




# RADIO TEST REPORT


**Test Report No. : 31JE0038-HO-05-B-R1**

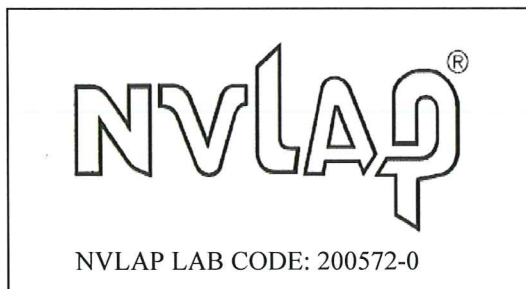
**Applicant** : silex technology, Inc.  
**Type of Equipment** : Wireless LAN PCI Express Mini Card Module  
**Model No.** : SX-PCEAN  
**FCC ID** : N6C-SXPCEAN  
**Test regulation** : **FCC Part 15 Subpart E: 2012**  
(Permissive Change Class II Application)  
\* Conducted emission and Radiated Spurious Emission tests 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 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 31JE0038-HO-05-B. 31JE0038-HO-05-B is replaced with this report.

**Date of test:** July 28 to August 9, 2012

**Representative test engineer:**   
Takumi Shimada  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**   
Takahiro Hatakeda  
Leader of WiSE Japan,  
UL Verification Service



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>

**REVISION HISTORY**

**Original Test Report No.: 31JE0038-HO-05-B**

Revision	Test report No.	Date	Page revised	Contents
- (Original)	31JE0038-HO-05-B	September 28, 2012	-	-
1	31JE0038-HO-05-B-R1	March 28, 2013	P. 6	Updated FCC version
1	31JE0038-HO-05-B-R1	March 28, 2013	P. 13	Corrected IF Bandwidth of AV on the table in Section 6
1	31JE0038-HO-05-B-R1	March 28, 2013	P. 15-20	Added test setting description such as VBW setting value

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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 : February 15, 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-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

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	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	Inverted-F Antenna (Omni-Directional)				
Antenna Gain: G <sub>ANT</sub>	1.27dBi@2.4GHz Band, 3.71dBi@5.25GHz Band, 3.94dBi@5.6GHz Band, 4.31dBi@5.85GHz Band				
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.: 31JE0038-HO-05-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 IEEE802.11a/b/g/n was changed and the EUT was changed from Master device to Client device.

Therefore only Conducted emission test and Radiated Spurious Emission test of 11a/b/g/n was performed in this report.

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart E: 2012, final revised on December 27, 2012 and effective January 28, 2013

Title : FCC 47CFR Part15 Radio Frequency Device Subpart E  
Unlicensed National Information Infrastructure Devices  
Section 15.407 General technical requirements

\* The revision on August 13, 2012 and December 27, 2012 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 19.5dB, 6.10433MHz, L	Complied	-
	IC: RSS-Gen 7.2.4	IC: RSS-Gen 7.2.4	AV 15.5dB, 6.10433MHz, L		
Spurious Emission Restricted Band Edge	FCC: ANSI C63.4:2003 FCC KDB 789033 D01 v01r01	FCC : 15.407(b), 15.205 and 15.209	2.8dB 5350.000MHz,	Complied	Radiated
	IC: -	IC: RSS-210 A.9.2(1)(2)(3)	AV, Horizontal		
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. For DFS tests, please see the test report number 31JE0038-HO-05-C issued by UL Japan, Inc.					

#### **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 and Reverse SMA for Antenna itself).

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.

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### 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	3.6dB
No.3	3.6dB
No.4	3.6dB

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

#### 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	4.75 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.

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## **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.

<b>Mode</b>	<b>Remarks*</b>
IEEE 802.11a (11a)	54Mbps, PN9
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 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: 11a(54Mbps): 12.5dBm(5180 to 5320MHz) 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)

<b>Test Item</b>	<b>Operating Mode</b>	<b>Tested Antenna</b>	<b>Tested Frequency</b>	
			<b>Low Band</b>	<b>Middle Band</b>
Conducted emission	11n-40 Tx *1)	0+1	5230MHz	-
Spurious Emission(Radiated)	11n-20 Tx *2)	0+1	5180MHz 5240MHz	5320MHz
	11n-40 Tx	0+1	5190MHz 5230MHz	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.

