





Date :2012. 11. 15

# SPECIFICATION

<b>Product Name</b>	<b>Antenna</b>
<b>Customer</b>	<b>Samsin innotec</b>
<b>Model Name</b>	<b>Iriver-on antenna</b>
<b>Customer Code.</b>	
<b>Provider</b>	<b>RadiAnt</b>
<b>Part Code.</b>	<b>RKA1233-0000AA</b>

	Submitted	Checked		Approved
<b>Buyer</b>				
<b>RadiAnt</b>	Submitted	Checked	Checked	Approved
				

## – Table of Contents –

1. Product History	3
2. Electrical Feature	4
2.1 Frequency Band	
2.2 Impedance	
2.3 VSWR	
2.4 Directivity	
2.5 Maximum Power	
3. Environment Test	6
4. Electric Performance Data	8
5. Drawing	10
6. Certification of RoHS	11

## 1. Product History

LIST					
NO	Data	Front	After	Change	REV
1	2012.11.15			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	2.4GHz~2.485GHz

### 2.2 Impedance

#### 2.2.1 Input Impedance

-  $R = 50\Omega$

#### 2.2.2 Measuring Method

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

### 2.3 VSWR

Impedance Matching optimization is performed under the below mentioned environment.

#### 2.3.1 Free Space Environment

BAND	Bluetooth			
FREQ	2.4GHz	2.425GHz	2.45GHz	2.485GHz
VSWR	2.0:1	2.0:1	2.0:1	2.0:1

### 2.3.2 Measuring Method

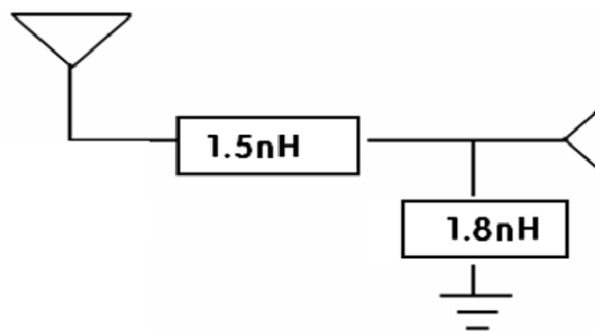
Connect (soldering) 50Ω semi-rigid coaxial cable to the 50Ω spot in Set Bluetooth terminal. To minimize the loss of transmission, semi-rigid coaxial cable is used. Including PCB, the Set Bluetooth terminal shouldn't be different from the one, which will be used for mass production.

Specification should be the same for all frequency bands. Free Space means that

Set Bluetooth terminal is put on the surface of no conducting plastic.

### 2.3.3 Matching circuit

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



<Figure 2.3.1 Matching circuit>

## 2.4 Directivity

### Directional (Horizontal)

BAND		2.4GHz	2.425GHz	2.45GHz	2.485GHz
GAIN	AVG	-3.90dBi	-4.12dBi	-3.68dBi	-4.12dBi
	Peak	1.43dBi	1.23dBi	1.27dBi	0.81dBi

## 2.5 Maximum Power

- P=2W Under

## 3. Environment Test

### 3.1 Operating Temperature Test

#### 3.1.1 Test Condition

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

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  $-30^{\circ}\text{C}$  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 =  $-40^{\circ}\text{C}$
- 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  $-40^{\circ}\text{C}$  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.

