



RADIO TEST REPORT cover sheet

Applicant : **Clarion Co., Ltd.**

Type of Equipment : **Car Audio**

Model No. : **PF-3693**

FCC ID : **AX2PF3693**

PF-3693 and PF-3547 are essentially the same device except for the difference that showed in the test report.

This difference doesn't affect the radio characteristics.

The electrical characteristics among those models are identical to each other.

Therefore, we use test report No. 10066163S-D.

For detail of the difference between PF-3693 and PF-3547, refer Section 2.2 of Page 4 in the test report.

Date

April 10, 2015

A handwritten signature in blue ink that reads 'T. Imamura'.

Toyokazu Imamura

Leader

Consumer Technology Division

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




RADIO TEST REPORT

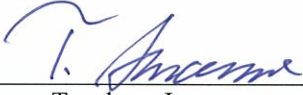
Test Report No.: 10066163S-D

Applicant : **Clarion Co., Ltd.**
Type of Equipment : **Car Audio**
Model No. : **PF-3547**
FCC ID : **AX2PF3693**
Test regulation : **FCC Part15 Subpart C: 2015**
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 23 to 30, 2013

Tested by: 
Tatsuya Arai
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.
 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	6
SECTION 4: Operation of E.U.T. during testing.....	9
SECTION 5: Carrier frequency separation.....	12
SECTION 6: 20dB bandwidth & Occupied bandwidth (99%).....	12
SECTION 7: Number of hopping frequency	12
SECTION 8: Dwell time	12
SECTION 9: Maximum peak output power.....	12
SECTION 10: Spurious emissions (Antenna port conducted).....	12
SECTION 11: Radiated emission.....	13
Contents of APPENDIXES	15
APPENDIX 1: Data of radio tests	16
APPENDIX 2: Test instruments	49
APPENDIX 3: Photographs of test setup.....	50

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 : Clarion Co., Ltd.
Address : 7-2 Shintoshin, Chuo-ku, Saitama-shi, Saitama, 330-0081 Japan
Telephone Number : +81-48-601-4120
Facsimile Number : +81-48-601-3802
Contact Person : Matsuhiro Hirano

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

2.1 Identification of E.U.T.

Type of Equipment : Car Audio
Model Number : PF-3547
Serial Number : Refer to 4.2 of this report.
Rating : DC12V (car battery)
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 23, 2013
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: PF-3547 (referred to as the EUT in this report) is a Car Audio.

Specification of the EUT and its derived models:

	Tested Model	Application Model
Model Name	PF-3547	PF-3693
Place of Production	Mexico	Japan
Tuner System	Phase Diversity Control *1	Single Tuner
HD Radio	✓	None
XM Tuner	✓	None
RBDS *2 (Radio Broadcast Data System)	✓	None
Acoustic Characteristic	6 Speakers System	4 Speakers System
Paint (Front Color)	aluminium black	shiny black
Appearance		
Remarks	--	The escutcheon is different due to the difference of the vehicle is mounted.

*1 : Phase Diversity Control :

The method for stability improvement of Radio reception performance by synthesizing and tuning both the gain and phase of the received signals from two tuners

*2 : RBDS is the Data Broadcasting Receiver.

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

Clock frequency(ies) in the system : 41.6MHz (Xtal), 26MHz (Xtal), 32MHz

Bluetooth specification:

Equipment type : Transceiver
Frequency of operation : 2402-2480MHz
Bandwidth & channel spacing : 79MHz & 1MHz
Type of modulation : FHSS
Antenna type : Pattern
Antenna connector type : None
Antenna gain : -7.1dBi
ITU code : F1D, G1D

FCC 15.31 (e)

The EUT provides stable voltage (DC3.3V) 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 antenna is not removable from the EUT. Therefore the equipment complies with the requirement.

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

* All the revisions made after testing date (October 30, 2013) do 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		2.2 dB Freq.: 31.077 MHz Polarization: Vertical Detection: Quasi-Peak Mode: Tx 2402MHz, DH5
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.						

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 report meets the limits unless the uncertainty is taken into consideration.

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

	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
<input type="checkbox"/> No.1 semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input type="checkbox"/> No.2 semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input checked="" type="checkbox"/> No.3 semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
<input type="checkbox"/> No.4 semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
<input type="checkbox"/> No.1 shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.2 shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
<input type="checkbox"/> No.3 shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
<input type="checkbox"/> No.4 shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
<input type="checkbox"/> No.5 shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input type="checkbox"/> No.6 shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input checked="" type="checkbox"/> 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 / 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 (Conducted)	Transmitting (DH5 / 3-DH5), Payload: PRBS9 -Hopping ON -Hopping OFF	Band edge compliance: 2402MHz, 2480MHz
(Radiated)	Transmitting (DH5 / 3-DH5), Payload: PRBS9 -Hopping OFF	Spurious emission: 2402MHz, 2441MHz, 2480MHz
99% occupied bandwidth	Transmitting (DH5 / 3-DH5), Payload: PRBS9 / Inquiry -Hopping ON -Hopping OFF	2402MHz, 2441MHz, 2480MHz

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

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

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

The EUT has no inquiry mode.

Software: Tera Term ver. 4.66
Power setting: Fixed

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

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

UL Japan, Inc.

Shonan EMC Lab.

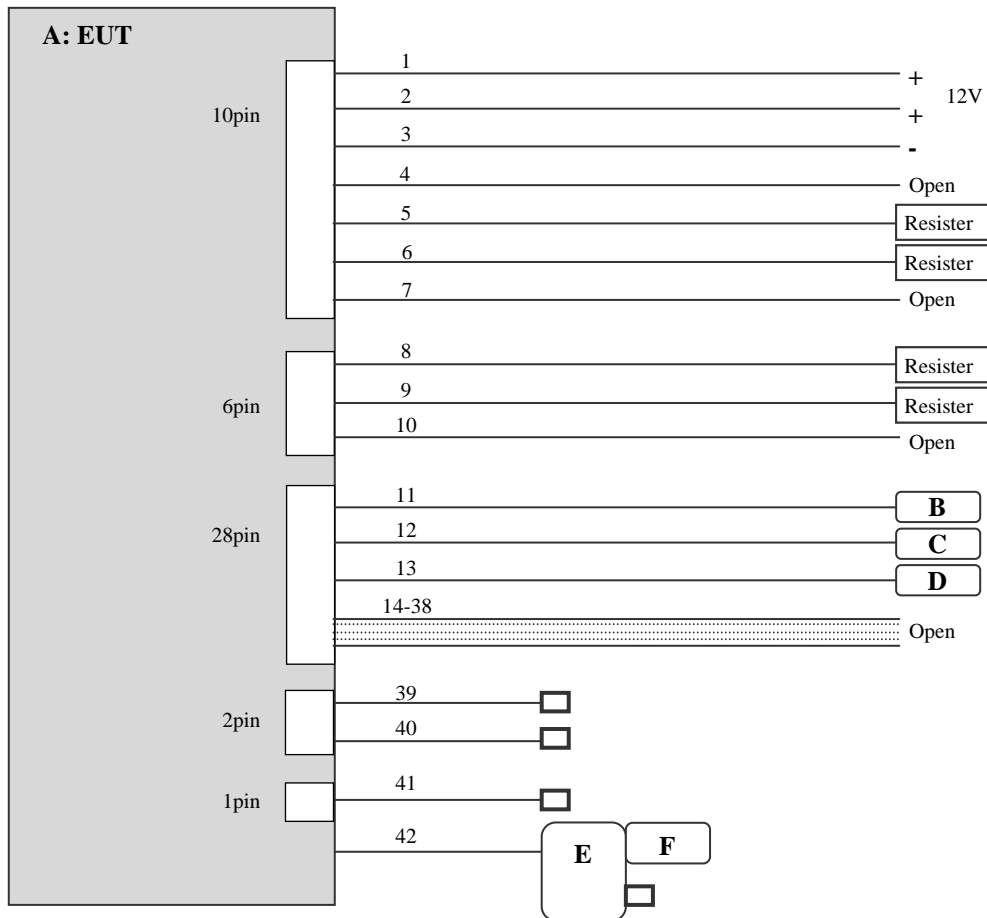
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN

Telephone: +81 463 50 6400

Facsimile: +81 463 50 6401

4.2 Configuration and peripherals

: Terminated



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

*1) DC power supply (Model No.: PAN35-10A) was used for DC 12V input.

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

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Audio	PF-3547	*1)	Clarion	EUT
B	Camera	-	-	-	-
C	Microphone	-	-	-	-
D	Controller	-	-	-	-
E	Aux box	-	-	-	-
F	USB Memory	-	-	-	-

*1) 0000263: Antenna port conducted test, 0000265: Radiated emission

List of cables used

No.	Name	Length (m)	Shield- Cable	Shield- Connector	Remarks
1	ACC	2.0	Unshielded	Unshielded	-
2	B/U	2.0	Unshielded	Unshielded	-
3	GND	2.0	Unshielded	Unshielded	-
4	ILL(+)	2.0	Unshielded	Unshielded	-
5	FL	2.0	Unshielded	Unshielded	-
6	FR	2.0	Unshielded	Unshielded	-
7	Signal	2.0	Unshielded	Unshielded	-
8	RL	2.0	Unshielded	Unshielded	-
9	RR	2.0	Unshielded	Unshielded	-
10	ILL(+)	2.0	Unshielded	Unshielded	-
11	Camera	2.0	Unshielded	Unshielded	-
12	Microphone	2.0	Unshielded	Unshielded	-
13	Controller	2.0	Unshielded	Unshielded	-
14-38	Signal	1.8	Unshielded	Unshielded	-
39	Signal	0.1	Shielded	Shielded	-
40	Signal	0.1	Shielded	Shielded	-
41	Signal	0.4	Shielded	Shielded	-
42	Signal	0.6	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	
Detection Type	Quasi-Peak	Peak	* Average
IF Bandwidth	120kHz	RBW:1MHz VBW:3MHz	RBW:1MHz VBW:10Hz

* 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 angle of 0 to 30 deg. based on the product specification to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Antenna polarization \ Test item	Carrier	Spurious emission (Below 1GHz)	Spurious emission (Above 1GHz)
Horizontal	30 deg.	0 deg.	30 deg.
Vertical	30 deg.	0 deg.	30 deg.

UL Japan, Inc.

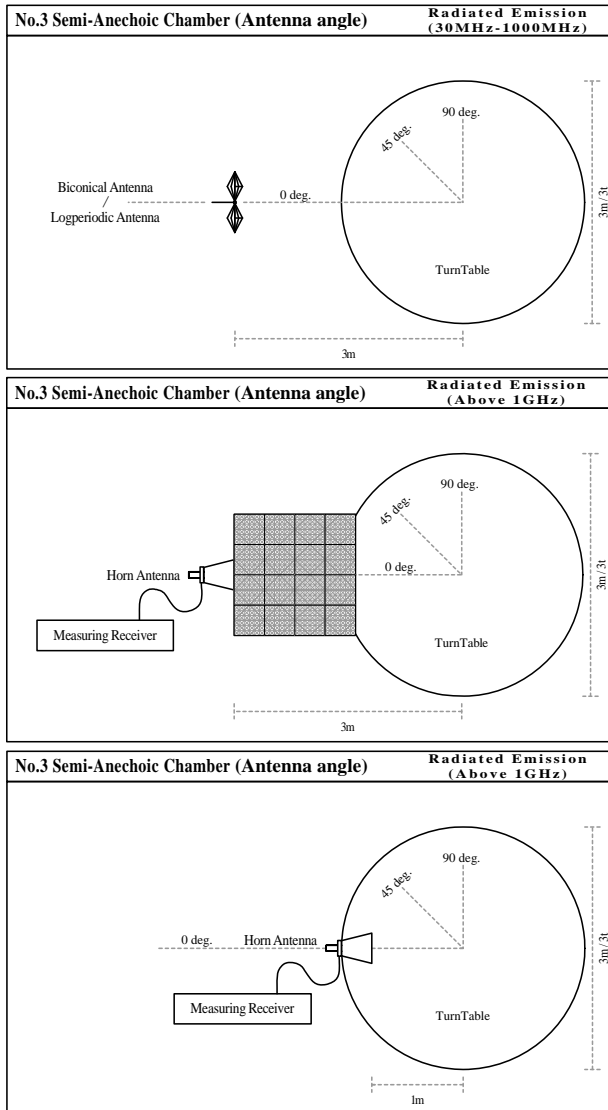
Shonan EMC Lab.

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 is below the limits of FCC 15.209. 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 24, 2013
Temperature / Humidity 26 deg.C , 40 %RH
Engineer Tatsuya Arai
Mode Tx, Bluetooth, BDR, PRBS9

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.949	1.000	>= 0.633
DH5	2441.0	0.927	1.000	>= 0.618
DH5	2480.0	0.931	1.000	>= 0.620

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.

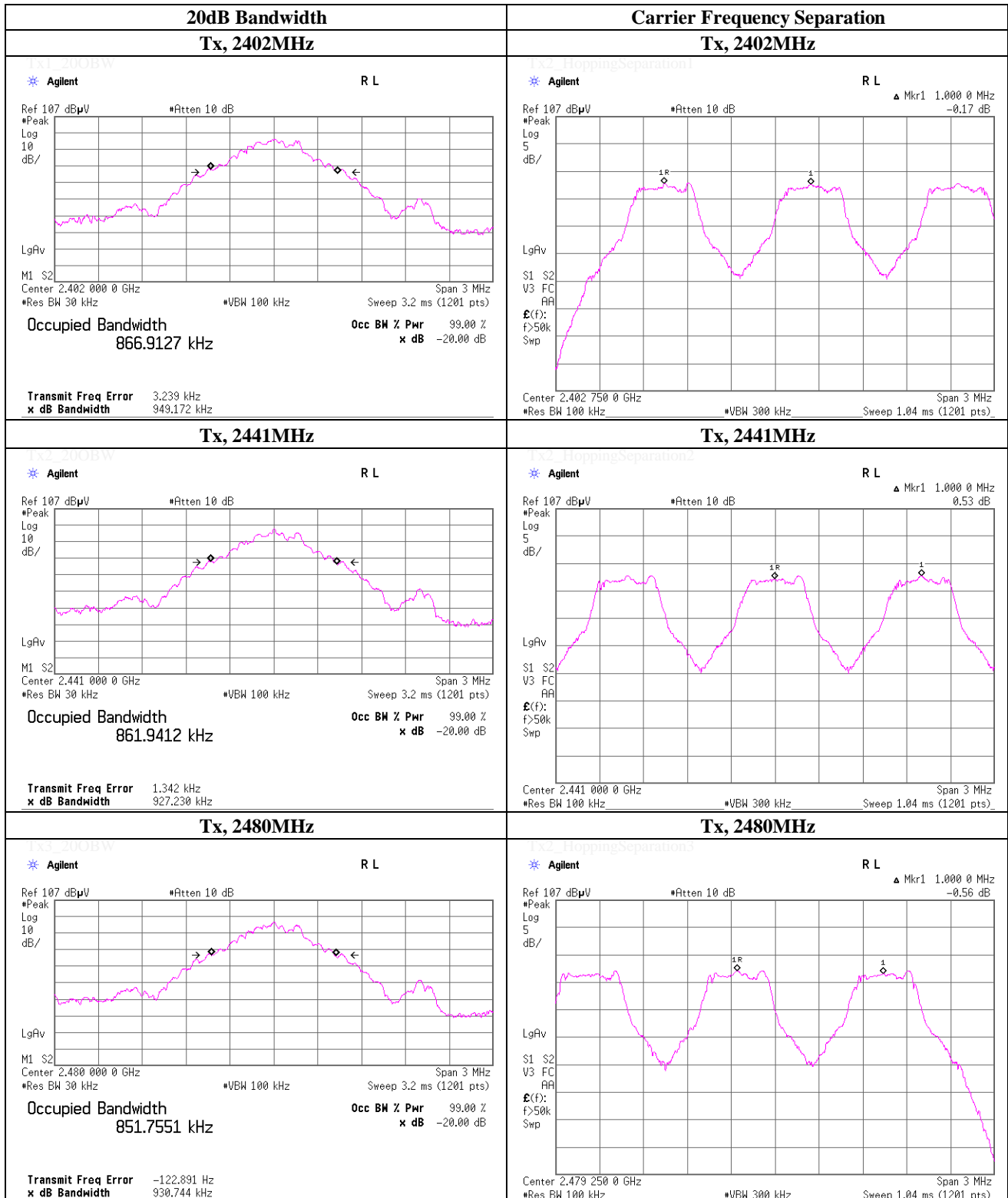
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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 24, 2013
 Temperature / Humidity 26 deg.C , 40 %RH
 Engineer Tatsuya Arai
 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	1.205	1.000	>= 0.803
3-DH5	2441.0	1.256	1.000	>= 0.837
3-DH5	2480.0	1.264	1.000	>= 0.842

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

No limit applies to 20dB Bandwidth.

