

FCC Part 15 Subpart C Test Report

for FHSS System

Product Name : GNSS receiver
Model Name : N72 WXYZ

Prepared for:

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Date of Report : 05-11-2015
Date of Test : 05-08-2015~05-11-2015

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: Shanghai Huace Navigation Technology LTD.
Building C,599 Gaojing Road,Qingpu District,Shanghai

Manufacturer: Shanghai Huace Navigation Technology LTD.
Building C,599 Gaojing Road,Qingpu District,Shanghai

Product Name: GNSS receiver

Brand Name:



Model Name: N72 WXYZ

Model Description: See Part1.1EUT DESCRIPTION NOTE4

FCC ID: SY4-A02003

Serial Number: N/A

EUT Voltage: AC input: AC 100~240V 50/60Hz
Output: DC12V 2A

Date of Receipt: 03-12-2015

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

Test Result: PASS

Date of Test 05-08-2015~05-11-2015

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TABLE OF CONTENTS

1.	GENERAL INFORMATION	5
1.1	EUT DESCRIPTION.....	5
1.2	COMPLIANCE DESCRIPTION FOR BLUETOOTH TRANSMITTER	6
1.3	TEST MODE	6
2.	TEST METHODOLOGY	7
2.1	EUT CONFIGURATION	7
2.2	EUT EXERCISE	7
2.3	GENERAL TEST PROCEDURES	7
2.4	FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS	7
2.5	DESCRIPTION OF TEST MODES.....	8
3.	TECHNICAL SUMMARY	9
3.1	SUMMARY OF STANDARDS AND TEST RESULTS	9
3.2	TEST UNCERTAINTY.....	9
3.3	TEST EQUIPMENT LIST	9
3.4	SUPPORT EQUIPMENT	10
3.5	TEST FACILITY	10
3.6	TEST SETUP CONFIGURATION	10
4.	CHANNEL SEPARATION	11
4.1	TEST SETUP	11
4.2	LIMITS.....	11
4.3	TEST PROCEDURE	11
4.4	TEST RESULT	12
5.	MINIMUM HOPPING CHANNELS.....	14
5.1	TEST SETUP	14
5.2	LIMITS.....	14
5.3	TEST PROCEDURE	14
5.4	TEST RESULT.....	15
6.	OCCUPIED BANDWIDTH	17
6.1	TEST SETUP	17
6.2	LIMITS.....	17
6.3	TEST PROCEDURE	17
6.4	TEST RESULTS	18
7.	DWELL TIME.....	23
7.1	TEST SETUP	23
7.2	LIMITS.....	23
7.3	TEST PROCEDURE	23
7.4	TEST RESULTS	24
8.	PEAK OUTPUT POWER (CONDUCTION)	30
8.1	TEST SETUP	30
8.2	LIMITS.....	30
8.3	TEST PROCEDURE	30
8.4	RESULTS & PERFORMANCE	31
9.	SPURIOUS EMISSIONS (CONDUCTION).....	36
9.1	TEST SETUP	36
9.2	LIMITS.....	36
9.3	TEST PROCEDURE	36

	9.4 RESULTS & PERFORMANCE	37
10.	BAND EDGE MEASUREMENT.....	51
	10.1 TEST SETUP	51
	10.2 LIMITS.....	51
	10.3 TEST PROCEDURE	51
	10.4 RESULTS & PERFORMANCE	52
	GFSK CH0	76
	GFSK CH78.....	76
11.	SPURIOUS EMISSIONS (RADIATION)	82
	11.1 TEST SETUP	82
	11.2 LIMITS.....	83
	11.3 TEST PROCEDURE	83
	11.4 RESULTS & PERFORMANCE	85
12.	AC POWER LINE CONDUCTED EMISSIONS.....	92
	12.1 TEST SETUP	92
	12.2 LIMITS.....	92
	12.3 TEST PROCEDURE	92
	12.4 RESULTS & PERFORMANCE	93
APPENDIX 1	PHOTOGRAPHS OF TEST SETUP.....	99
APPENDIX 2	PHOTOGRAPHS OF EUT	99

1. GENERAL INFORMATION

1.1 EUT DESCRIPTION

Product Name:	GNSS receiver
Model Name:	N72 WXYZ
Hardware Version:	V2.2
Software Version:	1.0.11
RF Exposure Environment:	Uncontrolled
Bluetooth	
Frequency Range:	2402MHz~2480MHz
Carrier Frequency of Each Channel	2402+N*1MHz(N=0~78)
Type of Modulation:	GFSK, $\pi/4$ -DQPSK, 8-DPSK
Channel Separation:	1MHz
Channel Number:	79
Antenna Type:	Internal
Antenna Peak Gain:	1.0dBi
Component	
AC Adapter:	Input: AC 100-240V 50/60Hz
	Output: DC 12V/2A
The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.	

NOTE:

- 1) Model N72 WXYZ, W is variable, it indicated A-Z or 0-9 or blank , X is variable, it indicated A-Z or 0-9 or blank , Y is variable, it indicated A-Z, 0-9 or blank. Z is variable, it indicated A-Z, 0-9 or blank. due to sales purpose in different countries or regions. The internal PCB design are no difference , but only distinct in colours and model names. This test model name is N72.

1.2 COMPLIANCE DESCRIPTION FOR BLUETOOTH TRANSMITTER

This Bluetooth module was built by TI WL1271 chip, it supports Bluetooth v2.1 + Enhanced Data Rate(EDR), it has been tested by a Bluetooth Qualification Lab, it compliance the 15.247 requirements for Bluetooth transmitter, and we confirm the following:

a) Pseudorandom Frequency Hopping Sequence

This system is hopping pseudo-randomly, and its carrier is modulated with the coded information. According to the test plots in section 4 “channel separation” and section 5 “minimum hopping channels”, the frequency of the carrier changes at fixed intervals under the direction of a pseudo-randomly coded sequence, and it has 79 hopping frequencies, for example, the hopping sequence channels can be {20, 12, 28, 04, 52, 44, 60, 36, 76, 05, 13, 68, 29, 37, 45, 21, 69, 73, 77, 65, 22, 28, 30, 20, 46, 58, 62, 42, 78, 13, 15, 76} in one period.

b) Equal Hopping Frequency Use

Each frequency is used equally on the average by each transmitter, from the test result about minimum hopping channels, the each new transmission event begins on the next channel in the hopping sequence after the final channel used in the previous transmission event.

c) System Receiver Input Bandwidth

The receiver input bandwidths that match the hopping channel bandwidths of their corresponding transmitters, and the receiver shifts frequencies in synchronization with the transmitted signals.

1.3 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
Mode 7: $\Pi/4$ -DQPSK CH0
Mode 8: $\Pi/4$ -DQPSK CH39
Mode 9: $\Pi/4$ -DQPSK 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 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	11/11/2015
Wireless Connectivity Test Set	Agilent	N4010A	MY49080305	10/23/2015
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

Bilog Antenna	Schwarzbeck	VULB9160	9160-3316	09/19/2016
VHF-UHF-Biconical Antenna	Schwarzbeck	VUBA9117	9117-263	09/19/2016
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-942	09/19/2016
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	9120D-943	09/19/2016
Horn Antenna(18-40GHz)	ETS	3116	00070497	07/18/2016.

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	10/23/2015

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.

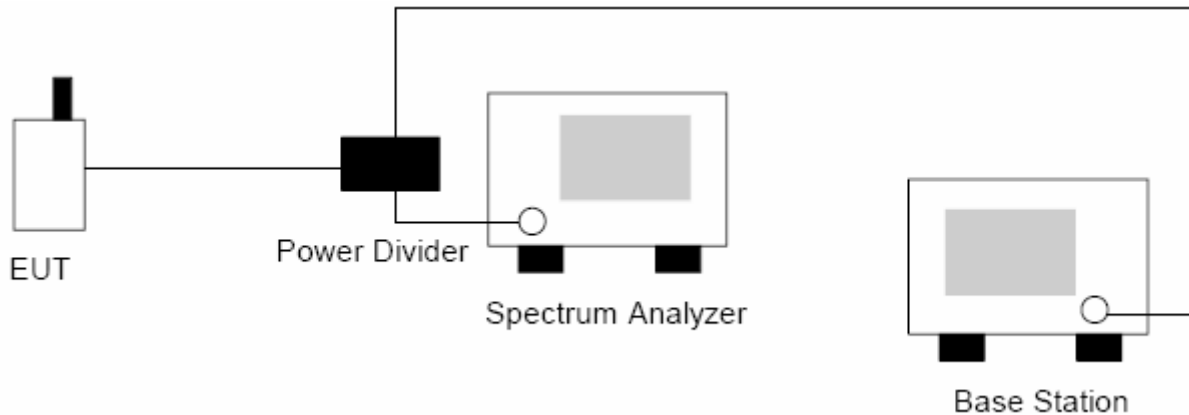
3.6 TEST SETUP CONFIGURATION

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.

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. CHANNEL SEPARATION

4.1 TEST SETUP



4.2 LIMITS

Limits	≥ 25 kHz or 20 dB bandwidth of hopping channel
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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

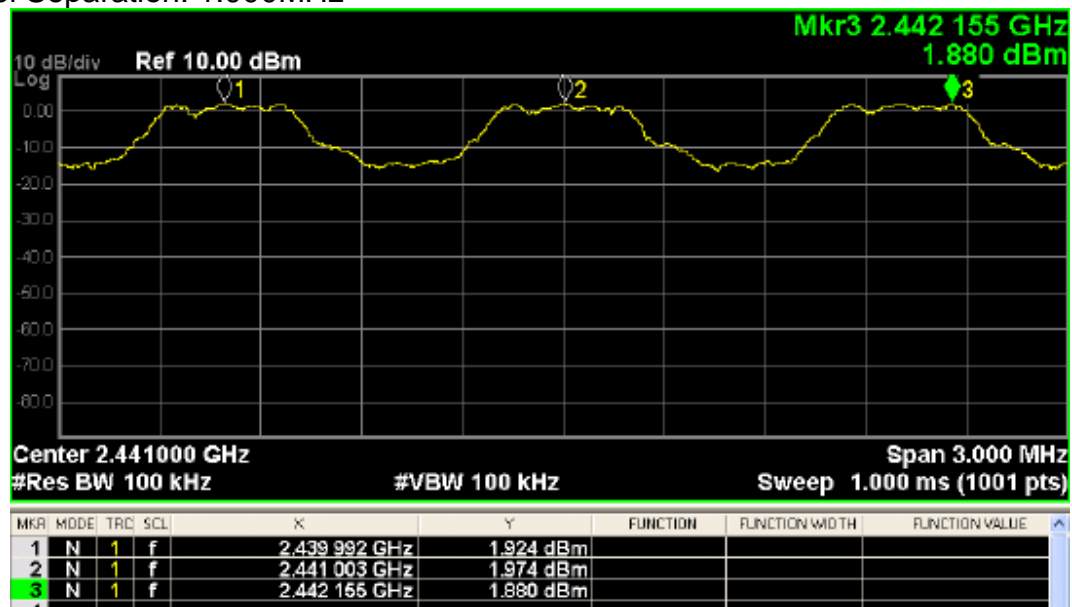
Video (or Average) Bandwidth (VBW) \geq RBW

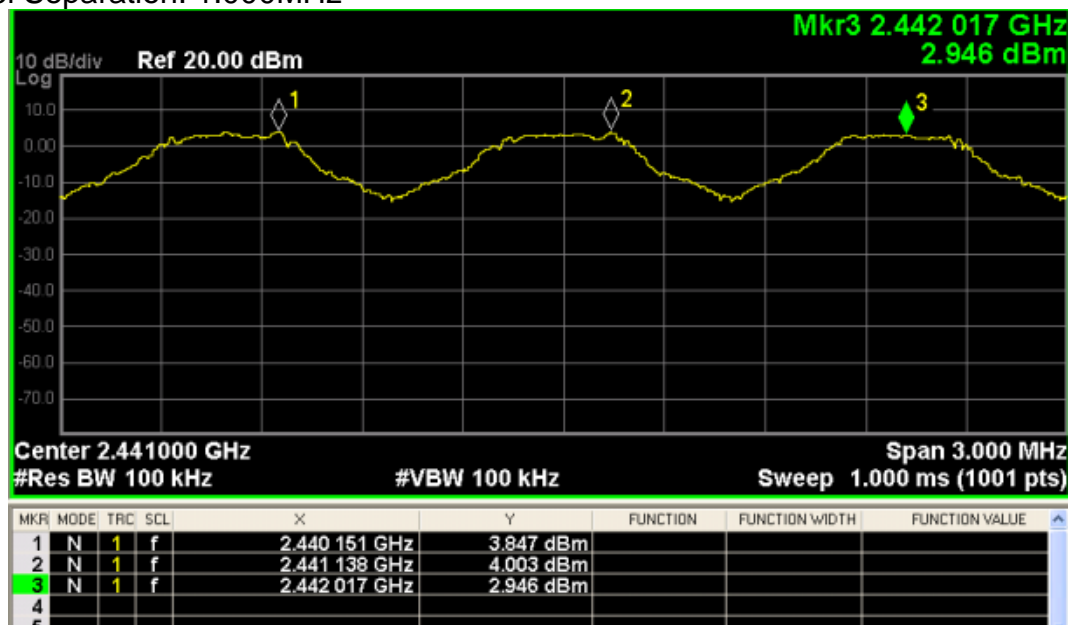
Sweep = auto

Detector function = peak

Trace = max hold

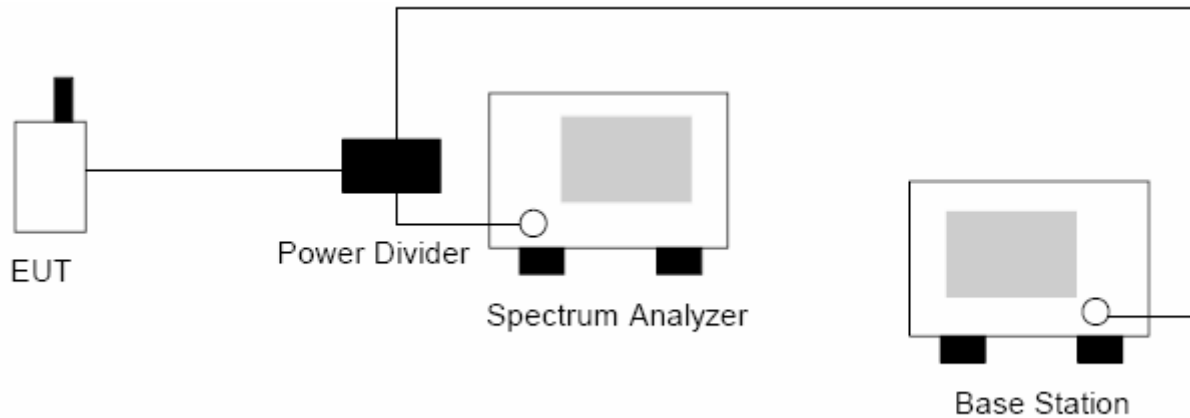
Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.





5. MINIMUM HOPPING CHANNELS

5.1 TEST SETUP



5.2 LIMITS

Limits	≥ 15 Channels
--------	--------------------

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

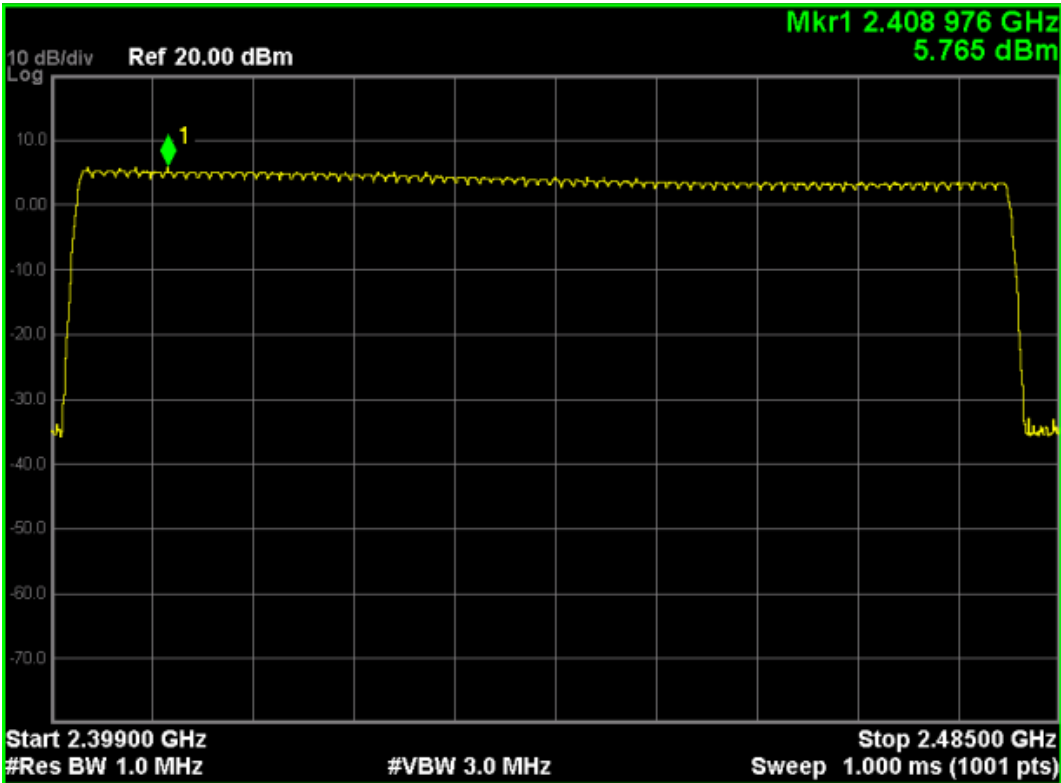
Trace = max hold

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

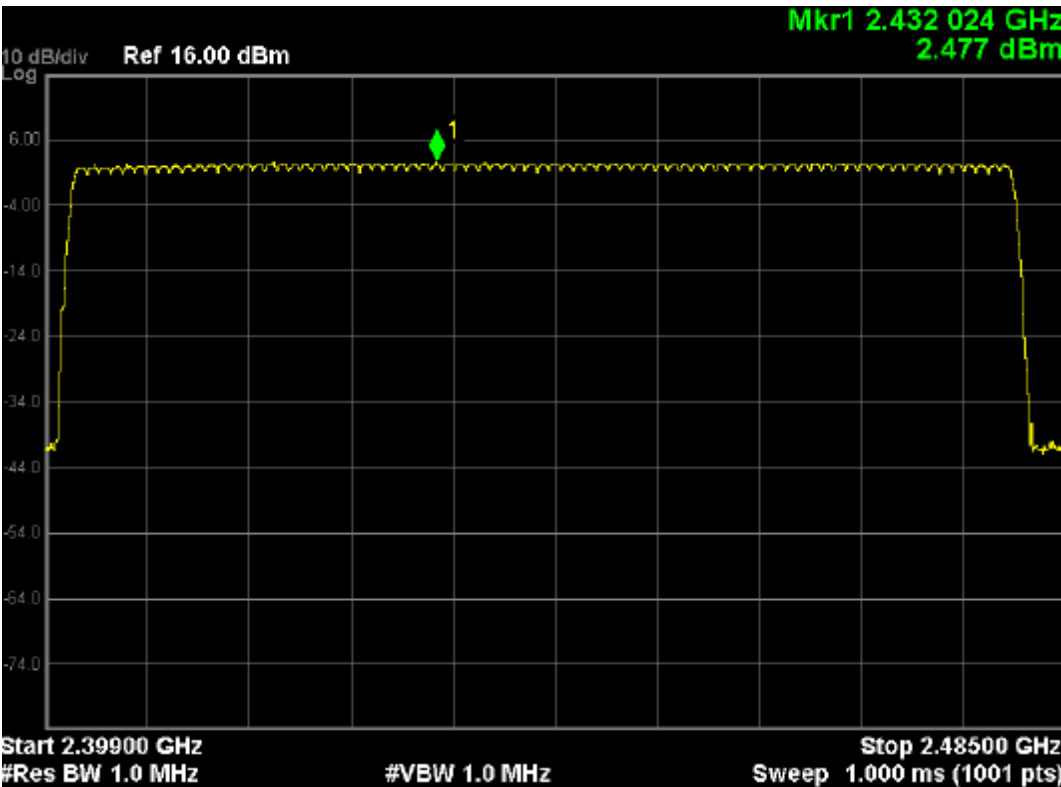
GFSK

Hopping Channel: 79 channels

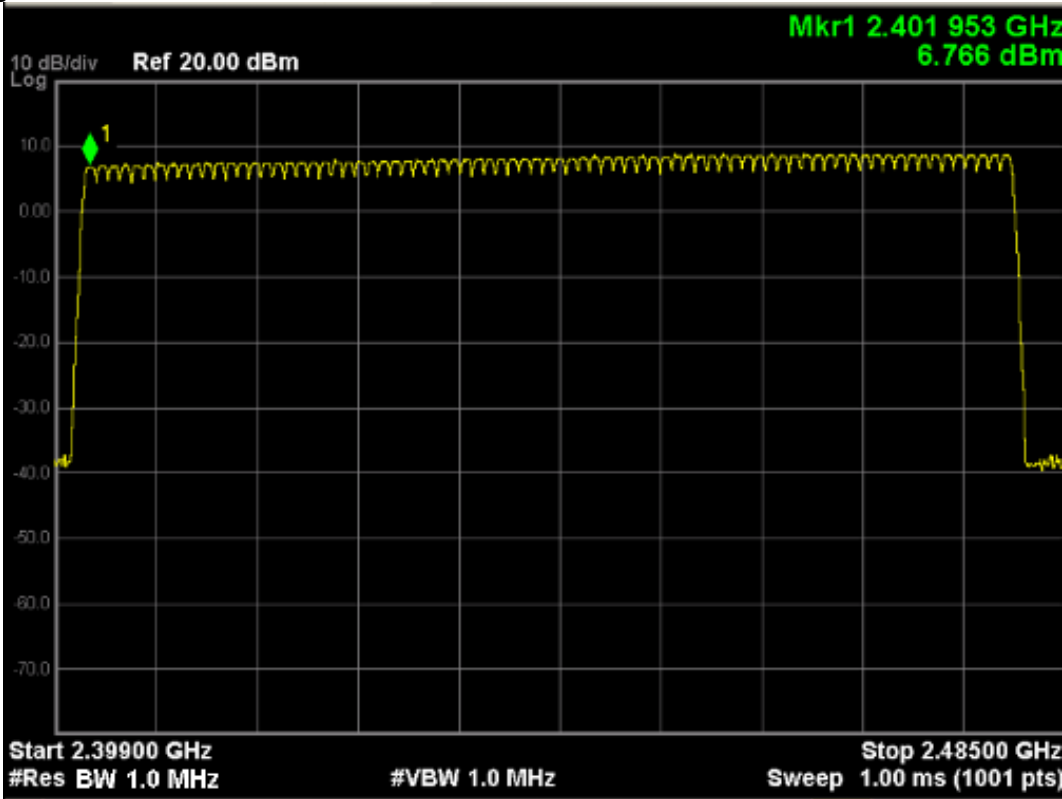


$\pi/4$ -DQPSK

Hopping Channel: 79 channels

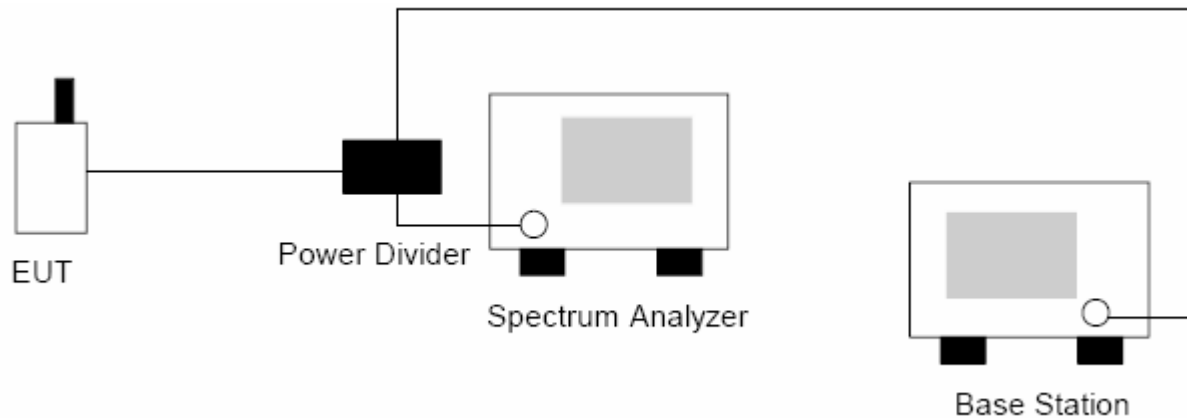


8-DPSK
Hopping Channel: 79 channels



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

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.

BT: Low(0), Middle(39) and High (78).

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

XdB = -20dB

RBW = 20KHz

VBW \geq RBW

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

Sweep = auto

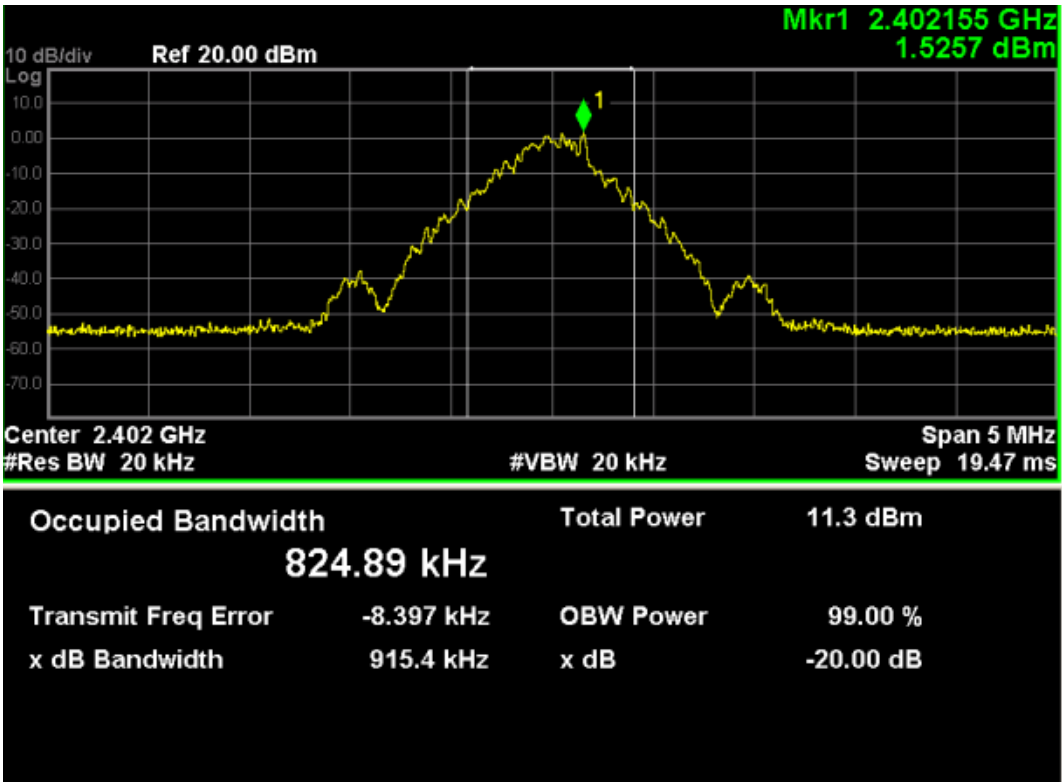
Detector function = peak

Trace = max hold

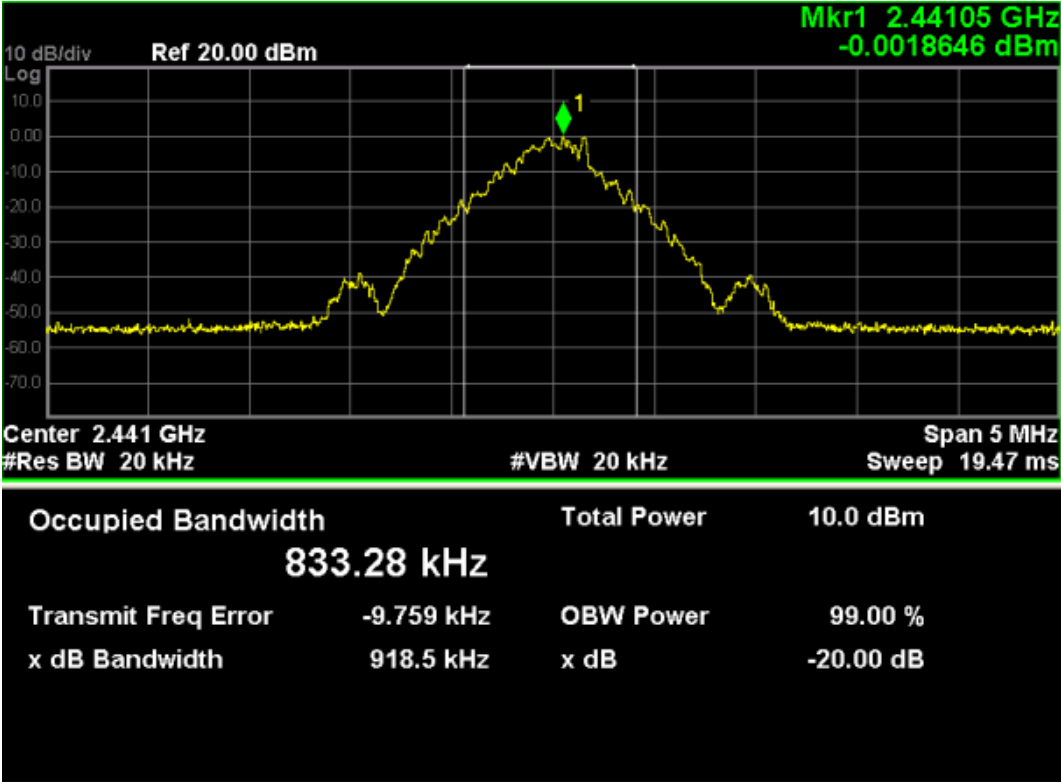
6.4 TEST RESULTS

Channel	20dB bandwidth (kHz)	99% bandwidth (kHz)
GFSK		
BT CH0	915.4	824.89
BT CH39	918.5	833.28
BT CH78	918.3	829.96
Π /4-DQPSK		
BT CH0	1227	1188.7
BT CH39	1307	1194.7
BT CH78	1306	1202.5
8-DPSK		
BT CH0	1333	1189
BT CH39	1335	1188.5
BT CH78	1335	1189.8

