



RADIO TEST REPORT

Test Report No.: 10037151S-A

Applicant : **Sony Corporation**
Type of Equipment : **AV Center**
Model No. : **XAV-602BT**
FCC ID : **AK8XAV602BT**
Test regulation : **FCC Part15 Subpart C: 2013**
Test result : **Complied**

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2. The results in this report apply only to the sample tested.
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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: August 5 to 6, 2013

Tested by: 
Kenichi Adachi
Engineer of WiSE Japan,
UL Verification Service

Approved by : 
Toyokazu Imamura
Leader of WiSE Japan,
UL Verification Service



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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 : AV Center
Model Number : XAV-602BT
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 : July 16, 2013
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: XAV-602BT (referred to as the EUT in this report) is an AV Center.

Clock frequency(ies) in the system : 36.48MHz, 32.000MHz, 30.000MHz, 27.000MHz, 24.000MHz,
12.000MHz, 11.2896MHz, 10.000MHz, 6.000MHz, 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 : (MITSUBISHI) AMD0302-ST01 SMD
Antenna connector type : None
Antenna gain : -3.8dBi (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 June 11, 2013 and effective July 11, 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 10037151S-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		3.2 dB Polarization: Horizontal Detection: QP Freq.: 720.051MHz, Mode: Tx 2441MHz, DH5 Freq.: 720.050MHz, Mode: Tx 2402MHz, 3-DH5 Freq.: 720.050MHz, Mode: Tx 2441MHz, 3-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	4.9 dB	5.1 dB	4.9 dB
	300MHz-1GHz	5.0 dB	5.2 dB	4.9 dB
	1GHz-15GHz	4.8 dB	4.8 dB	4.9 dB
Radiated emission (Measurement distance: 1m)	15GHz-18GHz	5.6 dB	5.6 dB	5.6 dB
	18GHz-40GHz	4.6 dB	4.3 dB	4.4 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: (±) 1.7dB

Spurious emission (Conducted) measurement (1G-3GHz) uncertainty for this test was: (±) 2.3dB

Spurious emission (Conducted) measurement (3G-18GHz) uncertainty for this test was: (±) 3.0dB

Spurious emission (Conducted) measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.9dB

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

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3.5 Test location

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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 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 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 checked="" 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 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 checked="" 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	-

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.
As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.

Software: CSR Blue Suite BlueTest Ver.1.24
CSR Blue Suite BtCli Ver.1.24 (Inquiry mode only)
Power Settings: BDR = 44
EDR = 48

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

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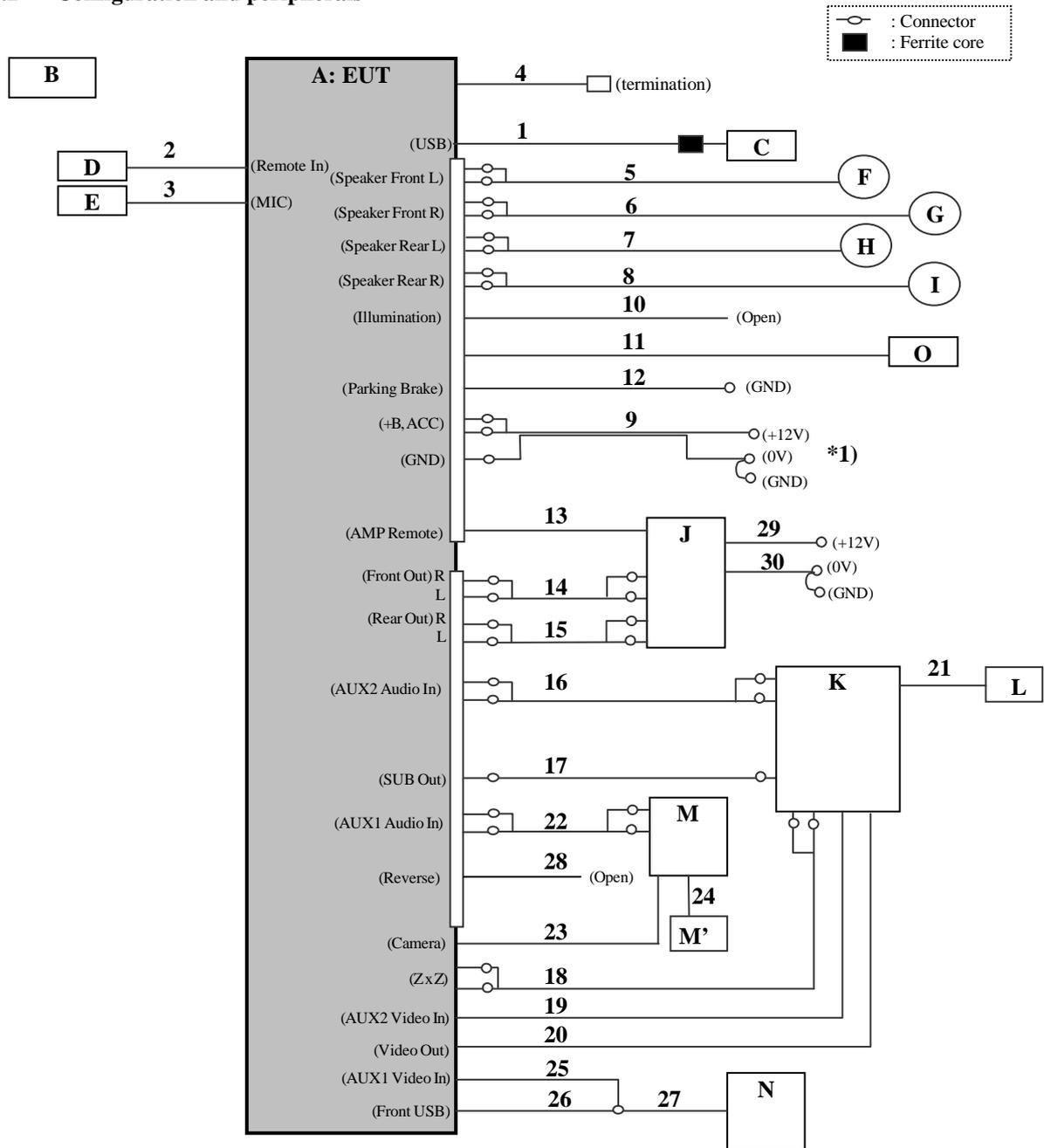
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4.2 Configuration and peripherals



* 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	AV Center	XAV-602BT	*2)	Sony	EUT
B	Remote Commander	RM-X271	-	Sony	-
C	USB Memory	SDK-USM4GL(B)	10615MEDB	Sony	-
D	Wired Remote Controller	RM-X4S	-	Sony	-
E	MIC	-	-	Sony	-
F	Speaker 1	XS-J1620	-	Sony	-
G	Speaker 2	XS-J1620	-	Sony	-
H	Speaker 3	XS-F1023	-	Sony	-
I	Speaker 4	XS-F1023	-	Sony	-
J	Stereo Power Amplifier	XM-2042	-	Sony	-
K	Connection Box	XA-124	3509579	Sony	-
L	LCD Monitor	XVM-F65	3509383	Sony	-
M	Color Video Camera	CCD-MC100	1007356	Sony	-
M'					
N	iPod touch	A1288	9C90590L201	Apple	-
O	SIRIUS XM CONNECT VEHICLE TUNER	SXV100	1113	SIRIUS	-

*2) 37: Antenna port conducted tests, 38: Radiated emission tests

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List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB	1.5	Shielded	Shielded	-
2	REMOTE IN	1.9	Shielded	Shielded	-
3	MIC	4.0	Shielded	Shielded	-
4	FM antenna	3.0	Shielded	Shielded	-
5	Speaker (1)	0.15+4.0	Unshielded	Unshielded	-
6	Speaker (2)	0.15+4.0	Unshielded	Unshielded	-
7	Speaker (3)	0.15+2.0	Unshielded	Unshielded	-
8	Speaker (4)	0.15+2.0	Unshielded	Unshielded	-
9	DC Power	0.15+2.2	Unshielded	Unshielded	-
10	Illumination	0.15+1.9	Unshielded	Unshielded	-
11	Signal	0.6	Shielded	Shielded	-
12	Parking brake	2.0	Unshielded	Unshielded	-
13	AMP Remote	0.15+1.6	Unshielded	Unshielded	-
14	RCA (Front Audio Out)	0.1+1.0	Shielded	Shielded	-
15	RCA (Rear Audio Out)	0.1+2.0	Shielded	Shielded	-
16	RCA (AUX2 Audio In)	0.1+1.2	Shielded	Shielded	-
17	RCA (SUB Out)	0.1+2.0	Shielded	Shielded	-
18	RCA (Z x Z)	1.4	Shielded	Shielded	-
19	RCA (AUX2 Video in)	1.2	Shielded	Shielded	-
20	RCA (Video Out)	1.4	Shielded	Shielded	-
21	LCD Monitor	3.0	Shielded	Shielded	-
22	RCA (AUX1 Audio In)	0.1+1.4	Shielded	Shielded	-
23	RCA (Camera)	1.4	Shielded	Shielded	-
24	Camera	2.0	Shielded	Shielded	-
25	RCA (AUX1 Video In)	1.5	Shielded	Shielded	-
26	USB (Front)	1.0	Shielded	Shielded	-
27	iPod	0.8	Shielded	Shielded	-
28	Reverse	0.1+1.0	Unshielded	Unshielded	-
29	DC Power (+)	1.6	Unshielded	Unshielded	-
30	DC Power (-)	0.6	Unshielded	Unshielded	-

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SECTION 5: Carrier frequency separation

Test procedure

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

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

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

Test procedure

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

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

SECTION 7: Number of hopping frequency

Test procedure

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

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

SECTION 8: Dwell time

Test procedure

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

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

SECTION 9: Maximum peak output power

Test procedure

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

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

SECTION 10: Spurious emissions (Antenna port conducted)

Test procedure

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

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		20dBc
Detection Type	: Quasi-Peak	Peak	* Average	Peak
IF Bandwidth	: 120kHz	RBW:1MHz VBW:3MHz	RBW:1MHz VBW:10Hz	RBW: 100kHz VBW: 300kHz

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

The carrier level and noise levels were confirmed at mounting angle of 0 to 45 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 (1-15GHz)	Spurious emission (Above 15GHz)
Horizontal	0 deg.	0 deg.	0 deg.	0 deg.
Vertical	0 deg.	0 deg.	0 deg.	0 deg.

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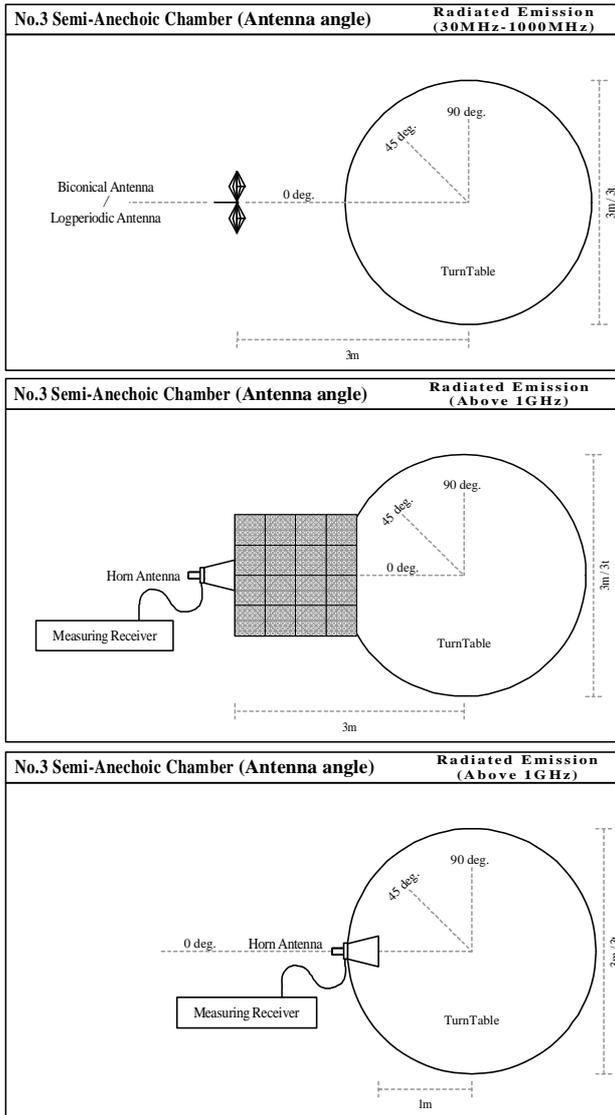
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Figure 1. Antenna angle



11.5 Band edge

Band edge level at 2390MHz and 2483.5MHz is below the limits of FCC 15.209 and band edge level at 2400MHz is below the 20dBc. Refer to the data.

11.6 Results

Summary of the test results: Pass *No noise was detected above the 3rd order harmonics.

Refer to APPENDIX 1.

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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
Dwell time factor Calculation chart
Spurious emission (Antenna port conducted)
Occupied bandwidth

APPENDIX 2: Test instruments

Test instruments

APPENDIX 3: Photographs of test setup

Radiated emission

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APPENDIX 1: Data of Radio tests

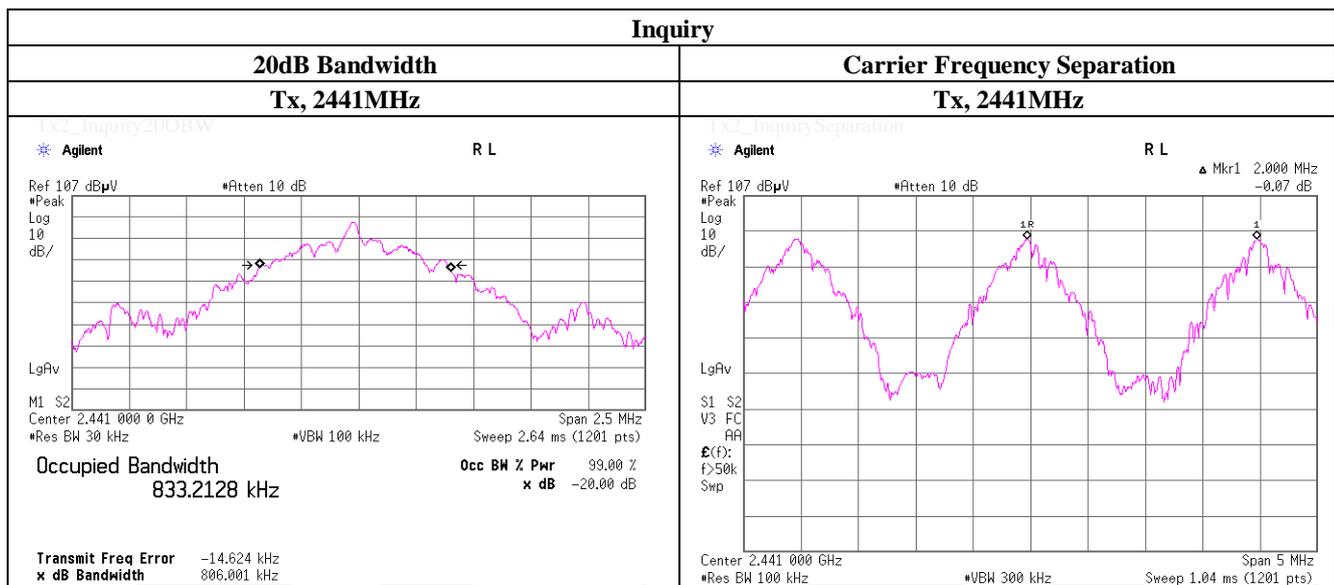
20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date August 5, 2013
 Temperature / Humidity 25 deg.C , 60 %RH
 Engineer Kenichi Adachi
 Mode Tx, Bluetooth, BDR, PRBS9

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.928	1.000	>= 0.619
DH5	2441.0	0.932	1.000	>= 0.621
DH5	2480.0	0.925	1.000	>= 0.617
Inquiry	2441.0	0.806	2.000	>= 0.537

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

No limit applies to 20dB Bandwidth.



