



Test report No. : 10103669S-A
Page : 1 of 50
Issued date : November 28, 2013
Revised date : December 20, 2013
FCC ID : AK8MEXGS610BT

RADIO TEST REPORT

Test Report No.: 10103669S-A

Applicant : Sony Corporation
Type of Equipment : Bluetooth Audio System
Model No. : MEX-GS610BT
FCC ID : AK8MEXGS610BT
Test regulation : FCC Part15 Subpart C: 2013
Test result : Complied

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Date of test: November 16 to 18 and December 5, 2013

Tested by:

T. Arai

Tatsuya Arai
Engineer of WiSE Japan,
UL Verification Service

Approved by :

T. Imamura

Toyokazu Imamura
Leader of WiSE Japan,
UL Verification Service



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

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13-EM-F0429

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SECTION 1: Customer information

Company Name : Sony Corporation
Address : Sony City Osaki, 2-10-1 Osaki, Shinagawa-ku, Tokyo 141-8610 Japan
Telephone Number : +81 50 3750 7634
Facsimile Number : +81 50 3750 6574
Contact Person : Toshihiro Maeda

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

2.1 Identification of E.U.T.

Type of Equipment : Bluetooth Audio System
Model Number : MEX-GS610BT
Serial Number : Refer to 4.2 of this report.
Rating : DC12V (car battery)
Country of Mass-production : Thailand
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample : November 15, 2013
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: MEX-GS610BT (referred to as the EUT in this report) is a Bluetooth Audio System.

Clock frequency(ies) in the system : 48.000MHz, 36.480MHz, 26.000MHz, 16.9344MHz, 13.333MHz,
32.768kHz

Bluetooth specification:

Equipment type : Transceiver
Frequency of operation : 2402-2480MHz
Bandwidth & channel spacing : 79MHz & 1MHz
Type of modulation : FHSS
Operation temperature range : -20 to +60 deg.C.
Antenna type : Meander Monopole
Antenna connector type : U-FL Type Interchangeability
Antenna gain : 0.929dBi (Peak)
ITU code : F1D, G1D

FCC 15.31 (e)

The equipment provides the wireless transmitter with stable power supply (DC3.3V). 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.

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SECTION 3: Test specification, procedures & results

3.1 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 EUT has been tested for compliance with FCC Part 15 Subpart B. Refer to the test report 10103669S-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		10.0dB Freq.: 1920.128MHz Polarization: Horizontal Detection: Average Mode: Tx 2402MHz&2441MHz, DH5	Complied

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

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

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3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2009 13. Measurement of intentional radiators, RSS-Gen 4.6.1	-	Conducted	-	-

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

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

3.4 Uncertainty

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

Item	Frequency range	No.1 SAC*1/SR*2 (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.7 dB	3.7 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%

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Facsimile: +81 463 50 6401

3.5 Test location

UL Japan, Inc. Shonan EMC Lab.

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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
<input checked="" type="checkbox"/> No.1 semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input checked="" type="checkbox"/> No.2 semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
<input type="checkbox"/> No.3 semi-anechoic chamber	697847	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 checked="" 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 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.

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SECTION 4: Operation of E.U.T. during testing

4.1 Operating mode

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

Software: Blue Suite ver.2.5.0, BlueTest3 ver.2.5.0.93
BtCli ver.2.5.0.93 (Inquiry mode only)

Power Settings: BDR: Ext PA: 23, Int PA: 39
EDR: Ext PA: 73, Int PA: 48

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

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

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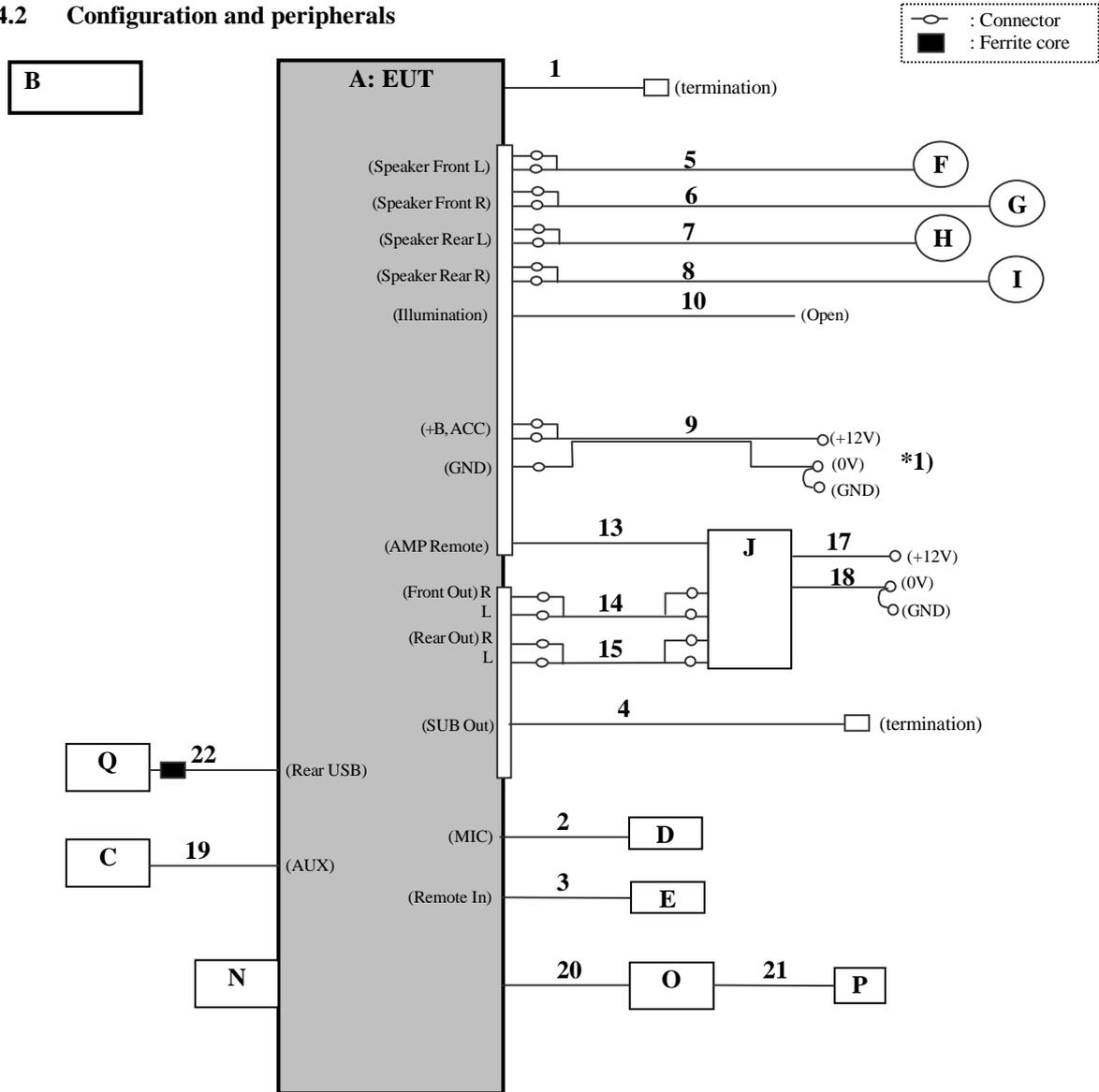
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4.2 Configuration and peripherals



* 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.

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Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Bluetooth Audio System	MEX-GS610BT	*2)	Sony	EUT
B	Remote Commander	RM-X231	-	Sony	-
C	Media Player	NWZ-A829	1000200	Sony	-
D	MIC	-	-	Sony	-
E	Wired Remote Controller	RM-X2S	-	Sony	-
F	Speaker 1	XS-GTF1338	-	Sony	-
G	Speaker 2	XS-GTF1338	-	Sony	-
H	Speaker 3	XS-GTF1338	-	Sony	-
I	Speaker 4	XS-GTF1338	-	Sony	-
J	Stereo Power Amplifier	XM-4S	-	Sony	-
N	USB Memory	USM4GL	-	Sony	-
O	Sirius XM tuner	SXV100	REG004RR	Sirius	-
P	Antenna for Sirius XM tuner	XVANT1	1046	Sirius	-
Q	USB Memory	USM4GL	-	Sony	-

*2) 90: Antenna terminal conducted tests, 51: Radiated emission tests

List of cables used

No.	Name	Length (m)	Shield- Cable	Shield- Connector	Remarks
1	FM antenna	2.0	Shielded	Shielded	-
2	MIC	4.0	Shielded	Shielded	-
3	REMOTE IN	1.9	Shielded	Shielded	-
4	Audio OUT(SUB)	0.45	Shielded	Shielded	-
5	Speaker (1)	0.15+2.1	Unshielded	Unshielded	-
6	Speaker (2)	0.15+2.1	Unshielded	Unshielded	-
7	Speaker (3)	0.15+2.1	Unshielded	Unshielded	-
8	Speaker (4)	0.15+2.1	Unshielded	Unshielded	-
9	DC Power	0.15+1.0	Unshielded	Unshielded	-
10	Illumination	0.15+1.9	Unshielded	Unshielded	-
13	AMP Remote	0.15+1.6	Unshielded	Unshielded	-
14	RCA (Front Audio Out)	0.1+5.0	Shielded	Shielded	-
15	RCA (Rear Audio Out)	0.1+5.0	Shielded	Shielded	-
17	DC Power (+)	1.0	Unshielded	Unshielded	-
18	DC Power (-)	1.0	Unshielded	Unshielded	-
19	Audio	1.5	Shielded	Shielded	-
20	XM tuner	0.6	Shielded	Shielded	-
21	Antenna	7.0	Shielded	Shielded	-
22	USB	1.5	Shielded	Shielded	-

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SECTION 5: Carrier frequency separation

Test procedure

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

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

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

Test procedure

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

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

SECTION 7: Number of hopping frequency

Test procedure

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

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

SECTION 8: Dwell time

Test procedure

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

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

SECTION 9: Maximum peak output power

Test procedure

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

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

SECTION 10: Spurious emissions (Antenna port conducted)

Test procedure

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

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.

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SECTION 11: Radiated emission

11.1 Operating environment

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

11.2 Test configuration

EUT was placed on a platform of nominal size, 1.0m by 2.0m, raised 0.8m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Photographs of the set up are shown in APPENDIX 3.

11.3 Test conditions

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

11.4 Test procedure

The Radiated Electric Field Strength intensity has been measured on a semi-anechoic chamber with a ground plane and at a distance of 3m (below 15GHz) / 1m (above 15GHz) (Refer to Figure 1). Measurements were performed with quasi-peak, peak and average detector. The measuring antenna height was varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

The radiated emission measurements were made with the following detection.

Frequency	30 - 1000MHz	1 - 25GHz	
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 mounting angle of 0 to +45 deg (lengthwise direction) and -45 to +45 deg (crosswise direction) 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.

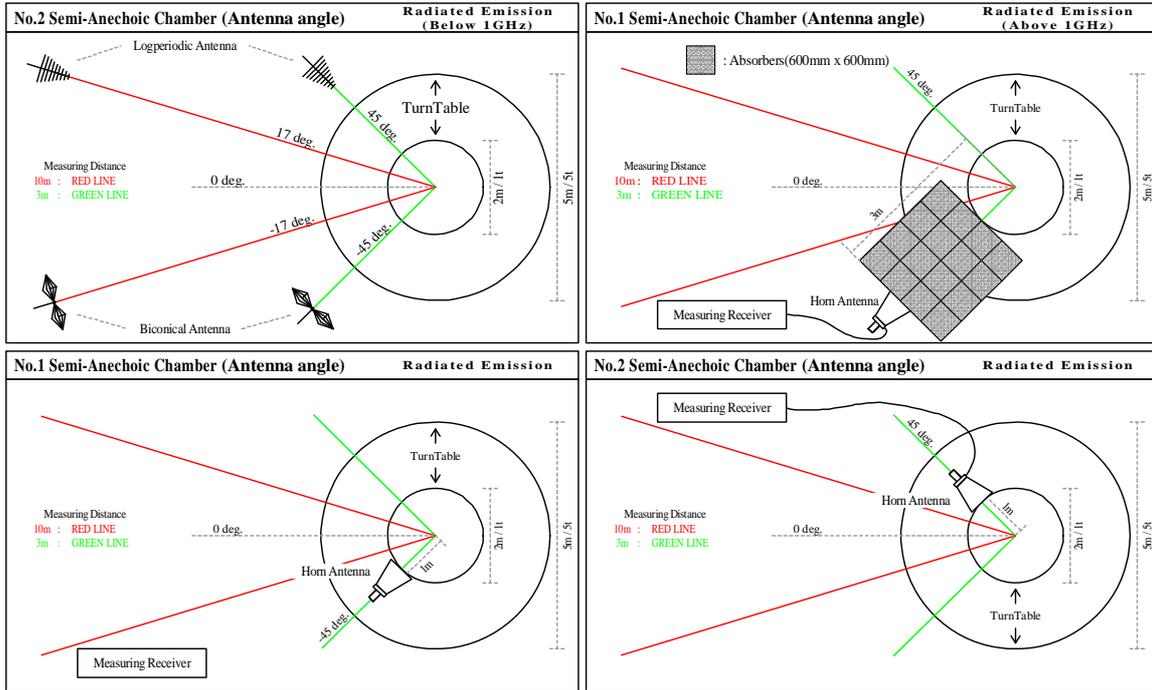
Antenna polarization \ Test item		Carrier	Spurious emission (Below 1GHz)	Spurious emission (1-15GHz)	Spurious emission (Above 15GHz)
Horizontal	Lengthwise	45 deg.	0 deg.	0 deg.	0 deg.
	Crosswise	0 deg.	0 deg.	0 deg.	0 deg.
Vertical	Lengthwise	0 deg.	0 deg.	0 deg.	0 deg.
	Crosswise	0 deg.	0 deg.	0 deg.	0 deg.

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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.

No emission was detected at the following frequencies:

2.507GHz, 2.557GHz, 2.247GHz, 2.297GHz, 2.570GHz, 2.597GHz, 2.310GHz, 2.337GHz, 2.583GHz, 2.637GHz, 2.323GHz, 2.377GHz, 2.543GHz

Refer to APPENDIX 1.

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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

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APPENDIX 1: Data of Radio tests

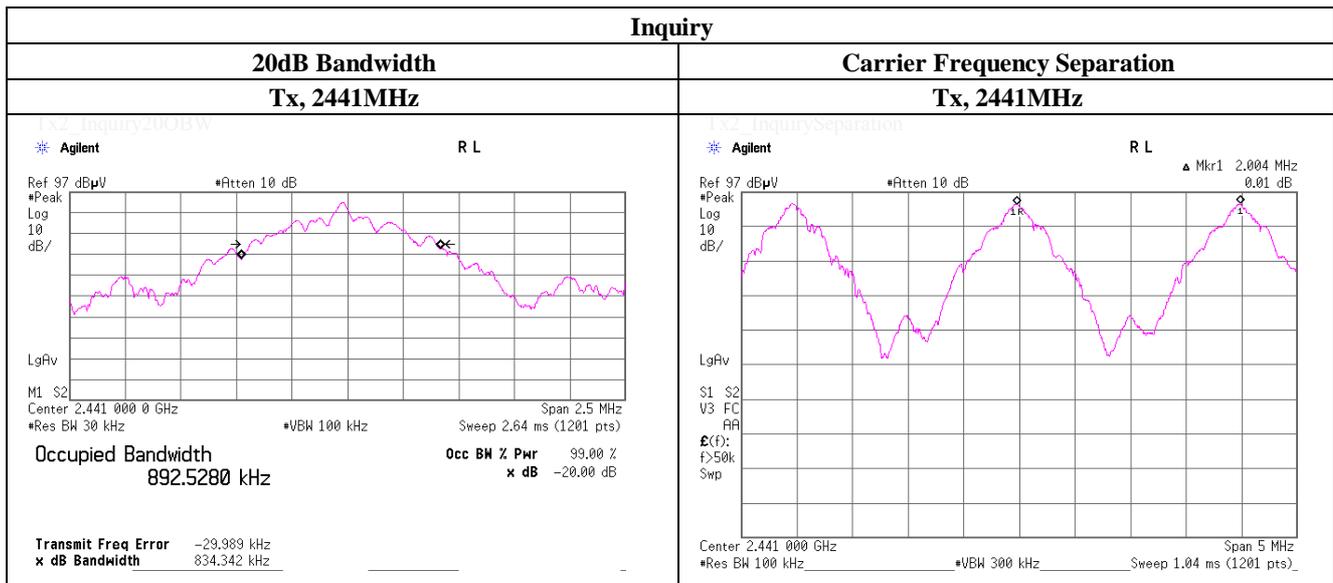
20dB Bandwidth and Carrier Frequency Separation

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 18, 2013	
Temperature / Humidity	24 deg.C , 28 %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	0.959	1.005	>= 0.639
DH5	2441.0	1.023	1.003	>= 0.682
DH5	2480.0	0.965	1.008	>= 0.643
Inquiry	2441.0	0.834	2.004	>= 0.556

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

No limit applies to 20dB Bandwidth.