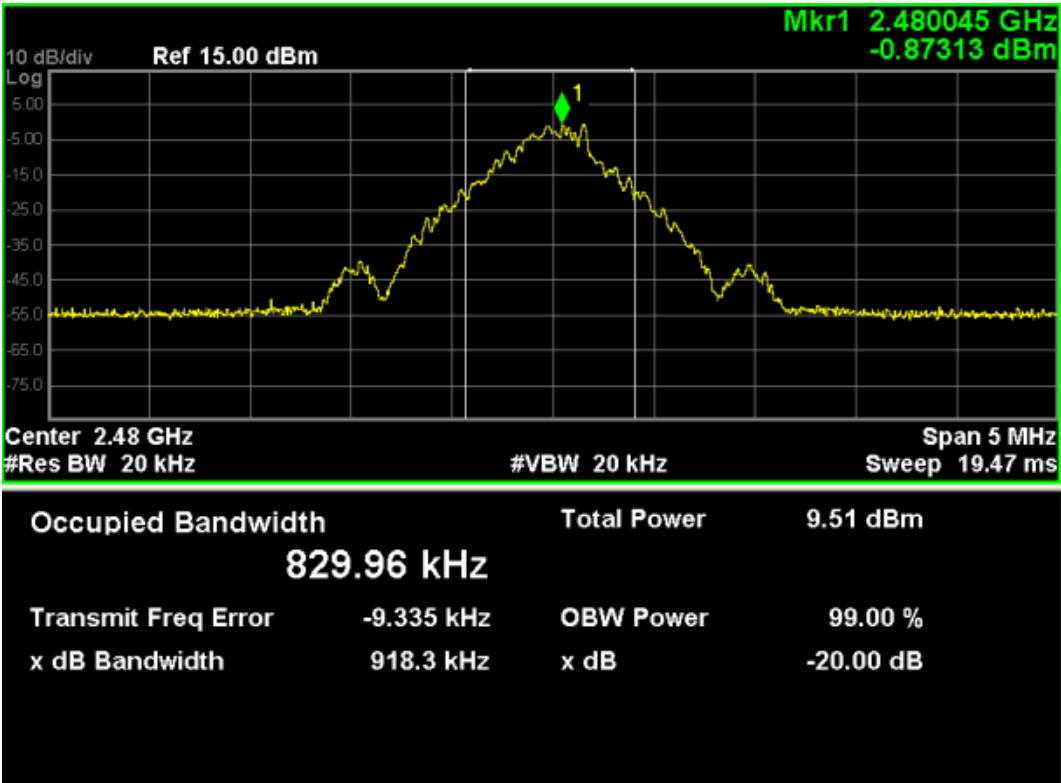
GFSK
Bluetooth Channel 0



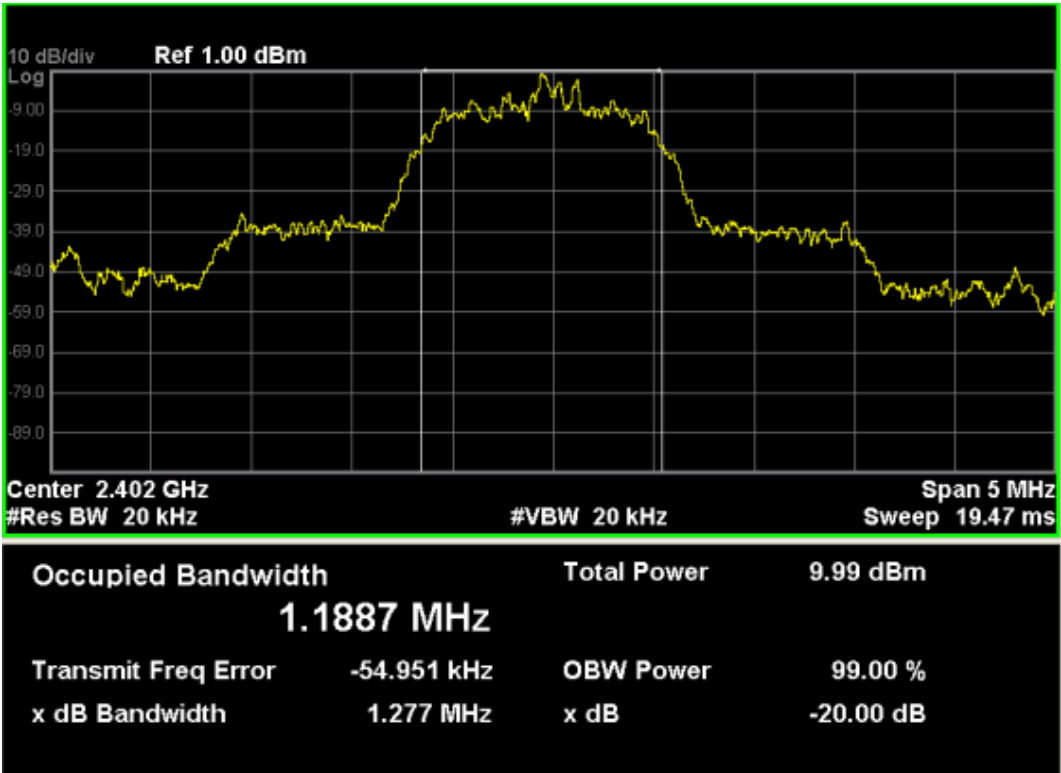
Bluetooth Channel 39



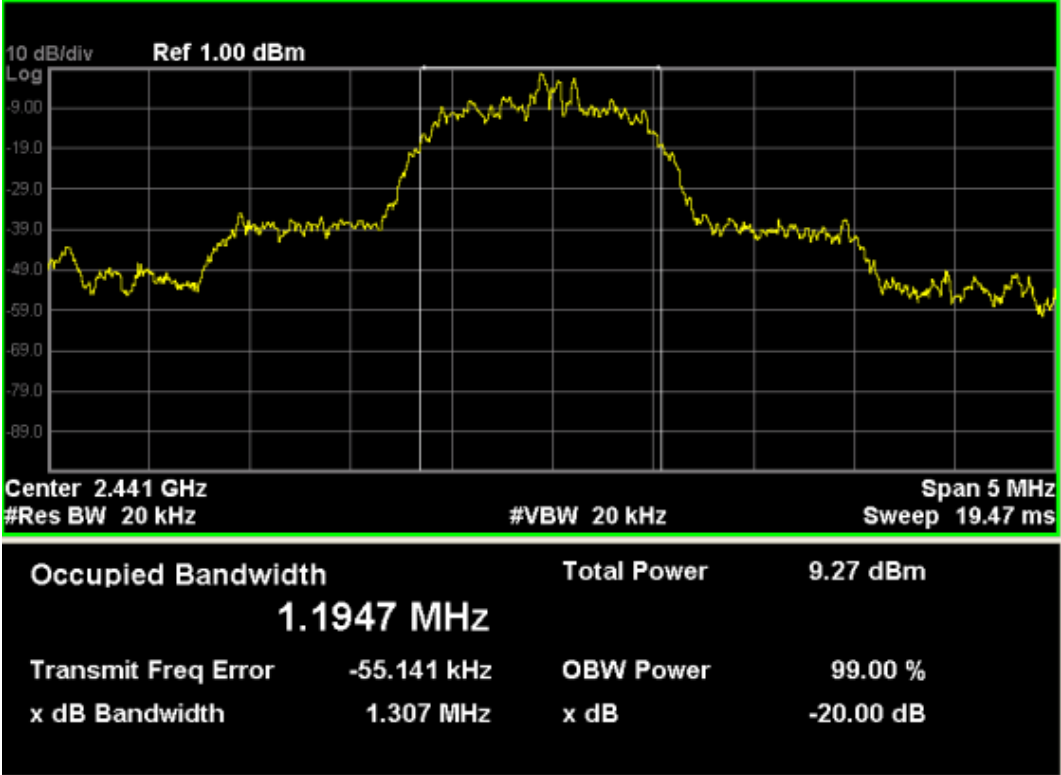
Bluetooth Channel 78



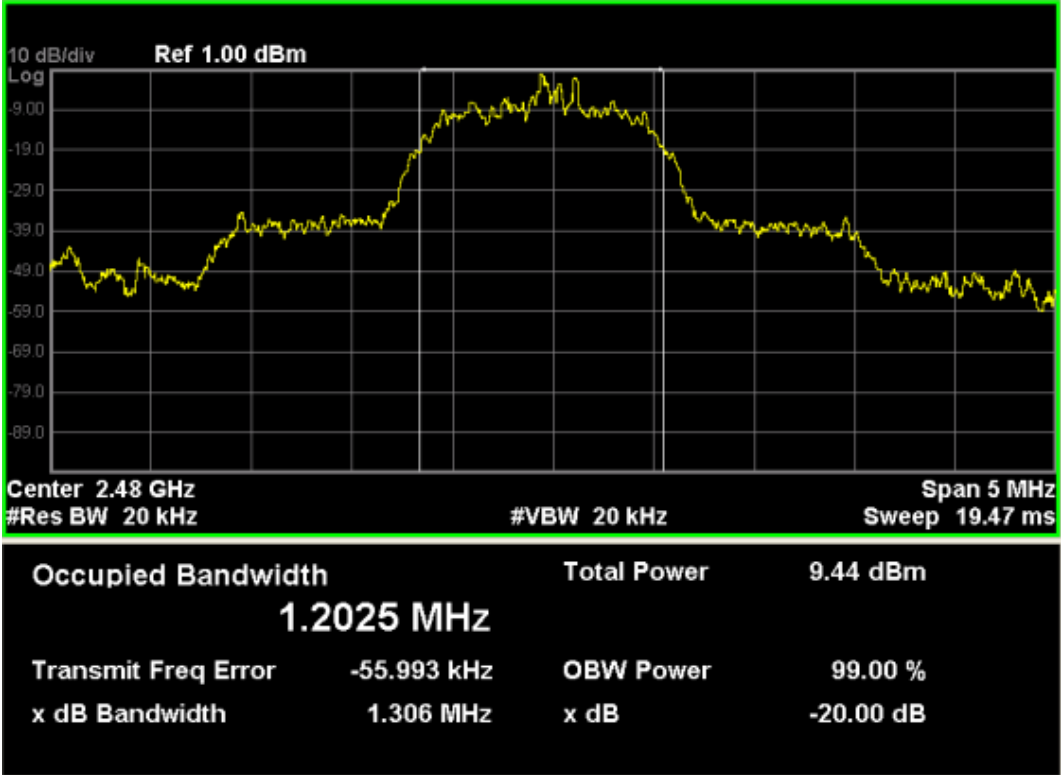
Π /4-DQPSK
Bluetooth Channel 0



Bluetooth Channel 39

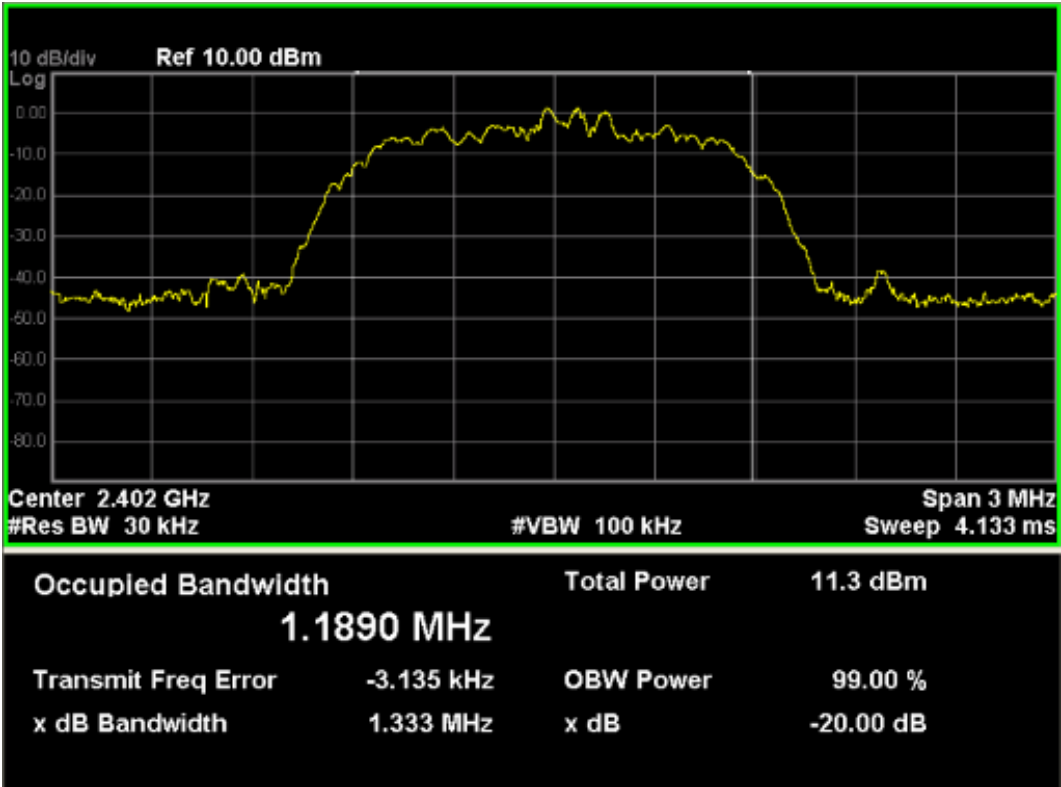


Bluetooth Channel 78

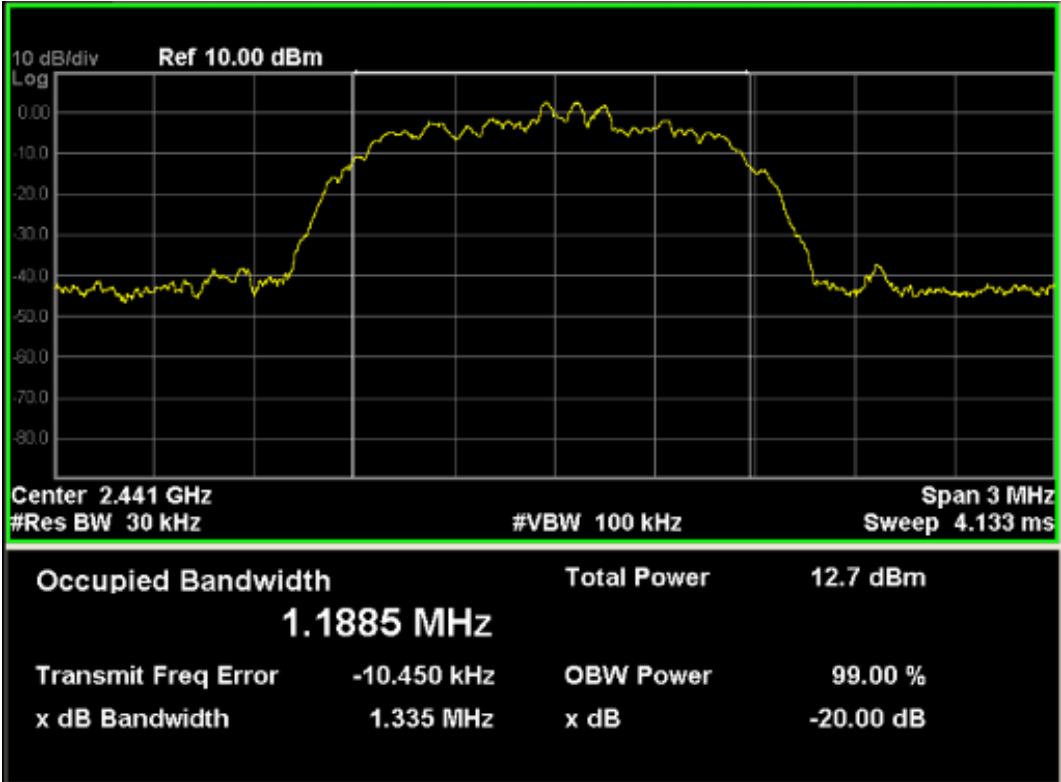


8-DPSK

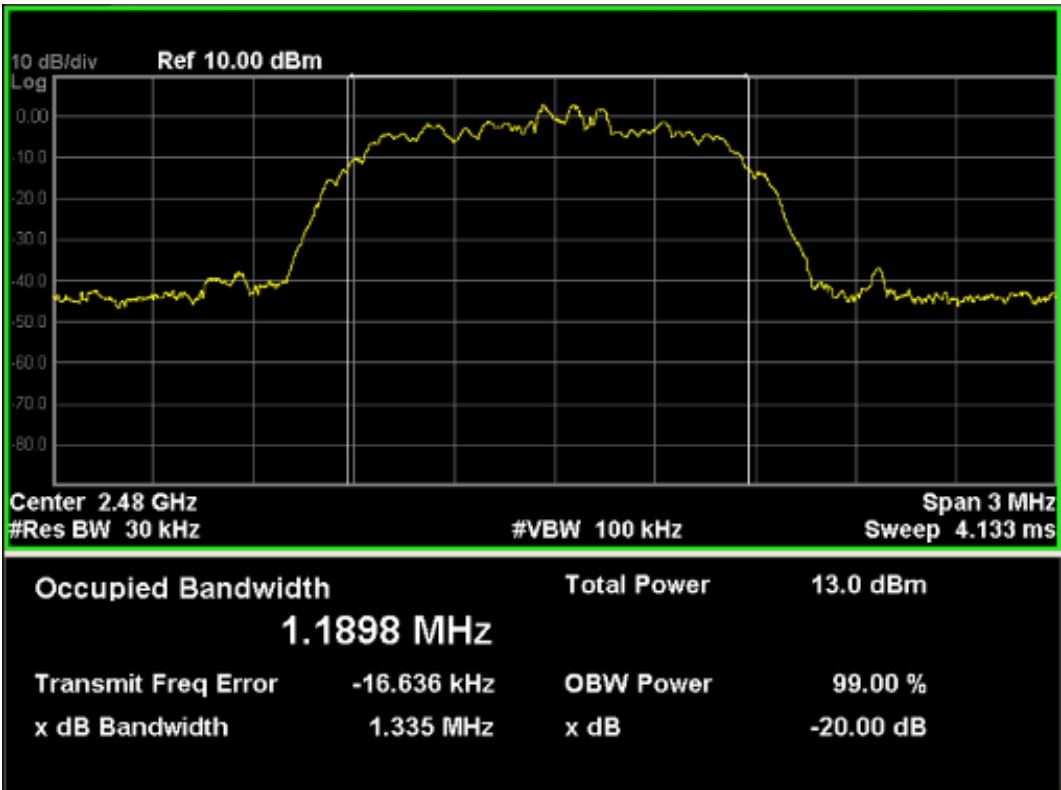
Bluetooth Channel 0



Bluetooth Channel 39

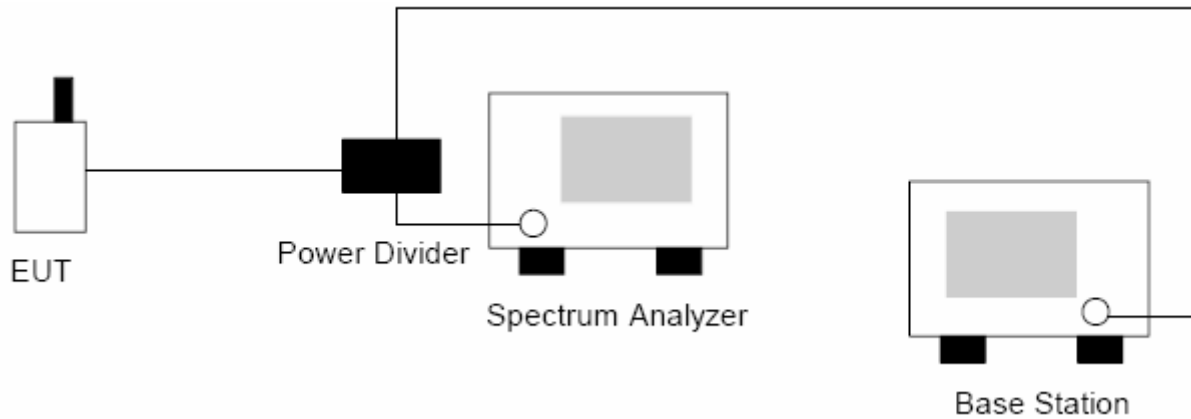


Bluetooth Channel 78



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.

7.4 TEST RESULTS

GFSK

Packet	N	x(ms)	Calculation formula	Result(T)(ms)
DH1	2	0.390	$T = \frac{1600}{79 \times N} \times x \times (0.4 \times 79) = \frac{1600}{79 \times N} \times x \times 31.6$ DH1, N=2; DH3, N=4; DH5, N=6	124.8
DH3	4	1.645		263.2
DH5	6	2.890		308.3

π/4-DQPSK

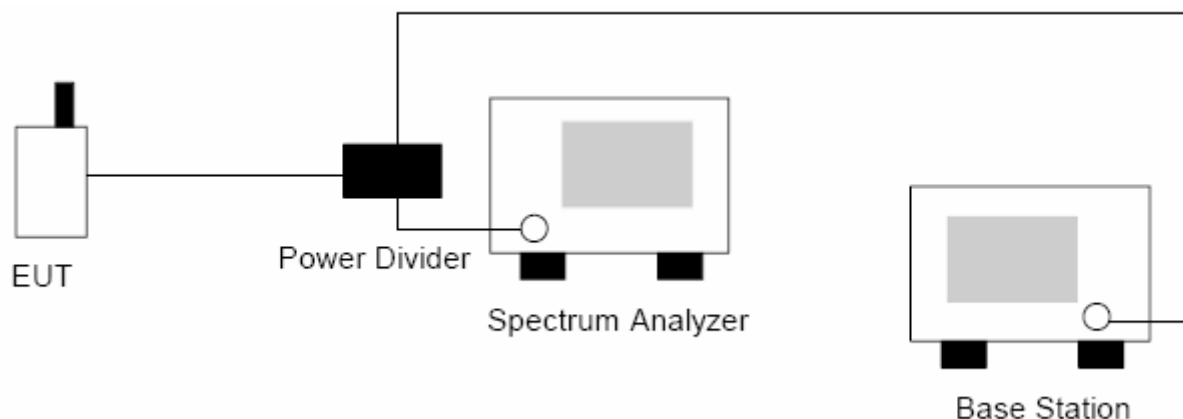
Packet	N	x(ms)	Calculation formula	Result(T)(ms)
DH1	2	0.387	$T = \frac{1600}{79 \times N} \times x \times (0.4 \times 79) = \frac{1600}{79 \times N} \times x \times 31.6$ DH1, N=2; DH3, N=4; DH5, N=6	123.84
DH3	4	1.635		261.6
DH5	6	2.880		307.2

8-DPSK

Packet	N	x(ms)	Calculation formula	Result(T)(ms)
DH1	2	0.406	$T = \frac{1600}{79 \times N} \times x \times (0.4 \times 79) = \frac{1600}{79 \times N} \times x \times 31.6$ DH1, N=2; DH3, N=4; DH5, N=6	129.92
DH3	4	1.654		264.64
DH5	6	2.905		309.87

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:

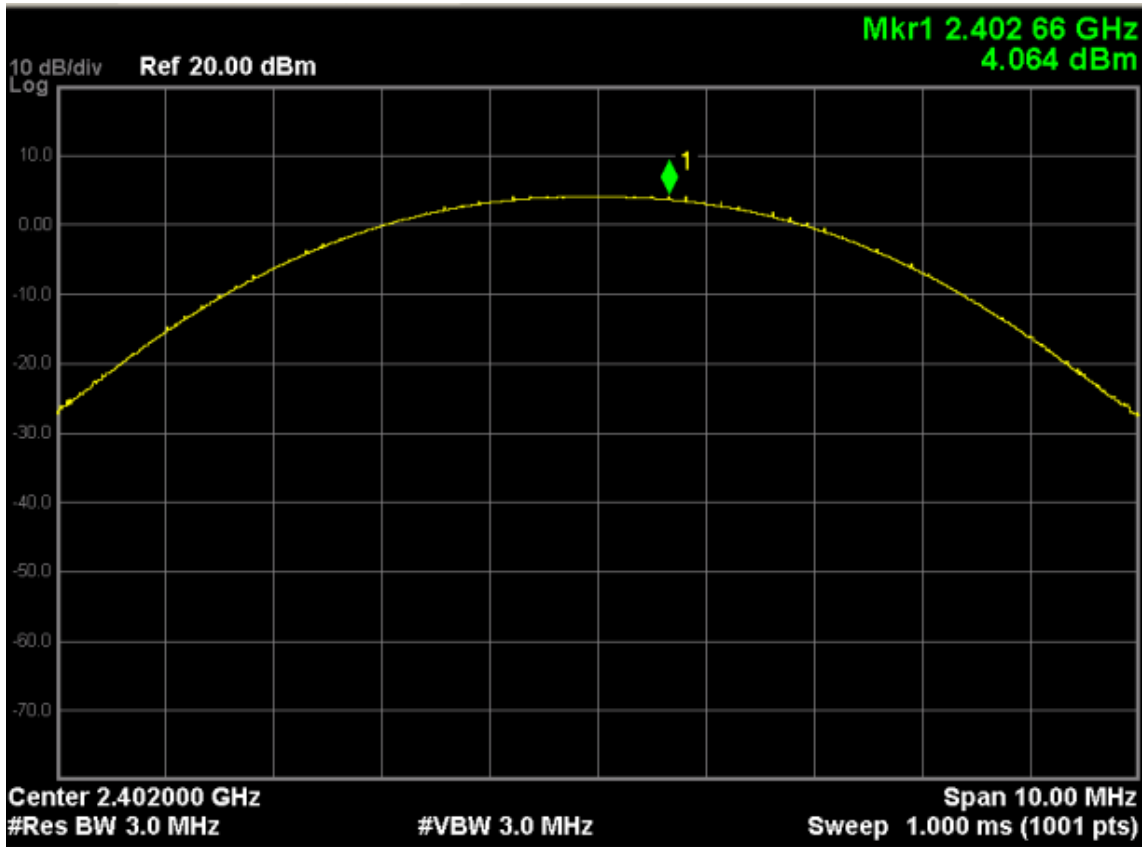
Bluetooth: Low(0), middle(39) and High (78),

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

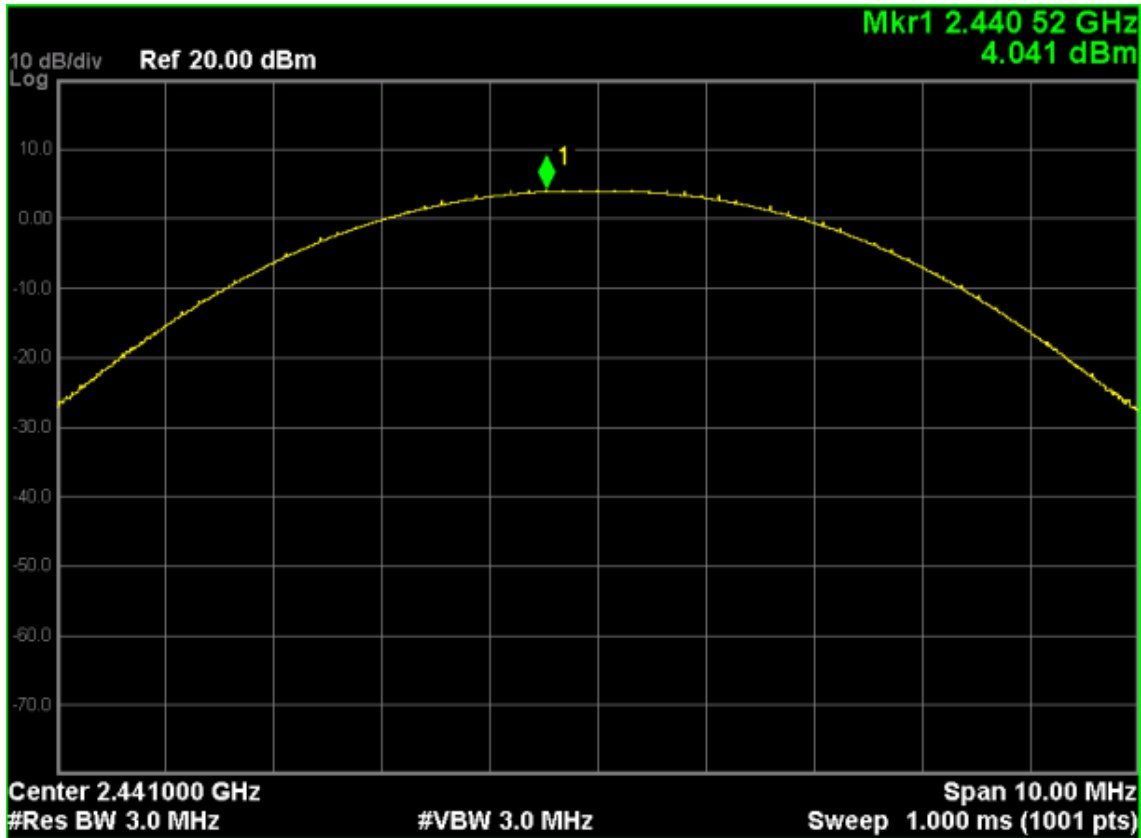
8.4 RESULTS & PERFORMANCE

GFSK				
Channel	Peak power (dBm)	Peak power (mW)	Limit (mW)	Result
0 (2402MHz)	4.064	2.55	125	Pass
39 (2441MHz)	4.041	2.54		Pass
78 (2480MHz)	3.981	2.50		Pass
Π /4-DQPSK				
Channel	Peak power (dBm)	Peak power (mW)	Limit (mW)	Result
0 (2402MHz)	0.322	1.08	125	Pass
39 (2441MHz)	0.297	1.07		Pass
78 (2480MHz)	0.200	1.05		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

