



Test report No. : 10712938S-B
Page : 1 of 50
Issued date : March 18, 2015
Revised date : March 31, 2015
FCC ID : AJDK090

RADIO TEST REPORT

Test Report No.: 10712938S-B

Applicant : PIONEER CORPORATION

Type of Equipment : Car Audio

Model No. : CVH-8538ZH

FCC ID : AJDK090

Test regulation : FCC Part15 Subpart C: 2015

Test result : Complied

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Date of test: March 2 to 3, 2015

Representative test engineer:

Y. Ishikawa

Yosuke Ishikawa

Engineer

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Consumer Technology Division



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13-EM-F0429

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SECTION 1: Customer information

Company Name : PIONEER CORPORATION
Brand name : Pioneer
Address : 25-1 Aza-Nishi-machi, Yamada, Kawagoe-shi, Saitama, 350-8555, JAPAN
Telephone Number : +81-49-228-6415
Facsimile Number : +81-49-228-6493
Contact Person : Tomoyuki Tanaka

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

2.1 Identification of E.U.T.

Type of Equipment : Car Audio
Model No. : CVH-8538ZH
Serial No. : Refer to 4.2 of this report.
Rating : DC 13.2V
Country of Mass-production : Japan
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No modification by the test lab.
Receipt Date of Sample : March 2, 2015

2.2 Product description

Model: CVH-8538ZH (referred to as the EUT in this report) is a Car Audio.

The clock frequencies used in the EUT:

26MHz (Crystal and oscillator)
533MHz (Max in others)

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Radio specification:

Bluetooth:

Equipment type : Transceiver
Frequency of operation : 2402-2480MHz
Bandwidth & channel spacing : 79MHz & 1MHz
Type of modulation : GFSK, $\pi/4$ DQPSK, 8DPSK
Antenna type : Inverted-F Antenna
Antenna gain with cable loss : -0.996dBi (max)
Antenna connector type : U.FL Connector
Operation temperature range : -20 to +70 deg.C.

Wireless LAN:

Equipment type : Transceiver
Frequency of operation : 2412-2462MHz
Bandwidth & channel spacing : 5MHz
Type of modulation : BPSK, QPSK, CCK, 16QAM, 64QAM
Antenna type : Inverted-F Antenna
Antenna gain with cable loss : -1.387dBi (max)
Antenna connector type : U.FL Connector
Operation temperature range : -20 to +70 deg.C.

Refer to the test report: 10712938S-A for Bluetooth part.

FCC 15.31 (e)

The EUT provides stable voltage ($DC3.3\pm0.1V$) constantly to the wireless transmitter regardless of input voltage. Instead of a new battery, DC power supply was used for the test. That does not affect the test result, therefore the EUT complies with the requirement.

FCC 15.203

The equipment and its antenna comply with the requirement since the antenna is built in the equipment and it cannot be replaced by end users.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

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

3.2 Procedures & Results

Item	Test Procedure *1)	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.10:2009	FCC 15.207	-	N/A *2)	-	-
6dB bandwidth	ANSI C63.10:2009	FCC 15.247 (a)(2)	Conducted	N/A	* See data	Complied
Maximum peak conducted 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	10.2dB Freq.: 9648.000MHz Polarization: Vertical Detection: Average Mode: Tx 2412MHz, IEEE 802.11g Freq.: 2390.000 MHz Polarization: Horizontal Detection: Average Mode: Tx 2412MHz, IEEE 802.11n-HT20	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".

*2) The test is not applicable since the EUT has no AC mains.

3.3 Addition to standard

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

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

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

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3.4 Uncertainty

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

Item	Frequency range	No.1 SAC ^{*1} /SR ^{*2} (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
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

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

Antenna port conducted test

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

Conducted emissions, Power Density Measurement (below 1GHz) uncertainty for this test was: (±) 1.5dB

Conducted emissions, Power Density Measurement (1G-3GHz) uncertainty for this test was: (±) 1.7dB

Conducted emissions, Power Density Measurement (3G-18GHz) uncertainty for this test was: (±) 2.4dB

Conducted emissions Measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.5dB

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

3.5 Test location

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JAB Accreditation No. : RTL02610

	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
☐ No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
☐ No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
☐ No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
☐ No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
☒ No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ No.7 Shielded room	-	2.76 x 3.76 x 2.4	2.76 x 3.76	-
☐ No.8 Shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
☐ No.1 Measurement room	-	2.55 x 4.1 x 2.5	2.55 x 4.1	-

3.6 Test setup, Data of test & 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	Worst data mode *1)
Radiated emission (below 1GHz), Out of band emission (Antenna port conducted) *2)	Transmitting IEEE 802.11n(HT20)	2462MHz	MCS0, 800ns GI, PN9
Other items	Transmitting IEEE 802.11b	2412MHz, 2437MHz, 2462MHz	11Mbps, PN9
	Transmitting IEEE 802.11g	2412MHz, 2437MHz, 2462MHz	12Mbps, PN9
	Transmitting IEEE 802.11n(HT20)	2412MHz, 2437MHz, 2462MHz	MCS0, 800ns GI, PN9
*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.			

EUT has the power settings by the software as follows;

Power settings	Fixed
Software	System uCOM: H42F0D 21.02.12, Application: 1.DY02.68

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

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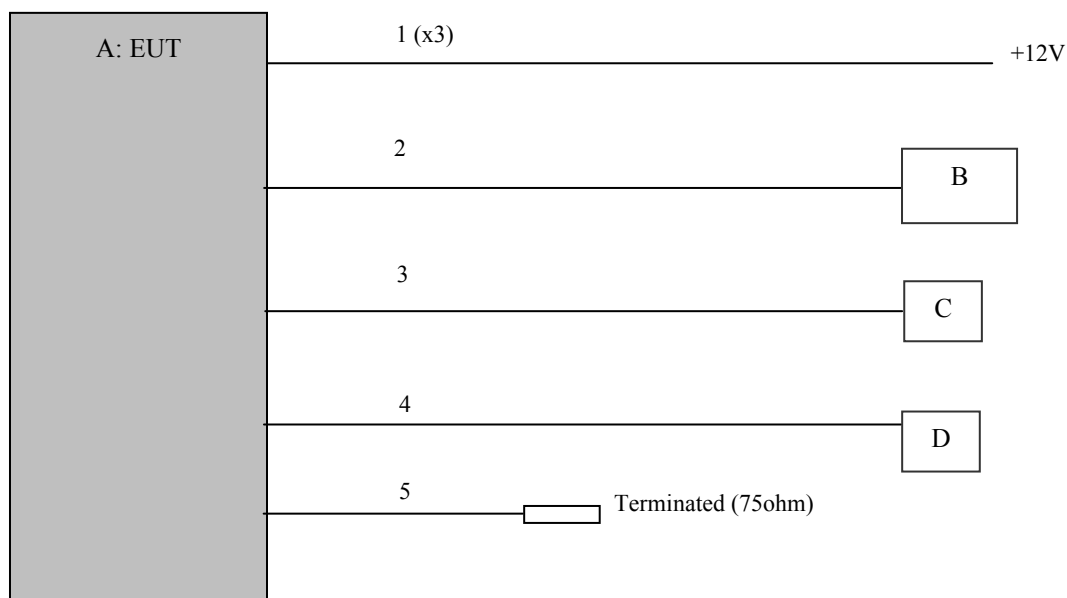
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4.2 Configuration and peripherals



* 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	Car Audio	CVH-8538ZH	*1)	PIONEER	EUT
B	Tablet Computer	Nexus 7 (2013) ME571-16G	07924744	ASUS	-
C	iPod nano	A1199	YM7034TTVQH	Apple	-
D	iPod nano	A1137	UM619HBMUNA	Apple	-

*1) AAB999999CS: used for Radiated emission tests. , AAB999998CS: used for Antenna terminal tests.

List of cables used

No.	Cable Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC	0.3	Unshielded	Unshielded	ACC, +B, GND
2	HDMI	2.2	Unshielded	Unshielded	-
3	USB	4.3	Unshielded	Unshielded	-
4	USB	4.3	Unshielded	Unshielded	-
5	Radio	2.1	Unshielded	Unshielded	-

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SECTION 5: 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 8.1 Option 1 and 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 6: Maximum peak conducted output power

Test procedure

The Maximum Peak Output Power was measured with a power meter connected to the antenna port.

The test was measured based on Method 9.1.2 PKPM1 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

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

SECTION 7: Out of band emissions (Antenna port conducted)

Test procedure

The Out of Band Emissions was measured with a spectrum analyzer connected to the antenna port.

The radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.

Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=10kHz)

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

SECTION 8: 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 9: Radiated emission

9.1 Operating environment

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

9.2 Test configuration

EUT was placed on a platform of nominal size, 1.0m 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 EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Photographs of the set up are shown in APPENDIX 3.

9.3 Test conditions

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

9.4 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: Liner voutage averaging	RBW: 100kHz VBW: 300kHz

*1) Average Power Measurement was measured based on 12.2.5 of KDB 558074 "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247".

The axis of EUT was fixed at angle of 34 deg. based on the product specification.

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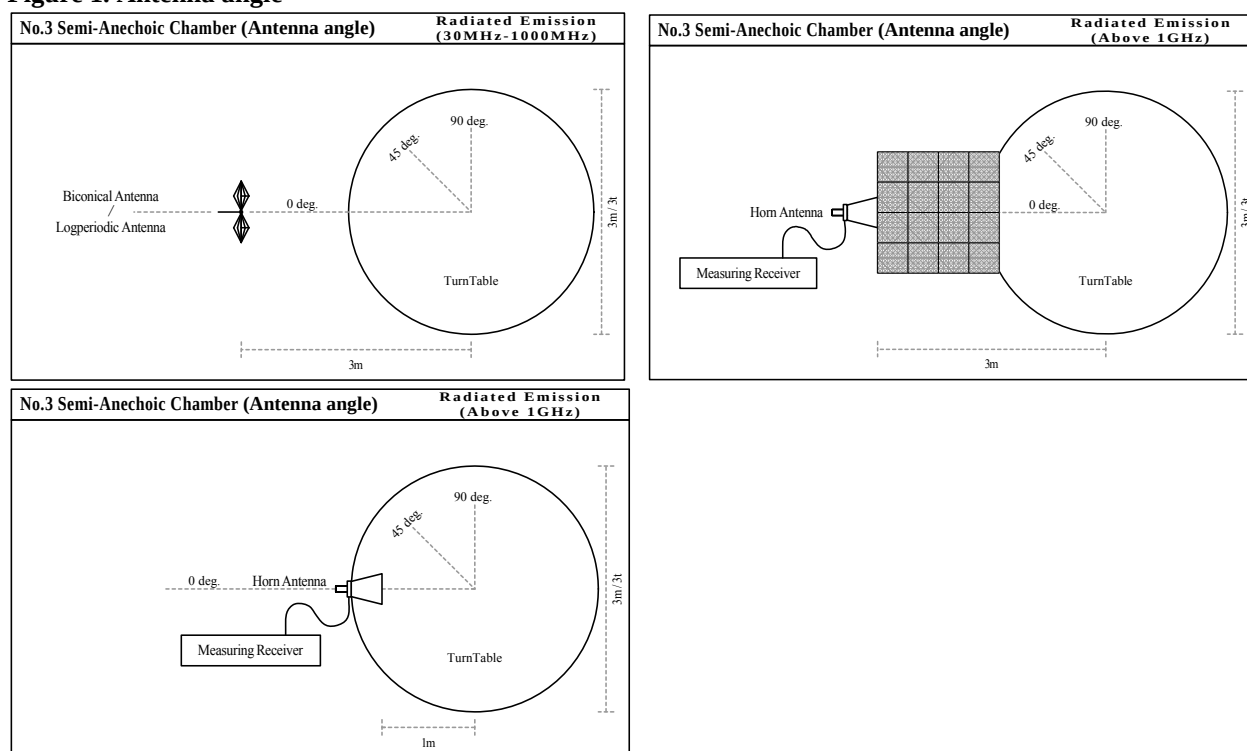
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Figure 1. Antenna angle



9.5 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.

9.6 Results

Summary of the test results :

Pass

* No noise was detected above the 4th order harmonics.

Refer to APPENDIX 1.

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APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Radiated emission

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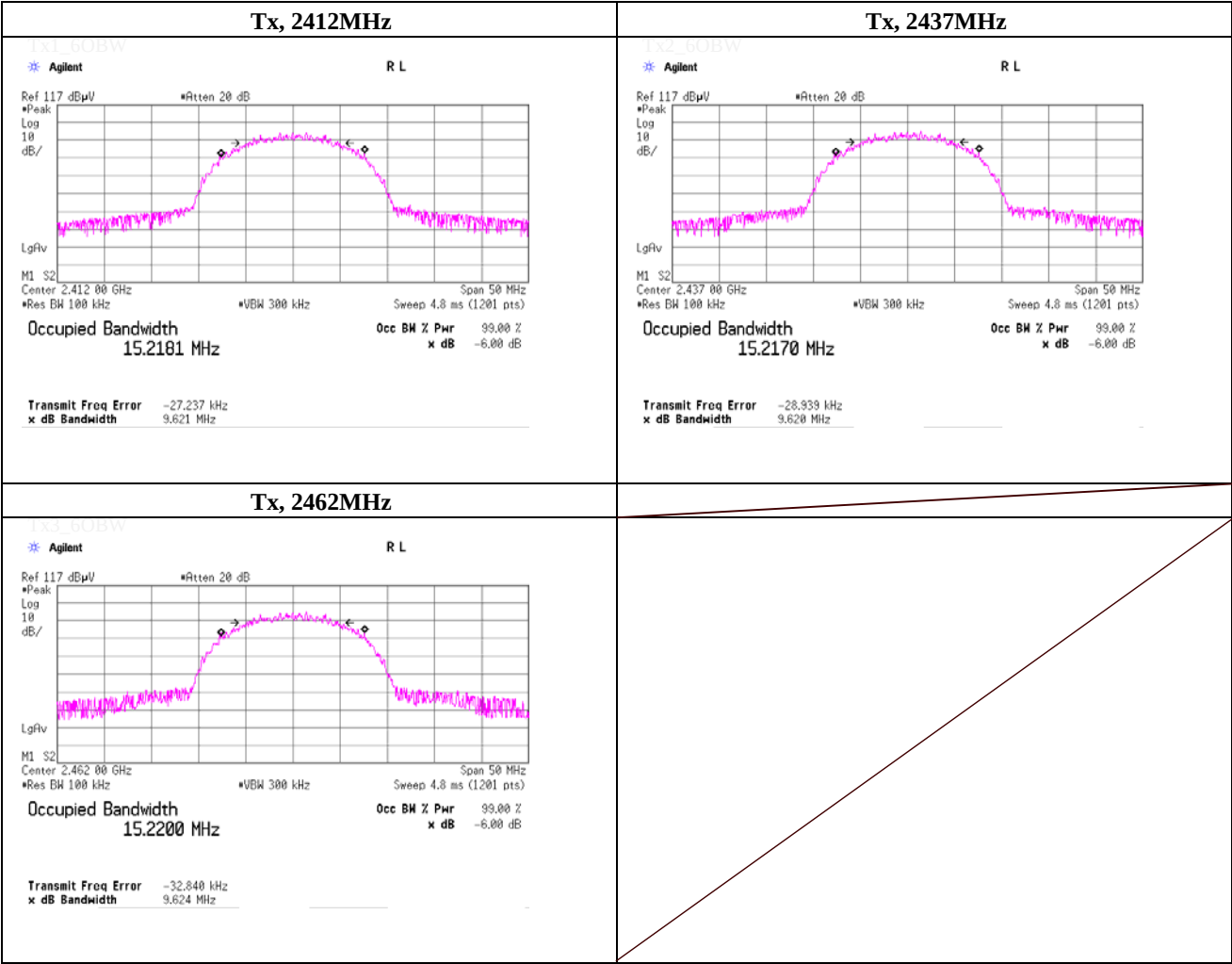
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APPENDIX 1: Data of Radio tests

