



Test report No. : 10712938S-A
Page : 1 of 44
Issued date : March 18, 2015
Revised date : March 31, 2015
FCC ID : AJDK090

RADIO TEST REPORT

Test Report No.: 10712938S-A

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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3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: March 2 to 5, 2015

Representative test engineer:

Yosuke Ishikawa
Engineer
Consumer Technology Division

Approved by :

Toyokazu Imamura
Leader
Consumer Technology Division



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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

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

Refer to the test report: 10712938S-B for Wireless LAN 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	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2009 7. AC powerline conducted emission measurements	FCC 15.207	-	N/A *1)	-	-
Carrier frequency separation	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)	Conducted	N/A	*See data.	Complied
20dB bandwidth	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)	Conducted	N/A		-
Number of hopping frequency	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)(iii)	Conducted	N/A		Complied
Dwell time	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)(iii)	Conducted	N/A		Complied
Maximum peak output power	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (b)(1)	Conducted	N/A		Complied
Band edge compliance & Spurious emission	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (d) 15.209	Conducted/ Radiated	N/A	8.8 dB Freq.: 814.005 MHz Polarization: Vertical Detection: Quasi-Peak Mode: Tx 2480MHz, DH5	Complied

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

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

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3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2009 13. Measurement of intentional radiators, RSS-Gen 4.6.1	-	Conducted	-	-
Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422					

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

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%

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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
☐ 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	Operating mode	Tested frequency
Carrier frequency separation	Transmitting Hopping ON (DH5 / 3-DH5) / Inquiry, Payload: PRBS9	-
20dB bandwidth	Transmitting Hopping OFF (DH5 / 3-DH5) / Inquiry, Payload: PRBS9	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting Hopping ON (DH5 / 3-DH5) / Inquiry, Payload: PRBS9	-
Dwell time	Transmitting (Hopping ON), Payload: PRBS9 - DH1, - DH3, - DH5 - 3-DH1, - 3-DH3, - 3-DH5 -Inquiry	-
Maximum peak output power	Transmitting Hopping OFF, Payload: PRBS9 - DH5, - 2-DH5, - 3-DH5	2402MHz, 2441MHz, 2480MHz
Band edge compliance & Spurious emission	Transmitting (DH5 / 3-DH5), Payload: PRBS9 -Hopping OFF	Band edge compliance: 2402MHz, 2480MHz Spurious emission: 2402MHz, 2441MHz, 2480MHz
99% occupied bandwidth	Transmitting (DH5 / 3-DH5), Payload: PRBS9 / Inquiry -Hopping ON -Hopping OFF	2402MHz, 2441MHz, 2480MHz

*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload (except Dwell time test).

*Remarks: Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not affect the output power and bandwidth of the EUT.

The carrier separation may be less than 20 dB bandwidth, therefore 125mW power limit was applied to it.

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

We removed 2-DH mode (2 Mb/s EDR: pi/4DQPSK) except power measurement by using 3-DH mode (3 Mb/s EDR: 8DPSK) as a representative.

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

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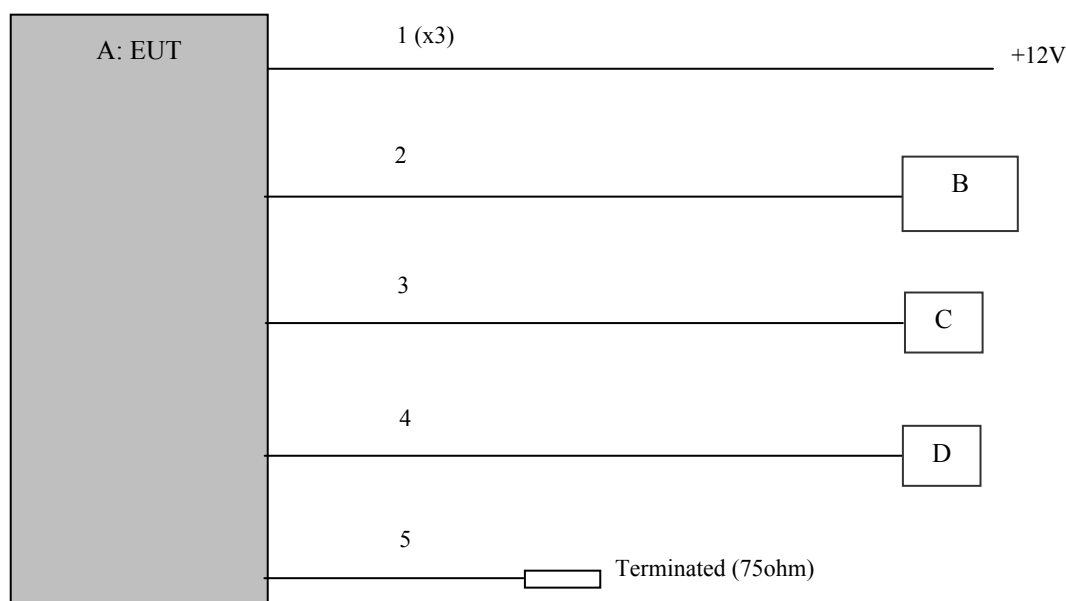
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4.2 Configuration and peripherals



* 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: Carrier frequency separation

Test procedure

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna port.

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

SECTION 6: 20dB bandwidth & Occupied bandwidth (99%)

Test procedure

The bandwidth was measured with a spectrum analyzer connected to the antenna port.

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

SECTION 7: Number of hopping frequency

Test procedure

The Number of Hopping Frequency was measured with a spectrum analyzer connected to the antenna port.

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

SECTION 8: Dwell time

Test procedure

The Dwell time was measured with a spectrum analyzer connected to the antenna port.

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

SECTION 9: Maximum peak output power

Test procedure

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

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

SECTION 10: Spurious 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.

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SECTION 11: Radiated emission

11.1 Operating environment

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

11.2 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.

11.3 Test conditions

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

11.4 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	Peak
IF Bandwidth	: 120kHz	RBW:1MHz	RBW:1MHz	RBW: 100kHz
		VBW:3MHz	VBW:10Hz	VBW: 300kHz

* When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold. Although 00-705 accepts VBW=10Hz for AV measurements, confirmed that superfluous smoothing was not performed.

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

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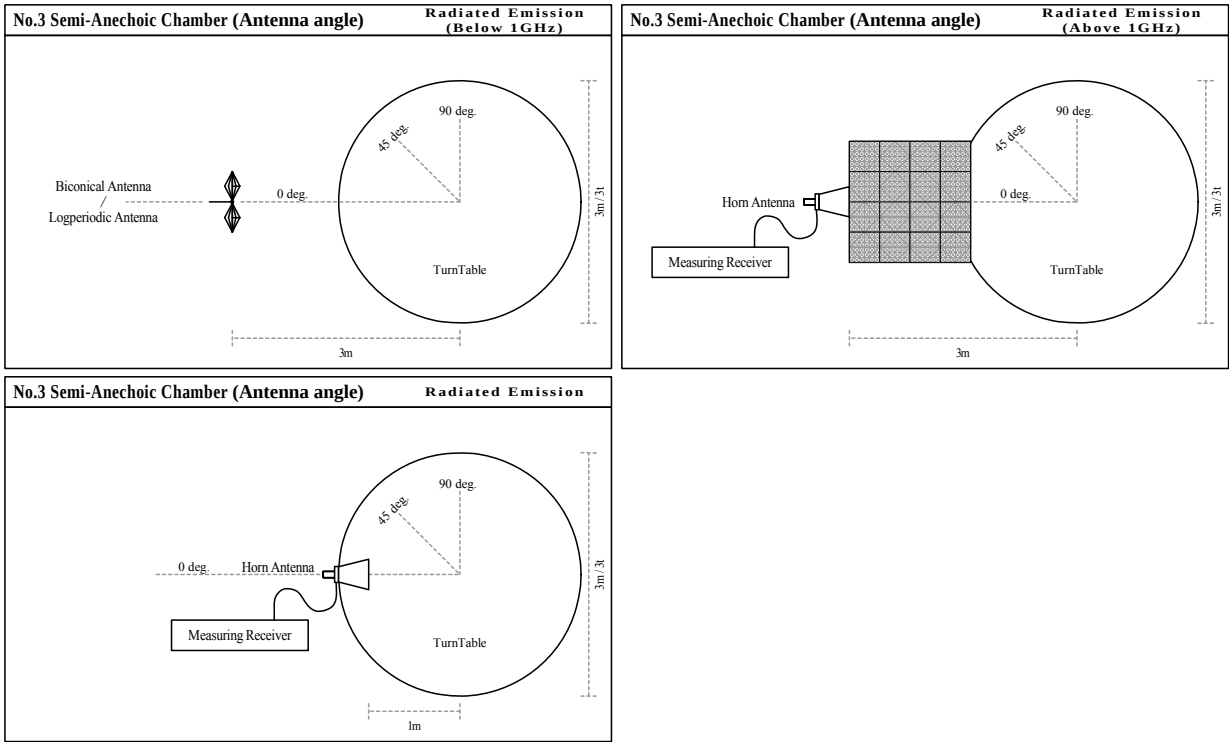
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Figure 1. Antenna angle



11.5 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.

11.6 Results

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

Refer to APPENDIX 1.

Contents of APPENDIXES

APPENDIX 1: Data of Radio tests

20dB bandwidth and Carrier frequency separation
Number of hopping frequency
Dwell time
Maximum peak output power
Radiated emission
Spurious emission (Antenna port conducted)
Occupied bandwidth

APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Radiated emission

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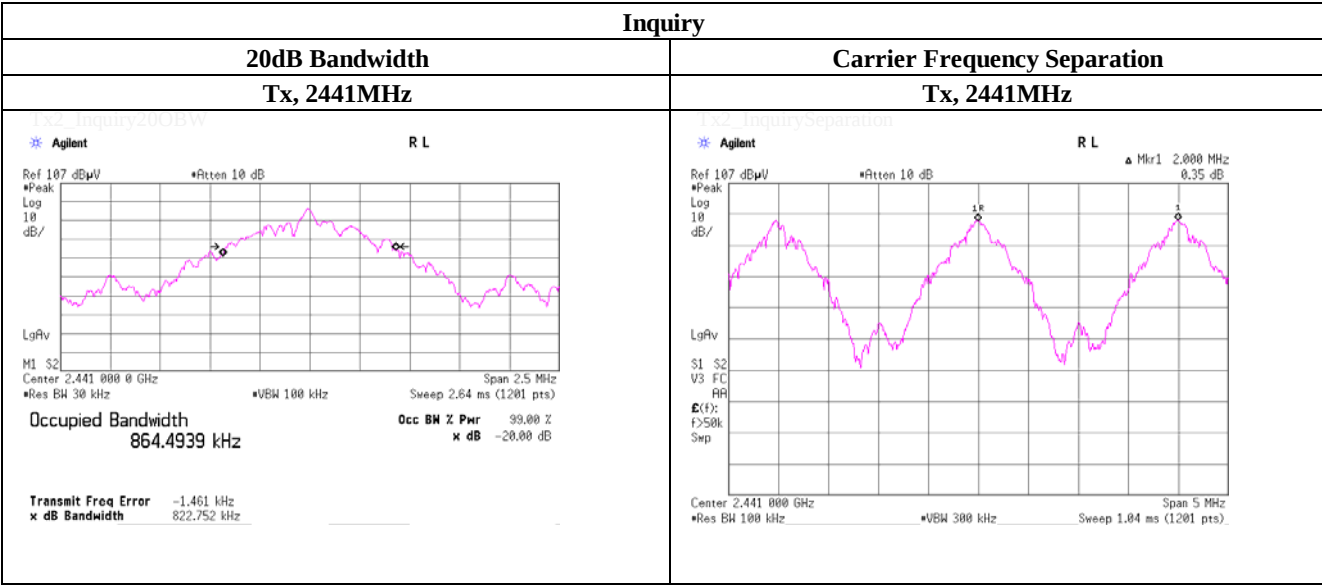
APPENDIX 1: Data of Radio tests

20dB Bandwidth and Carrier Frequency Separation

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	March 5, 2015	
Temperature / Humidity	22 deg.C , 30 %RH	
Engineer	Yosuke Ishikawa	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.956	1.000	>= 0.637
DH5	2441.0	0.962	1.000	>= 0.642
DH5	2480.0	0.957	1.000	>= 0.638
Inquiry	2441.0	0.823	2.000	>= 0.549

