RADIO TEST REPORT

Test Report No.: 10489568S-A

Applicant	:	**Sony Corporation**
Type of Equipment	:	**Wireless Stereo Headset**
Model No.	:	**MDR-AS600BT**
FCC ID	:	**AK8MDRAS600BT**
Test regulation	:	**FCC Part15 Subpart C: 2014**
Test result	:	**Complied**

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.

Date of test: September 29 to 30, 2014

Tested by:

Kenichi Adachi
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.: 10489568S-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10489568S-A	October 22, 2014	-	-
1	10489568S-A	October 29, 2014	4	Correction of Supplied voltage information
2	10489568S-A	October 31, 2014	4	Correction of Supplied voltage information

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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	:	Shigeru Higai

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

2.1 Identification of E.U.T.

Type of Equipment	:	Wireless Stereo Headset
Model Number	:	MDR-AS600BT
Serial Number	:	Refer to Clause 4.2
Rating	:	DC3.7V
Country of Mass-production	:	China
Condition of EUT	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Receipt Date of Sample	:	September 22, 2014
Modification of EUT	:	No modification by the test lab.

2.2 Product description

Model: MDR-AS600BT (referred to as the EUT in this report) is a Wireless Stereo Headset.

Clock frequencies: Bluetooth: 26MHz

Bluetooth specification:

Equipment type	:	Transceiver
Frequency of operation	:	2402-2480MHz
Bandwidth / Channel spacing	:	1MHz / 1MHz
Type of modulation	:	FHSS (GFSK, π/4-DQPSK, 8DPSK)
Antenna type	:	Pattern antenna
Antenna connector type	:	Integral
Antenna gain	:	-1.74 dBi
ITU code	:	F1D, G1D
Operation temperature range	:	0 to +40 deg.C

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
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.

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2014, final revised on August 15, 2014 and effective October 14, 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 revision on August 15, 2014 does not affect the test specification applied to the EUT.
* The EUT has been tested for compliance with FCC Part 15 Subpart B. Refer to the test report: 10489568S-C.

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	10.2 dB Freq.: 12010.000 MHz Polarization: Horizontal Detection: AV Mode: Tx 2402MHz, 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. Bluetooth does not operate during charging.

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

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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.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
☐ 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 (Tx) Hopping ON (DH5 / 3-DH5)/Inquiry, Payload: PRBS9	-
20dB bandwidth	Transmitting (Tx) Hopping OFF (DH5 / 3-DH5) / Inquiry, Payload: PRBS9	2402MHz, 2441MHz, 2480MHz
Number of hopping frequency	Transmitting (Tx) Hopping ON (DH5 / 3-DH5)/Inquiry, Payload: PRBS9	-
Dwell time	Transmitting (Tx) (Hopping ON) - DH1, - DH3, - DH5 - 3-DH1, - 3-DH3, - 3-DH5	-
	-Inquiry	
Maximum peak conducted output power	Transmitting (Tx) Hopping OFF (DH5 / 2-DH5 / 3-DH5) / Inquiry, Payload: PRBS9 - DH5 - 2-DH5 - 3-DH5	2402MHz, 2441MHz, 2480MHz
Band edge compliance & Spurious emission (Conducted)	Transmitting (Tx) (DH5 / 3-DH5), Payload: PRBS9 -Hopping ON / Inquiry -Hopping OFF	Band edge compliance: 2402MHz, 2480MHz Spurious emission: 2402MHz, 2441MHz, 2480MHz
(Radiated)	Transmitting (Tx) (DH5 / 3-DH5), Payload: PRBS9	
99% occupied bandwidth	Transmitting (Tx) (DH5 / 3-DH5), Payload: PRBS9 -Hopping ON -Hopping OFF	2402MHz, 2441MHz, 2480MHz

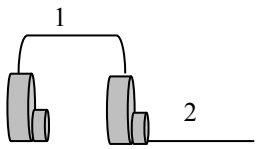
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum packet type / payload (except Dwell time test)
*Remarks: Test was not performed at AFH mode, because the decrease of number of channel (min: 20ch) at AFH mode does not influence on the output power and bandwidth of the EUT.
As this device had AFH mode and frequency separation could not meet the requirement of over 20dB BW without 2/3 relaxation, 125mW power limit was applied to it.
*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.
*EUT has the power settings by the software as follows;

Software: CSR Blue Suite BlueTest3 Ver.2.5.0.93
CSR Blue Suite BtCli Ver.2.5.0.93 (Inquiry mode only)
Power settings: BDR: Ext.= 7, Int.=50
EDR: Ext.=54, Int.=61

*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.

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

4.2 Configuration and peripherals



A: EUT

* Test data was taken under worse case conditions.

Description of EUT and support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Wireless Stereo Headset	MDR-AS600BT	*1)	Sony	EUT

*1) 001: Radiated emission tests, 003: Antenna terminal conducted tests

List of cable used

No.	Cable name	Length (m)	Shield		Remark
			Cable	Connector	
1	Headset	0.5	Unshielded	Unshielded	-
2	USB	0.5	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.
In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating,
the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.
In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart. (9kHz-150kHz:RBW=200Hz, 150kHz-30MHz:RBW=10kHz)

Summary of the test results: Pass
Refer to APPENDIX 1.

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, 0.5m by 0.5m, raised 0.8m above the conducting ground plane. The table is made of Styrofoam and covered with polyvinyl chloride. That has very low permittivity.
The rear of EUT, including its peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and for the forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane.
Photographs of the set up are shown in APPENDIX 3.

11.3 Test conditions

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

11.4 Test procedure

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

The radiated emission measurements were made with the following detection.

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

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

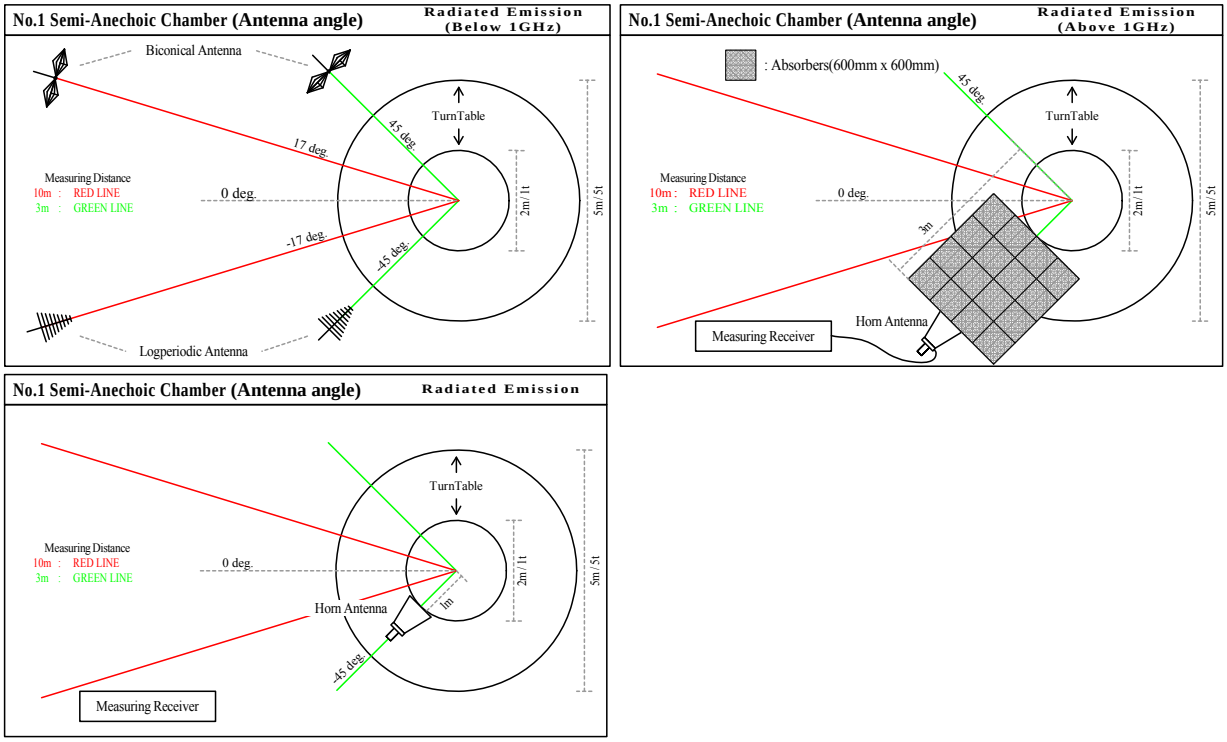
The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Combinations of the worst case

Frequency / Antenna polarization	Carrier *2)	Spurious		
		Below 1GHz	1-2.8GHz	2.8-25GHz
Horizontal	Y	Y	Y	Y
Vertical	X	Y	Z	Z

*2) with spurious emissions near carrier frequency

Figure 1. Antenna angle



11.5 Band edge

Band edge level at 2390MHz and 2483.5MHz is below the limits of FCC 15.209 and band edge level at 2400MHz is below the 20dBc. Refer to the data.

11.6 Results

Summary of the test results: Pass *No noise was detected above the 8th order harmonics.

Refer to APPENDIX 1.

Contents of APPENDIXES

APPENDIX 1: Data of Radio tests

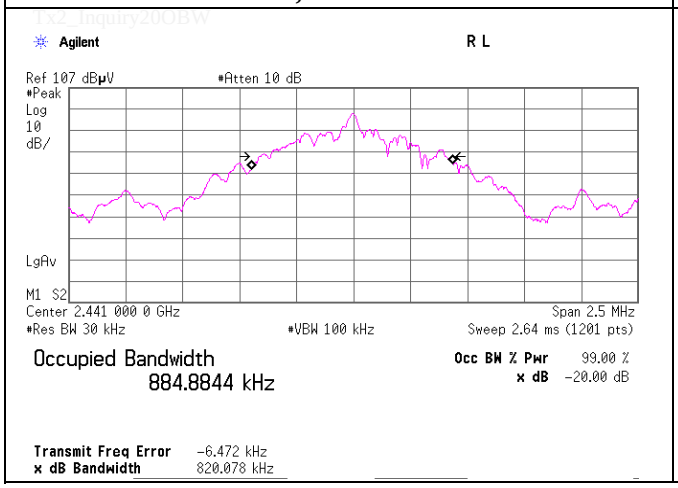
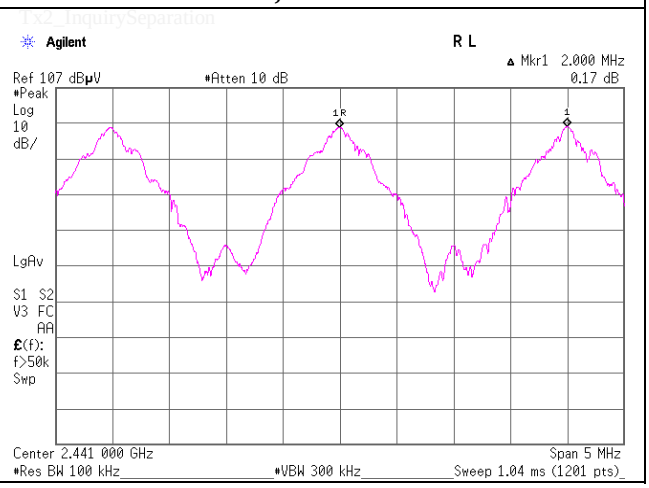
20dB Bandwidth and Carrier Frequency Separation

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.942	1.003	>= 0.628
DH5	2441.0	0.937	1.000	>= 0.624
DH5	2480.0	0.933	1.000	>= 0.622
Inquiry	2441.0	0.820	2.000	>= 0.547

