



# RADIO TEST REPORT

**Test Report No.: 10005018S-A**

**Applicant** : **Canon Inc.**  
**Type of Equipment** : **Wireless LAN Module**  
**Model No.** : **K30356**  
**FCC ID** : **AZDK30356**  
**Test regulation** : **FCC Part15 Subpart C: 2012**  
**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.
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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 7 to 16, 2013

**Tested by:** *S. Takano*

Shinichi Takano  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by :** *G. Ishiwata*

Go Ishiwata  
Manager of WiSE Japan,  
UL Verification Service



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

**UL Japan, Inc.**  
**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN  
Telephone : +81 463 50 6400  
Facsimile : +81 463 50 6401

13-EM-F0429



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1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## **SECTION 1: Customer information**

Company Name : Canon Inc.  
Address : 3-451 Tsukagoshi, Saiwai-ku, Kawasaki, Kanagawa 212-8530, Japan  
Telephone Number : +81-44-542-2111  
Facsimile Number : +81-44-548-7513  
Contact Person : Kenichi Nampei

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

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

Type of Equipment : Wireless LAN Module  
Model Number : K30356  
Serial Number : See Section 4.  
Rating : DC3.6V  
Country of Mass-production : Thailand, Vietnam  
Condition of EUT : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Receipt Date of Sample : February 7, 2013  
Modification of EUT : No modification by the test lab.

### **2.2 Product description**

Model: K30356 (referred to as the EUT in this report) is a Wireless LAN Module.

Clock frequency(ies) in the system : 40MHz

<Radio part>

Equipment type : Transceiver  
Frequency of operation : 2412-2462MHz (IEEE 802.11b, 11g, 11n-HT20)  
2422-2452MHz (IEEE 802.11n-HT40)  
Bandwidth : 20MHz (IEEE 802.11b, 11g, 11n-HT20), 40MHz (IEEE 802.11n-HT40)  
Channel spacing : 5MHz  
Type of modulation : DSSS (IEEE 802.11b), OFDM (IEEE 802.11g/n)  
Antenna type : Pattern antenna (meander)  
Antenna connector type : U.FL  
Antenna gain : 1.08 dBi  
ITU code : D1D, G1D  
Operation temperature range : -5 to +55 deg.C

FCC 15.31 (e) / 212

The Wireless LAN Module has its own regulator.

The Wireless LAN Module is constantly provided voltage (DC3.1V) through the regulator regardless of input voltage.  
Therefore, this EUT complies with the requirement.

FCC 15.203 / 212

The antenna is not removable from the EUT. Therefore, the equipment complies with the antenna requirement.  
The antenna connector is a unique type and not used by end user.

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

### **3.1 Test specification**

Test specification : Test specification: FCC Part 15 Subpart C: 2012, final revised on December 27, 2012 and effective January 28, 2013  
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	20.4dB Freq.: 0.40644MHz Detector: QP Phase: N Mode: Tx 2437MHz, IEEE 802.11g	Complied
6dB bandwidth	ANSI C63.10:2009	FCC 15.247 (a)(2)	Conducted	N/A	* See data	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	3.2dB Freq.: 4924MHz Polarization: Vertical Detection: Average Mode: Tx 2462MHz / 11b	Complied
Power density	ANSI C63.10:2009	FCC 15.247 (e)	Conducted	N/A	* See data	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 (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 C63.4:2009 13. Measurement of intentional radiators, 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	3.6 dB	3.5 dB
<b>Radiated emission (Measurement distance: 3m)</b>	9kHz-30MHz	3.7 dB	3.7 dB	3.6 dB
	30MHz-300MHz	4.9 dB	5.1 dB	4.9 dB
	300MHz-1GHz	5.0 dB	5.2 dB	4.9 dB
	1GHz-15GHz	4.8 dB	4.8 dB	4.9 dB
<b>Radiated emission (Measurement distance: 1m)</b>	15GHz-18GHz	5.6 dB	5.6 dB	5.6 dB
	18GHz-40GHz	4.6 dB	4.3 dB	4.4 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 meets the limits unless the uncertainty is taken into consideration.

#### Antenna port conducted test

Power measurement uncertainty above 1GHz for this test was: (±) 1.5dB

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

Spurious emission (Conducted) measurement (1G-3GHz) uncertainty for this test was: (±) 2.3dB

Spurious emission (Conducted) measurement (3G-18GHz) uncertainty for this test was: (±) 3.0dB

Spurious emission (Conducted) measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.9dB

Bandwidth measurement uncertainty for this test was: (±) 5.4%

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### Shonan EMC Lab.

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

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Facsimile : +81 463 50 6401

### 3.5 Test location

UL Japan, Inc. Shonan EMC Lab.

1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN

Telephone number : +81 463 50 6400

Facsimile number : +81 463 50 6401

JAB Accreditation No. : RTL02610

	FCC Registration No.	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
<input type="checkbox"/> No.1 semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input checked="" type="checkbox"/> No.2 semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input checked="" type="checkbox"/> No.3 semi-anechoic chamber	697847	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 type="checkbox"/> No.1 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input checked="" 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	-

### 3.6 Test setup, Data of EMI & Test instruments

Refer to APPENDIX 3 to 3.

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**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

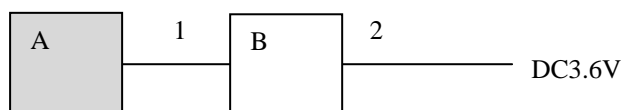
## SECTION 4: Operation of E.U.T. during testing

### 4.1 Operating mode

Test item	Mode	Tested frequency	Power setting *1)	Worst data rate *2)
Conducted emission Radiated emission (below 1GHz) *3)	Transmitting IEEE 802.11g	2437MHz	12dBm	6Mbps, PN9
Other items	Transmitting IEEE 802.11b	2412MHz, 2437MHz, 2462MHz	13dBm	1Mbps, PN9
	Transmitting IEEE 802.11g	2412MHz, 2437MHz, 2462MHz	ch1: 7dBm, ch6: 12dBm, ch11: 7dBm	6Mbps, PN9
	Transmitting IEEE 802.11n-20	2412MHz, 2437MHz, 2462MHz	ch1: 7dBm, ch6: 12dBm, ch11: 7dBm	MCS0, PN9
	Transmitting IEEE 802.11n-40	2422MHz, 2437MHz, 2452MHz	7dBm	MCS3, PN9
*1) Software used for the test: MFG-USB-8782-FC8-X86, Version: 1.1.7.34-14.1.11.p75				
*2) The worst condition was determined based on the test result of Maximum Peak 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.				

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

### 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 LAN Module	K30356	*1)	Canon	EUT
B	WLAN JOINT PCB	-	-	Canon	-

\*1) Conducted / Radiated emission: 1, Other test: 2

#### List of cables used

No.	Cable Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Flat	0.1	Unshielded	Unshielded	-
2	DC	1.3	Unshielded	Unshielded	-

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Facsimile : +81 463 50 6401



## **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 2.0m, 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 via DC power supply within a Shielded room. The EUT was connected to a Line Impedance Stabilization Network (LISN) via DC power supply.

An overview sweep with peak detection has been performed.

The measurements had been performed with a quasi-peak detector and if required, an average detector.

The conducted emission measurements were made with the following detection of the test receiver.

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

### **5.5 Results**

Summary of the test results : Pass  
Refer to APPENDIX 1

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### **Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## **SECTION 6: Radiated emission**

### **6.1 Operating environment**

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

### **6.2 Test configuration**

EUT was placed on a urethane 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.

### **6.3 Test conditions**

Frequency range : 9kHz to 25GHz  
EUT position : Table top

### **6.4 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). Measurements were performed with quasi-peak, peak and average detector.

<Below 30MHz>

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0deg.to 360deg.) and horizontal polarization. Drawing of the antenna direction is shown in Figure 1.

<Above 30MHz>

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. Drawing of the antenna direction is shown in Figure 2.

The radiated emission measurements were made with the following detection.

<Below 30MHz>

Frequency	9kHz to 90kHz & 110kHz to 150kHz	90kHz to 110kHz	150kHz to 490kHz	490kHz to 30MHz
Detection type	PK/AV	QP	PK/AV	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz

<Above 30MHz>

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: RMS	RBW: 100kHz VBW: 300kHz

\* FCC Part 15 Section 15.31 (f)(2) (9kHz-30MHz)

9kHz – 490kHz [Limit at 3m]= [Limit at 300m]-40log (3[m]/300[m])

490kHz – 30MHz [Limit at 3m]= [Limit at 30m]-40log (3[m]/30[m])

\*1) Average Power Measurement was measured based on 10.2.3.3 and 8.2.1 of "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

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Telephone : +81 463 50 6400

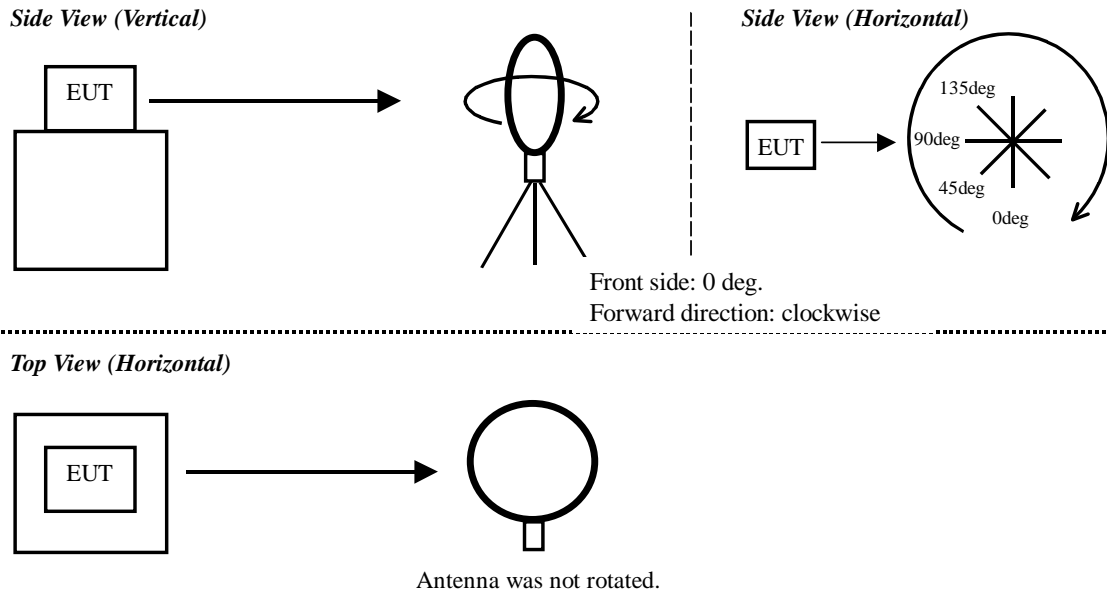
Facsimile : +81 463 50 6401

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.

**Worst case:**

Antenna polarization	Carrier (Band edge)	Spurious		
		Below 1GHz	Above 1GHz	
			1-2.8GHz	2.8-25GHz
Horizontal	Y	Z	Y	Z
Vertical	Z	Y	Z	Y

**Figure 1. Direction of the Loop Antenna**



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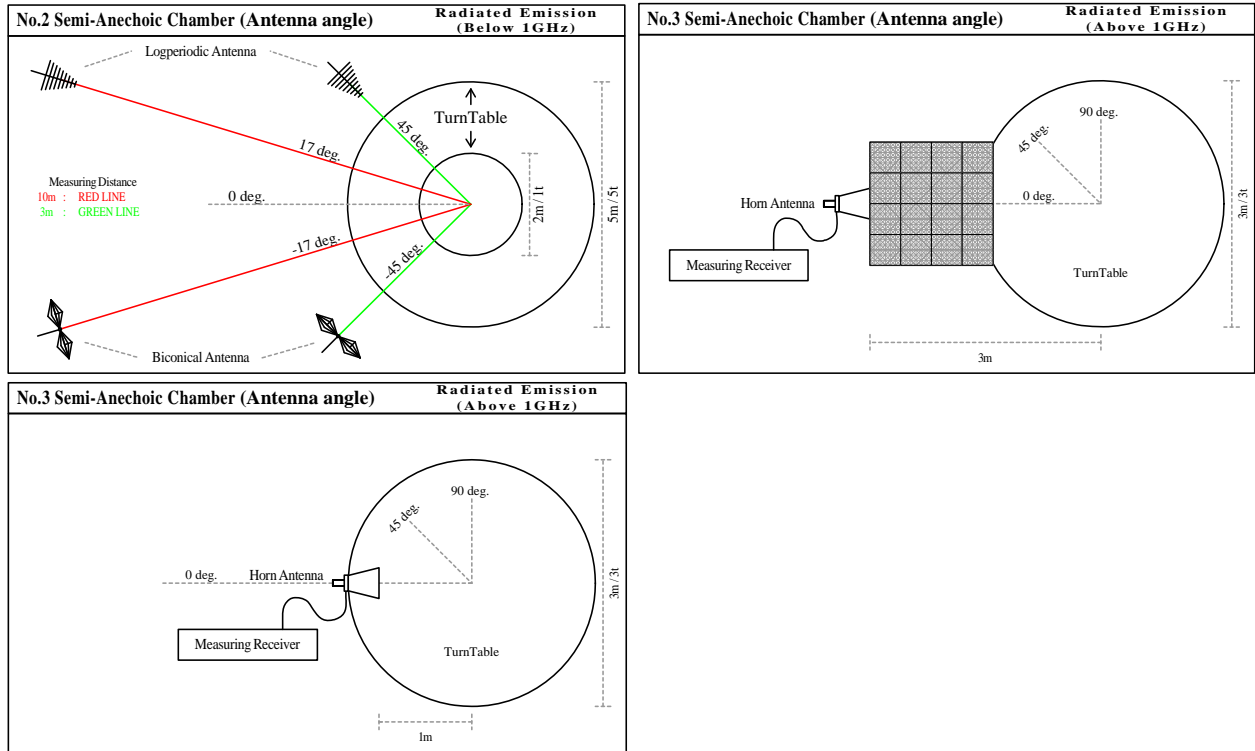
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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

**Figure 2. Antenna angle**



## 6.5 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.

## 6.6 Results

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

Refer to APPENDIX 1

## **SECTION 7: 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. In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement. 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 8: 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 7.1 Option 1 and 7.2 Option 2 of "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 9: 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 8.1.3 Option 3 of "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 10: 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 9.1 Option 1 of "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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1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## **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 worst position

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1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

# APPENDIX 1: Data of Radio tests

## DATA OF CONDUCTED EMISSION TEST

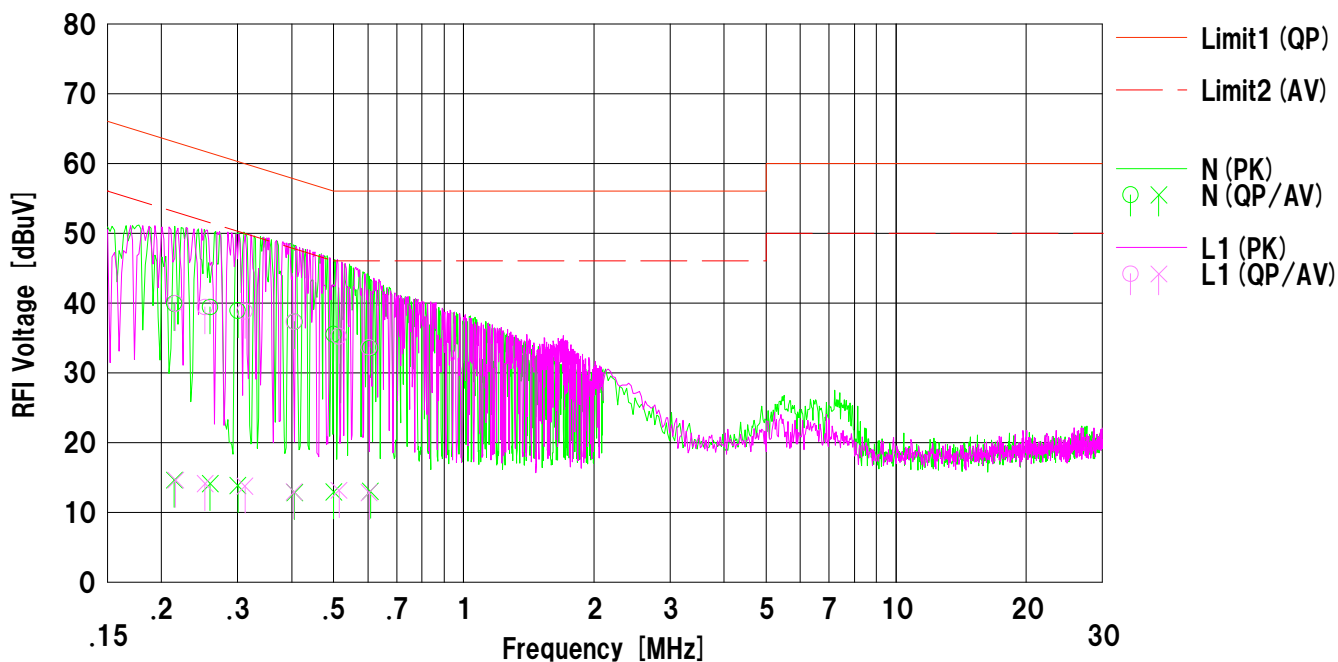
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room  
Date : 2013/02/16

Company : CANON INC.  
Kind of EUT : Wireless LAN Module  
Model No. : K30356  
Serial No. : 1  
Remarks : -

Mode : 11g Tx 2437MHz  
Report No. : 10005018S-A  
Power : AC120V/60Hz  
Temp./Humi. : 24deg.C / 28%

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

Engineer : Shinichi Takano



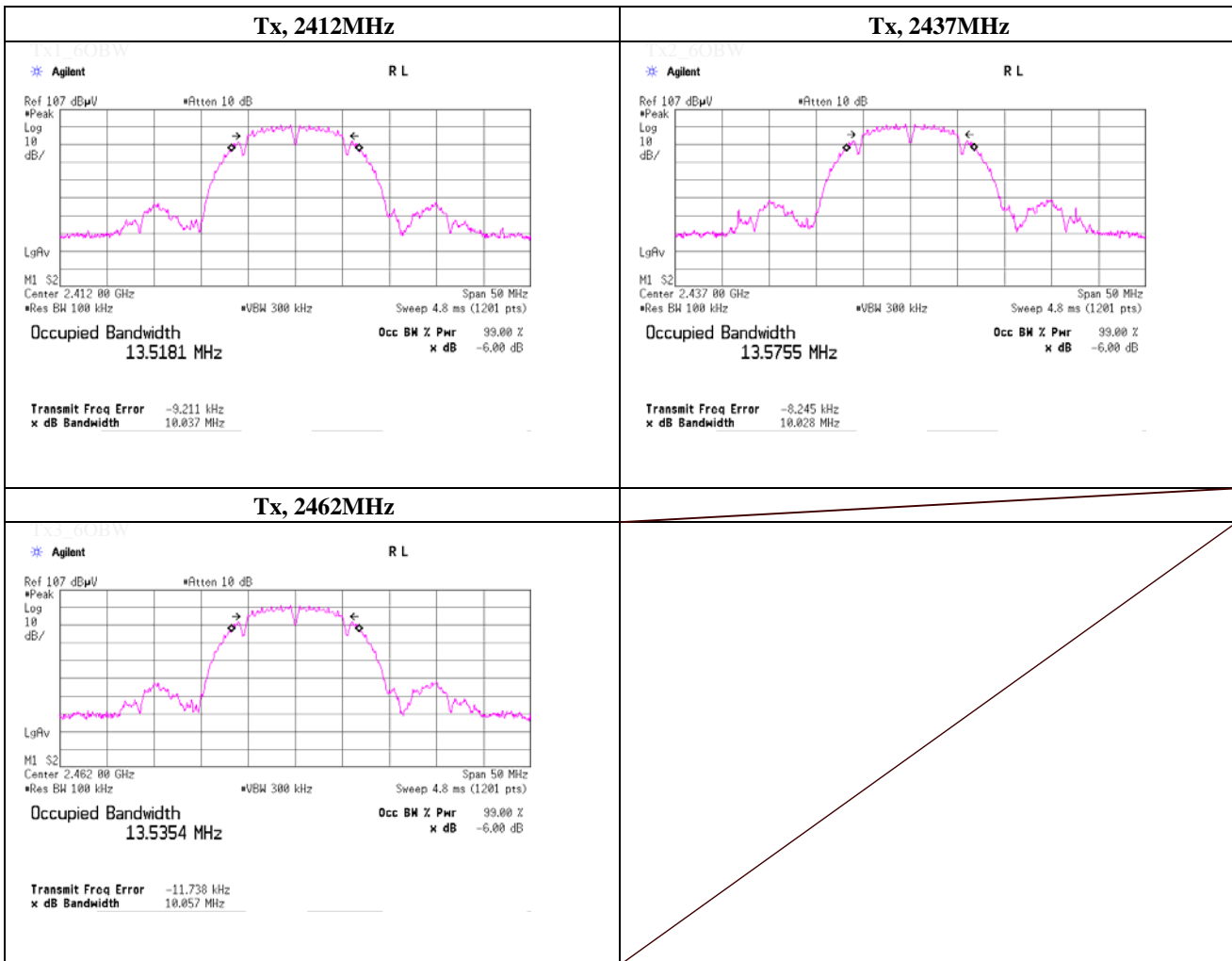
No.	Freq. [MHz]	Reading		C.Fac [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.21405	27.3	2.0	12.6	39.9	14.6	63.0	53.0	23.1	38.4	N	
2	0.25935	26.8	1.5	12.6	39.4	14.1	61.4	51.4	22.0	37.3	N	
3	0.30052	26.3	1.2	12.6	38.9	13.8	60.2	50.2	21.3	36.4	N	
4	0.40644	24.7	0.2	12.6	37.3	12.8	57.7	47.7	20.4	34.9	N	
5	0.50027	22.9	0.3	12.6	35.5	12.9	56.0	46.0	20.5	33.1	N	
6	0.60841	20.9	0.4	12.6	33.5	13.0	56.0	46.0	22.5	33.0	N	
7	0.21567	27.3	2.0	12.6	39.9	14.6	62.9	52.9	23.0	38.3	L1	
8	0.25193	26.8	1.5	12.6	39.4	14.1	61.6	51.6	22.2	37.5	L1	
9	0.31184	26.2	1.1	12.6	38.8	13.7	59.9	49.9	21.1	36.2	L1	
10	0.40517	24.7	0.3	12.6	37.3	12.9	57.7	47.7	20.4	34.8	L1	
11	0.51481	22.6	0.5	12.6	35.2	13.1	56.0	46.0	20.8	32.9	L1	
12	0.60410	21.0	0.2	12.6	33.6	12.8	56.0	46.0	22.4	33.2	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN+Cable+ATT) [dB]  
LISN:SLS-03

### -6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 8, 2013	
Temperature / Humidity	23deg.C , 35%	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11b, PN9, worst data mode 1Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	10.037	> 0.500
2437.0000	10.028	> 0.500
2462.0000	10.057	> 0.500

