



RADIO TEST REPORT

Test Report No.: 32KE0188-SH-02-A

Applicant : PIONEER CORPORATION
Type of Equipment : DVD AV RECEIVER
Model No. : AVH-X5500BHS
FCC ID : AJDK058
Test regulation : FCC Part15 Subpart C: 2012
Test result : Complied

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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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 31 to September 9, 2012

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

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



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13-EM-F0429

Original Test Report No.: 32KE0188-SH-02-A

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SECTION 1: Customer information

Company Name : PIONEER CORPORATION
Brand name : Pioneer
Address : 25-1 Aza-Nishi-machi, Yamada, Kawagoe-shi, Saitama, 350-8555, JAPAN
Telephone Number : +81-49-228-6415
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Contact Person : Makoto Kaieda

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

2.1 Identification of E.U.T.

Type of Equipment : DVD AV RECEIVER
Model No. : AVH-X5500BHS
Serial No. : See Section 4.
Rating : DC 14.4V
Country of Mass-production : Thailand
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No modification by the test lab.
Receipt Date of Sample : August 31, 2012

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2.2 Product description

Model: AVH-X5500BHS (referred to as the EUT in this report) is a DVD AV RECEIVER.

Clock Frequency:

FM/AM TUNER: 36.48MHz

HD-Radio TUNER: 24.00MHz

DVD DRIVE

DVD DECODER: 27MHz, 33.8688MHz, 36.864MHz, 40.5MHz, 48MHz,
67.5MHz, 108MHz, 121.5MHz, 405MHz

DC-DC CONVERTER: 365.8kHz/413.9kHz

SYSTEM MICRO COMPUTER: 12.5MHz

DISPLAY CONVERTER: 13.3333MHz, 48MHz, 16.9344MHz

Bluetooth module OSC: 26MHz

LCD BACK LIGHT DRIVER: 476.6kHz/514.8kHz

Equipment type : Transceiver
Frequency of operation : 2402-2480MHz
Bandwidth & channel spacing : 1MHz
Type of modulation : GFSK, $\pi/4$ DQPSK, 8DPSK
Antenna type : Pattern
Antenna gain with cable loss : -2.3dBi (max)
Antenna connector type : None
Operation temperature range : -10 to +60 deg.C.

The EUT and its derived models:

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

	Monitor size	Autoslide	SiriusXM-BUS	Built-in HD Radio
AVH-X5500BHS	6.95inch	A	A	A
AVH-X4500BT	6.95inch	A	NA	NA
AVH-X3500BHS	6.1inch	NA	A	A
AVH-X2500BT	6.1inch	NA	NA	NA

A: application

NA : Not application

FCC 15.31 (e)

The equipment provides the Bluetooth transmitter with stable power supply (DC1.8V and DC3.3V). Therefore, the equipment complies with the requirement.

FCC 15.203

The equipment and its antenna comply with this requirement since this 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 : Test specification: FCC Part 15 Subpart C: 2012, final revised on August 13, 2012 and effective September 12, 2012

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

* The revision on August 13, 2012 does not affect the test specification applied to the EUT.
 The EUT complies with FCC Part 15 Subpart B. The test is performed by the customer.

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)	-	N/A
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	4.7dB Freq.: 405.000MHz Polarization: Horizontal Detection: Quasi Peak Mode: Tx 2480MHz, 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	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

Radiated emission test

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
☒ No.1 Semi-anechoic chamber	697847	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 Semi-anechoic chamber	697847	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.3 Semi-anechoic chamber	697847	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5m
☐ No.4 Full-anechoic chamber	-	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
☐ No.1 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.2 shielded room	-	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
☐ No.3 shielded room	-	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
☐ No.4 shielded room	-	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
☒ No.5 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
☐ No.6 shielded room	-	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-

3.6 Test setup, Data of EMI & 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 (DH5/3DH5)/Inquiry, Payload: PRBS9	-
20dB bandwidth	Transmitting Hopping OFF (DH5/3DH5)/Inquiry, Payload: PRBS9	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting Hopping ON (DH5/3DH5)/Inquiry, Payload: PRBS9	-
Dwell time	Transmitting (Hopping ON), Payload: PRBS9 -DH1, -DH3, -DH5 -3DH1, -3DH3, -3DH5 -Inquiry	-
Maximum peak output power	Transmitting (Hopping OFF), Payload: PRBS9 -DH5, -2DH5, -3DH5	2402MHz, 2441MHz, 2480MHz
Band edge compliance & Spurious emission (Conducted)	Transmitting (DH5/3DH5), Payload: PRBS9 -Hopping ON -Hopping OFF	Band edge compliance: 2402MHz, 2480MHz
(Radiated)	Transmitting (DH5/3DH5), Payload: PRBS9	Spurious emission: 2402MHz, 2441MHz, 2480MHz
99% occupied bandwidth	Transmitting (DH5/3DH5), Payload: PRBS9 -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.

*EUT has the power settings by the software as follows;

Power settings: 4

Software name: BT module only Control software manufactured by ver.: HW05-SW01.27.10

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

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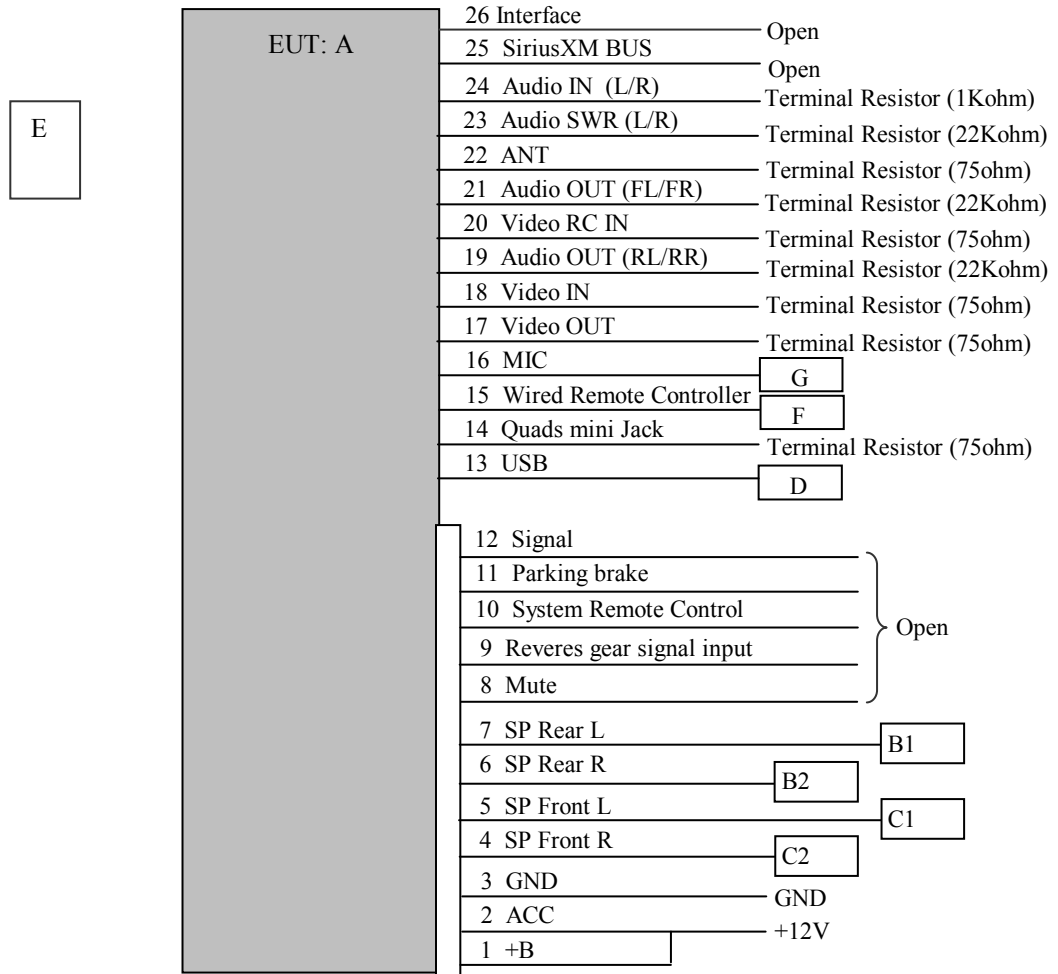
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4.2 Configuration of tested system



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	DVD AV RECEIVER	AVH-X5500BHS	27 *1) 35 *2)	PIONEER	EUT
B1	Speaker	KFC-RS160	-	KENWOOD	-
B2	Speaker	KFC-RS160	-	KENWOOD	-
C1	Speaker	TS-X180	No.4	PIONEER	-
C2	Speaker	TS-X180	No.4	PIONEER	-
D	USB Memory	A1S2	-	BUFFALO	-
E	Remote Controller	CXE5116	-	PIONEER	-
F	Wired Remote Controller	RM-X2S	-	SONY	-
G	HF-MIC	-	-	-	-

*1) Used for Antenna terminal conducted tests.

*2) Used for Radiated emission tests.

List of cables used

No.	Cable name	Length (m)	Shield		Remark
			Cable	Connector	
1	+B	0.1+1.5	Unshielded	Unshielded	-
2	ACC	0.1+1.5	Unshielded	Unshielded	-
3	GND	0.1+1.5	Unshielded	Unshielded	-
4	SP Front R	0.1+3.0	Unshielded	Unshielded	-
5	SP Front L	0.1+3.0	Unshielded	Unshielded	-
6	SP Rear R	0.1+1.8	Unshielded	Unshielded	-
7	SP Rear L	0.1+1.8	Unshielded	Unshielded	-
8	Mute	0.1+1.0	Unshielded	Unshielded	-
9	Reveres gear signal input	0.1+1.0	Unshielded	Unshielded	-
10	System Remote Control	0.1+1.0	Unshielded	Unshielded	-
11	Parking brake	1.9	Unshielded	Unshielded	-
12	Signal	0.1+1.0	Unshielded	Unshielded	-
13	USB	1.4	Shielded	Shielded	-
14	Quads mini Jack	2.0	Unshielded	Unshielded	-
15	Wired Remote Controller	1.9	Shielded	Shielded	-
16	MIC	4.0	Unshielded	Unshielded	-
17	Video OUT	6.0	Unshielded	Unshielded	-
18	Video IN	6.0	Unshielded	Unshielded	-
19	Audio OUT (RL/RR)	3.0	Unshielded	Unshielded	-
20	Video RC IN	1.5	Unshielded	Unshielded	-
21	Audio OUT (FL/FR)	6.0	Unshielded	Unshielded	-
22	ANT	0.25	Shielded	Shielded	-
23	Audio SWR (L/R)	6.0	Unshielded	Unshielded	-
24	Audio IN (L/R)	1.5	Unshielded	Unshielded	-
25	SiriusXM BUS	1.1	Shielded	Shielded	-
26	Interface	0.6	Shielded	Shielded	-

*All cables used for the measurement are exclusive use or marketed.

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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

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

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

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

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

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

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SECTION 11: Radiated emission

11.1 Operating environment

The test was carried out in No. 3 Semi-Anechoic Chamber.

Temperature : See test data (APPENDIX)
Humidity : See test data (APPENDIX)

11.2 Test configuration

EUT was placed on a platform of nominal size, 1m 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.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Photographs of the set up are shown in APPENDIX.

11.3 Test conditions

Frequency range : 30MHz to 25GHz
Test distance : 3m (below 15GHz) / 1m (above 15GHz)
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 of the test receiver.

Frequency	30 - 1000MHz	1 - 25GHz	
Detection Type	: Quasi-Peak	Peak	* Average
IF Bandwidth	: 120kHz	RBW:1MHz/VBW:3MHz	RBW:1MHz/VBW:10Hz

* When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

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

The carrier level and noise levels were confirmed at angle of 0 to 30 deg. based on the product specification to see the position of maximum noise, and the test was made at the position (0 deg.) that has the maximum noise.

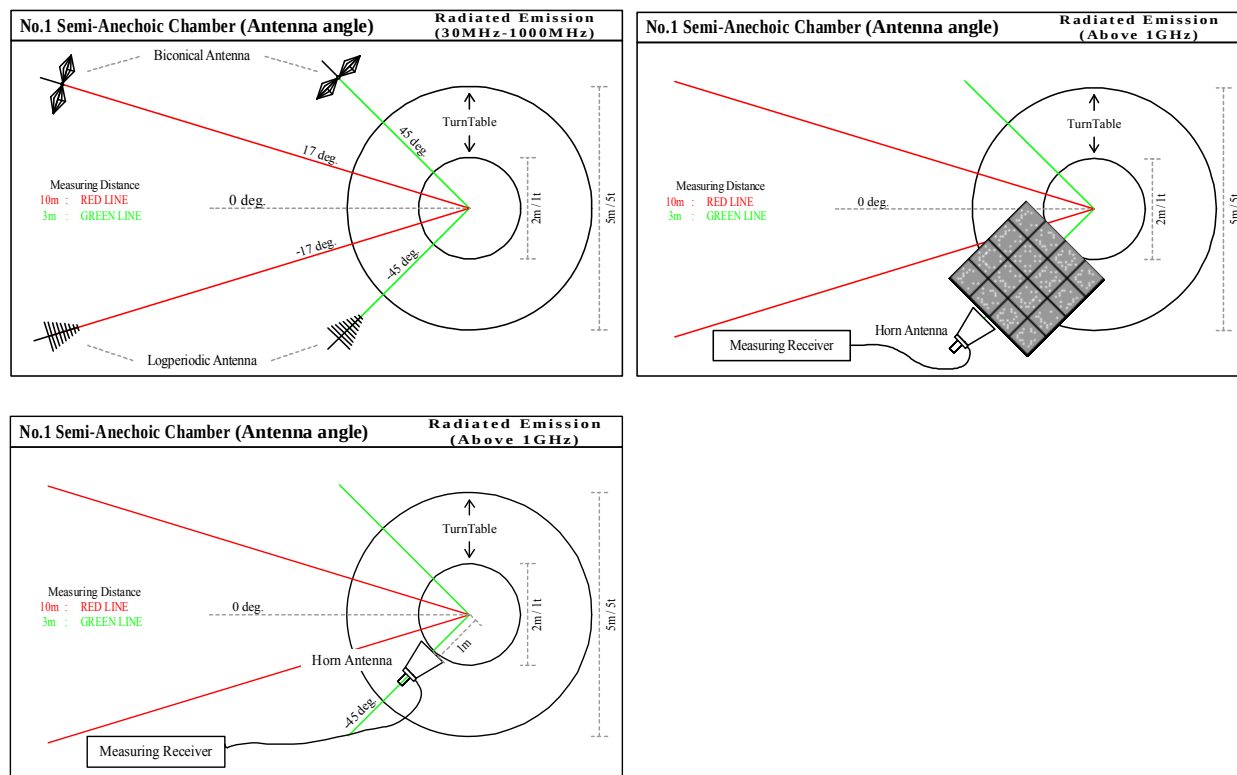
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Figure 1. Antenna angle

11.5 Band edge

Band edge level is below the limits of FCC 15.209. Refer to the data.

11.6 Results

Summary of the test results : Pass *No noise was detected above the 5th order harmonics.
Refer to APPENDIX

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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
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

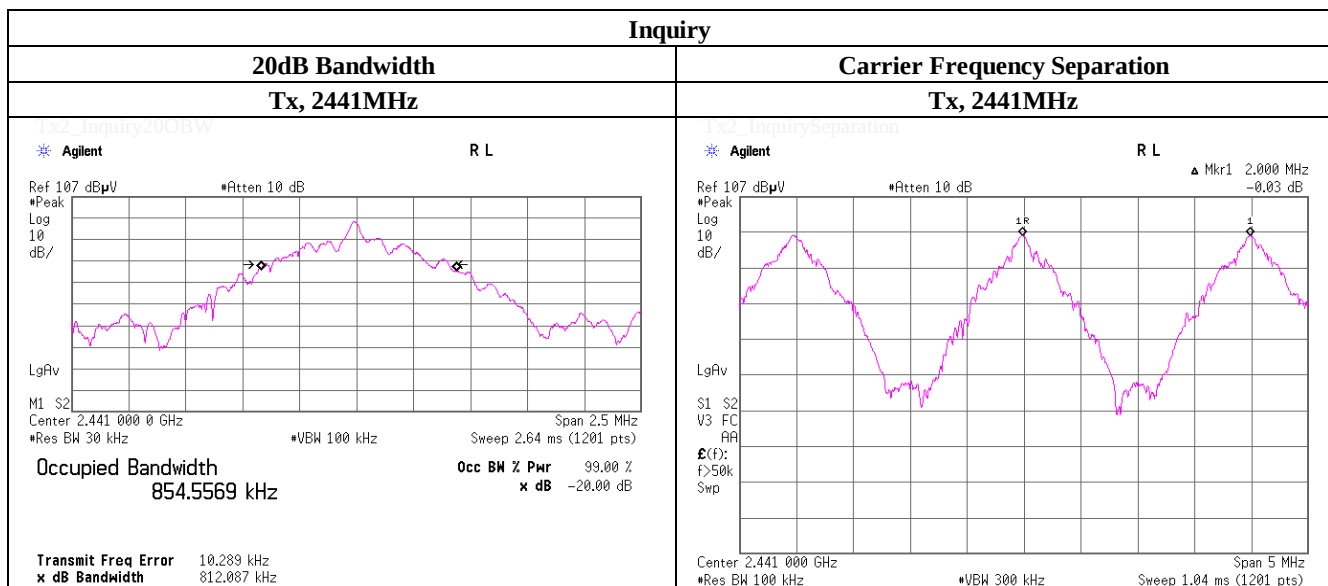
20dB Bandwidth and Carrier Frequency Separation

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	August 31, 2012	
Temperature / Humidity	27 deg.C , 61 %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	0.934	1.000	>= 0.623
DH5	2441.0	0.933	1.000	>= 0.622
DH5	2480.0	0.932	1.000	>= 0.621
Inquiry	2441.0	0.812	2.000	>= 0.541

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

No limit applies to 20dB Bandwidth.