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
	

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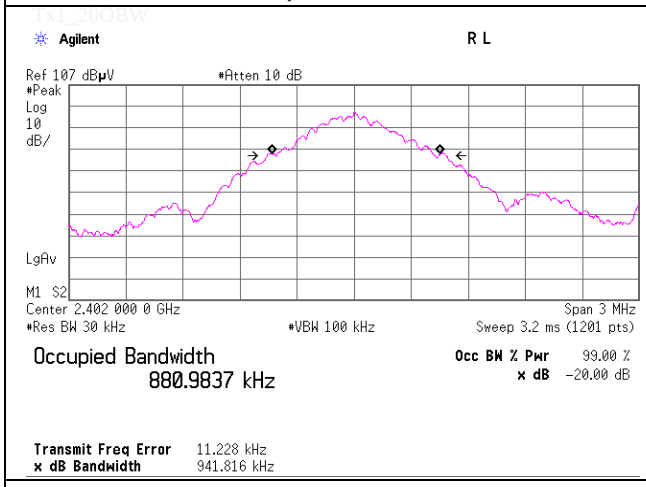
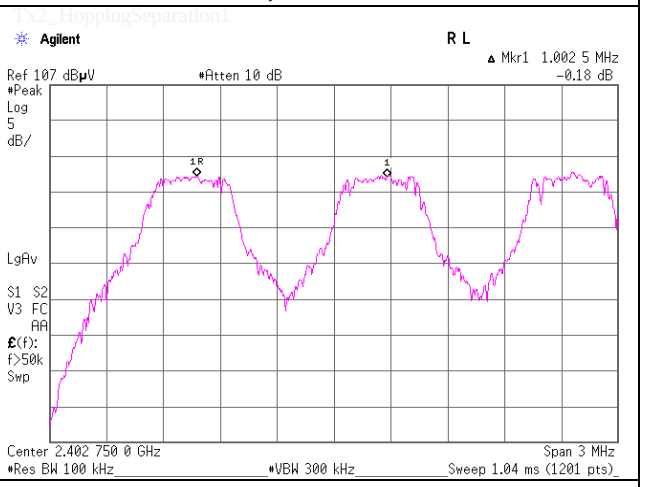
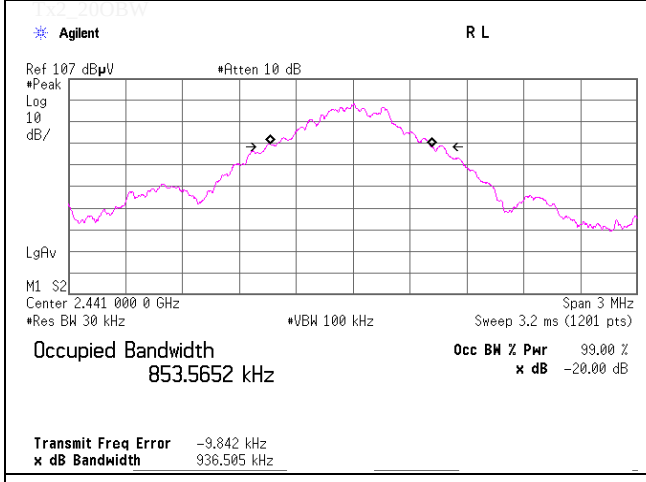
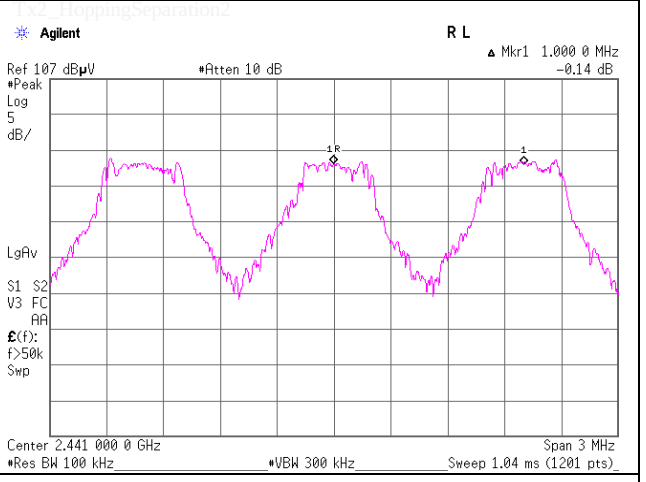
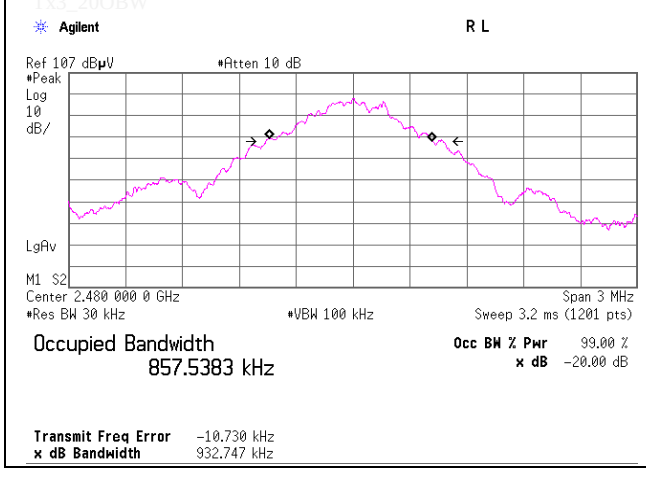
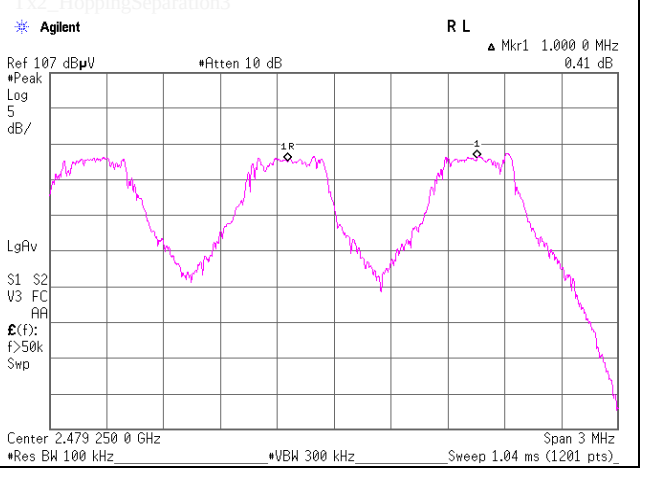
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	

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**
	

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20dB Bandwidth and Carrier Frequency Separation

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	
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	1.270	1.003	>= 0.847
3-DH5	2441.0	1.267	1.000	>= 0.844
3-DH5	2480.0	1.266	1.000	>= 0.844

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

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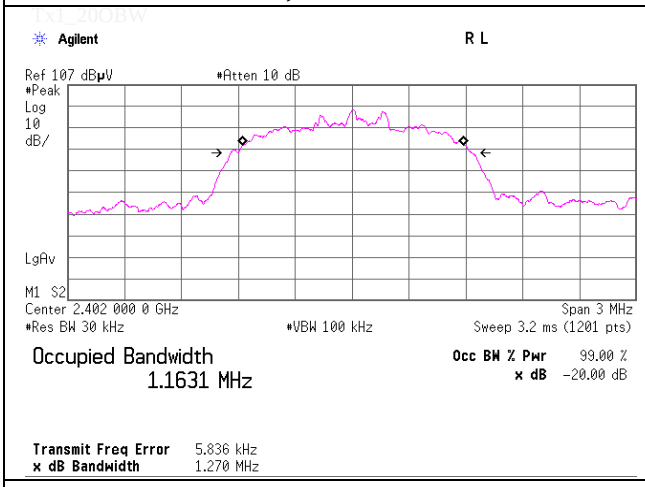
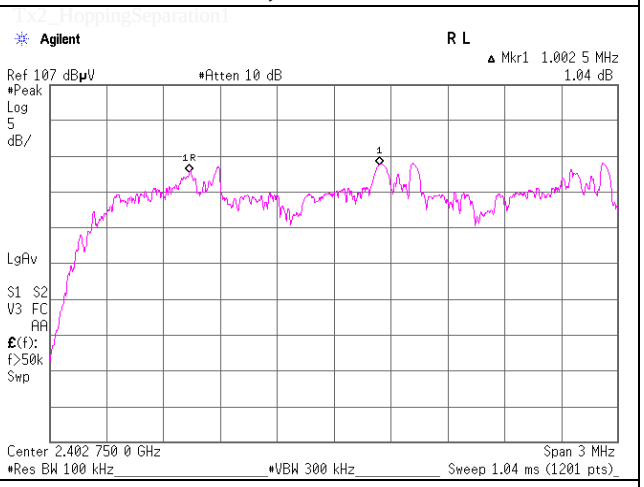
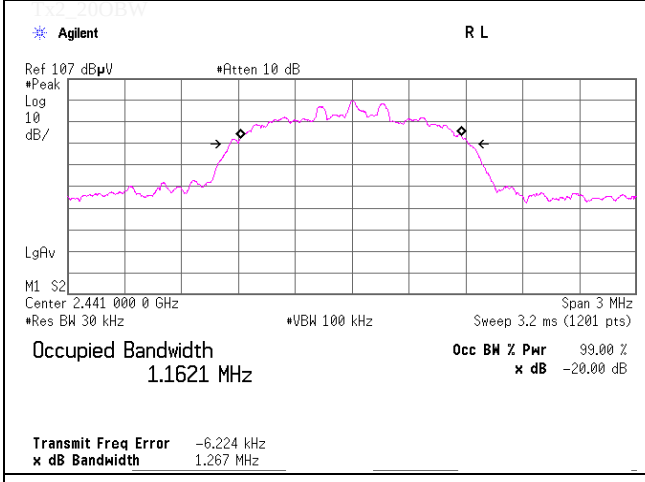
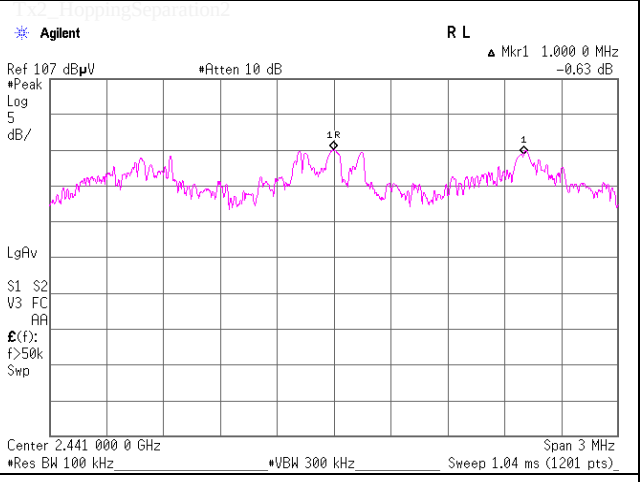
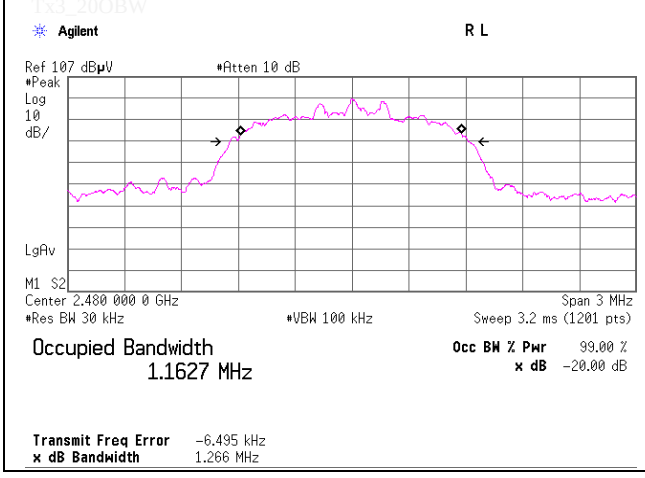
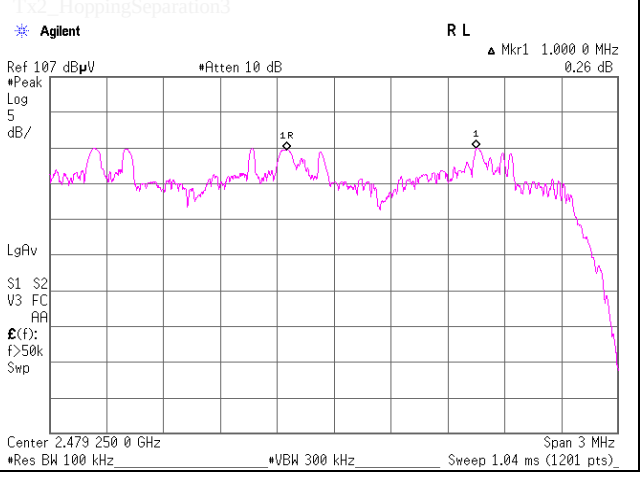
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	

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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Facsimile : +81 463 50 6401

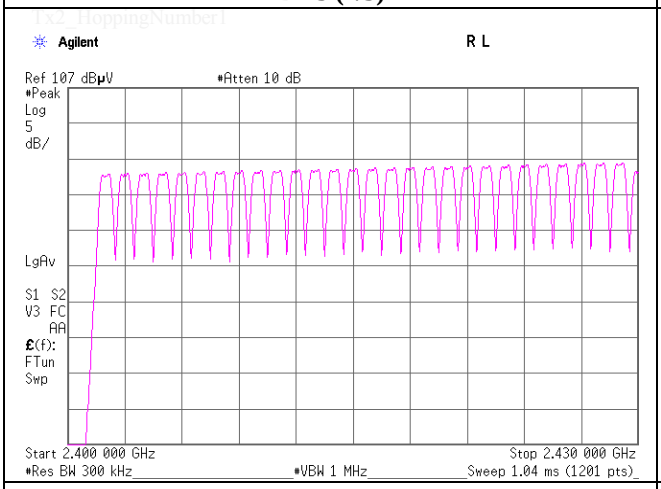
Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	
Mode	Tx, Bluetooth, BDR, PRBS9	

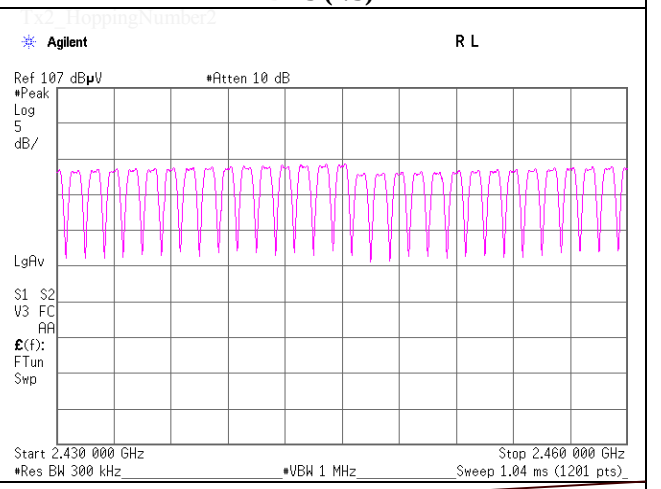
Mode	Number of Channel [times]	Limit [times]
DH5	79	>= 15

* 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.

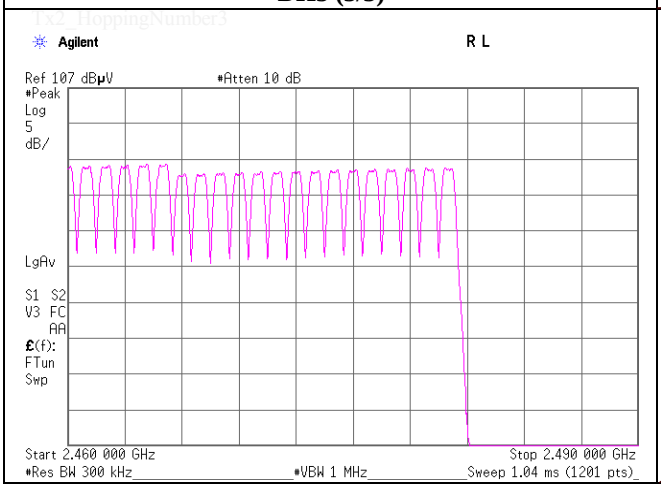
DH5 (1/3)

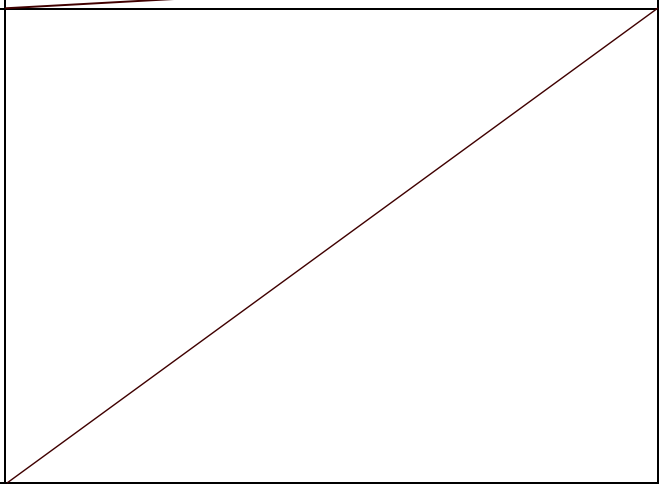


DH5 (2/3)



DH5 (3/3)





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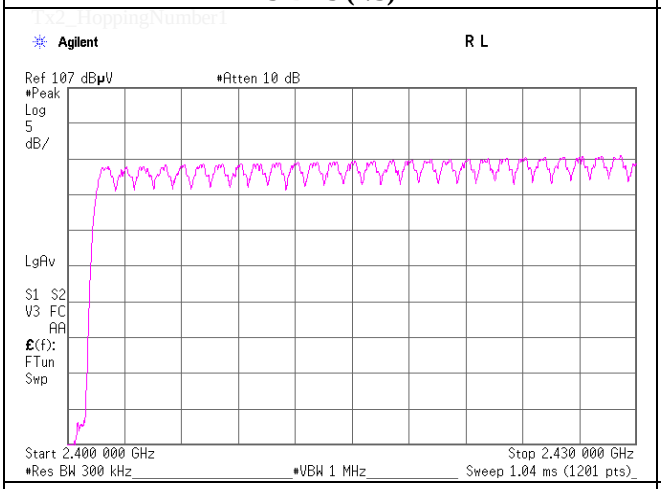
Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	
Mode	Tx, Bluetooth, EDR, PRBS9	

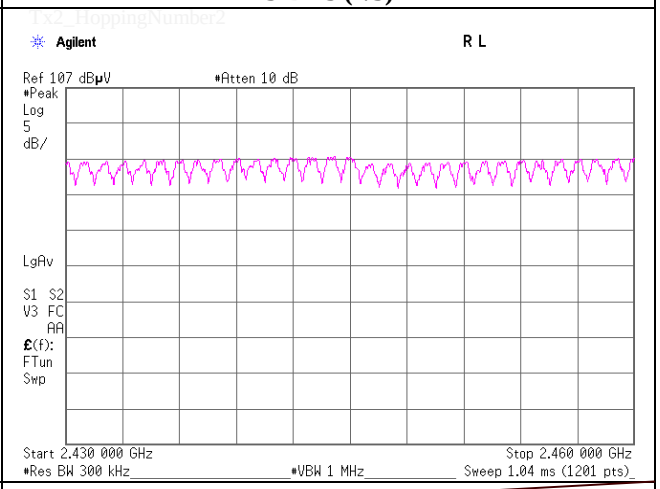
Mode	Number of Channel [times]	Limit [times]
3-DH5	79	>= 15

* 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.

