

APPLICATION FOR CERTIFICATION

On Behalf of

LG Electronics Inc.

Bluetooth Adapter Card

Model No.: MB8811C1

FCC ID: BEJ9QK-DMMB8811C1

IC: 2703H-DMMB8811C1

Brand : LG

Prepared for : LG Electronics Inc.

222, LG-ro, Jinwi-myeon,
Pyeongtaek-si, Gyeonggi-do, 451-713,
Korea

Prepared by : AUDIX Technology Corporation

EMC Department
No. 53-11, Dingfu, Linkou Dist.,
New Taipei City 244, Taiwan

Tel : (02) 2609-9301, 2609-2133

Fax: (02) 2609-9303

File Number : C1M1410236

Report Number : EM-F140696

Date of Test : 2014. 11. 04 ~ 07

Date of Report : 2014. 11. 07

TABLE OF CONTENTS

Description	Page
TEST REPORT CERTIFICATION	4
1. DESCRIPTION OF REVISION HISTORY.....	5
2. GENERAL INFORMATION	6
2.1. Description of Device (EUT).....	6
2.1. Antenna Information.....	6
2.2. Tested Supporting System Details	7
2.3. Description of Test Facility	7
2.4. Measurement Uncertainty	8
3. CONDUCTED EMISSION MEASUREMENT.....	9
3.1. Test Equipment.....	9
3.2. Block Diagram of Test Setup.....	9
3.3. Powerline Conducted Emission Limit §15.207, Class B, RSS-Gen §7.2.2/Table 2]	9
3.4. Operating Condition of EUT	10
3.5. Test Procedure	10
3.6. Powerline Conducted Emission Measurement Results.....	10
4. RADIATED EMISSION MEASUREMENT	13
4.1. Test Equipment.....	13
4.2. Test Setup	13
4.3. Radiated Emission Limits (§15.209, RSS-210 §2.7/Table 2).....	15
4.4. Operating Condition of EUT	15
4.5. Test Procedure	16
4.6. Test Results.....	17
5. DUTY CYCLE CORRECTION FACTOR.....	25
5.1. Test Equipment.....	25
5.2. Block Diagram of Test Setup.....	25
5.3. Test Results.....	25
6. 6dB BANDWIDTH MEASUREMENT	27
6.1. Test Equipment.....	27
6.2. Block Diagram of Test Setup.....	27
6.3. Specification Limits [§15.247(a)(2), RSS-210 §A8.2 (a)]	27
6.4. Operating Condition of EUT	27
6.5. Test Procedure	27
6.6. Test Results.....	28
7. MAXIMUM PEAK OUTPUT POWER MEASUREMENT	31
7.1. Test Equipment.....	31
7.2. Block Diagram of Test Setup.....	31
7.3. Specification Limits [§15.247(b)-(3), RSS-210 §A8.4 (4)].....	31
7.4. Operating Condition of EUT	31
7.5. Test Procedure	31
7.6. Test Results.....	32
8. REFERENCE LEVEL	33
8.1. Test Equipment.....	33
8.2. Block Diagram of Test Setup.....	33
8.3. Operating Condition of EUT	33
8.4. Test Procedure	33
8.5. Test Results.....	33
9. EMISSION LIMITATIONS MEASUREMENT	36

9.1. Test Equipment.....	36
9.2. Block Diagram of Test Setup.....	36
9.3. Specification Limits (§15.247(c), RSS-210 A8.5).....	36
9.4. Operating Condition of EUT	36
9.5. Test Procedure	36
9.6. Test Results.....	36
10. BAND EDGES MEASUREMENT	43
10.1. Test Equipment.....	43
10.2. Block Diagram of Test Setup.....	43
10.3. Specification Limits [§15.247(c), RSS-210 §A8.5].....	43
10.4. Operating Condition of EUT	43
10.5. Test Procedure	43
10.6. Test Results.....	43
11. POWER SPECTRAL DENSITY MEASUREMENT	45
11.1. Test Equipment.....	45
11.2. Block Diagram of Test Setup.....	45
11.3. Specification Limits [§15.247(d), RSS-210 §A8.2 (b)].....	45
11.4. Operating Condition of EUT	45
11.5. Test Procedure	45
11.6. Test Results.....	45
12. DEVIATION TO TEST SPECIFICATIONS.....	48
13. PHOTOGRAPHS.....	49
13.1. Photos of Conducted Disturbance Measurement.....	49
13.2. Photos of Radiated Measurement at Semi-Anechoic Chamber	50
13.3. Photo of Section RF Conducted Measurement	51
13.4. Photo of Maximum Peak Output Power Measurement	51

TEST REPORT CERTIFICATION

Applicant : LG Electronics Inc.
Manufacturer : LG Electronics Inc.
EUT Description : Bluetooth Adapter Card
FCC ID : BEJ9QK-DMMB8811C1
IC : 2703H-DMMB8811C1
(A) Model No. : MB8811C1
(B) Serial No. : N/A
(C) Brand : LG
(D) Power Supply : DC 3.3V
(E) Test Voltage : DC 3.3V
(Transferred via JIG Board)

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C, Oct. 2013
Industry Canada Rules and Regulations RSS-Gen (Issue 3), December 2010 and
RSS-210 (Issue 8), December 2010
(Canada RSS-210 §Annex 8)
And ANSI C63.4:2003

(FCC CFR 47 Part 15C, §15.205 and §15.207 and §15.209 and §15.247)

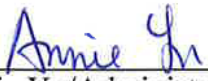
The device described above was tested by AUDIX Technology Corporation to determine the maximum emission levels emanating from the device. The maximum emission levels were compared to the FCC Part 15 subpart B and C and Canada RSS-Gen, RSS-210 limits.

The measurement results are contained in this test report and AUDIX Technology Corporation is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliant with the requirements of FCC and Industry Canada RSS-Gen, RSS-210 standards.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX Technology Corporation.

Date of Test: 2014. 11. 04 ~ 07

Date of Report: 2014. 11. 07

Producer: 
(Annie Yu/Administrator)

Signatory: 
(Ben Cheng/Manager)

1. DESCRIPTION OF REVISION HISTORY

Edition No.	Date of Rev.	Revision Summary	Report No.
0	2014. 11. 07	Original Report	EM-F140696

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Product	Bluetooth Adapter Card
Model Number	MB8811C1
Serial Number	N/A
Brand Name	LG
Applicant	LG Electronics Inc. 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 451-713, Korea
Manufacturer	LG Electronics Inc. 222, LG-ro, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, 451-713, Korea
FCC ID	BEJ9QK-DMMB8811C1
IC	2703H-DMMB8811C1
Fundamental Range	2402MHz ~ 2480MHz
Frequency Channel	BT: 79 channels BLE: 40 channels
Radio Technology	BT: FHSS (GFSK, $\pi/4$ DQPSK, 8-DPSK) BLE: GFSK
Data Transfer Rate	1/2/3Mbps
Date of Receipt of Sample	2014. 10. 30
Date of Test	2014. 11. 04 ~ 07

2.1. Antenna Information

Manufacture	Antenna Type	Peak Gain
MCS LOGIC CO.,LTD	PCB Antenna	1.396dBi

2.2. Tested Supporting System Details

2.2.1. Support Peripheral Unit

No.	Product	Brand	Model No.	Serial No.	FCC ID
1.	Notebook PC (For Conduction Test)	ASUS	U5F	6CN0AG047651	By DoC
2.	Notebook PC	acer	MS2362	N/A	PPD-AAR5B22
3.	JIG Board	N/A	N/A	N/S	N/A

2.2.2. Cable Lists

No.	Cable Description Of The Above Support Units
1.	Adapter: DELTA, M/N SADP-65KB B, Cord: Non-Shielded, Detachable, 1.8m Power Cord: Non-Shielded, Undetachable, 1.8m
2.	Adapter: Chicony, M/N CPA09-A065N1, Cord: Non-Shielded, Detachable, 1.8m Power Cord: Shielded, Undetachable, 1.8m
3.	USB Cable: Non-Shielded, Detachable, 0.55m Bus Cable: Non-Shielded, Detachable, 0.20m

2.3. Description of Test Facility

Name of Firm : **AUDIX Technology Corporation**
EMC Department
No. 53-11, Dingfu, Linkou Dist.,
New Taipei City 244, Taiwan

Test Site : **No. 8 Shielded Room &**
(C8/Semi-AC) No. 53-11, Dingfu, Linkou Dist.,
New Taipei City 244, Taiwan

Semi-Anechoic Chamber
No. 53-11, Dingfu, Linkou Dist.,
New Taipei City 244, Taiwan
May 11, 2012 Renewal on
Federal Communication Commission
Registration Number: 90993

NVLAP Lab. Code : 200077-0

TAF Accreditation No : 1724

2.4. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Conduction Test	150kHz~30MHz	$\pm 3.43\text{dB}$
Radiation Test (Distance: 3m)	30MHz~300MHz	$\pm 2.91\text{dB}$
	300MHz~1000MHz	$\pm 2.74\text{dB}$
	Above 1GHz	$\pm 5.02\text{dB}$

Remark : Uncertainty = $k u_c(y)$

Test Item	Uncertainty
6dB Bandwidth	$\pm 0.05\text{kHz}$
Maximum peak output power	$\pm 0.33\text{dBm}$
Emission Limitations	$\pm 0.13\text{dB}$
Band edges	$\pm 0.13\text{dB}$
Power spectral density	$\pm 0.13\text{dB}$

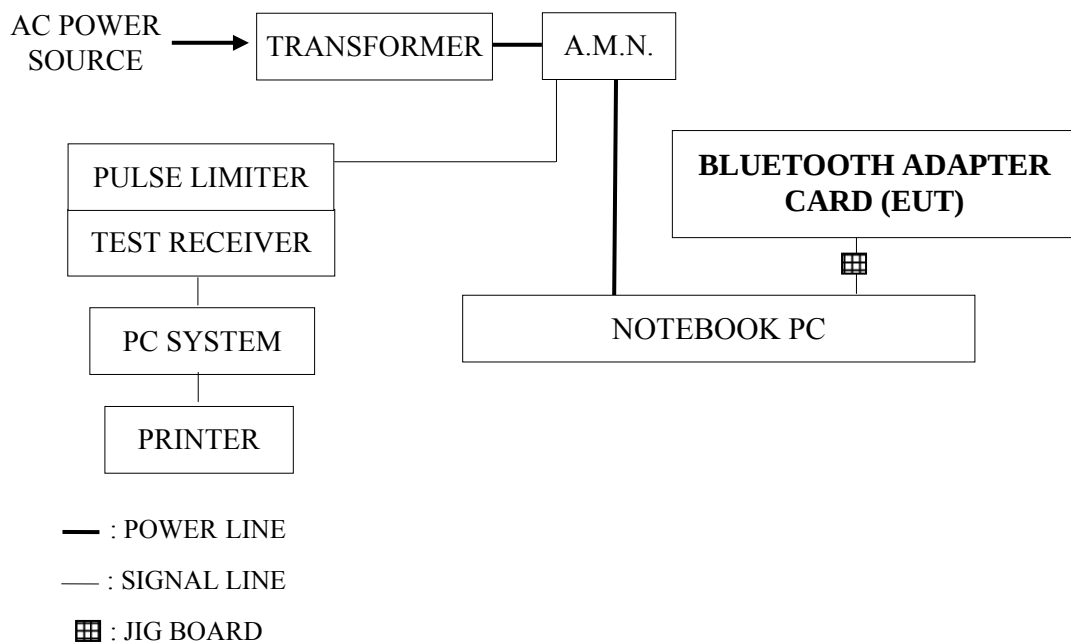
3. CONDUCTED EMISSION MEASUREMENT

3.1. Test Equipment

The following test equipment was used during the powerline conducted emission measurement: (No. 8 Shielded Room)

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Test Receiver	R&S	ESR3	101774	2014. 02. 19	1 Year
2	A.M.N.	R&S	ESH2-Z5	100366	2014. 03. 21	1 Year
3	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2013. 12. 26	1 Year
4	Pulse Limiter	R&S	ESH3-Z2	100354	2014. 01. 18	1 Year

3.2. Block Diagram of Test Setup



3.3. Powerline Conducted Emission Limit §15.207, Class B, RSS-Gen §7.2.2/Table 2]

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dB μ V	56 ~ 46 dB μ V
500kHz ~ 5MHz	56 dB μ V	46 dB μ V
5MHz ~ 30MHz	60 dB μ V	50 dB μ V

- Remark: 1. If the average limit is met when using a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary.
2. The lower limit applies at the band edges.

3.4. Operating Condition of EUT

3.4.1. Set up the EUT as shown on 3.2.

3.4.2. The Notebook PC was running test software “CSR” to set EUT on transmitting and receiving during all testing.

3.5. Test Procedure

The EUT was linked to notebook PC was placed on the table which was above the ground by 80cm and notebook PC’s adapter’s power cord connected to the AC mains through an Artificial Mains Network (A.M.N.). This provided a 50 ohm coupling impedance for the measuring equipment. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions simulators of the interface cables should be manipulated according to ANSI C63.4-2003, RSS-Gen and RSS-210 regulation during conducted measurement.

The bandwidth of the R&S Test Receiver ESR3 was set at 9kHz.

The frequency range from 150kHz to 30MHz was checked.

All the final readings from Test Receiver were measured with the Quasi-Peak detector and Average detector. Remark: If the Average limit is met when using a Quasi-Peak detector, the Average detector is unnecessary)

3.6. Powerline Conducted Emission Measurement Results

PASSED. All emissions not reported below are too low against the prescribed limits.

The EUT was measured during this section testing and all the test results are listed in next pages.

