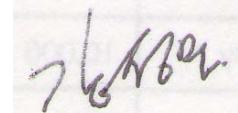
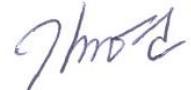


Approval Sheet

Product	Dielectric Chip Antenna		
Customer	UNEE DS Commers Co.,Ltd.		
Model	Bluetooth Stereo Headset		
Customer Code			
Supplier	MicroRF Co., LTD.		
Supplier Code	ADSBTM1003-A03		
Customer	Designed by	Checked by	Approved by
MicroRF	Designed by	By checked	By approved
			
	R&D	QC	R&D
	Myoungsoo,Kim	Sunmo,Kang	Seungyun,Kim

2011. 5. 17

MicroRF Co., Ltd.

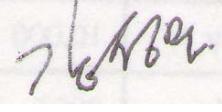
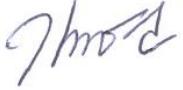
TEL. 82-2-6406-5590

FAX. 82-2-6406-5591

SPECIFICATION

Model : ADSBTM1003-A03

DIELECTRIC CHIP ANTENNA

Designed by	Approved by	Approved by
		
R&D	QC	R&D
Myungsoo, Kim	Sunmo, Kang	Seungyun, Kim
090519	090519	090519

2011. 5. 17

MicroRF Co., Ltd.

TEL. 82-02-6406-5590

FAX. 82-02-6406-5591

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1. Revision History

Product	Dielectric Chip Antenna	Model	Bluetooth headset
		CODE NO.	ADSBTM1003-A03

Rev No.	Date	Name	Page	Item	Revision Issue
1.0	080519	M.S.Kim			Issued
2.0	110517	M.S.Kim			Revised

2. FEATURES AND APPLICATIONS

This ceramic chip antenna is applied to 2.4 GHz ISM band applications, i.e. wireless LAN, Bluetooth, Zigbee, etc..

3. CODE NO.

CODE NO. : ADSBTM1003-A03

CUSTOMER PART NO. :

4. ELECTRICAL SPECIFICATIONS

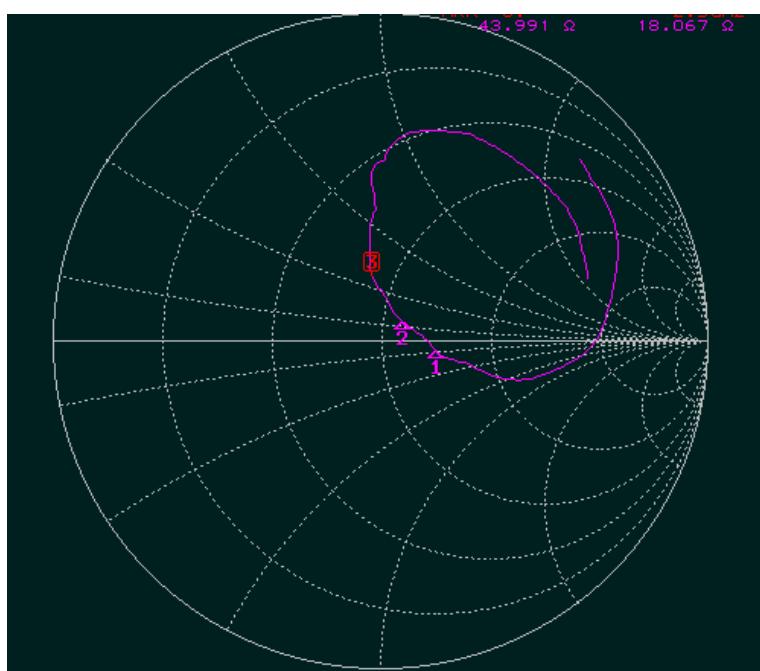
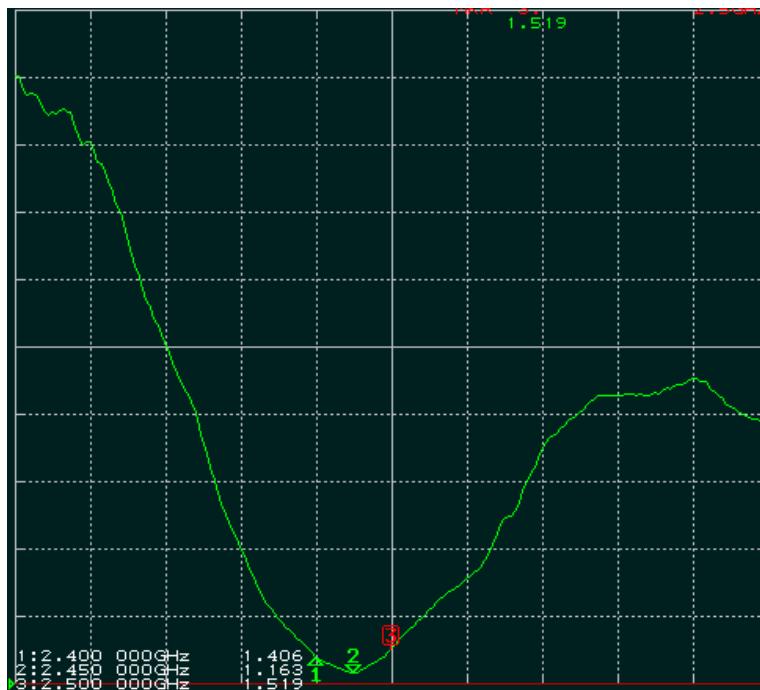
4-1.