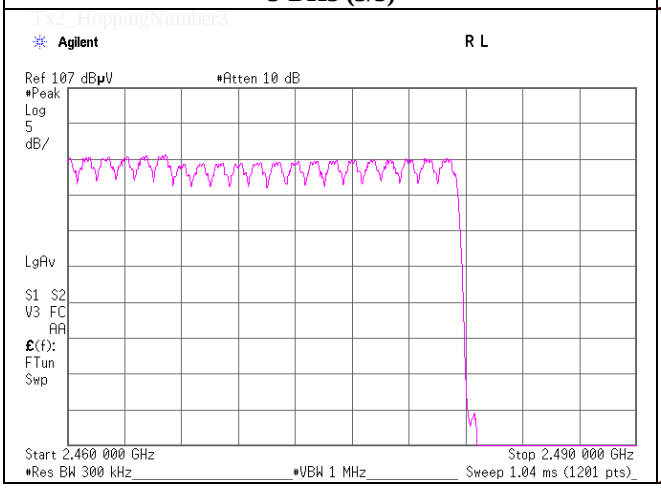
3-DH5 (1/3)

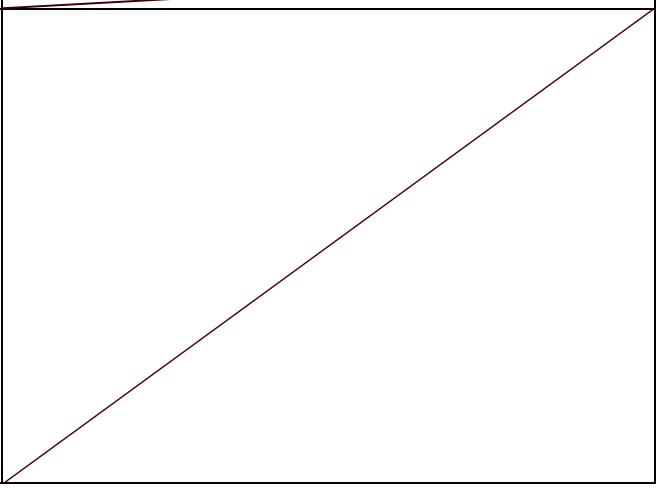


3-DH5 (2/3)



3-DH5 (3/3)





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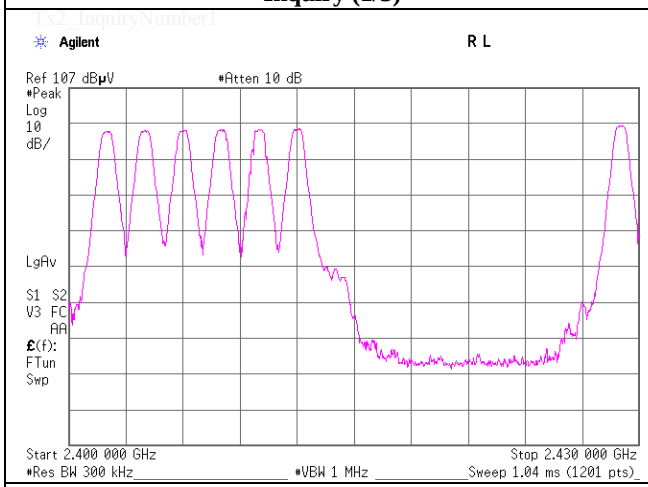
Number of Hopping Frequency

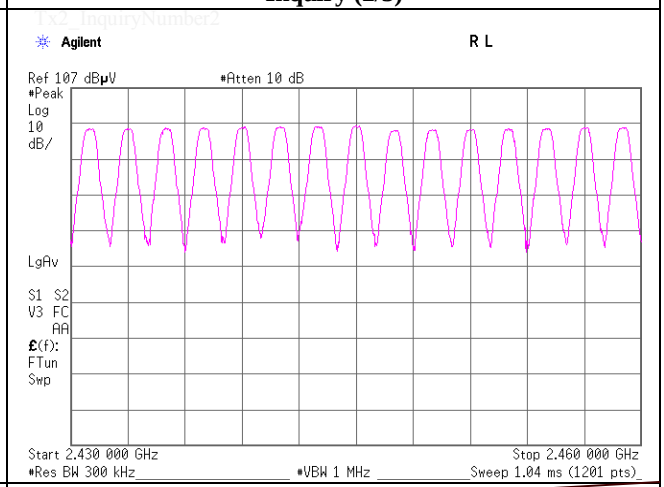
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	
Mode	Tx, Bluetooth, Inquiry	

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

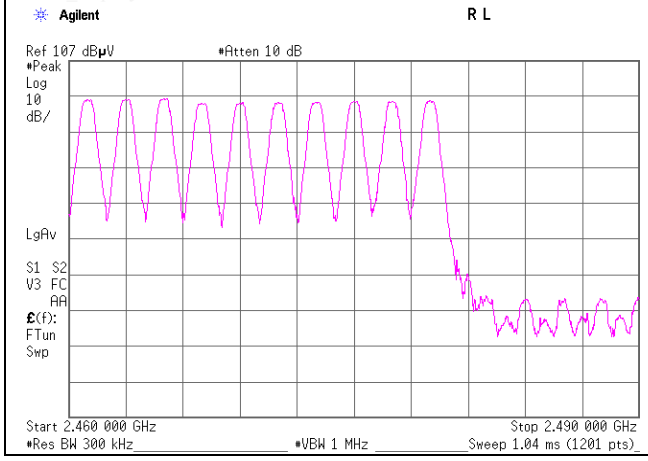
Inquiry (1/3)



Inquiry (2/3)



Inquiry (3/3)



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Dwell Time

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) / 12.8 (32 Hopping x 0.4) second period	Length of transmission time [msec]	Result [msec]	Limit [msec]
DH1	51.0 / 5.0 sec. x 31.6 sec. = 323 times	0.424	137	400
DH3	26.0 / 5.0 sec. x 31.6 sec. = 165 times	1.680	277	400
DH5	17.0 / 5.0 sec. x 31.6 sec. = 108 times	2.929	316	400
Inquiry	100.0 / 1.0 sec. x 12.8 sec. = 1280 times	0.125	161	400

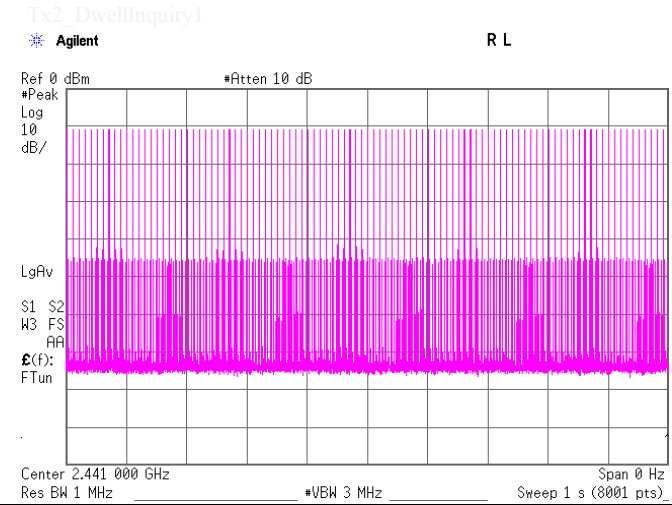
Sample Calculation

Result = Number of transmission x Length of transmition time

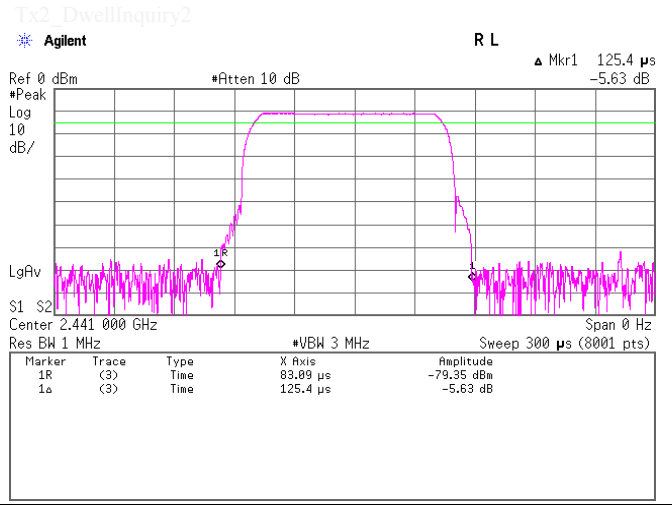
* This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence (20 ≤ N ≤ 79), is always less than 0.4s regardless of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

Inquiry

Inquiry (1/2)



Inquiry (2/2)



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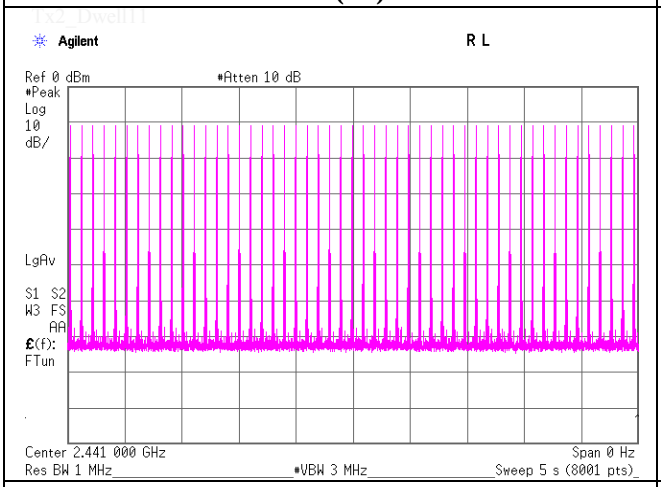
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	

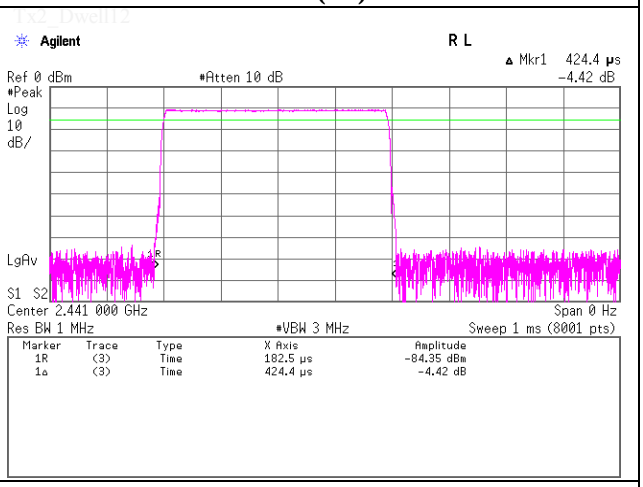
Dwell time

Tx, Bluetooth, BDR, PRBS9

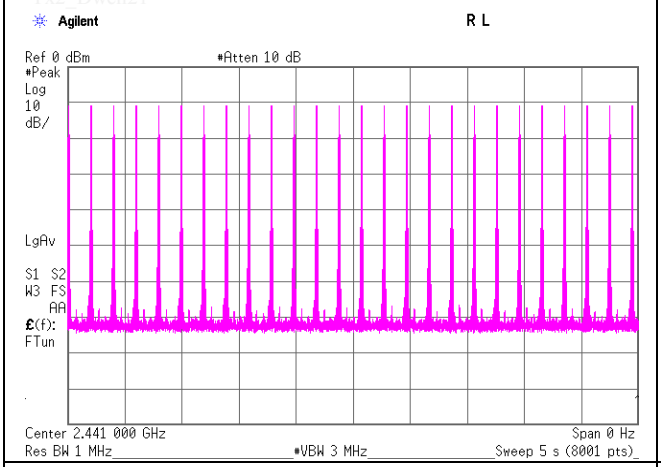
DH1 (1/2)



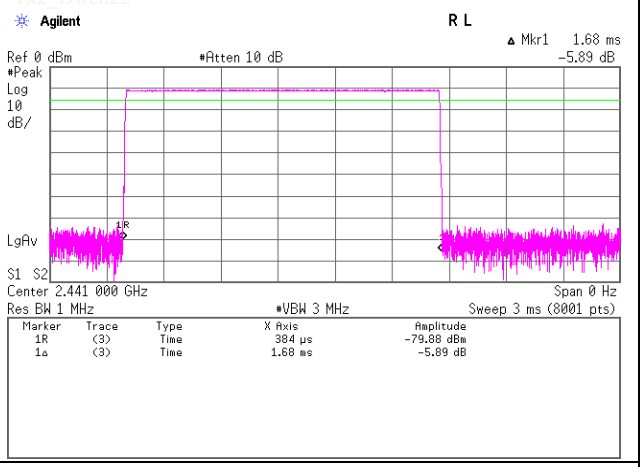
DH1 (2/2)



