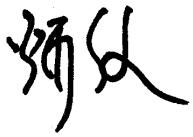
MSL Level 1

Approval Sheet

Products	Dielectric Chip Antenna		
Customer	Pantech		
Model	IMD		
Customer CODE			
Supplier	PARTRON		
Supplier CODE	ACS2450GBAIM		
Pantech	By designed	By checked	By approved
PARTRON	By designed	By checked	By approved
			
	Research 5Team	Quality Assurance	Laboratory
	Chanik.Jeon	Kwang-Gyu.Lee	Byoung-Jun.Yim
	06/05	06/05	06/05

2007 . 06. 05

partron
33 Banwol-dong, Hwaseong-si, Gyeonggi-do,Korea 455-300
Tel : 82-31-201-7870~6
Fax : 82-31-201-7800
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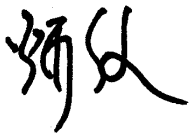
MSL Level 1

SPECIFICATION

MODEL : ACS2450GBAIM

DIELECTRIC CHIP ANTENNA

By designed	By checked	By approved
		
Research, 2P	Quality Assurance	Laboratory
Chan-Ik.Jeon	Kwang-Gyu.Lee	Byoung-Jun.Yim
06/05	06/05	06/05

2007 . 06. 05

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- Contents -

1. 이력관리

Revision No	Originator	Description of changes	Date of changes
Ver 1.0	Chanik.Jeon	Issued	2007.06.05

2. Electrical Characteristics

2.1 Single Element Spec

ITEM	SPEC
Frequency Range [MHz]	2400 ~ 2485
SWR [Max]	3 : 1
Bandwidth [MHz]	85
Gain (Peak / Avg) [dBi]	1.7 / -1.8

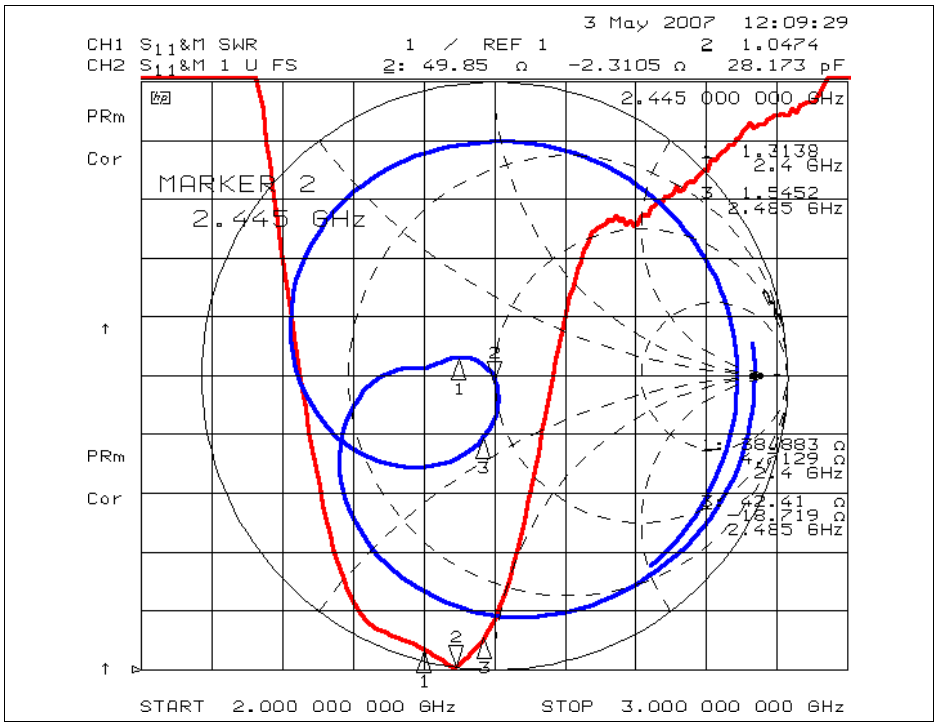
2.2 Set Condition

ITEM				SPEC
Frequency Range [MHz]				2400 ~ 2485
VSWR [Max]				3 : 1
Bandwidth [MHz]				85
Polarization				Linear
Gain[dBi]	Total Gain (Peak / Avg) [dBi]			-0.2 / -7.0
	Azimuth	Theta	Peak	-0.19
			Average	-4.74
		Phi	Peak	-2.04
			Average	-7.86
	Elevation 1	Theta	Peak	-2.58
			Average	-6.88
		Phi	Peak	-0.19
			Average	-6.59
	Elevation 2	Theta	Peak	-7.19
			Average	-12.19
		Phi	Peak	-2.97
			Average	-6.55