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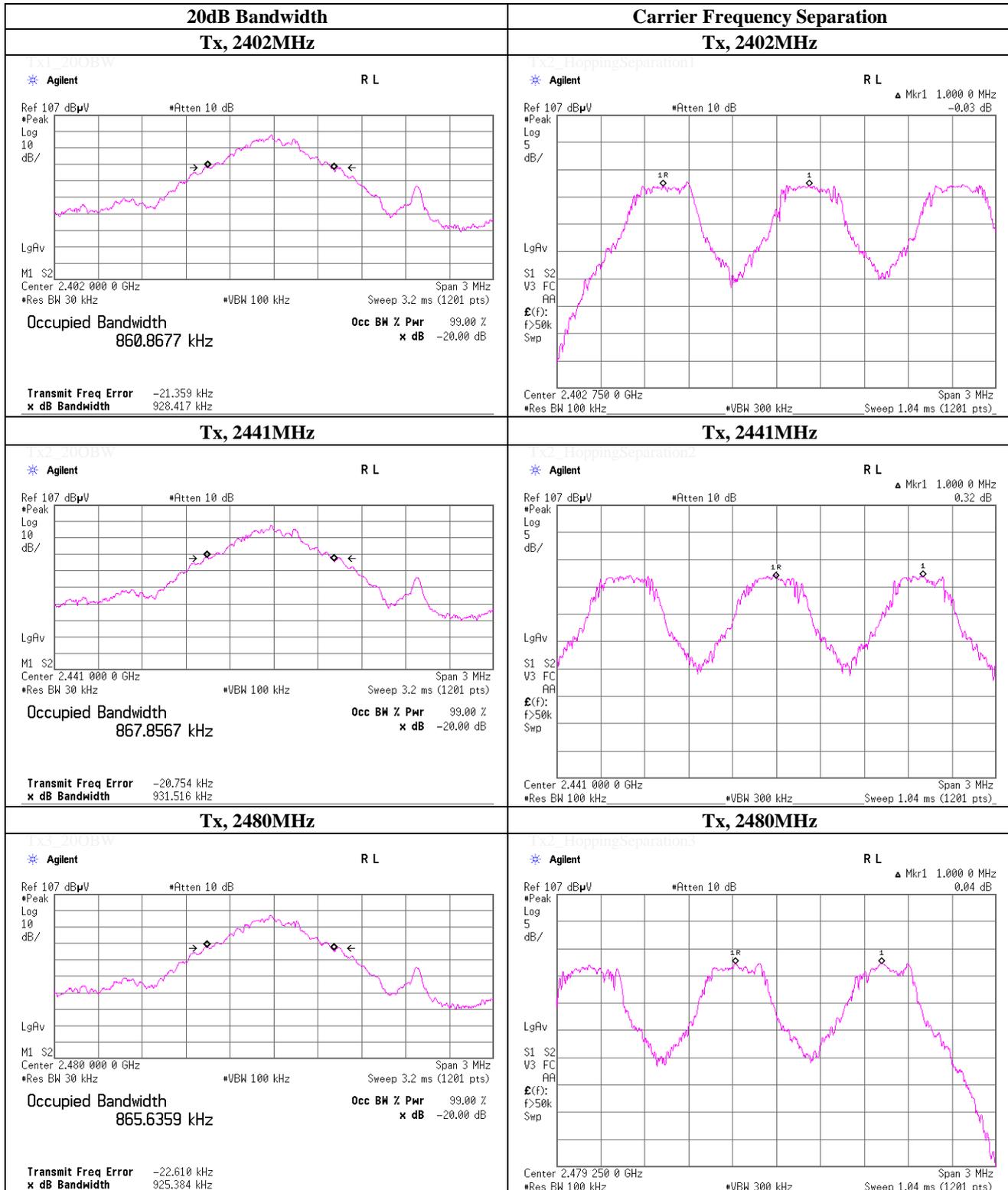
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, BDR, PRBS9



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20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
Date August 5, 2013
Temperature / Humidity 25 deg.C , 60 %RH
Engineer Kenichi Adachi
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	1.268	1.005	>= 0.846
3-DH5	2441.0	1.283	1.000	>= 0.855
3-DH5	2480.0	1.273	1.000	>= 0.849

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

No limit applies to 20dB Bandwidth.

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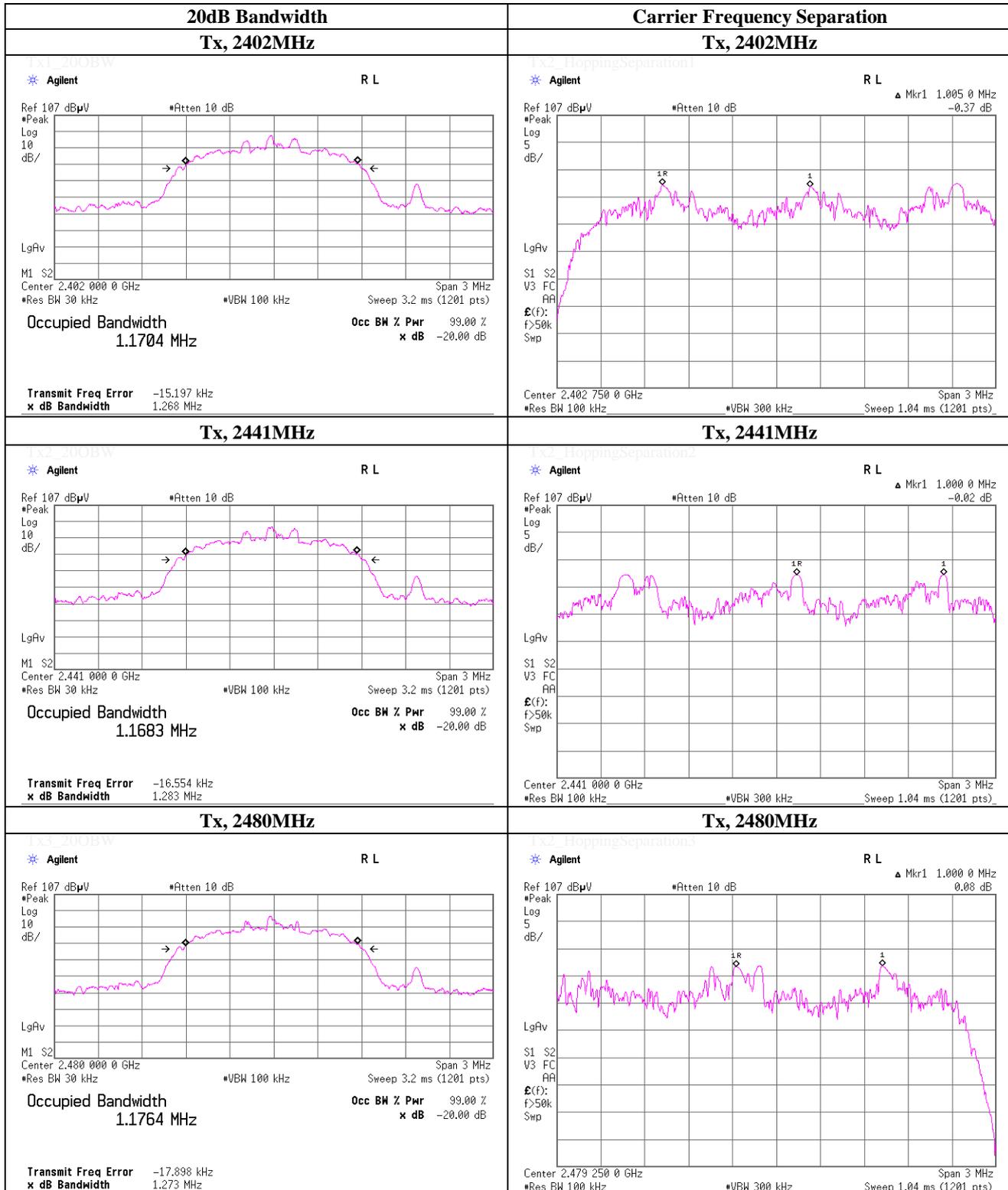
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, PRBS9



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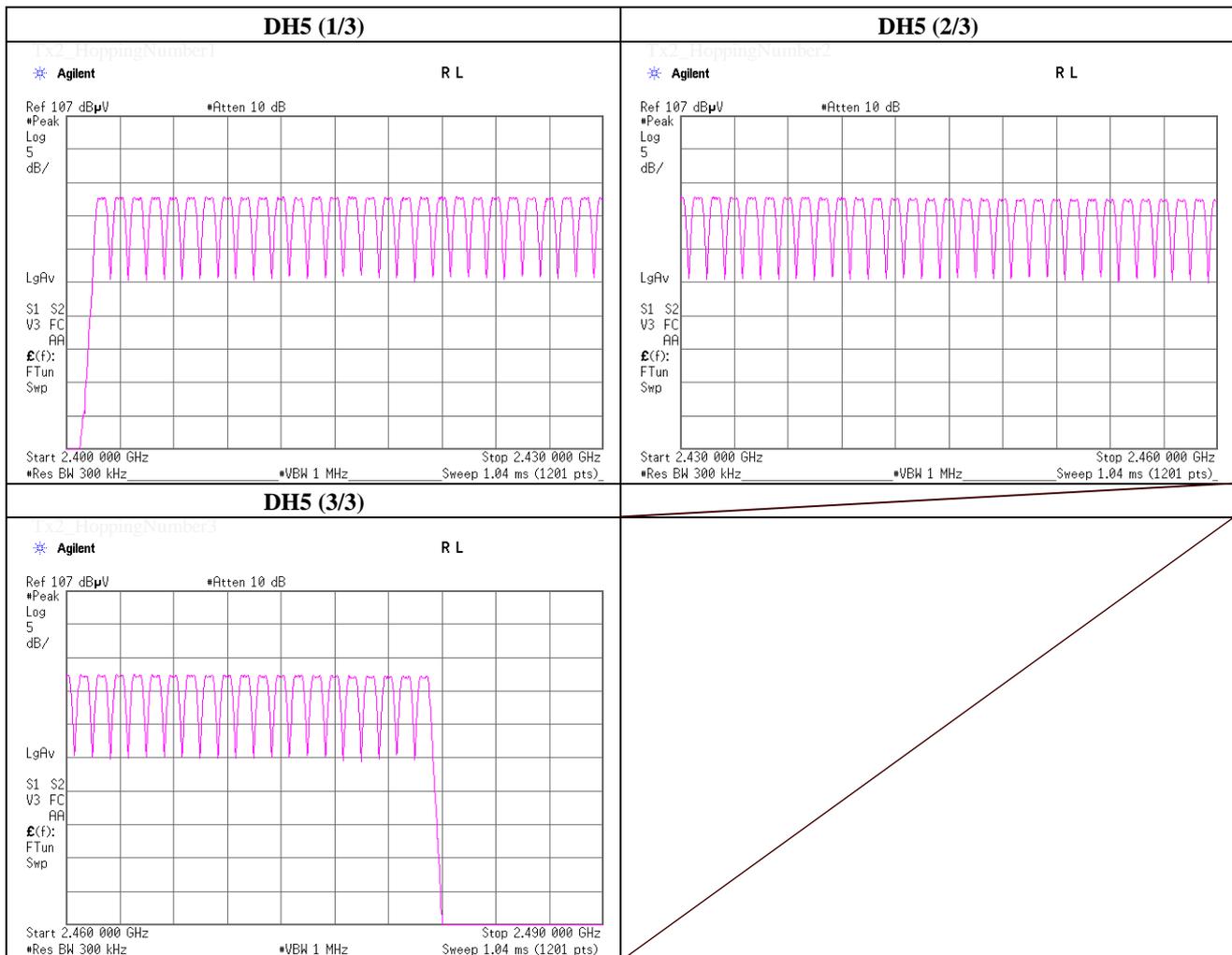
Facsimile : +81 463 50 6401

Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	August 5, 2013	
Temperature / Humidity	25 deg.C , 60 %RH	
Engineer	Kenichi Adachi	
Mode	Tx, Bluetooth, BDR, PRBS9	

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

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



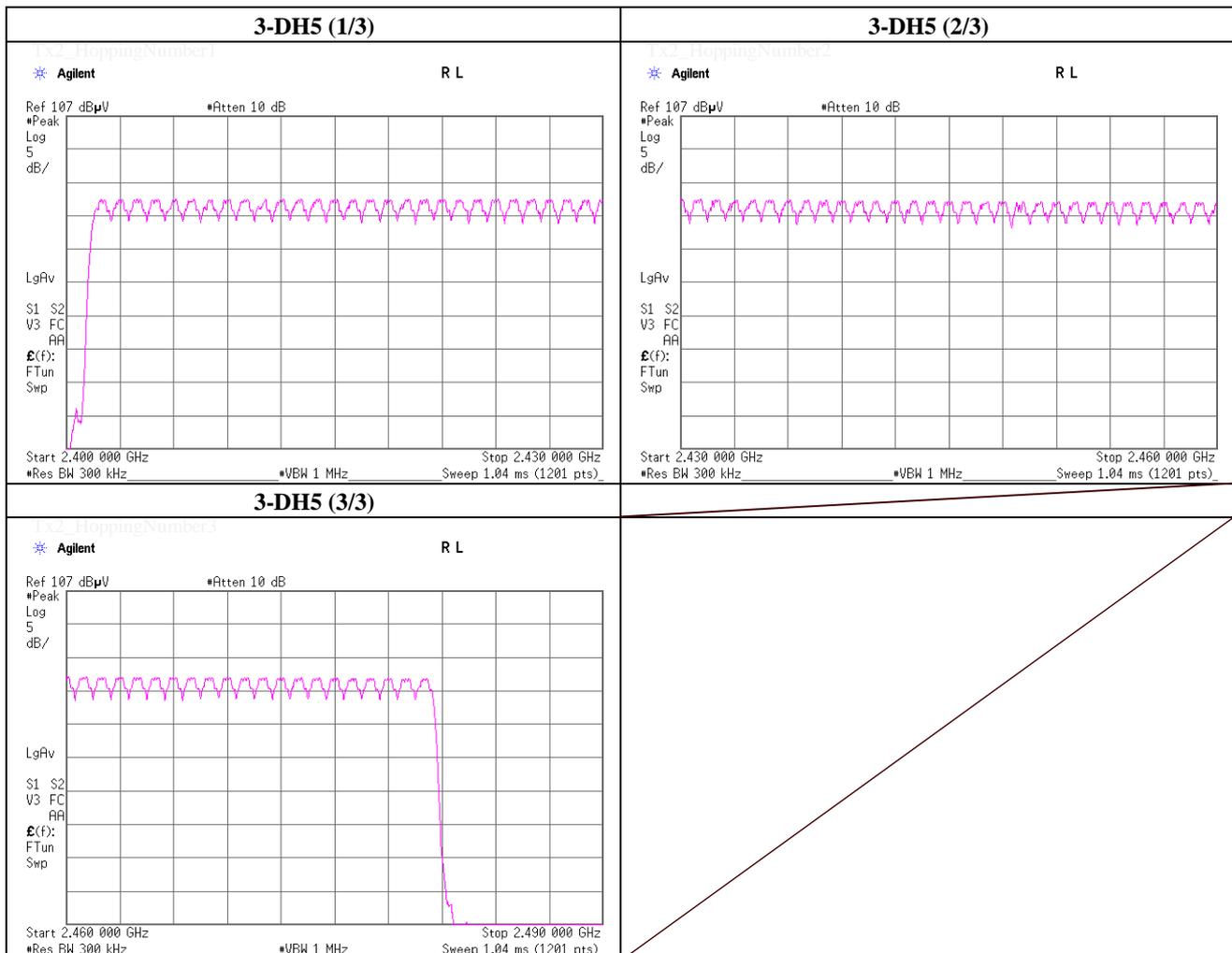
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Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	August 5, 2013	
Temperature / Humidity	25 deg.C , 60 %RH	
Engineer	Kenichi Adachi	
Mode	Tx, Bluetooth, EDR, PRBS9	

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

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

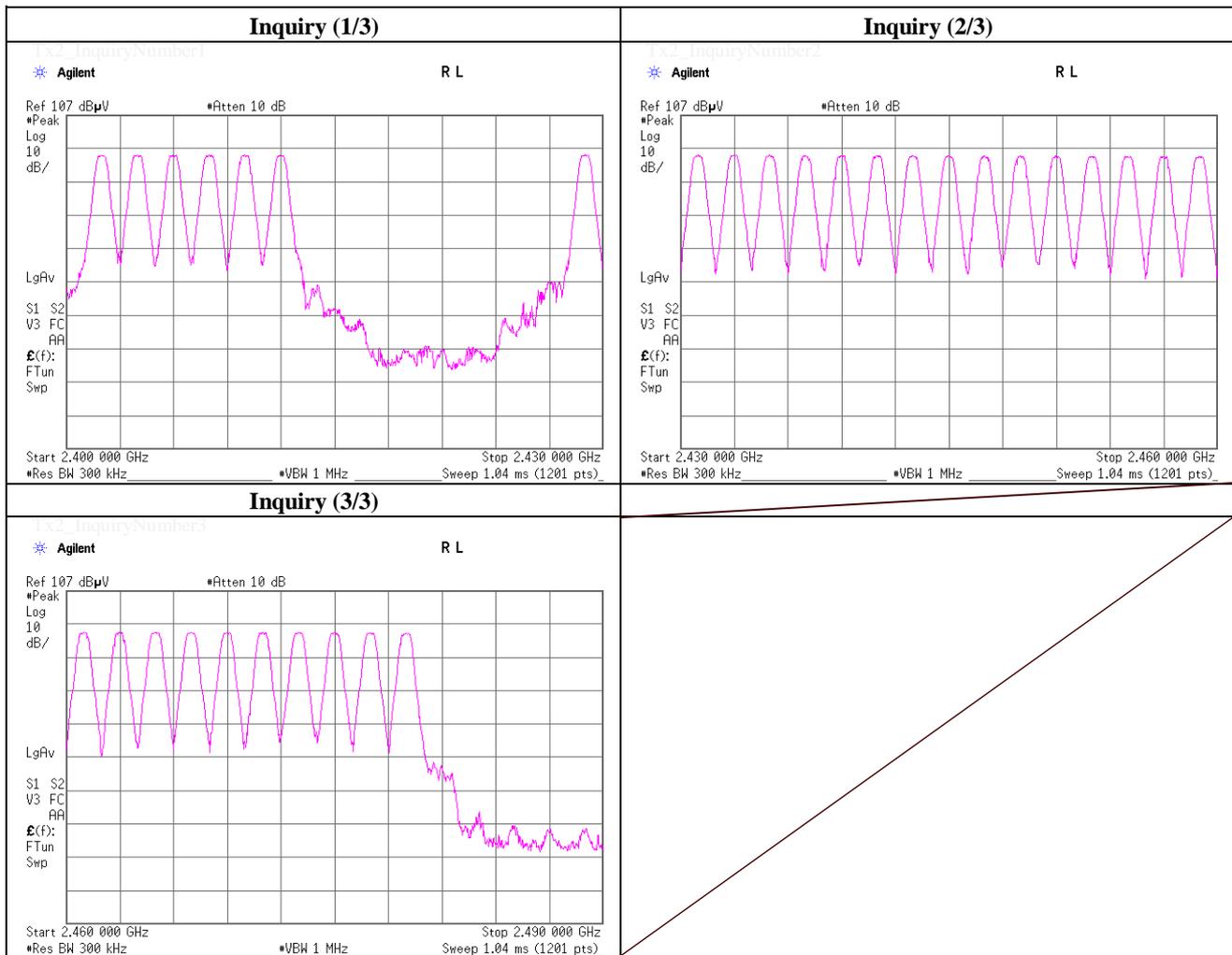


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Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	August 5, 2013	
Temperature / Humidity	25 deg.C , 60 %RH	
Engineer	Kenichi Adachi	
Mode	Tx, Bluetooth, Inquiry	

