

FCC Part 15 Subpart C Test Report

for DSSS System

Product Name : **Android Moblie Data Terminal**
Model Name : **MX-5050-1D, MX-5050-2D,
MX-5050-EX**

Prepared for:
Mexxen Technology(ShangHai)INC.
Unit B,12F,Building 11,No. 518,xinzhuan Rd., Songjiang
District,Shanghai,China
TEL: +86-21-64955599
FAX: +86-21-64959598

Prepared by:
Unilab (Shanghai) Co., Ltd
FCC 2.948 register number is 714465
No.1350, Lianxi Rd. Pudong New District, Shanghai, China
TEL: +86-21-50275125
FAX: +86-21-50275126

Report Number : **UL32220150710FCC009-3**
Date of Report : **08-03-2015**
Date of Test : **07-17-2015~08-03-2015**

Notes :

The test results only relate to these samples which have been tested.
Partly using this report will not be admitted unless been allowed by Unilab.
Unilab is only responsible for the complete report with the reported stamp of Unilab.

Applicant: Mexzen Technology(ShangHai)INC.
Unit B,12F,Building 11,No. 518,xinzhan Rd., Songjiang
District,Shanghai,China

Manufacturer: Mexzen Technology(ShangHai)INC.
Unit B,12F,Building 11,No. 518,xinzhan Rd., Songjiang
District,Shanghai,China

Product Name: Android Moblie Data Terminal

Brand Name: MEXXEN

Model Name: MX-5050-1D

Model Description: See Part1.1 Note.

FCC ID: 2ADXO-MX-5050

Serial Number: N/A

EUT Voltage: AC input: AC 100~240V 50/60Hz 0.4A
Output: 5V 2A

Date of Receipt: 07-10-2015

Date of Test: 07-17-2015~08-03-2015

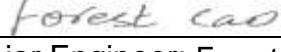
Test Standard: FCC CFR Tile 47 Part 15 Subpart C
ANSI C 63.4: 2009
KDB 558074 D01 v03r02

Test Result: PASS

Prepared by :


(Technical Engineer: Jeffrey Wang)

Reviewed by :


(Senior Engineer: Forest Cao)

Approved by :


(Supervisor: Eva Wang)

TABLE OF CONTENTS

1.	GENERAL INFORMATION	5
1.1	EUT DESCRIPTION.....	5
1.2	TEST MODE	5
2.	TEST METHODOLOGY	5
2.1	EUT CONFIGURATION.....	6
2.2	EUT EXERCISE	6
2.3	GENERAL TEST PROCEDURES	6
2.4	FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS	7
3.	TECHNIACL SUMMARY	8
3.1	SUMMARY OF STANDARDS AND TEST RESULTS.....	8
3.2	TEST UNCERTAINTY.....	8
3.3	TEST EQUIPMENT LIST	8
3.4	TEST FACILITY	9
3.5	TEST SETUP CONFIGURATION	9
4.	6 DB BANDWIDTH.....	10
4.1	TEST SETUP	10
4.2	LIMITS.....	10
4.3	TEST PROCEDURE	10
4.4	RESULTS & PERFORMANCE	11
5.	POWER SPECTRAL DENSITY.....	13
5.1	TEST SETUP	13
5.2	LIMITS.....	13
5.3	TEST PROCEDURE	13
5.4	RESULTS & PERFORMANCE	14
6.	PEAK OUTPUT POWER (CONDUCTION)	16
6.1	TEST SETUP	16
6.2	LIMITS.....	16
6.3	TEST PROCEDURE	16
6.4	RESULTS & PERFORMANCE	16
7.	SPURIOUS EMISSIONS (CONDUCTION).....	17
7.1	TEST SETUP	17
7.2	LIMITS.....	17
7.3	TEST PROCEDURE	17
7.4	RESULTS & PERFORMANCE	18
8.	BAND EDGE MEASUREMENT.....	26
8.1	TEST SETUP	26
8.2	LIMITS.....	26
8.3	TEST PROCEDURE	26
8.4	RESULTS & PERFORMANCE	27
9.	SPURIOUS EMISSIONS (RADIATION)	36
9.1	TEST SETUP	36
9.2	LIMITS.....	37
9.3	TEST PROCEDURE	37
9.4	RESULTS & PERFORMANCE	39
10.	AC POWER LINE CONDUCTED EMISSIONS.....	46
10.1	TEST SETUP	46
10.2	LIMITS.....	46

10.3 TEST PROCEDURE	46
10.4 RESULTS & PERFORMANCE	47
APPENDIX 1 PHOTOGRAHPS OF TEST SETUP.....	53
APPENDIX 2 PHOTOGRAHPS OF EUT	53

1. GENERAL INFORMATION

1.1 EUT DESCRIPTION

Product Name:	Android Mobile Data Terminal
Model Name:	MX-5050-1D
Hardware Version:	V3.0
Software Version:	GST_A82_M30_3110955E_MUL_V02_2015 0619
RF Exposure Environment:	Uncontrolled
BT	
Frequency Range:	2402MHz~2480MHz
Type of Modulation:	GFSK
Channel Number:	40
Antenna Type:	Internal
Antenna Peak Gain:	2.6dBi
Component	
AC Adapter:	Input: AC 100-240V 50/60Hz 0.4A
	Output: DC 5V 2A
The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.	

Note: We Mexzen Technology(ShangHai)INC.hereby declaration that the Model MX-5050-1D, MX-5050-2D, and Model MX-5050-EX, have the same PCBA design, and same accessories; And no any other difference except for model name.

1.2 TEST MODE

Unilab has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Bluetooth V4.0 LE:GFSK

Note:

1. Regards to the frequency band operation: the lowest, middle and highest frequency of channel were selected to perform the test, then shown on this report.
2. For the radiated emission test, every axis (X, Y, Z) was verified, and show the worst result on this report.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 15.247.

2.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application

2.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

2.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4: 2009 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4: 2009.

2.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

2 Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3. TECHNICAL SUMMARY

3.1 SUMMARY OF STANDARDS AND TEST RESULTS

The EUT have been tested according to the applicable standards as referenced below:

Test Item	FCC	Result
6 dB bandwidth	§15.247 (a)	P
Power spectral density	§15.247 (e)	P
Peak Output Power (Conduction)	§15.247 (b)(1)	P
Spurious Emissions (Conduction)	§15.247 (d)	P
Band edge measurement	§15.247 (d)	P
Spurious Emissions (Radiation)	§15.247 (d) §15.35 (b) §15.209 (a)	P
AC Power Line Conducted Emissions	§15.207 (a)	P

Note: P means pass, F means failure, N/A means not applicable

3.2 TEST UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Value (dB)
Conducted disturbance	3.4
Radiated disturbance	4.2

3.3 TEST EQUIPMENT LIST

Equipment	Manufacturer	Model	Serial No.	Due Date
Receiver	Agilent	N9038A	MY51210142	11/11/2015
Power meter	R&S	NRP2	101607	02/18/2016
Loop Antenna	Schwarzbeck	FMZB1519	1519-020	03/25/2016
LISN	R&S	ENV216	100069	08/22/2015
3m Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	CT-0000336	11/26/2017
Microwave Preamplifier	EM Electronics	EM30180	3008A02425	02/27/2016
Power Splitter	Agilent	11667C/ 52401	MY53806148	02/27/2016
Biconilog Antenna	Schwarzbeck	VULB 9160	3316	09/19/2016
Horn Antenna	Schwarzbeck	BBHA9120D	942	09/19/2016

Horn Antenna	Schwarzbeck	BBHA9120D	943	09/19/2016
Horn Antenna(18-40GHz)	ETS	3116	00070497	07/18/2016

3.4 TEST FACILITY

All test facilities used to collect the test data are located at No.1350, Lianxi Rd. Pudong New District, Shanghai, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4: 2009, CISPR 16-1-1 and other equivalent standards. The laboratory is compliance with the requirements of the ISO/IEC/E 17025.

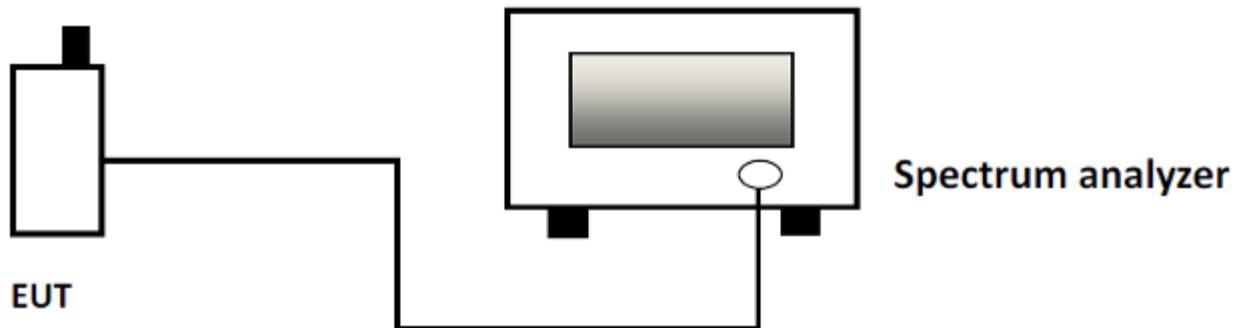
3.5 TEST SETUP CONFIGURATION

The information contained within this report is intended to show verification of compliance of the EUT to the requirements of CFR 47 FCC Part 15.247.

Unilab has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report.

4. 6 DB BANDWIDTH

4.1 TEST SETUP



4.2 LIMITS

Limit	≥ 500 kHz
-------	----------------

4.3 TEST PROCEDURE

Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum analyzer. The loss between RF output port of the EUT and the input port of the tester will be taken into consideration.

The measurement will be conducted at three channels.

Bluetooth: Low(0), Middle(19) and High (39).

Using occupied BW measurement function of spectrum analyzer and settings are:

XdB = -6dB

RBW = 100KHz

VBW $\geq 3 \times$ RBW

Span = approximately 2 to 3 times the 6 dB bandwidth, centered on a channel

Sweep = auto

Detector function = peak

Trace = max hold

4.4 RESULTS & PERFORMANCE

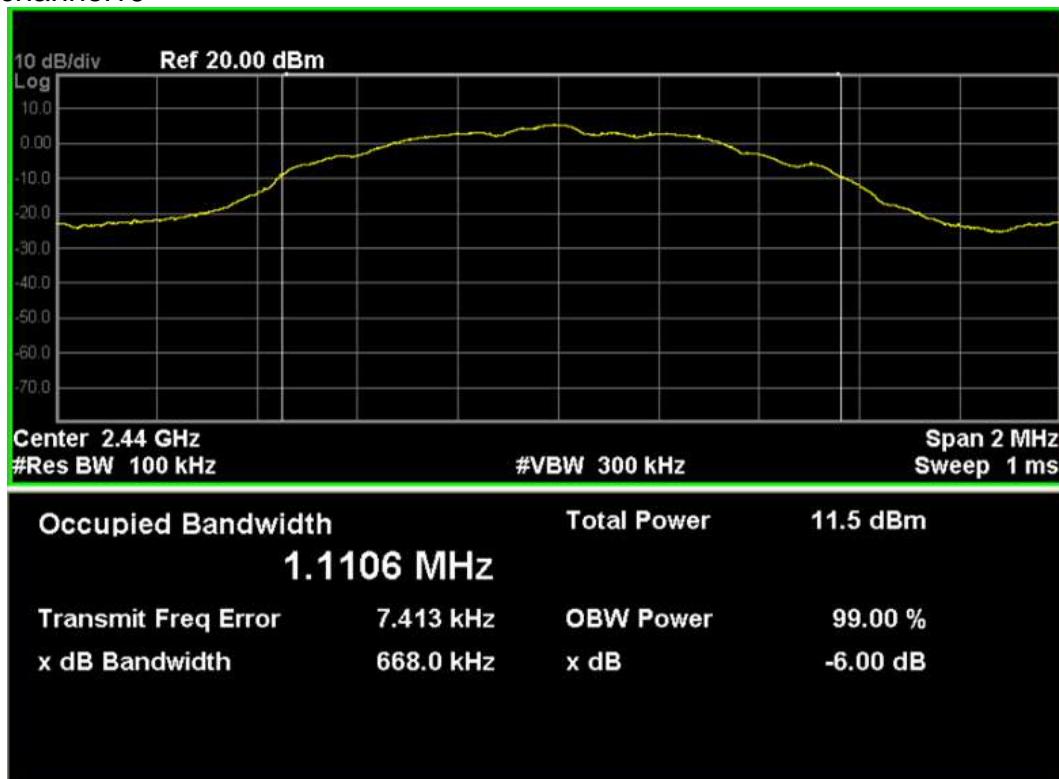
Channel	Measured 6dB bandwidth (KHz)	Limit (MHz)	Result
Bluetooth V4.0 LE			
GFSK CH0	659.9	≥0.5	PASS
GFSK CH19	668.0	≥0.5	PASS
GFSK CH39	669.9	≥0.5	PASS

Bluetooth V4.0 LE:

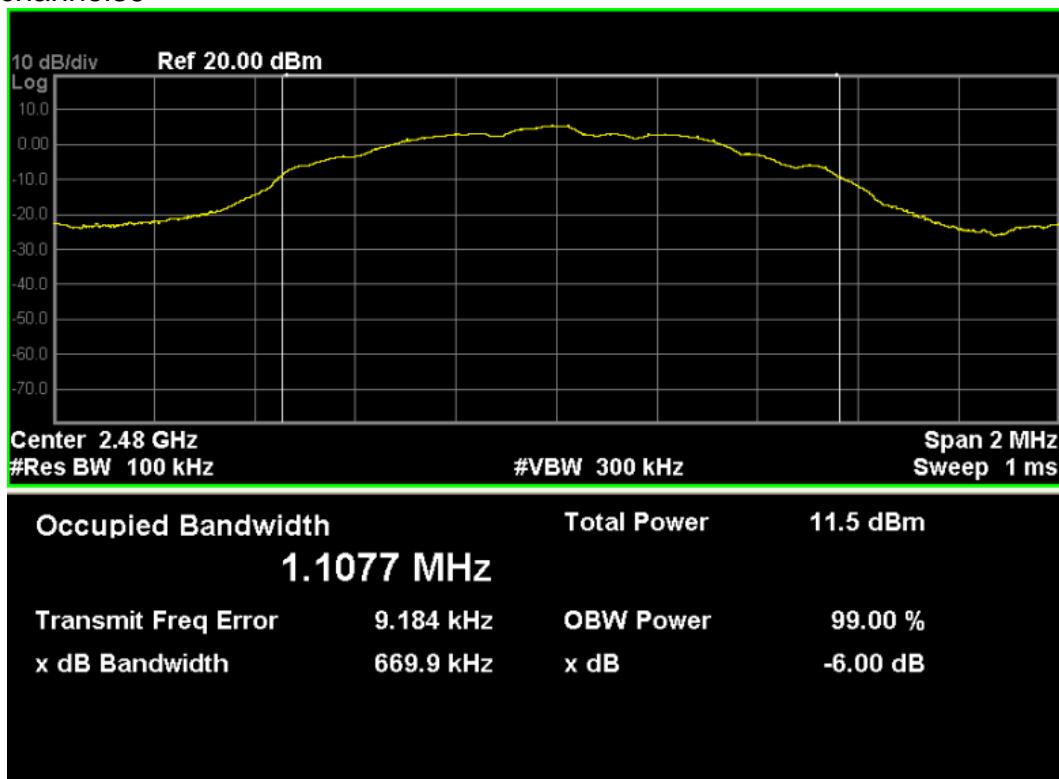
GFSK channel 0



GFSK channel19

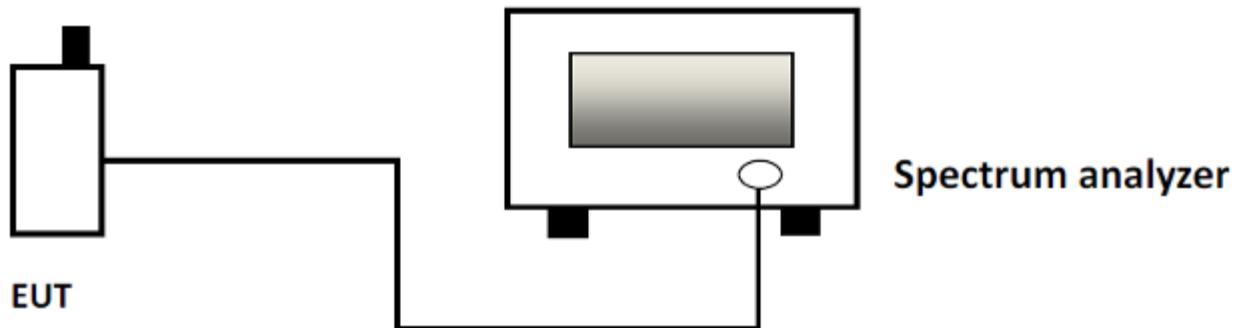


GFSK channel39



5. POWER SPECTRAL DENSITY

5.1 TEST SETUP



5.2 LIMITS

Limits	$\leq 8\text{dBm}/3\text{kHz}$
--------	--------------------------------

5.3 TEST PROCEDURE

Set analyzer center frequency to DTS channel center frequency.

Set the span to 1.5 times the DTS bandwidth.

Set the RBW to: $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$.

Set the VBW $\geq 3 \times \text{RBW}$.

Detector = peak.

Sweep time = auto couple.

Trace mode = max hold.

Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level within the RBW.