EUT : Bluetooth Adapter Card

M/N : MB8811C1

Test Date : 2014. 11. 07

Temperature : 25°C

Humidity : 45%

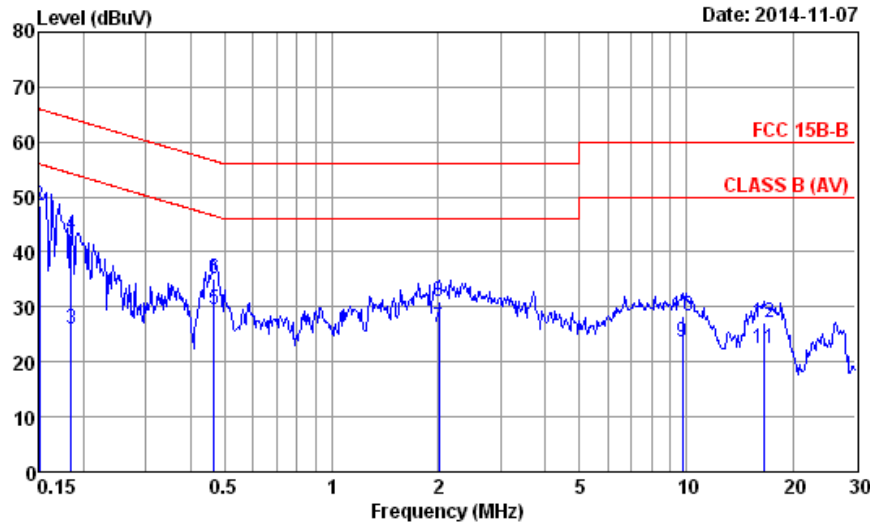
The details are as follows :

Mode	Reference Test Data	
	Neutral	Line
1.	# 2	# 1



AUDIX TECHNOLOGY Corp. EMC Department
No.53-11, Dingfu, Linkou Dist., New Taipei City
244, Taiwan R.O.C.
Tel:+886-2-26092133 Fax:+886-2-26099303
Email:emc@audixtech.com

Data: 2 File: D:\test data\REPORT\2014\C1M1410XXX\C1M1410236-C-D(RF).EM6 (2)



Site no. : No.8 Shielded Room Data no. : 2
Condition : ESH2-Z5 366 Phase : NEUTRAL
Limit : FCC 15B-B
Env. / Ins. : 25°C / 45% ESR3 (1774) Engineer : Hank
EUT : MB8811C1
Power Rating : 120Vac/60Hz
Test Mode : Operating

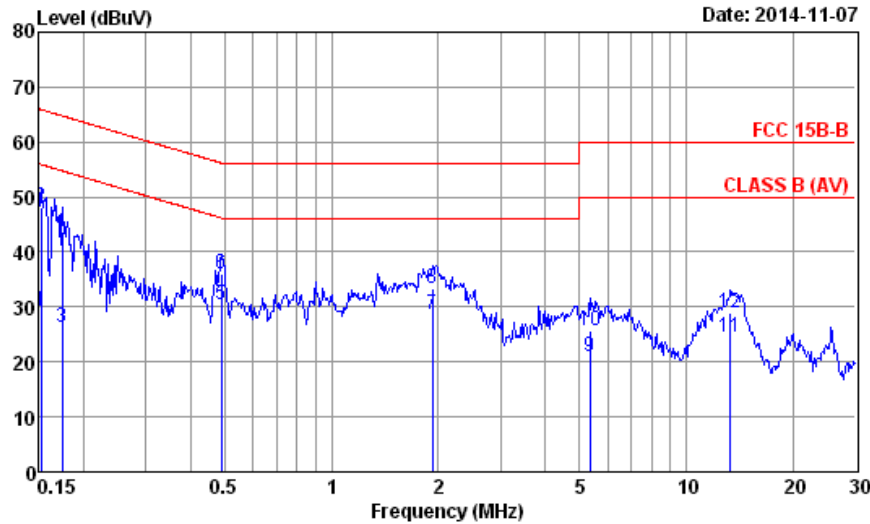
	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
1	0.150	0.21	0.02	9.85	24.45	34.53	55.99	21.46	Average
2	0.150	0.21	0.02	9.85	38.46	48.54	65.99	17.45	QP
3	0.184	0.21	0.03	9.85	15.91	26.00	54.28	28.28	Average
4	0.184	0.21	0.03	9.85	32.91	43.00	64.28	21.28	QP
5	0.466	0.23	0.03	9.85	19.47	29.58	46.58	17.00	Average
6	0.466	0.23	0.03	9.85	24.90	35.01	56.58	21.57	QP
7	2.012	0.25	0.06	9.84	16.24	26.39	46.00	19.61	Average
8	2.012	0.25	0.06	9.84	20.92	31.07	56.00	24.93	QP
9	9.757	0.46	0.14	9.89	13.13	23.62	50.00	26.38	Average
10	9.757	0.46	0.14	9.89	17.90	28.39	60.00	31.61	QP
11	16.486	0.71	0.18	9.92	11.70	22.51	50.00	27.49	Average
12	16.486	0.71	0.18	9.92	16.37	27.18	60.00	32.82	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
2. If the average limit is met when using a quasi-peak detector,
the EUT shall be deemed to meet both limits and measurement
with average detector is unnecessary.



AUDIX TECHNOLOGY Corp. EMC Department
No.53-11, Dingfu, Linkou Dist., New Taipei City
244, Taiwan R.O.C.
Tel: +886-2-26092133 Fax: +886-2-26099303
Email: emc@audixtech.com

Data: 1 File: D:\test data\REPORT\2014\C1M1410XXX\C1M1410236-C-D(RF).EM6 (2)



Site no. : No.8 Shielded Room Data no. : 1
Condition : ESH2-Z5 366 Phase : LINE
Limit : FCC 15B-B
Env. / Ins. : 25°C / 45% ESR3 (1774) Engineer : Hank
EUT : MB8811C1
Power Rating : 120Vac/60Hz
Test Mode : Operating

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
1	0.152	0.18	0.02	9.85	19.23	29.28	55.91	26.63	Average
2	0.152	0.18	0.02	9.85	38.05	48.10	65.91	17.81	QP
3	0.174	0.18	0.03	9.85	16.36	26.42	54.77	28.35	Average
4	0.174	0.18	0.03	9.85	33.68	43.74	64.77	21.03	QP
5	0.489	0.20	0.03	9.85	20.29	30.37	46.19	15.82	Average
6	0.489	0.20	0.03	9.85	26.03	36.11	56.19	20.08	QP
7	1.928	0.24	0.06	9.84	18.56	28.70	46.00	17.30	Average
8	1.928	0.24	0.06	9.84	23.12	33.26	56.00	22.74	QP
9	5.333	0.33	0.10	9.86	10.57	20.86	50.00	29.14	Average
10	5.333	0.33	0.10	9.86	15.51	25.80	60.00	34.20	QP
11	13.267	0.53	0.16	9.90	13.90	24.49	50.00	25.51	Average
12	13.267	0.53	0.16	9.90	18.24	28.83	60.00	31.17	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
2. If the average limit is met when using a quasi-peak detector,
the EUT shall be deemed to meet both limits and measurement
with average detector is unnecessary.

4. RADIATED EMISSION MEASUREMENT

4.1. Test Equipment

The following test equipment was used during the radiated emission measurement:

4.1.1. For Frequency Range 30MHz~1000MHz (at Semi-Anechoic Chamber)

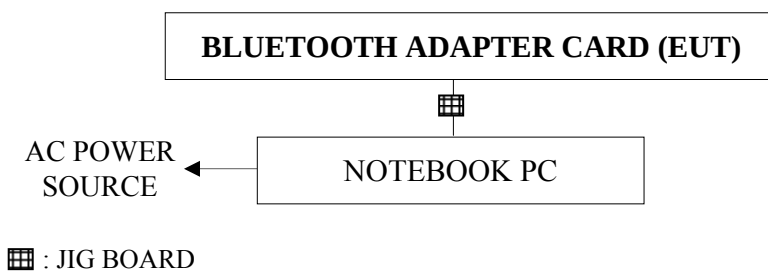
Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9010A-503	MY52220119	2014. 06. 25	1 Year
2	Test Receiver	R & S	ESCS30	100338	2014. 06. 24	1 Year
3	Amplifier	HP	8447D	2944A06305	2014. 02. 19	1 Year
4	Bilog Antenna	TESEQ	CBL6112D	33821	2014. 08. 02	1 Year

4.1.2. For Frequency Above 1GHz (at Semi-Anechoic Chamber)

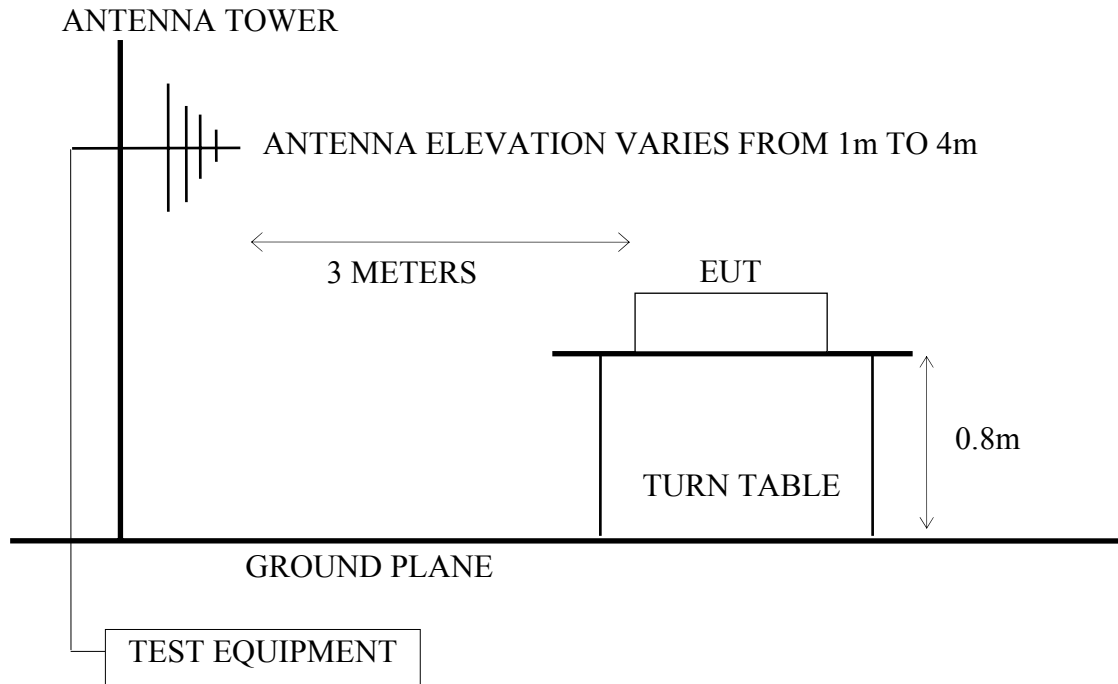
Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9030A-544	US51350140	2014. 06. 25	1 Year
2	Test Receiver	R & S	ESCS30	100338	2014. 06. 24	1 Year
3	Amplifier	Agilent	8449B	3008A02676	2014. 02. 21	1 Year
4	2.4GHz Notch Filter	K&L	7NSL10-2441 .5E130.5-00	1	2014. 06. 12	1 Year
5	3G High Pass Filter	Microwave Circuits	H3G018G1	484796	2014. 06. 12	1 Year
6	Horn Antenna	EMCO	3115	9609-4927	2014. 06. 17	1 Year
7	Horn Antenna	EMCO	3116	2653	2014. 10. 10	1 Year

4.2. Test Setup

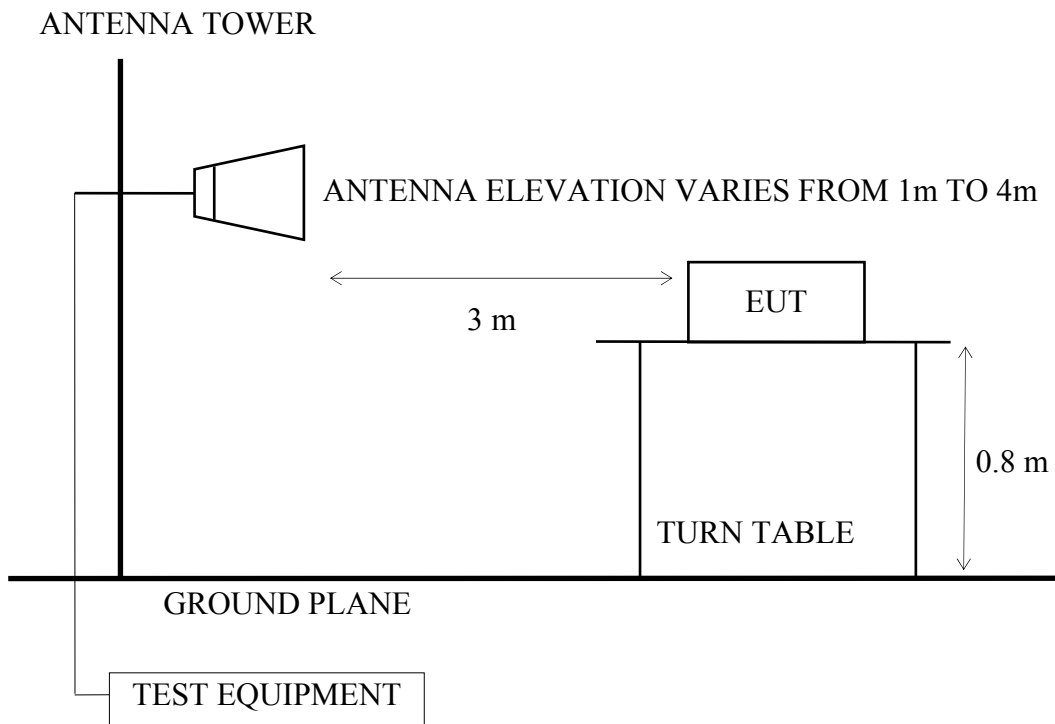
4.2.1. Block Diagram of connection between EUT and simulators



4.2.2. Semi-Anechoic Chamber (3m) Setup Diagram for 30-1000MHz



4.2.3. Semi-Anechoic Chamber (3m) Setup Diagram for above 1GHz



4.3. Radiated Emission Limits (§15.209, RSS-210 §2.7/Table 2)

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMITS	
		$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0
Above 1000	3	74.0 $\text{dB}\mu\text{V/m}$ (Peak) 54.0 $\text{dB}\mu\text{V/m}$ (Average)	

Remark : (1) Emission level ($\text{dB}\mu\text{V/m}$) = $20 \log$ Emission level ($\mu\text{V/m}$)

(2) The tighter limit applies at the edge between two frequency bands.

(3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

(4) The limits in this table are based on CFR 47 Part 15.205(a)(b) and Part 15.209 (a).

(5) The over 1GHz limit, FCC limit is used based on CFR 47 Part 15.35(b) and Part 15.205(b) & Part 15.209(e) and Part 15.207(c).

4.4. Operating Condition of EUT

4.4.1. Set up the EUT as shown on 4.2.

4.4.2. The Notebook PC was running test software “CSR” to set EUT on transmitting and receiving during all testing.

4.4.3. The EUT set to continuously transmit signals at 2402MHz, 2440MHz and 2480MHz and receiving signal at 2440MHz during all test time.

4.5. Test Procedure

The EUT and its simulators were placed on a turn table which was 0.8 meter above the ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. EUT was set 3 meters away from the receiving antenna which was mounted on an antenna tower. The antenna moved up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna such as bilog antenna or horn antenna were used as a receiving antenna. Both horizontal and vertical polarization of the antenna were set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4-2003, RSS-Gen and RSS-210 regulation.

The bandwidth of the R&S Test Receiver ESCS30 was set at 120kHz. (For 30MHz to 1000MHz)

The resolution bandwidth and video bandwidth of test spectrum analyzer is 1MHz for peak detection (PK) at frequency above 1GHz.

The resolution bandwidth of test spectrum analyzer is 1MHz and the video bandwidth is 10Hz for average detection (AV) at frequency above 1GHz.

The frequency range from 30MHz to 25GHz (Up to 10th harmonics from fundamental frequency) was checked. 30MHz to 1000MHz was measured with Quasi-Peak detector. Pursuant to ANSI 4.2.2, peak detector is an alternate option for frequency from 30MHz to 1000MHz.

