



RADIO TEST REPORT

Test Report No.: 10622710S-C

Applicant : Murata Manufacturing Co., Ltd.
Type of Equipment : Communication Module
Model No. : Type1DR
FCC ID : VPYLB1DR
Test regulation : FCC Part15 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.
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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: December 22, 2014 to February 11, 2015

Representative test engineer:

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- ☐ 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

REVISION HISTORY

Original Test Report No.: 10622710S-C

[illegible]

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SECTION 1: Customer information

Company Name : Murata Manufacturing Co., Ltd.
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Telephone Number : +81-75-955-6173
Facsimile Number : +81-75-955-7096
Contact Person : Noriko Ueno

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

2.1 Identification of E.U.T.

Type of equipment : Communication Module
Model No. : Type1DR
Serial No. : Refer to 4.2 in this report.
Rating : 3.2(VBAT), 1.8(VDDXO), 1.8 or 3.3(VIO)
Country of Mass-production : China, Japan
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 : December 22, 2014

2.2 Product description

Model: Type1DR (referred to as the EUT in this report) is Communication Module.

Clock frequency(ies) in the system : 37.4MHz

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Radio Specification

Equipment type	: Transceiver
Frequency of operation	: 2.4GHz: 2402-2480MHz (Bluetooth BDR/EDR/Low Energy (LE)) 2412-2462MHz (IEEE 802.11b, 11g, 11n (HT20)) W52: 5180-5240MHz (IEEE 802.11a, 11n (HT20), 11ac (VHT20)) 5190-5230MHz (IEEE 802.11n (HT40), 11ac (VHT40)) 5210MHz (IEEE 802.11ac (VHT80)) W53: 5260-5320MHz (IEEE 802.11a, 11n (HT20), 11ac (VHT20)) 5270-5310MHz (IEEE 802.11n (HT40), 11ac (VHT40)) 5290MHz (IEEE 802.11ac (VHT80)) W56: 5500-5700MHz (IEEE 802.11a, 11n (HT20), 11ac (VHT20)) 5510-5670MHz (IEEE 802.11n (HT40), 11ac (VHT40)) 5530-5610MHz (IEEE 802.11ac (VHT80)) W58: 5745-5825MHz (IEEE 802.11a, 11n (HT20), 11ac (VHT20)) 5755-5795MHz (IEEE 802.11n (HT40), 11ac (VHT40)) 5775MHz(IEEE 802.11ac (VHT80))
Bandwidth	: 20MHz (IEEE 802.11a/b/g/n/ac), 40MHz (IEEE 802.11n/ac), 80MHz(IEEE 802.11ac) , 79MHz (Bluetooth BDR/EDR), 1MHz (Bluetooth LE)
Channel spacing	: 5MHz (Wi-Fi 2.4GHz), 20MHz/40MHz/80MHz (Wi-Fi 5GHz), 1MHz (Bluetooth BDR/EDR), 2MHz (Bluetooth LE)
Type of modulation	: DSSS (IEEE 802.11b), OFDM (IEEE 802.11a/g/n/ac), FHSS (Bluetooth BDR/EDR), GFSK (Bluetooth LE)
Antenna type	: [2.4GHz] Monopole antenna/Dipole antenna/Dual monopole antenna [5GHz] Monopole antenna/ Dual monopole antenna
Antenna connector type	: spring
Antenna gain	: [2.4GHz] Monopole antenna:+0.91dBi [2.4GHz] Dipole antenna:-0.15dBi [2.4GHz] Dual monopole antenna:-1.1dBi [5GHz] Monopole antenna:+1.0dBi [5GHz] Dual monopole antenna:+0.28dBi
TU code	: F1D, G1D (Bluetooth BDR/EDR), F1D (Bluetooth LE) D1D, G1D (IEEE802.11b/g/n/a/ac)
Operation temperature range	: -20 to +85 deg.C
* For Bluetooth BDR/EDR part, refer to the test report: 10622710S-A. For FCC 15.407, refer to the test reports: 10622710S-E.	

FCC 15.31 (e) / 212

The RF Module has its own regulator.

The RF Module is constantly provided voltage (DC 1.2, 1.35, 2.5 and 3.0V) through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement of 15.212.

FCC 15.203 / 212

It is impossible for end users to replace the antenna, because it is soldered on the circuit board.

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

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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

* The revision on January 21, 2015 does not affect the test specification applied to the EUT.

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	21.2dB Detection: Average Phase: L1 Mode: LE, Tx, 2480MHz Freq.: 24.89773MHz (2.4GHz monopole) Freq.: 24.89778MHz (2.4GHz Dipole)	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	0.4 dB Freq.: 2483.500MHz Polarization: Horizontal Detection: Average Mode: Tx, IEEE802.11n HT20, 2457 MHz Dipole Antenna	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 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 6.6	-	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 ^{*1} /SR ^{*2} (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Conducted emission (AC Mains) LISN	150kHz-30MHz	3.6 dB	3.4 dB	3.4 dB
Radiated emission (Measurement distance: 3m)	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
Radiated emission (Measurement distance: 1m)	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 report meets the limits unless the uncertainty is taken into consideration.

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%

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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 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 checked="" 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 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 checked="" 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 type="checkbox"/> No.7 Shielded room	-	2.76 x 3.76 x 2.4	2.76 x 3.76	-
<input type="checkbox"/> No.8 Shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
<input checked="" type="checkbox"/> No.1 Measurement room	-	2.55 x 4.1 x 2.5	2.55 x 4.1	-

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 [dBm] *3)	Worst data mode *1)	Antenna *5)
Conducted emission, Radiated emission (below 1GHz)	Transmitting(Tx) IEEE 802.11n (HT20) *2)	2437MHz *2)	17	MCS0	Monopole, Dipole
	Transmitting(Tx) Hopping OFF Low Energy(LE), Payload: PRBS9	2402MHz, 2440MHz, 2480MHz	7	-	Monopole, Dipole
Radiated emission (Spurious emission) (Above 1GHz)	Transmitting(Tx) IEEE 802.11b	2412MHz, 2437MHz, 2462MHz	17	11Mbps	Monopole, Dipole Dual monopole
		2412MHz, 2462MHz	13.5	6Mbps	Monopole, Dipole Dual monopole
	Transmitting(Tx) IEEE 802.11g *4)	2417MHz, 2457MHz	17		
		2412MHz, 2462MHz	13.5	MCS0	Monopole, Dipole Dual monopole
	Transmitting(Tx) IEEE 802.11n (HT20) *5)	2417MHz, 2437MHz, 2457MHz	17		
		2402MHz, 2440MHz, 2480MHz	7	-	Monopole, Dipole Dual monopole
	Transmitting(Tx) Hopping OFF Low Energy(LE), Payload: PRBS9 *5)	2402MHz, 2440MHz, 2480MHz	7	-	-
		2402MHz, 2440MHz, 2480MHz	7	-	-
Other items	Transmitting(Tx) IEEE 802.11b	2412MHz, 2437MHz, 2462MHz	High: 17 Low: 7	11Mbps	-
		2412MHz, 2462MHz	High: 13.5 Low: 7	6Mbps	-
	Transmitting(Tx) IEEE 802.11g	2437MHz,	High: 17 Low: 7		
		2412MHz, 2462MHz	High: 13.5 Low: 7	MCS0	-
	Transmitting(Tx) IEEE 802.11n (HT20)	2437MHz,	High: 17 Low: 7		
		2402MHz, 2440MHz, 2480MHz	7	-	-
	Transmitting(Tx) Hopping OFF Low Energy(LE), Payload: PRBS9	2402MHz, 2440MHz, 2480MHz	7	-	-
		2402MHz, 2440MHz, 2480MHz	7	-	-

*1) The worst condition was determined based on the test result of Maximum Peak Output Power.

*2) 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.

*3) Lowest power setting mode was performed only worst mode (maximum peak conducted output power mode).

*4) These were carried out only in Band edge.

*5) Monopole antenna and Dipole antenna were used in Bandwidth 1-25GHz. Dual monopole antenna was used only in Band edge.

(Wireless LAN mode)

Software : Tera Term ver. 4.69

(Bluetooth Low energy mode)

Software : Broadcom BlueTool ver. 1.8.7.3

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

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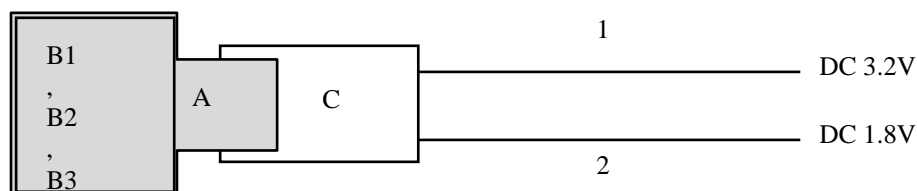
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4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID (Remarks)
A	Module	Type1DR	*1)	Murata Manufacturing Co., Ltd.	EUT
B1	Monopole antenna	2.4-Mono	-	Murata Manufacturing Co., Ltd.	EUT
B2	Dipole antenna	2.4-D1-1	-	Murata Manufacturing Co., Ltd.	EUT
B3	Dual monopole antenna	Dual-8	-	Murata Manufacturing Co., Ltd.	EUT
C	Jig	-	-	Murata Manufacturing Co., Ltd.	-

*1) 11: used for Radiated emission tests (WLAN, monopole antenna) and Antenna terminal tests.

47: used for Radiated emission tests (WLAN, Dipole antenna)

BT_11: used for Radiated emission tests (Bluetooth LE, monopole antenna) and Antenna terminal tests.

BT_28: used for Radiated emission tests (Bluetooth LE, Dipole antenna)

48: used for Radiated emission tests (Dual monopole antenna)

List of cables used

No.	Cable Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC cable	1.4	Unshielded	Unshielded	-
2	DC cable	1.1	Unshielded	Unshielded	-

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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 peripheral 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. All unused 50ohm connectors of the LISN were resistively terminated in 50ohm when not connected to the measuring equipment.

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 via DC power supply 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 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 platform of nominal size, 1m by 1.5m, raised 0.8m (Below 1GHz) and a polystyrene platform of nominal size, 0.5m by 0.5m, raised 0.8m (Above 1GHz) 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 Antennas to see the position of maximum noise, and the test was made at the position that has the maximum noise.

[Monopole antenna (2.4GHz WLAN)]

Antenna polarization	Spurious (30-1000MHz)	Carrier	Spurious (1-2.8GHz)	Spurious (2.8-15GHz)	Spurious (15-18GHz)	Spurious (18-26.5GHz)
Horizontal	X	X	X	X	X	X
Vertical	X	Z	Z	Z	X	X

[Dipole antenna (2.4GHz WLAN)]

Antenna polarization	Spurious (30-1000MHz)	Carrier	Spurious (1-2.8GHz)	Spurious (2.8-15GHz)	Spurious (15-18GHz)	Spurious (18-26.5GHz)
Horizontal	X	Y	Y	Y	X	X
Vertical	X	Y	Y	Y	X	X

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[Dual monopole antenna (2.4GHz WLAN)]

Antenna polarization	Carrier
Horizontal	X
Vertical	Y

[Monopole antenna (2.4GHz Bluetooth Low Energy)]

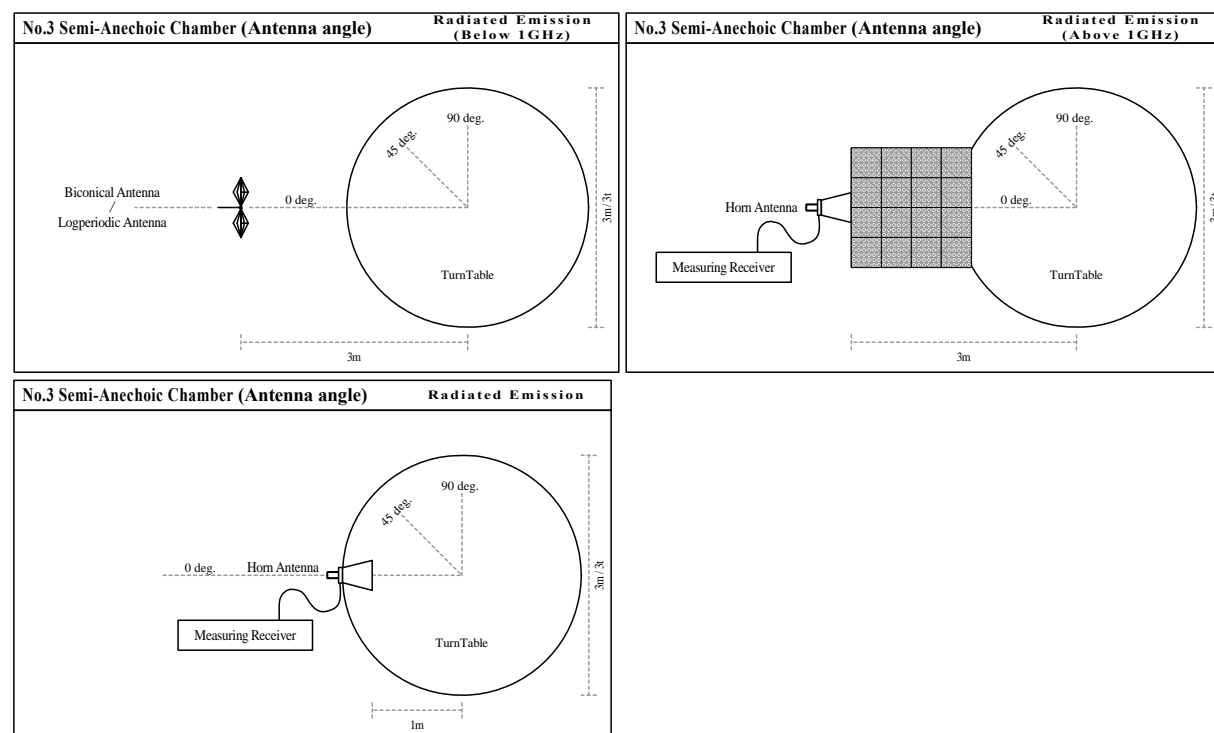
Antenna polarization	Spurious (30-1000MHz)	Carrier	Spurious (1-2.8GHz)	Spurious (2.8-15GHz)	Spurious (15-18GHz)	Spurious (18-26.5GHz)
Horizontal	X	X	X	X	X	X
Vertical	X	X	X	Z	X	X

[Dipole antenna (2.4GHz Bluetooth Low Energy)]

Antenna polarization	Spurious (30-1000MHz)	Carrier	Spurious (1-2.8GHz)	Spurious (2.8-15GHz)	Spurious (15-18GHz)	Spurious (18-26.5GHz)
Horizontal	X	Y	Y	Y	X	X
Vertical	X	X	X	Y	X	X

[Dual monopole antenna (2.4GHz Bluetooth Low Energy)]

Antenna polarization	Carrier
Horizontal	Y
Vertical	Y

Figure 1. Antenna angle**UL Japan, Inc.****Shonan EMC Lab.**

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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

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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

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

APPENDIX 1: Data of Radio tests**DATA OF CONDUCTED EMISSION TEST**

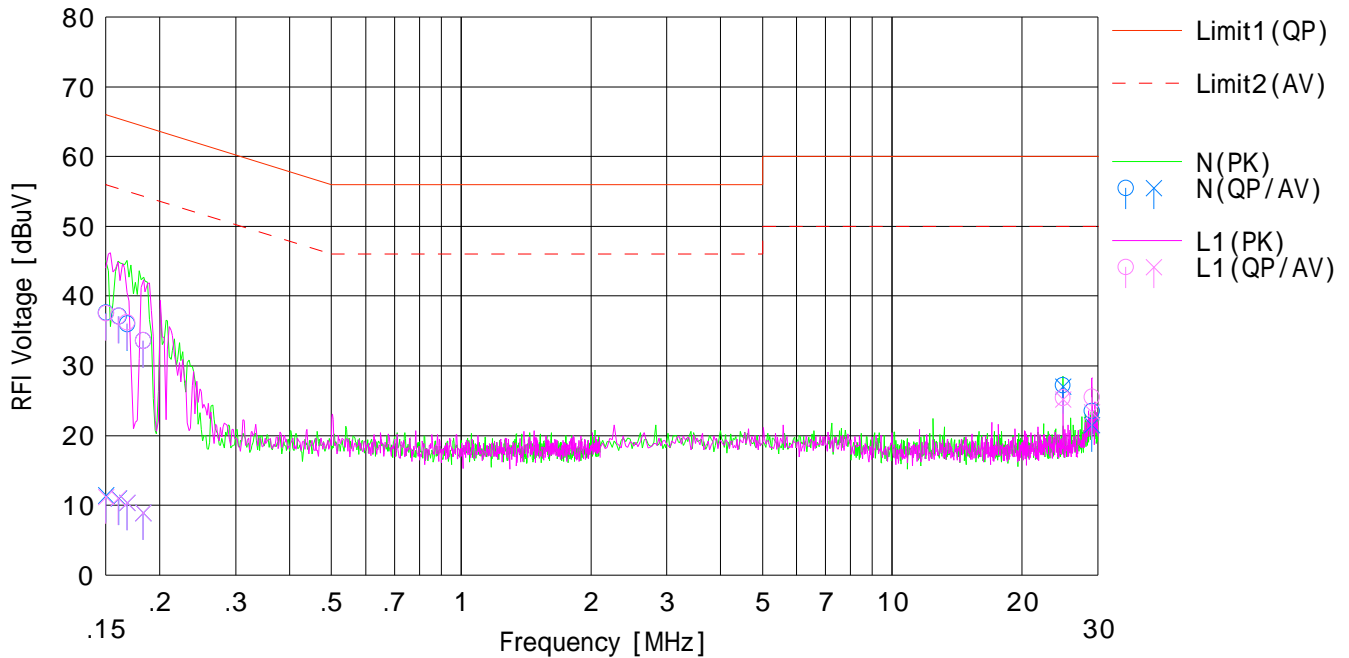
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2015/01/17

Company : Murata Manufacturing Co., Ltd.
Kind of EUT : Communication Module
Model No. : Type1DR
Serial No. : 11 (2.4GHz monopole)
Remarks : -

Mode : IEEE802.11n(HT20), Tx, 2437MHz
Order No. : 10622710S
Power : DC 3.2V / 1.8V
Temp./Humi. : 22deg.C / 32%RH

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

Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	25.1	-1.1	12.5	37.6	11.4	65.9	55.9	28.3	44.5	N	
2	0.16080	24.6	-1.5	12.5	37.1	11.0	65.4	55.4	28.3	44.4	N	
3	0.16806	23.5	-2.2	12.5	36.0	10.3	65.0	55.0	29.0	44.7	N	
4	0.18309	21.1	-3.6	12.5	33.6	8.9	64.3	54.3	30.7	45.4	N	
5	24.89834	13.7	13.5	13.5	27.2	27.0	60.0	50.0	32.8	23.0	N	
6	29.04764	9.8	7.8	13.7	23.5	21.5	60.0	50.0	36.5	28.5	N	
7	0.15000	25.0	-1.3	12.5	37.5	11.2	65.9	55.9	28.4	44.7	L1	
8	0.16024	24.6	-1.5	12.5	37.1	11.0	65.4	55.4	28.3	44.4	L1	
9	0.16793	23.7	-2.2	12.5	36.2	10.3	65.0	55.0	28.8	44.7	L1	
10	0.18292	21.1	-3.6	12.5	33.6	8.9	64.3	54.3	30.7	45.4	L1	
11	24.89906	11.9	11.7	13.5	25.4	25.2	60.0	50.0	34.6	24.8	L1	
12	29.04810	11.8	9.6	13.7	25.5	23.3	60.0	50.0	34.5	26.7	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN + Cable + ATT) [dB]
LISN: SLS-05

DATA OF CONDUCTED EMISSION TEST

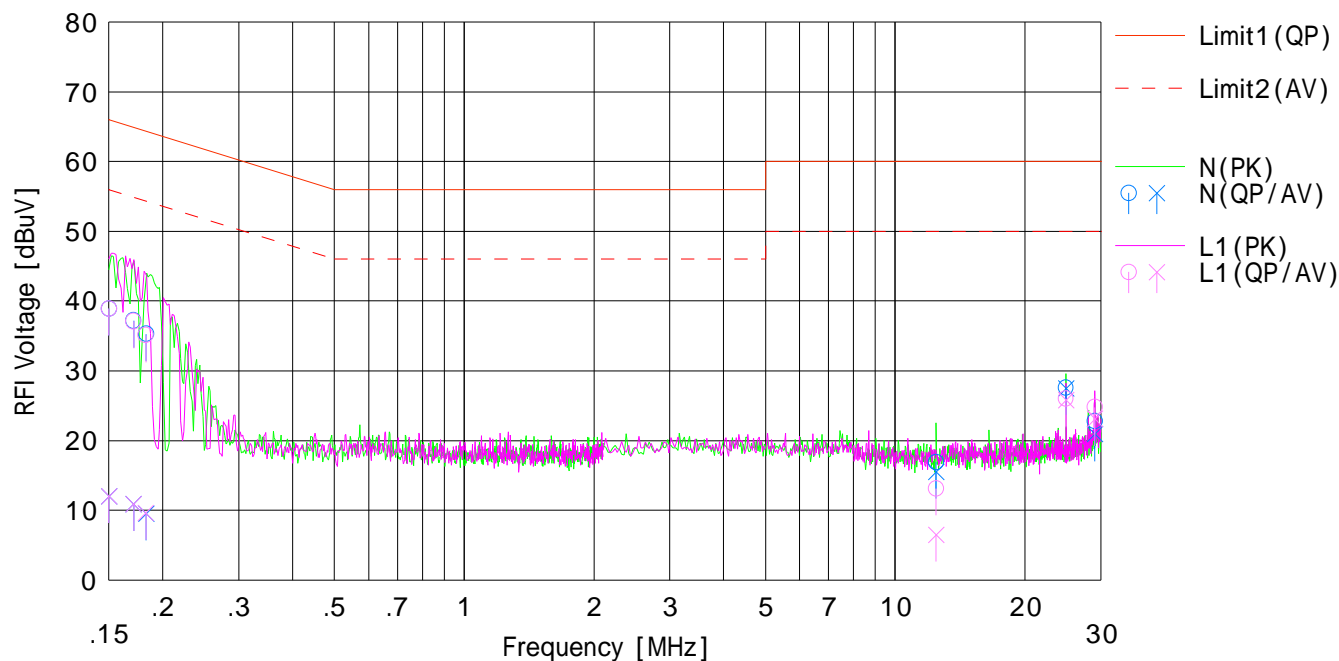
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2015/01/17

Company : Murata Manufacturing Co., Ltd.
Kind of EUT : Communication Module
Model No. : Type1DR
Serial No. : 47 (2.4GHz Dipole)
Remarks : -

Mode : IEEE802.11n(HT20), Tx, 2437MHz
Order No. : 10622710S
Power : DC 3.2V / 1.8V
Temp./Humi. : 22deg.C / 32%RH

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

Engineer : Shinichi Takano



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15000	26.4	-0.5	12.5	38.9	12.0	65.9	55.9	27.0	43.9	N	
2	0.17112	24.7	-1.6	12.5	37.2	10.9	64.9	54.9	27.7	44.0	N	
3	0.18309	22.8	-3.0	12.5	35.3	9.5	64.3	54.3	29.0	44.8	N	
4	12.45020	3.9	2.5	13.0	16.9	15.5	60.0	50.0	43.1	34.5	N	
5	24.89994	14.1	14.0	13.5	27.6	27.5	60.0	50.0	32.4	22.5	N	
6	29.04910	9.1	7.2	13.7	22.8	20.9	60.0	50.0	37.2	29.1	N	
7	0.15000	26.4	-0.5	12.5	38.9	12.0	65.9	55.9	27.0	43.9	L1	
8	0.17110	24.6	-1.6	12.5	37.1	10.9	64.9	54.9	27.8	44.0	L1	
9	0.18288	22.6	-2.9	12.5	35.1	9.6	64.3	54.3	29.2	44.7	L1	
10	12.45010	0.1	-6.5	13.0	13.1	6.5	60.0	50.0	46.9	43.5	L1	
11	24.90006	12.5	12.3	13.5	26.0	25.8	60.0	50.0	34.0	24.2	L1	
12	29.04990	11.1	9.4	13.7	24.8	23.1	60.0	50.0	35.2	26.9	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN + Cable + ATT) [dB]
LISN: SLS-05

DATA OF CONDUCTED EMISSION TEST

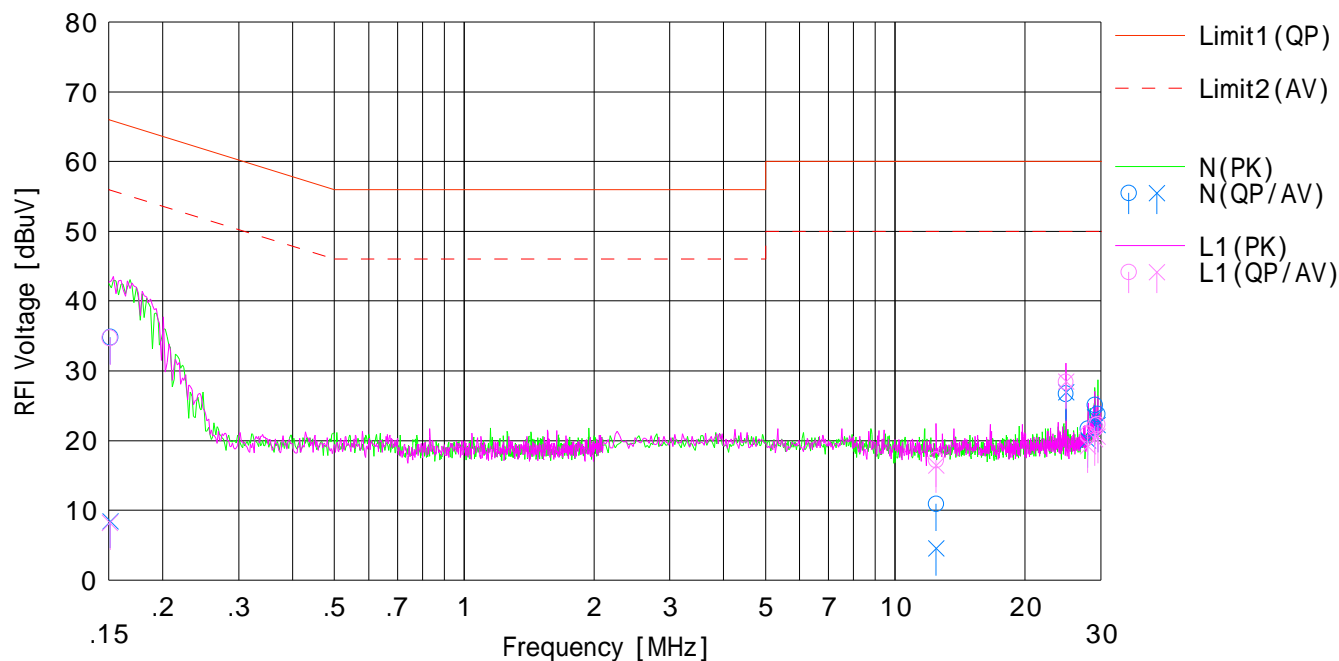
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2015/02/11

Company : Murata Manufacturing Co., Ltd.
Kind of EUT : Communication Module
Model No. : Type1DR
Serial No. : BT_11
Remarks : -

Mode : LE, Tx, 2402MHz
Order No. : 10622710S
Power : DC 3.2V / 1.8V
Temp./Humi. : 22deg.C / 25%RH