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



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Dwell Time

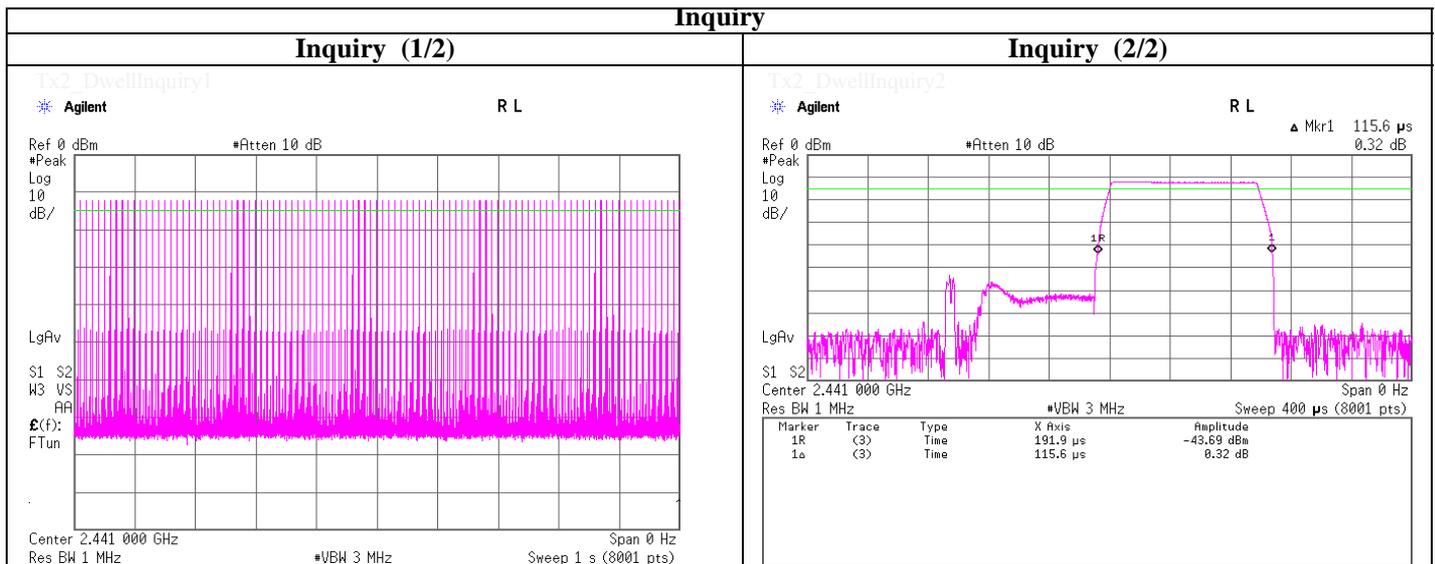
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	August 5, 2013	
Temperature / Humidity	25 deg.C , 60 %RH	
Engineer	Kenichi Adachi	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period	Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	51.0 / 5.0 sec. x 31.6 sec. = 323 times	0.413	133	400
DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.668	275	400
DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	2.912	314	400
Inquiry	100.0 / 1.0 sec. x 12.8 sec. = 1280 times	0.116	148	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 $N=79$.



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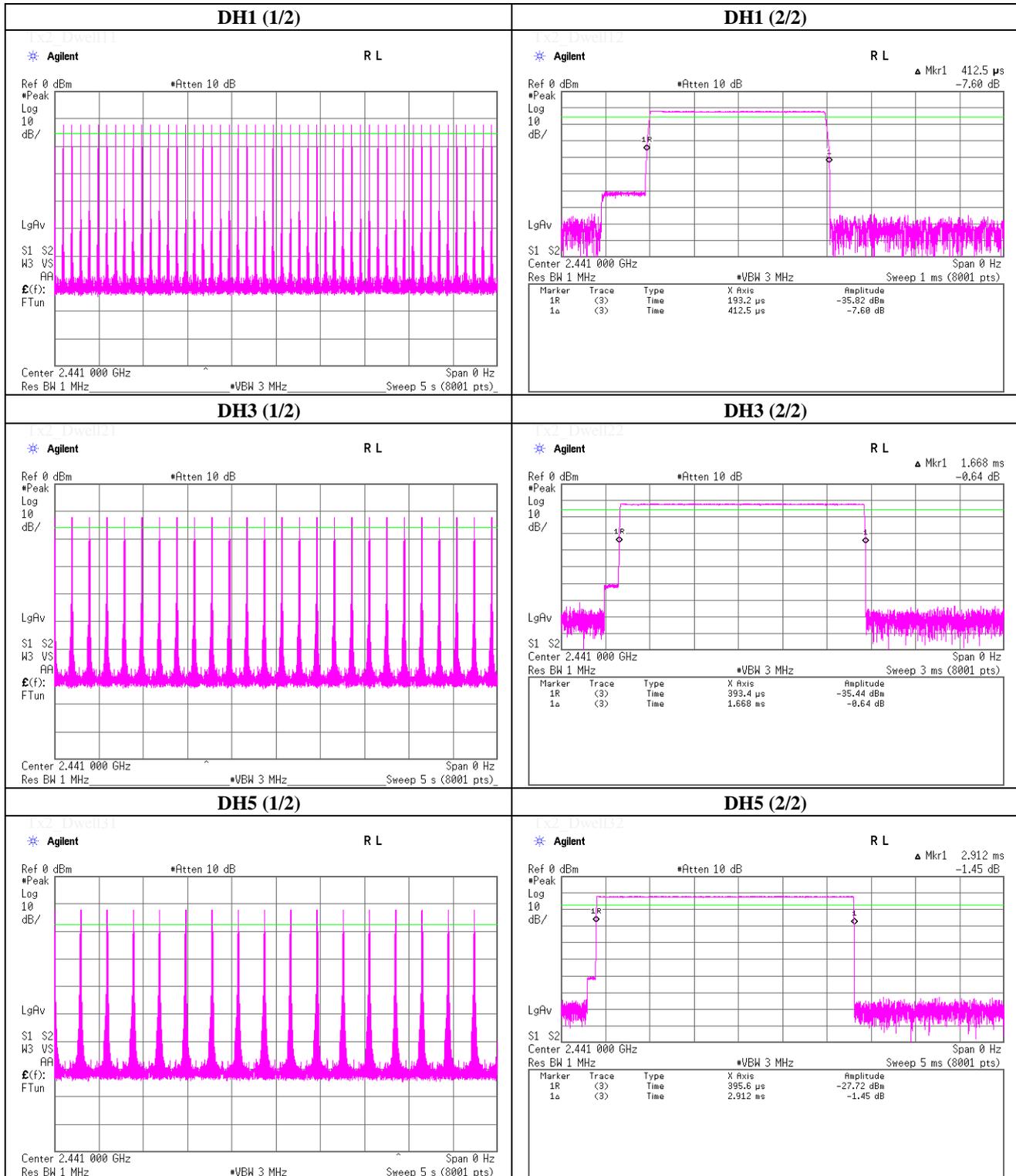
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Dwell time

Tx, Bluetooth, BDR, PRBS9



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Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date August 5, 2013
 Temperature / Humidity 25 deg.C , 60 %RH
 Engineer Kenichi Adachi
 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	0.427	138	400
3-DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.675	276	400
3-DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	2.923	316	400

Sample Calculation

Result = Number of transmission x Length of transmission time

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

UL Japan, Inc.

Shonan EMC Lab.

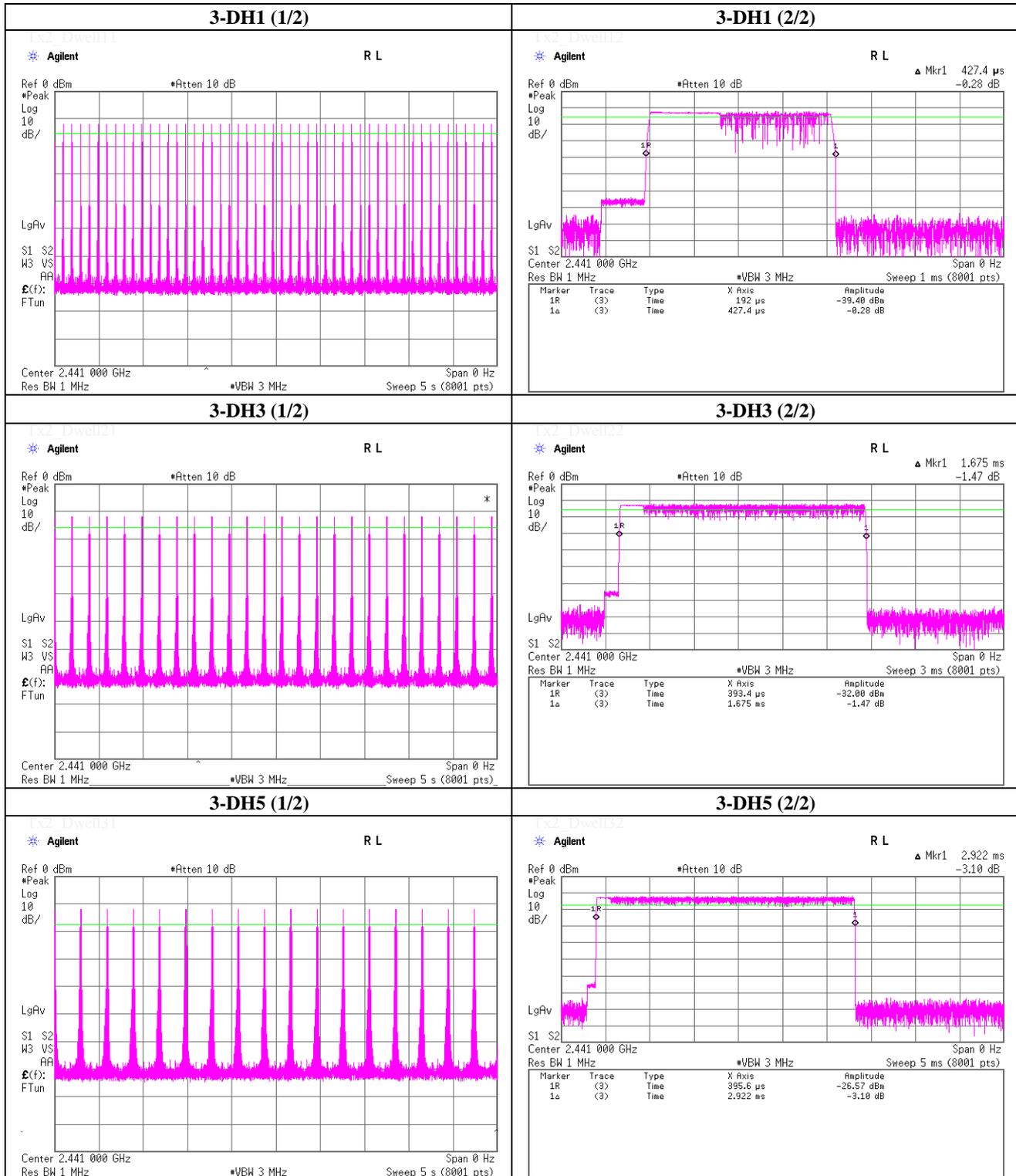
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Dwell time

Tx, Bluetooth, EDR, PRBS9



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Maximum Peak Conducted Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date August 5, 2013
 Temperature / Humidity 25 deg.C , 60 %RH
 Engineer Kenichi Adachi
 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	-11.72	1.82	9.62	-0.28	0.94	20.97	125	21.25
DH5	2441.0	-11.80	1.83	9.63	-0.34	0.92	20.97	125	21.31
DH5	2480.0	-12.27	1.85	9.63	-0.79	0.83	20.97	125	21.76
2-DH5	2402.0	-11.26	1.82	9.62	0.18	1.04	20.97	125	20.79
2-DH5	2441.0	-11.48	1.83	9.63	-0.02	1.00	20.97	125	20.99
2-DH5	2480.0	-12.01	1.85	9.63	-0.53	0.89	20.97	125	21.50
3-DH5	2402.0	-11.17	1.82	9.62	0.27	1.06	20.97	125	20.70
3-DH5	2441.0	-11.38	1.83	9.63	0.08	1.02	20.97	125	20.89
3-DH5	2480.0	-11.91	1.85	9.63	-0.43	0.91	20.97	125	21.40

Sample Calculation:

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date August 5, 2013 August 6, 2013
 Temperature / Humidity 23 deg.C, 68 %RH 23 deg.C, 66 %RH
 Engineer Makoto Hosaka Makoto Hosaka
 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.	239.853	QP	42.0	16.9	8.2	32.0	35.1	46.0	10.9	152	219	
Hori.	271.513	QP	40.3	18.1	8.4	32.0	34.8	46.0	11.2	128	227	
Hori.	354.620	QP	36.6	15.2	8.8	31.9	28.7	46.0	17.3	100	314	
Hori.	462.008	QP	42.6	17.0	9.3	31.9	37.0	46.0	9.0	100	118	
Hori.	720.042	QP	43.8	20.4	10.2	31.8	42.6	46.0	3.4	100	19	
Hori.	2390.000	PK	46.2	27.4	14.7	41.1	47.2	73.9	26.7	100	54	
Hori.	2399.433	PK	47.3	27.4	14.7	41.1	48.3	73.9	25.6	112	206	
Hori.	4804.000	PK	51.4	31.1	7.5	41.2	48.8	73.9	25.1	135	202	
Hori.	7206.000	PK	50.1	36.6	9.1	41.0	54.8	73.9	19.1	100	0	
Hori.	9608.000	PK	46.4	38.5	10.2	38.9	56.2	73.9	17.7	100	0	
Hori.	12010.000	PK	49.4	39.4	11.5	39.1	61.2	73.9	12.7	100	0	
Vert.	76.737	QP	34.0	6.5	7.2	32.1	15.6	40.0	24.4	100	286	
Vert.	254.906	QP	40.4	17.3	8.3	32.0	34.0	46.0	12.0	100	37	
Vert.	883.048	QP	35.6	22.0	10.7	31.1	37.2	46.0	8.8	100	1	
Vert.	2390.000	PK	47.2	27.4	14.7	41.1	48.2	73.9	25.7	100	322	
Vert.	2399.433	PK	47.5	27.4	14.7	41.1	48.5	73.9	25.4	100	318	
Vert.	4804.000	PK	53.0	31.1	7.5	41.2	50.4	73.9	23.5	118	1	
Vert.	7206.000	PK	48.4	36.6	9.1	41.0	53.1	73.9	20.8	100	0	
Vert.	9608.000	PK	46.1	38.5	10.2	38.9	55.9	73.9	18.0	100	0	
Vert.	12010.000	PK	48.7	39.4	11.5	39.1	60.5	73.9	13.4	100	0	

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

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

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	35.2	27.4	14.7	41.1	-24.7	11.5	53.9	42.4	
Hori.	4804.000	AV	43.5	31.1	7.5	41.2	-24.7	16.2	53.9	37.7	
Hori.	7206.000	AV	36.2	36.6	9.1	41.0	-24.7	16.2	53.9	37.7	
Hori.	9608.000	AV	33.5	38.5	10.2	38.9	-24.7	18.6	53.9	35.3	
Hori.	12010.000	AV	35.0	39.4	11.5	39.1	-24.7	22.1	53.9	31.8	
Vert.	2390.000	AV	35.6	27.4	14.7	41.1	-24.7	11.9	53.9	42.0	
Vert.	4804.000	AV	47.3	31.1	7.5	41.2	-24.7	20.0	53.9	33.9	
Vert.	7206.000	AV	36.2	36.6	9.1	41.0	-24.7	16.2	53.9	37.7	
Vert.	9608.000	AV	33.6	38.5	10.2	38.9	-24.7	18.7	53.9	35.2	
Vert.	12010.000	AV	35.1	39.4	11.5	39.1	-24.7	22.2	53.9	31.7	