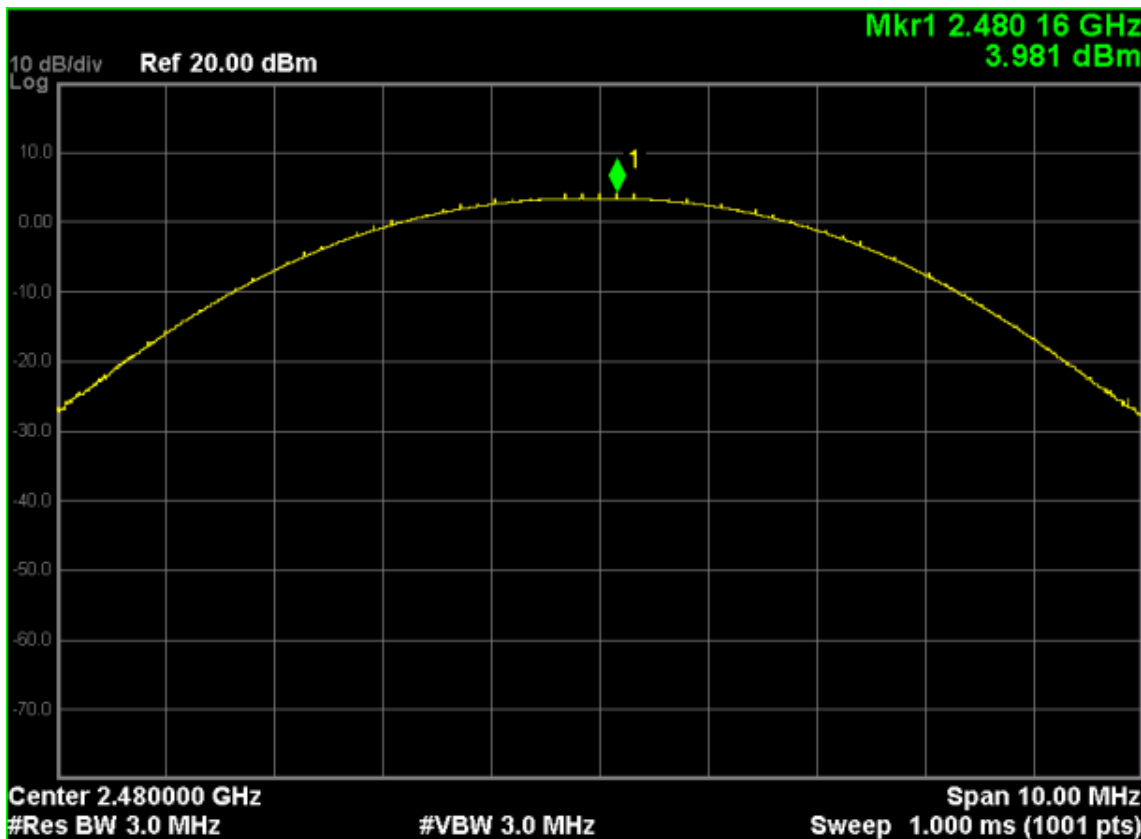
Bluetooth GFSK Channel 0



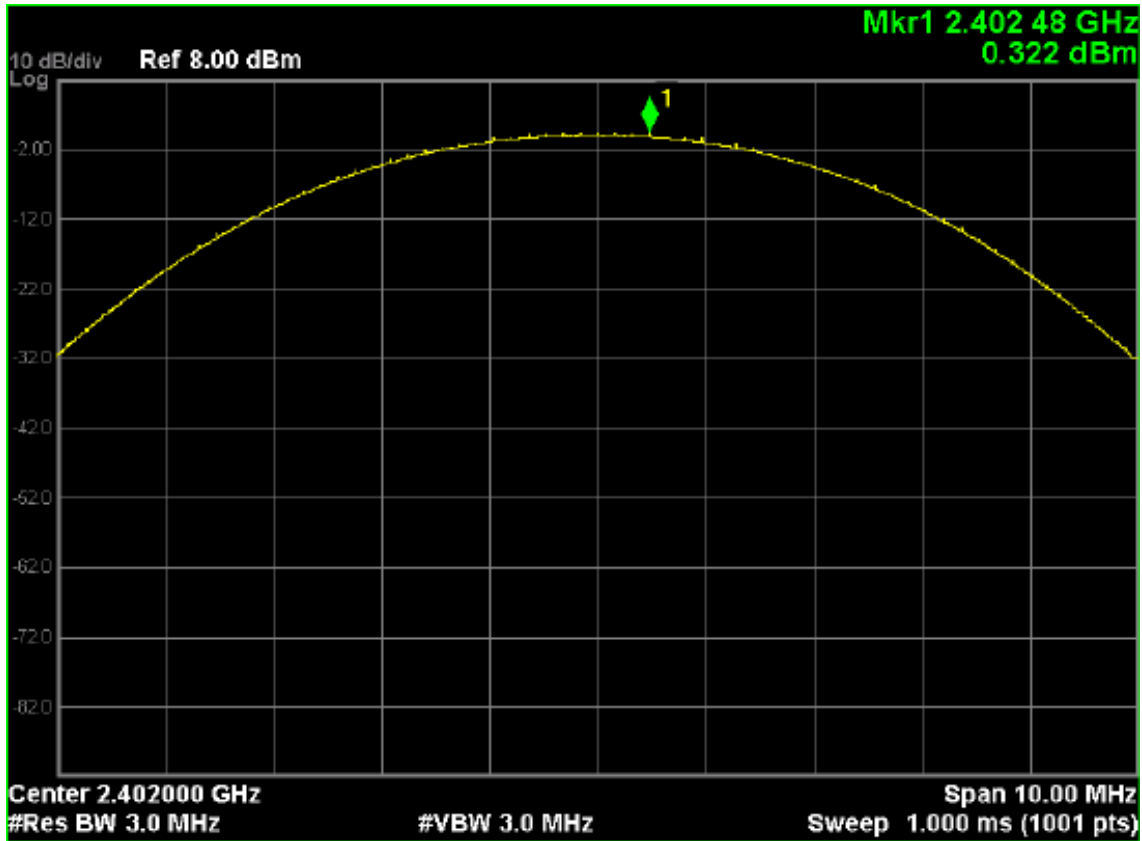
Bluetooth GFSK Channel 39



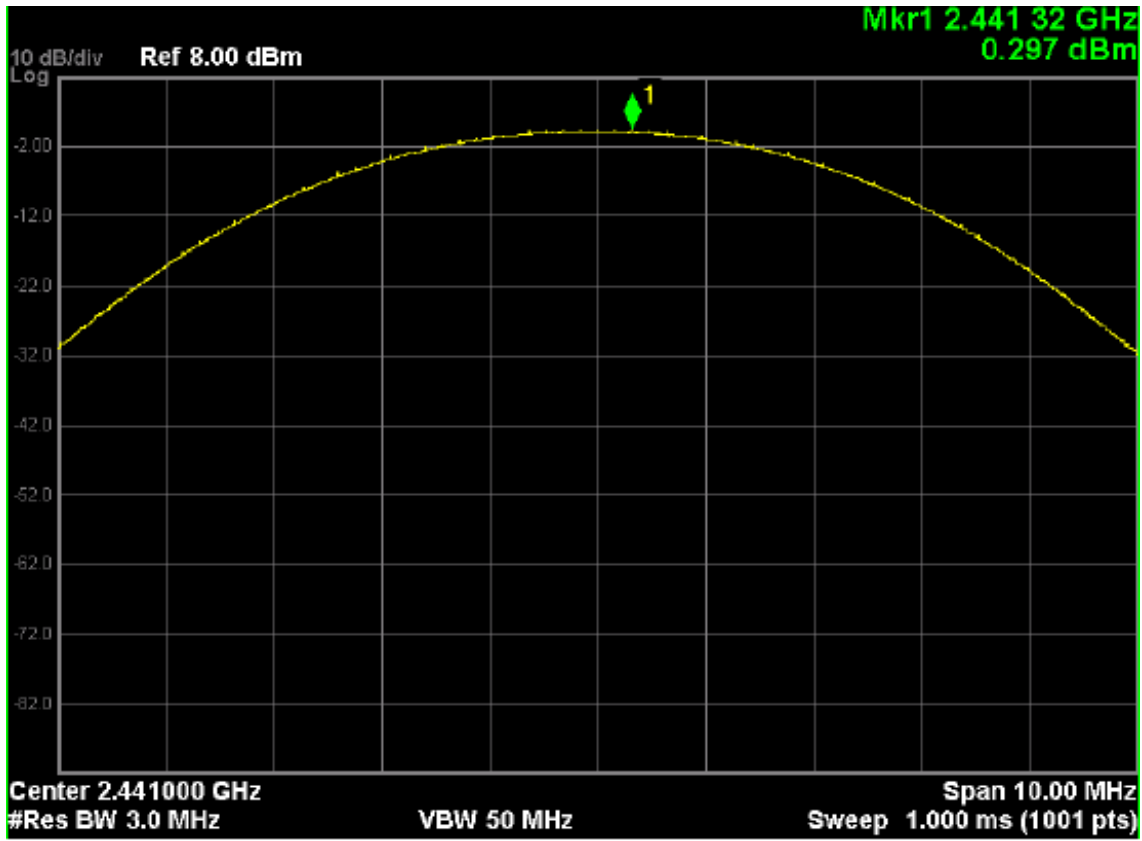
Bluetooth GFSK Channel 78



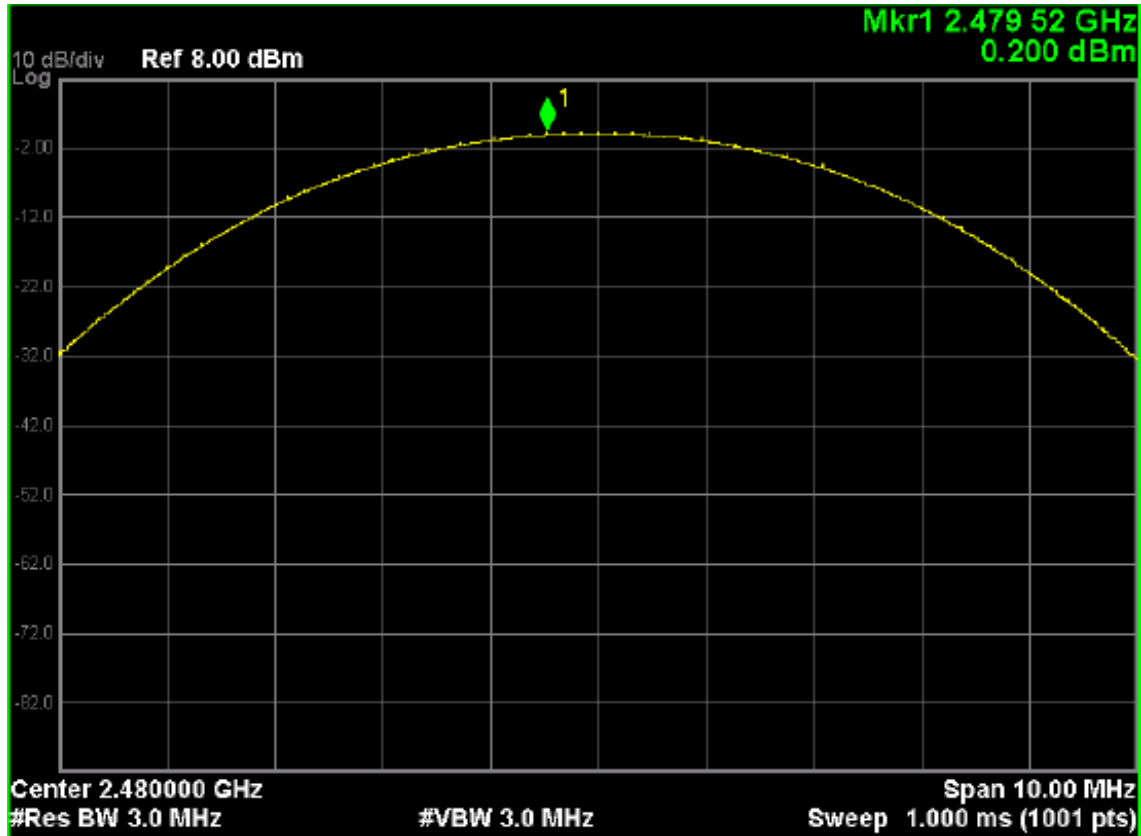
Bluetooth Π /4-DQPSK Channel 0



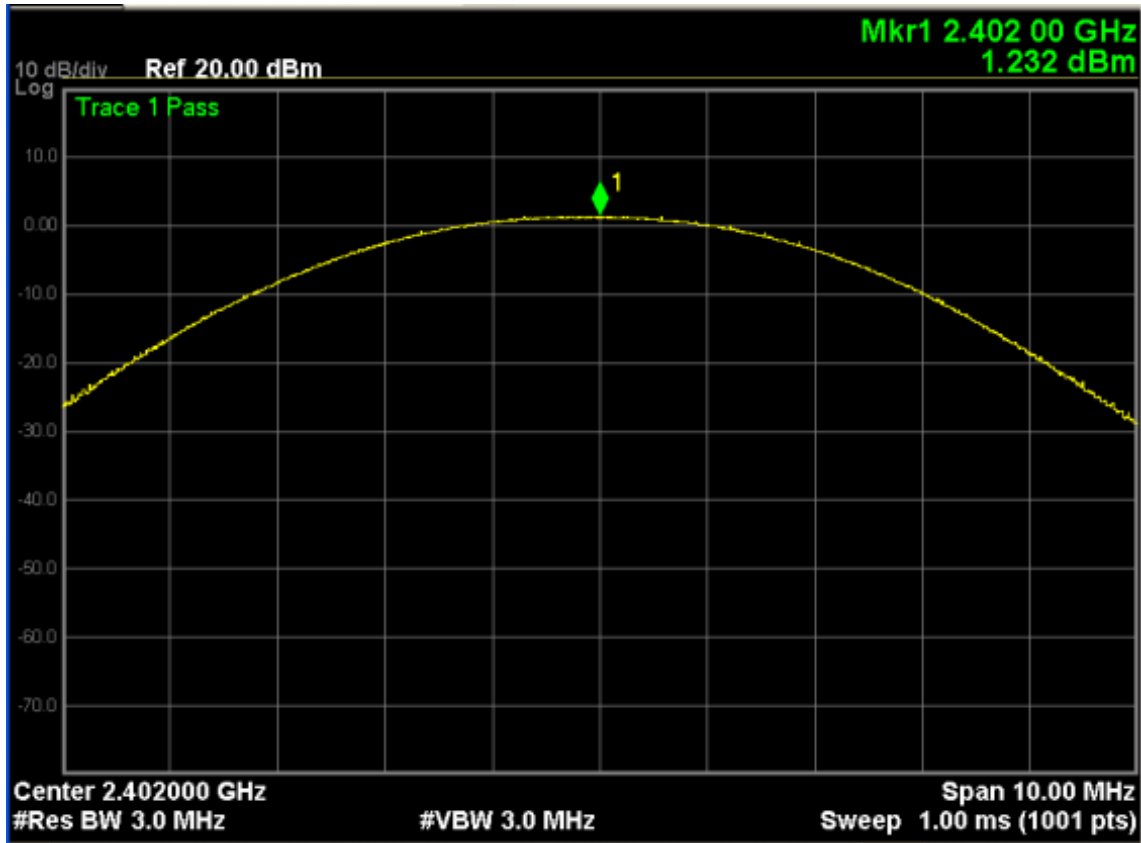
Bluetooth Π /4-DQPSK Channel 39



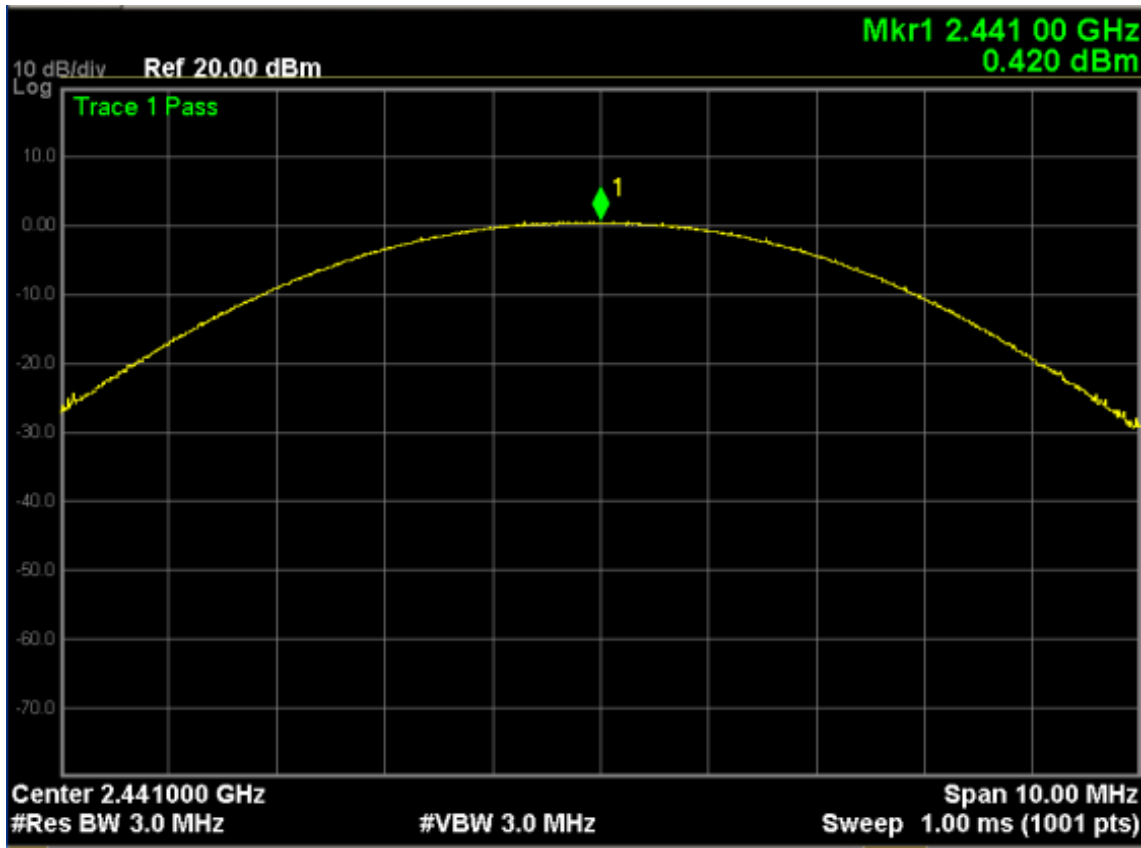
Bluetooth Π /4-DQPSK Channel 78



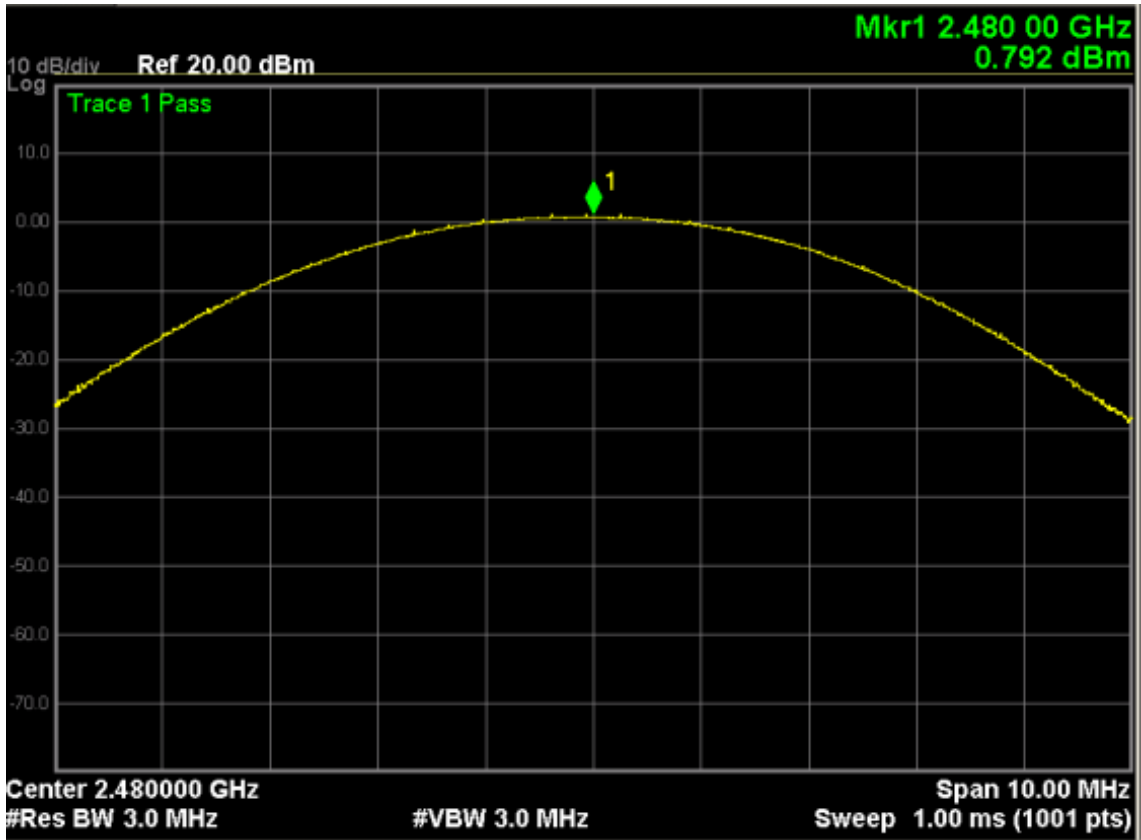
Bluetooth 8-DPSK Channel 0



Bluetooth 8-DPSK Channel 39

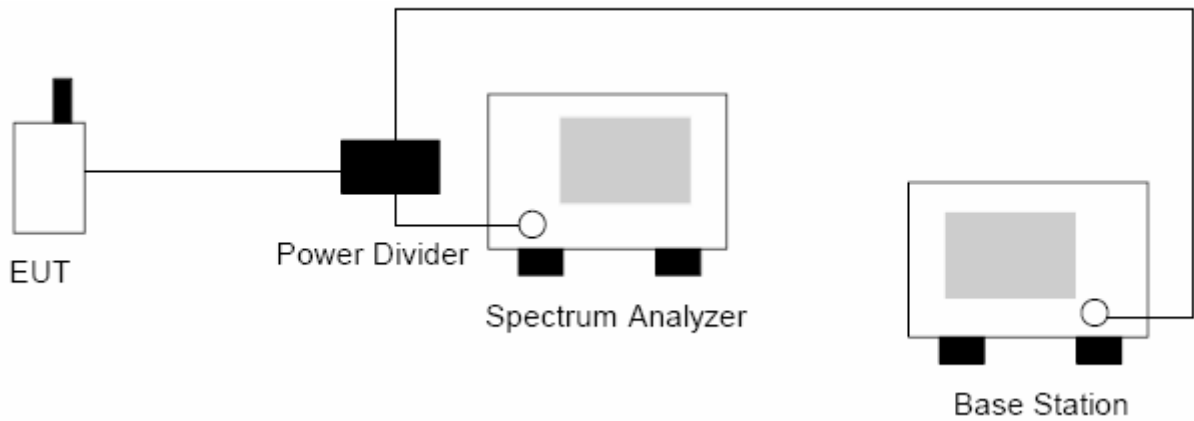


Bluetooth 8-DPSK Channel 78



9. SPURIOUS EMISSIONS (CONDUCTION)

9.1 TEST SETUP



9.2 LIMITS

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

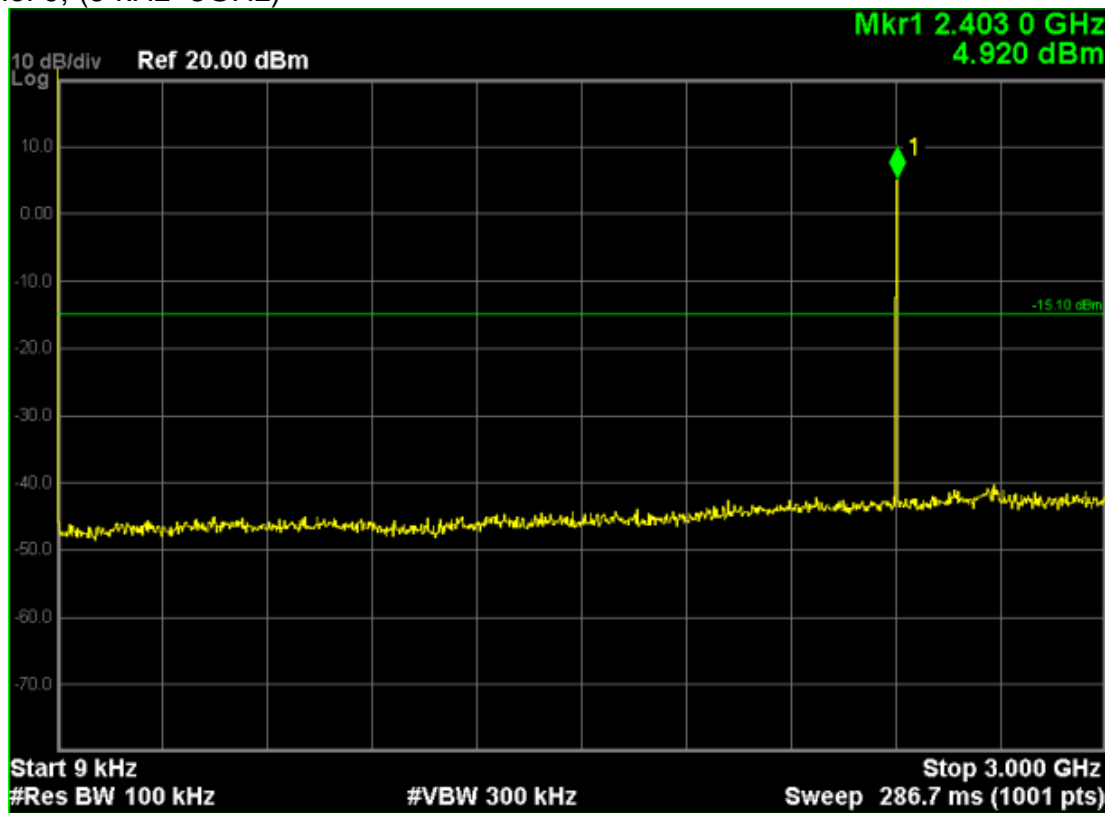
9.3 TEST PROCEDURE

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 = 100 kHz; VBW=300 kHz; 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

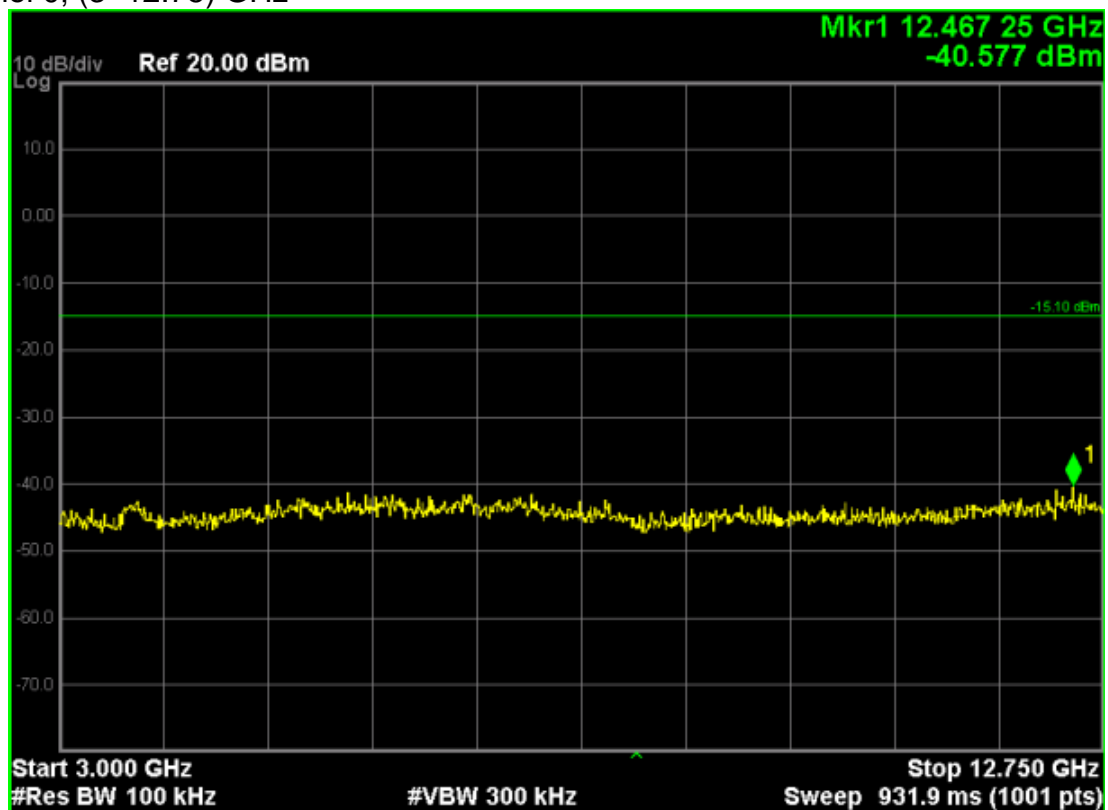
Bluetooth traffic mode GFSK

Channel 0; (9 kHz~3GHz)

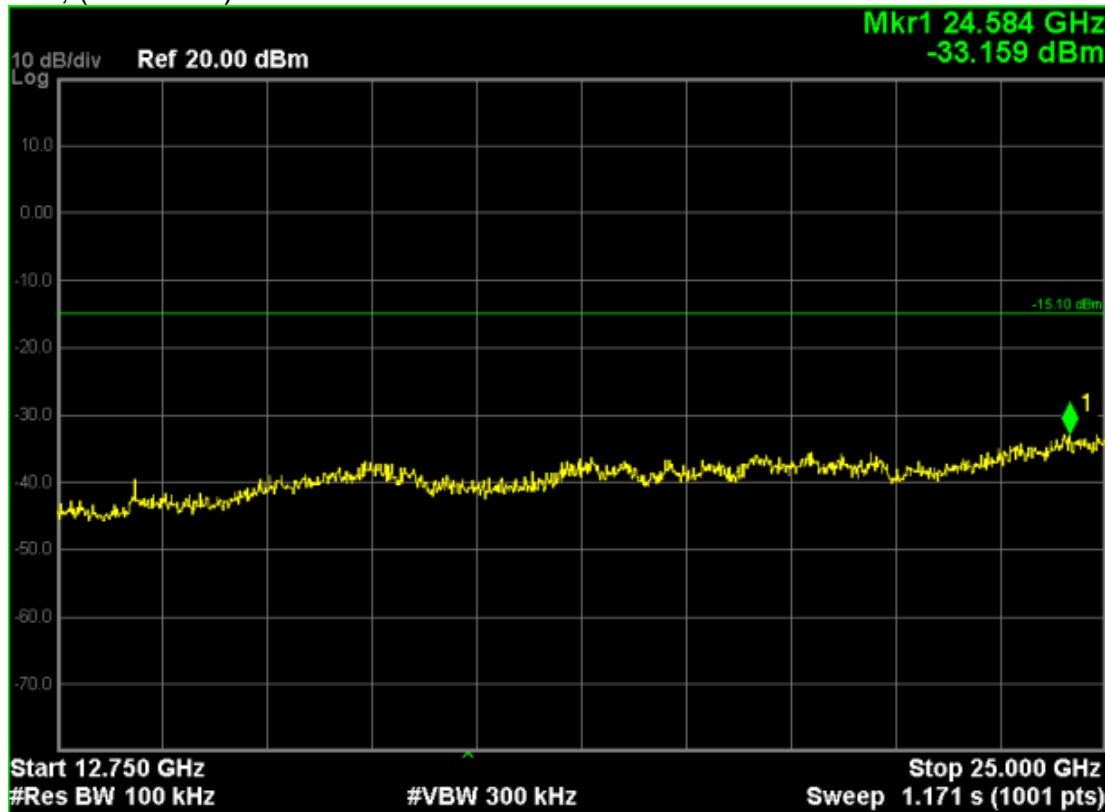


Note: The point mark1 is carrier.