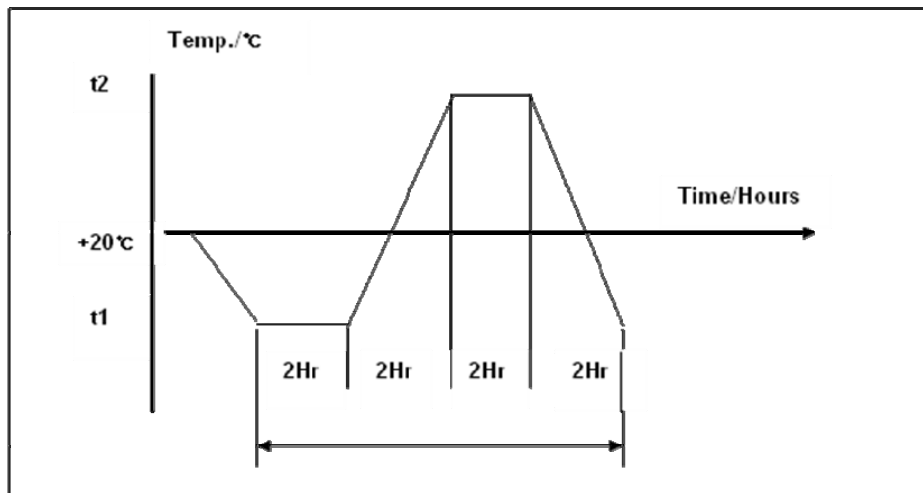


Figure 3.2.1 Temperature Cycling

## 3.3 Corrosion Resistance Test

### 3.3.1 Test Condition

- NaCl = 90%
- Water Temperature =  $60^{\circ}\text{C}$
- Duration Time = 96 hours

### 3.3.2 Requirements

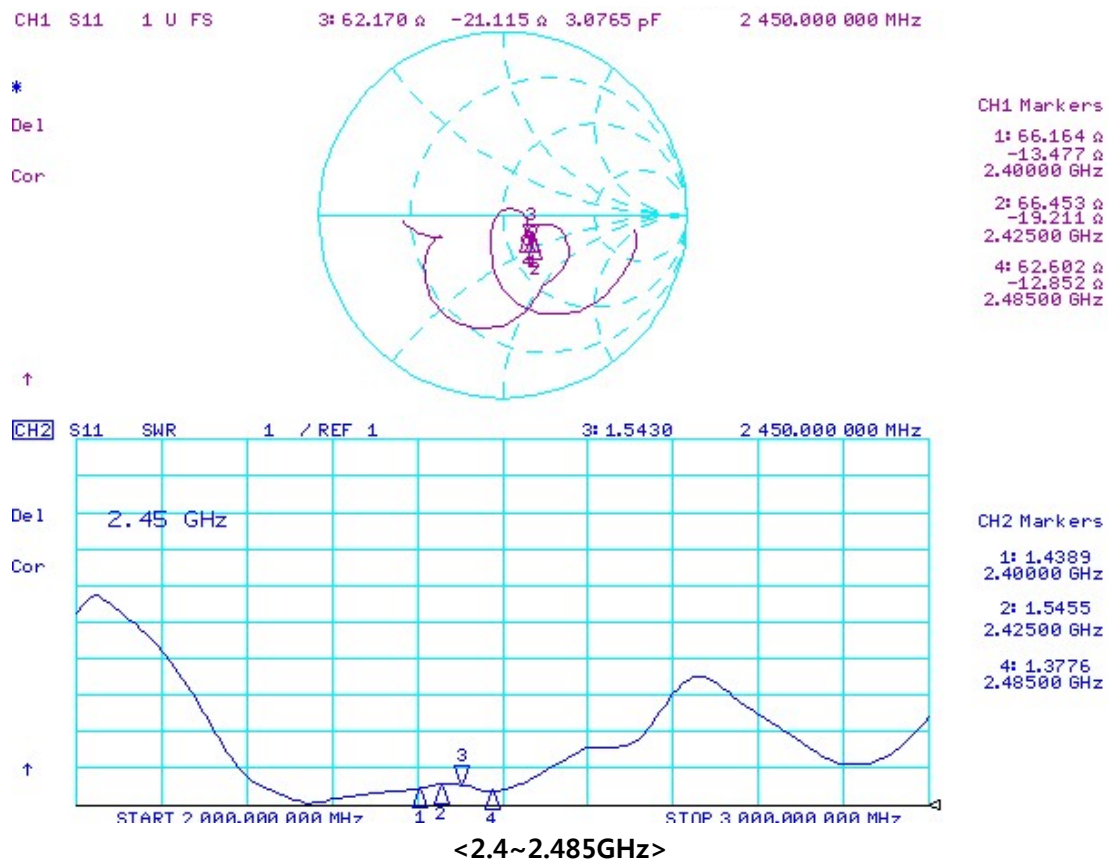
After the test, the antenna must not have an outer damage, and also it must pass requirement shown in 2.4.

