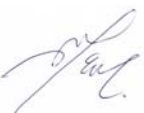




Date :2013. 08.08

SPECIFICATION

Product Name	Bluetooth ANTENNA
Customer	CLIPCOMM
Model Name	BS-F200
Customer Code.	
Provider	RadiAnt
Part Code.	RKA1222-0000AA (Same as BS-H200)

	Submitted	Checked		Approved
Buyer				
RadiAnt	Submitted	Checked	Checked	Approved
			/	

– Table of Contents –

1. Product History -----	3
2. Electrical Feature -----	4
2.1 Frequency Band	
2.2 Impedance	
2.3 Matching circuit	
2.4 S.W.R.	
2.5 Directivity	
2.6 Maximum Power	
3. Environment Test -----	6
4. Electric Performance Data -----	8
5. Drawing -----	10
6. Tool Drawing - -----	11
7. Material Sheet -----	12
8. QC Process -----	13
9. Packing -----	15
10. Inspection Sheet -----	16
11. Certification of RoHS -----	17

1. Product History

LIST					
NO	Data	Front	After	Change	REV
1	2013.08.08			Approval	0
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

2. Electrical Feature

2.1. Frequency Band

BAND	Bluetooth
FREQUENCY [MHz]	2,400 ~ 2,485

2.2 Impedance

2.2.1 Input Impedance

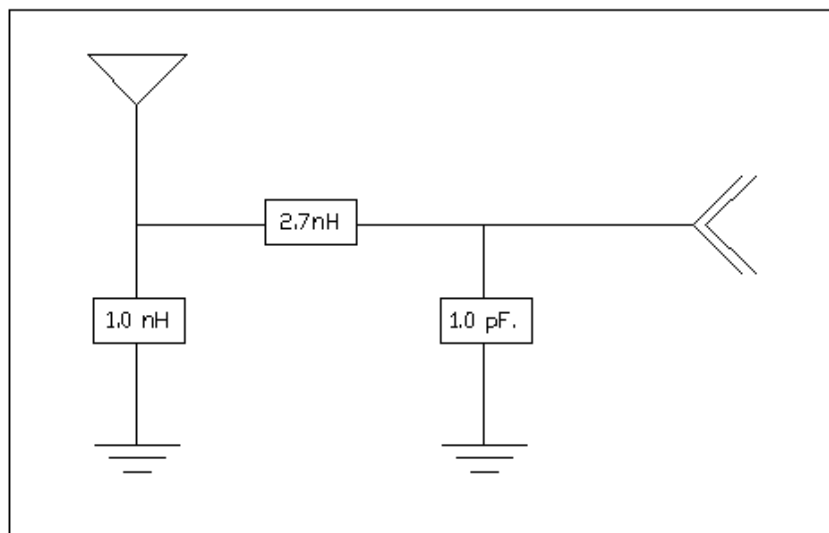
- R = 50Ω

2.2.2 Measuring Method

By using Network Analyzer, connect the antenna installed Set to the reflection point of Analyzer and measure the impedance value within the designated frequency band.

2.3 Matching circuit

Matching Circuit is composed in free space of 2.1 frequency band while satisfying customer's requirements.



2.4 VSWR

Impedance Matching optimization is performed under the below mentioned environment.

2.4.1 Free Space Environment

BAND	Bluetooth	
FREQ.	2,400 MHz	2,485 MHz
S.W.R.	2.0 : 1	2.0 : 1

2.4.2 Measuring Method

Connect (soldering) 50Ω semi-rigid coaxial cable to the 50Ω spot in set. To minimize the loss of transmission, semi-rigid coaxial cable is used. Including PCB, the set shouldn't be different from the one, which will be used for mass production.

Specification should be the same for all frequency bands. Free Space means that set is put on the surface of no conducting plastic.

2.5 Directivity

Omni-directional (Pwr sum.)

BAND		Bluetooth			
Freq.[MHz]		2,400	2,425	2,450	2,485
Gain	Avg.[dBi]	-4.0	-3.5	-3.5	-4.0
	Peak[dBi]	0.5	1.0	1.0	1.0

2.6 Maximum Power

- P=2W Under

3. Environment Test

3.1 Operating Temperature Test

3.1.1 Test Condition

Temperature = -30°C , $+80^{\circ}\text{C}$

Duration time = 1 hour

3.1.2 Requirements

After the test, the antenna must not have an outer damage, and also it must pass requirement shown in 2.4.

3.1.3 Measuring Method

Antenna is kept at -30°C for 1 hour and $+80^{\circ}\text{C}$ for 1 hour and then passed test of 2.4

3.2 Temperature Cycling Test

3.2.1 Test Condition

- Low cycling Temperature TLC = -40°C
- High cycling Temperature THC = $+80^{\circ}\text{C}$
- 1Cycle = 4 hours
- Test number = 10Cycle

3.2.2 Requirements

After the test, the antenna must not have an outer damage, and also it must pass requirement shown in 2.4.

3.2.3 Measuring Method

Antenna is kept at low temperature -40°C for 2 hours and increase the temperature up to $+80^{\circ}\text{C}$ within 2 hour and kept for another 2 hours at the same temperature will be 1 cycle. As shown in Figure 3.2.1 repeat 10 cycle and kept for 2 hour in normal temperature.

