RADIO TEST REPORT

Test Report No. : 32GE0051-SH-06-E

Applicant	:	**Panasonic Corporation**
Type of Equipment	:	**Bluetooth Module Assy**
Model No.	:	**YEAP01A466**
FCC ID	:	**ACJ932YEAP01A466**
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: June 26 to July 12, 2012

Tested by:

Makoto Hosaka
Engineer
Consumer Technology Division

Approved by :

Toyokazu Imamura
Leader
Consumer Technology Division

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

RTL02610

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REVISION HISTORY

Original Test Report No.: 32GE0051-SH-06-E

Revision	Test report No.	Date	Page revised	Contents
- (Original)	32GE0051-SH-06-E	July 9, 2014	-	-
1	32GE0051-SH-06-E	July 14, 2014	4	Correction of Supplied voltage regulation
			31, 33, 35, 37	Update of test data

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Contents

Page

SECTION 1: Customer information 4
SECTION 2: Equipment under test (E.U.T.) 4
SECTION 3: Test specification, procedures & results 6
SECTION 4: Operation of E.U.T. during testing 9
SECTION 5: Carrier frequency separation 11
SECTION 6: 20dB bandwidth & Occupied bandwidth (99%) 11
SECTION 7: Number of hopping frequency 11
SECTION 8: Dwell time 11
SECTION 9: Maximum peak output power 11
SECTION 10: Radiated emission 12
SECTION 11: Spurious emissions (Antenna port conducted) 13
Contents of APPENDIXES 14
APPENDIX 1: Data of radio tests 15
APPENDIX 2: Test instruments 55
APPENDIX 3: Photographs of test setup 56

SECTION 1: Customer information

Company Name	:	Panasonic Corporation
Brand Name	:	Panasonic
Address	:	4261 Ikonobe-cho, Tsuzuki-ku, Yokohama-shi, Kanagawa 224-8520 Japan
Telephone Number	:	+81-50-3689-6973
Facsimile Number	:	+81-45-931-0806
Contact Person	:	Ichiro Furuya

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

2.1 Identification of E.U.T.

Type of Equipment	:	Bluetooth Module Assy
Model No.	:	YEAP01A466
Serial No.	:	Refer to 4.2 in this report.
Rating	:	DC5.0V
Receipt Date of Sample	:	June 20, 2012
Country of Mass-production	:	Japan
Condition of EUT	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No modification by the test lab.

2.2 Product description

Model: YEAP01A466 (referred to as the EUT in this report) is a Bluetooth Module Assy.

Clock frequency(ies) in the system : 26MHz, 32.768kHz

Radio specification

Equipment type	:	Transceiver
Frequency of operation	:	2402-2480MHz
Bandwidth / Channel spacing	:	79MHz & 1MHz
Type of modulation	:	FHSS (GFSK, π/4-DQPSK, 8DPSK)
Antenna type	:	Monopole *1)
Antenna connector type	:	U.FL
Antenna gain with cable loss	:	-3.8dBi (N1KYYYY00019), -4.4dBi (N1KYYYY00030)
ITU code	:	F1D, G1D
Operation temperature range	:	-30 to +85 deg. C.

*1) N1KYYYY00019 or N1KYYYY00030 is installed to the module. The length of coaxial cable is different.

Antenna	Cable Loss (dB)
N1KYYYY00019	0.165
N1KYYYY00030	0.743

FCC 15.31 (e)
The Bluetooth module is constantly provided voltage (DC 3.3V and DC1.8V) through the regulator. Therefore, the equipment complies with the power supply regulation.

FCC 15.203
The EUT complies with the requirement, because the antenna has a unique coupling (U.FL).

Derived model and difference:

Model	Board
YEAP01A466	EGA
YEAP01A473	VGA
YEAP01B952	VGA

Difference of circuit does not affect to the RF part.

There is 2-type of bottom plate. The size is different. Bottom plate is located on the bottom of the EUT.

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart C: 2014, final revised on May 1, 2014 and effective June 2, 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 May 1, 2014 does not affect the test specification applied to the EUT.

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	10.9dB Freq.: 4804.000MHz Polarization: Horizontal Detection: Peak Mode: Tx 2402MHz, 3DH5	Complied
Note: UL Japan's Work Procedures No. 13-EM-W0420 and 13-EM-W0422 *1) The test is not applicable since the EUT does not have AC Mains.						

3.3 Addition to standard

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

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

3.4 Uncertainty

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

Item	Frequency range	No.1 SAC*1/SR*2 (±)	No.2 SAC/SR (±)	No.3 SAC/SR (±)
Radiated emission (Measurement distance: 3m)	9kHz-30MHz	3.7 dB	3.7 dB	3.6 dB
	30MHz-300MHz	4.9 dB	5.1 dB	5.0 dB
	300MHz-1GHz	5.0 dB	5.2 dB	5.0 dB
	1GHz-15GHz	4.8 dB	4.8 dB	4.9 dB
Radiated emission (Measurement distance: 1m)	15GHz-18GHz	5.6 dB	5.6 dB	5.6 dB
	18GHz-40GHz	4.8 dB	4.3 dB	4.4 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 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: (±) 1.7dB
Spurious emission (Conducted) measurement (1G-3GHz) uncertainty for this test was: (±) 2.3dB
Spurious emission (Conducted) measurement (3G-18GHz) uncertainty for this test was: (±) 3.0dB
Spurious emission (Conducted) measurement (18G-26.5GHz) uncertainty for this test was: (±) 2.9dB
Bandwidth measurement uncertainty for this test was: (±) 5.4%

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	-

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

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

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

Power settings	Fixed (The setting is not controlled by the software and it is equivalent to that of mass- produced items.)
Software	HCI Tester Ver 3.0.0.12

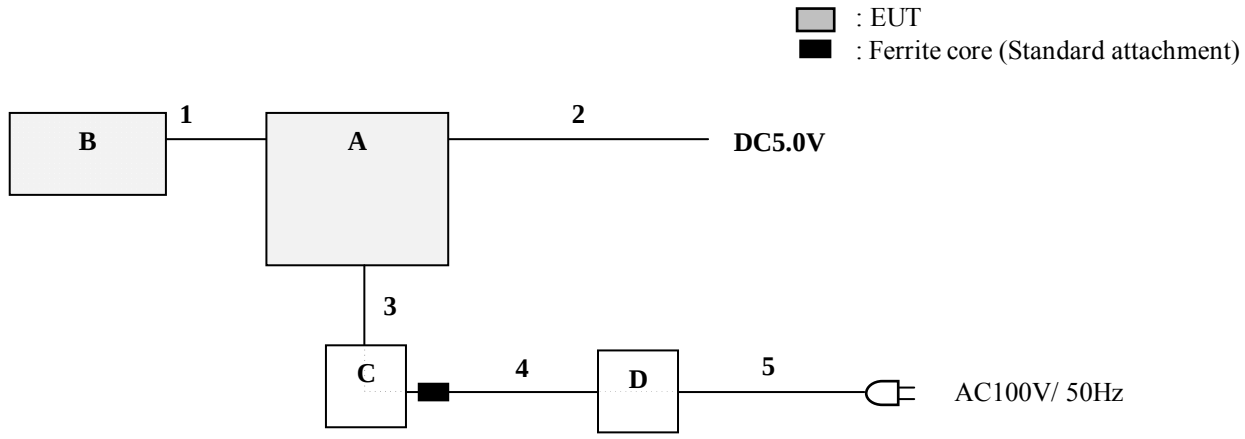
Antenna and bottom plate:

Test item	Antenna	Bottom plate
Radiated emission	N1KYYYY00019	Small
Other items	-	Small

The carrier level and noise levels were confirmed with each antenna and each bottom plate to see the case of maximum noise, and the test was made at the case that has the maximum noise.

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	Bluetooth Module Assy	YEAP01A466	17	Panasonic Corporation	EUT
B	Monopole Antenna	N1KYYYY00019	-	NISSEI ELECTRIC CO., LTD.	EUT
C	Test Jig	PCA-A-036702	48641	Panasonic Corporation	-
D	AC Adaptor	SA06-20S05R-V	R00100300177	AUTEC POWER SYSTEMS	-

List of cables used

No.	Cable name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna	0.03	Shielded	Shielded	-
2	DC	1.4	Unshielded	Unshielded	-
3	Signal	0.2	Unshielded	Unshielded	-
4	DC	1.2	Unshielded	Unshielded	-
5	AC	2.0	Unshielded	Unshielded	-

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: Radiated emission

10.1 Operating environment

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

10.2 Test configuration

EUT was placed on a urethane 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.

10.3 Test conditions

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

10.4 Test procedure

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

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

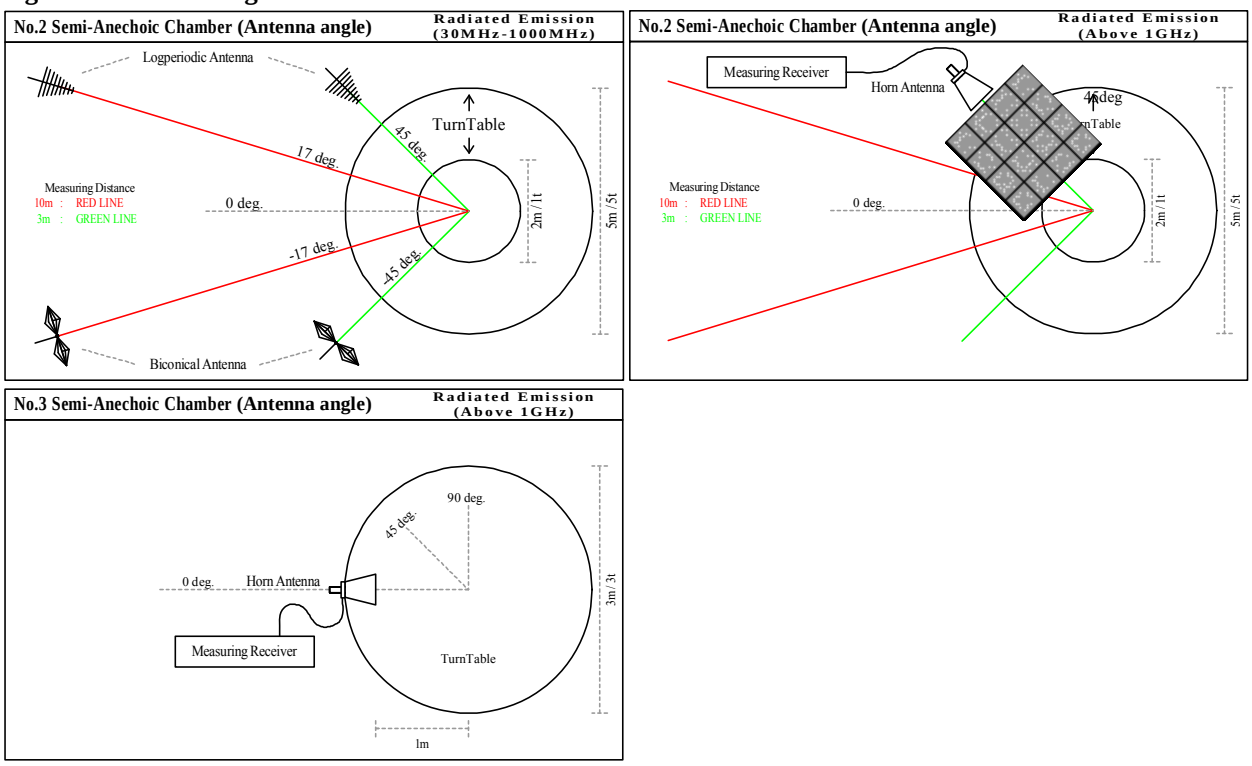
* When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.
Although 00-705 accepts VBW=10Hz for AV measurements, confirmed that superfluous smoothing was not performed.

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.
Worst position:

Frequency range		Below 1GHz	Above 1GHz	Carrier
EUT	Horizontal	Y	Z	X
(Module & Antenna)	Vertical	X	Y	Z

* The definition of the axis was listed in a 'Pre-check of the worst position' in APPENDIX 3.

Figure 1. Antenna angle



10.5 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.

10.6 Results

Summary of the test results : Pass *No noise was detected above the 5th order harmonics.
Refer to APPENDIX 1

SECTION 11: 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

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 worst position
Antenna type

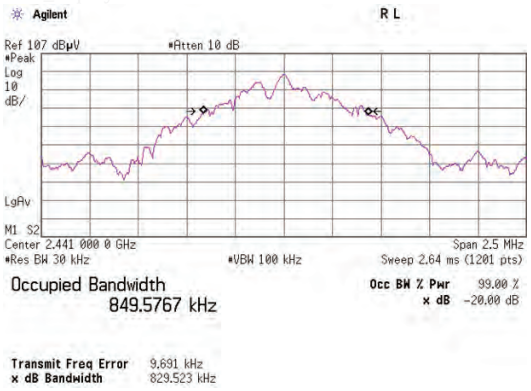
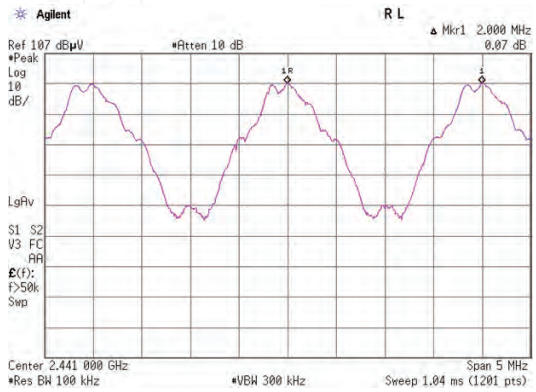
APPENDIX 1: Data of Radio tests

20dB Bandwidth and Carrier Frequency Separation

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June 26, 2012	
Temperature / Humidity	25 deg.C , 51 %RH	
Engineer	Makoto Hosaka	
Mode	Tx, Bluetooth, BDR, PRBS9	

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
DH5	2402.0	0.940	1.000	>= 0.627
DH5	2441.0	0.946	1.000	>= 0.631
DH5	2480.0	0.960	1.000	>= 0.640
Inquiry	2441.0	0.830	2.000	>= 0.553

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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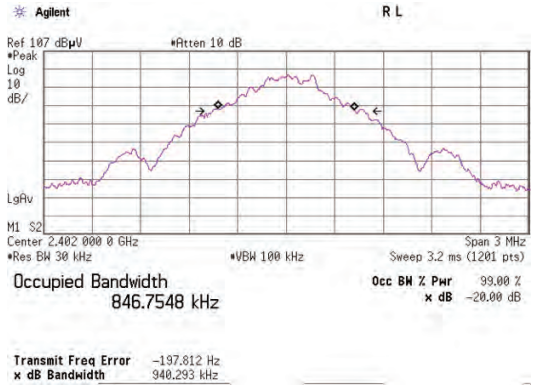
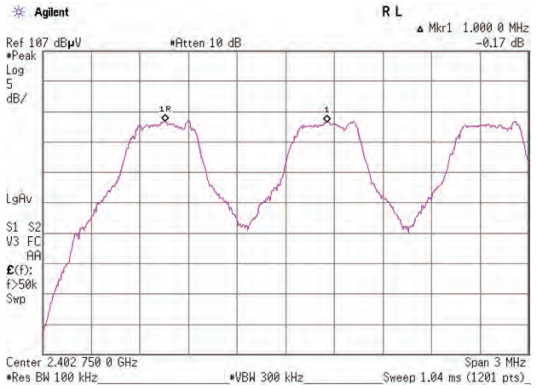
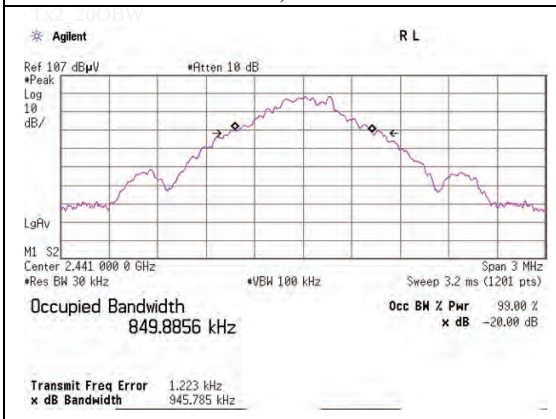
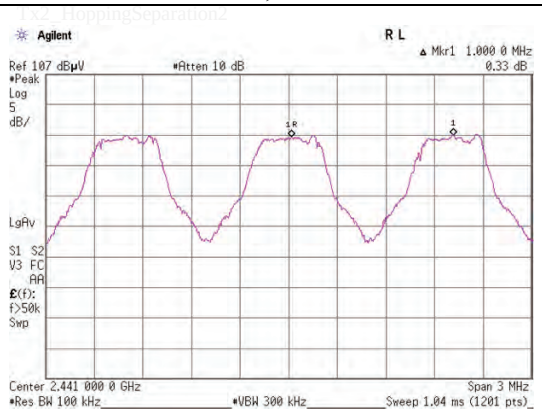
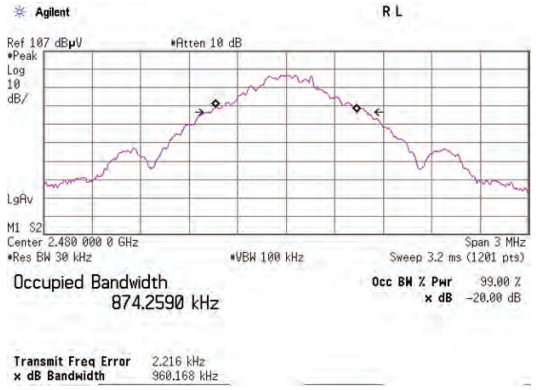
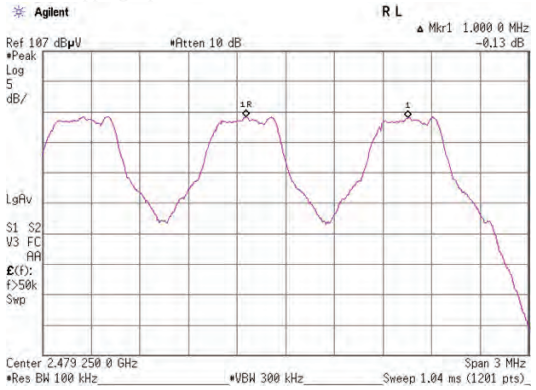
20dB Bandwidth and Carrier Frequency Separation

