity : (60 ± 5) % R.H.

Test Type : RoHS wet chemical analysis
 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.

Approved by,



Jade Jang / Lab. Technical Manager

Authorized by,



Bo Park / Lab. General Manager

This Test Report is issued by the Company subject to its Terms and Conditions of Business printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. This Test Report shall not be reproduced, except in full, without prior written consent of the Company.

Intertek Testing Services Korea Ltd.

Seoul Office: Tel : 02-6090-9500 Fax : 02-3409-0026 Daegu Office : Tel : 053-600-8647 Fax : 053-600-8645 Web Site : www.intertek.co.kr
 Seoul Lab. Address : 1/F, A-ju Digital Tower, #284-56, Seongsu 2-ga, Seongdong-Gu, Seoul, 133-833 Korea
 Ulsan Lab. Address : #340-2, Yongam-Ri, Chongryang-Myun, Ulsu-Gun, Ulsan 689-865 Korea

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	20



TEST REPORT

Report No. RT11R-S1374-001-E1

Page: 2 of 4

Date: Apr. 07, 2011

Sample ID No. : RT11R-S1374-001

Sample Description : DS-7402

Test Item	Unit	Test Method	MDL	Result
Cadmium (Cd)	ug/kg	With reference to IEC 62321 Edition 1.0 : 2008, by acid digestion and determined by ICP-OES	0.5	N.D.
Lead (Pb)	ug/kg		5	N.D.
Mercury (Hg)	ug/kg		2	N.D.
Hexavalent Chromium (Cr ⁶⁺) (For non-metal)	ug/kg	With reference to IEC 62321 Edition 1.0 : 2008, by alkaline digestion and determined by UV-VIS Spectrophotometer	1	N.D.
Polybrominated Biphenyl (PBBs)				
Monobromobiphenyl	ug/kg	With reference to IEC 62321 Edition 1.0 : 2008, by solvent extraction and determined by GC/MS	5	N.D.
Dibromobiphenyl	ug/kg		5	N.D.
Tribromobiphenyl	ug/kg		5	N.D.
Tetrabromobiphenyl	ug/kg		5	N.D.
Pentabromobiphenyl	ug/kg		5	N.D.
Hexabromobiphenyl	ug/kg		5	N.D.
Heptabromobiphenyl	ug/kg		5	N.D.
Octabromobiphenyl	ug/kg		5	N.D.
Nonabromobiphenyl	ug/kg		5	N.D.
Decabromobiphenyl	ug/kg		5	N.D.
Polybrominated Diphenyl Ether (PBDEs)				
Monobromodiphenyl ether	ug/kg	With reference to IEC 62321 Edition 1.0 : 2008, by solvent extraction and determined by GC/MS	5	N.D.
Dibromodiphenyl ether	ug/kg		5	N.D.
Tribromodiphenyl ether	ug/kg		5	N.D.
Tetrabromodiphenyl ether	ug/kg		5	N.D.
Pentabromodiphenyl ether	ug/kg		5	N.D.
Hexabromodiphenyl ether	ug/kg		5	N.D.
Heptabromodiphenyl ether	ug/kg		5	N.D.
Octabromodiphenyl ether	ug/kg		5	N.D.
Nonabromodiphenyl ether	ug/kg		5	N.D.
Decabromodiphenyl ether	ug/kg		5	N.D.

Tested by : Nikkie Lee, Leo Kim, Ellen Jung, Jessica Kang

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

This Test Report is issued by the Company subject to its Terms and Conditions of Business printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. This Test Report shall not be reproduced, except in full, without prior written consent of the Company.

Intertek Testing Services Korea Ltd.

Seoul Office: Tel : 02-6090-9500 Fax : 02-3409-0026 Daegu Office: Tel : 053-600-8647 Fax : 053-600-8645 Web Site: www.intertek.co.kr
 Seoul Lab. Address : 1/F, A-Ju Digital Tower, #284-56, Seongsu 2-ga, Seongdong-Gu, Seoul, 133-833 Korea
 Ulsan Lab. Address : #340-2, Yongam-Ri, Chongryang-Myun, Ulsu-Gun, Ulsan 689-865 Korea

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	21



TEST REPORT

Report No. RT11R-S1374-001-E1

Sample ID No. : RT11R-S1374-001

Sample Description : D5-7402

Page: 3 of 4

Date: Apr. 07, 2011

* View of sample as received:-



This Test Report is issued by the Company subject to its Terms and Conditions of Business printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. This Test Report shall not be reproduced, except in full, without prior written consent of the Company.

Intertek Testing Services Korea Ltd.

Seoul Office: Tel : 02-6090-9500 Fax : 02-3409-0026 Daegu Office: Tel : 053-600-8647 Fax : 053-600-8645 Web Site : www.intertek.co.kr
 Seoul Lab. Address : 1/F, A-ju Digital Tower, #284-56, Seongsu 2-ga, Seongdong-Gu, Seoul, 133-833 Korea
 Ulsan Lab. Address : #340-2, Yongam-Ri, Chongryang-Myun, Ulsu-Gun, Ulsan 689-865 Korea

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	22



TEST REPORT

Report No. RT11R-S1374-001-E1

Sample ID No. : RT11R-S1374-001

Sample Description : DS-7402

Page: 4 of 4

Date: Apr. 07, 2011

Flow Chart
 (ISO 62321 Edition 1.0 : 2008)

Receipt

Sampling/
Grinding or Cutting

Pb, Cd, Hg

For different material,
digest the sample with
appropriate acid^{*1}

Confirm the tested
samples are
totally dissolved

Make up with
deionized water

Analyzed by ICP-OES

Data

Report

Cr⁶⁺

Polymers/Electronics

Weigh sample and add
alkaline solution

Definite temperature
extraction

Cool and filter
the extract

Make up with deionized
water and add diethylen-
carbazide solution

Analyzed by UV-VIS

Data

Report

PBBs/PBDEs

Weigh sample
and add organic solvent

Soxhlet extraction
or solvent extraction

Concentrate the extract
and make up with
organic solvent

Analyzed by GC-MS

Data

Report

Remarks :

*1 : List of appropriate acid :

Material	Acid added for digestion
Polymers	HNO ₃ , HCl, HF, H ₂ O ₂ , H ₃ BO ₃
Metals	HNO ₃ , HCl, HF
Electronics	HNO ₃ , HCl, H ₂ O ₂ , HBF ₄

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

This Test Report is issued by the Company subject to its Terms and Conditions of Business printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. This Test Report shall not be reproduced, except in full, without prior written consent of the Company.

Intertek Testing Services Korea Ltd.

Seoul Office: Tel : 02-6090-9500 Fax : 02-3409-0026 Daegu Office : Tel : 053-600-8647 Fax : 053-600-8645 Web Site : www.intertek.co.kr
 Seoul Lab. Address : 1/F, A-Ju Digital Tower, #284-56, Seongsu 2-ga, Seongdong-Gu, Seoul, 133-833 Korea
 Ulsan Lab. Address : #340-2, Yongam-Ri, Chongryang-Myun, Ulsu-Gun, Ulsan 689-865 Korea

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	23

▶ PSR [DPR-700 BLACK]



Test Report No. F690501/LF-CT\$AYAA11-08668 Issued Date: 2011. 03. 18 Page 1 of 4

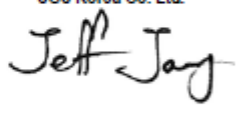
To: **DOZENTECH CORPORATION**
955-1
Dohwa-dong
Nam-gu
Incheon
Korea

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

SGS File No. : AYAA11-08668
Product Name : PCB INK
Item No./Part No. : DPR-700 BLACK
Received Date : 2011. 03. 15
Test Period : 2011. 03. 16 to 2011. 03. 18
Test Results : For further details, please refer to following page(s)
Test Performed : SGS Korea tested the sample(s) selected by applicant with following results.

Timothy Jeon
Jinhee Kim
Cindy Park
Jerry Jung/ Testing Person

SGS Korea Co. Ltd.



Jeff Jang / Chemical Lab Mgr

This document is issued by the Company subject to its General Conditions of Service (which are not available on www.sgs.com and www.sgs.com/sgsnet) and its standard formal documents, subject to Terms and Conditions for Standard Conditions of Service (which are not available on www.sgs.com and www.sgs.com/sgsnet). It is the client's responsibility to ensure that the document does not constitute a basis for a transaction from standing of their rights and obligations under the transaction documents. This document serves for informational scope in all cases and prior written approval of the Company is required for any other use. The client is responsible for the accuracy of the information provided and the Company is not liable for any loss or damage resulting from the use of this document. The client is responsible for the accuracy of the information provided and the Company is not liable for any loss or damage resulting from the use of this document.