UL Japan, Inc.

Shonan EMC Lab.

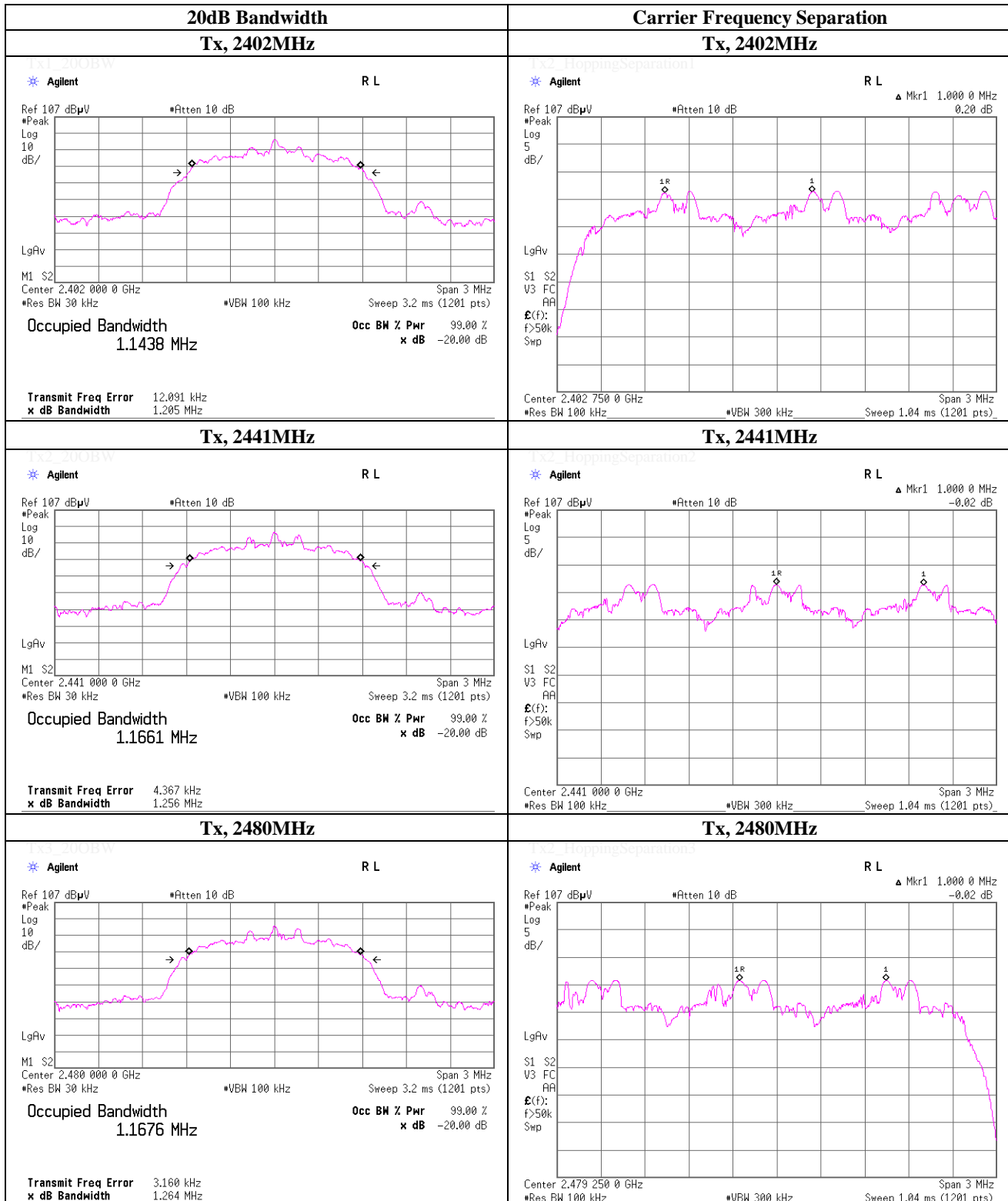
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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

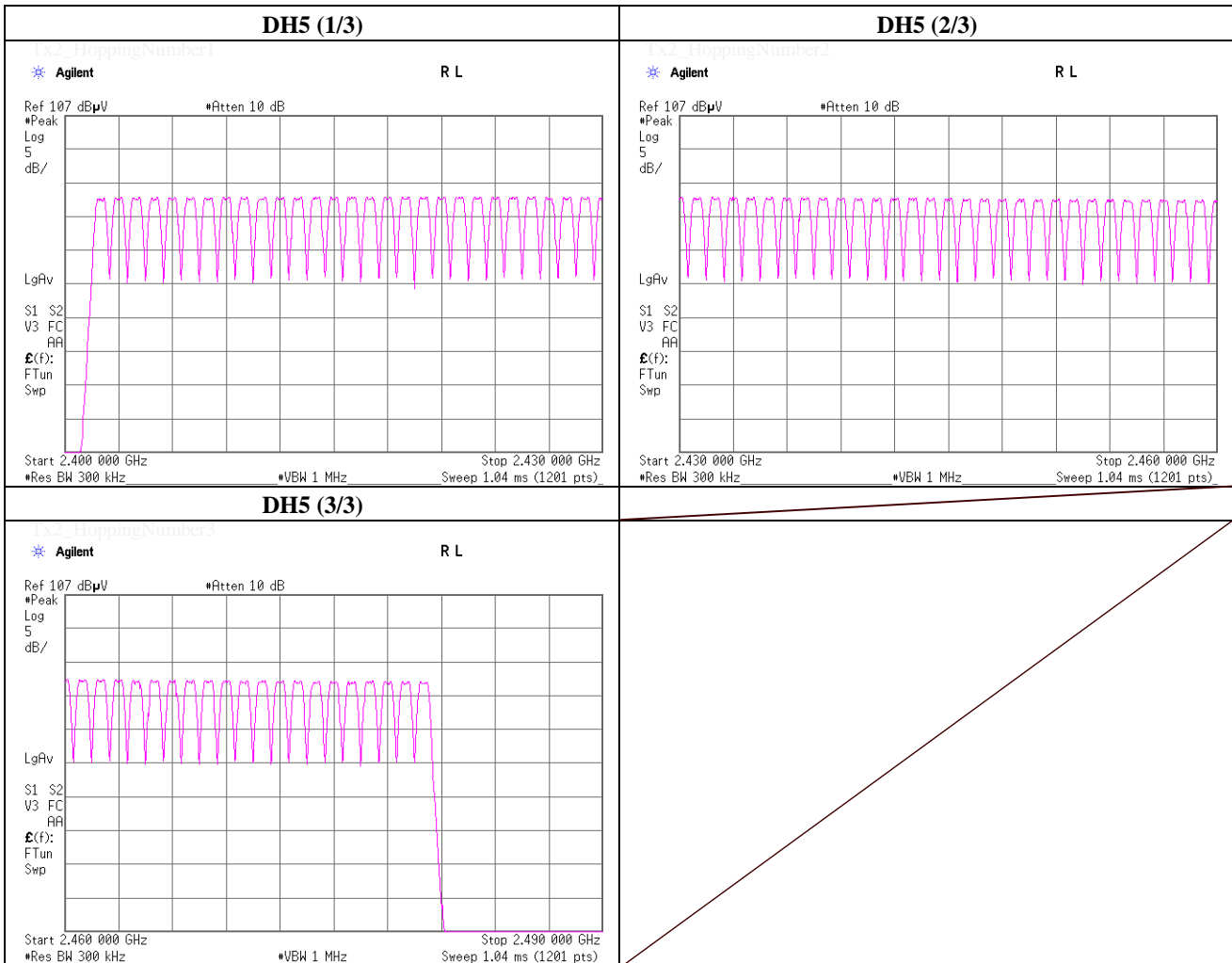
Facsimile : +81 463 50 6401

Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	October 24, 2013	
Temperature / Humidity	26 deg.C , 40 %RH	
Engineer	Tatsuya Arai	
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

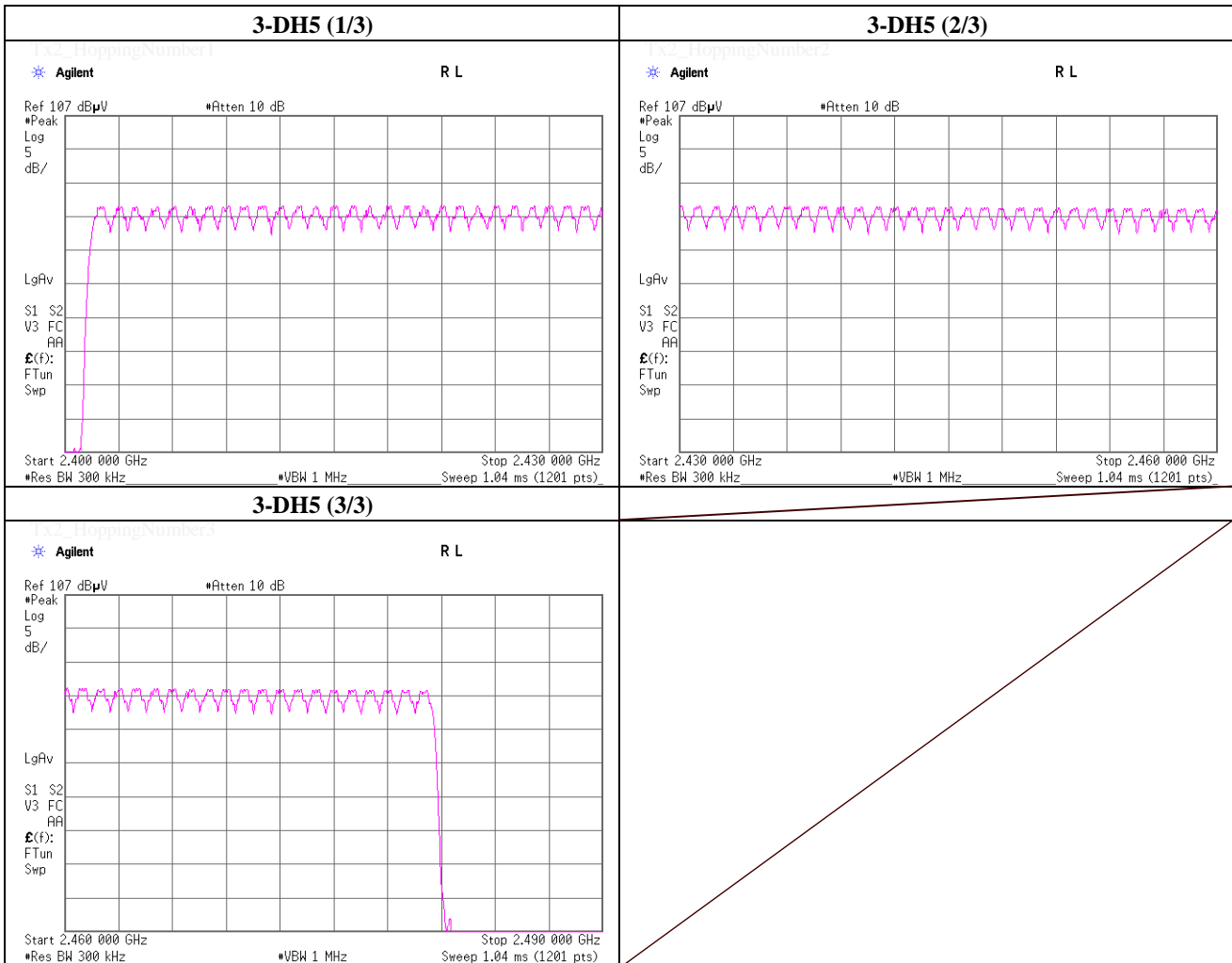
Facsimile : +81 463 50 6401

Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	October 24, 2013	
Temperature / Humidity	26 deg.C , 40 %RH	
Engineer	Tatsuya Arai	
Mode	Tx, Bluetooth, EDR, PRBS9	

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

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



Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date October 24, 2013 October 30, 2013
 Temperature / Humidity 26 deg.C , 40 %RH 25 deg.C , 51 %RH
 Engineer Tatsuya Arai
 Mode Tx, Bluetooth, BDR, PRBS9

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4)	Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	51.0 / 5.0 sec. x 31.6 sec. = 323 times	0.521	168	400
DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.778	293	400
DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	3.026	327	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 $N=79$.

UL Japan, Inc.

Shonan EMC Lab.