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

* All items are measured at customer set condition.

No.	ITEM	Specification
1	Frequency	2400 ~ 2500 MHz
2	VSWR	2.0 max
3	Total Gain(Peak)	Gain : 2.840dBi max.
4	Impedance	50 Ω
5	Polarization	Linear

4-2 VSWR data (S11 of SET condition)

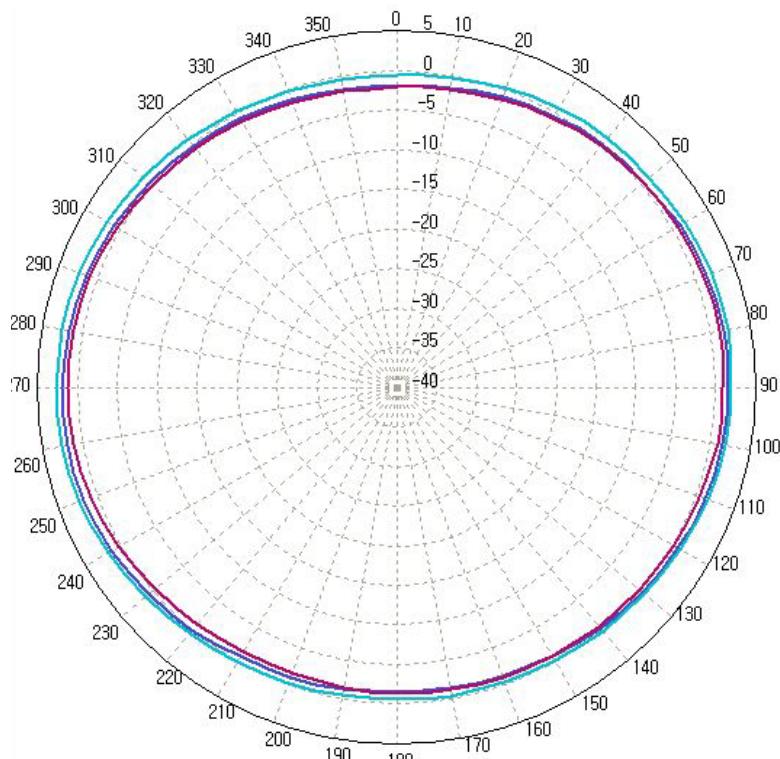


4-3 Radiation Patterns

