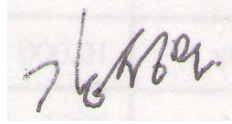


Approval Sheet

Product	Dual band PCB Antenna		
Customer	Bitel		
Model	IC 5100		
Customer Code			
Supplier	MicroRF Co., LTD.		
Supplier Code	ABDG1M5121-A00		
Customer	Designed by	Checked by	Approved by
MicroRF	Designed by	By checked	By approved
			
	R&D	QC	R&D
	Junyoung, Kwon	Sunmo, Kang	Seungyun, Kim

2010. 06. 22

MicroRF Co., Ltd.

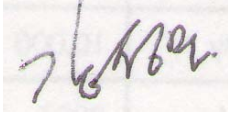
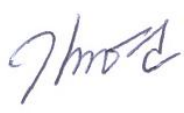
TEL. 82-2-6406-5590

FAX. 82-2-6406-5591

SPECIFICATION

Model : IC 5100

Dual band PCB Antenna

Designed by	Approved by	Approved by
		
R&D	QC	R&D
Junyoung, Kwon	Sunmo, Kang	Seungyun, Kim
100622	100622	100622

2010. 06. 22

MicroRF Co., Ltd.

TEL. 82-02-6406-5590

FAX. 82-02-6406-5591

Contents

1. Revision History -----	1
2. Features and Applications -----	2
3. Code No. -----	2
4. Electrical Specifications -----	2
5. Mechanical Dimensions -----	5
6. Measurement Method and Conditions -----	6
7. Environmental Specifications -----	7
8. Environmental Tests and conditions -----	8
9. RoHS Data -----	9

Product	Dual band PCB Antenna	Model	IC 5100
		CODE NO.	ABDG1M5121-A00

Rev No.	Date	Name	Page	Item	Revision Issue
1.0	100622	J.Y.Kwon			Issued

2. FEATURES AND APPLICATIONS

This dual band PCB Antenna is applied to GSM900/DCS band applications.

3. CODE NO.

CODE NO. : ABDG1M5121-A00

CUSTOMER PART NO. :