Above 1GHz was measured with peak and average detector. For frequency from 1GHz to 25GHz, we checked it in 1 meter distance and with a shorter cable 2 meter instead of original's. There is no signal exist.

Pursuant to ANSI C63.4 8.3.1.2, when peak value complies with the average limit, we didn't perform measurement in average detector.

4.6. Test Results

PASSED.

(All emissions not reported for there is no emission be found.)

EUT: Bluetooth Adapter Card

M/N: MB8811C1

Test Date: 2014. 11. 04 Temperature: 22°C Humidity: 51%

For Frequency Range 30MHz~1000MHz:

The EUT emitted the fundamental frequency with data code at the stand, side and lying conditions.

The EUT select **worst position “lying”** and with following test modes was performed during this section testing and all the test results are listed in section 4.6.1.

Mode	Channel	Frequency	Test Mode	Reference Test Data	
				Horizontal	Vertical
1.	CH 0	2402MHz	Transmit	# 2	# 1
2.	CH 19	2440MHz		# 4	# 3
3.	CH 39	2480MHz		# 6	# 5

* Above all final readings were measured with Peak detector.

For Frequency above 1GHz:

The emissions (up to 25GHz) not reported are too low to be measured.

For Restricted Bands:

The EUT was tested in restricted bands and all the test results are listed in section 4.6.2. (The restricted bands defined in part 15.205(a))

Mode	Channel	Frequency	Test Mode	Reference Test Data No.	
				Horizontal	Vertical
1	CH 0	2402MHz	Transmit	# 2	# 1
2	CH 39	2480MHz		# 4	# 3

4.6.1. For 30-1000MHz Frequency Range Measurement Results

Bluetooth Low Energy, Transmit, Frequency: 2402MHz

Site no. : Audix NO.1 Chamber
 Dis. / Ant. : 3m CBL6112D 33821
 Limit : 30M-1G
 Env. / Ins. : 22°C / 51% N9010A
 EUT : MB8811C1
 Power Rating : DC 3.3V
 Test Mode : Tx 2402MHz

Data no. : 2
 Ant. pol. : HORIZONTAL
 Engineer : Johnny_Hsueh

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Remark
1	268.62	12.68	4.46	20.54	37.68	46.00	8.32	Peak
2	400.54	15.56	5.66	17.07	38.29	46.00	7.71	Peak
3	528.58	17.37	6.46	5.40	29.23	46.00	16.77	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : Audix NO.1 Chamber
 Dis. / Ant. : 3m CBL6112D 33821
 Limit : 30M-1G
 Env. / Ins. : 22°C / 51% N9010A
 EUT : MB8811C1
 Power Rating : DC 3.3V
 Test Mode : Tx 2402MHz

Data no. : 1
 Ant. pol. : VERTICAL
 Engineer : Johnny_Hsueh

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Remark
1	277.35	12.81	4.51	16.16	33.48	46.00	12.52	Peak
2	455.83	16.38	6.12	13.44	35.94	46.00	10.06	Peak
3	576.11	18.03	6.49	6.31	30.83	46.00	15.17	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 2. The emission levels that are 20dB below the official limit are not reported.

Bluetooth Low Energy, Transmit, Frequency: 2440MHz

Site no. : Audix NO.1 Chamber
 Dis. / Ant. : 3m CBL6112D 33821
 Limit : 30M-1G
 Env. / Ins. : 22°C / 51% N9010A
 EUT : MB8811C1
 Power Rating : DC 3.3V
 Test Mode : Tx 2441MHz

Data no. : 4
 Ant. pol. : HORIZONTAL
 Engineer : Johnny_Hsueh

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Remark
1	162.89	9.79	3.70	16.32	29.81	43.50	13.69	Peak
2	317.12	13.57	4.84	23.16	41.57	46.00	4.43	Peak
3	629.46	18.45	6.57	1.85	26.87	46.00	19.13	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : Audix NO.1 Chamber
 Dis. / Ant. : 3m CBL6112D 33821
 Limit : 30M-1G
 Env. / Ins. : 22°C / 51% N9010A
 EUT : MB8811C1
 Power Rating : DC 3.3V
 Test Mode : Tx 2441MHz

Data no. : 3
 Ant. pol. : VERTICAL
 Engineer : Johnny_Hsueh

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Remark
1	173.56	9.35	3.79	18.90	32.04	43.50	11.46	Peak
2	455.83	16.38	6.12	11.81	34.31	46.00	11.69	Peak
3	527.61	17.37	6.46	7.90	31.73	46.00	14.27	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 2. The emission levels that are 20dB below the official limit are not reported.

Bluetooth Low Energy, Transmit, Frequency: 2480MHz

Site no. : Audix NO.1 Chamber
 Dis. / Ant. : 3m CBL6112D 33821
 Limit : 30M-1G
 Env. / Ins. : 22°C / 51% N9010A
 EUT : MB8811C1
 Power Rating : DC 3.3V
 Test Mode : Tx 2480MHz

Data no. : 6
 Ant. pol. : HORIZONTAL
 Engineer : Johnny_Hsueh

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Remark
1	310.33	13.40	4.77	19.61	37.78	46.00	8.22	Peak
2	527.61	17.37	6.46	7.19	31.02	46.00	14.98	Peak
3	659.53	18.57	6.63	2.73	27.93	46.00	18.07	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 2. The emission levels that are 20dB below the official limit are not reported.

Site no. : Audix NO.1 Chamber
 Dis. / Ant. : 3m CBL6112D 33821
 Limit : 30M-1G
 Env. / Ins. : 22°C / 51% N9010A
 EUT : MB8811C1
 Power Rating : DC 3.3V
 Test Mode : Tx 2480MHz

Data no. : 5
 Ant. pol. : VERTICAL
 Engineer : Johnny_Hsueh

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Remark
1	332.64	13.99	5.01	20.27	39.27	46.00	6.73	Peak
2	527.61	17.37	6.46	8.27	32.10	46.00	13.90	Peak
3	672.14	18.63	6.66	3.18	28.47	46.00	17.53	Peak

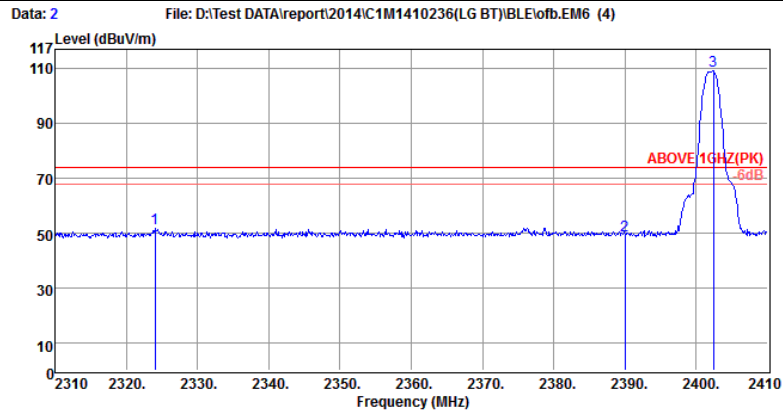
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 2. The emission levels that are 20dB below the official limit are not reported.

4.6.2. Restricted Bands Measurement Results

Date of Test : 2014. 11. 04 Temperature : 22°C

EUT : Bluetooth Adapter Card Humidity : 51%

Test Mode : Bluetooth Low Energy, Transmit, Channel 0, Frequency: 2402MHz



Site no. : Audix NO.1 Chamber Data no. : 2
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
 Limit : ABOVE 1GHZ(PK)
 Env. / Ins. : 22°C / 51% N9010A Engineer : Johnny_Hsueh
 EUT : MB8811C1
 Power Rating : DC 3.3V
 Test Mode : Tx 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2324.04	28.14	5.15	18.57	51.86	74.00	22.14	Peak
2	2390.00	28.20	5.24	15.85	49.29	74.00	24.71	Peak
3	2402.40	28.21	5.26	75.51	108.98	74.00	-34.98	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 2. The emission levels that are 20dB below the official limit are not reported.

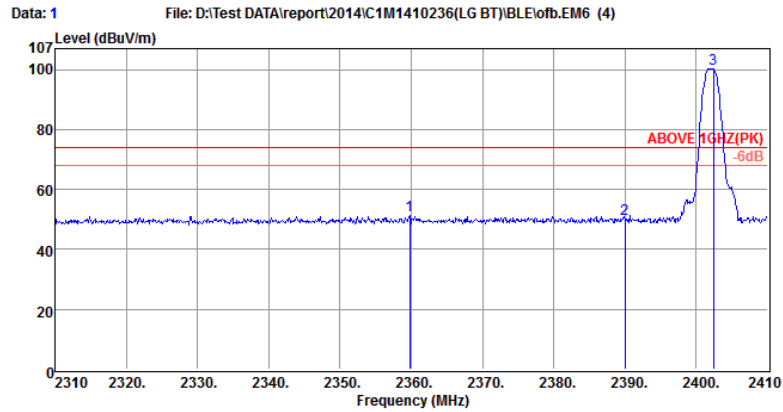
Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2324.04	51.86	-4.134	47.726	54.00	6.274
2390.00	49.29	-4.134	45.156	54.00	8.844

Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on/T})$
 $= 20\log(386\text{ms}/621.3\text{ms}) = -4.134$
 2. Low frequency section (spurious in the restricted band 2310-2420MHz).
 3. Average value = Peak value + Duty Cycle Correction Factor
 4. The pre-amplifier factor has been subtracted by test program actively.

Date of Test : 2014. 11. 04 Temperature : 22°C

EUT : Bluetooth Adapter Card Humidity : 51%

Test Mode : Bluetooth Low Energy, Transmit, Channel 0, Frequency: 2402MHz



Site no. : Audix NO.1 Chamber Data no. : 1
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : ABOVE 1GHZ(PK)
 Env. / Ins. : 22°C / 51% N9010A Engineer : Johnny_Hsueh
 EUT : MB8811C1
 Power Rating : DC 3.3V
 Test Mode : Tx 2402MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2359.80	28.17	5.20	17.93	51.30	74.00	22.70	Peak
2	2390.00	28.20	5.24	16.85	50.29	74.00	23.71	Peak
3	2402.40	28.21	5.26	66.94	100.41	74.00	-26.41	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 2. The emission levels that are 20dB below the official limit are not reported.

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2359.80	51.30	-4.134	47.166	54.00	6.834
2390.00	50.29	-4.134	46.156	54.00	7.844

Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on/T})$
 $= 20\log(386\text{ms}/621.3\text{ms}) = -4.134$

2. Low frequency section (spurious in the restricted band 2310-2420MHz).

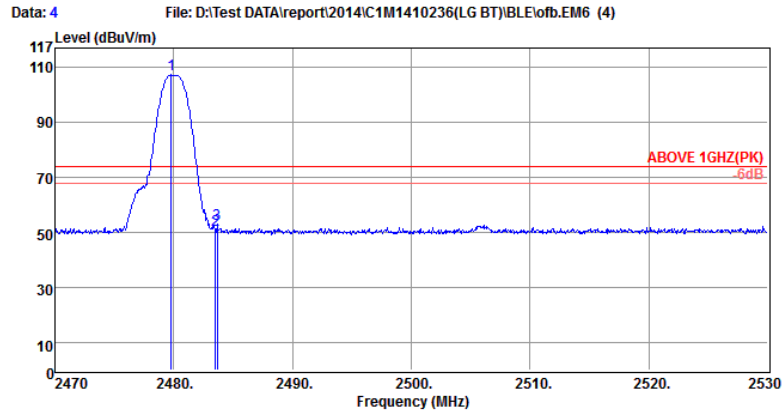
3. Average value = Peak value + Duty Cycle Correction Factor

4. The pre-amplifier factor has been subtracted by test program actively.

Date of Test : 2014. 11. 04 Temperature : 22°C

EUT : Bluetooth Adapter Card Humidity : 51%

Test Mode : Bluetooth Low Energy, Transmit, Channel 39, Frequency: 2480MHz



Site no. : Audix NO.1 Chamber Data no. : 4
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL
 Limit : ABOVE 1GHZ(PK)
 Env. / Ins. : 22°C / 51% N9010A Engineer : Johnny_Hsueh
 EUT : MB8811C1
 Power Rating : DC 3.3V
 Test Mode : Tx 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Remark
1	2479.78	28.28	5.36	73.60	107.24	74.00	-33.24	Peak
2	2483.50	28.29	5.37	17.10	50.76	74.00	23.24	Peak
3	2483.68	28.29	5.37	19.32	52.98	74.00	21.02	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 2. The emission levels that are 20dB below the official limit are not reported.

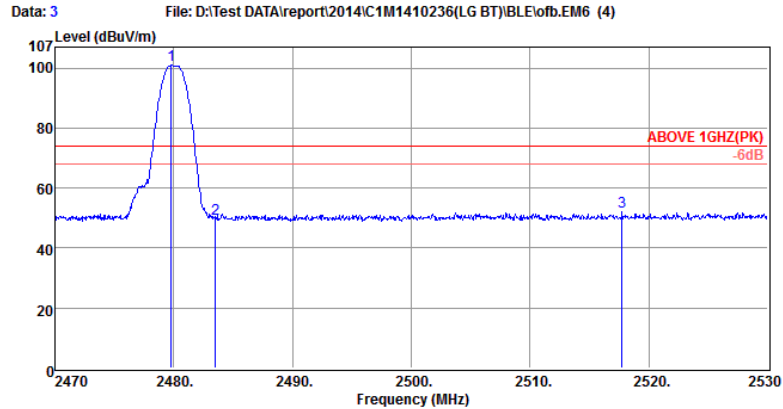
Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2483.50	50.76	-4.134	46.626	54.00	7.374
2483.68	52.98	-4.134	48.846	54.00	5.154

Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on/T})$
 $= 20\log(386\text{ms}/621.3\text{ms}) = -4.134$
 2. Low frequency section (spurious in the restricted band 2310-2420MHz).
 3. Average value = Peak value + Duty Cycle Correction Factor
 4. The pre-amplifier factor has been subtracted by test program actively.

Date of Test : 2014. 11. 04 Temperature : 22°C

EUT : Bluetooth Adapter Card Humidity : 51%

Test Mode : Bluetooth Low Energy, Transmit, Channel 39, Frequency: 2480MHz



Site no. : Audix NO.1 Chamber Data no. : 3
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL
 Limit : ABOVE 1GHZ(PK)
 Env. / Ins. : 22°C / 51% N9010A Engineer : Johnny_Hsueh
 EUT : MB8811C1
 Power Rating : DC 3.3V
 Test Mode : Tx 2480MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1	2479.78	28.28	5.36	67.31	100.95	74.00	-28.95	Peak
2	2483.50	28.29	5.37	16.01	49.67	74.00	24.33	Peak
3	2517.76	28.35	5.42	18.16	51.93	74.00	22.07	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
 2. The emission levels that are 20dB below the official limit are not reported.

