



RADIO TEST REPORT


Test Report No. : 10054421H-A

Applicant : silex technology, Inc.
Type of Equipment : SDIO Wireless Module
Model No. : PF-SDMGN
FCC ID : N6C-PFSDMGN
Test regulation : FCC Part 15 Subpart C: 2013
*Conducted emission and Radiated spurious emission tests only
Class II Permissive Change
Test Result : Complied

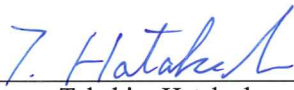
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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not 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: August 23 to October 23, 2013

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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13-EM-F0429

CONTENTS	PAGE
SECTION 1: Customer information.....	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results.....	5
SECTION 4: Operation of E.U.T. during testing.....	8
SECTION 5: Conducted Emission.....	11
SECTION 6: Radiated Spurious Emission	12
APPENDIX 1: Data of EMI test.....	13
Conducted Emission	13
Radiated Spurious Emission	15
APPENDIX 2: Test instruments	32
APPENDIX 3: Photographs of test setup.....	33
Conducted Emission	33
Radiated Spurious Emission	35
Worst Case Position.....	39

SECTION 1: Customer information

Company Name : silex technology, Inc.
Address : 2-3-1 Hikaridai, Seika-cho, Kyoto 619-0237, Japan
Telephone Number : +81-774-98-3878
Facsimile Number : +81-774-98-3758
Contact Person : Toshiro Kometani

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

2.1 Identification of E.U.T.

Type of Equipment : SDIO Wireless Module
Model No. : PF-SDMGN
Serial No. : Refer to Clause 4.2
Rating : DC3.3V
Receipt Date of Sample : August 17, 2013
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: PF-SDMGN (referred to as the EUT in this report) is the SDIO Wireless Module.

General Specification

Clock frequency(ies) in the system : 26MHz

Radio Specification

Radio Type : Transceiver
Method of Frequency Generation : Synthesizer
Power Supply (inner) : DC1.8V, 1.2V
Antenna Gain : 1.0dBi

	IEEE802.11b	IEEE802.11g	IEEE802.11n (20 M band)
Frequency of operation	2412-2462MHz	2412-2462MHz	2412 - 2462MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)
Channel spacing	5MHz		5MHz
Antenna type	Printed PCB Antenna		
Antenna Connector type	U.FL Alternative connector		

*The EUT is the modified version of model: PF-SDMGN (Test report No. 32FE0146-HO-01-A-R1 issued by UL Japan Inc.), and the difference from the original is Antenna gain and Antenna type. The radio specification is identical to the original. Therefore only Conducted emission and Radiated spurious emission tests were performed in this report.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2013, final revised on September 30, 2013 and effective October 30, 2013

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

* The revision on September 30, 2013 does not affect the test specification applied to the EUT.

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.4:2003 7. AC powerline Conducted Emission measurements ----- IC: RSS-Gen 7.2.4	FCC: Section 15.207 ----- IC: RSS-Gen 7.2.4	QP 16.4dB, 0.15000MHz, N AV 21.4dB, 0.51024MHz, L	Complied	-
Spurious Emission Restricted Band Edges	FCC: "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247(issued on April 9, 2013)" ----- IC: RSS-Gen 4.9	FCC: Section15.247(d) ----- IC: RSS-210 A8.5 RSS-Gen 7.2.3	2.2dB 638.042MHz, QP, Hori.	Complied	Radiated

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 through own regulator regardless of input voltage (DC3.3V).

Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement

The EUT has a unique antenna connector (U.FL on the Module).

Therefore the equipment complies with the requirement of 15.203/212.

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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)	Conducted emission (+dB)
	150kHz-30MHz
No.1	3.5dB
No.2	3.5dB
No.3	3.6dB
No.4	3.5dB

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	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

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

Conducted Emission test

The data listed in this test report has enough margin, more than the site margin.

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	4.0 x 4.5 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 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	-	6.2 x 4.7 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.

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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.

The test was performed on below worst test mode based on the original test report (test report No. 32FE0146-HO-01-A-R1).

Mode	Remarks*
IEEE 802.11b (11b)	11Mbps (Long GI), PN9
IEEE 802.11g (11g)	24Mbps (Long GI), PN9
IEEE 802.11n 20MHz BW (11n-20)	MCS 4 (Long GI), PN9
*Transmitting duty was close to 100% on all tests.	
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*EUT has the power settings by the software as follows; Power settings: 11b 11Mbps(Long GI): 13.0 dBm 11g 24Mbps(Long GI): 2412MHz: 10.5 dBm, 2437MHz: 14.5 dBm, 2462MHz: 10.5 dBm 11n-20 MCS 4(Long GI): 2412MHz: 10.0 dBm, 2437MHz: 14.5 dBm, 2462MHz: 10.0 dBm Software: Atheros Radio Test (ART) - Revision 0.2 BUILD #33 ART_11n - Customer Version (ANWI BUILD)	
*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.	

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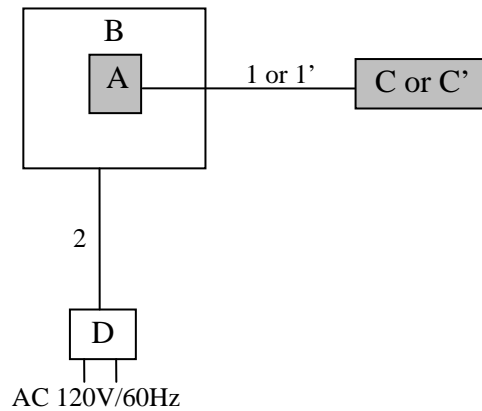
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4.2 Configuration and peripherals

[Conducted emission and Radiated spurious emission (Below 1GHz)]



* 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	SDIO Wireless Module	PF-SDMGN	008092 012D59	silex technology, Inc.	EUT
B	Jig	-	-	silex technology, Inc.	-
C	Antenna (CN1)	WHA9400-2301E	001	SMK	EUT
C'	Antenna (CN1)	WHA9400-2301E	002	SMK	EUT
D	AC Adaptor	US115-05	C08-0259306	UNIFIVE	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	0.1	Shielded	Shielded	Minimum Cable Antenna
1'	Antenna Cable	0.3	Shielded	Shielded	Maximum Cable Antenna
2	DC Cable	1.8	Unshielded	Unshielded	-