4. ELECTRICAL SPECIFICATIONS

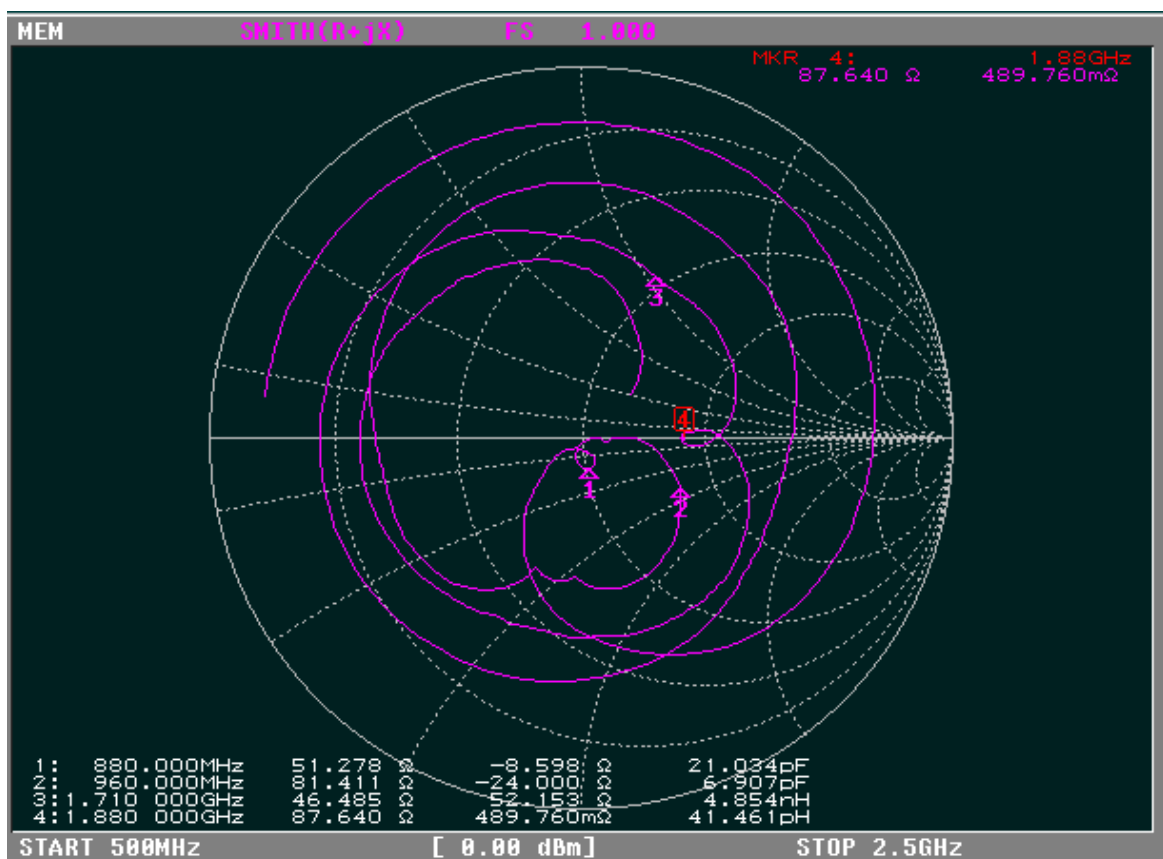
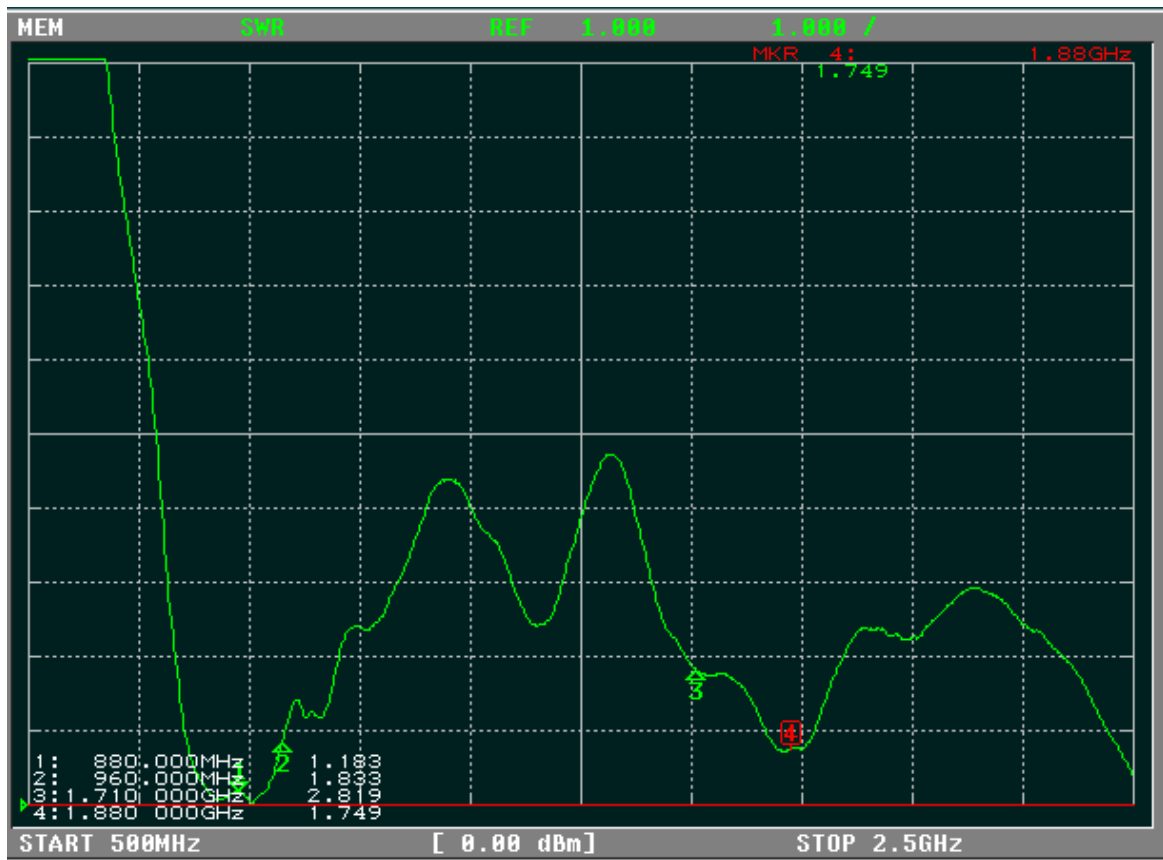
4-1.

* All items are measured in room temperature (25℃).

* All items are measured at customer set condition.

