



RADIO TEST REPORT

Test Report No.: 10059463S-A

Applicant : **Sony Corporation**
Type of Equipment : **AV Center**
Model No. : **XAV-612BT**
FCC ID : **AK8XAV612BT**
Test regulation : **FCC Part15 Subpart C: 2013**
Test result : **Complied**

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Date of test: August 30 to September 14, 2013

Tested by: *S. Takano*
Shinichi Takano
Engineer of WiSE Japan,
UL Verification Service

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



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13-EM-F0429

Contents

	Page
SECTION 1: Customer information	4
SECTION 2: Equipment under test (E.U.T.).....	4
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of E.U.T. during testing	8
SECTION 5: Carrier frequency separation	12
SECTION 6: 20dB bandwidth & Occupied bandwidth (99%).....	12
SECTION 7: Number of hopping frequency	12
SECTION 8: Dwell time.....	12
SECTION 9: Maximum peak output power	12
SECTION 10: Spurious emissions (Antenna port conducted)	12
SECTION 11: Radiated emission	13
Contents of APPENDIXES	15
APPENDIX 1: Data of radio tests.....	16
APPENDIX 2: Test instruments	52
APPENDIX 3: Photographs of test setup	53

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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-612BT
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 : August 21, 2013
Modification of EUT : No modification by the test lab.

2.2 Product description

Model: XAV-612BT (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

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results	
Conducted emission	ANSI C63.4:2009 7. AC powerline conducted emission measurements	FCC 15.207	-	N/A *1)	-	-	
Carrier frequency separation	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)	Conducted	N/A	*See data.	Complied	
20dB bandwidth	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)	Conducted	N/A		-	
Number of hopping frequency	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)(iii)	Conducted	N/A		Complied	
Dwell time	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)(iii)	Conducted	N/A		Complied	
Maximum peak output power	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (b)(1)	Conducted	N/A		Complied	
Band edge compliance & Spurious emission	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (d) 15.209	Conducted/ Radiated	N/A		7.3 dB Freq.: 324.009 MHz Polarization: Horizontal Detection: Quasi-Peak Mode: Tx 2480MHz, 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	4.8 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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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 type="checkbox"/> No.5 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
<input checked="" 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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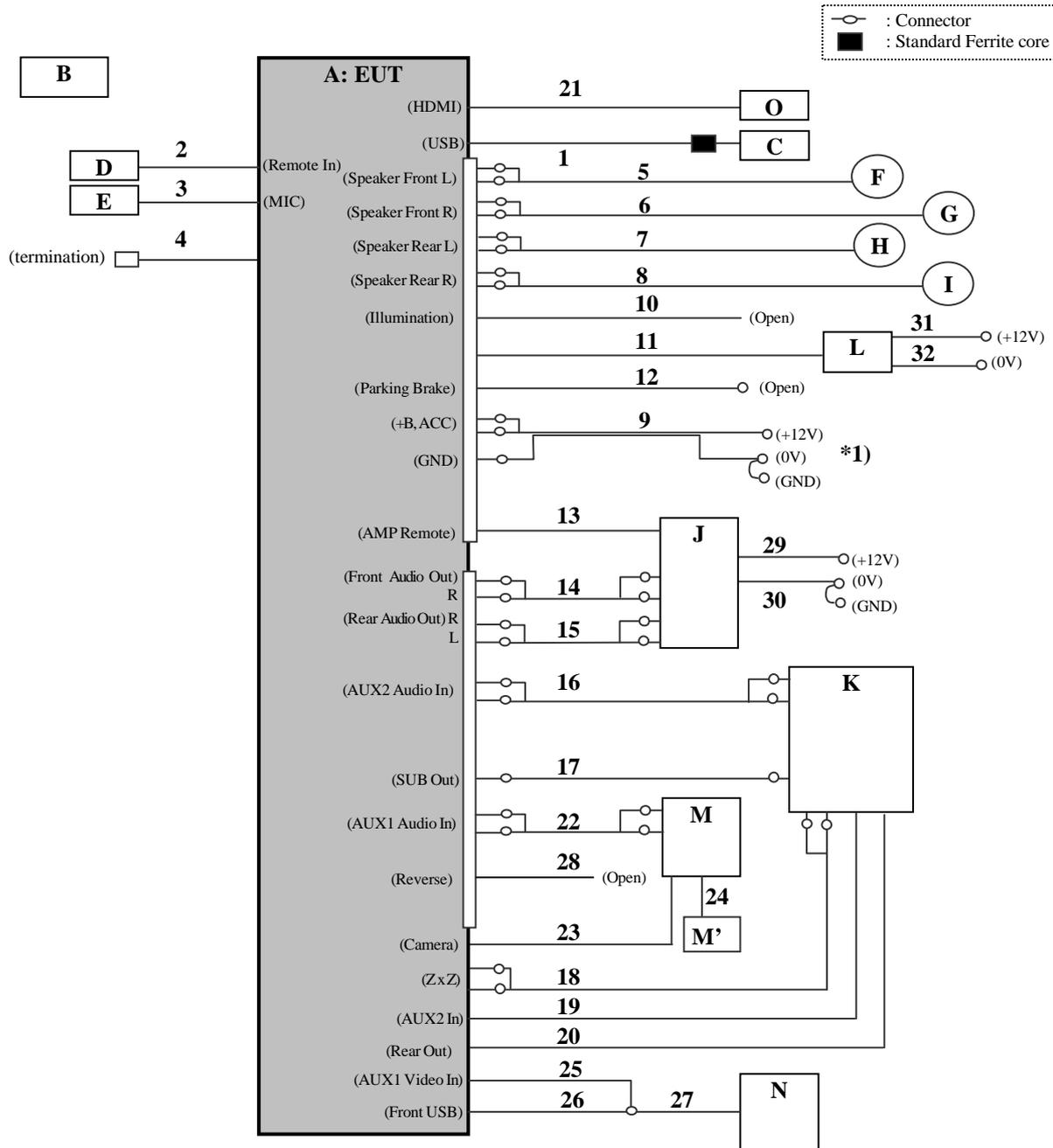
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4.2 Configuration and peripherals



* 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-612BT	*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	Navi Unit	-	-	Sony	-
M	Color Video Camera	CCD-MC100	1007356	Sony	-
M'					
N	iPod touch	A1288	9C90590L201	Apple	-
O	Smart Phone	ISW11SC	SSCAA087243	Samsung	-

*2) 48: Antenna port conducted tests, 42: 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+1.0	Unshielded	Unshielded	-
11	Signal	5.0	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 (Rear Out)	1.4	Shielded	Shielded	-
21	HDMI	0.15+1.0	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 (+)	2.0	Unshielded	Unshielded	-
30	DC Power (-)	2.0	Unshielded	Unshielded	-
31	DC Power (+)	2.0	Unshielded	Unshielded	-
32	DC Power (-)	2.0	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.	45 deg.	45 deg.	45 deg.
Vertical	45 deg.	45 deg.	45 deg.	45 deg.

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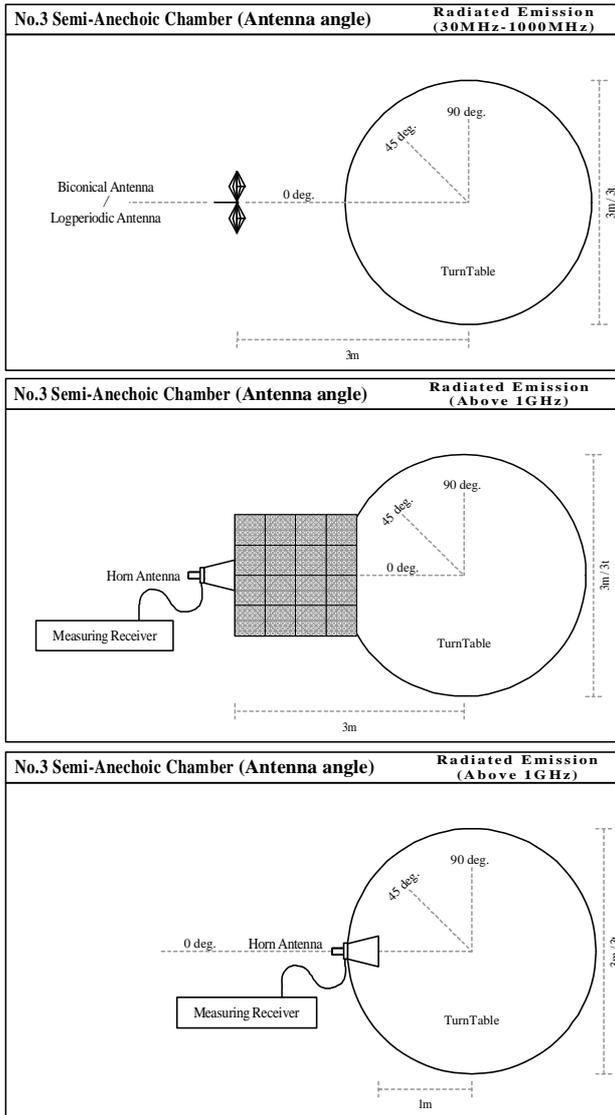
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Figure 1. Antenna angle



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 5th 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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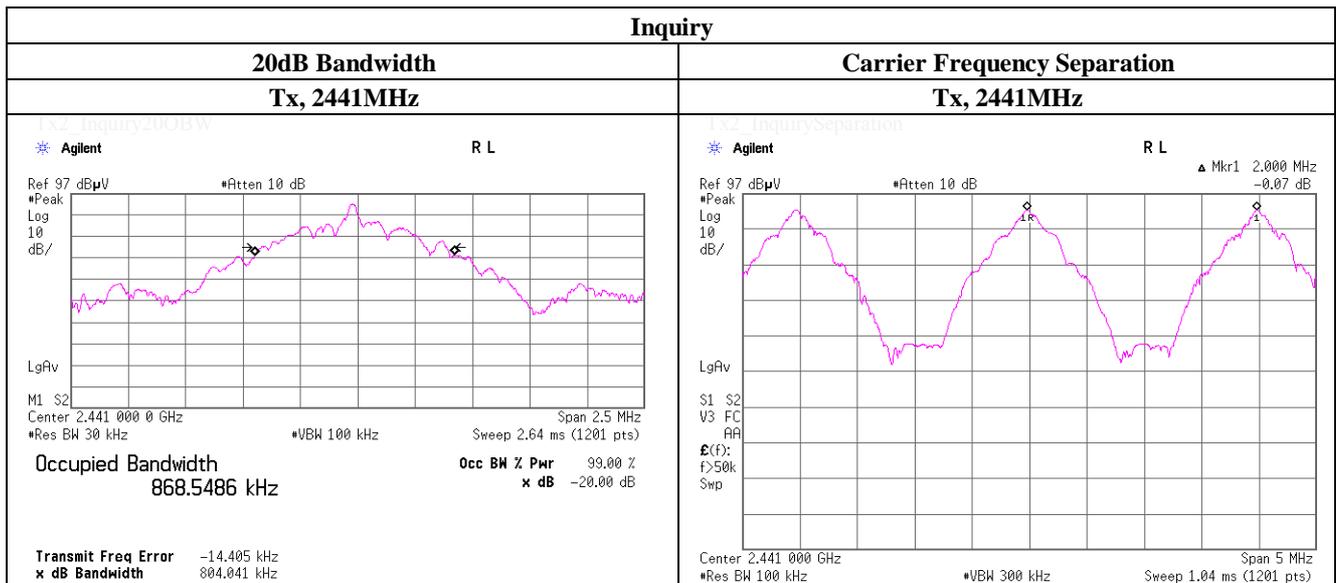
APPENDIX 1: Data of radio tests

20dB Bandwidth and Carrier Frequency Separation

Test place UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
 Date September 4, 2013
 Temperature / Humidity 26 deg.C , 53 %RH
 Engineer Shinichi Takano
 Mode Tx, Bluetooth, BDR, PRBS9

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.925	1.000	>= 0.617
DH5	2441.0	0.929	1.000	>= 0.619
DH5	2480.0	0.927	1.000	>= 0.618
Inquiry	2441.0	0.804	2.000	>= 0.536

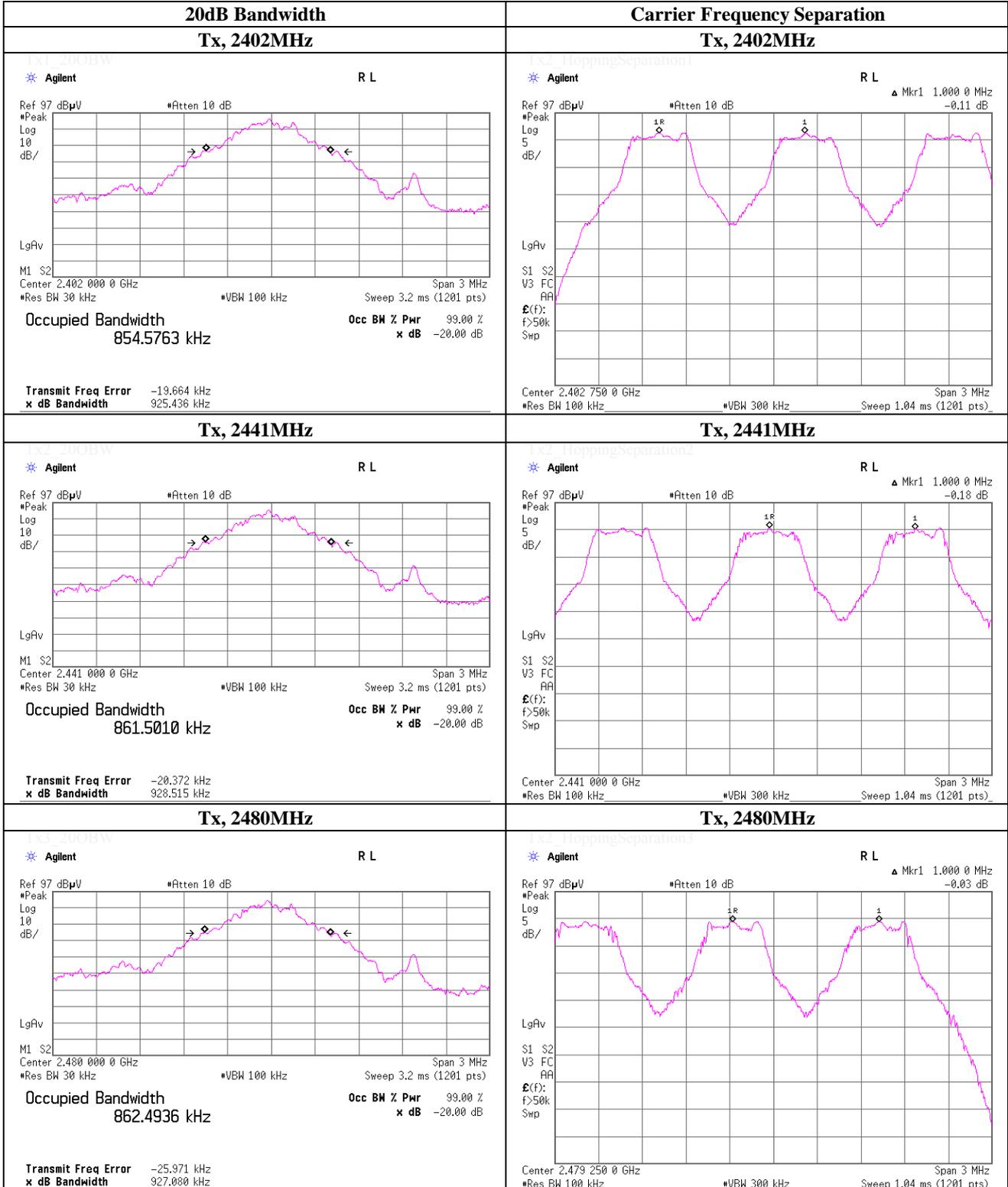
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
 No limit applies to 20dB Bandwidth.