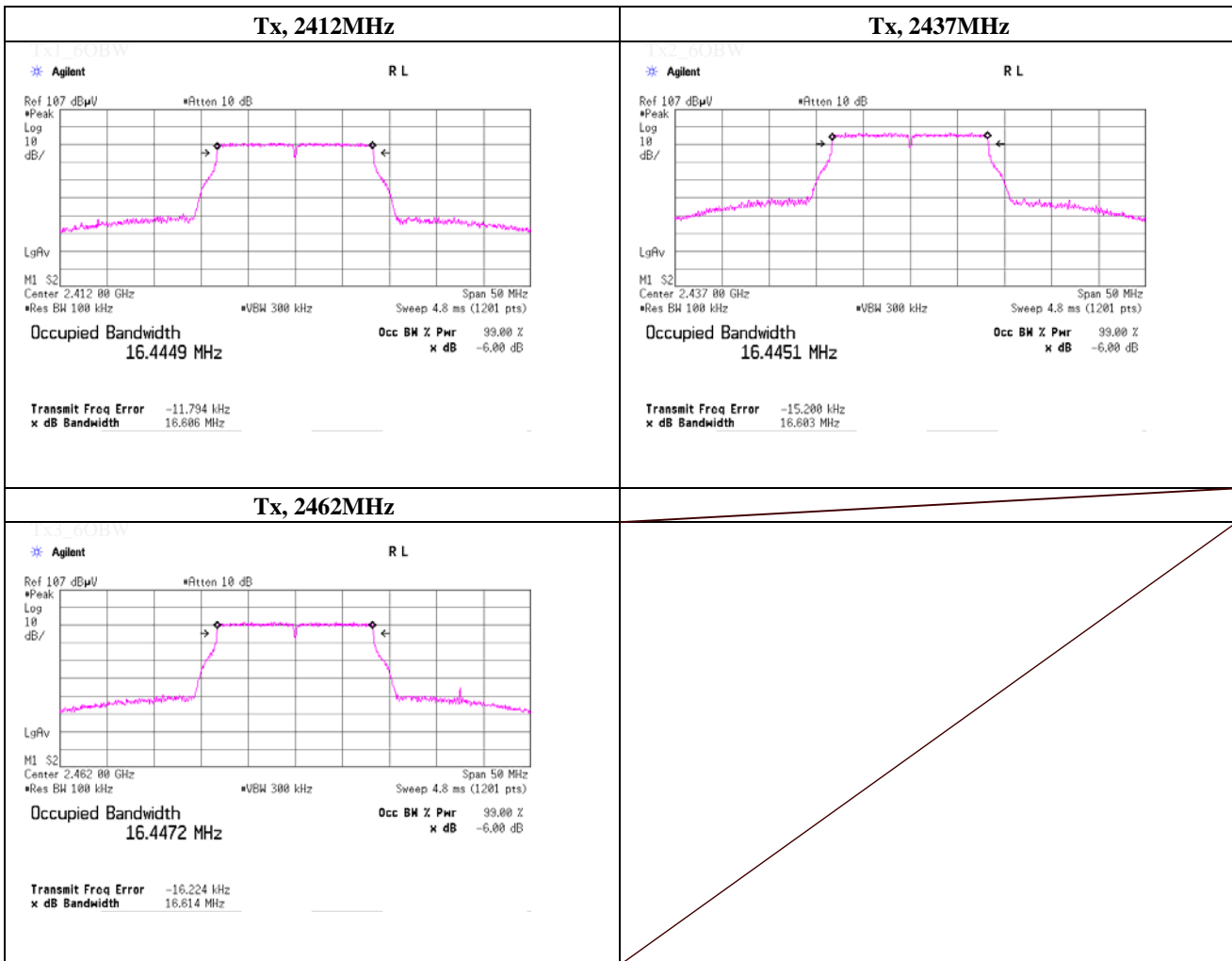




### -6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 8, 2013	
Temperature / Humidity	23deg.C , 35%	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11g, PN9, worst data mode 6Mbps	

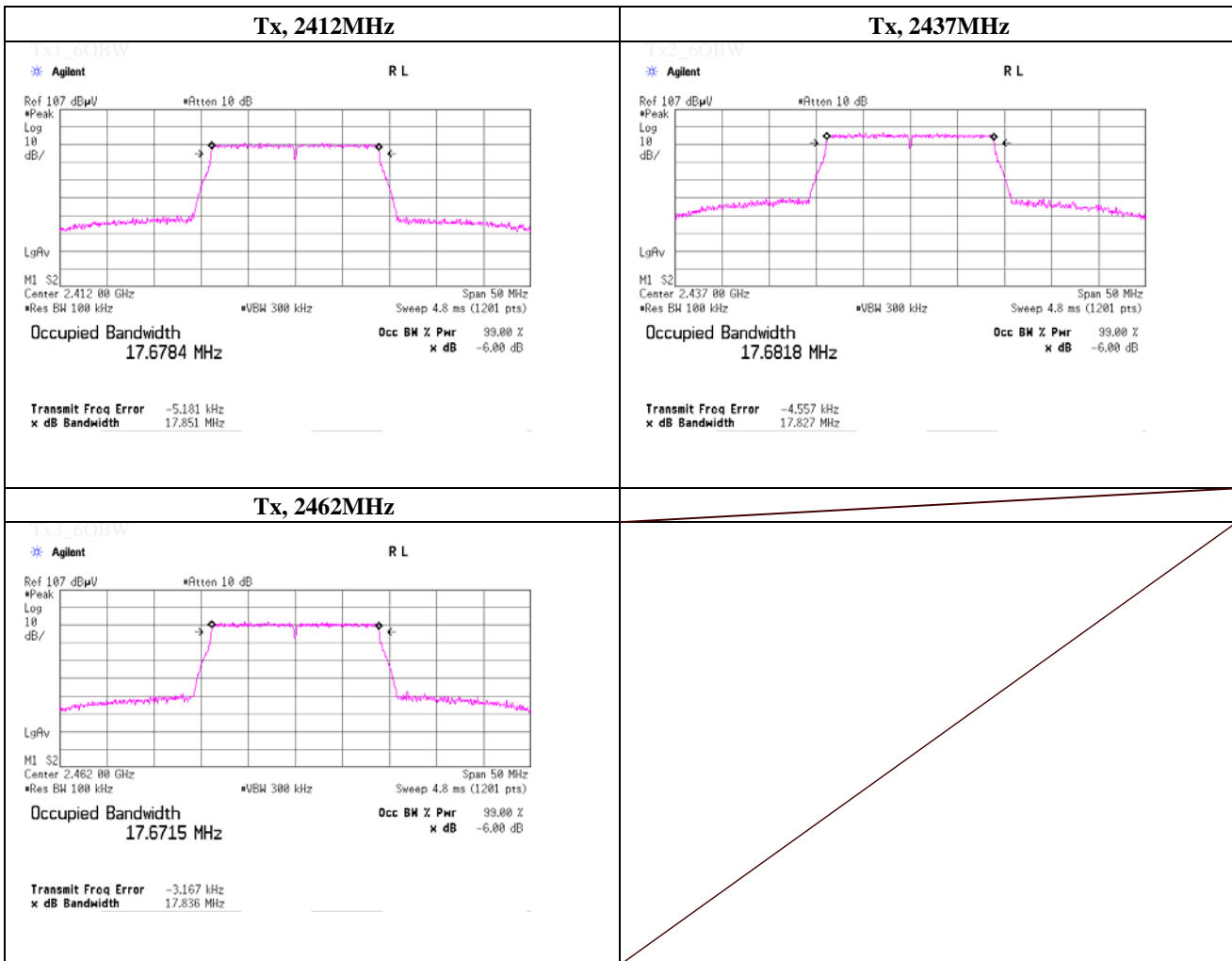
Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	16.606	> 0.500
2437.0000	16.603	> 0.500
2462.0000	16.614	> 0.500



### -6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 8, 2013	
Temperature / Humidity	23deg.C , 35%	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11n-HT20, PN9, worst data mode 0(MCS)	

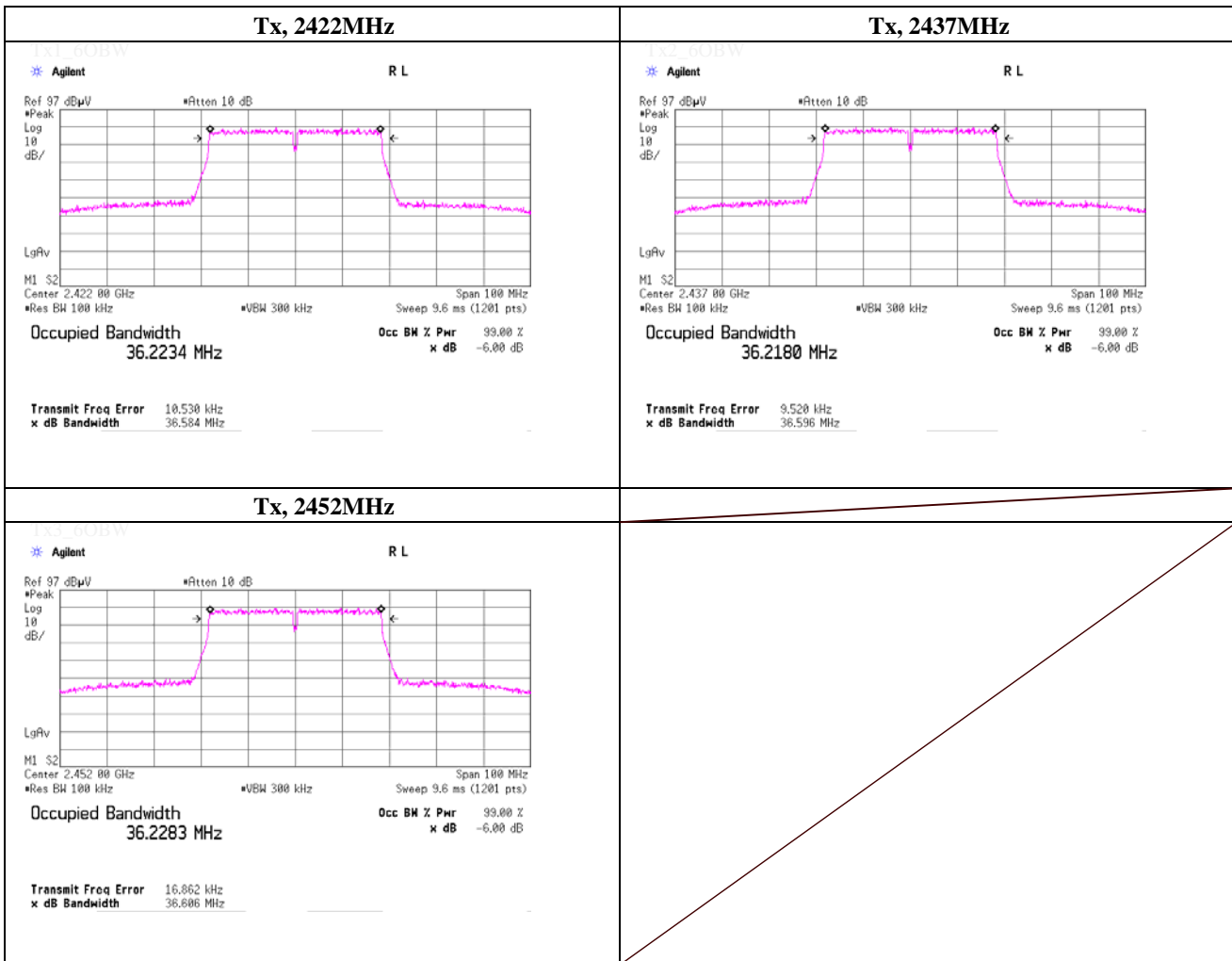
Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	17.851	> 0.500
2437.0000	17.827	> 0.500
2462.0000	17.836	> 0.500



### -6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 8, 2013	
Temperature / Humidity	23deg.C , 35%	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11n-HT40, PN9, worst data mode 3(MCS)	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2422.0000	36.584	> 0.500
2437.0000	36.596	> 0.500
2452.0000	36.606	> 0.500



## Maximum Peak Conducted Output Power

(Option 3)

Test place                      UL Japan, Inc. Shonan EMC Lab.      No.5 Shielded Room  
 Date                              February 7, 2013  
 Temperature / Humidity      24deg.C      , 34%RH  
 Engineer                        Akio Hayashi  
 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	4.16	1.25	9.97	15.38	34.51	30.00	1000	14.62
Mid	2437.0	4.12	1.25	9.97	15.34	34.20	30.00	1000	14.66
High	2462.0	4.43	1.25	9.97	15.65	36.73	30.00	1000	14.35

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	4.12	1.25	9.97	<b>15.34</b>	34.20	30.00	1000	<b>14.66</b>
	2	2437.0	4.09	1.25	9.97	15.31	33.96	30.00	1000	14.69
	5.5	2437.0	4.08	1.25	9.97	15.30	33.88	30.00	1000	14.70
	11	2437.0	4.10	1.25	9.97	15.32	34.04	30.00	1000	14.68

**Worst**

Sample Calculation:

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

**UL Japan, Inc.**  
**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Maximum Peak Conducted Output Power

(Option 3)

Test place                      UL Japan, Inc. Shonan EMC Lab.        No.5 Shielded Room  
 Date                              February 7, 2013  
 Temperature / Humidity        24deg.C        , 34%RH  
 Engineer                        Akio Hayashi  
 Mode                              Tx, IEEE802.11g, PN9,                      worst data mode :                      6 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	5.15	1.25	9.97	16.37	43.35	30.00	1000	13.63
Mid	2437.0	10.95	1.25	9.97	22.17	164.82	30.00	1000	7.83
High	2462.0	5.52	1.25	9.97	16.74	47.21	30.00	1000	13.26

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	10.95	1.25	9.97	<b>22.17</b>	164.82	30.00	1000	<b>7.83</b>
	9	2437.0	9.83	1.25	9.97	21.05	127.35	30.00	1000	8.95
	12	2437.0	10.92	1.25	9.97	22.14	163.68	30.00	1000	7.86
	18	2437.0	9.87	1.25	9.97	21.09	128.53	30.00	1000	8.91
	24	2437.0	10.86	1.25	9.97	22.08	161.44	30.00	1000	7.92
	36	2437.0	10.73	1.25	9.97	21.95	156.68	30.00	1000	8.05
	48	2437.0	9.95	1.25	9.97	21.17	130.92	30.00	1000	8.83
	54	2437.0	10.18	1.25	9.97	21.40	138.04	30.00	1000	8.60

**Worst**

Sample Calculation:

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

**UL Japan, Inc.**  
**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

**Maximum Peak Conducted Output Power**

(Option 3)

Test place                      UL Japan, Inc. Shonan EMC Lab.      No.5 Shielded Room  
 Date                              February 7, 2013  
 Temperature / Humidity      24deg.C      , 34%RH  
 Engineer                        Akio Hayashi  
 Mode                              Tx, IEEE802.11n-HT20, PN9,                              worst data mode :                              0 (MCS)

(\* 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	3.76	1.25	9.97	14.98	31.48	30.00	1000	15.02
Mid	2437.0	10.26	1.25	9.97	21.48	140.60	30.00	1000	8.52
High	2462.0	4.24	1.25	9.97	15.46	35.16	30.00	1000	14.54

Sample Calculation:

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

**[Pre check]**

Mode (MCS)	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Worst
					[dBm]	[mW]	[dBm]	[mW]		
0	2437.0	10.26	1.25	9.97	<b>21.48</b>	140.60	30.00	1000	<b>8.52</b>	
1	2437.0	10.12	1.25	9.97	21.34	136.14	30.00	1000	8.66	
2	2437.0	10.09	1.25	9.97	21.31	135.21	30.00	1000	8.69	
3	2437.0	10.09	1.25	9.97	21.31	135.21	30.00	1000	8.69	
4	2437.0	9.88	1.25	9.97	21.10	128.82	30.00	1000	8.90	
5	2437.0	9.95	1.25	9.97	21.17	130.92	30.00	1000	8.83	
6	2437.0	9.67	1.25	9.97	20.89	122.74	30.00	1000	9.11	
7	2437.0	9.49	1.25	9.97	20.71	117.76	30.00	1000	9.29	

Sample Calculation:

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

**UL Japan, Inc.**  
**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Maximum Peak Conducted Output Power

(Option 3)

Test place                    UL Japan, Inc. Shonan EMC Lab.          No.5 Shielded Room  
Date                            February 7, 2013  
Temperature / Humidity       24deg.C          , 34%RH  
Engineer                      Akio Hayashi  
Mode                            Tx, IEEE802.11n-HT40, PN9,                          worst data mode :          3 (MCS)

(\* 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	2422.0	5.47	1.25	9.97	16.69	46.67	30.00	1000	13.31
Mid	2437.0	5.77	1.25	9.97	16.99	50.00	30.00	1000	13.01
High	2452.0	5.82	1.25	9.97	17.04	50.58	30.00	1000	12.96

Sample Calculation:

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

### [Pre check]

Mode (MCS)	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
0	2437.0	4.90	1.25	9.97	16.12	40.93	30.00	1000	13.88
1	2437.0	4.74	1.25	9.97	15.96	39.45	30.00	1000	14.04
2	2437.0	5.54	1.25	9.97	16.76	47.42	30.00	1000	13.24
3	2437.0	5.77	1.25	9.97	<b>16.99</b>	50.00	30.00	1000	<b>13.01</b>
4	2437.0	5.52	1.25	9.97	16.74	47.21	30.00	1000	13.26
5	2437.0	3.83	1.25	9.97	15.05	31.99	30.00	1000	14.95
6	2437.0	3.71	1.25	9.97	14.93	31.12	30.00	1000	15.07
7	2437.0	3.60	1.25	9.97	14.82	30.34	30.00	1000	15.18

**Worst**

Sample Calculation:

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

**UL Japan, Inc.**  
**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Radiated Emission

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.3 Semi Anechoic Chamber  
 Date                        February 7, 2013                                       February 8, 2013                                       February 14, 2013  
 Temperature / Humidity   24 deg.C , 35%RH                               23 deg.C , 25%RH                               22 deg.C , 23%RH  
 Engineer                  Akio Hayashi                                       Shinichi Takano                                       Shinichi Takano  
 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.	2390.000	PK	49.9	27.4	14.2	41.4	50.1	73.9	23.8	134	326	
Hori.	4824.000	PK	54.0	31.1	6.8	41.2	50.7	73.9	23.2	100	265	
Hori.	7236.000	PK	47.3	36.6	8.4	41.4	50.9	73.9	23.0	100	0	
Hori.	9648.000	PK	43.1	38.6	9.5	38.9	52.3	73.9	21.6	100	0	
Hori.	12060.000	PK	43.8	39.5	10.8	39.4	54.7	73.9	19.2	100	0	
Hori.	2390.000	AV	39.3	27.4	14.2	41.4	39.5	53.9	14.4	134	326	
Hori.	4824.000	AV	51.0	31.1	6.8	41.2	47.7	53.9	6.2	100	265	
Hori.	7236.000	AV	37.9	36.6	8.4	41.4	41.5	53.9	12.4	100	0	
Hori.	9648.000	AV	34.1	38.6	9.5	38.9	43.3	53.9	10.6	100	0	
Hori.	12060.000	AV	35.3	39.5	10.8	39.4	46.2	53.9	7.7	100	0	
Vert.	2390.000	PK	51.4	27.4	14.2	41.4	51.6	73.9	22.3	100	359	
Vert.	4824.000	PK	54.7	31.1	6.8	41.2	51.4	73.9	22.5	111	157	
Vert.	7236.000	PK	47.1	36.6	8.4	41.4	50.7	73.9	23.2	100	0	
Vert.	9648.000	PK	43.5	38.6	9.5	38.9	52.7	73.9	21.2	100	0	
Vert.	12060.000	PK	44.2	39.5	10.8	39.4	55.1	73.9	18.8	100	0	
Vert.	2390.000	AV	41.0	27.4	14.2	41.4	41.2	53.9	12.7	100	359	
Vert.	4824.000	AV	52.1	31.1	6.8	41.2	48.8	53.9	<b>5.1</b>	111	157	
Vert.	7236.000	AV	36.8	36.6	8.4	41.4	40.4	53.9	13.5	100	0	
Vert.	9648.000	AV	33.2	38.6	9.5	38.9	42.4	53.9	11.5	100	0	
Vert.	12060.000	AV	34.4	39.5	10.8	39.4	45.3	53.9	8.6	100	0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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 Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	95.7	27.5	14.2	41.4	96.0	-	-	Carrier
Hori.	2396.995	PK	50.5	27.4	14.2	41.4	50.7	76.0	25.3	
Hori.	2400.000	PK	43.3	27.4	14.2	41.4	43.5	76.0	32.5	
Vert.	2412.000	PK	99.1	27.5	14.2	41.4	99.4	-	-	Carrier
Vert.	2396.996	PK	54.2	27.4	14.2	41.4	54.4	79.4	25.0	
Vert.	2400.000	PK	45.0	27.4	14.2	41.4	45.2	79.4	34.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

**UL Japan, Inc.**  
**Shonan EMC Lab.**  
 1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN  
 Telephone     : +81 463 50 6400  
 Facsimile    : +81 463 50 6401



## Radiated Emission

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.3 Semi Anechoic Chamber  
 Date                         February 7, 2013   February 7, 2013  
 Temperature / Humidity   22 deg.C , 31%RH                                     24 deg.C , 35%RH  
 Engineer                    Shinichi Takano   Akio Hayashi  
 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	54.1	31.3	6.9	41.1	51.2	73.9	22.7	102	227	
Hori.	7311.000	PK	46.5	36.6	8.4	41.4	50.1	73.9	23.8	100	0	
Hori.	9748.000	PK	44.7	38.7	9.5	38.9	54.0	73.9	19.9	100	0	
Hori.	12185.000	PK	44.3	39.5	10.8	39.3	55.3	73.9	18.6	100	0	
Hori.	4874.000	AV	51.1	31.3	6.9	41.1	48.2	53.9	5.7	102	227	
Hori.	7311.000	AV	36.7	36.6	8.4	41.4	40.3	53.9	13.6	100	0	
Hori.	9748.000	AV	34.3	38.7	9.5	38.9	43.6	53.9	10.3	100	0	
Hori.	12185.000	AV	34.9	39.5	10.8	39.3	45.9	53.9	8.0	100	0	
Vert.	4874.000	PK	55.2	31.3	6.9	41.1	52.3	73.9	21.6	108	182	
Vert.	7311.000	PK	46.9	36.6	8.4	41.4	50.5	73.9	23.4	100	0	
Vert.	9748.000	PK	43.5	38.7	9.5	38.9	52.8	73.9	21.1	100	0	
Vert.	12185.000	PK	44.0	39.5	10.8	39.3	55.0	73.9	18.9	100	0	
Vert.	4874.000	AV	52.5	31.3	6.9	41.1	49.6	53.9	<b>4.3</b>	108	182	
Vert.	7311.000	AV	36.5	36.6	8.4	41.4	40.1	53.9	13.8	100	0	
Vert.	9748.000	AV	34.1	38.7	9.5	38.9	43.4	53.9	10.5	100	0	
Vert.	12185.000	AV	34.2	39.5	10.8	39.3	45.2	53.9	8.7	100	0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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