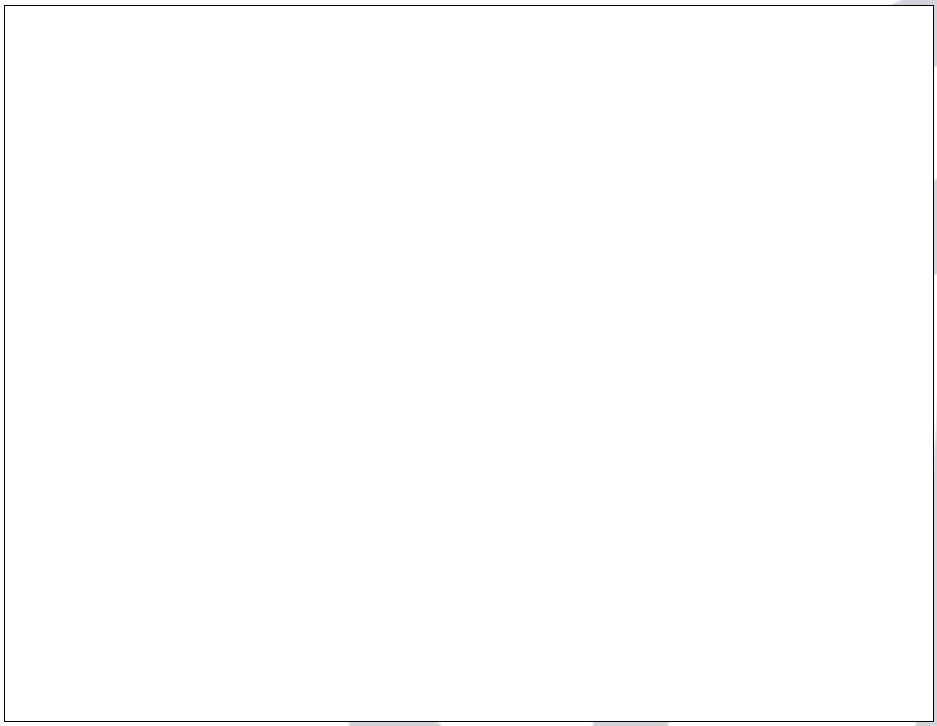
2.3 Test Fixture Condition

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

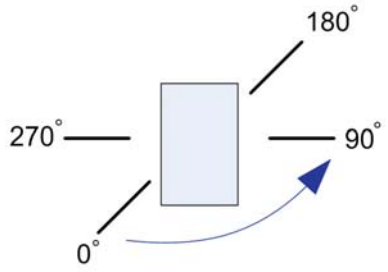
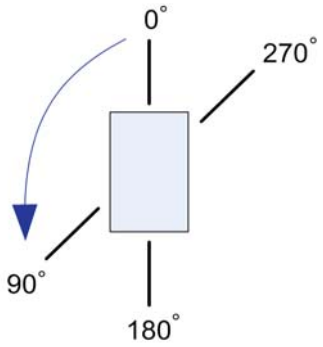
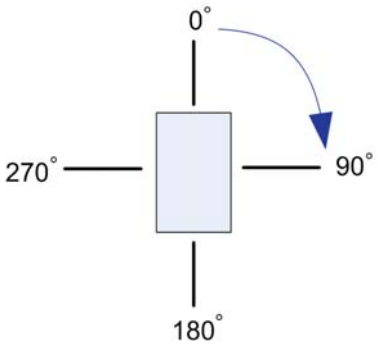
2.4 S11 Graph of Set Condition

