



Test report No. : 10191284S-A
Page : 1 of 43
Issued date : February 28, 2014
Revised date : March 14, 2014
FCC ID : AJDK082

RADIO TEST REPORT

Test Report No.: 10191284S-A

Applicant : PIONEER CORPORATION
Type of Equipment : Car Audio
Model No. : NVF-8538ZH
FCC ID : AJDK082
Test regulation : FCC Part15 Subpart C: 2013
Test result : Complied

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Date of test: January 28 to February 17, 2014

Representative test engineer:

Hikaru Shirasawa
Engineer of WiSE Japan,
UL Verification Service

Approved by :

Toyokazu Imamura
Leader of WiSE Japan,
UL Verification Service



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13-EM-F0429

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SECTION 1: Customer information

Company Name : PIONEER CORPORATION
Brand name : Pioneer
Address : 25-1 Aza-Nishi-machi, Yamada, Kawagoe-shi, Saitama, 350-8555, JAPAN
Telephone Number : +81-49-228-6415
Facsimile Number : +81-49-228-6493
Contact Person : Tomoyuki Tanaka

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

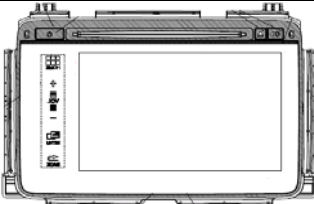
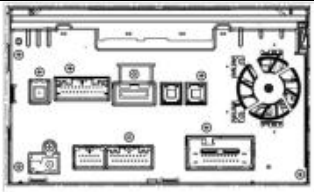
2.1 Identification of E.U.T.

Type of Equipment : Car Audio
Model No. : NVF-8538ZH
Serial No. : Refer to 4.2 of this report.
Rating : DC 13.2V
Country of Mass-production : Japan
Condition of EUT : Engineering 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 : January 28, 2014

2.2 Product description

Model: NVF-8538ZH (referred to as the EUT in this report) is a Car Audio.

The derived model and differences:

Model No.	NVF-8538ZH	NVF-8638ZH	CVH-7738ZH	CVH-7838ZH
Destination	United States	Canada	United States	Canada
Automotive navigation system	Internal	Internal	None	None
G/Gyro Sensor	Internal	Internal	None	None
HD radio Tuner	Internal	Internal	None	None
Front Side Design				
Back Side Design				

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Radio specification:

Bluetooth:

Equipment type : Transceiver
Frequency of operation : 2402-2480MHz
Bandwidth & channel spacing : 79MHz & 1MHz
Type of modulation : GFSK, $\pi/4$ DQPSK, 8DPSK
Antenna type : Inverted-F Antenna
Antenna gain with cable loss : -0.84dBi (max)
Antenna connector type : None
Operation temperature range : -20 to +70 deg.C.

Wireless LAN:

Equipment type : Transceiver
Frequency of operation : 2412-2462MHz
Bandwidth & channel spacing : 5MHz
Type of modulation : CCK, OFDM
Antenna type : Inverted-F Antenna
Antenna gain with cable loss : -1.30dBi (max)
Antenna connector type : None
Operation temperature range : -20 to +70 deg.C.

Refer to the test report: 10191284S-C for Wireless LAN part.

The clock frequencies used in the EUT:

- (1) FM/AM TUNER CLOCK: 41.6MHz, 16.384MHz, 8.192MHz, 2.048MHz
- (2) MICRO COMPUTER CLOCK: 25MHz, 3.98MHz, 32.768kHz
- (3) DDR3 CLOCK: 533MHz
- (4) AUDIO CLOCK: 24.576MHz, 11.2896MHz, 4.096MHz, 3.072MHz, 2.8224MHz, 1.024MHz, 133.33kHz, 48kHz, 44.1kHz, 512kHz, 16kHz, 8kHz
- (5) VIDEO: 37MHz, 24.576MHz, 27MHz
- (6) LED: 100kHz
- (7) HDMI: 28.636MHz
- (8) USB: 48MHz
- (9) WLAN: 50MHz
- (10) POWER: 2.1MHz, 615kHz, 404kHz

FCC 15.31 (e)

The equipment provides the wireless transmitter with stable power supply (DC3.3V $\pm$ 0.1V). Therefore, the equipment complies with the requirement.

FCC 15.203

The equipment and its antenna comply with the requirement since the antenna is built in the equipment and it cannot be replaced by end users.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2013,
final revised on September 30, 2013 and effective October 30, 2013
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits, general requirements
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz,
and 5725-5850MHz

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	6.1dB Freq.: 336.000MHz Polarization: Horizontal Detection: Quasi-Peak Mode: Tx 2441MHz, DH5	Complied

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

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

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3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Worst Margin	Results
Occupied Bandwidth (99%)	ANSI C63.4:2009 13. Measurement of intentional radiators, RSS-Gen 4.6.1	-	Conducted	-	-
Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422					

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

3.4 Uncertainty

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

Item	Frequency range	No.1 SAC ^{*1} /SR ^{*2} (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.7 dB	3.7 dB	3.6 dB
	30MHz-300MHz	4.8 dB	5.0 dB	4.8 dB
	300MHz-1GHz	5.0 dB	5.0 dB	4.8 dB
	1GHz-15GHz	4.9 dB	4.9 dB	4.9 dB
Radiated emission (Measurement distance: 1m)	15GHz-18GHz	5.7 dB	5.6 dB	5.6 dB
	18GHz-40GHz	5.2 dB	4.3 dB	4.3 dB

*1: SAC=Semi-Anechoic Chamber

*2: SR= Shielded Room is applied besides radiated emission

The data listed in this test report has enough margin, more than the 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
☐ 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 semi-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	-
☒ No.1 measurement room	-	-	2.55 x 4.1 x 2.5	-	-

3.6 Test setup, Data of test & Test instruments

Refer to APPENDIX 1 to 3.

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

4.1 Operating mode

Test item	Operating mode	Tested frequency
Carrier frequency separation	Transmitting Hopping ON (DH5 / 3-DH5) / Inquiry, Payload: PRBS9	-
20dB bandwidth	Transmitting Hopping OFF (DH5 / 3-DH5) / Inquiry, Payload: PRBS9	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting Hopping ON (DH5 / 3-DH5) / Inquiry, Payload: PRBS9	-
Dwell time	Transmitting (Hopping ON), Payload: PRBS9 - DH1, - DH3, - DH5 - 3-DH1, - 3-DH3, - 3-DH5	-
	-Inquiry	
Maximum peak output power	Transmitting Hopping OFF, Payload: PRBS9 - DH5, - 2-DH5, - 3-DH5	2402MHz, 2441MHz, 2480MHz
Band edge compliance & Spurious emission	Transmitting (DH5 / 3-DH5), Payload: PRBS9 -Hopping OFF	Band edge compliance: 2402MHz, 2480MHz Spurious emission: 2402MHz, 2441MHz, 2480MHz
99% occupied bandwidth	Transmitting (DH5 / 3-DH5), Payload: PRBS9 / Inquiry -Hopping ON -Hopping OFF	2402MHz, 2441MHz, 2480MHz

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

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

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

Software: System uCom: H41F10 21.29.12, Application: 1.D100.30

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

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

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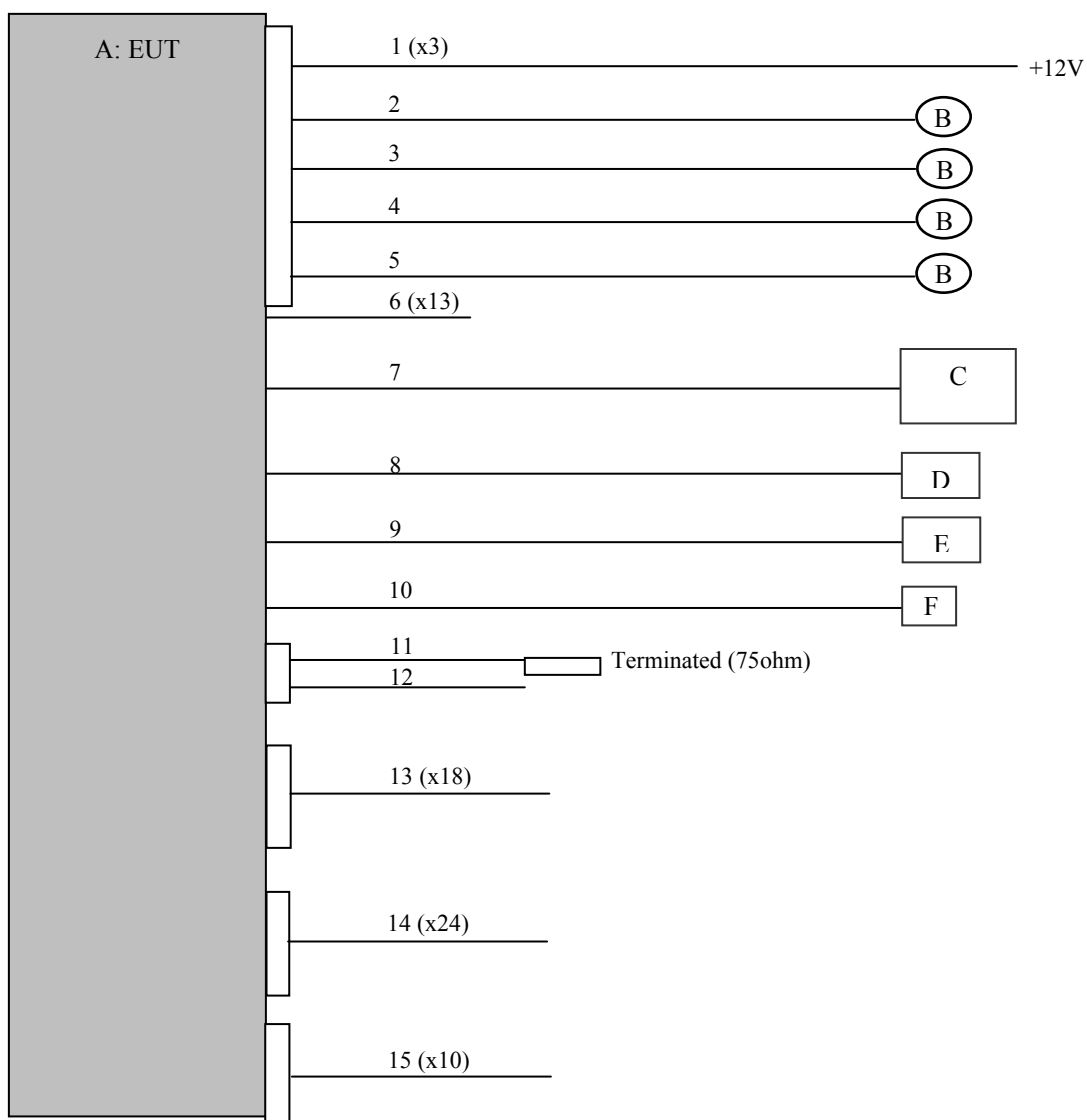
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4.2 Configuration and peripherals



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Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Audio	NVF-8538ZH	*1)	PIONEER	EUT
B	Speaker	LV-002	S11014200773 (x2) S11014200775 (x2)	L&V	-
C	Tablet Computer	Nexus 7 (2013) ME571-16G	07924744	ASUS	-
D	iPod nano	A1199	YM7034TTVQH	Apple	-
E	iPod nano	A1137	YM619HBMUNA	Apple	-
F	GPS antenna	CXB2773	SCP	PIONEER	-

*1) MLPGTP0001US: Antenna port conducted tests, MLPGTP0003US: Radiated emission

List of cables used

No.	Cable name	Length (m)	Shield (Cable)	Shield (Connector)	Remarks
1	DC	1.2+0.6	Unshielded	Unshielded	ACC, +B, GND
2	Speaker	0.8+3.0	Unshielded	Unshielded	-
3	Speaker	0.8+3.0	Unshielded	Unshielded	-
4	Speaker	0.8+3.0	Unshielded	Unshielded	-
5	Speaker	0.8+3.0	Unshielded	Unshielded	-
6	Signal	0.4	Unshielded	Unshielded	-
7	HDMI	0.2+3.0	Shielded	Shielded	-
8	USB	0.3+1.0	Shielded	Shielded	-
9	USB	0.3+1.0	Shielded	Shielded	-
10	GPS Antenna	5.0	Shielded	Shielded	-
11	Radio	0.2	Shielded	Shielded	-
12	Radio	0.2	Shielded	Shielded	-
13	H-5-1 connector	0.3	Unshielded	Unshielded	-
14	H-3-1 connector	0.3	Unshielded	Unshielded	-
15	H-2 connector	0.4 (x5) 1.0 (x5)	Unshielded	Unshielded	-

*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 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.

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 1.5m, raised 0.8m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Photographs of the set up are shown in APPENDIX 3.

11.3 Test conditions

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

11.4 Test procedure

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

The radiated emission measurements were made with the following detection.