No.	Contents	Standards			Unit	Conditions
		Min.	Typ.	Max.		
1	GSM900 Band	880		960	MHz	Tx: 880~915MHz Rx: 925~960MHz
	DCS Band	1710		1880	MHz	Tx: 1710~1785MHz Rx: 1805~1880MHz
2	Impedance		50		Ω	
3	Gain of GSM900	-3	2		dBi	Max. Gain in all direction
	Gain of DCS	0	3		dBi	Max. Gain in all direction
4	V.S.W.R. of GSM900		2	4		880 MHz
			2	4		960 MHz
	V.S.W.R. of DCS		3	3.5		1710 MHz
			2	3.5		1880 MHz

4-2 VSWR and Smith Chart data (S11 of SET condition)

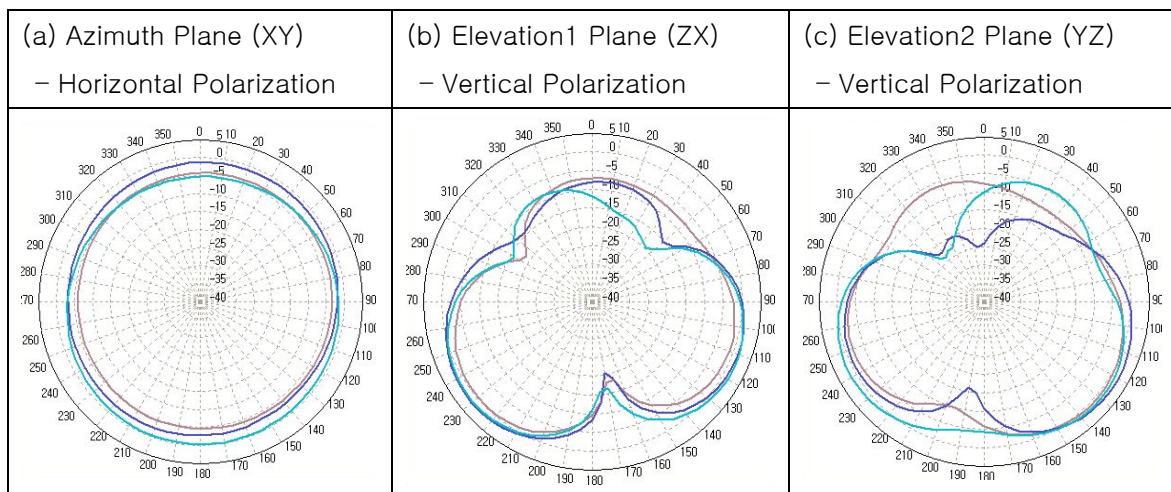


4-3 Radiation Patterns

GSM900 Band

Peak Value(Beam Peak :dBi)

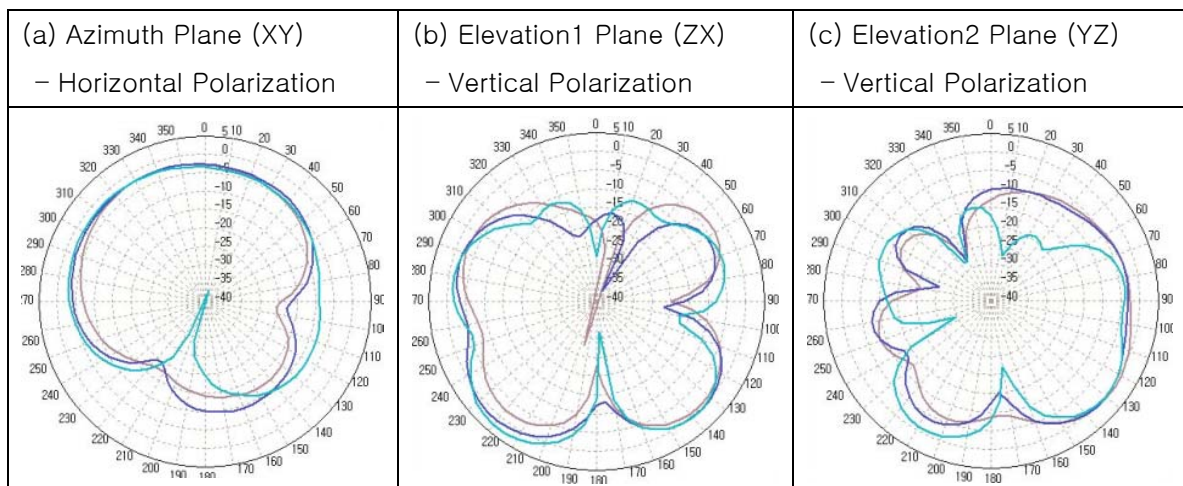
	Azimuth Plane	Elevation 1	Elevation 2
880 MHz	-3.352	-0.175	0.704
920 MHz	-0.962	1.977	2.294
960 MHz	-0.260	1.755	1.658