## Radiated Emission

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.3 Semi Anechoic Chamber  
 Date                        February 7, 2013                                       February 8, 2013                                       February 14, 2013  
 Temperature / Humidity   24 deg.C , 35%RH                                   23 deg.C , 25%RH                                   22 deg.C , 23%RH  
 Engineer                   Akio Hayashi   Shinichi Takano                                     Shinichi Takano  
 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	50.0	27.5	14.3	41.4	50.4	73.9	23.5	100	324	
Hori.	4924.000	PK	56.4	31.5	6.9	41.0	53.8	73.9	20.1	100	112	
Hori.	7386.000	PK	47.2	36.7	8.4	41.5	50.8	73.9	23.1	100	0	
Hori.	9848.000	PK	43.9	38.9	9.5	38.9	53.4	73.9	20.5	100	0	
Hori.	12310.000	PK	44.5	39.5	10.8	39.3	55.5	73.9	18.4	100	0	
Hori.	2483.500	AV	39.3	27.5	14.3	41.4	39.7	53.9	14.2	100	324	
Hori.	4924.000	AV	53.0	31.5	6.9	41.0	50.4	53.9	3.5	100	112	
Hori.	7386.000	AV	37.5	36.7	8.4	41.5	41.1	53.9	12.8	100	0	
Hori.	9848.000	AV	34.4	38.9	9.5	38.9	43.9	53.9	10.0	100	0	
Hori.	12310.000	AV	35.0	39.5	10.8	39.3	46.0	53.9	7.9	100	0	
Vert.	2483.500	PK	51.6	27.5	14.3	41.4	52.0	73.9	21.9	132	359	
Vert.	4924.000	PK	57.3	31.5	6.9	41.0	54.7	73.9	19.2	112	153	
Vert.	7386.000	PK	47.1	36.7	8.4	41.5	50.7	73.9	23.2	100	0	
Vert.	9848.000	PK	43.8	38.9	9.5	38.9	53.3	73.9	20.6	100	0	
Vert.	12310.000	PK	44.4	39.5	10.8	39.3	55.4	73.9	18.5	100	0	
Vert.	2483.500	AV	41.1	27.5	14.3	41.4	41.5	53.9	12.4	132	359	
Vert.	4924.000	AV	53.3	31.5	6.9	41.0	50.7	53.9	3.2	112	153	
Vert.	7386.000	AV	37.3	36.7	8.4	41.5	40.9	53.9	13.0	100	0	
Vert.	9848.000	AV	33.8	38.9	9.5	38.9	43.3	53.9	10.6	100	0	
Vert.	12310.000	AV	34.4	39.5	10.8	39.3	45.4	53.9	8.5	100	0	

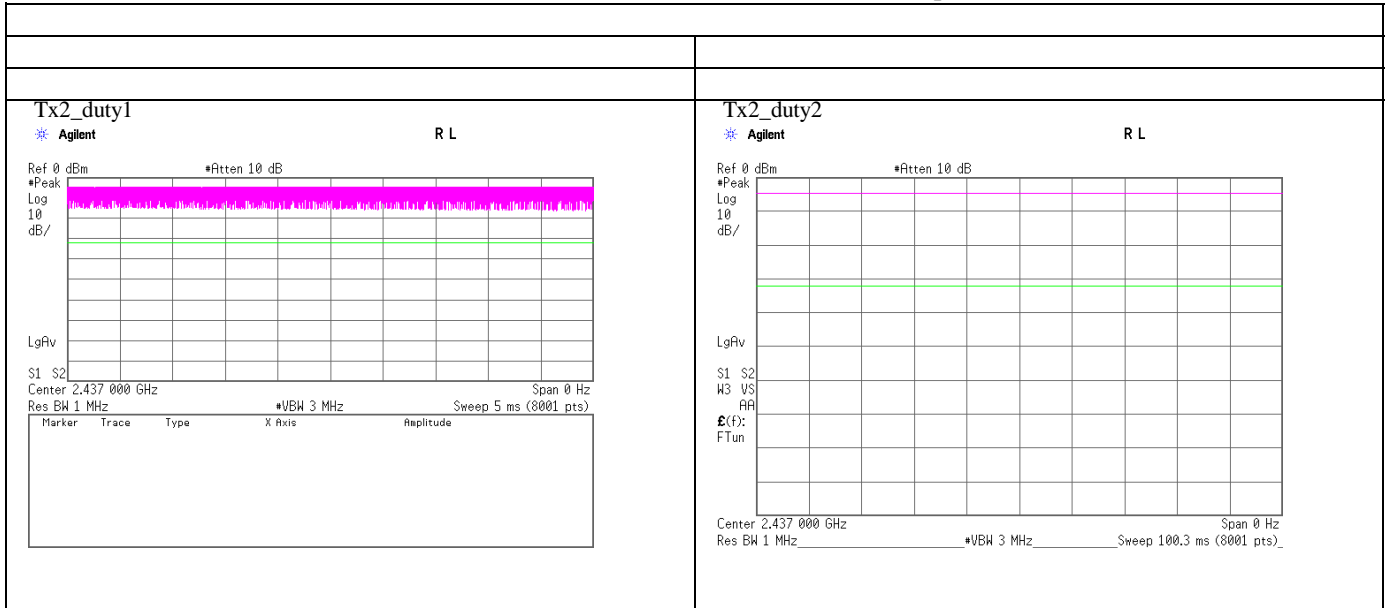
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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

## Burst rate confirmation

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



**UL Japan, Inc.**

**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Radiated Emission

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.3 Semi Anechoic Chamber  
 Date                         February 7, 2013   February 7, 2013   February 14, 2013  
 Temperature / Humidity   22 deg.C , 31%RH                                     24 deg.C , 35%RH                                     22 deg.C , 23%RH  
 Engineer                    Shinichi Takano   Akio Hayashi   Shinichi Takano  
 Mode                         Tx,   2412 MHz  
                                   Tx, IEEE802.11g, PN9, worst data mode 6Mbps

(\* 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.	2339.861	PK	48.7	27.4	14.1	41.4	48.8	73.9	25.1	100	333	
Hori.	2390.000	PK	54.6	27.4	14.2	41.4	54.8	73.9	19.1	100	335	
Hori.	4824.000	PK	48.2	31.1	6.8	41.2	44.9	73.9	29.0	130	327	
Hori.	7236.000	PK	46.5	36.6	8.4	41.4	50.1	73.9	23.8	100	0	
Hori.	9648.000	PK	43.4	38.6	9.5	38.9	52.6	73.9	21.3	100	0	
Hori.	12060.000	PK	44.5	39.5	10.8	39.4	55.4	73.9	18.5	100	0	
Hori.	2339.861	AV	39.0	27.4	14.1	41.4	39.1	53.9	14.8	100	333	
Hori.	2390.000	AV	43.9	27.4	14.2	41.4	44.1	53.9	9.8	100	335	
Hori.	4824.000	AV	37.4	31.1	6.8	41.2	34.1	53.9	19.8	130	327	
Hori.	7236.000	AV	36.8	36.6	8.4	41.4	40.4	53.9	13.5	100	0	
Hori.	9648.000	AV	33.2	38.6	9.5	38.9	42.4	53.9	11.5	100	0	
Hori.	12060.000	AV	34.4	39.5	10.8	39.4	45.3	53.9	<b>8.6</b>	100	0	
Vert.	2339.830	PK	50.0	27.4	14.1	41.4	50.1	73.9	23.8	100	359	
Vert.	2390.000	PK	56.9	27.4	14.2	41.4	57.1	73.9	16.8	100	359	
Vert.	4824.000	PK	46.7	31.1	6.8	41.2	43.4	73.9	30.5	100	157	
Vert.	7236.000	PK	46.4	36.6	8.4	41.4	50.0	73.9	23.9	100	0	
Vert.	9648.000	PK	43.2	38.6	9.5	38.9	52.4	73.9	21.5	100	0	
Vert.	12060.000	PK	44.3	39.5	10.8	39.4	55.2	73.9	18.7	100	0	
Vert.	2339.830	AV	40.6	27.4	14.1	41.4	40.7	53.9	13.2	100	359	
Vert.	2390.000	AV	44.9	27.4	14.2	41.4	45.1	53.9	8.8	100	359	
Vert.	4824.000	AV	37.3	31.1	6.8	41.2	34.0	53.9	19.9	100	157	
Vert.	7236.000	AV	36.8	36.6	8.4	41.4	40.4	53.9	13.5	100	0	
Vert.	9648.000	AV	33.3	38.6	9.5	38.9	42.5	53.9	11.4	100	0	
Vert.	12060.000	AV	34.4	39.5	10.8	39.4	45.3	53.9	<b>8.6</b>	100	0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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 Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	88.2	27.5	14.2	41.4	88.5	-	-	Carrier
Hori.	2400.000	PK	48.5	27.4	14.2	41.4	48.7	68.5	19.8	
Vert.	2412.000	PK	90.2	27.5	14.2	41.4	90.5	-	-	Carrier
Vert.	2400.000	PK	50.4	27.4	14.2	41.4	50.6	70.5	19.9	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

**UL Japan, Inc.**  
**Shonan EMC Lab.**  
 1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN  
 Telephone : +81 463 50 6400  
 Facsimile : +81 463 50 6401

## Radiated Emission

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.2 and 3 Semi Anechoic Chamber  
 Date                        February 7, 2013                                       February 14, 2013                                       February 16, 2013  
 Temperature / Humidity   24 deg.C , 35%RH                                   22 deg.C , 23%RH                                   23 deg.C , 40%RH  
 Engineer                   Akio Hayashi   Shinichi Takano                                     Shinichi Takano  
                                   (No.3 Semi Anechoic Chamber)                   (No.3 Semi Anechoic Chamber)                   (No.2 Semi Anechoic Chamber)  
 Mode                        Tx,    2437 MHz  
                                   Tx, IEEE802.11g, PN9, worst data mode 6Mbps

(\* 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.	40.000	QP	21.9	14.8	7.0	31.9	11.8	40.0	28.2	100	0	
Hori.	400.000	QP	22.0	16.6	7.6	31.7	14.5	46.0	31.5	100	180	
Hori.	2364.785	PK	52.5	27.4	14.2	41.4	52.7	73.9	21.2	100	335	
Hori.	2509.185	PK	53.1	27.6	14.3	41.4	53.6	73.9	20.3	100	335	
Hori.	4874.000	PK	52.8	31.3	6.9	41.1	49.9	73.9	24.0	100	150	
Hori.	7311.000	PK	46.0	36.6	8.4	41.4	49.6	73.9	24.3	100	0	
Hori.	9748.000	PK	44.6	38.7	9.5	38.9	53.9	73.9	20.0	100	0	
Hori.	12185.000	PK	44.0	39.5	10.8	39.3	55.0	73.9	18.9	100	0	
Hori.	2364.785	AV	42.8	27.4	14.2	41.4	43.0	53.9	10.9	100	335	
Hori.	2509.185	AV	45.0	27.6	14.3	41.4	45.5	53.9	8.4	100	335	
Hori.	4874.000	AV	43.1	31.3	6.9	41.1	40.2	53.9	13.7	100	150	
Hori.	7311.000	AV	36.5	36.6	8.4	41.4	40.1	53.9	13.8	100	0	
Hori.	9748.000	AV	33.3	38.7	9.5	38.9	42.6	53.9	11.3	100	0	
Hori.	12185.000	AV	34.2	39.5	10.8	39.3	45.2	53.9	8.7	100	0	
Vert.	40.000	QP	21.9	14.8	7.0	31.9	11.8	40.0	28.2	100	0	
Vert.	400.000	QP	21.5	16.6	7.6	31.7	14.0	46.0	32.0	100	0	
Vert.	2364.885	PK	52.2	27.4	14.2	41.4	52.4	73.9	21.5	100	359	
Vert.	2509.276	PK	54.8	27.6	14.3	41.4	55.3	73.9	18.6	123	359	
Vert.	4874.000	PK	52.8	31.3	6.9	41.1	49.9	73.9	24.0	100	154	
Vert.	7311.000	PK	46.5	36.6	8.4	41.4	50.1	73.9	23.8	100	0	
Vert.	9748.000	PK	44.5	38.7	9.5	38.9	53.8	73.9	20.1	100	0	
Vert.	12185.000	PK	43.6	39.5	10.8	39.3	54.6	73.9	19.3	100	0	
Vert.	2364.885	AV	43.4	27.4	14.2	41.4	43.6	53.9	10.3	100	359	
Vert.	2509.276	AV	46.2	27.6	14.3	41.4	46.7	53.9	7.2	123	359	
Vert.	4874.000	AV	43.3	31.3	6.9	41.1	40.4	53.9	13.5	100	154	
Vert.	7311.000	AV	36.7	36.6	8.4	41.4	40.3	53.9	13.6	100	0	
Vert.	9748.000	AV	33.6	38.7	9.5	38.9	42.9	53.9	11.0	100	0	
Vert.	12185.000	AV	34.1	39.5	10.8	39.3	45.1	53.9	8.8	100	0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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

## Radiated Emission

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.3 Semi Anechoic Chamber  
 Date                         February 7, 2013   February 7, 2013   February 14, 2013  
 Temperature / Humidity   22 deg.C , 31%RH                                     24 deg.C , 35%RH                                     22 deg.C , 23%RH  
 Engineer                    Shinichi Takano   Akio Hayashi   Shinichi Takano  
 Mode                         Tx,   2462 MHz  
                                   Tx, IEEE802.11g, PN9, worst data mode 6Mbps

(\* 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	54.9	27.5	14.3	41.4	55.3	73.9	18.6	131	338	
Hori.	2534.205	PK	49.5	27.6	14.3	41.4	50.0	73.9	23.9	100	335	
Hori.	4924.000	PK	47.9	31.5	6.9	41.0	45.3	73.9	28.6	100	359	
Hori.	7386.000	PK	46.5	36.7	8.4	41.5	50.1	73.9	23.8	100	0	
Hori.	9848.000	PK	43.7	38.9	9.5	38.9	53.2	73.9	20.7	100	0	
Hori.	12310.000	PK	44.0	39.5	10.8	39.3	55.0	73.9	18.9	100	0	
Hori.	2483.500	AV	45.1	27.5	14.3	41.4	45.5	53.9	8.4	131	338	
Hori.	2534.205	AV	40.9	27.6	14.3	41.4	41.4	53.9	12.5	100	335	
Hori.	4924.000	AV	39.0	31.5	6.9	41.0	36.4	53.9	17.5	100	359	
Hori.	7386.000	AV	37.1	36.7	8.4	41.5	40.7	53.9	13.2	100	0	
Hori.	9848.000	AV	33.8	38.9	9.5	38.9	43.3	53.9	10.6	100	0	
Hori.	12310.000	AV	34.3	39.5	10.8	39.3	45.3	53.9	8.6	100	0	
Vert.	2483.500	PK	56.5	27.5	14.3	41.4	56.9	73.9	17.0	128	359	
Vert.	2534.290	PK	50.4	27.6	14.3	41.4	50.9	73.9	23.0	100	359	
Vert.	4924.000	PK	49.0	31.5	6.9	41.0	46.4	73.9	27.5	100	151	
Vert.	7386.000	PK	47.2	36.7	8.4	41.5	50.8	73.9	23.1	100	0	
Vert.	9848.000	PK	43.5	38.9	9.5	38.9	53.0	73.9	20.9	100	0	
Vert.	12310.000	PK	44.2	39.5	10.8	39.3	55.2	73.9	18.7	100	0	
Vert.	2483.500	AV	47.0	27.5	14.3	41.4	47.4	53.9	<b>6.5</b>	128	359	
Vert.	2534.290	AV	41.8	27.6	14.3	41.4	42.3	53.9	11.6	100	359	
Vert.	4924.000	AV	39.4	31.5	6.9	41.0	36.8	53.9	17.1	100	151	
Vert.	7386.000	AV	37.1	36.7	8.4	41.5	40.7	53.9	13.2	100	0	
Vert.	9848.000	AV	33.8	38.9	9.5	38.9	43.3	53.9	10.6	100	0	
Vert.	12310.000	AV	34.2	39.5	10.8	39.3	45.2	53.9	8.7	100	0	

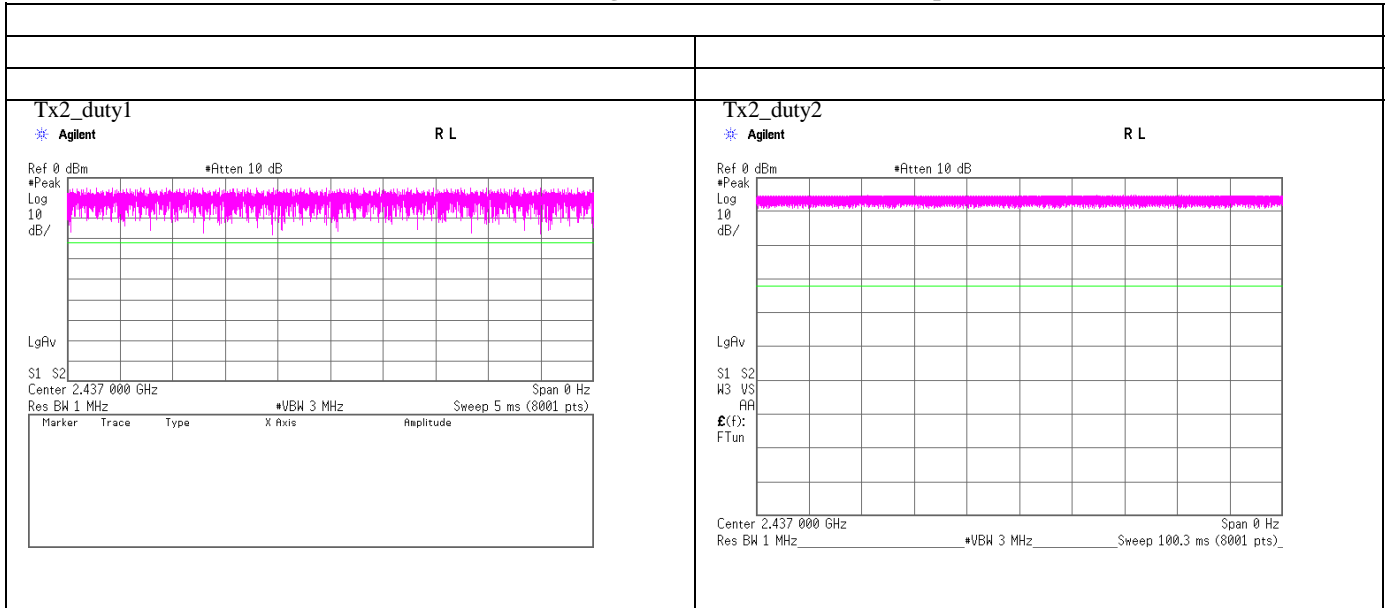
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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

## Burst rate confirmation

**Tx, IEEE802.11g, PN9, worst data mode 6Mbps**



**UL Japan, Inc.**

**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

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## Radiated Emission

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.3 Semi Anechoic Chamber  
 Date                         February 7, 2013   February 7, 2013   February 15, 2013  
 Temperature / Humidity   22 deg.C , 31%RH                                     24 deg.C , 35%RH                                     22 deg.C , 24%RH  
 Engineer                    Shinichi Takano   Akio Hayashi   Shinichi Takano  
 Mode                         Tx,   2412 MHz  
                                   Tx, IEEE802.11n-HT20, PN9, worst data mode 0(MCS)

(\* 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.	2340.295	PK	48.1	27.4	14.1	41.4	48.2	73.9	25.7	100	331	
Hori.	2390.000	PK	57.6	27.4	14.2	41.4	57.8	73.9	16.1	100	333	
Hori.	4824.000	PK	47.2	31.1	6.8	41.2	43.9	73.9	30.0	138	186	
Hori.	7236.000	PK	46.0	36.6	8.4	41.4	49.6	73.9	24.3	100	0	
Hori.	9648.000	PK	42.9	38.6	9.5	38.9	52.1	73.9	21.8	100	0	
Hori.	12060.000	PK	44.9	39.5	10.8	39.4	55.8	73.9	18.1	100	0	
Hori.	2340.295	AV	38.8	27.4	14.1	41.4	38.9	53.9	15.0	100	331	
Hori.	2390.000	AV	44.4	27.4	14.2	41.4	44.6	53.9	9.3	100	333	
Hori.	4824.000	AV	36.2	31.1	6.8	41.2	32.9	53.9	21.0	138	186	
Hori.	7236.000	AV	36.2	36.6	8.4	41.4	39.8	53.9	14.1	100	0	
Hori.	9648.000	AV	33.5	38.6	9.5	38.9	42.7	53.9	11.2	100	0	
Hori.	12060.000	AV	34.4	39.5	10.8	39.4	45.3	53.9	8.6	100	0	
Vert.	2340.410	PK	49.3	27.4	14.1	41.4	49.4	73.9	24.5	100	359	
Vert.	2390.000	PK	58.3	27.4	14.2	41.4	58.5	73.9	15.4	100	359	
Vert.	4824.000	PK	48.6	31.1	6.8	41.2	45.3	73.9	28.6	111	158	
Vert.	7236.000	PK	47.1	36.6	8.4	41.4	50.7	73.9	23.2	100	0	
Vert.	9648.000	PK	43.1	38.6	9.5	38.9	52.3	73.9	21.6	100	0	
Vert.	12060.000	PK	43.7	39.5	10.8	39.4	54.6	73.9	19.3	100	0	
Vert.	2340.410	AV	40.1	27.4	14.1	41.4	40.2	53.9	13.7	100	359	
Vert.	2390.000	AV	45.3	27.4	14.2	41.4	45.5	53.9	<b>8.4</b>	100	359	
Vert.	4824.000	AV	37.7	31.1	6.8	41.2	34.4	53.9	19.5	111	158	
Vert.	7236.000	AV	36.9	36.6	8.4	41.4	40.5	53.9	13.4	100	0	
Vert.	9648.000	AV	33.2	38.6	9.5	38.9	42.4	53.9	11.5	100	0	
Vert.	12060.000	AV	34.3	39.5	10.8	39.4	45.2	53.9	8.7	100	0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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 Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	87.3	27.5	14.2	41.4	87.6	-	-	Carrier
Hori.	2400.000	PK	48.3	27.4	14.2	41.4	48.5	67.6	19.1	
Vert.	2412.000	PK	89.6	27.5	14.2	41.4	89.9	-	-	Carrier
Vert.	2400.000	PK	49.5	27.4	14.2	41.4	49.7	69.9	20.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

**UL Japan, Inc.**  
**Shonan EMC Lab.**  
 1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN  
 Telephone : +81 463 50 6400  
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## Radiated Emission

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.3 Semi Anechoic Chamber  
Date                           February 7, 2013   February 15, 2013  
Temperature / Humidity    24 deg.C , 35%RH                                   22 deg.C , 24%RH  
Engineer                    Akio Hayashi   Shinichi Takano  
Mode                         Tx,    2437 MHz  
                                  Tx, IEEE802.11n-HT20, PN9, worst data mode 0(MCS)