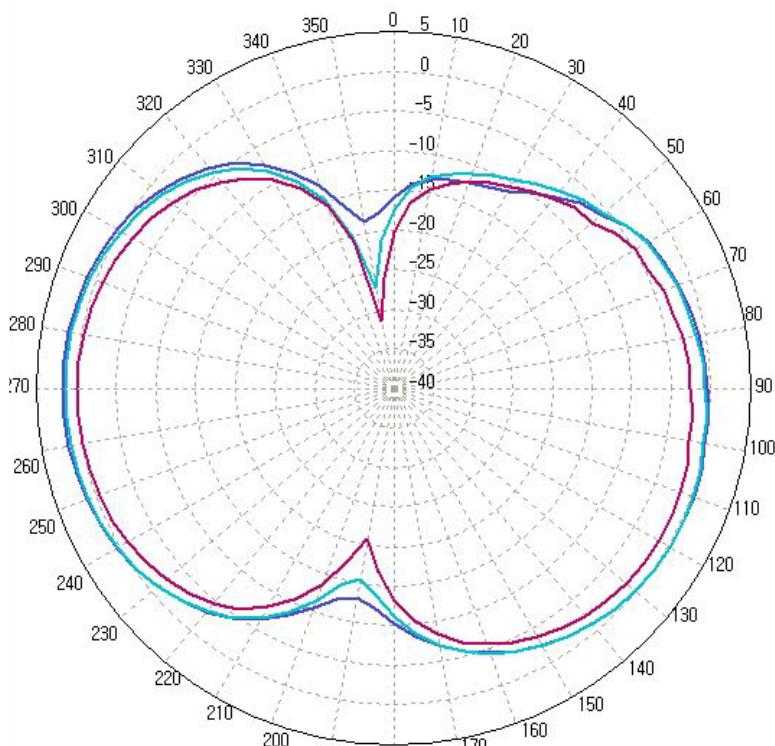
Peak Value(Beam Peak :dB)

	Azimuth Plane	Elevation 1	Elevation 2
2.4 GHz	2.195	1.981	1.882
2.45 GHz	2.840	1.674	2.000
2.5 GHz	1.504	0.159	1.023

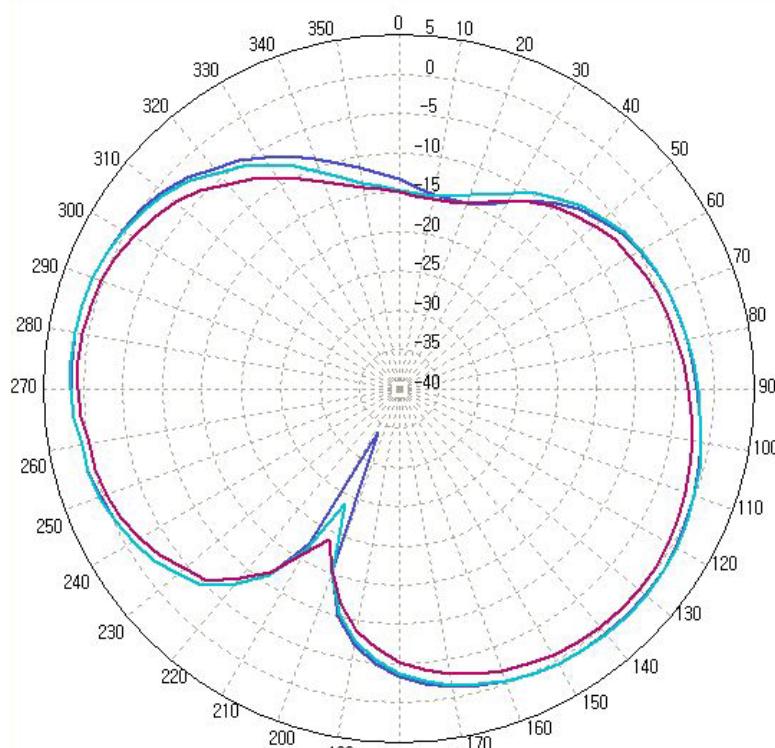
(a) Azimuth Plane (XY) – Horizontal Polarization



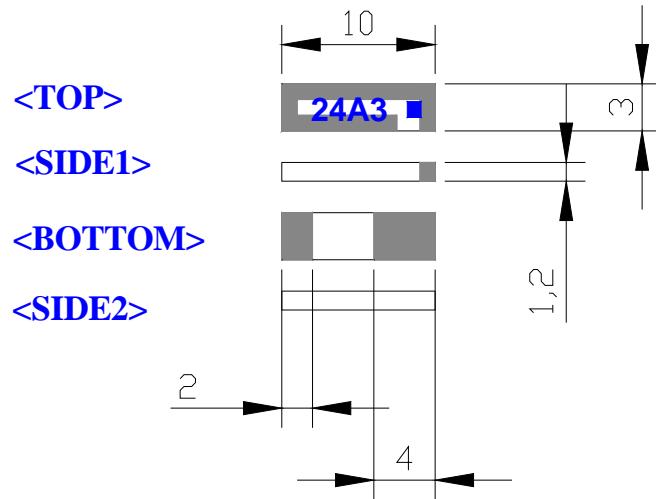
(b) Elevation1 Plane (ZX) – Vertical Polarization