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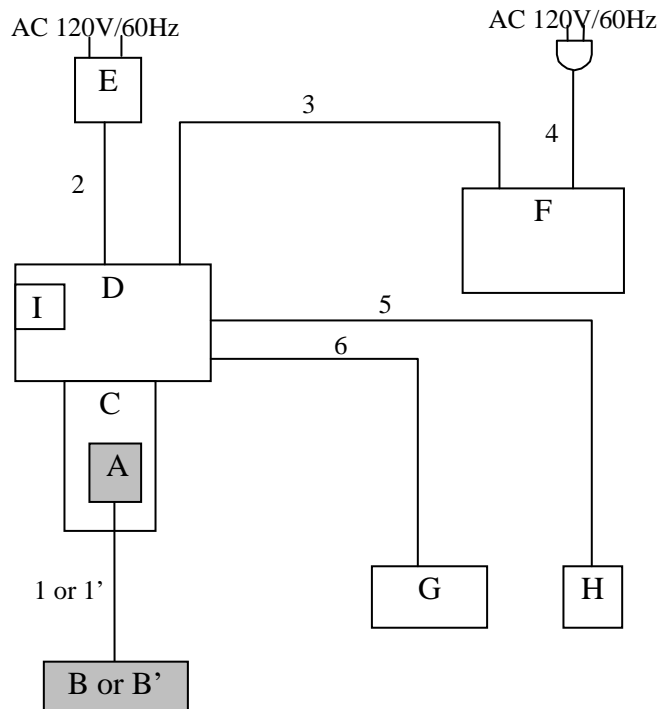
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[Radiated spurious emission (Above 1GHz)]



* 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	SDIO Wireless Module	PF-SDMGN	008092 012843	silex technology, Inc.	EUT
B	Antenna (CN1)	WHA9400-2301E	001	SMK	EUT
B	Antenna (CN1)	WHA9400-2301E	002	SMK	EUT
C	Jig	-	-	silex technology, Inc.	-
D	Linux PC (Board)	i.MX53 QUICK START BOARD	K1141229399-004	IMXCOMMUNITY	-
E	AC Adaptor	XA012AM05002 00	1207043-03	SCEPTRE POWER	-
F	Display	9419-HC2	VLP2401	Lenovo	-
G	Key Board	TK-UP04FPBK	10102700845C	Elecom	-
H	Mouse	M-LY2UL	0X000841	Elecom	-
I	Micro SD	-	-	-	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	0.3	Shielded	Shielded	Maximum Cable Antenna
1'	Antenna Cable	0.1	Shielded	Shielded	Minimum Cable Antenna
2	DC Cable	1.8	Unshielded	Unshielded	-
3	RGB Cable	1.8	Unshielded	Unshielded	-
4	AC Cable	2.4	Unshielded	Unshielded	-
5	Mouse Cable	1.6	Shielded	Shielded	-
6	Key Board Cable	1.5	Shielded	Shielded	-

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SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane.

The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. All unused 50ohm connectors of the LISN(AMN) were resistivity terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

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

Detector	: QP and CISPR AV
Measurement range	: 0.15-30MHz
Test data	: APPENDIX
Test result	: Pass

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SECTION 6: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)".

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, 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 FCC15.205 / Table 3 of RSS-Gen 7.2.2 (IC).

Frequency	Below 1GHz	Above 1GHz		20dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	Average Power Method: <u>WLAN: 12.2.5.1</u> RBW: 1MHz VBW: 3MHz Detector: Power Averaging (RMS) Trace: Free Run	RBW: 100kHz VBW: 300kHz (S/A)
Test Distance	3m	3m (below 10GHz), 1m *2) (above 10GHz)		3m (below 10GHz), 1m *2) (above 10GHz)

*1) Average Power Measurement was performed based on 6.0 & 12.2.5.1 of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (Issued on April 9, 2013)"

*2) 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 EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

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

Conducted Emission
Minimum Cable Antenna

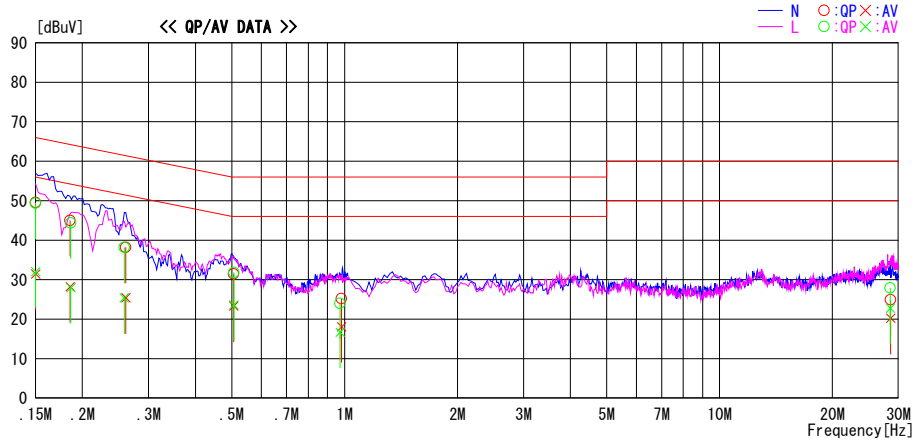
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2013/10/23

Report No. : 10054421H
Temp./Humi. : 23deg. C / 67% RH
Engineer : Katsunori Okai

Mode / Remarks : Tx 11g 2437MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	36.3	18.1	13.3	49.6	31.4	66.0	56.0	16.4	24.6	N	
0.18545	31.7	14.9	13.3	45.0	28.2	64.2	54.2	19.2	26.0	N	
0.26093	24.9	12.1	13.3	38.2	25.4	61.4	51.4	23.2	26.0	N	
0.50602	18.2	10.0	13.3	31.5	23.3	56.0	46.0	24.5	22.7	N	
0.98159	11.8	4.7	13.4	25.2	18.1	56.0	46.0	30.8	27.9	N	
28.59697	5.9	1.2	19.0	24.9	20.2	60.0	50.0	35.1	29.8	N	
0.15000	36.1	18.8	13.3	49.4	32.1	66.0	56.0	16.6	23.9	L	
0.18629	31.1	14.7	13.3	44.4	28.0	64.2	54.2	19.8	26.2	L	
0.25837	24.9	12.1	13.3	38.2	25.4	61.5	51.5	23.3	26.1	L	
0.50658	18.5	10.3	13.3	31.8	23.6	56.0	46.0	24.2	22.4	L	
0.97259	10.6	3.3	13.4	24.0	16.7	56.0	46.0	32.0	29.3	L	
28.50865	8.9	3.8	19.0	27.9	22.8	60.0	50.0	32.1	27.2	L	

CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT[dBuV]=READING[dBuV]+C.F[dB] (ISN+CABLE.)
Except for the above table : adequate margin data below the limits.