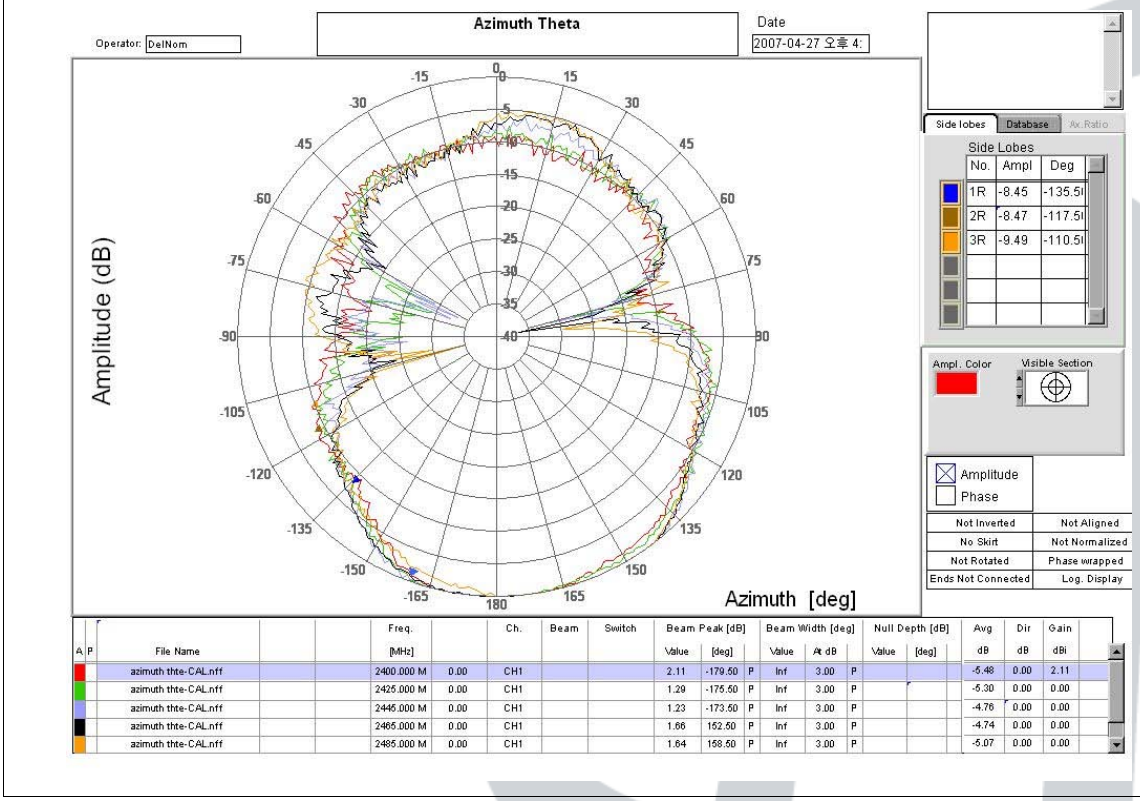


2.5 S11 Graph of Test Fixture Condition CTQ

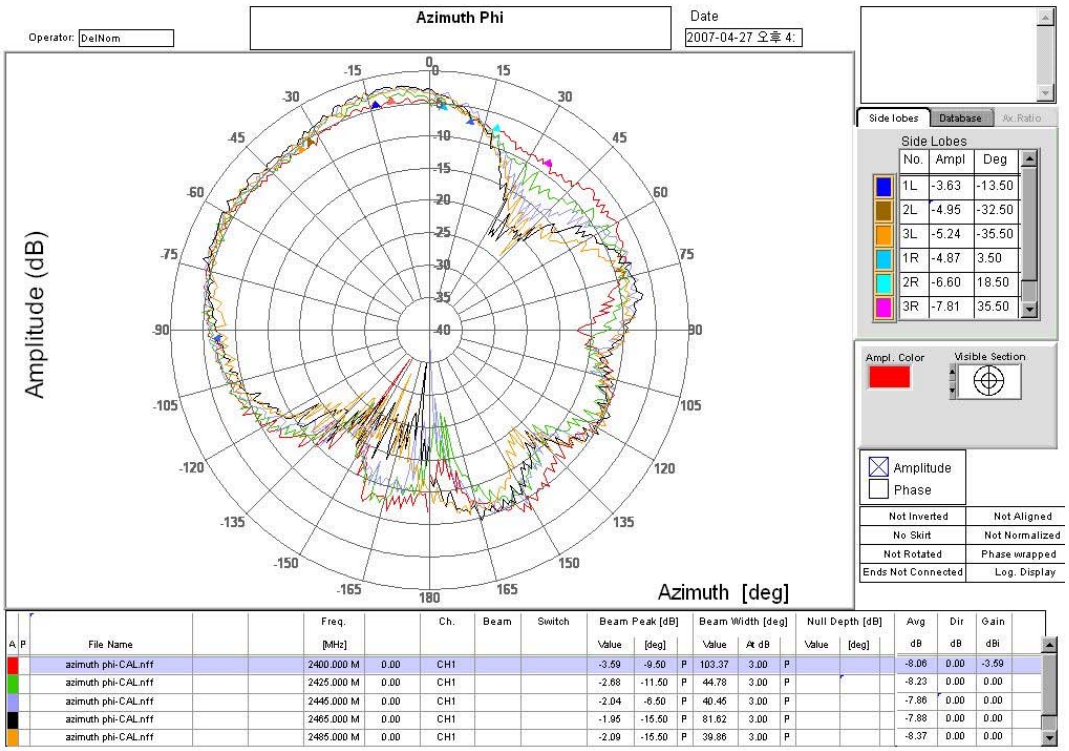


2.6 Radiation Pattern

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

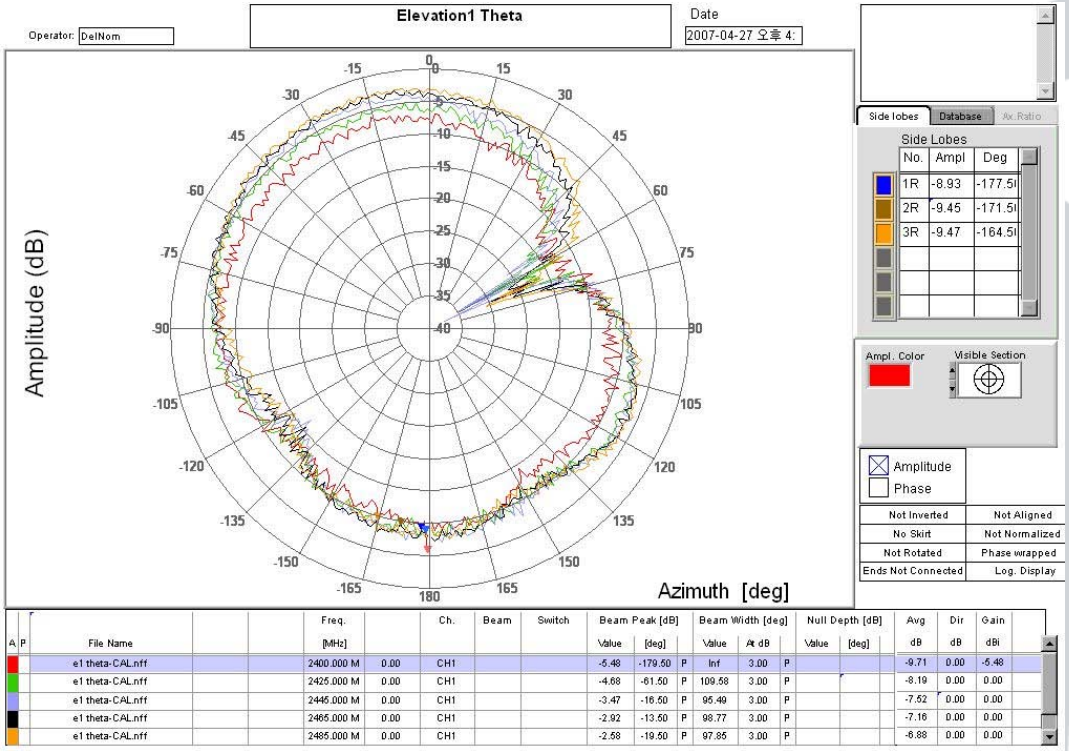
Azimuth Theta


Azimuth Phi



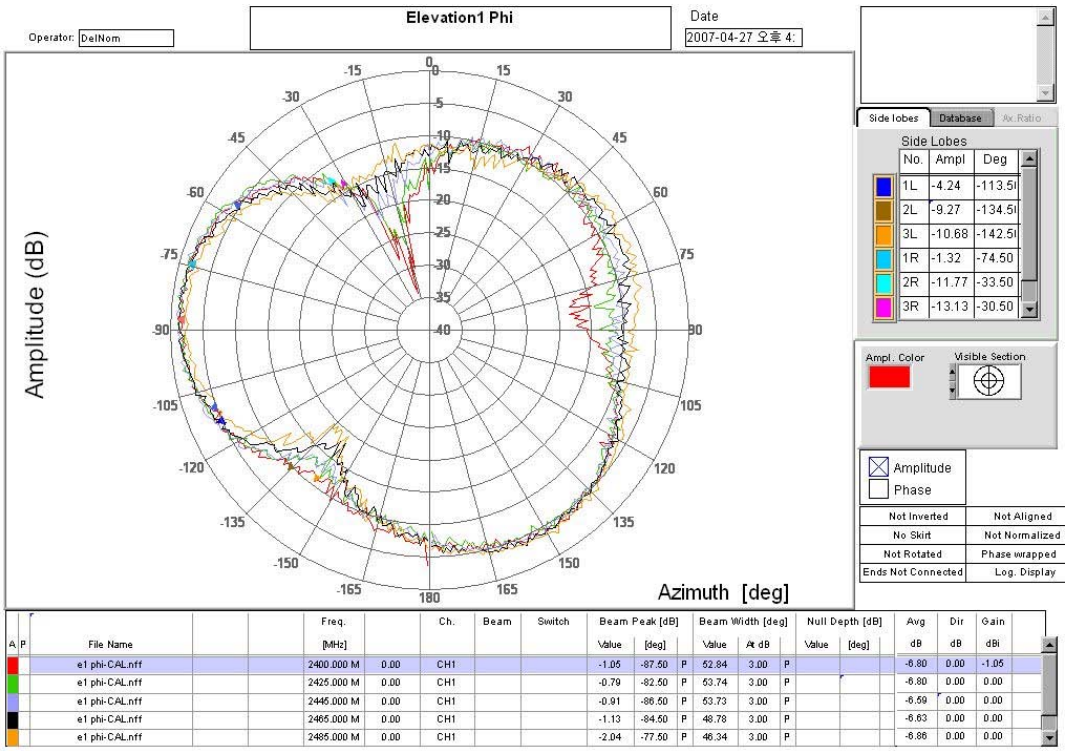
A	P	File Name			Freq. [MHz]		Ch.	Beam	Switch	Beam Peak [dB] Value	[deg]		Beam Width [deg] Value	At dB		Null Depth [dB] Value	[deg]	Avg dB	Dir dB	Gain dBi
		azimuth phi-CAL.nff			2400.000 M	0.00	CH1			-3.59	-9.50	P	103.37	3.00	P			-8.06	0.00	-3.59
		azimuth phi-CAL.nff			2425.000 M	0.00	CH1			-2.68	-11.50	P	44.78	3.00	P			-8.23	0.00	0.00
		azimuth phi-CAL.nff			2445.000 M	0.00	CH1			-2.04	-8.50	P	40.45	3.00	P			-7.86	0.00	0.00
		azimuth phi-CAL.nff			2465.000 M	0.00	CH1			-1.95	-15.50	P	81.62	3.00	P			-7.88	0.00	0.00
		azimuth phi-CAL.nff			2485.000 M	0.00	CH1			-2.09	-15.50	P	39.86	3.00	P			-8.37	0.00	0.00