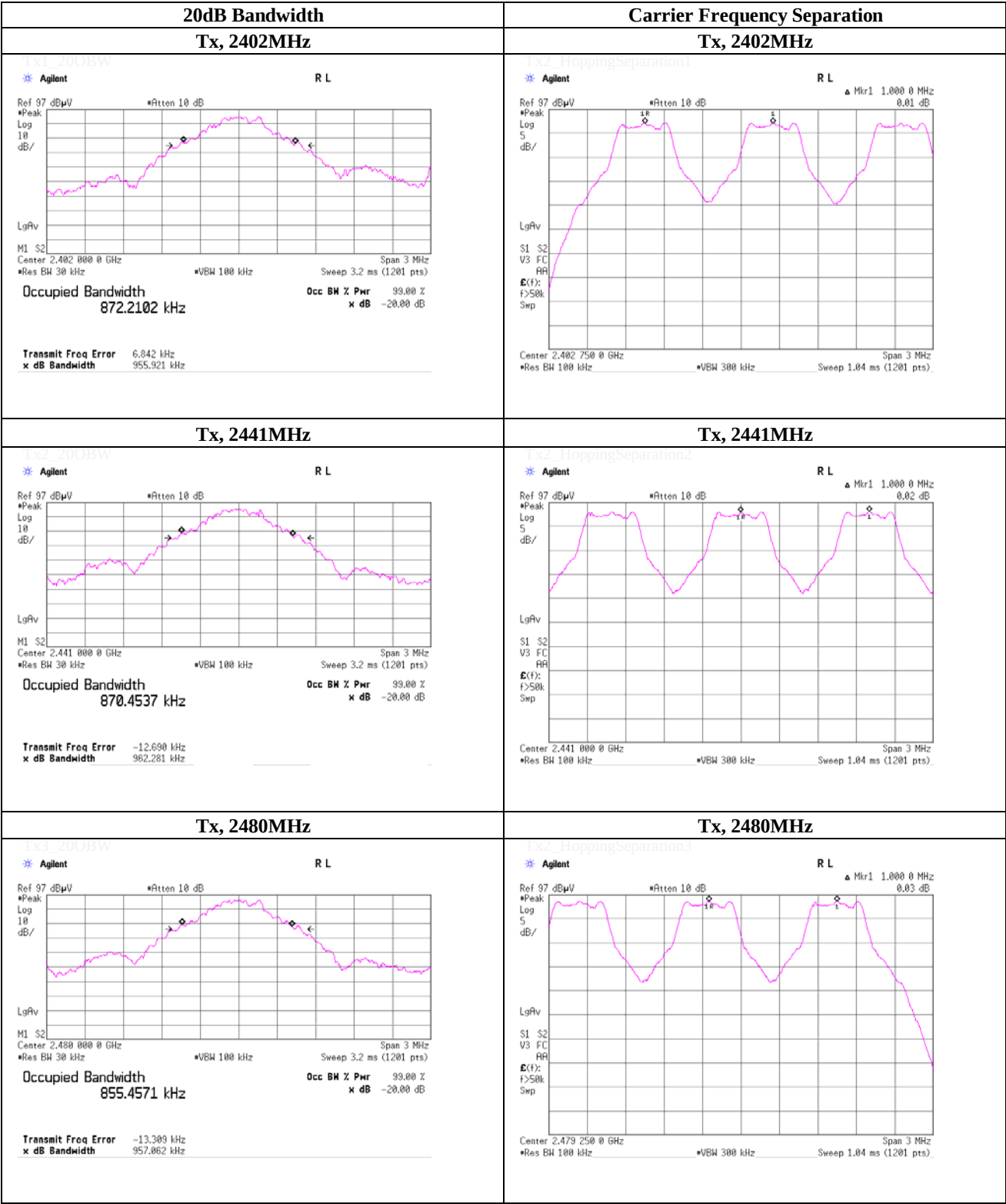
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.



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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, BDR, PRBS9



20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date March 5, 2015
Temperature / Humidity 22 deg.C , 30 %RH
Engineer Yosuke Ishikawa
Mode Tx, Bluetooth, EDR, PRBS9

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
3-DH5	2402.0	1.293	1.000	>= 0.862
3-DH5	2441.0	1.284	1.000	>= 0.856
3-DH5	2480.0	1.284	1.000	>= 0.856

Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).

No limit applies to 20dB Bandwidth.

Tx2_Inquiry20OBW

Tx2_InquirySeparation

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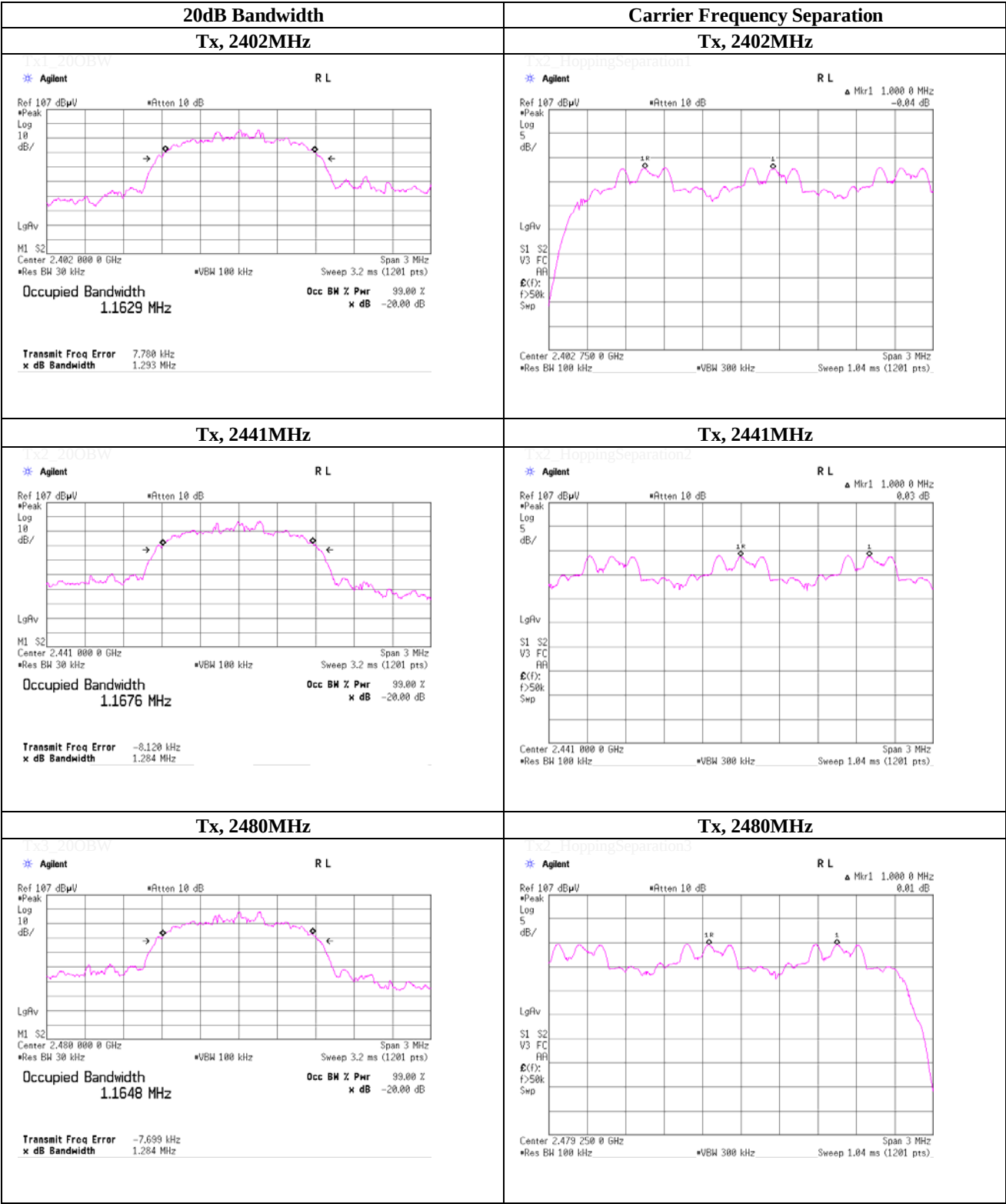
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, PRBS9



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Number of Hopping Frequency

Test place

Date

Temperature / Humidity

Engineer

Mode

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March 5, 2015

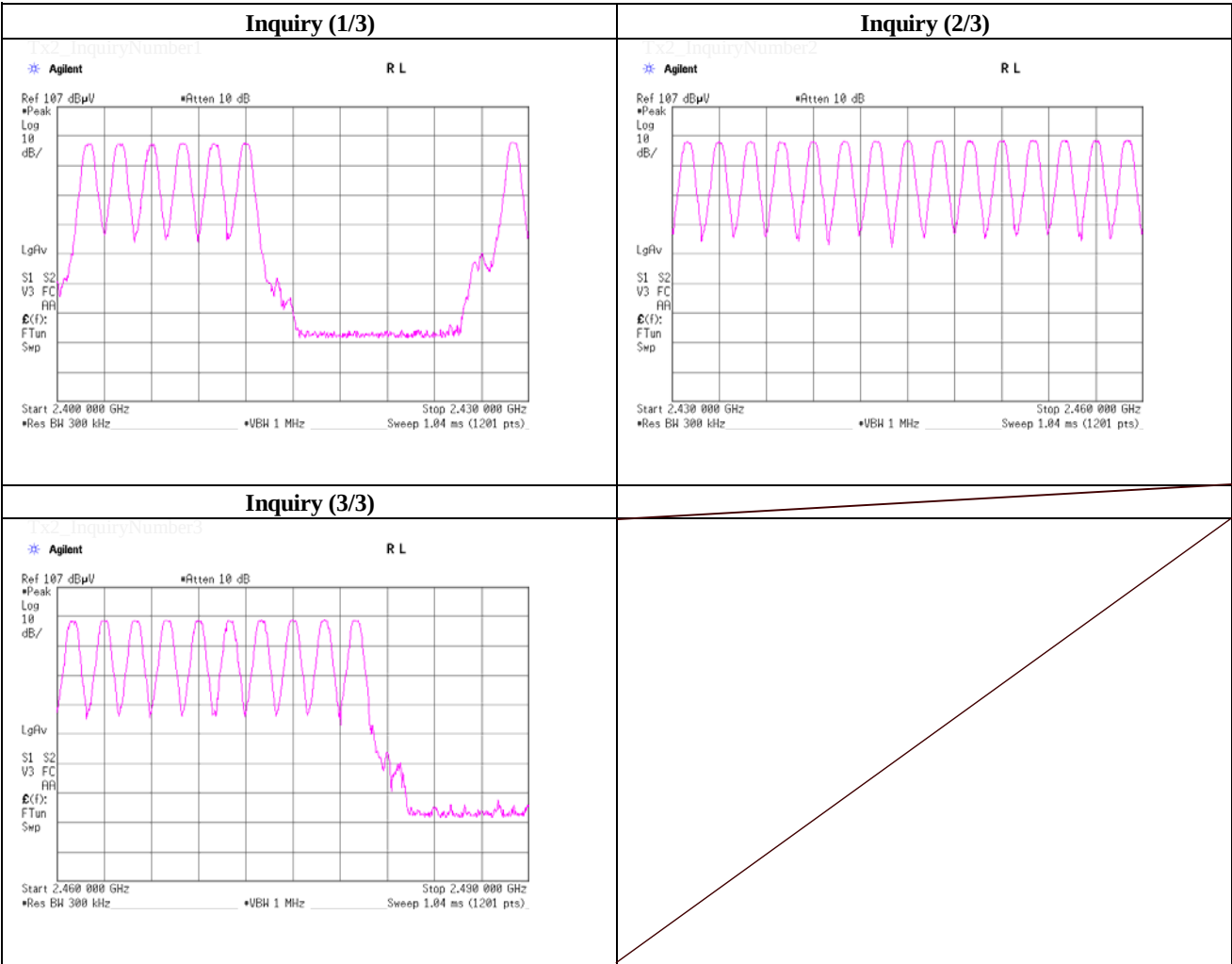
22 deg.C , 30 %RH

Yosuke Ishikawa

Tx, Bluetooth, Inquiry

No.5 Shielded Room

Mode	Number of Channel [times]	Limit [times]
Inquiry	32	>= 15



Number of Hopping Frequency

Test place

UL Japan, Inc. Shonan EMC Lab.

