MSL Level 1

승 인 원

제 품 명	칩안테나		
사 용 자	텔리안		
적 용 모 델	MGQ9180		
사용자 CODE			
공급자	주식회사 파트론		
공급자 CODE	ACS2450EBAMQ		
텔 리 안	작성자	검토자	승인자
(주)파트론	작성자	품질합의	승인자
			
	개발 2P	품질보증파트	연구소
	전찬익	이광규	임병준
	02/12	02/12	02/12

2007 . 02. 12

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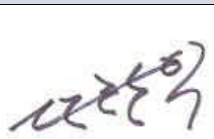
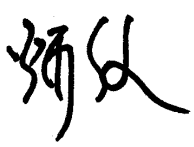
MSL Level 1

SPECIFICATION

MODEL : ACS2450EBAMQ

DIELECTRIC CHIP ANTENNA

작성자	검토자	승인자
		
개발 2P	품질보증파트	연구소
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2007 . 02. 12

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- 목 차 -

1. 이력관리

Revision No	Originator	Description of changes	Date of changes
Ver 1.0	전찬익	승인원 제정	2007.02.12

2. 전기적 특성

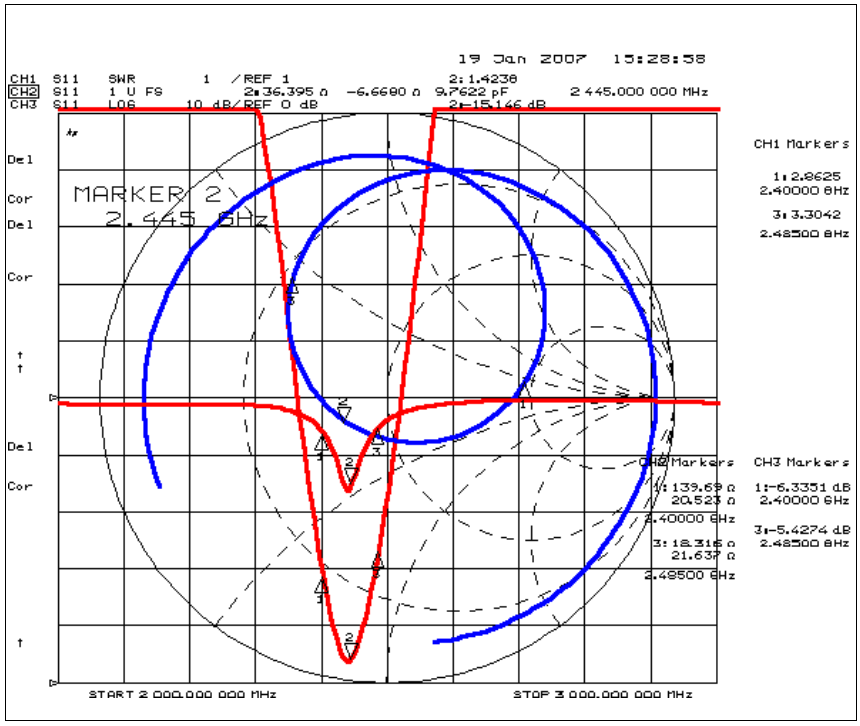
2.1 Set 실장 측정

ITEM				SPEC
Frequency Range [MHz]				2400 ~ 2485
VSWR [Max]				3 : 1
Bandwidth [MHz]				85
Polarization				Linear
Gain[dBi]	Total Gain (Peak / Avg) [dBi]			1.31 / -5.9
	Azimuth	Theta	Peak	-3.95
			Average	-9.28
		Phi	Peak	-4.04
			Average	-10.04
	Elevation 1	Theta	Peak	-2.09
			Average	-5.53
		Phi	Peak	-0.47
			Average	-6.34
	Elevation 2	Theta	Peak	-8.58
			Average	-14.81
		Phi	Peak	1.31
			Average	-3.86

2.2 Test Fixture 측정

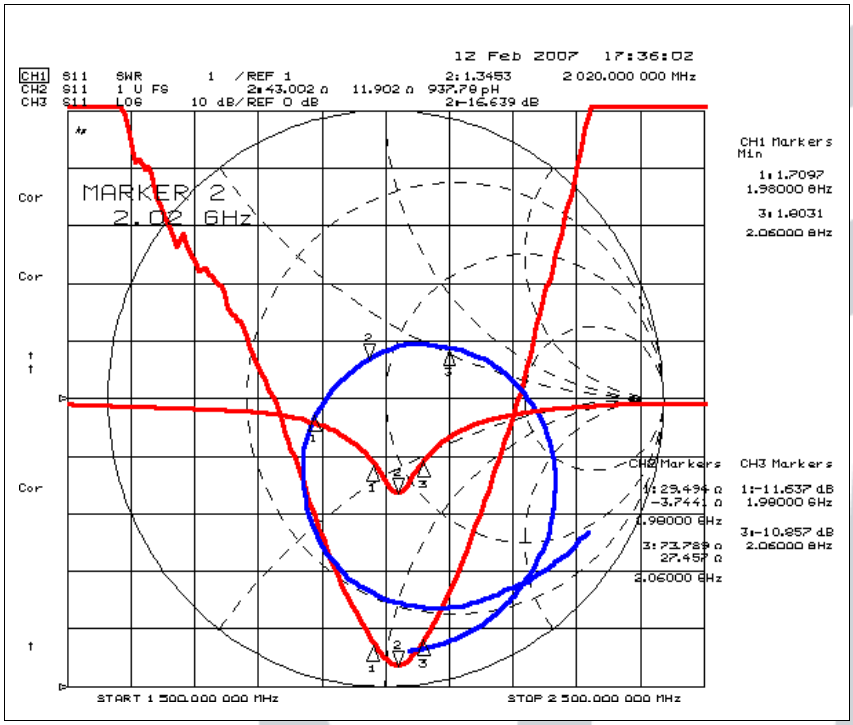
ITEM	SPEC CTQ
Frequency Range [MHz]	1980 ~ 2060
SWR [Max]	3 : 1
Bandwidth [MHz]	80

2.4 Set 실장 측정 Graph

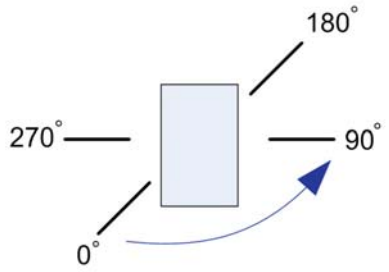
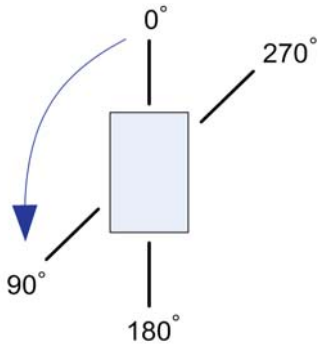
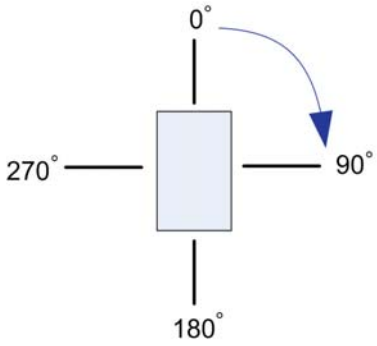