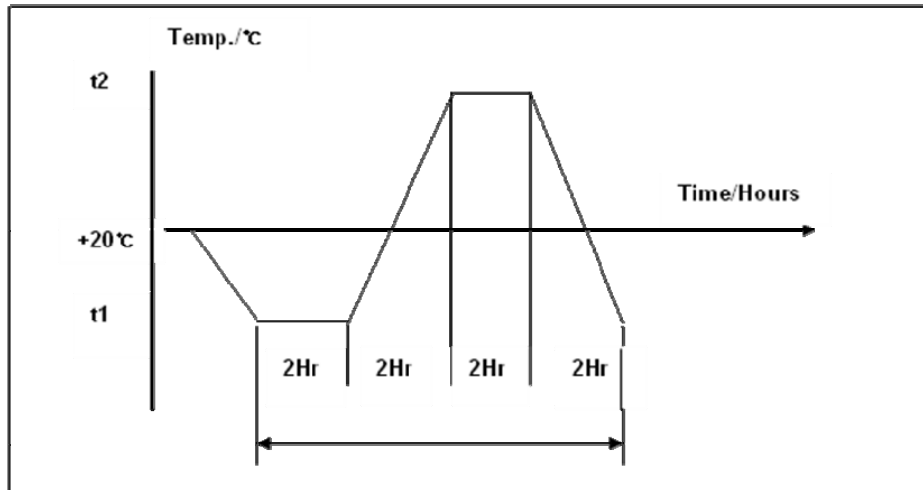


Figure 3.2.1 Temperature Cycling

3.3 Corrosion Resistance Test

3.3.1 Test Condition

- NaCl = 90%
- Water Temperature = 60°C
- Duration Time = 96 hours

3.3.2 Requirements

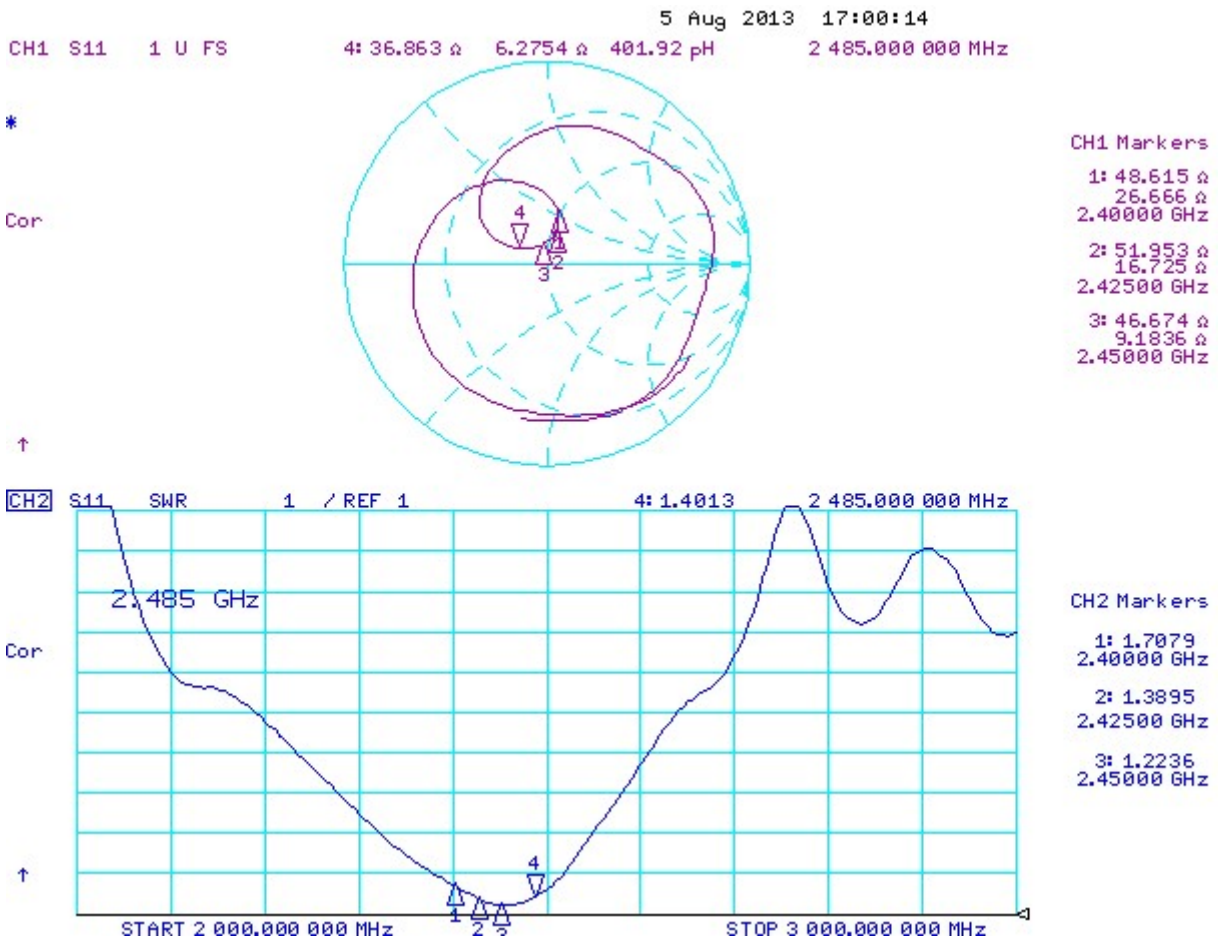
After the test, the antenna must not have an outer damage, and also it must pass requirement shown in 2.4.

3.3.3 Measuring Method

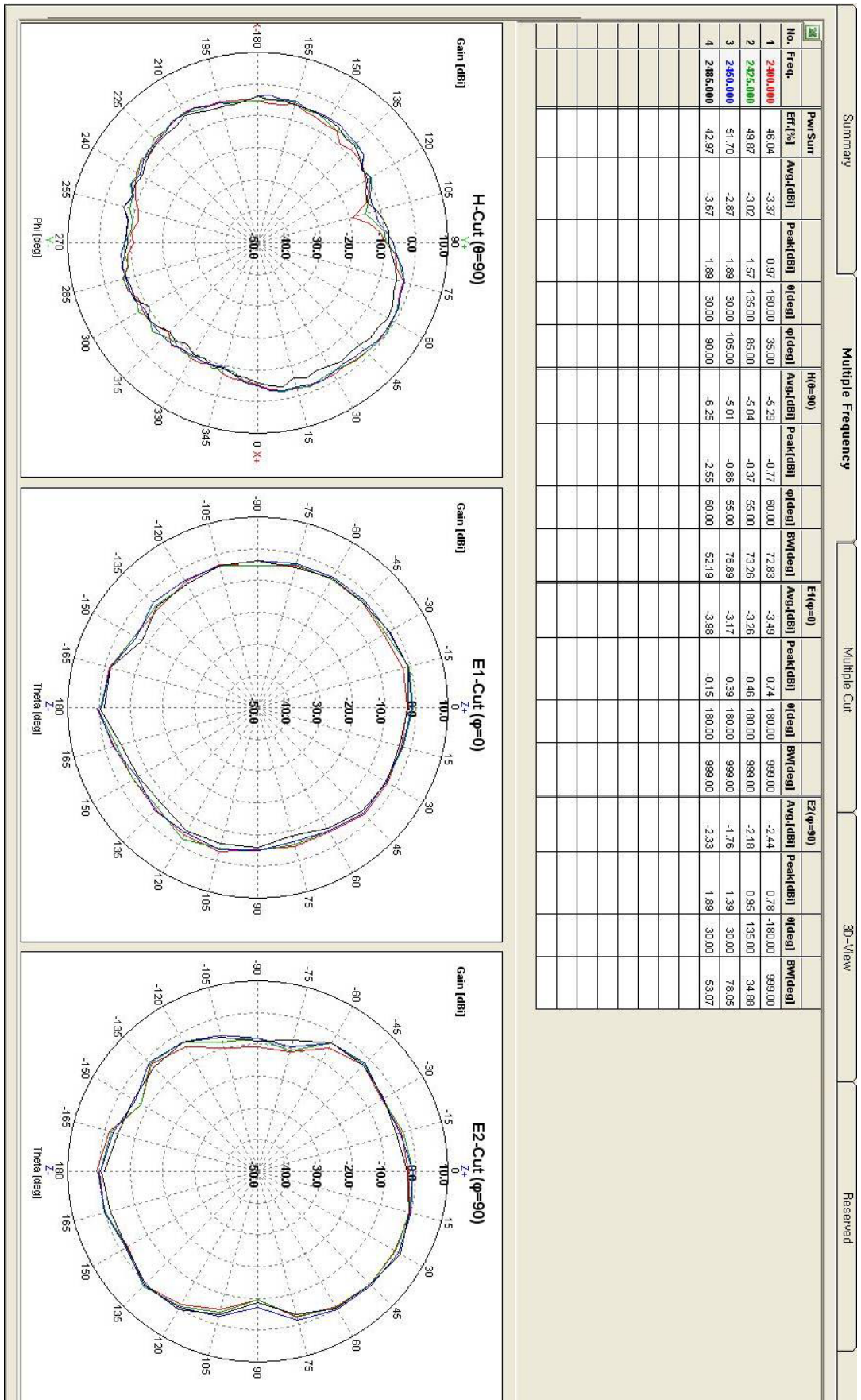
Antenna is soaked in sodium chloride solution at temperature $+60^{\circ}\text{C}$ and 90%(NaCl) for 96 hours and dry out.