-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 2, 2015	
Temperature / Humidity	22deg.C , 40%RH	
Engineer	Yosuke Ishikawa	
Mode	Tx, IEEE802.11b, PN9, worst data mode 11Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	9.621	> 0.500
2437.0000	9.620	> 0.500
2462.0000	9.624	> 0.500

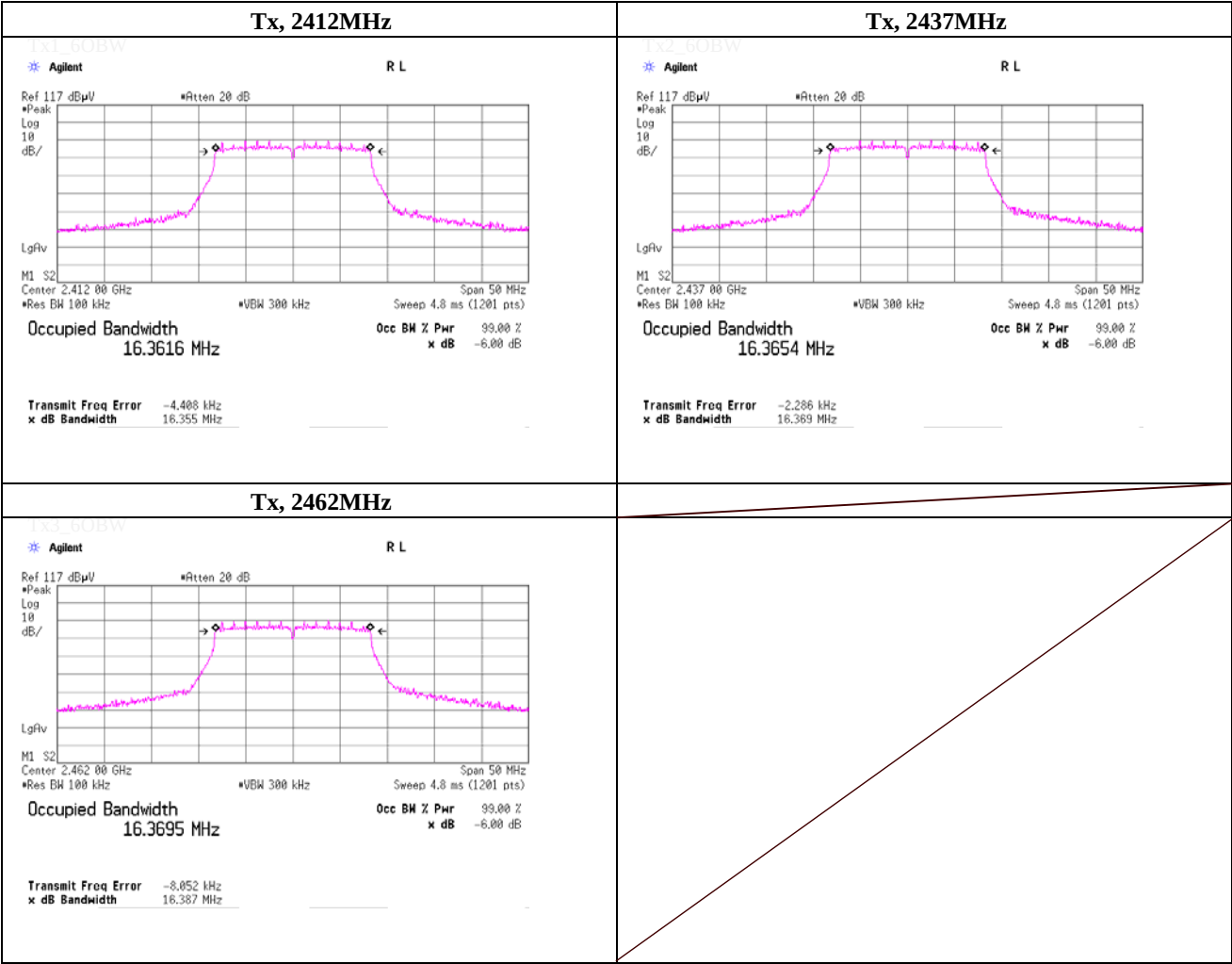


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-6dB Bandwidth

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 2, 2015	
Temperature / Humidity	22deg.C , 40%RH	
Engineer	Yosuke Ishikawa	
Mode	Tx, IEEE802.11g, PN9, worst data mode 12Mbps	

Freq. [MHz]	-6dB Bandwidth [MHz]	Limit [MHz]
2412.0000	16.355	> 0.500
2437.0000	16.369	> 0.500
2462.0000	16.387	> 0.500



[illegible]

Maximum Peak Conducted Output Power

(PKPM1)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
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Date March 2, 2015

Temperature / Humidity 22deg.C , 40%RH

Engineer Yosuke Ishikawa

Mode	Tx, IEEE802.11b, PN9,
------	-----------------------

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]	
Low	2412.0	5.62	1.12	9.90	16.64	46.13	30.00	1000	13.36
Mid	2437.0	5.74	1.12	9.90	16.76	47.42	30.00	1000	13.24
High	2462.0	5.66	1.13	9.90	16.69	46.67	30.00	1000	13.31

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	2437.0	5.43	1.12	9.90	16.45	44.16	30.00	1000	13.55
	2	2437.0	5.60	1.12	9.90	16.62	45.92	30.00	1000	13.38
	5.5	2437.0	5.44	1.12	9.90	16.46	44.26	30.00	1000	13.54
	11	2437.0	5.74	1.12	9.90	16.76	47.42	30.00	1000	13.24

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 March 2, 2015
Temperature / Humidity 22deg.C , 40%RH
Engineer Yosuke Ishikawa
Mode Tx, IEEE802.11b, PN9, 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	3.28	1.12	9.90	0.07	14.37	27.35
Mid	2437.0	3.40	1.12	9.90	0.07	14.49	28.12
High	2462.0	3.36	1.13	9.90	0.07	14.46	27.93

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

[Pre check]

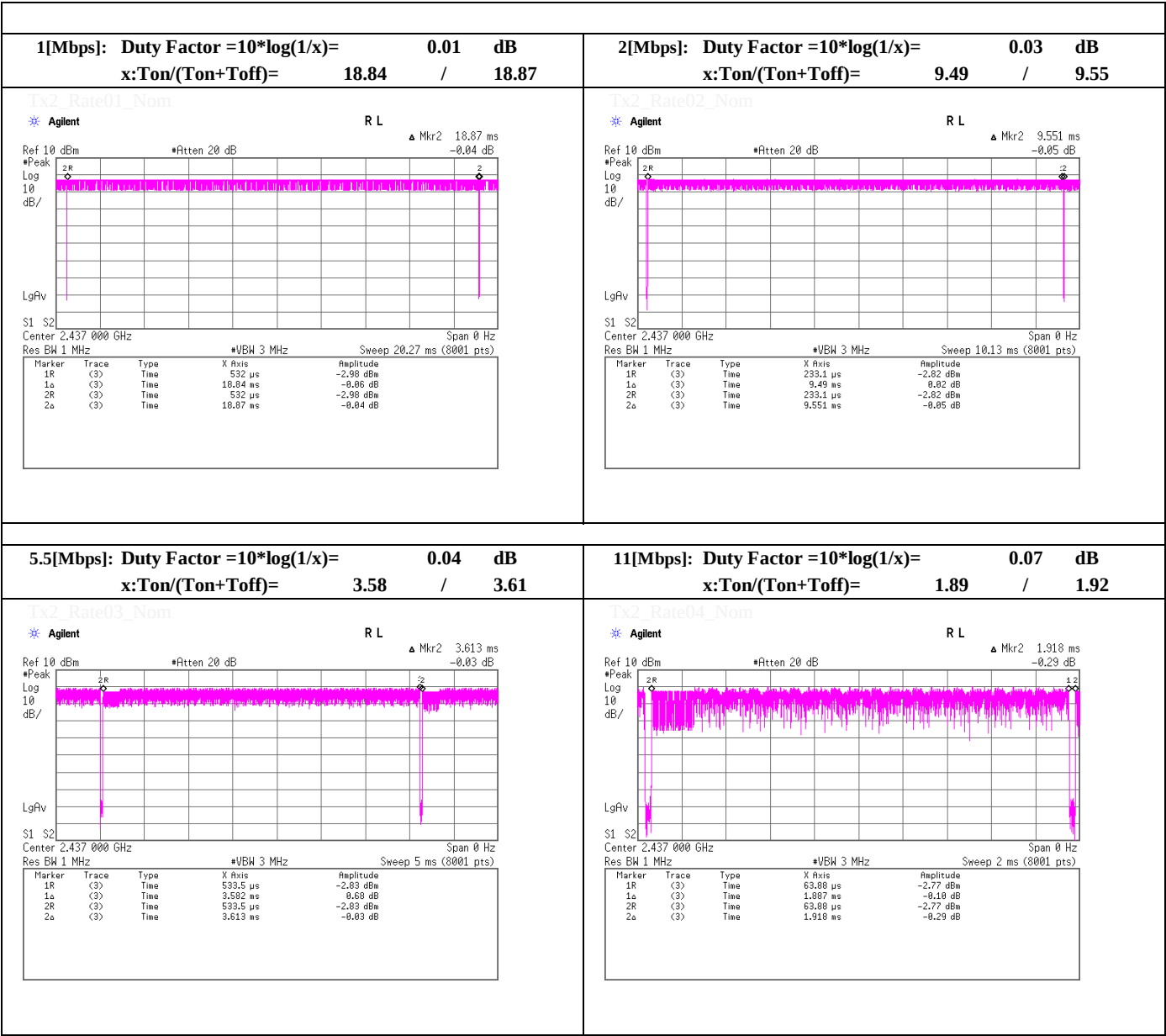
	Data rate	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result	
	[Mbps]						[dBm]	[mW]
	1	2437.0	3.23	1.12	9.90	0.01	14.26	26.67
	2	2437.0	3.39	1.12	9.90	0.03	14.44	27.80
	5.5	2437.0	3.26	1.12	9.90	0.04	14.32	27.04
	11	2437.0	3.40	1.12	9.90	0.07	14.49	28.12

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

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Duty Factor Caliculation 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 March 2, 2015

Temperature / Humidity 22deg.C , 40%RH

Engineer Yosuke Ishikawa

Mode	Tx, IEEE802.11g, PN9,
------	-----------------------

worst data mode : 12 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]	
Low	2412.0	10.28	1.12	9.90	21.30	134.90	30.00	1000	8.70
Mid	2437.0	10.33	1.12	9.90	21.35	136.46	30.00	1000	8.65
High	2462.0	10.35	1.13	9.90	21.38	137.40	30.00	1000	8.62

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]
	6	2437.0	10.21	1.12	9.90	21.23	132.74	30.00	1000	8.77
	9	2437.0	9.61	1.12	9.90	20.63	115.61	30.00	1000	9.37
	12	2437.0	10.33	1.12	9.90	21.35	136.46	30.00	1000	8.65
	18	2437.0	10.08	1.12	9.90	21.10	128.82	30.00	1000	8.90
	24	2437.0	10.15	1.12	9.90	21.17	130.92	30.00	1000	8.83
	36	2437.0	10.31	1.12	9.90	21.33	135.83	30.00	1000	8.67
	48	2437.0	10.10	1.12	9.90	21.12	129.42	30.00	1000	8.88
	54	2437.0	10.28	1.12	9.90	21.30	134.90	30.00	1000	8.70

Worst

Sample Calculation:

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

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Maximum Conducted Output Power (Reference data)
(AVGPM)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date March 2, 2015
Temperature / Humidity 22deg.C , 40%RH
Engineer Yosuke Ishikawa
Mode Tx, IEEE802.11g, PN9, worst data mode : 54 Mbps

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

Ch	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result	
						[dBm]	[mW]
Low	2412.0	0.03	1.12	9.90	1.63	12.68	18.54
Mid	2437.0	0.13	1.12	9.90	1.63	12.78	18.97
High	2462.0	0.06	1.13	9.90	1.63	12.72	18.71

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

[Pre check]