Frequency	30 - 1000MHz	1 - 25GHz	
Detection Type	: Quasi-Peak	Peak	* Average
IF Bandwidth	: 120kHz	RBW:1MHz	RBW:1MHz
		VBW:3MHz	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 axis of EUT was fixed at angle of 34 deg. based on the product specification.

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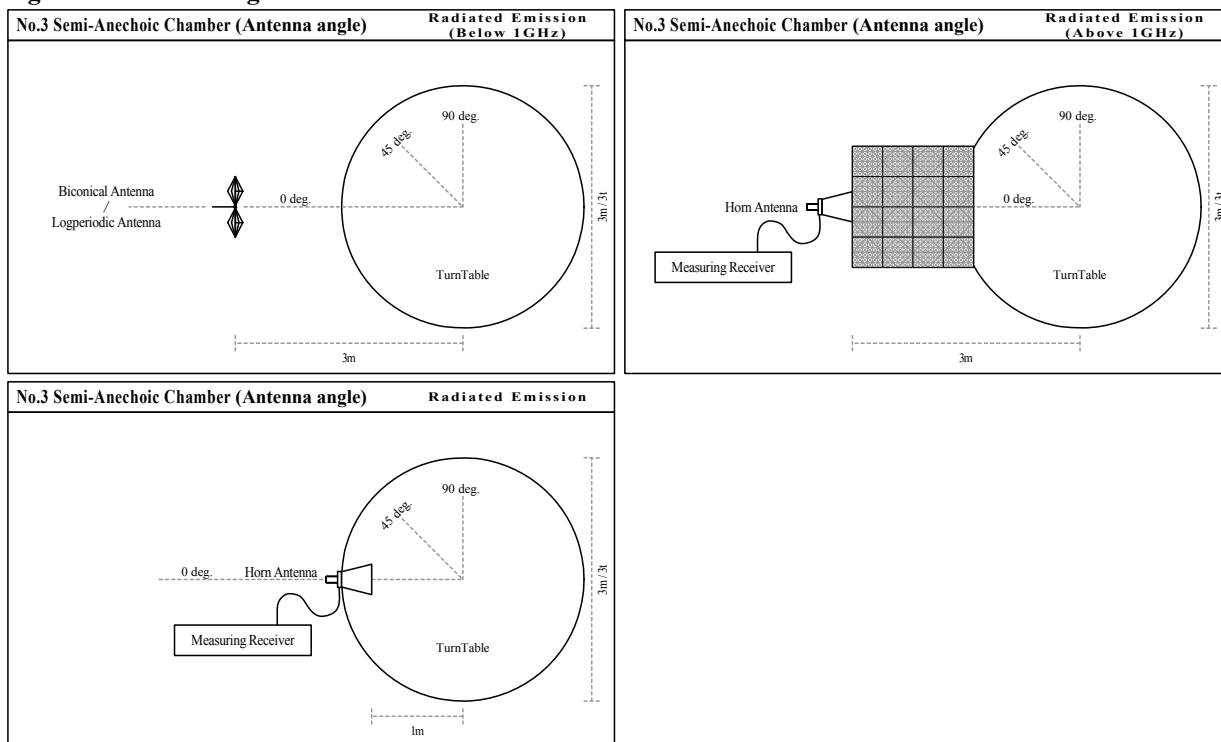
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Figure 1. Antenna angle



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 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
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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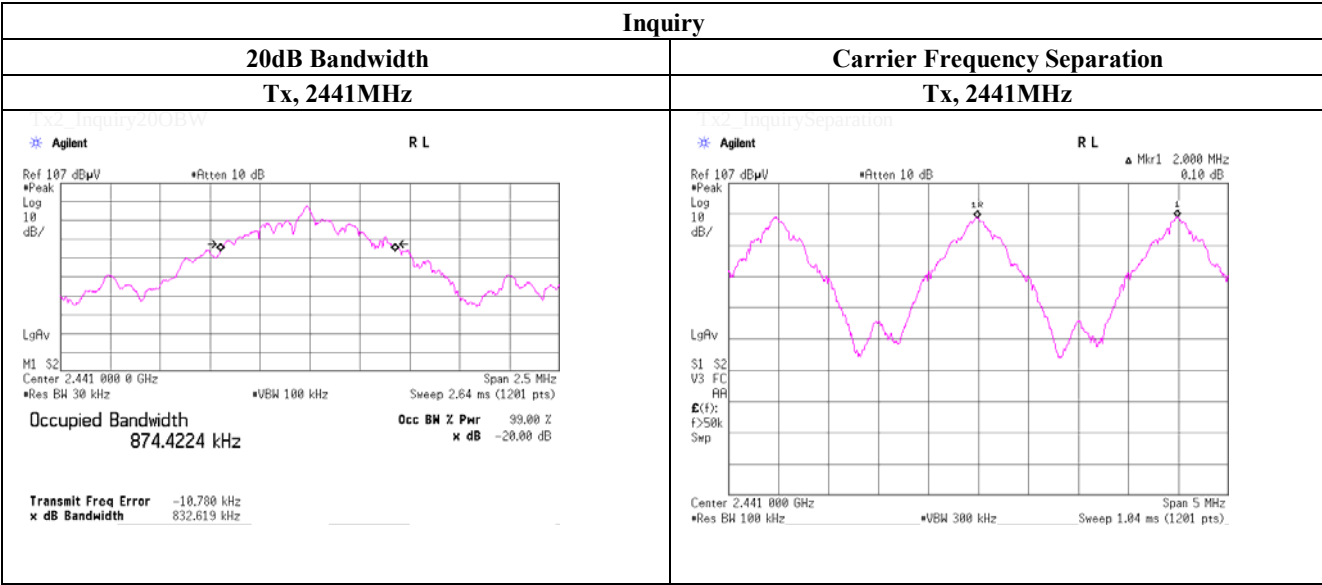
APPENDIX 1: Data of Radio tests

20dB Bandwidth and Carrier Frequency Separation

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 28, 2014	
Temperature / Humidity	25 deg.C , 46 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.960	1.008	>= 0.640
DH5	2441.0	0.963	1.008	>= 0.642
DH5	2480.0	0.961	1.000	>= 0.641
Inquiry	2441.0	0.833	2.000	>= 0.555

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

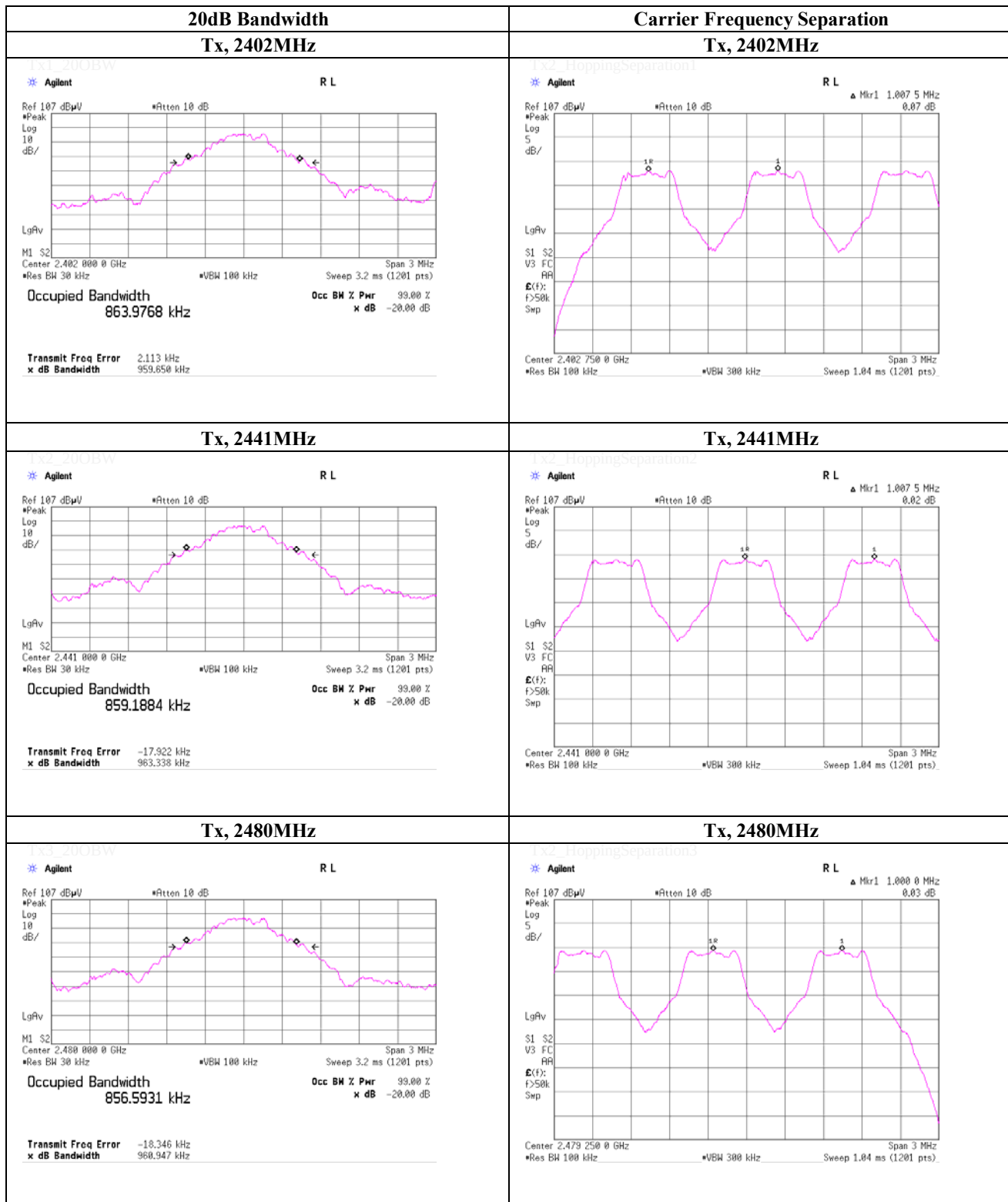


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Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date January 28, 2014
 Temperature / Humidity 25 deg.C , 46 %RH
 Engineer Hikaru Shirasawa

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.1 Measurement Room
Date January 28, 2014
Temperature / Humidity 25 deg.C , 46 %RH
Engineer Hikaru Shirasawa
Mode Tx, Bluetooth, EDR, PRBS9

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
3-DH5	2402.0	1.287	1.013	>= 0.858
3-DH5	2441.0	1.280	1.005	>= 0.853
3-DH5	2480.0	1.282	1.008	>= 0.855

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

Tx2_Inquiry20OBW

Tx2_InquirySeparation

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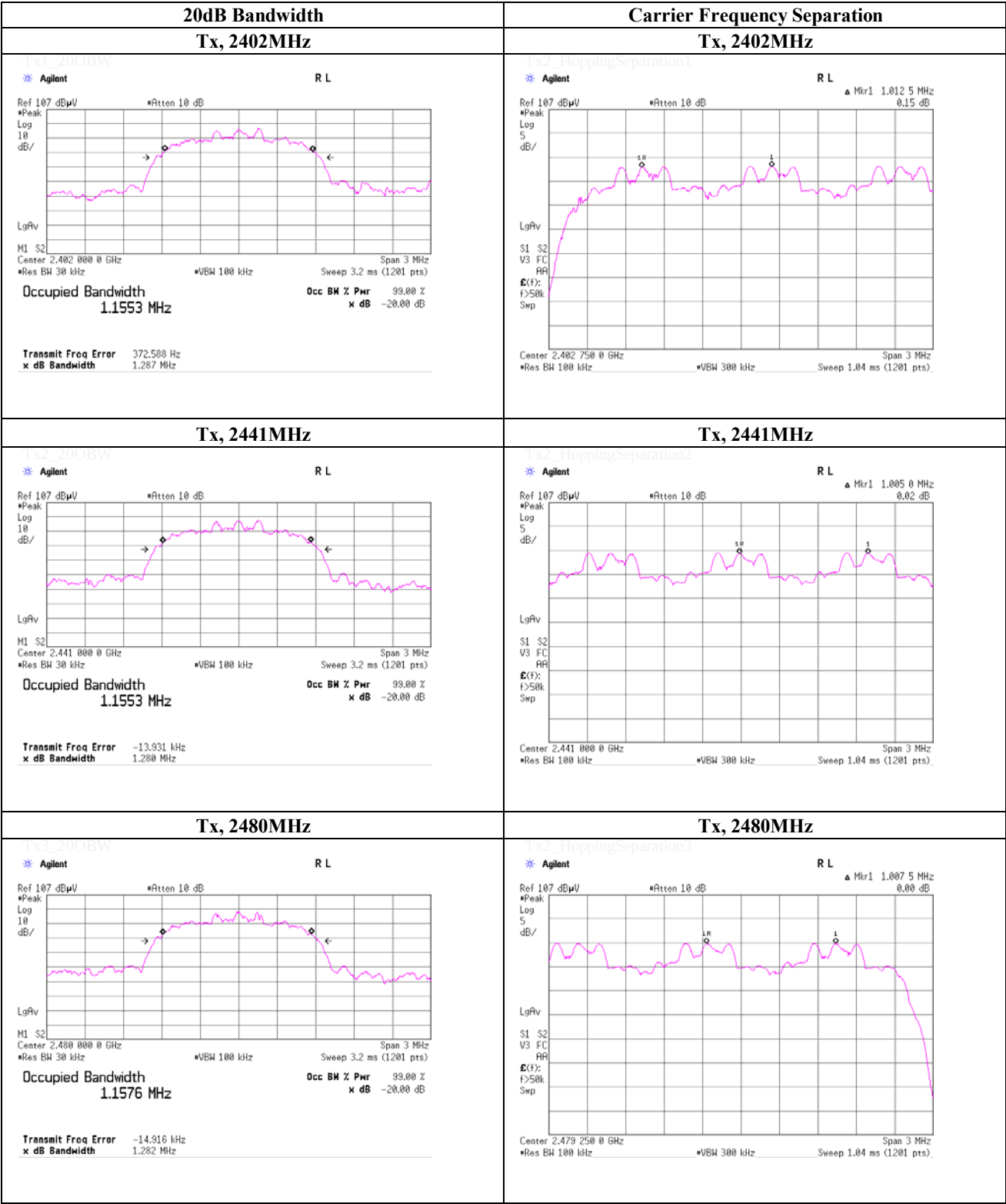
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Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
Date January 28, 2014
Temperature / Humidity 25 deg.C , 46 %RH
Engineer Hikaru Shirasawa

20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, PRBS9



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Number of Hopping Frequency

Test place

UL Japan, Inc. Shonan EMC Lab.