(c) Elevation2 Plane (YZ) – Vertical Polarization



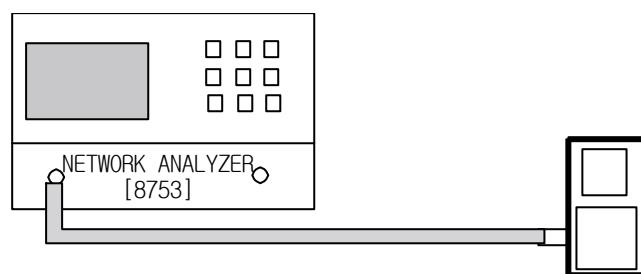
5. MECHANICAL DIMENSIONS



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.

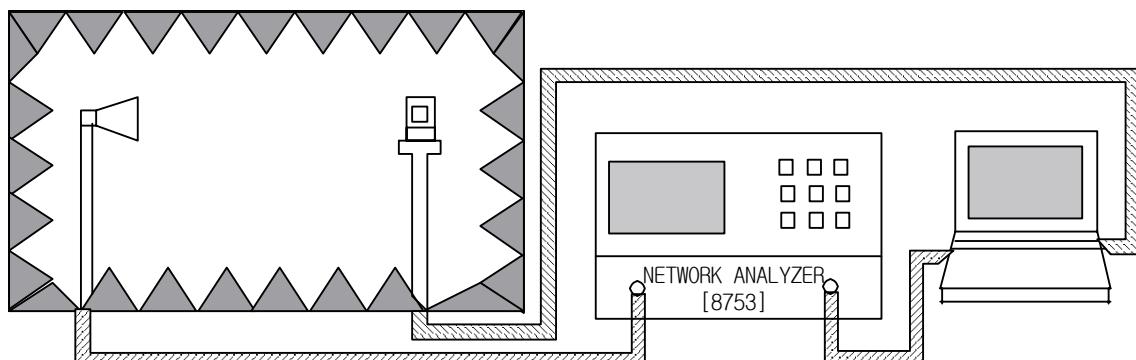
6-1. The measurement of Frequency and VSWR



<Measurement Method>

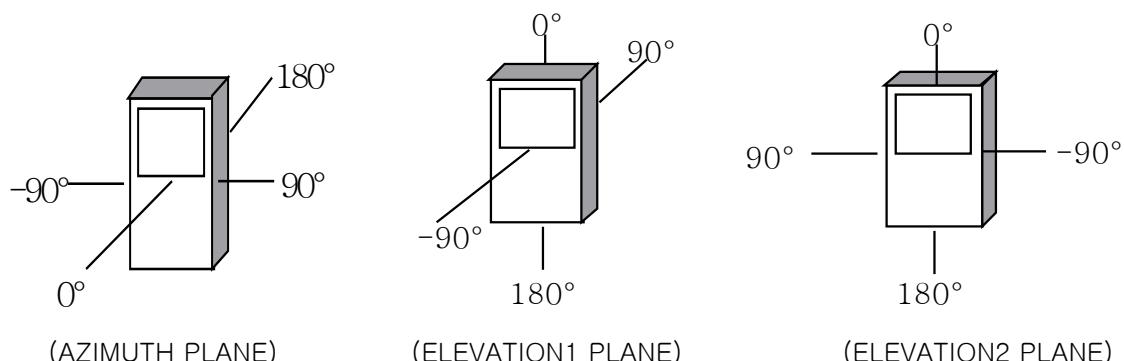
- 1) As seen the above, network analyzer is set up for S11 measurement.
- 2) The measurement frequency range is to set up from 2 GHz to 3 GHz.
- 3) Perform S11 one port full calibration.
- 4) Measure the VSWR of three points of Bluetooth frequency range such as 2400 MHz, 2450 MHz, and 2500 MHz.

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.