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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.6 Shielded Room
Date September 4, 2013
Temperature / Humidity 26 deg.C , 53 %RH
Engineer Shinichi Takano
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	1.262	1.000	>= 0.842
3-DH5	2441.0	1.264	1.000	>= 0.843
3-DH5	2480.0	1.272	1.000	>= 0.848

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

No limit applies to 20dB Bandwidth.

Tx2_Inquiry200BW

Tx2_InquirySeparation

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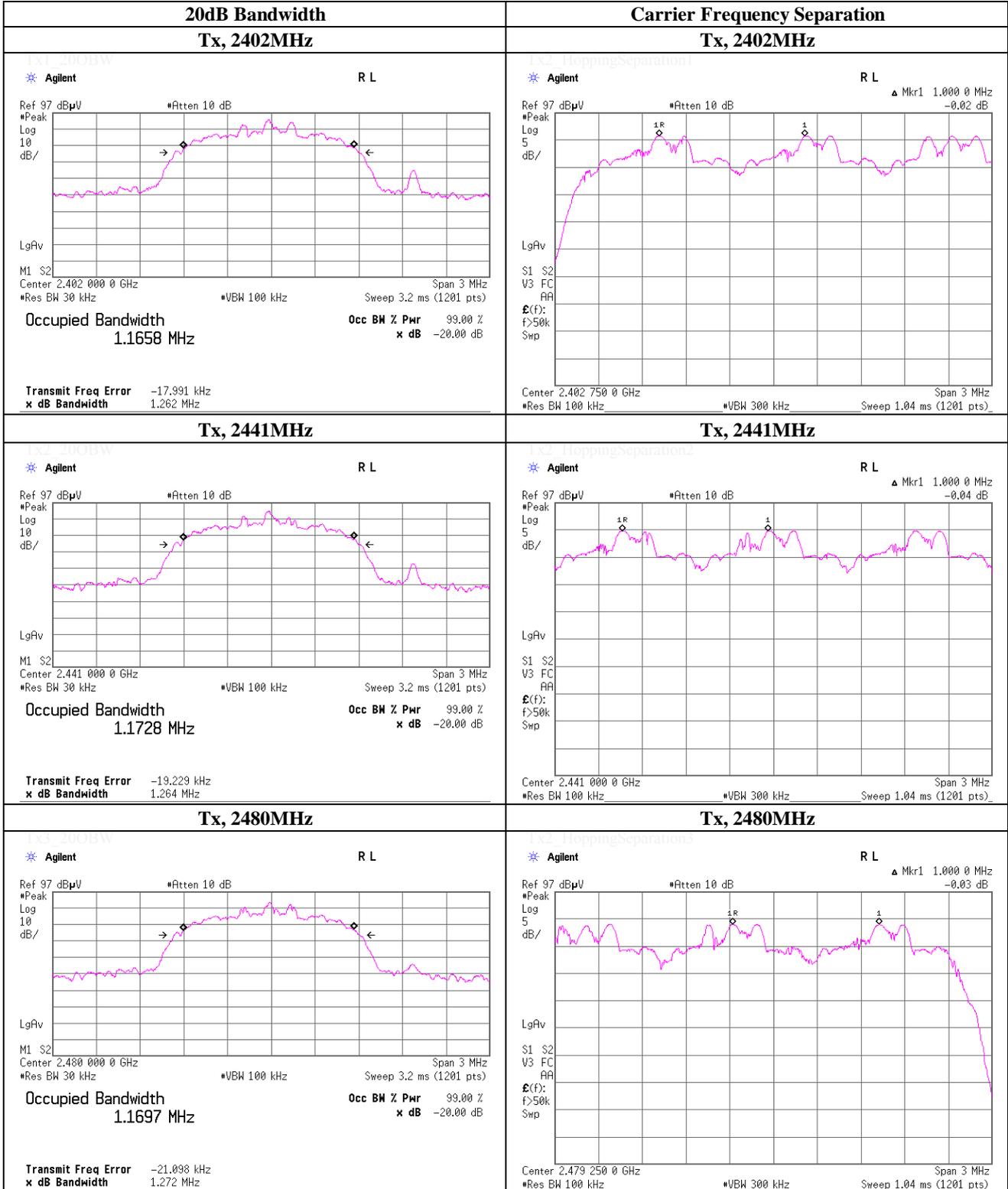
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, PRBS9



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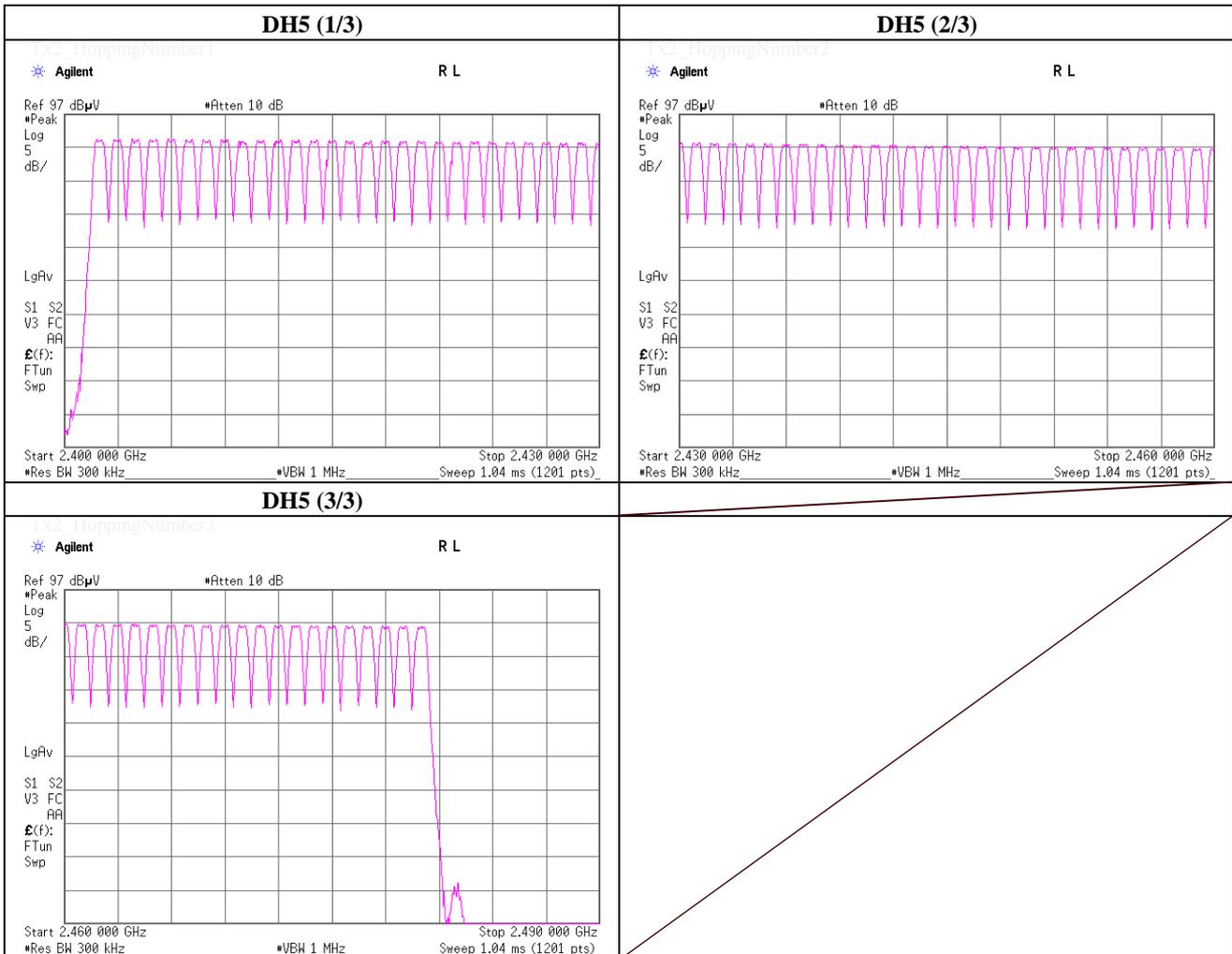
Facsimile : +81 463 50 6401

Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.6 Shielded Room
Date	September 4, 2013	
Temperature / Humidity	26 deg.C , 53 %RH	
Engineer	Shinichi Takano	
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.

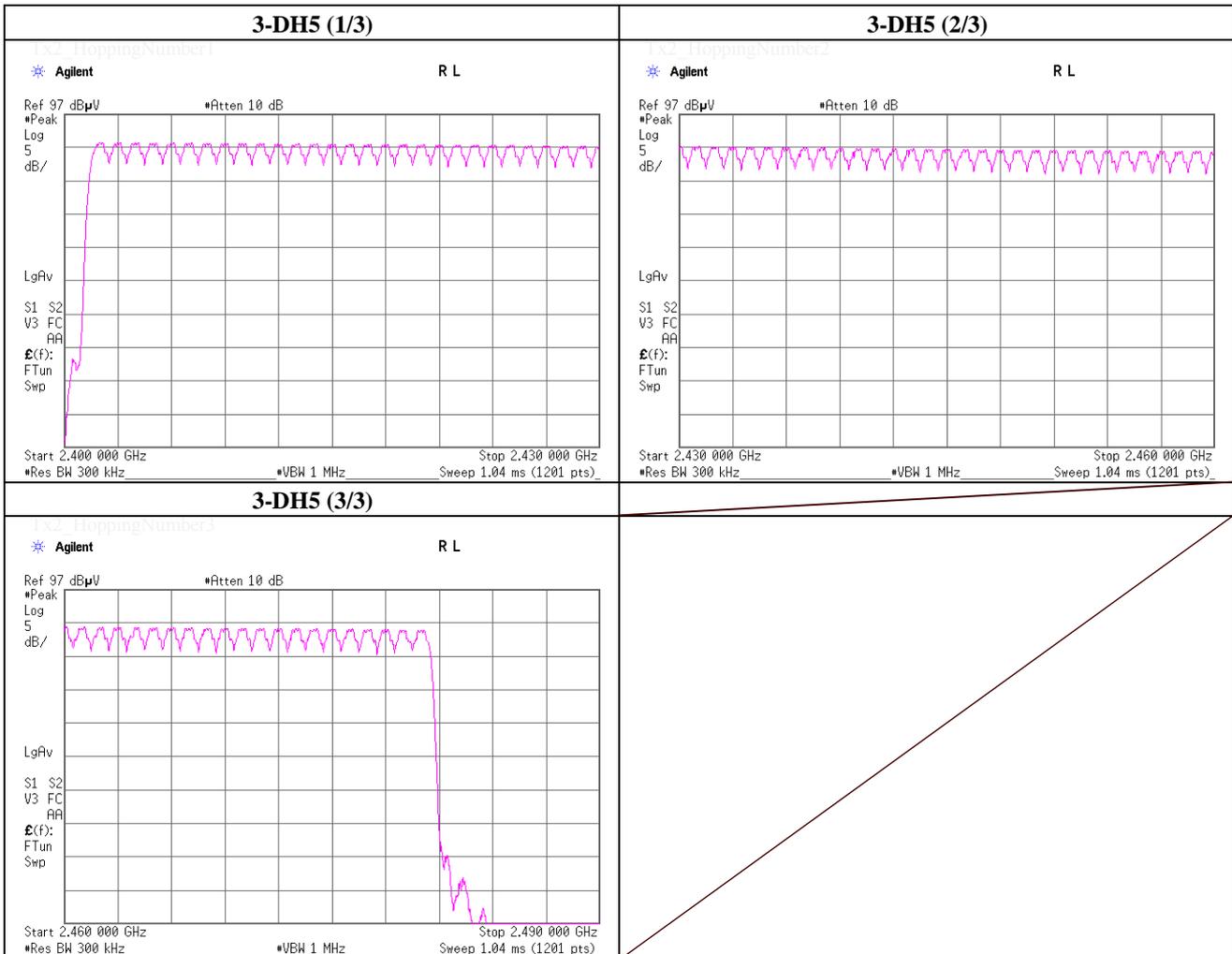


Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.6 Shielded Room
Date	September 4, 2013	
Temperature / Humidity	26 deg.C , 53 %RH	
Engineer	Shinichi Takano	
Mode	Tx, Bluetooth, EDR, PRBS9	

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

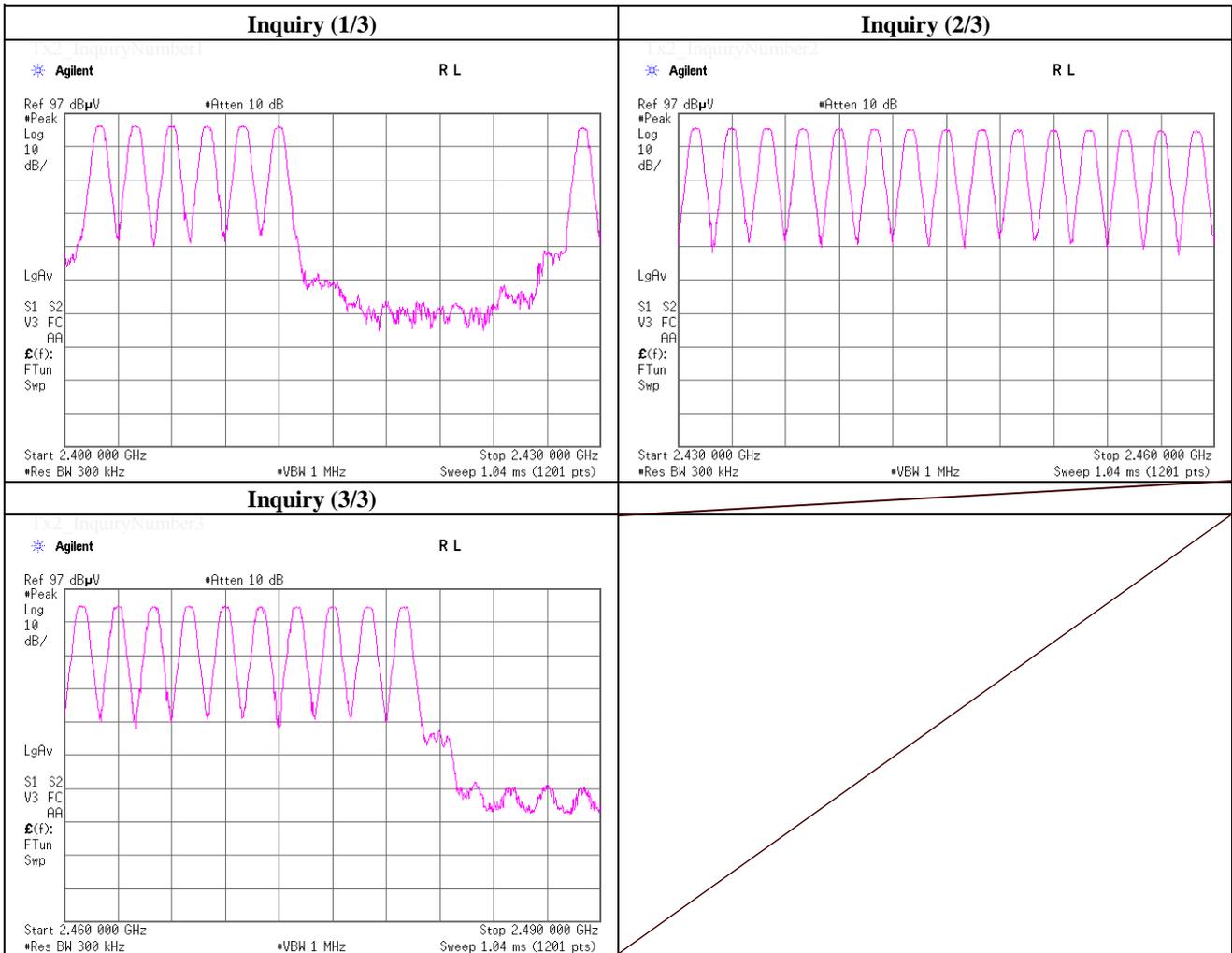
* Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.



Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.6 Shielded Room
Date	September 4, 2013	
Temperature / Humidity	26 deg.C , 53 %RH	
Engineer	Shinichi Takano	
Mode	Tx, Bluetooth, Inquiry	

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



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Dwell Time

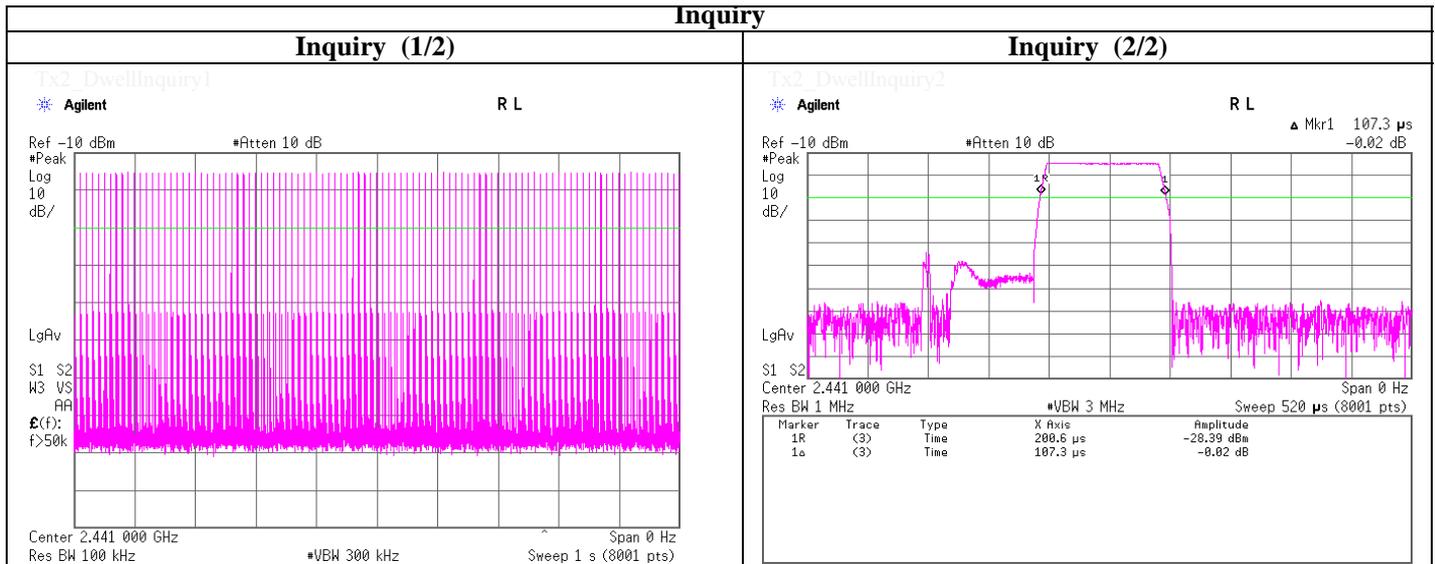
Test place UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
 Date September 4, 2013
 Temperature / Humidity 26 deg.C , 53 %RH
 Engineer Shinichi Takano
 Mode Tx, Bluetooth, BDR, PRBS9

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	0.401	129	400
DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.659	274	400
DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	2.908	314	400
Inquiry	100.0 / 1.0 sec. x 12.8 sec. = 1280 times	0.107	137	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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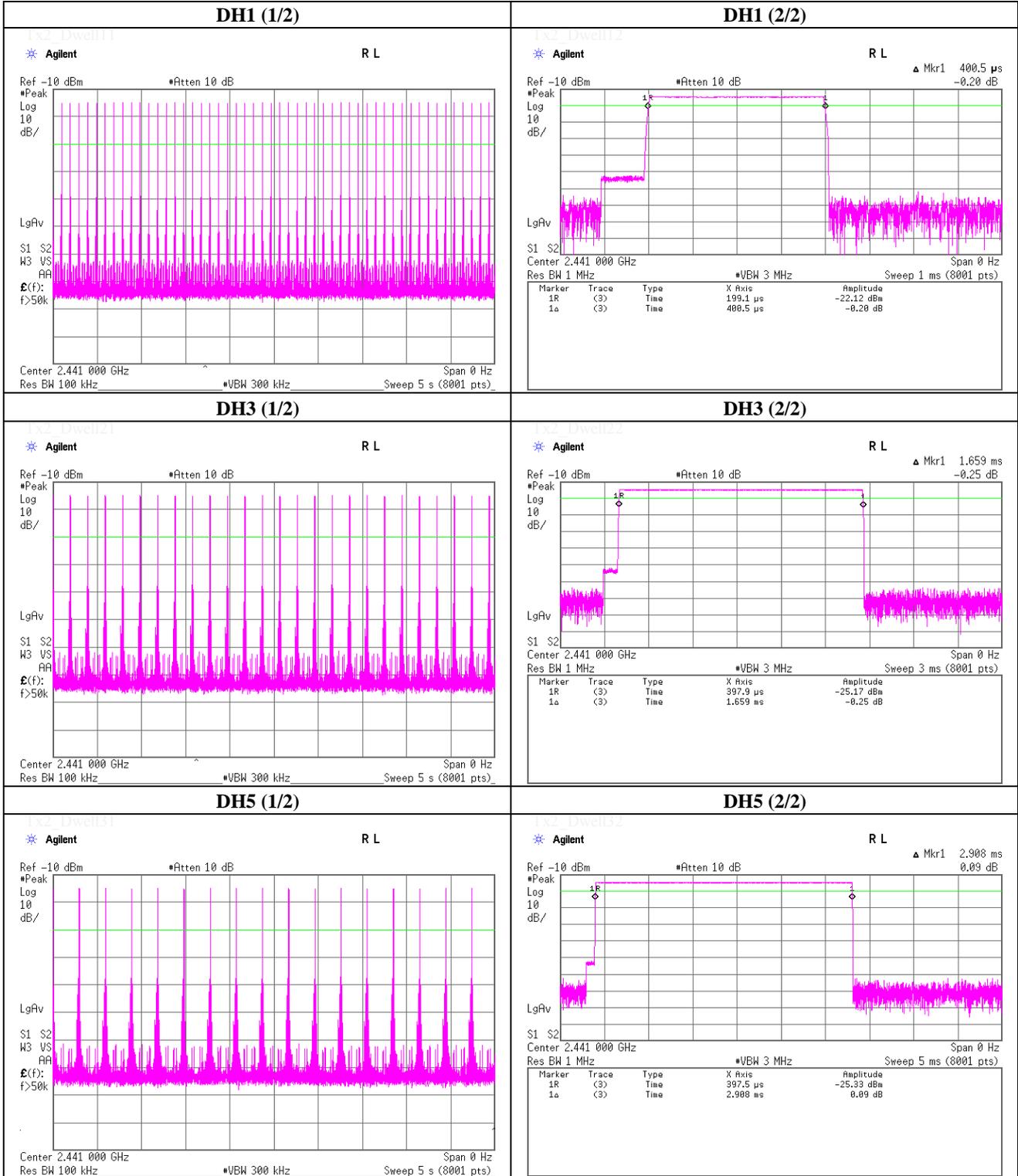
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Dwell time

Tx, Bluetooth, BDR, PRBS9



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Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
 Date September 4, 2013
 Temperature / Humidity 26 deg.C , 53 %RH
 Engineer Shinichi Takano
 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	0.416	134	400
3-DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.666	275	400
3-DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	2.918	315	400

Sample Calculation

Result = Number of transmission x Length of transmission time

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

UL Japan, Inc.

Shonan EMC Lab.

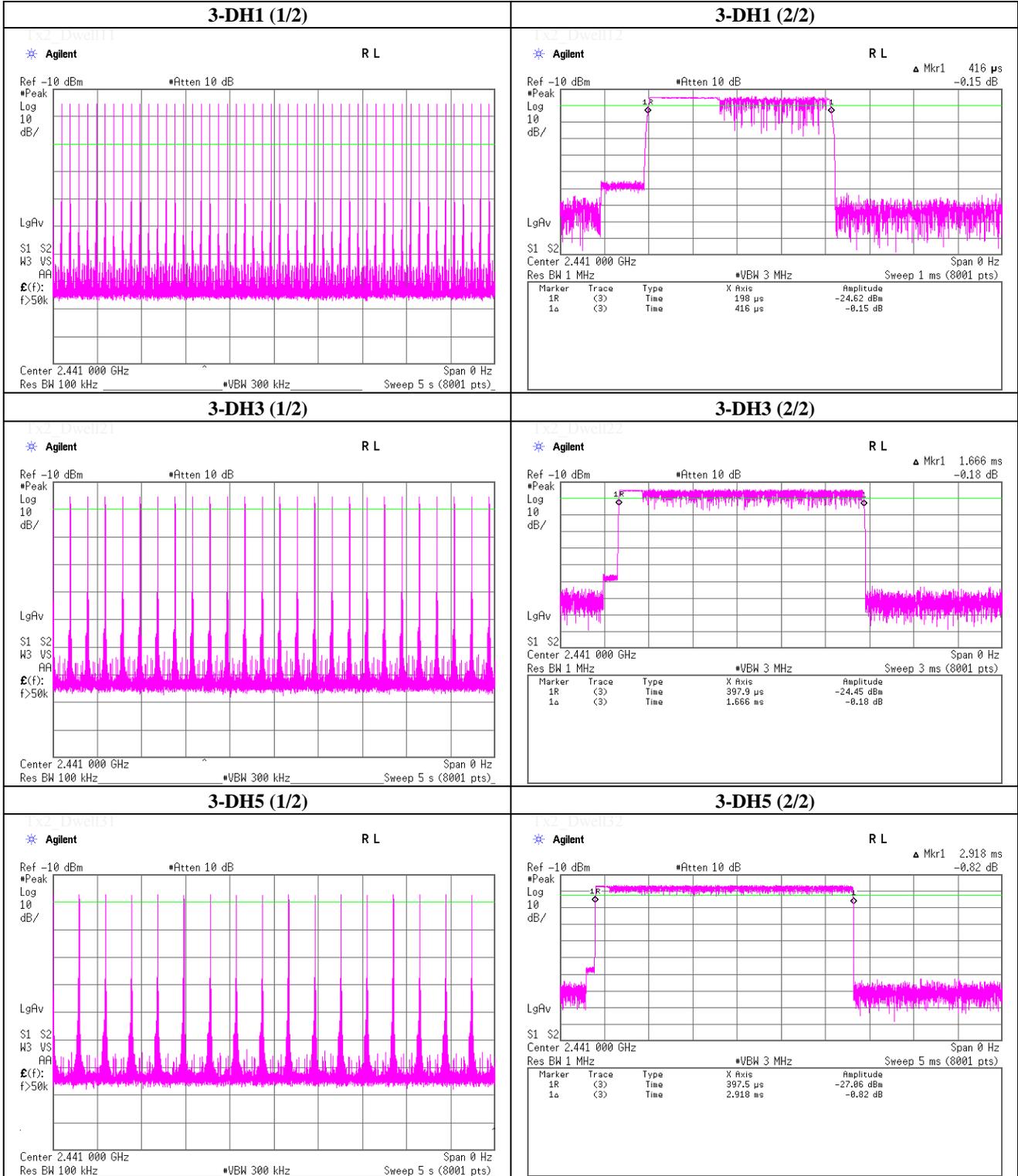
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Dwell time

Tx, Bluetooth, EDR, PRBS9



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Maximum Peak Conducted Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.6 Shielded Room
 Date August 30, 2013
 Temperature / Humidity 24 deg.C , 45 %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	-13.07	1.95	9.62	-1.50	0.71	20.97	125	22.47
DH5	2441.0	-13.90	1.96	9.63	-2.31	0.59	20.97	125	23.28
DH5	2480.0	-14.58	1.98	9.63	-2.97	0.50	20.97	125	23.94
2-DH5	2402.0	-12.87	1.95	9.62	-1.30	0.74	20.97	125	22.27
2-DH5	2441.0	-13.83	1.96	9.63	-2.24	0.60	20.97	125	23.21
2-DH5	2480.0	-14.62	1.98	9.63	-3.01	0.50	20.97	125	23.98
3-DH5	2402.0	-12.78	1.95	9.62	-1.21	0.76	20.97	125	22.18
3-DH5	2441.0	-13.62	1.96	9.63	-2.03	0.63	20.97	125	23.00
3-DH5	2480.0	-14.38	1.98	9.63	-2.77	0.53	20.97	125	23.74

Sample Calculation:

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

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date September 9, 2013 September 14, 2013
Temperature / Humidity 26 deg.C , 52 %RH 23 deg.C , 45 %RH
Engineer Akio Hayashi Akio Hayashi
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.	198.027	QP	37.7	16.3	7.8	32.0		29.8	43.5	13.7	169	41	
Hori.	324.003	QP	47.1	14.5	8.7	31.9		38.4	46.0	7.6	102	73	
Hori.	329.997	QP	45.2	14.6	8.7	31.9		36.6	46.0	9.4	105	304	
Hori.	399.697	QP	41.8	16.2	9.0	32.0		35.0	46.0	11.0	100	126	
Hori.	432.007	QP	40.6	16.6	9.2	31.9		34.5	46.0	11.5	100	207	
Hori.	480.006	QP	39.5	17.2	9.4	31.9		34.2	46.0	11.8	100	285	
Hori.	2483.500	PK	47.2	26.9	14.8	41.0		47.9	73.9	26.0	100	55	
Hori.	2492.223	PK	46.0	26.9	14.8	41.0		46.7	73.9	27.2	100	55	
Hori.	4960.000	PK	53.4	31.8	7.5	41.1		51.6	73.9	22.3	108	51	
Hori.	7440.000	PK	47.0	37.4	9.0	41.1		52.3	73.9	21.6	100	0	
Hori.	9920.000	PK	43.4	38.9	10.0	38.8		53.5	73.9	20.4	100	0	
Hori.	12400.000	PK	44.8	39.7	11.3	39.1		56.7	73.9	17.2	100	0	
Hori.	2483.500	AV	35.0	26.9	14.8	41.0		35.7	53.9	18.2	100	55	
Hori.	2492.223	AV	34.1	26.9	14.8	41.0		34.8	53.9	19.1	100	55	
Vert.	432.007	QP	38.9	16.6	9.2	31.9		32.8	46.0	13.2	121	337	
Vert.	2483.500	PK	48.0	26.9	14.8	41.0		48.7	73.9	25.2	100	183	
Vert.	2492.223	PK	45.9	26.9	14.8	41.0		46.6	73.9	27.3	100	183	
Vert.	4960.000	PK	53.3	31.8	7.5	41.1		51.5	73.9	22.4	100	125	
Vert.	7440.000	PK	47.2	37.4	9.0	41.1		52.5	73.9	21.4	100	0	
Vert.	9920.000	PK	43.4	38.9	10.0	38.8		53.5	73.9	20.4	100	0	
Vert.	12400.000	PK	45.3	39.7	11.3	39.1		57.2	73.9	16.7	100	0	
Vert.	2483.500	AV	35.7	26.9	14.8	41.0		36.4	53.9	17.5	100	183	
Vert.	2492.223	AV	34.1	26.9	14.8	41.0		34.8	53.9	19.1	100	183	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell time factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	4960.000	AV	47.5	31.8	7.5	41.1	-24.7	21.0	53.9	32.9	108	51	
Hori.	7440.000	AV	35.1	37.4	9.0	41.1	-24.7	15.7	53.9	38.2	100	0	
Hori.	9920.000	AV	30.7	38.9	10.0	38.8	-24.7	16.1	53.9	37.8	100	0	
Hori.	12400.000	AV	32.7	39.7	11.3	39.1	-24.7	19.9	53.9	34.0	100	0	
Vert.	4960.000	AV	47.3	31.8	7.5	41.1	-24.7	20.8	53.9	33.1	100	125	
Vert.	7440.000	AV	35.1	37.4	9.0	41.1	-24.7	15.7	53.9	38.2	100	0	
Vert.	9920.000	AV	30.7	38.9	10.0	38.8	-24.7	16.1	53.9	37.8	100	0	
Vert.	12400.000	AV	32.6	39.7	11.3	39.1	-24.7	19.8	53.9	34.1	100	0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell time factor (refer to "Dwell time factor Calculation")

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

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

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

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Radiated Emission

Test place UL Japan, Inc. Shonan EMC Lab. No.3 Semi Anechoic Chamber
 Date September 9, 2013 September 14, 2013
 Temperature / Humidity 26 deg.C , 52 %RH 23 deg.C , 45 %RH
 Engineer Akio Hayashi Akio Hayashi
 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.	198.000	QP	39.4	16.3	7.8	32.0		31.5	43.5	12.0	158	44	
Hori.	324.014	QP	46.4	14.5	8.7	31.9		37.7	46.0	8.3	100	63	
Hori.	330.004	QP	46.0	14.6	8.7	31.9		37.4	46.0	8.6	100	309	
Hori.	399.697	QP	41.8	16.2	9.0	32.0		35.0	46.0	11.0	100	133	
Hori.	432.016	QP	41.3	16.6	9.2	31.9		35.2	46.0	10.8	100	205	
Hori.	479.557	QP	40.3	17.2	9.4	31.9		35.0	46.0	11.0	100	285	
Hori.	4882.000	PK	49.8	31.4	7.5	41.1		47.6	73.9	26.3	100	93	
Hori.	7323.000	PK	47.0	37.2	9.0	41.1		52.1	73.9	21.8	100	0	
Hori.	9764.000	PK	43.1	38.8	10.1	38.8		53.2	73.9	20.7	100	0	
Hori.	12205.000	PK	45.0	39.6	11.4	39.1		56.9	73.9	17.0	100	0	
Vert.	462.013	QP	39.8	17.0	9.3	31.9		34.2	46.0	11.8	135	170	
Vert.	4882.000	PK	47.8	31.4	7.5	41.1		45.6	73.9	28.3	100	138	
Vert.	7323.000	PK	46.5	37.2	9.0	41.1		51.6	73.9	22.3	100	0	
Vert.	9764.000	PK	42.2	38.8	10.1	38.8		52.3	73.9	21.6	100	0	
Vert.	12205.000	PK	44.6	39.6	11.4	39.1		56.5	73.9	17.4	100	0	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell time factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	4882.000	AV	39.5	31.4	7.5	41.1	-24.6	12.7	53.9	41.2	100	93	
Hori.	7323.000	AV	34.7	37.2	9.0	41.1	-24.6	15.2	53.9	38.7	100	0	
Hori.	9764.000	AV	31.2	38.8	10.1	38.8	-24.6	16.7	53.9	37.2	100	0	
Hori.	12205.000	AV	32.4	39.6	11.4	39.1	-24.6	19.7	53.9	34.2	100	0	
Vert.	4882.000	AV	37.4	31.4	7.5	41.1	-24.6	10.6	53.9	43.3	100	138	
Vert.	7323.000	AV	34.6	37.2	9.0	41.1	-24.6	15.1	53.9	38.8	100	0	
Vert.	9764.000	AV	31.2	38.8	10.1	38.8	-24.6	16.7	53.9	37.2	100	0	
Vert.	12205.000	AV	32.4	39.6	11.4	39.1	-24.6	19.7	53.9	34.2	100	0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell time factor (refer to "Dwell time factor Calculation")

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

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.3 Semi Anechoic Chamber
Date September 9, 2013 September 14, 2013
Temperature / Humidity 26 deg.C , 52 %RH 23 deg.C , 45 %RH
Engineer Akio Hayashi Akio Hayashi
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.	198.014	QP	37.3	16.3	7.8	32.0		29.4	43.5	14.1	172	56	
Hori.	324.009	QP	47.4	14.5	8.7	31.9		38.7	46.0	7.3	102	76	
Hori.	329.999	QP	44.2	14.6	8.7	31.9		35.6	46.0	10.4	106	305	
Hori.	399.696	QP	42.7	16.2	9.0	32.0		35.9	46.0	10.1	100	134	
Hori.	432.035	QP	42.1	16.6	9.2	31.9		36.0	46.0	10.0	100	208	
Hori.	480.008	QP	39.8	17.2	9.4	31.9		34.5	46.0	11.5	100	285	
Hori.	2483.500	PK	48.3	26.9	14.8	41.0		49.0	73.9	24.9	100	58	
Hori.	4960.000	PK	47.5	31.8	7.5	41.1		45.7	73.9	28.2	100	116	
Hori.	7440.000	PK	46.6	37.4	9.0	41.1		51.9	73.9	22.0	100	0	
Hori.	9920.000	PK	42.1	38.9	10.0	38.8		52.2	73.9	21.7	100	0	
Hori.	12400.000	PK	44.8	39.7	11.3	39.1		56.7	73.9	17.2	100	0	
Hori.	2483.500	AV	34.6	26.9	14.8	41.0		35.3	53.9	18.6	100	58	
Vert.	432.005	QP	38.6	16.6	9.2	31.9		32.5	46.0	13.5	123	326	
Vert.	2483.500	PK	47.8	26.9	14.8	41.0		48.5	73.9	25.4	100	183	
Vert.	4960.000	PK	46.5	31.8	7.5	41.1		44.7	73.9	29.2	107	146	
Vert.	7440.000	PK	46.1	37.4	9.0	41.1		51.4	73.9	22.5	100	0	
Vert.	9920.000	PK	42.7	38.9	10.0	38.8		52.8	73.9	21.1	100	0	
Vert.	12400.000	PK	44.3	39.7	11.3	39.1		56.2	73.9	17.7	100	0	
Vert.	2483.500	AV	35.3	26.9	14.8	41.0		36.0	53.9	17.9	100	183	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell time factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	4960.000	AV	36.0	31.8	7.5	41.1	-24.6	9.6	53.9	44.3	100	116	
Hori.	7440.000	AV	34.9	37.4	9.0	41.1	-24.6	15.6	53.9	38.3	100	0	
Hori.	9920.000	AV	30.6	38.9	10.0	38.8	-24.6	16.1	53.9	37.8	100	0	
Hori.	12400.000	AV	32.4	39.7	11.3	39.1	-24.6	19.7	53.9	34.2	100	0	
Vert.	4960.000	AV	35.4	31.8	7.5	41.1	-24.6	9.0	53.9	44.9	107	146	
Vert.	7440.000	AV	34.9	37.4	9.0	41.1	-24.6	15.6	53.9	38.3	100	0	
Vert.	9920.000	AV	30.6	38.9	10.0	38.8	-24.6	16.1	53.9	37.8	100	0	
Vert.	12400.000	AV	32.4	39.7	11.3	39.1	-24.6	19.7	53.9	34.2	100	0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell time factor (refer to "Dwell time factor Calculation")

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

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

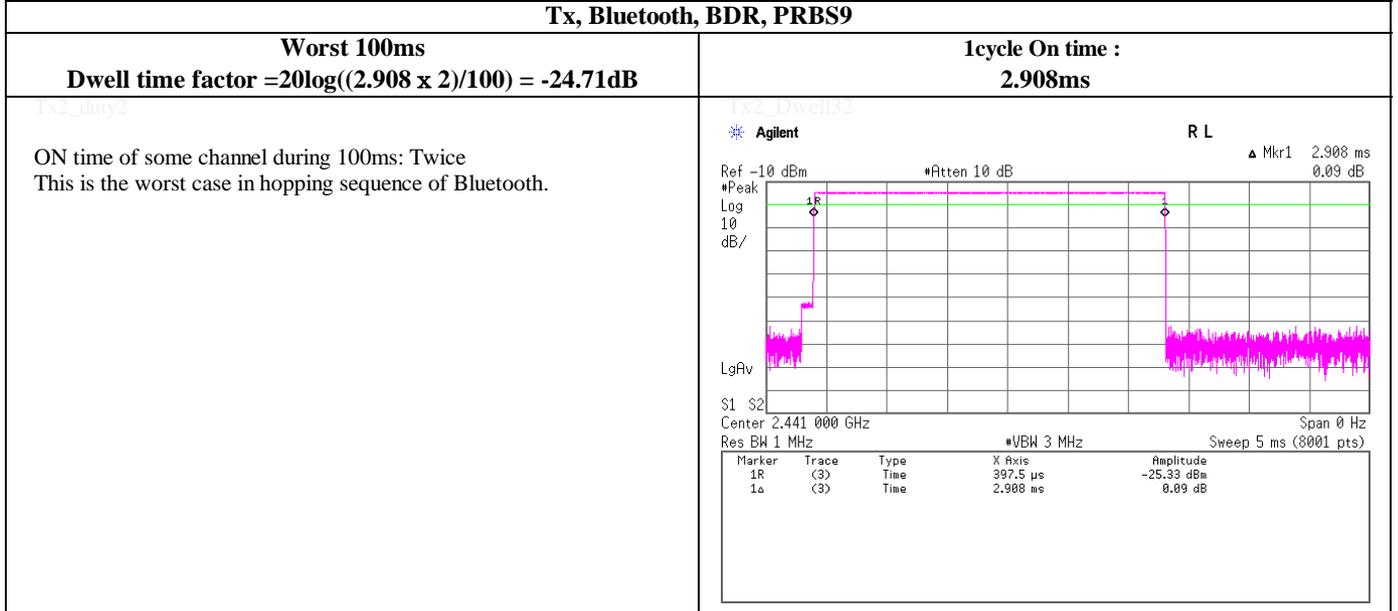
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Dwell time factor Calculation chart

Dwell time factor Calculation Tx, Bluetooth, BDR, PRBS9



VBW (Average) setting

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

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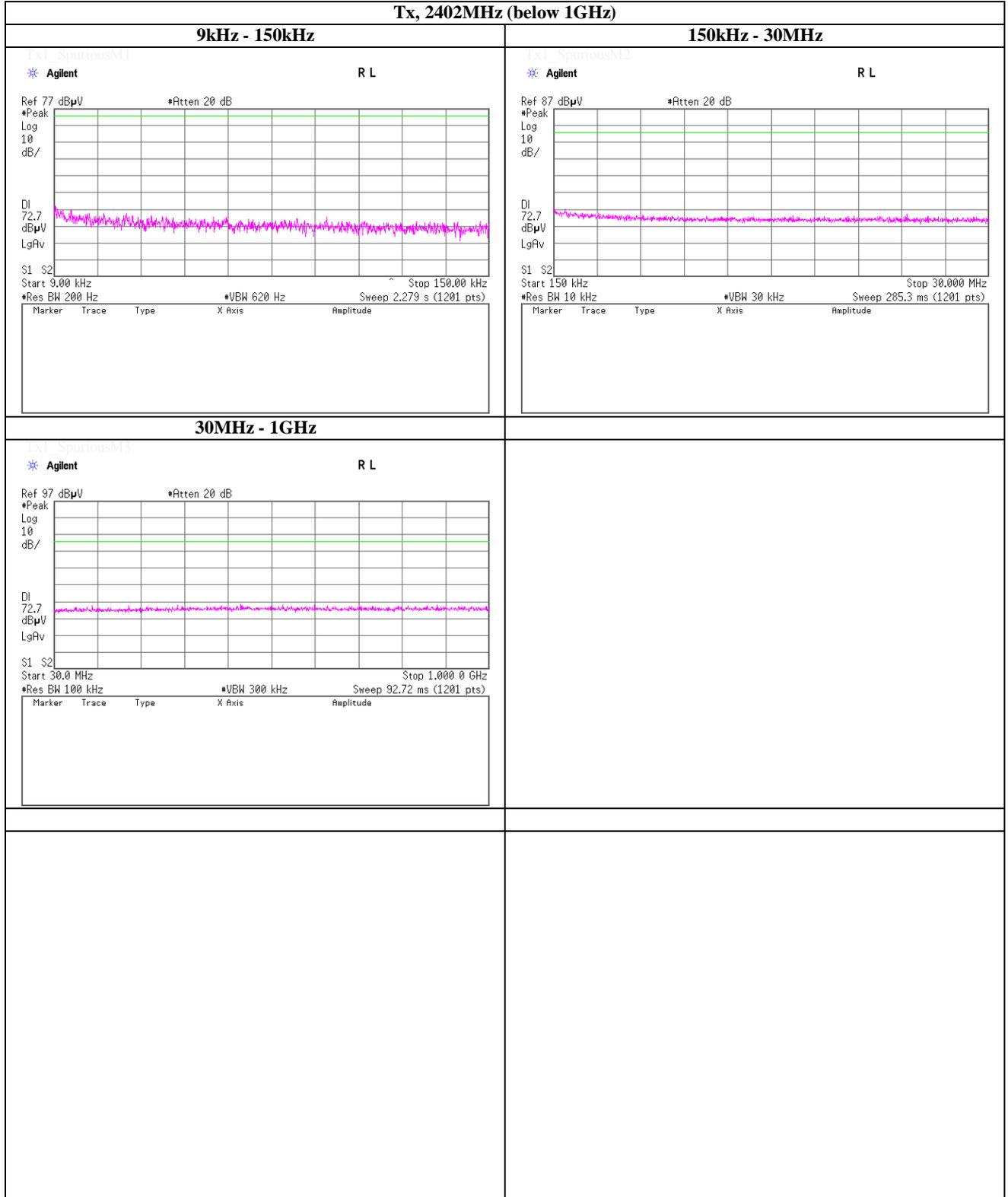
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Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (below 1GHz)



UL Japan, Inc.