FD52 Version4

SGS Korea Co., Ltd.

322, The O valley, 555-6, Haeje-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-680
t +82 (0)31 4608 000 f +82 (0)31 4608 059 www.sgs.com www.sgs.com/sgsnet

Member of the SGS Group (Société Générale de Surveillance)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	24



Test Report No. F690501/LF-CTSA11-08668 **Issued Date:** 2011. 03. 18 **Page** 2 of 4

Sample No. : AYAA11-08668.001
Sample Description : PCB INK
Item No./Part No. : DPR-700 BLACK
Comments : Material is PCB INK.

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	With reference to IEC 62321:2008, ICP	0.5	N.D.
Lead (Pb)	mg/kg	With reference to IEC 62321:2008, ICP	5	N.D.
Mercury (Hg)	mg/kg	With reference to IEC 62321:2008, ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	With reference to IEC 62321:2008, UV-VIS	1	N.D.

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Monobromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Dibromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Tribromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Pentabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Hexabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Heptabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Octabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Nonabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Decabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Monobromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Dibromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Tribromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Tetrabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Pentabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Hexabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Heptabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Octabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Nonabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Decabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, 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) * = Boiling-water-extraction:
Negative = Absence of CrVI coating
Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

This document is issued by the Company subject to its General Conditions of Service printed on each order or request or available at www.korlab.co.kr and, by default, formal documents subject to Terms and Conditions by Electronic Documents at www.korlab.co.kr. Services to assist in the selection of suitable instrumentation and procedures issued under these. Any reuse of this document or content, the reproduction, distribution, sale, rental, or other use of this document without the Company's written consent is prohibited. The Company's liability is limited to the extent of the information provided and does not extend to any other use of this document. The Company's liability is limited to the extent of the information provided and does not extend to any other use of this document. The Company's liability is limited to the extent of the information provided and does not extend to any other use of this document.

FOR2 Version1 SGS Korea Co., Ltd. 322, The G Valley, 555-6, Hyeon-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-000
t +82 (0)31 4008 000 f +82 (0)31 4008 059 <http://www.korlab.co.kr> www.sgs.com/korea

Member of the SGS Group (Société Générale de Surveillance)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	25



Test Report No. F690501/LF-CT\$AYAA11-08668 **Issued Date:** 2011. 03. 18 **Page** 3 of 4

Sample No. : AYAA11-08668.001
Sample Description : PCB INK
Item No./Part No. : DPR-700 BLACK
Comments : Material is PCB INK.

Picture of Sample as Received:



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) * = Boiling-water-extraction:
 Negative = Absence of CrVI coating
 Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

This document is issued by the Company subject to its General Conditions of Service (which remain available on request at www.sgslab.com and www.sgskorea.co.kr) and its standard formal documents subject to Terms and Conditions for Customer (available at www.sgslab.com and www.sgskorea.co.kr). Neither is drawn in the opinion of SGS, its subsidiaries and associated firms (collectively, "SGS"). The Company's sole responsibility is to its client and this document shall not constitute a contract or a warranty from SGS or its subsidiaries. The document shall be subject to SGS's internal policy and shall not be used for any other purpose without the prior written approval of the Company. No responsibility shall be accepted by SGS or its subsidiaries for any damage or loss of data or information caused by the use of this document or any other document or information provided by SGS or its subsidiaries. The Company shall not be held responsible for any damage or loss of data or information caused by the use of this document or any other document or information provided by SGS or its subsidiaries.

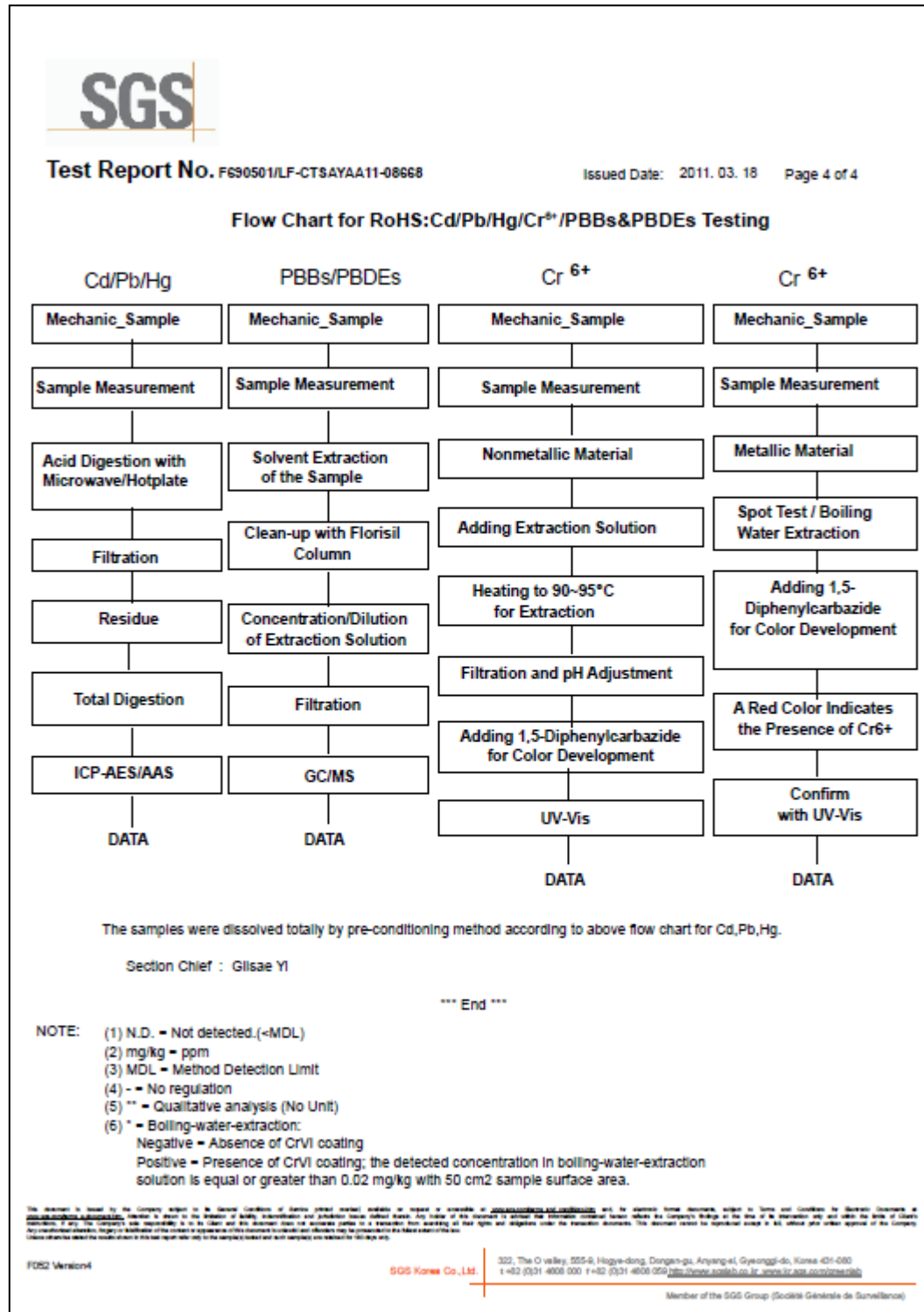
PO21 Version4

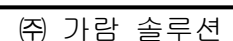
SGS Korea Co., Ltd.

322, The O Valley, 225-6, Hyeon-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea (41-090)
 t +82 (0)31 4808 000 f +82 (0)31 4808 058 <http://www.sgslab.com> <http://www.sgskorea.co.kr>

Member of the SGS Group (Société Générale de Surveillance)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	26



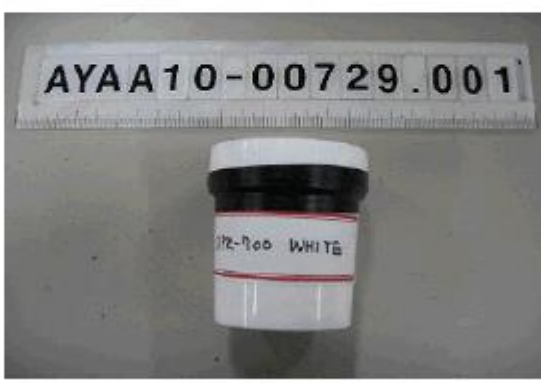
28

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	29



Test Report No. F690501/LF-CTSA YAA10-00729 Issued Date: January 14, 2010 Page 3 of 4

Picture of Sample as Received:



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) * = Boiling-water-extraction:
 - Negative = Absence of CrVI coating
 - Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

This document is issued by the Company subject to its General Conditions of Service printed hereon, available on request or accessible at www.sgslab.com/conditions and its analytical formal documents subject to Terms and Conditions for Electronic Documents at www.sgslab.com/electronic. Attention is drawn to the limitation of liability, indemnification and prohibition clauses defined therein. Any failure of the document to reflect the information contained herein reflects the Company's liability in the form of its disclaimer only and under the limits of clients' transactions if any. The Company's sole responsibility is to its Client and this document shall not constitute evidence in a litigation from ascribing all their rights and obligations under the transaction documents. This document shall be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, copying or distribution may render the reproduction in this case illegible and only the sample's label and seal carry company and laboratory identification only.