DCS Band

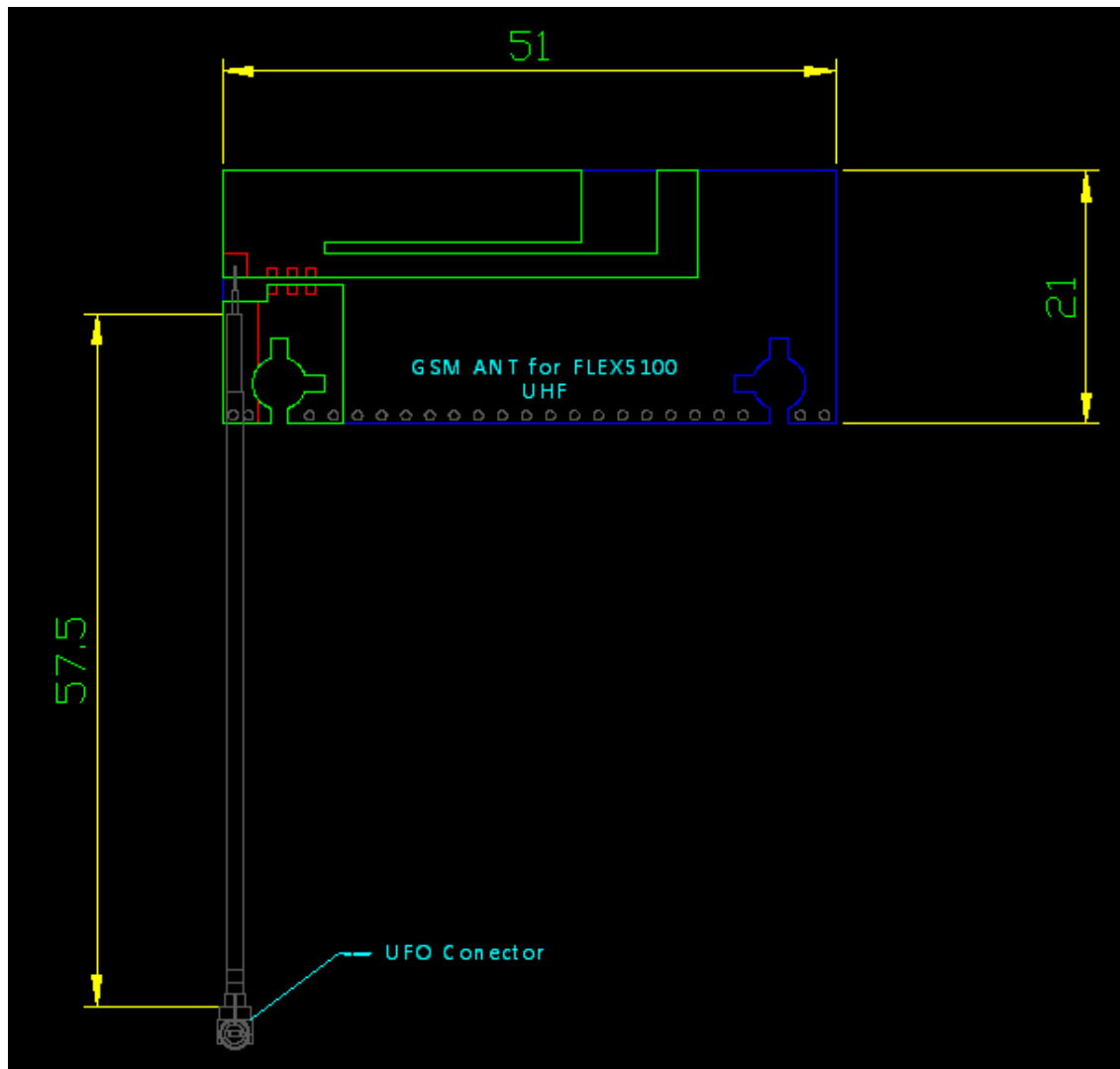
Peak Value(Beam Peak :dBi)

	Azimuth Plane	Elevation 1	Elevation 2
1710 MHz	-2.183	-0.694	0.693
1795 MHz	-2.140	1.462	0.386
1880 MHz	-1.860	3.016	0.313



5. MECHANICAL DIMENSIONS

(Unit : mm)

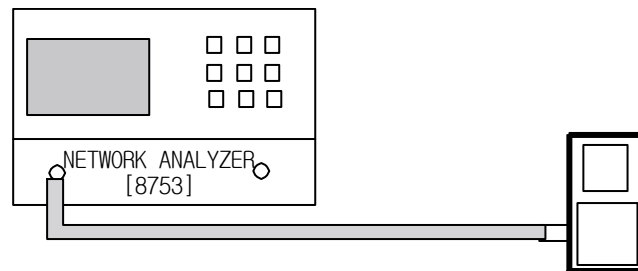


- PCB Thickness : 1.0
- Cable Diameter : 1.2

6. Measurement Method and Conditions

The measurement of antenna performance is measurement of gain, radiation pattern using ORBIT/FR apparatus in Anechoic chamber and measurement of VSWR using Network analyzer.