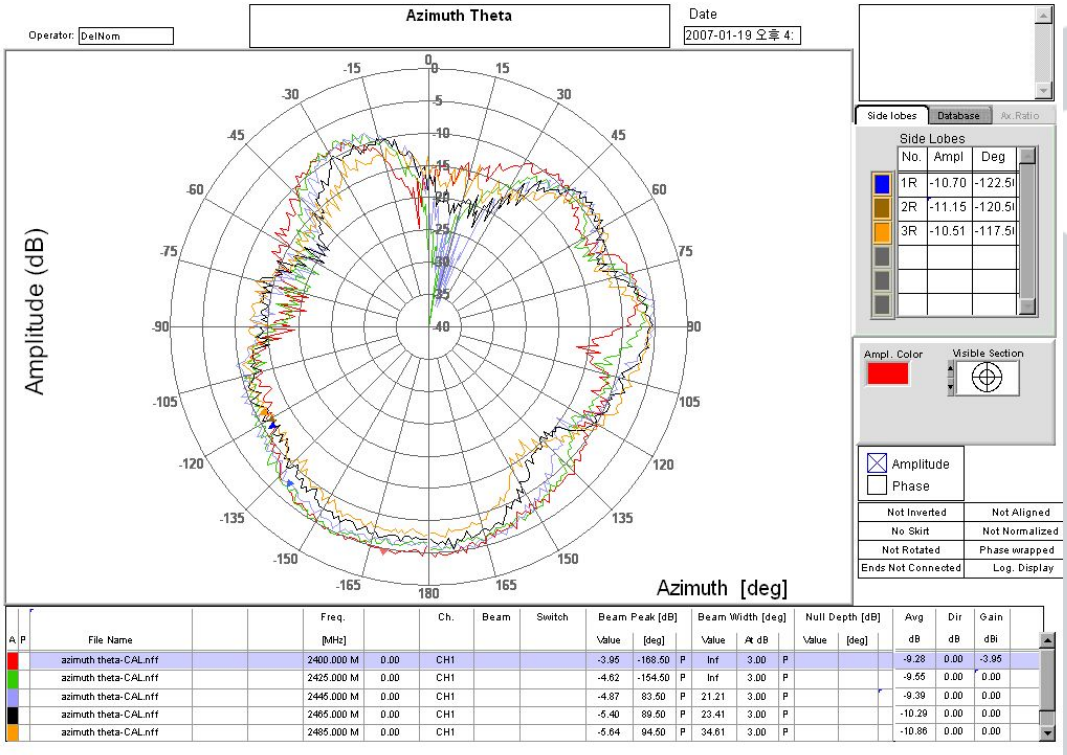
2.5 Test Fixture 측정 Graph

CTQ



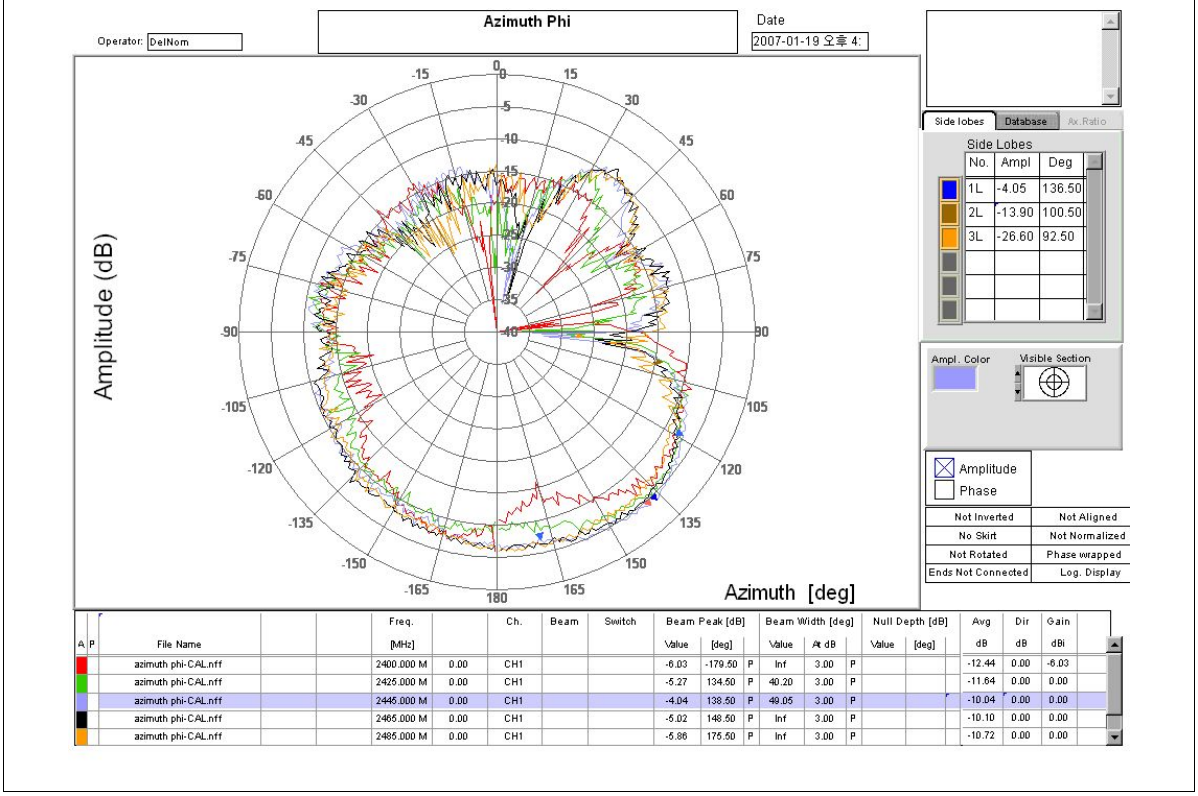
2.6 방사패턴

Azimuth Plane	Elevation 1 Plane	Elevation2 Plane
		
Theta	Vertical field of measured plane	
Phi	Horizontal field of measured plane	

Azimuth Theta


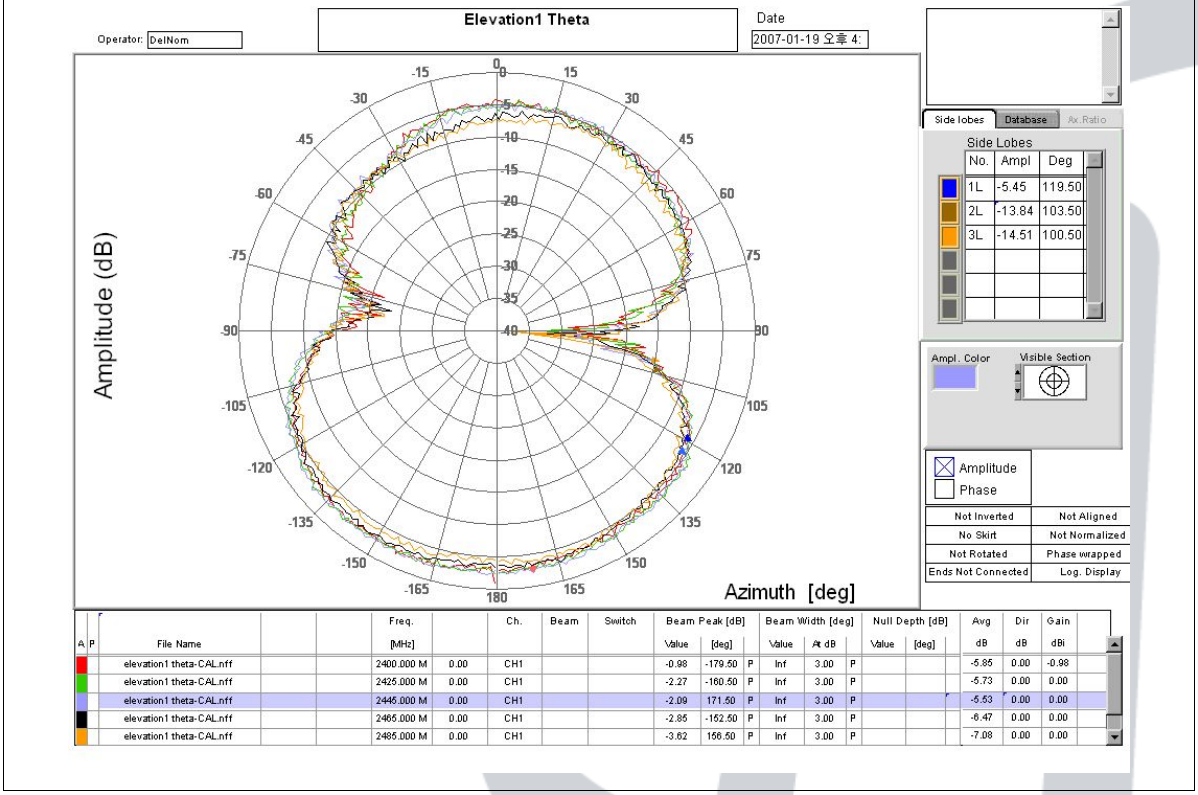
A	P	File Name	Freq. [MHz]		Ch.	Beam	Switch	Beam Peak [dB] Value	[deg]		Beam Width [deg] Value	At dB		Null Depth [dB] Value	[deg]	Avg dB	Dir dB	Gain dBi
		azimuth theta-CAL.nff	2400.000 M	0.00	CH1			-3.95	-168.50	P	Inf	3.00	P			-9.28	0.00	-3.95
		azimuth theta-CAL.nff	2425.000 M	0.00	CH1			-4.62	-154.50	P	Inf	3.00	P			-9.55	0.00	0.00
		azimuth theta-CAL.nff	2445.000 M	0.00	CH1			-4.87	83.50	P	21.21	3.00	P			-9.39	0.00	0.00
		azimuth theta-CAL.nff	2465.000 M	0.00	CH1			-5.40	89.50	P	23.41	3.00	P			-10.29	0.00	0.00
		azimuth theta-CAL.nff	2485.000 M	0.00	CH1			-5.64	94.50	P	34.61	3.00	P			-10.86	0.00	0.00

