RADIO TEST REPORT

Test Report No.: 10329797S-A

Applicant	:	**Sony Corporation**
Type of Equipment	:	**Digital Music Player**
Model No.	:	**NWZ-WS613**
FCC ID	:	**AK8NWZWS610**
Test regulation	:	**FCC Part15 Subpart C: 2014**
Test result	:	**Complied**

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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: May 12 to 18, 2014

Tested by:

Hikaru Shirasawa
Engineer
Consumer Technology Division

Approved by :

Toyokazu Imamura
Leader
Consumer Technology Division

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☒ There is no testing item of "Non-accreditation".

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REVISION HISTORY

Original Test Report No.: 10329797S-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10329797S-A	May 30, 2014	-	-
1	10329797S-A	June 17, 2014	5	Addition the note to 3.1.

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SECTION 1: Customer information

Company Name	:	Sony Corporation
Brand Name	:	SONY
Address	:	2-10-1 Osaki, Shinagawa-ku, Tokyo, 141-8610, Japan
Telephone Number	:	+81 50 3750 7634
Contact Person	:	Shinichi Maru

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

2.1 Identification of E.U.T.

Type of Equipment	:	Digital Music Player
Model Number	:	NWZ-WS613
Serial Number	:	Refer to Clause 4.2
Rating	:	DC3.7V
Country of Mass-production	:	Malaysia
Condition of EUT	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample	:	May 9, 2014
Modification of EUT	:	No modification by the test lab.

2.2 Product description

Model: NWZ-WS613 (referred to as the EUT in this report) is a Digital Music Player.

Variant model: NWZ-WS615
Difference is the memory capacity: NWZ-WS613 (4GB), NWZ-WS615 (16GB)

Clock frequency(ies) in the system	:	24MHz (CPU), 26MHz (BT), 240MHz (USB), ~151.58MHz (mSDRAM), 16MHz (eMMC_Data), ~454MHz (CPU core)

Bluetooth specification:

Equipment type	:	Transceiver
Frequency of operation	:	2402-2480MHz
Bandwidth / Channel spacing	:	1MHz / 2MHz & 1MHz
Type of modulation	:	FHSS (GFSK, π/4-DQPSK, 8DPSK), DSSS (GFSK)
Antenna type	:	Pattern
Antenna connector type	:	None
Antenna gain	:	-1dBi
ITU code	:	F1D, G1D
Operation temperature range	:	+5 to +35 deg.C

* For Bluetooth Low Energy part, refer to the test report: 10329797S-B.

FCC 15.31 (e)
The EUT is a battery-operated device and test was performed with the full-charged battery. Therefore, the EUT complies with the requirement.

FCC 15.203
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore the EUT complies with the requirement.

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2014, final revised on March 6, 2014 and effective April 7, 2014
Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits, general requirements
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

* The EUT has been tested for compliance with FCC Part 15 Subpart B by the customer.

3.2 Procedures & Results

Item	Test Procedure	Specification	Remarks	Deviation	Worst Margin	Results
Conducted emission	ANSI C63.4:2009 7. AC powerline conducted emission measurements	FCC 15.207	-	N/A *1)	N/A	N/A
Carrier frequency separation	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)	Conducted	N/A	*See data.	Complied
20dB bandwidth	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)	Conducted	N/A		-
Number of hopping frequency	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)(iii)	Conducted	N/A		Complied
Dwell time	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (a)(1)(iii)	Conducted	N/A		Complied
Maximum peak output power	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (b)(1)	Conducted	N/A		Complied
Band edge compliance & Spurious emission	FCC Public Notice DA 00-705 & ANSI C63.4:2009 13. Measurement of intentional radiators	FCC 15.247 (d) 15.209	Conducted/ Radiated	N/A	16.2dB Freq.: 225.026MHz Polarization: Horizontal Detection: Quasi-Peak Mode: Tx 2402MHz, 3DH5	Complied

Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422
*1) The EUT operates with a battery. AC Line can be connected to the EUT via PC; however, the EUT stops transmission during recharging. Therefore, the test is not applicable to the EUT.

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%

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

	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	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☐ No.2 semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10m
☒ No.3 semi-anechoic chamber	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) / Inquiry, Payload: PRBS9	-
20dB bandwidth	Transmitting Hopping OFF (DH5 / 3-DH5) / Inquiry, Payload: PRBS9	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting Hopping ON (DH5 / 3-DH5) / Inquiry, Payload: PRBS9	-
Dwell time	Transmitting (Hopping ON), Payload: PRBS9 - DH1, - DH3, - DH5 - 3-DH1, - 3-DH3, - 3-DH5	-
	-Inquiry	
Maximum peak output power	Transmitting Hopping OFF , Payload: PRBS9 - DH5, - 2-DH5, - 3-DH5	2402MHz, 2441MHz, 2480MHz
Band edge compliance & Spurious emission (Conducted)	Transmitting (DH5 / 3-DH5), Payload: PRBS9 -Hopping ON -Hopping OFF	Band edge compliance: 2402MHz, 2480MHz Spurious emission: 2402MHz, 2441MHz, 2480MHz
(Radiated)	Transmitting (DH5 / 3-DH5), Payload: PRBS9 -Hopping OFF	
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).

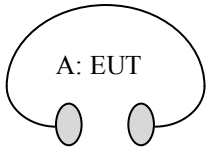
*Remarks: Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not affect the output power and bandwidth of the EUT.
The carrier separation may be less than 20 dB bandwidth, therefore 125mW power limit was applied to it.

Software : BtCli.exe ver.2.5.0.93 for Inquiry mode
BlueTest3.exe ver.2.5.0.93 for other mode
Power Settings : Fixed BDR= Ext PA:23, Int PA:38
EDR= Ext PA:72, Int PA:46

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.

4.2 Configuration and peripherals



* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Digital Music Player	NWZ-WS613	*1)	SONY	EUT

*1) Antenna port conducted tests: 3000060, Radiated emission tests: 3000043

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 polystyrene platform of nominal size, 0.5m by 0.5m, raised 0.8m above the conducting ground plane. Photographs of the set up are shown in APPENDIX 3.

11.3 Test conditions

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

11.4 Test procedure

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

The radiated emission measurements were made with the following detection.

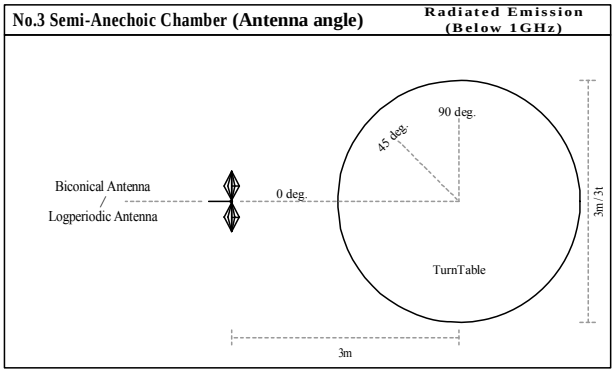
Frequency		30 - 1000MHz	1 - 25GHz		20dBc
Detection Type	:	Quasi-Peak	Peak	Average *1)	Peak
IF Bandwidth	:	120kHz	RBW:1MHz VBW:3MHz	RBW:1MHz VBW:10Hz	RBW: 100kHz, VBW: 300kHz

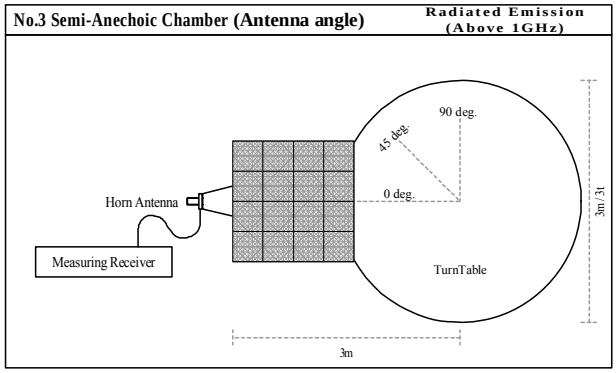
*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold. Although 00-705 accepts VBW=10Hz for AV measurements, confirmed that superfluous smoothing was not performed.

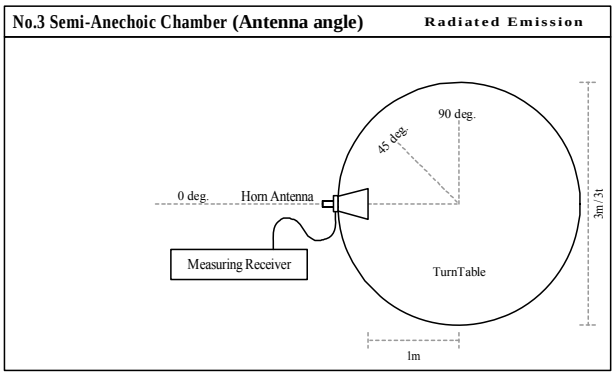
The carrier levels and noise levels were confirmed at each position of X, Y and Z axes to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Antenna polarization	Carrier	Spurious (Below 1GHz)	Spurious (1-15GHz)	Spurious (15-18GHz)	Spurious (18-25GHz)
Horizontal	X	X	X	X	Y
Vertical	Y	X	Y	Y	Z

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 9th 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
Pre-check of the worst position

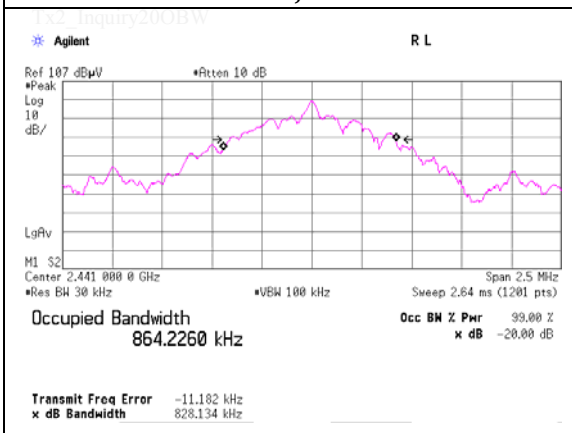
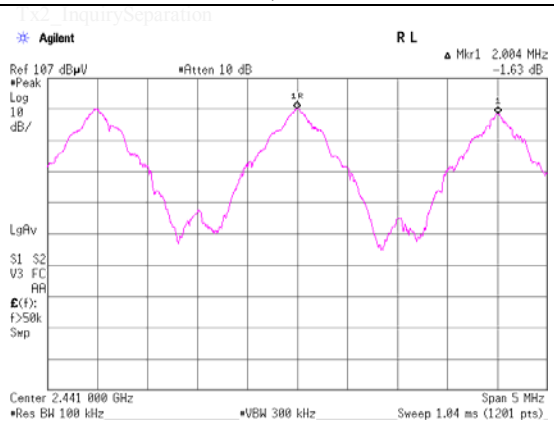
APPENDIX 1: Data of Radio tests

20dB Bandwidth and Carrier Frequency Separation

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	May 12, 2014	
Temperature / Humidity	24 deg.C , 43 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, BDR, PRBS9	