F052 Version3

SGS Testing Korea Co., Ltd.

322, The O valley, 255-9, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
 t +82 (0)31 4905 000 f +82 (0)31 4905 059 <http://www.sgslab.co.kr> www.kr.sgs.com/greentlab

Member of the SGS Group (Société Générale de Surveillance)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	31

▶ OSP [INOS-G]

	
Test Report No. F690501/LF-CT\$AYAA11-09433	
Issued Date: 2011. 03. 24 Page 1 of 5	
To: INSOL 769-3, Wonsi-dong Danwon-gu Ansan-si Gyeonggi-do 425-852 Korea	
The following merchandise was submitted and identified by the client as :	
SGS File No.	: AYAA11-09433
Product Name	: INOS-G
Item No./Part No.	: N/A
Received Date	: 2011. 03. 21
Test Period	: 2011. 03. 22 to 2011. 03. 24
Buyer(s)	: SAMSUNG,LG,SONY
Test Results	: For further details, please refer to following page(s)
Test Performed	: SGS Korea tested the sample(s) selected by applicant with following results.
Timothy Jeon Jinhee Kim Cindy Park Jerry Jung/ Testing Person SGS Korea Co. Ltd.  Jeff Jang / Chemical Lab Mgr	
This document is issued by the Company subject to the General Conditions of Service which are available on request at www.sgs.com and its electronic format documents, subject to the same and conditions to the General Conditions of Service which are available on request at www.sgs.com. The Company is not responsible for the accuracy of the information contained herein, which is the responsibility of the client. The Company is not responsible for the accuracy of the information contained herein, which is the responsibility of the client. The Company is not responsible for the accuracy of the information contained herein, which is the responsibility of the client.	
FDS Version SGS Korea Co., Ltd. 325, The O Valley, 525-6, Hoggie-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 421-680 T +82 (0)31 4906 000 F +82 (0)31 4906 059 http://www.sgs.com www.kr.sgs.com	
Member of the SGS Group (Société Générale de Surveillance)	

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	32



Test Report No. F690501/LF-CTSAAYAA11-09433

Issued Date: 2011. 03. 24 Page 2 of 5

Sample No. : AYAA11-09433.001
Sample Description : INOS-G
Item No./Part No. : N/A
Comments : Material is Liquid.

Heavy Metals

Test Item	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	With reference to IEC 62321:2008, ICP	0.5	N.D.
Lead (Pb)	mg/kg	With reference to IEC 62321:2008, ICP	5	N.D.
Mercury (Hg)	mg/kg	With reference to IEC 62321:2008, ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	With reference to IEC 62321:2008, UV-VIS	1	N.D.

Flame Retardants-PBBs/PBDEs

Test Item	Unit	Test Method	MDL	Results
Monobromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Dibromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Tri bromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Pentabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Hexabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Heptabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Octabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Nonabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Decabromobiphenyl	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Monobromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Dibromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Tri bromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Tetrabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Pentabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Hexabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Heptabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Octabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Nonabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, GC-MS	5	N.D.
Decabromodiphenyl ether	mg/kg	With reference to IEC 62321:2008, 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) * = Boiling-water-extraction:
Negative = Absence of CrVI coating
Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

This document is issued by the Company subject to its General Conditions of Service printed on each report or available at www.korlab.co.kr and, for separate formal documents, subject to Terms and Conditions for Separate Documents at www.korlab.co.kr. Neither is meant to be the basis of liability, indemnification and jurisdiction issues without breach. Any holder of this document is advised that the information contained herein reflects the Company's findings at the time of its issuance only and under the terms of Client's acceptance of any. The Company's sole responsibility is to its Client and this document does not constitute parties to a transaction from, nor acting as their agent or advisor under the transaction documents. This document cannot be reproduced except in full without prior written approval of the Company. Any unauthorized disclosure, misuse or distortion of the contents of this document to third parties may be prosecuted to the full extent of the law.

FORM Version4

SGS Korea Co., Ltd.

322, The O Valley, 555-8, Hyeon-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
t +82 (0)31 4808 000 f +82 (0)31 4808 059 <http://www.korlab.co.kr> www.sgsgroup.com/korlab

Member of the SGS Group (Société Générale de Surveillance)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	33



Test Report No. F690501/LF-CTSA11-09433 Issued Date: 2011. 03. 24 Page 3 of 5

Sample No. : AYAA11-09433.001
Sample Description : INOS-G
Item No./Part No. : N/A
Comments : Material is Liquid.

Inorganic Contents

Test Items	Unit	Test Method	MDL	Results
Bromide (Br ⁻)	mg/L	US EPA300.0, IC	30	N.D.
Chloride (Cl ⁻)	mg/L	US EPA300.0, IC	30	42

Picture of Sample as Received:



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) * = Boiling-water-extraction:
 Negative = Absence of CrVI coating
 Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

The document is issued by the Company subject to the General Conditions of Service (attached hereto) available on request at www.sgs.com and its derivative forms. Documents subject to terms and conditions. No liability is accepted for errors in the document or quality of analysis. Information and analysis results are subject to the terms of the contract. The Company's liability is limited to the extent of the information and analysis results provided. The Company's liability is limited to the extent of the information and analysis results provided. The Company's liability is limited to the extent of the information and analysis results provided.

F082 Version1 SGS Korea Co., Ltd. 322, The O valley, 555-6, Hage-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
 t +82 (0)31 4908 000 f +82 (0)31 4908 050 <http://www.sgs.co.kr> sgs@sgs.co.kr

Member of the SGS Group (Sociétés Général de Surveillance)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	34



Test Report No. F690501/LF-CT5AYAA11-09433 Issued Date: 2011. 03. 24 Page 4 of 5

Flow Chart for RoHS:Cd/Pb/Hg/Cr⁶⁺/PBBs&PBDEs Testing

Cd/Pb/Hg	PBBs/PBDEs	Cr ⁶⁺	Cr ⁶⁺
Mechanic_Sample	Mechanic_Sample	Mechanic_Sample	Mechanic_Sample
Sample Measurement	Sample Measurement	Sample Measurement	Sample Measurement
Acid Digestion with Microwave/Hotplate	Solvent Extraction of the Sample	Nonmetallic Material	Metallic Material
Filtration	Clean-up with Florisil Column	Adding Extraction Solution	Spot Test / Boiling Water Extraction
Residue	Concentration/Dilution of Extraction Solution	Heating to 90-95°C for Extraction	Adding 1,5-Diphenylcarbazide for Color Development
Total Digestion	Filtration	Filtration and pH Adjustment	A Red Color Indicates the Presence of Cr6+
ICP-AES/AAS	GC/MS	Adding 1,5-Diphenylcarbazide for Color Development	Confirm with UV-Vis
DATA	DATA	UV-Vis	DATA
		DATA	

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

Section Chief : Gilsae Yi

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) * = Boiling-water-extraction:
 Negative = Absence of CrVI coating
 Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

This document is issued by the Company subject to its General Conditions of Service printed on each order or request or acceptable at www.sgs.com/conditions and its electronic forms documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/conditions. Member is bound to the validity of being identification and production traceability. Any issue of this document to which the information contained herein reflects the Company's findings at the time of its issuance only and under the terms of clients' responsibility. If any. The Company's sole responsibility is to its client and this document does not constitute either a transaction from marketing of their goods and services under the transaction documents. This document serves for operational work in its without prior written approval of the Company. Any modification, deletion or falsification of the content or appearance of this document to constitute either may be prosecuted in the future under the law. Clients can also detect the modification in this test report only by the sample's tested and test sampling the selected for 30 days only.

F052 Version4

SGS Korea Co., Ltd.