Azimuth Phi



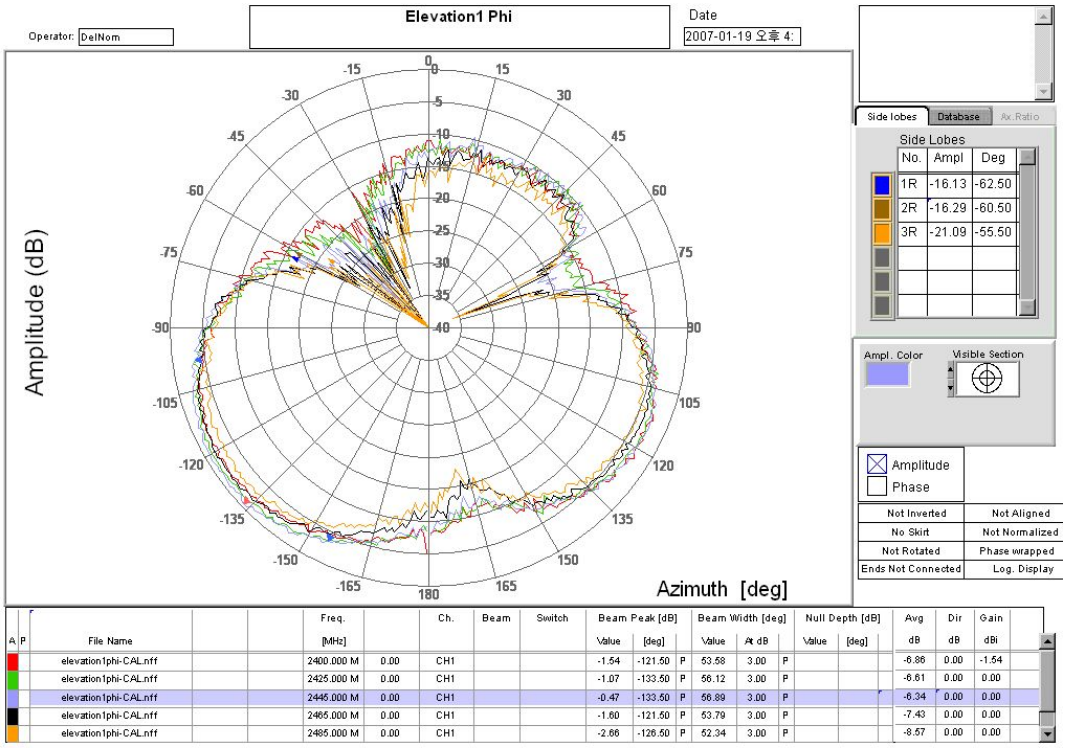
A	P	File Name	Freq. [MHz]		Ch.	Beam	Switch	Beam Peak [dB] Value	[deg]		Beam Width [deg] Value	At dB		Null Depth [dB] Value	[deg]	Avg dB	Dir dB	Gain dBi
		azimuth phi-CAL.nff	2400.000 M	0.00	CH1			-6.03	-179.50	P	Inf	3.00	P			-12.44	0.00	-6.03
		azimuth phi-CAL.nff	2425.000 M	0.00	CH1			-5.27	134.50	P	40.20	3.00	P			-11.64	0.00	0.00
		azimuth phi-CAL.nff	2445.000 M	0.00	CH1			-4.04	138.50	P	49.05	3.00	P			-10.04	0.00	0.00
		azimuth phi-CAL.nff	2465.000 M	0.00	CH1			-5.02	148.50	P	Inf	3.00	P			-10.10	0.00	0.00
		azimuth phi-CAL.nff	2485.000 M	0.00	CH1			-5.86	175.50	P	Inf	3.00	P			-10.72	0.00	0.00

Elevation1 Theta



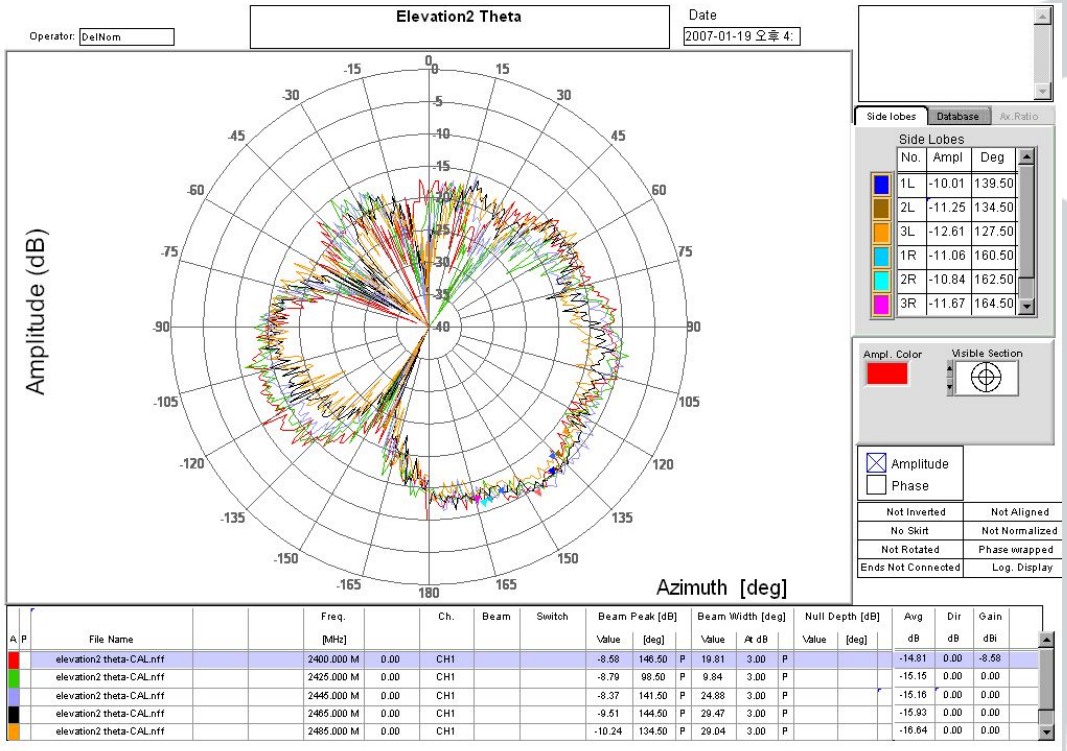
A	P	File Name	Freq. [MHz]		Ch.	Beam	Switch	Beam Peak [dB] Value	[deg]		Beam Width [deg] Value	At dB		Null Depth [dB] Value	[deg]	Avg dB	Dir dB	Gain dBi
		elevation1 theta-CAL.nff	2400.000 M	0.00	CH1			-0.98	-179.50	P	Inf	3.00	P			-5.85	0.00	-0.98
		elevation1 theta-CAL.nff	2425.000 M	0.00	CH1			-2.27	-160.50	P	Inf	3.00	P			-5.73	0.00	0.00
		elevation1 theta-CAL.nff	2445.000 M	0.00	CH1			-2.09	171.50	P	Inf	3.00	P			-5.53	0.00	0.00
		elevation1 theta-CAL.nff	2465.000 M	0.00	CH1			-2.85	-152.50	P	Inf	3.00	P			-6.47	0.00	0.00
		elevation1 theta-CAL.nff	2485.000 M	0.00	CH1			-3.62	156.50	P	Inf	3.00	P			-7.08	0.00	0.00

