

FCC Part 15 Test Report

for FHSS System

Product Name : **MobileMapper 20**
Model Name : **MobileMapper 20**

Prepared for:
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Report Number : **UL28620131105CE/FCC/IC014-3**
Date of Report : **2013-12-24**
Date of Test : **2013-11-17~2013-12-20**

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: Trimble Nantes S.A.S.
Z.A.C de La Fleuriaye CD 60433,44474 Carquefou Cedex France

Manufacturer: Trimble Nantes S.A.S.
Z.A.C de La Fleuriaye CD 60433,44474 Carquefou Cedex France

Product Name: MobileMapper 20

Brand Name: SPECTRA Precision

Model Name: MobileMapper 20

FCC ID: NZI802168

IC ID: 9288A-802168

Serial Number: N/A

Technical Data: AC input: AC 100~240V 50/60Hz
Battery: 3.64V~4.2V

Date of Receipt: 2013-11-17

Test Standard: FCC CFR Title 47 Part 15 Subpart C
ANSI C 63.4: 2009
DA 00705

Test Result: Complied

Date of Test 2013-11-10~2013-12-20

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1. GENERAL INFORMATION

1.1 EUT DESCRIPTION

Product Name:	MobileMapper 20
Model Name:	MobileMapper 20
Hardware Version:	E750W_V0.3
Software Version:	V1.1.2
RF Exposure Environment:	Uncontrolled
Bluetooth	
Frequency Range:	2400MHz~2483.5MHz
Type of Modulation:	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Channel Separation:	1MHz
Channel Number:	79
Antenna Type:	Internal
Antenna Peak Gain:	-0.5dBi
Component	
AC Adapter:	Model Name: PSAl05R-050Q
	Input: AC 100-240V 50/60Hz
	Output: DC 5V/1A

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: GFSK CH0
Mode 2: GFSK CH39
Mode 3: GFSK CH78
Mode 4: 8-DPSK CH0
Mode 5: 8-DPSK CH39
Mode 6: 8-DPSK CH78

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 ERP/EIRP and 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 13.3 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 13.4 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.

2.5 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

After verification, all tests were carried out with the worst case test modes as shown below GFSK(1Mbps) and 8-DPSK(3 Mbps) Channel Low (2402MHz) 、Mid (2441MHz) and High (2480MHz), these were chosen for full testing.

3. TECHNIACL 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
Channel Separation	§15.247 (a)	P
Minimum Hopping Channel	§15.247 (a)	P
Occupied Bandwidth	§15.247 (a)	P
Dwell Time	§15.247 (a)	P
Peak Output Power (Conduction)	§15.247 (b)	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	2014/09/27
Wireless Connectivity Test Set	Agilent	N4010A	MY49080305	2014/09/27
LISN	R&S	ENV216	100069	2014/08/28
3m Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	CT-0000336	2016/08/25
Microwave Preamplifier	EM Electronics	EM30180	3008A02425	2014/03/01
Power Splitter	Agilent	11667C/ 52401	MY53806148	2014/03/01
Cold-heat climate test chamber	Weiss-Voetsch Environmental	C, 180, -40	546860026200 10	2013/12/4

	Testing Instruments(Taichang) Co., Ltd.			
DC Power Supply	Agilent	6612C	MY43002989	2014/03/04
Loop Antenna	Schwarzbeck	FMZB1519	1519-020	2014/03/27
Bilog Antenna	Schwarzbeck	VULB9160	9160-3316	2014/07/19
VHF-UHF-Biconical Antenna	Schwarzbeck	VUBA9117	9117-263	2014/07/19
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-942	2014/07/19
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-943	2014/07/19
Horn Antenna(18-40GHz)	ETS	3116	00070497	2014/07/19

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and has been calibrated by accredited calibration laboratories.

3.4 SUPPORT EQUIPMENT

Equipment	Manufacturer	Model	Serial No.	Due Date
Signal Generator	Agilent	N4010A	MY50140938	2014/08/26

3.5 TEST FACILITY

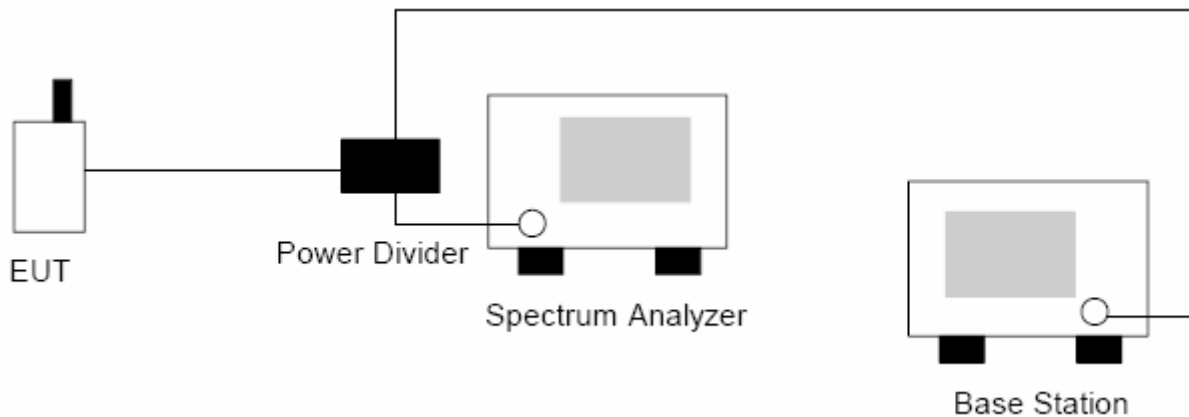
All test facilities used to collect the test data are located at Shanghai Institute of Measurement and Testing Technology EMC Lab., Shanghai, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4: 2009, CISPR 16-1-1 and other equivalent standards. The laboratory is compliance with the requirements of the ISO/IEC/E 17025.

3.6 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 and RSS-210. ZTE 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. CHANNEL SEPARATION

4.1 TEST SETUP



4.2 LIMITS

Limits	≥ 25 kHz or 20 dB bandwidth of hopping channel
--------	---

4.3 TEST PROCEDURE

The EUT have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) $\geq 1\%$ of the span

Video (or Average) Bandwidth (VBW) \geq RBW

Sweep = auto

Detector function = peak

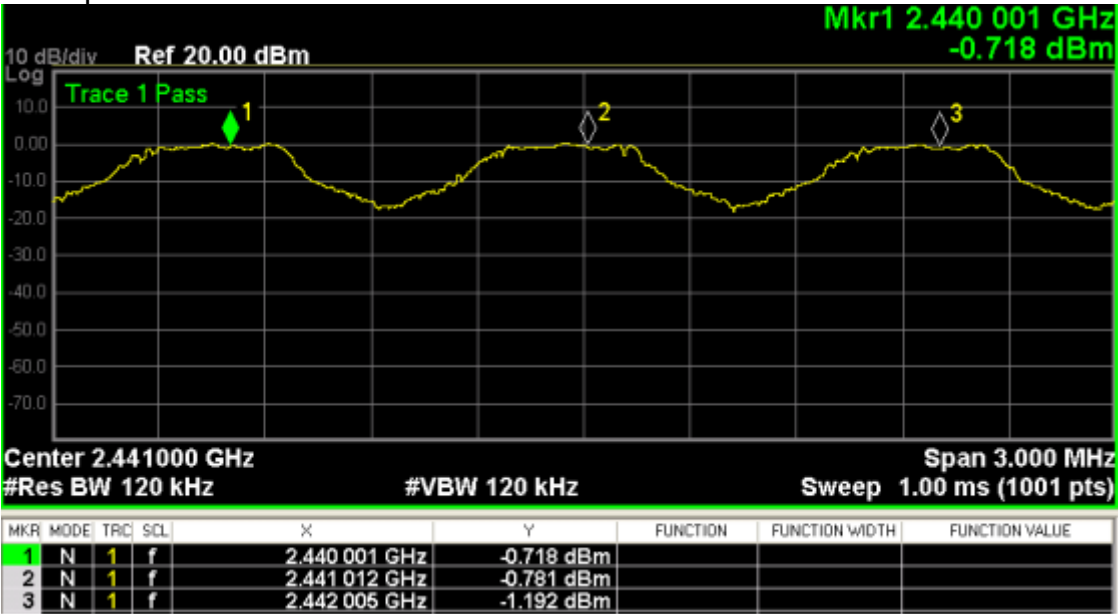
Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

4.4 TEST RESULT

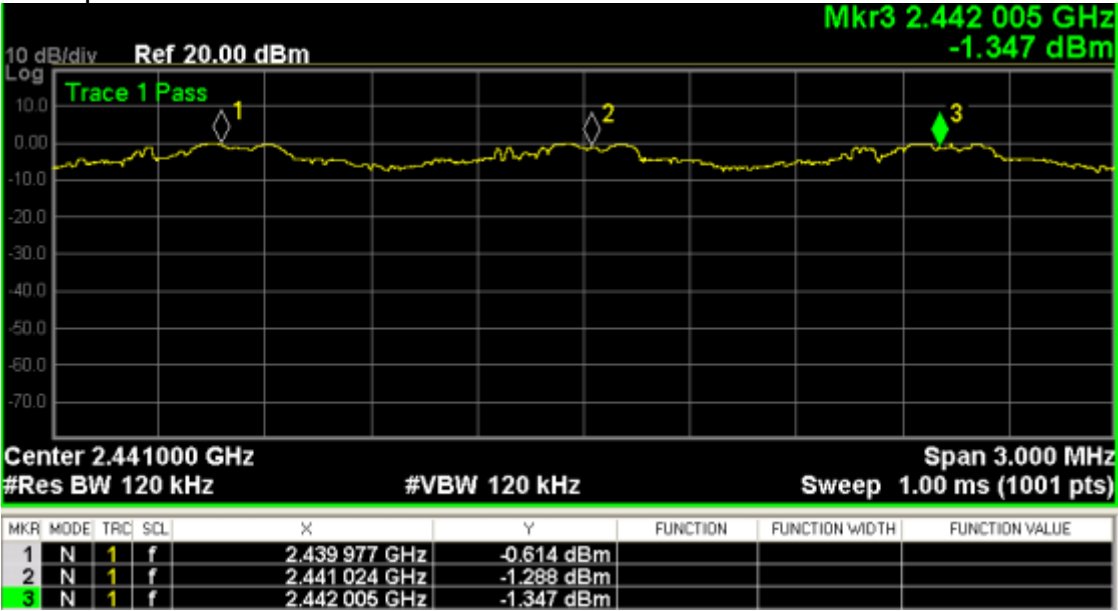
GFSK

Channel Separation: 1.000MHz



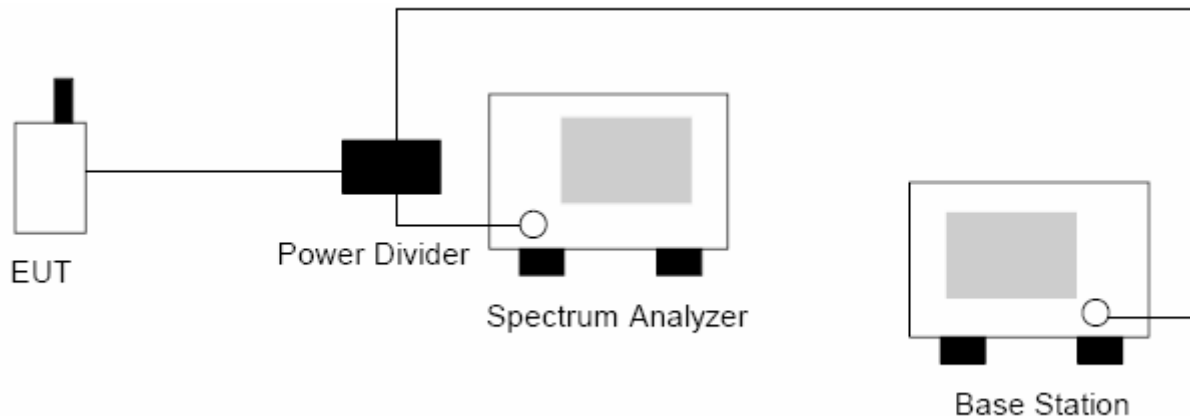
8-DPSK

Channel Separation: 1.000MHz



5. MINIMUM HOPPING CHANNELS

5.1 TEST SETUP



5.2 LIMITS

Limits	≥ 15 Channels
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5.3 TEST PROCEDURE

The EUT have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW $\geq 1\%$ of the span

VBW \geq RBW

Sweep = auto

Detector function = peak

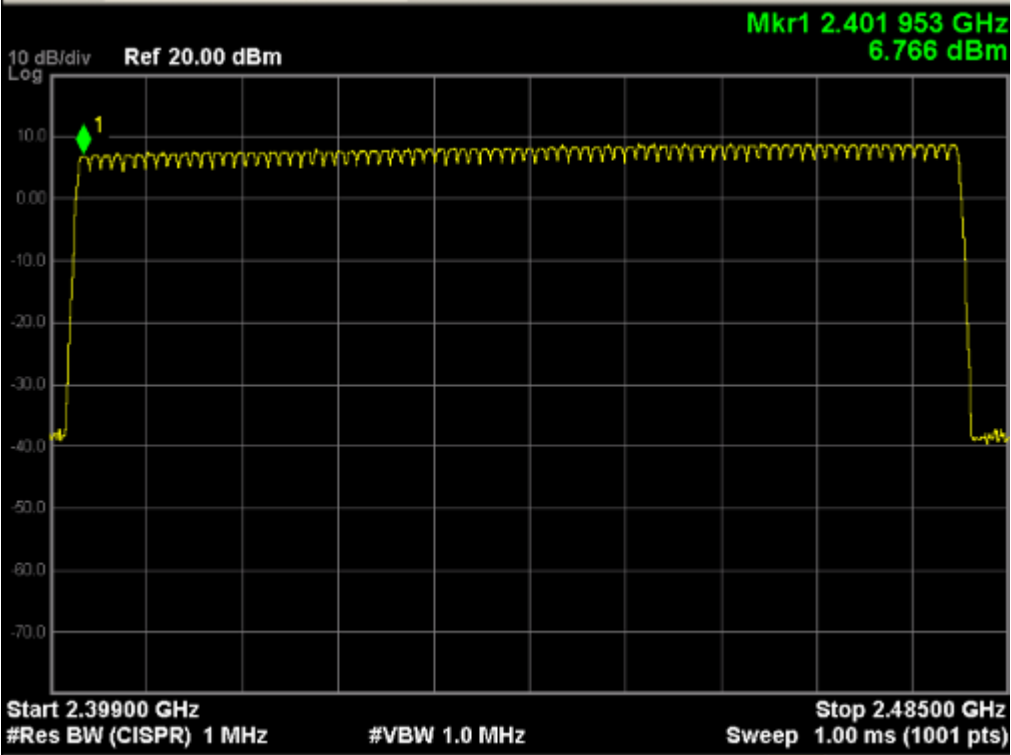
Trace = max hold

Allow the trace to stabilize. It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies.

5.4 TEST RESULT

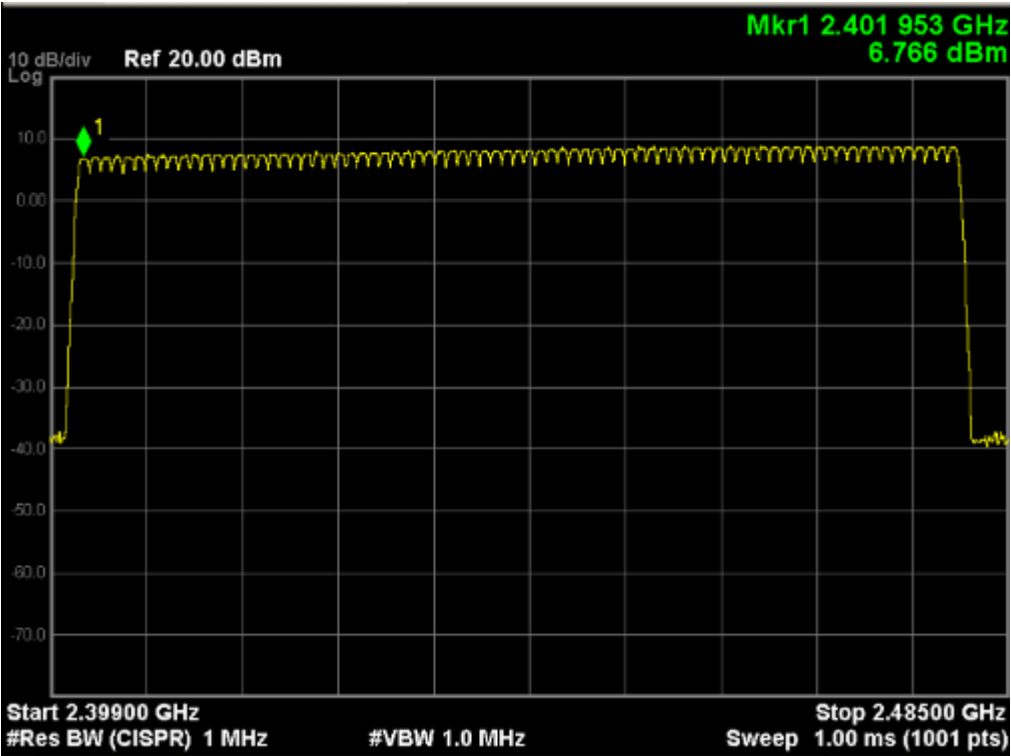
GFSK

Hopping Channel: 79 channels



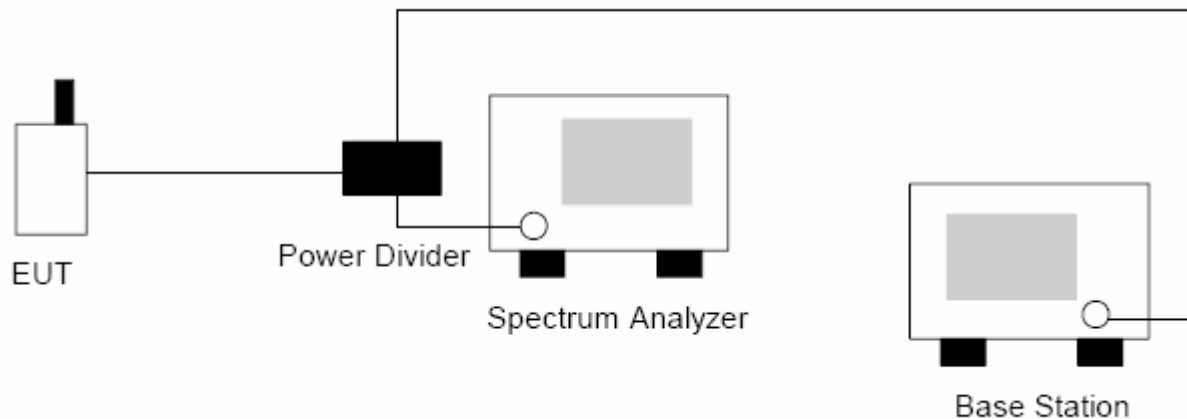
8-DPSK

Hopping Channel: 79 channels



6. OCCUPIED BANDWIDTH

6.1 TEST SETUP



6.2 LIMITS

Limits	≥ 25 kHz or 2 to 3 times the 20 dB bandwidth
--------	---

6.3 TEST PROCEDURE

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 6 dB or 20 dB bandwidth, centered on a channel

RBW $\geq 1\%$ of the 6 dB or 20 dB bandwidth

VBW \geq RBW

Sweep = auto

Detector function = peak

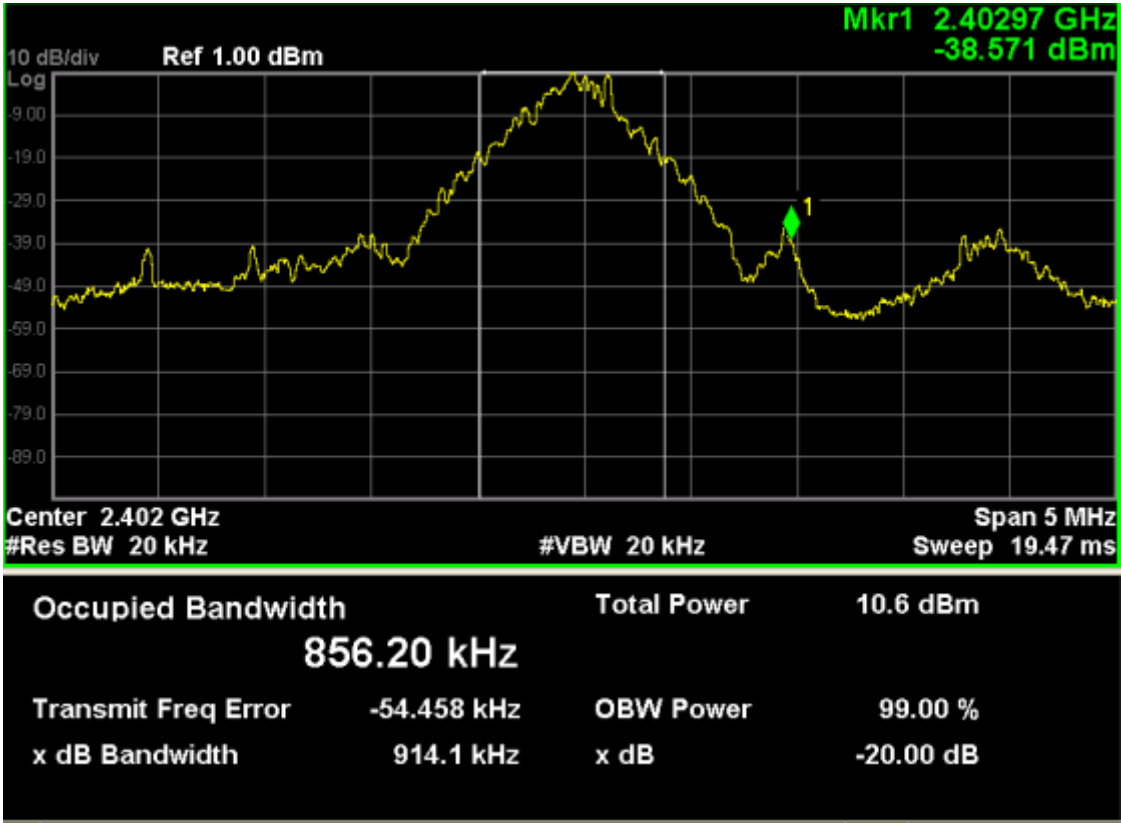
Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 6 dB or 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 6 dB or 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

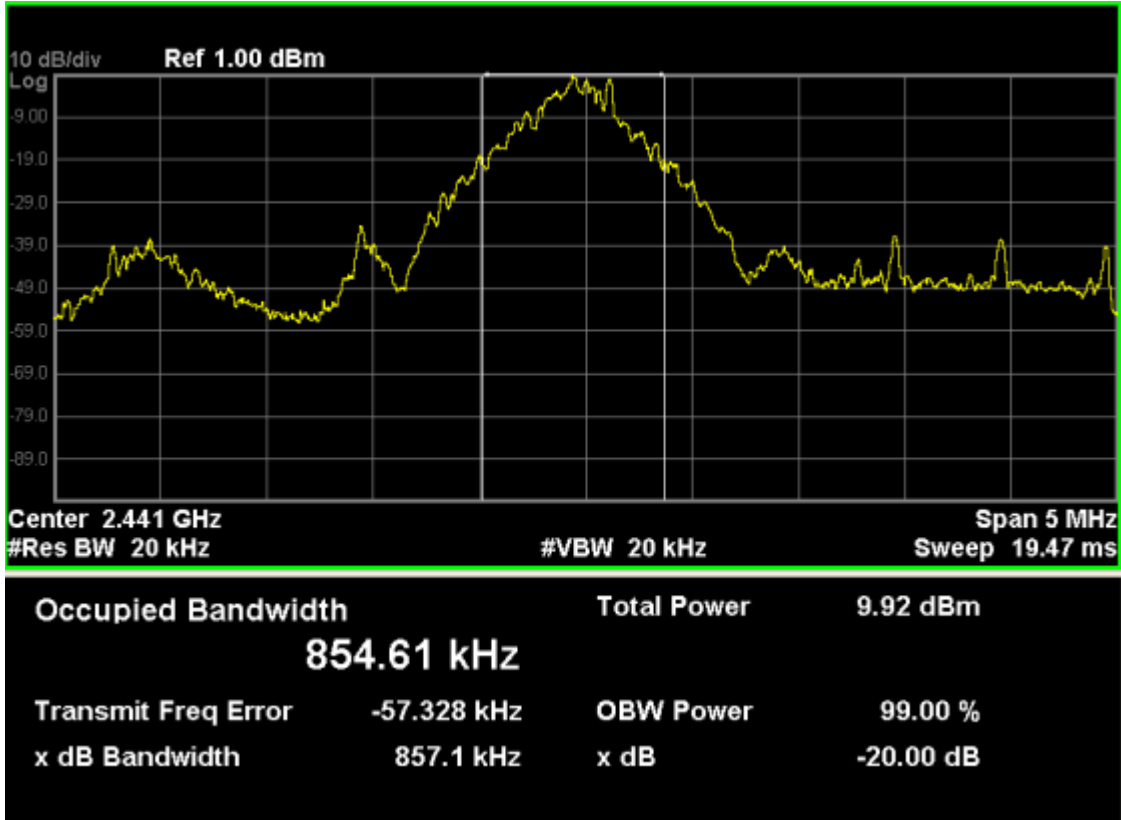
6.4 TEST RESULTS

Channel	20dB bandwidth (MHz)	99% bandwidth (MHz)
GFSK		
BT CH0	0.9141	0.85620
BT CH39	0.8571	0.85461
BT CH79	0.9170	0.86242
8-DPSK		
BT CH0	1.277	1.1887
BT CH39	1.307	1.1947
BT CH79	1.306	1.2025

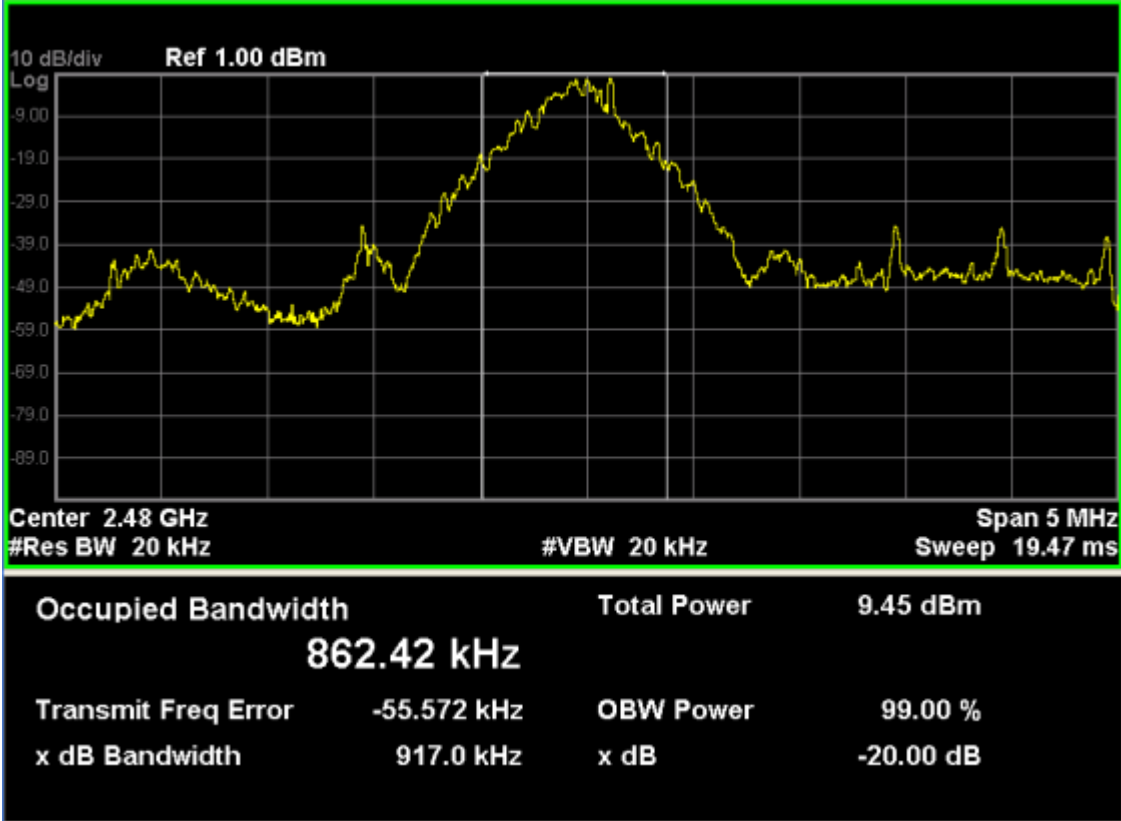
GFSK
Bluetooth Channel 0



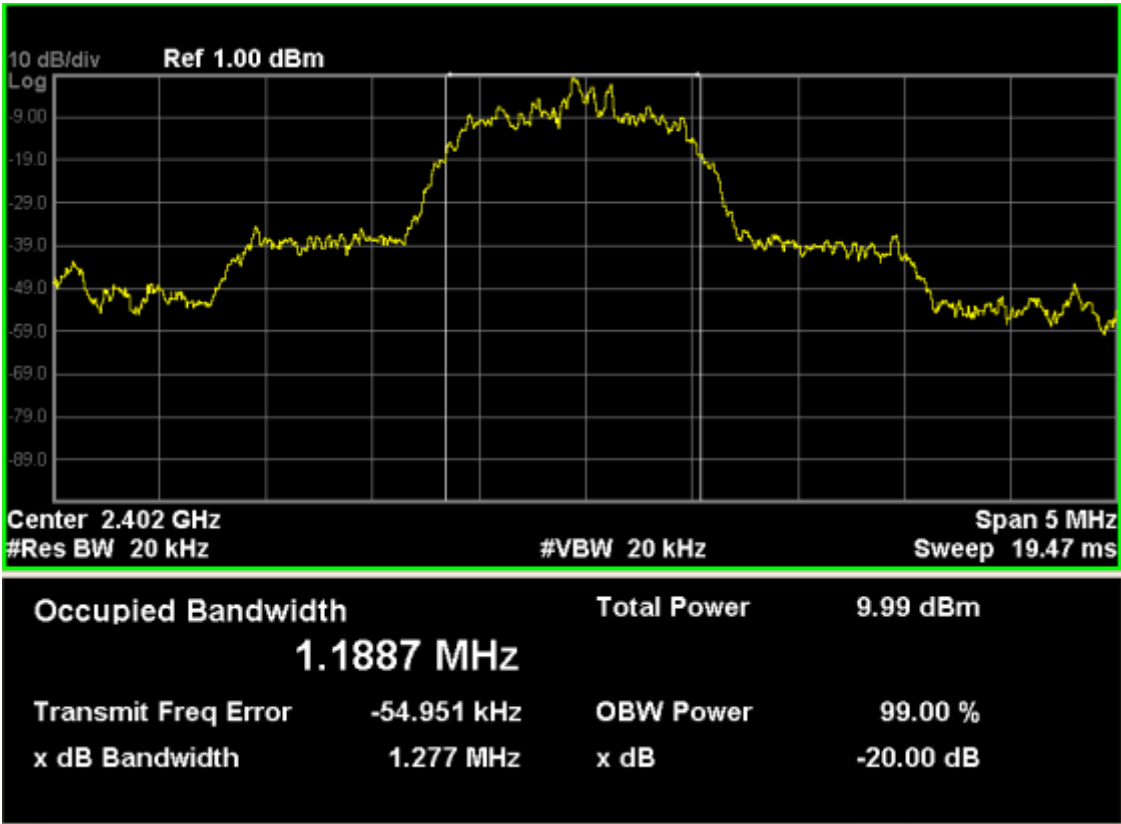
Bluetooth Channel 39



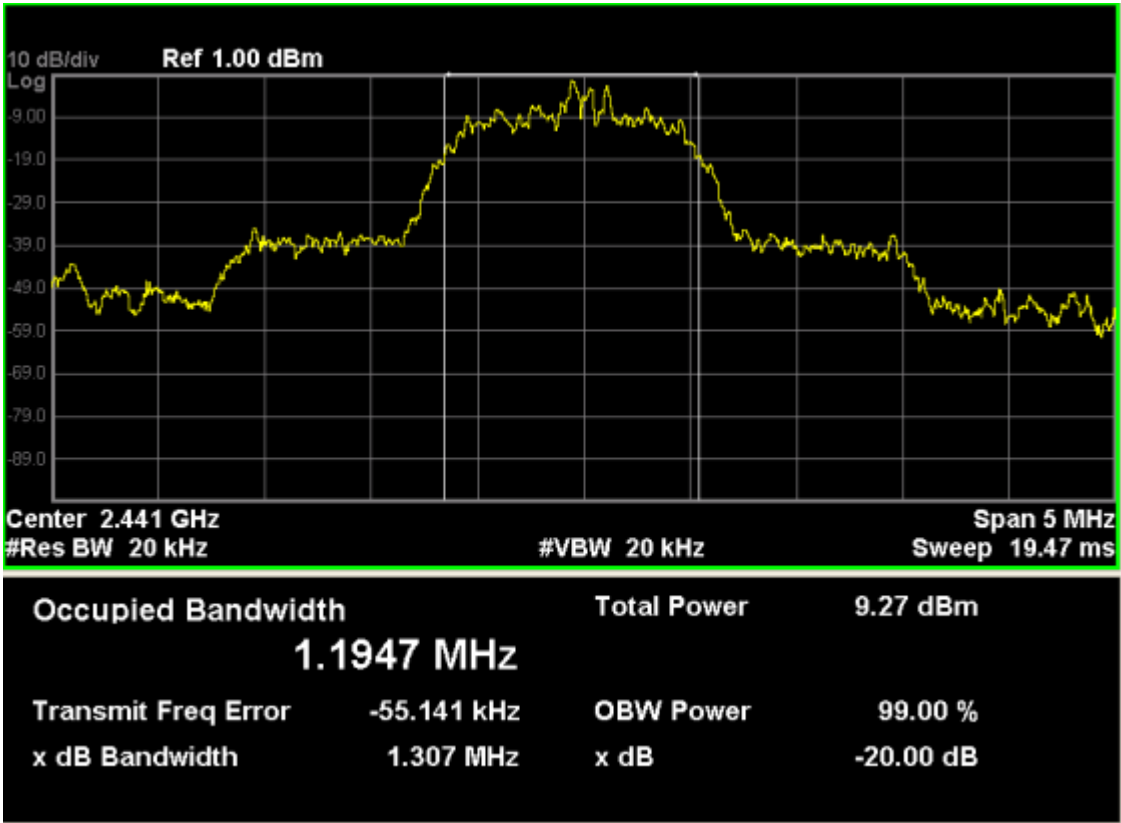
Bluetooth Channel 78



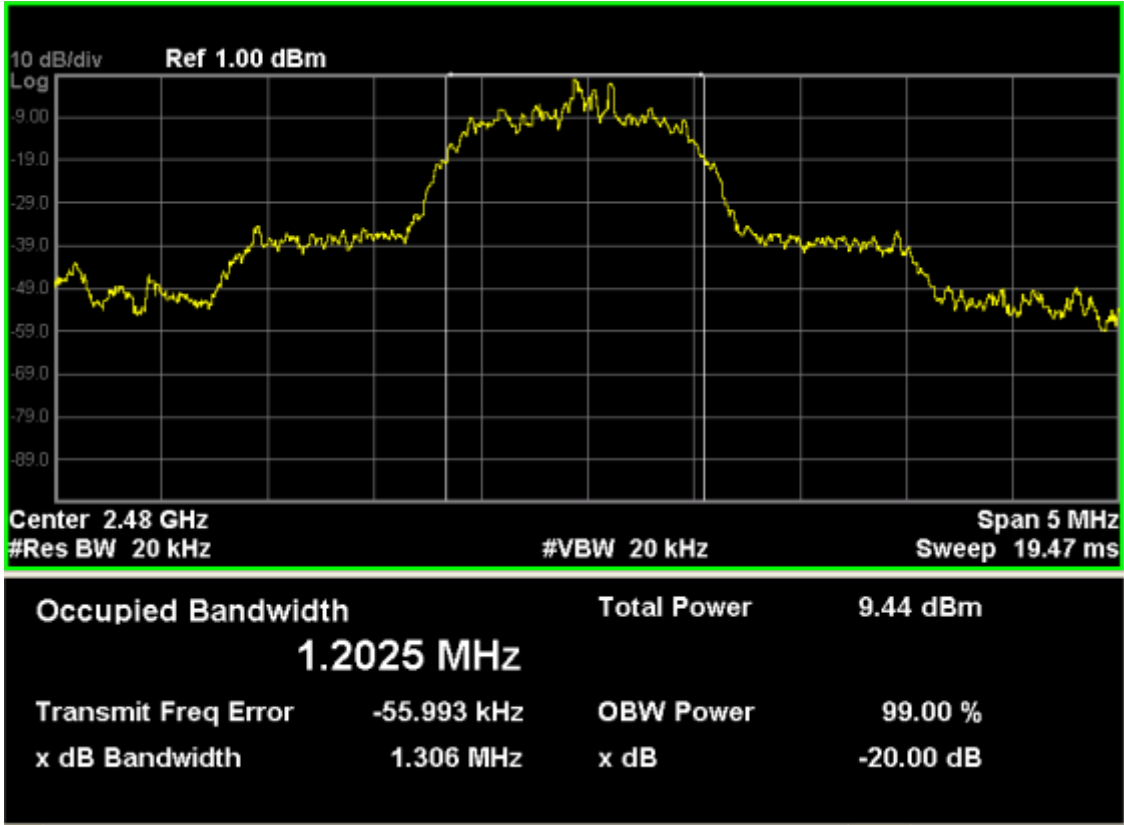
8-DPSK
Bluetooth Channel 0



Bluetooth Channel 39

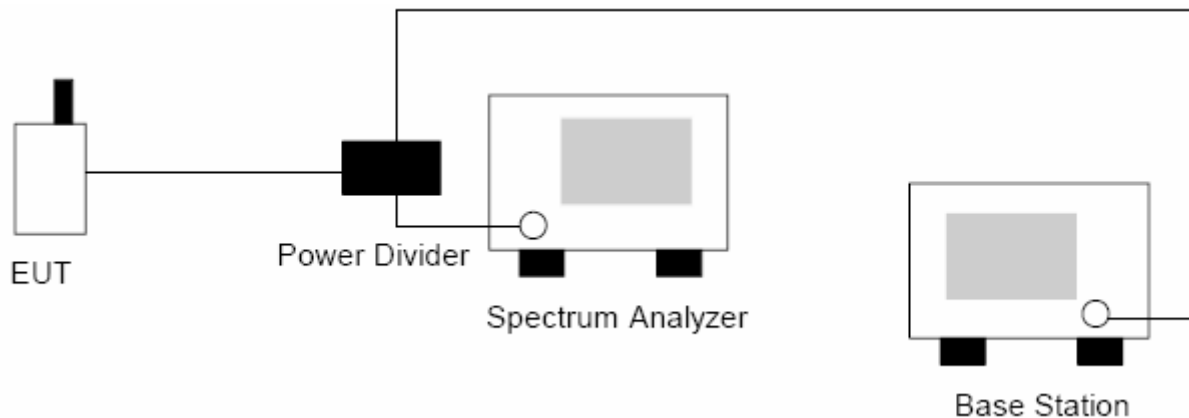


Bluetooth Channel 78



7. DWELL TIME

7.1 TEST SETUP



7.2 LIMITS

Limits	<400.00ms
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7.3 TEST PROCEDURE

