



Test report No. : 10604534S
Page : 1 of 47
Issued date : February 5, 2015
Revised date : April 3, 2015
FCC ID : AJDK087

RADIO TEST REPORT

Test Report No.: 10604534S

Applicant : PIONEER CORPORATION
Type of Equipment : Car Audio with Bluetooth
Model No. : NXF-1858
FCC ID : AJDK087
Test regulation : FCC Part 15 Subpart C: 2015
Test result : Complied

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Date of test: December 18, 2014 to January 30, 2015

Tested by:

Makoto Hosaka
Engineer
Consumer Technology Division

Approved by :

Toyokazu Imamura
Leader
Consumer Technology Division



- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10604534S

[illegible]

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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 : +81-49-228-6416
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Contact Person : Yoshihisa Kobayashi

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

2.1 Identification of E.U.T.

Type of Equipment : Car Audio with Bluetooth
Model No. : NXF-1858
Serial No. : Refer to 4.2 in this report.
Rating : DC 12V
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 : December 16, 2014

2.2 Product description

Model: NXF-1858 (referred to as the EUT in this report) is a Car Audio with Bluetooth.

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 : Pattern inverted F
Antenna gain : -0.42dBi (max)
Antenna connector type : 20279-001E-01
Operation temperature range : -20 to +65 deg.C.

FCC 15.31 (e)

The EUT provides stable voltage (DC3.3 and 1.8V) 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.

Clock frequency: 26MHz (crystal and oscillator)

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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 Part 15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits, general requirements
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz,
and 5725-5850MHz

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

3.2 Procedures & Results

Item	Test Procedure	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	2.1dB Freq.: 956.729MHz Detection: Quasi-Peak Polarization: Vertical Mode: Tx, 2402 MHz, BDR,	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 6.6	-	Conducted	-	-
Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422					

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

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-18GHz	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 report meets the limits unless the uncertainty is taken into consideration.

Antenna port conducted test

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

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

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

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

Time Measurement uncertainty for this test was: (±) 0.012%

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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) Payload: PRBS9	-
20dB bandwidth	Transmitting Hopping OFF (DH5 / 3-DH5) Payload: PRBS9	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting Hopping ON (DH5 / 3-DH5) Payload: PRBS9	-
Dwell time	Transmitting (Hopping ON), Payload: PRBS9 - DH1, - DH3, - DH5 - 3-DH1, - 3-DH3, - 3-DH5	-
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 -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.

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.

The EUT has no Inquiry mode.

EUT has the power settings by the software as follows;

Power settings	Fixed
Software	PxMplWin.exe, Ver.1.2.0.1

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

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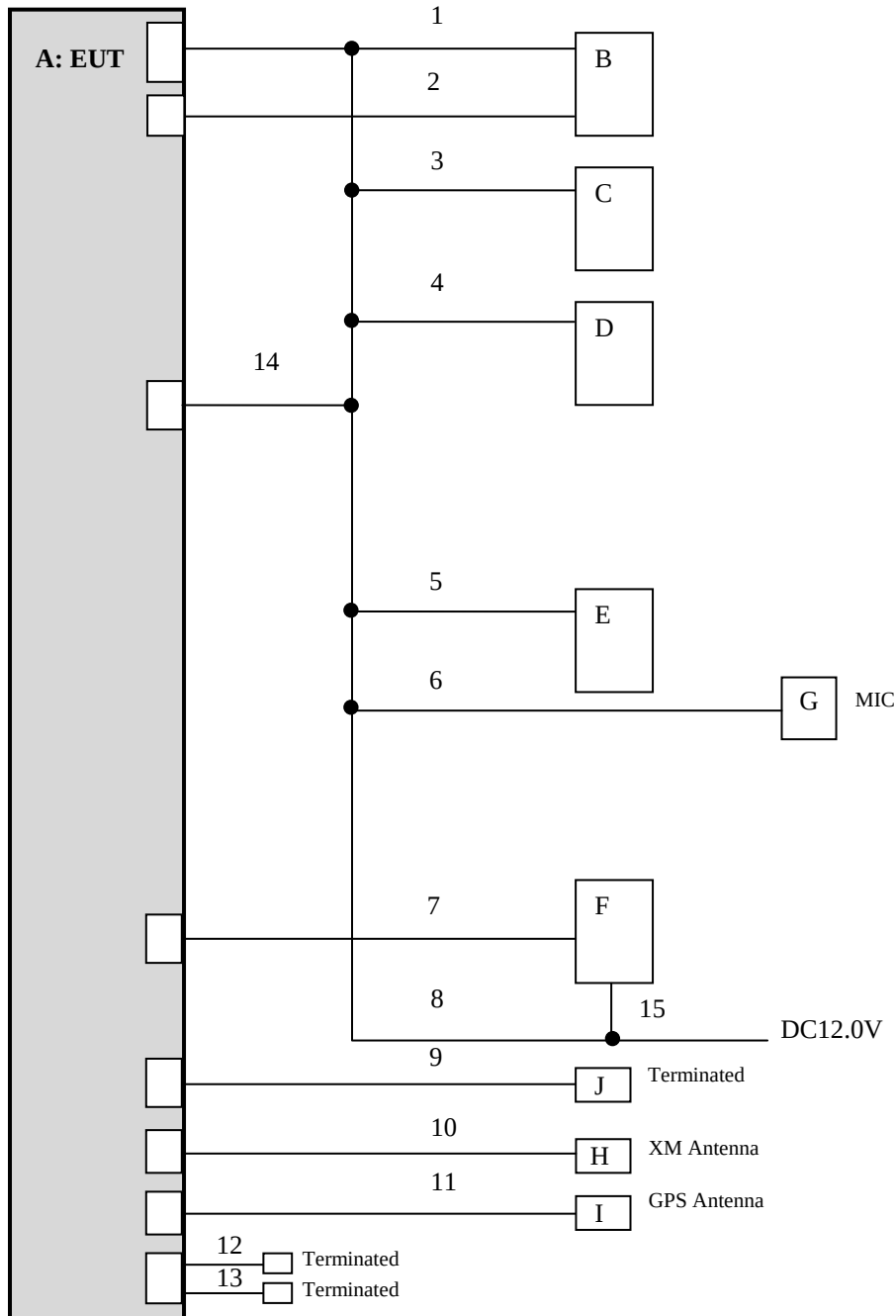
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4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

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Description of EUT and Auxiliary equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Audio with Bluetooth	NXF-1858	*1)	Pioneer	EUT
B	Display	83290-30190	-	DENSO	-
C	Remote Control Device	84780-30080	12Mar09 0248AA	DENSO	-
D	Steering Switch	-	-	-	-
E	Rear Camera	86790-30151	3YC02976	-	-
F	Amplifier	GM-4038ZT/WL (86280-53190)	TPJA000140WL	Pioneer	-
G	Microphone	-	-	-	-
H	DAB Antenna	86860-30330	-	DENSO	-
I	GPS Antenna	86860-22090	-	AISIN	-
J	USB Memory	USM4GU	-	Sony	-

*1) Antenna port conducted tests: NKPKTP0002EW, Radiated emission tests: NKPKTP0003EW

List of cables used

No.	Item	Length(m)	Shield (Cable)	Shield (Connector)	Remarks
1	Signal cable for Display	1.9	Unshielded	Unshielded	-
2	GVIF cable	1.9	Unshielded	Unshielded	-
3	Signal cable for Remote control	1.9	Unshielded	Unshielded	-
4	Signal cable for Steering Switch	2.0	Unshielded	Unshielded	-
5	Signal cable for Rear Camera	2.0	Unshielded	Unshielded	-
6	Signal cable for Microphone	4.0	Shielded	Shielded	-
7	Bus cable	2.0	Shielded	Shielded	-
8	DC power cable	3.1	Unshielded	Unshielded	-
9	USB cable	2.0	Shielded	Shielded	-
10	Antenna cable for XM	1.3	Shielded	Shielded	-
11	Antenna cable for GPS	1.7	Shielded	Shielded	-
12	HCI cable	3.3	Shielded	Shielded	-
13	HCI cable	3.3	Shielded	Shielded	-
14	Bus cable	1.6	Unshielded	Unshielded	-
15	Wire harness for amplifier	1.6	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 2.0m, raised 0.8m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of 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 VBW:3MHz	RBW:1MHz VBW:10Hz	RBW: 100kHz 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 EUT was set at 11.5 degree as normal position according to the EUT's specification.

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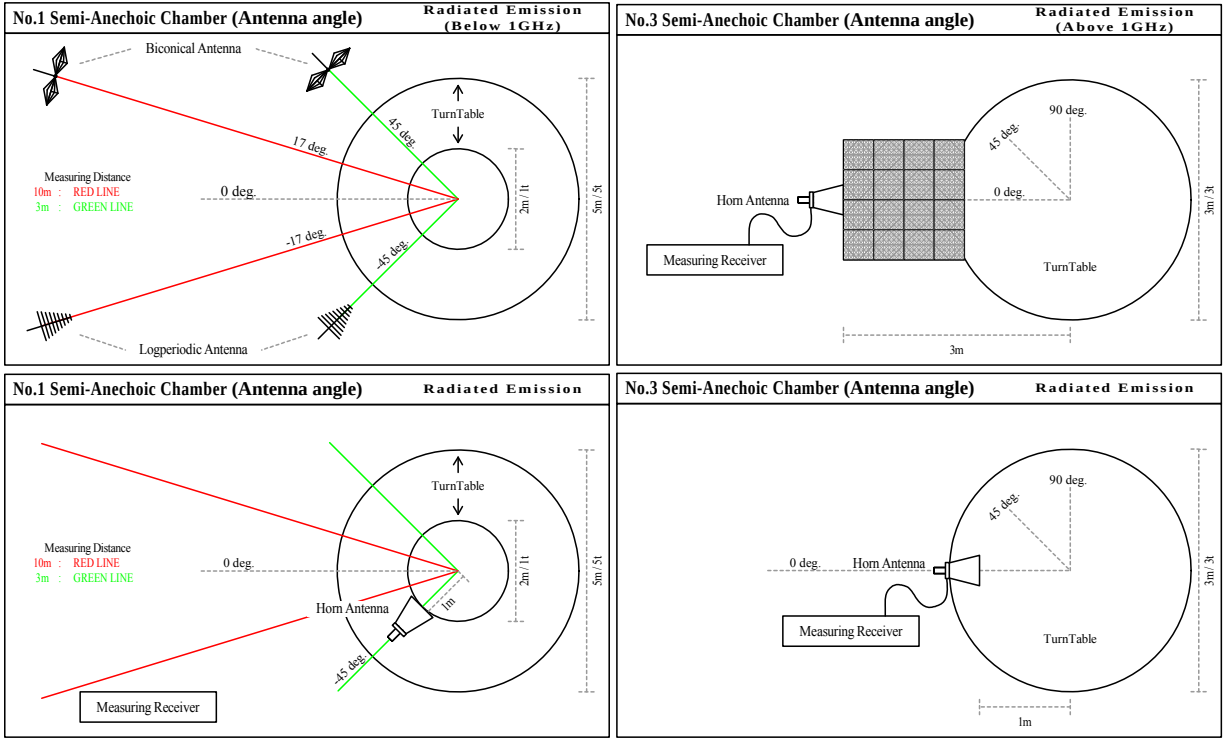
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Figure 1. Antenna angle



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 3rd 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	December 18, 2014	
Temperature / Humidity	24 deg.C , 21 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.958	1.000	>= 0.639
DH5	2441.0	0.953	1.000	>= 0.635
DH5	2480.0	0.953	1.000	>= 0.635

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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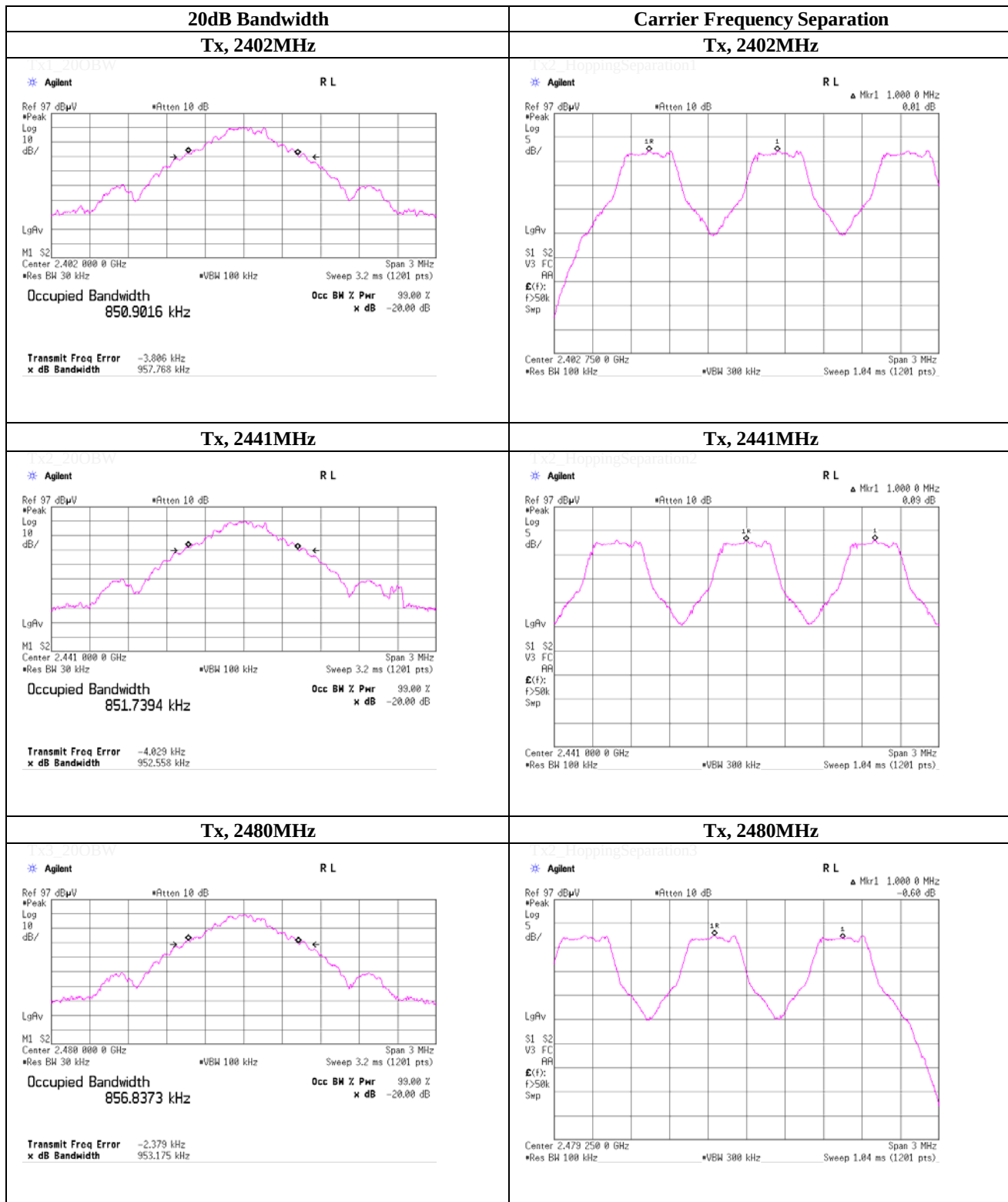
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, BDR, PRBS9