Elevation1 Phi



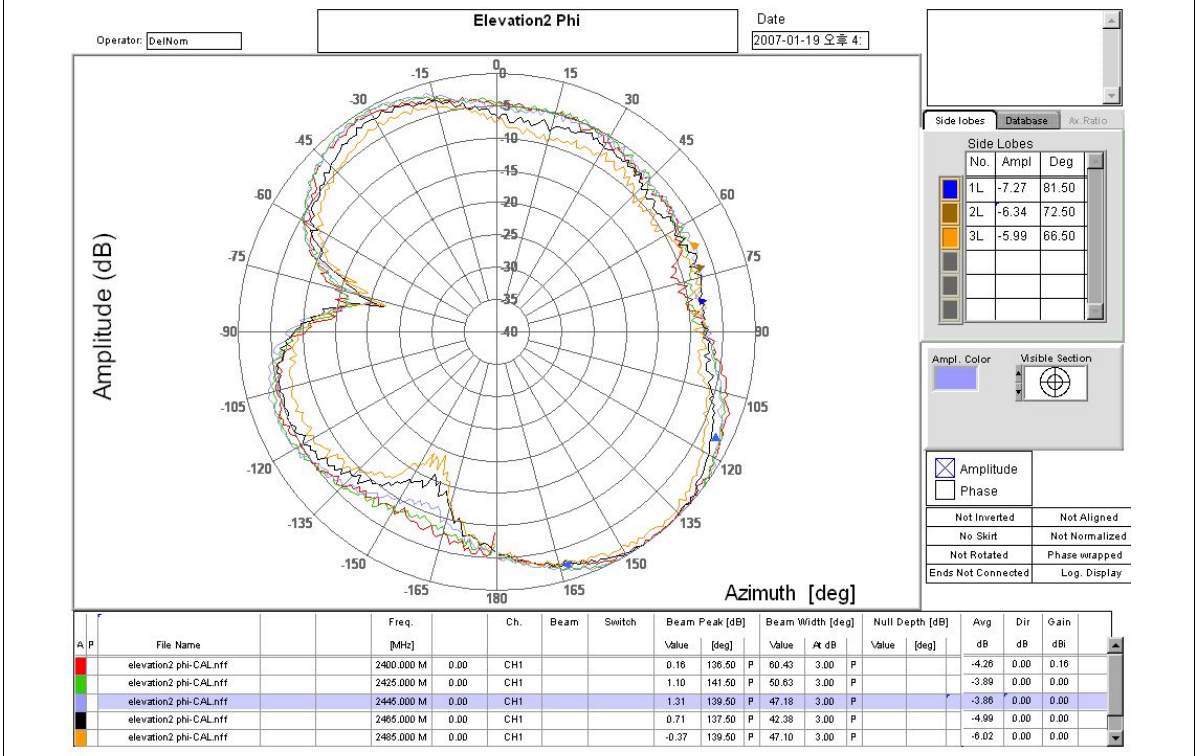
A	P	File Name	Freq. [MHz]		Ch.	Beam	Switch	Beam Peak [dB] Value	[deg]		Beam Width [deg] Value	At dB		Null Depth [dB] Value	[deg]	Avg dB	Dir dB	Gain dBi
		elevation1phi-CAL.nff	2400.000 M	0.00	CH1			-1.54	-121.50	P	53.58	3.00	P			-6.86	0.00	-1.54
		elevation1phi-CAL.nff	2425.000 M	0.00	CH1			-1.07	-133.50	P	56.12	3.00	P			-6.61	0.00	0.00
		elevation1phi-CAL.nff	2445.000 M	0.00	CH1			-0.47	-133.50	P	56.89	3.00	P			-6.34	0.00	0.00
		elevation1phi-CAL.nff	2465.000 M	0.00	CH1			-1.60	-121.50	P	53.79	3.00	P			-7.43	0.00	0.00
		elevation1phi-CAL.nff	2485.000 M	0.00	CH1			-2.66	-126.50	P	52.34	3.00	P			-8.57	0.00	0.00

Elevation2 Theta



A	P	File Name	Freq. [MHz]		Ch.	Beam	Switch	Beam Peak [dB] Value	[deg]		Beam Width [deg] Value	At dB		Null Depth [dB] Value	[deg]	Avg dB	Dir dB	Gain dBi
		elevation2 theta-CAL.nff	2400.000 M	0.00	CH1			-8.58	146.50	P	19.81	3.00	P			-14.81	0.00	-8.58
		elevation2 theta-CAL.nff	2425.000 M	0.00	CH1			-8.79	98.50	P	9.84	3.00	P			-15.15	0.00	0.00
		elevation2 theta-CAL.nff	2445.000 M	0.00	CH1			-8.37	141.50	P	24.88	3.00	P			-15.16	0.00	0.00
		elevation2 theta-CAL.nff	2465.000 M	0.00	CH1			-9.51	144.50	P	29.47	3.00	P			-15.93	0.00	0.00
		elevation2 theta-CAL.nff	2485.000 M	0.00	CH1			-10.24	134.50	P	29.04	3.00	P			-16.64	0.00	0.00

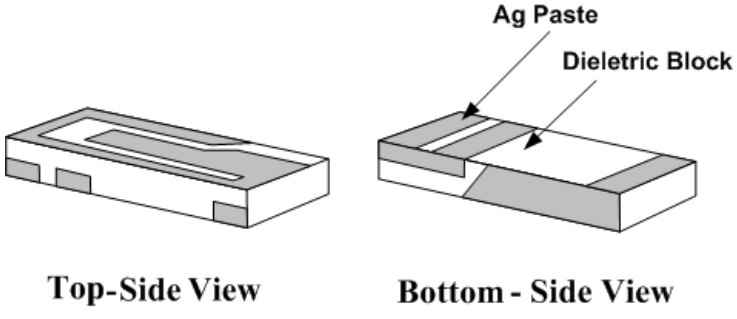
Elevation2 Phi



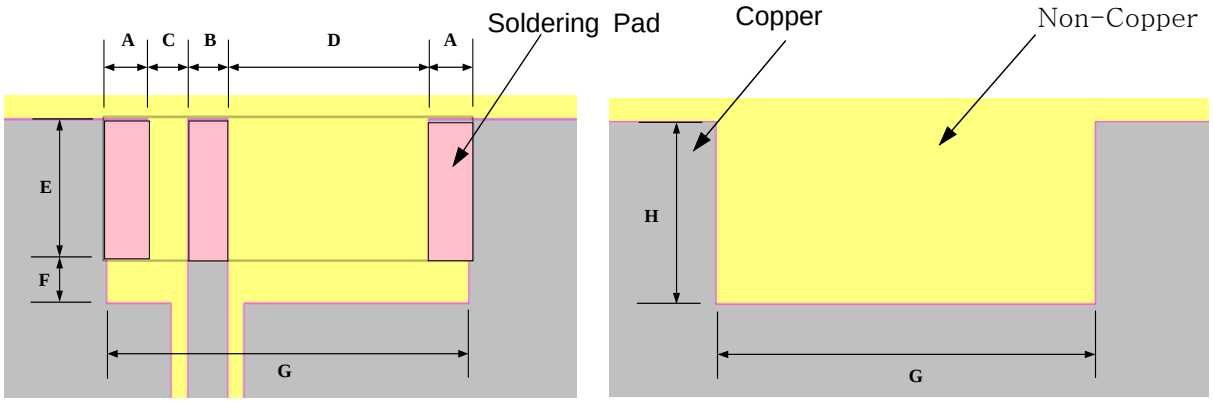
3. 기구적 특성

- 직방체의 형상을 갖는 유전체 소체에 은(Ag) Paste로 패턴을 형성하여 특성을 구현함

3.1 구조와 재질

Material	Dielectric Block (MMS-08)	3D Structure
	Ag Paste (Metech)	
Size [mm]	W = 2.0±0.1	
	L = 5.4±0.1	
	T = 1.2±0.1	
Temperature [℃]	- 40 ~ +80	
Humidity [%]	At the normal temperature, RH 100	

3.2 PCB Layout & Soldering Pad Dimension



Top Layout **Bottom Pattern**

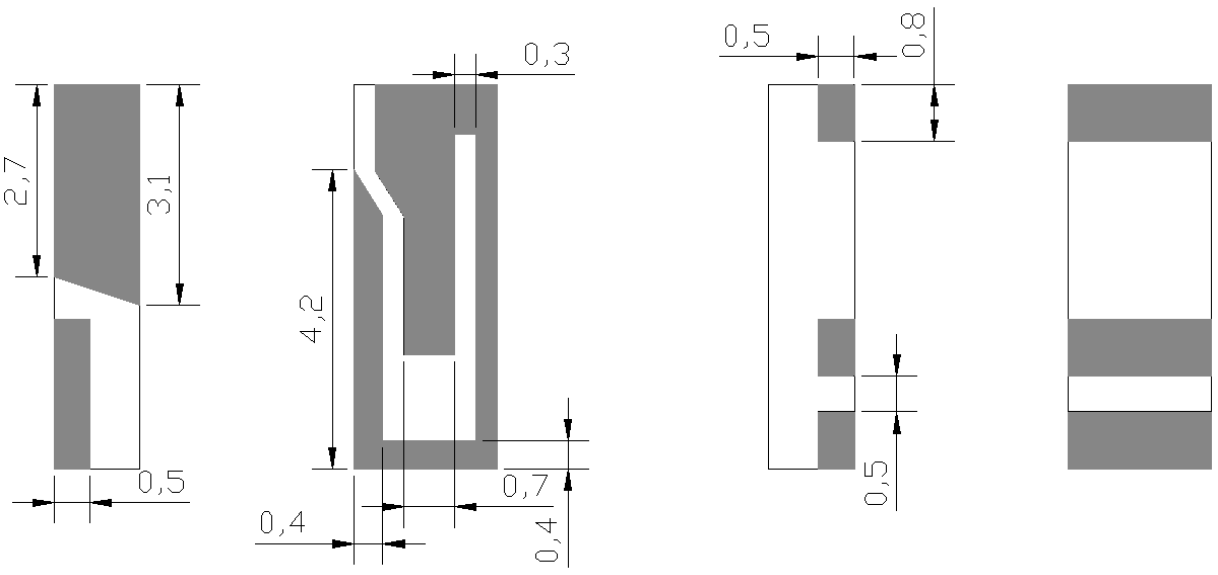
Parameter	A	B	C	D	E	F	G	H
Value[mm]	**0.9**	**0.8**	**0.5**	**2.5**	**2.2**	more than **1.5**	more than **5.6**	more than **3.7**