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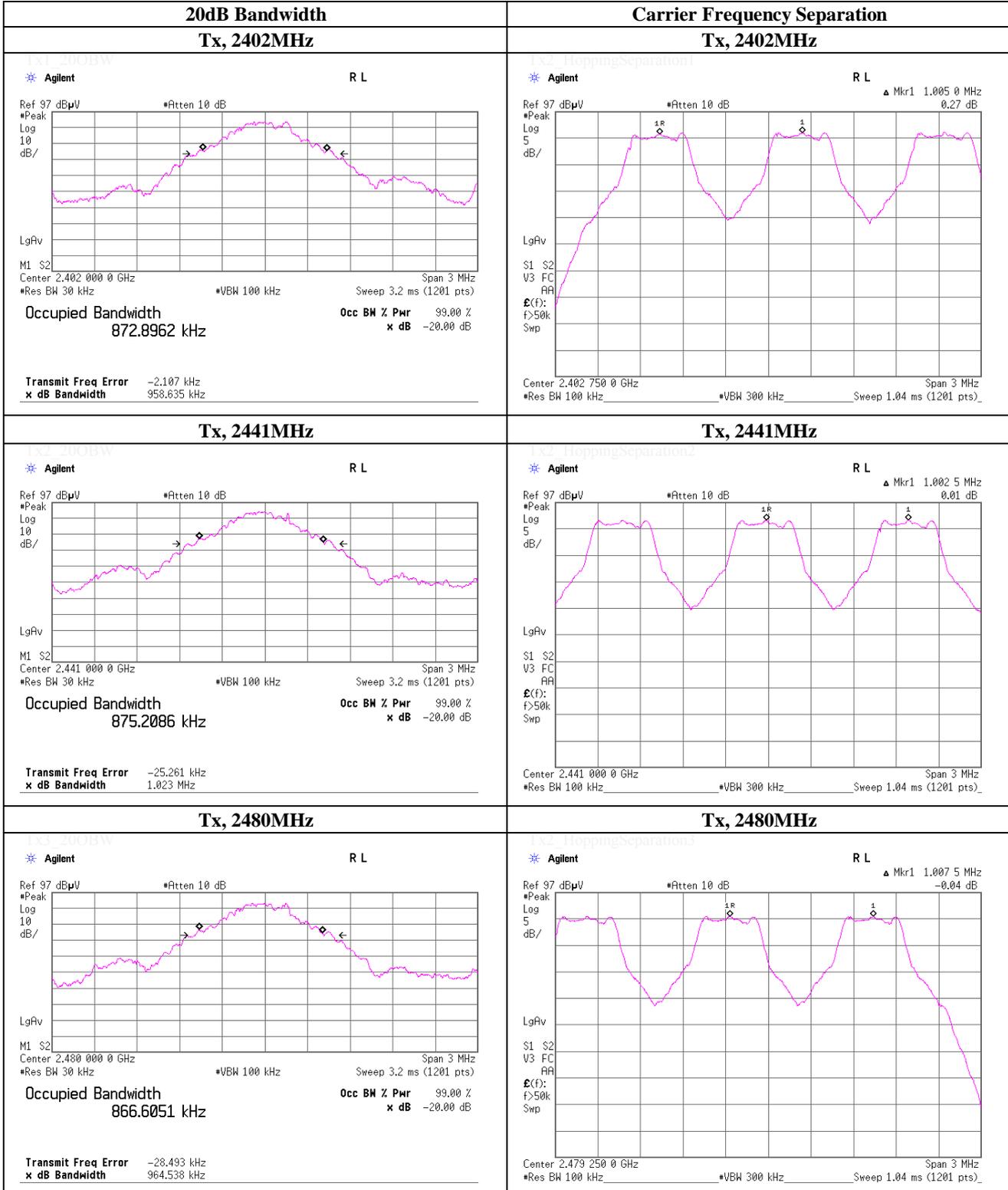
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, BDR, PRBS9



UL Japan, Inc.

Shonan EMC Lab.

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

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Facsimile : +81 463 50 6401

20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
Date November 18, 2013
Temperature / Humidity 24 deg.C , 28 %RH
Engineer Hikaru Shirasawa
Mode Tx, Bluetooth, EDR, PRBS9

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
3-DH5	2402.0	1.289	1.003	>= 0.859
3-DH5	2441.0	1.282	1.003	>= 0.855
3-DH5	2480.0	1.281	1.003	>= 0.854

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

No limit applies to 20dB Bandwidth.

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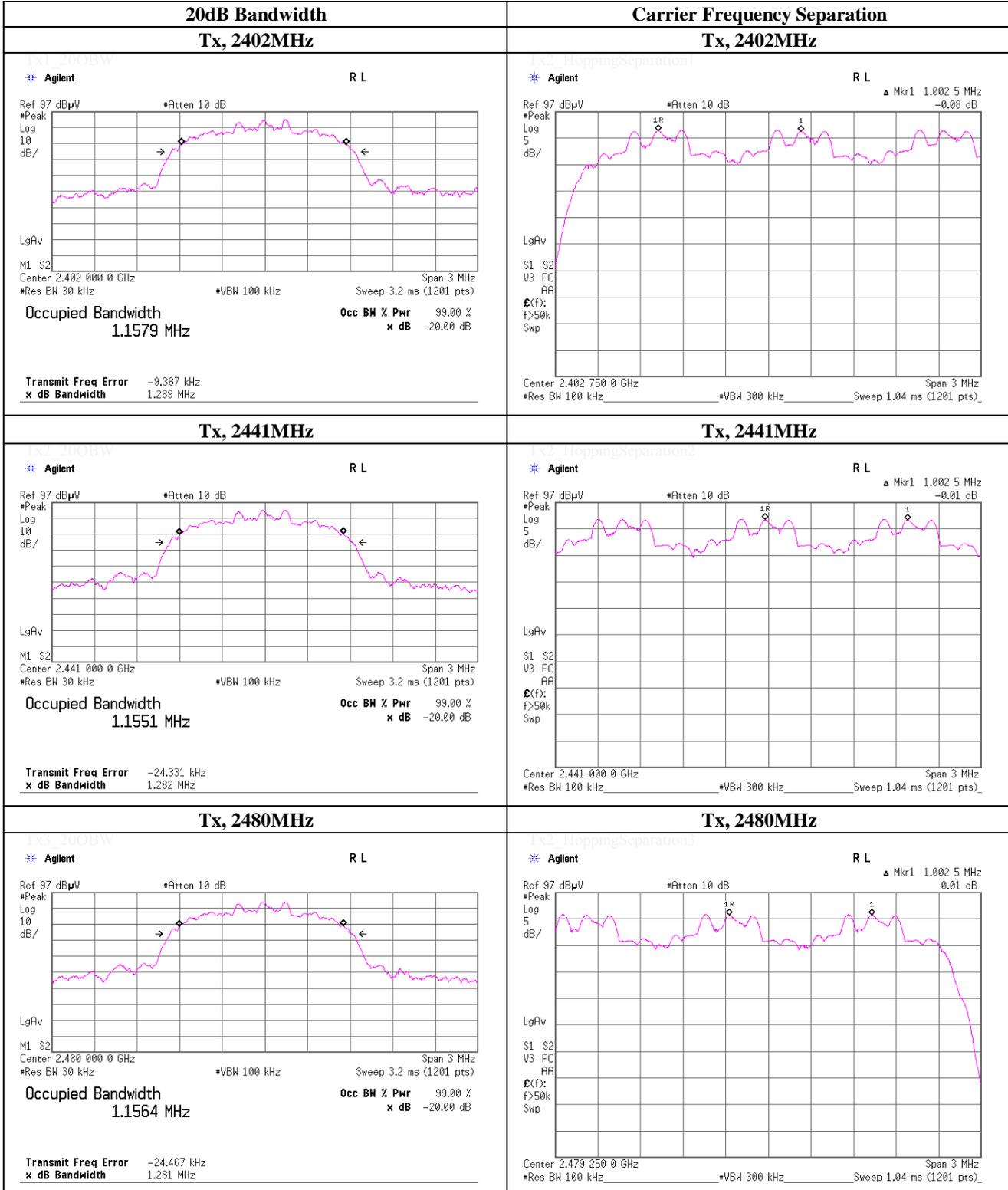
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, PRBS9



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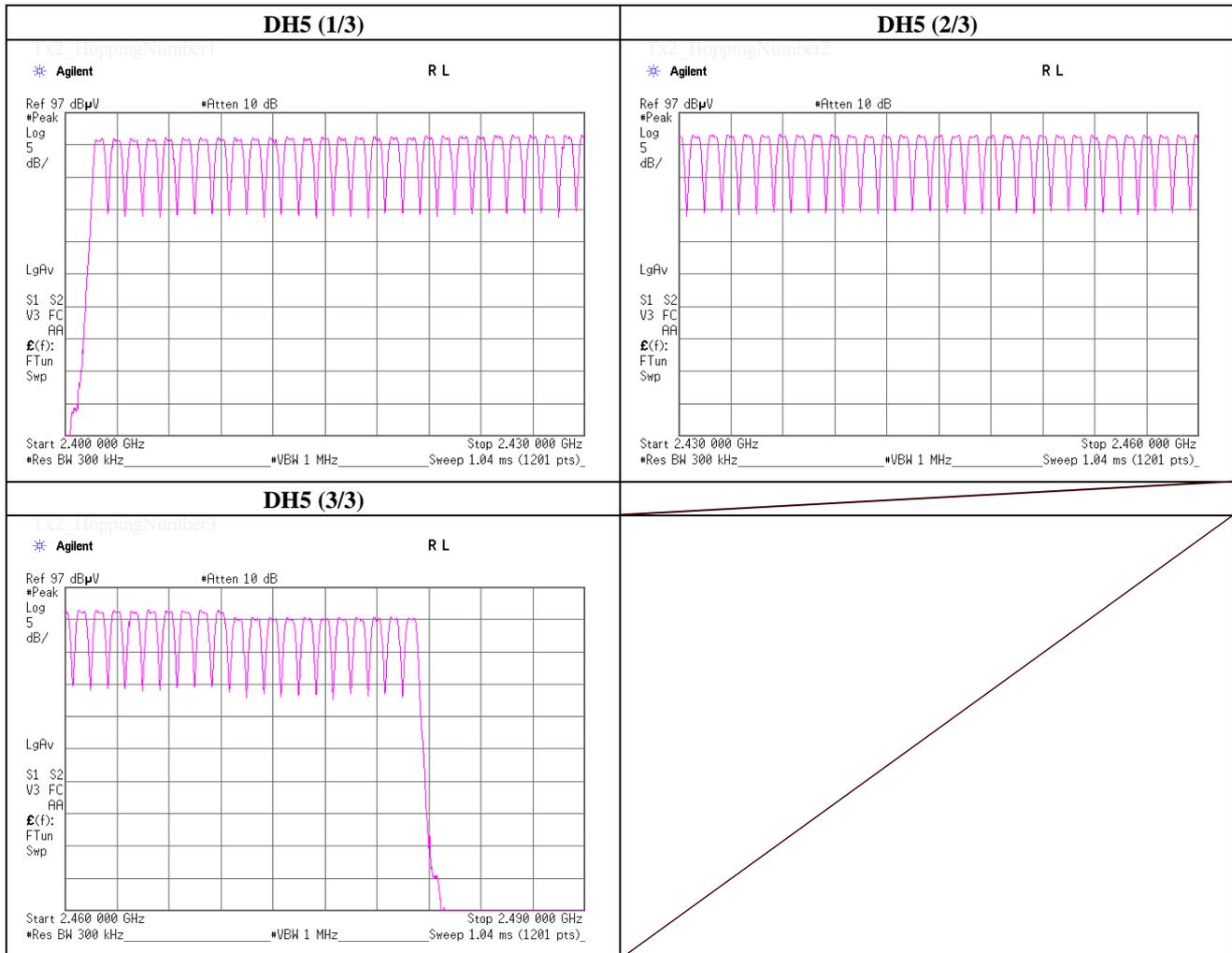
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Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 18, 2013	
Temperature / Humidity	24 deg.C , 28 %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.

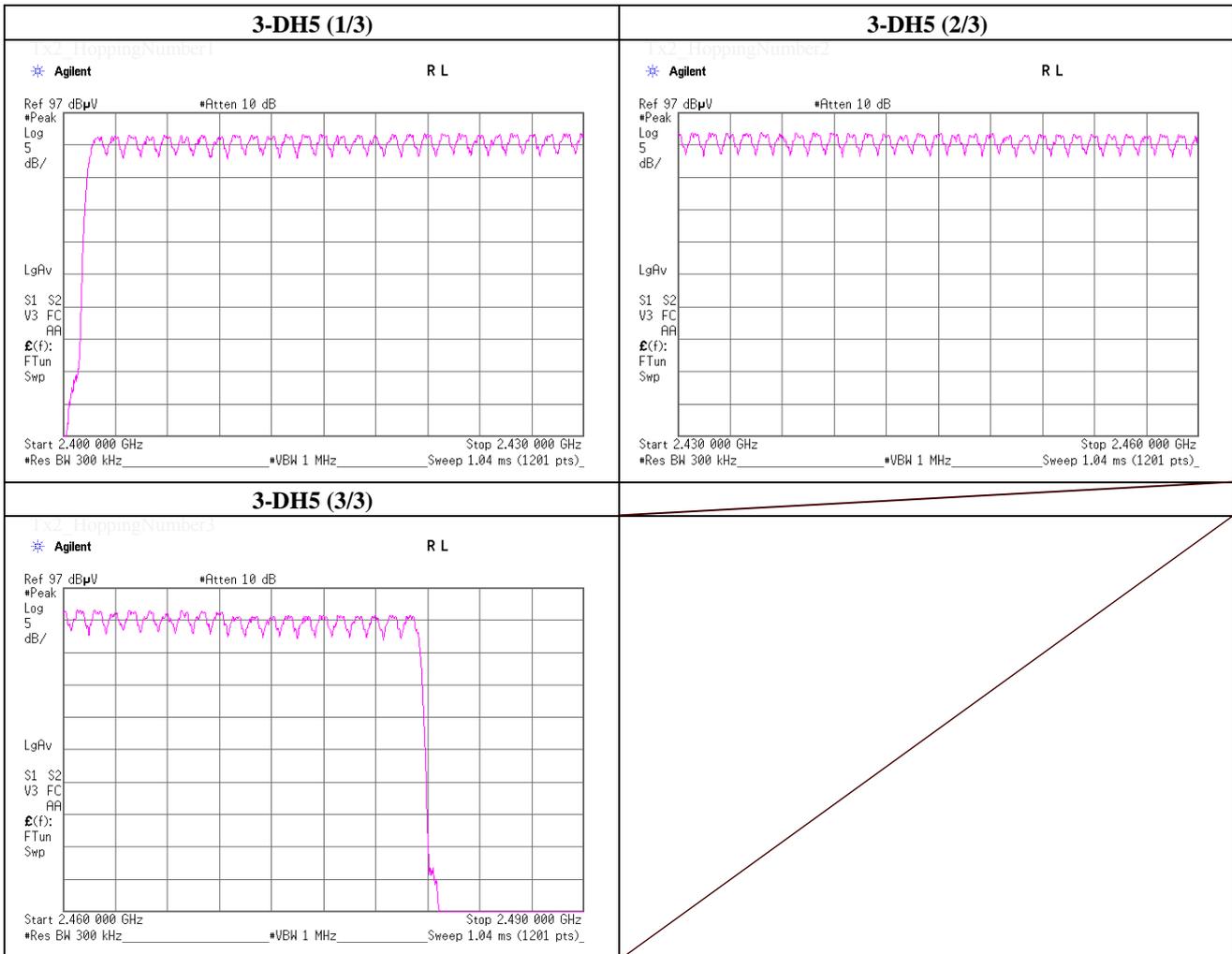


Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 18, 2013	
Temperature / Humidity	24 deg.C , 28 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, EDR, PRBS9	

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

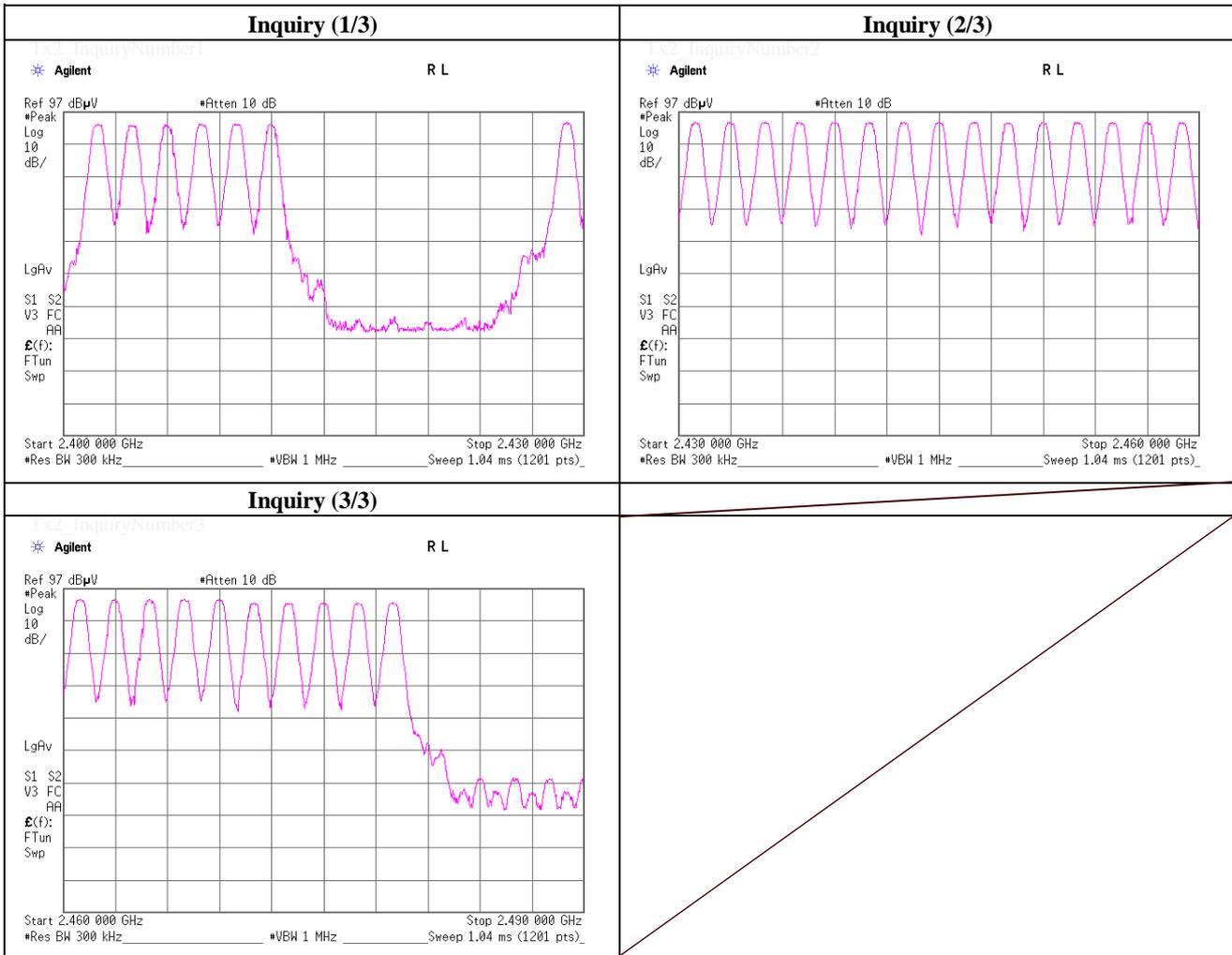
* Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.



Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 18, 2013	
Temperature / Humidity	24 deg.C , 28 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, Inquiry	

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



Dwell Time

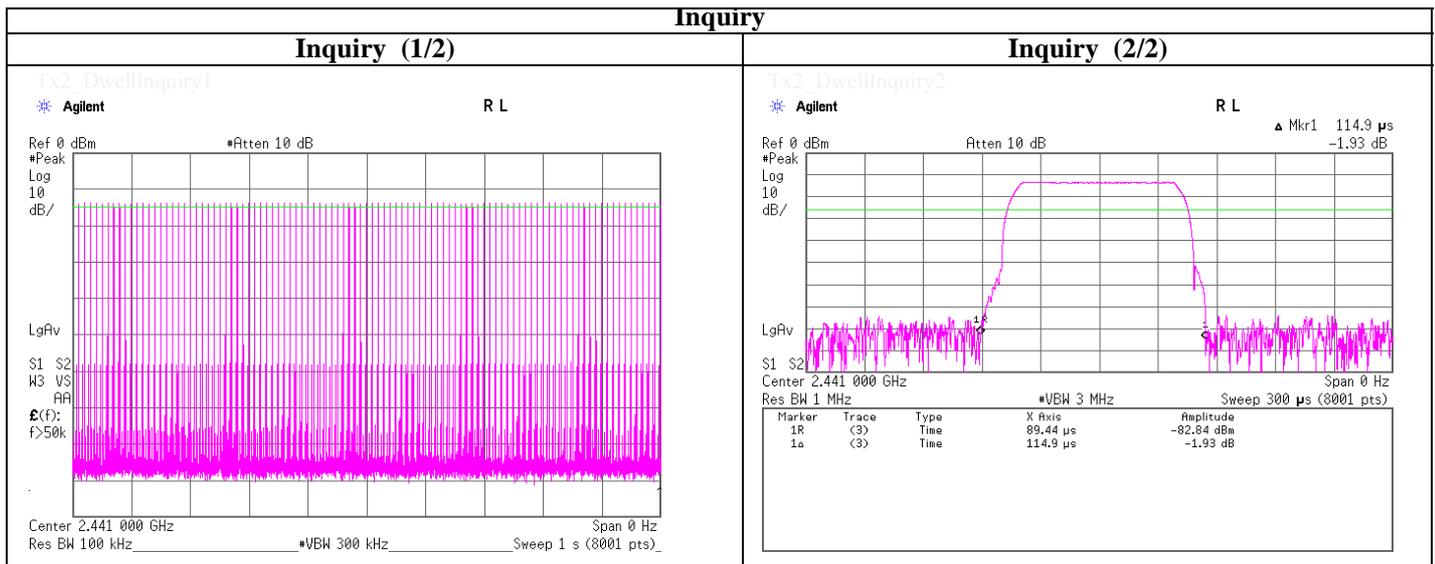
Test place	UL Japan, Inc. Shonan EMC Lab.	No.3 Shielded Room
Date	November 18, 2013	December 5, 2013
Temperature / Humidity	24 deg.C , 28 %RH	25 deg.C , 34 %RH
Engineer	Hikaru Shirasawa	Tatsuya Arai
Mode	Tx, Bluetooth, BDR, PRBS9	

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	0.413	130	400
DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.670	276	400
DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	2.916	315	400
Inquiry	100.0 / 1.0 sec. x 12.8 sec. = 1280 times	0.115	147	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.

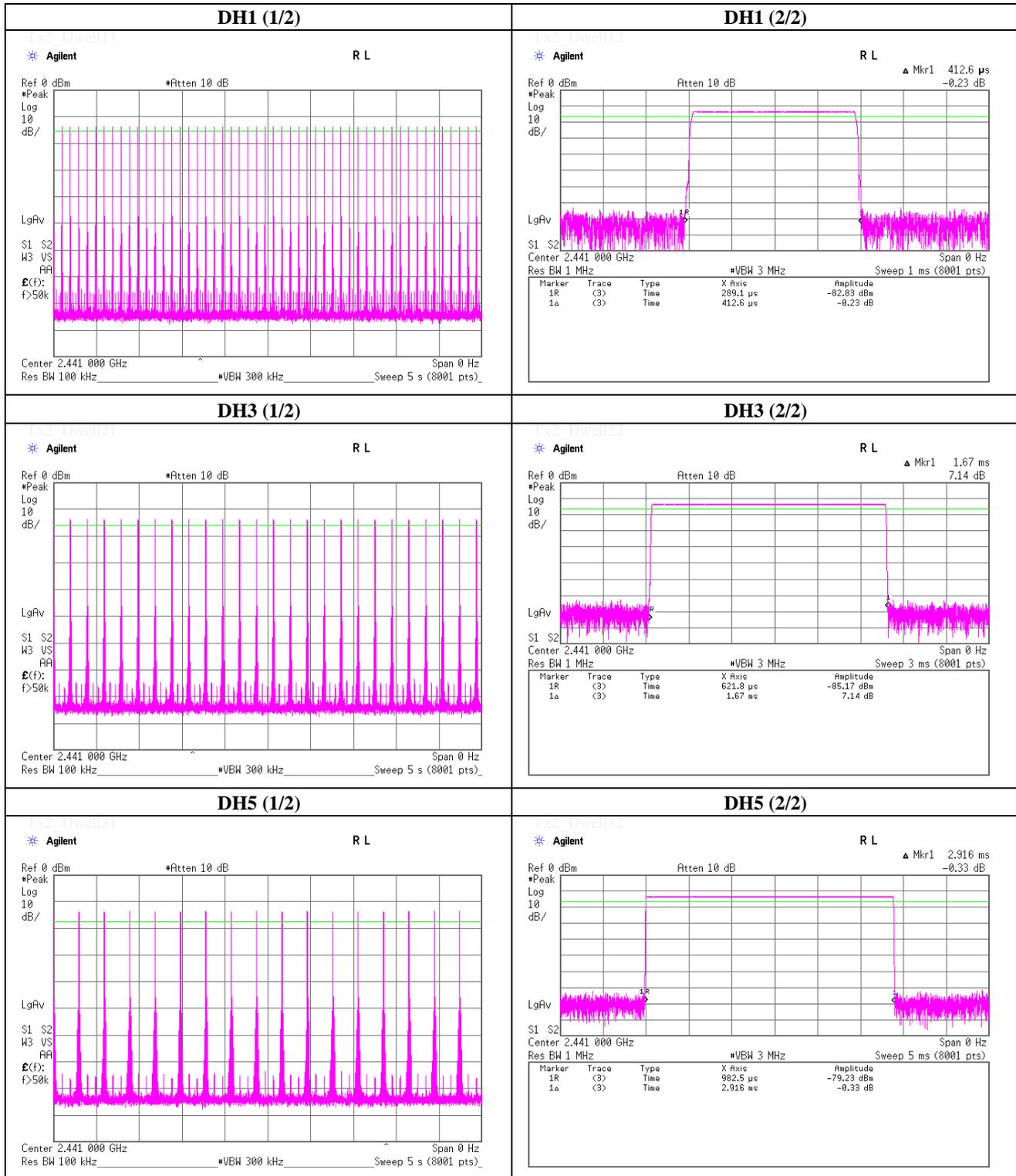
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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.3 Shielded Room
Date	November 18, 2013	December 5, 2013
Temperature / Humidity	24 deg.C , 28 %RH	25 deg.C , 34 %RH
Engineer	Hikaru Shirasawa	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	50.0 / 5.0 sec. x 31.6 sec. = 316 times	0.430	136	400
3-DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.683	278	400
3-DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	2.934	317	400

Sample Calculation

Result = Number of transmission x Length of transmission time

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

UL Japan, Inc.

Shonan EMC Lab.

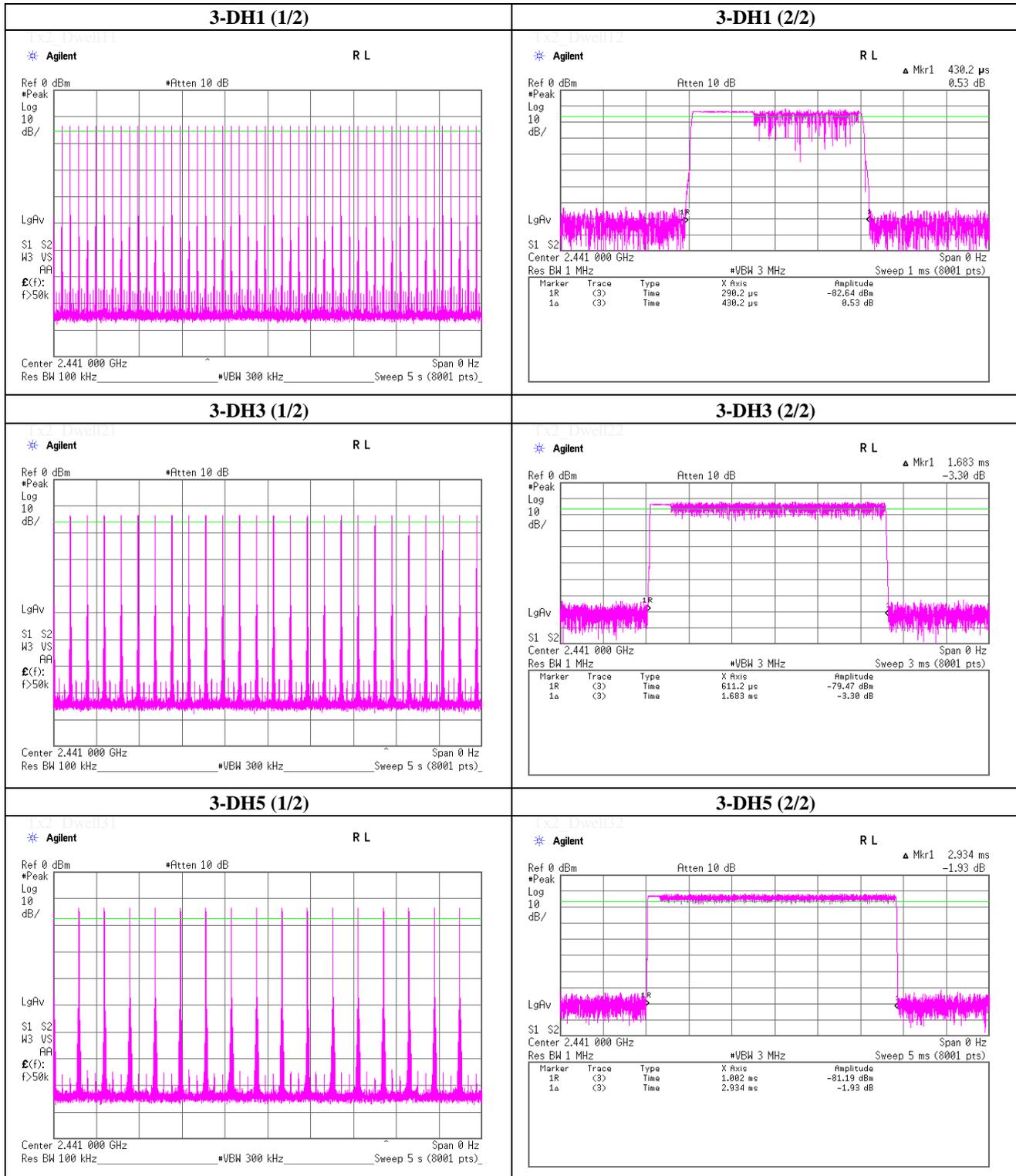
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, EDR, PRBS9



UL Japan, Inc.

Shonan EMC Lab.

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Maximum Peak Conducted Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Shielded Room
 Date November 18, 2013
 Temperature / Humidity 24 deg.C , 28 %RH
 Engineer Hikaru Shirasawa
 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	-13.25	1.60	9.60	-2.05	0.62	20.97	125	23.02
DH5	2441.0	-12.67	1.67	9.61	-1.39	0.73	20.97	125	22.36
DH5	2480.0	-13.72	1.74	9.62	-2.36	0.58	20.97	125	23.33
2-DH5	2402.0	-12.10	1.60	9.60	-0.90	0.81	20.97	125	21.87
2-DH5	2441.0	-11.65	1.67	9.61	-0.37	0.92	20.97	125	21.34
2-DH5	2480.0	-12.69	1.74	9.62	-1.33	0.74	20.97	125	22.30
3-DH5	2402.0	-11.62	1.60	9.60	-0.42	0.91	20.97	125	21.39
3-DH5	2441.0	-11.28	1.67	9.61	0.00	1.00	20.97	125	20.97
3-DH5	2480.0	-12.32	1.74	9.62	-0.96	0.80	20.97	125	21.93

Sample Calculation:

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

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Shonan EMC Lab.

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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1& No.2 Semi Anechoic Chamber
Date November 16, 2013 November 17, 2013
Temperature / Humidity 21 deg.C , 43 %RH 24 deg.C , 44 %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.	52.059	QP	36.5	10.7	7.3	31.9		22.6	40.0	17.4	222	58	
Hori.	151.226	QP	40.6	15.1	8.9	31.8		32.8	43.5	10.7	200	313	
Hori.	479.932	QP	40.3	17.5	8.4	31.6		34.6	46.0	11.4	100	287	
Hori.	960.837	QP	40.4	23.0	10.5	30.4		43.5	53.9	10.4	150	229	
Hori.	1920.128	PK	50.7	26.4	13.7	41.0		49.8	73.9	24.1	100	265	
Hori.	2272.000	PK	46.7	27.6	14.0	40.9		47.4	73.9	26.5	100	103	
Hori.	2390.000	PK	45.3	28.1	14.1	40.9		46.6	73.9	27.3	136	101	
Hori.	2400.000	PK	48.5	28.1	14.1	40.9		49.8	73.9	24.1	136	101	
Hori.	2532.000	PK	45.9	28.5	14.4	40.9		47.9	73.9	26.0	100	9	
Hori.	4804.000	PK	47.9	32.2	6.6	41.8		44.9	73.9	29.0	100	146	
Hori.	7206.000	PK	45.5	37.1	8.3	41.4		49.5	73.9	24.4	100	0	
Hori.	9608.000	PK	43.7	39.1	9.3	40.6		51.5	73.9	22.4	100	0	
Hori.	1920.128	AV	44.8	26.4	13.7	41.0		43.9	53.9	10.0	100	265	
Hori.	2272.000	AV	34.9	27.6	14.0	40.9		35.6	53.9	18.3	100	103	
Hori.	2390.000	AV	33.9	28.1	14.1	40.9		35.2	53.9	17.7	136	101	
Hori.	2400.000	AV	34.9	28.1	14.1	40.9		36.2	53.9	16.5	100	9	
Hori.	2532.000	AV	35.4	28.5	14.4	40.9		37.4	53.9	18.9	100	146	
Hori.	4804.000	AV	34.6	37.1	8.3	41.4		38.6	53.9	15.3	100	0	
Hori.	7206.000	AV	32.4	39.1	9.3	40.6		40.2	53.9	13.7	100	0	
Hori.	9608.000	AV	38.5	11.3	7.3	31.9		25.2	40.0	14.8	100	356	
Vert.	49.966	QP	40.8	9.7	8.2	31.9		26.8	43.5	16.7	100	274	
Vert.	95.900	QP	39.8	15.3	8.9	31.8		32.2	43.5	11.3	100	174	
Vert.	155.287	QP	36.8	23.0	10.5	30.4		39.9	53.9	14.0	100	273	
Vert.	960.713	QP	47.6	26.4	13.7	41.0		46.7	73.9	27.2	100	119	
Vert.	1920.128	PK	47.0	27.6	14.0	40.9		47.7	73.9	26.2	100	306	
Vert.	2272.000	PK	45.9	28.1	14.1	40.9		47.2	73.9	26.7	100	282	
Vert.	2390.000	PK	48.4	28.1	14.1	40.9		49.7	73.9	24.2	100	282	
Vert.	2400.000	PK	47.1	28.5	14.4	40.9		49.1	73.9	24.8	100	311	
Vert.	2532.000	PK	50.4	32.2	6.6	41.8		47.4	73.9	26.5	100	338	
Vert.	4804.000	PK	46.3	37.1	8.3	41.4		50.3	73.9	23.6	100	0	
Vert.	7206.000	PK	43.7	39.1	9.3	40.6		51.5	73.9	22.4	100	0	
Vert.	9608.000	PK	38.2	26.4	13.7	41.0		37.3	53.9	16.6	100	119	
Vert.	1920.128	AV	36.8	27.6	14.0	40.9		37.5	53.9	16.4	100	306	
Vert.	2272.000	AV	33.4	28.1	14.1	40.9		34.7	53.9	19.2	100	282	
Vert.	2390.000	AV	35.3	28.1	14.1	40.9		36.6	53.9	17.3	100	282	
Vert.	2400.000	AV	37.6	28.5	14.4	40.9		39.6	53.9	14.3	100	311	
Vert.	2532.000	AV	42.8	32.2	6.6	41.8		39.8	53.9	14.1	100	338	
Vert.	4804.000	AV	34.7	37.1	8.3	41.4		38.7	53.9	15.2	100	0	
Vert.	7206.000	AV	32.4	39.1	9.3	40.6		40.2	53.9	13.7	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 10th harmonic was not seen so the result was its base noise level.