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

Engineer : Yosuke Ishikawa



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15117	22.3	-4.1	12.5	34.8	8.4	65.9	55.9	31.1	47.5	N	
2	12.44682	-2.1	-8.5	13.0	10.9	4.5	60.0	50.0	49.1	45.5	N	
3	24.89770	13.2	13.4	13.5	26.7	26.9	60.0	50.0	33.3	23.1	N	
4	28.01113	8.1	6.4	13.6	21.7	20.0	60.0	50.0	38.3	30.0	N	
5	29.04885	11.4	9.6	13.7	25.1	23.3	60.0	50.0	34.9	26.7	N	
6	29.49666	10.1	8.5	13.7	23.8	22.2	60.0	50.0	36.2	27.8	N	
7	0.15085	22.2	-4.3	12.5	34.7	8.2	65.9	55.9	31.2	47.7	L1	
8	12.44865	4.2	3.4	13.0	17.2	16.4	60.0	50.0	42.8	33.6	L1	
9	24.89901	14.9	15.0	13.5	28.4	28.5	60.0	50.0	31.6	21.5	L1	
10	28.00862	7.3	5.6	13.6	20.9	19.2	60.0	50.0	39.1	30.8	L1	
11	29.04548	8.4	6.5	13.7	22.1	20.2	60.0	50.0	37.9	29.8	L1	
12	29.49648	8.6	6.9	13.7	22.3	20.6	60.0	50.0	37.7	29.4	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN + Cable + ATT) [dB]
LISN: SLS-05

DATA OF CONDUCTED EMISSION TEST

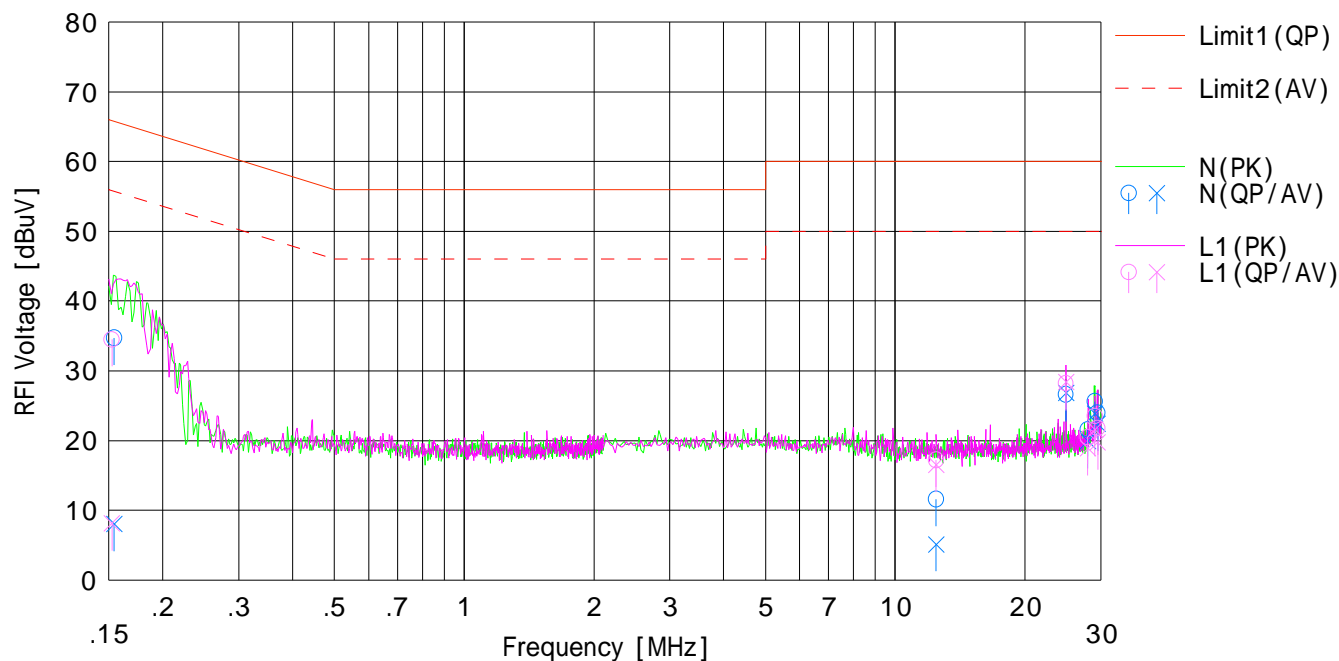
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2015/02/11

Company : Murata Manufacturing Co., Ltd.
Kind of EUT : Communication Module
Model No. : Type1DR
Serial No. : BT_11
Remarks : -

Mode : LE, Tx, 2440MHz
Order No. : 10622710S
Power : DC 3.2V / 1.8V
Temp./Humi. : 22deg.C / 25%RH

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

Engineer : Yosuke Ishikawa



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	0.15431	22.2	-4.5	12.5	34.7	8.0	65.7	55.7	31.0	47.7	N	
2	12.44749	-1.4	-7.9	13.0	11.6	5.1	60.0	50.0	48.4	44.9	N	
3	24.89841	13.1	13.3	13.5	26.6	26.8	60.0	50.0	33.4	23.2	N	
4	28.00908	8.0	6.3	13.6	21.6	19.9	60.0	50.0	38.4	30.1	N	
5	29.04756	11.9	10.2	13.7	25.6	23.9	60.0	50.0	34.4	26.1	N	
6	29.49669	10.3	8.7	13.7	24.0	22.4	60.0	50.0	36.0	27.6	N	
7	0.15241	22.0	-4.4	12.5	34.5	8.1	65.8	55.8	31.3	47.7	L1	
8	12.44874	4.2	3.5	13.0	17.2	16.5	60.0	50.0	42.8	33.5	L1	
9	24.89688	14.7	14.9	13.5	28.2	28.4	60.0	50.0	31.8	21.6	L1	
10	28.01204	6.9	5.3	13.6	20.5	18.9	60.0	50.0	39.5	31.1	L1	
11	29.04774	9.8	7.9	13.7	23.5	21.6	60.0	50.0	36.5	28.4	L1	
12	29.49498	8.1	6.0	13.7	21.8	19.7	60.0	50.0	38.2	30.3	L1	

DATA OF CONDUCTED EMISSION TEST

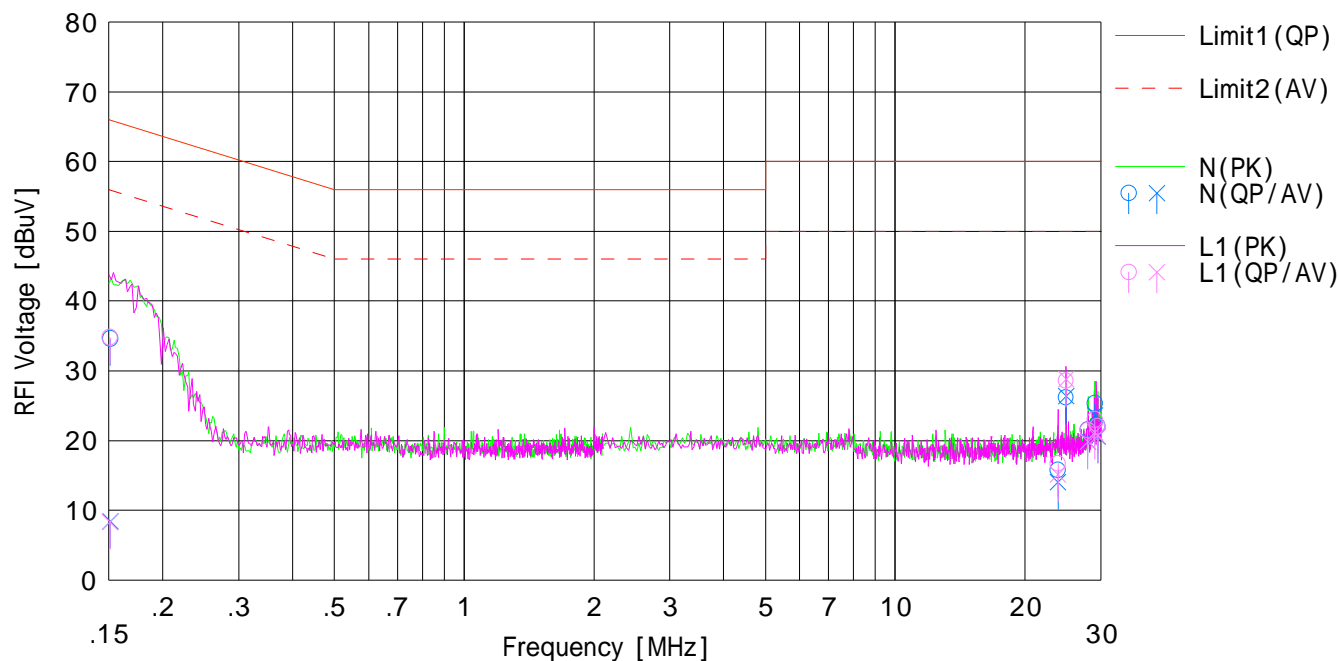
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2015/02/11

Company : Murata Manufacturing Co., Ltd.
Kind of EUT : Communication Module
Model No. : Type1DR
Serial No. : BT_11
Remarks : -

Mode : LE, Tx, 2480MHz
Order No. : 10622710S
Power : DC 3.2V / 1.8V
Temp./Humi. : 22deg.C / 25%RH

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

Engineer : Yosuke Ishikawa



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	0.15118	22.1	-4.1	12.5	34.6	8.4	65.9	55.9	31.3	47.5	N	
2	23.85958	2.3	0.5	13.5	15.8	14.0	60.0	50.0	44.2	36.0	N	
3	24.89906	12.7	12.9	13.5	26.2	26.4	60.0	50.0	33.8	23.6	N	
4	28.00898	8.0	6.2	13.6	21.6	19.8	60.0	50.0	38.4	30.2	N	
5	29.04847	11.6	9.9	13.7	25.3	23.6	60.0	50.0	34.7	26.4	N	
6	29.49927	8.4	6.9	13.7	22.1	20.6	60.0	50.0	37.9	29.4	N	
7	0.15090	22.3	-4.2	12.5	34.8	8.3	65.9	55.9	31.1	47.6	L1	
8	23.86208	3.2	1.6	13.5	16.7	15.1	60.0	50.0	43.3	34.9	L1	
9	24.89773	15.1	15.3	13.5	28.6	28.6	60.0	50.0	31.4	21.2	L1	
10	28.01035	7.9	6.2	13.6	21.5	19.8	60.0	50.0	38.5	30.2	L1	
11	29.04871	9.3	7.5	13.7	23.0	21.2	60.0	50.0	37.0	28.8	L1	
12	29.49759	8.3	7.0	13.7	22.0	20.7	60.0	50.0	38.0	29.3	L1	

DATA OF CONDUCTED EMISSION TEST

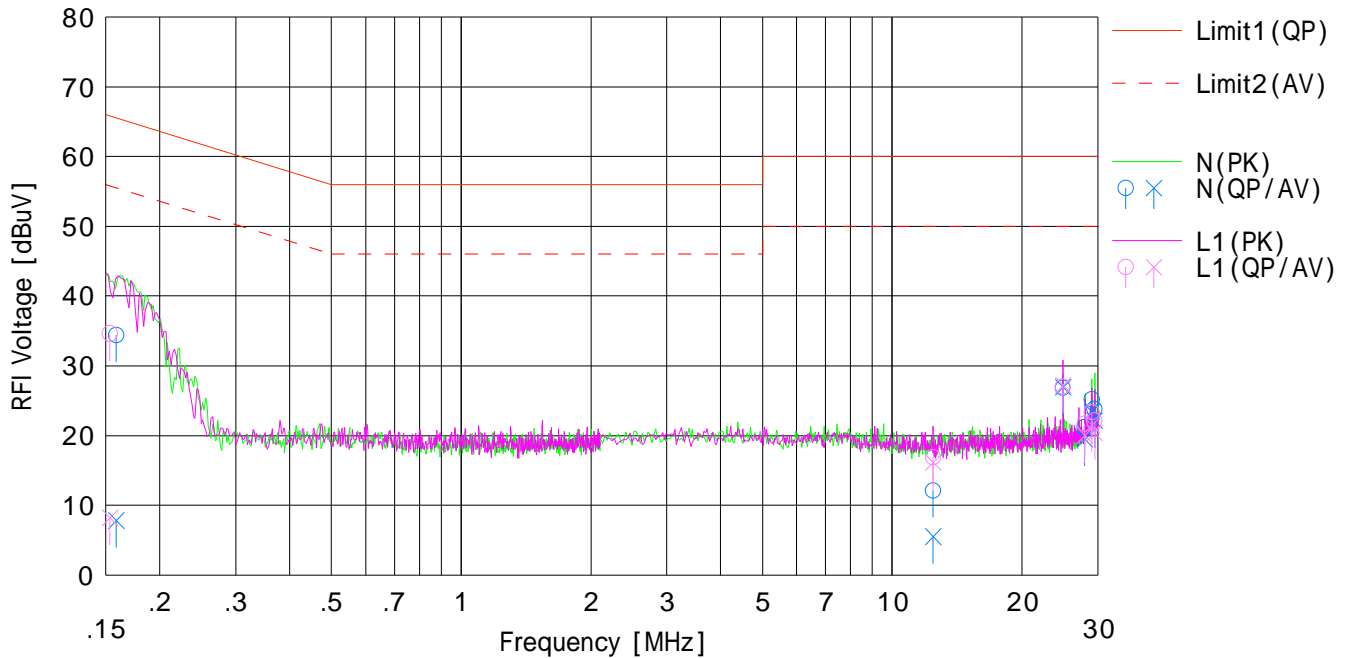
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2015/02/11

Company : Murata Manufacturing Co., Ltd.
Kind of EUT : Communication Module
Model No. : Type1DR
Serial No. : BT_28
Remarks : -

Mode : LE, Tx, 2402MHz
Order No. : 10622710S
Power : DC 3.2V / 1.8V
Temp./Humi. : 22deg.C / 25%RH

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

Engineer : Yosuke Ishikawa



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	0.15861	21.9	-4.7	12.5	34.4	7.8	65.5	55.5	31.1	47.7	N	
2	12.44866	-0.9	-7.5	13.0	12.1	5.5	60.0	50.0	47.9	44.5	N	
3	24.89830	13.3	13.4	13.5	26.8	26.9	60.0	50.0	33.2	23.1	N	
4	28.01228	7.6	5.9	13.6	21.2	19.5	60.0	50.0	38.8	30.5	N	
5	29.04695	11.5	9.7	13.7	25.2	23.4	60.0	50.0	34.8	26.6	N	
6	29.49656	10.1	8.4	13.7	23.8	22.1	60.0	50.0	36.2	27.9	N	
7	0.15330	22.1	-4.3	12.5	34.6	8.2	65.8	55.8	31.2	47.6	L1	
8	12.44808	3.9	3.1	13.0	16.9	16.1	60.0	50.0	43.1	33.9	L1	
9	24.89607	13.5	13.7	13.5	27.0	27.2	60.0	50.0	33.0	22.8	L1	
10	28.01045	8.1	6.4	13.6	21.7	20.0	60.0	50.0	38.3	30.0	L1	
11	29.04863	9.6	7.8	13.7	23.3	21.5	60.0	50.0	36.7	28.5	L1	
12	29.49568	8.4	6.7	13.7	22.1	20.4	60.0	50.0	37.9	29.6	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN + Cable + ATT) [dB]
LISN: SLS-05

DATA OF CONDUCTED EMISSION TEST

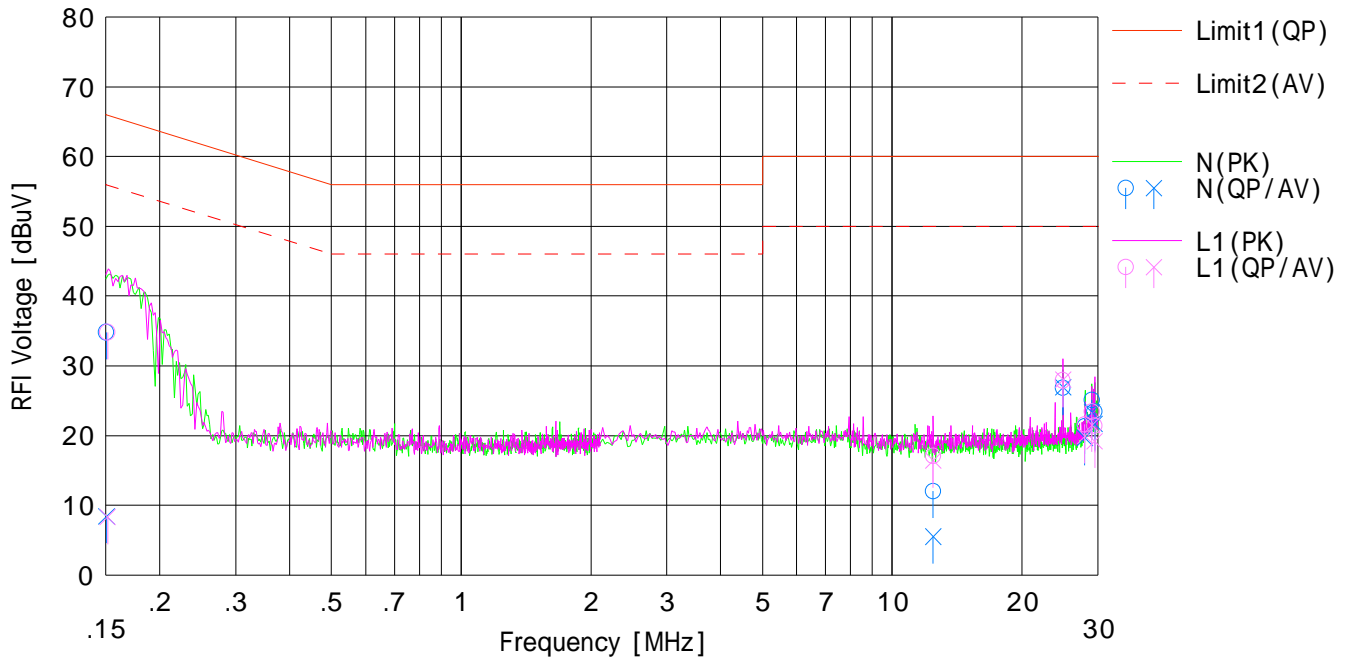
UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2015/02/11

Company : Murata Manufacturing Co., Ltd.
Kind of EUT : Communication Module
Model No. : Type1DR
Serial No. : BT_28
Remarks : -

Mode : LE, Tx, 2440MHz
Order No. : 10622710S
Power : DC 3.2V / 1.8V
Temp./Humi. : 22deg.C / 25%RH

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

Engineer : Yosuke Ishikawa



No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15045	22.3	-4.1	12.5	34.8	8.4	65.9	55.9	31.1	47.5	N	
2	12.44966	-1.0	-7.5	13.0	12.0	5.5	60.0	50.0	48.0	44.5	N	
3	24.89823	13.3	13.4	13.5	26.8	26.9	60.0	50.0	33.2	23.1	N	
4	28.00893	7.7	6.0	13.6	21.3	19.6	60.0	50.0	38.7	30.4	N	
5	29.04669	11.4	9.6	13.7	25.1	23.3	60.0	50.0	34.9	26.7	N	
6	29.49539	9.7	8.0	13.7	23.4	21.7	60.0	50.0	36.6	28.3	N	
7	0.15140	22.3	-4.2	12.5	34.8	8.3	65.9	55.9	31.1	47.6	L1	
8	12.44967	4.1	3.4	13.0	17.1	16.4	60.0	50.0	42.9	33.6	L1	
9	24.89668	14.4	14.5	13.5	27.9	28.0	60.0	50.0	32.1	22.0	L1	
10	28.01109	8.0	6.3	13.6	21.6	19.9	60.0	50.0	38.4	30.1	L1	
11	29.04778	9.7	7.8	13.7	23.4	21.5	60.0	50.0	36.6	28.5	L1	
12	29.49466	7.7	5.5	13.7	21.4	19.2	60.0	50.0	38.6	30.8	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN + Cable + ATT) [dB]
LISN: SLS-05

DATA OF CONDUCTED EMISSION TEST

UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room

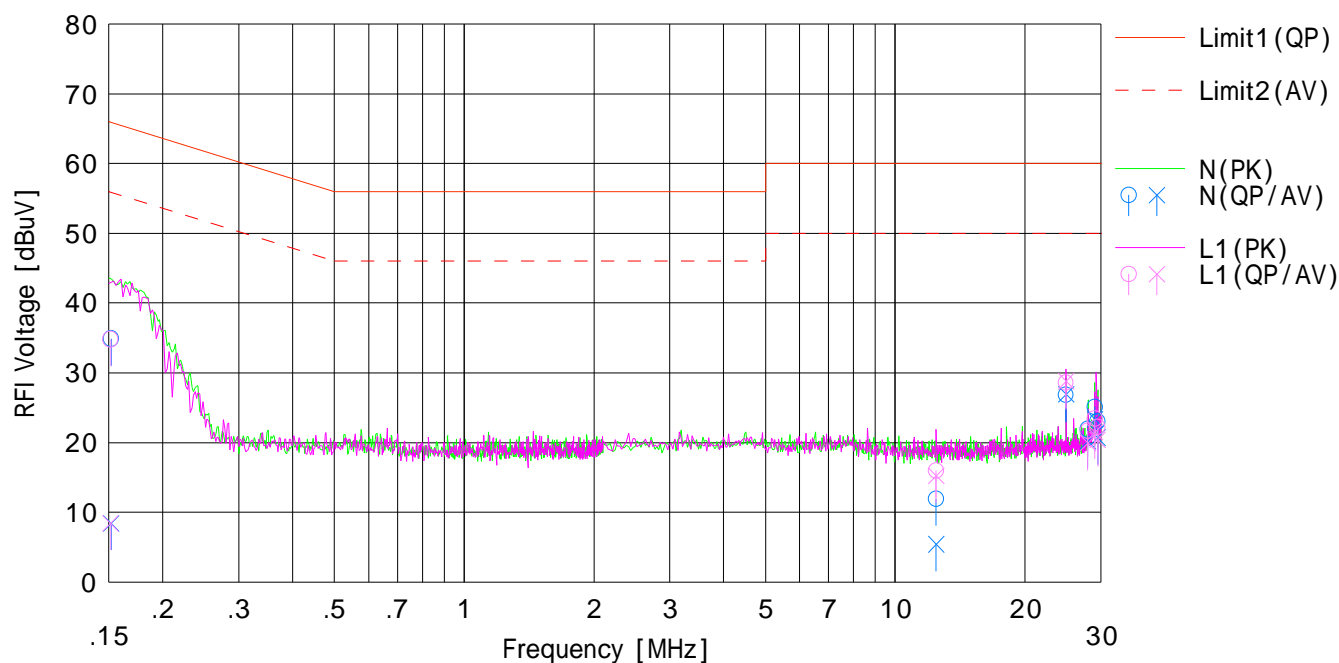
Date : 2015/02/11

Company : Murata Manufacturing Co., Ltd.
 Kind of EUT : Communication Module
 Model No. : Type1DR
 Serial No. : BT_28
 Remarks : -

Mode : LE, Tx, 2480MHz
 Order No. : 10622710S
 Power : DC 3.2V / 1.8V
 Temp./Humi. : 22deg.C / 25%RH

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

Engineer : Yosuke Ishikawa



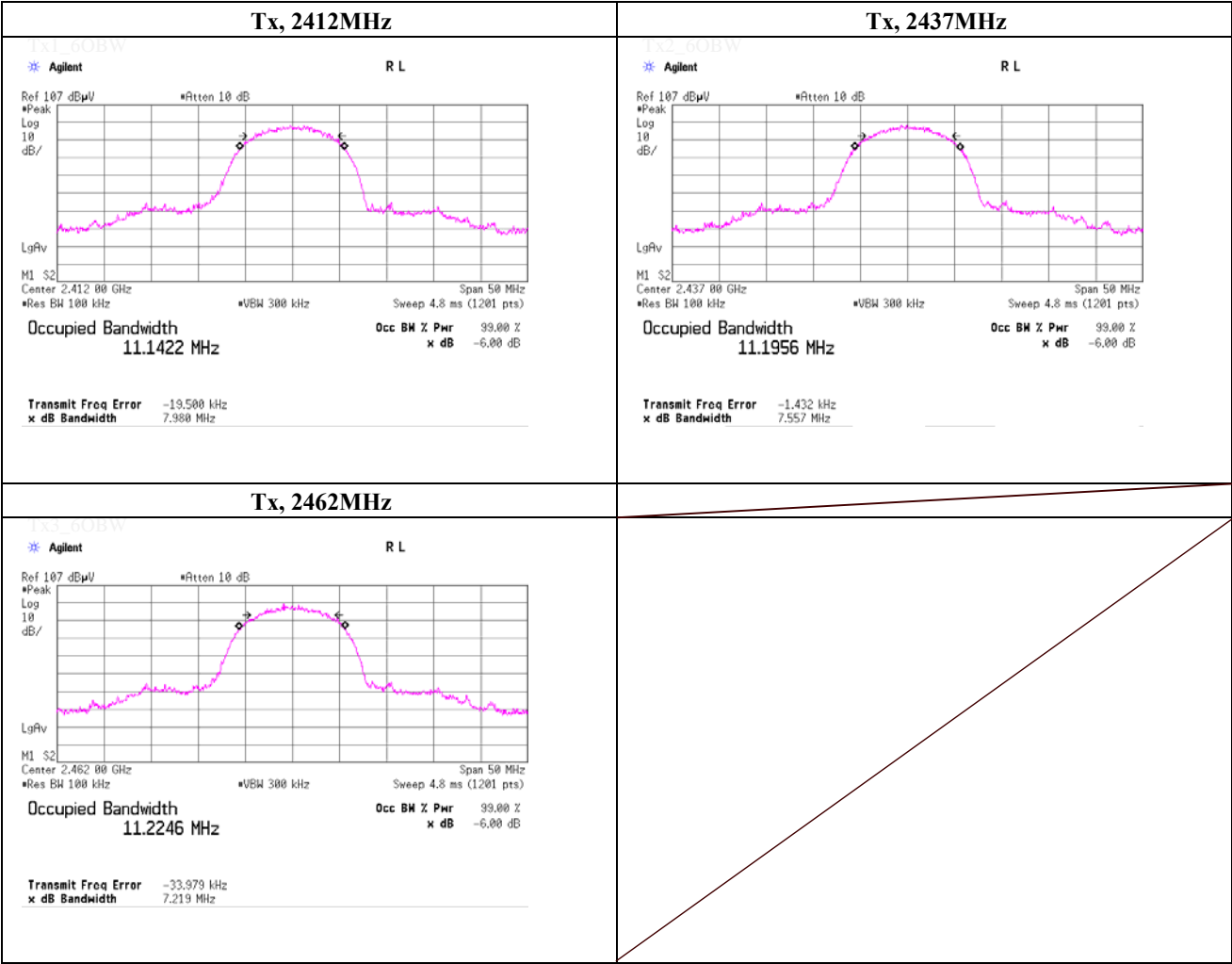
No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<AV> [dBuV]		<QP> [dBuV]	<AV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15183	22.4	-4.1	12.5	34.9	8.4	65.8	55.8	30.9	47.4	N	
2	12.44801	-1.1	-7.6	13.0	11.9	5.4	60.0	50.0	48.1	44.6	N	
3	24.89790	13.3	13.4	13.5	26.8	26.9	60.0	50.0	33.2	23.1	N	
4	28.00985	8.3	6.6	13.6	21.9	20.2	60.0	50.0	38.1	29.8	N	
5	29.04665	11.4	9.6	13.7	25.1	23.3	60.0	50.0	34.9	26.7	N	
6	29.49462	9.3	7.0	13.7	23.0	20.7	60.0	50.0	37.0	29.3	N	
7	0.15136	22.3	-4.1	12.5	34.8	8.4	65.9	55.9	31.1	47.5	L1	
8	12.44697	3.0	2.2	13.0	16.0	15.2	60.0	50.0	44.0	34.8	L1	
9	24.89778	15.1	15.3	13.5	28.6	28.6	60.0	50.0	31.4	21.2	L1	
10	28.01042	8.1	6.3	13.6	21.7	19.9	60.0	50.0	38.3	30.1	L1	
11	29.04799	9.7	7.8	13.7	23.4	21.5	60.0	50.0	36.6	28.5	L1	
12	29.49599	8.5	6.7	13.7	22.2	20.4	60.0	50.0	37.8	29.6	L1	

