RADIO TEST REPORT

Test Report No.: 10158552S-A

Applicant	:	**PIONEER CORPORATION**
Type of Equipment	:	**Car Audio with Bluetooth**
Model No.	:	**NXF-9738**
FCC ID	:	**AJDK081**
Test regulation	:	**FCC Part15 Subpart C: 2013**
Test result	:	**Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
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.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by any agency of the Federal Government.
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: January 16 to 20, 2014

Representative test engineer:

Makoto Hosaka
Engineer of WiSE Japan,
UL Verification Service

Approved by :

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".

Testing
RTL02610

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone: +81 463 50 6400
Facsimile: +81 463 50 6401

13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10158552S-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10158552S-A	February 28, 2014	-	-
1	10158552S-A	March 18, 2014	1,4,11	Correction of Model No.
			5	Correction of clock frequency

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone: +81 463 50 6400
Facsimile: +81 463 50 6401

Contents

Page

SECTION 1: Customer information 4
SECTION 2: Equipment under test (E.U.T.) 4
SECTION 3: Test specification, procedures & results 6
SECTION 4: Operation of E.U.T. during testing 9
SECTION 5: Carrier frequency separation 12
SECTION 6: 20dB bandwidth & Occupied bandwidth (99%) 12
SECTION 7: Number of hopping frequency 12
SECTION 8: Dwell time 12
SECTION 9: Maximum peak output power 12
SECTION 10: Spurious emissions (Antenna port conducted) 12
SECTION 11: Radiated emission 13
Contents of APPENDIXES 15
APPENDIX 1: Data of radio tests 16
APPENDIX 2: Test instruments 45
APPENDIX 3: Photographs of test setup 46

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 with Bluetooth
Model No.	:	NXF-9738
Serial No.	:	Refer to 4.2 of this report.
Rating	:	DC 13.2V
Country of Mass-production	:	Japan
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	:	January 10, 2014

2.2 Product description

Model: NXF-9738 (referred to as the EUT in this report) is a Car Audio with Bluetooth.

Radio specification:
Bluetooth:

Equipment type	:	Transceiver
Frequency of operation	:	2402-2480MHz
Bandwidth & channel spacing	:	79MHz & 1MHz
Type of modulation	:	GFSK, π/4DQPSK, 8DPSK
Antenna type	:	Ceramic patch antenna
Antenna gain with cable loss	:	+2dBi (max)
Antenna connector type	:	MHF series micro coaxial connector receptacle vertical
Operation temperature range	:	-20 to +65 deg.C.

Wireless LAN:

Equipment type	:	Transceiver
Frequency of operation	:	2412-2462MHz
Bandwidth & channel spacing	:	20MHz & 5MHz
Type of modulation	:	BPSK, QPSK, CCK, 16QAM, 64QAM
Antenna type	:	Ceramic patch antenna
Antenna gain with cable loss	:	+2dBi (max)
Antenna connector type	:	MHF series micro coaxial connector receptacle vertical
Operation temperature range	:	-20 to +65 deg.C.

Refer to the test report: 10158552S-B for Wireless LAN part.

FCC 15.31 (e)
The equipment provides the wireless transmitter with stable power supply (DC3.3V). Therefore, the equipment complies with the requirement.

FCC 15.203
The equipment and its antenna comply with the requirement since the antenna is built in the equipment and it cannot be replaced by end users.

Clock Frequency:
48MHz, 24MHz, 32.768kHz, 4MHz, 24.576MHz

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	0.9dB Freq.: 777.196MHz Polarization: Vertical Detection: Quasi-Peak Mode: Tx 2402MHz, 3-DH5	Complied

Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422
*1) The test is not applicable since the EUT has no AC mains.

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 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: (±) 1.6dB
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%

3.5 Test location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone number : +81 463 50 6400
Facsimile number : +81 463 50 6401
JAB Accreditation No. : RTL02610

	FCC Registration No.	IC Registration No.	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
☐ 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.

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), Payload: PRBS9	-
20dB bandwidth	Transmitting Hopping OFF (DH5 / 3-DH5), Payload: PRBS9	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting Hopping ON (DH5 / 3-DH5), Payload: PRBS9	-
Dwell time	Transmitting (Hopping ON), Payload: PRBS9 - DH1, - DH3, - DH5 - 3-DH1, - 3-DH3, - 3-DH5	-
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 -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.

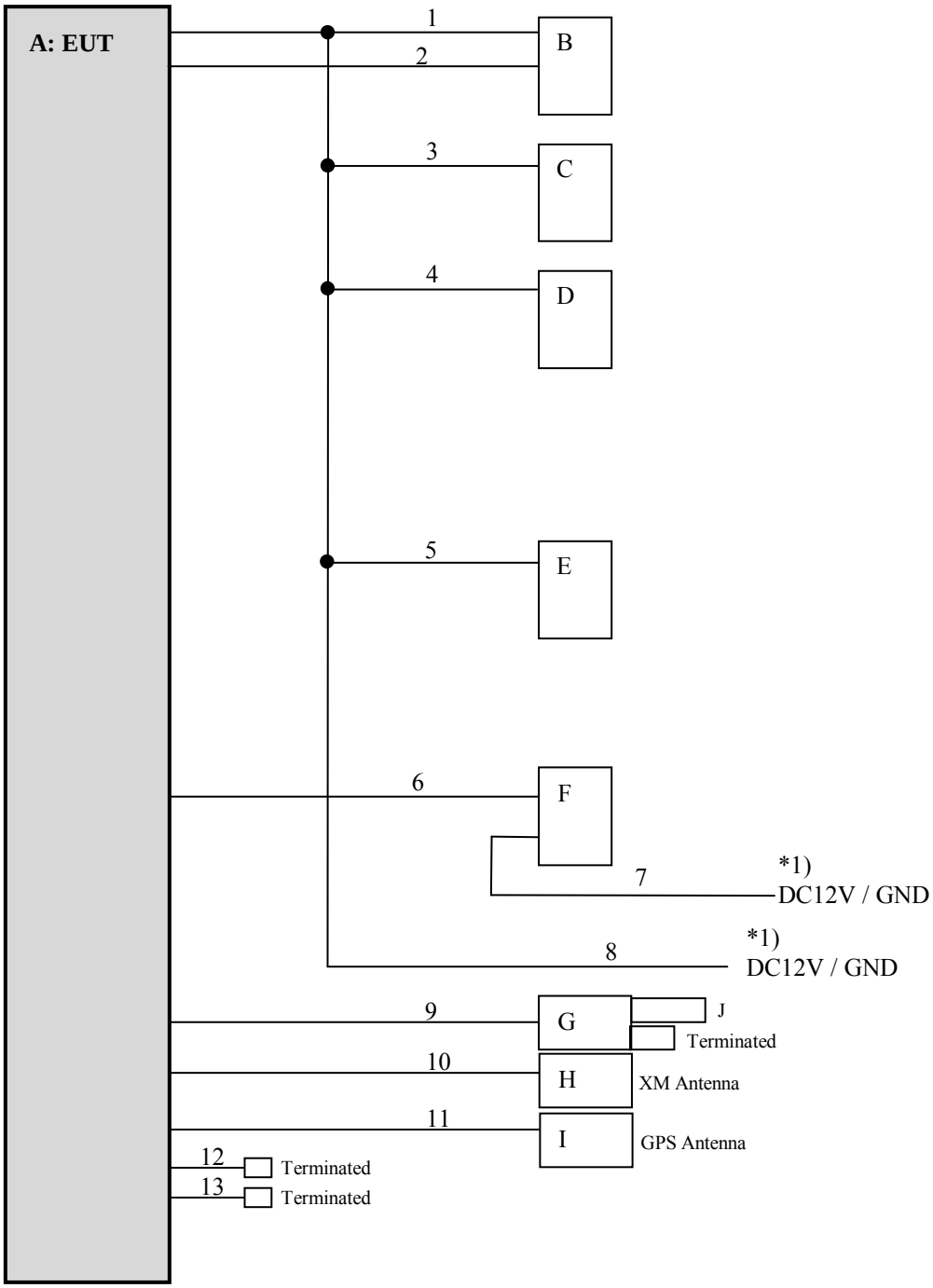
Software: MLT 3rd Series logver 20110928
Power Settings: Fixed

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.

The EUT has no Inquiry mode.

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

4.2 Configuration and peripherals



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

*1) DC power supply (Model No.: PAN35-10A) was used for DC 12V input.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Audio with Bluetooth	NXF-9738	*1)	Pioneer	EUT
B	Display	86110-30330	462200-3296	DENSO	-
C	Remote Control Device	84780-30080	-	Tokai Rika Co., Ltd.	-
D	Steering Switch	-	-	-	-
E	Rear Camera	86790-48130	2XC00154	-	-
F	Amplifier	GM-4038ZT	TPJA000142WL	Pioneer	-
G	USB connector	86190-48036	3104482	-	-
H	XM Antenna	86860-30330	-	AISIN	-
I	GPS Antenna	86860-22090	-	DENSO	-
J	USB Memory	JF V33/2GB	-	Transcend	

*1) Antenna terminal conducted tests: MKPKTP0022EW, Radiated emission tests: MKPKTP0016EW

List of cables used

No.	Name	Length (m)	Shield- Cable	Shield- Connector	Remarks
1	Signal cable for Display	2.0	Unshielded	Unshielded	-
2	Image output cable	2.0	Unshielded	Unshielded	-
3	Signal cable for Remote control	2.0	Unshielded	Unshielded	-
4	Signal cable for Steering Switch	2.0	Unshielded	Unshielded	-
5	Signal cable for Rear Camera	2.0	Unshielded	Unshielded	-
6	Signal cable for Amplifier	2.0	Shielded	Shielded	-
7	DC power cable	4.0	Unshielded	Unshielded	-
8	DC power cable	4.0	Unshielded	Unshielded	-
9	USB cable	3.0	Shielded	Shielded	-
10	Antenna cable for XM	2.4	Shielded	Shielded	-
11	Antenna cable for GPS	1.6	Shielded	Shielded	-
12	Antenna cable for Radio	0.15	Shielded	Shielded	-
13	Antenna cable for Radio	0.15	Shielded	Shielded	-

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.

SECTION 11: Radiated emission

11.1 Operating environment

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

11.2 Test configuration

EUT was placed on a platform of nominal size, 1.0m by 2.0m, raised 0.8m (30MHz-15GHz) or 1.0m (15-25GHz) above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity. The rear of EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane.
Photographs of the set up are shown in APPENDIX 3.

11.3 Test conditions

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

11.4 Test procedure

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

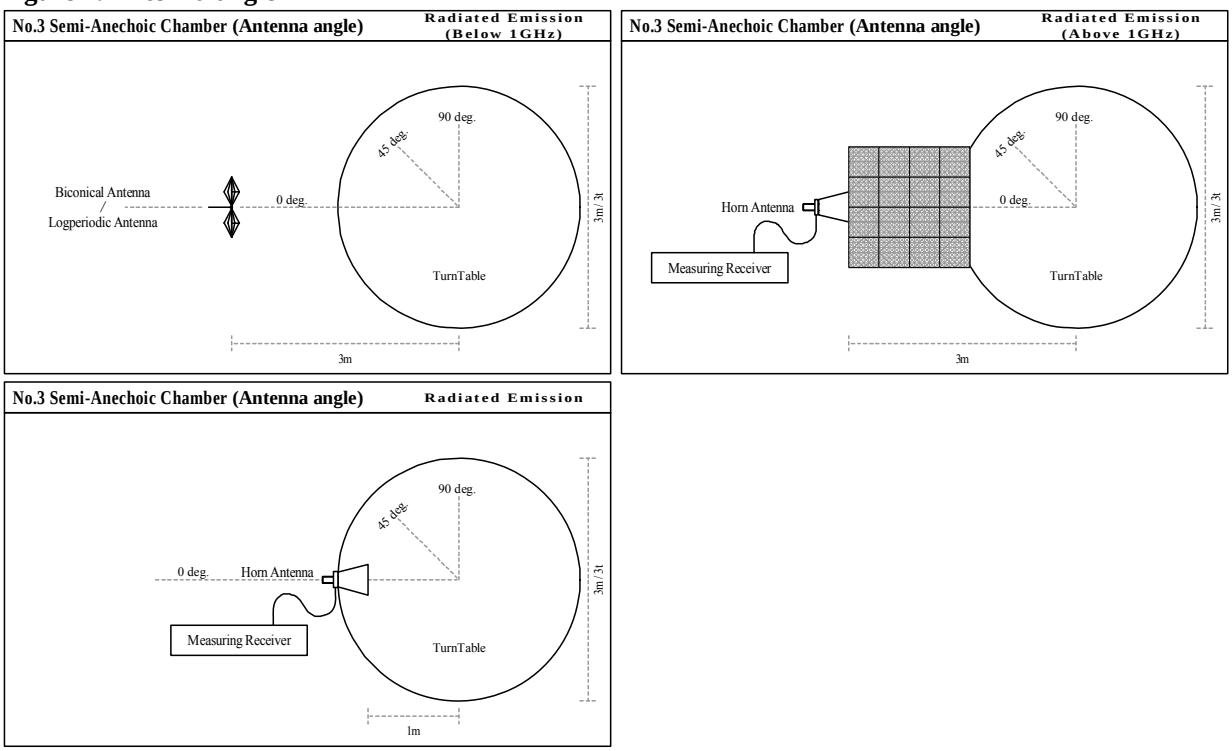
The radiated emission measurements were made with the following detection.