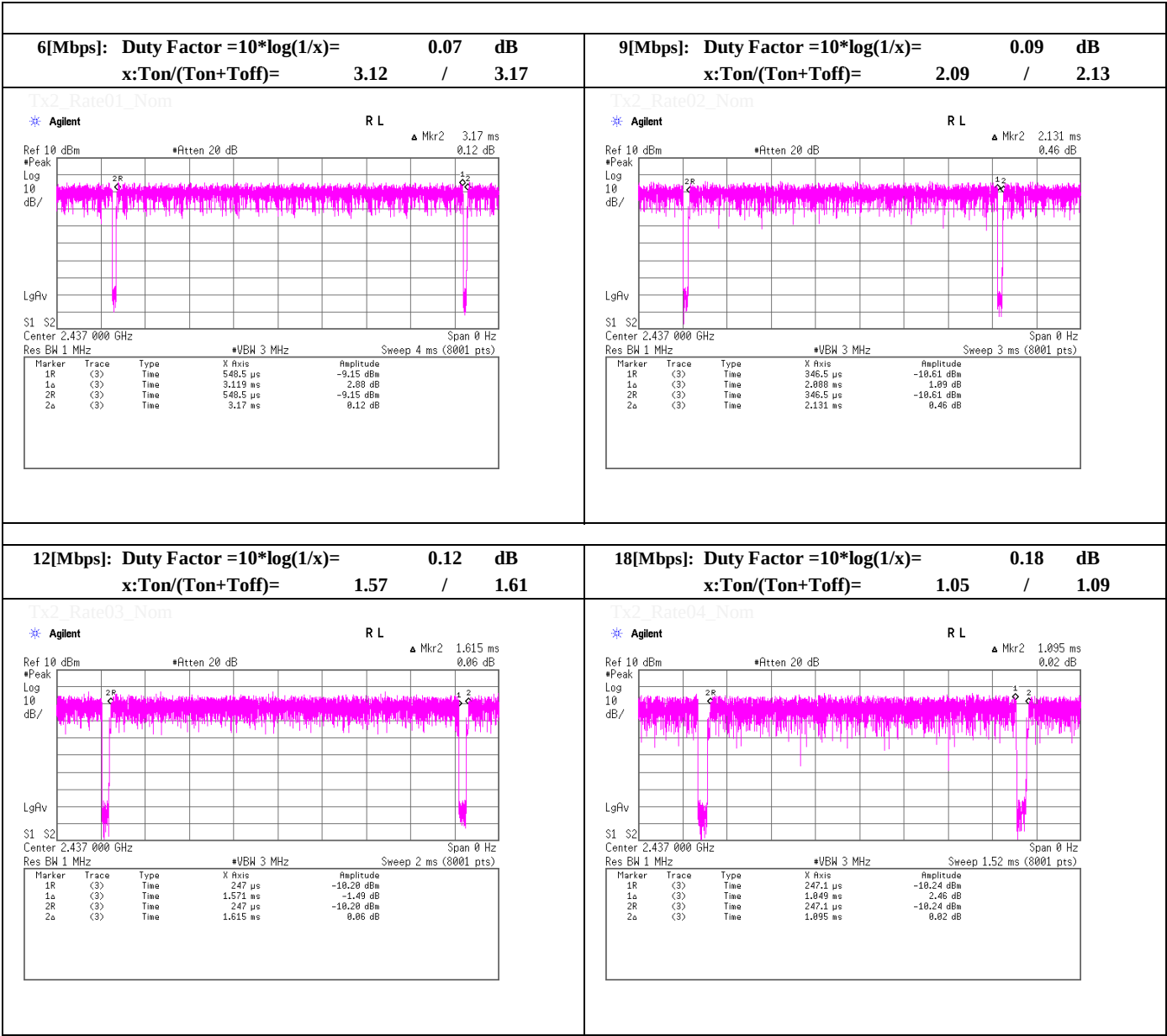
	Data rate	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result	
	[Mbps]						[dBm]	[mW]
	6	2437.0	1.38	1.12	9.90	0.07	12.47	17.66
	9	2437.0	1.33	1.12	9.90	0.09	12.44	17.54
	12	2437.0	1.35	1.12	9.90	0.12	12.49	17.74
	18	2437.0	1.32	1.12	9.90	0.18	12.52	17.86
	24	2437.0	1.26	1.12	9.90	0.23	12.51	17.82
	36	2437.0	1.15	1.12	9.90	0.34	12.51	17.82
	48	2437.0	0.60	1.12	9.90	0.99	12.61	18.24
	54	2437.0	0.13	1.12	9.90	1.63	12.78	18.97

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

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Duty Factor Calculation chart for Maximum Conducted Output Power



UL Japan, Inc.

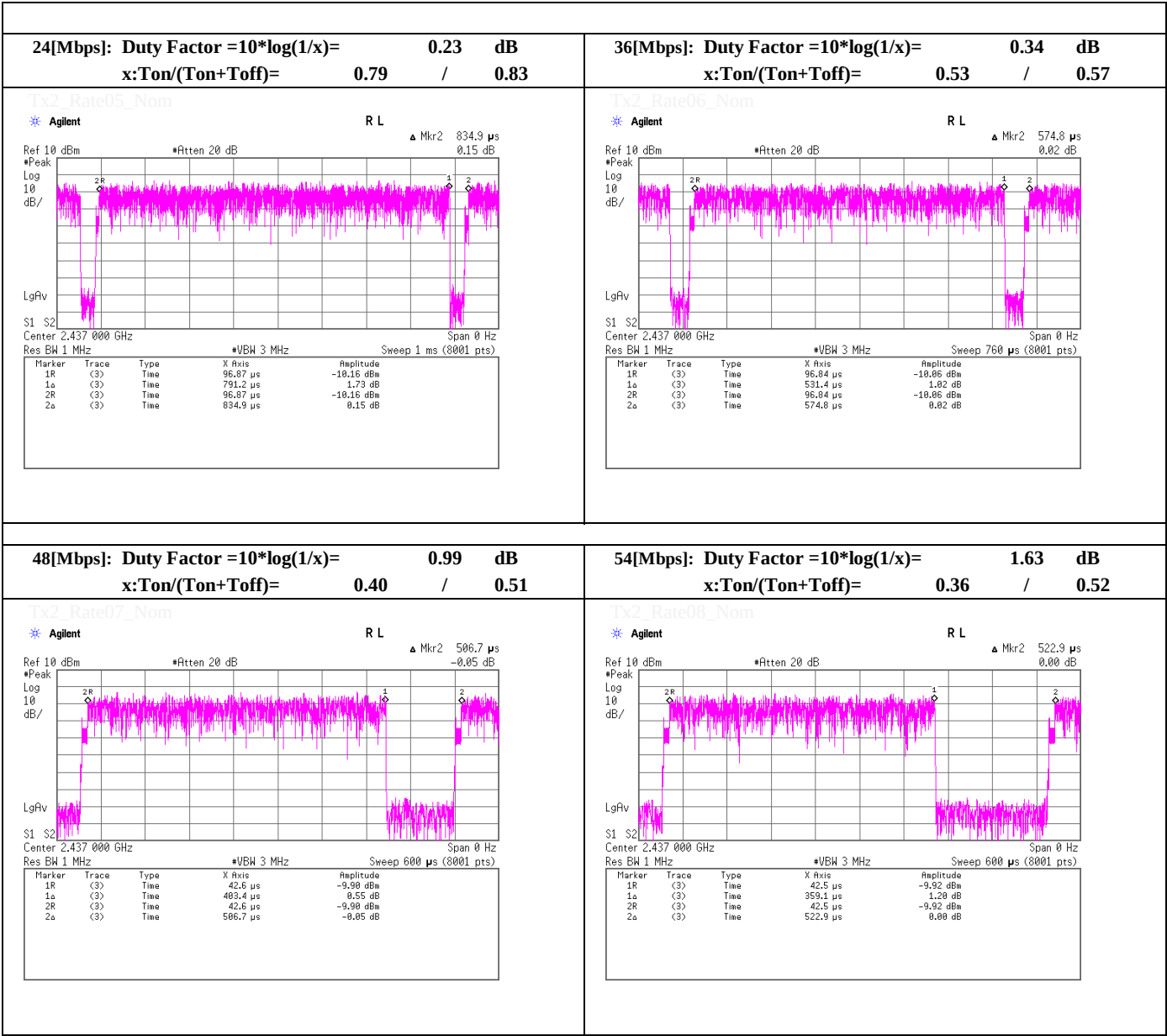
Shonan EMC Lab.

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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
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Date March 2, 2015

Temperature / Humidity 22deg.C , 40%RH

Engineer Yosuke Ishikawa

Mode	Tx, IEEE802.11n-HT20, PN9,
------	----------------------------

worst data mode : 0 (MCS) [800ns GI]

(* 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	10.32	1.12	9.90	21.34	136.14	30.00	1000	8.66
Mid	2437.0	10.33	1.12	9.90	21.35	136.46	30.00	1000	8.65
High	2462.0	10.37	1.13	9.90	21.40	138.04	30.00	1000	8.60

Sample Calculation:

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

[Pre check]

[400ns GI]

	Mode	Freq.	P/M (Peak)	Cable	Atten.	Result		Limit		Margin
	(MCS)	[MHz]	Reading [dBm]	Loss [dB]	Loss [dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
	0	2437.0	10.30	1.12	9.90	21.32	135.52	30.00	1000	8.68
	1	2437.0	10.15	1.12	9.90	21.17	130.92	30.00	1000	8.83
	2	2437.0	10.28	1.12	9.90	21.30	134.90	30.00	1000	8.70
	3	2437.0	9.95	1.12	9.90	20.97	125.03	30.00	1000	9.03
	4	2437.0	10.22	1.12	9.90	21.24	133.05	30.00	1000	8.76
	5	2437.0	9.34	1.12	9.90	20.36	108.64	30.00	1000	9.64
	6	2437.0	9.95	1.12	9.90	20.97	125.03	30.00	1000	9.03
	7	2437.0	9.51	1.12	9.90	20.53	112.98	30.00	1000	9.47

[800ns GI]

	Mode	Freq.	P/M (Peak) Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	(MCS)	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
[Table 1]	0	2437.0	10.33	1.12	9.90	21.35	136.46	30.00	1000	8.65
	1	2437.0	10.15	1.12	9.90	21.17	130.92	30.00	1000	8.83
	2	2437.0	10.32	1.12	9.90	21.34	136.14	30.00	1000	8.66
	3	2437.0	10.15	1.12	9.90	21.17	130.92	30.00	1000	8.83
	4	2437.0	10.10	1.12	9.90	21.12	129.42	30.00	1000	8.88
	5	2437.0	9.57	1.12	9.90	20.59	114.55	30.00	1000	9.41
	6	2437.0	10.00	1.12	9.90	21.02	126.47	30.00	1000	8.98
	7	2437.0	9.63	1.12	9.90	20.65	116.14	30.00	1000	9.35

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 March 2, 2015
 Temperature / Humidity 22deg.C , 40%RH
 Engineer Yosuke Ishikawa
 Mode Tx, IEEE802.11n-HT20, PN9, worst data mode : 0 (MCS) [400ns GI]

(* 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	1.22	1.12	9.90	0.07	12.31	17.02
Mid	2437.0	1.45	1.12	9.90	0.07	12.54	17.95
High	2462.0	1.51	1.13	9.90	0.07	12.61	18.24

Sample Calculation:

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

[Pre check] [400ns GI]

	Mode (MCS)	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result	
							[dBm]	[mW]
	0	2437.0	1.45	1.12	9.90	0.07	12.54	17.95
	1	2437.0	1.32	1.12	9.90	0.16	12.50	17.78
	2	2437.0	1.18	1.12	9.90	0.24	12.44	17.54
	3	2437.0	1.14	1.12	9.90	0.25	12.41	17.42
	4	2437.0	0.98	1.12	9.90	0.53	12.53	17.91
	5	2437.0	-2.02	1.12	9.90	1.72	10.72	11.80
	6	2437.0	-2.42	1.12	9.90	2.25	10.85	12.16
	7	2437.0	-2.82	1.12	9.90	2.62	10.82	12.08

[800ns GI]

	Mode (MCS)	Freq. [MHz]	P/M (AV) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty Factor [dB]	Result	
							[dBm]	[mW]
	0	2437.0	1.24	1.12	9.90	0.07	12.33	17.10
	1	2437.0	1.11	1.12	9.90	0.13	12.26	16.83
	2	2437.0	1.15	1.12	9.90	0.19	12.36	17.22
	3	2437.0	1.05	1.12	9.90	0.25	12.32	17.06
	4	2437.0	1.02	1.12	9.90	0.36	12.40	17.38
	5	2437.0	-1.73	1.12	9.90	1.37	10.66	11.64
	6	2437.0	-2.06	1.12	9.90	1.84	10.80	12.02
	7	2437.0	-2.41	1.12	9.90	2.17	10.78	11.97

Sample Calculation:

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

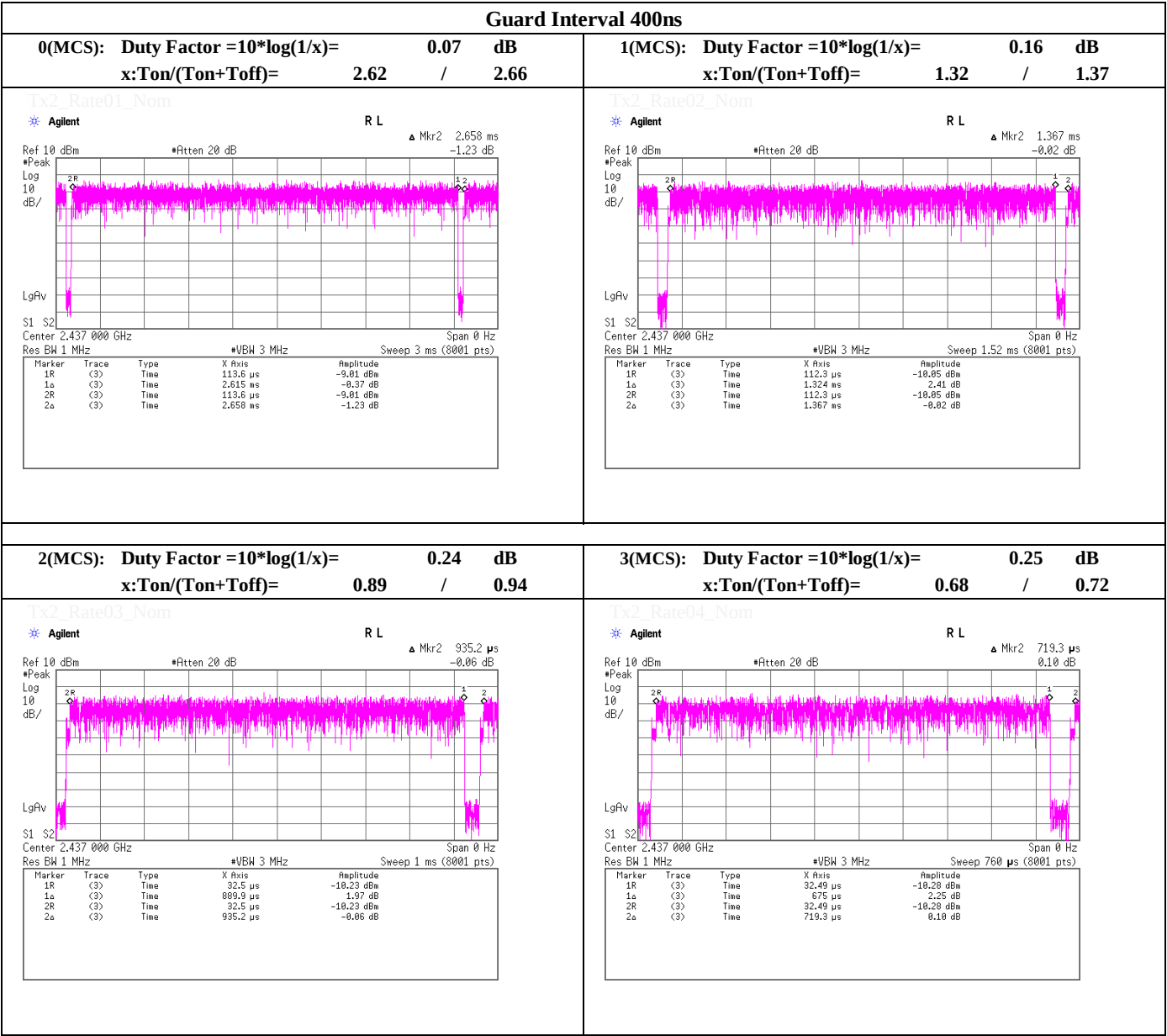
UL Japan, Inc.
Shonan EMC Lab.