Calculation: Result [dBuV] = Reading [dBuV] + C.Fac (LISN + Cable + ATT) [dB]
 LISN: SLS-05

-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	January 5, 2015	
Temperature / Humidity	26deg.C , 30%RH	
Engineer	Yosuke Ishikawa	
Mode	Tx, IEEE802.11b, PN9, worst data mode 11Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	7.980	> 0.500
2437.0000	7.557	> 0.500
2462.0000	7.219	> 0.500

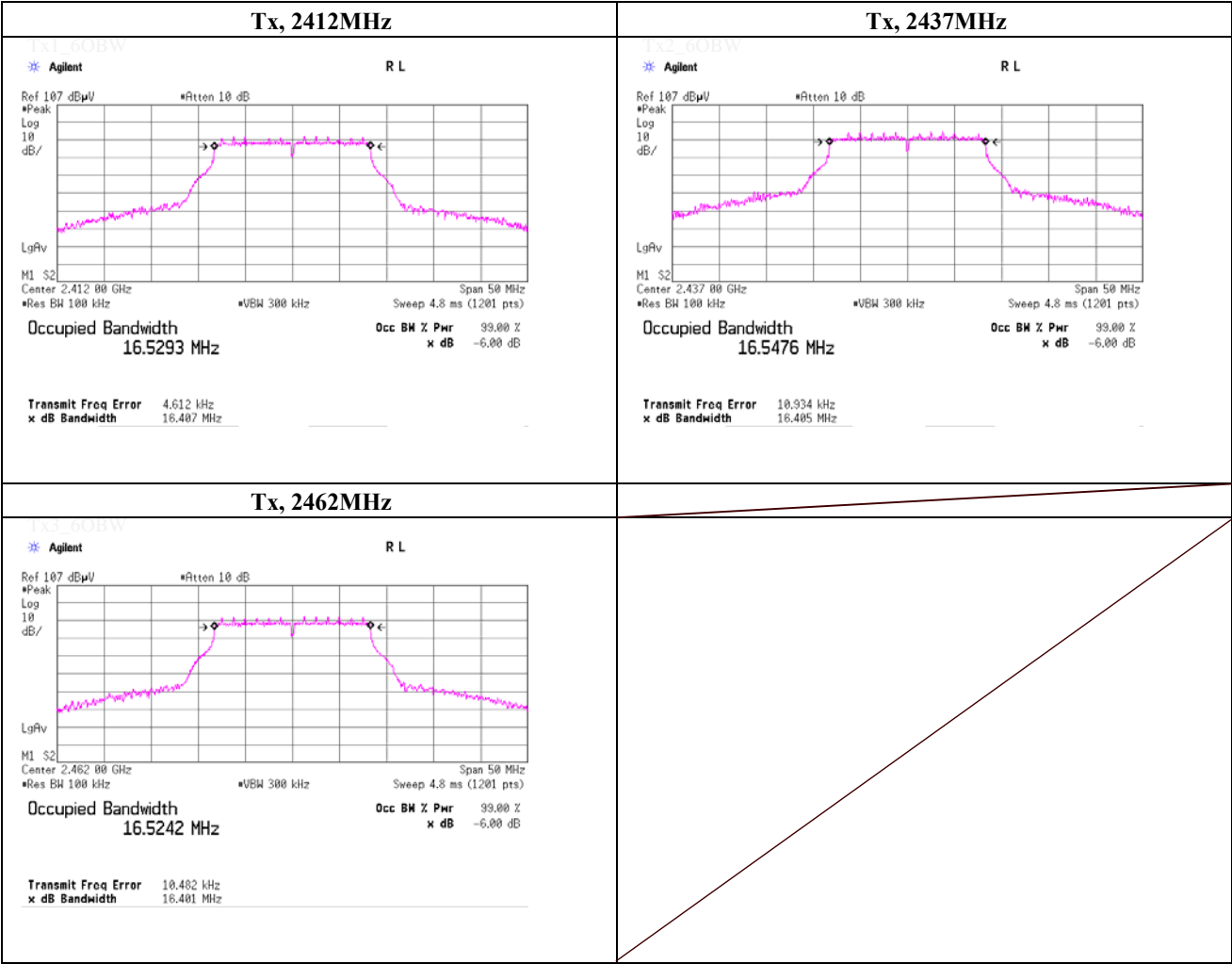


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-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	January 5, 2015	
Temperature / Humidity	26deg.C , 30%RH	
Engineer	Yosuke Ishikawa	
Mode	Tx, IEEE802.11g, PN9, worst data mode 6Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	16.407	> 0.500
2437.0000	16.405	> 0.500
2462.0000	16.401	> 0.500

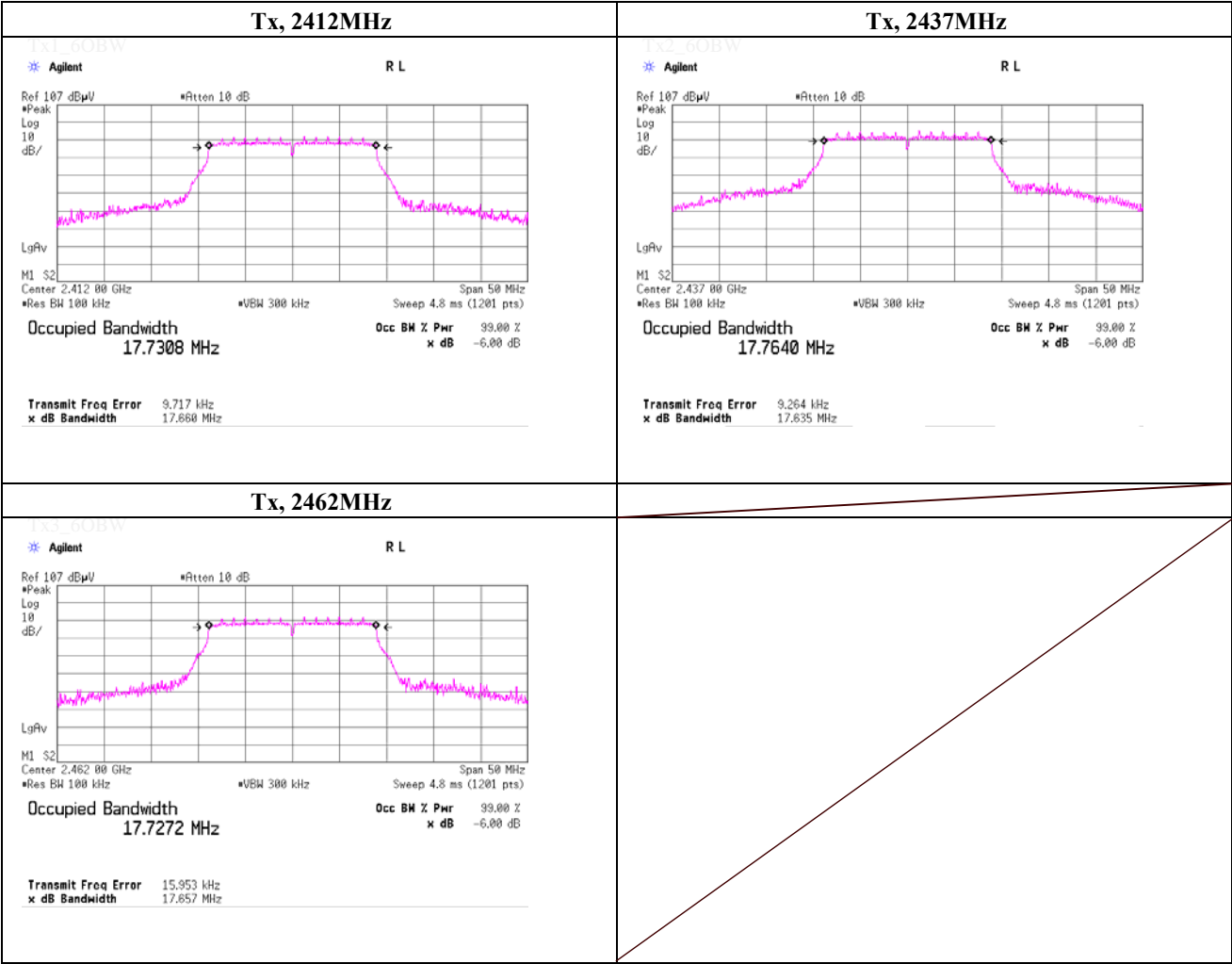


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-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	January 5, 2015	
Temperature / Humidity	26deg.C , 30%RH	
Engineer	Yosuke Ishikawa	
Mode	Tx, IEEE802.11n(HT20), PN9, worst data mode 0(MCS)	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	17.660	> 0.500
2437.0000	17.635	> 0.500
2462.0000	17.657	> 0.500

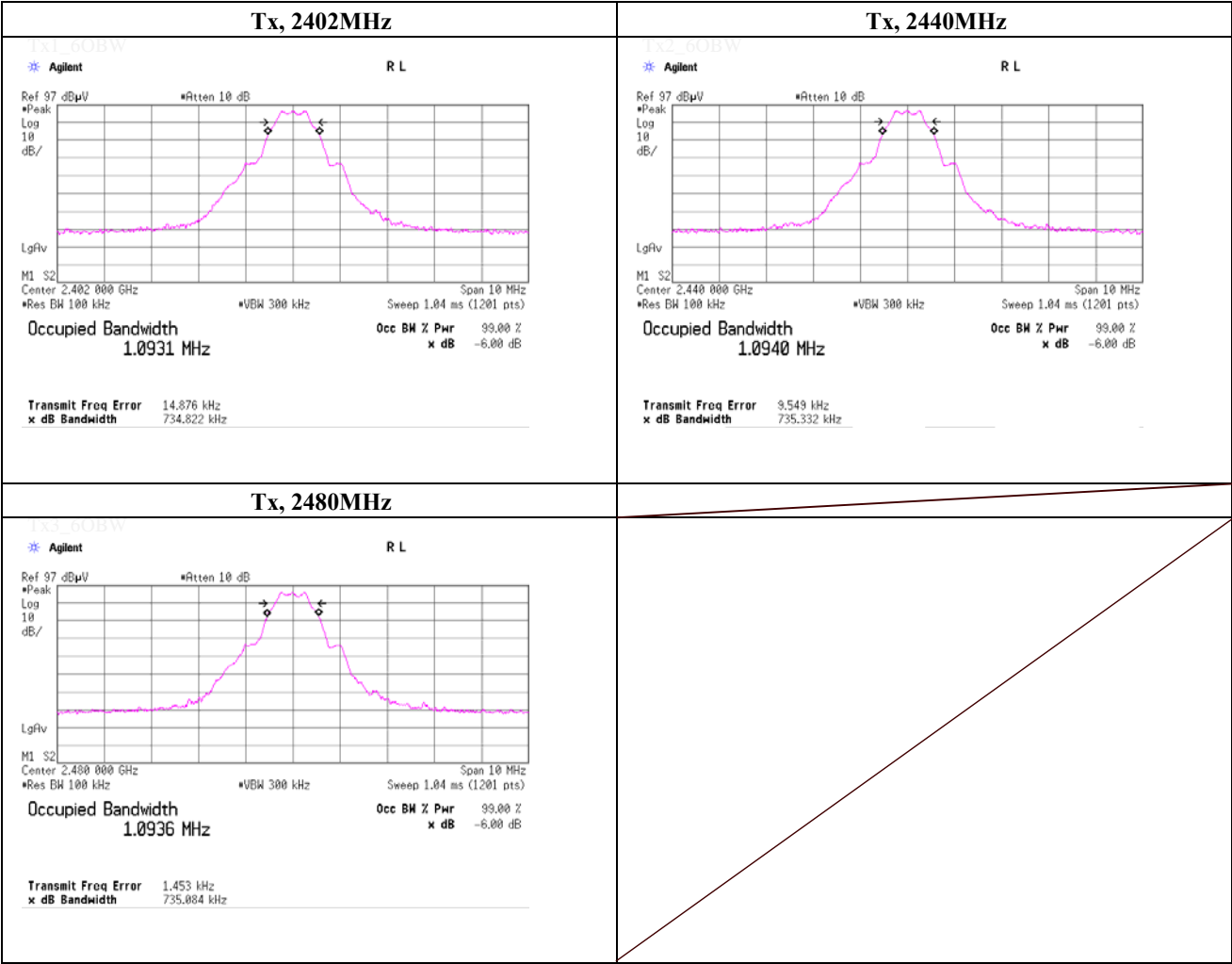


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-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 9, 2015	
Temperature / Humidity	24 deg.C , 43 %RH	
Engineer	Tatsuya Arai	
Mode	Tx, Bluetooth, Low Energy, PN9	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2402.0000	0.735	> 0.500
2440.0000	0.735	> 0.500
2480.0000	0.735	> 0.500



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Maximum Peak Conducted Output Power

(PKPM1)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room & No.5 Shielded Room
Date	December 23, 2014	January 5, 2015
Temperature / Humidity	23deg.C , 32%RH	26deg.C , 30%RH
Engineer	Tatsuya Arai	Yosuke Ishikawa
Mode	Tx, IEEE802.11b, PN9, High power setting	worst data mode : 11 Mbps

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

Ch	Freq.	P/M (Peak Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
Low	2412.0	0.38	1.10	20.24	21.72	148.59	30.00	1000	8.28
Mid	2437.0	0.36	1.10	20.24	21.70	147.91	30.00	1000	8.30
High	2462.0	0.36	1.10	20.24	21.70	147.91	30.00	1000	8.30

Sample Calculation:

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

[Pre check]

	Data rate	Freq.	P/M (Peak Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[Mbps]	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
	1	2412.0	-0.24	1.10	20.24	21.10	128.82	30.00	1000	8.90
	2	2412.0	-0.13	1.10	20.24	21.21	132.13	30.00	1000	8.79
	5.5	2412.0	0.11	1.10	20.24	21.45	139.64	30.00	1000	8.55
	11	2412.0	0.38	1.10	20.24	21.72	148.59	30.00	1000	8.28

Worst

Sample Calculation:

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

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Maximum Conducted Output Power (Reference data)
(AVGPM)

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room & No.5 Shielded Room
Date December 23, 2014 January 5, 2015
Temperature / Humidity 23deg.C , 32%RH 26deg.C , 30%RH
Engineer Tatsuya Arai Yosuke Ishikawa
Mode Tx, IEEE802.11b, PN9, High power setting worst data mode : 11 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	-3.50	1.10	20.24	0.08	17.92	61.94
Mid	2437.0	-3.56	1.10	20.24	0.08	17.86	61.09
High	2462.0	-3.23	1.10	20.24	0.08	18.19	65.92

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

[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	2412.0	-3.48	1.10	20.24	0.01	17.87	61.24
	2	2412.0	-3.50	1.10	20.24	0.02	17.86	61.09
	5.5	2412.0	-3.48	1.10	20.24	0.04	17.90	61.66
	11	2412.0	-3.50	1.10	20.24	0.08	17.92	61.94

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

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(PKPM1)

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

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

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(AVGPM)

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

Sample Calculation:

$$\text{Result} = \text{Reading} + \text{Cable Loss (including the cable(s) customer supplied)} + \text{Atten. Loss} + \text{Duty Factor}$$

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Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date December 22, 2014
 Temperature / Humidity 24deg.C , 32%RH
 Engineer Tatsuya Arai

Duty Factor Calculation chart for Maximum Conducted Output Power



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Maximum Peak Conducted Output Power

(PKPM1)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	January 5, 2015	January 21, 2015
Temperature / Humidity	26deg.C , 30%RH	23deg.C , 41%RH
Engineer	Yosuke Ishikawa	Shinichi Takano
Mode	Tx, IEEE802.11g, PN9, High power setting	
	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
					[dBm]	[mW]	[dBm]	[mW]	[dB]
Low	2412.0	3.26	1.10	20.24	24.60	288.40	30.00	1000	5.40
Mid	2437.0	4.05	1.10	20.24	25.39	345.94	30.00	1000	4.61
High	2462.0	3.11	1.10	20.24	24.45	278.61	30.00	1000	5.55

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
						[dBm]	[mW]	[dBm]	[mW]	[dB]
	6	2412.0	3.26	1.10	20.24	24.60	288.40	30.00	1000	5.40
	9	2412.0	3.17	1.10	20.24	24.51	282.49	30.00	1000	5.49
	12	2412.0	3.23	1.10	20.24	24.57	286.42	30.00	1000	5.43
	18	2412.0	3.18	1.10	20.24	24.52	283.14	30.00	1000	5.48
	24	2412.0	3.19	1.10	20.24	24.53	283.79	30.00	1000	5.47
	36	2412.0	2.97	1.10	20.24	24.31	269.77	30.00	1000	5.69
	48	2412.0	3.21	1.10	20.24	24.55	285.10	30.00	1000	5.45
	54	2412.0	2.42	1.10	20.24	23.76	237.68	30.00	1000	6.24

Worst

Sample Calculation:

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

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Maximum Conducted Output Power (Reference data)

(AVGPM)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	January 5, 2015	January 21, 2015
Temperature / Humidity	26deg.C , 30%RH	23deg.C , 41%RH
Engineer	Yosuke Ishikawa	Shinichi Takano
Mode	Tx, IEEE802.11g, PN9, High power setting	worst data mode : 6 Mbps

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

Ch	Freq.	P/M (AV) Reading	Cable Loss	Atten. Loss	Duty Factor	Result	
	[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBm]	[mW]
Low	2412.0	-6.71	1.10	20.24	0.07	14.70	29.51
Mid	2437.0	-3.83	1.10	20.24	0.07	17.58	57.28
High	2462.0	-6.75	1.10	20.24	0.07	14.66	29.24

Sample Calculation:

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

[Pre check]

	Data rate	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result	
	[Mbps]						[dBm]	[mW]
	6	2412.0	-6.71	1.10	20.24	0.07	14.70	29.51
	9	2412.0	-6.84	1.10	20.24	0.10	14.60	28.84
	12	2412.0	-7.01	1.10	20.24	0.13	14.46	27.93
	18	2412.0	-6.87	1.10	20.24	0.19	14.66	29.24
	24	2412.0	-6.98	1.10	20.24	0.25	14.61	28.91
	36	2412.0	-7.21	1.10	20.24	0.36	14.49	28.12
	48	2412.0	-7.25	1.10	20.24	0.47	14.56	28.58
	54	2412.0	-7.23	1.10	20.24	0.51	14.62	28.97

Sample Calculation:

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

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(PKPM1)

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

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

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Maximum Conducted Output Power (Reference data)
(AVGPM)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date January 15, 2015
Temperature / Humidity 21deg.C , 55%RH
Engineer Yosuke Ishikawa
Mode Tx, IEEE802.11g, PN9, Low power setting worst data mode : 6 Mbps

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

Ch	Freq.	P/M (AV) Reading	Cable Loss	Atten. Loss	Duty Factor	Result	
	[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBm]	[mW]
Low	2412.0	-13.45	1.10	20.24	0.07	7.96	6.25
Mid	2437.0	-13.63	1.10	20.24	0.07	7.78	6.00
High	2462.0	-13.61	1.10	20.24	0.07	7.80	6.03

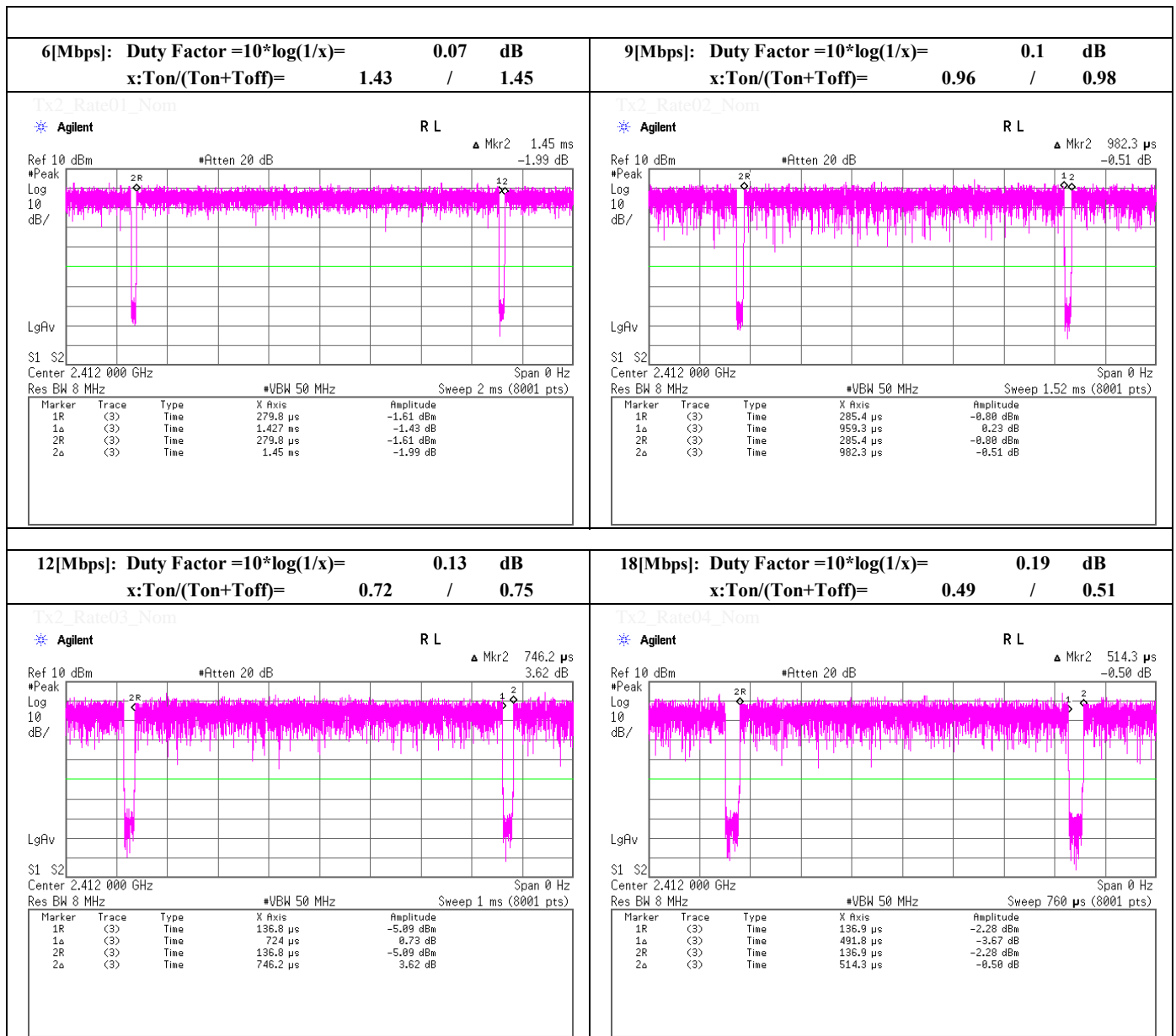
Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

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Shonan EMC Lab.

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Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date December 22, 2014
 Temperature / Humidity 24deg.C , 32%RH
 Engineer Tatsuya Arai

Duty Factor Calculation chart for Maximum Conducted Output Power



UL Japan, Inc.

Shonan EMC Lab.

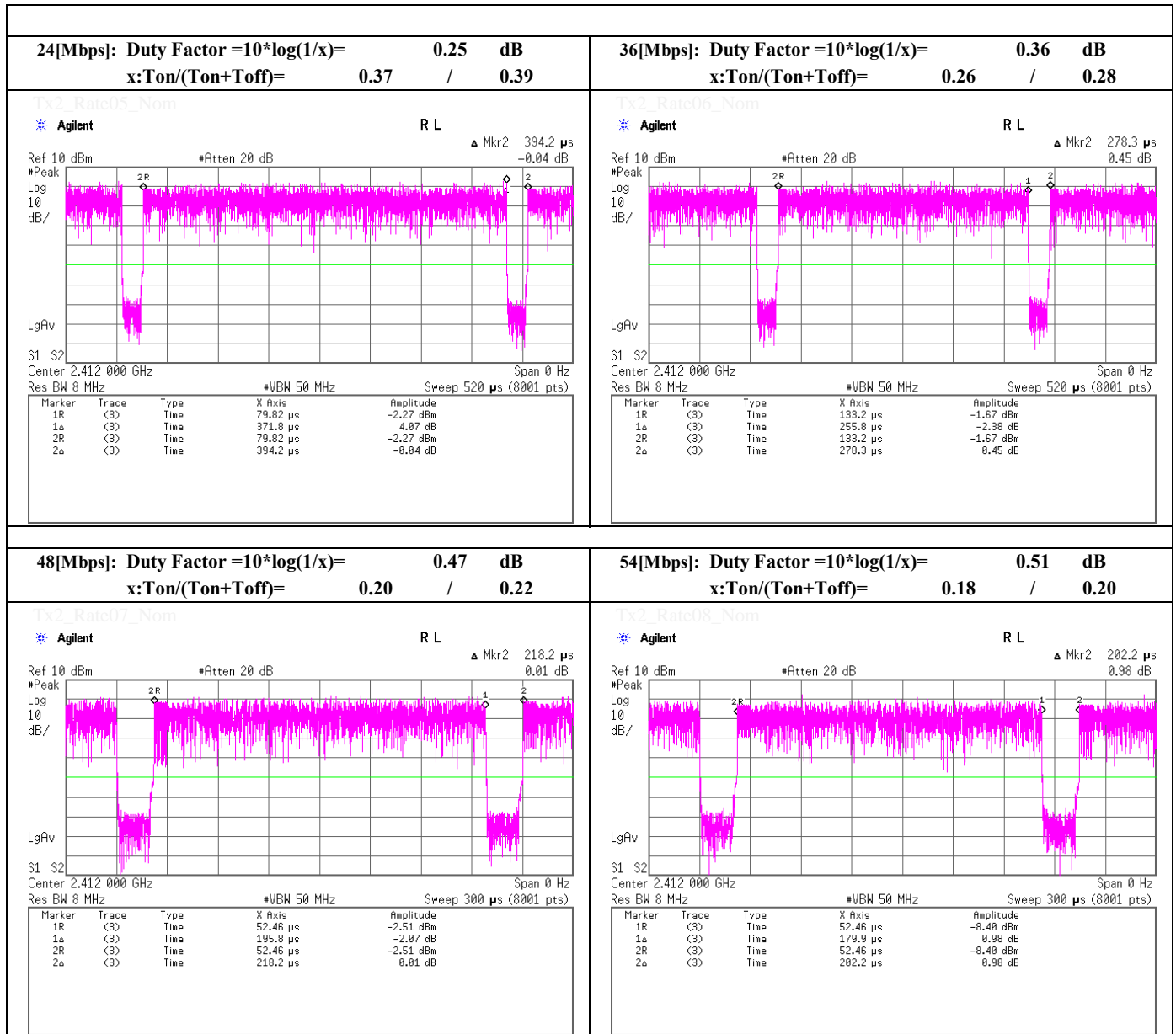
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Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date December 22, 2014
 Temperature / Humidity 24deg.C , 32%RH
 Engineer Tatsuya Arai

Duty Factor Calculation chart for Maximum Conducted Output Power



UL Japan, Inc.

Shonan EMC Lab.