Conducted Emission
Maximum Cable Antenna

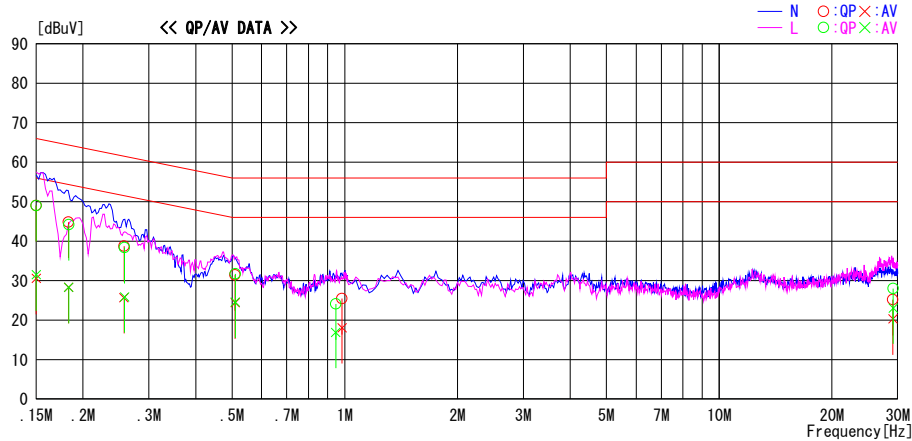
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2013/10/23

Report No. : 10054421H
Temp./Humi. : 23deg. C / 67% RH
Engineer : Katsunori Okai

Mode / Remarks : Tx 11g 2437MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor [dB]	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	35.7	17.3	13.3	49.0	30.6	66.0	56.0	17.0	25.4	N	
0.18291	31.5	15.0	13.3	44.8	28.3	64.4	54.4	19.6	26.1	N	
0.25735	25.4	12.4	13.3	38.7	25.7	61.5	51.5	22.8	25.8	N	
0.50945	18.2	11.1	13.3	31.5	24.4	56.0	46.0	24.5	21.6	N	
0.98364	12.1	4.7	13.4	25.5	18.1	56.0	46.0	30.5	27.9	N	
29.09780	6.1	1.2	19.1	25.2	20.3	60.0	50.0	34.8	29.7	N	
0.15000	35.7	18.2	13.3	49.0	31.5	66.0	56.0	17.0	24.5	L	
0.18329	30.9	15.0	13.3	44.2	28.3	64.3	54.3	20.1	26.0	L	
0.25824	25.1	12.6	13.3	38.4	25.9	61.5	51.5	23.1	25.6	L	
0.51024	18.4	11.3	13.3	31.7	24.6	56.0	46.0	24.3	21.4	L	
0.94635	10.7	3.5	13.4	24.1	16.9	56.0	46.0	31.9	29.1	L	
29.14792	8.9	4.0	19.1	28.0	23.1	60.0	50.0	32.0	26.9	L	

CHART: WITH FACTOR, Peak hold data. CALCULATION: RESULT[dBuV]=READING[dBuV]+C.F[dB] (ISN+CABLE.)
Except for the above table : adequate margin data below the limits.

Radiated Spurious Emission
Minimum Cable Antenna

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. 10054421H
Date 08/23/2013 08/24/2013
Temperature/ Humidity 22 deg. C / 55% RH 22 deg. C / 58% RH
Engineer Keisuke Kawamura Takumi Shimada
(1-10GHz) (Above 10GHz)
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	2390.000	PK	51.3	27.5	2.6	32.4	49.0	73.9	24.9	
Hori	2800.000	PK	53.5	28.1	2.8	32.2	52.2	73.9	21.7	
Hori	4824.000	PK	42.7	31.4	4.4	31.4	47.1	73.9	26.8	
Hori	7236.000	PK	42.6	35.8	5.3	32.3	51.4	73.9	22.6	
Hori	9648.000	PK	42.1	38.3	6.1	33.0	53.5	73.9	20.4	
Hori	2390.000	AV	38.4	27.5	2.6	32.4	36.1	53.9	17.8	
Hori	2800.000	AV	46.1	28.1	2.8	32.2	44.8	53.9	9.1	
Hori	4824.000	AV	30.1	31.4	4.4	31.4	34.5	53.9	19.4	
Hori	7236.000	AV	31.0	35.8	5.3	32.3	39.8	53.9	14.1	
Hori	9648.000	AV	30.9	38.3	6.1	33.0	42.3	53.9	11.6	
Vert	2390.000	PK	47.5	27.5	2.6	32.4	45.2	73.9	28.7	
Vert	2800.000	PK	49.5	28.1	2.8	32.2	48.2	73.9	25.7	
Vert	4824.000	PK	40.6	31.4	4.4	31.4	45.0	73.9	28.9	
Vert	7236.000	PK	44.1	35.8	5.3	32.3	52.9	73.9	21.0	
Vert	9648.000	PK	43.0	38.3	6.1	33.0	54.4	73.9	19.6	
Vert	2390.000	AV	35.2	27.5	2.6	32.4	32.9	53.9	21.0	
Vert	2800.000	AV	41.3	28.1	2.8	32.2	40.0	53.9	13.9	
Vert	4824.000	AV	29.8	31.4	4.4	31.4	34.2	53.9	19.7	
Vert	7236.000	AV	31.0	35.8	5.3	32.3	39.8	53.9	14.1	
Vert	9648.000	AV	30.9	38.3	6.1	33.0	42.3	53.9	11.6	

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).