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2483.50	49.67	-4.134	45.536	54.00	8.464
2517.76	51.93	-4.134	47.796	54.00	6.204

Remarks: 1. Duty Cycle Correction Factor = $20\log(\text{cumulative on/T})$
 $= 20\log(386\text{ms}/621.3\text{ms}) = -4.134$

2. Low frequency section (spurious in the restricted band 2310-2420MHz).

3. Average value = Peak value + Duty Cycle Correction Factor

4. The pre-amplifier factor has been subtracted by test program actively.

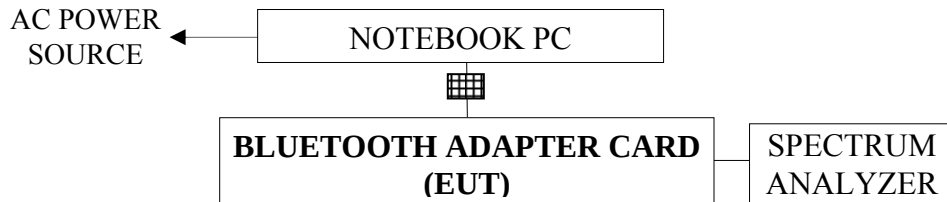
5. DUTY CYCLE CORRECTION FACTOR

5.1. Test Equipment

The following test equipment was used during the duty cycle factor measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2013. 11. 08	1 Year

5.2. Block Diagram of Test Setup

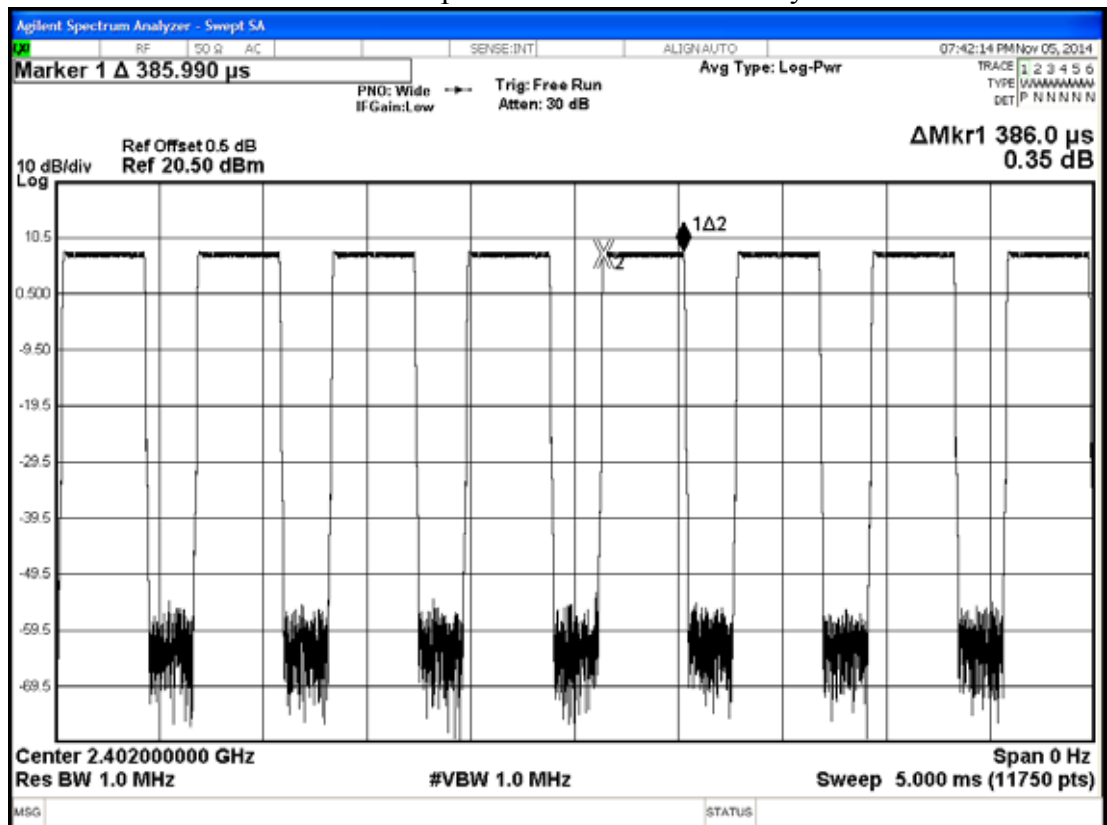


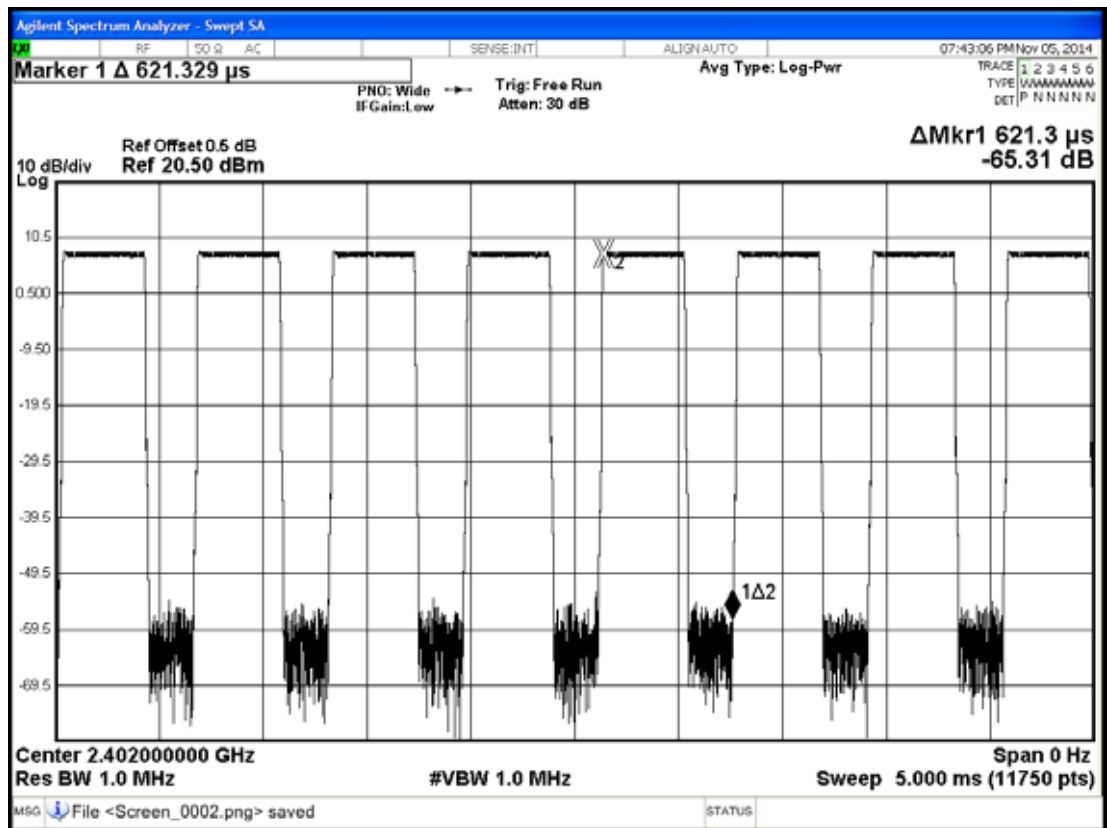
 : JIG BOARD

5.3. Test Results

PASSED.

Test Date: 2014. 11. 05 Temperature : 25°C Humidity : 50%





$$\text{Duty Cycle Factor} = 20 \log(\text{cumulative on}/T) = 20 \log(386/621.3) = -4.134$$

T: The period of the pulse train or 100ms if the pulse train length is greater than 100ms

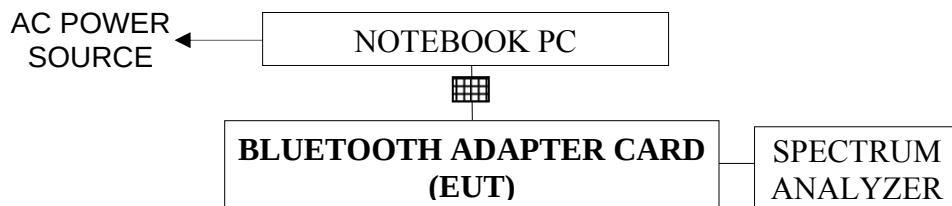
6. 6dB BANDWIDTH MEASUREMENT

6.1. Test Equipment

The following test equipment was used during the Emission Bandwidth measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	R&S	FSV30	101181	2014. 03. 04	1 Year

6.2. Block Diagram of Test Setup



 : JIG BOARD

6.3. Specification Limits [§15.247(a)(2), RSS-210 §A8.2 (a)]

The minimum 6dB bandwidth shall be at least 500kHz.

6.4. Operating Condition of EUT

6.4.1. Set up the EUT as shown on 5.2.

6.4.2. The Notebook PC was running test software “CSR” to set EUT on transmitting and receiving during all testing.

6.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 1.5% EBW, $VBW \geq 3 \times RBW$. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

The measurement guideline was according to 558074 D01 v03r02.

6.6. Test Results

PASSED. All the test results are attached in next pages.

Test Date: 2014. 11. 04 Temperature: 25°C Humidity: 55%

Mode	Type of Network	Channel	Frequency	6dB Bandwidth
1	Bluetooth Low Energy	CH0	2402MHz	0.71430 MHz
2		CH19	2440MHz	0.71430 MHz
3		CH39	2480MHz	0.71430 MHz

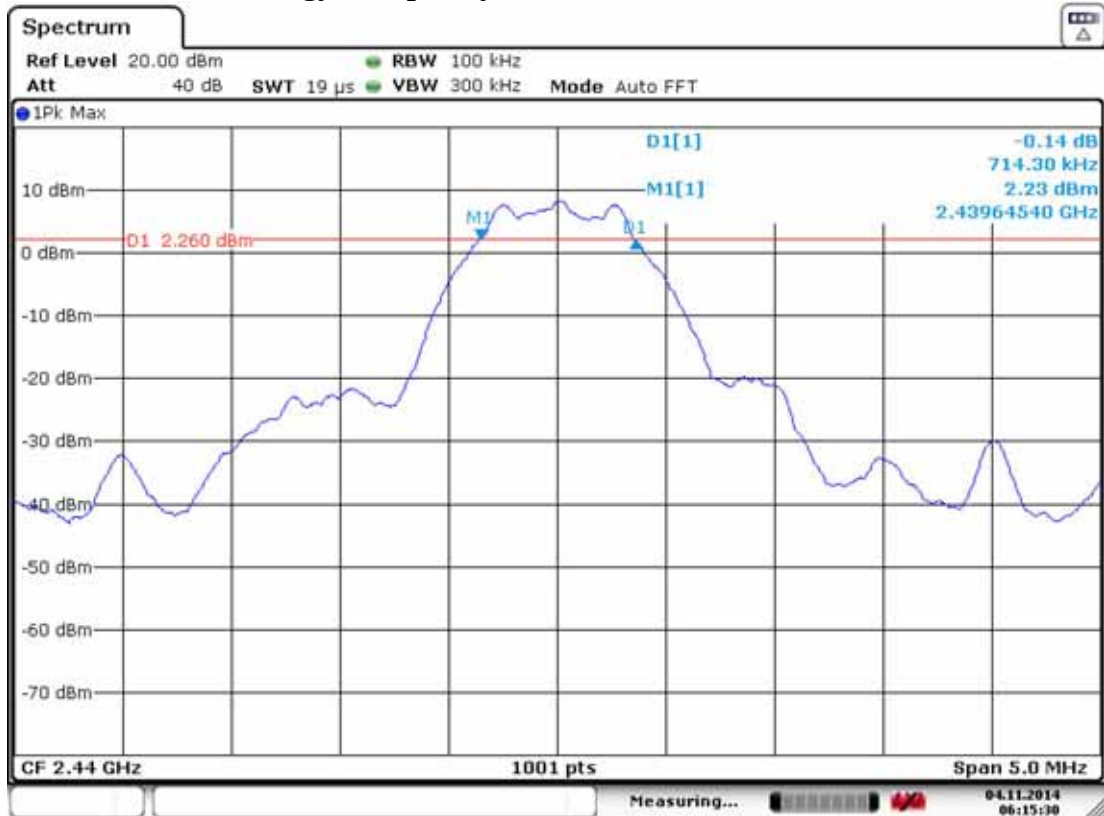
[Limit: least 500kHz]

Bluetooth Low Energy, Frequency: 2402MHz



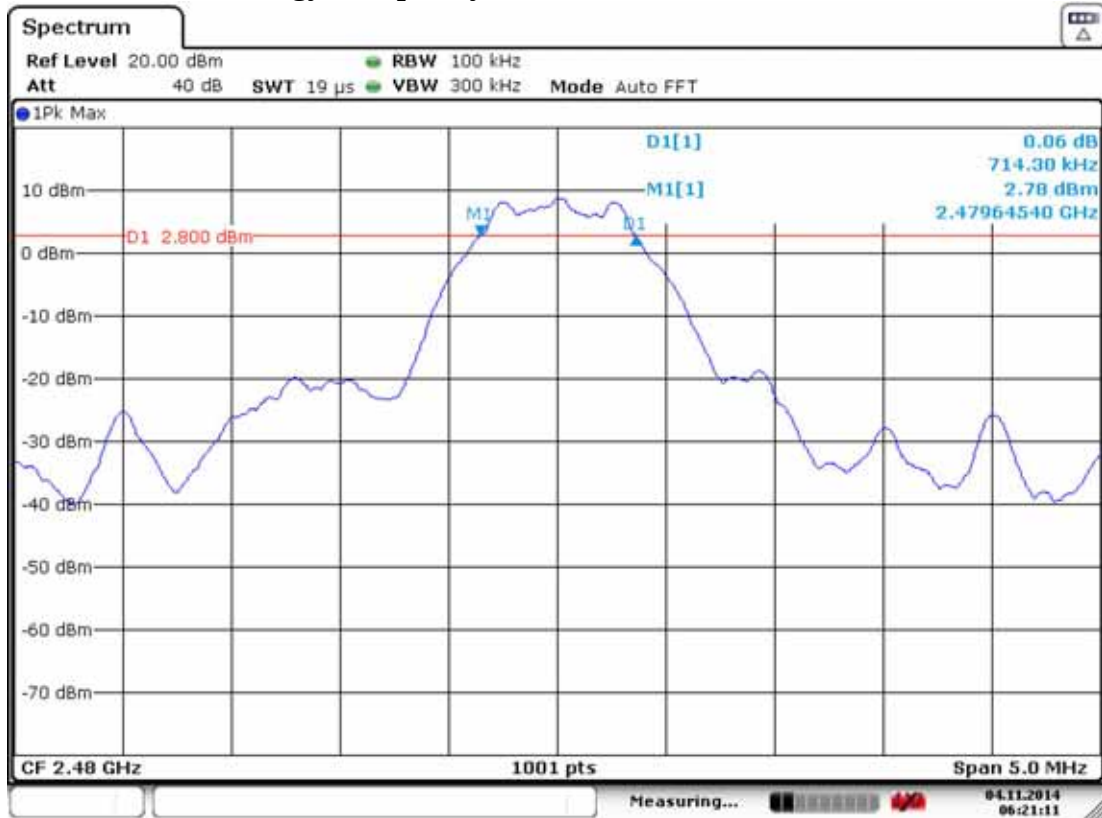
Date: 4.NOV.2014 06:05:28

Bluetooth Low Energy, Frequency: 2440MHz



Date: 4.NOV.2014 06:15:30

Bluetooth Low Energy, Frequency: 2480MHz



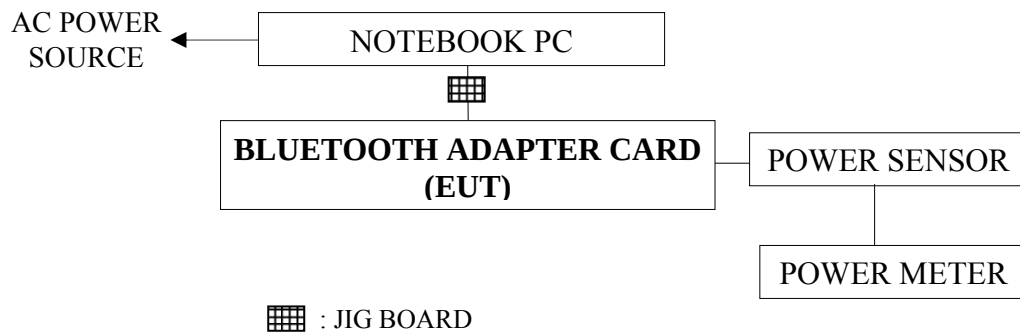
7. MAXIMUM PEAK OUTPUT POWER MEASUREMENT

7.1. Test Equipment

The following test equipment was used during the maximum peak output power measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Power Meter	Power Meter	Anritsu	ML2495A	1145008	2014. 10. 17
2.	Power Sensor	Power Sensor	Anritsu	MA2411B	1126096	2014. 10. 17

