RADIO TEST REPORT

Test Report No. : 10219901H-B-R1

Applicant	:	**silex technology, Inc.**
Type of Equipment	:	**Wireless LAN PCI Express Mini Card Module**
Model No.	:	**SX-PCEAN**
FCC ID	:	**N6C-SXPCEAN**
Test regulation	:	**FCC Part 15 Subpart E: 2014 (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 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.
6. This report is a revised version of 10219901H-B. 10219901H-B is replaced with this report.

Date of test: April 6 to 12, 2014

Representative test engineer:
Kazuya Yoshioka
Engineer
Consumer Technology Division

Approved by:
Takahiro Hatakeda
Leader
Consumer Technology Division

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

UL Japan, Inc.
Ise EMC Lab.
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REVISION HISTORY

Original Test Report No.: 10219901H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10219901H-B	April 25, 2014	-	-
1	10219901H-B-R1	July 24, 2014	P.6	Version update of FCC Part 15E
1	10219901H-B-R1	July 24, 2014	P.9	Correction of word from “tested antenna” to “tested antenna port”

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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	:	Wireless LAN PCI Express Mini Card Module
Model No.	:	SX-PCEAN
Serial No.	:	Refer to Clause 4.2
Rating	:	DC3.3V
Receipt Date of Sample	:	April 5, 2014
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-PCEAN (referred to as the EUT in this report) is the Wireless LAN PCI Express Mini Card Module.

General Specification

Clock frequency(ies) in the system : 40MHz

Radio Specification

Radio Type : Transceiver
Method of Frequency Generation : Synthesizer
Power Supply (inner) : DC1.2V
Antenna Gain : 2.6dBi@2.4GHz Band, 3.3dBi@5GHz Band

	IEEE802.11b	IEEE802.11g	IEEE802.11a	IEEE802.11n (20 M band)	IEEE802.11n (40 M band)
Frequency of operation	2412-2462MHz	2412-2462MHz	5180-5320MHz *1) 5745-5825MHz	2412-2462MHz 5180-5320MHz *1) 5745-5825MHz	2422-2452MHz 5190-5310MHz *1) 5755-5795MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)		
Channel spacing	5MHz		20MHz	2.4GHz band 5MHz 5GHz band 20MHz	2.4GHz band 5MHz 5GHz band 40MHz
Antenna type	Printed PCB Antenna				
Antenna Connector type	U.FL Alternative connector				

*1) These bands(5180 - 5320MHz and 5190-5310MHz) are applied for this report.
Other bands are applied for other test report. (Test Report No.: 10219901H-A)

<Contents of the change from original model>
Test Report Number of original model is 31JE0038-HO-01-B.
Specification was changed from the original model as follows:
*Antenna of the EUT was added. The radio specification is identical to the original.
Therefore Conducted emission and Radiated spurious emission tests were only performed.
Additionally, only the information of added antenna is described in this report.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart E: 2014, final revised on May 1, 2014 and effective June 2, 2014
Title	:	FCC 47CFR Part15 Radio Frequency Device Subpart E Unlicensed National Information Infrastructure Devices Section 15.407 General technical requirements

* The revision on May 1, 2014 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	**FCC:** 15.407(b)(6) / 15.207	**QP** 15.0dB, 0.20120MHz, L **AV** 17.3dB, 0.20120MHz, L	Complied	-
	IC: RSS-Gen 7.2.4	**IC:** RSS-Gen 7.2.4			
Spurious Emission Restricted Band Edge	**FCC:** ANSI C63.4:2003 FCC KDB 789033 D01 v01r03	**FCC :** 15.407(b), 15.205 and 15.209	0.7dB 5150.000MHz, PK, Hori.	Complied	Radiated
	IC: -	**IC:** RSS-210 A.9.2(1)(2)(3)			
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.					

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.

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.

3.5 Test Location

UL Japan, Inc. Ise HQ EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999 Facsimile : +81 596 24 8124

	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	4.8 x 4.6m	-

* 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 Modes

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.

