



# RADIO TEST REPORT

**Test Report No. : 32IE0158-HO-01-A**

**Applicant** : IBA Dosimetry GmBH  
**Type of Equipment** : Wireless 11abg Adapter  
**Model No.** : SX-10WAG-IT  
**FCC ID** : ZY5-SX10WAGIT  
**Test regulation** : FCC Part 15 Subpart C: 2012  
(Permissive Change Class II Application)  
\* Spurious Emission (Radiated) test only  
**Test Result** : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

**Date of test:** May 5 to July 11, 2012

**Representative test engineer:**

Katsunori Okai  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**

Takahiro Hatakeda  
Leader of WiSE Japan,  
UL Verification Service



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.  
\*As for the range of Accreditation in NVLAP, you may refer to the WEB address,  
<http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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## **SECTION 1: Customer information**

Company Name : IBA Dosimetry GmbH  
Address : Bahnhofstrasse 5, 90592 Schwarzenbruck, Germany  
Telephone Number : +49 9128 607 0  
Facsimile Number : +49 9128 607 10  
Contact Person : Uwe Mollenhauer

## **SECTION 2: Equipment under test (E.U.T.)**

### **2.1 Identification of E.U.T.**

Type of Equipment : Wireless 11abg Adapter  
Model No. : SX-10WAG-IT  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 3.3V  
Receipt Date of Sample : April 25, 2012  
Country of Mass-production : Japan  
Condition of EUT : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No Modification by the test lab

### **2.2 Product Description**

Model No: SX-10WAG-IT (referred to as the EUT in this report) is the Wireless 11abg Adapter.

Equipment Type : Transceiver  
Clock frequency : 33MHz, 40MHz  
Method of Frequency Generation : Crystal  
Operating voltage (inner) : DC3.3V +/-0.3V

	<b>IEEE802.11b</b>	<b>IEEE802.11g</b>
Frequency of operation	2412-2462MHz	2412-2462MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)
Channel spacing	5MHz	5MHz
ITU Code	G1D	D1D
Antenna type	1/4 Dipole	1/4 Dipole
Antenna Gain	1.81dBi	1.81dBi

#### **<Contents of the change from original model>**

Test Report Number of original model is 29EE0161-HO-01-A.

Specification was changed from the original model as follows:

IEEE802.11a is excluded from class II permissive change this time.

\*Only antenna of IEEE802.11b/g was changed.

Therefore only Spurious Emission (Radiated) test of 11b/g was performed in this report.

Additionally, only the information of modified antenna is described in this report.

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## SECTION 3: Test specification, procedures & results

### 3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2012, final revised on May 17, 2012 and effective June 18, 2012

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.247 Operation within the bands 902-928MHz,  
2400-2483.5MHz, and 5725-5850MHz

### 3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Spurious Emission Restricted Band Edges	FCC: "Guidance on Measurement of Digital Transmission Systems Operating under Section15.247"	FCC: Section15.247(d)	0.6dB 196.605MHz, Hori, QP	Complied	Radiated
	IC: RSS-Gen 4.9	IC: RSS-210 A8.5			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

\* In case any questions arise about test procedure, ANSI C63.4: 2003 is also referred.

#### **FCC 15.31 (e)**

The RF Module has own regulator.

The RF Module is constantly provided voltage (DC3.3V) through own regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

#### **FCC Part 15.203/212 Antenna requirement**

The EUT has a unique coupling/antenna connector (Reverse SMA). Therefore the equipment complies with the requirement of 15.203/212.

### 3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

### 3.4 Uncertainty

#### **EMI**

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test room (semi-anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.3dB	5.0dB	5.1dB	4.9dB	5.8dB	4.4dB	4.3dB
No.2	4.3dB	5.2dB	5.1dB	5.0dB	5.7dB	4.3dB	4.2dB
No.3	4.6dB	5.0dB	5.1dB	5.0dB	5.7dB	4.5dB	4.2dB
No.4	4.8dB	5.2dB	5.0dB	5.0dB	5.7dB	5.2dB	4.2dB

\*3m/1m/0.5m = Measurement distance

#### **Radiated emission test (3m)**

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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### 3.5 Test Location

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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

## **SECTION 4: Operation of E.U.T. during testing**

### **4.1 Operating Mode(s)**

Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing- Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11b (11b)	11Mbps, PN9
IEEE 802.11g (11g)	24Mbps, PN9
*Transmitting duty was 100% on all tests.	
*Power of the EUT was set by the software as follows; Power settings: Refer to the following table Software: ART-53 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

\*The details of Operating mode(s)

Test Item	Operating Mode	Used Antenna	Tested frequency
Spurious Emission	11b Tx 11g Tx	A	2412MHz 2437MHz 2462MHz

Power settings

	Setting value	
	IEEE 802.11b (11b)	IEEE 802.11g (11g)
2412MHz	15	12.5
2437MHz	15	13.5
2462MHz	15	12.5

