



Test report No. : 10083526S-A
Page : 1 of 49
Issued date : November 14, 2013
Revised date : November 20, 2013
FCC ID : AK8MDRZX750BN

RADIO TEST REPORT

Test Report No.: 10083526S-A

Applicant : Sony Corporation
Type of Equipment : Wireless Noise Canceling Stereo Headset
Model No. : MDR-ZX750BN
FCC ID : AK8MDRZX750BN
Test regulation : FCC Part15 Subpart C: 2013
Test result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by any agency of the Federal Government.
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: October 15 to October 25, 2013

Tested by:

S. Takano

Shinichi Takano
Engineer of WiSE Japan,
UL Verification Service

Approved by :

T. Amamura

Toyokazu Imamura
Leader of WiSE Japan,
UL Verification Service



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

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

13-EM-F0429

Contents

	Page
SECTION 1: Customer information	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of E.U.T. during testing.....	8
SECTION 5: Carrier frequency separation.....	10
SECTION 6: 20dB bandwidth & Occupied bandwidth (99%).....	10
SECTION 7: Number of hopping frequency	10
SECTION 8: Dwell time	10
SECTION 9: Maximum peak output power.....	10
SECTION 10: Spurious emissions (Antenna port conducted).....	10
SECTION 11: Radiated emission.....	11
Contents of APPENDIXES	13
APPENDIX 1: Data of radio tests	14
APPENDIX 2: Test instruments	47
APPENDIX 3: Photographs of test setup	48

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

SECTION 1: Customer information

Company name : Sony Corporation
Brand name : SONY
Address : 2-10-1 Osaki, Shinagawa-ku, Tokyo 141-8610 Japan
Telephone Number : +81-50-3750-7634
Facsimile Number : +81-50-3750-6574
Contact Person : Shigeru Higai

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

2.1 Identification of E.U.T.

Type of Equipment : Wireless Noise Canceling Stereo Headset
Model Number : MDR-ZX750BN
Serial Number : Refer to Clause 4.2
Rating : DC3.7V
AC100-240V, 50/60Hz (AC Adapter)
Country of Mass-production : China
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample : October 15, 2013
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: MDR-ZX750BN (referred to as the EUT in this report) is a Wireless Noise Canceling Stereo Headset.

Clock frequency(ies) in the system : 4MHz/5.4MHz (DD converter)
26MHz/16MHz (Bluetooth)
11.2896MHz (OSC)
315-1260kHz (HP AMP)

Bluetooth specification:

Equipment type : Transceiver
Frequency of operation : 2402-2480MHz
Bandwidth / Channel spacing : 1MHz & 1MHz
Type of modulation : FHSS (GFSK, $\pi/4$ -DQPSK)
Antenna type : Pattern Antenna
Antenna connector type : Integral
Antenna gain : 1.57dBi
ITU code : F1D, G1D
Operation temperature range : +0 to +40 deg.C

FCC 15.31 (e)

The equipment provides the wireless transmitter with stable power supply (DC1.35V). Therefore, the equipment 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.

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : Test specification: FCC Part 15 Subpart C: 2013, final revised on September 30, 2013 and effective October 30, 2013
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits, general requirements
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

* The revision on September 30, 2013 does not affect the test specification applied to the EUT.

The EUT has been tested for compliance with FCC Part 15 Subpart B. Refer to the test report 10083526S-C.

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	7.1 dB Freq.: 12010.000 MHz Polarization: Horizontal Detection: Average Mode: Tx 2402MHz, EDR	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. During charging, the EUT doesn't perform BT operation.

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

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	3.7 dB	3.6 dB
	30MHz-300MHz	4.8 dB	5.0 dB	4.8 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	5.6 dB	5.6 dB
	18GHz-40GHz	5.2 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 site margin.

Antenna port conducted test

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

Spurious emission (Conducted) measurement (below 1GHz) uncertainty for this test was: (±) 1.6dB

Spurious emission (Conducted) measurement (1G-3GHz) uncertainty for this test was: (±) 1.4dB

Spurious emission (Conducted) measurement (3G-18GHz) uncertainty for this test was: (±) 2.8dB

Spurious emission (Conducted) measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.5dB

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

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

3.5 Test location

UL Japan, Inc. Shonan EMC Lab.

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

Telephone number : +81 463 50 6400

Facsimile number: +81 463 50 6401

JAB Accreditation No. : RTL02610

	FCC Registration No.	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
☐ No.1 semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.3 semi-anechoic chamber	697847	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.1 Measurement room	-	-	2.55 x 4.1 x 2.5	-	-

3.6 Test setup, Data of test & Test instruments

Refer to APPENDIX 1 to 3.

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

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 / 2-DH5) , Payload: PRBS9	-
20dB bandwidth	Transmitting Hopping OFF (DH5 / 2-DH5) , Payload: PRBS9	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting Hopping ON (DH5 / 2-DH5) , Payload: PRBS9	-
Dwell time	Transmitting (Hopping ON), Payload: PRBS9 - DH1, - DH3, - DH5 - 2-DH1, - 2-DH3, - 2-DH5	-
Maximum peak output power	Transmitting Hopping OFF , Payload: PRBS9 - DH5, - 2-DH5	2402MHz, 2441MHz, 2480MHz
Band edge compliance & Spurious emission (Conducted)	Transmitting (DH5 / 2-DH5), Payload: PRBS9 -Hopping ON -Hopping OFF	Band edge compliance: 2402MHz, 2480MHz
(Radiated)	Transmitting (DH5 / 2-DH5), Payload: PRBS9 -Hopping OFF	Spurious emission: 2402MHz, 2441MHz, 2480MHz
99% occupied bandwidth	Transmitting (DH5 / 2-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.
As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.

The EUT has no inquiry mode.

Software: CSR Blue Suite BlueTest Ver.2.5

Power settings:

BDR: Ext.=23, Int.=39

EDR: Ext.=56, Int.=40

TX PA ATTEN settings:

BDR: 1

EDR: 0

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

UL Japan, Inc.

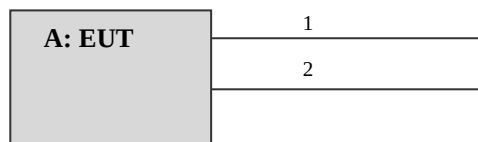
Shonan EMC Lab.

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Wireless Noise Canceling Stereo Headset	MDR-ZX750BN	5000045	Sony	EUT

List of cables used

No.	Cable name	Length(m)	Shield		Remarks
			Cable	Connector	
1	Audio	1.5	Unshielded	Unshielded	-
2	USB	0.5	Shielded	Shielded	-

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

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.

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating,

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

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

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

Summary of the test results: Pass

Refer to APPENDIX 1.

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

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 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 carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Combinations of the worst case

Frequency Antenna polarization	Carrier *2)	Spurious				
		Below 1GHz	1-2.8GHz	2.8-15GHz	15-18GHz	18-25GHz
Horizontal	X	Y	X	X	X	X
Vertical	X	Y	X	Y	X	Z

*2) with spurious emissions near carrier frequency

UL Japan, Inc.

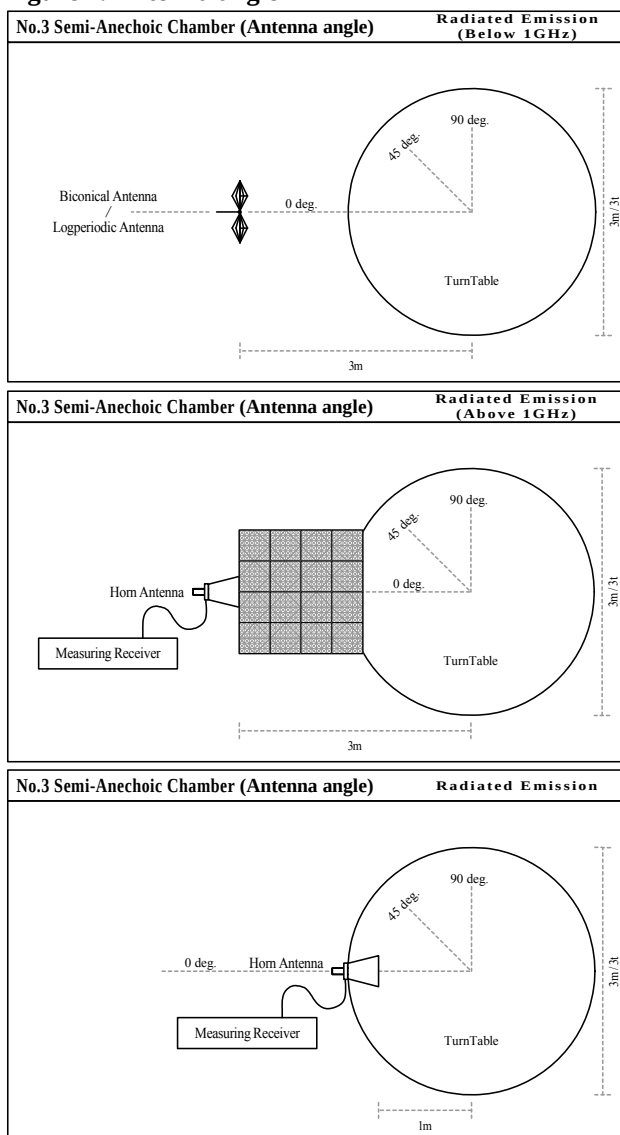
Shonan EMC Lab.

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

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.

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

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

UL Japan, Inc.

Shonan EMC Lab.

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

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

APPENDIX 1: Data of Radio tests

20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date October 25, 2013
 Temperature / Humidity 25 deg.C , 61 %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	0.944	1.005	>= 0.629
DH5	2441.0	0.941	1.005	>= 0.628
DH5	2480.0	0.941	1.005	>= 0.627

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

Tx2_Inquiry20OBW

Tx2_InquirySeparation

UL Japan, Inc.

Shonan EMC Lab.

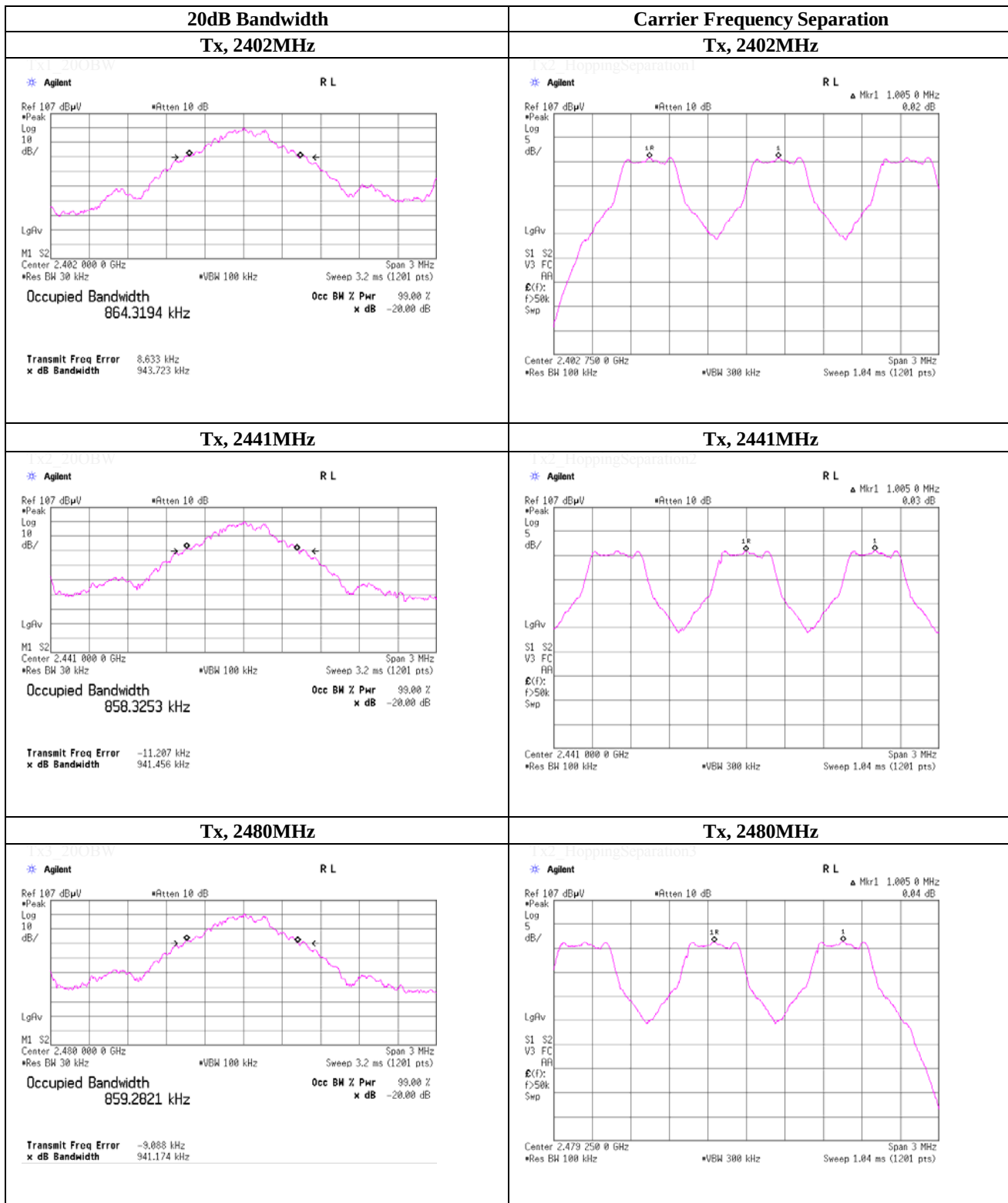
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, BDR, 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

20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
Date October 25, 2013
Temperature / Humidity 25 deg.C , 61 %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]
2-DH5	2402.0	1.259	1.005	>= 0.840
2-DH5	2441.0	1.228	1.005	>= 0.818
2-DH5	2480.0	1.229	1.005	>= 0.819