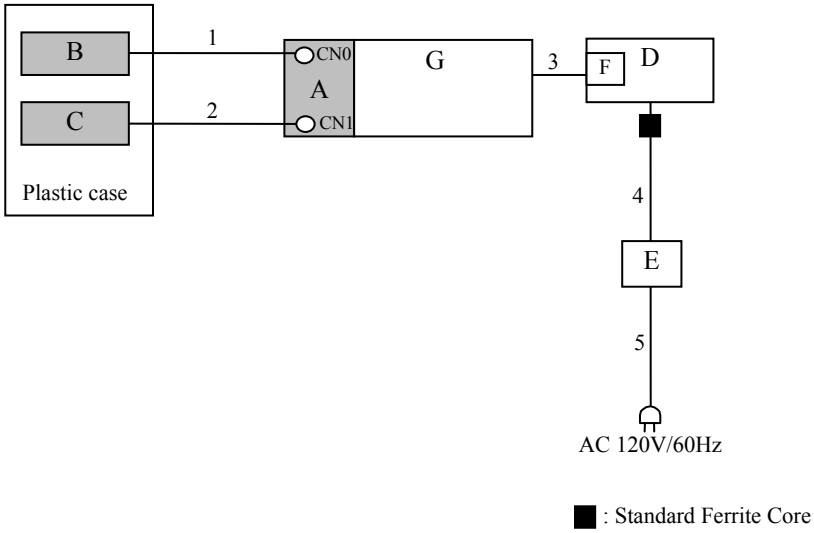
Mode	Remarks*
IEEE 802.11n MIMO 20MHz BW (11n-20): 5GHz	MCS 8, PN9
IEEE 802.11n MIMO 40MHz BW (11n-40): 5GHz	MCS 8, PN9
*Transmitting duty was 100% on all tests. *The worst condition was determined based on the test result of Maximum Conducted Output Power (Mid Channel). Please refer to original test report 31JE0038-HO-01-B issued by UL Japan, Inc..	
*EUT has the power settings by the software as follows; Power settings: 11n-20 5GHz (MCS8): 11.0dBm(5180 to 5320MHz) 11n-40 5GHz (MCS8): 10.0dBm(5190 and 5310MHz), 11.0dBm(5230 and 5270MHz) Software: Atheros Radio Test (ART) - Revision 0.9 BUILD #27 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.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested Antenna port	Tested Frequency	
			Low Band	Middle Band
Conducted emission, Spurious Emission (Radiated)(Below 1GHz)	11n-40 Tx *1)	0+1	5230MHz	-
Spurious Emission (Radiated)(Above 1GHz)	11n-20 Tx *2)	0+1	5180MHz 5240MHz	5260MHz 5320MHz
	11n-40 Tx	0+1	5190MHz 5230MHz	5270MHz 5310MHz

*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.
*2) Since 11a and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power.

4.2 Configuration and peripherals



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.
* No difference was confirmed with and without a standard ferrite core in Conducted emission test.
* The typical plastic case was used for this test in order to ensure the capability of PCB antenna.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Wireless LAN PCI Express Mini Card Module	SX-PCEAN	008092 4DC308	silex technology, Inc.	EUT
B	Antenna	AA222	001	Unictron	EUT
C	Antenna	AA222	002	Unictron	EUT
D	Laptop PC	T61	L3R2056	Lenovo	-
E	AC Adaptor	92P1160	11S92P1160Z1ZBGH6B6DKV	Lenovo	-
F	Express Card Adaptor	-	-	B plus	-
G	Jig	-	200023176	B plus	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	0.1	Shielded	Shielded	-
2	Antenna Cable	0.1	Shielded	Shielded	-
3	MiniPCI Cable	0.3	Shielded	Shielded	-
4	DC Cable	1.8	Unshielded	Unshielded	-
5	AC Cable	1.0	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure

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 cable and AC 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 or a Measurement Room.
The EUT was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

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

SECTION 6: Radiated Spurious Emission and Band Edge Compliance

Test Procedure

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 made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
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.

Below 1GHz
The result also satisfied with the general limits specified in section 15.209(a).

Above 1GHz

Inside of restricted bands(Section 15.205):	Apply to limit in the Section 15.209(a).
Outside of the restricted bands:	Apply to limit 68.2dBuV/m(–27dBm e.i.r.p.*) in the Section 15.407(b)(1)(2)(3).