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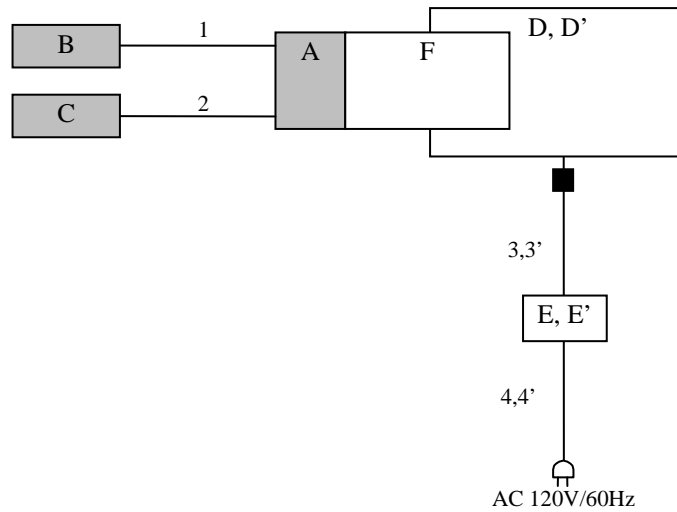
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## 4.2 Configuration and peripherals



■ : Standard Ferrite Core

\* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

### Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Wireless 11abg Adapter	SX-10WAG-IT	008092423703	silex technology, Inc.	EUT
B	Antenna	ANT-2.4-CW-RAH-SMA	001	Linx Technologies	EUT
C	Antenna	ANT-2.4-CW-RAH-SMA	002	Linx Technologies	EUT
D	Laptop PC	D40ES	NKD40ES05A01286	CLEVO	*1)
D'	Laptop PC	2373-L32	L3-NHT4A	IBM	*2)
E	AC Adaptor	LSE0202C2090	A30525126497	Li Shin International Enterprise Corporation	*1)
E'	AC Adaptor	08K8208	11S08K8208Z1Z9MA5686XR	IBM	*2)
F	Jig	-	-	silex technology, Inc.	-

### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	0.2	Shielded	Shielded	-
2	Antenna Cable	0.2	Shielded	Shielded	-
3	DC Cable	1.8	Unshielded	Unshielded	-
3'	DC Cable	1.8	Unshielded	Unshielded	-
4	AC Cable	1.8	Unshielded	Unshielded	-
4'	AC Cable	1.0	Unshielded	Unshielded	-

\*1) Used for the test above 1GHz

\*2) Used for the test below 1GHz

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## **SECTION 5: Radiated Spurious Emission**

### **Test Procedure**

It was measured based on "2. Radiated emission test" of "Guidance on Measurement of Digital Transmission Systems Operating under Section 15.247".

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

The height of the measuring antenna varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

### **Test Antennas are used as below;**

Frequency	30MHz to 300MHz	300MHz to 1GHz	Above 1GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

**20dBc was applied to the frequency over the limit of FCC 15.209 / Table 5 of RSS-Gen 7.2.5(IC) and outside the restricted band of FCC 15.205 / Table 3 of RSS-Gen 7.2.2 (IC).**

Frequency	Below 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer *1)		Spectrum Analyzer *1)
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 10Hz *2)	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz), 1m*3) (above 10GHz),		3m (below 10GHz), 1m*3) (above 10GHz)

\*1) The Spectrum Analyzer was used in 3dB resolution bandwidth.

\*2) The test was performed with VBW 10Hz since the EUT had no intervals during which the transmitter was off.

\*3) Distance Factor:  $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of Module and Antenna to see the position of maximum noise, and the test was made at the position that has the maximum noise.

The support equipments were arranged that module height was 80cm.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range	: 30M-26.5GHz
Test data	: APPENDIX
Test result	: Pass

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## APPENDIX 1: Data of EMI test

### Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. 32IE0158-HO  
Date 05/05/2012 05/06/2012  
Temperature/ Humidity 21 deg.C/ 51% RH 22 deg.C/ 48% RH  
Engineer Tomohisa Nakagawa Tomohisa Nakagawa  
(1-10GHz) (10-26.5GHz)  
Mode 11b Tx 2412MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2287.931	PK	45.4	27.6	2.1	32.3	42.8	73.9	31.1	
Hori	2390.000	PK	62.6	28.1	2.2	32.3	60.6	73.9	13.3	
Hori	2400.000	PK	74.4	28.1	2.2	32.3	72.4	-	-	See 20dBc Data Sheet
Hori	3216.000	PK	55.0	28.7	2.6	31.9	54.4	-	-	See 20dBc Data Sheet
Hori	4824.000	PK	48.8	31.2	3.8	31.5	52.3	73.9	21.6	
Hori	7236.000	PK	44.4	35.6	4.5	32.5	52.0	73.9	21.9	
Hori	9648.000	PK	44.6	38.3	5.3	32.9	55.3	-	-	See 20dBc Data Sheet
Hori	24120.000	PK	46.0	38.7	-1.8	32.1	50.8	73.9	23.1	
Hori	2287.931	AV	42.0	27.6	2.1	32.3	39.4	53.9	14.5	
Hori	2390.000	AV	35.3	28.1	2.2	32.3	33.3	53.9	20.6	
Hori	2400.000	AV	54.4	28.1	2.2	32.3	52.4	-	-	See 20dBc Data Sheet
Hori	3216.000	AV	53.4	28.7	2.6	31.9	52.8	-	-	See 20dBc Data Sheet
Hori	4824.000	AV	37.1	31.2	3.8	31.5	40.6	53.9	13.3	
Hori	7236.000	AV	31.6	35.6	4.5	32.5	39.2	53.9	14.7	
Hori	9648.000	AV	34.9	38.3	5.3	32.9	45.6	-	-	See 20dBc Data Sheet
Hori	24120.000	AV	34.1	38.7	-1.8	32.1	38.9	53.9	15.0	
Vert	2287.931	PK	47.5	27.6	2.1	32.3	44.9	73.9	29.0	
Vert	2390.000	PK	66.4	28.1	2.2	32.3	64.4	73.9	9.5	
Vert	2400.000	PK	77.4	28.1	2.2	32.3	75.4	-	-	See 20dBc Data Sheet
Vert	3216.000	PK	57.0	28.7	2.6	31.9	56.4	-	-	See 20dBc Data Sheet
Vert	4824.000	PK	56.2	31.2	3.8	31.5	59.7	73.9	14.2	
Vert	7236.000	PK	48.8	35.6	4.5	32.5	56.4	73.9	17.5	
Vert	9648.000	PK	47.5	38.3	5.3	32.9	58.2	-	-	See 20dBc Data Sheet
Vert	24120.000	PK	45.6	38.7	-1.8	32.1	50.4	73.9	23.5	
Vert	2287.931	AV	46.7	27.6	2.1	32.3	44.1	53.9	9.8	
Vert	2390.000	AV	38.5	28.1	2.2	32.3	36.5	53.9	17.4	
Vert	2400.000	AV	57.9	28.1	2.2	32.3	55.9	-	-	See 20dBc Data Sheet
Vert	3216.000	AV	55.6	28.7	2.6	31.9	55.0	-	-	See 20dBc Data Sheet
Vert	4824.000	AV	43.6	31.2	3.8	31.5	47.1	53.9	6.9	
Vert	7236.000	AV	38.2	35.6	4.5	32.5	45.8	53.9	8.1	
Vert	9648.000	AV	40.5	38.3	5.3	32.9	51.2	-	-	See 20dBc Data Sheet
Vert	24120.000	AV	34.0	38.7	-1.8	32.1	38.8	53.9	15.1	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

#### 20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	101.0	28.2	2.2	32.3	99.1	-	-	Carrier
Hori	2400.000	PK	57.8	28.1	2.2	32.3	55.8	79.1	23.3	
Hori	3216.000	PK	54.0	28.7	2.6	31.9	53.4	79.1	25.7	
Hori	9648.000	PK	39.6	38.3	5.3	32.9	50.3	79.1	28.8	
Vert	2412.000	PK	103.2	28.2	2.2	32.3	101.3	-	-	Carrier
Vert	2400.000	PK	77.4	28.1	2.2	32.3	75.4	81.3	5.9	
Vert	3216.000	PK	57.0	28.7	2.6	31.9	56.4	81.3	24.9	
Vert	9648.000	PK	47.5	38.3	5.3	32.9	58.2	81.3	23.1	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

## Radiated Spurious Emission

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. : 32IE0158-HO  
Date : 05/05/2012      05/06/2012  
Temperature/ Humidity : 21 deg.C/ 51% RH      22 deg.C/ 48% RH  
Engineer : Tomohisa Nakagawa      Tomohisa Nakagawa  
(1-10GHz)      (10-26.5GHz)  
Mode : 11b Tx 2437MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	3249.329	PK	55.3	28.8	2.6	31.9	54.8	-	-	See 20dBc Data Sheet
Hori	4874.000	PK	48.0	31.4	3.8	31.5	51.7	73.9	22.2	
Hori	7311.000	PK	44.5	35.7	4.5	32.5	52.2	73.9	21.7	
Hori	9748.000	PK	45.3	38.4	5.3	32.9	56.1	-	-	See 20dBc Data Sheet
Hori	24370.000	PK	45.3	38.6	-1.8	32.1	50.0	73.9	23.9	
Hori	3249.329	AV	53.5	28.8	2.6	31.9	53.0	-	-	See 20dBc Data Sheet
Hori	4874.000	AV	34.4	31.4	3.8	31.5	38.1	53.9	15.8	
Hori	7311.000	AV	31.9	35.7	4.5	32.5	39.6	53.9	14.3	
Hori	9748.000	AV	37.1	38.4	5.3	32.9	47.9	-	-	See 20dBc Data Sheet
Hori	24370.000	AV	33.8	38.6	-1.8	32.1	38.5	53.9	15.4	
Vert	3249.379	PK	57.4	28.8	2.6	31.9	56.9	-	-	See 20dBc Data Sheet
Vert	4874.000	PK	55.5	31.4	3.8	31.5	59.2	73.9	14.7	
Vert	7311.000	PK	48.4	35.7	4.5	32.5	56.1	73.9	17.8	
Vert	9748.000	PK	47.3	38.4	5.3	32.9	58.1	-	-	See 20dBc Data Sheet
Vert	24370.000	PK	46.1	38.6	-1.8	32.1	50.8	73.9	23.1	
Vert	3249.379	AV	56.1	28.8	2.6	31.9	55.6	-	-	See 20dBc Data Sheet
Vert	4874.000	AV	43.2	31.4	3.8	31.5	46.9	53.9	7.0	
Vert	7311.000	AV	37.2	35.7	4.5	32.5	44.9	53.9	9.0	
Vert	9748.000	AV	41.5	38.4	5.3	32.9	52.3	-	-	See 20dBc Data Sheet
Vert	24370.000	AV	33.7	38.6	-1.8	32.1	38.4	53.9	15.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