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 UL Japan, Inc. Shonan EMC Lab. No.1& No.2 Semi Anechoic Chamber
 Date November 16, 2013 November 17, 2013
 Temperature / Humidity 21 deg.C , 43 %RH 24 deg.C , 44 %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.	48.499	QP	35.4	11.8	7.3	31.9		22.6	40.0	17.4	211	70	
Hori.	95.886	QP	44.3	9.7	8.2	31.9		30.3	43.5	13.2	200	40	
Hori.	152.096	QP	40.5	15.2	8.9	31.8		32.8	43.5	10.7	200	335	
Hori.	216.012	QP	30.3	17.1	9.8	31.7		25.5	46.0	20.5	101	254	
Hori.	960.678	QP	40.4	23.0	10.5	30.4		43.5	53.9	10.4	100	339	
Hori.	1920.128	PK	49.9	26.4	13.7	41.0		49.0	73.9	24.9	100	263	
Hori.	2311.000	PK	45.7	27.8	14.1	40.9		46.7	73.9	27.2	100	132	
Hori.	2571.000	PK	46.5	28.6	14.4	40.9		48.6	73.9	25.3	100	37	
Hori.	4882.000	PK	48.8	32.6	6.6	41.7		46.3	73.9	27.6	100	129	
Hori.	7323.000	PK	46.1	37.3	8.1	41.4		50.1	73.9	23.8	100	0	
Hori.	9764.000	PK	44.8	39.0	9.3	40.6		52.5	73.9	21.4	100	0	
Hori.	1920.128	AV	43.1	26.4	13.7	41.0		42.2	53.9	11.7	100	263	
Hori.	2311.000	AV	35.5	27.8	14.1	40.9		36.5	53.9	17.4	100	132	
Hori.	2571.000	AV	35.8	28.6	14.4	40.9		37.9	53.9	16.0	100	37	
Hori.	4882.000	AV	39.3	32.6	6.6	41.7		36.8	53.9	17.1	100	129	
Hori.	7323.000	AV	34.9	37.3	8.1	41.4		38.9	53.9	15.0	100	0	
Hori.	9764.000	AV	32.9	39.0	9.3	40.6		40.6	53.9	13.3	100	0	
Vert.	50.807	QP	36.5	11.1	7.3	31.9		23.0	40.0	17.0	100	347	
Vert.	117.218	QP	40.3	13.2	8.1	31.8		29.8	43.5	13.7	100	62	
Vert.	155.303	QP	39.5	15.3	8.9	31.8		31.9	43.5	11.6	100	172	
Vert.	479.890	QP	38.0	17.5	8.4	31.6		32.3	46.0	13.7	100	233	
Vert.	960.414	QP	34.9	23.0	10.5	30.4		38.0	53.9	15.9	100	268	
Vert.	1920.128	PK	47.9	26.4	13.7	41.0		47.0	73.9	26.9	100	152	
Vert.	2311.000	PK	47.3	27.8	14.1	40.9		48.3	73.9	25.6	100	313	
Vert.	2571.000	PK	47.0	28.6	14.4	40.9		49.1	73.9	24.8	100	296	
Vert.	4882.000	PK	51.2	32.6	6.6	41.7		48.7	73.9	25.2	100	337	
Vert.	7323.000	PK	47.2	37.3	8.1	41.4		51.2	73.9	22.7	100	0	
Vert.	9764.000	PK	43.4	39.0	9.3	40.6		51.1	73.9	22.8	100	0	
Vert.	1920.128	AV	37.8	26.4	13.7	41.0		36.9	53.9	17.0	100	152	
Vert.	2311.000	AV	38.4	27.8	14.1	40.9		39.4	53.9	14.5	100	313	
Vert.	2571.000	AV	36.8	28.6	14.4	40.9		38.9	53.9	15.0	100	296	
Vert.	4882.000	AV	43.1	32.6	6.6	41.7		40.6	53.9	13.3	100	337	
Vert.	7323.000	AV	35.0	37.3	8.1	41.4		39.0	53.9	14.9	100	0	
Vert.	9764.000	AV	32.8	39.0	9.3	40.6		40.5	53.9	13.4	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 10th harmonic was not seen so the result was its base noise level.

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

Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1& No.2 Semi Anechoic Chamber
Date November 16, 2013 November 17, 2013
Temperature / Humidity 21 deg.C , 43 %RH 24 deg.C , 44 %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.	51.319	QP	37.2	10.9	7.2	31.9		23.4	40.0	16.6	200	75	
Hori.	95.897	QP	43.5	9.7	8.2	31.9		29.5	43.5	14.0	200	25	
Hori.	150.137	QP	37.6	15.1	8.9	31.8		29.8	43.5	13.7	200	326	
Hori.	226.013	QP	29.9	17.3	9.9	31.7		25.4	46.0	20.6	150	266	
Hori.	233.568	QP	27.7	17.4	10.1	31.7		23.5	46.0	22.5	150	282	
Hori.	960.775	QP	40.6	23.0	10.5	30.4		43.7	53.9	10.2	100	297	
Hori.	1920.128	PK	50.1	26.4	13.7	41.0		49.2	73.9	24.7	100	263	
Hori.	2350.000	PK	46.6	27.9	14.1	40.9		47.7	73.9	26.2	100	135	
Hori.	2483.500	PK	46.3	28.4	14.2	40.9		48.0	73.9	25.9	126	113	
Hori.	2610.000	PK	47.1	28.7	14.4	41.0		49.2	73.9	24.7	100	38	
Hori.	4960.000	PK	48.3	33.0	6.7	41.5		46.5	73.9	27.4	100	14	
Hori.	7440.000	PK	46.8	37.4	8.1	41.4		50.9	73.9	23.0	100	0	
Hori.	9920.000	PK	45.7	38.9	9.2	40.7		53.1	73.9	20.8	100	0	
Hori.	1920.128	AV	43.4	26.4	13.7	41.0		42.5	53.9	11.4	100	263	
Hori.	2350.000	AV	36.2	27.9	14.1	40.9		37.3	53.9	16.6	100	135	
Hori.	2483.500	AV	33.5	28.4	14.2	40.9		35.2	53.9	18.7	126	113	
Hori.	2610.000	AV	37.2	28.7	14.4	41.0		39.3	53.9	14.6	100	38	
Hori.	4960.000	AV	38.0	33.0	6.7	41.5		36.2	53.9	17.7	100	14	
Hori.	7440.000	AV	35.3	37.4	8.1	41.4		39.4	53.9	14.5	100	0	
Hori.	9920.000	AV	33.7	38.9	9.2	40.7		41.1	53.9	12.8	100	0	
Vert.	50.855	QP	35.6	11.0	7.3	31.9		22.0	40.0	18.0	100	129	
Vert.	155.255	QP	36.7	15.3	8.9	31.8		29.1	43.5	14.4	100	167	
Vert.	960.505	QP	37.9	23.0	10.5	30.4		41.0	53.9	12.9	100	260	
Vert.	1920.128	PK	47.9	26.4	13.7	41.0		47.0	73.9	26.9	100	348	
Vert.	2350.000	PK	48.1	27.9	14.1	40.9		49.2	73.9	24.7	100	313	
Vert.	2483.500	PK	46.2	28.4	14.2	40.9		47.9	73.9	26.0	100	263	
Vert.	2610.000	PK	47.8	28.7	14.4	41.0		49.9	73.9	24.0	122	293	
Vert.	4960.000	PK	50.2	33.0	6.7	41.5		48.4	73.9	25.5	100	339	
Vert.	7440.000	PK	46.8	37.4	8.1	41.4		50.9	73.9	23.0	100	0	
Vert.	9920.000	PK	45.5	38.9	9.2	40.7		52.9	73.9	21.0	100	0	
Vert.	1920.128	AV	37.8	26.4	13.7	41.0		36.9	53.9	17.0	100	348	
Vert.	2350.000	AV	40.0	27.9	14.1	40.9		41.1	53.9	12.8	100	313	
Vert.	2483.500	AV	33.5	28.4	14.2	40.9		35.2	53.9	18.7	100	263	
Vert.	2610.000	AV	38.5	28.7	14.4	41.0		40.6	53.9	13.3	122	293	
Vert.	4960.000	AV	41.5	33.0	6.7	41.5		39.7	53.9	14.2	100	339	
Vert.	7440.000	AV	35.2	37.4	8.1	41.4		39.3	53.9	14.6	100	0	
Vert.	9920.000	AV	33.7	38.9	9.2	40.7		41.1	53.9	12.8	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 10th harmonic was not seen so the result was its base noise level.

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 UL Japan, Inc. Shonan EMC Lab. No.1& No.2 Semi Anechoic Chamber
Date November 16, 2013 November 17, 2013
Temperature / Humidity 21 deg.C , 43 %RH 24 deg.C , 44 %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.	52.296	QP	36.5	10.6	7.3	31.9		22.5	40.0	17.5	278	80	
Hori.	95.898	QP	43.2	9.7	8.2	31.9		29.2	43.5	14.3	234	45	
Hori.	151.956	QP	39.9	15.2	8.9	31.8		32.2	43.5	11.3	200	77	
Hori.	221.142	QP	29.8	17.2	9.8	31.7		25.1	46.0	20.9	150	276	
Hori.	479.895	QP	40.5	17.5	8.4	31.6		34.8	46.0	11.2	150	267	
Hori.	960.548	QP	40.7	23.0	10.5	30.4		43.8	53.9	10.1	100	293	
Hori.	1920.128	PK	50.2	26.4	13.7	41.0		49.3	73.9	24.6	100	262	
Hori.	2272.000	PK	45.1	27.6	14.0	40.9		45.8	73.9	28.1	100	0	
Hori.	2390.000	PK	45.8	28.1	14.1	40.9		47.1	73.9	26.8	141	98	
Hori.	2400.000	PK	49.2	28.1	14.1	40.9		50.5	73.9	23.4	141	98	
Hori.	2532.000	PK	46.6	28.5	14.4	40.9		48.6	73.9	25.3	100	114	
Hori.	4804.000	PK	47.4	32.2	6.6	41.8		44.4	73.9	29.5	100	147	
Hori.	7206.000	PK	46.4	37.1	8.3	41.4		50.4	73.9	23.5	100	0	
Hori.	9608.000	PK	44.3	39.1	9.3	40.6		52.1	73.9	21.8	100	0	
Hori.	1920.128	AV	43.5	26.4	13.7	41.0		42.6	53.9	11.3	100	262	
Hori.	2272.000	AV	34.1	27.6	14.0	40.9		34.8	53.9	19.1	100	0	
Hori.	2390.000	AV	33.8	28.1	14.1	40.9		35.1	53.9	18.8	141	98	
Hori.	2400.000	AV	34.9	28.1	14.1	40.9		36.2	53.9	17.7	141	98	
Hori.	2532.000	AV	35.2	28.5	14.4	40.9		37.2	53.9	16.7	100	114	
Hori.	4804.000	AV	36.3	32.2	6.6	41.8		33.3	53.9	20.6	100	147	
Hori.	7206.000	AV	34.8	37.1	8.3	41.4		38.8	53.9	15.1	100	0	
Hori.	9608.000	AV	33.0	39.1	9.3	40.6		40.8	53.9	13.1	100	0	
Vert.	47.870	QP	38.6	12.1	7.3	31.9		26.1	40.0	13.9	100	359	
Vert.	155.232	QP	38.9	15.3	8.9	31.8		31.3	43.5	12.2	100	189	
Vert.	1920.128	PK	48.7	26.4	13.7	41.0		47.8	73.9	26.1	100	124	
Vert.	2272.000	PK	46.7	27.6	14.0	40.9		47.4	73.9	26.5	100	308	
Vert.	2390.000	PK	46.8	28.1	14.1	40.9		48.1	73.9	25.8	100	305	
Vert.	2400.000	PK	52.8	28.1	14.1	40.9		54.1	73.9	19.8	100	305	
Vert.	2532.000	PK	46.7	28.5	14.4	40.9		48.7	73.9	25.2	100	144	
Vert.	4804.000	PK	48.9	32.2	6.6	41.8		45.9	73.9	28.0	100	336	
Vert.	7206.000	PK	46.2	37.1	8.3	41.4		50.2	73.9	23.7	100	0	
Vert.	9608.000	PK	44.6	39.1	9.3	40.6		52.4	73.9	21.5	100	0	
Vert.	1920.128	AV	38.0	26.4	13.7	41.0		37.1	53.9	16.8	100	124	
Vert.	2272.000	AV	35.8	27.6	14.0	40.9		36.5	53.9	17.4	100	308	
Vert.	2390.000	AV	33.2	28.1	14.1	40.9		34.5	53.9	19.4	100	305	
Vert.	2400.000	AV	37.5	28.1	14.1	40.9		38.8	53.9	15.1	100	305	
Vert.	2532.000	AV	35.3	28.5	14.4	40.9		37.3	53.9	16.6	100	144	
Vert.	4804.000	AV	38.4	32.2	6.6	41.8		35.4	53.9	18.5	100	336	
Vert.	7206.000	AV	34.7	37.1	8.3	41.4		38.7	53.9	15.2	100	0	
Vert.	9608.000	AV	32.8	39.1	9.3	40.6		40.6	53.9	13.3	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 10th harmonic was not seen so the result was its base noise level.

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

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Facsimile : +81 463 50 6401

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1& No.2 Semi Anechoic Chamber
Date	November 16, 2013	November 17, 2013
Temperature / Humidity	21 deg.C , 43 %RH	24 deg.C , 44 %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.	51.886	QP	37.8	10.7	7.3	31.9	23.9	40.0	16.1	150	240	
Hori.	151.743	QP	38.9	15.2	8.9	31.8	31.2	43.5	12.3	200	339	
Hori.	223.609	QP	29.6	17.2	9.9	31.7	25.0	46.0	21.0	200	265	
Hori.	479.836	QP	40.2	17.5	8.4	31.6	34.5	46.0	11.5	100	266	
Hori.	960.703	QP	40.3	23.0	10.5	30.4	43.4	53.9	10.5	100	316	
Hori.	1920.128	PK	50.2	26.4	13.7	41.0	49.3	73.9	24.6	100	263	
Hori.	2311.000	PK	46.0	27.8	14.1	40.9	47.0	73.9	26.9	118	136	
Hori.	2571.000	PK	47.1	28.6	14.4	40.9	49.2	73.9	24.7	100	107	
Hori.	4882.000	PK	47.2	32.6	6.6	41.7	44.7	73.9	29.2	100	21	
Hori.	7323.000	PK	46.1	37.3	8.1	41.4	50.1	73.9	23.8	100	0	
Hori.	9764.000	PK	45.4	39.0	9.3	40.6	53.1	73.9	20.8	100	0	
Hori.	1920.128	AV	43.3	26.4	13.7	41.0	42.4	53.9	11.5	100	263	
Hori.	2311.000	AV	35.1	27.8	14.1	40.9	36.1	53.9	17.8	118	136	
Hori.	2571.000	AV	35.0	28.6	14.4	40.9	37.1	53.9	16.8	100	107	
Hori.	4882.000	AV	36.0	32.6	6.6	41.7	33.5	53.9	20.4	100	21	
Hori.	7323.000	AV	35.0	37.3	8.1	41.4	39.0	53.9	14.9	100	0	
Hori.	9764.000	AV	33.6	39.0	9.3	40.6	41.3	53.9	12.6	100	0	
Vert.	51.362	QP	36.7	10.9	7.2	31.9	22.9	40.0	17.1	100	353	
Vert.	117.194	QP	40.9	13.2	8.1	31.8	30.4	43.5	13.1	100	59	
Vert.	155.859	QP	39.8	15.3	8.9	31.8	32.2	43.5	11.3	100	175	
Vert.	960.048	QP	38.0	23.0	10.5	30.4	41.1	53.9	12.8	100	258	
Vert.	1920.128	PK	47.1	26.4	13.7	41.0	46.2	73.9	27.7	172	125	
Vert.	2311.000	PK	46.3	27.8	14.1	40.9	47.3	73.9	26.6	100	310	
Vert.	2571.000	PK	46.2	28.6	14.4	40.9	48.3	73.9	25.6	100	142	
Vert.	4882.000	PK	49.2	32.6	6.6	41.7	46.7	73.9	27.2	100	341	
Vert.	7323.000	PK	46.2	37.3	8.1	41.4	50.2	73.9	23.7	100	0	
Vert.	9764.000	PK	44.6	39.0	9.3	40.6	52.3	73.9	21.6	100	0	
Vert.	1920.128	AV	38.5	26.4	13.7	41.0	37.6	53.9	16.3	172	125	
Vert.	2311.000	AV	37.2	27.8	14.1	40.9	38.2	53.9	15.7	100	310	
Vert.	2571.000	AV	35.5	28.6	14.4	40.9	37.6	53.9	16.3	100	142	
Vert.	4882.000	AV	38.6	32.6	6.6	41.7	36.1	53.9	17.8	100	341	
Vert.	7323.000	AV	35.0	37.3	8.1	41.4	39.0	53.9	14.9	100	0	
Vert.	9764.000	AV	33.5	39.0	9.3	40.6	41.2	53.9	12.7	100	0	

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

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*The 10th harmonic was not seen so the result was its base noise level.