*Electric Field Strength to e.i.r.p. Conversion

$$E = \frac{1000000\sqrt{30P}}{3} \text{ (uV/m)} \qquad \text{:P is the e.i.r.p. (Watts)}$$

Test Antennas are used as below;

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

Frequency	Below 1GHz	Above 1GHz	
Instrument used	Test Receiver	Spectrum Analyzer	
Detector	QP	PK	AV
IF Bandwidth	BW 120kHz(T/R)	RBW: 1MHz VBW: 3MHz	Method VB *1) RBW: 1MHz When duty cycle ≥ 98 percent (or duty cycle < 98 percent when a video trigger with the trigger level set to enable triggering only on full power pulse is used), VBW was set at 10Hz. Average-VBW type: Voltage
Test Distance	3m	3m (below 10GHz), 1m*2) (above 10GHz) 0.5m*3) (above 26.5GHz)	

*1) The test method was also referred to KDB 789033 D01 UNII General Test Procedures v01r03 "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E(Issued on April 8, 2013)".
*2) Distance Factor: 20 x log (3.0m/1.0m) = 9.5dB
*3) Distance Factor: 20 x log (3.0m/0.5m) = 15.6dB

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT (Antenna and Module) 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-40GHz
Test data : APPENDIX
Test result : Pass

APPENDIX 1: Data of EMI test

Conducted Emission

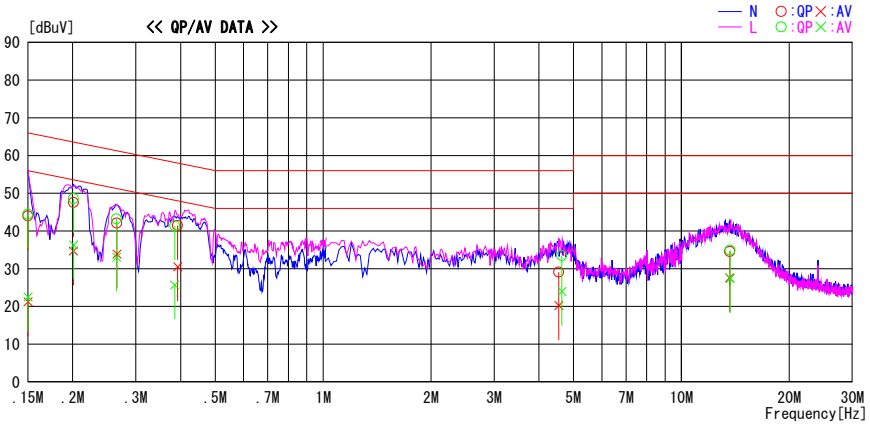
DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2014/04/12

Report No. : 10219901H
Temp./Humi. : 23deg. C / 39% RH
Engineer : Kazuya Yoshioka

Mode / Remarks : WLAN Tx 11n40 MCS8 5230MHz

LIMIT : FCC15.207 QP
FCC15.207 AV



Frequency	Reading Level		Corr.	Results		Limit		Margin		Phase	Comment
	QP	AV	Factor	QP	AV	QP	AV	QP	AV		
[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
0.15000	30.8	8.0	13.2	44.0	21.2	66.0	56.0	22.0	34.8	N	
0.20096	34.4	21.5	13.2	47.6	34.7	63.6	53.6	16.0	18.9	N	
0.26573	28.9	20.7	13.2	42.1	33.9	61.3	51.3	19.2	17.4	N	
0.39270	28.3	17.3	13.2	41.5	30.5	58.0	48.0	16.5	17.5	N	
4.54640	15.2	6.3	13.9	29.1	20.2	56.0	46.0	26.9	25.8	N	
13.63070	19.8	12.8	14.8	34.6	27.6	60.0	50.0	25.4	22.4	N	
0.15000	31.3	9.3	13.2	44.5	22.5	66.0	56.0	21.5	33.5	L	
0.20120	35.4	23.1	13.2	48.6	36.3	63.6	53.6	15.0	17.3	L	
0.26500	30.0	19.9	13.2	43.2	33.1	61.3	51.3	18.1	18.2	L	
0.38540	28.2	12.5	13.2	41.4	25.7	58.2	48.2	16.8	22.5	L	
4.63857	19.6	10.1	13.9	33.5	24.0	56.0	46.0	22.5	22.0	L	
13.67920	20.1	12.6	14.8	34.9	27.4	60.0	50.0	25.1	22.6	L	

CHART:WITH FACTOR,Peak hold data. CALCULATION:RESULT=READING+C.F(LISN LOSS+ATT LOSS +CABLE LOSS)
Except for the above table : adequate margin data below the limits.