322, The O Valley, 055-6, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
 t +82 (0)31 4808 000 f +82 (0)31 4808 059 <http://www.sgs.co.kr> www.kr.sgs.com/sgsweb

Member of the SGS Group (Société Générale de Surveillance)

안테나 규격서	문서번호	KRS-AA-0047	REV.	가람 솔루션	00
	DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	35



Test Report No. F630501/LF-CT\$AYAA11-09433 Issued Date: 2011. 03. 24 Page 5 of 5

Flow Chart for Halogen Test

```

graph TD
    A[Sample screening using XRF.] --> B[Liquid containing water(>80%)?]
    B -- Yes --> D[Dilute the solution (EPA300)]
    B -- No --> C[Weigh the samples into the combustion boat.]
    C --> E[Add absorption solution into the bomb or tube.]
    E --> F[Admit O2 gas or O2 +Ar2 gas and start the combustion.]
    F --> G[Allow during absorption of the burnt gas.]
    G --> H[Analyze absorbed solution using Ion Chromatography.]
    H --> D
    D --> I[*** End ***]
  
```

*** 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) * = Boiling-water-extraction:
 Negative = Absence of CrVI coating
 Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

This document is issued by the Company subject to the General Conditions of Service (please contact) available on request or accessible at www.sgs.com and for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/etd/electronicdocuments. Attention is drawn to the limitation of liability, indemnification and jurisdiction clause contained therein. Any value of this document is subject to the information contained therein. Unless the Company's findings at the time of the inspection are not within the limits of liability. Furthermore, if any. The Company's sole responsibility is to its client and this document does not constitute parties to a transaction from accepting all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any reproduction, alteration, deletion or addition of the content or appearance of this document is prohibited and shall be subject to the Company's prior written consent. Unless otherwise stated the results shown in this test report refer only to the samples tested and such samples are retained for 90 days only.

F052 Version04

SGS Korea Co., Ltd.

322, The O valley, 555-8, Hoggie-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
 t +82 (0)31 4808 000 f +82 (0)31 4808 059 <http://www.sgs.co.kr> www.kr.sgs.com/sgs-kr

Member of the SGS Group (Société Générale de Surveillance)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	36

▶ CABLE [FCM SH H1372 BLACK]



Test Report

No. SHAEC1016022410

Date: 15 Nov 2010

Page 1 of 10

DAICOLOR SHANGHAI MFG CO.,LTD
NO.125 CHUHUA ROAD,SHANGHAI CHEMICAL INDUSTRIAL ZONE FENGXIAN SUB ZONE,CHINA

The following sample(s) was/were submitted and identified on behalf of the clients as : Functional Fluorine Master Batch

SGS Job No. :	SP10-036646 - SH
Model No. :	FCM SH H 1372 BLACK
Composition :	FEP RESIN,PIGMENT
Date of Sample Received :	05 Nov 2010
Testing Period :	05 Nov 2010 - 11 Nov 2010
Test Requested :	Selected test(s) as requested by client.
Test Method :	Please refer to next page(s).
Test Results :	Please refer to next page(s).
Conclusion :	Based on the performed tests on submitted samples, the results comply with the RoHS Directive 2002/95/EC and its subsequent amendments.

Signed for and on behalf of
SGS-CSTC Ltd.



Fan Jingjie, JJ
Approved Signatory

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at http://www.sgs.com/terms_and_conditions.htm and for electronic format documents subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms_e-document.htm. Attention is drawn to the limitation of liability, exclusion of warranty and jurisdiction issues defined therein. Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its preparation and only within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated, the results shown in this test report refer only to the sample(s) tested.



SGS-CSTC Standard Technical Service (Shanghai) Co., Ltd.
Testing Center

3rd Building No.889 Yishan Road Kufu District, Shanghai China 200253
中国·上海·徐汇区宜山路889号3号楼 邮编: 200253

T: E&E (86-21) 61402553 F: E&E (86-21) 64853679 www.cn.sgs.com
HL: (86-21) 61402554 HL: (86-21) 64800353 e: sgs.china@sgs.com

Member of the SGS Group (SGS SA)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	37



Test Report No. SHAEC1016022410 Date: 15 Nov 2010 Page 2 of 10

Test Results :

Test Part Description :

Specimen No.	SGS Sample ID	Description
1	SHA10-160224.010	Black solid grain

Remarks :

(1) 1 mg/kg = 1 ppm = 0.0001%
(2) MDL = Method Detection Limit
(3) ND = Not Detected (< MDL)
(4) "-" = Not Regulated

RoHS Directive 2002/95/EC

Test Method : With reference to IEC 62321:2008
(1) Determination of Cadmium by ICP-OES.
(2) Determination of Lead by ICP-OES.
(3) Determination of Mercury by ICP-OES.
(4) Determination of Hexavalent Chromium by Colorimetric Method using UV-Vis.
(5) Determination of PBBs / PBDEs content by GC-MS.

Test Item(s)	Limit	Unit	MDL	Q10
Cadmium (Cd)	100	mg/kg	2	ND
Lead (Pb)	1,000	mg/kg	2	ND
Mercury (Hg)	1,000	mg/kg	2	ND
Hexavalent Chromium (CrVI)	1,000	mg/kg	2	ND
Sum of PBBs	1,000	mg/kg	-	ND
Monobromobiphenyl	-	mg/kg	5	ND
Dibromobiphenyl	-	mg/kg	5	ND
Tribromobiphenyl	-	mg/kg	5	ND
Tetrabromobiphenyl	-	mg/kg	5	ND
Pentabromobiphenyl	-	mg/kg	5	ND
Hexabromobiphenyl	-	mg/kg	5	ND
Heptabromobiphenyl	-	mg/kg	5	ND
Octabromobiphenyl	-	mg/kg	5	ND
Nonabromobiphenyl	-	mg/kg	5	ND
Decabromobiphenyl	-	mg/kg	5	ND
Sum of PBDEs	1,000	mg/kg	-	ND
Monobromodiphenyl ether	-	mg/kg	5	ND

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at http://www.sgs.com/terms_and_conditions.htm and for electronic format documents subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms_e-documents.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction clauses defined therein. Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its preparation only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated, the results shown in this test report refer only to the sample(s) tested.



SGS
SGS-CTI Standards Technical Service (Shanghai) Co., Ltd.
Testing Laboratory

3rd Building No. 881 Yishan Road, Baohui District, Shanghai, China 200233
中国·上海·徐汇区宜山路881号3号楼 邮编: 200233

TEL: (86-21) 61402553 FAX: (86-21) 64663679 www.cn.sgs.com
HL: (86-21) 61402554 HL: (86-21) 64600353 e: sgs.china@sgs.com

Member of the SGS Group (SGS SA)

안테나 규격서	문서번호	KRS-AA-0047	REV.	가람 솔루션	00
	DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	38



Test Report
 No. SHAEC1016022410
 Date: 15 Nov 2010
 Page 3 of 10

Test Item(s)	Limit	Unit	MDL	Q10
Dibromodiphenyl ether	-	mg/kg	5	ND
Tribromodiphenyl ether	-	mg/kg	5	ND
Tetrabromodiphenyl ether	-	mg/kg	5	ND
Pentabromodiphenyl ether	-	mg/kg	5	ND
Hexabromodiphenyl ether	-	mg/kg	5	ND
Heptabromodiphenyl ether	-	mg/kg	5	ND
Octabromodiphenyl ether	-	mg/kg	5	ND
Nonabromodiphenyl ether	-	mg/kg	5	ND
Decabromodiphenyl ether	-	mg/kg	5	ND

Notes :

(1) The maximum permissible limit is quoted from the document 2005/618/EC amending RoHS directive 2002/95/EC

Halogen

Test Method : With reference to EN 14582: 2007, analysis was performed by Ion Chromatograph (IC).

Test Item(s)	Unit	MDL	Q10
Fluorine (F)*	mg/kg	50	519233
Chlorine (Cl)	mg/kg	50	ND
Bromine (Br)	mg/kg	50	ND
Iodine (I)	mg/kg	50	ND

Notes :

(1) *The test result is only for reference

Phthalates

Test Method : With reference to EN14372: 2004, analysis was performed by GC-MS.

Test Item(s)	Unit	MDL	Q10
Dibutyl Phthalate (DBP)	%	0.003	ND
Benzylbutyl Phthalate (BBP)	%	0.003	ND
Bis-(2-ethylhexyl) Phthalate (DEHP)	%	0.003	ND

Notes :

(1) DBP,BBP,DEHP Reference information: Entry 51 of Regulation (EC) No 552/2009 amending Annex XVII of REACH Regulation (EC) No 1907/2006 (previously restricted under Directive 2005/84/EC):
 i) Shall not be used as substances or in mixtures, in concentrations greater than 0,1 % by weight of

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at http://www.sgs.com/terms_and_conditions.htm and for electronic format documents subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms_e-documents.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction clauses defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its issuance on only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from observing all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.