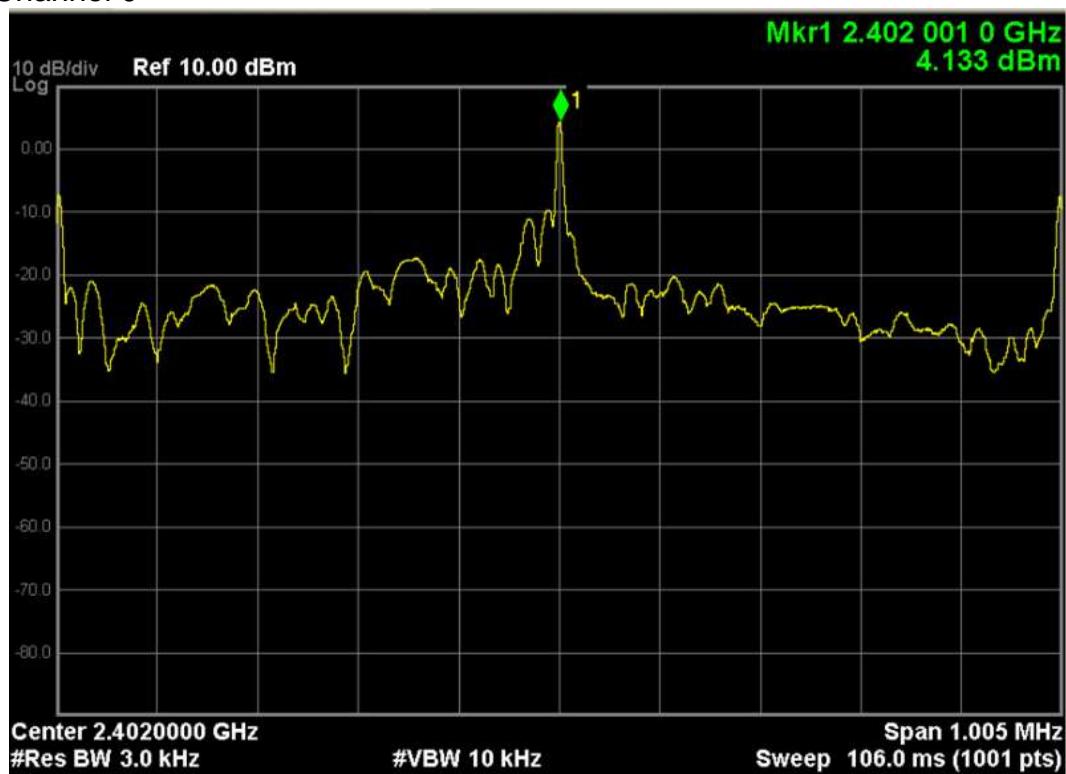
If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

5.4 RESULTS & PERFORMANCE

Mode	Channel	Measured level (dBm/3KHz)	Limit (dBm/3KHz)	Result
Bluetooth V4.0 LE	CH0	4.133	≤8.00	Pass
	CH19	4.222	≤8.00	Pass
	CH39	4.576	≤8.00	Pass

Bluetooth V4.0 LE

GFSK Channel 0



GFSK Channel 19

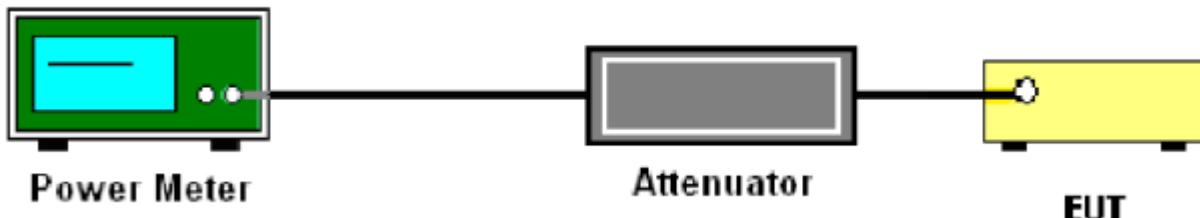


GFSK Channel 39



6. PEAK OUTPUT POWER (CONDUCTION)

6.1 TEST SETUP



6.2 LIMITS

Limits	<30dBm
--------	--------

6.3 TEST PROCEDURE

Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum analyzer. The loss between RF output port of the EUT and the input port of the tester will be taken into consideration.

The measurement will be conducted at three channels.

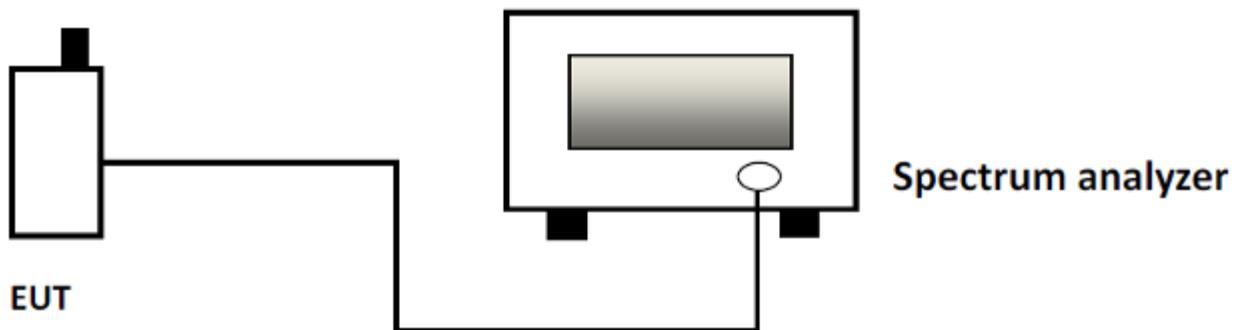
Bluetooth: Low(0), Middle(19) and High (39).

6.4 RESULTS & PERFORMANCE

Bluetooth V4.0 LE			
Channel	Peak power (dBm)	Limit (dBm)	Margin (dB)
0 (2402MHz)	4.847	30	25.153
19 (2440MHz)	3.924	30	26.076
39 (2480MHz)	4.581	30	25.419

7. SPURIOUS EMISSIONS (CONDUCTION)

7.1 TEST SETUP



7.2 LIMITS

Limit	$<(P-20\text{dB})$
Note: P is the highest level of the desired power	

7.3 TEST PROCEDURE

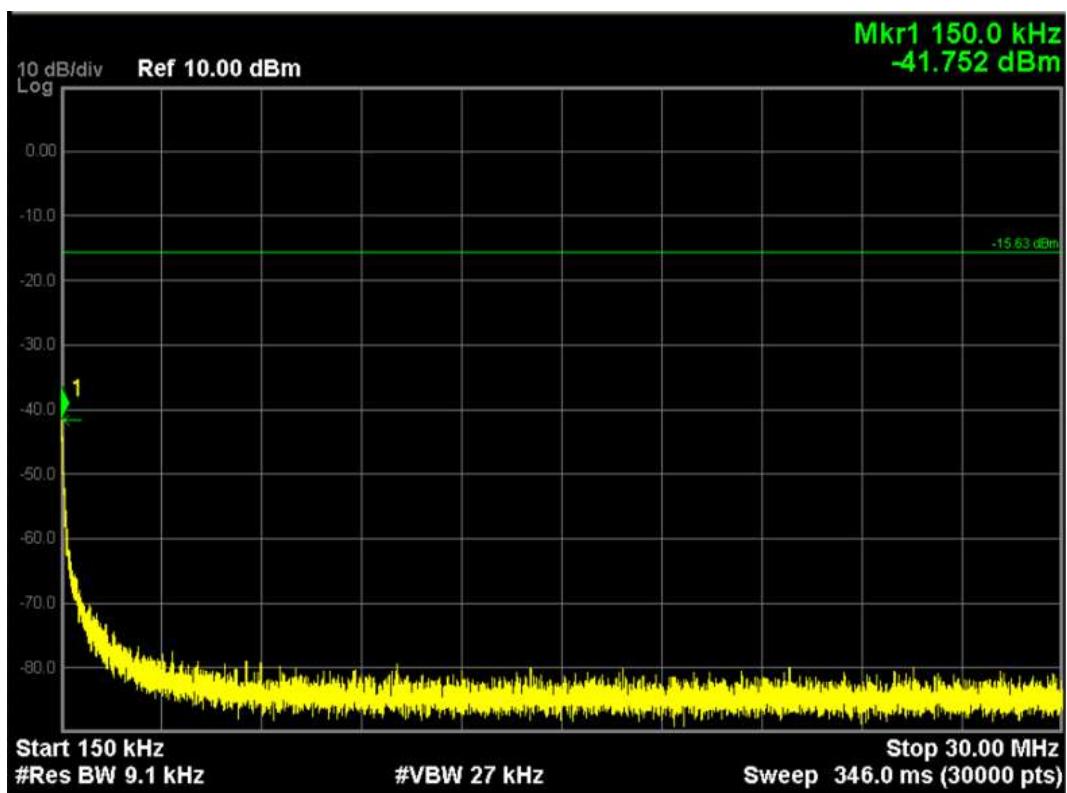
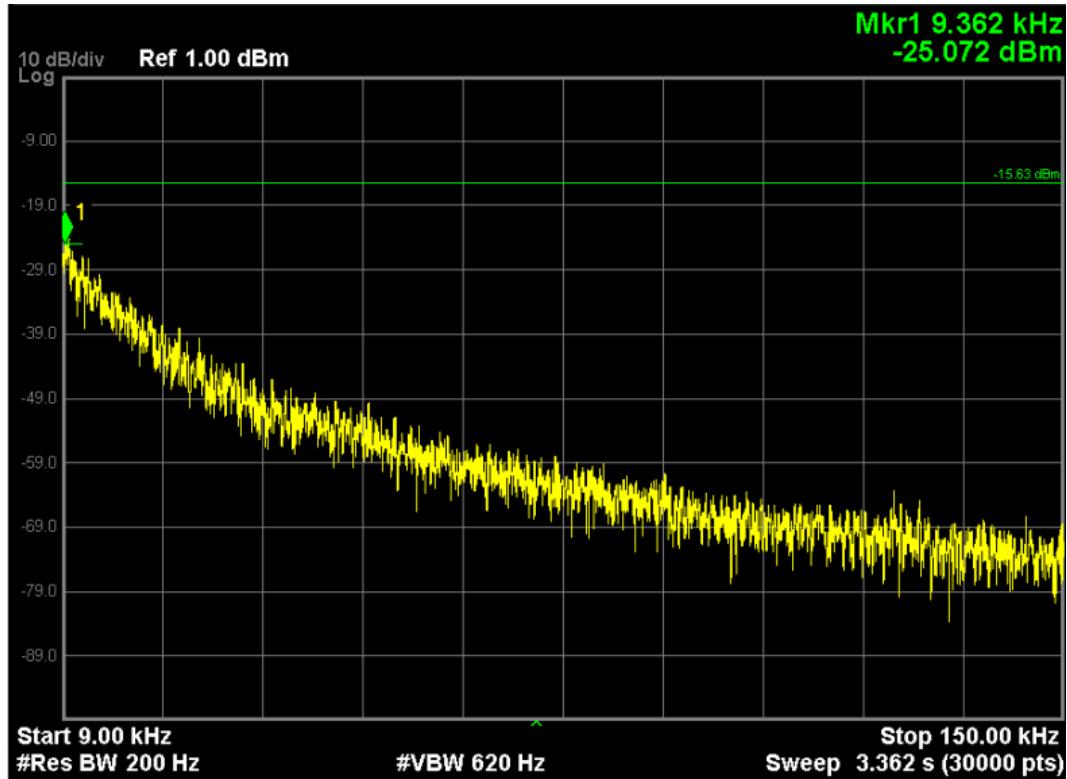
The EUT was connected to Spectrum Analyzer and Base Station via power divider. Use the following spectrum analyzer settings:

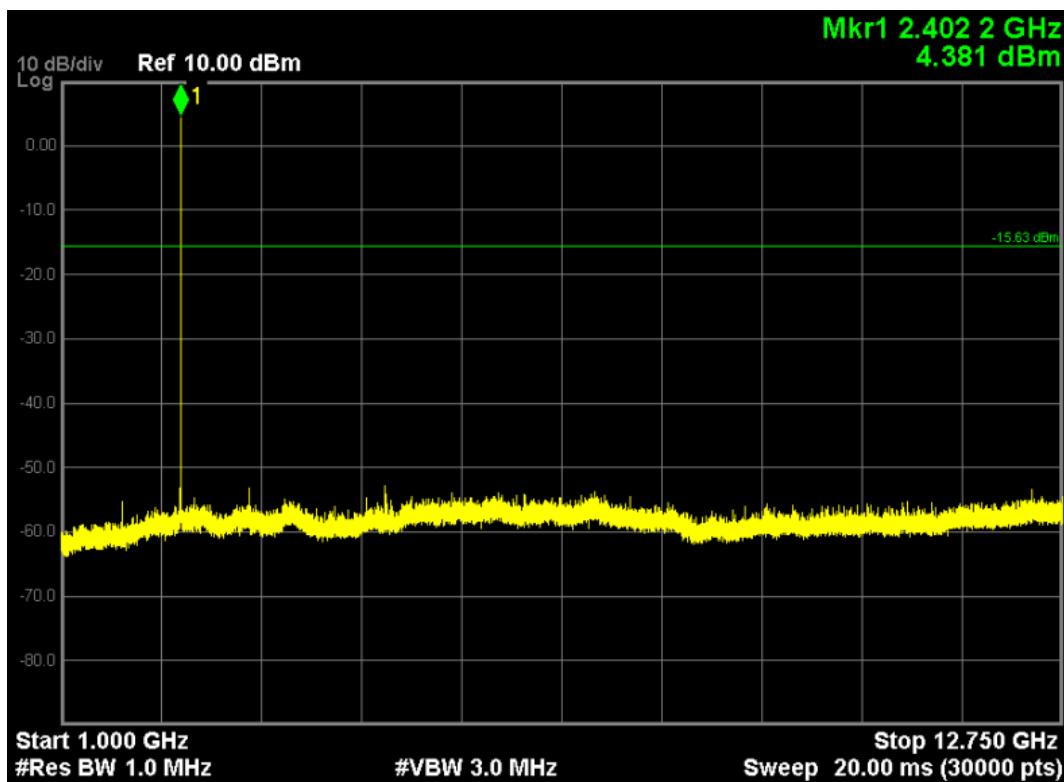
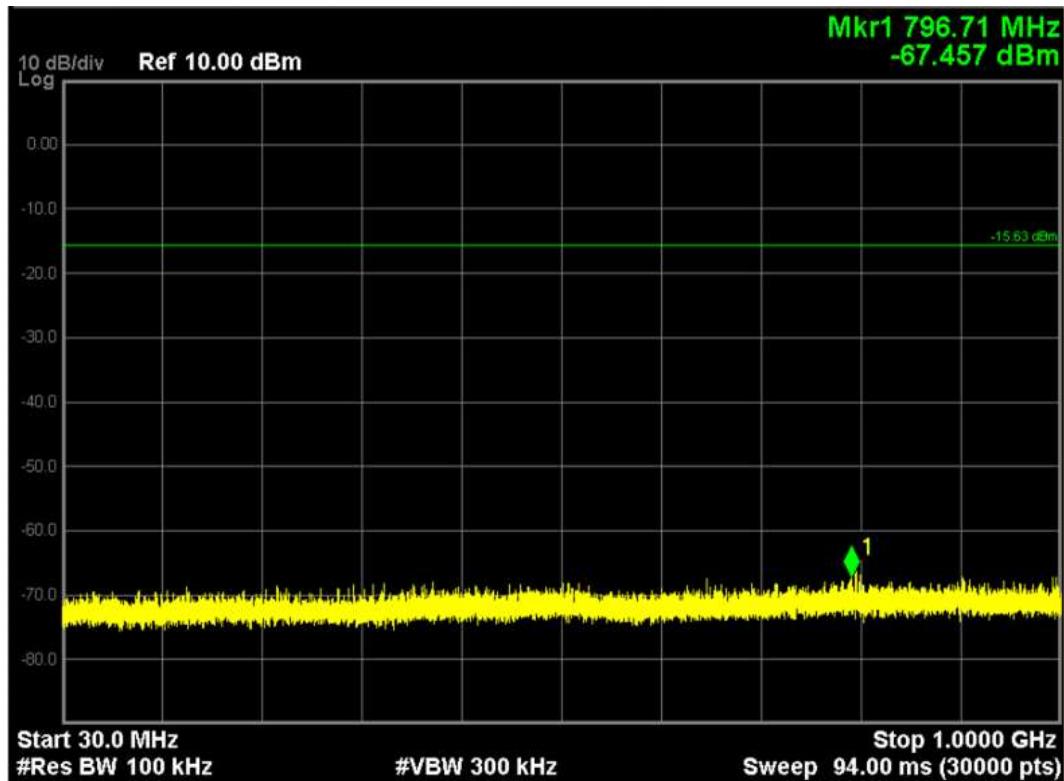
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold
Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this Section.