Elevation1 Theta



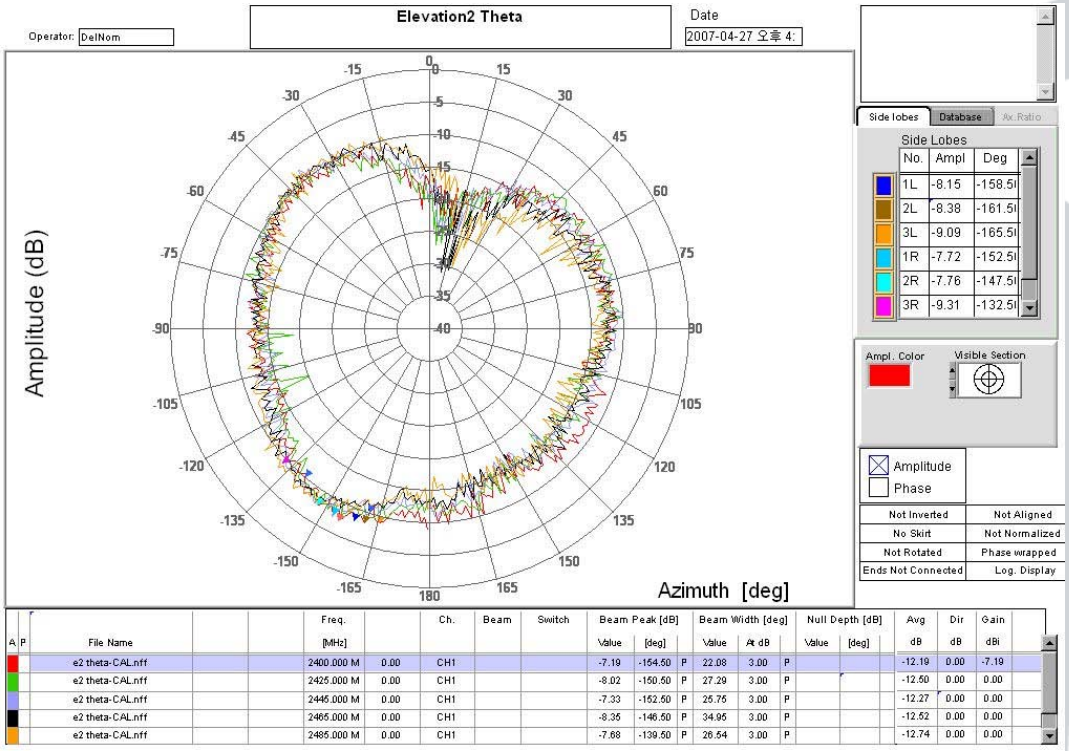
A	P	File Name			Freq. [MHz]		Ch.	Beam	Switch	Beam Peak [dB] Value	[deg]		Beam Width [deg] Value	At dB		Null Depth [dB] Value	[deg]	Avg dB	Dir dB	Gain dBi
		e1 theta-CAL.nff			2400.000 M	0.00	CH1			-5.48	-179.50	P	Inf	3.00	P			-9.71	0.00	-5.48
		e1 theta-CAL.nff			2425.000 M	0.00	CH1			-4.68	-61.50	P	109.58	3.00	P			-8.19	0.00	0.00
		e1 theta-CAL.nff			2445.000 M	0.00	CH1			-3.47	-16.50	P	95.49	3.00	P			-7.52	0.00	0.00
		e1 theta-CAL.nff			2465.000 M	0.00	CH1			-2.92	-13.50	P	98.77	3.00	P			-7.16	0.00	0.00
		e1 theta-CAL.nff			2485.000 M	0.00	CH1			-2.58	-19.50	P	97.85	3.00	P			-6.88	0.00	0.00

Elevation1 Phi



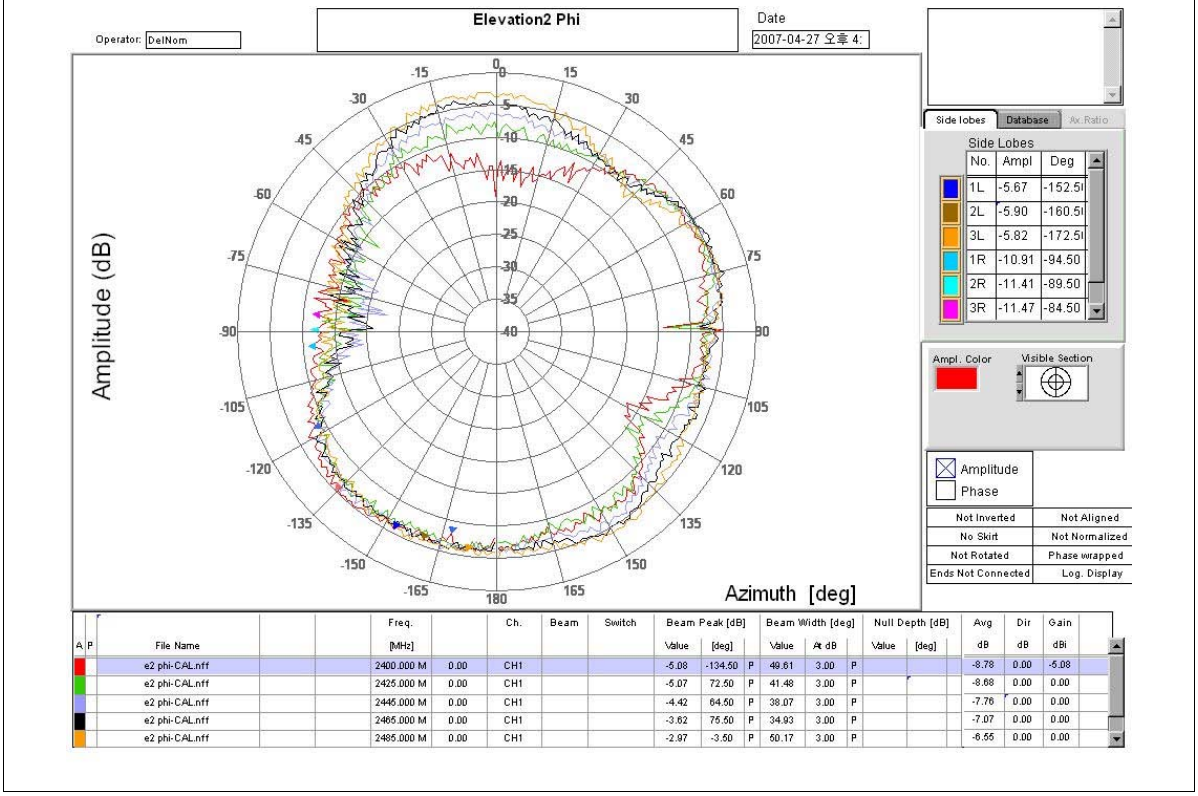
A	P	File Name			Freq. [MHz]		Ch.	Beam	Switch	Beam Peak [dB] Value	[deg]		Beam Width [deg] Value	At dB		Null Depth [dB] Value	[deg]	Avg dB	Dir dB	Gain dBi
		e1 phi-CAL.nff			2400.000 M	0.00	CH1			-1.05	-87.50	P	52.84	3.00	P			-6.80	0.00	-1.05
		e1 phi-CAL.nff			2425.000 M	0.00	CH1			-0.79	-82.50	P	53.74	3.00	P			-6.80	0.00	0.00
		e1 phi-CAL.nff			2445.000 M	0.00	CH1			-0.91	-86.50	P	53.73	3.00	P			-6.59	0.00	0.00
		e1 phi-CAL.nff			2465.000 M	0.00	CH1			-1.13	-84.50	P	48.78	3.00	P			-6.63	0.00	0.00
		e1 phi-CAL.nff			2485.000 M	0.00	CH1			-2.04	-77.50	P	46.34	3.00	P			-6.86	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
		e2 theta-CAL.nff			2400.000 M	0.00	CH1			-7.19	-154.50	P	22.08	3.00	P			-12.19	0.00	-7.19
		e2 theta-CAL.nff			2425.000 M	0.00	CH1			-8.02	-160.50	P	27.29	3.00	P			-12.50	0.00	0.00
		e2 theta-CAL.nff			2445.000 M	0.00	CH1			-7.33	-152.50	P	25.75	3.00	P			-12.27	0.00	0.00
		e2 theta-CAL.nff			2465.000 M	0.00	CH1			-8.35	-146.50	P	34.95	3.00	P			-12.52	0.00	0.00
		e2 theta-CAL.nff			2485.000 M	0.00	CH1			-7.68	-139.50	P	26.54	3.00	P			-12.74	0.00	0.00