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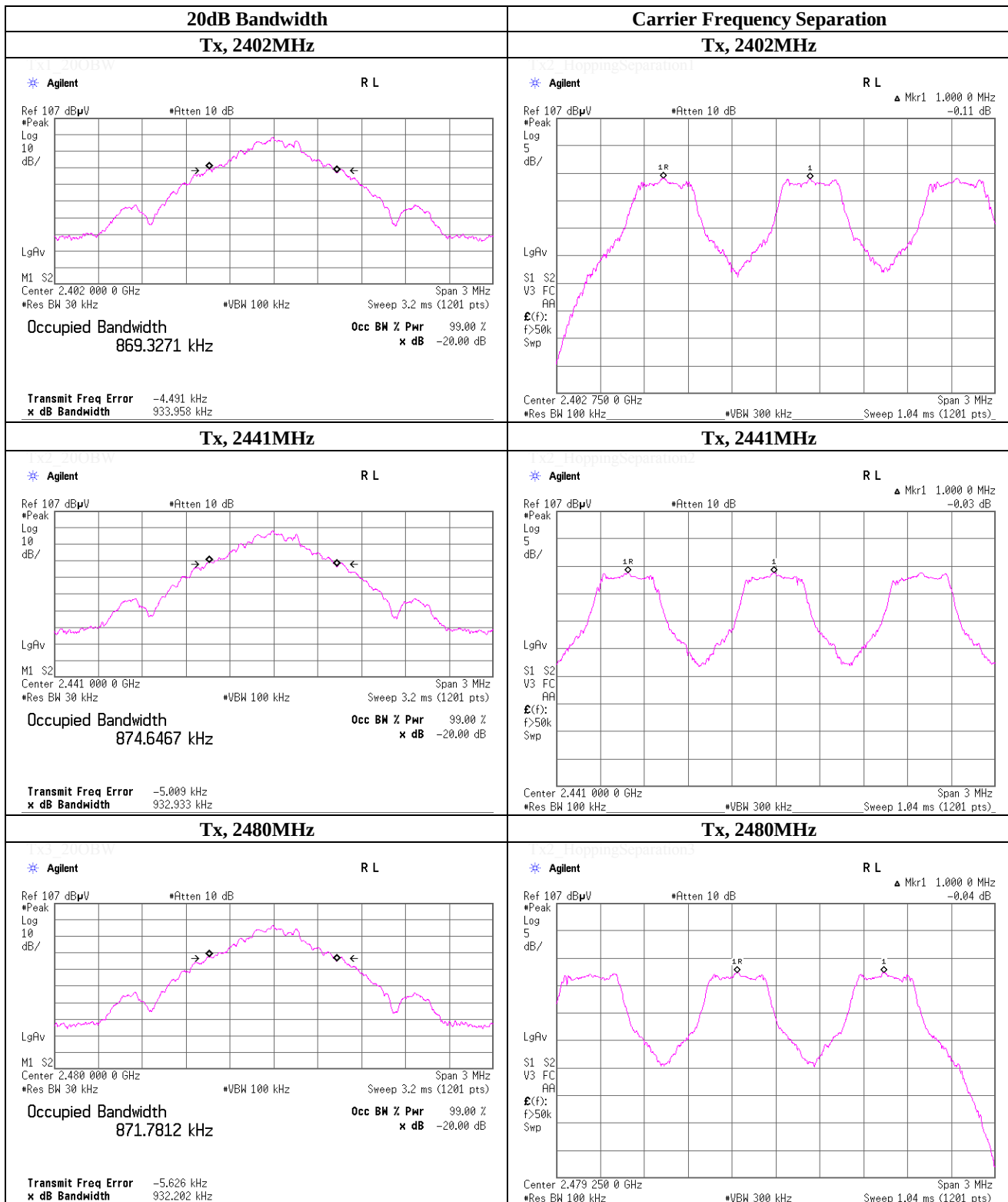
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20dB Bandwidth and Carrier Frequency Separation

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 31, 2012
Temperature / Humidity 27 deg.C , 61 %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	1.289	1.000	>= 0.859
3-DH5	2441.0	1.292	1.000	>= 0.861
3-DH5	2480.0	1.318	1.000	>= 0.878

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

No limit applies to 20dB Bandwidth.

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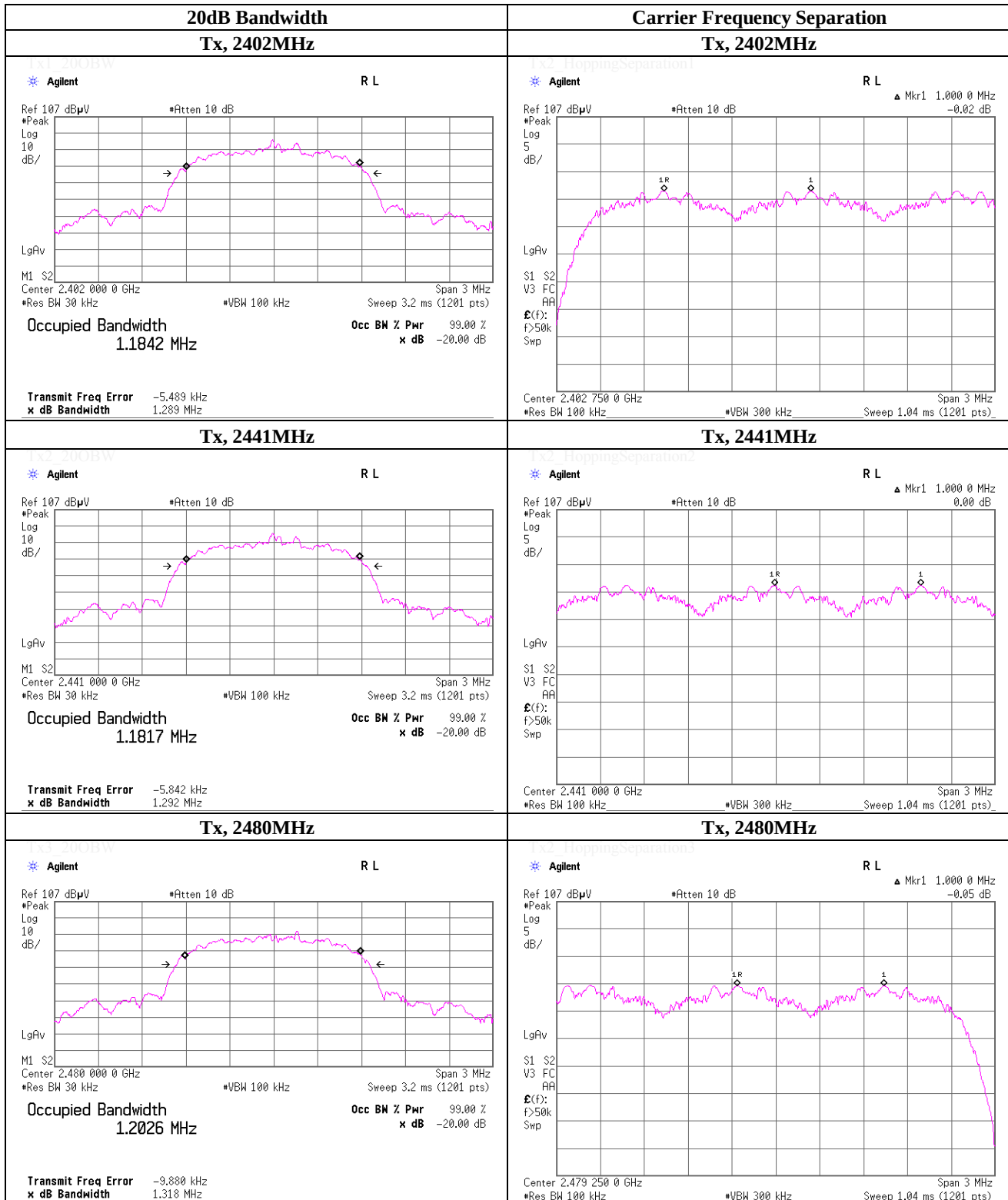
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20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, PRBS9



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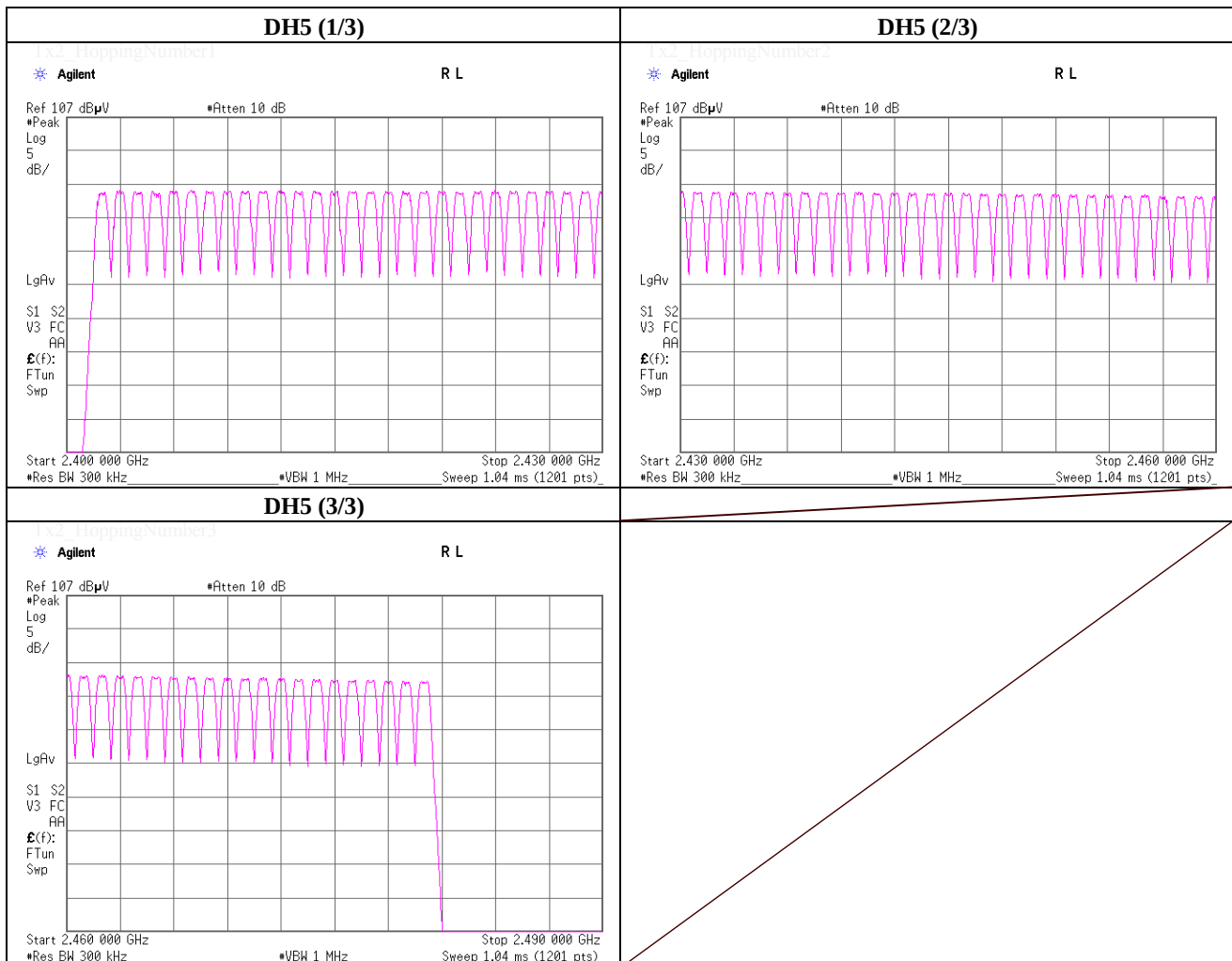
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Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	August 31, 2012	
Temperature / Humidity	27 deg.C , 61 %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.



UL Japan, Inc.

Shonan EMC Lab.

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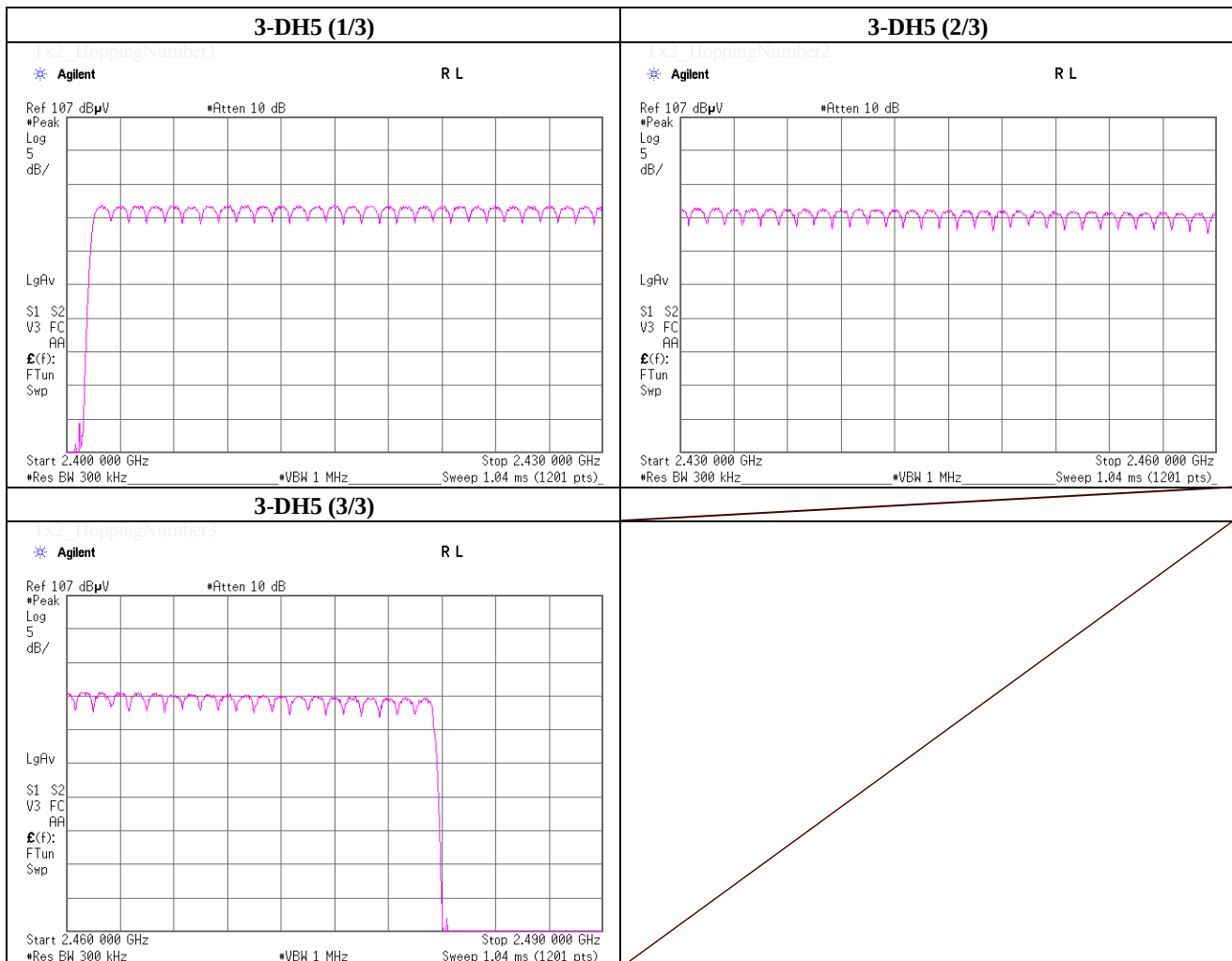
Facsimile : +81 463 50 6401

Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	August 31, 2012	
Temperature / Humidity	27 deg.C , 61 %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.