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

Tx2_Inquiry20OBW

Tx2_InquirySeparation

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

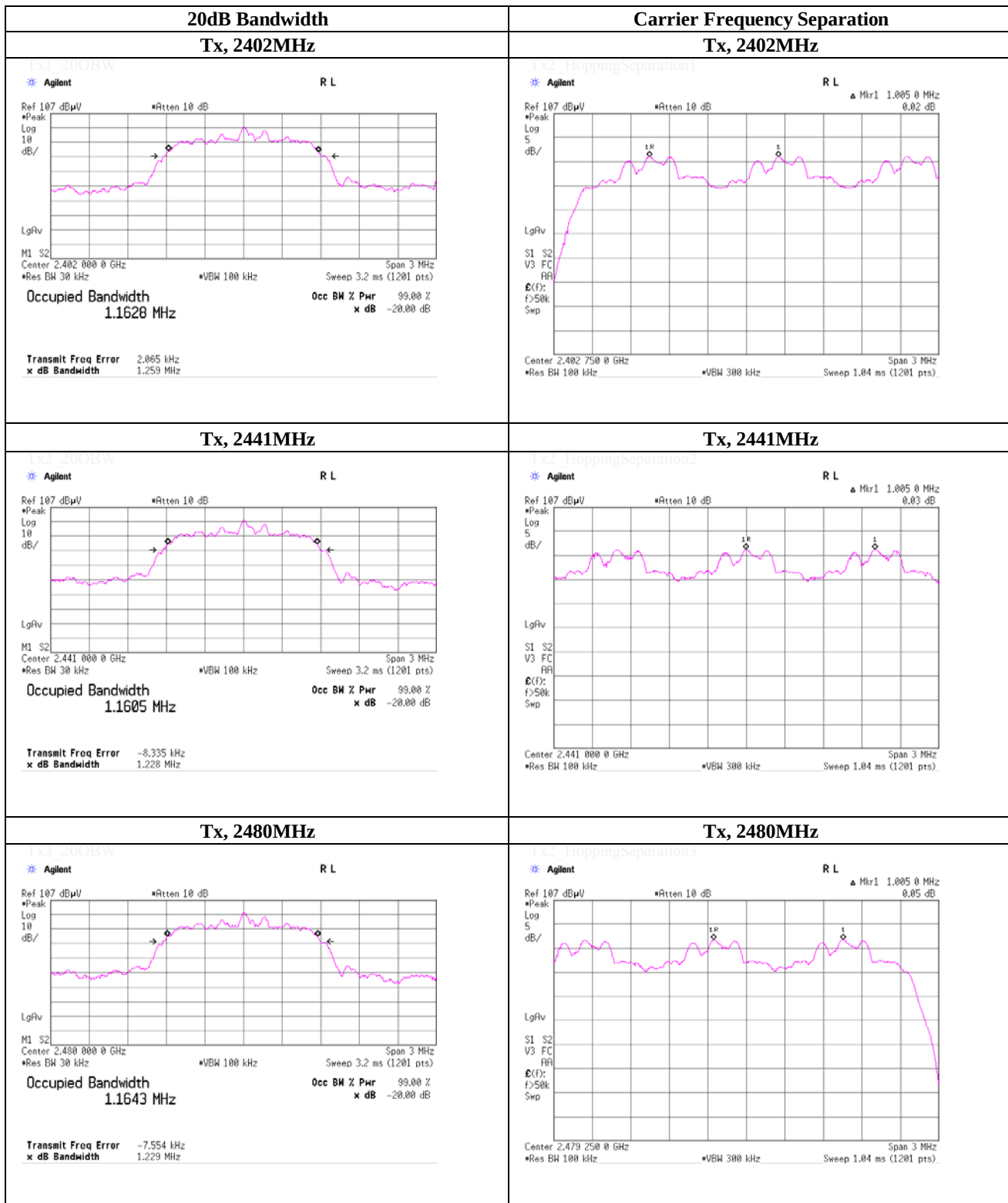
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

20dB Bandwidth and Carrier Frequency Separation

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

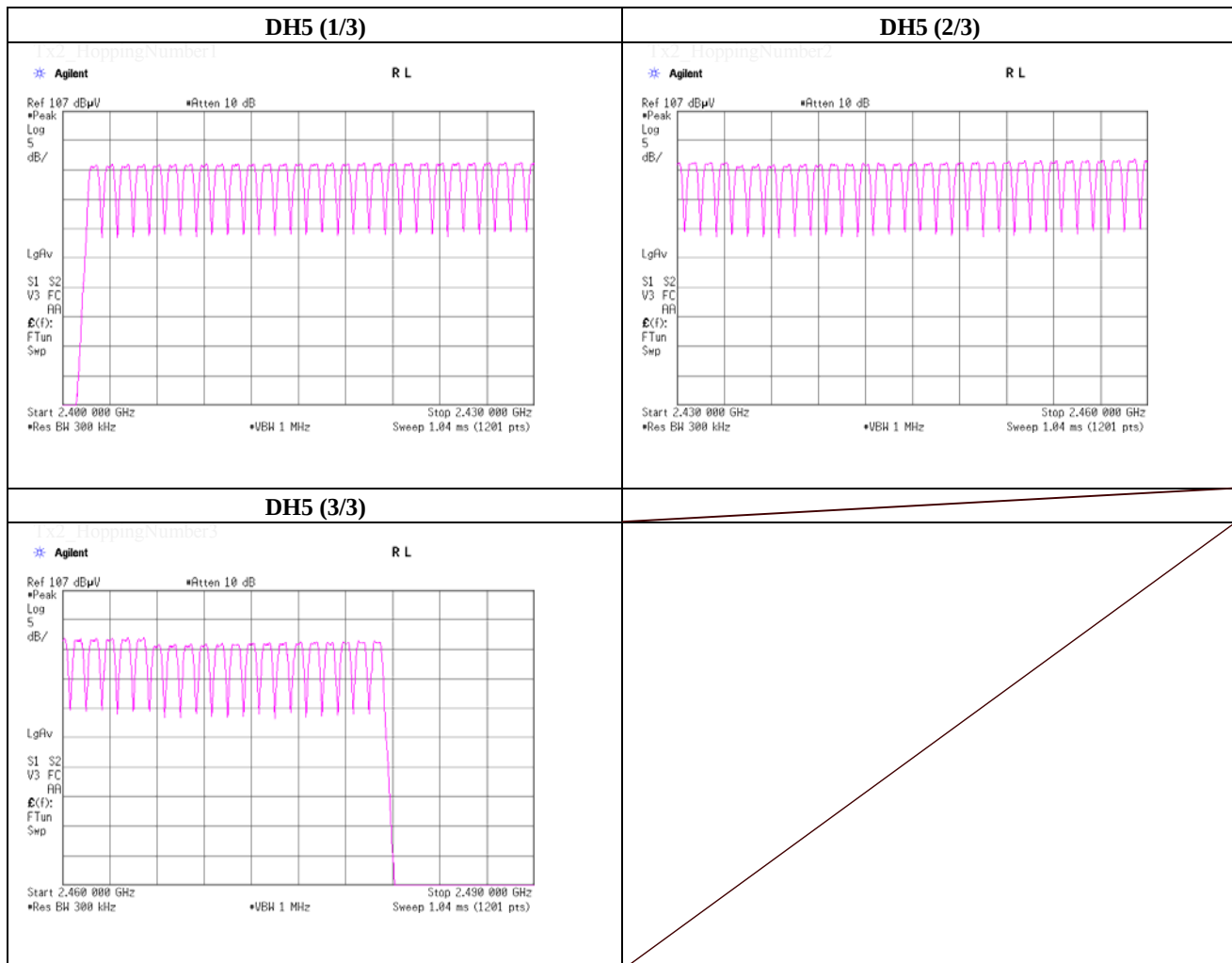
Facsimile : +81 463 50 6401

Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	October 25, 2013	
Temperature / Humidity	25 deg.C , 61 %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.



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

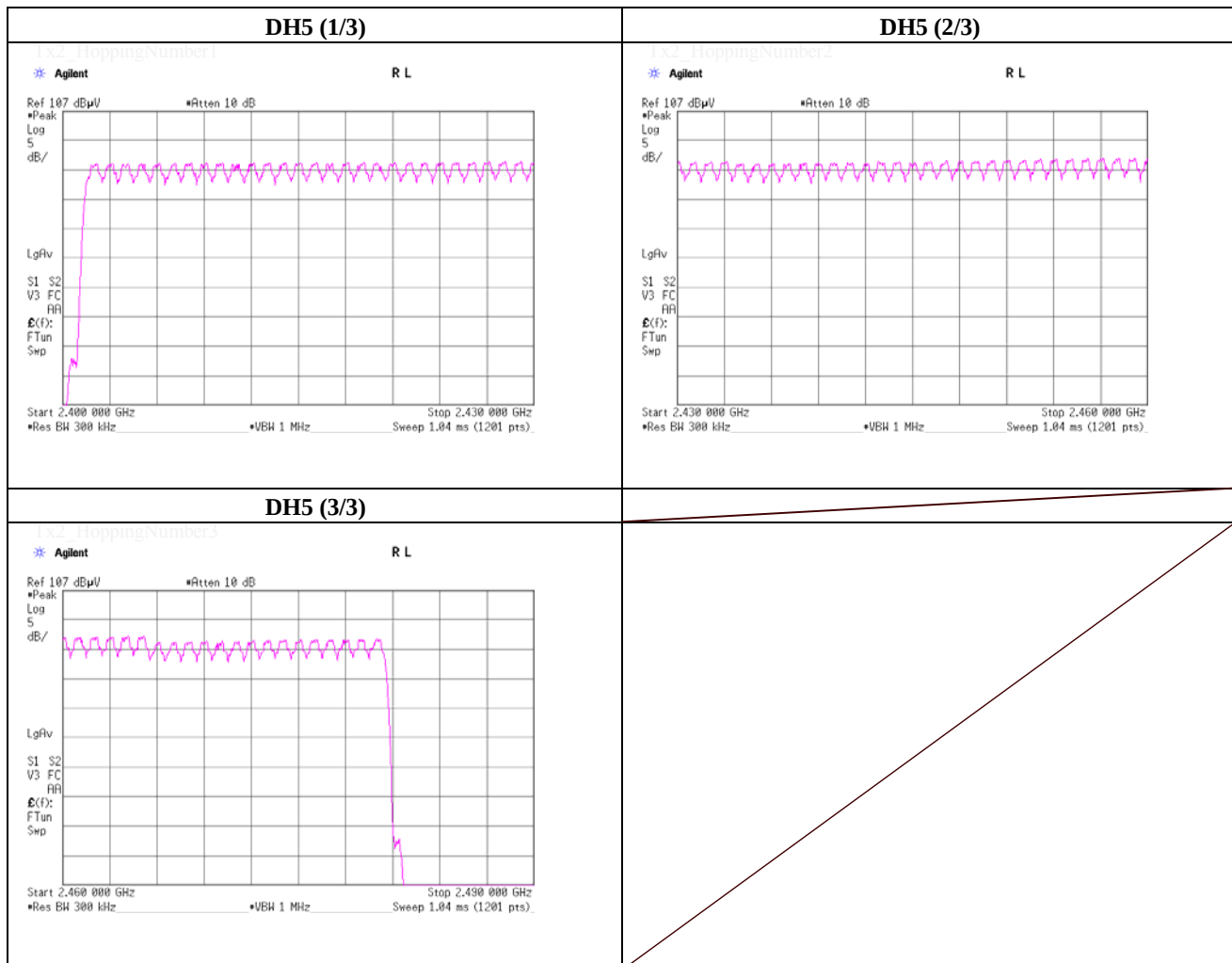
Facsimile : +81 463 50 6401

Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	October 25, 2013	
Temperature / Humidity	25 deg.C , 61 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, EDR, PRBS9	

Mode	Number of Channel [times]	Limit [times]
2-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.



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

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	October 25, 2013	
Temperature / Humidity	25 deg.C , 61 %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	50.0	/ 5.0 sec.	x 31.6 sec. = 316 times	0.400	126	400
DH3	26.0	/ 5.0 sec.	x 31.6 sec. = 165 times	1.656	273	400
DH5	17.0	/ 5.0 sec.	x 31.6 sec. = 108 times	2.904	314	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 (DH1, DH3 or DH5). This is confirmed in the test report for $N=79$.

Tx2_DwellInquiry1

Tx2_DwellInquiry2

UL Japan, Inc.

Shonan EMC Lab.

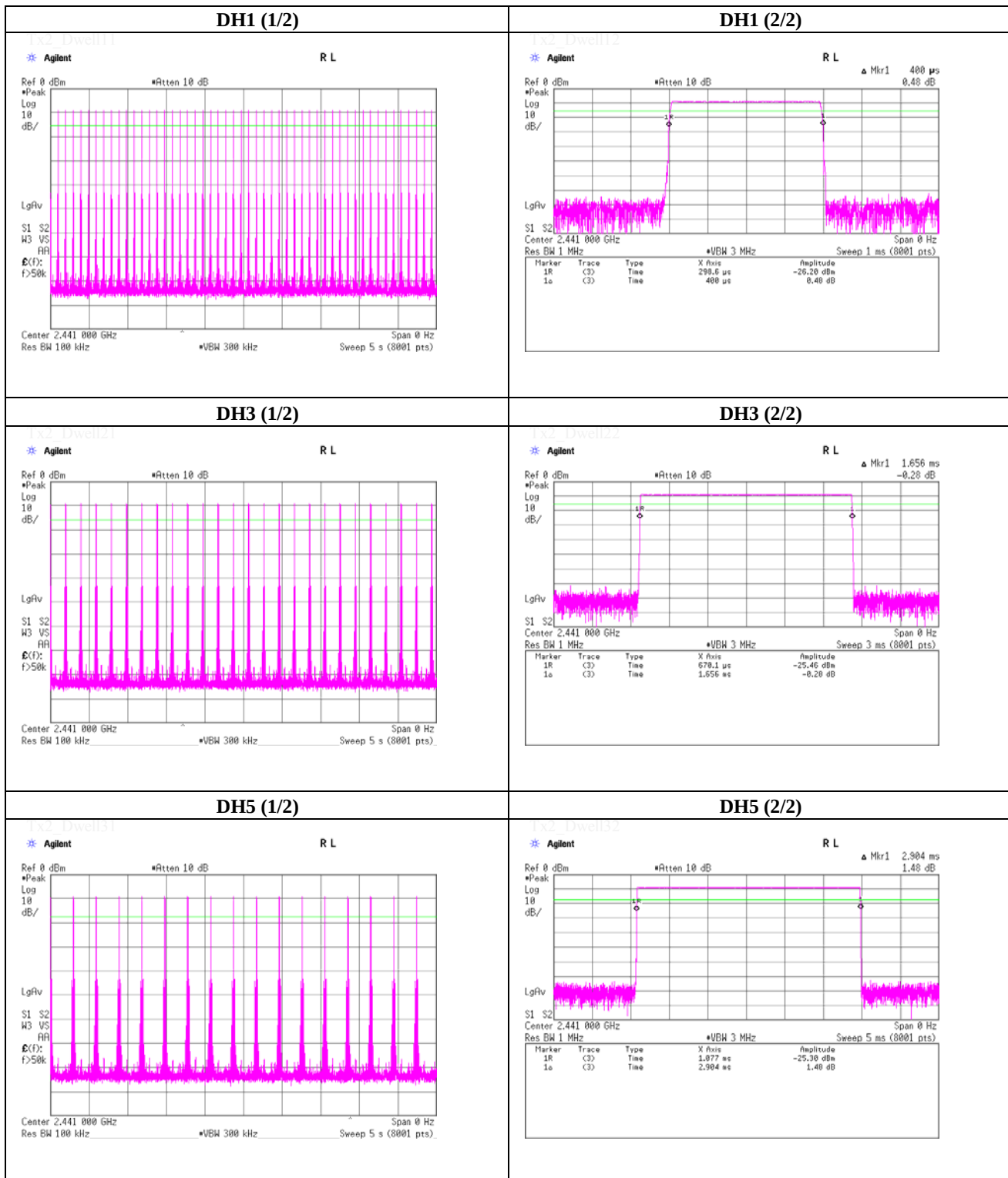
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, BDR, PRBS9



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

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date October 25, 2013
 Temperature / Humidity 25 deg.C , 61 %RH
 Engineer Hikaru Shirasawa
 Mode Tx, Bluetooth, EDR, 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]
2-DH1	50.0	/ 5.0 sec.	x 31.6 sec. = 316 times	0.411	130	400
2-DH3	26.0	/ 5.0 sec.	x 31.6 sec. = 165 times	1.663	274	400
2-DH5	17.0	/ 5.0 sec.	x 31.6 sec. = 108 times	2.913	315	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 (DH1, DH3 or DH5). This is confirmed in the test report for $N=79$.