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	103.1	27.5	2.6	32.4	100.8	-	-	Carrier
Hori	2400.000	PK	60.7	27.5	2.6	32.4	58.4	80.8	22.4	
Vert	2412.000	PK	101.6	27.5	2.6	32.4	99.3	-	-	Carrier
Vert	2400.000	PK	58.2	27.5	2.6	32.4	55.9	79.3	23.4	

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

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Radiated Spurious Emission
Minimum Cable Antenna

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. 10054421H
Date 08/23/2013 08/24/2013
Temperature/ Humidity 22 deg. C / 55% RH 22 deg. C / 58% RH
Engineer Keisuke Kawamura Takumi Shimada
(1-10GHz) (Above 10GHz)
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	50.9	27.5	2.7	32.3	48.8	73.9	25.1	
Hori	2800.000	PK	51.6	28.1	2.8	32.2	50.3	73.9	23.6	
Hori	4924.000	PK	41.7	31.7	4.5	31.4	46.5	73.9	27.4	
Hori	7386.000	PK	42.6	35.9	5.3	32.4	51.4	73.9	22.5	
Hori	9848.000	PK	42.1	38.5	6.2	33.1	53.7	73.9	20.2	
Hori	2483.500	AV	39.6	27.5	2.7	32.3	37.5	53.9	16.4	
Hori	2800.000	AV	43.6	28.1	2.8	32.2	42.3	53.9	11.7	
Hori	4924.000	AV	30.4	31.7	4.5	31.4	35.2	53.9	18.7	
Hori	7386.000	AV	31.0	35.9	5.3	32.4	39.8	53.9	14.1	
Hori	9848.000	AV	30.9	38.5	6.2	33.1	42.5	53.9	11.4	
Vert	2483.500	PK	49.8	27.5	2.7	32.3	47.7	73.9	26.2	
Vert	2800.000	PK	50.4	28.1	2.8	32.2	49.1	73.9	24.8	
Vert	4924.000	PK	42.1	31.7	4.5	31.4	46.9	73.9	27.0	
Vert	7386.000	PK	44.1	35.9	5.3	32.4	52.9	73.9	21.0	
Vert	9848.000	PK	43.0	38.5	6.2	33.1	54.6	73.9	19.3	
Vert	2483.500	AV	38.7	27.5	2.7	32.3	36.6	53.9	17.3	
Vert	2800.000	AV	42.1	28.1	2.8	32.2	40.8	53.9	13.1	
Vert	4924.000	AV	29.9	31.7	4.5	31.4	34.7	53.9	19.2	
Vert	7386.000	AV	31.0	35.9	5.3	32.4	39.8	53.9	14.1	
Vert	9848.000	AV	30.9	38.5	6.2	33.1	42.5	53.9	11.4	

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).

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Radiated Spurious Emission
Minimum Cable Antenna

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. 10054421H
Date 08/23/2013 08/24/2013
Temperature/ Humidity 22 deg. C / 55% RH 22 deg. C / 58% RH
Engineer Keisuke Kawamura Takumi Shimada
(1-10GHz) (Above 10GHz)
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	2390.000	PK	65.7	27.5	2.6	32.4	63.4	73.9	10.5	
Hori	2800.000	PK	53.0	28.1	2.8	32.2	51.7	73.9	22.2	
Hori	4824.000	PK	42.5	31.4	4.4	31.4	46.9	73.9	27.1	
Hori	7236.000	PK	41.9	35.8	5.3	32.3	50.7	73.9	23.2	
Hori	9648.000	PK	42.2	38.3	6.1	33.0	53.6	73.9	20.3	
Hori	2390.000	AV	52.0	27.5	2.6	32.4	49.7	53.9	4.3	
Hori	2800.000	AV	45.4	28.1	2.8	32.2	44.1	53.9	9.8	
Hori	4824.000	AV	31.1	31.4	4.4	31.4	35.5	53.9	18.4	
Hori	7236.000	AV	30.7	35.8	5.3	32.3	39.5	53.9	14.4	
Hori	9648.000	AV	30.5	38.3	6.1	33.0	41.9	53.9	12.0	
Vert	2390.000	PK	67.1	27.5	2.6	32.4	64.8	73.9	9.1	
Vert	2800.000	PK	50.4	28.1	2.8	32.2	49.1	73.9	24.8	
Vert	4824.000	PK	41.4	31.4	4.4	31.4	45.8	73.9	28.1	
Vert	7236.000	PK	42.6	35.8	5.3	32.3	51.4	73.9	22.5	
Vert	9648.000	PK	43.0	38.3	6.1	33.0	54.4	73.9	19.5	
Vert	2390.000	AV	52.7	27.5	2.6	32.4	50.4	53.9	3.5	
Vert	2800.000	AV	42.4	28.1	2.8	32.2	41.1	53.9	12.8	
Vert	4824.000	AV	30.0	31.4	4.4	31.4	34.4	53.9	19.5	
Vert	7236.000	AV	30.7	35.8	5.3	32.3	39.5	53.9	14.4	
Vert	9648.000	AV	30.5	38.3	6.1	33.0	41.9	53.9	12.0	

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).

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	98.4	27.5	2.6	32.4	96.1	-	-	Carrier
Hori	2400.000	PK	70.4	27.5	2.6	32.4	68.1	76.1	8.0	
Vert	2412.000	PK	98.7	27.5	2.6	32.4	96.4	-	-	Carrier
Vert	2400.000	PK	71.5	27.5	2.6	32.4	69.2	76.4	7.2	

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

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Radiated Spurious Emission
Minimum Cable Antenna