No.5 Shielded Room

Date

March 5, 2015

Temperature / Humidity

22 deg.C , 30 %RH

Engineer

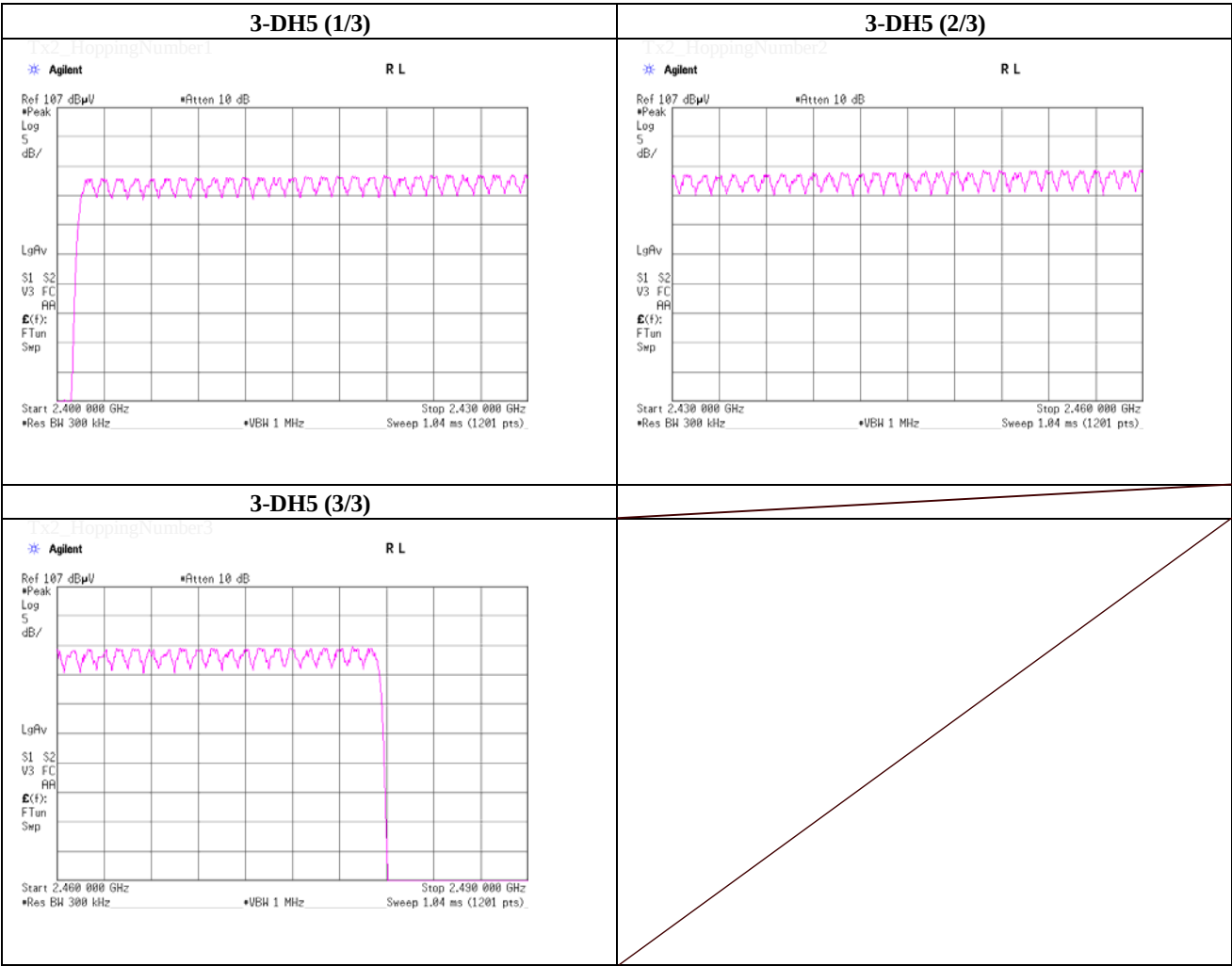
Yosuke Ishikawa

Mode

Tx, Bluetooth, EDR, PRBS9

Mode	Number of Channel [times]	Limit [times]
3-DH5	79	>= 15

* Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.



Dwell Time

Test place

UL Japan, Inc. Shonan EMC Lab.

No.5 Shielded Room

Date

March 5, 2015

Temperature / Humidity

22 deg.C , 30 %RH

Engineer

Yosuke Ishikawa

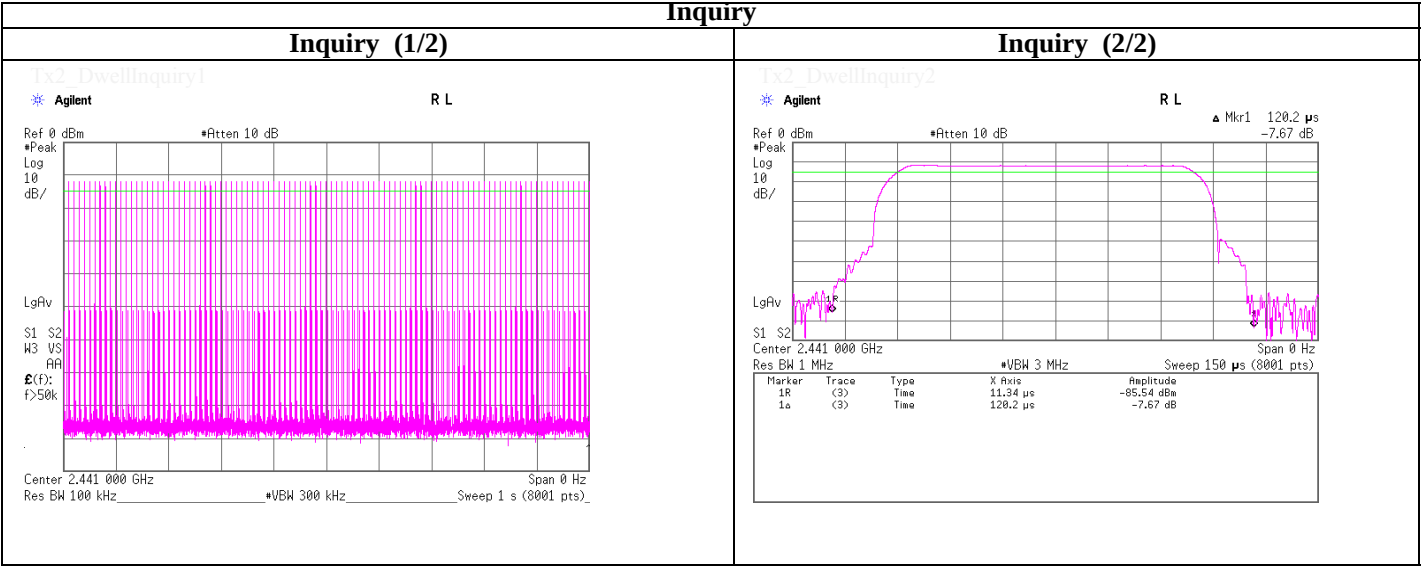
Mode

Tx, Bluetooth, BDR, PRBS9

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period			Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	51.0	/ 5.0 sec.	x 31.6 sec. =	323 times	0.423	137
DH3	26.0	/ 5.0 sec.	x 31.6 sec. =	165 times	1.681	277
DH5	17.0	/ 5.0 sec.	x 31.6 sec. =	108 times	2.931	317
Inquiry	100.0	/ 1.0 sec.	x 12.8 sec. =	1280 times	0.120	154

Sample Calculation
Result = Number of transmission x Length of transmission time

* This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in $N \times 0.4s$, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless of packet size (DH1, DH3 or DH5). This is confirmed in the test report for $N=79$.



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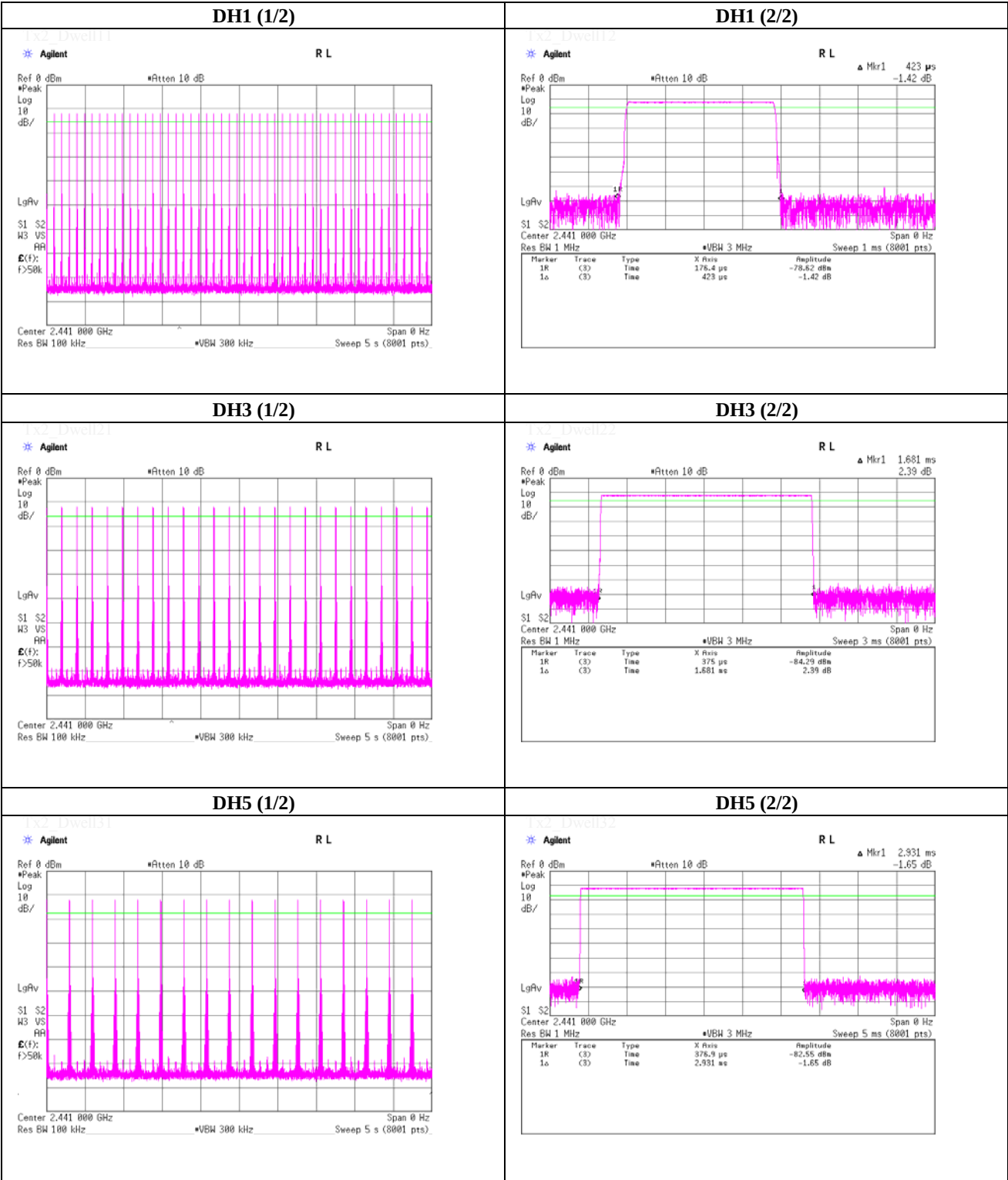
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Dwell time

Tx, Bluetooth, BDR, PRBS9



Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date March 5, 2015
 Temperature / Humidity 22 deg.C , 30 %RH
 Engineer Yosuke Ishikawa
 Mode Tx, Bluetooth, EDR, PRBS9

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) second			Length of transmission time [msec]	Result [msec]	Limit [msec]
3-DH1	51.0	/ 5.0 sec.	x 31.6 sec. = 323 times	0.431	139	400
3-DH3	26.0	/ 5.0 sec.	x 31.6 sec. = 165 times	1.683	278	400
3-DH5	17.0	/ 5.0 sec.	x 31.6 sec. = 108 times	2.934	317	400

Sample Calculation

Result = Number of transmission x Length of transmission time

* This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in $N \times 0.4s$, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4s regardless of packet size (3-DH1, 3-DH3 or 3-DH5). This is confirmed in the test report for $N=79$.

UL Japan, Inc.

Shonan EMC Lab.

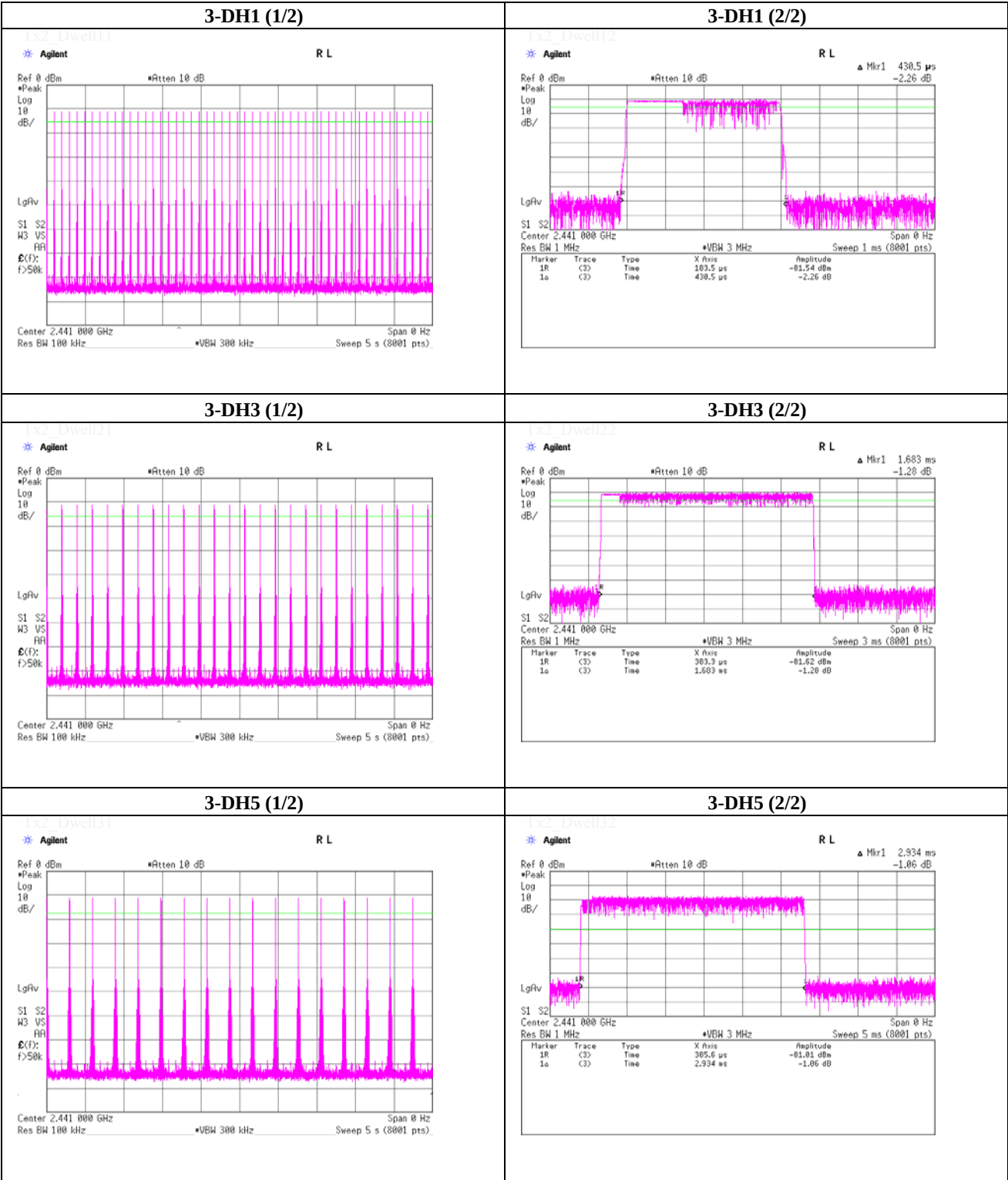
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Dwell time