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

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

The axis of EUT was fixed at angle of 6.9 deg. based on the product specification.

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.

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

APPENDIX 1: Data of Radio tests

20dB Bandwidth and Carrier Frequency Separation

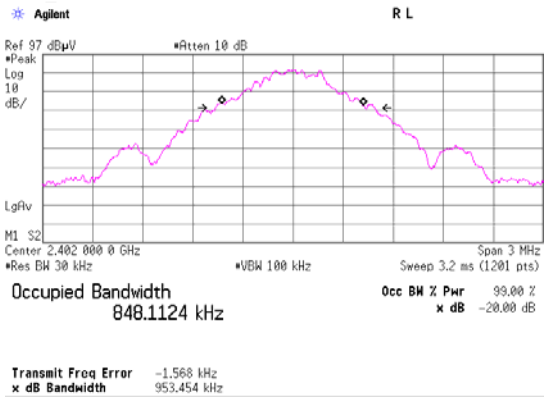
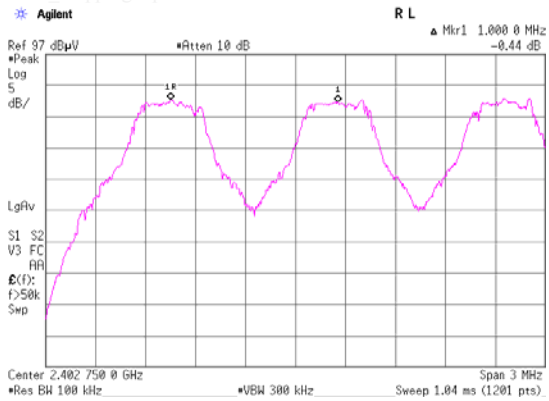
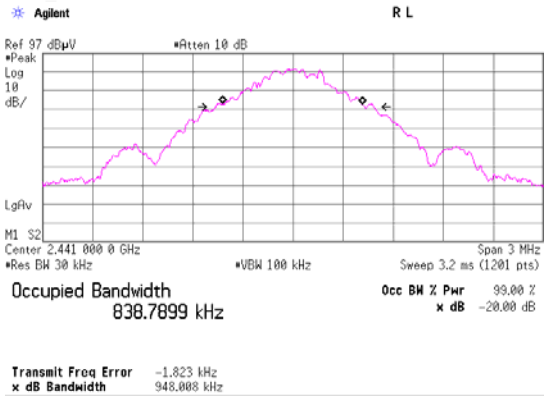
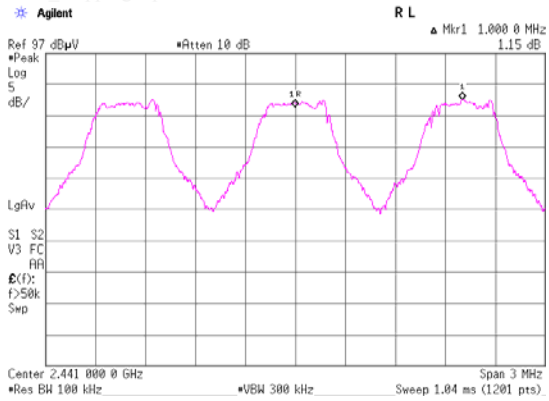
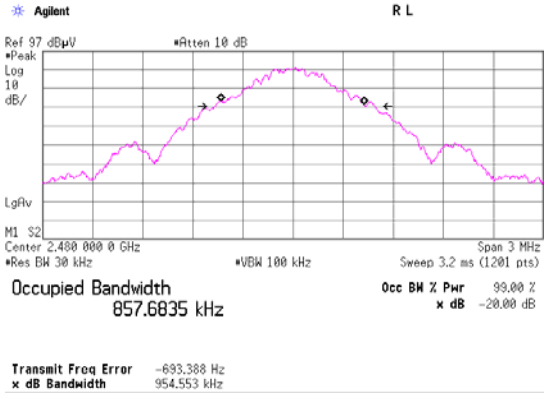
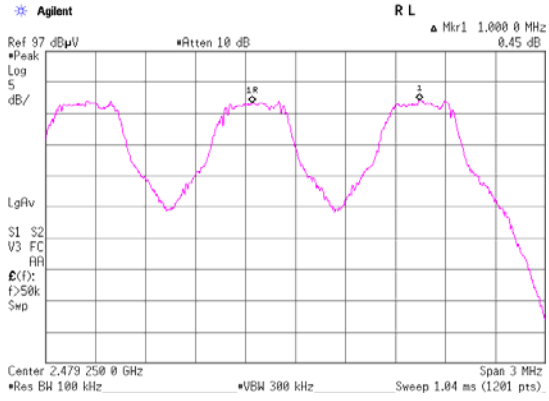
Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 17, 2014	
Temperature / Humidity	23 deg.C , 41 %RH	
Engineer	Makoto Hosaka	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.953	1.000	>= 0.636
DH5	2441.0	0.948	1.000	>= 0.632
DH5	2480.0	0.955	1.000	>= 0.636

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

20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, BDR, PRBS9

20dB Bandwidth	Carrier Frequency Separation
Tx, 2402MHz	**Tx, 2402MHz**
	
Tx, 2441MHz	**Tx, 2441MHz**
	
Tx, 2480MHz	**Tx, 2480MHz**
	

20dB Bandwidth and Carrier Frequency Separation

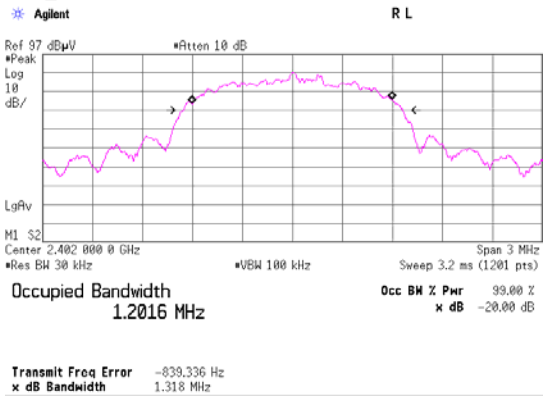
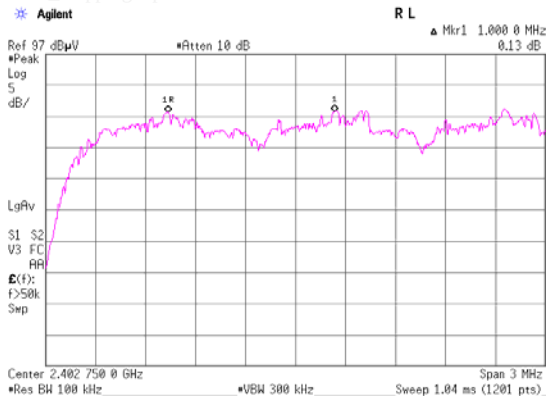
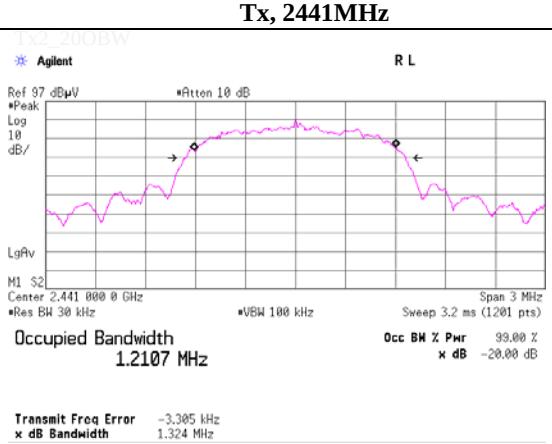
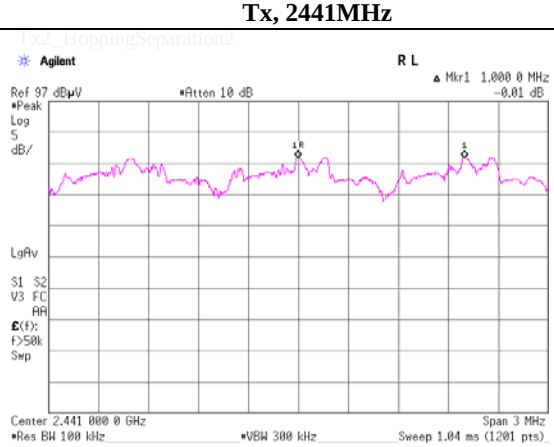
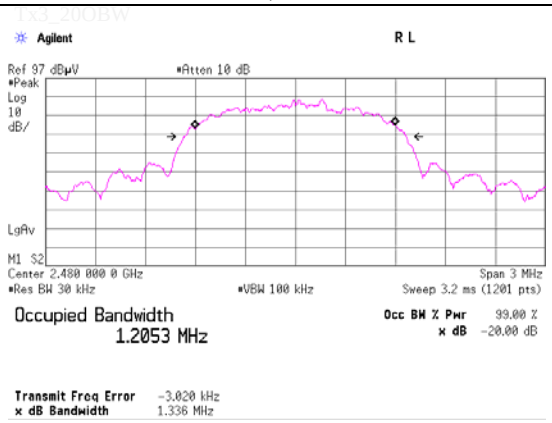
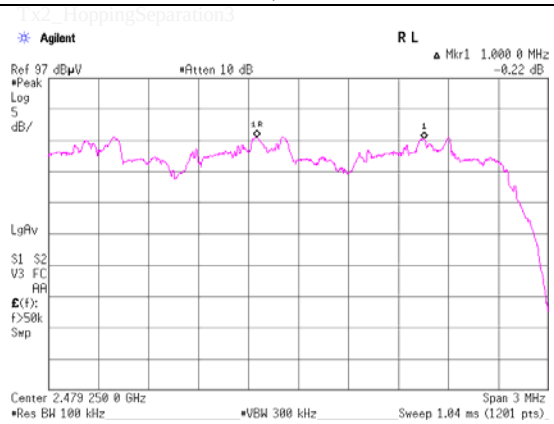
Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 17, 2014	
Temperature / Humidity	23 deg.C , 41 %RH	
Engineer	Makoto Hosaka	
Mode	Tx, Bluetooth, EDR, PRBS9	

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
3-DH5	2402.0	1.318	1.000	>= 0.879
3-DH5	2441.0	1.324	1.000	>= 0.883
3-DH5	2480.0	1.336	1.000	>= 0.890

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

20dB Bandwidth and Carrier Frequency Separation

Tx, Bluetooth, EDR, PRBS9

20dB Bandwidth	Carrier Frequency Separation
Tx, 2402MHz	**Tx, 2402MHz**
	
Tx, 2441MHz	**Tx, 2441MHz**
	
Tx, 2480MHz	**Tx, 2480MHz**
	

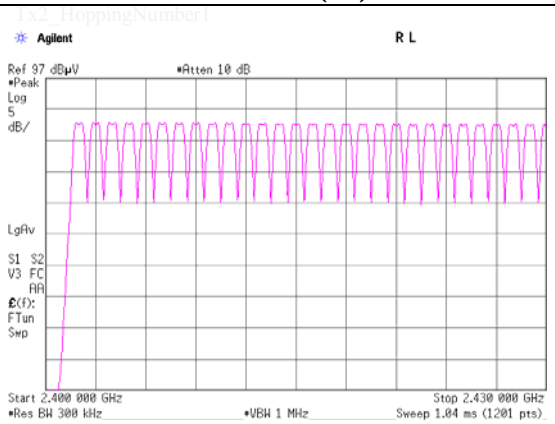
Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 17, 2014	
Temperature / Humidity	23 deg.C , 41 %RH	
Engineer	Makoto Hosaka	
Mode	Tx, Bluetooth, BDR, PRBS9	

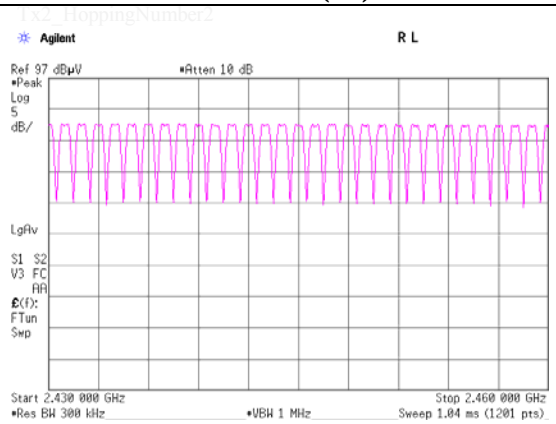
Mode	Number of Channel [times]	Limit [times]
DH5	79	>= 15

* 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.