(\* 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.	2365.390	PK	51.2	27.4	14.2	41.4	51.4	73.9	22.5	100	332	
Hori.	2508.635	PK	53.4	27.6	14.3	41.4	53.9	73.9	20.0	100	332	
Hori.	4874.000	PK	53.8	31.3	6.9	41.1	50.9	73.9	23.0	100	176	
Hori.	7311.000	PK	46.1	36.6	8.4	41.4	49.7	73.9	24.2	100	0	
Hori.	9748.000	PK	44.0	38.7	9.5	38.9	53.3	73.9	20.6	100	0	
Hori.	12185.000	PK	44.1	39.5	10.8	39.3	55.1	73.9	18.8	100	0	
Hori.	2365.390	AV	42.3	27.4	14.2	41.4	42.5	53.9	11.4	100	332	
Hori.	2508.635	AV	44.7	27.6	14.3	41.4	45.2	53.9	8.7	100	332	
Hori.	4874.000	AV	42.2	31.3	6.9	41.1	39.3	53.9	14.6	100	176	
Hori.	7311.000	AV	36.1	36.6	8.4	41.4	39.7	53.9	14.2	100	0	
Hori.	9748.000	AV	33.5	38.7	9.5	38.9	42.8	53.9	11.1	100	0	
Hori.	12185.000	AV	34.3	39.5	10.8	39.3	45.3	53.9	8.6	100	0	
Vert.	2365.366	PK	53.8	27.4	14.2	41.4	54.0	73.9	19.9	100	359	
Vert.	2508.735	PK	54.7	27.6	14.3	41.4	55.2	73.9	18.7	100	359	
Vert.	4874.000	PK	55.4	31.3	6.9	41.1	52.5	73.9	21.4	102	157	
Vert.	7311.000	PK	46.5	36.6	8.4	41.4	50.1	73.9	23.8	100	0	
Vert.	9748.000	PK	43.2	38.7	9.5	38.9	52.5	73.9	21.4	100	0	
Vert.	12185.000	PK	45.0	39.5	10.8	39.3	56.0	73.9	17.9	100	0	
Vert.	2365.366	AV	44.1	27.4	14.2	41.4	44.3	53.9	9.6	100	359	
Vert.	2508.735	AV	46.6	27.6	14.3	41.4	47.1	53.9	<b>6.8</b>	100	359	
Vert.	4874.000	AV	43.4	31.3	6.9	41.1	40.5	53.9	13.4	102	157	
Vert.	7311.000	AV	36.8	36.6	8.4	41.4	40.4	53.9	13.5	100	0	
Vert.	9748.000	AV	33.4	38.7	9.5	38.9	42.7	53.9	11.2	100	0	
Vert.	12185.000	AV	34.1	39.5	10.8	39.3	45.1	53.9	8.8	100	0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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

## Radiated Emission

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.3 Semi Anechoic Chamber  
Date                           February 7, 2013   February 7, 2013   February 15, 2013  
Temperature / Humidity    22 deg.C , 31%RH                                   24 deg.C , 35%RH                                   22 deg.C , 24%RH  
Engineer                    Shinichi Takano                                       Akio Hayashi   Shinichi Takano  
Mode                         Tx,    2462 MHz  
                                  Tx, IEEE802.11n-HT20, PN9, worst data mode 0(MCS)

(\* 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	56.9	27.5	14.3	41.4	57.3	73.9	16.6	132	339	
Hori.	2533.545	PK	49.9	27.6	14.3	41.4	50.4	73.9	23.5	100	332	
Hori.	4924.000	PK	48.4	31.5	6.9	41.0	45.8	73.9	28.1	100	119	
Hori.	7386.000	PK	46.8	36.7	8.4	41.5	50.4	73.9	23.5	100	0	
Hori.	9848.000	PK	44.6	38.9	9.5	38.9	54.1	73.9	19.8	100	0	
Hori.	12310.000	PK	44.4	39.5	10.8	39.3	55.4	73.9	18.5	100	0	
Hori.	2483.500	AV	45.3	27.5	14.3	41.4	45.7	53.9	8.2	132	339	
Hori.	2533.545	AV	41.0	27.6	14.3	41.4	41.5	53.9	12.4	100	332	
Hori.	4924.000	AV	37.7	31.5	6.9	41.0	35.1	53.9	18.8	100	119	
Hori.	7386.000	AV	36.2	36.7	8.4	41.5	39.8	53.9	14.1	100	0	
Hori.	9848.000	AV	33.9	38.9	9.5	38.9	43.4	53.9	10.5	100	0	
Hori.	12310.000	AV	34.3	39.5	10.8	39.3	45.3	53.9	8.6	100	0	
Vert.	2483.500	PK	59.0	27.5	14.3	41.4	59.4	73.9	14.5	127	359	
Vert.	2533.710	PK	51.9	27.6	14.3	41.4	52.4	73.9	21.5	125	359	
Vert.	4924.000	PK	48.7	31.5	6.9	41.0	46.1	73.9	27.8	100	152	
Vert.	7386.000	PK	46.8	36.7	8.4	41.5	50.4	73.9	23.5	100	0	
Vert.	9848.000	PK	43.9	38.9	9.5	38.9	53.4	73.9	20.5	100	0	
Vert.	12310.000	PK	44.6	39.5	10.8	39.3	55.6	73.9	18.3	100	0	
Vert.	2483.500	AV	47.8	27.5	14.3	41.4	48.2	53.9	<b>5.7</b>	127	359	
Vert.	2533.710	AV	42.1	27.6	14.3	41.4	42.6	53.9	11.3	125	359	
Vert.	4924.000	AV	38.7	31.5	6.9	41.0	36.1	53.9	17.8	100	152	
Vert.	7386.000	AV	37.0	36.7	8.4	41.5	40.6	53.9	13.3	100	0	
Vert.	9848.000	AV	33.7	38.9	9.5	38.9	43.2	53.9	10.7	100	0	
Vert.	12310.000	AV	34.2	39.5	10.8	39.3	45.2	53.9	8.7	100	0	

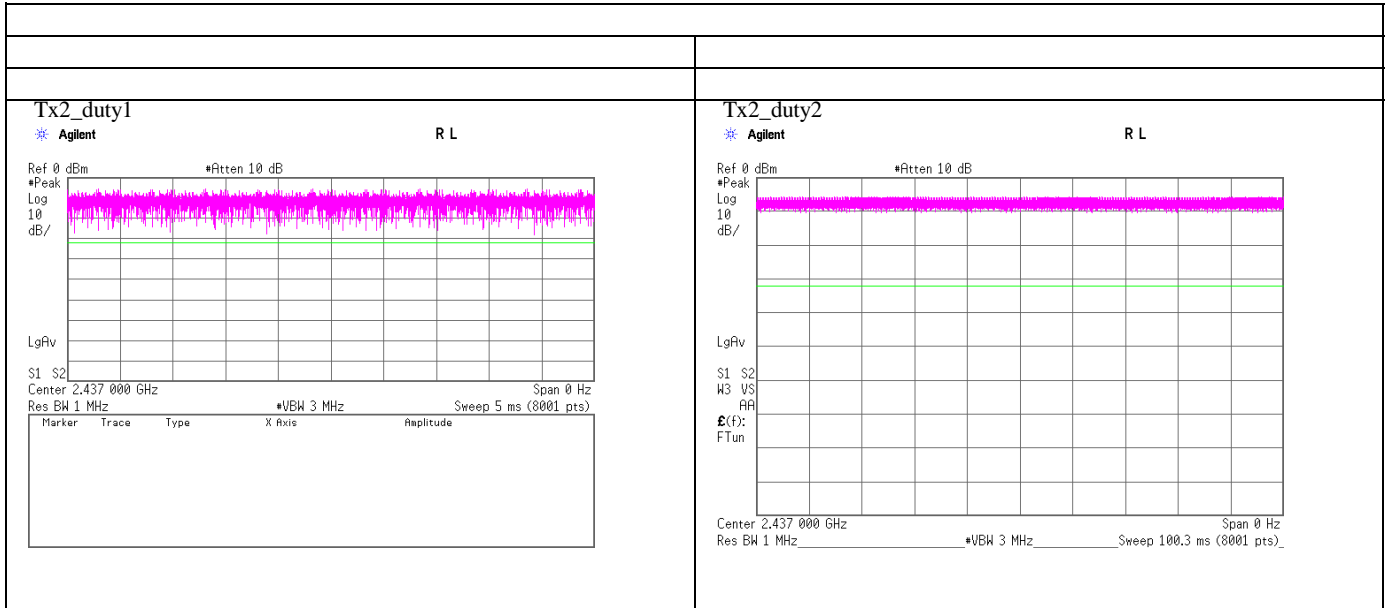
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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

## Burst rate confirmation

**Tx, IEEE802.11n-HT20, PN9, worst data mode 0(MCS)**



**UL Japan, Inc.**

**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

## Radiated Emission

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.3 Semi Anechoic Chamber  
 Date                         February 7, 2013   February 8, 2013   February 15, 2013  
 Temperature / Humidity   24 deg.C , 35%RH                                     23 deg.C , 25%RH                                     22 deg.C , 24%RH  
 Engineer                   Akio Hayashi   Shinichi Takano   Shinichi Takano  
 Mode                         Tx,   2422 MHz  
                                   Tx, IEEE802.11n-HT40, PN9, worst data mode 3(MCS)

(\* 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.	2390.000	PK	55.5	27.4	14.2	41.4	55.7	73.9	18.2	100	333	
Hori.	4844.000	PK	47.2	31.2	6.8	41.1	44.1	73.9	29.8	100	148	
Hori.	7266.000	PK	46.1	36.6	8.4	41.4	49.7	73.9	24.2	100	0	
Hori.	9688.000	PK	44.2	38.6	9.5	38.9	53.4	73.9	20.5	100	0	
Hori.	12110.000	PK	44.9	39.5	10.9	39.4	55.9	73.9	18.0	100	0	
Hori.	2390.000	AV	44.4	27.4	14.2	41.4	44.6	53.9	9.3	100	333	
Hori.	4844.000	AV	36.4	31.2	6.8	41.1	33.3	53.9	20.6	100	148	
Hori.	7266.000	AV	36.3	36.6	8.4	41.4	39.9	53.9	14.0	100	0	
Hori.	9688.000	AV	33.7	38.6	9.5	38.9	42.9	53.9	11.0	100	0	
Hori.	12110.000	AV	34.4	39.5	10.9	39.4	45.4	53.9	8.5	100	0	
Vert.	2390.000	PK	58.5	27.4	14.2	41.4	58.7	73.9	15.2	100	359	
Vert.	4844.000	PK	46.0	31.2	6.8	41.1	42.9	73.9	31.0	112	154	
Vert.	7266.000	PK	46.3	36.6	8.4	41.4	49.9	73.9	24.0	100	0	
Vert.	9688.000	PK	43.8	38.6	9.5	38.9	53.0	73.9	20.9	100	0	
Vert.	12110.000	PK	44.4	39.5	10.9	39.4	55.4	73.9	18.5	100	0	
Vert.	2390.000	AV	47.1	27.4	14.2	41.4	47.3	53.9	<b>6.6</b>	100	359	
Vert.	4844.000	AV	35.9	31.2	6.8	41.1	32.8	53.9	21.1	112	154	
Vert.	7266.000	AV	36.1	36.6	8.4	41.4	39.7	53.9	14.2	100	0	
Vert.	9688.000	AV	33.5	38.6	9.5	38.9	42.7	53.9	11.2	100	0	
Vert.	12110.000	AV	34.4	39.5	10.9	39.4	45.4	53.9	8.5	100	0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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 Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2422.000	PK	86.4	27.5	14.2	41.4	86.7	-	-	Carrier
Hori.	2400.000	PK	46.0	27.4	14.2	41.4	46.2	66.7	20.5	
Vert.	2422.000	PK	88.4	27.5	14.2	41.4	88.7	-	-	Carrier
Vert.	2400.000	PK	48.5	27.4	14.2	41.4	48.7	68.7	20.0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

**UL Japan, Inc.**  
**Shonan EMC Lab.**  
 1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN  
 Telephone : +81 463 50 6400  
 Facsimile : +81 463 50 6401

## Radiated Emission

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.3 Semi Anechoic Chamber  
Date                           February 7, 2013   February 15, 2013  
Temperature / Humidity    24 deg.C , 35%RH                                   22 deg.C , 24%RH  
Engineer                    Akio Hayashi   Shinichi Takano  
Mode                         Tx,    2437 MHz  
                                  Tx, IEEE802.11n-HT40, PN9, worst data mode 3(MCS)

(\* 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	31.3	6.9	41.1	44.9	73.9	29.0	100	172	
Hori.	7311.000	PK	47.4	36.6	8.4	41.4	51.0	73.9	22.9	100	0	
Hori.	9748.000	PK	43.4	38.7	9.5	38.9	52.7	73.9	21.2	100	0	
Hori.	12185.000	PK	44.3	39.5	10.8	39.3	55.3	73.9	18.6	100	0	
Hori.	4874.000	AV	36.5	31.3	6.9	41.1	33.6	53.9	20.3	100	172	
Hori.	7311.000	AV	36.3	36.6	8.4	41.4	39.9	53.9	14.0	100	0	
Hori.	9748.000	AV	33.5	38.7	9.5	38.9	42.8	53.9	11.1	100	0	
Hori.	12185.000	AV	34.9	39.5	10.8	39.3	45.9	53.9	<b>8.0</b>	100	0	
Vert.	4874.000	PK	46.8	31.3	6.9	41.1	43.9	73.9	30.0	112	154	
Vert.	7311.000	PK	46.3	36.6	8.4	41.4	49.9	73.9	24.0	100	0	
Vert.	9748.000	PK	43.9	38.7	9.5	38.9	53.2	73.9	20.7	100	0	
Vert.	12185.000	PK	44.9	39.5	10.8	39.3	55.9	73.9	18.0	100	0	
Vert.	4874.000	AV	37.1	31.3	6.9	41.1	34.2	53.9	19.7	112	154	
Vert.	7311.000	AV	36.5	36.6	8.4	41.4	40.1	53.9	13.8	100	0	
Vert.	9748.000	AV	33.6	38.7	9.5	38.9	42.9	53.9	11.0	100	0	
Vert.	12185.000	AV	34.3	39.5	10.8	39.3	45.3	53.9	8.6	100	0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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

## Radiated Emission

Test place                   UL Japan, Inc. Shonan EMC Lab.                   No.3 Semi Anechoic Chamber  
Date                           February 7, 2013   February 8, 2013   February 15, 2013  
Temperature / Humidity    24 deg.C , 35%RH                                   23 deg.C , 25%RH                                   22 deg.C , 24%RH  
Engineer                    Akio Hayashi   Shinichi Takano                                       Shinichi Takano  
Mode                           Tx,   2452 MHz  
                                  Tx, IEEE802.11n-HT40, PN9, worst data mode 3(MCS)

(\* 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	57.0	27.5	14.3	41.4	57.4	73.9	16.5	100	332	
Hori.	4904.000	PK	46.8	31.4	6.9	41.0	44.1	73.9	29.8	100	170	
Hori.	7356.000	PK	46.7	36.6	8.4	41.5	50.2	73.9	23.7	100	0	
Hori.	9808.000	PK	43.7	38.8	9.6	38.9	53.2	73.9	20.7	100	0	
Hori.	12260.000	PK	44.0	39.5	10.8	39.3	55.0	73.9	18.9	100	0	
Hori.	2483.500	AV	45.5	27.5	14.3	41.4	45.9	53.9	8.0	100	332	
Hori.	4904.000	AV	37.2	31.4	6.9	41.0	34.5	53.9	19.4	100	170	
Hori.	7356.000	AV	36.9	36.6	8.4	41.5	40.4	53.9	13.5	100	0	
Hori.	9808.000	AV	33.7	38.8	9.6	38.9	43.2	53.9	10.7	100	0	
Hori.	12260.000	AV	34.5	39.5	10.8	39.3	45.5	53.9	8.4	100	0	
Vert.	2483.500	PK	59.9	27.5	14.3	41.4	60.3	73.9	13.6	130	359	
Vert.	4904.000	PK	48.2	31.4	6.9	41.0	45.5	73.9	28.4	112	153	
Vert.	7356.000	PK	47.5	36.6	8.4	41.5	51.0	73.9	22.9	100	0	
Vert.	9808.000	PK	44.1	38.8	9.6	38.9	53.6	73.9	20.3	100	0	
Vert.	12260.000	PK	44.8	39.5	10.8	39.3	55.8	73.9	18.1	100	0	
Vert.	2483.500	AV	48.0	27.5	14.3	41.4	48.4	53.9	5.5	130	359	
Vert.	4904.000	AV	37.5	31.4	6.9	41.0	34.8	53.9	19.1	112	153	
Vert.	7356.000	AV	36.8	36.6	8.4	41.5	40.3	53.9	13.6	100	0	
Vert.	9808.000	AV	33.7	38.8	9.6	38.9	43.2	53.9	10.7	100	0	
Vert.	12260.000	AV	34.5	39.5	10.8	39.3	45.5	53.9	8.4	100	0	

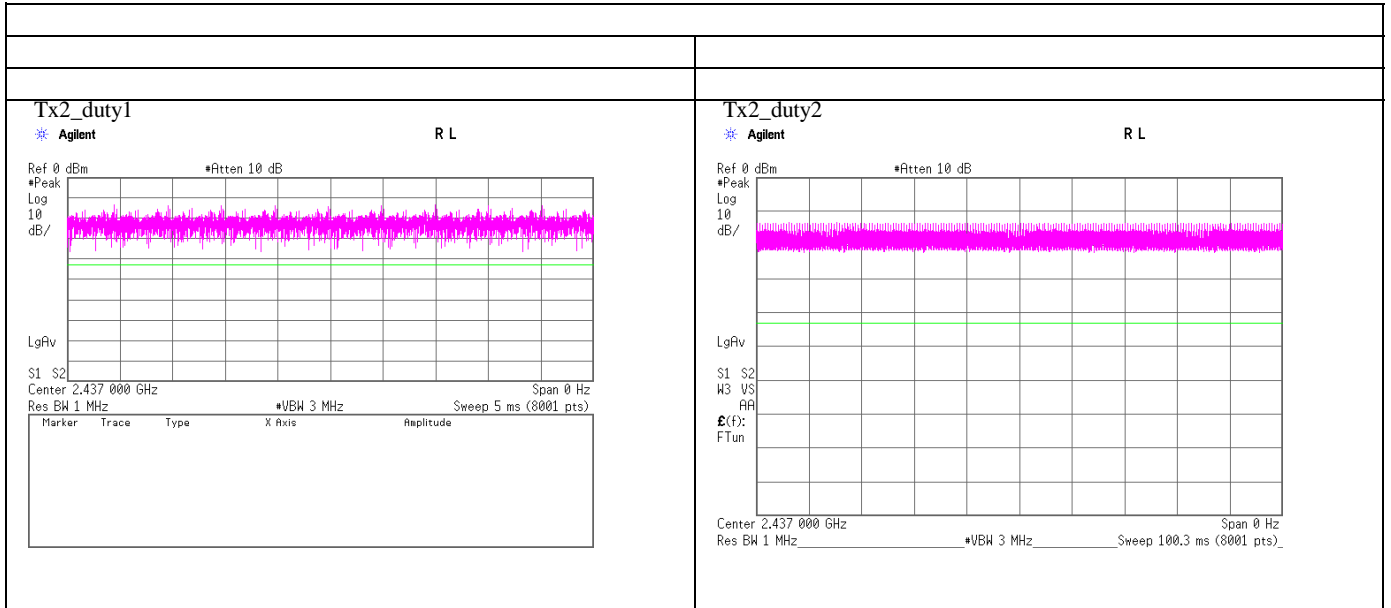
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier)

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

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

## Burst rate confirmation

**Tx, IEEE802.11n-HT40, PN9, worst data mode 3(MCS)**

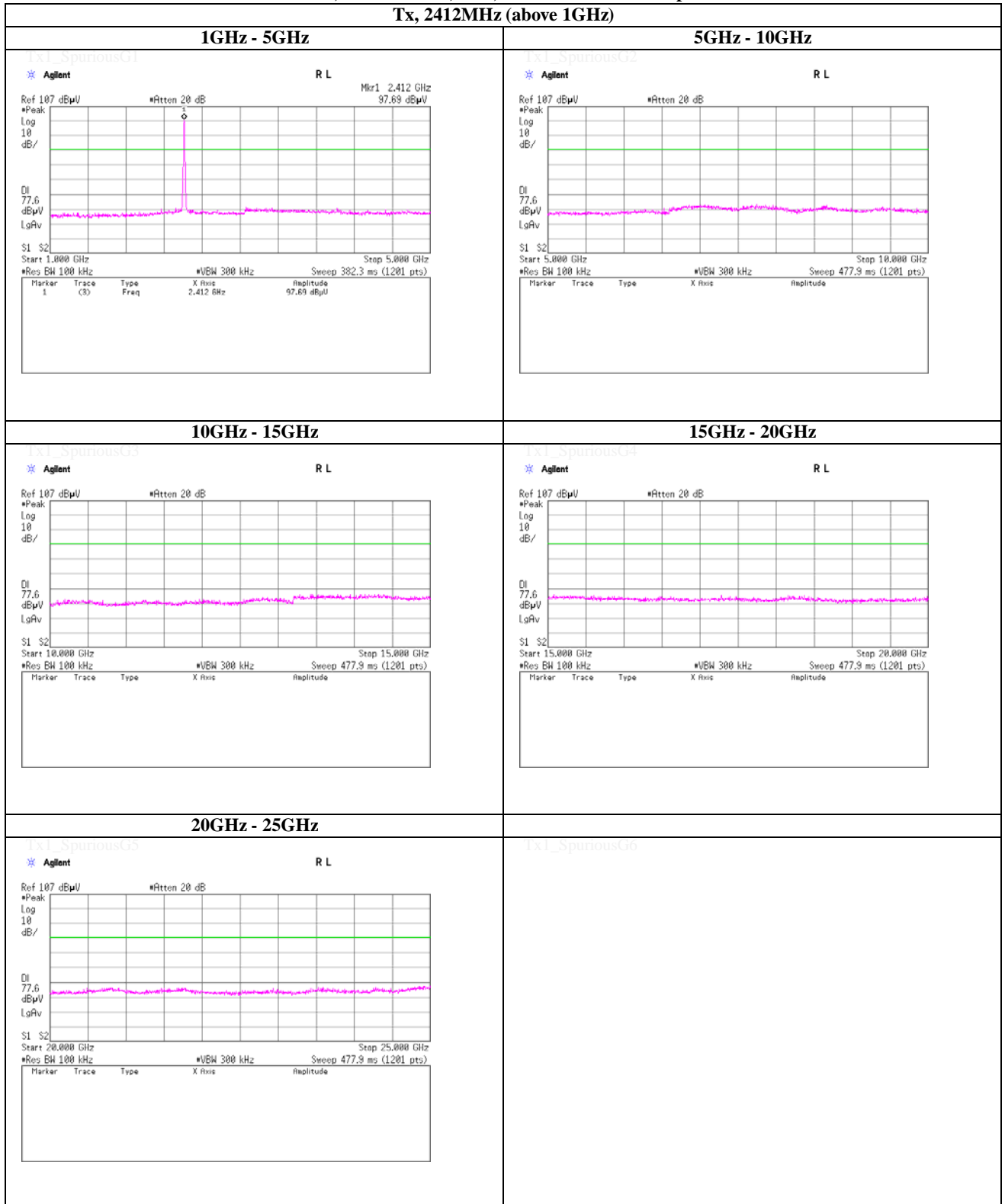


**UL Japan, Inc.**  
**Shonan EMC Lab.**  
 1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN  
 Telephone : +81 463 50 6400  
 Facsimile : +81 463 50 6401