The EUT must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel

$RBW \leq \text{Channel Separation}$

$VBW \geq RBW$

Sweep = as necessary to capture the entire dwell time per hopping channel

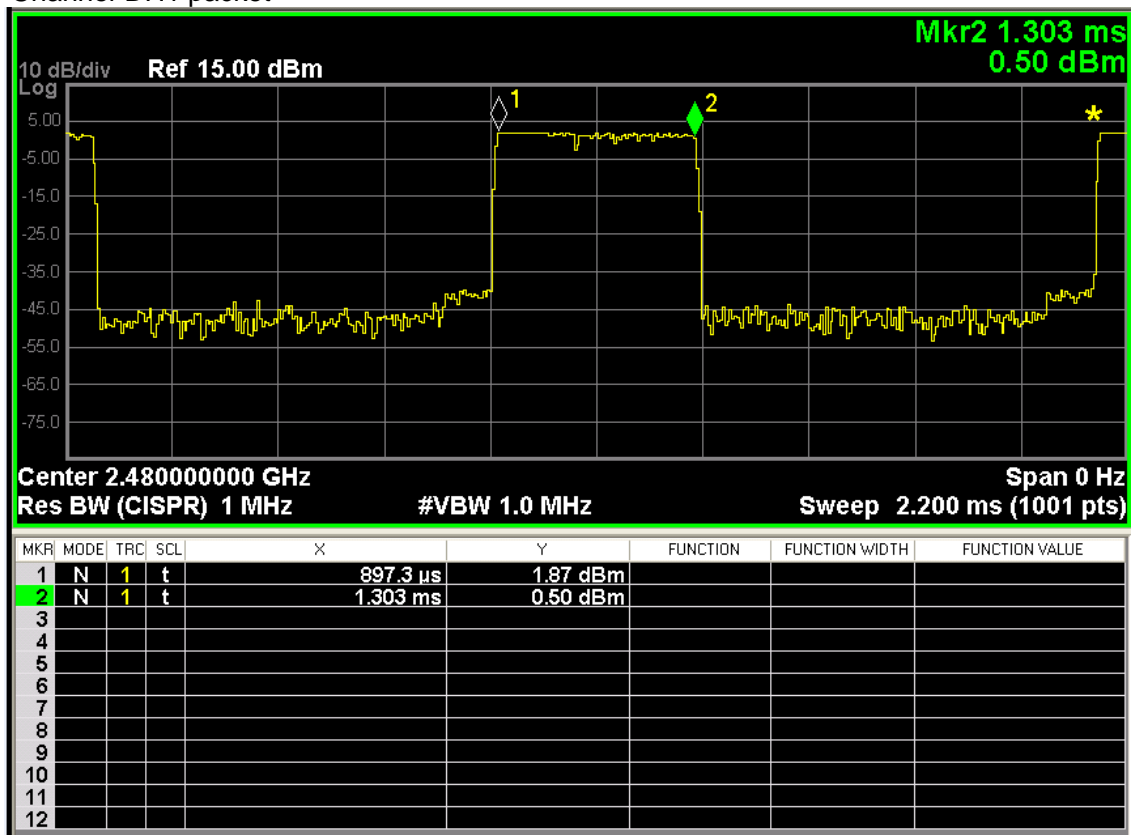
Detector function = peak

Trace = max hold

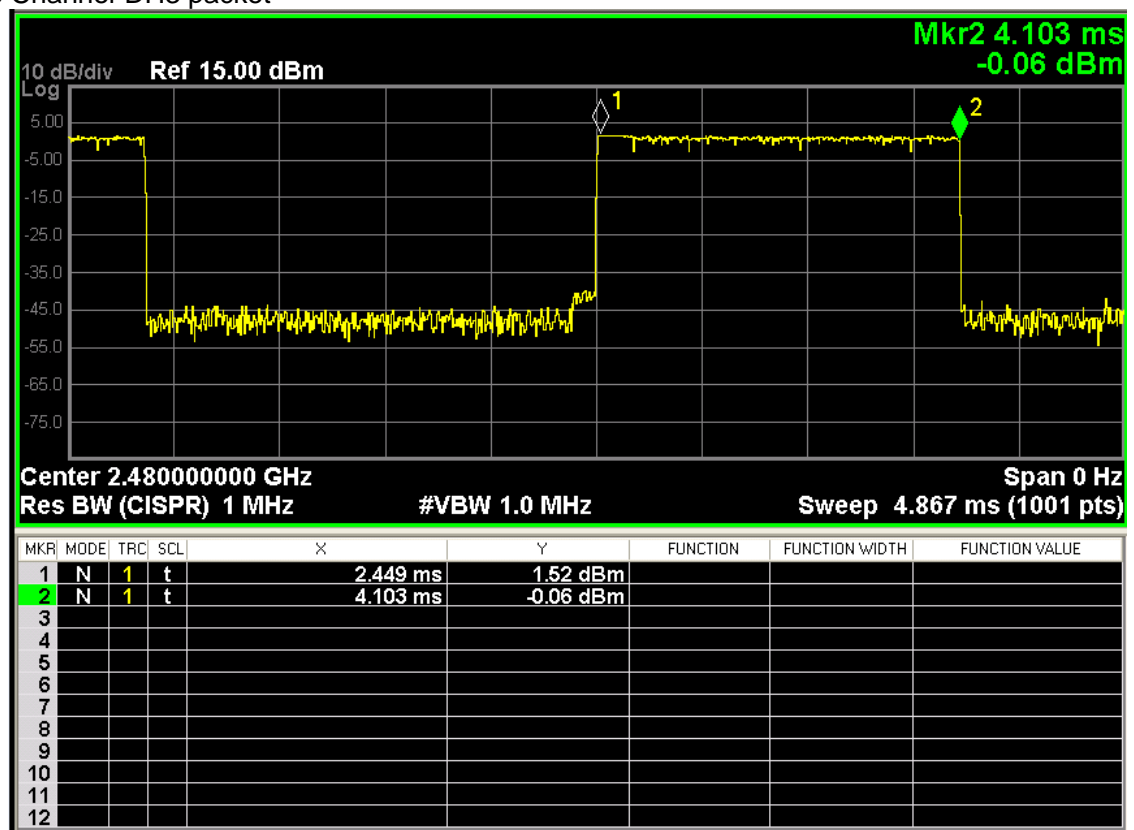
If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

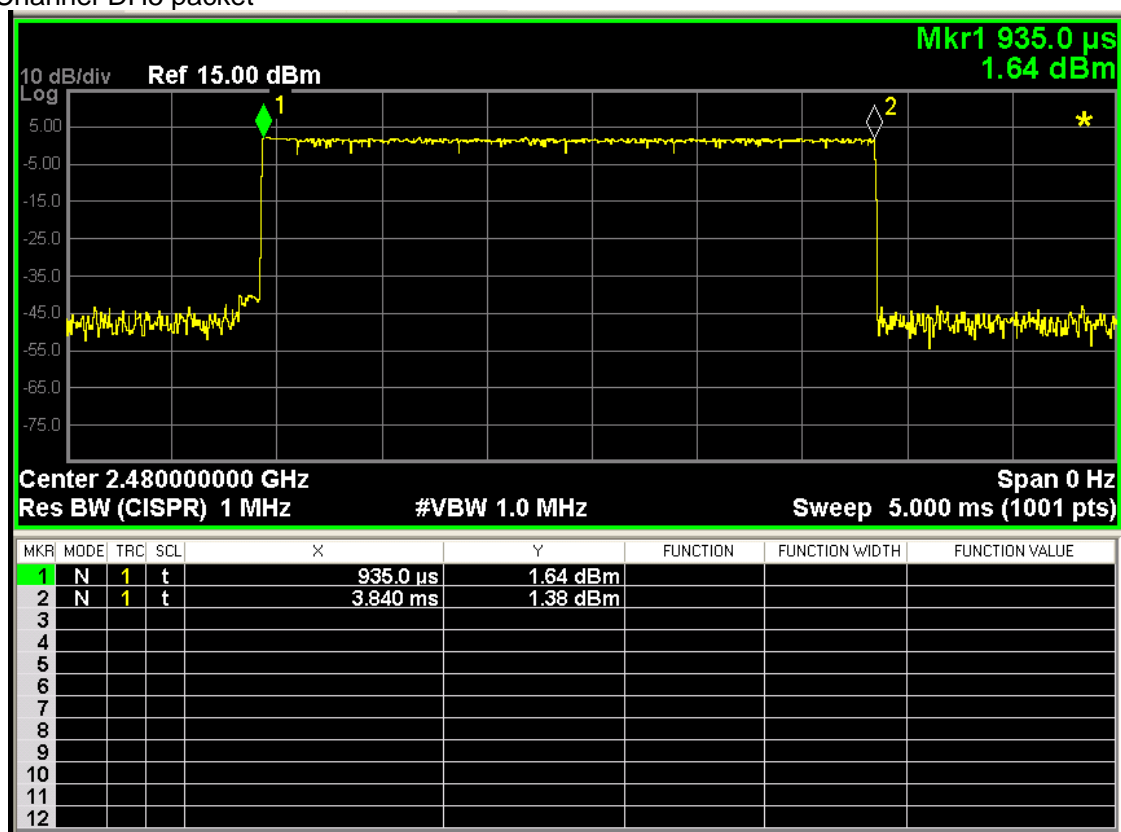
8-DPSK

Single Channel-DH1 packet



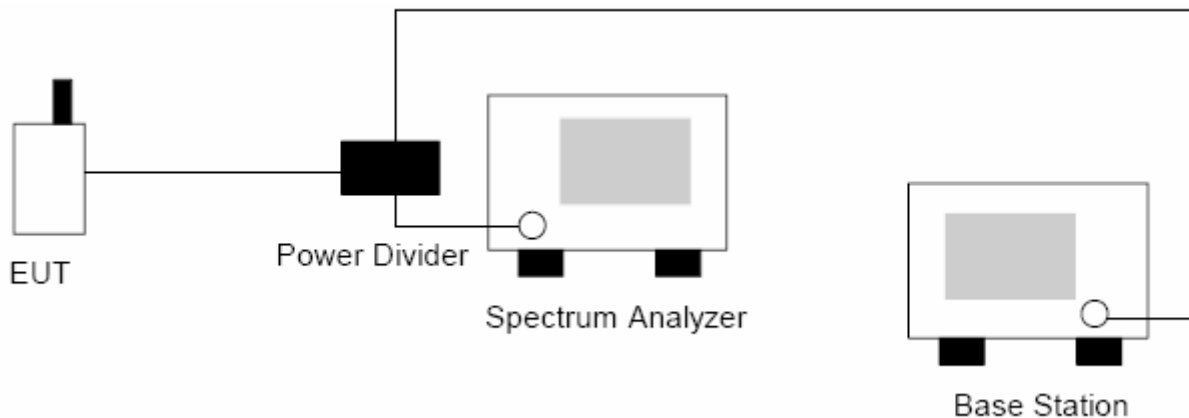
Single Channel-DH3 packet





8. PEAK OUTPUT POWER (CONDUCTION)

8.1 TEST SETUP



8.2 LIMITS

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
2. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
3. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

8.3 TEST PROCEDURE

After a radio link has been established between EUT and Base station, using spectrum analyzer to measure the output power of the cell signal of the EUT, and record the max. 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:

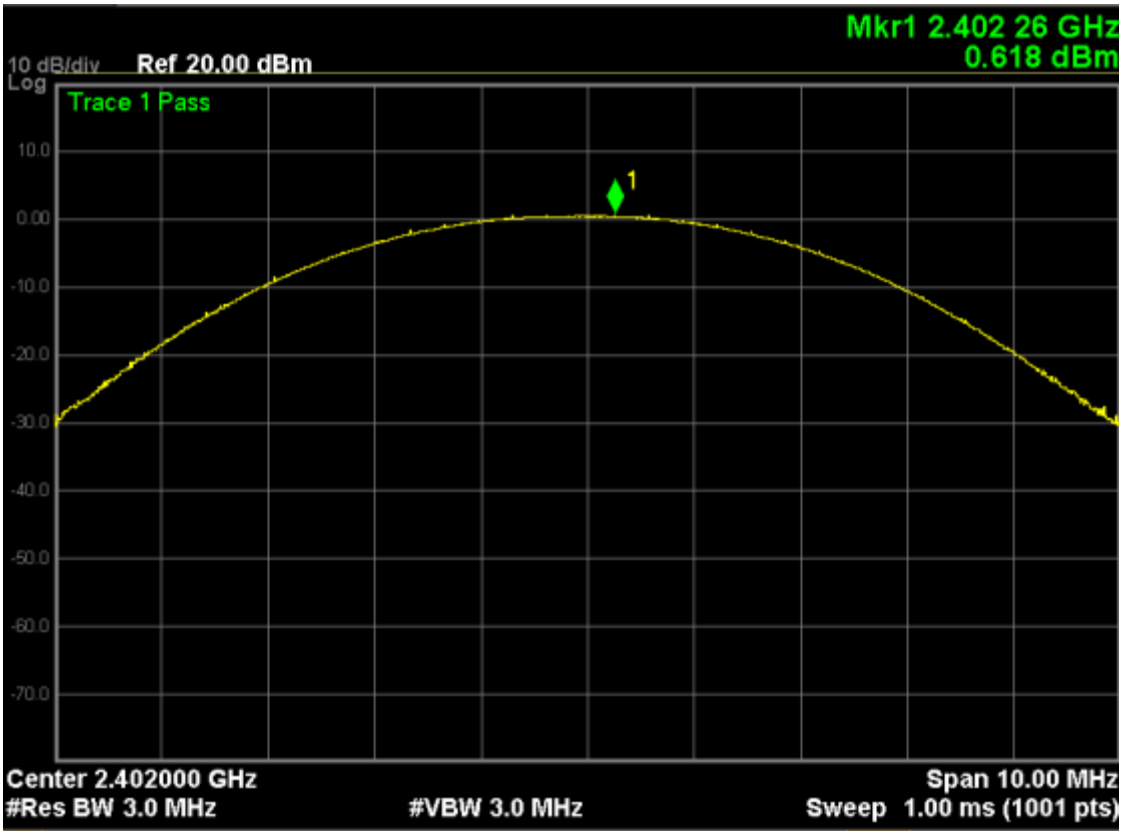
Bluetooth: Low(0), middle(39) and High (78),

Set the spectrum analyzer as RBW = 3MHz, VBW = 3MHz, Span = 10MHz, Sweep = auto
Detector = Peak, Trace mode = max hold

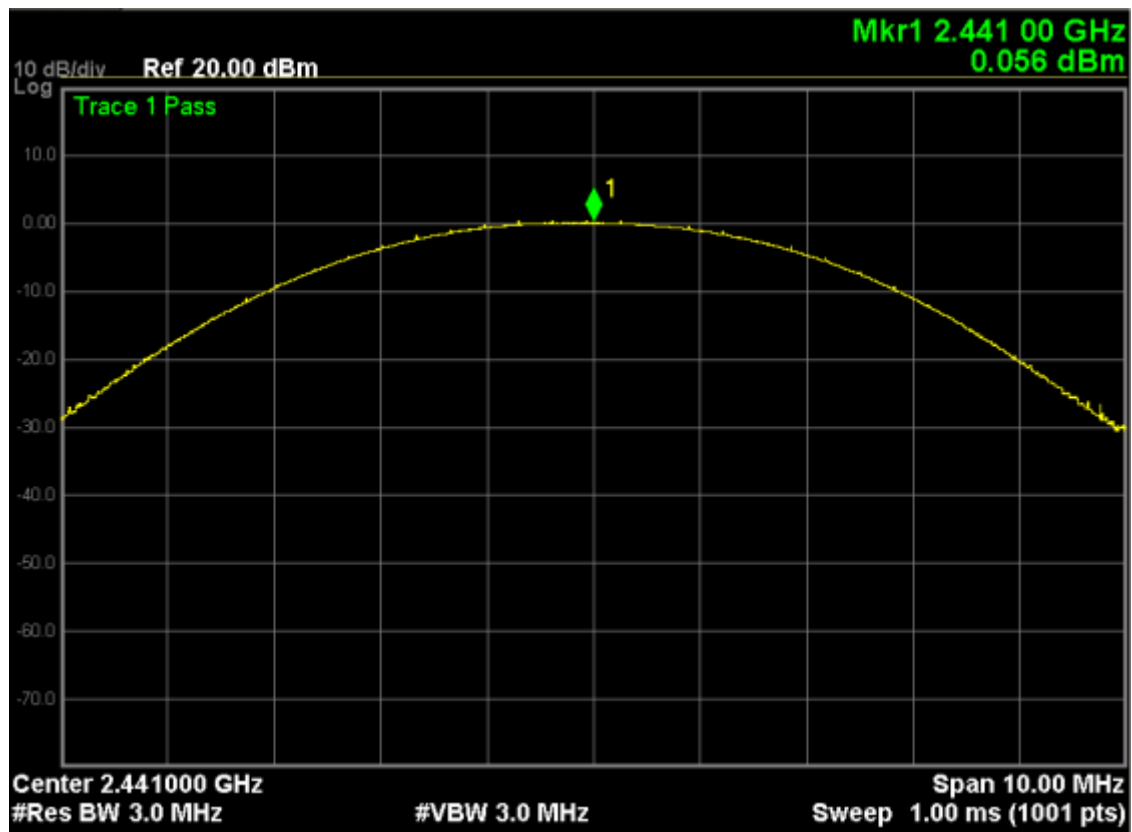
8.4 RESULTS & PERFORMANCE

GFSK				
Channel	Peak power (dBm)	Peak power (mW)	Limit (mW)	Result
0 (2402MHz)	0.618	1.15	125	Pass
39 (2441MHz)	0.056	1.01		Pass
78 (2480MHz)	0.093	1.02		Pass
8-DPSK				
Channel	Peak power (dBm)	Peak power (mW)	Limit (dBm)	Result
0 (2402MHz)	1.232	1.33	125	Pass
39 (2441MHz)	0.420	1.10		Pass
78 (2480MHz)	0.792	1.20		Pass

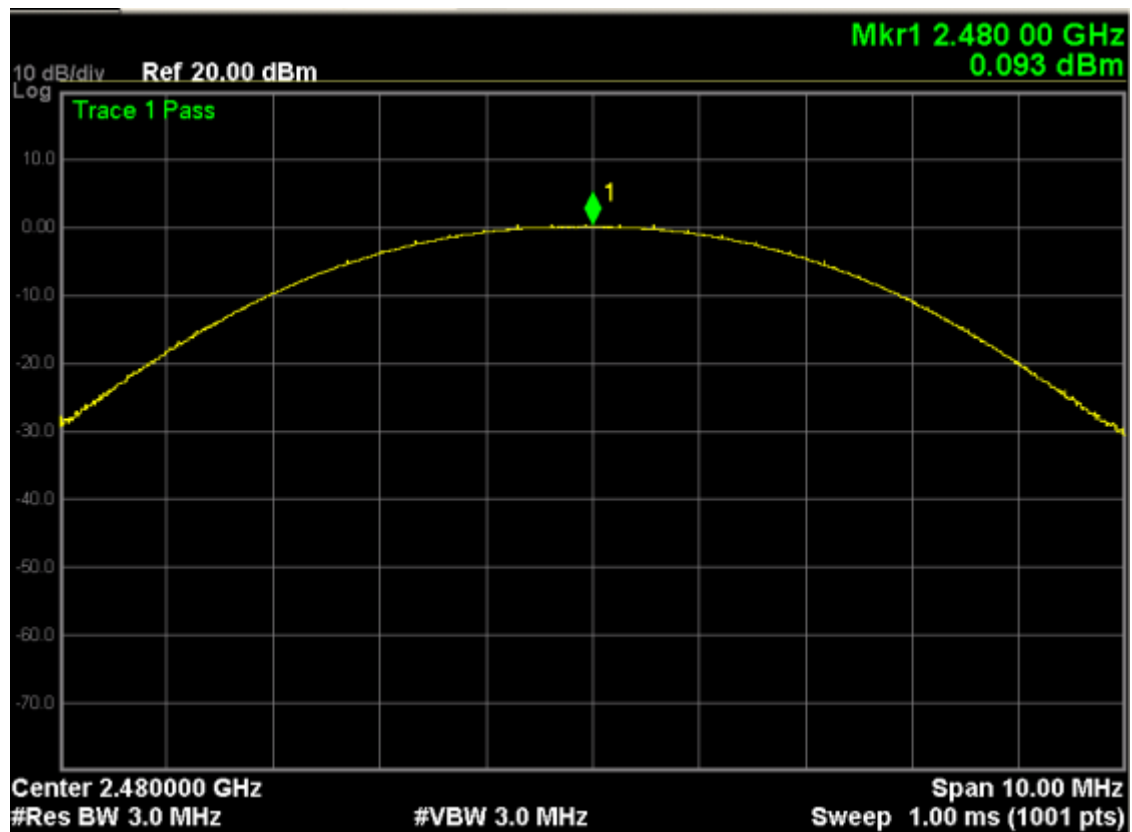
Bluetooth GFSK Channel 0



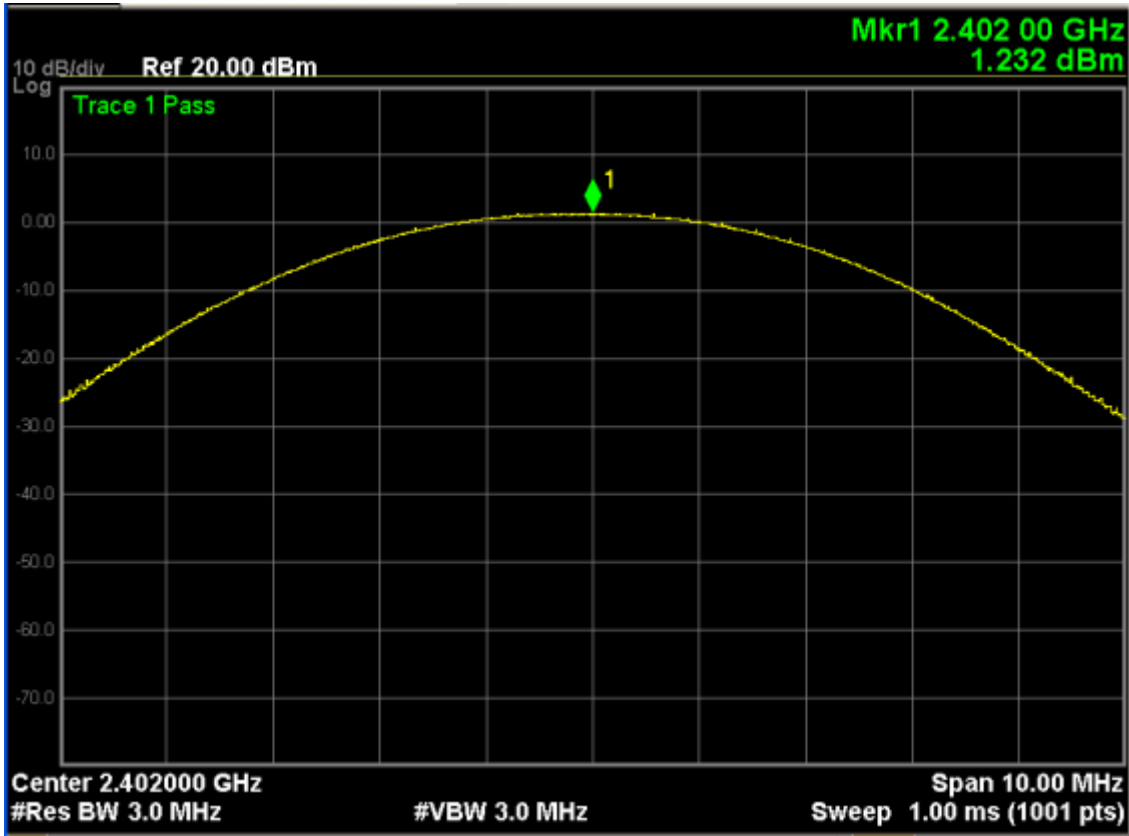
Bluetooth GFSK Channel 39



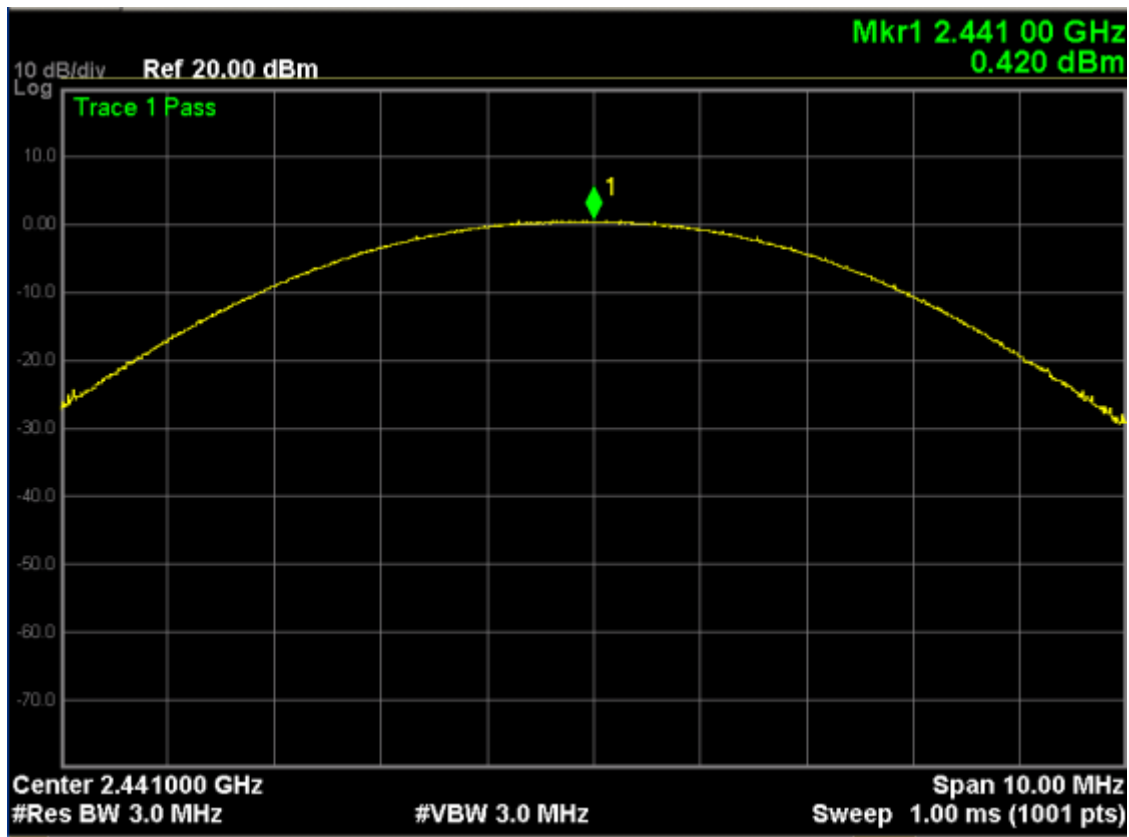
Bluetooth GFSK Channel 78



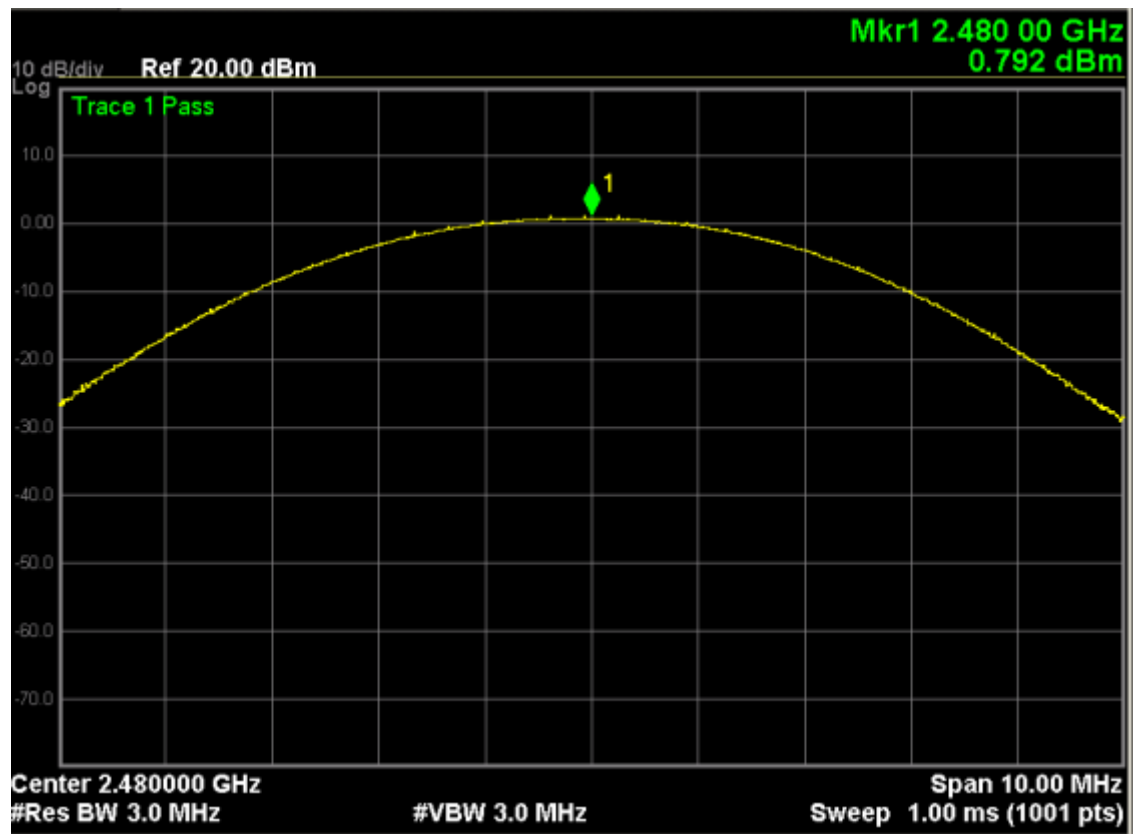
Bluetooth 8-DPSK Channel 0



Bluetooth 8-DPSK Channel 39

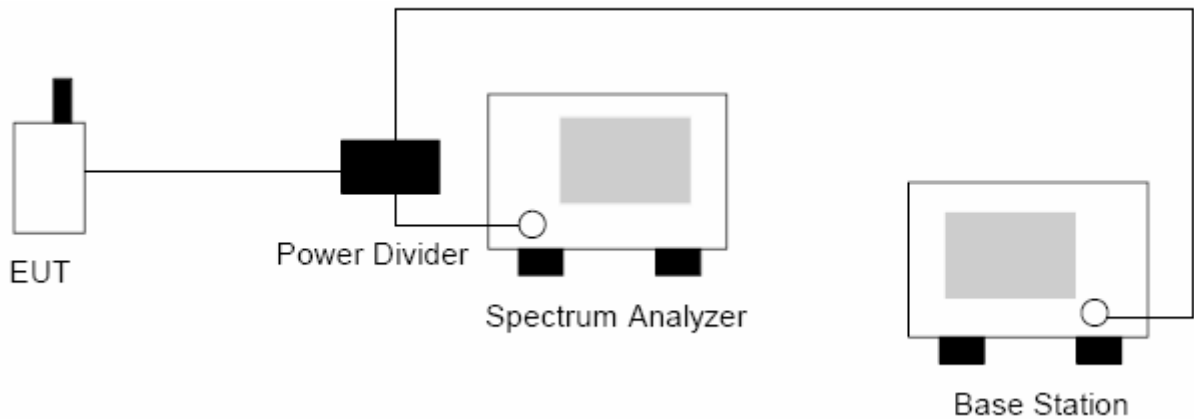


Bluetooth 8-DPSK Channel 78



9. SPURIOUS EMISSIONS (CONDUCTION)

9.1 TEST SETUP



9.2 LIMITS

Limit	<(P-20dB)
Note: P is the highest level of the desired power	

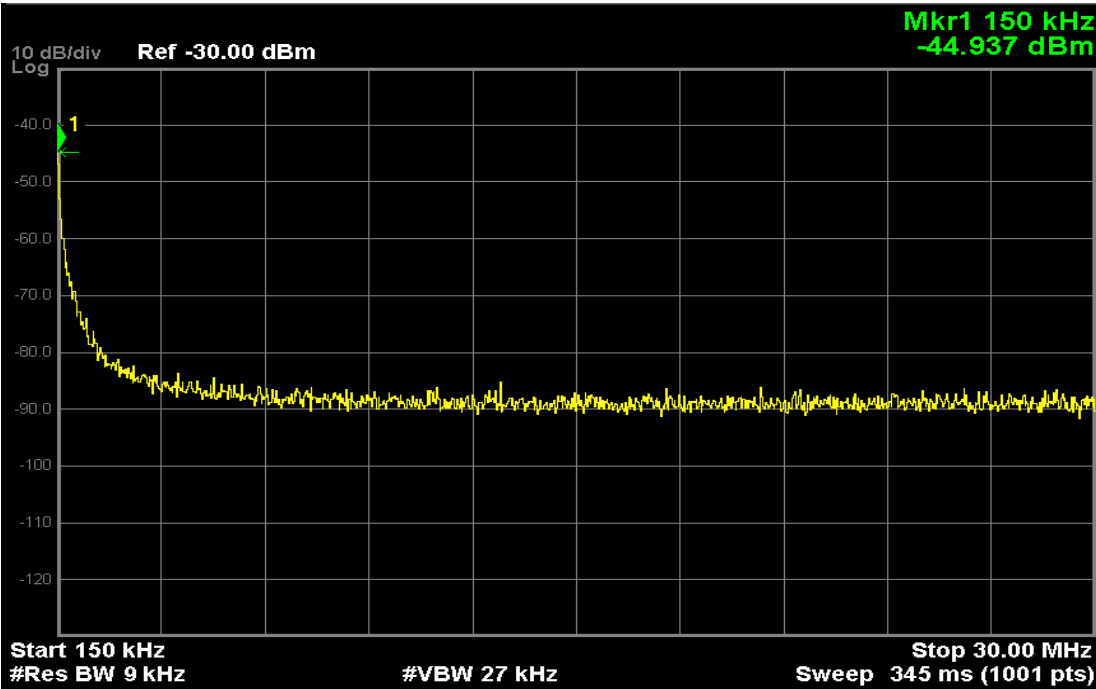
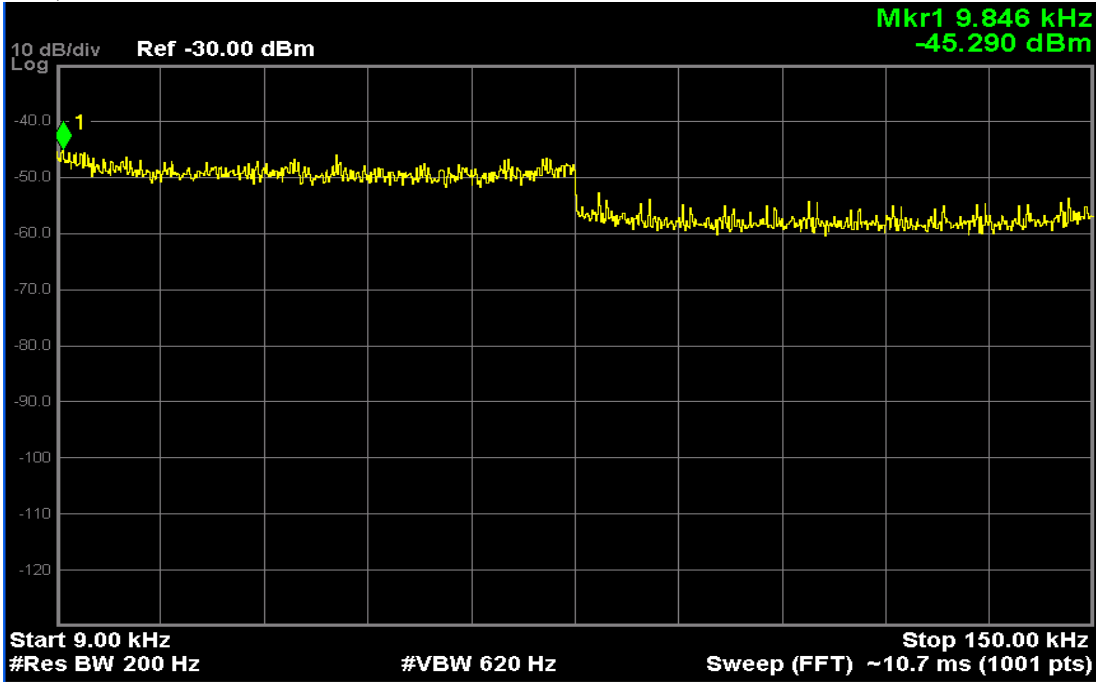
9.3 TEST PROCEDURE

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 = 200 Hz for range frequency from 9 KHz to 150KHz, RBW = 9KHz for range frequency from 0.15MHz to 30MHz, and RBW = 100 kHz for above 30MHz; VBW ≥ 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.