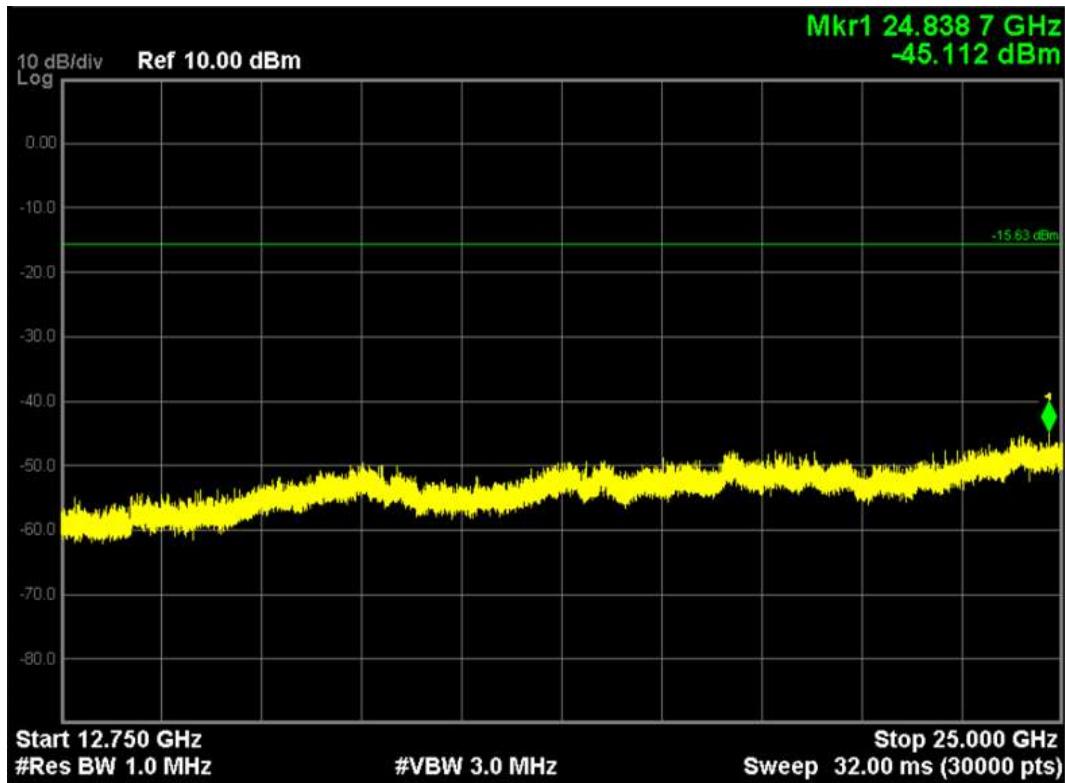
7.4 RESULTS & PERFORMANCE

Bluetooth V4.0 LE GFSK Channel 0

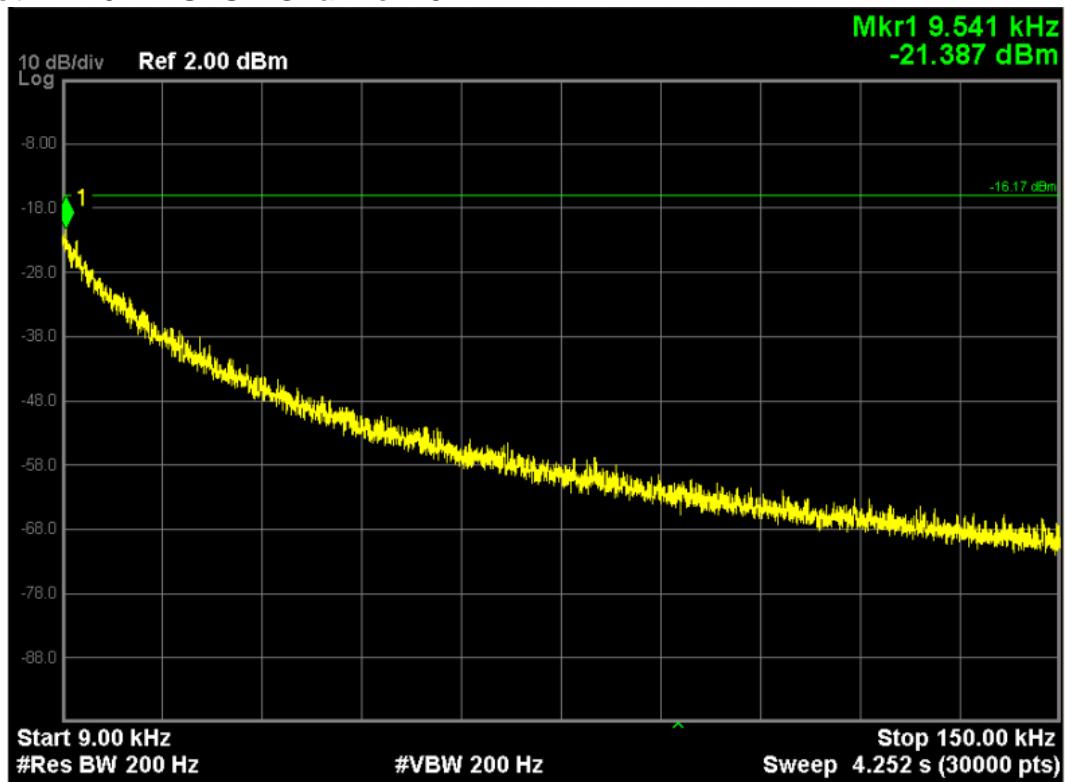


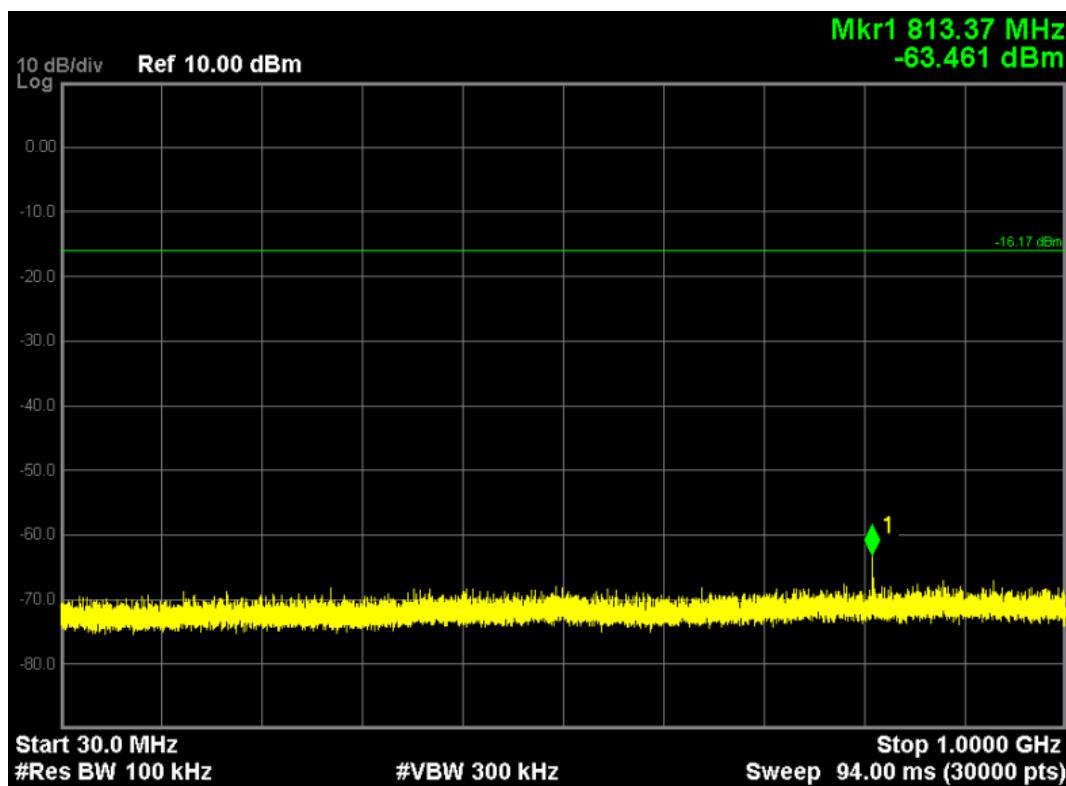
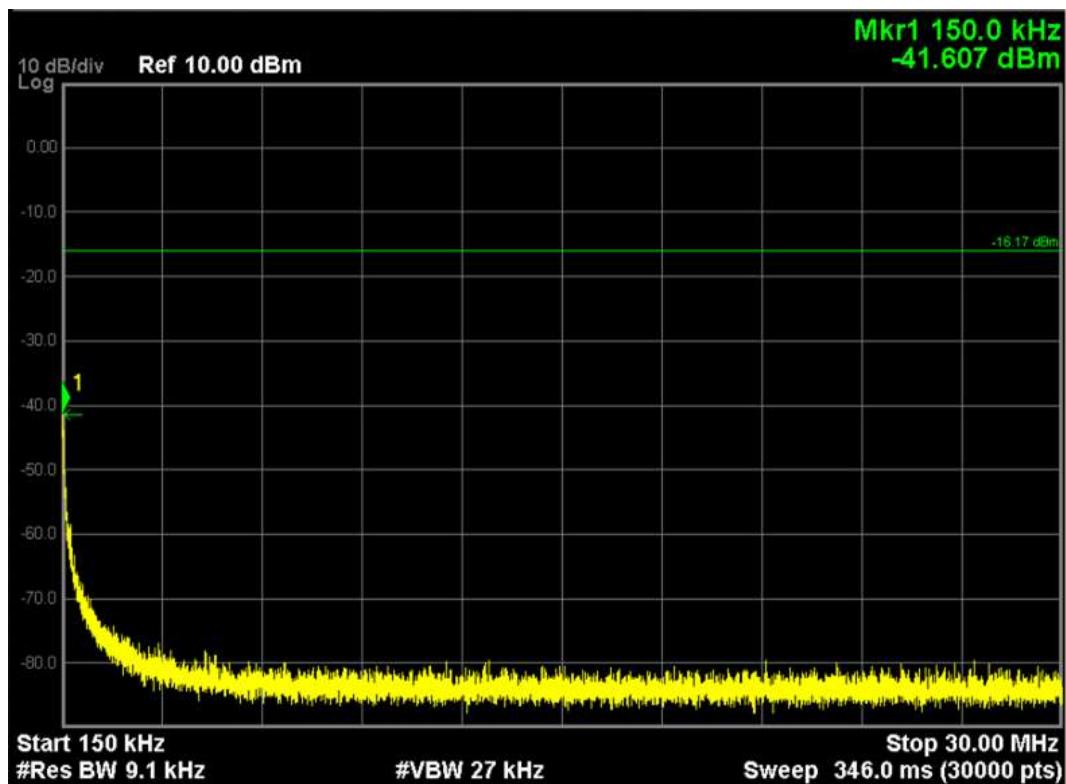


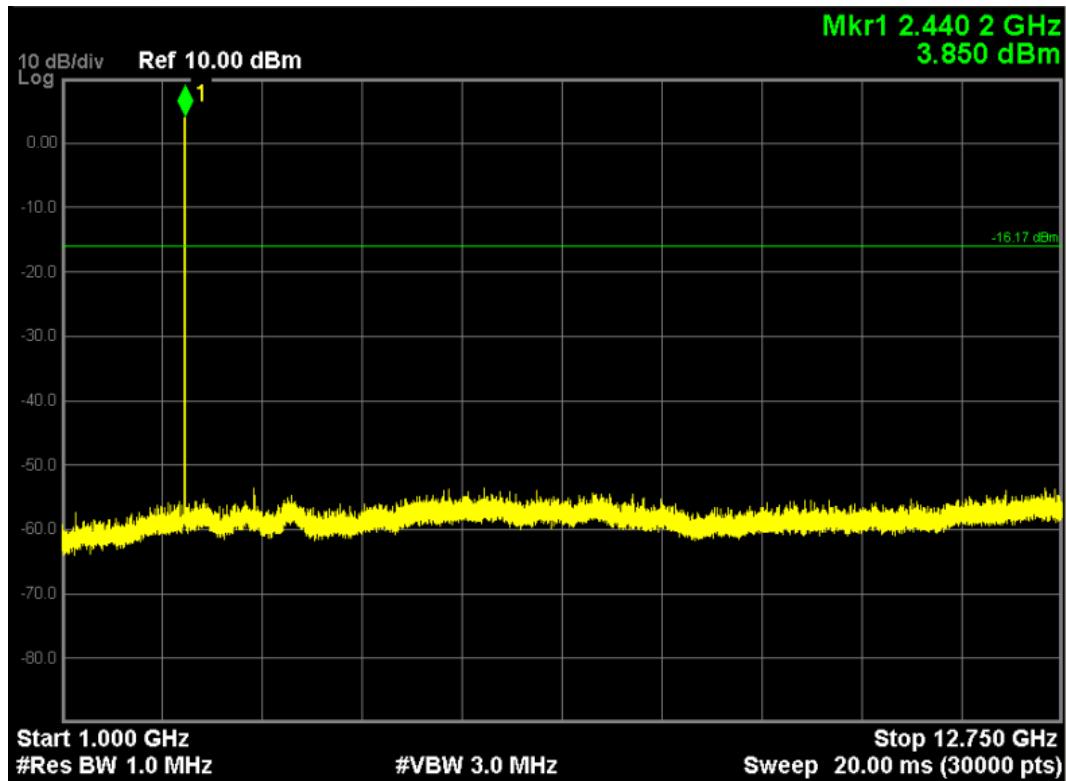
Note: The point mark1 is carrier.