Test place Head Office EMC Lab. No.2 and 4 Semi Anechoic Chamber
Report No. 10054421H
Date 08/23/2013 08/24/2013 10/21/2013
Temperature/ Humidity 22 deg. C / 55% RH 22 deg. C / 58% RH 23 deg. C / 67% RH
Engineer Keisuke Kawamura Takumi Shimada Katsunori Okai
(1-10GHz) (Above 10GHz) (Below 1GHz)
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	45.181	QP	27.0	12.7	6.9	28.5	18.1	40.0	21.9	
Hori	48.843	QP	27.7	11.3	7.0	28.5	17.5	40.0	22.5	
Hori	151.577	QP	23.0	14.9	7.9	28.2	17.6	43.5	25.9	
Hori	240.282	QP	21.8	17.0	8.4	27.7	19.5	46.0	26.5	
Hori	411.426	QP	33.6	17.4	9.4	28.4	32.0	46.0	14.0	
Hori	499.996	QP	28.5	18.1	9.7	28.8	27.5	46.0	18.5	
Hori	644.242	QP	32.0	19.8	10.4	28.7	33.5	46.0	12.5	
Hori	2799.971	PK	56.5	28.1	2.8	32.2	55.2	73.9	18.7	
Hori	4874.000	PK	41.0	31.5	4.4	31.4	45.5	73.9	28.4	
Hori	7311.000	PK	41.9	35.8	5.3	32.4	50.6	73.9	23.3	
Hori	9748.000	PK	42.2	38.4	6.1	33.0	53.7	73.9	20.2	
Hori	2799.971	AV	45.0	28.1	2.8	32.2	43.7	53.9	10.2	
Hori	4874.000	AV	30.3	31.5	4.4	31.4	34.8	53.9	19.1	
Hori	7311.000	AV	30.7	35.8	5.3	32.4	39.4	53.9	14.5	
Hori	9748.000	AV	30.5	38.4	6.1	33.0	42.0	53.9	11.9	
Vert	44.284	QP	40.0	13.1	6.9	28.6	31.4	40.0	8.6	
Vert	48.833	QP	40.4	11.3	7.0	28.5	30.2	40.0	9.8	
Vert	151.575	QP	24.0	14.9	7.9	28.2	18.6	43.5	24.9	
Vert	240.281	QP	21.7	17.0	8.4	27.7	19.4	46.0	26.6	
Vert	411.427	QP	26.3	17.4	9.4	28.4	24.7	46.0	21.3	
Vert	499.997	QP	26.2	18.1	9.7	28.8	25.2	46.0	20.8	
Vert	638.433	QP	26.8	19.8	10.4	28.8	28.2	46.0	17.8	
Vert	2799.971	PK	49.0	28.1	2.8	32.2	47.7	73.9	26.2	
Vert	4874.000	PK	40.8	31.5	4.4	31.4	45.3	73.9	28.6	
Vert	7311.000	PK	42.6	35.8	5.3	32.4	51.3	73.9	22.6	
Vert	9748.000	PK	43.0	38.4	6.1	33.0	54.5	73.9	19.4	
Vert	2799.971	AV	40.9	28.1	2.8	32.2	39.6	53.9	14.4	
Vert	4874.000	AV	29.8	31.5	4.4	31.4	34.3	53.9	19.7	
Vert	7311.000	AV	30.7	35.8	5.3	32.4	39.4	53.9	14.5	
Vert	9748.000	AV	30.5	38.4	6.1	33.0	42.0	53.9	11.9	

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).

Radiated Spurious Emission
Minimum Cable Antenna

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. 10054421H
Date 08/23/2013 08/24/2013
Temperature/ Humidity 22 deg. C / 55% RH 22 deg. C / 58% RH
Engineer Keisuke Kawamura Takumi Shimada
(1-10GHz) (Above 10GHz)
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	66.5	27.5	2.7	32.3	64.4	73.9	9.5	
Hori	2800.000	PK	52.7	28.1	2.8	32.2	51.4	73.9	22.5	
Hori	4924.000	PK	43.0	31.7	4.5	31.4	47.8	73.9	26.1	
Hori	7386.000	PK	41.9	35.9	5.3	32.4	50.7	73.9	23.2	
Hori	9848.000	PK	42.2	38.5	6.2	33.1	53.8	73.9	20.1	
Hori	2483.500	AV	50.7	27.5	2.7	32.3	48.6	53.9	5.3	
Hori	2800.000	AV	45.2	28.1	2.8	32.2	43.9	53.9	10.0	
Hori	4924.000	AV	31.4	31.7	4.5	31.4	36.2	53.9	17.7	
Hori	7386.000	AV	30.7	35.9	5.3	32.4	39.5	53.9	14.4	
Hori	9848.000	AV	30.5	38.5	6.2	33.1	42.1	53.9	11.8	
Vert	2483.500	PK	68.5	27.5	2.7	32.3	66.4	73.9	7.5	
Vert	2800.000	PK	49.8	28.1	2.8	32.2	48.5	73.9	25.4	
Vert	4924.000	PK	40.7	31.7	4.5	31.4	45.5	73.9	28.4	
Vert	7386.000	PK	42.6	35.9	5.3	32.4	51.4	73.9	22.5	
Vert	9848.000	PK	43.0	38.5	6.2	33.1	54.6	73.9	19.3	
Vert	2483.500	AV	51.7	27.5	2.7	32.3	49.6	53.9	4.3	
Vert	2800.000	AV	41.8	28.1	2.8	32.2	40.5	53.9	13.4	
Vert	4924.000	AV	29.6	31.7	4.5	31.4	34.4	53.9	19.5	
Vert	7386.000	AV	30.7	35.9	5.3	32.4	39.5	53.9	14.4	
Vert	9848.000	AV	30.5	38.5	6.2	33.1	42.1	53.9	11.8	

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).

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Radiated Spurious Emission
Minimum Cable Antenna

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. 10054421H
Date 08/23/2013
Temperature/ Humidity 22 deg. C / 55% RH
Engineer Keisuke Kawamura
(Band Edge)
Mode 11n-20 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	2390.000	PK	67.7	27.5	2.6	32.4	65.4	73.9	8.5	
Hori	2390.000	AV	53.1	27.5	2.6	32.4	50.8	53.9	3.1	
Vert	2390.000	PK	66.1	27.5	2.6	32.4	63.8	73.9	10.1	
Vert	2390.000	AV	52.1	27.5	2.6	32.4	49.8	53.9	4.1	

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

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	98.4	27.5	2.6	32.4	96.1	-	-	Carrier
Hori	2400.000	PK	68.7	27.5	2.6	32.4	66.4	76.1	9.7	
Vert	2412.000	PK	97.9	27.5	2.6	32.4	95.6	-	-	Carrier
Vert	2400.000	PK	68.0	27.5	2.6	32.4	65.7	75.6	9.9	

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

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Radiated Spurious Emission
Maximum Cable Antenna

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10054421H
Date : 09/02/2013
Temperature/ Humidity : 20 deg. C / 62% RH
Engineer : Yutaka Yoshida
(1-26.5GHz)
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	2390.000	PK	49.3	26.8	2.4	35.7	42.8	73.9	31.1	
Hori	2800.000	PK	54.9	27.3	2.6	35.4	49.4	73.9	24.5	
Hori	4824.000	PK	45.3	30.7	4.2	34.9	45.3	73.9	28.6	
Hori	7236.000	PK	44.9	35.6	5.0	34.9	50.6	73.9	23.3	
Hori	9648.000	PK	45.4	38.2	5.8	35.4	54.0	73.9	19.9	
Hori	2390.000	AV	35.7	26.8	2.4	35.7	29.2	53.9	24.7	
Hori	2800.000	AV	47.7	27.3	2.6	35.4	42.2	53.9	11.7	
Hori	4824.000	AV	33.9	30.7	4.2	34.9	33.9	53.9	20.0	
Hori	7236.000	AV	33.5	35.6	5.0	34.9	39.2	53.9	14.7	
Hori	9648.000	AV	33.4	38.2	5.8	35.4	42.0	53.9	11.9	
Vert	2390.000	PK	49.3	26.8	2.4	35.7	42.8	73.9	31.1	
Vert	2800.000	PK	51.9	27.3	2.6	35.4	46.4	73.9	27.5	
Vert	4824.000	PK	45.6	30.7	4.2	34.9	45.6	73.9	28.3	
Vert	7236.000	PK	46.1	35.6	5.0	34.9	51.8	73.9	22.1	
Vert	9648.000	PK	45.7	38.2	5.8	35.4	54.3	73.9	19.6	
Vert	2390.000	AV	35.7	26.8	2.4	35.7	29.2	53.9	24.7	
Vert	2800.000	AV	43.5	27.3	2.6	35.4	38.0	53.9	15.9	
Vert	4824.000	AV	33.8	30.7	4.2	34.9	33.8	53.9	20.1	
Vert	7236.000	AV	33.4	35.6	5.0	34.9	39.1	53.9	14.8	
Vert	9648.000	AV	33.4	38.2	5.8	35.4	42.0	53.9	11.9	

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).

