



# RADIO TEST REPORT

## Test Report No.: 10679344S-A

**Applicant** : Canon Inc.  
**Type of Equipment** : Wireless Module  
**Model No.** : WM319  
**FCC ID** : AZD319  
**Test regulation** : FCC Part 15 Subpart C: 2015  
**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 limits of the above regulation.
4. The test results in this test 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 any agency of the Federal Government.
6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

**Date of test:** February 19 to 27, 2015

**Representative test engineer:**

Tatsuya Arai  
Engineer  
Consumer Technology Division

**Approved by :**

Toyokazu Imamura  
Leader  
Consumer Technology Division



- The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.  
 There is no testing item of "Non-accreditation".

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13-EM-F0429



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## **SECTION 1: Customer information**

Company Name : Canon Inc.  
Address : 30-2, Shimomaruko 3-chome, Ohta-ku, Tokyo 146-8501, Japan  
Telephone Number : +81-3-5482-8070  
Facsimile Number : +81-3-3757-8431  
Contact Person : Hironobu Saida

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

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

Type of equipment : Wireless Module  
Model No. : WM319  
Serial No. : Refer to 4.2.  
Rating : DC24V  
Country of Mass-production : China  
Condition of EUT : Engineering prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification of EUT : No modification by the test lab.  
Receipt Date of Sample : February 18, 2015

### **2.2 Product description**

Model: WM319 (referred to as the EUT in this report) is a Wireless Module.

General specification:

Clock frequency(ies) in the system : 24MHz, 40MHz

Radio specification:

Equipment type : Transceiver  
Frequency of operation : 2412-2462MHz  
Bandwidth : 20MHz  
Channel spacing : 5MHz  
Type of modulation : DSSS (IEEE 802.11b), OFDM (IEEE 802.11g)  
Antenna type : Pattern  
Antenna connector type : None  
Antenna gain : -2.6dBi  
ITU code : D1D, G1D  
Operation temperature : Max.+55 deg.C

FCC 15.31 (e) / 212

The stable voltage (DC3.3V) is provided constantly to RF part via regulator. Therefore, the EUT complies with the requirement.

FCC 15.203 / 212

The antenna is not removable from the EUT. Therefore, the equipment complies with the requirement.

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

### **3.1 Test specification**

Test specification : FCC Part 15 Subpart C: 2015, final revised on January 21, 2015  
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators  
Section 15.207 Conducted limits  
Section 15.209 Radiated emission limits, general requirements  
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz,  
and 5725-5850MHz

### **3.2 Procedures & Results**

Item	Test Procedure *1)	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.10:2009	FCC 15.207	-	N/A	7.0dB Freq.: 0.41374MHz Detector: Average Phase: L1 Mode: Tx 2412MHz, IEEE 802.11g	Complied
6dB bandwidth	ANSI C63.10:2009	FCC 15.247 (a)(2)	Conducted	N/A	-	Complied
Maximum peak output power	ANSI C63.10:2009	FCC 15.247 (b)(3)	Conducted	N/A		Complied
Out of band emission & Restricted band edges	ANSI C63.10:2009	FCC 15.109, 15.247 (d) & 15.209	Conducted / Radiated	N/A	5.5dB Freq.: 2483.500 MHz Polarization: Vertical Detection: Average Mode: Tx 2462MHz, IEEE 802.11g	Complied
Power density	ANSI C63.10:2009	FCC 15.247 (e)	Conducted	N/A	-	Complied

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

\*1) These tests were also referred to KDB 558074 v03 r02 (FCC), "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

### **3.3 Addition to standard**

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.10:2009, RSS-Gen 4.6.1	-	Conducted	-	-

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

\* Other than above, no addition, exclusion nor deviation has been made from the standard.

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### 3.4 Uncertainty

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

Item	Frequency range	No.1 SAC <sup>*1</sup> /SR <sup>*2</sup> (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
<b>Conducted emission (AC Mains) LISN</b>	150kHz-30MHz	3.6 dB	3.4 dB	3.4 dB
<b>Radiated emission (Measurement distance: 3m)</b>	9kHz-30MHz	3.7 dB	3.5 dB	3.5 dB
	30MHz-300MHz	4.9 dB	4.9 dB	4.7 dB
	300MHz-1GHz	5.0 dB	5.0 dB	4.8 dB
	1GHz-15GHz	4.9 dB	4.9 dB	4.9 dB
<b>Radiated emission (Measurement distance: 1m)</b>	15GHz-18GHz	5.7 dB	5.7 dB	5.7 dB
	18GHz-40GHz	4.5 dB	4.3 dB	4.3 dB

\*1: SAC=Semi-Anechoic Chamber

\*2: SR= Shielded Room is applied besides radiated emission

#### Conducted emission test

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

#### Radiated emission test

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

#### Antenna port conducted test

Power measurement uncertainty above 1GHz for this test was: (±) 0.68dB

Spurious emission (Conducted) measurement (below 1GHz) uncertainty for this test was: (±) 1.5dB

Spurious emission (Conducted) measurement (1G-3GHz) uncertainty for this test was: (±) 1.7dB

Spurious emission (Conducted) measurement (3G-18GHz) uncertainty for this test was: (±) 2.4dB

Spurious emission (Conducted) measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.5dB

Bandwidth measurement uncertainty for this test was: (±) 0.66%

### 3.5 Test location

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JAB Accreditation No. : RTL02610

	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
<input checked="" type="checkbox"/> No.1 semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input type="checkbox"/> No.2 semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input type="checkbox"/> No.3 semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
<input type="checkbox"/> No.4 semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
<input checked="" type="checkbox"/> No.1 shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.2 shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.3 shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
<input type="checkbox"/> No.4 shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
<input checked="" type="checkbox"/> No.5 shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input type="checkbox"/> No.6 shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input checked="" type="checkbox"/> No.1 measurement room	-	2.55 x 4.1 x 2.5	-	-

### 3.6 Test setup, Test data & Test instruments

Refer to APPENDIX 1 to 3.

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

### **4.1 Operating mode**

Test item	Mode	Tested frequency	Power setting *1)	Worst data rate *2)
Conducted emission *3)	Transmitting IEEE 802.11g	2412MHz	10dBm	24Mbps
Radiated emission (below 1GHz) *3) *4)	Transmitting IEEE 802.11b	2412MHz	10dBm	1Mbps
	Transmitting IEEE 802.11g	2412MHz	10dBm	24Mbps
Other items	Transmitting IEEE 802.11b	2412MHz, 2437MHz, 2462MHz	10dBm	1Mbps
	Transmitting IEEE 802.11g	2412MHz, 2437MHz, 2462MHz	10dBm	24Mbps
*1) The actual output power differs from the setting value. Software used for the test: RF TEST TOOL for EC392 V76.02 *2) The worst condition was determined based on the test result of Maximum Peak Conducted Output Power. *3) 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. *4) The spurious emission level within the range of 1GHz or less was measured in all mode, because the tendency was different in each mode of 11b and 11g. However, maximum channel of Maximum Peak Output Power was measured as a representative, because the difference of each channel had not been seen.				

Justification: The system was configured in typical fashion (as customer would normally use it) for testing.

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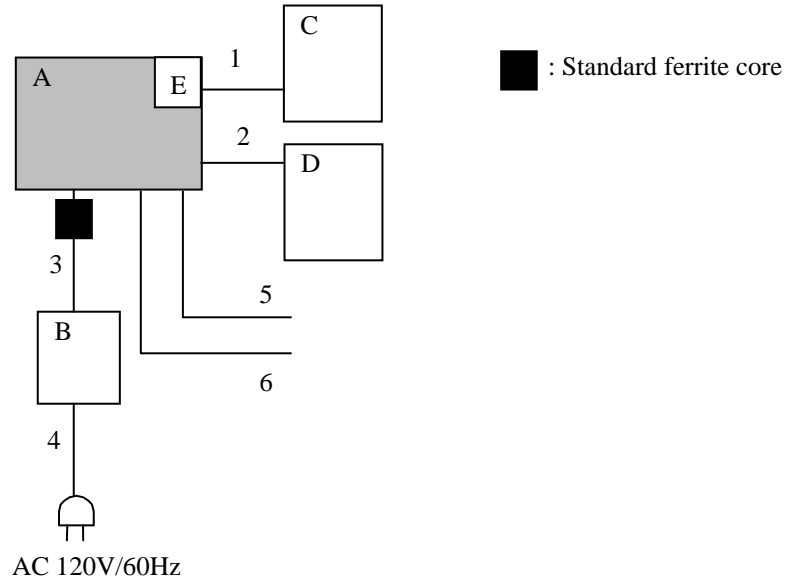
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## 4.2 Configuration and peripherals



\* Test data was taken under worse case conditions.

### Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless Module	WM319	*1)	Canon Inc.	EUT
B	AC adapter	CA-CP200 B	-	Canon Inc.	-
C	Switch board	-	-	Canon Inc.	-
D	LCD unit	-	-	Canon Inc.	-
E	SDHC memory card	MF-FSDH08GC6	-	ELECOM	-

\*1) Antenna port conducted tests: 1054, Other tests: 3023

### List of cables used

No.	Cable Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	FLAT	0.06	Unshielded	Unshielded	-
2	FLAT	0.06	Unshielded	Unshielded	-
3	DC	1.5	Unshielded	Unshielded	-
4	AC	1.5	Unshielded	Unshielded	-
5	USB	1.9	Shielded	Shielded	-
6	USB	2.0	Shielded	Shielded	-

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## **SECTION 5: Conducted emission**

### **5.1 Operating environment**

Test place : See test data (APPENDIX 1)  
Temperature : See test data (APPENDIX 1)  
Humidity : See test data (APPENDIX 1)

### **5.2 Test configuration**

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 0.8m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals was aligned and was 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 LISN. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. Photographs of the set up are shown in APPENDIX 3.

### **5.3 Test conditions**

Frequency range : 0.15 - 30MHz  
EUT position : Table top

### **5.4 Test procedure**

The AC Mains Terminal Continuous disturbance Voltage had been measured with the EUT within a Shielded room. The EUT was connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection has been performed. The measurements had been performed with a quasi-peak detector and if required, a CISPR average detector. The conducted emission measurements were made with the following detection of the test receiver.

Detection Type : Quasi-Peak/ CISPR Average  
IF Bandwidth : 9kHz

### **5.5 Results**

Summary of the test results : Pass  
Refer to APPENDIX 1.

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## **SECTION 6: 6dB bandwidth & Occupied bandwidth (99%)**

### **Test procedure**

The bandwidth was measured with a spectrum analyzer connected to the antenna port.  
The test was measured based on Method 8.2 Option 2 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass  
Refer to APPENDIX 1

## **SECTION 7: Maximum peak output power**

### **Test procedure**

The Maximum Peak Output Power was measured with a power meter connected to the antenna port.  
The test was measured based on Method 9.1.2 PKPM1 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Detection type: Peak / Average \*1)

Summary of the test results: Pass  
Refer to APPENDIX 1

\*1) Average detector was used only for Reference data.