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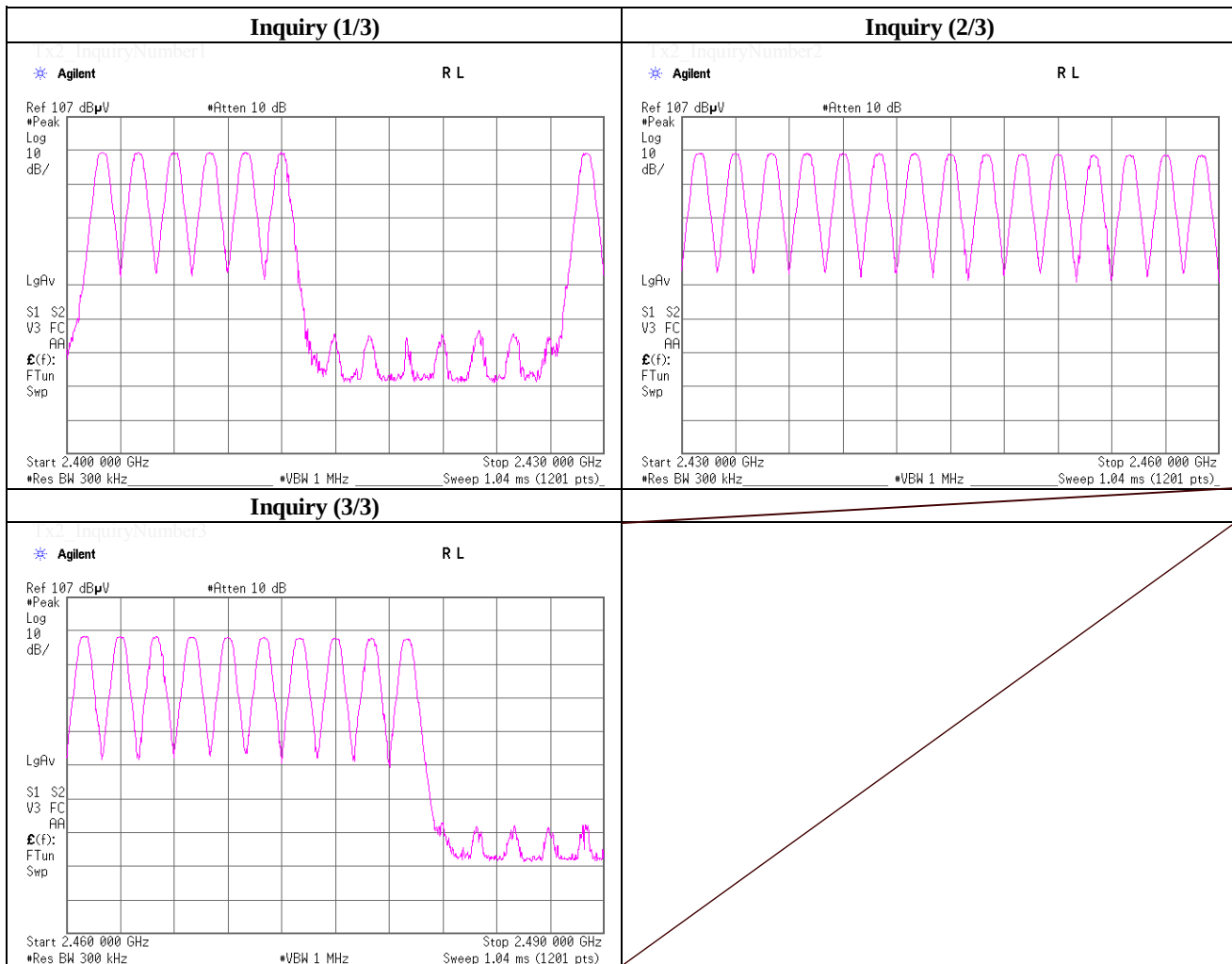
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	August 31, 2012	
Temperature / Humidity	27 deg.C , 61 %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.5 Shielded Room
Date	August 31, 2012	
Temperature / Humidity	27 deg.C , 61 %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	19.4	/ 5.0 sec. x 31.6 sec. = 123 times	0.398	49	400
DH3	19.0	/ 5.0 sec. x 31.6 sec. = 121 times	1.654	200	400
DH5	20.2	/ 5.0 sec. x 31.6 sec. = 128 times	2.903	372	400
Inquiry	100.0	/ 1.0 sec. x 12.8 sec. = 1280 times	0.100	128	400

Sample Calculation

Result = Number of transmission x Length of transmission time

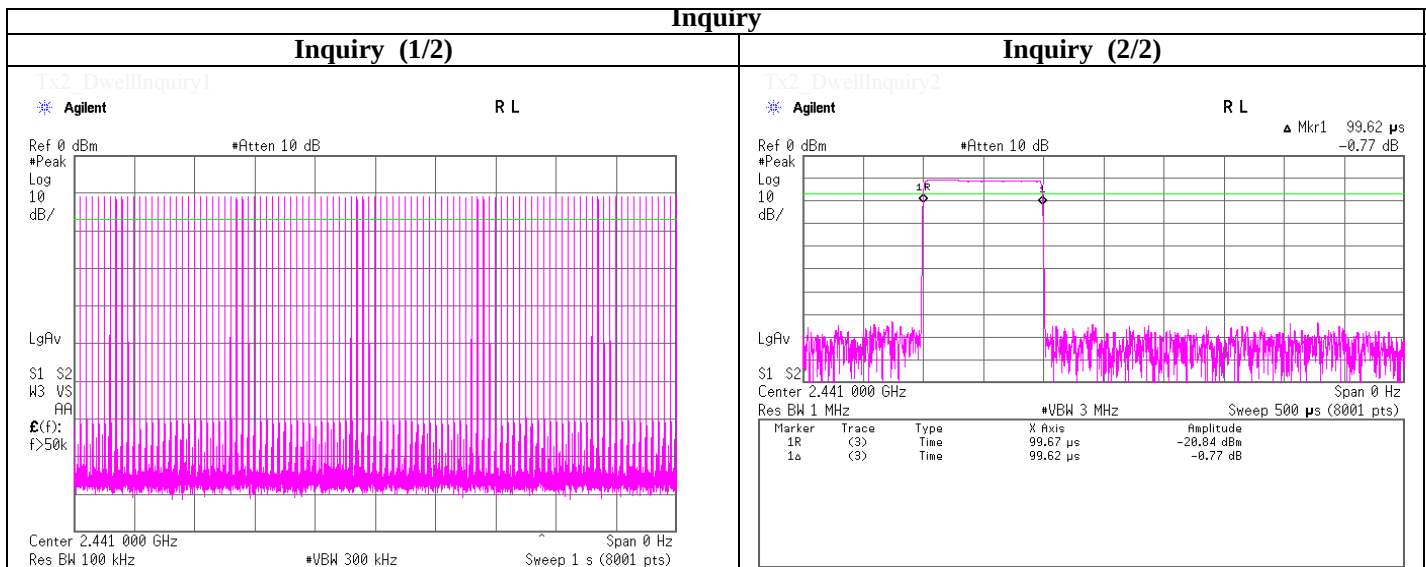
*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	16	19	23	19	20	19.4
DH3	21	19	18	15	22	19.0
DH5	19	23	20	19	20	20.2
Inquiry	100	100	100	100	100	100.0

Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

* 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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Shonan EMC Lab.

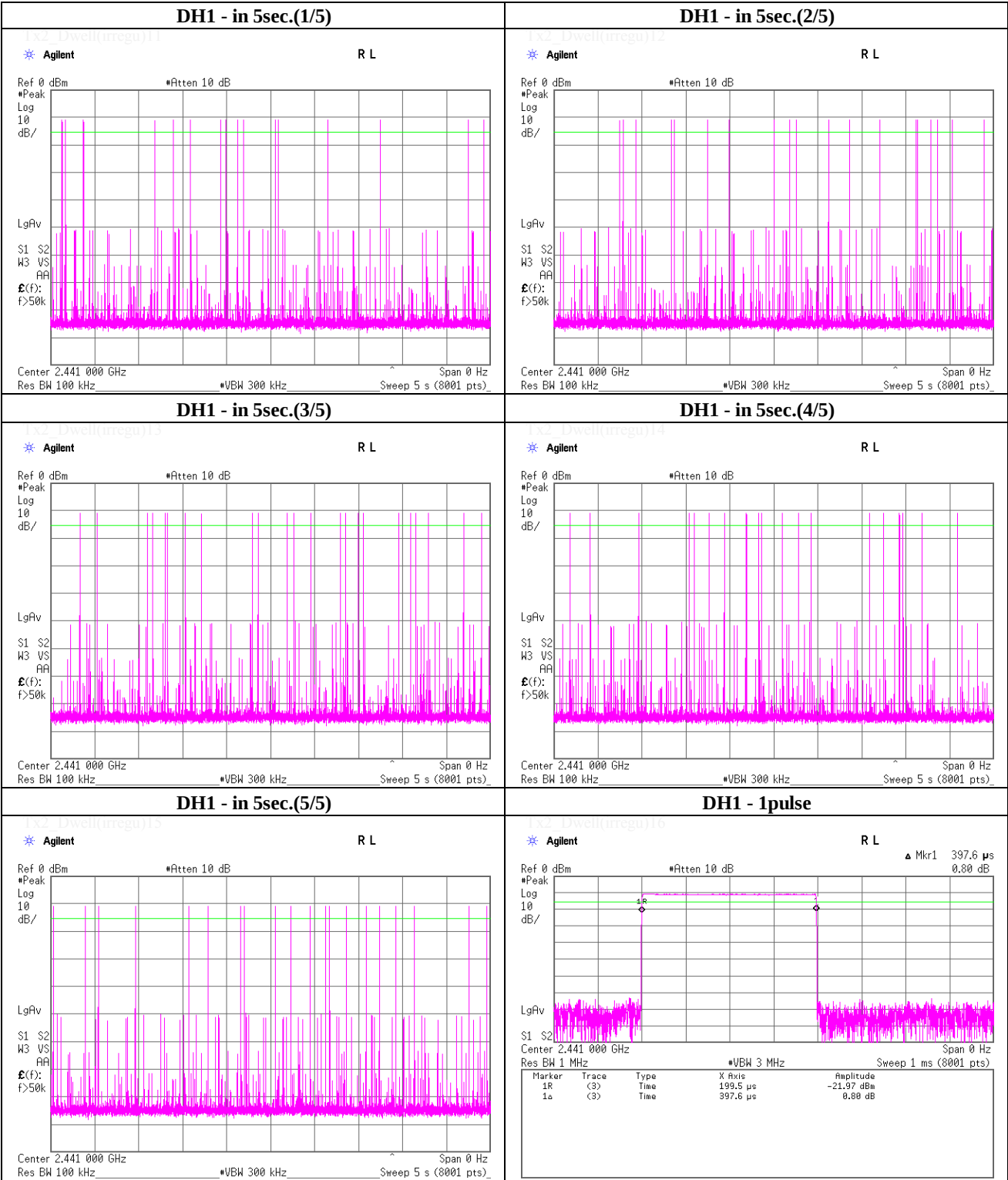
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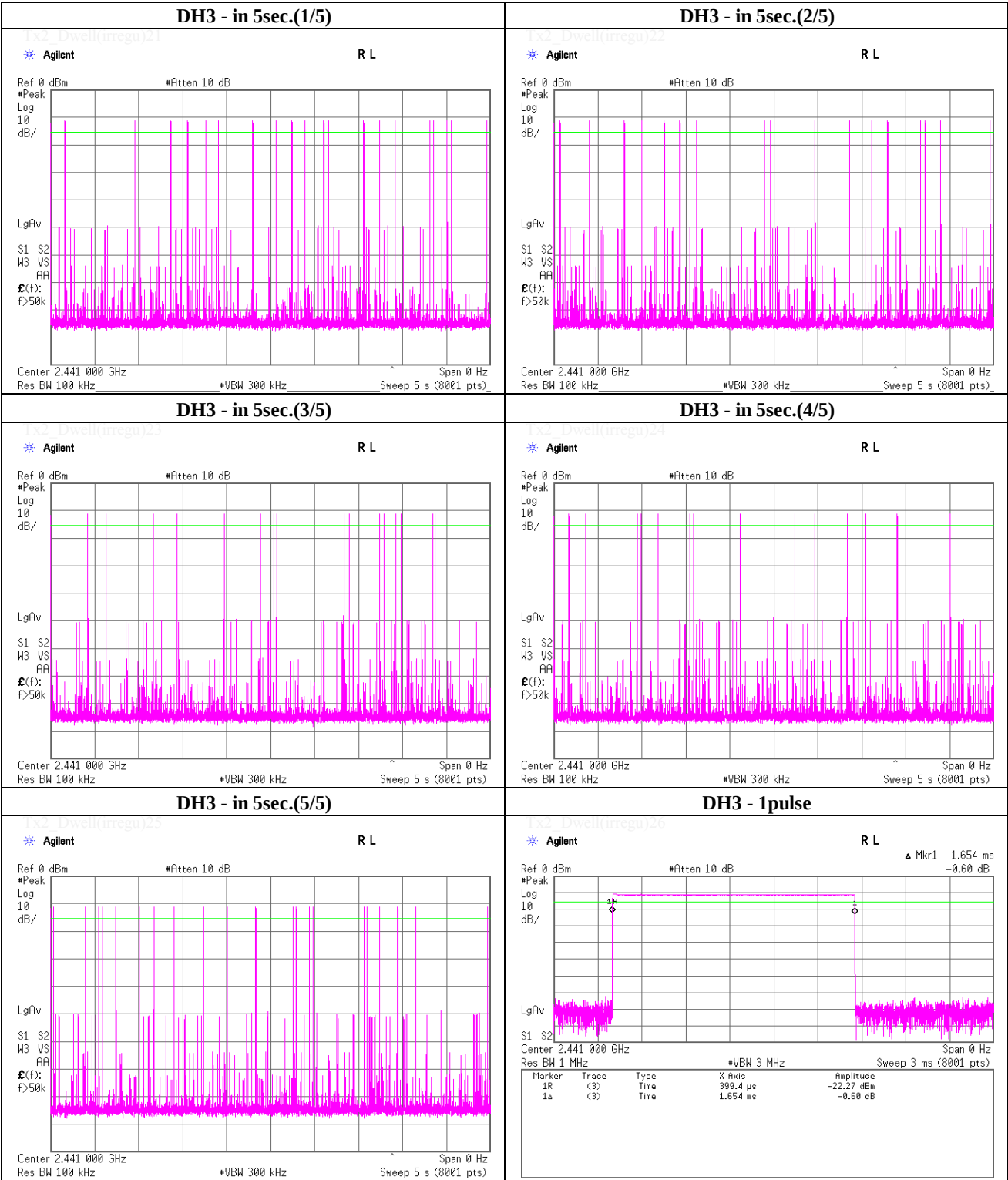
Dwell time

Tx, Bluetooth, BDR, PRBS9



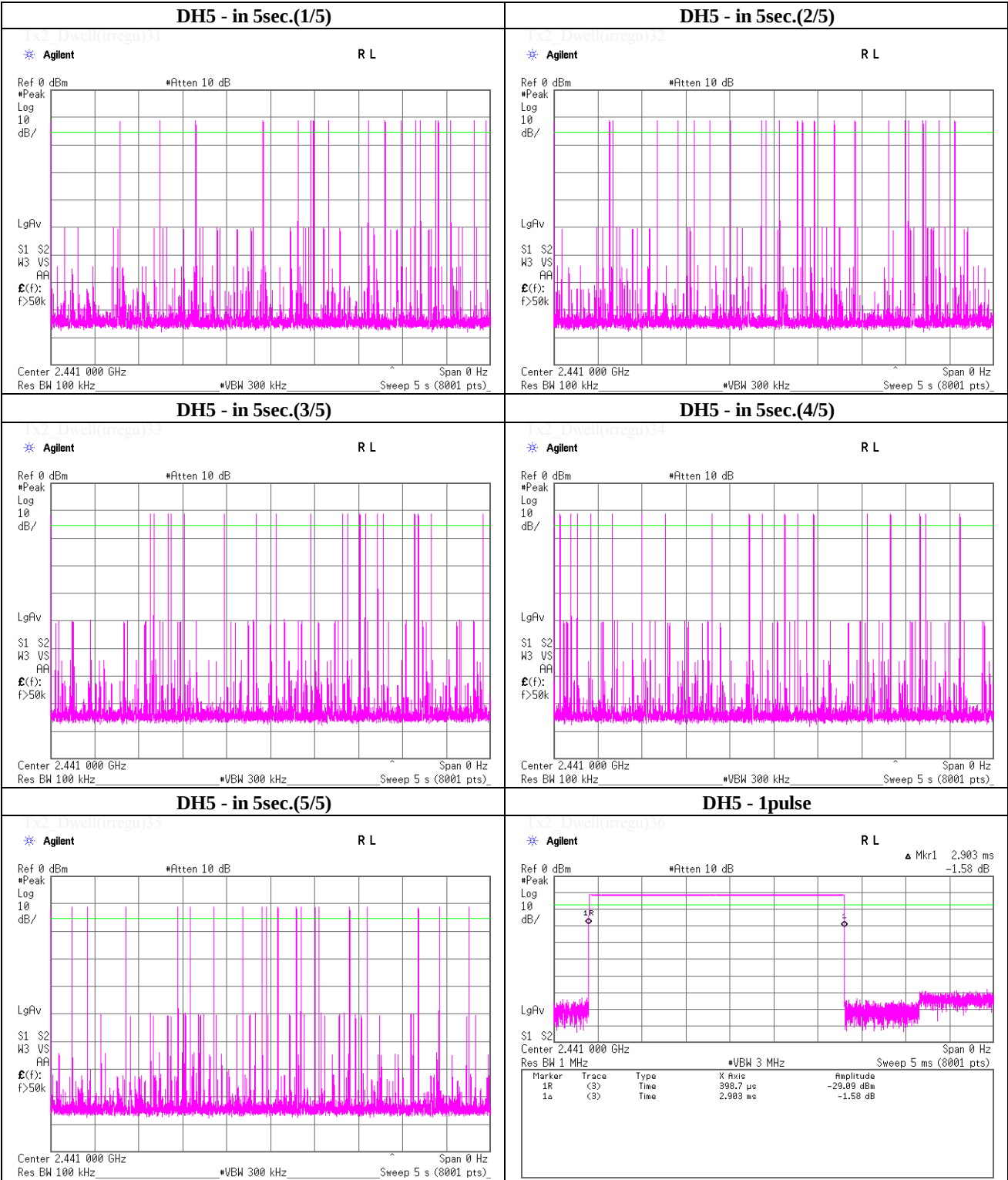
Dwell time

Tx, Bluetooth, BDR, PRBS9



Dwell time

Tx, Bluetooth, BDR, PRBS9



Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date August 31, 2012
 Temperature / Humidity 27 deg.C , 61 %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	20.6 / 5.0 sec. x 31.6 sec. = 131 times	0.408	53	400
3-DH3	18.4 / 5.0 sec. x 31.6 sec. = 117 times	1.659	194	400
3-DH5	19.4 / 5.0 sec. x 31.6 sec. = 123 times	2.911	358	400

Sample Calculation

Result = Number of transmission x Length of transmission time

*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
3-DH1	17	19	21	21	25	20.6
3-DH3	18	20	19	17	18	18.4
3-DH5	20	21	19	19	18	19.4

Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

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

UL Japan, Inc.

Shonan EMC Lab.