Tx2_DwellInquiry1

Tx2_DwellInquiry2

UL Japan, Inc.

Shonan EMC Lab.

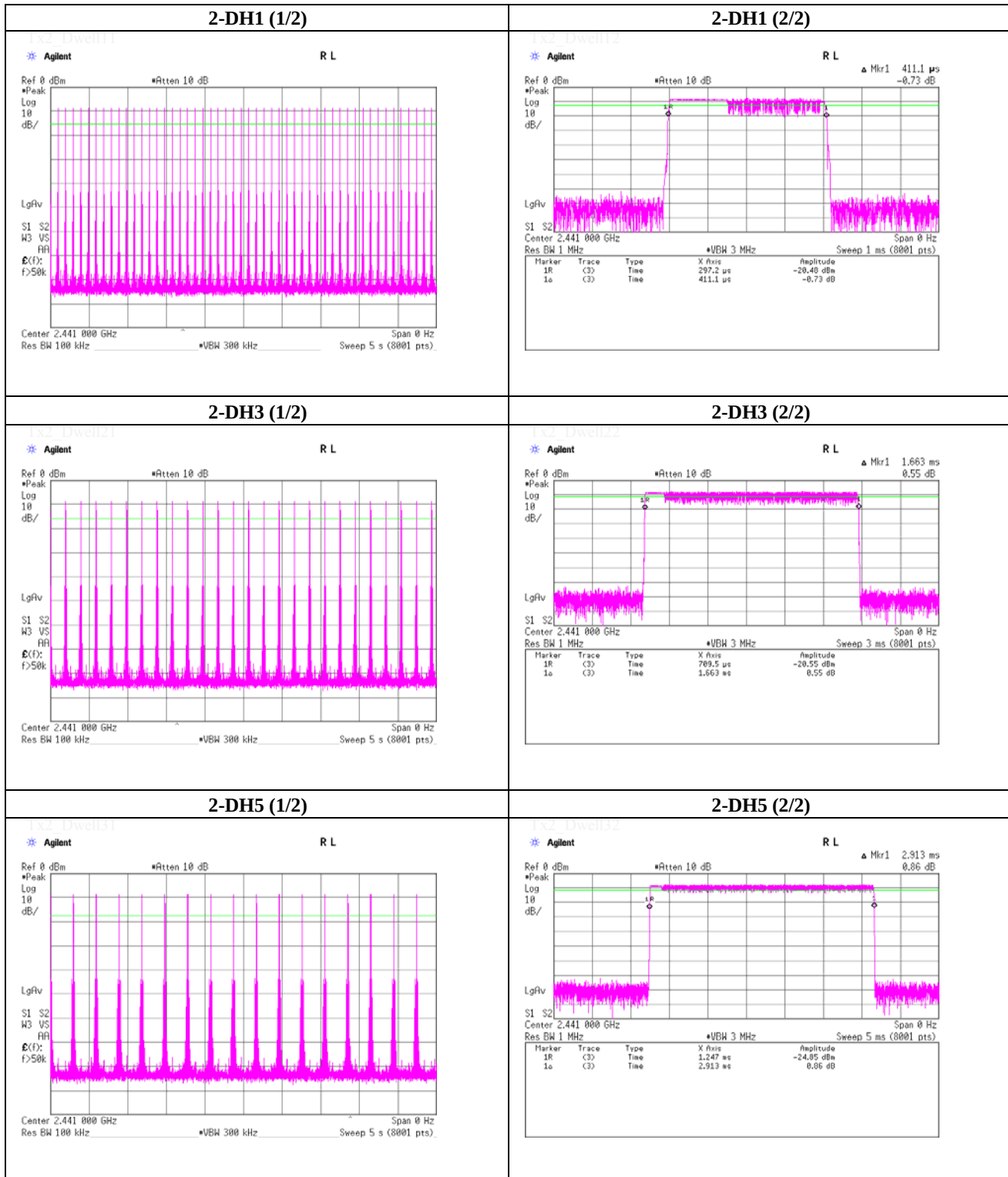
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, 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

Maximum Peak Conducted Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date October 25, 2013
 Temperature / Humidity 25 deg.C , 61 %RH
 Engineer Hikaru Shirasawa
 Mode Tx, Bluetooth

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

	Freq.	P/M (Peak) Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-8.86	0.37	9.98	1.49	1.41	20.97	125	19.48
DH5	2441.0	-8.64	0.38	9.98	1.72	1.49	20.97	125	19.25
DH5	2480.0	-8.25	0.38	9.98	2.11	1.63	20.97	125	18.86
2-DH5	2402.0	-6.72	0.37	9.98	3.63	2.31	20.97	125	17.34
2-DH5	2441.0	-6.46	0.38	9.98	3.90	2.45	20.97	125	17.07
2-DH5	2480.0	-5.98	0.38	9.98	4.38	2.74	20.97	125	16.59

Sample Calculation:

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

UL Japan, Inc.
Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date October 15, 2013 October 16, 2013
 Temperature / Humidity 25 deg.C, 46 %RH 26 deg.C, 54 %RH
 Engineer Shinichi Takano Shinichi Takano
 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.	356.001	QP	32.1	15.2	8.8	31.9	24.2	46.0	21.8	100	265	
Hori.	2246.024	PK	46.9	26.7	14.5	41.2	46.9	73.9	27.0	100	329	
Hori.	2390.000	PK	46.0	26.8	14.7	41.1	46.4	73.9	27.5	100	266	
Hori.	2558.026	PK	50.3	27.0	15.0	41.1	51.2	73.9	22.7	100	262	
Hori.	4804.000	PK	52.4	30.9	7.5	41.2	49.6	73.9	24.3	100	120	
Hori.	7206.000	PK	48.3	37.1	9.1	41.0	53.5	73.9	20.4	100	0	
Hori.	9608.000	PK	44.4	38.6	10.2	38.9	54.3	73.9	19.6	100	0	
Hori.	12010.000	PK	46.9	39.6	11.5	39.1	58.9	73.9	15.0	100	0	
Hori.	19220.040	PK	48.6	41.1	2.1	48.1	43.7	73.9	30.2	114	143	
Hori.	2246.024	AV	35.2	26.7	14.5	41.2	35.2	53.9	18.7	100	329	
Hori.	2390.000	AV	34.1	26.8	14.7	41.1	34.5	53.9	19.4	100	266	
Hori.	2558.026	AV	42.1	27.0	15.0	41.1	43.0	53.9	10.9	100	262	
Hori.	4804.000	AV	45.3	30.9	7.5	41.2	42.5	53.9	11.4	100	120	
Hori.	7206.000	AV	36.2	37.1	9.1	41.0	41.4	53.9	12.5	100	0	
Hori.	9608.000	AV	33.4	38.6	10.2	38.9	43.3	53.9	10.6	100	0	
Hori.	12010.000	AV	34.6	39.6	11.5	39.1	46.6	53.9	7.3	100	0	
Hori.	19220.040	AV	42.7	41.1	2.1	48.1	37.8	53.9	16.1	114	143	
Vert.	124.001	QP	32.2	13.3	7.2	32.1	20.6	43.5	22.9	100	15	
Vert.	2246.073	PK	46.3	26.7	14.5	41.2	46.3	73.9	27.6	100	37	
Vert.	2390.000	PK	45.9	26.8	14.7	41.1	46.3	73.9	27.6	100	245	
Vert.	2558.023	PK	49.0	27.0	15.0	41.1	49.9	73.9	24.0	100	319	
Vert.	4804.000	PK	51.5	30.9	7.5	41.2	48.7	73.9	25.2	100	351	
Vert.	7206.000	PK	46.9	37.1	9.1	41.0	52.1	73.9	21.8	100	0	
Vert.	9608.000	PK	45.0	38.6	10.2	38.9	54.9	73.9	19.0	100	0	
Vert.	12010.000	PK	46.4	39.6	11.5	39.1	58.4	73.9	15.5	100	0	
Vert.	19220.010	PK	49.1	41.1	2.1	48.1	44.2	73.9	29.7	111	165	
Vert.	2246.073	AV	35.4	26.7	14.5	41.2	35.4	53.9	18.5	100	37	
Vert.	2390.000	AV	34.1	26.8	14.7	41.1	34.5	53.9	19.4	100	245	
Vert.	2558.023	AV	40.7	27.0	15.0	41.1	41.6	53.9	12.3	100	319	
Vert.	4804.000	AV	44.3	30.9	7.5	41.2	41.5	53.9	12.4	100	351	
Vert.	7206.000	AV	36.0	37.1	9.1	41.0	41.2	53.9	12.7	100	0	
Vert.	9608.000	AV	32.8	38.6	10.2	38.9	42.7	53.9	11.2	100	0	
Vert.	12010.000	AV	34.4	39.6	11.5	39.1	46.4	53.9	7.5	100	0	
Vert.	19220.010	AV	42.5	41.1	2.1	48.1	37.6	53.9	16.3	111	165	

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	96.2	26.8	14.7	41.1	96.6	-	-	100k/300k
Hori.	2399.164	PK	47.4	26.8	14.7	41.1	49.8	76.6	28.8	100k/300k
Hori.	2400.000	PK	48.6	26.8	14.7	41.1	47.0	76.6	27.6	100k/300k
Vert.	2402.000	PK	95.4	26.8	14.7	41.1	95.8	-	-	
Vert.	2399.168	PK	46.3	26.8	14.7	41.1	46.7	75.8	29.1	100k/300k
Vert.	2400.000	PK	47.1	26.8	14.7	41.1	47.5	75.8	28.3	100k/300k

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

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

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date October 15, 2013 October 16, 2013
 Temperature / Humidity 25 deg.C, 46 %RH 26 deg.C, 54 %RH
 Engineer Shinichi Takano Shinichi Takano
 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.	356.005	QP	32.6	15.2	8.8	31.9	24.7	46.0	21.3	100	264	
Hori.	2285.016	PK	46.9	26.8	14.6	41.2	47.1	73.9	26.8	100	258	
Hori.	2596.980	PK	49.1	27.1	15.0	41.1	50.1	73.9	23.8	100	267	
Hori.	4882.000	PK	52.7	31.4	7.5	41.1	50.5	73.9	23.4	100	33	
Hori.	7323.000	PK	46.5	37.2	9.0	41.1	51.6	73.9	22.3	100	0	
Hori.	9764.000	PK	44.5	38.8	10.1	38.8	54.6	73.9	19.3	100	0	
Hori.	12205.000	PK	45.0	39.6	11.4	39.1	56.9	73.9	17.0	100	0	
Hori.	19524.010	PK	50.3	41.1	2.2	47.6	46.0	73.9	27.9	107	141	
Hori.	2285.016	AV	37.3	26.8	14.6	41.2	37.5	53.9	16.4	100	258	
Hori.	2596.980	AV	39.9	27.1	15.0	41.1	40.9	53.9	13.0	100	267	
Hori.	4882.000	AV	45.4	31.4	7.5	41.1	43.2	53.9	10.7	100	33	
Hori.	7323.000	AV	35.3	37.2	9.0	41.1	40.4	53.9	13.5	100	0	
Hori.	9764.000	AV	32.8	38.8	10.1	38.8	42.9	53.9	11.0	100	0	
Hori.	12205.000	AV	33.6	39.6	11.4	39.1	45.5	53.9	8.4	100	0	
Hori.	19524.010	AV	43.5	41.1	2.2	47.6	39.2	53.9	14.7	107	141	
Vert.	124.003	QP	31.5	13.3	7.2	32.1	19.9	43.5	23.6	100	6	
Vert.	2285.016	PK	47.2	26.8	14.6	41.2	47.4	73.9	26.5	100	359	
Vert.	2596.997	PK	48.7	27.1	15.0	41.1	49.7	73.9	24.2	100	253	
Vert.	4882.000	PK	52.7	31.4	7.5	41.1	50.5	73.9	23.4	100	344	
Vert.	7323.000	PK	47.0	37.2	9.0	41.1	52.1	73.9	21.8	100	0	
Vert.	9764.000	PK	43.4	38.8	10.1	38.8	53.5	73.9	20.4	100	0	
Vert.	12205.000	PK	45.5	39.6	11.4	39.1	57.4	73.9	16.5	100	0	
Vert.	19524.020	PK	49.2	41.1	2.2	47.6	44.9	73.9	29.0	106	154	
Vert.	2285.016	AV	37.4	26.8	14.6	41.2	37.6	53.9	16.3	100	359	
Vert.	2596.997	AV	38.9	27.1	15.0	41.1	39.9	53.9	14.0	100	253	
Vert.	4882.000	AV	45.4	31.4	7.5	41.1	43.2	53.9	10.7	100	344	
Vert.	7323.000	AV	35.3	37.2	9.0	41.1	40.4	53.9	13.5	100	0	
Vert.	9764.000	AV	32.6	38.8	10.1	38.8	42.7	53.9	11.2	100	0	
Vert.	12205.000	AV	33.5	39.6	11.4	39.1	45.4	53.9	8.5	100	0	
Vert.	19524.020	AV	42.6	41.1	2.2	47.6	38.3	53.9	15.6	106	154	