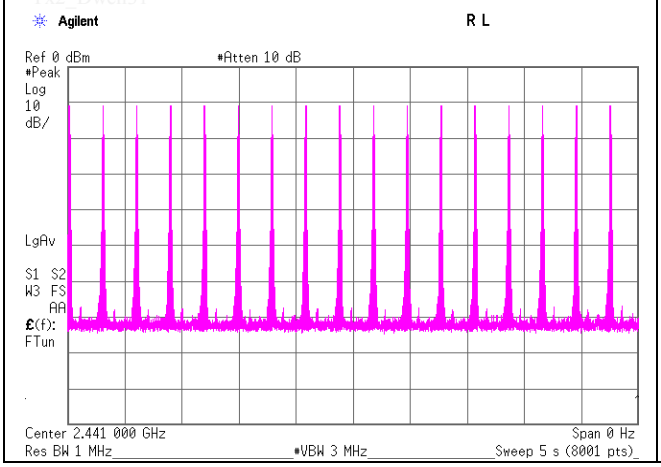
DH3 (1/2)



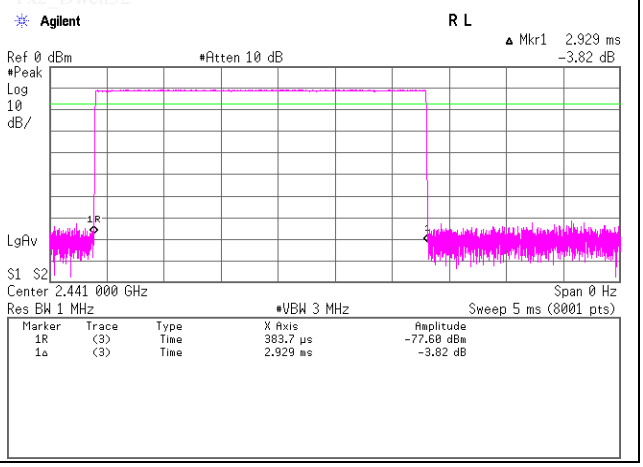
DH3 (2/2)



DH5 (1/2)



DH5 (2/2)



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Dwell Time

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	
Mode	Tx, Bluetooth, EDR, PRBS9	

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4) second				Length of transmission time [msec]	Result [msec]	Limit [msec]
3-DH1	51.0	/ 5.0 sec. x 31.6 sec. =	323	times	0.444	144	400
3-DH3	26.0	/ 5.0 sec. x 31.6 sec. =	165	times	1.696	280	400
3-DH5	17.0	/ 5.0 sec. x 31.6 sec. =	108	times	2.953	319	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.

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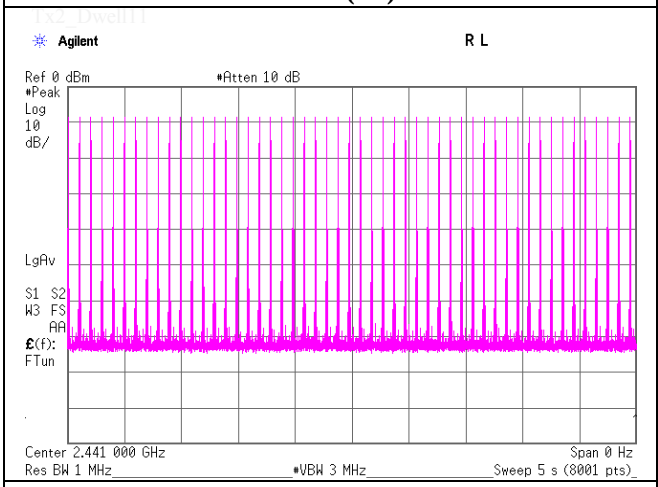
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	

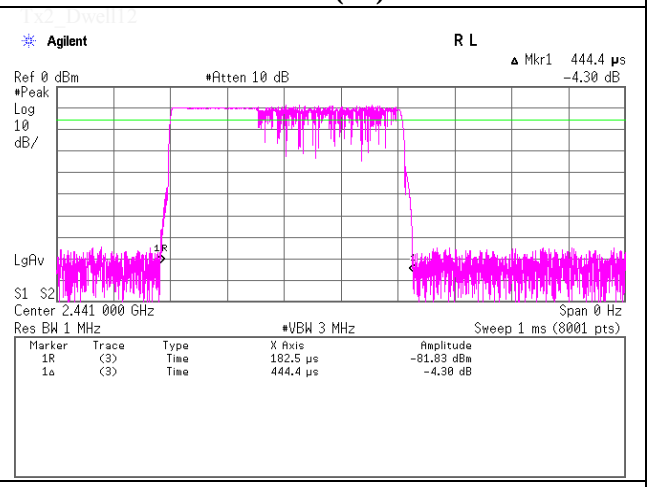
Dwell time

Tx, Bluetooth, EDR, PRBS9

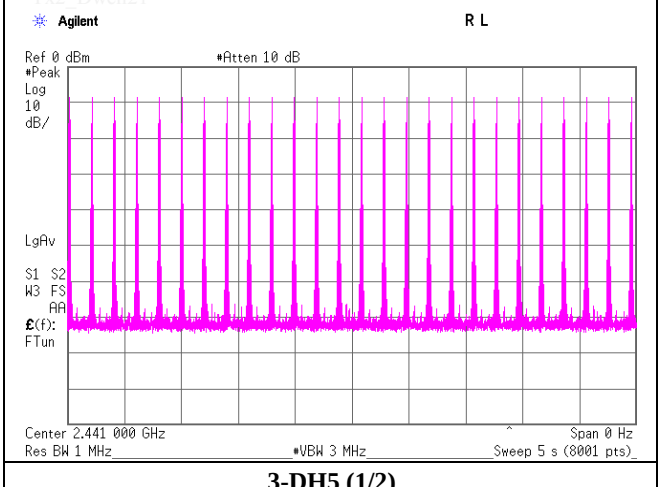
3-DH1 (1/2)



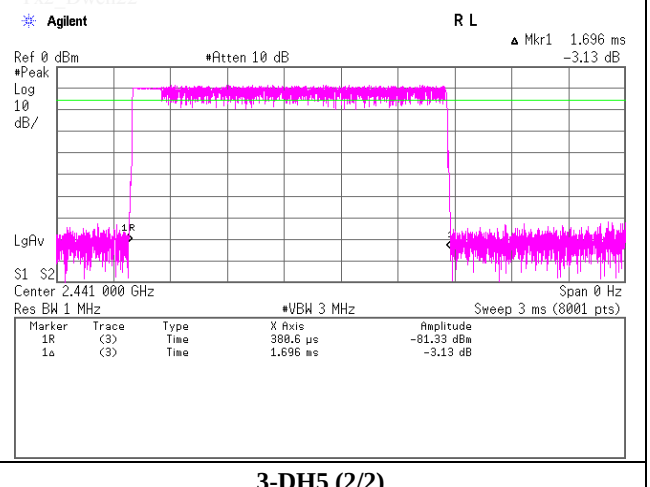
3-DH1 (2/2)



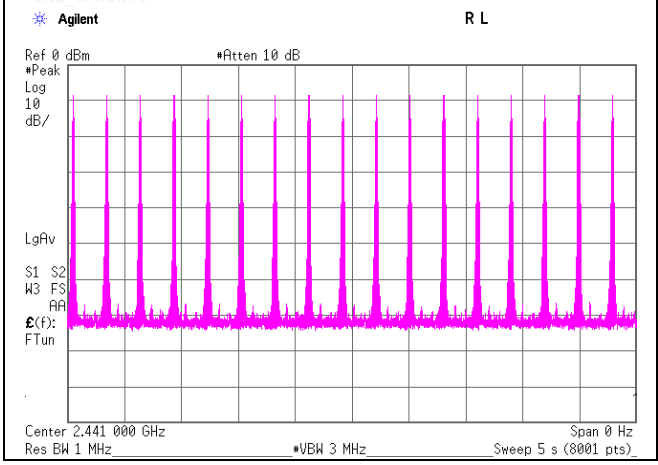
3-DH3 (1/2)



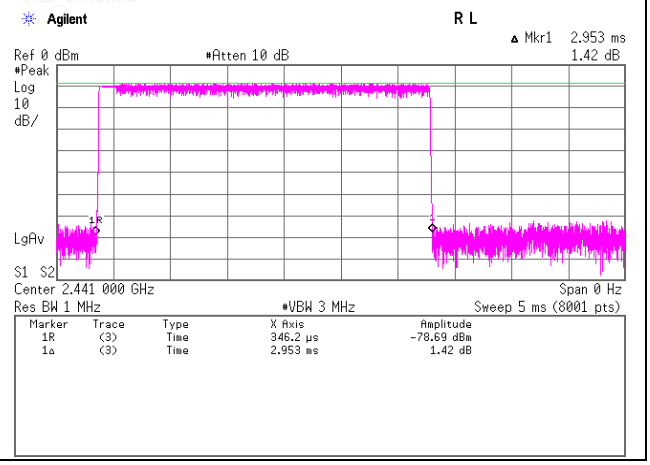
3-DH3 (2/2)



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.5 Shielded Room
Date	September 30, 2014
Temperature / Humidity	26deg.C , 44%RH
Engineer	Kenichi Adachi
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	-11.78	1.38	9.65	-0.75	0.84	20.97	125	21.72
DH5	2441.0	-10.83	1.39	9.66	0.22	1.05	20.97	125	20.75
DH5	2480.0	-11.02	1.40	9.66	0.04	1.01	20.97	125	20.93
2-DH5	2402.0	-10.39	1.38	9.65	0.64	1.16	20.97	125	20.33
2-DH5	2441.0	-9.21	1.39	9.66	1.84	1.53	20.97	125	19.13
2-DH5	2480.0	-9.22	1.40	9.66	1.84	1.53	20.97	125	19.13
3-DH5	2402.0	-10.15	1.38	9.65	0.88	1.22	20.97	125	20.09
3-DH5	2441.0	-8.96	1.39	9.66	2.09	1.62	20.97	125	18.88
3-DH5	2480.0	-8.98	1.40	9.66	2.08	1.61	20.97	125	18.89

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

(Reference maximum conducted power (average))

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

	Freq.	P/M (Average) Reading	Cable Loss	Atten. Loss	Duty factor	Result	
	[MHz]	[dBm]	[dB]	[dB]	[dB]	[dBm]	[mW]
DH5	2402.0	-13.32	1.38	9.65	1.13	-1.16	0.77
DH5	2441.0	-12.16	1.39	9.66	1.13	0.02	1.00
DH5	2480.0	-12.35	1.40	9.66	1.13	-0.16	0.96
2-DH5	2402.0	-13.17	1.38	9.65	1.11	-1.03	0.79
2-DH5	2441.0	-12.01	1.39	9.66	1.11	0.15	1.04
2-DH5	2480.0	-12.04	1.40	9.66	1.11	0.13	1.03
3-DH5	2402.0	-13.17	1.38	9.65	1.11	-1.03	0.79
3-DH5	2441.0	-12.01	1.39	9.66	1.11	0.15	1.04
3-DH5	2480.0	-12.05	1.40	9.66	1.11	0.12	1.03

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Atten. Loss + Duty factor
* Duty factor is refer to the page of "(Reference) duty chart for Maximum conducted power"

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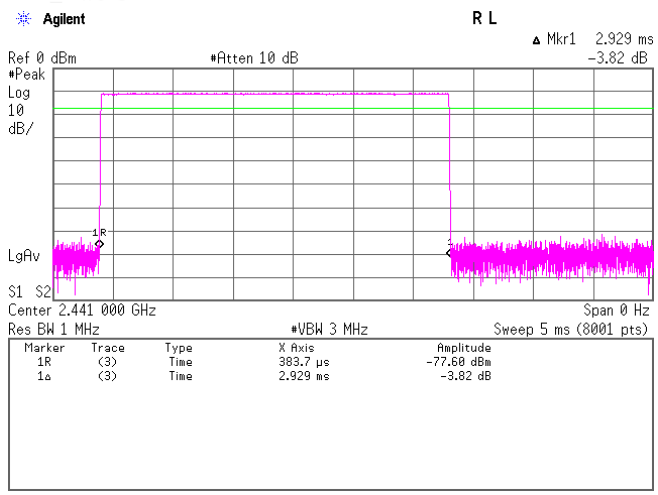
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	

Dwell time factor Calculation chart

Dwell time factor Calculation

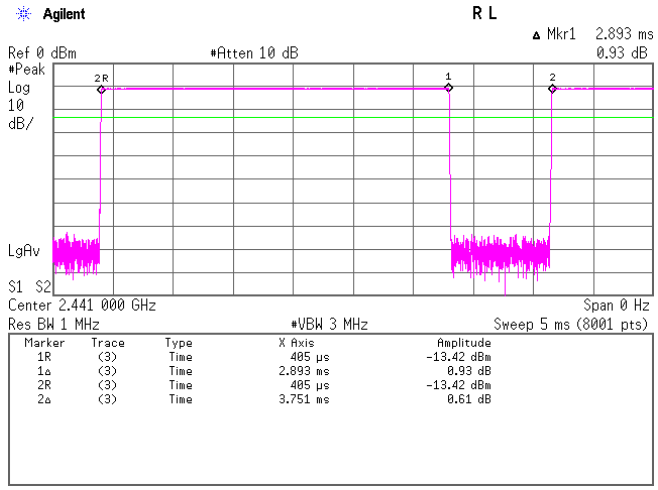
Tx, Bluetooth, BDR, PRBS9	
Worst 100ms **Dwell time factor =20log((2.929 x 2)/100) = -24.65dB**	**1cycle On time :** **2.929ms**
ON time of some channel during 100ms: Twice This is the worst case in hopping sequence of Bluetooth.	