## **SECTION 8: Out of band emissions (Antenna port conducted)**

### **Test procedure**

The Out of Band Emissions was measured with a spectrum analyzer connected to the antenna port.  
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.  
In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.  
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.  
(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=10kHz)

Summary of the test results: Pass  
Refer to APPENDIX 1

## **SECTION 9: Peak power density**

### **Test procedure**

The peak power density was measured with a spectrum analyzer connected to the antenna port.

Instrument used : Spectrum Analyzer  
RBW / VBW : 3kHz / 9.1kHz

The test was measured based on Method 10.2 PKPSD of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

Summary of the test results: Pass  
Refer to APPENDIX 1

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## **SECTION 10: Radiated emission**

### **10.1 Operating environment**

Test place : See test data (APPENDIX 1)  
Temperature : See test data (APPENDIX 1)  
Humidity : See test data (APPENDIX 1)

### **10.2 Test configuration**

EUT was placed on a polystyrene platform of nominal size, 0.5m by 0.5m, raised 0.8m above the conducting ground plane. Photographs of the set up are shown in APPENDIX 3.

### **10.3 Test conditions**

Frequency range : 30MHz to 25GHz  
EUT position : Table top

### **10.4 Test procedure**

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane and at a distance of 3m (below 15GHz) / 1m (above 15GHz) (Refer to Figure 1). Measurements were performed with quasi-peak, peak and average detector. The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detection.

Frequency	30-1000MHz	1-25GHz		20dBc
Detection type	Quasi-Peak	Peak	Average *1)	Peak
IF Bandwidth	120kHz	RBW: 1MHz VBW: 3MHz	RBW: 1MHz VBW: 3MHz Detector: Linear Voltage Averaging	RBW: 100kHz VBW: 300kHz

\*1) Average Power Measurement was measured based on 13.3.2 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

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.

Antenna polarization	Carrier (Band edge)	Spurious (Below 1GHz)	Spurious (1-15GHz)	Spurious (15-18GHz)	Spurious (18-25GHz)
Horizontal	Y	X	Y	X	X
Vertical	Y	X	Y	X	X

\* The definition of each position is shown in a 'Pre-check of the worst position' in APPENDIX 3.

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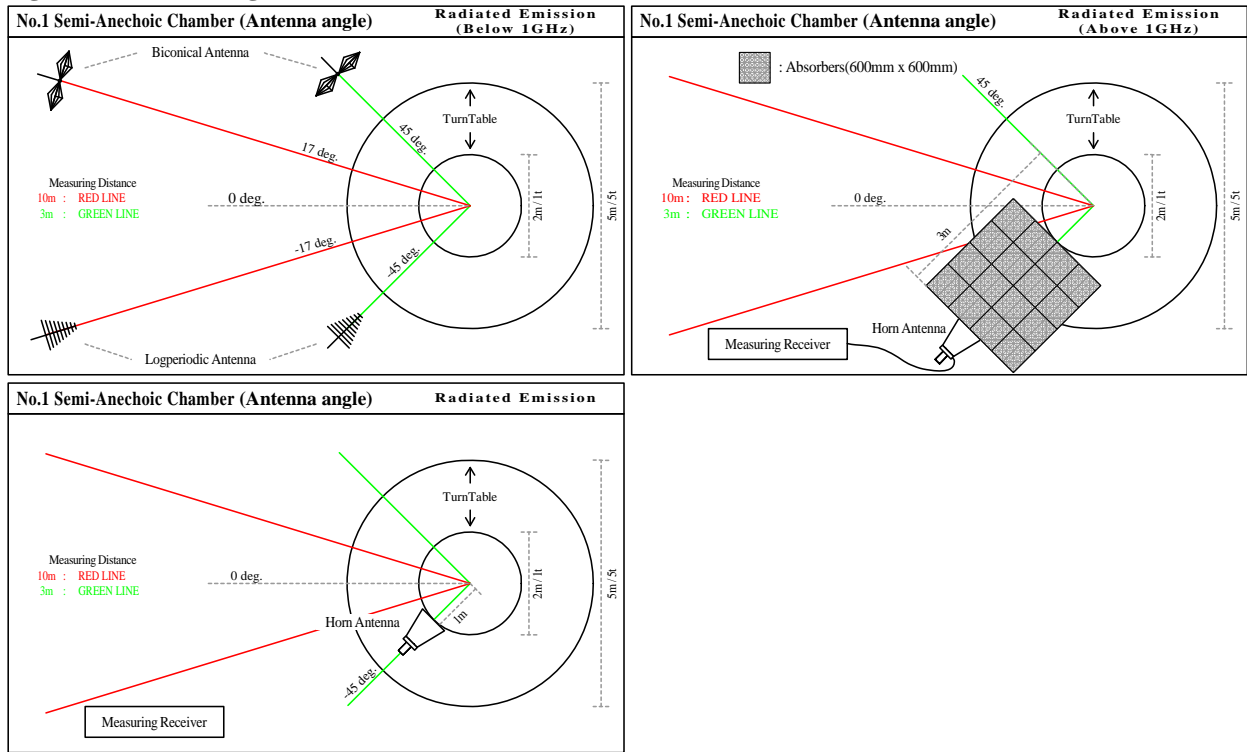
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**Figure 1. Antenna angle**



**10.5 Band edge**

Band edge level at 2390MHz and 2483.5MHz is below the limits of FCC 15.209 and band edge level at 2400MHz is below the 20dBc. Refer to the data.

**10.6 Results**

Summary of the test results : Pass  
\* No noise was detected above the 5th order harmonics.

Refer to APPENDIX 1

## **Contents of APPENDIXES**

### **APPENDIX 1: Data of Radio tests**

Conducted emission  
6dB bandwidth  
Maximum peak output power  
Radiated emission  
Spurious emission (Antenna port conducted)  
Peak power density  
Occupied bandwidth

### **APPENDIX 2: Test instruments**

Test instruments

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

Conducted emission  
Radiated emission  
Pre-check of the worst position

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# DATA OF CONDUCTED EMISSION TEST

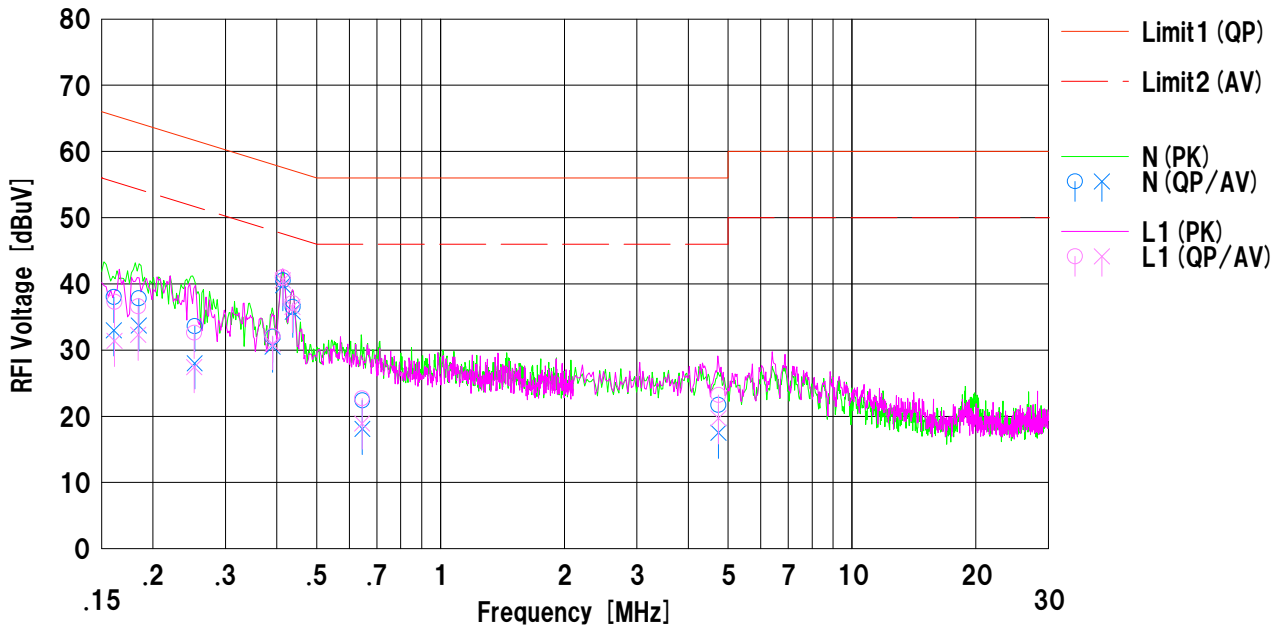
UL Japan,Inc. Shonan EMC Lab. No.1 Shielded Room  
Date : 2015/02/27

Company : Canon Inc.  
Kind of EUT : Wireless Module  
Model No. : WM319  
Serial No. : 3023  
Remarks :

Mode : Tx 11g 2412MHz  
Order No. : 10679344S  
Power : AC 120V / 60Hz  
Temp./Humi. : 21deg.C / 37%RH