Elevation2 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
		e2 phi-CAL.nff	2400.000 M	0.00		CH1			-5.08	-134.50	P	49.61	3.00	P			-8.78	0.00	-5.08
		e2 phi-CAL.nff	2425.000 M	0.00		CH1			-5.07	72.50	P	41.48	3.00	P			-8.68	0.00	0.00
		e2 phi-CAL.nff	2445.000 M	0.00		CH1			-4.42	64.50	P	38.07	3.00	P			-7.76	0.00	0.00
		e2 phi-CAL.nff	2465.000 M	0.00		CH1			-3.62	75.50	P	34.93	3.00	P			-7.07	0.00	0.00
		e2 phi-CAL.nff	2485.000 M	0.00		CH1			-2.97	-3.50	P	50.17	3.00	P			-6.55	0.00	0.00

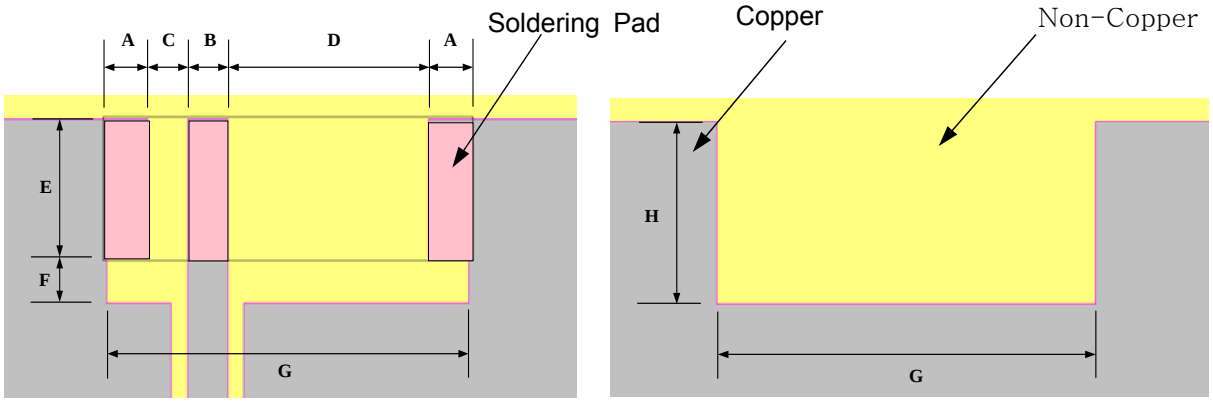
3. Mechanical Characteristics

- The structure is materialized printing Ag paste at the dielectric block

3.1 Structure and Material

Material	Dielectric Block (MMS-08)	3D Structure
	Ag Paste (Metech)	
Size [mm]	W = 2.0±0.1	
	L = 7.0±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]	**1.1**	**1.0**	**0.5**	**3.5**	**2.2**	**1.0**	**7.0**	**3.2**

Unit ; mm

Unless specified tolerances are ±0.1

3.3 Antenna Pattern Dimension

Antenna Pattern View
Unit ; mm Unless specified tolerances are ±0.1 Top Side1 Bottom Side2

3.4 LOT Notation

7	1	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

Marking View
◀ I M 7 1 1

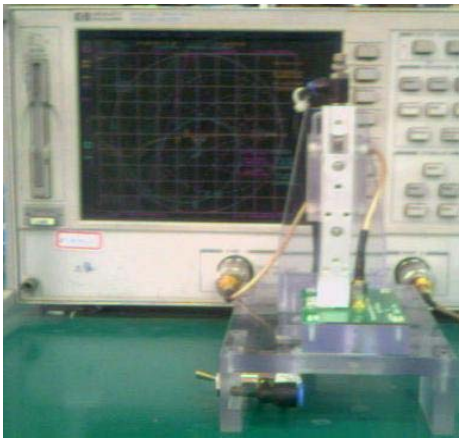
◀	I M	7	1	1
①	②	③	④	⑤

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. Measurement Process

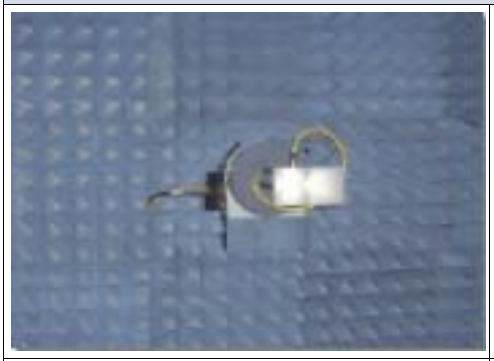
4.1 SWR/Returnloss

The SWR/Returnloss is measured by Network Analyzer

Set Condition	Test Fixture Condition
	

4.2 Gain

The Antenna Gain is measured using the set at Anechoic Chamber

Anechoic Chamber	
	
	

5. Primary Inspection List

Item	Electrical Characteristic [MHz] CTQ		Mechanical Dimension [mm] CTQ		
Standard	VSWR 3.0 Max		W=2.0±0.1	L=7.0±0.1	T=1.2±0.1
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
X					
σ					
Cpk					

6. Reliability Condition

6.1 ENVIRONMENT TEST

ITEM	TEST CONDITION	LIMIT
High Temperature Resistance	+85℃±3℃, 120hr±2hr	*After the test, specimen would be kept at 25℃±5℃ for 1 hours *specimen sheet meet the electrical specification
Low Temperature Resistance	-40℃±3℃ , 120hr±2hr	
Humidity Resistance	+60±3℃, RH90~95% ,120hr±2hr	

6.2 Thermal Shock Test , Reflow Test

ITEM	TEST CONDITION	LIMIT
Thermal Shock	-40℃±3℃(2Hr) ↔ +85℃±3℃(2Hr) cycle : 15cycle recovery time : with in 5min	SAME as 6-1
Reflow	Pre Heating : 140±10℃ , 60～120 sec peak Heating : 240℃,10sec Max	