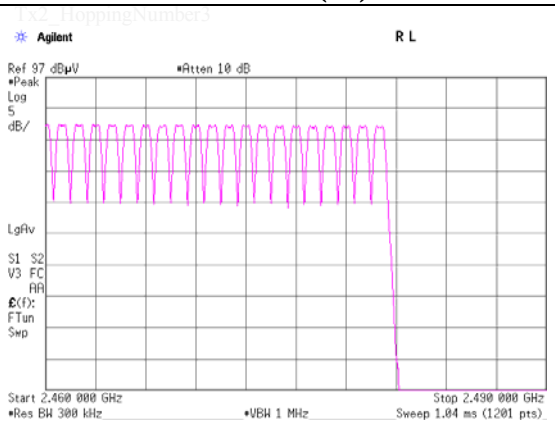
DH5 (1/3)



DH5 (2/3)



DH5 (3/3)



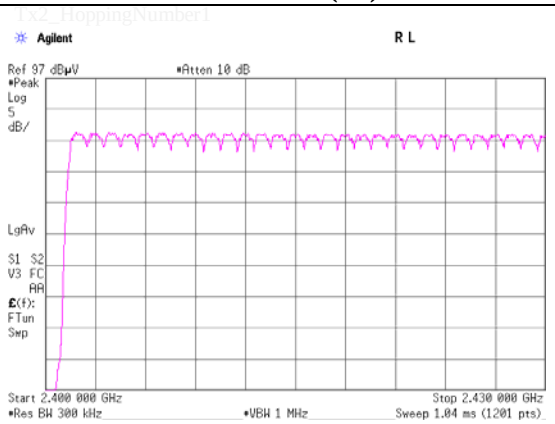
Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 17, 2014	
Temperature / Humidity	23 deg.C , 41 %RH	
Engineer	Makoto Hosaka	
Mode	Tx, Bluetooth, EDR, PRBS9	

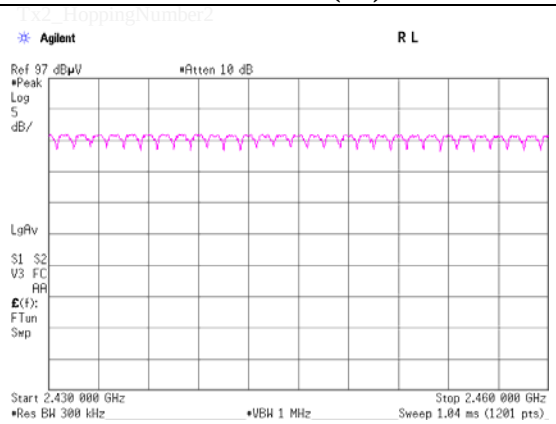
Mode	Number of Channel [times]	Limit [times]
3-DH5	79	>= 15

* 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.

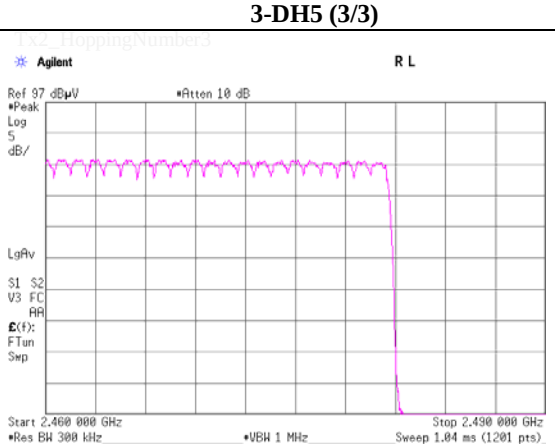
3-DH5 (1/3)



3-DH5 (2/3)



3-DH5 (3/3)



UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Dwell Time

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 17, 2014	
Temperature / Humidity	23 deg.C , 41 %RH	
Engineer	Makoto Hosaka	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4)					Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	50.4	/ 5.0 sec.	x 31.6 sec.	=	319 times	0.404	129	400
DH3	23.6	/ 5.0 sec.	x 31.6 sec.	=	150 times	1.654	248	400
DH5	17.8	/ 5.0 sec.	x 31.6 sec.	=	113 times	2.904	328	400

Sample Calculation

Result = Number of transmission x Length of transmition time

*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	49	51	51	50	50.4
DH3	21	23	26	24	24	23.6
DH5	16	18	19	20	16	17.8

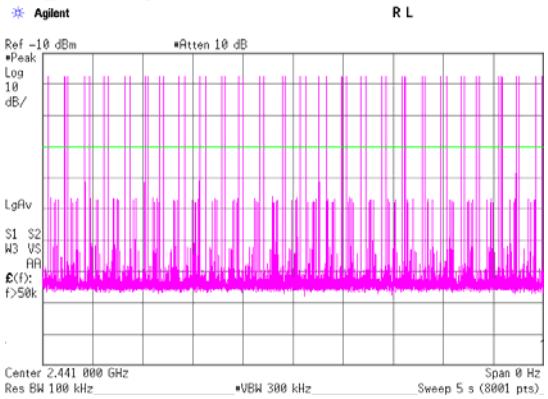
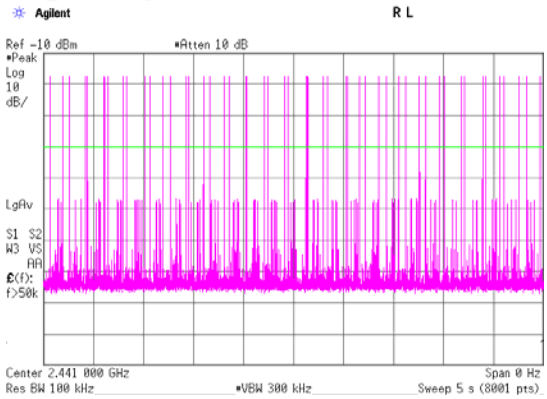
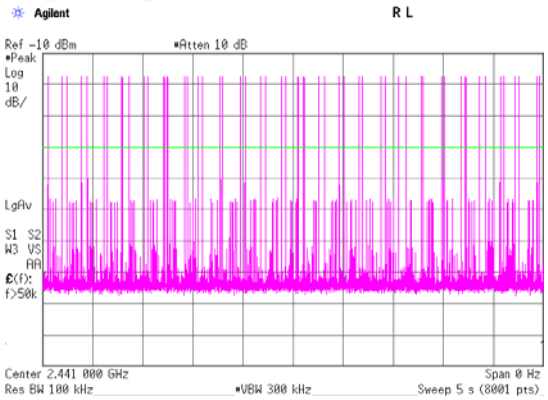
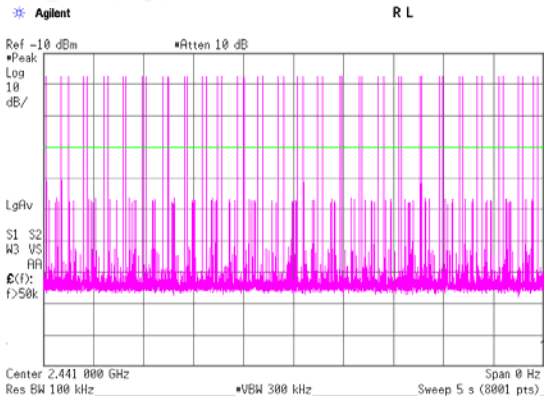
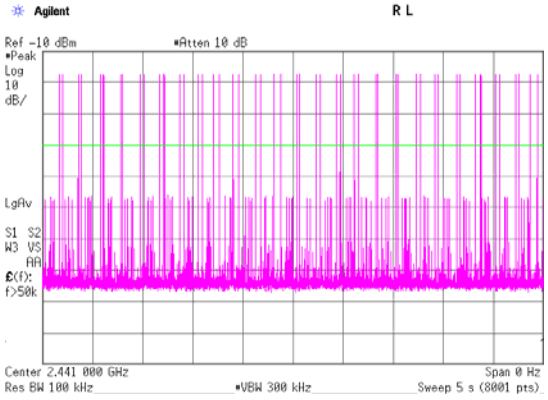
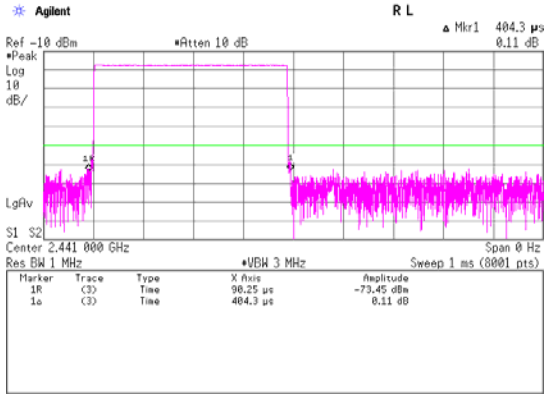
Sample Calculation

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 x 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.

Dwell time

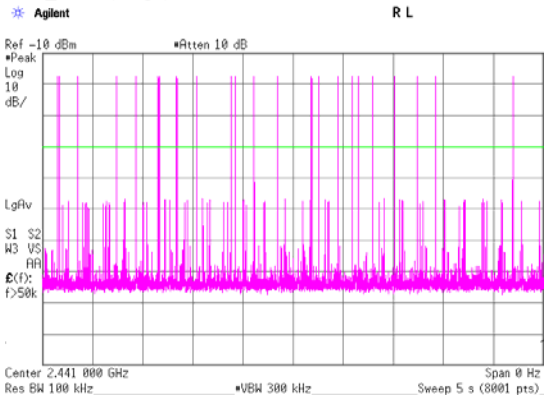
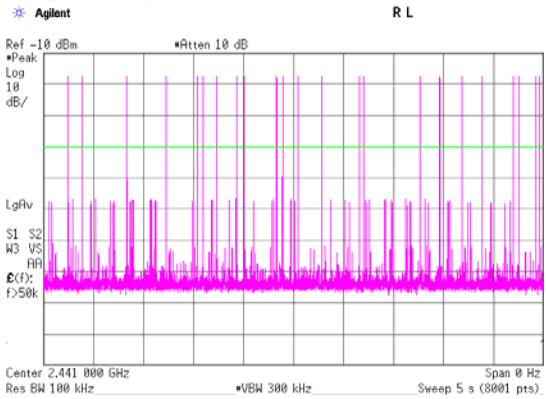
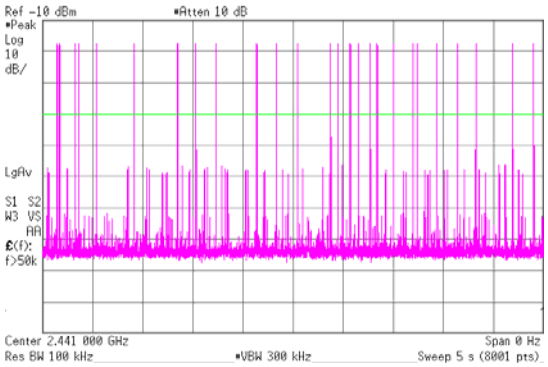
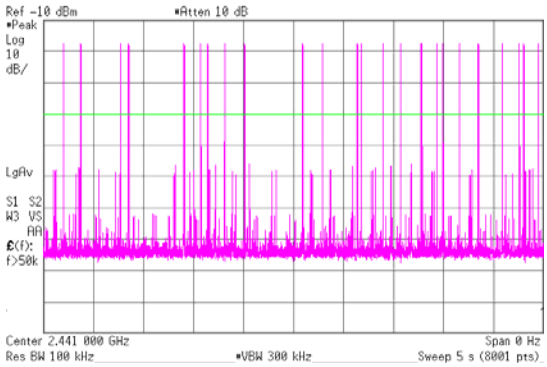
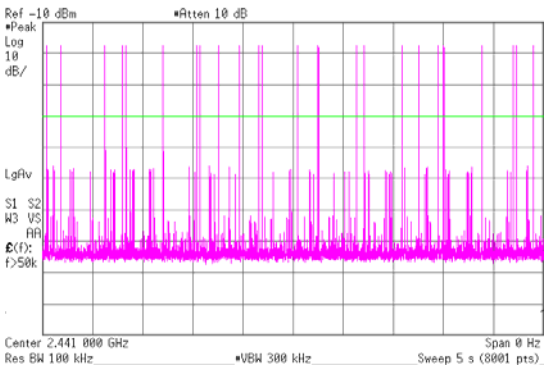
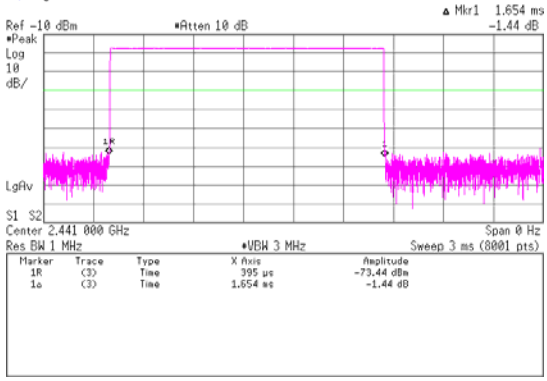
Tx, Bluetooth, BDR, PRBS9

DH1 - in 5sec.(1/5)	DH1 - in 5sec.(2/5)
	