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

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.1& No.2 Semi Anechoic Chamber
Date November 16, 2013 November 17, 2013
Temperature / Humidity 21 deg.C , 43 %RH 24 deg.C , 44 %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.	51.313	QP	35.4	10.9	7.2	31.9		21.6	40.0	18.4	192	255	
Hori.	95.886	QP	44.2	9.7	8.2	31.9		30.2	43.5	13.3	300	255	
Hori.	150.597	QP	40.2	15.1	8.9	31.8		32.4	43.5	11.1	200	324	
Hori.	223.603	QP	29.8	17.2	9.9	31.7		25.2	46.0	20.8	150	251	
Hori.	960.585	QP	40.2	23.0	10.5	30.4		43.3	53.9	10.6	100	312	
Hori.	1920.128	PK	50.0	26.4	13.7	41.0		49.1	73.9	24.8	100	262	
Hori.	2350.000	PK	46.0	27.9	14.1	40.9		47.1	73.9	26.8	100	103	
Hori.	2483.500	PK	46.6	28.4	14.2	40.9		48.3	73.9	25.6	112	102	
Hori.	2610.000	PK	47.0	28.7	14.4	41.0		49.1	73.9	24.8	100	39	
Hori.	4960.000	PK	47.5	33.0	6.7	41.5		45.7	73.9	28.2	100	81	
Hori.	7440.000	PK	46.7	37.4	8.1	41.4		50.8	73.9	23.1	100	0	
Hori.	9920.000	PK	46.3	38.9	9.2	40.7		53.7	73.9	20.2	100	0	
Hori.	1920.128	AV	43.3	26.4	13.7	41.0		42.4	53.9	11.5	100	262	
Hori.	2350.000	AV	35.3	27.9	14.1	40.9		36.4	53.9	17.5	100	103	
Hori.	2483.500	AV	33.3	28.4	14.2	40.9		35.0	53.9	18.9	112	102	
Hori.	2610.000	AV	35.9	28.7	14.4	41.0		38.0	53.9	15.9	100	39	
Hori.	4960.000	AV	36.1	33.0	6.7	41.5		34.3	53.9	19.6	100	81	
Hori.	7440.000	AV	35.5	37.4	8.1	41.4		39.6	53.9	14.3	100	0	
Hori.	9920.000	AV	34.4	38.9	9.2	40.7		41.8	53.9	12.1	100	0	
Vert.	52.791	QP	35.5	10.5	7.3	31.9		21.4	40.0	18.6	100	2	
Vert.	120.758	QP	40.3	13.6	8.1	31.8		30.2	43.5	13.3	100	2	
Vert.	155.245	QP	39.8	15.3	8.9	31.8		32.2	43.5	11.3	100	210	
Vert.	479.900	QP	38.6	17.5	8.4	31.6		32.9	46.0	13.1	100	249	
Vert.	960.547	QP	37.2	23.0	10.5	30.4		40.3	53.9	13.6	100	268	
Vert.	1920.128	PK	49.0	26.4	13.7	41.0		48.1	73.9	25.8	100	125	
Vert.	2350.000	PK	47.7	27.9	14.1	40.9		48.8	73.9	25.1	100	305	
Vert.	2483.500	PK	46.7	28.4	14.2	40.9		48.4	73.9	25.5	100	261	
Vert.	2610.000	PK	47.6	28.7	14.4	41.0		49.7	73.9	24.2	116	290	
Vert.	4960.000	PK	48.6	33.0	6.7	41.5		46.8	73.9	27.1	100	103	
Vert.	7440.000	PK	47.0	37.4	8.1	41.4		51.1	73.9	22.8	100	0	
Vert.	9920.000	PK	45.4	38.9	9.2	40.7		52.8	73.9	21.1	100	0	
Vert.	1920.128	AV	37.8	26.4	13.7	41.0		36.9	53.9	17.0	100	125	
Vert.	2350.000	AV	37.6	27.9	14.1	40.9		38.7	53.9	15.2	100	305	
Vert.	2483.500	AV	33.3	28.4	14.2	40.9		35.0	53.9	18.9	100	261	
Vert.	2610.000	AV	36.8	28.7	14.4	41.0		38.9	53.9	15.0	116	290	
Vert.	4960.000	AV	37.8	33.0	6.7	41.5		36.0	53.9	17.9	100	103	
Vert.	7440.000	AV	35.4	37.4	8.1	41.4		39.5	53.9	14.4	100	0	
Vert.	9920.000	AV	34.3	38.9	9.2	40.7		41.7	53.9	12.2	100	0	

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

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

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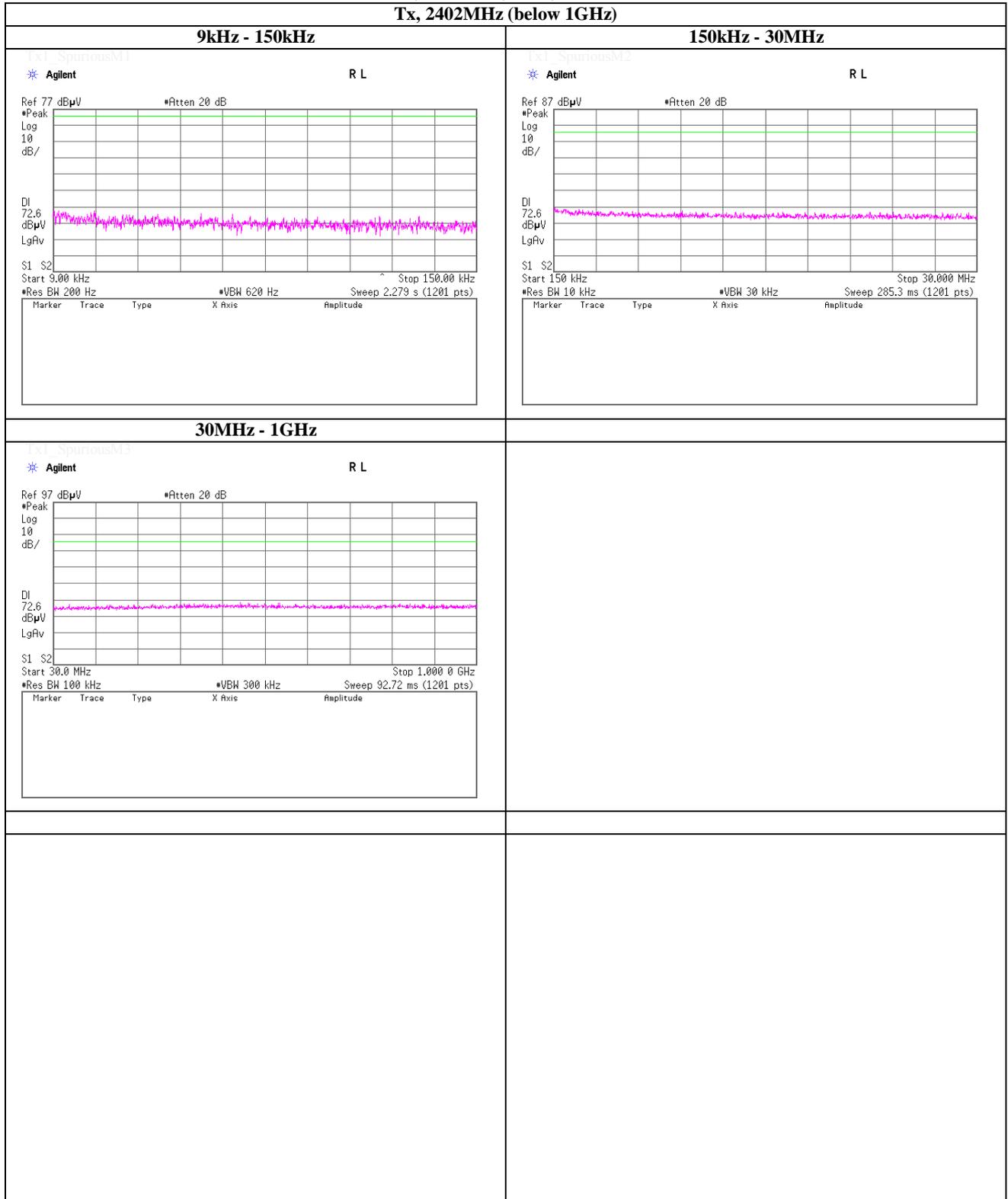
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (below 1GHz)



UL Japan, Inc.

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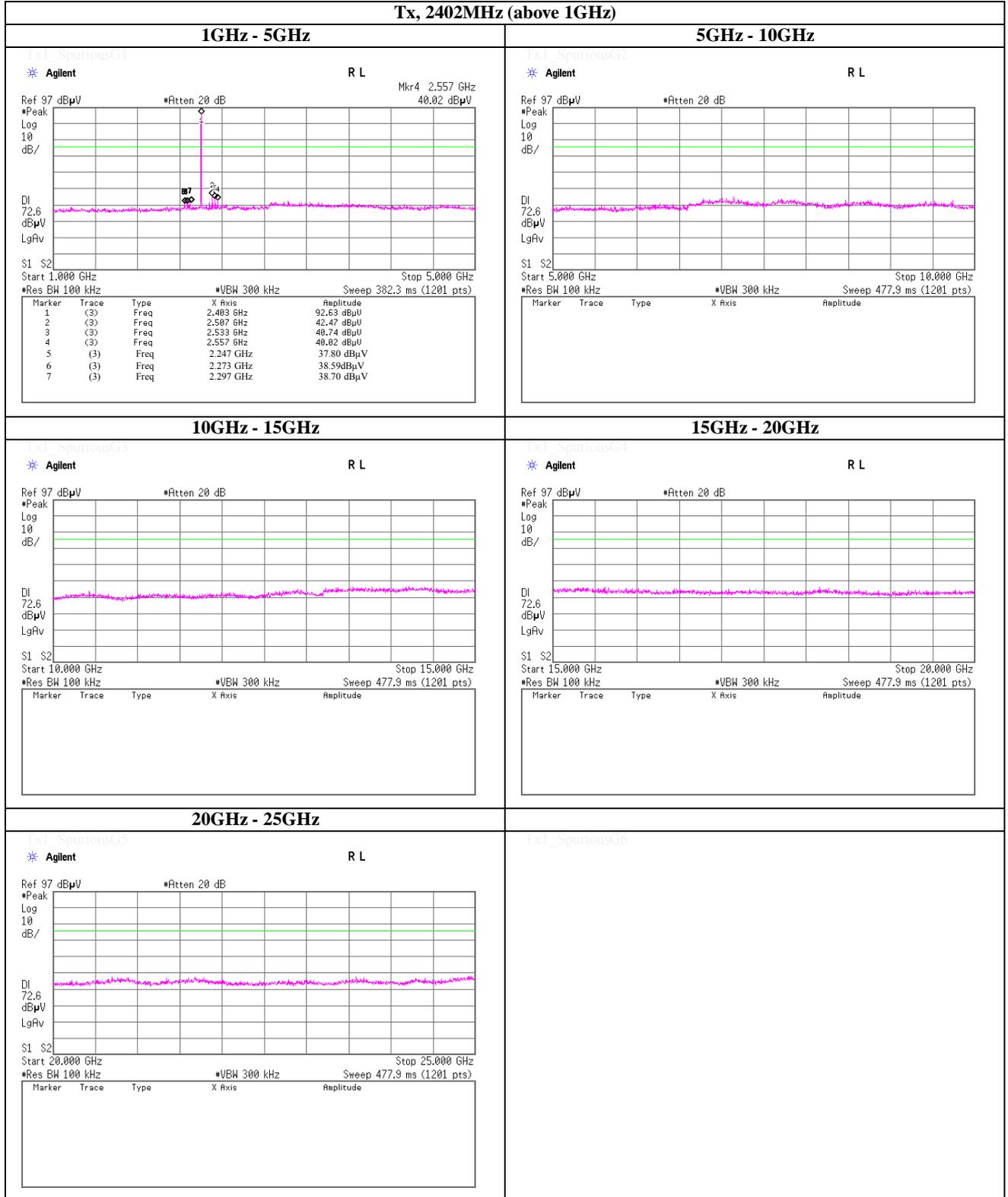
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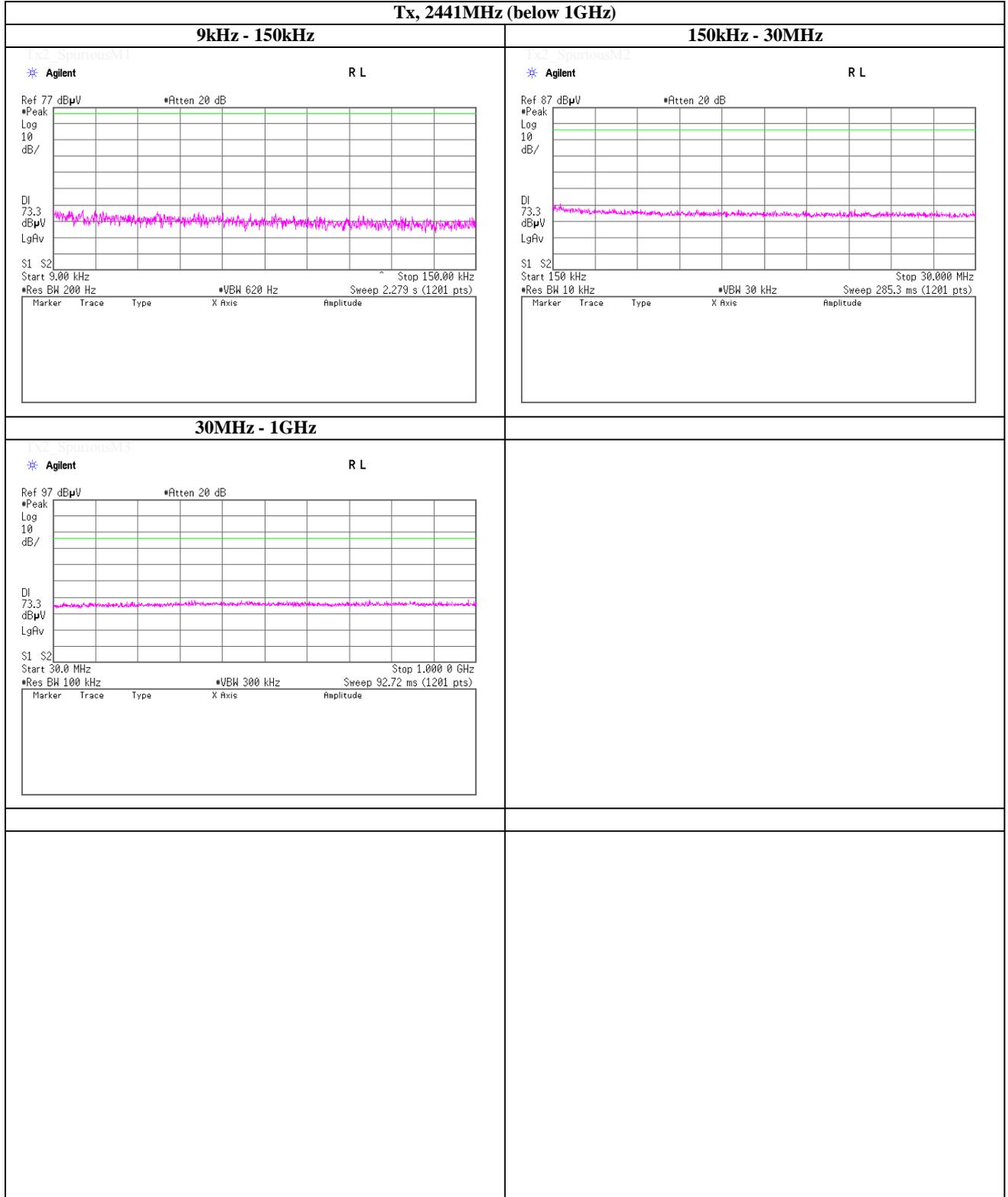
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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (below 1GHz)