Tx, Bluetooth, EDR, PRBS9



Maximum Peak Conducted Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date March 5, 2015
 Temperature / Humidity 22 deg.C , 30 %RH
 Engineer Yosuke Ishikawa
 Mode Tx, Bluetooth

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

	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-11.94	1.18	9.90	-0.86	0.82	20.97	125	21.83
DH5	2441.0	-11.14	1.12	9.90	-0.12	0.97	20.97	125	21.09
DH5	2480.0	-10.64	1.14	9.90	0.40	1.10	20.97	125	20.57
2-DH5	2402.0	-10.24	1.18	9.90	0.84	1.21	20.97	125	20.13
2-DH5	2441.0	-9.27	1.12	9.90	1.75	1.50	20.97	125	19.22
2-DH5	2480.0	-8.61	1.14	9.90	2.43	1.75	20.97	125	18.54
3-DH5	2402.0	-10.04	1.18	9.90	1.04	1.27	20.97	125	19.93
3-DH5	2441.0	-9.07	1.12	9.90	1.95	1.57	20.97	125	19.02
3-DH5	2480.0	-8.49	1.14	9.90	2.55	1.80	20.97	125	18.42

Sample Calculation:

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

(Reference maximum conducted power (average))

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

	Freq. [MHz]	P/M (Average) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty factor [dB]	Result	
						[dBm]	[mW]
DH5	2402.0	-13.82	1.18	9.90	1.15	-1.59	0.69
DH5	2441.0	-12.95	1.12	9.90	1.15	-0.78	0.84
DH5	2480.0	-12.39	1.14	9.90	1.15	-0.20	0.95
2-DH5	2402.0	-14.46	1.18	9.90	1.13	-2.25	0.60
2-DH5	2441.0	-13.38	1.12	9.90	1.13	-1.23	0.75
2-DH5	2480.0	-12.61	1.14	9.90	1.13	-0.44	0.90
3-DH5	2402.0	-14.50	1.18	9.90	1.13	-2.29	0.59
3-DH5	2441.0	-13.44	1.12	9.90	1.13	-1.29	0.74
3-DH5	2480.0	-12.72	1.14	9.90	1.13	-0.55	0.88

Sample Calculation:

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

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

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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, 2402 MHz
 Tx, Bluetooth, BDR, PRBS9,

(* 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.	156.001	QP	41.4	15.0	7.9	32.1	32.2	43.5	11.3	213	94	
Hori.	204.003	QP	39.1	16.4	8.1	32.0	31.6	43.5	11.9	169	232	
Hori.	228.003	QP	41.7	16.7	8.2	32.0	34.6	46.0	11.4	146	116	
Hori.	360.003	QP	43.1	15.5	8.9	31.9	35.6	46.0	10.4	100	129	
Hori.	432.001	QP	40.0	16.9	9.2	31.9	34.2	46.0	11.8	100	140	
Hori.	2390.000	PK	45.8	26.4	13.6	41.1	44.7	73.9	29.2	100	158	
Hori.	2932.731	PK	49.0	27.4	5.4	40.7	41.1	73.9	32.8	100	0	
Hori.	3366.366	PK	47.0	28.0	5.2	40.9	39.3	73.9	34.6	100	0	
Hori.	4804.000	PK	47.9	30.6	5.6	39.8	44.3	73.9	29.6	100	137	
Hori.	7206.000	PK	45.0	36.6	7.1	40.2	48.5	73.9	25.4	100	0	
Hori.	9608.000	PK	45.3	38.5	8.1	40.1	51.8	73.9	22.1	100	0	
Hori.	12010.000	PK	46.2	39.5	9.2	39.6	55.3	73.9	18.6	100	0	
Hori.	2390.000	AV	33.7	26.4	13.6	41.1	32.6	53.9	21.3	100	158	
Hori.	2932.731	AV	43.1	27.4	5.4	40.7	35.2	53.9	18.7	100	0	
Hori.	3366.366	AV	34.7	28.0	5.2	40.9	27.0	53.9	26.9	100	0	
Hori.	4804.000	AV	34.3	30.6	5.6	39.8	30.7	53.9	23.2	100	137	
Hori.	7206.000	AV	34.1	36.6	7.1	40.2	37.6	53.9	16.3	100	0	
Hori.	9608.000	AV	34.1	38.5	8.1	40.1	40.6	53.9	13.3	100	0	
Hori.	12010.000	AV	34.7	39.5	9.2	39.6	43.8	53.9	10.1	100	0	
Vert.	156.000	QP	38.8	15.0	7.9	32.1	29.6	43.5	13.9	100	260	
Vert.	813.990	QP	33.2	21.2	10.6	31.4	33.6	46.0	12.4	107	353	
Vert.	2390.000	PK	45.4	26.4	13.6	41.1	44.3	73.9	29.6	100	158	
Vert.	2956.814	PK	51.9	27.4	5.3	40.7	43.9	73.9	30.0	100	0	
Vert.	2963.698	PK	51.0	27.4	5.3	40.7	43.0	73.9	30.9	100	0	
Vert.	4804.000	PK	46.2	30.6	5.6	39.8	42.6	73.9	31.3	123	301	
Vert.	7206.000	PK	44.7	36.6	7.1	40.2	48.2	73.9	25.7	100	0	
Vert.	9608.000	PK	45.2	38.5	8.1	40.1	51.7	73.9	22.2	100	0	
Vert.	12010.000	PK	46.4	39.5	9.2	39.6	55.5	73.9	18.4	100	0	
Vert.	2390.000	AV	32.3	26.4	13.6	41.1	31.2	53.9	22.7	100	158	
Vert.	2956.814	AV	35.5	27.4	5.3	40.7	27.5	53.9	26.4	100	0	
Vert.	2963.698	AV	40.0	27.4	5.3	40.7	32.0	53.9	21.9	100	0	
Vert.	4804.000	AV	34.5	30.6	5.6	39.8	30.9	53.9	23.0	123	301	
Vert.	7206.000	AV	34.1	36.6	7.1	40.2	37.6	53.9	16.3	100	0	
Vert.	9608.000	AV	34.6	38.5	8.1	40.1	41.1	53.9	12.8	100	0	
Vert.	12010.000	AV	35.2	39.5	9.2	39.6	44.3	53.9	9.6	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.	2402.000	PK	89.8	26.4	13.6	41.1	88.7	-	-	Carrier
Hori.	2400.000	PK	44.4	26.4	13.6	41.1	43.3	68.7	25.4	
Vert.	2402.000	PK	84.6	26.4	13.6	41.1	83.5	-	-	Carrier
Vert.	2400.000	PK	40.6	26.4	13.6	41.1	39.5	63.5	24.0	

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 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, 2441 MHz
 Tx, Bluetooth, BDR, PRBS9,

(* 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.	156.001	QP	41.2	15.0	7.9	32.1	32.0	43.5	11.5	204	266	
Hori.	204.028	QP	38.4	16.4	8.1	32.0	30.9	43.5	12.6	172	230	
Hori.	228.026	QP	42.5	16.7	8.2	32.0	35.4	46.0	10.6	153	119	
Hori.	360.031	QP	41.9	15.5	8.9	31.9	34.4	46.0	11.6	100	137	
Hori.	432.025	QP	39.0	16.9	9.2	31.9	33.2	46.0	12.8	100	141	
Hori.	2988.786	PK	46.3	27.5	5.1	40.7	38.2	73.9	35.7	100	0	
Hori.	3384.072	PK	45.5	28.0	5.2	41.0	37.7	73.9	36.2	100	0	
Hori.	4882.000	PK	46.5	30.9	5.6	39.7	43.3	73.9	30.6	100	199	
Hori.	7323.000	PK	44.8	36.8	7.0	40.3	48.3	73.9	25.6	100	0	
Hori.	9764.000	PK	46.6	38.6	8.1	40.0	53.3	73.9	20.6	100	0	
Hori.	12205.000	PK	46.0	39.4	9.3	39.8	54.9	73.9	19.0	100	0	
Hori.	2988.786	AV	43.6	27.5	5.1	40.7	35.5	53.9	18.4	100	0	
Hori.	3384.072	AV	47.2	28.0	5.2	41.0	39.4	53.9	14.5	100	0	
Hori.	4882.000	AV	35.3	30.9	5.6	39.7	32.1	53.9	21.8	100	199	
Hori.	7323.000	AV	33.8	36.8	7.0	40.3	37.3	53.9	16.6	100	0	
Hori.	9764.000	AV	33.3	38.6	8.1	40.0	40.0	53.9	13.9	100	0	
Hori.	12205.000	AV	33.7	39.4	9.3	39.8	42.6	53.9	11.3	100	0	
Vert.	156.034	QP	40.2	15.0	7.9	32.1	31.0	43.5	12.5	100	97	
Vert.	814.022	QP	34.2	21.2	10.6	31.4	34.6	46.0	11.4	100	359	
Vert.	2970.179	PK	50.2	27.4	5.2	40.7	42.1	73.9	31.8	100	0	
Vert.	2985.587	PK	49.7	27.5	5.2	40.7	41.7	73.9	32.2	100	0	
Vert.	4882.000	PK	46.7	30.9	5.6	39.7	43.5	73.9	30.4	119	27	
Vert.	7323.000	PK	45.0	36.8	7.0	40.3	48.5	73.9	25.4	100	0	
Vert.	9764.000	PK	44.9	38.6	8.1	40.0	51.6	73.9	22.3	100	0	
Vert.	12205.000	PK	45.3	39.4	9.3	39.8	54.2	73.9	19.7	100	0	
Vert.	2970.179	AV	38.1	27.4	5.2	40.7	30.0	53.9	23.9	100	0	
Vert.	2985.587	AV	42.2	27.5	5.2	40.7	34.2	53.9	19.7	100	0	
Vert.	4882.000	AV	33.9	30.9	5.6	39.7	30.7	53.9	23.2	119	27	
Vert.	7323.000	AV	33.8	36.8	7.0	40.3	37.3	53.9	16.6	100	0	
Vert.	9764.000	AV	33.8	38.6	8.1	40.0	40.5	53.9	13.4	100	0	
Vert.	12205.000	AV	34.2	39.4	9.3	39.8	43.1	53.9	10.8	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.****Shonan EMC Lab.**

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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, 2480 MHz
 Tx, Bluetooth, BDR, PRBS9,