6.3 Mechanical Test

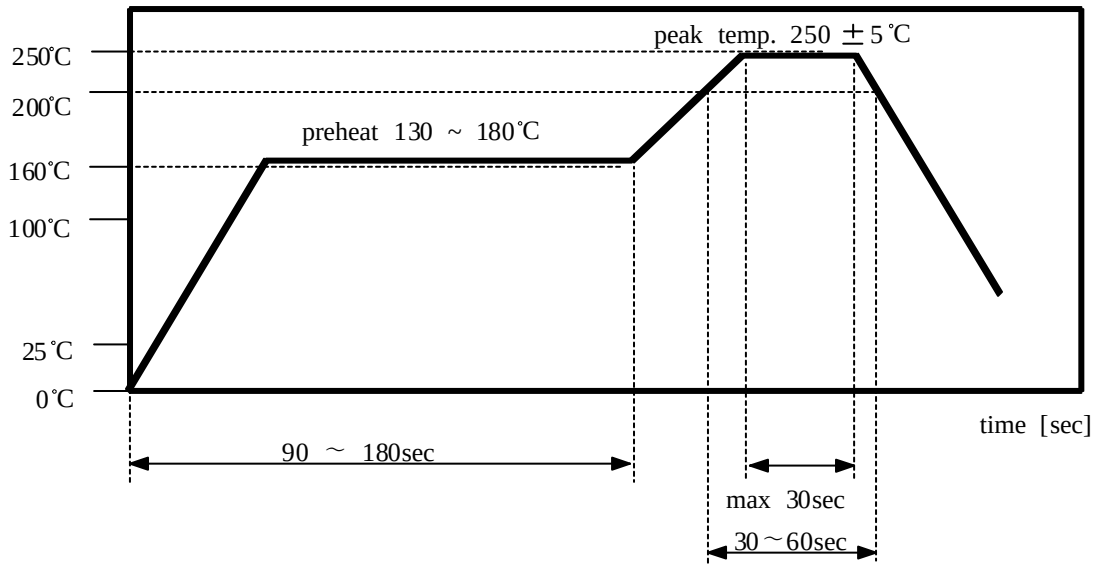
ITEM	TEST CONDITION	LIMIT
Random Vibration	Frequency 10~500Hz - 10 ×9.8㎨(G) Sweep time 15min , X.Y.Z each 5 times	*After the test, specimen sheet meet the electrical specification
Drop	Height 120㎝ , 12 times Height 152㎝ , 19 times	

6.4 Reliability Test Result

※ Appendix

7. Soldering Condition

7.1 Reflow Soldering



7.2 Manual Soldering

Pre-heating Temperature : 120℃ , 60 ~ 300 sec.

Soldering Temperature : 340℃±5℃ , 5sec max per each terminal

8. Attention

8.1 Temperature Condition

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

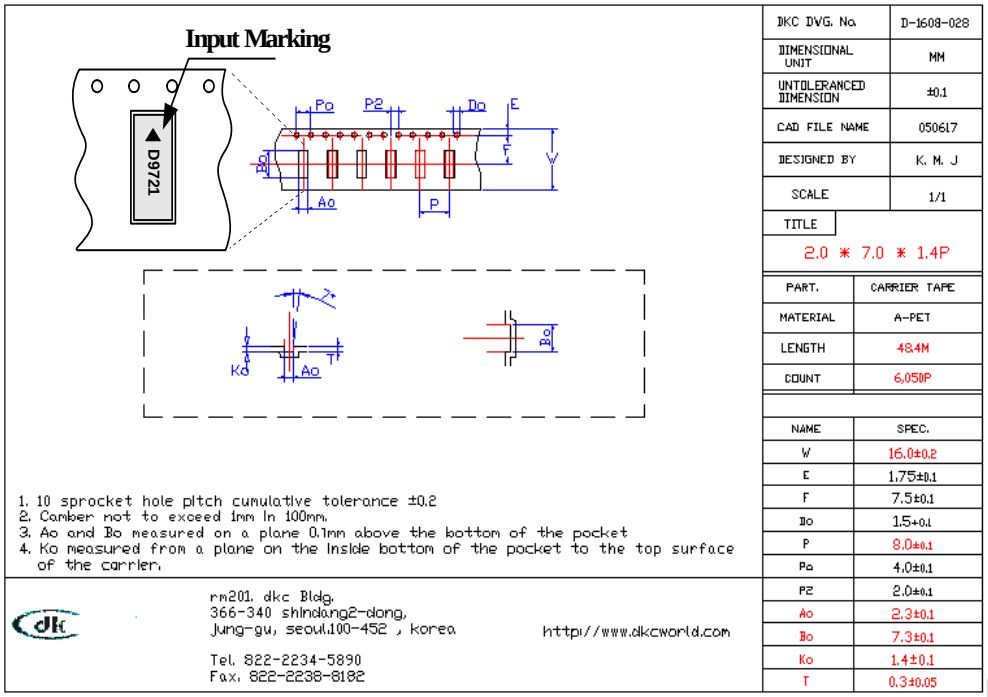
8.2 MSL LEVEL 1 (JEDEC J-STD-020C)

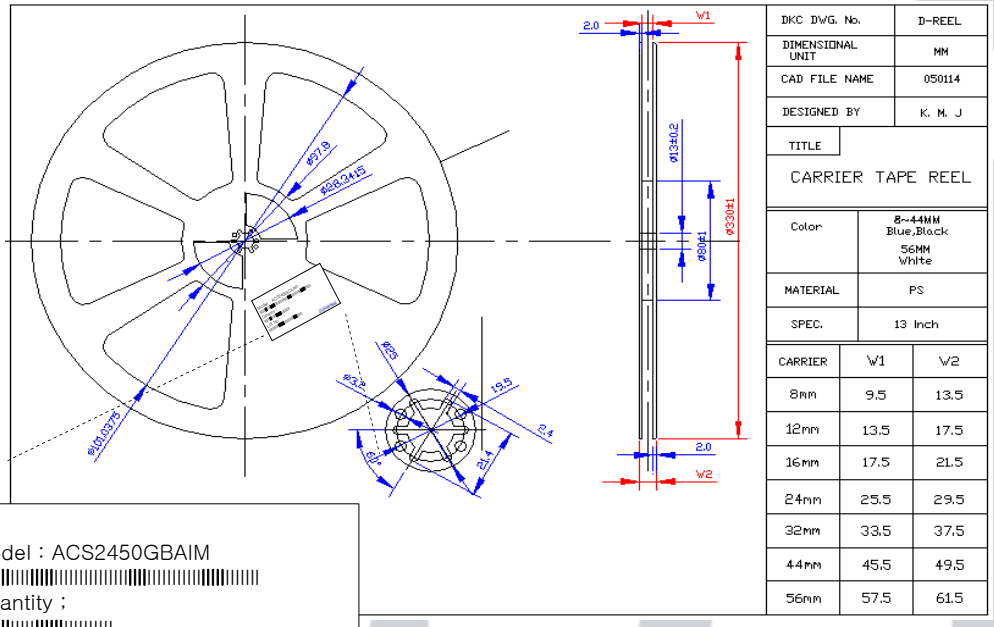
	Floor Life		Soak Requirements	
	Time	Conditions	Time	Conditions
	Unlimited	= < 30℃/85%RH	168+5/-0	= < 85℃/85%RH