Unit ; mm

Unless specified tolerances are ±0.1

3.3 안테나 패턴 도면

Antenna Pattern View



Side1 Top Side2 Bottom

Unit ; mm

Unless specified tolerances are ±0.1

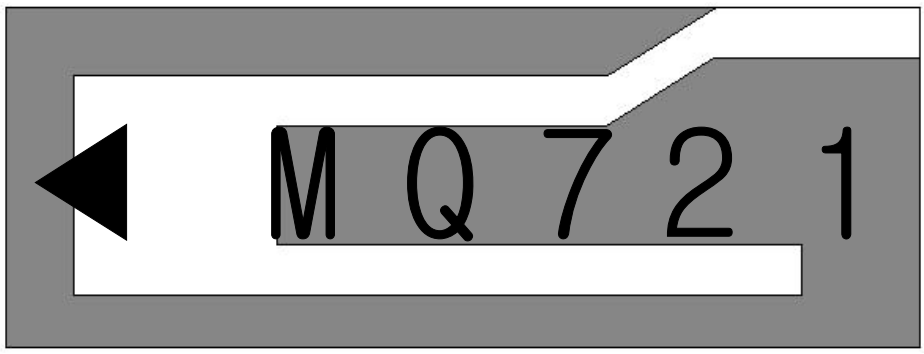
3.4 LOT 번호 표 기 법

7	2	1
①	②	③

① Year ; 1 - 2001, 2 - 2002, ···· 7 - 2007 ····
② Month ; 1 - January, 2 - February ···· 9 - September, A - October, B - November ··
③ Date : 1 - 1st , 2 - 2nd ···· A - 10th, B - 11th ····

3.5 Marking 사양

Marking View



◀	M	Q	7	2	1
	①	②	③	④	⑤

① Input Signal
② Serial
③ Year; 1 - 2001, 2 - 2002, ···· 7 - 2007 ····
④ Month ; 1 - January, 2 - February ···· 9 - September, A - October, B - November ····
⑤ Date : 1 - 1st , 2 - 2nd ···· A - 10th, B - 11th ····

4. 시험 방법

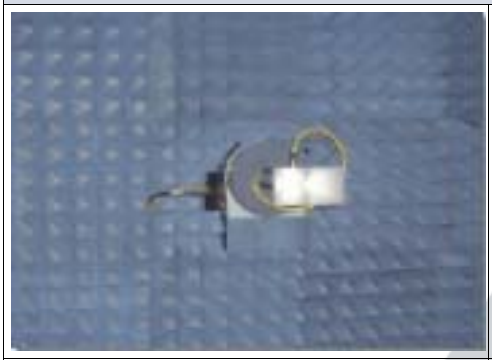
4.1 SWR/Returnloss

Network Analyzer를 이용하여 SWR/Returnloss 를 측정하며 표본 SPL을 선별 Test Fixture 를 이용 양품과 불량품을 선별한다.

Set Condition	Test Fixture Condition
	

4.2 Gain

당사가 보유한 전파 무반사실에서 상기4.1에서 측정된 Set를 이용하여 Antenna Gain을 측정한다.

Anechoic Chamber	
	
	

5. 초기 검사 성적서

검사항목	특성 [MHz] CTQ		치수 [mm] CTQ		
규격	VSWR 3.0 Max		W=2.0±0.1	L=5.4±0.1	T=1.2±0.1
	1980	2060			
1	1.70	1.80	2.02	5.41	1.23
2	1.95	1.71	2.03	5.42	1.23
3	1.92	1.74	2.03	5.43	1.23
4	1.93	1.70	2.03	5.41	1.22
5	1.77	1.85	2.02	5.41	1.23
6	1.88	1.75	2.04	5.41	1.24
7	1.88	1.72	2.02	5.42	1.24
8	1.96	1.74	2.03	5.42	1.22
9	1.89	1.76	2.02	5.42	1.24
10	1.84	1.76	2.03	5.42	1.24
11	1.93	1.73	2.03	5.40	1.23
12	1.95	1.71	2.02	5.40	1.24
13	1.85	1.80	2.04	5.42	1.22
14	1.91	1.88	2.02	5.41	1.23
15	1.90	1.86	2.03	5.41	1.23
16	1.94	1.83	2.03	5.42	1.24
17	1.86	1.81	2.02	5.40	1.22
18	1.91	1.83	2.04	5.40	1.24
19	1.87	1.79	2.02	5.41	1.23
20	1.84	1.81	2.02	5.42	1.24
X	1.88	1.77	2.02	5.41	1.23
σ	0.06	0.05	0.01	0.01	0.01
Cpk	5.75	7.39	3.28	3.31	2.91
판정	OK	OK	OK	OK	OK

6. 신뢰성 보증조건

6.1 환경 시험

항목	조 건	비고
고온방치	+85℃±3℃, 120hr±2hr	*시험 후 상온(25℃±5℃)에서 1시간 방치 후 측정한다. *테이블1의 전기적 특성을 만족하여야한다
저온방치	-40℃±3℃ , 120hr±2hr	
내습시험	+60±3℃, RH90~95% ,120hr±2hr	
ESD	MIL-STD-883D 3015.7(HBM), Class3B(8KV) 테스트 횟수 : 100회	*테이블1의 전기적 특성을 만족하여야한다

6.2 열충격 , REFLOW시험

항목	조 건	비고
열충격	-40℃±3℃/45min ↔ +85℃±3℃/45min cycle : 30 cycle 온도변환시간 : 5min 미만	6-1와 동일
Reflow	Pre Heating 200±5℃ , 30~60 sec Peak Heating 260℃±5℃ , 30sec Max	

6.3 기계적 시험

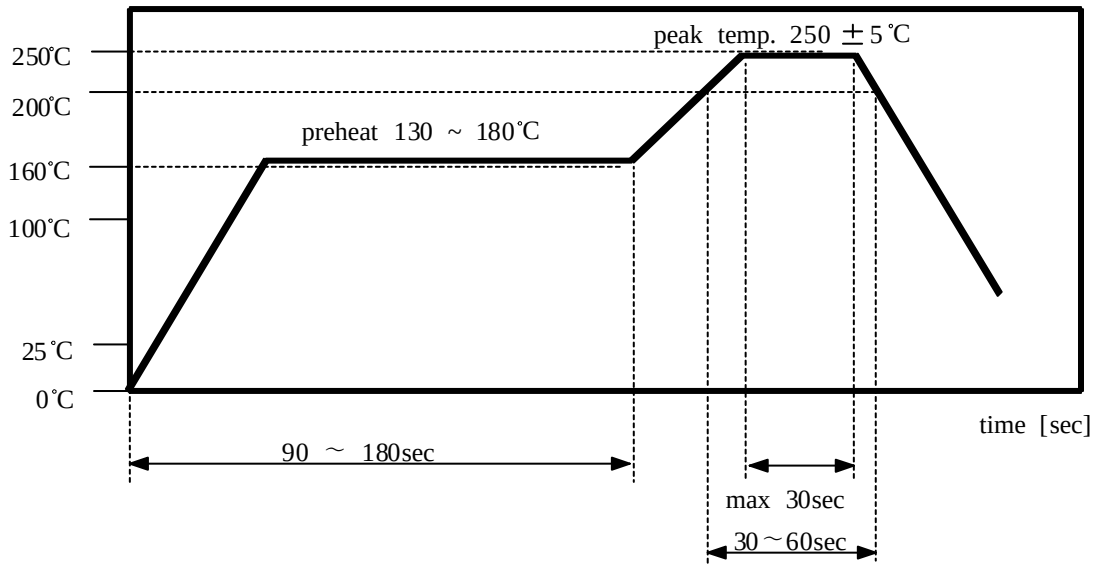
항목	조 건	비고
진동시험	주파수: 10~500Hz에서 10 ×9.8㎨(G) Sweep time 15min ,X.Y.Z each 5 times	*시험 후 테이블1의 전기적 특성을 만족하여야한다
낙하시험	높이 152㎝에서 각 면 5회 낙하(지그낙하)	
휨 강도	휨정도 : 2mm 속도 : 0.5mm/초 지속시간 5초	
고착강도	PCB에 SMT후 힘 F를 주어 제품이 PCB에서 떨어질때까지 힘 F를 증가	*F > 5kgf 을 만족하여야한다

6.4 신뢰성 시험 성적서

※ 별첨

7. 납땜 조건

7.1 표준 열경화(Reflow) 조건



7.2 수동 납땜 (납땜 인두기를 사용할 경우)

예 열 : 120℃ / 시 간 : 60 ~ 300 sec.