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

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

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

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	89.2	27.4	14.7	41.1	90.2	-	-	
Hori.	2399.433	PK	36.1	27.4	14.7	41.1	37.1	70.2	33.1	
Hori.	2400.000	PK	36.4	27.4	14.7	41.1	37.4	70.2	32.8	
Vert.	2402.000	PK	88.3	27.4	14.7	41.1	89.3	-	-	
Vert.	2399.433	PK	36.3	27.4	14.7	41.1	37.3	69.3	32.0	
Vert.	2400.000	PK	37.2	27.4	14.7	41.1	38.2	69.3	31.1	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date August 5, 2013 August 6, 2013
 Temperature / Humidity 23 deg.C, 68 %RH 23 deg.C, 66 %RH
 Engineer Makoto Hosaka Makoto Hosaka
 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.	240.036	QP	42.2	16.9	8.2	32.0	35.3	46.0	10.7	152	220	
Hori.	273.854	QP	40.2	18.3	8.4	32.0	34.9	46.0	11.1	128	229	
Hori.	354.850	QP	36.8	15.2	8.8	31.9	28.9	46.0	17.1	100	310	
Hori.	462.008	QP	42.8	17.0	9.3	31.9	37.2	46.0	8.8	100	120	
Hori.	720.051	QP	44.0	20.4	10.2	31.8	42.8	46.0	3.2	148	359	
Hori.	4882.000	PK	53.4	31.3	7.5	41.1	51.1	73.9	22.8	151	47	
Hori.	7323.000	PK	50.0	36.6	9.0	41.1	54.5	73.9	19.4	100	0	
Hori.	9764.000	PK	44.7	38.7	10.1	38.8	54.7	73.9	19.2	100	0	
Hori.	12205.000	PK	46.0	39.5	11.4	39.1	57.8	73.9	16.1	100	0	
Vert.	76.342	QP	34.0	6.5	7.2	32.1	15.6	40.0	24.4	100	288	
Vert.	255.684	QP	40.3	17.4	8.3	32.0	34.0	46.0	12.0	100	33	
Vert.	883.052	QP	35.5	22.0	10.7	31.1	37.1	46.0	8.9	100	359	
Vert.	4882.000	PK	55.0	31.3	7.5	41.1	52.7	73.9	21.2	100	341	
Vert.	7323.000	PK	48.7	36.6	9.0	41.1	53.2	73.9	20.7	100	0	
Vert.	9764.000	PK	45.5	38.7	10.1	38.8	55.5	73.9	18.4	100	0	
Vert.	12205.000	PK	47.6	39.5	11.4	39.1	59.4	73.9	14.5	100	0	

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

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

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	AV	49.6	31.3	7.5	41.1	-24.7	22.6	53.9	31.3	
Hori.	7323.000	AV	35.4	36.6	9.0	41.1	-24.7	15.2	53.9	38.7	
Hori.	9764.000	AV	32.6	38.7	10.1	38.8	-24.7	17.9	53.9	36.0	
Hori.	12205.000	AV	33.3	39.5	11.4	39.1	-24.7	20.4	53.9	33.5	
Vert.	4882.000	AV	51.1	31.3	7.5	41.1	-24.7	24.1	53.9	29.8	
Vert.	7323.000	AV	35.3	36.6	9.0	41.1	-24.7	15.1	53.9	38.8	
Vert.	9764.000	AV	32.7	38.7	10.1	38.8	-24.7	18.0	53.9	35.9	
Vert.	12205.000	AV	33.1	39.5	11.4	39.1	-24.7	20.2	53.9	33.7	

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

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

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date August 5, 2013 August 6, 2013
 Temperature / Humidity 23 deg.C, 68 %RH 23 deg.C, 66 %RH
 Engineer Makoto Hosaka Makoto Hosaka
 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.	240.036	QP	42.8	16.9	8.2	32.0	35.9	46.0	10.1	153	219	
Hori.	271.562	QP	40.5	18.1	8.4	32.0	35.0	46.0	11.0	130	225	
Hori.	353.465	QP	36.8	15.1	8.8	31.9	28.8	46.0	17.2	100	311	
Hori.	462.010	QP	42.8	17.0	9.3	31.9	37.2	46.0	8.8	100	120	
Hori.	720.055	QP	43.9	20.4	10.2	31.8	42.7	46.0	3.3	138	22	
Hori.	2483.500	PK	47.3	27.5	14.8	41.0	48.6	73.9	25.3	100	56	
Hori.	4960.000	PK	52.1	31.6	7.5	41.1	50.1	73.9	23.8	140	305	
Hori.	7440.000	PK	47.8	36.7	9.0	41.1	52.4	73.9	21.5	100	0	
Hori.	9920.000	PK	44.6	39.0	10.0	38.8	54.8	73.9	19.1	100	0	
Hori.	12400.000	PK	45.1	39.5	11.3	39.1	56.8	73.9	17.1	100	0	
Vert.	76.738	QP	34.4	6.5	7.2	32.1	16.0	40.0	24.0	100	300	
Vert.	254.946	QP	40.6	17.3	8.3	32.0	34.2	46.0	11.8	100	4	
Vert.	883.051	QP	35.6	22.0	10.7	31.1	37.2	46.0	8.8	100	1	
Vert.	2483.500	PK	46.8	27.5	14.8	41.0	48.1	73.9	25.8	110	336	
Vert.	4960.000	PK	54.1	31.6	7.5	41.1	52.1	73.9	21.8	100	359	
Vert.	7440.000	PK	47.7	36.7	9.0	41.1	52.3	73.9	21.6	100	0	
Vert.	9920.000	PK	44.4	39.0	10.0	38.8	54.6	73.9	19.3	100	0	
Vert.	12400.000	PK	44.9	39.5	11.3	39.1	56.6	73.9	17.3	100	0	

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

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

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	35.4	27.5	14.8	41.0	-24.7	12.0	53.9	41.9	
Hori.	4960.000	AV	47.6	31.6	7.5	41.1	-24.7	20.9	53.9	33.0	
Hori.	7440.000	AV	34.8	36.7	9.0	41.1	-24.7	14.7	53.9	39.2	
Hori.	9920.000	AV	31.5	39.0	10.0	38.8	-24.7	17.0	53.9	36.9	
Hori.	12400.000	AV	32.1	39.5	11.3	39.1	-24.7	19.1	53.9	34.8	
Vert.	2483.500	AV	35.5	27.5	14.8	41.0	-24.7	12.1	53.9	41.8	
Vert.	4960.000	AV	49.6	31.6	7.5	41.1	-24.7	22.9	53.9	31.0	
Vert.	7440.000	AV	35.0	36.7	9.0	41.1	-24.7	14.9	53.9	39.0	
Vert.	9920.000	AV	31.6	39.0	10.0	38.8	-24.7	17.1	53.9	36.8	
Vert.	12400.000	AV	32.2	39.5	11.3	39.1	-24.7	19.2	53.9	34.7	

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

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

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

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

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Facsimile : +81 463 50 6401

Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date August 5, 2013 August 6, 2013
 Temperature / Humidity 23 deg.C, 66 %RH 23 deg.C, 68 %RH
 Engineer Makoto Hosaka Makoto Hosaka
 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.	76.975	QP	36.6	6.5	7.3	32.1	18.3	40.0	21.7	180	78	
Hori.	240.002	QP	44.7	16.9	8.2	32.0	37.8	46.0	8.2	148	223	
Hori.	273.854	QP	39.5	18.3	8.4	32.0	34.2	46.0	11.8	167	230	
Hori.	357.017	QP	36.7	15.2	8.8	31.9	28.8	46.0	17.2	100	316	
Hori.	462.002	QP	42.0	17.0	9.3	31.9	36.4	46.0	9.6	100	135	
Hori.	720.050	QP	44.0	20.4	10.2	31.8	42.8	46.0	3.2	141	229	
Hori.	2390.000	PK	46.4	27.4	14.7	41.1	47.4	73.9	26.5	100	52	
Hori.	2399.700	PK	47.7	27.4	14.7	41.1	48.7	73.9	25.2	100	197	
Hori.	2400.000	PK	48.8	27.4	14.7	41.1	49.8	73.9	24.1	100	52	
Hori.	4804.000	PK	51.8	31.1	7.5	41.2	49.2	73.9	24.7	155	23	
Hori.	7206.000	PK	50.0	36.6	9.1	41.0	54.7	73.9	19.2	100	0	
Hori.	9608.000	PK	46.3	38.5	10.2	38.9	56.1	73.9	17.8	100	0	
Hori.	12010.000	PK	49.1	39.4	11.5	39.1	60.9	73.9	13.0	100	0	
Vert.	255.685	QP	39.4	17.4	8.3	32.0	33.1	46.0	12.9	100	46	
Vert.	883.051	QP	34.6	22.0	10.7	31.1	36.2	46.0	9.8	100	355	
Vert.	2390.000	PK	47.7	27.4	14.7	41.1	48.7	73.9	25.2	183	359	
Vert.	2399.700	PK	48.3	27.4	14.7	41.1	49.3	73.9	24.6	116	325	
Vert.	2400.000	PK	48.8	27.4	14.7	41.1	49.8	73.9	24.1	183	359	
Vert.	4804.000	PK	54.7	31.1	7.5	41.2	52.1	73.9	21.8	100	10	
Vert.	7206.000	PK	49.4	36.6	9.1	41.0	54.1	73.9	19.8	100	0	
Vert.	9608.000	PK	46.0	38.5	10.2	38.9	55.8	73.9	18.1	100	0	
Vert.	12010.000	PK	48.4	39.4	11.5	39.1	60.2	73.9	13.7	100	0	

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

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

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	35.3	27.4	14.7	41.1	-24.7	11.6	53.9	42.3	
Hori.	4804.000	AV	44.7	31.1	7.5	41.2	-24.7	17.4	53.9	36.5	
Hori.	7206.000	AV	36.3	36.6	9.1	41.0	-24.7	16.3	53.9	37.6	
Hori.	9608.000	AV	33.7	38.5	10.2	38.9	-24.7	18.8	53.9	35.1	
Hori.	12010.000	AV	34.8	39.4	11.5	39.1	-24.7	21.9	53.9	32.0	
Vert.	2390.000	AV	35.7	27.4	14.7	41.1	-24.7	12.0	53.9	41.9	
Vert.	4804.000	AV	51.1	31.1	7.5	41.2	-24.7	23.8	53.9	30.1	
Vert.	7206.000	AV	36.3	36.6	9.1	41.0	-24.7	16.3	53.9	37.6	
Vert.	9608.000	AV	33.7	38.5	10.2	38.9	-24.7	18.8	53.9	35.1	
Vert.	12010.000	AV	35.0	39.4	11.5	39.1	-24.7	22.1	53.9	31.8	

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

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

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

20dBc Data Sheet (RBW 100kHz, VBW 300kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	90.6	27.4	14.7	41.1	91.6	-	-	
Hori.	2399.700	PK	37.8	27.4	14.7	41.1	38.8	71.6	32.8	
Hori.	2400.000	PK	37.4	27.4	14.7	41.1	38.4	71.6	33.2	
Vert.	2402.000	PK	92.2	27.4	14.7	41.1	93.2	-	-	
Vert.	2399.700	PK	37.6	27.4	14.7	41.1	38.6	73.2	34.6	
Vert.	2400.000	PK	37.2	27.4	14.7	41.1	38.2	73.2	35.0	

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date August 5, 2013 August 6, 2013
 Temperature / Humidity 23 deg.C, 66 %RH 23 deg.C, 68 %RH
 Engineer Makoto Hosaka Makoto Hosaka
 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.	240.006	QP	45.0	16.9	8.2	32.0	38.1	46.0	7.9	150	206	
Hori.	273.927	QP	39.5	18.3	8.4	32.0	34.2	46.0	11.8	166	223	
Hori.	357.020	QP	36.6	15.2	8.8	31.9	28.7	46.0	17.3	100	316	
Hori.	462.005	QP	42.1	17.0	9.3	31.9	36.5	46.0	9.5	100	136	
Hori.	720.050	QP	44.0	20.4	10.2	31.8	42.8	46.0	3.2	140	230	
Hori.	907.632	QP	34.2	22.3	10.8	31.0	36.3	46.0	9.7	122	344	
Hori.	4882.000	PK	54.6	31.3	7.5	41.1	52.3	73.9	21.6	150	49	
Hori.	7323.000	PK	49.8	36.6	9.0	41.1	54.3	73.9	19.6	100	0	
Hori.	9764.000	PK	45.4	38.7	10.1	38.8	55.4	73.9	18.5	100	0	
Hori.	12205.000	PK	46.0	39.5	11.4	39.1	57.8	73.9	16.1	100	0	
Vert.	76.955	QP	35.7	6.5	7.3	32.1	17.4	40.0	22.6	100	2	
Vert.	255.837	QP	39.1	17.4	8.3	32.0	32.8	46.0	13.2	100	50	
Vert.	4882.000	PK	54.1	31.3	7.5	41.1	51.8	73.9	22.1	100	2	
Vert.	7323.000	PK	48.6	36.6	9.0	41.1	53.1	73.9	20.8	100	0	
Vert.	9764.000	PK	45.6	38.7	10.1	38.8	55.6	73.9	18.3	100	0	
Vert.	12205.000	PK	47.5	39.5	11.4	39.1	59.3	73.9	14.6	100	0	

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

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

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	AV	50.6	31.3	7.5	41.1	-24.7	23.6	53.9	30.3	
Hori.	7323.000	AV	35.6	36.6	9.0	41.1	-24.7	15.4	53.9	38.5	
Hori.	9764.000	AV	32.8	38.7	10.1	38.8	-24.7	18.1	53.9	35.8	
Hori.	12205.000	AV	33.3	39.5	11.4	39.1	-24.7	20.4	53.9	33.5	
Vert.	4882.000	AV	50.0	31.3	7.5	41.1	-24.7	23.0	53.9	30.9	
Vert.	7323.000	AV	35.7	36.6	9.0	41.1	-24.7	15.5	53.9	38.4	
Vert.	9764.000	AV	32.6	38.7	10.1	38.8	-24.7	17.9	53.9	36.0	
Vert.	12205.000	AV	33.3	39.5	11.4	39.1	-24.7	20.4	53.9	33.5	

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

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date August 5, 2013 August 6, 2013
 Temperature / Humidity 23 deg.C, 66 %RH 23 deg.C, 68 %RH
 Engineer Makoto Hosaka Makoto Hosaka
 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.	240.002	QP	44.8	16.9	8.2	32.0	37.9	46.0	8.1	150	130	
Hori.	274.021	QP	38.8	18.3	8.4	32.0	33.5	46.0	12.5	166	224	
Hori.	357.020	QP	36.8	15.2	8.8	31.9	28.9	46.0	17.1	100	94	
Hori.	462.003	QP	42.1	17.0	9.3	31.9	36.5	46.0	9.5	100	129	
Hori.	720.048	QP	43.9	20.4	10.2	31.8	42.7	46.0	3.3	142	228	
Hori.	2483.500	PK	47.3	27.5	14.8	41.0	48.6	73.9	25.3	100	0	
Hori.	4960.000	PK	52.0	31.6	7.5	41.1	50.0	73.9	23.9	131	304	
Hori.	7440.000	PK	47.8	36.7	9.0	41.1	52.4	73.9	21.5	100	0	
Hori.	9920.000	PK	44.9	39.0	10.0	38.8	55.1	73.9	18.8	100	0	
Hori.	12400.000	PK	45.7	39.5	11.3	39.1	57.4	73.9	16.5	100	0	
Vert.	76.447	QP	35.5	6.5	7.2	32.1	17.1	40.0	22.9	100	356	
Vert.	255.877	QP	39.3	17.4	8.3	32.0	33.0	46.0	13.0	100	32	
Vert.	883.125	QP	34.6	22.0	10.7	31.1	36.2	46.0	9.8	100	358	
Vert.	2483.500	PK	46.9	27.5	14.8	41.0	48.2	73.9	25.7	100	336	
Vert.	4960.000	PK	53.7	31.6	7.5	41.1	51.7	73.9	22.2	100	359	
Vert.	7440.000	PK	47.3	36.7	9.0	41.1	51.9	73.9	22.0	100	0	
Vert.	9920.000	PK	46.4	39.0	10.0	38.8	56.6	73.9	17.3	100	0	
Vert.	12400.000	PK	45.6	39.5	11.3	39.1	57.3	73.9	16.6	100	0	