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	98.2	26.8	2.4	35.7	91.7	-	-	Carrier
Hori	2400.000	PK	55.6	26.8	2.4	35.7	49.1	71.7	22.6	
Vert	2412.000	PK	95.8	26.8	2.4	35.7	89.3	-	-	Carrier
Vert	2400.000	PK	54.9	26.8	2.4	35.7	48.4	69.3	20.9	

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

UL Japan, Inc.

Head Office EMC Lab.

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Radiated Spurious Emission
Maximum Cable Antenna

Test place Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. 10054421H
Date 09/02/2013
Temperature/ Humidity 20 deg. C / 62% RH
Engineer Yutaka Yoshida
(1-26.5GHz)
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	2800.000	PK	55.3	27.3	2.6	35.4	49.8	73.9	24.1	
Hori	4874.000	PK	44.4	30.8	4.2	34.9	44.5	73.9	29.4	
Hori	7311.000	PK	44.8	35.7	5.0	34.9	50.6	73.9	23.3	
Hori	9748.000	PK	43.2	38.4	5.8	35.4	52.0	73.9	21.9	
Hori	2800.000	AV	48.6	27.3	2.6	35.4	43.1	53.9	10.8	
Hori	4874.000	AV	34.1	30.8	4.2	34.9	34.2	53.9	19.7	
Hori	7311.000	AV	33.2	35.7	5.0	34.9	39.0	53.9	14.9	
Hori	9748.000	AV	32.3	38.4	5.8	35.4	41.1	53.9	12.8	
Vert	2800.000	PK	51.3	27.3	2.6	35.4	45.8	73.9	28.1	
Vert	4874.000	PK	45.1	30.8	4.2	34.9	45.2	73.9	28.7	
Vert	7311.000	PK	44.7	35.7	5.0	34.9	50.5	73.9	23.4	
Vert	9748.000	PK	43.4	38.4	5.8	35.4	52.2	73.9	21.7	
Vert	2800.000	AV	43.3	27.3	2.6	35.4	37.8	53.9	16.1	
Vert	4874.000	AV	33.7	30.8	4.2	34.9	33.8	53.9	20.1	
Vert	7311.000	AV	33.5	35.7	5.0	34.9	39.3	53.9	14.7	
Vert	9748.000	AV	33.1	38.4	5.8	35.4	41.9	53.9	12.0	

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).

Radiated Spurious Emission
Maximum Cable Antenna

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10054421H
Date : 09/02/2013
Temperature/ Humidity : 20 deg. C / 62% RH
Engineer : Yutaka Yoshida
(1-26.5GHz)
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	48.9	26.7	2.4	35.7	42.3	73.9	31.6	
Hori	2800.000	PK	54.3	27.3	2.6	35.4	48.8	73.9	25.1	
Hori	4924.000	PK	44.8	31.0	4.2	34.9	45.1	73.9	28.8	
Hori	7386.000	PK	44.4	35.8	5.1	34.9	50.4	73.9	23.5	
Hori	9848.000	PK	45.0	38.6	5.9	35.4	54.1	73.9	19.9	
Hori	2483.500	AV	36.7	26.7	2.4	35.7	30.1	53.9	23.8	
Hori	2800.000	AV	47.5	27.3	2.6	35.4	42.0	53.9	11.9	
Hori	4924.000	AV	33.1	31.0	4.2	34.9	33.4	53.9	20.5	
Hori	7386.000	AV	33.4	35.8	5.1	34.9	39.4	53.9	14.5	
Hori	9848.000	AV	33.0	38.6	5.9	35.4	42.1	53.9	11.8	
Vert	2483.500	PK	47.9	26.7	2.4	35.7	41.3	73.9	32.6	
Vert	2800.000	PK	51.9	27.3	2.6	35.4	46.3	73.9	27.6	
Vert	4924.000	PK	45.1	31.0	4.2	34.9	45.4	73.9	28.5	
Vert	7386.000	PK	44.9	35.8	5.1	34.9	50.9	73.9	23.0	
Vert	9848.000	PK	44.8	38.6	5.9	35.4	53.9	73.9	20.0	
Vert	2483.500	AV	35.7	26.7	2.4	35.7	29.1	53.9	24.8	
Vert	2800.000	AV	44.2	27.3	2.6	35.4	38.7	53.9	15.2	
Vert	4924.000	AV	33.0	31.0	4.2	34.9	33.3	53.9	20.6	
Vert	7386.000	AV	33.3	35.8	5.1	34.9	39.3	53.9	14.6	
Vert	9848.000	AV	33.0	38.6	5.9	35.4	42.1	53.9	11.8	

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).