DH1 - in 5sec.(3/5)	**DH1 - in 5sec.(4/5)**
	
DH1 - in 5sec.(5/5)	**DH1 - 1pulse**
	

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Dwell time

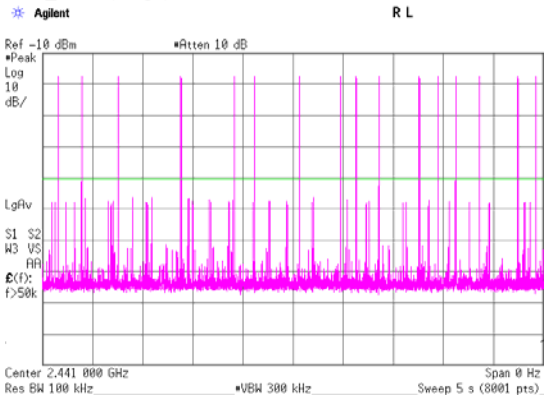
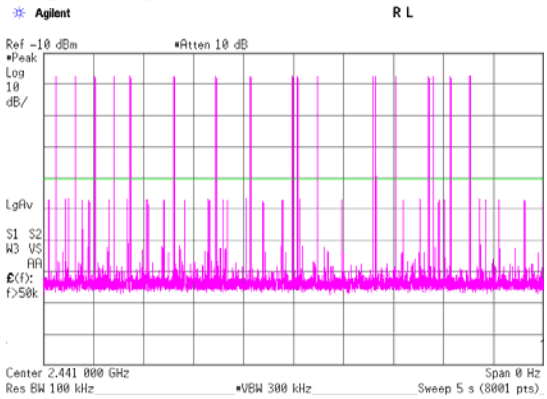
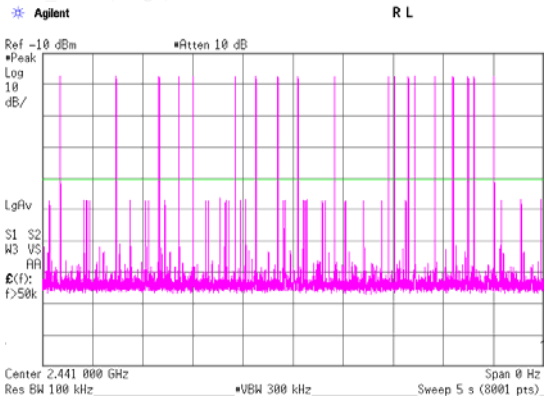
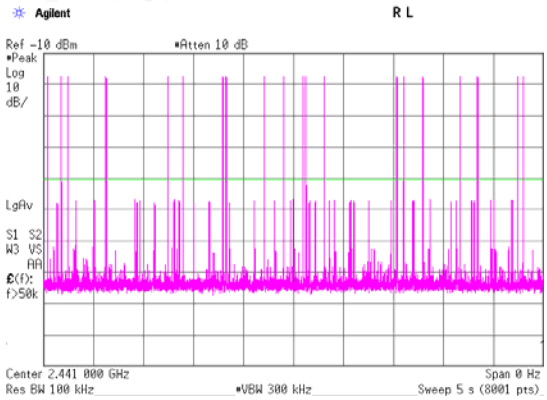
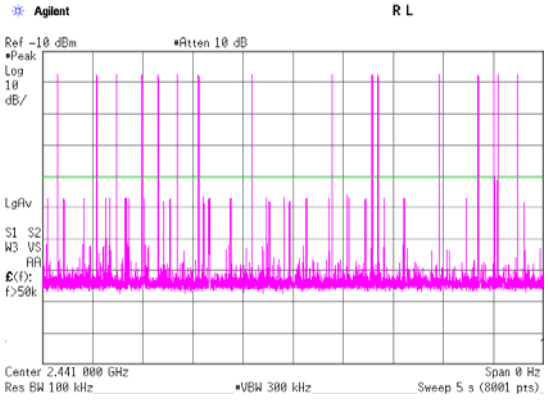
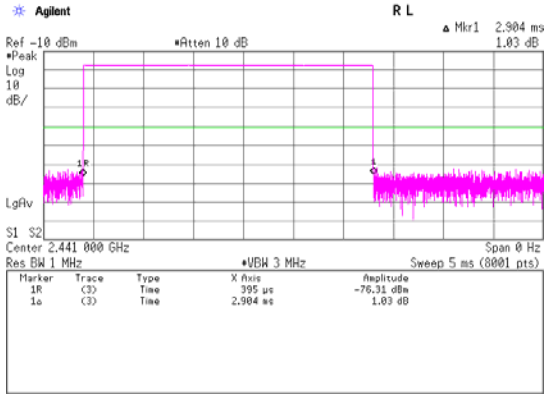
Tx, Bluetooth, BDR, PRBS9

DH3 - in 5sec.(1/5)	DH3 - in 5sec.(2/5)
	
DH3 - in 5sec.(3/5)	**DH3 - in 5sec.(4/5)**
	
DH3 - in 5sec.(5/5)	**DH3 - 1pulse**
	

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, BDR, PRBS9

DH5 - in 5sec.(1/5)	DH5 - in 5sec.(2/5)
	
DH5 - in 5sec.(3/5)	**DH5 - in 5sec.(4/5)**
	
DH5 - in 5sec.(5/5)	**DH5 - 1pulse**
	

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Dwell Time

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	January 17, 2014	
Temperature / Humidity	23 deg.C , 41 %RH	
Engineer	Makoto Hosaka	
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	50.2 / 5.0 sec. x 31.6 sec. = 318 times	0.422	134	400
3-DH3	24.2 / 5.0 sec. x 31.6 sec. = 153 times	1.677	257	400
3-DH5	17.6 / 5.0 sec. x 31.6 sec. = 112 times	2.930	328	400

Sample Calculation

Result = Number of transmission x Length of transmition time

*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
3-DH1	50	50	50	51	50	50.2
3-DH3	26	24	21	27	23	24.2
3-DH5	21	16	15	21	15	17.6

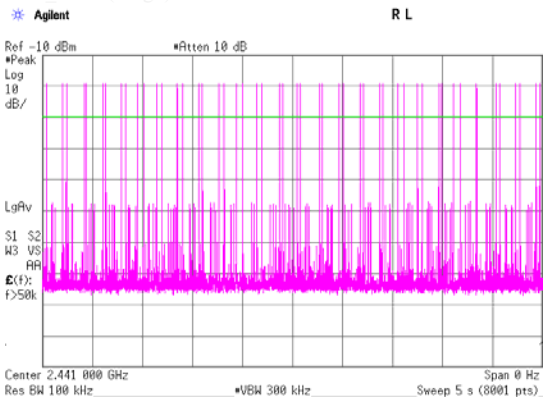
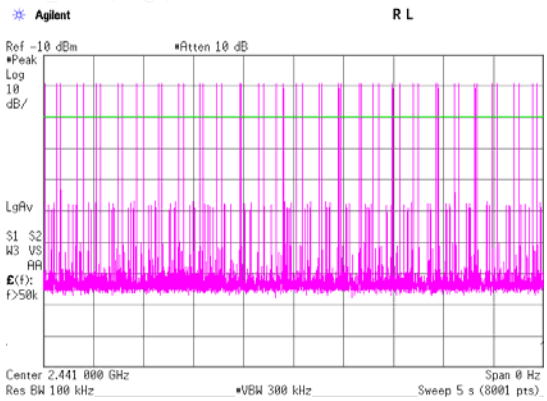
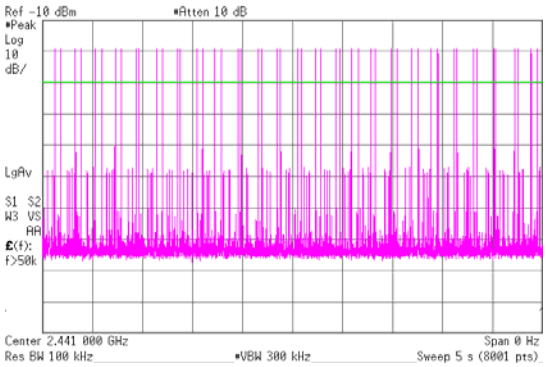
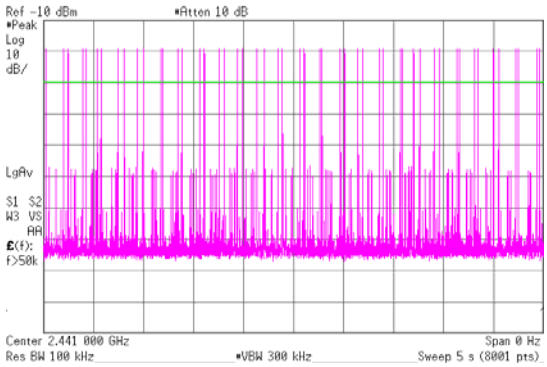
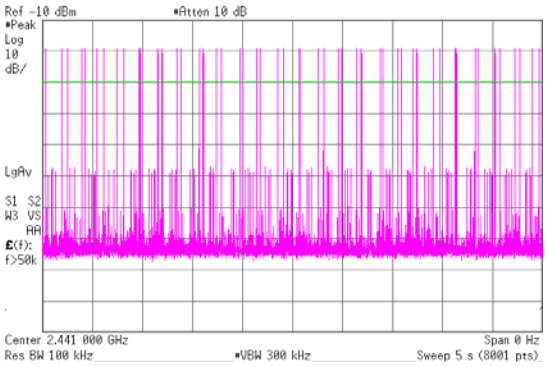
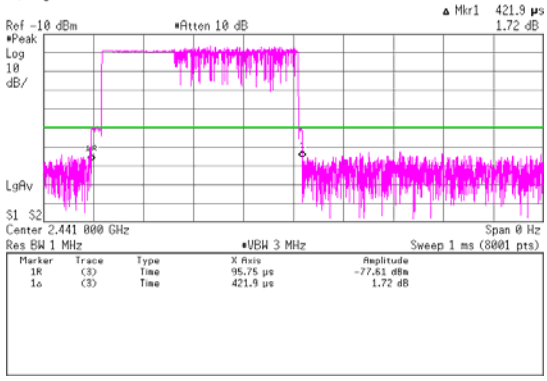
Sample Calculation

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 x 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.

Dwell time

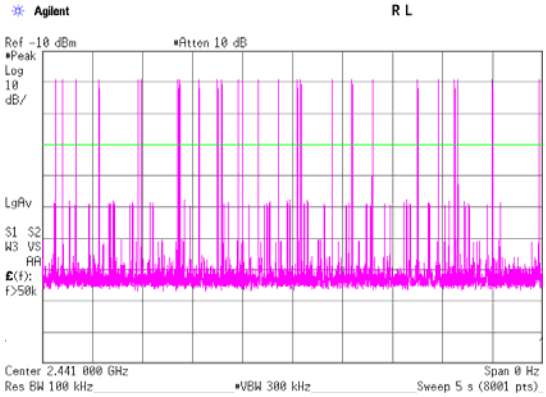
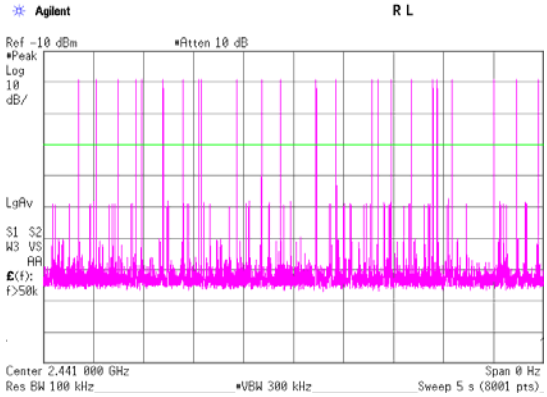
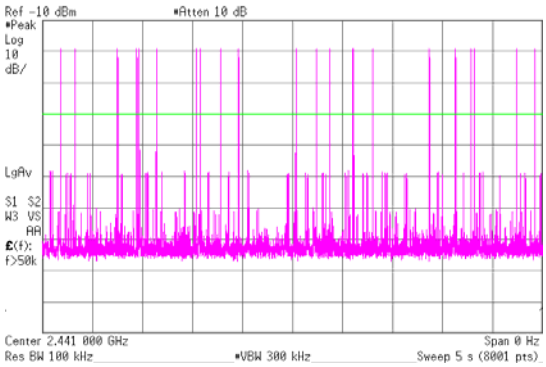
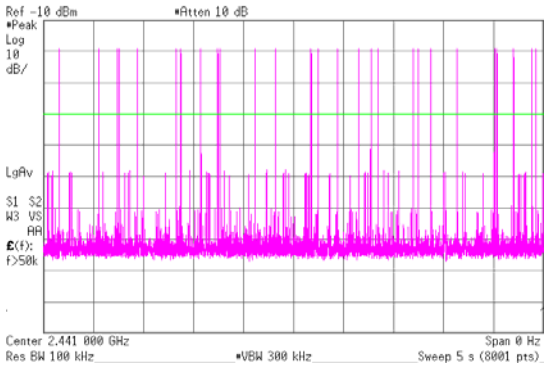
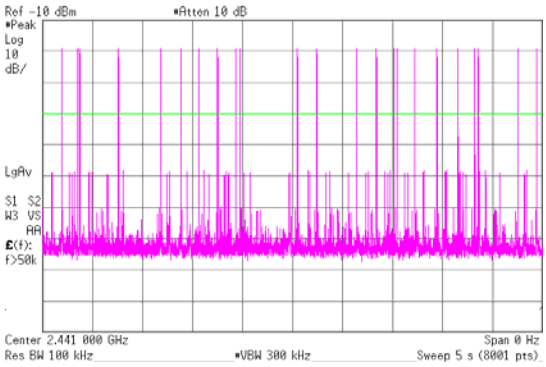
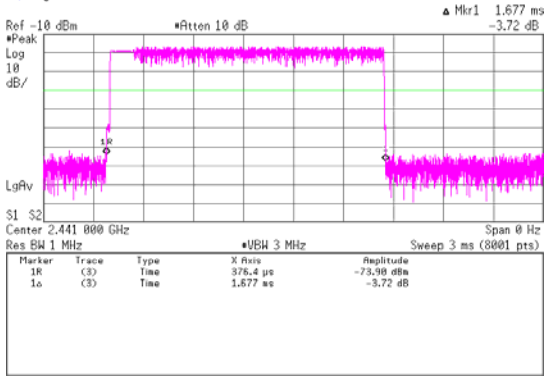
Tx, Bluetooth, EDR, PRBS9