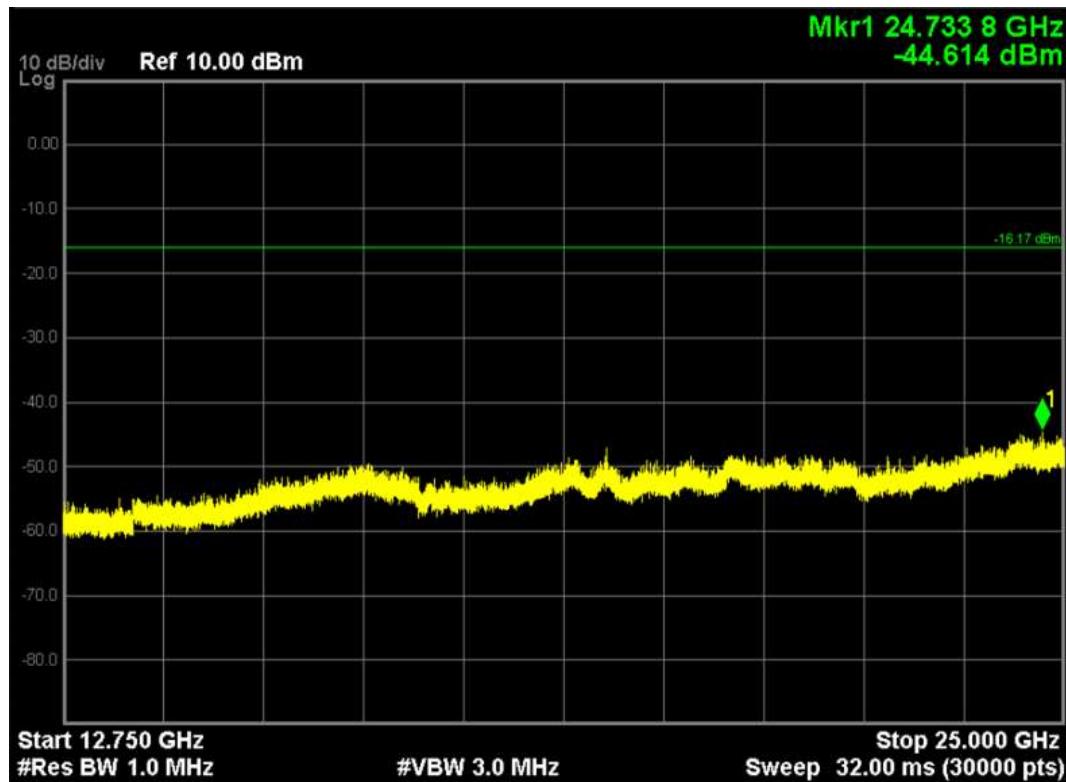
Bluetooth V4.0 LE GFSK Channel 19



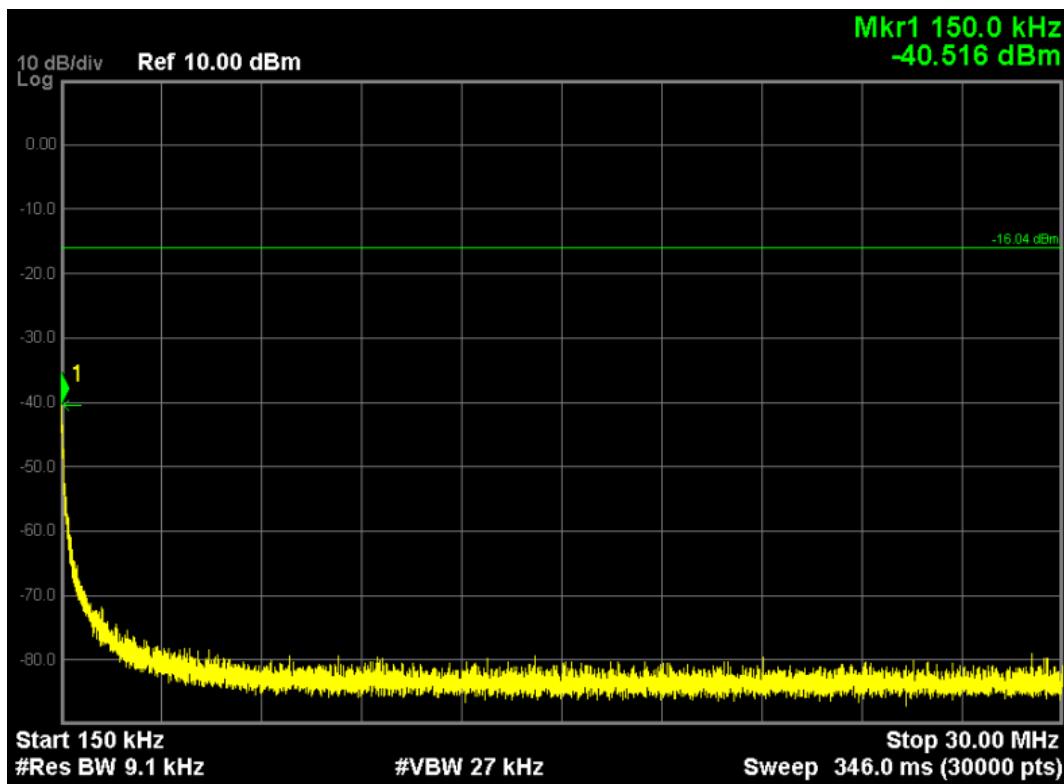
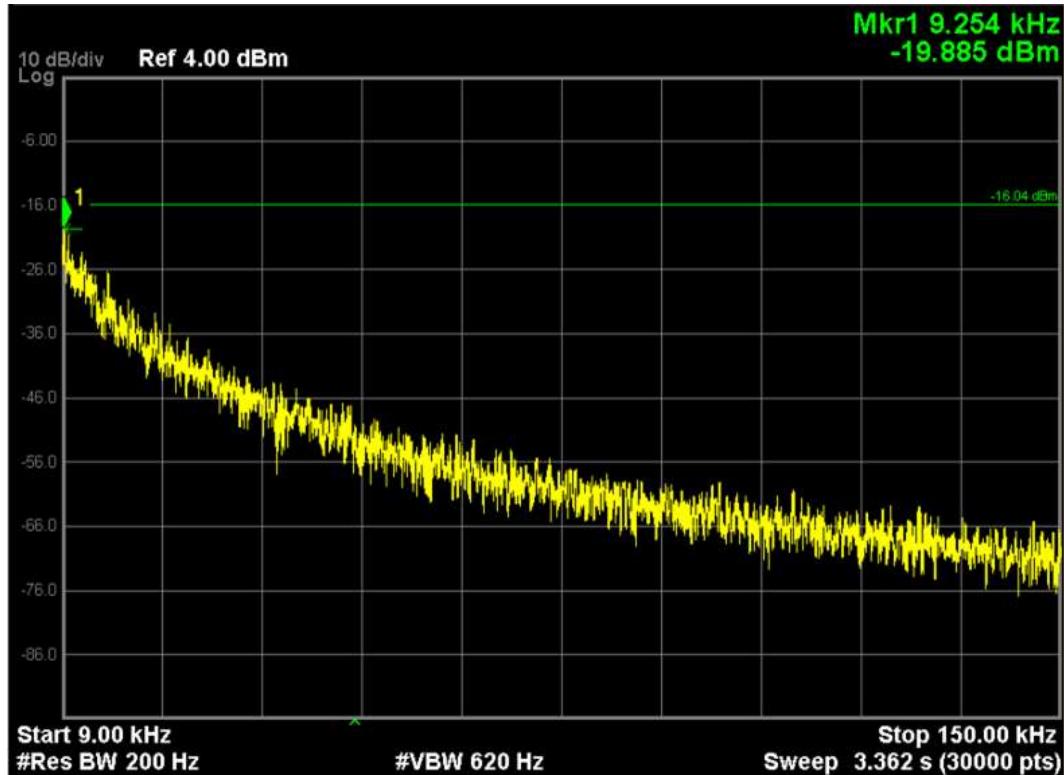


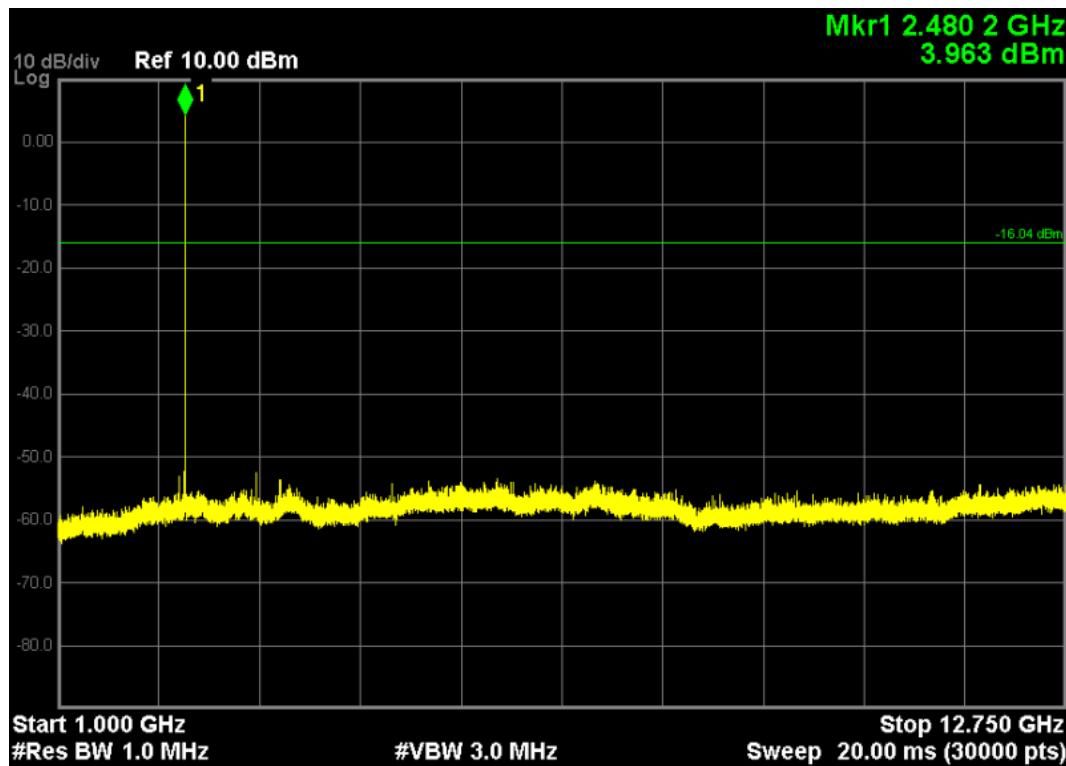
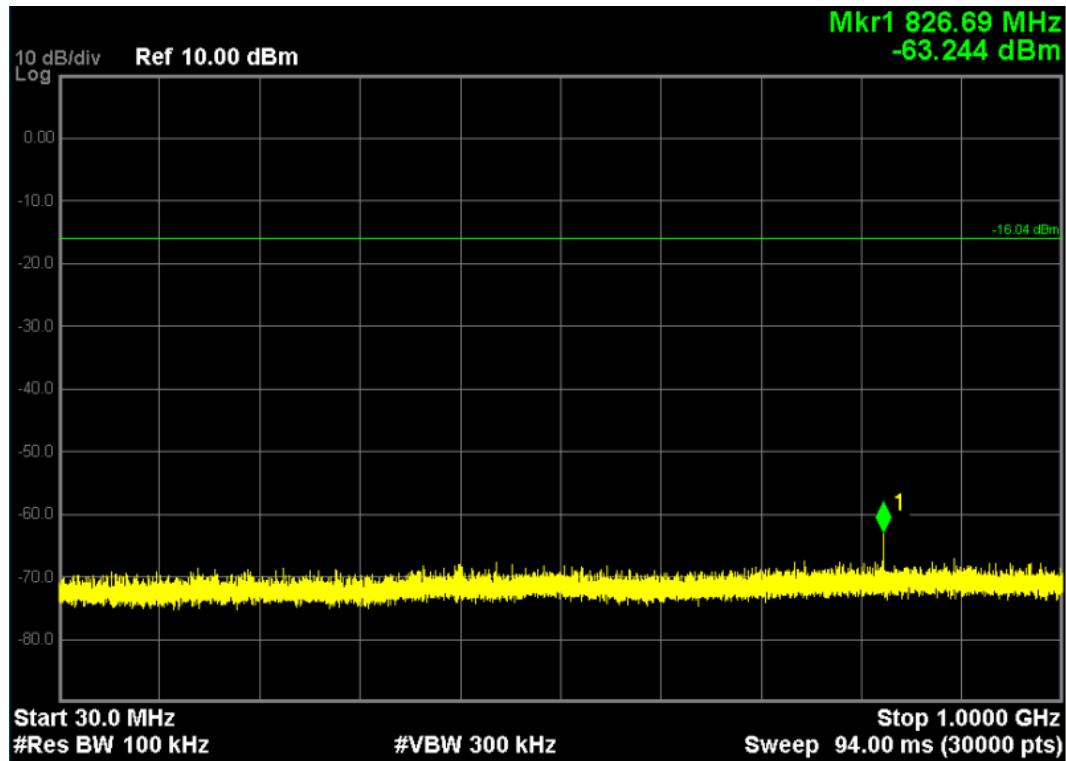


Note: The Mark1 point is carrier.

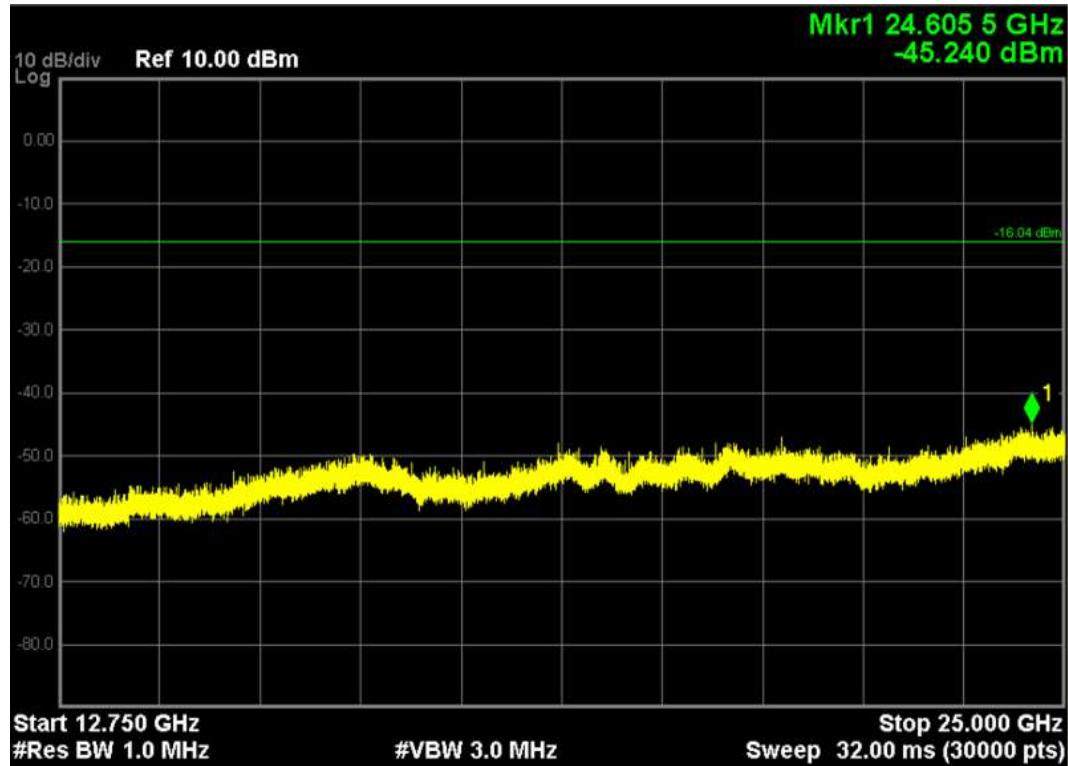


Bluetooth V4.0 LE GFSK Channel 39



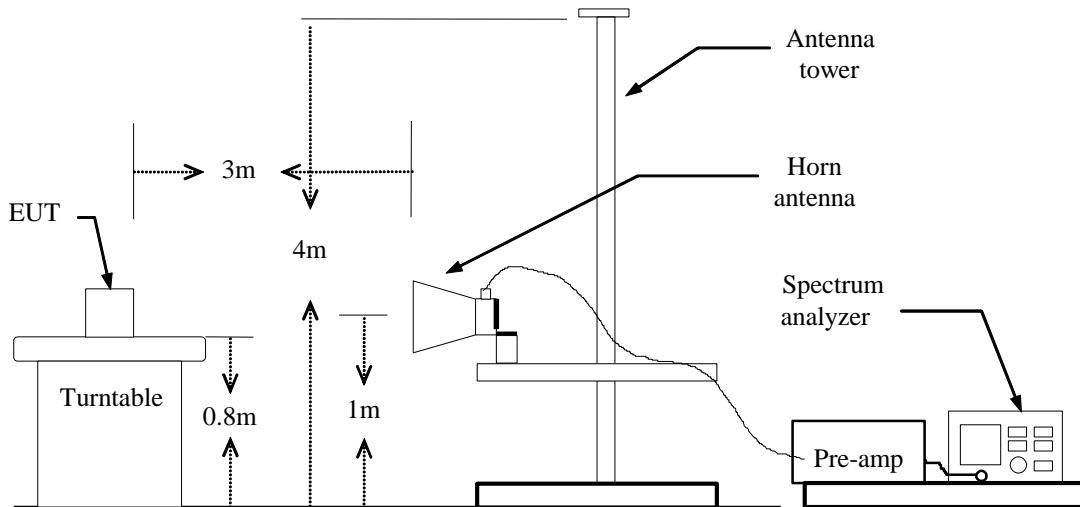


Note: The Mark1 point is carrier.



8. BAND EDGE MEASUREMENT

8.1 TEST SETUP



8.2 LIMITS

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

8.3 TEST PROCEDURE

The EUT is placed on a turntable, which is 0.8m above the ground plane.

The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

PEAK: RBW=VBW=1MHz / Sweep=AUTO

AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

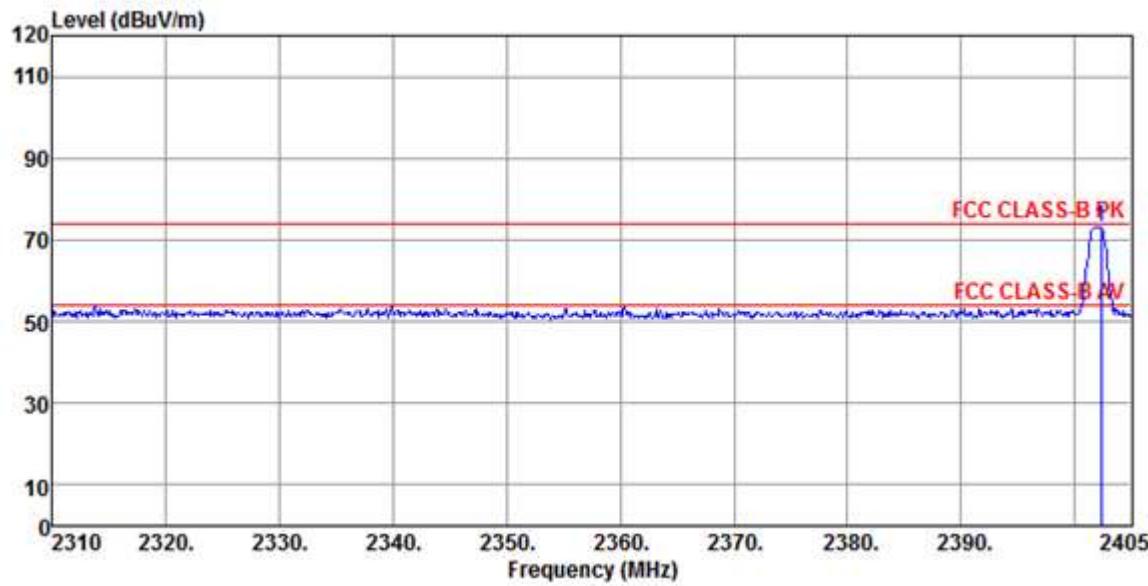
8.4 RESULTS & PERFORMANCE

Radiated Band Edge:

Bluetooth V4.0 LE GFSK Channel 0

Detector mode: Peak

Polarity: Horizontal



Site : chamber

Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL

EUT :

Model Name :

Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60Hz

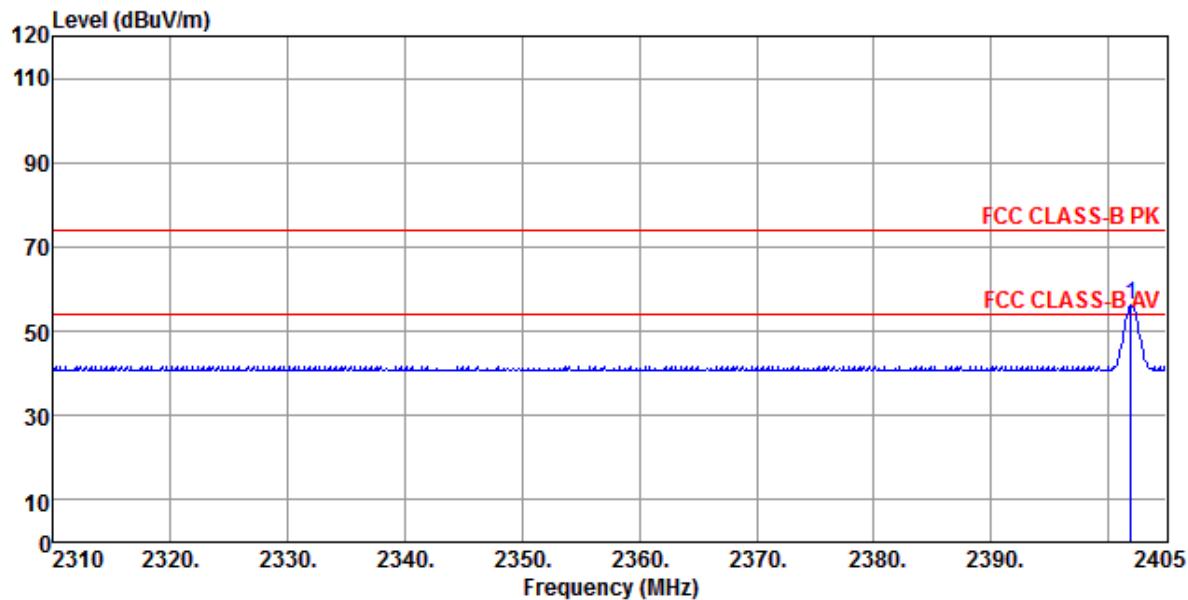
Mode : BT4.0 CH0

Memo :