**(Reference chart) Spurious emission (Conducted)**

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

**Tx, 2412MHz (above 1GHz)**



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**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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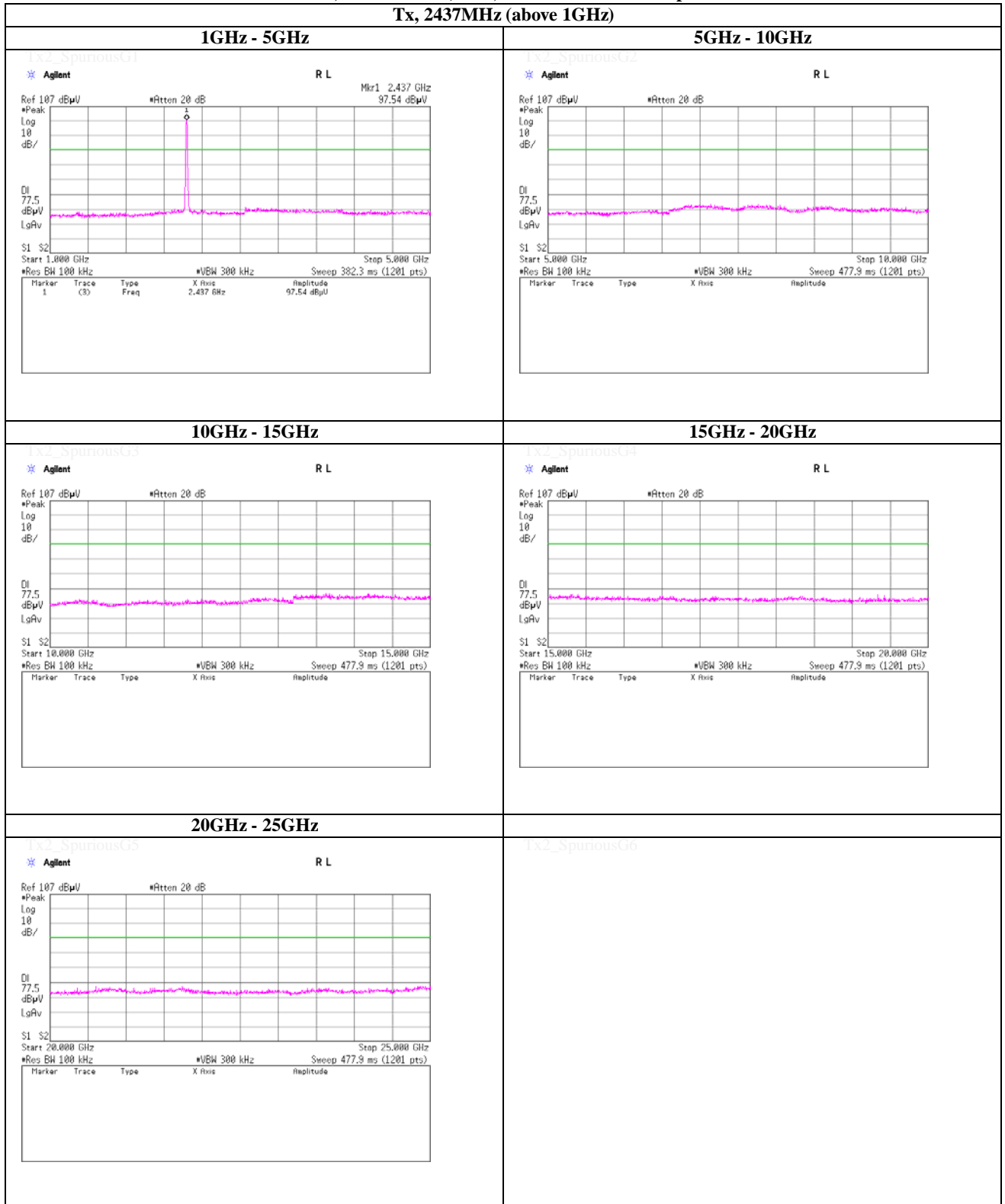
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**(Reference chart) Spurious emission (Conducted)**

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

**Tx, 2437MHz (above 1GHz)**



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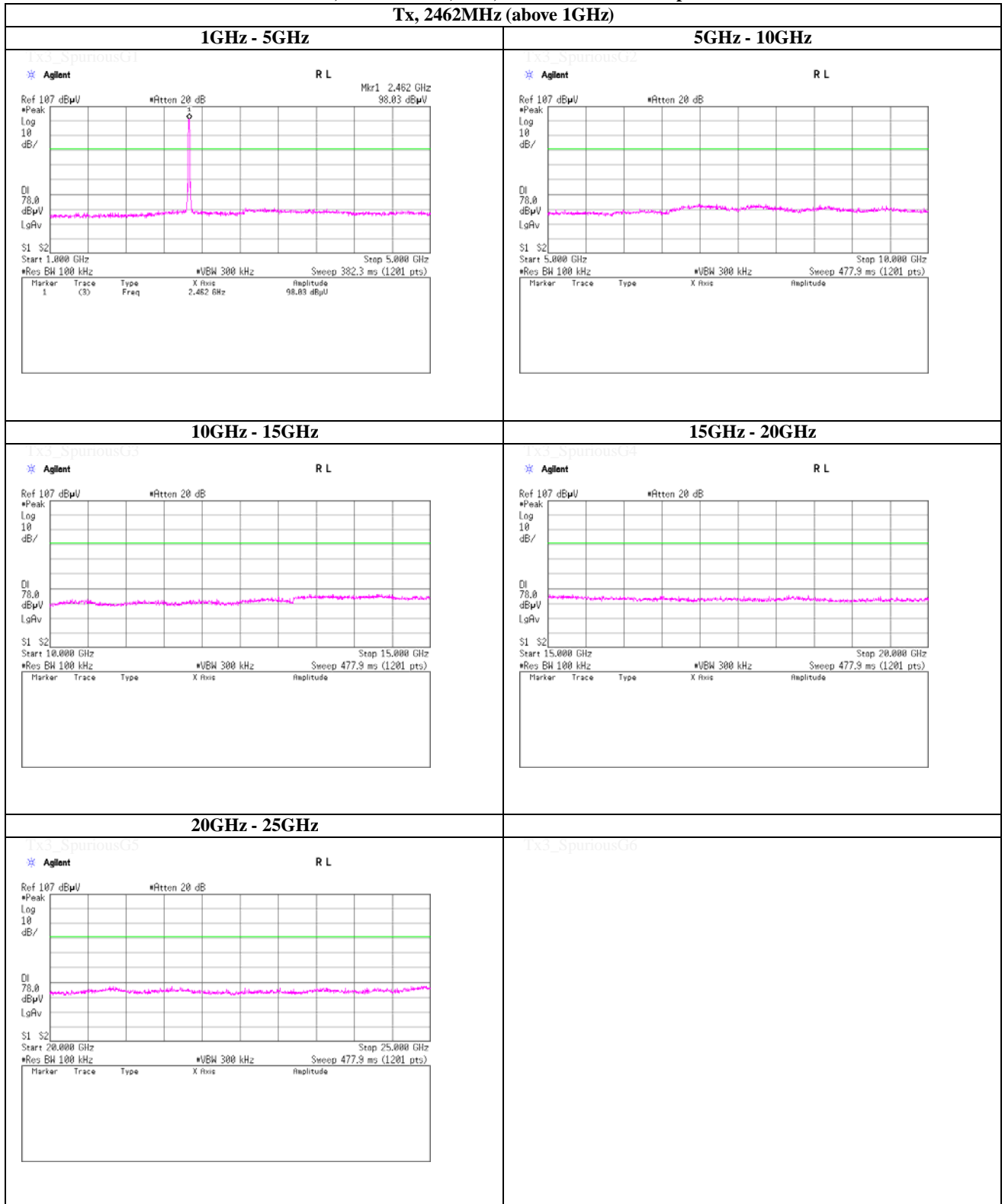
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Facsimile : +81 463 50 6401

**(Reference chart) Spurious emission (Conducted)**

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

**Tx, 2462MHz (above 1GHz)**



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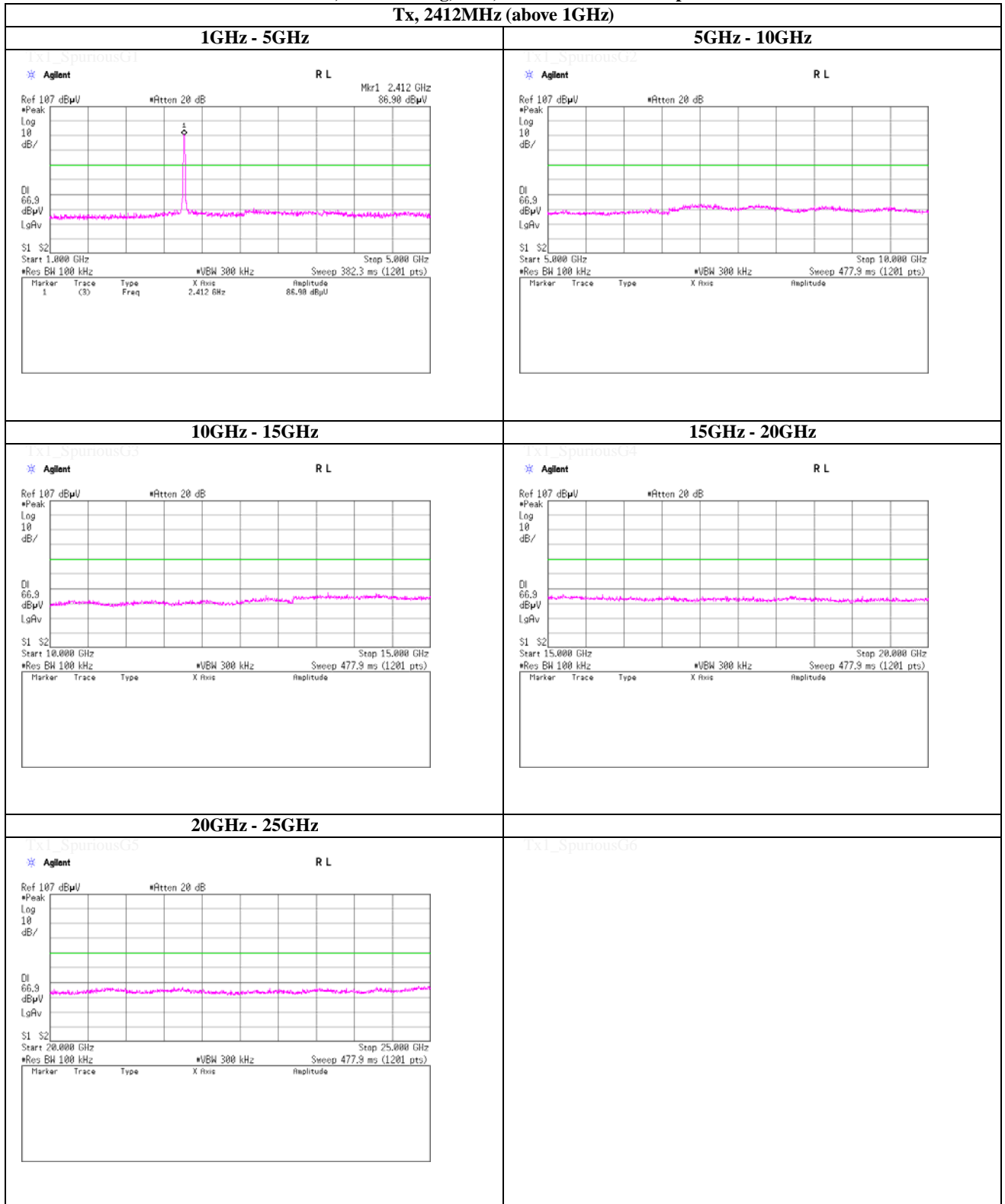
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**(Reference chart) Spurious emission (Conducted)**

**Tx, IEEE802.11g, PN9, worst data mode 6Mbps**

**Tx, 2412MHz (above 1GHz)**



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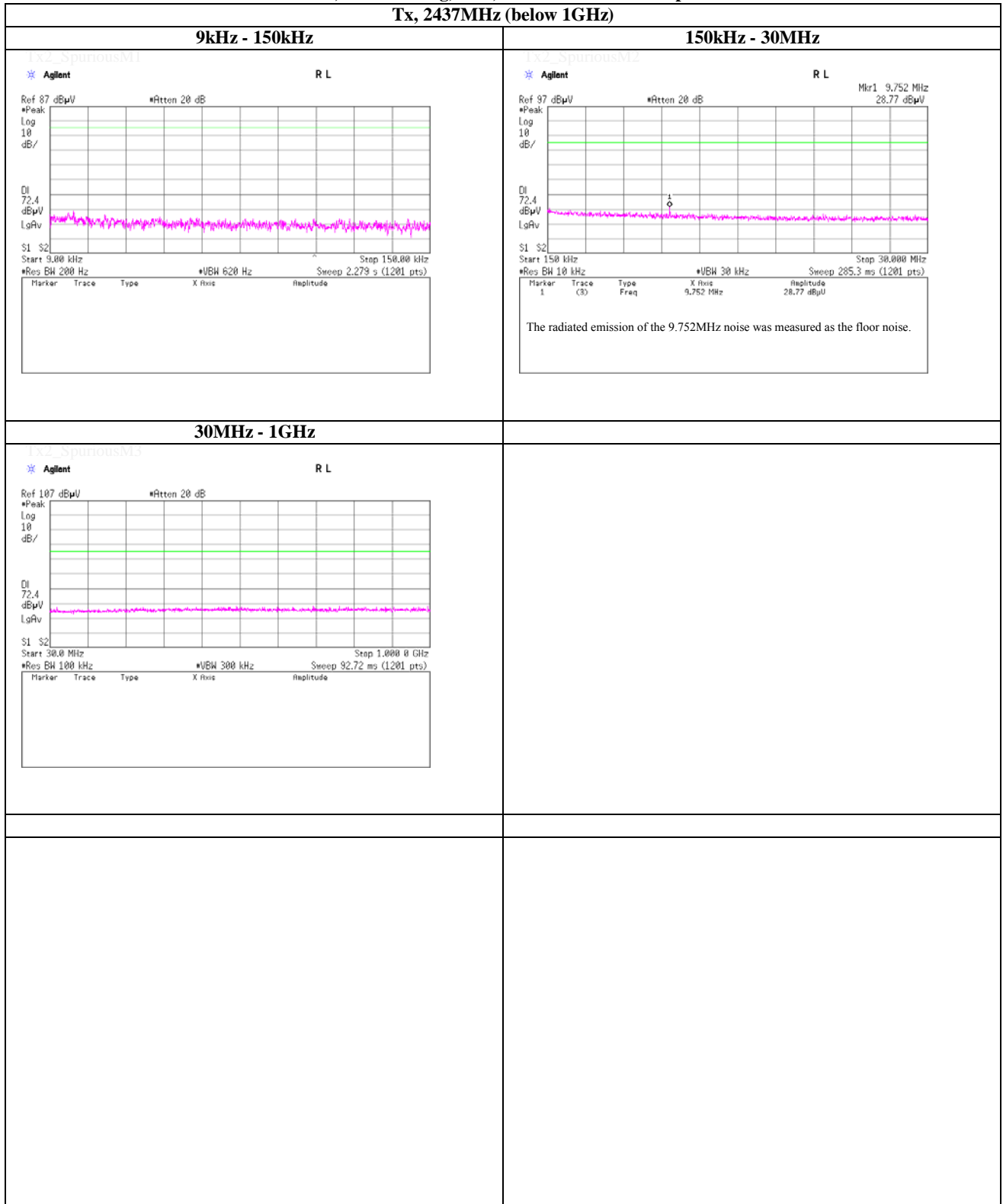
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

**(Reference chart) Spurious emission (Conducted)**

**Tx, IEEE802.11g, PN9, worst data mode 6Mbps**

**Tx, 2437MHz (below 1GHz)**



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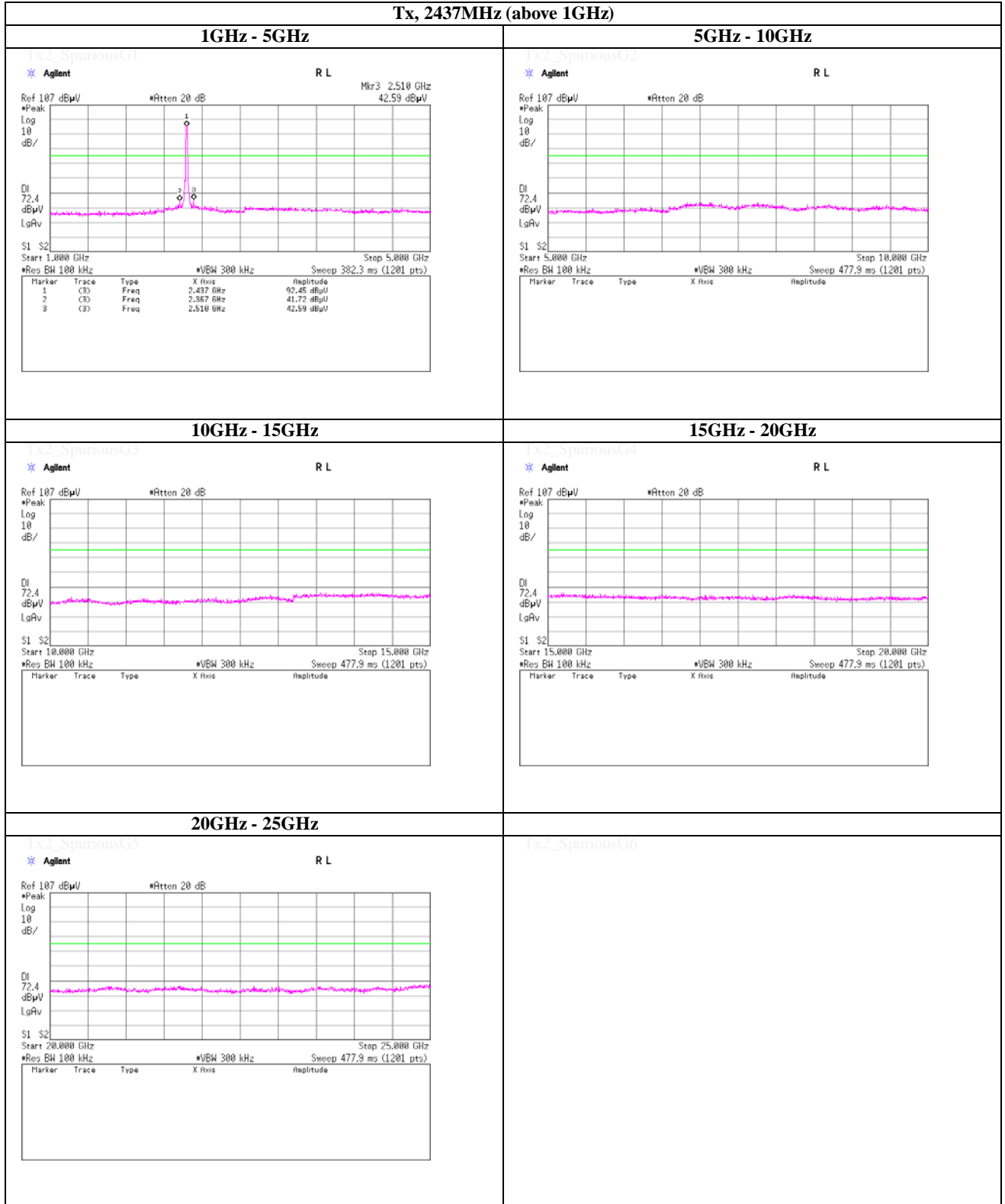
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

**(Reference chart) Spurious emission (Conducted)**

**Tx, IEEE802.11g, PN9, worst data mode 6Mbps**

**Tx, 2437MHz (above 1GHz)**



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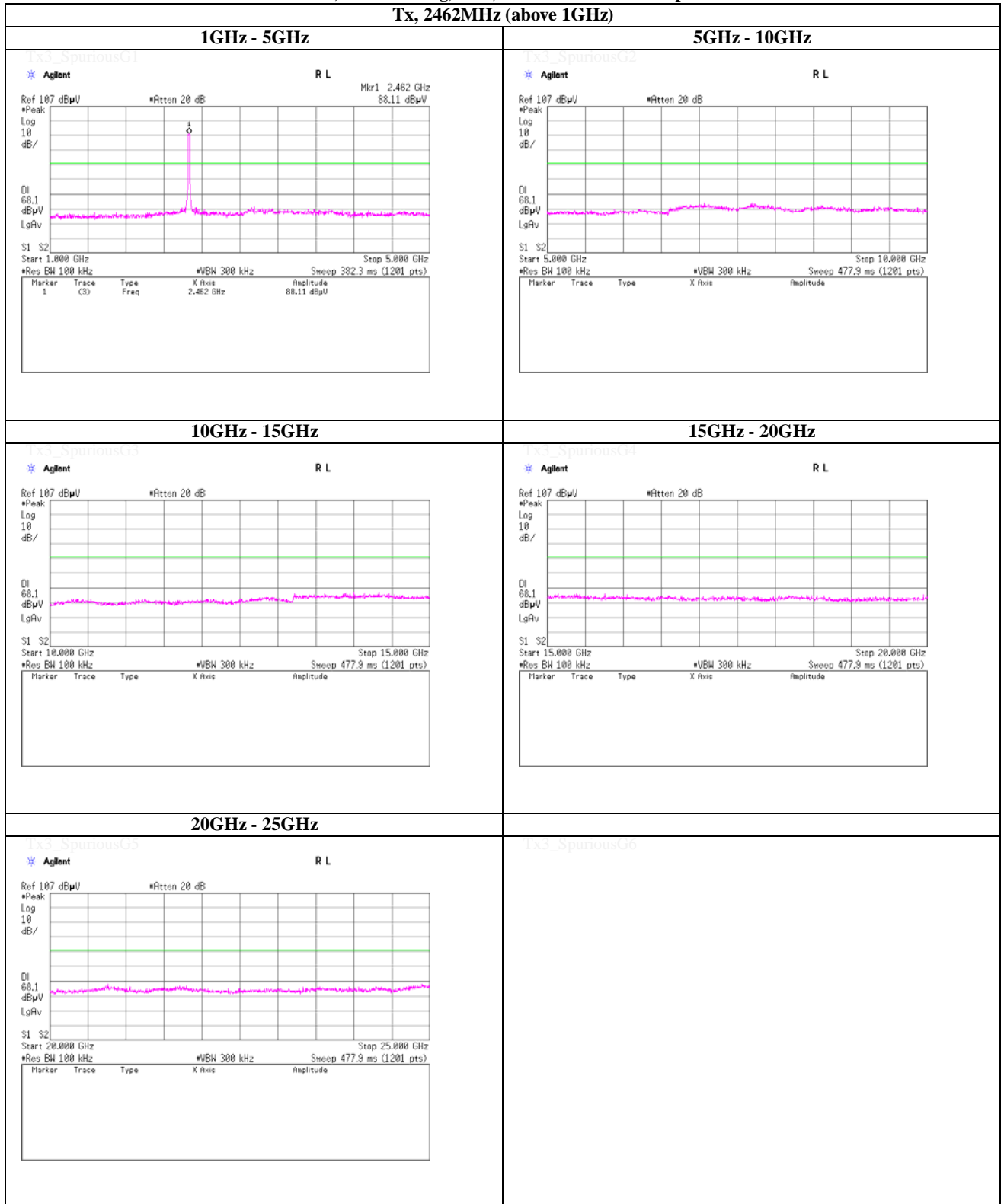
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**(Reference chart) Spurious emission (Conducted)**