3-DH1 - in 5sec.(1/5)	3-DH1 - in 5sec.(2/5)
	
3-DH1 - in 5sec.(3/5)	**3-DH1 - in 5sec.(4/5)**
	
3-DH1 - in 5sec.(5/5)	**3-DH1 - 1pulse**
	

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Dwell time

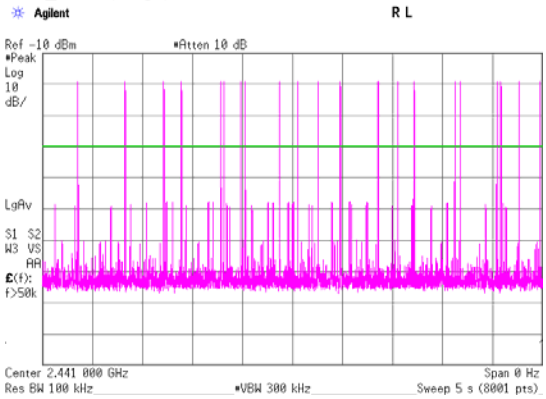
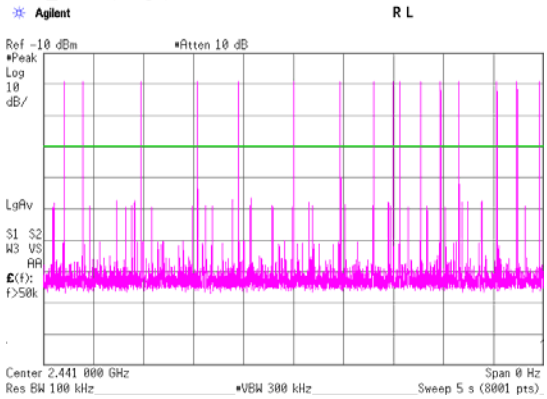
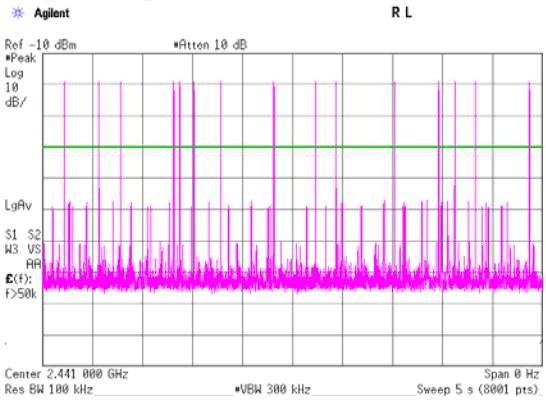
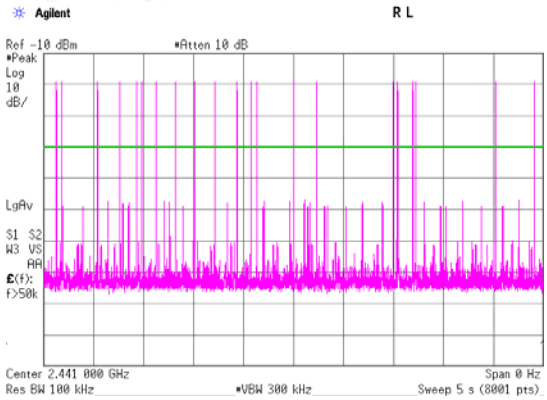
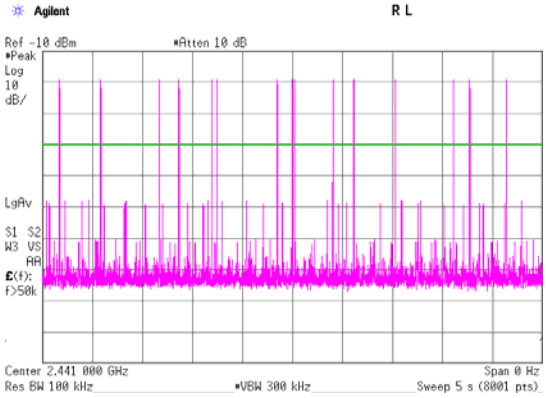
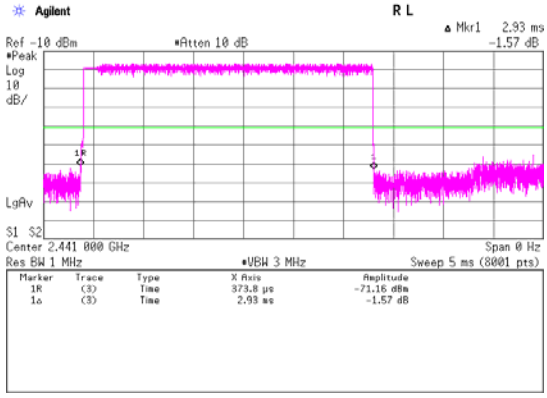
Tx, Bluetooth, EDR, PRBS9

3-DH3 - in 5sec.(1/5)	3-DH3 - in 5sec.(2/5)
	
3-DH3 - in 5sec.(3/5)	**3-DH3 - in 5sec.(4/5)**
	
3-DH3 - in 5sec.(5/5)	**3-DH3 - 1pulse**
	

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Dwell time

Tx, Bluetooth, EDR, PRBS9

3-DH5 - in 5sec.(1/5)	3-DH5 - in 5sec.(2/5)
	
3-DH5 - in 5sec.(3/5)	**3-DH5 - in 5sec.(4/5)**
	
3-DH5 - in 5sec.(5/5)	**3-DH5 - 1pulse**
	

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Maximum Peak Conducted Output Power (Conducted)

Test place	UL Japan, Inc. Shonan EMC Lab. No.1 Measurement Room
Date	January 16, 2014
Temperature / Humidity	23 deg.C , 44 %RH
Engineer	Makoto Hosaka
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	-16.07	1.99	9.98	-4.10	0.39	20.97	125	25.07
DH5	2441.0	-16.24	2.00	9.98	-4.26	0.37	20.97	125	25.23
DH5	2480.0	-16.54	2.01	9.98	-4.55	0.35	20.97	125	25.52
2-DH5	2402.0	-15.71	1.99	9.98	-3.74	0.42	20.97	125	24.71
2-DH5	2441.0	-15.96	2.00	9.98	-3.98	0.40	20.97	125	24.95
2-DH5	2480.0	-16.37	2.01	9.98	-4.38	0.36	20.97	125	25.35
3-DH5	2402.0	-15.48	1.99	9.98	-3.51	0.45	20.97	125	24.48
3-DH5	2441.0	-15.66	2.00	9.98	-3.68	0.43	20.97	125	24.65
3-DH5	2480.0	-16.08	2.01	9.98	-4.09	0.39	20.97	125	25.06

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

Radiated Emission

Test place	No.3 Semi Anechoic Chamber		
Date	January 18, 2014	January 19, 2014	January 20, 2014
Temperature / Humidity	23 deg.C, 30 %RH	23 deg.C, 29 %RH	21 deg.C, 32 %RH
Engineer	Wataru Kojima	Yasumasa Owaki	Makoto Hosaka
Mode	Tx, 2402 MHz		
	Tx, Bluetooth, BDR, PRBS9		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	481.126	QP	45.5	17.1	9.4	31.9	40.1	46.0	5.9	100	0	
Hori.	666.172	QP	42.2	19.3	10.1	31.9	39.7	46.0	6.3	100	32	
Hori.	777.201	QP	42.5	20.4	10.5	31.7	41.7	46.0	4.3	110	221	
Hori.	851.221	QP	42.2	21.1	10.7	31.3	42.7	46.0	3.3	100	151	
Hori.	925.238	QP	38.9	21.8	10.9	30.8	40.8	46.0	5.2	100	212	
Hori.	1776.474	PK	49.9	26.2	14.0	38.6	51.5	73.9	22.4	100	70	
Hori.	2390.000	PK	43.2	26.8	14.7	38.2	46.5	73.9	27.4	100	78	
Hori.	2400.000	PK	43.9	26.8	14.7	38.2	47.2	73.9	26.7	100	78	
Hori.	4804.000	PK	43.6	30.9	7.9	37.1	45.3	73.9	28.6	100	0	
Hori.	7206.000	PK	45.6	37.1	9.1	39.4	52.4	73.9	21.5	100	0	
Hori.	9608.000	PK	43.3	38.6	10.2	37.6	54.5	73.9	19.4	100	0	
Hori.	12010.000	PK	44.2	39.6	11.2	38.5	56.5	73.9	17.4	100	0	
Hori.	1776.474	AV	40.8	26.2	14.0	38.6	42.4	53.9	11.5	100	70	
Hori.	2390.000	AV	32.0	26.8	14.7	38.2	35.3	53.9	18.6	100	78	
Hori.	2400.000	AV	32.5	26.8	14.7	38.2	35.8	53.9	18.1	100	78	
Hori.	4804.000	AV	31.4	30.9	7.9	37.1	33.1	53.9	20.8	100	0	
Hori.	7206.000	AV	34.1	37.1	9.1	39.4	40.9	53.9	13.0	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	32.2	39.6	11.2	38.5	44.5	53.9	9.4	100	0	
Vert.	777.201	QP	44.2	20.4	10.5	31.7	43.4	46.0	**2.6**	100	354	
Vert.	851.221	QP	39.4	21.1	10.7	31.3	39.9	46.0	6.1	100	159	
Vert.	925.238	QP	38.4	21.8	10.9	30.8	40.3	46.0	5.7	100	54	
Vert.	1776.474	PK	50.8	26.2	14.0	38.6	52.4	73.9	21.5	100	215	
Vert.	2390.000	PK	42.8	26.8	14.7	38.2	46.1	73.9	27.8	100	54	
Vert.	2400.000	PK	44.1	26.8	14.7	38.2	47.4	73.9	26.5	100	54	
Vert.	4804.000	PK	42.9	30.9	7.9	37.1	44.6	73.9	29.3	100	0	
Vert.	7206.000	PK	46.2	37.1	9.1	39.4	53.0	73.9	20.9	100	0	
Vert.	9608.000	PK	42.3	38.6	10.2	37.6	53.5	73.9	20.4	100	0	
Vert.	12010.000	PK	44.6	39.6	11.2	38.5	56.9	73.9	17.0	100	0	
Vert.	1776.474	AV	42.1	26.2	14.0	38.6	43.7	53.9	10.2	100	215	
Vert.	2390.000	AV	31.6	26.8	14.7	38.2	34.9	53.9	19.0	100	54	
Vert.	2400.000	AV	31.9	26.8	14.7	38.2	35.2	53.9	18.7	100	54	
Vert.	4804.000	AV	31.5	30.9	7.9	37.1	33.2	53.9	20.7	100	0	
Vert.	7206.000	AV	34.1	37.1	9.1	39.4	40.9	53.9	13.0	100	0	
Vert.	9608.000	AV	31.9	38.6	10.2	37.6	43.1	53.9	10.8	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(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Radiated Emission