인두온도 : 340℃±5℃ / 시 간 : 각 단 최대 5 sec.

8. 주의 사항

8.1 온도 조건

	Range of Temperature	unit
Application	-40 ~ +85	℃
Keeping	-40 ~ +85	℃

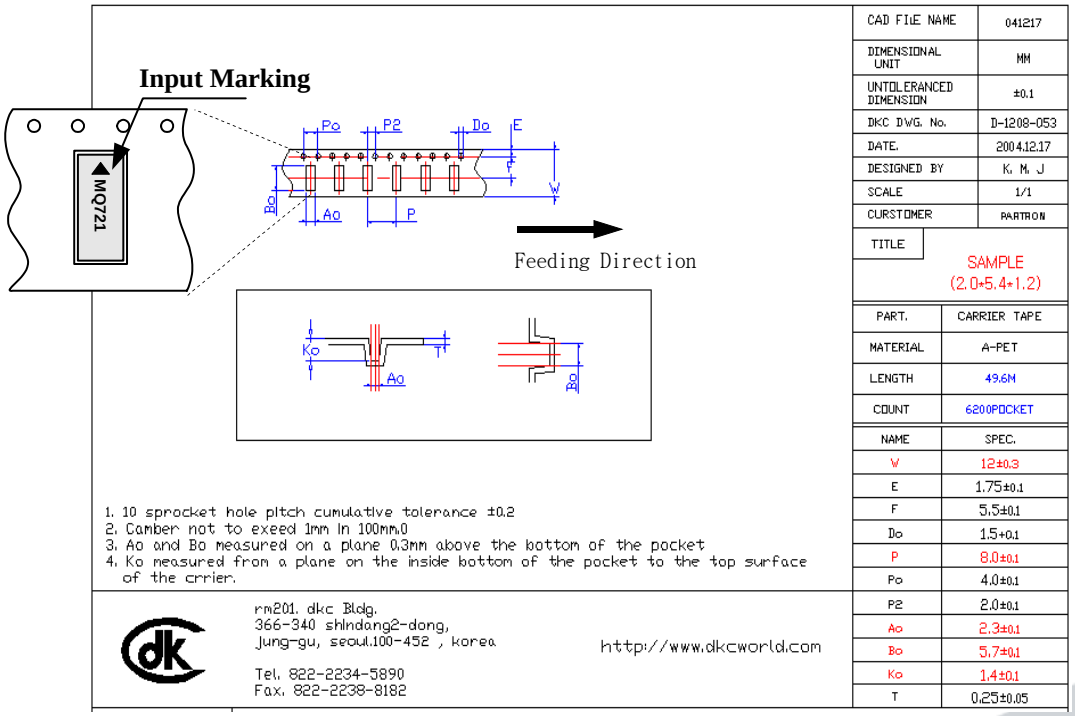
8.2 MSL LEVEL 1 (JEDEC J-STD-020C)

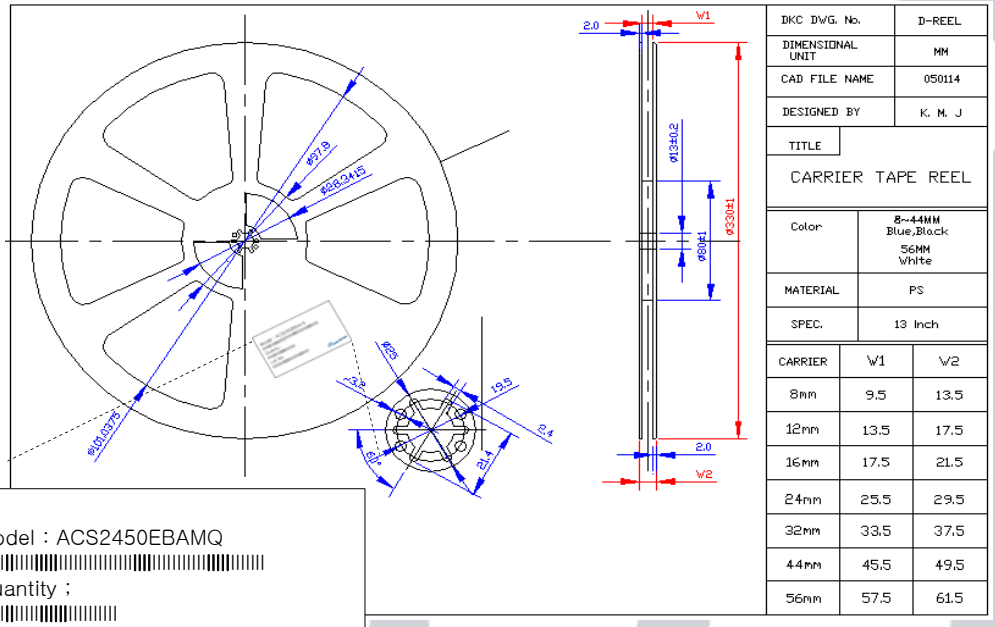
	Floor Life		Soak Requirements	
	Time	Conditions	Time	Conditions
	Unlimited	= < 30℃/85%RH	168+5/-0	= < 85℃/85%RH

9. 포장 사양

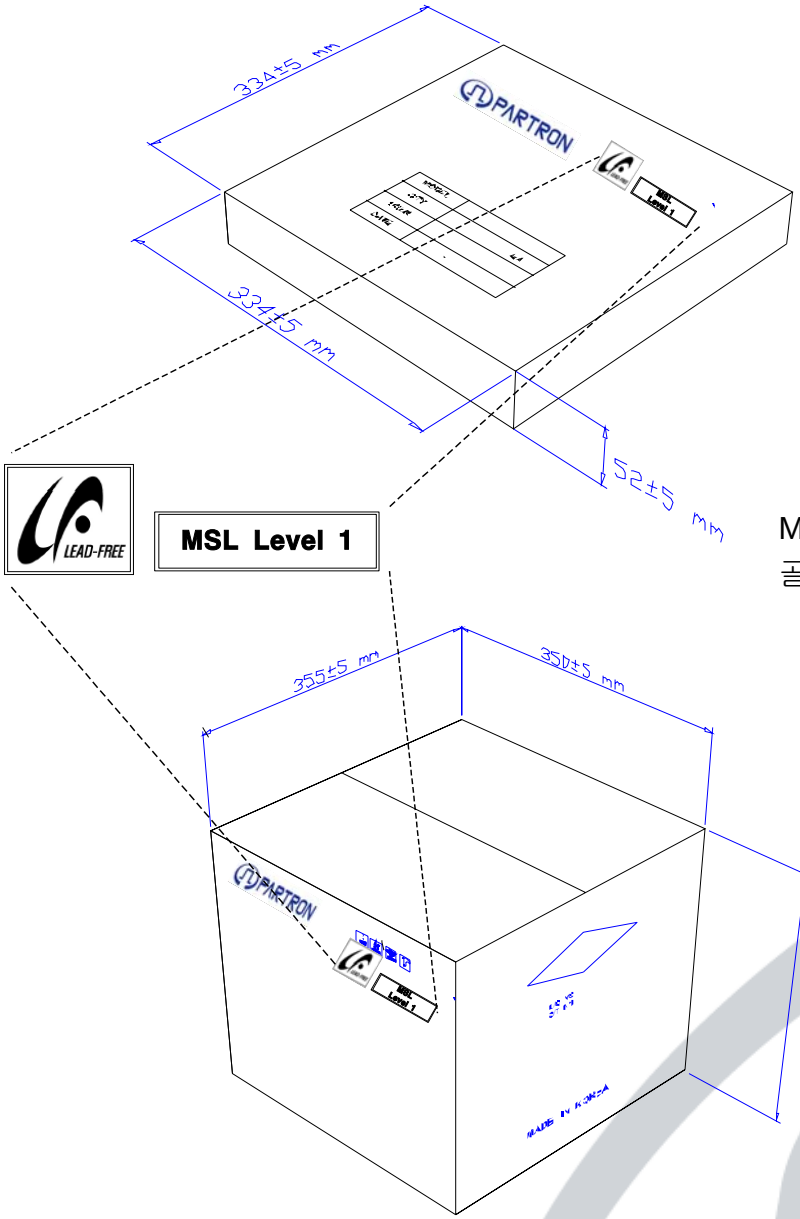
9.1 Carrier/Reel 사양

재질	표면저항	포장방식
대전 방지용 A-PET	Typical $10^8\Omega$	열 압착식





9.2 Box 사양



Material : SK/S/K-B
골판지

10. 관리공정도

제품	발행 /개정		품질관리공정도	관리번호	기안	심의	결정
CHIP ANTENNA	Issued	04.04.06		PRCP-C001			
	Revised	05.04.03					