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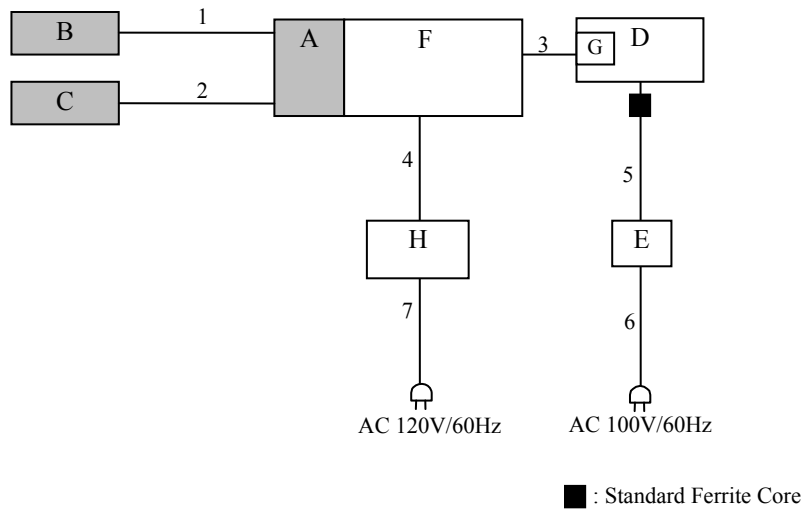
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## 4.2 Configuration and peripherals



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

### Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Wireless LAN PCI Express Mini Card Module	SX-PCEAN	008092-01 1B48	silex technology, Inc.	EUT
B	Antenna	ANT1267-164C/U-100B	001	NISSEI ELECTRIC CO., LTD	EUT
C	Antenna	ANT1267-164C/U-100B	002	NISSEI ELECTRIC CO., LTD	EUT
D	Laptop PC	T60	L3-KY149	Lenovo	-
E	AC Adaptor	92P1160	11S92P1160Z1ZBGH77 W6YJ	Lenovo	-
F	Jig	MR11-EC2C	-	B plus	-
G	Express Card Adaptor	-	-	B plus	-
H	DC Power Supply	PW8-3ATP	09067054	KENWOOD TMI	-

### 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	2.0	Unshielded	Unshielded	-
5	DC Cable	1.8	Unshielded	Unshielded	-
6	AC Cable	0.9	Unshielded	Unshielded	-
7	AC Cable	2.0	Unshielded	Unshielded	-

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## **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.

<b>Detector</b>	<b>: QP and AV</b>
<b>Measurement range</b>	<b>: 0.15-30MHz</b>
<b>Test data</b>	<b>: APPENDIX</b>
<b>Test result</b>	<b>: Pass</b>

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## **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

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

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**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	G)6)d) Method VB*1) RBW: 1MHz When duty cycle $\geq$ 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.  duty cycle is < 98 percent, set VBW $\geq$ 1/T
Test Distance	3m	3m (below 10GHz), 1m*2) (above 10GHz) 0.5m*3) (above 26.5GHz)	

\*1) The test method was also referred to FCC KDB 789033 D01 "Guidelines for Compliance Testing of unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E".

\*2) Distance Factor:  $20 \times \log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

\*3) Distance Factor:  $20 \times \log(3.0\text{m}/0.5\text{m}) = 15.6\text{dB}$

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT and of X(0 and 90), Y(0 and 90) and Z(0 and 90) axes of antenna 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

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**APPENDIX 1: Data of EMI test**