Test place	No.3 Semi Anechoic Chamber		
Date	January 18, 2014	January 19, 2014	January 20, 2014
Temperature / Humidity	23 deg.C, 30 %RH	23 deg.C, 29 %RH	21 deg.C, 32 %RH
Engineer	Wataru Kojima	Yasumasa Owaki	Makoto Hosaka
Mode	Tx, 2441 MHz		
	Tx, Bluetooth, BDR, PRBS9		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	481.127	QP	44.9	17.1	9.4	31.9	39.5	46.0	6.5	100	0	
Hori.	666.175	QP	42.4	19.3	10.1	31.9	39.9	46.0	6.1	100	31	
Hori.	777.200	QP	42.6	20.4	10.5	31.7	41.8	46.0	4.2	100	223	
Hori.	851.219	QP	43.0	21.1	10.7	31.3	43.5	46.0	2.5	110	147	
Hori.	925.238	QP	38.5	21.8	10.9	30.8	40.4	46.0	5.6	104	167	
Hori.	1776.445	PK	50.2	26.2	14.0	38.6	51.8	73.9	22.1	100	64	
Hori.	4882.000	PK	42.0	31.4	7.9	37.0	44.3	73.9	29.6	100	0	
Hori.	7323.000	PK	44.2	37.2	9.1	39.4	51.1	73.9	22.8	100	0	
Hori.	9764.000	PK	41.9	38.8	10.1	37.5	53.3	73.9	20.6	100	0	
Hori.	12205.000	PK	43.5	39.6	11.3	38.3	56.1	73.9	17.8	100	0	
Hori.	1776.445	AV	41.0	26.2	14.0	38.6	42.6	53.9	11.3	100	64	
Hori.	4882.000	AV	31.3	31.4	7.9	37.0	33.6	53.9	20.3	100	0	
Hori.	7323.000	AV	33.6	37.2	9.1	39.4	40.5	53.9	13.4	100	0	
Hori.	9764.000	AV	31.5	38.8	10.1	37.5	42.9	53.9	11.0	100	0	
Hori.	12205.000	AV	32.1	39.6	11.3	38.3	44.7	53.9	9.2	100	0	
Vert.	777.200	QP	44.6	20.4	10.5	31.7	43.8	46.0	**2.2**	100	358	
Vert.	851.219	QP	39.2	21.1	10.7	31.3	39.7	46.0	6.3	100	153	
Vert.	925.238	QP	38.2	21.8	10.9	30.8	40.1	46.0	5.9	100	50	
Vert.	1776.445	PK	51.1	26.2	14.0	38.6	52.7	73.9	21.2	100	217	
Vert.	4882.000	PK	41.6	31.4	7.9	37.0	43.9	73.9	30.0	100	0	
Vert.	7323.000	PK	44.4	37.2	9.1	39.4	51.3	73.9	22.6	100	0	
Vert.	9764.000	PK	43.1	38.8	10.1	37.5	54.5	73.9	19.4	100	0	
Vert.	12205.000	PK	42.9	39.6	11.3	38.3	55.5	73.9	18.4	100	0	
Vert.	1776.445	AV	42.2	26.2	14.0	38.6	43.8	53.9	10.1	100	217	
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	31.3	38.8	10.1	37.5	42.7	53.9	11.2	100	0	
Vert.	12205.000	AV	32.1	39.6	11.3	38.3	44.7	53.9	9.2	100	0	

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

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Radiated Emission

Test place	No.3 Semi Anechoic Chamber		
Date	January 18, 2014	January 19, 2014	January 20, 2014
Temperature / Humidity	23 deg.C, 30 %RH	23 deg.C, 29 %RH	21 deg.C, 32 %RH
Engineer	Wataru Kojima	Yasumasa Owaki	Makoto Hosaka
Mode	Tx, 2480 MHz		
	Tx, Bluetooth, BDR, PRBS9		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	481.126	QP	43.7	17.1	9.4	31.9	38.3	46.0	7.7	100	0	
Hori.	666.172	QP	42.4	19.3	10.1	31.9	39.9	46.0	6.1	100	32	
Hori.	777.201	QP	42.3	20.4	10.5	31.7	41.5	46.0	4.5	104	225	
Hori.	851.221	QP	43.0	21.1	10.7	31.3	43.5	46.0	2.5	109	147	
Hori.	925.240	QP	38.2	21.8	10.9	30.8	40.1	46.0	5.9	105	168	
Hori.	1776.450	PK	50.8	26.2	14.0	38.6	52.4	73.9	21.5	100	60	
Hori.	2483.500	PK	43.0	26.9	14.8	38.1	46.6	73.9	27.3	100	348	
Hori.	4960.000	PK	42.8	31.8	7.8	37.0	45.4	73.9	28.5	100	0	
Hori.	7440.000	PK	45.0	37.4	9.3	39.4	52.3	73.9	21.6	100	0	
Hori.	9920.000	PK	42.3	38.9	10.1	37.5	53.8	73.9	20.1	100	0	
Hori.	12400.000	PK	42.4	39.7	11.4	38.2	55.3	73.9	18.6	100	0	
Hori.	1776.450	AV	41.3	26.2	14.0	38.6	42.9	53.9	11.0	100	60	
Hori.	2483.500	AV	31.4	26.9	14.8	38.1	35.0	53.9	18.9	100	348	
Hori.	4960.000	AV	31.4	31.8	7.8	37.0	34.0	53.9	19.9	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	31.1	38.9	10.1	37.5	42.6	53.9	11.3	100	0	
Hori.	12400.000	AV	31.4	39.7	11.4	38.2	44.3	53.9	9.6	100	0	
Vert.	777.201	QP	45.1	20.4	10.5	31.7	44.3	46.0	**1.7**	100	358	
Vert.	851.221	QP	38.8	21.1	10.7	31.3	39.3	46.0	6.7	100	154	
Vert.	925.240	QP	38.2	21.8	10.9	30.8	40.1	46.0	5.9	100	52	
Vert.	1776.450	PK	50.6	26.2	14.0	38.6	52.2	73.9	21.7	100	218	
Vert.	2483.500	PK	44.2	26.9	14.8	38.1	47.8	73.9	26.1	100	309	
Vert.	4960.000	PK	42.7	31.8	7.8	37.0	45.3	73.9	28.6	100	0	
Vert.	7440.000	PK	44.4	37.4	9.3	39.4	51.7	73.9	22.2	100	0	
Vert.	9920.000	PK	42.4	38.9	10.1	37.5	53.9	73.9	20.0	100	0	
Vert.	12400.000	PK	42.6	39.7	11.4	38.2	55.5	73.9	18.4	100	0	
Vert.	1776.450	AV	41.6	26.2	14.0	38.6	43.2	53.9	10.7	100	218	
Vert.	2483.500	AV	32.0	26.9	14.8	38.1	35.6	53.9	18.3	100	309	
Vert.	4960.000	AV	31.3	31.8	7.8	37.0	33.9	53.9	20.0	100	0	
Vert.	7440.000	AV	33.3	37.4	9.3	39.4	40.6	53.9	13.3	100	0	
Vert.	9920.000	AV	31.0	38.9	10.1	37.5	42.5	53.9	11.4	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(Amprifier)
Distance factor : 15GHz -40GHz : 20log(3.0m/1.0m)= 9.5dB

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	January 18, 2014	January 19, 2014
Temperature / Humidity	23 deg.C, 30 %RH	23 deg.C, 29 %RH
Engineer	Wataru Kojima	Yasumasa Owaki
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.	481.123	QP	44.0	17.1	9.4	31.9	38.6	46.0	7.4	100	1	
Hori.	777.197	QP	44.0	20.4	10.5	31.7	43.2	46.0	2.8	124	145	
Hori.	851.217	QP	42.7	21.1	10.7	31.3	43.2	46.0	2.8	111	149	
Hori.	925.234	QP	40.6	21.8	10.9	30.8	42.5	46.0	3.5	192	212	
Hori.	1776.472	PK	50.8	26.2	14.0	38.6	52.4	73.9	21.5	100	66	
Hori.	2390.000	PK	44.6	26.8	14.7	38.2	47.9	73.9	26.0	100	79	
Hori.	2400.000	PK	45.9	26.8	14.7	38.2	49.2	73.9	24.7	100	79	
Hori.	4804.000	PK	42.5	30.9	7.9	37.1	44.2	73.9	29.7	100	0	
Hori.	7206.000	PK	45.7	37.1	9.1	39.4	52.5	73.9	21.4	100	0	
Hori.	9608.000	PK	43.4	38.6	10.2	37.6	54.6	73.9	19.3	100	0	
Hori.	12010.000	PK	44.7	39.6	11.2	38.5	57.0	73.9	16.9	100	0	
Hori.	1776.472	AV	41.5	26.2	14.0	38.6	43.1	53.9	10.8	100	66	
Hori.	2390.000	AV	32.0	26.8	14.7	38.2	35.3	53.9	18.6	100	79	
Hori.	2400.000	AV	33.6	26.8	14.7	38.2	36.9	53.9	17.0	100	79	
Hori.	4804.000	AV	31.5	30.9	7.9	37.1	33.2	53.9	20.7	100	0	
Hori.	7206.000	AV	34.1	37.1	9.1	39.4	40.9	53.9	13.0	100	0	
Hori.	9608.000	AV	31.8	38.6	10.2	37.6	43.0	53.9	10.9	100	0	
Hori.	12010.000	AV	31.8	39.6	11.2	38.5	44.1	53.9	9.8	100	0	
Vert.	777.196	QP	45.9	20.4	10.5	31.7	45.1	46.0	**0.9**	104	5	
Vert.	851.215	QP	39.8	21.1	10.7	31.3	40.3	46.0	5.7	224	17	
Vert.	925.234	QP	36.8	21.8	10.9	30.8	38.7	46.0	7.3	100	53	
Vert.	1776.472	PK	51.1	26.2	14.0	38.6	52.7	73.9	21.2	100	213	
Vert.	2390.000	PK	43.6	26.8	14.7	38.2	46.9	73.9	27.0	100	33	
Vert.	2400.000	PK	47.0	26.8	14.7	38.2	50.3	73.9	23.6	100	33	
Vert.	4804.000	PK	42.8	30.9	7.9	37.1	44.5	73.9	29.4	100	0	
Vert.	7206.000	PK	45.5	37.1	9.1	39.4	52.3	73.9	21.6	100	0	
Vert.	9608.000	PK	43.3	38.6	10.2	37.6	54.5	73.9	19.4	100	0	
Vert.	12010.000	PK	44.1	39.6	11.2	38.5	56.4	73.9	17.5	100	0	
Vert.	1776.472	AV	42.1	26.2	14.0	38.6	43.7	53.9	10.2	100	213	
Vert.	2390.000	AV	32.2	26.8	14.7	38.2	35.5	53.9	18.4	100	33	
Vert.	2400.000	AV	34.2	26.8	14.7	38.2	37.5	53.9	16.4	100	33	
Vert.	4804.000	AV	31.5	30.9	7.9	37.1	33.2	53.9	20.7	100	0	
Vert.	7206.000	AV	34.1	37.1	9.1	39.4	40.9	53.9	13.0	100	0	
Vert.	9608.000	AV	31.7	38.6	10.2	37.6	42.9	53.9	11.0	100	0	
Vert.	12010.000	AV	31.8	39.6	11.2	38.5	44.1	53.9	9.8	100	0	

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

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	January 18, 2014	January 19, 2014
Temperature / Humidity	23 deg.C, 30 %RH	23 deg.C, 29 %RH
Engineer	Wataru Kojima	Yasumasa Owaki
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.	481.124	QP	43.9	17.1	9.4	31.9	38.5	46.0	7.5	100	1	
Hori.	777.197	QP	44.2	20.4	10.5	31.7	43.4	46.0	2.6	128	141	
Hori.	851.216	QP	42.8	21.1	10.7	31.3	43.3	46.0	2.7	115	151	
Hori.	925.235	QP	41.0	21.8	10.9	30.8	42.9	46.0	3.1	193	211	
Hori.	1776.441	PK	49.3	26.2	14.0	38.6	50.9	73.9	23.0	100	0	
Hori.	4882.000	PK	43.0	31.4	7.9	37.0	45.3	73.9	28.6	100	0	
Hori.	7323.000	PK	44.5	37.2	9.1	39.4	51.4	73.9	22.5	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.	1776.441	AV	39.8	26.2	14.0	38.6	41.4	53.9	12.5	100	0	
Hori.	4882.000	AV	31.3	31.4	7.9	37.0	33.6	53.9	20.3	100	0	
Hori.	7323.000	AV	33.6	37.2	9.1	39.4	40.5	53.9	13.4	100	0	
Hori.	9764.000	AV	31.5	38.8	10.1	37.5	42.9	53.9	11.0	100	0	
Hori.	12205.000	AV	32.0	39.6	11.3	38.3	44.6	53.9	9.3	100	0	
Vert.	777.195	QP	44.6	20.4	10.5	31.7	43.8	46.0	**2.2**	104	3	
Vert.	851.214	QP	39.2	21.1	10.7	31.3	39.7	46.0	6.3	226	22	
Vert.	925.234	QP	37.0	21.8	10.9	30.8	38.9	46.0	7.1	100	53	
Vert.	1776.441	PK	51.3	26.2	14.0	38.6	52.9	73.9	21.0	100	214	
Vert.	4882.000	PK	42.1	31.4	7.9	37.0	44.4	73.9	29.5	100	0	
Vert.	7323.000	PK	45.1	37.2	9.1	39.4	52.0	73.9	21.9	100	0	
Vert.	9764.000	PK	42.8	38.8	10.1	37.5	54.2	73.9	19.7	100	0	
Vert.	12205.000	PK	44.2	39.6	11.3	38.3	56.8	73.9	17.1	100	0	
Vert.	1776.441	AV	41.7	26.2	14.0	38.6	43.3	53.9	10.6	100	214	
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	31.5	38.8	10.1	37.5	42.9	53.9	11.0	100	0	
Vert.	12205.000	AV	32.0	39.6	11.3	38.3	44.6	53.9	9.3	100	0	