7.2. Block Diagram of Test Setup



7.3. Specification Limits [§15.247(b)-(3), RSS-210 §A8.4 (4)]

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5MHz is: 1Watt. (30dBm)

7.4. Operating Condition of EUT

Same as 6dB bandwidth measurement which was listed in section 5.4.

7.5. Test Procedure

The transmitter output was connected to the power sensor and record the reading of power meter.

The measurement guideline was according to 558074 D01 v03r02.

7.6. Test Results

PASSED. All the test results are listed below.

Test Date: 2014. 11. 04 Temperature: 25°C Humidity: 55%

Mode	Type of Network	Channel	Test Frequency	Output Power(dBm)
1	Bluetooth Low Energy	CH0	2402MHz	8.73
2		CH19	2440MHz	8.10
3		CH39	2480MHz	8.69

[Limit: 1Watt. (30dBm)]

8. REFERENCE LEVEL

8.1. Test Equipment

The following test equipment was used during the maximum peak output power measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	R&S	FSV30	101181	2014. 03. 04	1 Year

8.2. Block Diagram of Test Setup

The same as section.5.2

8.3. Operating Condition of EUT

Same as 6dB bandwidth measurement which was listed in section 5.4.

8.4. Test Procedure

The transmitter output was connected to the spectrum analyzer. Set both RBW=100 kHz and VBW to 300kHz with suitable frequency span including 100kHz bandwidth from band edge.

The measurement guideline was according to 558074 D01 v03r02.

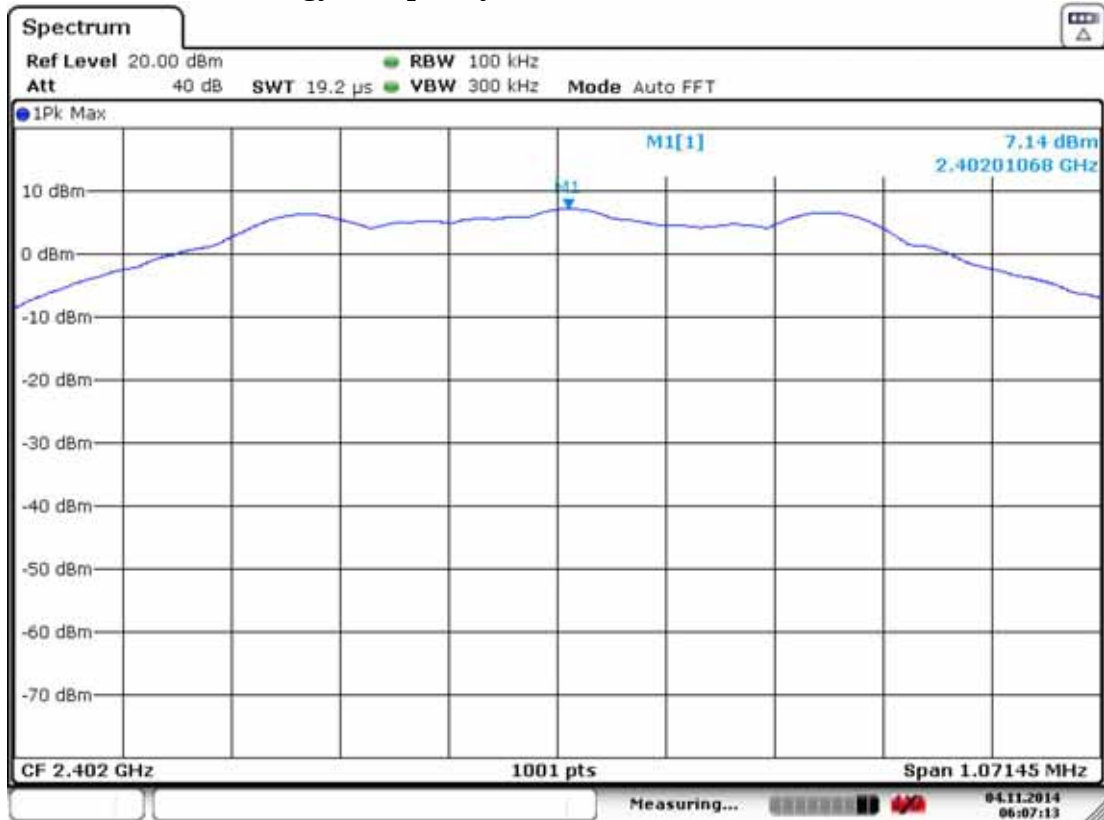
8.5. Test Results

The measurement results presented as reference level were applied to section 9 and 10.

The testing data was attached in the next pages.

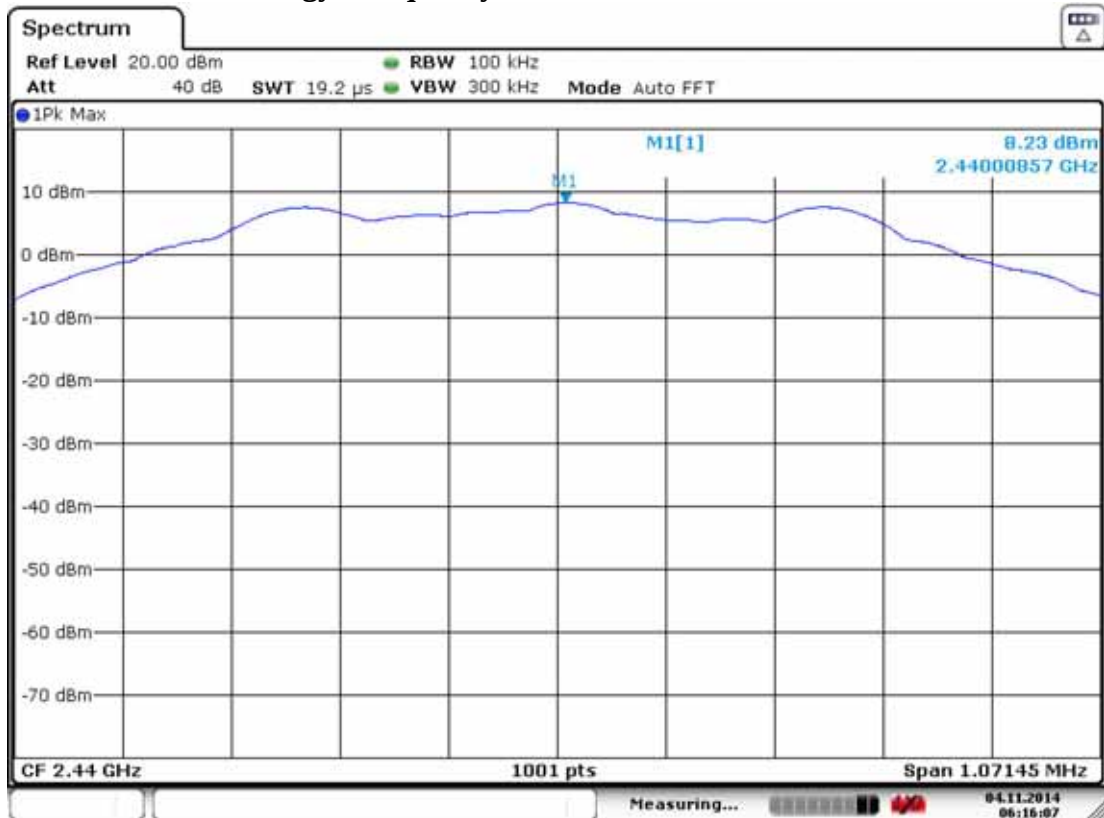
Test Date: 2014. 11. 04 Temperature: 25°C Humidity: 55%

Bluetooth Low Energy, Frequency: 2402MHz



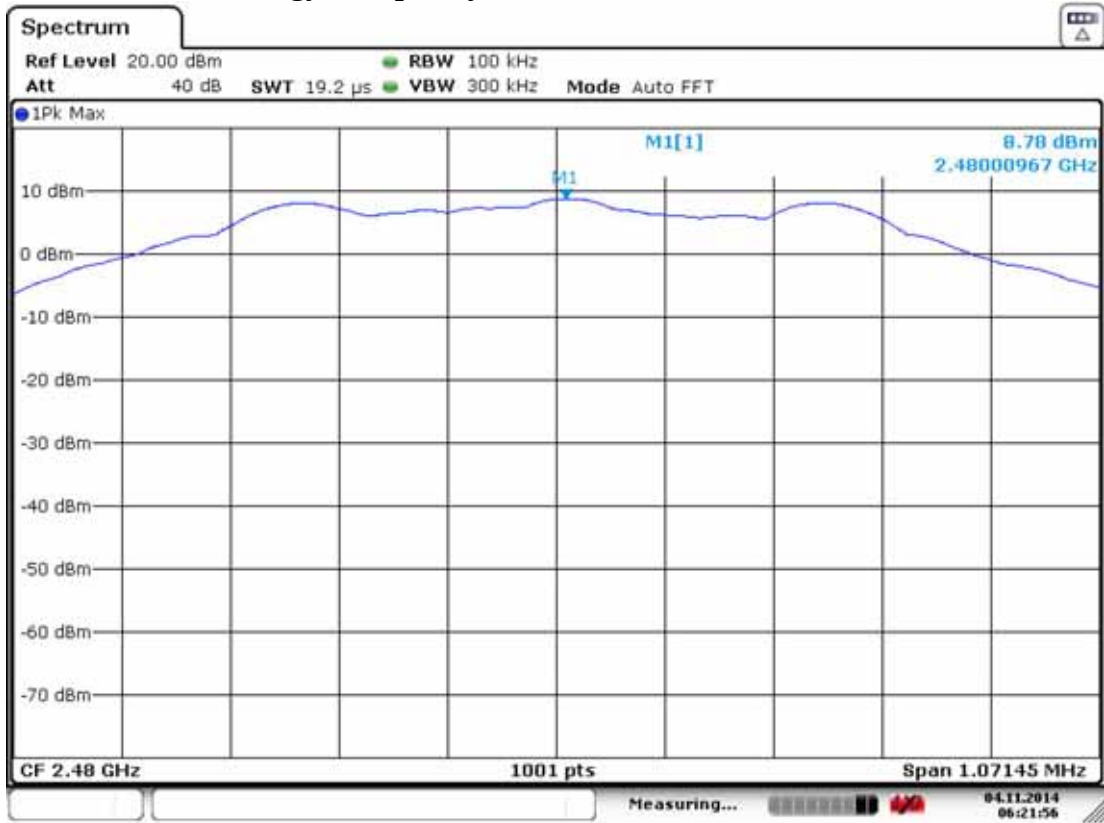
Date: 4.NOV.2014 06:07:13

Bluetooth Low Energy, Frequency: 2440MHz



Date: 4.NOV.2014 06:16:07

Bluetooth Low Energy, Frequency: 2480MHz



Date: 4.NOV.2014 06:21:56

9. EMISSION LIMITATIONS MEASUREMENT

9.1. Test Equipment

The following test equipment was used during the emission limitations test :

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	R&S	FSV30	101181	2014. 03. 04	1 Year

9.2. Block Diagram of Test Setup

The same as section.5.2

9.3. Specification Limits (§15.247(c), RSS-210 A8.5)

9.3.1. In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (See Section 15.205(c)).(※This test result attaching to §4.6.3)

9.3.2. The reference level for determining limit of emission limitations is according to the value measured indicated in plots at section 9.6.

9.4. Operating Condition of EUT

Same as 6dB bandwidth measurement which was listed in section 5.4.

9.5. Test Procedure

The RF output of EUT was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 100kHz RBW and 300kHz VBW.