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	96.0	26.7	2.4	35.7	89.4	-	-	Carrier
Hori	2400.000	PK	50.9	26.8	2.4	35.7	44.4	69.4	25.0	
Vert	2462.000	PK	93.8	26.7	2.4	35.7	87.2	-	-	Carrier
Vert	2400.000	PK	54.8	26.8	2.4	35.7	48.3	67.2	18.9	

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

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Radiated Spurious Emission
Maximum Cable Antenna

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber
Report No. : 10054421H
Date : 09/02/2013
Temperature/ Humidity : 20 deg. C / 62% RH
Engineer : Yutaka Yoshida
(1-26.5GHz)
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	2390.000	PK	64.7	26.8	2.4	35.7	58.2	73.9	15.7	
Hori	2800.000	PK	53.9	27.3	2.6	35.4	48.4	73.9	25.5	
Hori	4824.000	PK	45.1	30.7	4.2	34.9	45.1	73.9	28.8	
Hori	7236.000	PK	45.4	35.6	5.0	34.9	51.1	73.9	22.8	
Hori	9648.000	PK	44.6	38.2	5.8	35.4	53.2	73.9	20.7	
Hori	2390.000	AV	49.6	26.8	2.4	35.7	43.1	53.9	10.8	
Hori	2800.000	AV	46.8	27.3	2.6	35.4	41.3	53.9	12.6	
Hori	4824.000	AV	33.7	30.7	4.2	34.9	33.7	53.9	20.2	
Hori	7236.000	AV	33.5	35.6	5.0	34.9	39.2	53.9	14.7	
Hori	9648.000	AV	33.4	38.2	5.8	35.4	42.0	53.9	11.9	
Vert	2390.000	PK	60.1	26.8	2.4	35.7	53.6	73.9	20.3	
Vert	2800.000	PK	51.5	27.3	2.6	35.4	46.0	73.9	27.9	
Vert	4824.000	PK	47.9	30.7	4.2	34.9	47.9	73.9	26.0	
Vert	7236.000	PK	45.6	35.6	5.0	34.9	51.3	73.9	22.6	
Vert	9648.000	PK	44.9	38.2	5.8	35.4	53.5	73.9	20.4	
Vert	2390.000	AV	44.7	26.8	2.4	35.7	38.2	53.9	15.7	
Vert	2800.000	AV	43.6	27.3	2.6	35.4	38.1	53.9	15.8	
Vert	4824.000	AV	33.8	30.7	4.2	34.9	33.8	53.9	20.1	
Vert	7236.000	AV	33.5	35.6	5.0	34.9	39.2	53.9	14.7	
Vert	9648.000	AV	33.4	38.2	5.8	35.4	42.0	53.9	11.9	

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).

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	94.0	26.8	2.4	35.7	87.5	-	-	Carrier
Hori	2400.000	PK	66.4	26.8	2.4	35.7	59.9	67.5	7.6	
Vert	2412.000	PK	89.7	26.8	2.4	35.7	83.2	-	-	Carrier
Vert	2400.000	PK	61.1	26.8	2.4	35.7	54.6	63.2	8.6	

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

Radiated Spurious Emission
Maximum Cable Antenna

Test place Head Office EMC Lab. No.2 and 4 Semi Anechoic Chamber
Report No. 10054421H
Date 09/02/2013 10/21/2013
Temperature/ Humidity 20 deg. C / 62% RH 23 deg. C / 67% RH
Engineer Yutaka Yoshida Katsunori Okai
(1-26.5GHz) (Below 1GHz)
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	45.185	QP	27.3	12.7	6.9	28.5	18.4	40.0	21.6	
Hori	48.831	QP	26.0	11.3	7.0	28.5	15.8	40.0	24.2	
Hori	151.575	QP	22.6	14.9	7.9	28.2	17.2	43.5	26.3	
Hori	240.283	QP	22.9	17.0	8.4	27.7	20.6	46.0	25.4	
Hori	399.997	QP	25.3	17.3	9.3	28.3	23.6	46.0	22.4	
Hori	638.042	QP	42.4	19.8	10.4	28.8	43.8	46.0	2.2	
Hori	2800.000	PK	54.3	27.3	2.6	35.4	48.8	73.9	25.1	
Hori	4874.000	PK	45.9	30.8	4.2	34.9	46.0	73.9	27.9	
Hori	7311.000	PK	44.2	35.7	5.0	34.9	50.0	73.9	23.9	
Hori	9748.000	PK	43.8	38.4	5.8	35.4	52.6	73.9	21.3	
Hori	2800.000	AV	47.1	27.3	2.6	35.4	41.6	53.9	12.3	
Hori	4874.000	AV	34.1	30.8	4.2	34.9	34.2	53.9	19.7	
Hori	7311.000	AV	33.3	35.7	5.0	34.9	39.1	53.9	14.8	
Hori	9748.000	AV	33.1	38.4	5.8	35.4	41.9	53.9	12.0	
Vert	45.183	QP	40.6	12.7	6.9	28.5	31.7	40.0	8.3	
Vert	48.829	QP	39.6	11.3	7.0	28.5	29.4	40.0	10.6	
Vert	151.578	QP	26.2	14.9	7.9	28.2	20.8	43.5	22.7	
Vert	240.282	QP	21.8	17.0	8.4	27.7	19.5	46.0	26.5	
Vert	399.998	QP	22.5	17.3	9.3	28.3	20.8	46.0	25.2	
Vert	638.433	QP	34.2	19.8	10.4	28.8	35.6	46.0	10.4	
Vert	2800.000	PK	51.8	27.3	2.6	35.4	46.3	73.9	27.6	
Vert	4874.000	PK	45.4	30.8	4.2	34.9	45.5	73.9	28.4	
Vert	7311.000	PK	44.1	35.7	5.0	34.9	49.9	73.9	24.0	
Vert	9748.000	PK	44.1	38.4	5.8	35.4	52.9	73.9	21.0	
Vert	2800.000	AV	43.7	27.3	2.6	35.4	38.2	53.9	15.7	
Vert	4874.000	AV	33.5	30.8	4.2	34.9	33.6	53.9	20.3	
Vert	7311.000	AV	33.5	35.7	5.0	34.9	39.3	53.9	14.6	
Vert	9748.000	AV	33.1	38.4	5.8	35.4	41.9	53.9	12.0	

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).