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

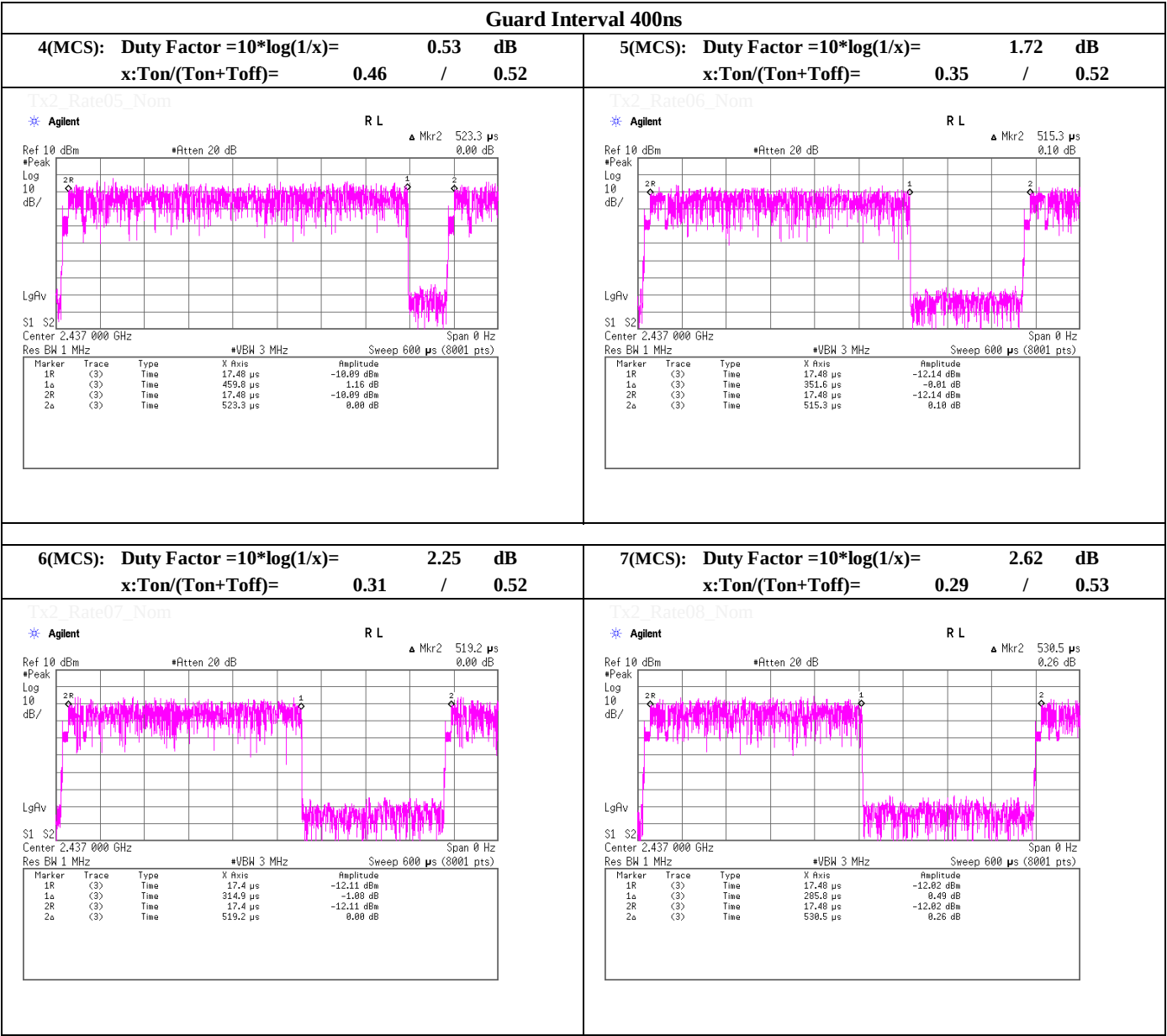
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Duty Factor Caliculation chart for Maximum Conducted Output Power



Duty Factor Caliculation chart for Maximum Conducted Output Power



UL Japan, Inc.

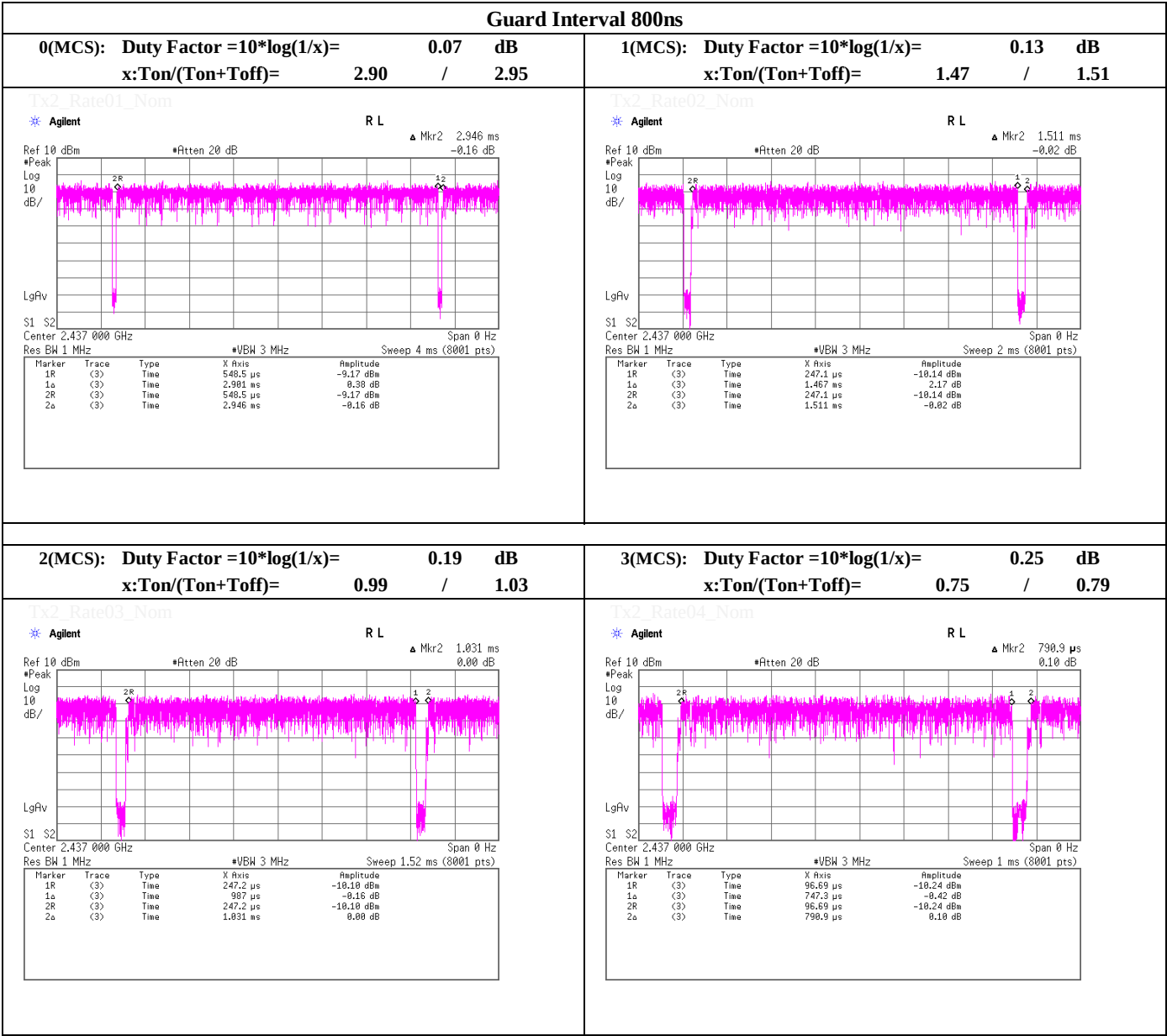
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Duty Factor Caliculation chart for Maximum Conducted Output Power



UL Japan, Inc.

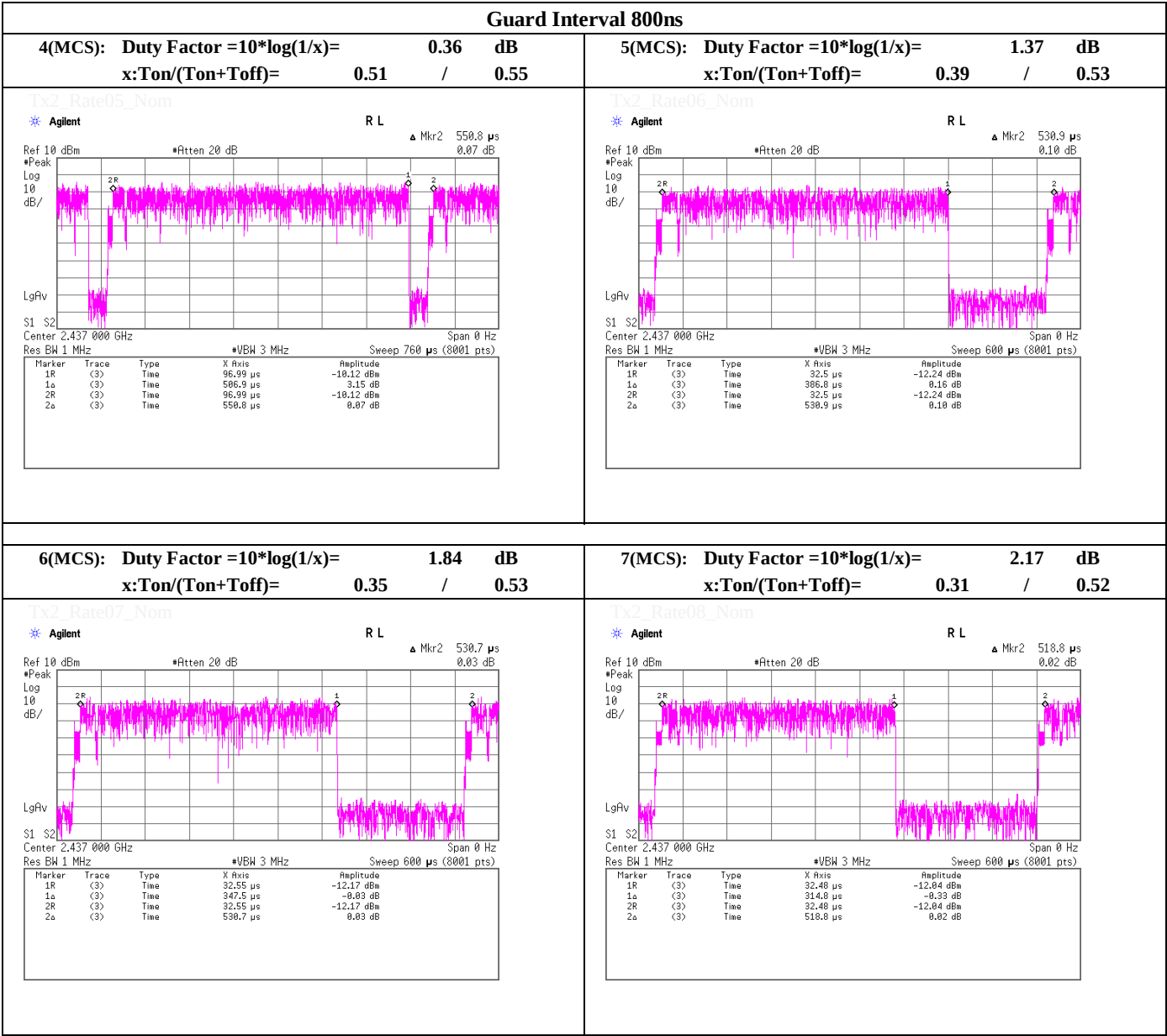
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Duty Factor Calculation chart for Maximum Conducted Output Power



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Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date March 2, 2015 March 3, 2015
Temperature / Humidity 25 deg.C, 24 %RH 22 deg.C, 35 %RH
Engineer Yosuke Ishikawa Yosuke Ishikawa
Mode Tx, 2412 MHz
 Tx, IEEE802.11b

(* 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	61.3	26.4	13.6	41.1	60.2	73.9	13.7	100	297	
Hori.	2822.400	PK	48.6	27.2	5.8	40.8	40.8	73.9	33.1	100	0	
Hori.	4824.000	PK	54.3	30.7	5.6	39.8	50.8	73.9	23.1	126	218	
Hori.	7236.000	PK	45.4	36.7	7.1	40.2	49.0	73.9	24.9	100	0	
Hori.	9648.000	PK	46.6	38.5	8.2	40.1	53.2	73.9	20.7	100	0	
Hori.	2390.000	AV	40.9	26.4	13.6	41.1	39.8	53.9	14.1	100	297	
Hori.	2822.400	AV	35.4	27.2	5.8	40.8	27.6	53.9	26.3	100	0	
Hori.	4824.000	AV	43.5	30.7	5.6	39.8	40.0	53.9	13.9	126	218	
Hori.	7236.000	AV	36.4	36.7	7.1	40.2	40.0	53.9	13.9	100	0	
Hori.	9648.000	AV	36.5	38.5	8.2	40.1	43.1	53.9	10.8	100	0	
Vert.	2390.000	PK	51.4	26.4	13.6	41.1	50.3	73.9	23.6	100	323	
Vert.	2822.400	PK	50.3	27.2	5.8	40.8	42.5	73.9	31.4	100	0	
Vert.	4824.000	PK	52.5	30.7	5.6	39.8	49.0	73.9	24.9	100	56	
Vert.	7236.000	PK	45.5	36.7	7.1	40.2	49.1	73.9	24.8	100	0	
Vert.	9648.000	PK	45.7	38.5	8.2	40.1	52.3	73.9	21.6	100	0	
Vert.	2390.000	AV	37.2	26.4	13.6	41.1	36.1	53.9	17.8	100	323	
Vert.	2822.400	AV	36.1	27.2	5.8	40.8	28.3	53.9	25.6	100	0	
Vert.	4824.000	AV	41.7	30.7	5.6	39.8	38.2	53.9	15.7	100	56	
Vert.	7236.000	AV	35.5	36.7	7.1	40.2	39.1	53.9	14.8	100	0	
Vert.	9648.000	AV	35.1	38.5	8.2	40.1	41.7	53.9	12.2	100	0	