SGS SCS Service Technical Service (Shanghai) Co., Ltd.
Testing Laboratory

3rd Building No.889 Yishan Road Huai District, Shanghai China 200233
中国·上海·徐汇区宜山路889号3号楼 邮编: 200233

TEL: (86-21) 61402553 FAX: (86-21) 64853679
HL: (86-21) 61402554 HL: (86-21) 64800353

www.cn.sgs.com
sgs.china@sgs.com

Member of the SGS Group (SGS SA)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	39



Test Report

No. SHAEC1016022410

Date: 15 Nov 2010

Page 4 of 10

the plasticised material, in toys and childcare articles.
 ii) Toys and childcare articles containing these phthalates in a concentration greater than 0.1 % by weight of the plasticised material shall not be placed on the market.
 Please refer to Regulation (EC) No 552/2009 to get more detail information

Hexabromocyclododecane (HBCDD)

Test Method : With reference to US EPA 3550C: 2007, analysis was performed by GC-MS.

Test Item(s)	Unit	MDL	Q10
Hexabromocyclododecane (HBCDD)	mg/kg	10	ND

PFOS (Perfluorooctane Sulfonates) and PFOA (Perfluorooctanoic Acid)

Test Method : With reference to US EPA 3550C: 2007, analysis was performed by HPLC-MS.

Test Item(s)	Unit	MDL	Q10
Perfluorooctane Sulfonates (PFOS) and related Acid, Metal Salt and Amide	mg/kg	10	ND
Perfluorooctyl Acid (PFOA)	mg/kg	10	ND

Notes :

- (1) PFOS Reference Information: Entry 53 of Regulation (EC) No 552/2009 amending Annex XVII of REACH Regulation (EC) No 1907/2006 (previously restricted under Directive 2006/122/EC)
 - (i) May not be placed on the market or used as a substance or constituent of preparations in a concentration equal to or higher than 0.005 % by mass.
 - (ii) May not be placed on the market in semi-finished products or articles, or parts thereof, if the concentration of PFOS is equal to or higher than 0.1 % by mass calculated with reference to the mass of structurally or microstructurally distinct parts that contain PFOS or, for textiles or other coated materials, if the amount of PFOS is equal to or higher than 1µg /m² of the coated material.
 Please refer to Regulation (EC) No 552/2009 to get more detail information

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at http://www.sgs.com/terms_and_conditions.htm and for electronic format documents subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms_e-document.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its provision only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.



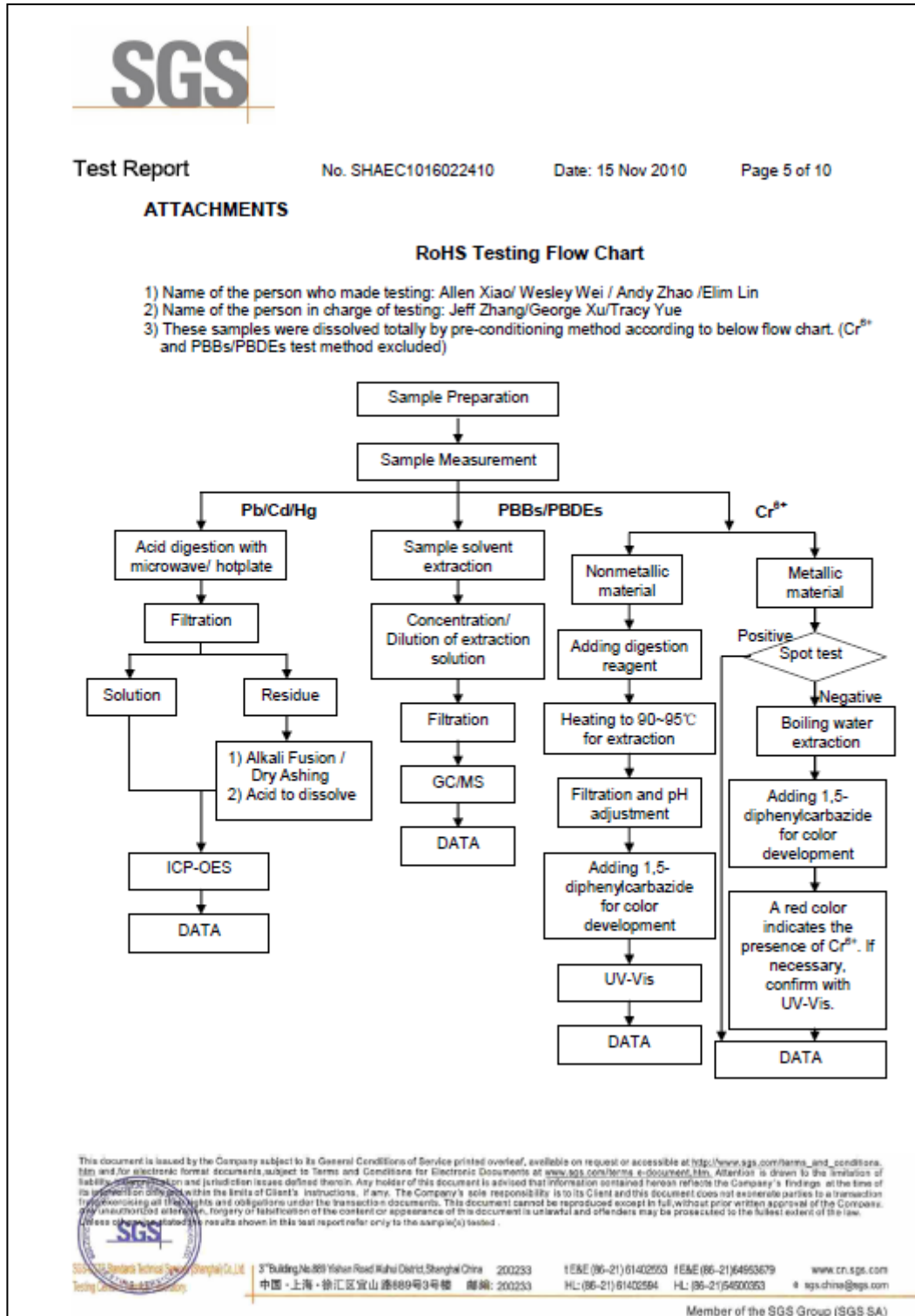
SGS Testing Center (Shanghai) Co., Ltd.
 Testing Center (China) & Laboratory

3rd Building No. 889 Yishu Road, Waifu District, Shanghai, China 200233
 中国·上海·徐汇区宜山路889号3号楼 邮编: 200233

TEL: (86-21) 61402553 FAX: (86-21) 64953679 www.cn.sgs.com
 HL: (86-21) 61402554 HL: (86-21) 64900353 # sgs.china@sgs.com

Member of the SGS Group (SGS SA)

안테나 규격서	문서번호	KRS-AA-0047	REV.	가람 솔루션	00
	DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	40



안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	41



Test Report No. SHAEC1016022410 Date: 15 Nov 2010 Page 6 of 10

Halogen Testing Flow Chart

1) Name of the person who made testing: Daisy Gong
2) Name of the person in charge of testing: Alex Jiang

```

graph TD
    A[Sample cutting/preparation] --> B[Sample measurement]
    B --> C[Combustion in oxygen bomb]
    C --> D[Dissolved in an absorption solution]
    D --> E[Filtration]
    E --> F[Analyzed by ion chromatography. Double confirm by other instruments, if necessary]
    F --> G[DATA]
        
```

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at http://www.sgs.com/terms_and_conditions.htm and for electronic format documents subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms_e-documents.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its preparation only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.