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Maximum Peak Conducted Output Power

(PKPM1)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date January 5, 2015
 Temperature / Humidity 26deg.C , 30%RH
 Engineer Yosuke Ishikawa
 Mode Tx, IEEE802.11n(HT20), PN9, High power setting 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
					[dBm]	[mW]	[dBm]	[mW]	[dB]
Low	2412.0	3.60	1.10	20.24	24.94	311.89	30.00	1000	5.06
Mid	2437.0	4.20	1.10	20.24	25.54	358.10	30.00	1000	4.46
High	2462.0	3.61	1.10	20.24	24.95	312.61	30.00	1000	5.05

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
						[dBm]	[mW]	[dBm]	[mW]	[dB]
	0	2412.0	3.60	1.10	20.24	24.94	311.89	30.00	1000	5.06
	1	2412.0	3.34	1.10	20.24	24.68	293.76	30.00	1000	5.32
	2	2412.0	3.39	1.10	20.24	24.73	297.17	30.00	1000	5.27
	3	2412.0	3.49	1.10	20.24	24.83	304.09	30.00	1000	5.17
	4	2412.0	3.49	1.10	20.24	24.83	304.09	30.00	1000	5.17
	5	2412.0	3.44	1.10	20.24	24.78	300.61	30.00	1000	5.22
	6	2412.0	3.53	1.10	20.24	24.87	306.90	30.00	1000	5.13
	7	2412.0	3.41	1.10	20.24	24.75	298.54	30.00	1000	5.25

Worst

Sample Calculation:

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

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Maximum Conducted Output Power (Reference data)

(AVGPM)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date January 5, 2015
 Temperature / Humidity 26deg.C , 30%RH
 Engineer Yosuke Ishikawa
 Mode Tx, IEEE802.11n(HT20), PN9, High power setting worst data mode : 0 (MCS)

(* 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	-7.05	1.10	20.24	0.07	14.36	27.29
Mid	2437.0	-4.02	1.10	20.24	0.07	17.39	54.83
High	2462.0	-6.95	1.10	20.24	0.07	14.46	27.93

Sample Calculation:

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

[Pre check]

	Mode (MCS)	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result	
							[dBm]	[mW]
	0	2412.0	-7.05	1.10	20.24	0.07	14.36	27.29
	1	2412.0	-7.13	1.10	20.24	0.14	14.35	27.23
	2	2412.0	-7.26	1.10	20.24	0.20	14.28	26.79
	3	2412.0	-7.27	1.10	20.24	0.26	14.33	27.10
	4	2412.0	-7.37	1.10	20.24	0.36	14.33	27.10
	5	2412.0	-7.51	1.10	20.24	0.46	14.29	26.85
	6	2412.0	-7.50	1.10	20.24	0.50	14.34	27.16
	7	2412.0	-7.75	1.10	20.24	0.54	14.13	25.88

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.5 Shielded Room
Date January 15, 2015
Temperature / Humidity 21deg.C , 55%RH
Engineer Yosuke Ishikawa
Mode Tx, IEEE802.11n(HT20), PN9, Low power setting 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
					[dBm]	[mW]	[dBm]	[mW]	[dB]
Low	2412.0	-3.31	1.10	20.24	18.03	63.53	30.00	1000	11.97
Mid	2437.0	-3.15	1.10	20.24	18.19	65.92	30.00	1000	11.81
High	2462.0	-3.35	1.10	20.24	17.99	62.95	30.00	1000	12.01

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

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Maximum Conducted Output Power (Reference data)
(AVGPM)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date January 15, 2015
Temperature / Humidity 21deg.C , 55%RH
Engineer Yosuke Ishikawa
Mode Tx, IEEE802.11n(HT20), PN9, Low power setting worst data mode : 0 (MCS)

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

Ch	Freq.	P/M (AV) Reading	Cable Loss	Atten. Loss	Duty Factor	Result	
	[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBm]	[mW]
Low	2412.0	-13.59	1.10	20.24	0.07	7.82	6.05
Mid	2437.0	-13.62	1.10	20.24	0.07	7.79	6.01
High	2462.0	-13.63	1.10	20.24	0.07	7.78	6.00

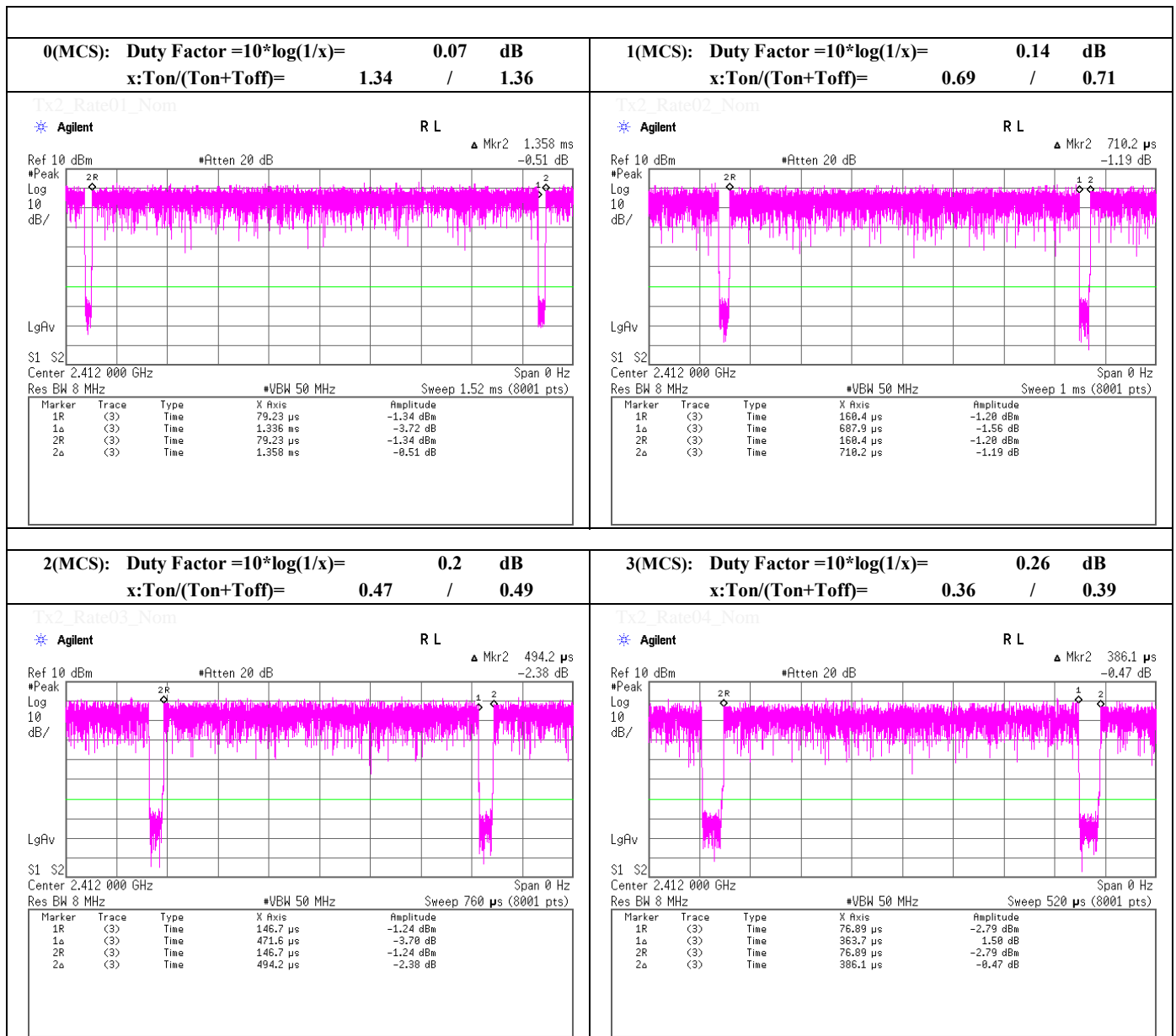
Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty Factor

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Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date December 22, 2014
 Temperature / Humidity 24deg.C , 32%RH
 Engineer Tatsuya Arai

Duty Factor Calculation chart for Maximum Conducted Output Power



UL Japan, Inc.

Shonan EMC Lab.

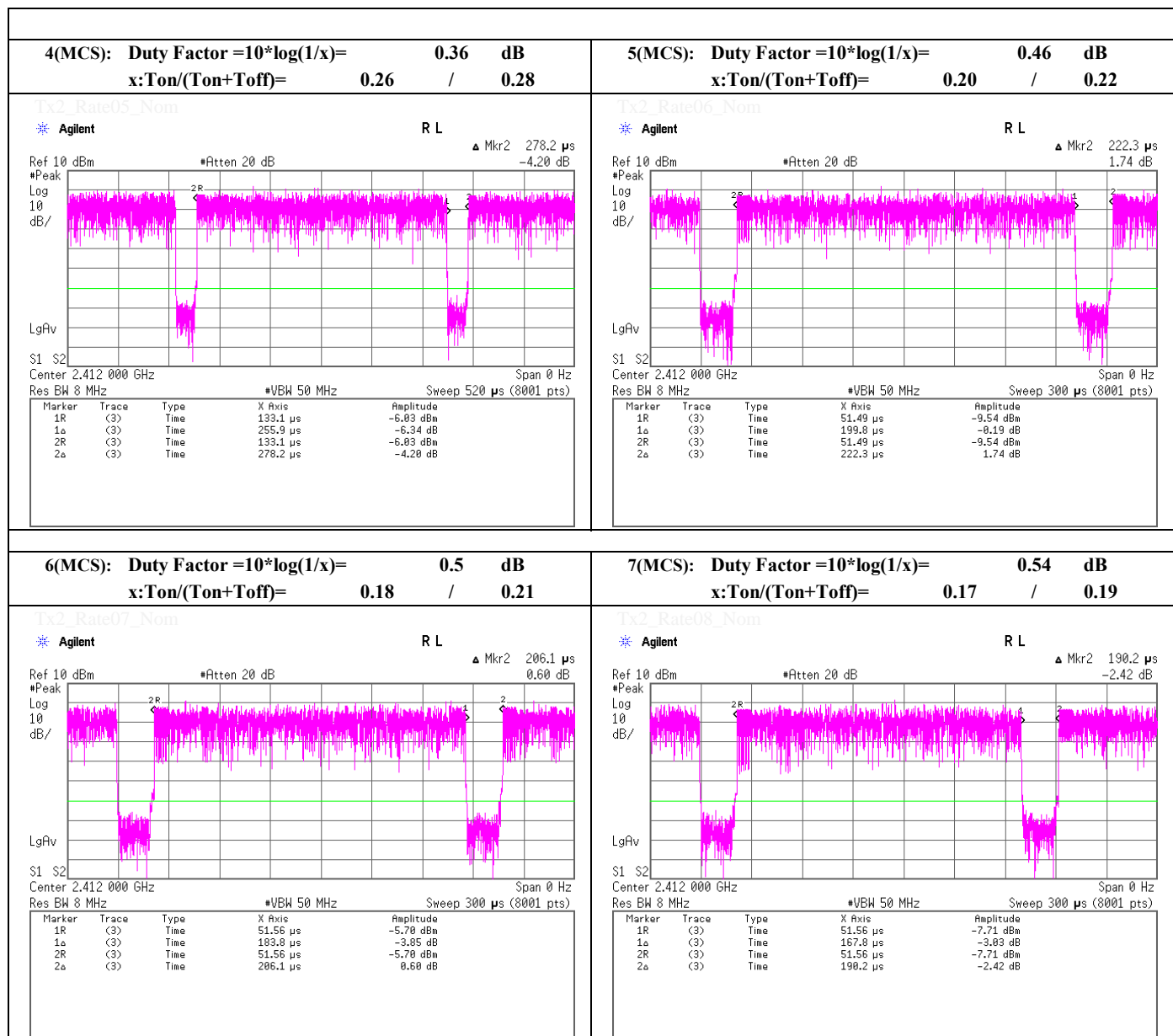
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Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date December 22, 2014
 Temperature / Humidity 24deg.C , 32%RH
 Engineer Tatsuya Arai

Duty Factor Calculation chart for Maximum Conducted Output Power



UL Japan, Inc.

Shonan EMC Lab.

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

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Maximum Peak Conducted Output Power
(PKPM1)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date February 4, 2015
Temperature / Humidity 25deg.C , 48%RH
Engineer Shinichi Takano
Mode Tx, Bluetooth, Low Energy, PN9,

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

Ch	Freq.	P/M (Peak Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
Low	2402.0	-12.54	1.09	20.24	8.79	7.57	30.00	1000	21.21
Mid	2440.0	-12.41	1.10	20.24	8.93	7.82	30.00	1000	21.07
High	2480.0	-13.03	1.11	20.24	8.32	6.79	30.00	1000	21.68

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

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Maximum Conducted Output Power
(AVGPM)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date February 4, 2015
Temperature / Humidity 25deg.C , 48%RH
Engineer Shinichi Takano
Mode Tx, Bluetooth, Low Energy, PN9,

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

Ch	Freq.	P/M (AV) Reading	Cable Loss	Atten. Loss	Duty Factor	Result	
	[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBm]	[mW]
Low	2402.0	-15.27	1.09	20.24	2.06	8.12	6.49
Mid	2440.0	-15.10	1.10	20.24	2.06	8.30	6.76
High	2480.0	-15.78	1.11	20.24	2.06	7.63	5.79

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

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Test place

UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room

Date

February 4, 2015

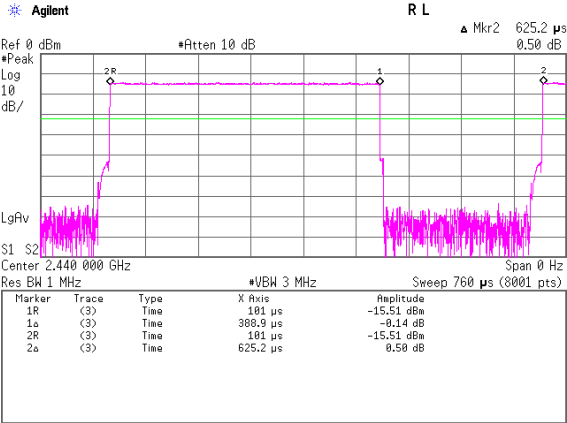
Temperature / Humidity

25deg.C , 48%RH

Engineer

Shinichi Takano

Duty Factor Caliculation chart for Maximum Conducted Output Power

<div>Duty Factor =10*log(1/x)=2.06 dB</div> <div>x: Ton/(Ton+Toff)=0.39 / 0.63</div>	
<div>Tx2_Rate01_Nom</div> <div></div>	<div>Tx2_Rate02_Nom</div>
<div>Tx2_Rate03_Nom</div>	<div>Tx2_Rate04_Nom</div>

UL Japan, Inc.

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date December 25, 2014 January 14, 2015 January 15, 2015
 Temperature / Humidity 23 deg.C, 33 %RH 22 deg.C, 34 %RH 22 deg.C, 34 %RH
 Engineer Makoto Hosaka Tatsuya Arai Tatsuya Arai
 Mode Tx, 2412 MHz
 Tx, IEEE802.11b, Monopole Antenna

(* 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	50.7	26.4	23.8	41.1	59.8	73.9	14.1	100	137	
Hori.	4824.000	PK	50.9	30.7	5.5	39.8	47.3	73.9	26.6	100	273	
Hori.	7236.000	PK	49.0	36.7	6.9	40.2	52.4	73.9	21.5	100	73	
Hori.	12060.000	PK	47.3	39.5	8.9	39.6	56.1	73.9	17.8	100	36	
Hori.	2390.000	AV	41.5	26.4	23.8	41.1	50.6	53.9	3.3	100	137	
Hori.	4824.000	AV	42.5	30.7	5.5	39.8	38.9	53.9	15.0	100	273	
Hori.	7236.000	AV	37.3	36.7	6.9	40.2	40.7	53.9	13.2	100	73	
Hori.	12060.000	AV	37.2	39.5	8.9	39.6	46.0	53.9	7.9	100	36	
Vert.	2390.000	PK	47.7	26.4	23.8	41.1	56.8	73.9	17.1	100	177	
Vert.	4824.000	PK	50.3	30.7	5.5	39.8	46.7	73.9	27.2	100	306	
Vert.	7236.000	PK	48.4	36.7	6.9	40.2	51.8	73.9	22.1	100	0	
Vert.	12060.000	PK	46.7	39.5	8.9	39.6	55.5	73.9	18.4	100	0	
Vert.	2390.000	AV	38.0	26.4	23.8	41.1	47.1	53.9	6.8	100	177	
Vert.	4824.000	AV	42.0	30.7	5.5	39.8	38.4	53.9	15.5	100	306	
Vert.	7236.000	AV	36.5	36.7	6.9	40.2	39.9	53.9	14.0	100	0	
Vert.	12060.000	AV	35.0	39.5	8.9	39.6	43.8	53.9	10.1	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	96.8	26.4	23.8	41.1	105.9	-	-	Carrier
Hori.	2396.459	PK	54.3	26.4	23.8	41.1	63.4	85.9	22.5	
Hori.	2400.000	PK	51.4	26.4	23.8	41.1	60.5	85.9	25.4	
Hori.	9648.000	PK	50.8	38.5	8.0	40.1	57.2	85.9	28.7	
Vert.	2412.000	PK	90.6	26.4	23.8	41.1	99.7	-	-	Carrier
Vert.	2396.459	PK	48.3	26.4	23.8	41.1	57.4	79.7	22.3	
Vert.	2400.000	PK	44.3	26.4	23.8	41.1	53.4	79.7	26.3	
Vert.	9648.000	PK	50.1	38.5	8.0	40.1	56.5	79.7	23.2	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date January 14, 2015 January 15, 2015
 Temperature / Humidity 22 deg.C, 34 %RH 22 deg.C, 34 %RH
 Engineer Tatsuya Arai Tatsuya Arai
 Mode Tx, 2437 MHz
 Tx, IEEE802.11b, Monopole Antenna

(* 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	51.3	30.9	5.5	39.7	48.0	73.9	25.9	100	294	
Hori.	7311.000	PK	48.6	36.8	6.8	40.3	51.9	73.9	22.0	100	19	
Hori.	12185.000	PK	45.4	39.4	9.0	39.8	54.0	73.9	19.9	100	0	
Hori.	4874.000	AV	42.5	30.9	5.5	39.7	39.2	53.9	14.7	100	294	
Hori.	7311.000	AV	39.6	36.8	6.8	40.3	42.9	53.9	11.0	100	19	
Hori.	12185.000	AV	35.0	39.4	9.0	39.8	43.6	53.9	10.3	100	0	
Vert.	4874.000	PK	50.6	30.9	5.5	39.7	47.3	73.9	26.6	114	281	
Vert.	7311.000	PK	47.7	36.8	6.8	40.3	51.0	73.9	22.9	100	0	
Vert.	12185.000	PK	46.1	39.4	9.0	39.8	54.7	73.9	19.2	100	0	
Vert.	4874.000	AV	42.0	30.9	5.5	39.7	38.7	53.9	15.2	114	281	
Vert.	7311.000	AV	38.0	36.8	6.8	40.3	41.3	53.9	12.6	100	0	
Vert.	12185.000	AV	35.0	39.4	9.0	39.8	43.6	53.9	10.3	100	0	

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

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.	2437.000	PK	95.5	26.5	23.8	41.1	104.7	-	-	Carrier
Hori.	9748.000	PK	51.7	38.6	8.0	40.0	58.3	84.7	26.4	
Vert.	2437.000	PK	88.9	26.5	23.8	41.1	98.1	-	-	Carrier
Vert.	9748.000	PK	50.9	38.6	8.0	40.0	57.5	78.1	20.6	

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date December 25, 2014 January 14, 2015 January 15, 2015
Temperature / Humidity 23 deg.C, 33 %RH 22 deg.C, 34 %RH 22 deg.C, 34 %RH
Engineer Makoto Hosaka Tatsuya Arai Tatsuya Arai
Mode Tx, 2462 MHz
 Tx, IEEE802.11b, Monopole Antenna

(* 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	50.2	26.6	23.8	41.1	59.5	73.9	14.4	100	136	
Hori.	4924.000	PK	51.2	31.1	5.5	39.6	48.2	73.9	25.7	100	289	
Hori.	7386.000	PK	45.5	36.9	6.8	40.4	48.8	73.9	25.1	100	0	
Hori.	12310.000	PK	44.7	39.3	9.0	39.9	53.1	73.9	20.8	100	0	
Hori.	2483.500	AV	41.4	26.6	23.8	41.1	50.7	53.9	3.2	100	136	
Hori.	4924.000	AV	41.2	31.1	5.5	39.6	38.2	53.9	15.7	100	289	
Hori.	7386.000	AV	35.2	36.9	6.8	40.4	38.5	53.9	15.4	100	0	
Hori.	12310.000	AV	35.4	39.3	9.0	39.9	43.8	53.9	10.1	100	0	
Vert.	2483.500	PK	47.8	26.6	23.8	41.1	57.1	73.9	16.8	100	175	
Vert.	4924.000	PK	50.0	31.1	5.5	39.6	47.0	73.9	26.9	100	272	
Vert.	7386.000	PK	42.5	36.9	6.8	40.4	45.8	73.9	28.1	100	0	
Vert.	12310.000	PK	44.4	39.3	9.0	39.9	52.8	73.9	21.1	100	0	
Vert.	2483.500	AV	38.7	26.6	23.8	41.1	48.0	53.9	5.9	100	175	
Vert.	4924.000	AV	41.2	31.1	5.5	39.6	38.2	53.9	15.7	100	272	
Vert.	7386.000	AV	37.9	36.9	6.8	40.4	41.2	53.9	12.7	100	0	
Vert.	12310.000	AV	35.2	39.3	9.0	39.9	43.6	53.9	10.3	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.	2462.000	PK	97.3	26.5	23.8	41.1	106.5	-	-	Carrier
Hori.	9848.000	PK	51.1	38.6	8.0	39.9	57.8	86.5	28.7	
Vert.	2462.000	PK	90.8	26.5	23.8	41.1	100.0	-	-	Carrier
Vert.	9848.000	PK	51.2	38.6	8.0	39.9	57.9	80.0	22.1	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date December 25, 2014
 Temperature / Humidity 23 deg.C, 33 %RH
 Engineer Makoto Hosaka
 Mode Tx, 2412 MHz
 Tx, IEEE802.11g, Monopole Antenna

(* 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.	2261.119	PK	49.5	26.2	13.5	41.2	48.0	73.9	25.9	100	221	
Hori.	2390.000	PK	69.1	26.4	13.6	41.1	68.0	73.9	5.9	100	133	
Hori.	2713.531	PK	49.3	27.0	13.8	40.9	49.2	73.9	24.7	100	143	
Hori.	2261.119	AV	41.5	26.2	13.5	41.2	40.0	53.9	13.9	100	221	
Hori.	2390.000	AV	52.4	26.4	13.6	41.1	51.3	53.9	2.6	100	133	
Hori.	2713.531	AV	42.5	27.0	13.8	40.9	42.4	53.9	11.5	100	143	
Vert.	2261.119	PK	47.4	26.2	13.5	41.2	45.9	73.9	28.0	100	40	
Vert.	2390.000	PK	62.1	26.4	13.6	41.1	61.0	73.9	12.9	100	18	
Vert.	2713.531	PK	48.9	27.0	13.8	40.9	48.8	73.9	25.1	100	38	
Vert.	2261.119	AV	38.2	26.2	13.5	41.2	36.7	53.9	17.2	100	40	
Vert.	2390.000	AV	45.2	26.4	13.6	41.1	44.1	53.9	9.8	100	18	
Vert.	2713.531	AV	40.2	27.0	13.8	40.9	40.1	53.9	13.8	100	38	

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$ **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	99.1	26.4	13.6	41.1	98.0	-	-	Carrier
Hori.	2400.000	PK	63.9	26.4	13.6	41.1	62.8	78.0	15.2	
Vert.	2412.000	PK	93.4	26.4	13.6	41.1	92.3	-	-	Carrier
Vert.	2400.000	PK	57.9	26.4	13.6	41.1	56.8	72.3	15.5	

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$ **UL Japan, Inc.****Shonan EMC Lab.**

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date January 7, 2015
 Temperature / Humidity 23 deg.C, 33 %RH
 Engineer Tatsuya Arai
 Mode Tx, 2417 MHz
 Tx, IEEE802.11g, Monopole Antenna

(* 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	70.2	26.4	13.6	41.1	69.1	73.9	4.8	100	134	
Hori.	2390.000	AV	53.4	26.4	13.6	41.1	52.3	53.9	1.6	100	134	
Vert.	2390.000	PK	64.5	26.4	13.6	41.1	63.4	73.9	10.5	120	148	
Vert.	2390.000	AV	48.1	26.4	13.6	41.1	47.0	53.9	6.9	120	148	

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.	2417.000	PK	102.7	26.4	13.6	41.1	101.6	-	-	Carrier
Hori.	2400.000	PK	66.8	26.4	13.6	41.1	65.7	81.6	15.9	
Vert.	2417.000	PK	97.4	26.4	13.6	41.1	96.3	-	-	Carrier
Vert.	2400.000	PK	60.3	26.4	13.6	41.1	59.2	76.3	17.1	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date January 7, 2015
Temperature / Humidity 23 deg.C, 33 %RH
Engineer Tatsuya Arai
Mode Tx, 2457 MHz
 Tx, IEEE802.11g, Monopole Antenna

(* 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	68.3	26.6	13.6	41.1	67.4	73.9	6.5	100	137	
Hori.	2483.500	AV	52.7	26.6	13.6	41.1	51.8	53.9	2.1	100	137	
Vert.	2483.500	PK	65.0	26.6	13.6	41.1	64.1	73.9	9.8	107	153	
Vert.	2483.500	AV	49.3	26.6	13.6	41.1	48.4	53.9	5.5	107	153	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date December 25, 2014
 Temperature / Humidity 23 deg.C, 33 %RH
 Engineer Makoto Hosaka
 Mode Tx, 2462 MHz
 Tx, IEEE802.11g, Monopole Antenna

(* 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.	2308.162	PK	48.9	26.2	13.5	41.2	47.4	73.9	26.5	100	224	
Hori.	2483.500	PK	68.6	26.6	13.6	41.1	67.7	73.9	6.2	100	140	
Hori.	2769.638	PK	49.5	27.1	13.8	40.9	49.5	73.9	24.4	100	143	
Hori.	2308.162	AV	41.0	26.2	13.5	41.2	39.5	53.9	14.4	100	224	
Hori.	2483.500	AV	50.1	26.6	13.6	41.1	49.2	53.9	4.7	100	140	
Hori.	2769.638	AV	42.6	27.1	13.8	40.9	42.6	53.9	11.3	100	143	
Vert.	2483.500	PK	65.6	26.6	13.6	41.1	64.7	73.9	9.2	113	151	
Vert.	2769.638	PK	48.6	27.1	13.8	40.9	48.6	73.9	25.3	100	0	
Vert.	2483.500	AV	46.0	26.6	13.6	41.1	45.1	53.9	8.8	113	151	
Vert.	2769.638	AV	40.2	27.1	13.8	40.9	40.2	53.9	13.7	100	0	

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

UL Japan, Inc.