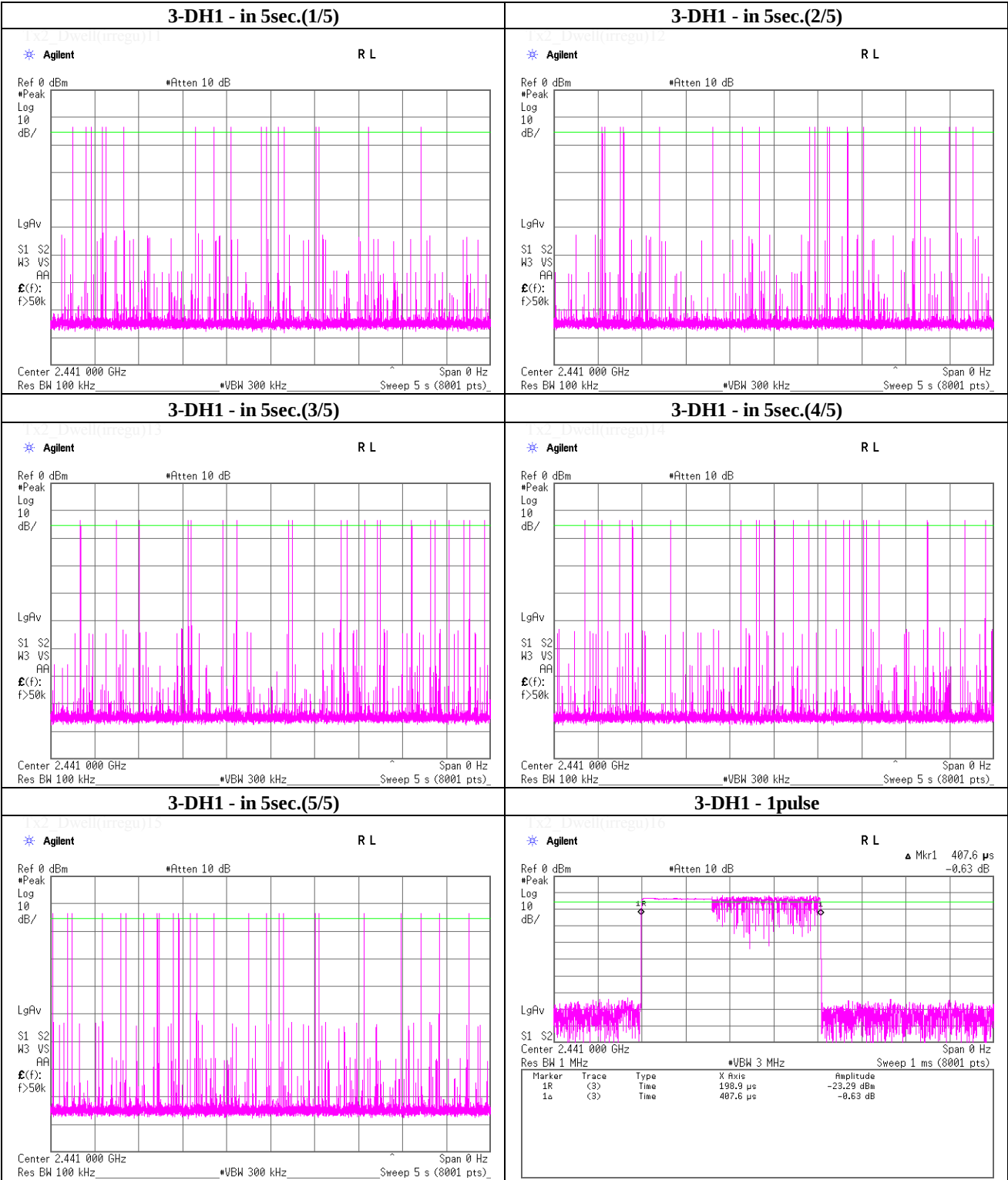
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

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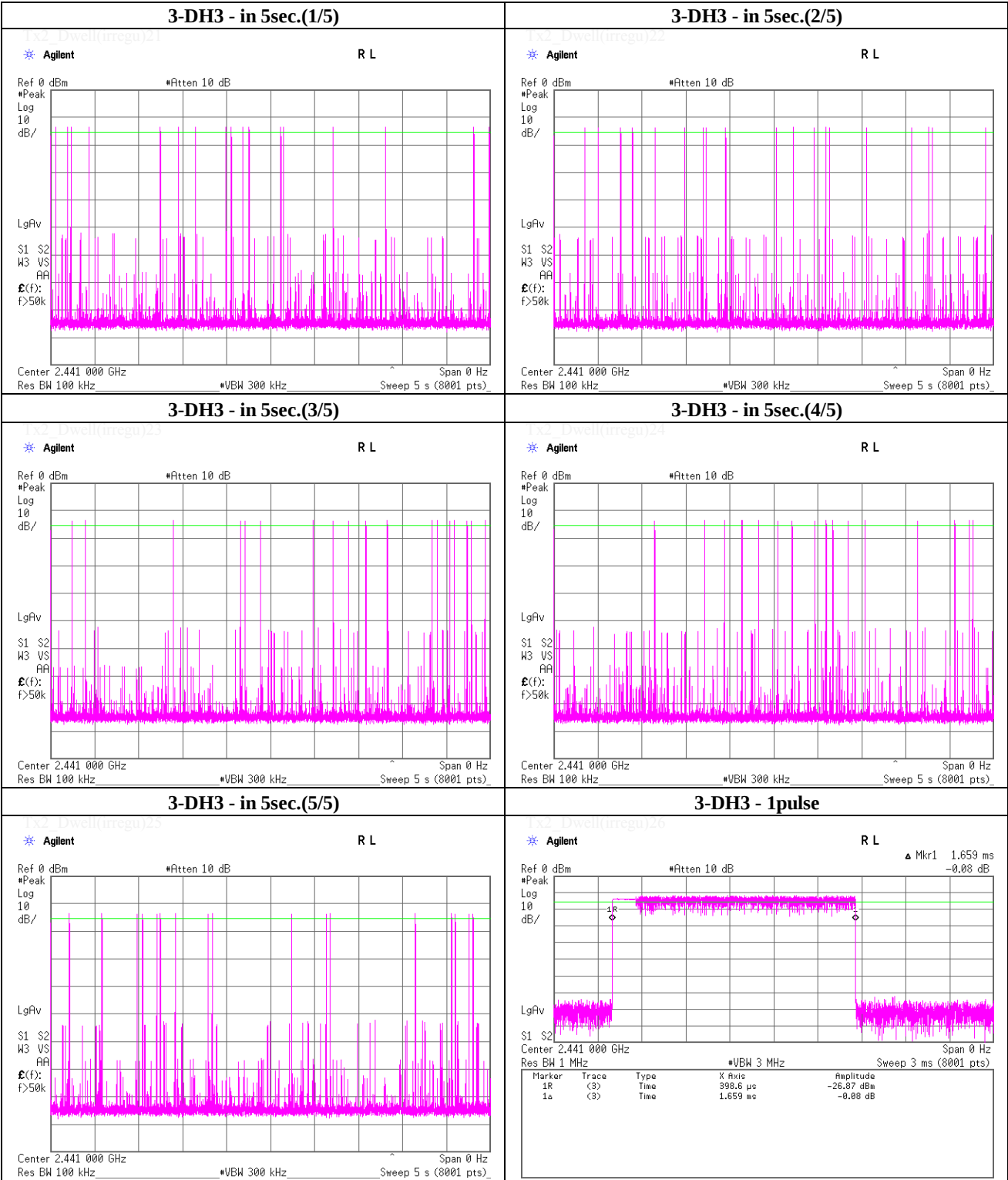
Dwell time

Tx, Bluetooth, EDR, PRBS9



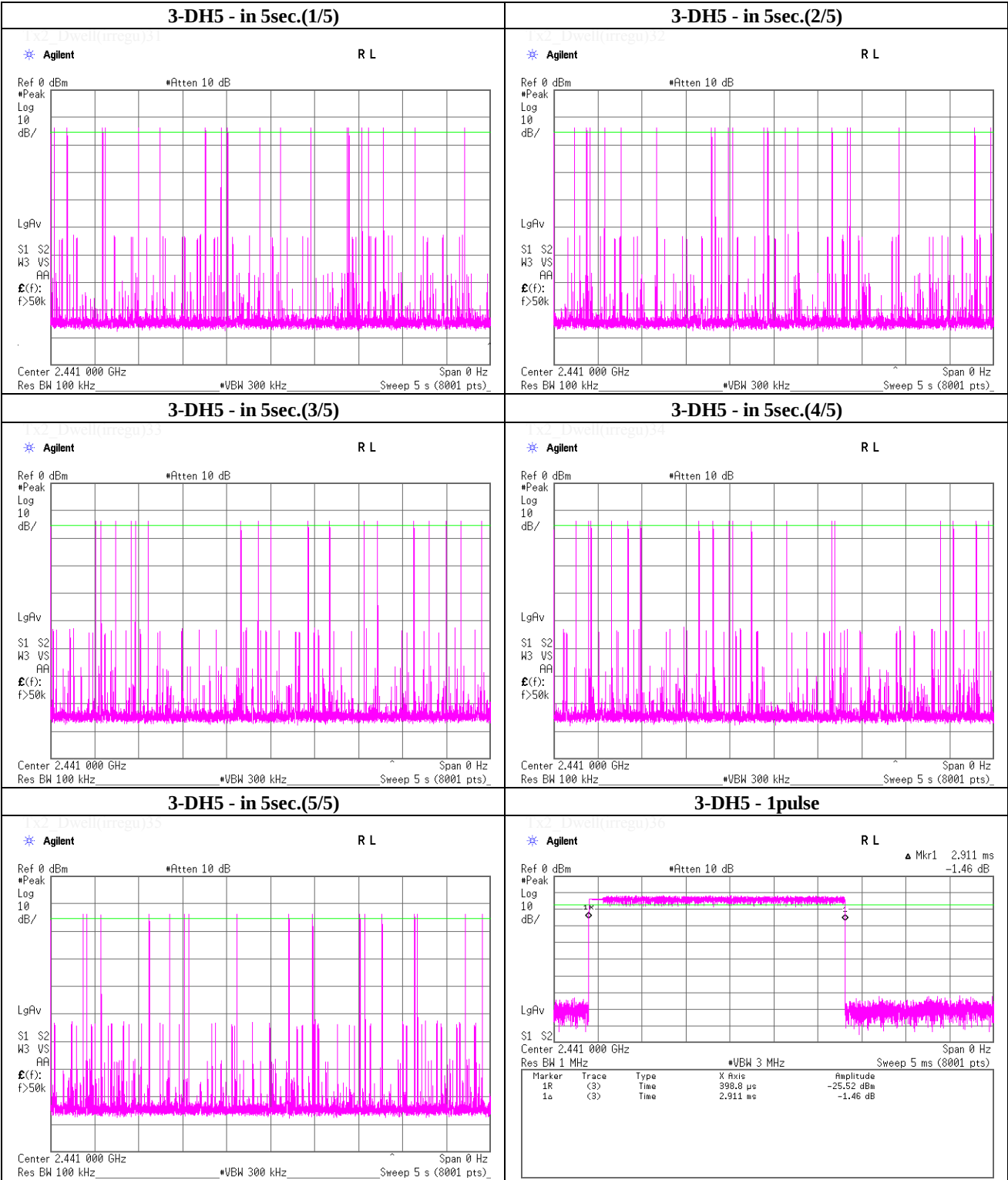
Dwell time

Tx, Bluetooth, EDR, PRBS9



Dwell time

Tx, Bluetooth, EDR, PRBS9



Peak Output Power (Conducted)

Test place UL Japan, Inc. Shonan EMC Lab. No.5 Shielded Room
 Date August 31, 2012
 Temperature / Humidity 27 deg.C , 61 %RH
 Engineer Shinichi Takano
 Mode Tx, Bluetooth

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

	Freq.	P/M (Peak) Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-10.54	1.34	9.97	0.77	1.19	20.97	125	20.20
DH5	2441.0	-10.82	1.35	9.97	0.50	1.12	20.97	125	20.47
DH5	2480.0	-12.22	1.35	9.97	-0.90	0.81	20.97	125	21.87
2-DH5	2402.0	-11.12	1.34	9.97	0.19	1.04	20.97	125	20.78
2-DH5	2441.0	-11.41	1.35	9.97	-0.09	0.98	20.97	125	21.06
2-DH5	2480.0	-12.79	1.35	9.97	-1.47	0.71	20.97	125	22.44
3-DH5	2402.0	-10.77	1.34	9.97	0.54	1.13	20.97	125	20.43
3-DH5	2441.0	-11.04	1.35	9.97	0.28	1.07	20.97	125	20.69
3-DH5	2480.0	-12.44	1.35	9.97	-1.12	0.77	20.97	125	22.09

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.1 Semi Anechoic Chamber
Date	September 7, 2012	September 9, 2012
Temperature / Humidity	25 deg.C , 55 %RH	26 deg.C , 73 %RH
Engineer	Hikaru Shirasawa	Hikaru Shirasawa
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.	189.003	QP	43.4	16.0	8.9	31.8	36.5	43.5	7.0	177	303	
Hori.	378.000	QP	46.7	15.5	7.6	31.8	38.0	46.0	8.0	100	178	
Hori.	405.000	QP	48.7	16.0	7.8	31.8	40.7	46.0	5.3	100	198	
Hori.	432.001	QP	45.8	16.5	7.9	31.8	38.4	46.0	7.6	100	170	
Hori.	2377.000	PK	45.1	27.6	13.9	40.7	45.9	73.9	28.0	100	0	
Hori.	2388.167	PK	45.6	27.6	13.9	40.7	46.4	73.9	27.5	100	0	
Hori.	2390.000	PK	46.5	27.6	13.9	40.7	47.3	73.9	26.6	100	155	
Hori.	2400.000	PK	44.3	27.6	13.9	40.7	45.1	73.9	28.8	100	155	
Hori.	3789.539	PK	49.5	29.8	5.7	41.8	43.2	73.9	30.7	153	72	
Hori.	4804.000	PK	46.3	31.2	6.4	41.6	42.3	73.9	31.6	100	0	
Hori.	7206.000	PK	47.6	36.0	7.7	41.2	50.1	73.9	23.8	100	0	
Hori.	9608.000	PK	45.6	38.1	8.8	40.4	52.1	73.9	21.8	100	0	
Hori.	12010.000	PK	44.7	39.0	10.1	39.4	54.4	73.9	19.5	100	0	
Hori.	2377.000	AV	34.6	27.6	13.9	40.7	35.4	53.9	18.5	100	0	
Hori.	2388.167	AV	34.3	27.6	13.9	40.7	35.1	53.9	18.8	100	0	
Hori.	2390.000	AV	34.1	27.6	13.9	40.7	34.9	53.9	19.0	100	155	
Hori.	2400.000	AV	34.2	27.6	13.9	40.7	35.0	53.9	18.9	100	155	
Hori.	3789.539	AV	42.7	29.8	5.7	41.8	36.4	53.9	17.5	153	72	
Hori.	4804.000	AV	34.2	31.2	6.4	41.6	30.2	53.9	23.7	100	0	
Hori.	7206.000	AV	36.2	36.0	7.7	41.2	38.7	53.9	15.2	100	0	
Hori.	9608.000	AV	33.8	38.1	8.8	40.4	40.3	53.9	13.6	100	0	
Hori.	12010.000	AV	33.8	39.0	10.1	39.4	43.5	53.9	10.4	100	0	
Vert.	195.737	QP	33.9	16.2	9.0	31.8	27.3	43.5	16.2	100	245	
Vert.	512.998	QP	43.5	17.8	8.3	31.9	37.7	46.0	8.3	124	129	
Vert.	566.995	QP	39.8	18.4	8.6	31.9	34.9	46.0	11.1	100	109	
Vert.	2377.000	PK	45.8	27.6	13.9	40.7	46.6	73.9	27.3	100	0	
Vert.	2388.167	PK	46.2	27.6	13.9	40.7	47.0	73.9	26.9	100	0	
Vert.	2390.000	PK	43.9	27.6	13.9	40.7	44.7	73.9	29.2	158	93	
Vert.	2400.000	PK	43.5	27.6	13.9	40.7	44.3	73.9	29.6	158	93	
Vert.	3789.539	PK	50.4	29.8	5.7	41.8	44.1	73.9	29.8	100	270	
Vert.	4804.000	PK	45.8	31.2	6.4	41.6	41.8	73.9	32.1	100	0	
Vert.	7206.000	PK	47.3	36.0	7.7	41.2	49.8	73.9	24.1	100	0	
Vert.	9608.000	PK	44.9	38.1	8.8	40.4	51.4	73.9	22.5	100	0	
Vert.	12010.000	PK	45.5	39.0	10.1	39.4	55.2	73.9	18.7	100	0	
Vert.	2377.000	AV	35.1	27.6	13.9	40.7	35.9	53.9	18.0	100	0	
Vert.	2388.167	AV	34.5	27.6	13.9	40.7	35.3	53.9	18.6	100	0	
Vert.	2390.000	AV	33.9	27.6	13.9	40.7	34.7	53.9	19.2	158	93	
Vert.	2400.000	AV	34.2	27.6	13.9	40.7	35.0	53.9	18.9	158	93	
Vert.	3789.539	AV	44.7	29.8	5.7	41.8	38.4	53.9	15.5	100	270	
Vert.	4804.000	AV	35.6	31.2	6.4	41.6	31.6	53.9	22.3	100	0	
Vert.	7206.000	AV	35.5	36.0	7.7	41.2	38.0	53.9	15.9	100	0	
Vert.	9608.000	AV	33.4	38.1	8.8	40.4	39.9	53.9	14.0	100	0	
Vert.	12010.000	AV	33.8	39.0	10.1	39.4	43.5	53.9	10.4	100	0	