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	June 26, 2012	
Temperature / Humidity	25 deg.C , 51 %RH	
Engineer	Makoto Hosaka	
Mode	Tx, Bluetooth, EDR, PRBS9	

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency Separation [MHz]
3-DH5	2402.0	1.315	1.000	>= 0.876
3-DH5	2441.0	1.311	1.000	>= 0.874
3-DH5	2480.0	1.315	1.000	>= 0.877

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

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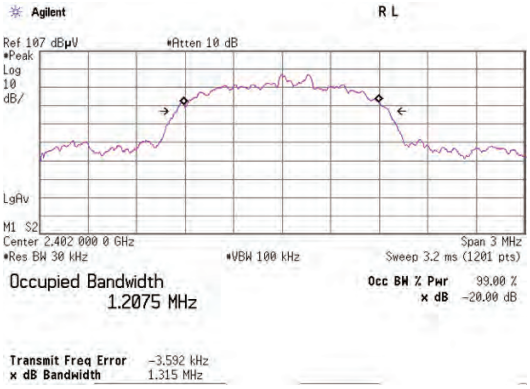
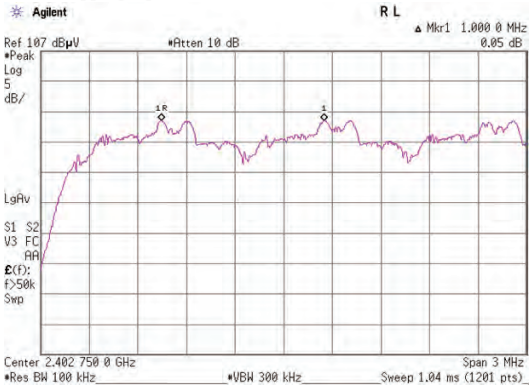
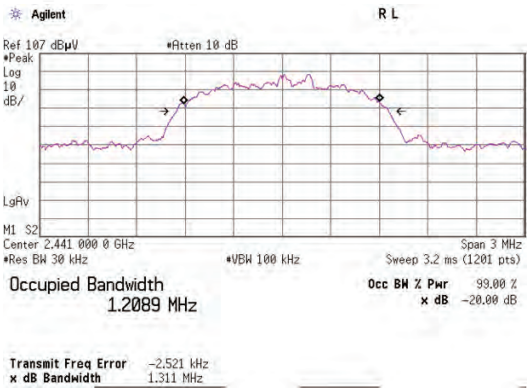
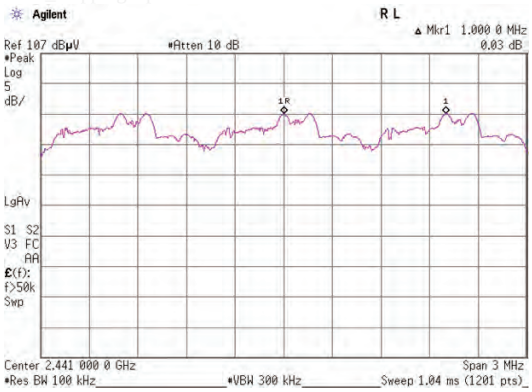
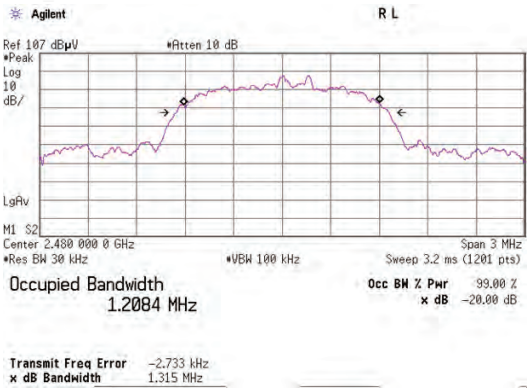
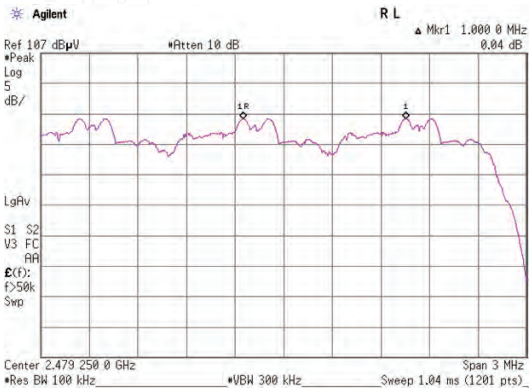
20dB Bandwidth and Carrier Frequency Separation

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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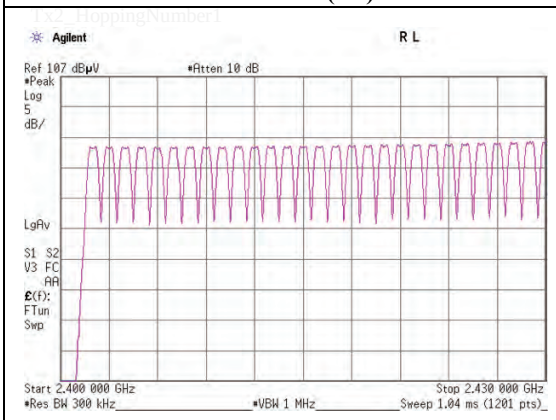
Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June 26, 2012	
Temperature / Humidity	25 deg.C , 51 %RH	
Engineer	Makoto Hosaka	
Mode	Tx, Bluetooth, BDR, PRBS9	

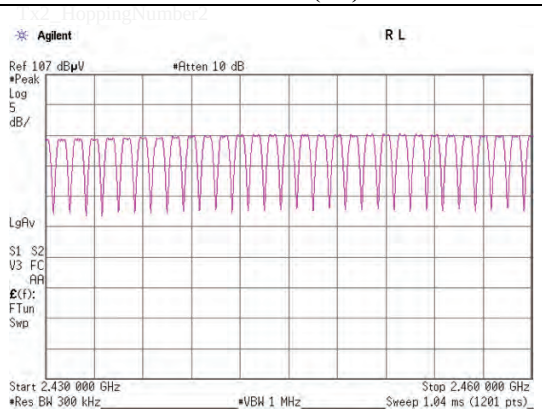
Mode	Number of Channel [times]	Limit [times]
DH5	79	>= 15

Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification 3.0.

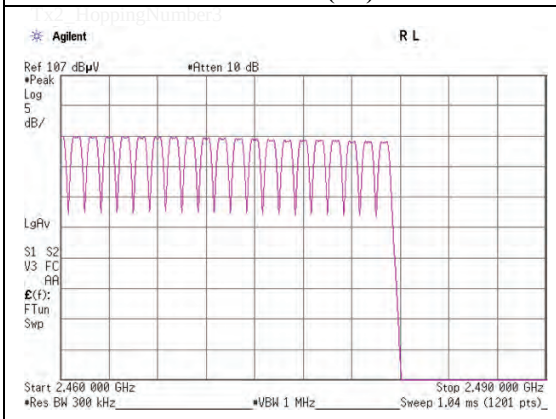
DH5 (1/3)



DH5 (2/3)



DH5 (3/3)



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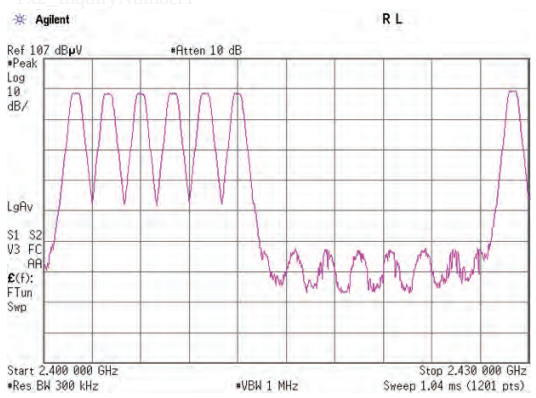
Number of Hopping Frequency

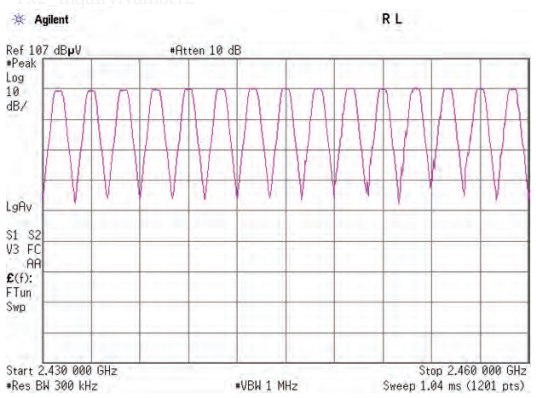
Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June 28, 2012	
Temperature / Humidity	26 deg.C , 46 %RH	
Engineer	Makoto Hosaka	
Mode	Tx, Bluetooth, Inquiry	

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

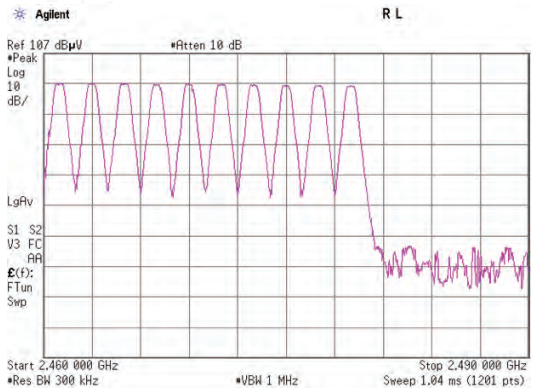
Inquiry (1/3)



Inquiry (2/3)



Inquiry (3/3)



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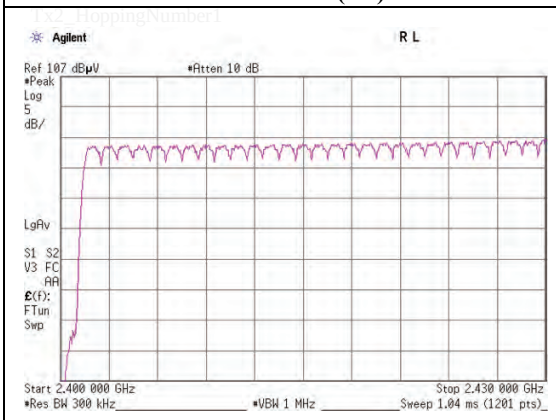
Number of Hopping Frequency

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June 26, 2012	
Temperature / Humidity	25 deg.C , 51 %RH	
Engineer	Makoto Hosaka	
Mode	Tx, Bluetooth, EDR, PRBS9	

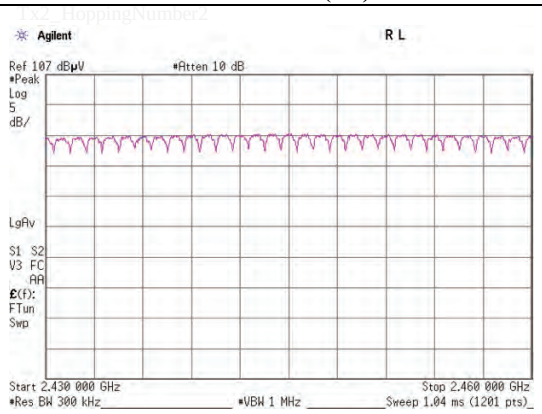
Mode	Number of Channel [times]	Limit [times]
3-DH5	79	>= 15

Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification 3.0.

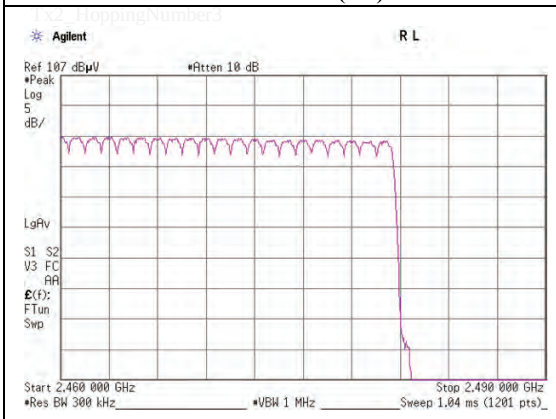
3-DH5 (1/3)



3-DH5 (2/3)



3-DH5 (3/3)



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Dwell Time

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June 28, 2012	
Temperature / Humidity	26 deg.C , 46 %RH	
Engineer	Makoto Hosaka	
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	49.0 / 5.0 sec. x 31.6 sec. = 310 times	0.387	120	400
DH3	26.6 / 5.0 sec. x 31.6 sec. = 169 times	1.643	278	400
DH5	18.2 / 5.0 sec. x 31.6 sec. = 116 times	2.891	335	400
Inquiry	100.0 / 1.0 sec. x 12.8 sec. = 1280 times	0.093	119	400

Sample Calculation

Result = Number of transmission x Length of transmition time

*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	50	48	50	47	49.0
DH3	25	26	29	24	29	26.6
DH5	18	20	16	21	16	18.2
Inquiry	100	-	-	-	-	100.0

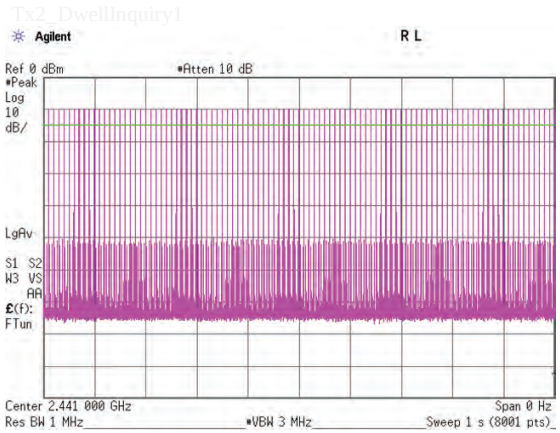
Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

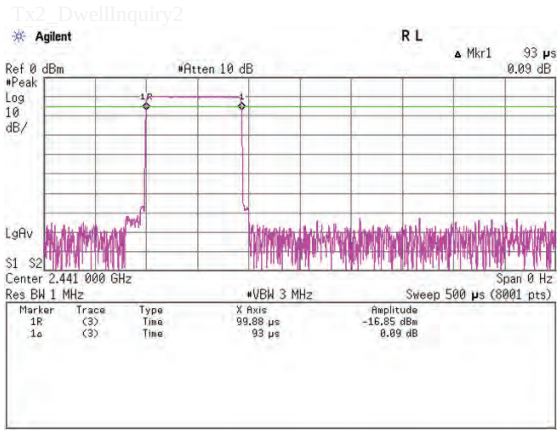
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4s, where N is the number of channels being used in the hopping sequence (20 ≤ N ≤ 79), is always less than 0.4s regardless of packet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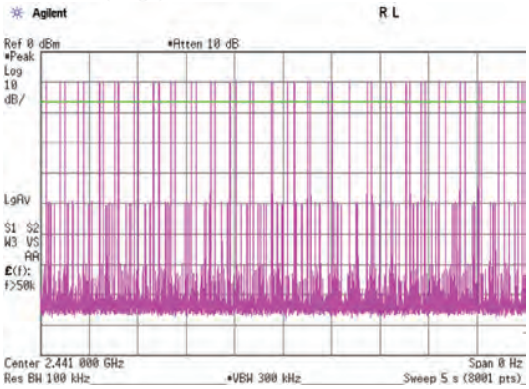
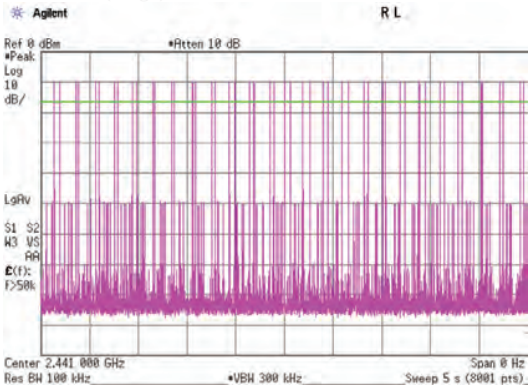
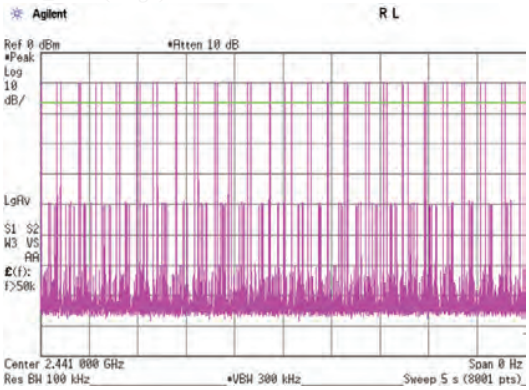
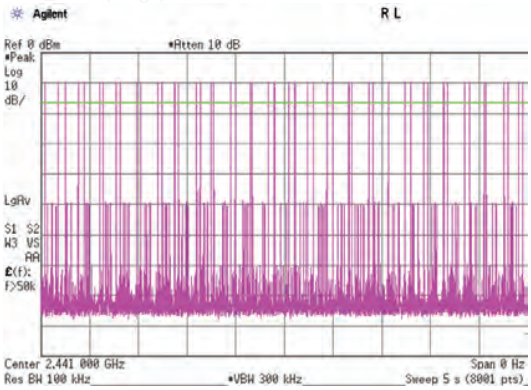
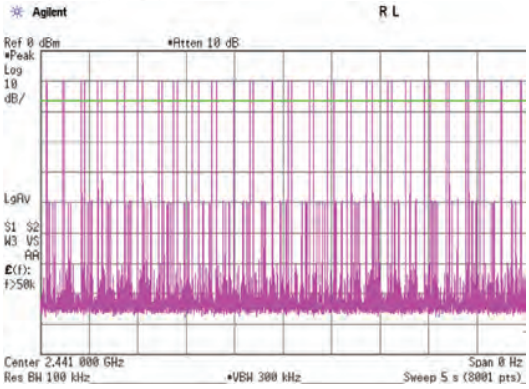
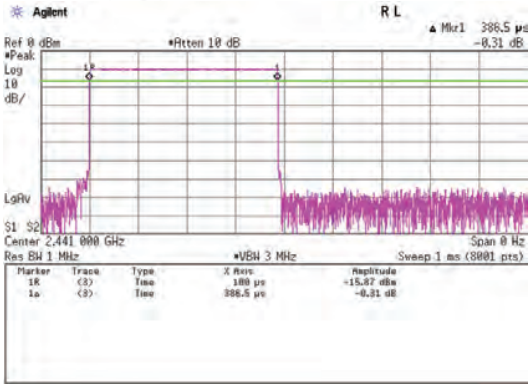
Dwell time