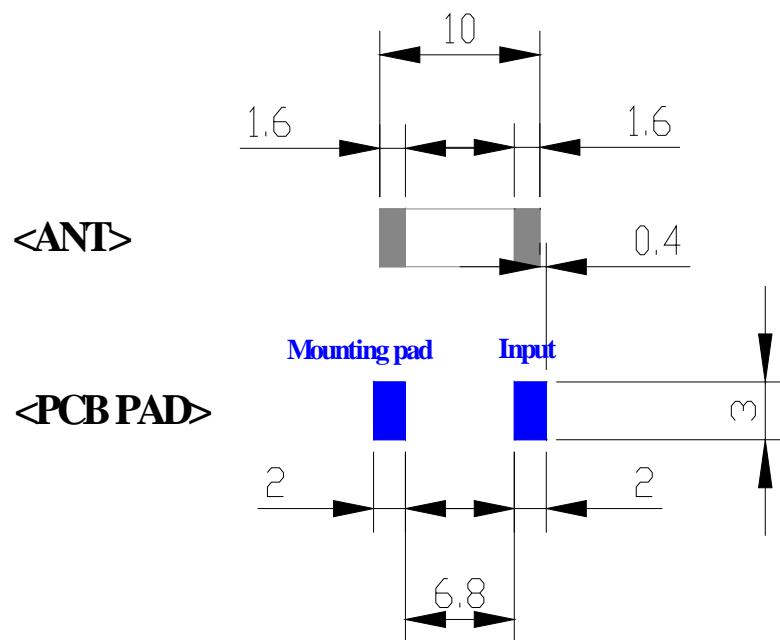
7. ENVIRONMENTAL SPECIFICATIONS

No.	Items	Specifications
1	Material	Pb-free system
2	Operating Temperature Range	-30 ~ +85 °C
3	Operating Humidity Range	45 ~ 85 % RH

8. ENVIRONMENTAL TESTS

No.	Item	Test Conditions
1	High Temperature Storage	Leave for 72 ± 2 hours in a test bath retaining $85\pm2^\circ\text{C}$. 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 $-30\pm2^\circ\text{C}$. After then, leave on the test condition for 1.5 hours.
3	Static Humidity	Leave for 24 ± 2 hours in a test bath retaining $90\sim95\%$ RH / $50\pm3^\circ\text{C}$. After then, leave in the test condition for 1.5 hours.
4	Thermal Shock	Cool from 25°C down to $-30\pm2^\circ\text{C}$ and leave for 30 minutes. After that, heat up to $+85\pm2^\circ\text{C}$ 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	$230\pm5^\circ\text{C}$ / 5 ± 1 sec for Sn/Pb soldering system $245\pm5^\circ\text{C}$ / 2 ± 1 sec for Pb-free soldering system

9. RECOMMENDED SOLDERING PATTERNS



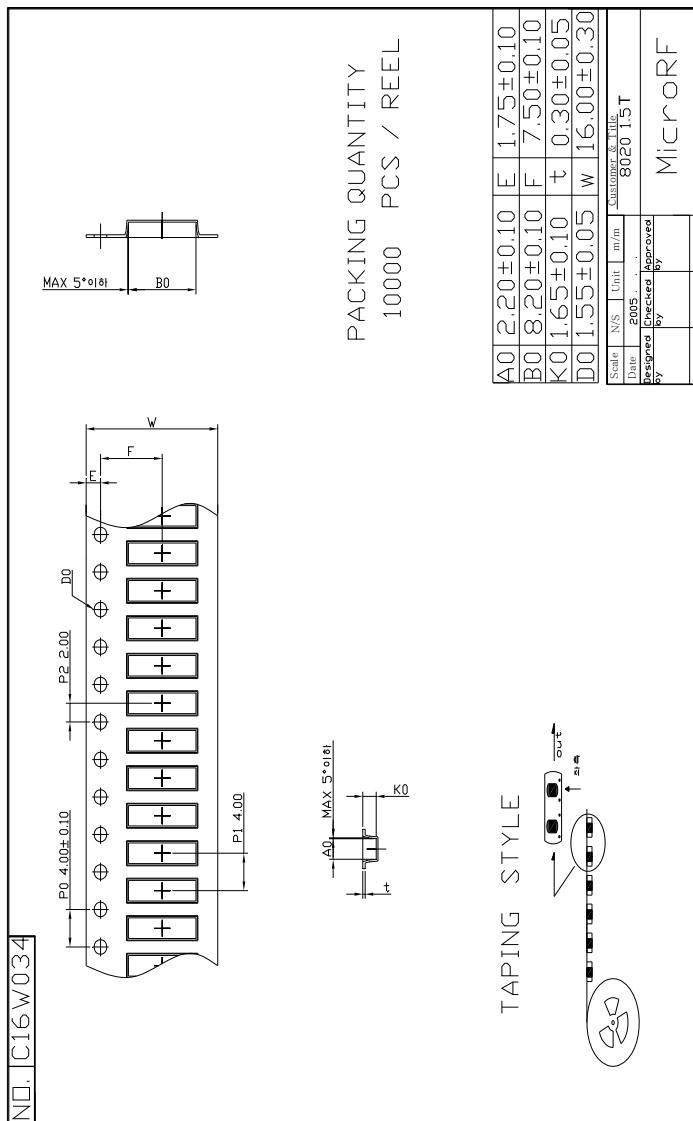
10. PACKAGING

10-1. Reel Taping Quantity

10,000 pcs / 1 reel

10-2. Reel Dimensions

: Reel Hall Direction should be same as Input Dot Direction of Antenna.