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

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

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

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

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

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	September 7, 2012	September 9, 2012
Temperature / Humidity	25 deg.C , 55 %RH	26 deg.C , 73 %RH
Engineer	Hikaru Shirasawa	Hikaru Shirasawa
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.	189.001	QP	43.5	16.0	8.9	31.8	36.6	43.5	6.9	178	314	
Hori.	196.052	QP	36.2	16.2	9.0	31.8	29.6	43.5	13.9	172	110	
Hori.	378.000	QP	46.7	15.5	7.6	31.8	38.0	46.0	8.0	100	179	
Hori.	405.000	QP	49.0	16.0	7.8	31.8	41.0	46.0	5.0	100	198	
Hori.	432.004	QP	46.1	16.5	7.9	31.8	38.7	46.0	7.3	100	167	
Hori.	3789.352	PK	51.2	29.8	5.7	41.8	44.9	73.9	29.0	100	153	
Hori.	4882.000	PK	46.1	31.3	6.4	41.5	42.3	73.9	31.6	100	0	
Hori.	7323.000	PK	47.6	36.2	8.1	41.2	50.7	73.9	23.2	100	0	
Hori.	9764.000	PK	44.6	38.1	8.9	40.4	51.2	73.9	22.7	100	0	
Hori.	12205.000	PK	44.1	38.9	10.2	39.2	54.0	73.9	19.9	100	0	
Hori.	3789.352	AV	45.6	29.8	5.7	41.8	39.3	53.9	14.6	100	153	
Hori.	4882.000	AV	34.9	31.3	6.4	41.5	31.1	53.9	22.8	100	0	
Hori.	7323.000	AV	34.5	36.2	8.1	41.2	37.6	53.9	16.3	100	0	
Hori.	9764.000	AV	32.4	38.1	8.9	40.4	39.0	53.9	14.9	100	0	
Hori.	12205.000	AV	33.4	38.9	10.2	39.2	43.3	53.9	10.6	100	0	
Vert.	195.731	QP	34.1	16.2	9.0	31.8	27.5	43.5	16.0	100	230	
Vert.	512.999	QP	43.7	17.8	8.3	31.9	37.9	46.0	8.1	120	132	
Vert.	566.998	QP	40.1	18.4	8.6	31.9	35.2	46.0	10.8	100	110	
Vert.	3789.477	PK	51.9	29.8	5.7	41.8	45.6	73.9	28.3	100	114	
Vert.	4882.000	PK	46.1	31.3	6.4	41.5	42.3	73.9	31.6	100	0	
Vert.	7323.000	PK	47.5	36.2	8.1	41.2	50.6	73.9	23.3	100	0	
Vert.	9764.000	PK	42.8	38.1	8.9	40.4	49.4	73.9	24.5	100	0	
Vert.	12205.000	PK	45.9	38.9	10.2	39.2	55.8	73.9	18.1	100	0	
Vert.	3789.477	AV	45.2	29.8	5.7	41.8	38.9	53.9	15.0	100	114	
Vert.	4882.000	AV	35.9	31.3	6.4	41.5	32.1	53.9	21.8	100	0	
Vert.	7323.000	AV	35.4	36.2	8.1	41.2	38.5	53.9	15.4	100	0	
Vert.	9764.000	AV	33.4	38.1	8.9	40.4	40.0	53.9	13.9	100	0	
Vert.	12205.000	AV	33.8	38.9	10.2	39.2	43.7	53.9	10.2	100	0	

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

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

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

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

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

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	September 7, 2012	September 9, 2012
Temperature / Humidity	25 deg.C , 55 %RH	26 deg.C , 73 %RH
Engineer	Hikaru Shirasawa	Hikaru Shirasawa
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.	189.002	QP	43.7	16.0	8.9	31.8	36.8	43.5	6.7	181	312	
Hori.	377.997	QP	46.6	15.5	7.6	31.8	37.9	46.0	8.1	100	179	
Hori.	405.000	QP	49.3	16.0	7.8	31.8	41.3	46.0	4.7	100	199	
Hori.	431.999	QP	46.3	16.5	7.9	31.8	38.9	46.0	7.1	100	169	
Hori.	2483.500	PK	43.1	27.6	14.0	40.7	44.0	73.9	29.9	100	101	
Hori.	2489.900	PK	45.6	27.7	14.0	40.7	46.6	73.9	27.3	100	0	
Hori.	2507.000	PK	44.1	27.7	14.0	40.7	45.1	73.9	28.8	100	0	
Hori.	3789.354	PK	50.8	29.8	5.7	41.8	44.5	73.9	29.4	198	86	
Hori.	4960.000	PK	47.6	31.5	6.5	41.4	44.2	73.9	29.7	100	0	
Hori.	7440.000	PK	46.9	36.3	8.2	41.3	50.1	73.9	23.8	100	0	
Hori.	9920.000	PK	44.3	38.1	9.0	40.3	51.1	73.9	22.8	100	0	
Hori.	12400.000	PK	45.7	38.9	10.3	39.0	55.9	73.9	18.0	100	0	
Hori.	2483.500	AV	33.7	27.6	14.0	40.7	34.6	53.9	19.3	100	101	
Hori.	2489.900	AV	33.7	27.7	14.0	40.7	34.7	53.9	19.2	100	0	
Hori.	2507.000	AV	33.7	27.7	14.0	40.7	34.7	53.9	19.2	100	0	
Hori.	3789.354	AV	46.7	29.8	5.7	41.8	40.4	53.9	13.5	198	86	
Hori.	4960.000	AV	35.3	31.5	6.5	41.4	31.9	53.9	22.0	100	0	
Hori.	7440.000	AV	35.5	36.3	8.2	41.3	38.7	53.9	15.2	100	0	
Hori.	9920.000	AV	33.7	38.1	9.0	40.3	40.5	53.9	13.4	100	0	
Hori.	12400.000	AV	33.5	38.9	10.3	39.0	43.7	53.9	10.2	100	0	
Vert.	199.199	QP	31.0	16.3	9.0	31.8	24.5	43.5	19.0	100	257	
Vert.	512.998	QP	43.1	17.8	8.3	31.9	37.3	46.0	8.7	100	128	
Vert.	566.997	QP	40.2	18.4	8.6	31.9	35.3	46.0	10.7	100	110	
Vert.	2483.500	PK	43.7	27.6	14.0	40.7	44.6	73.9	29.3	100	95	
Vert.	2489.900	PK	45.2	27.7	14.0	40.7	46.2	73.9	27.7	100	0	
Vert.	2507.000	PK	45.9	27.7	14.0	40.7	46.9	73.9	27.0	100	0	
Vert.	3789.354	PK	52.5	29.8	5.7	41.8	46.2	73.9	27.7	100	112	
Vert.	4960.000	PK	46.9	31.5	6.5	41.4	43.5	73.9	30.4	100	0	
Vert.	7440.000	PK	47.6	36.3	8.2	41.3	50.8	73.9	23.1	100	0	
Vert.	9920.000	PK	46.2	38.1	9.0	40.3	53.0	73.9	20.9	100	0	
Vert.	12400.000	PK	43.8	38.9	10.3	39.0	54.0	73.9	19.9	100	0	
Vert.	2483.500	AV	33.7	27.6	14.0	40.7	34.6	53.9	19.3	100	95	
Vert.	2489.900	AV	33.1	27.7	14.0	40.7	34.1	53.9	19.8	100	0	
Vert.	2507.000	AV	33.7	27.7	14.0	40.7	34.7	53.9	19.2	100	0	
Vert.	3789.354	AV	47.9	29.8	5.7	41.8	41.6	53.9	12.3	100	112	
Vert.	4960.000	AV	33.5	31.5	6.5	41.4	30.1	53.9	23.8	100	0	
Vert.	7440.000	AV	35.9	36.3	8.2	41.3	39.1	53.9	14.8	100	0	
Vert.	9920.000	AV	33.8	38.1	9.0	40.3	40.6	53.9	13.3	100	0	
Vert.	12400.000	AV	33.4	38.9	10.3	39.0	43.6	53.9	10.3	100	0	

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

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

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

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

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

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	September 7, 2012	September 9, 2012
Temperature / Humidity	25 deg.C , 55 %RH	26 deg.C , 73 %RH
Engineer	Hikaru Shirasawa	Hikaru Shirasawa
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.	189.006	QP	43.6	16.0	8.9	31.8	36.7	43.5	6.8	186	310	
Hori.	378.000	QP	46.6	15.5	7.6	31.8	37.9	46.0	8.1	100	178	
Hori.	405.001	QP	48.0	16.0	7.8	31.8	40.0	46.0	6.0	100	154	
Hori.	432.000	QP	46.8	16.5	7.9	31.8	39.4	46.0	6.6	100	166	
Hori.	2377.000	PK	46.2	27.6	13.9	40.7	47.0	73.9	26.9	100	0	
Hori.	2387.950	PK	46.6	27.6	13.9	40.7	47.4	73.9	26.5	100	0	
Hori.	2390.000	PK	45.2	27.6	13.9	40.7	46.0	73.9	27.9	100	159	
Hori.	2400.000	PK	45.3	27.6	13.9	40.7	46.1	73.9	27.8	100	159	
Hori.	3789.664	PK	51.6	29.8	5.7	41.8	45.3	73.9	28.6	103	133	
Hori.	4804.000	PK	47.6	31.2	6.4	41.6	43.6	73.9	30.3	100	0	
Hori.	7206.000	PK	46.7	36.0	7.7	41.2	49.2	73.9	24.7	100	0	
Hori.	9608.000	PK	44.8	38.1	8.8	40.4	51.3	73.9	22.6	100	0	
Hori.	12010.000	PK	45.9	39.0	10.1	39.4	55.6	73.9	18.3	100	0	
Hori.	2377.000	AV	34.2	27.6	13.9	40.7	35.0	53.9	18.9	100	0	
Hori.	2387.950	AV	34.9	27.6	13.9	40.7	35.7	53.9	18.2	100	0	
Hori.	2390.000	AV	34.4	27.6	13.9	40.7	35.2	53.9	18.7	100	159	
Hori.	2400.000	AV	34.1	27.6	13.9	40.7	34.9	53.9	19.0	100	159	
Hori.	3789.664	AV	45.5	29.8	5.7	41.8	39.2	53.9	14.7	103	133	
Hori.	4804.000	AV	35.7	31.2	6.4	41.6	31.7	53.9	22.2	100	0	
Hori.	7206.000	AV	35.7	36.0	7.7	41.2	38.2	53.9	15.7	100	0	
Hori.	9608.000	AV	33.5	38.1	8.8	40.4	40.0	53.9	13.9	100	0	
Hori.	12010.000	AV	33.8	39.0	10.1	39.4	43.5	53.9	10.4	100	0	
Vert.	195.694	QP	33.4	16.2	9.0	31.8	26.8	43.5	16.7	100	228	
Vert.	513.000	QP	43.1	17.8	8.3	31.9	37.3	46.0	8.7	100	134	
Vert.	567.003	QP	40.1	18.4	8.6	31.9	35.2	46.0	10.8	100	110	
Vert.	2377.000	PK	46.5	27.6	13.9	40.7	47.3	73.9	26.6	100	0	
Vert.	2387.950	PK	47.0	27.6	13.9	40.7	47.8	73.9	26.1	100	0	
Vert.	2390.000	PK	45.3	27.6	13.9	40.7	46.1	73.9	27.8	144	90	
Vert.	2400.000	PK	44.5	27.6	13.9	40.7	45.3	73.9	28.6	144	90	
Vert.	3789.602	PK	51.9	29.8	5.7	41.8	45.6	73.9	28.3	206	176	
Vert.	4804.000	PK	47.2	31.2	6.4	41.6	43.2	73.9	30.7	100	0	
Vert.	7206.000	PK	46.8	36.0	7.7	41.2	49.3	73.9	24.6	100	0	
Vert.	9608.000	PK	45.6	38.1	8.8	40.4	52.1	73.9	21.8	100	0	
Vert.	12010.000	PK	42.4	39.0	10.1	39.4	52.1	73.9	21.8	100	0	
Vert.	2377.000	AV	34.6	27.6	13.9	40.7	35.4	53.9	18.5	100	0	
Vert.	2387.950	AV	34.0	27.6	13.9	40.7	34.8	53.9	19.1	100	0	
Vert.	2390.000	AV	34.2	27.6	13.9	40.7	35.0	53.9	18.9	144	90	
Vert.	2400.000	AV	34.9	27.6	13.9	40.7	35.7	53.9	18.2	144	90	
Vert.	3789.602	AV	45.3	29.8	5.7	41.8	39.0	53.9	14.9	206	176	
Vert.	4804.000	AV	35.7	31.2	6.4	41.6	31.7	53.9	22.2	100	0	
Vert.	7206.000	AV	35.3	36.0	7.7	41.2	37.8	53.9	16.1	100	0	
Vert.	9608.000	AV	33.7	38.1	8.8	40.4	40.2	53.9	13.7	100	0	
Vert.	12010.000	AV	33.4	39.0	10.1	39.4	43.1	53.9	10.8	100	0	

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

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

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

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

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

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	September 7, 2012	September 9, 2012
Temperature / Humidity	25 deg.C , 55 %RH	26 deg.C , 73 %RH
Engineer	Hikaru Shirasawa	Hikaru Shirasawa
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.	189.013	QP	43.4	16.0	8.9	31.8	36.5	43.5	7.0	185.0	312	
Hori.	378.000	QP	46.8	15.5	7.6	31.8	38.1	46.0	7.9	100.0	178	
Hori.	404.999	QP	49.2	16.0	7.8	31.8	41.2	46.0	4.8	100.0	198	
Hori.	432.000	QP	46.9	16.5	7.9	31.8	39.5	46.0	6.5	100.0	168	
Hori.	3789.353	PK	50.8	29.8	5.7	41.8	44.5	73.9	29.4	100.0	145	
Hori.	4882.000	PK	46.0	31.3	6.4	41.5	42.2	73.9	31.7	100.0	0	
Hori.	7323.000	PK	47.2	36.2	8.1	41.2	50.3	73.9	23.6	100.0	0	
Hori.	9764.000	PK	44.3	38.1	8.9	40.4	50.9	73.9	23.0	100.0	0	
Hori.	12205.000	PK	44.4	38.9	10.2	39.2	54.3	73.9	19.6	100.0	0	
Hori.	3789.353	AV	45.9	29.8	5.7	41.8	39.6	53.9	14.3	100.0	145	
Hori.	4882.000	AV	35.0	31.3	6.4	41.5	31.2	53.9	22.7	100.0	0	
Hori.	7323.000	AV	34.2	36.2	8.1	41.2	37.3	53.9	16.6	100.0	0	
Hori.	9764.000	AV	32.3	38.1	8.9	40.4	38.9	53.9	15.0	100.0	0	
Hori.	12205.000	AV	33.6	38.9	10.2	39.2	43.5	53.9	10.4	100.0	0	
Vert.	195.735	QP	34.0	16.2	9.0	31.8	27.4	43.5	16.1	100.0	235	
Vert.	513.004	QP	43.1	17.8	8.3	31.9	37.3	46.0	8.7	100.0	130	
Vert.	566.999	QP	40.1	18.4	8.6	31.9	35.2	46.0	10.8	100.0	110	
Vert.	3789.472	PK	52.4	29.8	5.7	41.8	46.1	73.9	27.8	100.0	110	
Vert.	4882.000	PK	46.5	31.3	6.4	41.5	42.7	73.9	31.2	100.0	0	
Vert.	7323.000	PK	47.3	36.2	8.1	41.2	50.4	73.9	23.5	100.0	0	
Vert.	9764.000	PK	43.0	38.1	8.9	40.4	49.6	73.9	24.3	100.0	0	
Vert.	12205.000	PK	46.0	38.9	10.2	39.2	55.9	73.9	18.0	100.0	0	
Vert.	3789.472	AV	46.3	29.8	5.7	41.8	40.0	53.9	13.9	100.0	110	
Vert.	4882.000	AV	36.3	31.3	6.4	41.5	32.5	53.9	21.4	100.0	0	
Vert.	7323.000	AV	36.0	36.2	8.1	41.2	39.1	53.9	14.8	100.0	0	
Vert.	9764.000	AV	33.7	38.1	8.9	40.4	40.3	53.9	13.6	100.0	0	
Vert.	12205.000	AV	33.4	38.9	10.2	39.2	43.3	53.9	10.6	100.0	0	

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

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

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

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

Distance factor : 15GHz ~40GHz : $20\log(3.0\text{m}/1.0\text{m}) = 9.5\text{dB}$

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	September 7, 2012	September 9, 2012
Temperature / Humidity	25 deg.C , 55 %RH	26 deg.C , 73 %RH
Engineer	Hikaru Shirasawa	Hikaru Shirasawa
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.	189.000	QP	43.5	16.0	8.9	31.8	36.6	43.5	6.9	178	313	
Hori.	377.999	QP	46.7	15.5	7.6	31.8	38.0	46.0	8.0	100	176	
Hori.	405.000	QP	49.2	16.0	7.8	31.8	41.2	46.0	4.8	100	197	
Hori.	432.002	QP	46.9	16.5	7.9	31.8	39.5	46.0	6.5	100	167	
Hori.	2483.500	PK	43.6	27.6	14.0	40.7	44.5	73.9	29.4	100	92	
Hori.	3789.352	PK	50.6	29.8	5.7	41.8	44.3	73.9	29.6	167	102	
Hori.	4960.000	PK	47.5	31.5	6.5	41.4	44.1	73.9	29.8	100	0	
Hori.	7440.000	PK	46.8	36.3	8.2	41.3	50.0	73.9	23.9	100	0	
Hori.	9920.000	PK	44.2	38.1	9.0	40.3	51.0	73.9	22.9	100	0	
Hori.	12400.000	PK	44.9	38.9	10.3	39.0	55.1	73.9	18.8	100	0	
Hori.	2483.500	AV	34.9	27.6	14.0	40.7	35.8	53.9	18.1	100	92	
Hori.	3789.352	AV	46.3	29.8	5.7	41.8	40.0	53.9	13.9	167	102	
Hori.	4960.000	AV	35.5	31.5	6.5	41.4	32.1	53.9	21.8	100	0	
Hori.	7440.000	AV	35.9	36.3	8.2	41.3	39.1	53.9	14.8	100	0	
Hori.	9920.000	AV	33.8	38.1	9.0	40.3	40.6	53.9	13.3	100	0	
Hori.	12400.000	AV	33.5	38.9	10.3	39.0	43.7	53.9	10.2	100	0	
Vert.	195.778	QP	34.3	16.2	9.0	31.8	27.7	43.5	15.8	100	232	
Vert.	513.000	QP	43.1	17.8	8.3	31.9	37.3	46.0	8.7	100	130	
Vert.	566.999	QP	40.2	18.5	8.6	31.9	35.4	46.0	10.6	100	110	
Vert.	2483.500	PK	43.5	27.6	14.0	40.7	44.4	73.9	29.5	100	97	
Vert.	3789.352	PK	52.7	29.8	5.7	41.8	46.4	73.9	27.5	100	115	
Vert.	4960.000	PK	47.0	31.5	6.5	41.4	43.6	73.9	30.3	100	0	
Vert.	7440.000	PK	48.2	36.3	8.2	41.3	51.4	73.9	22.5	100	0	
Vert.	9920.000	PK	46.5	38.1	9.0	40.3	53.3	73.9	20.6	100	0	
Vert.	12400.000	PK	44.2	38.9	10.3	39.0	54.4	73.9	19.5	100	0	
Vert.	2483.500	AV	33.8	27.6	14.0	40.7	34.7	53.9	19.2	100	97	
Vert.	3789.352	AV	48.2	29.8	5.7	41.8	41.9	53.9	12.0	100	115	
Vert.	4960.000	AV	34.0	31.5	6.5	41.4	30.6	53.9	23.3	100	0	
Vert.	7440.000	AV	36.0	36.3	8.2	41.3	39.2	53.9	14.7	100	0	
Vert.	9920.000	AV	34.0	38.1	9.0	40.3	40.8	53.9	13.1	100	0	
Vert.	12400.000	AV	33.6	38.9	10.3	39.0	43.8	53.9	10.1	100	0	