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

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

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	36.1	27.5	14.8	41.0	-24.7	12.7	53.9	41.2	
Hori.	4960.000	AV	45.1	31.6	7.5	41.1	-24.7	18.4	53.9	35.5	
Hori.	7440.000	AV	35.0	36.7	9.0	41.1	-24.7	14.9	53.9	39.0	
Hori.	9920.000	AV	31.6	39.0	10.0	38.8	-24.7	17.1	53.9	36.8	
Hori.	12400.000	AV	32.1	39.5	11.3	39.1	-24.7	19.1	53.9	34.8	
Vert.	2483.500	AV	35.8	27.5	14.8	41.0	-24.7	12.4	53.9	41.5	
Vert.	4960.000	AV	49.6	31.6	7.5	41.1	-24.7	22.9	53.9	31.0	
Vert.	7440.000	AV	35.1	36.7	9.0	41.1	-24.7	15.0	53.9	38.9	
Vert.	9920.000	AV	31.5	39.0	10.0	38.8	-24.7	17.0	53.9	36.9	
Vert.	12400.000	AV	32.0	39.5	11.3	39.1	-24.7	19.0	53.9	34.9	

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

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

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

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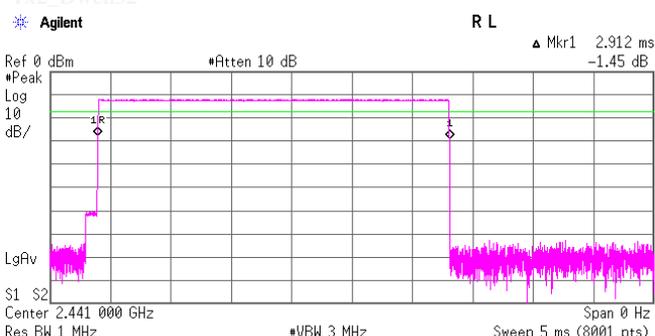
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Dwell time factor Calculation chart

Dwell time factor Calculation

Tx, Bluetooth, BDR, PRBS9

Worst 100ms Dwell time factor = $20\log((2.912 \times 2)/100) = -24.7\text{dB}$	1cycle On time : 2.912ms															
<p><small>1x2_duty2</small></p> <p>ON time of some channel during 100ms: Twice This is the worst case in hopping sequence of Bluetooth.</p>	<p><small>1x2_Dwell32</small></p>  <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1R</td> <td>(3)</td> <td>Time</td> <td>395.6 μs</td> <td>-27.72 dBm</td> </tr> <tr> <td>1a</td> <td>(3)</td> <td>Time</td> <td>2.912 ms</td> <td>-1.45 dB</td> </tr> </tbody> </table>	Marker	Trace	Type	X Axis	Amplitude	1R	(3)	Time	395.6 μs	-27.72 dBm	1a	(3)	Time	2.912 ms	-1.45 dB
Marker	Trace	Type	X Axis	Amplitude												
1R	(3)	Time	395.6 μs	-27.72 dBm												
1a	(3)	Time	2.912 ms	-1.45 dB												

VBW (Average) setting

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

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Dwell time factor Calculation chart

Dwell time factor Calculation

Tx, Bluetooth, EDR, PRBS9

Worst 100ms Dwell time factor = $20\log((2.922 \times 2)/100) = -24.67\text{dB}$	1cycle On time : 2.922ms															
<p>ON time of some channel during 100ms: Twice This is the worst case in hopping sequence of Bluetooth.</p>	<p>Agilent R L #Peak 1R Log 10 dB/ LgAv S1 S2 Center 2.441 000 GHz Span 0 Hz Res BW 1 MHz #VBW 3 MHz Sweep 5 ms (8001 pts)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Marker</th> <th>Trace</th> <th>Type</th> <th>X Axis</th> <th>Amplitude</th> </tr> </thead> <tbody> <tr> <td>1R</td> <td>(3)</td> <td>Time</td> <td>395.6 μs</td> <td>-26.57 dBm</td> </tr> <tr> <td>1a</td> <td>(3)</td> <td>Time</td> <td>2.922 ms</td> <td>-3.10 dB</td> </tr> </tbody> </table>	Marker	Trace	Type	X Axis	Amplitude	1R	(3)	Time	395.6 μs	-26.57 dBm	1a	(3)	Time	2.922 ms	-3.10 dB
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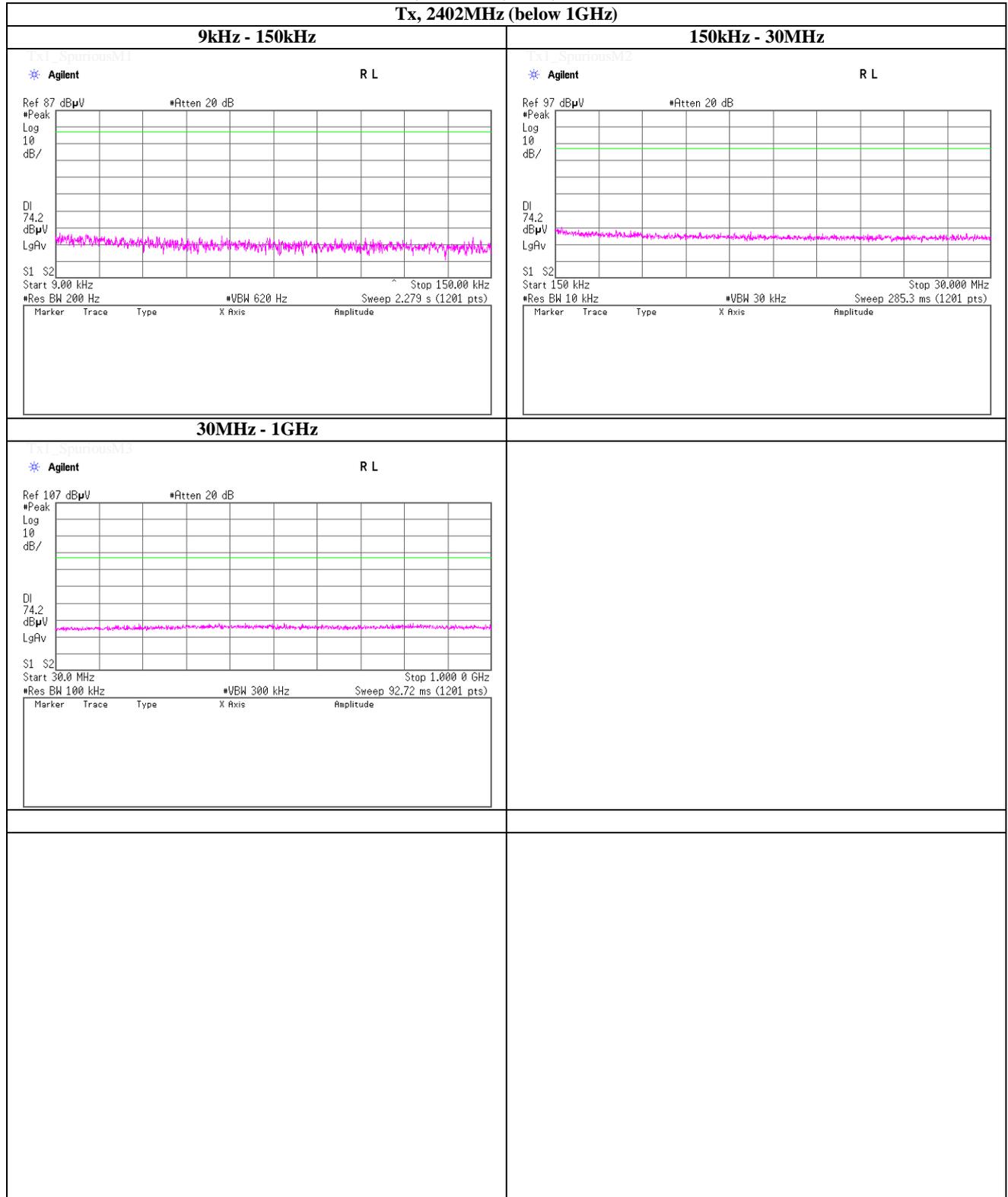
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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (below 1GHz)



UL Japan, Inc.

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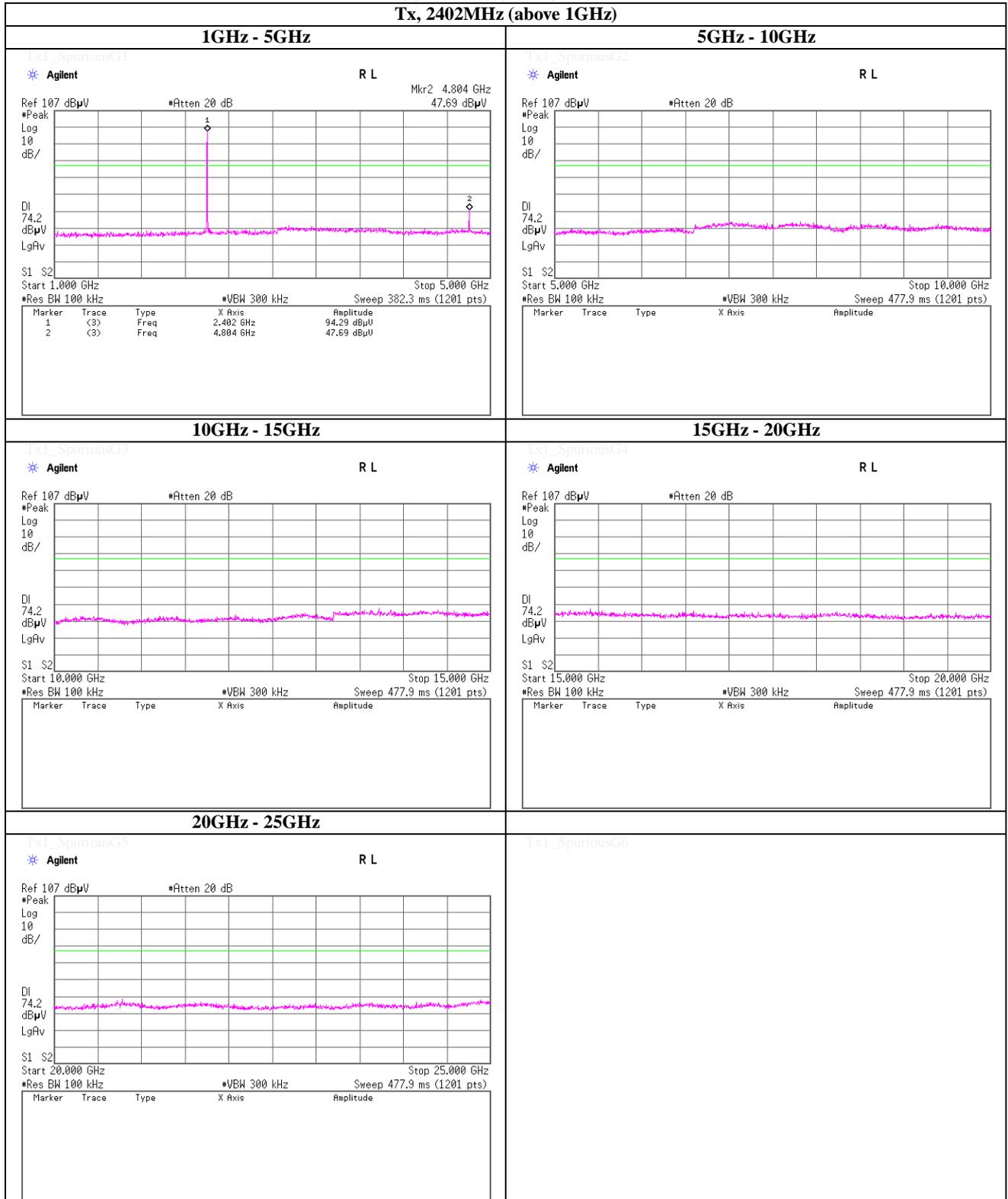
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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (above 1GHz)



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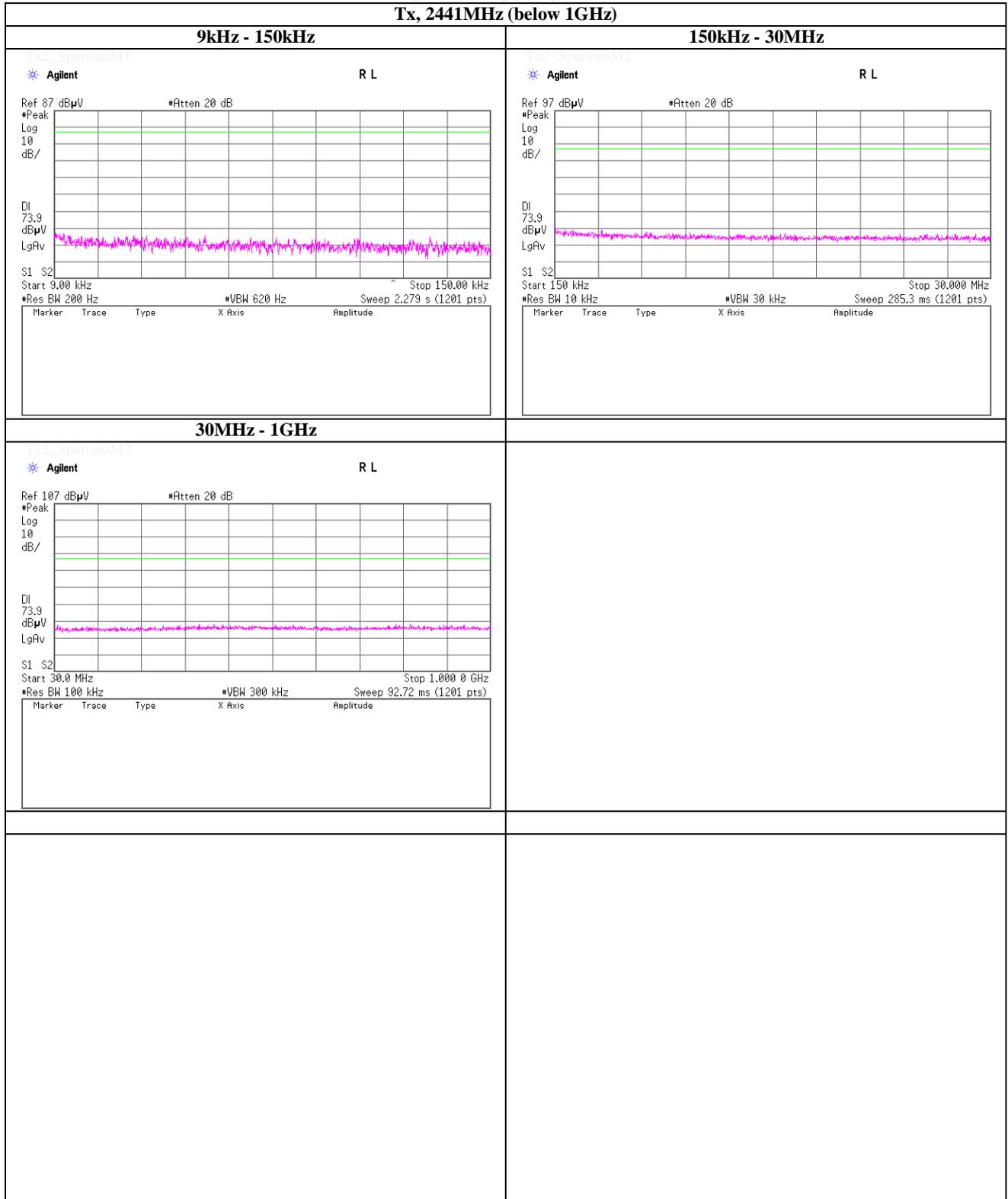
Telephone : +81 463 50 6400

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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (below 1GHz)



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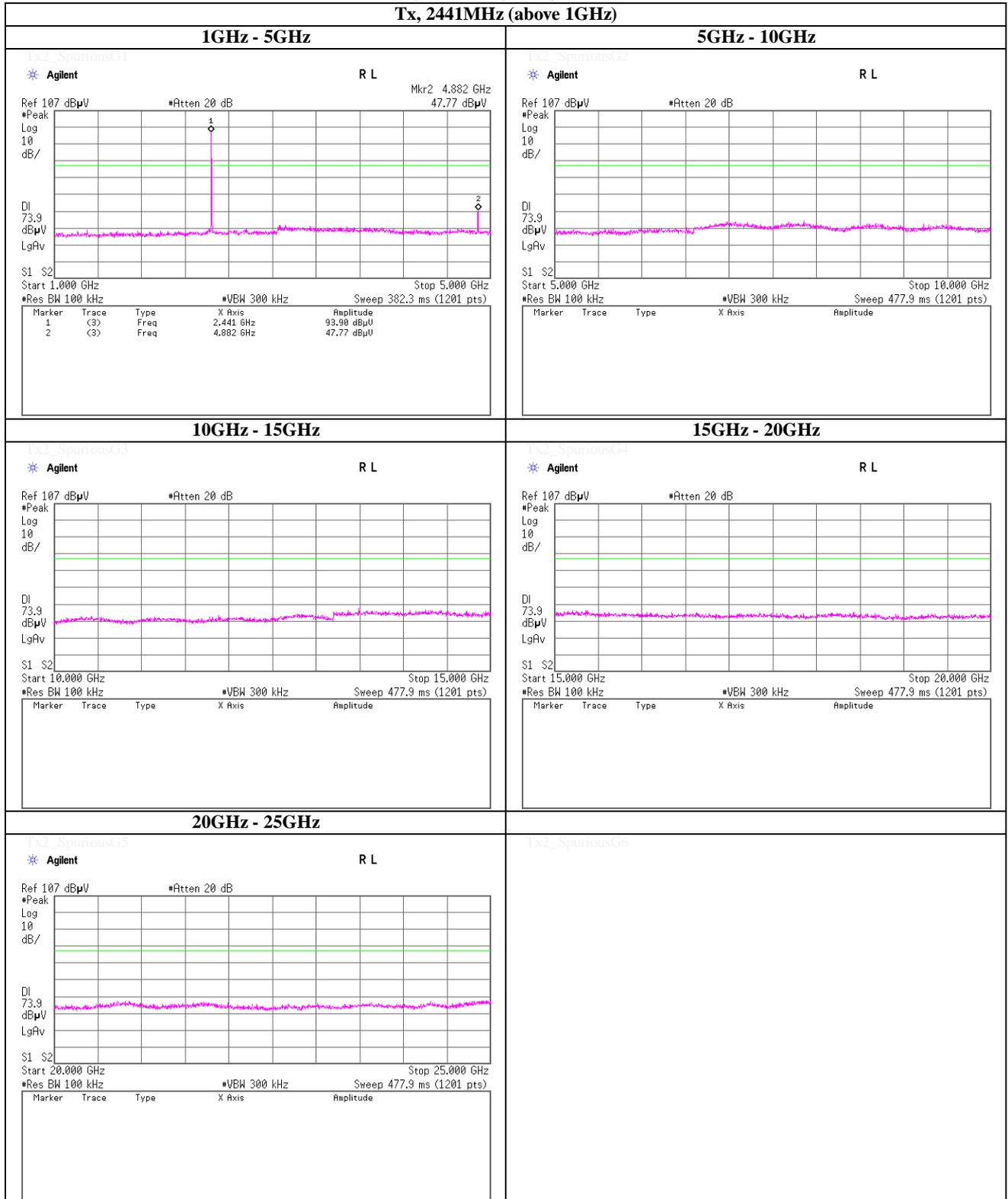
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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (above 1GHz)



UL Japan, Inc.