투입자재	FLOW CHART		공정명	요인관리					품질특성관리					
	준비	본공정		설비명	관리항목	조건	관리주기	기록관리	관리항목	관리한계	검사방법	관리주기	기록관리	조치사항
세라믹 파우더		◇	수입검사						수축율 유전율	작업지도서 참조	Micrometer Network	10개/LOT	C/sheet	반품
파우더 윤활제	○		분말	Mixer					혼합	파우더:윤활제	저울	혼합시	-	폐기
		○	성형	프레스	양압 금형상태	작업지도서 참조	매LOT 1회/일	parameter C/SHEET	치수 무게 밀도 외관	작업지도서 참조	Micrometer 저울 Calculated Visual	5/100개검사 10개/LOT	LOT CARD	폐기
		○	소성	소성로	SETTER 외관 온도 PROFILE	작업지도서 참조	전수 2회/일 1회/월	C/sheet						
		◇	소체						폭 길이 모양	검사지도서 참조	Micrometer Calipers 목시	20개/LOT 20개/LOT 전수	C/sheet	폐기
AG PASTE		○	SIDE1 PAD 인쇄	인쇄기 screen	스퀴즈 속도 /압력 SNAP	작업지도서 참조	1회/일	-	PATTERN치수 외관	작업지도서 참조	측정기 현미경	10개/3Jig	c/sheet	재작업
		○	건조	건조기 건조Jig	온도 Belt speed	작업지도서 참조	1회/주	Parameter	건조상태 인쇄상태 파손	작업지도서 참조	목시	전수검사	Lot card	재작업

제품	발행 /개정		품질관리공정도	관리번호	기안	심의	결정
CHIP ANTENNA	Issued	04.04.06.		PRCP-C001			
	Revised	05.04.03					

투입자재	FLOW CHART		공정명	요인관리					품질특성관리					
	준비	본공정		설비명	관리항목	조건	관리주기	기록관리	관리항목	관리한계	검사방법	관리주기	기록관리	조치사항
AG PASTE		◯	SIDE 2 PAD 인쇄	인쇄기 screen	스퀴즈 속도 /압력 SNAP	작업지도서 참조	1회/일	-	PATTERN치수 외관	작업지도서 참조	측정기 현미경	10개 /3Jig	c/sheet	재작업
		◯	건조	건조기 건조Jig	온도 Belt speed	작업지도서 참조	1회/주	Parameter	건조상태 인쇄상태 파손	작업지도서 참조	목시	전수검사	Lot card	재작업
		◯	소부	소부로 mesh망	온도 Belt speed	작업지도서 참조	1회/주	Parameter C/Sheet	소체파손 오염	작업지도서 참조	목시	전수	Lot card	폐기 재작업
AG PASTE		◯	TOP 인쇄	인쇄기 screen	스퀴즈 속도 /압력 SNAP	작업지도서 참조	1회/일	-	PATTERN치수	작업지도서 참조	측정기	10개 /3Jig	c/sheet	재작업
		◯	건조	건조기 건조Jig	온도 Belt speed	작업지도서 참조	1회/주	Parameter	건조상태 인쇄상태 파손	작업지도서 참조	목시	전수검사	Lot card	재작업
AG PASTE		◯	BOTTOM PAD 인쇄 (초중종물 관리) CTQ공정	인쇄기 screen	스퀴즈 속도 /압력 SNAP	작업지도서 참조	1회/일	-	PATTERN치수 외관	작업지도서 참조	측정기 현미경	10개 /3Jig	c/sheet	재작업

제품	발행 /개정		품질관리공정도	관리번호	기안	심의	결정
CHIP ANTENNA	Issued	04.04.06.		PRCP-C001			
	Revised	05.04.03					

투입자재	FLOW CHART		공정명	요인관리					품질특성관리					
	준비	본공정		설비명	관리항목	조건	관리주기	기록관리	검사항목	관리한계	검사방법	관리주기	기록관리	조치사항
		○	건조	건조기 건조Jig	온도 Belt speed	작업지도서 참조	1회/주	Parameter	건조상태 인쇄상태 파손	작업지도서 참조	목시	전수검사	Lot card	재작업
		○	소부	소부로 mesh망	온도 Belt speed	작업지도서 참조	1회/주	Parameter C/Sheet	소체파손 오염	작업지도서 참조	목시	전수	Lot card	폐기 재작업
		◇	외관검사						제품외관	한도견본 작업지도서 참조	목시 현미경	전수	Lot card 생산일보	폐기 수리
		○	MARKING	마킹기					마킹외관	한도견본	목시	전수	Lot card 생산일보	재작업 폐기
		◇	특성검사	NETWORK 검사지그	교정상태	작업지도서 참조	1회/반	C/sheet	전기적 특성	작업지도서 참조	Network	전수	Lot card 생산일보	폐기 수리
		◇	외관검사						제품외관 제품치수	한도견본 작업지도서 참조	목시 현미경	전수	Lot card 생산일보	폐기 수리
Carrier cover reel		○	Taping						수량 역삽 외관	작업지도서 참조	수작업	전수	Lot card 생산일보	재작업
		◇	출하검사	NETWORK 검사지그	교정상태	작업지도서 참조	1회/반	C/sheet	전기적특성 제품외관 포장상태	검사지도서	Network 현미경 목시	작업 지도서	성적서	return 폐기
포장 box label		○	포장	bar code printer					포장상태 기종혼입 포장수량	포장작업 지도서	목시	전수	-	재작업
		◇	포장검사						포장상태 기종혼입 포장수량	포장작업 지도서	목시	전수	-	return

11. 유해물질 분석 성적서

1) Ceramic Powder

SGS

Test Report

FUJI TITANIUM IND. CO., LTD.
12-8, SENGEN-CHO, HIRATSUKA-CITY, KANAKAWA-PREF. JAPAN. (T) 81-463-32-0210

Report No. : CE/2006/75167
Date : 2006/07/25
Page : 1 of 4

The following sample(s) was/were submitted and identified by/on behalf of the client as :

Sample Description	:	MIXTURE OF (1) MAGNESIUM SILICATE (2) STRONTIUM ZIRCONATE (3) BARIUM TITANATE
Style/Item No	:	MMS-08 (B)
Sample Received	:	2006/07/18
Testing Period	:	2006/07/18 TO 2006/07/25

Test Result(s) : - Please see the next page(s) -

Daniel Yeh, M.R. / Operation Manager
Signed for and on behalf of
SGS TAIWAN LTD.

SGS

Test Report

FUJI TITANIUM IND. CO., LTD.
12-8, SENGEN-CHO, HIRATSUKA-CITY, KANAKAWA-PREF. JAPAN. (T) 81-463-32-0210

Report No. : CE/2006/75167
Date : 2006/07/25
Page : 2 of 4

Test Result(s)

PART NAME NO.1 : WHITE POWDER

Test Item (s):	Unit	Method	MDL	Result No.1
PBBs (Polybrominated biphenyls)	---	---	---	---
Monobromobiphenyl	%	With reference to USEPA3540C. Analysis was performed by HPLC/DAD, LC/MS or GC/MS. (prohibited by 2002/95/EC (RoHS), 83/264/EEC, and 76/769/EEC)	0.0005	N.D.
Dibromobiphenyl	%		0.0005	N.D.
Tribromobiphenyl	%		0.0005	N.D.
Tetrabromobiphenyl	%		0.0005	N.D.
Pentabromobiphenyl	%		0.0005	N.D.
Hexabromobiphenyl	%		0.0005	N.D.
Heptabromobiphenyl	%		0.0005	N.D.
Octabromobiphenyl	%		0.0005	N.D.
Nonabromobiphenyl	%		0.0005	N.D.
Decabromobiphenyl	%		0.0005	N.D.
Total PBBs (Polybrominated biphenyls)/Sum of above	%		-	N.D.
PBBEs(PBDEs) (Polybrominated biphenyl ethers)	---	---	---	---
Monobromobiphenyl ether	%	With reference to USEPA3540C. Analysis was performed by HPLC/DAD, LC/MS or GC/MS. (prohibited by 2002/95/EC (RoHS), 83/264/EEC, and 76/769/EEC)	0.0005	N.D.
Dibromobiphenyl ether	%		0.0005	N.D.
Tribromobiphenyl ether	%		0.0005	N.D.
Tetrabromobiphenyl ether	%		0.0005	N.D.
Pentabromobiphenyl ether	%		0.0005	N.D.
Hexabromobiphenyl ether	%		0.0005	N.D.
Heptabromobiphenyl ether	%		0.0005	N.D.
Octabromobiphenyl ether	%		0.0005	N.D.
Nonabromobiphenyl ether	%		0.0005	N.D.
Decabromobiphenyl ether	%		0.0005	N.D.
Total PBBEs(PBDEs) (Polybrominated biphenyl ethers)/Sum of above	%		-	N.D.
Total of Mono to Nona-brominated biphenyl ether. (Note 4)	%		-	N.D.