9. Packing

9.1 Carrier/Reel

Material	Surface Resistance	Method
PET	Typical $10^8\Omega$	Heat Press





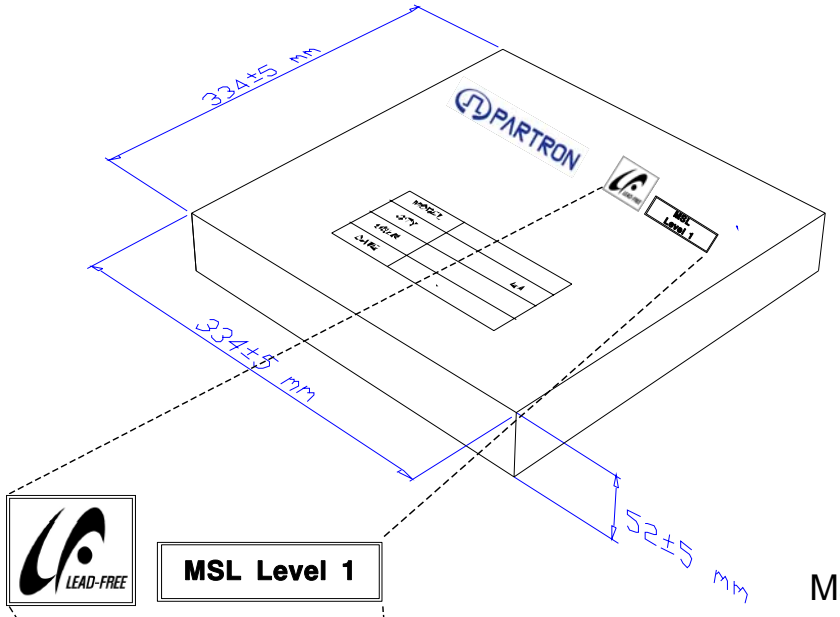
Model : ACS2450GBAIM

Quantity ;

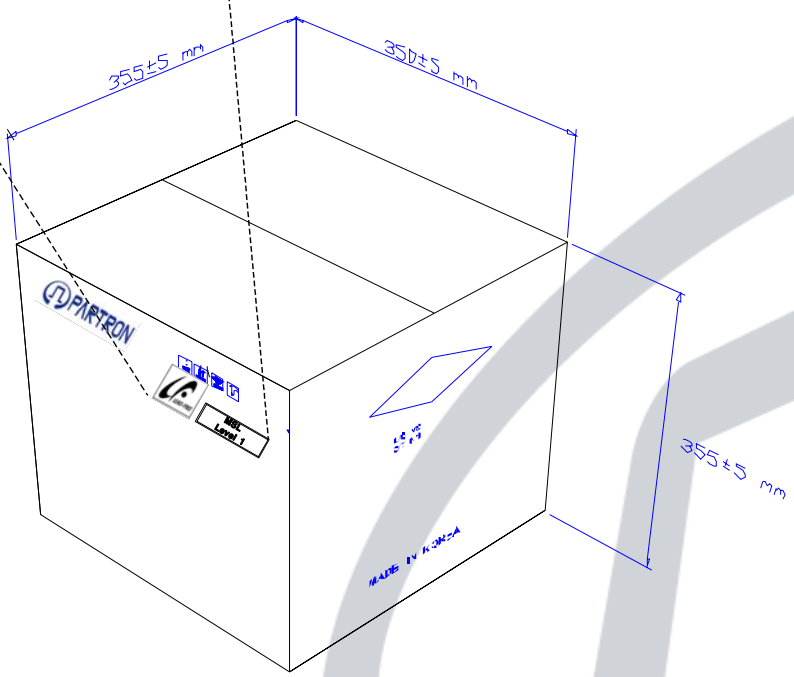
Lot No

PARTRON

9.2 Box Specification



Material : SK/S/K-B
골판지



10. Process Control

Product	Issued/Revision		Process Control	Record	By designed	By checked	By approved
CHIP ANTENNA	Issued	04.04.06		PRCP-C001			
	Revised	05.04.03					

Input Materials	FLOW CHART		Process name	Management of Factors					Management of quality					
	preparation	Main Process		Equipment Name	Checked	Condition	Cycle of management	Record	Checked Item	Margin	Method of Inspection	Cycle of management	Record	Action
Ceramic POWDER			Import Inspection						shrinking rate permittivity	refer to Guide Sheet	Micrometer Network	10ea/LOT	C/sheet	Return
POWDER lubricant			powder	Mixer					mixing	POWDER lubricant	Scale	PER MIXING	-	Exhaust
			Shaping	Press	pressure Mold Condition	refer to Guide Sheet	Per LOT 1/day	parameter C/SHEET	dimension weight density aspect	refer to Guide Sheet	Micrometer scale Calculated Visual	5/100EA 10ea/lot	LOT CARD	Exhaust
			Plasticity	Plasticity Hole	SETTER Outside Temperature PROFILE	refer to Guide Sheet	all 2/day 1/month	C/sheet						
			Block						wide length shape	refer to Guide Sheet	Micrometer Calipers Visual Inspection	20ea/LOT 20ea/LOT all	C/sheet	Exhaust
AG PASTE			SIDE1 PAD Printing	Printer screen	Squeeze velocity/presure SNAP	refer to Guide Sheet	1/day	-	PATTERN Dimension aspect	refer to Guide Sheet	Microscope	10ea/3Jig	c/sheet	Rework
			Dry	Dryer Dry Jig	Temperature Belt speed	refer to Guide Sheet	1/week	Parameter	Dry Condition Printed condition breakage	refer to Guide Sheet	Visual Inspection	all	Lot card	Rework

Product	Issued/Revision		Process Control	Record	By designed	By checked	By approved
CHIP ANTENNA	Issued	04.04.06		PRCP-C001			
	Revised	05.04.03					