	ReadAntenna Freq	Cable Level	Preamp Factor	Loss Factor	Limit Level	Over Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	2402.34	76.93	27.54	7.13	38.34	73.26	74.00	-0.74 Peak

Detector mode: Average

Polarity: Horizontal



Site : chamber

Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL

EUT :

Model Name :

Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60Hz

Mode : BT4.0 CH0

Memo :

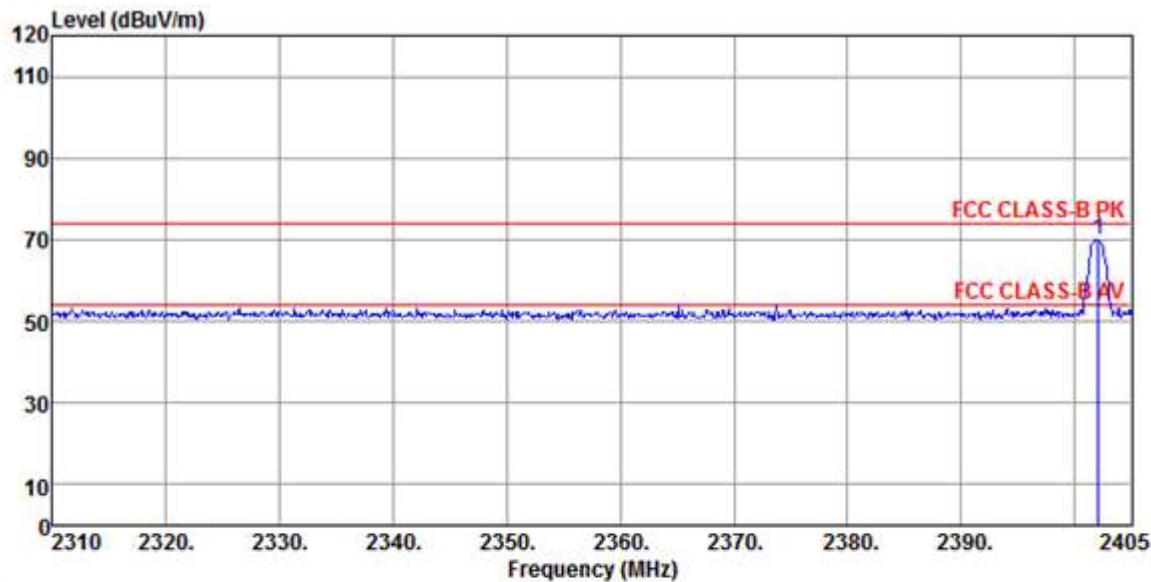
	ReadAntenna	Cable	Preamp	Limit	Over			
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark

MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
-----	------	------	----	----	--------	--------	----	--

1 pp	2401.96	59.69	27.54	7.13	38.34	56.02	54.00	2.02 Average
------	---------	-------	-------	------	-------	-------	-------	--------------

Detector mode: Peak

Polarity: Vertical



Site : chamber

Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL

EUT :

Model Name :

Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60Hz

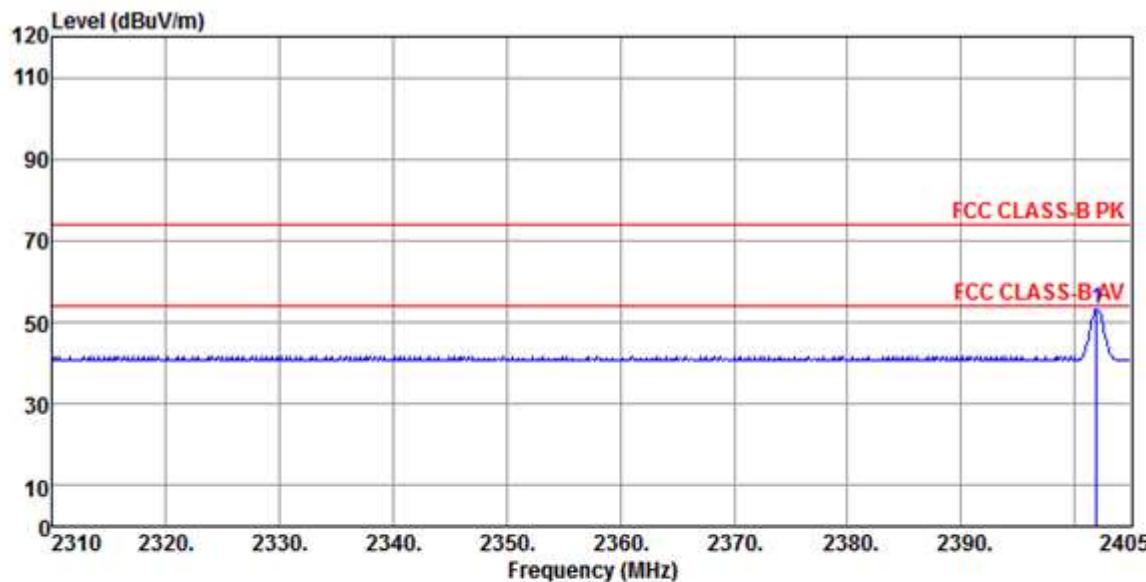
Mode : BT4.0 CH0

Memo :

Freq	ReadAntenna		Cable		Preamp Level	Limit Line	Over Limit	Remark
	Level	Factor	Loss	Factor				
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 pp	2402.15	73.64	27.54	7.13	38.34	69.97	74.00	-4.03 Peak

Detector mode: Average

Polarity: Vertical



Site : chamber

Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL

EUT :

Model Name :

Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60Hz

Mode : BT4.0 CH0

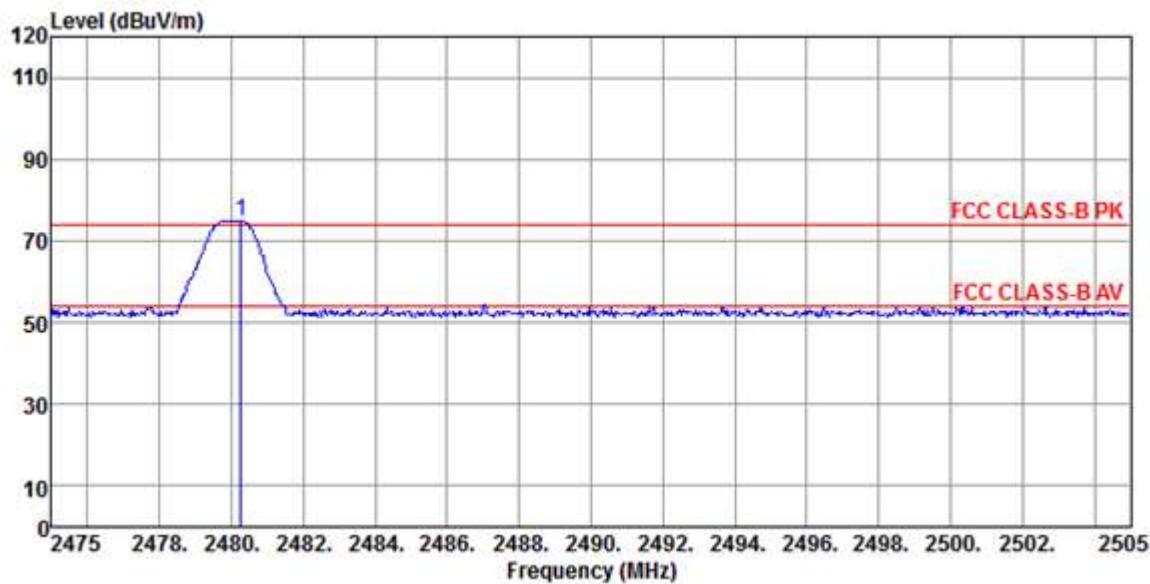
Memo :

	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	2401.96	56.97	27.54	7.13	38.34	53.30	54.00 -0.70 Average

Bluetooth V4.0 LE GFSK Channel 39

Detector mode: Peak

Polarity: Horizontal



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL

EUT :

Model Name :

Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60Hz

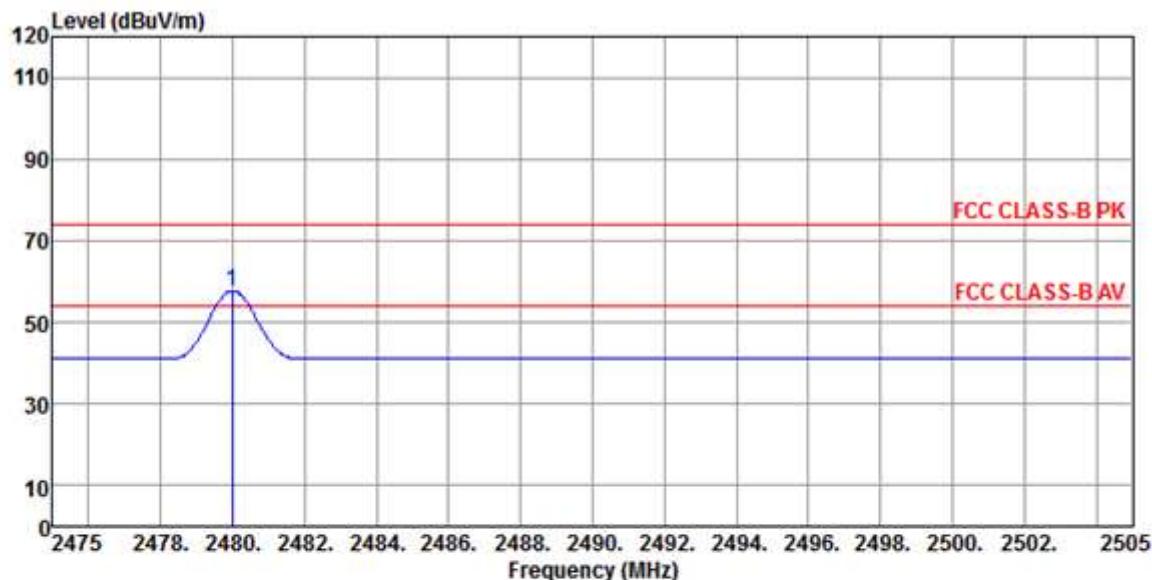
Mode : BT4.0 CH39

Memo :

Freq	ReadAntenna		Cable		Preamp Loss Factor	Level	Limit Line	Over Limit	Remark
	Level	Factor	Loss	dB					
MHz	dBuV	dB/m		dB	dB	dBuV/m	dBuV/m	dB	
1 pp	2480.25	78.43	27.52	7.41	38.31	75.05	74.00	1.05	Peak

Detector mode: Average

Polarity: Horizontal



Site : chamber

Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL

EUT :

Model Name :

Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60Hz

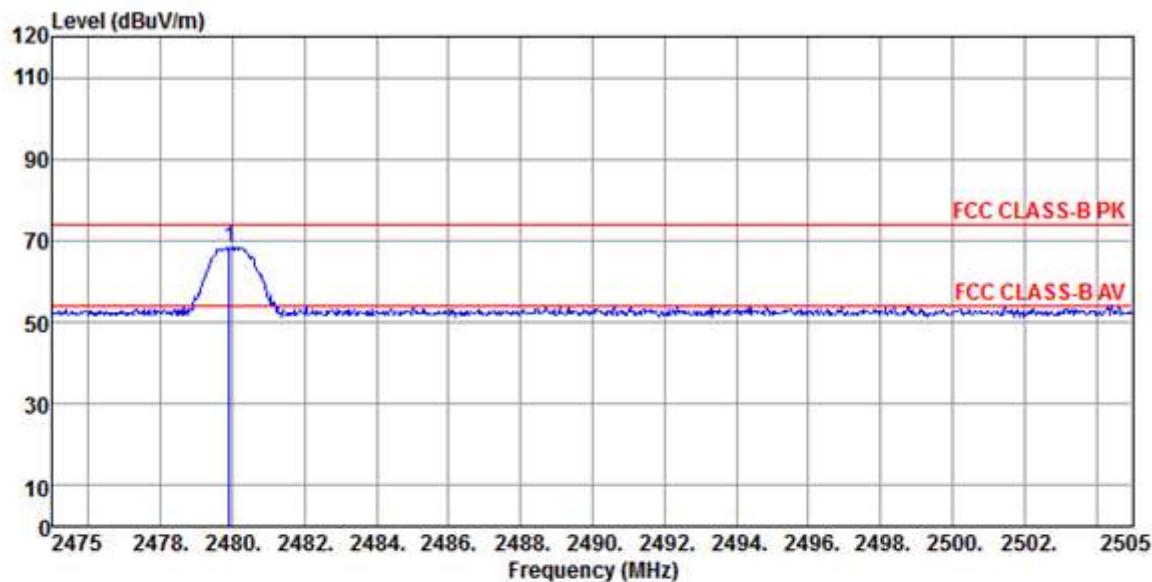
Mode : BT4.0 CH39

Memo :

	ReadAntenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Level	Line	Limit
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
1 pp	2479.98	61.02	27.52	7.41	38.31	57.64
					54.00	3.64 Average

Detector mode: Peak

Polarity: Vertical



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL

EUT :

Model Name :

Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60Hz

Mode : BT4.0 CH39

Memo :

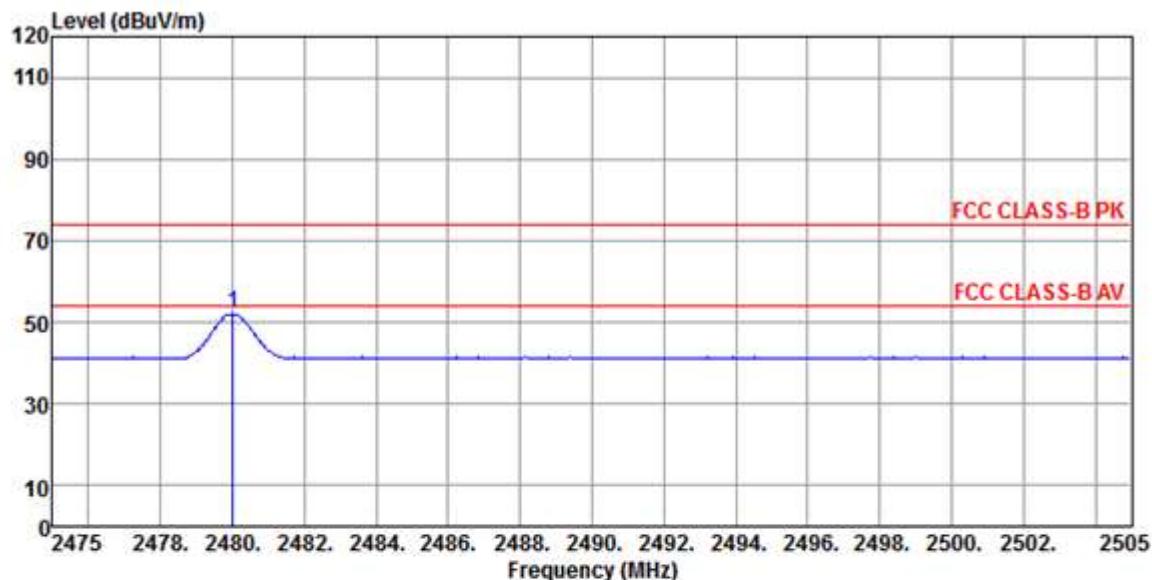
	Read	Antenna	Cable	Preamp	Limit	Over	
Freq	Level	Factor	Loss	Factor	Level	Line	Limit Remark

MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
-----	------	------	----	----	--------	--------	----

1 pp	2479.92	71.78	27.52	7.41	38.31	68.40	74.00	-5.60 Peak
------	---------	-------	-------	------	-------	-------	-------	------------

Detector mode: Average

Polarity: Vertical



Site : chamber

Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL

EUT :

Model Name :