**Tx, IEEE802.11g, PN9, worst data mode 6Mbps**

**Tx, 2462MHz (above 1GHz)**



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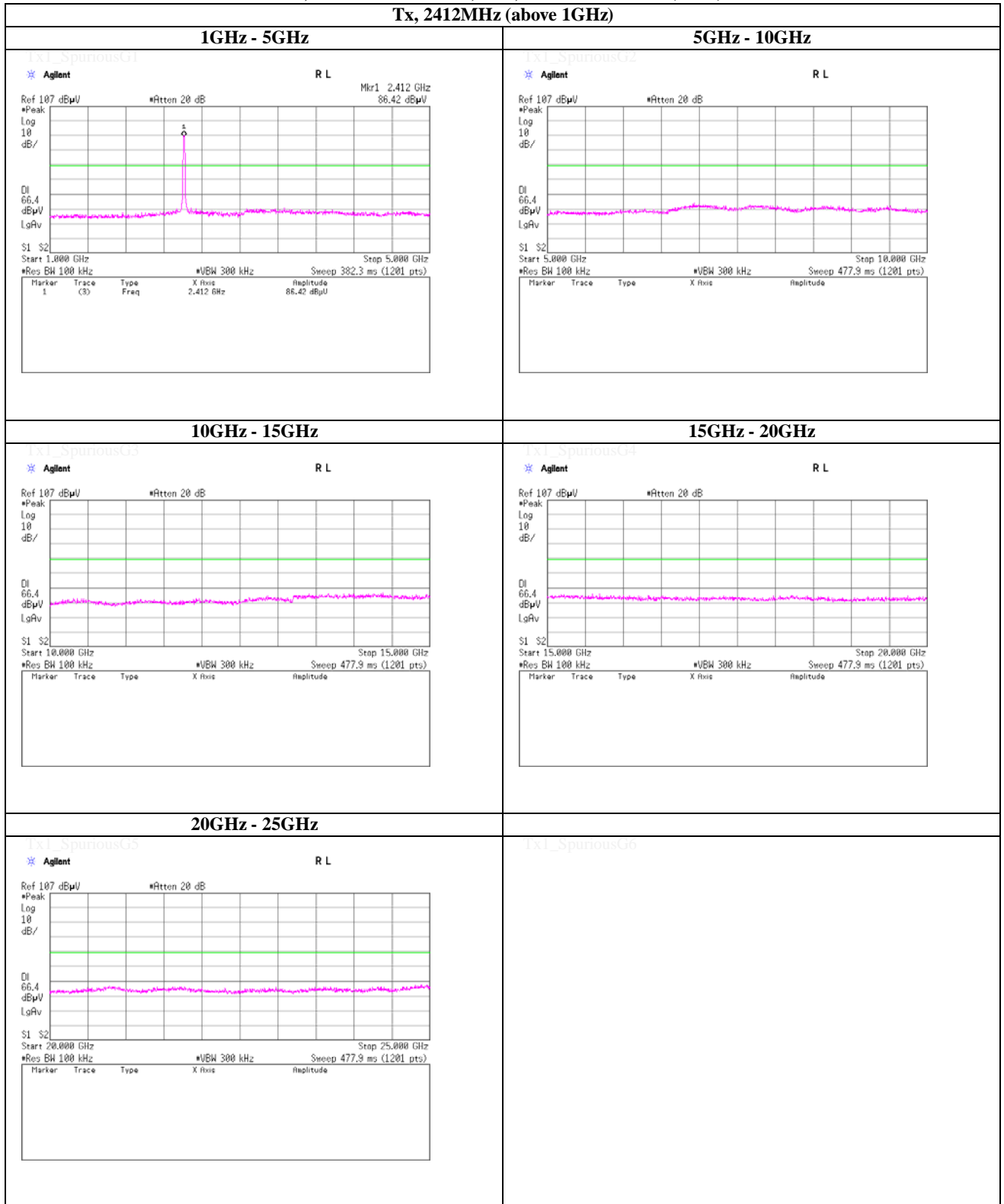
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**(Reference chart) Spurious emission (Conducted)**

**Tx, IEEE802.11n-HT20, PN9, worst data mode 0(MCS)**

**Tx, 2412MHz (above 1GHz)**



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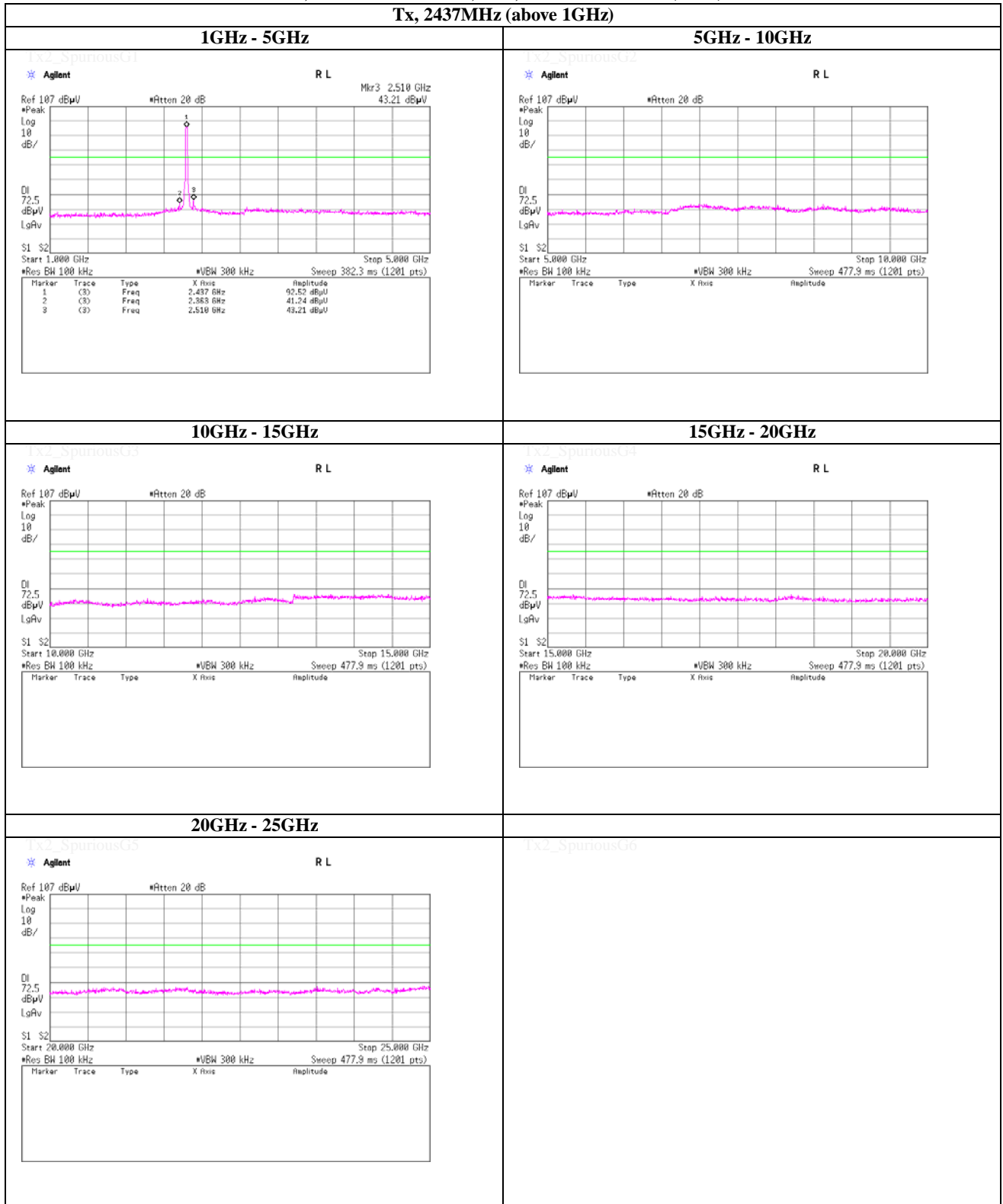
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**(Reference chart) Spurious emission (Conducted)**

**Tx, IEEE802.11n-HT20, PN9, worst data mode 0(MCS)**

**Tx, 2437MHz (above 1GHz)**



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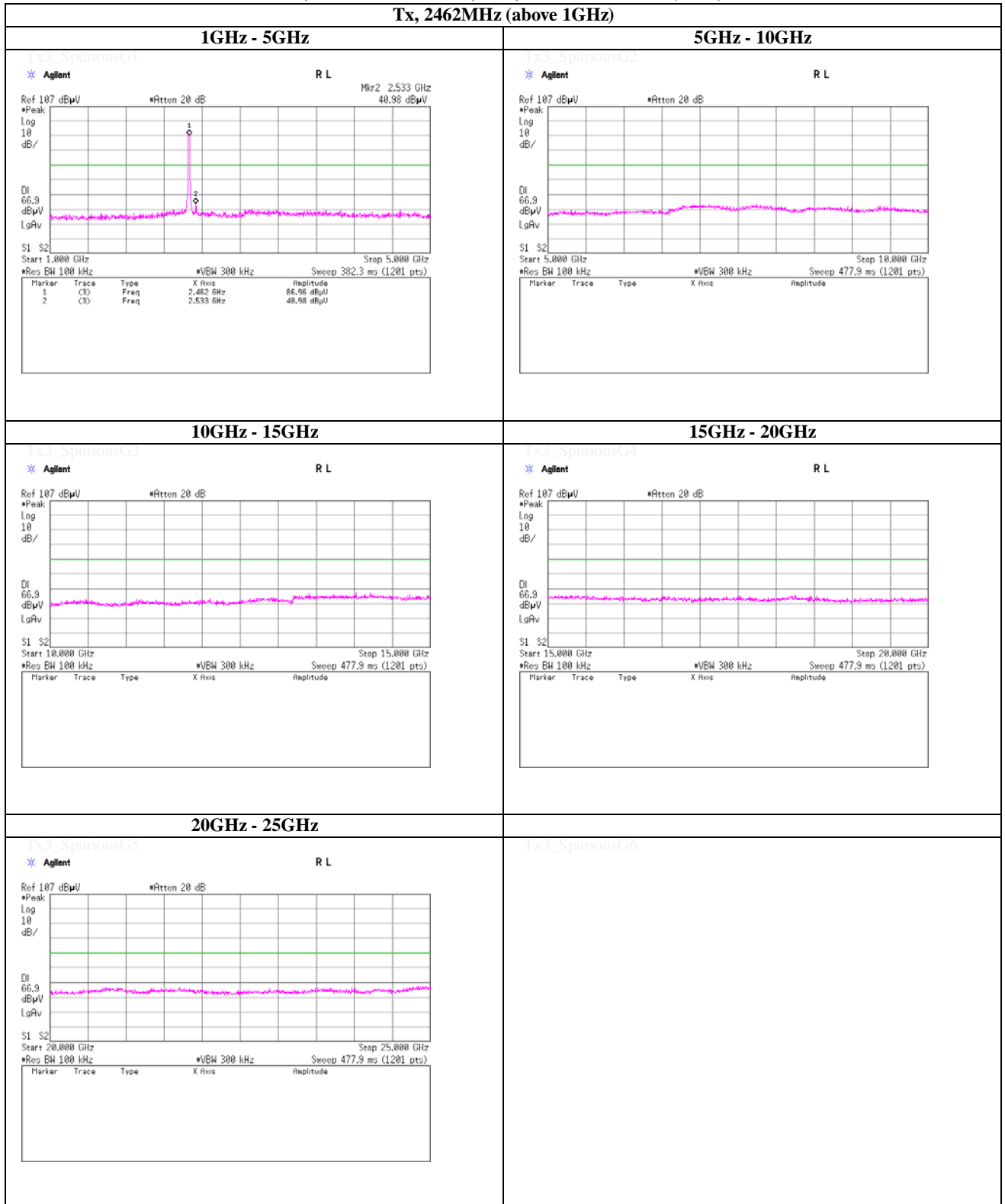
Facsimile : +81 463 50 6401



**(Reference chart) Spurious emission (Conducted)**

**Tx, IEEE802.11n-HT20, PN9, worst data mode 0(MCS)**

**Tx, 2462MHz (above 1GHz)**



**UL Japan, Inc.**

**Shonan EMC Lab.**

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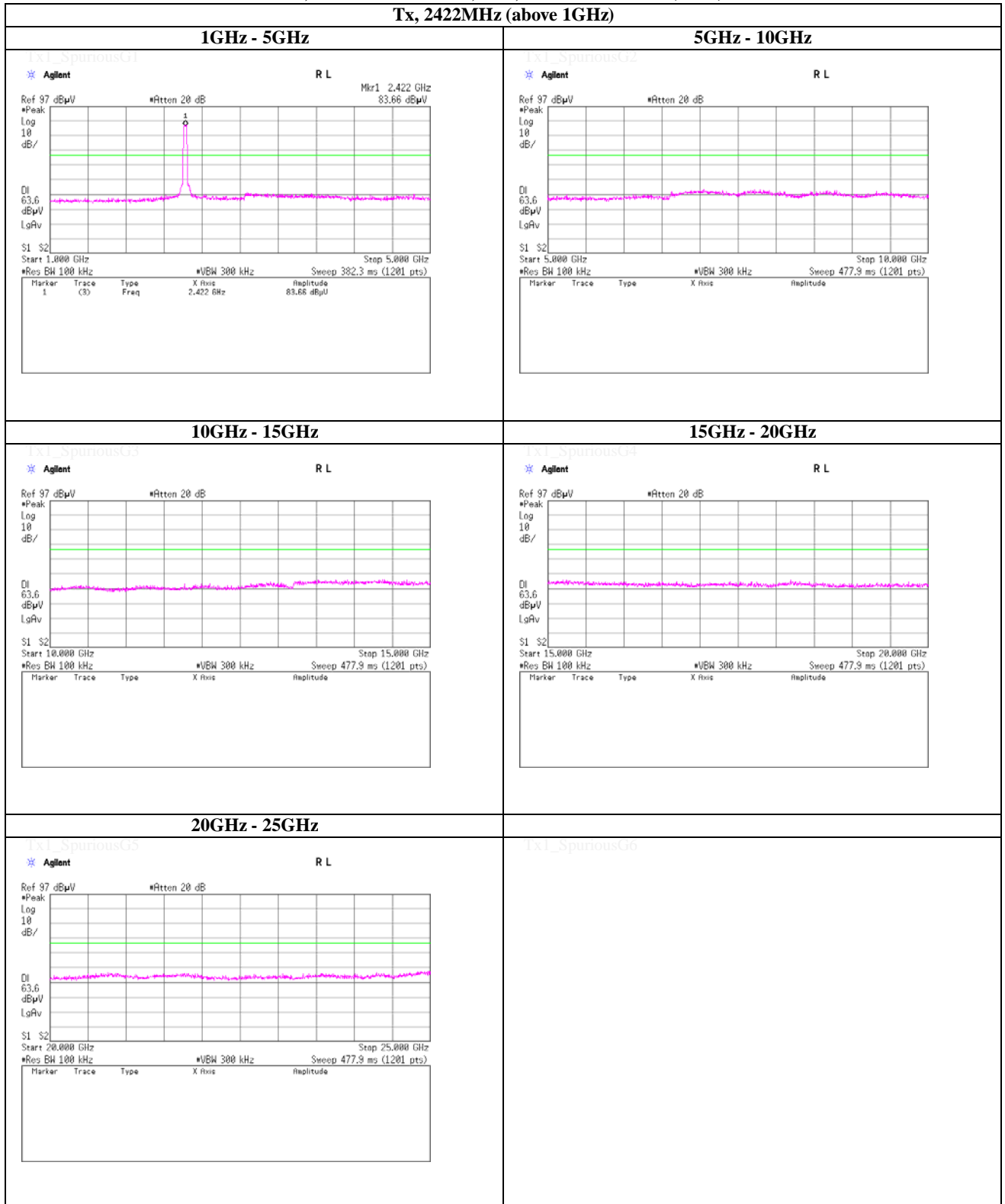
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

**(Reference chart) Spurious emission (Conducted)**

**Tx, IEEE802.11n-HT40, PN9, worst data mode 3(MCS)**

**Tx, 2422MHz (above 1GHz)**



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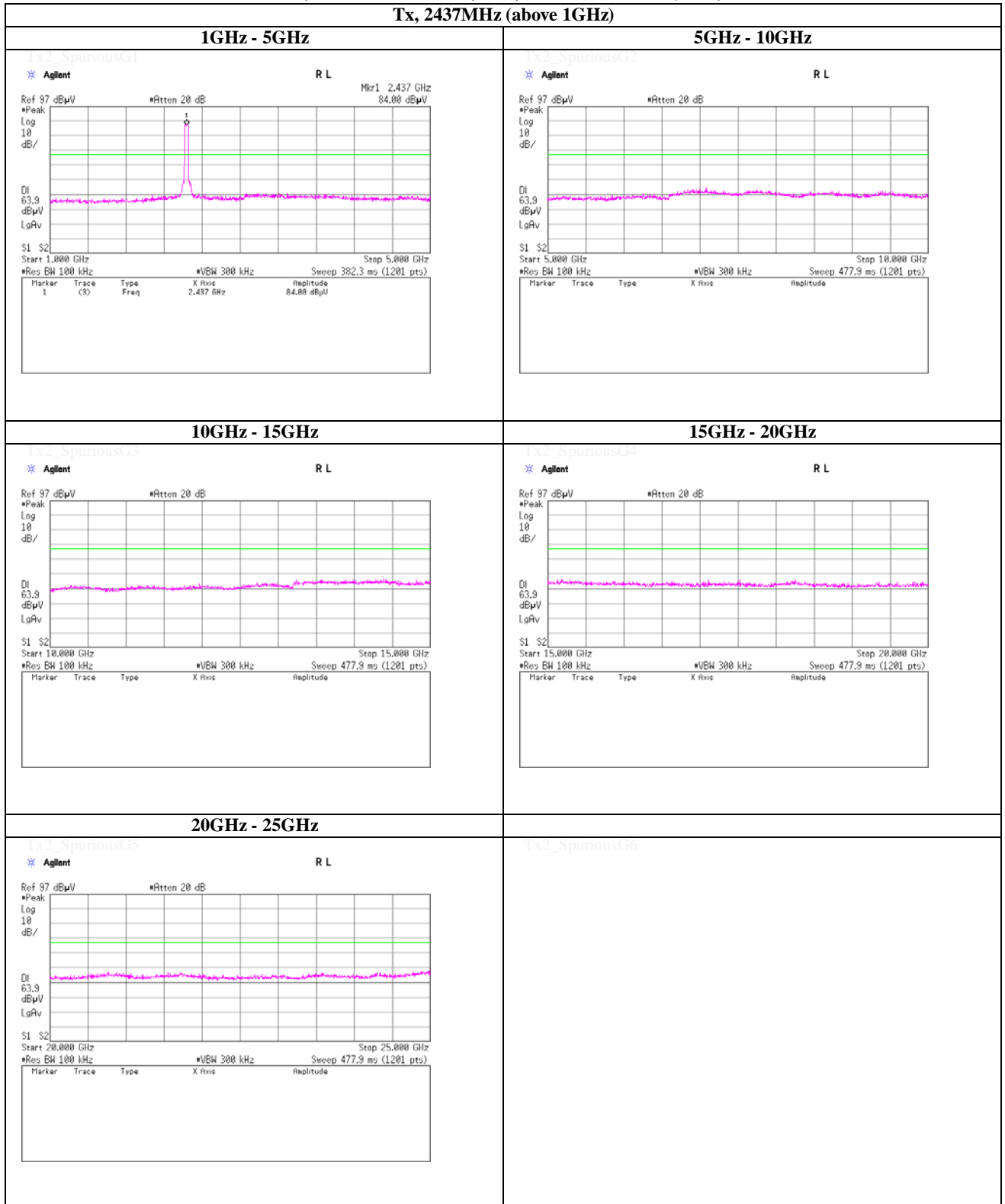
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

**(Reference chart) Spurious emission (Conducted)**

**Tx, IEEE802.11n-HT40, PN9, worst data mode 3(MCS)**

**Tx, 2437MHz (above 1GHz)**



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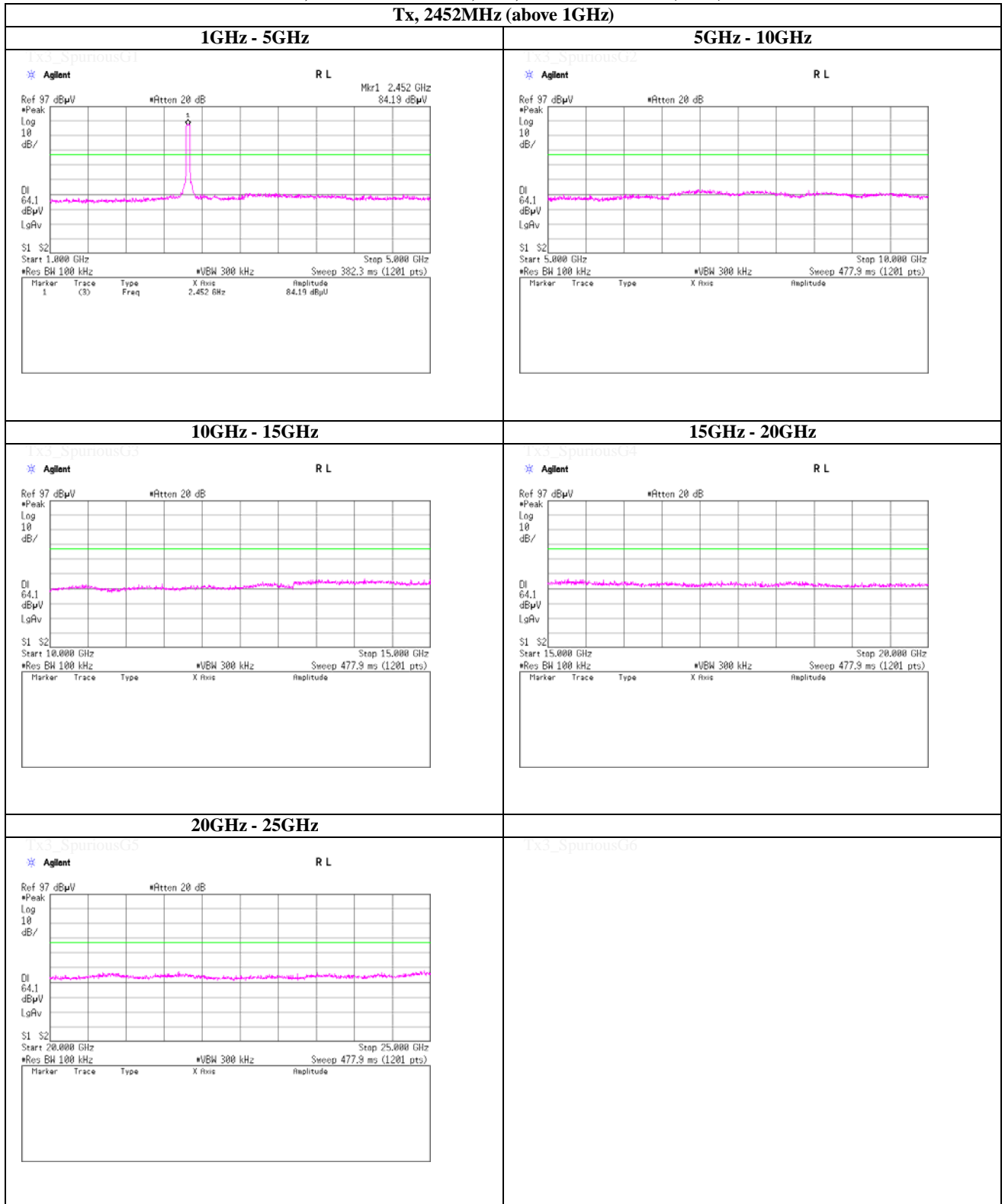
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