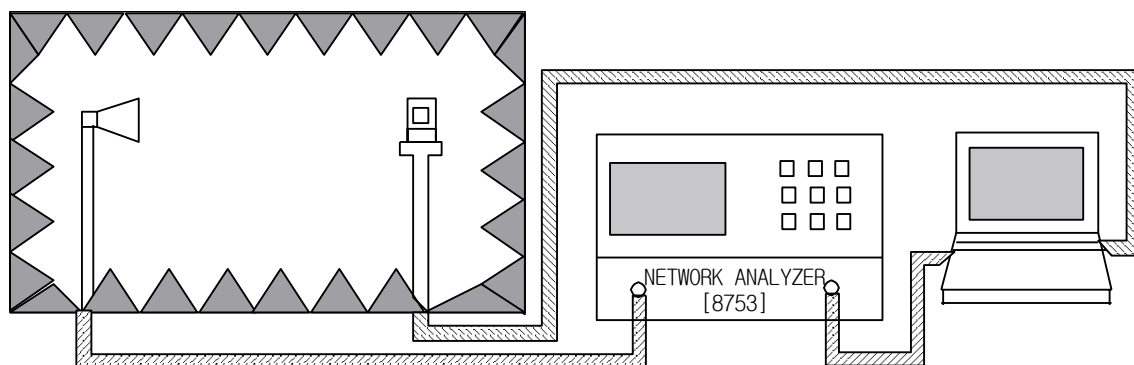
6-1. The measurement of Frequency and VSWR



<Measurement Method>

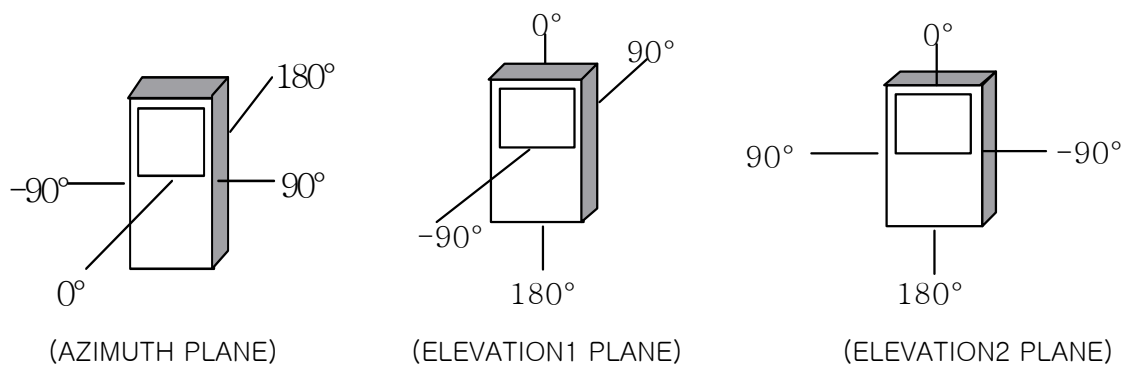
- 1) As seen the above, network analyzer is set up for S11 measurement.
- 2) The measurement frequency range is to set up from 500MHz to 2.5 GHz.
- 3) Perform S11 one port full calibration.
- 4) Measure the VSRW of GSM900/DCS frequency range.

6-2. The measurement of Gain and Radiation Patterns



<Measurement Method>

- 1) As seen the above, network analyzer is to set up in Anechoic chamber.
- 2) As seen the beneath, for the measurement planes as Azimuth, Elevation1, and Elevation2, measure Gain data of vertical polarization and horizontal polarization for each plane.



7. ENVIRONMENTAL SPECIFICATIONS

No.	Items	Specifications
1	Material	Pb-free system
2	Operating Temperature Range	$-30 \sim +85 \text{ }^\circ\text{C}$
3	Operating Humidity Range	$45 \sim 85 \text{ \% RH}$