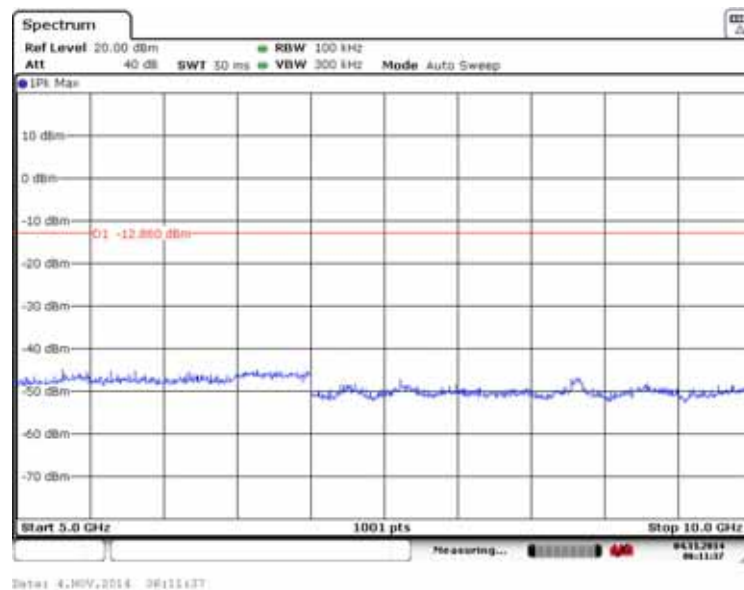
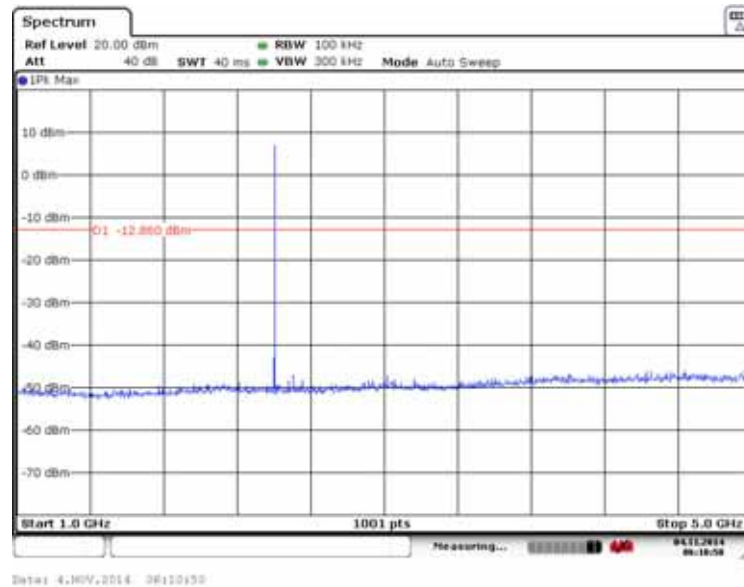
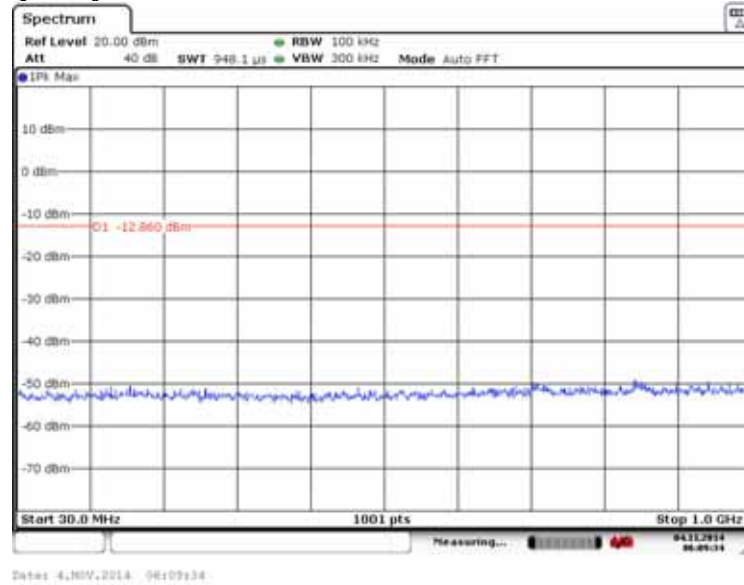
The measurement guideline was according to 558074 D01 v03r02.

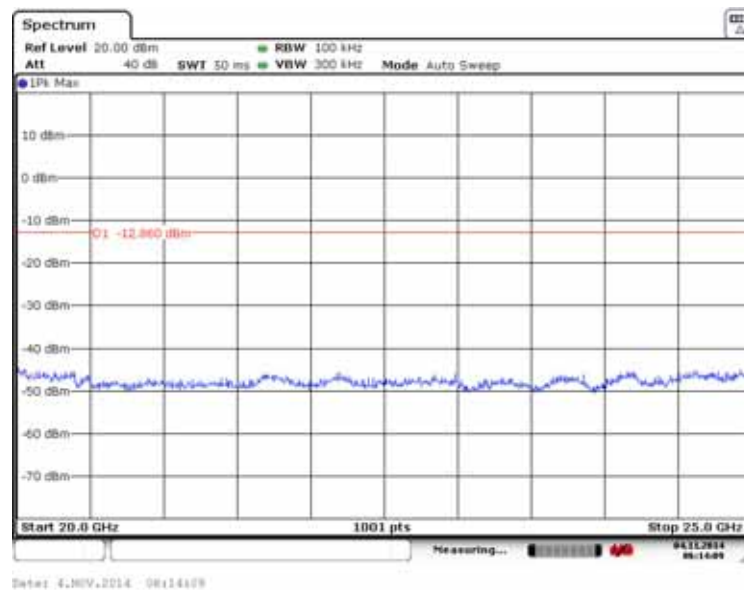
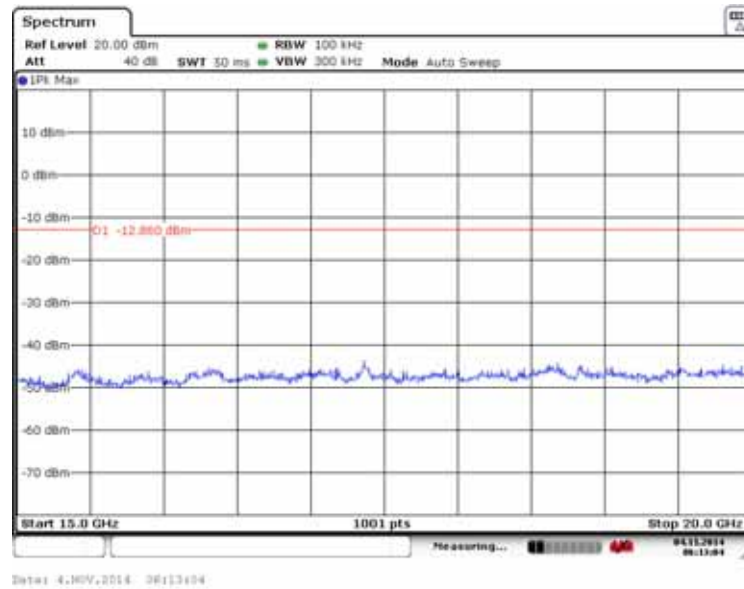
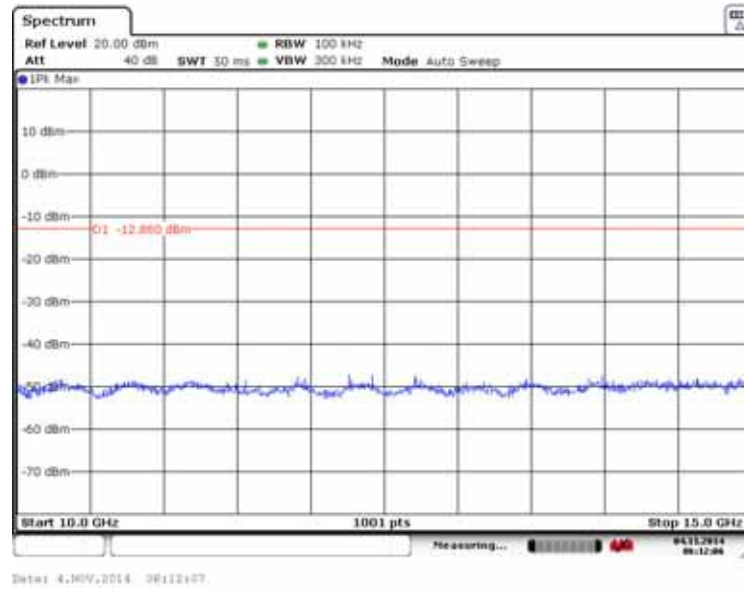
9.6. Test Results

PASSED. The testing data was attached in the next pages.

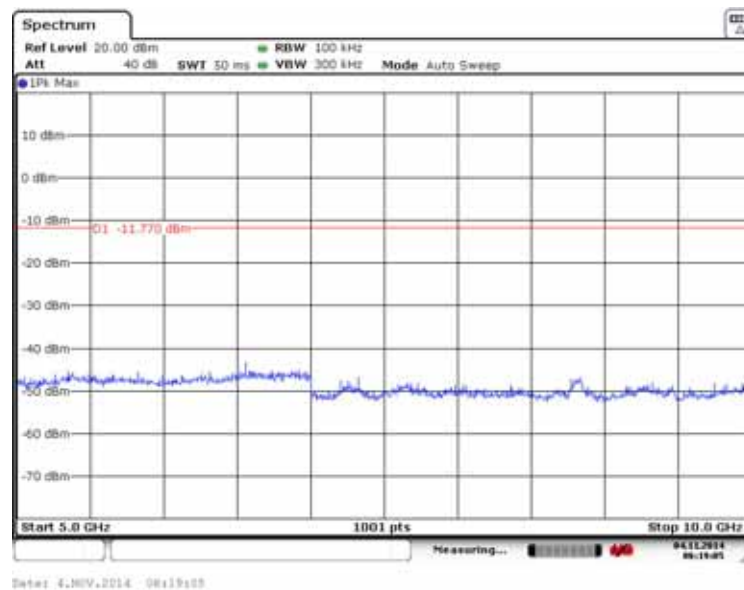
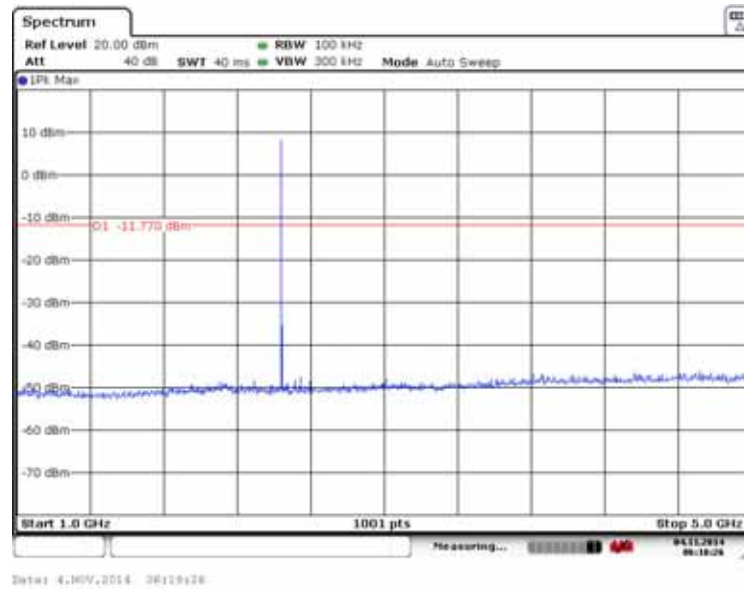
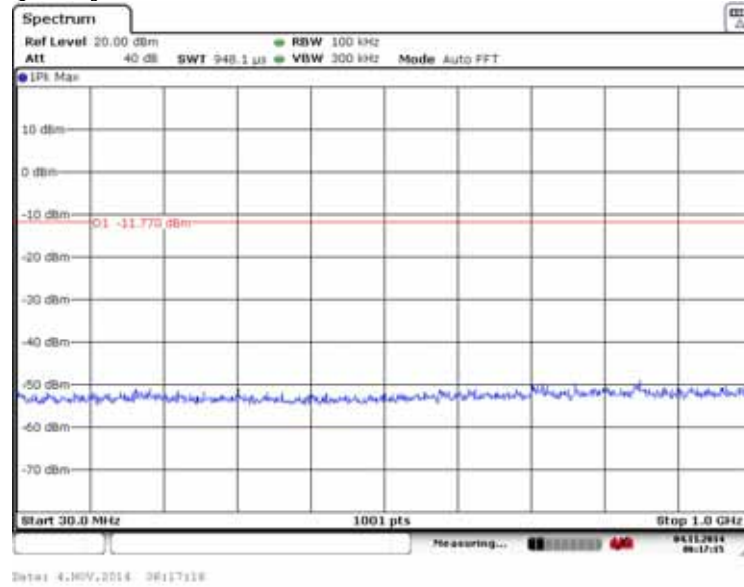
Test Date: 2014. 11. 04 Temperature: 25°C Humidity: 55%

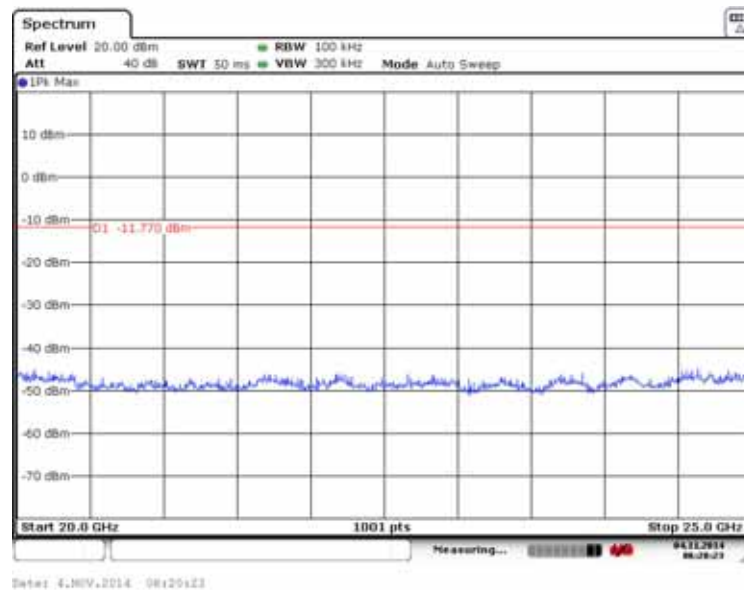
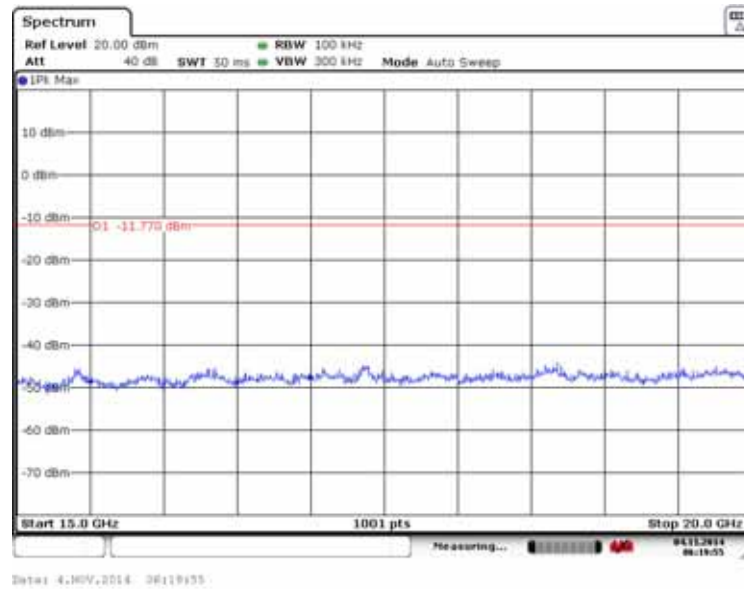
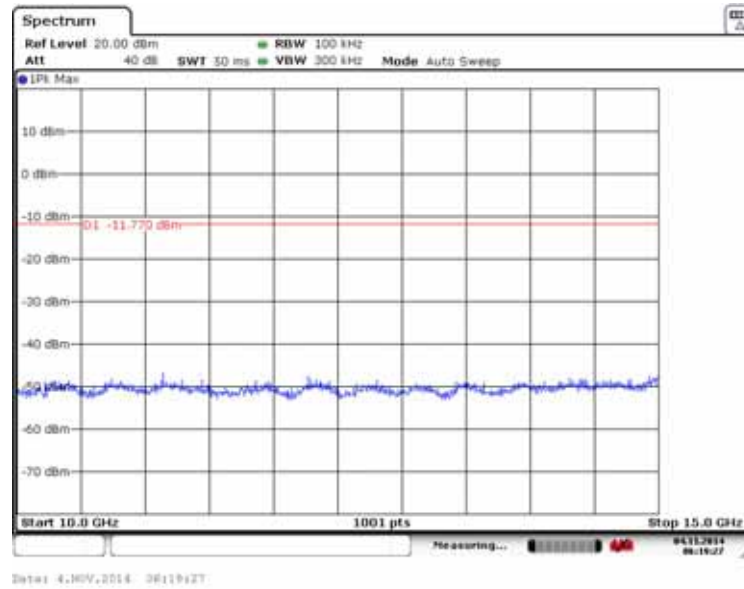
Test Frequency: CH 0, 2402MHz