SGS Standards Technical Services (Shanghai) Co., Ltd.
Testing Center No. 4-1337 Building

3rd Building No. 889 Yixian Road Huai District, Shanghai China 200233
中国·上海·徐汇区宜山路889号3号楼 邮编: 200233

TEL: (86-21) 61402563 FAX: (86-21) 64563679 www.cn.sgs.com
HL: (86-21) 61402594 HL: (86-21) 64500353 sgs.china@sgs.com

Member of the SGS Group (SGS SA)

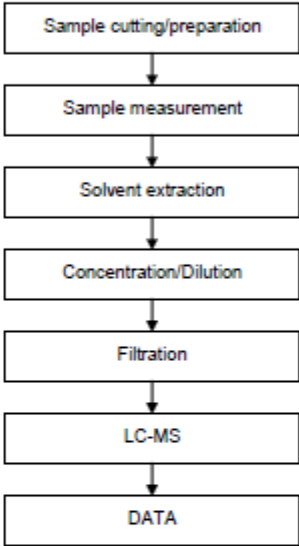
안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	42



Test Report No. SHAEC1016022410 Date: 15 Nov 2010 Page 7 of 10

PFOS/PFOA Testing Flow Chart

1) Name of the person who made testing: Judy Li
2) Name of the person in charge of testing: Nancy Du



```

graph TD
    A[Sample cutting/preparation] --> B[Sample measurement]
    B --> C[Solvent extraction]
    C --> D[Concentration/Dilution]
    D --> E[Filtration]
    E --> F[LC-MS]
    F --> G[DATA]

```

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at http://www.sgs.com/terms_and_conditions.htm and/or electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms_e-document.htm. Attention is drawn to the limitation of liability, jurisdiction and jurisdiction issues defined therein. Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its preparation and is subject to the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated, the results shown in this test report refer only to the sample(s) tested.



SGS S.R.L. (Società per Azioni)
Testing Center, Shanghai, China

3rd Building No. 889 Yishan Road, Huai District, Shanghai, China 200233
中国·上海·徐汇区宜山路889号3号楼 邮编: 200233

Tel: (86-21) 61402953 Fax: (86-21) 64663679 www.cn.sgs.com
HL: (86-21) 61402594 HL: (86-21) 64600363 sgs.china@sgs.com

Member of the SGS Group (SGS SA)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	43



Test Report

No. SHAEC1016022410

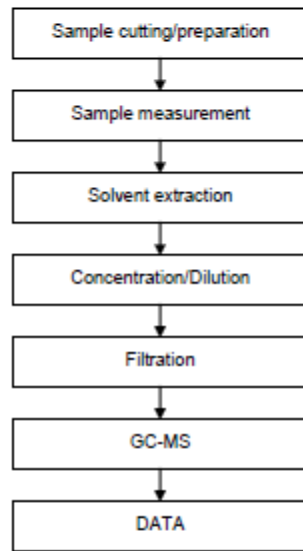
Date: 15 Nov 2010

Page 8 of 10

Phthalates Testing Flow Chart

1) Name of the person who made testing: Vickey Gui

2) Name of the person in charge of testing: Susan Liu



This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at http://www.sgs.com/terms_and_conditions.htm and for electronic format documents subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms_e-documents.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction clauses defined therein. Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its preparation only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.



SGS Standard Technical Services (Shanghai) Co., Ltd.
Testing Laboratory

3rd Building No. 881 Yishu Road Huihai District Shanghai China 200233
中国·上海·徐汇区宜山路881号3号楼 邮编: 200233

TEL: (86-21) 61402553 FAX: (86-21) 64653679
HL: (86-21) 61402564 HL: (86-21) 64600353

www.cn.sgs.com
sgs.china@sgs.com

Member of the SGS Group (SGS SA)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	44

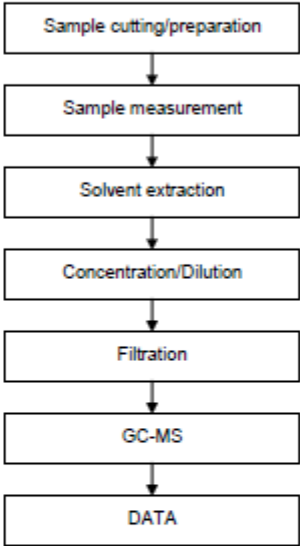


Test Report
No. SHAEC1016022410
Date: 15 Nov 2010
Page 9 of 10

HBCDD Testing Flow Chart

1) Name of the person who made testing: Bill Zhong

2) Name of the person in charge of testing: Susan Liu



```

graph TD
    A[Sample cutting/preparation] --> B[Sample measurement]
    B --> C[Solvent extraction]
    C --> D[Concentration/Dilution]
    D --> E[Filtration]
    E --> F[GC-MS]
    F --> G[DATA]
  
```

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at http://www.sgs.com/terms_and_conditions.htm and for electronic format documents subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms_e-document.htm. Attention is drawn to the limitation of liability, exclusion of damages and jurisdiction issues defined therein. Any holder of this document is advised that information contained herein reflects the Company's findings at the time of its inspection only and is subject to the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated, the results shown in this test report refer only to the sample(s) tested.



SGS Standard Technical Service (Shanghai) Co., Ltd.
Testing Laboratory

3rd Building No. 889 Yishan Road Kufei District, Shanghai China 200233
中国·上海·徐汇区宜山路889号3号楼 邮编: 200233

T: E&E (86-21) 61402553 F: E&E (86-21) 64553679 www.cn.sgs.com
HL: (86-21) 61402584 HL: (86-21) 54500353 @ sgs.china@sgs.com

Member of the SGS Group (SGS SA)

안테나 규격서	문서번호	KRS-AA-0047	REV.	가람 솔루션	00
	DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	45

▶ JOINT [KN126]



TEST REPORT

Applicant : KOLON PLASTICS, INC.
Address : #1018, Ungmyoung-dong, Gimcheon-si,
Gyeongsangbuk-do, 740-180 Korea

Page: 1 of 4
Date: Apr. 19, 2011

Report No. RT11R-U0733-001-E

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

Name/Type of Product : KOPA
Name of Material : PA6
Sample ID No. : RT11R-U0733-001
Item No. : KN111, KN126, KN126K, KN171
Manufacturer/Vender : KOLON PLASTICS, INC.

Sample received : Apr. 14, 2011
Testing Date : Apr. 14, 2011 ~ Apr. 19, 2011
Testing Environment : Temperature : (24 ± 2) °C, Humidity : (60 ± 5) % R.H.

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.
* Note 3 : The item no. is assigned by client and indicated according to their requirement and guarantee letter.

Approved by, 
E.Y. Lee / Lab. Technical Manager

Authorized by, 
H.W. Yoo / Lab. General Manager

This Test Report is issued by the Company subject to its Terms and Conditions of Business printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. This Test Report shall not be reproduced, except in full, without prior written consent of the Company.

Intertek Testing Services Korea Ltd.

Seoul Office: Tel : 02-6090-9500 Fax : 02-3409-0026 Daegu Office: Tel : 053-600-8647 Fax : 053-600-8645 Web Site : www.intertek.co.kr
Seoul Lab. Address : 1/F, A-ju Digital Tower, #284-56, Seongsu 2-ga, Seongdong-Gu, Seoul, 133-833 Korea
Ulsan Lab. Address : #340-2, Yongam-Ri, Chongryang-Myun, Ulju-Gun, Ulsan 689-865 Korea

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	46



TEST REPORT

Page: 2 of 4

Date: Apr. 19, 2011

Report No. RT11R-U0733-001-E

Sample ID No. : RT11R-U0733-001

Sample Description : KOPA

Test Item	Unit	Test Method	MDL	Result
Cadmium (Cd)	ug/kg	With reference to IEC 62321 Edition 1.0:2008, by acid digestion and determined by ICP-OES	0.5	N.D.
Lead (Pb)	ug/kg		5	N.D.
Mercury (Hg)	ug/kg		2	N.D.
Hexavalent Chromium (Cr ⁶⁺) (For non-metal)	ug/kg	With reference to IEC 62321 Edition 1.0:2008, by alkaline digestion and determined by UV-VIS Spectrophotometer	1	N.D.
Polybrominated Biphenyl (PBBs)				
Monobromobiphenyl	ug/kg	With reference to IEC 62321 Edition 1.0:2008, by solvent extraction and determined by GC/MS	5	N.D.
Dibromobiphenyl	ug/kg		5	N.D.
Tribromobiphenyl	ug/kg		5	N.D.
Tetrabromobiphenyl	ug/kg		5	N.D.
Pentabromobiphenyl	ug/kg		5	N.D.
Hexabromobiphenyl	ug/kg		5	N.D.
Heptabromobiphenyl	ug/kg		5	N.D.
Octabromobiphenyl	ug/kg		5	N.D.
Nonabromobiphenyl	ug/kg		5	N.D.
Decabromobiphenyl	ug/kg		5	N.D.
Polybrominated Diphenyl Ether (PBDEs)				
Monobromodiphenyl ether	ug/kg	With reference to IEC 62321 Edition 1.0:2008, by solvent extraction and determined by GC/MS	5	N.D.
Dibromodiphenyl ether	ug/kg		5	N.D.
Tribromodiphenyl ether	ug/kg		5	N.D.
Tetrabromodiphenyl ether	ug/kg		5	N.D.
Pentabromodiphenyl ether	ug/kg		5	N.D.
Hexabromodiphenyl ether	ug/kg		5	N.D.
Heptabromodiphenyl ether	ug/kg		5	N.D.
Octabromodiphenyl ether	ug/kg		5	N.D.
Nonabromodiphenyl ether	ug/kg		5	N.D.
Decabromodiphenyl ether	ug/kg		5	N.D.