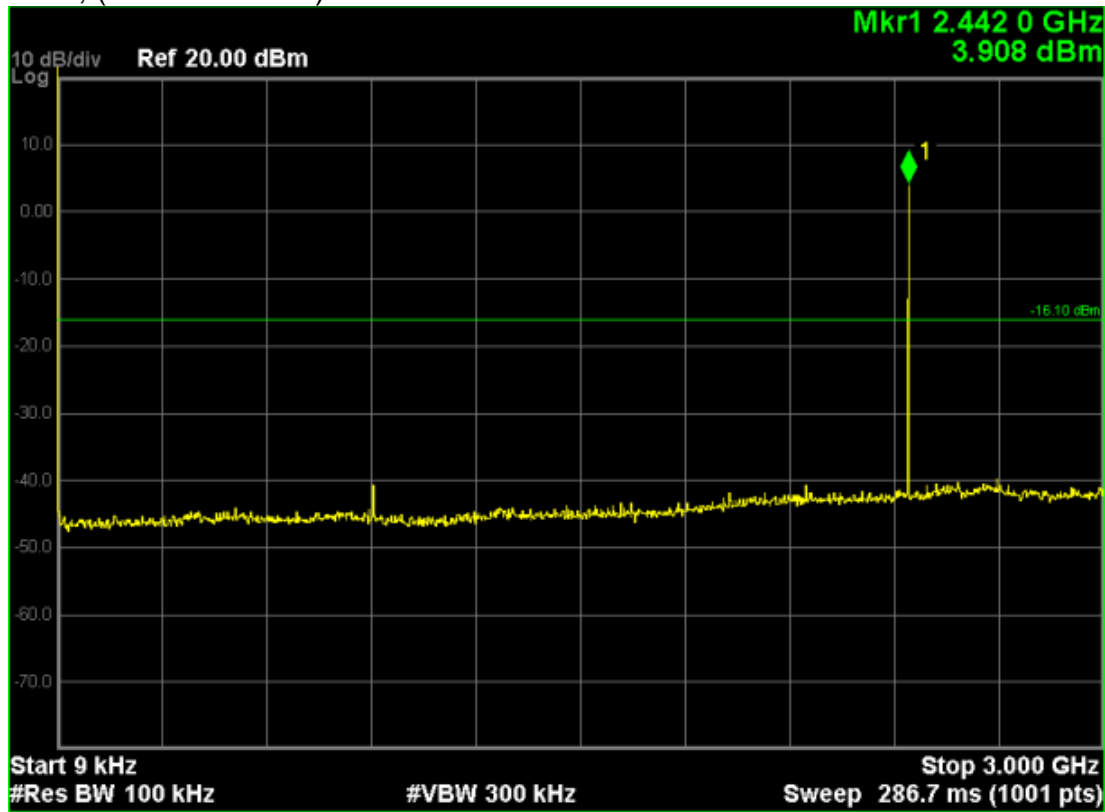
Channel 0; (3~12.75) GHz



Channel 0; (12.75~25) GHz

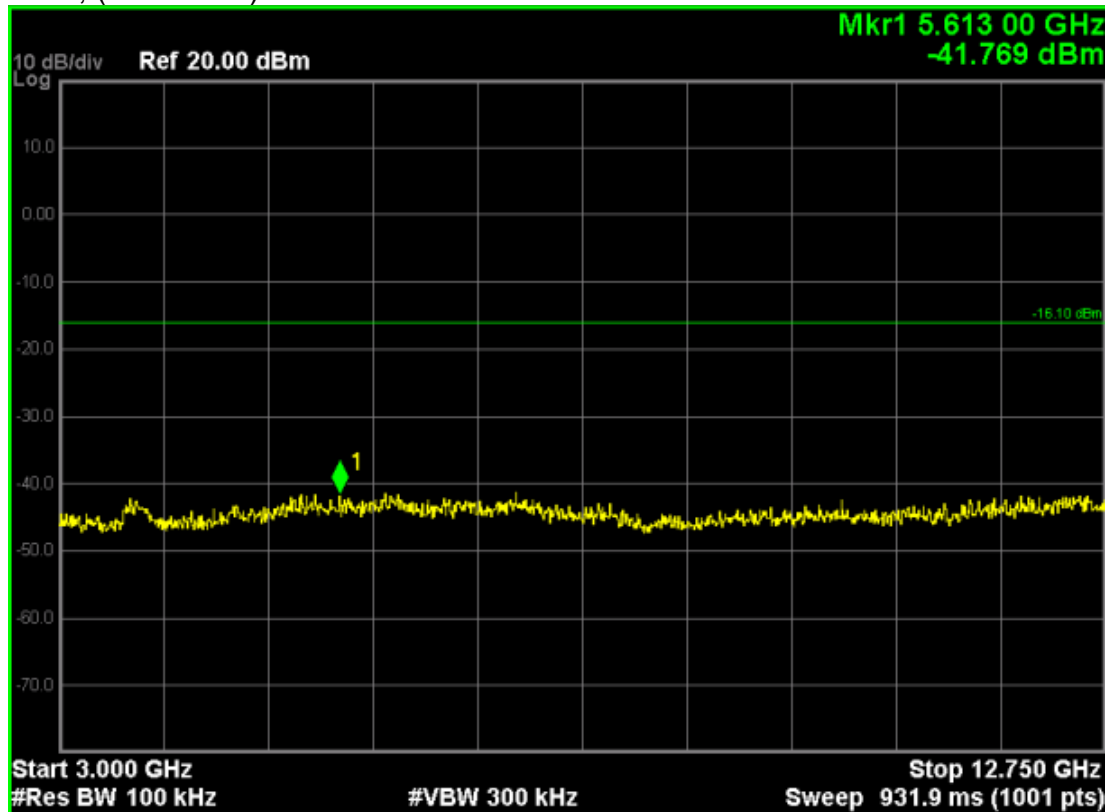


Channel 39; (9 kHz~3.0GHz)

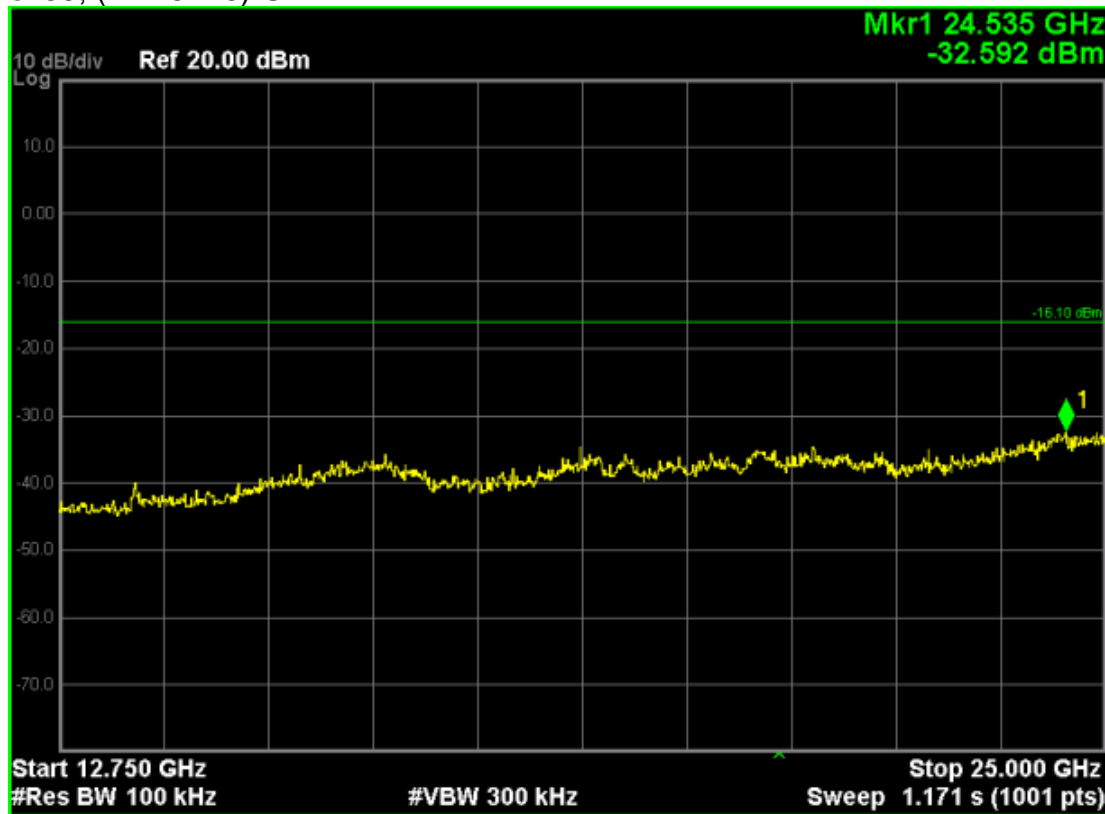


Note: The point mark1 is carrier.

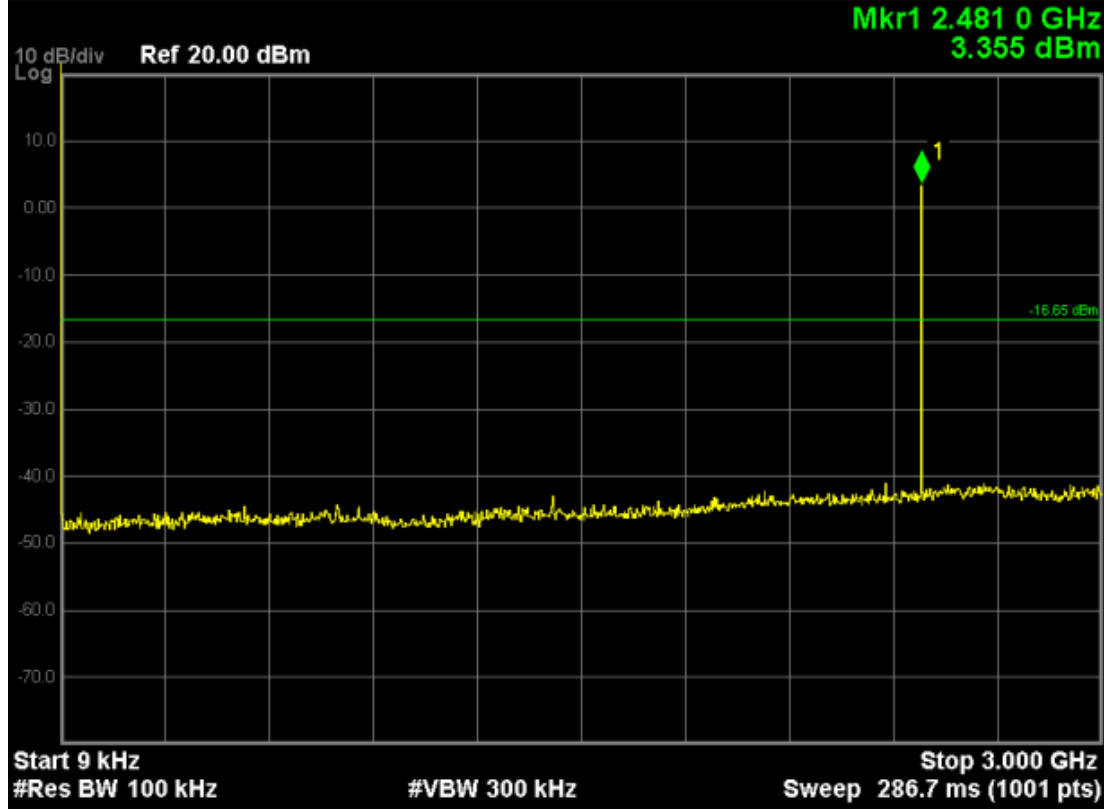
Channel 39; (3.0~12.75) GHz



Channel 39; (12.75~25) GHz

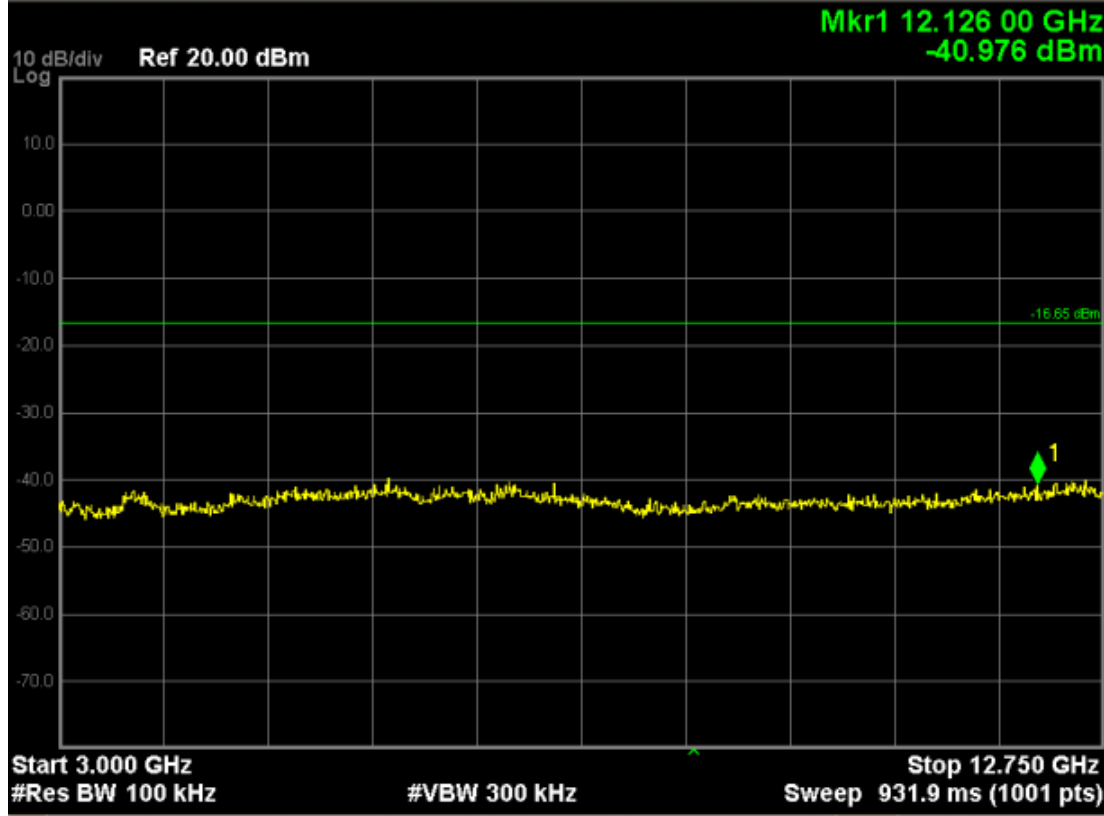


Channel 78; (9kHz~3.0GHz)

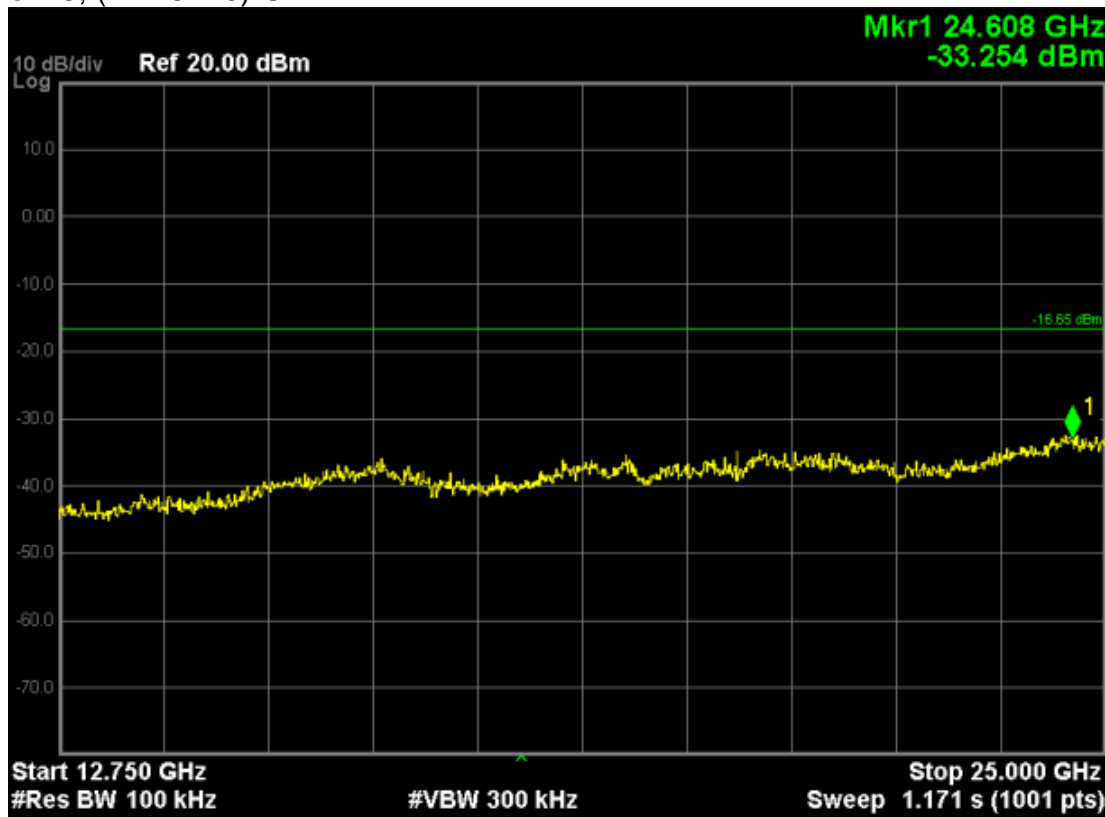


Note:The point mark1 is carrier.

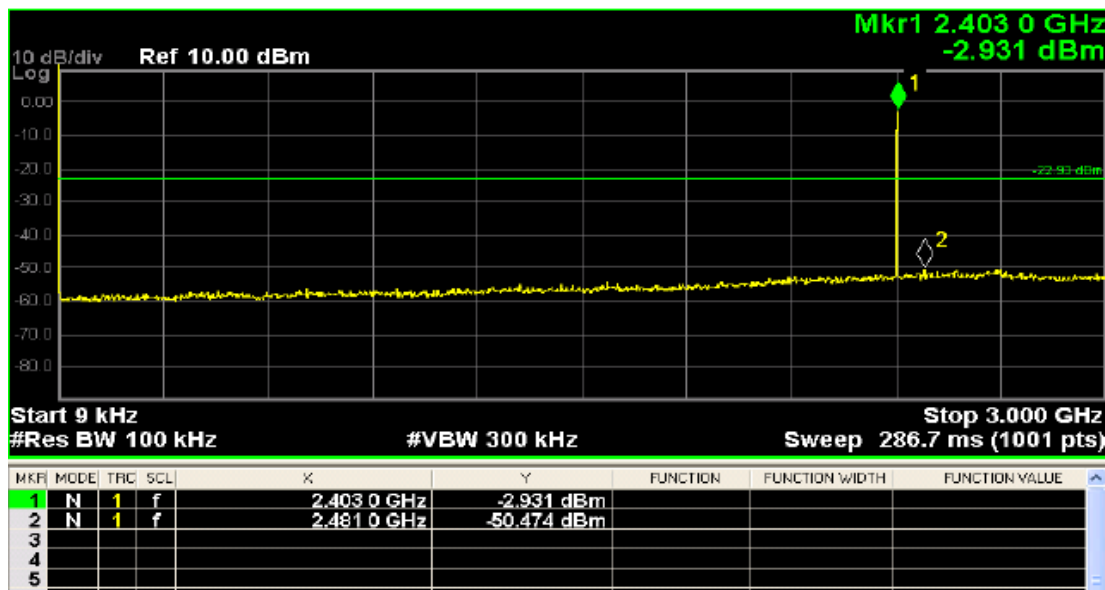
Channel 78; (3.0~12.75) GHz



Channel 78; (12.75~25) GHz

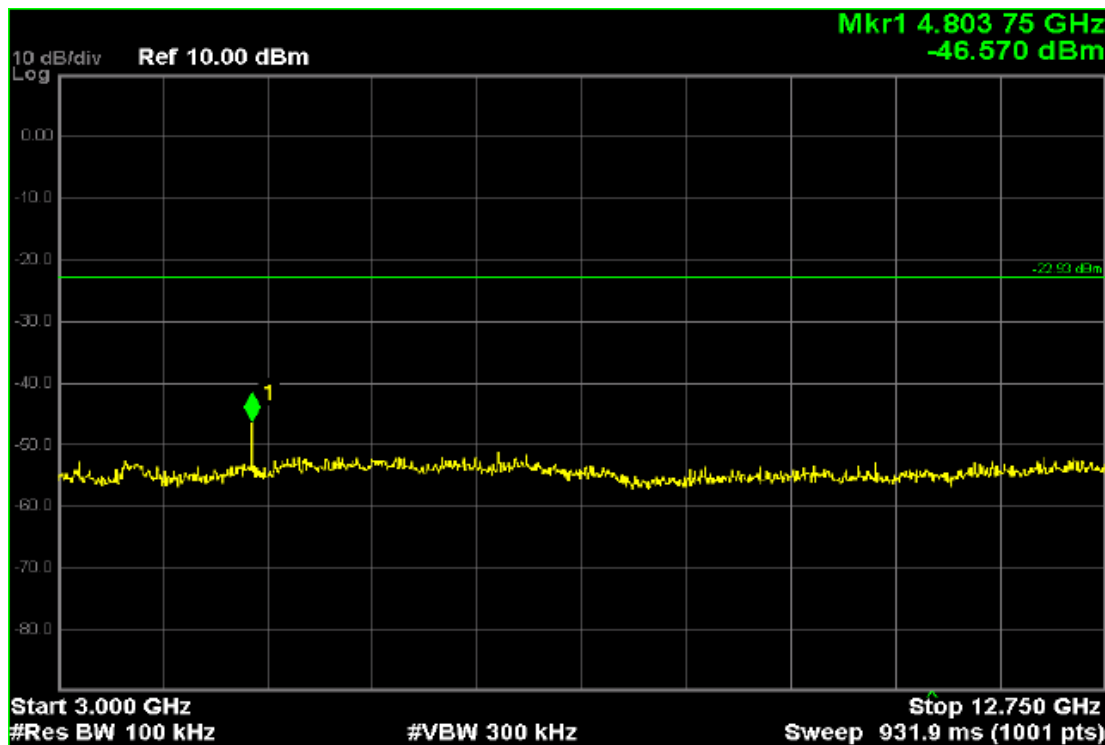


Bluetooth; traffic mode; $\pi/4$ -DQPSK
Channel 0 (9 kHz~3.0GHz)



Note: The point mark 1 is carrier, and the point mark 2 is the DL signal of the test instrument (N4010A)

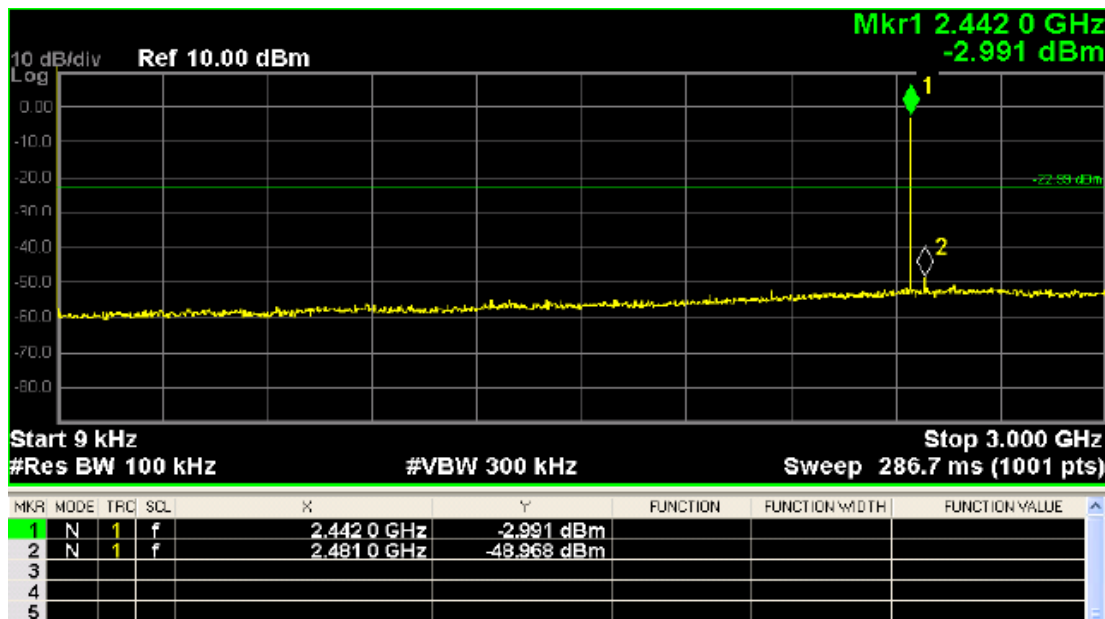
Channel 0 (3GHz~12.75GHz)



Channel 0 (12.75GHz~25GHz)

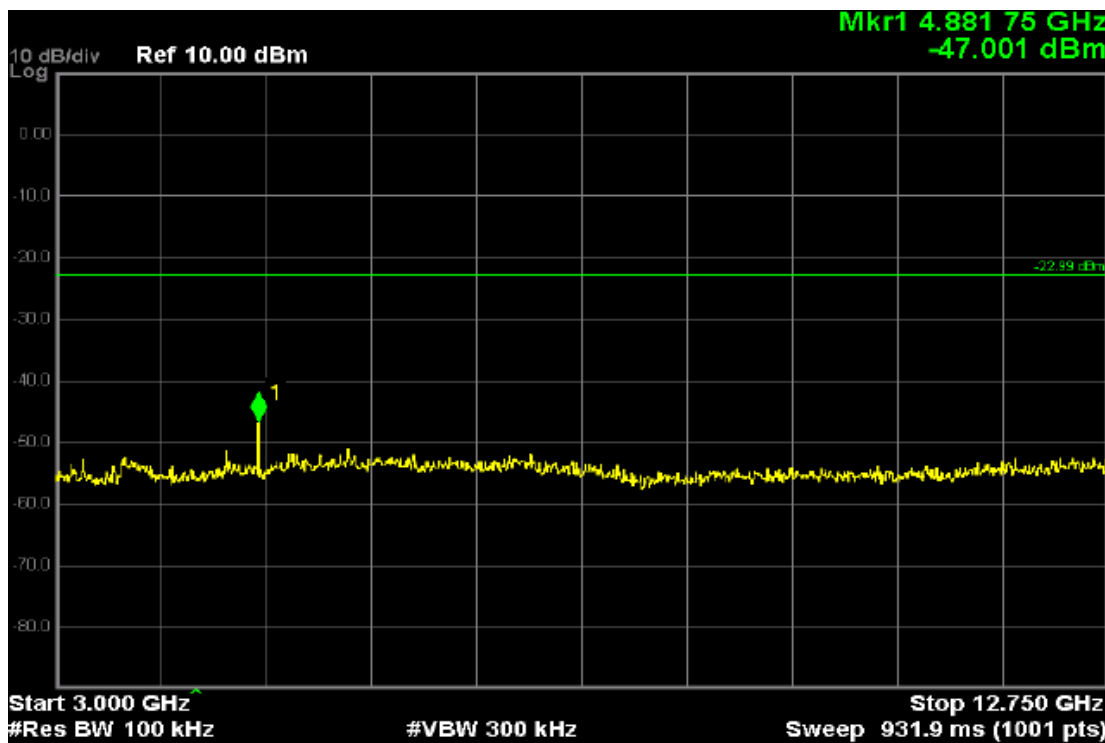


Channel 39 (9 kHz~3.0GHz)



Note:The point mark1 is carrier, and the point mark 2 is the DL signal of the test instrument(N4010A)

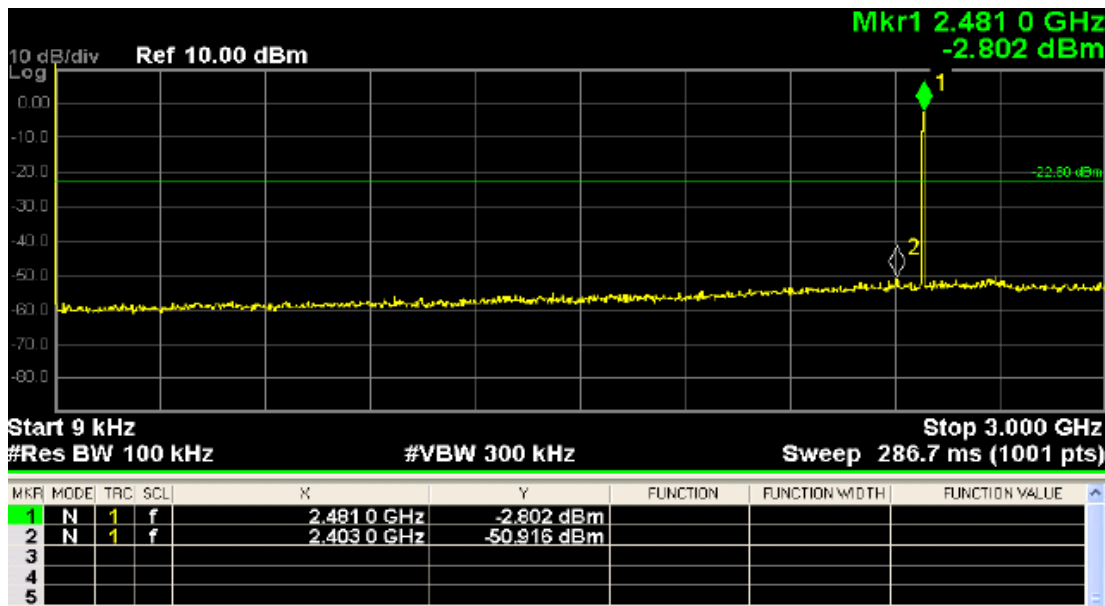
Channel 39 (3.0GHz ~12.75GHz)



Channel 39 (12.75GHz ~25GHz)