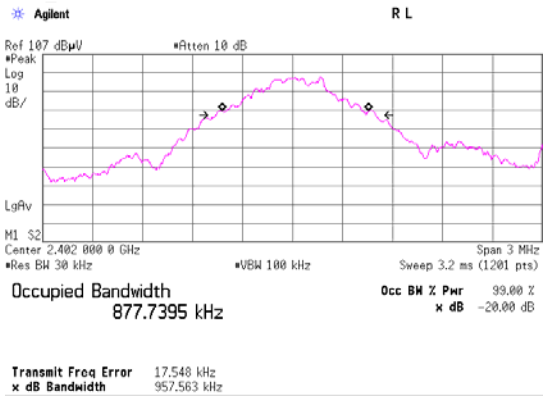
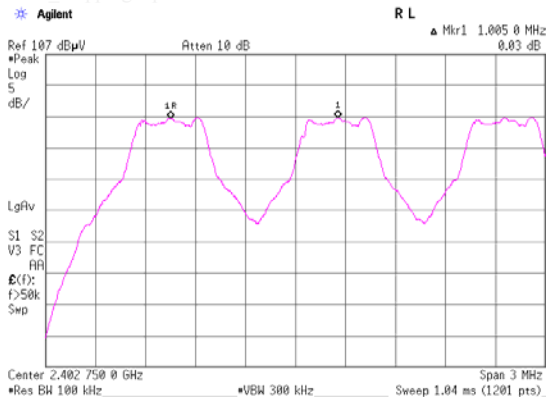
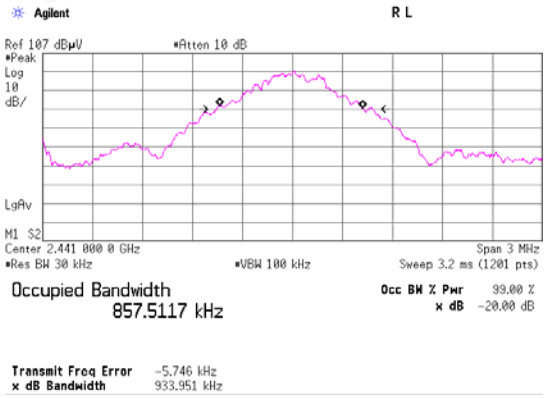
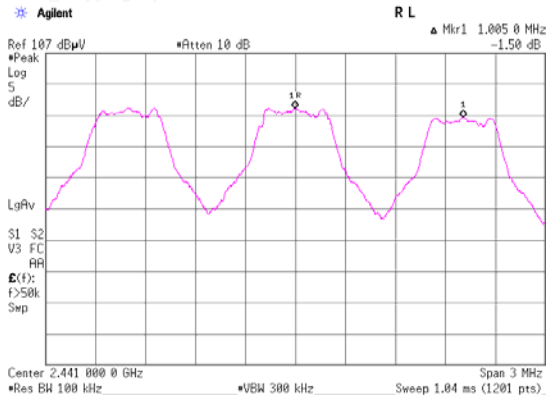
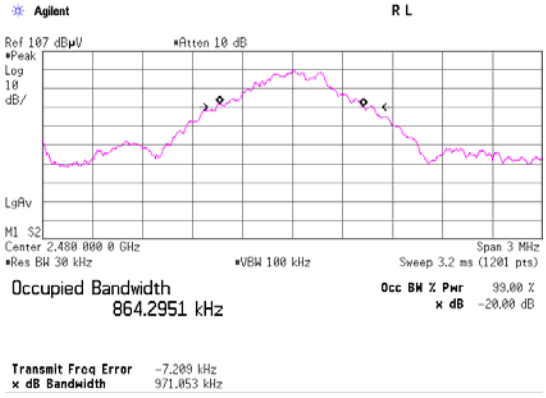
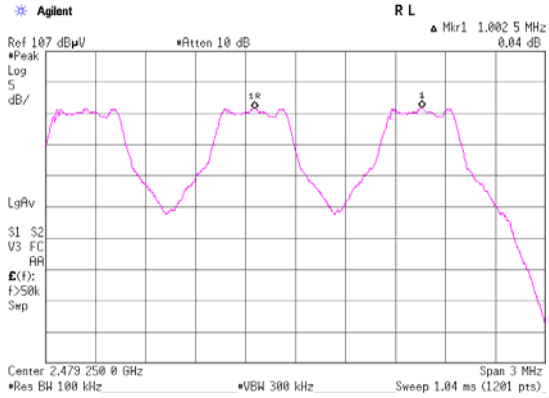
Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.958	1.005	>= 0.638
DH5	2441.0	0.934	1.005	>= 0.623
DH5	2480.0	0.971	1.003	>= 0.647
Inquiry	2441.0	0.828	2.004	>= 0.552

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

Inquiry	
20dB Bandwidth	**Carrier Frequency Separation**
Tx, 2441MHz	**Tx, 2441MHz**
	

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	May 12, 2014	
Temperature / Humidity	24 deg.C , 43 %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	1.274	1.005	>= 0.849
3-DH5	2441.0	1.258	1.005	>= 0.839
3-DH5	2480.0	1.261	1.005	>= 0.841

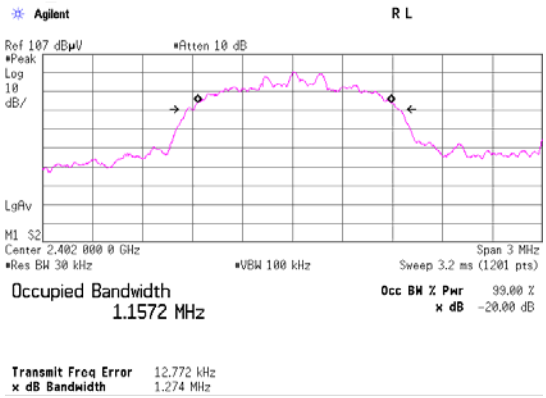
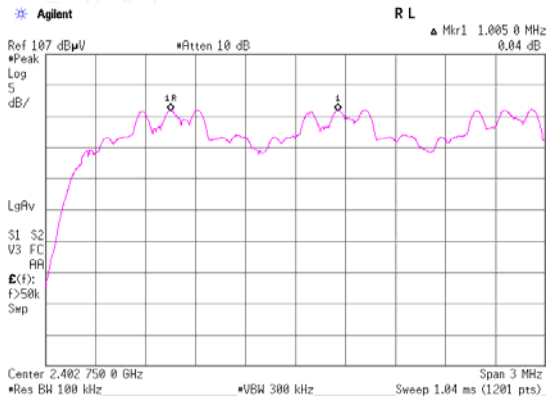
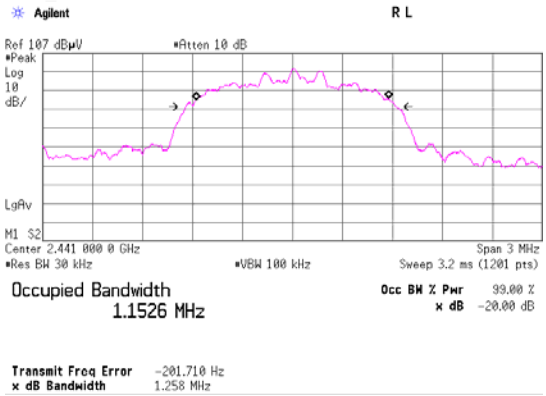
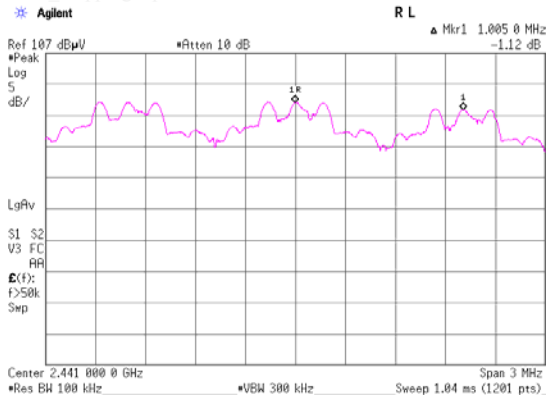
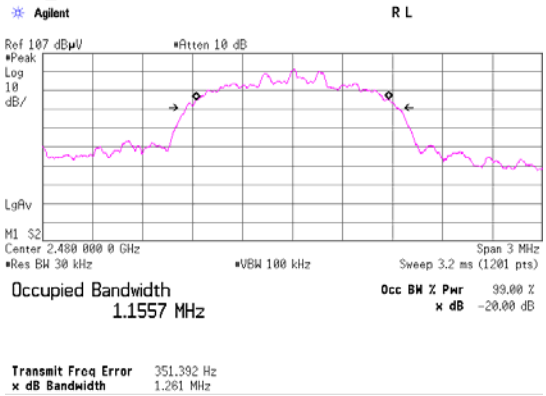
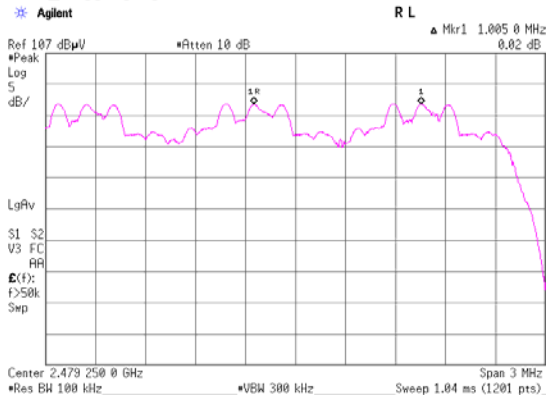
Limit: Two-thirds of 20dB Bandwidth or 25kHz (whichever is greater).
No limit applies to 20dB Bandwidth.

Tx2_Inquiry20OBW

Tx2_InquirySeparation

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**
	

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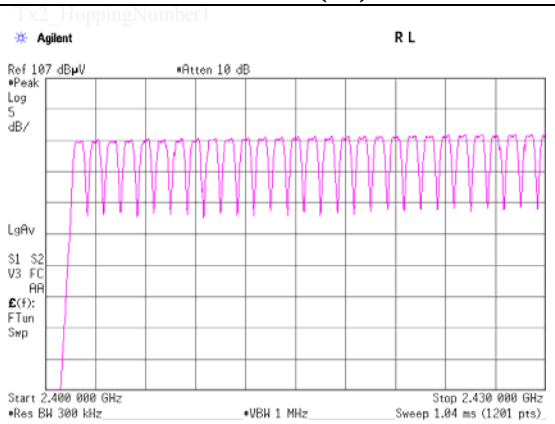
Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	May 12, 2014	
Temperature / Humidity	24 deg.C , 43 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, BDR, PRBS9	

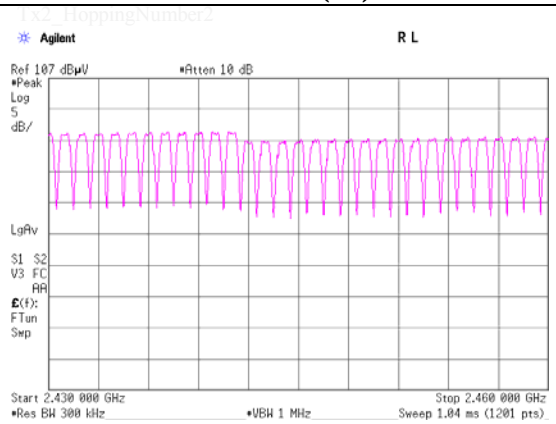
Mode	Number of Channel [times]	Limit [times]
DH5	79	>= 15

* 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.