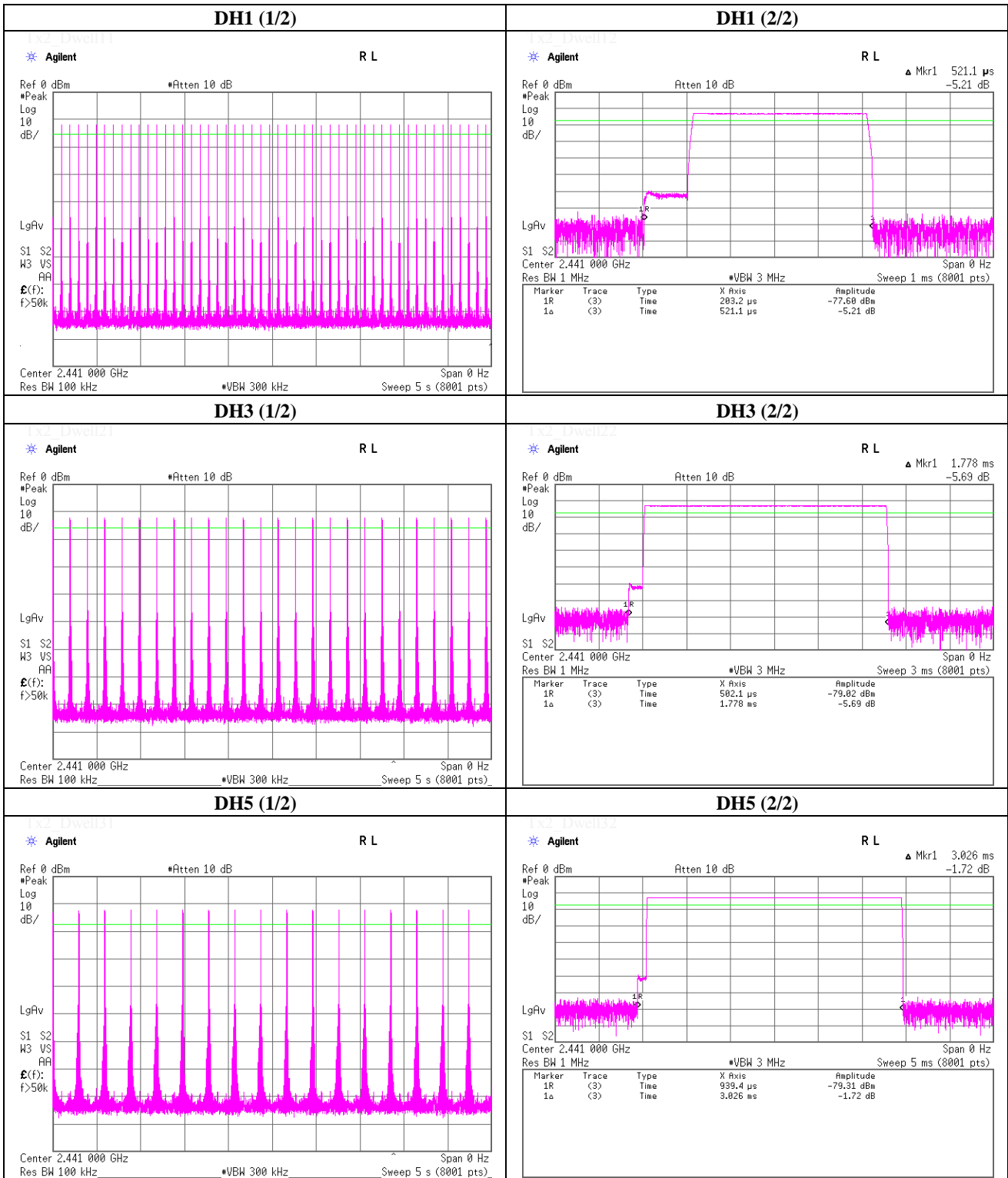
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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 24, 2013
 Temperature / Humidity 26 deg.C , 40 %RH
 Engineer Tatsuya Arai
 Mode Tx, Bluetooth, EDR, PRBS9

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) second	Length of transmission time [msec]	Result [msec]	Limit [msec]
3-DH1	51.0 / 5.0 sec. x 31.6 sec. = 323 times	0.535	173	400
3-DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.785	295	400
3-DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	3.037	328	400

Sample Calculation

Result = Number of transmission x Length of transmission time

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

UL Japan, Inc.

Shonan EMC Lab.

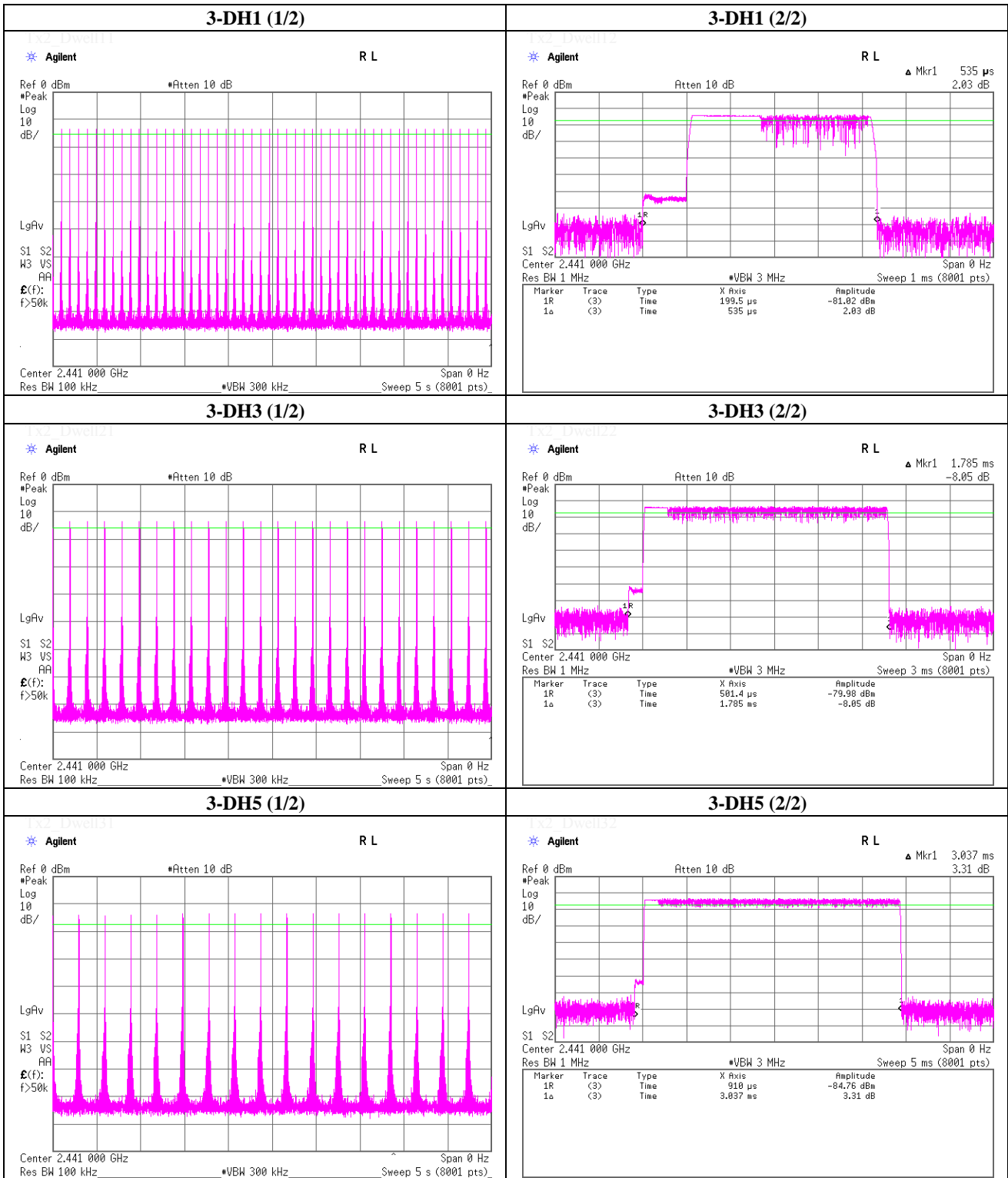
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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 23, 2013
 Temperature / Humidity 26 deg.C , 45 %RH
 Engineer Tatsuya Arai
 Mode Tx, Bluetooth

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

	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-11.63	1.32	10.04	-0.27	0.94	20.97	125	21.24
DH5	2441.0	-11.77	1.33	10.04	-0.40	0.91	20.97	125	21.37
DH5	2480.0	-12.44	1.34	10.04	-1.06	0.78	20.97	125	22.03
2-DH5	2402.0	-12.17	1.32	10.04	-0.81	0.83	20.97	125	21.78
2-DH5	2441.0	-12.26	1.33	10.04	-0.89	0.81	20.97	125	21.86
2-DH5	2480.0	-12.88	1.34	10.04	-1.50	0.71	20.97	125	22.47
3-DH5	2402.0	-12.01	1.32	10.04	-0.65	0.86	20.97	125	21.62
3-DH5	2441.0	-12.08	1.33	10.04	-0.71	0.85	20.97	125	21.68
3-DH5	2480.0	-12.70	1.34	10.04	-1.32	0.74	20.97	125	22.29

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 24, 2013 October 25, 2013
 Temperature / Humidity 20 deg.C, 50 %RH 22 deg.C, 56 %RH
 Engineer Tatsuya Arai Tatsuya Arai
 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.	108.002	QP	36.4	11.8	7.2	32.1	23.3	43.5	20.2	167	212	
Hori.	240.037	QP	37.2	17.8	8.2	32.0	31.2	46.0	14.8	126	258	
Hori.	338.831	QP	35.6	16.8	8.8	31.9	29.3	46.0	16.7	100	275	
Hori.	959.999	QP	37.4	24.6	10.9	30.5	42.4	46.0	3.6	100	131	
Hori.	1603.000	PK	46.7	25.8	13.8	40.9	45.4	73.9	28.5	100	2	
Hori.	2390.000	PK	43.6	26.8	14.7	41.1	44.0	73.9	29.9	139	254	
Hori.	2400.000	PK	45.9	26.8	14.7	41.1	46.3	73.9	27.6	139	254	
Hori.	3118.125	PK	48.7	28.2	6.6	41.6	41.9	73.9	32.0	100	143	
Hori.	4804.000	PK	47.8	30.9	7.5	41.2	45.0	73.9	28.9	100	222	
Hori.	7206.000	PK	45.6	37.1	9.1	41.0	50.8	73.9	23.1	100	0	
Hori.	1603.000	AV	34.9	25.8	13.8	40.9	33.6	53.9	20.3	100	2	
Hori.	2390.000	AV	34.9	26.8	14.7	41.1	35.3	53.9	18.6	139	254	
Hori.	2400.000	AV	35.7	26.8	14.7	41.1	36.1	53.9	17.8	139	254	
Hori.	3118.125	AV	40.1	28.2	6.6	41.6	33.3	53.9	20.6	100	143	
Hori.	4804.000	AV	40.4	30.9	7.5	41.2	37.6	53.9	16.3	100	222	
Hori.	7206.000	AV	35.8	37.1	9.1	41.0	41.0	53.9	12.9	100	0	
Vert.	31.077	QP	45.6	17.9	6.5	32.2	37.8	40.0	2.2	100	113	
Vert.	429.027	QP	32.8	18.1	9.2	31.9	28.2	46.0	17.8	100	185	
Vert.	1603.000	PK	45.7	25.8	13.8	40.9	44.4	73.9	29.5	100	356	
Vert.	2390.000	PK	43.2	26.8	14.7	41.1	43.6	73.9	30.3	100	170	
Vert.	2400.000	PK	44.5	26.8	14.7	41.1	44.9	73.9	29.0	100	170	
Vert.	3118.125	PK	50.8	28.2	6.6	41.6	44.0	73.9	29.9	100	231	
Vert.	4804.000	PK	47.8	30.9	7.5	41.2	45.0	73.9	28.9	100	153	
Vert.	7206.000	PK	46.8	37.1	9.1	41.0	52.0	73.9	21.9	100	0	
Vert.	1603.000	AV	34.7	25.8	13.8	40.9	33.4	53.9	20.5	100	356	
Vert.	2390.000	AV	34.5	26.8	14.7	41.1	34.9	53.9	19.0	100	170	
Vert.	2400.000	AV	36.2	26.8	14.7	41.1	36.6	53.9	17.3	100	170	
Vert.	3118.125	AV	46.5	28.2	6.6	41.6	39.7	53.9	14.2	100	231	
Vert.	4804.000	AV	39.8	30.9	7.5	41.2	37.0	53.9	16.9	100	153	
Vert.	7206.000	AV	35.4	37.1	9.1	41.0	40.6	53.9	13.3	100	0	

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

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

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 24, 2013 October 25, 2013
 Temperature / Humidity 20 deg.C, 50 %RH 22 deg.C, 56 %RH
 Engineer Tatsuya Arai Tatsuya Arai
 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.	107.997	QP	37.3	11.8	7.2	32.1	24.2	43.5	19.3	150	280	
Hori.	239.786	QP	36.8	17.8	8.2	32.0	30.8	46.0	15.2	133	239	
Hori.	338.568	QP	37.0	16.8	8.8	31.9	30.7	46.0	15.3	100	254	
Hori.	959.999	QP	37.2	24.6	10.9	30.5	42.2	46.0	3.8	100	109	
Hori.	1627.000	PK	46.3	25.9	13.8	41.0	45.0	73.9	28.9	100	0	
Hori.	3118.085	PK	48.4	28.2	6.6	41.6	41.6	73.9	32.3	100	123	
Hori.	4882.000	PK	49.2	31.4	7.5	41.1	47.0	73.9	26.9	100	156	
Hori.	7323.000	PK	46.9	37.2	9.0	41.1	52.0	73.9	21.9	100	0	
Hori.	1627.000	AV	34.5	25.9	13.8	41.0	33.2	53.9	20.7	100	0	
Hori.	3118.085	AV	40.3	28.2	6.6	41.6	33.5	53.9	20.4	100	123	
Hori.	4882.000	AV	41.8	31.4	7.5	41.1	39.6	53.9	14.3	100	156	
Hori.	7323.000	AV	35.2	37.2	9.0	41.1	40.3	53.9	13.6	100	0	
Vert.	31.033	QP	45.4	17.9	6.5	32.2	37.6	40.0	2.4	100	120	
Vert.	429.654	QP	33.2	18.1	9.2	31.9	28.6	46.0	17.4	100	199	
Vert.	1627.000	PK	46.6	25.9	13.8	41.0	45.3	73.9	28.6	100	0	
Vert.	3118.085	PK	50.9	28.2	6.6	41.6	44.1	73.9	29.8	100	221	
Vert.	4882.000	PK	50.4	31.4	7.5	41.1	48.2	73.9	25.7	100	234	
Vert.	7323.000	PK	46.1	37.2	9.0	41.1	51.2	73.9	22.7	100	0	
Vert.	1627.000	AV	34.2	25.9	13.8	41.0	32.9	53.9	21.0	100	0	
Vert.	3118.085	AV	46.3	28.2	6.6	41.6	39.5	53.9	14.4	100	221	
Vert.	4882.000	AV	43.2	31.4	7.5	41.1	41.0	53.9	12.9	100	234	
Vert.	7323.000	AV	35.5	37.2	9.0	41.1	40.6	53.9	13.3	100	0	