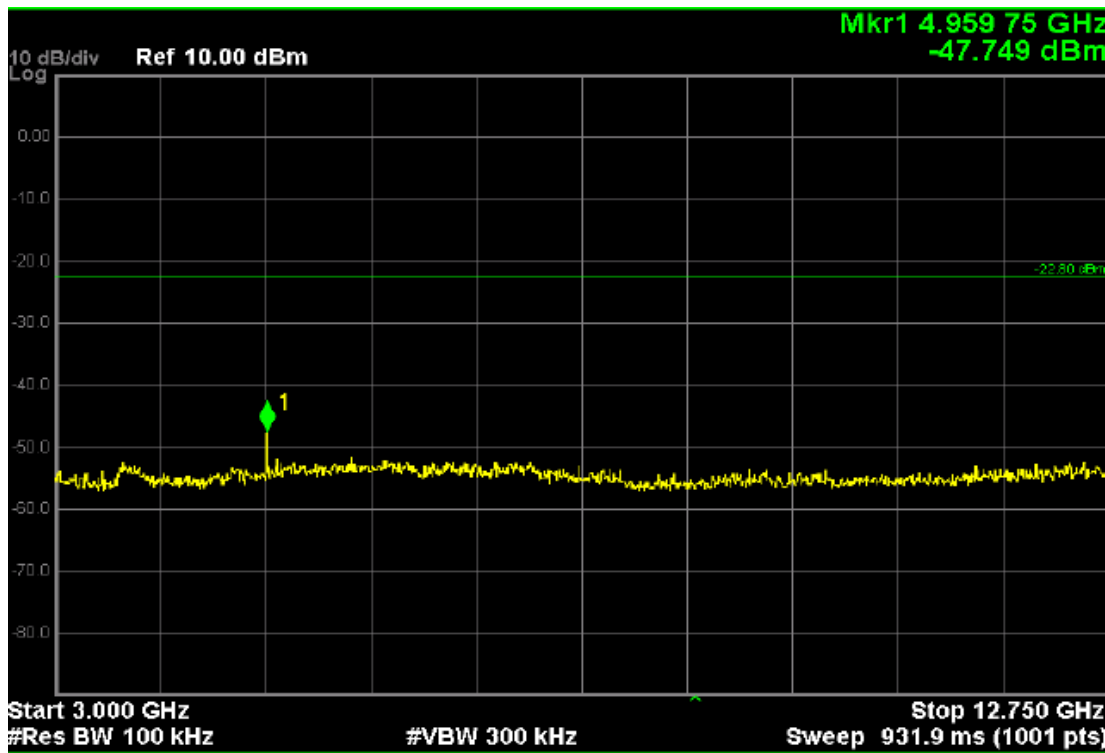


Channel 78 (9 kHz~3.0GHz)

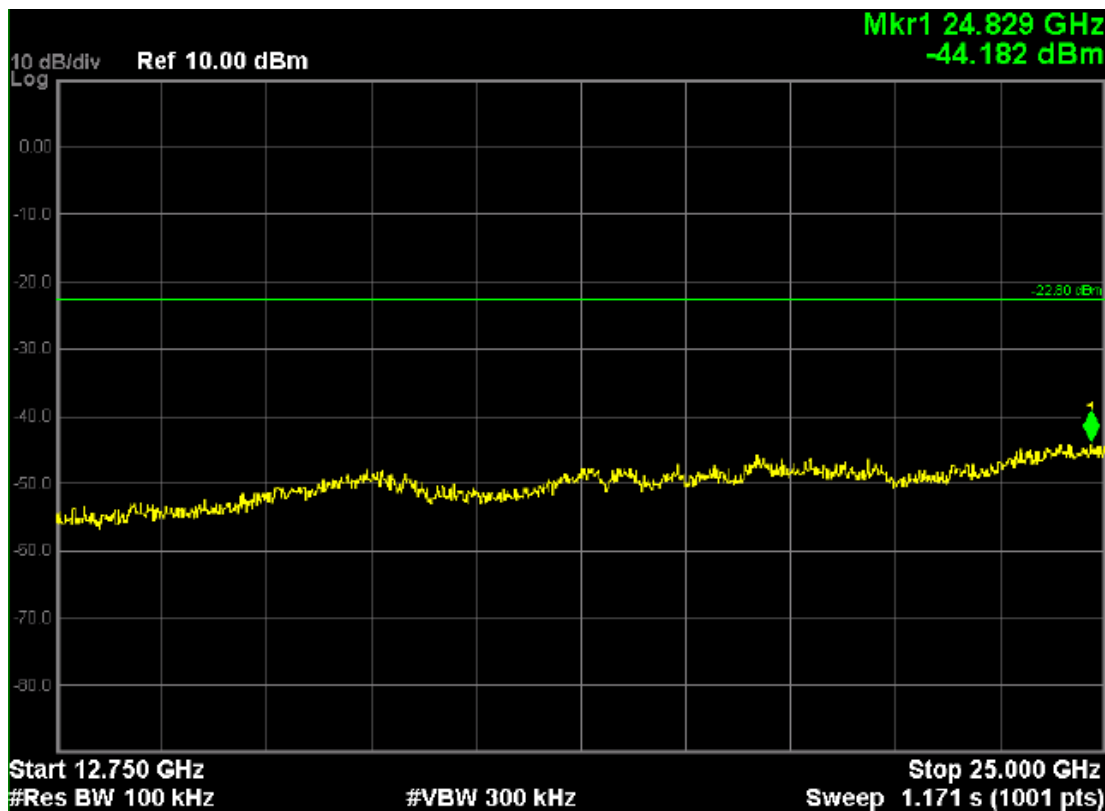


Note:The point mark1 is carrier, and the point mark 2 is the DL signal of the test instrument(N4010A)

Channel 78 (3.0GHz ~12.75GHz)

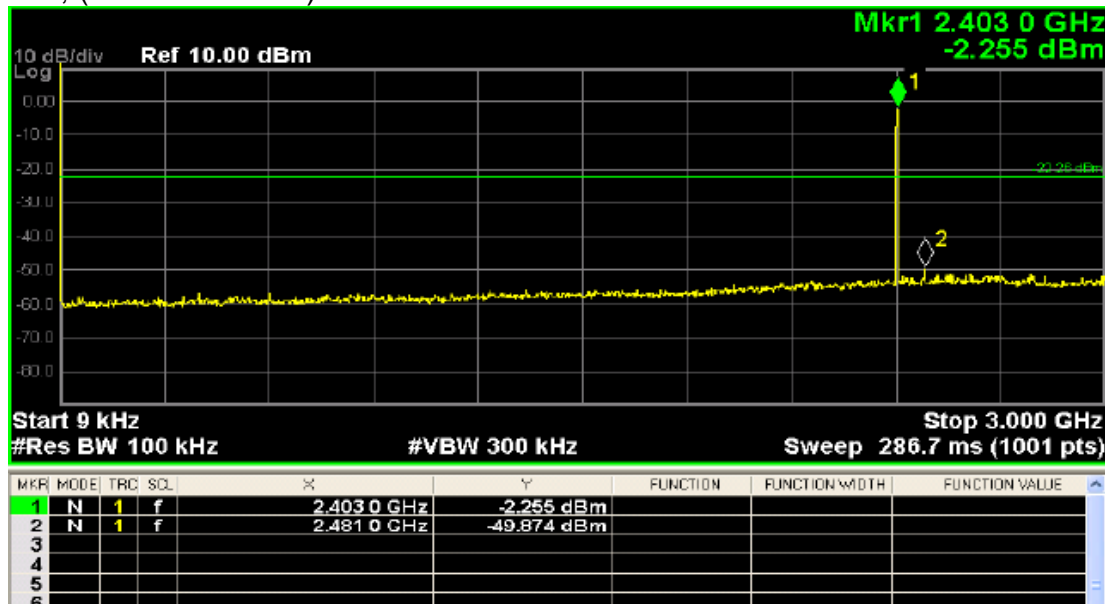


Channel 78 (12.75GHz ~25GHz)



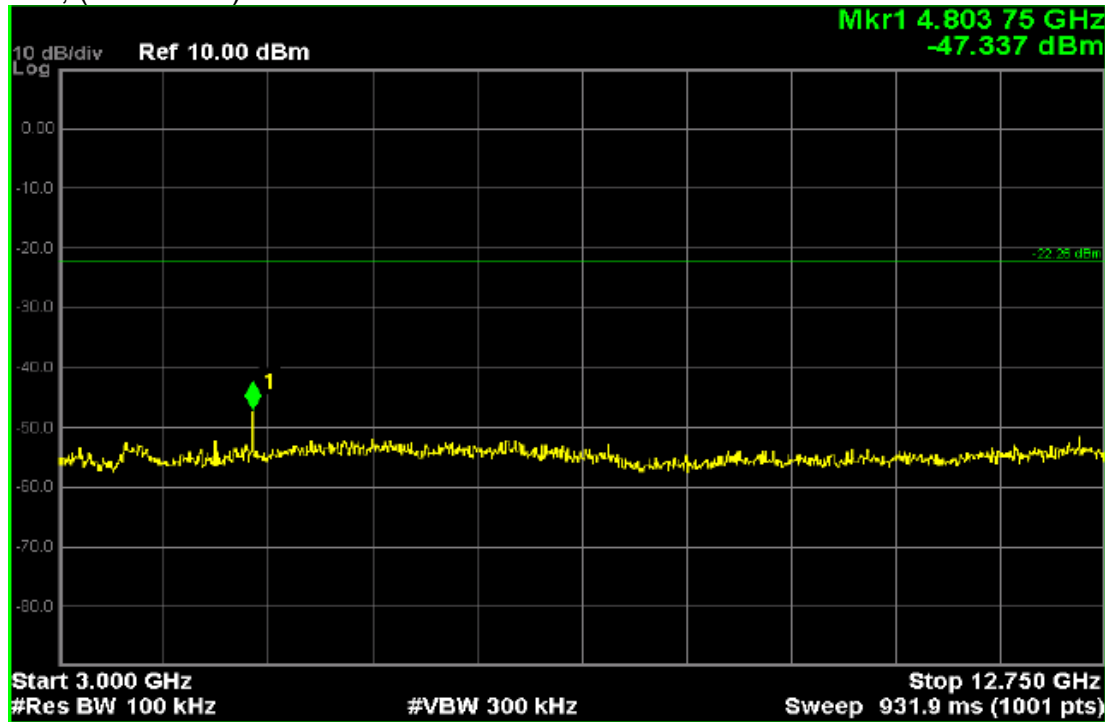
Bluetooth traffic mode 8-DPSK

Channel 0; (9 kHz~3.0 GHz)



Note:The point mark1 is carrier, and the point mark 2 is the DL signal of the test instrument(N4010A)

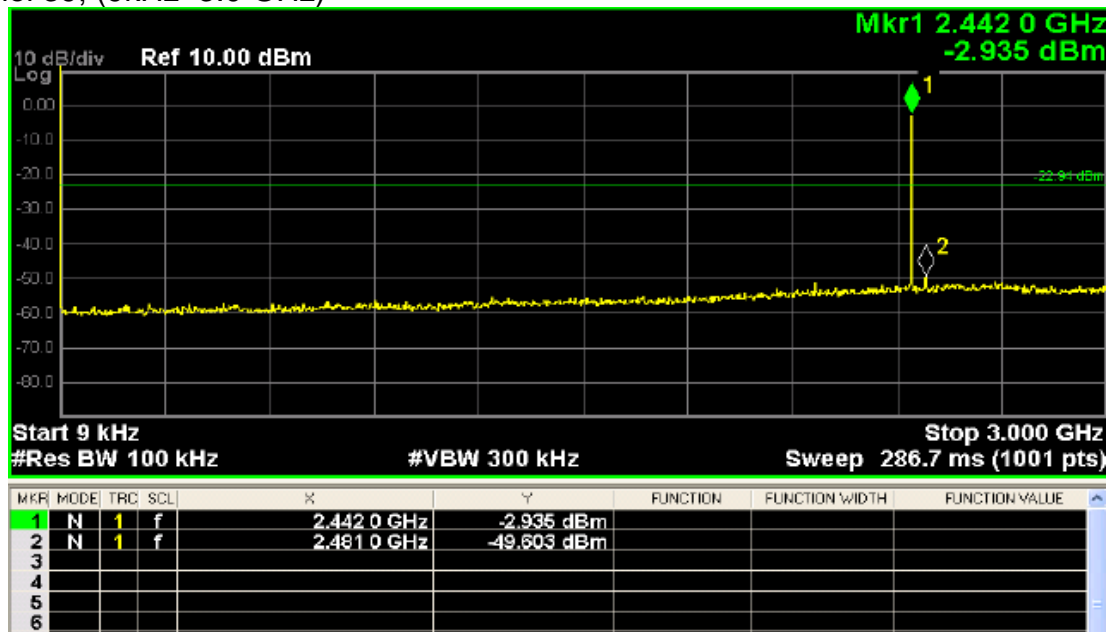
Channel 0; (3.0~12.75) GHz



Channel 0; (12.75~25) GHz

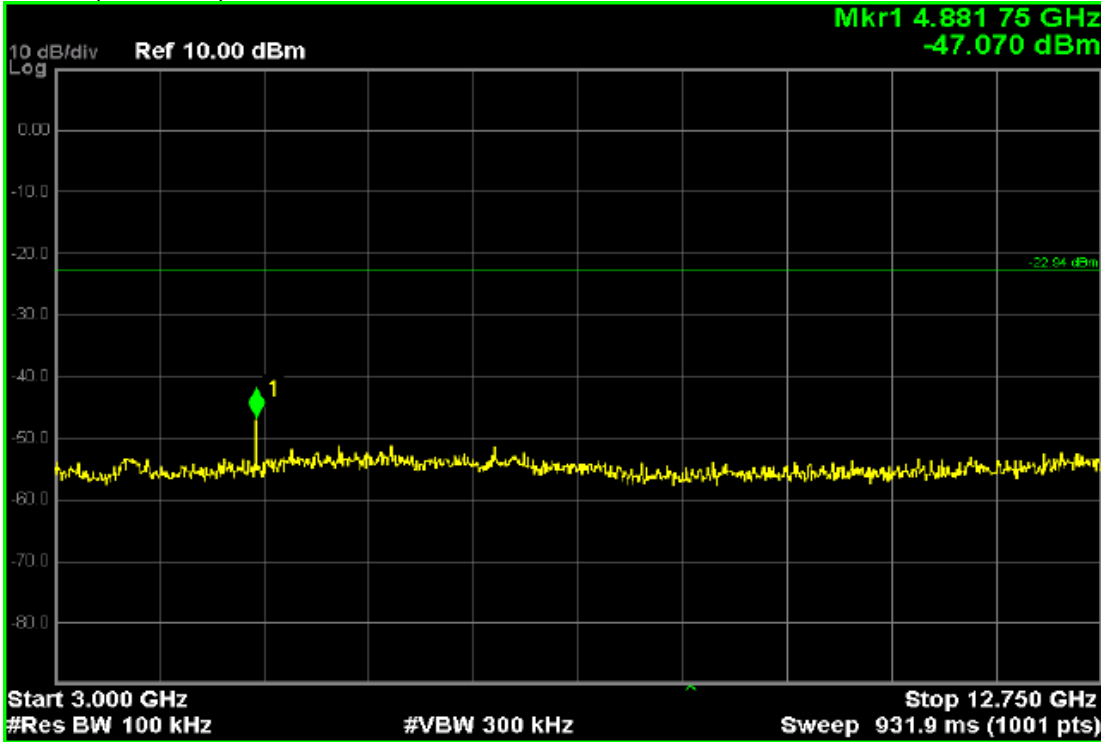


Channel 39; (9kHz~3.0 GHz)



Note: The point mark1 is carrier, and the point mark 2 is the DL signal of the test instrument(N4010A)

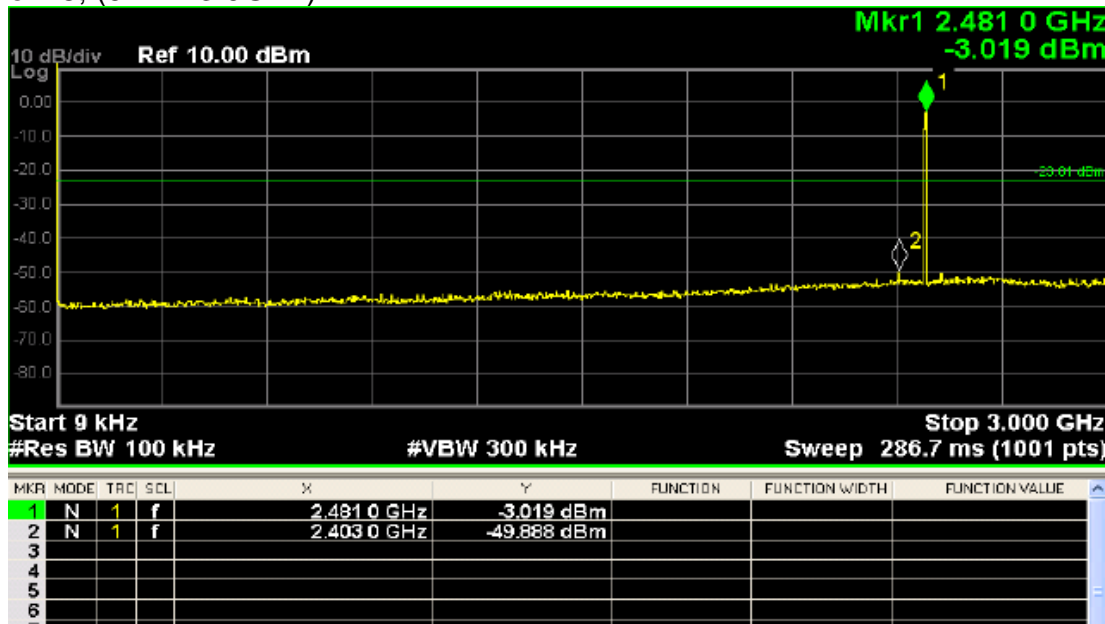
Channel 39; (3~12.75) GHz



Channel 39; (12.75~25) GHz

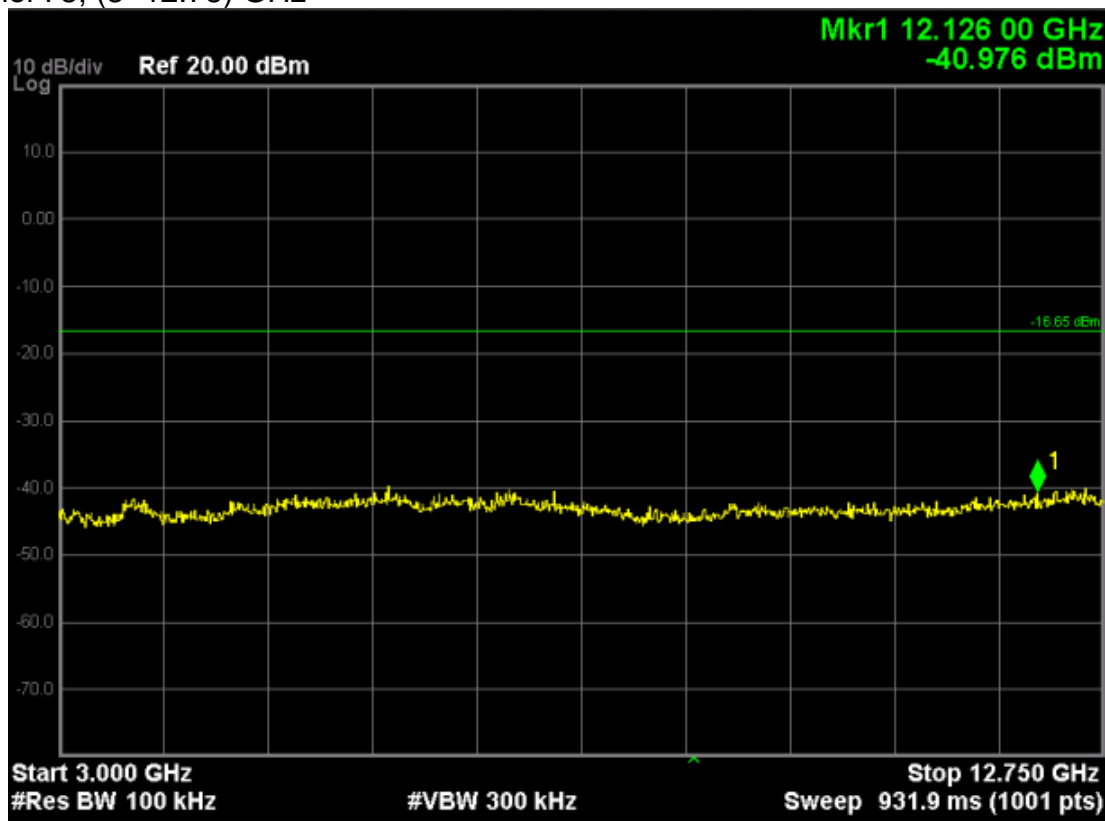


Channel 78; (9kHz~3.0GHz)

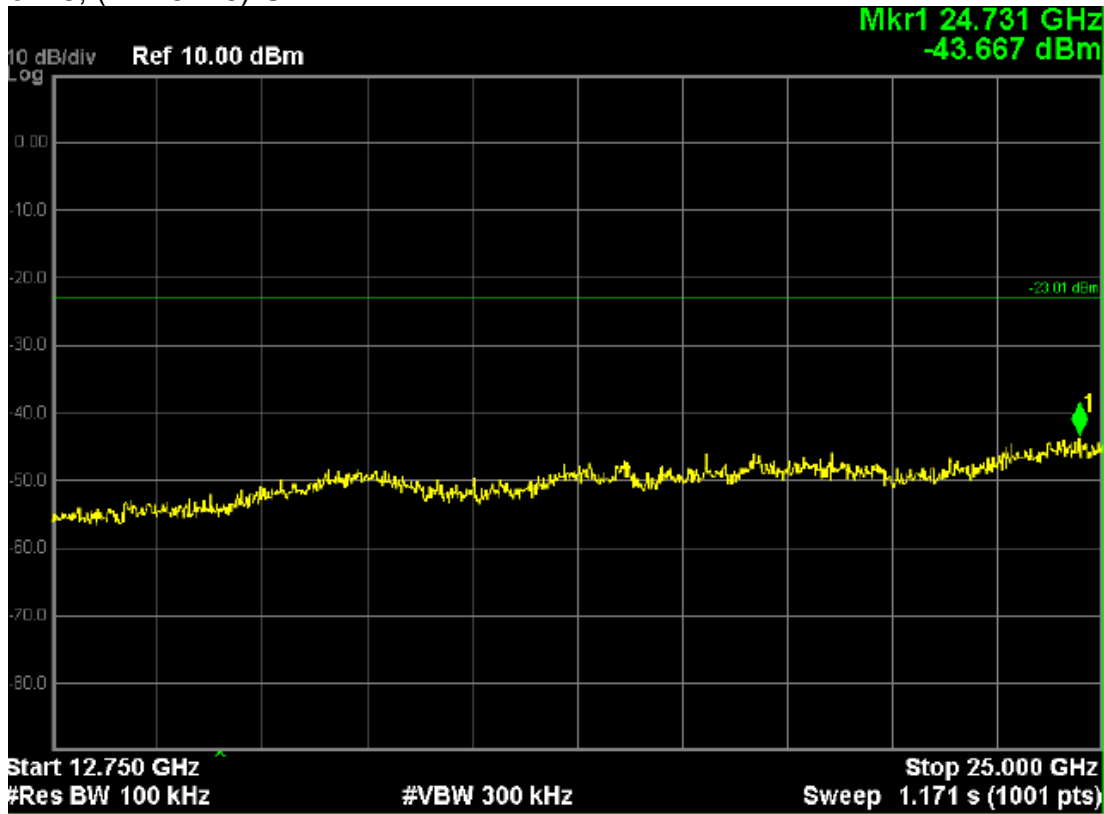


Note: The point mark1 is carrier, and the point mark 2 is the DL signal of the test instrument(N4010A)

Channel 78; (3~12.75) GHz

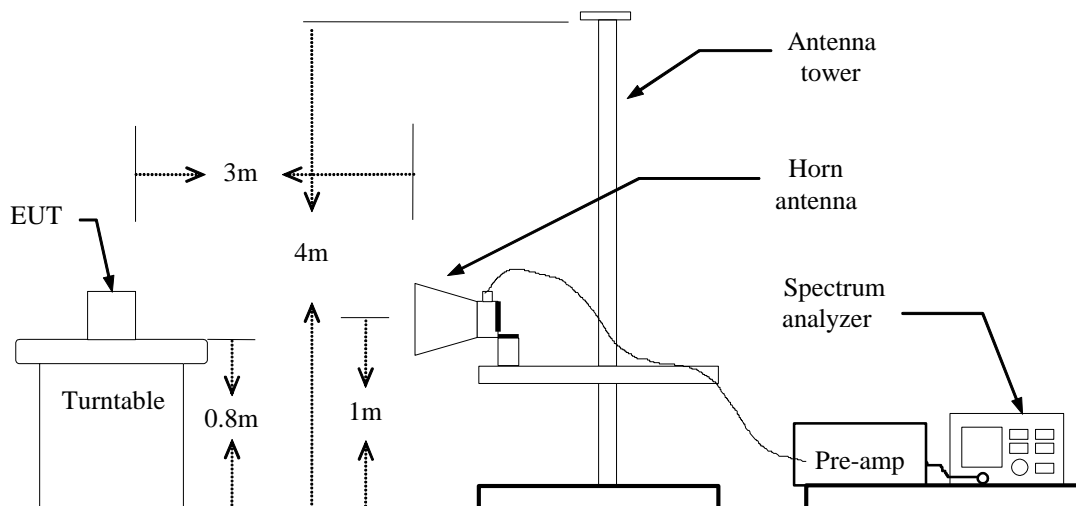


Channel 78; (12.75~25) GHz



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.

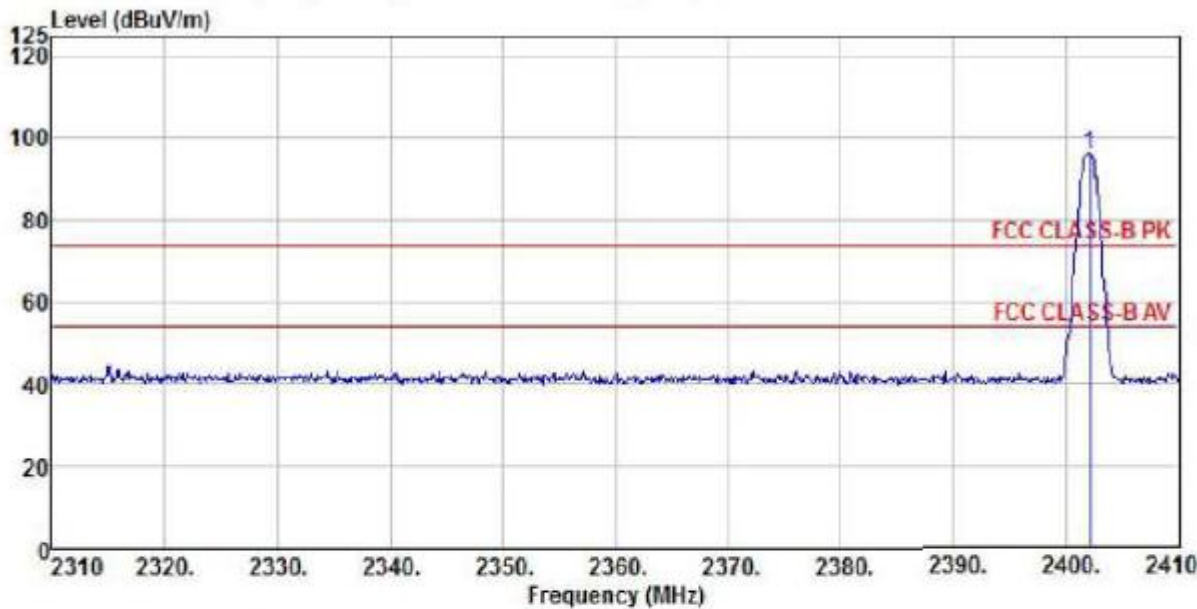
10.4 RESULTS & PERFORMANCE

Radiated Band Edge:

BT GFSK (Low Channel)

Detector mode: Peak

Polarity: Horizontal

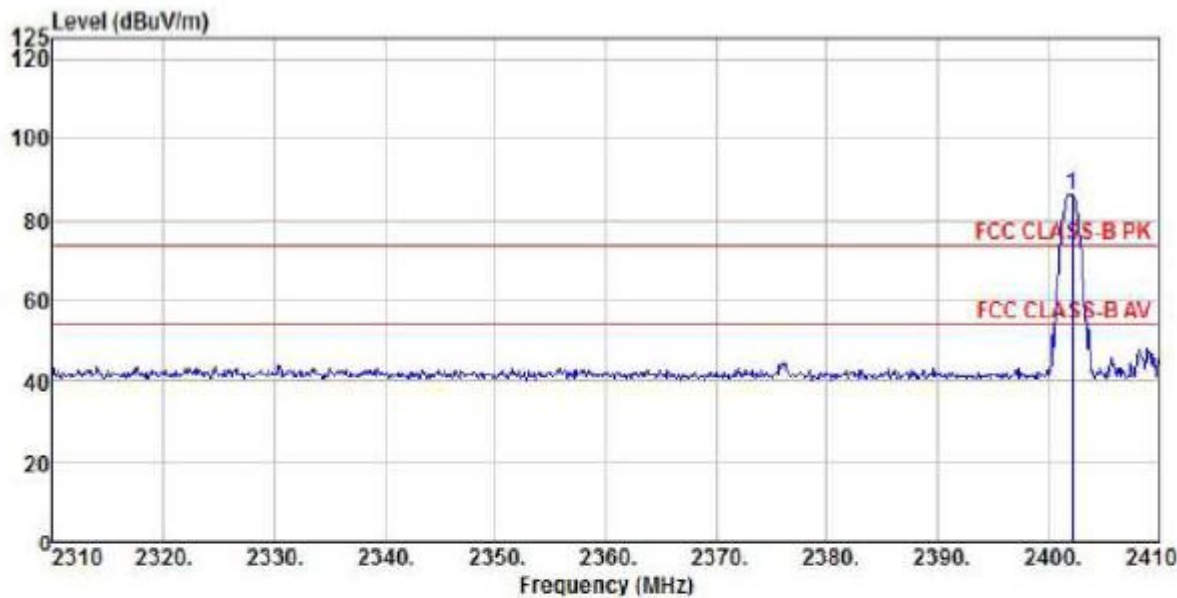


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : GFSK CH0
Memo :

	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	2402.20	99.72	27.54	7.13	38.34	96.05	74.00	22.05	Peak