**20dBc Data Sheet**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2437.000	PK	102.5	28.3	2.2	32.2	100.8	-	-	Carrier
Hori	3249.329	PK	54.3	28.8	2.6	31.9	53.8	80.8	27.0	
Hori	9748.000	PK	41.1	38.4	5.3	32.9	51.9	80.8	28.9	
Vert	2437.000	PK	105.5	28.3	2.2	32.2	103.8	-	-	Carrier
Vert	3249.379	PK	56.6	28.8	2.6	31.9	56.1	83.8	27.7	
Vert	9748.000	PK	44.5	38.4	5.3	32.9	55.3	83.8	28.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

## Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. 32IE0158-HO  
Date 05/05/2012 05/06/2012  
Temperature/ Humidity 21 deg.C/ 51% RH 22 deg.C/ 48% RH  
Engineer Tomohisa Nakagawa Tomohisa Nakagawa  
(1-10GHz) (10-26.5GHz)  
Mode 11b Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	60.5	28.5	2.2	32.2	59.0	73.9	14.9	See 20dBc Data Sheet
Hori	3282.654	PK	53.8	28.8	2.6	31.9	53.3	-	-	
Hori	4924.000	PK	47.3	31.5	3.8	31.5	51.1	73.9	22.8	
Hori	7386.000	PK	43.1	35.8	4.5	32.6	50.8	73.9	23.1	
Hori	9848.000	PK	42.6	38.5	5.4	33.0	53.5	73.9	20.4	
Hori	24620.000	PK	47.5	38.6	-1.7	32.2	52.2	73.9	21.7	
Hori	2483.500	AV	38.4	28.5	2.2	32.2	36.9	53.9	17.0	See 20dBc Data Sheet
Hori	3282.654	AV	52.6	28.8	2.6	31.9	52.1	-	-	
Hori	4924.000	AV	37.1	31.5	3.8	31.5	40.9	53.9	13.0	
Hori	7386.000	AV	31.3	35.8	4.5	32.6	39.0	53.9	14.9	
Hori	9848.000	AV	30.8	38.5	5.4	33.0	41.7	53.9	12.2	
Hori	24620.000	AV	34.3	38.6	-1.7	32.2	39.0	53.9	14.9	
Vert	2483.500	PK	62.7	28.5	2.2	32.2	61.2	73.9	12.8	See 20dBc Data Sheet
Vert	3282.667	PK	54.8	28.8	2.6	31.9	54.3	-	-	
Vert	4924.000	PK	55.0	31.5	3.8	31.5	58.8	73.9	15.1	
Vert	7386.000	PK	47.3	35.8	4.5	32.6	55.0	73.9	18.9	
Vert	9848.000	PK	43.0	38.5	5.4	33.0	53.9	73.9	20.0	
Vert	24620.000	PK	45.9	38.6	-1.7	32.2	50.6	73.9	23.3	
Vert	2483.500	AV	40.4	28.5	2.2	32.2	38.9	53.9	15.0	See 20dBc Data Sheet
Vert	3282.667	AV	53.5	28.8	2.6	31.9	53.0	-	-	
Vert	4924.000	AV	40.9	31.5	3.8	31.5	44.7	53.9	9.3	
Vert	7386.000	AV	34.8	35.8	4.5	32.6	42.5	53.9	11.4	
Vert	9848.000	AV	30.1	38.5	5.4	33.0	41.0	53.9	12.9	
Vert	24620.000	AV	34.3	38.6	-1.7	32.2	39.0	53.9	14.9	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

**20dBc Data Sheet**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2462.000	PK	103.2	28.4	2.2	32.2	101.6	-	-	Carrier
Hori	3282.654	PK	53.3	28.8	2.6	31.9	52.8	81.6	28.8	
Vert	2462.000	PK	104.3	28.4	2.2	32.2	102.7	-	-	Carrier
Vert	3282.667	PK	54.0	28.8	2.6	31.9	53.5	82.7	29.2	

## Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. 32IE0158-HO  
Date 05/05/2012 05/06/2012  
Temperature/ Humidity 21 deg.C/ 51% RH 22 deg.C/ 48% RH  
Engineer Tomohisa Nakagawa Tomohisa Nakagawa  
(1-10GHz) (10-26.5GHz)  
Mode 11g Tx 2412MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2287.930	PK	60.1	27.6	2.1	32.3	57.5	73.9	16.4	
Hori	2390.000	PK	66.1	28.1	2.2	32.3	64.1	73.9	9.8	
Hori	2400.000	PK	87.4	28.1	2.2	32.3	85.4	-	-	See 20dBc Data Sheet
Hori	3216.000	PK	54.9	28.7	2.6	31.9	54.3	-	-	See 20dBc Data Sheet
Hori	4824.000	PK	42.7	31.2	3.8	31.5	46.2	73.9	27.7	
Hori	7236.000	PK	42.3	35.6	4.5	32.5	49.9	73.9	24.0	
Hori	9648.000	PK	42.6	38.3	5.3	32.9	53.3	73.9	20.6	
Hori	24120.000	PK	46.4	38.7	-1.8	32.1	51.2	73.9	22.7	
Hori	2287.930	AV	50.4	27.6	2.1	32.3	47.8	53.9	6.1	
Hori	2390.000	AV	48.8	28.1	2.2	32.3	46.8	53.9	7.1	
Hori	2400.000	AV	66.3	28.1	2.2	32.3	64.3	-	-	See 20dBc Data Sheet
Hori	3216.000	AV	53.1	28.7	2.6	31.9	52.5	-	-	See 20dBc Data Sheet
Hori	4824.000	AV	29.8	31.2	3.8	31.5	33.3	53.9	20.6	
Hori	7236.000	AV	30.4	35.6	4.5	32.5	38.0	53.9	15.9	
Hori	9648.000	AV	30.3	38.3	5.3	32.9	41.0	53.9	12.9	
Hori	24120.000	AV	33.7	38.7	-1.8	32.1	38.5	53.9	15.4	
Vert	2287.931	PK	60.0	27.6	2.1	32.3	57.4	73.9	16.5	
Vert	2390.000	PK	64.2	28.1	2.2	32.3	62.2	73.9	11.7	
Vert	2400.000	PK	85.2	28.1	2.2	32.3	83.2	-	-	See 20dBc Data Sheet
Vert	3222.000	PK	57.5	28.8	2.6	31.9	57.0	-	-	See 20dBc Data Sheet
Vert	4824.000	PK	53.2	31.2	3.8	31.5	56.7	73.9	17.2	
Vert	7236.000	PK	52.1	35.6	4.5	32.5	59.7	73.9	14.2	
Vert	9648.000	PK	43.4	38.3	5.3	32.9	54.1	73.9	19.8	
Vert	24120.000	PK	46.5	38.7	-1.8	32.1	51.3	73.9	22.6	
Vert	2287.931	AV	49.9	27.6	2.1	32.3	47.3	53.9	6.6	
Vert	2390.000	AV	46.9	28.1	2.2	32.3	44.9	53.9	9.0	
Vert	2400.000	AV	64.3	28.1	2.2	32.3	62.3	-	-	See 20dBc Data Sheet
Vert	3222.000	AV	56.3	28.8	2.6	31.9	55.8	-	-	See 20dBc Data Sheet
Vert	4824.000	AV	39.7	31.2	3.8	31.5	43.2	53.9	10.7	
Vert	7236.000	AV	36.4	35.6	4.5	32.5	44.0	53.9	9.9	
Vert	9648.000	AV	30.9	38.3	5.3	32.9	41.6	53.9	12.3	
Vert	24120.000	AV	33.7	38.7	-1.8	32.1	38.5	53.9	15.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

### 20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	102.2	28.2	2.2	32.3	100.3	-	-	Carrier
Hori	2400.000	PK	71.8	28.1	2.2	32.3	69.8	80.3	10.5	
Hori	3216.000	PK	53.5	28.7	2.6	31.9	52.9	80.3	27.4	
Vert	2412.000	PK	100.9	28.2	2.2	32.3	99.0	-	-	Carrier
Vert	2400.000	PK	60.7	28.1	2.2	32.3	58.7	79.0	20.3	
Vert	3222.000	PK	56.7	28.8	2.6	31.9	56.2	79.0	22.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