4. Electric Performance Data

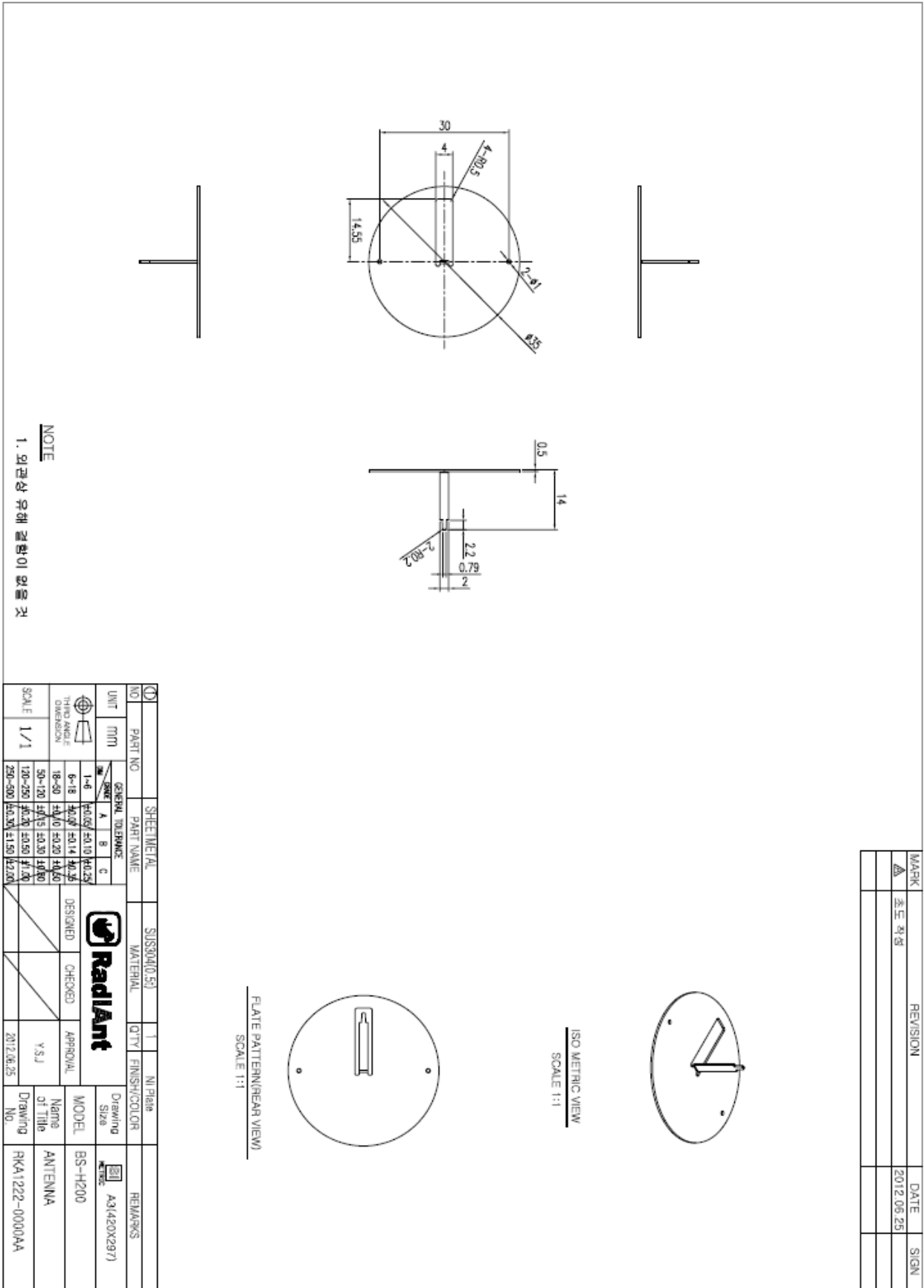
4.1 Smith Chart & VSWR



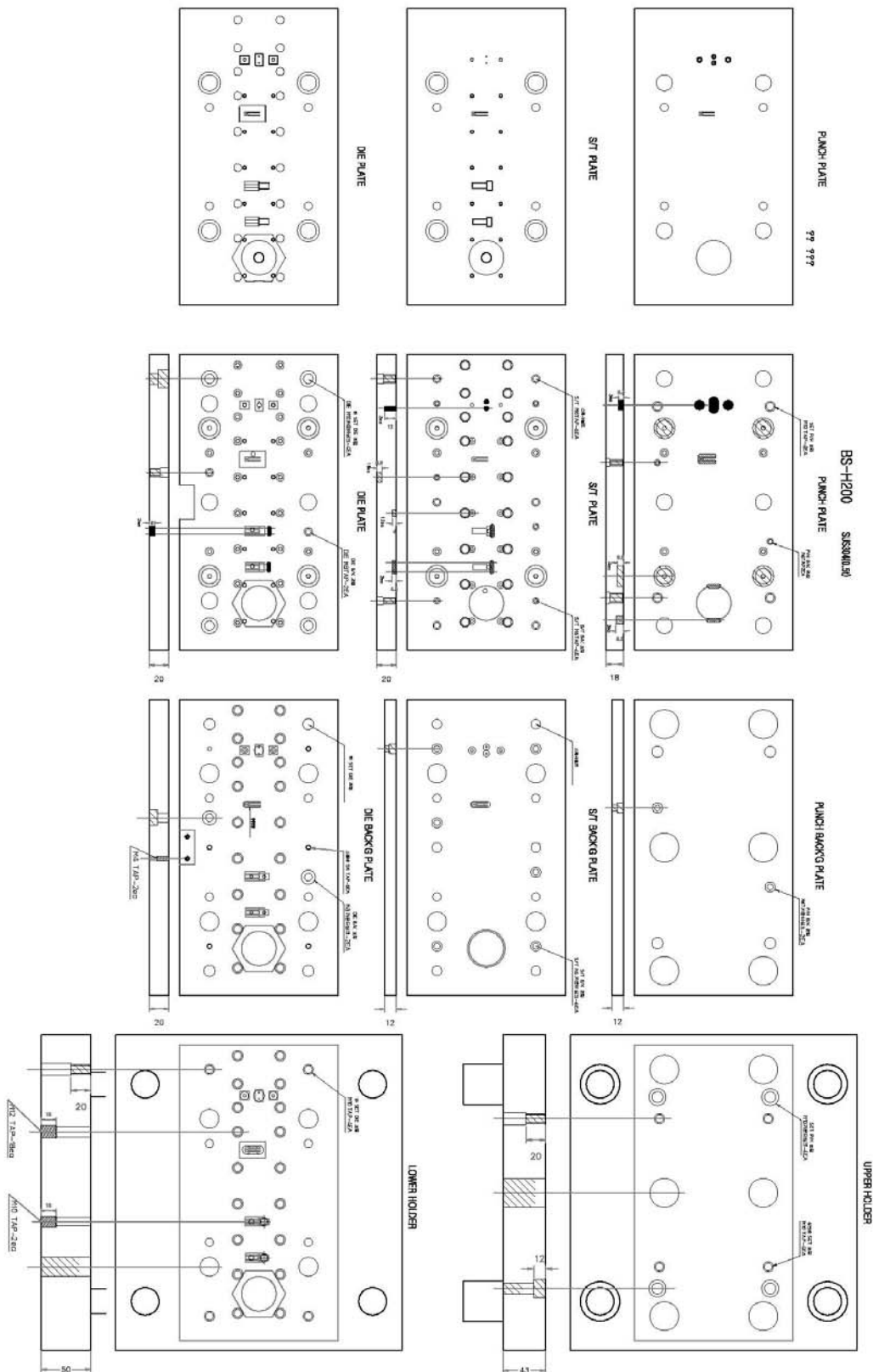
4.2. GAIN DATA



5. Drawing



6. Tool Drawing



7. Material Sheet

INSPECTION CERTIFICATE																
SONGEUN METAL CO., LTD.																
CUSTOMER		: 대우하이테크														
SPECIFICATION		: KS D-3698														
COMMODITY		: COLD ROLLED STAINLESS STEEL														
SPEC.		: STS 304-1/2H														
SURFACE FINISH		:														
SONGEUN METAL CO., LTD.																
48-179, SAMJUNG-DONG, GYONG-GU, BUCHHEON-CITY, KYUNGGI-DO, KOREA TEL:032)682-4328 FAX:032)682-9746																
CERTIFICATE NO		: SR-20110524														
DATE OF TEST		: May. 24, 2011.														
DIMENSIONS	PRODUCT NO	WEIGHT (KG)	CHEMICAL COMPOSITION(%)								TENSILE TEST			BEND TEST	HARDNESS	REMARK
			C		SI	Mn	P	S	NI	CR	MO	Yield Strength (N/mm ²)	Tensile Strength (N/mm ²)			
0.5*156		65.0	Max 0.08 Min	1.00	2.00	0.045	0.030	10.50 8.00	20.00 18.00					180/0	265	
<p>Remark : We hereby certify that above material has been tested to comply with the specification.</p> <p style="text-align: center; font-weight: bold; font-size: 1.2em;">SONGEUN METAL CO., LTD.</p> <p style="text-align: right; font-weight: bold; font-size: 1.2em;">ZINCHUN</p> <p style="text-align: right; font-size: 0.8em;">MANAGER OF QUALITY ASSURANCE TEAM</p>																