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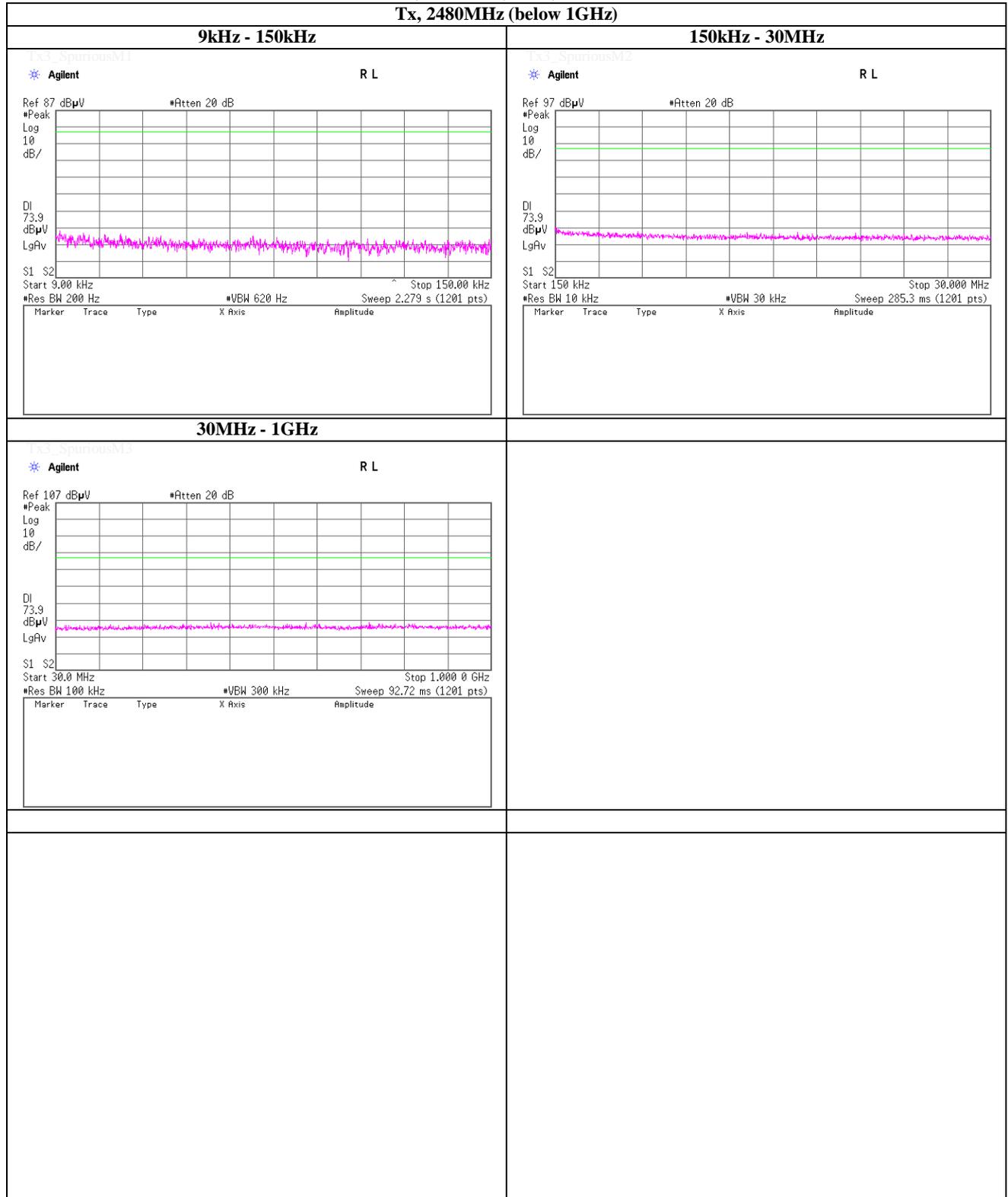
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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (below 1GHz)



UL Japan, Inc.

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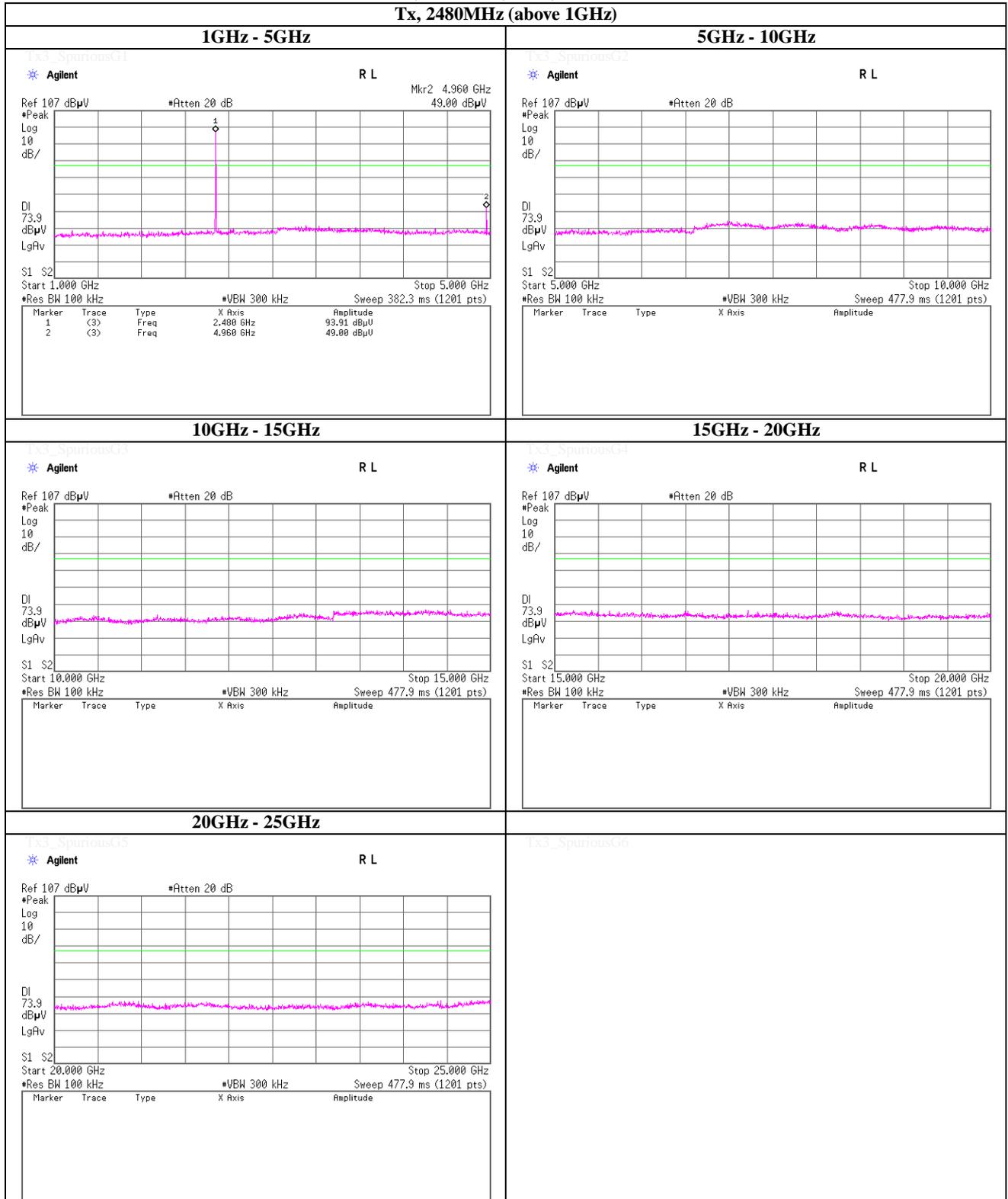
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Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (above 1GHz)



UL Japan, Inc.

Shonan EMC Lab.

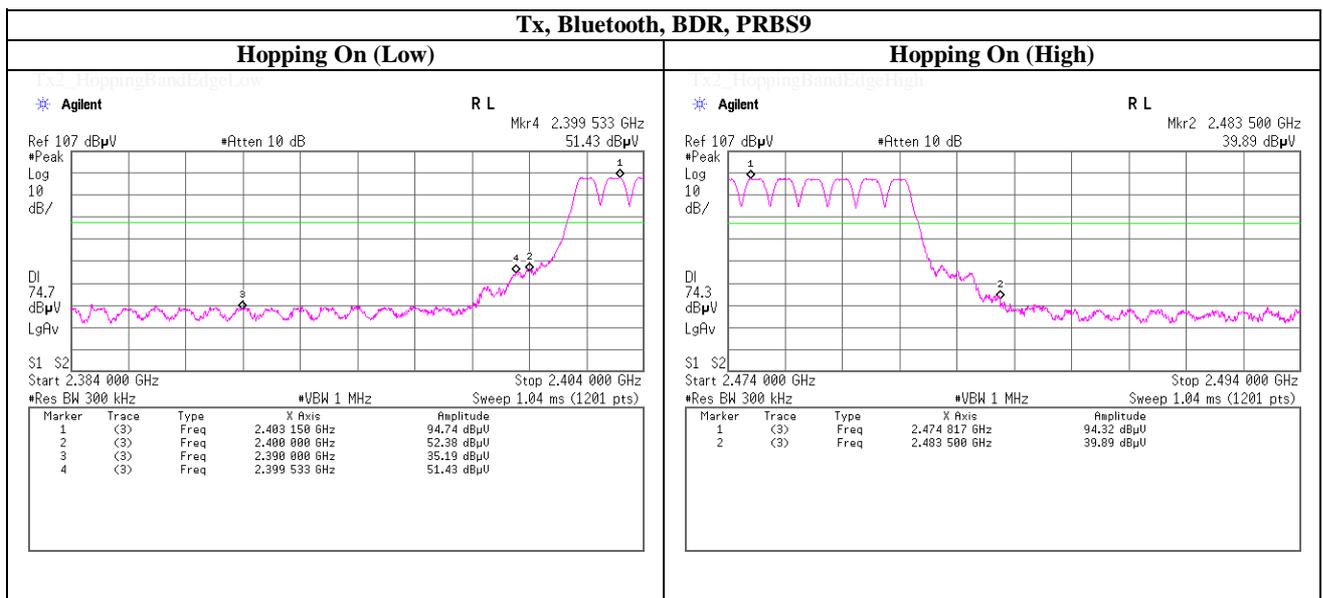
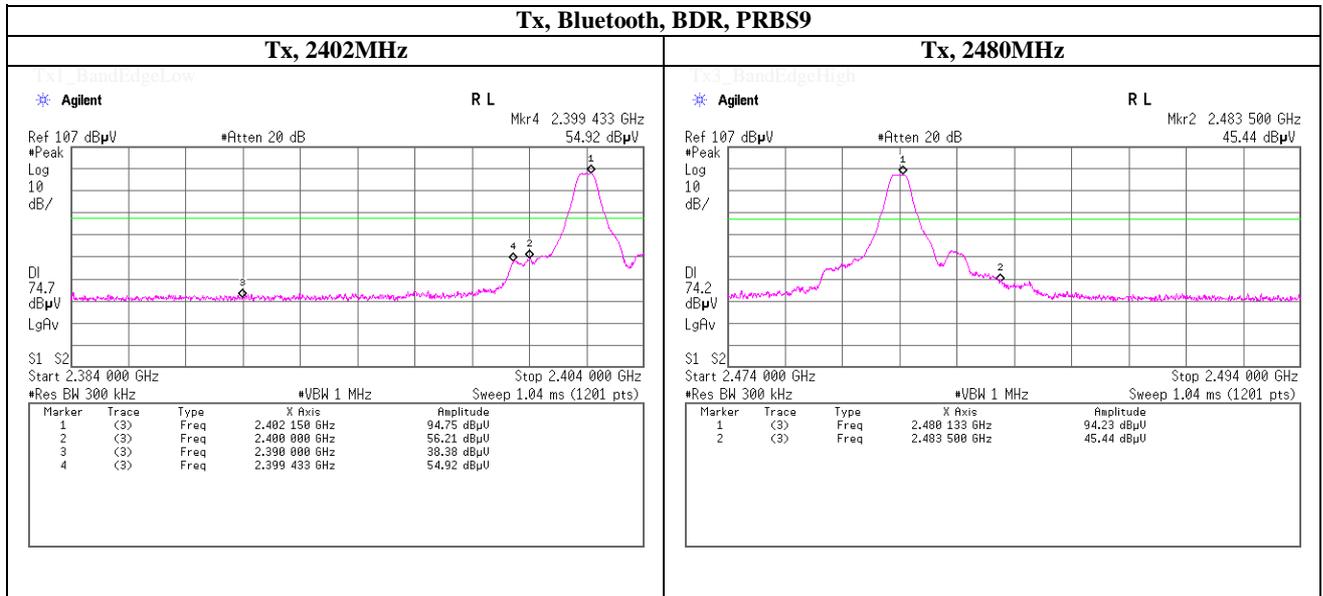
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Band Edge compliance



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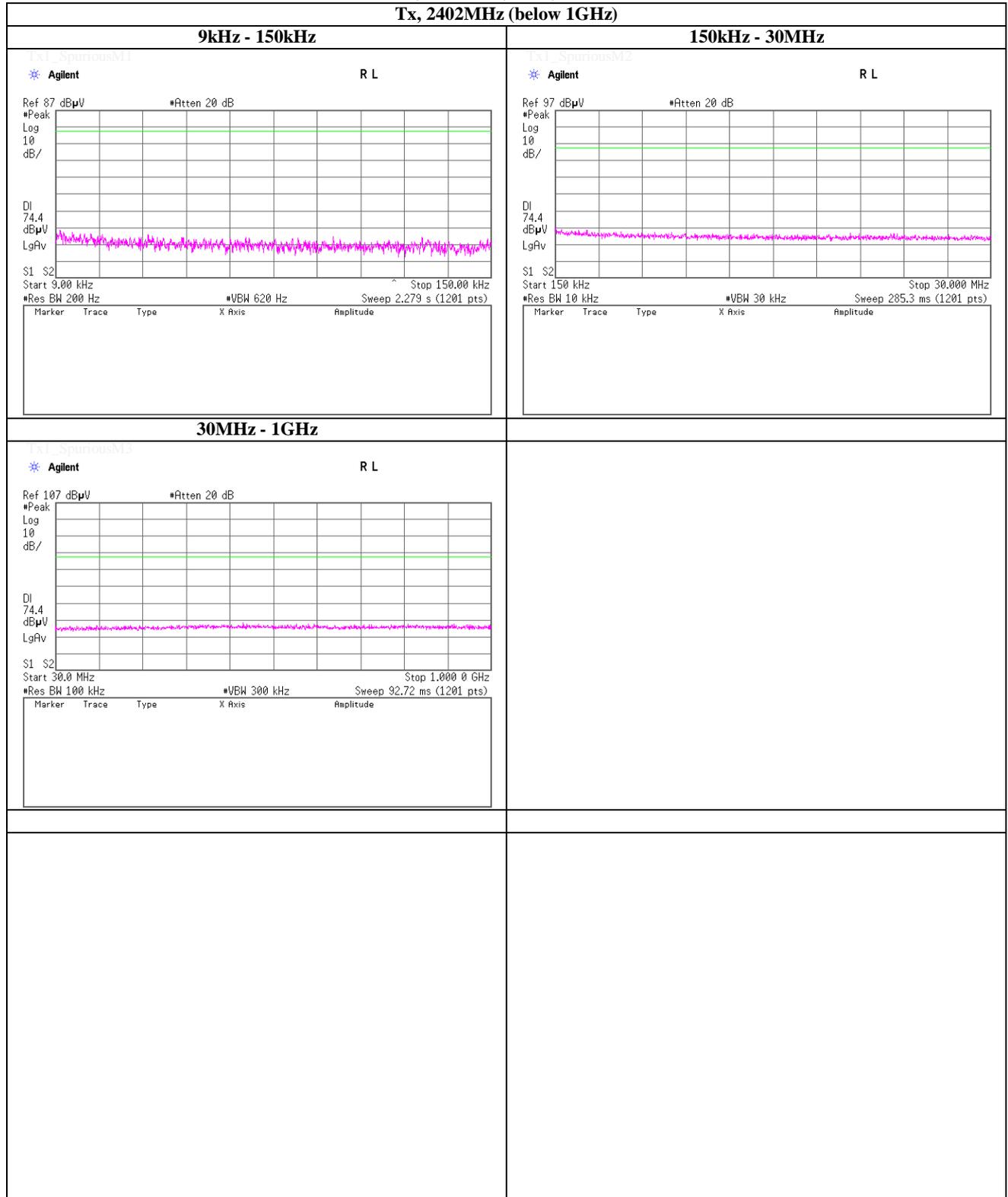
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (below 1GHz)



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Shonan EMC Lab.