Shonan EMC Lab.

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

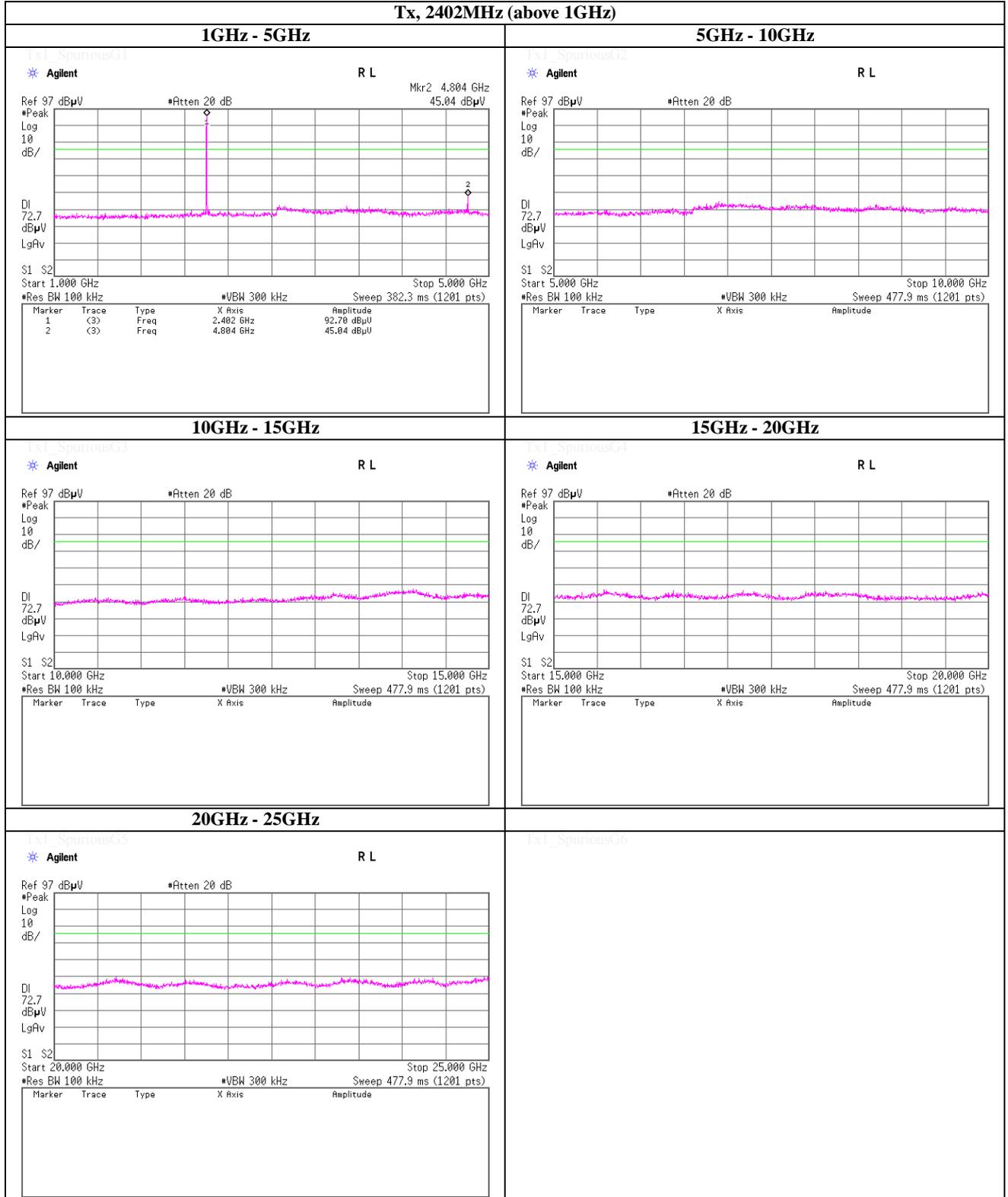
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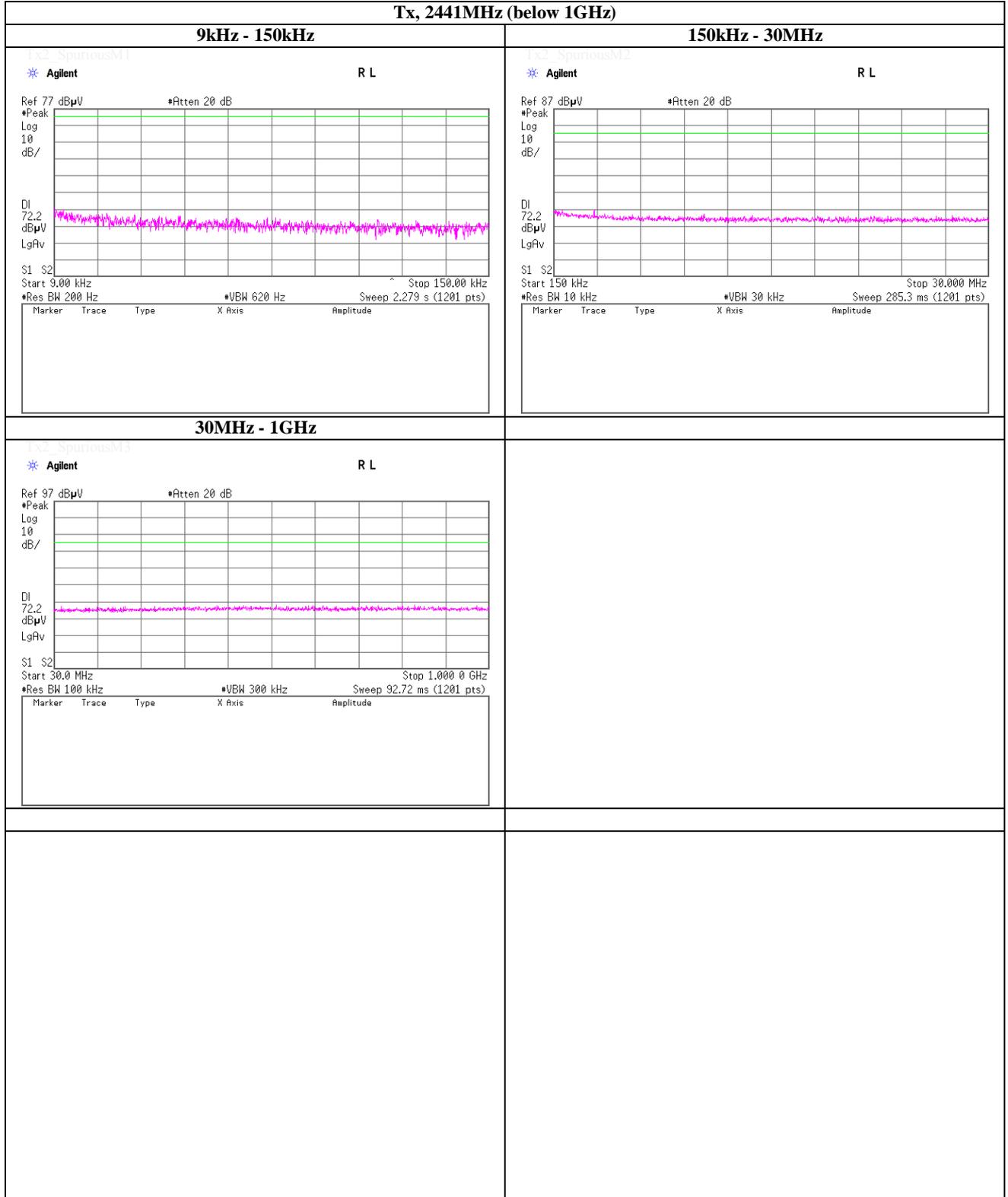
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Tx, 2441MHz (below 1GHz)



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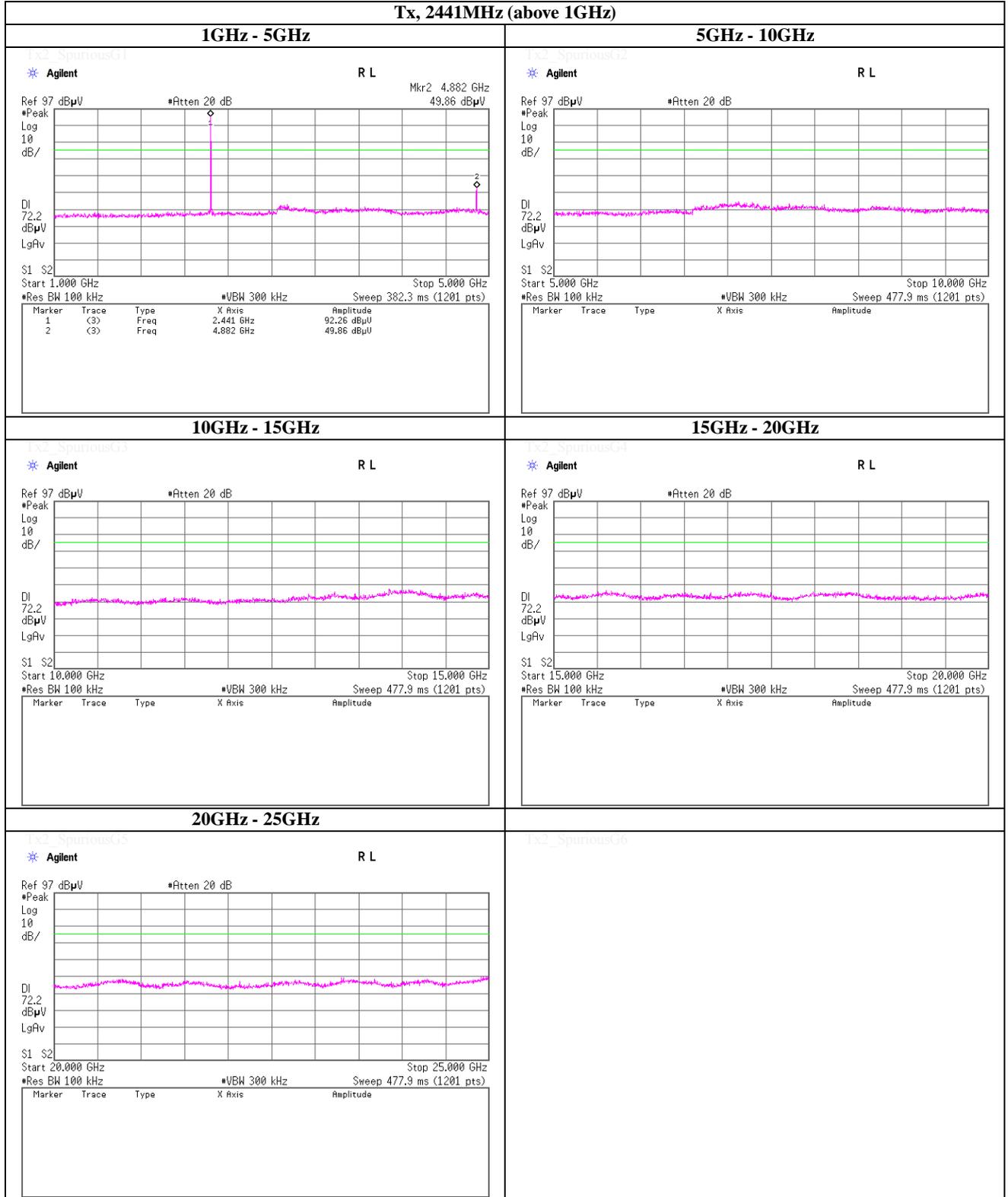
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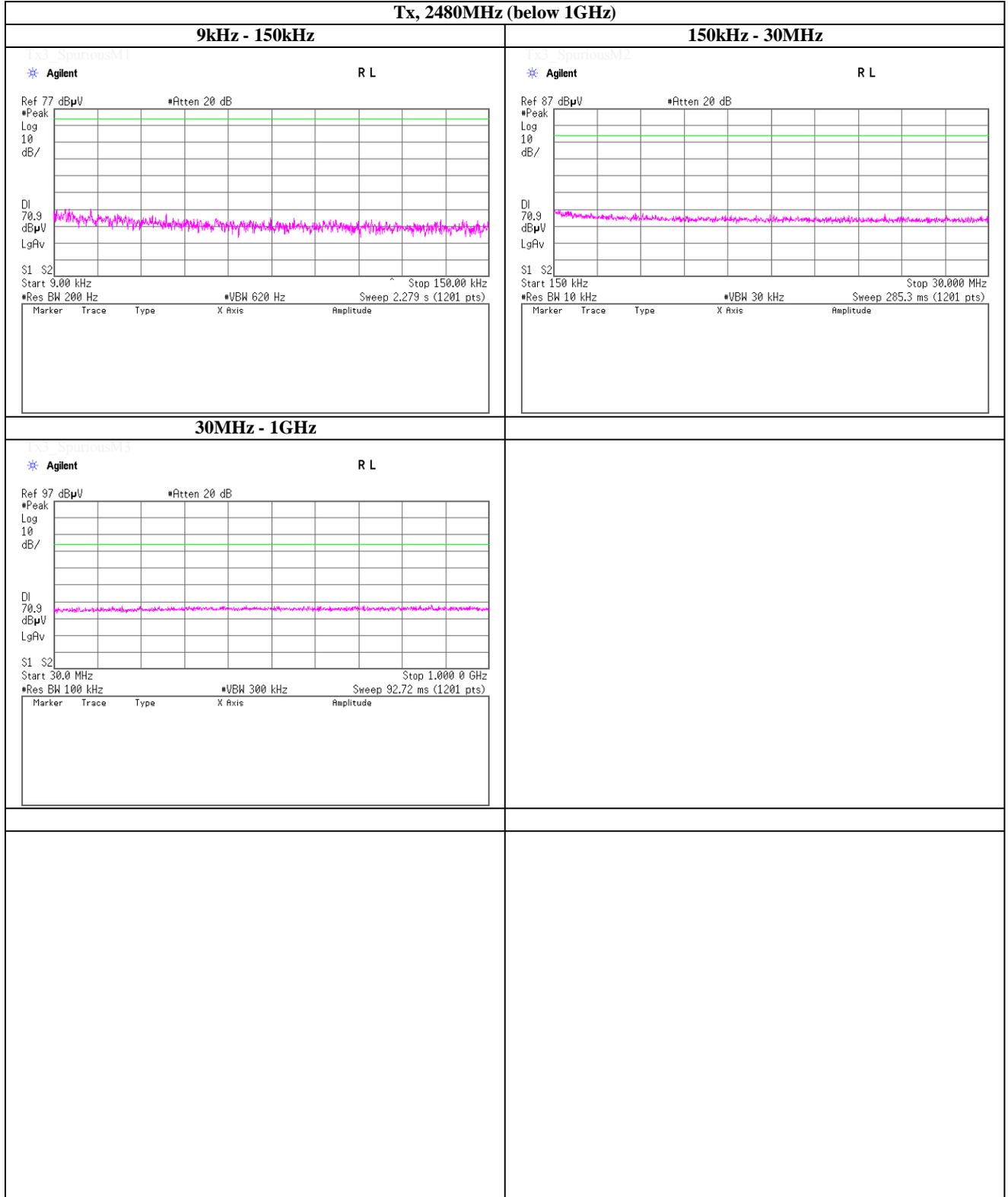
Telephone : +81 463 50 6400