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

Radiated Emission

Test place	No.3 Semi Anechoic Chamber	
Date	January 18, 2014	January 19, 2014
Temperature / Humidity	23 deg.C, 30 %RH	23 deg.C, 29 %RH
Engineer	Wataru Kojima	Yasumasa Owaki
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.	481.123	QP	43.5	17.1	9.4	31.9	38.1	46.0	7.9	100	352	
Hori.	777.196	QP	45.5	20.4	10.5	31.7	44.7	46.0	**1.3**	128	143	
Hori.	851.216	QP	43.2	21.1	10.7	31.3	43.7	46.0	2.3	111	148	
Hori.	925.235	QP	40.3	21.8	10.9	30.8	42.2	46.0	3.8	193	212	
Hori.	1776.438	PK	50.4	26.2	14.0	38.6	52.0	73.9	21.9	100	66	
Hori.	2483.500	PK	43.8	26.9	14.8	38.1	47.4	73.9	26.5	100	17	
Hori.	4960.000	PK	42.4	31.8	7.8	37.0	45.0	73.9	28.9	100	0	
Hori.	7440.000	PK	44.1	37.4	9.3	39.4	51.4	73.9	22.5	100	0	
Hori.	9920.000	PK	42.0	38.9	10.1	37.5	53.5	73.9	20.4	100	0	
Hori.	12400.000	PK	42.8	39.7	11.4	38.2	55.7	73.9	18.2	100	0	
Hori.	1776.438	AV	41.0	26.2	14.0	38.6	42.6	53.9	11.3	100	66	
Hori.	2483.500	AV	32.2	26.9	14.8	38.1	35.8	53.9	18.1	100	17	
Hori.	4960.000	AV	31.3	31.8	7.8	37.0	33.9	53.9	20.0	100	0	
Hori.	7440.000	AV	33.4	37.4	9.3	39.4	40.7	53.9	13.2	100	0	
Hori.	9920.000	AV	31.1	38.9	10.1	37.5	42.6	53.9	11.3	100	0	
Hori.	12400.000	AV	31.5	39.7	11.4	38.2	44.4	53.9	9.5	100	0	
Vert.	777.195	QP	45.3	20.4	10.5	31.7	44.5	46.0	1.5	104	5	
Vert.	851.215	QP	39.2	21.1	10.7	31.3	39.7	46.0	6.3	216	19	
Vert.	925.234	QP	36.2	21.8	10.9	30.8	38.1	46.0	7.9	100	54	
Vert.	1776.438	PK	50.0	26.2	14.0	38.6	51.6	73.9	22.3	100	216	
Vert.	2483.500	PK	43.9	26.9	14.8	38.1	47.5	73.9	26.4	100	309	
Vert.	4960.000	PK	41.8	31.8	7.8	37.0	44.4	73.9	29.5	100	0	
Vert.	7440.000	PK	44.1	37.4	9.3	39.4	51.4	73.9	22.5	100	0	
Vert.	9920.000	PK	41.7	38.9	10.1	37.5	53.2	73.9	20.7	100	0	
Vert.	12400.000	PK	42.7	39.7	11.4	38.2	55.6	73.9	18.3	100	0	
Vert.	1776.438	AV	41.2	26.2	14.0	38.6	42.8	53.9	11.1	100	216	
Vert.	2483.500	AV	32.9	26.9	14.8	38.1	36.5	53.9	17.4	100	309	
Vert.	4960.000	AV	31.3	31.8	7.8	37.0	33.9	53.9	20.0	100	0	
Vert.	7440.000	AV	33.4	37.4	9.3	39.4	40.7	53.9	13.2	100	0	
Vert.	9920.000	AV	31.1	38.9	10.1	37.5	42.6	53.9	11.3	100	0	
Vert.	12400.000	AV	31.5	39.7	11.4	38.2	44.4	53.9	9.5	100	0	

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

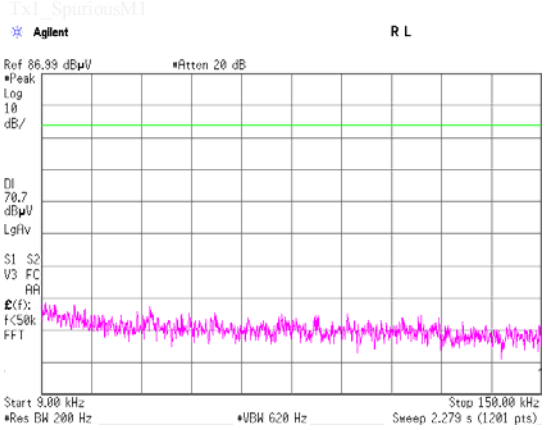
UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

(Reference chart) Spurious emission (Conducted)

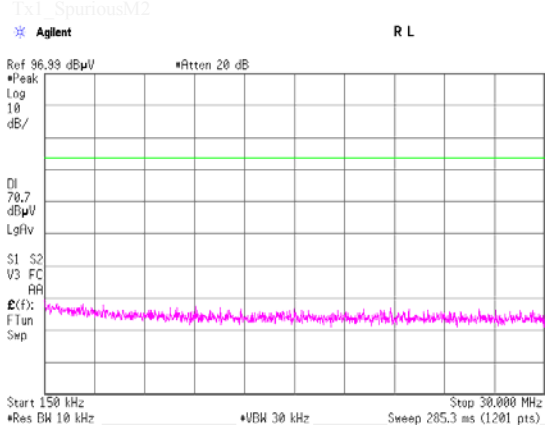
Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (below 1GHz)

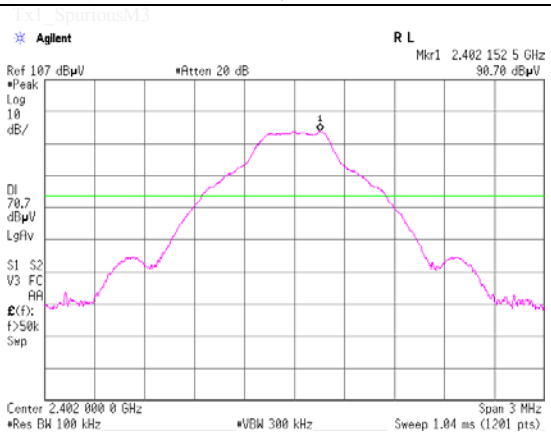
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit

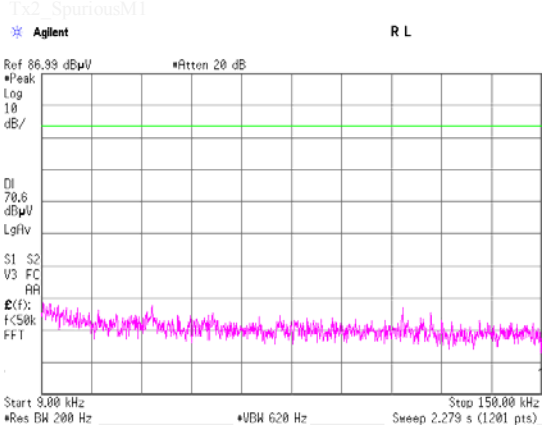


(Reference chart) Spurious emission (Conducted)

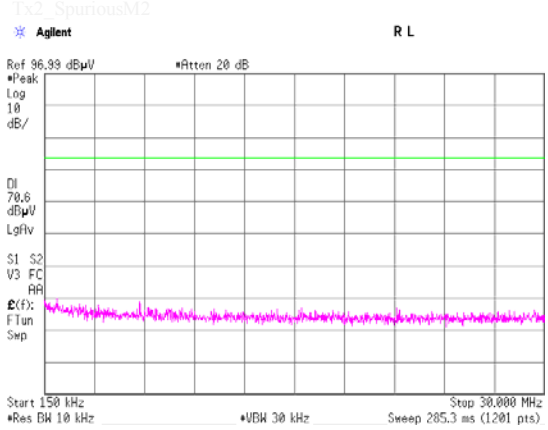
Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (below 1GHz)

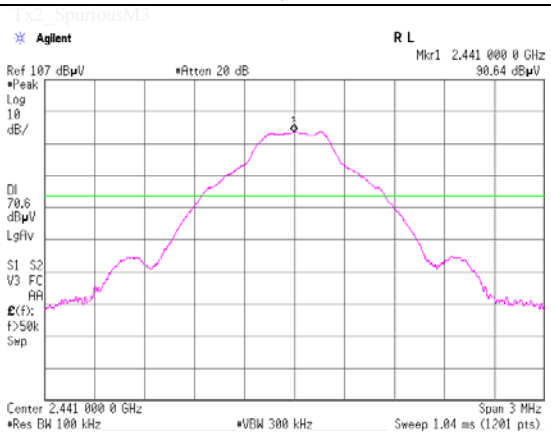
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit

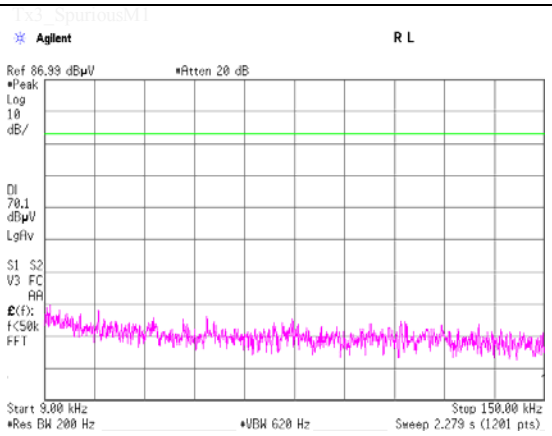


(Reference chart) Spurious emission (Conducted)

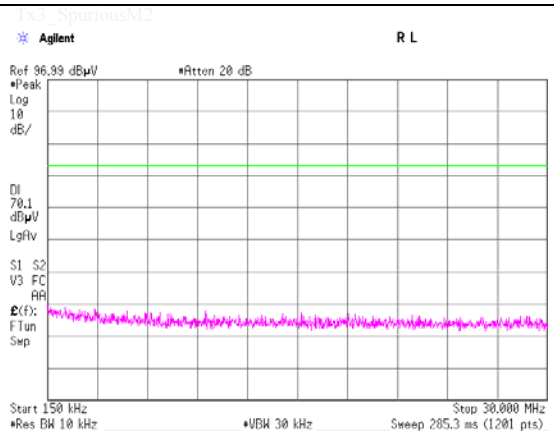
Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (below 1GHz)

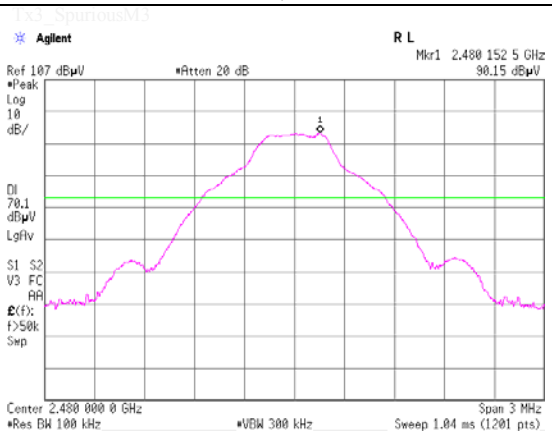
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit

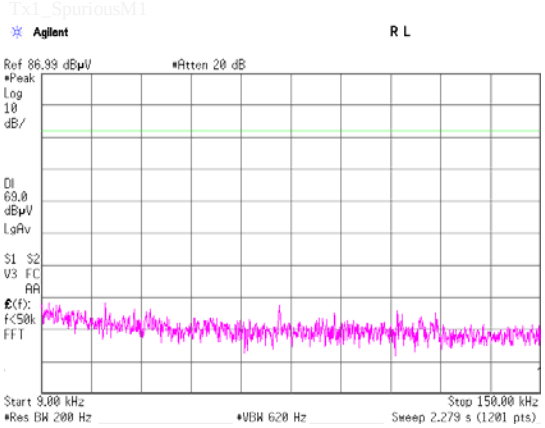


(Reference chart) Spurious emission (Conducted)

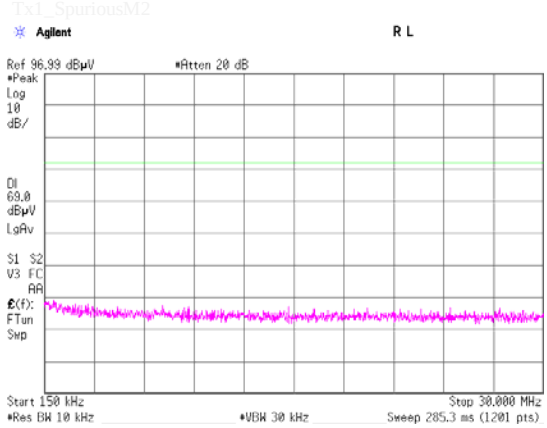
Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (below 1GHz)