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20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date December 18, 2014
Temperature / Humidity 24 deg.C , 21 %RH
Engineer Hikaru Shirasawa
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	1.318	1.000	>= 0.879
3-DH5	2441.0	1.328	1.000	>= 0.885
3-DH5	2480.0	1.315	1.005	>= 0.877

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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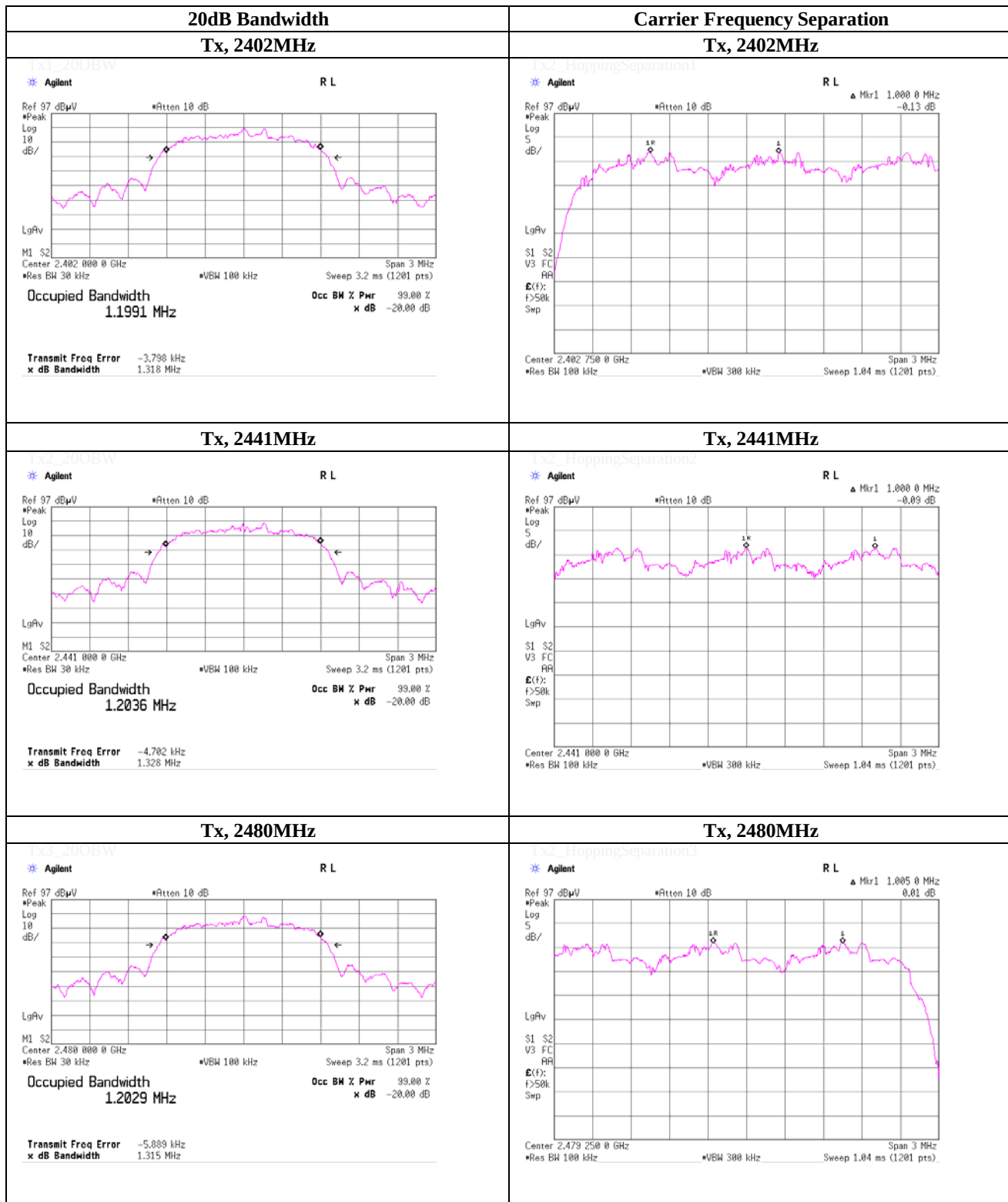
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, PRBS9



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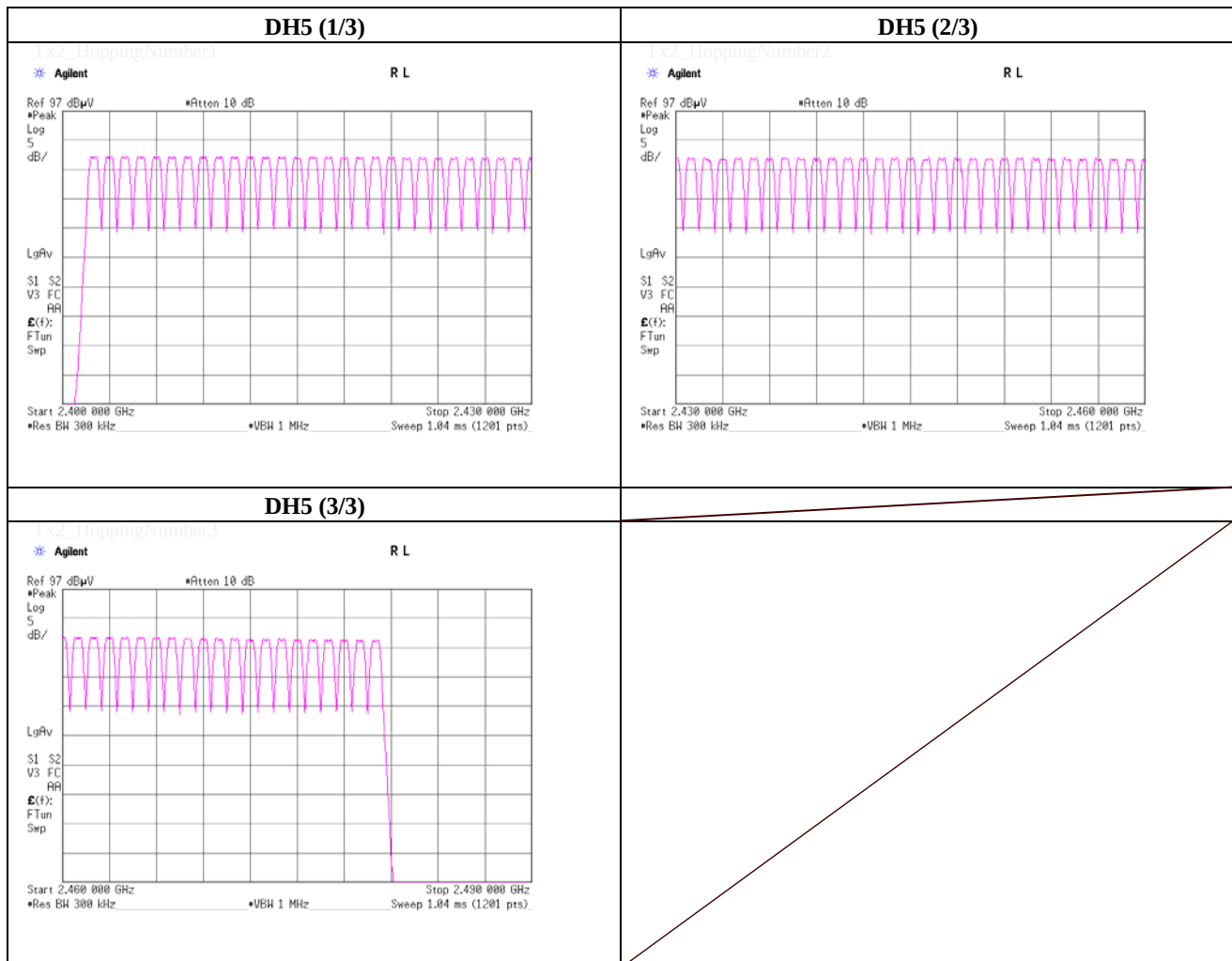
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Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	December 18, 2014	
Temperature / Humidity	24 deg.C , 21 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Number of Channel [times]	Limit [times]
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.



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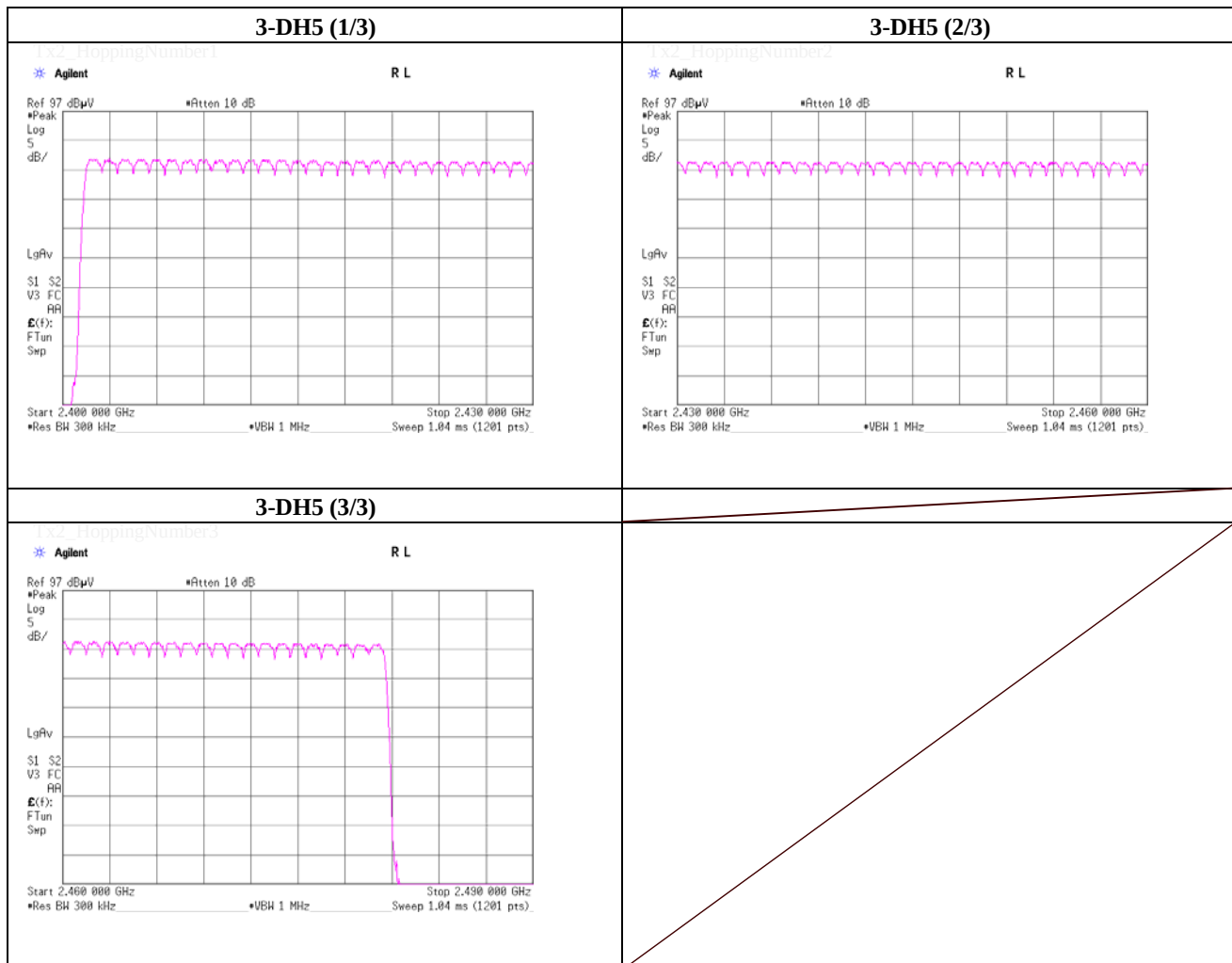
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Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	December 18, 2014	
Temperature / Humidity	24 deg.C , 21 %RH	
Engineer	Hikaru Shirasawa	
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.



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Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date December 18, 2014
 Temperature / Humidity 24 deg.C , 21 %RH
 Engineer Hikaru Shirasawa
 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	43.6	/ 5.0 sec. x 31.6 sec. = 276 times	0.394	109	400
DH3	24.2	/ 5.0 sec. x 31.6 sec. = 153 times	1.653	253	400
DH5	19.0	/ 5.0 sec. x 31.6 sec. = 121 times	2.899	351	400

Sample Calculation

Result = Number of transmission x Length of transmission time

*Average data of 5 tests.

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	46	44	43	42	43	43.6
DH3	24	24	23	26	24	24.2
DH5	17	19	19	18	22	19.0

Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

* 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 $N=79$.

Tx2_DwellInquiry1

Tx2_DwellInquiry2

UL Japan, Inc.

Shonan EMC Lab.