### 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

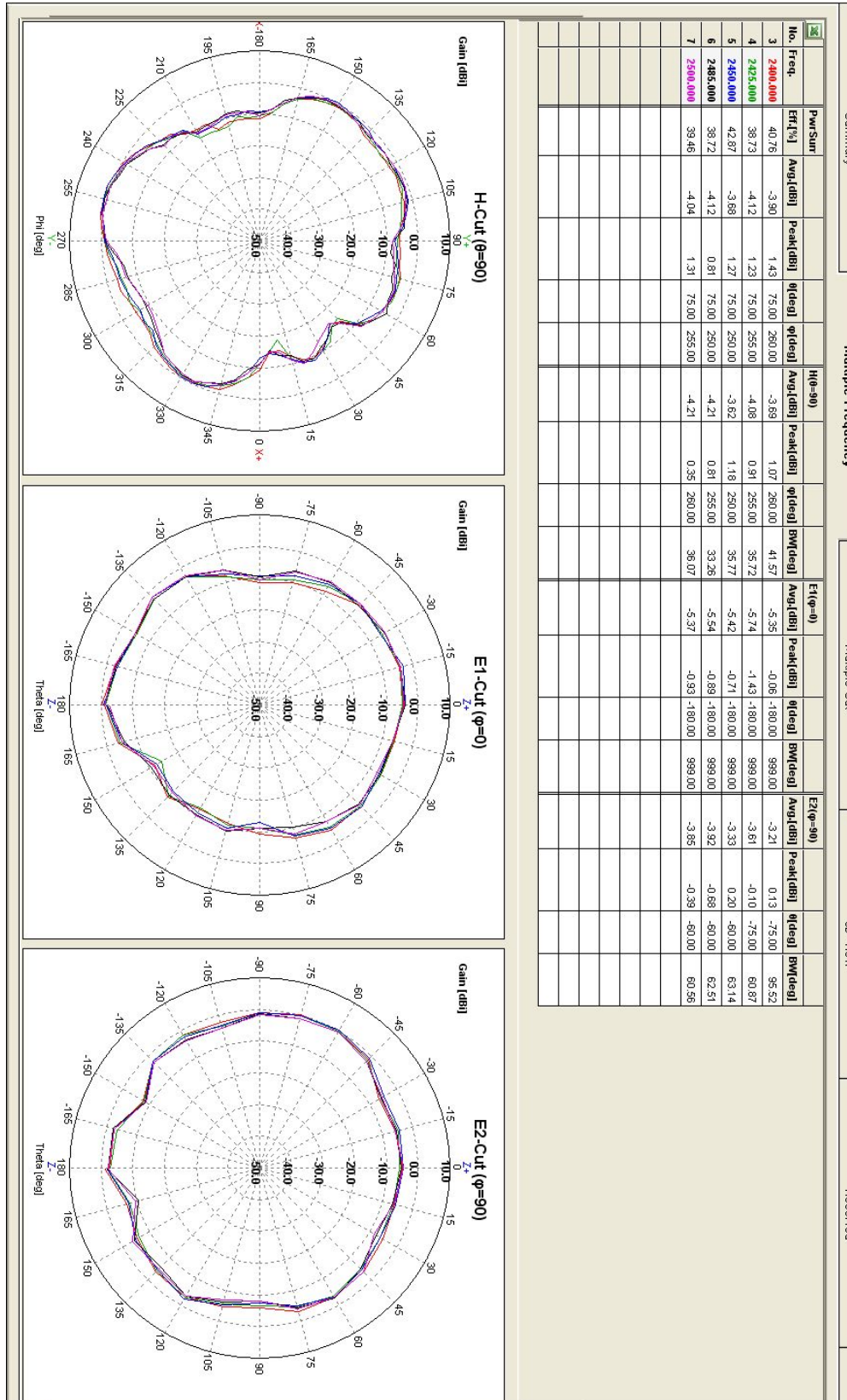
### 4.1. Smith Chart & VSWR





## 4.2. GAIN DATA

### 4.2. 3D-Gain Data (2.4~2.485GHz)



## RadiAnt






**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 cm<sup>2</sup> sample surface area.

This document is issued by the Company subject to the General Conditions of Service printed on back, available on request or accessible at [www.sgs.com](http://www.sgs.com), and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgs.com](http://www.sgs.com). The Company does not accept any liability for the use of this document in any way other than for the purpose of the test or analysis for which it was issued. The Company does not accept any liability for the use of this document in any way other than for the purpose of the test or analysis for which it was issued. The Company does not accept any liability for the use of this document in any way other than for the purpose of the test or analysis for which it was issued.