8. ENVIRONMENTAL TESTS

No.	Item	Test Conditions
1	High Temperature Storage	Leave for 72 ± 2 hours in a test bath retaining $85 \pm 2^\circ\text{C}$. After then, leave on the test conditions for 1.5 hours.
2	Low Temperature Storage	Leave for 72 ± 2 hours in a test bath retaining $-30 \pm 2^\circ\text{C}$. After then, leave on the test condition for 1.5 hours.
3	Static Humidity	Leave for 24 ± 2 hours in a test bath retaining 90~95% RH / $50 \pm 3^\circ\text{C}$. After then, leave in the test condition for 1.5 hours.
4	Thermal Shock	Cool from 25°C down to $-30 \pm 2^\circ\text{C}$ and leave for 30 minutes. After that, heat up to $+85 \pm 2^\circ\text{C}$ and leave for 30 minutes. After then, cool down to 25°C . Repeat the cycle 15 times and leave on the test conditions for 1.5 hours.
5	Drop Shock	Drop 150g weight onto steel floor from the height of 152cm, 19 times and 120cm, 12 times.
6	Vibration	With 5g of the whole acceleration at 20 to 2000 Hz, apply a vibration for 2 hours for each of 3 directions.
7	Solder Proof	No reaching after reflow for 5 ± 1 sec at 260°C .
8	Soldering Conditions	$230 \pm 5^\circ\text{C}$ / 5 ± 1 sec for Sn/Pb soldering system $245 \pm 5^\circ\text{C}$ / 2 ± 1 sec for Pb-free soldering system

9 .RoHS Data



TEST REPORT

Applicant : Doosan Corporation Electro-Materials BG
Address : 12th Floor, Doosan Technical Center Bldg. 39-3 Sungbok-dong, Suji-gu,
Yongin-si, Kyungki-do, Korea

Page: 1 of 4

Report No. RT08R-7946-010-A

Date: Feb. 28, 2008

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

Name/Type of Product : DS-7405
Sample ID No. : RT08R-7946-010
Manufacturer/Vender : Doosan Corporation Electro-Materials BG

Sample received : Feb. 22, 2008
Testing Date : Feb. 22, 2008 ~ Feb. 28, 2008
Testing Laboratory : Intertek Testing Center
Testing Environment : Temperature : (22 ~ 26) °C Relative Humidity: (55 ~ 65) %

Test Method(s) : Please see the following page(s).
Test Result(s) : Please see the following page(s).

* Note 1 : The test results presented in this report relate only to the object tested.

* Note 2 : This report shall not be reproduced except in full without the written approval of the testing laboratory.

Tested by,



E.Y. Lee / Chemist

Authorized by,



H.W. Yoo / Lab Manager

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Intertek Testing Center

Seoul Office : Tel : 02-2109-1250 Fax : 02-2109-1259 Gumi Office : Tel : 054-462-7647 Fax : 054-462-7657 Web Site : www.intertek.co.kr
Seoul Lab. : #709, 7F, Ace Techno Tower V, 197-22, Guro-3Dong, Guro-Gu, Seoul 152-766 Korea Tel : 02-2109-1260 Fax : 02-2109-1258
Ulsan Lab. : #340-2, Yongam-Ri, Chongryang-Myun, Ulsu-Gun, Ulsan 689-865 Korea Tel : 052-257-6754 Fax : 052-276-6792



TEST REPORT

Report No. RT08R-7946-010-A

Page: 2 of 4

Date: Feb. 28, 2008

Sample ID No. : RT08R-7946-010

Sample Description : DS-7405

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	With reference to IEC 62321 Ed.1 (111/95/CDV) by ICP-OES	0.5	N.D.
Lead (Pb)	mg/kg	With reference to IEC 62321 Ed.1 (111/95/CDV) by ICP-OES	2	N.D.
Mercury (Hg)	mg/kg	With reference to IEC 62321 Ed.1 (111/95/CDV) by ICP-OES	2	N.D.
Hexavalent Chromium (Cr ⁶⁺)	mg/kg	IEC 62321 Ed.1 (111/95/CDV) by UV-VIS Spectrometry	1	N.D.
Polybrominated Biphenyl (PBBs)				
Monobromobiphenyl	mg/kg	With reference to IEC 62321 Ed.1 (111/95/CDV) by GC/MS	5	N.D.
Dibromobiphenyl	mg/kg		5	N.D.
Tribromobiphenyl	mg/kg		5	N.D.
Tetrabromobiphenyl	mg/kg		5	N.D.
Pentabromobiphenyl	mg/kg		5	N.D.
Hexabromobiphenyl	mg/kg		5	N.D.
Heptabromobiphenyl	mg/kg		5	N.D.
Octabromobiphenyl	mg/kg		5	N.D.
Nonabromobiphenyl	mg/kg		5	N.D.
Decabromobiphenyl	mg/kg		5	N.D.
Polybrominated Diphenyl Ether (PBDEs)				
Monobromodiphenyl ether	mg/kg	With reference to IEC 62321 Ed.1 (111/95/CDV) by GC/MS	5	N.D.
Dibromodiphenyl ether	mg/kg		5	N.D.
Tribromodiphenyl ether	mg/kg		5	N.D.
Tetrabromodiphenyl ether	mg/kg		5	N.D.
Pentabromodiphenyl ether	mg/kg		5	N.D.
Hexabromodiphenyl ether	mg/kg		5	N.D.
Heptabromodiphenyl ether	mg/kg		5	N.D.
Octabromodiphenyl ether	mg/kg		5	N.D.
Nonabromodiphenyl ether	mg/kg		5	N.D.
Decabromodiphenyl ether	mg/kg		5	N.D.