**(Reference chart) Spurious emission (Conducted)**

**Tx, IEEE802.11n-HT40, PN9, worst data mode 3(MCS)**

**Tx, 2452MHz (above 1GHz)**



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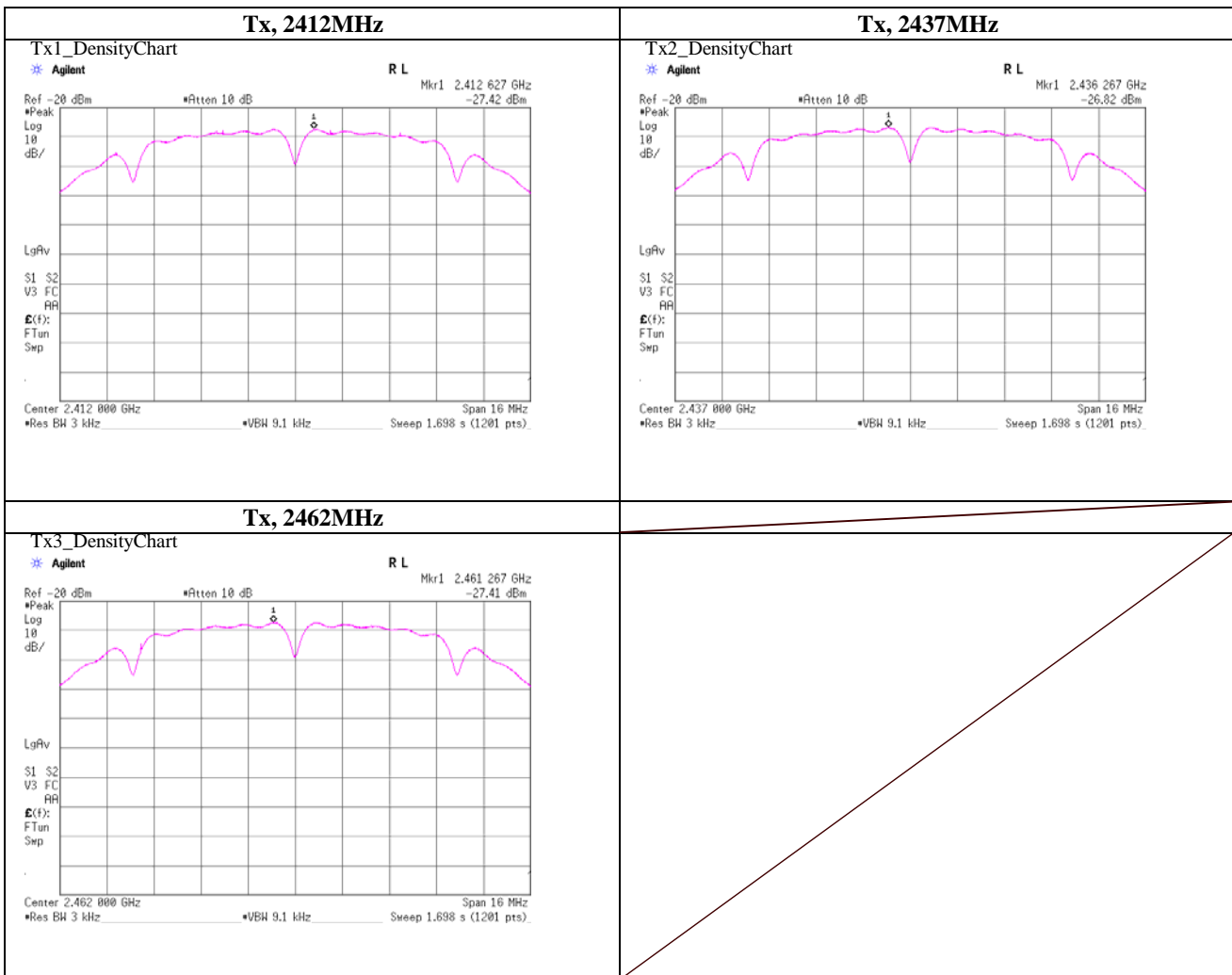
### Maximum Power Spectral Density

(Option 1)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 8, 2013	
Temperature / Humidity	23deg.C , 35%RH	
Engineer	Akio Hayashi	
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	2412.63	-27.42	1.25	9.97	-16.20	8.00	24.20
2437.0000	2436.27	-26.82	1.25	9.97	-15.60	8.00	23.60
2462.0000	2461.27	-27.41	1.25	9.97	-16.19	8.00	24.19

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



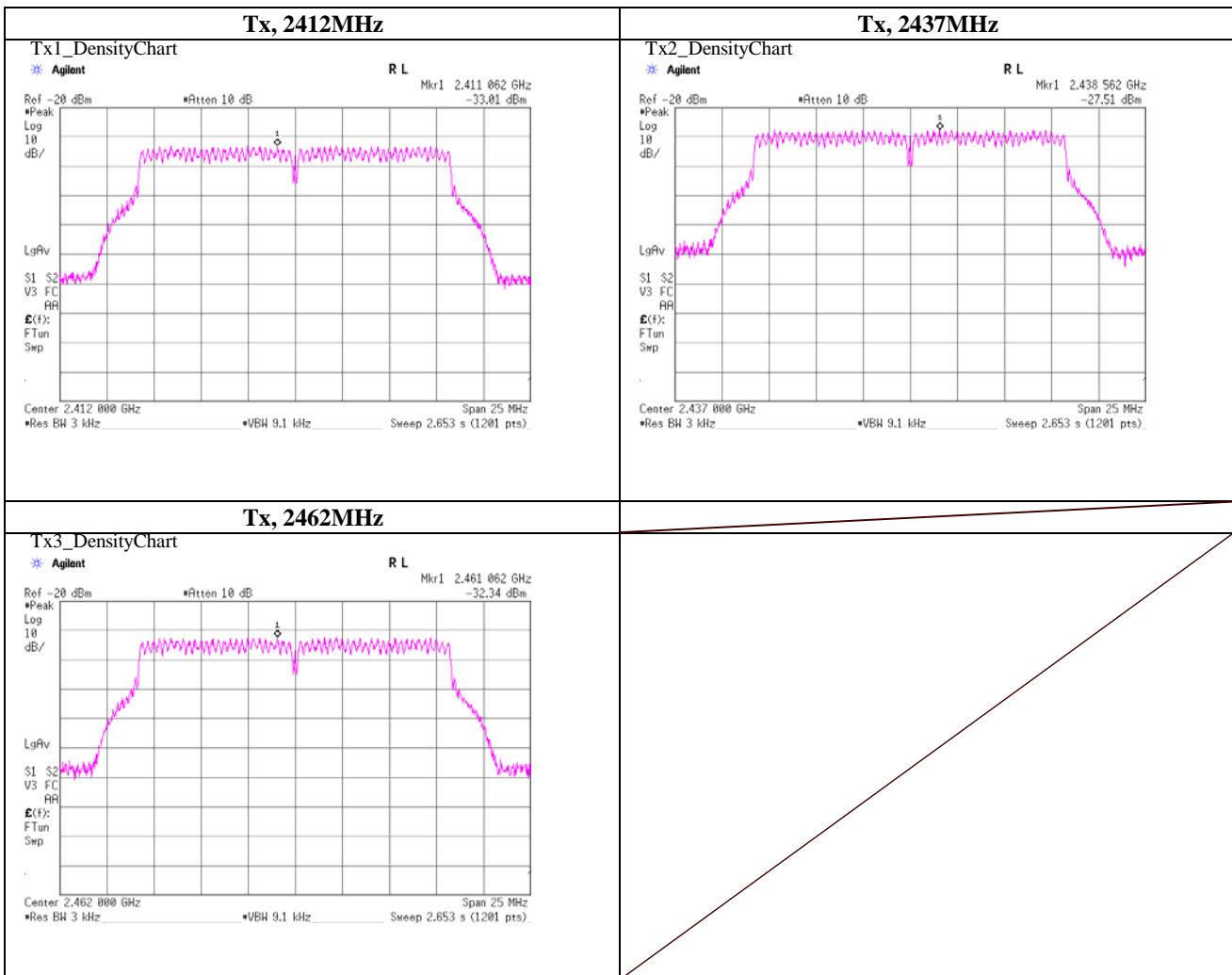
### Maximum Power Spectral Density

(Option 1)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 8, 2013	
Temperature / Humidity	23deg.C , 35%RH	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11g, PN9, worst data mode 6Mbps	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2411.06	-33.01	1.25	9.97	-21.79	8.00	29.79
2437.0000	2438.56	-27.51	1.25	9.97	-16.29	8.00	24.29
2462.0000	2461.06	-32.34	1.25	9.97	-21.12	8.00	29.12

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



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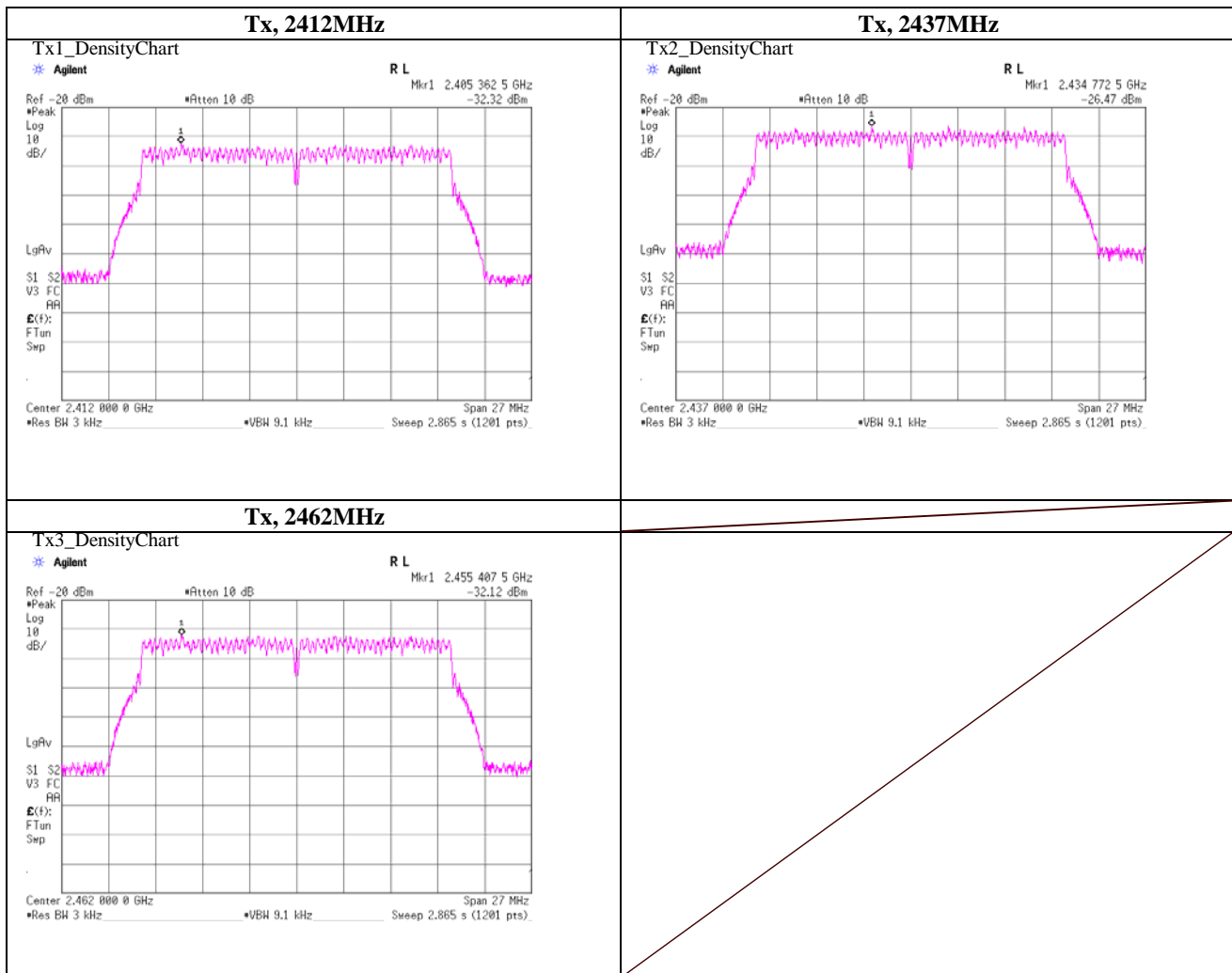
### Maximum Power Spectral Density

(Option 1)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 8, 2013	
Temperature / Humidity	23deg.C , 35%RH	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11n-HT20, PN9, worst data mode 0(MCS)	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2405.36	-32.32	1.25	9.97	-21.10	8.00	29.10
2437.0000	2434.77	-26.47	1.25	9.97	-15.25	8.00	23.25
2462.0000	2455.41	-32.12	1.25	9.97	-20.90	8.00	28.90

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



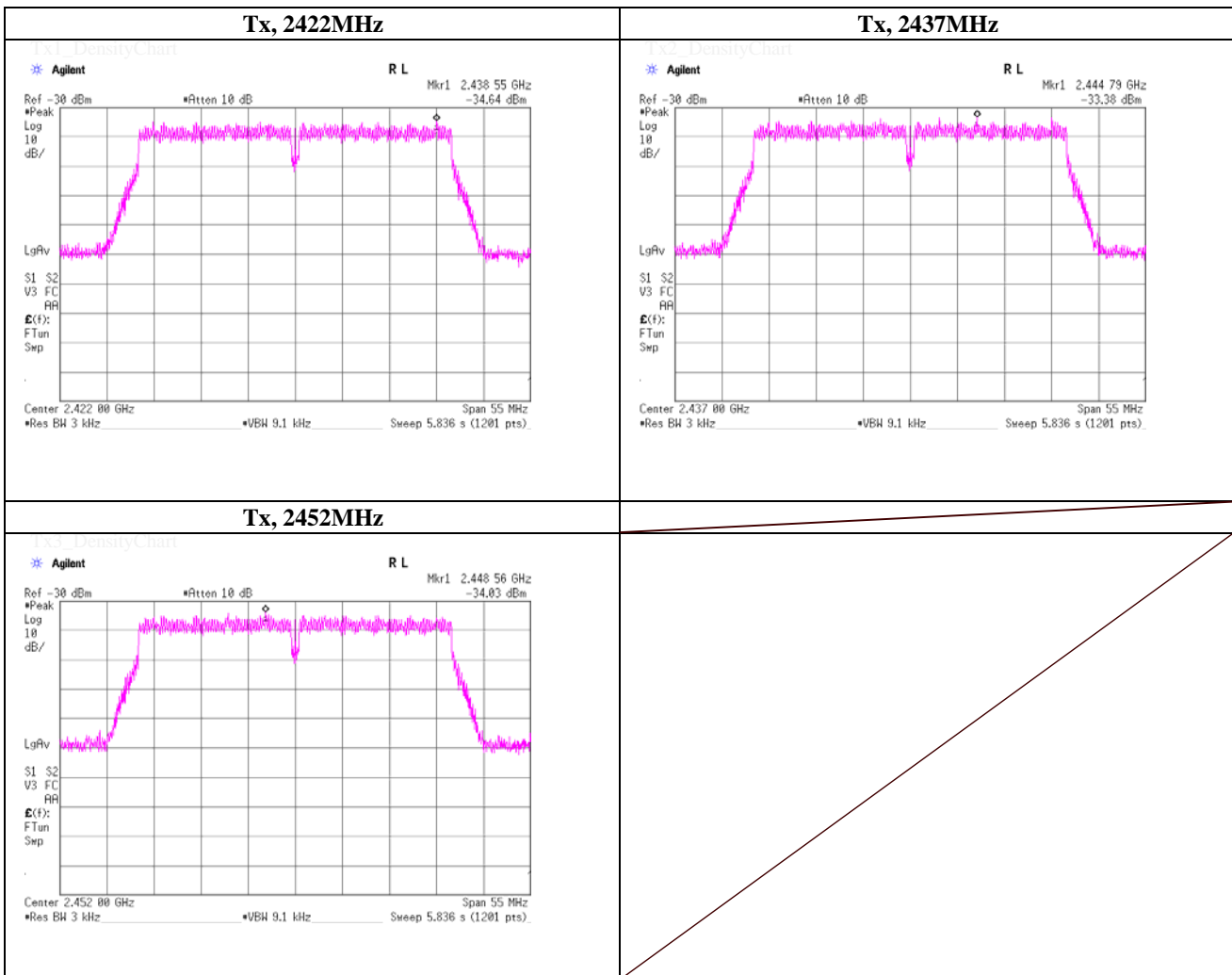
### Maximum Power Spectral Density

(Option 1)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 8, 2013	
Temperature / Humidity	23deg.C , 35%RH	
Engineer	Akio Hayashi	
Mode	Tx, IEEE802.11n-HT40, PN9, worst data mode 3(MCS)	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2422.0000	2438.55	-34.64	1.25	9.97	-23.42	8.00	31.42
2437.0000	2444.79	-33.38	1.25	9.97	-22.16	8.00	30.16
2452.0000	2448.56	-34.03	1.25	9.97	-22.81	8.00	30.81

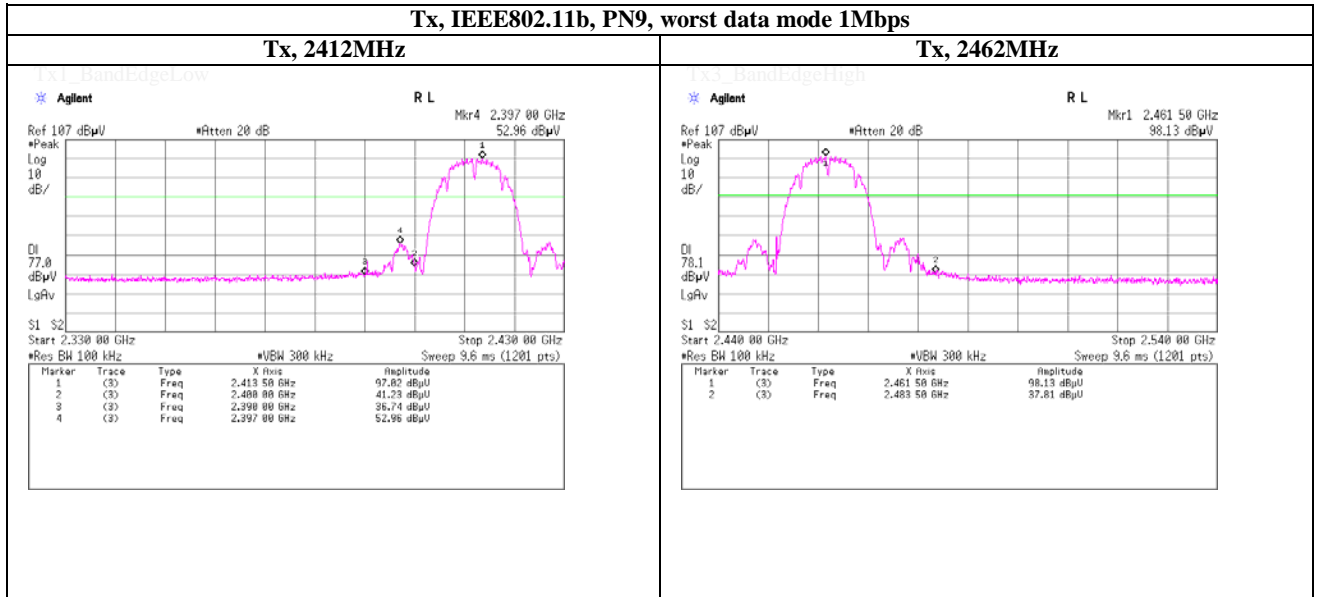
Sample Calculation:  
 Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss





**(Reference chart) Spurious emission (Conducted)**

**Band Edge compliance**



**UL Japan, Inc.**

**Shonan EMC Lab.**

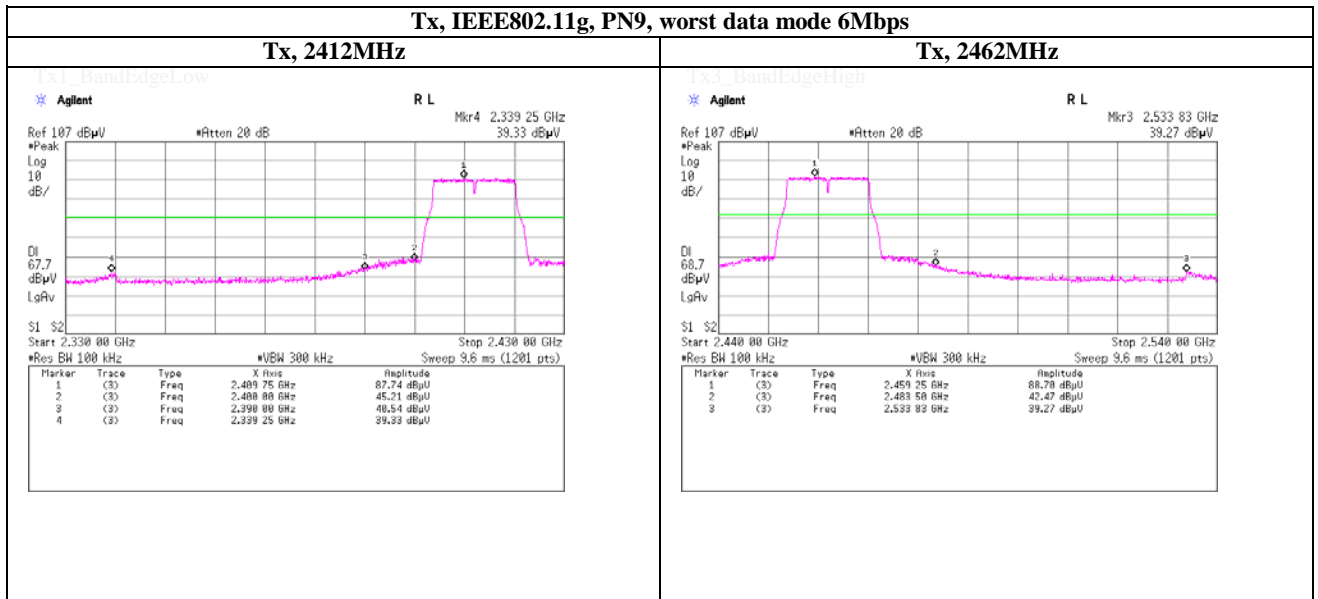
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**(Reference chart) Spurious emission (Conducted)**