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

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

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	95.5	26.4	13.6	41.1	94.4	-	-	Carrier
Hori.	2400.000	PK	50.2	26.4	13.6	41.1	49.1	74.4	25.3	
Vert.	2412.000	PK	89.2	26.4	13.6	41.1	88.1	-	-	Carrier
Vert.	2400.000	PK	43.9	26.4	13.6	41.1	42.8	68.1	25.3	

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

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date March 2, 2015 March 3, 2015
Temperature / Humidity 25 deg.C, 24 %RH 22 deg.C, 35 %RH
Engineer Yosuke Ishikawa Yosuke Ishikawa
Mode Tx, 2437 MHz
 Tx, IEEE802.11b

(* 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.	2822.400	PK	48.4	27.2	5.8	40.8	40.6	73.9	33.3	100	0	
Hori.	4874.000	PK	51.6	30.9	5.6	39.7	48.4	73.9	25.5	100	200	
Hori.	7311.000	PK	45.6	36.8	7.0	40.3	49.1	73.9	24.8	100	0	
Hori.	9748.000	PK	45.3	38.6	8.1	40.0	52.0	73.9	21.9	100	0	
Hori.	2822.400	AV	36.4	27.2	5.8	40.8	28.6	53.9	25.3	100	0	
Hori.	4874.000	AV	39.6	30.9	5.6	39.7	36.4	53.9	17.5	100	200	
Hori.	7311.000	AV	36.0	36.8	7.0	40.3	39.5	53.9	14.4	100	0	
Hori.	9748.000	AV	36.5	38.6	8.1	40.0	43.2	53.9	10.7	100	0	
Vert.	2822.400	PK	51.5	27.2	5.8	40.8	43.7	73.9	30.2	100	0	
Vert.	4874.000	PK	52.8	30.9	5.6	39.7	49.6	73.9	24.3	148	5	
Vert.	7311.000	PK	44.8	36.8	7.0	40.3	48.3	73.9	25.6	100	0	
Vert.	9748.000	PK	45.5	38.6	8.1	40.0	52.2	73.9	21.7	100	0	
Vert.	2822.400	AV	36.0	27.2	5.8	40.8	28.2	53.9	25.7	100	0	
Vert.	4874.000	AV	41.7	30.9	5.6	39.7	38.5	53.9	15.4	148	5	
Vert.	7311.000	AV	36.2	36.8	7.0	40.3	39.7	53.9	14.2	100	0	
Vert.	9748.000	AV	36.2	38.6	8.1	40.0	42.9	53.9	11.0	100	0	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date March 2, 2015 March 3, 2015
Temperature / Humidity 25 deg.C, 24 %RH 22 deg.C, 35 %RH
Engineer Yosuke Ishikawa Yosuke Ishikawa
Mode Tx, 2462 MHz
Tx, IEEE802.11b

(* 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	63.8	26.6	13.6	41.1	62.9	73.9	11.0	100	299	
Hori.	2822.400	PK	47.5	27.2	5.8	40.8	39.7	73.9	34.2	100	0	
Hori.	4924.000	PK	54.0	31.1	5.6	39.6	51.1	73.9	22.8	100	199	
Hori.	7386.000	PK	45.1	36.9	7.0	40.4	48.6	73.9	25.3	100	0	
Hori.	9848.000	PK	44.5	38.6	8.0	39.9	51.2	73.9	22.7	100	0	
Hori.	2483.500	AV	41.6	26.6	13.6	41.1	40.7	53.9	13.2	100	299	
Hori.	2822.400	AV	36.1	27.2	5.8	40.8	28.3	53.9	25.6	100	0	
Hori.	4924.000	AV	43.5	31.1	5.6	39.6	40.6	53.9	13.3	100	199	
Hori.	7386.000	AV	36.0	36.9	7.0	40.4	39.5	53.9	14.4	100	0	
Hori.	9848.000	AV	36.2	38.6	8.0	39.9	42.9	53.9	11.0	100	0	
Vert.	2483.500	PK	57.5	26.6	13.6	41.1	56.6	73.9	17.3	100	326	
Vert.	2822.400	PK	51.8	27.2	5.8	40.8	44.0	73.9	29.9	100	0	
Vert.	4924.000	PK	53.0	31.1	5.6	39.6	50.1	73.9	23.8	144	34	
Vert.	7386.000	PK	45.6	36.9	7.0	40.4	49.1	73.9	24.8	100	0	
Vert.	9848.000	PK	46.5	38.6	8.0	39.9	53.2	73.9	20.7	100	0	
Vert.	2483.500	AV	37.9	26.6	13.6	41.1	37.0	53.9	16.9	100	326	
Vert.	2822.400	AV	36.2	27.2	5.8	40.8	28.4	53.9	25.5	100	0	
Vert.	4924.000	AV	40.8	31.1	5.6	39.6	37.9	53.9	16.0	144	34	
Vert.	7386.000	AV	36.3	36.9	7.0	40.4	39.8	53.9	14.1	100	0	
Vert.	9848.000	AV	36.9	38.6	8.0	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(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date March 2, 2015 March 3, 2015
Temperature / Humidity 25 deg.C, 24 %RH 22 deg.C, 35 %RH
Engineer Yosuke Ishikawa Yosuke Ishikawa
Mode Tx, 2412 MHz
Tx, IEEE802.11g

(* 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	56.7	26.4	13.6	41.1	55.6	73.9	18.3	100	298	
Hori.	2822.400	PK	48.1	27.2	5.8	40.8	40.3	73.9	33.6	100	0	
Hori.	4824.000	PK	48.4	30.7	5.6	39.8	44.9	73.9	29.0	100	202	
Hori.	7236.000	PK	46.3	36.7	7.1	40.2	49.9	73.9	24.0	100	0	
Hori.	9648.000	PK	45.9	38.5	8.2	40.1	52.5	73.9	21.4	100	0	
Hori.	2390.000	AV	44.4	26.4	13.6	41.1	43.3	53.9	10.6	100	298	*1)
Hori.	2822.400	AV	36.7	27.2	5.8	40.8	28.9	53.9	25.0	100	0	
Vert.	2390.000	PK	48.3	26.4	13.6	41.1	47.2	73.9	26.7	100	323	
Vert.	2822.400	PK	52.0	27.2	5.8	40.8	44.2	73.9	29.7	100	0	
Vert.	4824.000	PK	49.0	30.7	5.6	39.8	45.5	73.9	28.4	133	61	
Vert.	7236.000	PK	46.2	36.7	7.1	40.2	49.8	73.9	24.1	100	0	
Vert.	9648.000	PK	45.2	38.5	8.2	40.1	51.8	73.9	22.1	100	0	
Vert.	2390.000	AV	38.3	26.4	13.6	41.1	37.2	53.9	16.7	100	323	*1)
Vert.	2822.400	AV	36.0	27.2	5.8	40.8	28.2	53.9	25.7	100	0	

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

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

*1) Out of Band emission (Leakage Power)

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.	4824.000	AV	37.6	30.7	5.6	39.8	0.2	34.3	53.9	19.6	
Hori.	7236.000	AV	36.5	36.7	7.1	40.2	0.2	40.3	53.9	13.6	
Hori.	9648.000	AV	36.4	38.5	8.2	40.1	0.2	43.2	53.9	10.7	
Vert.	4824.000	AV	40.3	30.7	5.6	39.8	0.2	37.0	53.9	16.9	
Vert.	7236.000	AV	36.1	36.7	7.1	40.2	0.2	39.9	53.9	14.0	
Vert.	9648.000	AV	36.9	38.5	8.2	40.1	0.2	43.7	53.9	10.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprefier) + 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.	2412.000	PK	91.3	26.4	13.6	41.1	90.2	-	-	Carrier
Hori.	2400.000	PK	51.9	26.4	13.6	41.1	50.8	70.2	19.4	
Vert.	2412.000	PK	84.9	26.4	13.6	41.1	83.8	-	-	Carrier
Vert.	2400.000	PK	45.5	26.4	13.6	41.1	44.4	63.8	19.4	

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

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date March 2, 2015 March 3, 2015
Temperature / Humidity 25 deg.C, 24 %RH 22 deg.C, 35 %RH
Engineer Yosuke Ishikawa Yosuke Ishikawa
Mode Tx, 2437 MHz
Tx, IEEE802.11g

(* 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.	2822.400	PK	47.6	27.2	5.8	40.8	39.8	73.9	34.1	100	0	
Hori.	4874.000	PK	47.3	30.9	5.6	39.7	44.1	73.9	29.8	100	200	
Hori.	7311.000	PK	44.8	36.8	7.0	40.3	48.3	73.9	25.6	100	0	
Hori.	9748.000	PK	45.7	38.6	8.1	40.0	52.4	73.9	21.5	100	0	
Hori.	2822.400	AV	36.5	27.2	5.8	40.8	28.7	53.9	25.2	100	0	
Vert.	2822.400	PK	52.4	27.2	5.8	40.8	44.6	73.9	29.3	100	0	
Vert.	4874.000	PK	48.1	30.9	5.6	39.7	44.9	73.9	29.0	107	35	
Vert.	7311.000	PK	45.9	36.8	7.0	40.3	49.4	73.9	24.5	100	0	
Vert.	9748.000	PK	46.2	38.6	8.1	40.0	52.9	73.9	21.0	100	0	
Vert.	2822.400	AV	36.2	27.2	5.8	40.8	28.4	53.9	25.5	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

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.	4874.000	AV	38.6	30.9	5.6	39.7	0.2	35.6	53.9	18.3	
Hori.	7311.000	AV	36.3	36.8	7.0	40.3	0.2	40.0	53.9	13.9	
Hori.	9748.000	AV	36.4	38.6	8.1	40.0	0.2	43.3	53.9	10.6	
Vert.	4874.000	AV	37.5	30.9	5.6	39.7	0.2	34.5	53.9	19.4	
Vert.	7311.000	AV	36.1	36.8	7.0	40.3	0.2	39.8	53.9	14.1	
Vert.	9748.000	AV	36.2	38.6	8.1	40.0	0.2	43.1	53.9	10.8	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date March 2, 2015 March 3, 2015
Temperature / Humidity 25 deg.C, 24 %RH 22 deg.C, 35 %RH
Engineer Yosuke Ishikawa Yosuke Ishikawa
Mode Tx, 2462 MHz
 Tx, IEEE802.11g

(* 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	58.3	26.6	13.6	41.1	57.4	73.9	16.5	100	300	
Hori.	2822.400	PK	48.0	27.2	5.8	40.8	40.2	73.9	33.7	100	0	
Hori.	4924.000	PK	49.3	31.1	5.6	39.6	46.4	73.9	27.5	100	200	
Hori.	7386.000	PK	45.3	36.9	7.0	40.4	48.8	73.9	25.1	100	0	
Hori.	9848.000	PK	45.3	38.6	8.0	39.9	52.0	73.9	21.9	100	0	
Hori.	2483.500	AV	44.3	26.6	13.6	41.1	43.4	53.9	10.5	100	300	*1)
Hori.	2822.400	AV	36.7	27.2	5.8	40.8	28.9	53.9	25.0	100	0	
Vert.	2483.500	PK	53.1	26.6	13.6	41.1	52.2	73.9	21.7	100	325	
Vert.	2822.400	PK	52.5	27.2	5.8	40.8	44.7	73.9	29.2	100	0	
Vert.	4924.000	PK	49.1	31.1	5.6	39.6	46.2	73.9	27.7	135	35	
Vert.	7386.000	PK	45.3	36.9	7.0	40.4	48.8	73.9	25.1	100	0	
Vert.	9848.000	PK	46.0	38.6	8.0	39.9	52.7	73.9	21.2	100	0	
Vert.	2483.500	AV	39.6	26.6	13.6	41.1	38.7	53.9	15.2	100	325	*1)
Vert.	2822.400	AV	36.8	27.2	5.8	40.8	29.0	53.9	24.9	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

*1) Out of Band emission (Leakage Power)

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.	4924.000	AV	40.4	31.1	5.6	39.6	0.2	37.7	53.9	16.2	
Hori.	7386.000	AV	36.2	36.9	7.0	40.4	0.2	39.9	53.9	14.0	
Hori.	9848.000	AV	36.0	38.6	8.0	39.9	0.2	42.9	53.9	11.0	
Vert.	4924.000	AV	37.5	31.1	5.6	39.6	0.2	34.8	53.9	19.1	
Vert.	7386.000	AV	36.1	36.9	7.0	40.4	0.2	39.8	53.9	14.1	
Vert.	9848.000	AV	36.1	38.6	8.0	39.9	0.2	43.0	53.9	10.9	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date March 2, 2015 March 3, 2015
Temperature / Humidity 25 deg.C, 24 %RH 22 deg.C, 35 %RH
Engineer Yosuke Ishikawa Yosuke Ishikawa
Mode Tx, 2412 MHz
 Tx, IEEE802.11n-HT20