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

Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date October 15, 2013 October 16, 2013
 Temperature / Humidity 25 deg.C, 46 %RH 26 deg.C, 54 %RH
 Engineer Shinichi Takano Shinichi Takano
 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.	355.999	QP	32.3	15.2	8.8	31.9	24.4	46.0	21.6	100	259	
Hori.	2324.025	PK	49.5	26.8	14.6	41.1	49.8	73.9	24.1	100	265	
Hori.	2483.500	PK	49.4	26.9	14.8	41.0	50.1	73.9	23.8	100	255	
Hori.	2484.083	PK	48.9	26.9	14.8	41.0	49.6	73.9	24.3	100	255	
Hori.	2636.023	PK	48.2	27.2	15.0	41.2	49.2	73.9	24.7	121	263	
Hori.	4960.000	PK	51.7	31.8	7.5	41.1	49.9	73.9	24.0	100	32	
Hori.	7440.000	PK	46.1	37.4	9.0	41.1	51.4	73.9	22.5	100	0	
Hori.	9920.000	PK	43.3	38.9	10.0	38.8	53.4	73.9	20.5	100	0	
Hori.	12400.000	PK	43.2	39.7	11.3	39.1	55.1	73.9	18.8	100	0	
Hori.	19836.030	PK	47.6	41.1	2.3	47.8	43.2	73.9	30.7	105	141	
Hori.	2324.025	AV	41.2	26.8	14.6	41.1	41.5	53.9	12.4	100	265	
Hori.	2483.500	AV	36.1	26.9	14.8	41.0	36.8	53.9	17.1	100	255	
Hori.	2484.083	AV	36.2	26.9	14.8	41.0	36.9	53.9	17.0	100	255	
Hori.	2636.023	AV	39.1	27.2	15.0	41.2	40.1	53.9	13.8	121	263	
Hori.	4960.000	AV	44.4	31.8	7.5	41.1	42.6	53.9	11.3	100	32	
Hori.	7440.000	AV	34.6	37.4	9.0	41.1	39.9	53.9	14.0	100	0	
Hori.	9920.000	AV	31.7	38.9	10.0	38.8	41.8	53.9	12.1	100	0	
Hori.	12400.000	AV	32.0	39.7	11.3	39.1	43.9	53.9	10.0	100	0	
Hori.	19836.030	AV	40.2	41.1	2.3	47.8	35.8	53.9	18.1	105	141	
Vert.	124.000	QP	32.7	13.3	7.2	32.1	21.1	43.5	22.4	100	45	
Vert.	2324.017	PK	47.9	26.8	14.6	41.1	48.2	73.9	25.7	100	40	
Vert.	2483.500	PK	48.1	26.9	14.8	41.0	48.8	73.9	25.1	100	180	
Vert.	2484.083	PK	47.6	26.9	14.8	41.0	48.3	73.9	25.6	100	180	
Vert.	2636.008	PK	47.6	27.2	15.0	41.2	48.6	73.9	25.3	100	255	
Vert.	4960.000	PK	52.3	31.8	7.5	41.1	50.5	73.9	23.4	100	341	
Vert.	7440.000	PK	44.2	37.4	9.0	41.1	49.5	73.9	24.4	100	0	
Vert.	9920.000	PK	42.7	38.9	10.0	38.8	52.8	73.9	21.1	100	0	
Vert.	12400.000	PK	44.1	39.7	11.3	39.1	56.0	73.9	17.9	100	0	
Vert.	19836.000	PK	47.7	41.1	2.3	47.8	43.3	73.9	30.6	107	161	
Vert.	2324.017	AV	38.9	26.8	14.6	41.1	39.2	53.9	14.7	100	40	
Vert.	2483.500	AV	35.5	26.9	14.8	41.0	36.2	53.9	17.7	100	180	
Vert.	2484.083	AV	35.4	26.9	14.8	41.0	36.1	53.9	17.8	100	180	
Vert.	2636.008	AV	37.6	27.2	15.0	41.2	38.6	53.9	15.3	100	255	
Vert.	4960.000	AV	45.4	31.8	7.5	41.1	43.6	53.9	10.3	100	341	
Vert.	7440.000	AV	34.6	37.4	9.0	41.1	39.9	53.9	14.0	100	0	
Vert.	9920.000	AV	31.7	38.9	10.0	38.8	41.8	53.9	12.1	100	0	
Vert.	12400.000	AV	32.0	39.7	11.3	39.1	43.9	53.9	10.0	100	0	
Vert.	19836.000	AV	40.7	41.1	2.3	47.8	36.3	53.9	17.6	107	161	

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.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date October 15, 2013 October 16, 2013
 Temperature / Humidity 25 deg.C, 46 %RH 26 deg.C, 54 %RH
 Engineer Shinichi Takano Shinichi Takano
 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.	356.001	QP	33.0	15.2	8.8	31.9	25.1	46.0	20.9	100	263	
Hori.	2390.000	PK	46.8	26.8	14.7	41.1	47.2	73.9	26.7	100	243	
Hori.	2558.028	PK	49.3	27.0	15.0	41.1	50.2	73.9	23.7	100	263	
Hori.	4804.000	PK	51.9	30.9	7.5	41.2	49.1	73.9	24.8	100	119	
Hori.	7206.000	PK	48.0	37.1	9.1	41.0	53.2	73.9	20.7	100	0	
Hori.	9608.000	PK	44.5	38.6	10.2	38.9	54.4	73.9	19.5	100	0	
Hori.	12010.000	PK	46.5	39.6	11.5	39.1	58.5	73.9	15.4	100	0	
Hori.	19220.030	PK	49.3	41.1	2.1	48.1	44.4	73.9	29.5	119	143	
Hori.	2390.000	AV	34.7	26.8	14.7	41.1	35.1	53.9	18.8	100	243	
Hori.	2558.028	AV	40.0	27.0	15.0	41.1	40.9	53.9	13.0	100	263	
Hori.	4804.000	AV	42.6	30.9	7.5	41.2	39.8	53.9	14.1	100	119	
Hori.	7206.000	AV	36.0	37.1	9.1	41.0	41.2	53.9	12.7	100	0	
Hori.	9608.000	AV	33.5	38.6	10.2	38.9	43.4	53.9	10.5	100	0	
Hori.	12010.000	AV	34.8	39.6	11.5	39.1	46.8	53.9	7.1	100	0	
Hori.	19220.030	AV	43.1	41.1	2.1	48.1	38.2	53.9	15.7	119	143	
Vert.	124.003	QP	33.2	13.3	7.2	32.1	21.6	43.5	21.9	100	80	
Vert.	2390.000	PK	46.3	26.8	14.7	41.1	46.7	73.9	27.2	100	267	
Vert.	2558.090	PK	48.7	27.0	15.0	41.1	49.6	73.9	24.3	100	320	
Vert.	4804.000	PK	51.9	30.9	7.5	41.2	49.1	73.9	24.8	100	339	
Vert.	7206.000	PK	47.9	37.1	9.1	41.0	53.1	73.9	20.8	100	0	
Vert.	9608.000	PK	45.2	38.6	10.2	38.9	55.1	73.9	18.8	100	0	
Vert.	12010.000	PK	47.5	39.6	11.5	39.1	59.5	73.9	14.4	100	0	
Vert.	19220.030	PK	49.6	41.1	2.1	48.1	44.7	73.9	29.2	103	161	
Vert.	2390.000	AV	34.2	26.8	14.7	41.1	34.6	53.9	19.3	100	267	
Vert.	2558.090	AV	37.8	27.0	15.0	41.1	38.7	53.9	15.2	100	320	
Vert.	4804.000	AV	42.1	30.9	7.5	41.2	39.3	53.9	14.6	100	339	
Vert.	7206.000	AV	36.0	37.1	9.1	41.0	41.2	53.9	12.7	100	0	
Vert.	9608.000	AV	33.0	38.6	10.2	38.9	42.9	53.9	11.0	100	0	
Vert.	12010.000	AV	34.3	39.6	11.5	39.1	46.3	53.9	7.6	100	0	
Vert.	19220.030	AV	43.1	41.1	2.1	48.1	38.2	53.9	15.7	103	161	

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	95.4	26.8	14.7	41.1	95.8	-	-	100k/300k
Hori.	2400.000	PK	48.3	26.8	14.7	41.1	48.7	75.8	27.1	100k/300k
Vert.	2402.000	PK	94.4	26.8	14.7	41.1	94.8	-	-	100k/300k
Vert.	2400.000	PK	47.3	26.8	14.7	41.1	47.7	74.8	27.1	100k/300k

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

UL Japan, Inc.
Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date October 15, 2013 October 16, 2013
 Temperature / Humidity 25 deg.C, 46 %RH 26 deg.C, 54 %RH
 Engineer Shinichi Takano Shinichi Takano
 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.	356.002	QP	32.3	15.2	8.8	31.9	24.4	46.0	21.6	100	267	
Hori.	2285.006	PK	46.9	26.8	14.6	41.2	47.1	73.9	26.8	200	260	
Hori.	2596.977	PK	48.2	27.1	15.0	41.1	49.2	73.9	24.7	100	258	
Hori.	4882.000	PK	51.9	31.4	7.5	41.1	49.7	73.9	24.2	100	30	
Hori.	7323.000	PK	47.3	37.2	9.0	41.1	52.4	73.9	21.5	100	0	
Hori.	9764.000	PK	43.8	38.8	10.1	38.8	53.9	73.9	20.0	100	0	
Hori.	12205.000	PK	45.3	39.6	11.4	39.1	57.2	73.9	16.7	100	0	
Hori.	19524.010	PK	49.0	41.1	2.2	47.6	44.7	73.9	29.2	104	145	
Hori.	2285.006	AV	36.9	26.8	14.6	41.2	37.1	53.9	16.8	200	260	
Hori.	2596.977	AV	38.2	27.1	15.0	41.1	39.2	53.9	14.7	100	258	
Hori.	4882.000	AV	42.1	31.4	7.5	41.1	39.9	53.9	14.0	100	30	
Hori.	7323.000	AV	35.3	37.2	9.0	41.1	40.4	53.9	13.5	100	0	
Hori.	9764.000	AV	32.7	38.8	10.1	38.8	42.8	53.9	11.1	100	0	
Hori.	12205.000	AV	33.2	39.6	11.4	39.1	45.1	53.9	8.8	100	0	
Hori.	19524.010	AV	42.9	41.1	2.2	47.6	38.6	53.9	15.3	104	145	
Vert.	124.006	QP	34.0	13.3	7.2	32.1	22.4	43.5	21.1	100	36	
Vert.	2285.069	PK	48.1	26.8	14.6	41.2	48.3	73.9	25.6	100	217	
Vert.	2596.988	PK	47.6	27.1	15.0	41.1	48.6	73.9	25.3	100	255	
Vert.	4882.000	PK	52.1	31.4	7.5	41.1	49.9	73.9	24.0	100	333	
Vert.	7323.000	PK	46.9	37.2	9.0	41.1	52.0	73.9	21.9	100	0	
Vert.	9764.000	PK	44.2	38.8	10.1	38.8	54.3	73.9	19.6	100	0	
Vert.	12205.000	PK	44.6	39.6	11.4	39.1	56.5	73.9	17.4	100	0	
Vert.	19524.030	PK	49.3	41.1	2.2	47.6	45.0	73.9	28.9	102	152	
Vert.	2285.069	AV	36.5	26.8	14.6	41.2	36.7	53.9	17.2	100	217	
Vert.	2596.988	AV	37.2	27.1	15.0	41.1	38.2	53.9	15.7	100	255	
Vert.	4882.000	AV	42.3	31.4	7.5	41.1	40.1	53.9	13.8	100	333	
Vert.	7323.000	AV	35.2	37.2	9.0	41.1	40.3	53.9	13.6	100	0	
Vert.	9764.000	AV	32.7	38.8	10.1	38.8	42.8	53.9	11.1	100	0	
Vert.	12205.000	AV	33.3	39.6	11.4	39.1	45.2	53.9	8.7	100	0	
Vert.	19524.030	AV	43.7	41.1	2.2	47.6	39.4	53.9	14.5	102	152	

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.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Emission

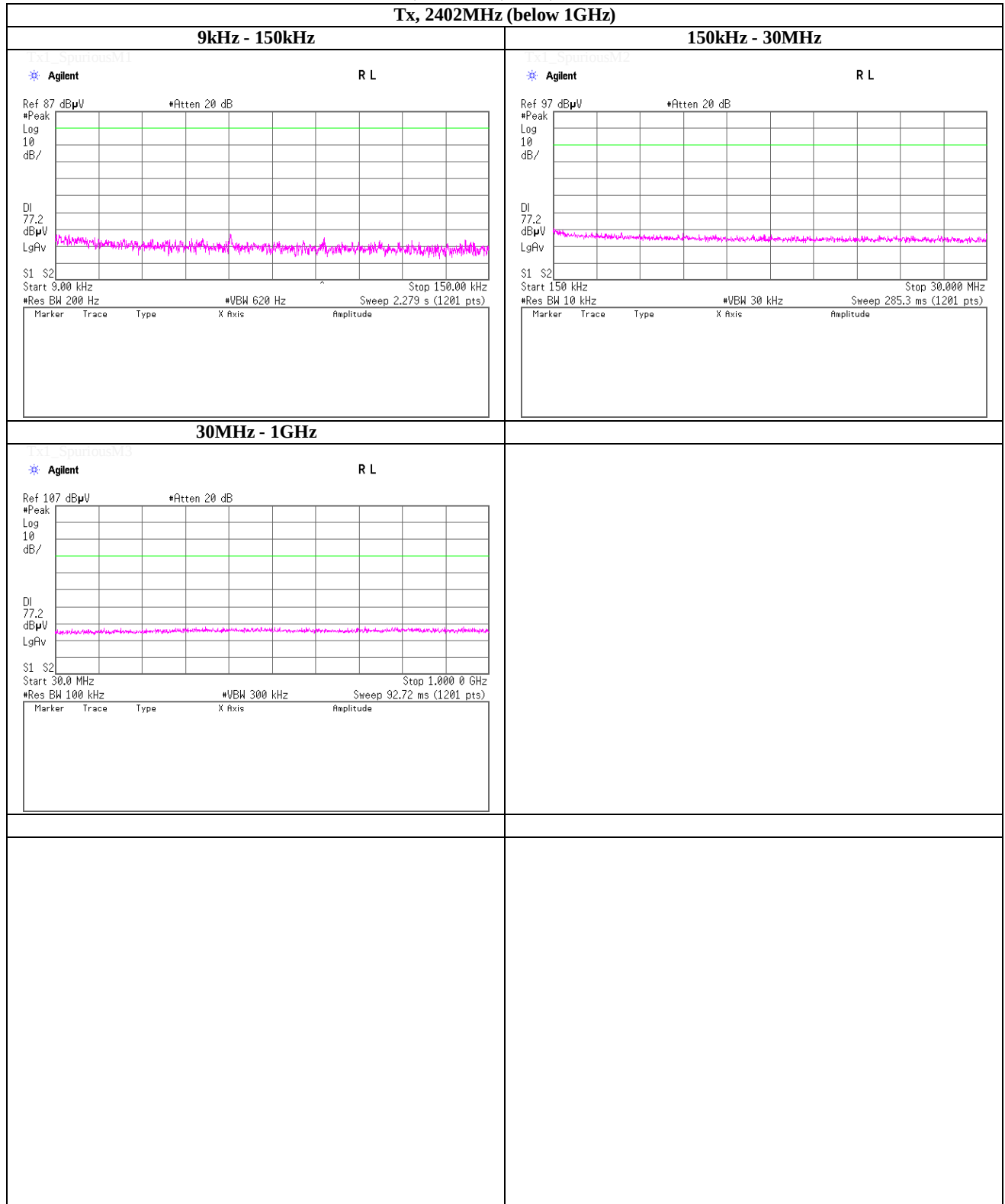
Test place No.3 Semi Anechoic Chamber
 Date October 15, 2013 October 16, 2013
 Temperature / Humidity 25 deg.C, 46 %RH 26 deg.C, 54 %RH
 Engineer Shinichi Takano Shinichi Takano
 Mode Tx, 2480 MHz
 Tx, Bluetooth, EDR, PRBS9