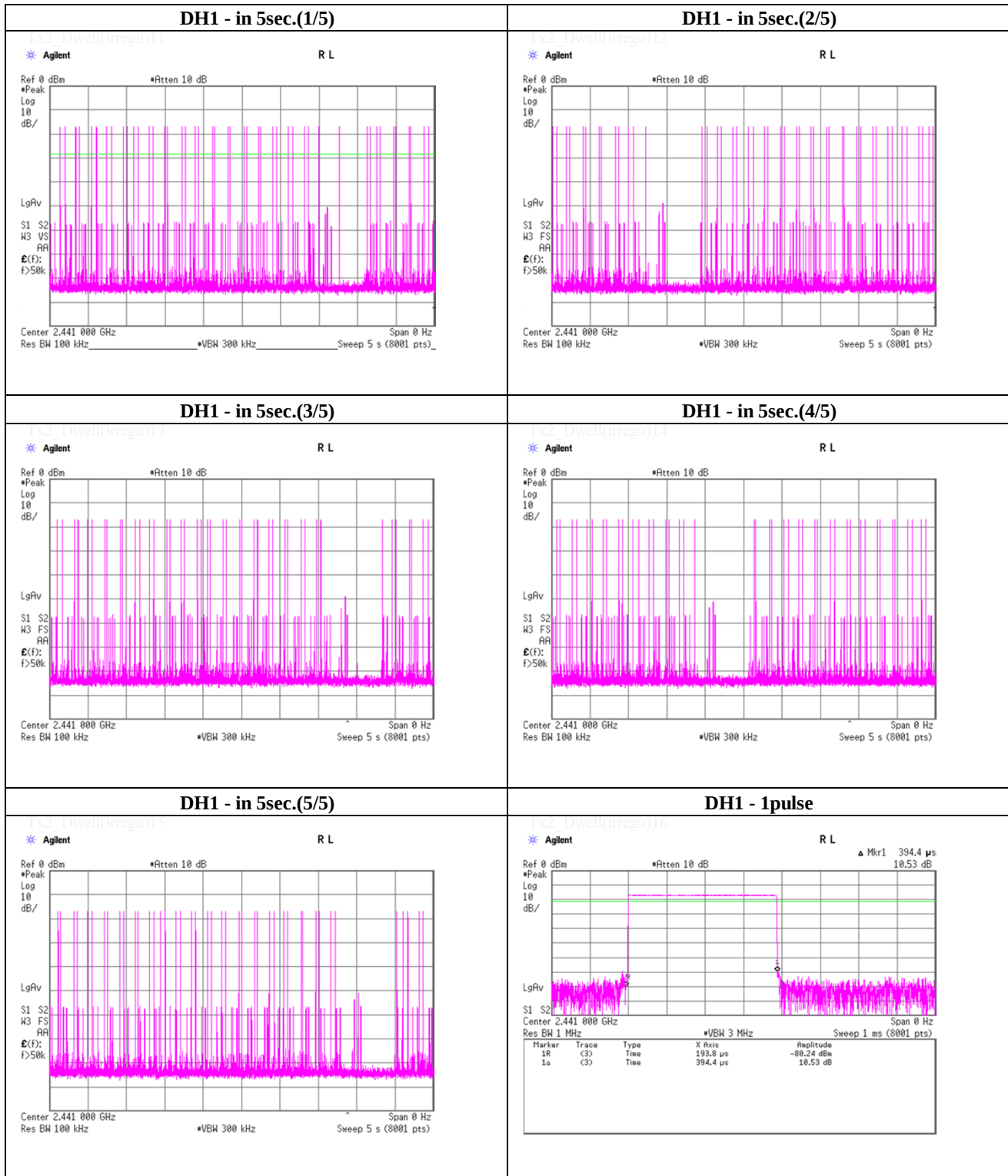
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, BDR, PRBS9



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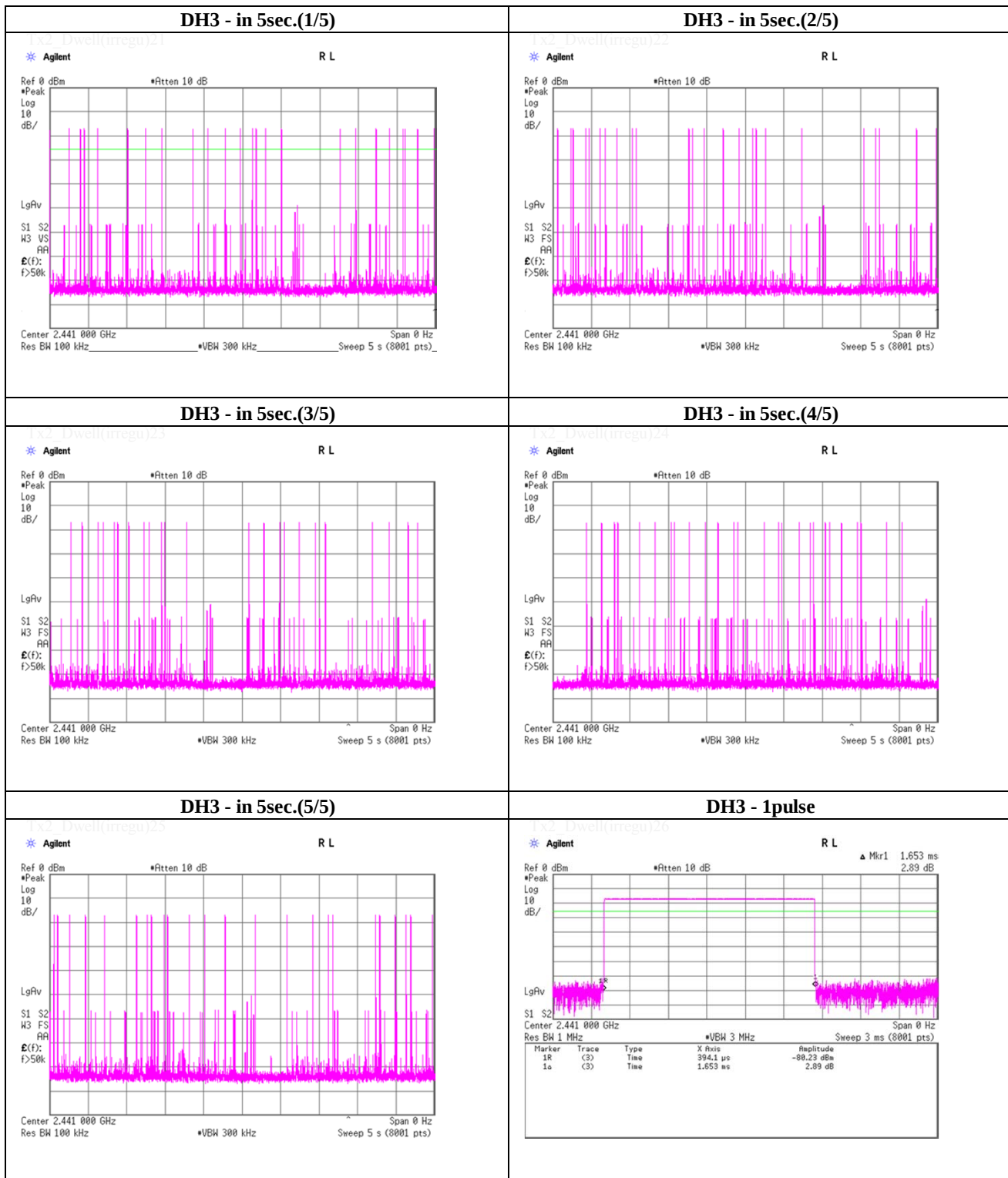
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, BDR, PRBS9



UL Japan, Inc.

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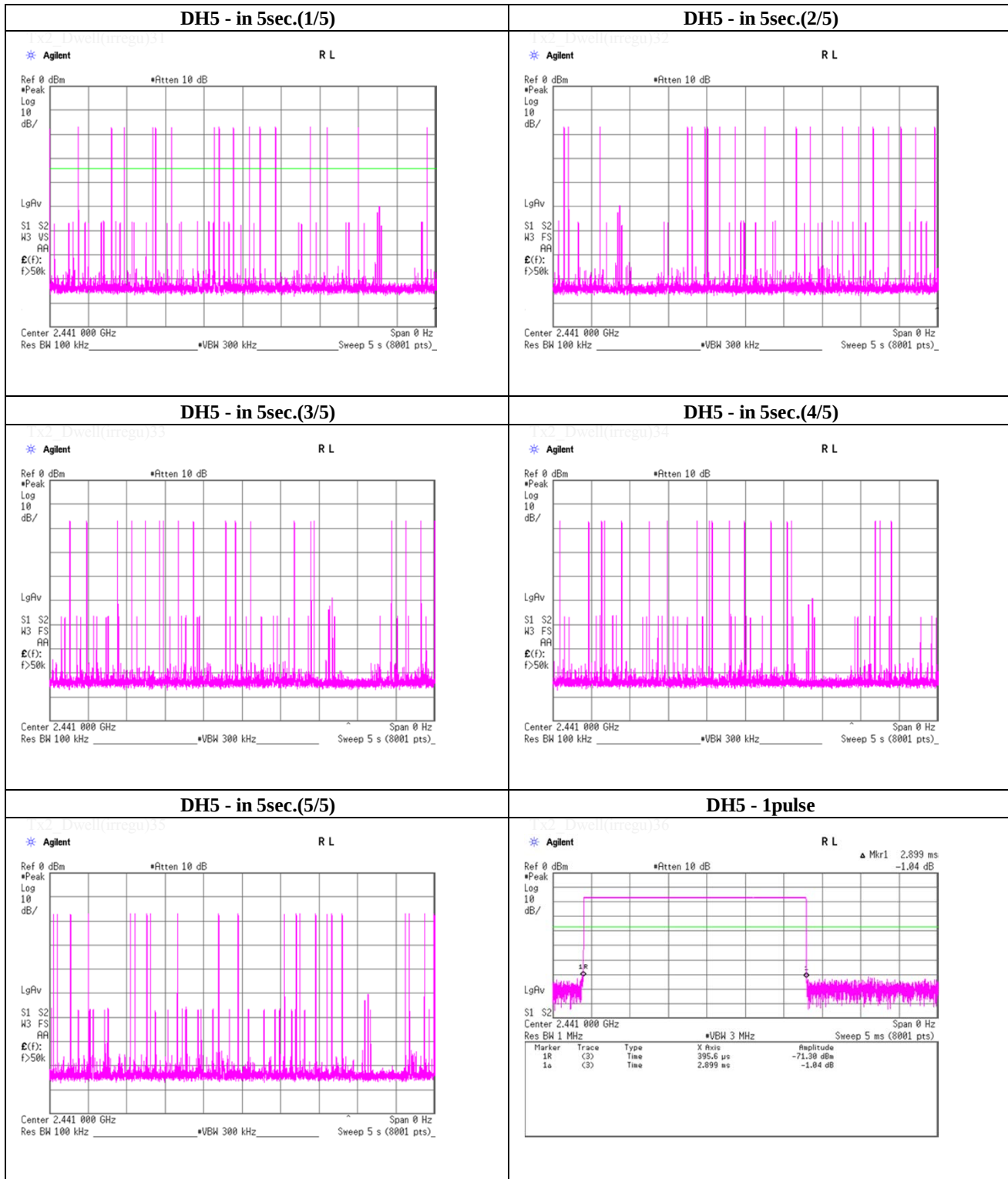
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, BDR, PRBS9



UL Japan, Inc.

Shonan EMC Lab.

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Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date December 18, 2014
 Temperature / Humidity 24 deg.C , 21 %RH
 Engineer Hikaru Shirasawa
 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	44.2	/ 5.0 sec.	x 31.6 sec. = 280 times	0.430	120	400
3-DH3	24.4	/ 5.0 sec.	x 31.6 sec. = 155 times	1.679	260	400
3-DH5	19.2	/ 5.0 sec.	x 31.6 sec. = 122 times	2.932	358	400

Sample Calculation

Result = Number of transmission x Length of transmission time

*Average data of 5 tests.

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
3-DH1	45	44	44	45	43	44.2
3-DH3	25	23	24	26	24	24.4
3-DH5	19	18	19	20	20	19.2

Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

* 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.

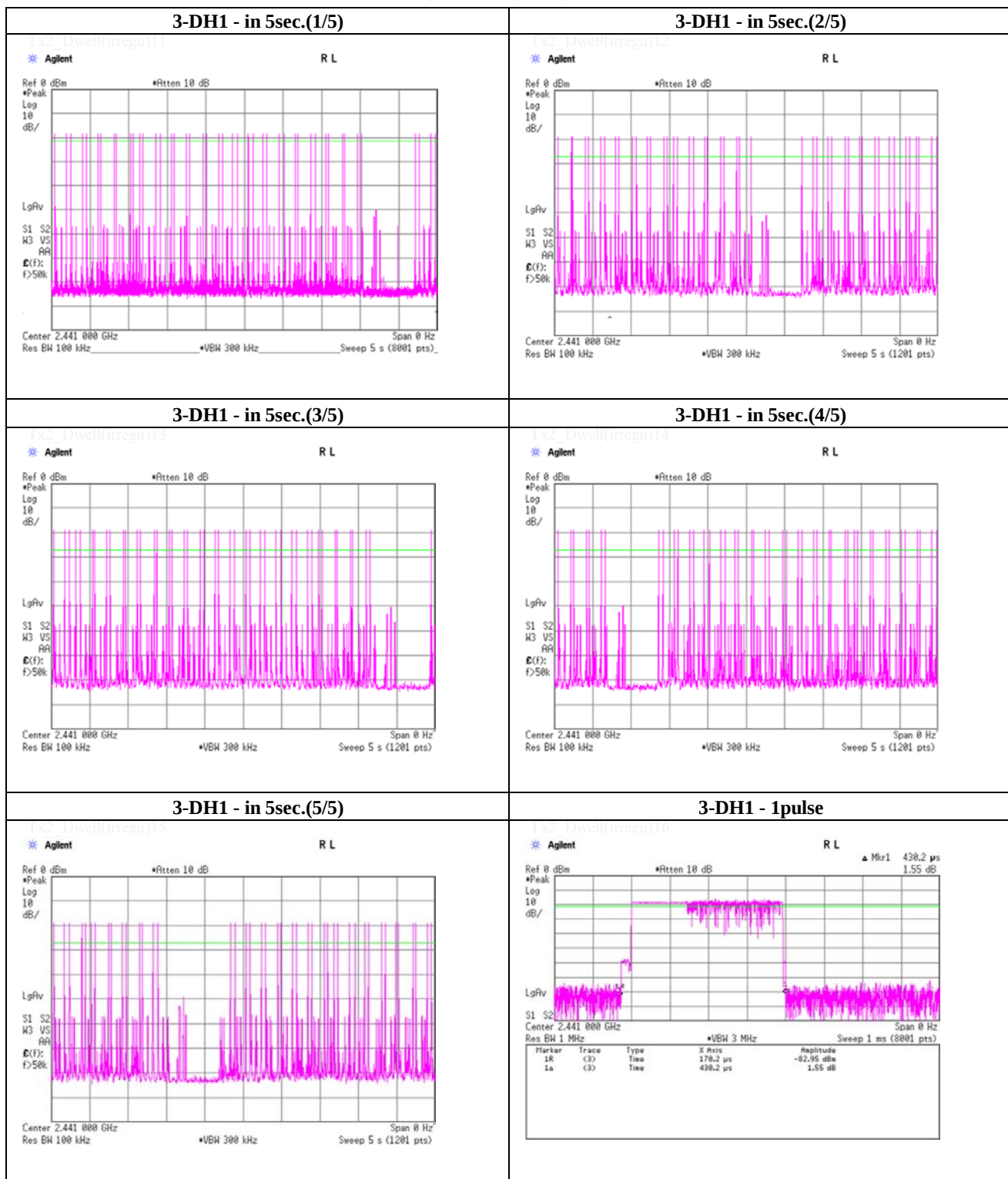
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, EDR, PRBS9



UL Japan, Inc.

Shonan EMC Lab.