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.co.kr> [www.kr.sgs.com](http://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.

Picture of Sample as Received:



NOTE: (1) N.D. = Not detected.( $<MDL$ )

(2)  $\text{mg/kg} = \text{ppm}$

(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 cm<sup>2</sup> sample surface area.

[illegible]

3GB Korea Co., Ltd.

322, The O valley, 555-9, 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.sqa.co.kr> [www.kz.sqa.com/journal](http://www.kz.sqa.com/journal)

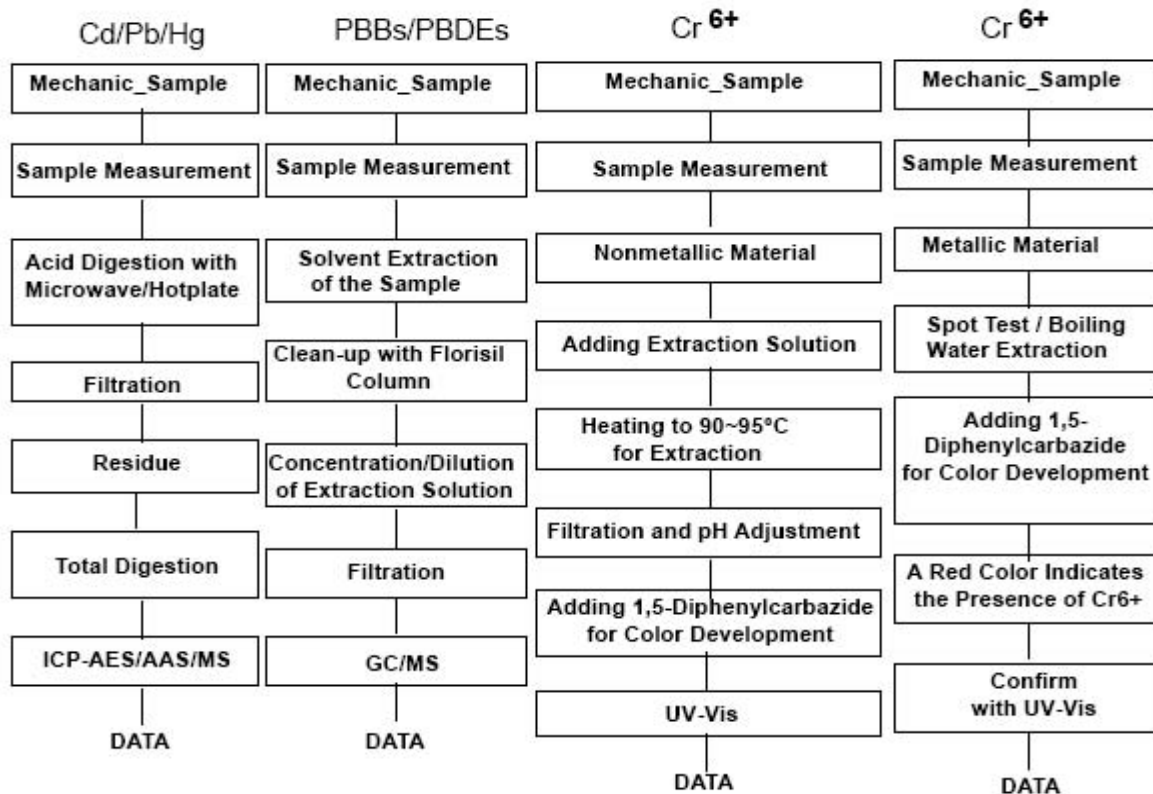
Member of the SGS Group (Société Générale de Surveillance)

FO52 Version4




**Test Report No. F690101/LF-CTSAYAA12-08483**

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

**Testing Flow Chart for RoHS:Cd/Pb/Hg/Cr<sup>6+</sup> /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 back, available on request or accessible at [www.sgs.com](http://www.sgs.com), and, subject to the said, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgs.com/conditions](http://www.sgs.com/conditions). The Company is not responsible for the content of this document and does not accept liability for a transaction arising out of this document. The document is not to be reproduced or used in any way without the prior written approval of the Company. Any such reproduction, copying or distribution without the prior written approval of the Company is prohibited. The results of the analysis are valid only for the samples tested and such samples are retained for 100 days only.