No.1 Measurement Room

Date

January 28, 2014

Temperature / Humidity

25 deg.C , 46 %RH

Engineer

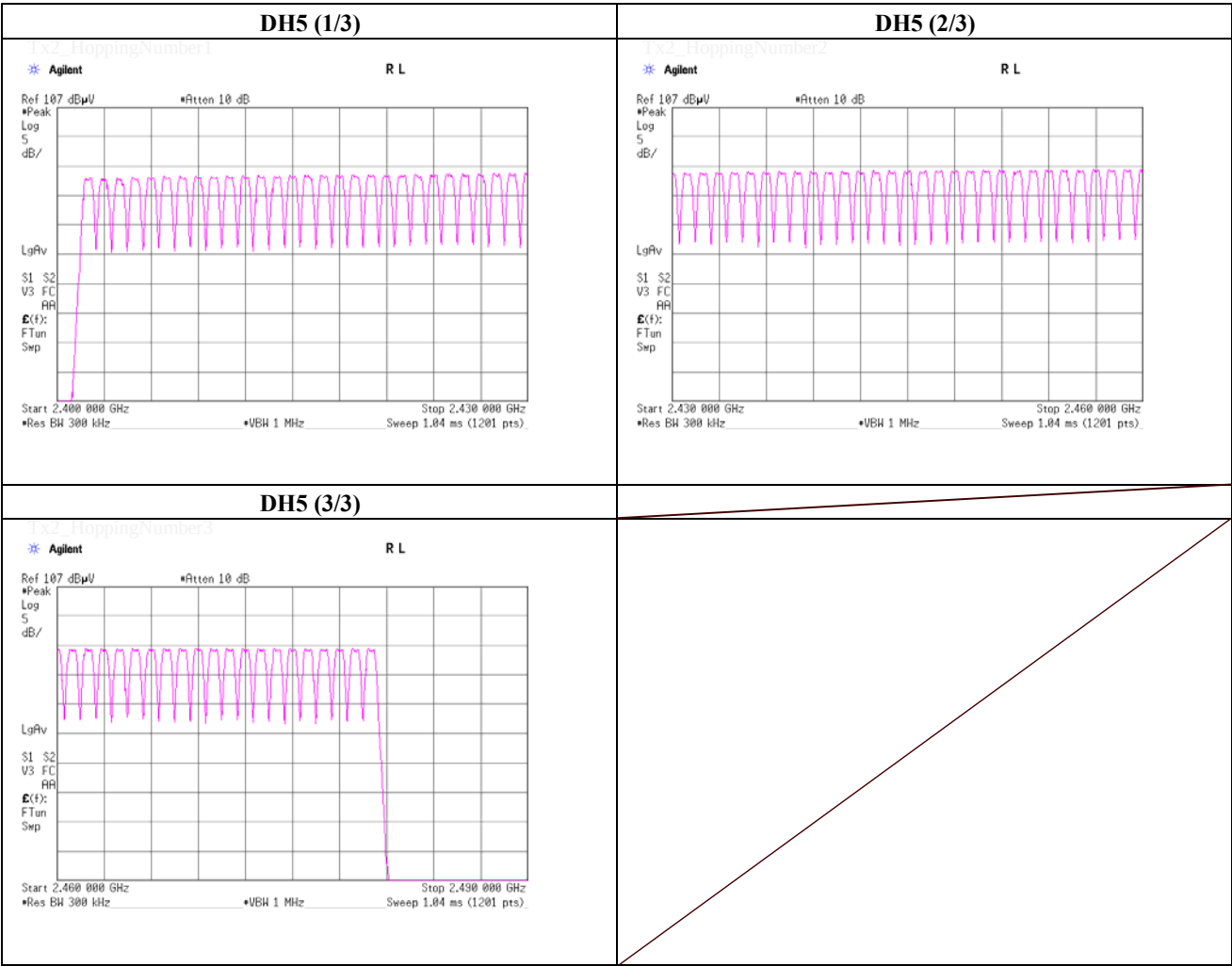
Hikaru Shirasawa

Mode

Tx, Bluetooth, BDR, PRBS9

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

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



Number of Hopping Frequency

Test place

Date

Temperature / Humidity

Engineer

Mode

UL Japan, Inc. Shonan EMC Lab.

January 28, 2014

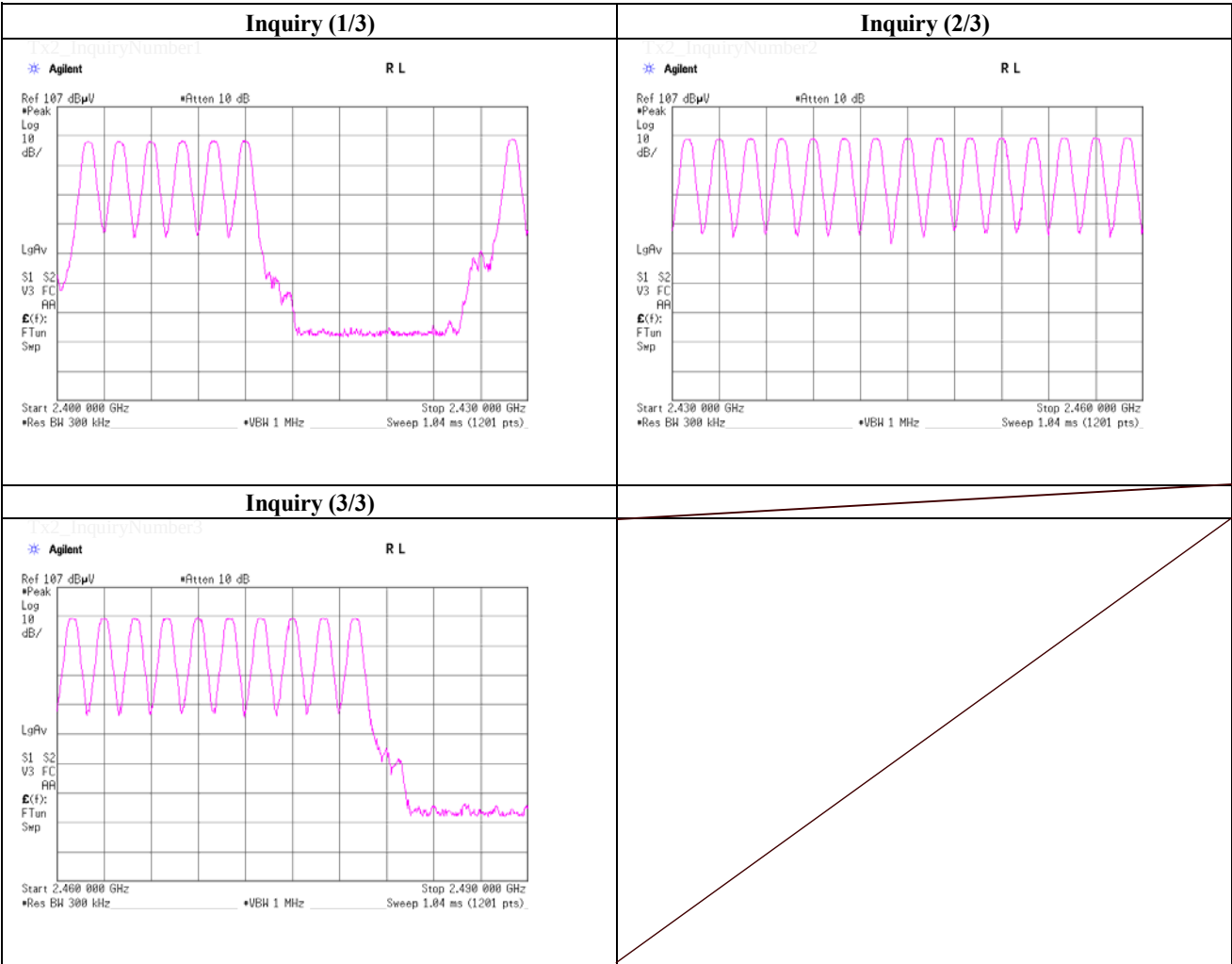
25 deg.C , 46 %RH

Hikaru Shirasawa

Tx, Bluetooth, Inquiry

No.1 Measurement Room

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



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Number of Hopping Frequency

Test place

UL Japan, Inc. Shonan EMC Lab.

No.1 Measurement Room

Date

January 28, 2014

Temperature / Humidity

25 deg.C , 46 %RH

Engineer

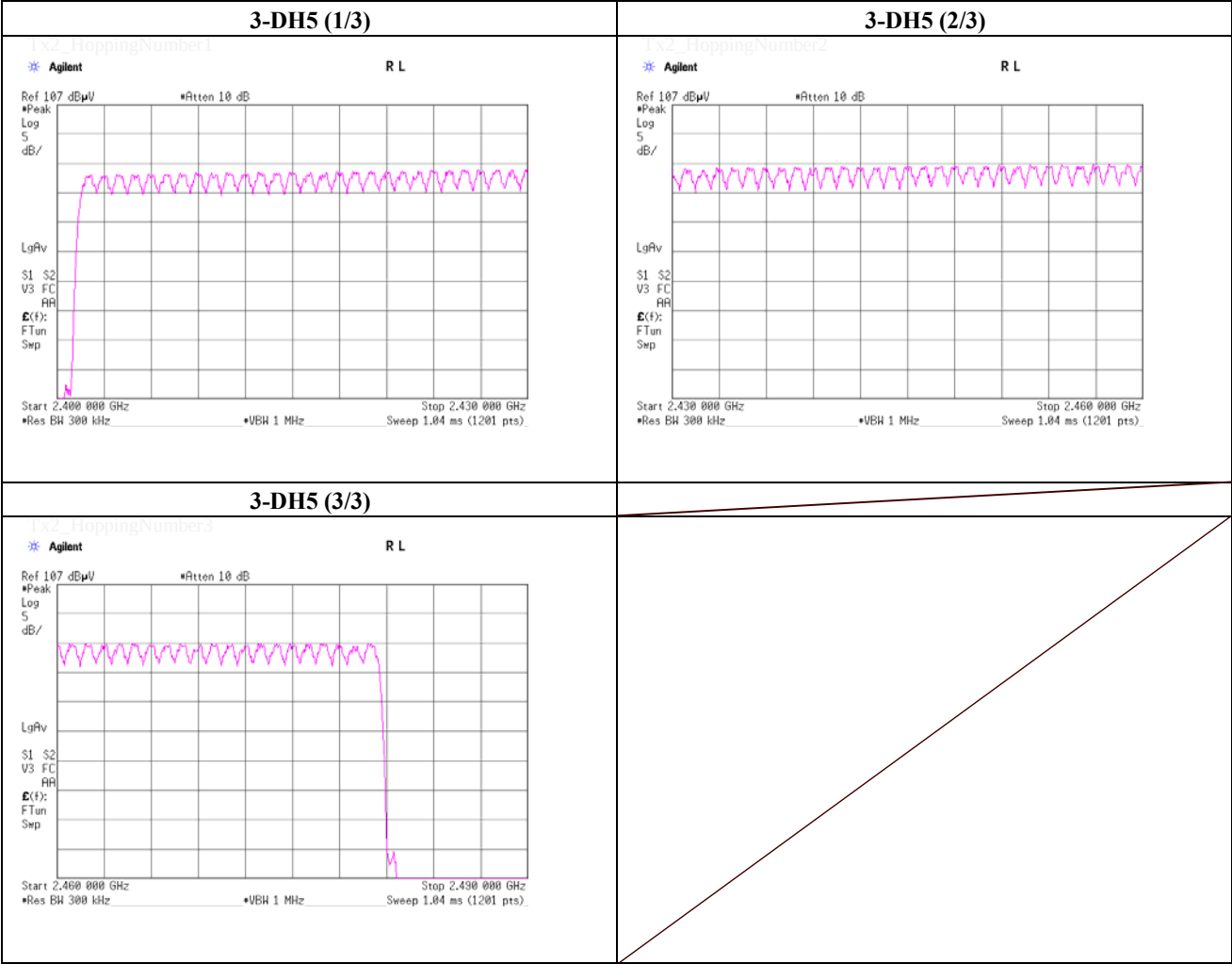
Hikaru Shirasawa

Mode

Tx, Bluetooth, EDR, PRBS9

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

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



Dwell Time

Test place

UL Japan, Inc. Shonan EMC Lab.