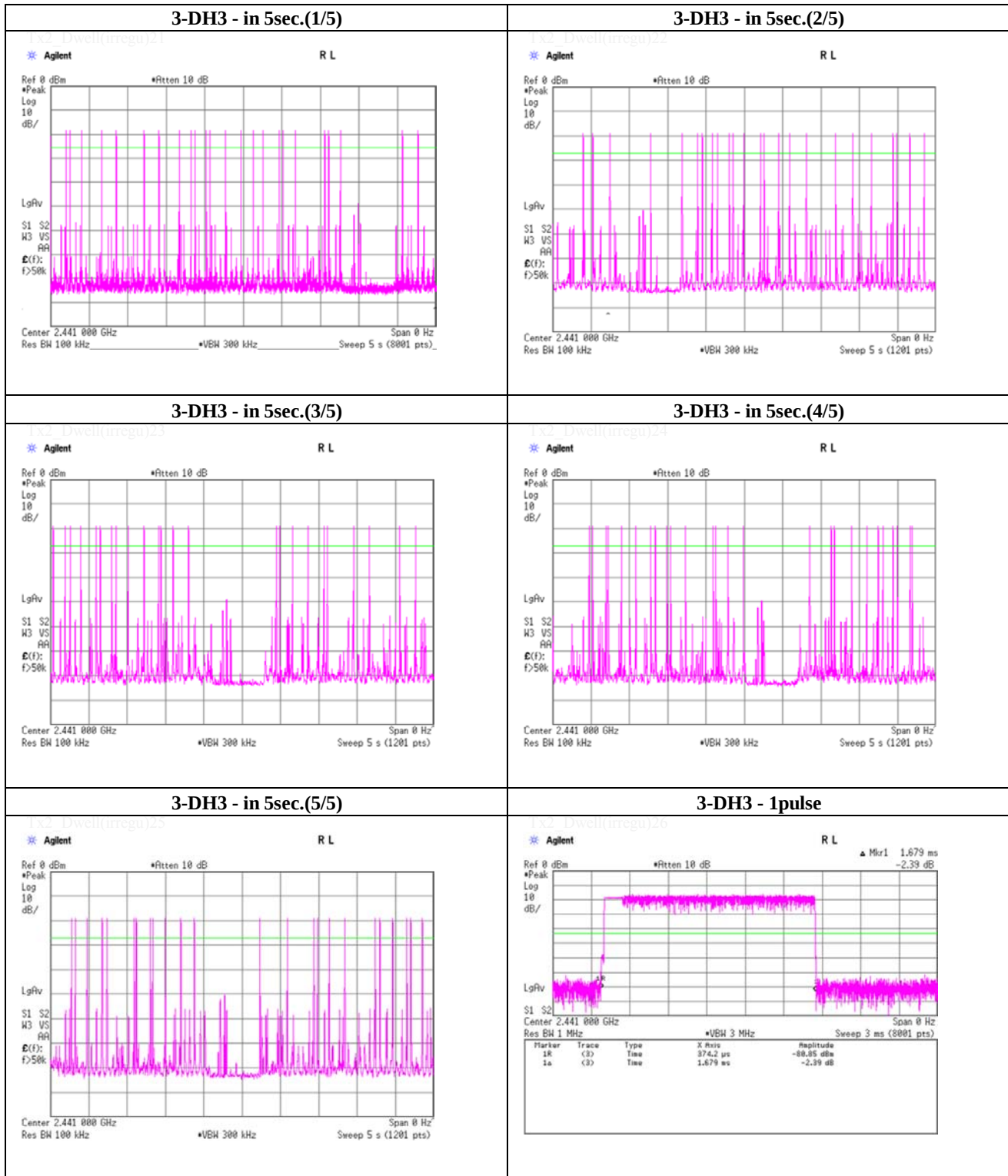
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, EDR, PRBS9



UL Japan, Inc.

Shonan EMC Lab.

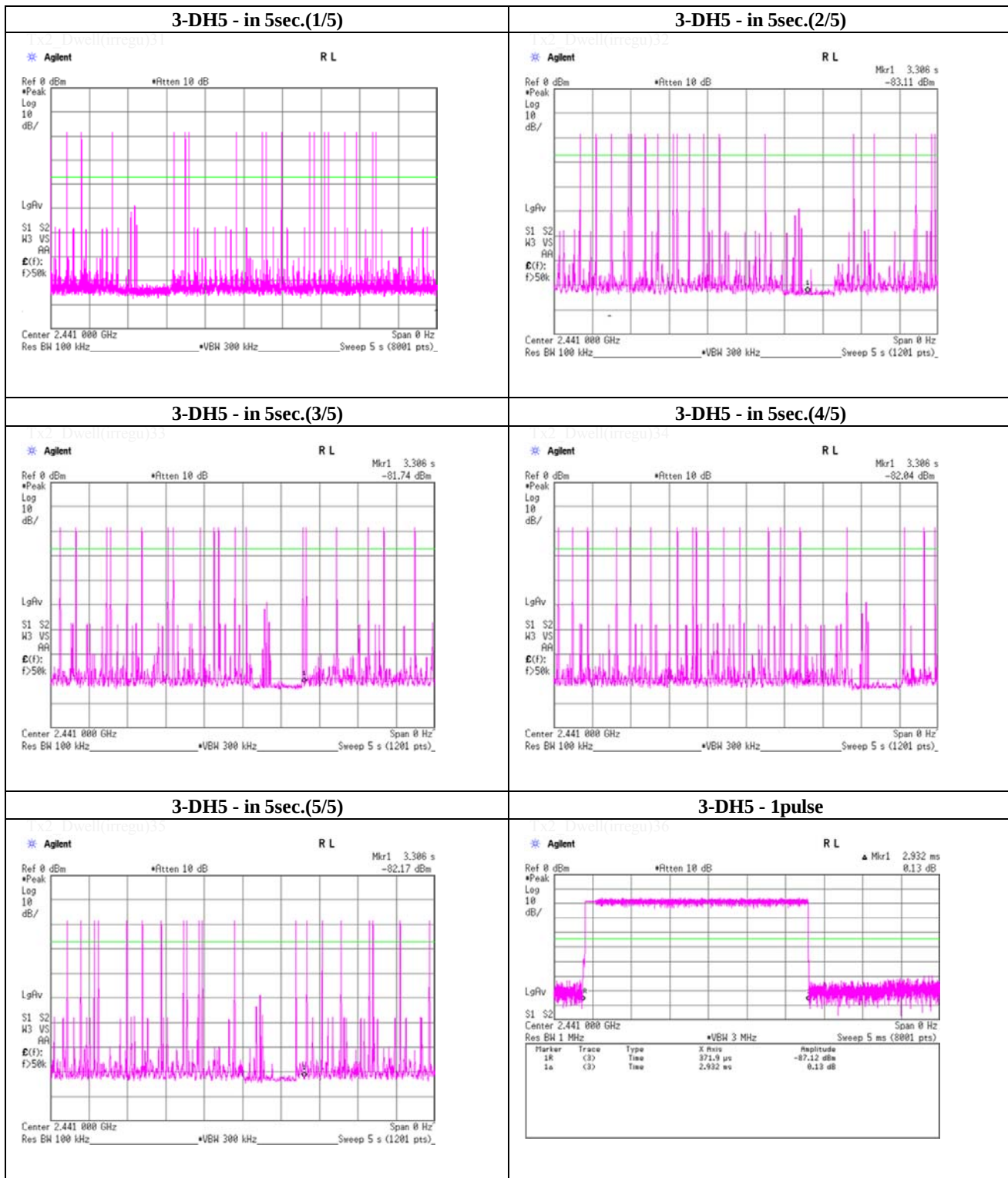
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, EDR, PRBS9



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Maximum Peak Conducted Output Power (Conducted)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	December 18, 2014	December 22, 2014
Temperature / Humidity	24 deg.C , 21 %RH	22 deg.C , 31 %RH
Engineer	Hikaru Shirasawa	Shinichi Takano
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	-16.08	2.06	9.90	-4.12	0.39	20.97	125	25.09
DH5	2441.0	-16.17	2.07	9.89	-4.21	0.38	20.97	125	25.18
DH5	2480.0	-16.60	2.08	9.89	-4.63	0.34	20.97	125	25.60
2-DH5	2402.0	-15.80	2.06	9.90	-3.84	0.41	20.97	125	24.81
2-DH5	2441.0	-15.78	2.07	9.89	-3.82	0.41	20.97	125	24.79
2-DH5	2480.0	-16.11	2.08	9.89	-4.14	0.39	20.97	125	25.11
3-DH5	2402.0	-15.57	2.06	9.90	-3.61	0.44	20.97	125	24.58
3-DH5	2441.0	-15.74	2.07	9.89	-3.78	0.42	20.97	125	24.75
3-DH5	2480.0	-16.01	2.08	9.89	-4.04	0.39	20.97	125	25.01

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	-17.69	2.06	9.90	1.07	-4.66	0.34
DH5	2441.0	-18.02	2.07	9.89	1.07	-4.99	0.32
DH5	2480.0	-18.30	2.08	9.89	1.07	-5.26	0.30
2-DH5	2402.0	-19.34	2.06	9.90	1.04	-6.34	0.23
2-DH5	2441.0	-19.66	2.07	9.89	1.04	-6.66	0.22
2-DH5	2480.0	-19.99	2.08	9.89	1.04	-6.98	0.20
3-DH5	2402.0	-19.32	2.06	9.90	1.04	-6.32	0.23
3-DH5	2441.0	-19.65	2.07	9.89	1.04	-6.65	0.22
3-DH5	2480.0	-19.90	2.08	9.89	1.04	-6.89	0.20

Sample Calculation:

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

UL Japan, Inc.
Shonan EMC Lab.

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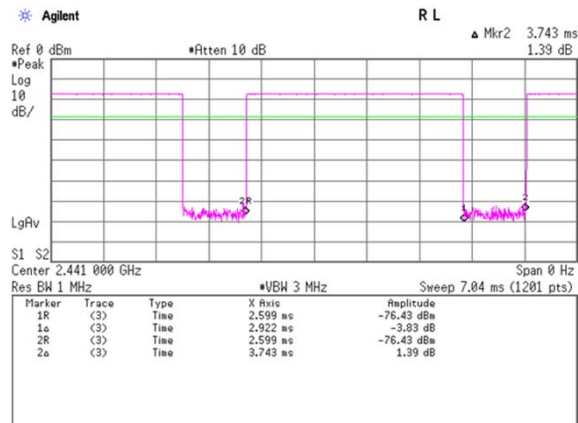
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date December 18, 2014
Temperature / Humidity 24 deg.C , 21 %RH
Engineer Hikaru Shirasawa

(Reference) duty chart for Maximum conducted power

(Reference duty chart for Maximum conducted power)



on time [ms] 2.922 1cycle[ms] 3.743 duty 0.781
duty factor [dB] 1.07
* calculation: duty factor [dB] = 10 x log (1cycle [ms] / on time [ms])

UL Japan, Inc.

Shonan EMC Lab.

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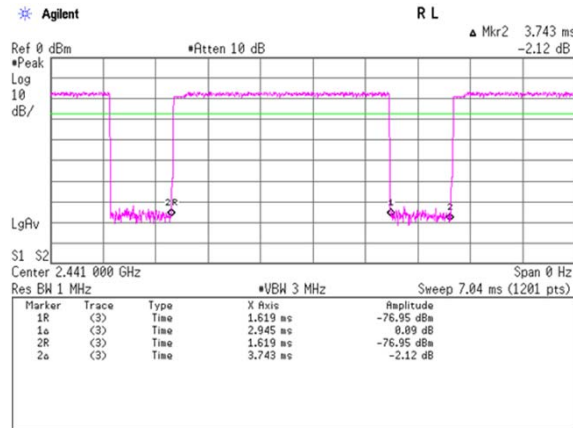
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date December 18, 2014
 Temperature / Humidity 24 deg.C , 21 %RH
 Engineer Hikaru Shirasawa

(Reference) duty chart for Maximum conducted power

(Reference duty chart for Maximum conducted power)



on time [ms] 2.945 1cycle[ms] 3.743 duty 0.787
 duty factor [dB] 1.04
 * calculation: duty factor [dB] = 10 x log (1cycle [ms] / on time [ms])

UL Japan, Inc.

Shonan EMC Lab.

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Radiated Emission

Test place	No.3 Semi Anechoic Chamber	No.1 Semi Anechoic Chamber
Date	January 30, 2015	January 30, 2015
Temperature / Humidity	23 deg.C, 34 %RH	22 deg.C, 32 %RH
Engineer	Makoto Hosaka	Hikaru Shirasawa
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.	159.450	QP	36.1	15.2	8.8	31.8	28.3	43.5	15.2	196	317	
Hori.	318.912	QP	46.3	14.5	6.5	31.8	35.5	46.0	10.5	103	288	
Hori.	425.211	QP	42.5	16.7	7.1	31.9	34.4	46.0	11.6	100	293	
Hori.	744.128	QP	42.6	20.8	8.7	32.0	40.1	46.0	5.9	143	253	
Hori.	956.730	QP	36.6	22.6	9.6	30.9	37.9	46.0	8.1	100	215	
Hori.	1929.360	PK	49.9	25.6	13.2	41.3	47.4	73.9	26.5	100	85	
Hori.	2390.000	PK	48.2	26.4	13.6	41.1	47.1	73.9	26.8	100	44	
Hori.	2657.577	PK	49.2	26.9	13.7	40.9	48.9	73.9	25.0	111	211	
Hori.	3292.820	PK	53.4	27.9	5.2	40.9	45.6	73.9	28.3	100	140	
Hori.	4804.000	PK	48.3	30.6	5.6	39.8	44.7	73.9	29.2	100	0	
Hori.	4939.228	PK	51.2	31.2	5.7	39.6	48.5	73.9	25.4	100	154	
Hori.	6585.684	PK	48.7	35.0	6.8	39.4	51.1	73.9	22.8	100	187	
Hori.	7206.000	PK	48.3	36.6	7.1	40.2	51.8	73.9	22.1	100	0	
Hori.	1929.360	AV	41.2	25.6	13.2	41.3	38.7	53.9	15.2	100	85	
Hori.	2390.000	AV	34.9	26.4	13.6	41.1	33.8	53.9	20.1	100	44	
Hori.	2657.577	AV	36.5	26.9	13.7	40.9	36.2	53.9	17.7	111	211	
Hori.	3292.820	AV	46.8	27.9	5.2	40.9	39.0	53.9	14.9	100	140	
Hori.	4804.000	AV	35.5	30.6	5.6	39.8	31.9	53.9	22.0	100	0	
Hori.	4939.228	AV	43.2	31.2	5.7	39.6	40.5	53.9	13.4	100	154	
Hori.	6585.684	AV	38.0	35.0	6.8	39.4	40.4	53.9	13.5	100	187	
Hori.	7206.000	AV	35.5	36.6	7.1	40.2	39.0	53.9	14.9	100	0	
Vert.	159.450	QP	33.6	15.2	8.8	31.8	25.8	43.5	17.7	100	0	
Vert.	637.818	QP	42.3	19.7	8.2	32.1	38.1	46.0	7.9	100	267	
Vert.	744.123	QP	43.6	20.8	8.7	32.0	41.1	46.0	4.9	107	339	
Vert.	850.426	QP	40.6	21.6	9.2	31.7	39.7	46.0	6.3	168	291	
Vert.	956.729	QP	42.6	22.6	9.6	30.9	43.9	46.0	2.1	167	341	
Vert.	1929.360	PK	52.0	25.6	13.2	41.3	49.5	73.9	24.4	100	7	
Vert.	2390.000	PK	48.0	26.4	13.6	41.1	46.9	73.9	27.0	100	206	
Vert.	2657.577	PK	54.8	26.9	13.7	40.9	54.5	73.9	19.4	100	179	
Vert.	3292.820	PK	53.1	27.9	5.2	40.9	45.3	73.9	28.6	100	48	
Vert.	4804.000	PK	49.0	30.6	5.6	39.8	45.4	73.9	28.5	100	0	
Vert.	4939.228	PK	51.1	31.2	5.7	39.6	48.4	73.9	25.5	105	163	
Vert.	6585.684	PK	48.9	35.0	6.8	39.4	51.3	73.9	22.6	100	191	
Vert.	7206.000	PK	47.9	36.6	7.1	40.2	51.4	73.9	22.5	100	120	
Vert.	1929.360	AV	44.6	25.6	13.2	41.3	42.1	53.9	11.8	100	7	
Vert.	2390.000	AV	34.9	26.4	13.6	41.1	33.8	53.9	20.1	100	206	
Vert.	2657.577	AV	41.8	26.9	13.7	40.9	41.5	53.9	12.4	100	179	
Vert.	3292.820	AV	46.5	27.9	5.2	40.9	38.7	53.9	15.2	100	48	
Vert.	4804.000	AV	35.6	30.6	5.6	39.8	32.0	53.9	21.9	100	0	
Vert.	4939.228	AV	42.7	31.2	5.7	39.6	40.0	53.9	13.9	105	163	
Vert.	6585.684	AV	41.0	35.0	6.8	39.4	43.4	53.9	10.5	100	191	
Vert.	7206.000	AV	35.3	36.6	7.1	40.2	38.8	53.9	15.1	100	120	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-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	75.7	26.4	13.6	41.1	74.6	-	-	
Hori.	2400.000	PK	37.4	26.4	13.6	41.1	36.3	54.6	18.3	
Vert.	2402.000	PK	73.5	26.4	13.6	41.1	72.4	-	-	
Vert.	2400.000	PK	37.3	26.4	13.6	41.1	36.2	52.4	16.2	