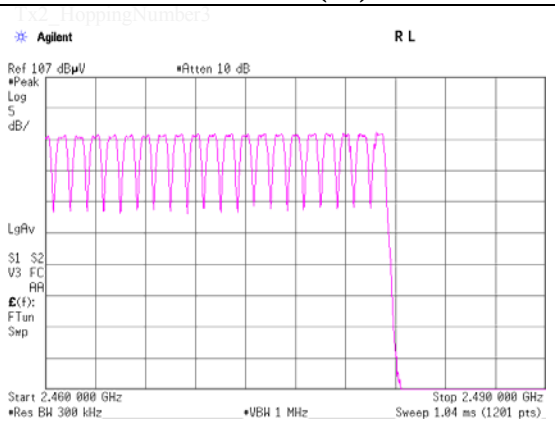
DH5 (1/3)



DH5 (2/3)



DH5 (3/3)



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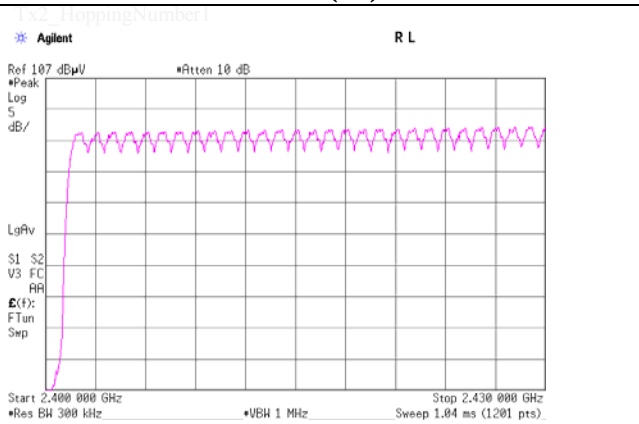
Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	May 12, 2014	
Temperature / Humidity	24 deg.C , 43 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, EDR, PRBS9	

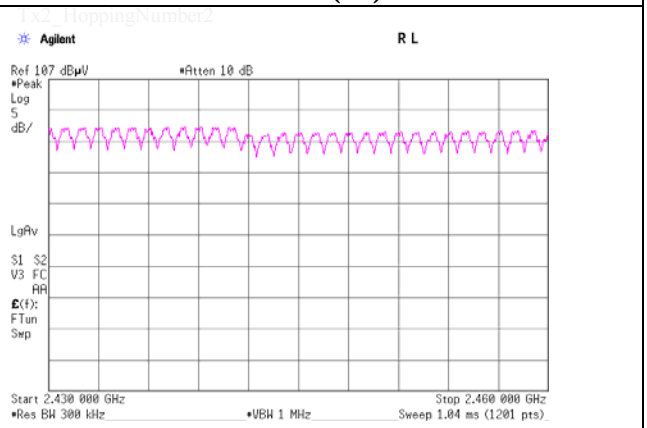
Mode	Number of Channel [times]	Limit [times]
3-DH5	79	>= 15

* 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.

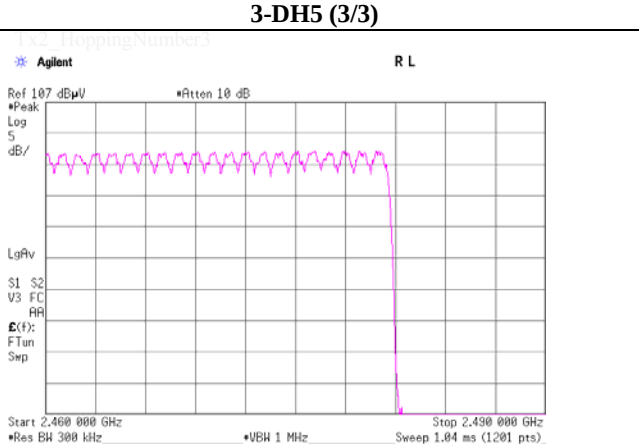
3-DH5 (1/3)



3-DH5 (2/3)



3-DH5 (3/3)



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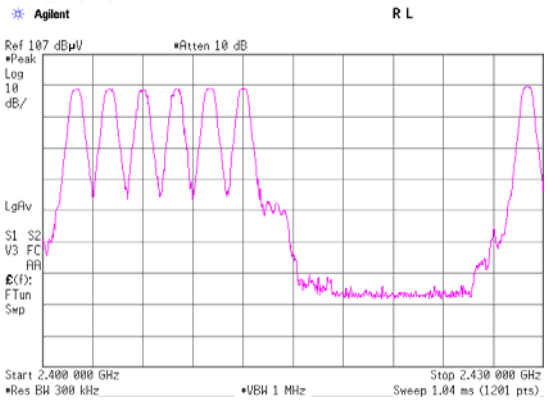
Number of Hopping Frequency

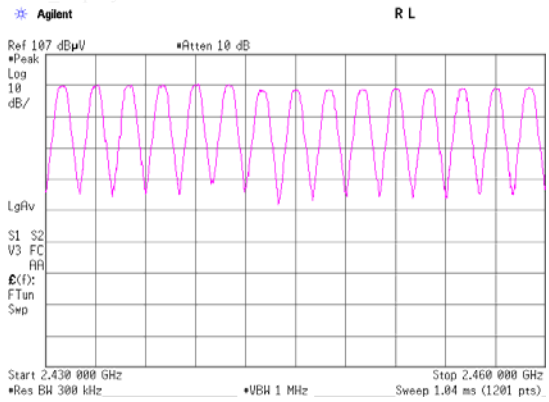
Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	May 12, 2014	
Temperature / Humidity	24 deg.C , 43 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth, Inquiry	

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

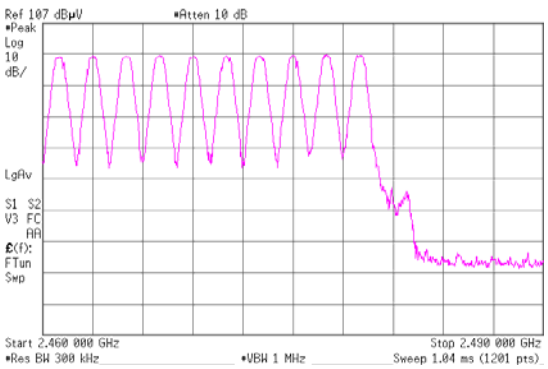
Inquiry (1/3)



Inquiry (2/3)



Inquiry (3/3)



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Dwell Time

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	May 12, 2014	
Temperature / Humidity	24 deg.C , 43 %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	0.419	132	400
DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.676	277	400
DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	2.922	316	400
Inquiry	100.0 / 1.0 sec. x 12.8 sec. = 1280 times	0.119	152	400

Sample Calculation

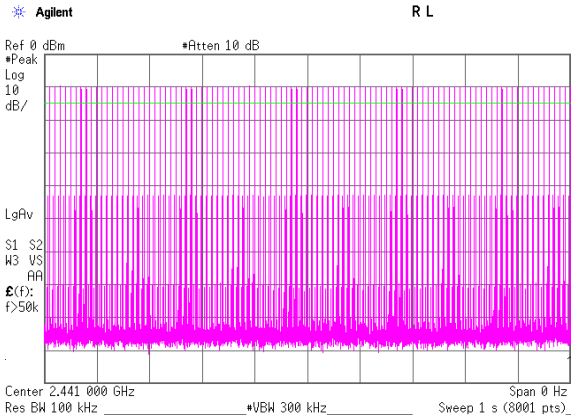
Result = Number of transmission x Length of transmition time

* 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 x 0.4s, where N is the number of channels being used in the hopping sequence (20 ≤ N ≤ 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.

Inquiry

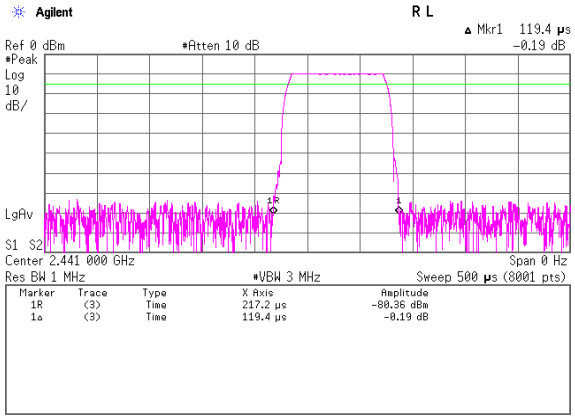
Inquiry (1/2)

1x2_DwellInquiry1



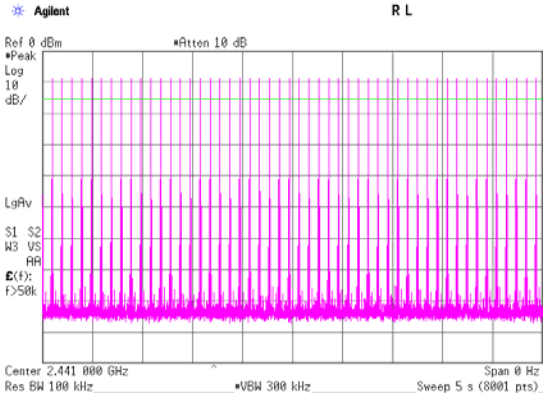
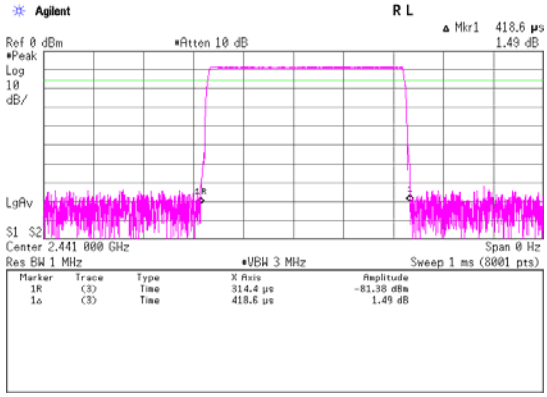
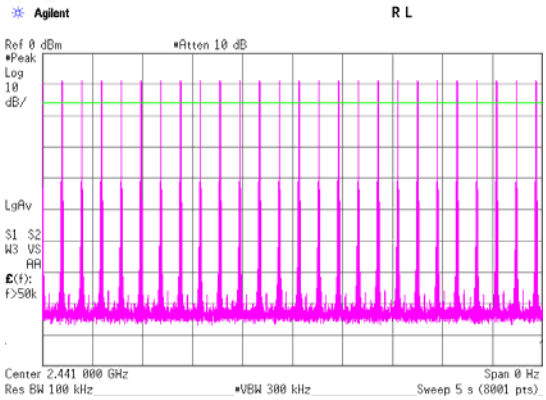
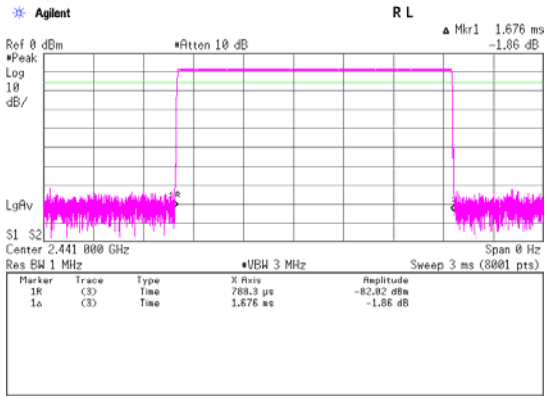
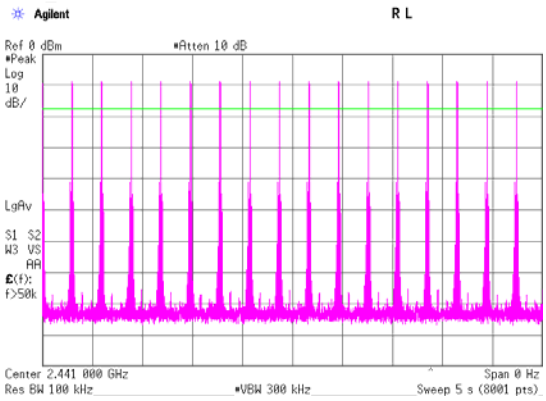
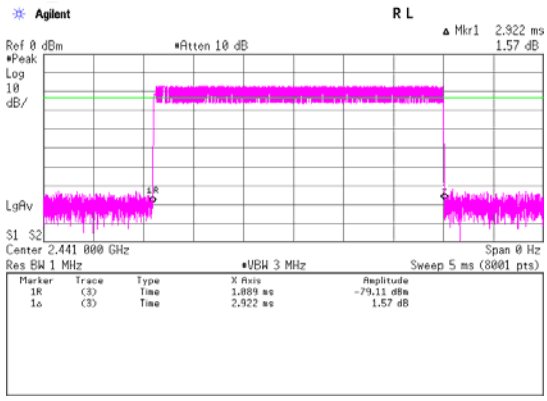
Inquiry (2/2)

1x2_DwellInquiry2



Dwell time

Tx, Bluetooth, BDR, PRBS9

DH1 (1/2)	DH1 (2/2)
	