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date December 24, 2014 January 14, 2015 January 15, 2015
 Temperature / Humidity 24 deg.C, 56 %RH 22 deg.C, 34 %RH 22 deg.C, 34 %RH
 Engineer Tatsuya Arai Tatsuya Arai Tatsuya Arai
 Mode Tx, 2412 MHz
 Tx, IEEE802.11n (HT20), Monopole Antenna

(* 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.	2261.269	PK	49.0	26.2	13.5	41.2	47.5	73.9	26.4	100	223	
Hori.	2390.000	PK	71.7	26.4	13.6	41.1	70.6	73.9	3.3	100	219	
Hori.	2713.530	PK	49.7	27.0	13.8	40.9	49.6	73.9	24.3	100	142	
Hori.	4824.000	PK	46.5	30.7	5.5	39.8	42.9	73.9	31.0	100	267	
Hori.	7236.000	PK	46.4	36.7	6.9	40.2	49.8	73.9	24.1	100	0	
Hori.	9648.000	PK	47.5	38.5	8.0	40.1	53.9	73.9	20.0	100	77	
Hori.	12060.000	PK	47.2	39.5	8.9	39.6	56.0	73.9	17.9	100	0	
Hori.	2261.269	AV	41.5	26.2	13.5	41.2	40.0	53.9	13.9	100	223	
Hori.	2390.000	AV	52.3	26.4	13.6	41.1	51.2	53.9	2.7	100	219	
Hori.	2713.530	AV	42.3	27.0	13.8	40.9	42.2	53.9	11.7	100	142	
Hori.	4824.000	AV	35.9	30.7	5.5	39.8	32.3	53.9	21.6	100	267	
Hori.	7236.000	AV	35.5	36.7	6.9	40.2	38.9	53.9	15.0	100	0	
Hori.	9648.000	AV	35.8	38.5	8.0	40.1	42.2	53.9	11.7	100	77	
Hori.	12060.000	AV	36.5	39.5	8.9	39.6	45.3	53.9	8.6	100	0	
Vert.	2390.000	PK	65.9	26.4	13.6	41.1	64.8	73.9	9.1	118	168	
Vert.	2713.530	PK	48.2	27.0	13.8	40.9	48.1	73.9	25.8	100	38	
Vert.	4824.000	PK	46.6	30.7	5.5	39.8	43.0	73.9	30.9	100	67	
Vert.	7236.000	PK	46.2	36.7	6.9	40.2	49.6	73.9	24.3	100	0	
Vert.	9648.000	PK	46.7	38.5	8.0	40.1	53.1	73.9	20.8	100	124	
Vert.	12060.000	PK	47.3	39.5	8.9	39.6	56.1	73.9	17.8	100	0	
Vert.	2390.000	AV	46.4	26.4	13.6	41.1	45.3	53.9	8.6	118	168	
Vert.	2713.530	AV	39.6	27.0	13.8	40.9	39.5	53.9	14.4	100	38	
Vert.	4824.000	AV	36.2	30.7	5.5	39.8	32.6	53.9	21.3	100	67	
Vert.	7236.000	AV	36.5	36.7	6.9	40.2	39.9	53.9	14.0	100	0	
Vert.	9648.000	AV	36.0	38.5	8.0	40.1	42.4	53.9	11.5	100	124	
Vert.	12060.000	AV	36.8	39.5	8.9	39.6	45.6	53.9	8.3	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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date December 24, 2014
 Temperature / Humidity 24 deg.C, 56 %RH
 Engineer Tatsuya Arai
 Mode Tx, 2417 MHz
 Tx, IEEE802.11n (HT20), Monopole Antenna

(* 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	72.0	26.4	13.6	41.1	70.9	73.9	3.0	100	221	
Hori.	2390.000	AV	51.2	26.4	13.6	41.1	50.1	53.9	3.8	100	221	
Vert.	2390.000	PK	66.8	26.4	13.6	41.1	65.7	73.9	8.2	121	164	
Vert.	2390.000	AV	47.8	26.4	13.6	41.1	46.7	53.9	7.2	121	164	

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.	2417.000	PK	102.4	26.4	13.6	41.1	101.3	-	-	Carrier
Hori.	2400.000	PK	69.8	26.4	13.6	41.1	68.7	81.3	12.6	
Vert.	2417.000	PK	97.3	26.4	13.6	41.1	96.2	-	-	Carrier
Vert.	2400.000	PK	62.6	26.4	13.6	41.1	61.5	76.2	14.7	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date January 14, 2015 January 15, 2015 January 17, 2015
Temperature / Humidity 22 deg.C, 34 %RH 22 deg.C, 34 %RH 22 deg.C, 32 %RH
Engineer Tatsuya Arai Tatsuya Arai Shinichi Takano
Mode Tx, 2437 MHz
 Tx, IEEE802.11n (HT20), Monopole Antenna

(* 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.	37.414	QP	22.5	15.2	6.5	32.2	12.0	40.0	28.0	294	59	
Hori.	548.595	QP	22.1	18.5	9.4	32.1	17.9	46.0	28.1	100	302	
Hori.	2741.469	PK	49.1	27.0	13.8	40.9	49.0	73.9	24.9	100	140	
Hori.	4874.000	PK	47.4	30.9	5.5	39.7	44.1	73.9	29.8	100	63	
Hori.	7311.000	PK	46.1	36.8	6.8	40.3	49.4	73.9	24.5	100	0	
Hori.	9748.000	PK	50.6	38.6	8.0	40.0	57.2	73.9	16.7	100	278	
Hori.	12185.000	PK	45.2	39.4	9.0	39.8	53.8	73.9	20.1	100	0	
Hori.	2741.469	AV	43.9	27.0	13.8	40.9	43.8	53.9	10.1	100	140	
Hori.	4874.000	AV	38.0	30.9	5.5	39.7	34.7	53.9	19.2	100	63	
Hori.	7311.000	AV	35.6	36.8	6.8	40.3	38.9	53.9	15.0	100	0	
Hori.	9748.000	AV	38.3	38.6	8.0	40.0	44.9	53.9	9.0	100	278	
Hori.	12185.000	AV	35.6	39.4	9.0	39.8	44.2	53.9	9.7	100	0	
Vert.	37.514	QP	22.4	15.1	6.5	32.2	11.8	40.0	28.2	100	326	
Vert.	548.323	QP	22.0	18.5	9.4	32.1	17.8	46.0	28.2	100	247	
Vert.	2741.469	PK	48.0	27.0	13.8	40.9	47.9	73.9	26.0	100	45	
Vert.	4874.000	PK	47.6	30.9	5.5	39.7	44.3	73.9	29.6	100	272	
Vert.	7311.000	PK	47.1	36.8	6.8	40.3	50.4	73.9	23.5	100	0	
Vert.	9748.000	PK	47.8	38.6	8.0	40.0	54.4	73.9	19.5	100	265	
Vert.	12185.000	PK	45.4	39.4	9.0	39.8	54.0	73.9	19.9	100	0	
Vert.	2741.469	AV	42.2	27.0	13.8	40.9	42.1	53.9	11.8	100	45	
Vert.	4874.000	AV	37.1	30.9	5.5	39.7	33.8	53.9	20.1	100	272	
Vert.	7311.000	AV	37.1	36.8	6.8	40.3	40.4	53.9	13.5	100	0	
Vert.	9748.000	AV	36.9	38.6	8.0	40.0	43.5	53.9	10.4	100	265	
Vert.	12185.000	AV	35.6	39.4	9.0	39.8	44.2	53.9	9.7	100	0	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date December 24, 2014
Temperature / Humidity 24 deg.C, 56 %RH
Engineer Tatsuya Arai
Mode Tx, 2457 MHz
 Tx, IEEE802.11n (HT20), Monopole Antenna

(* 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	70.9	26.6	13.6	41.1	70.0	73.9	3.9	100	140	
Hori.	2483.500	AV	52.6	26.6	13.6	41.1	51.7	53.9	2.2	100	140	
Vert.	2483.500	PK	67.5	26.6	13.6	41.1	66.6	73.9	7.3	112	150	
Vert.	2483.500	AV	50.3	26.6	13.6	41.1	49.4	53.9	4.5	112	150	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date December 24, 2014 January 14, 2015 January 15, 2015
 Temperature / Humidity 24 deg.C, 56 %RH 22 deg.C, 34 %RH 22 deg.C, 34 %RH
 Engineer Tatsuya Arai Tatsuya Arai Tatsuya Arai
 Mode Tx, 2462 MHz
 Tx, IEEE802.11n (HT20), Monopole Antenna

(* 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	74.1	26.6	13.6	41.1	73.2	73.9	0.7	100	142	
Hori.	2769.776	PK	49.7	27.1	13.8	40.9	49.7	73.9	24.2	123	146	
Hori.	4924.000	PK	45.9	31.1	5.5	39.6	42.9	73.9	31.0	100	267	
Hori.	7386.000	PK	46.6	36.9	6.8	40.4	49.9	73.9	24.0	102	0	
Hori.	9848.000	PK	44.7	38.6	8.0	39.9	51.4	73.9	22.5	100	0	
Hori.	12310.000	PK	46.1	39.3	9.0	39.9	54.5	73.9	19.4	100	5	
Hori.	2483.500	AV	48.0	26.6	13.6	41.1	47.1	53.9	6.8	100	142	
Hori.	2769.776	AV	42.5	27.1	13.8	40.9	42.5	53.9	11.4	123	146	
Hori.	4924.000	AV	34.8	31.1	5.5	39.6	31.8	53.9	22.1	100	267	
Hori.	7386.000	AV	35.9	36.9	6.8	40.4	39.2	53.9	14.7	102	0	
Hori.	9848.000	AV	34.8	38.6	8.0	39.9	41.5	53.9	12.4	100	0	
Hori.	12310.000	AV	35.2	39.3	9.0	39.9	43.6	53.9	10.3	100	5	
Vert.	2483.500	PK	71.6	26.6	13.6	41.1	70.7	73.9	3.2	113	98	
Vert.	2769.776	PK	48.5	27.1	13.8	40.9	48.5	73.9	25.4	100	79	
Vert.	4924.000	PK	45.6	31.1	5.5	39.6	42.6	73.9	31.3	100	279	
Vert.	7386.000	PK	45.5	36.9	6.8	40.4	48.8	73.9	25.1	100	0	
Vert.	9848.000	PK	45.0	38.6	8.0	39.9	51.7	73.9	22.2	100	0	
Vert.	12310.000	PK	45.5	39.3	9.0	39.9	53.9	73.9	20.0	100	23	
Vert.	2483.500	AV	46.6	26.6	13.6	41.1	45.7	53.9	8.2	113	98	
Vert.	2769.776	AV	39.8	27.1	13.8	40.9	39.8	53.9	14.1	100	79	
Vert.	4924.000	AV	35.5	31.1	5.5	39.6	32.5	53.9	21.4	100	279	
Vert.	7386.000	AV	36.3	36.9	6.8	40.4	39.6	53.9	14.3	100	0	
Vert.	9848.000	AV	36.5	38.6	8.0	39.9	43.2	53.9	10.7	100	0	
Vert.	12310.000	AV	34.8	39.3	9.0	39.9	43.2	53.9	10.7	100	23	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date February 5, 2015 February 8, 2015
 Temperature / Humidity 24 deg.C, 32 %RH 24 deg.C, 30 %RH
 Engineer Yasumasa Owaki Yosuke Ishikawa
 Mode Tx, 2402 MHz
 Tx, Bluetooth Low Energy, Monopole Antenna

(* 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.	37.314	QP	22.1	15.2	6.8	32.2	11.9	40.0	28.1	100	0	
Hori.	506.661	QP	20.9	17.9	9.5	32.1	16.2	46.0	29.8	100	0	
Hori.	2390.000	PK	46.9	26.4	13.6	41.1	45.8	73.9	28.1	100	248	
Hori.	3202.718	PK	53.5	27.8	5.2	40.8	45.7	73.9	28.2	109	148	
Hori.	4804.000	PK	52.8	30.6	5.6	39.8	49.2	73.9	24.7	100	64	
Hori.	7206.000	PK	44.3	36.6	7.1	40.2	47.8	73.9	26.1	100	0	
Hori.	12010.000	PK	45.0	39.5	9.2	39.6	54.1	73.9	19.8	100	0	
Hori.	3202.718	AV	48.8	27.8	5.2	40.8	41.0	53.9	12.9	109	148	
Vert.	37.128	QP	22.0	15.2	6.8	32.2	11.8	40.0	28.2	100	0	
Vert.	506.450	QP	20.9	17.9	9.5	32.1	16.2	46.0	29.8	100	0	
Vert.	2390.000	PK	45.7	26.4	13.6	41.1	44.6	73.9	29.3	100	233	
Vert.	3202.689	PK	52.8	27.8	5.2	40.8	45.0	73.9	28.9	107	194	
Vert.	4804.000	PK	51.9	30.6	5.6	39.8	48.3	73.9	25.6	100	76	
Vert.	7206.000	PK	44.2	36.6	7.1	40.2	47.7	73.9	26.2	100	0	
Vert.	12010.000	PK	44.4	39.5	9.2	39.6	53.5	73.9	20.4	100	0	
Vert.	3202.689	AV	47.2	27.8	5.2	40.8	39.4	53.9	14.5	107	194	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	36.9	26.4	13.6	41.1	4.1	39.9	53.9	14.0	*1)
Hori.	4804.000	AV	45.6	30.6	5.6	39.8	4.1	46.1	53.9	7.8	
Hori.	7206.000	AV	34.9	36.6	7.1	40.2	4.1	42.5	53.9	11.4	
Hori.	12010.000	AV	35.8	39.5	9.2	39.6	4.1	49.0	53.9	4.9	
Vert.	2390.000	AV	36.9	26.4	13.6	41.1	4.1	39.9	53.9	14.0	*1)
Vert.	4804.000	AV	44.5	30.6	5.6	39.8	4.1	45.0	53.9	8.9	
Vert.	7206.000	AV	35.1	36.6	7.1	40.2	4.1	42.7	53.9	11.2	
Vert.	12010.000	AV	35.9	39.5	9.2	39.6	4.1	49.1	53.9	4.8	

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

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

*1) Not out of Band emission (Leakage Power)

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.	2402.000	PK	102.8	26.4	13.6	41.1	101.7	-	-	Carrier
Hori.	2400.000	PK	42.3	26.4	13.6	41.1	41.2	81.7	40.5	
Hori.	9608.001	PK	44.0	38.5	8.1	40.1	50.5	81.7	31.2	
Vert.	2402.000	PK	96.9	26.4	13.6	41.1	95.8	-	-	Carrier
Vert.	2400.000	PK	39.2	26.4	13.6	41.1	38.1	75.8	37.7	
Vert.	9608.001	PK	44.6	38.5	8.1	40.1	51.1	75.8	24.7	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date February 5, 2015 February 8, 2015
 Temperature / Humidity 24 deg.C, 32 %RH 24 deg.C, 30 %RH
 Engineer Yasumasa Owaki Yosuke Ishikawa
 Mode Tx, 2440 MHz
 Tx, Bluetooth Low Energy, Monopole Antenna

(* 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.	36.496	QP	21.9	15.4	6.8	32.2	11.9	40.0	28.1	100	0	
Hori.	500.890	QP	20.7	17.8	9.4	32.1	15.8	46.0	30.2	100	0	
Hori.	3253.357	PK	52.3	27.9	5.2	40.9	44.5	73.9	29.4	100	146	
Hori.	4880.000	PK	50.8	30.9	5.6	39.7	47.6	73.9	26.3	100	301	
Hori.	7320.000	PK	45.6	36.8	7.0	40.3	49.1	73.9	24.8	100	0	
Hori.	12200.000	PK	43.8	39.4	9.3	39.8	52.7	73.9	21.2	100	0	
Hori.	3253.357	AV	47.1	27.9	5.2	40.9	39.3	53.9	14.6	100	146	
Vert.	36.599	QP	22.0	15.4	6.8	32.2	12.0	40.0	28.0	100	0	
Vert.	500.766	QP	20.7	17.8	9.4	32.1	15.8	46.0	30.2	100	0	
Vert.	3253.362	PK	53.4	27.9	5.2	40.9	45.6	73.9	28.3	105	259	
Vert.	4880.000	PK	50.1	30.9	5.6	39.7	46.9	73.9	27.0	106	82	
Vert.	7320.000	PK	44.3	36.8	7.0	40.3	47.8	73.9	26.1	100	0	
Vert.	12200.000	PK	44.5	39.4	9.3	39.8	53.4	73.9	20.5	100	0	
Vert.	3253.362	AV	48.2	27.9	5.2	40.9	40.4	53.9	13.5	105	259	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	AV	43.2	30.9	5.6	39.7	4.1	44.1	53.9	9.8	
Hori.	7320.000	AV	35.1	36.8	7.0	40.3	4.1	42.7	53.9	11.2	
Hori.	12200.000	AV	35.2	39.4	9.3	39.8	4.1	48.2	53.9	5.7	
Vert.	4880.000	AV	43.0	30.9	5.6	39.7	4.1	43.9	53.9	10.0	
Vert.	7320.000	AV	35.1	36.8	7.0	40.3	4.1	42.7	53.9	11.2	
Vert.	12200.000	AV	35.2	39.4	9.3	39.8	4.1	48.2	53.9	5.7	

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

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.	2440.000	PK	102.5	26.5	13.6	41.1	101.5	-	-	Carrier
Hori.	9760.001	PK	41.3	38.6	8.1	40.0	48.0	81.5	33.5	
Vert.	2440.000	PK	95.8	26.5	13.6	41.1	94.8	-	-	Carrier
Vert.	9760.001	PK	41.7	38.6	8.1	40.0	48.4	74.8	26.4	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date February 5, 2015 February 8, 2015
 Temperature / Humidity 24 deg.C, 32 %RH 24 deg.C, 30 %RH
 Engineer Yasumasa Owaki Yosuke Ishikawa
 Mode Tx, 2480 MHz
 Tx, Bluetooth Low Energy, Monopole Antenna

(* 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.	36.529	QP	21.9	15.4	6.8	32.2	11.9	40.0	28.1	100	0	
Hori.	500.957	QP	20.7	17.8	9.4	32.1	15.8	46.0	30.2	100	0	
Hori.	2483.500	PK	48.1	26.6	13.6	41.1	47.2	73.9	26.7	149	239	
Hori.	3306.678	PK	52.7	27.9	5.2	40.9	44.9	73.9	29.0	100	148	
Hori.	4960.000	PK	49.1	31.2	5.7	39.6	46.4	73.9	27.5	100	304	
Hori.	7440.000	PK	44.8	37.0	7.0	40.4	48.4	73.9	25.5	100	0	
Hori.	12400.000	PK	44.9	39.3	9.4	40.0	53.6	73.9	20.3	100	0	
Hori.	3306.678	AV	47.2	27.9	5.2	40.9	39.4	53.9	14.5	100	148	
Vert.	36.712	QP	22.0	15.4	6.8	32.2	12.0	40.0	28.0	100	0	
Vert.	500.748	QP	20.6	17.8	9.4	32.1	15.7	46.0	30.3	100	0	
Vert.	2483.500	PK	46.2	26.6	13.6	41.1	45.3	73.9	28.6	100	140	
Vert.	3306.712	PK	51.4	27.9	5.2	40.9	43.6	73.9	30.3	100	31	
Vert.	4960.000	PK	49.2	31.2	5.7	39.6	46.5	73.9	27.4	110	281	
Vert.	7440.000	PK	45.0	37.0	7.0	40.4	48.6	73.9	25.3	100	0	
Vert.	12400.000	PK	44.9	39.3	9.4	40.0	53.6	73.9	20.3	100	0	
Vert.	3306.712	AV	45.4	27.9	5.2	40.9	37.6	53.9	16.3	100	31	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	37.7	26.6	13.6	41.1	4.1	40.9	53.9	13.0	*1)
Hori.	4960.000	AV	41.4	31.2	5.7	39.6	4.1	42.8	53.9	11.1	
Hori.	7440.000	AV	35.6	37.0	7.0	40.4	4.1	43.3	53.9	10.6	
Hori.	12400.000	AV	35.7	39.3	9.4	40.0	4.1	48.5	53.9	5.4	
Vert.	2483.500	AV	36.6	26.6	13.6	41.1	4.1	39.8	53.9	14.1	*1)
Vert.	4960.000	AV	40.9	31.2	5.7	39.6	4.1	42.3	53.9	11.6	
Vert.	7440.000	AV	35.7	37.0	7.0	40.4	4.1	43.4	53.9	10.5	
Vert.	12400.000	AV	35.6	39.3	9.4	40.0	4.1	48.4	53.9	5.5	

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

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

*1) Not out of Band emission (Leakage Power)

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.	2480.000	PK	101.7	26.6	13.6	41.1	100.8	-	-	Carrier
Hori.	9920.001	PK	36.6	38.6	8.0	39.9	43.3	80.8	37.5	
Vert.	2480.000	PK	94.1	26.6	13.6	41.1	93.2	-	-	Carrier
Vert.	9920.001	PK	39.0	38.6	8.0	39.9	45.7	73.2	27.5	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date January 7, 2015 January 9, 2015 January 10, 2015
 Temperature / Humidity 24 deg.C, 56 %RH 23 deg.C, 33 %RH 22 deg.C, 34 %RH
 Engineer Tatsuya Arai Tatsuya Arai Hikaru Shirasawa
 Mode Tx, 2412 MHz
 Tx, IEEE802.11b, Dipole Antenna

(* 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	50.0	26.4	23.8	41.1	59.1	73.9	14.8	100	127	
Hori.	4824.000	PK	53.1	30.7	5.5	39.8	49.5	73.9	24.4	100	5	
Hori.	7236.000	PK	49.1	36.7	6.9	40.2	52.5	73.9	21.4	100	328	
Hori.	12060.000	PK	46.0	39.5	8.9	39.6	54.8	73.9	19.1	160	343	
Hori.	2390.000	AV	40.6	26.4	23.8	41.1	49.7	53.9	4.2	100	127	
Hori.	4824.000	AV	45.7	30.7	5.5	39.8	42.1	53.9	11.8	100	5	
Hori.	7236.000	AV	40.4	36.7	6.9	40.2	43.8	53.9	10.1	100	328	
Hori.	12060.000	AV	37.6	39.5	8.9	39.6	46.4	53.9	7.5	160	343	
Vert.	2390.000	PK	48.0	26.4	23.8	41.1	57.1	73.9	16.8	100	207	
Vert.	4824.000	PK	53.5	30.7	5.5	39.8	49.9	73.9	24.0	107	359	
Vert.	7236.000	PK	47.9	36.7	6.9	40.2	51.3	73.9	22.6	100	0	
Vert.	12060.000	PK	44.8	39.5	8.9	39.6	53.6	73.9	20.3	144	359	
Vert.	2390.000	AV	38.1	26.4	23.8	41.1	47.2	53.9	6.7	100	207	
Vert.	4824.000	AV	45.1	30.7	5.5	39.8	41.5	53.9	12.4	107	359	
Vert.	7236.000	AV	38.8	36.7	6.9	40.2	42.2	53.9	11.7	100	0	
Vert.	12060.000	AV	36.4	39.5	8.9	39.6	45.2	53.9	8.7	144	359	

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$ **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	95.8	26.4	23.8	41.1	104.9	-	-	Carrier
Hori.	2396.487	PK	54.4	26.4	23.8	41.1	63.5	84.9	21.4	
Hori.	2400.000	PK	51.3	26.4	23.8	41.1	60.4	84.9	24.5	
Hori.	9648.000	PK	51.5	38.5	8.0	40.1	57.9	84.9	27	
Vert.	2412.000	PK	91.0	26.4	23.8	41.1	100.1	-	-	Carrier
Vert.	2396.487	PK	48.5	26.4	23.8	41.1	57.6	80.1	22.5	
Vert.	2400.000	PK	45.4	26.4	23.8	41.1	54.5	80.1	25.6	
Vert.	9648.000	PK	45.6	38.5	8.0	40.1	52.0	80.1	28.1	

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$ **UL Japan, Inc.****Shonan EMC Lab.**

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date January 9, 2015 January 10, 2015
 Temperature / Humidity 23 deg.C, 33 %RH 22 deg.C, 34 %RH
 Engineer Tatsuya Arai Hikaru Shirasawa
 Mode Tx, 2437 MHz
 Tx, IEEE802.11b, Dipole Antenna

(* 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	50.6	30.9	5.5	39.7	47.3	73.9	26.6	100	17	
Hori.	7311.000	PK	49.2	36.8	6.8	40.3	52.5	73.9	21.4	100	332	
Hori.	12185.000	PK	46.2	39.4	9.0	39.8	54.8	73.9	19.1	100	342	
Hori.	4874.000	AV	42.8	30.9	5.5	39.7	39.5	53.9	14.4	100	17	
Hori.	7311.000	AV	39.7	36.8	6.8	40.3	43.0	53.9	10.9	100	332	
Hori.	12185.000	AV	37.1	39.4	9.0	39.8	45.7	53.9	8.2	100	342	
Vert.	4874.000	PK	51.2	30.9	5.5	39.7	47.9	73.9	26.0	126	0	
Vert.	7311.000	PK	47.4	36.8	6.8	40.3	50.7	73.9	23.2	100	358	
Vert.	12185.000	PK	44.9	39.4	9.0	39.8	53.5	73.9	20.4	131	1	
Vert.	4874.000	AV	43.0	30.9	5.5	39.7	39.7	53.9	14.2	126	0	
Vert.	7311.000	AV	38.5	36.8	6.8	40.3	41.8	53.9	12.1	100	358	
Vert.	12185.000	AV	36.5	39.4	9.0	39.8	45.1	53.9	8.8	131	1	

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$ **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.	2437.000	PK	96.5	26.5	23.8	41.1	105.7	-	-	Carrier
Hori.	9748.000	PK	51.3	38.6	8.0	40.0	57.9	85.7	27.8	
Vert.	2437.000	PK	89.9	26.5	23.8	41.1	99.1	-	-	Carrier
Vert.	9748.000	PK	47.5	38.6	8.0	40.0	54.1	79.1	25.0	

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m})= 9.5\text{dB}$ **UL Japan, Inc.****Shonan EMC Lab.**

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date January 7, 2015 January 9, 2015 January 10, 2015
 Temperature / Humidity 24 deg.C, 56 %RH 23 deg.C, 33 %RH 22 deg.C, 34 %RH
 Engineer Tatsuya Arai Tatsuya Arai Hikaru Shirasawa
 Mode Tx, 2462 MHz
 Tx, IEEE802.11b, Dipole Antenna

(* 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	50.8	26.6	23.8	41.1	60.1	73.9	13.8	100	134	
Hori.	4924.000	PK	50.3	31.1	5.5	39.6	47.3	73.9	26.6	100	22	
Hori.	7386.000	PK	47.0	36.9	6.8	40.4	50.3	73.9	23.6	100	330	
Hori.	12310.000	PK	45.1	39.3	9.0	39.9	53.5	73.9	20.4	100	339	
Hori.	2483.500	AV	41.0	26.6	23.8	41.1	50.3	53.9	3.6	100	134	
Hori.	4924.000	AV	42.1	31.1	5.5	39.6	39.1	53.9	14.8	100	22	
Hori.	7386.000	AV	38.1	36.9	6.8	40.4	41.4	53.9	12.5	100	330	
Hori.	12310.000	AV	36.9	39.3	9.0	39.9	45.3	53.9	8.6	100	339	
Vert.	2483.500	PK	47.5	26.6	23.8	41.1	56.8	73.9	17.1	125	71	
Vert.	4924.000	PK	50.1	31.1	5.5	39.6	47.1	73.9	26.8	159	1	
Vert.	7386.000	PK	46.6	36.9	6.8	40.4	49.9	73.9	24.0	148	359	
Vert.	12310.000	PK	45.1	39.3	9.0	39.9	53.5	73.9	20.4	120	5	
Vert.	2483.500	AV	38.1	26.6	23.8	41.1	47.4	53.9	6.5	125	71	
Vert.	4924.000	AV	41.8	31.1	5.5	39.6	38.8	53.9	15.1	159	1	
Vert.	7386.000	AV	37.8	36.9	6.8	40.4	41.1	53.9	12.8	148	359	
Vert.	12310.000	AV	36.3	39.3	9.0	39.9	44.7	53.9	9.2	120	5	

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.	2462.000	PK	95.6	26.5	23.8	41.1	104.8	-	-	Carrier
Hori.	9848.000	PK	52.8	38.6	8.0	39.9	59.5	84.8	25.3	
Vert.	2462.000	PK	90.2	26.5	23.8	41.1	99.4	-	-	Carrier
Vert.	9848.000	PK	46.7	38.6	8.0	39.9	53.4	79.4	26.0	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date December 25, 2014
 Temperature / Humidity 23 deg.C, 33 %RH
 Engineer Tatsuya Arai
 Mode Tx, 2412 MHz
 Tx, IEEE802.11g, Dipole Antenna

(* 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	66.8	26.4	13.6	41.1	65.7	73.9	8.2	100	124	
Hori.	2713.596	PK	48.1	27.0	13.8	40.9	48.0	73.9	25.9	128	202	
Hori.	2390.000	AV	51.2	26.4	13.6	41.1	50.1	53.9	3.8	100	124	
Hori.	2713.596	AV	40.8	27.0	13.8	40.9	40.7	53.9	13.2	128	202	
Vert.	2390.000	PK	61.7	26.4	13.6	41.1	60.6	73.9	13.3	100	275	
Vert.	2713.596	PK	48.5	27.0	13.8	40.9	48.4	73.9	25.5	100	24	
Vert.	2390.000	AV	45.5	26.4	13.6	41.1	44.4	53.9	9.5	100	275	
Vert.	2713.596	AV	40.9	27.0	13.8	40.9	40.8	53.9	13.1	100	24	