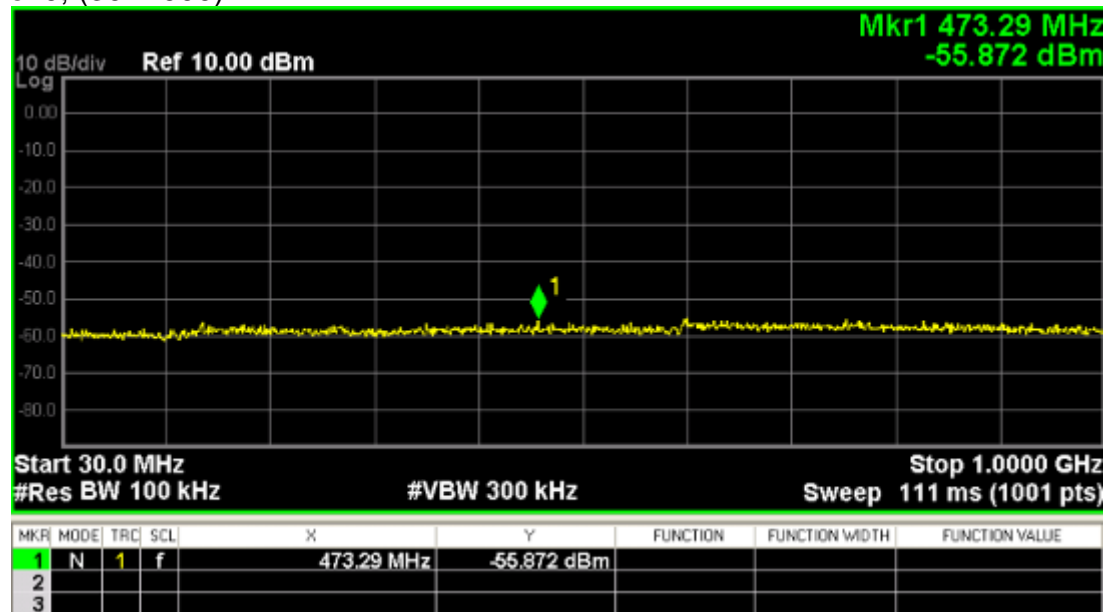
9.4 RESULTS & PERFORMANCE

Bluetooth traffic mode GFSK

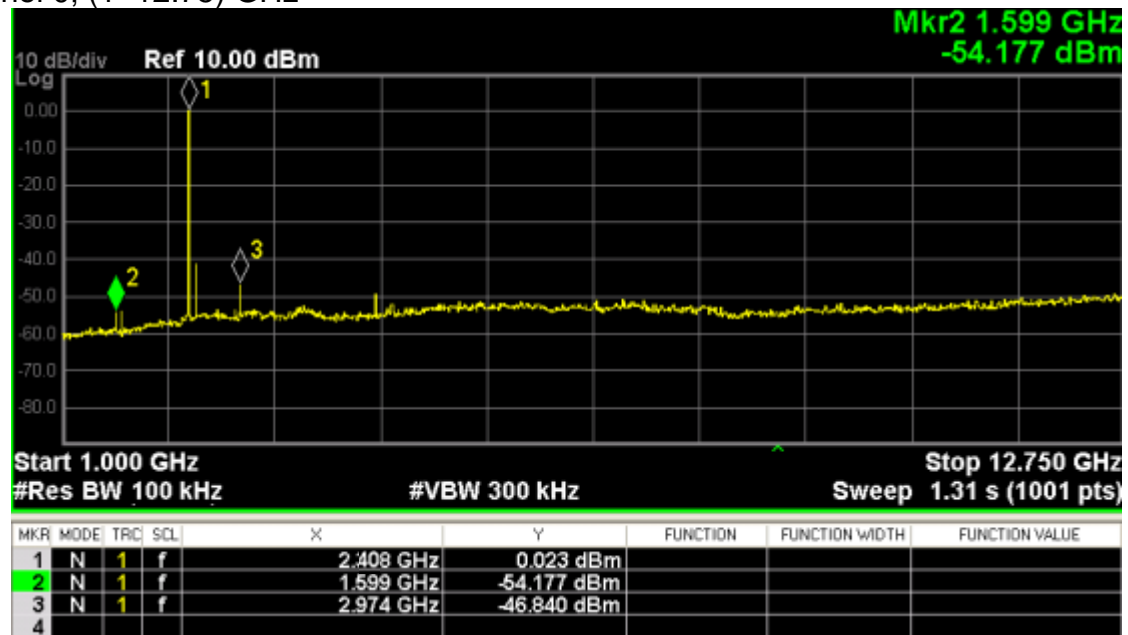
Channel 0; Below 30 MHz



Channel 0; (30~1000) MHz

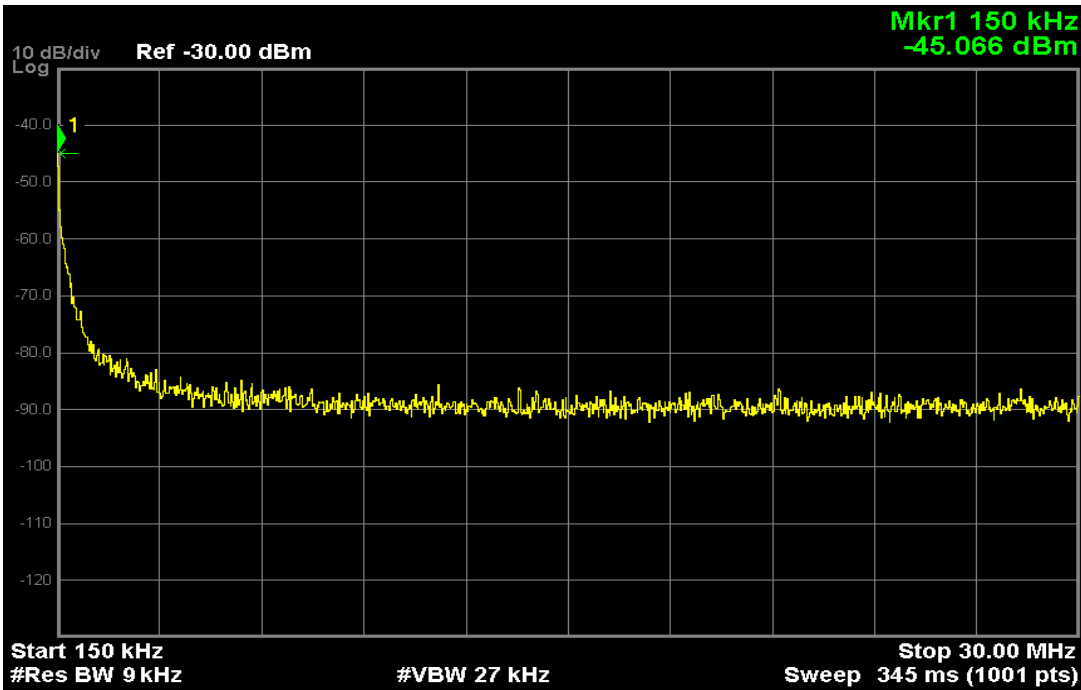
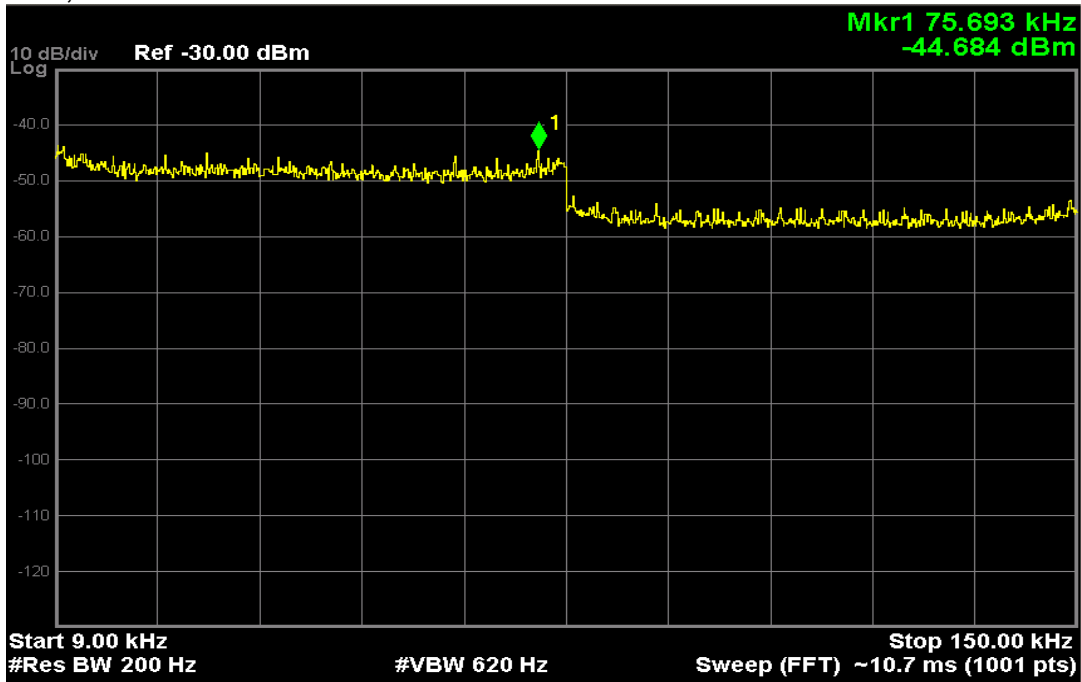


Channel 0; (1~12.75) GHz

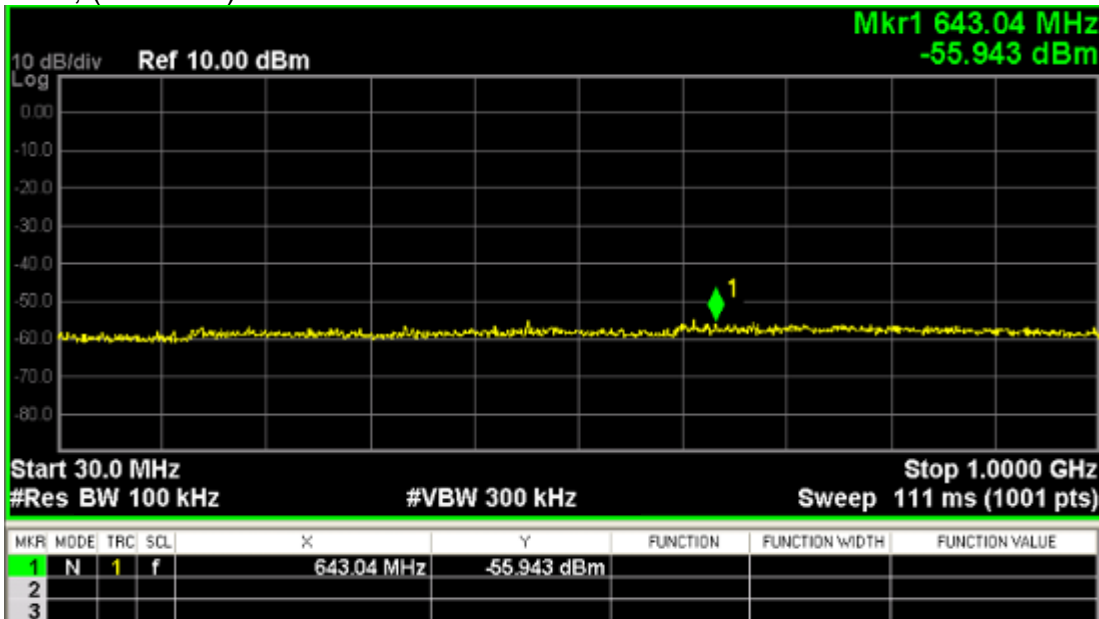


Note: The point mark1 is carrier.

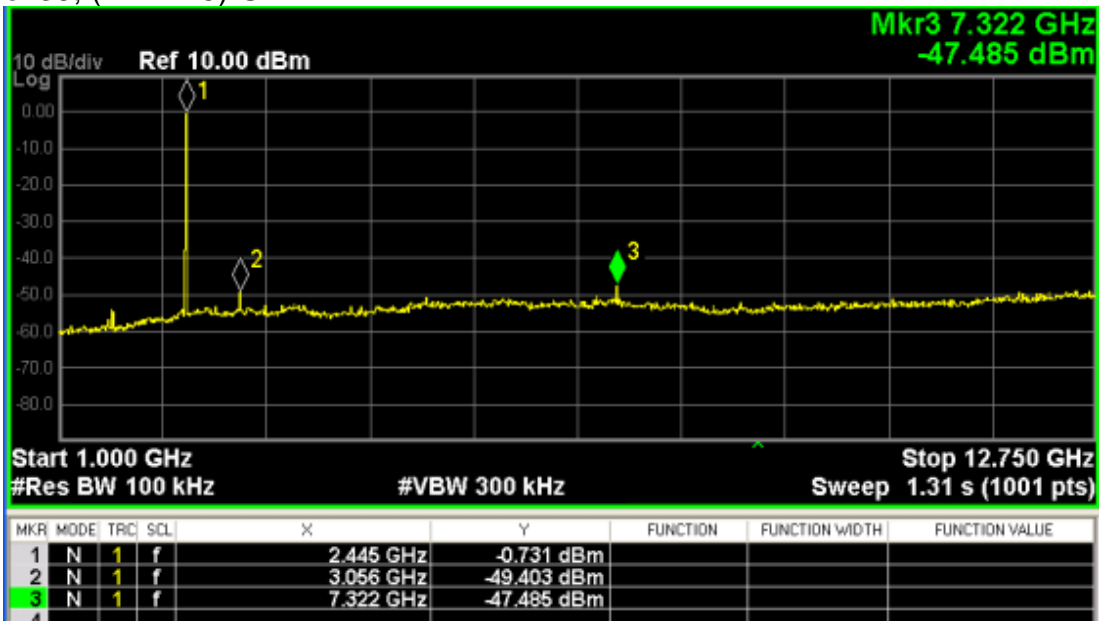
Channel 39; Below 30 MHz



Channel 39; (30~1000) MHz

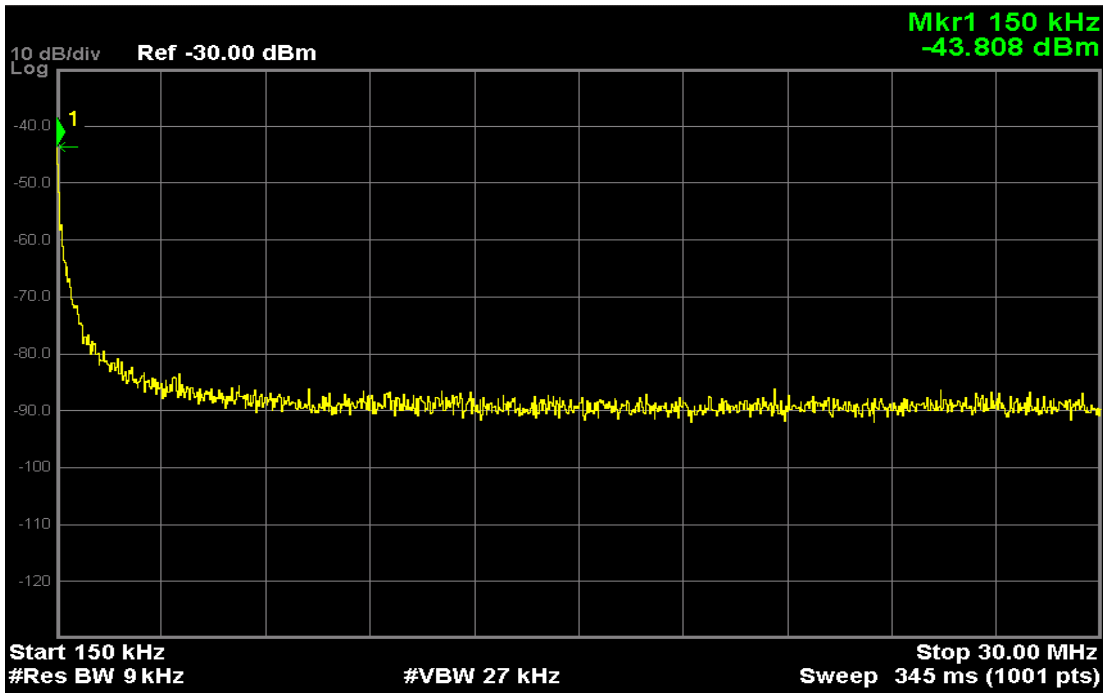
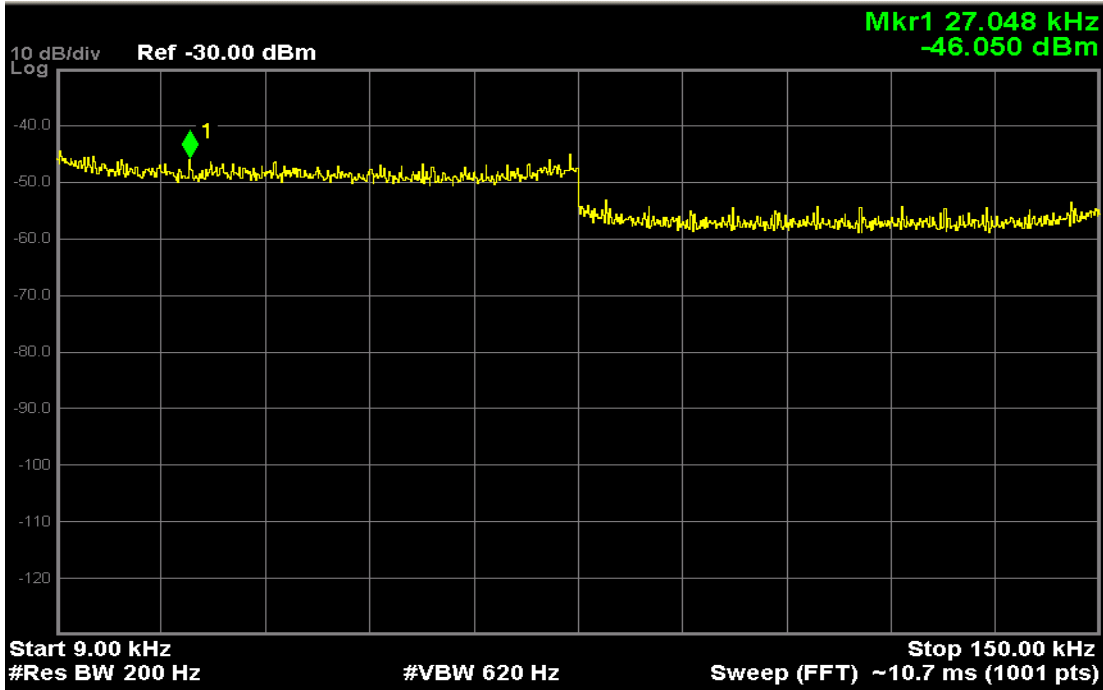


Channel 39; (1~12.75) GHz

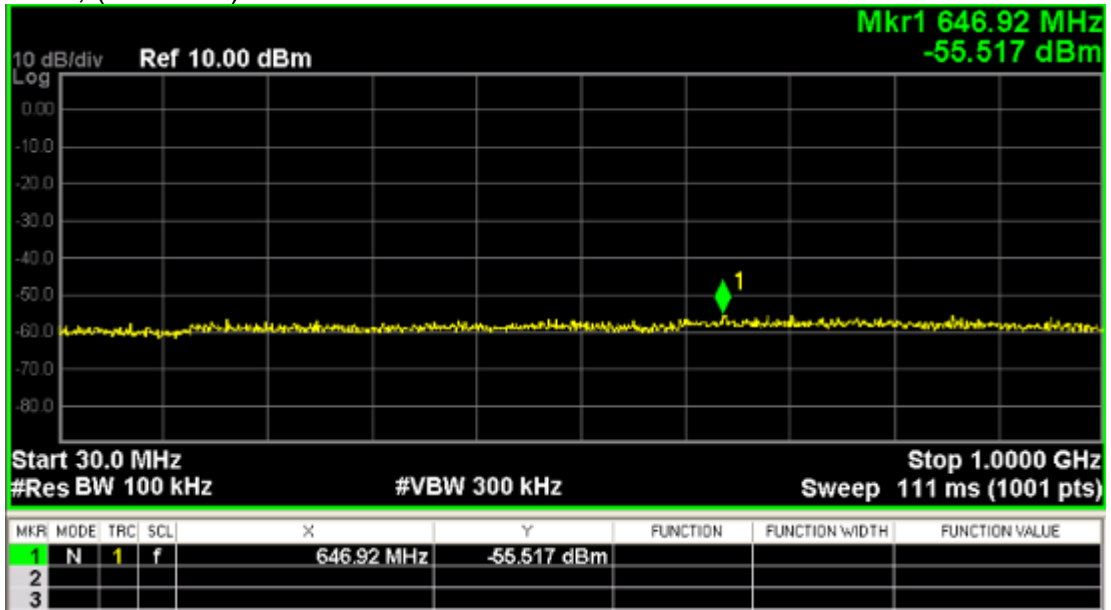


Note: The The point mark1 is carrier.

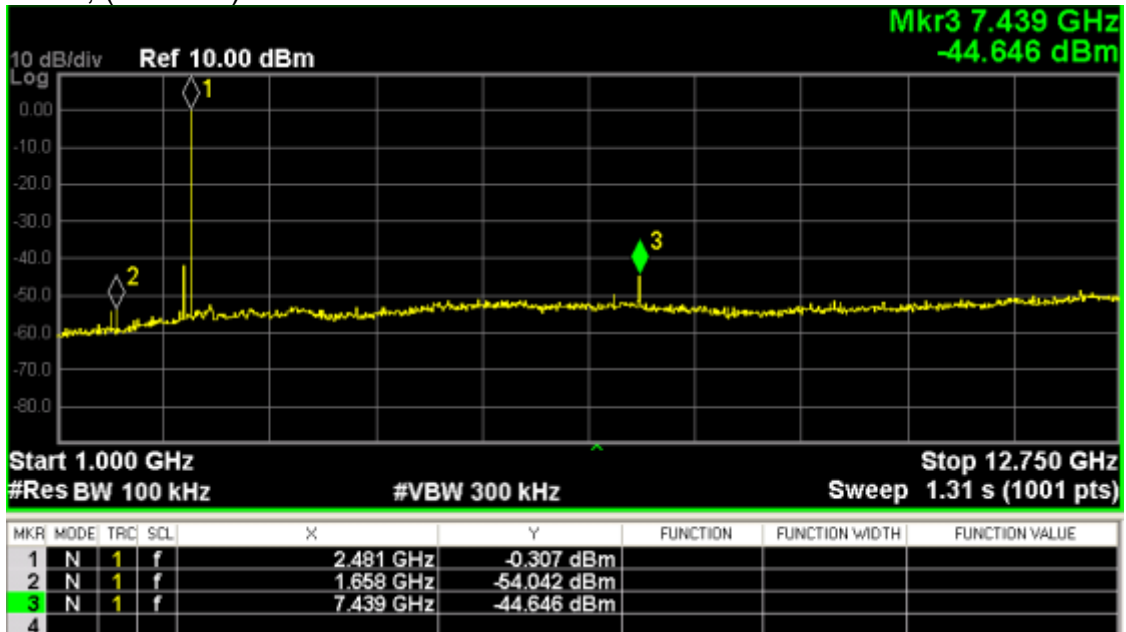
Channel 78; Below 30 MHz



Channel 78; (30~1000) MHz



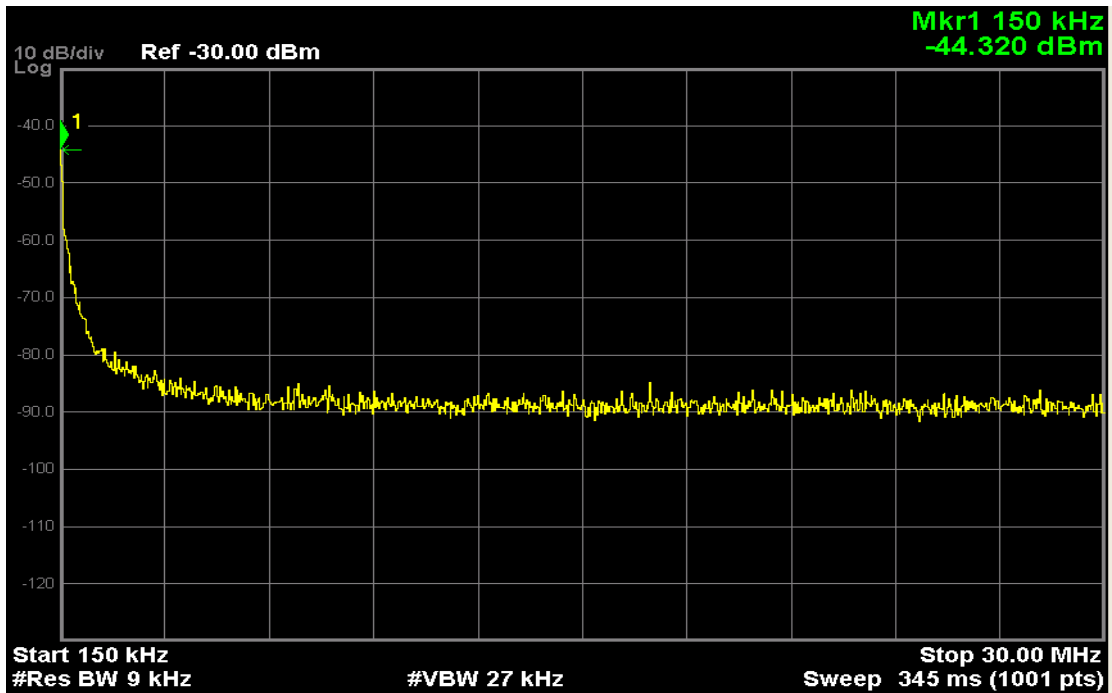
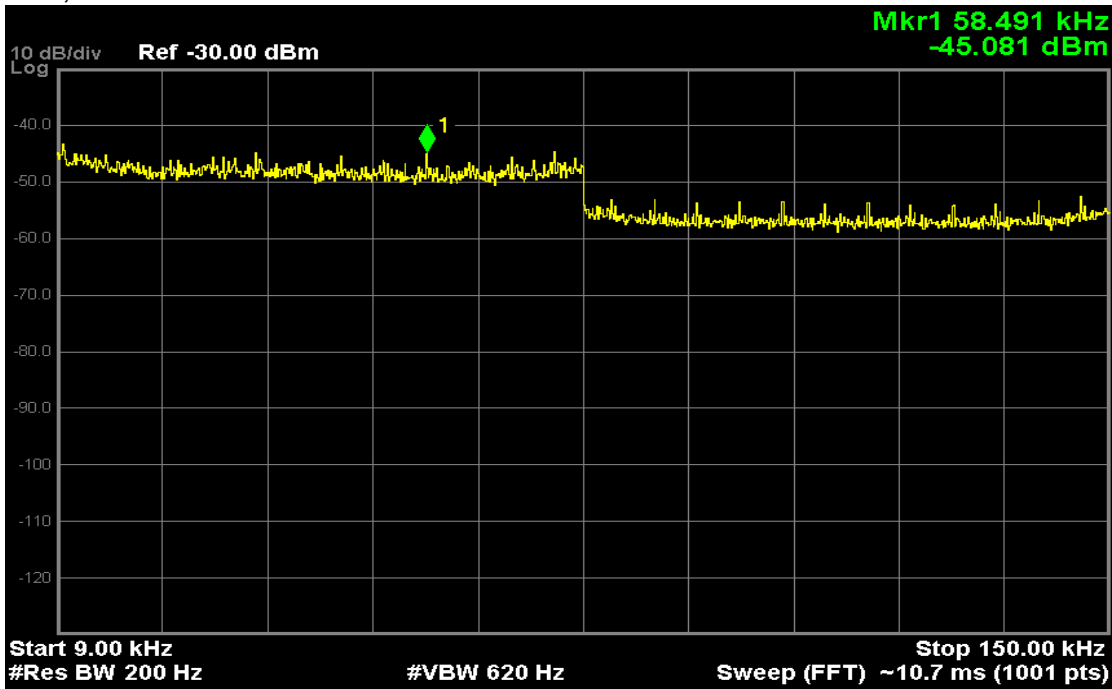
Channel 78; (1~12.75) GHz



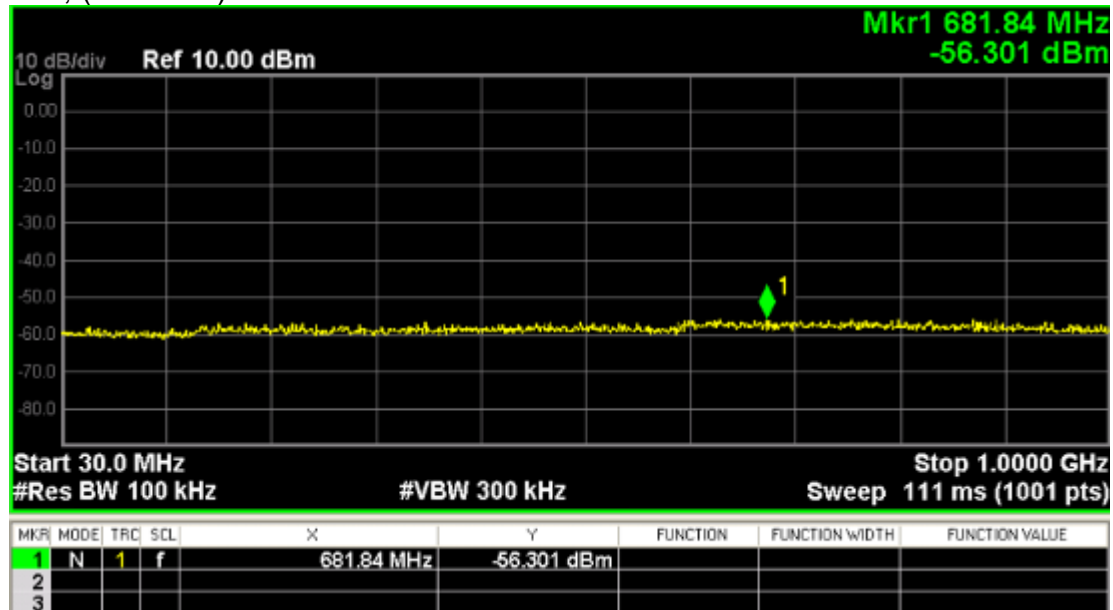
Note: The point mark1 is carrier.