11. USAGE AND CAUTIONS

– Safe-keeping conditions: 3 months in $20 \pm 15^\circ\text{C}$ and less than 60% RH

Report No. : RoHS-07-08356



Page 1 of 3

Testing Report

Client : MICRO RF CO.,LTD.

Name : KIM SEUNG YUN

Address : #709, Business Incubating Center, Suwon University, Bongdam-eup, Hwaseong-si, Gyeonggi-do, KOREA

Tel. : +82-31- 226-6845 Fax : +82-31- 220-2699

Name of Product : Bluetooth Chip Antenna

Model / Ref. No : ADSBTXXXXX-XXX

Remark : The above set of complex sample (Bluetooth Chip Antenna) is completely ground and mixed up by a request of client.
This analytical report is only based on the completely ground and mixed complex sample, not homogeneous one.

Date of Application : 10 August, 2007

Test Period : 4 days

Date of Issue : 16 August, 2007

Test Result : For further details, please refer to the following page.

Tested by : Nayeon Lee

Approved by : Bongjin Jung (Technical Director, Ph.D./Prof.)

San2-2, Wau-ri, Bongdam-eup
Hwaseong-si, Gyeonggi-do
445-743, Korea
www.cleantech.re.kr
Tel. : +82-31-220-2620
Fax : +82-31-220-2621

Certificated by



Signed by Director of CECT

Chan-Kyo, Chung

Center for Environmental & Clean Technologies
The University of Suwon

Report No. : RoHS-07-08356

1. Testing Condition(Lab.) : 22±2°C, 55% R.H below
2. Testing Specification : Heavy Metals & Flame Retardants
3. Testing Result

1) Heavy Metals

Test Item	Test Method	Unit	MDL	Analytical Instrument	Result
Pb	KS M 1061 : 2007	mg/kg	5	ICP-AES	N.D.
Cd	KS M 1061 : 2007	mg/kg	0.5	ICP-AES	N.D.
Hg	KS M 1061 : 2007	mg/kg	2	ICP-AES	N.D.
Cr ⁶⁺	KS M 1061 : 2007	mg/kg	1	UV-VIS	N.D.

Note> 1. N.D. : Not Detected 2. MDL : Method Detection Limit 3. mg/kg = ppm

2) Flame Retardants

Test Item	Test Method	Unit	MDL	Analytical Instrument	Result
Total PBBs	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Mono-BB	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Di-BB	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Tri-BB	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Tetra-BB	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Penta-BB	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Hexa-BB	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Hepta-BB	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Octa-BB	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Nona-BB	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Deca-BB	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.

Test Item	Test Method	Unit	MDL	Analytical Instrument	Result
Total PBDEs	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Mono-BDE	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Di-BDE	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Tri-BDE	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Tetra-BDE	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Penta-BDE	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Hexa-BDE	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Hepta-BDE	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Octa-BDE	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Nona-BDE	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.
Deca-BDE	KS M 1061 : 2007	mg/kg	5	GC/MS	N.D.

1. PBBs : Polybrominated biphenyls, PBDEs : Polybrominated diphenyl ethers

1. The above results are for the samples that the client has offered, and all sample names are obtained from the client.
2. Analysis results are effective limited to the above samples, and they are not allowed to be corrected or reissued without the approval of the Director of Center for Environmental & Clean Technologies, The University of Suwon.

Center for Environmental & Clean Technologies
The University of Suwon

Report No. : RoHS-07-08356

Received Sample



Name of Product : Bluetooth Chip Antenna

Model / Ref. No : ADSBTXXXX-XXX

Remark : The above set of complex sample (Bluetooth Chip Antenna) is completely ground and mixed up by a request of client. This analytical report is only based on the completely ground and mixed complex sample, not homogeneous one.

Center for Environmental & Clean Technologies
The University of Suwon