VBW (Average) setting

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

(Reference) duty chart for Maximum conducted power

(Reference duty chart for Maximum conducted power)



on time [ms] 2.893 1cycle[ms] 3.751 duty 0.771

duty factor [dB] 1.13

* caliculation: duty factor [dB] = 10 x log (1cycle [ms] / on time [ms])

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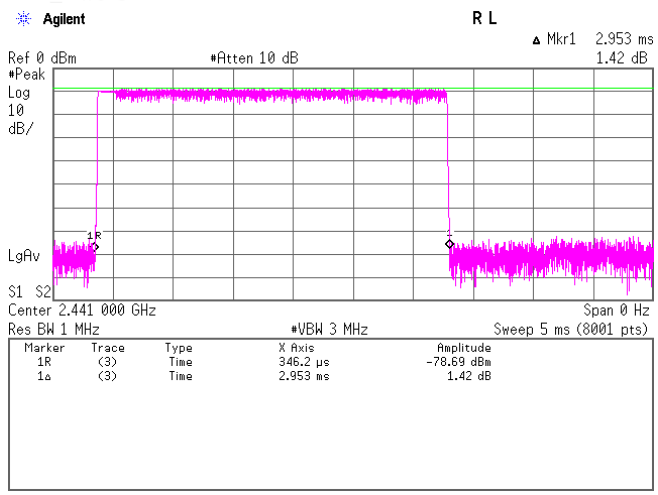
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	

Dwell time factor Calculation chart

Dwell time factor Calculation

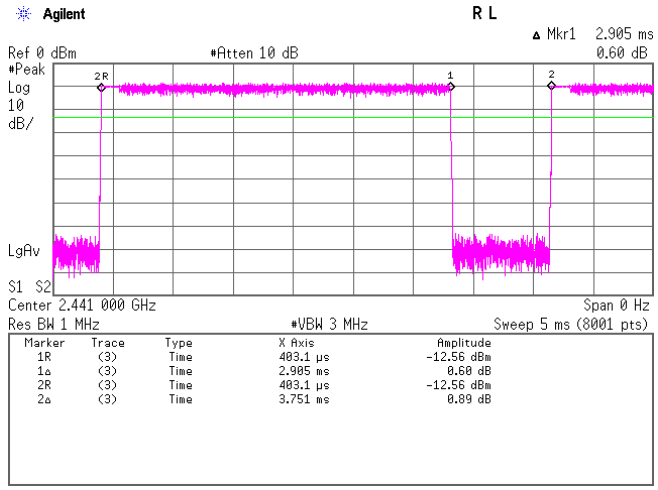
Tx, Bluetooth, EDR, PRBS9	
Worst 100ms **Dwell time factor =20log((2.953 x 2)/100) = -24.57dB**	**1cycle On time :** **2.953ms**
ON time of some channel during 100ms: Twice This is the worst case in hopping sequence of Bluetooth.	

VBW (Average) setting

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

(Reference) duty chart for Maximum conducted power

(Reference duty chart for Maximum conducted power)



on time [ms] 2.905 1cycle[ms] 3.751 duty 0.774

duty factor [dB] 1.11

* caliculation: duty factor [dB] = 10 x log (1cycle [ms] / on time [ms])

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	September 29, 2014	September 30, 2014
Temperature / Humidity	26deg.C , 58%RH	24deg.C , 57%RH
Engineer	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.	512.741	QP	23.4	17.4	7.7	32.0	16.5	46.0	29.5	100	105	
Hori.	828.521	QP	23.3	20.8	9.2	31.8	21.5	46.0	24.5	100	347	
Hori.	2390.000	PK	46.2	25.9	14.6	40.9	45.8	73.9	28.1	138	212	
Hori.	4804.000	PK	52.5	30.5	7.0	41.7	48.3	73.9	25.6	100	240	
Hori.	7206.000	PK	49.0	36.2	8.4	41.5	52.1	73.9	21.8	125	247	
Hori.	9608.000	PK	46.7	38.3	9.3	40.4	53.9	73.9	20.0	100	0	
Hori.	12010.000	PK	47.1	39.4	10.3	39.7	57.1	73.9	16.8	100	0	
Hori.	19216.000	PK	50.2	40.8	1.9	48.4	44.5	73.9	29.4	100	201	
Hori.	2390.000	AV	33.5	25.9	14.6	40.9	33.1	53.9	20.8	138	212	
Hori.	4804.000	AV	42.5	30.5	7.0	41.7	38.3	53.9	15.6	100	240	
Hori.	7206.000	AV	36.3	36.2	8.4	41.5	39.4	53.9	14.5	125	247	
Hori.	9608.000	AV	33.7	38.3	9.3	40.4	40.9	53.9	13.0	100	0	
Hori.	12010.000	AV	33.7	39.4	10.3	39.7	43.7	53.9	**10.2**	100	0	
Hori.	19216.000	AV	43.5	40.8	1.9	48.4	37.8	53.9	16.1	100	201	
Vert.	258.184	QP	23.2	17.5	9.6	31.8	18.5	46.0	27.5	100	123	
Vert.	740.214	QP	23.5	20.0	8.8	32.0	20.3	46.0	25.7	100	136	
Vert.	2390.000	PK	46.2	25.9	14.6	40.9	45.8	73.9	28.1	100	348	
Vert.	4804.000	PK	50.8	30.5	7.0	41.7	46.6	73.9	27.3	100	71	
Vert.	7206.000	PK	47.3	36.2	8.4	41.5	50.4	73.9	23.5	100	0	
Vert.	9608.000	PK	45.2	38.3	9.3	40.4	52.4	73.9	21.5	100	0	
Vert.	12010.000	PK	44.6	39.4	10.3	39.7	54.6	73.9	19.3	100	0	
Vert.	19216.000	PK	51.1	40.8	1.9	48.4	45.4	73.9	28.5	101	79	
Vert.	2390.000	AV	33.7	25.9	14.6	40.9	33.3	53.9	20.6	100	348	
Vert.	4804.000	AV	41.1	30.5	7.0	41.7	36.9	53.9	17.0	100	71	
Vert.	7206.000	AV	34.0	36.2	8.4	41.5	37.1	53.9	16.8	100	0	
Vert.	9608.000	AV	32.1	38.3	9.3	40.4	39.3	53.9	14.6	100	0	
Vert.	12010.000	AV	32.1	39.4	10.3	39.7	42.1	53.9	11.8	100	0	
Vert.	19216.000	AV	45.0	40.8	1.9	48.4	39.3	53.9	14.6	101	79	

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

20dBc Data Sheet **(RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	94.8	26.0	14.6	40.9	94.5	-	-	carrier
Hori.	2400.000	PK	45.5	26.0	14.6	40.9	45.2	74.5	29.3	
Hori.	2505.997	PK	45.3	26.2	14.7	40.9	45.3	74.5	29.2	
Hori.	2532.004	PK	45.0	26.2	14.7	40.9	45.0	74.5	29.5	
Hori.	2558.158	PK	47.0	26.3	14.7	40.9	47.1	74.5	27.4	
Hori.	2583.976	PK	42.3	26.4	14.8	40.9	42.6	74.5	31.9	
Hori.	2610.997	PK	40.0	26.4	14.8	40.9	40.3	74.5	34.2	
Vert.	2402.000	PK	95.8	26.0	14.6	40.9	95.5	-	-	carrier
Vert.	2400.000	PK	44.7	26.0	14.6	40.9	44.4	75.5	31.1	
Vert.	2506.014	PK	48.2	26.2	14.7	40.9	48.2	75.5	27.3	
Vert.	2531.996	PK	46.1	26.2	14.7	40.9	46.1	75.5	29.4	
Vert.	2558.000	PK	50.1	26.3	14.7	40.9	50.2	75.5	25.3	
Vert.	2583.978	PK	43.8	26.4	14.8	40.9	44.1	75.5	31.4	
Vert.	2610.000	PK	41.5	26.4	14.8	40.9	41.8	75.5	33.7	

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

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	September 29, 2014	September 30, 2014
Temperature / Humidity	26deg.C , 58%RH	24deg.C , 57%RH
Engineer	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.	512.741	QP	23.4	17.4	7.7	32.0	16.5	46.0	29.5	100	354	
Hori.	828.521	QP	23.3	20.8	9.2	31.8	21.5	46.0	24.5	150	330	
Hori.	4882.000	PK	52.9	30.8	7.0	41.6	49.1	73.9	24.8	114	72	
Hori.	7323.000	PK	47.4	36.3	8.3	41.5	50.5	73.9	23.4	100	0	
Hori.	9764.000	PK	45.1	38.3	9.5	40.4	52.5	73.9	21.4	100	0	
Hori.	12205.000	PK	44.8	39.3	10.4	39.7	54.8	73.9	19.1	100	0	
Hori.	19528.000	PK	49.4	40.8	2.0	48.1	44.1	73.9	29.8	100	170	
Hori.	4882.000	AV	44.2	30.8	7.0	41.6	40.4	53.9	13.5	114	72	
Hori.	7323.000	AV	34.6	36.3	8.3	41.5	37.7	53.9	16.2	100	0	
Hori.	9764.000	AV	32.2	38.3	9.5	40.4	39.6	53.9	14.3	100	0	
Hori.	12205.000	AV	32.0	39.3	10.4	39.7	42.0	53.9	**11.9**	100	0	
Hori.	19528.000	AV	43.1	40.8	2.0	48.1	37.8	53.9	16.1	100	170	
Vert.	258.184	QP	23.3	17.5	9.6	31.8	18.6	46.0	27.4	100	16	
Vert.	740.214	QP	23.4	20.0	8.8	32.0	20.2	46.0	25.8	100	14	
Vert.	4882.000	PK	50.9	30.8	7.0	41.6	47.1	73.9	26.8	100	327	
Vert.	7323.000	PK	47.4	36.3	8.3	41.5	50.5	73.9	23.4	100	0	
Vert.	9764.000	PK	44.9	38.3	9.5	40.4	52.3	73.9	21.6	100	0	
Vert.	12205.000	PK	44.3	39.3	10.4	39.7	54.3	73.9	19.6	100	0	
Vert.	19528.000	PK	50.2	40.8	2.0	48.1	44.9	73.9	29.0	100	247	
Vert.	4882.000	AV	40.4	30.8	7.0	41.6	36.6	53.9	17.3	100	327	
Vert.	7323.000	AV	34.6	36.3	8.3	41.5	37.7	53.9	16.2	100	0	
Vert.	9764.000	AV	32.2	38.3	9.5	40.4	39.6	53.9	14.3	100	0	
Vert.	12205.000	AV	31.9	39.3	10.4	39.7	41.9	53.9	12.0	100	0	
Vert.	19528.000	AV	43.1	40.8	2.0	48.1	37.8	53.9	16.1	100	247	

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

20dBc Data Sheet **(RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2441.000	PK	97.1	26.0	14.6	40.9	96.8	-	-	carrier
Hori.	2519.017	PK	41.2	26.2	14.7	40.9	41.2	76.8	35.6	
Hori.	2545.010	PK	47.2	26.3	14.7	40.9	47.3	76.8	29.5	
Hori.	2570.996	PK	45.6	26.3	14.7	40.9	45.7	76.8	31.1	
Hori.	2596.985	PK	48.4	26.4	14.8	40.9	48.7	76.8	28.1	
Hori.	2622.955	PK	41.5	26.4	14.8	40.9	41.8	76.8	35.0	
Vert.	2441.000	PK	97.3	26.0	14.6	40.9	97.0	-	-	carrier
Vert.	2519.017	PK	39.8	26.2	14.7	40.9	39.8	77.0	37.2	
Vert.	2545.010	PK	45.4	26.3	14.7	40.9	45.5	77.0	31.5	
Vert.	2570.996	PK	45.1	26.3	14.7	40.9	45.2	77.0	31.8	
Vert.	2596.985	PK	48.4	26.4	14.8	40.9	48.7	77.0	28.3	
Vert.	2622.955	PK	41.3	26.4	14.8	40.9	41.6	77.0	35.4	

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

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	September 29, 2014	September 30, 2014
Temperature / Humidity	26deg.C , 58%RH	24deg.C , 57%RH
Engineer	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.	512.741	QP	23.3	17.4	7.7	32.0	16.4	46.0	29.6	150	300	
Hori.	828.521	QP	23.3	20.8	9.2	31.8	21.5	46.0	24.5	100	14	
Hori.	2483.500	PK	46.9	26.1	14.7	40.9	46.8	73.9	27.1	125	212	
Hori.	4960.000	PK	50.6	31.1	7.1	41.5	47.3	73.9	26.6	100	74	
Hori.	7440.000	PK	47.6	36.4	8.4	41.4	51.0	73.9	22.9	100	0	
Hori.	9920.000	PK	45.7	38.3	9.6	40.4	53.2	73.9	20.7	100	0	
Hori.	12400.000	PK	44.0	39.2	10.5	39.7	54.0	73.9	19.9	100	0	
Hori.	19840.000	PK	50.0	40.7	2.1	47.9	44.9	73.9	29.0	106	233	
Hori.	2483.500	AV	34.3	26.1	14.7	40.9	34.2	53.9	19.7	125	212	
Hori.	4960.000	AV	41.5	31.1	7.1	41.5	38.2	53.9	15.7	100	74	
Hori.	7440.000	AV	34.5	36.4	8.4	41.4	37.9	53.9	16.0	100	0	
Hori.	9920.000	AV	32.7	38.3	9.6	40.4	40.2	53.9	13.7	100	0	
Hori.	12400.000	AV	31.1	39.2	10.5	39.7	41.1	53.9	**12.8**	100	0	
Hori.	19840.000	AV	43.1	40.7	2.1	47.9	38.0	53.9	15.9	106	233	
Vert.	258.184	QP	23.3	17.5	9.6	31.8	18.6	46.0	27.4	100	93	
Vert.	740.214	QP	23.4	20.0	8.8	32.0	20.2	46.0	25.8	100	6	
Vert.	2483.500	PK	48.2	26.1	14.7	40.9	48.1	73.9	25.8	100	180	
Vert.	4960.000	PK	49.7	31.1	7.1	41.5	46.4	73.9	27.5	100	181	
Vert.	7440.000	PK	47.7	36.4	8.4	41.4	51.1	73.9	22.8	100	0	
Vert.	9920.000	PK	45.2	38.3	9.6	40.4	52.7	73.9	21.2	100	0	
Vert.	12400.000	PK	43.5	39.2	10.5	39.7	53.5	73.9	20.4	100	0	
Vert.	19840.000	PK	49.5	40.7	2.1	47.9	44.4	73.9	29.5	102	95	
Vert.	2483.500	AV	35.6	26.1	14.7	40.9	35.5	53.9	18.4	100	180	
Vert.	4960.000	AV	39.0	31.1	7.1	41.5	35.7	53.9	18.2	100	181	
Vert.	7440.000	AV	34.5	36.4	8.4	41.4	37.9	53.9	16.0	100	0	
Vert.	9920.000	AV	32.6	38.3	9.6	40.4	40.1	53.9	13.8	100	0	
Vert.	12400.000	AV	31.1	39.2	10.5	39.7	41.1	53.9	**12.8**	100	0	
Vert.	19840.000	AV	42.3	40.7	2.1	47.9	37.2	53.9	16.7	102	95	

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

20dBc Data Sheet **(RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2480.000	PK	94.3	26.1	14.7	40.9	94.2	-	-	carrier
Hori.	2583.986	PK	46.5	26.4	14.8	40.9	46.8	74.2	27.4	
Hori.	2609.986	PK	45.1	26.4	14.8	40.9	45.4	74.2	28.8	
Hori.	2635.992	PK	45.4	26.5	14.8	41.0	45.7	74.2	28.5	
Vert.	2480.000	PK	96.0	26.1	14.7	40.9	95.9	-	-	carrier
Vert.	2583.986	PK	46.0	26.4	14.8	40.9	46.3	75.9	29.6	
Vert.	2609.986	PK	44.4	26.4	14.8	40.9	44.7	75.9	31.2	
Vert.	2635.992	PK	46.0	26.5	14.8	41.0	46.3	75.9	29.6	