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Test Report

FUJI TITANIUM IND. CO., LTD.
12-8, SENGEN-CHO, HIRATSUKA-CITY, KANAKAWA-PREF. JAPAN. (T) 81-463-32-0210

Report No. : CE/2006/75167
Date : 2006/07/25
Page : 3 of 4

Test Item (s):	Unit	Method	MDL	Result No.1
Chromium VI (Cr+6)	ppm	UV-VIS(US EPA 7196A) after reference to US EPA 3060A.	2	N.D.
Cadmium (Cd)	ppm	ICP-AES after reference to EN 1122, method B:2001 or other acid digestion.	2	N.D.
Mercury (Hg)	ppm	ICP-AES after reference to US EPA 3052 or other acid digestion.	2	N.D.
Lead (Pb)	ppm	ICP-AES after reference to US EPA 3050B or other acid digestion.	2	19.3

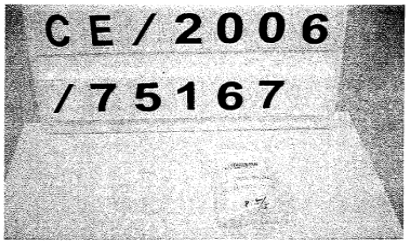
NOTE: (1) N.D. = Not Detected (<MDL)
(2) ppm = mg/kg
(3) MDL = Method Detection Limit
(4) Decabromobiphenyl ether (DecaBDE) in polymeric applications is exempted by Commission Decision of 13 Oct 2005 amending Directive 2002/95/EC notified under document 2005/717/EC.
(5) PBBEs=PBDEs=Polybrominated Diphenyl Ethers=PBDOs=PBBOs.
(6) " - " = Not Regulation
(7) " --- " = Not Applicable

SGS

Test Report

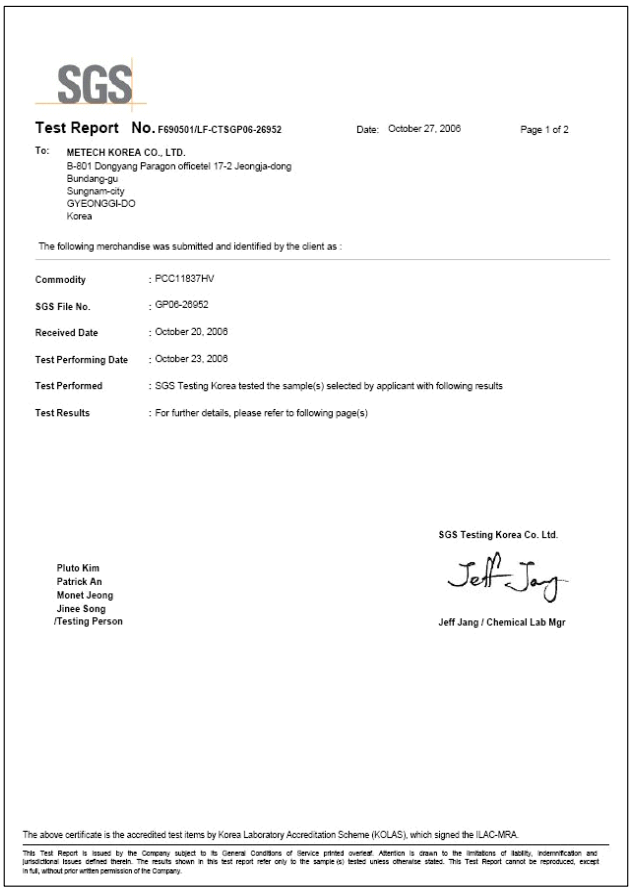
FUJI TITANIUM IND. CO., LTD.
12-8, SENGEN-CHO, HIRATSUKA-CITY, KANAKAWA-PREF. JAPAN. (T) 81-463-32-0210

Report No. : CE/2006/75167
Date : 2006/07/25
Page : 4 of 4



** End of Report **

2) Ag paste



SGS

Test Report No. F690501/LF-CTSGP06-26952 Date: October 27, 2006 Page 1 of 2

To: METECH KOREA CO., LTD.
B-801 Dongyang Paragon officetel 17-2 Jeongja-dong
Bundang-gu
Sungnam-city
GYEONGGI-DO
Korea

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

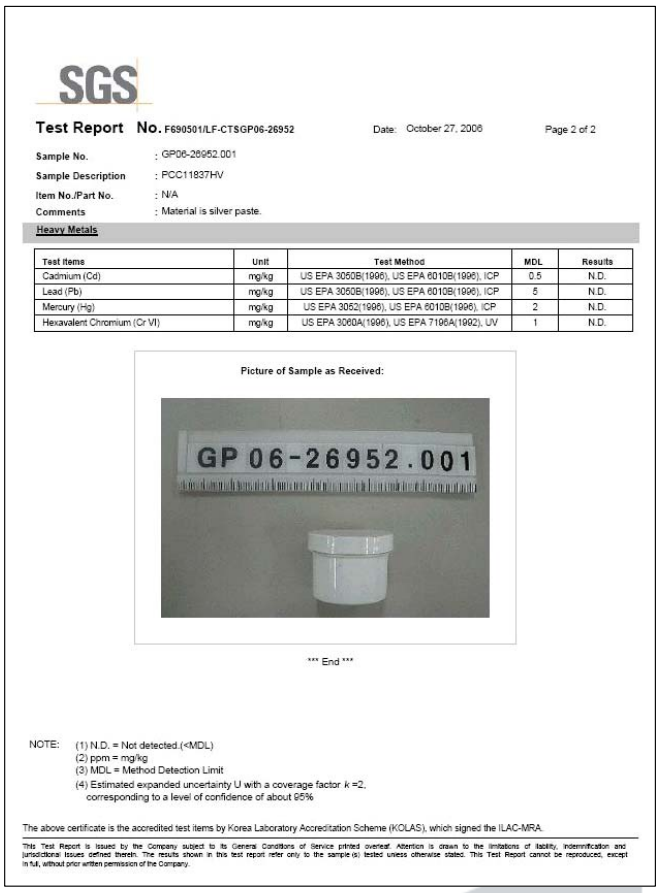
Commodity	: PCC11837HV
SGS File No.	: GP06-26952
Received Date	: October 20, 2006
Test Performing Date	: October 23, 2006
Test Performed	: SGS Testing Korea tested the sample(s) selected by applicant with following results
Test Results	: For further details, please refer to following page(s)

SGS Testing Korea Co. Ltd.

Pluto Kim
Patrick An
Monet Jeong
Jinee Song
/Testing Person

Jeff Jang / Chemical Lab Mgr

The above certificate is the accredited test items by Korea Laboratory Accreditation Scheme (KOLAS), which signed the ILAC-MRA.



SGS

Test Report No. F690501/LF-CTSGP06-26952 Date: October 27, 2006 Page 2 of 2

Sample No.	: GP06-26952.001
Sample Description	: PCC11837HV
Item No./Part No.	: N/A
Comments	: Material is silver paste.

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	US EPA 3060A(1996), US EPA 7196A(1992), UV	1	N.D.

Picture of Sample as Received:

*** End ***

NOTE: (1) N.D. = Not detected.(<MDL)
(2) ppm = mg/kg
(3) MDL = Method Detection Limit
(4) Estimated expanded uncertainty U with a coverage factor *k* =2, corresponding to a level of confidence of about 95%

The above certificate is the accredited test items by Korea Laboratory Accreditation Scheme (KOLAS), which signed the ILAC-MRA.

3) Marking ink

SGS

Test Report No. F690501/LF-CTSGP06-27074 Date: October 27, 2006 Page 1 of 3

To: IMAJE KOREA CO., LTD
%1302, Daeryang Techno Town 7th
Kasan-dong
Keumcheon-ku
SEOUL
Korea

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

Commodity	: ink-6126E black ink
SGS File No.	: GP06-27074
Received Date	: October 20, 2006
Test Performing Date	: October 23, 2006
Test Performed	: SGS Testing Korea tested the sample(s) selected by applicant with following results
Test Results	: For further details, please refer to following page(s)

SGS Testing Korea Co. Ltd.

Pluto Kim
Monet Jeong
Judy Oh
Jenny Jung
/Testing Person

Jeff Jang / Chemical Lab Mgr

SGS

Test Report No. F690501/LF-CTSGP06-27074 Date: October 27, 2006 Page 2 of 3

Sample No.	: GP06-27074.001
Sample Description	: ink-6126E black ink
Style/Item No.	: N/A

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	US EPA 3060A(1996), US EPA 7196A(1992), UV	1	N.D.

Flame Retardants (PBBs/PBDEs)

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

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

SGS

Test Report No. F690501/LF-CTSGP06-27074 Date: October 27, 2006 Page 3 of 3

Picture of Sample as Received:

*** End ***

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