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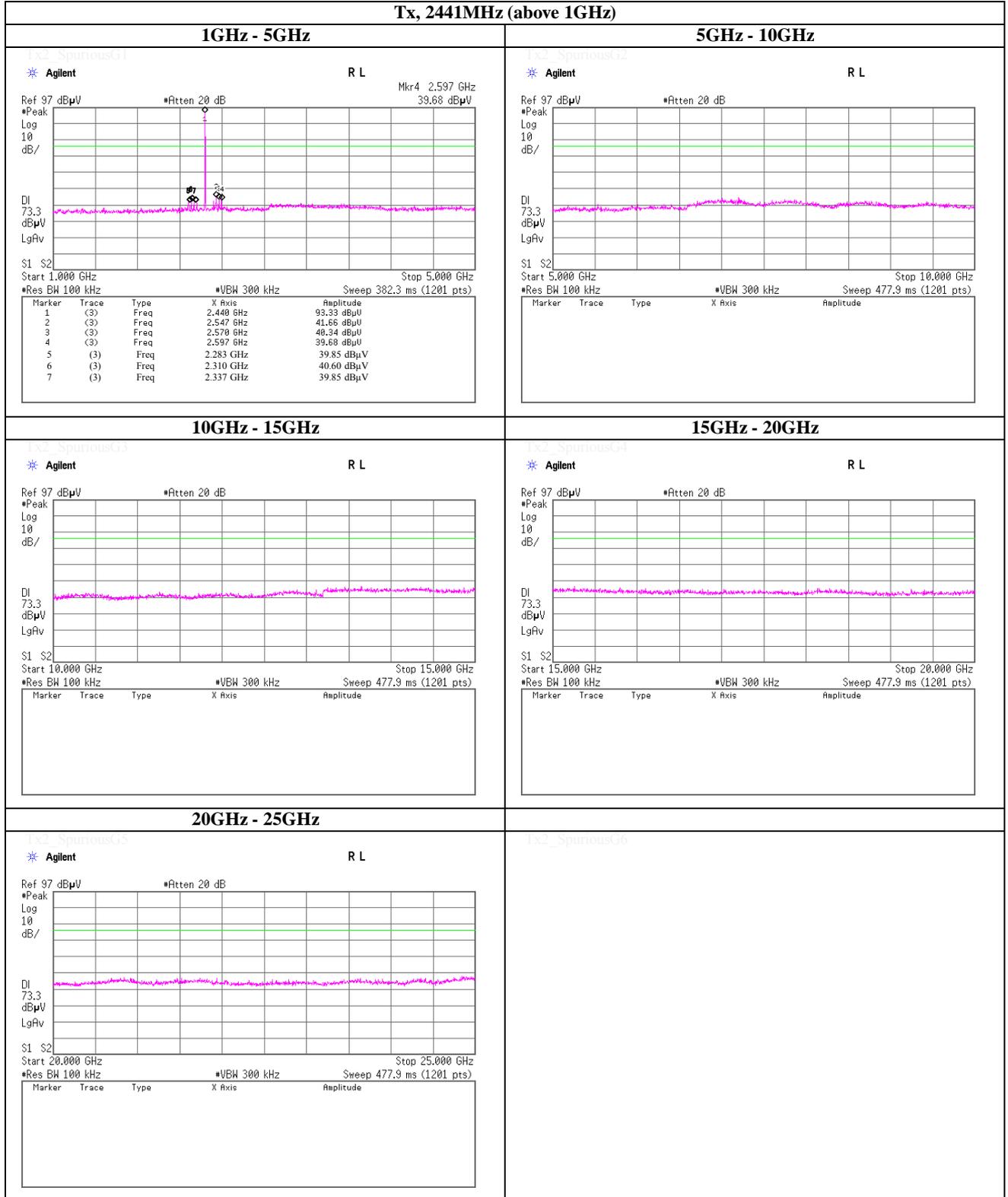
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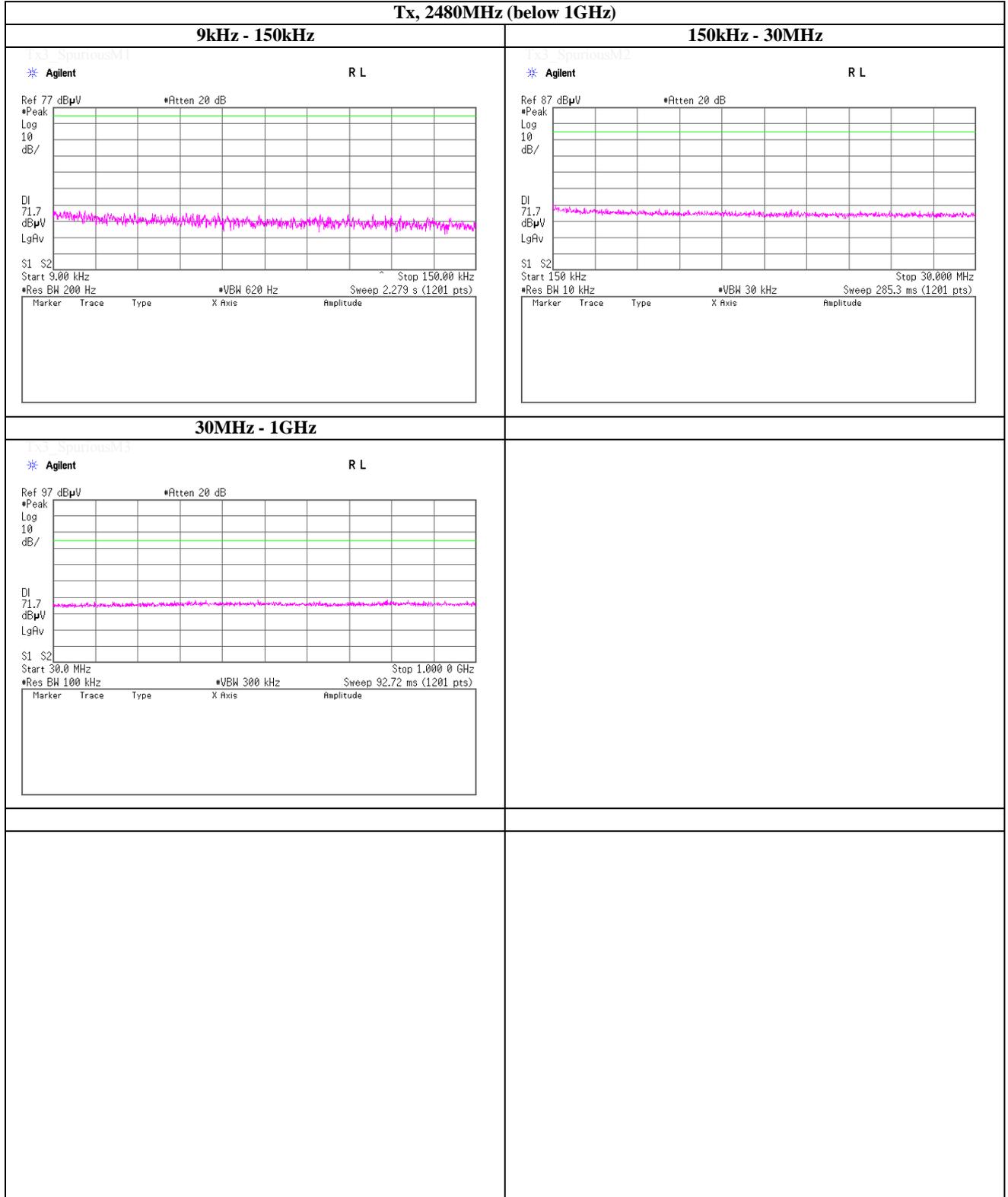
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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (below 1GHz)



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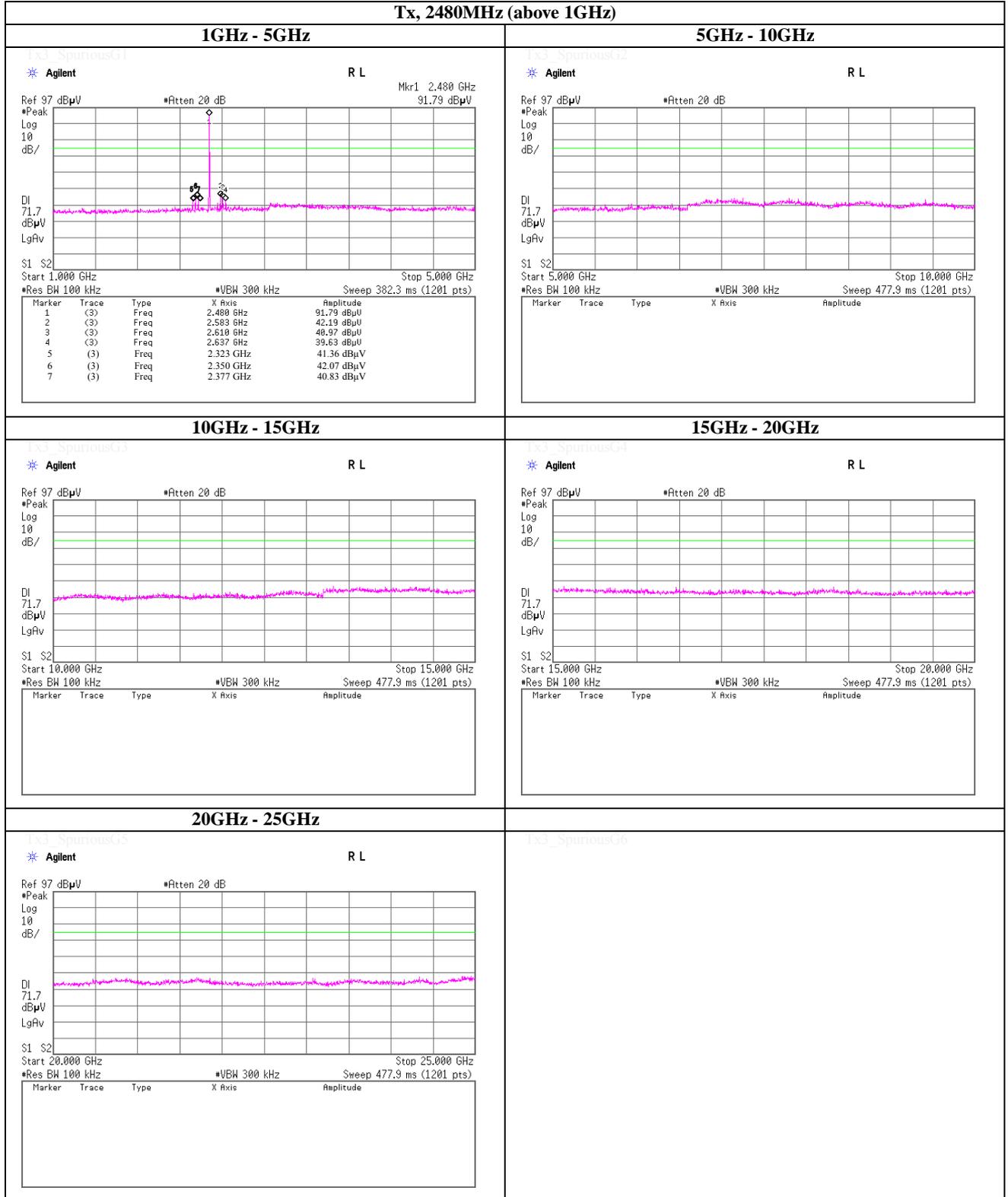
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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (above 1GHz)



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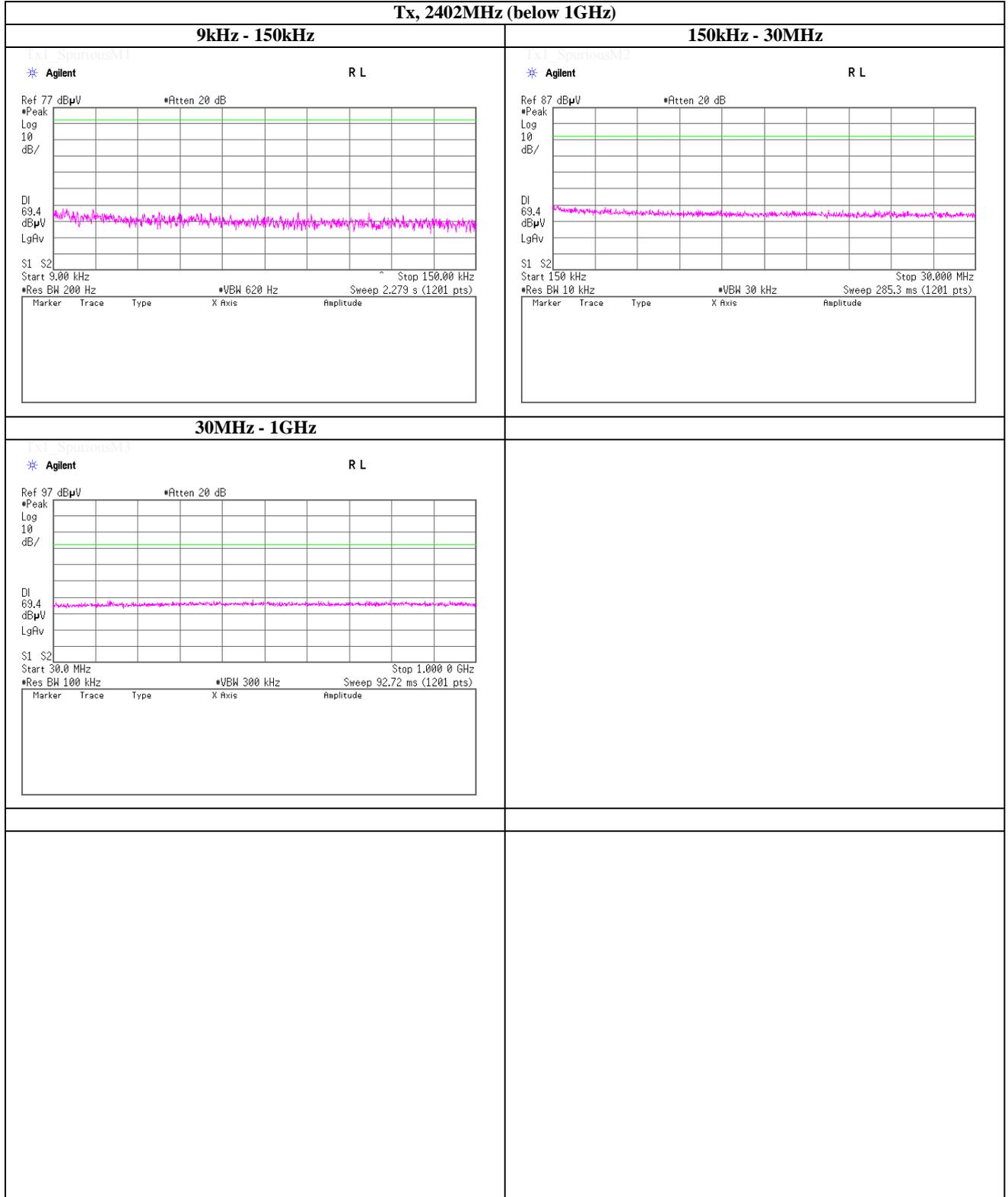
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Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (below 1GHz)