Temp/Humi : 23 °C / 54 %

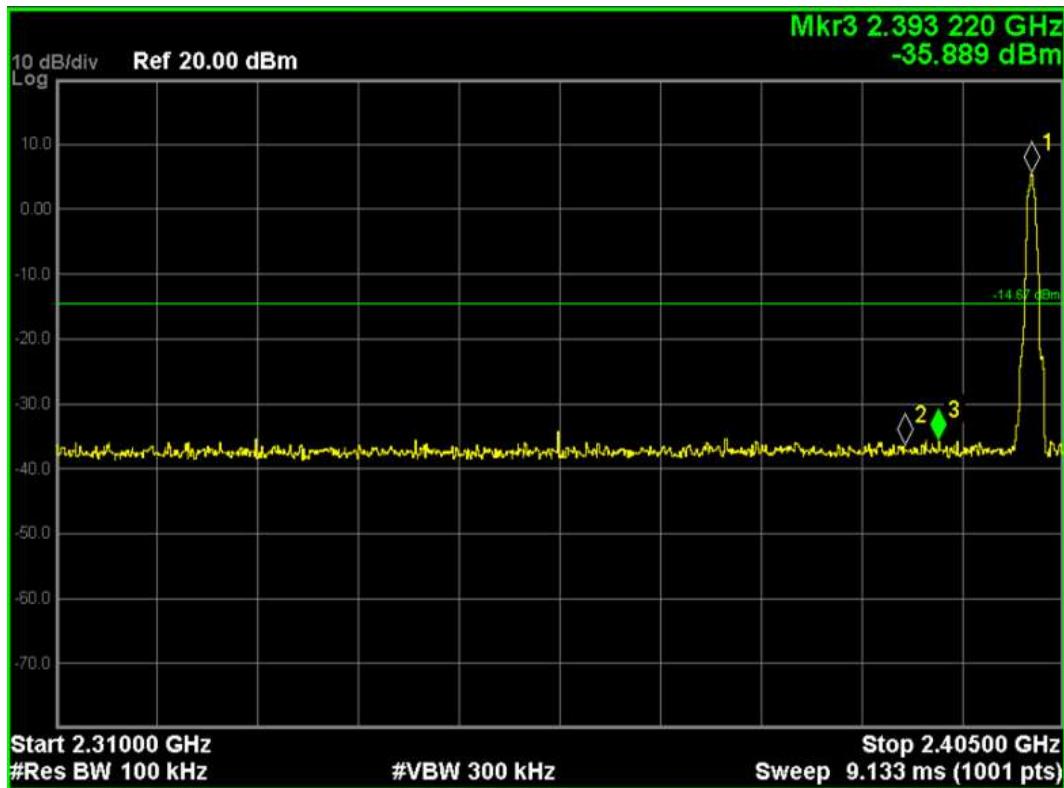
Power Rating: AC 120V/60Hz

Mode : BT4.0 CH39

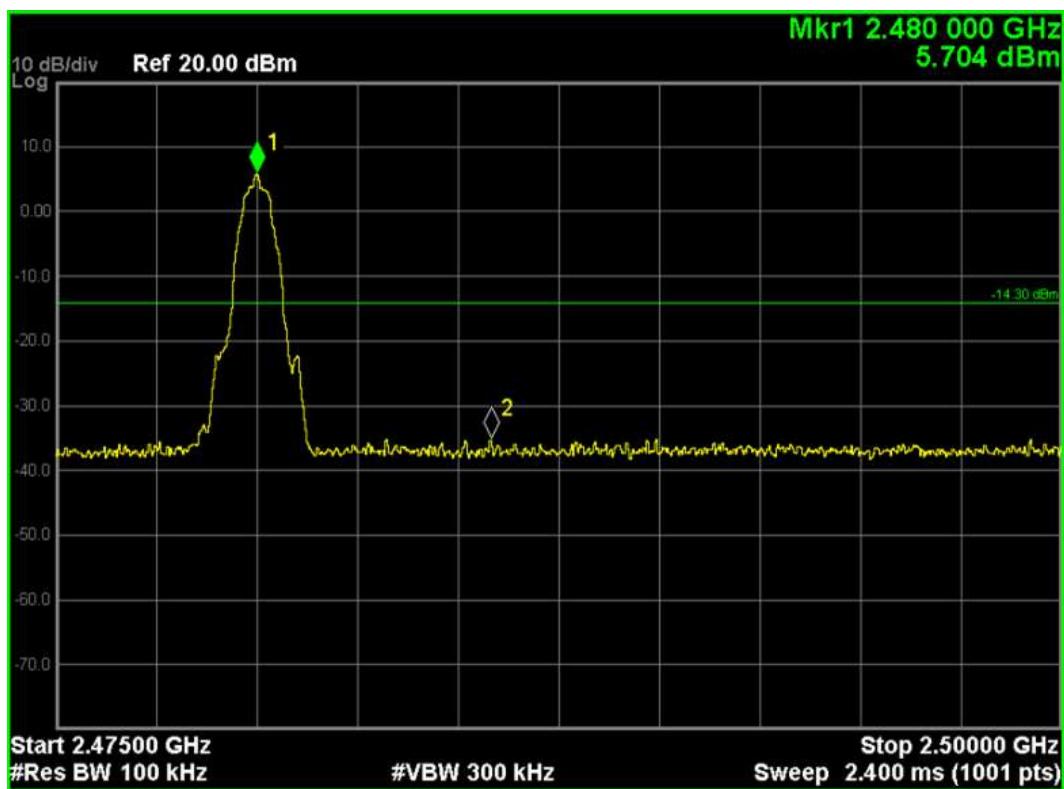
Memo :

Freq	ReadAntenna		Cable Preamp		Limit	Over	Remark
	Level	Factor	Loss	Factor			
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	2480.01	55.43	27.52	7.41	38.31	52.05	54.00 -1.95 Average

Conducted Band Edge:
Bluetooth V4.0 LE GFSK Channel 0



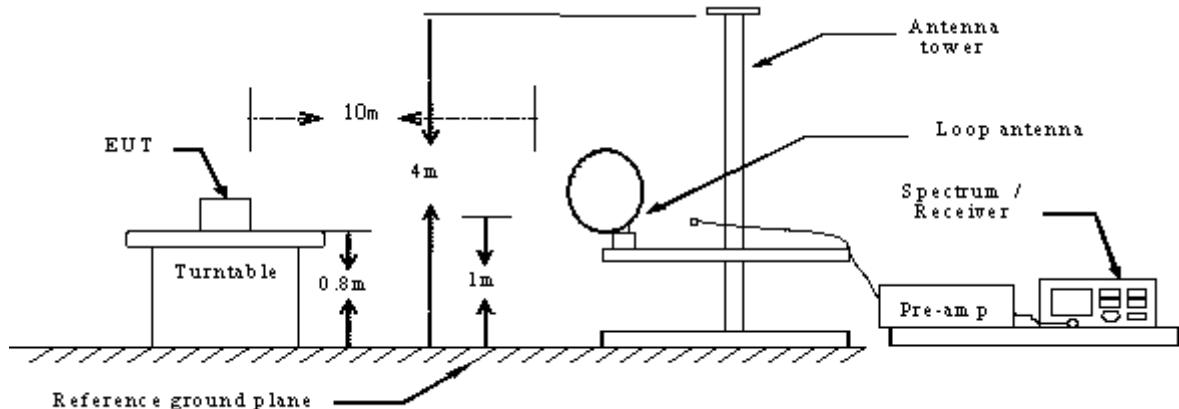
Bluetooth V4.0 LE GFSK Channel 39



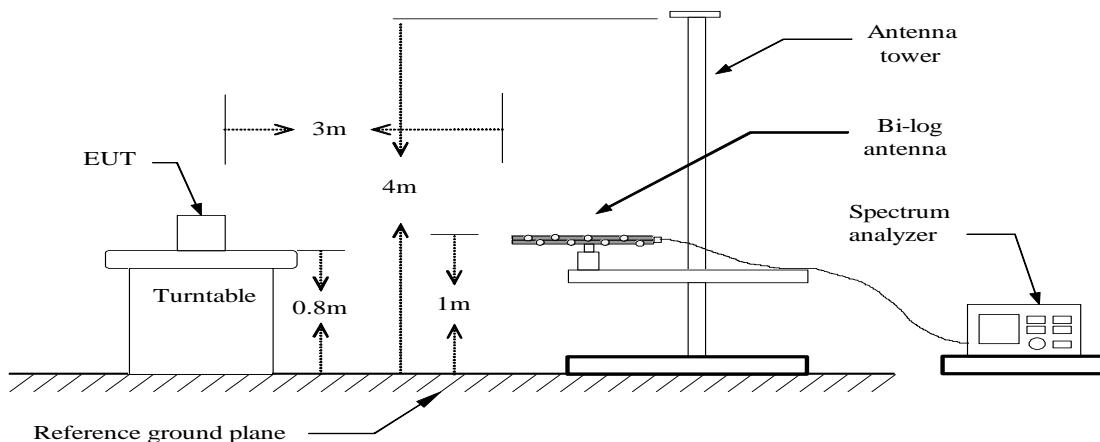
9. SPURIOUS EMISSIONS (RADIATION)

9.1 TEST SETUP

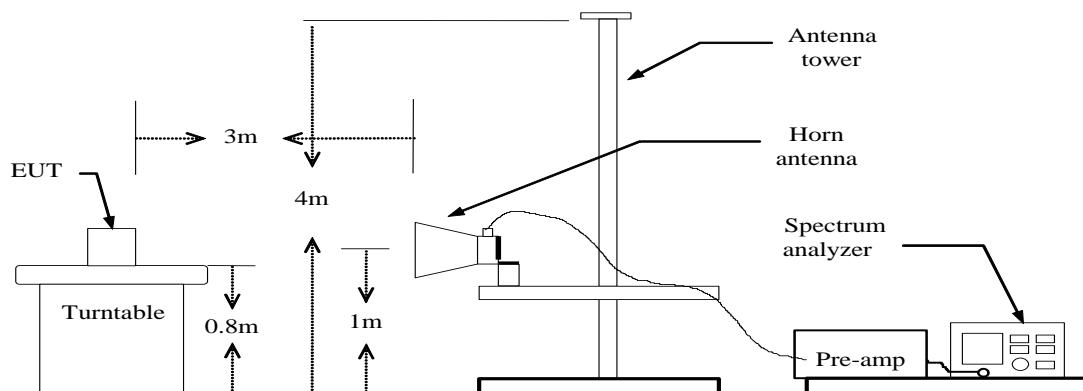
Radiated Spurious Measurement: below 30MHz



Radiated Spurious Measurement: below 1GHz



Radiated Spurious Measurement: above 1GHz



9.2 LIMITS

Frequency (MHz)	Limits (uV/m)	Limits(dBuV/m) At 3m	Measured Distance (m)
0.009-0.490	2400/F(KHz)	128.5-93.80	300
0.490-1.705	24000/F(KHz)	73.80-63.00	30
1.705-30.0	30	69.5	30
30~88	100	40	3
88~216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Notes: the calculate formula for below 30MHz

$$L2 = 20\lg(L1) + 40\lg(d1/d2)$$

L2: is the specified limit in dB microvolts per metre at distance d2.

L1: is the specified limit in microvolts per metre at distance d1.

For example:

$L1 = 2400/9 \text{ } (\mu\text{V/m})$, $d1 = 300 \text{ (m)}$, $d2 = 3 \text{ (m)}$, so L2 as follows:

$$20\lg(2400/9) + 40\lg(300/3) = 128.5(\text{dB}\mu\text{V/m})$$

9.3 TEST PROCEDURE

Radiated Emission (9 kHz – 30 MHz) :

Spurious emissions from the EUT are measured in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The antenna was positioned 3 meters horizontally from the EUT. The RBW of the spectrum analyzer is set to 200Hz(measured frequency range was 9KHz~150KHz) or 9KHz(measured frequency range was 150KHz~30MHz).Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz (these two bands employing a average detector).

Radiated Emission (30 MHz – 1000 MHz):

According to description of ANSI C63.4: 2009 sec.13.4, the preliminary radiated emissions measurement were carried out. The preliminary radiated measurements were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT. The EUT configuration (in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for the final radiated emissions measurements. The measurement is carried out using a spectrum analyzer or receiver. The Quasi-peak detector is used and RBW is set to 120kHz.The antenna height and turn table rotation is adjusted until the maximum power value is founded on spectrum analyzer or receiver.

Radiated Emission (Above 1 GHz):

According to description of ANSI C63.4: 2009 sec.13.4, the preliminary radiated emissions measurement were carried out. The preliminary radiated measurements were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT. The EUT configuration (in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for the final radiated emissions measurements. The measurement is carried out using a spectrum analyzer or receiver. The spectrum analyzer scans from 1GHz to 25GHz (higher than the 10th harmonic of the carrier). The peak detector is used for Peak limit and RBW is set to 1MHz ,VBW \geq 3RBW. The peak detector is used for Average limit and RBW is set to 1MHz ,VBW is not smaller than 1/T, T = to the shortest pulse width. The antenna height and turn table rotation is adjusted until the maximum power value is founded on spectrum analyzer or receiver.

9.4 RESULTS & PERFORMANCE

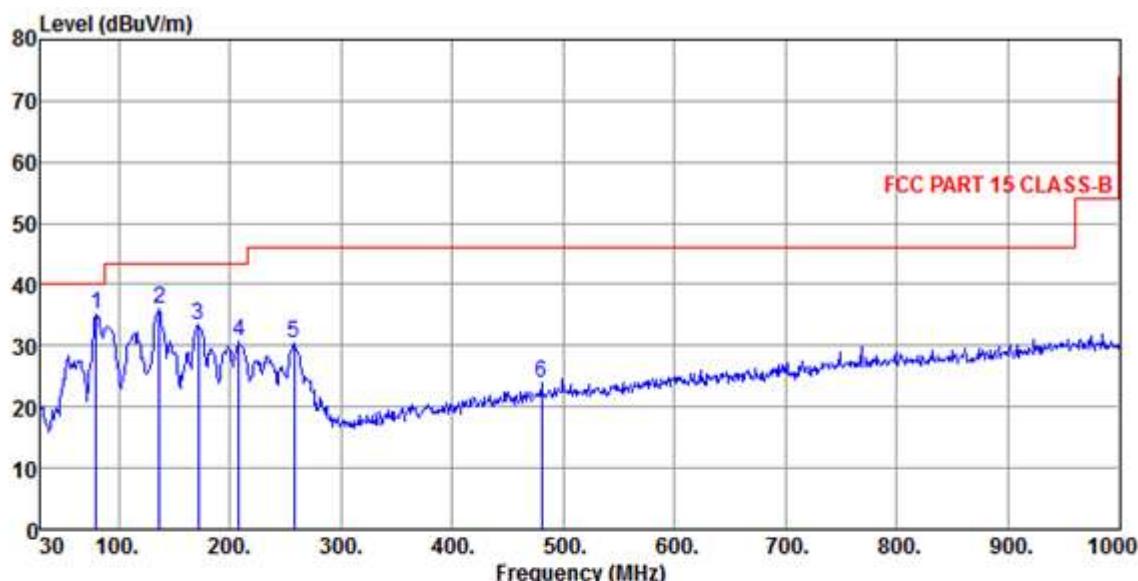
From 9KHz to 30MHz:

The test data was 20dB lower than the permissible limit was not recorded in the report.
802.11b, traffic mode; Channel 1

From 30MHz to 1GHz:

Bluetooth V4.0 LE GFSK Channel 0

Polarity: Horizontal



Site : chamber

Condition : FCC PART 15 CLASS-B 3m VULB9160 HORIZONTAL

EUT :

Model Name :

Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60HZ

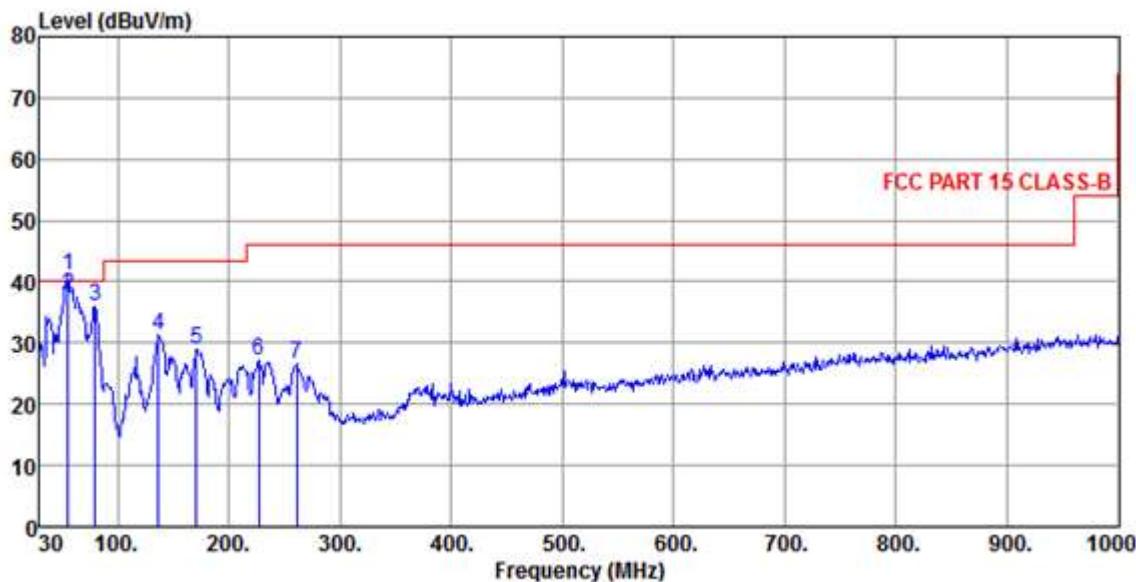
Mode : 802.11b CH1

Memo :

Freq	Read	Antenna	Cable	Preamp	Limit		Over	Line	Limit	Remark
					Level	Factor				
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	dB	dB	dB
1 pp	79.47	25.19	8.77	1.09	0.00	35.05	40.00	-4.95	Peak	
2	136.70	21.24	13.21	1.62	0.00	36.07	43.50	-7.43	Peak	
3	171.62	18.39	13.15	1.86	0.00	33.40	43.50	-10.10	Peak	
4	208.48	18.14	10.53	1.93	0.00	30.60	43.50	-12.90	Peak	
5	257.95	16.08	12.09	2.18	0.00	30.35	46.00	-15.65	Peak	
6	480.08	4.00	16.89	3.00	0.00	23.89	46.00	-22.11	Peak	