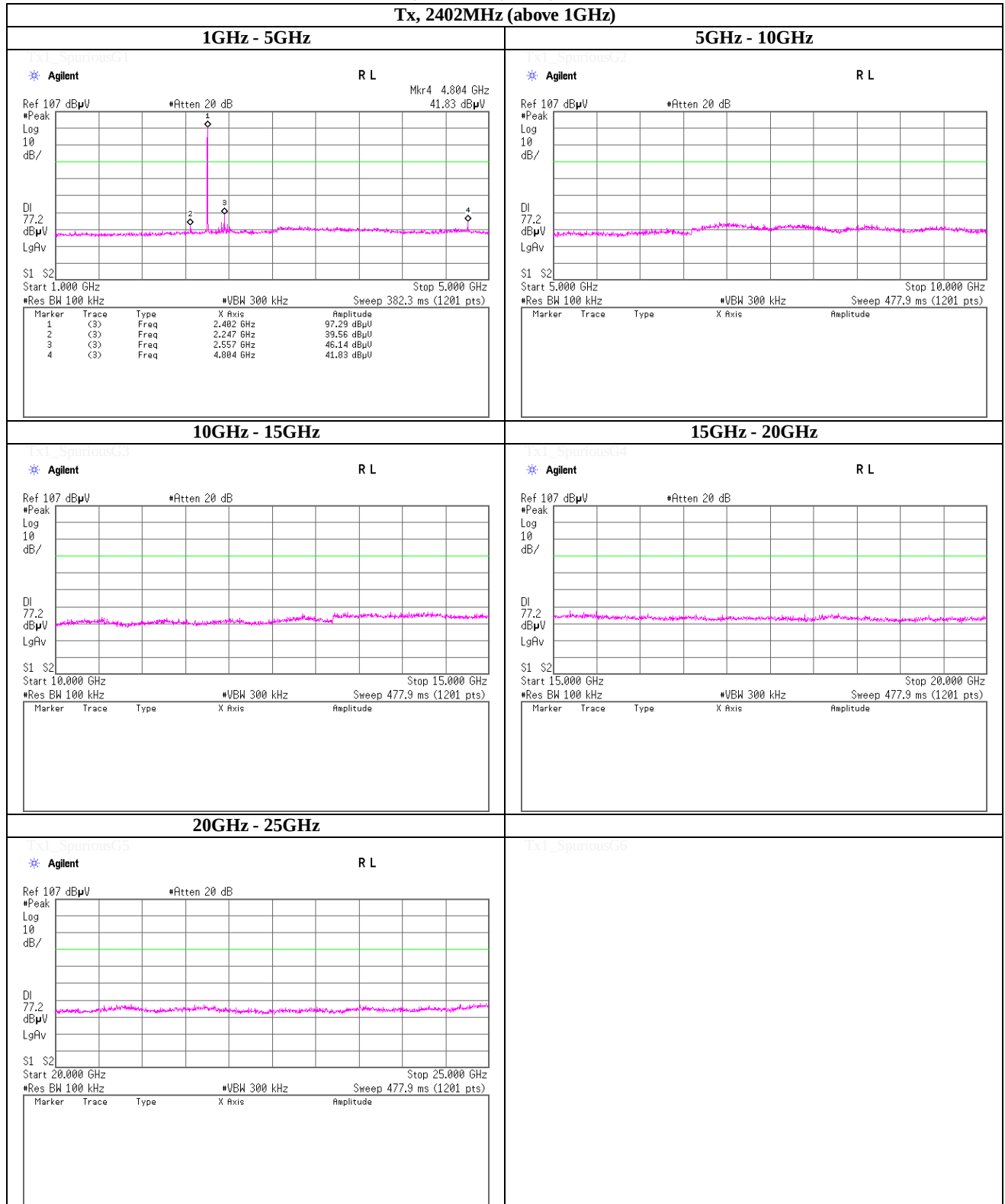
(* PK: Peak, AV: Average, QP: Quasi-Peak)

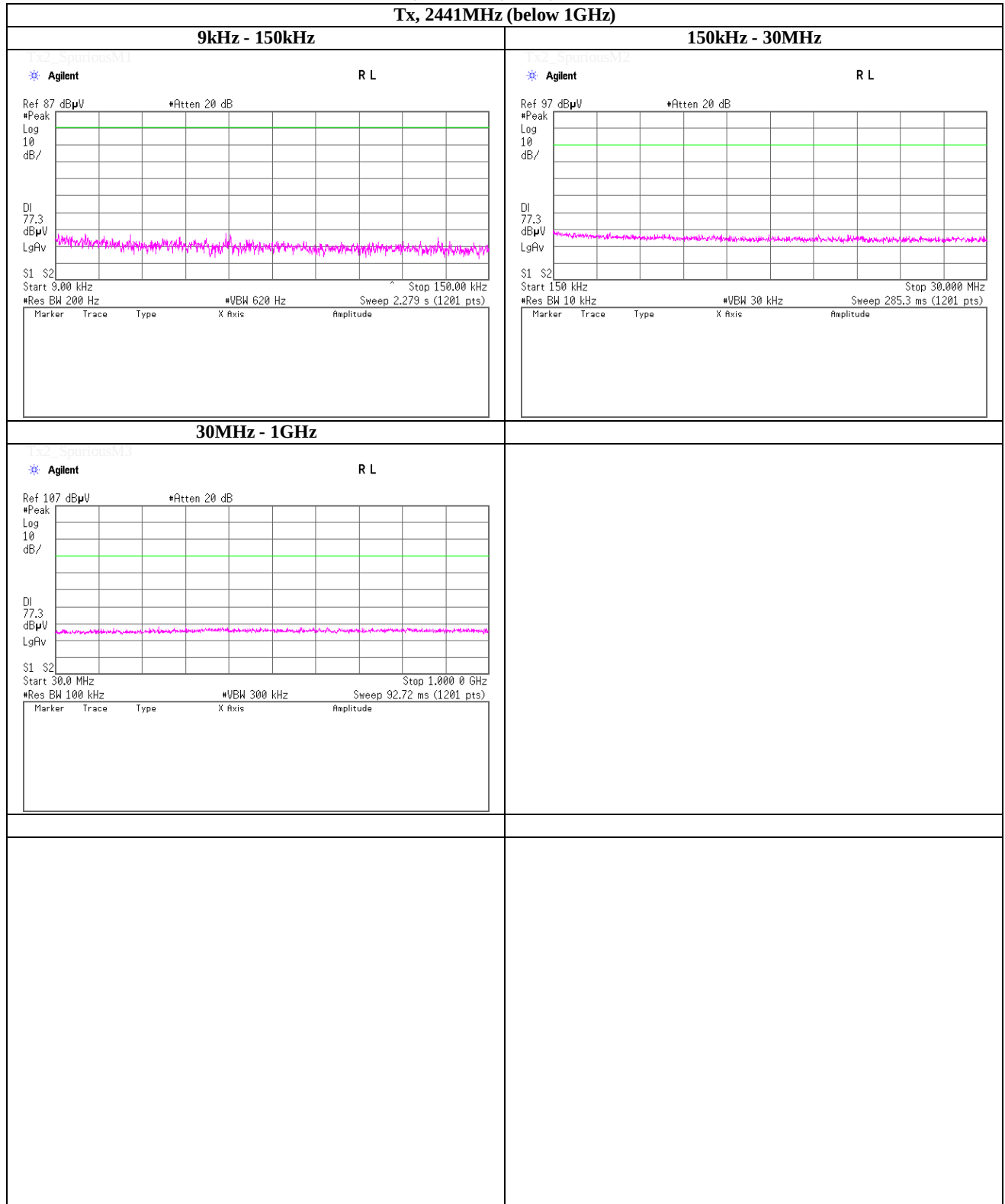
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	355.998	QP	31.1	15.2	8.8	31.9	23.2	46.0	22.8	100	277	
Hori.	2324.031	PK	49.1	26.8	14.6	41.1	49.4	73.9	24.5	100	265	
Hori.	2483.500	PK	51.2	26.9	14.8	41.0	51.9	73.9	22.0	100	265	
Hori.	2635.998	PK	48.3	27.2	15.0	41.2	49.3	73.9	24.6	100	263	
Hori.	4960.000	PK	50.7	31.8	7.5	41.1	48.9	73.9	25.0	100	29	
Hori.	7440.000	PK	45.9	37.4	9.0	41.1	51.2	73.9	22.7	100	0	
Hori.	9920.000	PK	44.1	38.9	10.0	38.8	54.2	73.9	19.7	100	0	
Hori.	12400.000	PK	43.3	39.7	11.3	39.1	55.2	73.9	18.7	100	0	
Hori.	19836.030	PK	47.6	41.1	2.3	47.8	43.2	73.9	30.7	107	144	
Hori.	2324.031	AV	38.8	26.8	14.6	41.1	39.1	53.9	14.8	100	265	
Hori.	2483.500	AV	36.8	26.9	14.8	41.0	37.5	53.9	16.4	100	265	
Hori.	2635.998	AV	37.8	27.2	15.0	41.2	38.8	53.9	15.1	100	263	
Hori.	4960.000	AV	41.5	31.8	7.5	41.1	39.7	53.9	14.2	100	29	
Hori.	7440.000	AV	34.6	37.4	9.0	41.1	39.9	53.9	14.0	100	0	
Hori.	9920.000	AV	31.7	38.9	10.0	38.8	41.8	53.9	12.1	100	0	
Hori.	12400.000	AV	32.1	39.7	11.3	39.1	44.0	53.9	9.9	100	0	
Hori.	19836.030	AV	40.2	41.1	2.3	47.8	35.8	53.9	18.1	107	144	
Vert.	124.001	QP	34.1	13.3	7.2	32.1	22.5	43.5	21.0	100	301	
Vert.	2324.031	PK	48.4	26.8	14.6	41.1	48.7	73.9	25.2	100	324	
Vert.	2483.500	PK	49.8	26.9	14.8	41.0	50.5	73.9	23.4	100	181	
Vert.	2636.021	PK	47.4	27.2	15.0	41.2	48.4	73.9	25.5	116	216	
Vert.	4960.000	PK	51.5	31.8	7.5	41.1	49.7	73.9	24.2	100	339	
Vert.	7440.000	PK	46.7	37.4	9.0	41.1	52.0	73.9	21.9	100	0	
Vert.	9920.000	PK	42.9	38.9	10.0	38.8	53.0	73.9	20.9	100	0	
Vert.	12400.000	PK	43.5	39.7	11.3	39.1	55.4	73.9	18.5	100	0	
Vert.	19836.030	PK	47.9	41.1	2.3	47.8	43.5	73.9	30.4	101	159	
Vert.	2324.031	AV	38.6	26.8	14.6	41.1	38.9	53.9	15.0	100	324	
Vert.	2483.500	AV	35.8	26.9	14.8	41.0	36.5	53.9	17.4	100	181	
Vert.	2636.021	AV	36.6	27.2	15.0	41.2	37.6	53.9	16.3	116	216	
Vert.	4960.000	AV	42.2	31.8	7.5	41.1	40.4	53.9	13.5	100	339	
Vert.	7440.000	AV	34.7	37.4	9.0	41.1	40.0	53.9	13.9	100	0	
Vert.	9920.000	AV	31.8	38.9	10.0	38.8	41.9	53.9	12.0	100	0	
Vert.	12400.000	AV	32.2	39.7	11.3	39.1	44.1	53.9	9.8	100	0	
Vert.	19836.030	AV	41.0	41.1	2.3	47.8	36.6	53.9	17.3	101	159	

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

Spurious emission (Conducted)**Tx, Bluetooth, BDR, PRBS9****Tx, 2402MHz (below 1GHz)****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**

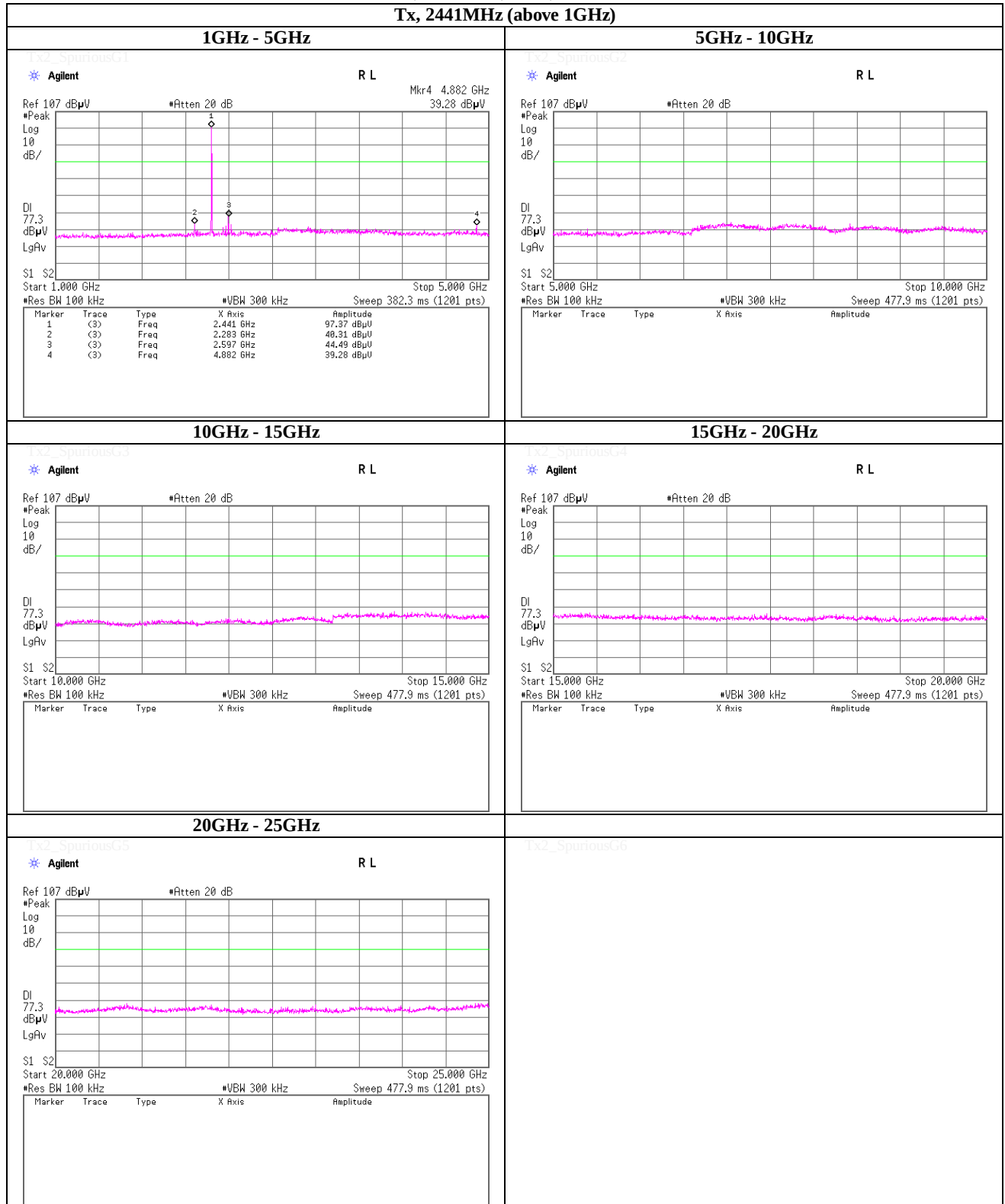
Spurious emission (Conducted)**Tx, Bluetooth, BDR, PRBS9****Tx, 2402MHz (above 1GHz)****UL Japan, Inc.****Shonan EMC Lab.****1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN****Telephone : +81 463 50 6400****Facsimile : +81 463 50 6401**