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Tx, 2480MHz (below 1GHz)



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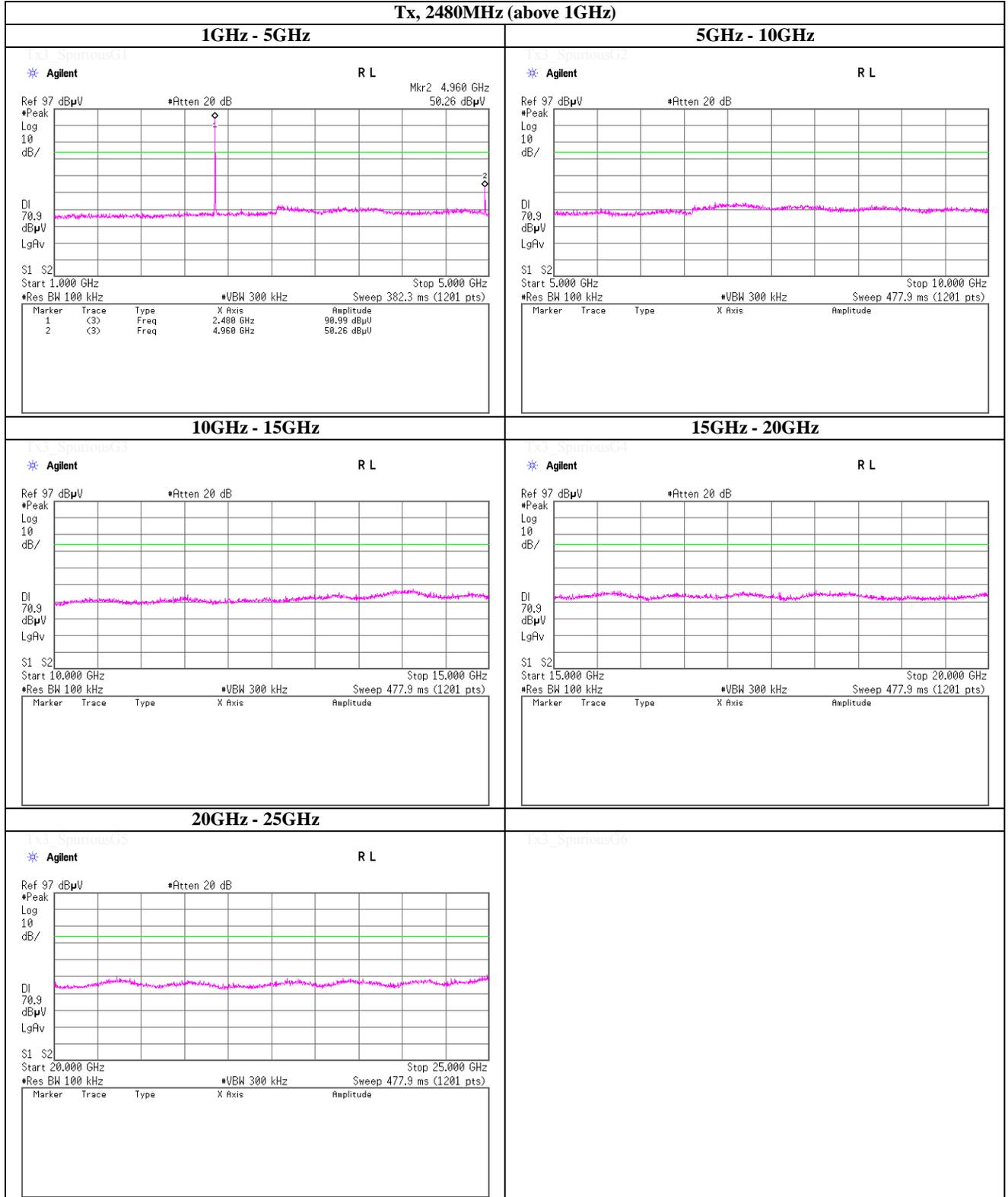
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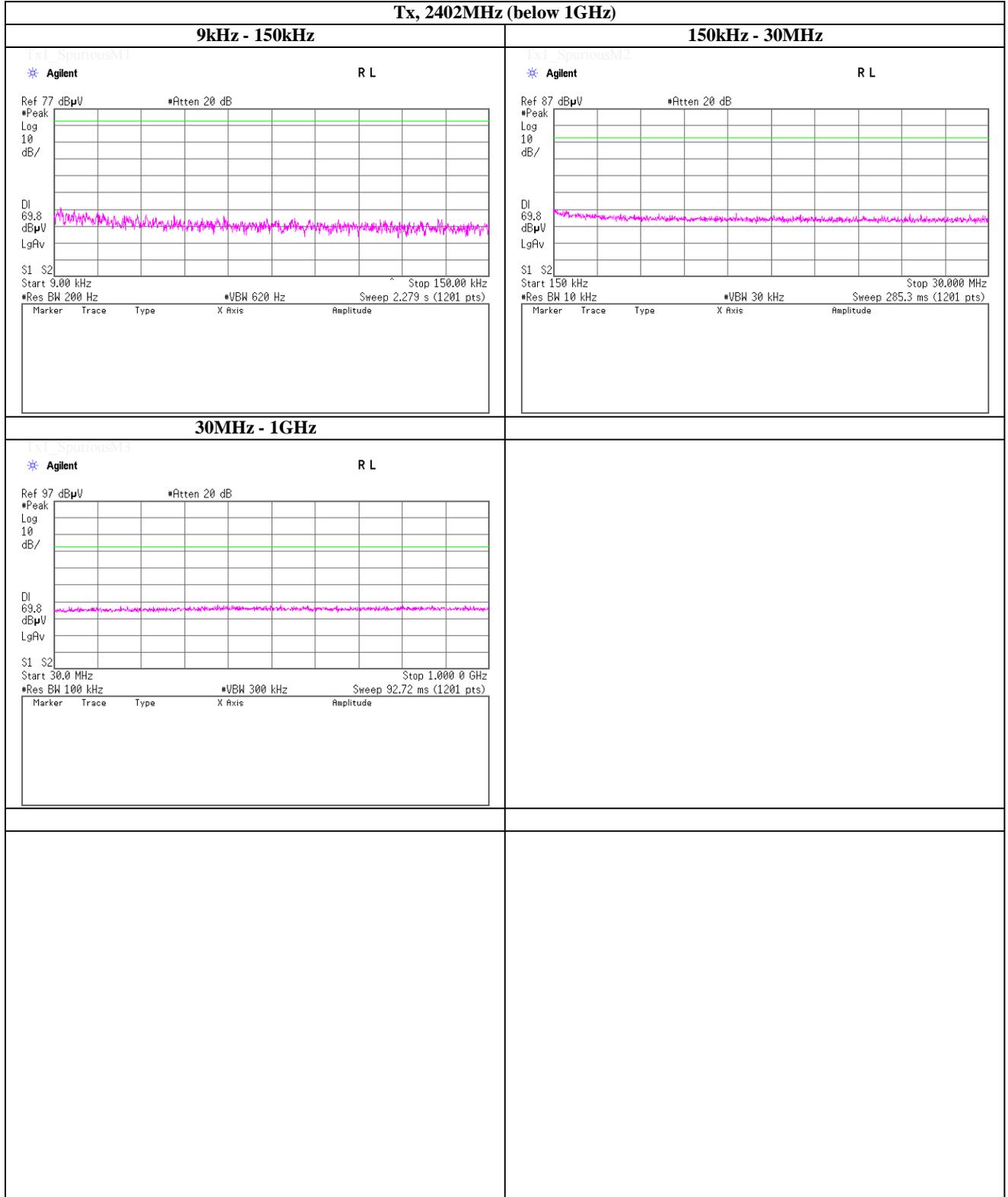
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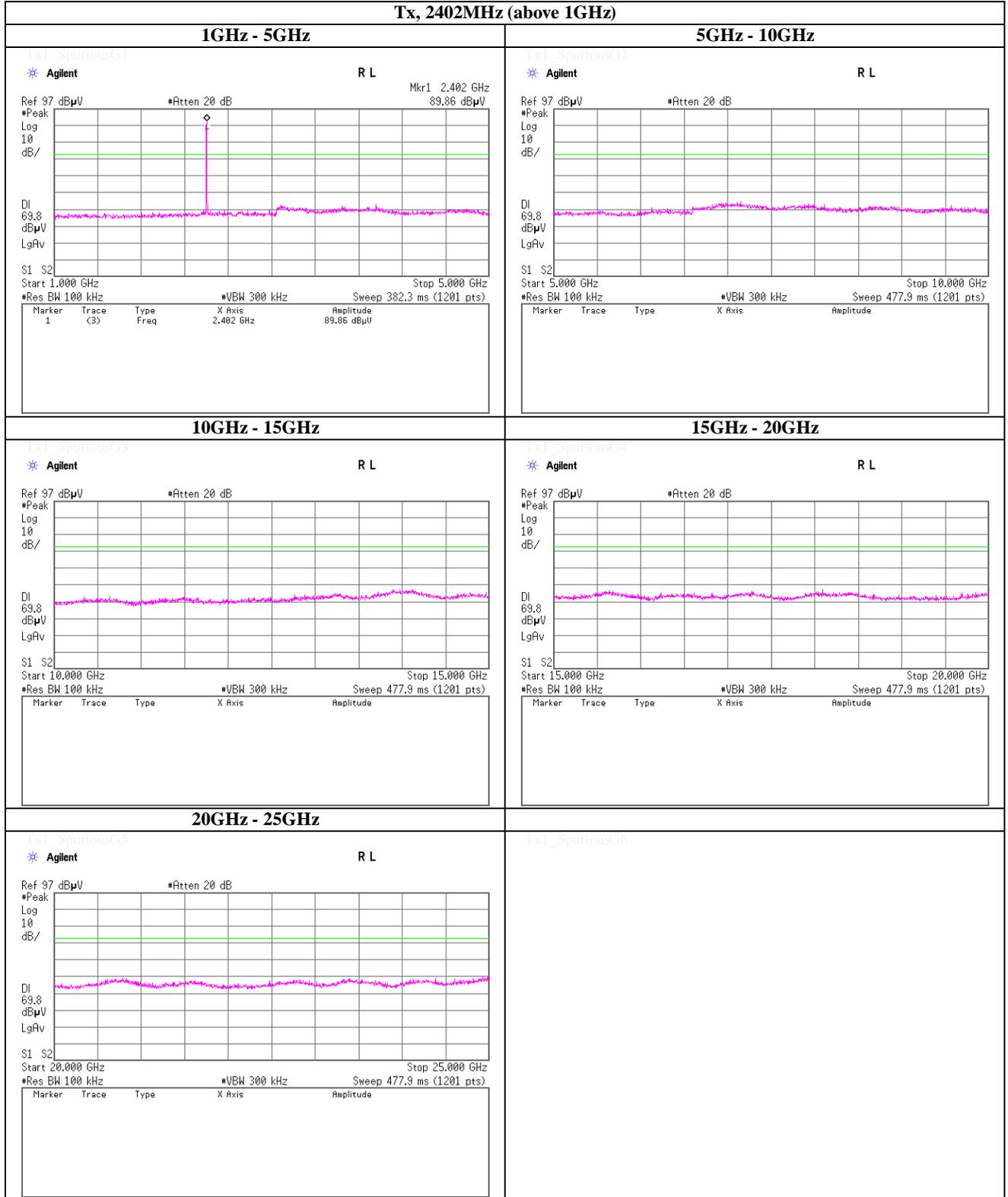
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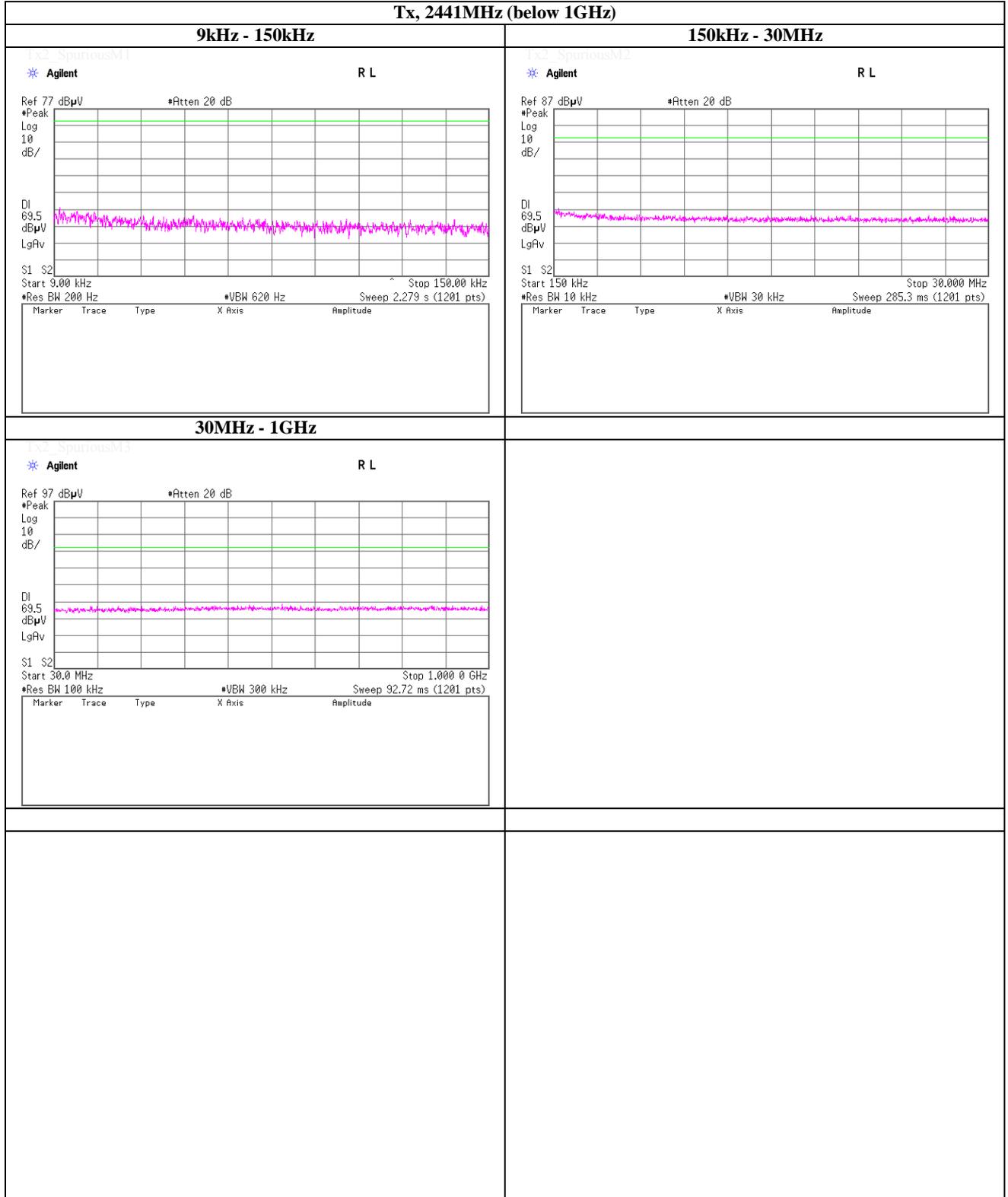
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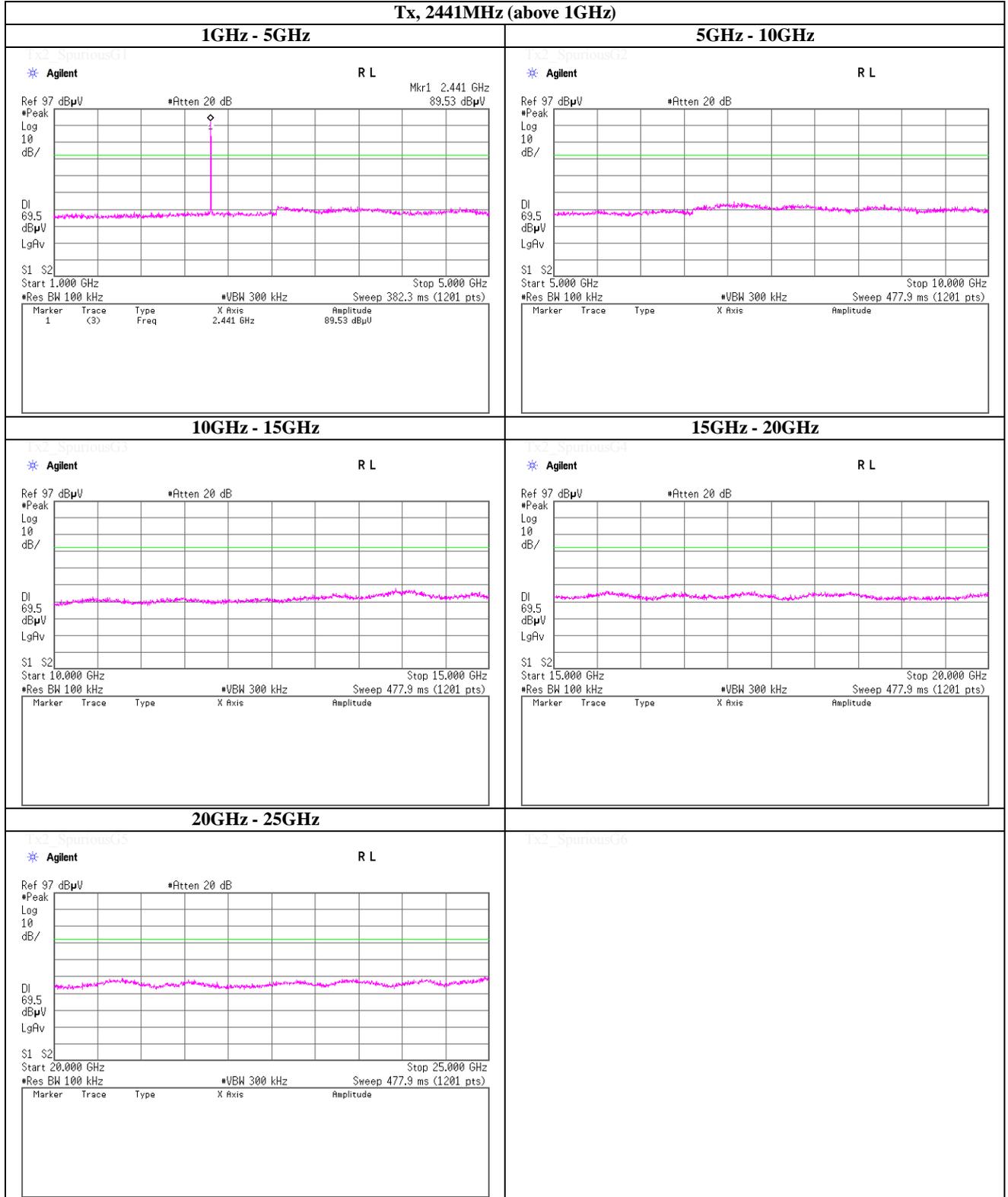
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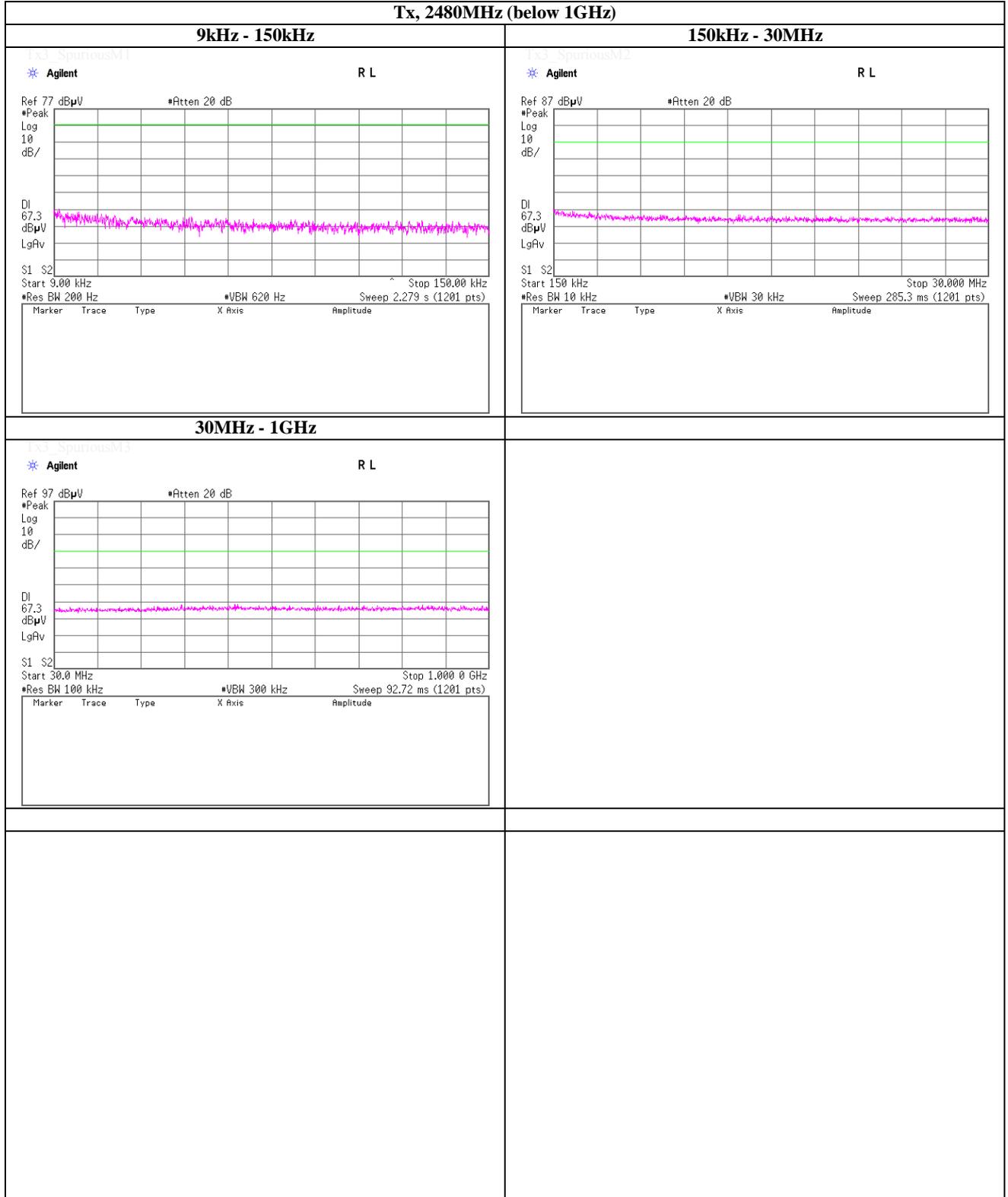
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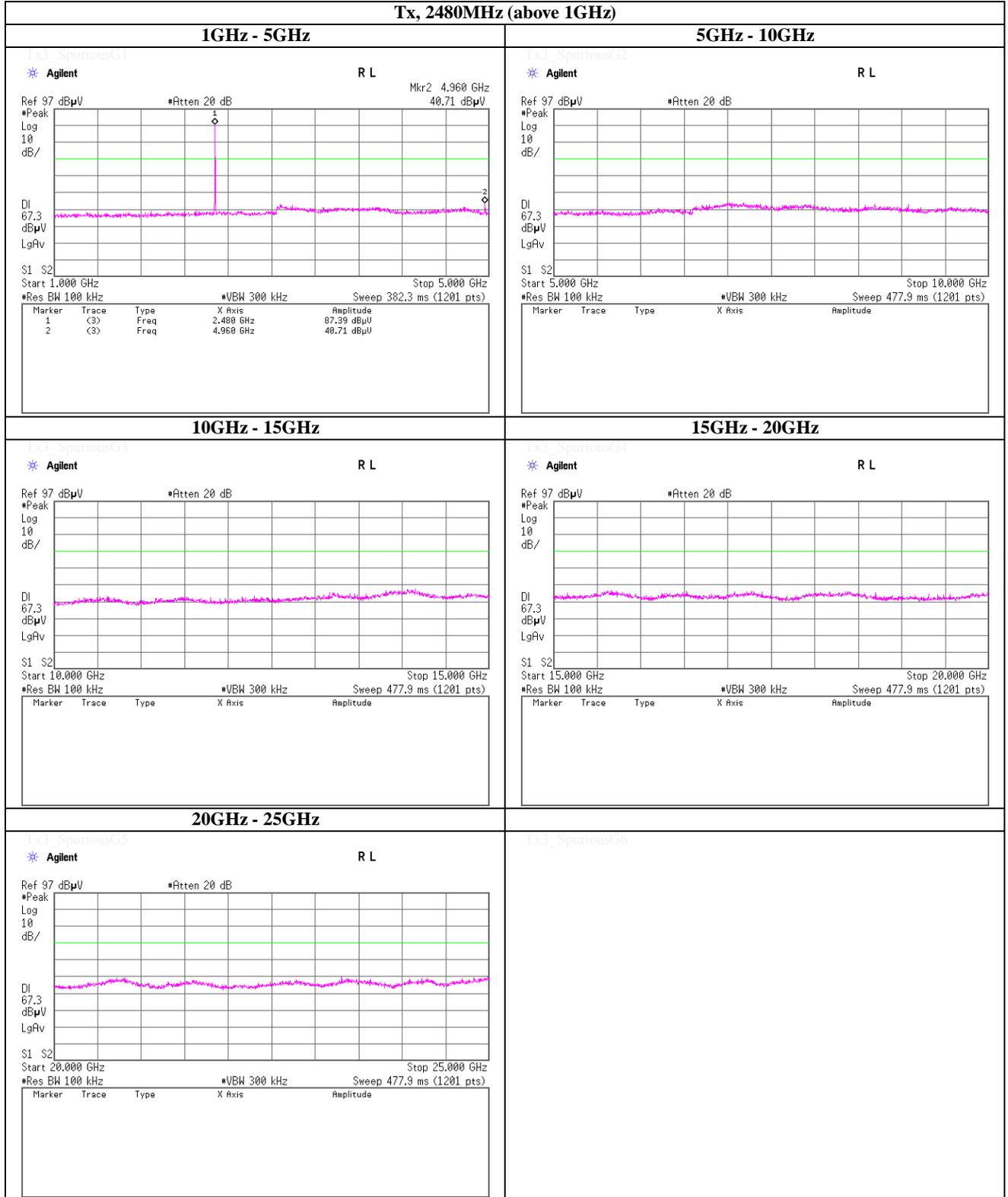
Tx, 2480MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (above 1GHz)