DH3 (1/2)	**DH3 (2/2)**
	
DH5 (1/2)	**DH5 (2/2)**
	

Dwell Time

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	May 12, 2014	
Temperature / Humidity	24 deg.C , 43 %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	0.438	138	400
3-DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.693	279	400
3-DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	2.940	318	400

Sample Calculation

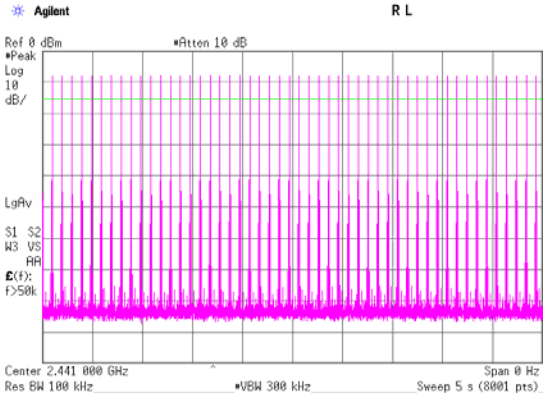
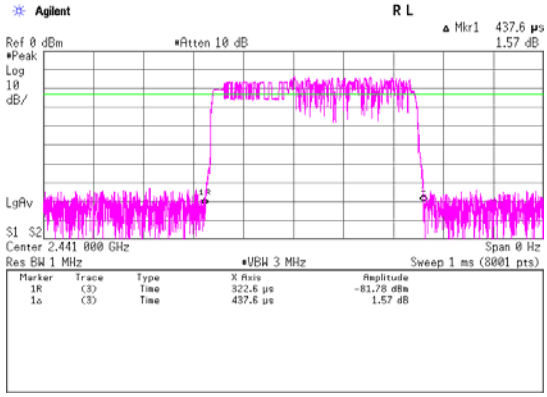
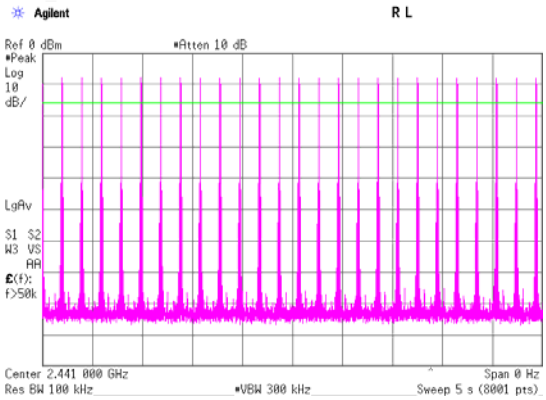
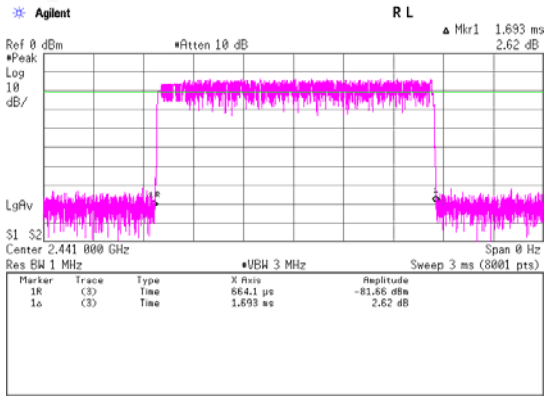
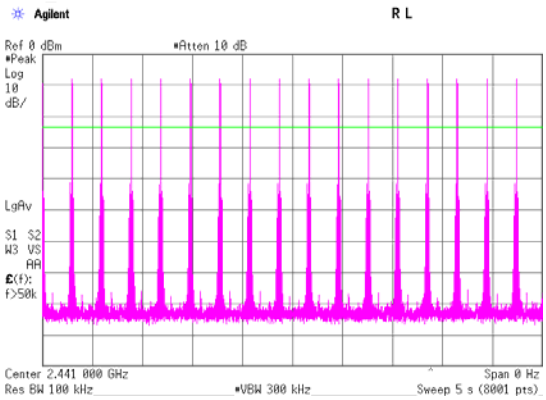
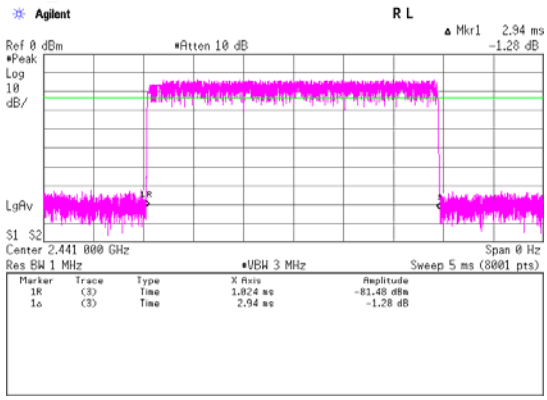
Result = Number of transmission x Length of transmition time

* 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 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.

Tx2_DwellInquiry1 Tx2_DwellInquiry2

Dwell time

Tx, Bluetooth, EDR, PRBS9

3-DH1 (1/2)	3-DH1 (2/2)
	
3-DH3 (1/2)	**3-DH3 (2/2)**
	
3-DH5 (1/2)	**3-DH5 (2/2)**
	

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Maximum Peak Conducted Output Power (Conducted)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Measurement Room
Date	May 12, 2014	
Temperature / Humidity	24 deg.C , 43 %RH	
Engineer	Hikaru Shirasawa	
Mode	Tx, Bluetooth	

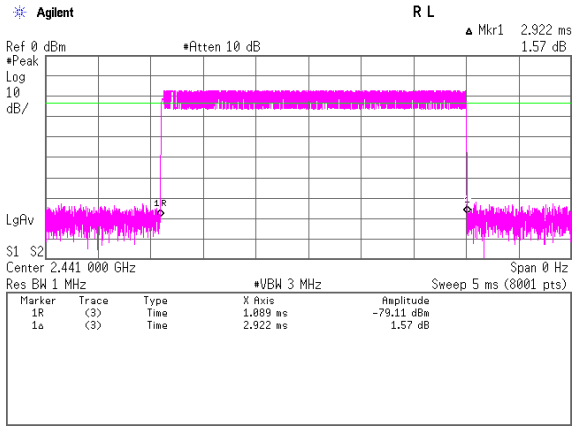
(* P/M: Power Meter with power sensor)

	Freq.	P/M (Peak) Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-9.79	1.05	9.90	1.16	1.31	20.97	125	19.81
DH5	2441.0	-8.30	1.06	9.89	2.65	1.84	20.97	125	18.32
DH5	2480.0	-8.66	1.07	9.89	2.30	1.70	20.97	125	18.67
2-DH5	2402.0	-7.44	1.05	9.90	3.51	2.24	20.97	125	17.46
2-DH5	2441.0	-6.08	1.06	9.89	4.87	3.07	20.97	125	16.10
2-DH5	2480.0	-6.38	1.07	9.89	4.58	2.87	20.97	125	16.39
3-DH5	2402.0	-7.12	1.05	9.90	3.83	2.42	20.97	125	17.14
3-DH5	2441.0	-5.85	1.06	9.89	5.10	3.24	20.97	125	15.87
3-DH5	2480.0	-5.91	1.07	9.89	5.05	3.20	20.97	125	15.92

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

Dwell time factor Calculation chart

Dwell time factor Calculation

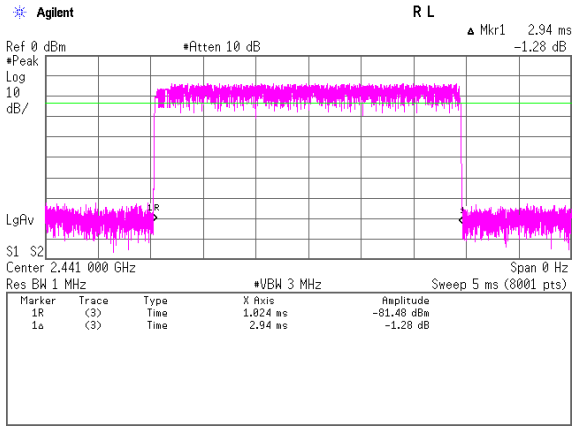
Tx, Bluetooth, BDR, PRBS9	
Worst 100ms **Dwell time factor =20log((2.922 x 2)/100) = -24.67dB**	**1cycle On time :** **2.922ms**
ON time of some channel during 100ms: Twice This is the worst case in hopping sequence of Bluetooth.	

VBW (Average) setting

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

Dwell time factor Calculation chart

Dwell time factor Calculation

Tx, Bluetooth, EDR, PRBS9	
Worst 100ms **Dwell time factor =20log((2.94 x 2)/100) = -24.61dB**	**1cycle On time :** **2.94ms**
ON time of some channel during 100ms: Twice This is the worst case in hopping sequence of Bluetooth.	

VBW (Average) setting

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

Radiated Emission

Test place	No.3 Semi Anechoic Chamber		
Date	May 16, 2014	May 17, 2014	May 18, 2014
Temperature / Humidity	26 deg.C, 36 %RH	21 deg.C, 41 %RH	22 deg.C, 34 %RH
Engineer	Kenichi Adachi	Wataru Kojima	Wataru Kojima
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.	224.310	QP	36.5	16.7	8.0	32.0	29.2	46.0	**16.8**	148	209	
Hori.	240.060	QP	32.1	16.9	8.1	32.0	25.1	46.0	20.9	109	40	
Hori.	706.767	QP	22.1	19.7	10.0	31.9	19.9	46.0	26.1	134	2	
Hori.	2390.000	PK	43.1	26.8	14.6	38.2	46.3	73.9	27.6	100	41	
Hori.	2400.000	PK	44.3	26.8	14.6	38.2	47.5	73.9	26.4	100	41	
Hori.	4804.000	PK	55.1	30.9	7.5	37.1	56.4	73.9	17.5	100	43	
Hori.	7206.000	PK	45.1	37.1	8.6	39.4	51.4	73.9	22.5	100	0	
Hori.	9608.000	PK	43.1	38.6	9.6	37.6	53.7	73.9	20.2	100	0	
Hori.	19216.000	PK	51.2	40.8	1.9	48.4	45.5	73.9	28.4	131	172	
Hori.	2390.000	AV	31.2	26.8	14.6	38.2	34.4	53.9	19.5	100	41	
Hori.	2400.000	AV	32.7	26.8	14.6	38.2	35.9	53.9	18.0	100	41	
Vert.	91.813	QP	25.2	8.5	7.4	32.1	9.0	43.5	34.5	100	282	
Vert.	133.684	QP	25.9	13.9	7.3	32.1	15.0	43.5	28.5	100	164	
Vert.	294.342	QP	22.3	18.7	8.4	32.0	17.4	46.0	28.6	100	210	
Vert.	2390.000	PK	43.2	26.8	14.6	38.2	46.4	73.9	27.5	100	71	
Vert.	2400.000	PK	44.4	26.8	14.6	38.2	47.6	73.9	26.3	100	71	
Vert.	4804.000	PK	54.3	30.9	7.5	37.1	55.6	73.9	18.3	100	267	
Vert.	7206.000	PK	45.2	37.1	8.6	39.4	51.5	73.9	22.4	100	0	
Vert.	9608.000	PK	43.0	38.6	9.6	37.6	53.6	73.9	20.3	100	0	
Vert.	19216.000	PK	54.0	40.8	1.9	48.4	48.3	73.9	25.6	119	74	
Vert.	2390.000	AV	31.3	26.8	14.6	38.2	34.5	53.9	19.4	100	71	
Vert.	2400.000	AV	32.9	26.8	14.6	38.2	36.1	53.9	17.8	100	71	