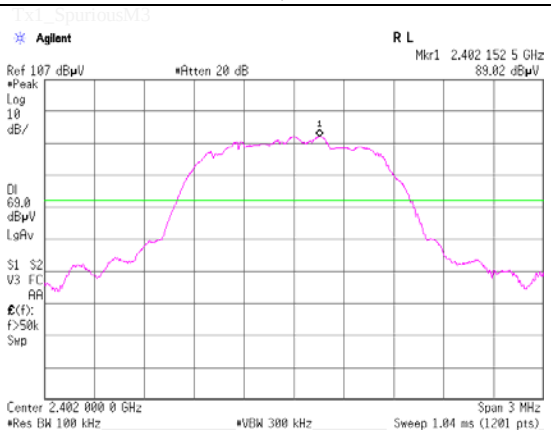
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit

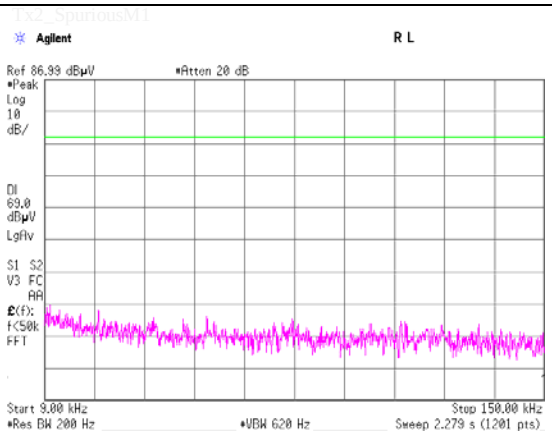


(Reference chart) Spurious emission (Conducted)

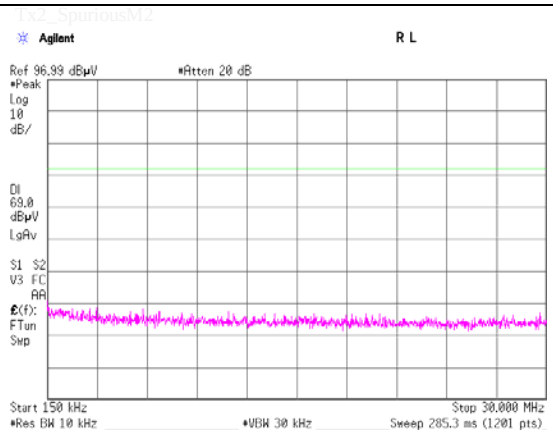
Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (below 1GHz)

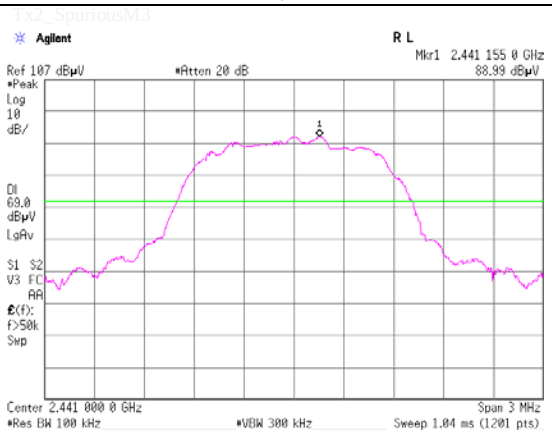
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit

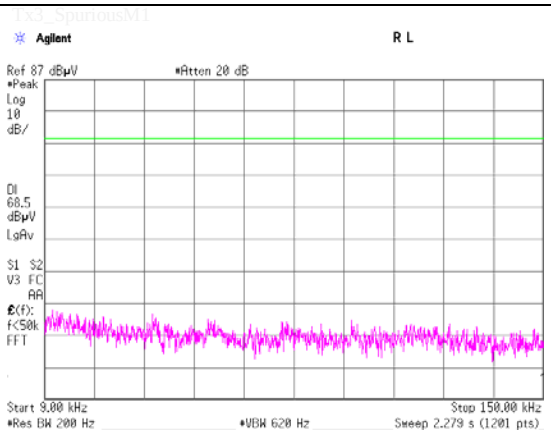


(Reference chart) Spurious emission (Conducted)

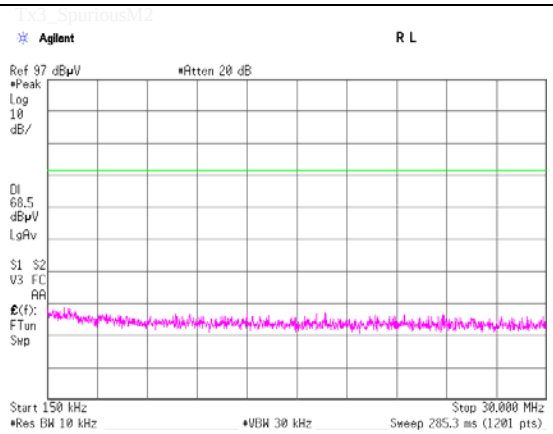
Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (below 1GHz)

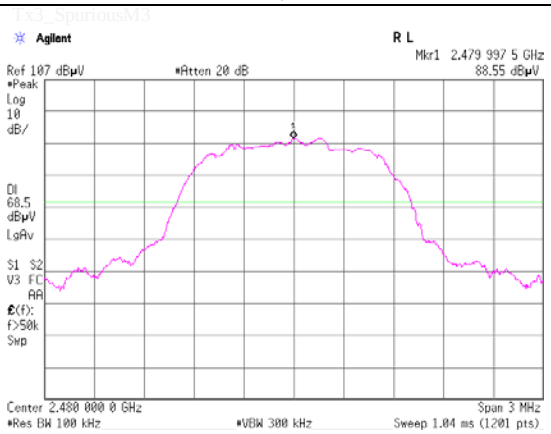
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit

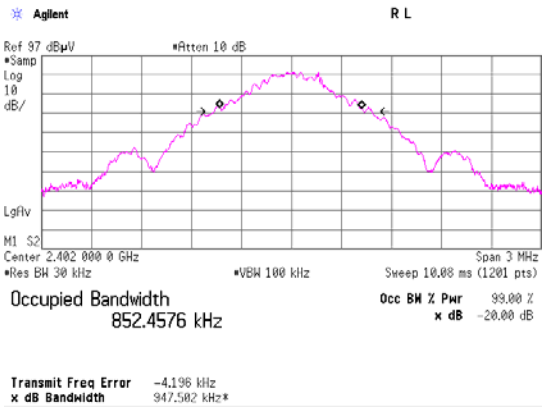


99% Occupied Bandwidth

Tx, Bluetooth, BDR, PRBS9

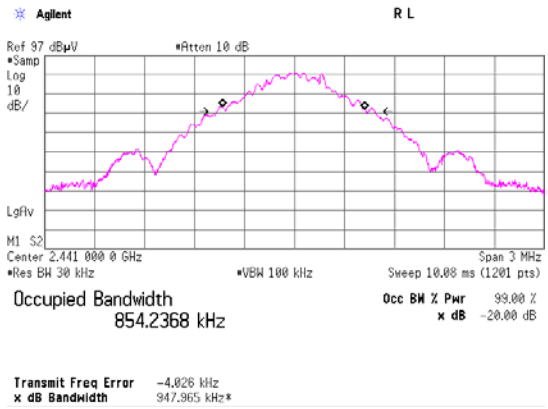
Tx, 2402MHz

Tx1_99OBW



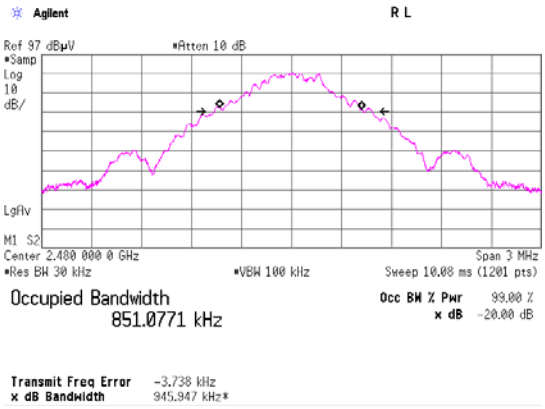
Tx, 2441MHz

Tx2_99OBW



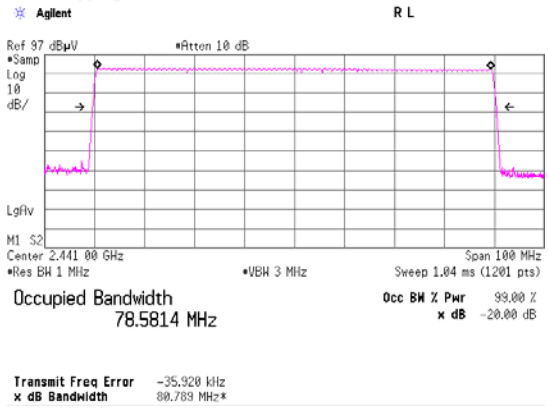
Tx, 2480MHz

Tx3_99OBW



Tx, Hopping On

Tx2_Hopping99OBW



Tx2_Inquiry99OBW

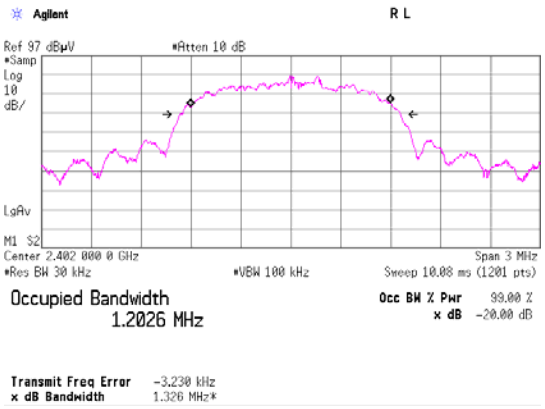
Tx2_InqHopping99OBW

99% Occupied Bandwidth

Tx, Bluetooth, EDR, PRBS9

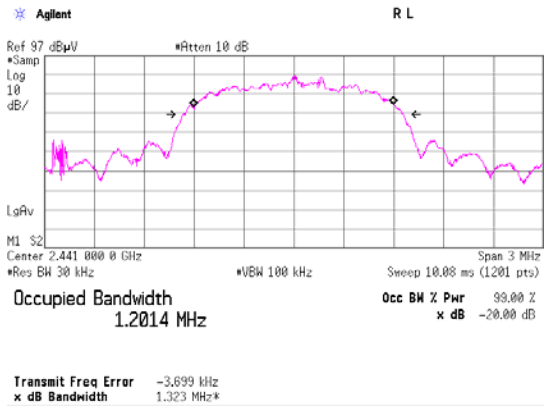
Tx, 2402MHz

Tx1_99OBW



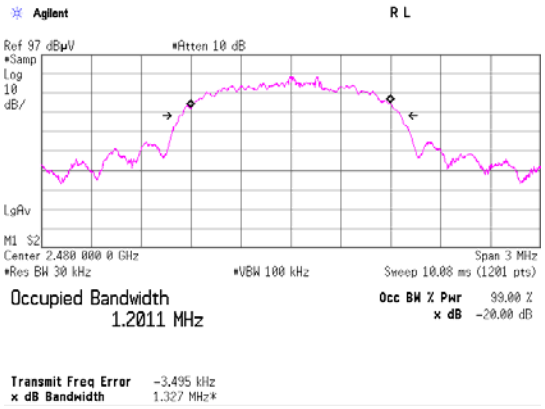
Tx, 2441MHz

Tx2_99OBW



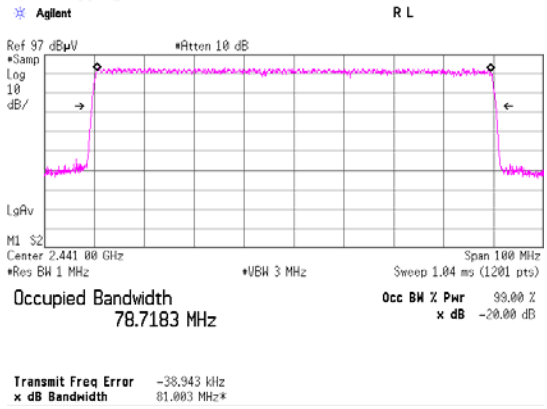
Tx, 2480MHz

Tx3_99OBW



Tx, Hopping On

Tx2_Hopping99OBW



Tx2_Inquiry99OBW

Tx2_InqHopping99OBW

APPENDIX 2
Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date ＊Interval(month)
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2013/04/09 ＊ 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2013/04/09 ＊ 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2013/03/04 ＊ 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2013/04/09 ＊ 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2013/03/16 ＊ 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2013/04/25 ＊ 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2013/07/09 ＊ 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2013/11/22 ＊ 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, RFI,MF)	-	RE	-
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2013/11/22 ＊ 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2013/11/22 ＊ 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2013/03/14 ＊ 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2013/03/19 ＊ 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2013/03/16 ＊ 12
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

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