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

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Radiated Emission

Test place	No.3 Semi Anechoic Chamber	No.1 Semi Anechoic Chamber
Date	January 30, 2015	January 30, 2015
Temperature / Humidity	23 deg.C, 34 %RH	22 deg.C, 32 %RH
Engineer	Makoto Hosaka	Hikaru Shirasawa
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.	159.395	QP	36.2	15.2	8.8	31.8	28.4	43.5	15.1	300	315	
Hori.	318.907	QP	46.3	14.5	6.5	31.8	35.5	46.0	10.5	115	290	
Hori.	425.214	QP	42.5	16.7	7.1	31.9	34.4	46.0	11.6	100	293	
Hori.	744.127	QP	41.4	20.8	8.7	32.0	38.9	46.0	7.1	139	226	
Hori.	956.732	QP	36.7	22.6	9.6	30.9	38.0	46.0	8.0	100	212	
Hori.	1929.366	PK	50.0	25.6	13.2	41.3	47.5	73.9	26.4	100	84	
Hori.	2657.579	PK	48.6	26.9	13.7	40.9	48.3	73.9	25.6	100	262	
Hori.	3292.821	PK	54.1	27.9	5.2	40.9	46.3	73.9	27.6	100	144	
Hori.	4882.000	PK	46.9	30.9	5.6	39.7	43.7	73.9	30.2	100	0	
Hori.	4939.228	PK	51.4	31.2	5.7	39.6	48.7	73.9	25.2	100	155	
Hori.	6585.636	PK	49.0	35.0	6.8	39.4	51.4	73.9	22.5	100	189	
Hori.	7323.000	PK	48.3	36.8	7.0	40.3	51.8	73.9	22.1	179	3	
Hori.	1929.366	AV	41.4	25.6	13.2	41.3	38.9	53.9	15.0	100	84	
Hori.	2657.579	AV	35.9	26.9	13.7	40.9	35.6	53.9	18.3	100	262	
Hori.	3292.821	AV	48.1	27.9	5.2	40.9	40.3	53.9	13.6	100	144	
Hori.	4882.000	AV	34.3	30.9	5.6	39.7	31.1	53.9	22.8	100	0	
Hori.	4939.228	AV	43.0	31.2	5.7	39.6	40.3	53.9	13.6	100	155	
Hori.	6585.636	AV	38.5	35.0	6.8	39.4	40.9	53.9	13.0	100	189	
Hori.	7323.000	AV	36.9	36.8	7.0	40.3	40.4	53.9	13.5	179	3	
Vert.	159.450	QP	33.8	15.2	8.8	31.8	26.0	43.5	17.5	100	0	
Vert.	637.821	QP	42.5	19.7	8.2	32.1	38.3	46.0	7.7	100	272	
Vert.	744.129	QP	43.6	20.8	8.7	32.0	41.1	46.0	4.9	111	337	
Vert.	850.428	QP	40.5	21.6	9.2	31.7	39.6	46.0	6.4	167	295	
Vert.	956.728	QP	42.1	22.6	9.6	30.9	43.4	46.0	2.6	165	338	
Vert.	1929.366	PK	51.7	25.6	13.2	41.3	49.2	73.9	24.7	100	6	
Vert.	2657.579	PK	55.5	26.9	13.7	40.9	55.2	73.9	18.7	100	182	
Vert.	3292.821	PK	53.5	27.9	5.2	40.9	45.7	73.9	28.2	100	154	
Vert.	4882.000	PK	47.2	30.9	5.6	39.7	44.0	73.9	29.9	100	0	
Vert.	4939.228	PK	50.6	31.2	5.7	39.6	47.9	73.9	26.0	105	195	
Vert.	6585.636	PK	50.6	35.0	6.8	39.4	53.0	73.9	20.9	100	190	
Vert.	7323.000	PK	47.1	36.8	7.0	40.3	50.6	73.9	23.3	100	145	
Vert.	1929.366	AV	44.5	25.6	13.2	41.3	42.0	53.9	11.9	100	6	
Vert.	2657.579	AV	42.5	26.9	13.7	40.9	42.2	53.9	11.7	100	182	
Vert.	3292.821	AV	47.7	27.9	5.2	40.9	39.9	53.9	14.0	100	154	
Vert.	4882.000	AV	34.4	30.9	5.6	39.7	31.2	53.9	22.7	100	0	
Vert.	4939.228	AV	41.6	31.2	5.7	39.6	38.9	53.9	15.0	105	195	
Vert.	6585.636	AV	43.0	35.0	6.8	39.4	45.4	53.9	8.5	100	190	
Vert.	7323.000	AV	34.7	36.8	7.0	40.3	38.2	53.9	15.7	100	145	

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

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

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

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Radiated Emission

Test place	No.3 Semi Anechoic Chamber	No.1 Semi Anechoic Chamber
Date	January 30, 2015	January 30, 2015
Temperature / Humidity	23 deg.C, 34 %RH	22 deg.C, 32 %RH
Engineer	Makoto Hosaka	Hikaru Shirasawa
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.	159.454	QP	36.5	15.2	8.8	31.8	28.7	43.5	14.8	192	313	
Hori.	318.912	QP	46.6	14.5	6.5	31.8	35.8	46.0	10.2	120	286	
Hori.	425.207	QP	42.8	16.7	7.1	31.9	34.7	46.0	11.3	100	289	
Hori.	744.126	QP	40.1	20.8	8.7	32.0	37.6	46.0	8.4	132	229	
Hori.	956.735	QP	36.4	22.6	9.6	30.9	37.7	46.0	8.3	100	213	
Hori.	1929.360	PK	50.2	25.6	13.2	41.3	47.7	73.9	26.2	100	84	
Hori.	2483.500	PK	47.2	26.6	13.6	41.1	46.3	73.9	27.6	100	30	
Hori.	2657.570	PK	49.6	26.9	13.7	40.9	49.3	73.9	24.6	112	210	
Hori.	3292.820	PK	53.9	27.9	5.2	40.9	46.1	73.9	27.8	100	131	
Hori.	4939.230	PK	50.7	31.2	5.7	39.6	48.0	73.9	25.9	100	155	
Hori.	4960.000	PK	46.6	31.2	5.7	39.6	43.9	73.9	30.0	100	0	
Hori.	6585.680	PK	47.9	35.0	6.8	39.4	50.3	73.9	23.6	100	155	
Hori.	7440.000	PK	48.5	37.0	7.0	40.4	52.1	73.9	21.8	151	299	
Hori.	1929.360	AV	41.5	25.6	13.2	41.3	39.0	53.9	14.9	100	84	
Hori.	2483.500	AV	34.9	26.6	13.6	41.1	34.0	53.9	19.9	100	30	
Hori.	2657.570	AV	36.8	26.9	13.7	40.9	36.5	53.9	17.4	112	210	
Hori.	3292.820	AV	48.7	27.9	5.2	40.9	40.9	53.9	13.0	100	131	
Hori.	4939.230	AV	42.5	31.2	5.7	39.6	39.8	53.9	14.1	100	155	
Hori.	4960.000	AV	34.0	31.2	5.7	39.6	31.3	53.9	22.6	100	0	
Hori.	6585.680	AV	38.0	35.0	6.8	39.4	40.4	53.9	13.5	100	155	
Hori.	7440.000	AV	36.7	37.0	7.0	40.4	40.3	53.9	13.6	151	299	
Vert.	159.454	QP	33.2	15.2	8.8	31.8	25.4	43.5	18.1	100	0	
Vert.	531.519	QP	43.5	18.2	7.7	32.0	37.4	46.0	8.6	147	325	
Vert.	637.820	QP	42.6	19.7	8.2	32.1	38.4	46.0	7.6	100	273	
Vert.	744.122	QP	43.6	20.8	8.7	32.0	41.1	46.0	4.9	111	336	
Vert.	956.730	QP	42.3	22.6	9.6	30.9	43.6	46.0	2.4	168	339	
Vert.	1929.360	PK	51.5	25.6	13.2	41.3	49.0	73.9	24.9	104	7	
Vert.	2483.500	PK	47.0	26.6	13.6	41.1	46.1	73.9	27.8	100	0	
Vert.	2657.570	PK	54.0	26.9	13.7	40.9	53.7	73.9	20.2	100	182	
Vert.	3292.820	PK	52.4	27.9	5.2	40.9	44.6	73.9	29.3	100	36	
Vert.	4939.230	PK	49.9	31.2	5.7	39.6	47.2	73.9	26.7	111	190	
Vert.	4960.000	PK	46.4	31.2	5.7	39.6	43.7	73.9	30.2	100	0	
Vert.	6585.680	PK	49.3	35.0	6.8	39.4	51.7	73.9	22.2	100	209	
Vert.	7440.000	PK	48.2	37.0	7.0	40.4	51.8	73.9	22.1	100	133	
Vert.	1929.360	AV	44.8	25.6	13.2	41.3	42.3	53.9	11.6	104	7	
Vert.	2483.500	AV	34.8	26.6	13.6	41.1	33.9	53.9	20.0	100	0	
Vert.	2657.570	AV	41.4	26.9	13.7	40.9	41.1	53.9	12.8	100	182	
Vert.	3292.820	AV	45.8	27.9	5.2	40.9	38.0	53.9	15.9	100	36	
Vert.	4939.230	AV	41.7	31.2	5.7	39.6	39.0	53.9	14.9	111	190	
Vert.	4960.000	AV	34.1	31.2	5.7	39.6	31.4	53.9	22.5	100	0	
Vert.	6585.680	AV	40.5	35.0	6.8	39.4	42.9	53.9	11.0	100	209	
Vert.	7440.000	AV	35.8	37.0	7.0	40.4	39.4	53.9	14.5	100	133	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-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	No.1 Semi Anechoic Chamber
Date	January 30, 2015	January 30, 2015
Temperature / Humidity	23 deg.C, 34 %RH	22 deg.C, 32 %RH
Engineer	Makoto Hosaka	Hikaru Shirasawa
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.	159.455	QP	36.4	15.2	8.8	31.8	28.6	43.5	14.9	194	314	
Hori.	318.914	QP	46.7	14.5	6.5	31.8	35.9	46.0	10.1	105	285	
Hori.	425.211	QP	42.8	16.7	7.1	31.9	34.7	46.0	11.3	100	291	
Hori.	744.132	QP	40.0	20.8	8.7	32.0	37.5	46.0	8.5	135	228	
Hori.	956.727	QP	36.4	22.6	9.6	30.9	37.7	46.0	8.3	100	215	
Hori.	1929.360	PK	50.0	25.6	13.2	41.3	47.5	73.9	26.4	100	83	
Hori.	2390.000	PK	47.0	26.4	13.6	41.1	45.9	73.9	28.0	100	48	
Hori.	2657.570	PK	48.9	26.9	13.7	40.9	48.6	73.9	25.3	100	268	
Hori.	3292.820	PK	54.3	27.9	5.2	40.9	46.5	73.9	27.4	100	129	
Hori.	4804.000	PK	47.8	30.6	5.6	39.8	44.2	73.9	29.7	100	0	
Hori.	4939.230	PK	51.1	31.2	5.7	39.6	48.4	73.9	25.5	100	155	
Hori.	6585.680	PK	48.9	35.0	6.8	39.4	51.3	73.9	22.6	100	188	
Hori.	7206.000	PK	46.9	36.6	7.1	40.2	50.4	73.9	23.5	196	11	
Hori.	1929.360	AV	40.7	25.6	13.2	41.3	38.2	53.9	15.7	100	83	
Hori.	2390.000	AV	34.8	26.4	13.6	41.1	33.7	53.9	20.2	100	48	
Hori.	2657.570	AV	36.6	26.9	13.7	40.9	36.3	53.9	17.6	100	268	
Hori.	3292.820	AV	48.7	27.9	5.2	40.9	40.9	53.9	13.0	100	129	
Hori.	4804.000	AV	34.0	30.6	5.6	39.8	30.4	53.9	23.5	100	0	
Hori.	4939.230	AV	48.0	31.2	5.7	39.6	45.3	53.9	8.6	100	155	
Hori.	6585.680	AV	38.6	35.0	6.8	39.4	41.0	53.9	12.9	100	188	
Hori.	7206.000	AV	34.1	36.6	7.1	40.2	37.6	53.9	16.3	196	11	
Vert.	159.455	QP	33.2	15.2	8.8	31.8	25.4	43.5	18.1	100	0	
Vert.	637.817	QP	42.5	19.7	8.2	32.1	38.3	46.0	7.7	100	269	
Vert.	744.121	QP	43.7	20.8	8.7	32.0	41.2	46.0	4.8	110	336	
Vert.	850.428	QP	40.5	21.6	9.2	31.7	39.6	46.0	6.4	159	293	
Vert.	956.728	QP	42.3	22.6	9.6	30.9	43.6	46.0	2.4	158	337	
Vert.	1929.360	PK	51.5	25.6	13.2	41.3	49.0	73.9	24.9	105	10	
Vert.	2390.000	PK	47.6	26.4	13.6	41.1	46.5	73.9	27.4	113	210	
Vert.	2657.570	PK	54.6	26.9	13.7	40.9	54.3	73.9	19.6	100	179	
Vert.	3292.820	PK	53.5	27.9	5.2	40.9	45.7	73.9	28.2	100	188	
Vert.	4804.000	PK	45.7	30.6	5.6	39.8	42.1	73.9	31.8	100	0	
Vert.	4939.230	PK	50.3	31.2	5.7	39.6	47.6	73.9	26.3	105	195	
Vert.	6585.680	PK	50.4	35.0	6.8	39.4	52.8	73.9	21.1	100	188	
Vert.	7206.000	PK	46.4	36.6	7.1	40.2	49.9	73.9	24.0	100	143	
Vert.	1929.360	AV	44.6	25.6	13.2	41.3	42.1	53.9	11.8	105	10	
Vert.	2390.000	AV	34.8	26.4	13.6	41.1	33.7	53.9	20.2	113	210	
Vert.	2657.570	AV	42.0	26.9	13.7	40.9	41.7	53.9	12.2	100	179	
Vert.	3292.820	AV	47.4	27.9	5.2	40.9	39.6	53.9	14.3	100	188	
Vert.	4804.000	AV	34.0	30.6	5.6	39.8	30.4	53.9	23.5	100	0	
Vert.	4939.230	AV	42.1	31.2	5.7	39.6	39.4	53.9	14.5	105	195	
Vert.	6585.680	AV	42.3	35.0	6.8	39.4	44.7	53.9	9.2	100	188	
Vert.	7206.000	AV	33.8	36.6	7.1	40.2	37.3	53.9	16.6	100	143	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-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	73.9	26.4	13.6	41.1	72.8	-	-	
Hori.	2400.000	PK	36.5	26.4	13.6	41.1	35.4	52.8	17.4	
Vert.	2402.000	PK	72.0	26.4	13.6	41.1	70.9	-	-	
Vert.	2400.000	PK	36.5	26.4	13.6	41.1	35.4	50.9	15.5	