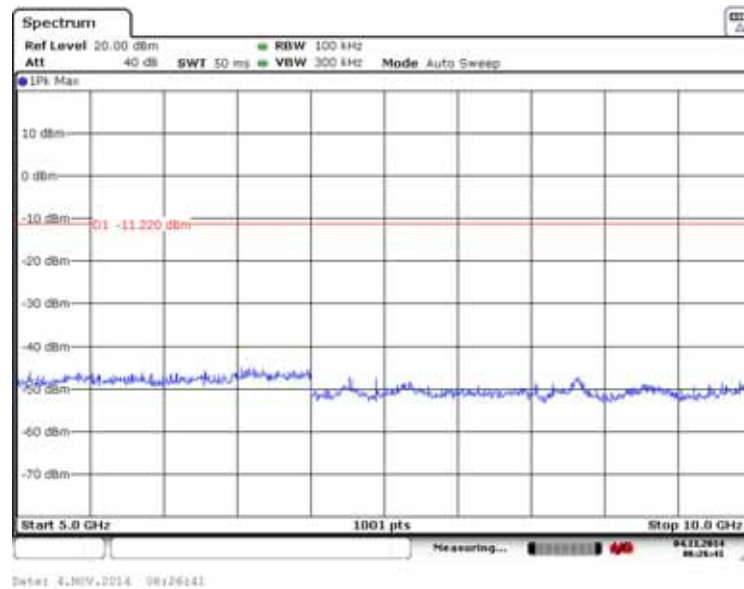
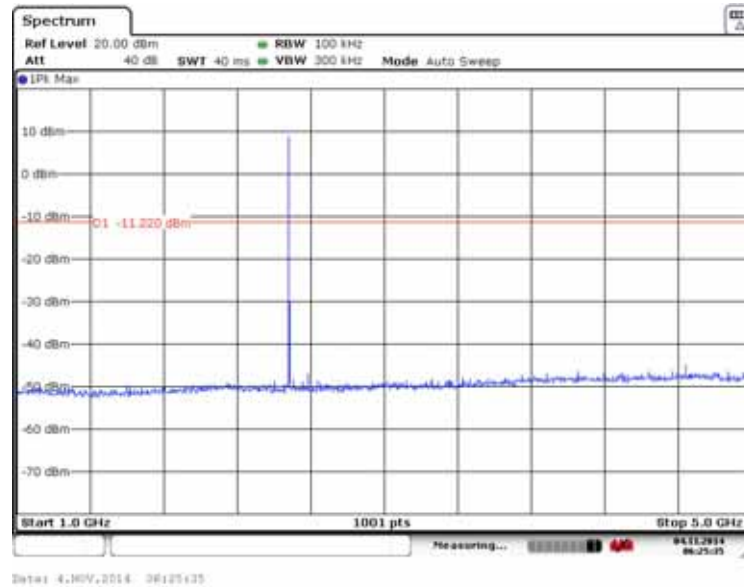
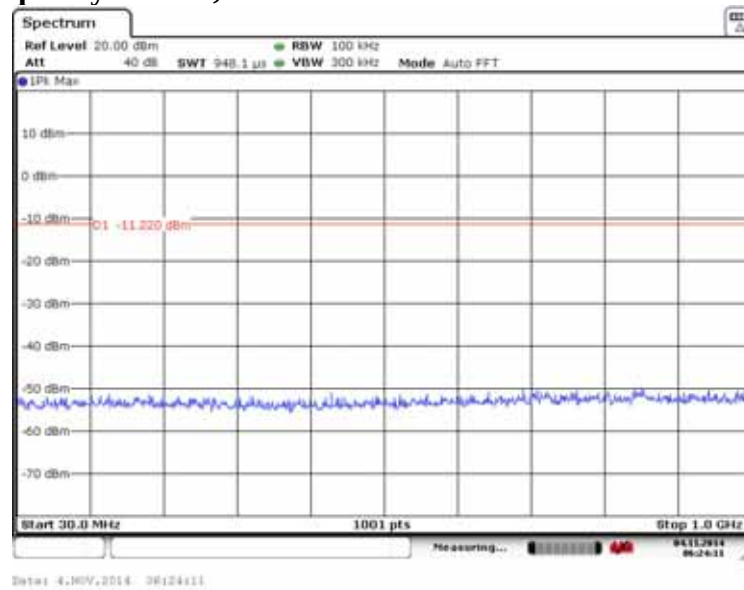


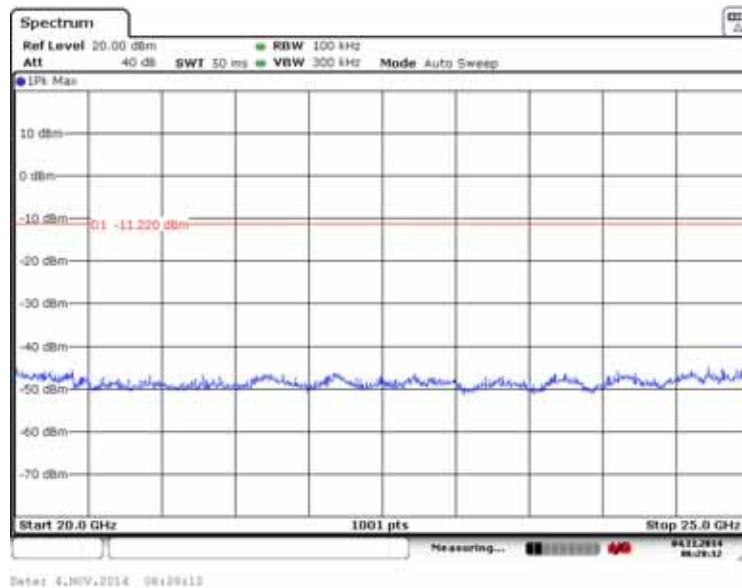
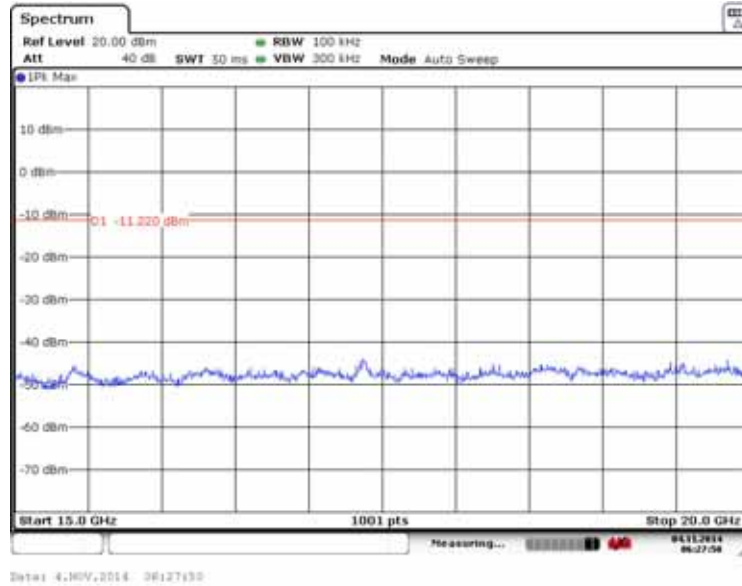
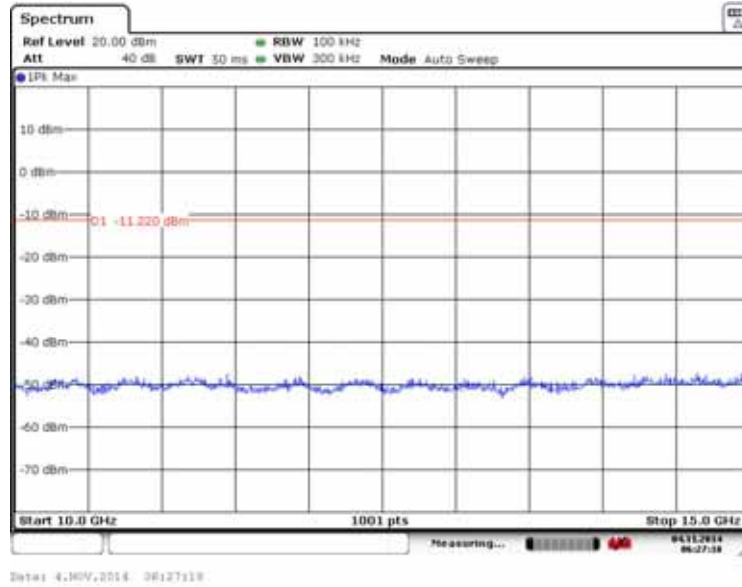
Test Frequency: CH 19, 2440MHz





Test Frequency: CH 39, 2480MHz





10.BAND EDGES MEASUREMENT

10.1.Test Equipment

The following test equipment was used during the band edges measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	R&S	FSV30	101181	2014. 03. 04	1 Year

10.2.Block Diagram of Test Setup

The same as section.5.2.

10.3.Specification Limits [§15.247(c), RSS-210 §A8.5]

10.3.1.In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (See Section 15.205(c)).(※This test result attaching to §4.6.3)

10.3.2. The reference level for determining limit of emission limitations is according to the value measured indicated in plots at section 9.6.

10.4.Operating Condition of EUT

Same as 6dB bandwidth measurement which was listed in section 5.4.

10.5.Test Procedure

The transmitter output was connected to the spectrum analyzer. Set both RBW=100 kHz and VBW to 300kHz with suitable frequency span including 100kHz bandwidth from band edge.

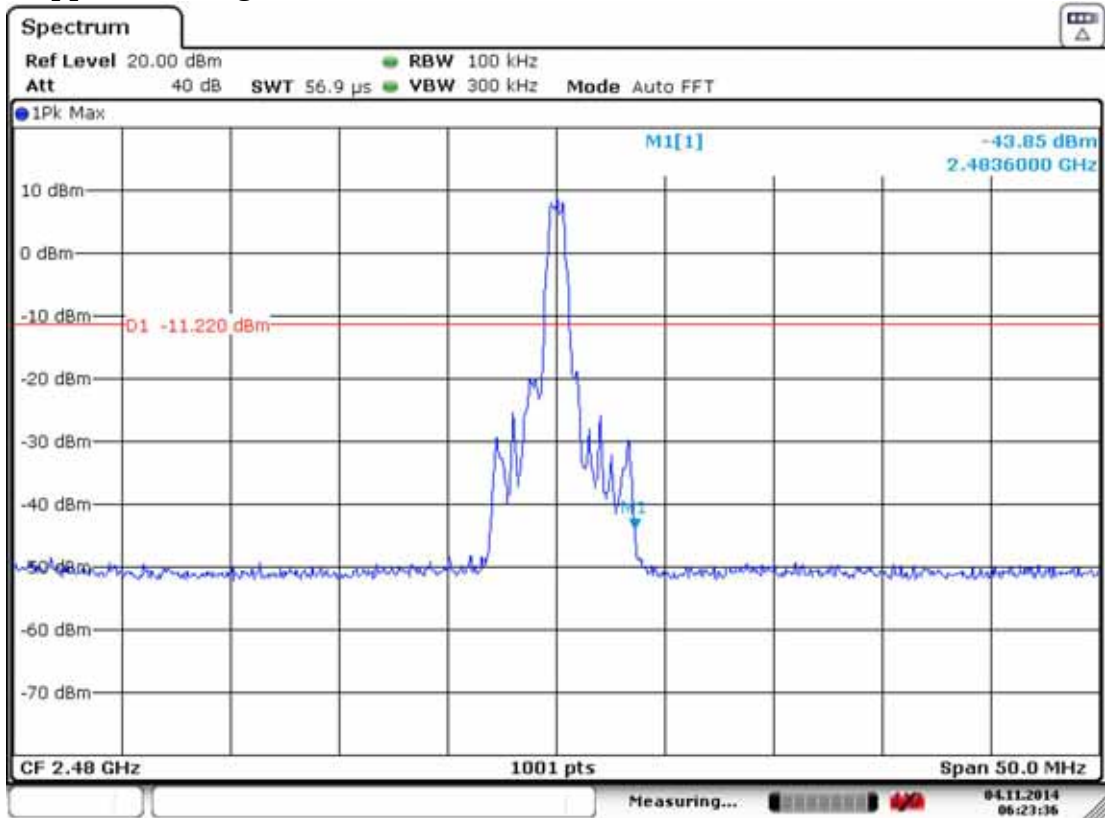
The measurement guideline was according to 558074 D01 v03r02.

10.6.Test Results

PASSED. All the test results are attached in next pages.