No.1 Measurement Room

Date

January 28, 2014

Temperature / Humidity

25 deg.C , 46 %RH

Engineer

Hikaru Shirasawa

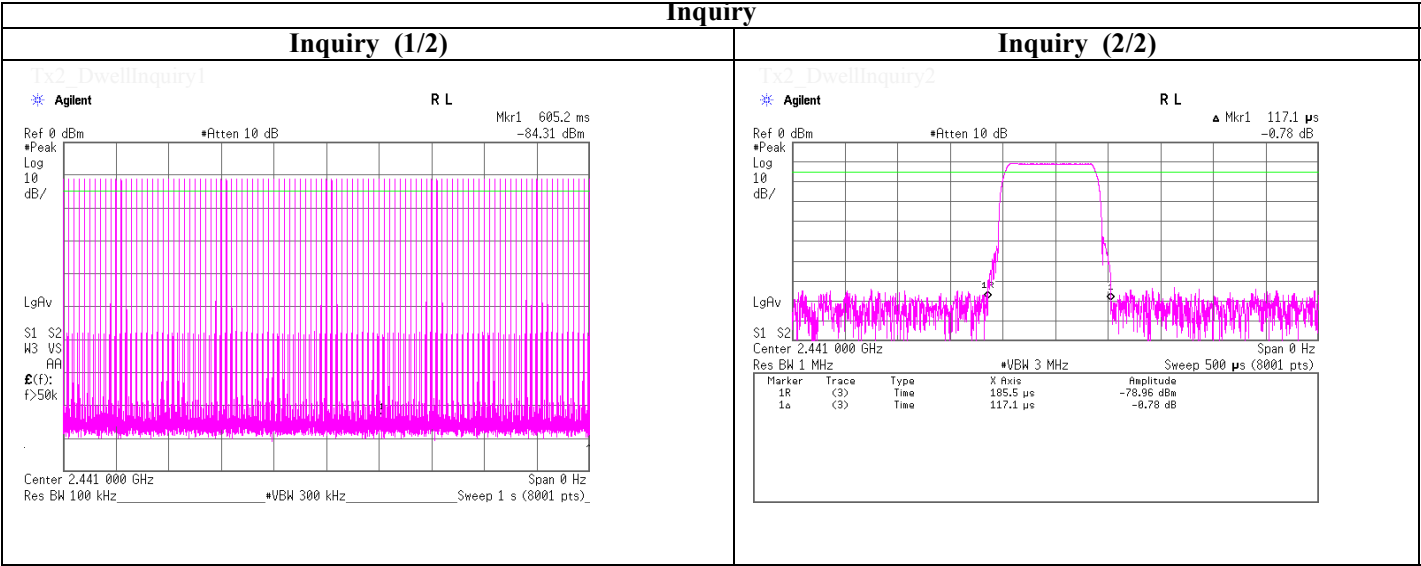
Mode

Tx, Bluetooth, BDR, PRBS9

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period		Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	50.0	/ 5.0 sec. x 31.6 sec. = 316 times	0.416	132	400
DH3	26.0	/ 5.0 sec. x 31.6 sec. = 165 times	1.671	276	400
DH5	17.0	/ 5.0 sec. x 31.6 sec. = 108 times	2.919	315	400
Inquiry	100.0	/ 1.0 sec. x 12.8 sec. = 1280 times	0.117	150	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 $N=79$.



Test place

UL Japan, Inc. Shonan EMC Lab.

No.1 Measurement Room

Date

January 28, 2014

Temperature / Humidity

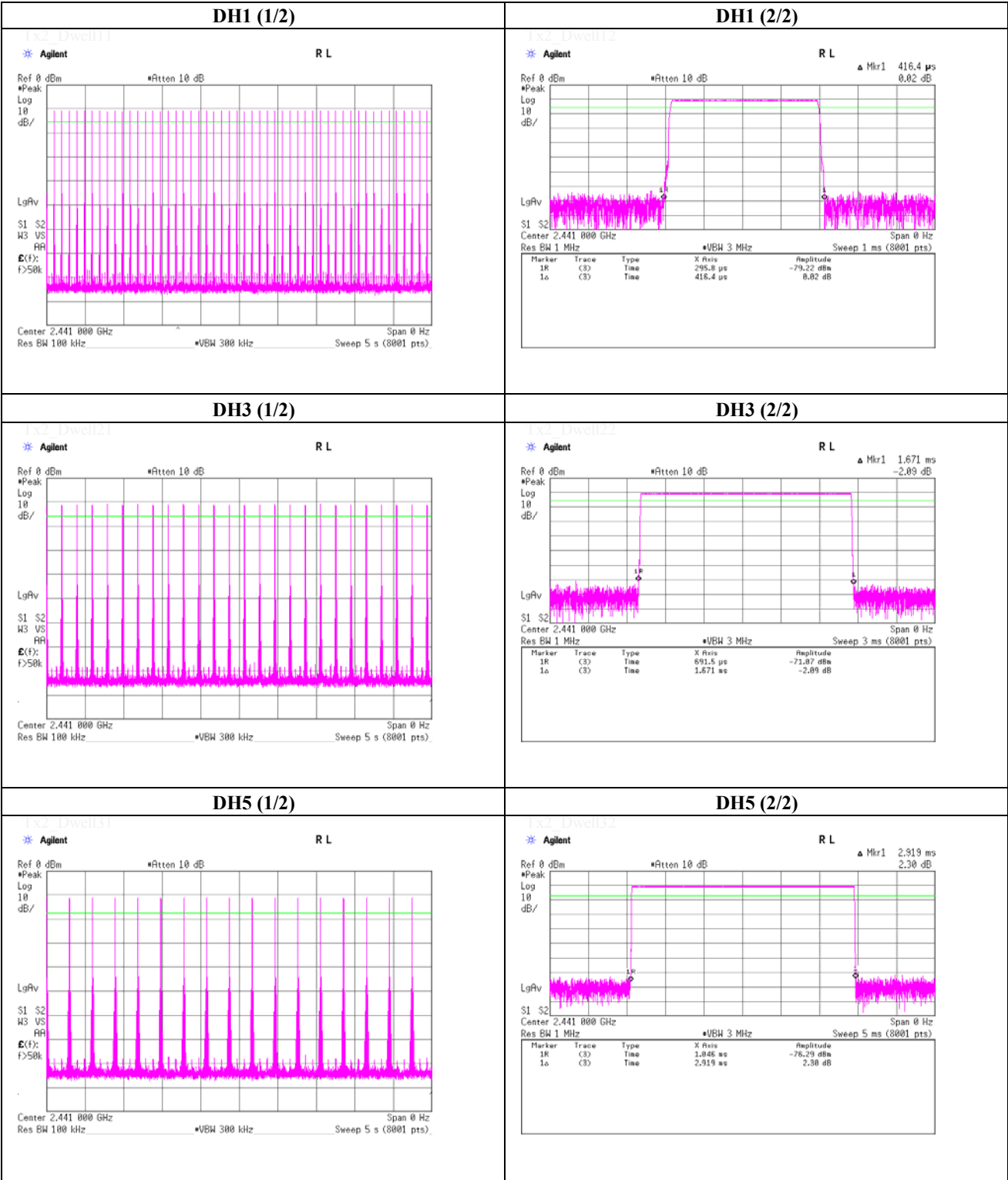
25 deg.C , 46 %RH

Engineer

Hikaru Shirasawa

Dwell time

Tx, Bluetooth, BDR, PRBS9



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Dwell Time

Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
 Date January 28, 2014
 Temperature / Humidity 25 deg.C , 46 %RH
 Engineer Hikaru Shirasawa
 Mode Tx, Bluetooth, EDR, PRBS9

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) second			Length of transmission time [msec]	Result [msec]	Limit [msec]
3-DH1	50.0	/ 5.0 sec.	x 31.6 sec. = 316 times	0.429	135	400
3-DH3	26.0	/ 5.0 sec.	x 31.6 sec. = 165 times	1.681	277	400
3-DH5	17.0	/ 5.0 sec.	x 31.6 sec. = 108 times	2.927	316	400

Sample Calculation

Result = Number of transmission x Length of transmission time

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

Tx2_DwellInquiry1

Tx2_DwellInquiry2

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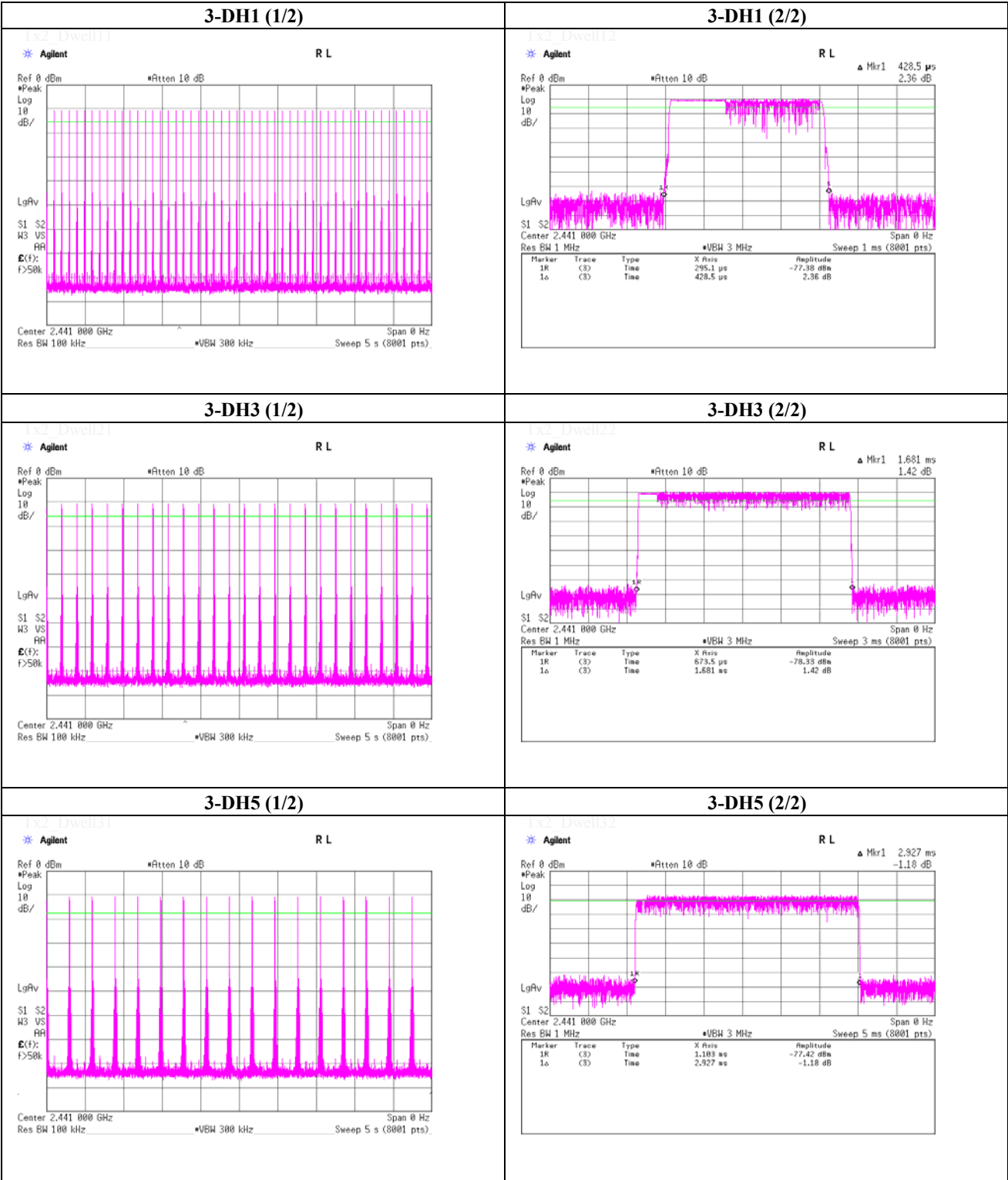
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Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
Date January 28, 2014
Temperature / Humidity 25 deg.C , 46 %RH
Engineer Hikaru Shirasawa