Limit1 : FCC 15C (15.207) QP  
Limit2 : FCC 15C (15.207) AV

Engineer : Akira Sato



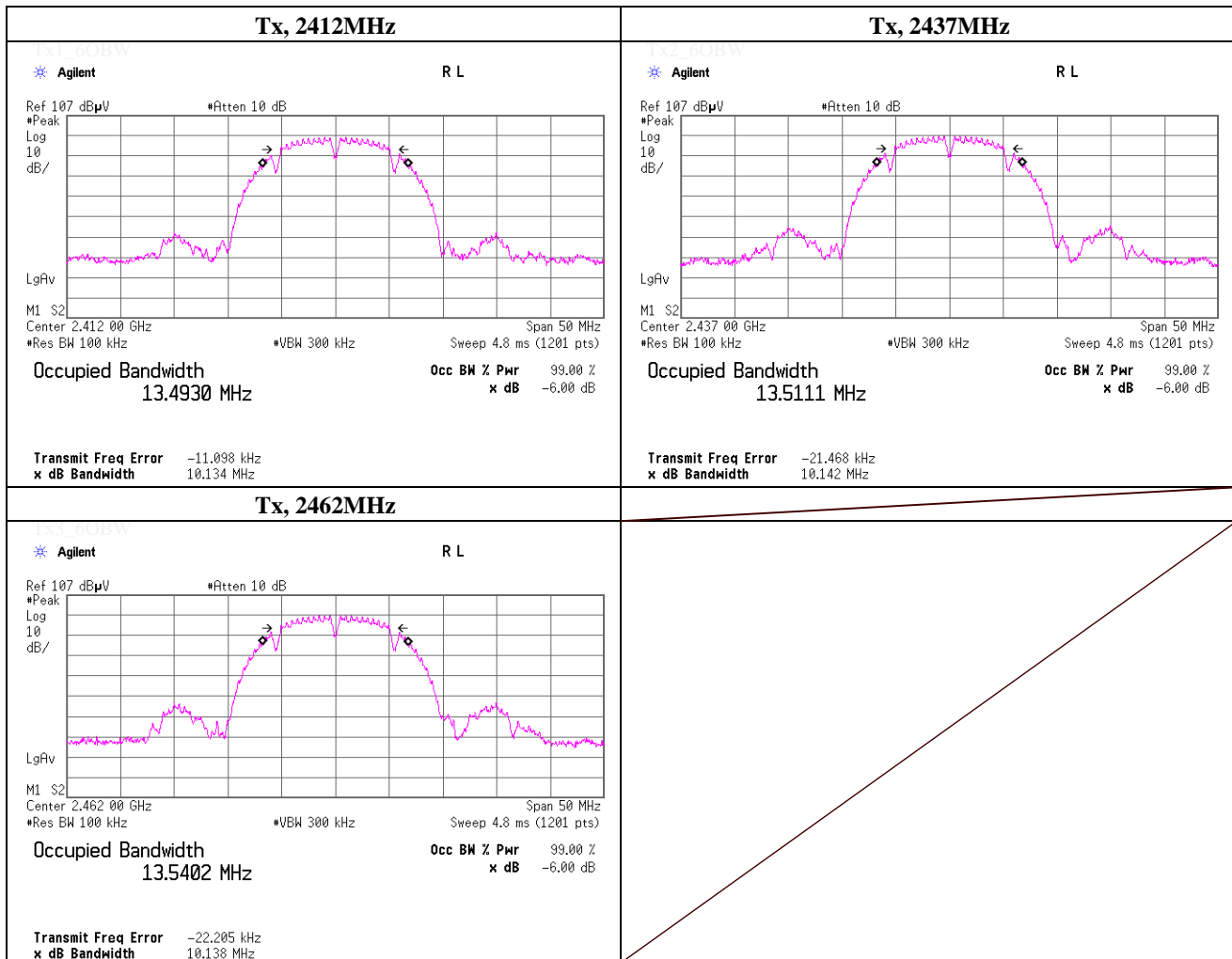
No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.16064	25.4	20.4	12.6	38.0	33.0	65.4	55.4	27.4	22.4	N	
2	0.18467	25.2	21.1	12.6	37.8	33.7	64.2	54.2	26.4	20.5	N	
3	0.25258	21.0	15.4	12.6	33.6	28.0	61.6	51.6	28.0	23.6	N	
4	0.39084	19.4	17.9	12.6	32.0	30.5	58.0	48.0	26.0	17.5	N	
5	0.41390	27.9	27.2	12.6	40.5	39.8	57.5	47.5	17.0	7.7	N	
6	0.43693	23.9	23.2	12.6	36.5	35.8	57.1	47.1	20.6	11.3	N	
7	0.64542	9.8	5.5	12.6	22.4	18.1	56.0	46.0	33.6	27.9	N	
8	4.73438	8.9	4.7	12.8	21.7	17.5	56.0	46.0	34.3	28.5	N	
9	0.16122	24.7	18.8	12.6	37.3	31.4	65.4	55.4	28.1	24.0	L1	
10	0.18413	24.0	19.7	12.6	36.6	32.3	64.2	54.2	27.6	21.9	L1	
11	0.25205	20.0	14.8	12.6	32.6	27.4	61.6	51.6	29.0	24.2	L1	
12	0.39045	19.5	18.3	12.6	32.1	30.9	58.0	48.0	25.9	17.1	L1	
13	0.41374	28.4	27.9	12.6	41.0	40.5	57.5	47.5	16.5	7.0	L1	
14	0.43655	24.5	23.9	12.6	37.1	36.5	57.1	47.1	20.0	10.6	L1	
15	0.64469	10.1	6.3	12.6	22.7	18.9	56.0	46.0	33.3	27.1	L1	
16	4.73520	10.4	6.9	12.8	23.2	19.7	56.0	46.0	32.8	26.3	L1	

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN+Cable+ATT) [dB]  
LISN:SLS-01

### -6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 22, 2015	
Temperature / Humidity	21deg.C , 36%RH	
Engineer	Tatsuya Arai	
Mode	Tx, IEEE802.11b, PN9, worst data mode 1Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	10.134	> 0.500
2437.0000	10.142	> 0.500
2462.0000	10.138	> 0.500

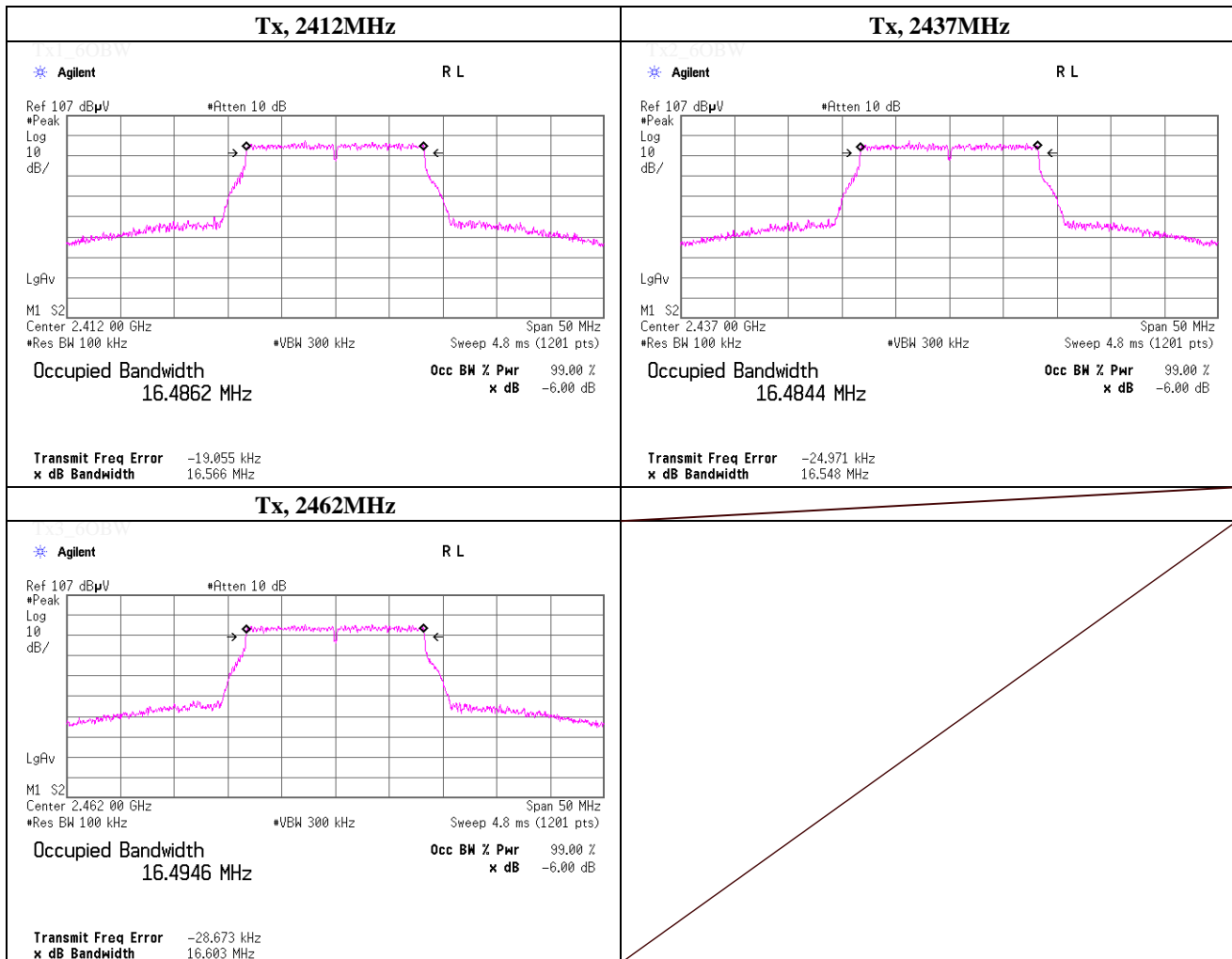


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### -6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 22, 2015	
Temperature / Humidity	21deg.C , 36%RH	
Engineer	Tatsuya Arai	
Mode	Tx, IEEE802.11g, PN9, worst data mode 24Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	16.566	> 0.500
2437.0000	16.548	> 0.500
2462.0000	16.603	> 0.500



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## Maximum Peak Conducted Output Power

(PKPM1)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	February 19, 2015	Serial No. 1054
Temperature / Humidity	22deg.C , 46%RH	
Engineer	Kenichi Adachi	
Mode	Tx, IEEE802.11b, PN9,	worst data mode : 1 Mbps

(\* P/M: Power Meter with power sensor)

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
Low	2412.0	2.34	1.26	9.63	13.23	21.04	30.00	1000	16.77
Mid	2437.0	2.74	1.26	9.63	13.63	23.07	30.00	1000	16.37
High	2462.0	2.40	1.26	9.63	13.29	21.33	30.00	1000	16.71

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

**[Pre check]**

	Data rate [Mbps]	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
						[dBm]	[mW]	[dBm]	[mW]	
	1	2437.0	2.74	1.26	9.63	<b>13.63</b>	23.07	30.00	1000	<b>16.37</b>
	2	2437.0	2.70	1.26	9.63	13.59	22.86	30.00	1000	16.41
	5.5	2437.0	2.08	1.26	9.63	12.97	19.82	30.00	1000	17.03
	11	2437.0	2.65	1.26	9.63	13.54	22.59	30.00	1000	16.46

**Worst**

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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## (Reference) Maximum Conducted Output Power

(AVGPM)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	February 19, 2015	Serial No. 1054
Temperature / Humidity	22deg.C , 46%RH	
Engineer	Kenichi Adachi	
Mode	Tx, IEEE802.11b, PN9,	worst data mode : 1 Mbps

(\* P/M: Power Meter with power sensor, AV: Average)

Ch	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result	
						[dBm]	[mW]
Low	2412.0	-0.24	1.26	9.63	0.00	10.65	11.61
Mid	2437.0	0.13	1.26	9.63	0.00	11.02	12.65
High	2462.0	-0.14	1.26	9.63	0.00	10.75	11.89

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

\* Duty factor is refer to the page of "(Reference) duty chart for Maximum conducted power".