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

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

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 24, 2013 October 25, 2013
 Temperature / Humidity 20 deg.C, 50 %RH 22 deg.C, 56 %RH
 Engineer Tatsuya Arai Tatsuya Arai
 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.	107.938	QP	35.9	11.8	7.2	32.1	22.8	43.5	20.7	149	209	
Hori.	239.990	QP	38.2	17.8	8.2	32.0	32.2	46.0	13.8	145	280	
Hori.	339.020	QP	36.0	16.8	8.8	31.9	29.7	46.0	16.3	100	261	
Hori.	959.999	QP	37.0	24.6	10.9	30.5	42.0	46.0	4.0	100	139	
Hori.	1653.000	PK	46.2	25.9	13.9	41.0	45.0	73.9	28.9	100	0	
Hori.	2483.500	PK	45.6	26.9	14.8	41.0	46.3	73.9	27.6	100	154	
Hori.	3118.115	PK	49.2	28.2	6.6	41.6	42.4	73.9	31.5	100	158	
Hori.	4960.000	PK	50.4	31.8	7.5	41.1	48.6	73.9	25.3	100	182	
Hori.	7440.000	PK	47.8	37.4	9.0	41.1	53.1	73.9	20.8	100	243	
Hori.	1653.000	AV	34.3	25.9	13.9	41.0	33.1	53.9	20.8	100	0	
Hori.	2483.500	AV	34.6	26.9	14.8	41.0	35.3	53.9	18.6	100	154	
Hori.	3118.115	AV	40.5	28.2	6.6	41.6	33.7	53.9	20.2	100	158	
Hori.	4960.000	AV	43.9	31.8	7.5	41.1	42.1	53.9	11.8	100	182	
Hori.	7440.000	AV	37.4	37.4	9.0	41.1	42.7	53.9	11.2	100	243	
Vert.	31.121	QP	45.5	17.8	6.5	32.2	37.6	40.0	2.4	100	127	
Vert.	429.020	QP	32.0	18.1	9.2	31.9	27.4	46.0	18.6	100	198	
Vert.	1653.000	PK	45.9	25.9	13.9	41.0	44.7	73.9	29.2	100	0	
Vert.	2483.500	PK	44.9	26.9	14.8	41.0	45.6	73.9	28.3	100	169	
Vert.	3118.115	PK	51.2	28.2	6.6	41.6	44.4	73.9	29.5	100	221	
Vert.	4960.000	PK	51.7	31.8	7.5	41.1	49.9	73.9	24.0	100	179	
Vert.	7440.000	PK	47.5	37.4	9.0	41.1	52.8	73.9	21.1	130	195	
Vert.	1653.000	AV	34.6	25.9	13.9	41.0	33.4	53.9	20.5	100	0	
Vert.	2483.500	AV	34.6	26.9	14.8	41.0	35.3	53.9	18.6	100	169	
Vert.	3118.115	AV	46.2	28.2	6.6	41.6	39.4	53.9	14.5	100	221	
Vert.	4960.000	AV	45.9	31.8	7.5	41.1	44.1	53.9	9.8	100	179	
Vert.	7440.000	AV	38.8	37.4	9.0	41.1	44.1	53.9	9.8	130	195	

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

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

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 24, 2013 October 25, 2013
 Temperature / Humidity 20 deg.C, 50 %RH 22 deg.C, 56 %RH
 Engineer Tatsuya Arai Tatsuya Arai
 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.	108.120	QP	38.9	11.8	7.2	32.1	25.8	43.5	17.7	154	245	
Hori.	240.149	QP	37.0	17.8	8.2	32.0	31.0	46.0	15.0	165	220	
Hori.	339.037	QP	36.3	16.8	8.8	31.9	30.0	46.0	16.0	100	239	
Hori.	959.999	QP	37.2	24.6	10.9	30.5	42.2	46.0	3.8	100	122	
Hori.	1603.000	PK	46.4	25.8	13.8	40.9	45.1	73.9	28.8	100	0	
Hori.	2390.000	PK	46.2	26.8	14.7	41.1	46.6	73.9	27.3	100	144	
Hori.	2400.000	PK	44.2	26.8	14.7	41.1	44.6	73.9	29.3	100	144	
Hori.	3118.112	PK	48.5	28.2	6.6	41.6	41.7	73.9	32.2	100	143	
Hori.	4804.000	PK	45.8	30.9	7.5	41.2	43.0	73.9	30.9	100	0	
Hori.	7206.000	PK	45.2	37.1	9.1	41.0	50.4	73.9	23.5	100	0	
Hori.	1603.000	AV	34.8	25.8	13.8	40.9	33.5	53.9	20.4	100	0	
Hori.	2390.000	AV	34.7	26.8	14.7	41.1	35.1	53.9	18.8	100	144	
Hori.	2400.000	AV	35.0	26.8	14.7	41.1	35.4	53.9	18.5	100	144	
Hori.	3118.112	AV	40.6	28.2	6.6	41.6	33.8	53.9	20.1	100	143	
Hori.	4804.000	AV	35.3	30.9	7.5	41.2	32.5	53.9	21.4	100	0	
Hori.	7206.000	AV	35.3	37.1	9.1	41.0	40.5	53.9	13.4	100	0	
Vert.	31.194	QP	45.3	17.8	6.5	32.2	37.4	40.0	2.6	100	128	
Vert.	430.220	QP	32.2	18.1	9.2	31.9	27.6	46.0	18.4	100	170	
Vert.	1603.000	PK	45.2	25.8	13.8	40.9	43.9	73.9	30.0	100	351	
Vert.	2390.000	PK	46.0	26.8	14.7	41.1	46.4	73.9	27.5	100	185	
Vert.	2400.000	PK	44.9	26.8	14.7	41.1	45.3	73.9	28.6	100	185	
Vert.	3118.112	PK	51.3	28.2	6.6	41.6	44.5	73.9	29.4	100	204	
Vert.	4804.000	PK	46.5	30.9	7.5	41.2	43.7	73.9	30.2	100	0	
Vert.	7206.000	PK	46.1	37.1	9.1	41.0	51.3	73.9	22.6	100	0	
Vert.	1603.000	AV	35.7	25.8	13.8	40.9	34.4	53.9	19.5	100	351	
Vert.	2390.000	AV	34.7	26.8	14.7	41.1	35.1	53.9	18.8	100	185	
Vert.	2400.000	AV	35.5	26.8	14.7	41.1	35.9	53.9	18.0	100	185	
Vert.	3118.112	AV	47.6	28.2	6.6	41.6	40.8	53.9	13.1	100	204	
Vert.	4804.000	AV	34.7	30.9	7.5	41.2	31.9	53.9	22.0	100	0	
Vert.	7206.000	AV	35.9	37.1	9.1	41.0	41.1	53.9	12.8	100	0	

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

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

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 24, 2013 October 25, 2013
 Temperature / Humidity 20 deg.C, 50 %RH 22 deg.C, 56 %RH
 Engineer Tatsuya Arai Tatsuya Arai
 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.	108.320	QP	36.1	11.8	7.2	32.1	23.0	43.5	20.5	159	222	
Hori.	239.769	QP	35.2	17.8	8.2	32.0	29.2	46.0	16.8	130	237	
Hori.	339.120	QP	37.8	16.8	8.8	31.9	31.5	46.0	14.5	100	240	
Hori.	959.999	QP	37.1	24.6	10.9	30.5	42.1	46.0	3.9	100	138	
Hori.	1627.000	PK	46.7	25.9	13.8	41.0	45.4	73.9	28.5	100	0	
Hori.	3118.210	PK	48.2	28.2	6.6	41.6	41.4	73.9	32.5	100	143	
Hori.	4882.000	PK	44.9	31.4	7.5	41.1	42.7	73.9	31.2	100	0	
Hori.	7323.000	PK	45.8	37.2	9.0	41.1	50.9	73.9	23.0	100	0	
Hori.	1627.000	AV	34.6	25.9	13.8	41.0	33.3	53.9	20.6	100	0	
Hori.	3118.210	AV	40.1	28.2	6.6	41.6	33.3	53.9	20.6	100	143	
Hori.	4882.000	AV	35.4	31.4	7.5	41.1	33.2	53.9	20.7	100	0	
Hori.	7323.000	AV	35.1	37.2	9.0	41.1	40.2	53.9	13.7	100	0	
Vert.	31.066	QP	44.9	17.9	6.5	32.2	37.1	40.0	2.9	100	120	
Vert.	429.165	QP	33.2	18.1	9.2	31.9	28.6	46.0	17.4	100	154	
Vert.	1627.000	PK	46.9	25.9	13.8	41.0	45.6	73.9	28.3	100	0	
Vert.	3118.210	PK	51.6	28.2	6.6	41.6	44.8	73.9	29.1	100	211	
Vert.	4882.000	PK	46.2	31.4	7.5	41.1	44.0	73.9	29.9	100	0	
Vert.	7323.000	PK	45.7	37.2	9.0	41.1	50.8	73.9	23.1	100	0	
Vert.	1627.000	AV	34.2	25.9	13.8	41.0	32.9	53.9	21.0	100	0	
Vert.	3118.210	AV	46.7	28.2	6.6	41.6	39.9	53.9	14.0	100	211	
Vert.	4882.000	AV	35.5	31.4	7.5	41.1	33.3	53.9	20.6	100	0	
Vert.	7323.000	AV	35.2	37.2	9.0	41.1	40.3	53.9	13.6	100	0	

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

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

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 24, 2013 October 25, 2013
 Temperature / Humidity 20 deg.C, 50 %RH 22 deg.C, 56 %RH
 Engineer Tatsuya Arai Tatsuya Arai
 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.	107.864	QP	36.2	11.8	7.2	32.1	23.1	43.5	20.4	154	220	
Hori.	240.023	QP	37.0	17.8	8.2	32.0	31.0	46.0	15.0	120	231	
Hori.	338.439	QP	35.8	16.8	8.8	31.9	29.5	46.0	16.5	100	239	
Hori.	959.999	QP	37.7	24.6	10.9	30.5	42.7	46.0	3.3	100	122	
Hori.	1653.000	PK	46.7	25.9	13.9	41.0	45.5	73.9	28.4	100	0	
Hori.	2483.500	PK	45.4	26.9	14.8	41.0	46.1	73.9	27.8	100	186	
Hori.	3118.152	PK	47.8	28.2	6.6	41.6	41.0	73.9	32.9	100	166	
Hori.	4960.000	PK	44.2	31.8	7.5	41.1	42.4	73.9	31.5	100	0	
Hori.	7440.000	PK	46.1	37.4	9.0	41.1	51.4	73.9	22.5	100	0	
Hori.	1653.000	AV	34.8	25.9	13.9	41.0	33.6	53.9	20.3	100	0	
Hori.	2483.500	AV	34.4	26.9	14.8	41.0	35.1	53.9	18.8	100	186	
Hori.	3118.152	AV	41.2	28.2	6.6	41.6	34.4	53.9	19.5	100	166	
Hori.	4960.000	AV	34.9	31.8	7.5	41.1	33.1	53.9	20.8	100	0	
Hori.	7440.000	AV	35.7	37.4	9.0	41.1	41.0	53.9	12.9	100	0	
Vert.	31.012	QP	45.2	17.9	6.5	32.2	37.4	40.0	2.6	100	149	
Vert.	430.430	QP	34.5	18.1	9.2	31.9	29.9	46.0	16.1	100	140	
Vert.	1653.000	PK	45.3	25.9	13.9	41.0	44.1	73.9	29.8	100	0	
Vert.	2483.500	PK	43.8	26.9	14.8	41.0	44.5	73.9	29.4	100	154	
Vert.	3118.152	PK	52.1	28.2	6.6	41.6	45.3	73.9	28.6	100	198	
Vert.	4960.000	PK	44.6	31.8	7.5	41.1	42.8	73.9	31.1	100	0	
Vert.	7440.000	PK	46.5	37.4	9.0	41.1	51.8	73.9	22.1	130	0	
Vert.	1653.000	AV	34.1	25.9	13.9	41.0	32.9	53.9	21.0	100	0	
Vert.	2483.500	AV	34.3	26.9	14.8	41.0	35.0	53.9	18.9	100	154	
Vert.	3118.152	AV	47.4	28.2	6.6	41.6	40.6	53.9	13.3	100	198	
Vert.	4960.000	AV	35.0	31.8	7.5	41.1	33.2	53.9	20.7	100	0	
Vert.	7440.000	AV	35.8	37.4	9.0	41.1	41.1	53.9	12.8	130	0	

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

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

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

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

Telephone : +81 463 50 6400

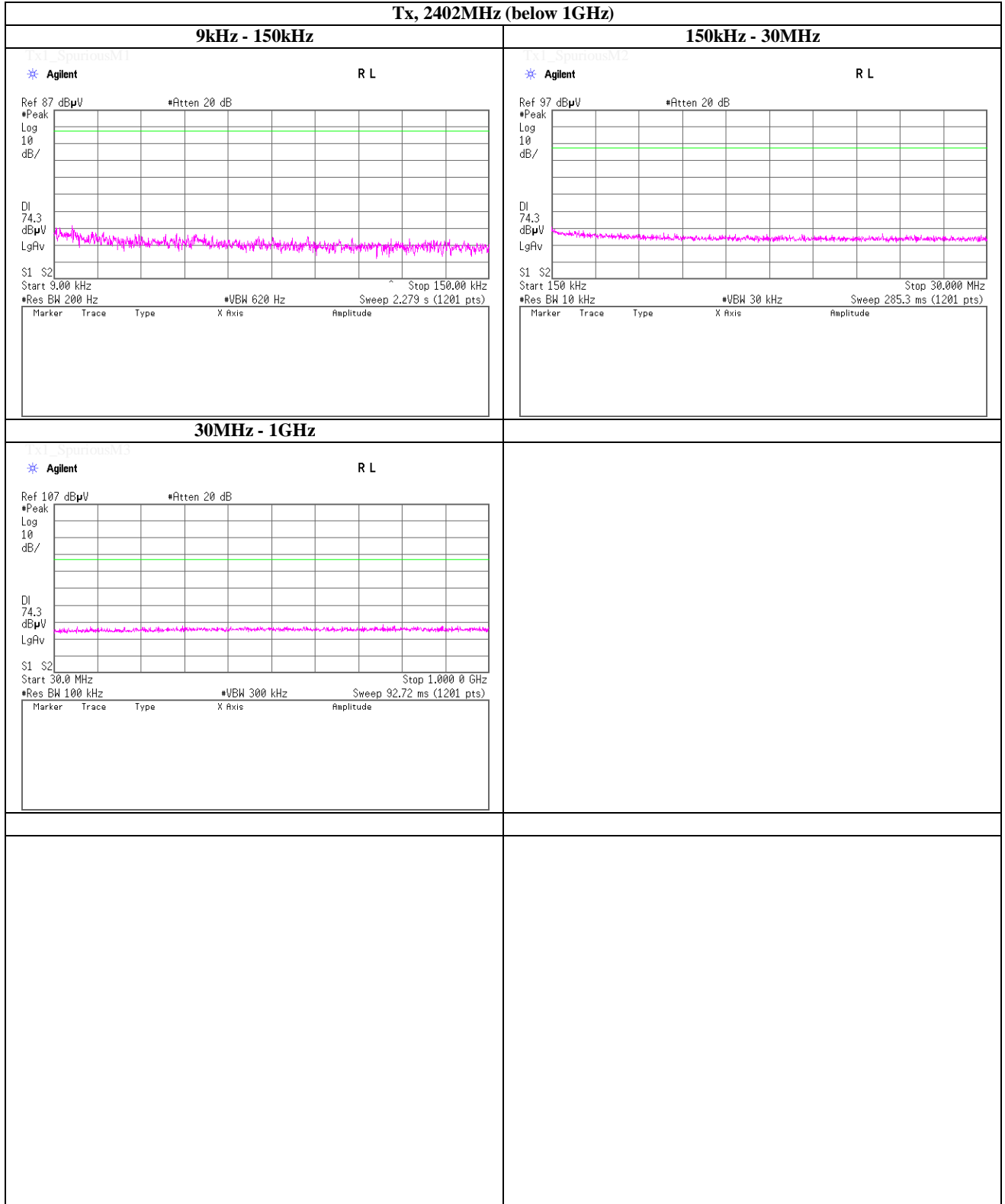
Facsimile : +81 463 50 6401

Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date: October 24, 2013
 Temperature / Humidity: 26 deg.C , 40 %RH
 Engineer: Tatsuya Arai