SGS Korea Co.,Ltd.

 322, The O valley, 555-0, Hogeil-dong, Dongan-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](http://www.kr.sgs.com/greenlab)

F052 Version4

Member of the SGS Group (Société Générale de Surveillance)

## 6-2. 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 :

<b>SGS File No.</b>	: AYAA12-11059
<b>Product Name</b>	: Electroless Ni Plating Agent
<b>Item No./Part No.</b>	: N/A
<b>Received Date</b>	: 2012. 03. 15
<b>Test Period</b>	: 2012. 03. 16 to 2012. 03. 20
<b>Test Results</b>	: For further details, please refer to following page(s)
<b>Test Performed</b>	: 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 the General Conditions of Service printed hereon, available on request or accessible at [www.sgs.com](http://www.sgs.com), and, in addition, to the specific conditions, subject to Terms and Conditions for Binding Documents of [www.sgs.com](http://www.sgs.com), submitted by Applicant in order to the initiation of analysis, identification and/or certification. Any holder of this document is advised that it is not to be used for any purpose other than the one for which it was issued. The Company's liability is limited to the extent of the information provided in this document. This document cannot be reproduced except in full without 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. (Except otherwise stated the results shown in this test report refer only to the sample(s) tested and each sample(s) are retained for 100 days only.)

F052 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 4808 000 f +82 (0)31 4808 050 <http://www.sgslab.co.kr> [www.ky.sgs.com/sgslab](http://www.ky.sgs.com/sgslab)

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 on the back of the report and is available on request or accessible at [www.sgs.com](http://www.sgs.com) and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgs.com/electronicdocuments](http://www.sgs.com/electronicdocuments).  
 Approval is given to the holder of the document to reproduce the document in whole or in part for internal use only and under the condition of confidentiality. Any other reproduction or use of the document is prohibited. The document is the property of the Company and its use is limited to the purpose for which it was issued. The document cannot be reproduced except in full without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is illegal and offenders may be prosecuted to the fullest extent of the law.  
 Unless otherwise stated the results shown in this test report shall only be the property (and such property) are retained for 100 days only.

F052 Version4

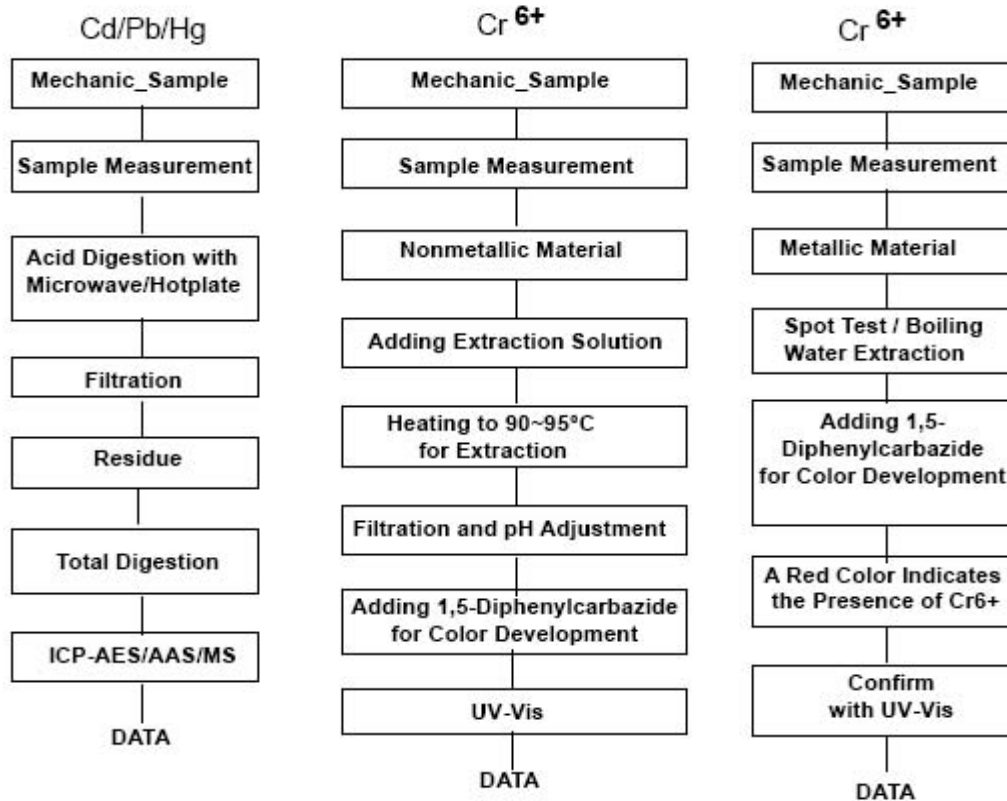
SGS Korea Co.,Ltd. 322 The O valley, 555-9, Hoge-dong, Dongen-gu, Anyang-si, Gyeonggi-do, Korea 431-080  
 t +82 (0)31 4905 000 f +82 (0)31 4905 050 <http://www.sgslab.co.kr> [www.kr.sgs.com/sgslab](http://www.kr.sgs.com/sgslab)  
 Member of the SGS Group (Société Générale de Surveillance)