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Anechoic Chamber	
Report No.	10219901H	
Date	04/09/2014	04/10/2014
Temperature/ Humidity	21deg. C / 47% RH	22 deg. C / 38% RH
Engineer	Tomohisa Nakagawa (1-26.5GHz)	Tomohisa Nakagawa (26.5-40 GHz)
Mode	11n-20(MIMO) Tx 5180MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	2492.811	PK	70.4	26.9	2.5	34.7	65.1	73.9	8.8	Inside	
Hori	5150.000	PK	58.3	32.2	3.8	33.9	60.4	68.2	7.8	Bandedge	
Hori	6906.608	PK	47.9	35.4	4.4	33.7	54.0	68.2	14.2	Outside	
Hori	10360.000	PK	48.0	39.1	-2.5	34.2	50.4	68.2	17.8	Outside	
Hori	15540.000	PK	45.8	39.7	-0.8	33.1	51.6	73.9	22.3	Inside	
Hori	2492.811	AV	51.6	26.9	2.5	34.7	46.3	53.9	7.6	Inside	
Hori	5150.000	AV	39.8	32.2	3.8	33.9	41.9	53.9	12.0	Bandedge	
Hori	15540.000	AV	32.5	39.7	-0.8	33.1	38.3	53.9	15.6	Inside	
Vert	2492.811	PK	63.8	26.9	2.5	34.7	58.5	73.9	15.4	Inside	
Vert	5150.000	PK	59.0	32.2	3.8	33.9	61.1	68.2	7.1	Bandedge	
Vert	6906.608	PK	48.6	35.4	4.4	33.7	54.7	68.2	13.5	Outside	
Vert	10360.000	PK	51.3	39.1	-2.5	34.2	53.7	68.2	14.5	Outside	
Vert	15540.000	PK	51.8	39.7	-0.8	33.1	57.6	73.9	16.3	Inside	
Vert	2492.811	AV	46.0	26.9	2.5	34.7	40.7	53.9	13.2	Inside	
Vert	5150.000	AV	41.7	32.2	3.8	33.9	43.8	53.9	10.1	Bandedge	
Vert	15540.000	AV	36.3	39.7	-0.8	33.1	42.1	53.9	11.8	Inside	

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Anechoic Chamber	
Report No.	10219901H	
Date	04/09/2014	04/10/2014
Temperature/ Humidity	21deg. C / 47% RH	22 deg. C / 38% RH
Engineer	Tomohisa Nakagawa (1-26.5 GHz)	Tomohisa Nakagawa (26.5-40 GHz)
Mode	11n-20(MIMO) Tx 5240MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	2492.811	PK	69.3	26.9	2.5	34.7	64.0	73.9	9.9	Inside	
Hori	6987.626	PK	45.8	35.6	4.4	33.7	52.1	68.2	16.1	Outside	
Hori	10480.000	PK	45.2	39.2	-2.3	34.1	48.0	68.2	20.2	Outside	
Hori	15720.000	PK	47.2	39.1	-0.7	33.2	52.4	73.9	21.5	Inside	
Hori	2492.811	AV	50.7	26.9	2.5	34.7	45.4	53.9	8.5	Inside	
Hori	15720.000	AV	33.5	39.1	-0.7	33.2	38.7	53.9	15.2	Inside	
Vert	2492.811	PK	63.8	26.9	2.5	34.7	58.5	73.9	15.4	Inside	
Vert	6987.626	PK	43.8	35.6	4.4	33.7	50.1	68.2	18.1	Outside	
Vert	10480.000	PK	48.1	39.2	-2.3	34.1	50.9	68.2	17.3	Outside	
Vert	15720.000	PK	49.7	39.1	-0.7	33.2	54.9	73.9	19.0	Inside	
Vert	2492.811	AV	46.1	26.9	2.5	34.7	40.8	53.9	13.1	Inside	
Vert	15720.000	AV	35.0	39.1	-0.7	33.2	40.2	53.9	13.7	Inside	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amprifier)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Anechoic Chamber	
Report No.	10219901H	
Date	04/09/2014	04/10/2014
Temperature/ Humidity	21deg. C / 47% RH	22 deg. C / 38% RH
Engineer	Tomohisa Nakagawa (1-26.5 GHz)	Tomohisa Nakagawa (26.5-40 GHz)
Mode	11n-20(MIMO) Tx 5260MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	2492.811	PK	69.9	26.9	2.5	34.7	64.6	73.9	9.3	Inside	
Hori	7026.000	PK	44.7	35.7	4.4	33.7	51.1	68.2	17.1	Outside	
Hori	10520.000	PK	45.4	39.2	-2.3	34.1	48.2	68.2	20.0	Outside	
Hori	15780.000	PK	45.6	38.9	-0.8	33.3	50.4	73.9	23.5	Inside	
Hori	2492.811	AV	52.1	26.9	2.5	34.7	46.8	53.9	7.1	Inside	
Hori	15780.000	AV	33.2	38.9	-0.8	33.3	38.0	53.9	15.9	Inside	
Vert	2492.811	PK	64.1	26.9	2.5	34.7	58.8	73.9	15.1	Inside	
Vert	7026.000	PK	43.1	35.7	4.4	33.7	49.5	68.2	18.7	Outside	
Vert	10520.000	PK	47.9	39.2	-2.3	34.1	50.7	68.2	17.5	Outside	
Vert	15780.000	PK	53.7	38.9	-0.8	33.3	58.5	73.9	15.4	Inside	
Vert	2492.811	AV	45.5	26.9	2.5	34.7	40.2	53.9	13.7	Inside	
Vert	15780.000	AV	37.8	38.9	-0.8	33.3	42.6	53.9	11.3	Inside	