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	99.3	26.4	13.6	41.1	98.2	-	-	Carrier
Hori.	2400.000	PK	62.2	26.4	13.6	41.1	61.1	78.2	17.1	
Vert.	2412.000	PK	93.7	26.4	13.6	41.1	92.6	-	-	Carrier
Vert.	2400.000	PK	56.2	26.4	13.6	41.1	55.1	72.6	17.5	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date January 6, 2015
Temperature / Humidity 23 deg.C, 33 %RH
Engineer Tatsuya Arai
Mode Tx, 2417 MHz
 Tx, IEEE802.11g, Dipole Antenna

(* 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	67.1	26.4	13.6	41.1	66.0	73.9	7.9	128	126	
Hori.	2390.000	AV	51.4	26.4	13.6	41.1	50.3	53.9	3.6	128	126	
Vert.	2390.000	PK	63.4	26.4	13.6	41.1	62.3	73.9	11.6	100	73	
Vert.	2390.000	AV	48.0	26.4	13.6	41.1	46.9	53.9	7.0	100	73	

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.	2417.000	PK	101.9	26.4	13.6	41.1	100.8	-	-	Carrier
Hori.	2400.000	PK	63.2	26.4	13.6	41.1	62.1	80.8	18.7	
Vert.	2417.000	PK	96.9	26.4	13.6	41.1	95.8	-	-	Carrier
Vert.	2400.000	PK	59.6	26.4	13.6	41.1	58.5	75.8	17.3	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date December 25, 2014
Temperature / Humidity 23 deg.C, 33 %RH
Engineer Tatsuya Arai
Mode Tx, 2457 MHz
 Tx, IEEE802.11g, Dipole Antenna

(* 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	67.8	26.6	13.6	41.1	66.9	73.9	7.0	100	133	
Hori.	2483.500	AV	53.7	26.6	13.6	41.1	52.8	53.9	1.1	100	133	
Vert.	2483.500	PK	63.0	26.6	13.6	41.1	62.1	73.9	11.8	100	275	
Vert.	2483.500	AV	48.5	26.6	13.6	41.1	47.6	53.9	6.3	100	275	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date December 25, 2014
Temperature / Humidity 23 deg.C, 33 %RH
Engineer Tatsuya Arai
Mode Tx, 2462 MHz
 Tx, IEEE802.11g, Dipole Antenna

(* 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	69.1	26.6	13.6	41.1	68.2	73.9	5.7	100	223	
Hori.	2769.858	PK	48.3	27.1	13.8	40.9	48.3	73.9	25.6	113	210	
Hori.	2483.500	AV	50.6	26.6	13.6	41.1	49.7	53.9	4.2	100	223	
Hori.	2769.858	AV	41.0	27.1	13.8	40.9	41.0	53.9	12.9	113	210	
Vert.	2483.500	PK	62.4	26.6	13.6	41.1	61.5	73.9	12.4	100	271	
Vert.	2769.858	PK	48.8	27.1	13.8	40.9	48.8	73.9	25.1	119	18	
Vert.	2483.500	AV	44.0	26.6	13.6	41.1	43.1	53.9	10.8	100	271	
Vert.	2769.858	AV	40.7	27.1	13.8	40.9	40.7	53.9	13.2	119	18	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date December 25, 2014 January 9, 2015 January 10, 2015
 Temperature / Humidity 23 deg.C, 33 %RH 23 deg.C, 33 %RH 22 deg.C, 34 %RH
 Engineer Tatsuya Arai Tatsuya Arai Hikaru Shirasawa
 Mode Tx, 2412 MHz
 Tx, IEEE802.11n (HT20), Dipole Antenna

(* 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	70.7	26.4	13.6	41.1	69.6	73.9	4.3	100	129	
Hori.	2713.616	PK	48.5	27.0	13.8	40.9	48.4	73.9	25.5	120	214	
Hori.	4824.000	PK	49.1	30.7	5.5	39.8	45.5	73.9	28.4	100	17	
Hori.	7236.000	PK	45.8	36.7	6.9	40.2	49.2	73.9	24.7	100	331	
Hori.	9648.000	PK	46.3	38.5	8.0	40.1	52.7	73.9	21.2	100	337	
Hori.	12060.000	PK	43.0	39.5	8.9	39.6	51.8	73.9	22.1	100	0	
Hori.	2390.000	AV	53.1	26.4	13.6	41.1	52.0	53.9	1.9	100	129	
Hori.	2713.616	AV	41.1	27.0	13.8	40.9	41.0	53.9	12.9	120	214	
Hori.	4824.000	AV	39.5	30.7	5.5	39.8	35.9	53.9	18.0	100	17	
Hori.	7236.000	AV	36.9	36.7	6.9	40.2	40.3	53.9	13.6	100	331	
Hori.	9648.000	AV	37.6	38.5	8.0	40.1	44.0	53.9	9.9	100	337	
Hori.	12060.000	AV	35.1	39.5	8.9	39.6	43.9	53.9	10.0	100	0	
Vert.	2390.000	PK	64.8	26.4	13.6	41.1	63.7	73.9	10.2	100	279	
Vert.	2713.616	PK	48.9	27.0	13.8	40.9	48.8	73.9	25.1	100	34	
Vert.	4824.000	PK	47.9	30.7	5.5	39.8	44.3	73.9	29.6	100	1	
Vert.	7236.000	PK	45.4	36.7	6.9	40.2	48.8	73.9	25.1	100	358	
Vert.	9648.000	PK	45.2	38.5	8.0	40.1	51.6	73.9	22.3	166	8	
Vert.	12060.000	PK	44.5	39.5	8.9	39.6	53.3	73.9	20.6	100	0	
Vert.	2390.000	AV	46.0	26.4	13.6	41.1	44.9	53.9	9.0	100	279	
Vert.	2713.616	AV	40.9	27.0	13.8	40.9	40.8	53.9	13.1	100	34	
Vert.	4824.000	AV	38.1	30.7	5.5	39.8	34.5	53.9	19.4	100	1	
Vert.	7236.000	AV	36.5	36.7	6.9	40.2	39.9	53.9	14.0	100	358	
Vert.	9648.000	AV	36.4	38.5	8.0	40.1	42.8	53.9	11.1	166	8	
Vert.	12060.000	AV	35.2	39.5	8.9	39.6	44.0	53.9	9.9	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	98.7	26.4	13.6	41.1	97.6	-	-	Carrier
Hori.	2400.000	PK	65.9	26.4	13.6	41.1	64.8	77.6	12.8	
Vert.	2412.000	PK	92.8	26.4	13.6	41.1	91.7	-	-	Carrier
Vert.	2400.000	PK	60.2	26.4	13.6	41.1	59.1	71.7	12.6	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date December 25, 2014
Temperature / Humidity 23 deg.C, 33 %RH
Engineer Tatsuya Arai
Mode Tx, 2417 MHz
 Tx, IEEE802.11n (HT20), Dipole Antenna

(* 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	67.9	26.4	13.6	41.1	66.8	73.9	7.1	100	122	
Hori.	2390.000	AV	52.1	26.4	13.6	41.1	51.0	53.9	2.9	100	122	
Vert.	2390.000	PK	62.5	26.4	13.6	41.1	61.4	73.9	12.5	100	276	
Vert.	2390.000	AV	47.1	26.4	13.6	41.1	46.0	53.9	7.9	100	276	

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.	2417.000	PK	101.9	26.4	13.6	41.1	100.8	-	-	Carrier
Hori.	2400.000	PK	67.8	26.4	13.6	41.1	66.7	80.8	14.1	
Vert.	2417.000	PK	96.8	26.4	13.6	41.1	95.7	-	-	Carrier
Vert.	2400.000	PK	62.9	26.4	13.6	41.1	61.8	75.7	13.9	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date January 9, 2015 January 10, 2015 January 17, 2015
Temperature / Humidity 23 deg.C, 33 %RH 22 deg.C, 34 %RH 22 deg.C, 32 %RH
Engineer Tatsuya Arai Hikaru Shirasawa Shinichi Takano
Mode Tx, 2437 MHz
 Tx, IEEE802.11n (HT20), Dipole Antenna

(* 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.	37.891	QP	22.4	15.0	6.5	32.2	11.7	40.0	28.3	284	296	
Hori.	491.656	QP	22.1	17.7	9.2	32.1	16.9	46.0	29.1	154	126	
Hori.	2741.644	PK	49.3	27.0	13.8	40.9	49.2	73.9	24.7	119	215	
Hori.	4874.000	PK	49.7	30.9	5.5	39.7	46.4	73.9	27.5	100	14	
Hori.	7311.000	PK	48.9	36.8	6.8	40.3	52.2	73.9	21.7	104	327	
Hori.	9748.000	PK	53.2	38.6	8.0	40.0	59.8	73.9	14.1	100	342	
Hori.	12185.000	PK	45.7	39.4	9.0	39.8	54.3	73.9	19.6	140	343	
Hori.	2741.644	AV	42.7	27.0	13.8	40.9	42.6	53.9	11.3	119	215	
Hori.	4874.000	AV	40.8	30.9	5.5	39.7	37.5	53.9	16.4	100	14	
Hori.	7311.000	AV	39.1	36.8	6.8	40.3	42.4	53.9	11.5	104	327	
Hori.	9748.000	AV	40.5	38.6	8.0	40.0	47.1	53.9	6.8	100	342	
Hori.	12185.000	AV	36.5	39.4	9.0	39.8	45.1	53.9	8.8	140	343	
Vert.	37.645	QP	22.4	15.1	6.5	32.2	11.8	40.0	28.2	100	218	
Vert.	487.921	QP	22.8	17.6	9.2	32.1	17.5	46.0	28.5	100	72	
Vert.	2741.644	PK	50.5	27.0	13.8	40.9	50.4	73.9	23.5	109	35	
Vert.	4874.000	PK	49.4	30.9	5.5	39.7	46.1	73.9	27.8	110	358	
Vert.	7311.000	PK	47.7	36.8	6.8	40.3	51.0	73.9	22.9	100	0	
Vert.	9748.000	PK	47.8	38.6	8.0	40.0	54.4	73.9	19.5	147	217	
Vert.	12185.000	PK	44.7	39.4	9.0	39.8	53.3	73.9	20.6	100	1	
Vert.	2741.644	AV	42.6	27.0	13.8	40.9	42.5	53.9	11.4	109	35	
Vert.	4874.000	AV	40.2	30.9	5.5	39.7	36.9	53.9	17.0	110	358	
Vert.	7311.000	AV	37.9	36.8	6.8	40.3	41.2	53.9	12.7	100	0	
Vert.	9748.000	AV	37.1	38.6	8.0	40.0	43.7	53.9	10.2	147	217	
Vert.	12185.000	AV	35.7	39.4	9.0	39.8	44.3	53.9	9.6	100	1	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date December 25, 2014
Temperature / Humidity 23 deg.C, 33 %RH
Engineer Tatsuya Arai
Mode Tx, 2457 MHz
 Tx, IEEE802.11n (HT20), Dipole Antenna

(* 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	68.5	26.6	13.6	41.1	67.6	73.9	6.3	100	133	
Hori.	2483.500	AV	54.4	26.6	13.6	41.1	53.5	53.9	0.4	100	133	
Vert.	2483.500	PK	63.6	26.6	13.6	41.1	62.7	73.9	11.2	100	217	
Vert.	2483.500	AV	49.4	26.6	13.6	41.1	48.5	53.9	5.4	100	217	

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

Radiated Emission

Test place	No.3 Semi Anechoic Chamber		
Date	December 25, 2014	January 9, 2015	January 10, 2015
Temperature / Humidity	23 deg.C, 33 %RH	23 deg.C, 33 %RH	22 deg.C, 34 %RH
Engineer	Tatsuya Arai	Tatsuya Arai	Hikaru Shirasawa
Mode	Tx, 2462 MHz		
	Tx, IEEE802.11n (HT20), Dipole Antenna		

(* 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	74.0	26.6	13.6	41.1	73.1	73.9	0.8	100	126	
Hori.	2769.848	PK	48.6	27.1	13.8	40.9	48.6	73.9	25.3	110	210	
Hori.	4924.000	PK	46.7	31.1	5.5	39.6	43.7	73.9	30.2	100	18	
Hori.	7386.000	PK	46.7	36.9	6.8	40.4	50.0	73.9	23.9	100	336	
Hori.	9848.000	PK	47.4	38.6	8.0	39.9	54.1	73.9	19.8	100	340	
Hori.	12310.000	PK	44.7	39.3	9.0	39.9	53.1	73.9	20.8	100	340	
Hori.	2483.500	AV	49.2	26.6	13.6	41.1	48.3	53.9	5.6	100	126	
Hori.	2769.848	AV	40.8	27.1	13.8	40.9	40.8	53.9	13.1	110	210	
Hori.	4924.000	AV	38.0	31.1	5.5	39.6	35.0	53.9	18.9	100	18	
Hori.	7386.000	AV	36.7	36.9	6.8	40.4	40.0	53.9	13.9	100	336	
Hori.	9848.000	AV	38.2	38.6	8.0	39.9	44.9	53.9	9.0	100	340	
Hori.	12310.000	AV	35.5	39.3	9.0	39.9	43.9	53.9	10.0	100	340	
Vert.	2483.500	PK	67.7	26.6	13.6	41.1	66.8	73.9	7.1	100	271	
Vert.	2769.848	PK	48.7	27.1	13.8	40.9	48.7	73.9	25.2	120	39	
Vert.	4924.000	PK	46.3	31.1	5.5	39.6	43.3	73.9	30.6	100	359	
Vert.	7386.000	PK	46.2	36.9	6.8	40.4	49.5	73.9	24.4	100	0	
Vert.	9848.000	PK	45.9	38.6	8.0	39.9	52.6	73.9	21.3	144	169	
Vert.	12310.000	PK	45.2	39.3	9.0	39.9	53.6	73.9	20.3	100	0	
Vert.	2483.500	AV	43.3	26.6	13.6	41.1	42.4	53.9	11.5	100	271	
Vert.	2769.848	AV	40.5	27.1	13.8	40.9	40.5	53.9	13.4	120	39	
Vert.	4924.000	AV	37.1	31.1	5.5	39.6	34.1	53.9	19.8	100	359	
Vert.	7386.000	AV	36.7	36.9	6.8	40.4	40.0	53.9	13.9	100	0	
Vert.	9848.000	AV	36.2	38.6	8.0	39.9	42.9	53.9	11.0	144	169	
Vert.	12310.000	AV	35.0	39.3	9.0	39.9	43.4	53.9	10.5	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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date February 5, 2015 February 8, 2015
 Temperature / Humidity 24 deg.C, 32 %RH 24 deg.C, 30 %RH
 Engineer Yasumasa Owaki Yosuke Ishikawa
 Mode Tx, 2402 MHz
 Tx, Bluetooth Low Energy, Dipole Antenna

(* 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.	36.596	QP	22.1	15.4	6.8	32.2	12.1	40.0	27.9	100	0	
Hori.	499.599	QP	20.7	17.8	9.4	32.1	15.8	46.0	30.2	100	0	
Hori.	2390.000	PK	45.6	26.4	13.6	41.1	44.5	73.9	29.4	100	134	
Hori.	3202.712	PK	52.7	27.8	5.2	40.8	44.9	73.9	29.0	112	232	
Hori.	4804.000	PK	55.1	30.6	5.6	39.8	51.5	73.9	22.4	100	1	
Hori.	7206.000	PK	43.5	36.6	7.1	40.2	47.0	73.9	26.9	100	0	
Hori.	12010.000	PK	45.0	39.5	9.2	39.6	54.1	73.9	19.8	100	0	
Hori.	3202.712	AV	47.0	27.8	5.2	40.8	39.2	53.9	14.7	112	232	
Vert.	36.729	QP	22.1	15.4	6.8	32.2	12.1	40.0	27.9	100	0	
Vert.	501.354	QP	20.8	17.8	9.4	32.1	15.9	46.0	30.1	100	0	
Vert.	2390.000	PK	46.6	26.4	13.6	41.1	45.5	73.9	28.4	100	351	
Vert.	3202.689	PK	49.6	27.8	5.2	40.8	41.8	73.9	32.1	110	56	
Vert.	4804.000	PK	53.8	30.6	5.6	39.8	50.2	73.9	23.7	100	1	
Vert.	7206.000	PK	44.4	36.6	7.1	40.2	47.9	73.9	26.0	100	0	
Vert.	12010.000	PK	45.3	39.5	9.2	39.6	54.4	73.9	19.5	100	0	
Vert.	3202.689	AV	42.7	27.8	5.2	40.8	34.9	53.9	19.0	110	56	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	36.8	26.4	13.6	41.1	4.1	39.8	53.9	14.1	*1)
Hori.	4804.000	AV	49.4	30.6	5.6	39.8	4.1	49.9	53.9	4.0	
Hori.	7206.000	AV	34.8	36.6	7.1	40.2	4.1	42.4	53.9	11.5	
Hori.	12010.000	AV	36.1	39.5	9.2	39.6	4.1	49.3	53.9	4.6	
Vert.	2390.000	AV	37.1	26.4	13.6	41.1	4.1	40.1	53.9	13.8	*1)
Vert.	4804.000	AV	48.3	30.6	5.6	39.8	4.1	48.8	53.9	5.1	
Vert.	7206.000	AV	34.8	36.6	7.1	40.2	4.1	42.4	53.9	11.5	
Vert.	12010.000	AV	35.9	39.5	9.2	39.6	4.1	49.1	53.9	4.8	

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

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

*1) Not out of Band emission (Leakage Power)

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.	2402.000	PK	102.9	26.4	13.6	41.1	101.8	-	-	Carrier
Hori.	2400.000	PK	41.7	26.4	13.6	41.1	40.6	81.8	41.2	
Hori.	9608.001	PK	45.1	38.5	8.1	40.1	51.6	81.8	30.2	
Vert.	2402.000	PK	98.9	26.4	13.6	41.1	97.8	-	-	Carrier
Vert.	2400.000	PK	38.8	26.4	13.6	41.1	37.7	77.8	40.1	
Vert.	9608.001	PK	42.3	38.5	8.1	40.1	48.8	77.8	29.0	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date February 5, 2015 February 8, 2015
 Temperature / Humidity 24 deg.C, 32 %RH 24 deg.C, 30 %RH
 Engineer Yasumasa Owaki Yosuke Ishikawa
 Mode Tx, 2440 MHz
 Tx, Bluetooth Low Energy, Dipole Antenna

(* 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.	35.734	QP	21.7	15.7	6.8	32.2	12.0	40.0	28.0	100	0	
Hori.	499.967	QP	20.8	17.8	9.4	32.1	15.9	46.0	30.1	100	0	
Hori.	3253.362	PK	52.6	27.9	5.2	40.9	44.8	73.9	29.1	106	229	
Hori.	4880.000	PK	52.9	30.9	5.6	39.7	49.7	73.9	24.2	100	359	
Hori.	7320.000	PK	43.6	36.8	7.0	40.3	47.1	73.9	26.8	100	0	
Hori.	12200.000	PK	44.4	39.4	9.3	39.8	53.3	73.9	20.6	100	0	
Hori.	3253.362	AV	47.5	27.9	5.2	40.9	39.7	53.9	14.2	106	229	
Vert.	35.715	QP	21.7	15.7	6.8	32.2	12.0	40.0	28.0	100	0	
Vert.	499.600	QP	20.8	17.8	9.4	32.1	15.9	46.0	30.1	100	0	
Vert.	3253.378	PK	48.8	27.9	5.2	40.9	41.0	73.9	32.9	102	260	
Vert.	4880.000	PK	52.3	30.9	5.6	39.7	49.1	73.9	24.8	100	1	
Vert.	7320.000	PK	43.6	36.8	7.0	40.3	47.1	73.9	26.8	100	0	
Vert.	12200.000	PK	44.3	39.4	9.3	39.8	53.2	73.9	20.7	100	0	
Vert.	3253.378	AV	41.2	27.9	5.2	40.9	33.4	53.9	20.5	102	260	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	AV	46.3	30.9	5.6	39.7	4.1	47.2	53.9	6.7	
Hori.	7320.000	AV	35.0	36.8	7.0	40.3	4.1	42.6	53.9	11.3	
Hori.	12200.000	AV	35.5	39.4	9.3	39.8	4.1	48.5	53.9	5.4	
Vert.	4880.000	AV	46.2	30.9	5.6	39.7	4.1	47.1	53.9	6.8	
Vert.	7320.000	AV	35.1	36.8	7.0	40.3	4.1	42.7	53.9	11.2	
Vert.	12200.000	AV	35.3	39.4	9.3	39.8	4.1	48.3	53.9	5.6	

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

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.	2440.000	PK	103.1	26.5	13.6	41.1	102.1	-	-	Carrier
Hori.	9760.001	PK	44.6	38.6	8.1	40.0	51.3	82.1	30.8	
Vert.	2440.000	PK	99.3	26.5	13.6	41.1	98.3	-	-	Carrier
Vert.	9760.001	PK	41.1	38.6	8.1	40.0	47.8	78.3	30.5	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date February 5, 2015 February 8, 2015
 Temperature / Humidity 24 deg.C, 32 %RH 24 deg.C, 30 %RH
 Engineer Yasumasa Owaki Yosuke Ishikawa
 Mode Tx, 2480 MHz
 Tx, Bluetooth Low Energy, Dipole Antenna

(* 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.	36.605	QP	22.0	15.4	6.8	32.2	12.0	40.0	28.0	100	0	
Hori.	500.306	QP	20.7	17.8	9.4	32.1	15.8	46.0	30.2	100	0	
Hori.	2483.500	PK	49.0	26.6	13.6	41.1	48.1	73.9	25.8	100	127	
Hori.	3306.674	PK	53.1	27.9	5.2	40.9	45.3	73.9	28.6	112	224	
Hori.	4960.000	PK	51.5	31.2	5.7	39.6	48.8	73.9	25.1	100	349	
Hori.	7440.000	PK	44.9	37.0	7.0	40.4	48.5	73.9	25.4	100	0	
Hori.	12400.000	PK	44.8	39.3	9.4	40.0	53.5	73.9	20.4	100	0	
Hori.	3306.674	AV	47.7	27.9	5.2	40.9	39.9	53.9	14.0	112	224	
Vert.	36.729	QP	22.0	15.4	6.8	32.2	12.0	40.0	28.0	100	0	
Vert.	500.429	QP	20.7	17.8	9.4	32.1	15.8	46.0	30.2	100	0	
Vert.	2483.500	PK	48.0	26.6	13.6	41.1	47.1	73.9	26.8	100	1	
Vert.	3306.671	PK	49.9	27.9	5.2	40.9	42.1	73.9	31.8	120	58	
Vert.	4960.000	PK	52.0	31.2	5.7	39.6	49.3	73.9	24.6	100	359	
Vert.	7440.000	PK	43.8	37.0	7.0	40.4	47.4	73.9	26.5	100	0	
Vert.	12400.000	PK	44.8	39.3	9.4	40.0	53.5	73.9	20.4	100	0	
Vert.	3306.671	AV	42.5	27.9	5.2	40.9	34.7	53.9	19.2	120	58	

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

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	38.3	26.6	13.6	41.1	4.1	41.5	53.9	12.4	*1)
Hori.	4960.000	AV	44.9	31.2	5.7	39.6	4.1	46.3	53.9	7.6	
Hori.	7440.000	AV	35.6	37.0	7.0	40.4	4.1	43.3	53.9	10.6	
Hori.	12400.000	AV	35.6	39.3	9.4	40.0	4.1	48.4	53.9	5.5	
Vert.	2483.500	AV	37.5	26.6	13.6	41.1	4.1	40.7	53.9	13.2	*1)
Vert.	4960.000	AV	44.1	31.2	5.7	39.6	4.1	45.5	53.9	8.4	
Vert.	7440.000	AV	35.4	37.0	7.0	40.4	4.1	43.1	53.9	10.8	
Vert.	12400.000	AV	35.6	39.3	9.4	40.0	4.1	48.4	53.9	5.5	

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

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

*1) Not out of Band emission (Leakage Power)

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.	2480.000	PK	103.4	26.6	13.6	41.1	102.5	-	-	Carrier
Hori.	9920.001	PK	43.5	38.6	8.0	39.9	50.2	82.5	32.3	
Vert.	2480.000	PK	98.9	26.6	13.6	41.1	98.0	-	-	Carrier
Vert.	9920.001	PK	39.6	38.6	8.0	39.9	46.3	78	31.7	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date February 9, 2015
 Temperature / Humidity 27 deg.C, 31 %RH
 Engineer Yosuke Ishikawa
 Mode Tx, 2402 MHz
 Tx, Bluetooth Low Energy, Dual Antenna

(* 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	46.7	26.4	13.6	41.1	45.6	73.9	28.3	100	131	
Vert.	2390.000	PK	46.5	26.4	13.6	41.1	45.4	73.9	28.5	100	314	

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$ **Average measurement value with duty factor**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	36.7	26.4	13.6	41.1	4.1	39.7	53.9	14.2	*1)
Vert.	2390.000	AV	36.8	26.4	13.6	41.1	4.1	39.8	53.9	14.1	*1)

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

*1) Not out of Band emission (Leakage Power)

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.	2402.000	PK	103.0	26.4	13.6	41.1	101.9	-	-	Carrier
Hori.	2400.000	PK	44.4	26.4	13.6	41.1	43.3	81.9	38.6	
Vert.	2402.000	PK	95.8	26.4	13.6	41.1	94.7	-	-	Carrier
Vert.	2400.000	PK	38.9	26.4	13.6	41.1	37.8	74.7	36.9	

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

Distance factor : 15GHz -40GHz : $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date February 9, 2015
Temperature / Humidity 27 deg.C, 31 %RH
Engineer Yosuke Ishikawa
Mode Tx, 2480 MHz
 Tx, Bluetooth Low Energy, Dual Antenna

(* 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	48.8	26.6	13.6	41.1	47.9	73.9	26.0	100	126	
Vert.	2483.500	PK	46.5	26.6	13.6	41.1	45.6	73.9	28.3	100	295	

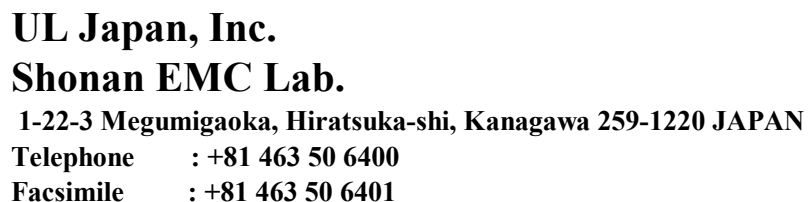
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Ampriifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	38.8	26.6	13.6	41.1	4.1	42.0	53.9	11.9	*1)
Vert.	2483.500	AV	37.3	26.6	13.6	41.1	4.1	40.5	53.9	13.4	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Ampriifier) + Duty factor
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB
*1) Not out of Band emission (Leakage Power)

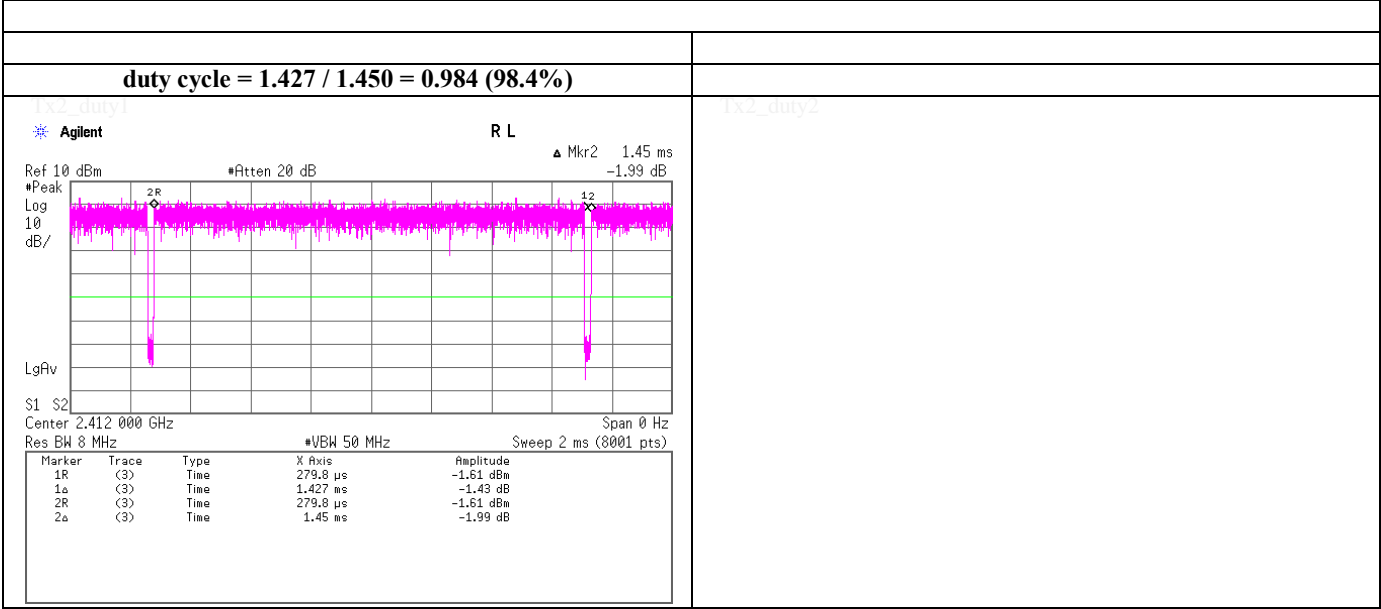
Tx, IEEE802.11b, PN9, worst data mode 11Mbps



Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date January 5, 2015
Temperature / Humidity 26deg.C , 30%RH
Engineer Yosuke Ishikawa

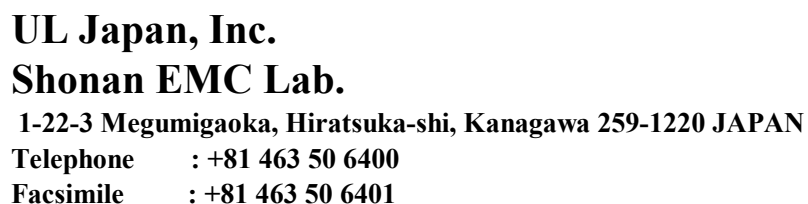
Burst rate confirmation

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



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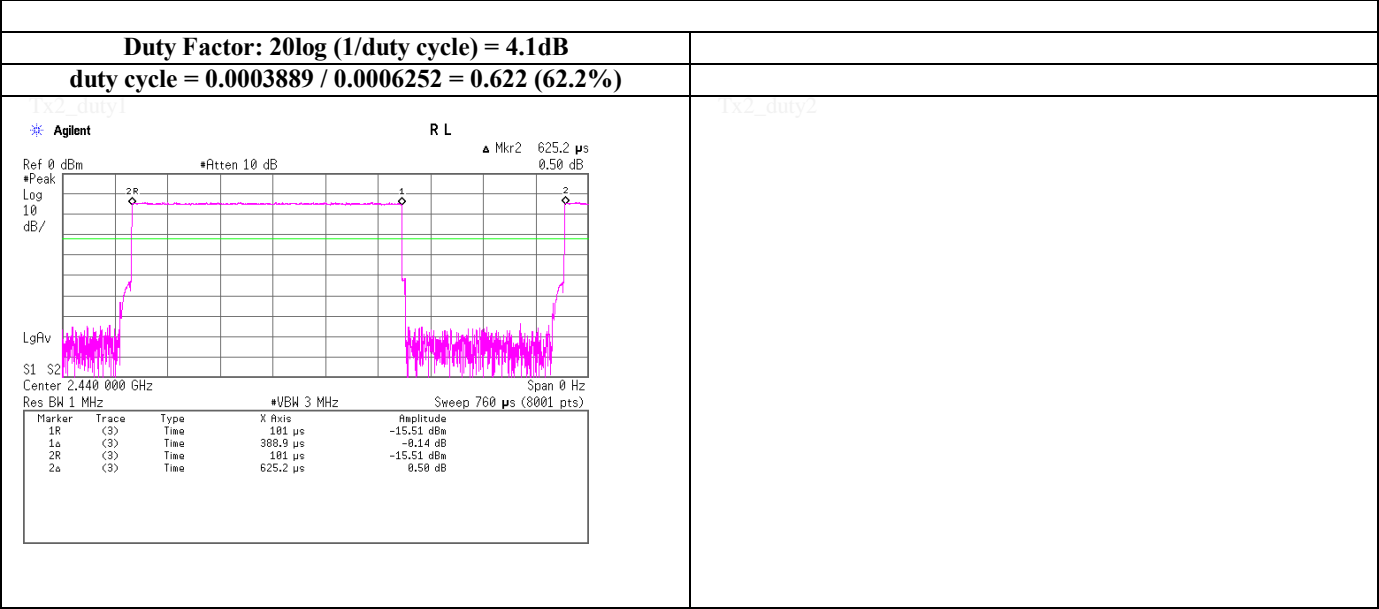
Tx, IEEE802.11n(HT20), PN9, worst data mode 0(MCS)



Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date February 4, 2015
Temperature / Humidity 25deg.C , 48%RH
Engineer Shinichi Takano

Duty Factor Calculation chart

Tx, Bluetooth, Low Energy, PN9



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Test place

UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room

Date

January 5, 2015

Temperature / Humidity

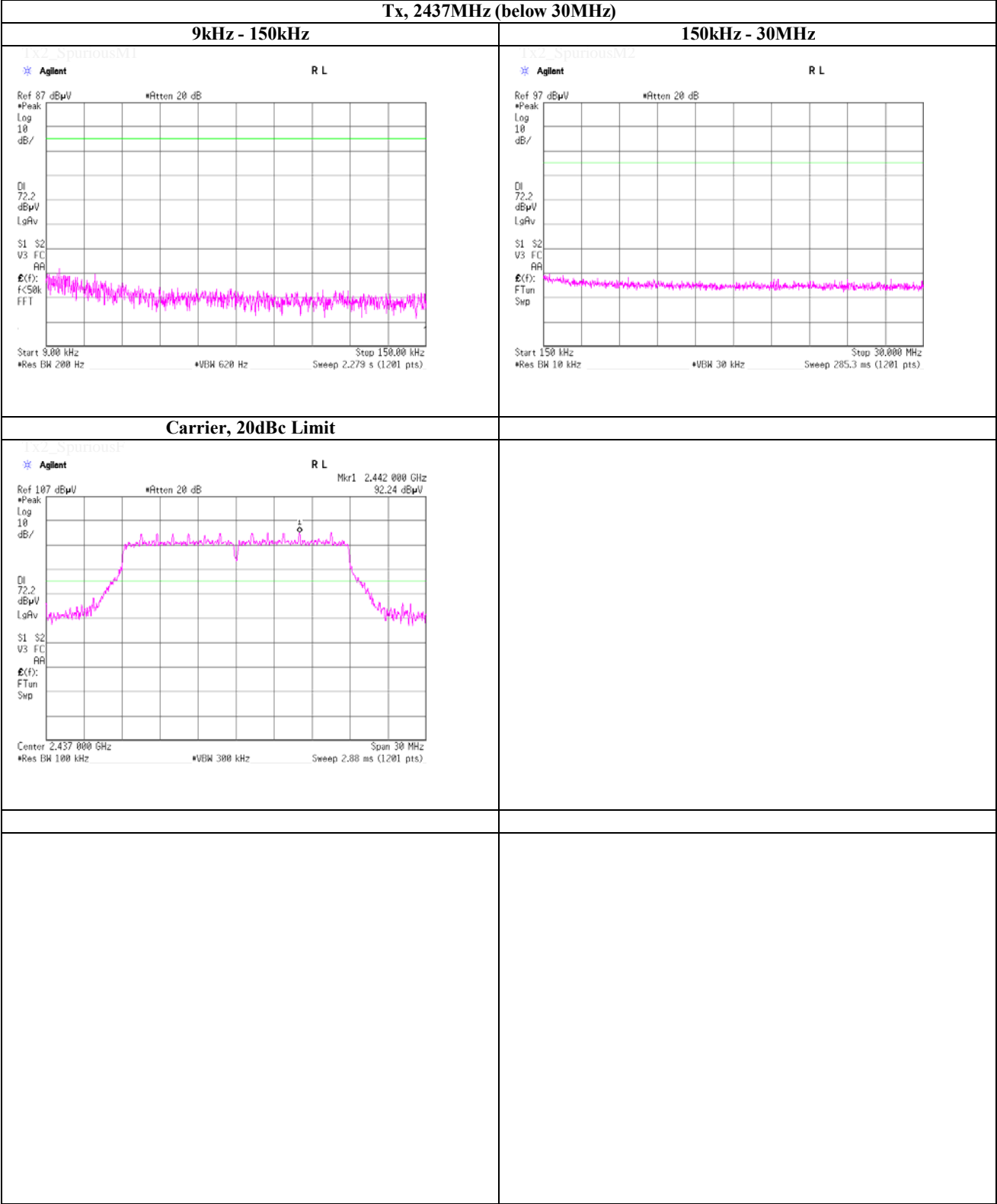
26deg.C , 30%RH

Engineer

Yosuke Ishikawa

Spurious emission (Conducted)

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



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Test place

UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room

Date

February 9, 2015

Temperature / Humidity

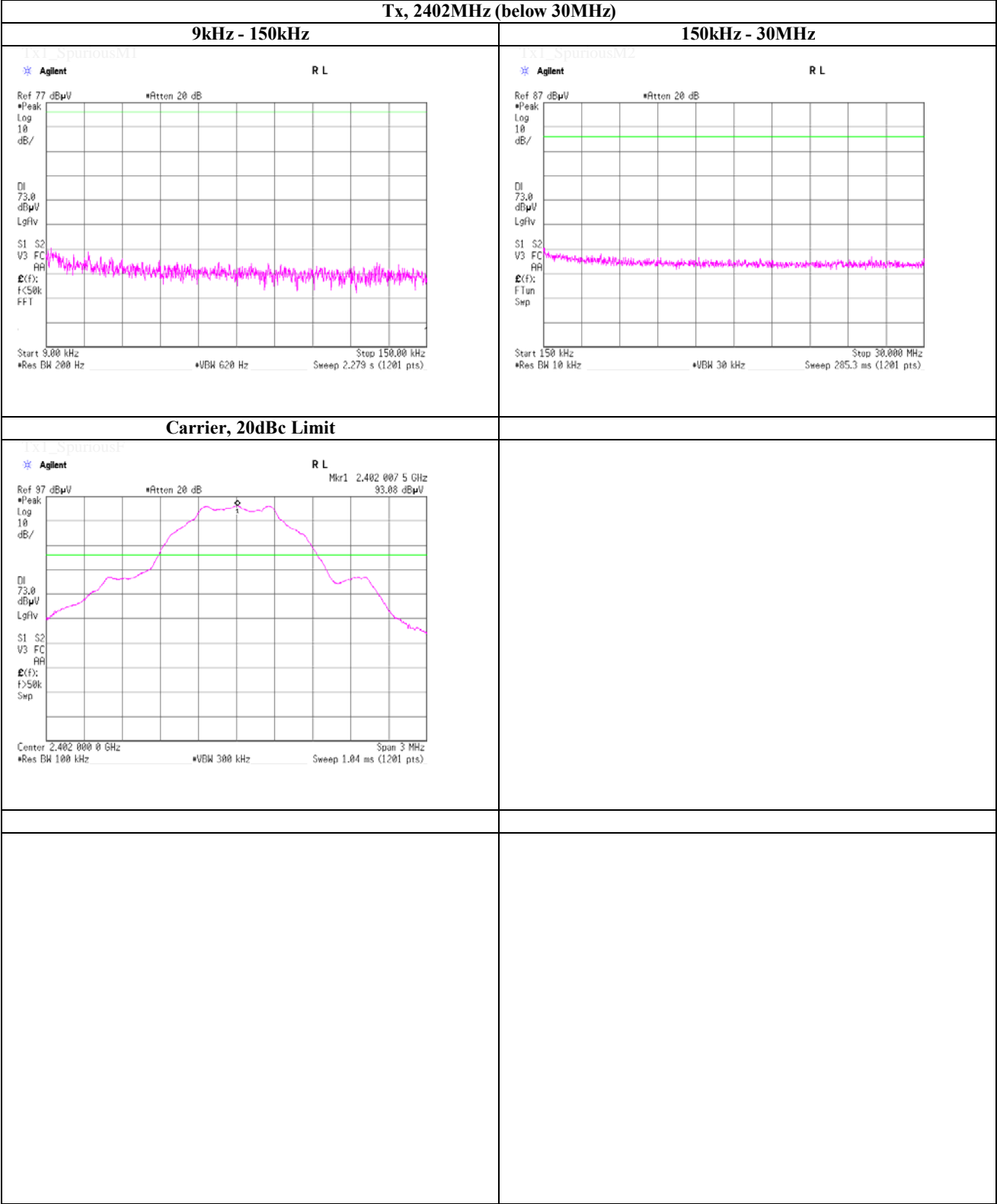
24 deg.C , 43 %RH

Engineer

Tatsuya Arai

Spurious emission (Conducted)

Tx, Bluetooth, Low Energy, PN9
Tx, 2402MHz (below 30MHz)



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Test place

UL Japan, Inc. Shonan EMC Lab.

No.5 Shielded Room

Date

February 9, 2015

Temperature / Humidity

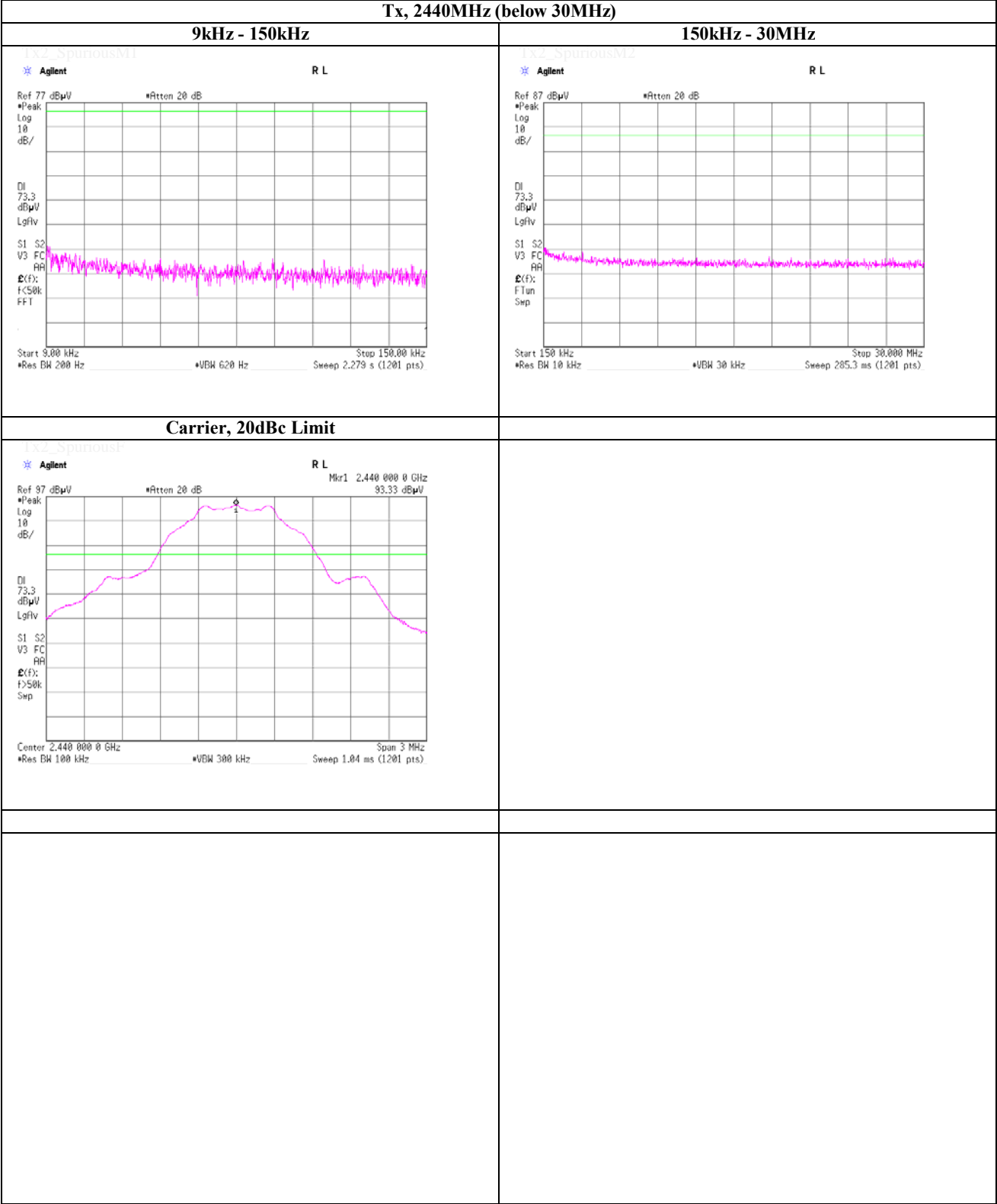
24 deg.C , 43 %RH

Engineer

Tatsuya Arai

Spurious emission (Conducted)

Tx, Bluetooth, Low Energy, PN9
Tx, 2440MHz (below 30MHz)



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Test place

UL Japan, Inc. Shonan EMC Lab.

No.5 Shielded Room

Date

February 9, 2015

Temperature / Humidity

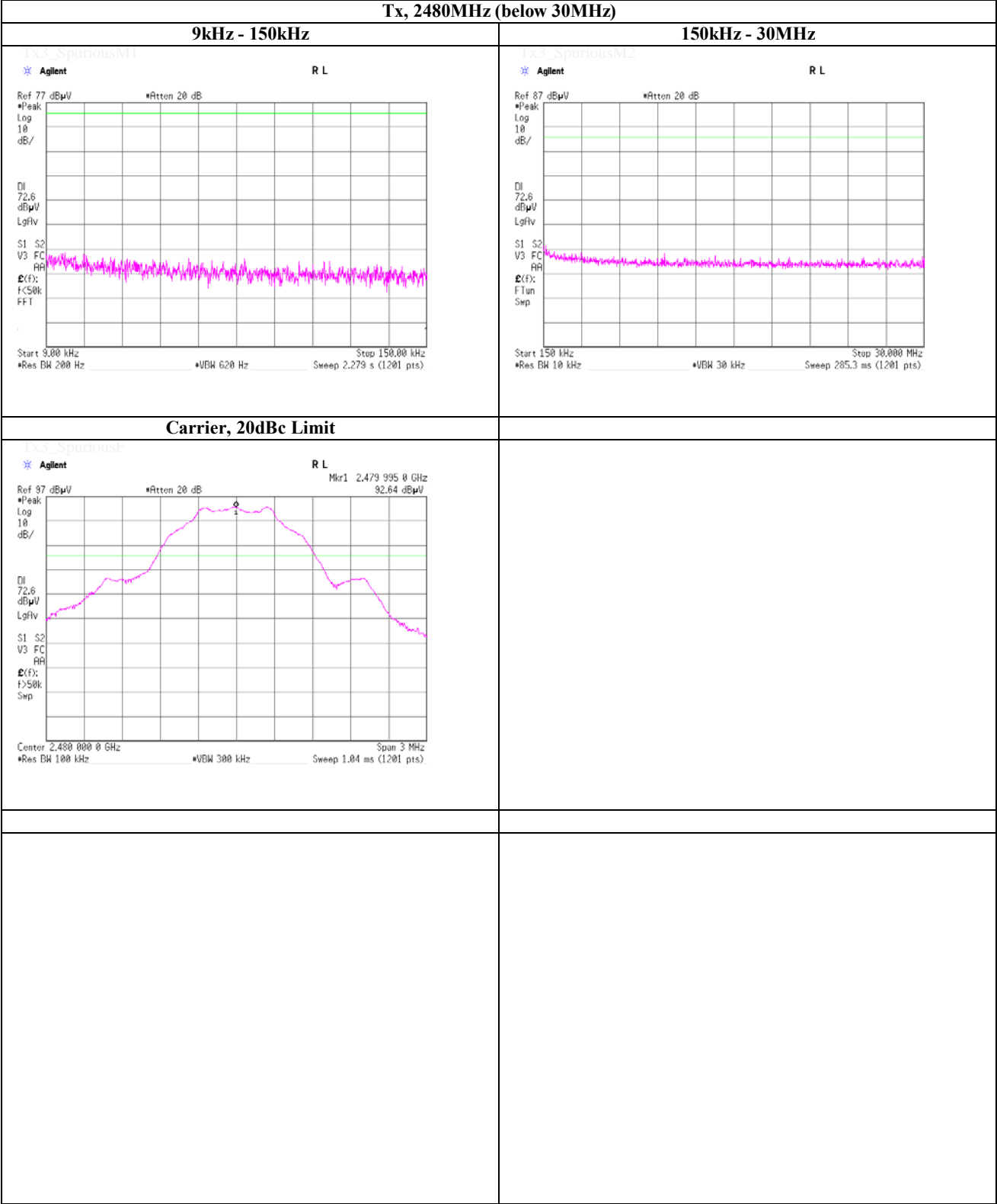
24 deg.C , 43 %RH

Engineer

Tatsuya Arai

Spurious emission (Conducted)

Tx, Bluetooth, Low Energy, PN9
Tx, 2480MHz (below 30MHz)



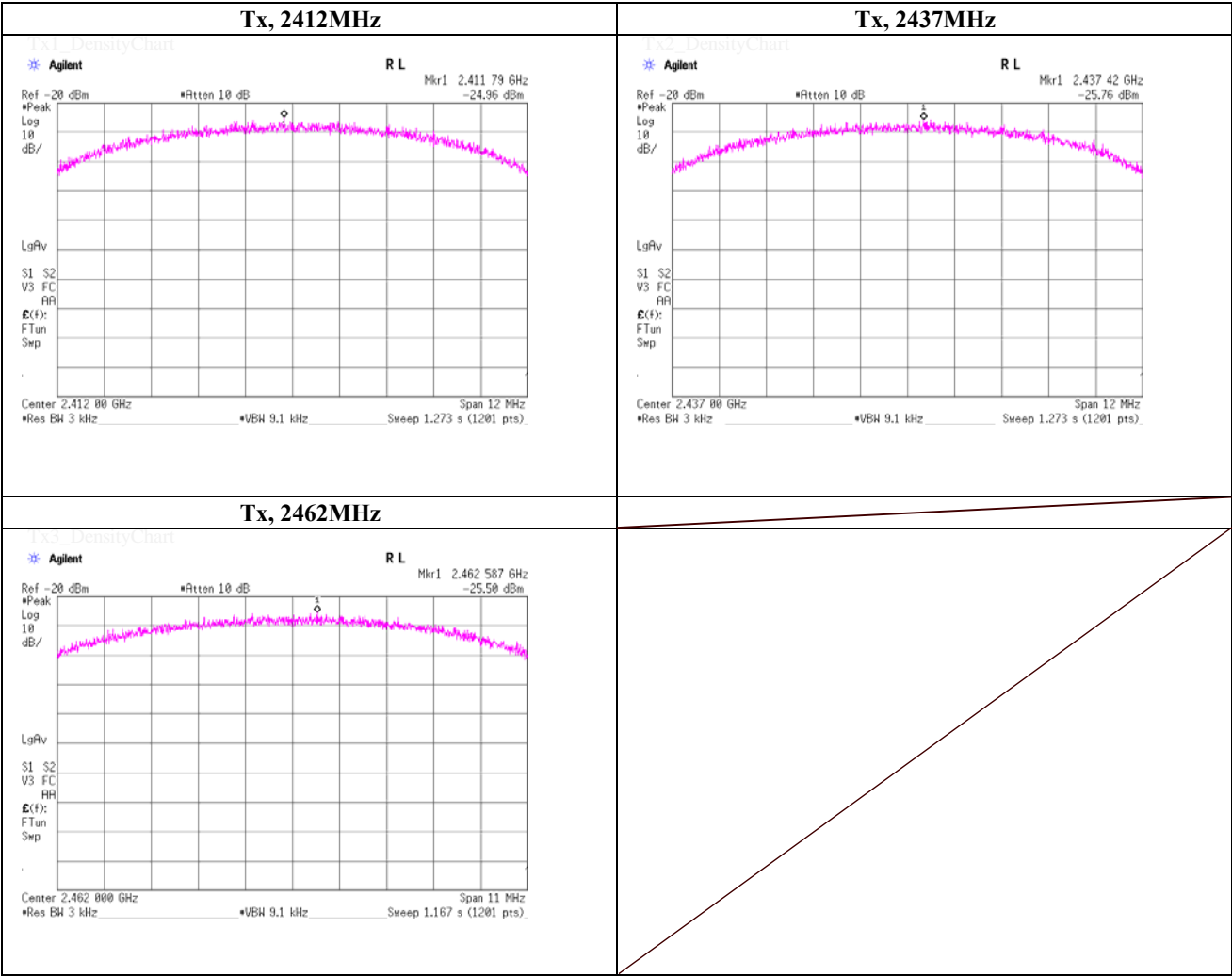
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Maximum Power Spectral Density
(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	January 5, 2015	
Temperature / Humidity	26deg.C , 30%RH	
Engineer	Yosuke Ishikawa	
Mode	Tx, IEEE802.11b, PN9, worst data mode 11Mbps	

Ch. Freq.	Freq. Reading	Reading	Cable Loss	Atten.	Result	Limit	Margin
[MHz]	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.0000	2411.79	-24.96	1.10	20.24	-3.62	8.00	11.62
2437.0000	2437.42	-25.76	1.10	20.24	-4.42	8.00	12.42
2462.0000	2462.59	-25.50	1.10	20.24	-4.16	8.00	12.16

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



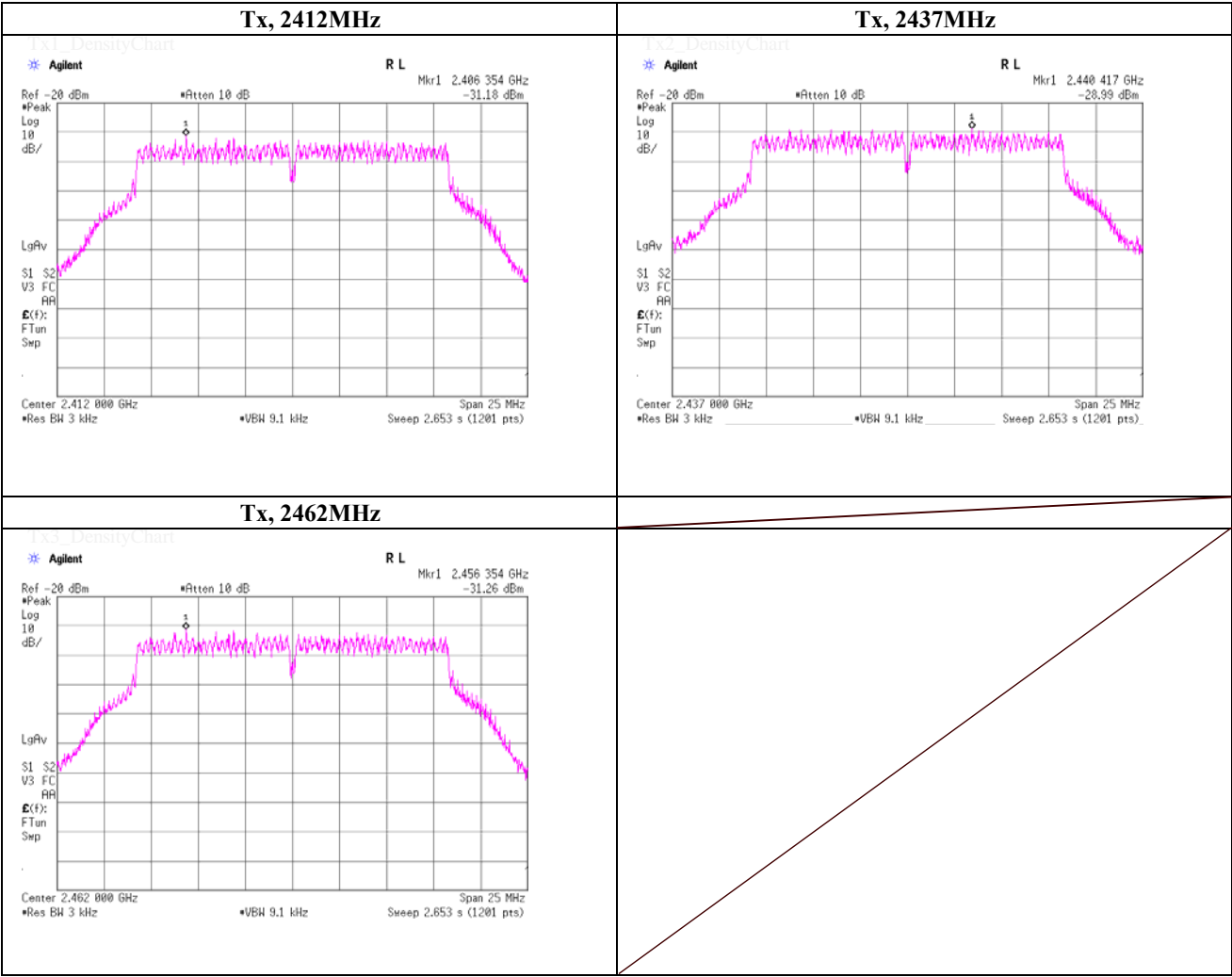
UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Maximum Power Spectral Density
(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	January 5, 2015	January 21, 2015
Temperature / Humidity	26deg.C , 30%RH	23deg.C , 41%RH
Engineer	Yosuke Ishikawa	Shinichi Takano
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	2406.35	-31.18	1.10	20.24	-9.84	8.00	17.84
2437.0000	2440.42	-28.99	1.10	20.24	-7.65	8.00	15.65
2462.0000	2456.35	-31.26	1.10	20.24	-9.92	8.00	17.92