UL Japan, Inc.

Shonan EMC Lab.

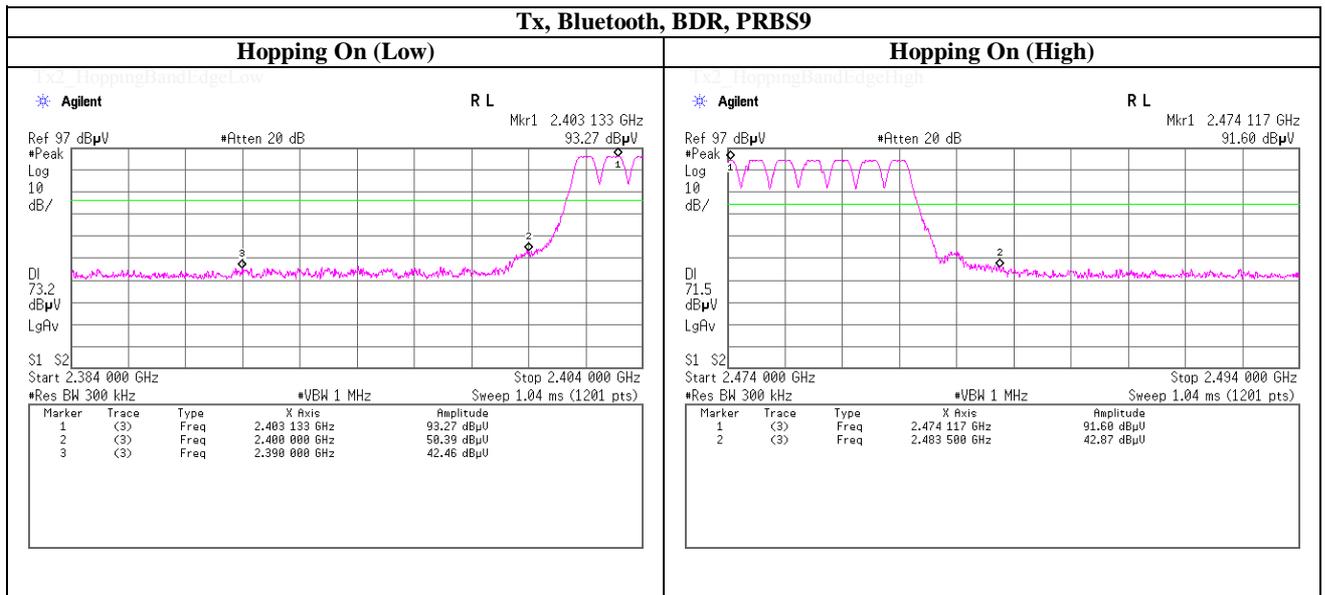
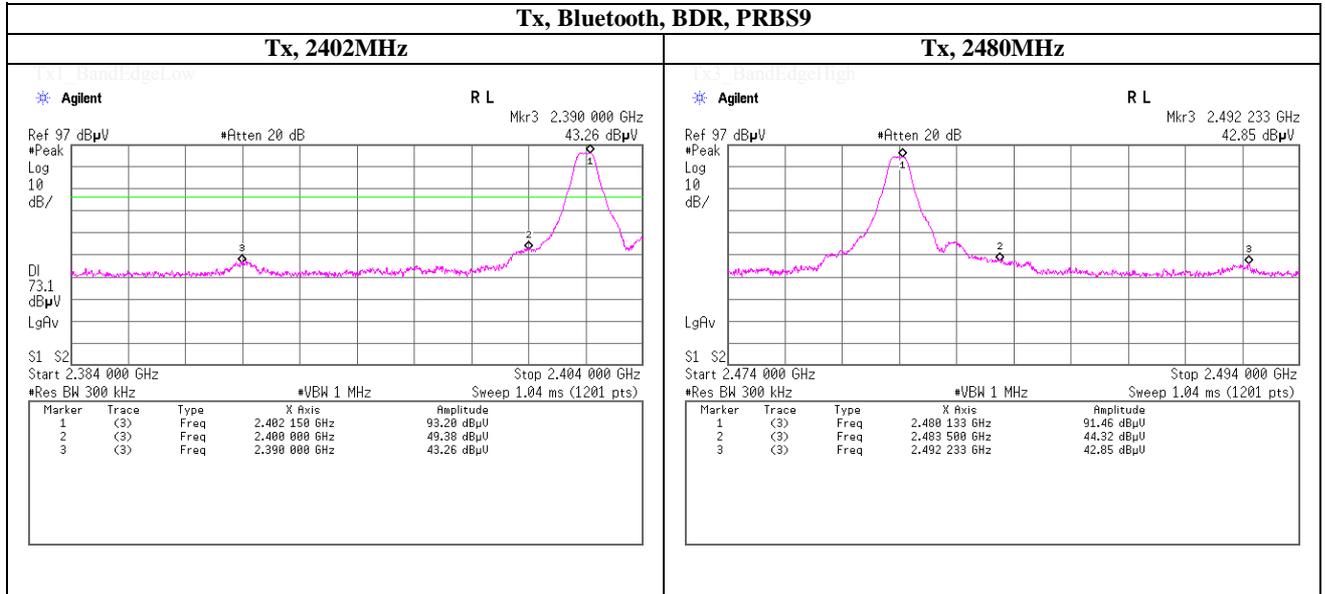
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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Spurious emission (Conducted)

Band Edge compliance



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Shonan EMC Lab.