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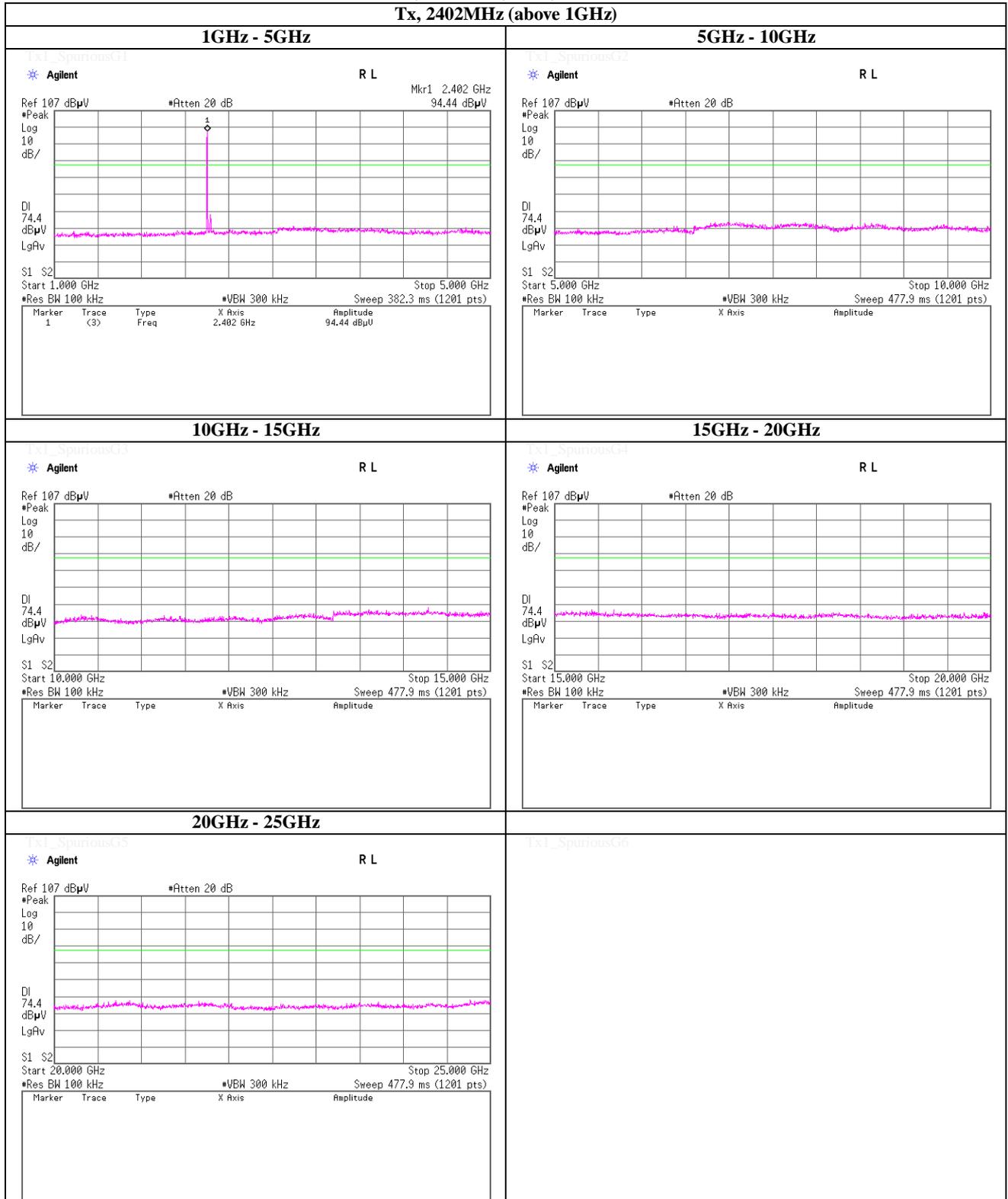
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Tx, 2402MHz (above 1GHz)



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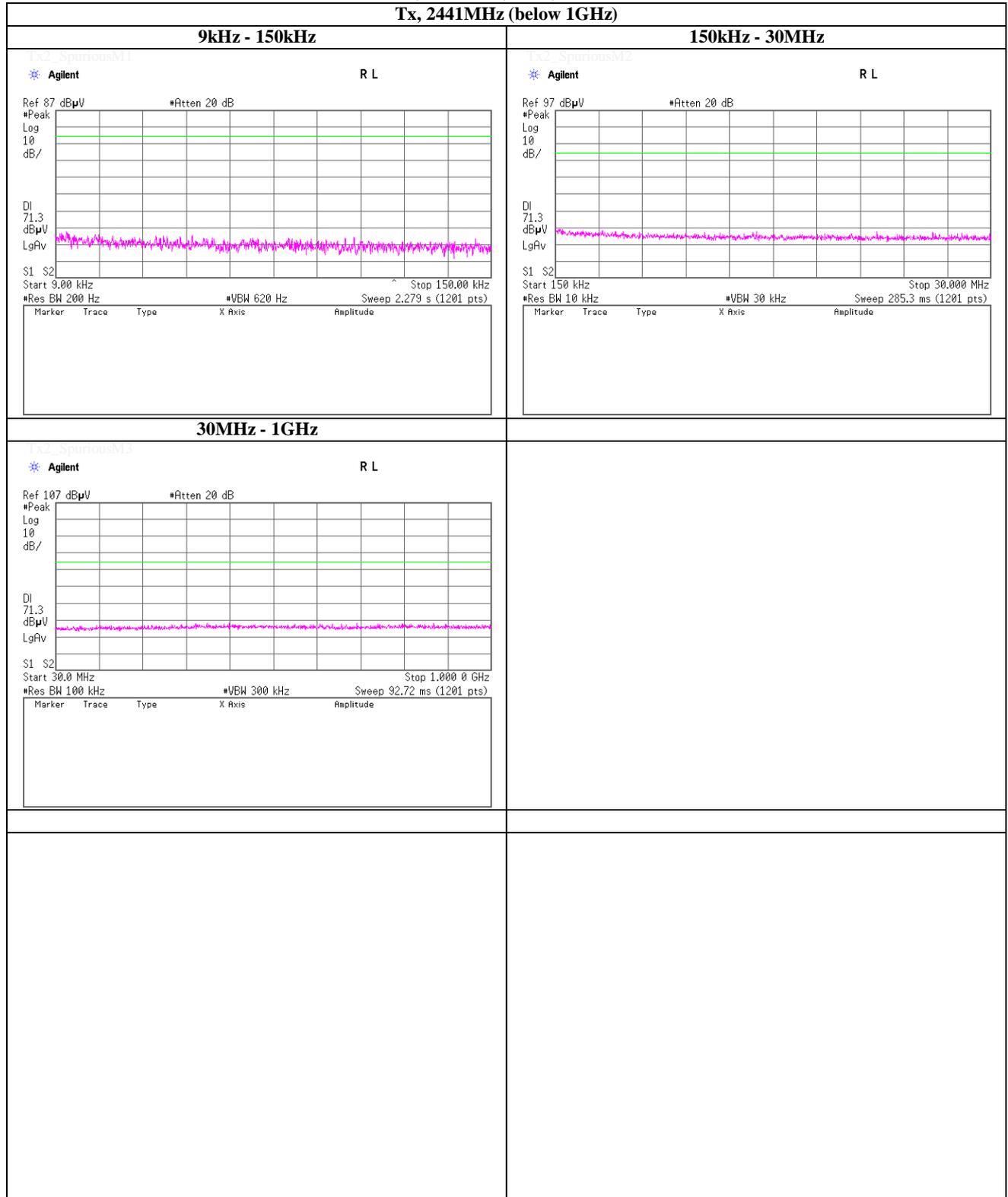
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (below 1GHz)



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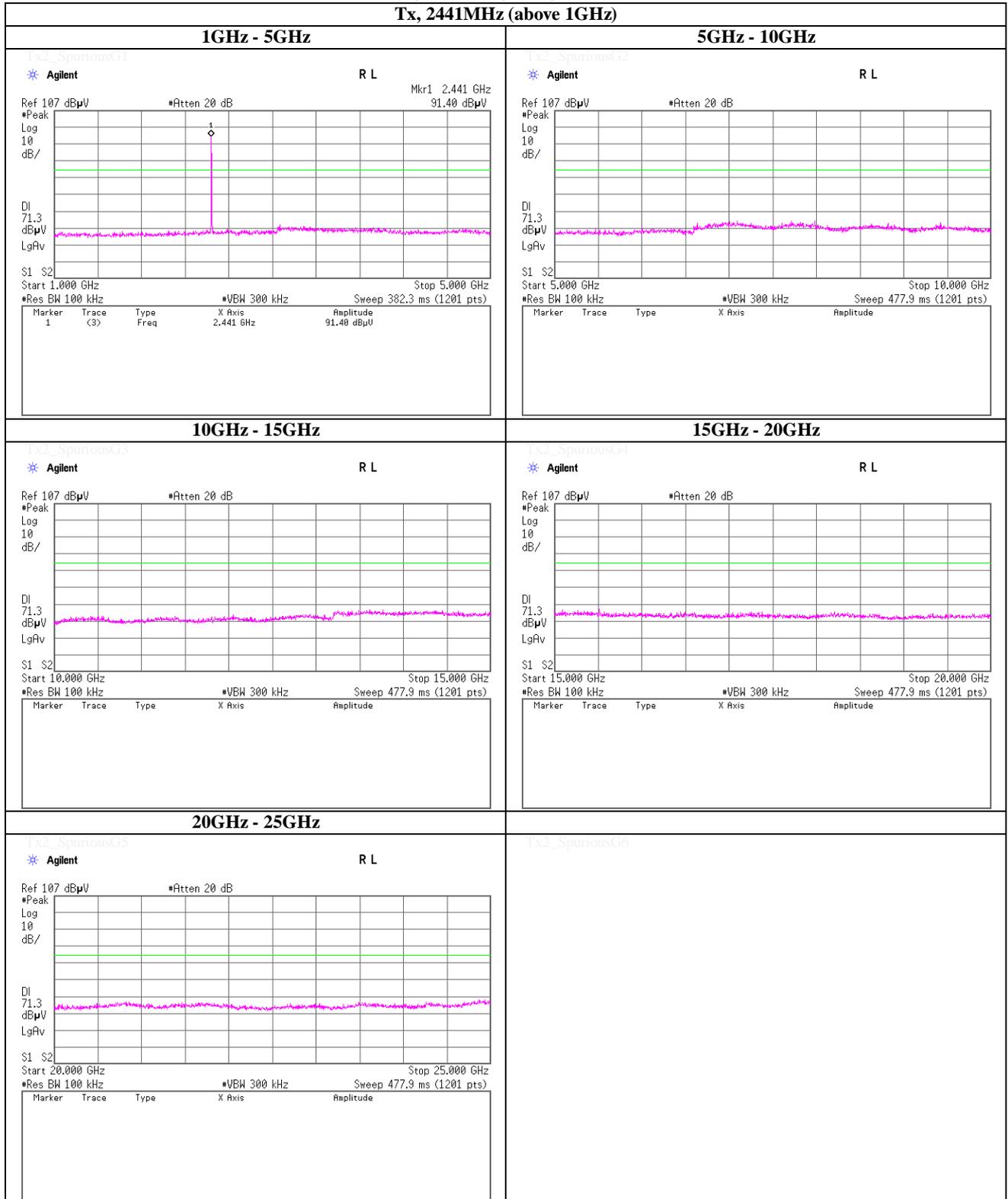
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Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (above 1GHz)



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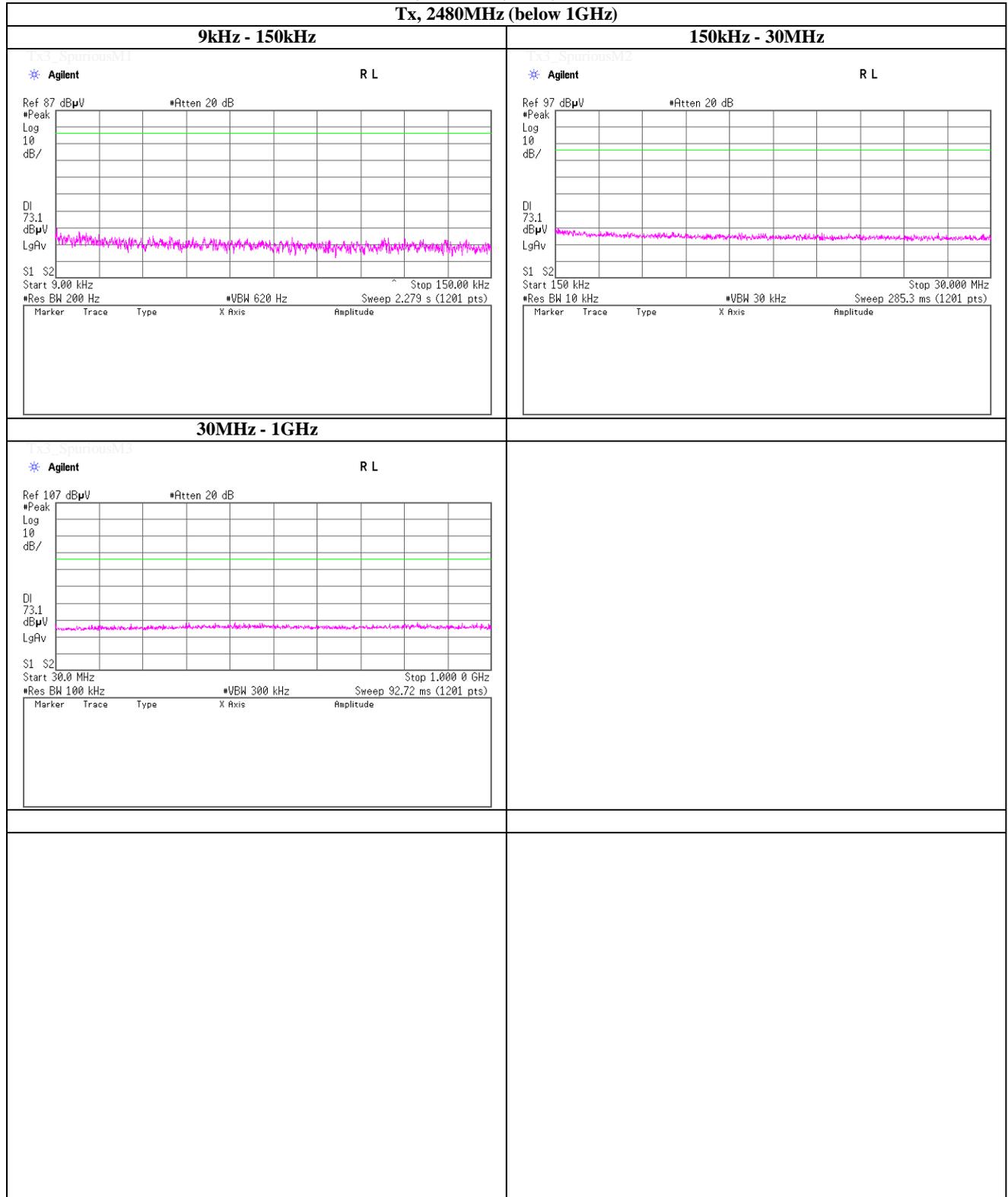
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (below 1GHz)



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Shonan EMC Lab.