**Conducted Emission**

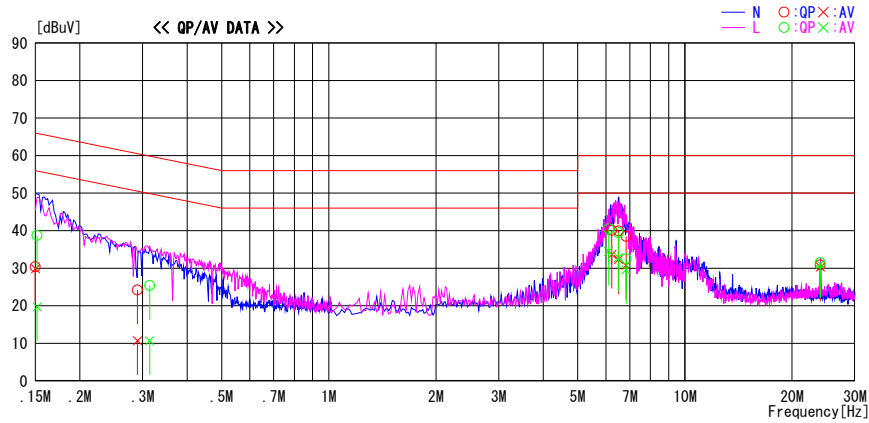
**DATA OF CONDUCTED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber  
Date : 2012/08/01

Report No. : 31JE0038-HO  
 Power : AC 120V / 60Hz  
 Temp./Humi. : 22deg. C / 57% RH  
 Engineer : Tomohisa Nakagawa

Mode / Remarks : 11n-40 (MIMO) 5230MHz

LIMIT : FCC15.207 QP  
FCC15.207 AV



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase	Comment
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]		
0.15000	17.2	16.7	13.2	30.4	29.9	66.0	56.0	35.6	26.1	N	
0.29019	10.9	-2.6	13.3	24.2	10.7	60.5	50.5	36.3	39.8	N	
6.23583	26.2	19.8	13.9	40.1	33.7	60.0	50.0	19.9	16.3	N	
6.50641	26.0	18.4	13.9	39.9	32.3	60.0	50.0	20.1	17.7	N	
6.83549	24.6	16.9	13.9	38.5	30.8	60.0	50.0	21.5	19.2	N	
24.00017	16.1	15.6	14.7	30.8	30.3	60.0	50.0	29.2	19.7	N	
0.15174	25.5	6.5	13.2	38.7	19.7	65.9	55.9	27.2	36.2	L	
0.31389	12.1	-2.6	13.3	25.4	10.7	59.9	49.9	34.5	39.2	L	
6.10433	26.6	20.6	13.9	40.5	34.5	60.0	50.0	19.5	15.5	L	
6.50341	25.6	19.0	13.9	39.5	32.9	60.0	50.0	20.5	17.1	L	
6.83399	18.6	15.7	13.9	32.5	29.6	60.0	50.0	27.5	20.4	L	
23.99900	16.8	16.4	14.7	31.5	31.1	60.0	50.0	28.5	18.9	L	

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

## Radiated Spurious Emission

Test place : Head Office EMC Lab. No.2 Anechoic Chamber  
Report No. : 31JE0038-HO-05  
Date : 08/09/2012  
Temperature/ Humidity : 24deg. C / 63% RH  
Engineer : Satofumi Matsuyama  
(Above 1GHz)  
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	5150.000	PK	58.5	31.9	3.3	34.0	59.7	68.2	8.5	Bandedge	
Hori	10360.000	PK	NS	-	-	-	-	68.2	-	Outside	
Hori	15540.000	PK	NS	-	-	-	-	73.9	-	Inside	
Hori	5150.000	AV	45.1	31.9	3.3	34.0	46.3	53.9	7.6	Bandedge	VBW:10Hz
Hori	15540.000	AV	NS	-	-	-	-	68.2	-	Inside	
Vert	5150.000	PK	56.5	31.9	3.3	34.0	57.7	68.2	10.5	Bandedge	
Vert	10360.000	PK	NS	-	-	-	-	68.2	-	Outside	
Vert	15540.000	PK	NS	-	-	-	-	73.9	-	Inside	
Vert	5150.000	AV	42.9	31.9	3.3	34.0	44.1	53.9	9.8	Bandedge	VBW:10Hz
Vert	15540.000	AV	NS	-	-	-	-	53.9	-	Inside	

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

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

\*NS: No Signal Detect

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

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## Radiated Spurious Emission