Bluetooth traffic mode 8-DPSK

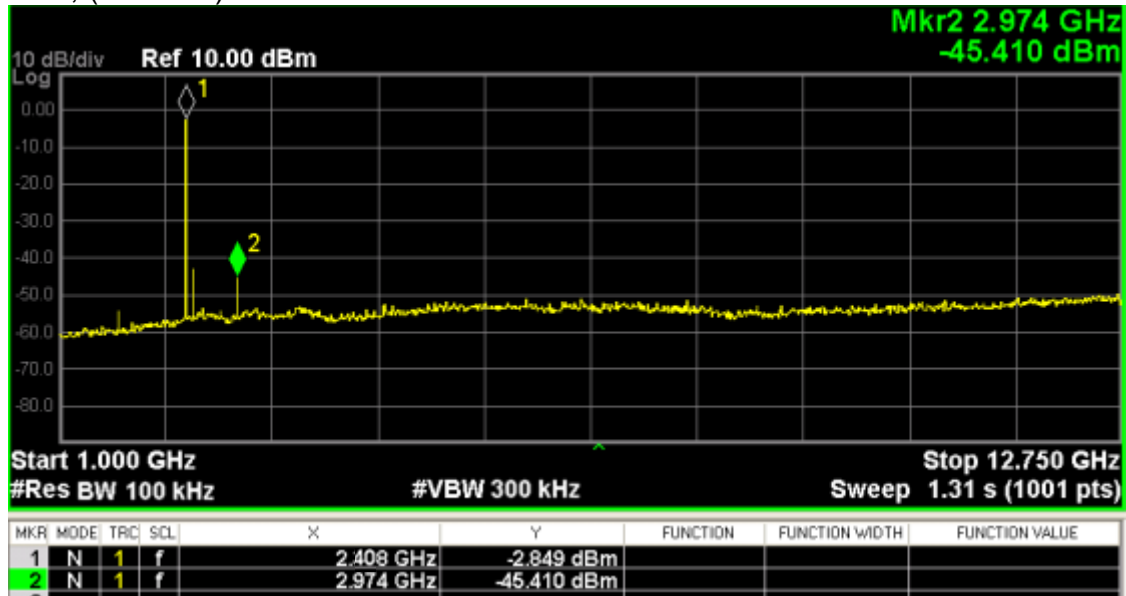
Channel 0; Below 30 MHz



Channel 0; (30~1000) MHz

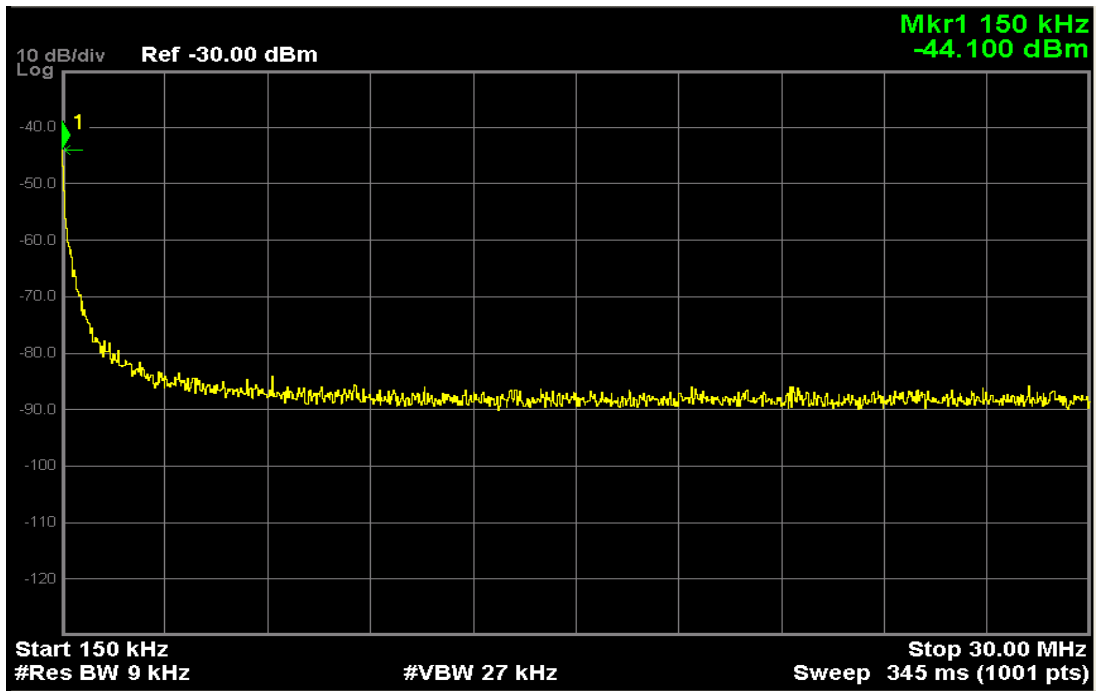
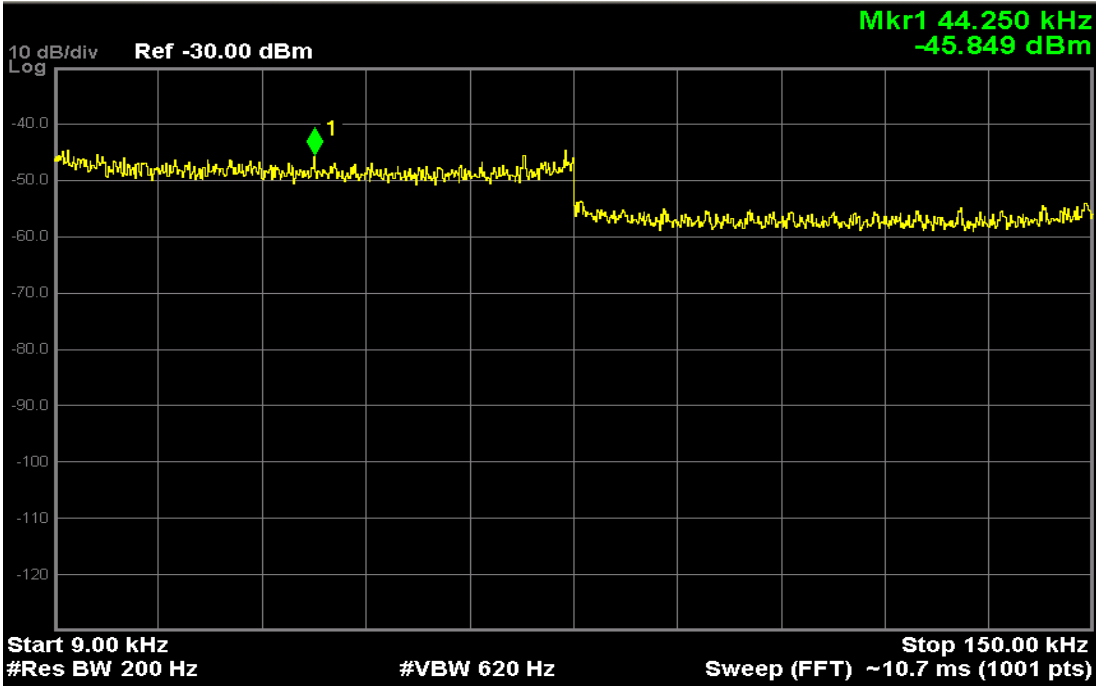


Channel 0; (1~12.75) GHz

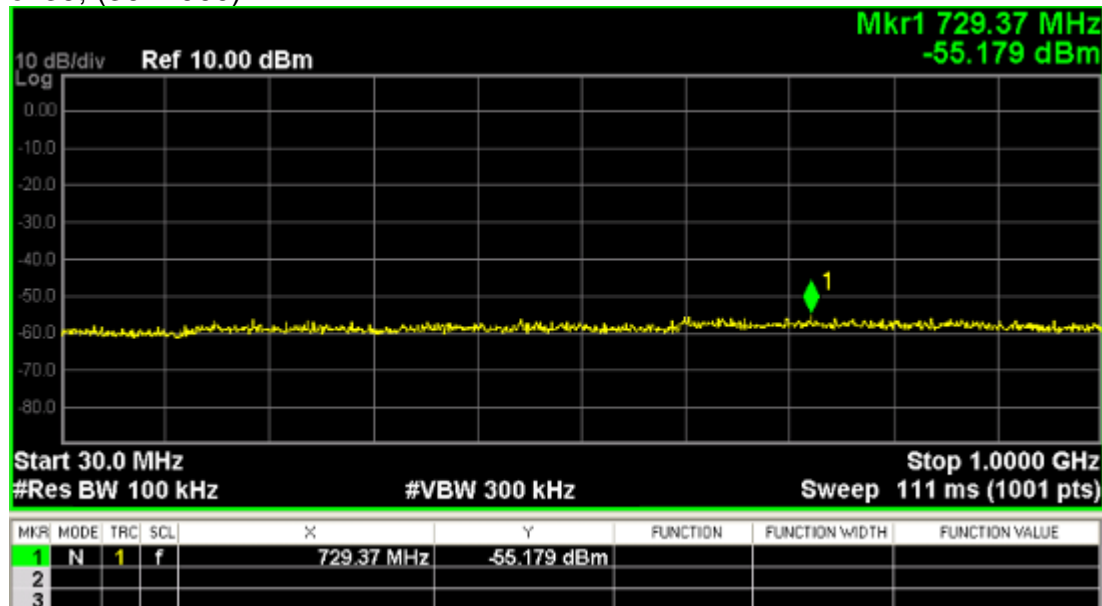


Note: The point mark1 is carrier.

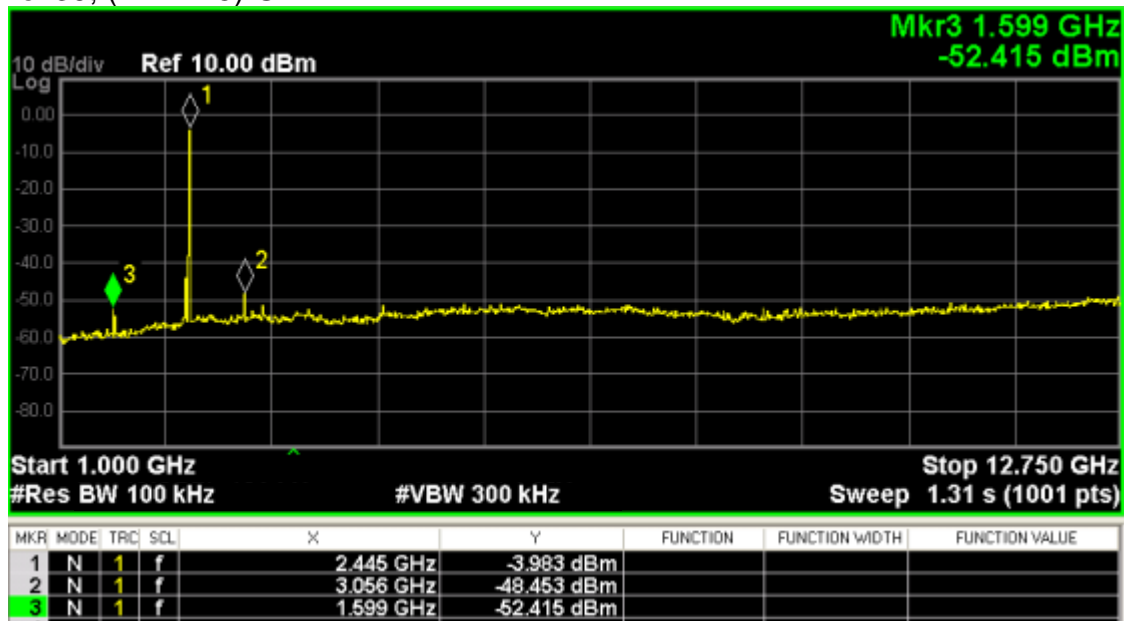
Channel 39; Below 30 MHz



Channel 39; (30~1000) MHz

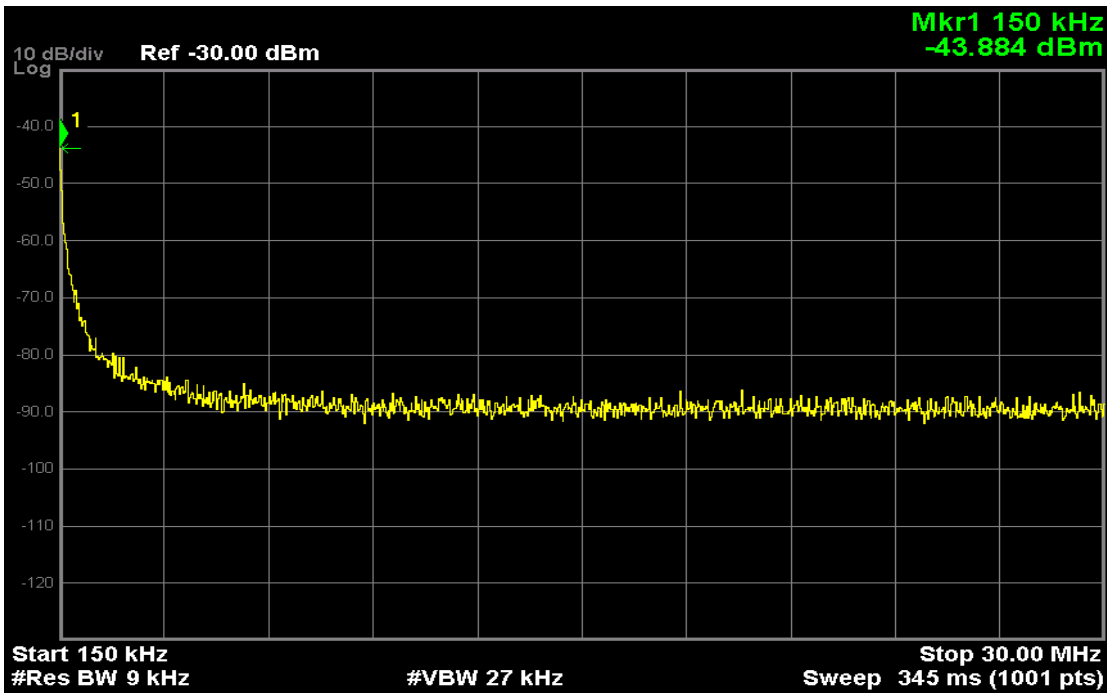
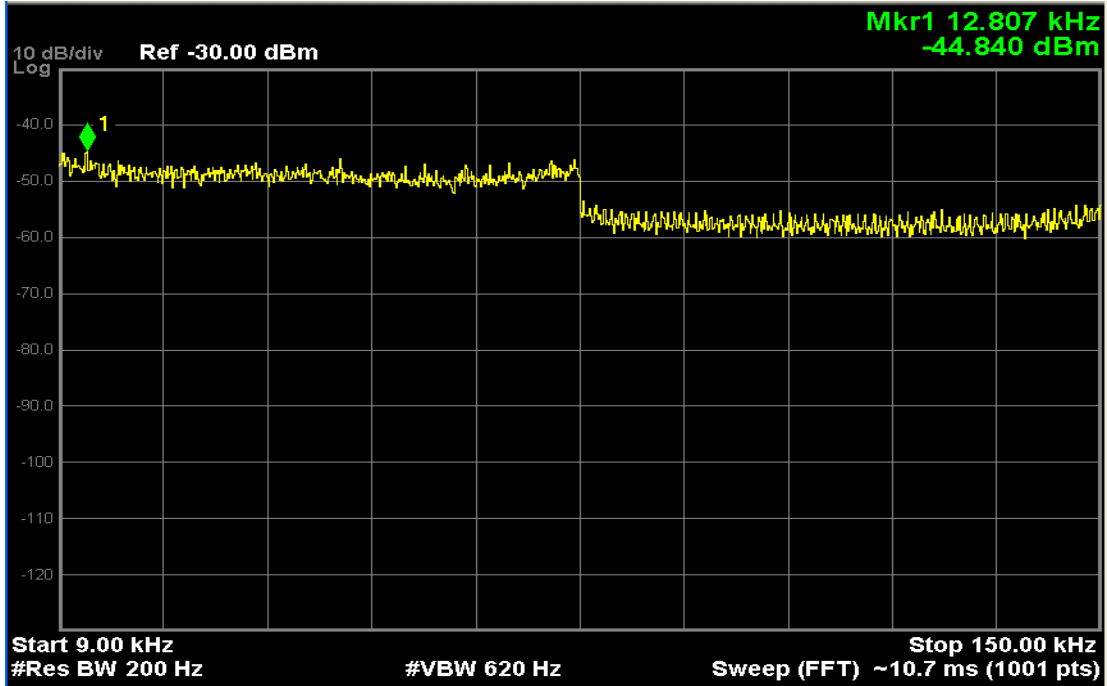


Channel 39; (1~12.75) GHz

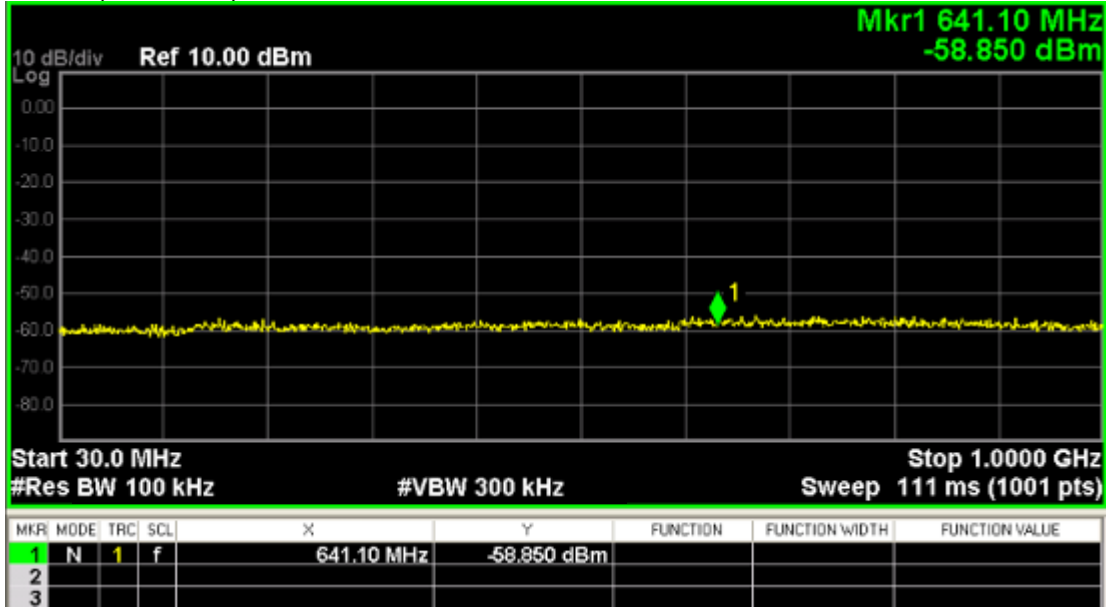


Note: The point mark1 is carrier.

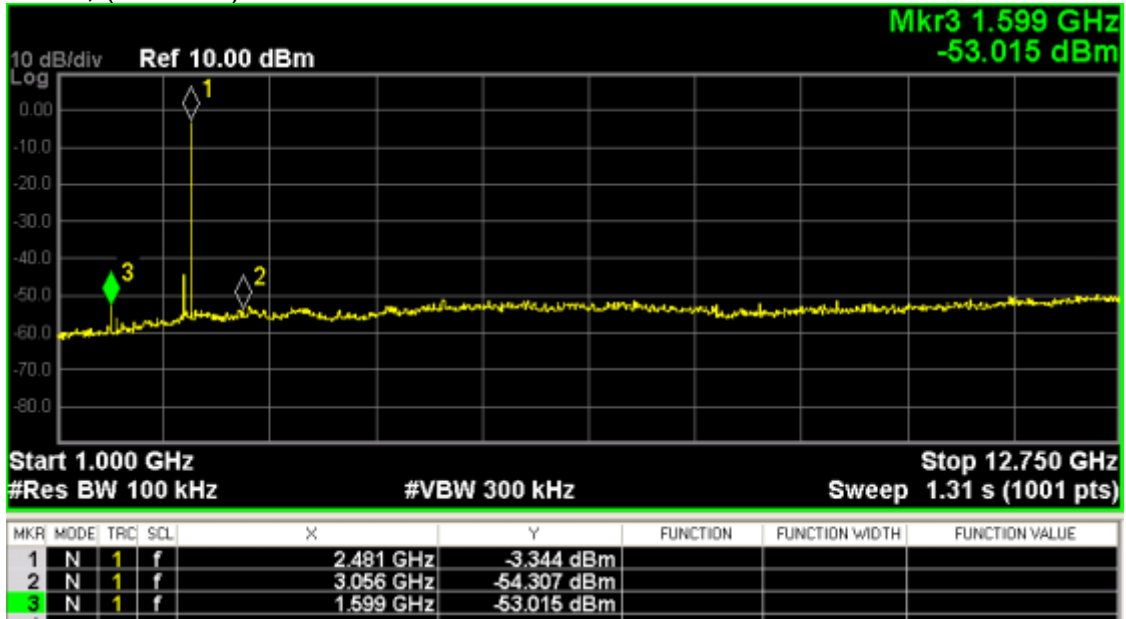
Channel 78; Below 30 MHz



Channel 78; (30~1000) MHz



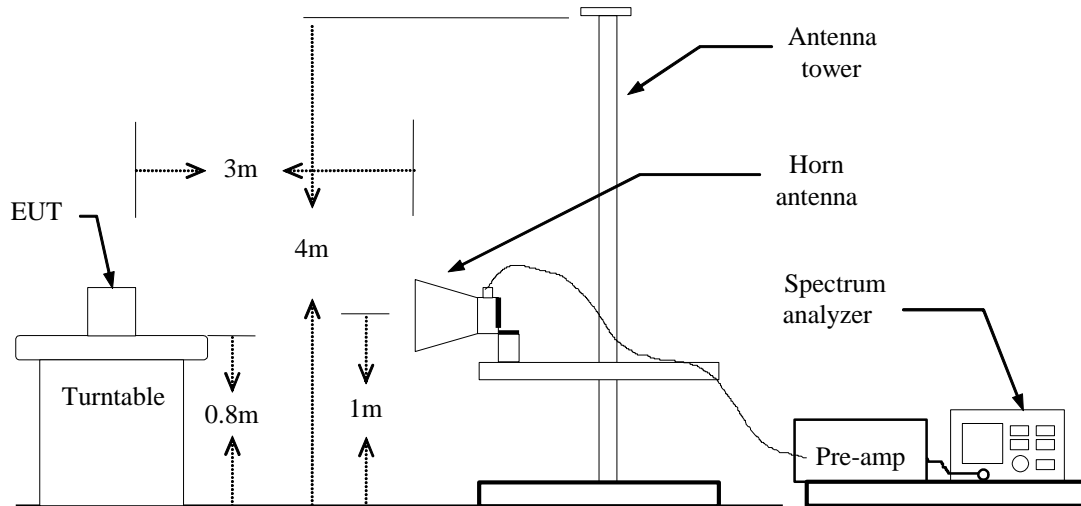
Channel 78; (1~12.75) GHz



Note: The point mark1 is carrier.

10. BAND EDGE MEASUREMENT

10.1 TEST SETUP



10.2 LIMITS

According to §15.247(c), 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).

10.3 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:

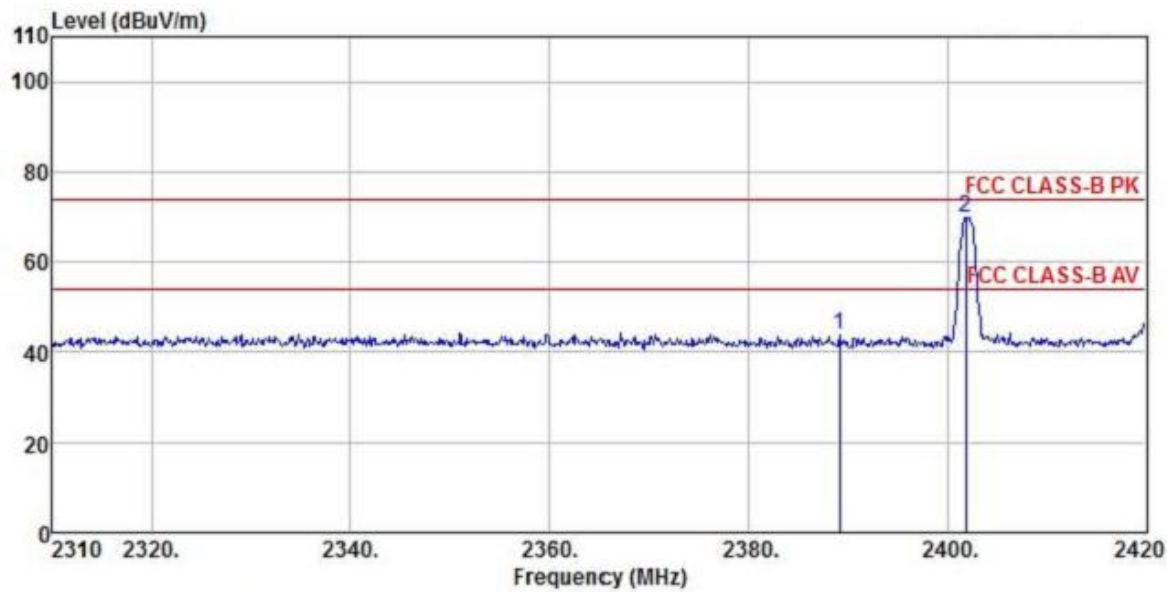
PEAK: RBW=VBW=1MHz / Sweep=AUTO

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

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

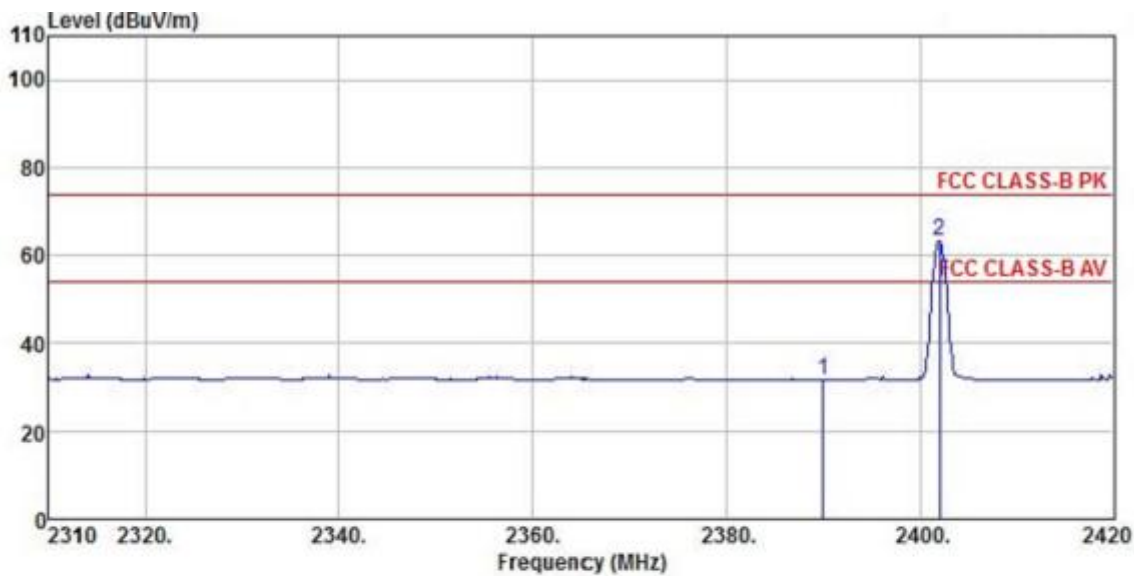
10.4 RESULTS & PERFORMANCE

BT GFSK (Low Channel)



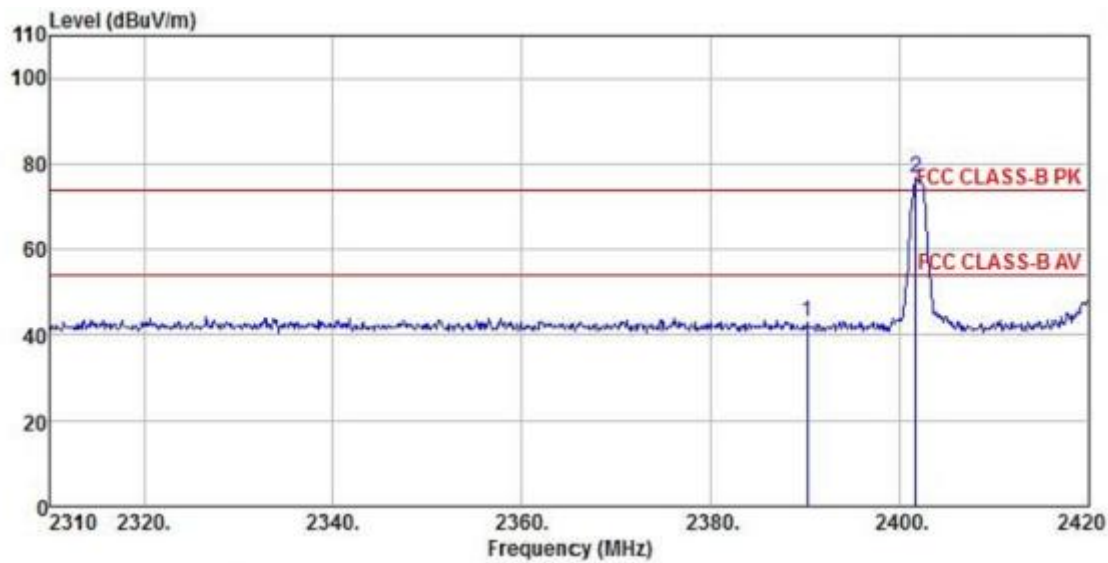
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT GFSK CH0
Memo :

	Freq	ReadLevel	AntennaFactor	CableLoss	PreamplifierFactor	Level	LimitLine	OverLimit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2389.09	47.65	27.58	7.13	38.34	44.02	74.00	-29.98	Peak
2 pp	2401.85	73.41	27.54	7.13	38.34	69.74	74.00	-4.26	Peak



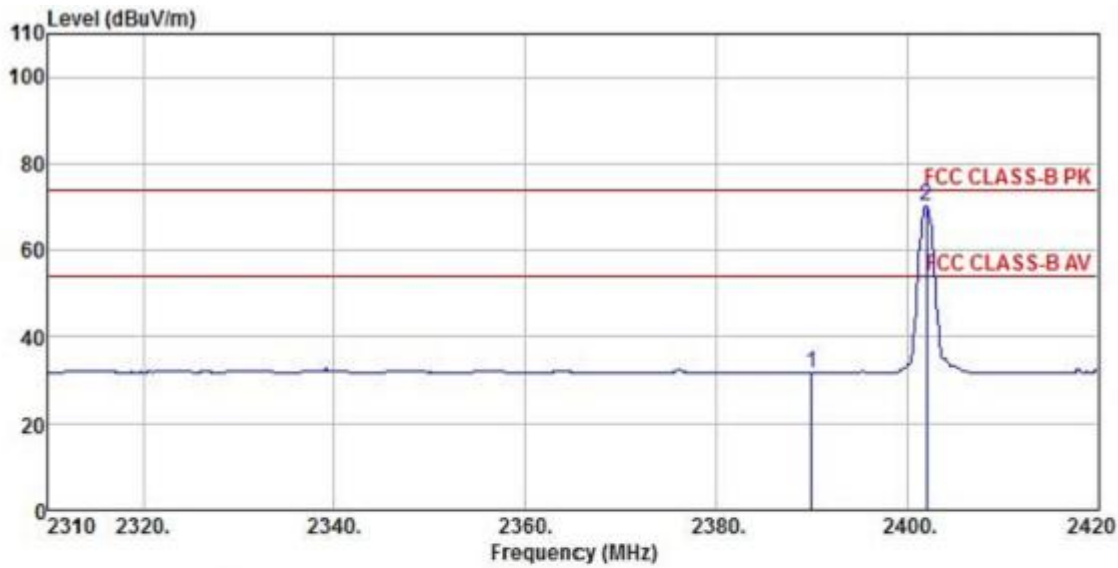
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT GFSK CH0
Memo :

	Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2389.97	35.39	27.58	7.13	38.34	31.76	54.00	-22.24	Average
2 pp	2401.96	67.19	27.54	7.13	38.34	63.52	54.00	9.52	Average



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT GFSK CH0
Memo :

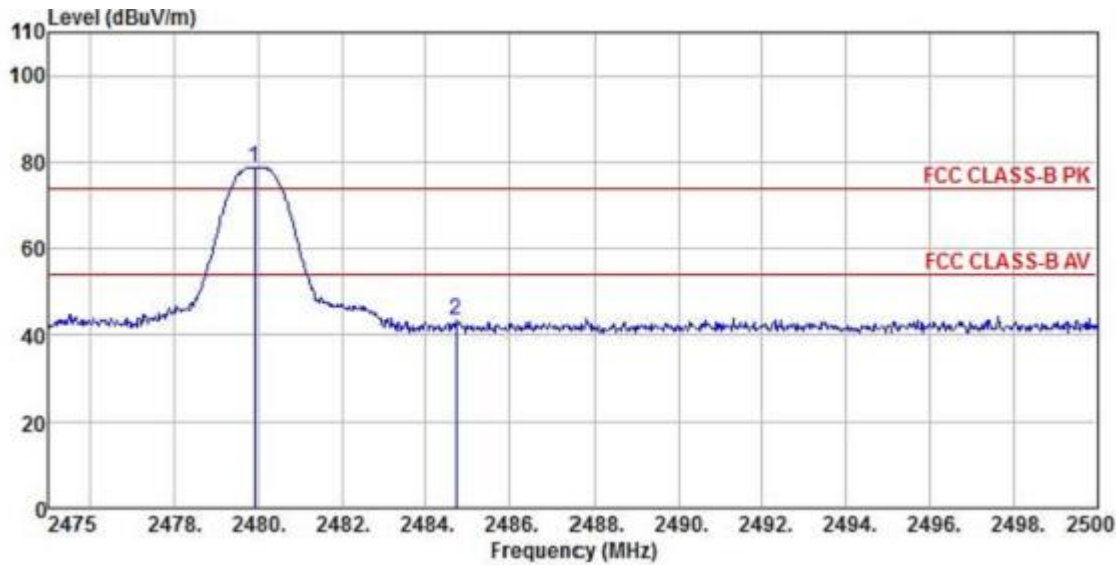
	Freq	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Limit Level	Over Line	Limit	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2390.19	46.54	27.58	7.13	38.34	42.91	74.00	-31.09	Peak	
2 pp	2401.74	80.15	27.58	7.13	38.34	76.52	74.00	2.52	Peak	



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT GFSK CH0
Memo :

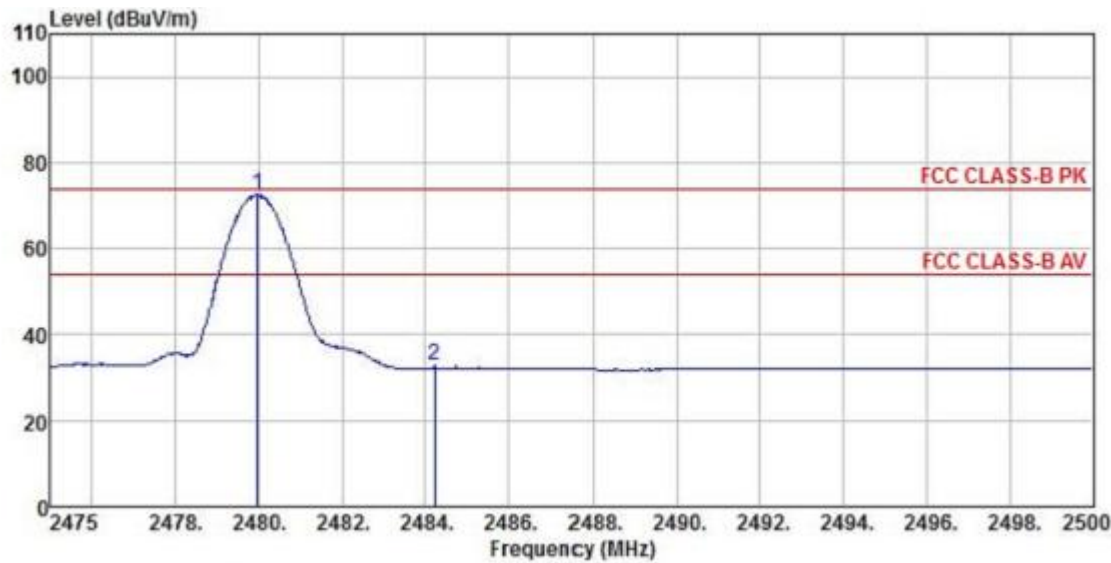
	Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2389.97	35.34	27.58	7.13	38.34	31.71	54.00	-22.29	Average
2 pp	2401.96	73.96	27.54	7.13	38.34	70.29	54.00	16.29	Average

BT GFSK (High Channel)



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT GFSK CH78
Memo :