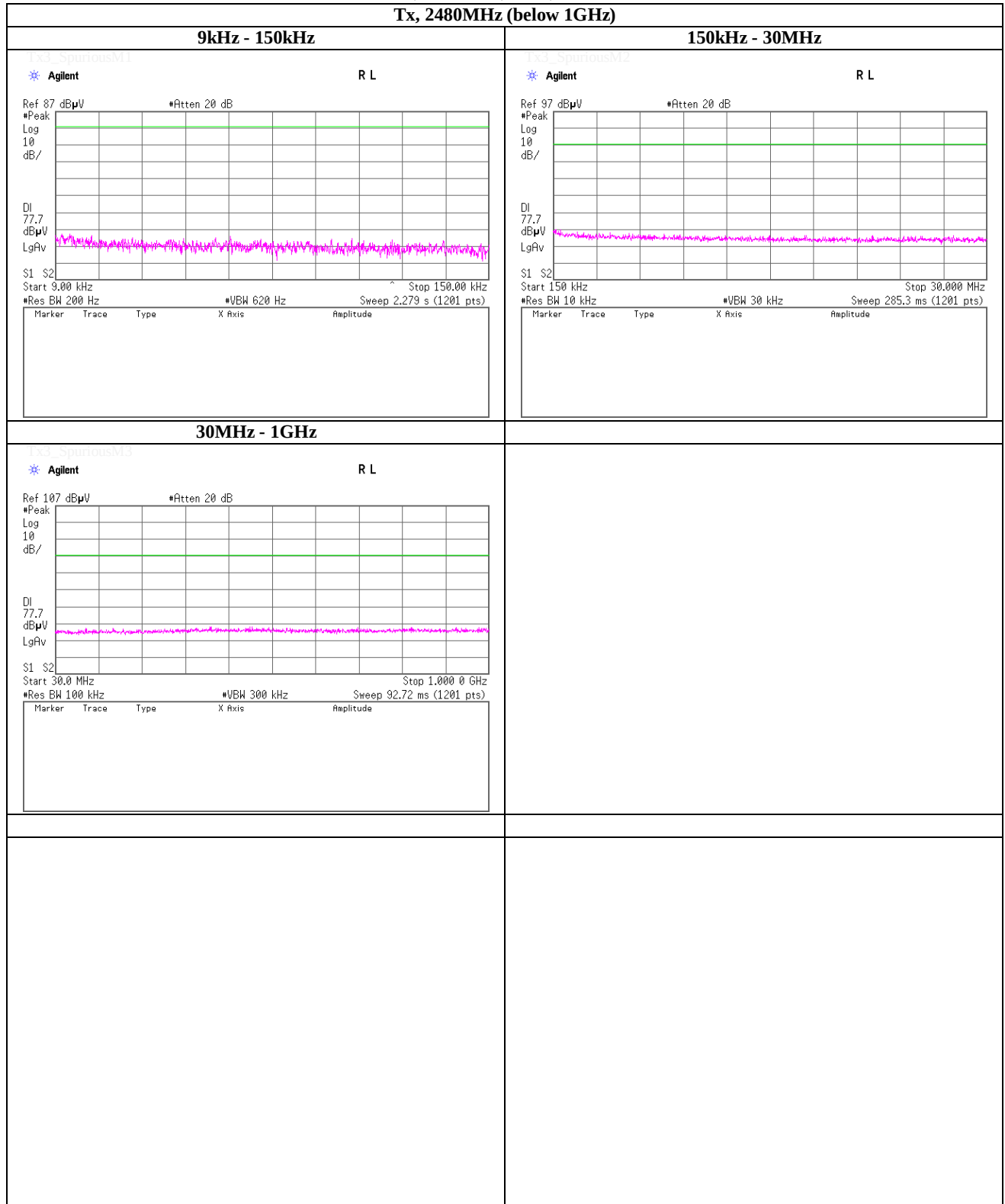
Spurious emission (Conducted)**Tx, Bluetooth, BDR, PRBS9****Tx, 2441MHz (below 1GHz)****UL Japan, Inc.****Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

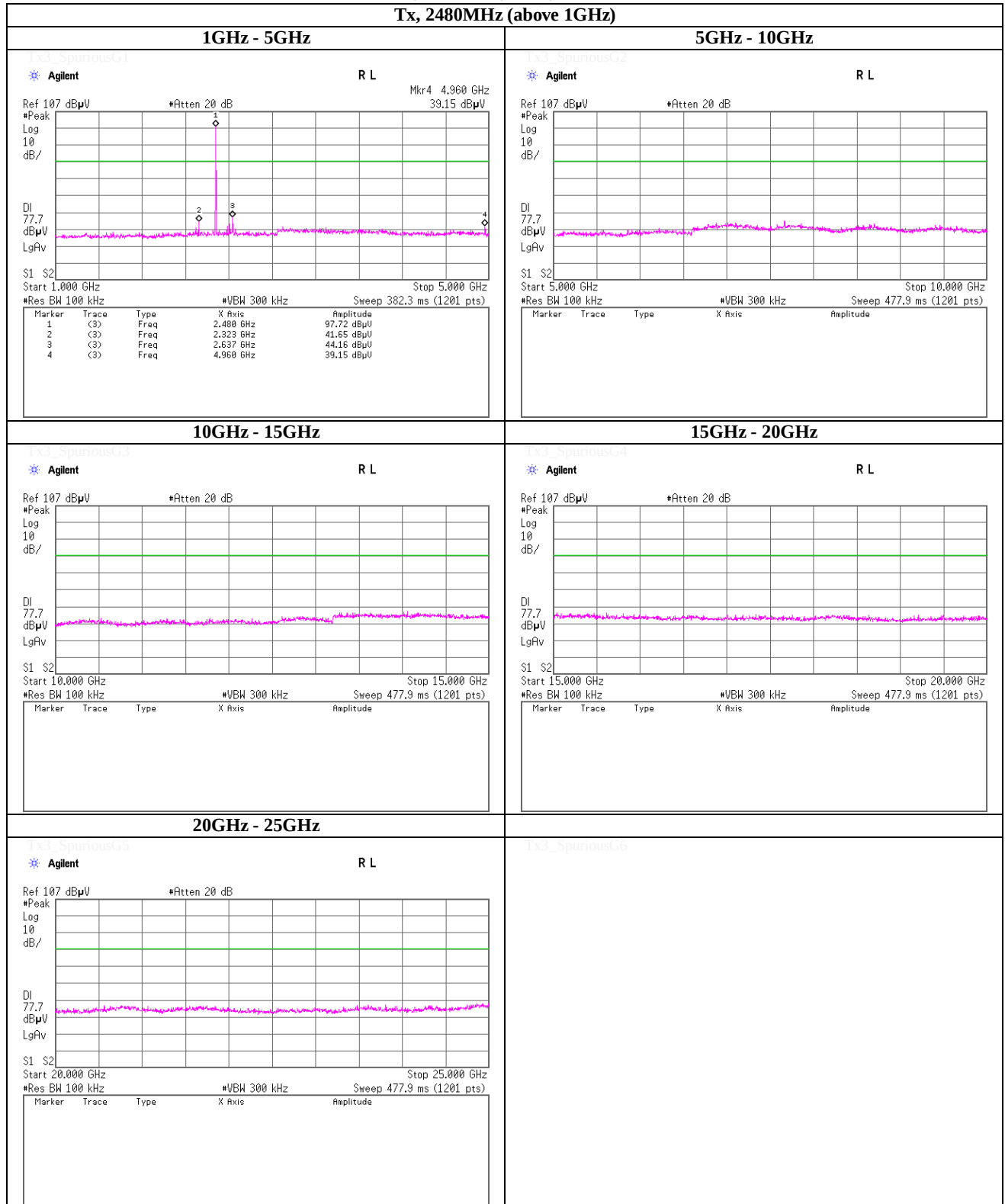
Spurious emission (Conducted)**Tx, Bluetooth, BDR, PRBS9****Tx, 2441MHz (above 1GHz)****UL Japan, Inc.****Shonan EMC Lab.****1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN****Telephone : +81 463 50 6400****Facsimile : +81 463 50 6401**

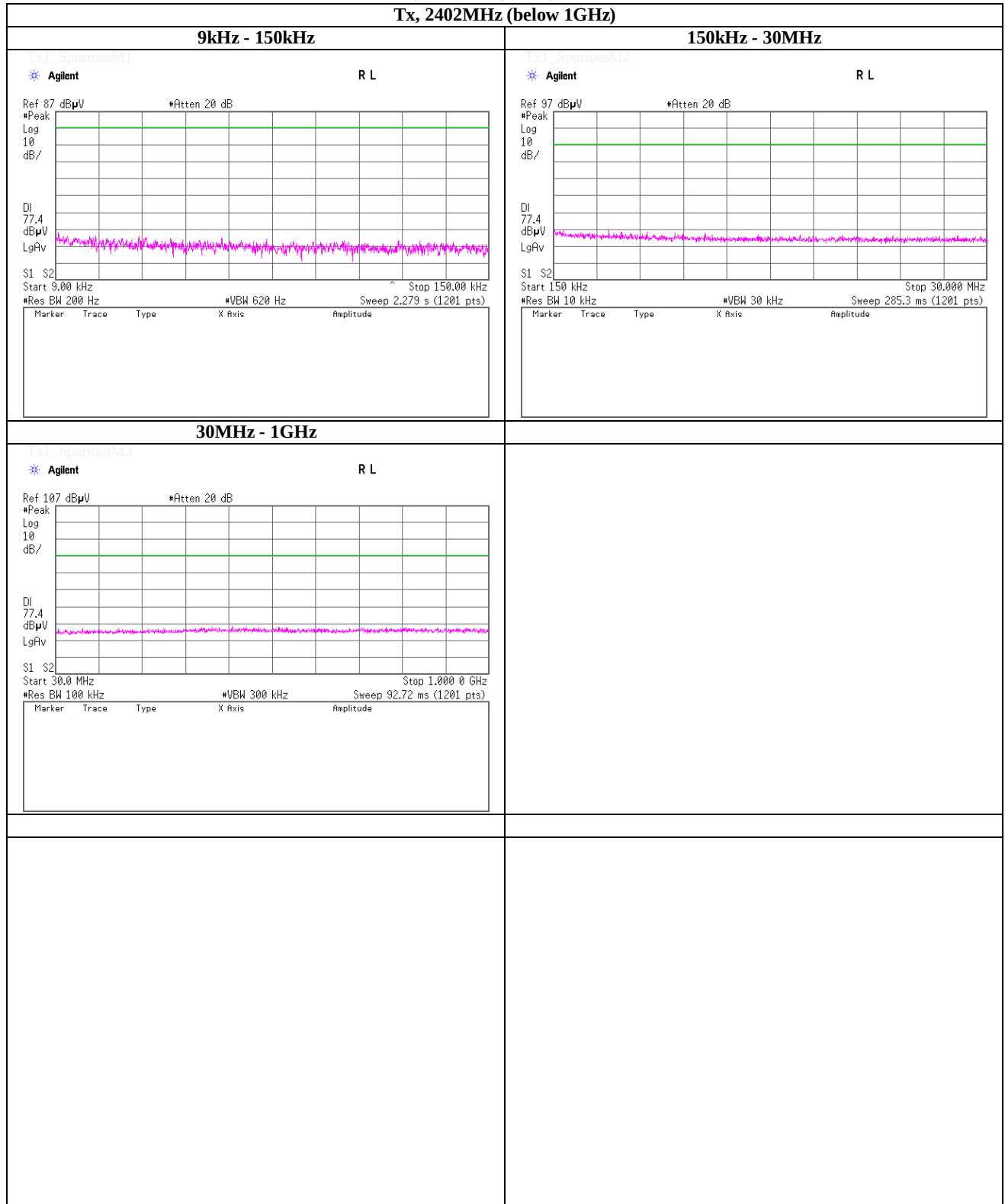
Spurious emission (Conducted)**Tx, Bluetooth, BDR, PRBS9****Tx, 2480MHz (below 1GHz)****UL Japan, Inc.****Shonan EMC Lab.**

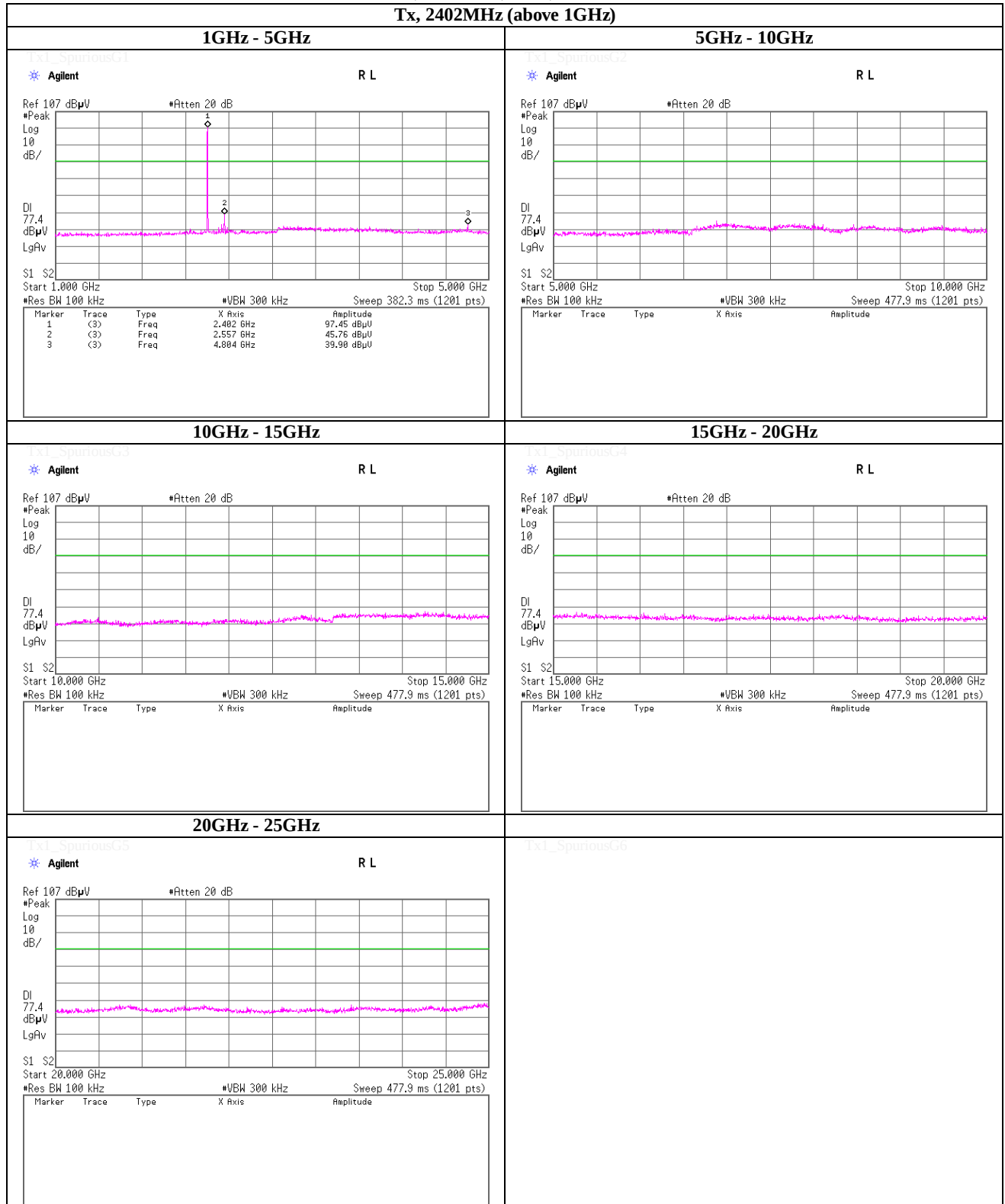
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)**Tx, Bluetooth, BDR, PRBS9****Tx, 2480MHz (above 1GHz)****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**