8. QC Process

관리 계획서 (Control Plan)

업체명 : 주식회사 라디앤티

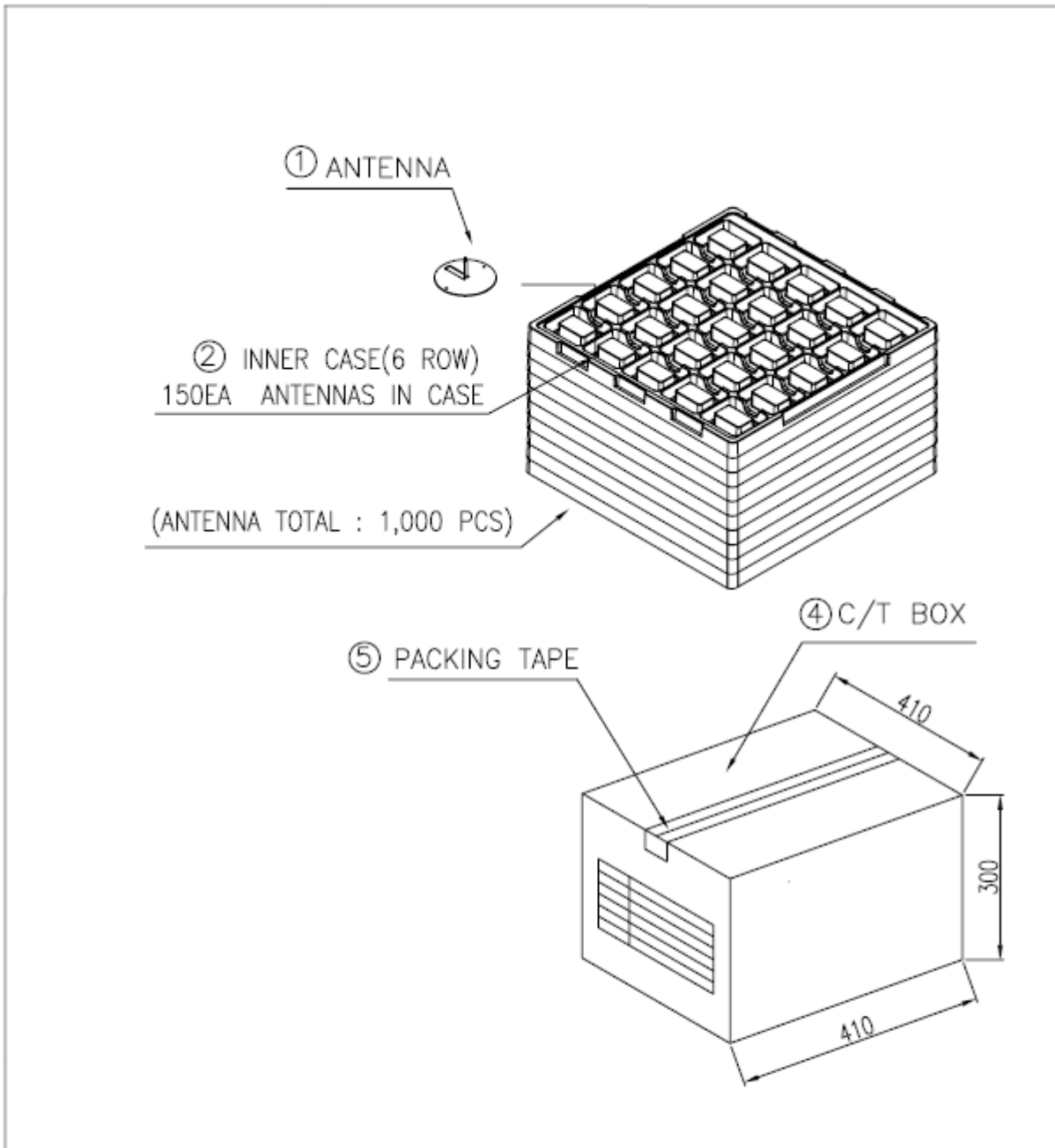
□ 시작단계	부품명/품명	BS-H200 ANTENNA	NO	일자	개정사유	작성	검토	승인	재정일자 : 2012. 09. 17								
									작성	검토	승인						
	부품 / 품번	RKA1220-0000AA															
● 양산단계				2012.09.17	개정	윤석준		채홍태									
업체코드		고객기술 승인/일자(요구시)		고객품질 승인/일자(요구시)		기타승인/일자(요구시)											
항목 번호	공정흐름도			관리 항목			관리 기준				관리분담	이상 발생시 조치 사항	비고				
	SUB	MAIN	외주	NO	제품	공정	특성 특성	규격	확인방법	주기				관리방안	생산	QM	
1			○	원부재수입검사	1		색, 외형		육안	LOT	작업지도서	○		관리자에 보고 후처리			
2			○	PRESS	1	슬라이드블레이		862.5 ± 3mm	게이지	LOT	작업지도서	○		관리자에 보고 후처리			
					2	타발속도		50 ± 10rpm	속도계	LOT	작업지도서	○		관리자에 보고 후처리			
3			○	공정검사	1	지수검사			V/C	LOT	검사기준서	○		관리자에 보고 후처리			
4			○	원부재 입고	1			입고대기 장소에서 대기									
					원부재 수입검사	약품함고 저물	2	화학성분		원부재 수입검사 기준에 준함	MILL SHEET	매일고시	MILL SHEET 보관		○		입체통보후 부적합 대기정소로 이동
							3	표장상태		정렬 유지함	육안	일고시	수입검사명세서 또는 수입검사 관리대장		○		
							4	종량확인		단위종량	저울/거래명세서	일고시			○		
							5	항고이동일정		약품수입표시TAG부착함	육안	적합시	약품관리대장 기록		○		
							6	부적합품 격리이동		붉은식별표부착하고 부적합품 보관장소로 이동함	붉은식별표 내용확인	발생시	부적합품 관리대장		○		부적합 보관장소 이동후 판송처리
							7	소재인고	표장용기/지게차	제품확인		공정이동표와 일치함	육안	일고시	일고대기장소 함치		○
					소재 수입검사	저물	8	외관		수입검사기준에준함	육안	LOT			○		입체통보후 부적합대기정소로 이동
							9	수량확인		공정 이동표와 일치함	저울(계수)	매일고시	수입검사 관리대장		○		
							10	이동용인		이동용인인인인	육안	매일고시			○		
							11	공정대기이동		공정대기장소 이동 (공정식별표 부착)	육안	적합시	공정 이동표에 압사이력기록		○		작업자교육
							12	부적합품 격리이동		붉은식별표부착하고 부적합품 보관장소로 이동함	붉은식별표 내용확인	발생시	부적합품 관리대장/ 품질이상 발생정보서		○		부적합 보관장소 이동후 판송처리