(* 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.	156.019	QP	38.5	15.0	7.9	32.1	29.3	43.5	14.2	210	268	
Hori.	203.984	QP	39.1	16.4	8.1	32.0	31.6	43.5	11.9	170	235	
Hori.	228.030	QP	42.3	16.7	8.2	32.0	35.2	46.0	10.8	154	120	
Hori.	360.035	QP	41.7	15.5	8.9	31.9	34.2	46.0	11.8	100	130	
Hori.	432.025	QP	38.8	16.9	9.2	31.9	33.0	46.0	13.0	100	140	
Hori.	2483.500	PK	46.6	26.6	13.6	41.1	45.7	73.9	28.2	100	63	
Hori.	2918.453	PK	47.7	27.3	5.5	40.8	39.7	73.9	34.2	100	0	
Hori.	3009.596	PK	46.5	27.5	5.1	40.7	38.4	73.9	35.5	100	0	
Hori.	4960.000	PK	47.3	31.2	5.7	39.6	44.6	73.9	29.3	100	199	
Hori.	7440.000	PK	45.0	37.0	7.0	40.4	48.6	73.9	25.3	100	0	
Hori.	9920.000	PK	43.6	38.6	8.0	39.9	50.3	73.9	23.6	100	0	
Hori.	12400.000	PK	44.5	39.3	9.4	40.0	53.2	73.9	20.7	100	0	
Hori.	2483.500	AV	34.4	26.6	13.6	41.1	33.5	53.9	20.4	100	63	
Hori.	2918.453	AV	37.9	27.3	5.5	40.8	29.9	53.9	24.0	100	0	
Hori.	3009.596	AV	37.0	27.5	5.1	40.7	28.9	53.9	25.0	100	0	
Hori.	4960.000	AV	35.6	31.2	5.7	39.6	32.9	53.9	21.0	100	199	
Hori.	7440.000	AV	33.7	37.0	7.0	40.4	37.3	53.9	16.6	100	0	
Hori.	9920.000	AV	33.1	38.6	8.0	39.9	39.8	53.9	14.1	100	0	
Hori.	12400.000	AV	33.0	39.3	9.4	40.0	41.7	53.9	12.2	100	0	
Vert.	156.027	QP	40.4	15.0	7.9	32.1	31.2	43.5	12.3	100	92	
Vert.	814.005	QP	36.8	21.2	10.6	31.4	37.2	46.0	8.8	100	359	
Vert.	2483.500	PK	45.8	26.6	13.6	41.1	44.9	73.9	29.0	100	240	
Vert.	2936.138	PK	50.5	27.4	5.4	40.7	42.6	73.9	31.3	100	0	
Vert.	3144.045	PK	46.0	27.7	5.2	40.8	38.1	73.9	35.8	100	0	
Vert.	4960.000	PK	46.1	31.2	5.7	39.6	43.4	73.9	30.5	113	175	
Vert.	7440.000	PK	46.0	37.0	7.0	40.4	49.6	73.9	24.3	100	0	
Vert.	9920.000	PK	44.8	38.6	8.0	39.9	51.5	73.9	22.4	100	0	
Vert.	12400.000	PK	44.6	39.3	9.4	40.0	53.3	73.9	20.6	100	0	
Vert.	2483.500	AV	33.8	26.6	13.6	41.1	32.9	53.9	21.0	100	240	
Vert.	2936.138	AV	43.1	27.4	5.4	40.7	35.2	53.9	18.7	100	0	
Vert.	3144.045	AV	36.1	27.7	5.2	40.8	28.2	53.9	25.7	100	0	
Vert.	4960.000	AV	34.2	31.2	5.7	39.6	31.5	53.9	22.4	113	175	
Vert.	7440.000	AV	33.7	37.0	7.0	40.4	37.3	53.9	16.6	100	0	
Vert.	9920.000	AV	33.2	38.6	8.0	39.9	39.9	53.9	14.0	100	0	
Vert.	12400.000	AV	33.1	39.3	9.4	40.0	41.8	53.9	12.1	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

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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, 2402 MHz
 Tx, Bluetooth, EDR, PRBS9,

(* 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.	156.032	QP	38.1	15.0	7.9	32.1	28.9	43.5	14.6	213	269	
Hori.	204.026	QP	39.1	16.4	8.1	32.0	31.6	43.5	11.9	165	228	
Hori.	228.042	QP	41.0	16.7	8.2	32.0	33.9	46.0	12.1	145	122	
Hori.	360.014	QP	43.1	15.5	8.9	31.9	35.6	46.0	10.4	100	124	
Hori.	432.030	QP	38.1	16.9	9.2	31.9	32.3	46.0	13.7	100	146	
Hori.	2390.000	PK	46.1	26.4	13.6	41.1	45.0	73.9	28.9	100	64	
Hori.	2971.213	PK	47.5	27.4	5.2	40.7	39.4	73.9	34.5	100	0	
Hori.	3033.563	PK	45.7	27.5	5.2	40.7	37.7	73.9	36.2	100	0	
Hori.	4804.000	PK	46.0	30.6	5.6	39.8	42.4	73.9	31.5	100	220	
Hori.	7206.000	PK	46.4	36.6	7.1	40.2	49.9	73.9	24.0	100	0	
Hori.	9608.000	PK	44.9	38.5	8.1	40.1	51.4	73.9	22.5	100	0	
Hori.	12010.000	PK	47.9	39.5	9.2	39.6	57.0	73.9	16.9	100	0	
Hori.	2390.000	AV	33.4	26.4	13.6	41.1	32.3	53.9	21.6	100	64	
Hori.	2971.213	AV	37.6	27.4	5.2	40.7	29.5	53.9	24.4	100	0	
Hori.	3033.563	AV	34.6	27.5	5.2	40.7	26.6	53.9	27.3	100	0	
Hori.	4804.000	AV	33.1	30.6	5.6	39.8	29.5	53.9	24.4	100	220	
Hori.	7206.000	AV	33.5	36.6	7.1	40.2	37.0	53.9	16.9	100	0	
Hori.	9608.000	AV	34.0	38.5	8.1	40.1	40.5	53.9	13.4	100	0	
Hori.	12010.000	AV	33.9	39.5	9.2	39.6	43.0	53.9	10.9	100	0	
Vert.	156.038	QP	39.9	15.0	7.9	32.1	30.7	43.5	12.8	100	89	
Vert.	814.035	QP	34.0	21.2	10.6	31.4	34.4	46.0	11.6	100	359	
Vert.	2390.000	PK	45.8	26.4	13.6	41.1	44.7	73.9	29.2	100	0	
Vert.	2905.595	PK	52.3	27.3	5.5	40.8	44.3	73.9	29.6	100	0	
Vert.	2947.224	PK	50.7	27.4	5.3	40.7	42.7	73.9	31.2	100	0	
Vert.	4804.000	PK	45.8	30.6	5.6	39.8	42.2	73.9	31.7	150	17	
Vert.	7206.000	PK	46.7	36.6	7.1	40.2	50.2	73.9	23.7	100	0	
Vert.	9608.000	PK	45.1	38.5	8.1	40.1	51.6	73.9	22.3	100	0	
Vert.	12010.000	PK	46.9	39.5	9.2	39.6	56.0	73.9	17.9	100	0	
Vert.	2390.000	AV	33.5	26.4	13.6	41.1	32.4	53.9	21.5	100	0	
Vert.	2905.595	AV	42.9	27.3	5.5	40.8	34.9	53.9	19.0	100	0	
Vert.	2947.224	AV	43.6	27.4	5.3	40.7	35.6	53.9	18.3	100	0	
Vert.	4804.000	AV	33.2	30.6	5.6	39.8	29.6	53.9	24.3	150	17	
Vert.	7206.000	AV	33.5	36.6	7.1	40.2	37.0	53.9	16.9	100	0	
Vert.	9608.000	AV	33.9	38.5	8.1	40.1	40.4	53.9	13.5	100	0	
Vert.	12010.000	AV	34.0	39.5	9.2	39.6	43.1	53.9	10.8	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.	2402.000	PK	89.1	26.4	13.6	41.1	88.0	-	-	Carrier
Hori.	2400.000	PK	40.6	26.4	13.6	41.1	39.5	68.0	28.5	
Vert.	2402.000	PK	84.2	26.4	13.6	41.1	83.1	-	-	Carrier
Vert.	2400.000	PK	36.9	26.4	13.6	41.1	35.8	63.1	27.3	

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

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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, 2441 MHz
 Tx, Bluetooth, EDR, PRBS9,

(* 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.	156.018	QP	39.4	15.0	7.9	32.1	30.2	43.5	13.3	211	265	
Hori.	204.007	QP	40.1	16.4	8.1	32.0	32.6	43.5	10.9	150	231	
Hori.	228.009	QP	43.5	16.7	8.2	32.0	36.4	46.0	9.6	154	118	
Hori.	360.066	QP	38.7	15.5	8.9	31.9	31.2	46.0	14.8	100	129	
Hori.	432.030	QP	38.5	16.9	9.2	31.9	32.7	46.0	13.3	100	140	
Hori.	2963.204	PK	49.7	27.4	5.3	40.7	41.7	73.9	32.2	100	0	
Hori.	2970.218	PK	47.2	27.4	5.2	40.7	39.1	73.9	34.8	100	0	
Hori.	4882.000	PK	47.0	30.9	5.6	39.7	43.8	73.9	30.1	100	203	
Hori.	7323.000	PK	45.6	36.8	7.0	40.3	49.1	73.9	24.8	100	0	
Hori.	9764.000	PK	46.3	38.6	8.1	40.0	53.0	73.9	20.9	100	0	
Hori.	12205.000	PK	45.5	39.4	9.3	39.8	54.4	73.9	19.5	100	0	
Hori.	2963.204	AV	41.5	27.4	5.3	40.7	33.5	53.9	20.4	100	0	
Hori.	2970.218	AV	38.3	27.4	5.2	40.7	30.2	53.9	23.7	100	0	
Hori.	4882.000	AV	34.3	30.9	5.6	39.7	31.1	53.9	22.8	100	203	
Hori.	7323.000	AV	33.2	36.8	7.0	40.3	36.7	53.9	17.2	100	0	
Hori.	9764.000	AV	33.3	38.6	8.1	40.0	40.0	53.9	13.9	100	0	
Hori.	12205.000	AV	33.6	39.4	9.3	39.8	42.5	53.9	11.4	100	0	
Vert.	156.008	QP	42.8	15.0	7.9	32.1	33.6	43.5	9.9	100	97	
Vert.	814.038	QP	33.6	21.2	10.6	31.4	34.0	46.0	12.0	100	355	
Vert.	2963.840	PK	50.8	27.4	5.3	40.7	42.8	73.9	31.1	100	0	
Vert.	3180.816	PK	50.2	27.7	5.2	40.8	42.3	73.9	31.6	100	0	
Vert.	4882.000	PK	46.2	30.9	5.6	39.7	43.0	73.9	30.9	123	356	
Vert.	7323.000	PK	46.1	36.8	7.0	40.3	49.6	73.9	24.3	100	0	
Vert.	9764.000	PK	46.6	38.6	8.1	40.0	53.3	73.9	20.6	100	0	
Vert.	12205.000	PK	46.4	39.4	9.3	39.8	55.3	73.9	18.6	100	0	
Vert.	2963.840	AV	42.8	27.4	5.3	40.7	34.8	53.9	19.1	100	0	
Vert.	3180.816	AV	43.4	27.7	5.2	40.8	35.5	53.9	18.4	100	0	
Vert.	4882.000	AV	33.1	30.9	5.6	39.7	29.9	53.9	24.0	123	356	
Vert.	7323.000	AV	33.2	36.8	7.0	40.3	36.7	53.9	17.2	100	0	
Vert.	9764.000	AV	33.2	38.6	8.1	40.0	39.9	53.9	14.0	100	0	
Vert.	12205.000	AV	33.7	39.4	9.3	39.8	42.6	53.9	11.3	100	0	

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

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

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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, 2480 MHz
 Tx, Bluetooth, EDR, PRBS9,