Tx, Bluetooth, BDR, PRBS9

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

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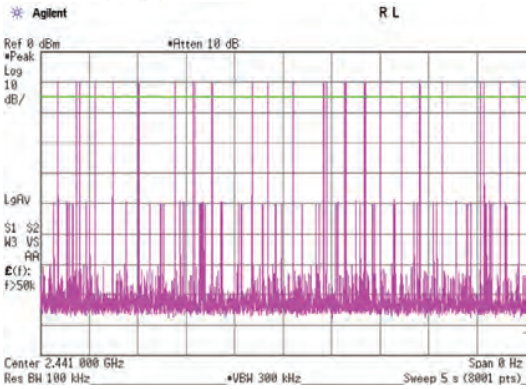
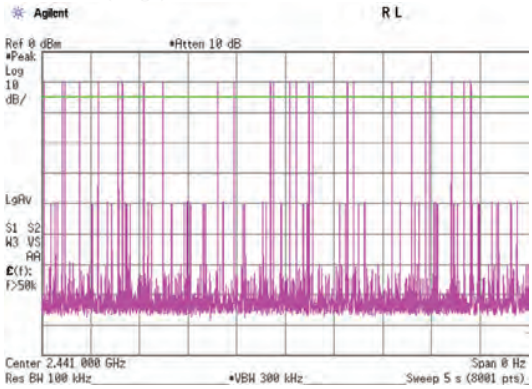
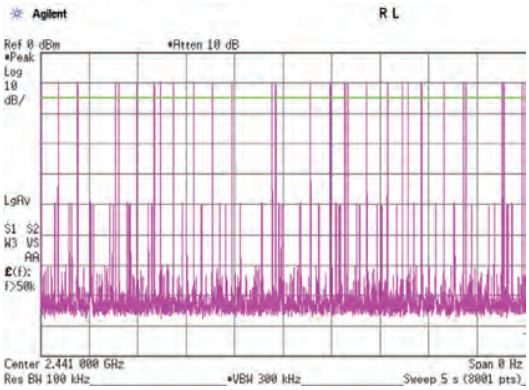
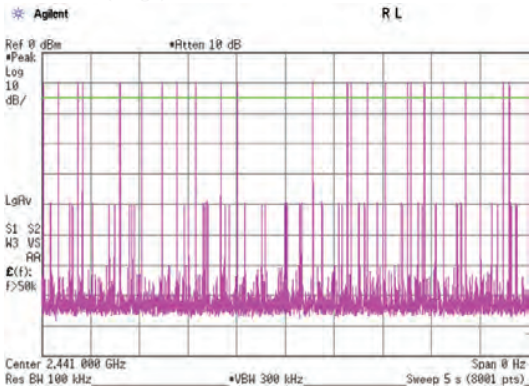
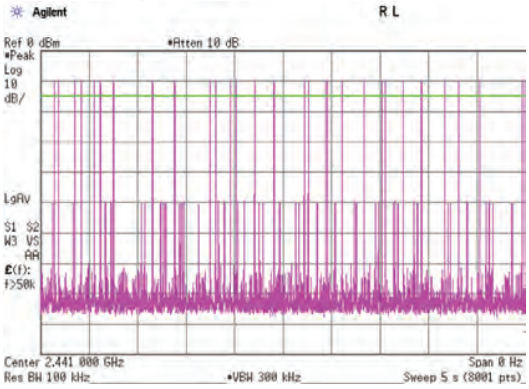
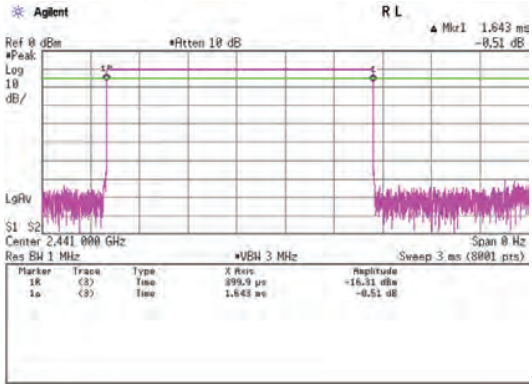
Dwell time

Tx, Bluetooth, BDR, PRBS9

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

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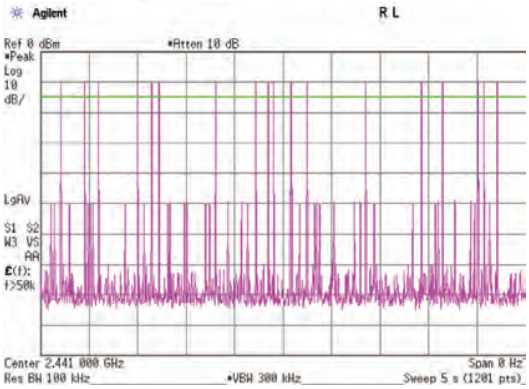
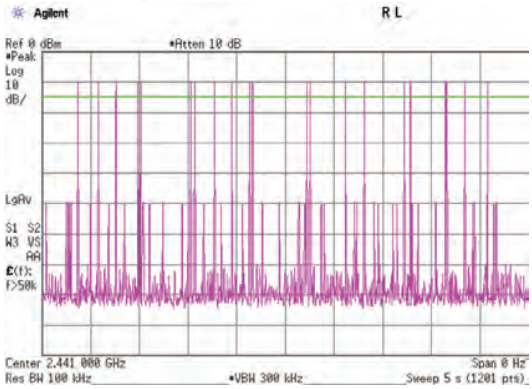
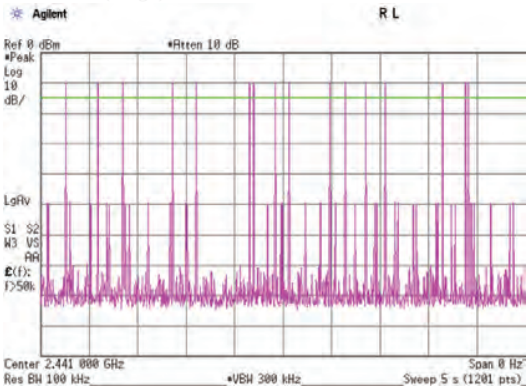
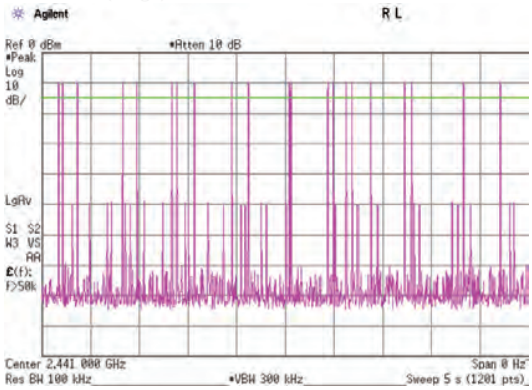
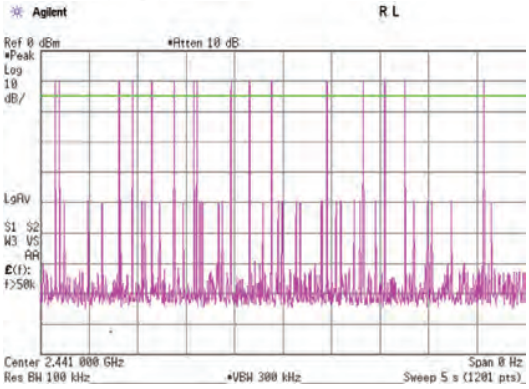
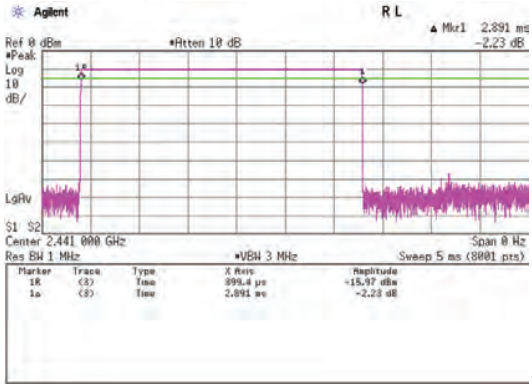
Dwell time

Tx, Bluetooth, BDR, PRBS9

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

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Dwell Time

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June 28, 2012	
Temperature / Humidity	26 deg.C , 46 %RH	
Engineer	Makoto Hosaka	
Mode	Tx, Bluetooth, EDR, PRBS9	

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4)	Length of transmission time [msec]	Result [msec]	Limit [msec]
3-DH1	49.4 / 5.0 sec. x 31.6 sec. = 313 times	0.388	121	400
3-DH3	26.2 / 5.0 sec. x 31.6 sec. = 166 times	1.636	272	400
3-DH5	19.4 / 5.0 sec. x 31.6 sec. = 123 times	2.884	355	400

Sample Calculation

Result = Number of transmission x Length of transmition time

*Average data of 5 tests.(except Inquiry)

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
3-DH1	50	48	50	48	51	49.4
3-DH3	25	27	27	27	25	26.2
3-DH5	18	20	22	15	22	19.4

Sample Calculation

Average= Summation(Sampling 1 to 5) / 5

This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N 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 (3-DH1, 3-DH3 or 3-DH5). This is confirmed in the test report for N=79.

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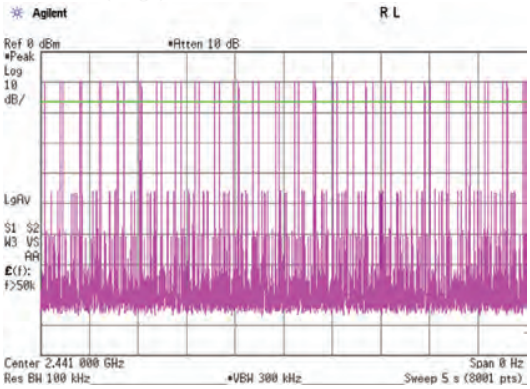
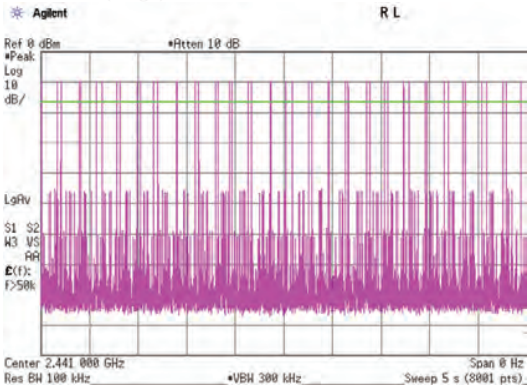
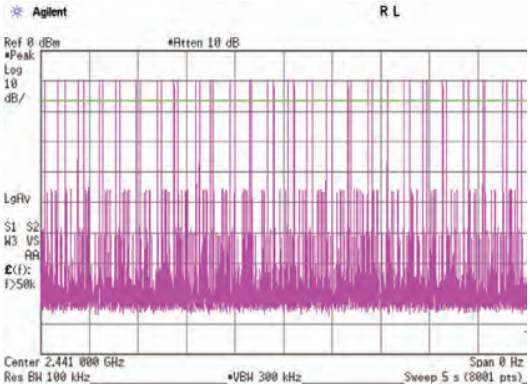
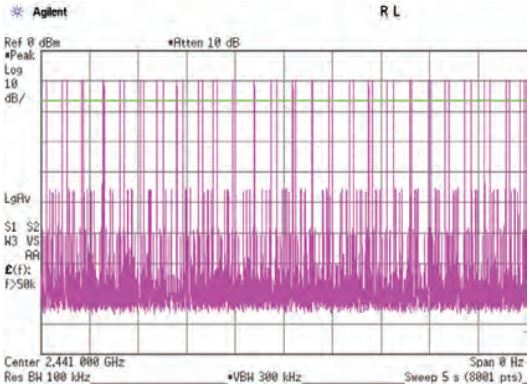
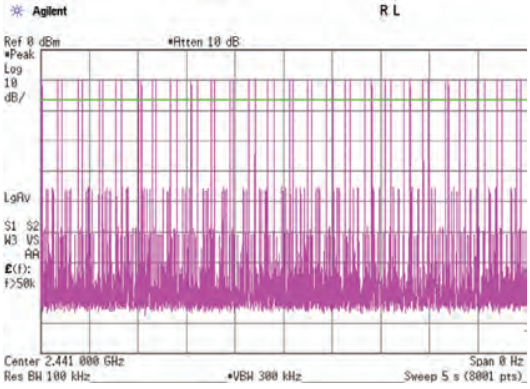
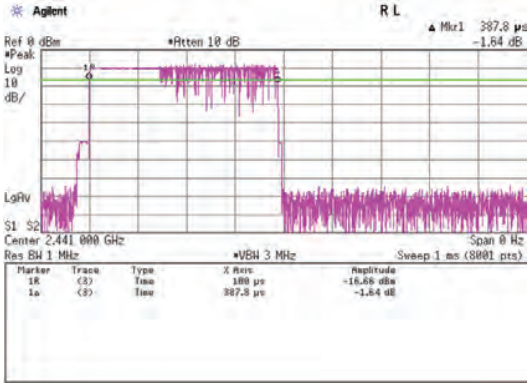
Dwell time

Tx, Bluetooth, EDR, PRBS9

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

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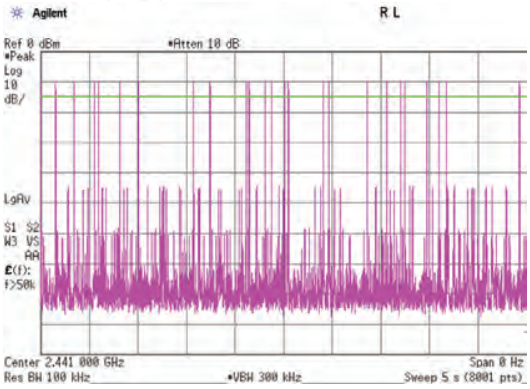
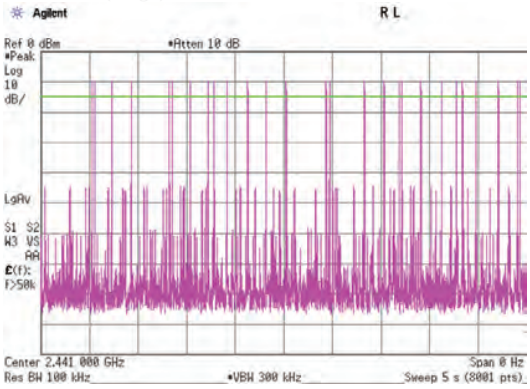
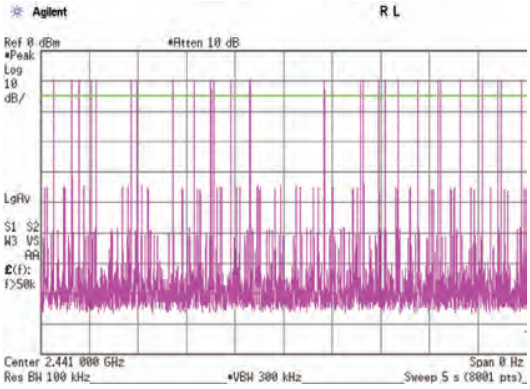
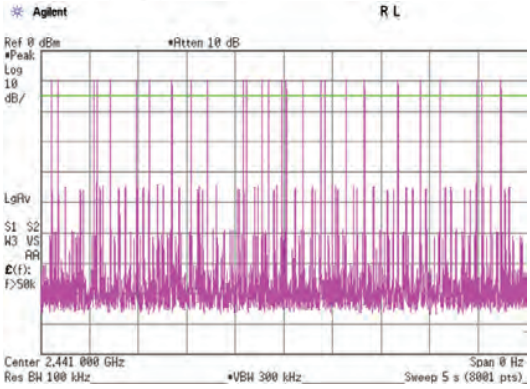
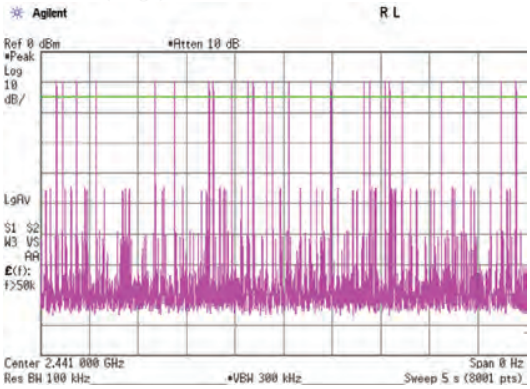
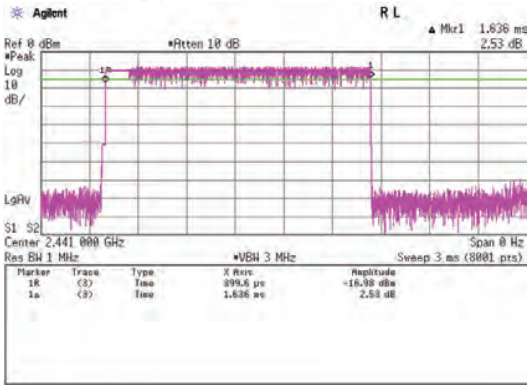
Dwell time