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

Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room

Date: October 24, 2013

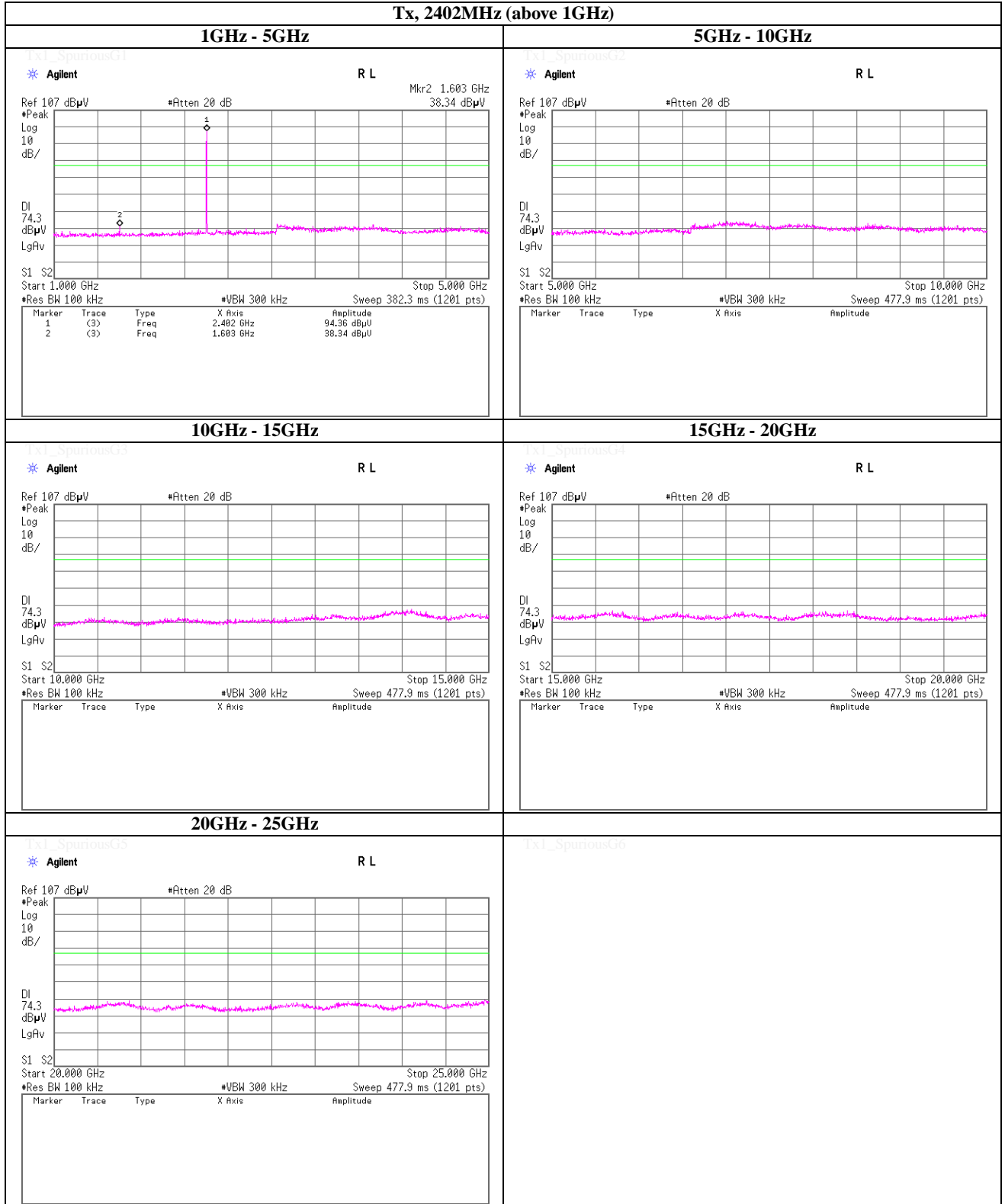
Temperature / Humidity: 26 deg.C , 40 %RH

Engineer: Tatsuya Arai

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

Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date: October 24, 2013
 Temperature / Humidity: 26 deg.C , 40 %RH
 Engineer: Tatsuya Arai

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

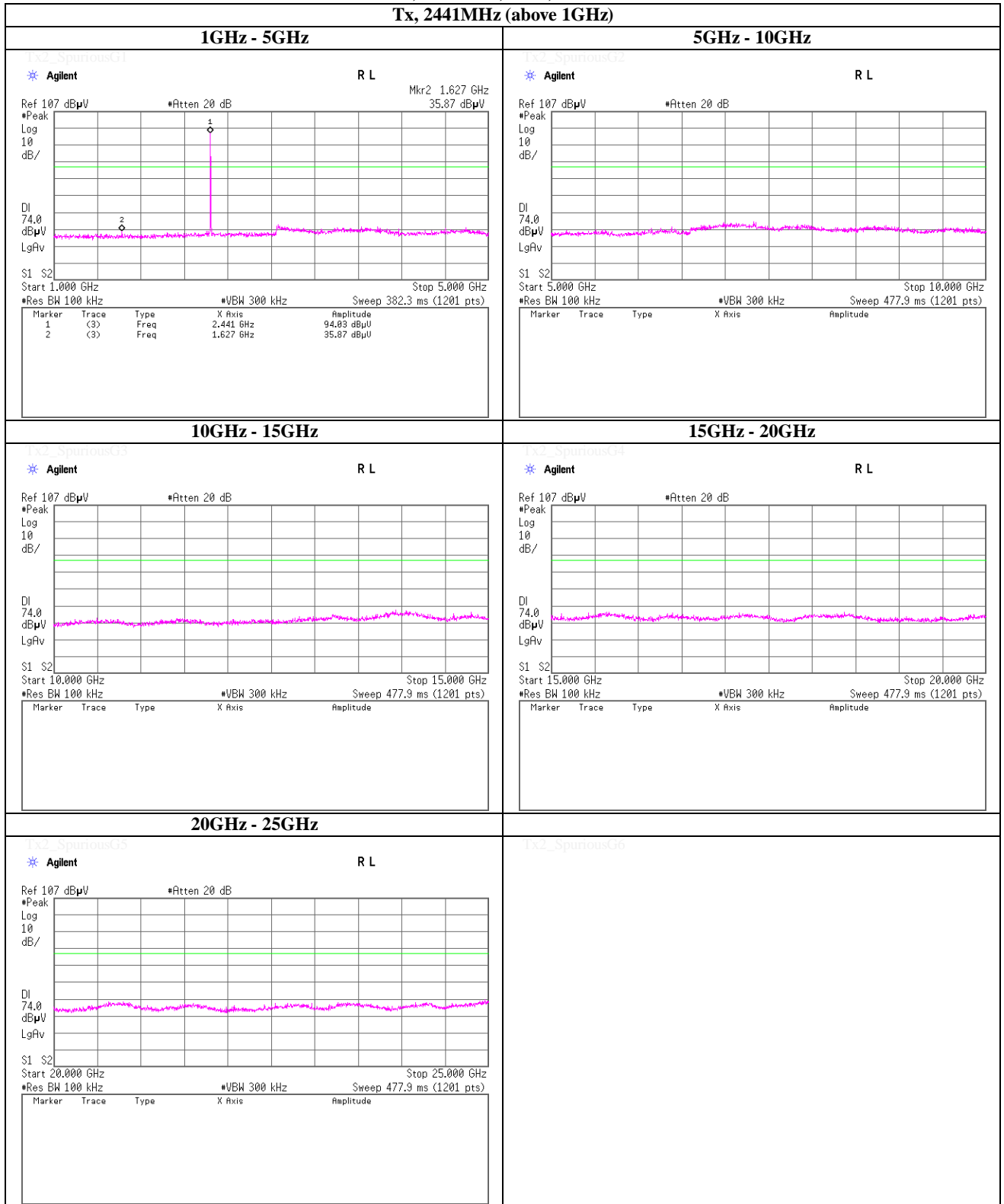
Facsimile : +81 463 50 6401

Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date: October 24, 2013
 Temperature / Humidity: 26 deg.C , 40 %RH
 Engineer: Tatsuya Arai

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (above 1GHz)



Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room

Date: October 24, 2013

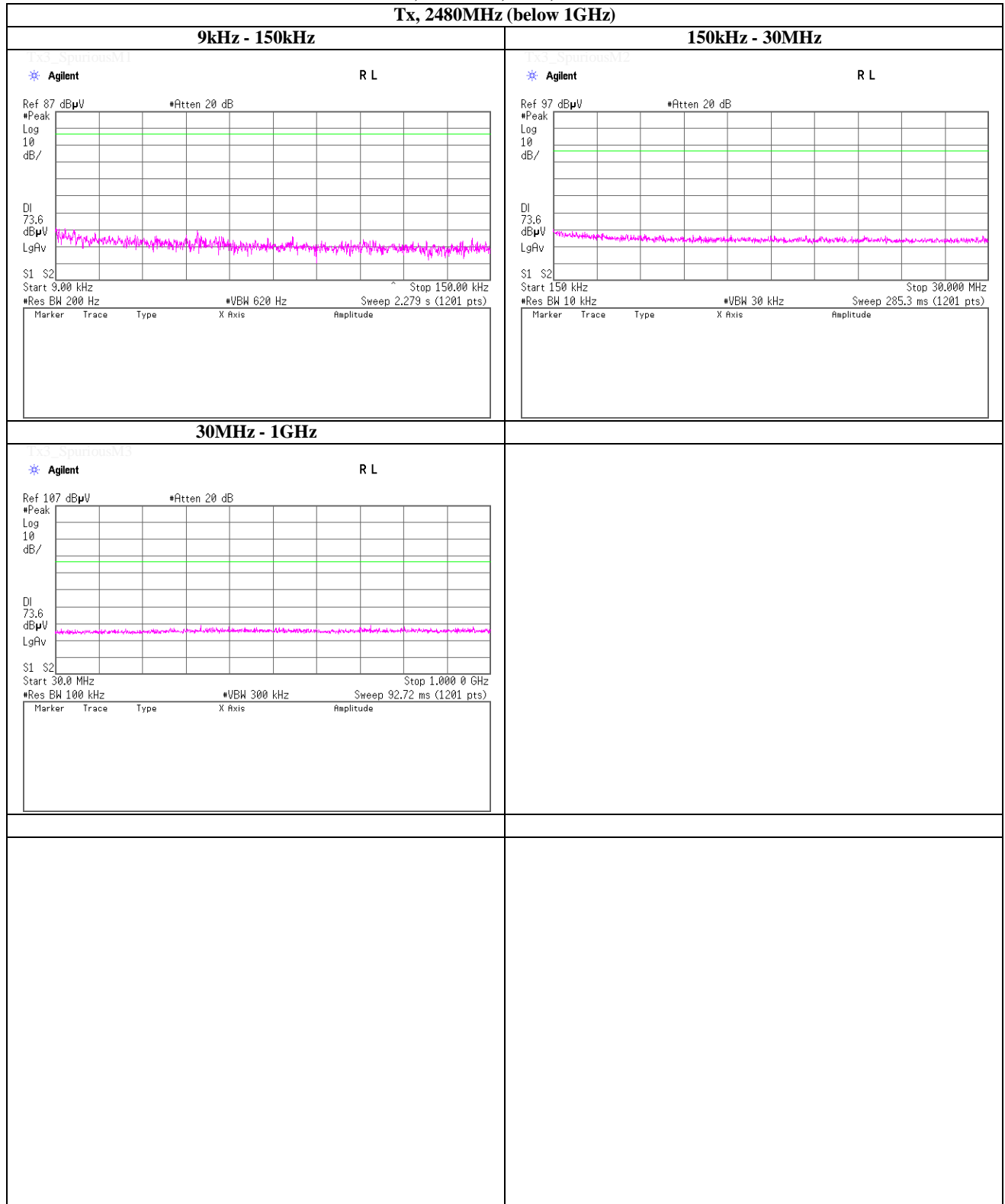
Temperature / Humidity: 26 deg.C , 40 %RH

Engineer: Tatsuya Arai

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

Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room

Date: October 24, 2013

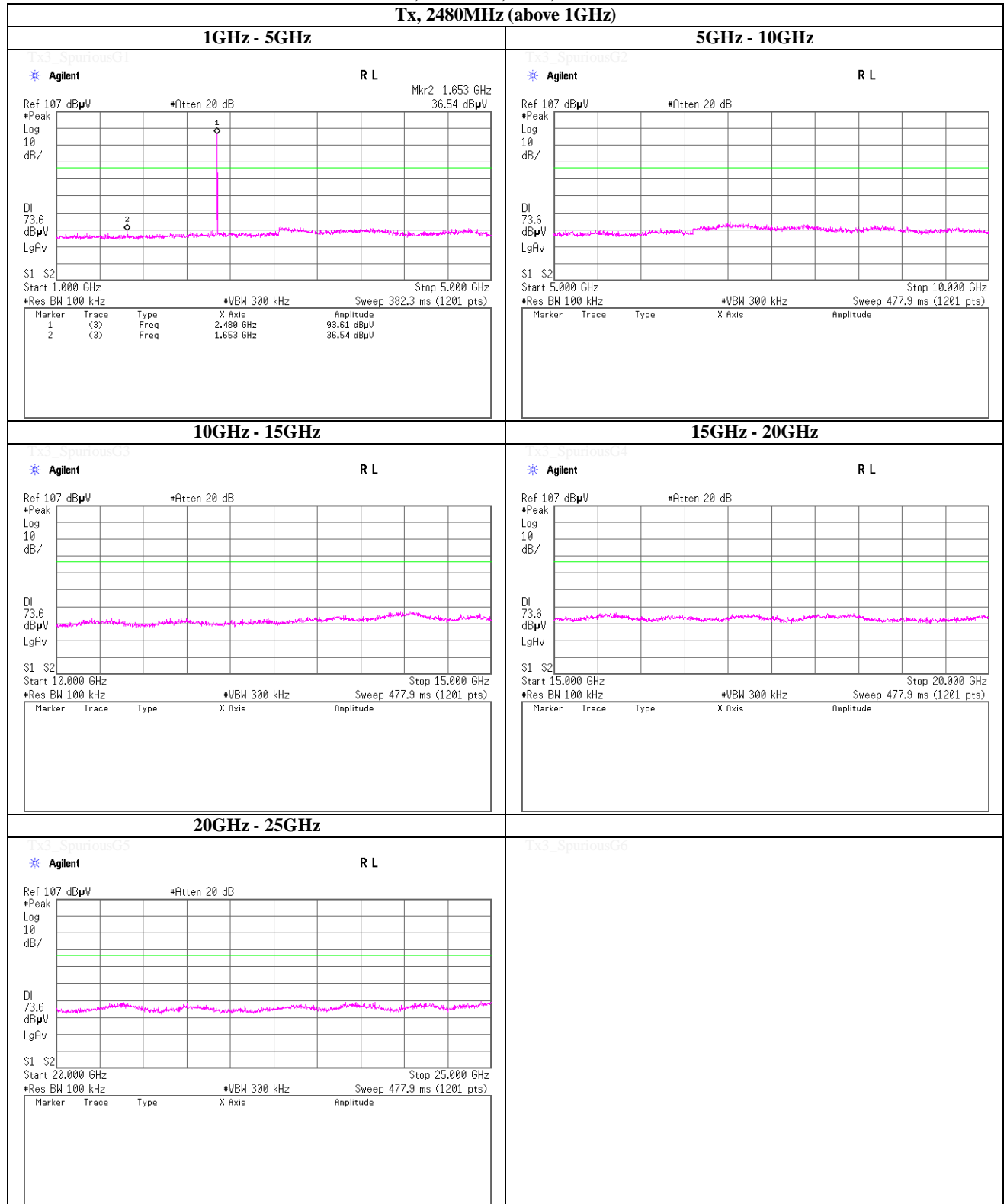
Temperature / Humidity: 26 deg.C , 40 %RH