(* 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.	156.007	QP	40.0	15.0	7.9	32.1	30.8	43.5	12.7	216	263	
Hori.	204.013	QP	39.9	16.4	8.1	32.0	32.4	43.5	11.1	170	233	
Hori.	228.022	QP	42.8	16.7	8.2	32.0	35.7	46.0	10.3	142	121	
Hori.	360.000	QP	43.3	15.5	8.9	31.9	35.8	46.0	10.2	100	129	
Hori.	432.007	QP	39.6	16.9	9.2	31.9	33.8	46.0	12.2	100	142	
Hori.	2483.500	PK	47.0	26.6	13.6	41.1	46.1	73.9	27.8	100	63	
Hori.	2913.464	PK	47.1	27.3	5.5	40.8	39.1	73.9	34.8	100	0	
Hori.	2937.636	PK	48.9	27.4	5.4	40.7	41.0	73.9	32.9	100	0	
Hori.	4960.000	PK	47.0	31.2	5.7	39.6	44.3	73.9	29.6	100	199	
Hori.	7440.000	PK	45.7	37.0	7.0	40.4	49.3	73.9	24.6	100	0	
Hori.	9920.000	PK	45.7	38.6	8.0	39.9	52.4	73.9	21.5	100	0	
Hori.	12400.000	PK	44.6	39.3	9.4	40.0	53.3	73.9	20.6	100	0	
Hori.	2483.500	AV	34.7	26.6	13.6	41.1	33.8	53.9	20.1	100	63	
Hori.	2913.464	AV	37.6	27.3	5.5	40.8	29.6	53.9	24.3	100	0	
Hori.	2937.636	AV	40.0	27.4	5.4	40.7	32.1	53.9	21.8	100	0	
Hori.	4960.000	AV	34.4	31.2	5.7	39.6	31.7	53.9	22.2	100	199	
Hori.	7440.000	AV	33.2	37.0	7.0	40.4	36.8	53.9	17.1	100	0	
Hori.	9920.000	AV	32.6	38.6	8.0	39.9	39.3	53.9	14.6	100	0	
Hori.	12400.000	AV	32.4	39.3	9.4	40.0	41.1	53.9	12.8	100	0	
Vert.	156.037	QP	41.4	15.0	7.9	32.1	32.2	43.5	11.3	100	96	
Vert.	814.054	QP	30.9	21.2	10.6	31.4	31.3	46.0	14.7	100	359	
Vert.	2483.500	PK	46.4	26.6	13.6	41.1	45.5	73.9	28.4	100	257	
Vert.	3001.605	PK	48.5	27.5	5.1	40.7	40.4	73.9	33.5	100	0	
Vert.	3182.346	PK	48.2	27.7	5.2	40.8	40.3	73.9	33.6	100	0	
Vert.	4960.000	PK	45.9	31.2	5.7	39.6	43.2	73.9	30.7	120	177	
Vert.	7440.000	PK	45.7	37.0	7.0	40.4	49.3	73.9	24.6	100	0	
Vert.	9920.000	PK	45.9	38.6	8.0	39.9	52.6	73.9	21.3	100	0	
Vert.	12400.000	PK	45.4	39.3	9.4	40.0	54.1	73.9	19.8	100	0	
Vert.	2483.500	AV	33.8	26.6	13.6	41.1	32.9	53.9	21.0	100	257	
Vert.	3001.605	AV	40.8	27.5	5.1	40.7	32.7	53.9	21.2	100	0	
Vert.	3182.346	AV	37.2	27.7	5.2	40.8	29.3	53.9	24.6	100	0	
Vert.	4960.000	AV	33.7	31.2	5.7	39.6	31.0	53.9	22.9	120	177	
Vert.	7440.000	AV	33.2	37.0	7.0	40.4	36.8	53.9	17.1	100	0	
Vert.	9920.000	AV	32.6	38.6	8.0	39.9	39.3	53.9	14.6	100	0	
Vert.	12400.000	AV	32.4	39.3	9.4	40.0	41.1	53.9	12.8	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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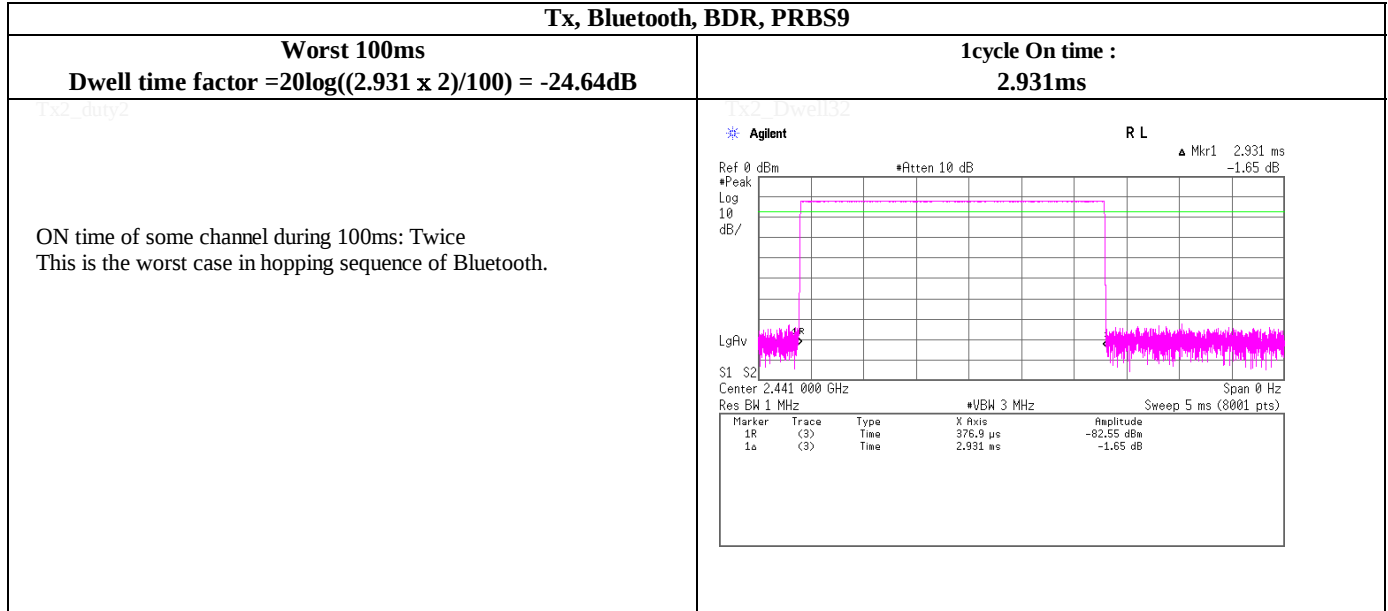
Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date March 5, 2015
 Temperature / Humidity 22 deg.C , 30 %RH
 Engineer Yosuke Ishikawa

Dwell time factor Calculation chart (Reference data)

Dwell time factor Calculation

Tx, Bluetooth, BDR, PRBS9

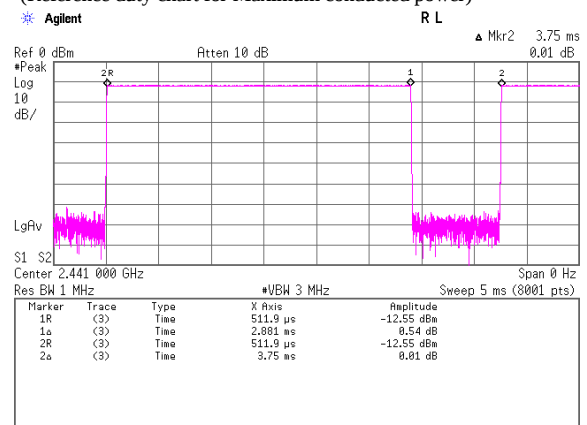


VBW (Average) setting

*Although 00-705 accepts VBW=10Hz for AV measurements, confirmed that superfluous smoothing was not performed.

(Reference) duty chart for Maximum conducted power

(Reference duty chart for Maximum conducted power)



on time [ms] 2.881 1cycle[ms] 3.75 duty 0.768
 duty factor [dB] 1.15
 * calculation: duty factor [dB] = $10 \times \log(1\text{ cycle [ms]} / \text{on time [ms]})$

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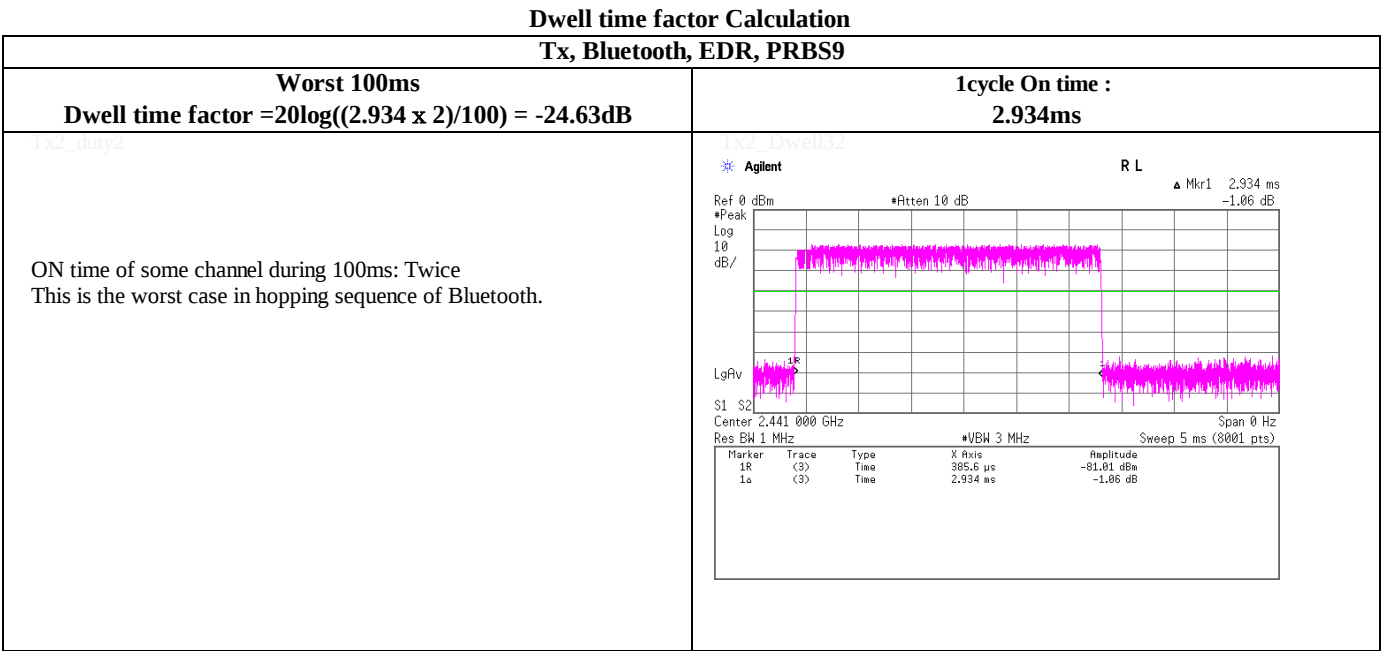
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Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date March 5, 2015
Temperature / Humidity 22 deg.C , 30 %RH
Engineer Yosuke Ishikawa

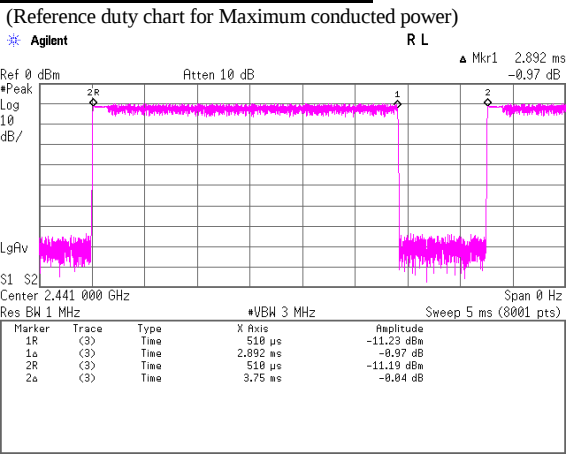
Dwell time factor Calculation chart (Reference data)



VBW (Average) setting

*Although 00-705 accepts VBW=10Hz for AV measurements, confirmed that superfluous smoothing was not performed.

(Reference) duty chart for Maximum conducted power



on time [ms] 2.892 1cycle[ms] 3.75 duty 0.771
duty factor [dB] 1.13
* calculation: duty factor [dB] = 10 x log (1cycle [ms] / on time [ms])

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Test place

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

Date

March 5, 2015

Temperature / Humidity

22 deg.C , 30 %RH

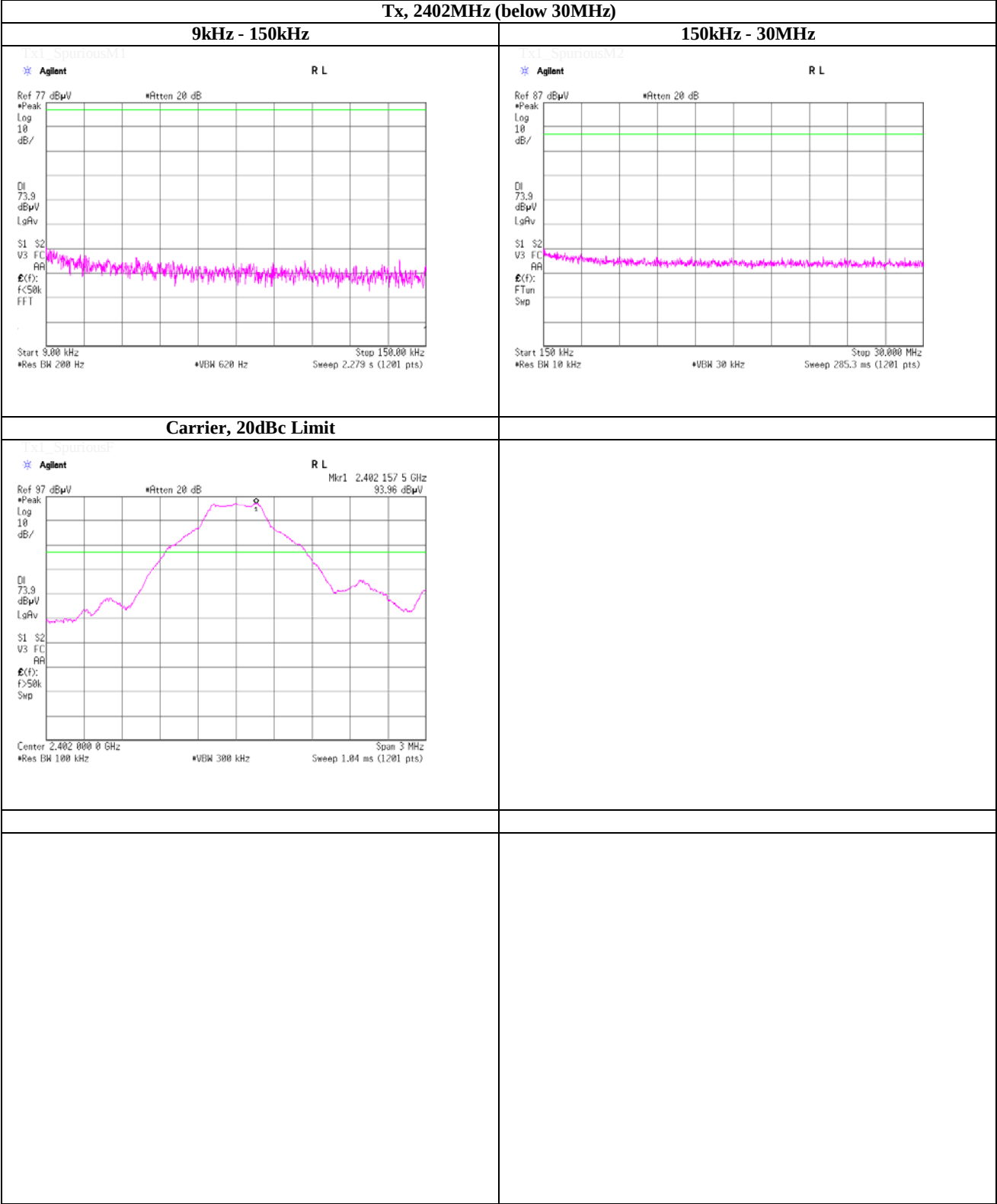
Engineer

Yosuke Ishikawa

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (below 30MHz)



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Test place

UL Japan, Inc. Shonan EMC Lab.