Detector mode: Peak

Polarity: Vertical

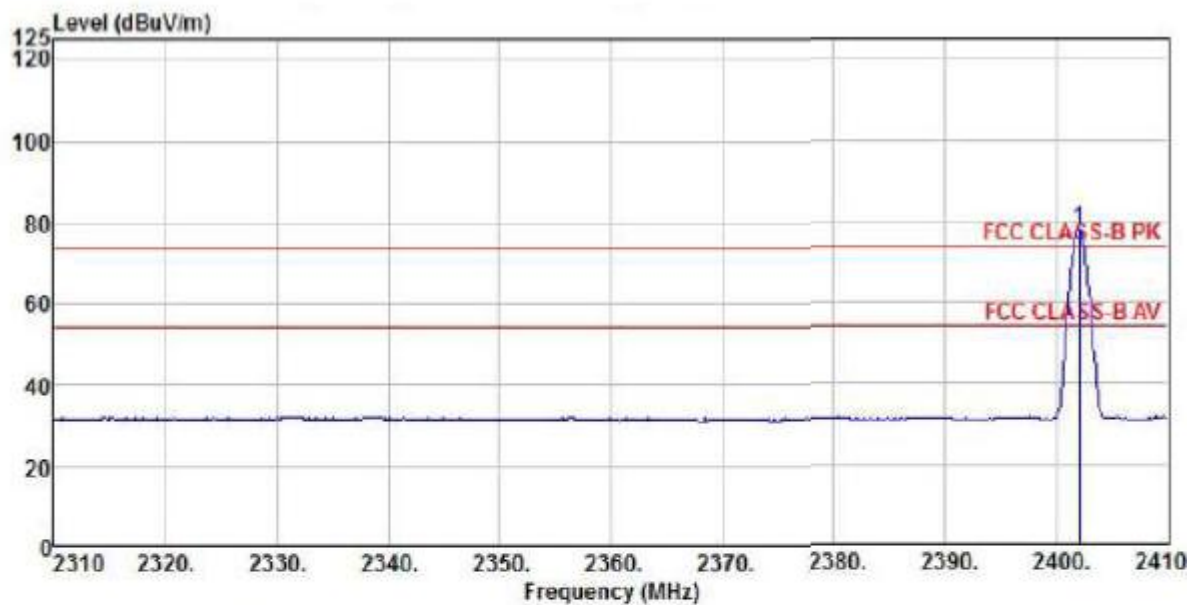


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) VERTICAL
EUT :
Model Name :
Temp/Humi : 23 ℃ /52 %
Power Rating: AC 120V/60Hz
Mode : GFSK CH0
Memo :

	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	2402.20	90.11	27.54	7.13	38.34	86.44	74.00	12.44	Peak

Detector mode: Average

Polarity: Horizontal

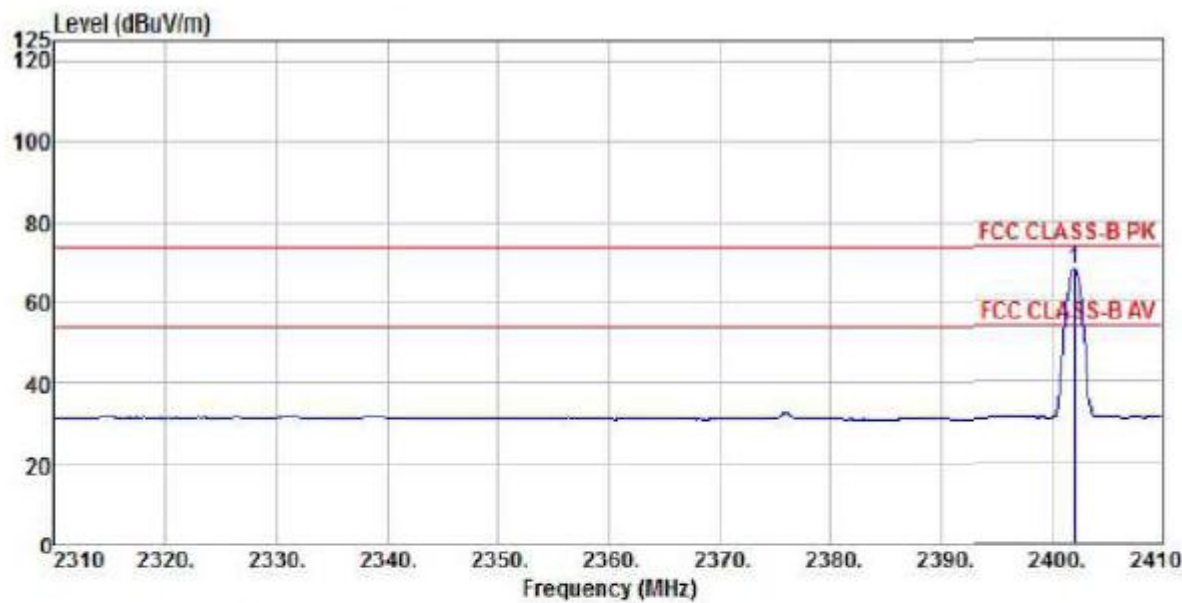


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 ℃ /52 %
Power Rating: AC 120V/60Hz
Mode : GFSK CH0
Memo :

Freq	ReadAntenna		Cable Preamp		Level	Limit	Over	Remark
	Level	Factor	Loss	Factor		Line	Limit	
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 pp 2402.00	81.69	27.54	7.13	38.34	78.02	54.00	24.02	Average

Detector mode: Average

Polarity: Vertical



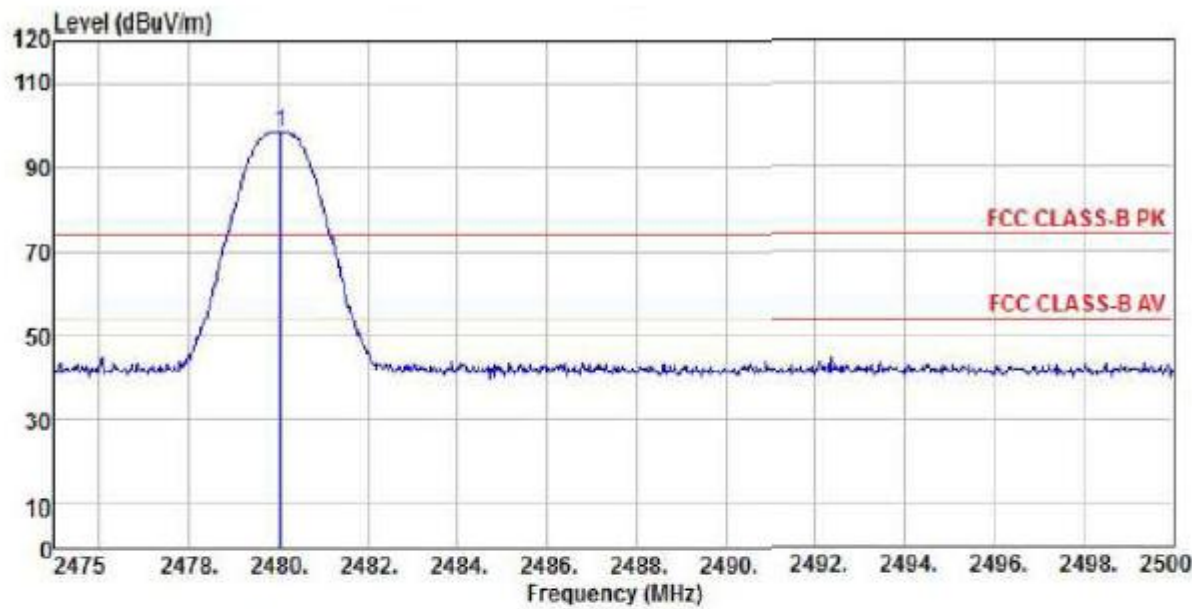
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) VERTICAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : GFSK CH0
Memo :

	Freq	ReadAntenna		Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
		Level	Factor						
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 pp	2402.00	71.62	27.54	7.13	38.34	67.95	54.00	13.95	Average

BT GFSK (High Channel)

Detector mode: Peak

Polarity: Horizontal

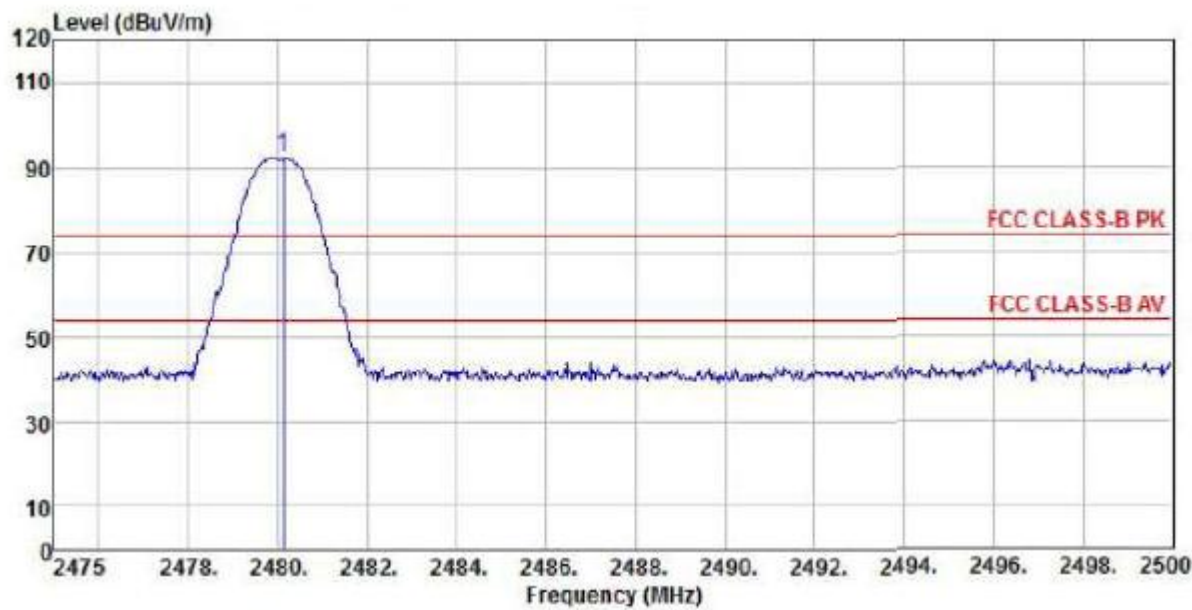


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 ℃ /52 %
Power Rating: AC 120V/60Hz
Mode : GFSK CH78
Memo :

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 2480.05	101.72	27.52	7.41	38.31	98.34	74.00	24.34 Peak

Detector mode: Peak

Polarity: Vertical

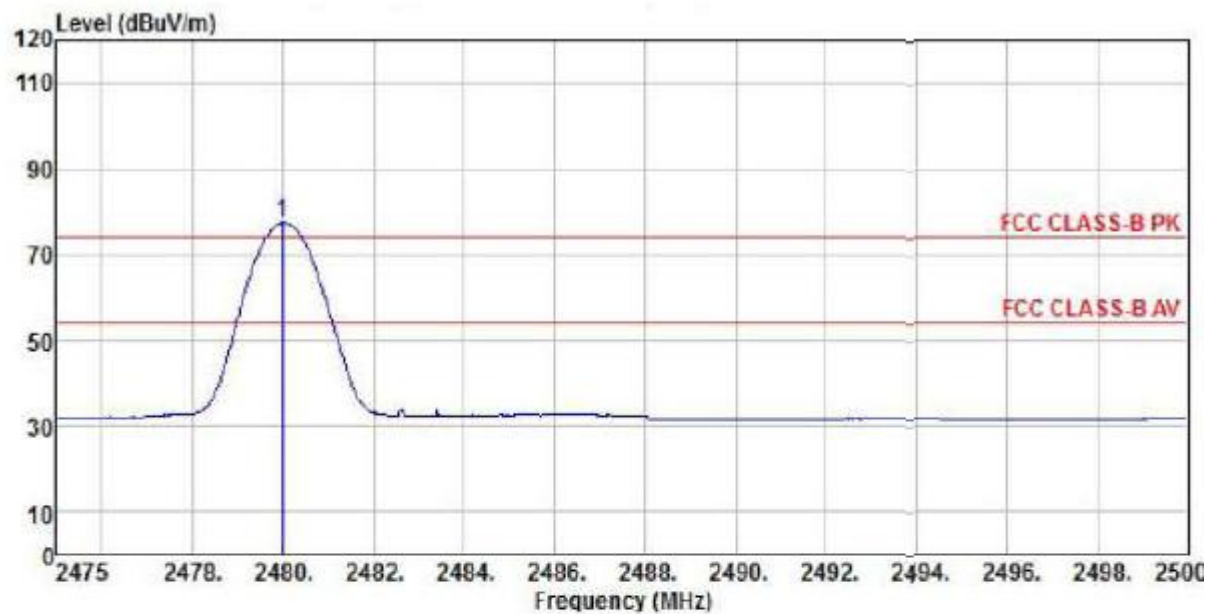


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) VERTICAL
EUT :
Model Name :
Temp/Humi : 23 ℃ /52 %
Power Rating: AC 120V/60Hz
Mode : GFSK CH78
Memo :

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 2480.11	95.72	27.52	7.41	38.31	92.34	74.00	18.34 Peak

Detector mode: Average

Polarity: Horizontal

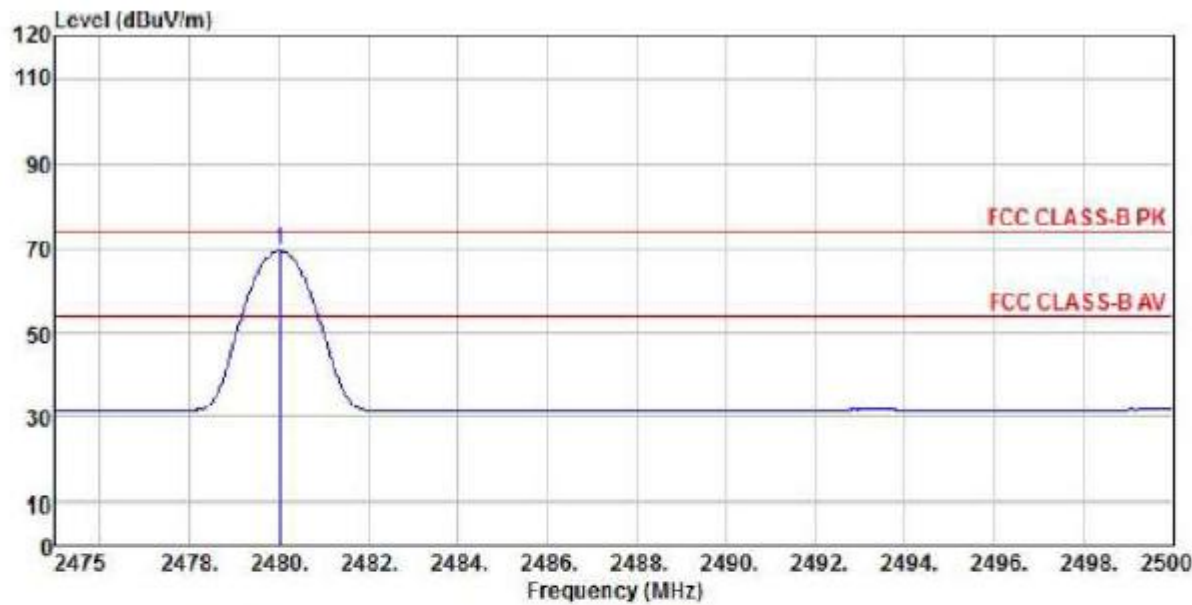


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : GFSK CH78
Memo :

	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	2480.00	80.67	27.52	7.41	38.31	77.29	54.00	23.29	Average

Detector mode: Average

Polarity: Vertical



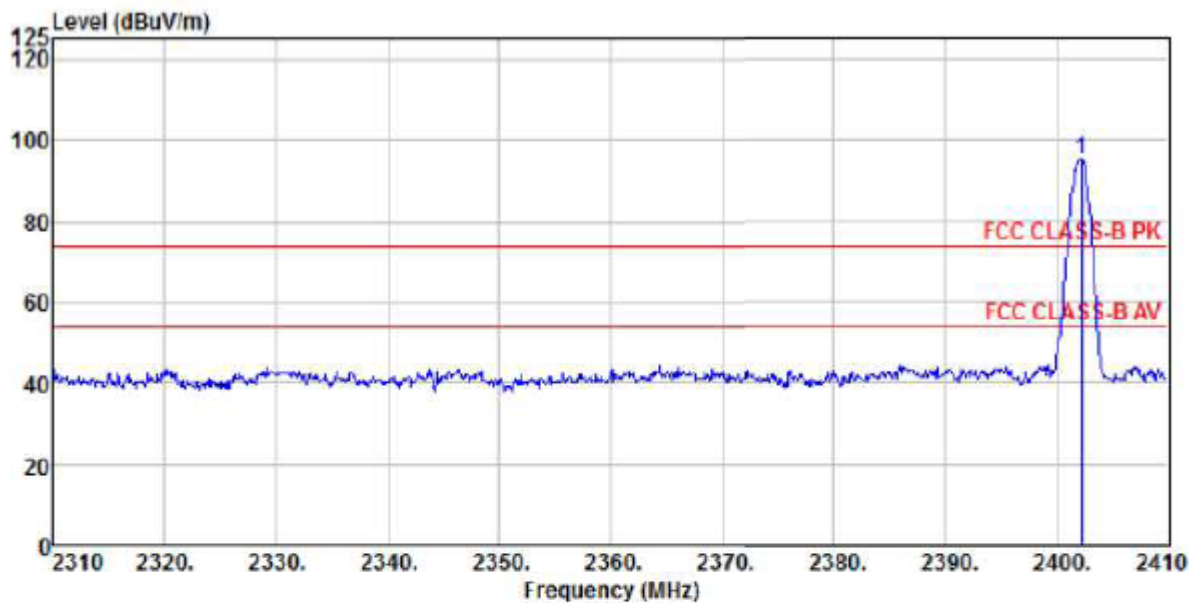
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) VERTICAL
EUT :
Model Name :
Temp/Humi : 23 ℃ /52 %
Power Rating: AC 120V/60Hz
Mode : GFSK CH78
Memo :

		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	2480.03	72.82	27.52	7.41	38.31	69.44	54.00	15.44	Average

BT $\pi/4$ -DQPSK (Low Channel)

Detector mode: Peak

Polarity: Horizontal

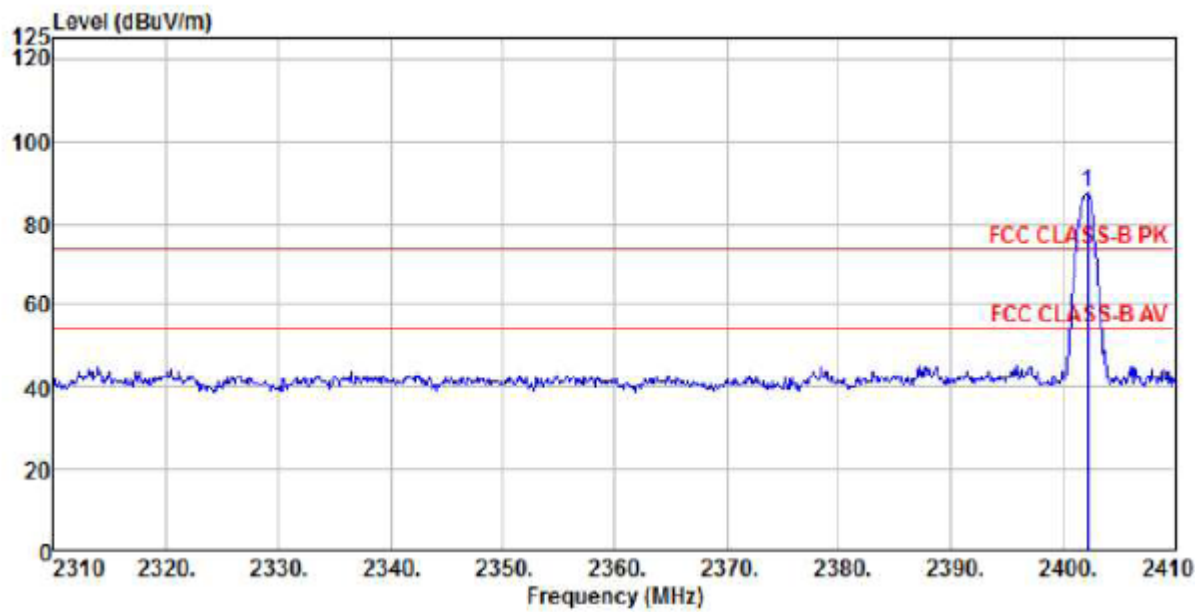


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : $\pi/4$ -DPSK CH0
Memo :

	Freq	ReadAntenna		Cable Preamp		Limit	Over	
		Level	Factor	Loss	Factor			
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pp	2402.20	98.72	27.54	7.13	38.34	95.05	74.00	21.05 Peak

Detector mode: Peak

Polarity: Vertical

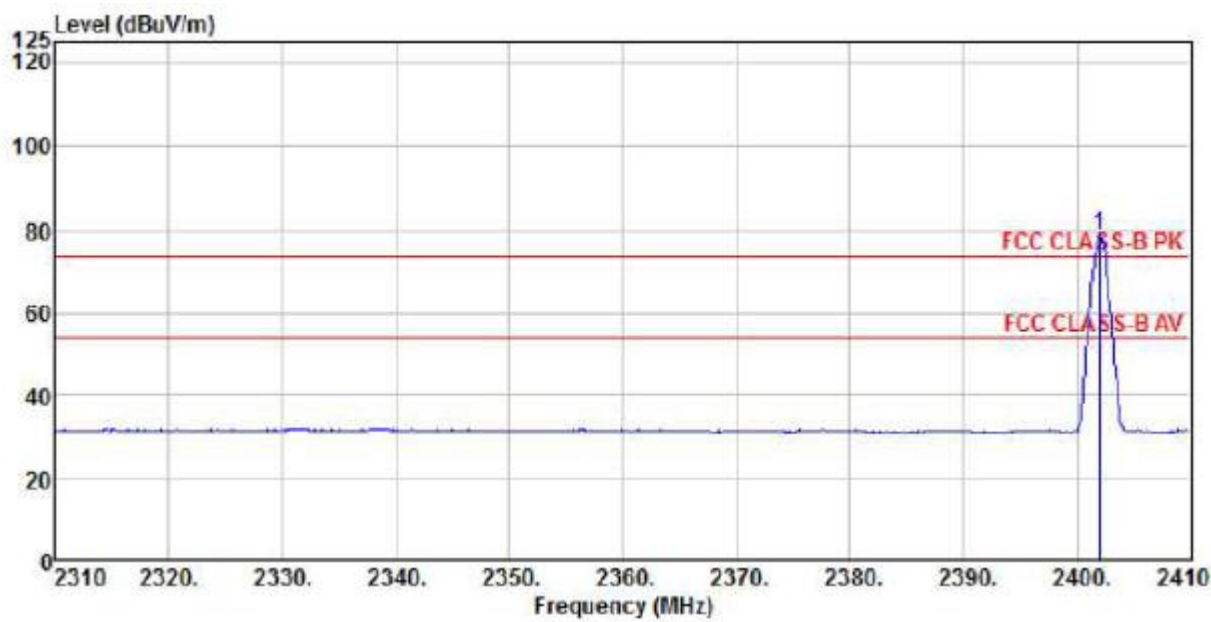


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) VERTICAL
EUT :
Model Name :
Temp/Humi : 23 ℃ /52 %
Power Rating: AC 120V/60Hz
Mode : Pi/4-DPSK CH0
Memo :

Freq	ReadAntenna		Cable Preamp		Limit		Over		Remark
	Level	Factor	Loss	Factor	Level	Line	Limit	Limit	
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	dB	
1 pp 2402.20	91.11	27.54	7.13	38.34	87.44	74.00	13.44		Peak

Detector mode: Average

Polarity: Horizontal

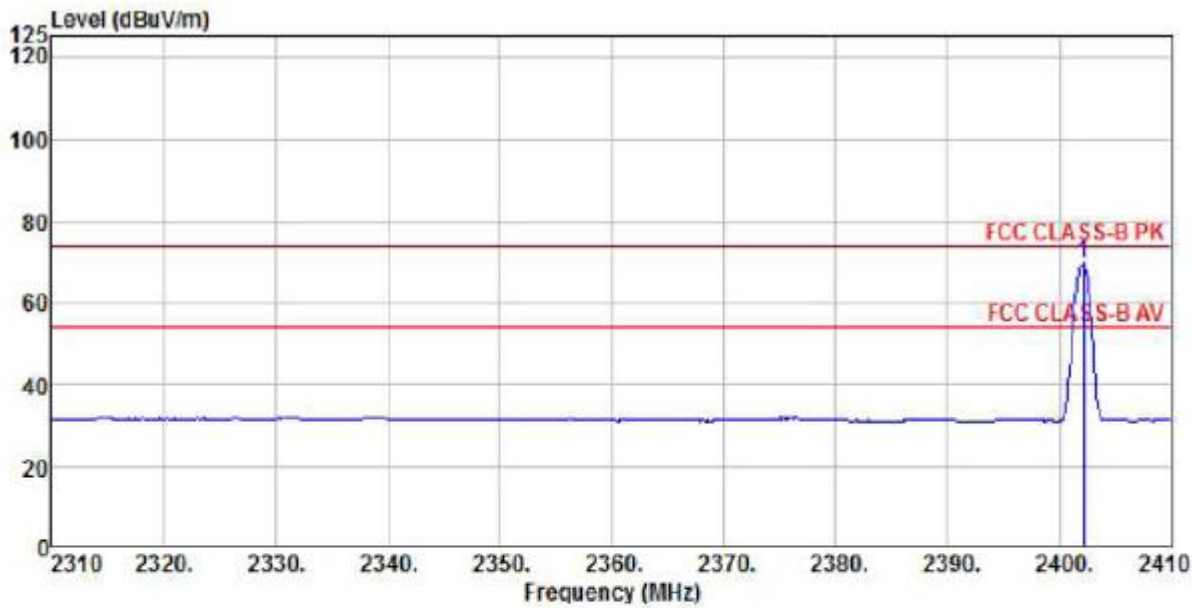


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : Pi/4-DPSK CH0
Memo :

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 2402.00	82.69	27.54	7.13	38.34	79.02	54.00	25.02 Average

Detector mode: Average

Polarity: Vertical



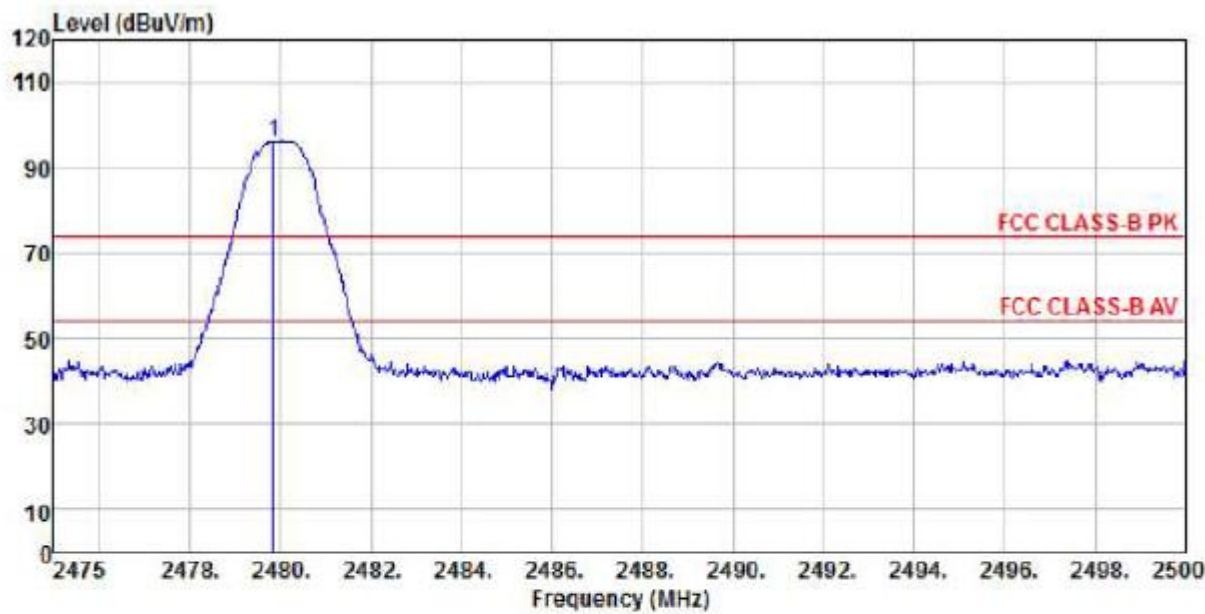
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) VERTICAL
EUT :
Model Name :
Temp/Humi : 23 ℃ /52 %
Power Rating: AC 120V/60Hz
Mode : Pi/4-DPSK CH0
Memo :

Freq	ReadAntenna		Cable		Preamp		Limit	Over	Remark
	Level	Factor	Loss	Factor	Level	Level	Line	Limit	
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m		dB	
1 pp 2402.20	73.20	27.54	7.13	38.34	69.53	54.00	15.53	Average	

BT $\pi/4$ -DQPSK (High Channel)

Detector mode: Peak

Polarity: Horizontal

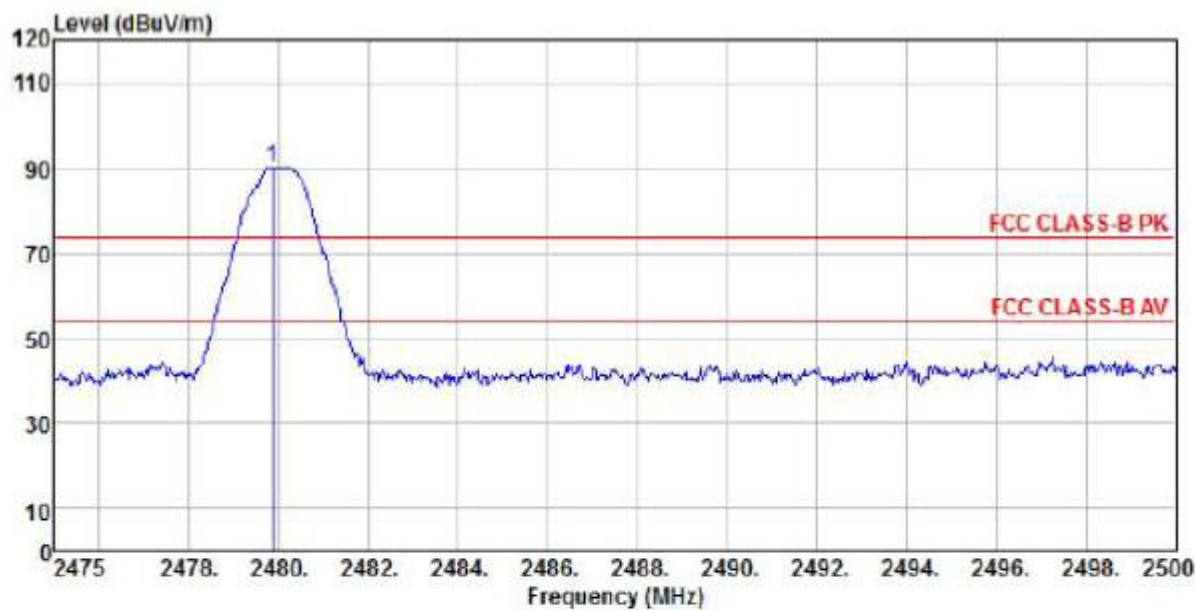


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : Pi/4-DPSK CH78
Memo :