**[Pre check]**

	Data rate [Mbps]	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result	
							[dBm]	[mW]
	1	2437.0	0.13	1.26	9.63	0.00	<b>11.02</b>	12.65
	2	2437.0	0.10	1.26	9.63	0.00	10.99	12.56
	5.5	2437.0	0.12	1.26	9.63	0.00	11.01	12.62
	11	2437.0	0.06	1.26	9.63	0.00	10.95	12.45

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

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## Maximum Peak Conducted Output Power (PKPM1)

Test place                    UL Japan, Inc. Shonan EMC Lab.            No.1 Measurement Room  
 Date                            February 19, 2015                                Serial No. 1054  
 Temperature / Humidity    22deg.C            , 46%RH  
 Engineer                      Kenichi Adachi  
 Mode                            Tx, IEEE802.11g, PN9,                                worst data mode :            24 Mbps

(\* P/M: Power Meter with power sensor)

Ch	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
Low	2412.0	10.31	1.26	9.63	21.20	131.83	30.00	1000	8.80
Mid	2437.0	9.85	1.26	9.63	20.74	118.58	30.00	1000	9.26
High	2462.0	8.90	1.26	9.63	19.79	95.28	30.00	1000	10.21

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

**[Pre check]**

	Data rate [Mbps]	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
						[dBm]	[mW]	[dBm]	[mW]	
	6	2437.0	9.83	1.26	9.63	20.72	118.03	30.00	1000	9.28
	9	2437.0	9.06	1.26	9.63	19.95	98.86	30.00	1000	10.05
	12	2437.0	8.96	1.26	9.63	19.85	96.61	30.00	1000	10.15
	18	2437.0	8.86	1.26	9.63	19.75	94.41	30.00	1000	10.25
	24	2437.0	9.85	1.26	9.63	<b>20.74</b>	118.58	30.00	1000	<b>9.26</b>
	36	2437.0	8.93	1.26	9.63	19.82	95.94	30.00	1000	10.18
	48	2437.0	8.94	1.26	9.63	19.83	96.16	30.00	1000	10.17
	54	2437.0	8.73	1.26	9.63	19.62	91.62	30.00	1000	10.38

**Worst**

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss

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**(Reference) Maximum Conducted Output Power**

(AVGPM)

Test place                    UL Japan, Inc. Shonan EMC Lab.                    No.1 Measurement Room  
Date                            February 19, 2015                                        Serial No. 1054  
Temperature / Humidity    22deg.C        , 46%RH  
Engineer                      Kenichi Adachi  
Mode                            Tx, IEEE802.11g, PN9,                                        worst data mode :                    24 Mbps

(\* P/M: Power Meter with power sensor, AV: Average)

Ch	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result	
						[dBm]	[mW]
Low	2412.0	0.31	1.26	9.63	0.00	11.20	13.18
Mid	2437.0	-0.30	1.26	9.63	0.00	10.59	11.46
High	2462.0	-1.29	1.26	9.63	0.00	9.60	9.12

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

\* Duty factor is refer to the page of "(Reference) duty chart for Maximum conducted power".

**[Pre check]**

Data rate [Mbps]	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result	
						[dBm]	[mW]
6	2437.0	-0.63	1.26	9.63	0.00	10.26	10.62
9	2437.0	-0.65	1.26	9.63	0.00	10.24	10.57
12	2437.0	-0.35	1.26	9.63	0.00	10.54	11.32
18	2437.0	-0.33	1.26	9.63	0.00	10.56	11.38
24	2437.0	-0.30	1.26	9.63	0.00	<b>10.59</b>	11.46
36	2437.0	-0.46	1.26	9.63	0.00	10.43	11.04
48	2437.0	-0.31	1.26	9.63	0.00	10.58	11.43
54	2437.0	-0.37	1.26	9.63	0.00	10.52	11.27

Sample Calculation:

Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

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## Radiated Emission

Test place            No.1 Semi Anechoic Chamber  
 Date                    February 26, 2015  
 Temperature / Humidity 22 deg.C, 36 %RH  
 Engineer              Akira Sato  
 Mode                    Tx,                    2412 MHz  
                              Tx, IEEE802.11b PN9, worst data mode 1Mbps

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2386.090	PK	56.1	25.9	14.6	40.9	55.7	73.9	18.2	100	205	
Hori.	2390.000	PK	47.7	25.9	14.6	40.9	47.3	73.9	26.6	100	205	
Hori.	4824.000	PK	47.4	30.6	7.1	41.7	43.4	73.9	30.5	100	353	
Hori.	6431.000	PK	47.1	34.4	8.3	41.2	48.6	73.9	25.3	100	324	
Hori.	7236.000	PK	45.5	36.2	8.6	41.5	48.8	73.9	25.1	100	359	
Hori.	9648.000	PK	43.6	38.3	9.5	40.4	51.0	73.9	22.9	100	0	
Hori.	12060.000	PK	43.4	39.4	10.6	39.7	53.7	73.9	20.2	100	359	
Hori.	2386.090	AV	37.7	25.9	14.6	40.9	37.3	53.9	16.6	100	205	
Hori.	2390.000	AV	38.2	25.9	14.6	40.9	37.8	53.9	16.1	100	205	
Hori.	4824.000	AV	38.1	30.6	7.1	41.7	34.1	53.9	19.8	100	353	
Hori.	6431.000	AV	37.1	34.4	8.3	41.2	38.6	53.9	15.3	100	324	
Hori.	7236.000	AV	36.6	36.2	8.6	41.5	39.9	53.9	14.0	100	359	
Hori.	9648.000	AV	34.4	38.3	9.5	40.4	41.8	53.9	12.1	100	0	
Hori.	12060.000	AV	34.2	39.4	10.6	39.7	44.5	53.9	<b>9.4</b>	100	359	
Vert.	2386.080	PK	59.9	25.9	14.6	40.9	59.5	73.9	14.4	100	0	
Vert.	2390.000	PK	48.7	25.9	14.6	40.9	48.3	73.9	25.6	100	150	
Vert.	4824.000	PK	46.7	30.6	7.1	41.7	42.7	73.9	31.2	100	8	
Vert.	6431.904	PK	48.1	34.4	8.3	41.2	49.6	73.9	24.3	100	67	
Vert.	7236.000	PK	46.0	36.2	8.6	41.5	49.3	73.9	24.6	100	359	
Vert.	9648.000	PK	44.4	38.3	9.5	40.4	51.8	73.9	22.1	100	0	
Vert.	12060.000	PK	43.3	39.4	10.6	39.7	53.6	73.9	20.3	100	359	
Vert.	2386.080	AV	38.5	25.9	14.6	40.9	38.1	53.9	15.8	100	0	
Vert.	2390.000	AV	39.8	25.9	14.6	40.9	39.4	53.9	14.5	100	150	
Vert.	4824.000	AV	38.1	30.6	7.1	41.7	34.1	53.9	19.8	100	8	
Vert.	6431.904	AV	39.6	34.4	8.3	41.2	41.1	53.9	12.8	100	67	
Vert.	7236.000	AV	36.6	36.2	8.6	41.5	39.9	53.9	14.0	100	359	
Vert.	9648.000	AV	34.5	38.3	9.5	40.4	41.9	53.9	12.0	100	0	
Vert.	12060.000	AV	34.2	39.4	10.6	39.7	44.5	53.9	<b>9.4</b>	100	359	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)  
 Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

### 20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	92.2	26.0	14.6	40.9	91.9	-	-	100k/300k
Hori.	2396.967	PK	48.6	25.9	14.6	40.9	48.2	71.9	23.7	100k/300k
Hori.	2399.804	PK	52.8	26.0	14.6	40.9	52.5	71.9	19.4	100k/300k
Hori.	2400.000	PK	49.7	26.0	14.6	40.9	49.4	71.9	22.5	100k/300k
Vert.	2412.000	PK	94.3	26.0	14.6	40.9	94.0	-	-	100k/300k
Vert.	2397.003	PK	50.6	25.9	14.6	40.9	50.2	74.0	23.8	100k/300k
Vert.	2399.804	PK	52.6	26.0	14.6	40.9	52.3	74.0	21.7	100k/300k
Vert.	2400.000	PK	44.0	26.0	14.6	40.9	43.7	74.0	30.3	100k/300k

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter) - Gain(Amplifier)

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## Radiated Emission

Test place            No.1 Semi Anechoic Chamber  
 Date                    February 26, 2015  
 Temperature / Humidity 22 deg.C, 36 %RH  
 Engineer              Akira Sato  
 Mode                    Tx,                    2437 MHz  
                              Tx, IEEE802.11b PN9, worst data mode 1Mbps

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	48.1	30.8	7.1	41.6	44.4	73.9	29.5	100	329	
Hori.	6498.743	PK	47.7	34.6	8.3	41.3	49.3	73.9	24.6	100	31	
Hori.	7311.000	PK	46.7	36.3	8.5	41.5	50.0	73.9	23.9	100	359	
Hori.	9748.000	PK	43.5	38.3	9.6	40.4	51.0	73.9	22.9	100	0	
Hori.	12185.000	PK	42.8	39.3	10.7	39.7	53.1	73.9	20.8	100	359	
Hori.	4874.000	AV	39.0	30.8	7.1	41.6	35.3	53.9	18.6	100	329	
Hori.	6498.743	AV	38.4	34.6	8.3	41.3	40.0	53.9	13.9	100	31	
Hori.	7311.000	AV	36.9	36.3	8.5	41.5	40.2	53.9	13.7	100	359	
Hori.	9748.000	AV	34.9	38.3	9.6	40.4	42.4	53.9	11.5	100	0	
Hori.	12185.000	AV	33.9	39.3	10.7	39.7	44.2	53.9	9.7	100	359	
Vert.	4874.000	PK	48.4	30.8	7.1	41.6	44.7	73.9	29.2	100	352	
Vert.	6498.690	PK	49.2	34.6	8.3	41.3	50.8	73.9	23.1	100	78	
Vert.	7311.000	PK	45.4	36.3	8.5	41.5	48.7	73.9	25.2	100	359	
Vert.	9748.000	PK	43.6	38.3	9.6	40.4	51.1	73.9	22.8	100	0	
Vert.	12185.000	PK	42.9	39.3	10.7	39.7	53.2	73.9	20.7	100	359	
Vert.	4874.000	AV	38.1	30.8	7.1	41.6	34.4	53.9	19.5	100	352	
Vert.	6498.690	AV	42.2	34.6	8.3	41.3	43.8	53.9	10.1	100	78	
Vert.	7311.000	AV	37.3	36.3	8.5	41.5	40.6	53.9	13.3	100	359	
Vert.	9748.000	AV	34.9	38.3	9.6	40.4	42.4	53.9	11.5	100	0	
Vert.	12185.000	AV	34.0	39.3	10.7	39.7	44.3	53.9	9.6	100	359	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprefier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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## Radiated Emission