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

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

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Anechoic Chamber	
Report No.	10219901H	
Date	04/09/2014	04/10/2014
Temperature/ Humidity	21deg. C / 47% RH	22 deg. C / 38% RH
Engineer	Tomohisa Nakagawa	Tomohisa Nakagawa
	(1-26.5 GHz)	(26.5-40 GHz)
Mode	11n-20(MIMO) Tx 5320MHz	

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	2492.811	PK	69.9	26.9	2.5	34.7	64.6	73.9	9.3	Inside	
Hori	5350.000	PK	59.6	32.2	3.8	33.7	61.9	68.2	6.3	Bandedge	
Hori	10640.000	PK	45.5	39.3	-2.3	34.0	48.5	73.9	25.4	Inside	
Hori	15960.000	PK	46.7	38.4	-0.7	33.3	51.1	73.9	22.8	Inside	
Hori	2492.811	AV	52.0	26.9	2.5	34.7	46.7	53.9	7.2	Inside	
Hori	5350.000	AV	41.4	32.2	3.8	33.7	43.7	53.9	10.2	Bandedge	
Hori	10640.000	AV	31.2	39.3	-2.3	34.0	34.2	53.9	19.7	Inside	
Hori	15960.000	AV	33.1	38.4	-0.7	33.3	37.5	53.9	16.4	Inside	
Vert	2492.811	PK	64.1	26.9	2.5	34.7	58.8	73.9	15.1	Inside	
Vert	5350.000	PK	57.3	32.2	3.8	33.7	59.6	68.2	8.6	Bandedge	
Vert	10640.000	PK	48.6	39.3	-2.3	34.0	51.6	73.9	22.3	Inside	
Vert	15960.000	PK	51.8	38.4	-0.7	33.3	56.2	73.9	17.7	Inside	
Vert	2492.811	AV	46.1	26.9	2.5	34.7	40.8	53.9	13.1	Inside	
Vert	5350.000	AV	38.6	32.2	3.8	33.7	40.9	53.9	13.0	Bandedge	
Vert	10640.000	AV	33.4	39.3	-2.3	34.0	36.4	53.9	17.5	Inside	
Vert	15960.000	AV	37.3	38.4	-0.7	33.3	41.7	53.9	12.2	Inside	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amprifier)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	10219901H		
Date	04/09/2014	04/09/2014	04/10/2014
Temperature/ Humidity	23 deg. C / 36% RH	21deg. C / 47% RH	22 deg. C / 38% RH
Engineer	Kazuya Yoshioka (1-10GHz)	Tomohisa Nakagawa (10-26.5GHz)	Tomohisa Nakagawa (26.5-40 GHz)
Mode	11n-40(MIMO) Tx 5190MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	2498.725	PK	70.2	26.9	2.5	34.7	64.9	73.9	9.0	Inside	
Hori	5150.000	PK	65.4	32.2	3.8	33.9	67.5	68.2	0.7	Bandedge	
Hori	6920.067	PK	48.8	35.4	4.4	33.7	54.9	68.2	13.3	Outside	
Hori	10380.000	PK	45.0	39.1	-2.5	34.2	47.4	68.2	20.8	Outside	
Hori	15570.000	PK	46.3	39.6	-0.8	33.2	51.9	73.9	22.0	Inside	
Hori	2498.725	AV	52.2	26.9	2.5	34.7	46.9	53.9	7.0	Inside	
Hori	5150.000	AV	49.8	32.2	3.8	33.9	51.9	53.9	2.0	Bandedge	
Hori	15570.000	AV	32.5	39.6	-0.8	33.2	38.1	53.9	15.8	Inside	
Vert	2498.450	PK	67.3	26.9	2.5	34.7	62.0	73.9	11.9	Inside	
Vert	5150.000	PK	61.3	32.2	3.8	33.9	63.4	68.2	4.8	Bandedge	
Vert	6920.083	PK	49.0	35.4	4.4	33.7	55.1	68.2	13.1	Outside	
Vert	10380.000	PK	50.1	39.1	-2.5	34.2	52.5	68.2	15.7	Outside	
Vert	15570.000	PK	47.5	39.6	-0.8	33.2	53.1	73.9	20.8	Inside	
Vert	2498.450	AV	49.0	26.9	2.5	34.7	43.7	53.9	10.2	Inside	
Vert	5150.000	AV	47.8	32.2	3.8	33.9	49.9	53.9	4.0	Bandedge	
Vert	15570.000	AV	34.2	39.6	-0.8	33.2	39.8	53.9	14.1	Inside	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amprifier)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 and No.4 Semi Anechoic Chamber			
Report No.	10219901H			
Date	04/09/2014	04/09/2014	04/10/2014	04/10/2014
Temperature/ Humidity	23 deg. C / 36% RH	21deg. C / 47% RH	23deg. C / 32% RH	22 deg. C / 38% RH
Engineer	Kazuya Yoshioka (1-10GHz)	Tomohisa Nakagawa (10-26.5GHz)	Tsubasa Takayama (Below 1GHz)	Tomohisa Nakagawa (26.5-40 GHz)
Mode	11n-40(MIMO) Tx 5230MHz			