Tx, Bluetooth, EDR, PRBS9

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

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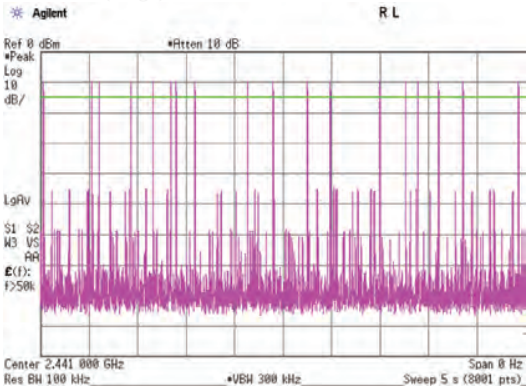
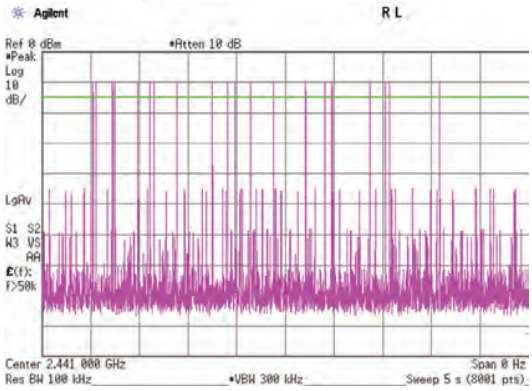
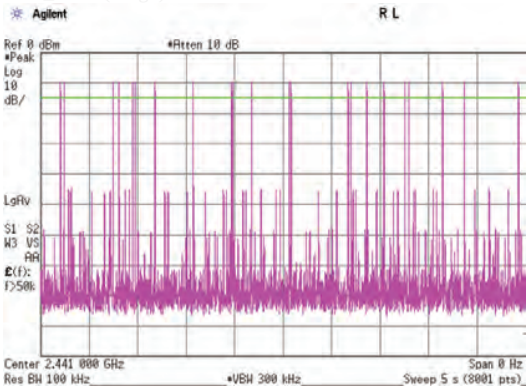
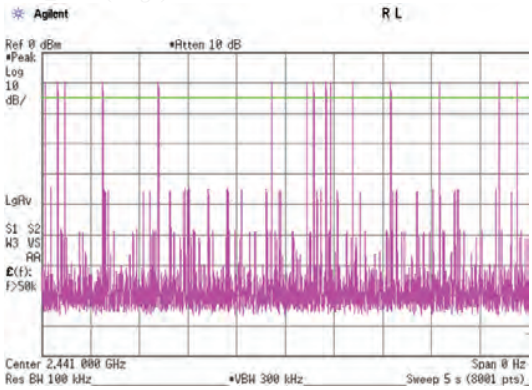
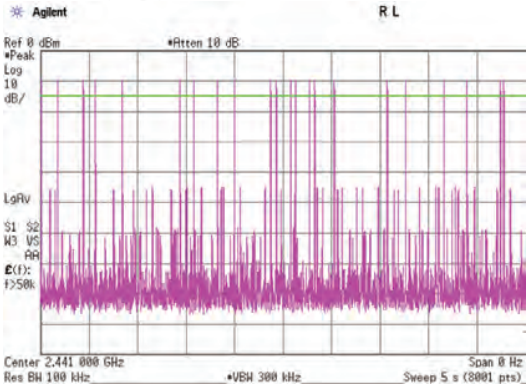
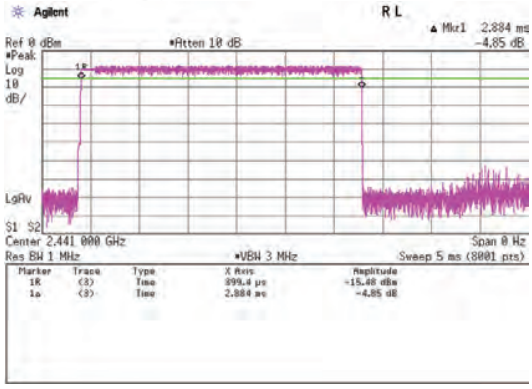
Dwell time

Tx, Bluetooth, EDR, PRBS9

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

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Peak Output Power (Conducted)

Test place	UL Japan, Inc. Shonan EMC Lab.	No.5 Shielded Room
Date	June 26, 2012	
Temperature / Humidity	25 deg.C , 51 %RH	
Engineer	Makoto Hosaka	
Mode	Tx, Bluetooth	

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

	Freq.	P/M (Peak) Reading	Cable Loss	Atten. Loss	Result		Limit		Margin
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]
DH5	2402.0	-11.20	1.51	9.97	0.28	1.07	20.97	125	20.69
DH5	2441.0	-9.76	1.48	9.97	1.69	1.48	20.97	125	19.28
DH5	2480.0	-10.67	1.49	9.97	0.79	1.20	20.97	125	20.18
2-DH5	2402.0	-9.52	1.51	9.97	1.96	1.57	20.97	125	19.01
2-DH5	2441.0	-7.83	1.48	9.97	3.62	2.30	20.97	125	17.35
2-DH5	2480.0	-8.96	1.49	9.97	2.50	1.78	20.97	125	18.47
3-DH5	2402.0	-9.21	1.51	9.97	2.27	1.69	20.97	125	18.70
3-DH5	2441.0	-7.49	1.48	9.97	3.96	2.49	20.97	125	17.01
3-DH5	2480.0	-8.59	1.49	9.97	2.87	1.94	20.97	125	18.10

Sample Calculation:
Result = Reading + Cable Loss + Atten. Loss

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.		No.2 and 3 Semi Anechoic Chamber
Date	July 3, 2012	July 11, 2012	July 12, 2012
Temperature / Humidity	25 deg.C , 62 %RH	23 deg.C , 60 %RH	24 deg.C , 64 %RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
Mode	Tx, 2402 MHz		
	Tx, Bluetooth, BDR, PRBS9		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]		Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	182.000	QP	28.6	16.0	9.0	31.8		21.8	43.5	21.7	178	4	
Hori.	2390.000	PK	43.9	27.2	14.1	38.2		47.0	73.9	26.9	100	81	
Hori.	4804.000	PK	61.5	31.2	6.5	37.0		62.2	73.9	11.7	126	69	
Hori.	7206.000	PK	52.6	36.5	8.0	39.0		58.1	73.9	15.8	154	289	
Hori.	9608.000	PK	45.0	38.3	9.1	37.2		55.2	73.9	18.7	100	332	
Hori.	12010.000	PK	46.0	39.3	10.5	37.9		57.9	73.9	16.0	100	0	
Hori.	2390.000	AV	31.5	27.2	14.1	38.2		34.6	53.9	19.3	100	81	(AV) VBW:10Hz
Vert.	56.540	QP	36.1	8.9	7.2	31.9		20.3	40.0	19.7	100	112	
Vert.	75.851	QP	32.7	6.4	7.8	31.9		15.0	40.0	25.0	100	77	
Vert.	78.000	QP	37.5	6.4	8.0	31.9		20.0	40.0	20.0	100	72	
Vert.	106.498	QP	26.9	11.1	8.0	31.9		14.1	43.5	29.4	100	84	
Vert.	129.999	QP	32.6	13.7	8.3	31.9		22.7	43.5	20.8	100	222	
Vert.	182.000	QP	23.6	16.0	9.0	31.8		16.8	43.5	26.7	100	174	
Vert.	2390.000	PK	43.7	27.2	14.1	38.2		46.8	73.9	27.1	123	161	
Vert.	4804.000	PK	60.6	31.2	6.5	37.0		61.3	73.9	12.6	100	230	
Vert.	7206.000	PK	52.0	36.5	8.0	39.0		57.5	73.9	16.4	160	5	
Vert.	9608.000	PK	44.6	38.3	9.1	37.2		54.8	73.9	19.1	100	80	
Vert.	12010.000	PK	46.4	39.3	10.5	37.9		58.3	73.9	15.6	100	0	
Vert.	2390.000	AV	31.4	27.2	14.1	38.2		34.5	53.9	19.4	123	161	(AV) VBW:10Hz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4804.000	AV	57.8	31.2	6.5	37.0	-24.8	33.7	53.9	20.2	(AV) VBW:10Hz
Hori.	7206.000	AV	44.8	36.5	8.0	39.0	-24.8	25.5	53.9	28.4	(AV) VBW:10Hz
Hori.	9608.000	AV	33.6	38.3	9.1	37.2	-24.8	19.0	53.9	34.9	(AV) VBW:10Hz
Hori.	12010.000	AV	33.8	39.3	10.5	37.9	-24.8	20.9	53.9	33.0	(AV) VBW:10Hz
Vert.	4804.000	AV	56.9	31.2	6.5	37.0	-24.8	32.8	53.9	21.1	(AV) VBW:10Hz
Vert.	7206.000	AV	44.8	36.5	8.0	39.0	-24.8	25.5	53.9	28.4	(AV) VBW:10Hz
Vert.	9608.000	AV	33.0	38.3	9.1	37.2	-24.8	18.4	53.9	35.5	(AV) VBW:10Hz
Vert.	12010.000	AV	33.9	39.3	10.5	37.9	-24.8	21.0	53.9	32.9	(AV) VBW:10Hz

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell time factor (refer to "Dwell time factor Calculation")

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

*No noise was detected above the 5th order harmonics.

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 Factor [dB/m]	Loss [dB]	Gain [dB]		Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	90.2	27.3	14.1	38.2		93.4	-	-	Carrier
Hori.	2400.000	PK	36.6	27.3	14.1	38.2		39.8	73.4	33.6	
Vert.	2402.000	PK	88.7	27.3	14.1	38.2		91.9	-	-	Carrier
Vert.	2400.000	PK	35.9	27.3	14.1	38.2		39.1	71.9	32.8	

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

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.		No.2 and 3 Semi Anechoic Chamber
Date	July 3, 2012	July 11, 2012	July 12, 2012
Temperature / Humidity	25 deg.C , 62 %RH	23 deg.C , 60 %RH	24 deg.C , 64 %RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
Mode	Tx, 2441 MHz		
	Tx, Bluetooth, BDR, PRBS9		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]		Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	182.000	QP	29.0	16.0	9.0	31.8		22.2	43.5	21.3	177	29	
Hori.	4882.000	PK	50.6	31.4	6.6	36.9		51.7	73.9	22.2	134	71	
Hori.	7323.000	PK	51.0	36.7	8.2	39.0		56.9	73.9	17.0	122	13	
Hori.	9764.000	PK	43.5	38.7	9.3	37.2		54.3	73.9	19.6	100	350	
Hori.	12205.000	PK	43.6	39.4	10.6	37.7		55.9	73.9	18.0	100	0	
Vert.	31.615	QP	24.3	17.8	6.8	31.9		17.0	40.0	23.0	100	187	
Vert.	53.208	QP	34.9	9.8	7.2	31.9		20.0	40.0	20.0	100	109	
Vert.	78.000	QP	37.5	6.4	8.0	31.9		20.0	40.0	20.0	100	114	
Vert.	113.151	QP	28.2	12.0	8.0	31.9		16.3	43.5	27.2	100	231	
Vert.	129.999	QP	32.8	13.7	8.3	31.9		22.9	43.5	20.6	100	269	
Vert.	4882.000	PK	49.7	31.4	6.6	36.9		50.8	73.9	23.1	100	229	
Vert.	7323.000	PK	52.1	36.7	8.2	39.0		58.0	73.9	15.9	148	12	
Vert.	9764.000	PK	42.9	38.7	9.3	37.2		53.7	73.9	20.2	100	85	
Vert.	12205.000	PK	43.2	39.4	10.6	37.7		55.5	73.9	18.4	100	0	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	AV	44.7	31.4	6.6	36.9	-24.8	21.0	53.9	32.9	(AV) VBW:10Hz
Hori.	7323.000	AV	43.4	36.7	8.2	39.0	-24.8	24.5	53.9	29.4	(AV) VBW:10Hz
Hori.	9764.000	AV	31.5	38.7	9.3	37.2	-24.8	17.5	53.9	36.4	(AV) VBW:10Hz
Hori.	12205.000	AV	31.6	39.4	10.6	37.7	-24.8	19.1	53.9	34.8	(AV) VBW:10Hz
Vert.	4882.000	AV	43.6	31.4	6.6	36.9	-24.8	19.9	53.9	34.0	(AV) VBW:10Hz
Vert.	7323.000	AV	45.0	36.7	8.2	39.0	-24.8	26.1	53.9	27.8	(AV) VBW:10Hz
Vert.	9764.000	AV	31.4	38.7	9.3	37.2	-24.8	17.4	53.9	36.5	(AV) VBW:10Hz
Vert.	12205.000	AV	31.8	39.4	10.6	37.7	-24.8	19.3	53.9	34.6	(AV) VBW:10Hz

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell time factor (refer to "Dwell time factor Calculation")

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

*No noise was detected above the 5th order harmonics.

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.2 and 3 Semi Anechoic Chamber
Date	July 3, 2012	July 11, 2012	July 12, 2012
Temperature / Humidity	25 deg.C , 62 %RH	23 deg.C , 60 %RH	24 deg.C , 64 %RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
Mode	Tx, 2480 MHz		
	Tx, Bluetooth, BDR, PRBS9		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]		Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	182.000	QP	28.7	16.0	9.0	31.8		21.9	43.5	21.6	175	25	
Hori.	2483.500	PK	44.7	27.5	14.1	38.1		48.2	73.9	25.7	100	67	
Hori.	4960.000	PK	55.0	31.6	6.7	36.8		56.5	73.9	17.4	122	15	
Hori.	7440.000	PK	52.7	37.0	8.4	39.0		59.1	73.9	14.8	140	12	
Hori.	9920.000	PK	43.9	39.0	9.3	37.2		55.0	73.9	18.9	100	350	
Hori.	12400.000	PK	44.3	39.5	10.5	37.5		56.8	73.9	17.1	100	0	
Hori.	2483.500	AV	31.9	27.5	14.1	38.1		35.4	53.9	18.5	100	67	(AV) VBW:10Hz
Vert.	31.600	QP	24.5	17.8	6.8	31.9		17.2	40.0	22.8	100	165	
Vert.	53.200	QP	35.1	9.8	7.2	31.9		20.2	40.0	19.8	100	102	
Vert.	78.000	QP	37.6	6.4	8.0	31.9		20.1	40.0	19.9	100	114	
Vert.	113.351	QP	28.0	12.0	8.0	31.9		16.1	43.5	27.4	100	218	
Vert.	129.999	QP	32.6	13.7	8.3	31.9		22.7	43.5	20.8	100	269	
Vert.	2483.500	PK	44.0	27.5	14.1	38.1		47.5	73.9	26.4	144	140	
Vert.	4960.000	PK	54.5	31.6	6.7	36.8		56.0	73.9	17.9	155	0	
Vert.	7440.000	PK	51.1	37.0	8.4	39.0		57.5	73.9	16.4	151	7	
Vert.	9920.000	PK	42.6	39.0	9.3	37.2		53.7	73.9	20.2	100	87	
Vert.	12400.000	PK	44.5	39.5	10.5	37.5		57.0	73.9	16.9	100	0	
Vert.	2483.500	AV	31.7	27.5	14.1	38.1		35.2	53.9	18.7	144	140	(AV) VBW:10Hz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4960.000	AV	50.6	31.6	6.7	36.8	-24.8	27.3	53.9	26.6	(AV) VBW:10Hz
Hori.	7440.000	AV	44.9	37.0	8.4	39.0	-24.8	26.5	53.9	27.4	(AV) VBW:10Hz
Hori.	9920.000	AV	31.3	39.0	9.3	37.2	-24.8	17.6	53.9	36.3	(AV) VBW:10Hz
Hori.	12400.000	AV	31.9	39.5	10.5	37.5	-24.8	19.6	53.9	34.3	(AV) VBW:10Hz
Vert.	4960.000	AV	50.2	31.6	6.7	36.8	-24.8	26.9	53.9	27.0	(AV) VBW:10Hz
Vert.	7440.000	AV	43.6	37.0	8.4	39.0	-24.8	25.2	53.9	28.7	(AV) VBW:10Hz
Vert.	9920.000	AV	31.2	39.0	9.3	37.2	-24.8	17.5	53.9	36.4	(AV) VBW:10Hz
Vert.	12400.000	AV	31.8	39.5	10.5	37.5	-24.8	19.5	53.9	34.4	(AV) VBW:10Hz

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell time factor (refer to "Dwell time factor Calculation")

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

*No noise was detected above the 5th order harmonics.