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

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	September 29, 2014	September 30, 2014
Temperature / Humidity	26deg.C , 58%RH	24deg.C , 57%RH
Engineer	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.	512.741	QP	23.4	17.4	7.7	32.0	16.5	46.0	29.5	150	211	
Hori.	828.521	QP	23.3	20.8	9.2	31.8	21.5	46.0	24.5	100	104	
Hori.	2390.000	PK	46.0	25.9	14.6	40.9	45.6	73.9	28.3	136	228	
Hori.	2505.996	PK	49.9	26.2	14.7	40.9	49.9	73.9	24.0	100	227	
Hori.	4804.000	PK	50.1	30.5	7.0	41.7	45.9	73.9	28.0	100	234	
Hori.	7206.000	PK	47.5	36.2	8.4	41.5	50.6	73.9	23.3	100	243	
Hori.	9608.000	PK	44.4	38.3	9.3	40.4	51.6	73.9	22.3	100	0	
Hori.	12010.000	PK	44.4	39.4	10.3	39.7	54.4	73.9	19.5	100	0	
Hori.	19216.000	PK	51.1	40.8	1.9	48.4	45.4	73.9	28.5	100	182	
Hori.	2390.000	AV	33.5	25.9	14.6	40.9	33.1	53.9	20.8	136	228	
Hori.	2505.996	AV	40.5	26.2	14.7	40.9	40.5	53.9	13.4	100	227	
Hori.	4804.000	AV	37.9	30.5	7.0	41.7	33.7	53.9	20.2	100	234	
Hori.	7206.000	AV	34.2	36.2	8.4	41.5	37.3	53.9	16.6	100	243	
Hori.	9608.000	AV	32.0	38.3	9.3	40.4	39.2	53.9	14.7	100	0	
Hori.	12010.000	AV	32.0	39.4	10.3	39.7	42.0	53.9	**11.9**	100	0	
Hori.	19216.000	AV	45.3	40.8	1.9	48.4	39.6	53.9	14.3	100	182	
Vert.	258.184	QP	23.3	17.5	9.6	31.8	18.6	46.0	27.4	100	4	
Vert.	740.241	QP	23.4	20.0	8.8	32.0	20.2	46.0	25.8	100	85	
Vert.	2390.000	PK	45.8	25.9	14.6	40.9	45.4	73.9	28.5	100	179	
Vert.	4804.000	PK	49.1	30.5	7.0	41.7	44.9	73.9	29.0	100	66	
Vert.	7206.000	PK	46.8	36.2	8.4	41.5	49.9	73.9	24.0	100	0	
Vert.	9608.000	PK	45.4	38.3	9.3	40.4	52.6	73.9	21.3	100	0	
Vert.	12010.000	PK	44.8	39.4	10.3	39.7	54.8	73.9	19.1	100	0	
Vert.	19216.000	PK	51.0	40.8	1.9	48.4	45.3	73.9	28.6	100	87	
Vert.	2390.000	AV	33.5	25.9	14.6	40.9	33.1	53.9	20.8	100	179	
Vert.	4804.000	AV	36.7	30.5	7.0	41.7	32.5	53.9	21.4	100	66	
Vert.	7206.000	AV	33.8	36.2	8.4	41.5	36.9	53.9	17.0	100	0	
Vert.	9608.000	AV	32.1	38.3	9.3	40.4	39.3	53.9	14.6	100	0	
Vert.	12010.000	AV	32.0	39.4	10.3	39.7	42.0	53.9	**11.9**	100	0	
Vert.	19216.000	AV	45.2	40.8	1.9	48.4	39.5	53.9	14.4	100	87	

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

20dBc Data Sheet **(RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	95.2	26.0	14.6	40.9	94.9	-	-	carrier
Hori.	2400.000	PK	46.9	26.0	14.6	40.9	46.6	74.9	28.3	
Hori.	2505.996	PK	45.2	26.2	14.7	40.9	45.2	74.9	29.7	
Hori.	2532.010	PK	43.8	26.2	14.7	40.9	43.8	74.9	31.1	
Hori.	2558.004	PK	47.9	26.3	14.7	40.9	48.0	74.9	26.9	
Hori.	2584.056	PK	42.2	26.4	14.8	40.9	42.5	74.9	32.4	
Vert.	2402.000	PK	97.8	26.0	14.6	40.9	97.5	-	-	carrier
Vert.	2400.000	PK	48.6	26.0	14.6	40.9	48.3	77.5	29.2	
Vert.	2479.954	PK	40.6	26.1	14.7	40.9	40.5	77.5	37.0	
Vert.	2506.028	PK	45.0	26.2	14.7	40.9	45.0	77.5	32.5	
Vert.	2532.021	PK	43.4	26.2	14.7	40.9	43.4	77.5	34.1	
Vert.	2558.014	PK	47.1	26.3	14.7	40.9	47.2	77.5	30.3	
Vert.	2583.980	PK	42.4	26.4	14.8	40.9	42.7	77.5	34.8	

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

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	September 29, 2014	September 30, 2014
Temperature / Humidity	26deg.C , 58%RH	24deg.C , 57%RH
Engineer	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.	512.741	QP	23.3	17.4	7.7	32.0	16.4	46.0	29.6	100	14	
Hori.	828.521	QP	23.4	20.8	9.2	31.8	21.6	46.0	24.4	150	355	
Hori.	4882.000	PK	50.4	30.8	7.0	41.6	46.6	73.9	27.3	107	73	
Hori.	7323.000	PK	47.3	36.3	8.3	41.5	50.4	73.9	23.5	137	255	
Hori.	9764.000	PK	45.7	38.3	9.5	40.4	53.1	73.9	20.8	100	0	
Hori.	12205.000	PK	44.8	39.3	10.4	39.7	54.8	73.9	19.1	100	0	
Hori.	19528.000	PK	51.2	40.8	2.0	48.1	45.9	73.9	28.0	109	231	
Hori.	4882.000	AV	38.8	30.8	7.0	41.6	35.0	53.9	18.9	107	73	
Hori.	7323.000	AV	34.6	36.3	8.3	41.5	37.7	53.9	16.2	137	255	
Hori.	9764.000	AV	32.3	38.3	9.5	40.4	39.7	53.9	14.2	100	0	
Hori.	12205.000	AV	31.9	39.3	10.4	39.7	41.9	53.9	**12.0**	100	0	
Hori.	19528.000	AV	45.5	40.8	2.0	48.1	40.2	53.9	13.7	109	231	
Vert.	258.184	QP	23.3	17.5	9.6	31.8	18.6	46.0	27.4	100	353	
Vert.	740.214	QP	23.4	20.0	8.8	32.0	20.2	46.0	25.8	100	12	
Vert.	4882.000	PK	48.7	30.8	7.0	41.6	44.9	73.9	29.0	100	341	
Vert.	7323.000	PK	47.2	36.3	8.3	41.5	50.3	73.9	23.6	100	0	
Vert.	9764.000	PK	44.7	38.3	9.5	40.4	52.1	73.9	21.8	100	0	
Vert.	12205.000	PK	44.2	39.3	10.4	39.7	54.2	73.9	19.7	100	0	
Vert.	19528.000	PK	50.4	40.8	2.0	48.1	45.1	73.9	28.8	103	69	
Vert.	4882.000	AV	36.4	30.8	7.0	41.6	32.6	53.9	21.3	100	341	
Vert.	7323.000	AV	34.4	36.3	8.3	41.5	37.5	53.9	16.4	100	0	
Vert.	9764.000	AV	32.2	38.3	9.5	40.4	39.6	53.9	14.3	100	0	
Vert.	12205.000	AV	31.8	39.3	10.4	39.7	41.8	53.9	12.1	100	0	
Vert.	19528.000	AV	44.7	40.8	2.0	48.1	39.4	53.9	14.5	103	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

20dBc Data Sheet **(RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2441.000	PK	95.9	26.0	14.6	40.9	95.6	-	-	carrier
Hori.	2544.966	PK	46.0	26.3	14.7	40.9	46.1	75.6	29.5	
Hori.	2570.986	PK	45.4	26.3	14.7	40.9	45.5	75.6	30.1	
Hori.	2596.971	PK	46.9	26.4	14.8	40.9	47.2	75.6	28.4	
Vert.	2441.000	PK	97.5	26.0	14.6	40.9	97.2	-	-	carrier
Vert.	2544.925	PK	43.4	26.3	14.7	40.9	43.5	77.2	33.7	
Vert.	2570.944	PK	42.2	26.3	14.7	40.9	42.3	77.2	34.9	
Vert.	2596.997	PK	45.2	26.4	14.8	40.9	45.5	77.2	31.7	

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

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.	No.1 Semi Anechoic Chamber
Date	September 29, 2014	September 30, 2014
Temperature / Humidity	26deg.C , 58%RH	24deg.C , 57%RH
Engineer	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.	512.741	QP	23.4	17.4	7.7	32.0	16.5	46.0	29.5	100	354	
Hori.	828.521	QP	23.3	20.8	9.2	31.8	21.5	46.0	24.5	100	341	
Hori.	2483.500	PK	52.7	26.1	14.7	40.9	52.6	73.9	21.3	125	218	
Hori.	4960.000	PK	48.4	31.1	7.1	41.5	45.1	73.9	28.8	100	93	
Hori.	7440.000	PK	46.9	36.4	8.4	41.4	50.3	73.9	23.6	100	241	
Hori.	9920.000	PK	45.4	38.3	9.6	40.4	52.9	73.9	21.0	100	0	
Hori.	12400.000	PK	43.8	39.2	10.5	39.7	53.8	73.9	20.1	100	0	
Hori.	19840.000	PK	49.6	40.7	2.1	47.9	44.5	73.9	29.4	100	190	
Hori.	2483.500	AV	40.3	26.1	14.7	40.9	40.2	53.9	13.7	125	218	
Hori.	4960.000	AV	36.8	31.1	7.1	41.5	33.5	53.9	20.4	100	93	
Hori.	7440.000	AV	34.3	36.4	8.4	41.4	37.7	53.9	16.2	100	241	
Hori.	9920.000	AV	32.7	38.3	9.6	40.4	40.2	53.9	13.7	100	0	
Hori.	12400.000	AV	31.2	39.2	10.5	39.7	41.2	53.9	**12.7**	100	0	
Hori.	19840.000	AV	42.6	40.7	2.1	47.9	37.5	53.9	16.4	100	190	
Vert.	258.184	QP	23.2	17.5	9.6	31.8	18.5	46.0	27.5	100	248	
Vert.	740.214	QP	23.3	20.0	8.8	32.0	20.1	46.0	25.9	100	291	
Vert.	2483.500	PK	53.5	26.1	14.7	40.9	53.4	73.9	20.5	100	181	
Vert.	4960.000	PK	48.3	31.1	7.1	41.5	45.0	73.9	28.9	100	62	
Vert.	7440.000	PK	46.7	36.4	8.4	41.4	50.1	73.9	23.8	100	0	
Vert.	9920.000	PK	45.6	38.3	9.6	40.4	53.1	73.9	20.8	100	0	
Vert.	12400.000	PK	44.2	39.2	10.5	39.7	54.2	73.9	19.7	100	0	
Vert.	19840.000	PK	48.2	40.7	2.1	47.9	43.1	73.9	30.8	100	98	
Vert.	2483.500	AV	40.5	26.1	14.7	40.9	40.4	53.9	13.5	100	181	
Vert.	4960.000	AV	35.3	31.1	7.1	41.5	32.0	53.9	21.9	100	62	
Vert.	7440.000	AV	34.3	36.4	8.4	41.4	37.7	53.9	16.2	100	0	
Vert.	9920.000	AV	32.7	38.3	9.6	40.4	40.2	53.9	13.7	100	0	
Vert.	12400.000	AV	31.2	39.2	10.5	39.7	41.2	53.9	**12.7**	100	0	
Vert.	19840.000	AV	40.8	40.7	2.1	47.9	35.7	53.9	18.2	100	98	

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

20dBc Data Sheet **(RBW 100kHz, VBW 300kHz)**

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2480.000	PK	94.5	26.1	14.7	40.9	94.4	-	-	carrier
Hori.	2583.952	PK	45.6	26.4	14.8	40.9	45.9	74.4	28.5	
Hori.	2610.015	PK	44.6	26.4	14.8	40.9	44.9	74.4	29.5	
Hori.	2635.957	PK	45.8	26.5	14.8	41.0	46.1	74.4	28.3	
Vert.	2480.000	PK	96.5	26.1	14.7	40.9	96.4	-	-	carrier
Vert.	2585.235	PK	44.4	26.4	14.8	40.9	44.7	76.4	31.7	
Vert.	2610.001	PK	43.9	26.4	14.8	40.9	44.2	76.4	32.2	
Vert.	2635.951	PK	46.0	26.5	14.8	41.0	46.3	76.4	30.1	

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

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Telephone : +81 463 50 6400
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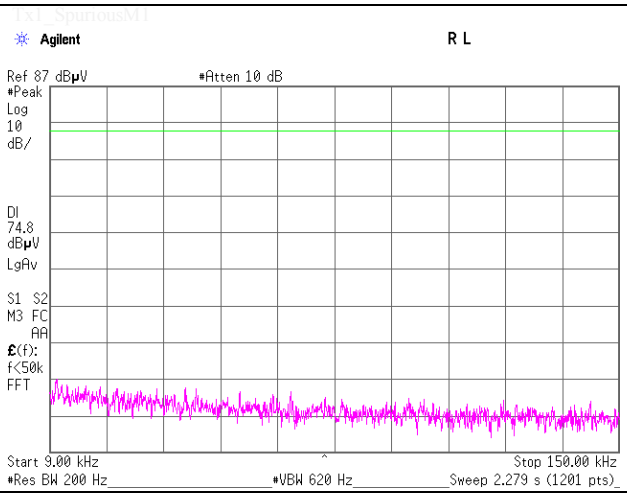
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	

Spurious emission (Conducted)

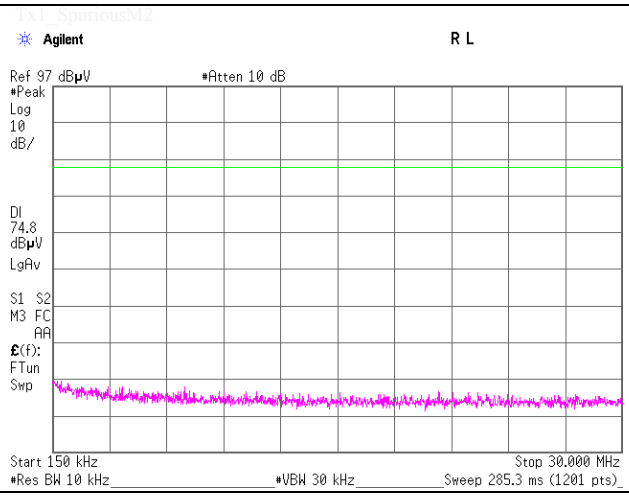
Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (below 30MHz)