		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 2479.85	99.68	27.52	7.41	38.31	96.30	74.00	22.30	Peak

Detector mode: Peak

Polarity: Vertical

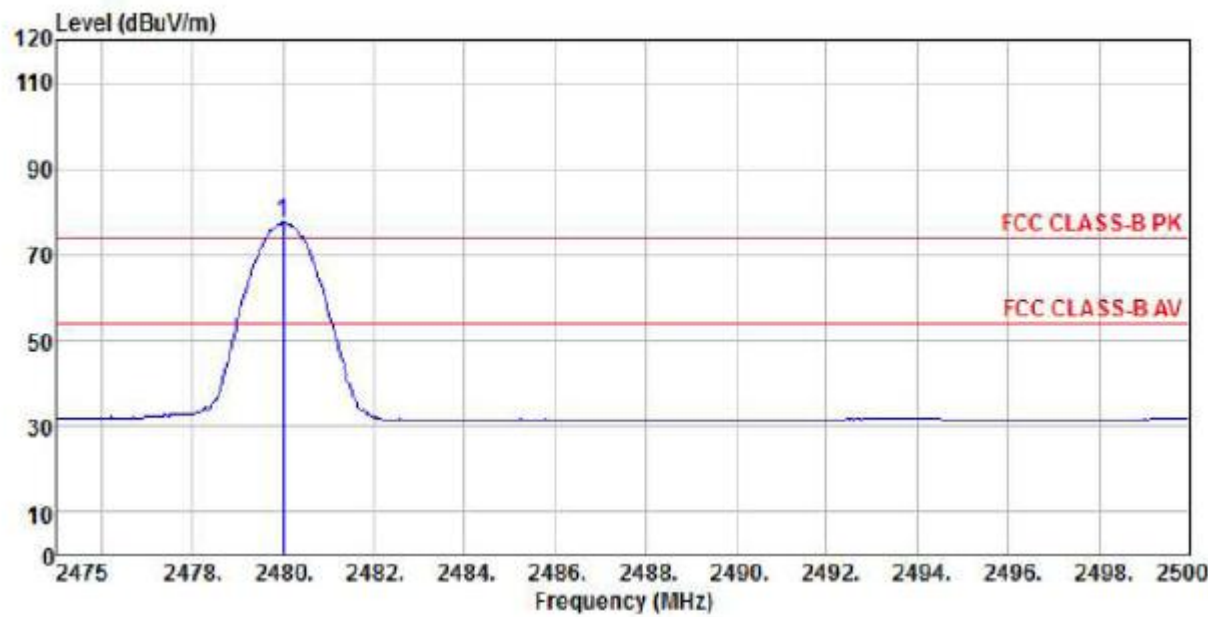


Site : chamber
Condition : FCC CLASS-B PK 3m DDIIA9120D(943) VERTICAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : Pi/4-DPSK CH78
Memo :

Freq	ReadAntenna		Cable Preamp		Level	Limit	Over	Remark
	Level	Factor	Loss	Factor		Line	Limit	
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 pp 2479.87	93.84	27.52	7.41	38.31	90.46	74.00	16.46	Peak

Detector mode: Average

Polarity: Horizontal

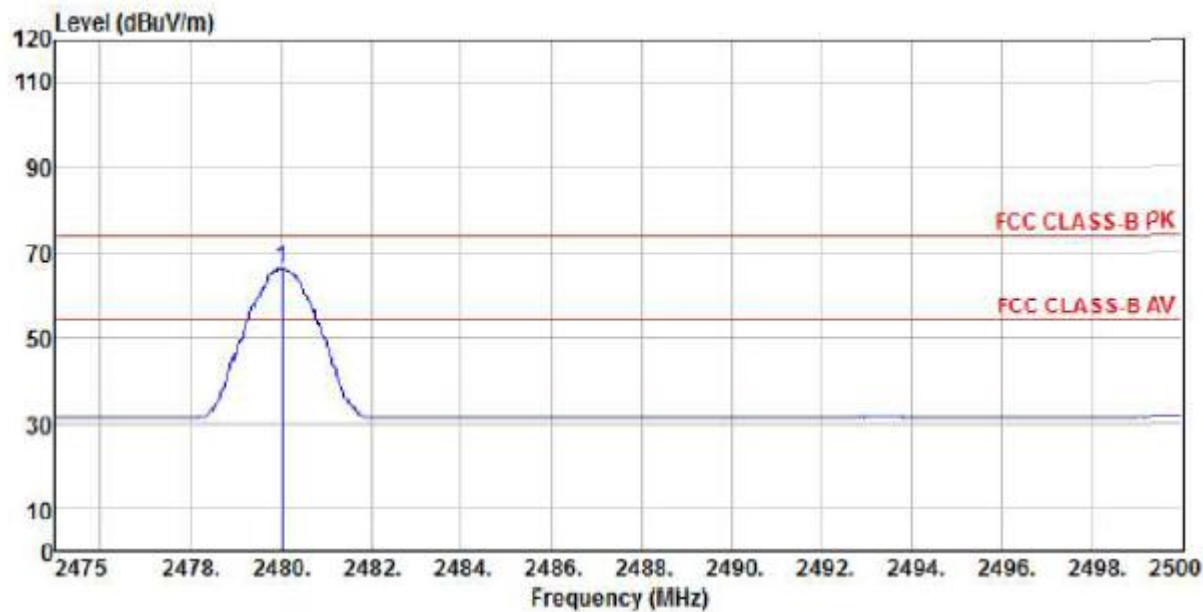


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : Pi/4-DPSK CH78
Memo :

	Freq	ReadAntenna	Cable	Preamp	Limit	Over	
		Level	Factor	Loss	Factor	Level	Line
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
1 pp	2480.00	80.67	27.52	7.41	38.31	77.29	54.00
							23.29
							Average

Detector mode: Average

Polarity: Vertical



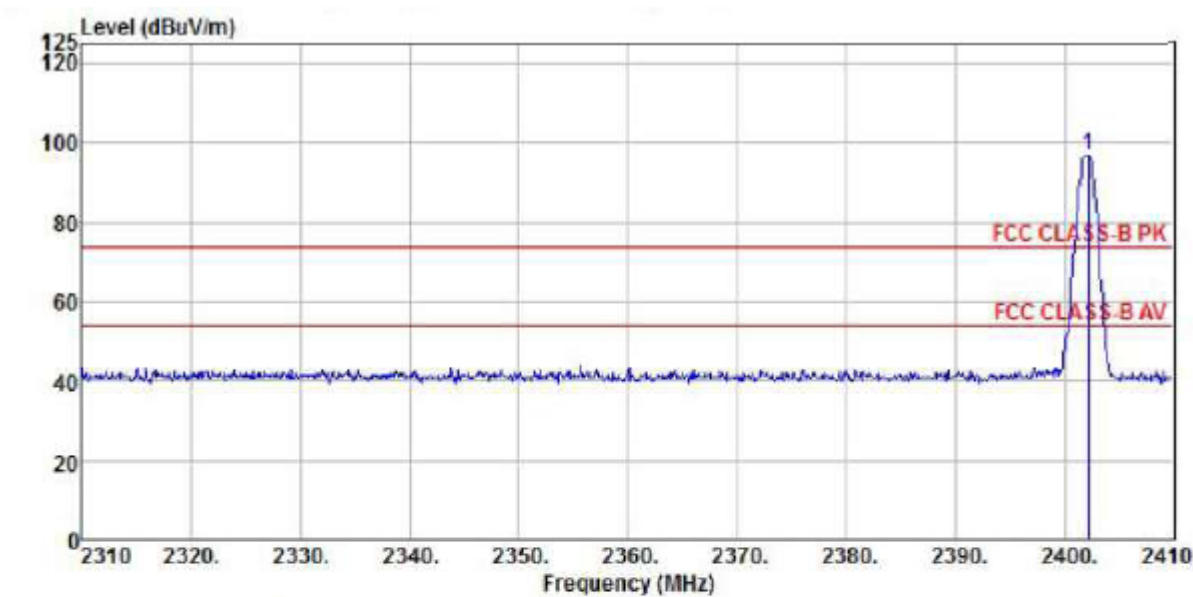
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) VERTICAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : Pi/4-DPSK CH78
Memo :

Freq	ReadAntenna		Cable Preamp		Limit		Over		Remark
	Level	Factor	Loss	Factor	Level	Line	Limit		
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1 pp 2480.03	69.82	27.52	7.41	38.31	66.44	54.00	12.44	Average	

BT 8-DPSK (Low Channel)

Detector mode: Peak

Polarity: Horizontal

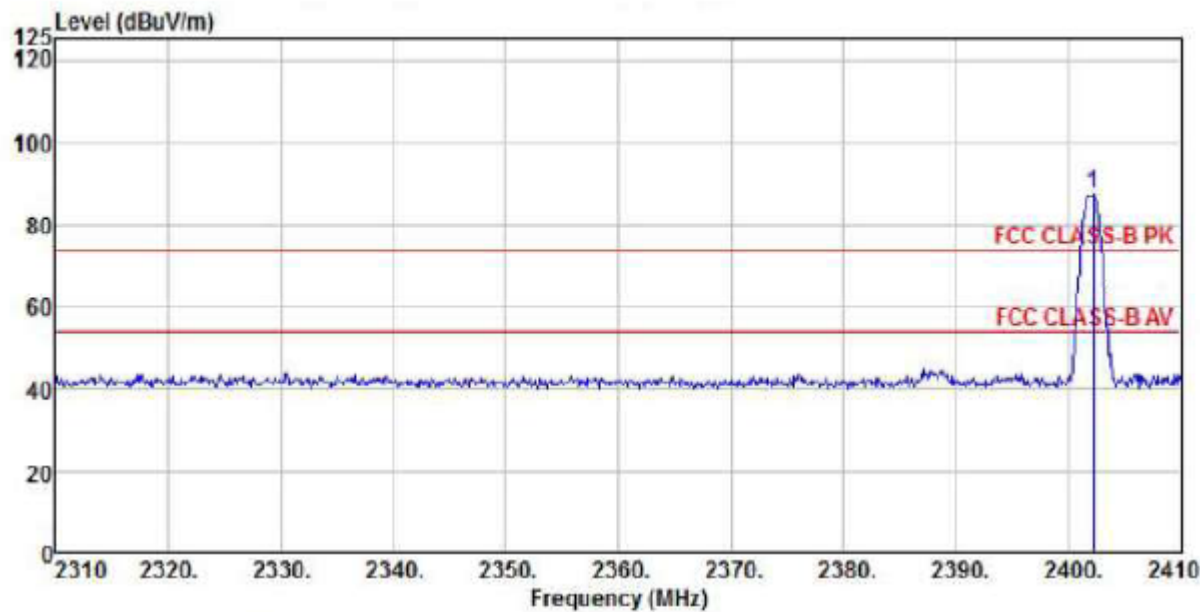


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : 8DPSK CH0
Memo :

	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	2402.20	100.72	27.54	7.13	38.34	97.05	74.00	23.05 Peak

Detector mode: Peak

Polarity: Vertical

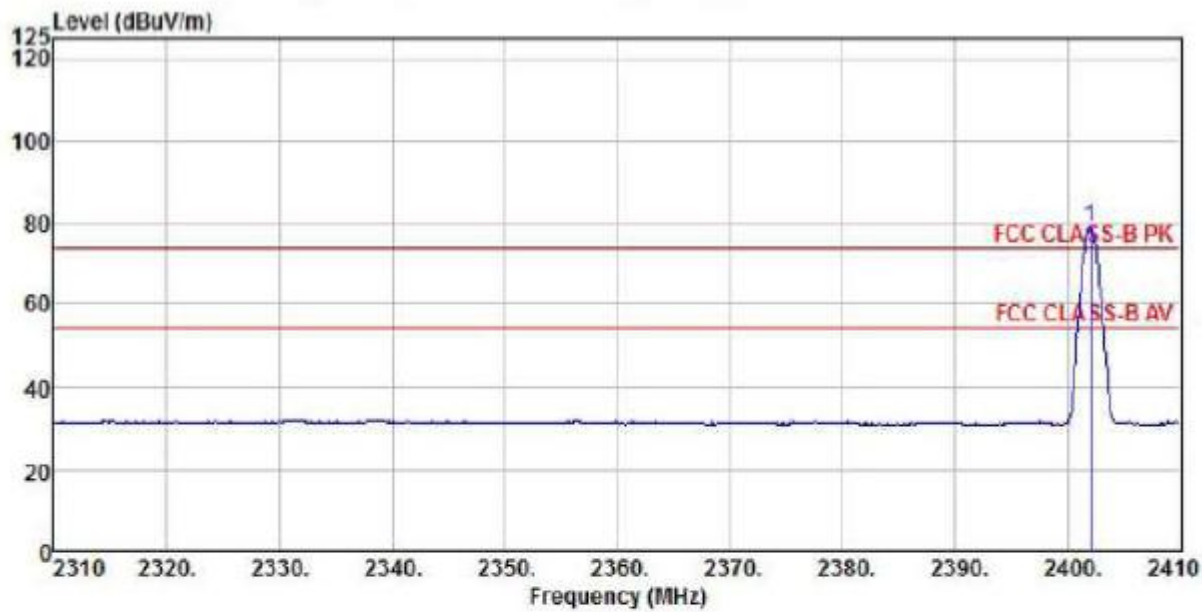


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) VERTICAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : 8DPSK CH0
Memo :

Freq	ReadAntenna		Cable	Preamp	Level	Limit	Over	Remark
	Level	Factor						
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 pp 2402.20	91.11	27.54	7.13	38.34	87.44	74.00	13.44	Peak

Detector mode: Average

Polarity: Horizontal

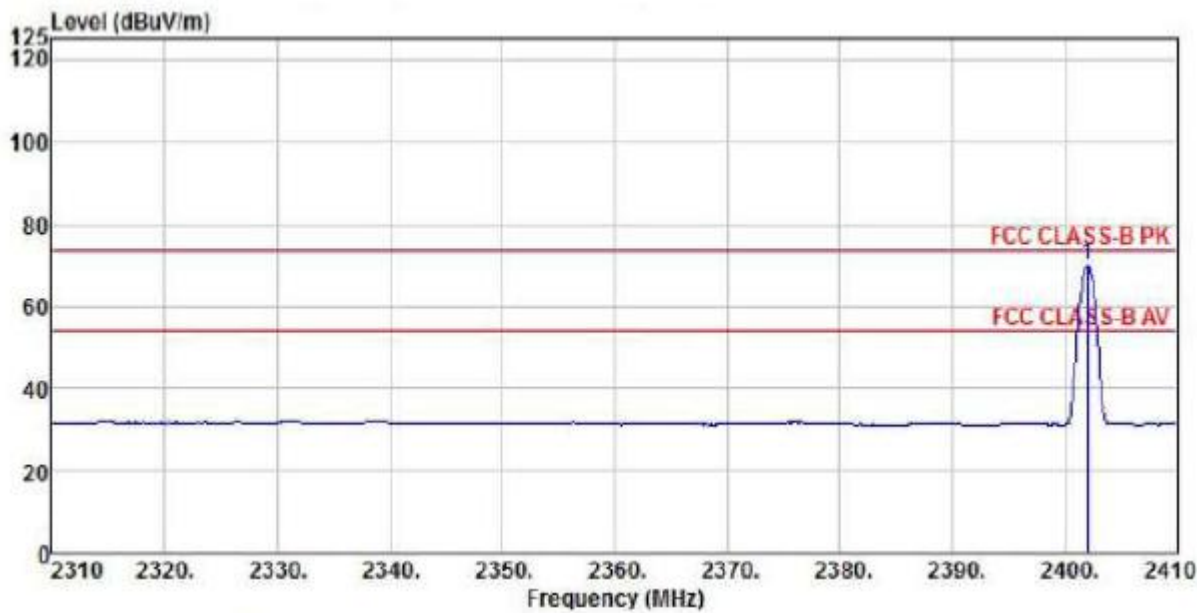


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : 8DPSK CH0
Memo :

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 2402.00	82.69	27.54	7.13	38.34	79.02	54.00	25.02	Average

Detector mode: Average

Polarity: Vertical



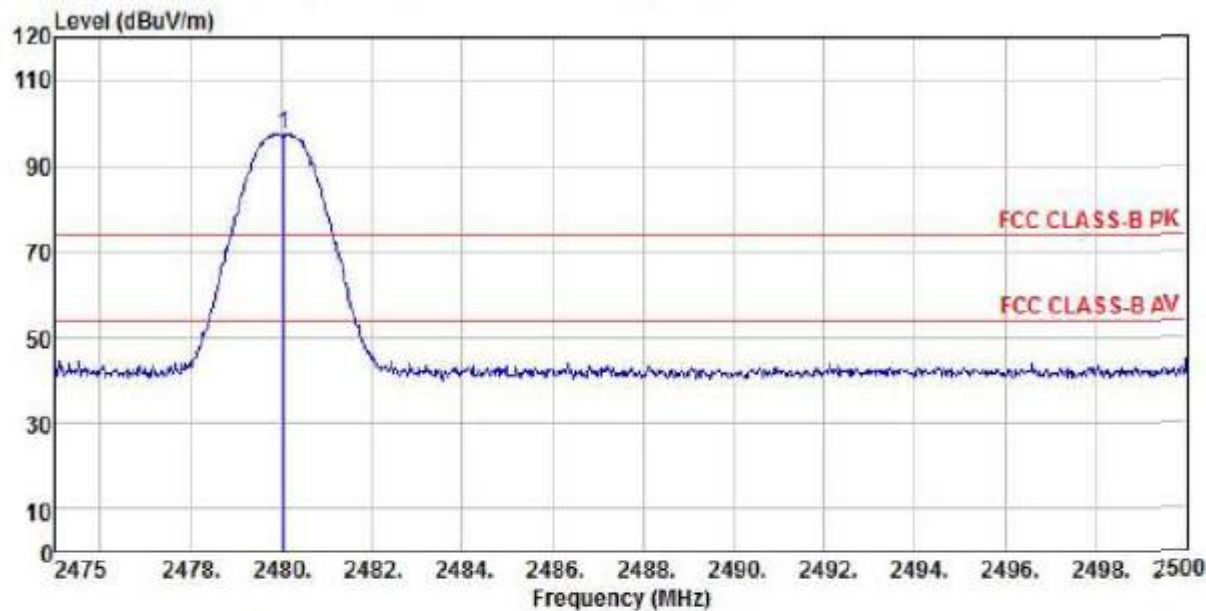
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) VERTICAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : 8DPSK CH0
Memo :

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 2402.00	73.62	27.54	7.13	38.34	69.95	54.00	15.95	Average

BT 8-DPSK (High Channel)

Detector mode: Peak

Polarity: Horizontal

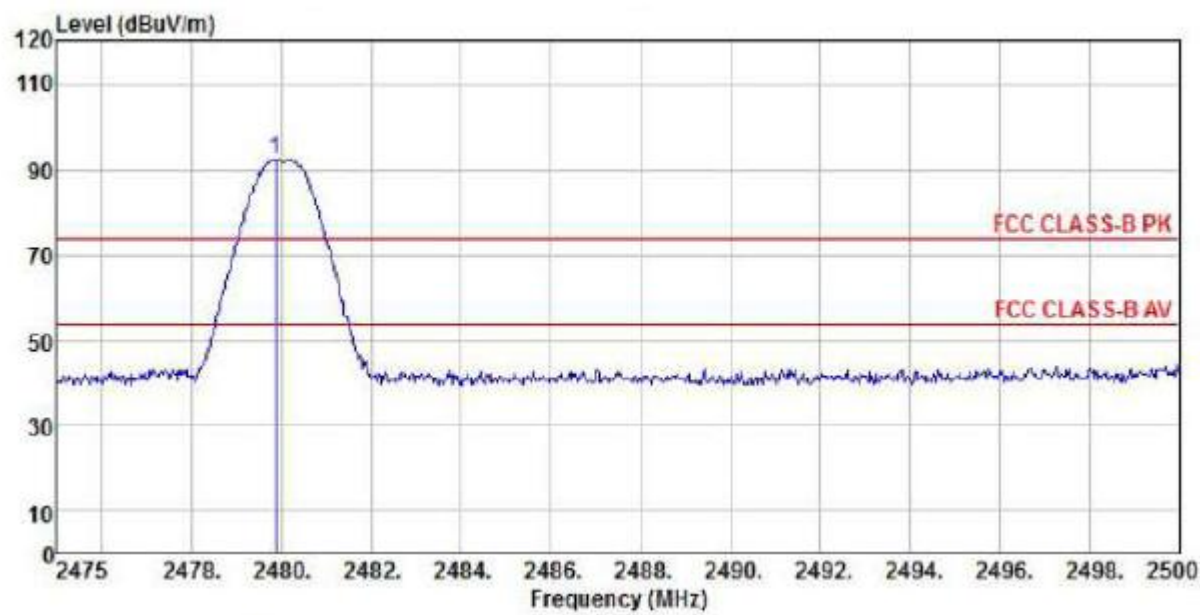


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : 8DPSK CH78
Memo :

Freq	ReadAntenna		Cable Preamp		Level	Limit	Over	Remark
	Level	Factor	Loss	Factor		Line	Limit	
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 pp 2480.05	100.72	27.52	7.41	38.31	97.34	74.00	23.34	Peak

Detector mode: Peak

Polarity: Vertical

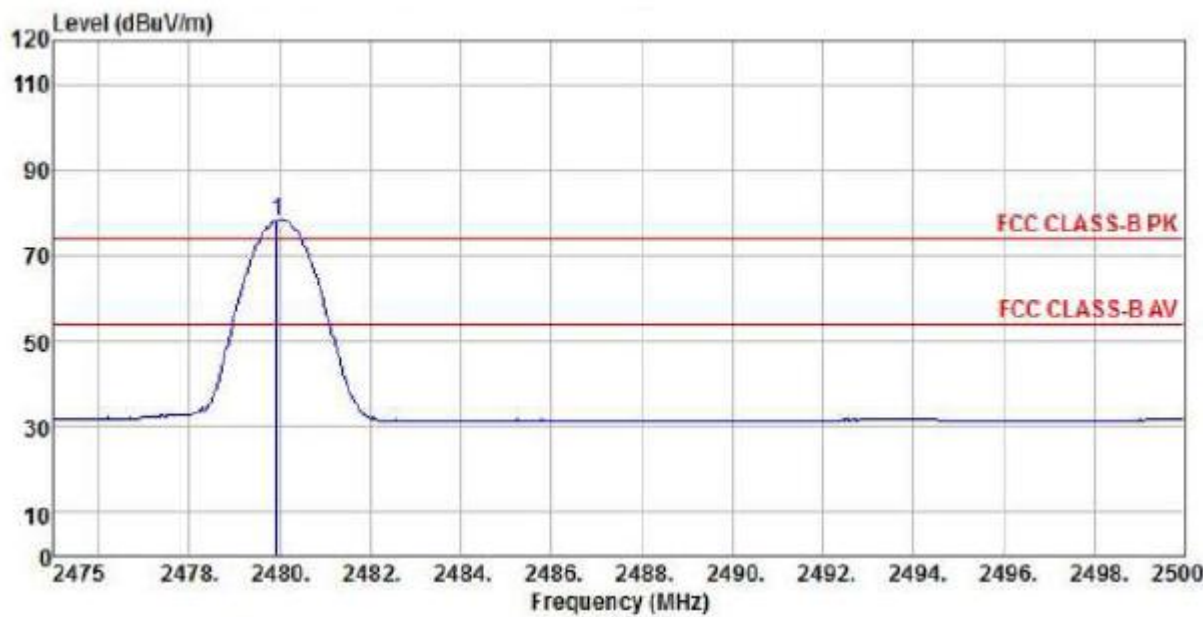


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) VERTICAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : 8DPSK CH78
Memo :

		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	2479.87	95.84	27.52	7.41	38.31	92.46	74.00	18.46 Peak

Detector mode: Average

Polarity: Horizontal

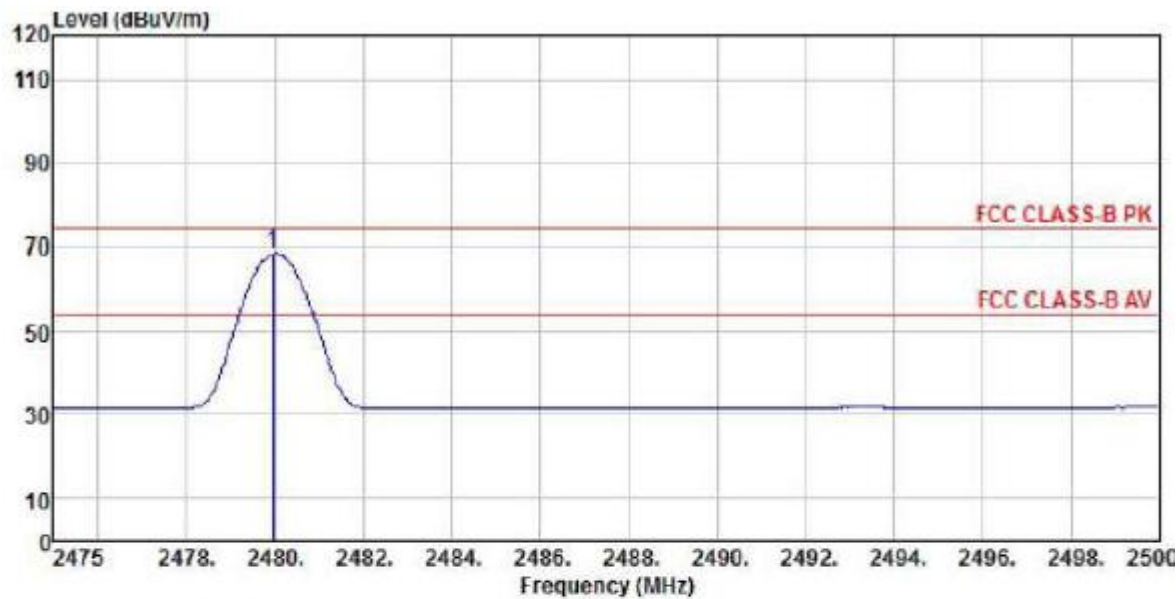


Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : 8DPSK CH78
Memo :

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	2479.93	81.52	27.52	7.41	38.31	78.14	54.00	24.14	Average

Detector mode: Average

Polarity: Vertical



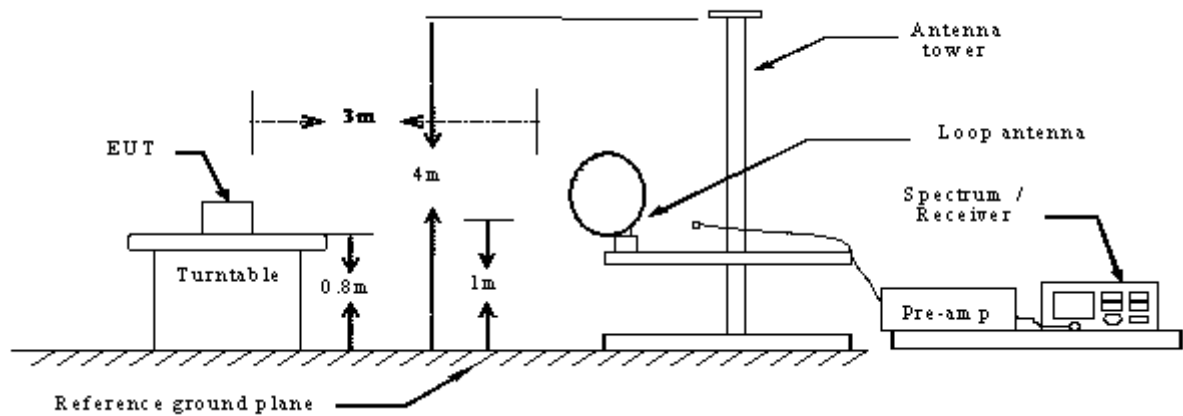
Site : chamber
Condition : FCC CLASS-B PK 3m BBHA9120D(943) VERTICAL
EUT :
Model Name :
Temp/Humi : 23 ℃ /52 %
Power Rating: AC 120V/60Hz
Mode : 8DPSK CH78
Memo :

	Freq	ReadAntenna		Cable Preamp		Limit		Over	
		Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 pp	2479.95	71.73	27.52	7.41	38.31	68.35	54.00	14.35	Average

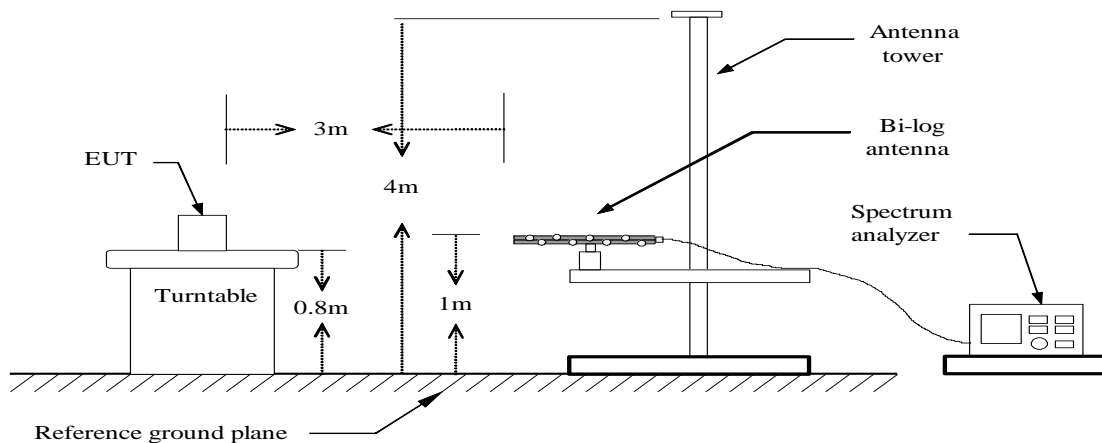
11. SPURIOUS EMISSIONS (RADIATION)

11.1 TEST SETUP

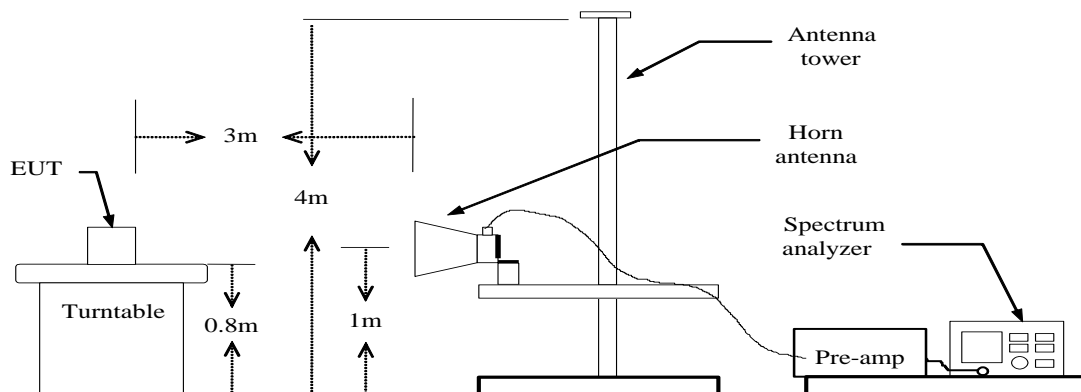
Radiated Spurious Measurement: below 30MHz



Radiated Spurious Measurement: below 1GHz



Radiated Spurious Measurement: above 1GHz



11.2 LIMITS

Frequency (MHz)	Limits (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 (uV/m), d1 = 300 (m), d2 = 3 (m), so L2 as follows:

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

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 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=1kHz 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

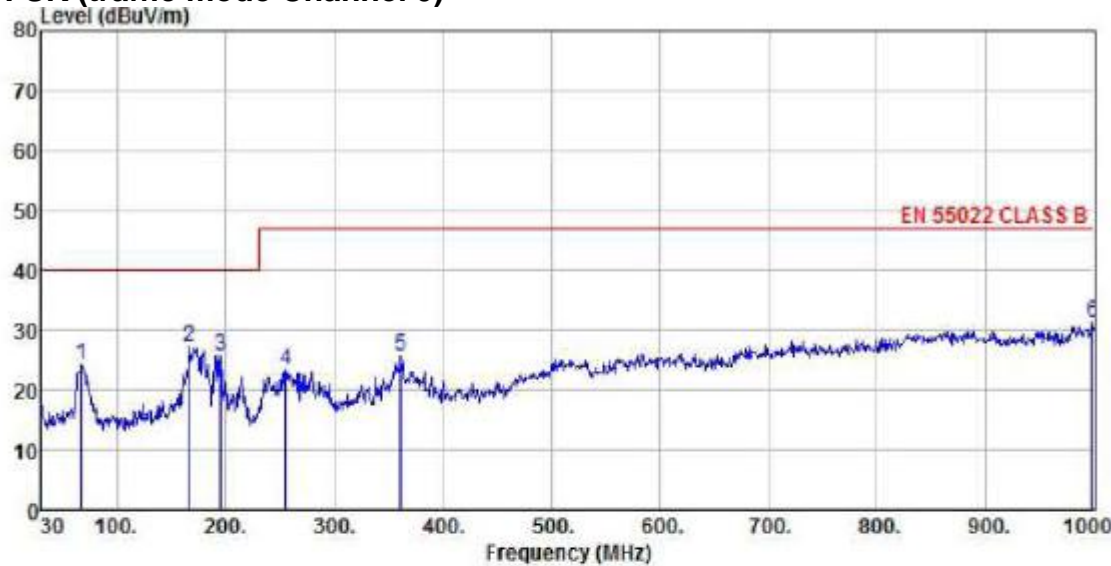
From 9kHz to 30MHz:

The test data was 20dB lower than the permissible limit was not recorded in the report.