항목 번호	공정흐름도			관리 항목			관리 기준				관리분담	이상 발생시 조치 사항	비고		
	SUB	MAIN	외주	NO	제품	공정	특성 특성	규격	확인방법	주기				관리방안	생산
5			○	조용파 세척	조용파기	1	오염도		비색관리 (색상현도안분해준함)	육안	2회/일	조건관리 CHECK SHEET 1조: 30-40℃ 3조: 40-50℃	○		생산직일자에게 통보후 역보송
						2	온도		1조(세척조) 30-40℃	온도계	2회/일		○		온도제설정
						3	불통		3 ~ 4	불통계	2회/일		○		불통제설정
						4	시간		2 ~ 3분	타이머	매LOT		○		시간제조정
6			○	알칼리 탈지	알칼리 탈지조	1	장입량		192개/Rack	육안	매LOT	공정관리 CHECK SHEET 역고항주기 (1회/2일)	○		장입량 제조정
						2	농도		전용탈지제: 40-45g / l	비중계 (Be 4-10)	2회/일		○		생산직일자에게 통보후 역보송
						3	온도		55 ± 5℃	온도계	2회/일		○		온도제설정
						4	시간		3-6분	타이머	매LOT		○		시간제조정
7			○	수세2단	수세조	1	오염도 (흔탁여부)		흔탁함 없음	육안	2회/일	공정관리 CHECK SHEET	○		수세수고제 또는 OVER FLOW
						2	PH		수세2조: 7-9	PH테이퍼	2회/일		○		
						3	시간		15 ~ 30초	타이머	매LOT		○		
8			○	전해탈지	전해탈지조	1	농도		전해탈지제: 40-45g / l	비중계 (Be 2-5)	2회/일	공정관리 CHECK SHEET	○		생산직일자에게 통보후 역보송
						2	PH		13 ~ 14	PH테이퍼	2회/일		○		PH 제조정
						3	전압		5 ~ 6V	전압계	2회/일		○		전압 제조정
						4	시간		20 ± 5초	타이머	매LOT		○		시간제조정
9			○	수세2단	수세조	1	오염도 (흔탁여부)		흔탁함 없음	육안	2회/일	공정관리 CHECK SHEET	○		OVER FLOW
						2	PH		수세2조: 4-6	PH테이퍼	2회/일		○		
						3	시간		15 ~ 30초	타이머	매LOT		○		
10			○	열화니켈 S/T	열화니켈 S/T조	1	농도		열화니켈: 240 ± 20g / l 열산: 120 ± 20ml / l	비중계 (Be 15-20)	2회/일	공정관리 CHECK SHEET	○		생산직일자에게 통보후 역보송
						2	시간		50 ± 10초	타이머	매LOT		○		
11			○	수세2단	수세조 (150 l)	1	오염도 (흔탁여부)		흔탁함 없음	육안	2회/일	공정관리 CHECK SHEET	○		OVER FLOW
						2	PH		수세2조: 5-7	PH테이퍼	2회/일		○		
						3	시간		15 ~ 30초	타이머	매LOT		○		

공정 번호	공정흐름도			공정명	설비명	관리 항목			특별 특성	관리 기준				관리분담		이상 발생시 조치 사항	비 고
	SUB	MAIN	외부			NO	제품	공정		규격	확인방법	주기	관리방안	생산	QM		
12			O	무전해Ni 도금	무전해Ni 도금조 (150 ℓ)	농도		2000제 : 160 ± 2mℓ / ℓ	습식분석	신규건역시	2회/일	관정관리 CHECK SHEET	O	O	생산책임자에게 행보후 역보증		
								2000A제 : 80 ± 2mℓ / ℓ									
								2000A제 : 80 ± 2mℓ / ℓ									
								2000B제 : 80 ± 2mℓ / ℓ									
								2000C제 : 80 ± 2mℓ / ℓ									
2	온도	80 ± 2℃	온도계	2회/일	O	O	온도재설정										
3	PH	4.8 ± 0.2	PH미터	2회/일	O	O	PH 재조정										
4	시간	10-15분	타이머	매LOT	O	O	시간재조정										
13			O	수세3단	수세조 (150 ℓ)			오염도 (혼탁여부)	혼탁함 없음것	육안	2회/일	O	O	OVER FLOW			
								2	PH	수세3조: 5-7	PH미터	2회/일					
								3	시간	15 ~ 30초	타이머	매LOT					
14			O	중간검사	X-RAY도금 두께측정기	1	도금두께	NIP: 2-4μm	X-RAY도금 두께측정기	n=2/LOT	중간검사 CHECK SHEET	O	O	품질. 생산책임자보고후 REWORK			
							2	부적합품 격리이동	불은식별표를부착하고 부적합품 보관장으로 이동할것	불은식별표 내용확인	발생시	O	O	품질팀장보고후부적합 대기장소 이동			
							3	REWORK	OP30으로 이동 재작업 실시	부적합품 식별표확인	발생시	O	O	부적합보관장소이동후 REWORK			
15			O	박리	박리조	1	농도	경원박리제 : 100-150mℓ / ℓ 정원소다: 100-150mℓ / ℓ	계량컵	발생시	O	O	생산책임자에게 보고후 역보증 또는 신규건역				
							2	온도	100 ± 10℃	온도계	O	O	온도재설정				
							3	시간	20 ± 10분	타이머/육안	O	O	시간재조정				
16			O	수세	수세조	1	수세수	흐름눈물 세척	육안	발생시	O	O	OVER FLOW				
							2	시간	20 ± 5초	타이머	O	O					
17			O	후처리	후처리조 (40 ℓ)	1	농도	후처리제 : 3-3.5mℓ / ℓ	비중계 (Be ¹ -1-2)	2회/일	관정관리 CHECK SHEET 확인주기 1회/일	O	O	농도재조정			
							2	시간	30초-1분	타이머	매LOT	O	O	시간재조정			
18			O	수세3단	수세조 (150 ℓ)	1	오염도 (혼탁여부)	혼탁함 없음것	육안	2회/일	O	O	OVER FLOW				
							2	PH	수세3조: 6-8	PH미터	2회/일						
							3	시간	15 ~ 30초	타이머	매LOT						

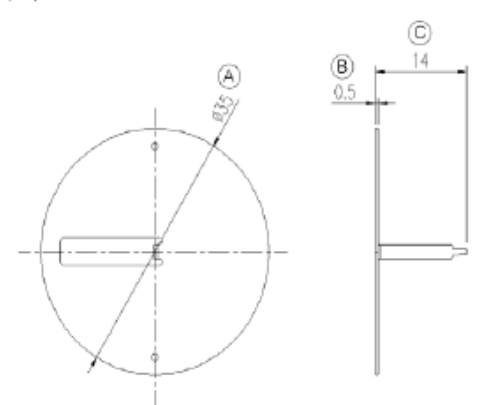
공정 번호	공정흐름도			공정명	설비명	관리 항목			특별 특성	관리 기준				관리분담		이상 발생시 조치 사항	비 고
	SUB	MAIN	외부			NO	제품	공정		규격	확인방법	주기	관리방안	생산	QM		
19			O	탕세	탕세조 (150 ℓ)			염프색상 확인할것 (교환주기: 복색→단색)	염프	2회/일	관정관리 CHECK SHEET	O	O	이온교환수지 교환			
								2	온도	75 ± 10℃					온도계	2회/일	
								3	시간	5초-10초					타이머	매LOT	
								4	오염도	부유물확인					육안	2회/일	
20			O	건조	건조기	1	온도	95 ± 5℃	온도계	매LOT	O	O	온도재설정				
							2	시간	50 ± 10분	타이머	O	O	시간재조정				
21			O	최종검사	검사대	1	외관	SAMPLING 검사	미도금, 부풀음, 흠 (변형), 찍힘, 긁힘 등 사용 상 유해한 결함 없을것	육안	LOT	최종검사일지	O	O	품질팀장보고후 REWORK		
							2	도금두께	NIP: 2-4μm	X-RAY도금 두께측정기	LOT	도금두께성적서	O				
							3	부적합품 격리이동	불은식별표를부착하고 부적합품 보관장으로 이동할것	불은식별표 내용확인	전량	발생시	O			부적합보관장리대장 부적합대기장소이동 부적합보고서작성후 REWORK	
							4	REWORK	REWORK일요시 OP30 으로이동 재작업실시	부적합품 식별표확인	전량	발생시	O				
22			O	포장	저울	1	포장용기	고려지정용기	용기	매LOT	포장기준서	O	O	용기교체			
							2	포장규격	고객요구사항에 준함	육안	O	O	제각업				
20			O	출하검사		1	외관	출하검사기준서 (도금두께 2-4μm)	육안	n=5/매LOT	검사성적서	O	O	윤하자에 보고 후 조치			
21			O	납품		1	수량	외관	1000/BOX	BOX 포장	전수	포장일지	O	O	윤하자에 보고 후 재작업 조치		
22			O	검사/포장	네트웍크	1	외관	외관	검사기준서	육안	매LOT/전수	작업일보	O	O	윤하자에 보고 후 조치		
23			O	출하검사	네트웍크	1	출하검사	치수검사	검사기준서	버니어	매LOT/6-11	검사성적서	O	O	윤하자에 보고 후 조치		
24			O	납품		1	수량	수량	1000/BOX	BOX 포장	거래명세서	O	O	윤하자에 보고 후 조치			