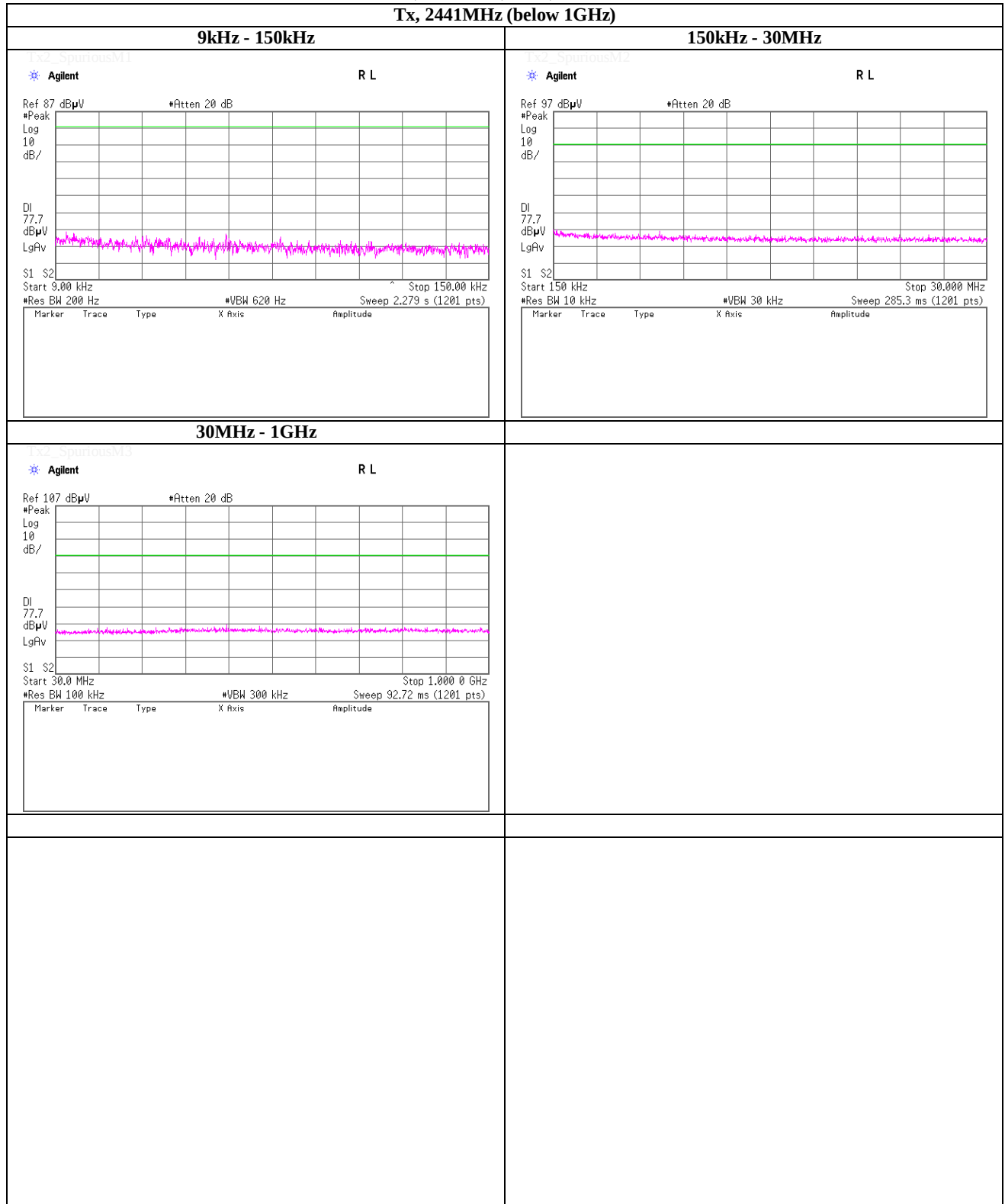
Spurious emission (Conducted)**Tx, Bluetooth, EDR, PRBS9****Tx, 2402MHz (below 1GHz)****UL Japan, Inc.****Shonan EMC Lab.****1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN****Telephone : +81 463 50 6400****Facsimile : +81 463 50 6401**

Spurious emission (Conducted)**Tx, Bluetooth, EDR, PRBS9****Tx, 2402MHz (above 1GHz)****UL Japan, Inc.****Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

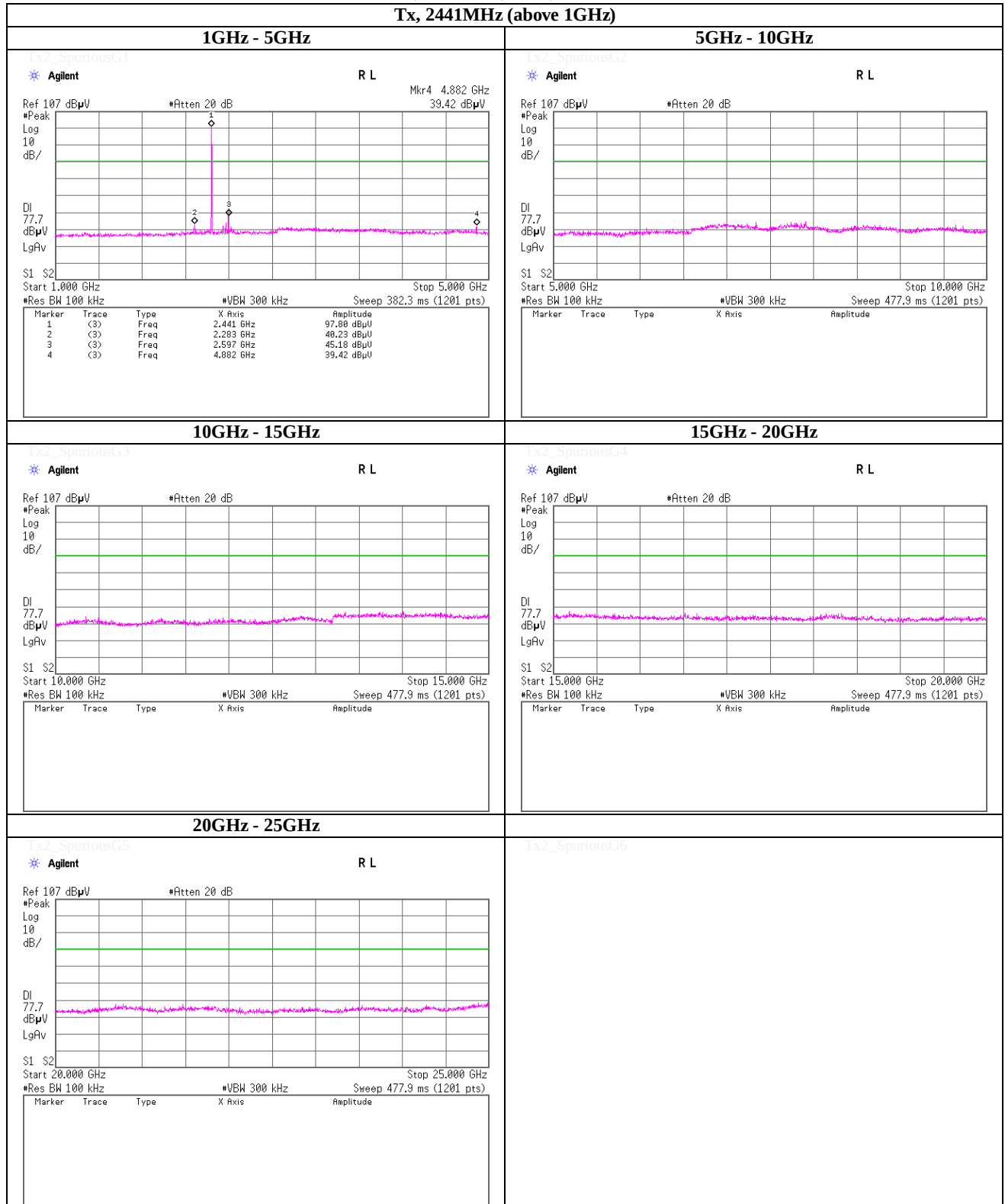
Facsimile : +81 463 50 6401

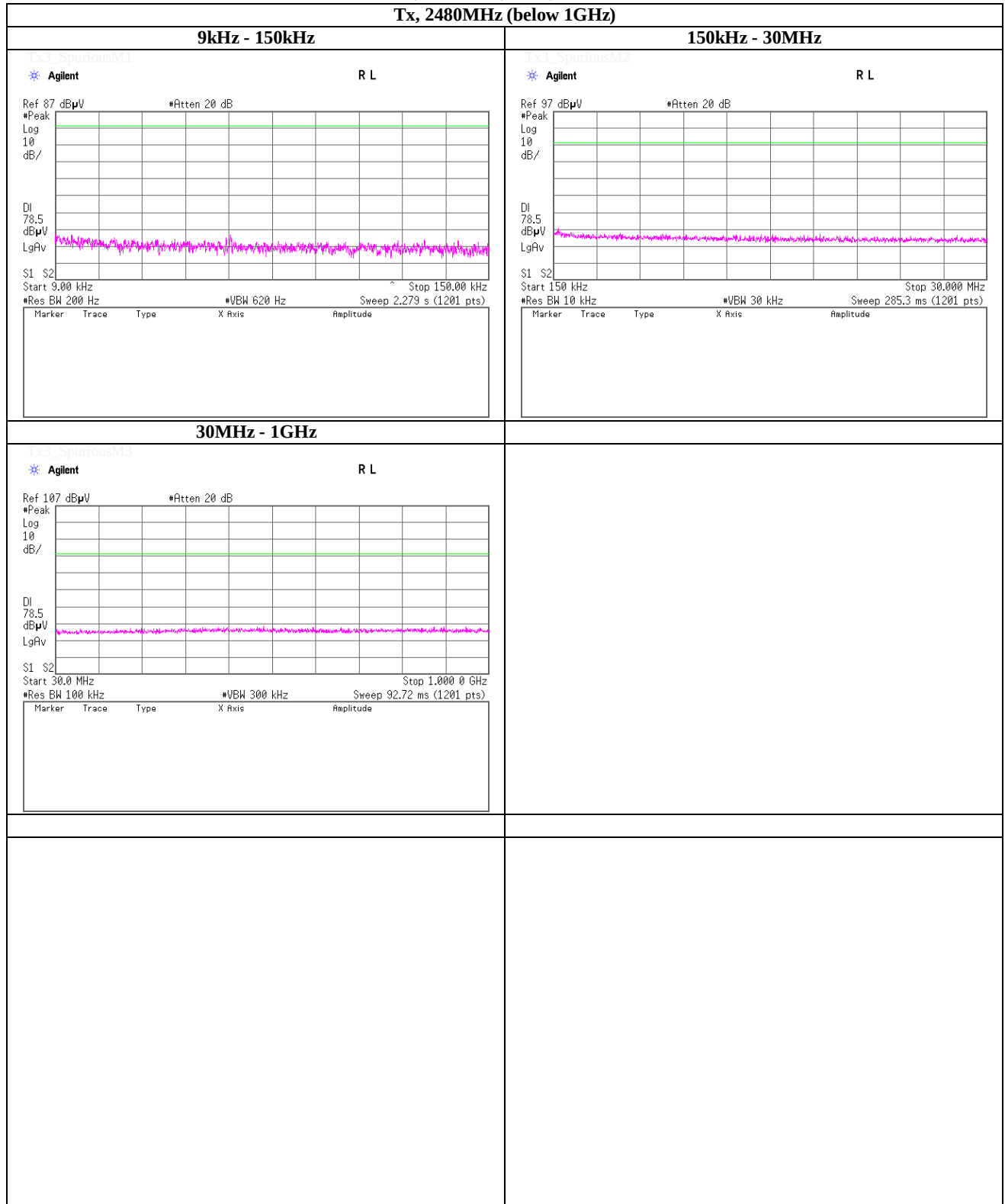
Spurious emission (Conducted)**Tx, Bluetooth, EDR, PRBS9****Tx, 2441MHz (below 1GHz)****UL Japan, Inc.****Shonan EMC Lab.**