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

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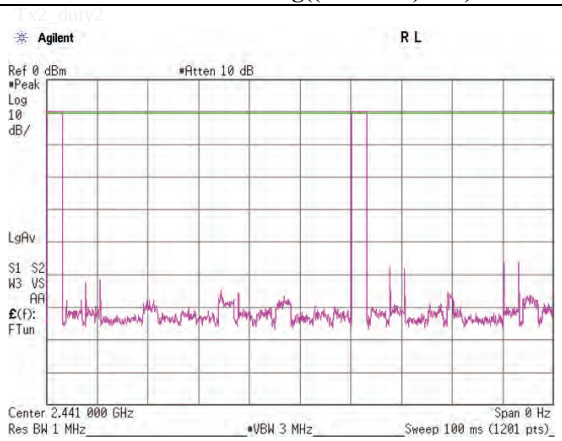
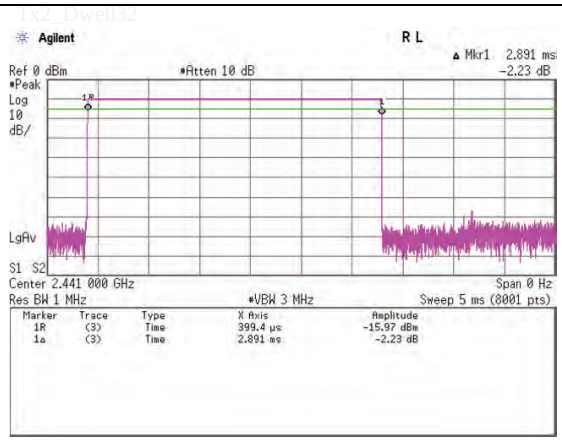
Dwell time factor Calculation chart

Dwell time factor Calculation

Tx, Bluetooth, BDR, PRBS9	
Worst 100ms **Dwell time factor =20log((2.891 x 2)/100) = -24.76dB**	**1cycle On time :** **2.891ms**
	

VBW (Average) Calculation

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

Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.		No.2 and 3 Semi Anechoic Chamber
Date	July 3, 2012	July 11, 2012	July 12, 2012
Temperature / Humidity	25 deg.C , 62 %RH	23 deg.C , 60 %RH	24 deg.C , 64 %RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
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.	182.000	QP	29.0	16.0	9.0	31.8		22.2	43.5	21.3	175	26	
Hori.	2383.484	PK	52.9	27.2	14.0	38.2		55.9	73.9	18.0	100	87	
Hori.	2390.000	PK	45.9	27.2	14.1	38.2		49.0	73.9	24.9	100	87	
Hori.	4804.000	PK	62.3	31.2	6.5	37.0		63.0	73.9	10.9	130	73	
Hori.	7206.000	PK	50.4	36.5	8.0	39.0		55.9	73.9	18.0	100	227	
Hori.	9608.000	PK	44.0	38.3	9.1	37.2		54.2	73.9	19.7	100	330	
Hori.	12010.000	PK	44.1	39.3	10.5	37.9		56.0	73.9	17.9	100	0	
Hori.	2383.484	AV	31.8	27.2	14.0	38.2		34.8	53.9	19.1	100	87	(AV) VBW:10Hz
Hori.	2390.000	AV	31.8	27.2	14.1	38.2		34.9	53.9	19.0	100	87	(AV) VBW:10Hz
Vert.	31.600	QP	24.2	17.8	6.8	31.9		16.9	40.0	23.1	100	165	
Vert.	53.200	QP	34.5	9.8	7.2	31.9		19.6	40.0	20.4	100	131	
Vert.	78.000	QP	38.0	6.4	8.0	31.9		20.5	40.0	19.5	100	111	
Vert.	113.305	QP	27.9	12.0	8.0	31.9		16.0	43.5	27.5	100	208	
Vert.	129.999	QP	32.9	13.7	8.3	31.9		23.0	43.5	20.5	100	264	
Vert.	2383.647	PK	51.7	27.2	14.0	38.2		54.7	73.9	19.2	124	132	
Vert.	2390.000	PK	45.0	27.2	14.1	38.2		48.1	73.9	25.8	124	132	
Vert.	4804.000	PK	60.7	31.2	6.5	37.0		61.4	73.9	12.5	100	226	
Vert.	7206.000	PK	51.2	36.5	8.0	39.0		56.7	73.9	17.2	146	10	
Vert.	9608.000	PK	42.8	38.3	9.1	37.2		53.0	73.9	20.9	100	80	
Vert.	12010.000	PK	44.2	39.3	10.5	37.9		56.1	73.9	17.8	100	0	
Vert.	2383.647	AV	31.7	27.2	14.0	38.2		34.7	53.9	19.2	124	132	(AV) VBW:10Hz
Vert.	2390.000	AV	31.6	27.2	14.1	38.2		34.7	53.9	19.2	124	132	(AV) VBW:10Hz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4804.000	AV	53.2	31.2	6.5	37.0	-24.8	29.1	53.9	24.8	(AV) VBW:10Hz
Hori.	7206.000	AV	39.5	36.5	8.0	39.0	-24.8	20.2	53.9	33.7	(AV) VBW:10Hz
Hori.	9608.000	AV	32.1	38.3	9.1	37.2	-24.8	17.5	53.9	36.4	(AV) VBW:10Hz
Hori.	12010.000	AV	32.0	39.3	10.5	37.9	-24.8	19.1	53.9	34.8	(AV) VBW:10Hz
Vert.	4804.000	AV	51.3	31.2	6.5	37.0	-24.8	27.2	53.9	26.7	(AV) VBW:10Hz
Vert.	7206.000	AV	41.5	36.5	8.0	39.0	-24.8	22.2	53.9	31.7	(AV) VBW:10Hz
Vert.	9608.000	AV	31.3	38.3	9.1	37.2	-24.8	16.8	53.9	37.2	(AV) VBW:10Hz
Vert.	12010.000	AV	32.0	39.3	10.5	37.9	-24.8	19.1	53.9	34.8	(AV) VBW:10Hz

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell time factor (refer to "Dwell time factor Calculation")

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

*No noise was detected above the 5th order harmonics.

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 Factor [dB/m]	Loss [dB]	Gain [dB]		Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	89.9	27.3	14.1	38.2		93.1	-	-	Carrier
Hori.	2400.000	PK	42.3	27.3	14.1	38.2		45.5	73.1	27.6	
Vert.	2402.000	PK	87.8	27.3	14.1	38.2		91.0	-	-	Carrier
Vert.	2400.000	PK	40.1	27.3	14.1	38.2		43.3	71.0	27.7	

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

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Radiated Emission

Test place	UL Japan, Inc. Shonan EMC Lab.		No.2 and 3 Semi Anechoic Chamber
Date	July 3, 2012	July 11, 2012	July 12, 2012
Temperature / Humidity	25 deg.C , 62 %RH	23 deg.C , 60 %RH	24 deg.C , 64 %RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
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.	182.000	QP	28.9	16.0	9.0	31.8		22.1	43.5	21.4	177	29	
Hori.	4882.000	PK	61.7	31.4	6.6	36.9		62.8	73.9	11.1	100	62	
Hori.	7323.000	PK	51.4	36.7	8.2	39.0		57.3	73.9	16.6	100	0	
Hori.	9764.000	PK	43.4	38.7	9.3	37.2		54.2	73.9	19.7	100	175	
Hori.	12205.000	PK	46.1	39.4	10.6	37.7		58.4	73.9	15.5	100	0	
Vert.	31.600	QP	24.5	17.8	6.8	31.9		17.2	40.0	22.8	100	160	
Vert.	53.200	QP	34.6	9.8	7.2	31.9		19.7	40.0	20.3	100	111	
Vert.	78.000	QP	37.5	6.4	8.0	31.9		20.0	40.0	20.0	100	115	
Vert.	113.305	QP	27.9	12.0	8.0	31.9		16.0	43.5	27.5	100	233	
Vert.	129.999	QP	33.0	13.7	8.3	31.9		23.1	43.5	20.4	100	265	
Vert.	4882.000	PK	60.7	31.4	6.6	36.9		61.8	73.9	12.1	163	0	
Vert.	7323.000	PK	52.6	36.7	8.2	39.0		58.5	73.9	15.4	160	10	
Vert.	9764.000	PK	43.3	38.7	9.3	37.2		54.1	73.9	19.8	100	250	
Vert.	12205.000	PK	44.0	39.4	10.6	37.7		56.3	73.9	17.6	100	0	

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4882.000	AV	54.4	31.4	6.6	36.9	-24.8	30.7	53.9	23.2	(AV) VBW:10Hz
Hori.	7323.000	AV	41.2	36.7	8.2	39.0	-24.8	22.3	53.9	31.6	(AV) VBW:10Hz
Hori.	9764.000	AV	32.1	38.7	9.3	37.2	-24.8	18.1	53.9	35.8	(AV) VBW:10Hz
Hori.	12205.000	AV	31.6	39.4	10.6	37.7	-24.8	19.1	53.9	34.8	(AV) VBW:10Hz
Vert.	4882.000	AV	53.5	31.4	6.6	36.9	-24.8	29.8	53.9	24.1	(AV) VBW:10Hz
Vert.	7323.000	AV	42.7	36.7	8.2	39.0	-24.8	23.8	53.9	30.1	(AV) VBW:10Hz
Vert.	9764.000	AV	31.1	38.7	9.3	37.2	-24.8	17.1	53.9	36.8	(AV) VBW:10Hz
Vert.	12205.000	AV	31.5	39.4	10.6	37.7	-24.8	19.0	53.9	34.9	(AV) VBW:10Hz

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell time factor (refer to "Dwell time factor Calculation")

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

*No noise was detected above the 5th order harmonics.

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.2 and 3 Semi Anechoic Chamber
Date	July 3, 2012	July 11, 2012	July 12, 2012
Temperature / Humidity	25 deg.C , 62 %RH	23 deg.C , 60 %RH	24 deg.C , 64 %RH
Engineer	Makoto Hosaka	Makoto Hosaka	Makoto Hosaka
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.	182.000	QP	28.7	16.0	9.0	31.8		21.9	43.5	21.6	177	28	
Hori.	2483.500	PK	49.3	27.5	14.1	38.1		52.8	73.9	21.1	100	226	
Hori.	2492.100	PK	48.1	27.6	14.1	38.1		51.7	73.9	22.2	100	226	
Hori.	2492.953	PK	48.7	27.6	14.1	38.1		52.3	73.9	21.6	100	226	
Hori.	2520.000	PK	47.8	27.6	14.1	38.1		51.4	73.9	22.5	100	226	
Hori.	4960.000	PK	54.5	31.6	6.7	36.8		56.0	73.9	17.9	153	76	
Hori.	7440.000	PK	51.8	37.0	8.4	39.0		58.2	73.9	15.7	127	9	
Hori.	9920.000	PK	42.8	39.0	9.3	37.2		53.9	73.9	20.0	100	353	
Hori.	12400.000	PK	44.2	39.5	10.5	37.5		56.7	73.9	17.2	100	0	
Hori.	2483.500	AV	34.0	27.5	14.1	38.1		37.5	53.9	16.4	100	226	(AV) VBW:10Hz
Hori.	2492.100	AV	31.8	27.6	14.1	38.1		35.4	53.9	18.5	100	226	(AV) VBW:10Hz
Hori.	2492.953	AV	32.3	27.6	14.1	38.1		35.9	53.9	18.0	100	226	(AV) VBW:10Hz
Hori.	2520.000	AV	36.1	27.6	14.1	38.1		39.7	53.9	14.2	100	226	(AV) VBW:10Hz
Vert.	31.600	QP	24.3	17.8	6.8	31.9		17.0	40.0	23.0	100	136	
Vert.	53.200	QP	34.8	9.8	7.2	31.9		19.9	40.0	20.1	100	145	
Vert.	78.000	QP	37.2	6.4	8.0	31.9		19.7	40.0	20.3	100	118	
Vert.	113.260	QP	28.0	12.0	8.0	31.9		16.1	43.5	27.4	100	211	
Vert.	129.999	QP	32.1	13.7	8.3	31.9		22.2	43.5	21.3	100	262	
Vert.	2483.500	PK	49.1	27.5	14.1	38.1		52.6	73.9	21.3	152	135	
Vert.	2492.100	PK	45.8	27.6	14.1	38.1		49.4	73.9	24.5	152	135	
Vert.	2492.953	PK	47.0	27.6	14.1	38.1		50.6	73.9	23.3	152	135	
Vert.	2520.000	PK	47.3	27.6	14.1	38.1		50.9	73.9	23.0	152	135	
Vert.	4960.000	PK	55.1	31.6	6.7	36.8		56.6	73.9	17.3	169	8	
Vert.	7440.000	PK	51.1	37.0	8.4	39.0		57.5	73.9	16.4	161	0	
Vert.	9920.000	PK	43.1	39.0	9.3	37.2		54.2	73.9	19.7	100	245	
Vert.	12400.000	PK	44.0	39.5	10.5	37.5		56.5	73.9	17.4	100	0	
Vert.	2483.500	AV	33.8	27.5	14.1	38.1		37.3	53.9	16.6	152	135	(AV) VBW:10Hz
Vert.	2492.100	AV	31.7	27.6	14.1	38.1		35.3	53.9	18.6	152	135	(AV) VBW:10Hz
Vert.	2492.953	AV	32.1	27.6	14.1	38.1		35.7	53.9	18.2	152	135	(AV) VBW:10Hz
Vert.	2520.000	AV	35.4	27.6	14.1	38.1		39.0	53.9	14.9	152	135	(AV) VBW:10Hz

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Dwell Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4960.000	AV	46.4	31.6	6.7	36.8	-24.8	23.2	53.9	30.7	(AV) VBW:10Hz
Hori.	7440.000	AV	41.9	37.0	8.4	39.0	-24.8	23.5	53.9	30.4	(AV) VBW:10Hz
Hori.	9920.000	AV	31.3	39.0	9.3	37.2	-24.8	17.6	53.9	36.3	(AV) VBW:10Hz
Hori.	12400.000	AV	31.8	39.5	10.5	37.5	-24.8	19.5	53.9	34.4	(AV) VBW:10Hz
Vert.	4960.000	AV	47.1	31.6	6.7	36.8	-24.8	23.8	53.9	30.1	(AV) VBW:10Hz
Vert.	7440.000	AV	41.4	37.0	8.4	39.0	-24.8	23.0	53.9	30.9	(AV) VBW:10Hz
Vert.	9920.000	AV	31.0	39.0	9.3	37.2	-24.8	17.3	53.9	36.6	(AV) VBW:10Hz
Vert.	12400.000	AV	31.8	39.5	10.5	37.5	-24.8	19.5	53.9	34.4	(AV) VBW:10Hz

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter-Distance factor(above 15GHz)) - Gain(Amplifier) + Dwell time factor (refer to "Dwell time factor Calculation")

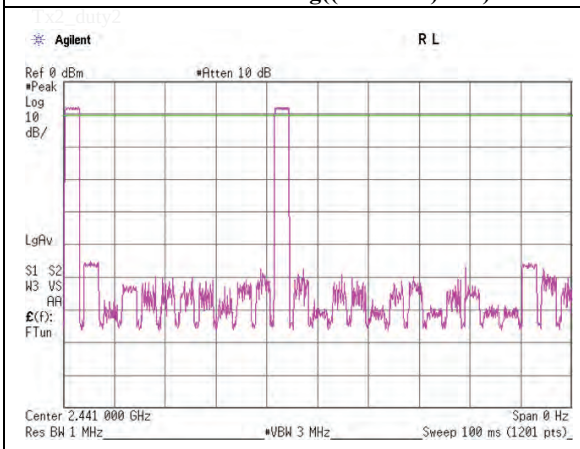
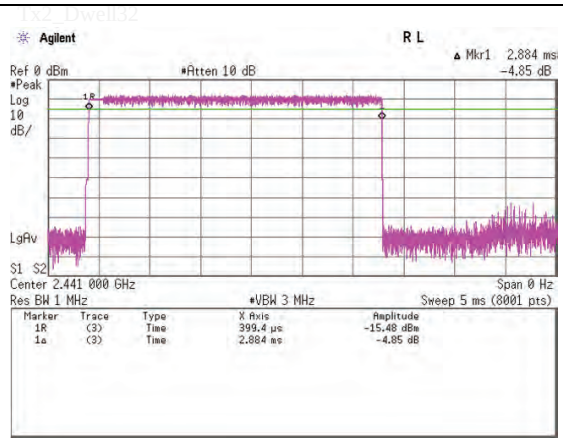
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20dB).

*No noise was detected above the 5th order harmonics.