Test place : Head Office EMC Lab. No.2 Anechoic Chamber  
 Report No. : 31JE0038-HO-05  
 Date : 08/09/2012  
 Temperature/ Humidity : 24deg. C / 63% RH  
 Engineer : Satofumi Matsuyama  
 (Above 1GHz)  
 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	10480.000	PK	NS	-	-	-	-	68.2	-	Outside	
Hori	15720.000	PK	NS	-	-	-	-	73.9	-	Inside	
Hori	15720.000	AV	NS	-	-	-	-	53.9	-	Inside	
Vert	10480.000	PK	NS	-	-	-	-	68.2	-	Outside	
Vert	15720.000	PK	NS	-	-	-	-	73.9	-	Inside	
Vert	15720.000	AV	NS	-	-	-	-	53.9	-	Inside	

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

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

\*NS: No Signal Detect

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

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## Radiated Spurious Emission

Test place : Head Office EMC Lab. No.2 Anechoic Chamber  
Report No. : 31JE0038-HO-05  
Date : 08/09/2012  
Temperature/ Humidity : 24deg. C / 63% RH  
Engineer : Satofumi Matsuyama  
(Above 1GHz)  
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	5350.000	PK	60.0	32.0	3.4	33.8	61.6	68.2	6.6	Bandedge	
Hori	10640.000	PK	NS	-	-	-	-	73.9	-	Inside	
Hori	15960.000	PK	NS	-	-	-	-	73.9	-	Inside	
Hori	5350.000	AV	43.9	32.0	3.4	33.8	45.5	53.9	8.4	Bandedge	VBW:10Hz
Hori	10640.000	AV	NS	-	-	-	-	53.9	-	Inside	
Hori	15960.000	AV	NS	-	-	-	-	53.9	-	Inside	
Vert	5350.000	PK	57.0	32.0	3.4	33.8	58.6	68.2	9.6	Bandedge	
Vert	10640.000	PK	NS	-	-	-	-	73.9	-	Inside	
Vert	15960.000	PK	NS	-	-	-	-	73.9	-	Inside	
Vert	5350.000	AV	42.6	32.0	3.4	33.8	44.2	53.9	9.7	Bandedge	VBW:10Hz
Vert	10640.000	AV	NS	-	-	-	-	53.9	-	Inside	
Vert	15960.000	AV	NS	-	-	-	-	53.9	-	Inside	

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

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

\*NS: No Signal Detect

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

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## Radiated Spurious Emission

Test place	Head Office EMC Lab. No.2 Anechoic Chamber
Report No.	31JE0038-HO-05
Date	07/28/2012                      07/29/2012
Temperature/ Humidity	23 deg. C / 58% RH            20 deg. C / 68% RH
Engineer	Takayuki Shimada            Takumi Shimada
	(1-10GHz)                      (Above 10GHz)
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	5150.000	PK	62.8	31.9	3.3	34.0	64.0	68.2	4.2	Bandedge	
Hori	10380.000	PK	43.5	39.7	-2.3	34.4	46.5	68.2	21.7	Outside	
Hori	15570.000	PK	46.7	38.7	-1.0	33.1	51.3	73.9	22.6	Inside	
Hori	5150.000	AV	49.7	31.9	3.3	34.0	50.9	53.9	3.0	Bandedge	Gate trigger ON, VBW:10Hz
Hori	15570.000	AV	35.0	38.7	-1.0	33.1	39.6	53.9	14.3	Inside	VBW:1/T
Vert	5150.000	PK	61.9	31.9	3.3	34.0	63.1	68.2	5.1	Bandedge	
Vert	10380.000	PK	44.1	39.7	-2.3	34.4	47.1	68.2	21.1	Outside	
Vert	15570.000	PK	45.6	38.7	-1.0	33.1	50.2	73.9	23.7	Inside	
Vert	5150.000	AV	47.5	31.9	3.3	34.0	48.7	53.9	5.2	Bandedge	Gate trigger ON, VBW:10Hz
Vert	15570.000	AV	36.3	38.7	-1.0	33.1	40.9	53.9	13.0	Inside	VBW:1/T

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 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