Test place No.1 Semi Anechoic Chamber  
 Date February 26, 2015  
 Temperature / Humidity 22 deg.C, 36 %RH  
 Engineer Akira Sato  
 Mode Tx, 2462 MHz  
 Tx, IEEE802.11b PN9, worst data mode 1Mbps

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	60.6	26.1	14.7	40.9	60.5	73.9	13.4	100	199	
Hori.	4924.000	PK	49.0	31.0	7.2	41.5	45.7	73.9	28.2	100	0	
Hori.	6565.442	PK	47.1	34.8	8.4	41.3	49.0	73.9	24.9	100	353	
Hori.	7386.000	PK	46.1	36.4	8.6	41.4	49.7	73.9	24.2	100	0	
Hori.	9848.000	PK	43.9	38.3	9.5	40.4	51.3	73.9	22.6	100	359	
Hori.	12310.000	PK	42.8	39.3	10.8	39.7	53.2	73.9	20.7	100	0	
Hori.	2483.500	AV	37.8	26.1	14.7	40.9	37.7	53.9	16.2	100	199	
Hori.	4924.000	AV	40.2	31.0	7.2	41.5	36.9	53.9	17.0	100	0	
Hori.	6565.442	AV	38.0	34.8	8.4	41.3	39.9	53.9	14.0	100	353	
Hori.	7386.000	AV	37.6	36.4	8.6	41.4	41.2	53.9	12.7	100	0	
Hori.	9848.000	AV	34.9	38.3	9.5	40.4	42.3	53.9	11.6	100	359	
Hori.	12310.000	AV	34.0	39.3	10.8	39.7	44.4	53.9	9.5	100	0	
Vert.	2483.500	PK	60.4	26.1	14.7	40.9	60.3	73.9	13.6	100	175	
Vert.	4924.000	PK	48.0	31.0	7.2	41.5	44.7	73.9	29.2	100	347	
Vert.	6565.261	PK	48.8	34.8	8.4	41.3	50.7	73.9	23.2	100	31	
Vert.	7386.000	PK	46.1	36.4	8.6	41.4	49.7	73.9	24.2	100	359	
Vert.	9848.000	PK	43.7	38.3	9.5	40.4	51.1	73.9	22.8	100	0	
Vert.	12310.000	PK	42.7	39.3	10.8	39.7	53.1	73.9	20.8	100	359	
Vert.	2483.500	AV	38.0	26.1	14.7	40.9	37.9	53.9	16.0	100	175	
Vert.	4924.000	AV	39.3	31.0	7.2	41.5	36.0	53.9	17.9	100	347	
Vert.	6565.261	AV	41.3	34.8	8.4	41.3	43.2	53.9	10.7	100	31	
Vert.	7386.000	AV	37.0	36.4	8.6	41.4	40.6	53.9	13.3	100	359	
Vert.	9848.000	AV	35.2	38.3	9.5	40.4	42.6	53.9	11.3	100	0	
Vert.	12310.000	AV	34.2	39.3	10.8	39.7	44.6	53.9	<b>9.3</b>	100	359	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Ampriifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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## Radiated Emission

Test place            No.1 Semi Anechoic Chamber  
Date                    February 26, 2015                    February 27, 2015  
Temperature / Humidity 22 deg.C, 36 %RH                    21 deg.C, 37 %RH  
Engineer              Akira Sato  
Mode                    Tx,                    2412 MHz  
                             Tx, IEEE802.11g PN9, worst data mode 24Mbps

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	415.027	QP	37.8	16.5	7.1	31.8	29.6	46.0	16.4	100	279	
Hori.	934.994	QP	21.0	22.3	9.6	31.0	21.9	46.0	24.1	150	39	
Hori.	2339.972	PK	47.1	25.8	14.5	40.9	46.5	73.9	27.4	100	194	
Hori.	2390.000	PK	62.3	25.9	14.6	40.9	61.9	73.9	12.0	100	194	
Hori.	4824.000	PK	46.9	30.6	7.1	41.7	42.9	73.9	31.0	100	359	
Hori.	6432.004	PK	48.0	34.4	8.3	41.2	49.5	73.9	24.4	100	352	
Hori.	7236.000	PK	46.3	36.2	8.6	41.5	49.6	73.9	24.3	100	0	
Hori.	9648.000	PK	43.8	38.3	9.5	40.4	51.2	73.9	22.7	100	0	
Hori.	12060.000	PK	43.3	39.4	10.6	39.7	53.6	73.9	20.3	100	359	
Hori.	2339.972	AV	39.5	25.8	14.5	40.9	38.9	53.9	15.0	100	194	
Hori.	2390.000	AV	43.4	25.9	14.6	40.9	43.0	53.9	10.9	100	194	
Hori.	4824.000	AV	37.7	30.6	7.1	41.7	33.7	53.9	20.2	100	359	
Hori.	6432.004	AV	37.0	34.4	8.3	41.2	38.5	53.9	15.4	100	352	
Hori.	7236.000	AV	36.9	36.2	8.6	41.5	40.2	53.9	13.7	100	0	
Hori.	9648.000	AV	34.5	38.3	9.5	40.4	41.9	53.9	12.0	100	0	
Hori.	12060.000	AV	34.7	39.4	10.6	39.7	45.0	53.9	8.9	100	359	
Vert.	50.066	QP	26.6	10.7	7.4	31.8	12.9	40.0	27.1	100	275	
Vert.	78.040	QP	26.8	6.3	8.1	31.8	9.4	40.0	30.6	111	252	
Vert.	159.324	QP	25.2	15.2	8.8	31.8	17.4	43.5	26.1	100	240	
Vert.	400.811	QP	32.5	16.3	7.0	31.8	24.0	46.0	22.0	232	281	
Vert.	2339.972	PK	49.5	25.8	14.5	40.9	48.9	73.9	25.0	100	159	
Vert.	2390.000	PK	64.7	25.9	14.6	40.9	64.3	73.9	9.6	100	159	
Vert.	4824.000	PK	47.2	30.6	7.1	41.7	43.2	73.9	30.7	100	359	
Vert.	6432.100	PK	48.2	34.4	8.3	41.2	49.7	73.9	24.2	100	31	
Vert.	7236.000	PK	45.9	36.2	8.6	41.5	49.2	73.9	24.7	100	0	
Vert.	9648.000	PK	44.0	38.3	9.5	40.4	51.4	73.9	22.5	100	359	
Vert.	12060.000	PK	43.5	39.4	10.6	39.7	53.8	73.9	20.1	100	0	
Vert.	2339.972	AV	41.8	25.8	14.5	40.9	41.2	53.9	12.7	100	159	
Vert.	2390.000	AV	45.8	25.9	14.6	40.9	45.4	53.9	<b>8.5</b>	100	159	
Vert.	4824.000	AV	36.8	30.6	7.1	41.7	32.8	53.9	21.1	100	359	
Vert.	6432.100	AV	40.0	34.4	8.3	41.2	41.5	53.9	12.4	100	31	
Vert.	7236.000	AV	36.5	36.2	8.6	41.5	39.8	53.9	14.1	100	0	
Vert.	9648.000	AV	34.4	38.3	9.5	40.4	41.8	53.9	12.1	100	359	
Vert.	12060.000	AV	34.6	39.4	10.6	39.7	44.9	53.9	9.0	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**20dBc Data Sheet (RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	89.9	26.0	14.6	40.9	89.6	-	-	100k/300k
Hori.	2396.949	PK	53.0	25.9	14.6	40.9	52.6	69.6	17.0	100k/300k
Hori.	2400.000	PK	50.3	26.0	14.6	40.9	50.0	69.6	19.6	100k/300k
Vert.	2412.000	PK	91.5	26.0	14.6	40.9	91.2	-	-	100k/300k
Vert.	2396.971	PK	53.7	25.9	14.6	40.9	53.3	71.2	17.9	100k/300k
Vert.	2400.000	PK	52.7	26.0	14.6	40.9	52.4	71.2	18.8	100k/300k

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter) - Gain(Amplifier)

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## Radiated Emission

Test place           No.1 Semi Anechoic Chamber  
 Date                 February 26, 2015  
 Temperature / Humidity 22 deg.C, 36 %RH  
 Engineer            Akira Sato  
 Mode                Tx,                2437 MHz  
                       Tx, IEEE802.11g PN9, worst data mode 24Mbps

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	47.8	30.8	7.1	41.6	44.1	73.9	29.8	100	359	
Hori.	6498.569	PK	46.9	34.6	8.3	41.3	48.5	73.9	25.4	100	13	
Hori.	7311.000	PK	46.1	36.3	8.5	41.5	49.4	73.9	24.5	100	359	
Hori.	9748.000	PK	43.3	38.3	9.6	40.4	50.8	73.9	23.1	100	0	
Hori.	12185.000	PK	43.7	39.3	10.7	39.7	54.0	73.9	19.9	100	359	
Hori.	4874.000	AV	37.9	30.8	7.1	41.6	34.2	53.9	19.7	100	359	
Hori.	6498.569	AV	37.6	34.6	8.3	41.3	39.2	53.9	14.7	100	13	
Hori.	7311.000	AV	37.3	36.3	8.5	41.5	40.6	53.9	13.3	100	359	
Hori.	9748.000	AV	34.8	38.3	9.6	40.4	42.3	53.9	11.6	100	0	
Hori.	12185.000	AV	34.0	39.3	10.7	39.7	44.3	53.9	9.6	100	359	
Vert.	4874.000	PK	47.0	30.8	7.1	41.6	43.3	73.9	30.6	100	0	
Vert.	6498.579	PK	48.4	34.6	8.3	41.3	50.0	73.9	23.9	100	40	
Vert.	7311.000	PK	46.5	36.3	8.5	41.5	49.8	73.9	24.1	100	359	
Vert.	9748.000	PK	43.1	38.3	9.6	40.4	50.6	73.9	23.3	100	0	
Vert.	12185.000	PK	42.5	39.3	10.7	39.7	52.8	73.9	21.1	100	359	
Vert.	4874.000	AV	37.0	30.8	7.1	41.6	33.3	53.9	20.6	100	0	
Vert.	6498.579	AV	40.3	34.6	8.3	41.3	41.9	53.9	12.0	100	40	
Vert.	7311.000	AV	36.9	36.3	8.5	41.5	40.2	53.9	13.7	100	359	
Vert.	9748.000	AV	34.7	38.3	9.6	40.4	42.2	53.9	11.7	100	0	
Vert.	12185.000	AV	34.3	39.3	10.7	39.7	44.6	53.9	<b>9.3</b>	100	359	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Ampriifier)

Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

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## Radiated Emission

Test place            No.1 Semi Anechoic Chamber  
 Date                    February 26, 2015  
 Temperature / Humidity 22 deg.C, 36 %RH  
 Engineer              Akira Sato  
 Mode                    Tx,                    2462 MHz  
                              Tx, IEEE802.11g PN9, worst data mode 24Mbps