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

Dwell time factor Calculation chart

Dwell time factor Calculation

Tx, Bluetooth, EDR, PRBS9	
Worst 100ms **Dwell time factor =20log((2.884 x 2)/100) = -24.78dB**	**1cycle On time :** **2.884ms**
	

VBW (Average) Calculation

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

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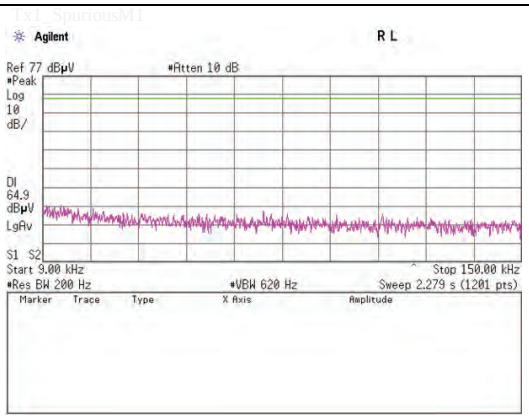
Spurious emission (Conducted)

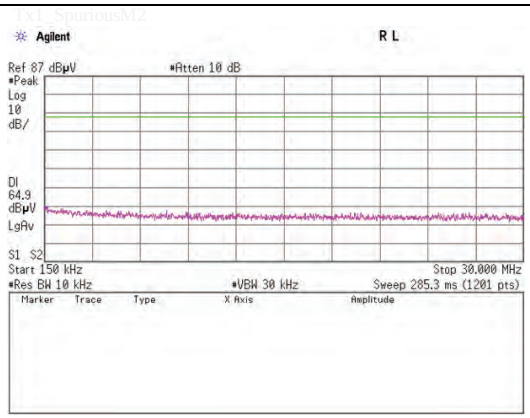
Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (1/2)

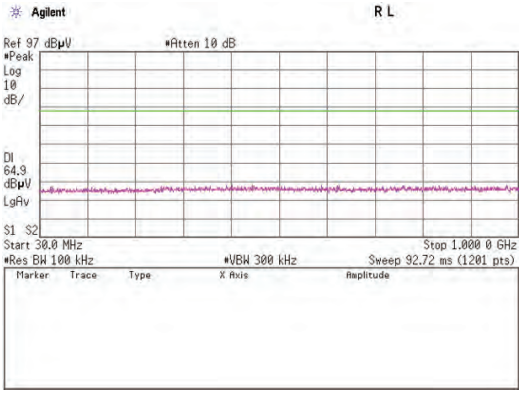
9kHz - 150kHz



150kHz - 30MHz



30MHz - 1GHz



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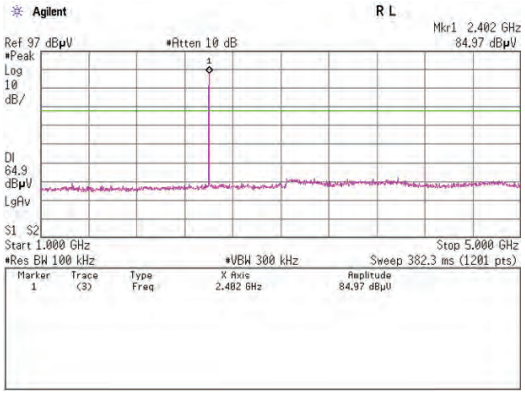
Facsimile : +81 463 50 6401

Spurious emission (Conducted)

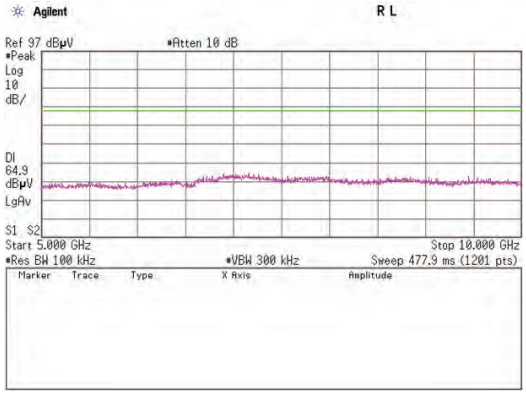
Tx, Bluetooth, BDR, PRBS9

Tx, 2402MHz (2/2)

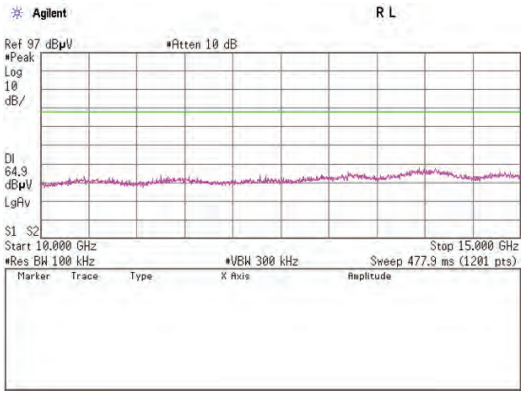
1GHz - 5GHz



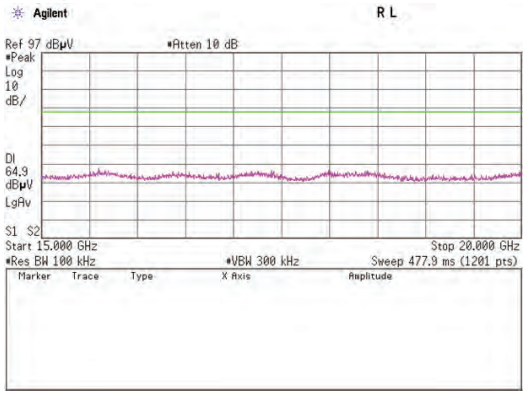
5GHz - 10GHz



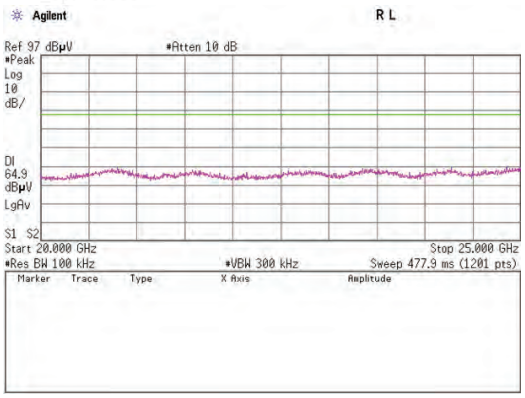
10GHz - 15GHz



15GHz - 20GHz



20GHz - 25GHz



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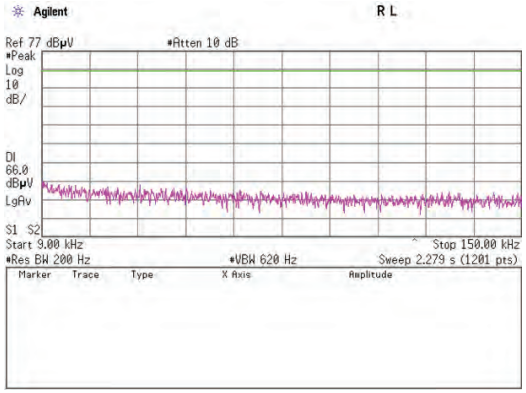
Spurious emission (Conducted)

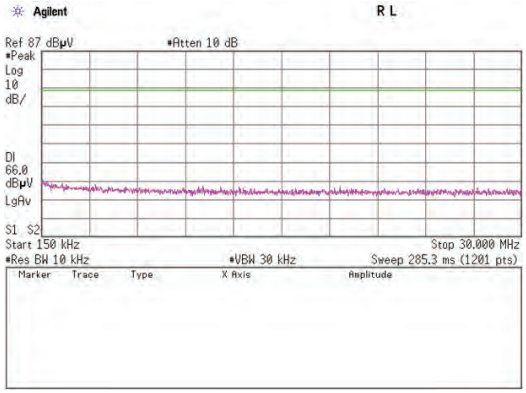
Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (1/2)

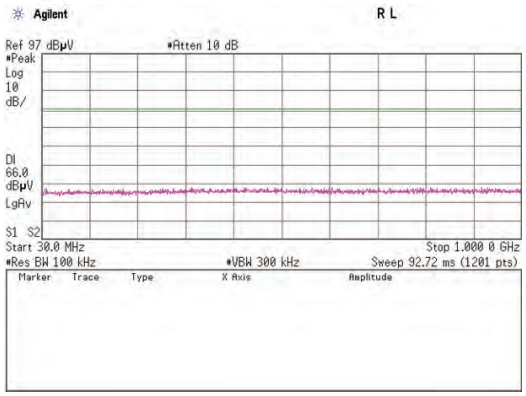
9kHz - 150kHz



150kHz - 30MHz



30MHz - 1GHz



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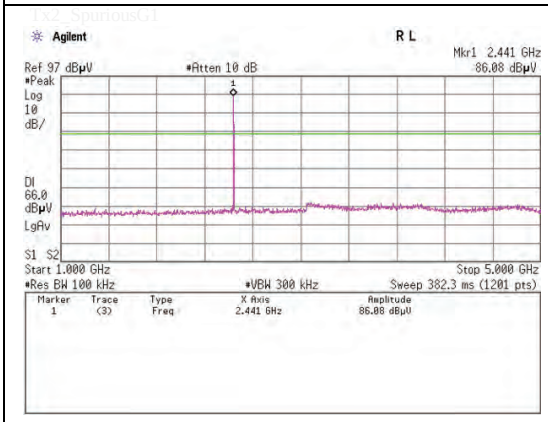
Spurious emission (Conducted)

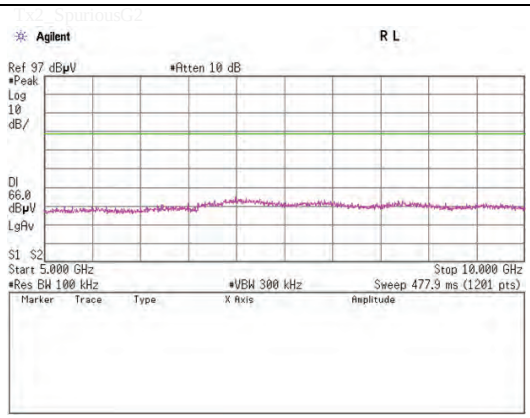
Tx, Bluetooth, BDR, PRBS9

Tx, 2441MHz (2/2)

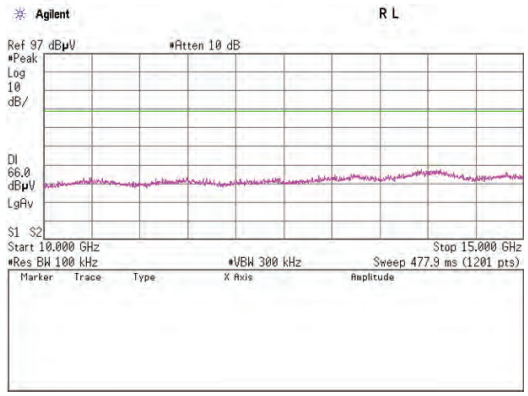
1GHz - 5GHz



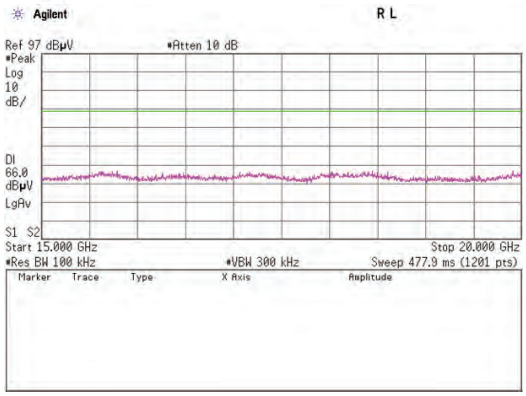
5GHz - 10GHz



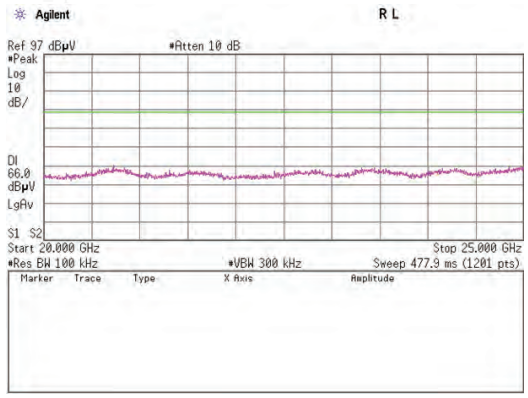
10GHz - 15GHz



15GHz - 20GHz



20GHz - 25GHz



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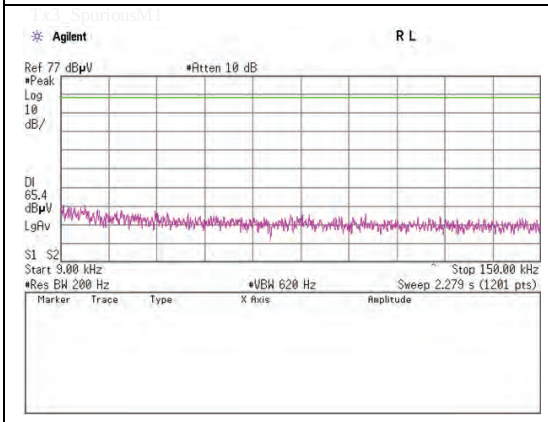
Spurious emission (Conducted)

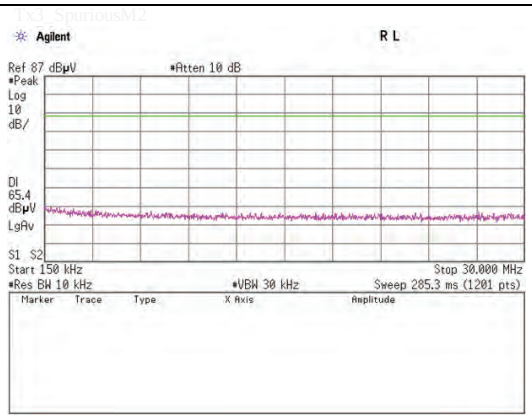
Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (1/2)

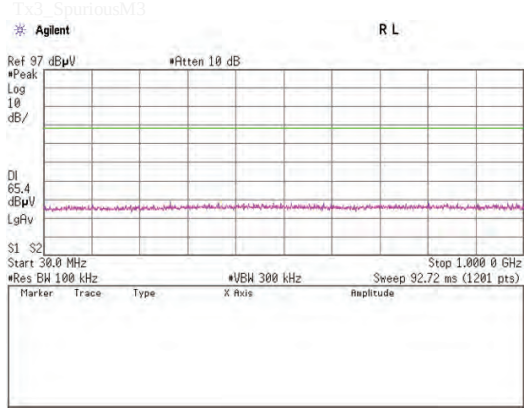
9kHz - 150kHz



150kHz - 30MHz



30MHz - 1GHz



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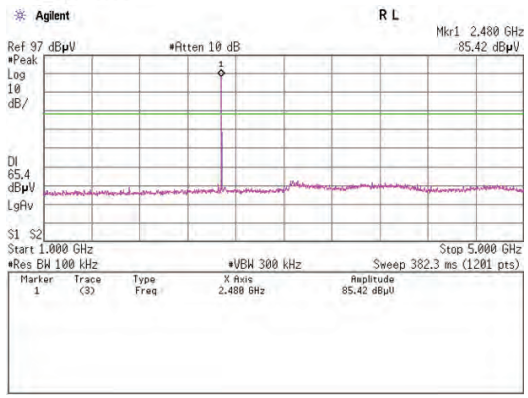
Spurious emission (Conducted)

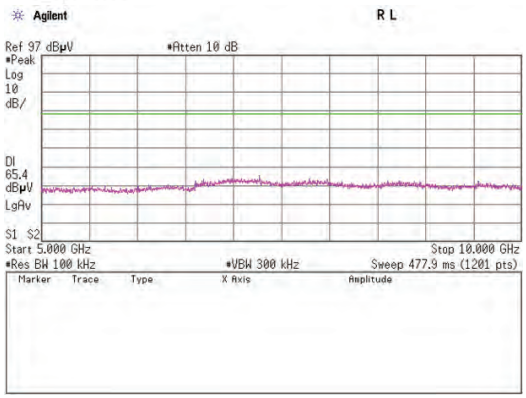
Tx, Bluetooth, BDR, PRBS9

Tx, 2480MHz (2/2)

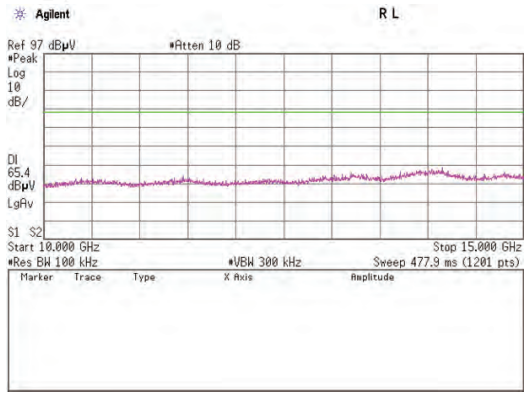
1GHz - 5GHz



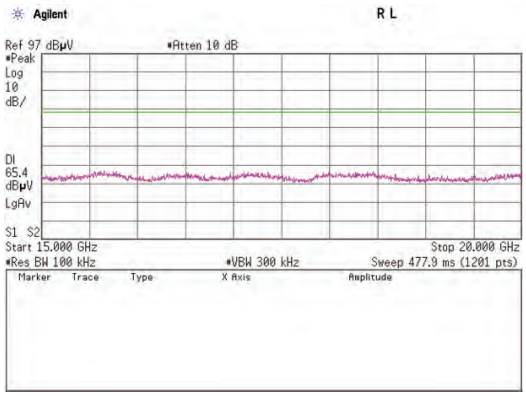
5GHz - 10GHz



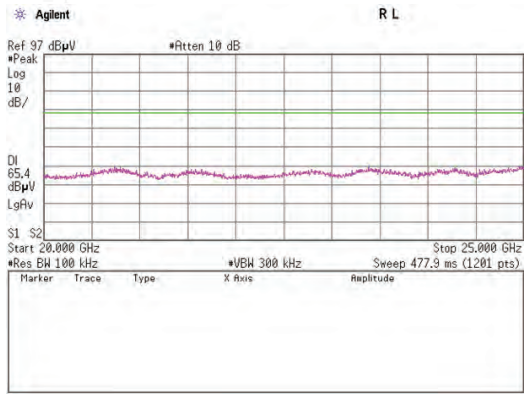
10GHz - 15GHz



15GHz - 20GHz



20GHz - 25GHz



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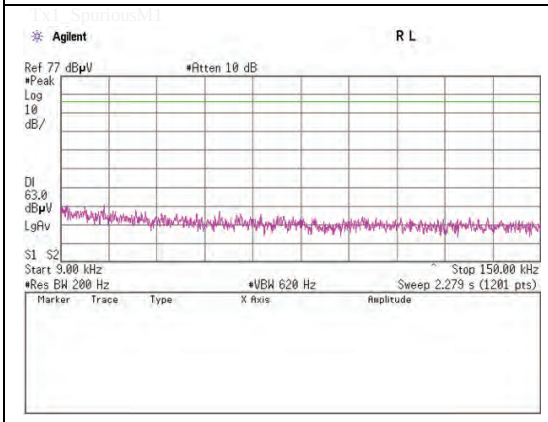
Spurious emission (Conducted)