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

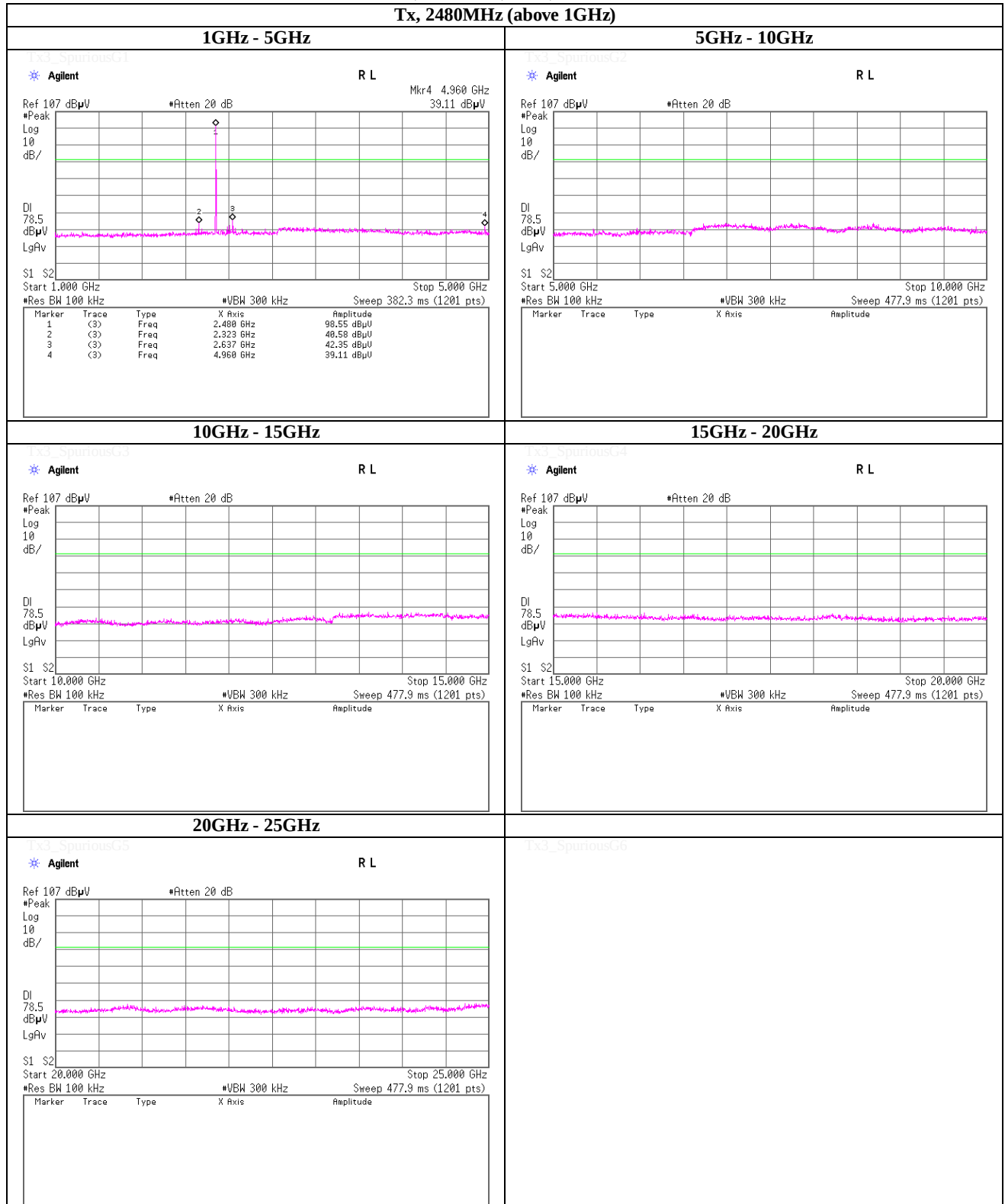
Spurious emission (Conducted)**Tx, Bluetooth, EDR, PRBS9****Tx, 2441MHz (above 1GHz)****UL Japan, Inc.****Shonan EMC Lab.****1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN****Telephone : +81 463 50 6400****Facsimile : +81 463 50 6401**

Spurious emission (Conducted)**Tx, Bluetooth, EDR, PRBS9****Tx, 2480MHz (below 1GHz)****UL Japan, Inc.****Shonan EMC Lab.**

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

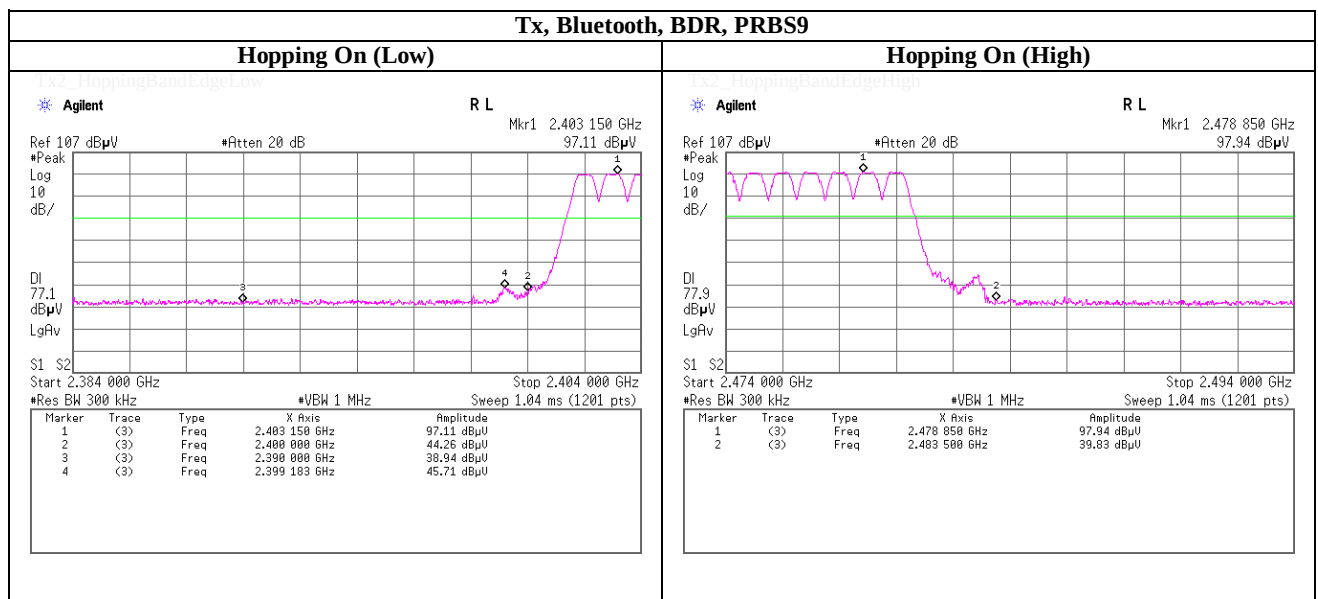
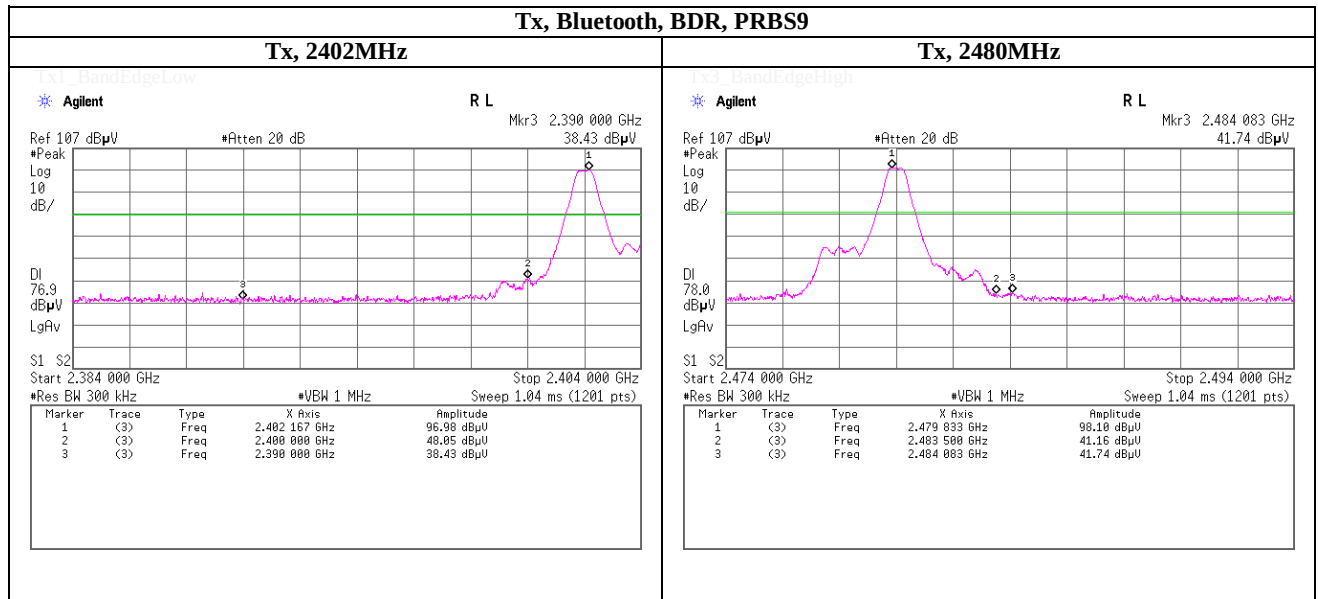
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)**Tx, Bluetooth, EDR, PRBS9****Tx, 2480MHz (above 1GHz)****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**

Spurious emission (Conducted)

Band Edge compliance



UL Japan, Inc.

Shonan EMC Lab.

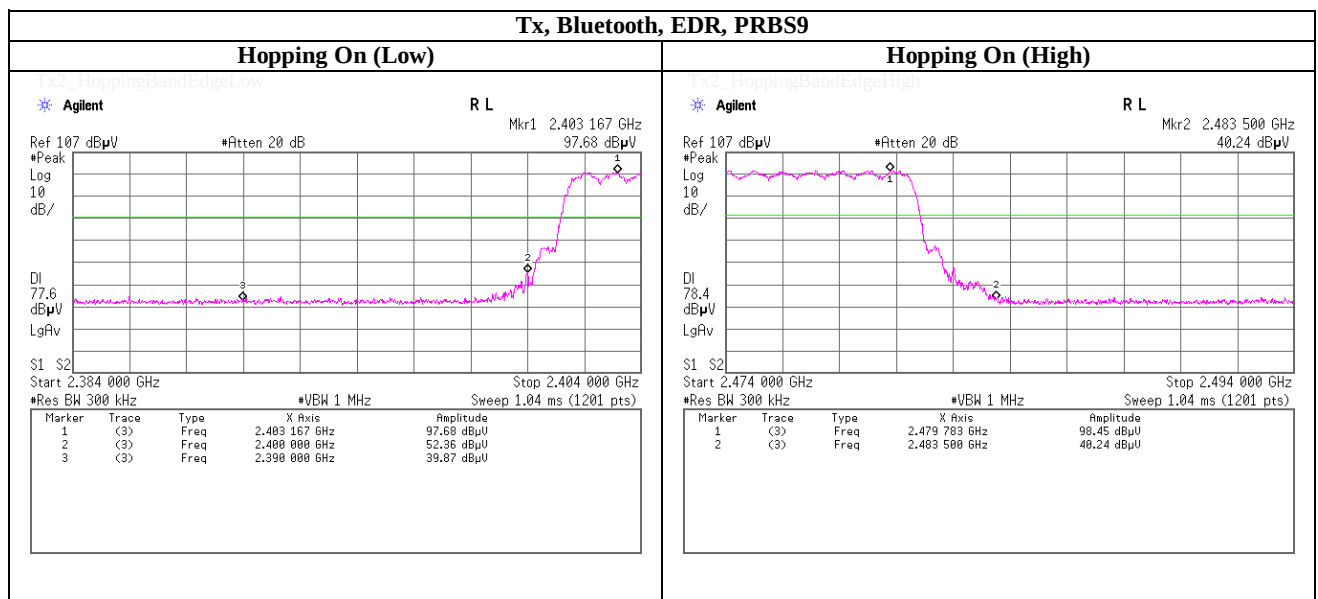
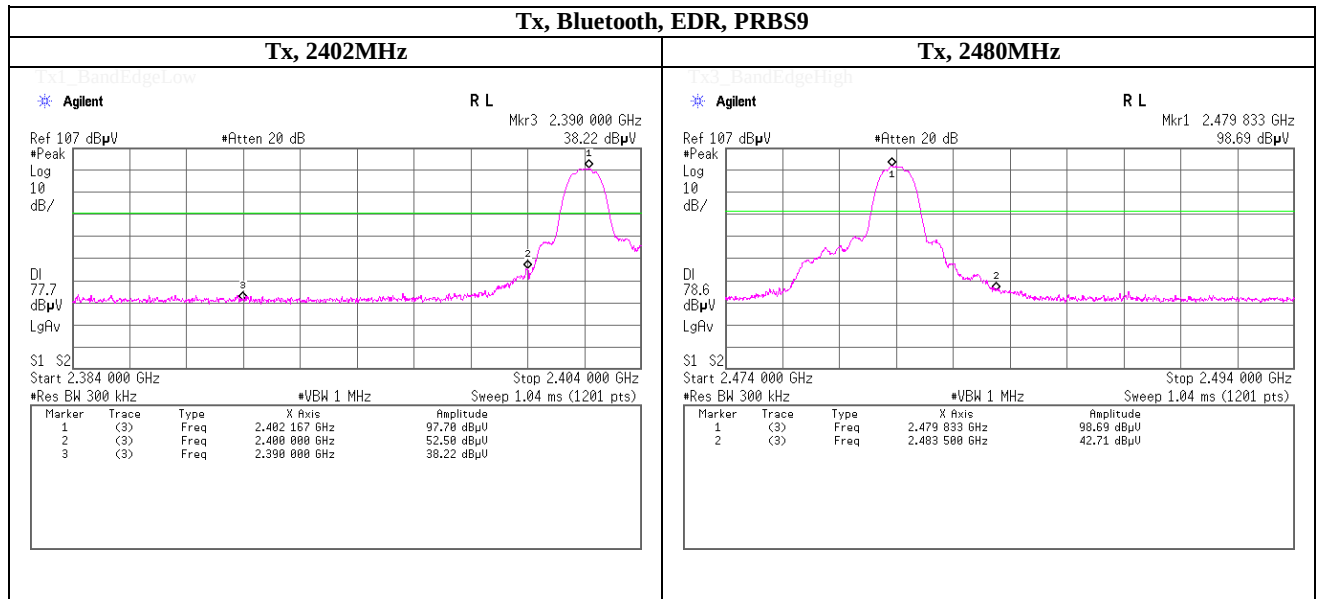
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Band Edge compliance



UL Japan, Inc.

Shonan EMC Lab.

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

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Tx, Bluetooth, BDR, PRBS9	
Tx, 2402MHz	Tx, 2441MHz
Tx, 2480MHz	Tx, Hopping On
Tx2_Inquiry99%OBW	Tx2_InqHopping99%OBW

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

99% Occupied Bandwidth

Tx, Bluetooth, EDR, PRBS9	
Tx, 2402MHz Occupied Bandwidth 1.1670 MHz Transmit Freq Error -1.829 kHz x dB Bandwidth 1.259 MHz*	Tx, 2441MHz Occupied Bandwidth 1.1625 MHz Transmit Freq Error -8.880 kHz x dB Bandwidth 1.229 MHz*
Tx, 2480MHz Occupied Bandwidth 1.1626 MHz Transmit Freq Error -8.163 kHz x dB Bandwidth 1.229 MHz*	Tx, Hopping On Occupied Bandwidth 78.6417 MHz Transmit Freq Error 28.139 kHz x dB Bandwidth 81.043 MHz*
Tx2_Inquiry99OBW	Tx2_InqHopping99OBW

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

APPENDIX 2

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT,RE	2013/03/28 * 12
SCC-G11	Coaxial Cable	Suhner	SUCOFLEX 102	31595/2	AT	2013/03/16 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2013/04/09 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2013/04/09 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2013/04/09 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	AT	2013/03/07 * 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2013/04/25 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2013/07/09 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2013/07/22 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2013/04/11 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2013/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2013/08/19 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2013/02/27 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-I	EMI Software	TSJ	TEPTO-DV(RE,CE, RFL,MF)	-	RE	-
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2012/12/18 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2012/12/18 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2013/02/12 * 12
SAT6-06	Attenuator	JFW	50HF-006N	-	RE	2013/02/12 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2012/10/08 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2013/04/03 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2012/10/08 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2013/02/27 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2013/03/14 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2013/03/19 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2013/03/16 * 12

The expiration date of the calibration is the end of the expired month .
As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards .

Test Item :

RE: Radiated emission ,
AT: Antenna terminal conducted test