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4804.000	AV	49.7	30.9	7.5	37.1	-24.6	26.4	53.9	**27.5**	
Hori.	7206.000	AV	33.2	37.1	8.6	39.4	-24.6	14.9	53.9	39.0	
Hori.	9608.000	AV	31.3	38.6	9.6	37.6	-24.6	17.3	53.9	36.6	
Hori.	19216.000	AV	45.9	40.8	1.9	48.4	-24.6	15.6	53.9	38.3	
Vert.	4804.000	AV	48.1	30.9	7.5	37.1	-24.6	24.8	53.9	29.1	
Vert.	7206.000	AV	33.3	37.1	8.6	39.4	-24.6	15.0	53.9	38.9	
Vert.	9608.000	AV	31.2	38.6	9.6	37.6	-24.6	17.2	53.9	36.7	
Vert.	19216.000	AV	49.0	40.8	1.9	48.4	-24.6	18.7	53.9	35.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18GHz)-Distance factor(above 15GHz)) - Gain(Amprifier) + Dwell(time)factor
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
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Radiated Emission

Test place	No.3 Semi Anechoic Chamber		
Date	May 16, 2014	May 17, 2014	May 18, 2014
Temperature / Humidity	26 deg.C, 36 %RH	21 deg.C, 41 %RH	22 deg.C, 34 %RH
Engineer	Kenichi Adachi	Wataru Kojima	Wataru Kojima
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.	225.069	QP	36.3	16.7	8.0	32.0	29.0	46.0	**17.0**	161	358	
Hori.	240.009	QP	33.0	16.9	8.1	32.0	26.0	46.0	20.0	150	114	
Hori.	808.602	QP	27.0	20.7	10.4	31.6	26.5	46.0	19.5	148	245	
Hori.	4882.000	PK	54.5	31.4	7.5	37.0	56.4	73.9	17.5	100	45	
Hori.	7323.000	PK	45.3	37.2	8.6	39.4	51.7	73.9	22.2	100	0	
Hori.	9764.000	PK	43.3	38.8	9.6	37.5	54.2	73.9	19.7	100	0	
Hori.	19528.000	PK	51.7	40.8	2.0	48.1	46.4	73.9	27.5	114	29	
Vert.	91.757	QP	24.8	8.4	7.4	32.1	8.5	43.5	35.0	100	39	
Vert.	146.383	QP	26.1	14.5	7.6	32.1	16.1	43.5	27.4	100	3	
Vert.	265.506	QP	26.4	17.6	8.2	32.0	20.2	46.0	25.8	100	109	
Vert.	4882.000	PK	53.6	31.4	7.5	37.0	55.5	73.9	18.4	100	263	
Vert.	7323.000	PK	45.4	37.2	8.6	39.4	51.8	73.9	22.1	100	0	
Vert.	9764.000	PK	43.2	38.8	9.6	37.5	54.1	73.9	19.8	100	0	
Vert.	19528.000	PK	50.8	40.8	2.0	48.1	45.5	73.9	28.4	118	78	

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	AV	49.5	31.4	7.5	37.0	-24.6	26.8	53.9	**27.1**	
Hori.	7323.000	AV	33.3	37.2	8.6	39.4	-24.6	15.1	53.9	38.8	
Hori.	9764.000	AV	31.4	38.8	9.6	37.5	-24.6	17.7	53.9	36.2	
Hori.	19528.000	AV	47.0	40.8	2.0	48.1	-24.6	17.1	53.9	36.8	
Vert.	4882.000	AV	47.9	31.4	7.5	37.0	-24.6	25.2	53.9	28.7	
Vert.	7323.000	AV	33.4	37.2	8.6	39.4	-24.6	15.2	53.9	38.7	
Vert.	9764.000	AV	31.3	38.8	9.6	37.5	-24.6	17.6	53.9	36.3	
Vert.	19528.000	AV	45.6	40.8	2.0	48.1	-24.6	15.7	53.9	38.2	

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

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Radiated Emission

Test place	No.3 Semi Anechoic Chamber		
Date	May 16, 2014	May 17, 2014	May 18, 2014
Temperature / Humidity	26 deg.C, 36 %RH	21 deg.C, 41 %RH	22 deg.C, 34 %RH
Engineer	Kenichi Adachi	Wataru Kojima	Wataru Kojima
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.	225.022	QP	36.5	16.7	8.0	32.0	29.2	46.0	**16.8**	150	347	
Hori.	240.052	QP	31.8	16.9	8.1	32.0	24.8	46.0	21.2	122	321	
Hori.	906.363	QP	23.1	21.7	10.7	31.0	24.5	46.0	21.5	150	167	
Hori.	2483.500	PK	42.7	26.9	14.7	38.1	46.2	73.9	27.7	100	37	
Hori.	4960.000	PK	53.5	31.8	7.5	37.0	55.8	73.9	18.1	100	42	
Hori.	9920.000	PK	42.7	38.9	9.6	37.5	53.7	73.9	20.2	100	0	
Hori.	19840.000	PK	49.9	40.7	2.1	47.9	44.8	73.9	29.1	100	234	
Hori.	2483.500	AV	31.6	26.9	14.7	38.1	35.1	53.9	18.8	100	37	
Vert.	62.339	QP	24.9	7.7	6.5	32.2	6.9	40.0	33.1	100	354	
Vert.	277.828	QP	24.5	18.1	8.3	32.0	18.9	46.0	27.1	100	332	
Vert.	727.858	QP	23.1	19.9	10.0	31.8	21.2	46.0	24.8	100	2	
Vert.	2483.500	PK	42.9	26.9	14.7	38.1	46.4	73.9	27.5	100	74	
Vert.	4960.000	PK	52.8	31.8	7.5	37.0	55.1	73.9	18.8	100	265	
Vert.	7440.000	PK	44.8	37.4	8.8	39.4	51.6	73.9	22.3	100	0	
Vert.	9920.000	PK	42.6	38.9	9.6	37.5	53.6	73.9	20.3	100	0	
Vert.	19840.000	PK	49.2	40.7	2.1	47.9	44.1	73.9	29.8	110	159	
Vert.	2483.500	AV	31.8	26.9	14.7	38.1	35.3	53.9	18.6	100	74	

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4960.000	AV	48.6	31.8	7.5	37.0	-24.6	26.3	53.9	**27.6**	
Hori.	7440.000	AV	32.8	37.4	8.8	39.4	-24.6	15.0	53.9	38.9	
Hori.	9920.000	AV	30.7	38.9	9.6	37.5	-24.6	17.1	53.9	36.8	
Hori.	19840.000	AV	43.6	40.7	2.1	47.9	-24.6	13.9	53.9	40.0	
Vert.	4960.000	AV	47.0	31.8	7.5	37.0	-24.6	24.7	53.9	29.2	
Vert.	7440.000	AV	32.9	37.4	8.8	39.4	-24.6	15.1	53.9	38.8	
Vert.	9920.000	AV	30.6	38.9	9.6	37.5	-24.6	17.0	53.9	36.9	
Vert.	19840.000	AV	43.5	40.7	2.1	47.9	-24.6	13.8	53.9	40.1	

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

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Radiated Emission

Test place	No.3 Semi Anechoic Chamber		
Date	May 16, 2014	May 17, 2014	May 18, 2014
Temperature / Humidity	26 deg.C, 36 %RH	21 deg.C, 41 %RH	22 deg.C, 34 %RH
Engineer	Kenichi Adachi	Wataru Kojima	Wataru Kojima
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.	225.026	QP	37.1	16.7	8.0	32.0	29.8	46.0	**16.2**	152	0	
Hori.	240.029	QP	31.9	16.9	8.1	32.0	24.9	46.0	21.1	181	353	
Hori.	927.428	QP	22.3	21.8	10.7	30.8	24.0	46.0	22.0	100	300	
Hori.	2390.000	PK	42.3	26.8	14.6	38.2	45.5	73.9	28.4	100	44	
Hori.	2400.000	PK	43.8	26.8	14.6	38.2	47.0	73.9	26.9	100	44	
Hori.	4804.000	PK	50.2	30.9	7.5	37.1	51.5	73.9	22.4	100	48	
Hori.	7206.000	PK	45.2	37.1	8.6	39.4	51.5	73.9	22.4	100	0	
Hori.	9608.000	PK	43.0	38.6	9.6	37.6	53.6	73.9	20.3	100	0	
Hori.	19216.000	PK	51.1	40.8	1.9	48.4	45.4	73.9	28.5	130	178	
Hori.	2390.000	AV	31.2	26.8	14.6	38.2	34.4	53.9	19.5	100	44	
Hori.	2400.000	AV	33.0	26.8	14.6	38.2	36.2	53.9	17.7	100	44	
Vert.	91.782	QP	26.2	8.5	7.4	32.1	10.0	43.5	33.5	100	316	
Vert.	116.795	QP	24.9	12.6	7.1	32.1	12.5	43.5	31.0	100	357	
Vert.	296.671	QP	22.8	18.8	8.4	32.0	18.0	46.0	28.0	100	2	
Vert.	2390.000	PK	42.4	26.8	14.6	38.2	45.6	73.9	28.3	100	72	
Vert.	2400.000	PK	44.0	26.8	14.6	38.2	47.2	73.9	26.7	100	72	
Vert.	4804.000	PK	51.3	30.9	7.5	37.1	52.6	73.9	21.3	100	266	
Vert.	7206.000	PK	45.3	37.1	8.6	39.4	51.6	73.9	22.3	100	0	
Vert.	9608.000	PK	43.1	38.6	9.6	37.6	53.7	73.9	20.2	100	0	
Vert.	19216.000	PK	52.7	40.8	1.9	48.4	47.0	73.9	26.9	121	71	
Vert.	2390.000	AV	31.3	26.8	14.6	38.2	34.5	53.9	19.4	100	72	
Vert.	2400.000	AV	33.6	26.8	14.6	38.2	36.8	53.9	17.1	100	72	

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4804.000	AV	43.8	30.9	7.5	37.1	-24.6	20.5	53.9	33.4	
Hori.	7206.000	AV	33.4	37.1	8.6	39.4	-24.6	15.1	53.9	38.8	
Hori.	9608.000	AV	31.2	38.6	9.6	37.6	-24.6	17.2	53.9	36.7	
Hori.	19216.000	AV	46.1	40.8	1.9	48.4	-24.6	15.8	53.9	38.1	
Vert.	4804.000	AV	44.8	30.9	7.5	37.1	-24.6	21.5	53.9	**32.4**	
Vert.	7206.000	AV	33.4	37.1	8.6	39.4	-24.6	15.1	53.9	38.8	
Vert.	9608.000	AV	31.3	38.6	9.6	37.6	-24.6	17.3	53.9	36.6	
Vert.	19216.000	AV	48.7	40.8	1.9	48.4	-24.6	18.4	53.9	35.5	

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

Radiated Emission

Test place	No.3 Semi Anechoic Chamber		
Date	May 16, 2014	May 17, 2014	May 18, 2014
Temperature / Humidity	26 deg.C, 36 %RH	21 deg.C, 41 %RH	22 deg.C, 34 %RH
Engineer	Kenichi Adachi	Wataru Kojima	Wataru Kojima
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.	225.074	QP	36.9	16.7	8.0	32.0	29.6	46.0	**16.4**	155	211	
Hori.	240.035	QP	33.1	16.9	8.1	32.0	26.1	46.0	19.9	150	251	
Hori.	952.957	QP	21.9	22.1	10.8	30.6	24.2	46.0	21.8	150	3	
Hori.	4882.000	PK	50.7	31.4	7.5	37.0	52.6	73.9	21.3	100	47	
Hori.	7323.000	PK	45.3	37.2	8.6	39.4	51.7	73.9	22.2	100	0	
Hori.	9764.000	PK	43.2	38.8	9.6	37.5	54.1	73.9	19.8	100	0	
Hori.	19528.000	PK	51.7	40.8	2.0	48.1	46.4	73.9	27.5	100	239	
Vert.	103.097	QP	24.2	10.5	7.2	32.1	9.8	43.5	33.7	100	280	
Vert.	132.087	QP	25.1	13.8	7.3	32.1	14.1	43.5	29.4	100	72	
Vert.	270.360	QP	23.1	17.8	8.2	32.0	17.1	46.0	28.9	100	70	
Vert.	4882.000	PK	51.6	31.4	7.5	37.0	53.5	73.9	20.4	100	266	
Vert.	7323.000	PK	45.2	37.2	8.6	39.4	51.6	73.9	22.3	100	0	
Vert.	9764.000	PK	43.3	38.8	9.6	37.5	54.2	73.9	19.7	100	0	
Vert.	19528.000	PK	50.3	40.8	2.0	48.1	45.0	73.9	28.9	118	85	