**Band Edge compliance**



**UL Japan, Inc.**

**Shonan EMC Lab.**

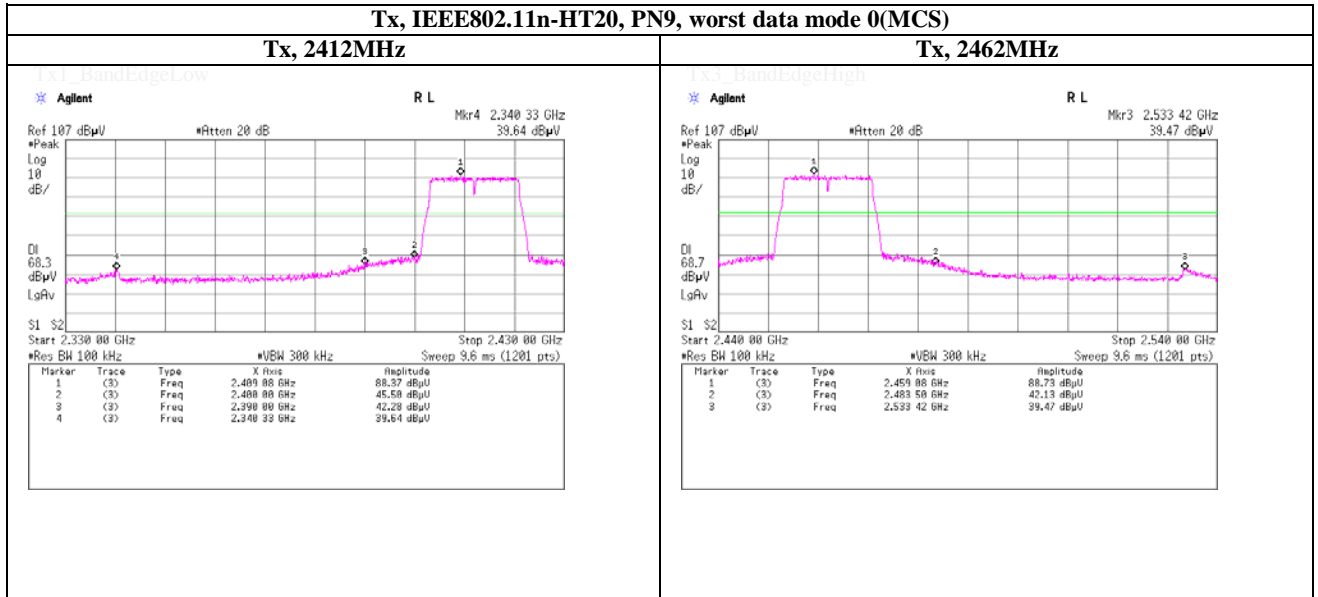
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

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**(Reference chart) Spurious emission (Conducted)**

**Band Edge compliance**



**UL Japan, Inc.**

**Shonan EMC Lab.**

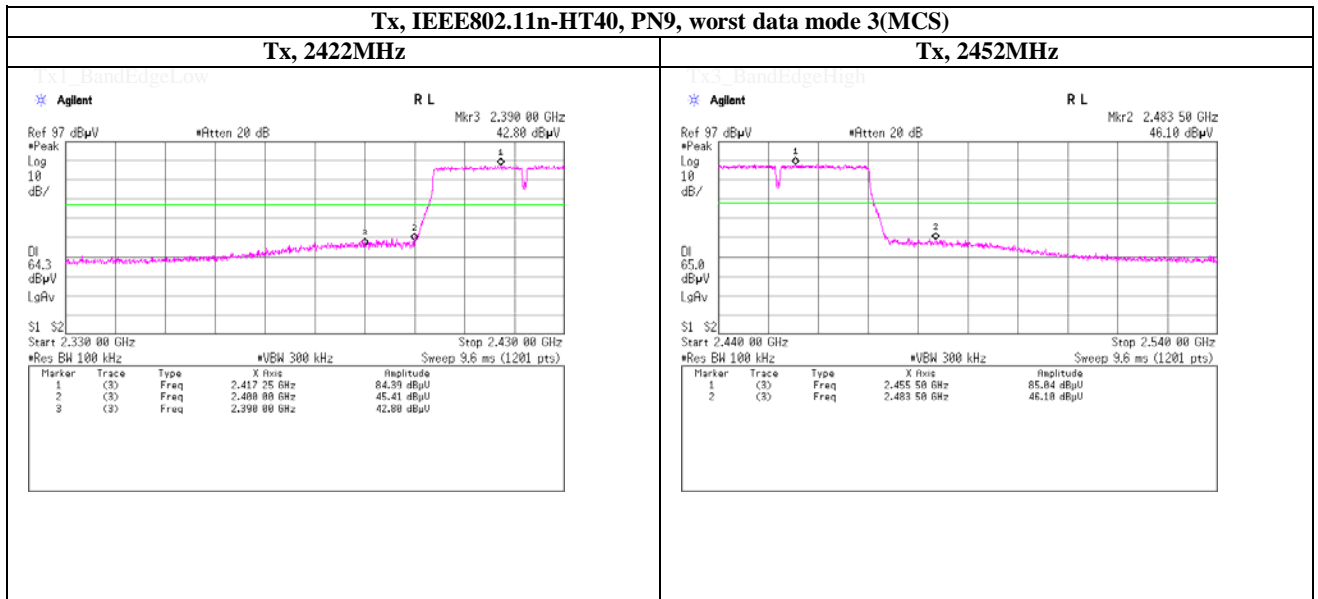
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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**(Reference chart) Spurious emission (Conducted)**

**Band Edge compliance**



**UL Japan, Inc.**

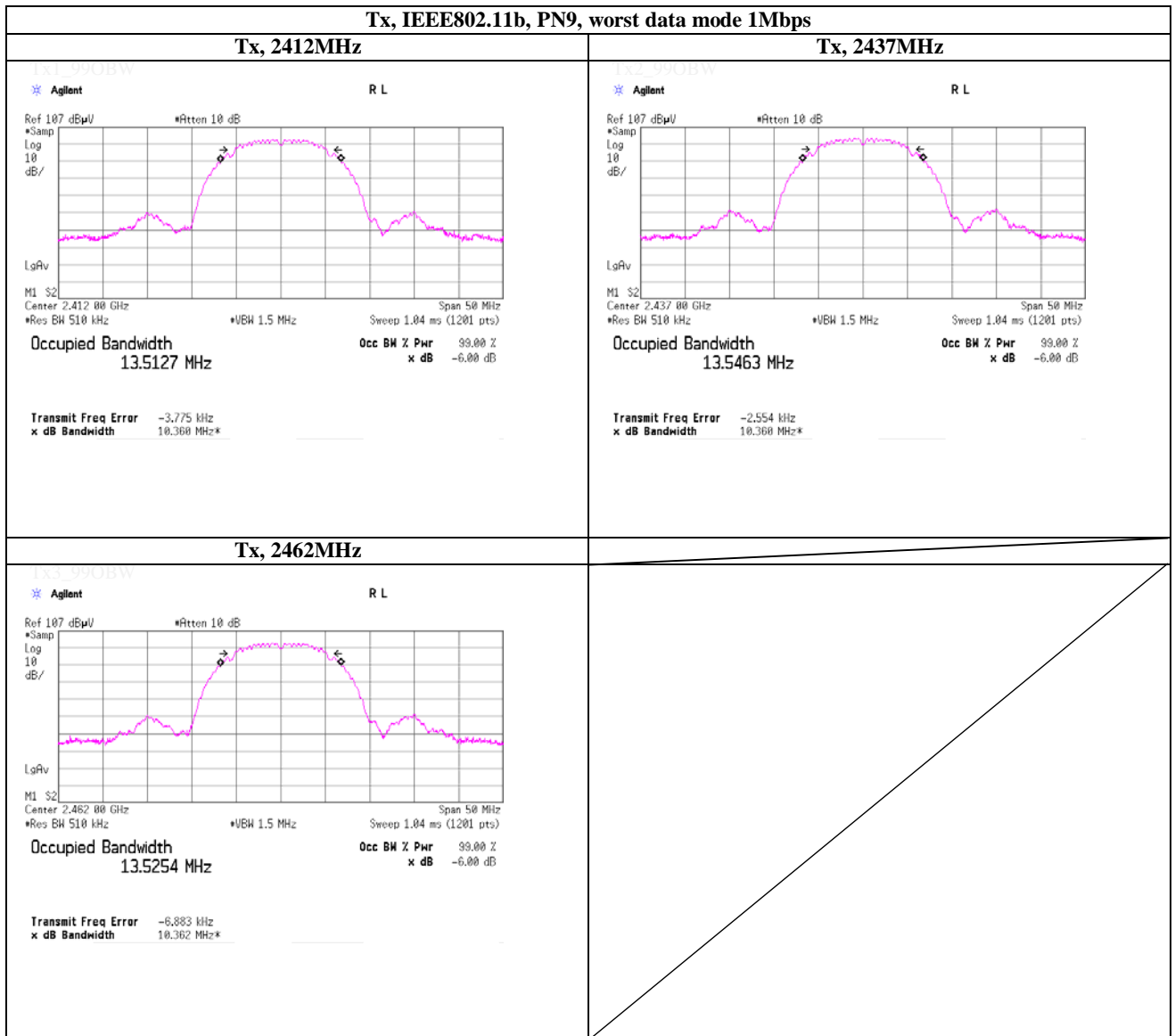
**Shonan EMC Lab.**

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**99% Occupied Bandwidth**



**UL Japan, Inc.**

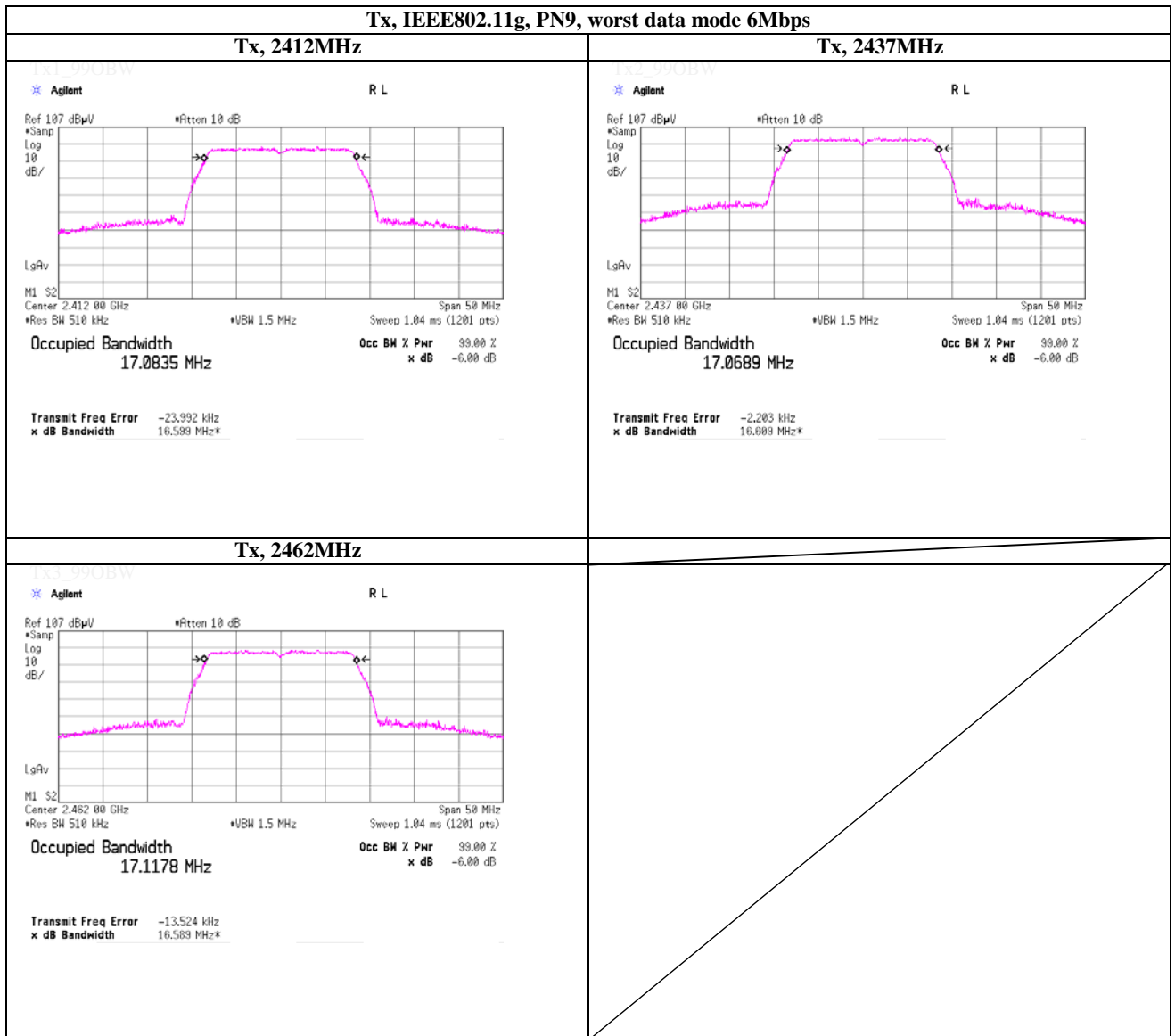
**Shonan EMC Lab.**

1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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### 99% Occupied Bandwidth



**UL Japan, Inc.**

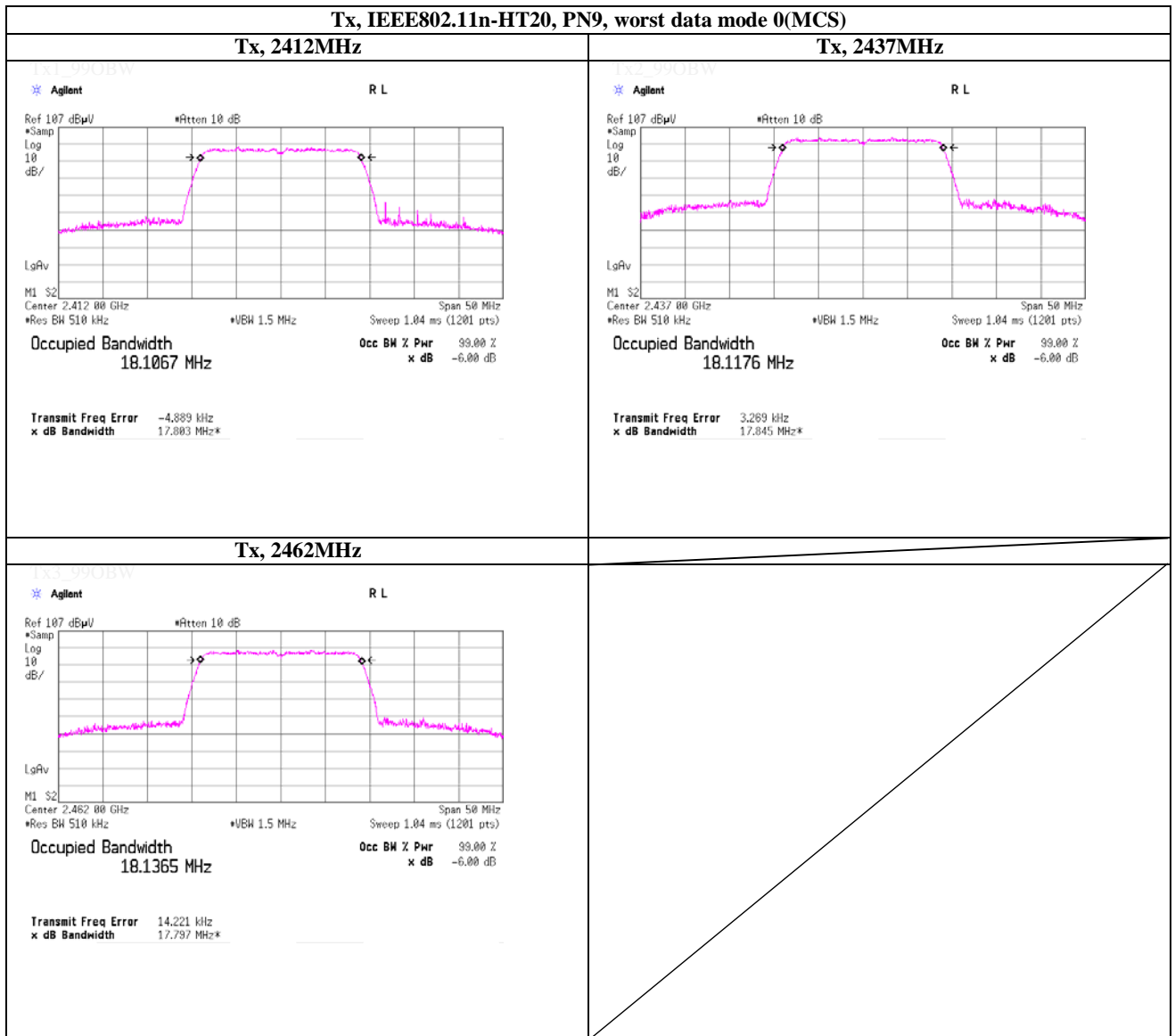
**Shonan EMC Lab.**

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### 99% Occupied Bandwidth



**UL Japan, Inc.**

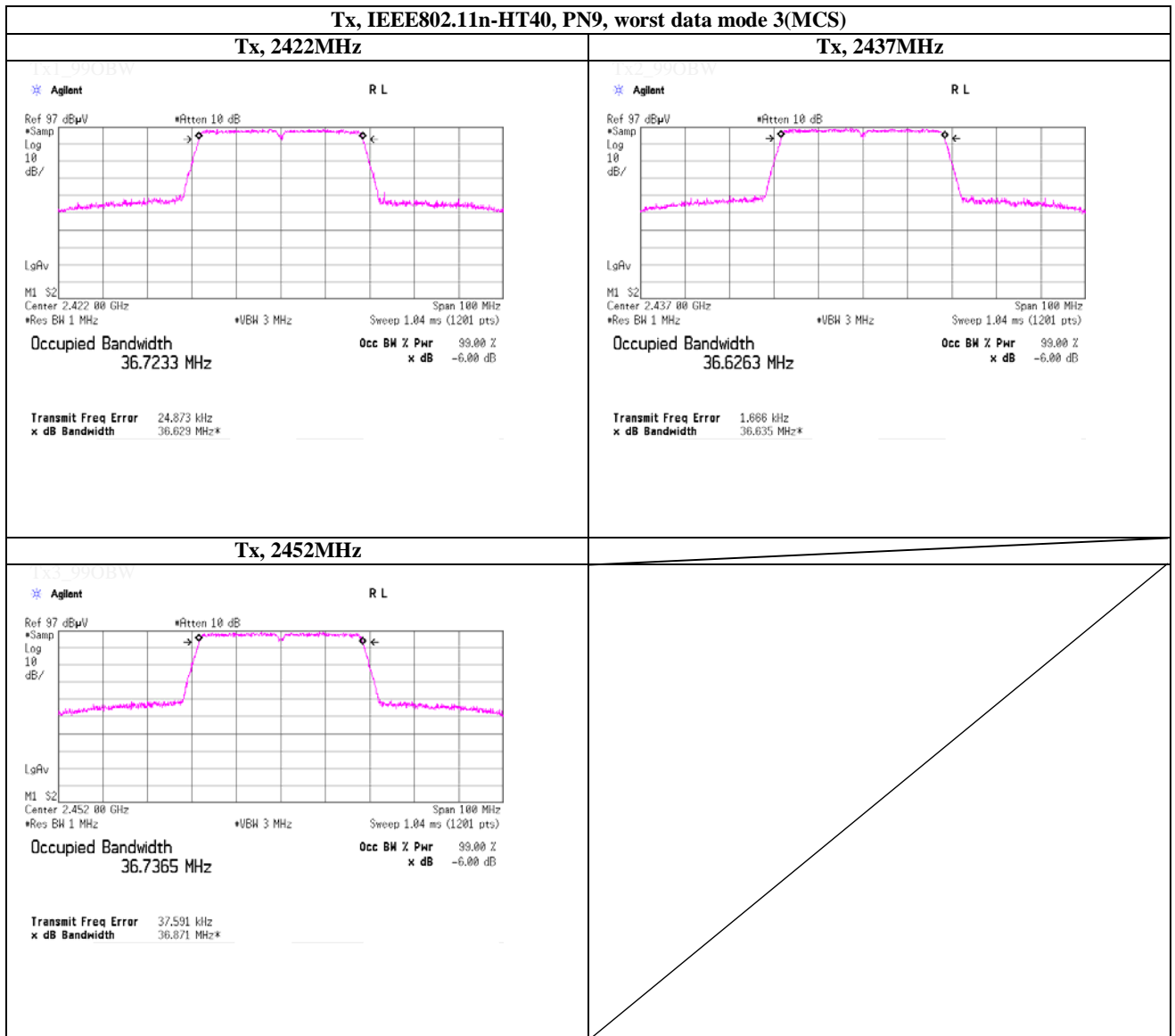
**Shonan EMC Lab.**

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### 99% Occupied Bandwidth



**UL Japan, Inc.**

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## APPENDIX 2 Test Instruments

### EMI test equipment (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2012/03/26 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2012/04/19 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2012/04/19 * 12
SCC-G29	Coaxial Cable	Junkosha	MWX241-01000KM SKMS	SEP-20-12-00 3	AT	2012/09/26 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2012/04/06 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2012/09/21 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2012/07/18 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2012/04/10 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2012/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2012/08/17 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2012/02/06 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT, RE	2012/03/16 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RF,LF)	-	RE,CE	-
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2012/12/18 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2012/12/18 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2012/03/30 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2012/03/12 * 12
SCC-G17	Coaxial Cable	Suhner	SUCOFLEX 104A	46291/4A	RE	2012/03/12 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2012/02/16 * 12
SLP-02	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100218	RE	2012/10/31 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2012/02/10 * 12
SAT6-03	Attenuator	JFW	50HF-006N	-	RE	2012/02/10 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271 (RF Selector)	RE	2012/04/10 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2012/02/07 * 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 test

## APPENDIX 2 Test Instruments

### EMI test equipment (2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2012/02/10 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2012/02/10 * 12
KAT3-11	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2012/08/07 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2012/11/18 * 12
SCC-B1/B3/B5/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2012/04/10 * 12
SCC-B2/B4/B6/B7/B8/B13/SRSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-270(RF Selector)	RE	2012/04/10 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP9108-A 0893	RE	2012/11/18 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2012/02/06 * 12
STR-02	Test Receiver	Rohde & Schwarz	ESCI	100575	RE,CE	2012/09/03 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE,CE	-
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2012/09/21 * 12
SCC-B12/B13/SRSE-02	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-270(RF Selector)	CE	2012/04/10 * 12
SLS-03	LISN	Rohde & Schwarz	ENV216	100513	CE	2012/02/23 * 12
SLS-04	LISN	Rohde & Schwarz	ENV216	100514	CE	2012/02/20 * 12
SAT3-05	Attenuator	JFW	50HF-003N	-	CE	2012/02/17 * 12
SOS-04	Humidity Indicator	A&D	AD-5681	4061512	CE	2012/03/26 * 12
STM-03	Terminator	TME	CT-01 BP	-	CE	2013/01/16 * 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