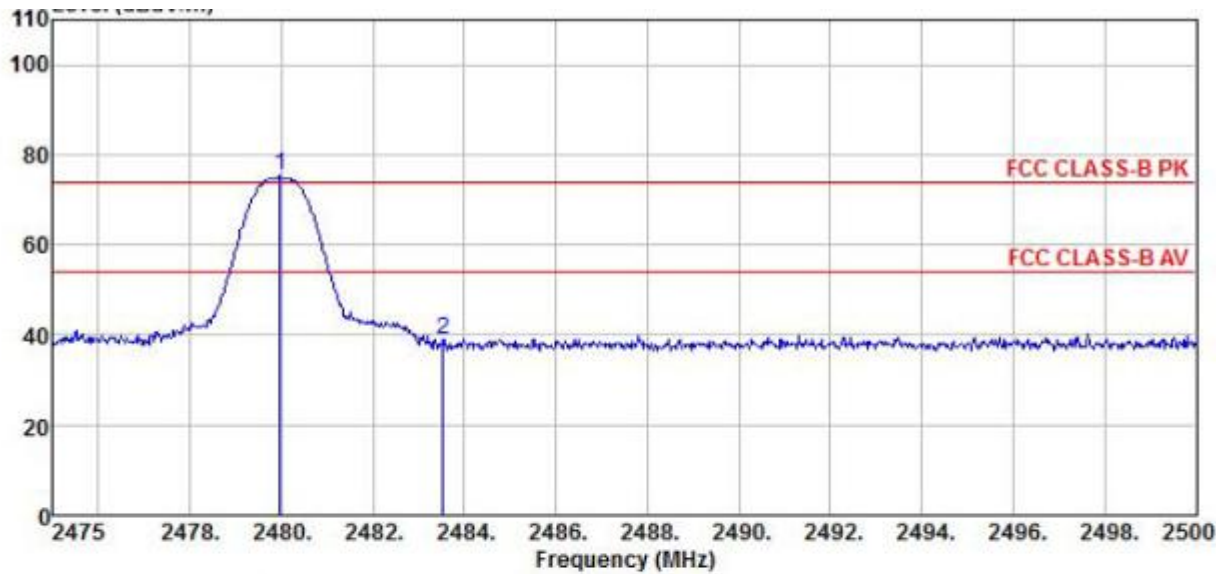
		ReadAntenna	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	pp 2479.90	82.30	27.52	7.41	38.31	78.92	74.00	4.92 Peak
2	2484.73	47.00	27.52	7.41	38.31	43.62	74.00	-30.38 Peak



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT GFSK CH78
Memo :

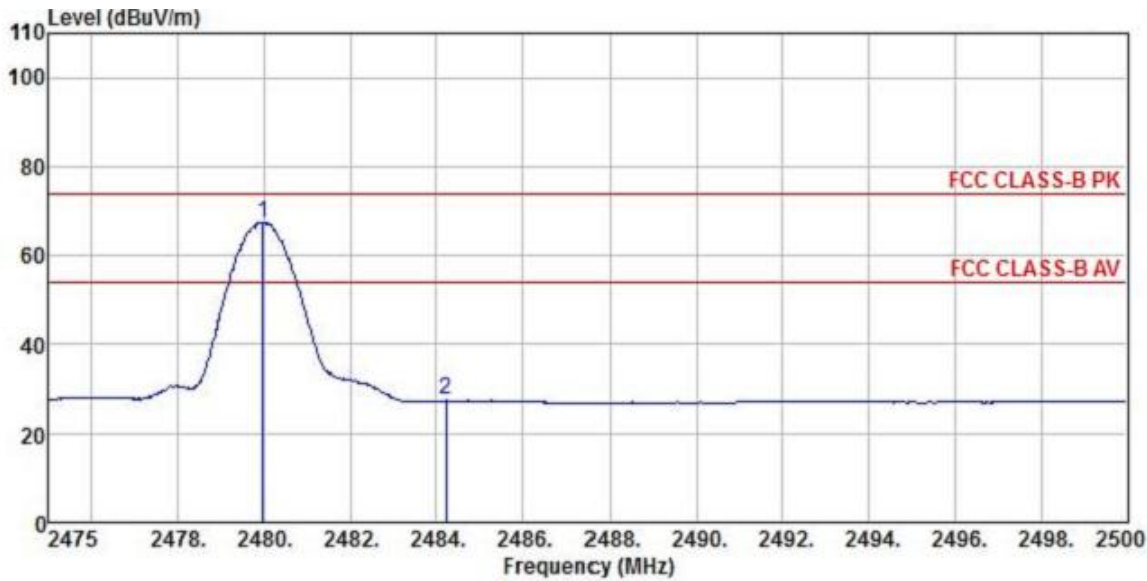
		ReadAntenna	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	pp 2479.98	75.92	27.52	7.41	38.31	72.54	54.00	18.54
2	2484.23	36.07	27.52	7.41	38.31	32.69	54.00	-21.31

Average
Average



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT GFSK CH78
Memo :

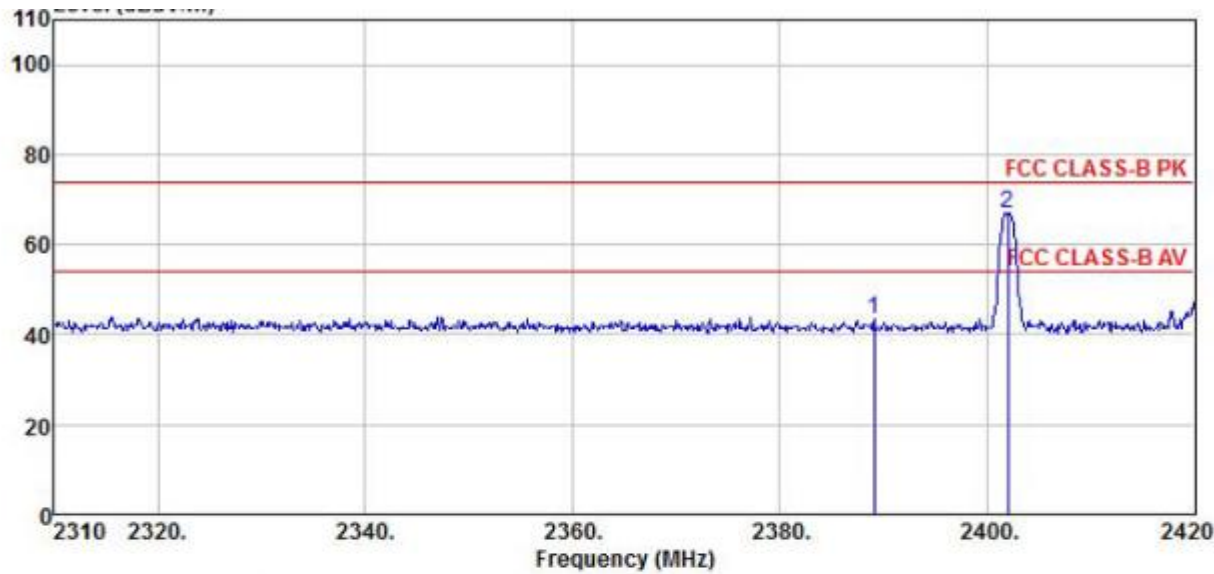
	Freq	ReadAntenna Level	Cable Factor	Preamp Loss	Factor	Limit Level	Over Line	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	2479.98	79.00	27.52	7.41	38.31	75.62	74.00	1.62 Peak
2	2483.53	42.28	27.52	7.41	38.31	38.90	74.00	-35.10 Peak



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT GFSK CH78
Memo :

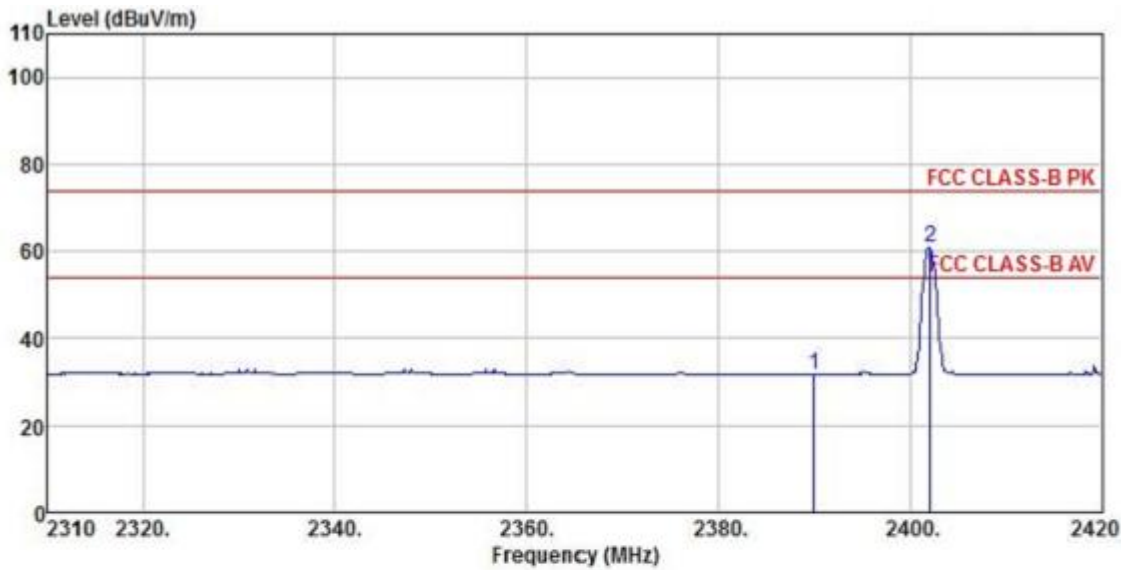
		ReadAntenna	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	2479.98	70.92	27.52	7.41	38.31	67.54	54.00	13.54
2	2484.23	31.07	27.52	7.41	38.31	27.69	54.00	-26.31

BT 8-DPSK (Low Channel)



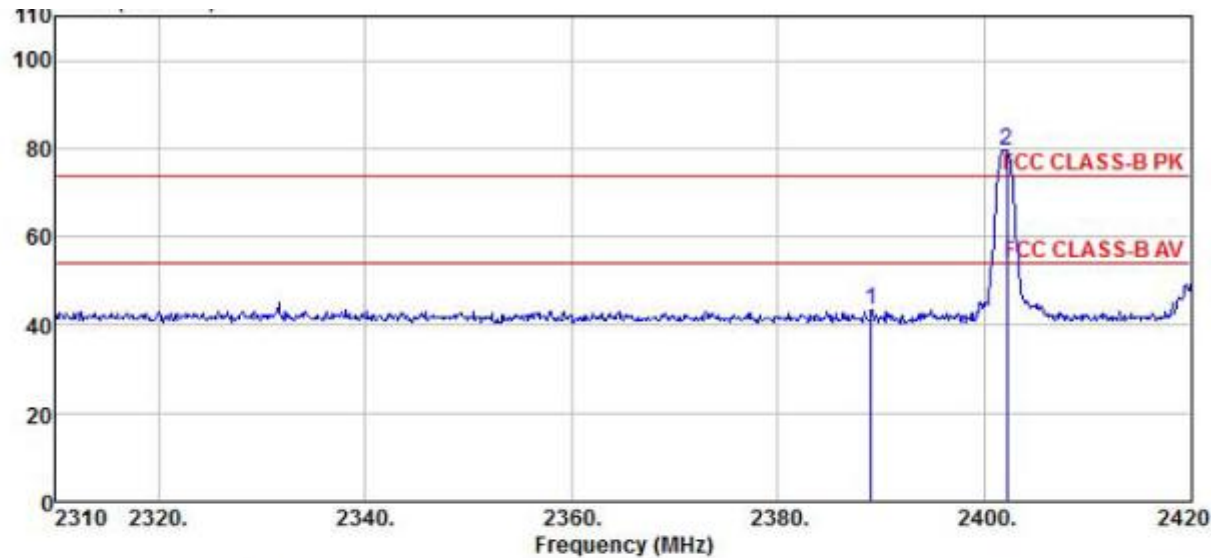
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT 8DPSK CH0
Memo :

	Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2389.09	47.16	27.58	7.13	38.34	43.53	74.00	-30.47	Peak
2 pp	2401.96	70.75	27.54	7.13	38.34	67.08	74.00	-6.92	Peak



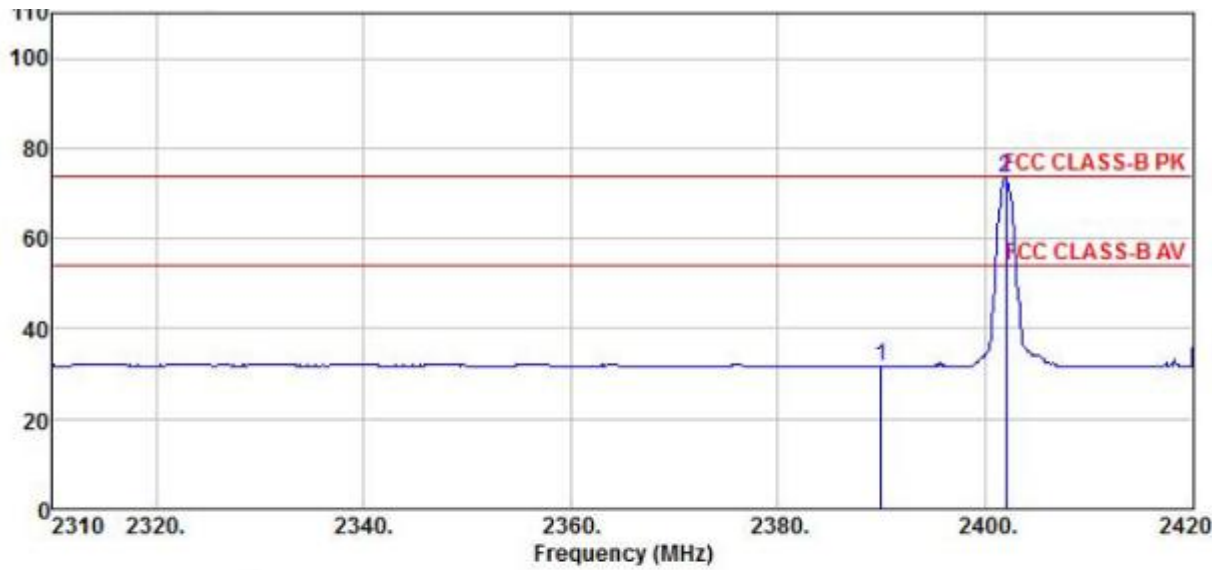
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT 8DPSK CH0
Memo :

	Freq	ReadAntenna	Cable	Preamp		Limit	Over	
		Level	Factor	Loss	Factor	Level	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2389.97	35.35	27.58	7.13	38.34	31.72	54.00	-22.28
2	2402.07	64.65	27.54	7.13	38.34	60.98	54.00	6.98



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT 8DPSK CH0
Memo :

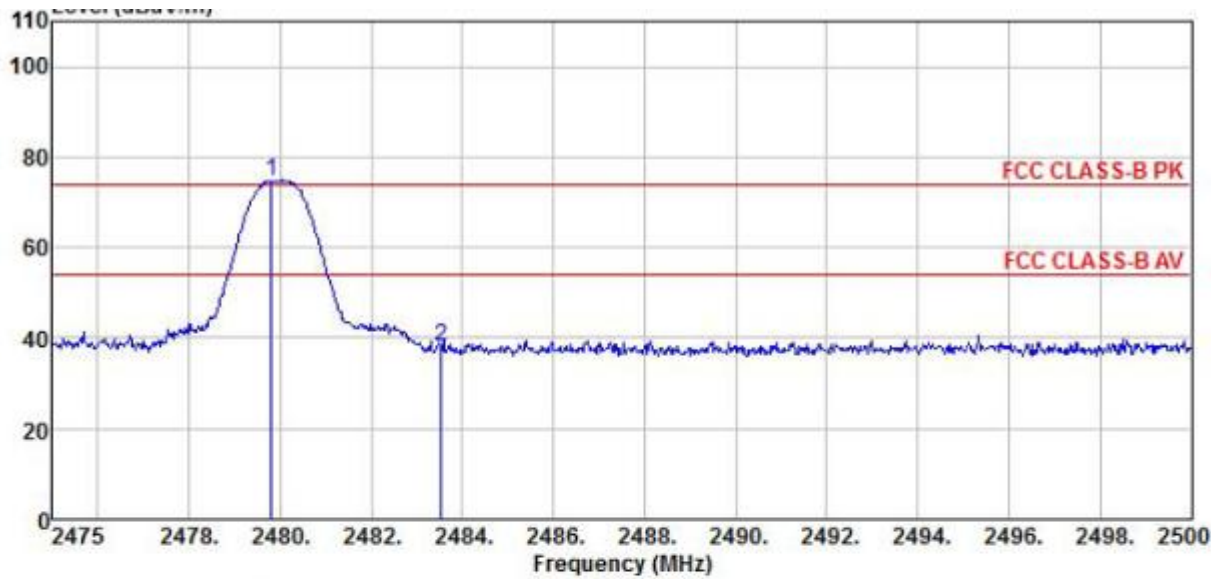
	Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2388.98	46.94	27.58	7.13	38.34	43.31	74.00	-30.69	Peak
2 pp	2402.18	83.30	27.54	7.13	38.34	79.63	74.00	5.63	Peak



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT 8DPSK CH0
Memo :

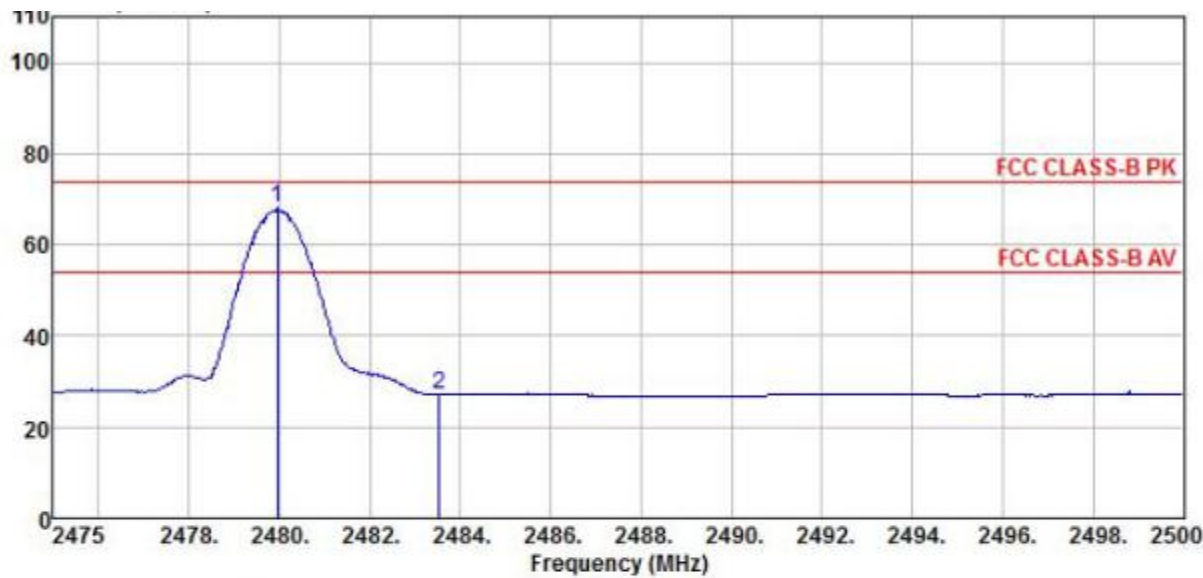
	Freq	ReadAntenna	Cable	Preamp		Limit	Over	
		Level	Factor	Loss	Factor	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2389.97	35.29	27.58	7.13	38.34	31.66	54.00	-22.34 Average
2 pp	2401.96	77.00	27.54	7.13	38.34	73.33	54.00	19.33 Average

BT 8-DPSK (High Channel)



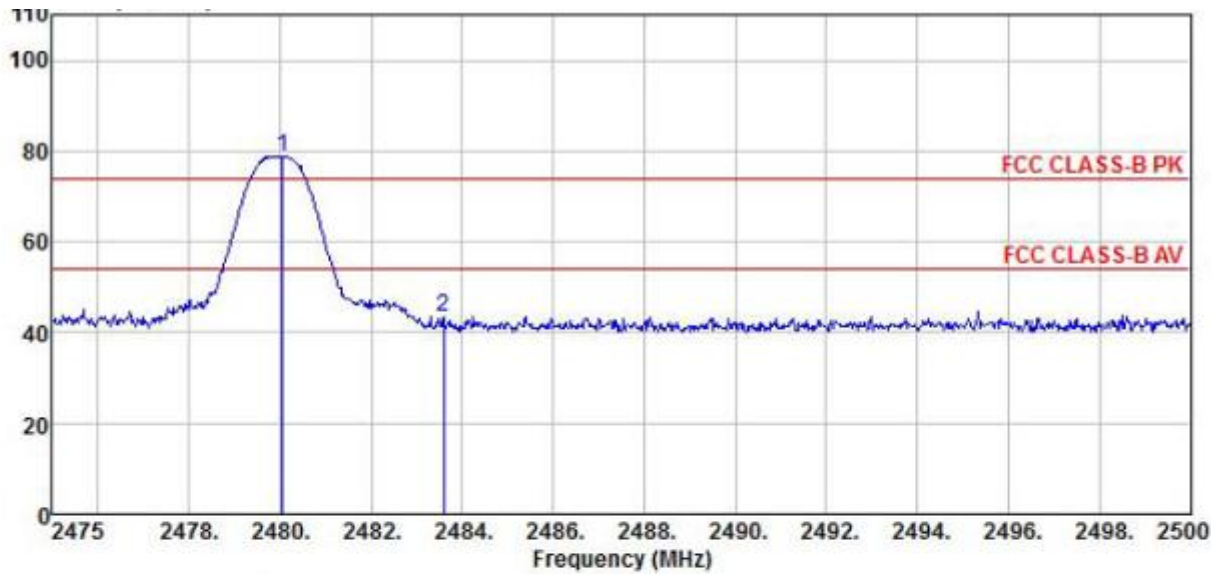
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT 8DPSK CH78
Memo :

		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	2479.80	78.07	27.52	7.41	38.31	74.69	74.00	0.69 Peak
2	2483.53	41.65	27.52	7.41	38.31	38.27	74.00	-35.73 Peak



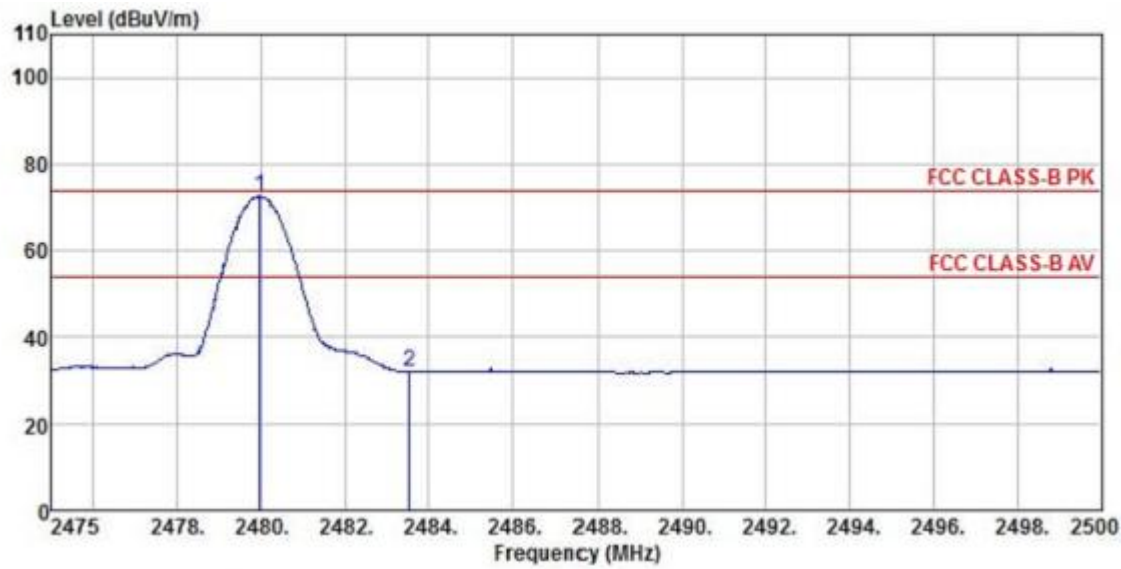
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT 8DPSK CH78
Memo :

	Freq	ReadAntenna Level	Cable Factor	Preamp Loss	Factor	Limit Level	Over Line	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	2479.95	71.39	27.52	7.41	38.31	68.01	54.00	14.01 Average
2 pk	2483.53	30.43	27.52	7.41	38.31	27.05	74.00	-46.95 Peak



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT 8DPSK CH78
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	2480.05	82.31	27.52	7.41	38.31	78.93	74.00	4.93 Peak
2	2483.60	46.74	27.52	7.41	38.31	43.36	74.00	-30.64 Peak



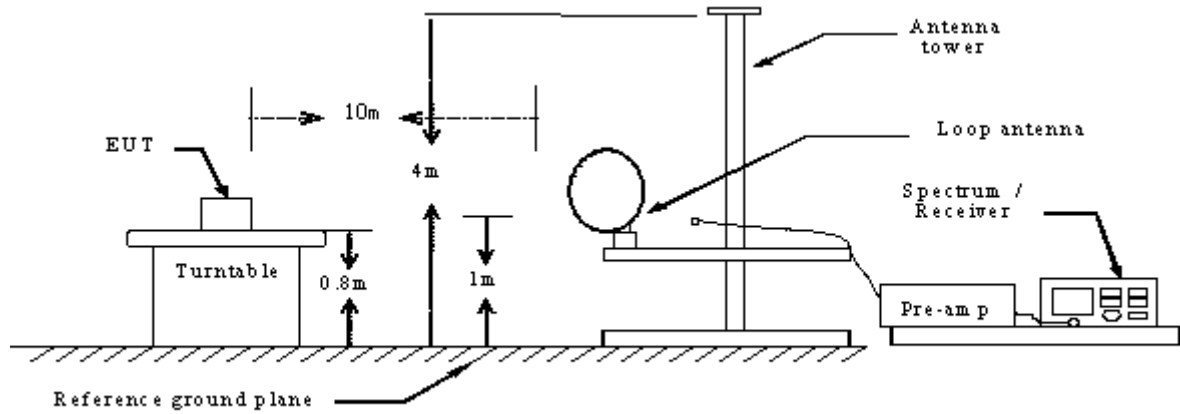
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(942) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C /52%
Power Rating: DC 3.8V
Mode : BT 8DPSK CH78
Memo :

		ReadAntenna		Cable Preamp		Limit		Over	Remark
Freq		Level	Factor	Loss	Factor	Level	Line	Limit	
MHz		dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	pp 2479.98	75.93	27.52	7.41	38.31	72.55	54.00	18.55	Average
2	2483.53	35.43	27.52	7.41	38.31	32.05	54.00	-21.95	Average

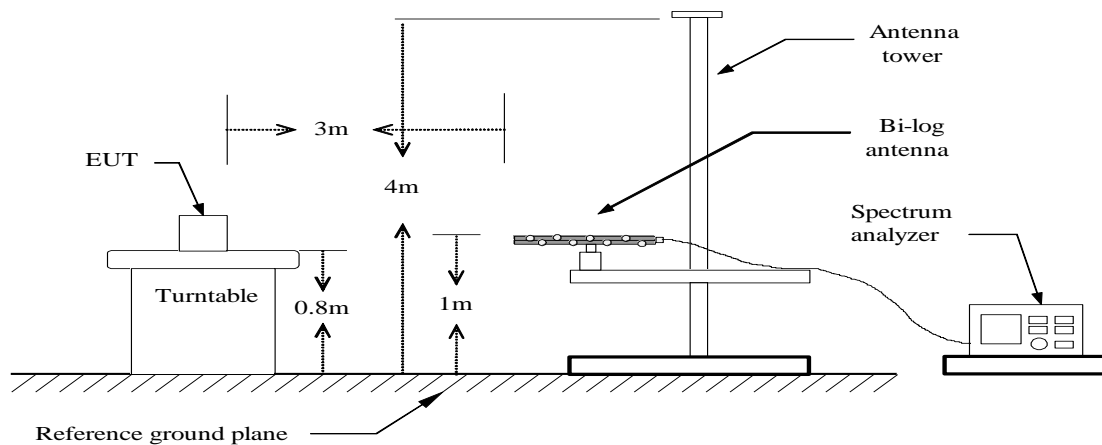
11. SPURIOUS EMISSIONS (RADIATION)

11.1 TEST SETUP

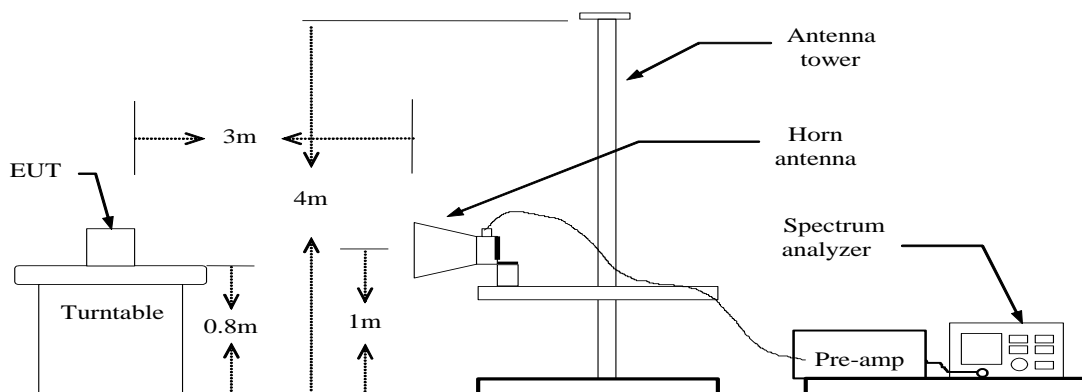
Radiated Spurious Measurement: below 30MHz



Radiated Spurious Measurement: below 1GHz



Radiated Spurious Measurement: above 1GHz



11.2 LIMITS

Frequency (MHz)	Limits (dBuV/m)	Measured distance (m)
0.009-0.490	107.6-72.9	10
0.490-1.705	52.8-42.1	
1.705-30.0	49	
30~88	40	3
88~216	43.5	
216-960	46	
Above 960	54	

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 (μV/m), d1 = 300 (m), d2 = 10 (m), so L2 as follows:

$$20\lg(2400/9) + 40\lg(300/10) = 107.6(\text{dB}\mu\text{V/m})$$

11.3 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 10 meters horizontally from the EUT. 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.

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) :

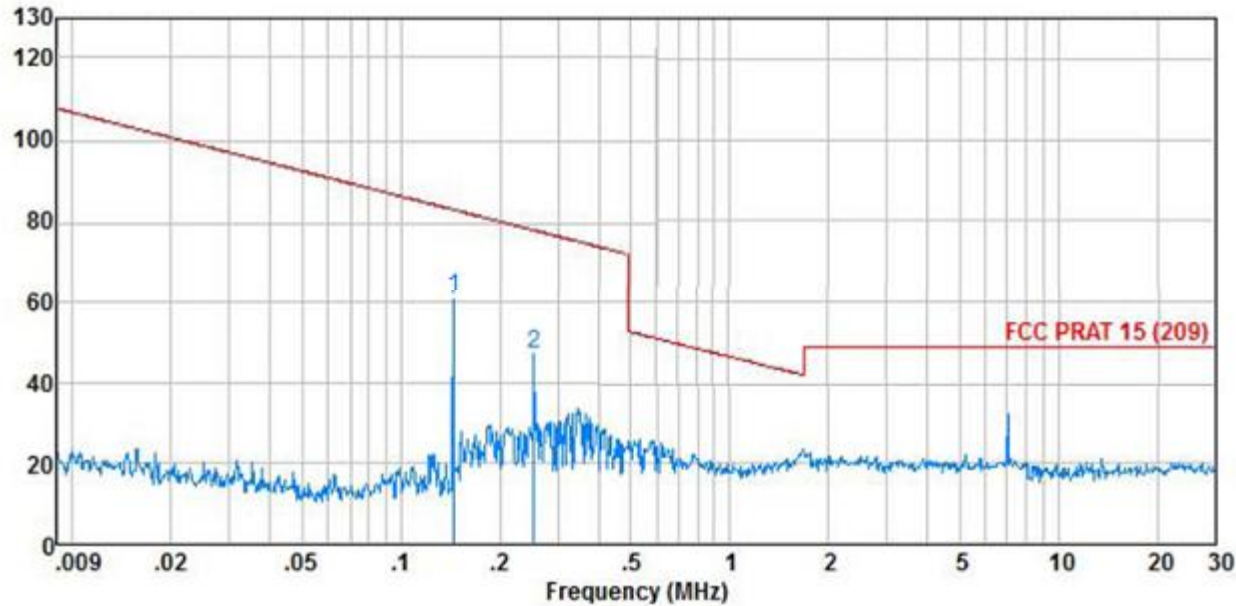
According to description of ANSI C63.4: 2009 sec.13.4, the preliminary radiated emissions measurement were carried out. The preliminary radiated measurements were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT. The EUT configuration (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.