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.1 Measurement Room
 Date January 30, 2014
 Temperature / Humidity 25deg.C , 49%RH
 Engineer Akio Hayashi
 Mode Tx, Bluetooth

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

	Freq. [MHz]	P/M (Peak) Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]	
DH5	2402.0	-11.31	1.17	9.65	-0.49	0.89	20.97	125	21.46
DH5	2441.0	-10.33	1.11	9.66	0.44	1.11	20.97	125	20.53
DH5	2480.0	-10.08	1.13	9.66	0.71	1.18	20.97	125	20.26
2-DH5	2402.0	-10.06	1.17	9.65	0.76	1.19	20.97	125	20.21
2-DH5	2441.0	-8.90	1.11	9.66	1.87	1.54	20.97	125	19.10
2-DH5	2480.0	-8.42	1.13	9.66	2.37	1.73	20.97	125	18.60
3-DH5	2402.0	-9.68	1.17	9.65	1.14	1.30	20.97	125	19.83
3-DH5	2441.0	-8.57	1.11	9.66	2.20	1.66	20.97	125	18.77
3-DH5	2480.0	-8.12	1.13	9.66	2.67	1.85	20.97	125	18.30

Sample Calculation:

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date February 13, 2014 February 17, 2014
 Temperature / Humidity 20 deg.C, 30 %RH 22 deg.C, 38 %RH
 Engineer Tatsuya Arai Takahiro Suzuki
 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.	204.000	QP	42.8	16.5	8.0	32.0	35.3	43.5	8.2	150	233	
Hori.	228.005	QP	46.6	16.8	8.1	32.0	39.5	46.0	6.5	150	229	
Hori.	336.004	QP	48.3	14.7	8.7	31.9	39.8	46.0	6.2	100	130	
Hori.	360.010	QP	43.4	15.3	8.9	31.9	35.7	46.0	10.3	100	145	
Hori.	432.003	QP	43.4	16.6	9.2	31.9	37.3	46.0	8.7	100	31	
Hori.	2390.000	PK	45.7	26.8	14.7	38.2	49.0	73.9	24.9	100	63	
Hori.	2400.000	PK	51.5	26.8	14.7	38.2	54.8	73.9	19.1	100	63	
Hori.	2918.672	PK	49.0	28.0	6.9	38.1	45.8	73.9	28.1	100	131	
Hori.	3394.283	PK	48.8	28.1	6.7	38.0	45.6	73.9	28.3	100	144	
Hori.	4804.000	PK	43.8	30.9	7.9	37.1	45.5	73.9	28.4	100	0	
Hori.	7206.000	PK	45.5	37.1	9.1	39.4	52.3	73.9	21.6	100	0	
Hori.	9608.000	PK	43.5	38.6	10.2	37.6	54.7	73.9	19.2	100	0	
Hori.	12010.000	PK	44.3	39.6	11.2	38.5	56.6	73.9	17.3	100	0	
Hori.	2390.000	AV	32.2	26.8	14.7	38.2	35.5	53.9	18.4	100	63	
Hori.	2400.000	AV	36.5	26.8	14.7	38.2	39.8	53.9	14.1	100	63	
Hori.	2918.672	AV	41.8	28.0	6.9	38.1	38.6	53.9	15.3	100	131	
Hori.	3394.283	AV	41.7	28.1	6.7	38.0	38.5	53.9	15.4	100	144	
Hori.	4804.000	AV	31.6	30.9	7.9	37.1	33.3	53.9	20.6	100	0	
Hori.	7206.000	AV	33.8	37.1	9.1	39.4	40.6	53.9	13.3	100	0	
Hori.	9608.000	AV	32.0	38.6	10.2	37.6	43.2	53.9	10.7	100	0	
Hori.	12010.000	AV	32.3	39.6	11.2	38.5	44.6	53.9	9.3	100	0	
Vert.	850.003	QP	34.3	21.1	10.7	31.3	34.8	46.0	11.2	100	190	
Vert.	2390.000	PK	44.8	26.8	14.7	38.2	48.1	73.9	25.8	100	153	
Vert.	2400.000	PK	51.3	26.8	14.7	38.2	54.6	73.9	19.3	100	153	
Vert.	2903.783	PK	49.1	28.0	6.9	38.1	45.9	73.9	28.0	100	140	
Vert.	3444.701	PK	49.3	28.0	6.7	38.0	46.0	73.9	27.9	100	152	
Vert.	4804.000	PK	45.5	30.9	7.9	37.1	47.2	73.9	26.7	100	0	
Vert.	7206.000	PK	45.3	37.1	9.1	39.4	52.1	73.9	21.8	100	0	
Vert.	9608.000	PK	41.8	38.6	10.2	37.6	53.0	73.9	20.9	100	0	
Vert.	12010.000	PK	44.4	39.6	11.2	38.5	56.7	73.9	17.2	100	0	
Vert.	2390.000	AV	31.6	26.8	14.7	38.2	34.9	53.9	19.0	100	153	
Vert.	2400.000	AV	37.1	26.8	14.7	38.2	40.4	53.9	13.5	100	153	
Vert.	2903.783	AV	42.4	28.0	6.9	38.1	39.2	53.9	14.7	100	140	
Vert.	3444.701	AV	42.0	28.0	6.7	38.0	38.7	53.9	15.2	100	152	
Vert.	4804.000	AV	31.1	30.9	7.9	37.1	32.8	53.9	21.1	100	0	
Vert.	7206.000	AV	33.2	37.1	9.1	39.4	40.0	53.9	13.9	100	0	
Vert.	9608.000	AV	31.6	38.6	10.2	37.6	42.8	53.9	11.1	100	0	
Vert.	12010.000	AV	32.1	39.6	11.2	38.5	44.4	53.9	9.5	100	0	

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

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date February 13, 2014 February 17, 2014
 Temperature / Humidity 20 deg.C, 30 %RH 22 deg.C, 38 %RH
 Engineer Tatsuya Arai Takahiro Suzuki
 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.	204.141	QP	42.7	16.5	8.0	32.0	35.2	43.5	8.3	150	232	
Hori.	228.006	QP	46.8	16.8	8.1	32.0	39.7	46.0	6.3	153	222	
Hori.	312.008	QP	45.3	14.1	8.6	31.9	36.1	46.0	9.9	100	137	
Hori.	324.008	QP	44.1	14.4	8.7	31.9	35.3	46.0	10.7	100	140	
Hori.	336.000	QP	48.4	14.7	8.7	31.9	39.9	46.0	6.1	100	131	
Hori.	360.007	QP	43.1	15.3	8.9	31.9	35.4	46.0	10.6	100	137	
Hori.	2867.767	PK	49.1	27.9	7.1	38.1	46.0	73.9	27.9	100	124	
Hori.	3270.316	PK	48.6	28.1	6.7	38.1	45.3	73.9	28.6	100	130	
Hori.	4882.000	PK	42.2	31.4	7.9	37.0	44.5	73.9	29.4	100	0	
Hori.	7323.000	PK	44.0	37.2	9.1	39.4	50.9	73.9	23.0	100	0	
Hori.	9764.000	PK	42.0	38.8	10.1	37.5	53.4	73.9	20.5	100	0	
Hori.	12205.000	PK	43.6	39.6	11.3	38.3	56.2	73.9	17.7	100	0	
Hori.	2867.767	AV	41.5	27.9	7.1	38.1	38.4	53.9	15.5	100	124	
Hori.	3270.316	AV	41.8	28.1	6.7	38.1	38.5	53.9	15.4	100	130	
Hori.	4882.000	AV	31.5	31.4	7.9	37.0	33.8	53.9	20.1	100	0	
Hori.	7323.000	AV	33.4	37.2	9.1	39.4	40.3	53.9	13.6	100	0	
Hori.	9764.000	AV	31.7	38.8	10.1	37.5	43.1	53.9	10.8	100	0	
Hori.	12205.000	AV	32.3	39.6	11.3	38.3	44.9	53.9	9.0	100	0	
Vert.	408.005	QP	39.2	16.4	9.1	32.0	32.7	46.0	13.3	100	185	
Vert.	2835.400	PK	48.8	27.8	7.2	38.1	45.7	73.9	28.2	100	132	
Vert.	3332.799	PK	49.1	28.1	6.8	38.0	46.0	73.9	27.9	100	150	
Vert.	4882.000	PK	41.4	31.4	7.9	37.0	43.7	73.9	30.2	100	0	
Vert.	7323.000	PK	44.6	37.2	9.1	39.4	51.5	73.9	22.4	100	0	
Vert.	9764.000	PK	43.2	38.8	10.1	37.5	54.6	73.9	19.3	100	0	
Vert.	12205.000	PK	43.0	39.6	11.3	38.3	55.6	73.9	18.3	100	0	
Vert.	2835.400	AV	42.1	27.8	7.2	38.1	39.0	53.9	14.9	100	132	
Vert.	3332.799	AV	41.7	28.1	6.8	38.0	38.6	53.9	15.3	100	150	
Vert.	4882.000	AV	31.4	31.4	7.9	37.0	33.7	53.9	20.2	100	0	
Vert.	7323.000	AV	33.7	37.2	9.1	39.4	40.6	53.9	13.3	100	0	
Vert.	9764.000	AV	31.5	38.8	10.1	37.5	42.9	53.9	11.0	100	0	
Vert.	12205.000	AV	32.2	39.6	11.3	38.3	44.8	53.9	9.1	100	0	

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

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date February 13, 2014 February 17, 2014
 Temperature / Humidity 20 deg.C, 30 %RH 22 deg.C, 38 %RH
 Engineer Tatsuya Arai Takahiro Suzuki
 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.	204.160	QP	40.0	16.5	8.0	32.0	32.5	43.5	11.0	150	244	
Hori.	228.168	QP	45.1	16.8	8.1	32.0	38.0	46.0	8.0	150	224	
Hori.	240.008	QP	46.0	16.9	8.2	32.0	39.1	46.0	6.9	151	150	
Hori.	336.009	QP	45.2	14.7	8.7	31.9	36.7	46.0	9.3	100	75	
Hori.	432.009	QP	44.4	16.6	9.2	31.9	38.3	46.0	7.7	100	38	
Hori.	2483.500	PK	46.3	26.9	14.8	38.1	49.9	73.9	24.0	100	63	
Hori.	3018.148	PK	48.7	28.2	6.6	38.1	45.4	73.9	28.5	100	125	
Hori.	3292.552	PK	48.8	28.1	6.7	38.0	45.6	73.9	28.3	100	129	
Hori.	4960.000	PK	42.7	31.8	7.8	37.0	45.3	73.9	28.6	100	0	
Hori.	7440.000	PK	45.2	37.4	9.3	39.4	52.5	73.9	21.4	100	0	
Hori.	9920.000	PK	42.5	38.9	10.1	37.5	54.0	73.9	19.9	100	0	
Hori.	12400.000	PK	42.2	39.7	11.4	38.2	55.1	73.9	18.8	100	0	
Hori.	2483.500	AV	31.9	26.9	14.8	38.1	35.5	53.9	18.4	100	63	
Hori.	3018.148	AV	41.5	28.2	6.6	38.1	38.2	53.9	15.7	100	125	
Hori.	3292.552	AV	41.9	28.1	6.7	38.0	38.7	53.9	15.2	100	129	
Hori.	4960.000	AV	31.3	31.8	7.8	37.0	33.9	53.9	20.0	100	0	
Hori.	7440.000	AV	33.6	37.4	9.3	39.4	40.9	53.9	13.0	100	0	
Hori.	9920.000	AV	31.4	38.9	10.1	37.5	42.9	53.9	11.0	100	0	
Hori.	12400.000	AV	31.3	39.7	11.4	38.2	44.2	53.9	9.7	100	0	
Vert.	849.999	QP	34.0	21.1	10.7	31.3	34.5	46.0	11.5	100	357	
Vert.	2483.500	PK	45.5	26.9	14.8	38.1	49.1	73.9	24.8	100	153	
Vert.	2831.725	PK	49.0	27.8	7.2	38.1	45.9	73.9	28.0	100	135	
Vert.	2915.326	PK	49.0	28.0	6.9	38.1	45.8	73.9	28.1	100	141	
Vert.	4960.000	PK	42.6	31.8	7.8	37.0	45.2	73.9	28.7	100	0	
Vert.	7440.000	PK	44.5	37.4	9.3	39.4	51.8	73.9	22.1	100	0	
Vert.	9920.000	PK	42.5	38.9	10.1	37.5	54.0	73.9	19.9	100	0	
Vert.	12400.000	PK	42.7	39.7	11.4	38.2	55.6	73.9	18.3	100	0	
Vert.	2483.500	AV	31.9	26.9	14.8	38.1	35.5	53.9	18.4	100	153	
Vert.	2831.725	AV	41.6	27.8	7.2	38.1	38.5	53.9	15.4	100	135	
Vert.	2915.326	AV	41.9	28.0	6.9	38.1	38.7	53.9	15.2	100	141	
Vert.	4960.000	AV	31.5	31.8	7.8	37.0	34.1	53.9	19.8	100	0	
Vert.	7440.000	AV	33.4	37.4	9.3	39.4	40.7	53.9	13.2	100	0	
Vert.	9920.000	AV	31.2	38.9	10.1	37.5	42.7	53.9	11.2	100	0	
Vert.	12400.000	AV	31.3	39.7	11.4	38.2	44.2	53.9	9.7	100	0	