(* 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	61.5	26.4	13.6	41.1	60.4	73.9	13.5	100	297	
Hori.	2822.400	PK	49.2	27.2	5.8	40.8	41.4	73.9	32.5	100	0	
Hori.	4824.000	PK	48.4	30.7	5.6	39.8	44.9	73.9	29.0	100	201	
Hori.	7236.000	PK	45.2	36.7	7.1	40.2	48.8	73.9	25.1	100	0	
Hori.	9648.000	PK	45.3	38.5	8.2	40.1	51.9	73.9	22.0	100	0	
Hori.	2390.000	AV	44.8	26.4	13.6	41.1	43.7	53.9	10.2	100	297	
Hori.	2822.400	AV	36.6	27.2	5.8	40.8	28.8	53.9	25.1	100	0	
Hori.	4824.000	AV	37.0	30.7	5.6	39.8	33.5	53.9	20.4	100	201	
Hori.	7236.000	AV	36.3	36.7	7.1	40.2	39.9	53.9	14.0	100	0	
Hori.	9648.000	AV	36.3	38.5	8.2	40.1	42.9	53.9	11.0	100	0	
Vert.	2390.000	PK	50.9	26.4	13.6	41.1	49.8	73.9	24.1	100	323	
Vert.	2822.400	PK	52.0	27.2	5.8	40.8	44.2	73.9	29.7	100	0	
Vert.	4824.000	PK	49.1	30.7	5.6	39.8	45.6	73.9	28.3	139	62	
Vert.	7236.000	PK	45.4	36.7	7.1	40.2	49.0	73.9	24.9	100	0	
Vert.	9648.000	PK	45.9	38.5	8.2	40.1	52.5	73.9	21.4	100	0	
Vert.	2390.000	AV	37.9	26.4	13.6	41.1	36.8	53.9	17.1	100	323	
Vert.	2822.400	AV	35.9	27.2	5.8	40.8	28.1	53.9	25.8	100	0	
Vert.	4824.000	AV	39.3	30.7	5.6	39.8	35.8	53.9	18.1	139	62	
Vert.	7236.000	AV	36.3	36.7	7.1	40.2	39.9	53.9	14.0	100	0	
Vert.	9648.000	AV	36.4	38.5	8.2	40.1	43.0	53.9	10.9	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	90.4	26.4	13.6	41.1	89.3	-	-	Carrier
Hori.	2400.000	PK	53.0	26.4	13.6	41.1	51.9	69.3	17.4	
Vert.	2412.000	PK	83.9	26.4	13.6	41.1	82.8	-	-	Carrier
Vert.	2400.000	PK	45.5	26.4	13.6	41.1	44.4	62.8	18.4	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date March 2, 2015 March 3, 2015
Temperature / Humidity 25 deg.C, 24 %RH 22 deg.C, 35 %RH
Engineer Yosuke Ishikawa Yosuke Ishikawa
Mode Tx, 2437 MHz
Tx, IEEE802.11n-HT20

(* 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.	2822.400	PK	48.3	27.2	5.8	40.8	40.5	73.9	33.4	100	0	
Hori.	4874.000	PK	49.1	30.9	5.6	39.7	45.9	73.9	28.0	100	200	
Hori.	7311.000	PK	45.3	36.8	7.0	40.3	48.8	73.9	25.1	100	0	
Hori.	9748.000	PK	45.4	38.6	8.1	40.0	52.1	73.9	21.8	100	0	
Hori.	2822.400	AV	37.0	27.2	5.8	40.8	29.2	53.9	24.7	100	0	
Hori.	4874.000	AV	37.1	30.9	5.6	39.7	33.9	53.9	20.0	100	200	
Hori.	7311.000	AV	36.3	36.8	7.0	40.3	39.8	53.9	14.1	100	0	
Hori.	9748.000	AV	36.6	38.6	8.1	40.0	43.3	53.9	10.6	100	0	
Vert.	2822.400	PK	51.1	27.2	5.8	40.8	43.3	73.9	30.6	100	0	
Vert.	4874.000	PK	48.1	30.9	5.6	39.7	44.9	73.9	29.0	149	19	
Vert.	7311.000	PK	45.7	36.8	7.0	40.3	49.2	73.9	24.7	100	0	
Vert.	9748.000	PK	46.2	38.6	8.1	40.0	52.9	73.9	21.0	100	0	
Vert.	2822.400	AV	36.2	27.2	5.8	40.8	28.4	53.9	25.5	100	0	
Vert.	4874.000	AV	36.6	30.9	5.6	39.7	33.4	53.9	20.5	149	19	
Vert.	7311.000	AV	36.3	36.8	7.0	40.3	39.8	53.9	14.1	100	0	
Vert.	9748.000	AV	36.2	38.6	8.1	40.0	42.9	53.9	11.0	100	0	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date March 2, 2015 March 3, 2015
Temperature / Humidity 25 deg.C, 24 %RH 22 deg.C, 35 %RH
Engineer Yosuke Ishikawa Yosuke Ishikawa
Mode Tx, 2462 MHz
Tx, IEEE802.11n-HT20

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

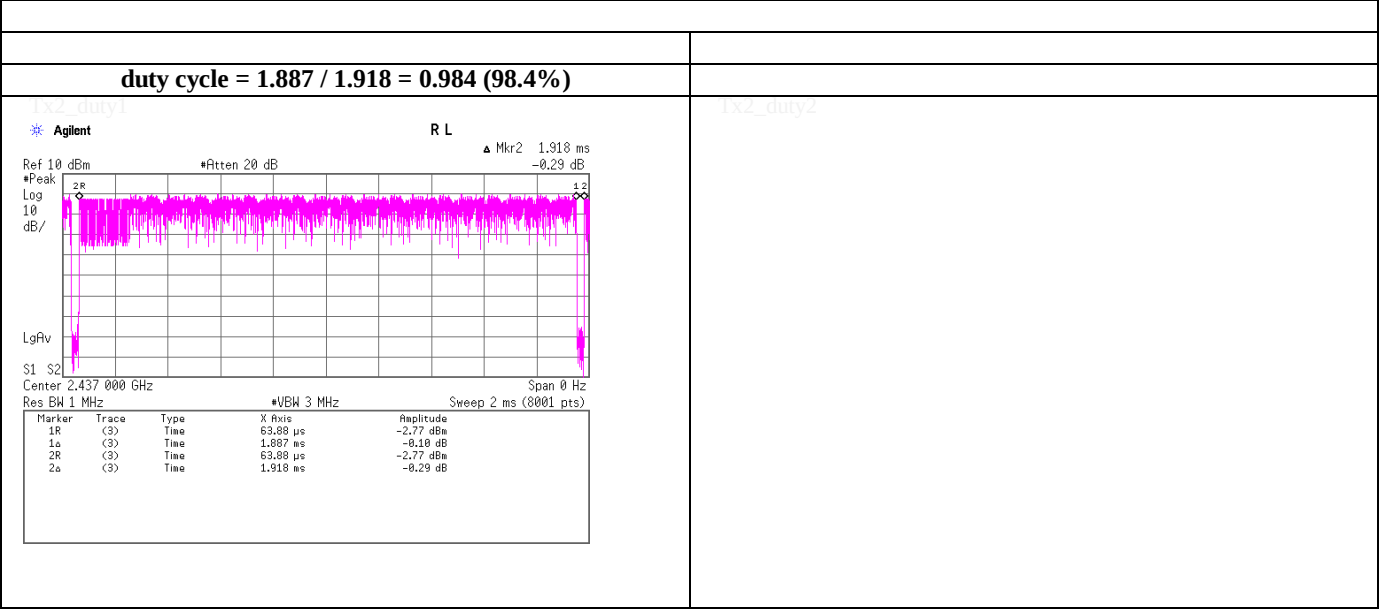
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	204.001	QP	37.3	16.4	8.1	32.0	29.8	43.5	13.7	170	237	
Hori.	228.003	QP	41.0	16.7	8.2	32.0	33.9	46.0	12.1	153	116	
Hori.	312.000	QP	43.1	14.3	8.6	31.9	34.1	46.0	11.9	100	129	
Hori.	360.001	QP	42.9	15.5	8.9	31.9	35.4	46.0	10.6	100	132	
Hori.	432.002	QP	39.6	16.9	9.2	31.9	33.8	46.0	12.2	100	141	
Hori.	799.988	QP	34.0	21.0	10.5	31.5	34.0	46.0	12.0	100	116	
Hori.	2483.500	PK	60.8	26.6	13.6	41.1	59.9	73.9	14.0	100	300	
Hori.	2822.400	PK	47.7	27.2	5.8	40.8	39.9	73.9	34.0	100	0	
Hori.	4924.000	PK	50.2	31.1	5.6	39.6	47.3	73.9	26.6	100	201	
Hori.	7386.000	PK	45.8	36.9	7.0	40.4	49.3	73.9	24.6	100	0	
Hori.	9848.000	PK	45.1	38.6	8.0	39.9	51.8	73.9	22.1	100	0	
Hori.	2483.500	AV	44.3	26.6	13.6	41.1	43.4	53.9	10.5	100	300	
Hori.	2822.400	AV	36.5	27.2	5.8	40.8	28.7	53.9	25.2	100	0	
Hori.	4924.000	AV	38.7	31.1	5.6	39.6	35.8	53.9	18.1	100	201	
Hori.	7386.000	AV	36.0	36.9	7.0	40.4	39.5	53.9	14.4	100	0	
Hori.	9848.000	AV	36.0	38.6	8.0	39.9	42.7	53.9	11.2	100	0	
Vert.	360.001	QP	35.5	15.5	8.9	31.9	28.0	46.0	18.0	142	169	
Vert.	813.991	QP	33.3	21.2	10.6	31.4	33.7	46.0	12.3	104	349	
Vert.	2483.500	PK	54.9	26.6	13.6	41.1	54.0	73.9	19.9	100	324	
Vert.	2822.400	PK	52.3	27.2	5.8	40.8	44.5	73.9	29.4	100	0	
Vert.	4924.000	PK	48.9	31.1	5.6	39.6	46.0	73.9	27.9	124	33	
Vert.	7386.000	PK	45.3	36.9	7.0	40.4	48.8	73.9	25.1	100	0	
Vert.	9848.000	PK	45.8	38.6	8.0	39.9	52.5	73.9	21.4	100	0	
Vert.	2483.500	AV	39.7	26.6	13.6	41.1	38.8	53.9	15.1	100	324	
Vert.	2822.400	AV	36.5	27.2	5.8	40.8	28.7	53.9	25.2	100	0	
Vert.	4924.000	AV	37.2	31.1	5.6	39.6	34.3	53.9	19.6	124	33	
Vert.	7386.000	AV	36.1	36.9	7.0	40.4	39.6	53.9	14.3	100	0	
Vert.	9848.000	AV	36.2	38.6	8.0	39.9	42.9	53.9	11.0	100	0	

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

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date March 2, 2015
Temperature / Humidity 22deg.C , 40%RH
Engineer Yosuke Ishikawa

Burst rate confirmation

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



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

Test place

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

Date

March 2, 2015

Temperature / Humidity

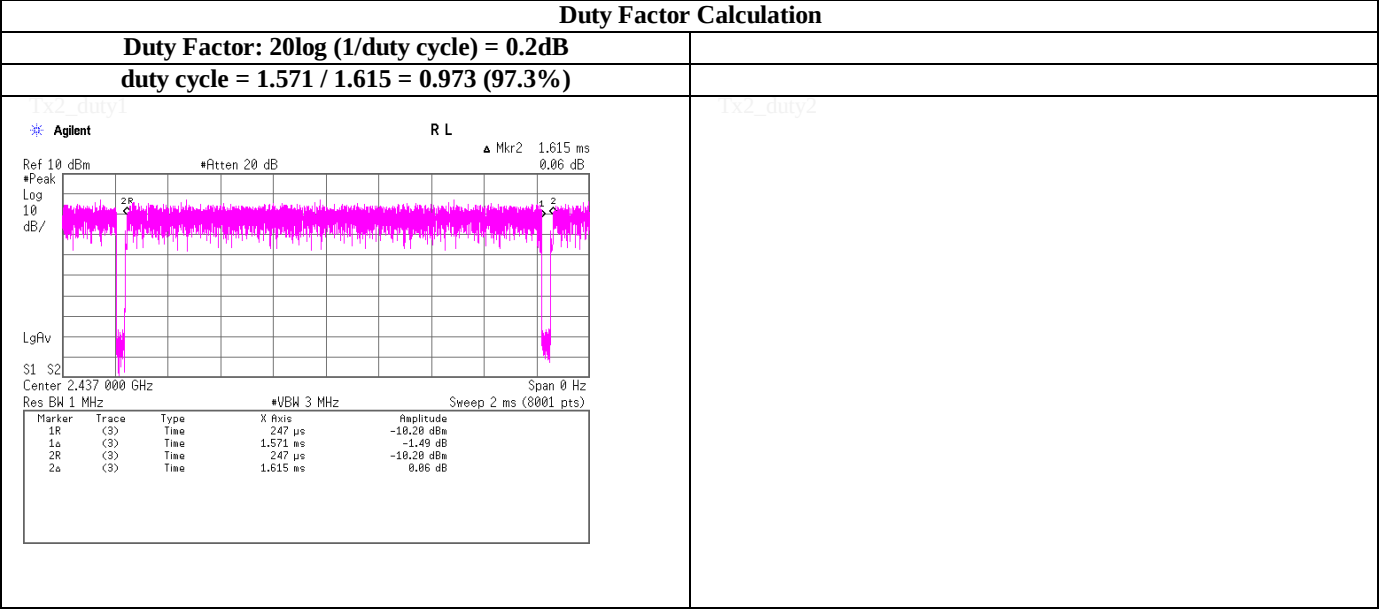
22deg.C , 40%RH

Engineer

Yosuke Ishikawa

Duty Factor Calculation chart

Tx, IEEE802.11g, PN9, worst data mode 12Mbps



UL Japan, Inc.

Shonan EMC Lab.