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

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Radiated Emission

Test place	No.3 Semi Anechoic Chamber	No.1 Semi Anechoic Chamber
Date	January 30, 2015	January 30, 2015
Temperature / Humidity	23 deg.C, 34 %RH	22 deg.C, 32 %RH
Engineer	Makoto Hosaka	Hikaru Shirasawa
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.	159.458	QP	36.4	15.2	8.8	31.8	28.6	43.5	14.9	194	315	
Hori.	318.904	QP	46.7	14.5	6.5	31.8	35.9	46.0	10.1	117	288	
Hori.	425.216	QP	42.8	16.7	7.1	31.9	34.7	46.0	11.3	100	294	
Hori.	744.127	QP	39.8	20.8	8.7	32.0	37.3	46.0	8.7	135	231	
Hori.	956.725	QP	36.4	22.6	9.6	30.9	37.7	46.0	8.3	100	212	
Hori.	1929.360	PK	50.1	25.6	13.2	41.3	47.6	73.9	26.3	100	84	
Hori.	2657.570	PK	49.5	26.9	13.7	40.9	49.2	73.9	24.7	100	267	
Hori.	3292.820	PK	53.9	27.9	5.2	40.9	46.1	73.9	27.8	100	129	
Hori.	4882.000	PK	46.8	30.9	5.6	39.7	43.6	73.9	30.3	100	0	
Hori.	4939.230	PK	50.6	31.2	5.7	39.6	47.9	73.9	26.0	100	155	
Hori.	6585.680	PK	48.5	35.0	6.8	39.4	50.9	73.9	23.0	100	189	
Hori.	7323.000	PK	46.6	36.8	7.0	40.3	50.1	73.9	23.8	183	9	
Hori.	1929.360	AV	40.9	25.6	13.2	41.3	38.4	53.9	15.5	100	84	
Hori.	2657.570	AV	36.5	26.9	13.7	40.9	36.2	53.9	17.7	100	267	
Hori.	3292.820	AV	48.2	27.9	5.2	40.9	40.4	53.9	13.5	100	129	
Hori.	4882.000	AV	33.9	30.9	5.6	39.7	30.7	53.9	23.2	100	0	
Hori.	4939.230	AV	43.6	31.2	5.7	39.6	40.9	53.9	13.0	100	155	
Hori.	6585.680	AV	38.3	35.0	6.8	39.4	40.7	53.9	13.2	100	189	
Hori.	7323.000	AV	34.5	36.8	7.0	40.3	38.0	53.9	15.9	183	9	
Vert.	159.458	QP	33.2	15.2	8.8	31.8	25.4	43.5	18.1	100	0	
Vert.	637.820	QP	42.6	19.7	8.2	32.1	38.4	46.0	7.6	100	272	
Vert.	744.124	QP	43.6	20.8	8.7	32.0	41.1	46.0	4.9	108	339	
Vert.	850.426	QP	40.8	21.6	9.2	31.7	39.9	46.0	6.1	166	292	
Vert.	956.728	QP	42.2	22.6	9.6	30.9	43.5	46.0	2.5	164	341	
Vert.	1929.360	PK	51.3	25.6	13.2	41.3	48.8	73.9	25.1	100	7	
Vert.	2657.570	PK	54.6	26.9	13.7	40.9	54.3	73.9	19.6	100	177	
Vert.	3292.820	PK	53.4	27.9	5.2	40.9	45.6	73.9	28.3	100	186	
Vert.	4882.000	PK	46.7	30.9	5.6	39.7	43.5	73.9	30.4	100	0	
Vert.	4939.230	PK	49.5	31.2	5.7	39.6	46.8	73.9	27.1	102	195	
Vert.	6585.680	PK	50.4	35.0	6.8	39.4	52.8	73.9	21.1	100	188	
Vert.	7323.000	PK	46.9	36.8	7.0	40.3	50.4	73.9	23.5	100	164	
Vert.	1929.360	AV	44.5	25.6	13.2	41.3	42.0	53.9	11.9	100	7	
Vert.	2657.570	AV	42.2	26.9	13.7	40.9	41.9	53.9	12.0	100	177	
Vert.	3292.820	AV	47.2	27.9	5.2	40.9	39.4	53.9	14.5	100	186	
Vert.	4882.000	AV	34.0	30.9	5.6	39.7	30.8	53.9	23.1	100	0	
Vert.	4939.230	AV	40.8	31.2	5.7	39.6	38.1	53.9	15.8	102	195	
Vert.	6585.680	AV	41.9	35.0	6.8	39.4	44.3	53.9	9.6	100	188	
Vert.	7323.000	AV	34.1	36.8	7.0	40.3	37.6	53.9	16.3	100	164	

Result = Reading + Ant.Fac. + Loss (Cable+Attenuator+Filter-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	No.1 Semi Anechoic Chamber
Date	January 30, 2015	January 30, 2015
Temperature / Humidity	23 deg.C, 34 %RH	22 deg.C, 32 %RH
Engineer	Makoto Hosaka	Hikaru Shirasawa
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.	159.457	QP	36.5	15.2	8.8	31.8	28.7	43.5	14.8	192	314	
Hori.	318.907	QP	46.6	14.5	6.5	31.8	35.8	46.0	10.2	108	283	
Hori.	425.215	QP	42.9	16.7	7.1	31.9	34.8	46.0	11.2	100	289	
Hori.	744.126	QP	40.0	20.8	8.7	32.0	37.5	46.0	8.5	133	231	
Hori.	956.727	QP	36.5	22.6	9.6	30.9	37.8	46.0	8.2	100	213	
Hori.	1929.360	PK	50.0	25.6	13.2	41.3	47.5	73.9	26.4	100	84	
Hori.	2483.500	PK	47.5	26.6	13.6	41.1	46.6	73.9	27.3	213	30	
Hori.	2657.570	PK	49.8	26.9	13.7	40.9	49.5	73.9	24.4	114	203	
Hori.	3292.820	PK	54.6	27.9	5.2	40.9	46.8	73.9	27.1	100	130	
Hori.	4939.230	PK	50.3	31.2	5.7	39.6	47.6	73.9	26.3	100	155	
Hori.	4960.000	PK	47.0	31.2	5.7	39.6	44.3	73.9	29.6	100	0	
Hori.	6585.680	PK	49.4	35.0	6.8	39.4	51.8	73.9	22.1	100	188	
Hori.	7440.000	PK	47.7	37.0	7.0	40.4	51.3	73.9	22.6	182	7	
Hori.	1929.360	AV	40.8	25.6	13.2	41.3	38.3	53.9	15.6	100	84	
Hori.	2483.500	AV	35.0	26.6	13.6	41.1	34.1	53.9	19.8	213	30	
Hori.	2657.570	AV	36.4	26.9	13.7	40.9	36.1	53.9	17.8	114	203	
Hori.	3292.820	AV	49.4	27.9	5.2	40.9	41.6	53.9	12.3	100	130	
Hori.	4939.230	AV	42.9	31.2	5.7	39.6	40.2	53.9	13.7	100	155	
Hori.	4960.000	AV	34.0	31.2	5.7	39.6	31.3	53.9	22.6	100	0	
Hori.	6585.680	AV	39.8	35.0	6.8	39.4	42.2	53.9	11.7	100	188	
Hori.	7440.000	AV	35.3	37.0	7.0	40.4	38.9	53.9	15.0	182	7	
Vert.	159.457	QP	33.2	15.2	8.8	31.8	25.4	43.5	18.1	100	0	
Vert.	637.819	QP	42.6	19.7	8.2	32.1	38.4	46.0	7.6	100	271	
Vert.	744.128	QP	43.5	20.8	8.7	32.0	41.0	46.0	5.0	103	335	
Vert.	850.427	QP	40.3	21.6	9.2	31.7	39.4	46.0	6.6	169	294	
Vert.	956.730	QP	42.1	22.6	9.6	30.9	43.4	46.0	2.6	162	340	
Vert.	1929.360	PK	51.5	25.6	13.2	41.3	49.0	73.9	24.9	105	7	
Vert.	2483.500	PK	47.6	26.6	13.6	41.1	46.7	73.9	27.2	100	0	
Vert.	2657.570	PK	54.5	26.9	13.7	40.9	54.2	73.9	19.7	100	175	
Vert.	3292.820	PK	52.9	27.9	5.2	40.9	45.1	73.9	28.8	100	174	
Vert.	4939.230	PK	49.7	31.2	5.7	39.6	47.0	73.9	26.9	104	195	
Vert.	4960.000	PK	46.6	31.2	5.7	39.6	43.9	73.9	30.0	100	0	
Vert.	6585.680	PK	51.0	35.0	6.8	39.4	53.4	73.9	20.5	100	188	
Vert.	7440.000	PK	47.5	37.0	7.0	40.4	51.1	73.9	22.8	100	134	
Vert.	1929.360	AV	44.6	25.6	13.2	41.3	42.1	53.9	11.8	105	7	
Vert.	2483.500	AV	34.9	26.6	13.6	41.1	34.0	53.9	19.9	100	0	
Vert.	2657.570	AV	41.5	26.9	13.7	40.9	41.2	53.9	12.7	100	175	
Vert.	3292.820	AV	46.7	27.9	5.2	40.9	38.9	53.9	15.0	100	174	
Vert.	4939.230	AV	41.1	31.2	5.7	39.6	38.4	53.9	15.5	104	195	
Vert.	4960.000	AV	34.0	31.2	5.7	39.6	31.3	53.9	22.6	100	0	
Vert.	6585.680	AV	43.8	35.0	6.8	39.4	46.2	53.9	7.7	100	188	
Vert.	7440.000	AV	35.0	37.0	7.0	40.4	38.6	53.9	15.3	100	134	

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

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

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

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Telephone : +81 463 50 6400

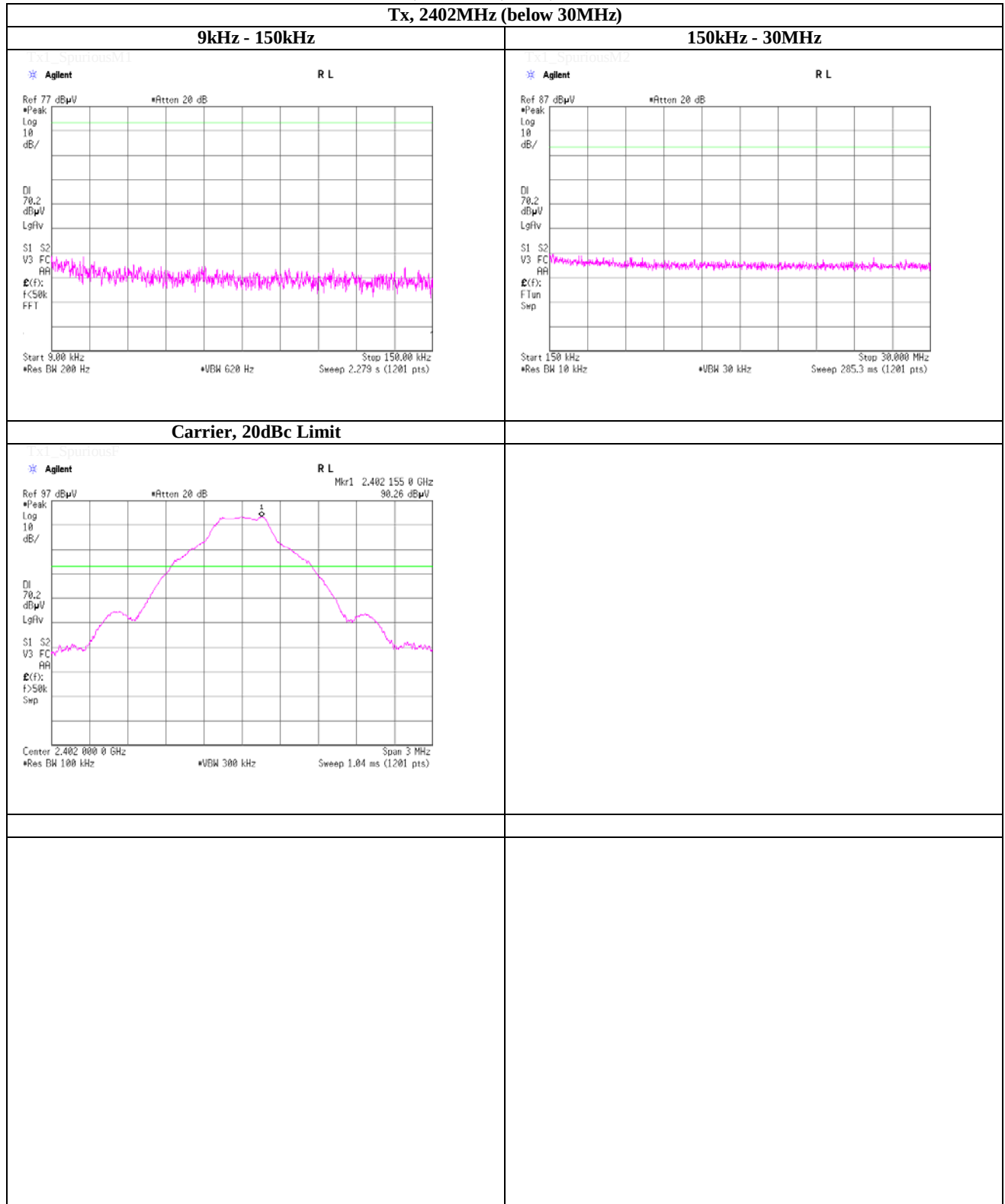
Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date December 22, 2014
Temperature / Humidity 22 deg.C , 31 %RH
Engineer Shinichi Takano