## Radiated Spurious Emission

Test place Head Office EMC Lab. No.3 and No.4 Semi Anechoic Chamber  
Report No. 32IE0158-HO  
Date 05/05/2012 05/06/2012 07/11/2012  
Temperature/ Humidity 21 deg.C/ 51% RH 22 deg.C/ 48% RH 23 deg.C/ 57% RH  
Engineer Tomohisa Nakagawa Tomohisa Nakagawa Katsunori Okai  
(1-10GHz) (10-26.5GHz) (30-1000MHz)  
Mode 11g Tx 2437MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	64.525	QP	37.1	7.4	7.7	32.2	20.0	40.0	20.0	
Hori	87.604	QP	41.0	8.0	8.0	32.2	24.8	40.0	15.2	
Hori	196.605	QP	49.2	16.8	9.1	32.2	42.9	43.5	0.6	
Hori	232.041	QP	46.2	17.2	9.4	32.2	40.6	46.0	5.4	
Hori	364.505	QP	46.2	16.6	10.4	32.1	41.1	46.0	4.9	
Hori	458.444	QP	43.5	18.1	11.0	32.0	40.6	46.0	5.4	
Hori	729.009	QP	35.6	21.0	12.6	31.8	37.4	46.0	8.6	
Hori	3249.248	PK	55.1	28.8	2.6	31.9	54.6	-	-	See 20dBc Data Sheet
Hori	4874.000	PK	44.7	31.4	3.8	31.5	48.4	73.9	25.5	
Hori	7311.000	PK	42.6	35.7	4.5	32.5	50.3	73.9	23.6	
Hori	9748.000	PK	41.9	38.4	5.3	32.9	52.7	73.9	21.2	
Hori	24370.000	PK	45.6	38.6	-1.8	32.1	50.3	73.9	23.6	
Hori	3249.248	AV	53.4	28.8	2.6	31.9	52.9	-	-	See 20dBc Data Sheet
Hori	4874.000	AV	32.3	31.4	3.8	31.5	36.0	53.9	17.9	
Hori	7311.000	AV	31.1	35.7	4.5	32.5	38.8	53.9	15.1	
Hori	9748.000	AV	30.1	38.4	5.3	32.9	40.9	53.9	13.0	
Hori	24370.000	AV	33.5	38.6	-1.8	32.1	38.2	53.9	15.7	
Vert	63.802	QP	44.7	7.5	7.7	32.2	27.7	40.0	12.3	
Vert	99.892	QP	48.3	10.0	8.1	32.3	34.1	43.5	9.4	
Vert	196.605	QP	43.0	16.8	9.1	32.2	36.7	43.5	6.8	
Vert	232.040	QP	40.6	17.2	9.4	32.2	35.0	46.0	11.0	
Vert	364.503	QP	40.2	16.6	10.4	32.1	35.1	46.0	10.9	
Vert	458.443	QP	33.5	18.1	11.0	32.0	30.6	46.0	15.4	
Vert	729.011	QP	36.7	21.0	12.6	31.8	38.5	46.0	7.5	
Vert	3249.283	PK	57.2	28.8	2.6	31.9	56.7	-	-	See 20dBc Data Sheet
Vert	4874.000	PK	50.7	31.4	3.8	31.5	54.4	73.9	19.5	
Vert	7311.000	PK	52.7	35.7	4.5	32.5	60.4	73.9	13.5	
Vert	9748.000	PK	41.4	38.4	5.3	32.9	52.2	73.9	21.7	
Vert	24370.000	PK	45.6	38.6	-1.8	32.1	50.3	73.9	23.6	
Vert	3249.283	AV	56.0	28.8	2.6	31.9	55.5	-	-	See 20dBc Data Sheet
Vert	4874.000	AV	39.1	31.4	3.8	31.5	42.8	53.9	11.1	
Vert	7311.000	AV	38.2	35.7	4.5	32.5	45.9	53.9	8.0	
Vert	9748.000	AV	30.5	38.4	5.3	32.9	41.3	53.9	12.6	
Vert	24370.000	AV	33.6	38.6	-1.8	32.1	38.3	53.9	15.6	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

**20dBc Data Sheet**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2437.000	PK	99.6	28.3	2.2	32.2	97.9	-	-	Carrier
Hori	3249.248	PK	54.1	28.8	2.6	31.9	53.6	77.9	24.3	
Vert	2437.000	PK	101.7	28.3	2.2	32.2	100.0	-	-	Carrier
Vert	3249.283	PK	56.5	28.8	2.6	31.9	56.0	80.0	24.0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

## Radiated Spurious Emission

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Report No. 32IE0158-HO  
Date 05/05/2012 05/06/2012  
Temperature/ Humidity 21 deg.C/ 51% RH 22 deg.C/ 48% RH  
Engineer Tomohisa Nakagawa Tomohisa Nakagawa  
(1-10GHz) (10-26.5GHz)  
Mode 11g Tx 2462MHz