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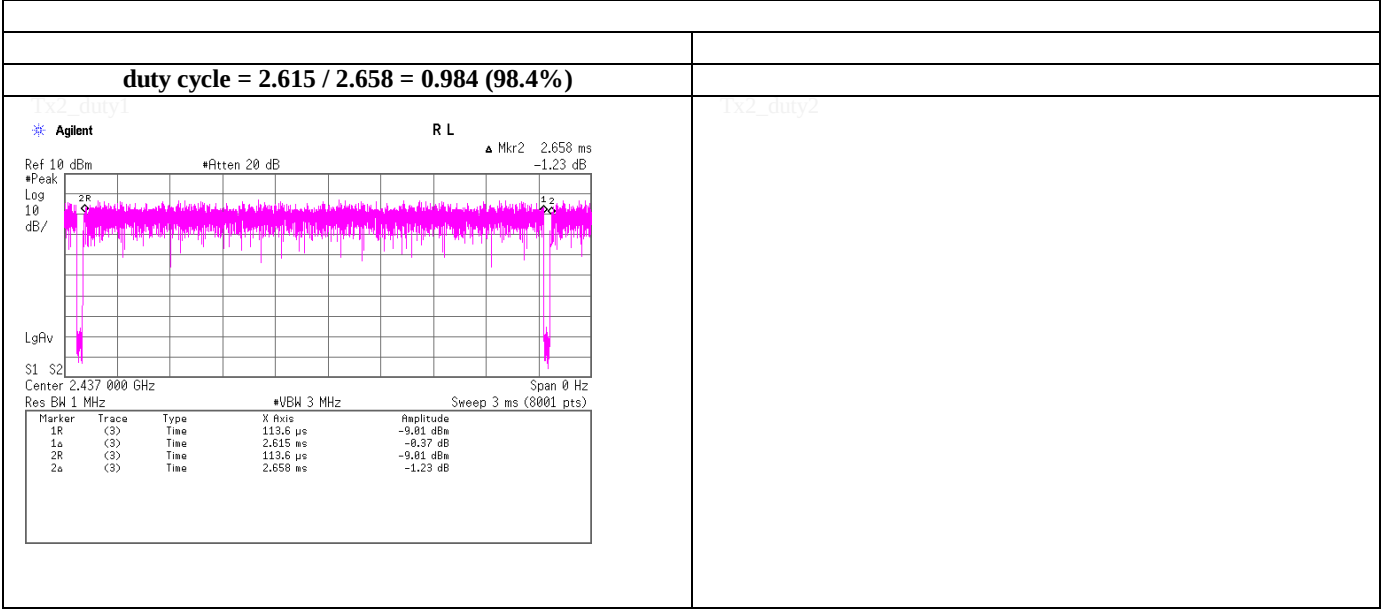
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date March 2, 2015
Temperature / Humidity 22deg.C , 40%RH
Engineer Yosuke Ishikawa

Burst rate confirmation

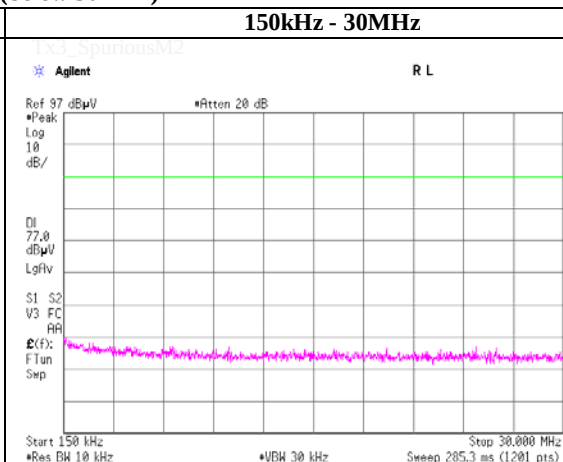
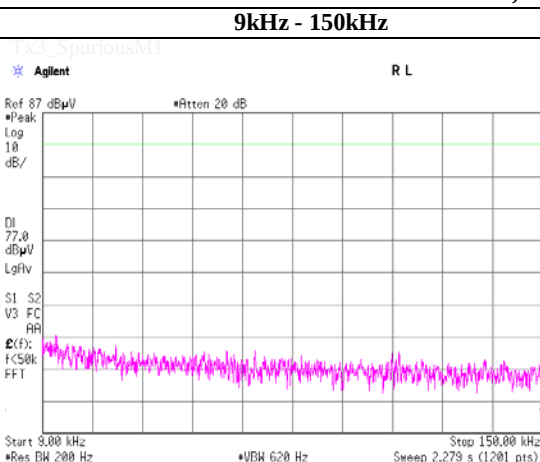
Tx, IEEE802.11n-HT20, PN9, 0(MCS) [800ns GI]



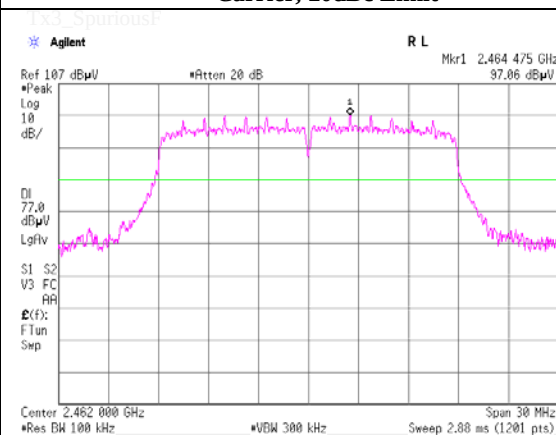
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T_x, IEEE802.11n-HT20, PN9, 0(MCS) [800ns GI]

Tx, 2462MHz (below 30MHz)



Carrier, 20dBc Limit

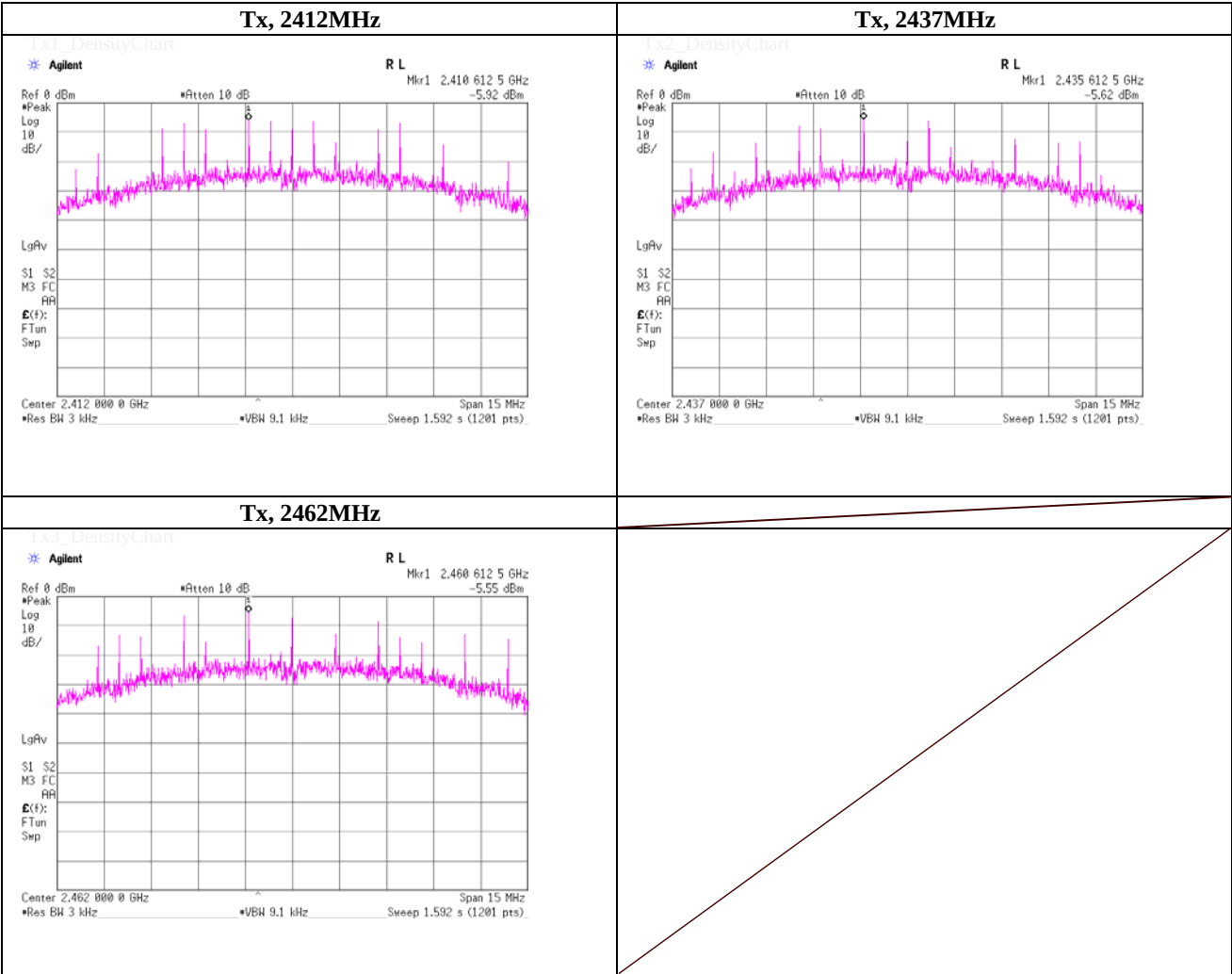


Maximum Power Spectral Density
(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 2, 2015	
Temperature / Humidity	22deg.C , 40%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	2410.61	-5.92	1.12	9.90	5.10	8.00	2.90
2437.0000	2435.61	-5.62	1.12	9.90	5.40	8.00	2.60
2462.0000	2460.61	-5.55	1.13	9.90	5.48	8.00	2.52

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



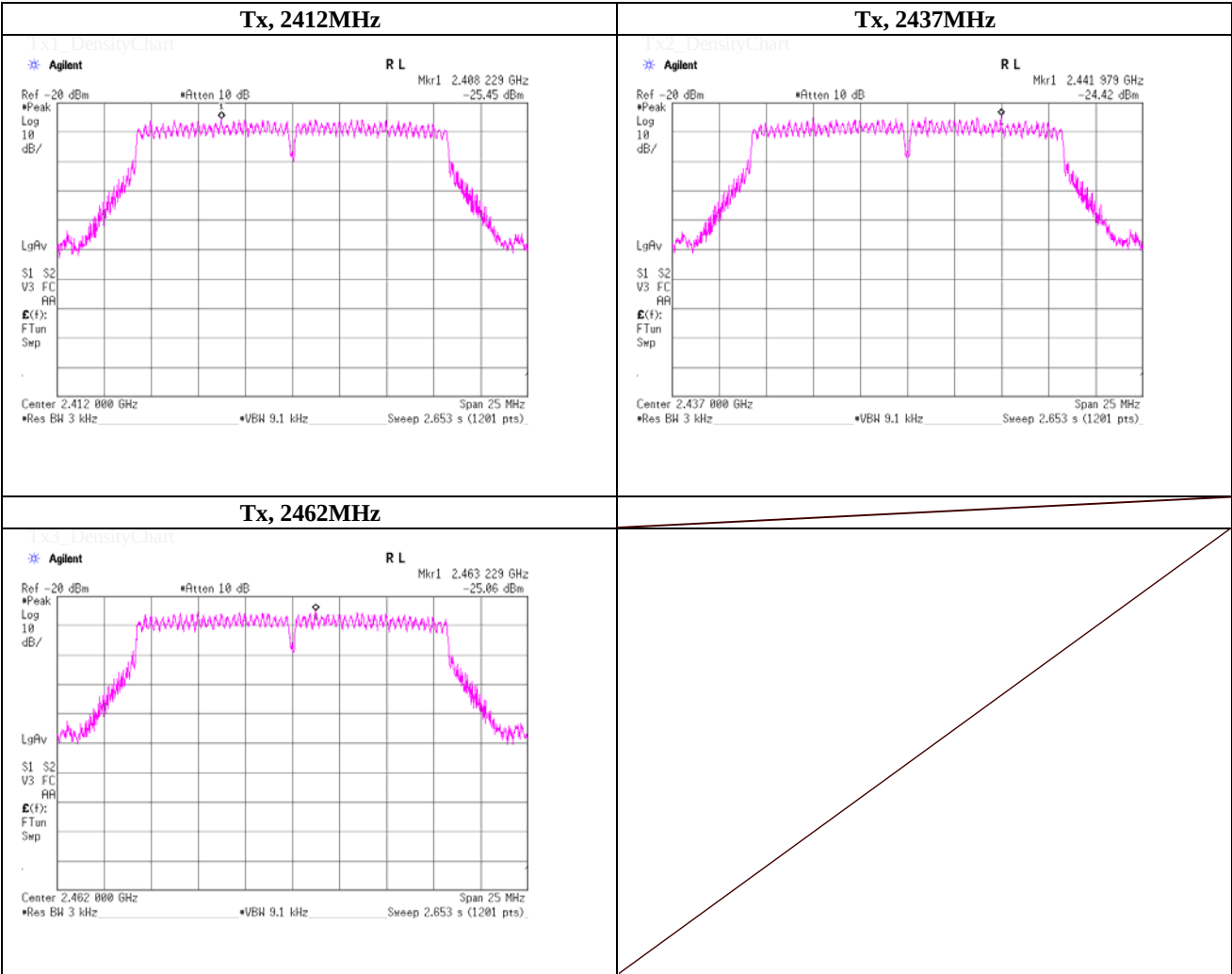
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Maximum Power Spectral Density
(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 2, 2015	
Temperature / Humidity	22deg.C , 40%RH	
Engineer	Yosuke Ishikawa	
Mode	Tx, IEEE802.11g, PN9, worst data mode 12Mbps	

Ch. Freq. [MHz]	Freq. Reading [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.0000	2408.23	-25.45	1.12	9.90	-14.43	8.00	22.43
2437.0000	2441.98	-24.42	1.12	9.90	-13.40	8.00	21.40
2462.0000	2463.23	-25.06	1.13	9.90	-14.03	8.00	22.03

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



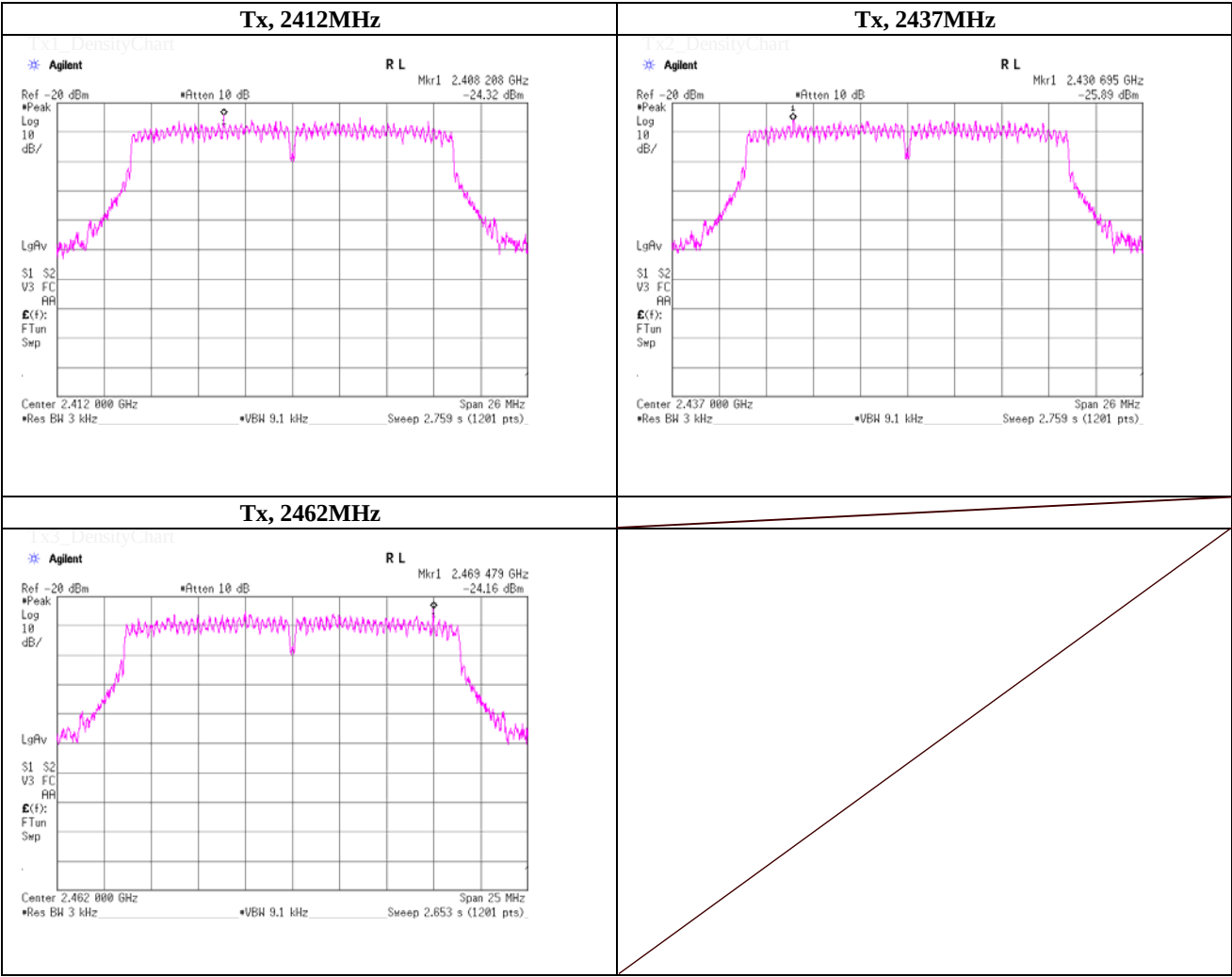
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Maximum Power Spectral Density
(PKPSD)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 2, 2015	
Temperature / Humidity	22deg.C , 40%RH	
Engineer	Yosuke Ishikawa	
Mode	Tx, IEEE802.11n-HT20, PN9, 0(MCS) [800ns GI]	