(\* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	62.8	26.1	14.7	40.9	62.7	73.9	11.2	100	183	
Hori.	2534.604	PK	47.5	26.3	14.7	40.9	47.6	73.9	26.3	100	180	
Hori.	4924.000	PK	46.9	31.0	7.2	41.5	43.6	73.9	30.3	100	0	
Hori.	6565.118	PK	47.6	34.8	8.4	41.3	49.5	73.9	24.4	100	350	
Hori.	7386.000	PK	46.3	36.4	8.6	41.4	49.9	73.9	24.0	100	359	
Hori.	9848.000	PK	45.4	38.3	9.5	40.4	52.8	73.9	21.1	100	0	
Hori.	12310.000	PK	43.6	39.3	10.8	39.7	54.0	73.9	19.9	100	359	
Hori.	2483.500	AV	45.6	26.1	14.7	40.9	45.5	53.9	8.4	100	183	
Hori.	2534.604	AV	38.3	26.3	14.7	40.9	38.4	53.9	15.5	100	180	
Hori.	4924.000	AV	39.1	31.0	7.2	41.5	35.8	53.9	18.1	100	0	
Hori.	6565.118	AV	38.1	34.8	8.4	41.3	40.0	53.9	13.9	100	350	
Hori.	7386.000	AV	37.5	36.4	8.6	41.4	41.1	53.9	12.8	100	359	
Hori.	9848.000	AV	35.3	38.3	9.5	40.4	42.7	53.9	11.2	100	0	
Hori.	12310.000	AV	34.1	39.3	10.8	39.7	44.5	53.9	9.4	100	359	
Vert.	2483.500	PK	59.3	26.1	14.7	40.9	59.2	73.9	14.7	100	155	
Vert.	2534.181	PK	49.3	26.3	14.7	40.9	49.4	73.9	24.5	100	147	
Vert.	4924.000	PK	46.5	31.0	7.2	41.5	43.2	73.9	30.7	100	359	
Vert.	6565.212	PK	49.0	34.8	8.4	41.3	50.9	73.9	23.0	100	30	
Vert.	7386.000	PK	46.2	36.4	8.6	41.4	49.8	73.9	24.1	100	359	
Vert.	9848.000	PK	44.3	38.3	9.5	40.4	51.7	73.9	22.2	100	0	
Vert.	12310.000	PK	43.1	39.3	10.8	39.7	53.5	73.9	20.4	100	359	
Vert.	2483.500	AV	48.5	26.1	14.7	40.9	48.4	53.9	5.5	100	155	
Vert.	2534.181	AV	39.9	26.3	14.7	40.9	40.0	53.9	13.9	100	147	
Vert.	4924.000	AV	38.1	31.0	7.2	41.5	34.8	53.9	19.1	100	359	
Vert.	6565.212	AV	41.4	34.8	8.4	41.3	43.3	53.9	10.6	100	30	
Vert.	7386.000	AV	37.6	36.4	8.6	41.4	41.2	53.9	12.7	100	359	
Vert.	9848.000	AV	35.1	38.3	9.5	40.4	42.5	53.9	11.4	100	0	
Vert.	12310.000	AV	34.2	39.3	10.8	39.7	44.6	53.9	9.3	100	359	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)  
 Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

**UL Japan, Inc.**

**Shonan EMC Lab.**

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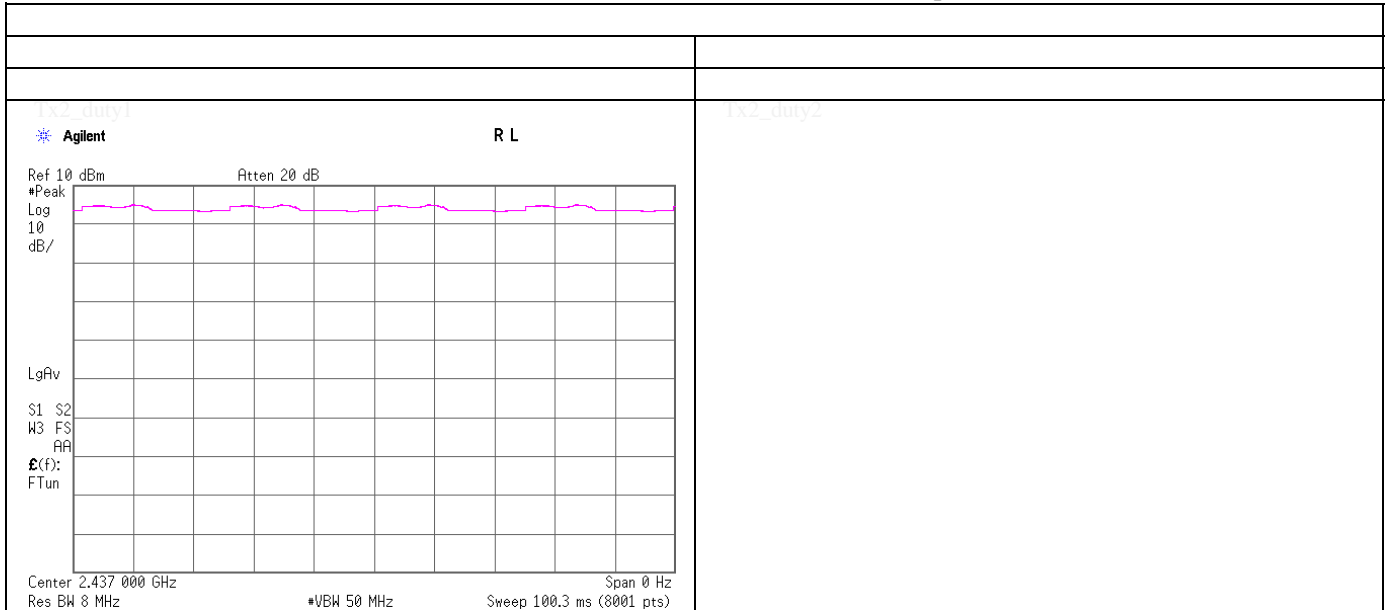
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Test place           UL Japan, Inc. Shonan EMC Lab.    No.5 Shielded Room  
 Date                 February 22, 2015  
 Temperature / Humidity   21deg.C     , 36%RH  
 Engineer            Tatsuya Arai

## Burst rate confirmation

**Tx, IEEE802.11b, PN9, worst data mode 1Mbps**

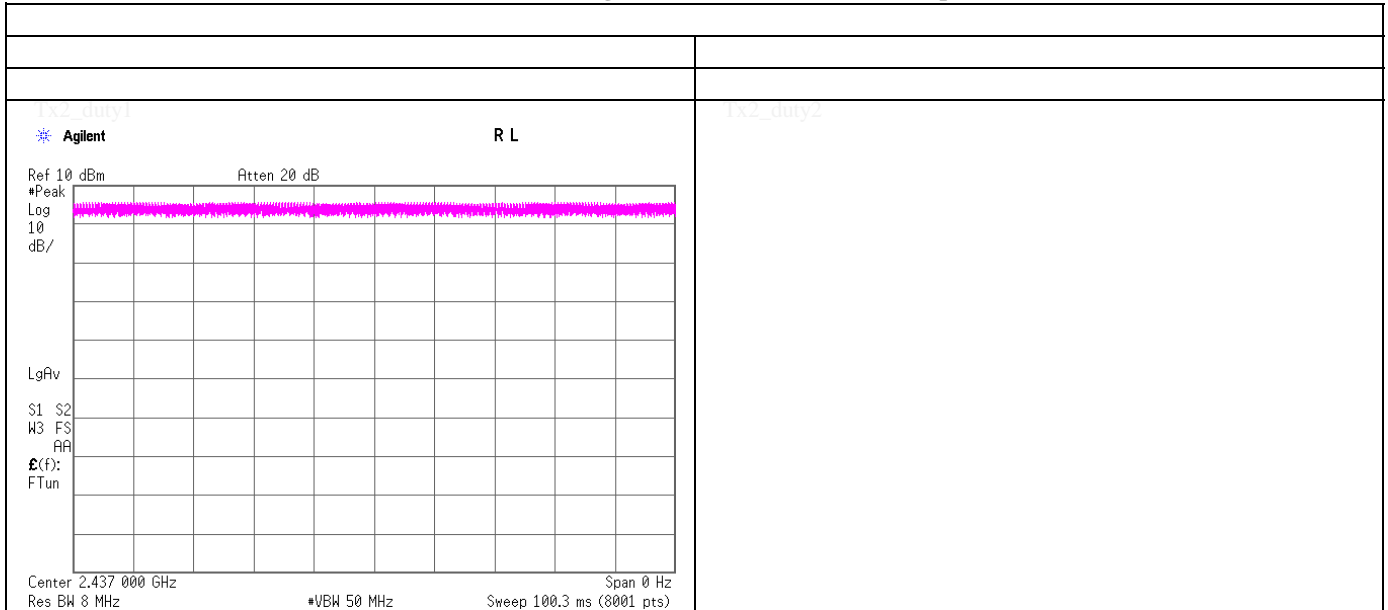


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Test place           UL Japan, Inc. Shonan EMC Lab.    No.5 Shielded Room  
 Date                 February 22, 2015  
 Temperature / Humidity   21deg.C     , 36%RH  
 Engineer            Tatsuya Arai