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



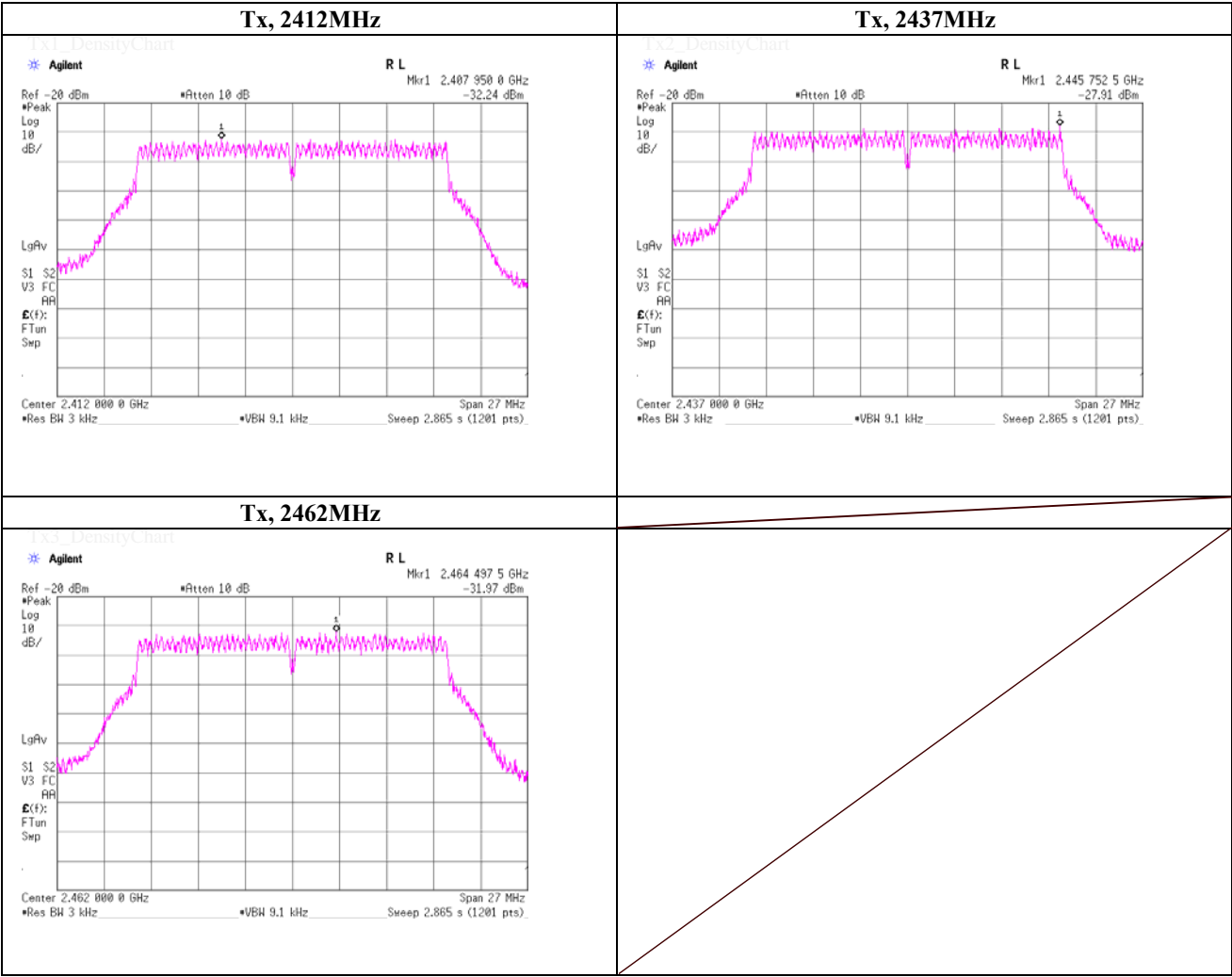
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Telephone : +81 463 50 6400
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Maximum Power Spectral Density
(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	January 5, 2015	
Temperature / Humidity	26deg.C , 30%RH	
Engineer	Yosuke Ishikawa	
Mode	Tx, IEEE802.11n(HT20), PN9, worst data mode 0(MCS)	

Ch. Freq.	Freq. Reading	Reading	Cable Loss	Atten.	Result	Limit	Margin
[MHz]	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.0000	2407.95	-32.24	1.10	20.24	-10.90	8.00	18.90
2437.0000	2445.75	-27.91	1.10	20.24	-6.57	8.00	14.57
2462.0000	2464.50	-31.97	1.10	20.24	-10.63	8.00	18.63

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



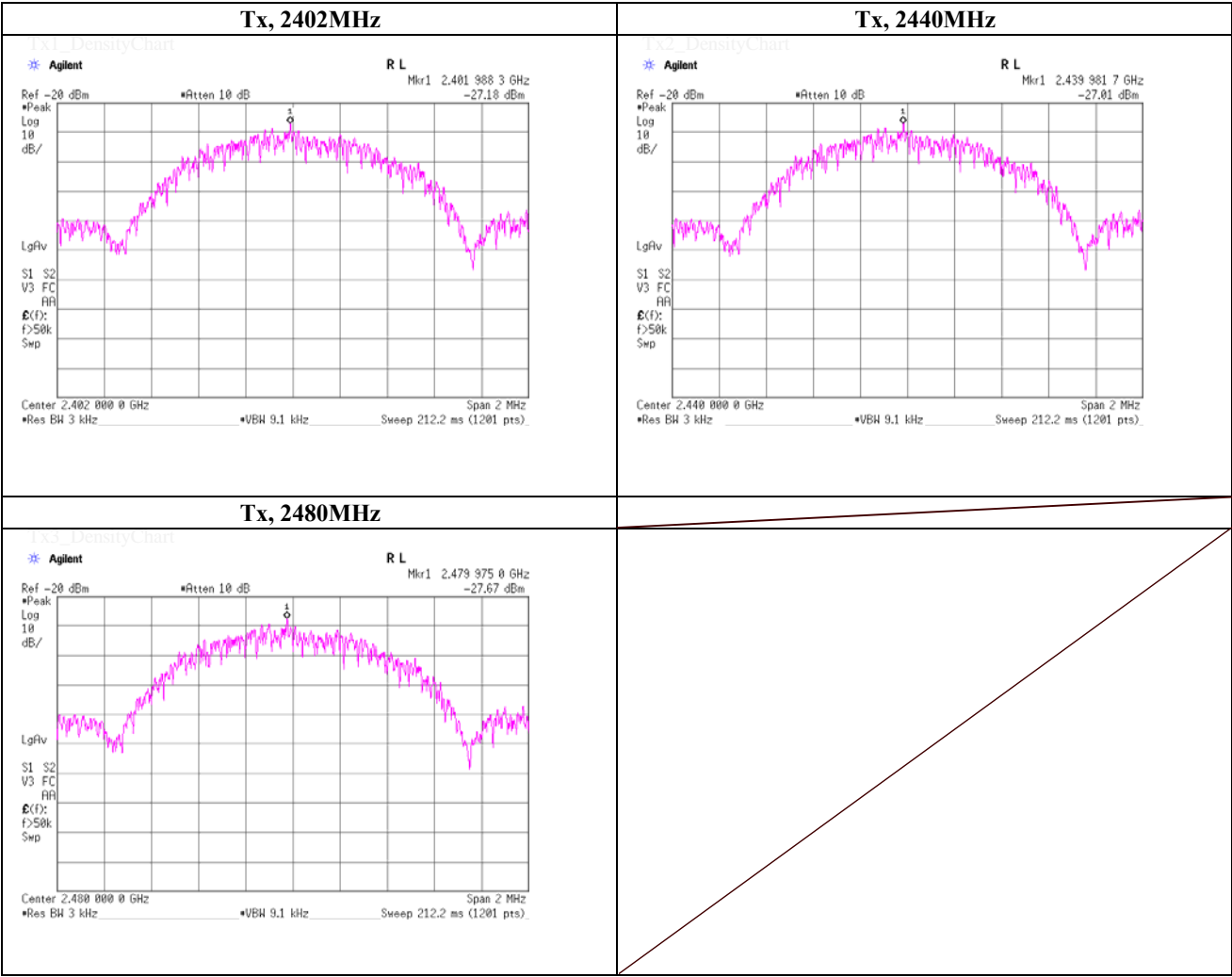
UL Japan, Inc.
Shonan EMC Lab.
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Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Maximum Power Spectral Density
(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	February 9, 2015	
Temperature / Humidity	24 deg.C , 43 %RH	
Engineer	Tatsuya Arai	
Mode	Tx, Bluetooth, Low Energy, PN9	

Ch. Freq.	Freq. Reading	Reading	Cable Loss	Atten.	Result	Limit	Margin
[MHz]	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2402.0000	2401.99	-27.18	1.09	20.24	-5.85	8.00	13.85
2440.0000	2439.98	-27.01	1.10	20.24	-5.67	8.00	13.67
2480.0000	2479.98	-27.67	1.11	20.24	-6.32	8.00	14.32

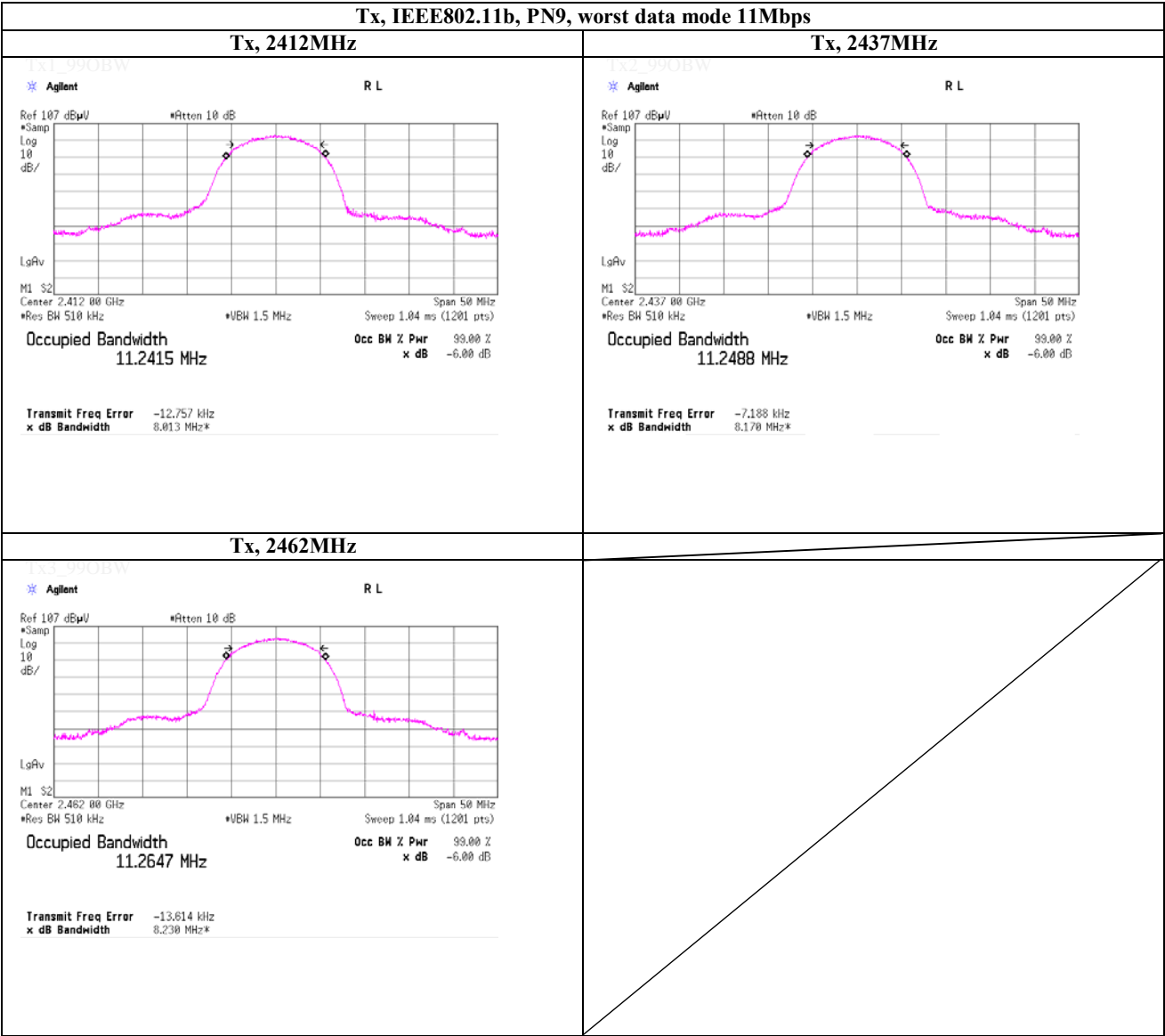
Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss



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Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date January 5, 2015
Temperature / Humidity 26deg.C , 30%RH
Engineer Yosuke Ishikawa

99% Occupied Bandwidth



UL Japan, Inc.
Shonan EMC Lab.
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Telephone : +81 463 50 6400
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Test place

UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room

Date

January 5, 2015

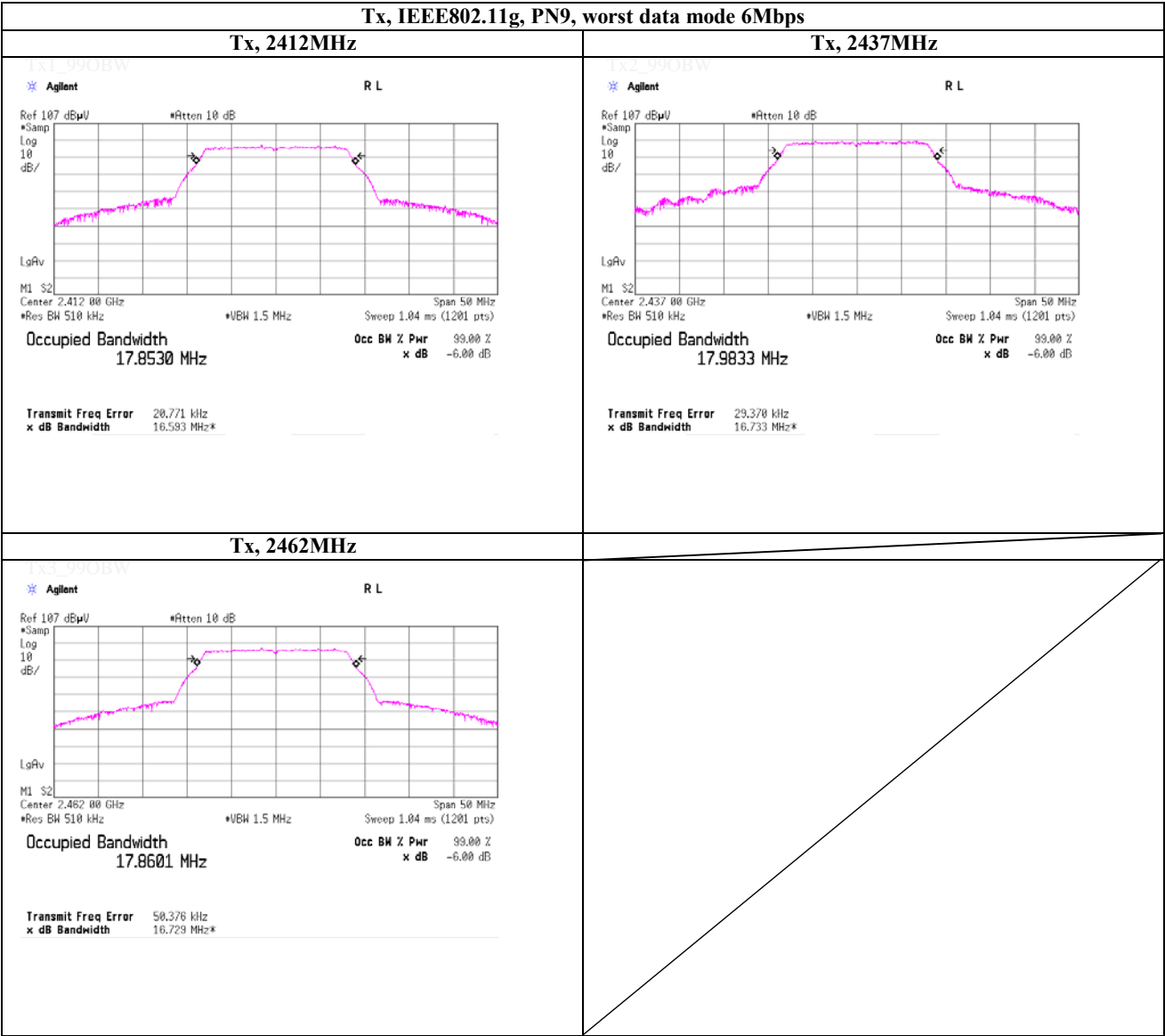
Temperature / Humidity

26deg.C , 30%RH

Engineer

Yosuke Ishikawa

99% Occupied Bandwidth



UL Japan, Inc.

Shonan EMC Lab.

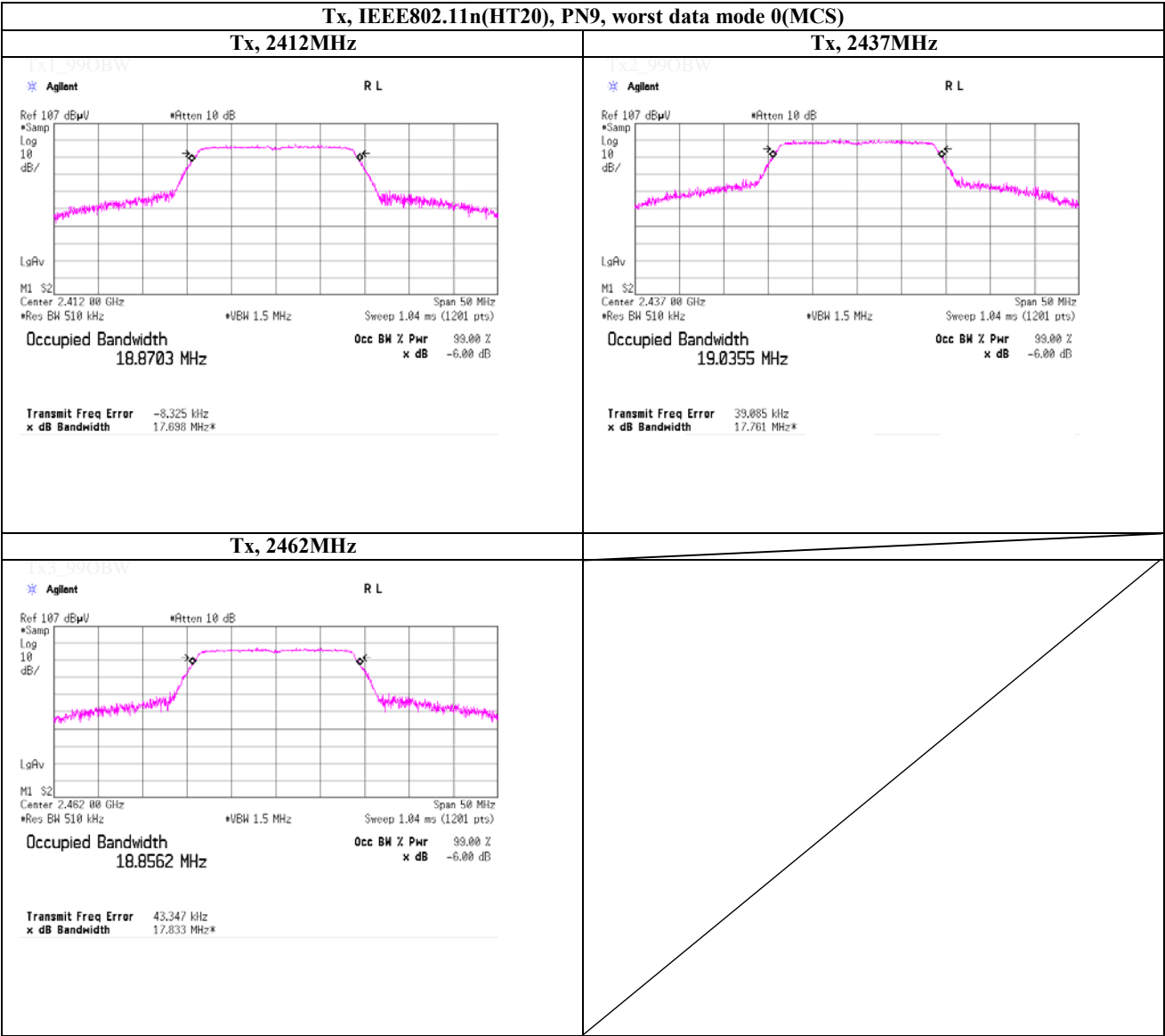
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

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Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date January 5, 2015
Temperature / Humidity 26deg.C , 30%RH
Engineer Yosuke Ishikawa

99% Occupied Bandwidth



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Test place

UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room

Date

February 9, 2015

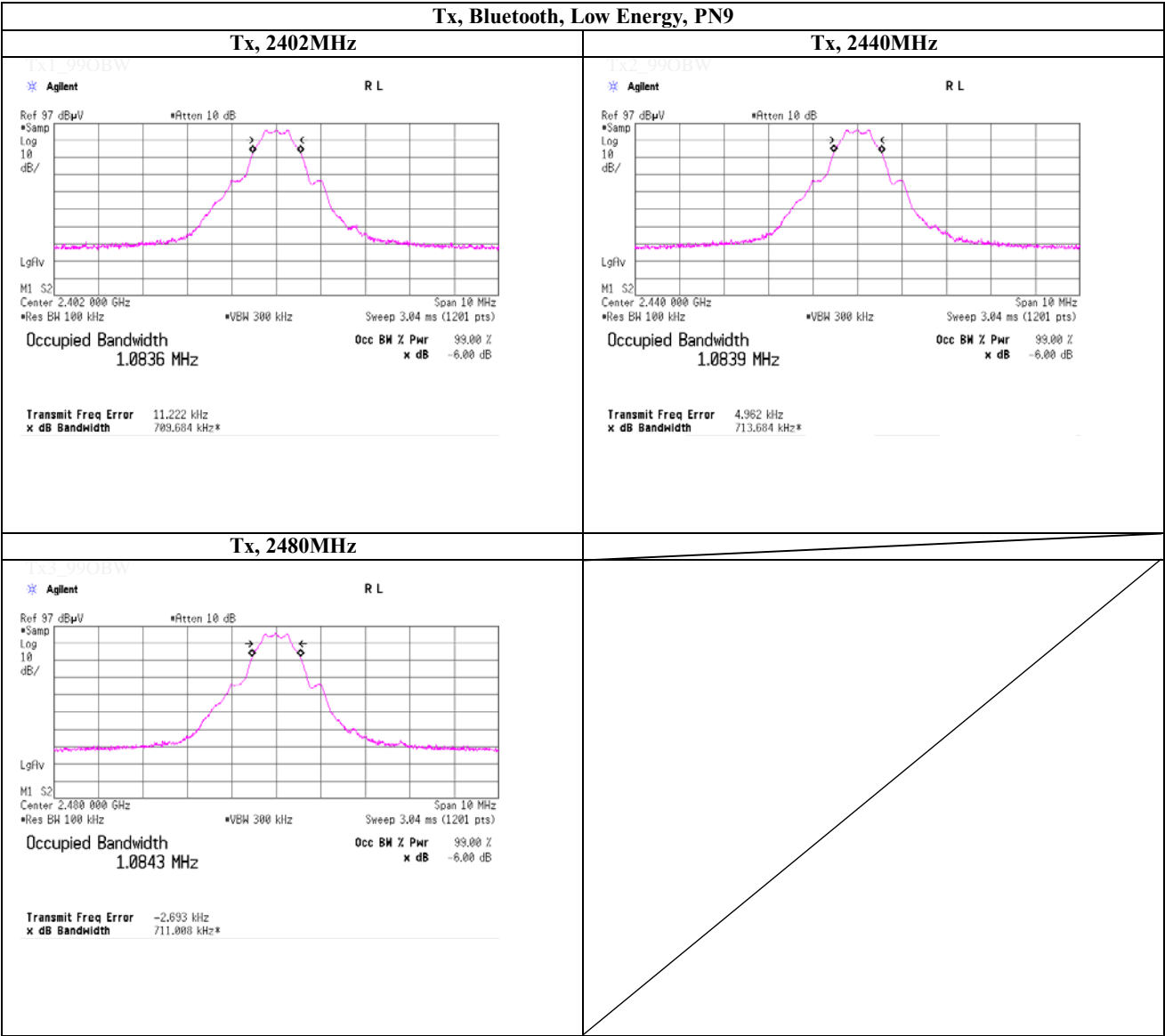
Temperature / Humidity

24 deg.C , 43 %RH

Engineer

Tatsuya Arai

99% Occupied Bandwidth



UL Japan, Inc.

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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-07	Power Meter	Agilent	8990B	MY5100272	AT	2014/04/04 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2014/04/04 * 12
SAT20-07	Attenuator	Weinschel Corp.	54A-20	31484	AT	2014/04/22 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2014/03/13 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2014/12/24 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2014/02/03 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2014/07/14 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2014/05/23 * 12
SCC-G04	Coaxial Cable	Junkosha	J12J102207-00	JUN-12-14-018	RE	2014/06/24 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2014/05/15 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2014/08/12 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2014/10/30 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2014/03/17 * 12
SJM-15	Measure	ASKUL	-	-	RE,CE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE,CE	-
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
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2014/04/22 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2014/03/15 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2014/05/15 * 12
SCC-G18	Coaxial Cable	Suhner	SUCOFLEX 104A	46292/4A	RE	2014/03/14 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2014/10/18 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2014/10/18 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2014/08/27 * 12
SCC-C1/C2/C 3/C4/C5/C10/ SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-271(RF Selector)	RE	2014/04/25 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2014/02/14 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE,CE	2014/03/04 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2014/03/15 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2014/03/13 * 12
SCC-C9/C10/S RSE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/N S4906	-/0901-271(RF Selector)	CE	2014/04/25 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2014/02/26 * 12
SAT3-06	Attenuator	JFW	50HF-003N	-	CE	2014/02/17 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2014/12/24 * 12
STM-05	Terminator	TME	CT-01 BP	-	CE	2014/12/19 * 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 disturbance voltage