No.5 Shielded Room

Date

March 5, 2015

Temperature / Humidity

22 deg.C , 30 %RH

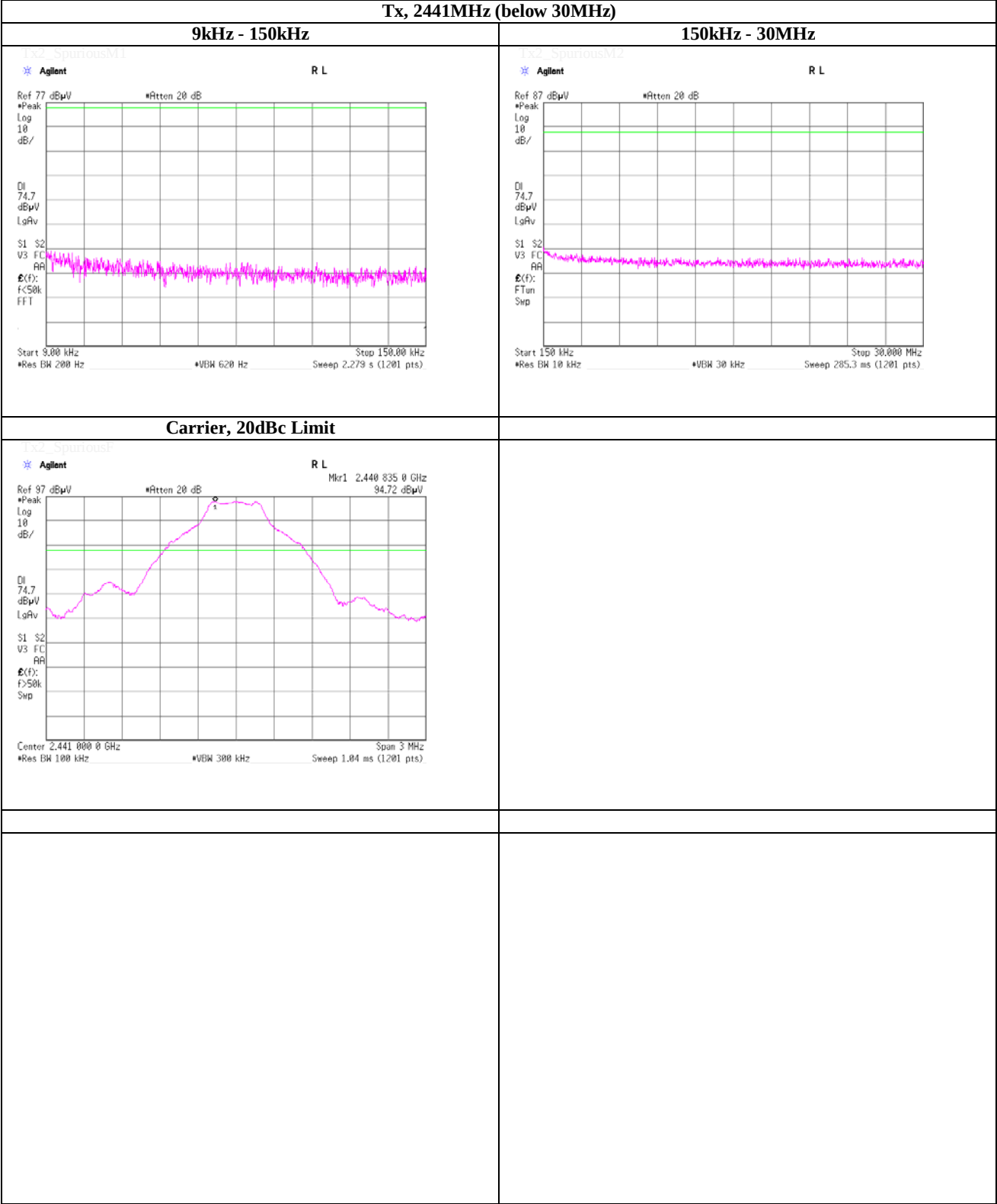
Engineer

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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (below 30MHz)



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Test place

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

Date

March 5, 2015

Temperature / Humidity

22 deg.C , 30 %RH

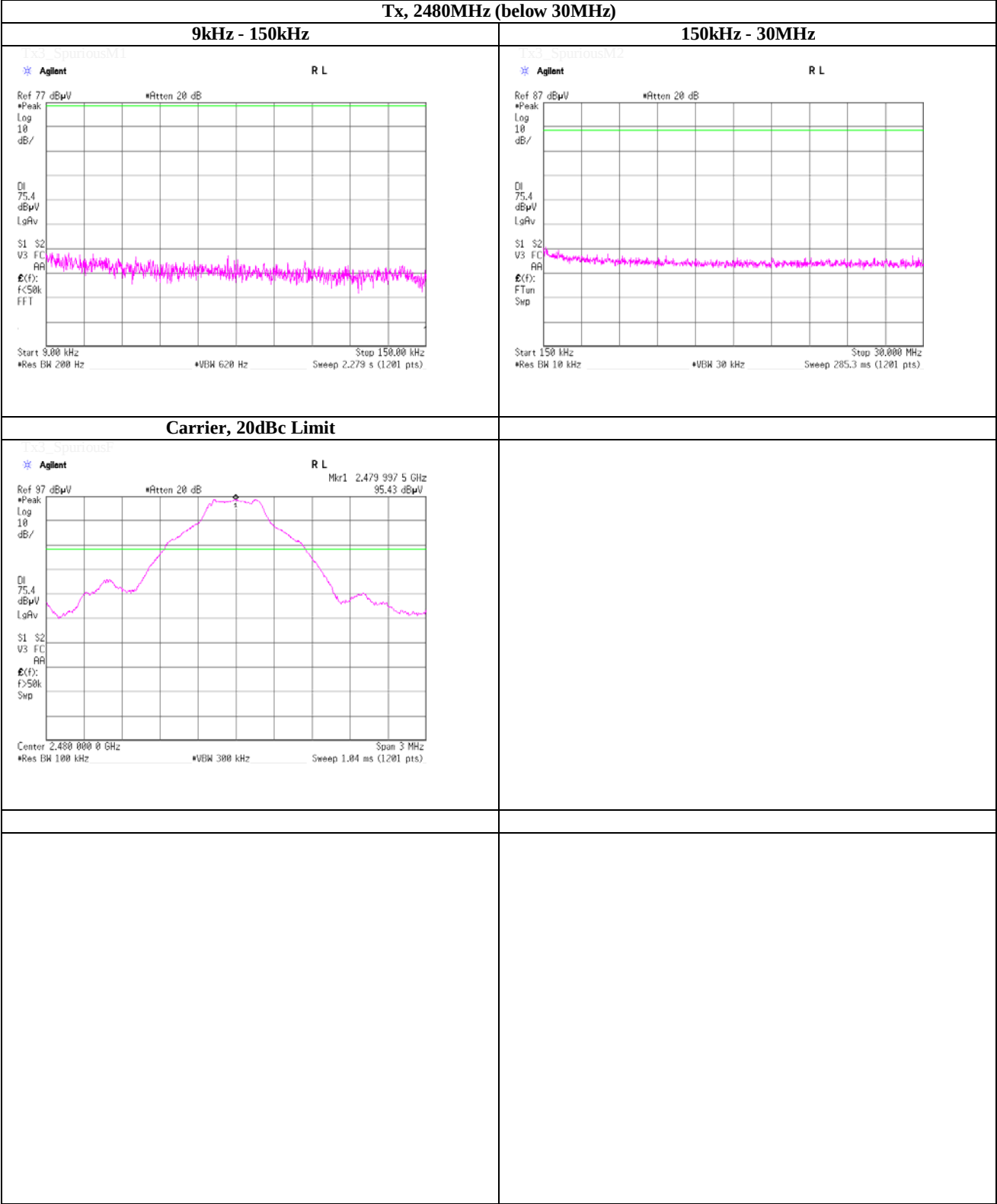
Engineer

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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (below 30MHz)



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Test place

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

Date

March 5, 2015

Temperature / Humidity

22 deg.C , 30 %RH

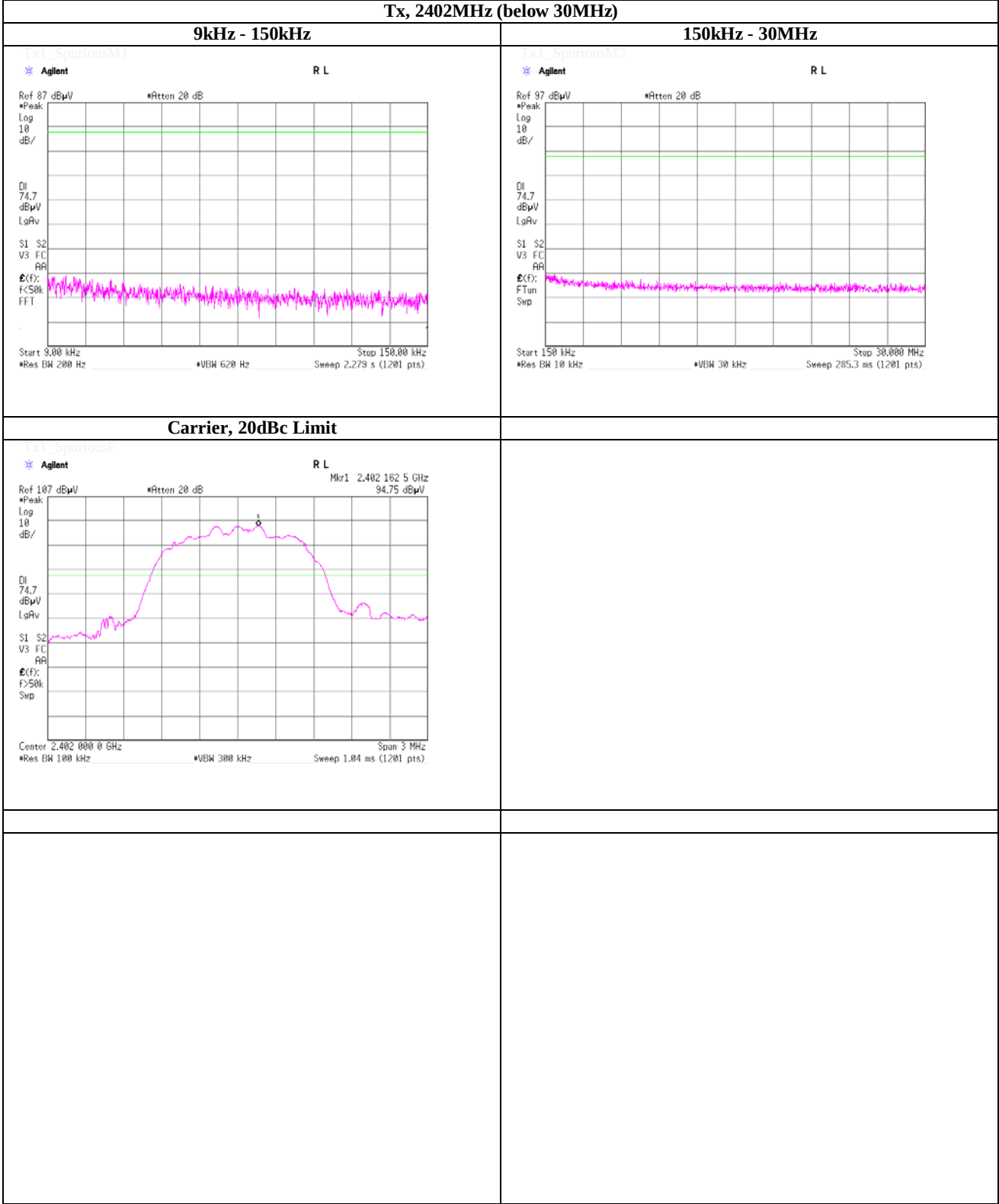
Engineer

Yosuke Ishikawa

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (below 30MHz)