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	AV	44.9	31.4	7.5	37.0	-24.6	22.2	53.9	31.7	
Hori.	7323.000	AV	33.4	37.2	8.6	39.4	-24.6	15.2	53.9	38.7	
Hori.	9764.000	AV	31.3	38.8	9.6	37.5	-24.6	17.6	53.9	36.3	
Hori.	19528.000	AV	46.9	40.8	2.0	48.1	-24.6	17.0	53.9	36.9	
Vert.	4882.000	AV	45.8	31.4	7.5	37.0	-24.6	23.1	53.9	**30.8**	
Vert.	7323.000	AV	33.3	37.2	8.6	39.4	-24.6	15.1	53.9	38.8	
Vert.	9764.000	AV	31.4	38.8	9.6	37.5	-24.6	17.7	53.9	36.2	
Vert.	19528.000	AV	45.7	40.8	2.0	48.1	-24.6	15.8	53.9	38.1	

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

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Radiated Emission

Test place	No.3 Semi Anechoic Chamber		
Date	May 16, 2014	May 17, 2014	May 18, 2014
Temperature / Humidity	26 deg.C, 36 %RH	21 deg.C, 41 %RH	22 deg.C, 34 %RH
Engineer	Kenichi Adachi	Wataru Kojima	Wataru Kojima
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.	225.011	QP	36.2	16.7	8.0	32.0	28.9	46.0	**17.1**	150	356	
Hori.	239.991	QP	33.0	16.9	8.1	32.0	26.0	46.0	20.0	150	358	
Hori.	956.389	QP	23.1	22.1	10.8	30.6	25.4	46.0	20.6	150	307	
Hori.	2483.500	PK	42.8	26.9	14.7	38.1	46.3	73.9	27.6	100	35	
Hori.	4960.000	PK	50.4	31.8	7.5	37.0	52.7	73.9	21.2	100	45	
Hori.	7440.000	PK	44.8	37.4	8.8	39.4	51.6	73.9	22.3	100	0	
Hori.	9920.000	PK	42.6	38.9	9.6	37.5	53.6	73.9	20.3	100	0	
Hori.	19840.000	PK	50.1	40.7	2.1	47.9	45.0	73.9	28.9	100	234	
Hori.	2483.500	AV	31.6	26.9	14.7	38.1	35.1	53.9	18.8	100	35	
Vert.	61.252	QP	25.6	7.9	6.5	32.2	7.8	40.0	32.2	100	332	
Vert.	198.359	QP	22.0	16.4	7.8	32.1	14.1	43.5	29.4	100	44	
Vert.	298.797	QP	24.2	18.9	8.4	32.0	19.5	46.0	26.5	100	211	
Vert.	2483.500	PK	42.9	26.9	14.7	38.1	46.4	73.9	27.5	100	69	
Vert.	4960.000	PK	51.1	31.8	7.5	37.0	53.4	73.9	20.5	100	263	
Vert.	7440.000	PK	44.7	37.4	8.8	39.4	51.5	73.9	22.4	100	0	
Vert.	9920.000	PK	42.7	38.9	9.6	37.5	53.7	73.9	20.2	100	0	
Vert.	19840.000	PK	50.4	40.7	2.1	47.9	45.3	73.9	28.6	116	333	
Vert.	2483.500	AV	31.7	26.9	14.7	38.1	35.2	53.9	18.7	100	69	

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

Dwell time factor relaxation

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4960.000	AV	43.9	31.8	7.5	37.0	-24.6	21.6	53.9	32.3	
Hori.	7440.000	AV	32.8	37.4	8.8	39.4	-24.6	15.0	53.9	38.9	
Hori.	9920.000	AV	30.6	38.9	9.6	37.5	-24.6	17.0	53.9	36.9	
Hori.	19840.000	AV	44.3	40.7	2.1	47.9	-24.6	14.6	53.9	39.3	
Vert.	4960.000	AV	44.5	31.8	7.5	37.0	-24.6	22.2	53.9	**31.7**	
Vert.	7440.000	AV	32.8	37.4	8.8	39.4	-24.6	15.0	53.9	38.9	
Vert.	9920.000	AV	30.7	38.9	9.6	37.5	-24.6	17.1	53.9	36.8	
Vert.	19840.000	AV	44.8	40.7	2.1	47.9	-24.6	15.1	53.9	38.8	

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

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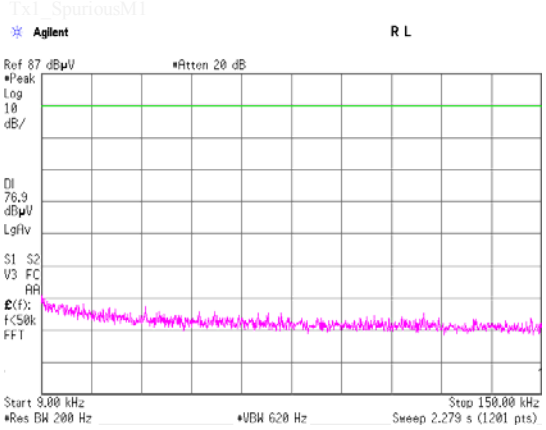
Spurious emission (Conducted)

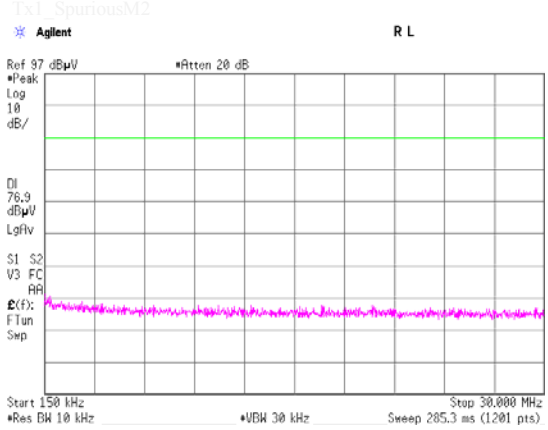
Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (below 30MHz)

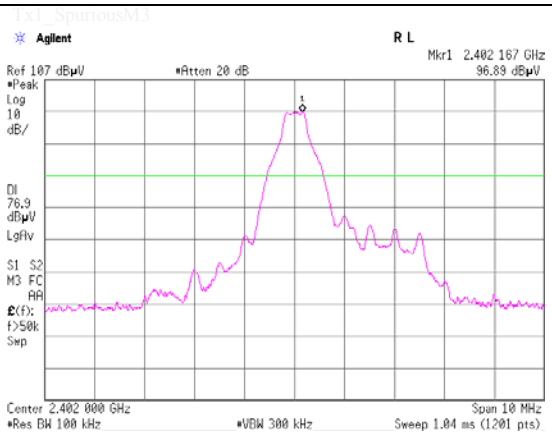
9kHz - 150kHz



150kHz - 30MHz



Carrier/ 20dBc limit



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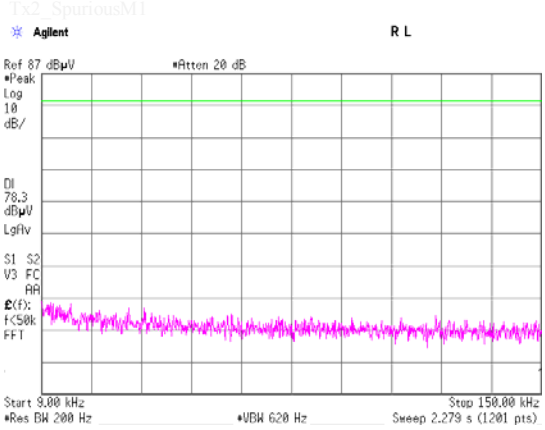
Spurious emission (Conducted)

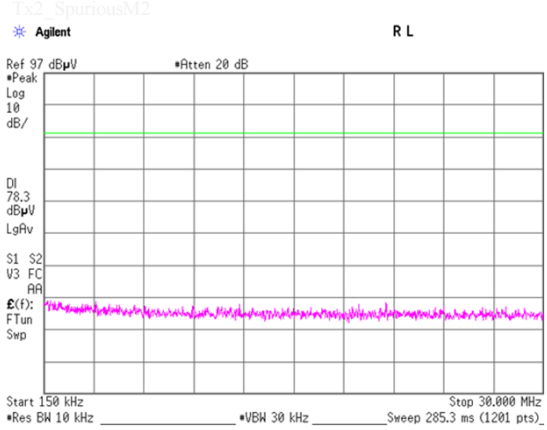
Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (below 30MHz)

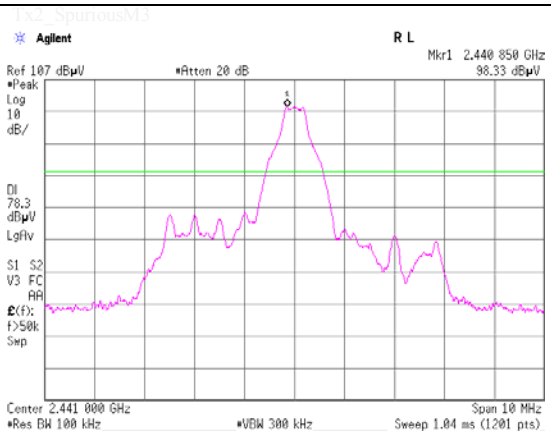
9kHz - 150kHz



150kHz - 30MHz



Carrier/ 20dBc limit

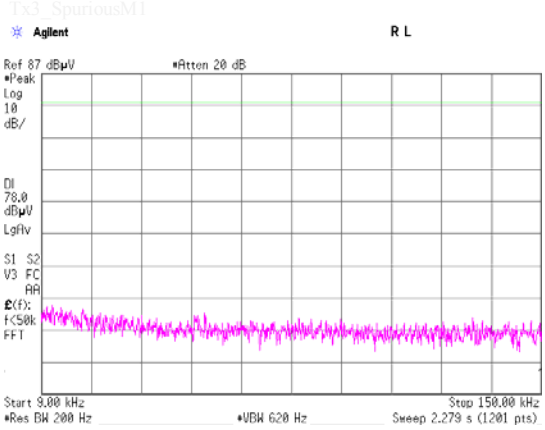


Spurious emission (Conducted)

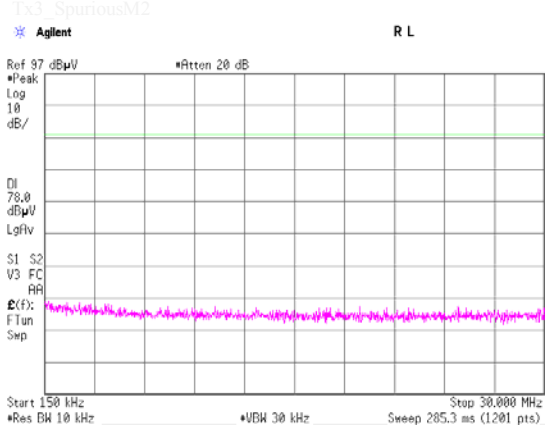
Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (below 30MHz)