11.4 RESULTS & PERFORMANCE

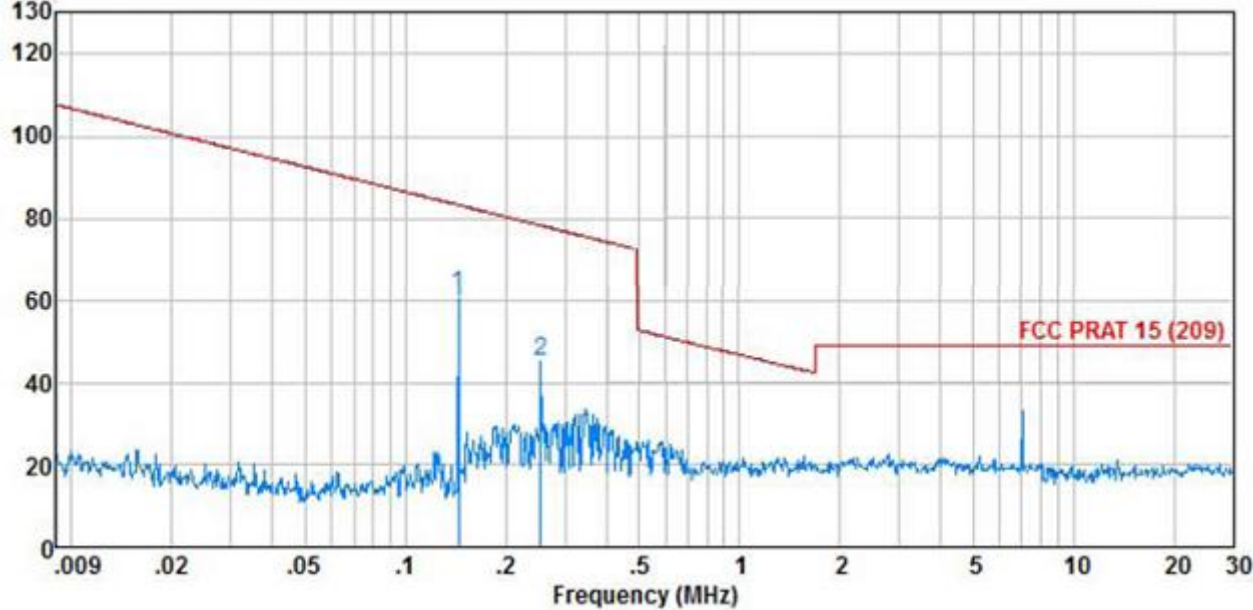
From 9KHz to 30MHz:

Bluetooth GFSK, traffic mode; Channel 0

H:



V:

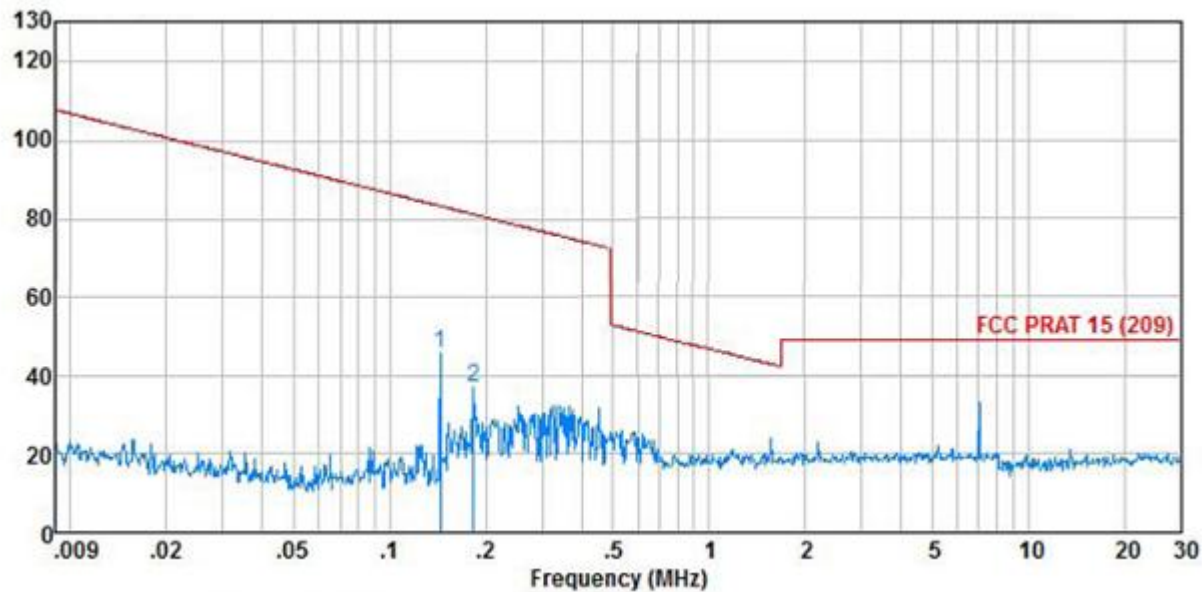


Frequency (MHz)	Polarization (H/V)	Reading (dBuV/m)	Correction Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector
0.14	H	41.06	19.53	60.59	83.76	-23.17	Peak
0.14	V	39.93	19.66	59.59	83.76	-24.17	Peak
0.25	H	28.45	18.14	46.95	78.72	-31.77	Peak
0.25	V	26.52	18.43	44.95	78.72	-33.77	Peak

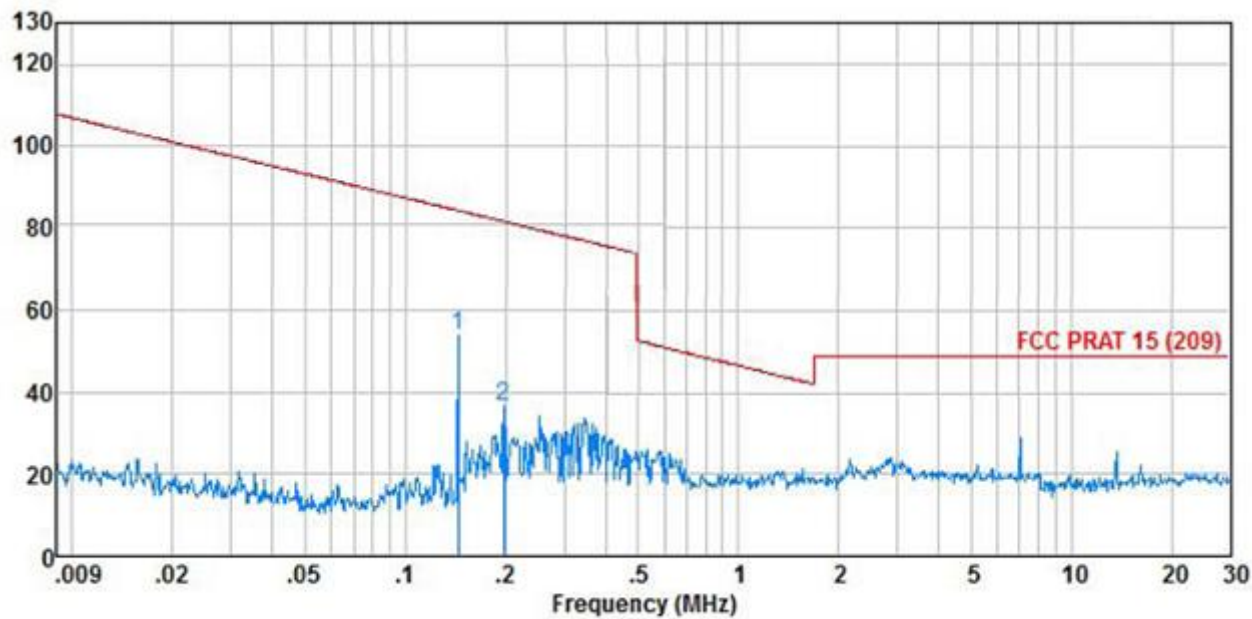
H: Horizontal V: Vertical

Measure Level(dBuV/m) = Reading (dBuV/m) + Correction Factor (dB/m)

Bluetooth GFSK, traffic mode; Channel 39
H:



V:

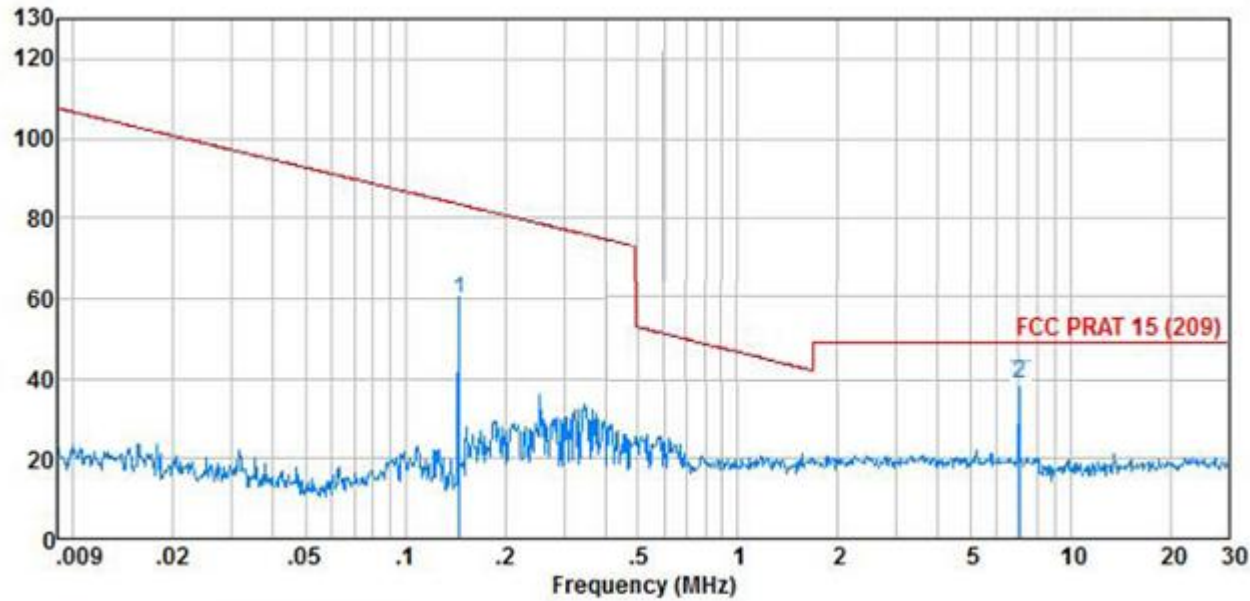


Frequency (MHz)	Polarization (H/V)	Reading (dBUV/m)	Correction Factor (dB/m)	Measure Level (dBUV/m)	Limit (dBUV/m)	Over Limit (dB)	Detector
0.14	H	30.06	19.53	49.59	83.76	-34.17	Peak
0.14	V	33.93	19.66	53.59	83.76	-30.17	Peak
0.18	H	18.45	18.14	36.95	81.58	-44.63	Peak
0.20	V	21.04	15.25	36.29	85.10	-48.81	Peak

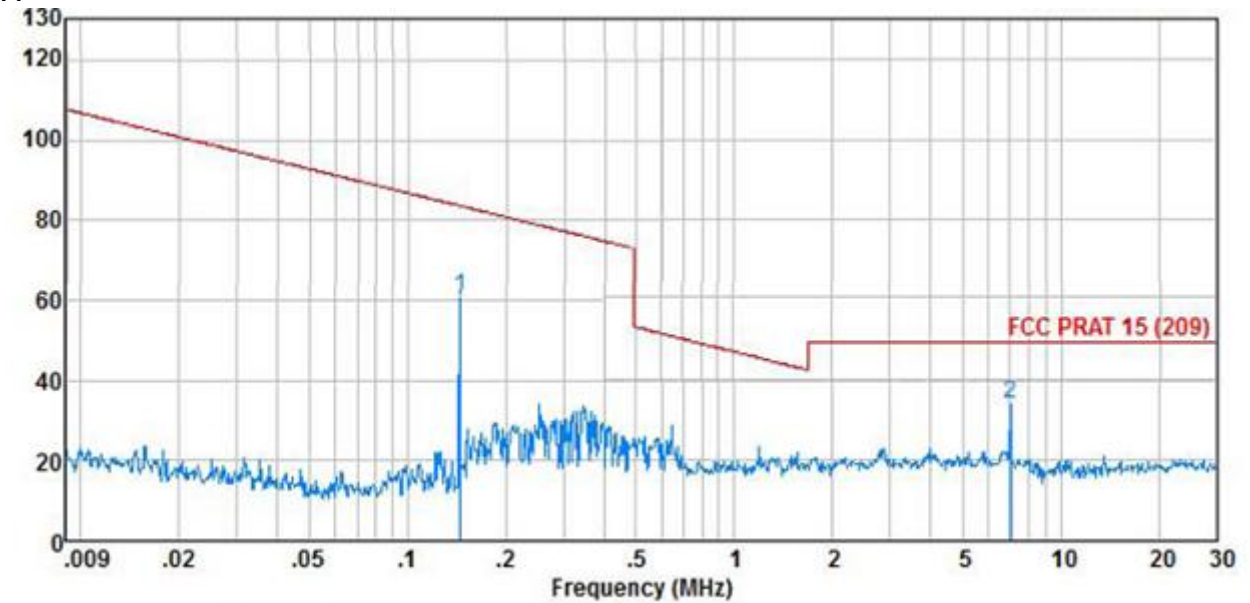
H: Horizontal V: Vertical

Measure Level(dBuV/m) = Reading (dBUV/m) + Correction Factor (dB/m)

Bluetooth GFSK, traffic mode; Channel 78
H:



V:

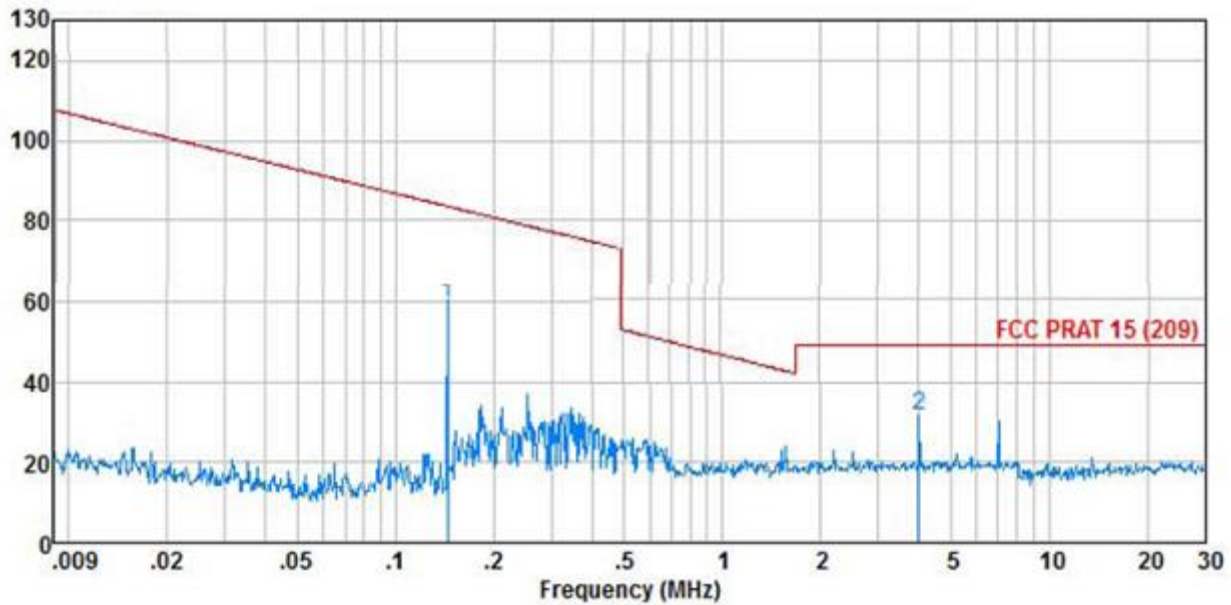


Frequency (MHz)	Polarization (H/V)	Reading (dBuV/m)	Correction Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector
0.14	H	41.06	19.53	60.59	83.76	-23.17	Peak
0.14	V	39.93	19.66	59.59	83.76	-24.17	Peak
7.02	H	19.88	18.14	38.02	49.00	-10.98	Peak
7.02	V	18.77	15.25	34.02	49.00	-14.98	Peak

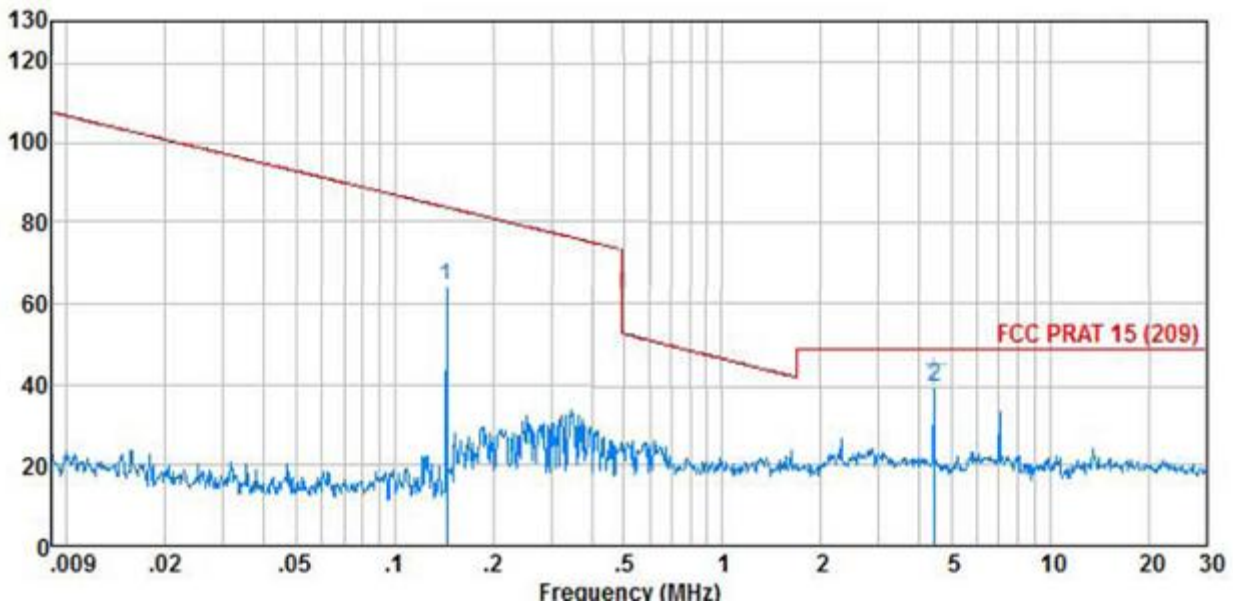
H: Horizontal V: Vertical

Measure Level(dBuV/m) = Reading (dBuV/m) + Correction Factor (dB/m)

Bluetooth 8-DPSK, traffic mode; Channel 0
H:



V:

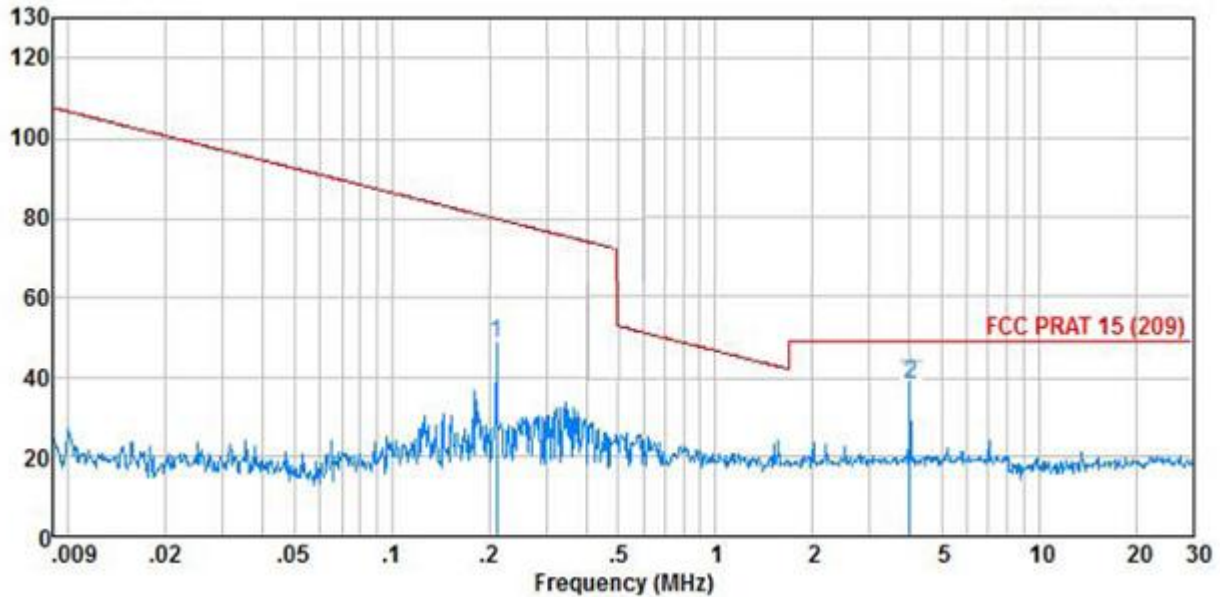


Frequency (MHz)	Polarization (H/V)	Reading (dBuV/m)	Correction Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector
0.14	H	44.91	19.53	59.59	83.76	-24.17	Peak
0.14	V	43.29	19.66	63.59	83.76	-20.17	Peak
4.01	H	28.14	18.14	31.74	49.00	-17.26	Peak
4.42	V	25.11	15.25	39.47	49.00	-9.53	Peak

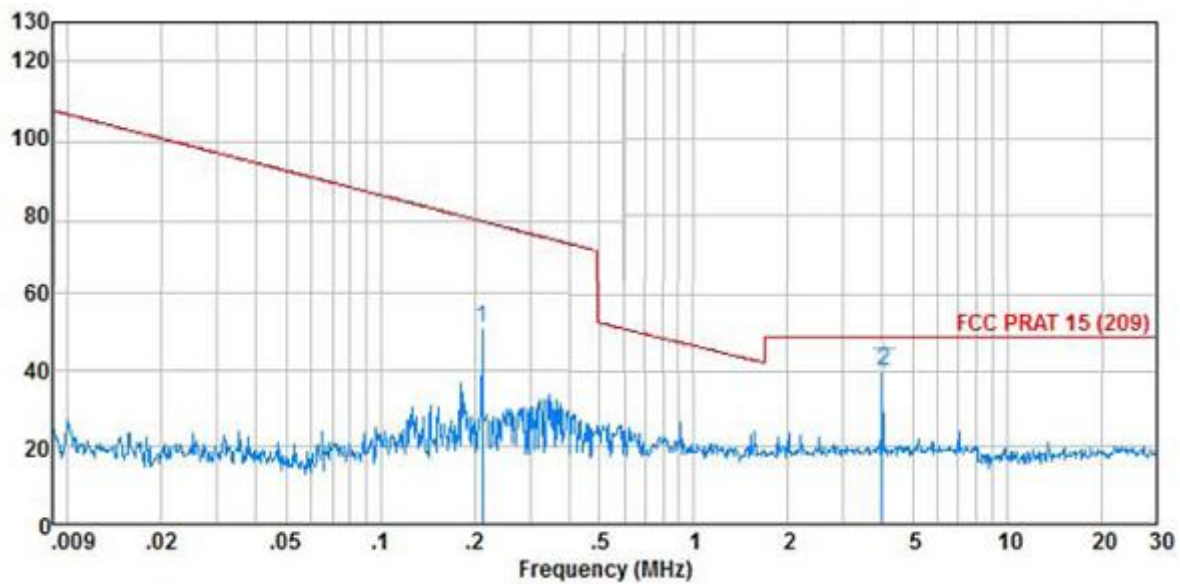
H: Horizontal V: Vertical

Measure Level(dBuV/m) = Reading (dBuV/m) + Correction Factor (dB/m)

Bluetooth 8-DPSK, traffic mode; Channel 39
H:



V:

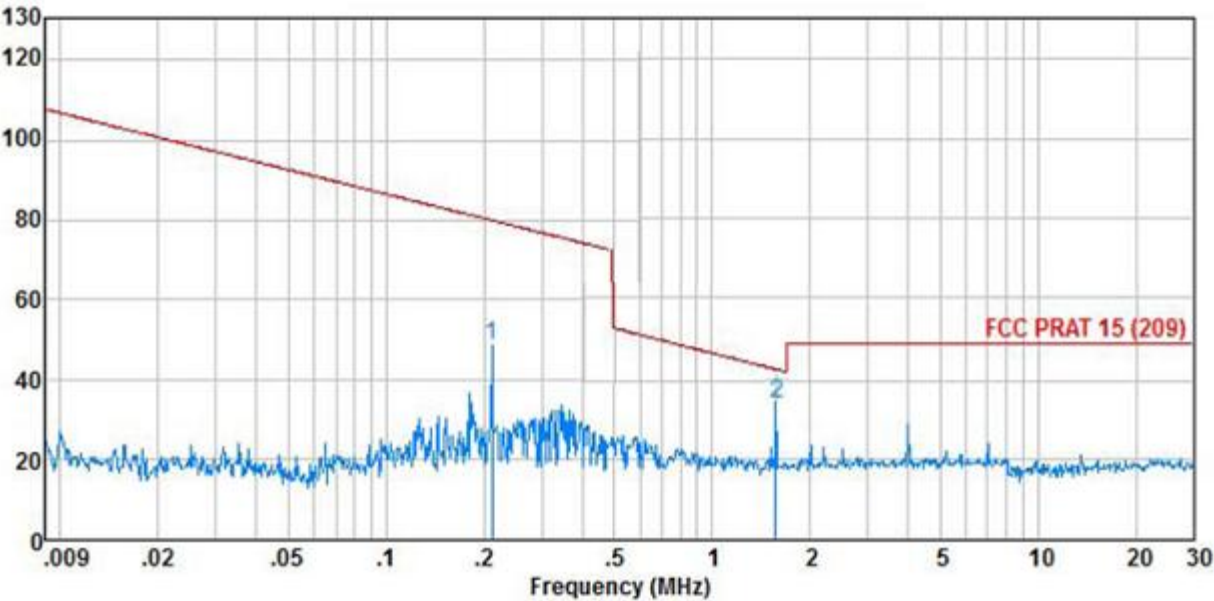


Frequency (MHz)	Polarization (H/V)	Reading (dBuV/m)	Correction Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector
0.21	H	29.09	19.53	48.62	80.24	-32.24	Peak
0.21	V	30.96	19.66	50.62	80.24	-29.62	Peak
4.01	H	20.23	18.14	38.37	49.00	-10.63	Peak
4.01	V	25.49	15.25	40.74	49.00	-8.26	Peak

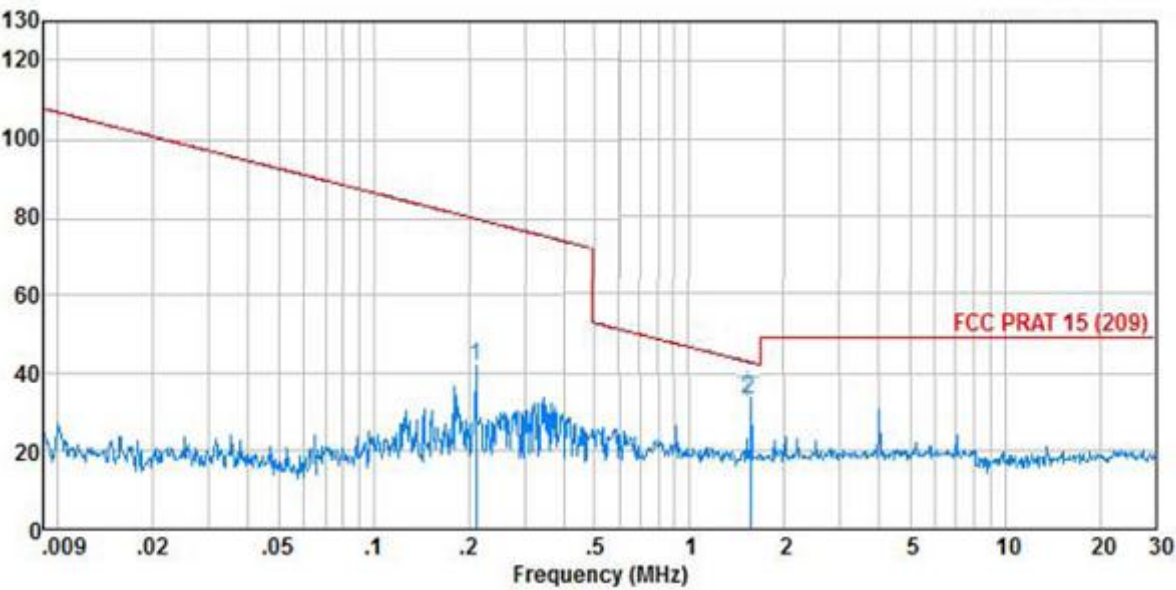
H: Horizontal V: Vertical

Measure Level(dBuV/m) = Reading (dBuV/m) + Correction Factor (dB/m)

Bluetooth 8-DPSK, traffic mode; Channel 78
H:



V:

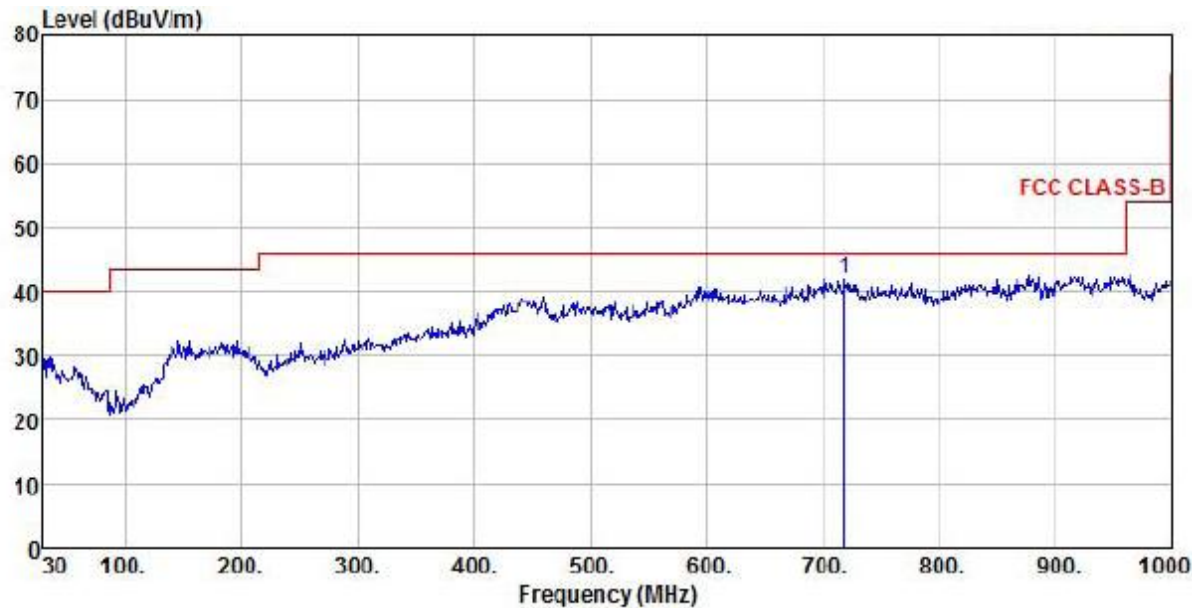


Frequency (MHz)	Polarization (H/V)	Reading (dBuV/m)	Correction Factor (dB/m)	Measure Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector
0.21	H	29.09	19.53	48.62	80.24	-31.62	Peak
0.21	V	21.96	19.66	41.62	80.24	-38.62	Peak
1.57	H	18.72	18.14	36.86	49.00	-12.14	Peak
1.57	V	20.61	15.25	35.86	49.00	-13.14	Peak

H: Horizontal V: Vertical

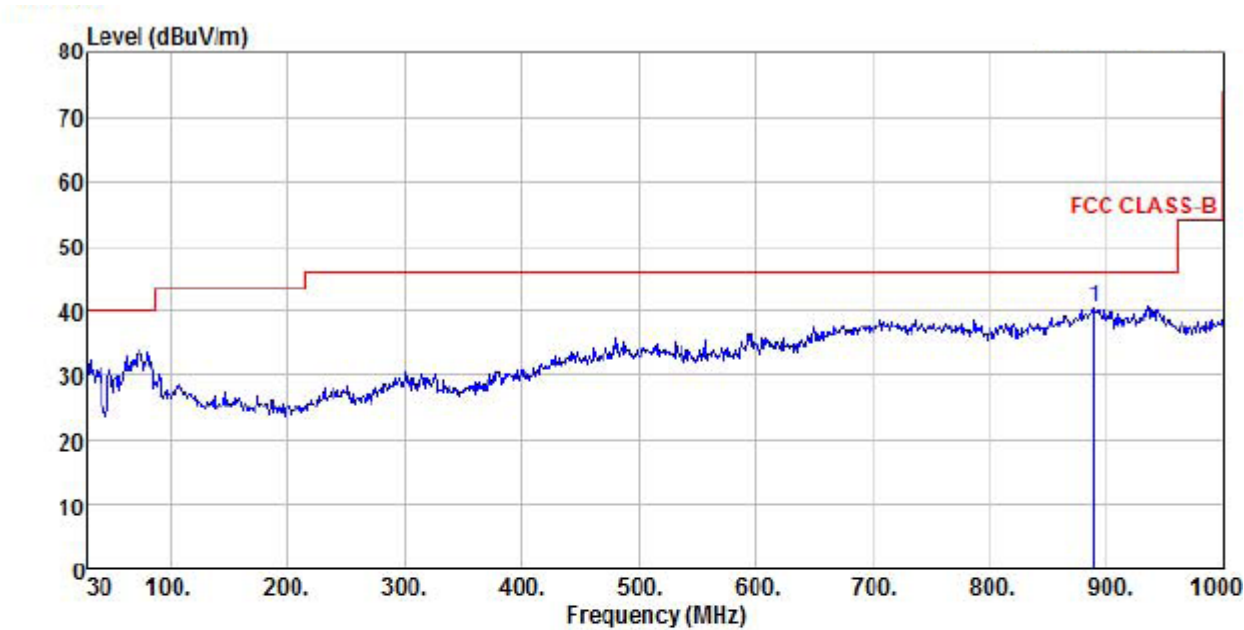
Measure Level(dBuV/m) = Reading (dBuV/m) + Correction Factor (dB/m)

From 30MHz to 1GHz:
Bluetooth GFSK, traffic mode; Channel 0



Site : chamber
Condition : FCC CLASS-B 3m VULB9160(RSE-H) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : GFSK CH0
Memo :

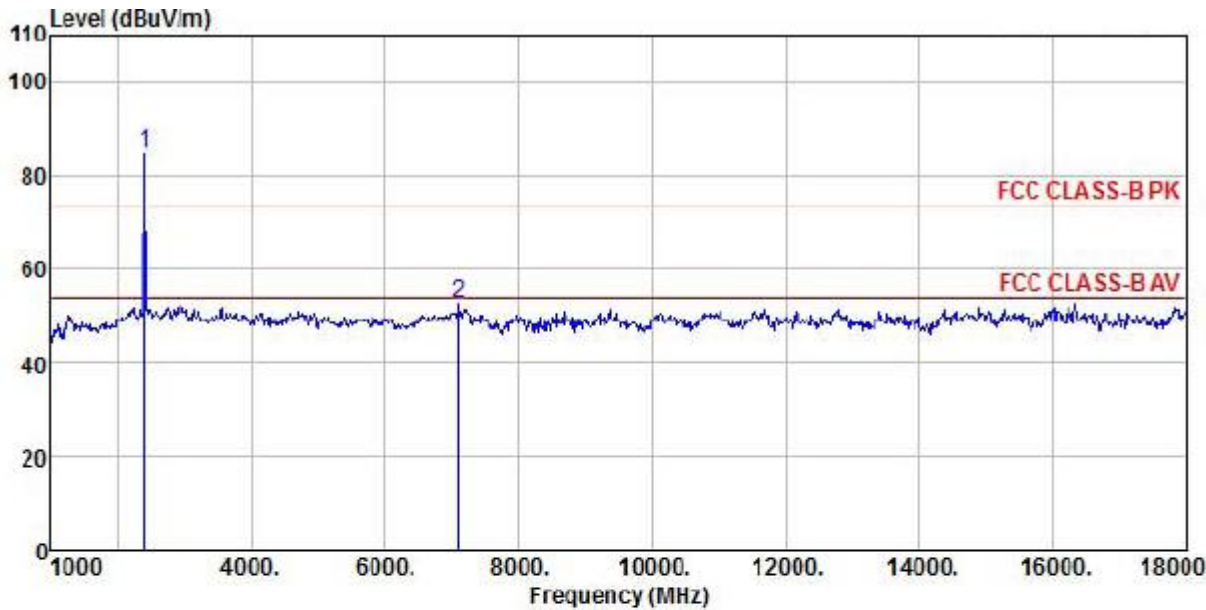
	Freq	ReadAntenna		Cable Preamp		Limit	Over	Remark
		Level	Factor	Loss	Factor	Level	Line	
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	718.70	-0.15	38.51	3.69	0.00	42.05	46.00	-3.95 Peak



Site : chamber
Condition : FCC CLASS-B 3m VULB9160(RSE-V) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : GFSK CH0
Memo :

	Freq	ReadAntenna		Cable Preamp		Limit	Over	Remark
		Level	Factor	Loss	Factor	Line	Limit	
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	889.42	0.93	35.64	4.01	0.00	40.58	46.00	-5.42 Peak

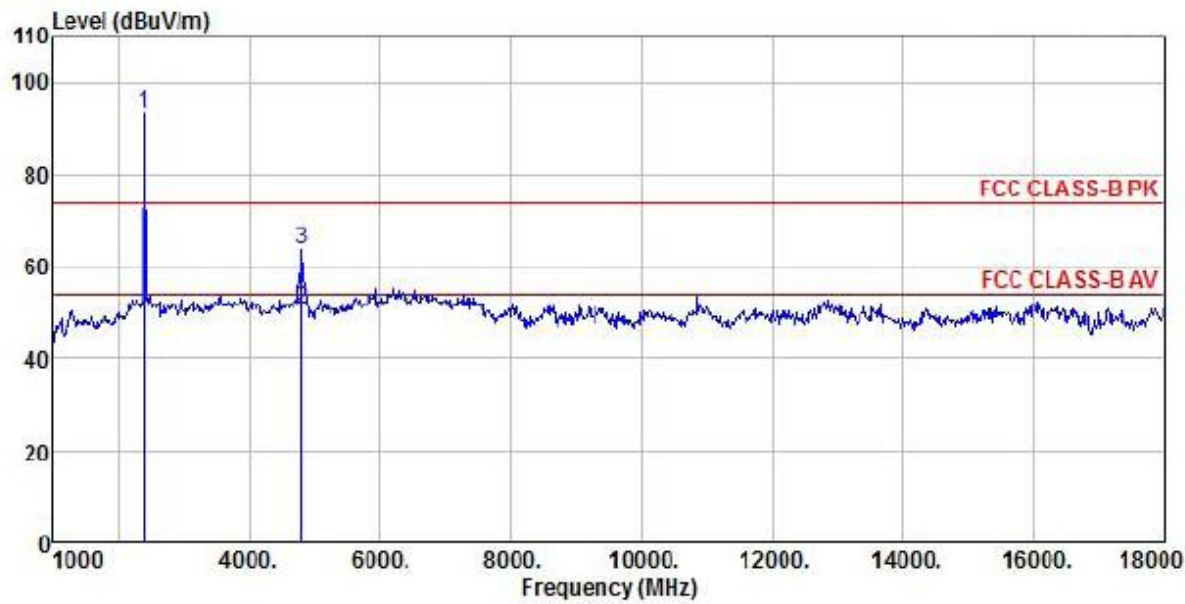
Bluetooth GFSK, traffic mode; Channel 39



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-H) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : GFSK CH39
Memo :

		ReadAntenna	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	2411.00	78.21	37.89	7.21	38.34	84.97	74.00	10.97
2	7120.00	32.41	44.84	12.41	36.72	52.94	74.00	-21.06

Note: The point mark1 is carrier.