## Burst rate confirmation

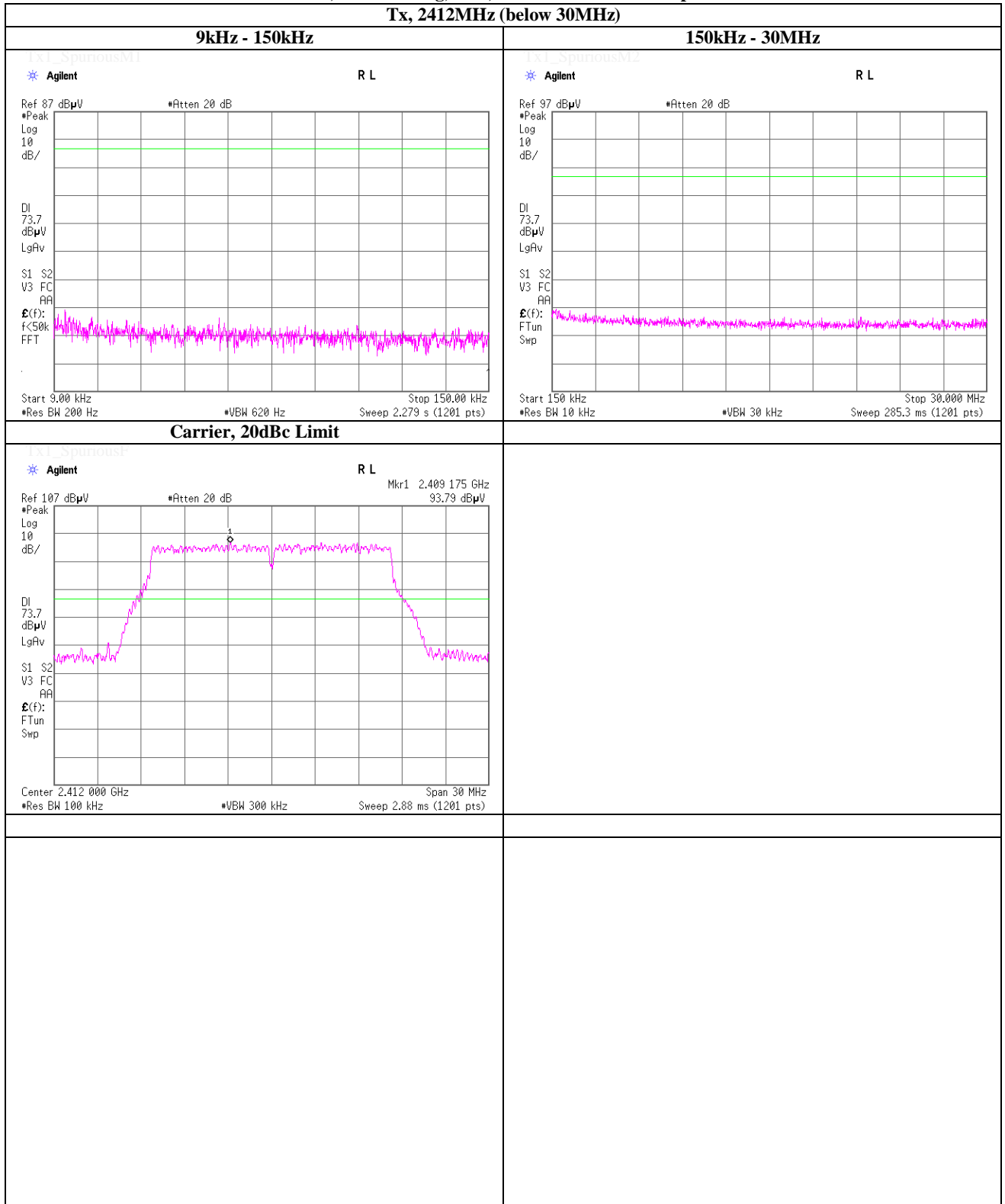
**Tx, IEEE802.11g, PN9, worst data mode 24Mbps**



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Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room  
 Date February 22, 2015  
 Temperature / Humidity 21deg.C , 36%RH  
 Engineer Tatsuya Arai

**Spurious emission (Conducted)**  
**Tx, IEEE802.11g, PN9, worst data mode 24Mbps**



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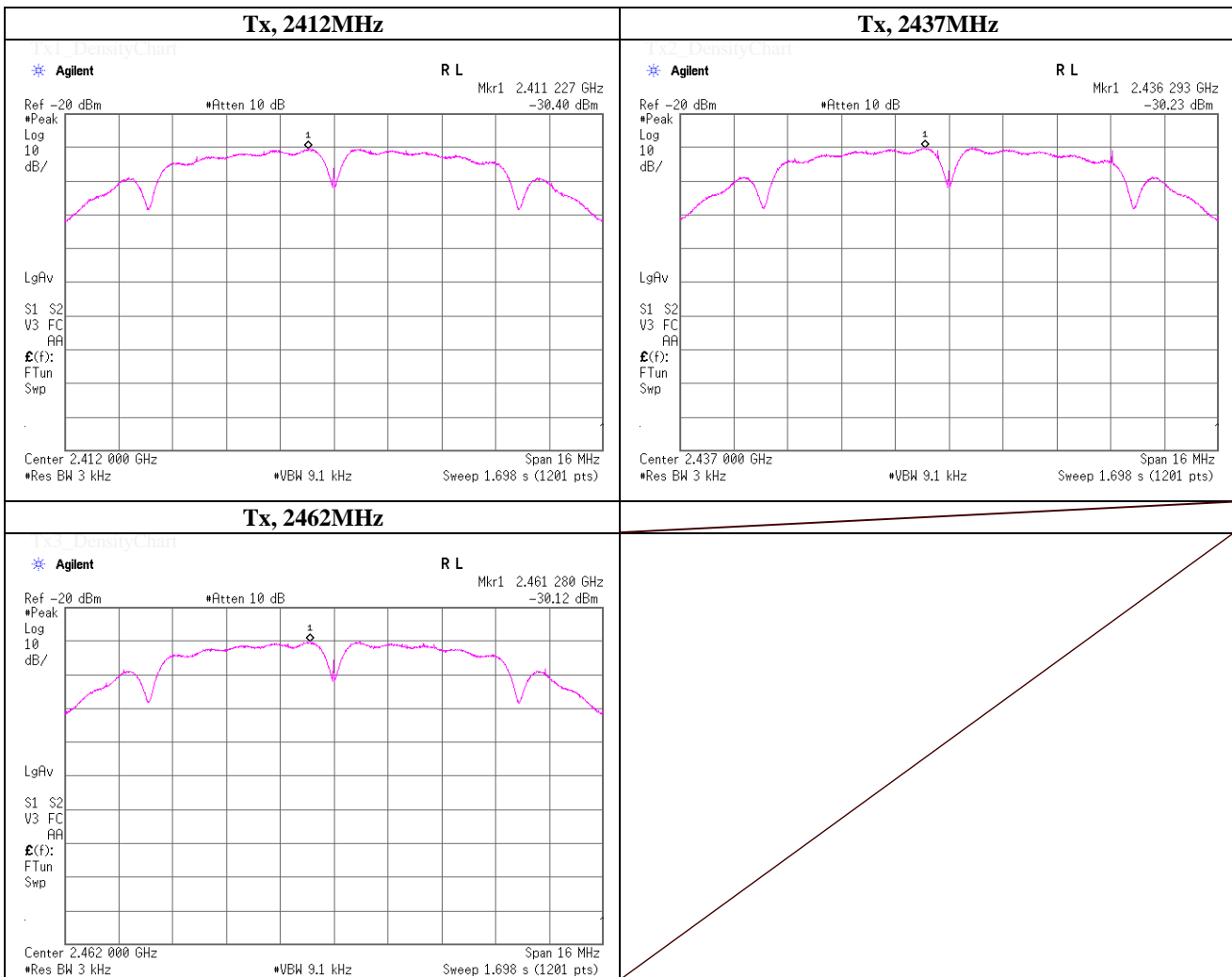
## Maximum Power Spectral Density

(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 22, 2015	
Temperature / Humidity	21deg.C , 36%RH	
Engineer	Tatsuya Arai	
Mode	Tx, IEEE802.11b, PN9, worst data mode 1Mbps	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2411.23	-30.40	1.26	9.63	-19.51	8.00	27.51
2437.0000	2436.29	-30.23	1.26	9.63	-19.34	8.00	27.34
2462.0000	2461.28	-30.12	1.26	9.63	-19.23	8.00	27.23

Sample Calculation:  
 Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss



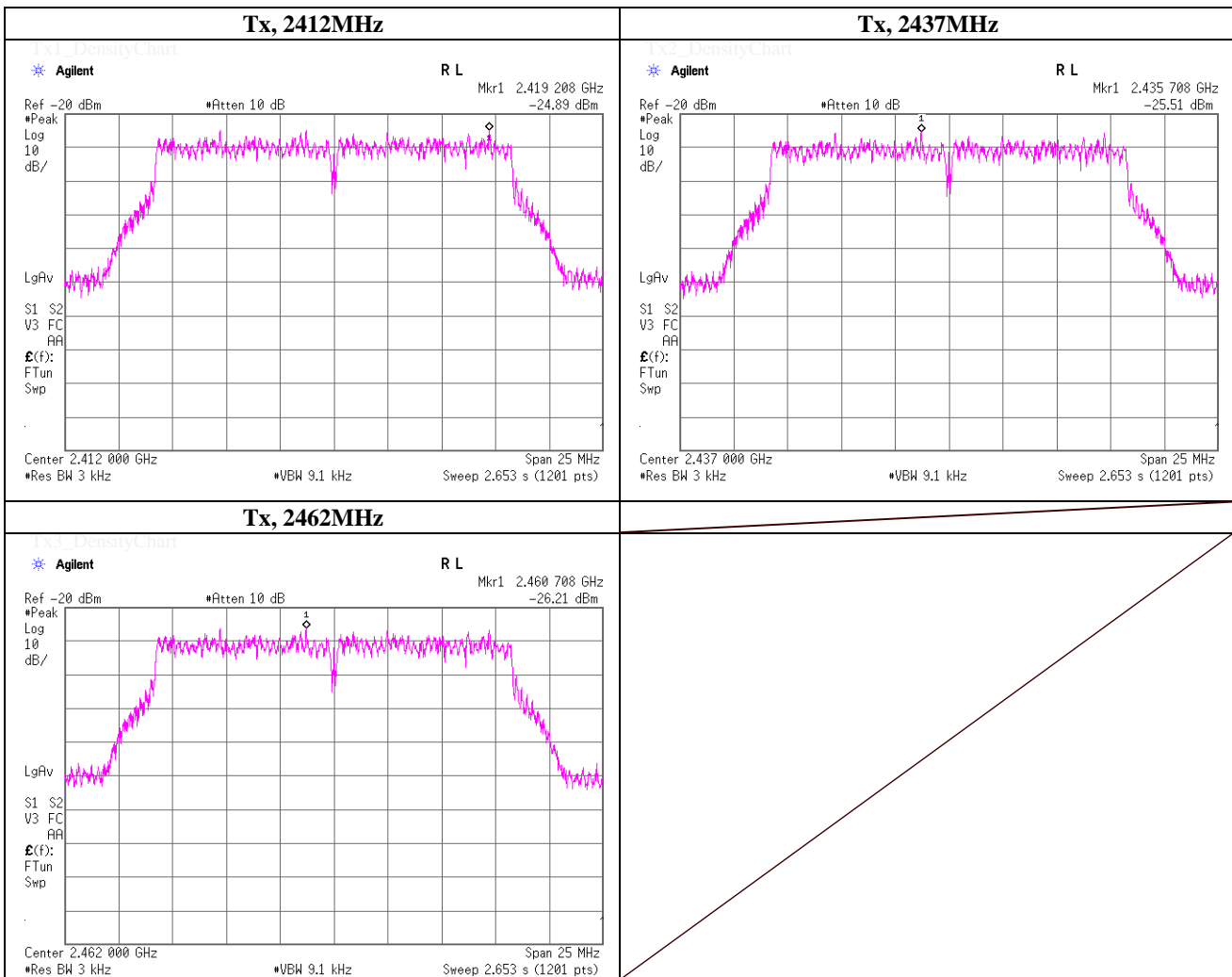
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## Maximum Power Spectral Density (PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 22, 2015	
Temperature / Humidity	21deg.C , 36%RH	
Engineer	Tatsuya Arai	
Mode	Tx, IEEE802.11g, PN9, worst data mode 24Mbps	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2419.21	-24.89	1.26	9.63	-14.00	8.00	22.00
2437.0000	2435.71	-25.51	1.26	9.63	-14.62	8.00	22.62
2462.0000	2460.71	-26.21	1.26	9.63	-15.32	8.00	23.32