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

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

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

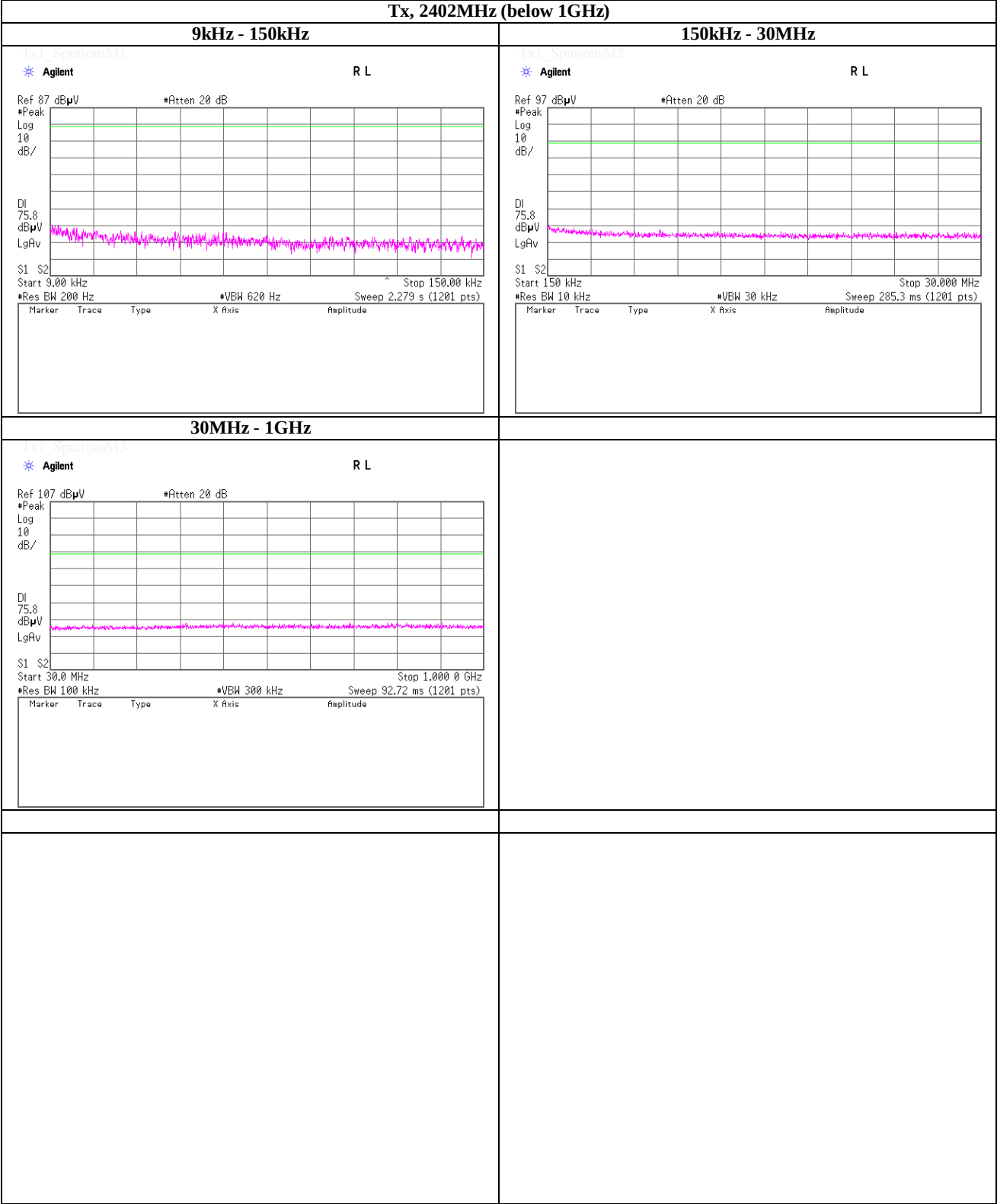
*The 10th harmonic was not seen so the result was its base noise level.

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

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

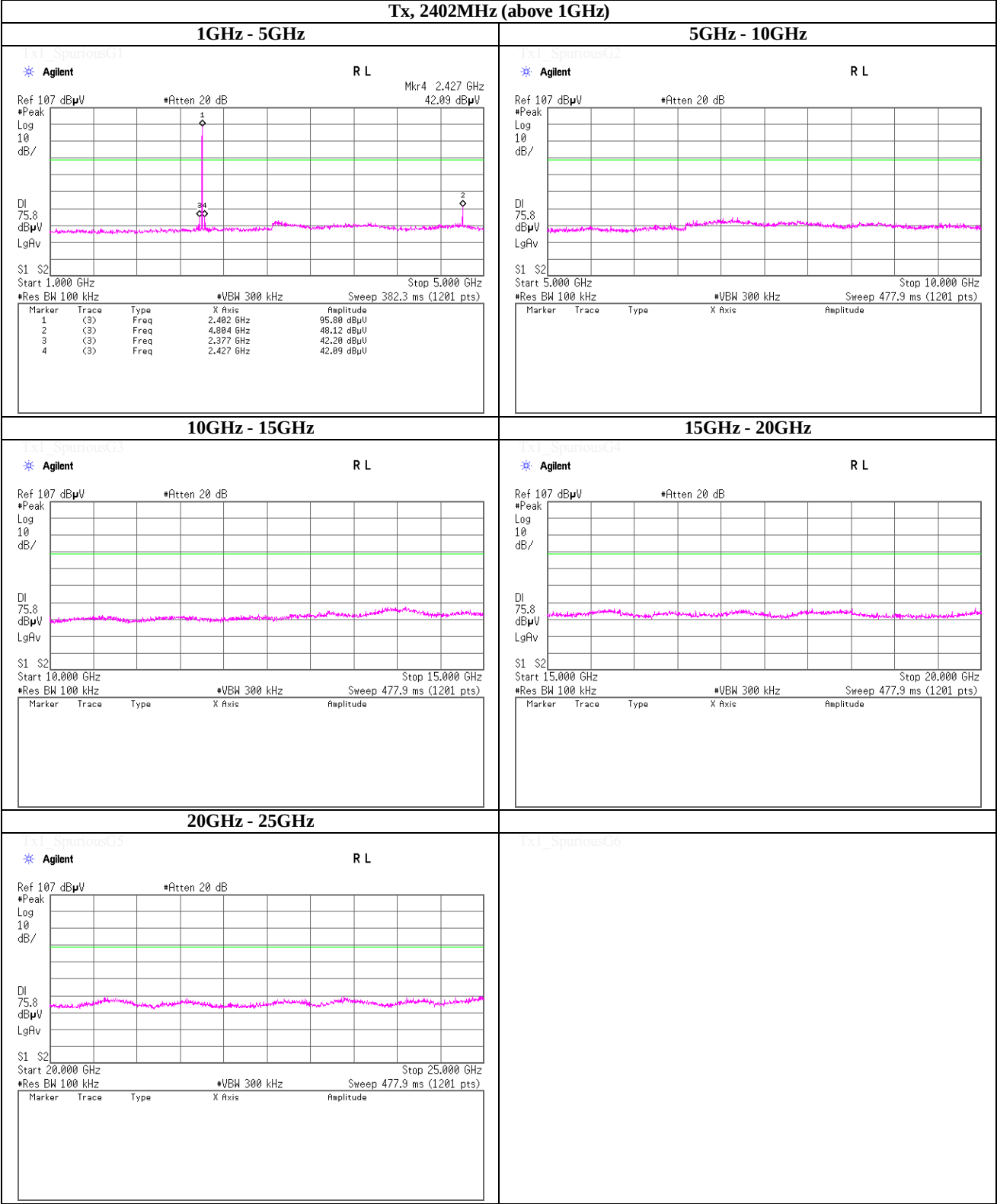
Tx, 2402MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

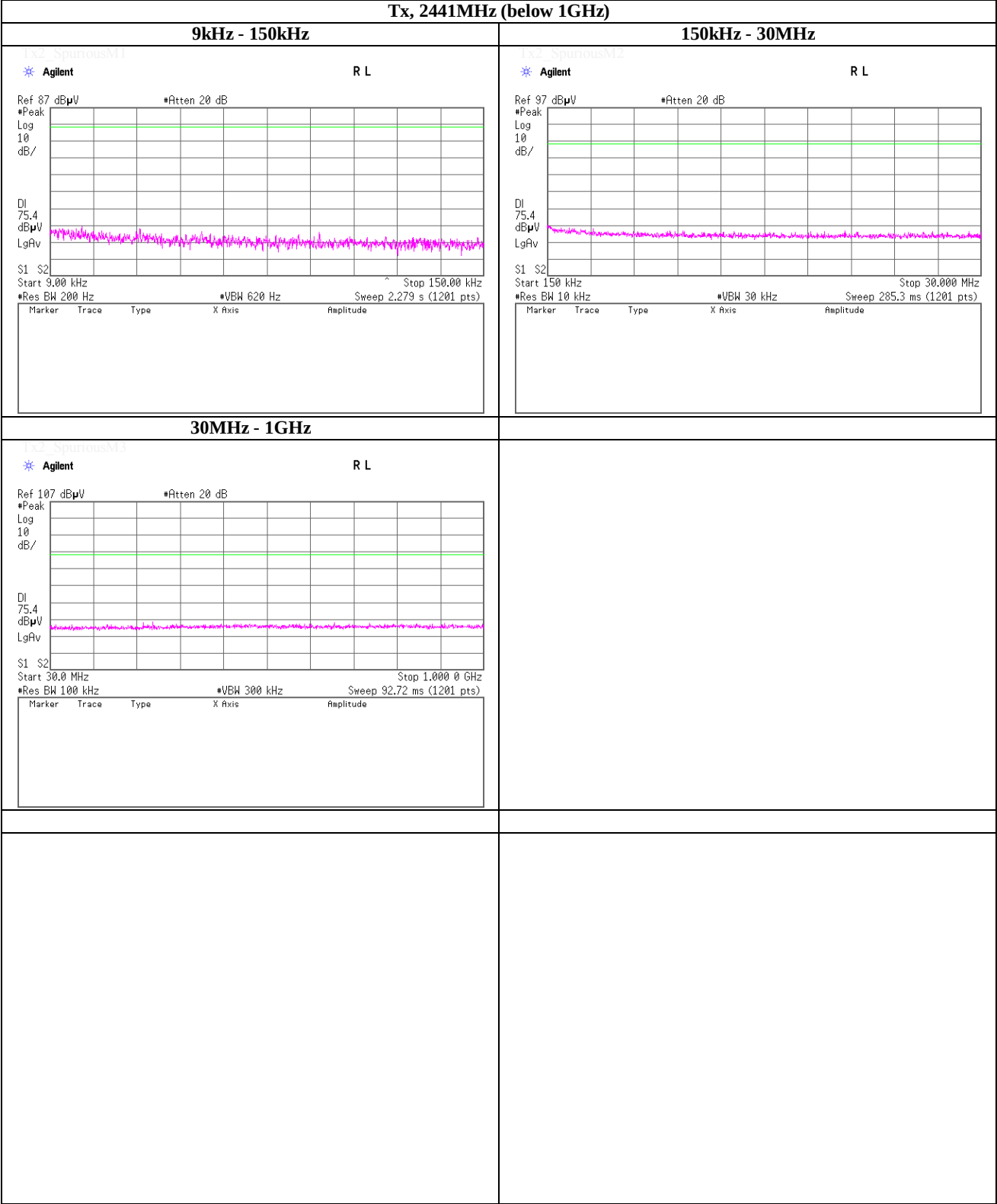
Tx, 2402MHz (above 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (below 1GHz)



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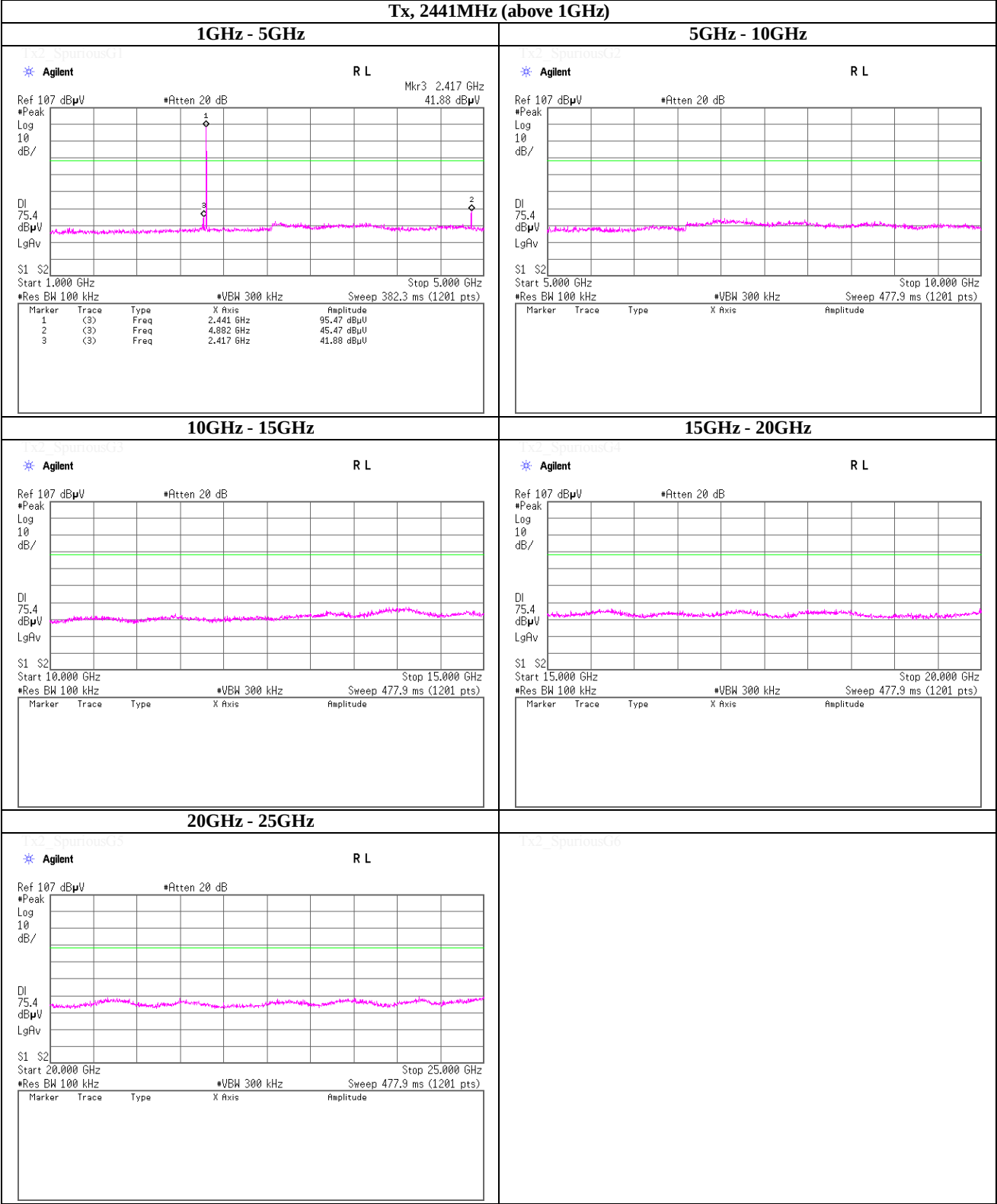
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (above 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (below 1GHz)