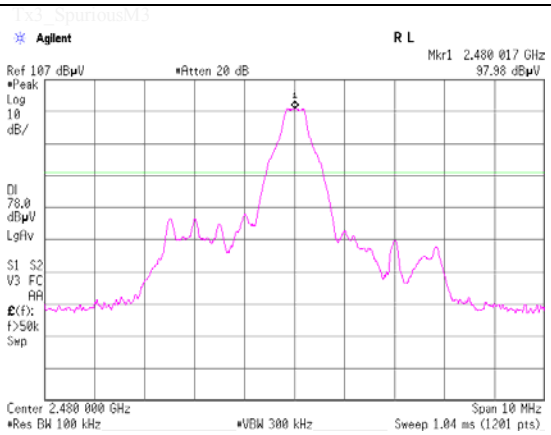
9kHz - 150kHz



150kHz - 30MHz



Carrier/ 20dBc limit



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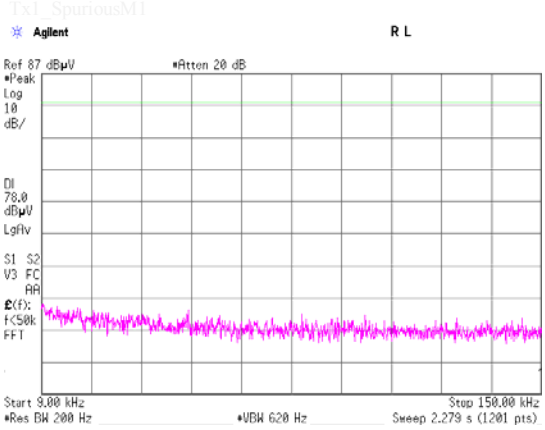
Spurious emission (Conducted)

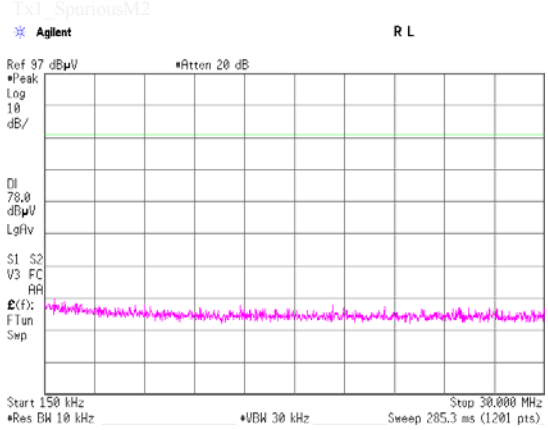
Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (below 30MHz)

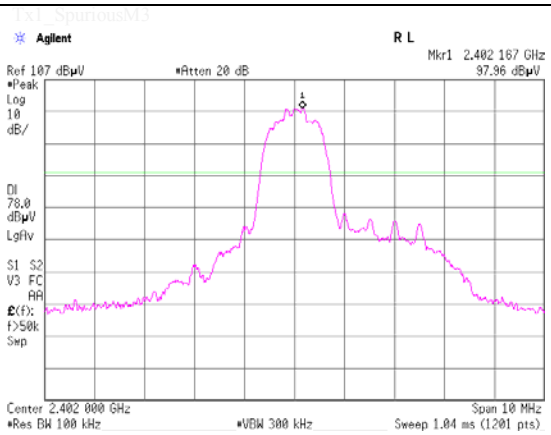
9kHz - 150kHz



150kHz - 30MHz



Carrier/ 20dBc limit

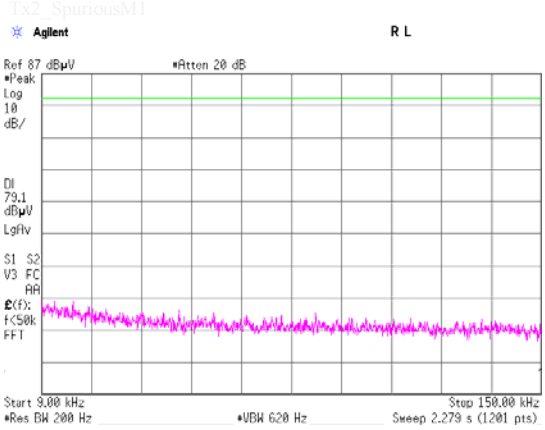


Spurious emission (Conducted)

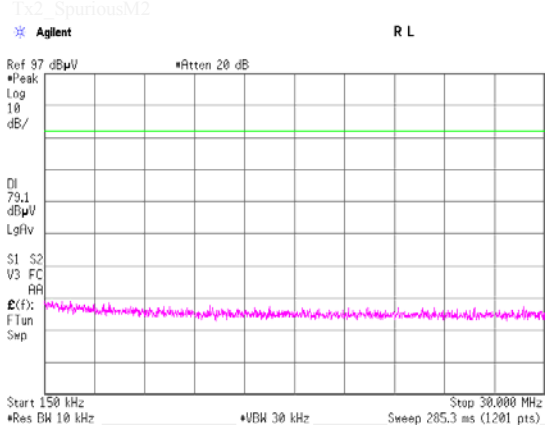
Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (below 30MHz)

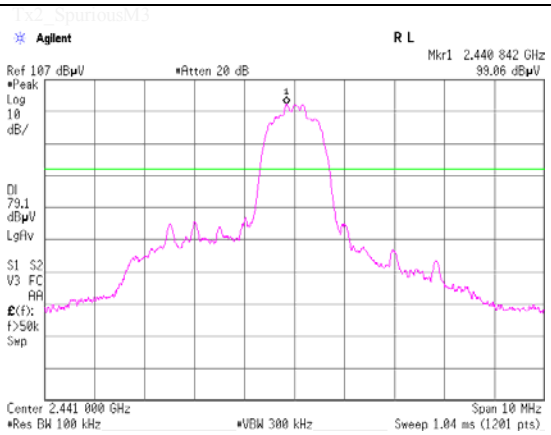
9kHz - 150kHz



150kHz - 30MHz



Carrier/ 20dBc limit



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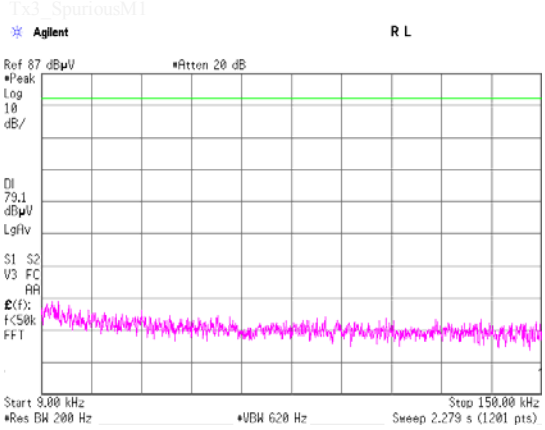
Spurious emission (Conducted)

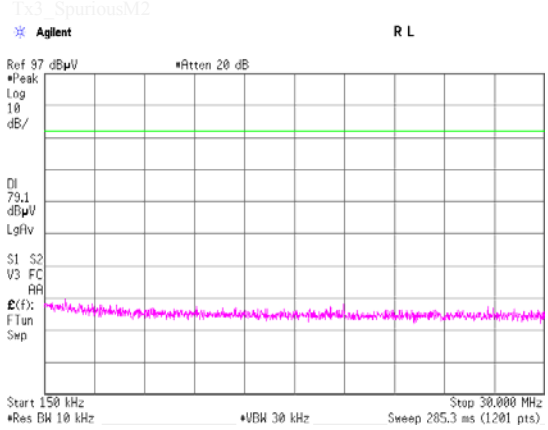
Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (below 30MHz)

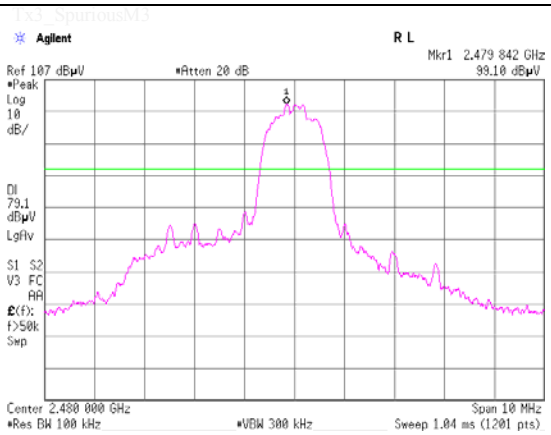
9kHz - 150kHz



150kHz - 30MHz

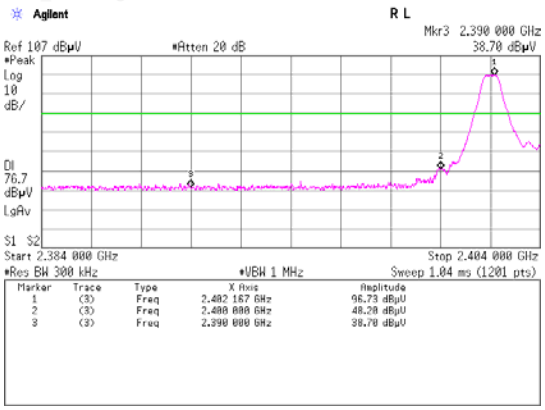
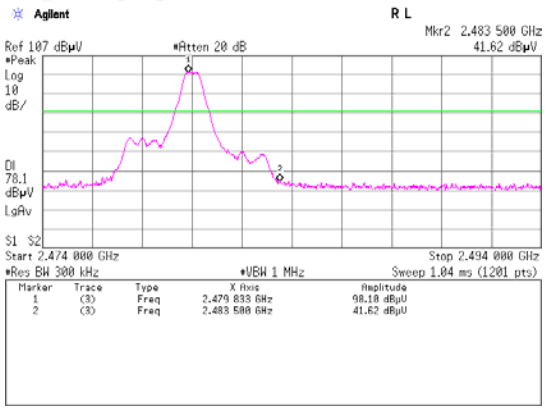


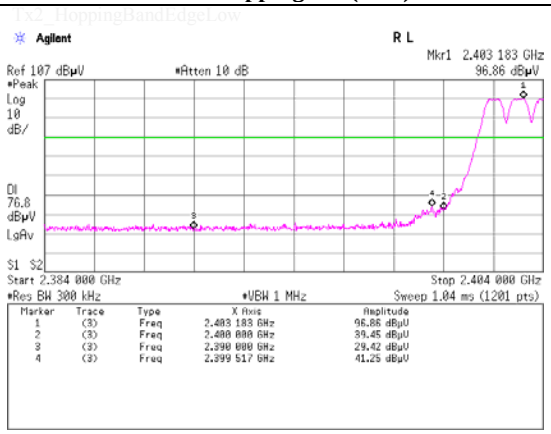
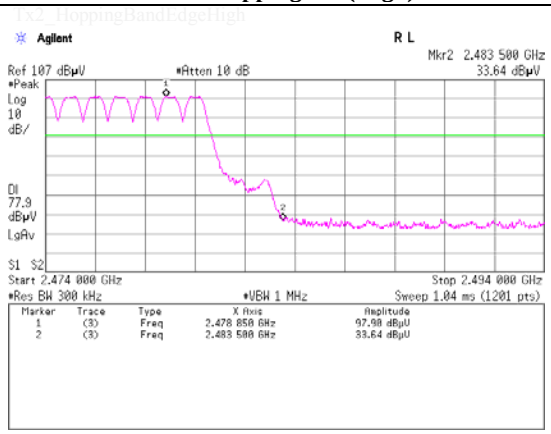
Carrier/ 20dBc limit



Spurious emission (Conducted)

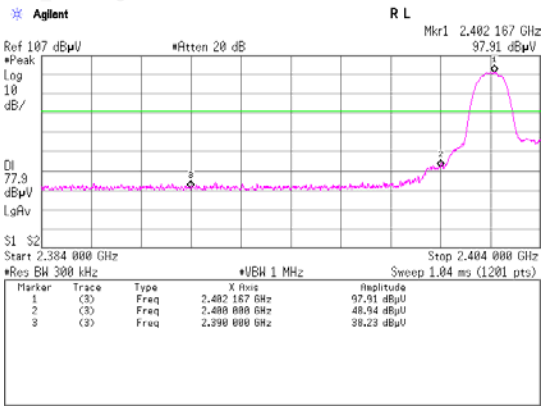
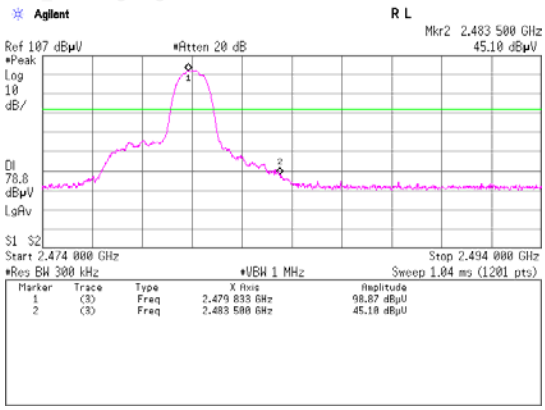
Band Edge compliance