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	99.741	QP	51.2	10.2	8.1	32.1	37.4	43.5	6.1	Outside	
Hori	120.000	QP	36.7	13.0	8.3	32.1	25.9	43.5	17.6	Inside	
Hori	199.882	QP	37.2	16.5	9.1	32.0	30.8	43.5	12.7	Outside	
Hori	298.927	QP	39.2	19.7	9.9	31.9	36.9	46.0	9.1	Outside	
Hori	398.512	QP	41.0	17.5	10.6	31.9	37.2	46.0	8.8	Outside	
Hori	497.812	QP	34.6	19.2	11.2	32.0	33.0	46.0	13.0	Outside	
Hori	698.031	QP	34.4	22.2	12.3	32.3	36.6	46.0	9.4	Outside	
Hori	925.666	QP	31.6	24.8	13.4	31.1	38.7	46.0	7.3	Outside	
Hori	2498.000	PK	67.4	26.9	2.5	34.7	62.1	73.9	11.8	Inside	
Hori	6973.597	PK	45.8	35.6	4.4	33.7	52.1	68.2	16.1	Outside	
Hori	10460.000	PK	45.8	39.2	-2.3	34.1	48.6	68.2	19.6	Outside	
Hori	15690.000	PK	46.6	39.2	-0.7	33.2	51.9	73.9	22.0	Inside	
Hori	2498.000	AV	49.4	26.9	2.5	34.7	44.1	53.9	9.8	Inside	
Hori	15690.000	AV	32.9	39.2	-0.7	33.2	38.2	53.9	15.7	Inside	
Vert	99.741	QP	47.4	10.2	8.1	32.1	33.6	43.5	9.9	Outside	
Vert	120.000	QP	35.2	13.0	8.3	32.1	24.4	43.5	19.1	Inside	
Vert	199.882	QP	30.9	16.5	9.1	32.0	24.5	43.5	19.0	Outside	
Vert	298.927	QP	37.3	19.7	9.9	31.9	35.0	46.0	11.0	Outside	
Vert	398.512	QP	35.6	17.5	10.6	31.9	31.8	46.0	14.2	Outside	
Vert	497.812	QP	33.6	19.2	11.2	32.0	32.0	46.0	14.0	Outside	
Vert	698.031	QP	31.2	22.2	12.3	32.3	33.4	46.0	12.6	Outside	
Vert	925.666	QP	31.0	24.8	13.4	31.1	38.1	46.0	7.9	Outside	
Vert	2488.667	PK	64.2	26.9	2.5	34.7	58.9	73.9	15.0	Inside	
Vert	6973.427	PK	46.2	35.6	4.4	33.7	52.5	68.2	15.7	Outside	
Vert	10460.000	PK	51.1	39.2	-2.3	34.1	53.9	68.2	14.3	Outside	
Vert	15690.000	PK	50.5	39.2	-0.7	33.2	55.8	73.9	18.1	Inside	
Vert	2488.667	AV	46.8	26.9	2.5	34.7	41.5	53.9	12.4	Inside	
Vert	15690.000	AV	35.0	39.2	-0.7	33.2	40.3	53.9	13.6	Inside	