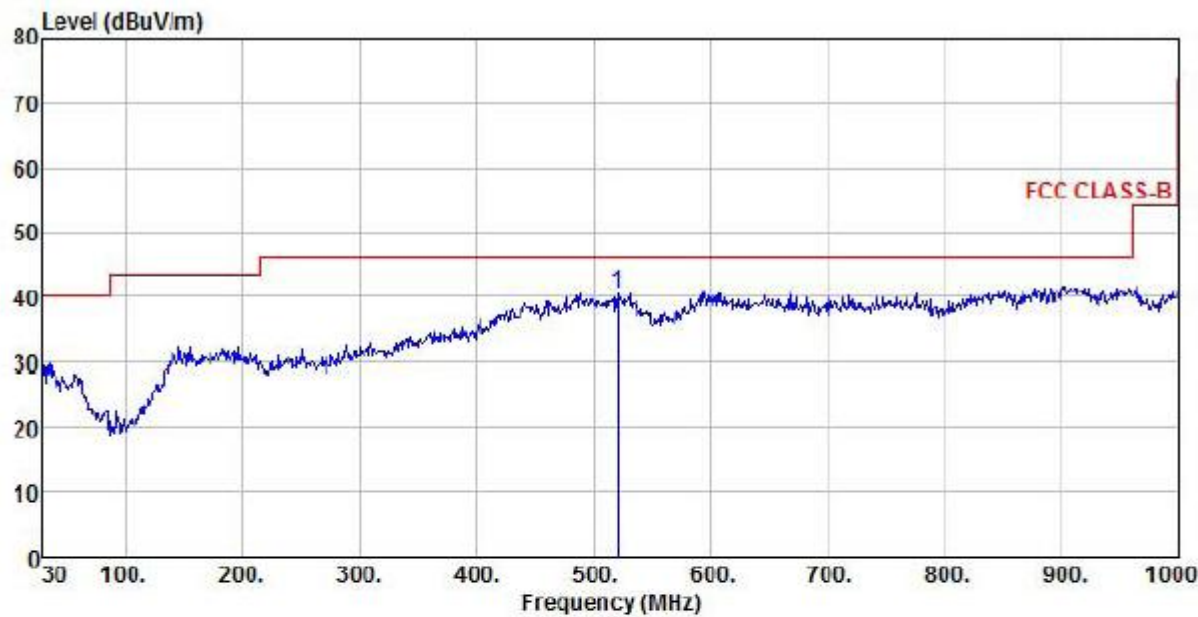


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-V) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : GFSK CH39
Memo :

		ReadAntenna	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	2394.00	86.84	37.92	7.13	38.34	93.55	74.00
2	av	4808.00	35.22	42.27	10.40	37.17	50.72	54.00
3		4808.00	48.25	42.27	10.40	37.17	63.75	74.00

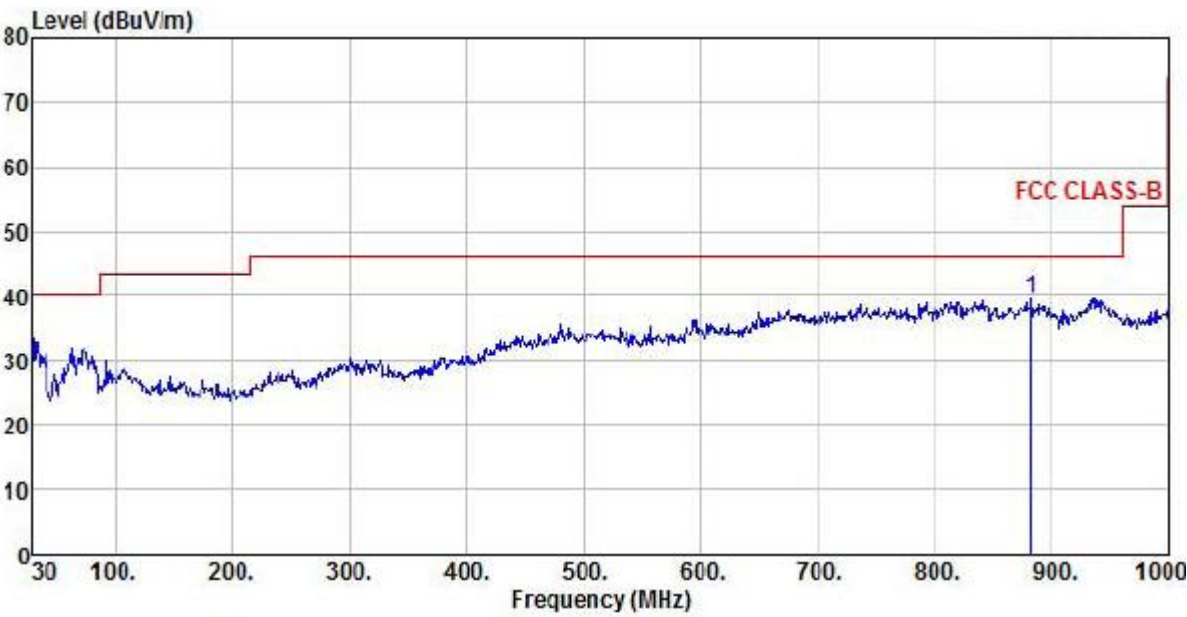
Note: The point mark1 is carrier.

Bluetooth GFSK, traffic mode; Channel 78



Site : chamber
Condition : FCC CLASS-B 3m VULB9160(RSE-H) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : GFSK CH78
Memo :

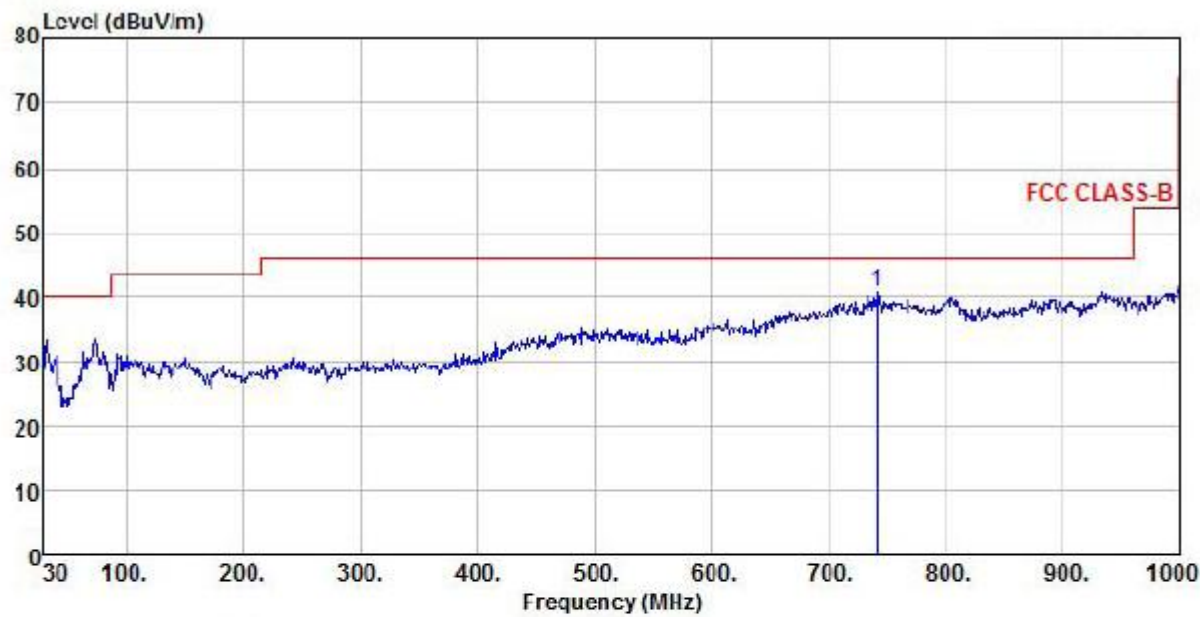
	Freq	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 pp	520.82	4.95	32.42	3.11	0.00	40.48	46.00	-5.52	Peak



Site : chamber
Condition : FCC CLASS-B 3m VULB9160(RSE-V) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : GFSK CH78
Memo :

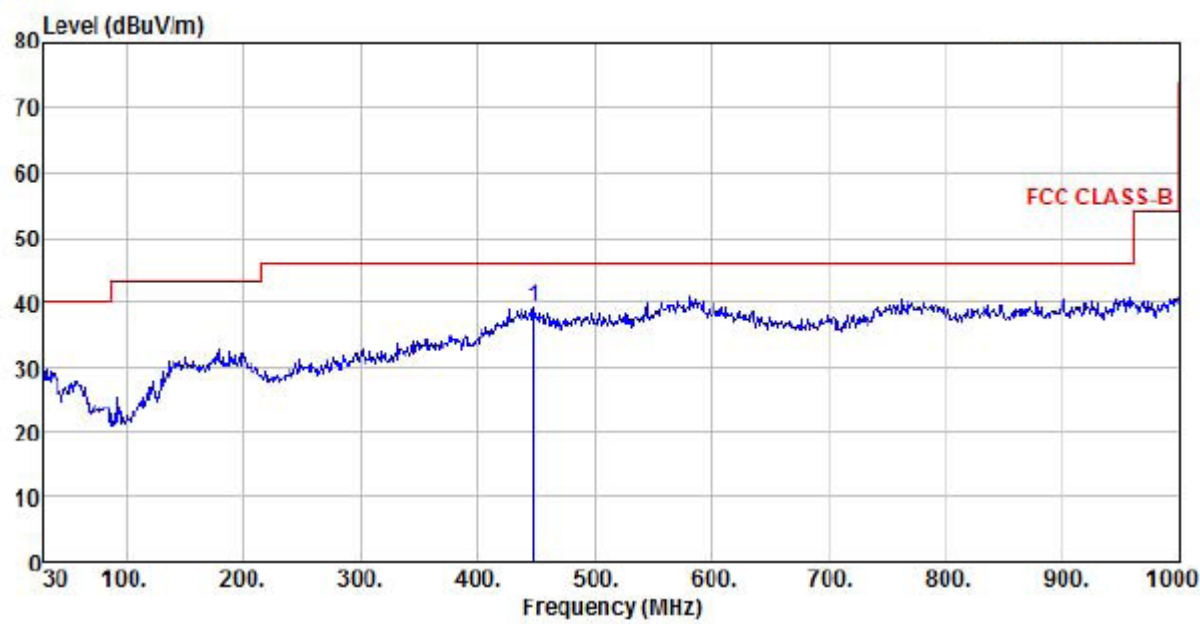
Freq	ReadAntenna		Cable Preamp		Level	Limit	Over	Remark
	Level	Factor	Loss	Factor				
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 pp 882.63	0.38	35.23	3.97	0.00	39.58	46.00	-6.42	Peak

Bluetooth 8-DPSK, traffic mode; Channel 0



Site : chamber
Condition : FCC CLASS-B 3m VULB9160(RSE-V) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : 8DPSK CH0
Memo :

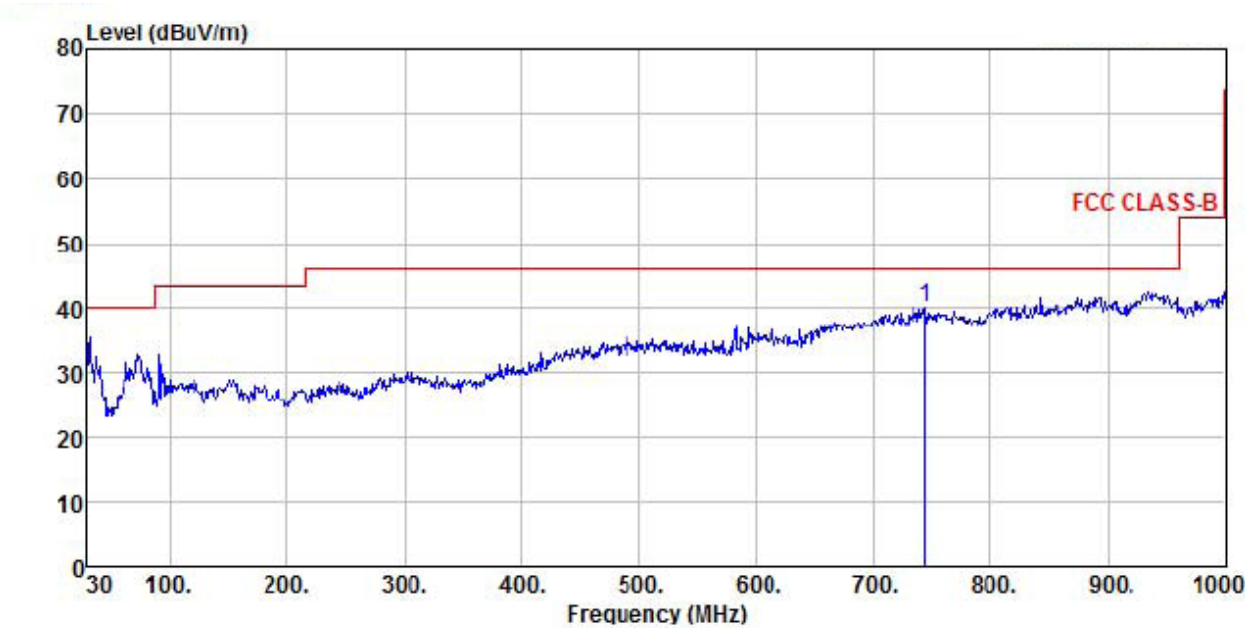
	Freq	ReadAntenna		Cable Preamp		Limit	Over	
		Level	Factor	Loss	Factor	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	741.98	4.07	33.00	3.77	0.00	40.84	46.00	-5.16 Peak



Site : chamber
Condition : FCC CLASS-B 3m VULB9160(RSE-H) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : 8DPSK CH0
Memo :

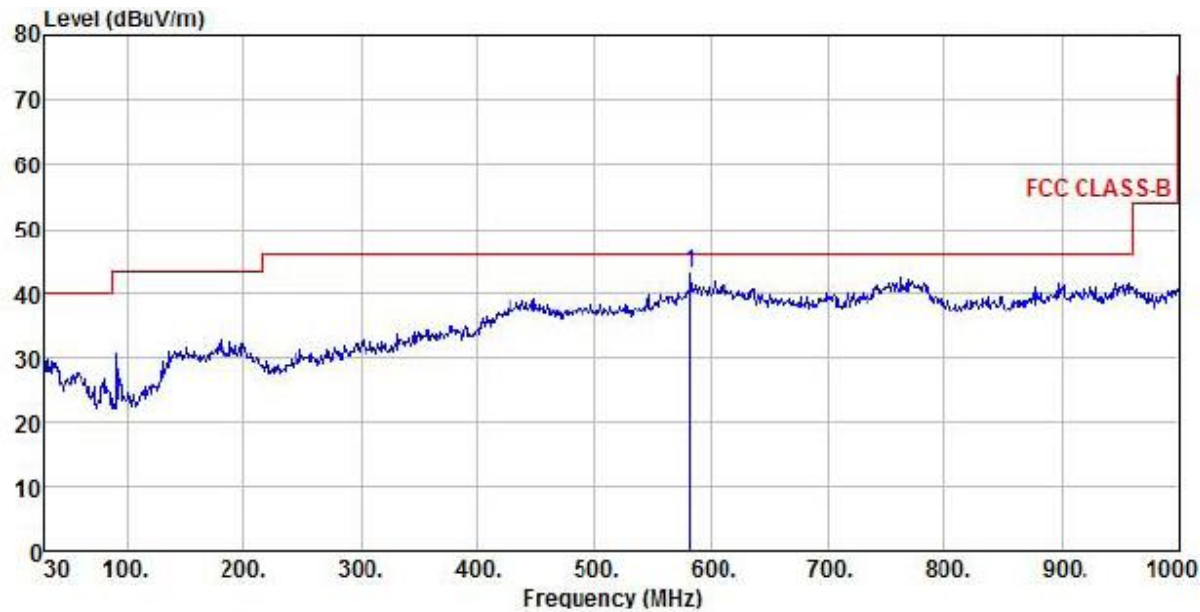
1	pp	Freq	ReadAntenna		Cable Preamp		Limit	Over	Remark
			Level	Factor	Loss	Factor	Line	Limit	
		MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	pp	449.04	3.15	33.37	2.88	0.00	39.40	46.00	-6.60 Peak

Bluetooth 8-DPSK, traffic mode; Channel 39



Site : chamber
Condition : FCC CLASS-B 3m VULB9160(RSE-V) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : 8DPSK CH39
Memo :

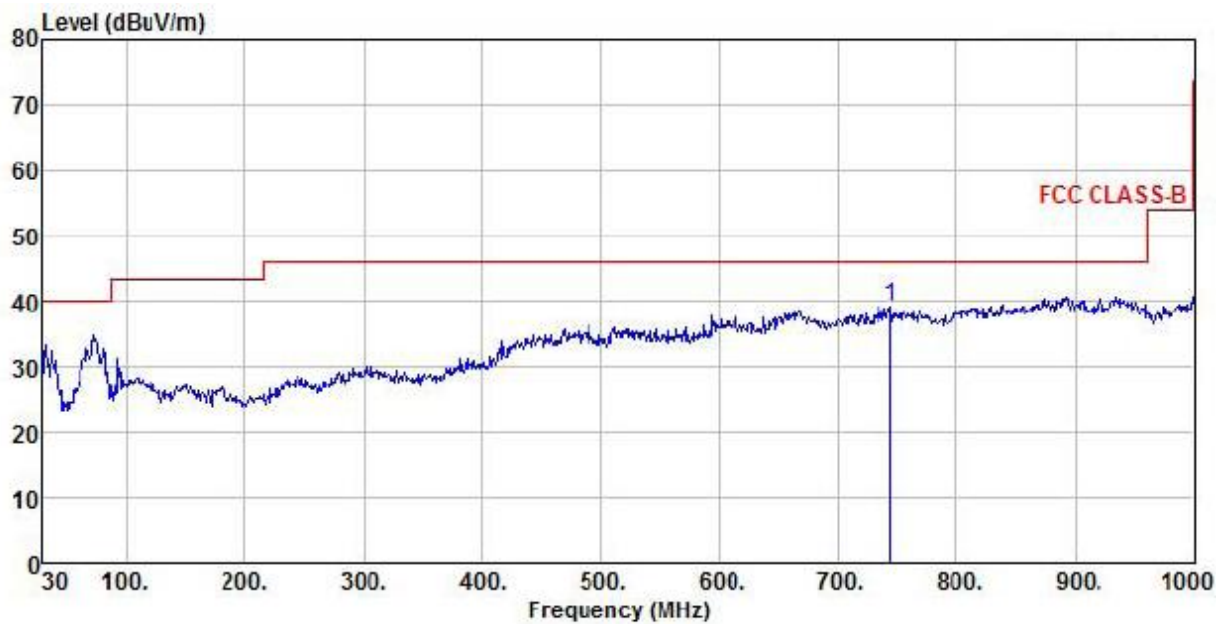
	Freq	ReadAntenna		Cable Preamp		Limit	Over	
		Level	Factor	Loss	Factor	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	744.89	3.43	32.99	3.78	0.00	40.20	46.00	-5.80 Peak



Site : chamber
Condition : FCC CLASS-B 3m VULB9160(RSE-H) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : 8DPSK CH39
Memo :

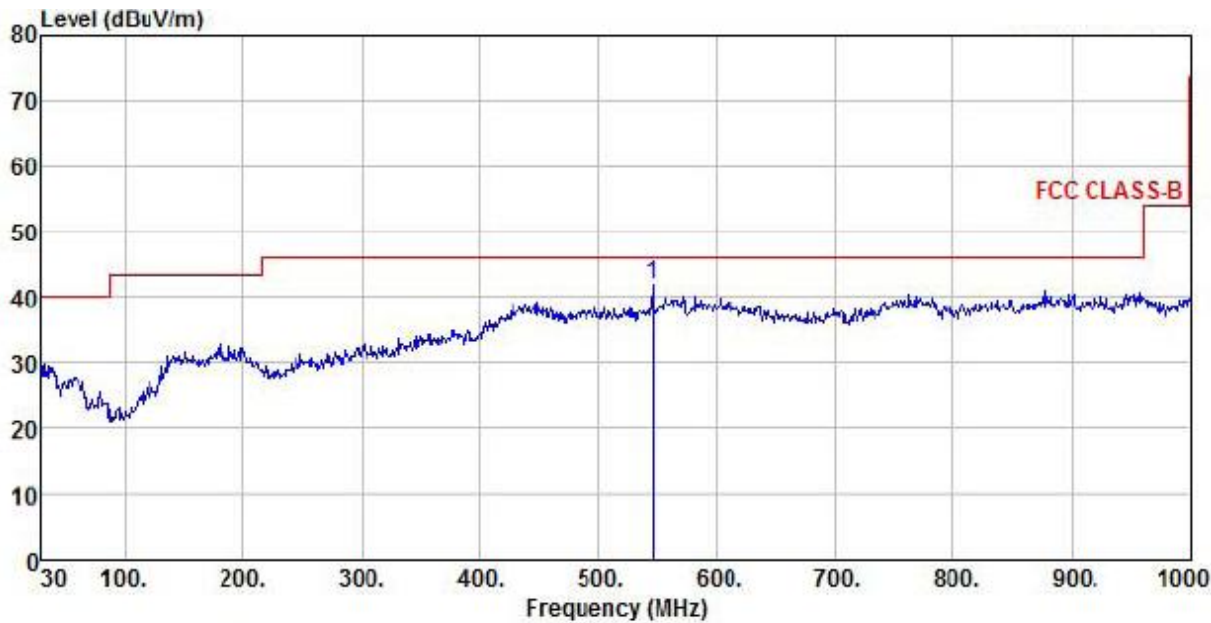
1	pp	Freq	ReadAntenna		Cable		Preamp		Limit	Over	Remark
			Level	Factor	Loss	Factor	Level	Line			
		MHz	dBuV	dB/m	dB		dB	dBuV/m	dBuV/m	dB	
1	pp	581.93	4.74	35.05	3.26	0.00	43.05	46.00	-2.95	Peak	

Bluetooth 8-DPSK, traffic mode; Channel 78



Site : chamber
Condition : FCC CLASS-B 3m VULB9160(RSE-V) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : 8DPSK CH78
Memo :

	Freq	ReadAntenna		Cable Preamp		Level	Limit	Over	Remark
		Level	Factor	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 pp	744.89	2.43	32.99	3.78	0.00	39.20	46.00	-6.80	Peak

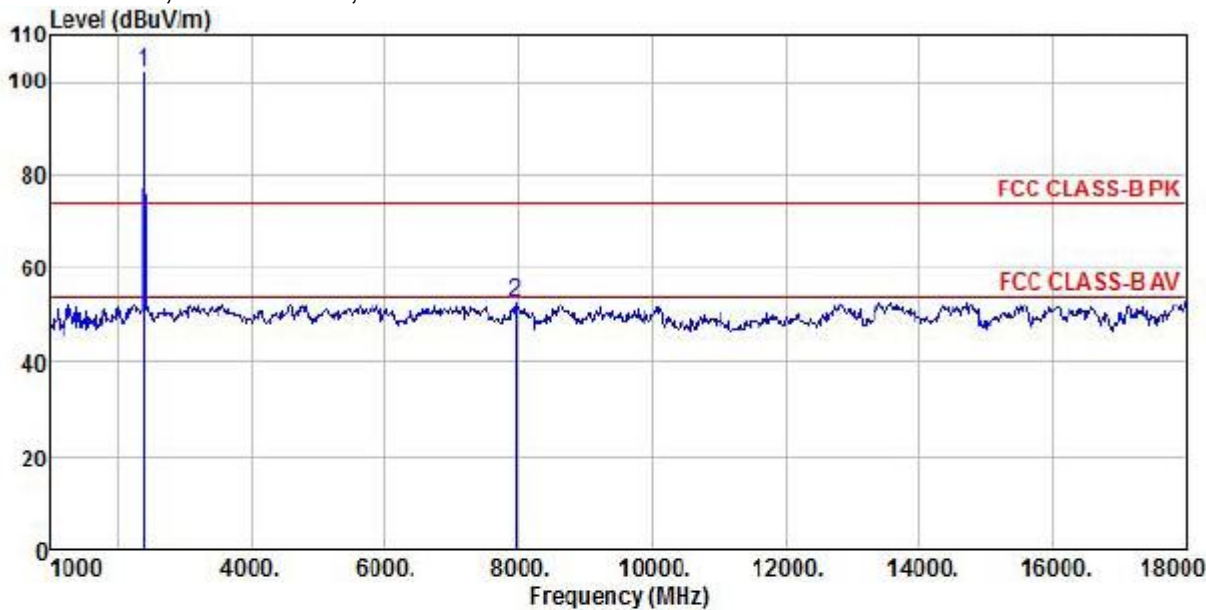


Site : chamber
Condition : FCC CLASS-B 3m VULB9160(RSE-H) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : 8DPSK CH78
Memo :

	Freq	ReadAntenna		Cable Preamp		Limit	Over	
		Level	Factor	Loss	Factor	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	545.07	5.79	32.96	3.14	0.00	41.89	46.00	-4.11 Peak

Above 1GHz:

Bluetooth GFSK, traffic mode; Channel 0

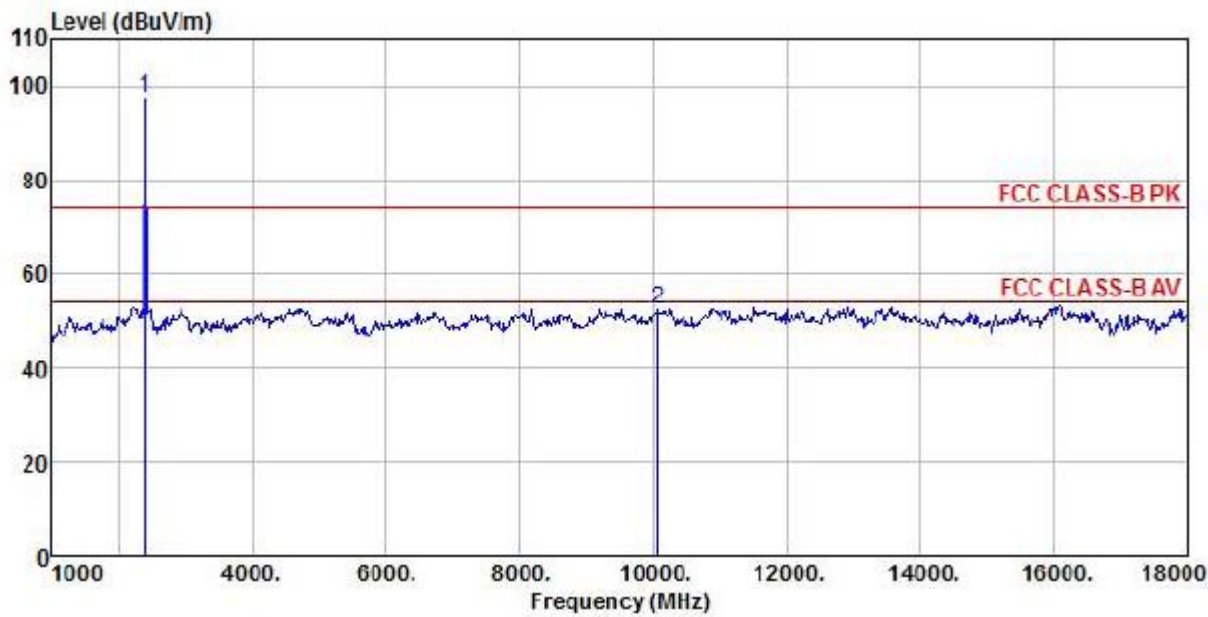


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-V) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 24℃ / 49%
Power Rating: DC 3.8V
Mode : GFSK Channel 0
Memo :

		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	2394.00	95.67	37.92	7.13	38.34	102.38	74.00	28.38 Peak
2	7953.00	31.10	48.23	13.11	39.62	52.82	74.00	-21.18 Peak

Note1: The point mark1 is carrier.

Note2: there is not any harmonic but for background noise above 6GHz

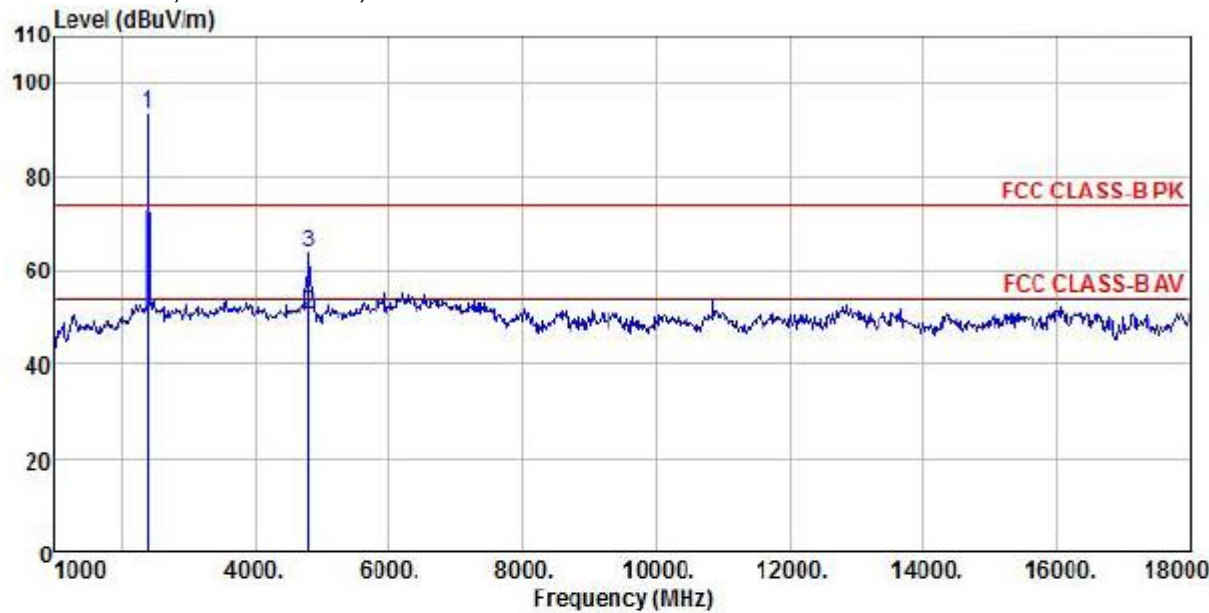


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-H) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 24°C / 49%
Power Rating: DC 3.8V
Mode : GFSK Channel 0
Memo :

		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	2394.00	90.84	37.92	7.13	38.34	97.55	74.00	23.55 Peak
2	10078.00	25.28	51.45	15.14	39.36	52.51	74.00	-21.49 Peak

Note1: The point mark1 is carrier.
Note2: there is not any harmonic but for background noise above 6GHz

Bluetooth GFSK, traffic mode; Channel 39

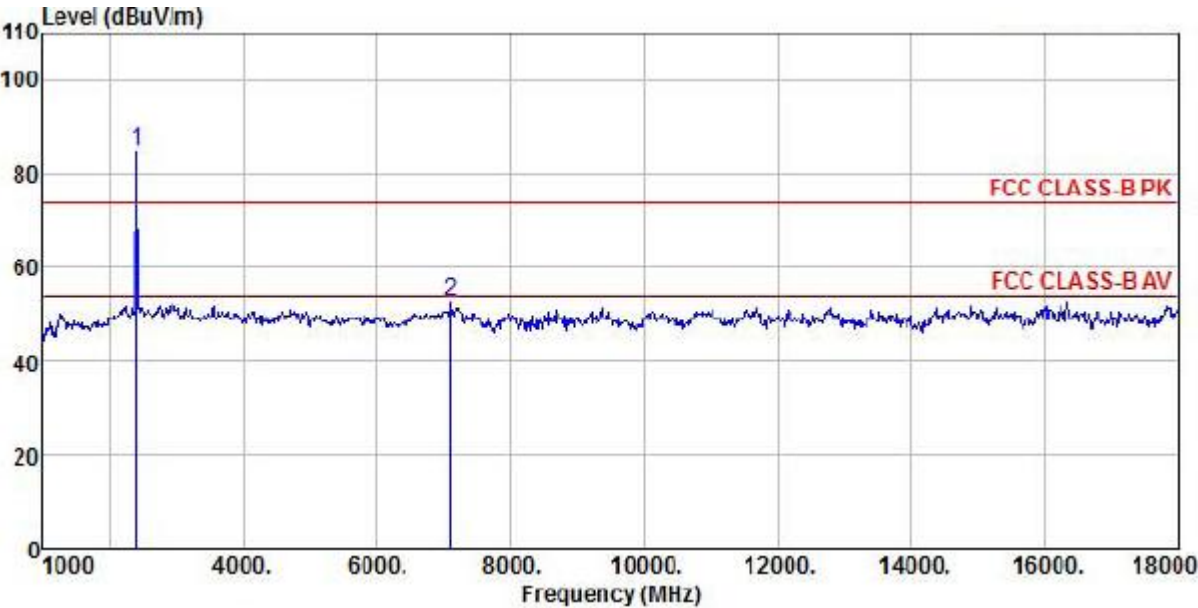


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-V) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : GFSK CH39
Memo :

		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	2394.00	86.84	37.92	7.13	38.34	93.55	74.00 19.55 Peak
2	av	4808.00	35.22	42.27	10.40	37.17	50.72	54.00 -3.28 Average
3		4808.00	48.25	42.27	10.40	37.17	63.75	74.00 -10.25 Peak

Note1: The point mark1 is carrier.