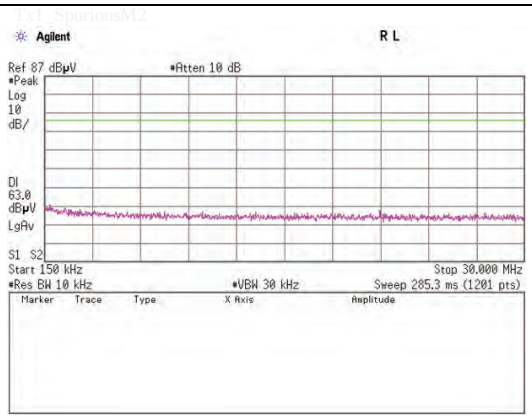
Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (1/2)

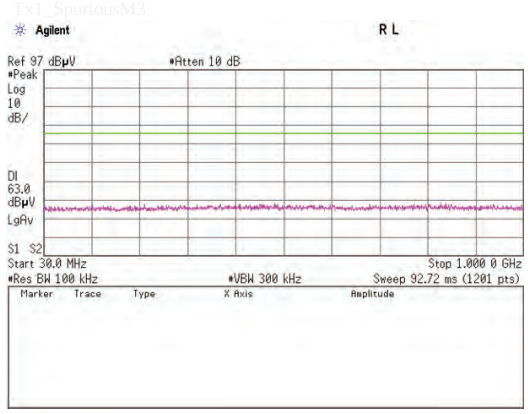
9kHz - 150kHz



150kHz - 30MHz



30MHz - 1GHz

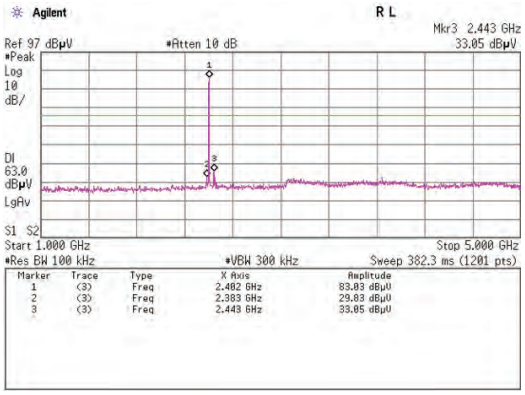


Spurious emission (Conducted)

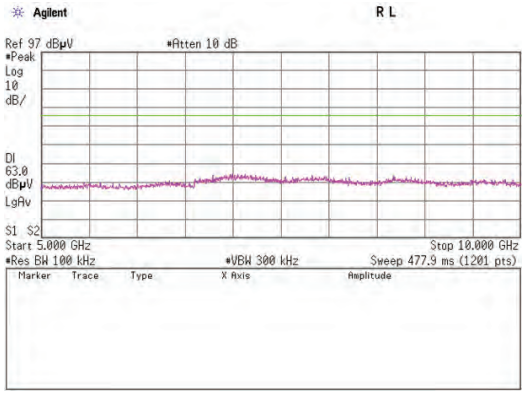
Tx, Bluetooth, EDR, PRBS9

Tx, 2402MHz (2/2)

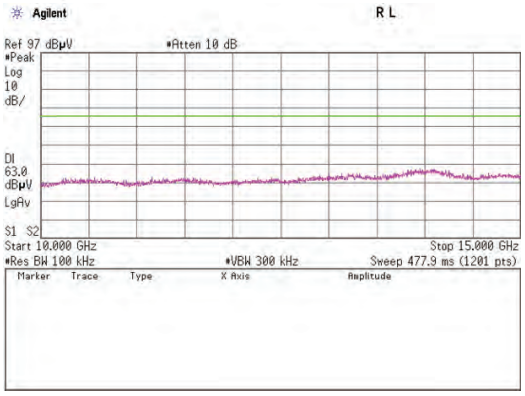
1GHz - 5GHz



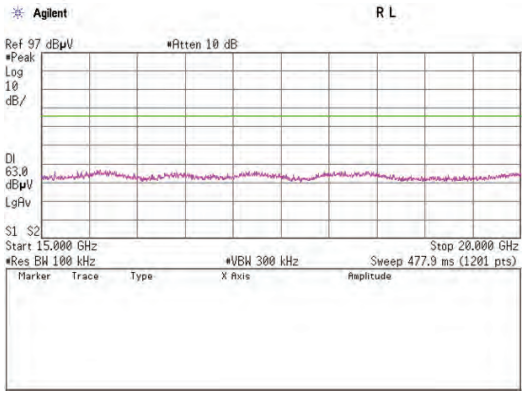
5GHz - 10GHz



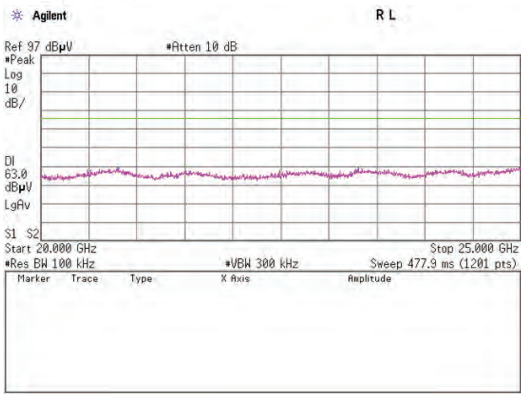
10GHz - 15GHz



15GHz - 20GHz



20GHz - 25GHz

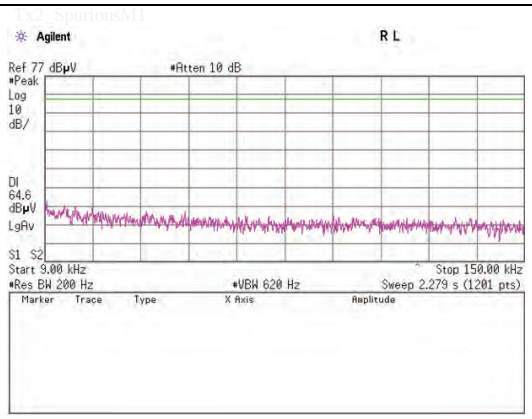


Spurious emission (Conducted)

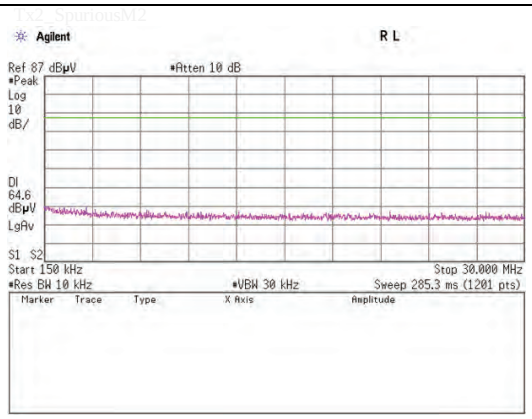
Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (1/2)

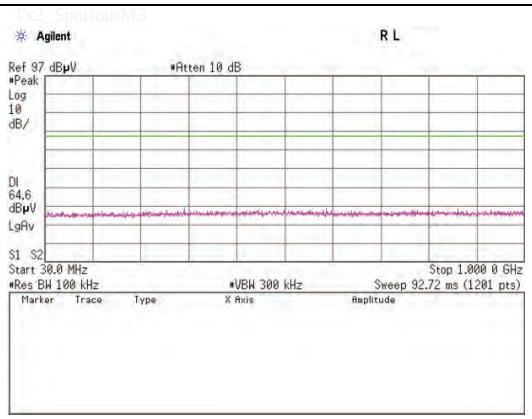
9kHz - 150kHz



150kHz - 30MHz



30MHz - 1GHz



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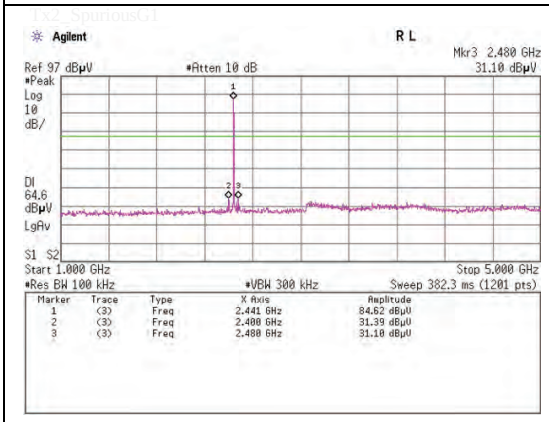
Spurious emission (Conducted)

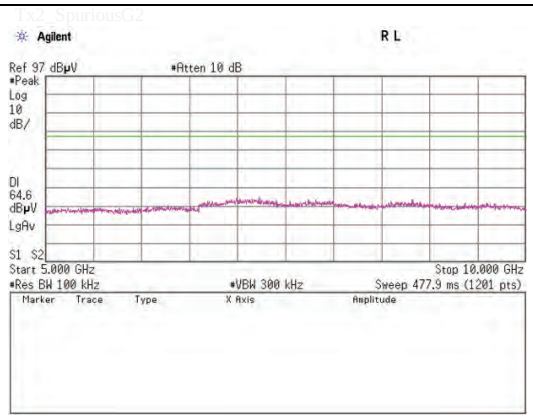
Tx, Bluetooth, EDR, PRBS9

Tx, 2441MHz (2/2)

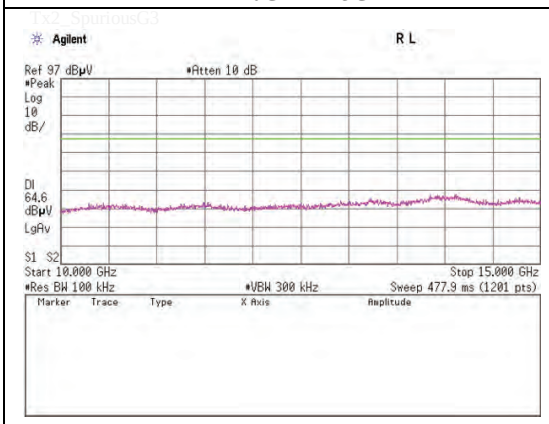
1GHz - 5GHz



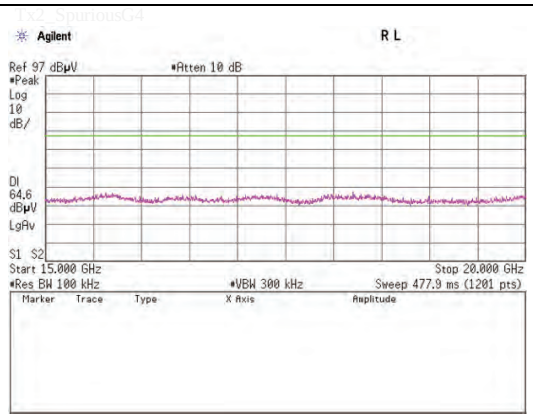
5GHz - 10GHz



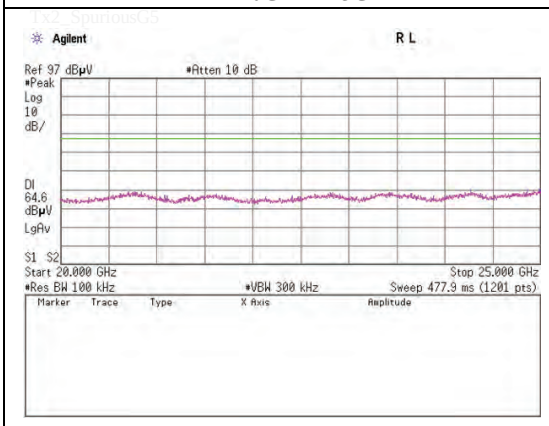
10GHz - 15GHz



15GHz - 20GHz



20GHz - 25GHz



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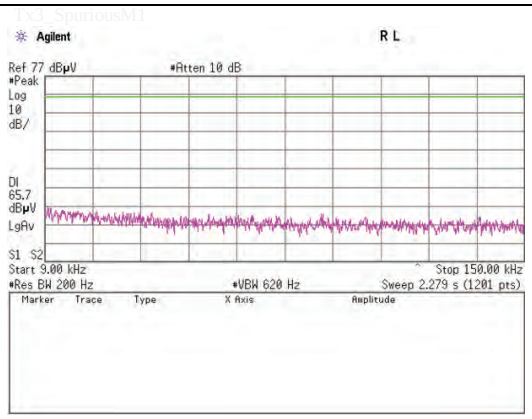
Spurious emission (Conducted)

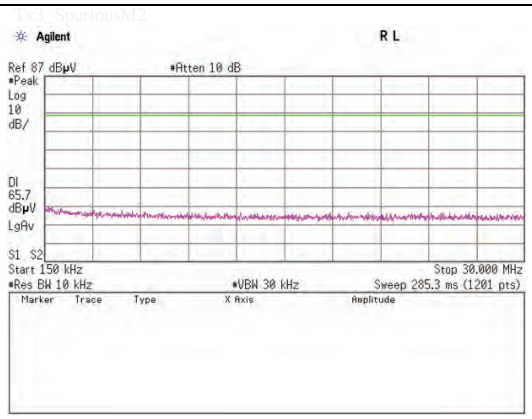
Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (1/2)

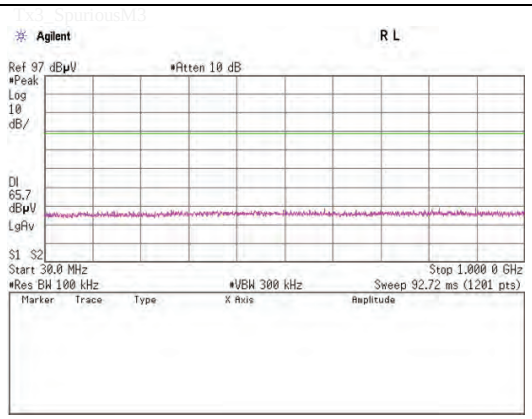
9kHz - 150kHz



150kHz - 30MHz



30MHz - 1GHz



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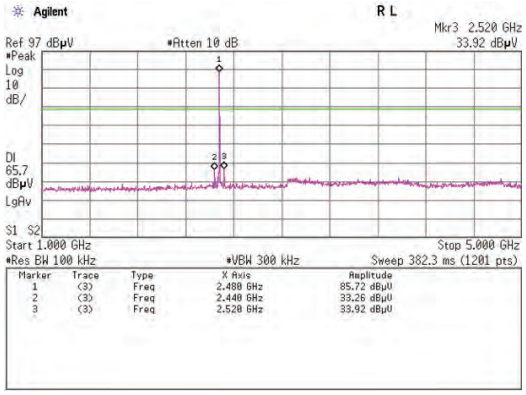
Spurious emission (Conducted)

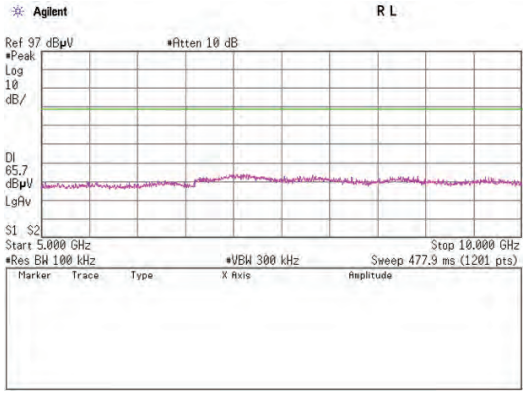
Tx, Bluetooth, EDR, PRBS9

Tx, 2480MHz (2/2)