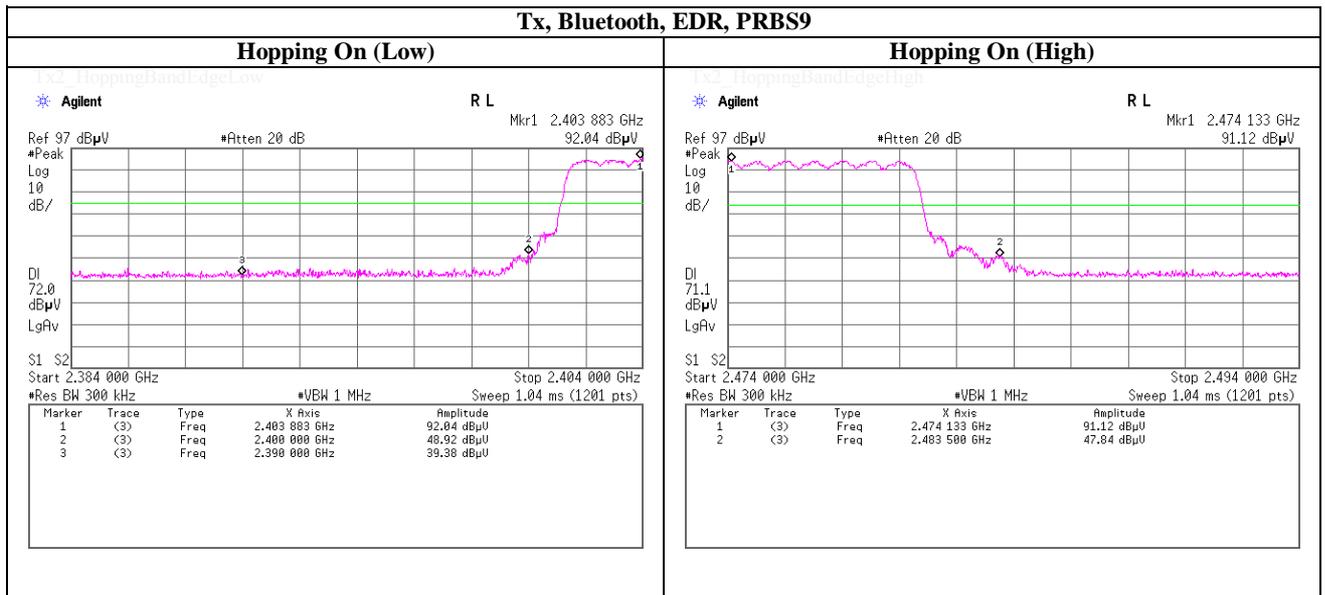
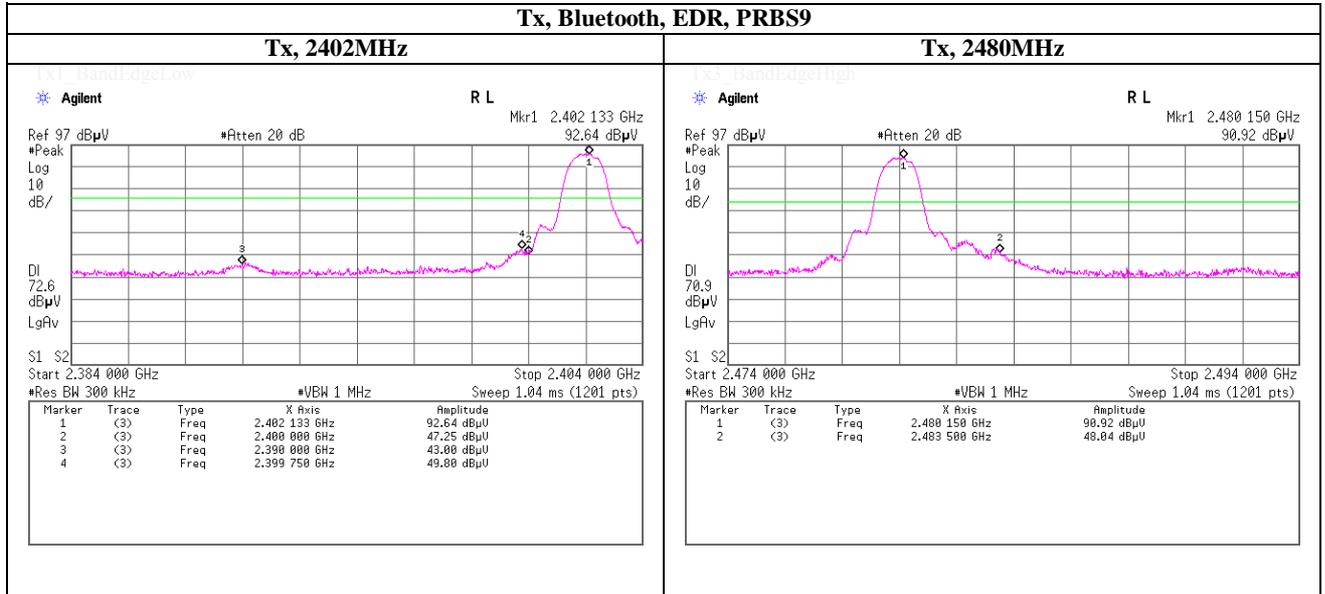
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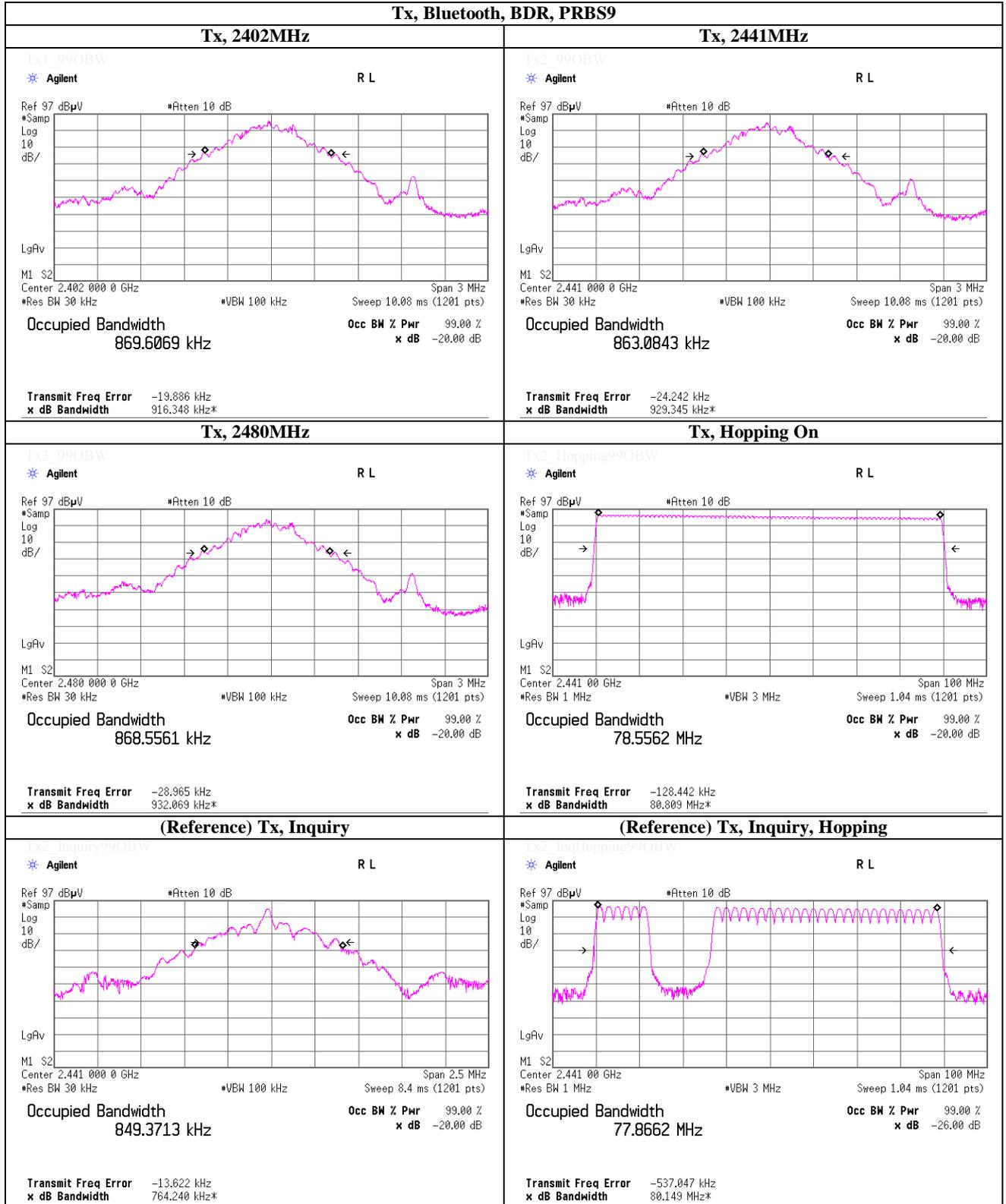
Shonan EMC Lab.

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99% Occupied Bandwidth



UL Japan, Inc.

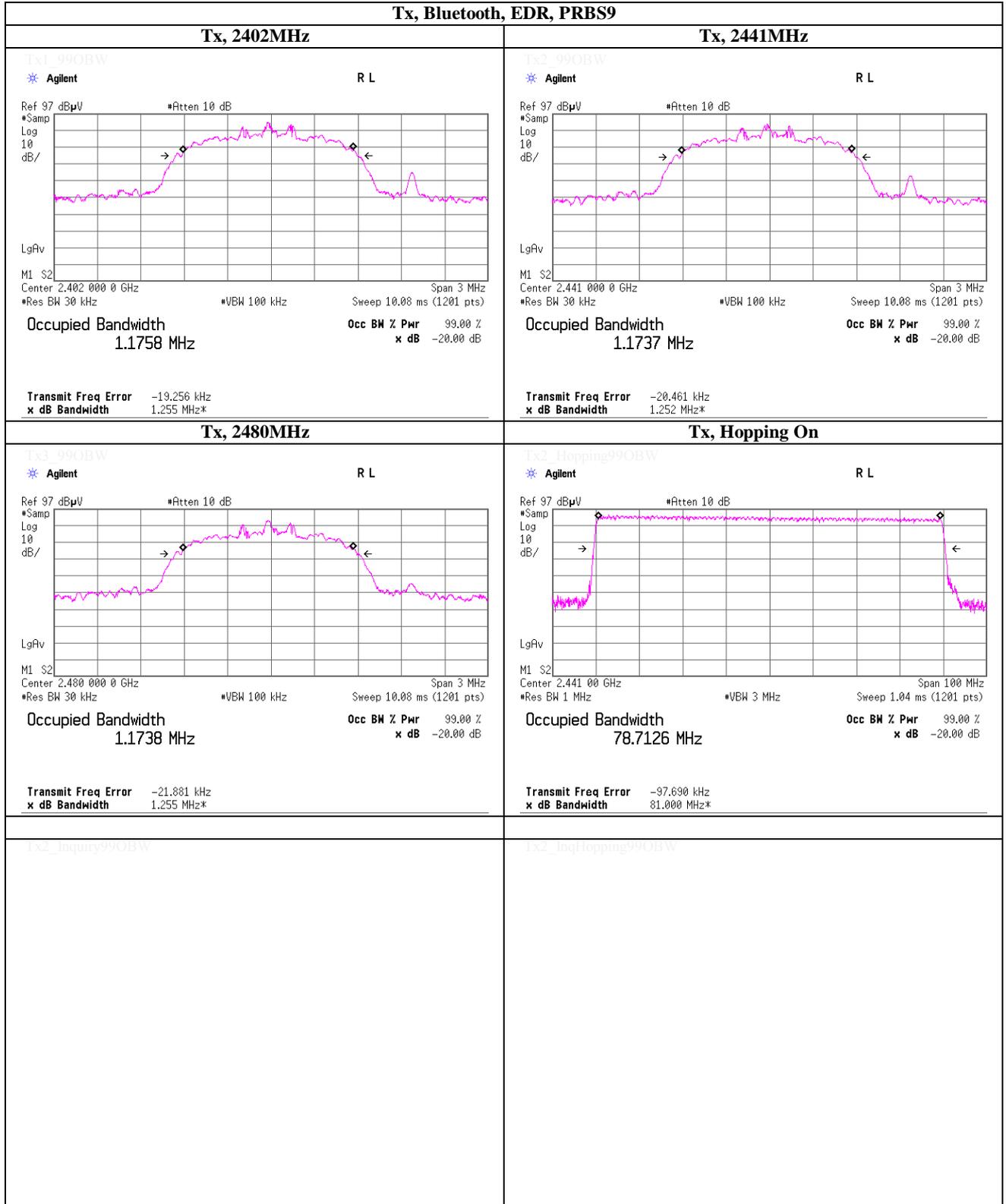
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Test Report No : 10059463S

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-G30	Coaxial Cable	Junkosha	MWX241-02000KM SKMS	SEP-20-12-00 4	AT	2012/09/26 * 12
SOS-10	Humidity Indicator	A&D	AD-5681	4064561	AT	2013/02/27 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	AT	2013/03/28 * 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/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
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2013/02/27 * 12
STR-03	Test Receiver	Rohde & Schwarz	ESI40	100054/040	RE	2013/07/09 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE	-
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2013/07/09 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF,LF)	-	RE	-
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2013/07/22 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2013/04/11 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2013/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2013/08/19 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2013/03/04 * 12
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
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2013/03/14 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2013/03/19 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2013/03/16 * 12

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

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

Test Item :

RE: Radiated emission ,
AT: Antenna terminal conducted test