Note2: there is not any harmonic but for background noise above 6GHz

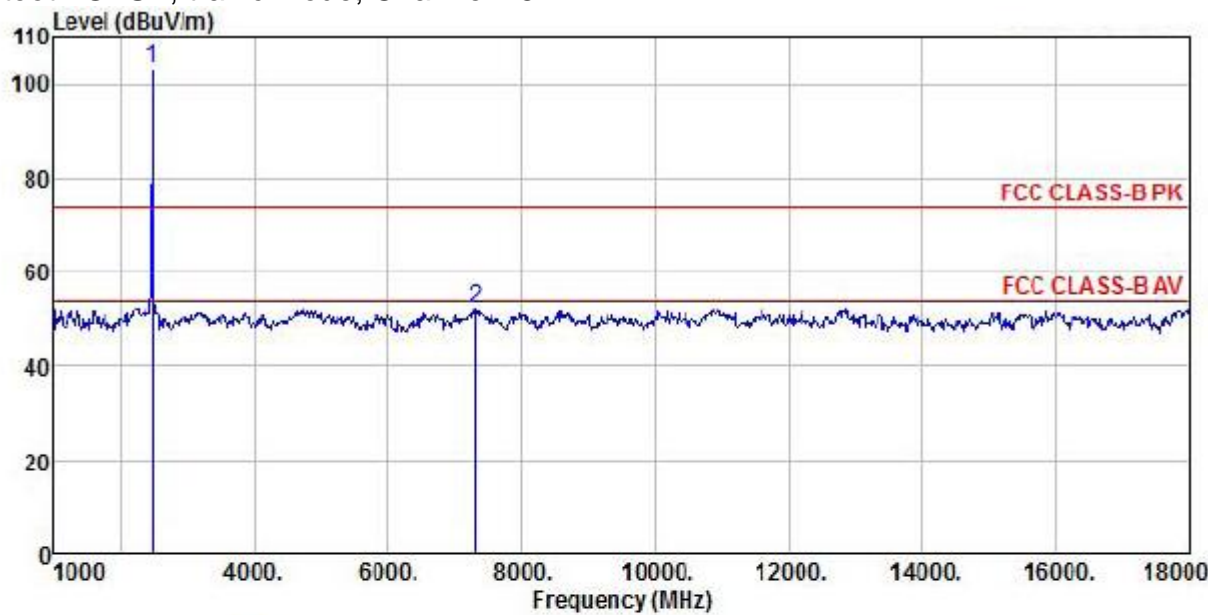


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-H) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : GFSK CH39
Memo :

	Freq	ReadAntenna		Cable Preamp		Limit		Over	Remark
		Level	Factor	Loss	Factor	Level	Line		
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 pp	2411.00	78.21	37.89	7.21	38.34	84.97	74.00	10.97	Peak
2	7120.00	32.41	44.84	12.41	36.72	52.94	74.00	-21.06	Peak

Note1: The point mark1 is carrier.
Note2: there is not any harmonic but for background noise above 6GHz

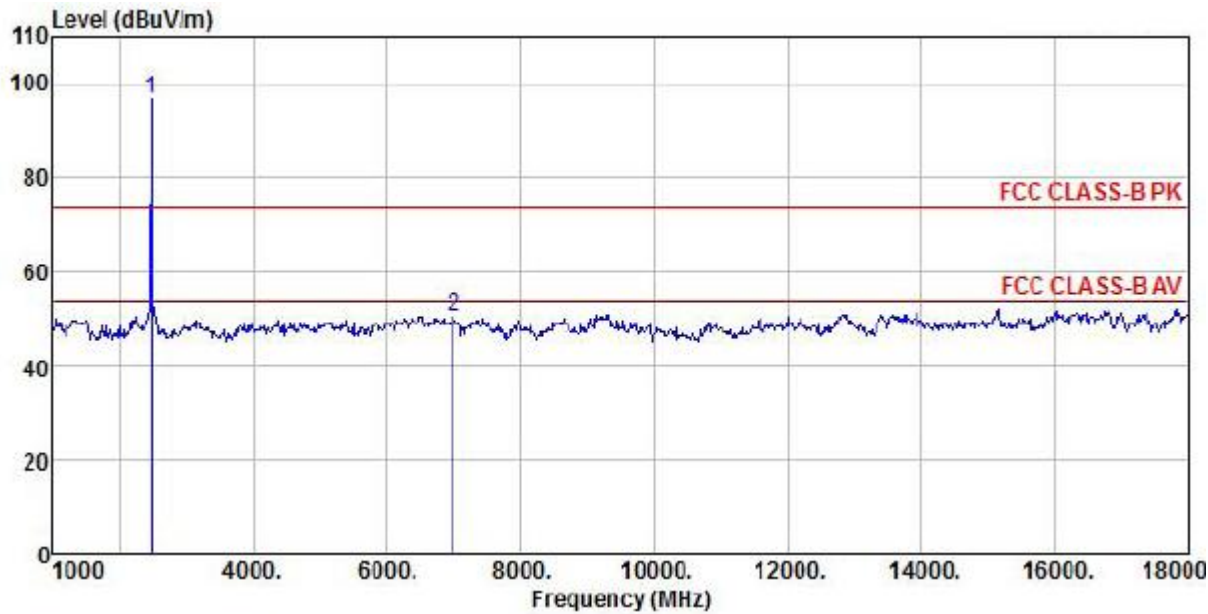
Bluetooth GFSK, traffic mode; Channel 78



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-V) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 24℃ / 49%
Power Rating: DC 3.8V
Mode : GFSK Channel 78
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	2479.00	96.20	38.38	7.41	38.31	103.68	74.00	29.68	Peak
2	7307.00	30.58	46.42	12.71	37.37	52.34	74.00	-21.66	Peak

Note1: The point mark1 is carrier.
Note2: there is not any harmonic but for background noise above 6GHz

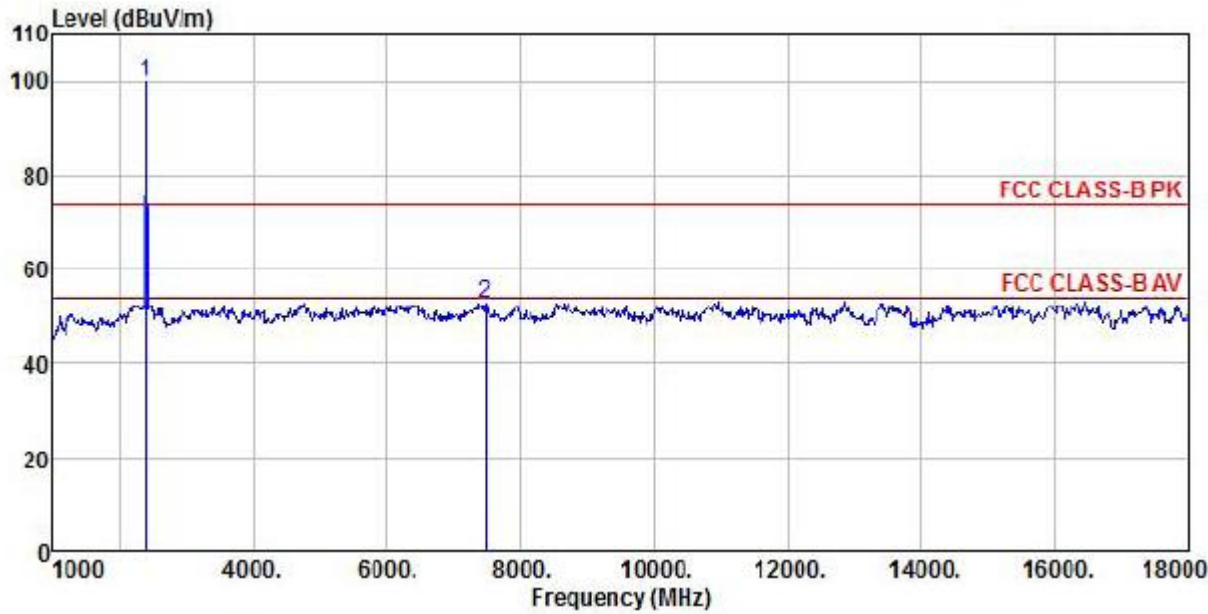


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-H) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 24°C / 49%
Power Rating: DC 3.8V
Mode : GFSK Channel 78
Memo :

		ReadAntenna	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	2479.00	89.18	38.38	7.41	38.31	96.66	74.00	22.66 Peak
2	7001.00	30.35	44.39	12.45	36.30	50.89	74.00	-23.11 Peak

Note1: The point mark1 is carrier.
Note2: there is not any harmonic but for background noise above 6GHz

Bluetooth 8-DPSK, traffic mode; Channel 0

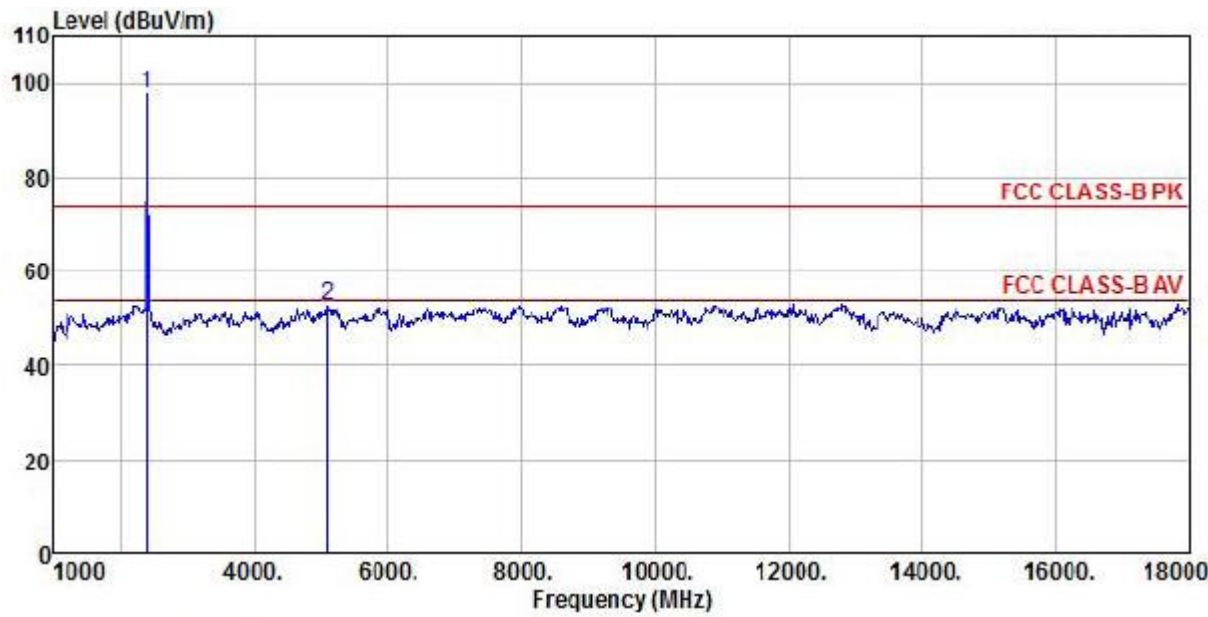


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-V) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 24°C / 49%
Power Rating: DC 3.8V
Mode : 8DPSK Channel 0
Memo :

		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 2394.00	93.16	37.92	7.13	38.34	99.87	74.00	25.87	Peak
2	7477.00	31.10	46.79	12.83	37.96	52.76	74.00	-21.24	Peak

Note1: The point mark1 is carrier.

Note2: there is not any harmonic but for background noise above 6GHz



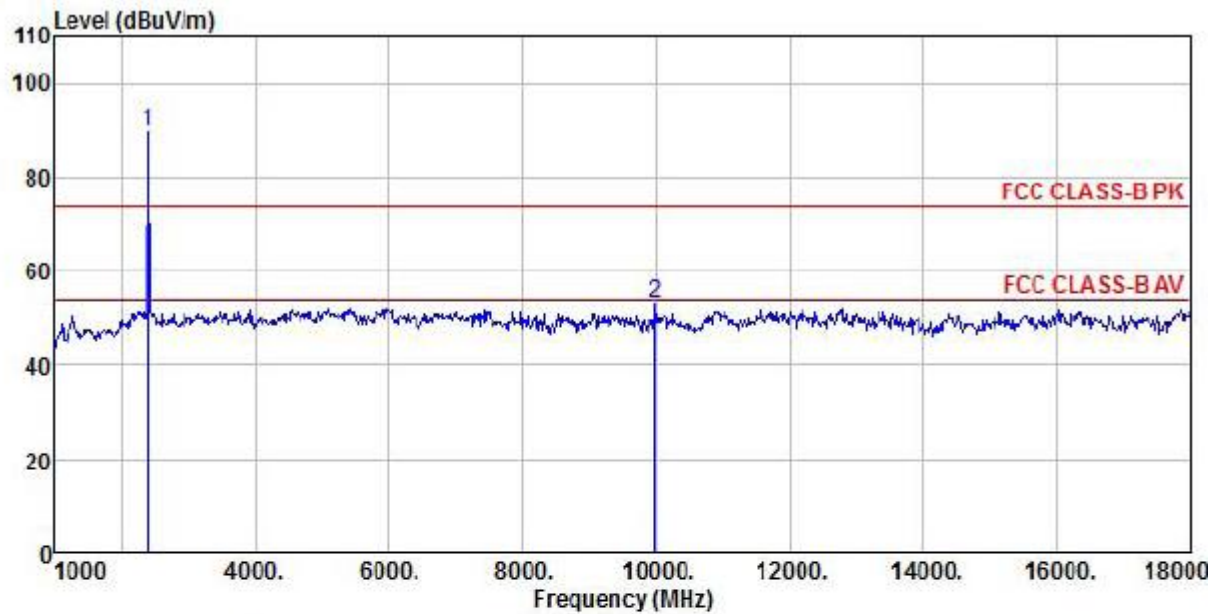
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-H) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 24℃ / 49%
Power Rating: DC 3.8V
Mode : 8DPSK Channel 0
Memo :

	Freq	ReadAntenna	Cable	Preamp		Limit	Over	
		Level	Factor	Loss	Factor	Level	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	2394.00	90.97	37.92	7.13	38.34	97.68	74.00	23.68 Peak
2	5097.00	35.93	43.34	10.54	37.07	52.74	74.00	-21.26 Peak

Note1: The point mark1 is carrier.

Note2: there is not any harmonic but for background noise above 6GHz

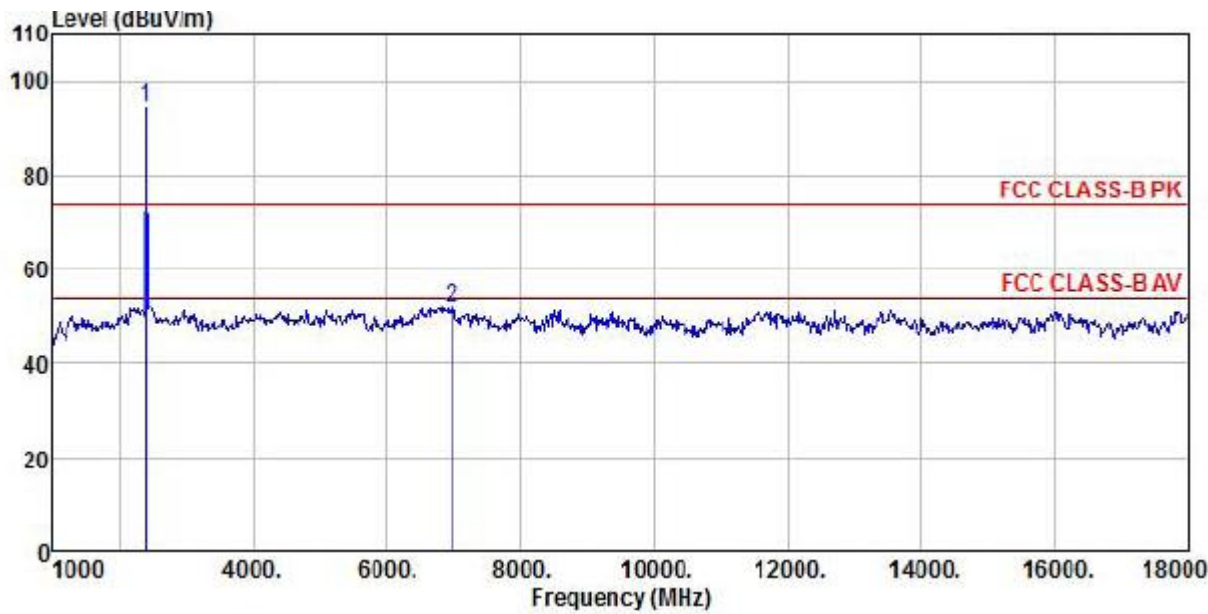
Bluetooth 8-DPSK, traffic mode; Channel 39



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-H) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : 8DPSK CH39
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 2394.00	82.97	37.92	7.13	38.34	89.68	74.00	15.68 Peak
2	9993.00	27.47	50.50	14.70	39.40	53.27	74.00	-20.73 Peak

Note1: The point mark1 is carrier.
Note2: there is not any harmonic but for background noise above 6GHz

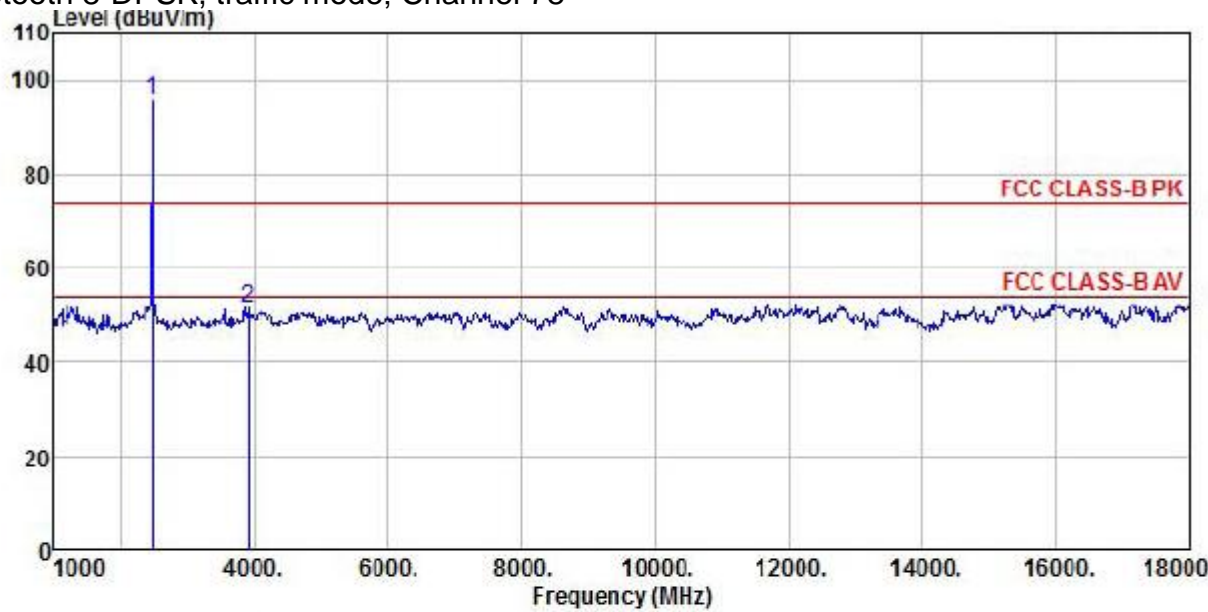


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-V) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 23 °C / 55%
Power Rating: DC 3.8V
Mode : 8DPSK CH39
Memo :

	Freq	ReadAntenna		Cable Preamp		Limit	Over	
		Level	Factor	Loss	Factor			
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	2394.00	87.73	37.92	7.13	38.34	94.44	74.00	20.44 Peak
2	6967.00	30.76	45.07	12.49	36.32	52.00	74.00	-22.00 Peak

Note1: The point mark1 is carrier.
Note2: there is not any harmonic but for background noise above 6GHz

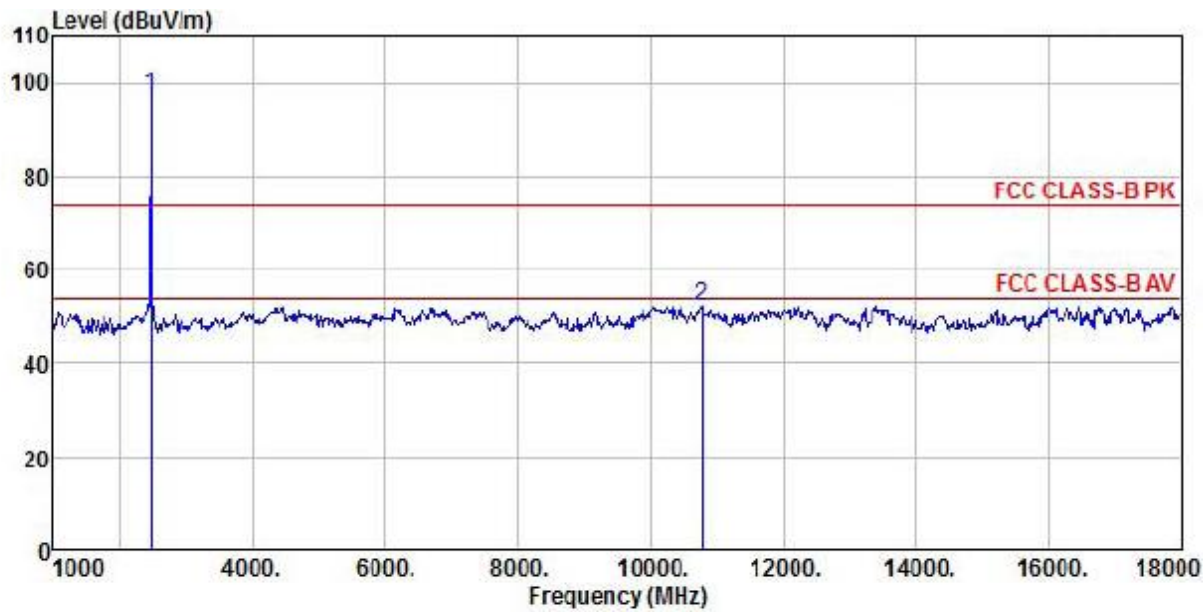
Bluetooth 8-DPSK, traffic mode; Channel 78



Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-H) HORIZONTAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 24℃ / 49%
Power Rating: DC 3.8V
Mode : 8DPSK Channel 78
Memo :

	Freq	ReadAntenna	Cable	Preamp		Limit	Over	
		Level	Factor	Loss	Factor	Level	Line	Limit
	MHz	dBuV	dB/m		dB	dBuV/m	dBuV/m	dB
1 pp	2479.00	88.30	38.38	7.41	38.31	95.78	74.00	21.78 Peak
2	3907.00	38.85	40.92	9.18	37.55	51.40	74.00	-22.60 Peak

Note1: The point mark1 is carrier.
Note2: there is not any harmonic but for background noise above 6GHz



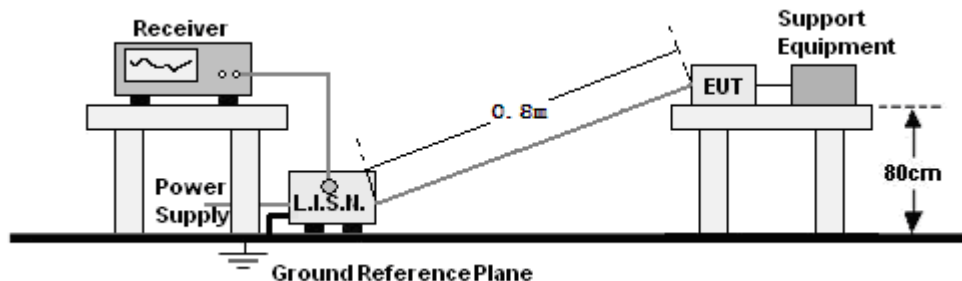
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(RSE-V) VERTICAL
EUT : MobileMapper 20
Model Name : MobileMapper 20
Temp/Humi : 24℃ / 49%
Power Rating: DC 3.8V
Mode : 8DPSK Channel 78
Memo :

		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	2479.00	90.02	38.38	7.41	38.31	97.50	74.00	23.50 Peak
2	10775.00	24.04	51.51	15.69	39.01	52.23	74.00	-21.77 Peak

Note1: The point mark1 is carrier.
Note2: there is not any harmonic but for background noise above 6GHz

12. AC POWER LINE CONDUCTED EMISSIONS

12.1 TEST SETUP



12.2 LIMITS

Frequency range (MHz)	Limits dB(μV)	
	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

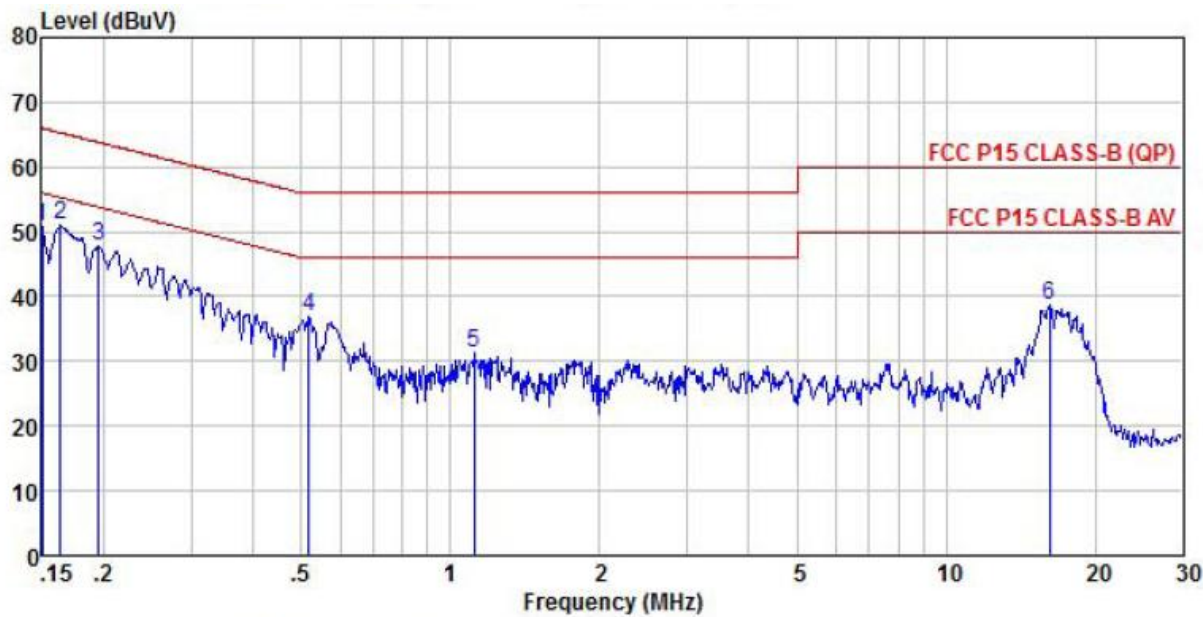
NOTE: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

12.3 TEST PROCEDURE

According to description of ANSI C63.4: 2009 sec.13.3, 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.

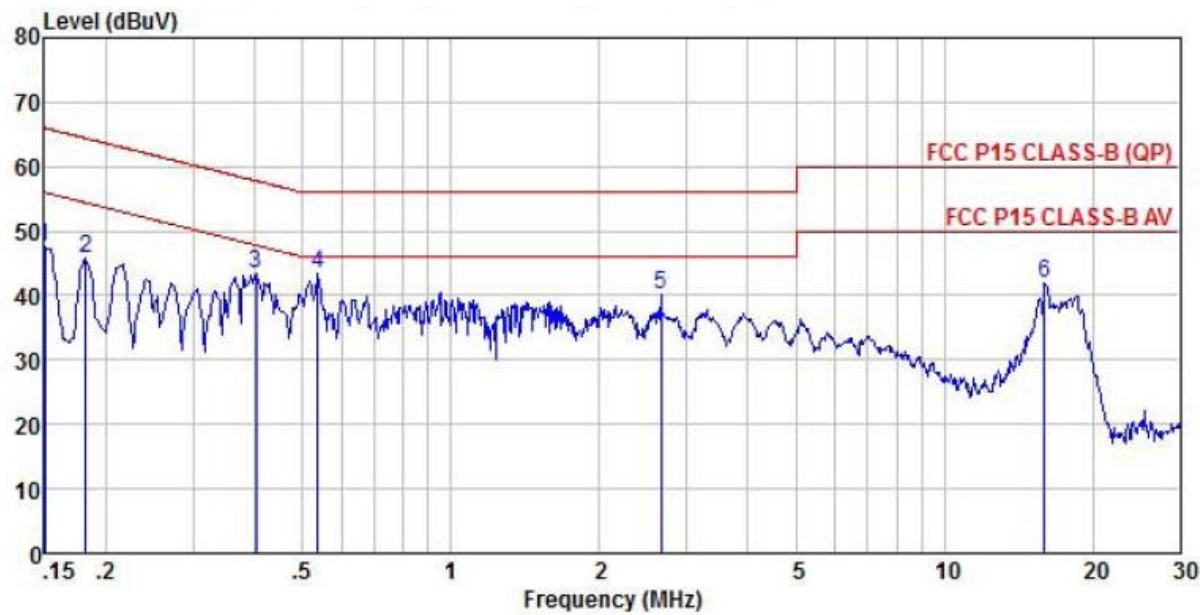
12.4 RESULTS & PERFORMANCE

GFSK:



Site : shielded room 3
Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE
EUT : MobileMepper 20
Model Name : MobileMepper 20
Temp/Humi : 23 °C / 55%
Power Rating: AC 120V/60Hz
Mode : BT GFSK
Memo :

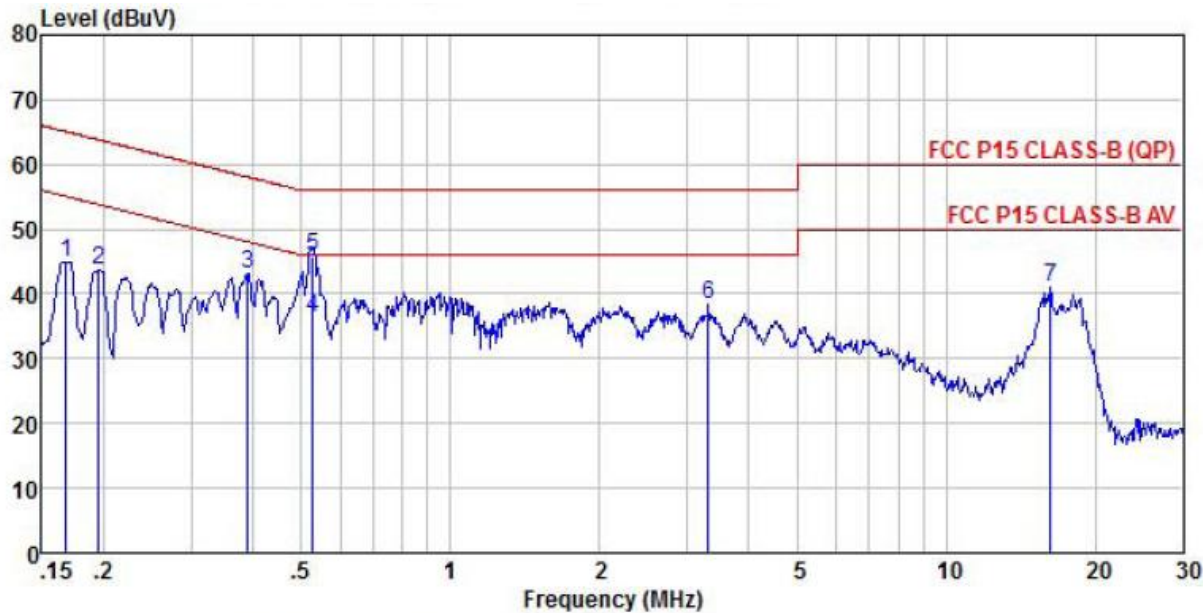
		Read	LISN	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.15	40.37	10.36	0.09	0.00	50.82	66.00	-15.18	Peak
2 pp	0.16	40.41	10.44	0.09	0.00	50.94	65.30	-14.36	Peak
3	0.20	37.07	10.44	0.23	0.00	47.74	63.80	-16.06	Peak
4	0.52	26.20	10.55	0.10	0.00	36.85	56.00	-19.15	Peak
5	1.12	20.66	10.52	0.14	0.00	31.32	56.00	-24.68	Peak
6	16.14	28.11	10.52	0.11	0.00	38.74	60.00	-21.26	Peak



Site : shielded room 3
Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL
EUT : MobileMepper 20
Model Name : MobileMepper 20
Temp/Humi : 23 °C / 55%
Power Rating: AC 120V/60Hz
Mode : BT GFSK
Memo :

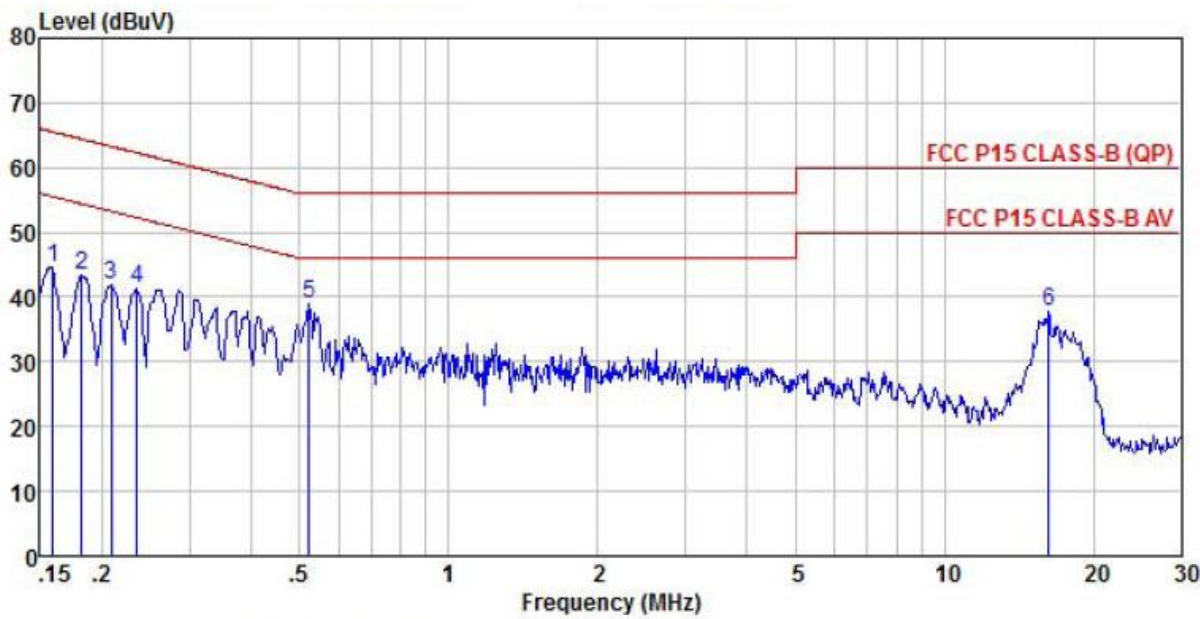
	Freq	Read Level	LISN Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.15	37.00	10.29	0.09	0.00	47.38	66.00	-18.62	Peak
2	0.18	35.22	10.24	0.23	0.00	45.69	64.42	-18.73	Peak
3	0.40	32.93	10.42	0.14	0.00	43.49	57.81	-14.32	Peak
4 pp	0.54	32.85	10.39	0.11	0.00	43.35	56.00	-12.65	Peak
5	2.66	29.82	10.32	0.15	0.00	40.29	56.00	-15.71	Peak
6	15.97	31.18	10.53	0.11	0.00	41.82	60.00	-18.18	Peak

8-DPSK:



Site : shielded room 3
Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL
EUT : MobileMepper 20
Model Name : MobileMepper 20
Temp/Humi : 23 °C / 55%
Power Rating: AC 120V/60Hz
Mode : BT 8DPSK
Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.17	34.63	10.27	0.09	0.00	44.99	65.08	-20.09	Peak
2	0.20	32.97	10.38	0.23	0.00	43.58	63.80	-20.22	Peak
3 pk	0.39	32.40	10.42	0.14	0.00	42.96	58.08	-15.12	Peak
4 pp	0.53	25.74	10.40	0.10	0.00	36.24	46.00	-9.76	Average
5 qp	0.53	35.30	10.40	0.10	0.00	45.80	56.00	-10.20	QP
6	3.31	27.93	10.32	0.15	0.00	38.40	56.00	-17.60	Peak
7	16.23	30.33	10.52	0.11	0.00	40.96	60.00	-19.04	Peak



Site : shielded room 3
Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE
EUT : MobileMepper 20
Model Name : MobileMepper 20
Temp/Humi : 23 °C / 55%
Power Rating: AC 120V/60Hz
Mode : BT 8DPSK
Memo :

		Read	LISN	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.16	34.19	10.40	0.09	0.00	44.68	65.52	-20.84	Peak
2	0.18	32.55	10.52	0.23	0.00	43.30	64.42	-21.12	Peak
3	0.21	31.33	10.43	0.22	0.00	41.98	63.27	-21.29	Peak
4	0.24	30.80	10.45	0.20	0.00	41.45	62.26	-20.81	Peak
5 pp	0.52	28.35	10.54	0.10	0.00	38.99	56.00	-17.01	Peak
6	16.23	27.04	10.52	0.11	0.00	37.67	60.00	-22.33	Peak

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

Please refer to the file named “NZI802168_Part 15C Setup Photos”.

APPENDIX 2 PHOTOGRAPHS OF EUT

Please refer to the two files named “NZI802168_EUT External Photos” and
“NZI802168_EUT Internal Photos”.

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