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

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date February 13, 2014 February 17, 2014
 Temperature / Humidity 20 deg.C, 30 %RH 22 deg.C, 38 %RH
 Engineer Tatsuya Arai Takahiro Suzuki
 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.	204.164	QP	39.8	16.5	8.0	32.0	32.3	43.5	11.2	150	129	
Hori.	228.006	QP	45.0	16.8	8.1	32.0	37.9	46.0	8.1	150	222	
Hori.	240.017	QP	46.2	16.9	8.2	32.0	39.3	46.0	6.7	150	126	
Hori.	360.003	QP	47.4	15.3	8.9	31.9	39.7	46.0	6.3	100	140	
Hori.	384.003	QP	40.7	15.9	9.0	31.9	33.7	46.0	12.3	100	142	
Hori.	2390.000	PK	45.9	26.8	14.7	38.2	49.2	73.9	24.7	100	63	
Hori.	2400.000	PK	55.8	26.8	14.7	38.2	59.1	73.9	14.8	100	0	
Hori.	2951.102	PK	48.7	28.1	6.8	38.1	45.5	73.9	28.4	100	130	
Hori.	3185.432	PK	49.0	28.2	6.6	38.1	45.7	73.9	28.2	100	141	
Hori.	4804.000	PK	43.6	30.9	7.9	37.1	45.3	73.9	28.6	100	0	
Hori.	7206.000	PK	45.3	37.1	9.1	39.4	52.1	73.9	21.8	100	0	
Hori.	9608.000	PK	43.7	38.6	10.2	37.6	54.9	73.9	19.0	100	0	
Hori.	12010.000	PK	44.2	39.6	11.2	38.5	56.5	73.9	17.4	100	0	
Hori.	2390.000	AV	31.6	26.8	14.7	38.2	34.9	53.9	19.0	100	63	
Hori.	2400.000	AV	40.3	26.8	14.7	38.2	43.6	53.9	10.3	100	0	
Hori.	2951.102	AV	41.4	28.1	6.8	38.1	38.2	53.9	15.7	100	130	
Hori.	3185.432	AV	41.5	28.2	6.6	38.1	38.2	53.9	15.7	100	141	
Hori.	4804.000	AV	31.4	30.9	7.9	37.1	33.1	53.9	20.8	100	0	
Hori.	7206.000	AV	33.7	37.1	9.1	39.4	40.5	53.9	13.4	100	0	
Hori.	9608.000	AV	31.9	38.6	10.2	37.6	43.1	53.9	10.8	100	0	
Hori.	12010.000	AV	32.1	39.6	11.2	38.5	44.4	53.9	9.5	100	0	
Vert.	749.998	QP	32.7	20.1	10.4	31.8	31.4	46.0	14.6	155	22	
Vert.	2390.000	PK	46.1	26.8	14.7	38.2	49.4	73.9	24.5	100	153	
Vert.	2400.000	PK	56.0	26.8	14.7	38.2	59.3	73.9	14.6	100	153	
Vert.	2898.063	PK	49.0	28.0	7.0	38.1	45.9	73.9	28.0	100	136	
Vert.	3449.681	PK	49.0	28.0	6.7	38.0	45.7	73.9	28.2	100	150	
Vert.	4804.000	PK	45.3	30.9	7.9	37.1	47.0	73.9	26.9	100	0	
Vert.	7206.000	PK	45.4	37.1	9.1	39.4	52.2	73.9	21.7	100	0	
Vert.	9608.000	PK	41.7	38.6	10.2	37.6	52.9	73.9	21.0	100	0	
Vert.	12010.000	PK	44.2	39.6	11.2	38.5	56.5	73.9	17.4	100	0	
Vert.	2390.000	AV	31.7	26.8	14.7	38.2	35.0	53.9	18.9	100	153	
Vert.	2400.000	AV	40.6	26.8	14.7	38.2	43.9	53.9	10.0	100	153	
Vert.	2898.063	AV	42.2	28.0	7.0	38.1	39.1	53.9	14.8	100	136	
Vert.	3449.681	AV	42.1	28.0	6.7	38.0	38.8	53.9	15.1	100	150	
Vert.	4804.000	AV	31.0	30.9	7.9	37.1	32.7	53.9	21.2	100	0	
Vert.	7206.000	AV	33.3	37.1	9.1	39.4	40.1	53.9	13.8	100	0	
Vert.	9608.000	AV	31.4	38.6	10.2	37.6	42.6	53.9	11.3	100	0	
Vert.	12010.000	AV	32.2	39.6	11.2	38.5	44.5	53.9	9.4	100	0	

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

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

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Radiated Emission

Test place No.3 Semi Anechoic Chamber
Date February 13, 2014 February 17, 2014
Temperature / Humidity 20 deg.C, 30 %RH 22 deg.C, 38 %RH
Engineer Tatsuya Arai Takahiro Suzuki
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.	204.167	QP	40.0	16.5	8.0	32.0	32.5	43.5	11.0	150	132	
Hori.	228.006	QP	45.1	16.8	8.1	32.0	38.0	46.0	8.0	150	224	
Hori.	240.013	QP	46.0	16.9	8.2	32.0	39.1	46.0	6.9	150	126	
Hori.	359.538	QP	47.4	15.3	8.9	31.9	39.7	46.0	6.3	100	129	
Hori.	384.005	QP	40.6	15.9	9.0	31.9	33.6	46.0	12.4	100	148	
Hori.	2892.866	PK	49.0	28.0	7.0	38.1	45.9	73.9	28.0	100	122	
Hori.	3443.518	PK	48.8	28.0	6.7	38.0	45.5	73.9	28.4	100	129	
Hori.	4882.000	PK	42.3	31.4	7.9	37.0	44.6	73.9	29.3	100	0	
Hori.	7323.000	PK	43.8	37.2	9.1	39.4	50.7	73.9	23.2	100	0	
Hori.	9764.000	PK	42.2	38.8	10.1	37.5	53.6	73.9	20.3	100	0	
Hori.	12205.000	PK	43.4	39.6	11.3	38.3	56.0	73.9	17.9	100	0	
Hori.	2892.866	AV	41.4	28.0	7.0	38.1	38.3	53.9	15.6	100	122	
Hori.	3443.518	AV	41.6	28.0	6.7	38.0	38.3	53.9	15.6	100	129	
Hori.	4882.000	AV	31.4	31.4	7.9	37.0	33.7	53.9	20.2	100	0	
Hori.	7323.000	AV	33.2	37.2	9.1	39.4	40.1	53.9	13.8	100	0	
Hori.	9764.000	AV	31.8	38.8	10.1	37.5	43.2	53.9	10.7	100	0	
Hori.	12205.000	AV	32.1	39.6	11.3	38.3	44.7	53.9	9.2	100	0	
Vert.	749.999	QP	32.7	20.1	10.4	31.8	31.4	46.0	14.6	166	20	
Vert.	2897.954	PK	48.7	28.0	7.0	38.1	45.6	73.9	28.3	100	135	
Vert.	3333.480	PK	48.9	28.1	6.8	38.0	45.8	73.9	28.1	100	144	
Vert.	4882.000	PK	41.5	31.4	7.9	37.0	43.8	73.9	30.1	100	0	
Vert.	7323.000	PK	44.8	37.2	9.1	39.4	51.7	73.9	22.2	100	0	
Vert.	9764.000	PK	43.4	38.8	10.1	37.5	54.8	73.9	19.1	100	0	
Vert.	12205.000	PK	43.2	39.6	11.3	38.3	55.8	73.9	18.1	100	0	
Vert.	2897.954	AV	41.8	28.0	7.0	38.1	38.7	53.9	15.2	100	135	
Vert.	3333.480	AV	41.8	28.1	6.8	38.0	38.7	53.9	15.2	100	144	
Vert.	4882.000	AV	31.3	31.4	7.9	37.0	33.6	53.9	20.3	100	0	
Vert.	7323.000	AV	33.6	37.2	9.1	39.4	40.5	53.9	13.4	100	0	
Vert.	9764.000	AV	31.2	38.8	10.1	37.5	42.6	53.9	11.3	100	0	
Vert.	12205.000	AV	32.4	39.6	11.3	38.3	45.0	53.9	8.9	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amplifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

Radiated Emission

Test place No.3 Semi Anechoic Chamber
 Date February 13, 2014 February 17, 2014
 Temperature / Humidity 20 deg.C, 30 %RH 22 deg.C, 38 %RH
 Engineer Tatsuya Arai Takahiro Suzuki
 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.	204.123	QP	40.0	16.5	8.0	32.0	32.5	43.5	11.0	150	236	
Hori.	228.006	QP	45.1	16.8	8.1	32.0	38.0	46.0	8.0	151	231	
Hori.	240.006	QP	45.6	16.9	8.2	32.0	38.7	46.0	7.3	150	131	
Hori.	360.005	QP	47.4	15.3	8.9	31.9	39.7	46.0	6.3	100	143	
Hori.	384.004	QP	40.7	15.9	9.0	31.9	33.7	46.0	12.3	100	151	
Hori.	2483.500	PK	46.0	26.9	14.8	38.1	49.6	73.9	24.3	100	63	
Hori.	2932.771	PK	48.8	28.1	6.8	38.1	45.6	73.9	28.3	100	127	
Hori.	3377.969	PK	48.9	28.1	6.7	38.0	45.7	73.9	28.2	100	125	
Hori.	4960.000	PK	42.8	31.8	7.8	37.0	45.4	73.9	28.5	100	0	
Hori.	7440.000	PK	45.3	37.4	9.3	39.4	52.6	73.9	21.3	100	0	
Hori.	9920.000	PK	42.6	38.9	10.1	37.5	54.1	73.9	19.8	100	0	
Hori.	12400.000	PK	42.3	39.7	11.4	38.2	55.2	73.9	18.7	100	0	
Hori.	2483.500	AV	32.1	26.9	14.8	38.1	35.7	53.9	18.2	100	63	
Hori.	2932.771	AV	41.6	28.1	6.8	38.1	38.4	53.9	15.5	100	127	
Hori.	3377.969	AV	41.7	28.1	6.7	38.0	38.5	53.9	15.4	100	125	
Hori.	4960.000	AV	31.5	31.8	7.8	37.0	34.1	53.9	19.8	100	0	
Hori.	7440.000	AV	33.5	37.4	9.3	39.4	40.8	53.9	13.1	100	0	
Hori.	9920.000	AV	31.6	38.9	10.1	37.5	43.1	53.9	10.8	100	0	
Hori.	12400.000	AV	31.4	39.7	11.4	38.2	44.3	53.9	9.6	100	0	
Vert.	850.005	QP	34.2	21.1	10.7	31.3	34.7	46.0	11.3	100	181	
Vert.	2483.500	PK	45.4	26.9	14.8	38.1	49.0	73.9	24.9	100	153	
Vert.	2875.255	PK	45.3	27.9	7.1	38.1	42.2	73.9	31.7	100	137	
Vert.	2945.716	PK	48.9	28.1	6.7	38.1	45.6	73.9	28.3	100	140	
Vert.	4960.000	PK	42.7	31.8	7.8	37.0	45.3	73.9	28.6	100	0	
Vert.	7440.000	PK	44.6	37.4	9.3	39.4	51.9	73.9	22.0	100	0	
Vert.	9920.000	PK	42.6	38.9	10.1	37.5	54.1	73.9	19.8	100	0	
Vert.	12400.000	PK	42.8	39.7	11.4	38.2	55.7	73.9	18.2	100	0	
Vert.	2483.500	AV	31.9	26.9	14.8	38.1	35.5	53.9	18.4	100	153	
Vert.	2875.255	AV	32.0	27.9	7.1	38.1	28.9	53.9	25.0	100	137	
Vert.	2945.716	AV	42.0	28.1	6.7	38.1	38.7	53.9	15.2	100	140	
Vert.	4960.000	AV	31.3	31.8	7.8	37.0	33.9	53.9	20.0	100	0	
Vert.	7440.000	AV	33.5	37.4	9.3	39.4	40.8	53.9	13.1	100	0	
Vert.	9920.000	AV	31.3	38.9	10.1	37.5	42.8	53.9	11.1	100	0	
Vert.	12400.000	AV	31.4	39.7	11.4	38.2	44.3	53.9	9.6	100	0	