Bluetooth V4.0 LE GFSK Channel 0

Polarity: Vertical



Site : chamber
Condition : FCC PART 15 CLASS-B 3m VULB9160 VERTICAL

EUT :

Model Name :

Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60HZ

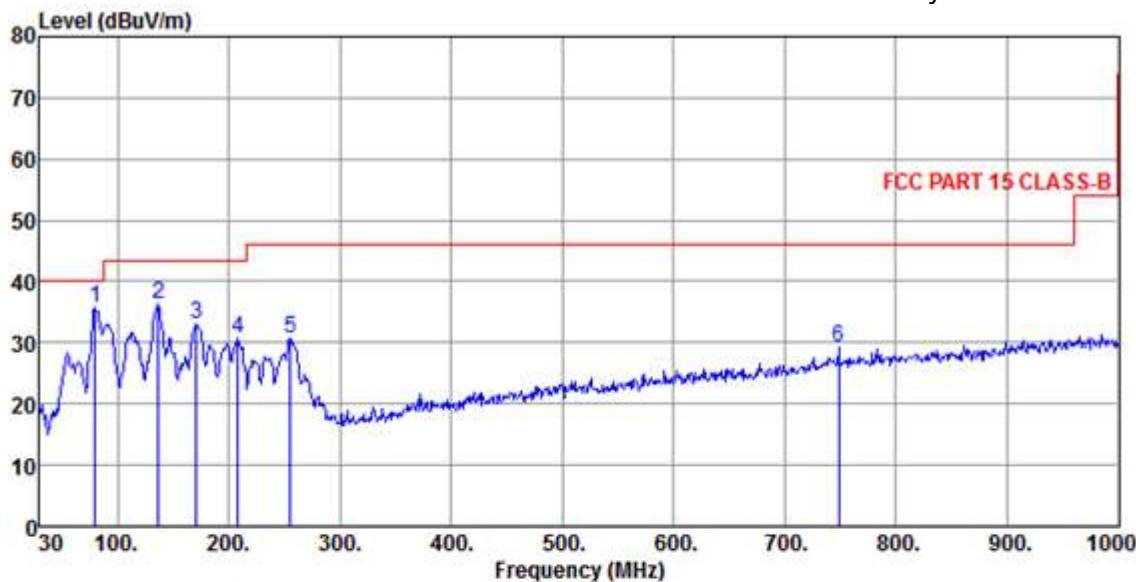
Mode : 802.11b CH1

Memo :

Freq	ReadAntenna		Cable Preamp		Limit	Over	Remark	
	MHz	Level	Factor	Loss	Factor			
1 pp	55.22	27.58	12.40	1.00	0.00	40.98	40.00	0.98 Peak
2 qp	55.73	24.36	12.49	1.00	0.00	37.85	40.00	-2.15 QP
3	79.47	26.17	8.77	1.09	0.00	36.03	40.00	-3.97 Peak
4	136.70	16.55	13.21	1.62	0.00	31.38	43.50	-12.12 Peak
5	170.65	13.97	13.15	1.86	0.00	28.98	43.50	-14.52 Peak
6	226.91	14.18	11.05	2.07	0.00	27.30	46.00	-18.70 Peak
7	260.86	12.31	12.13	2.19	0.00	26.63	46.00	-19.37 Peak

Bluetooth V4.0 LE GFSK Channel 19

Polarity: Horizontal



Site : chamber

Condition : FCC PART 15 CLASS-B 3m VULB9160 HORIZONTAL

EUT :

Model Name :

Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60HZ

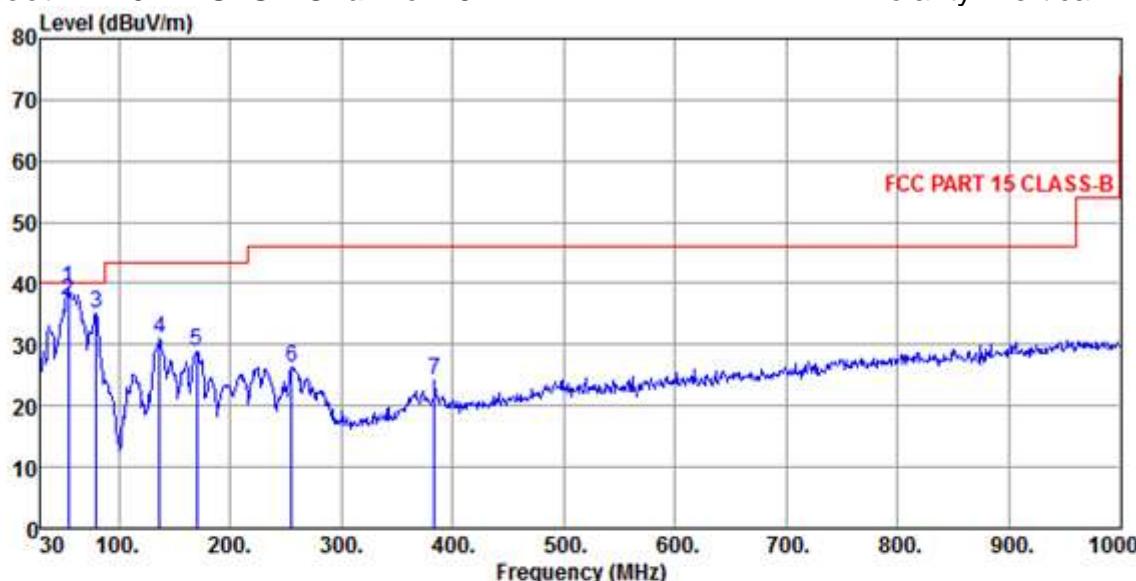
Mode : 802.11b CH6

Memo :

Freq	ReadAntenna		Cable Preamp		Limit Level	Over Line	Over Limit	Remark
	Level	Factor	Loss	Factor				
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 pp	79.47	25.74	8.77	1.09	0.00	35.60	40.00	-4.40 Peak
2	136.70	21.41	13.21	1.62	0.00	36.24	43.50	-7.26 Peak
3	170.65	18.05	13.15	1.86	0.00	33.06	43.50	-10.44 Peak
4	208.48	18.22	10.53	1.93	0.00	30.68	43.50	-12.82 Peak
5	255.04	16.62	12.00	2.17	0.00	30.79	46.00	-15.21 Peak
6	748.77	4.25	21.29	3.80	0.00	29.34	46.00	-16.66 Peak

Bluetooth V4.0 LE GFSK Channel 19

Polarity: Vertical

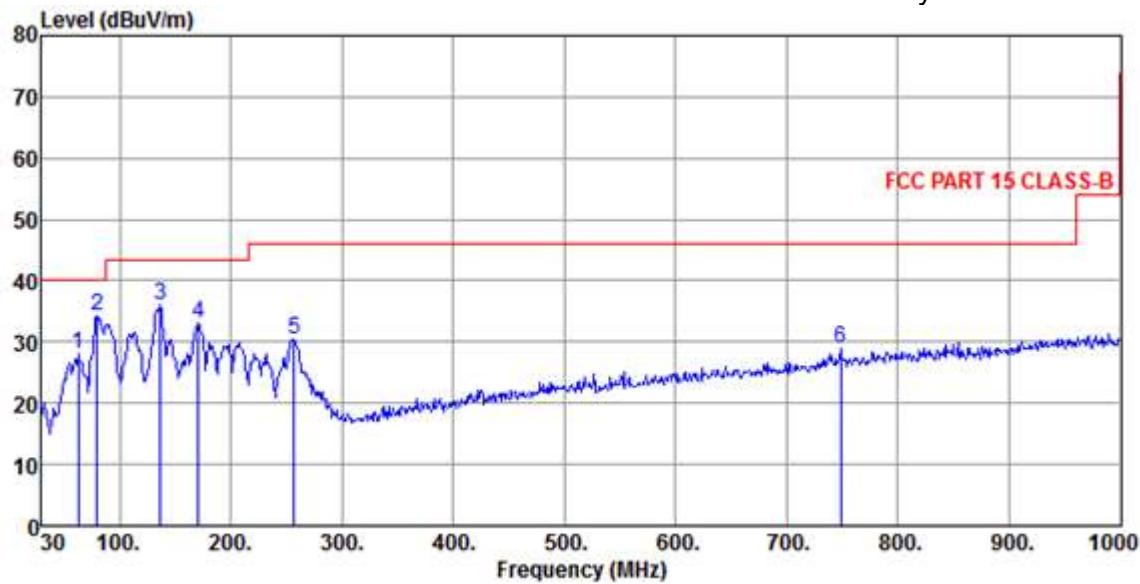


Site : chamber
Condition : FCC PART 15 CLASS-B 3m VULB9160 VERTICAL
EUT :
Model Name :
Temp/Humi : 23 °C / 54 %
Power Rating: AC 120V/60HZ
Mode : 802.11b CH6
Memo :

Freq	ReadAntenna		Cable Preamp		Limit Level	Line	Over Limit	Remark
	Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	54.25	25.84	12.40	0.99	0.00	39.23	40.00	-0.77 Peak
2 qp	54.86	23.84	12.40	0.99	0.00	37.23	40.00	-2.77 QP
3	79.47	25.36	8.77	1.09	0.00	35.22	40.00	-4.78 Peak
4	136.70	16.27	13.21	1.62	0.00	31.10	43.50	-12.40 Peak
5	169.68	13.64	13.33	1.84	0.00	28.81	43.50	-14.69 Peak
6	255.04	12.20	12.00	2.17	0.00	26.37	46.00	-19.63 Peak
7	384.05	6.61	14.97	2.74	0.00	24.32	46.00	-21.68 Peak

Bluetooth V4.0 LE GFSK Channel 39

Polarity: Horizontal



Site : chamber
Condition : FCC PART 15 CLASS-B 3m VULB9160 HORIZONTAL

EUT :

Model Name :

Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60HZ

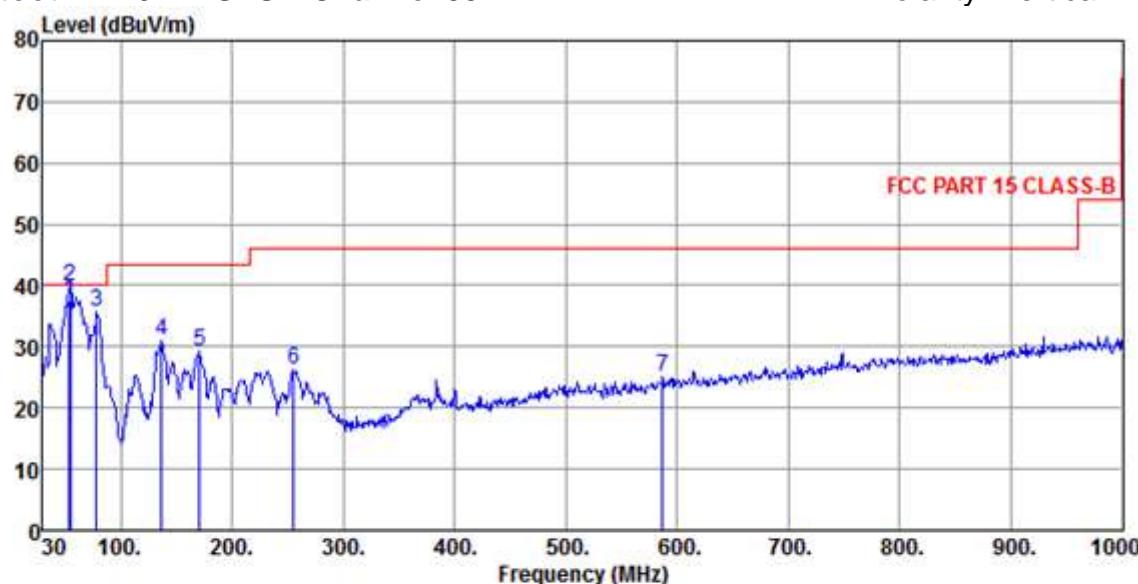
Mode : 802.11b CH11

Memo :

Freq	ReadAntenna		Cable Preamp		Limit Level	Line	Over Limit	Remark
	Level	Factor	Loss	Factor				
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	62.98	14.46	12.51	1.07	0.00	28.04	40.00	-11.96 Peak
2 pp	79.47	24.24	8.77	1.09	0.00	34.10	40.00	-5.90 Peak
3	136.70	21.32	13.21	1.62	0.00	36.15	43.50	-7.35 Peak
4	170.65	18.15	13.15	1.86	0.00	33.16	43.50	-10.34 Peak
5	256.98	16.22	12.05	2.17	0.00	30.44	46.00	-15.56 Peak
6	748.77	3.98	21.29	3.80	0.00	29.07	46.00	-16.93 Peak

Bluetooth V4.0 LE GFSK Channel 39

Polarity: Vertical



Site : chamber
Condition : FCC PART 15 CLASS-B 3m VULB9160 VERTICAL
EUT :
Model Name :
Temp/Humi : 23 °C / 54 %
Power Rating: AC 120V/60HZ
Mode : 802.11b CH11
Memo :

Freq	ReadAntenna		Cable Preamp		Limit Level	Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB				
1 qp	54.11	24.09	12.40	0.99	0.00	37.48	40.00	-2.52 QP
2 pp	54.25	26.55	12.40	0.99	0.00	39.94	40.00	-0.06 Peak
3	78.50	25.37	9.14	1.09	0.00	35.60	40.00	-4.40 Peak
4	136.70	16.21	13.21	1.62	0.00	31.04	43.50	-12.46 Peak
5	170.65	14.12	13.15	1.86	0.00	29.13	43.50	-14.37 Peak
6	255.04	12.22	12.00	2.17	0.00	26.39	46.00	-19.61 Peak
7	586.78	2.91	18.78	3.30	0.00	24.99	46.00	-21.01 Peak

From 1GHz to 25GHz:

Only show the worst test data when EUT was operated on different mode.

EUT operation mode : BT GFSK(Ch0/Ch19/Ch38)

Bluetooth V4.0 LE GFSK Channel 0

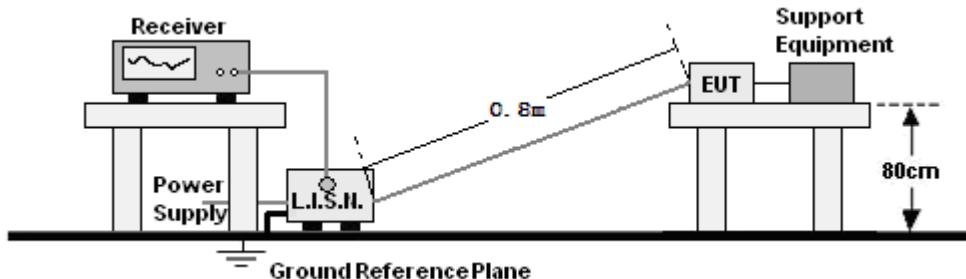
Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Antenna Polarity	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
2402	83.62	-3.55	Horizontal	80.07	/	/	Peak
4804	34.84	4.72	H	39.56	74	34.44	Peak
7206	38.11	10.83	H	48.94	74	25.06	Peak
2402	79.87	-3.55	Vertical	76.32	/	/	Peak
4804	33.43	4.72	V	38.15	74	35.85	Peak
7206	36.00	10.83	V	46.83	74	27.17	Peak

Note:

- 1, Total=Reading+Correct factor;
- 2, 2402 MHz was fundamental signal which can be ignored;
- 3, Average measurement was not performed if peak level were lower than the average limit;
- 4, Other harmonics are lower than background noise.

10. AC POWER LINE CONDUCTED EMISSIONS

10.1 TEST SETUP



10.2 LIMITS

Frequency range (MHz)	Limits dB(μ V)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

NOTE: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

10.3 TEST PROCEDURE

According to description of ANSI C63.4: 2009 sec.13.1.3, the AC power line preliminary conducted emissions measurements were carried out. The preliminary conducted measurements were performed using the spectrum analyzer to observe the emission characteristics of the EUT. The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for final AC power line conducted emissions measurements. The EUT is placed on a non-metallic table 0.8m above the horizontal metal reference ground plane. The EUT is connected to LISN and LISN is connected to the reference ground. All other supplemental devices are connected with EUT through other LISN. The distance between EUT and LISN is 80cm. A radio link is established between EUT and the tester. The output power of the EUT is controlled by the tester and driven to maximum value. An initial pre-scan was performed on the live L line and neutral line with peak detector (9kHz RBW). Both average detector and quasi-peak detector are performed at the frequencies with maximized peak emission.