Tested by : YK Cho, HJ Kim

Notes : ug/kg = ppm = parts per million

< = Less than

N.D. = Not detected (<MDL)

MDL = Method detection limit

This Test Report is issued by the Company subject to its Terms and Conditions of Business printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. This Test Report shall not be reproduced, except in full, without prior written consent of the Company.

Intertek Testing Services Korea Ltd.

Seoul Office: Tel : 02-6090-9500 Fax : 02-3409-0026 Daegu Office : Tel : 053-600-8647 Fax : 053-600-8645 Web Site : www.intertek.co.kr

Seoul Lab. Address : 1/F, A-ju Digital Tower, #284-56, Seongsu 2-ga, Seongdong-Gu, Seoul, 133-833 Korea

Ulsan Lab. Address : #340-2, Yongam-Ri, Chongjang-Myun, Ulsu-Gun, Ulsan 689-865 Korea

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	47



TEST REPORT

Report No. RT11R-U0733-001-E

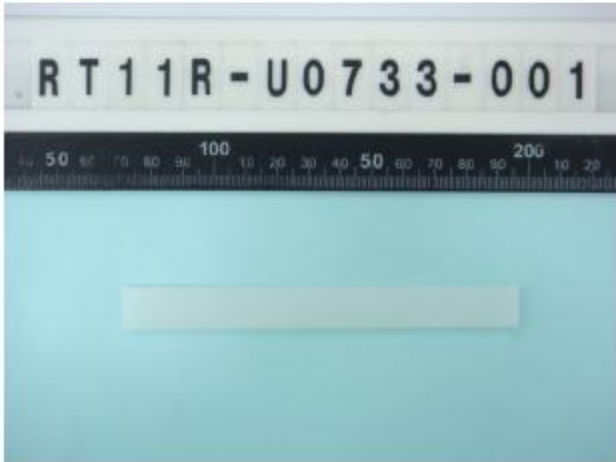
Sample ID No. : RT11R-U0733-001

Sample Description : KOPA

Page: 3 of 4

Date: Apr. 19, 2011

* View of sample as received:-



This Test Report is issued by the Company subject to its Terms and Conditions of Business printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. This Test Report shall not be reproduced, except in full, without prior written consent of the Company.

Intertek Testing Services Korea Ltd.

Seoul Office: Tel : 02-6090-9500 Fax : 02-3409-0026 Daegu Office : Tel : 053-600-8647 Fax : 053-600-8645 Web Site : www.intertek.co.kr

Seoul Lab. Address : 1/F, A-ju Digital Tower, #284-56, Seongsu 2-ga, Seongdong-Gu, Seoul, 133-833 Korea

Ulsan Lab. Address : #340-2, Yongam-Ri, Chonggang-Myun, Ulsan-Gun, Ulsan 689-865 Korea

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	48

Intertek

TEST REPORT

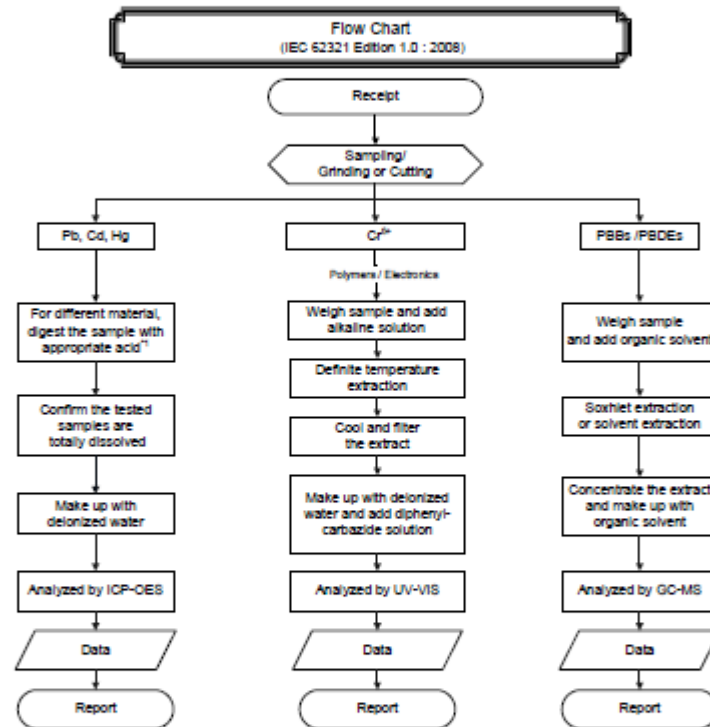
Report No. RT11R-U0733-001-E

Page: 4 of 4

Date: Apr. 19, 2011

Sample ID No. : RT11R-U0733-001

Sample Description : KOPA



Remarks :

*1 : List of appropriate acid :

Material	Acid added for digestion
Polymers	HNO ₃ , HCl, HF, H ₂ O ₂ , H ₃ BO ₃
Metals	HNO ₃ , HCl, HF
Electronics	HNO ₃ , HCl, H ₂ O ₂ , HBF ₄

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

This Test Report is issued by the Company subject to its Terms and Conditions of Business printed overleaf. Attention is drawn to the limitations of liability, indemnification and jurisdictional issues defined therein. This Test Report shall not be reproduced, except in full, without prior written consent of the Company.

Intertek Testing Services Korea Ltd.

Seoul Office: Tel : 02-6090-9500 Fax : 02-3409-0026 Daegu Office: Tel : 053-600-8647 Fax : 053-600-8645 Web Site : www.intertek.co.kr

Seoul Lab. Address : 1/F, A-ju Digital Tower, #284-56, Seongsu 2-ga, Seongdong-Gu, Seoul, 133-833 Korea

Ulsan Lab. Address : #340-2, Yongam-Ri, Chongnyang-Myun, Ulsu-Gun, Ulsan 689-865 Korea

안테나 규격서	문서번호	KRS-AA-0047	REV.	가람 솔루션	00
	DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	49

▶ COVER [BT1040D-NP]

		Page 1 of 4	
Test Report No. F690501/LF-CT\$AYAA10-10632		Issued Date: March 26, 2010	
To: LG CHEM, LTD. LG twin tower 23 Yeosu-dong Yeongdeungpo-gu SEOUL Korea			
The following merchandise was submitted and identified by the client as :			
SGS File No.	: AYAA10-10632		
Product Name	: KEYFLEX BT1040D-NP		
Item No./Part No.	: N/A		
Received Date	: March 23, 2010		
Test Performing Date	: March 24, 2010		
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)		
Pluto Kim Cindy Park/ Testing Person		SGS Testing Korea Co. Ltd.  Jeff Jang / Chemical Lab Mgr	
This document is issued by the Company subject to its General Conditions of Service printed on the reverse side of this document and its electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgslab.co.kr. It is the Client's responsibility to ensure the accuracy of the information provided and to ensure that the information is not used for any purpose other than the intended purpose. The Company is not responsible for any loss or damage to the Client's property or for any other loss or damage caused by the use of this document.			
F052 Version3		322, The C Valley, 525-9, Hoge-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-090 T +82 (0)31 4806 0000 F +82 (0)31 4806 0558 http://www.sgslab.co.kr www.kr.ags.com/gw/kr/lab Member of the SGS Group (Société Générale de Surveillance)	

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	50



Test Report No. F690501/LF-CTSAYAA10-10632
 Issued Date: March 26, 2010
 Page 2 of 4

Sample No. : AYAA10-10632.001
Sample Description : KEYFLEX BT1040D-NP
Item No./Part No. : N/A

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	With reference to EPA 3052(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	With reference to EPA 3052(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	With reference to EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	With reference to 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.

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

This document is issued by the Company subject to the General Conditions of Service printed on the back of the report or accessible at www.sgslab.co.kr and its electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgslab.co.kr. The Company is not responsible for the content or accuracy of the information provided in a document that originates from a third party and is not intended to be used as a basis for any legal action. The Company's use of the information provided in this document is limited to the purpose for which it was provided to the client and is not intended to be used for any other purpose. The Company is not responsible for the content or accuracy of the information provided in a document that originates from a third party and is not intended to be used as a basis for any legal action. The Company's use of the information provided in this document is limited to the purpose for which it was provided to the client and is not intended to be used for any other purpose.

F052 Version3
 SGS Testing Korea Co.,Ltd.