Radiated Spurious Emission
Maximum Cable Antenna

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 10054421H
Date : 09/02/2013
Temperature/ Humidity : 20 deg. C / 62% RH
Engineer : Yutaka Yoshida
(1-26.5GHz)
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	63.3	26.7	2.4	35.7	56.7	73.9	17.2	
Hori	2800.000	PK	53.8	27.3	2.6	35.4	48.3	73.9	25.6	
Hori	4924.000	PK	44.0	31.0	4.2	34.9	44.3	73.9	29.6	
Hori	7386.000	PK	44.2	35.8	5.1	34.9	50.2	73.9	23.7	
Hori	9848.000	PK	44.1	38.6	5.9	35.4	53.2	73.9	20.7	
Hori	2483.500	AV	46.0	26.7	2.4	35.7	39.4	53.9	14.5	
Hori	2800.000	AV	47.0	27.3	2.6	35.4	41.5	53.9	12.4	
Hori	4924.000	AV	32.7	31.0	4.2	34.9	33.0	53.9	20.9	
Hori	7386.000	AV	33.4	35.8	5.1	34.9	39.4	53.9	14.5	
Hori	9848.000	AV	33.1	38.6	5.9	35.4	42.2	53.9	11.7	
Vert	2483.500	PK	59.7	26.7	2.4	35.7	53.1	73.9	20.8	
Vert	2800.000	PK	51.6	27.3	2.6	35.4	46.1	73.9	27.8	
Vert	4924.000	PK	44.3	31.0	4.2	34.9	44.6	73.9	29.3	
Vert	7386.000	PK	44.6	35.8	5.1	34.9	50.6	73.9	23.3	
Vert	9848.000	PK	44.2	38.6	5.9	35.4	53.3	73.9	20.6	
Vert	2483.500	AV	43.1	26.7	2.4	35.7	36.5	53.9	17.4	
Vert	2800.000	AV	43.5	27.3	2.6	35.4	38.0	53.9	15.9	
Vert	4924.000	AV	32.8	31.0	4.2	34.9	33.1	53.9	20.8	
Vert	7386.000	AV	33.4	35.8	5.1	34.9	39.4	53.9	14.5	
Vert	9848.000	AV	33.1	38.6	5.9	35.4	42.2	53.9	11.7	

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).

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	92.1	26.7	2.4	35.7	85.5	-	-	Carrier
Hori	2400.000	PK	49.2	26.8	2.4	35.7	42.7	65.5	22.8	
Vert	2462.000	PK	88.6	26.7	2.4	35.7	82.0	-	-	Carrier
Vert	2400.000	PK	51.1	26.8	2.4	35.7	44.6	62.0	17.4	

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

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Radiated Spurious Emission
Maximum Cable Antenna

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber
Report No. : 10054421H
Date : 09/03/2013
Temperature/ Humidity : 20 deg. C / 60% RH
Engineer : Yutaka Yoshida
(Band Edge)
Mode : 11n-20 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	2390.000	PK	66.0	26.8	2.4	35.7	59.5	73.9	14.4	
Hori	2390.000	AV	50.6	26.8	2.4	35.7	44.1	53.9	9.8	
Vert	2390.000	PK	64.7	26.8	2.4	35.7	58.2	73.9	15.7	
Vert	2390.000	AV	48.5	26.8	2.4	35.7	42.0	53.9	11.9	

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

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	92.4	26.8	2.4	35.7	85.9	-	-	Carrier
Hori	2400.000	PK	63.5	26.8	2.4	35.7	57.0	65.9	8.9	
Vert	2412.000	PK	91.7	26.8	2.4	35.7	85.2	-	-	Carrier
Vert	2400.000	PK	62.5	26.8	2.4	35.7	56.0	65.2	9.2	

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

UL Japan, Inc.

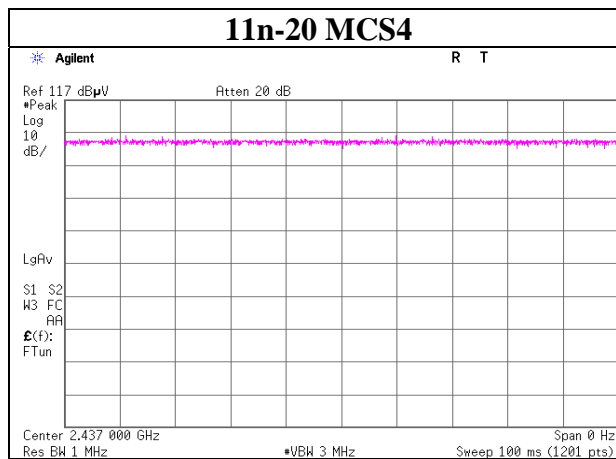
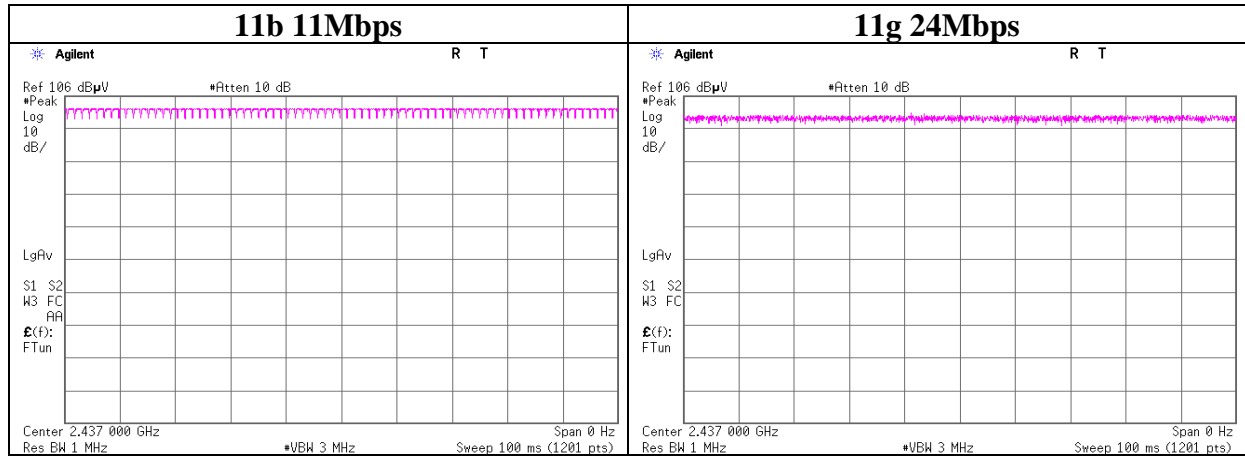
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Burst rate confirmation



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	2013/02/28 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2013/02/26 * 12
MJM-09	Measure	KDS	E19-55	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2013/02/22 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2013/08/12 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1204S062(5m)	RE	2013/05/28 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2013/03/12 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2013/05/30 * 12
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE/CE	2013/06/30 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE/CE	2013/02/26 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE/CE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2013/02/22 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2013/02/15 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2013/01/10 * 12
MCC-132	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336161/4(1m) / 340639(5m)	RE	2012/09/05 * 12 *1)
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE(MW)	2013/02/15 * 12
MRENT-112	Spectrum Analyzer	Agilent	E4440A	MY48250080	CE	2013/10/04 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	CE	2013/06/11 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE	2013/01/07 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D- 2W(5m)/5D- 2W(0.8m)/5D- 2W(1m)	-	CE	2013/02/06 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2013/01/09 * 12

***1) This test equipment was used for the tests before the expiration date of the calibration.**

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: CE: Conducted Emission
RE: Radiated Emission**

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