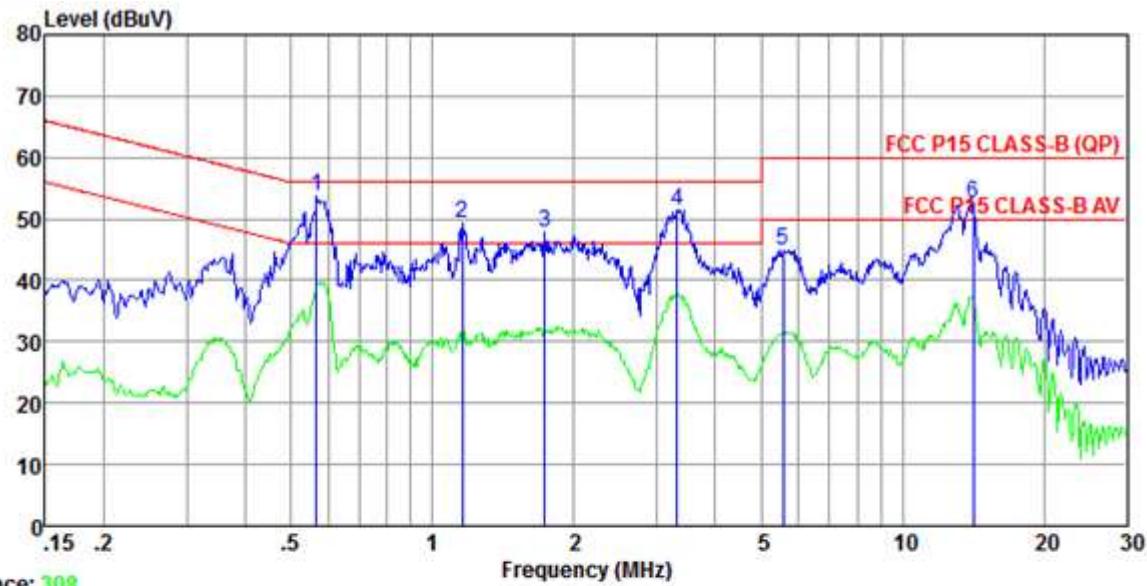
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

10.4 RESULTS & PERFORMANCE

Only show the worst test data when EUT was operated on different mode.

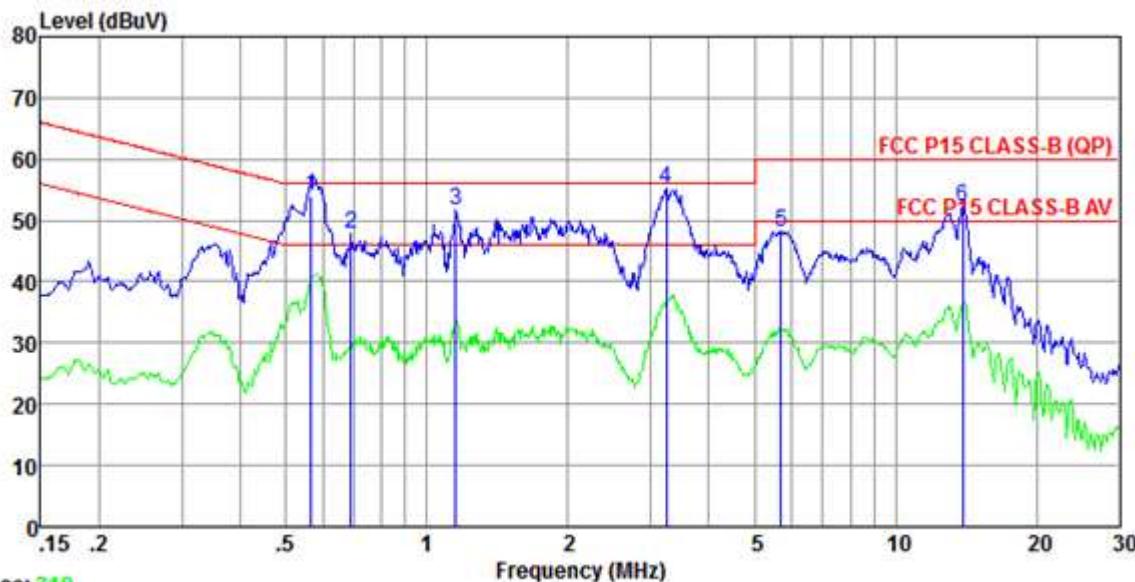
EUT operation mode: Bluetooth V4.0 LE GFSK (Ch0/Ch19/Ch39)

Bluetooth V4.0 LE GFSK Channel 0



Site : chamber
Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE
EUT :
Model Name :
Temp/Humi : 23 °C / 54 %
Power Rating: AC 120V/60HZ
Mode : 802.11b CH1
Memo :

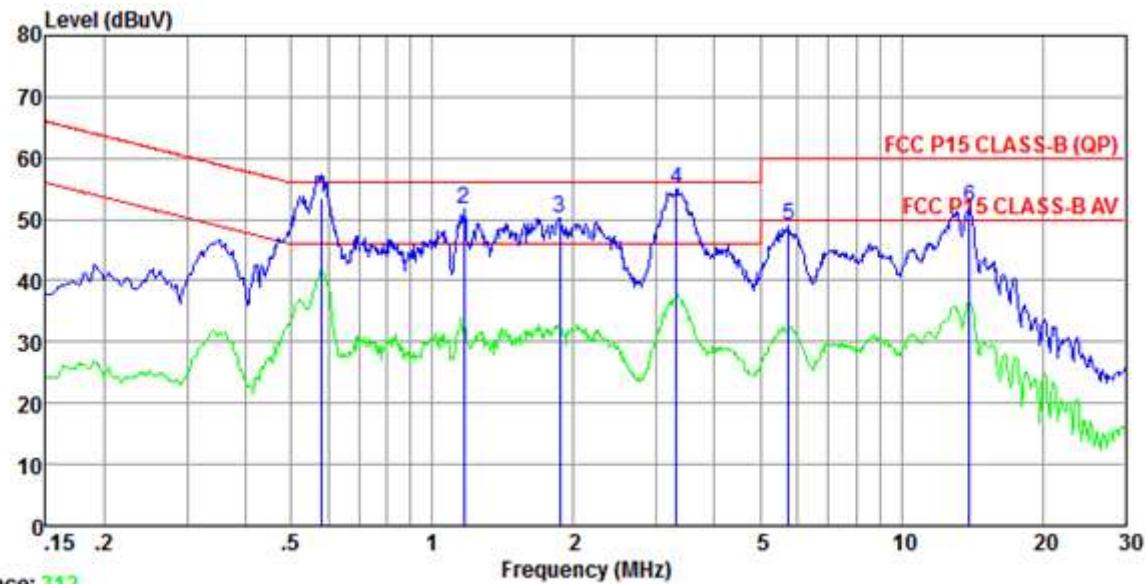
Freq	Read	LISN	Cable	Preamp	Limit	Over	Limit	Remark
	MHz	Level	Factor	Loss	Factor	Level	dBuV	dB
1 pp	0.57	43.20	10.50	0.11	0.00	53.81	56.00	-2.19 Peak
2	1.16	38.51	10.52	0.14	0.00	49.17	56.00	-6.83 Peak
3	1.73	37.25	10.52	0.15	0.00	47.92	56.00	-8.08 Peak
4	3.31	40.73	10.52	0.15	0.00	51.40	56.00	-4.60 Peak
5	5.56	34.24	10.50	0.19	0.00	44.93	60.00	-15.07 Peak
6	14.14	41.94	10.50	0.18	0.00	52.62	60.00	-7.38 Peak



Site : chamber
Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL
EUT :
Model Name :
Temp/Humi : 23 °C / 54 %
Power Rating: AC 120V/60HZ
Mode : 802.11b CH1
Memo :

Freq	Read	LISN	Cable	Preamp	Limit	Line	Over	Remark
	MHz	dBuV	Factor	Loss				
1 qp	0.57	43.60	10.38	0.11	0.00	54.09	56.00	-1.91 QP
2	0.69	37.52	10.31	0.12	0.00	47.95	56.00	-8.05 Peak
3	1.15	41.17	10.31	0.14	0.00	51.62	56.00	-4.38 Peak
4 pp	3.24	44.75	10.32	0.15	0.00	55.22	56.00	-0.78 Peak
5	5.68	37.73	10.33	0.20	0.00	48.26	60.00	-11.74 Peak
6	13.91	41.49	10.53	0.20	0.00	52.22	60.00	-7.78 Peak

Bluetooth V4.0 LE GFSK Channel 19



Site : chamber

Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL

EUT :

Model Name :

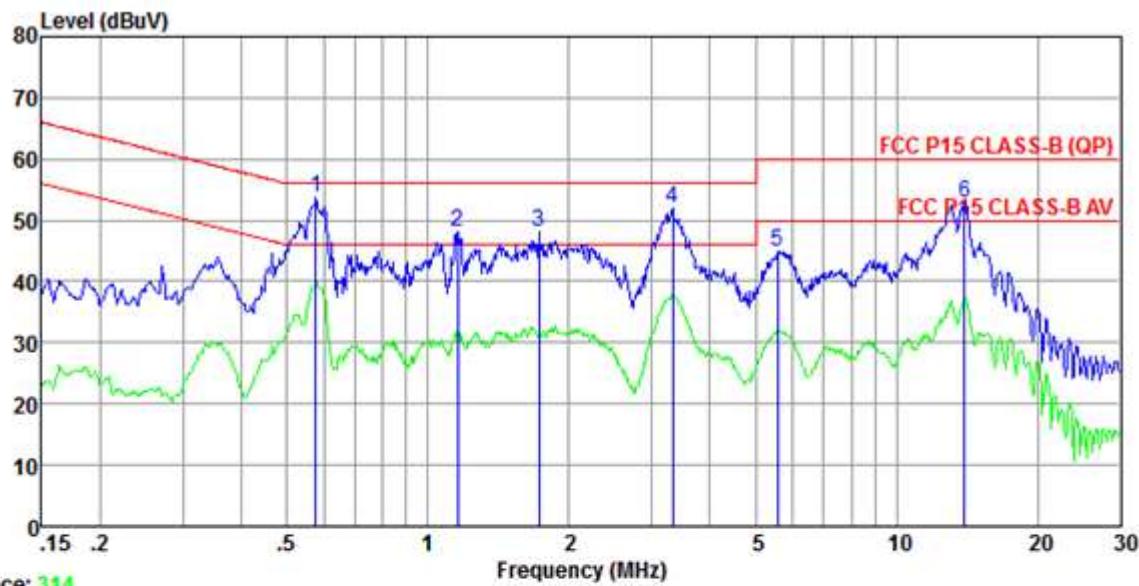
Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60HZ

Mode : 802.11b CH6

Memo :

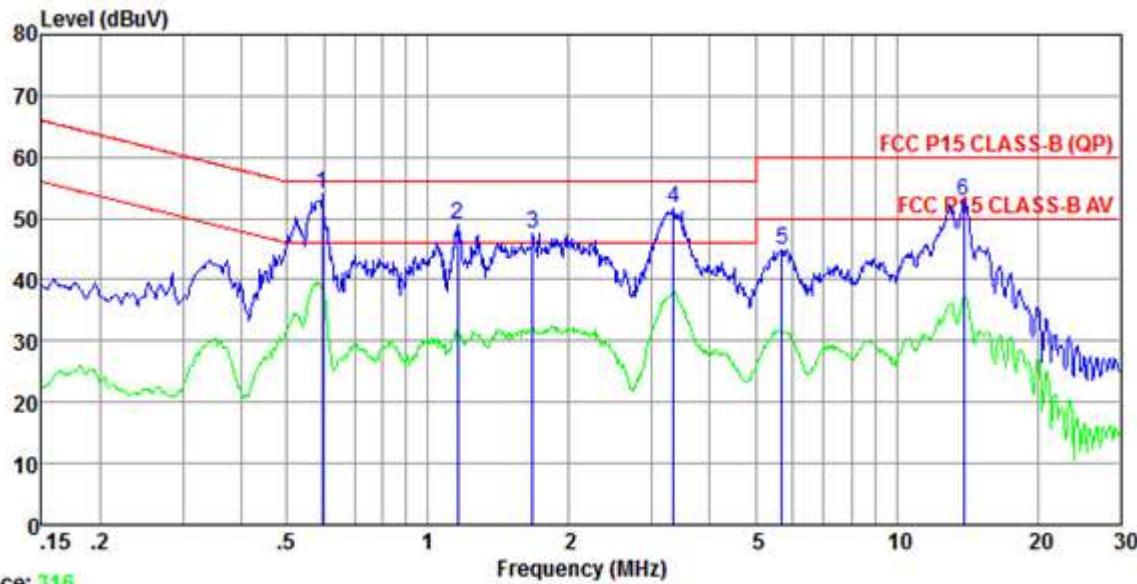
	Freq	Read	LISN	Cable	Preamp	Limit	Over	Remark
		Level	Factor	Loss	Factor			
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB
1 qp	0.58	42.86	10.37	0.11	0.00	53.34	56.00	-2.66 QP
2	1.17	41.23	10.31	0.14	0.00	51.68	56.00	-4.32 Peak
3	1.87	39.70	10.31	0.15	0.00	50.16	56.00	-5.84 Peak
4 pp	3.31	44.50	10.32	0.15	0.00	54.97	56.00	-1.03 Peak
5	5.74	38.36	10.33	0.21	0.00	48.90	60.00	-11.10 Peak
6	13.99	41.36	10.53	0.20	0.00	52.09	60.00	-7.91 Peak



Site : chamber
Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE
EUT :
Model Name :
Temp/Humi : 23 °C / 54 %
Power Rating: AC 120V/60HZ
Mode : 802.11b CH6
Memo :

Freq	Read	LISN	Cable	Preamp	Limit	Over	Remark	
	Freq	Level	Factor	Loss				
1 pp	0.58	43.16	10.49	0.11	0.00	53.76	56.00	-2.24 Peak
2	1.16	37.49	10.52	0.14	0.00	48.15	56.00	-7.85 Peak
3	1.73	37.42	10.52	0.15	0.00	48.09	56.00	-7.91 Peak
4	3.33	41.20	10.52	0.15	0.00	51.87	56.00	-4.13 Peak
5	5.56	34.20	10.50	0.19	0.00	44.89	60.00	-15.11 Peak
6	13.99	42.07	10.50	0.20	0.00	52.77	60.00	-7.23 Peak

Bluetooth V4.0 LE GFSK Channel 39



Site : chamber

Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE

EUT :

Model Name :

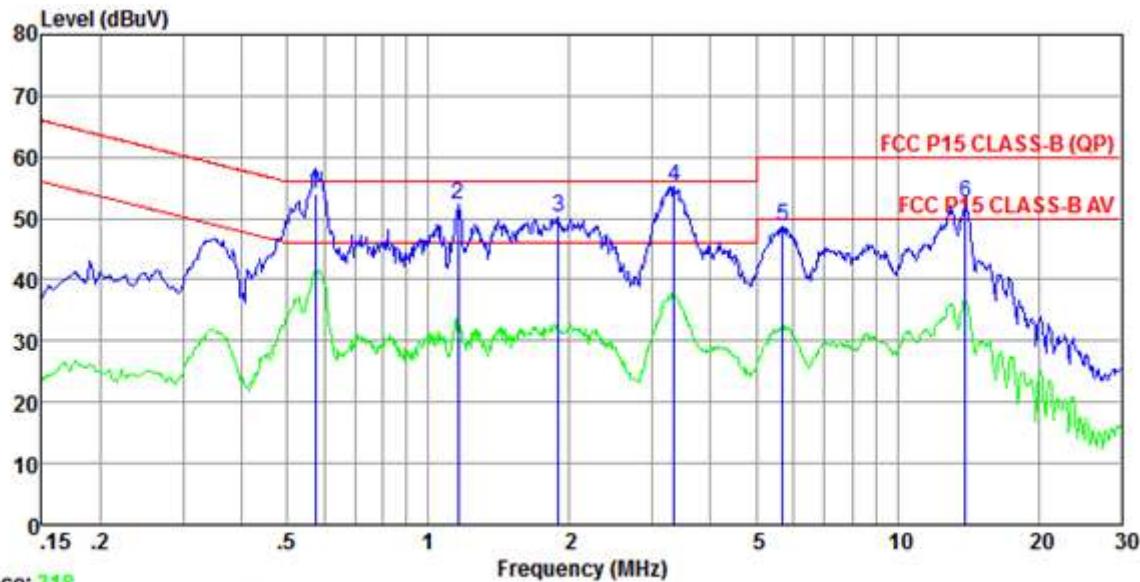
Temp/Humi : 23 °C / 54 %

Power Rating: AC 120V/60HZ

Mode : 802.11b CH11

Memo :

Freq	Read	LISN	Cable	Preamp	Limit	Over	Remark
	MHz	Level	Factor	Loss			
1 pp	0.59	43.49	10.47	0.11	0.00	54.07	56.00 -1.93 Peak
2	1.16	38.24	10.52	0.14	0.00	48.90	56.00 -7.10 Peak
3	1.67	36.86	10.52	0.15	0.00	47.53	56.00 -8.47 Peak
4	3.35	41.01	10.52	0.15	0.00	51.68	56.00 -4.32 Peak
5	5.68	34.15	10.50	0.20	0.00	44.85	60.00 -15.15 Peak
6	13.91	42.21	10.50	0.20	0.00	52.91	60.00 -7.09 Peak



Site : chamber
Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL
EUT :
Model Name :
Temp/Humi : 23 °C / 54 %
Power Rating: AC 120V/60HZ
Mode : 802.11b CH11
Memo :

		Read Freq	LISN Level	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	qp	0.57	43.65	10.37	0.11	0.00	54.13	56.00	-1.87 QP
2		1.16	41.68	10.31	0.14	0.00	52.13	56.00	-3.87 Peak
3		1.90	39.66	10.31	0.15	0.00	50.12	56.00	-5.88 Peak
4	pp	3.35	44.67	10.32	0.15	0.00	55.14	56.00	-0.86 Peak
5		5.68	38.25	10.33	0.20	0.00	48.78	60.00	-11.22 Peak
6		13.99	41.77	10.53	0.20	0.00	52.50	60.00	-7.50 Peak

APPENDIX 1 PHOTOGRAHPS OF TEST SETUP

Please refer to the file named “Part 15C Setup Photos”.

APPENDIX 2 PHOTOGRAHPS OF EUT

Please refer to the files named “EUT External Photos” and “EUT Internal Photos”.

----End of the report----