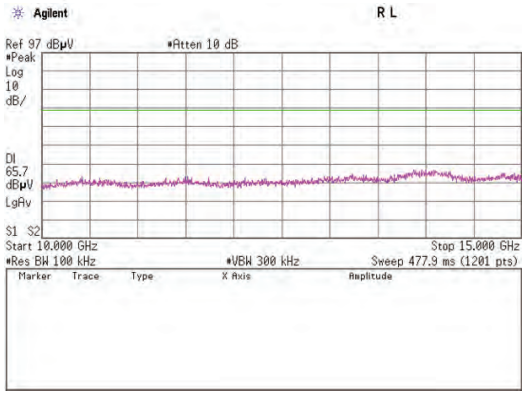
1GHz - 5GHz



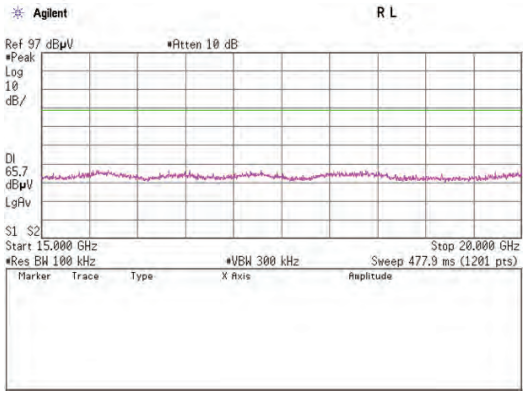
5GHz - 10GHz



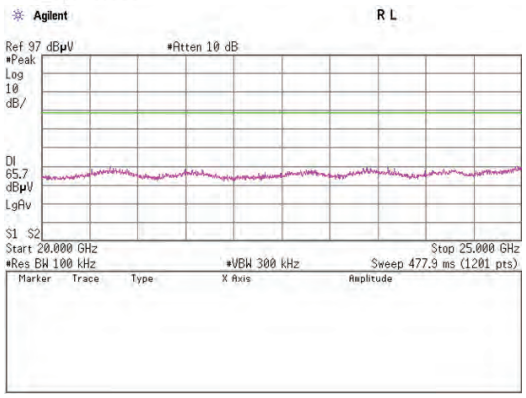
10GHz - 15GHz



15GHz - 20GHz



20GHz - 25GHz



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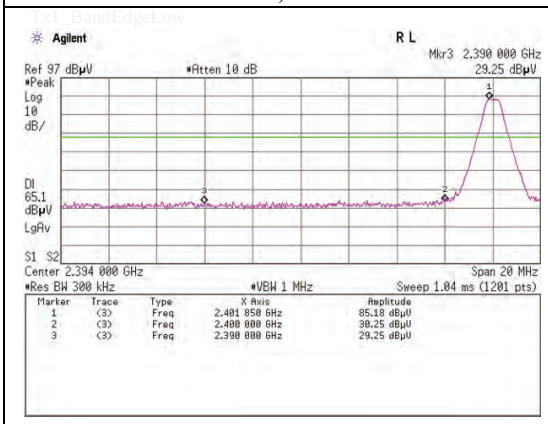
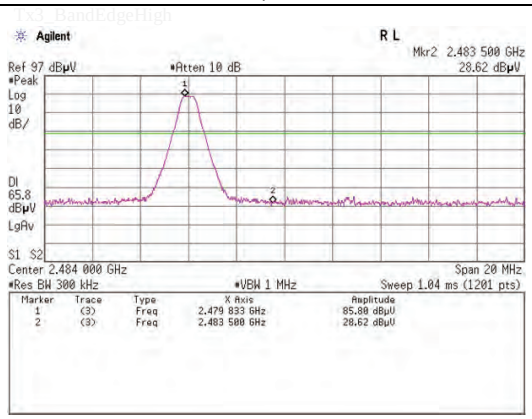
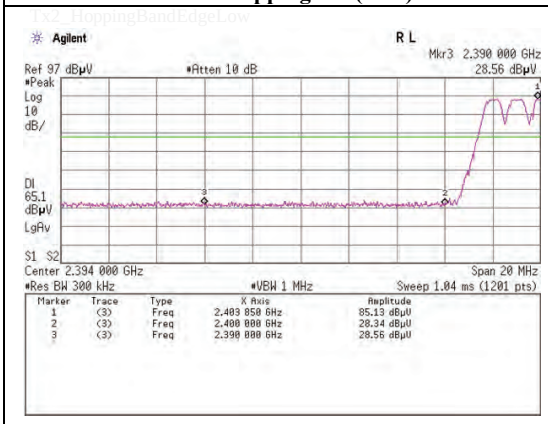
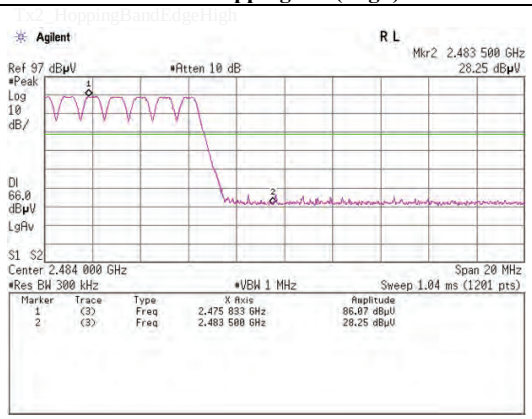
Spurious emission (Conducted)

Band Edge compliance

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

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

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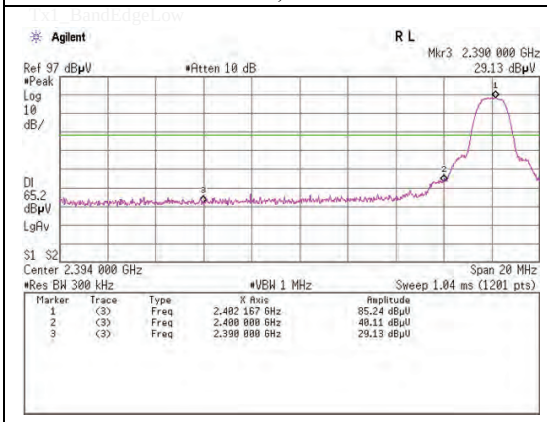
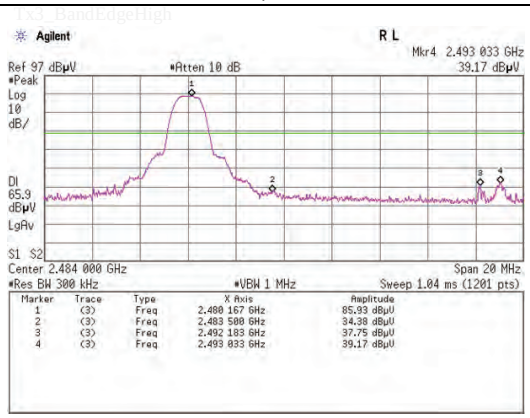
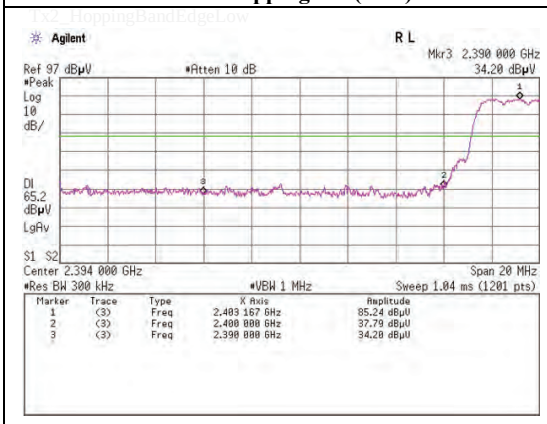
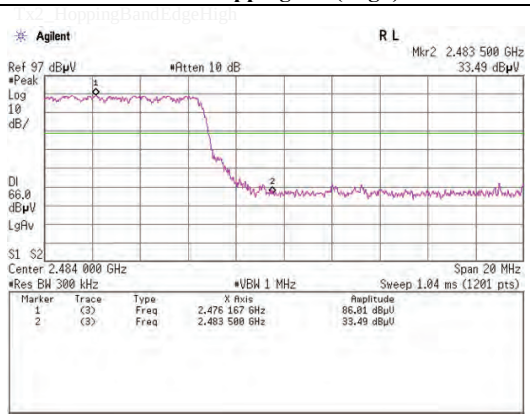
Spurious emission (Conducted)

Band Edge compliance

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

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

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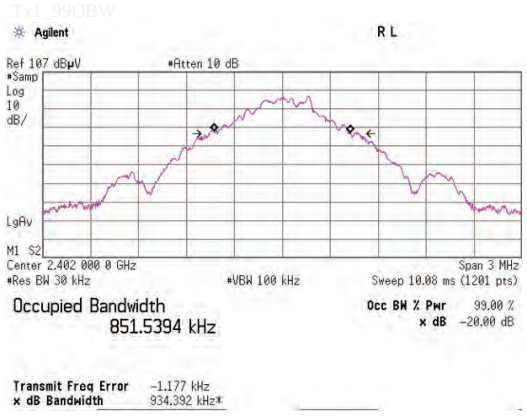
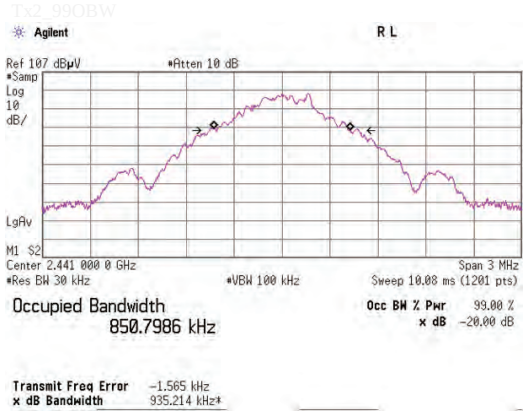
99% Occupied Bandwidth

Tx, Bluetooth, BDR, PRBS9

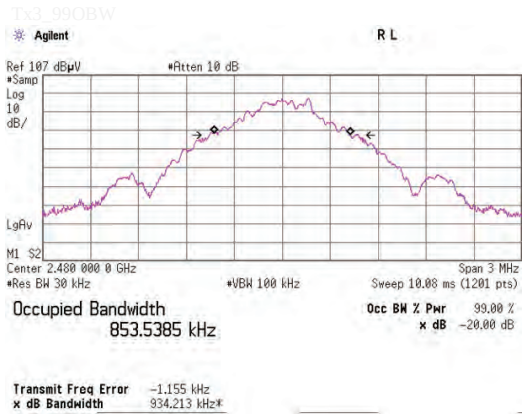
Tx, 2402MHz



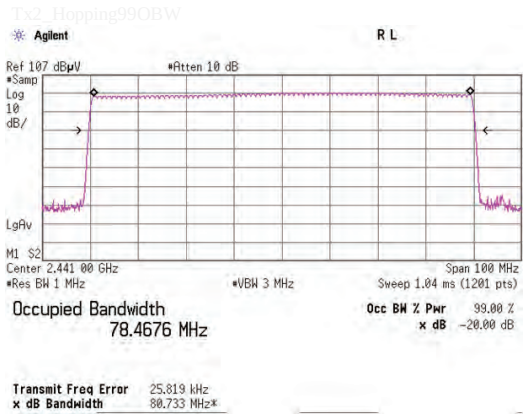
Tx, 2441MHz



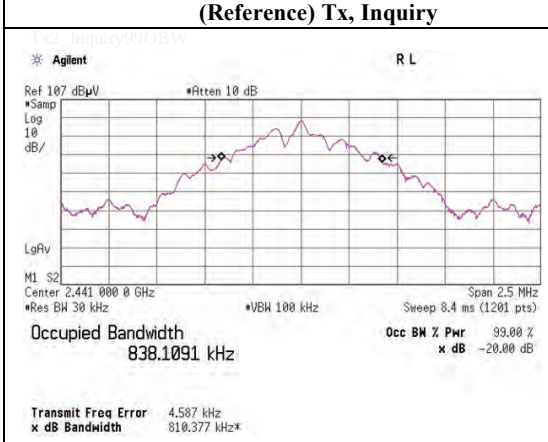
Tx, 2480MHz



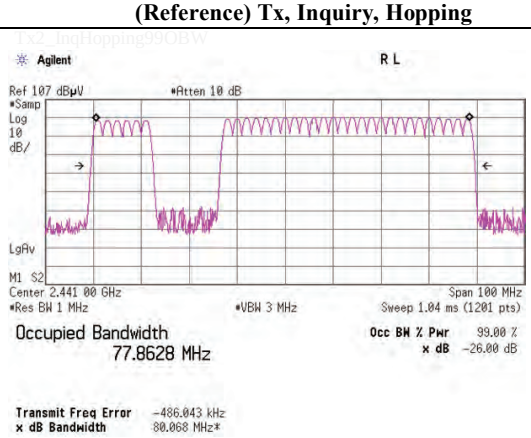
Tx, Hopping On



(Reference) Tx, Inquiry



(Reference) Tx, Inquiry, Hopping



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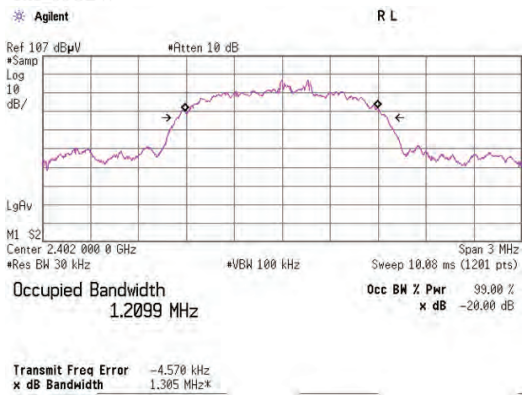
99% Occupied Bandwidth

Tx, Bluetooth, EDR, PRBS9

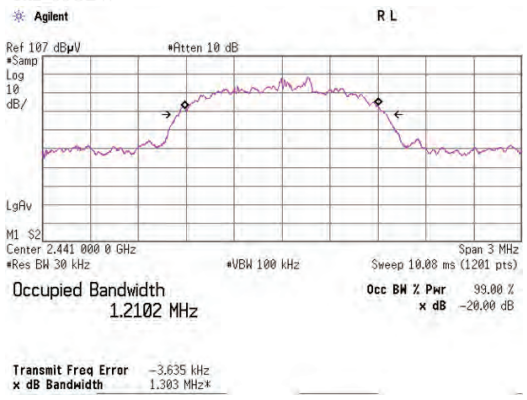
Tx, 2402MHz

Tx1_99OBW



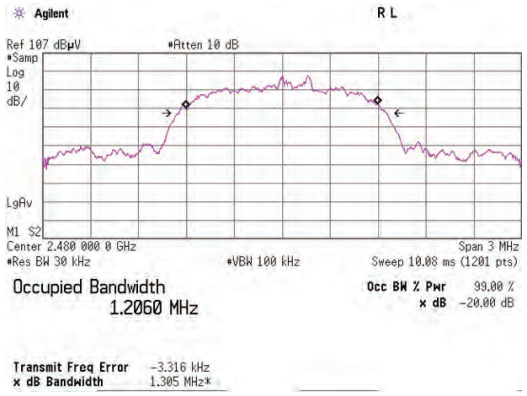
Tx, 2441MHz

Tx2_99OBW



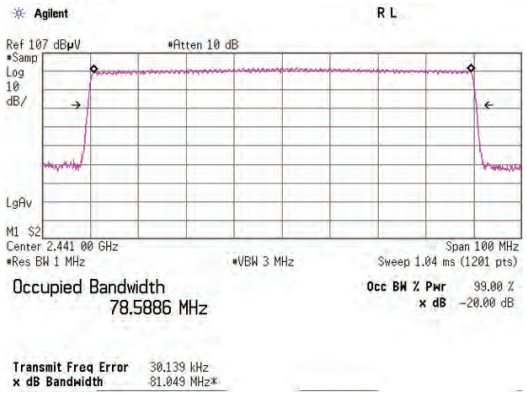
Tx, 2480MHz

Tx3_99OBW



Tx, Hopping On

Tx2_Hopping99OBW



Tx2_Inquiry99OBW

Tx2_InqHopping99OBW

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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)
SPM-06	Power Meter	Anritsu	ML2495A	0850009	AT	2012/04/19 * 12
SPSS-03	Power sensor	Anritsu	MA2411B	0917063	AT	2012/04/19 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2011/12/05 * 12
SAT10-10	Attenuator	Weinschel Corp.	54A-10	37584	AT	2012/04/06 * 12
SAT20-03	Attenuator	Agilent	8493C-020	74891	AT	2012/03/12 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2012/03/12 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2012/03/26 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	1440491	RE	2011/07/19 * 12
SCC-G03	Coaxial Cable	Suhner	SUCOFLEX 104A	46499/4A	RE	2012/04/10 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2012/05/22 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2011/08/28 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2012/02/06 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2012/02/16 * 12
SJM-10	Measure	PROMART	SEN1935	-	RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE,CE, RFI,MF)	-	RE	-
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2011/12/27 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2011/12/27 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM3640	RE	2012/03/30 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2012/03/12 * 12
SCC-G17	Coaxial Cable	Suhner	SUCOFLEX 104A	46291/4A	RE	2012/03/12 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2012/03/16 * 12
SAF-02	Pre Amplifier	SONOMA	310N	290212	RE	2012/02/10 * 12
SAT6-02	Attenuator	JFW	50HF-006N	-	RE	2012/02/10 * 12
KAT3-11	Attenuator	JFW IND. INC.	50HF-003N	-	RE	2011/08/30 * 12
SBA-02	Biconical Antenna	Schwarzbeck	BBA9106	91032665	RE	2011/11/16 * 12
SCC-B1/B3/B5 /B7/B8/B13/S RSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-270(RF Selector)	RE	2012/04/10 * 12
SCC-B2/B4/B6 /B7/B8/B13/S RSE-02	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhne r/Suhner/Suhner/Suhn er/TOYO	8D2W/12DSFA/14 1PE/141PE/141PE /141PE/NS4906	-/0901-270(RF Selector)	RE	2012/04/10 * 12
SLA-02	Logperiodic Antenna	Schwarzbeck	UHALP9108A	UHALP 9108-A 0893	RE	2011/11/16 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2012/02/06 * 12
STR-02	Test Receiver	Rohde & Schwarz	ESCI	100575	RE	2011/08/04 * 12
SJM-02	Measure	KOMELON	KMC-36	-	RE	-
SAEC-02(NSA)	Semi-Anechoic Chamber	TDK	SAEC-02(NSA)	2	RE	2011/09/25 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2012/03/12 * 12
SCC-G02	Coaxial Cable	Suhner	SUCOFLEX 104A	46498/4A	RE	2012/04/10 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2012/05/22 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2011/08/28 * 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 .

ll 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 test