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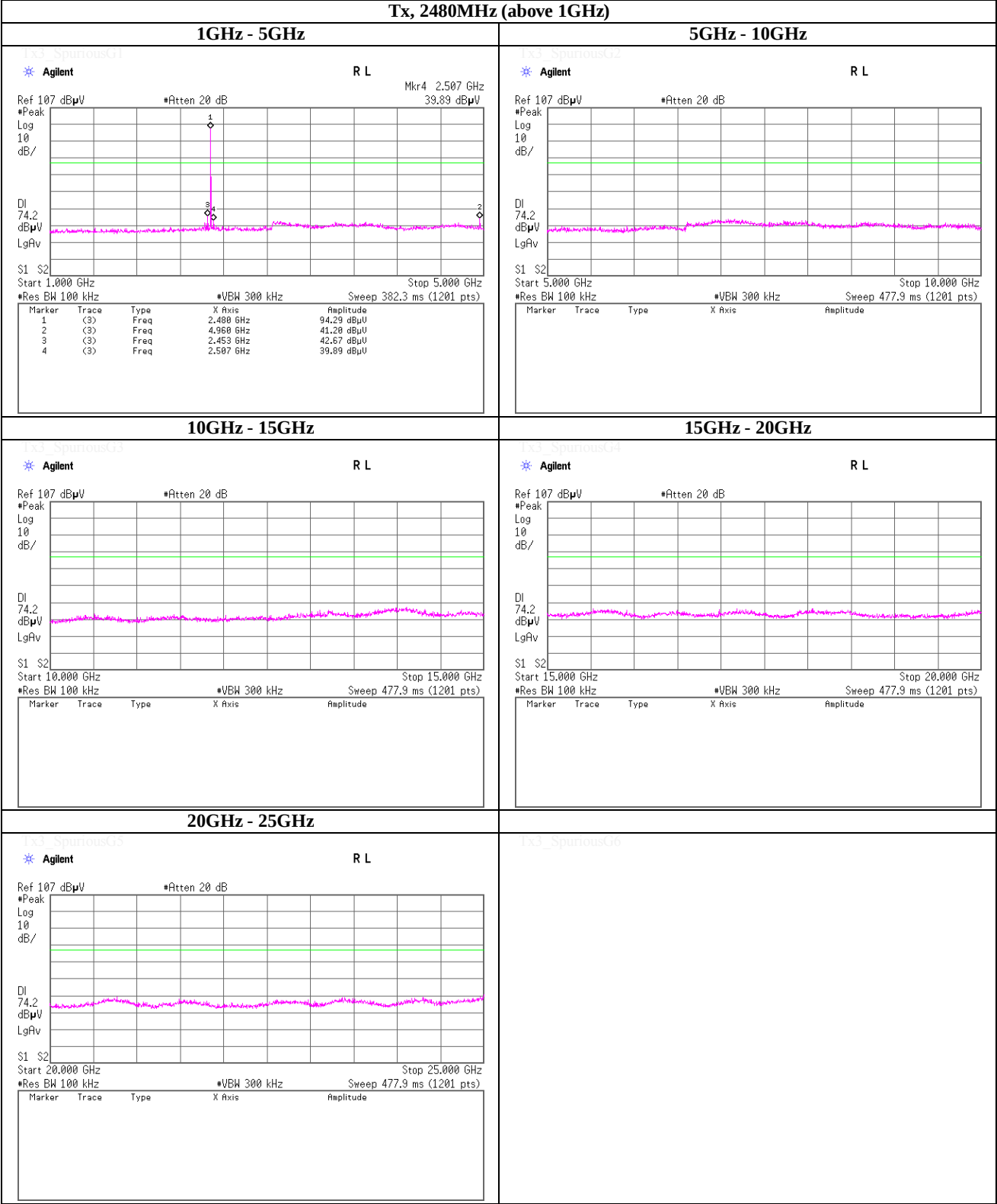
Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

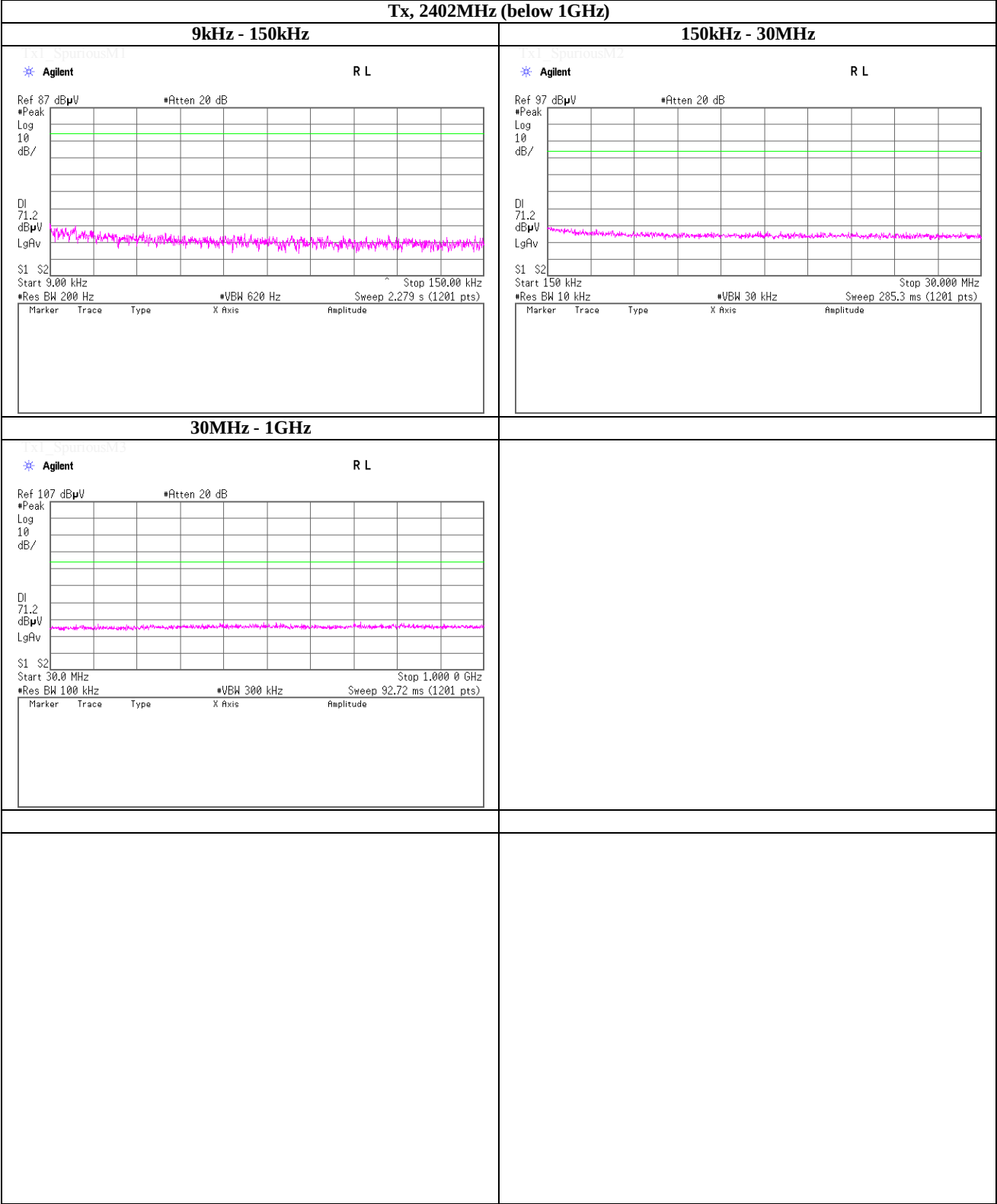
Tx, 2480MHz (above 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

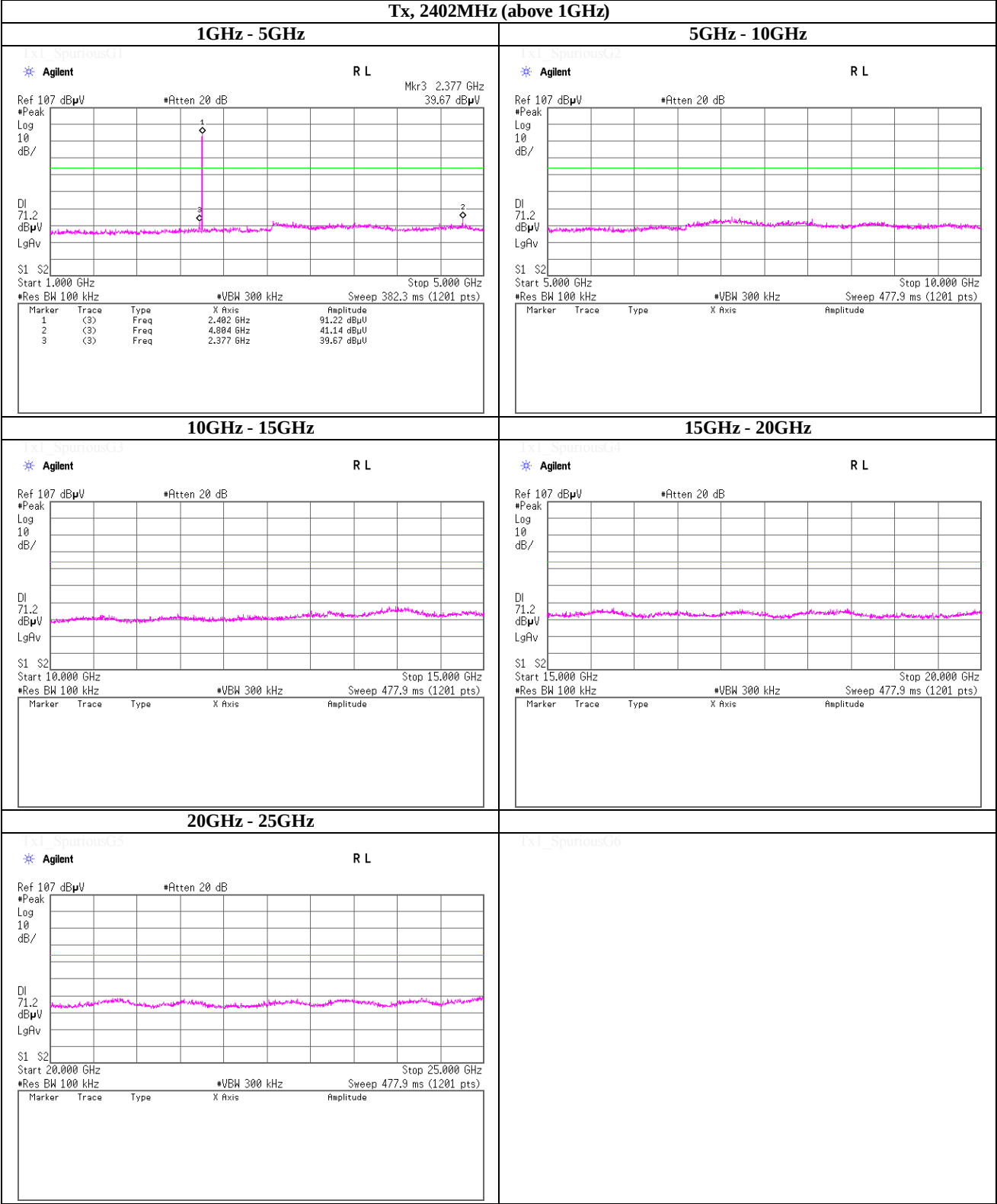
Tx, 2402MHz (below 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (above 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (below 1GHz)



UL Japan, Inc.

Shonan EMC Lab.

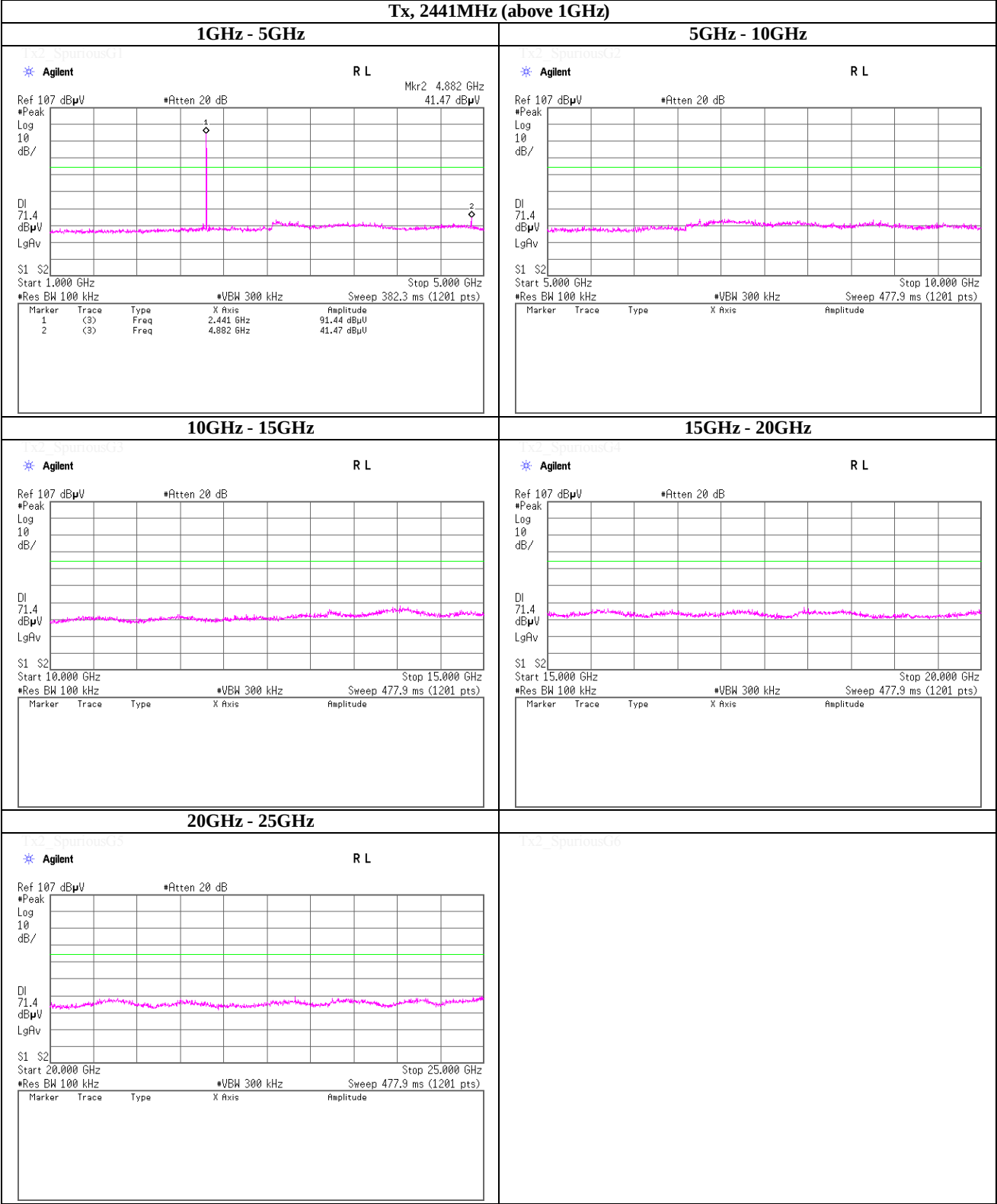
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Telephone : +81 463 50 6400

Facsimile : +81 463 50 6401

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9
Tx, 2441MHz (above 1GHz)



Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

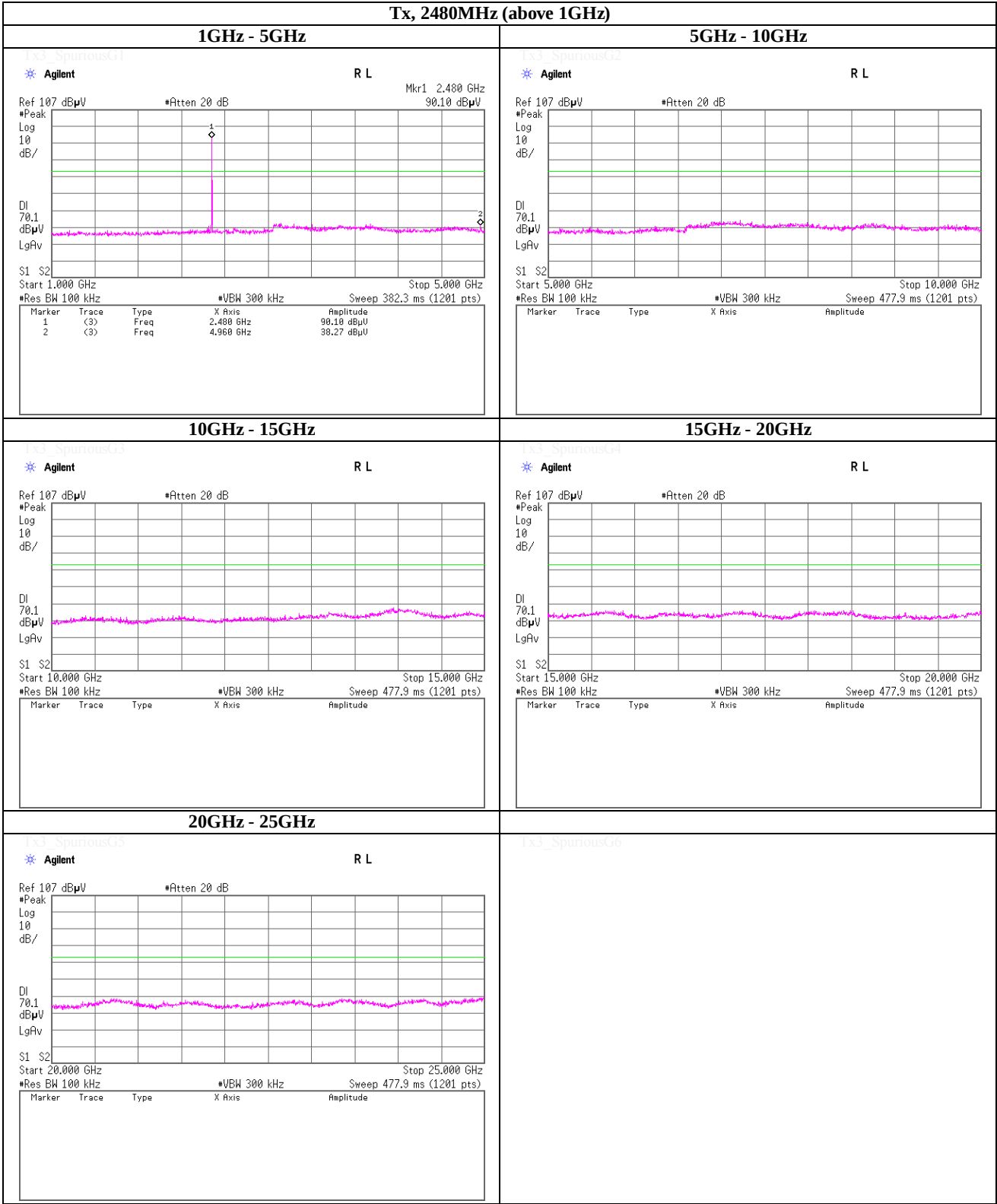
Tx, 2480MHz (below 1GHz)



Spurious emission (Conducted)