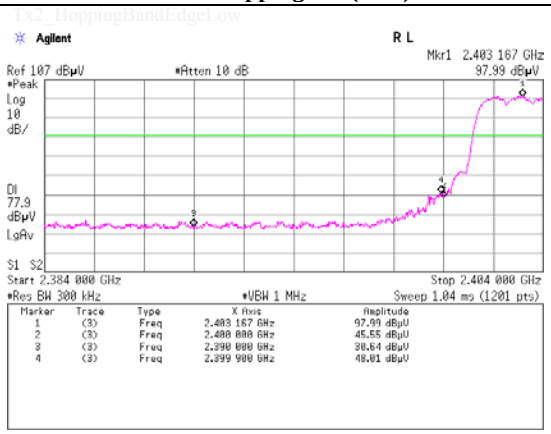
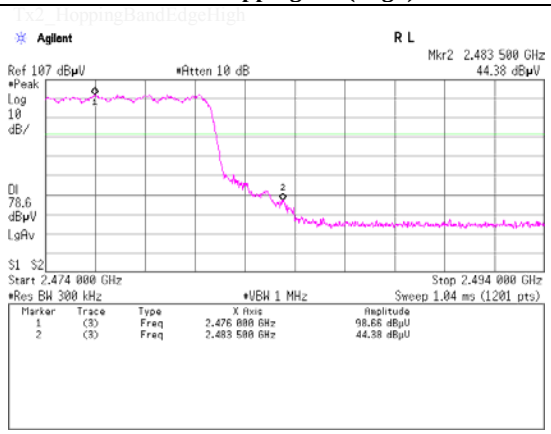
Tx, Bluetooth, BDR, PRBS9	
Tx, 2402MHz	**Tx, 2480MHz**
	

Tx, Bluetooth, BDR, PRBS9	
Hopping On (Low)	**Hopping On (High)**
	

Spurious emission (Conducted)

Band Edge compliance

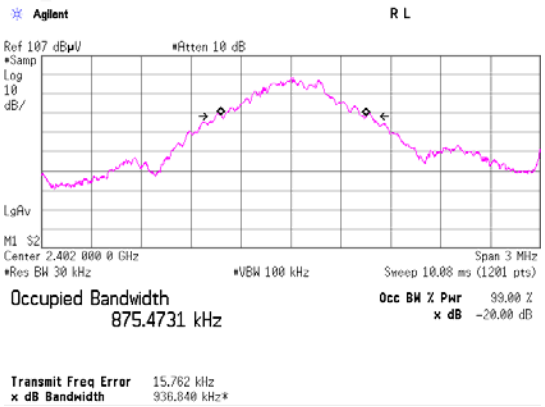
Tx, Bluetooth, EDR, PRBS9	
Tx, 2402MHz	**Tx, 2480MHz**
	

Tx, Bluetooth, EDR, PRBS9	
Hopping On (Low)	**Hopping On (High)**
	

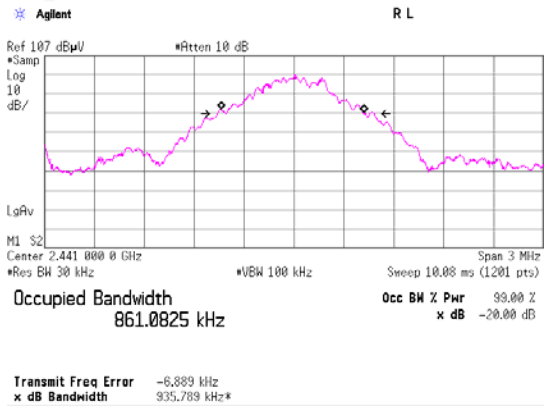
99% Occupied Bandwidth

Tx, Bluetooth, BDR, PRBS9

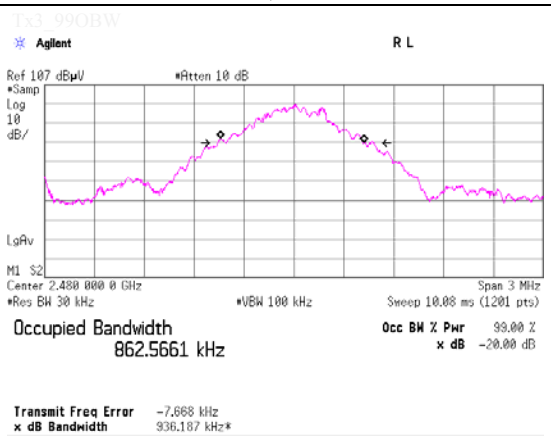
Tx, 2402MHz



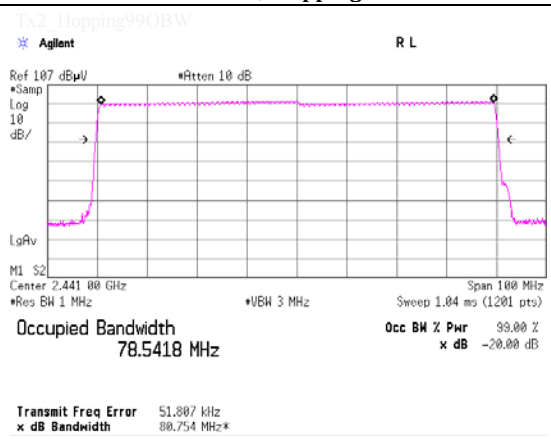
Tx, 2441MHz



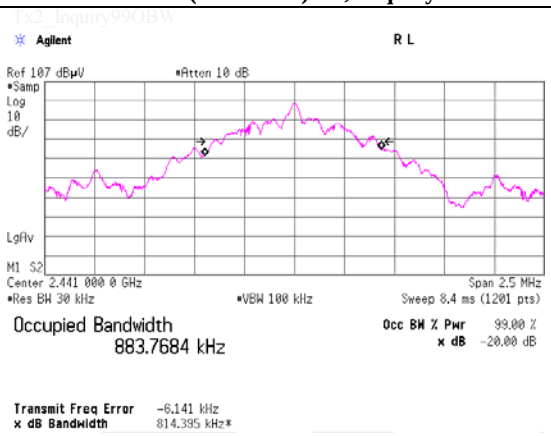
Tx, 2480MHz



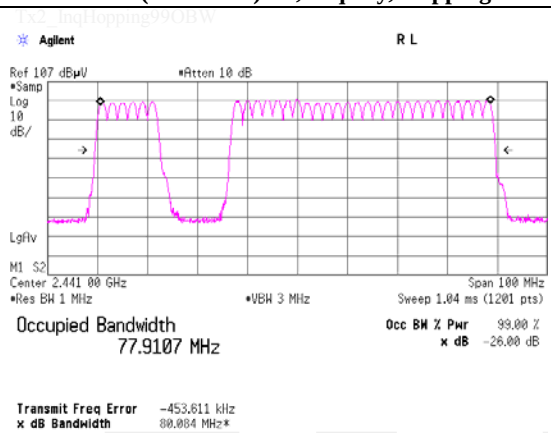
Tx, Hopping On



(Reference) Tx, Inquiry



(Reference) Tx, Inquiry, Hopping

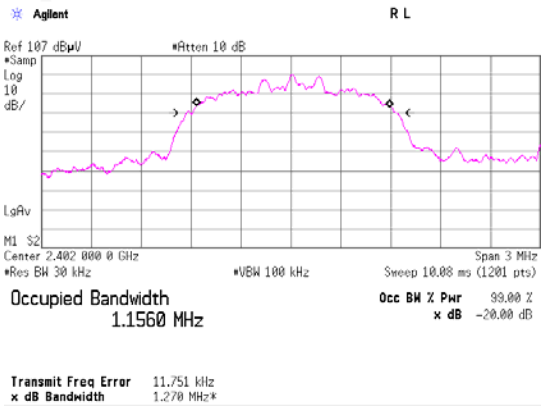


99% Occupied Bandwidth

Tx, Bluetooth, EDR, PRBS9

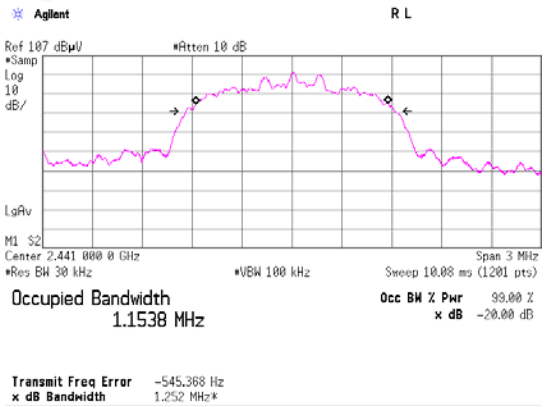
Tx, 2402MHz

Tx1_99OBW



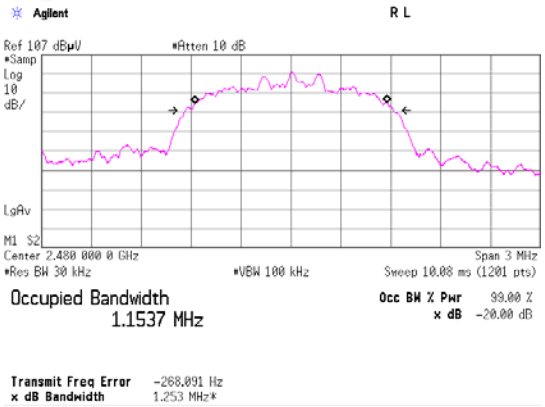
Tx, 2441MHz

Tx2_99OBW



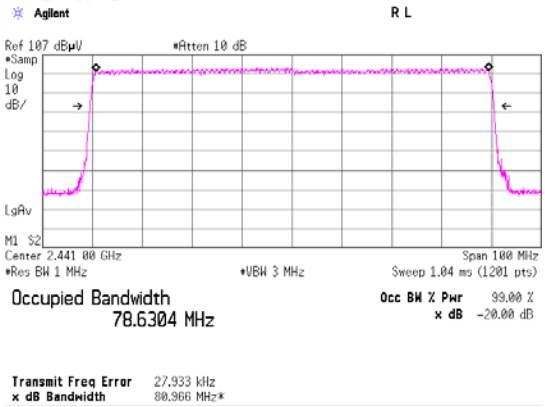
Tx, 2480MHz

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)
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	AT	2014/03/04 ＊12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2014/04/04 ＊12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2014/04/04 ＊12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2014/03/13 ＊12
SAT10-11	Attenuator	Weinschel Corp.	54A-10	37588	AT	2014/04/22 ＊12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2014/04/22 ＊12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2013/07/09 ＊12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2013/08/19 ＊12
SCC-G01	Coaxial Cable	Suhner	SUCOFLEX 104A	46497/4A	RE	2014/04/22 ＊12
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
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2013/11/22 ＊12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX 104	296169/4	RE	2014/05/15 ＊12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2014/03/17 ＊12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2014/02/21 ＊12
SJM-15	Measure	ASKUL	-	-	RE	-
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2014/03/15 ＊12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2014/03/13 ＊12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2014/03/14 ＊12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE	-
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2014/02/14 ＊12
SAT6-06	Attenuator	JFW	50HF-006N	-	RE	2014/02/17 ＊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/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2014/04/25 ＊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	2014/03/04 ＊12

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

All equipment is calibrated with valid calibrations . Each measurement data is traceable to the national or international standards .
Test Item :
RE: Radiated emission,
AT: Antenna terminal conducted tests