9. Packing



⑤	PACKING TAPE	-	-					
④	C/T BOX	SW2	1					
③	PAD	SW1	1					
②	INNER CASE	P.S	10					
①	ANTENNA	-	1,000					
NO	PART NAME	MATERIAL	Q'TY	FINISH//COLOR	REMARKS			
UNIT	mm	GENERAL TOLERANCE				Drawing Size	 A4(210X297)	
		DM	A	B		C	MODEL	PACKING
 THIRD ANGLE DIMENSION		1~6	±0.05	±0.10	±0.25	DESIGNED _____ CHECKED _____ APPROVAL PARK.S.S	Name of Title	
		6~18	±0.07	±0.14	±0.35		Drawing No.	-
		18~50	±0.10	±0.20	±0.50			
		50~120	±0.15	±0.30	±0.80			
SCALE	1/2	120~250	±0.20	±0.50	±1.00			
		250~500	±0.30	±1.50	±2.00			

10. Inspection Sheet

(주)라디언트				출하검사성적서				클립검							
결재	담당	검토	승인	검사방법: KA S ISO 2859-1				검사수준: G-II, S-II AQL 0.65%				결재	담당	검토	승인
	/	/	/										/	/	/
고객명		클립검						(대략도)							
MODEL 명		BS-H200													
부품명		ANTENNA													
부품번호		RKA1220-0000AA													
LOT NO.															
입고 / LOT수량															
검사	입고수량	시료수	불량	판정		조치									
결과	0		0	(합)	불	납품									
품질등급		A	중요	B	보통	C	경미								

번호	검사항목	규격	품질 등급	시료수										판정		
				1	2	3	4	5	6	7	8	9	10	(주)라디언트 고객		
1	외관	유해한 결함이 없을것.	B	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	합	불
2	A	∅35 ±0.2	A												합	불
3	B	0.5 ±0.1	A												합	불
4	C	14 ±0.14	A												합	불
5																
6																
7																
8																

(주)라디언트

A4(210X297mm)

11. Certification of RoHS

11-1 SUS304



Test Report No. F690101/LF-CTSAYAA12-08483

Issued Date: 2012. 03. 02 Page 1 of 4

To: **IETAL CO., LTD.**
100B-15L Namdong Industrial,#886-18
Gojan-Dong
Namdong-Gu
Incheon
Korea

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

SGS File No. : AYAA12-08483
Product Name : SUS 304
Item No./Part No. : N/A
Received Date : 2012. 02. 27
Test Period : 2012. 02. 28 to 2012. 03. 02
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 printed on back, available on request or accessible at www.sgslab.com and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgslab.com/condition. Attention is drawn to the fact that this document is subject to the conditions of service of the Company. Any holder of this document is advised that the Company's liability is limited to the facts of this document only and that the holder of this document, being the Company's sole responsibility to the Client and the document does not constitute a warranty or a guarantee in respect of the results of the tests. This document cannot be reproduced or copied in full without prior written approval of the Company. Any unauthorized alteration, forgery or falsification in 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 to the sample(s) tested and each sample(s) are retained for 100 days only.

SGS Korea Co., Ltd.

322, The O valley, 555-8, Hoge-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
T +82 (0)31 4905 000 F +82 (0)31 4808 050 <http://www.sgslab.co.kr> www.kr.sgs.com/sgslab

F052 Version4

Member of the SGS Group (Société Générale de Surveillance)


Test Report No. F690101/LF-CTSAYAA12-08483

Issued Date: 2012. 03. 02 Page 2 of 4

Sample No. : AYAA12-08483.001
Sample Description : SUS 304
Item No./Part No. : N/A
Materials : N/A

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) By boiling water extraction*	**	With reference to IEC 62321:2008	-	Negative
Antimony (Sb)	mg/kg	With reference to EPA 3052(1996), US EPA 6010B(1996), ICP	10	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.

- NOTE:** (1) N.D. = Not detected.(<MDL)
 (2) mg/kg = ppm
 (3) MDL = Method Detection Limit
 (4) - = No regulation
 (5) Negative = Undetectable / Positive = Detectable
 (6) ** = Qualitative analysis (No Unit)
 (7) * = 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 on last, available on request or accessible at www.sgs.com, and, for analytical result documents, subject to Terms and Conditions for Electronic Documents of www.sgs.com. Information related to this document is confidential and intended solely for the individual named in the header of this document. It is the property of the Company and its use is restricted to the individual named in the header of this document. The Company will not be held responsible for the content and the use of this document and any other parties to a transaction shall be deemed to have accepted the Company's disclaimer. This document is not to be reproduced, stored, transmitted, or otherwise used in any manner without the prior written approval of the Company. Any unauthorized alteration, copying or distribution of the content of this document is prohibited. The results shown in this test report refer only to the sample(s) tested and each sample(s) was tested for 100 days only.

SGS Korea Co.,Ltd.

 322, The O valley, 555-9, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
 T +82 (0)31 4808 000 F +82 (0)31 4808 050 <http://www.sgs.com> www.kz.sgs.com www.kr.sgs.com

F052 Version4

Member of the SGS Group (Société Générale de Surveillance)

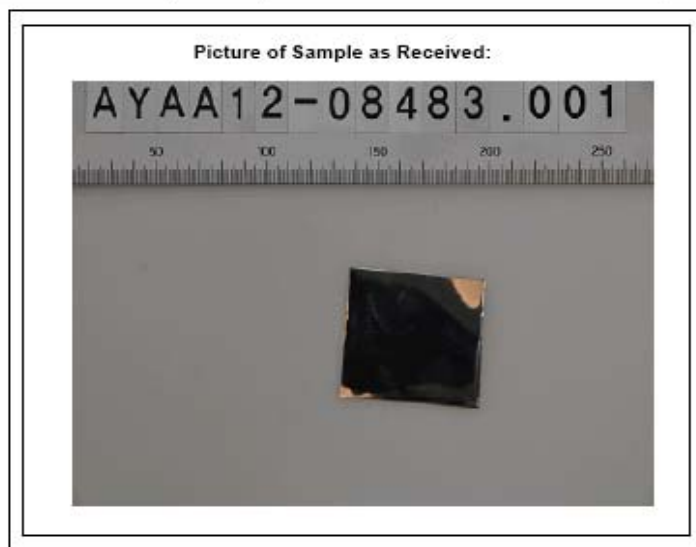

Test Report No. F690101/LF-CTSAYAA12-08483

Issued Date: 2012. 03. 02 Page 3 of 4

Sample No. : AYAA12-08483.001
Sample Description : SUS 304
Item No./Part No. : N/A
Materials : N/A

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
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) Negative = Undetectable / Positive = Detectable
 (6) ** = Qualitative analysis (No Unit)
 (7) * = 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 on the last page of this report and is available on request or accessible at www.sgs.com. It is intended for the sole use of the client and is not to be distributed, copied, or reproduced without the prior written approval of the Company. Any unauthorized use, copying, or reproduction of this document is strictly prohibited. The Company's liability is limited to the extent of the services provided. The Company's liability is limited to the extent of the services provided. The Company's liability is limited to the extent of the services provided.