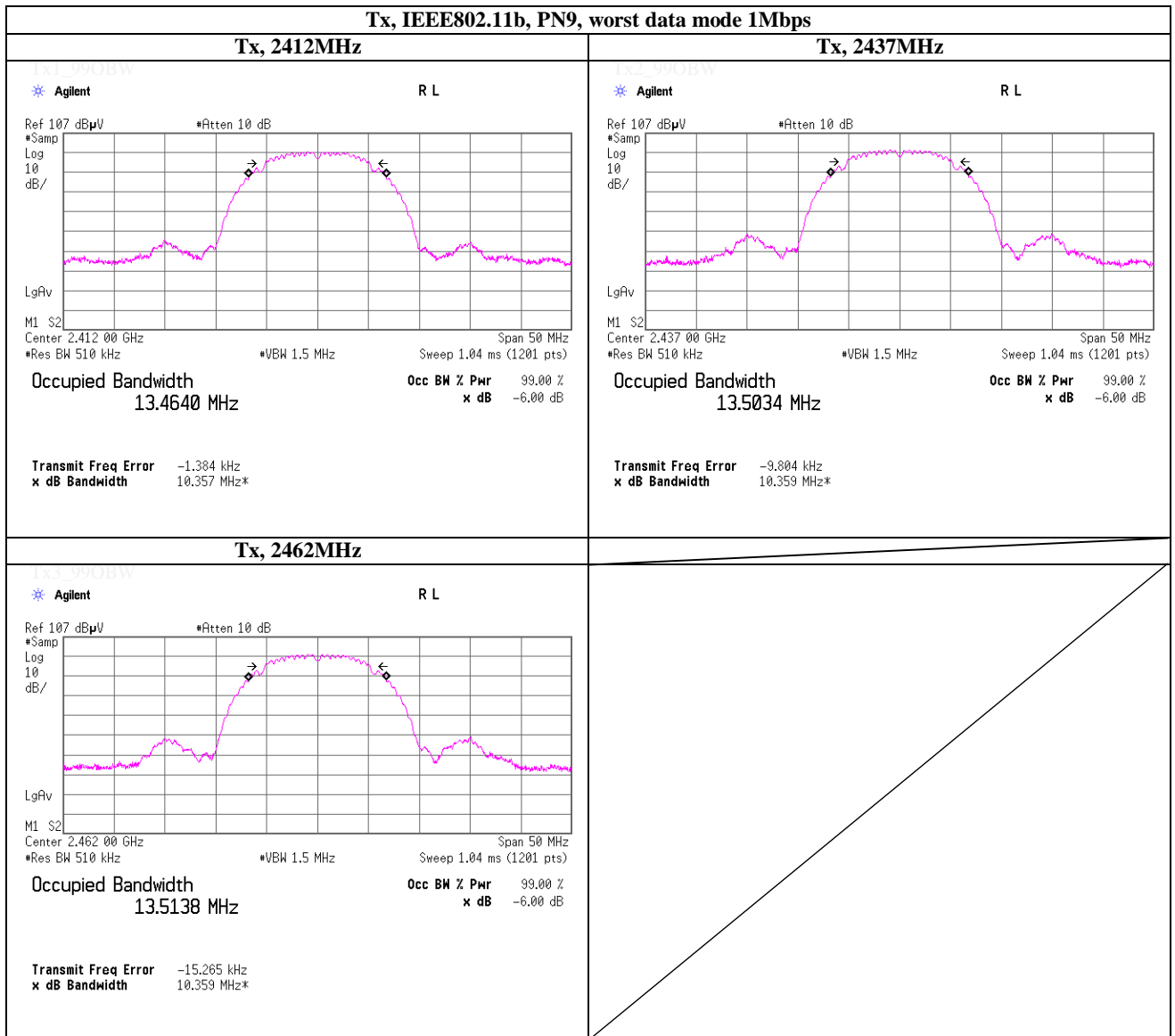
Sample Calculation:  
 Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss



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Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room  
 Date February 22, 2015  
 Temperature / Humidity 21deg.C , 36%RH  
 Engineer Tatsuya Arai

### 99% Occupied Bandwidth

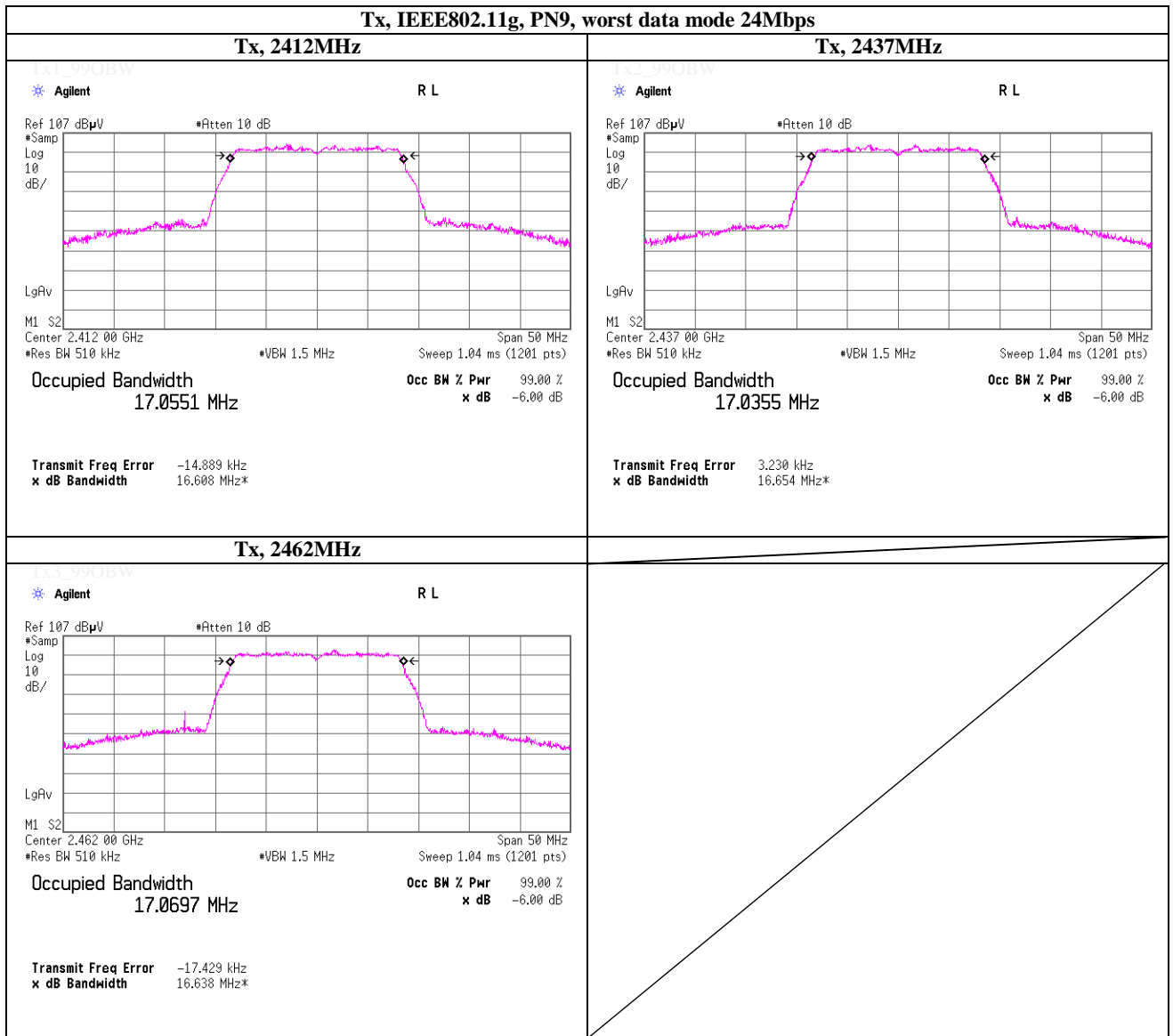


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Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room  
 Date February 22, 2015  
 Temperature / Humidity 21deg.C , 36%RH  
 Engineer Tatsuya Arai

### 99% Occupied Bandwidth



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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)
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2014/04/08 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2014/04/08 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT/RE	2014/03/04 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2014/11/21 * 12
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000KM SKMS	-	AT	2014/05/15 * 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2014/04/22 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT	2014/03/17 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2014/12/24 * 12
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2014/07/09 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2014/03/14 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2014/03/14 * 12
SCC-G01	Coaxial Cable	Suhner	SUCOFLEX 104A	46497/4A	RE	2014/04/22 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2014/03/13 * 12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX 104	296169/4	RE	2014/05/15 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2014/08/12 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2014/03/15 * 12
SAT10-05	Attenuator(above1GHz)	Agilent	8493C-010	74864	RE	2014/11/21 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2014/11/21 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2014/10/30 * 12
SJM-13	Measure	ASKUL	-	-	CE,RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	CE,RE	-
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2015/02/18 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2014/12/19 * 12
KAT3-09	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2014/08/27 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2014/10/18 * 12
SCC-A1/A3/A5 /A7/A8/A13/S RSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/ Suhner/Suhner/Suhner/ TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-269(RF Selector)	RE	2014/04/25 * 12
SCC-A2/A4/A6 /A7/A8/A13/S RSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/ Suhner/Suhner/Suhner/ TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-269(RF Selector)	RE	2014/04/25 * 12
SLA-01	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0888	RE	2014/10/18 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	CE,RE	2014/11/11 * 12
SCC-A12/A13/ SRSE-01	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/N S4906	-/0901-269(RF Selector)	CE	2014/04/25 * 12
SLS-01	LISN	Rohde & Schwarz	ENV216	100511	CE	2015/02/24 * 12
SAT3-06	Attenuator	JFW	50HF-003N	-	CE	2015/02/18 * 12
SOS-02	Humidity Indicator	A&D	AD-5681	4063343	CE	2014/12/24 * 12

The expiration date of the calibration is the end of the expired month .  
As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

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

Test Item :

- CE: Conducted emission ,
- RE: Radiated emission ,
- AT: Antenna terminal conducted tests ,