Notes : mg/kg = ppm = parts per million

< = Less than

N.D. = Not detected (<MDL)

MDL = Method detection limit

** Tests were conducted with reference to 111/95/CDV which is still a draft method and subject to future changes prior to publication.

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Seoul Lab. : #709, 7F, Ace Techno Tower V, 197-22, Guro-3Dong, Guro-Gu, Seoul 152-766 Korea Tel : 02-2109-1260 Fax : 02-2109-1258

Ulsan Lab. : #340-2, Yongam-Ri, Chongryang-Myun, Ulsu-Gun, Ulsan 689-865 Korea Tel : 052-257-6754 Fax : 052-276-6792



TEST REPORT

Report No. RT08R-7946-010-A

Page: 3 of 4

Date: Feb. 28, 2008

Sample ID No. : RT08R-7946-010

Sample Description : DS-7405

* View of sample as received;-



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Seoul Lab. : #709, 7F, Ace Techno Tower V, 197-22, Guro-3Dong, Guro-Gu, Seoul 152-766 Korea Tel : 02-2109-1260 Fax : 02-2109-1258

Ulsan Lab. : #340-2, Yongam-Ri, Chongryang-Myun, Ulsu-Gun, Ulsan 689-865 Korea Tel : 052-257-6754 Fax : 052-276-6792

Intertek**TEST REPORT**

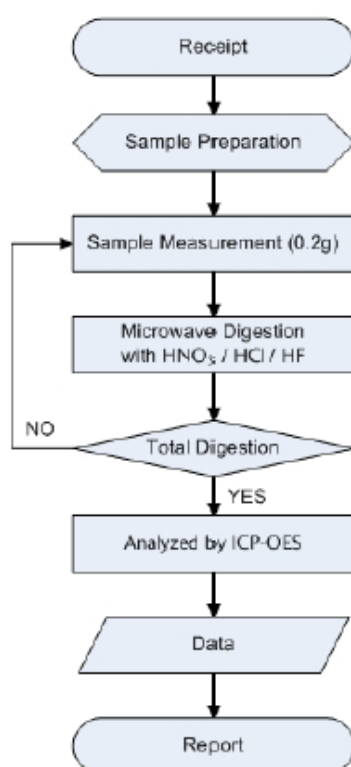
Report No. RT08R-7946-010-A

Page: 4 of 4

Date: Feb. 28, 2008

Sample ID No. : RT08R-7946-010

Sample Description : DS-7405

Flow Chart Of Digestion (IEC 62321 Ed.1 111/95/CDV For Cd, Pb)

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

Prepared by Eung Yong Lee, Chemist

Confirmed by Sang Chul Park, Senior Researcher

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

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Seoul Lab. : #709, 7F, Ace Techno Tower V, 197-22, Guro-3Dong, Guro-Gu, Seoul 152-766 Korea Tel : 02-2109-1260 Fax : 02-2109-1258
Ulsan Lab. : #340-2, Yongam-Ri, Chongryang-Myun, Ulsu-Gun, Ulsan 689-865 Korea Tel : 052-257-6754 Fax : 052-276-6792

**Test Report No. F690501/LF-CTSAYAA08-07025**

Issued Date: March 07, 2008

Page 1 of 4

To: SEOUL CHEMICAL RESEARCH LABORATORY CO., LTD
1696-7
Jungwang-dong
Shiheung-city
GYEONGGI-DO
Korea

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

Product Name : SPI-707G
SGS File No. : AYAA08-07025
Received Date : March 03, 2008
Test Performing Date : March 04, 2008
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)
Comments : The client has confirmed that the described item No./part No.s are same with the sample which has been submitted.

Pluto Kim
Monet Jeong
Billy Oh / Testing Person

SGS Testing Korea Co. Ltd.