Ch. Freq.	Freq. Reading	Reading	Cable Loss	Atten.	Result	Limit	Margin
[MHz]	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[dBm]	[dB]
2412.0000	2408.21	-24.32	1.12	9.90	-13.30	8.00	21.30
2437.0000	2430.70	-25.89	1.12	9.90	-14.87	8.00	22.87
2462.0000	2469.48	-24.16	1.13	9.90	-13.13	8.00	21.13

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

March 2, 2015

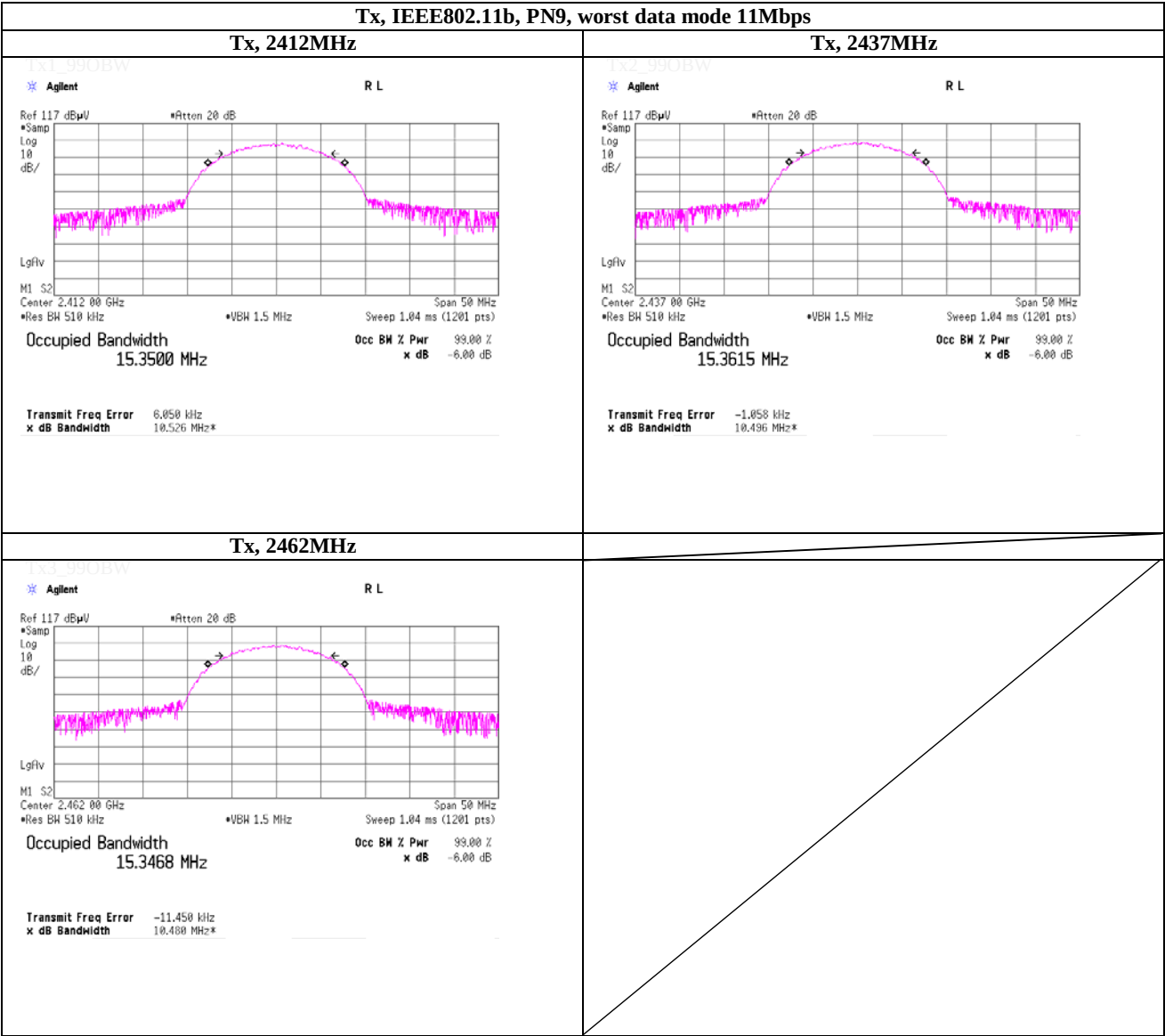
Temperature / Humidity

22deg.C , 40%RH

Engineer

Yosuke Ishikawa

99% Occupied Bandwidth



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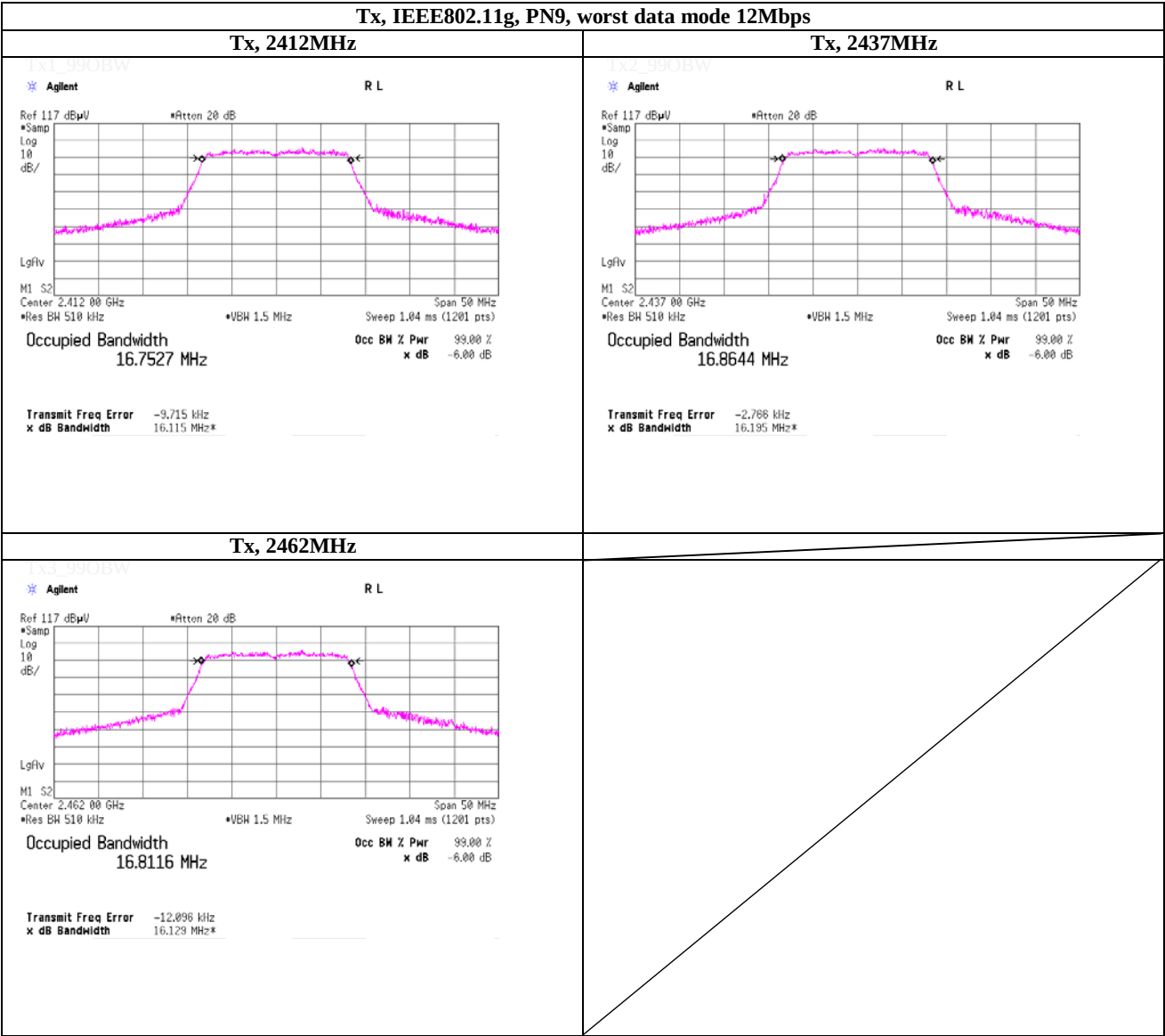
Temperature / Humidity

22deg.C , 40%RH

Engineer

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99% Occupied Bandwidth



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Test place

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No.5 Shielded Room

Date

March 2, 2015

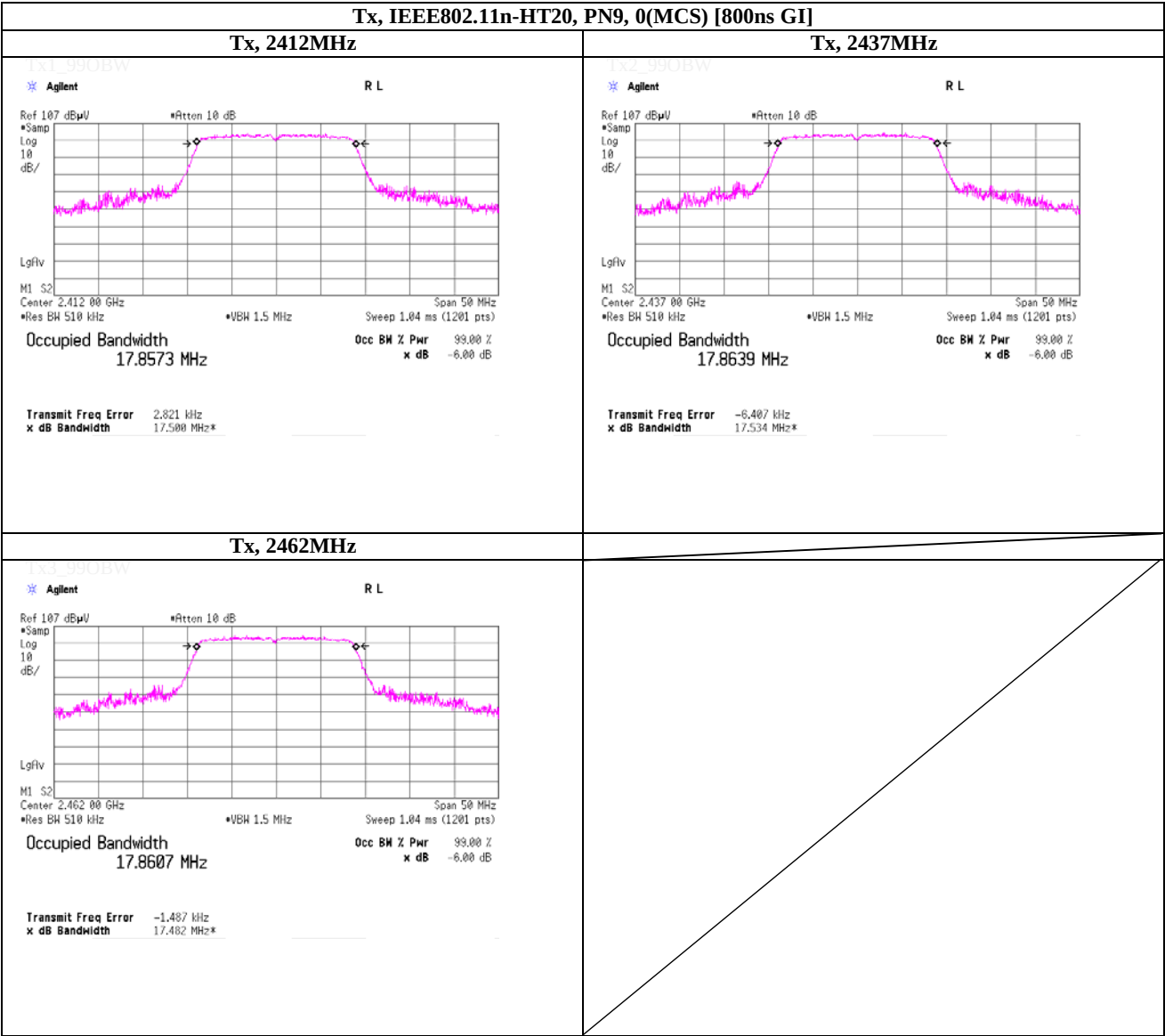
Temperature / Humidity

22deg.C , 40%RH

Engineer

Yosuke Ishikawa

99% Occupied Bandwidth



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APPENDIX 2

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
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	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF,LMF)	-	RE	-
SAT20-01	Attenuator(above1GHz)	Agilent	8493C-020	74889	RE	2014/11/21 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2014/11/21 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2014/03/15 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2014/03/14 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2014/03/13 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2014/10/18 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A0901	RE	2014/10/18 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2014/08/27 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271 (RF Selector)	RE	2014/04/25 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2015/02/18 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2014/03/04 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2015/02/24 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2014/04/04 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2014/04/04 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	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

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 :

RE: Radiated emission ,

AT: Antenna terminal disturbance voltage