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2483.500	PK	63.5	28.5	2.2	32.2	62.0	73.9	11.9	See 20dBc Data Sheet
Hori	3282.654	PK	54.5	28.8	2.6	31.9	54.0	-	-	
Hori	4924.000	PK	43.9	31.5	3.8	31.5	47.7	73.9	26.2	
Hori	7386.000	PK	44.0	35.8	4.5	32.6	51.7	73.9	22.2	
Hori	9848.000	PK	42.1	38.5	5.4	33.0	53.0	73.9	20.9	
Hori	24620.000	PK	46.0	38.6	-1.7	32.2	50.7	73.9	23.2	
Hori	2483.500	AV	47.5	28.5	2.2	32.2	46.0	53.9	7.9	See 20dBc Data Sheet
Hori	3282.654	AV	52.9	28.8	2.6	31.9	52.4	-	-	
Hori	4924.000	AV	31.0	31.5	3.8	31.5	34.8	53.9	19.1	
Hori	7386.000	AV	32.5	35.8	4.5	32.6	40.2	53.9	13.7	
Hori	9848.000	AV	30.3	38.5	5.4	33.0	41.2	53.9	12.7	
Hori	24620.000	AV	34.3	38.6	-1.7	32.2	39.0	53.9	14.9	
Vert	2483.500	PK	63.5	28.5	2.2	32.2	62.0	73.9	11.9	See 20dBc Data Sheet
Vert	3282.667	PK	56.0	28.8	2.6	31.9	55.5	-	-	
Vert	4924.000	PK	51.1	31.5	3.8	31.5	54.9	73.9	19.0	
Vert	7386.000	PK	50.2	35.8	4.5	32.6	57.9	73.9	16.0	
Vert	9848.000	PK	42.1	38.5	5.4	33.0	53.0	73.9	20.9	
Vert	24620.000	PK	46.5	38.6	-1.7	32.2	51.2	73.9	22.7	
Vert	2483.500	AV	50.7	28.5	2.2	32.2	49.2	53.9	4.7	See 20dBc Data Sheet
Vert	3282.667	AV	54.4	28.8	2.6	31.9	53.9	-	-	
Vert	4924.000	AV	37.1	31.5	3.8	31.5	40.9	53.9	13.0	
Vert	7386.000	AV	33.8	35.8	4.5	32.6	41.5	53.9	12.4	
Vert	9848.000	AV	31.1	38.5	5.4	33.0	42.0	53.9	11.9	
Vert	24620.000	AV	34.4	38.6	-1.7	32.2	39.1	53.9	14.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

\*Other frequency noises omitted in this report were not seen or had enough margin (more than 20dB).

\*The 10th harmonic was not seen so the result was its base noise level.

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB

### 20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2462.000	PK	99.5	28.4	2.2	32.2	97.9	-	-	Carrier
Hori	3282.654	PK	53.4	28.8	2.6	31.9	52.9	77.9	25.1	
Vert	2462.000	PK	101.4	28.4	2.2	32.2	99.8	-	-	Carrier
Vert	3282.667	PK	55.0	28.8	2.6	31.9	54.5	79.8	25.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amplifier)

## **APPENDIX 2: Test instruments**

### **EMI test equipment**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/29 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2011/11/23 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2011/08/11 * 12
MCC-134	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336167/4(1m) / 340641(5m)	RE	2011/09/07 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2012/03/28 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2012/06/27 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2012/05/30 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/24 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-06	Measure	PROMART	SEN1955	-	RE	
MSA-03	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2011/08/11 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1915	RE	2011/10/15 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2011/10/15 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2011/07/15 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2011/11/02 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2012/03/16 * 12

**The expiration date of the calibration is the end of the expired month.**

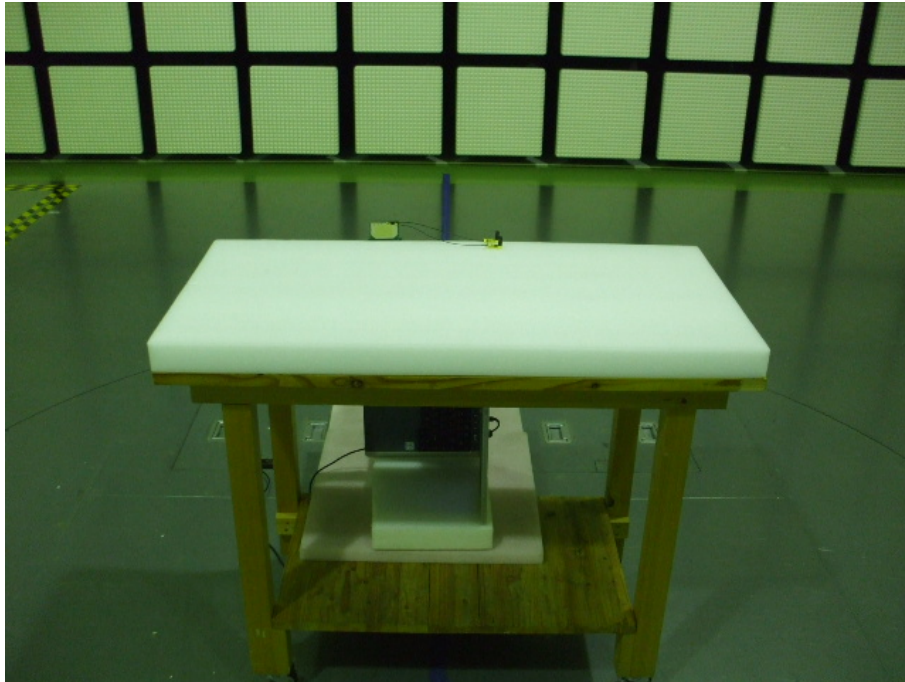
**All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.**