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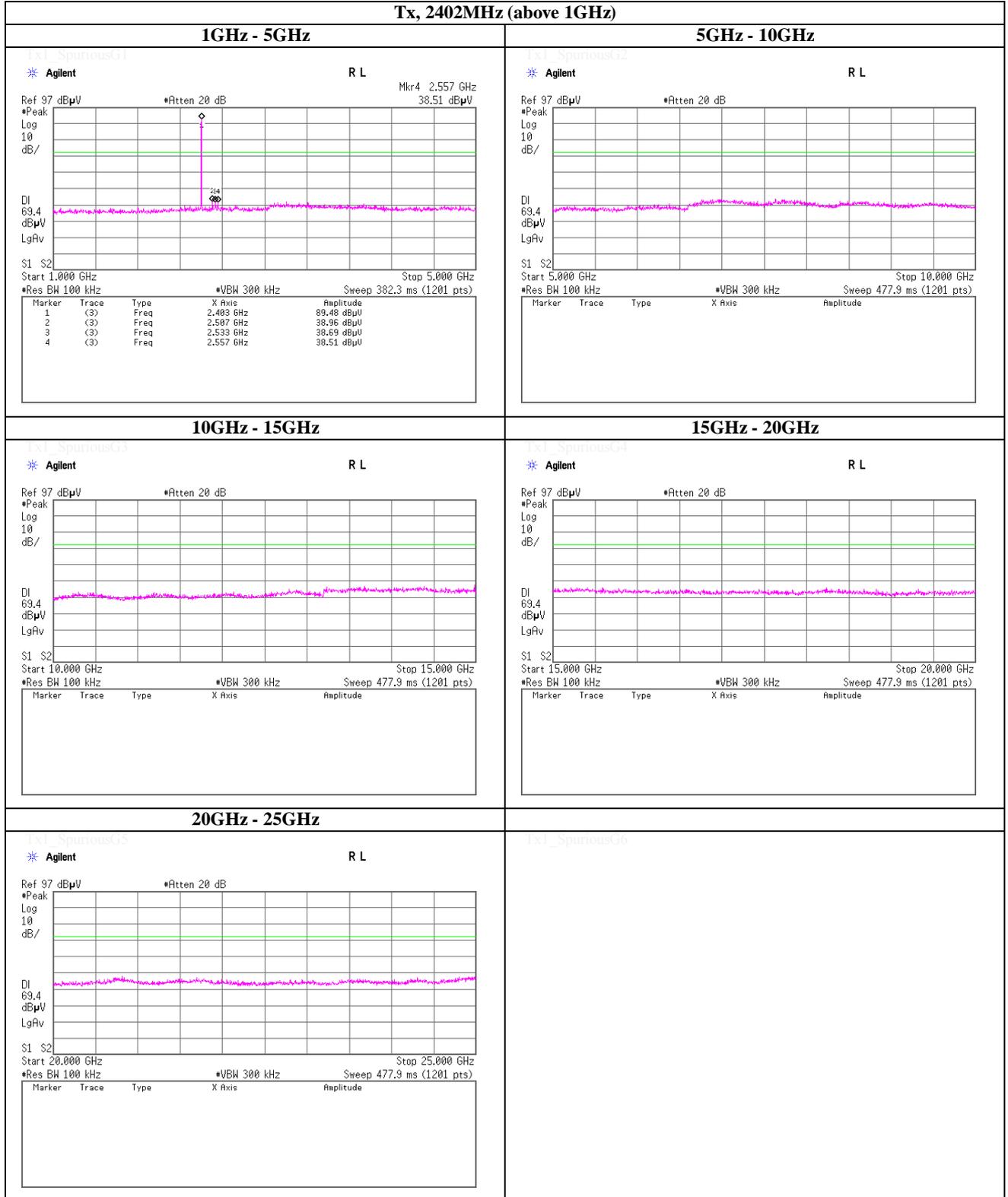
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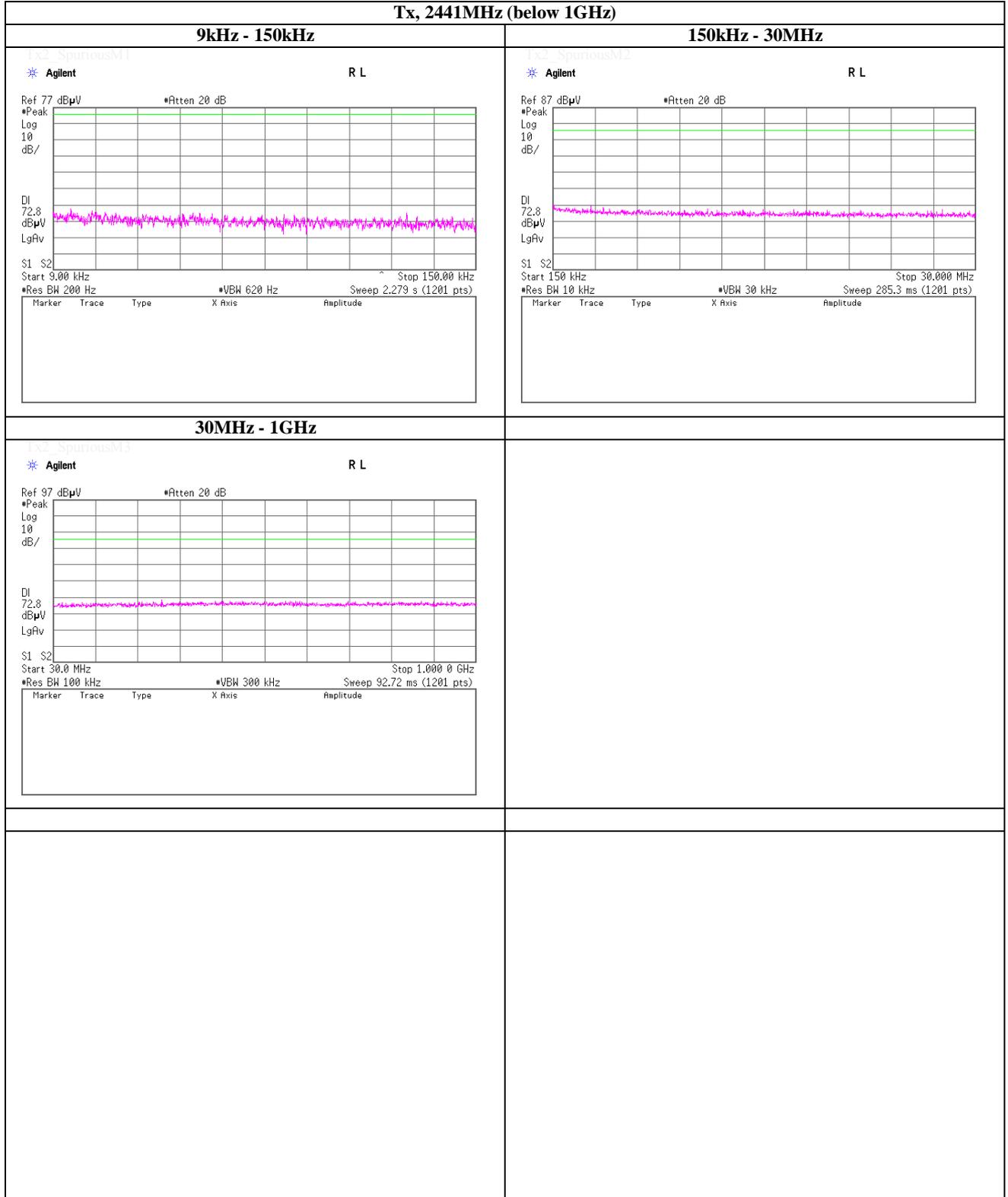
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Tx, 2441MHz (below 1GHz)



UL Japan, Inc.

Shonan EMC Lab.

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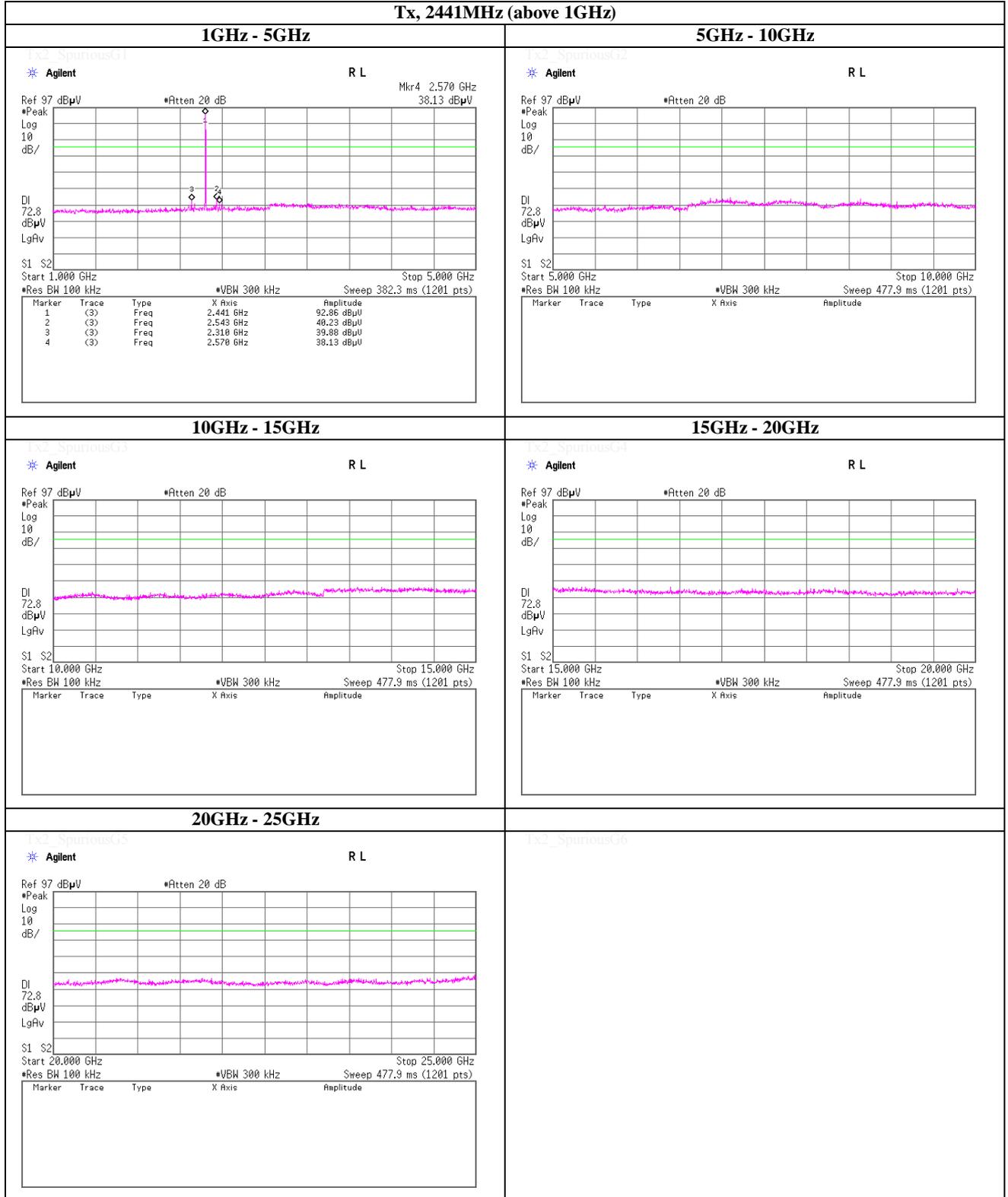
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (above 1GHz)



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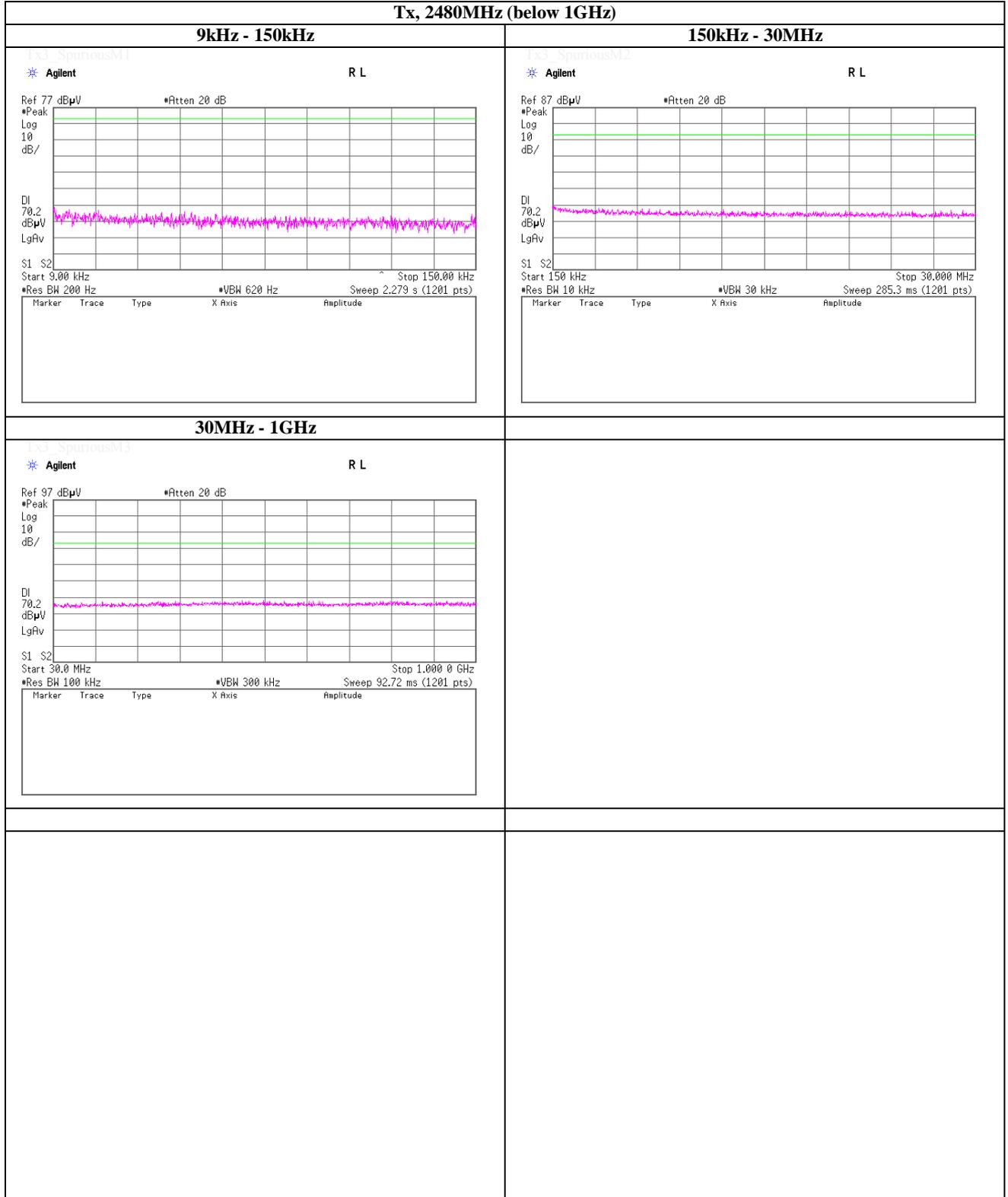
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (below 1GHz)



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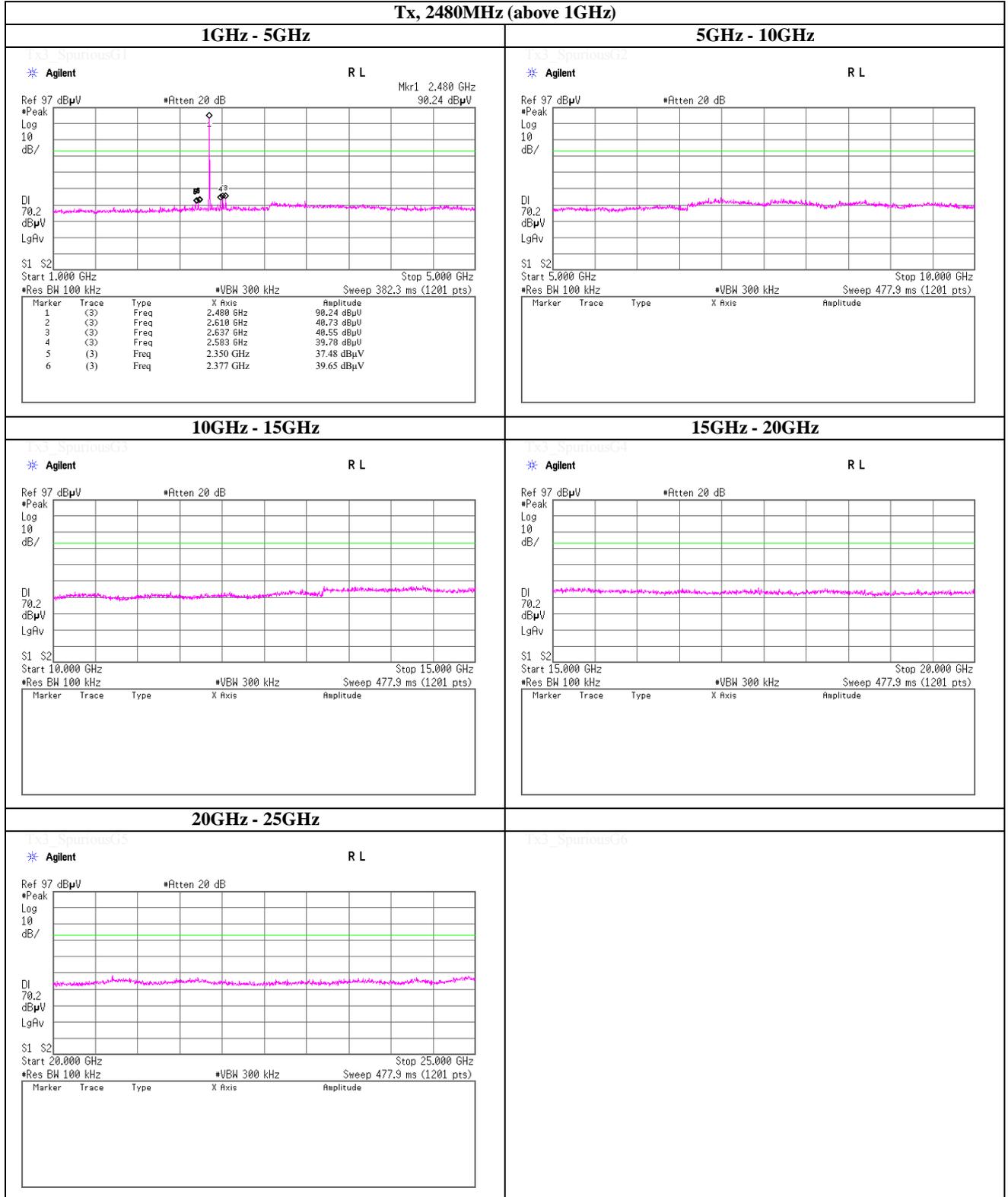
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Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (above 1GHz)



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Shonan EMC Lab.