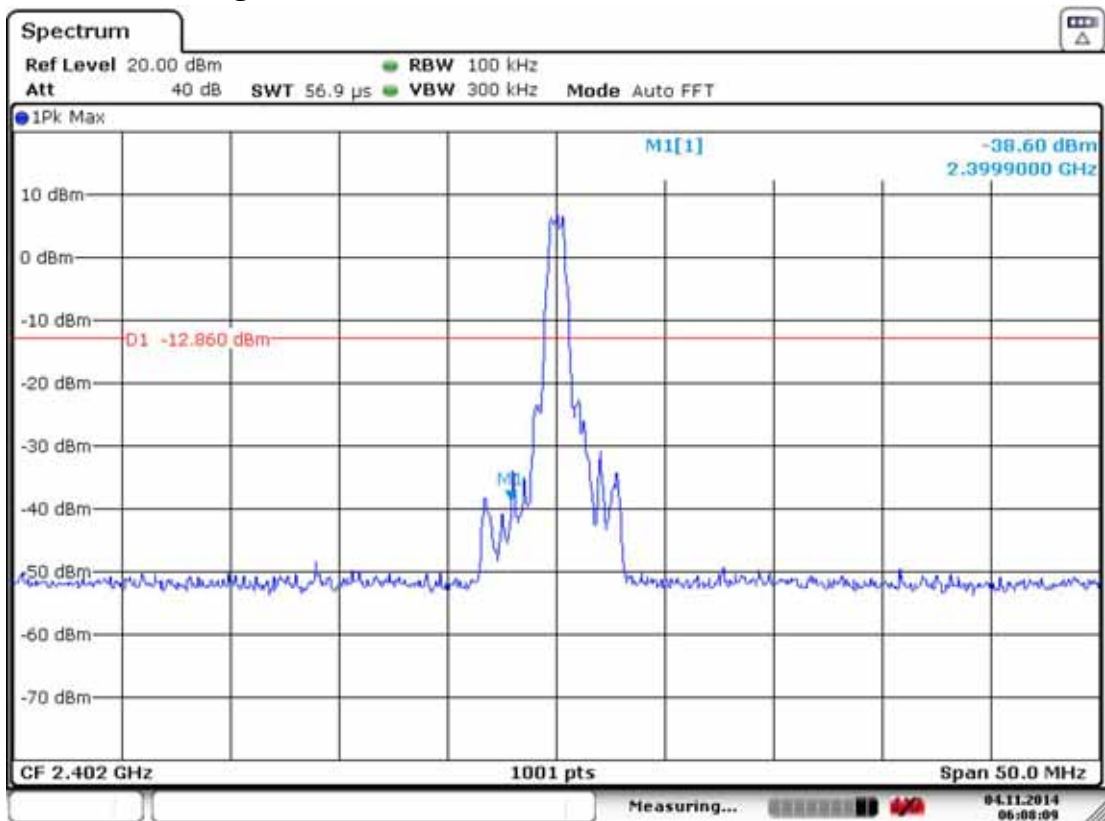
Test Date: 2014. 11. 04 Temperature: 25°C Humidity: 55%

Bluetooth Low Energy, Upper Band edge



Date: 4.NOV.2014 06:23:36

Below Band edge



Date: 4.NOV.2014 06:08:09

11. POWER SPECTRAL DENSITY MEASUREMENT

11.1. Test Equipment

The following test equipment was used during the power spectral density measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	R&S	FSV30	101181	2014. 03. 04	1 Year

11.2. Block Diagram of Test Setup

The same as section.5.2.

11.3. Specification Limits [§15.247(d), RSS-210 §A8.2 (b)]

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band.

11.4. Operating Condition of EUT

Same as 6dB bandwidth measurement which was listed in section 5.4.

11.5. Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using 100kHz RBW and ≥ 300 kHz VBW, set sweep time = Auto. The measurement guideline was according to 558074 D01 v03r02.

11.6. Test Results

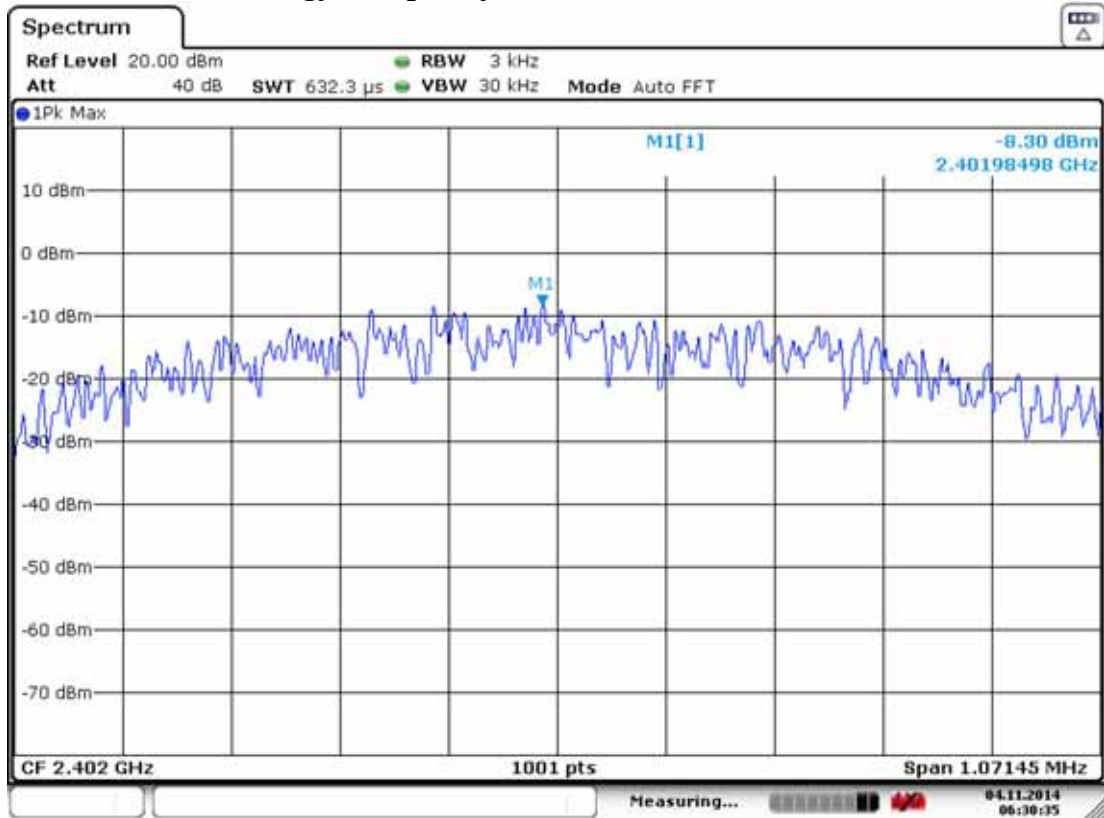
PASSED. All the test results are attached in next pages.

Test Date: 2014. 11. 04 Temperature: 25°C Humidity: 55%

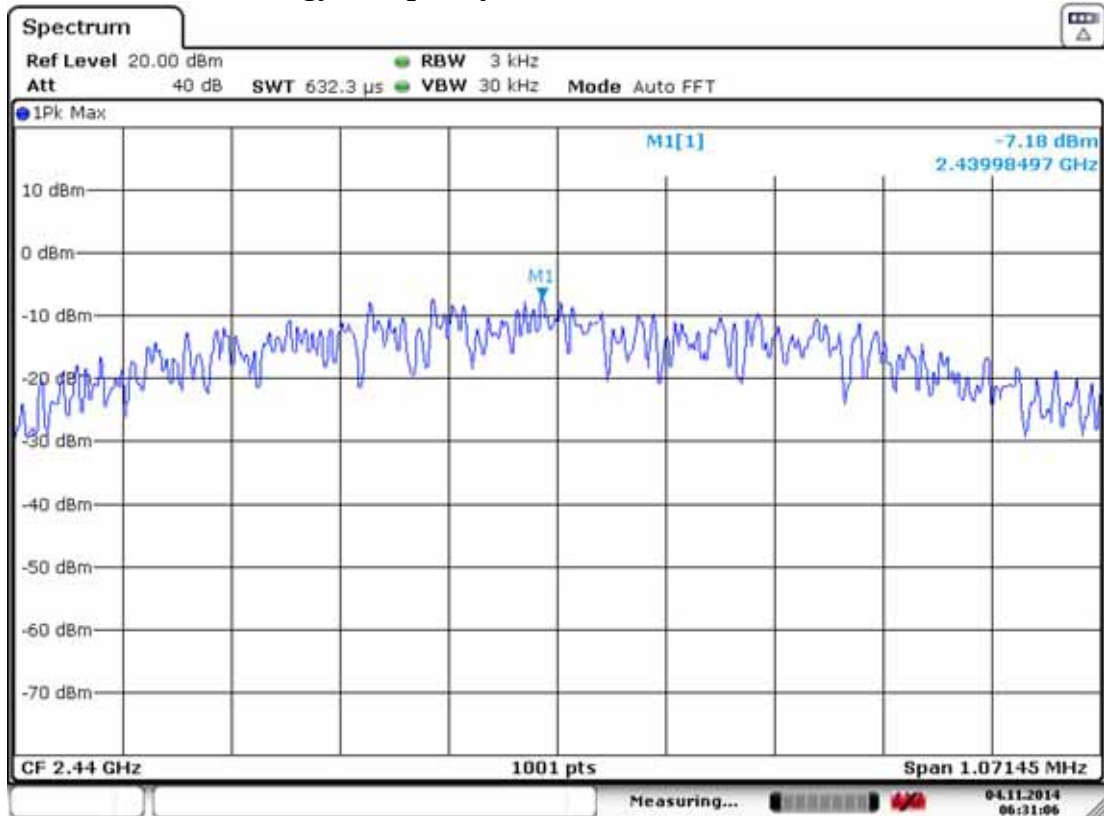
Mode	Type of Network	Channel	Frequency	Power Spectral Density
1	Bluetooth Low Energy	CH0	2402MHz	-8.30 dBm
2		CH19	2440MHz	-7.18 dBm
3		CH39	2480MHz	-6.68 dBm

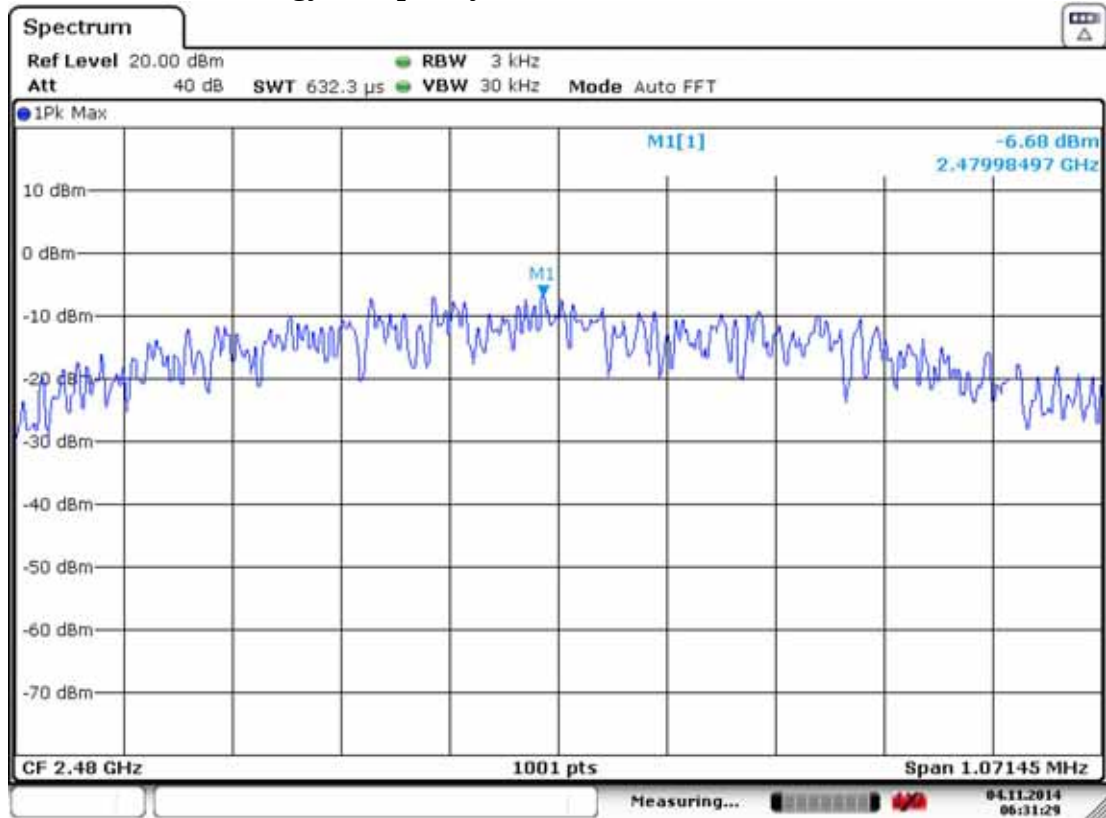
[Limit: 8dBm]

Bluetooth Low Energy, Frequency: 2402MHz



Bluetooth Low Energy, Frequency: 2440MHz



Bluetooth Low Energy, Frequency: 2480MHz

Date: 4.NOV.2014 06:31:29

12.DEVIATION TO TEST SPECIFICATIONS

【NONE】

13. PHOTOGRAPHS

13.1. Photos of Conducted Disturbance Measurement



FRONT VIEW OF CONDUCTED MEASUREMENT



BACK VIEW OF CONDUCTED MEASUREMENT

13.2.Photos of Radiated Measurement at Semi-Anechoic Chamber

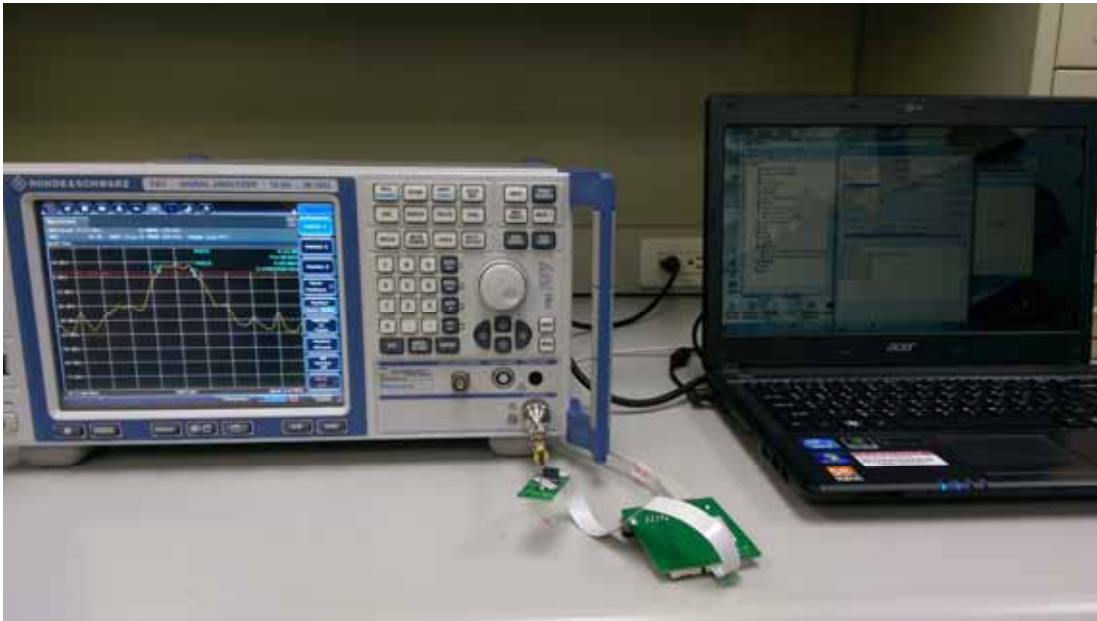
13.2.1.Frequency Range 30MHz~1GHz



13.2.2.Frequency Range Above 1GHz



13.3.Photo of Section RF Conducted Measurement



13.4.Photo of Maximum Peak Output Power Measurement