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

*Other frequency noises omitted in this report were not seen or have 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
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	10219901H		
Date	04/09/2014	04/09/2014	04/10/2014
Temperature/ Humidity	23 deg. C / 36% RH	21deg. C / 47% RH	22 deg. C / 38% RH
Engineer	Kazuya Yoshioka (1-10GHz)	Tomohisa Nakagawa (10-26.5GHz)	Tomohisa Nakagawa (26.5-40 GHz)
Mode	11n-40(MIMO) Tx 5270MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	2495.100	PK	68.6	26.9	2.5	34.7	63.3	73.9	10.6	Inside	
Hori	7027.085	PK	45.2	35.7	4.4	33.7	51.6	68.2	16.6	Outside	
Hori	10540.000	PK	45.3	39.2	-2.3	34.1	48.1	68.2	20.1	Outside	
Hori	15810.000	PK	46.5	38.9	-0.8	33.3	51.3	73.9	22.6	Inside	
Hori	2495.100	AV	50.8	26.9	2.5	34.7	45.5	53.9	8.4	Inside	
Hori	15810.000	AV	33.1	38.9	-0.8	33.3	37.9	53.9	16.0	Inside	
Vert	2492.433	PK	64.1	26.9	2.5	34.7	58.8	73.9	15.1	Inside	
Vert	7026.715	PK	45.1	35.7	4.4	33.7	51.5	68.2	16.7	Outside	
Vert	10540.000	PK	44.5	39.2	-2.3	34.1	47.3	68.2	20.9	Outside	
Vert	15810.000	PK	50.2	38.9	-0.8	33.3	55.0	73.9	18.9	Inside	
Vert	2492.433	AV	46.5	26.9	2.5	34.7	41.2	53.9	12.7	Inside	
Vert	15810.000	AV	36.1	38.9	-0.8	33.3	40.9	53.9	13.0	Inside	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amprifier)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

Radiated Spurious Emission

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber		
Report No.	10219901H		
Date	04/09/2014	04/09/2014	04/10/2014
Temperature/ Humidity	23 deg. C / 36% RH	21deg. C / 47% RH	22 deg. C / 38% RH
Engineer	Kazuya Yoshioka (1-10GHz)	Tomohisa Nakagawa (10-26.5GHz)	Tomohisa Nakagawa (26.5-40 GHz)
Mode	11n-40(MIMO) Tx 5310MHz		

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Inside or Outside of Restricted Bands	Remark
Hori	2498.300	PK	68.4	26.9	2.5	34.7	63.1	73.9	10.8	Inside	
Hori	5350.000	PK	63.6	32.2	3.8	33.7	65.9	68.2	2.3	Bandedge	
Hori	10620.000	PK	44.1	39.3	-2.3	34.0	47.1	73.9	26.8	Inside	
Hori	15930.000	PK	45.7	38.5	-0.8	33.3	50.1	73.9	23.8	Inside	
Hori	2498.300	AV	50.6	26.9	2.5	34.7	45.3	53.9	8.6	Inside	
Hori	5350.000	AV	49.7	32.2	3.8	33.7	52.0	53.9	1.9	Bandedge	
Hori	10620.000	AV	31.1	39.3	-2.3	34.0	34.1	53.9	19.8	Inside	
Hori	15930.000	AV	32.9	38.5	-0.8	33.3	37.3	53.9	16.6	Inside	
Vert	2498.850	PK	64.8	26.9	2.5	34.7	59.5	73.9	14.4	Inside	
Vert	5350.000	PK	61.8	32.2	3.8	33.7	64.1	68.2	4.1	Bandedge	
Vert	10620.000	PK	46.9	39.3	-2.3	34.0	49.9	73.9	24.0	Inside	
Vert	15930.000	PK	49.4	38.5	-0.8	33.3	53.8	73.9	20.1	Inside	
Vert	2498.850	AV	46.9	26.9	2.5	34.7	41.6	53.9	12.3	Inside	
Vert	5350.000	AV	46.9	32.2	3.8	33.7	49.2	53.9	4.7	Bandedge	
Vert	10620.000	AV	33.4	39.3	-2.3	34.0	36.4	53.9	17.5	Inside	
Vert	15930.000	AV	34.7	38.5	-0.8	33.3	39.1	53.9	14.8	Inside	