Engineer: Tatsuya Arai

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

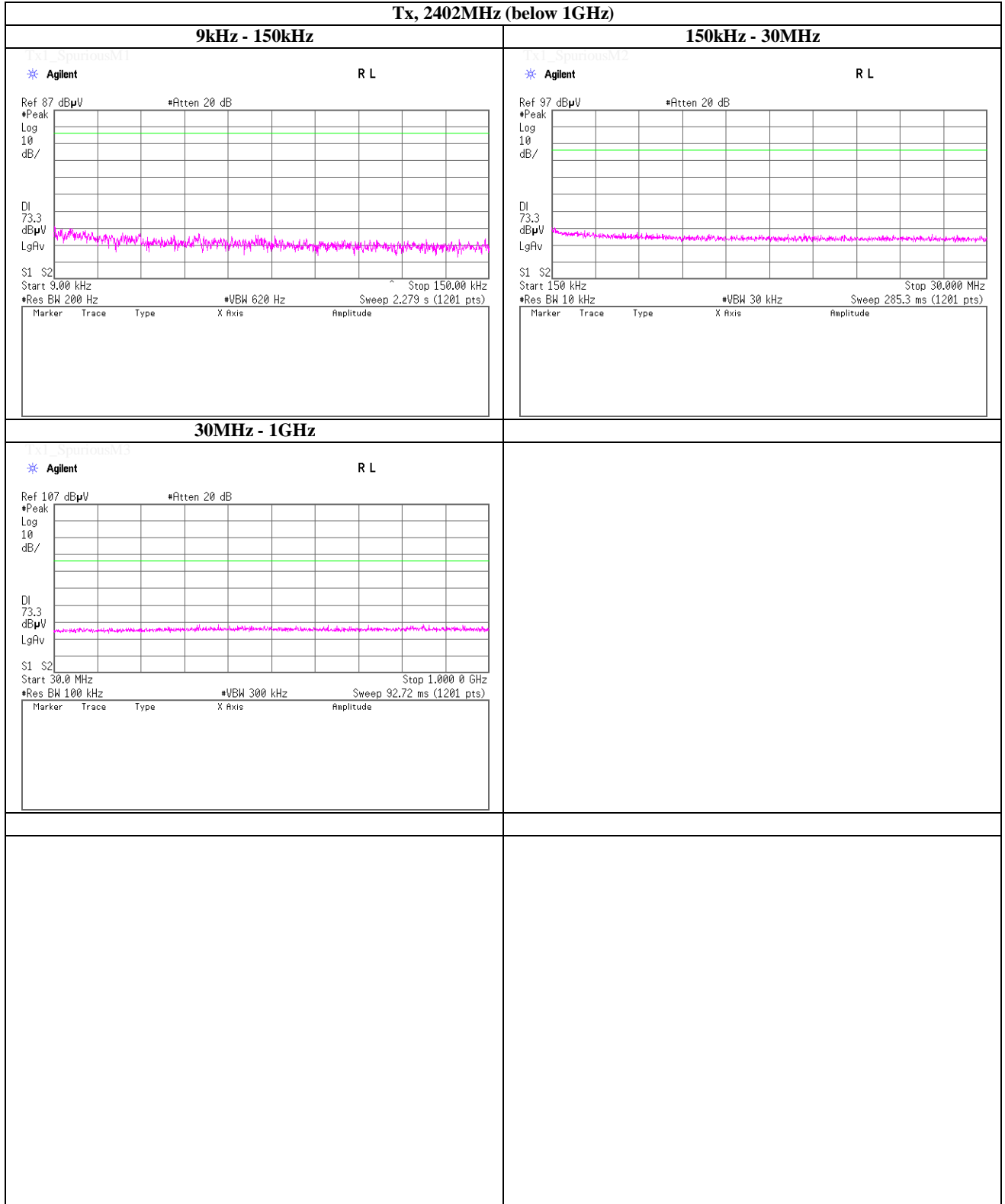
Facsimile : +81 463 50 6401

Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date: October 24, 2013
 Temperature / Humidity: 26 deg.C , 40 %RH
 Engineer: Tatsuya Arai

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

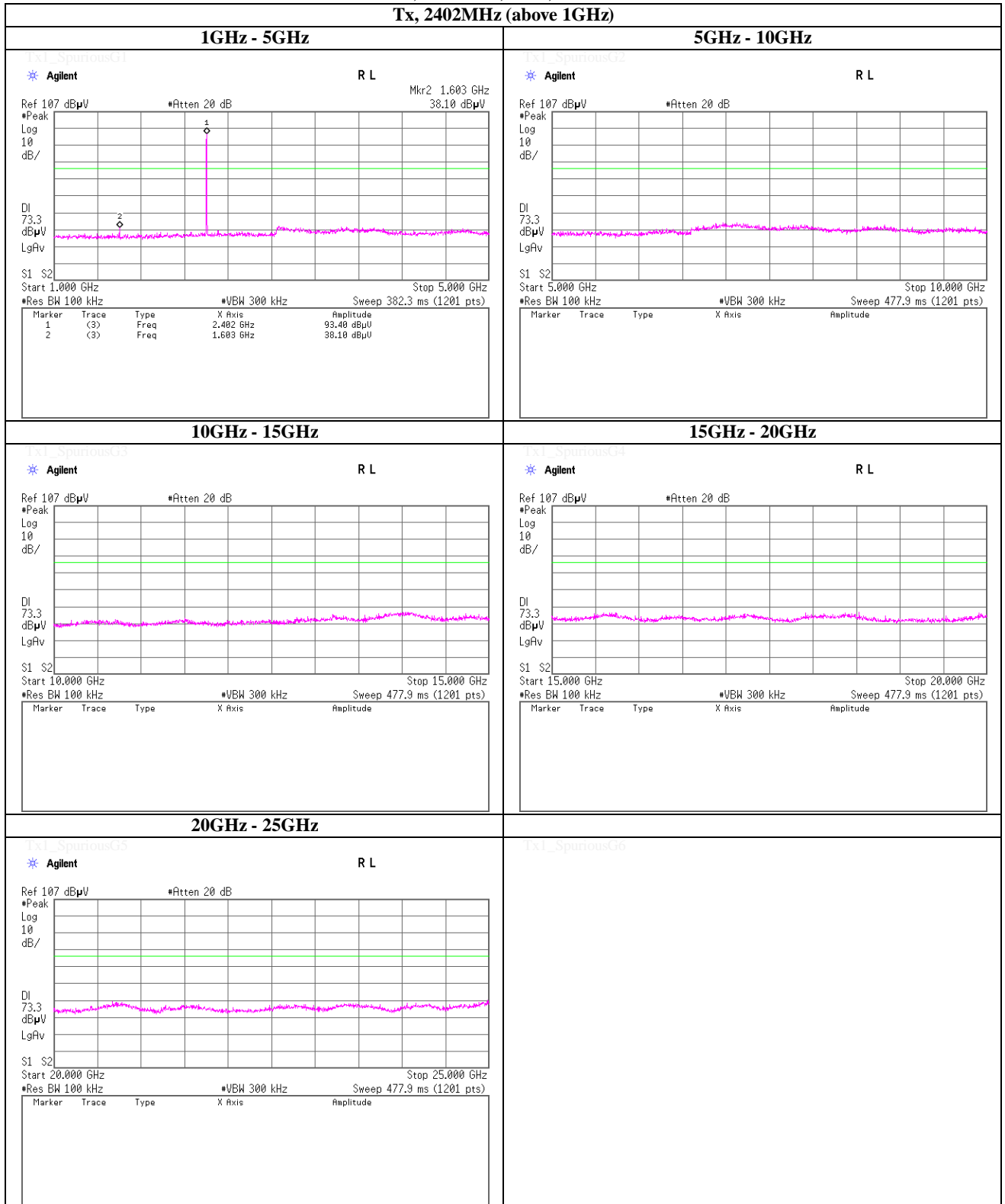
Facsimile : +81 463 50 6401

Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date: October 24, 2013
 Temperature / Humidity: 26 deg.C , 40 %RH
 Engineer: Tatsuya Arai

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (above 1GHz)



Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room

Date: October 24, 2013

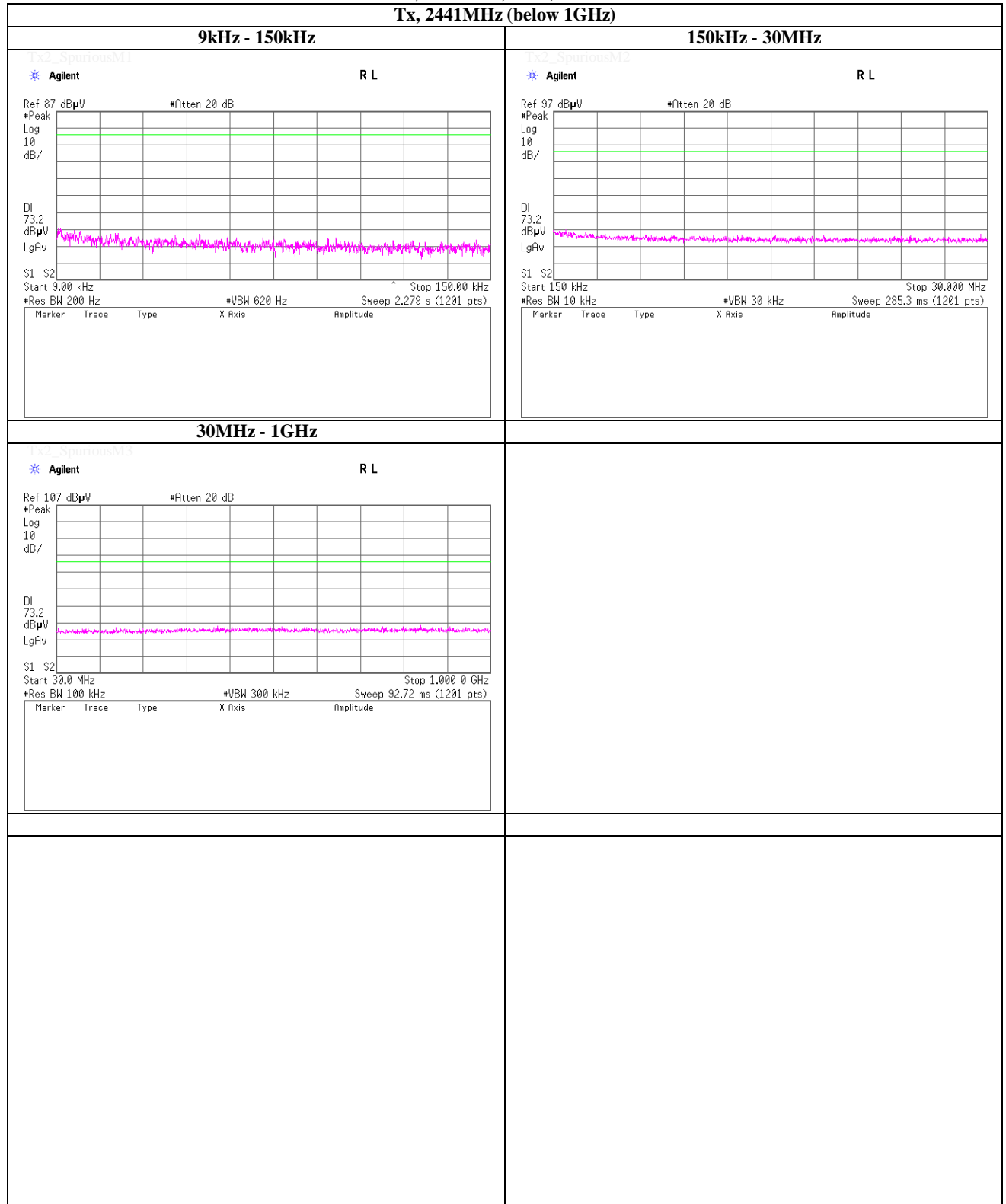
Temperature / Humidity: 26 deg.C , 40 %RH