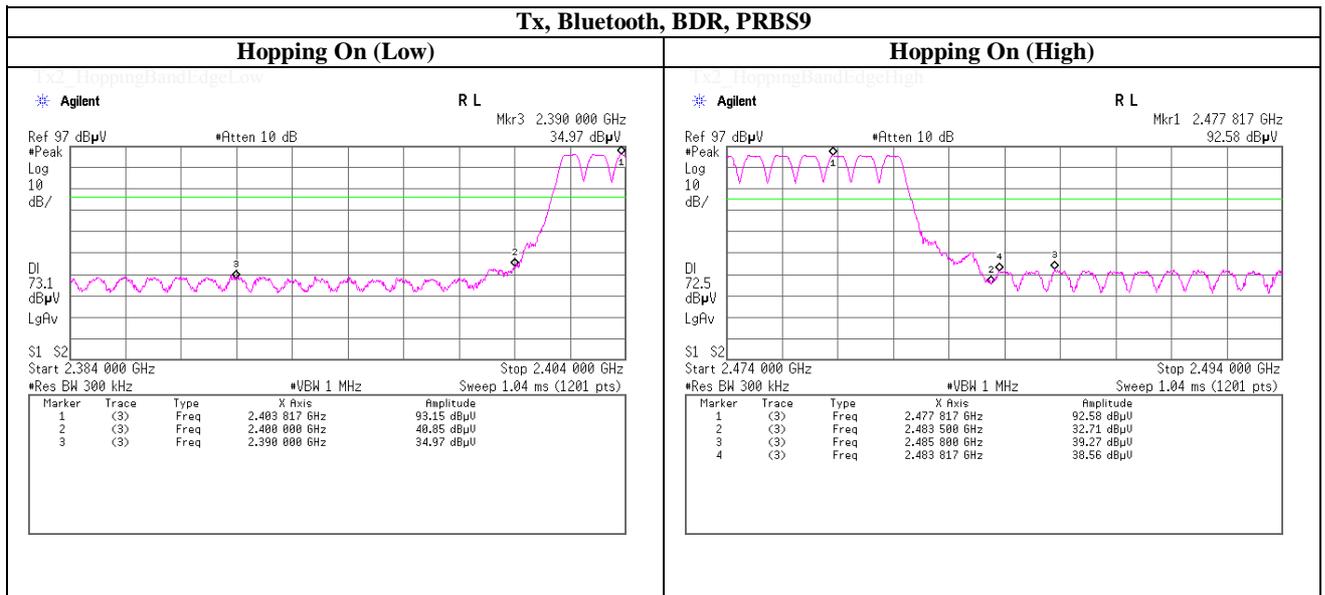
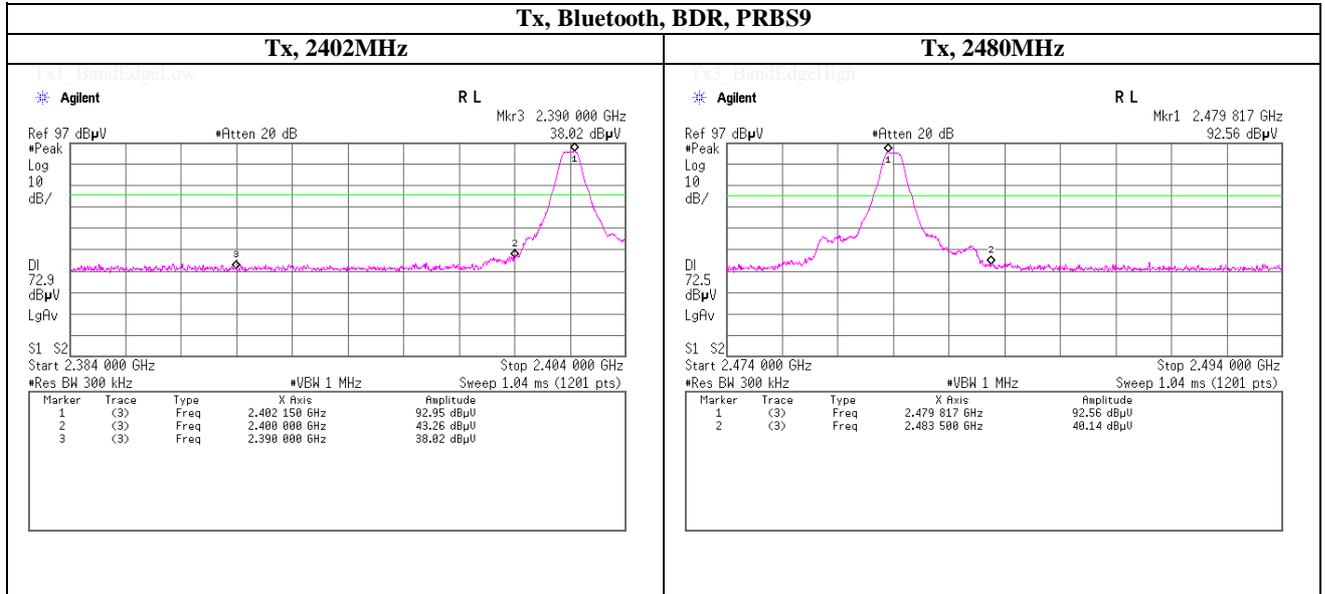
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Spurious emission (Conducted)

Band Edge compliance



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Shonan EMC Lab.

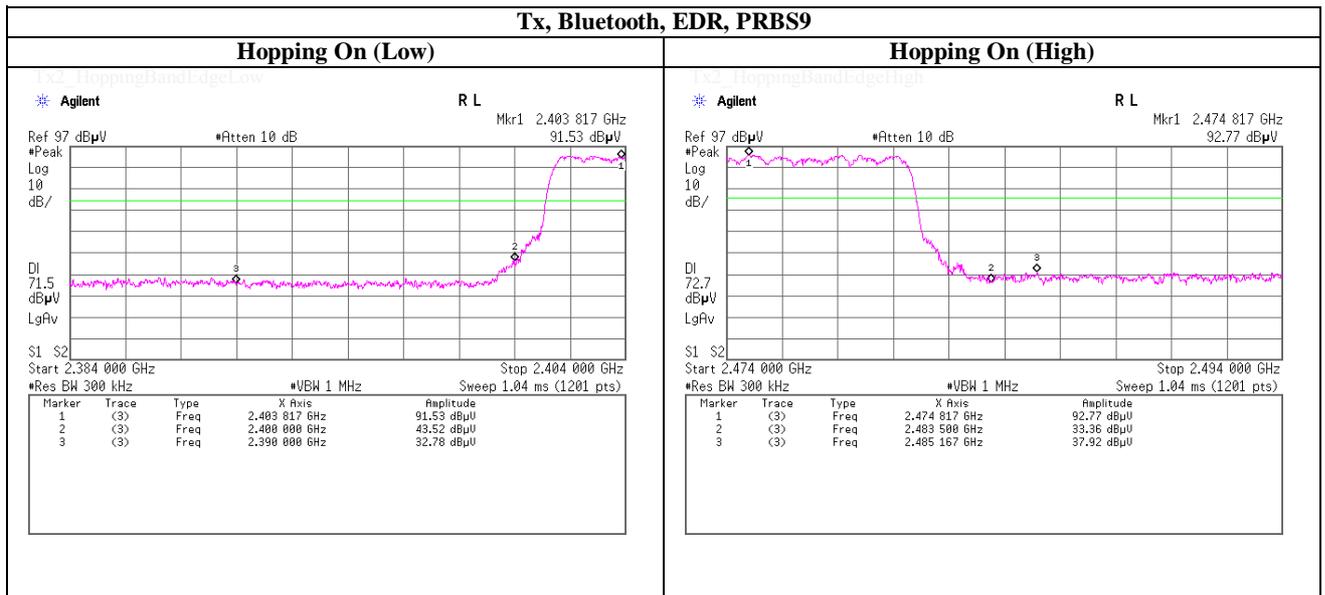
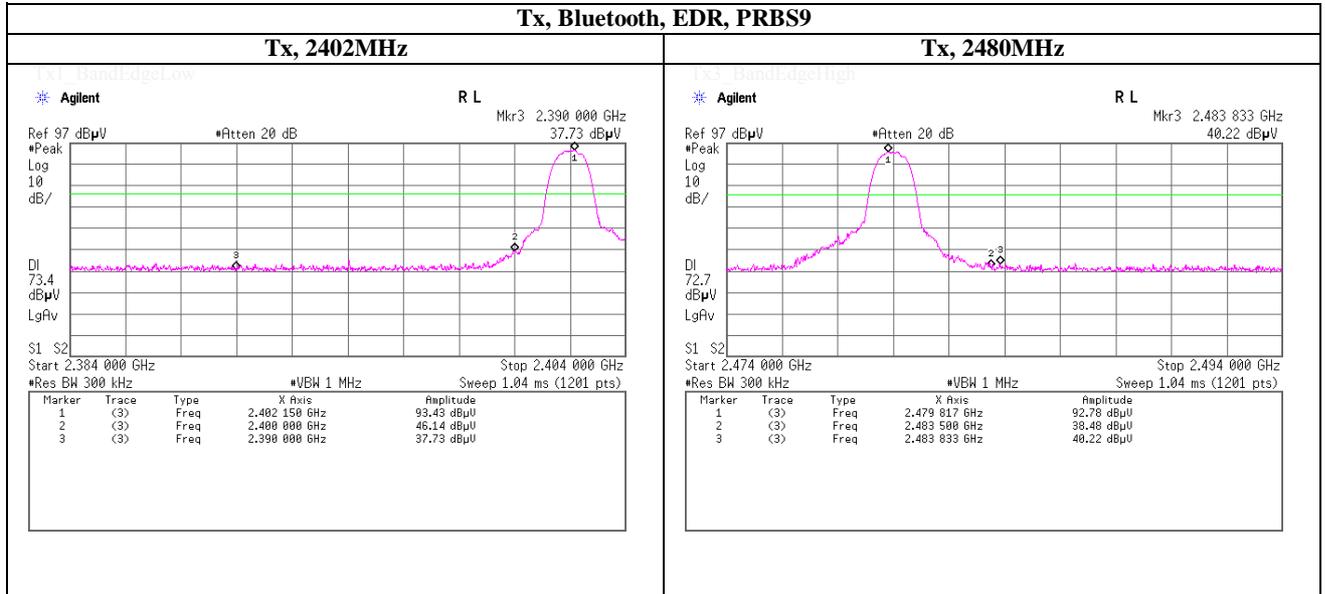
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Spurious emission (Conducted)

Band Edge compliance



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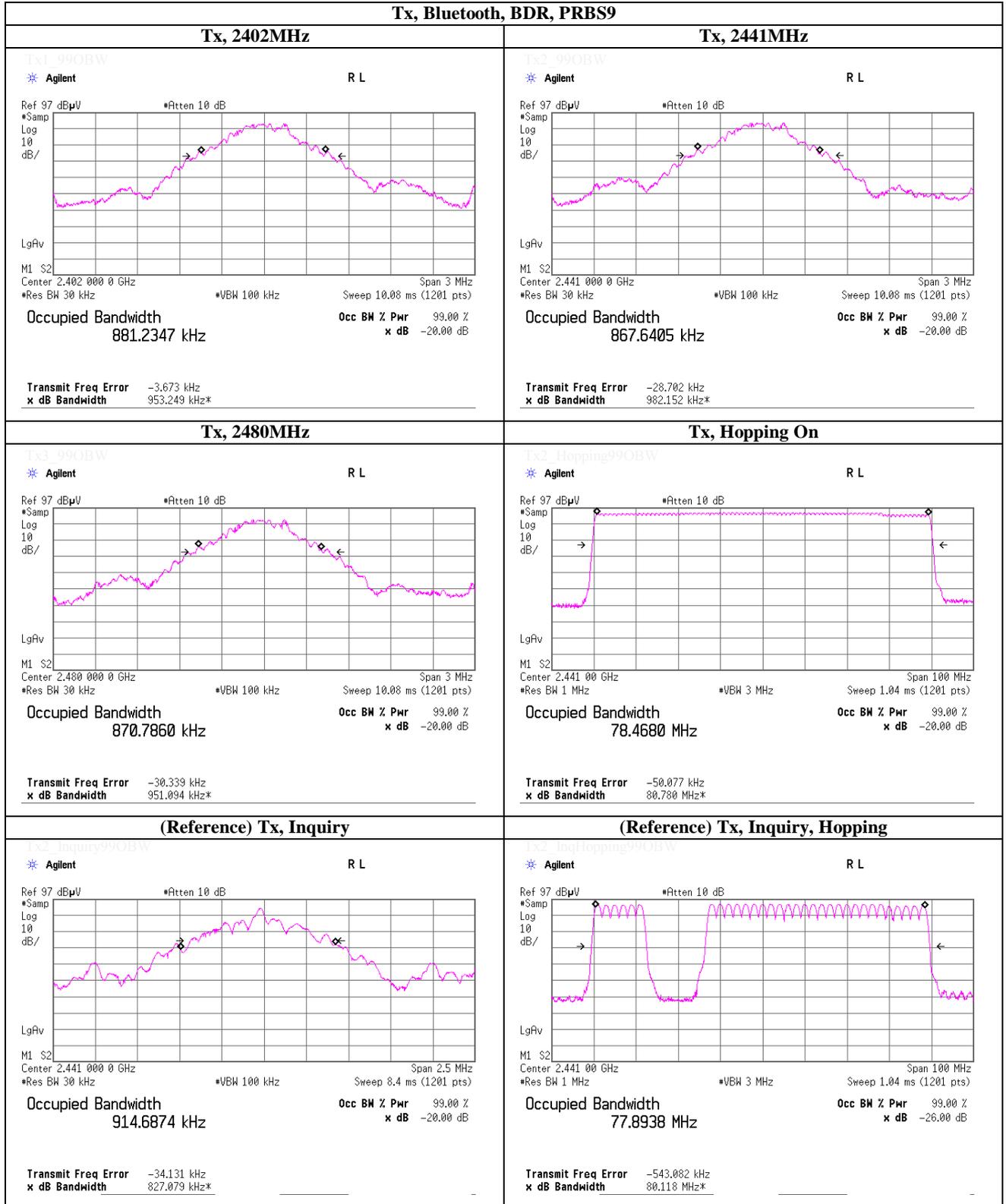
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99% Occupied Bandwidth



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Facsimile : +81 463 50 6401

99% Occupied Bandwidth

Tx, Bluetooth, EDR, PRBS9	
Tx, 2402MHz	Tx, 2441MHz
<p style="text-align: center;">Tx1_99OBW</p> <p style="text-align: center;">* Agilent R L</p> <p>Ref 97 dBµV #Atten 10 dB</p> <p>#Samp Log 10 dB/</p> <p>LgFv</p> <p>M1 S2</p> <p>Center 2.402 000 0 GHz Span 3 MHz</p> <p>#Res BW 30 kHz #VBW 100 kHz Sweep 10.08 ms (1201 pts)</p> <p>Occupied Bandwidth 1.1564 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -20.00 dB</p> <p>Transmit Freq Error -10.520 kHz x dB Bandwidth 1.281 MHz*</p>	<p style="text-align: center;">Tx2_99OBW</p> <p style="text-align: center;">* Agilent R L</p> <p>Ref 97 dBµV #Atten 10 dB</p> <p>#Samp Log 10 dB/</p> <p>LgFv</p> <p>M1 S2</p> <p>Center 2.441 000 0 GHz Span 3 MHz</p> <p>#Res BW 30 kHz #VBW 100 kHz Sweep 10.08 ms (1201 pts)</p> <p>Occupied Bandwidth 1.1558 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -20.00 dB</p> <p>Transmit Freq Error -24.999 kHz x dB Bandwidth 1.272 MHz*</p>
<p style="text-align: center;">Tx3_99OBW</p> <p style="text-align: center;">* Agilent R L</p> <p>Ref 97 dBµV #Atten 10 dB</p> <p>#Samp Log 10 dB/</p> <p>LgFv</p> <p>M1 S2</p> <p>Center 2.480 000 0 GHz Span 3 MHz</p> <p>#Res BW 30 kHz #VBW 100 kHz Sweep 10.08 ms (1201 pts)</p> <p>Occupied Bandwidth 1.1565 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -20.00 dB</p> <p>Transmit Freq Error -24.924 kHz x dB Bandwidth 1.274 MHz*</p>	<p style="text-align: center;">Tx2_Hopping99OBW</p> <p style="text-align: center;">* Agilent R L</p> <p>Ref 97 dBµV #Atten 10 dB</p> <p>#Samp Log 10 dB/</p> <p>LgFv</p> <p>M1 S2</p> <p>Center 2.441 00 GHz Span 100 MHz</p> <p>#Res BW 1 MHz #VBW 3 MHz Sweep 1.04 ms (1201 pts)</p> <p>Occupied Bandwidth 78.5980 MHz</p> <p>Occ BW % Pwr 99.00 % x dB -20.00 dB</p> <p>Transmit Freq Error -84.811 kHz x dB Bandwidth 80.987 MHz*</p>
<p style="text-align: center;">Tx2_Inquiry99OBW</p>	<p style="text-align: center;">Tx2_Inq_Hopping99OBW</p>

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APPENDIX 2 Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2013/07/03 * 12
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2013/07/06 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2013/03/19 * 12
SCC-G01	Coaxial Cable	Suhner	SUCOFLEX 104A	46497/4A	RE	2013/04/09 * 12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX 104	296169/4	RE	2013/05/22 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2013/08/12 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2013/02/27 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2013/03/04 * 12
SJM-08	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFLMF)	-	RE	-
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2013/11/22 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2013/11/22 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2013/03/14 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2		2013/03/16 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2013/03/19 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2013/02/12 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2013/02/12 * 12
KAT3-11	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2013/08/19 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2012/11/18 * 12
SCC-B1/B3/B5 /B7/B8/B13/S RSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-270(RF Selector)	RE	2013/04/03 * 12
SCC-B2/B4/B6 /B7/B8/B13/S RSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-270(RF Selector)	RE	2013/04/03 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2012/11/18 * 12
STR-02	Test Receiver	Rohde & Schwarz	ESCI	100575	RE	2013/09/24 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT	2013/03/28 * 12
KPM-08	Power meter	Anritsu	ML2495A	6K00003356	AT	2013/09/04 * 12
KPSS-04	Power sensor	Anritsu	MA2411B	012088	AT	2013/09/04 * 12
SCC-G14	Coaxial Cable	Suhner	SUCOFLEX 102	31600/2	AT	2013/03/16 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2013/11/27 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	AT	2013/03/07 * 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