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

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

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Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
Date January 28, 2014
Temperature / Humidity 25 deg.C , 46 %RH
Engineer Hikaru Shirasawa

Revised date : March 14, 2014

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (below 30MHz)



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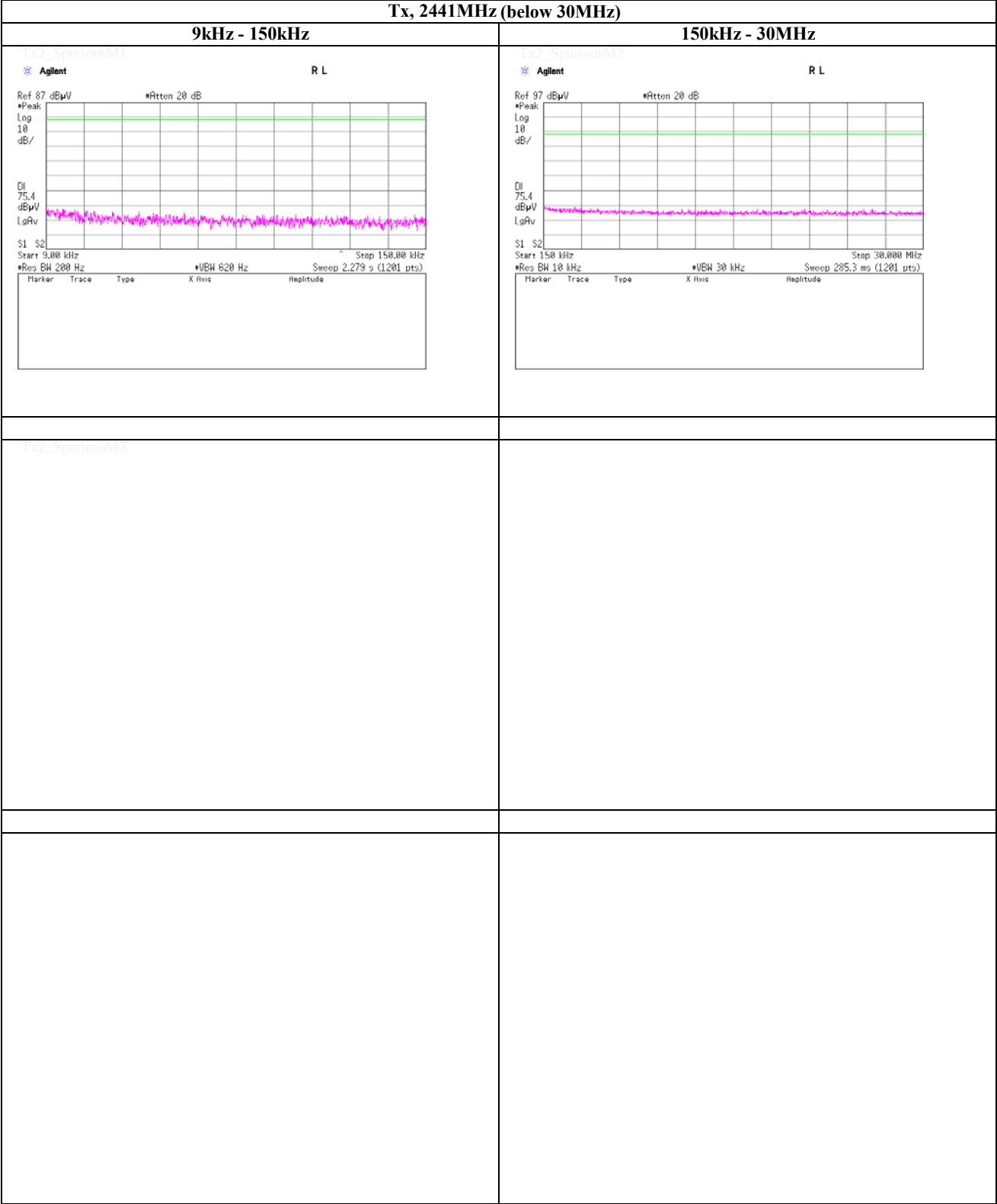
Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
Date January 28, 2014
Temperature / Humidity 25 deg.C , 46 %RH
Engineer Hikaru Shirasawa

Revised date : March 14, 2014

Spurious emission (Conducted)

Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (below 30MHz)



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Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
Date January 28, 2014
Temperature / Humidity 25 deg.C , 46 %RH
Engineer Hikaru Shirasawa

Revised date : March 14, 2014

Spurious emission (Conducted)**Tx, Bluetooth, BDR, PRBS9****Tx, 2480MHz (below 30MHz)****UL Japan, Inc.****Shonan EMC Lab.**

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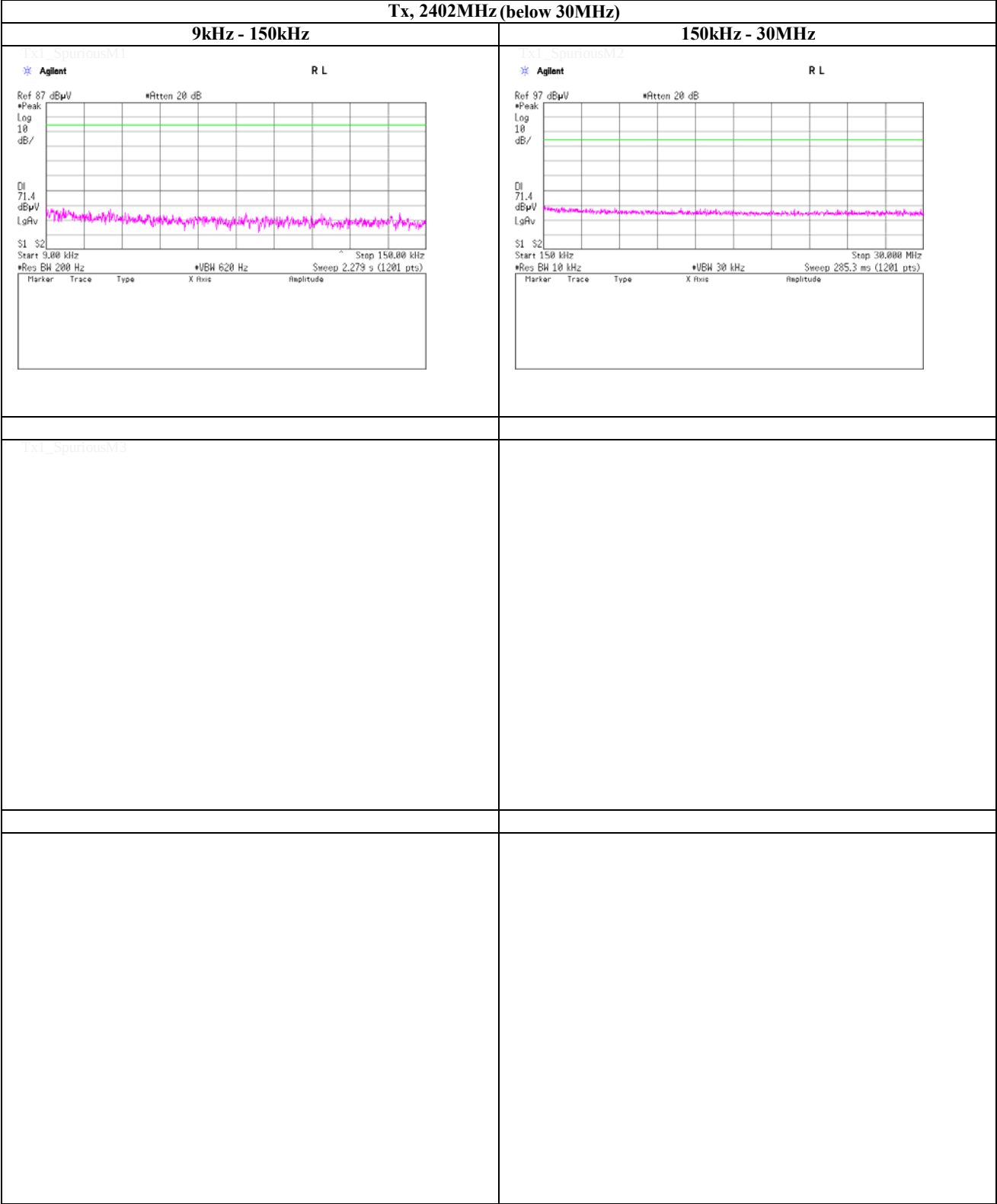
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Date January 28, 2014
Temperature / Humidity 25 deg.C , 46 %RH
Engineer Hikaru Shirasawa

Revised date : March 14, 2014

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (below 30MHz)



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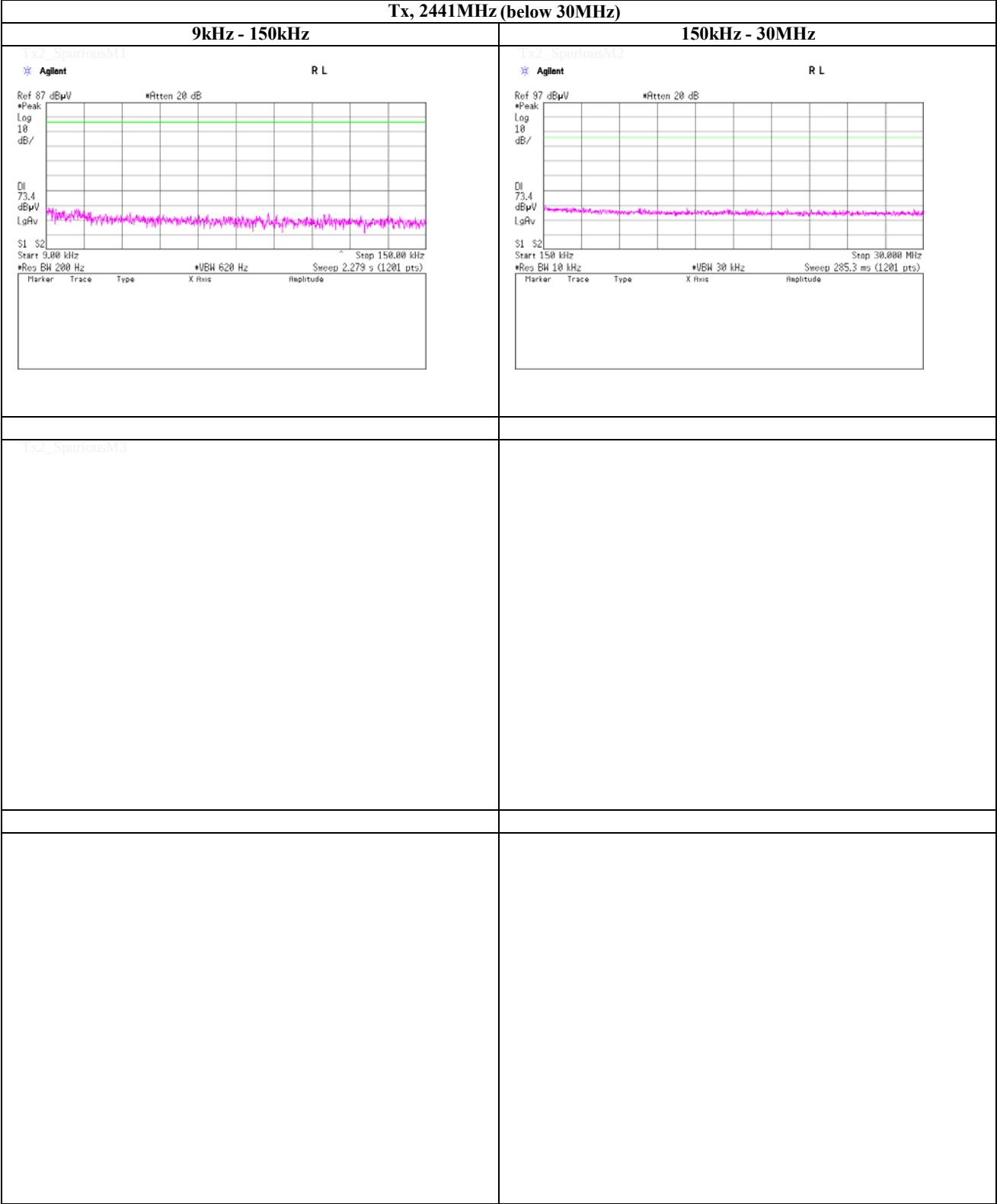
Test place UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
Date January 28, 2014
Temperature / Humidity 25 deg.C , 46 %RH
Engineer Hikaru Shirasawa

Revised date : March 14, 2014

Spurious emission (Conducted)