F052 Version4

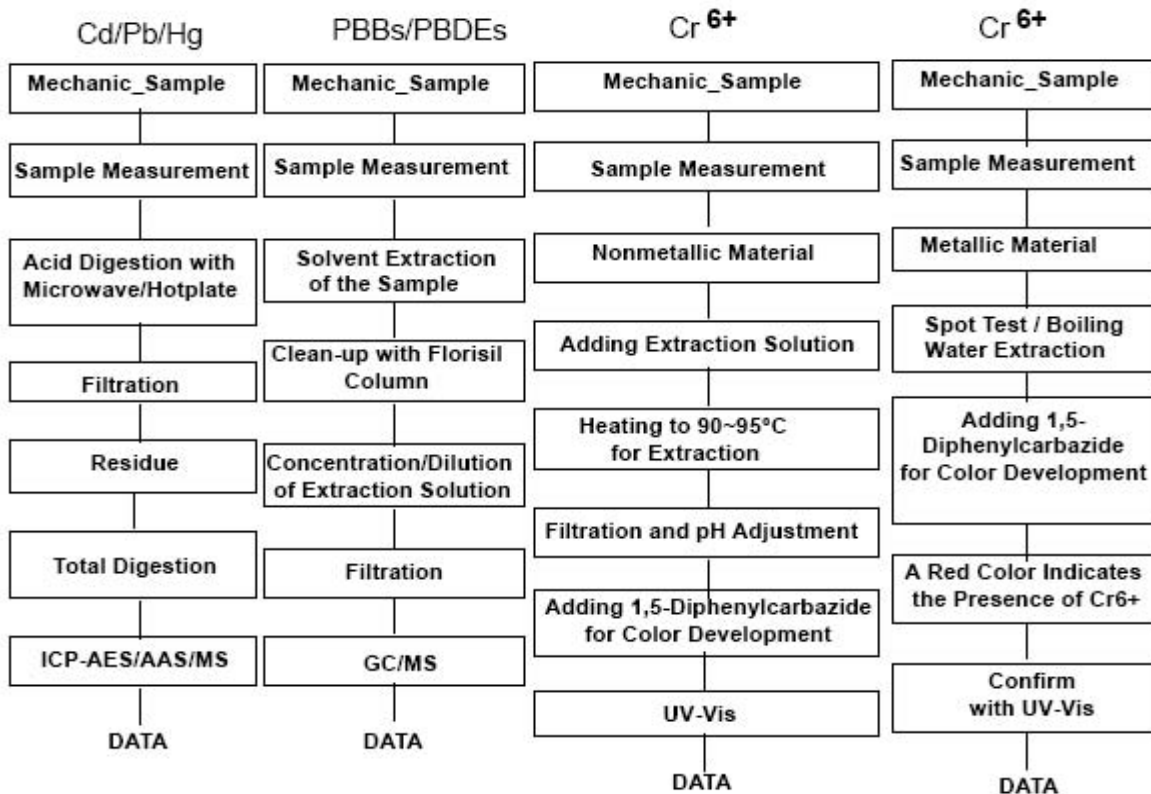
SGS Korea Co.,Ltd.

 322, The O valley, 555-9, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
 T +82 (0)31 4805 000 F +82 (0)31 4805 050 <http://www.sgs.com> www.kr.sgs.com/radiant

Member of the SGS Group (Société Générale de Surveillance)


Test Report No. F690101/LF-CTSAYAA12-08483

Issued Date: 2012. 03. 02 Page 4 of 4

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


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

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) Negative = Undetectable / Positive = Detectable
 (6) ** = Qualitative analysis (No Unit)
 (7) * = 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, available on request at www.sgs.com, and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/etd. All rights are reserved. Any holder of this document is advised that it contains confidential information and its disclosure to third parties is strictly prohibited. The Company's liability is limited to the extent of the information provided in this document. The Company's sole responsibility is to its Client and this document does not constitute a contract. Any holder of this document is advised that it contains confidential information and its disclosure to third parties is strictly prohibited. The document shall be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification in 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 report refer only to the samples tested and each sample is only tested for 100 days only.)

F052 Version4

SGS Korea Co.,Ltd.

 322, The O valley, 555-0, Hoggri-dong, Daejeon-gu, Anyang-si, Gyeonggi-do, Korea 431-080
 T +82 (0)31 4908 000 F +82 (0)31 4908 059 <http://www.sgs.co.kr> www.kr.sgs.com/greenlab

Member of the SGS Group (Société Générale de Surveillance)

10-2. Ni도금



Test Report No. F690101/LF-CTSAYAA12-11059

Issued Date: 2012. 03. 20 Page 1 of 5

To: **MAIN TECH**
 3B, 2-1L Banwol Industrial Complex
 393-7, Moknae-dong, Danwon-gu
 Ansan-si
 Gyeonggi-do
 Korea

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

SGS File No. : AYAA12-11059
Product Name : Electroless Ni Plating Agent
Item No./Part No. : N/A
Received Date : 2012. 03. 15
Test Period : 2012. 03. 16 to 2012. 03. 20
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.

SGS Korea Co. Ltd.



Jeff Jang / Chemical Lab Mgr

Timothy Jeon
 Jinhee Kim
 Cindy Park
 Jerry Jung/ Testing Person

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 and www.sgs.com/sgsnet, and, for electronic format documents, subject to Terms and Conditions for Electronic Documents of www.sgs.com. RadiAnt is a brand name of the Company. Information and/or data herein are for reference only. Any holder of this document is advised that the information is not intended to be used for any purpose other than that for which it was issued. The Company's liability is limited to the extent of the information provided. The Company is not responsible for any loss or damage caused by the use of this document. The document is not to be reproduced or used in any form without the prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is prohibited and 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 and each sample(s) are retained for 180 days only.)

F052 Version4

SGS Korea Co.,Ltd.

322, The O valley, 555-0, Hoge-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
 t +82 (0)31 4908 000 f +82 (0)31 4908 050 <http://www.sgsnet.co.kr> www.kr.sgs.com/ysenlab

Member of the SGS Group (Société Générale de Surveillance)


Test Report No. F690101/LF-CTSAYAA12-11059

Issued Date: 2012. 03. 20 Page 2 of 5

Sample No. : AYAA12-11059.001
Sample Description : Electroless Ni Plating Agent
Item No./Part No. : N/A
Materials : N/A

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.

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	38

- NOTE:
- (1) N.D. = Not detected.(<MDL)
 - (2) mg/kg = ppm
 - (3) MDL = Method Detection Limit
 - (4) - = No regulation
 - (5) Negative = Undetectable / Positive = Detectable
 - (6) ** = Qualitative analysis (No Unit)
 - (7) * = 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 hereon, available on request or accessible at www.sgs.com and, for electronic form documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/conditions. Approval is given to the recipient to copy, reproduce and distribute the same, provided that the recipient of this document is advised of the Company's liability in the form of the document only and under the limits of Client's instructions. The recipient is solely responsible for its use. Copy and this document does not constitute offers to a transaction that involves all their rights and obligations under the transaction document. This document cannot be reproduced except in full without prior written approval of the Company. Any unauthorized alteration, forgery or falsification in the content or appearance of this document is strictly prohibited and offenders may be prosecuted to the fullest extent of the law. (Unless otherwise stated the results shown in this test report shall apply to the sample(s) tested and such sample(s) are retained for 100 days only.)

F052 Version4

SGS Korea Co.,Ltd.

 322, The G valley, 555-0, Hajeje-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/guestlab

Member of the SGS Group (Société Générale de Surveillance)



Test Report No. F690101/LF-CTSAYAA12-11059

Issued Date: 2012. 03. 20 Page 3 of 5



- NOTE: (1) N.D. = Not detected (<MDL)
 (2) mg/kg = ppm
 (3) MDL = Method Detection Limit
 (4) - = No regulation
 (5) Negative = Undetectable / Positive = Detectable
 (6) ** = Qualitative analysis (No Unit)
 (7) * = 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 Terms and Conditions of Service printed hereon, available on request or accessible at www.sgs.com. It is a confidential document, subject to Terms and Conditions for Electronic Documents at www.sgs.com/sgsweb/sgsweb.htm. Reproduction or dissemination of this document is prohibited. The use of this document is limited to the use of the Client and the Client is responsible for its use. The Company's liability is limited to the extent of the Client's instructions. The Client is responsible for the accuracy of the data provided. The Client is responsible for the validity of the data provided. The Client is responsible for the accuracy of the data provided. The Client is responsible for the validity of the data provided. The Client is responsible for the accuracy of the data provided. The Client is responsible for the validity of the data provided.