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## Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Anechoic Chamber  
Report No. 31JE0038-HO-05  
Date 07/28/2012 07/29/2012  
Temperature/ Humidity 23 deg. C / 58% RH 20 deg. C / 68% RH  
Engineer Takayuki Shimada Takumi Shimada  
(1-10GHz) (Except 1-10GHz)  
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	120.000	QP	44.9	12.7	7.6	28.3	36.9	43.5	6.6	Inside	
Hori	145.970	QP	33.4	14.6	7.8	28.1	27.7	43.5	15.8	Outside	
Hori	175.349	QP	39.0	15.9	8.0	28.1	34.8	43.5	8.7	Outside	
Hori	372.882	QP	32.1	16.6	9.3	28.1	29.9	46.0	16.1	Outside	
Hori	738.588	QP	32.0	21.3	10.7	28.3	35.7	46.0	10.3	Outside	
Hori	925.867	QP	29.1	22.5	11.3	27.8	35.1	46.0	10.9	Outside	
Hori	10460.000	PK	45.0	39.8	-2.3	34.3	48.2	68.2	20.0	Outside	
Hori	15690.000	PK	45.7	38.3	-1.1	33.2	49.7	73.9	24.2	Inside	
Hori	15690.000	AV	35.2	38.3	-1.1	33.2	39.2	53.9	14.7	Inside	VBW:1/T
Vert	120.000	QP	42.0	12.7	7.6	28.3	34.0	43.5	9.5	Inside	
Vert	145.650	QP	31.4	14.6	7.8	28.1	25.7	43.5	17.8	Outside	
Vert	176.289	QP	37.2	15.9	8.0	28.1	33.0	43.5	10.5	Outside	
Vert	374.666	QP	24.9	16.7	9.3	28.1	22.8	46.0	23.2	Outside	
Vert	738.588	QP	28.0	21.3	10.7	28.3	31.7	46.0	14.3	Outside	
Vert	925.867	QP	27.9	22.5	11.3	27.8	33.9	46.0	12.1	Outside	
Vert	10460.000	PK	44.1	39.8	-2.3	34.3	47.3	68.2	20.9	Outside	
Vert	15690.000	PK	49.3	38.3	-1.1	33.2	53.3	73.9	20.6	Inside	
Vert	15690.000	AV	37.4	38.3	-1.1	33.2	41.4	53.9	12.5	Inside	VBW:1/T

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 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

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### Radiated Spurious Emission

Test place Head Office EMC Lab. No.2 Anechoic Chamber  
Report No. 31JE0038-HO-05  
Date 07/28/2012 07/29/2012  
Temperature/ Humidity 23 deg. C / 58% RH 20 deg. C / 68% RH  
Engineer Takayuki Shimada Takumi Shimada  
(1-10GHz) (Above 10GHz)  
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	5350.000	PK	63.0	32.0	3.4	33.8	64.6	68.2	3.6	Bandedge	
Hori	10620.000	PK	45.3	39.9	-2.2	34.2	48.8	73.9	25.1	Inside	
Hori	15930.000	PK	45.2	37.6	-1.3	33.4	48.1	73.9	25.8	Inside	
Hori	5350.000	AV	49.5	32.0	3.4	33.8	51.1	53.9	2.8	Bandedge	Gate trigger ON, VBW:10Hz
Hori	10620.000	AV	33.1	39.9	-2.2	34.2	36.6	53.9	17.3	Inside	VBW:1/T
Hori	15930.000	AV	34.7	37.6	-1.3	33.4	37.6	53.9	16.3	Inside	VBW:1/T
Vert	5350.000	PK	61.2	32.0	3.4	33.8	62.8	68.2	5.4	Bandedge	
Vert	10620.000	PK	43.6	39.9	-2.2	34.2	47.1	73.9	26.8	Inside	
Vert	5350.000	AV	47.6	32.0	3.4	33.8	49.2	53.9	4.7	Bandedge	Gate trigger ON, VBW:10Hz
Vert	10620.000	AV	33.0	39.9	-2.2	34.2	36.5	53.9	17.4	Inside	VBW:1/T
Vert	15930.000	AV	36.5	37.6	-1.3	33.4	39.4	53.9	14.5	Inside	VBW:1/T

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 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