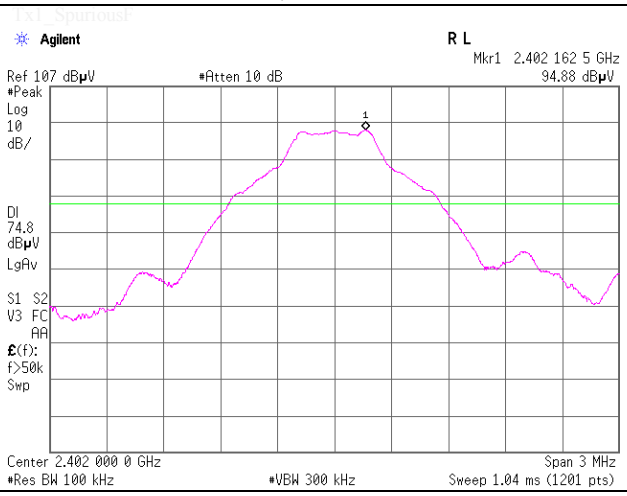
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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Temperature / Humidity	26deg.C , 44%RH	
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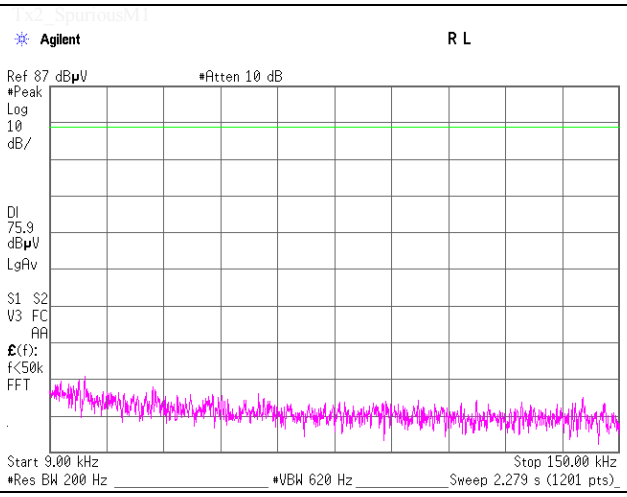
Spurious emission (Conducted)

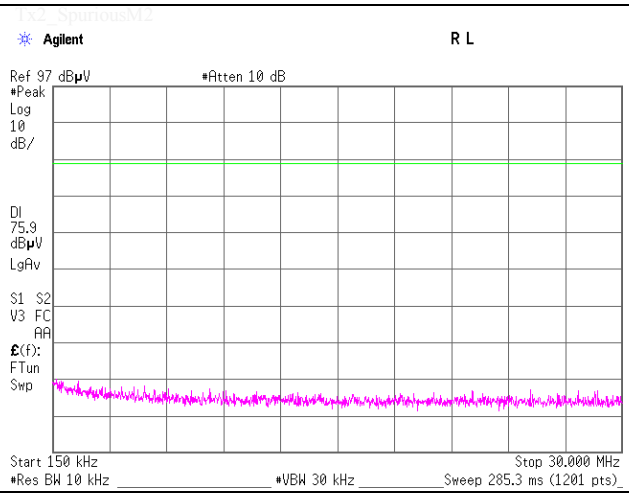
Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (below 30MHz)

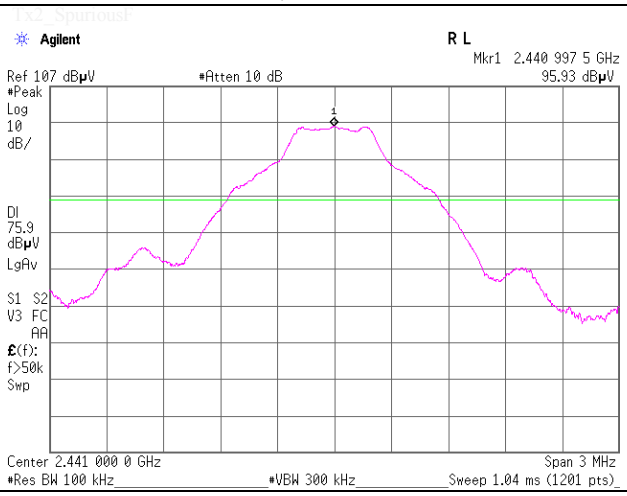
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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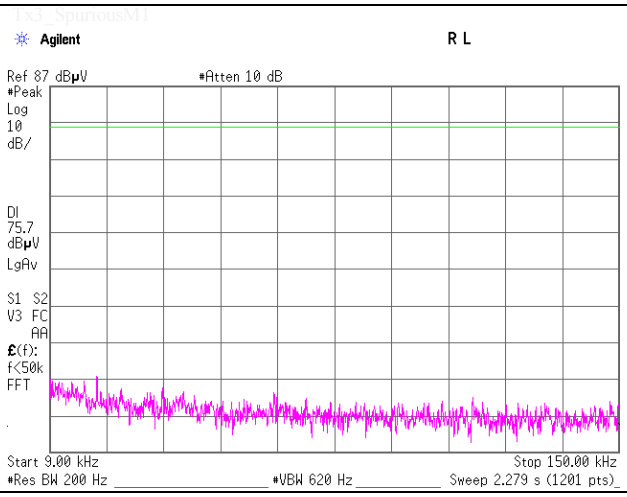
Engineer	Kenichi Adachi	

Spurious emission (Conducted)

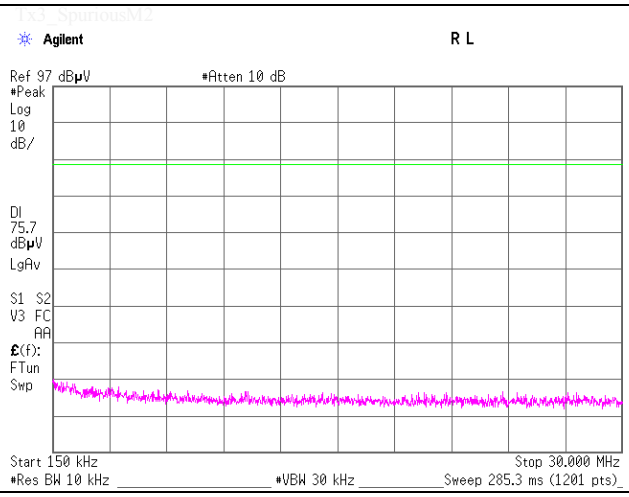
Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (below 30MHz)

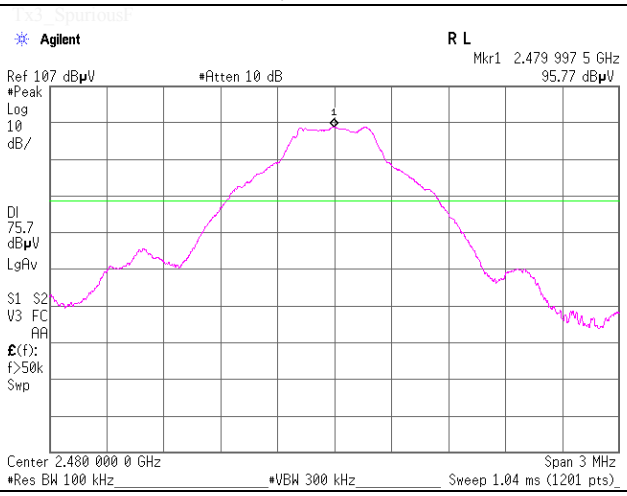
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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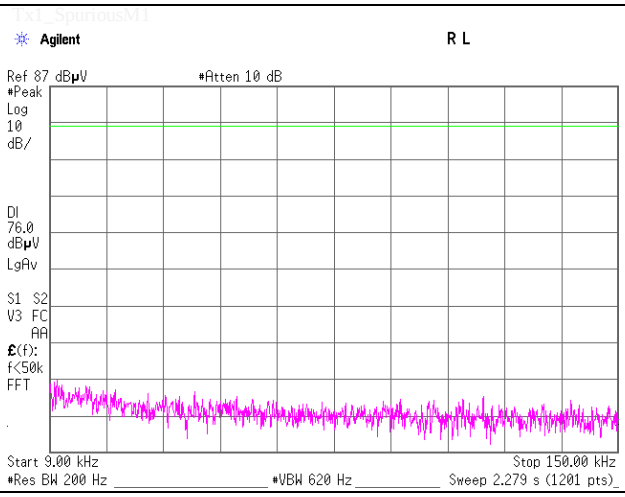
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	

Spurious emission (Conducted)

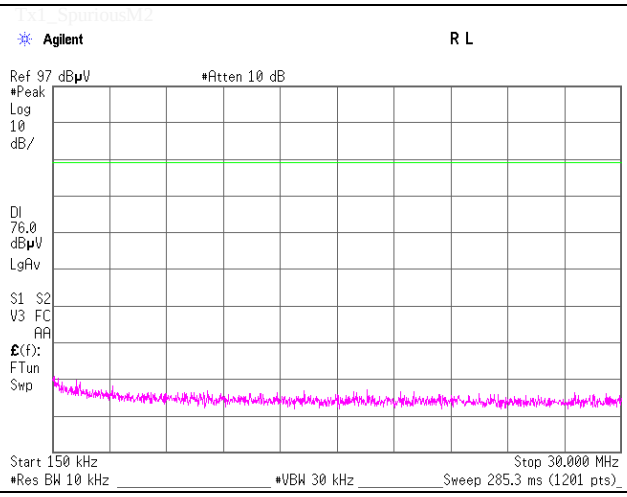
Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (below 30MHz)

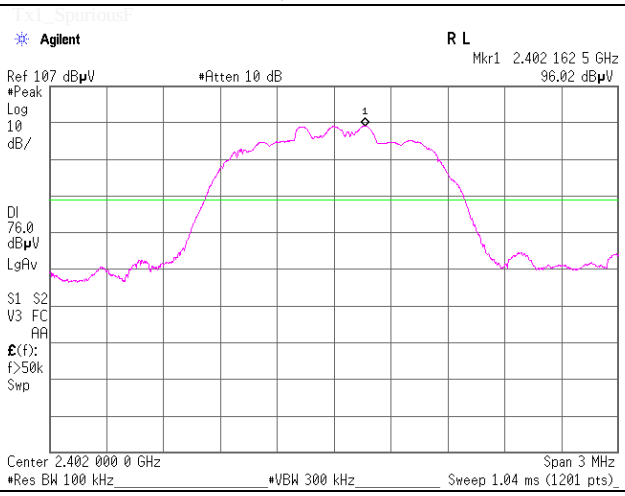
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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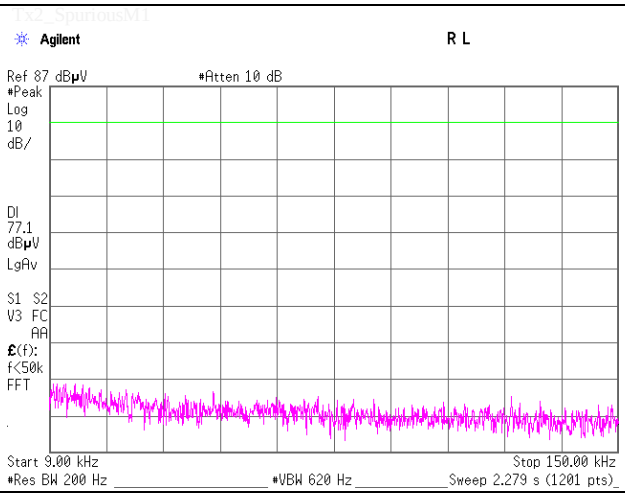
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	

Spurious emission (Conducted)

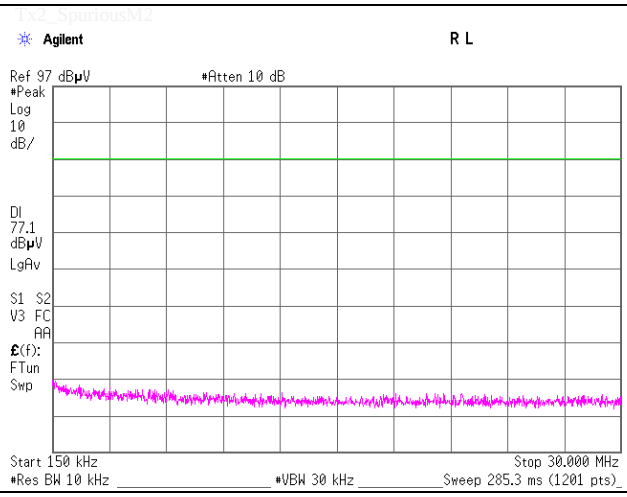
Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (below 30MHz)

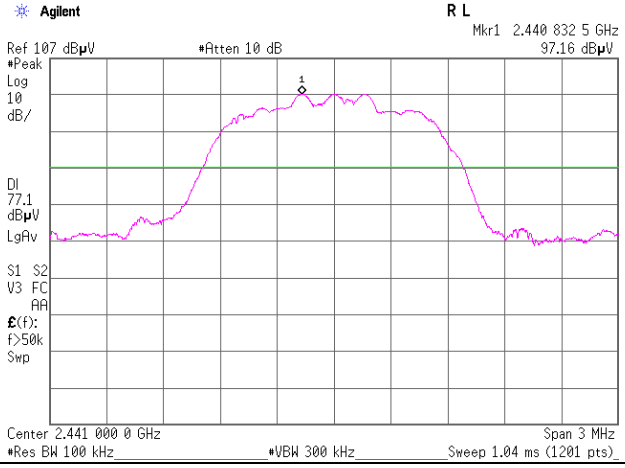
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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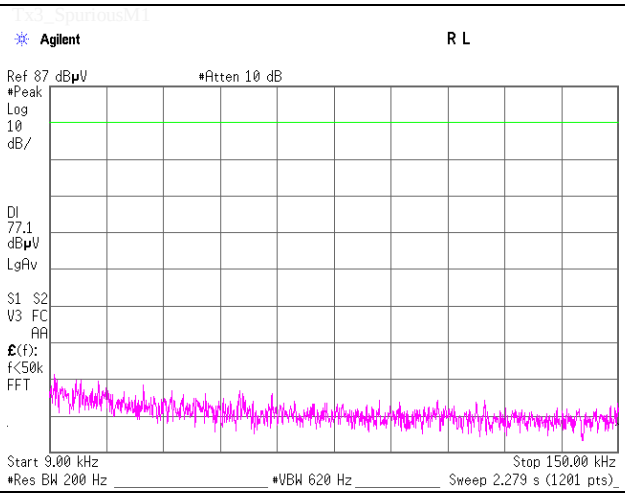
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	

Spurious emission (Conducted)