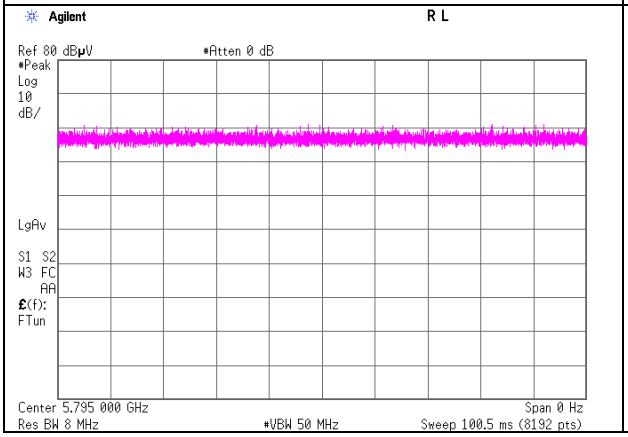
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 10GHz)) - Gain(Amprifier)
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

Distance factor: 10GHz-26.5GHz 20log(3.0m/1.0m)= 9.5dB
26.5GHz-40GHz 20log(3.0m/0.5m)=15.6dB

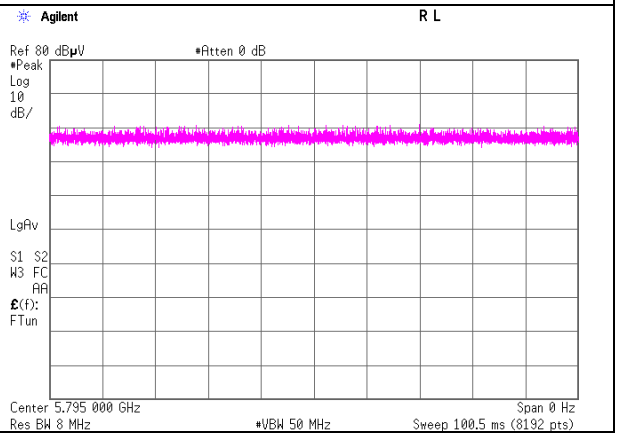
Duty Cycle

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Report No.	1021990H
Date	04/06/2014
Temperature/ Humidity	21 deg. C / 41% RH
Engineer	Tomohisa Nakagawa

11n-20 MCS 8



11n-40 MCS 8



APPENDIX 2: Test instruments

EMI test equipment (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
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	2014/02/20 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE/CE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE/CE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2014/02/20 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2014/02/21 * 12
MCC-166	Microwave Cable	Junkosha	MWX221	1303S120(1m) / 1311S167(5m)	RE	2013/11/27 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2014/01/21 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE	2014/02/21 * 12
MHF-16	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCA	7001	RE	2013/09/25 * 12
MCC-76	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278967/4	RE	2013/12/24 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2014/02/28 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2014/02/20 * 12
MJM-09	Measure	KDS	E19-55	-	RE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2014/04/08 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2013/11/12 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2013/11/24 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2013/11/24 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2013/06/18 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2013/11/26 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2014/03/14 * 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-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2014/03/11 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2013/06/30 * 12
MCC-79	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278923/4	RE	2013/12/24 * 12
MHF-23	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCC	603	RE	2014/01/16 * 12
MHA-04	Horn Antenna 26.5-40GHz	EMCO	3160-10	1140	RE	2013/11/25 * 12
MCC-140	Microwave Cable	Junkosha	J12J101596-00	JAN-31-12-001	RE	2014/02/21 * 12
MPA-03	Microwave System Power Amplifier	Agilent	83050A	3950M00205	RE	2013/06/20 * 12

EMI test equipment (2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	CE	2013/06/11 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE	2014/01/27 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	CE	2014/02/20 * 12
MAT-65	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2014/01/29 * 12
MRENT-116	Spectrum Analyzer	Agilent	E4440A	MY46187620	CE	2014/03/05 * 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: CE: Conducted Emission
RE: Radiated Emission