Input Materials	FLOW CHART		Process name	Management of Factors					Management of quality					
	preparation	Main Process		Equipment Name	Checked	Condition	Cycle of management	Record	Checked Item	Margin	Method of Inspection	Cycle of management	Record	Action
AG PASTE			SIDE 2 PAD Printing	Printer screen	Squeeze velocity/presure SNAP	refer to Guide Sheet	1/day	-	PATTERN Dimension aspect	refer to Guide Sheet	Microscope	10ea/3Jig	c/sheet	Rework
			Dry	Dryer Dry Jig	Temperature Belt speed	refer to Guide Sheet	1/week	Parameter	Dry Condition Printed condition breakage	refer to Guide Sheet	Visual Inspection	all	Lot card	Rework
			Baking	Baking Hole mesh net	Temperature Belt speed	refer to Guide Sheet	1/week	Parameter C/Sheet	Breakage Pollution	refer to Guide Sheet	Visual Inspection	all	Lot card	Exhaust Rework
AG PASTE			TOP printing	Printer screen	Squeeze velocity/presure SNAP	refer to Guide Sheet	1/day	-	PATTERN dimension	refer to Guide Sheet	measure	10ea/3Jig	c/sheet	Rework
			Dry	Dryer Dry Jig	Temperature Belt speed	refer to Guide Sheet	1/week	Parameter	Dry Condition Printed condition breakage	refer to Guide Sheet	Visual Inspection	all	Lot card	Rework
AG PASTE			BOTTOM PAD Printing CTQ	printer screen	Squeeze velocity/presure SNAP	refer to Guide Sheet	1/day	-	PATTERN dimension aspect	refer to Guide Sheet	measure Microscope	10ea/3Jig	c/sheet	Rework

Product	Issued/Revision		Process Control	Record	By designed	By checked	By approved
CHIP ANTENNA	Issued	04.04.06		PRCP-C001			
	Revised	05.04.03					

Input Materials	FLOW CHART		Process name	Management of Factors					Management of quality					
	preparation	Main Process		Equipment Name	Checked	Condition	Cycle of management	Record	Checked Item	Margin	Method of Inspection	Cycle of management	Record	Action
			Dry	Dryer Dry Jig	Temperature Belt speed	refer to Guide Sheet	1/week	Parameter	Dry Condition Printed condition breakage	refer to Guide Sheet	Visual Inspection	all	Lot card	Rework
			Baking	Baking Hole mesh net	Temperature Belt speed	refer to Guide Sheet	1/week	Parameter C/Sheet	Breakage Pollution	refer to Guide Sheet	Visual Inspection	all	Lot card	Exhaust Rework
			aspect inspection						aspect	Reference SPL refer to Guide Sheet	Visual Inspection microscope	all	Lot card production diary	Exhaust repair
			MARKING	Marking Machine					marking	Reference SPL	Visual Inspection	all	Lot card production diary	Rework Exhaust
			Electrical Characteristic	NETWORK Inspection Jig	proofreading Condition	refer to Guide Sheet	1/2hour	C/sheet	Electrical Characteristic	refer to Guide Sheet	Network	all	Lot card production diary	Exhaust repair
			aspect inspection						aspect dimension	Reference SPL refer to Guide Sheet	Visual Inspection microscope	all	Lot card production diary	Exhaust repair
Carrier cover reel			Taping						Quantity Direction aspect	refer to Guide Sheet	Manual	all	Lot card production diary	Rework
			shipper inspection	NETWORK Inspection Jig	proofreading Condition	refer to Guide Sheet	1/person	C/sheet	Electrical Characteristic aspect packing	refer to Guide Sheet	Network microscope Visual Inspection	refer to Guide Sheet	Result Paper	return Exhaust
packing box label			packing	bar code printer					packing P/N Quantity	refer to Guide Sheet	Visual Inspection	all	-	Rework
			packing inspection						packing P/N Quantity	refer to Guide Sheet	Visual Inspection	all	-	return

11. RoHS Data

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

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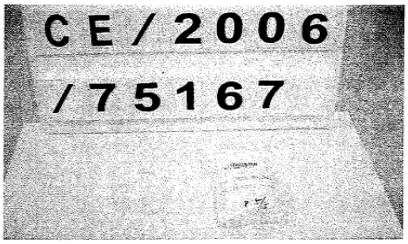
Test Report

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 : 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 :

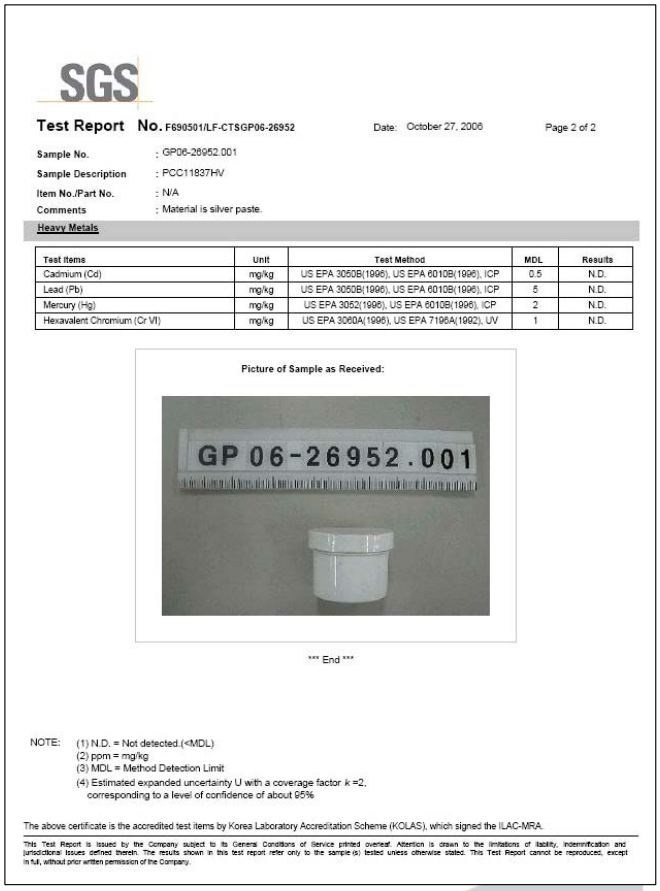
Commodity	: PCC11837HV
SGS File No.	: GP06-26952
Received Date	: October 20, 2006
Test Performing Date	: October 23, 2006
Test Performed	: SGS Testing Korea tested the sample(s) selected by applicant with following results
Test Results	: For further details, please refer to following page(s)

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, Daeryung Techno Town 7th
Kasan-dong
Keumcheon-ku
SEOUL
Korea

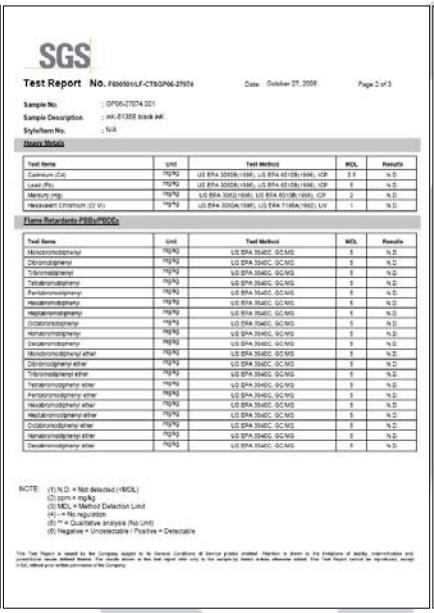
The following merchandise was submitted and identified by the client as :

Commodity	: HH-S120S 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
Jully Oh
Jerry 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	: HH-S120S 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