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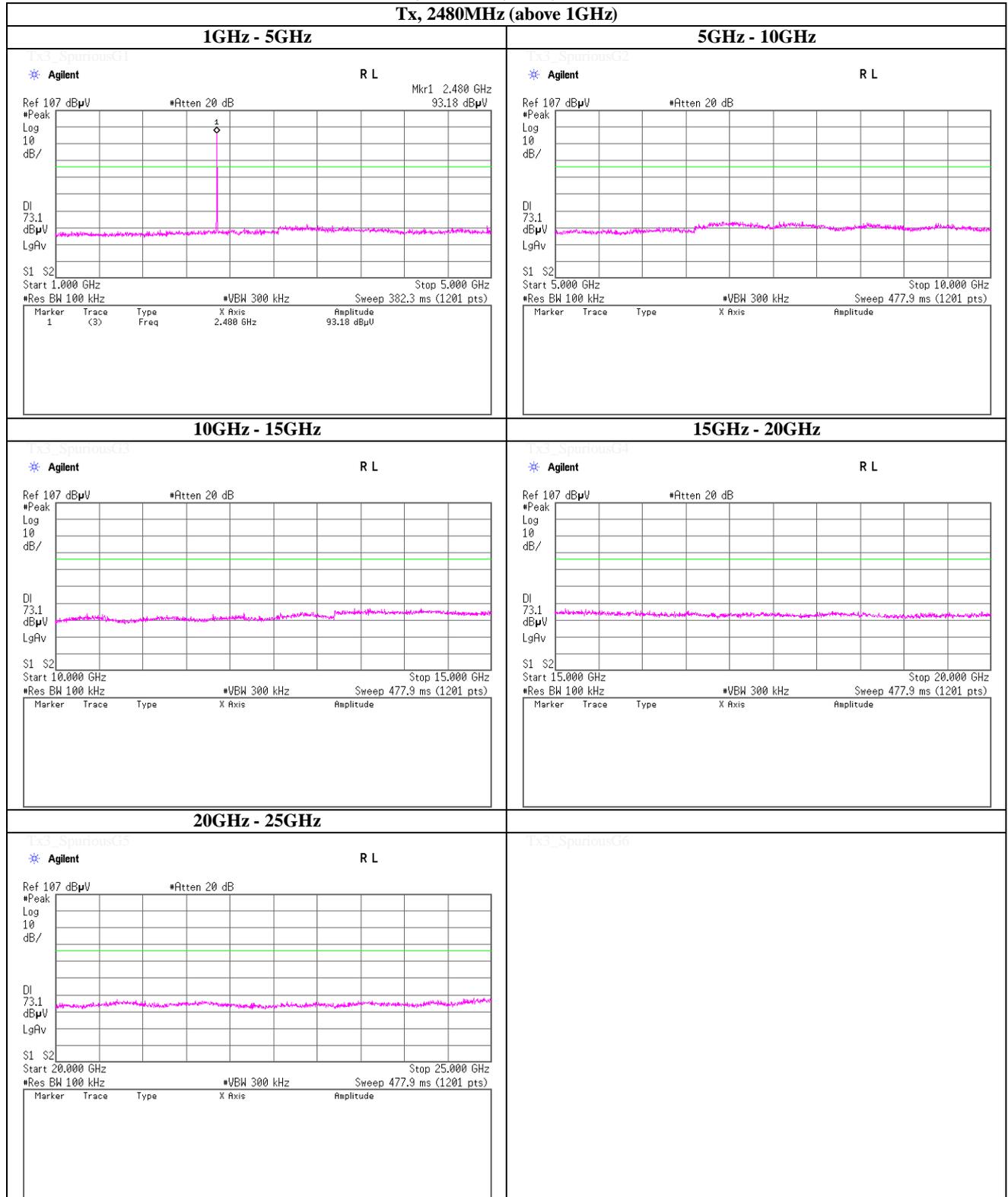
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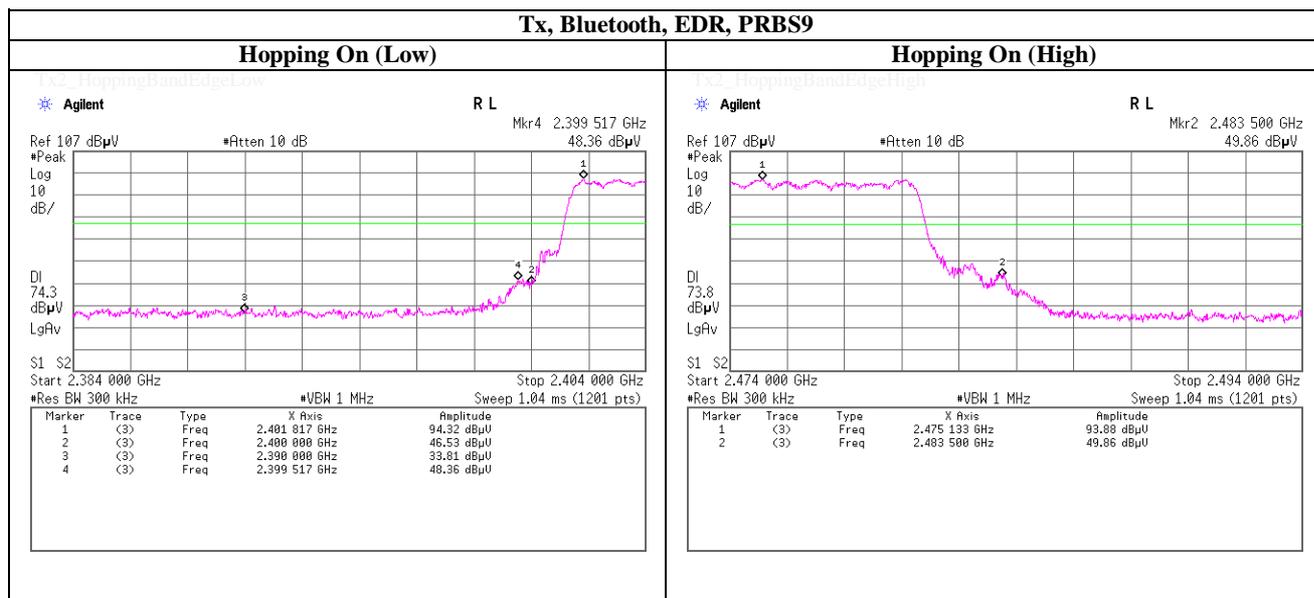
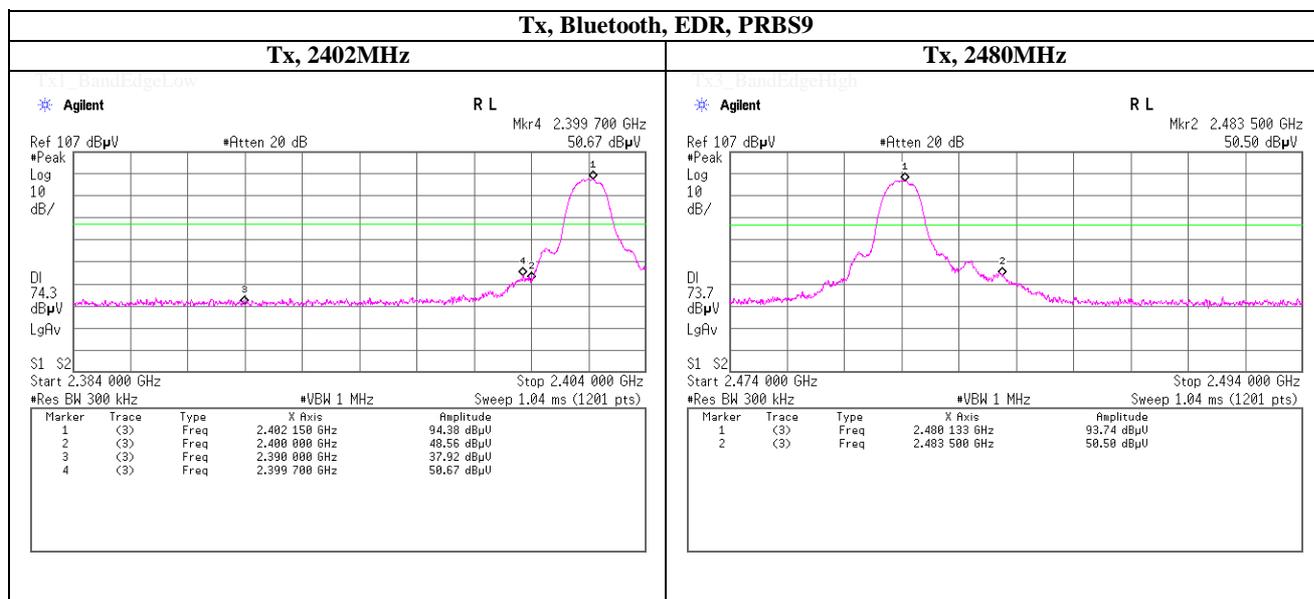
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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Spurious emission (Conducted)

Band Edge compliance



UL Japan, Inc.

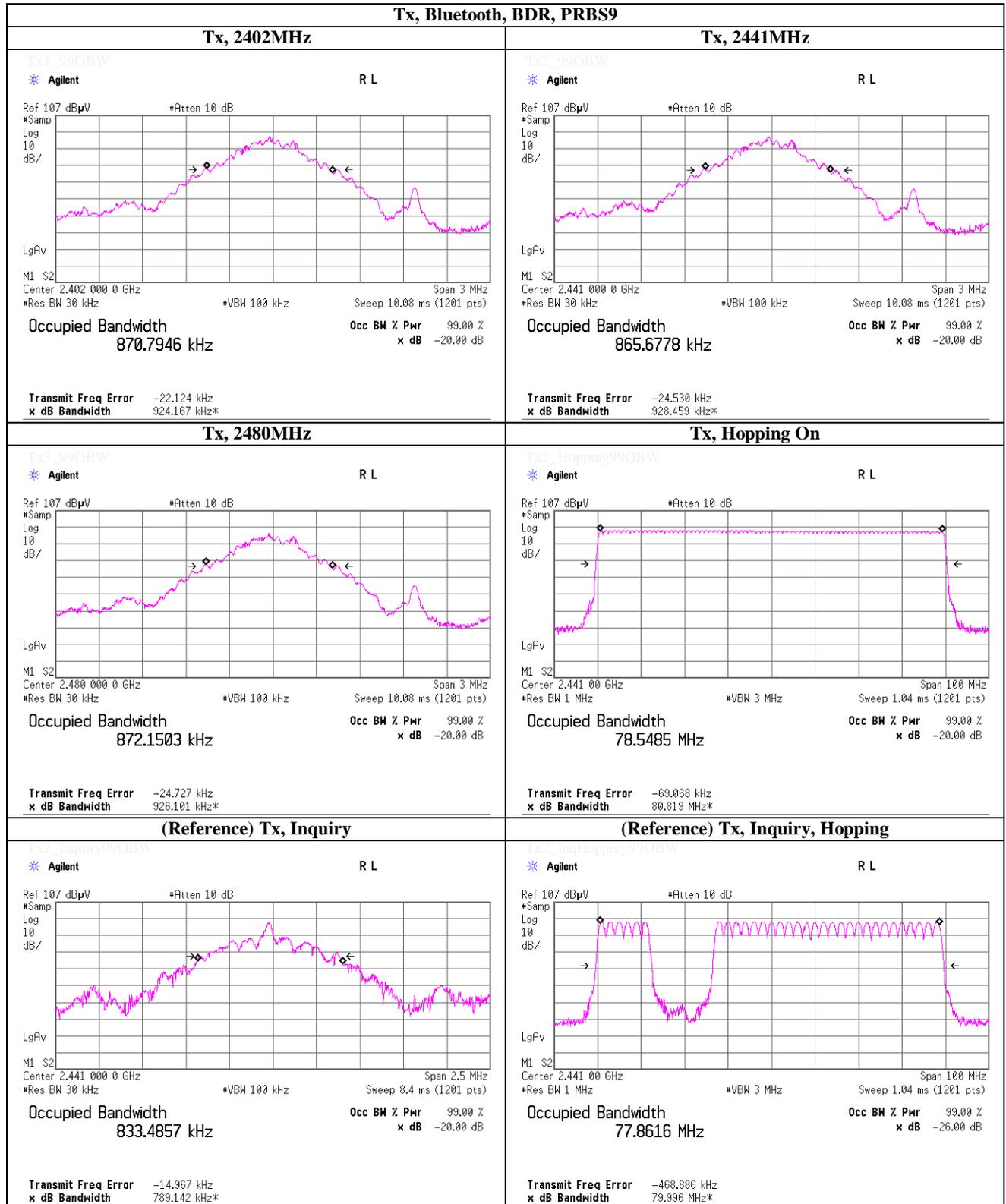
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99% Occupied Bandwidth



UL Japan, Inc.

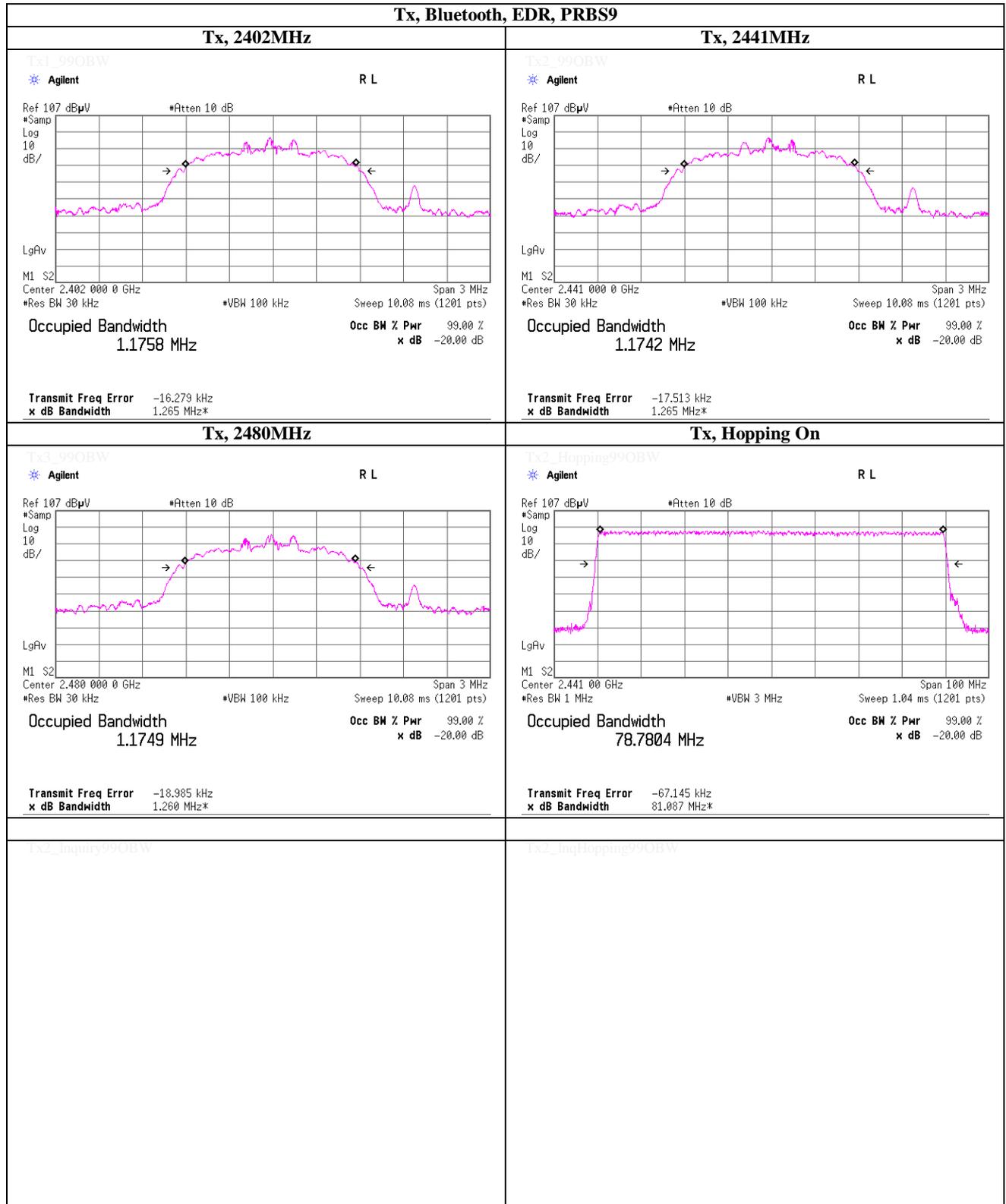
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Test Report No :10037151S-A

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
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2012/11/15 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2013/03/16 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	AT,RE	2013/02/27 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2013/07/09 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2013/07/22 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2013/04/11 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2013/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2012/08/17 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE,AT	2013/03/28 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF,LMF)	-	RE	-
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2012/12/18 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2012/12/18 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	00000018	RE	2013/03/19 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2013/03/14 * 12
SCC-G18	Coaxial Cable	Suhner	SUCOFLEX 104A	46292/4A	RE	2013/03/16 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2013/02/12 * 12
SAT6-06	Attenuator	JFW	50HF-006N	-	RE	2013/02/12 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2012/10/08 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2013/04/03 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2012/10/08 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2013/02/27 * 12

The expiration date of the calibration is the end of the expired month .

As for some calibrations performed after the tested dates , those test equipment have been controlled by means of an unbroken chains of calibrations .

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

Test Item :

RE: Radiated emission ,

AT: Antenna terminal conducted tests ,