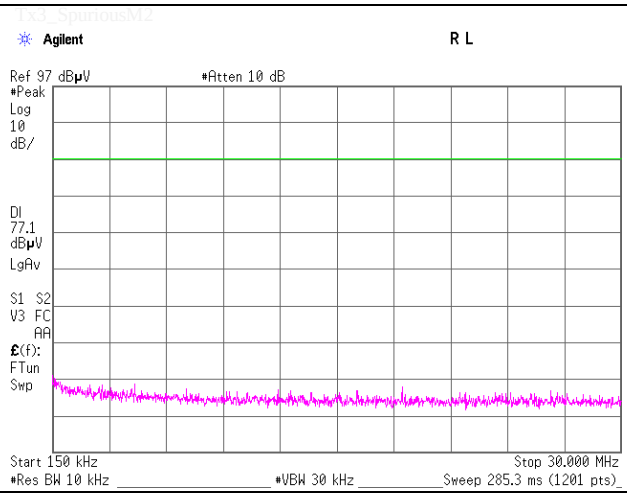
Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (below 30MHz)

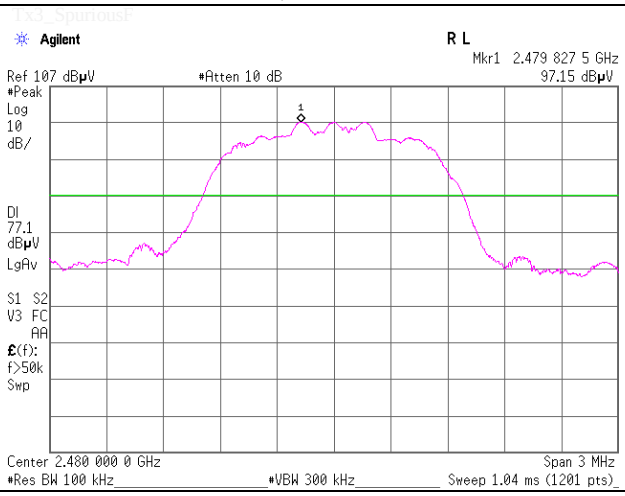
9kHz - 150kHz



150kHz - 30MHz



Carrier, 20dBc Limit



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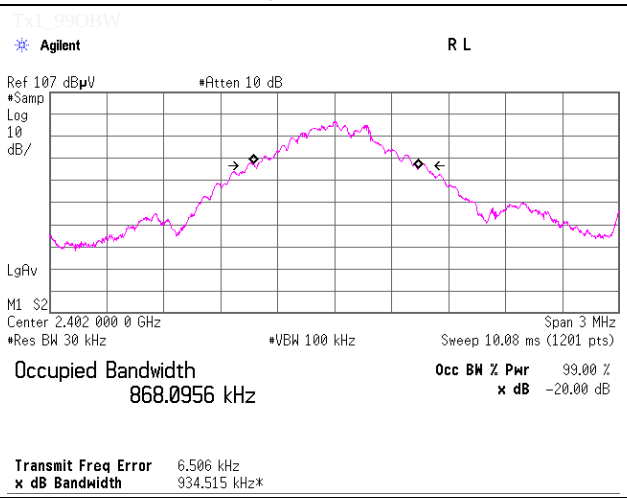
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	

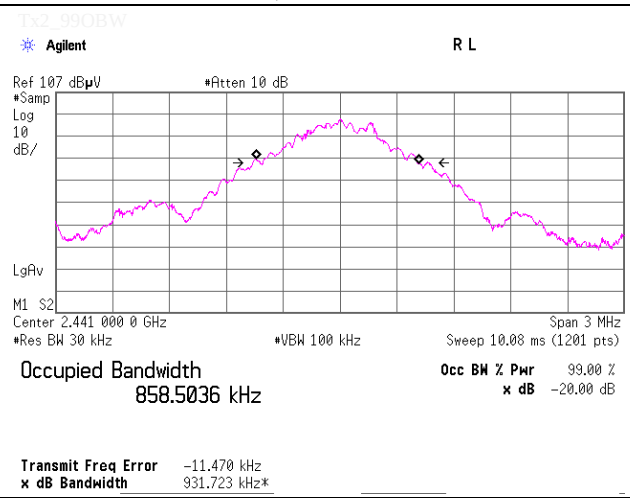
99% Occupied Bandwidth

Tx, Bluetooth, BDR, PRBS9

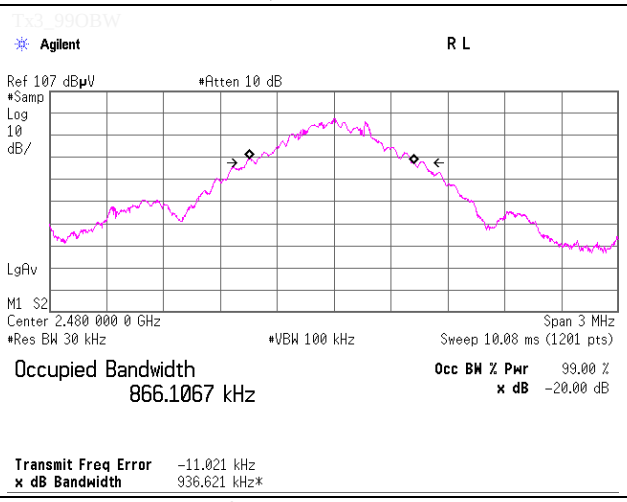
Tx, 2402MHz



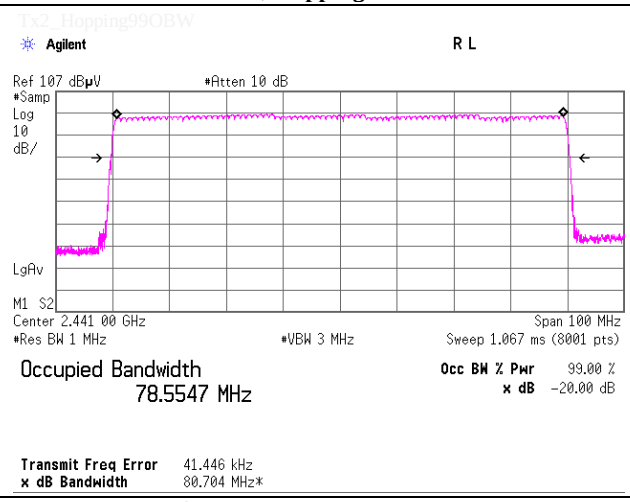
Tx, 2441MHz



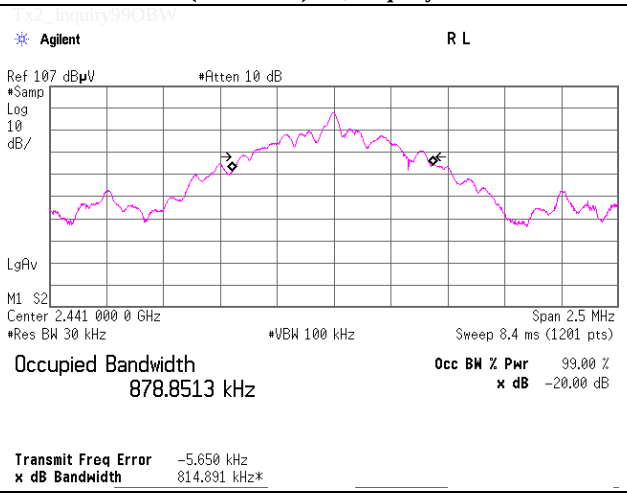
Tx, 2480MHz



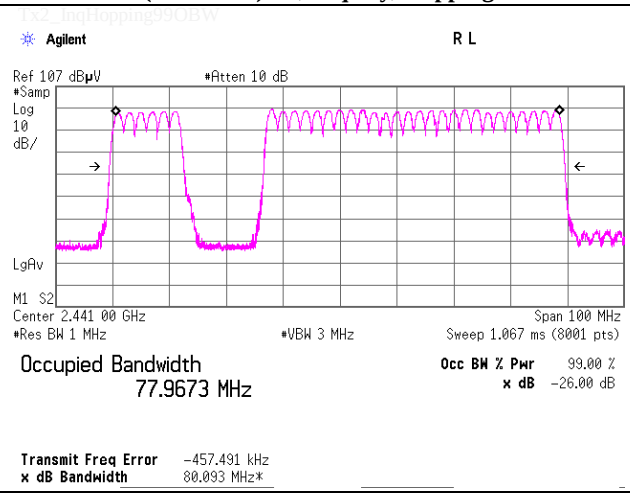
Tx, Hopping On



(Reference) Tx, Inquiry



(Reference) Tx, Inquiry, Hopping



UL Japan, Inc.
Shonan EMC Lab.
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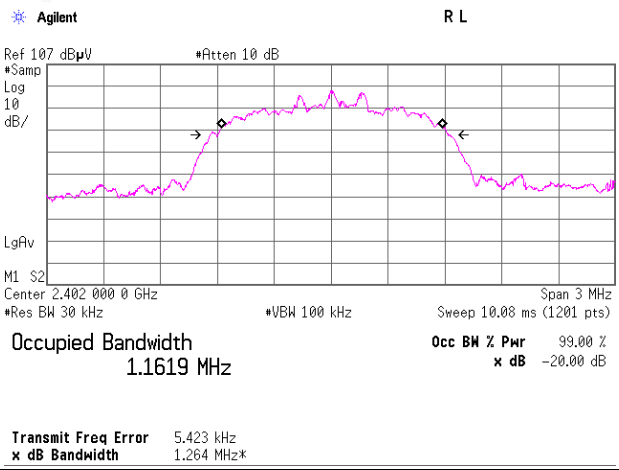
Facsimile : +81 463 50 6401

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	September 30, 2014	
Temperature / Humidity	26deg.C , 44%RH	
Engineer	Kenichi Adachi	

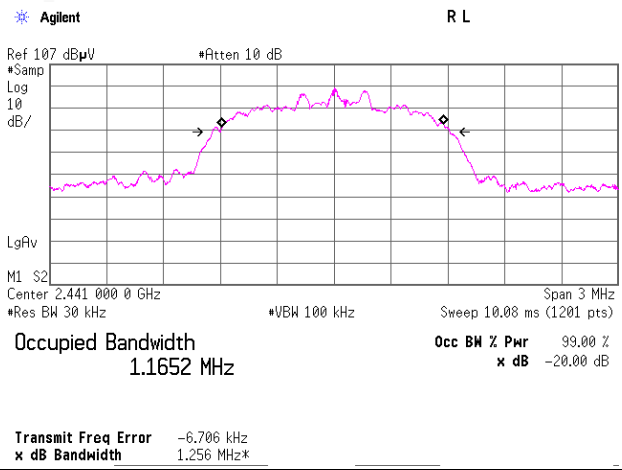
99% Occupied Bandwidth

Tx, Bluetooth, EDR, PRBS9

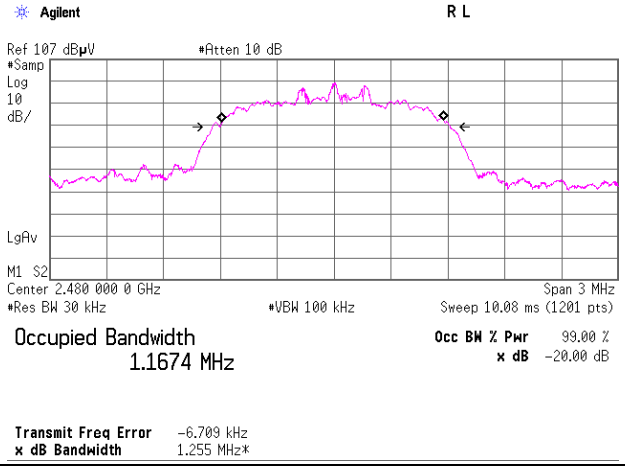
Tx, 2402MHz



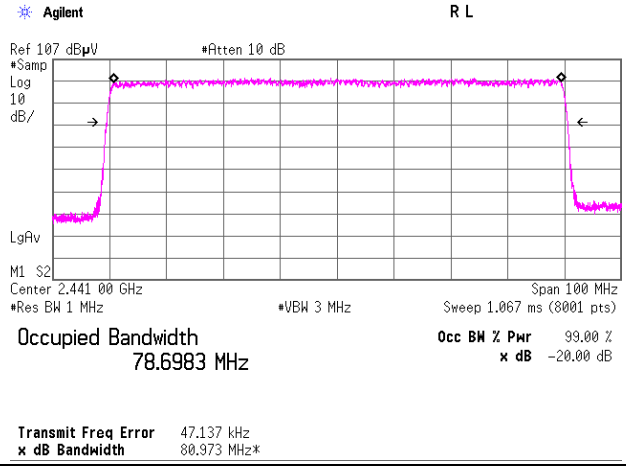
Tx, 2441MHz



Tx, 2480MHz



Tx, Hopping On



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APPENDIX 2
Test Instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SAF-01	Pre Amplifier	SONOMA	310N	290211	RE	2014/02/17 * 12
KAT6-04	Attenuator	INMET	18N-6dB	-	RE	2013/12/26 * 12
KAT3-09	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2014/08/27 * 12
SBA-01	Biconical Antenna	Schwarzbeck	BBA9106	91032664	RE	2013/10/13 * 12
SCC-A1/A3/A5/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2014/04/25 * 12
SCC-A2/A4/A6/A7/A8/A13/SRSE-01	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-269(RF Selector)	RE	2014/04/25 * 12
SLA-01	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0888	RE	2013/10/26 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2014/02/21 * 12
STR-01	Test Receiver	Rohde & Schwarz	ESU40	100093	RE	2013/11/20 * 12
SJM-13	Measure	ASKUL	-	-	RE	-
SAEC-01(NSA)	Semi-Anechoic Chamber	TDK	SAEC-01(NSA)	1	RE	2014/07/09 * 12
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE,RFI,MF)	-	RE	-
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2014/03/15 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2014/03/14 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2014/03/13 * 12
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2014/04/08 * 12
SPSS-01	Power Sensor	Anritsu	MA2444D	0738366	AT	2014/04/08 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2014/02/03 * 12
SAT10-09	Attenuator	Weinschel Corp.	54A-10	W5692	AT	2013/11/27 * 12
SCC-G13	Coaxial Cable	Suhner	SUCOFLEX 102	31599/2	AT	2014/03/14 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2014/03/07 * 12
SAF-04	Pre Amplifier	TOYO Corporation	TPA0118-36	1440489	RE	2014/03/14 * 12
SCC-G01	Coaxial Cable	Suhner	SUCOFLEX 104A	46497/4A	RE	2014/04/22 * 12
SCC-G21	Coaxial Cable	Suhner	SUCOFLEX 104	296169/4	RE	2014/05/15 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2014/08/12 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2013/11/22 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2014/04/22 * 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