Engineer: Tatsuya Arai

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

Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room

Date: October 24, 2013

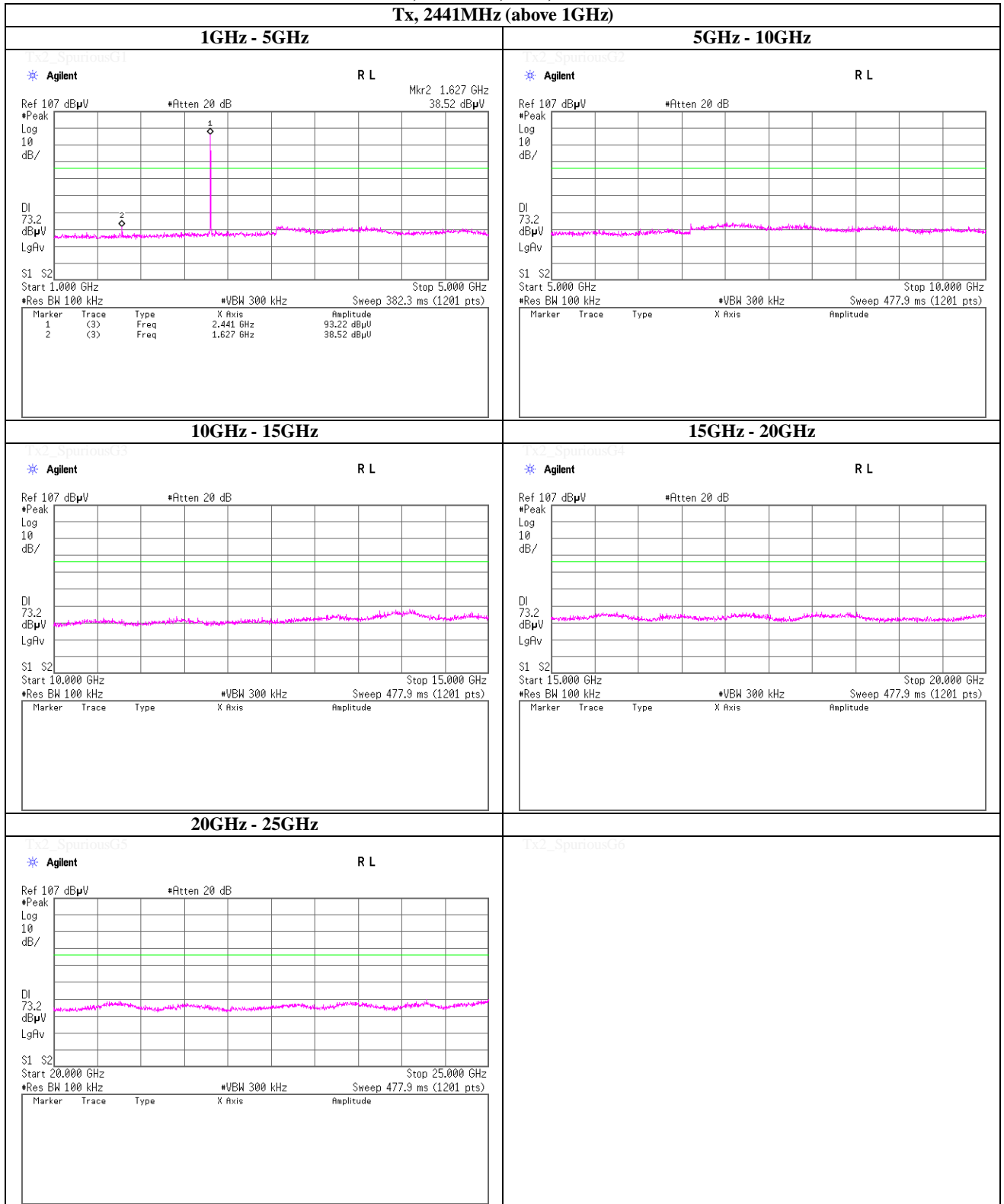
Temperature / Humidity: 26 deg.C , 40 %RH

Engineer: Tatsuya Arai

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

Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room

Date: October 24, 2013

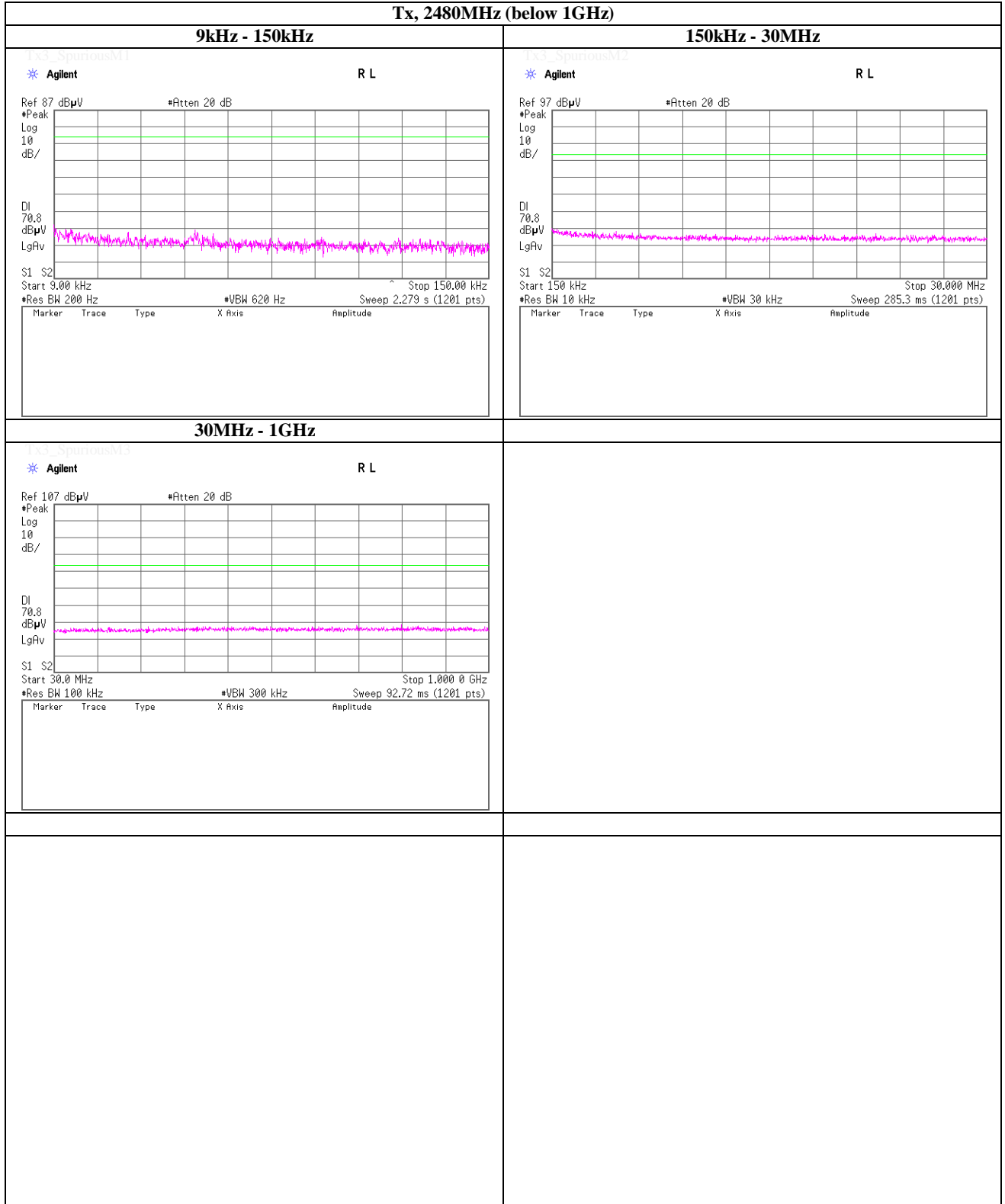
Temperature / Humidity: 26 deg.C , 40 %RH

Engineer: Tatsuya Arai

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

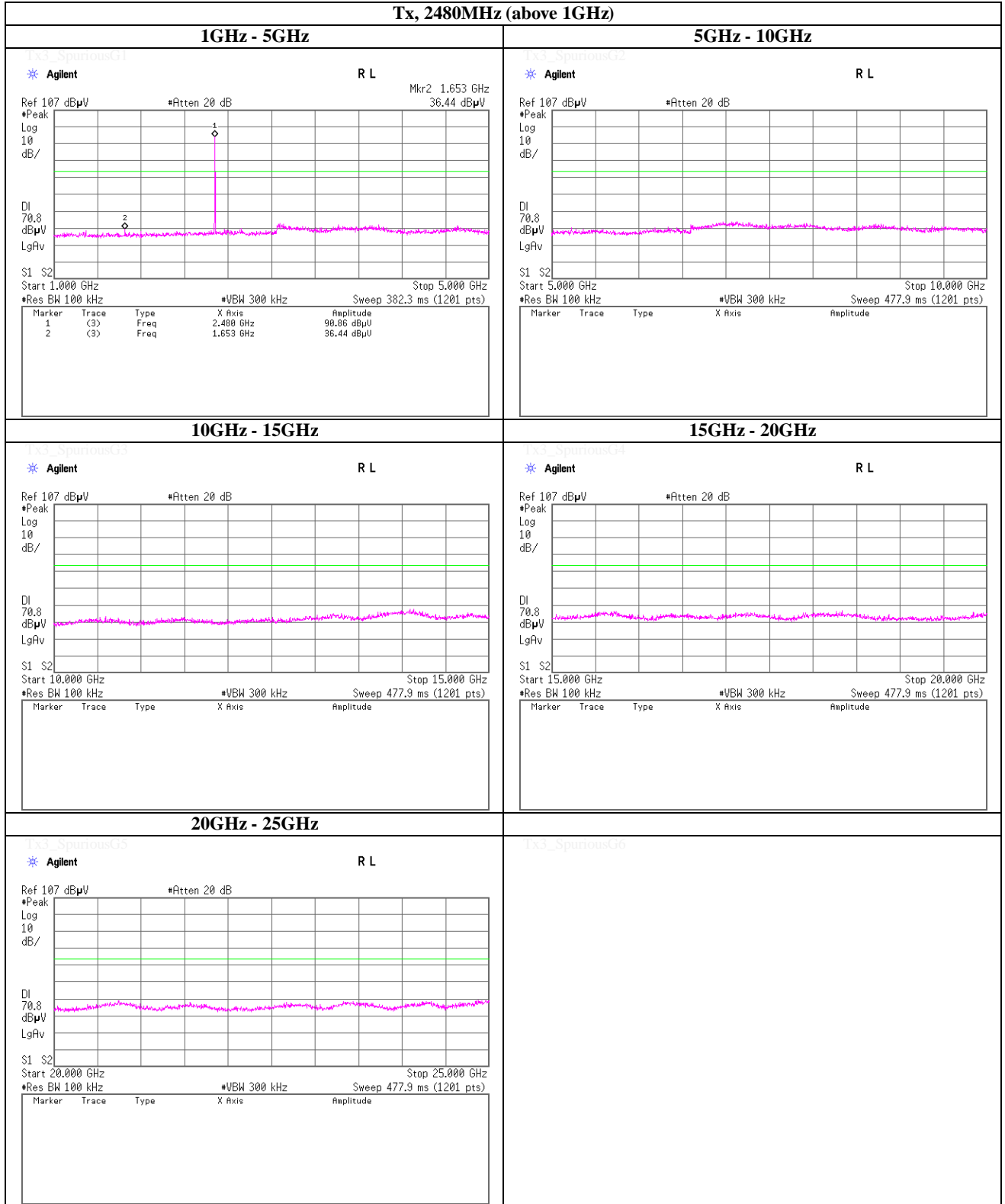
Facsimile : +81 463 50 6401

Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date: October 24, 2013
 Temperature / Humidity: 26 deg.C , 40 %RH
 Engineer: Tatsuya Arai

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

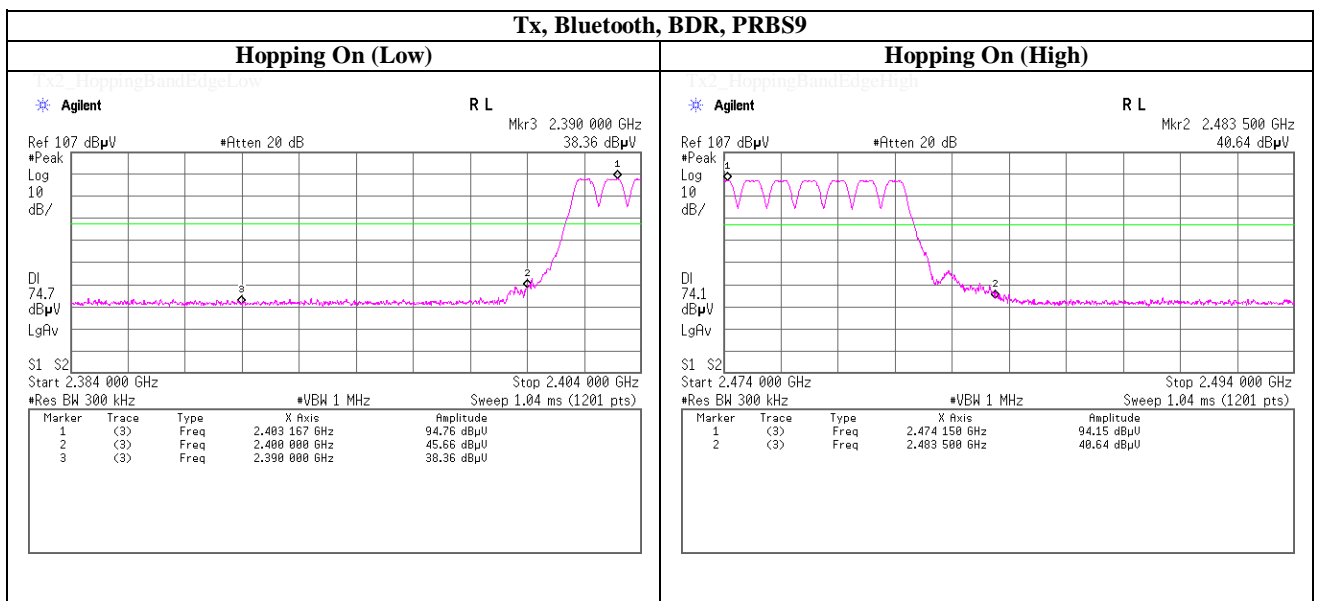
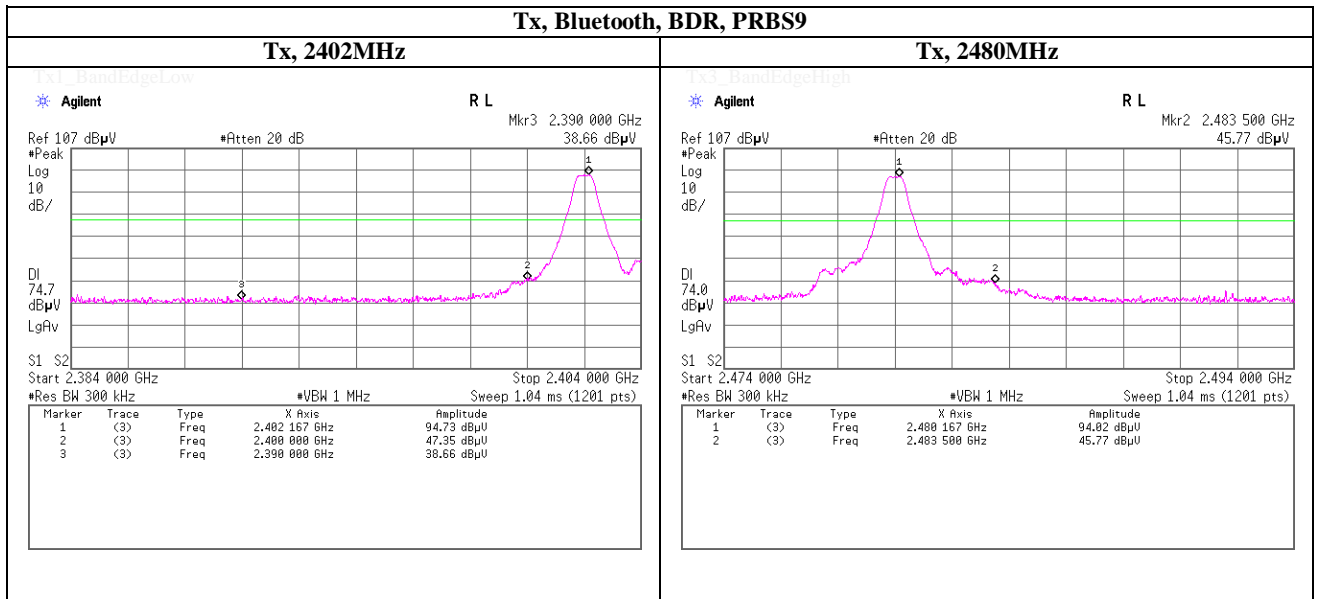
Tx, 2480MHz (above 1GHz)



Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date: October 24, 2013
 Temperature / Humidity: 26 deg.C , 40 %RH
 Engineer: Tatsuya Arai

Spurious emission (Conducted)

Band Edge compliance



Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room

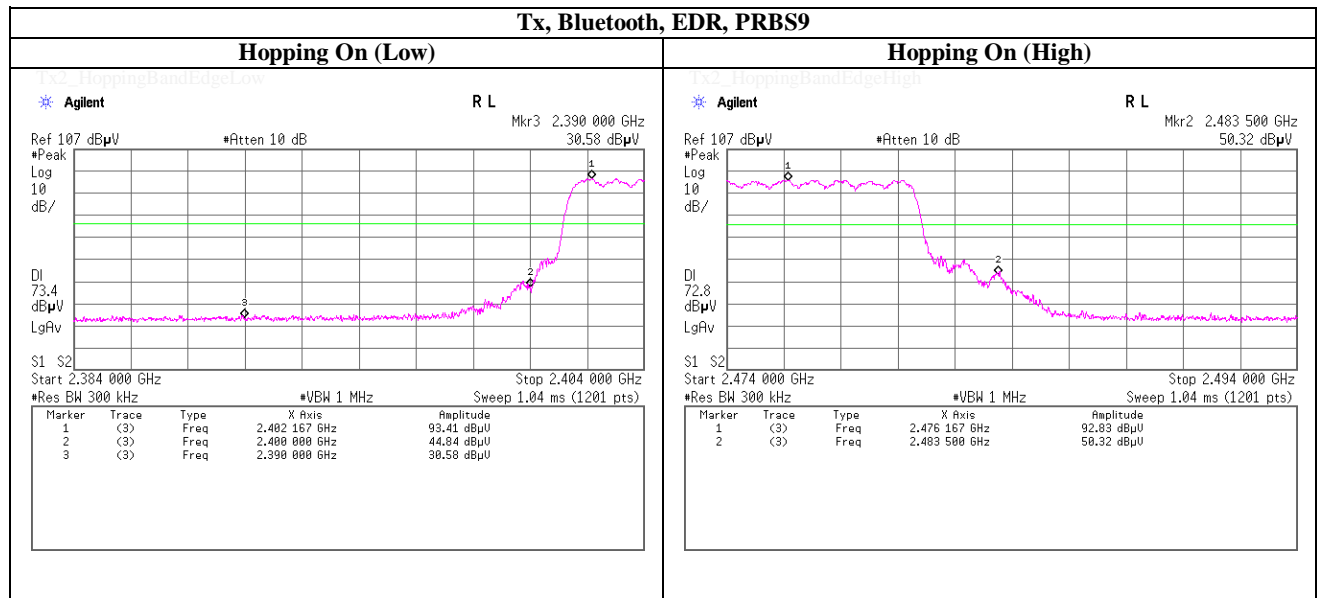
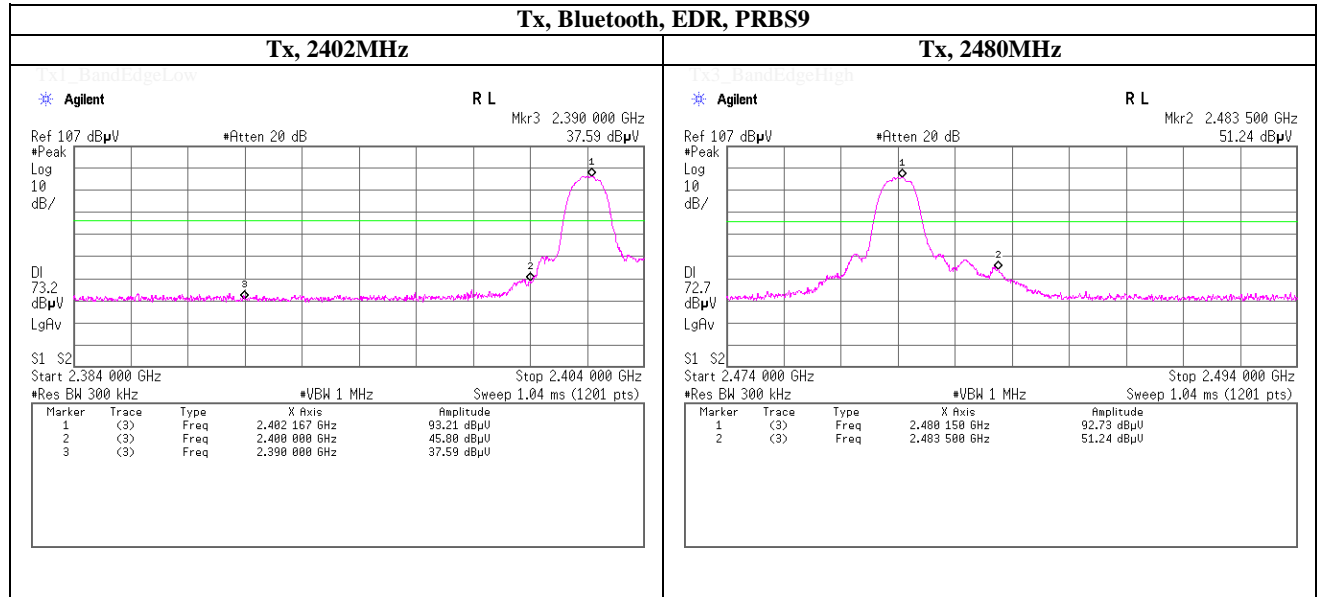
Date: October 24, 2013

Temperature / Humidity: 26 deg.C , 40 %RH

Engineer: Tatsuya Arai

Spurious emission (Conducted)

Band Edge compliance



UL Japan, Inc.

Shonan EMC Lab.

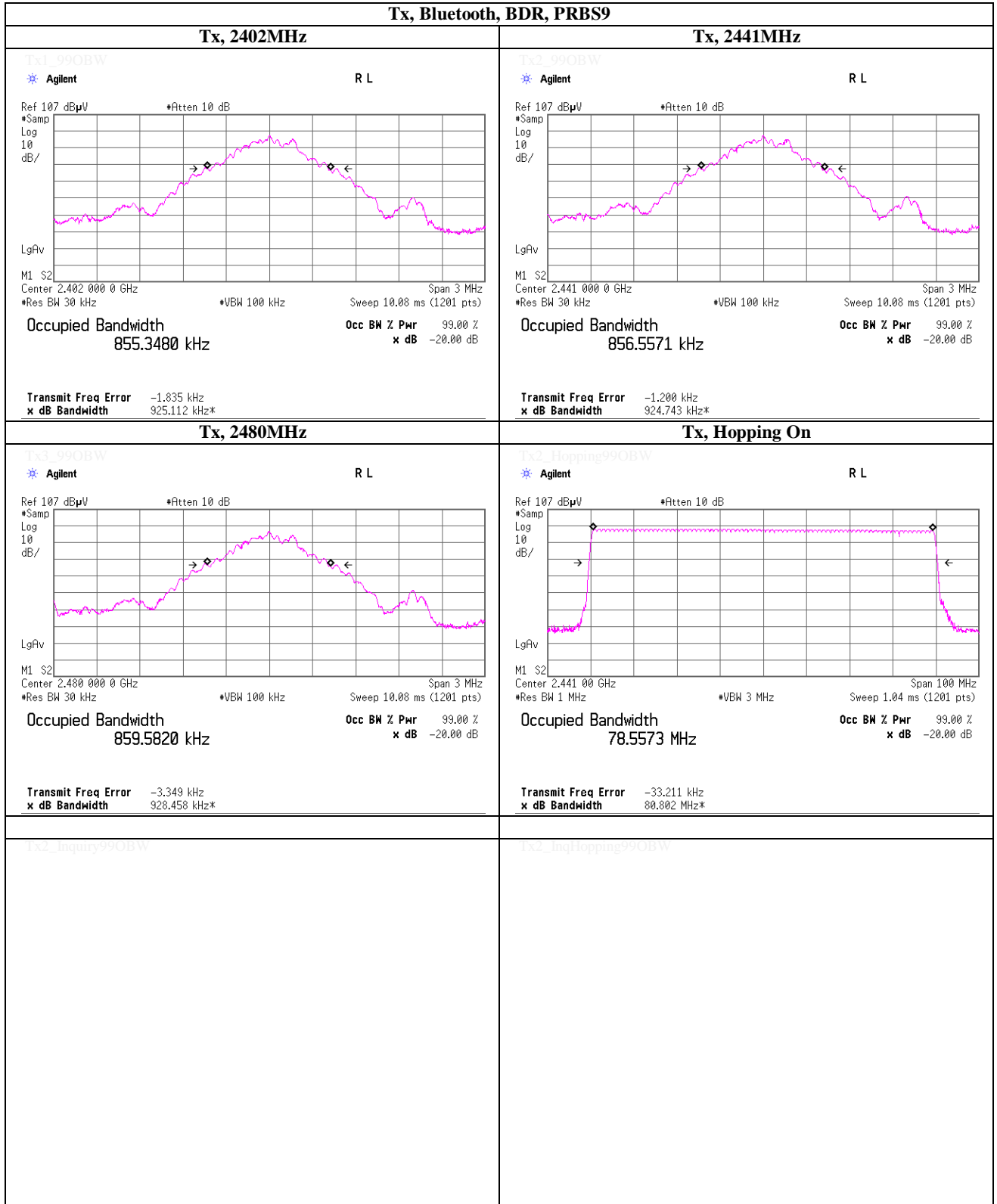
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Test place: UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date: October 24, 2013
 Temperature / Humidity: 26 deg.C , 40 %RH
 Engineer: Tatsuya Arai

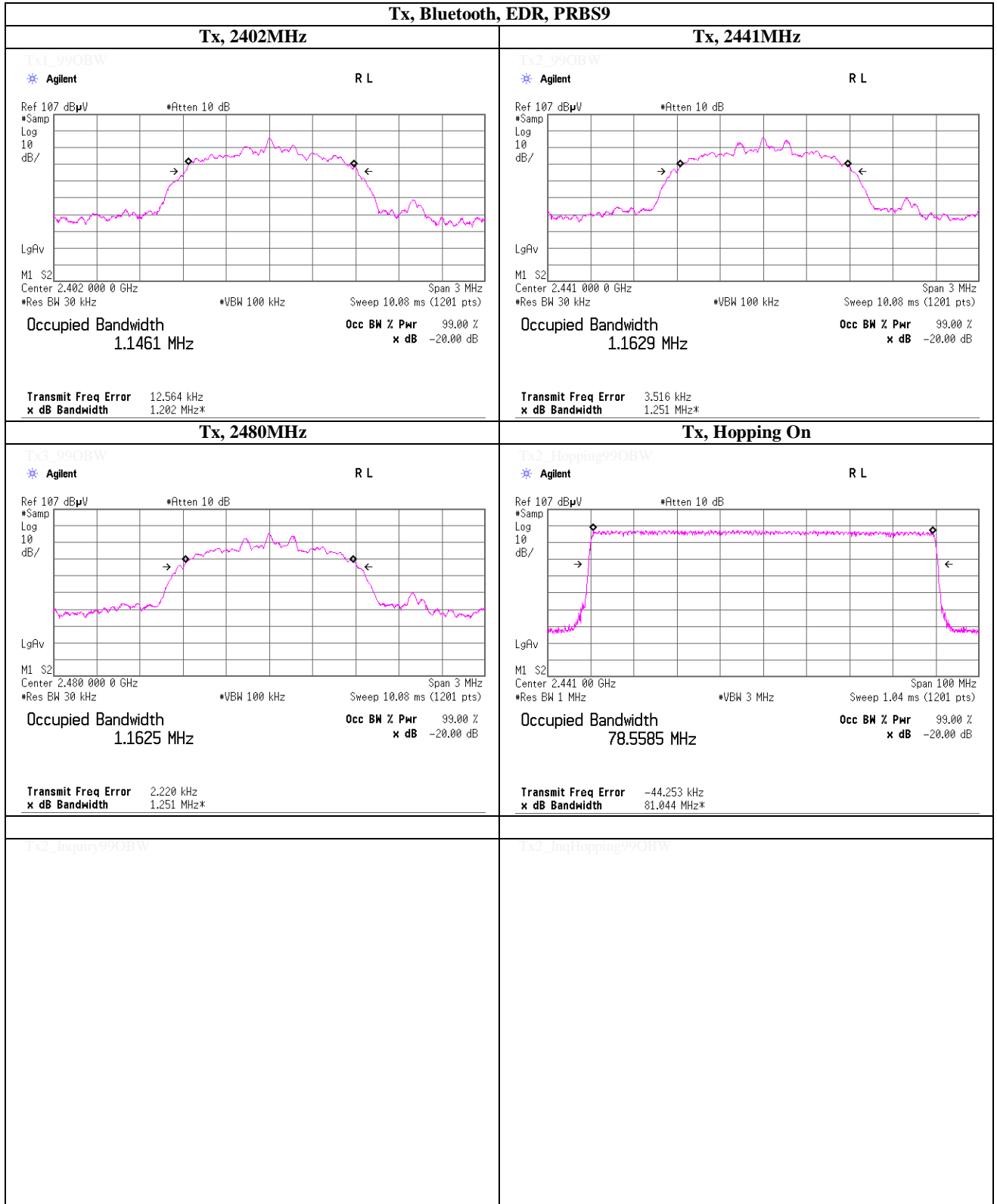
99% Occupied Bandwidth



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.1 Measurement Room
 Date: October 24, 2013
 Temperature / Humidity: 26 deg.C , 40 %RH
 Engineer: Tatsuya Arai

99% Occupied Bandwidth



APPENDIX 2 Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2013/04/09 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2013/04/09 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2013/01/08 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2013/03/04 * 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2013/04/25 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2013/03/16 * 12
SAT10-11	Attenuator	Weinschel Corp.	54A-10	37588	AT	2013/04/09 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2013/02/12 * 12
SAT6-06	Attenuator	JFW	50HF-006N	-	RE	2013/02/12 * 12
KBA-03	Biconical Antenna	Schwarzbeck	BBA9106	1926	RE	2012/11/18 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2013/04/03 * 12
KLA-06	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	125	RE	2012/11/18 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2013/02/27 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2013/02/27 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE	-
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2013/07/09 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFLMF)	-	RE	-
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
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2013/03/04 * 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: Out of Band Emission (Radiated)

AT: Antenna terminal conducted test