Tx, Bluetooth, EDR, PRBS9

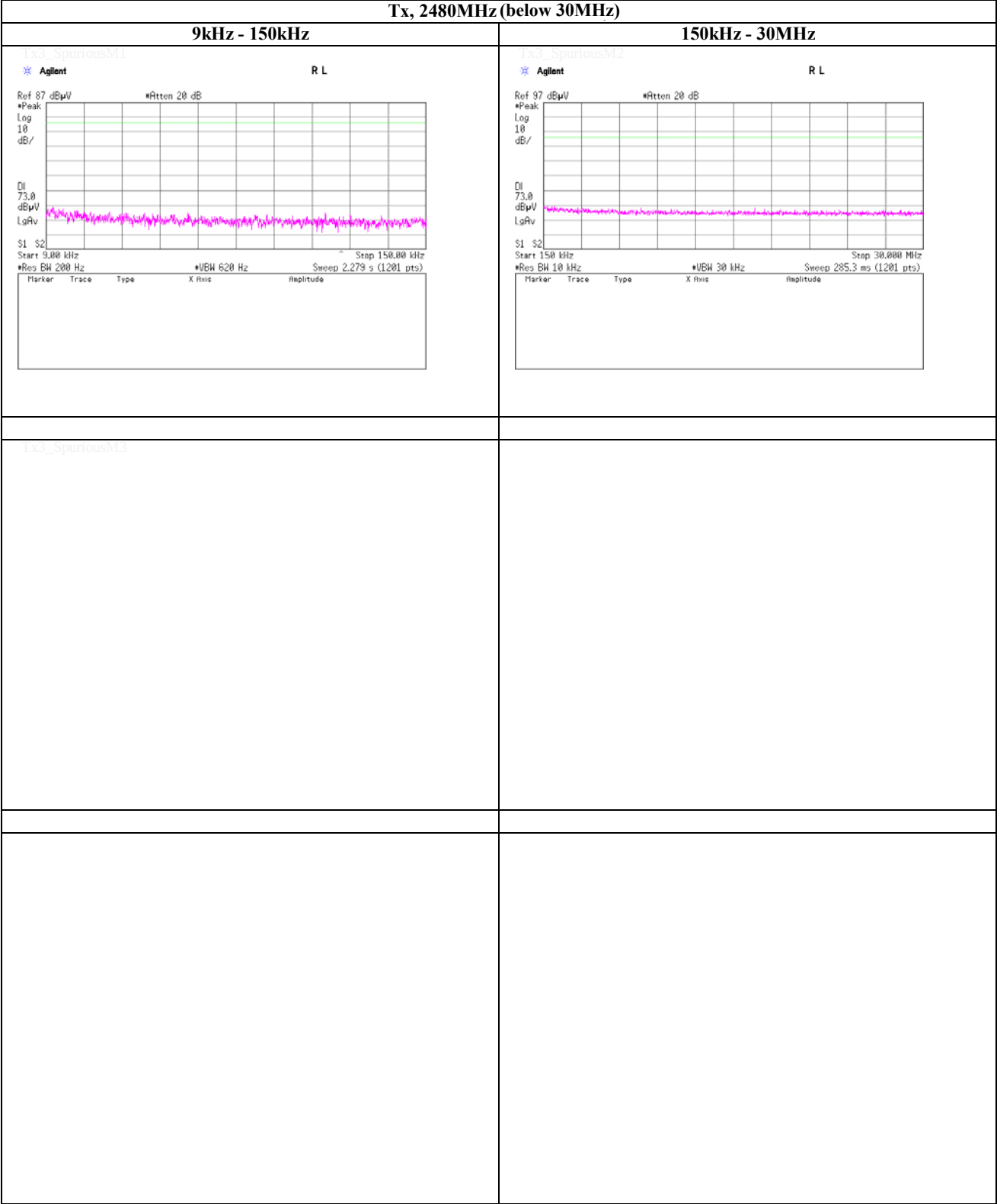
Tx, 2441MHz (below 30MHz)



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Temperature / Humidity 25 deg.C , 46 %RH
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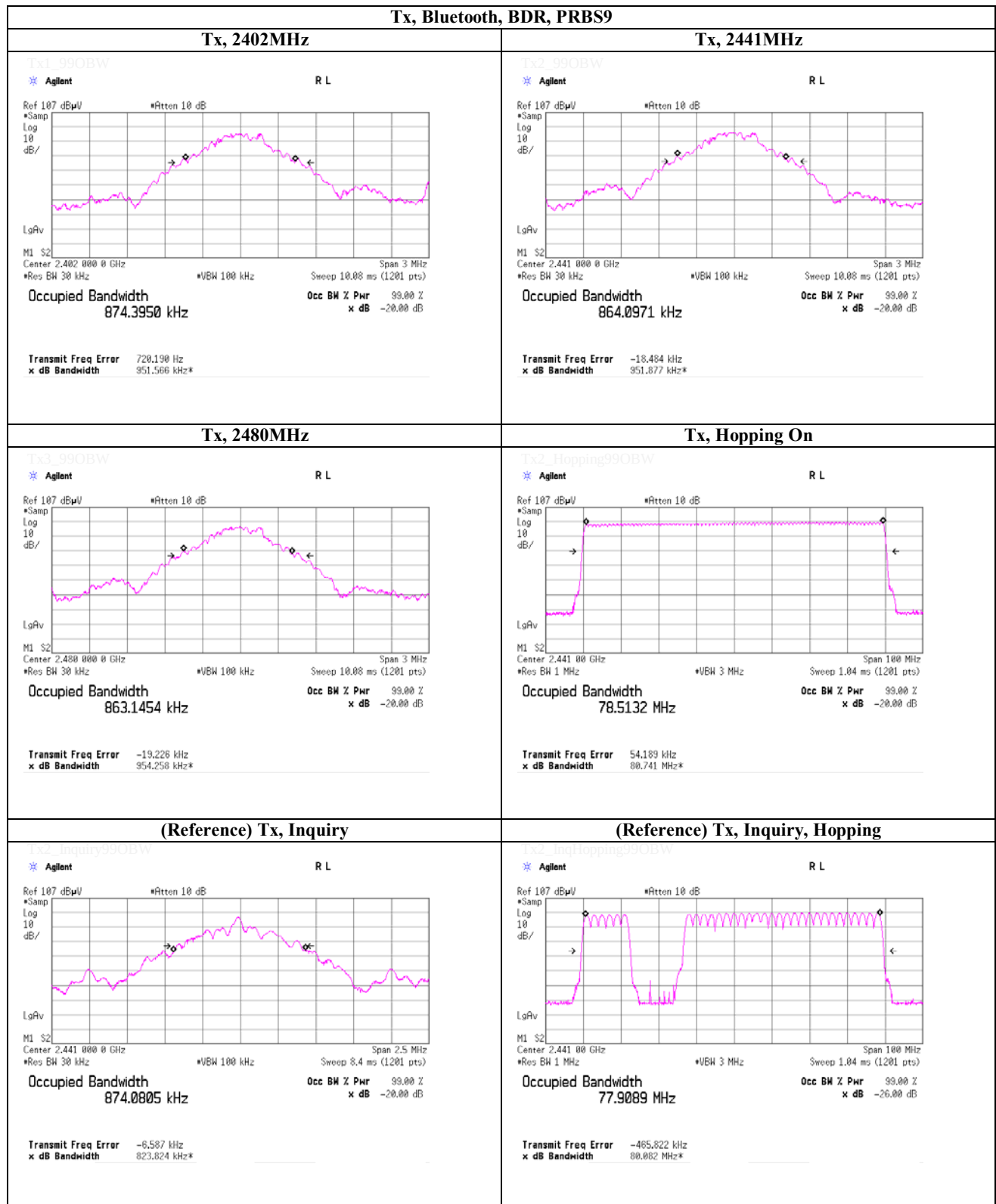
Spurious emission (Conducted)
Tx, Bluetooth, EDR, PRBS9
Tx, 2480MHz (below 30MHz)



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1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
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Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 28, 2014	
Temperature / Humidity	25 deg.C , 46 %RH	
Engineer	Hikaru Shirasawa	

99% Occupied Bandwidth



UL Japan, Inc.

Shonan EMC Lab.

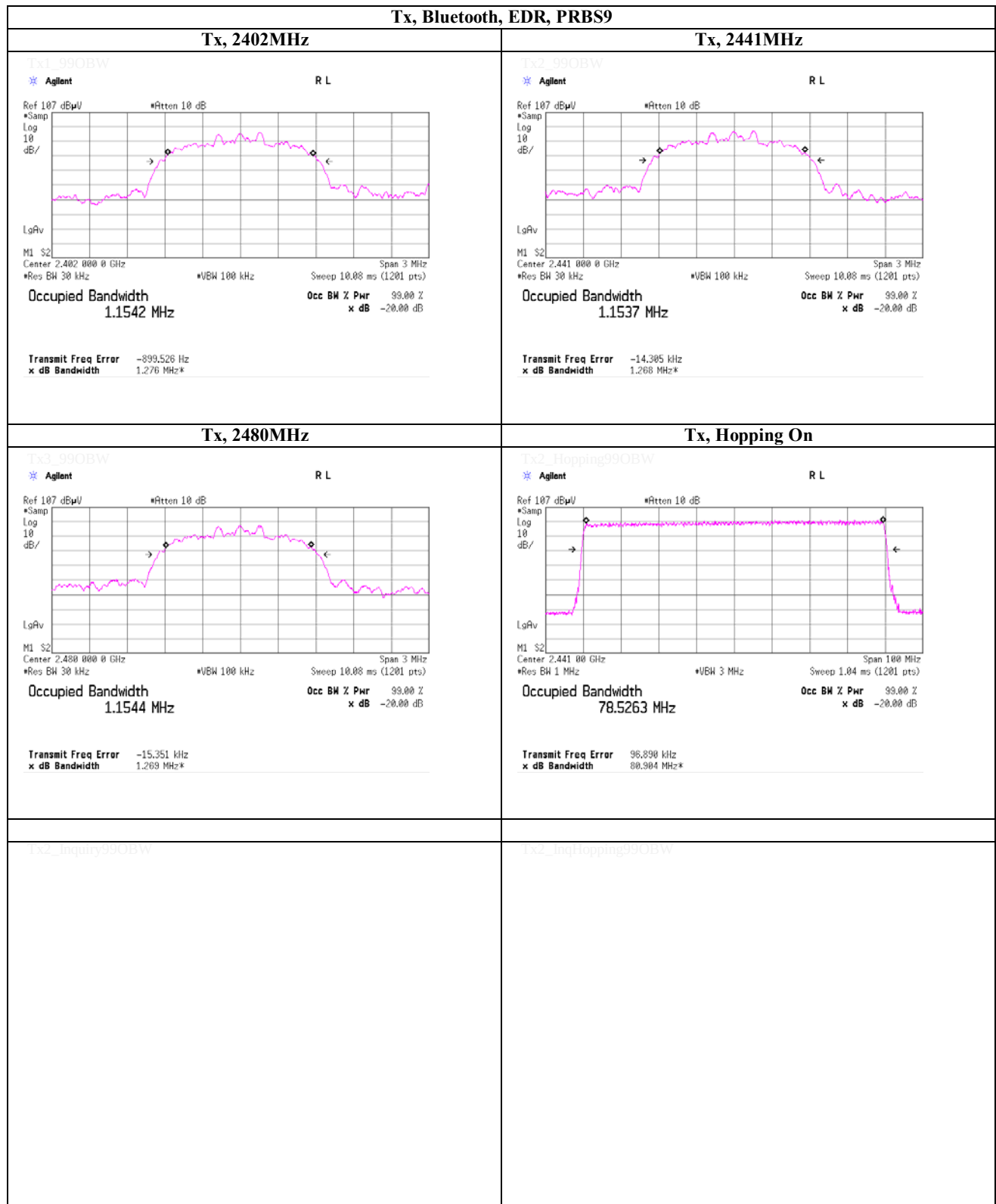
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99% Occupied Bandwidth



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APPENDIX 2

Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2013/07/09 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2013/07/22 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2013/04/11 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2013/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2013/08/19 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2013/02/27 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2013/03/28 * 12
SJM-11	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RF,LF)	-	RE	-
SAT10-06	Attenuator	Agilent	8493C-010	74865	AT	2013/11/22 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2013/11/22 * 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		2013/03/16 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2013/02/12 * 12
SAT6-06	Attenuator	JFW	50HF-006N	-	RE	2013/02/12 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2013/10/26 * 12
SCC-C1/C2/C3/C4/C5/C10/SRSE-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2013/04/03 * 12
SLA-03	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0901	RE	2013/10/26 * 12
STR-06	Test Receiver	Rohde & Schwarz	ESCI	101259	RE	2013/02/27 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2013/03/04 * 12
SAT20-06	Attenuator	Weinschel Corp.	54A-20	31506	AT	2013/04/09 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2013/03/16 * 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2013/04/25 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2013/04/09 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2013/04/09 * 12

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

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

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

Test Item :

RE: Out of Band Emission (Radiated)

AT: Antenna terminal conducted test