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Test place

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

Date

March 5, 2015

Temperature / Humidity

22 deg.C , 30 %RH

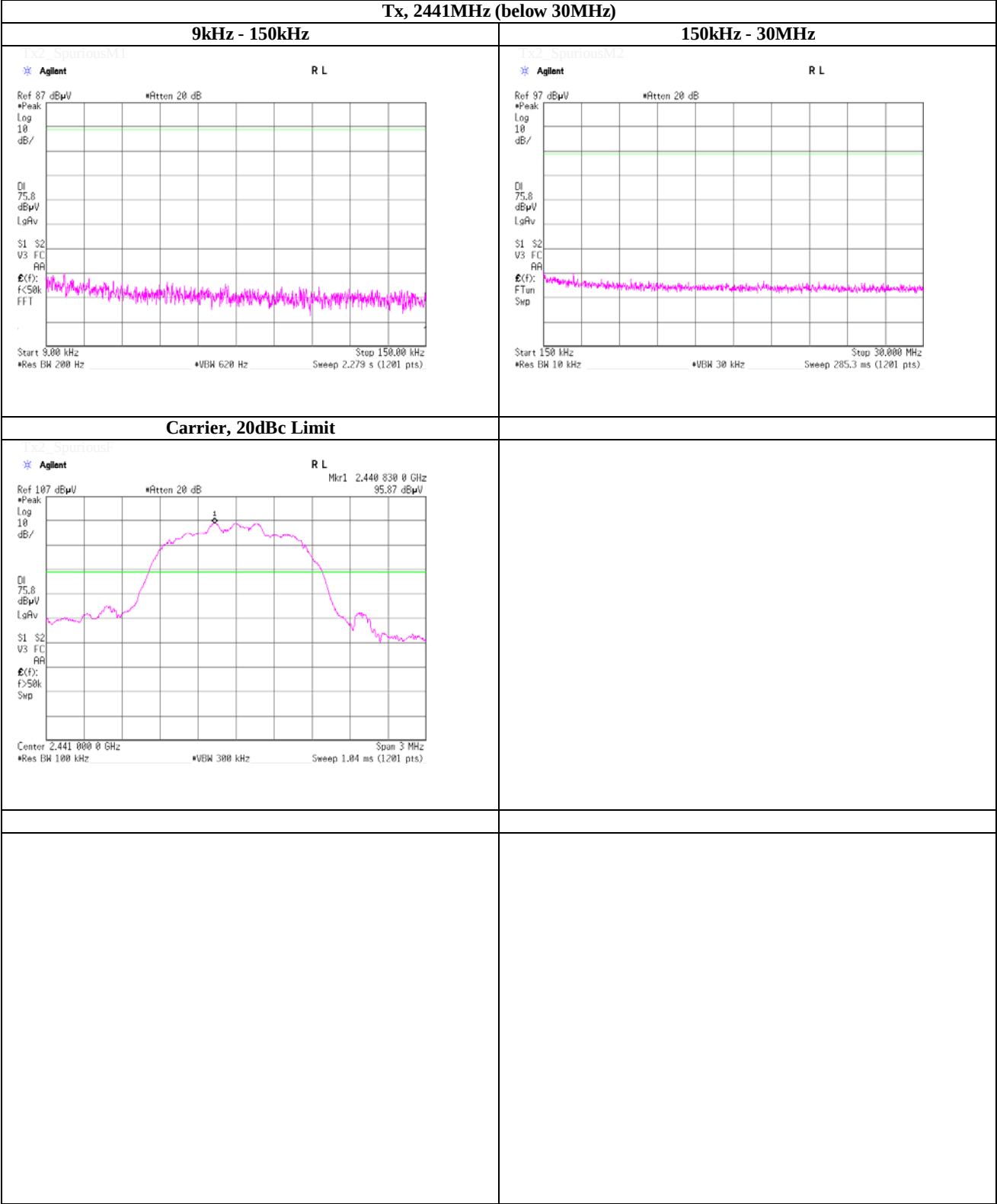
Engineer

Yosuke Ishikawa

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (below 30MHz)



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Test place

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

Date

March 5, 2015

Temperature / Humidity

22 deg.C , 30 %RH

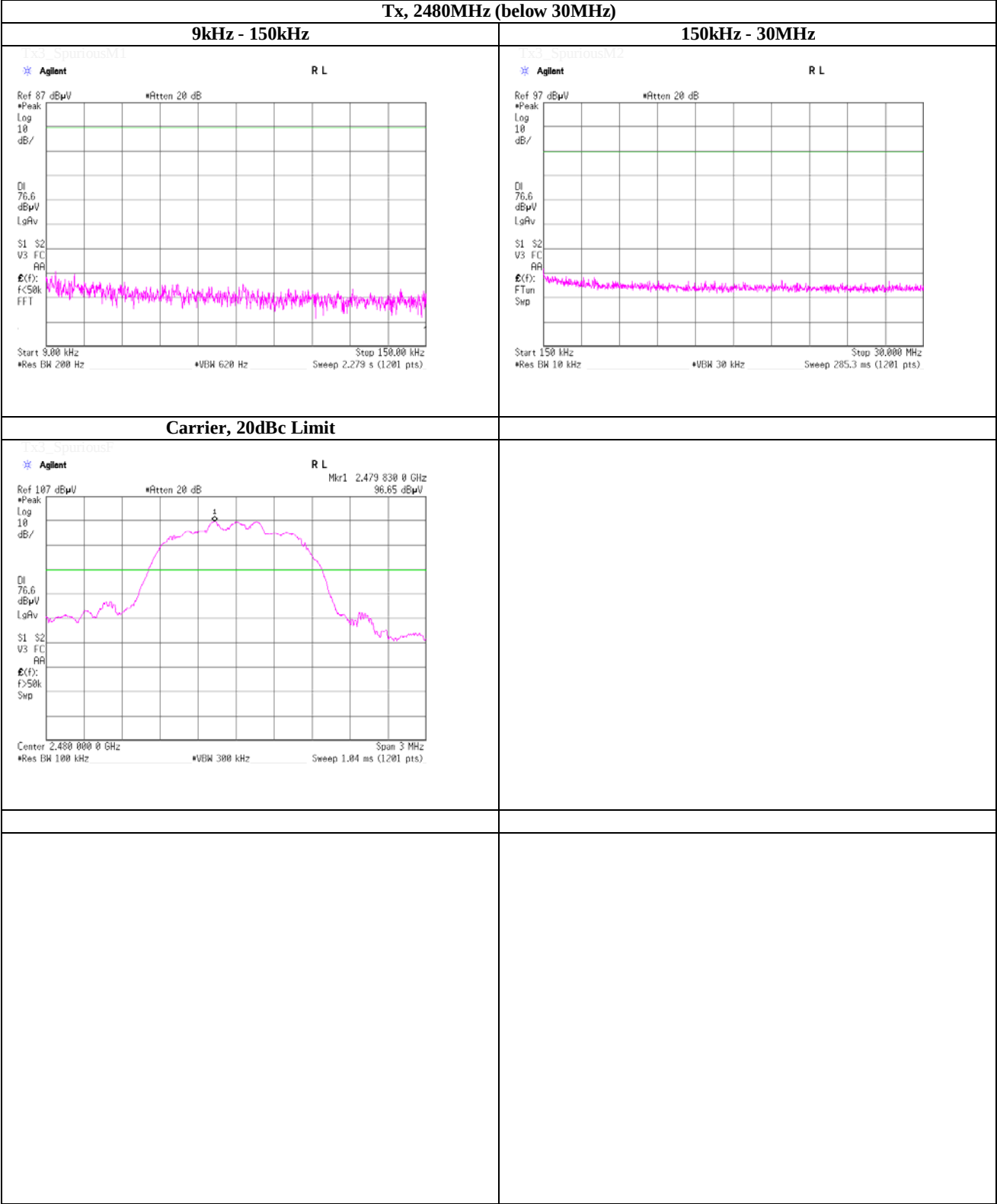
Engineer

Yosuke Ishikawa

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (below 30MHz)



UL Japan, Inc.

Shonan EMC Lab.

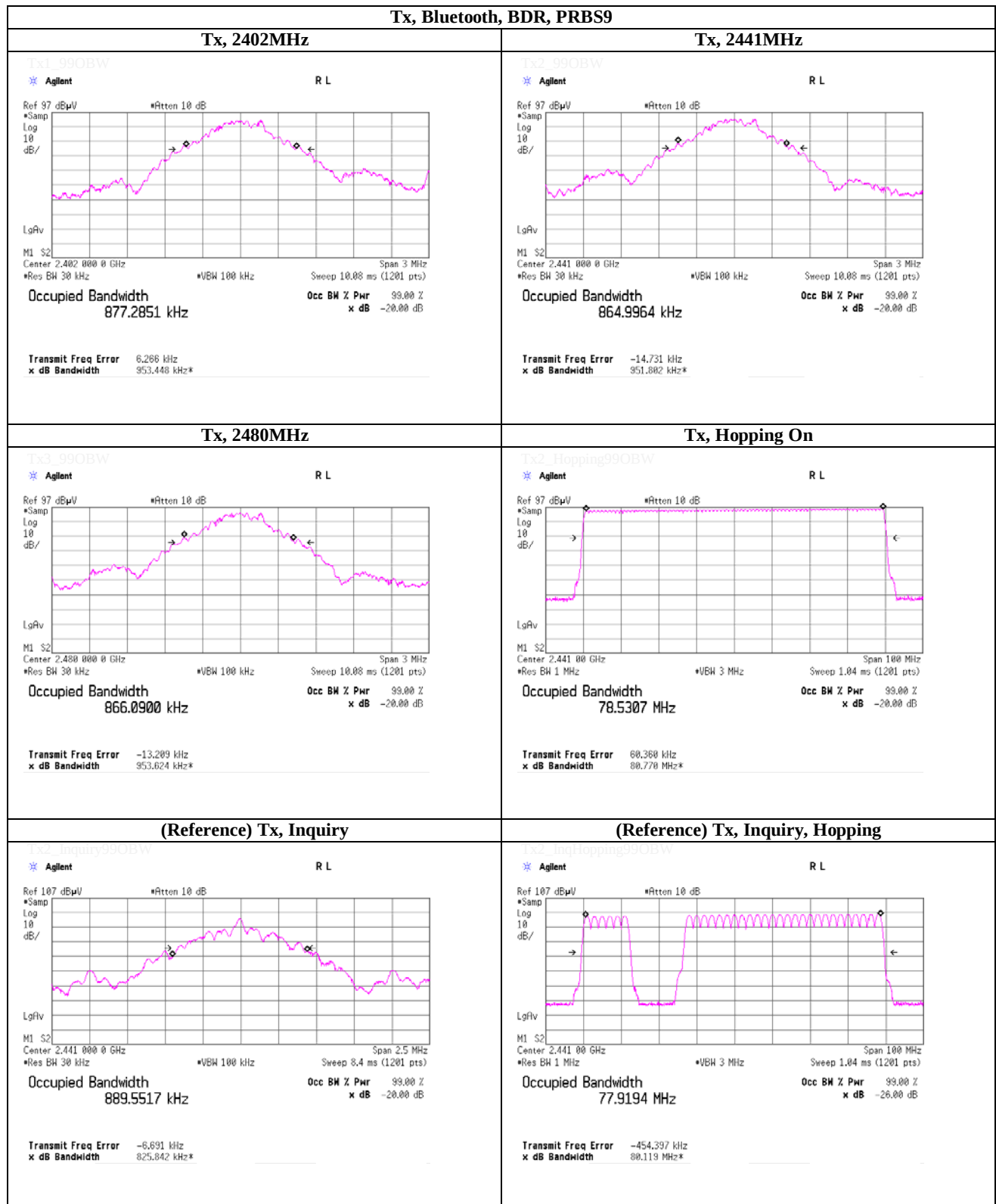
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Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date March 5, 2015
 Temperature / Humidity 22 deg.C , 30 %RH
 Engineer Yosuke Ishikawa

99% Occupied Bandwidth



UL Japan, Inc.

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Test place

UL Japan, Inc. Shonan EMC Lab.

No.5 Shielded Room

Date

March 5, 2015

Temperature / Humidity

22 deg.C , 30 %RH

Engineer

Yosuke Ishikawa

99% Occupied Bandwidth

Tx, Bluetooth, EDR, PRBS9	
Tx, 2402MHz	Tx, 2441MHz
Tx1_99OBW Agilent RL Ref 107 dBμV *Atten 10 dB → ← Log 10 dB/ LgAv M1 S2 Center 2.402 000 0 GHz *Res BW 30 kHz *VBW 100 kHz Sweep 10.08 ms (1201 pts) Span 3 MHz Occupied Bandwidth 1.1630 MHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error 6.895 kHz x dB Bandwidth 1.204 MHz*	Tx2_99OBW Agilent RL Ref 107 dBμV *Atten 10 dB → ← Log 10 dB/ LgAv M1 S2 Center 2.441 000 0 GHz *Res BW 30 kHz *VBW 100 kHz Sweep 10.08 ms (1201 pts) Span 3 MHz Occupied Bandwidth 1.1665 MHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error -8.673 kHz x dB Bandwidth 1.273 MHz*
Tx, 2480MHz	Tx, Hopping On
Tx3_99OBW Agilent RL Ref 107 dBμV *Atten 10 dB → ← Log 10 dB/ LgAv M1 S2 Center 2.480 000 0 GHz *Res BW 30 kHz *VBW 100 kHz Sweep 10.08 ms (1201 pts) Span 3 MHz Occupied Bandwidth 1.1646 MHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error -8.608 kHz x dB Bandwidth 1.274 MHz*	Tx2_Hopping99OBW Agilent RL Ref 107 dBμV *Atten 10 dB → ← Log 10 dB/ LgAv M1 S2 Center 2.441 00 6GHz *Res BW 1 MHz *VBW 3 MHz Sweep 1.04 ms (1201 pts) Span 100 MHz Occupied Bandwidth 78.5456 MHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error 48.459 kHz x dB Bandwidth 80.842 MHz*
Tx2_inquiry99OBW	Tx2_inqHopping99OBW

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