- 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 cm<sup>2</sup> sample surface area.

This document is issued by the Company subject to the Conditions of Service printed on the back of this report, available on request or accessible at [www.sgslab.co.kr](http://www.sgslab.co.kr) and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgslab.co.kr](http://www.sgslab.co.kr).  
 Reproduction or distribution of this document is prohibited without the written consent of the Company. The Company's liability is limited to the scope of the service provided and is not intended to be a basis for any other claim. The Company's liability is limited to the scope of the service provided and is not intended to be a basis for any other claim.

**Testing Flow Chart for RoHS:Cd/Pb/Hg/Cr<sup>6+</sup> 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 on the back, available on request or accessible at [www.sgslab.co.kr](http://www.sgslab.co.kr) and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgslab.co.kr](http://www.sgslab.co.kr). The Company's sole responsibility is to do its best and this document does not constitute a warranty or a guarantee. All rights and obligations are under the trademark of the Company. This document cannot be reproduced or used in any other manner without the written approval of the Company. Any violation will be subject to legal action.

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

```

graph TD
    A[Sample screening using XRF.] --> B[Liquid containing water(>80%)?]
    B -- Yes --> D[Dilute the solution (EPA300)]
    B -- No --> C[Weigh the samples into the combustion boat.]
    C --> E[Add absorption solution into the bomb or tube.]
    E --> F[Admit O2 gas or O2 +Ar2 gas and start the combustion.]
    F --> G[Allow during absorption of the burnt gas.]
    G --> H[Analyze absorbed solution using Ion Chromatography.]
    H --> I[Data]
    D --> I
    I --> J[*** 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 cm<sup>2</sup> sample surface area.

This document is created by the Company solely for the personal use of the individual named on the printed version, available in printed or accessible form at [www.irs.gov/efile/efilehelp/efilehelp.htm](http://www.irs.gov/efile/efilehelp/efilehelp.htm), for electronic format documents, subject to Terms and Conditions for Electronic Return Submission at [www.irs.gov/efile/efilehelp/efilehelp.htm](http://www.irs.gov/efile/efilehelp/efilehelp.htm). Attention is drawn to the federal copyright, information and jurisdiction issues stated below. Any other use of this document is prohibited. This document is not to be distributed, reproduced, stored, transmitted, or otherwise used in any manner by the Company's business or by the sole or common ownership of any of the Company's employees, agents, or independent contractors. The Company's responsibility is to the Client and this document does not constitute part of a transaction that extinguishes all of the rights and obligations under the transaction described. This document cannot be reproduced except by the authorized person who has approved the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is strictly prohibited. All rights are reserved. The Company's liability and such warranty claims are limited for 90 days only.

8GB Korea Co., Ltd.

322, The O valley, 555-0, Hoggae-dong, Dongan-gu, Anyang-si, Gyeonggi-do, Korea 431-080  
t+82 (0)31 4608 000 f+82 (0)31 4608 050 <http://www.sgslab.co.kr> [www.kz.sgs.com/greenlab](http://www.kz.sgs.com/greenlab)

Member of the SGS Group (Société Générale de Surveillance)

F052 Version4