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (below 30MHz)



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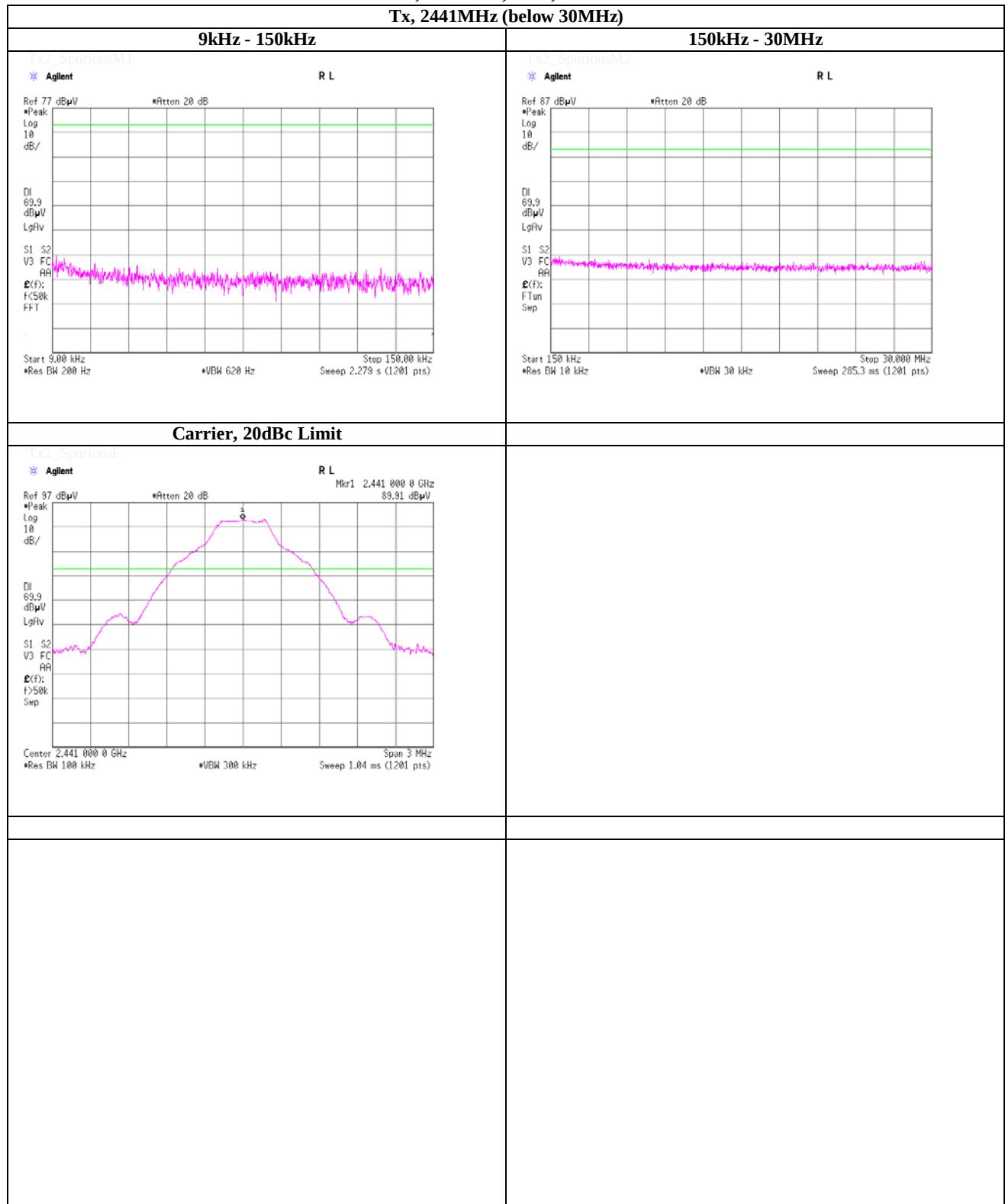
Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date December 22, 2014
Temperature / Humidity 22 deg.C , 31 %RH
Engineer Shinichi Takano

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (below 30MHz)



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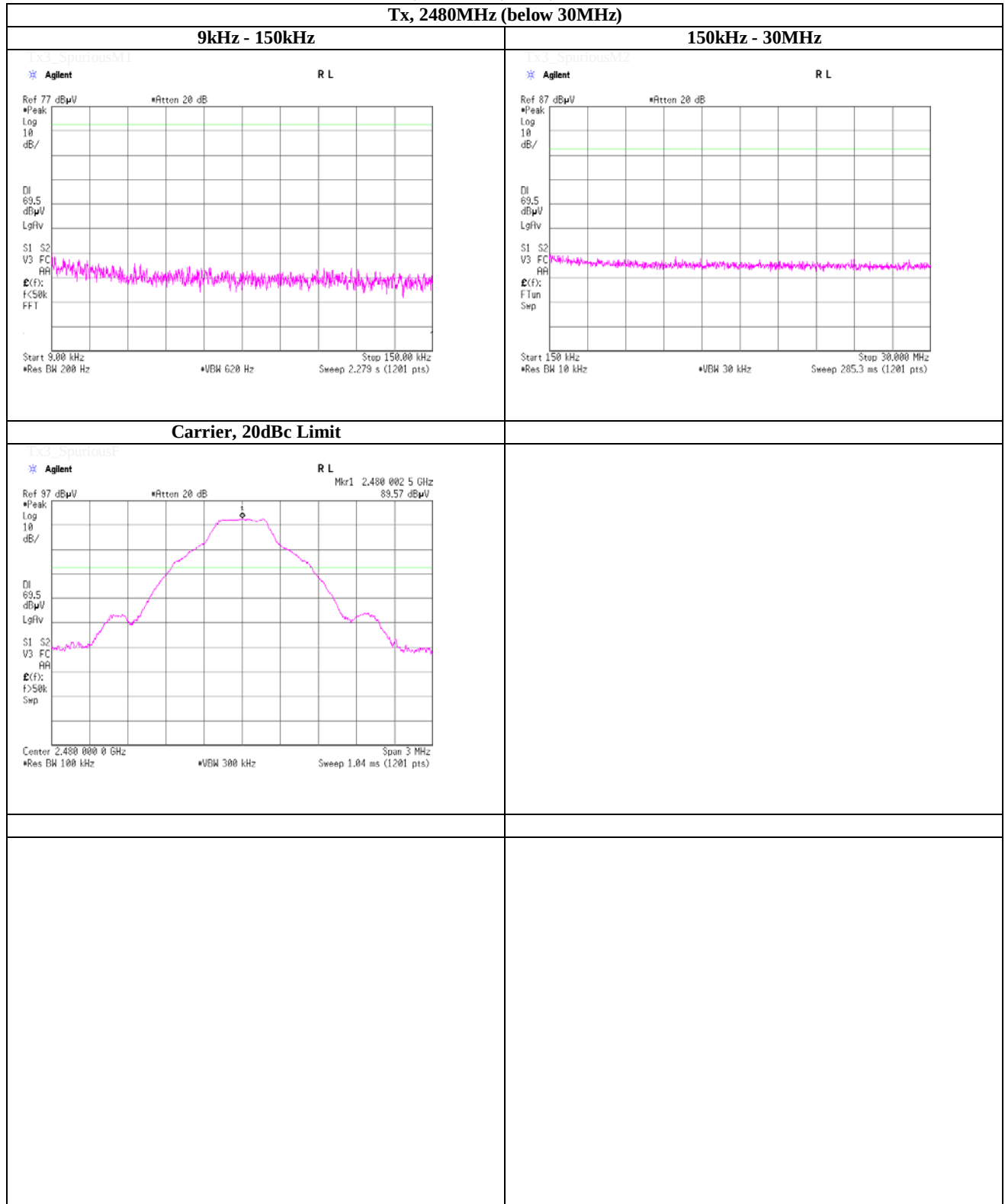
Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date December 22, 2014
Temperature / Humidity 22 deg.C , 31 %RH
Engineer Shinichi Takano

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (below 30MHz)



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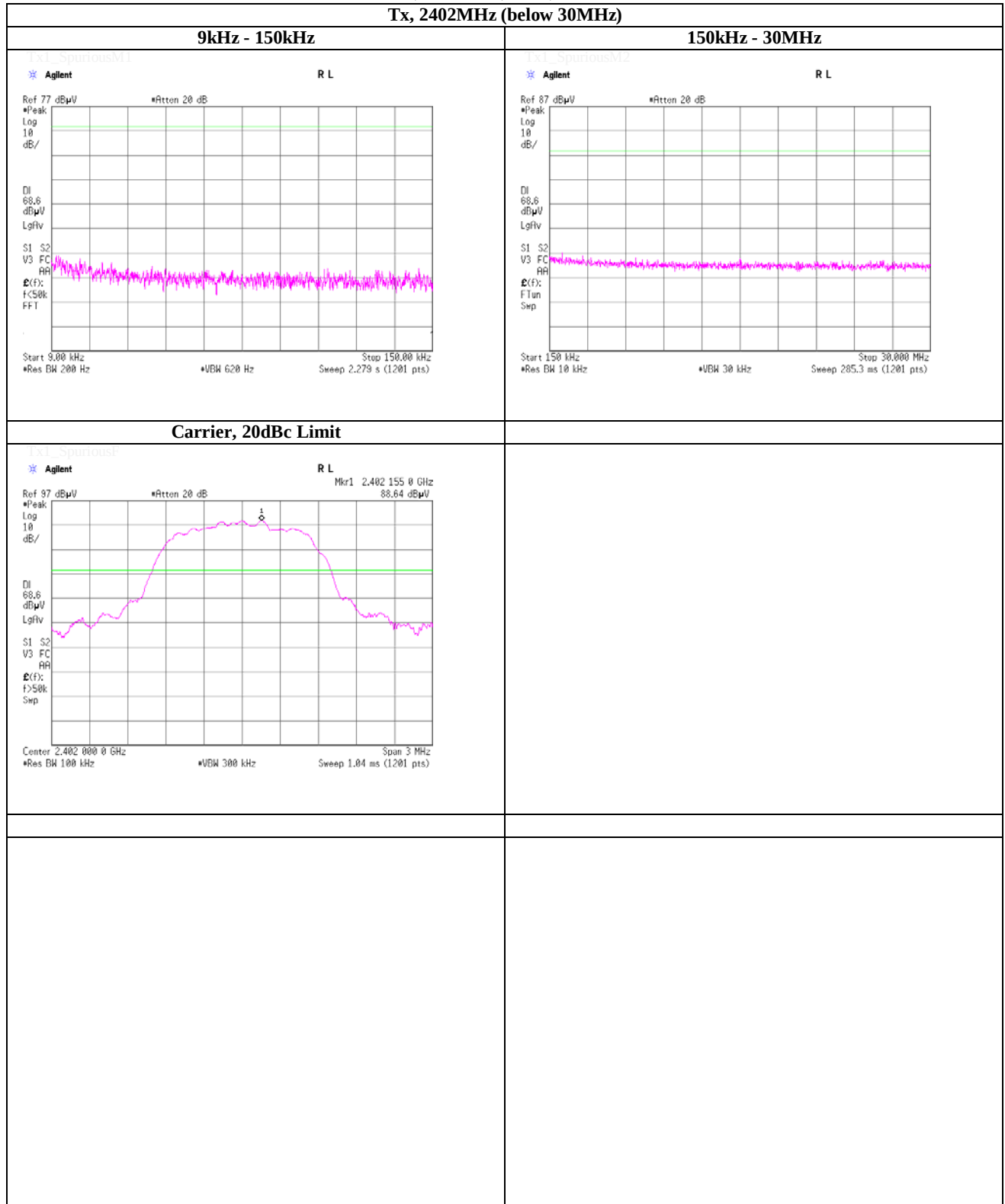
Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date December 22, 2014
Temperature / Humidity 22 deg.C , 31 %RH
Engineer Shinichi Takano

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (below 30MHz)