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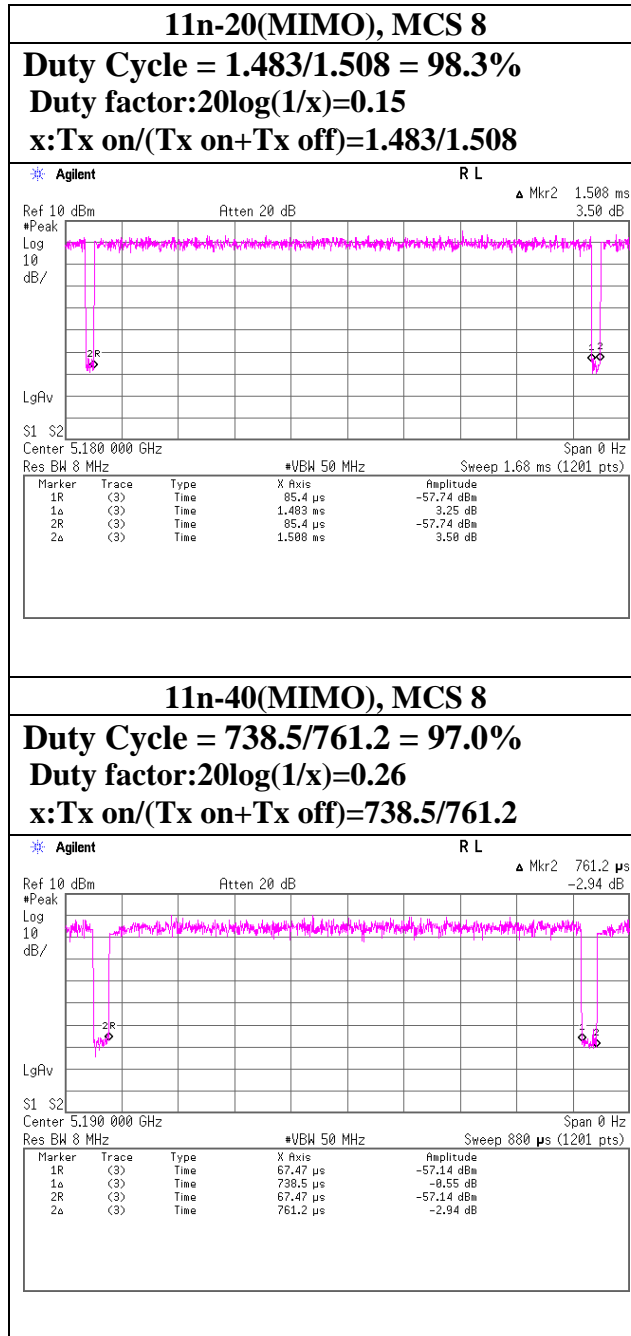
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### Duty Cycle



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## APPENDIX 2: Test instruments

### EMI test equipment

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	2012/06/29 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2012/02/06 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2012/04/06 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2012/02/22 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2012/01/25 * 12
MCC-132	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336161/4(1m) / 340639(5m)	RE	2011/09/06 * 12
MHF-06	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	RE	2012/05/30 * 12
MAT-23	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	RE	2012/03/27 * 12
MCC-77	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	278942/4	RE	2011/12/08 * 12
MHF-16	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCA	7001	RE	2011/09/08 * 12
MHA-02	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	RE	2012/02/22 * 12
MCC-54	Microwave Cable	Suhner	SUCOFLEX101	2873(1m) / 2876(5m)	RE	2012/03/21 * 12
MHA-17	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	RE	2012/06/27 * 12
MPA-03	Microwave System Power Amplifier	Agilent	83050A	3950M00205	RE	2012/06/22 * 12
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2012/06/19 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2012/04/03 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2011/10/23 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2011/10/23 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2012/02/16 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2011/11/02 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2011/09/26 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	CE	2012/02/24 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	CE	2012/02/06 * 12
MJM-06	Measure	PROMART	SEN1955	-	CE	
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	CE	2011/11/23 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	CE	2011/08/11 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	8127363	CE(AE)	2012/02/06 * 12
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	8127364	CE(EUT)	2012/02/09 * 12
MTA-31	Terminator	TME	CT-01	-	CE	2012/01/11 * 12
MCC-112	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(3m)/sucoform141-PE(1m)/421-010(1.5m)/RFM-E321(Switcher)	-/00640	CE	2012/07/12 * 12
MAT-66	Attenuator(13dB)	JFW Industries, Inc.	50FP-013H2 N	-	CE	2012/01/28 * 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

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