FD52 Version4

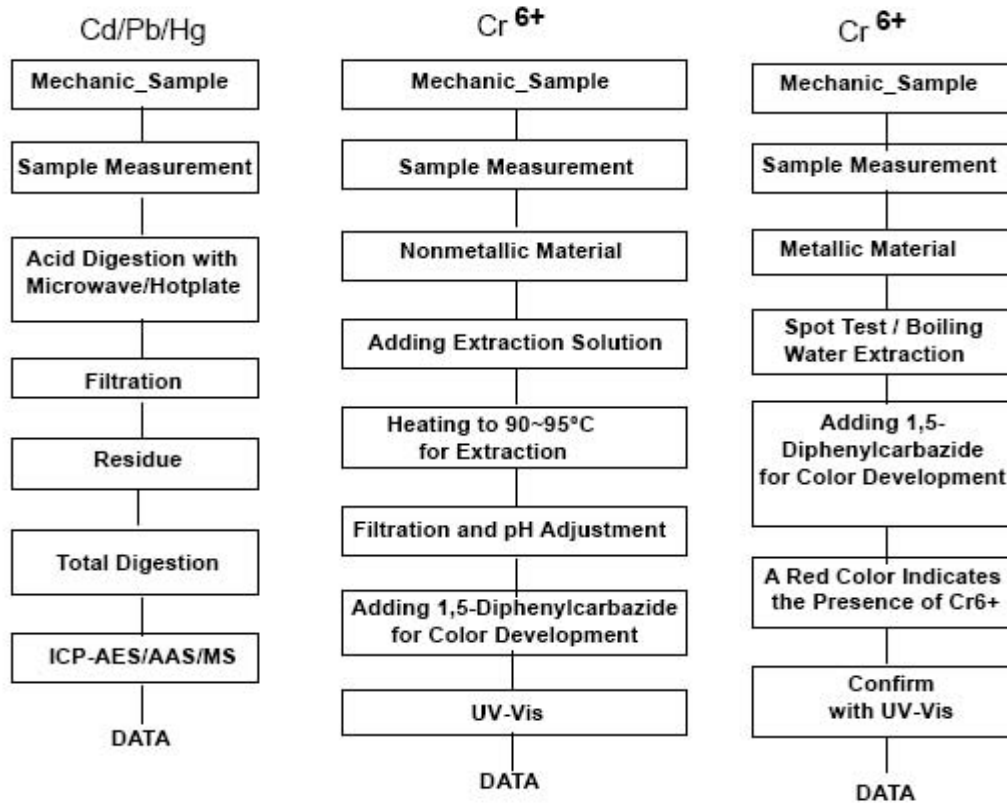
SGS Korea Co., Ltd.

322, The O valley, 555-8, Hoge-dong, Dongan-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/greenlab

Member of the SGS Group (Société Générale de Surveillance)


Test Report No. F690101/LF-CTSAYAA12-11059

Issued Date: 2012. 03. 20 Page 4 of 5

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


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) Negative = Undetectable / Positive = Detectable
 (6) ** = Qualitative analysis (No Unit)
 (7) * = 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 overleaf, 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. All rights are reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the Company. The Company's liability is limited to the extent of the services provided and the Company shall not be liable for any loss or damage of any kind, including consequential, special, or exemplary damages, arising out of the use of this document. The Company's liability is limited to the extent of the services provided and the Company shall not be liable for any loss or damage of any kind, including consequential, special, or exemplary damages, arising out of the use of this document.

F052 Version4

SGS Korea Co.,Ltd.

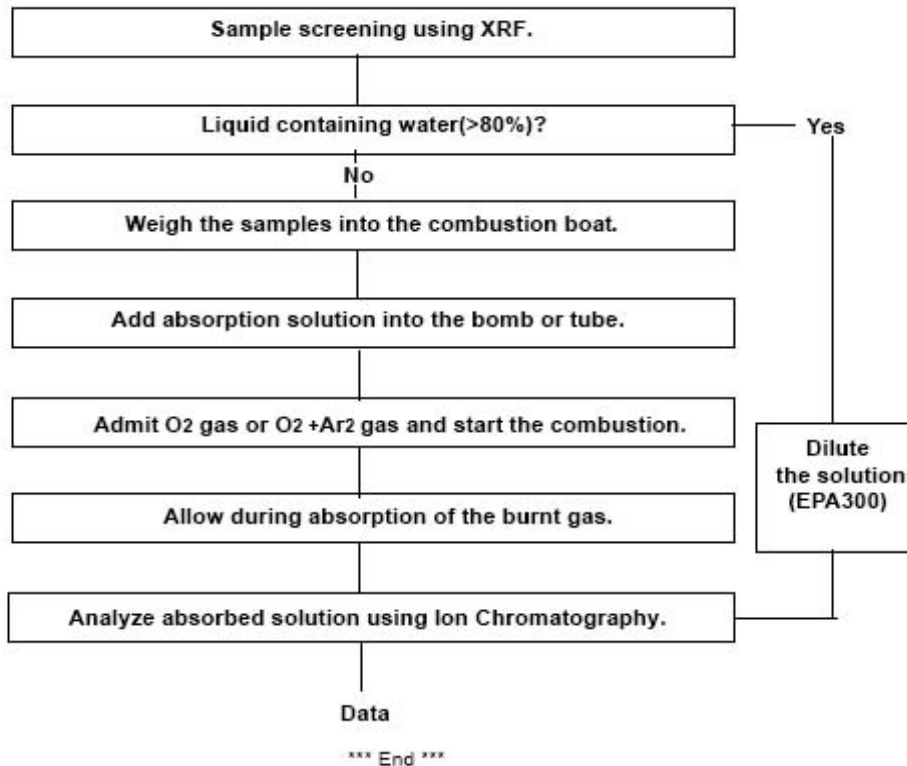
 322, The O valley, 555-9, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080
 T +82 (0)31 4908 000 F +82 (0)31 4908 050 <http://www.sgs.com> www.kr.sgs.com sgs@sgs.com

Member of the SGS Group (Société Générale de Surveillance)


Test Report No. F690101/LF-CTSAYAA12-11059

Issued Date: 2012. 03. 20 Page 5 of 5

Flow Chart for Halogen Test



- NOTE:
- (1) N.D. = Not detected, (<MDL)
 - (2) mg/kg = ppm
 - (3) MDL = Method Detection Limit
 - (4) - = No regulation
 - (5) Negative = Undetectable / Positive = Detectable
 - (6) ** = Qualitative analysis (No Unit)
 - (7) * = 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. Available on request at www.sgs.com and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/sgsnet/sgsnet/sgsnet/sgsnet.htm. Approval is given to the holder of this document to reproduce it for non-commercial purposes only. The reproduction of this document for any other purpose without the written approval of the Company is prohibited. The Company shall not be liable for any error or omission in this document. The reproduction of this document for any other purpose without the written approval of the Company is prohibited. The Company shall not be liable for any error or omission in this document. The reproduction of this document for any other purpose without the written approval of the Company is prohibited. The Company shall not be liable for any error or omission in this document.

F052 Version4

SGS Korea Co., Ltd.

 322, The O valley, 555-0, Hoge-dong, Dongen-gu, Anyang-si, Gyeonggi-do, Korea 431-080
 t +82 (0)31 4905 000 f +82 (0)31 4909 050 <http://www.sgs.com> www.kr.sgs.com sgsnet@sgs.com

Member of the SGS Group (Société Générale de Surveillance)