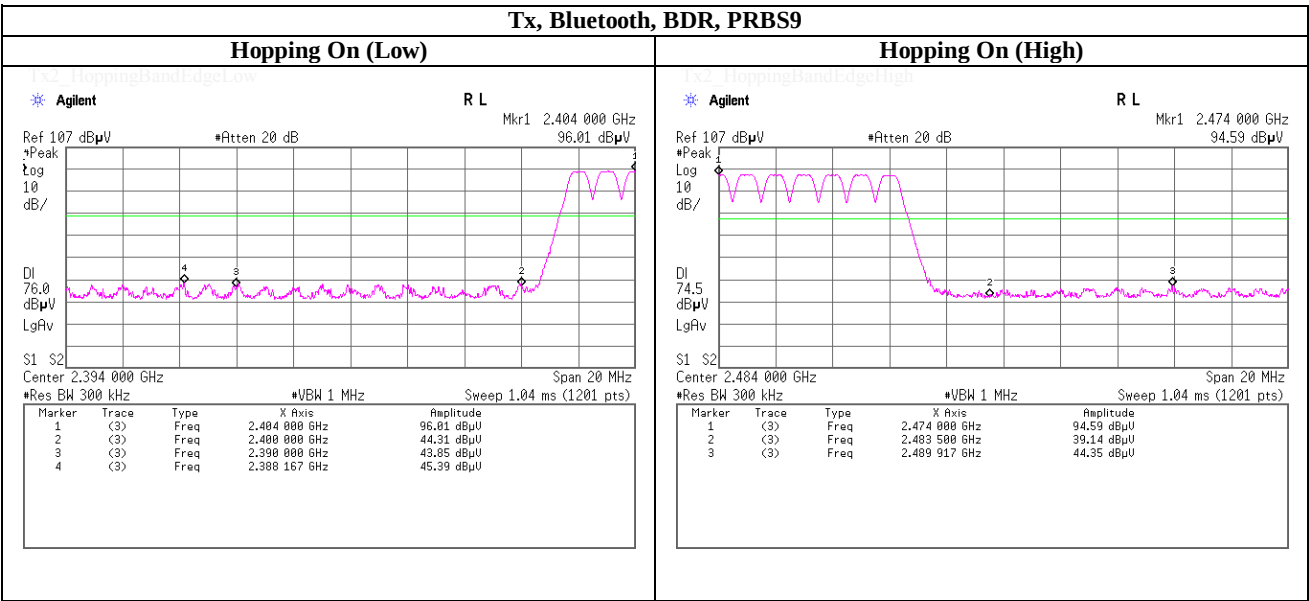
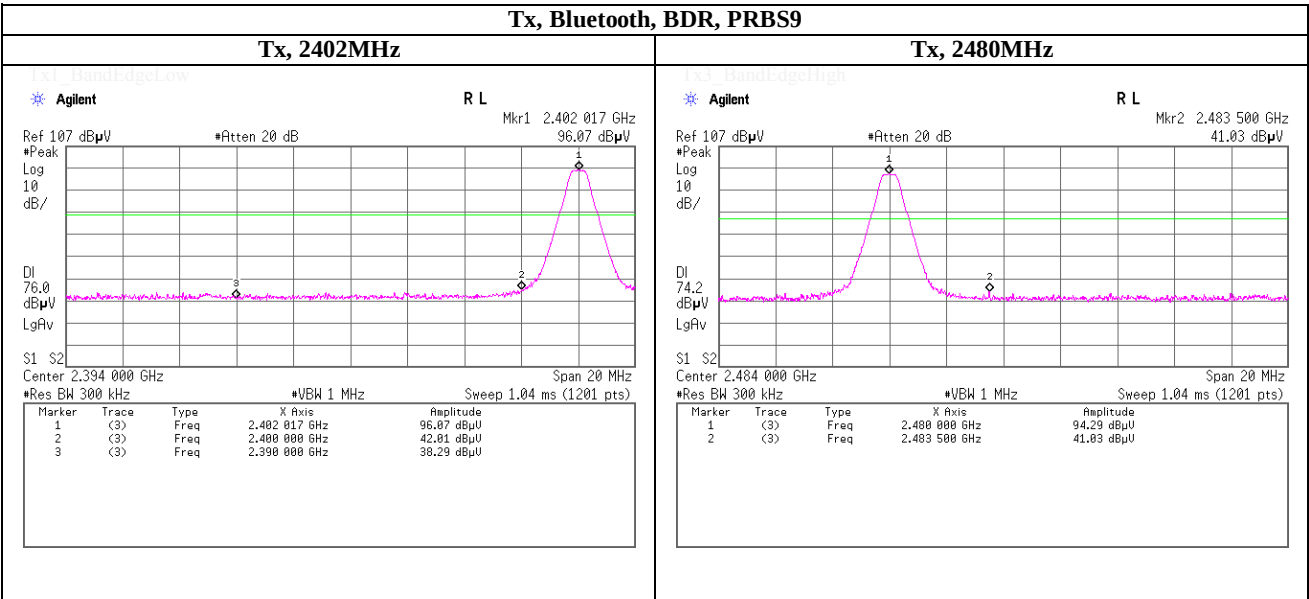
Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (above 1GHz)



Spurious emission (Conducted)

Band Edge compliance



UL Japan, Inc.

Shonan EMC Lab.

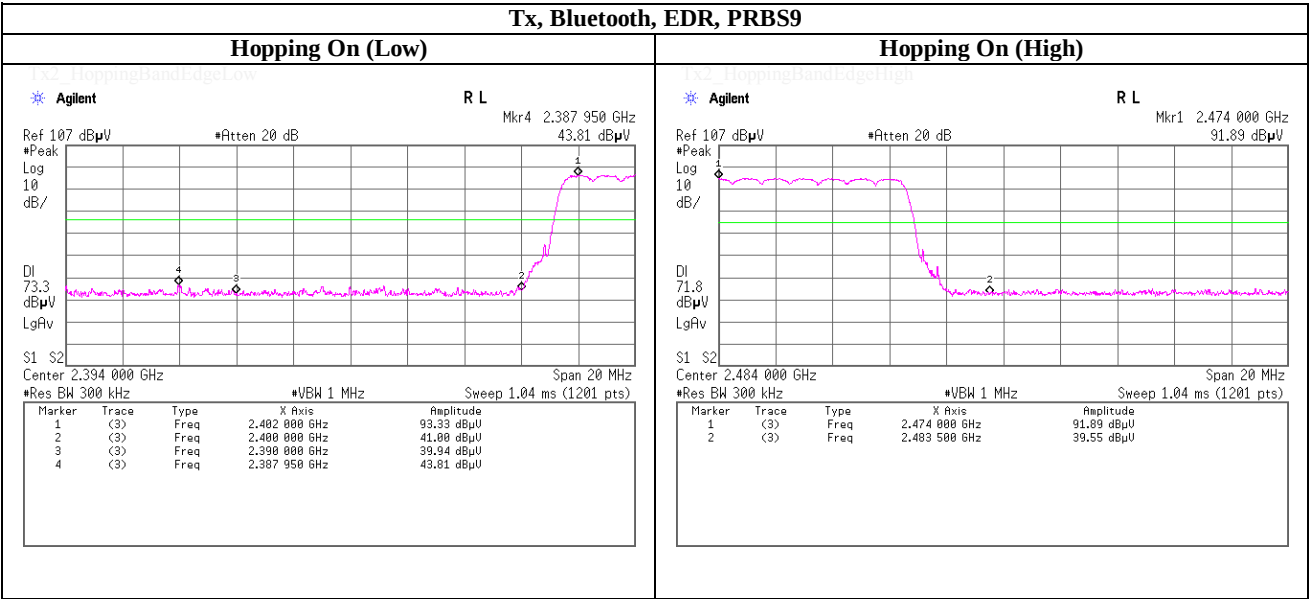
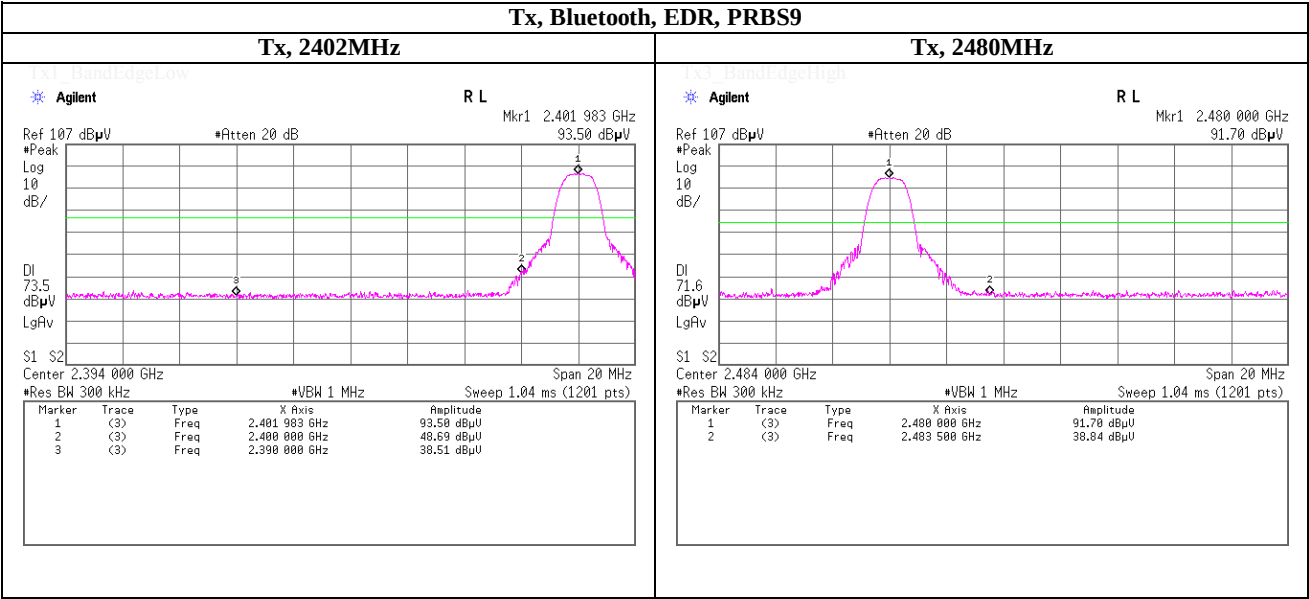
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN

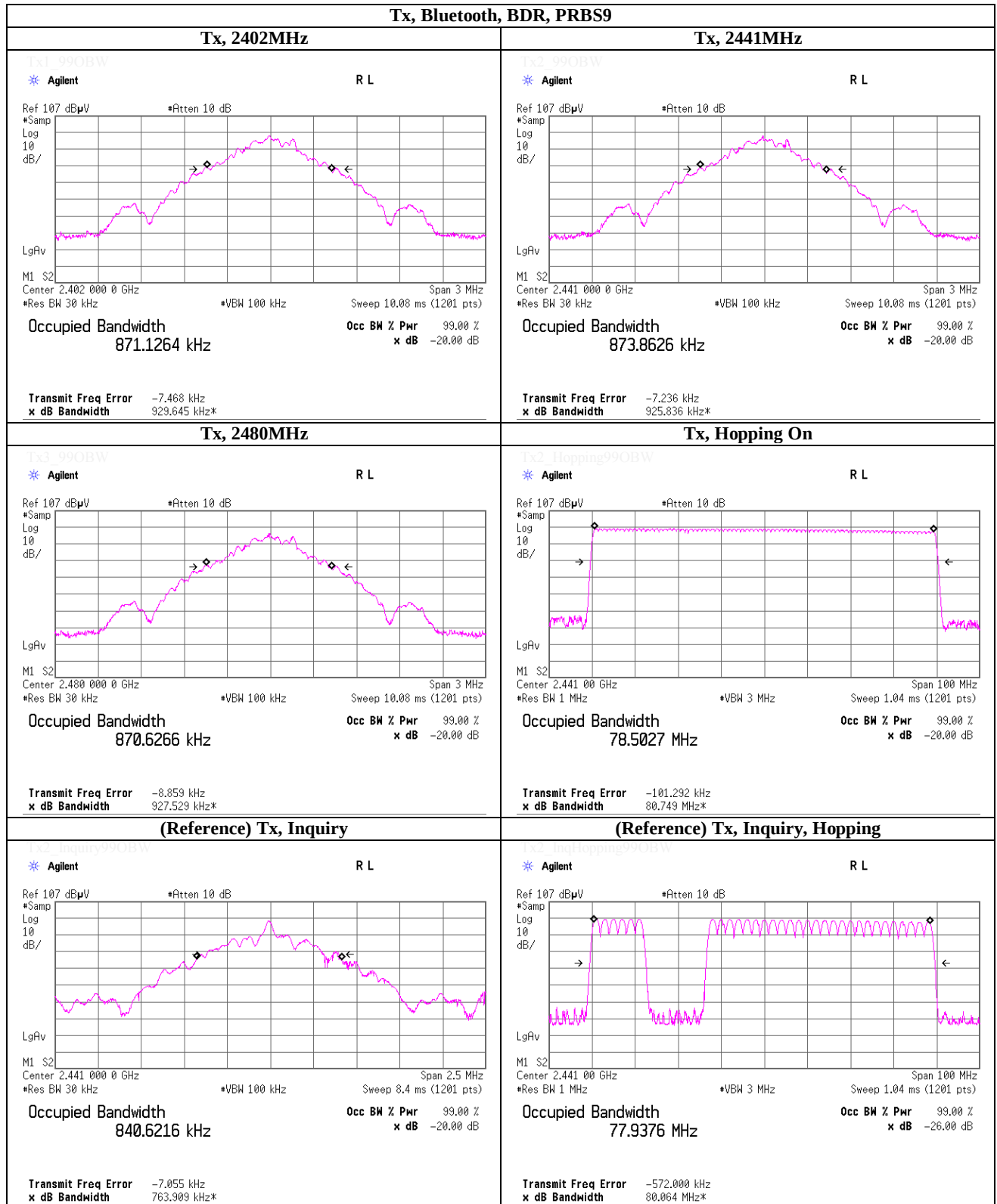
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Spurious emission (Conducted)

Band Edge compliance



99% Occupied Bandwidth**UL Japan, Inc.****Shonan EMC Lab.**

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99% Occupied Bandwidth

Tx, Bluetooth, EDR, PRBS9	
Tx, 2402MHz	Tx, 2441MHz
Tx1_99OBW Agilent R L Ref 107 dBμV #Atten 10 dB #Samp Log 10 dB/ LgAv M1 S2 Center 2.402 000 0 GHz #Res BW 30 kHz #VBW 100 kHz Sweep 10.08 ms (1201 pts) Span 3 MHz Occupied Bandwidth 1.1819 MHz Transmit Freq Error -5.997 kHz x dB Bandwidth 1.273 MHz* Occ BW % Pwr 99.00 % x dB -20.00 dB	Tx2_99OBW Agilent R L Ref 107 dBμV #Atten 10 dB #Samp Log 10 dB/ LgAv M1 S2 Center 2.441 000 0 GHz #Res BW 30 kHz #VBW 100 kHz Sweep 10.08 ms (1201 pts) Span 3 MHz Occupied Bandwidth 1.1787 MHz Transmit Freq Error -6.457 kHz x dB Bandwidth 1.271 MHz* Occ BW % Pwr 99.00 % x dB -20.00 dB
Tx, 2480MHz	Tx, Hopping On
Tx3_99OBW Agilent R L Ref 107 dBμV #Atten 10 dB #Samp Log 10 dB/ LgAv M1 S2 Center 2.480 000 0 GHz #Res BW 30 kHz #VBW 100 kHz Sweep 10.08 ms (1201 pts) Span 3 MHz Occupied Bandwidth 1.1801 MHz Transmit Freq Error -6.422 kHz x dB Bandwidth 1.281 MHz* Occ BW % Pwr 99.00 % x dB -20.00 dB	Tx2_Hopping99OBW Agilent R L Ref 107 dBμV #Atten 10 dB #Samp Log 10 dB/ LgAv M1 S2 Center 2.441 00 GHz #Res BW 1 MHz #VBW 3 MHz Sweep 1.04 ms (1201 pts) Span 100 MHz Occupied Bandwidth 78.5455 MHz Transmit Freq Error -142.953 kHz x dB Bandwidth 81.007 MHz* Occ BW % Pwr 99.00 % x dB -20.00 dB
Tx2_inquiry99OBW	Tx2_inqHopping99OBW

Tx2_99OBW

Agilent

R L

Ref 107 dBμV

#Atten 10 dB

#Samp

Log

10

dB/

LgAv

M1 S2

Center 2.441 000 0 GHz

#Res BW 30 kHz

#VBW 100 kHz

Sweep 10.08 ms (1201 pts)

Span 3 MHz

Occupied Bandwidth

1.1787 MHz

Transmit Freq Error

-6.457 kHz

x dB Bandwidth

1.271 MHz*

Occ BW % Pwr

99.00 %

x dB

-20.00 dB

APPENDIX

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2011/12/05 * 12
SCC-G11	Coaxial Cable	Suhner	SUCOFLEX 102	31595/2	AT	2012/03/12 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2012/04/06 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2012/04/19 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2012/04/19 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2012/03/26 * 12
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2011/09/01 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2012/03/12 * 12
SAT10-05	Attenuator(above1GHz)	Agilent	8493C-010	74864	RE	2011/12/27 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2011/12/27 * 12
SCC-G01	Coaxial Cable	Suhner	SUCOFLEX 104A	46497/4A	RE	2012/04/10 * 12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX 104	296169/4	RE	2012/05/22 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2012/08/20 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2012/02/06 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2012/02/16 * 12
SJM-12	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF,LF)	-	RE	-
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2012/03/30 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2012/03/12 * 12
SCC-G17	Coaxial Cable	Suhner	SUCOFLEX 104A	46291/4A	RE	2012/03/12 * 12
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2012/02/10 * 12
SAT6-05	Attenuator	JFW	50HF-006N	-	RE	2012/02/10 * 12
SAT3-04	Attenuator	JFW	50HF-003N	-	RE	2012/02/10 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2011/10/15 * 12
SCC-A1/A3/A5/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2012/04/10 * 12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2012/04/10 * 12
SLA-01	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0888	RE	2011/11/23 * 12
TR-09	Test Receiver	Rohde & Schwarz	ESCI	100769	RE	2012/09/06 * 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