322, The C valley, 225-9, Hoge-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-030
 t +82 (031) 4938 000 f +82 (031) 4938 059 <http://www.sgslab.co.kr> www.sgslab.co.kr

Member of the SGS Group (Société Générale de Surveillance)

안테나 규격서	문서번호	KRS-AA-0047	REV.	가람 솔루션	00
				한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	51



Test Report No. F690501/LF-CTSAAYAA10-10632 **Issued Date:** March 26, 2010 **Page** 3 of 4

Sample No. : AYAA10-10632.001
Sample Description : KEYFLEX BT1040D-NP
Item No./Part No. : N/A

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Decabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.

Picture of Sample as Received:



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

The document is issued by the Company subject to its General Conditions of Service printed on each order or request or available at www.sgs.com and its electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com. The Company's sole responsibility is to its Client and this document does not constitute a contract or a representation that the Company is not liable for any and all claims or damages arising from the use of this document. Any modification or alteration of the content or appearance of this document is strictly prohibited and shall be considered as a breach of contract. This document shall be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, copying or distribution shall be liable to prosecution in the law courts and may be subject to criminal and civil penalties.

PO52 Version3

SGS Testing Korea Co., Ltd.

322, The C-valley, 525-8, Haebye-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-030
t +82 (0)1 4808 000 f +82 (0)1 4808 059 <http://www.sgs.co.kr> www.kr.sgs.com/gwintab

Member of the SGS Group (Société Générale de Surveillance)

안테나 규격서	문서번호	KRS-AA-0047	REV.	가람 솔루션	00
				한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	52



Test Report No. F690501/LF-CTSAAYAA10-10632 Issued Date: March 26, 2010 Page 4 of 4

Testing Flow Chart for RoHS:Cd/Pb/Hg/Cr⁶⁺/PBBs&PBDEs Testing

Cd/Pb/Hg	PBBs/PBDEs	Cr ⁶⁺
Mechanic_Sample	Mechanic_Sample	Mechanic_Sample
Sample Measurement	Sample Measurement	Sample Measurement
Acid Digestion with Microwave/Hotplate	Solvent Extraction of the Sample	Adding Extraction Solution
Filtration	Clean-up with Florisil Column	Heating to 90~95°C for Extraction
Residue	Concentration / Dilution of Extraction Solution	Filtration and pH Adjustment
Total Digestion	Filtration	Adding 1,5-Diphenyl-carbazide for Color Development
ICP-AES	GC/MS	UV-Vis
DATA	DATA	DATA

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 ***

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

This document is issued by the Company subject to the General Conditions of Service, which are available on request or accessible at www.sgslab.co.kr and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgslab.co.kr. The Company's liability is limited to the extent of the information and services provided under the contract. The Company's liability is limited to the extent of the information and services provided under the contract. The Company's liability is limited to the extent of the information and services provided under the contract. The Company's liability is limited to the extent of the information and services provided under the contract.

F052 Version3

SGS Testing Korea Co.,Ltd.

322, The O'valley, 505-6, Hoge-dong, Dongen-gu, Anyang-si, Gyeonggi-do, Korea 431-080
t +82 (0)31 4908 000 f +82 (0)31 4908 059 <http://www.sgslab.co.kr> www.kr.sgs.com/gwslab

Member of the SGS Group (Société Générale de Surveillance)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	55



Test Report No. F690501/LF-CT\$AYAA10-31258 Issued Date: September 09, 2010 Page 3 of 4

Picture of Sample as Received:



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) * = Boiling-water-extraction:
 - Negative = Absence of CrVI coating
 - Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

This document is issued by the Company subject to the General Conditions of Service printed material available on request or accessible at www.sgslab.co.kr and its electronic format documents subject to Terms and Conditions for Electronic Documents at www.sgslab.co.kr. Member is aware of the limitation of liability, indemnification and limitation of damages. Any notice of this document is subject to the information contained herein without the Company's liability at the time of its publication only and within the limits of Client's responsibility. If any. The Company's sole responsibility is to its Client and the document shall not constitute either in a transaction from obtaining all their rights and obligations under the applicable documents. This document cannot be reproduced without the prior written approval of the Company. Any intentional alteration, deletion or modification of the content or appearance of this document in electronic and/or printed form is prohibited. The document shall be subject to the latest version of the document. Please refer to the latest version of this document only for the sample's latest and most complete information.

FD02 Version3

SGS Testing Korea Co., Ltd.

322, The O valley, 525-4, Haeje-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
 t +82 (0)31 4808 000 f +82 (0)31 4808 050 <http://www.sgslab.co.kr> service@sgslab.co.kr

Member of the SGS Group (Société Générale de Surveillance)

안테나 규격서	문서번호	KRS-AA-0047	REV.	가람 솔루션	00
				한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	56



Test Report No. F690501/LF-CTSA YAA10-31258 Issued Date: September 09, 2010 Page 4 of 4

Testing Flow Chart for RoHS: Cd/Pb/Hg/Cr⁶⁺/PBBs&PBDEs Testing

Cd/Pb/Hg	PBBs/PBDEs	Cr ⁶⁺	Cr ⁶⁺
Mechanic_Sample	Mechanic_Sample	Mechanic_Sample	Mechanic_Sample
Sample Measurement	Sample Measurement	Sample Measurement	Sample Measurement
Acid Digestion with Microwave/Hotplate	Solvent Extraction of the Sample	Nonmetallic Material	Metallic Material
Filtration	Clean-up with Florisil Column	Adding Extraction Solution	Spot Test / Boiling Water Extraction
Residue	Concentration/Dilution of Extraction Solution	Heating to 90~95°C for Extraction	Adding 1,5-Diphenylcarbazide for Color Development
Total Digestion	Filtration	Filtration and pH Adjustment	A Red Color Indicates the Presence of Cr ⁶⁺
ICP-AES/AAS	GC/MS	Adding 1,5-Diphenylcarbazide for Color Development	Confirm with UV-Vis
DATA	DATA	UV-Vis	DATA

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

Section Chief : Gilsae YI

*** 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) * = Boiling-water-extraction:
Negative = Absence of CrVI coating
Positive = Presence of CrVI coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

This document is issued by the Company subject to its General Conditions of Service printed hereon, available on request or accessible at www.sgs.com/sgsweb/sgsweb.asp and its electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/sgsweb/sgsweb.asp. Attention is drawn to the limitation of liability, indemnification and jurisdiction clause defined therein. Any holder of this document is advised that the information contained herein reflects the Company's findings at the time of its preparation only and under the limits of Client's instructions. If any. The Company shall not be liable for the content or consequences of this document in whatever way and whenever may be presented or the latest version of the document. The document shall be reproduced except in full without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document in whatever way and whenever may be presented or the latest version of the document is prohibited. This test report refers only to the samples tested and each sample is tested for 100 days only.

F052 Version3

SGS Testing Korea Co., Ltd.

322, The O valley, 225-6, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
t +82 (0)31 4800 000 f +82 (0)31 4800 059 <http://www.sgslab.co.kr> www.kr.sgs.com/greentab

Member of the SGS Group (Société Générale de Surveillance)

안테나 규격서		문서번호	KRS-AA-0047	REV.	가람 솔루션	00
		DATE	2011-07-26		한빛전자	
MODEL	MR50001WF	TYPE	External Ant	PAGE	PAGE	57

4.2.1 유해물질 성분 분석표

유해물질 성분 분석표										
협력업체명 : 가람솔루션										
책 임 자 : 이윤석										
MODEL	부 품	P/NO	부 품 소재별 구분	유해 물질 분석표						공인 시험 기관명
				Cd	Pb	Hg	Cr6+	PBBs	PBDEs	
MR50001WF	ANTENNA	KRS-COMBO-WA	PCB (PCB 원판)	N.D	N.D	N.D	N.D	N.D	N.D	INTERTEK
			PCB (PSR INK)	N.D	N.D	N.D	N.D	N.D	N.D	SGS
			PCB (MARKING INK)	N.D	N.D	N.D	N.D	N.D	N.D	SGS
			PCB (OSP)	N.D	N.D	N.D	N.D	N.D	N.D	SGS
			CABLE	N.D	N.D	N.D	N.D	N.D	N.D	SGS
			JOINT-1	N.D	N.D	N.D	N.D	N.D	N.D	INTERTEK
			JOINT-2	N.D	N.D	N.D	N.D	N.D	N.D	INTERTEK
			COVER	N.D	N.D	N.D	N.D	N.D	N.D	SGS
			BOND	N.D	N.D	N.D	N.D	N.D	N.D	SGS
※ 공인기관 성적서 첨부										