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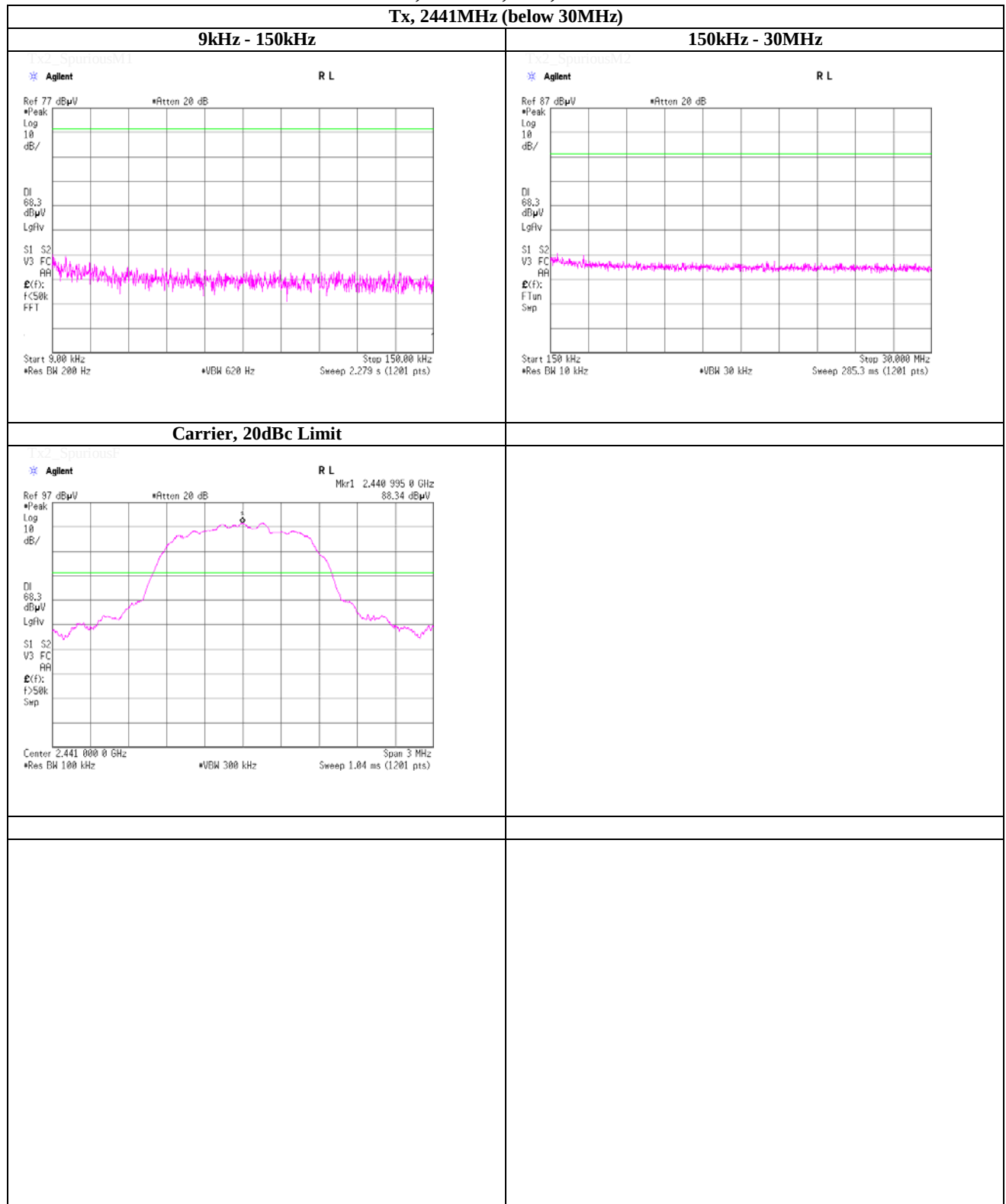
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Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
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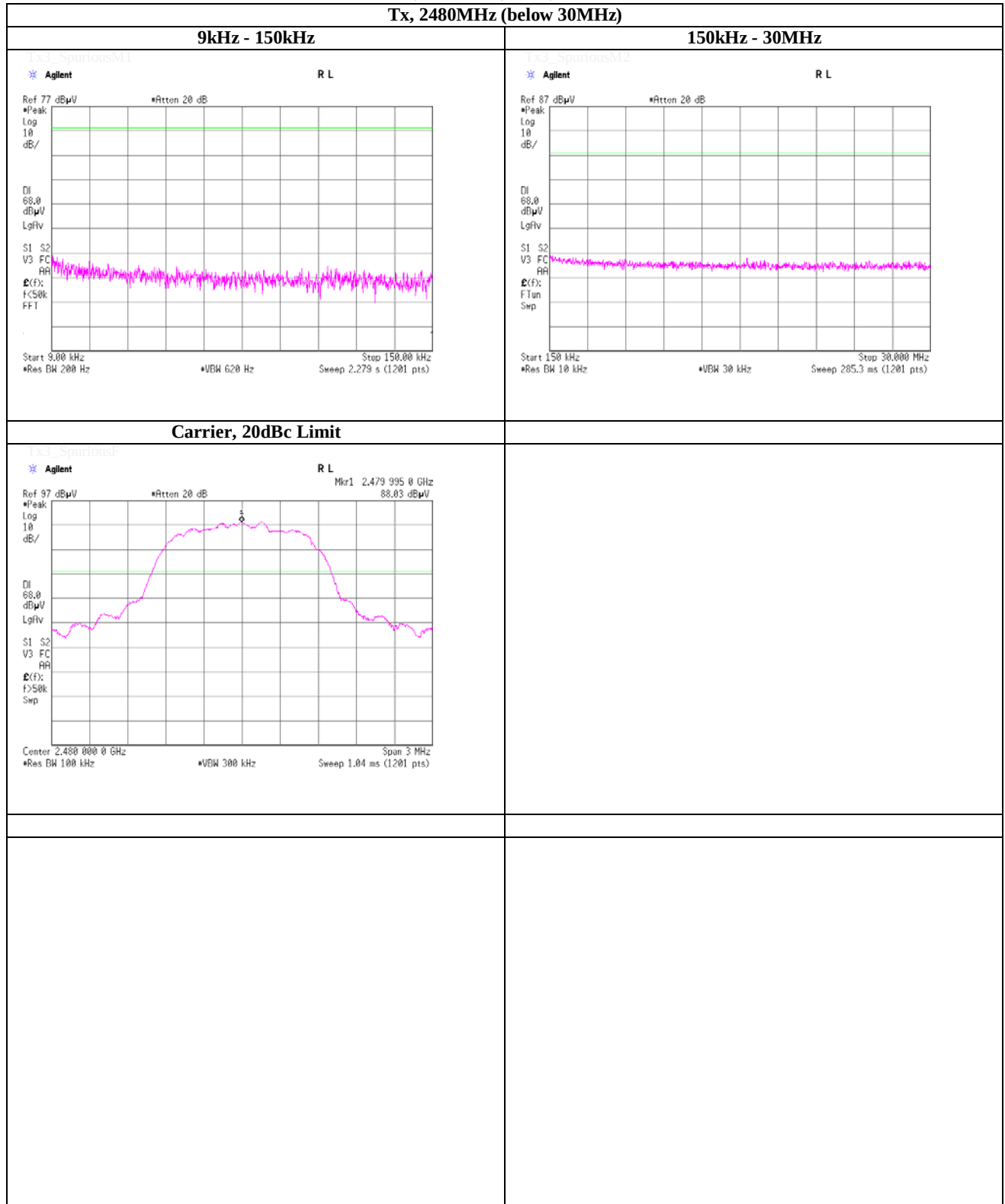
Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date December 22, 2014
Temperature / Humidity 22 deg.C , 31 %RH
Engineer Shinichi Takano

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (below 30MHz)



UL Japan, Inc.

Shonan EMC Lab.

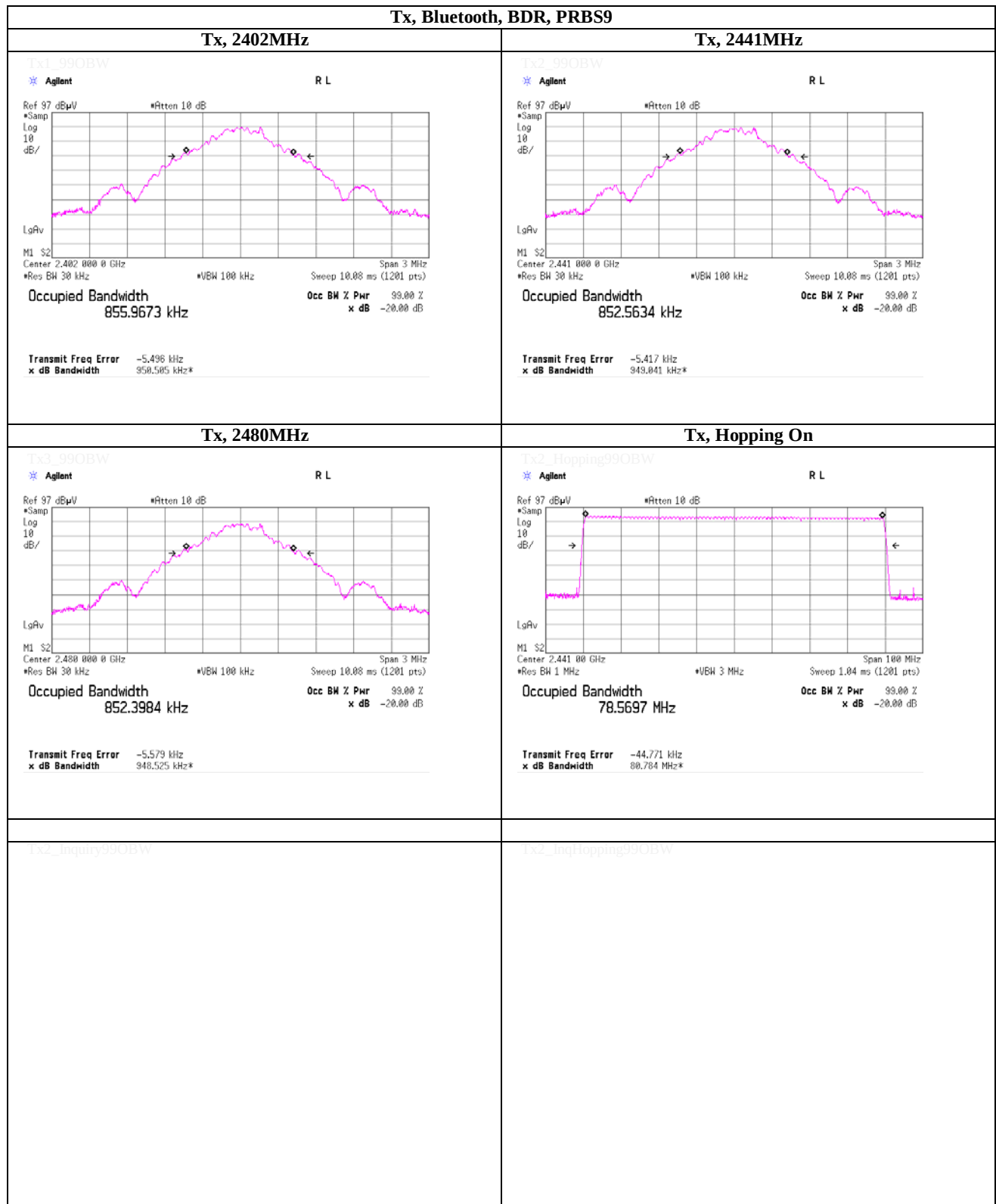
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date December 18, 2014
Temperature / Humidity 24 deg.C , 21 %RH
Engineer Hikaru Shirasawa

99% Occupied Bandwidth



UL Japan, Inc.

Shonan EMC Lab.

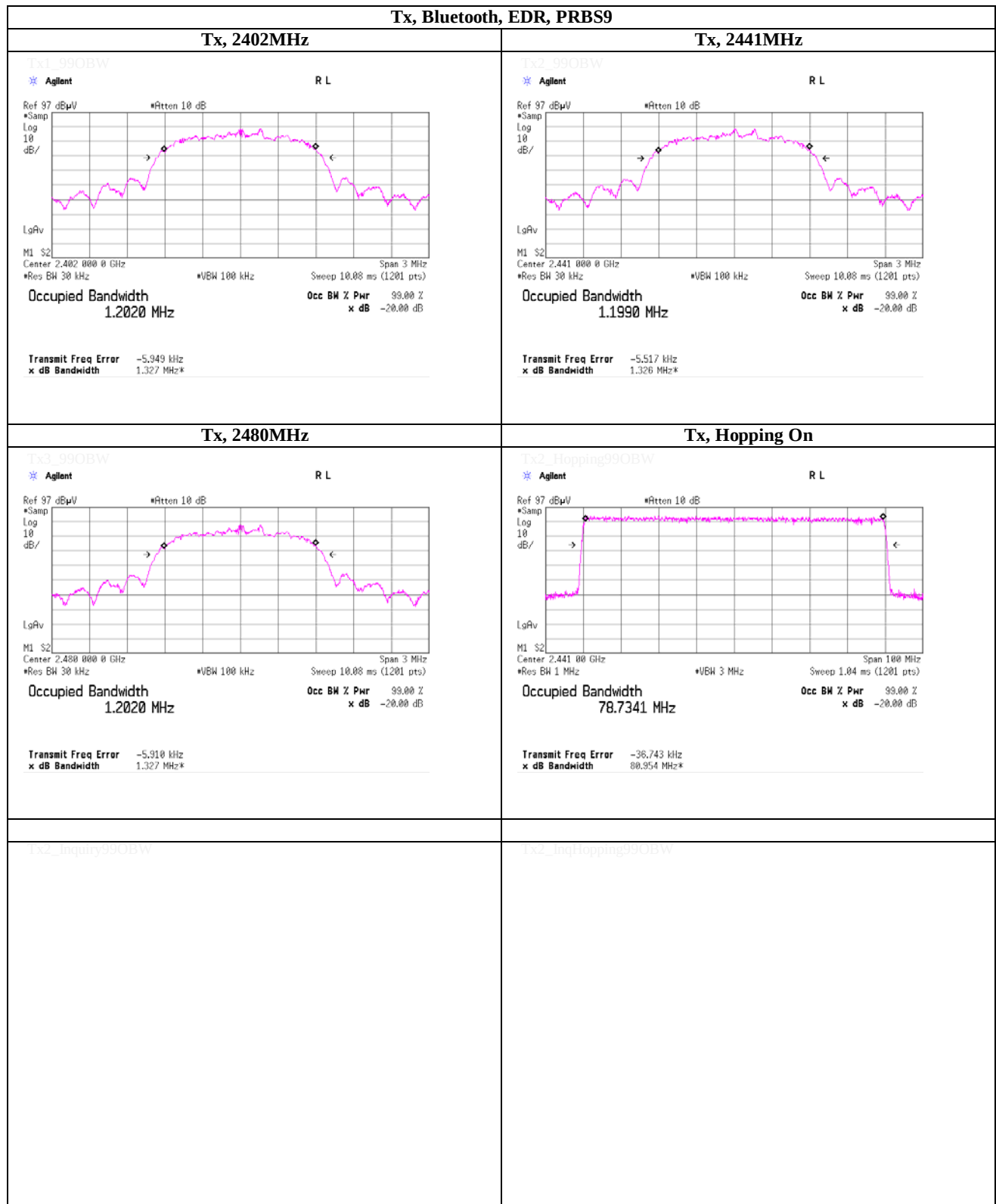
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Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date December 18, 2014
Temperature / Humidity 24 deg.C , 21 %RH
Engineer Hikaru Shirasawa

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APPENDIX 3 Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2014/03/04 * 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
SAT10-11	Attenuator	Weinschel Corp.	54A-10	37588	AT	2014/04/22 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2014/03/13 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2014/12/24 * 12
SOS-10	Humidity Indicator	A&D	AD-5681	4064561	AT	2014/10/30 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2014/04/08 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2014/04/08 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2014/07/14 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2014/05/23 * 12
SCC-G04	Coaxial Cable	Junkosha	J12J102207-00	JUN-12-14-018	RE	2014/06/24 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2014/05/15 * 12
SAT10-05	Attenuator(above1GHz)	Agilent	8493C-010	74864	RE	2014/11/21 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2014/11/21 * 12
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-01	Spectrum Analyzer	Agilent	N9010A-526	MY48031482	RE	2014/04/07 * 12
SJM-15	Measure	ASKUL	-	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2014/02/17 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2014/12/19 * 12
KAT3-09	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2014/08/27 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2014/10/18 * 12
SCC-A1/A3/A5/A7/A8/A13/S RSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2014/04/25 * 12
SCC-A2/A4/A6/A7/A8/A13/S RSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2014/04/25 * 12
SLA-01	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0888	RE	2014/10/18 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2014/10/30 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2014/11/11 * 12
SJM-13	Measure	ASKUL	-	-	RE	-
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2014/07/09 * 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

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 conducted test