Jeff Jang / Chemical Lab Mgr

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F052 Version2

**Test Report No. F690501/LF-CTSAYAA08-07025**

Issued Date: March 07, 2008

Page 2 of 4

Sample No. : AYAA08-07025.001

Sample Description : SPI-707G

Style/Item No. : TC,TC-2,TC-4

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3052(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) mg/kg = ppm
 (3) MDL = Method Detection Limit
 (4) - = No regulation
 (5) ** = Qualitative analysis (No Unit)
 (6) Negative = Undetectable / Positive = Detectable

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F052 Version2



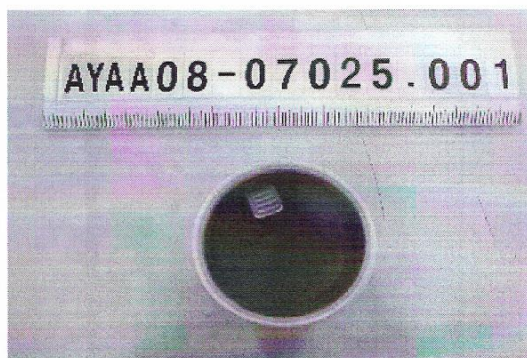
Test Report No. F690501/LF-CTSAYAA08-07025

Issued Date: March 07, 2008

Page 3 of 4

Picture of Sample as Received:

Sample Color : Green



- 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

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F052 Version2



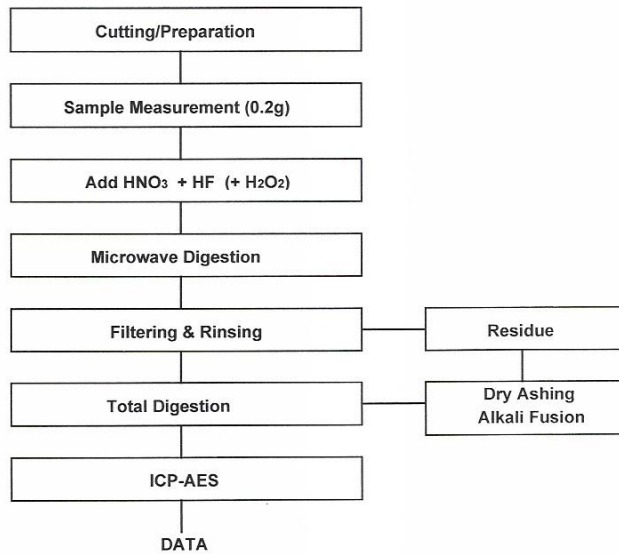
Test Report No. F690501/LF-CTSAYAA08-07025

Issued Date: March 07, 2008

Page 4 of 4

Flow Chart of Digestion

(EPA 3052 for Cd, Pb)



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

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

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F052 Version2



Test Report No. F690501/LF-CTSAYA07-28999

Issued Date: January 02, 2008

To: **SEOUL CHEMICAL RESEARCH LABORATORY CO., LTD**
1506-7
Jungwang-dong
Shiheung-city
GYEONGGI-DO
Korea

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

Product Name : SCM-500
SGS File No. : AYA07-28999
Received Date : December 26, 2007
Test Performing Date : December 27, 2007
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)
Comments : Client has confirmed that the described item No./part No. are same with the sample which has been submitted.

Pluto Kim
Monet Jeong
Billy Oh / Testing Person

SGS Testing Korea Co. Ltd.

Jeff Jang

Jeff Jang / Chemical Lab Mgr

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F690501/LF-CTSAYA07-28999



Test Report No. F690501/LF-CTSAYA07-28999

Issued Date: January 02, 2008

Sample No. : AYA07-28999.001

Sample Description : SCM-500

Style/Item No. : WHITE

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3052(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.
Dbromobiphenyl	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.
Dbromodiphenyl 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) mg/kg = ppm
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) * = Qualitative analysis (No Unit)
(6) Negative = Undetectable / Positive = Detectable

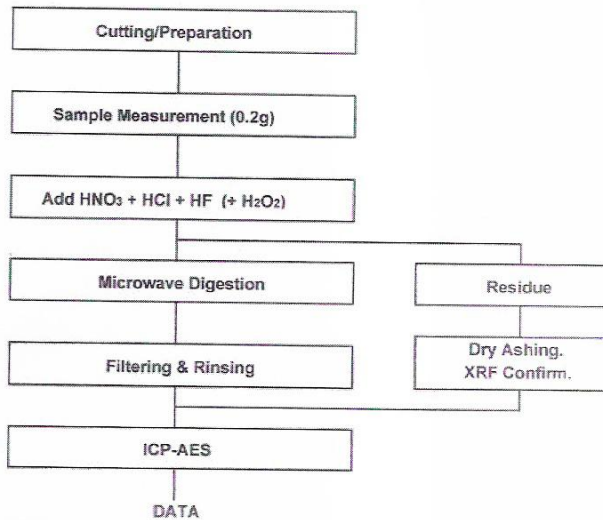


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Flow Chart of Digestion

(EPA 3052 for Cd, Pb)



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

Operator Dami Yeom

Section Chief Jeff Jang

*** End ***

- NOTE:
- (1) N.D. = Not detected (<MDL)
 - (2) mg/kg = ppm
 - (3) MDL = Method Detection Limit
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