**As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.**

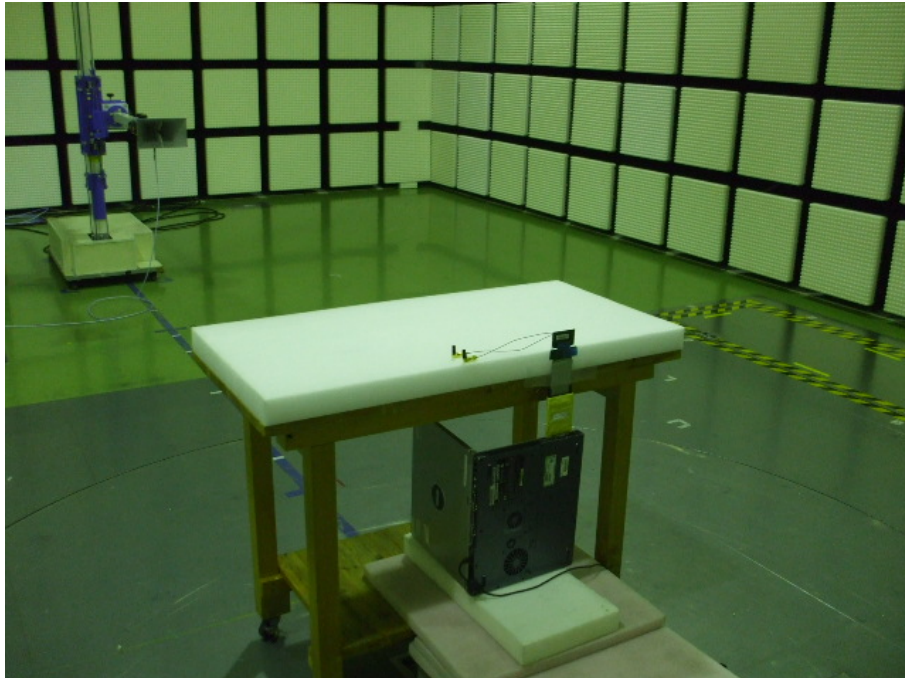
**Test Item: RE: Radiated Emission**

### **APPENDIX 3: Photographs of test setup**

#### **Radiated Spurious Emission**



**Photo 1**



**Photo 2**



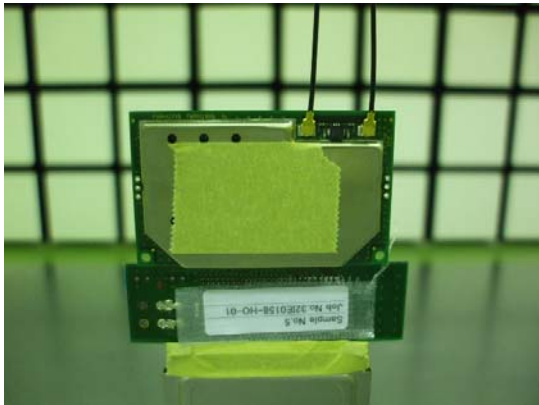
### Worst Case Position

(Module Horizontal: Y-axis/ Vertical:X-axis)  
(Antenna Horizontal: Y-axis/ Vertical:Y-axis)

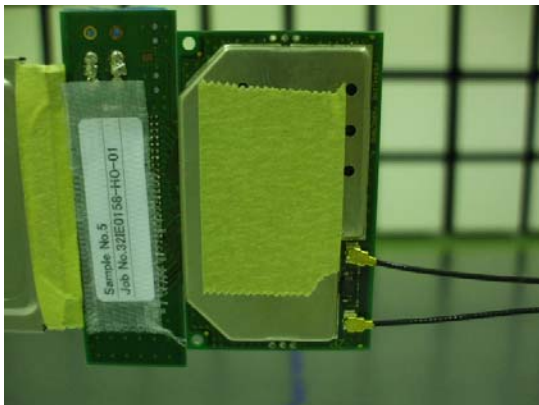
**Module**  
**X-axis**



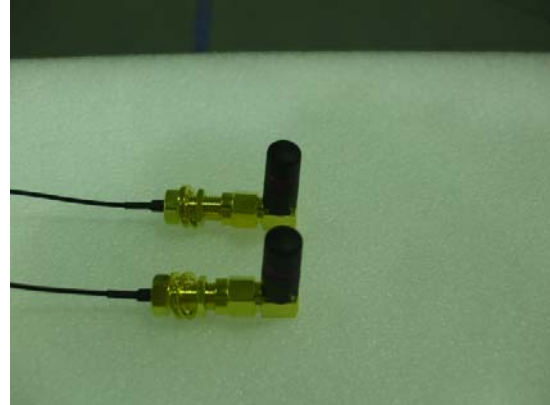
**Y-axis**



**Z-axis**



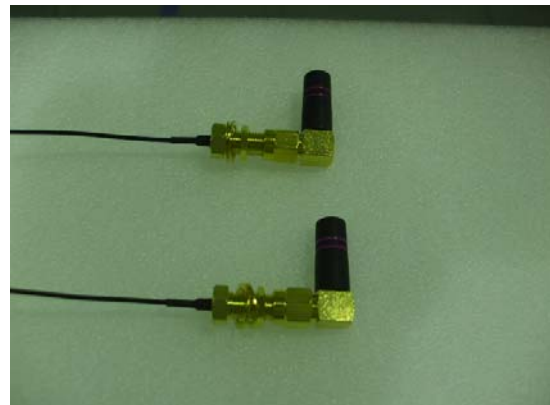
**Antenna**  
**X-axis**



**Y-axis**



**Z-axis**



**End of Report**