From 30MHz to 1GHz:

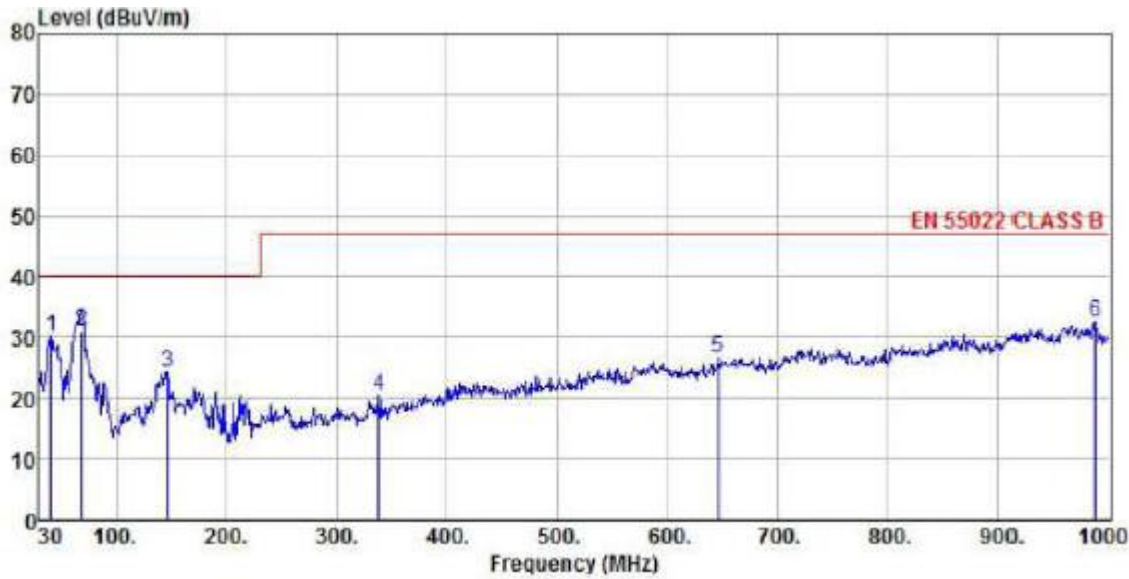
Only show the worst test data when EUT was operated on different mode.

BT GFSK (traffic mode Channel 0)



Site : chamber
Condition : EN 55022 CLASS B 3m VULB9160 HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : BT GFSK CH0
Memo :

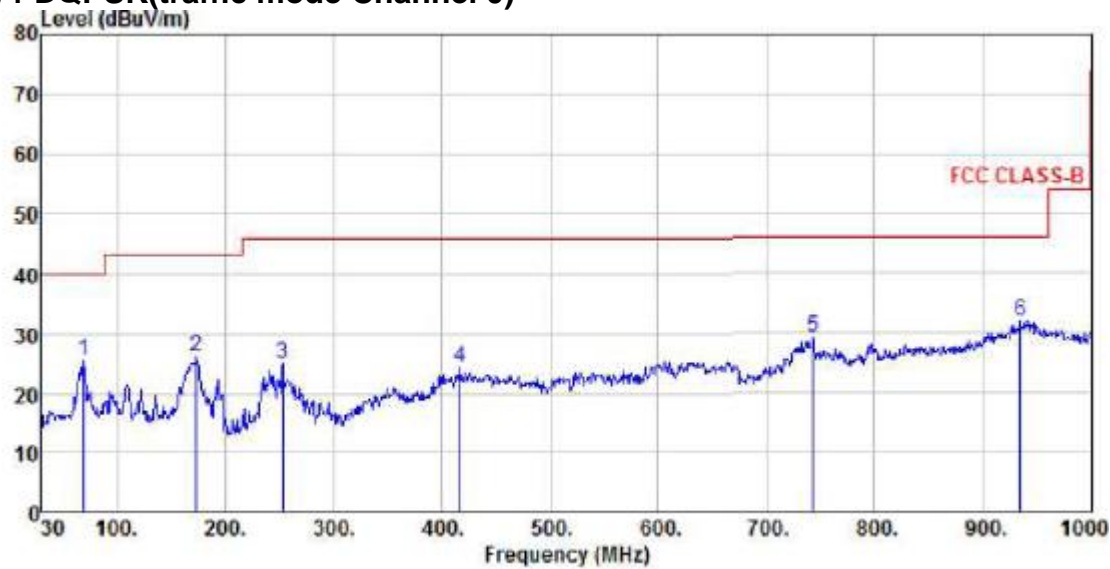
	Freq	ReadAntenna Level	Cable Factor	Preamp Loss	Level	Limit	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	66.86	11.17	11.89	1.10	0.00	24.16	40.00	-15.84 Peak
2 pp	165.80	11.85	13.55	1.77	0.00	27.17	40.00	-12.83 Peak
3	194.90	13.12	10.81	1.89	0.00	25.82	40.00	-14.18 Peak
4	255.04	9.06	12.00	2.17	0.00	23.23	47.00	-23.77 Peak
5	360.77	8.64	14.39	2.66	0.00	25.69	47.00	-21.31 Peak
6	998.06	3.40	23.44	4.35	0.00	31.19	47.00	-15.81 Peak



Site : chamber
Condition : EN 55022 CLASS B 3m VULB9160 VERTICAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : BT GFSK CH0
Memo :

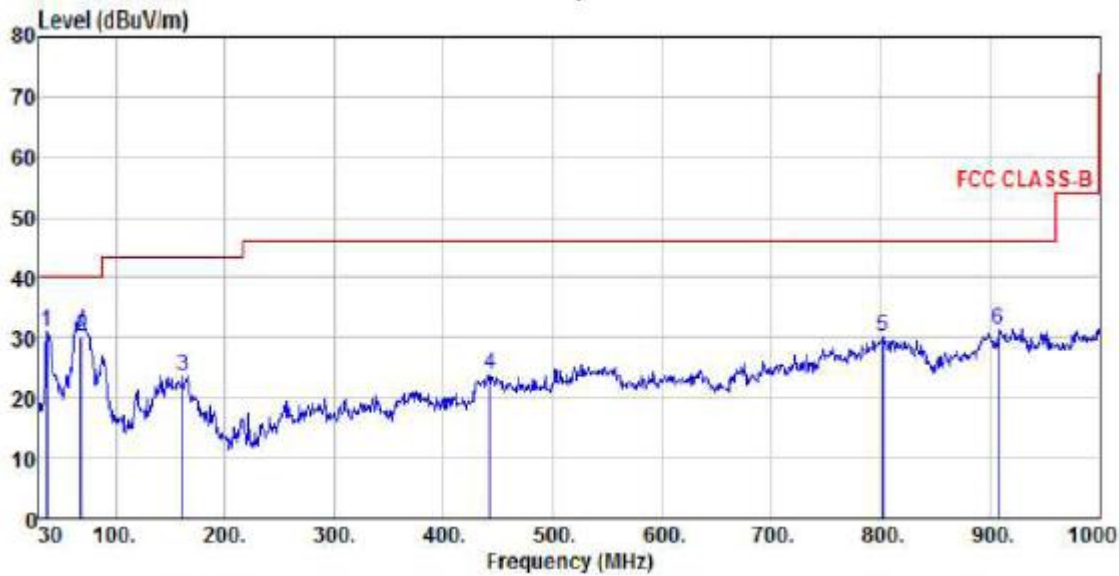
		ReadAntenna	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1 pk	40.67	16.65	12.71	0.83	0.00	30.19	40.00	-9.81
2 pp	68.68	18.53	11.44	1.11	0.00	31.08	40.00	-8.92
3	146.40	8.94	13.68	1.63	0.00	24.25	40.00	-15.75
4	338.46	3.89	14.09	2.51	0.00	20.49	47.00	-26.51
5	645.95	3.50	19.53	3.53	0.00	26.56	47.00	-20.44
6	986.42	4.72	23.43	4.32	0.00	32.47	47.00	-14.53

BT Π/4-DQPSK(traffic mode Channel 0)



Site : chamber
Condition : FCC CLASS-B 3m VULB9160 HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : Π/4-DPSK ch0
Memo :

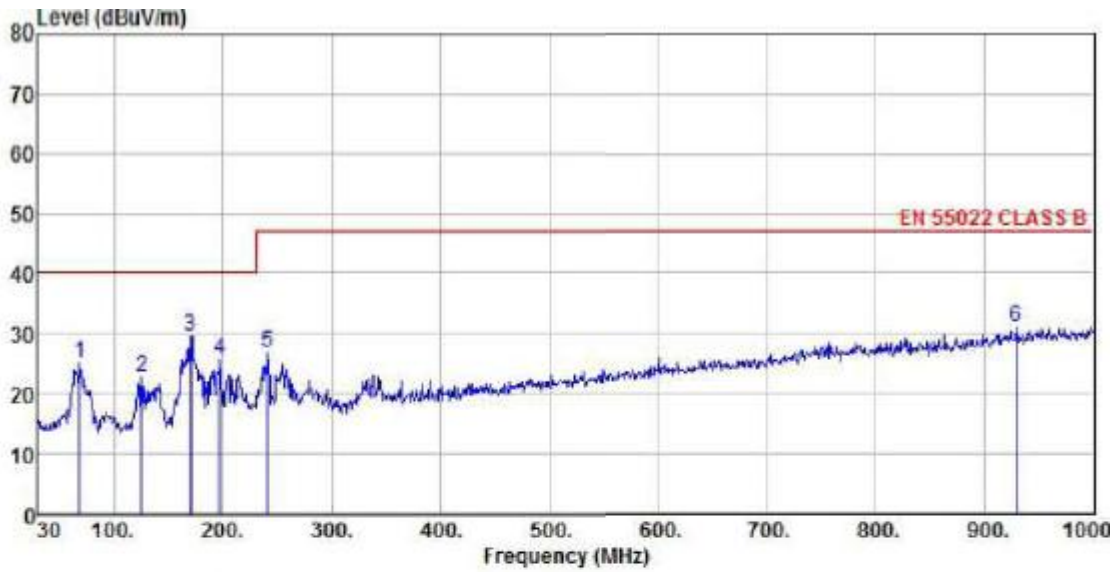
	Freq	ReadAntenna Level	Cable Factor	Preamp Loss	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	68.80	13.12	11.44	1.11	0.00	25.67	40.00	-14.33	Peak
2	172.59	11.36	12.97	1.86	0.00	26.19	43.50	-17.31	Peak
3	253.10	11.08	11.96	2.16	0.00	25.20	46.00	-20.80	Peak
4	416.06	6.11	15.62	2.83	0.00	24.56	46.00	-21.44	Peak
5	742.95	4.23	21.18	3.78	0.00	29.19	46.00	-16.81	Peak
6 pp	935.01	4.52	23.15	4.12	0.00	31.79	46.00	-14.21	Peak



Site : chamber
Condition : FCC CLASS-B 3m VULB9160 VERTICAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : Pi/4-DPSK ch0
Memo :

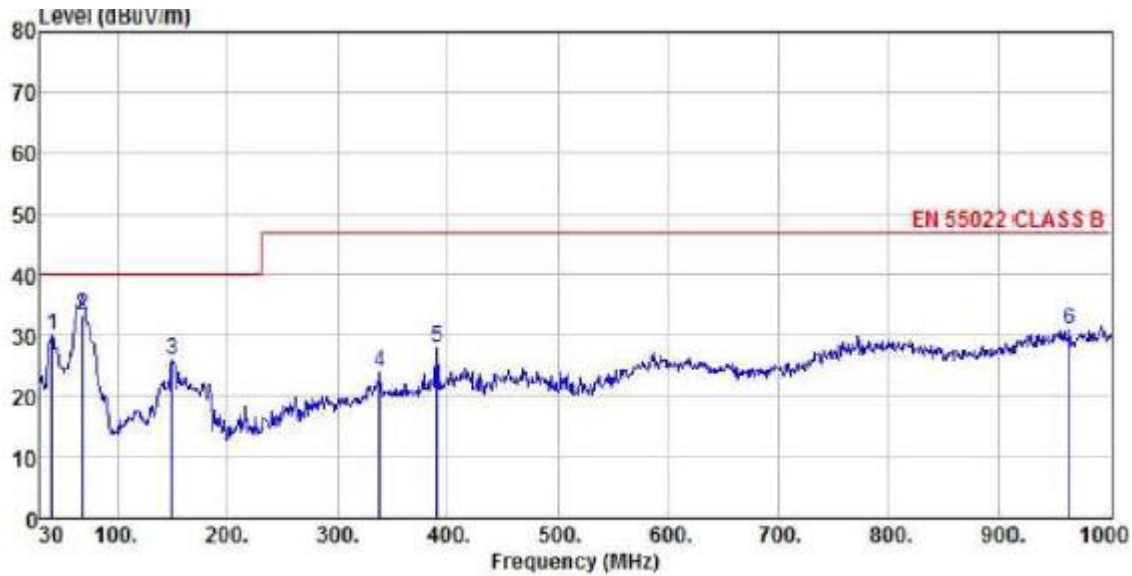
		ReadAntenna	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	pp	36.79	17.78	12.51	0.77	0.00	31.06	40.00
2	qp	68.78	17.57	11.44	1.11	0.00	30.12	40.00
3		160.95	8.20	13.77	1.69	0.00	23.66	43.50
4		442.25	4.89	16.24	2.86	0.00	23.99	46.00
5		802.12	4.63	21.77	3.81	0.00	30.21	46.00
6		907.85	4.53	22.69	4.07	0.00	31.29	46.00

BT 8-DPSK(traffic mode Channel 39)



Site : chamber
Condition : EN 55022 CLASS B 3m VULB9160 HORIZONTAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : BT 8-DPSK CH39
Memo :

	Freq	ReadAntenna	Cable	Preamp		Limit	Over	
		Level	Factor	Loss	Factor	Level	Line	Limit Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	68.80	12.59	11.44	1.11	0.00	25.14	40.00	-14.86 Peak
2	125.06	8.91	12.39	1.53	0.00	22.83	40.00	-17.17 Peak
3 pp	169.68	14.38	13.33	1.84	0.00	29.55	40.00	-10.45 Peak
4	196.84	13.16	10.67	1.89	0.00	25.72	40.00	-14.28 Peak
5	240.49	13.06	11.71	2.12	0.00	26.89	47.00	-20.11 Peak
6	929.19	3.74	23.03	4.10	0.00	30.87	47.00	-16.13 Peak



Site : chamber
Condition : EN 55022 CLASS B 3m VULB9160 VERTICAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : BT 8-DPSK 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 pk	40.67	16.44	12.71	0.83	0.00	29.98	40.00	-10.02
2 pp	68.80	20.75	11.44	1.11	0.00	33.30	40.00	-6.70
3	149.31	10.45	13.90	1.63	0.00	25.98	40.00	-14.02
4	338.46	7.26	14.09	2.51	0.00	23.86	47.00	-23.14
5	389.87	10.20	15.10	2.71	0.00	28.01	47.00	-18.99
6	962.17	3.45	23.43	4.21	0.00	31.09	47.00	-15.91

From 1GHz to 25GHz:

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

EUT operation mode : BT GFSK(Ch0/Ch39/Ch78); BT Π /4-DQPSK(Ch0/Ch39/Ch78);
BT 8-DPSK(Ch0/Ch39/Ch78)

BT GFSK traffic mode Ch78

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Antenna Polarity	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
2480	75.10	-2.88	Horizontal	72.22	/	/	Peak
4966	47.11	5.23	H	52.34	74	21.66	Peak
7445	32.23	13.15	H	45.38	74	28.62	Peak
2480	74.39	-2.88	Vertical	71.51	/	/	Peak
4966	45.66	5.23	V	50.89	74	23.11	Peak
7445	31.46	12.85	V	44.31	74	29.69	Peak

Note: 1, Total=Reading+Correct factor

2, 2480 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.

BT Π/4-DQPSK traffic mode Ch39

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Antenna Polarity	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
2441	71.40	-3.29	Horizontal	68.11	/	/	Peak
4880	46.09	5.02	H	51.11	74	22.89	Peak
7312	32.03	11.86	H	43.89	74	30.11	Peak
2441	70.34	-3.29	Vertical	67.05	/	/	Peak
4880	42.67	5.02	V	47.69	74	27.31	Peak
7312	30.45	12.36	V	42.81	74	31.19	Peak

Note: 1, Total=Reading+Correct factor

2, 2441MHz 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.

BT 8-DPSK traffic mode Ch39

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Antenna Polarity	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector Type
2441	71.44	-3.29	Horizontal	68.15	/	/	Peak
4882	45.98	5.02	H	51.00	74	23	Peak
7322	32.02	11.86	H	43.88	74	30.12	Peak
2441	70.39	-3.29	Vertical	67.50	/	/	Peak
4882	42.37	5.02	V	47.39	74	26.61	Peak
7322	30.32	12.36	V	42.68	74	31.32	Peak

Note: 1, Total=Reading+Correct factor

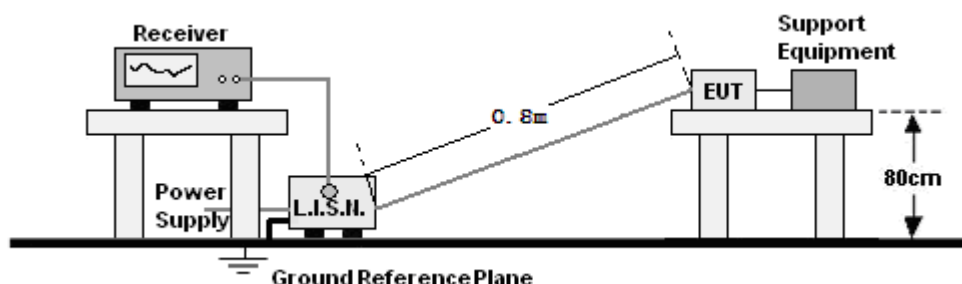
2, 2441MHz was fundamental signal which can be ignored.

3, Average measurement was not performed if peak level were lower than the average limit.

4, Other harmonics are lower than background noise.

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.

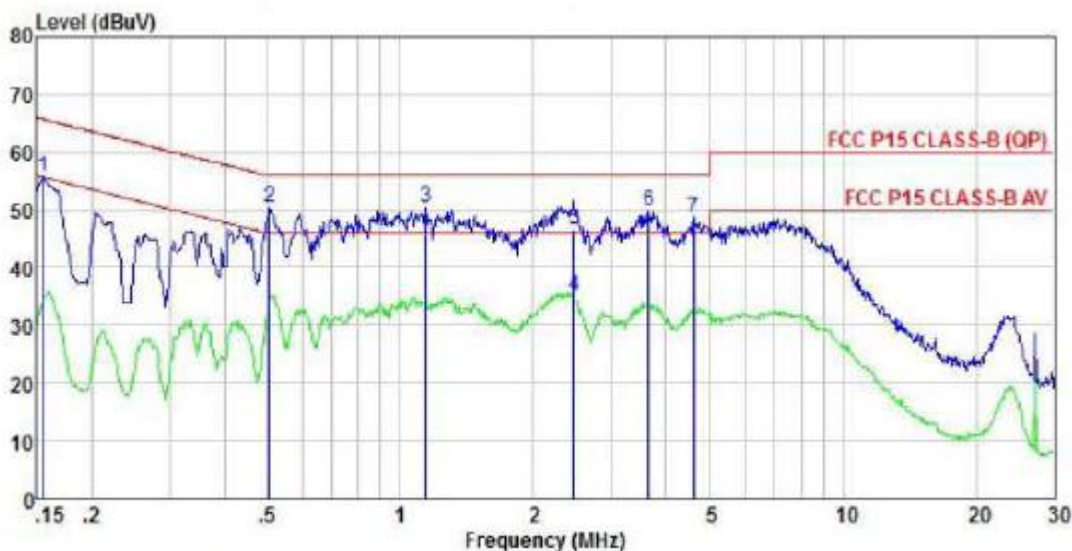
12.4 RESULTS & PERFORMANCE

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

EUT work mode: BT GFSK(CH0/39/78); BT π /4-DQPSK(CH0/39/78);
BT 8-DPSK(CH0/39/78)

GFSK traffic mode Ch0

Line

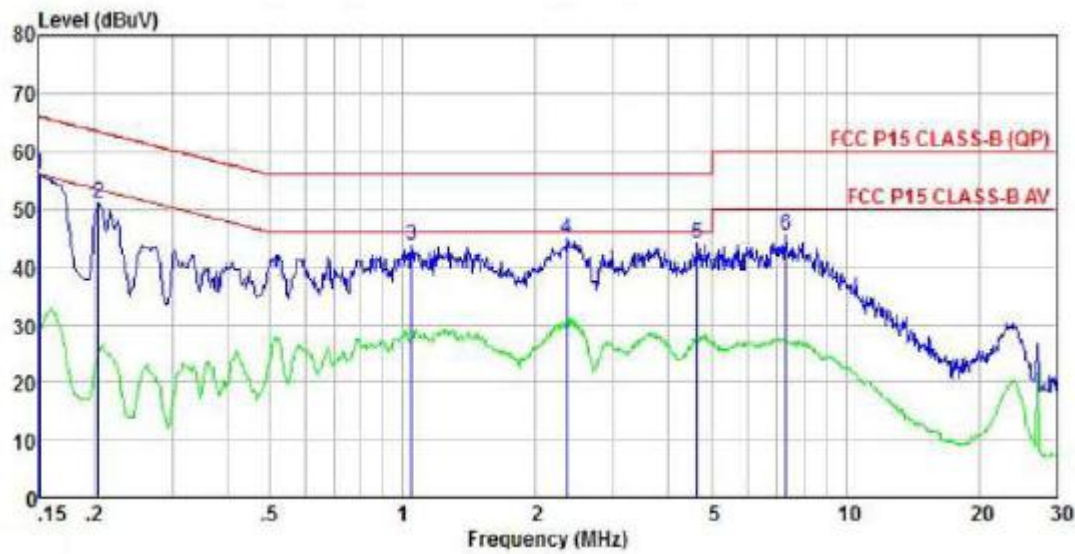


Site : chamber
Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : BT GFSK CH0
Memo :

		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	45.29	10.38	0.09	0.00	55.76	65.74	-9.98	Peak
2	pp	0.50	39.93	10.56	0.10	0.00	50.59	56.00	-5.41 Peak
3		1.14	39.68	10.52	0.14	0.00	50.34	56.00	-5.66 Peak
4	av	2.47	24.48	10.52	0.15	0.00	35.15	46.00	-10.85 Average
5	qp	2.47	35.92	10.52	0.15	0.00	46.59	56.00	-9.41 QP
6		3.66	39.24	10.52	0.14	0.00	49.90	56.00	-6.10 Peak
7		4.62	37.94	10.52	0.14	0.00	48.60	56.00	-7.40 Peak

GFSK traffic mode Ch0

Neutral

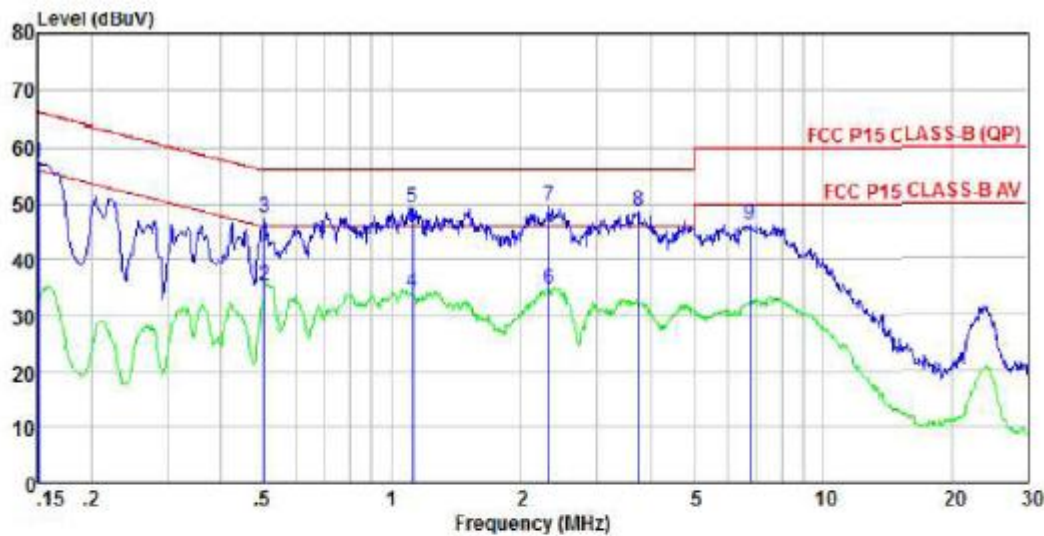


Site : chamber
Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : BT GFSK CH0
Memo :

		Read	LISN	Cable	Preamp		Limit	Over	
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1 pp	0.15	45.59	10.29	0.09	0.00	55.97	66.00	-10.03	Peak
2	0.20	40.31	10.43	0.22	0.00	50.96	63.45	-12.49	Peak
3	1.04	33.16	10.31	0.14	0.00	43.61	56.00	-12.39	Peak
4	2.36	34.29	10.32	0.15	0.00	44.76	56.00	-11.24	Peak
5	4.65	33.48	10.32	0.14	0.00	43.94	56.00	-12.06	Peak
6	7.29	34.95	10.34	0.31	0.00	45.60	60.00	-14.40	Peak

Π /4-DQPSK; traffic mode; Ch39

Line

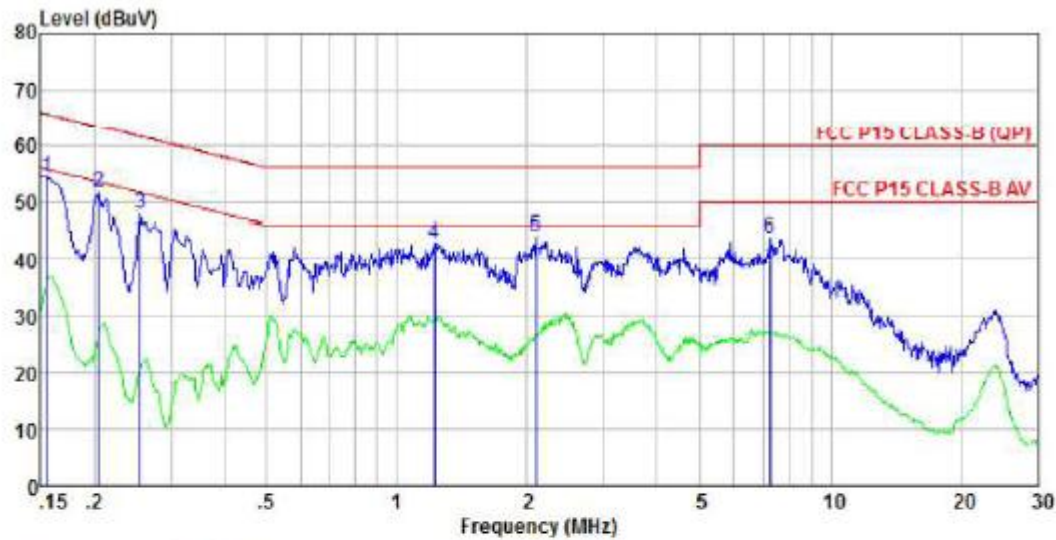


Site : chamber
Condition : FCC P15 CLASS-B (QP) ENV216(L)-20120730 LINE
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : Pi/4-DPSK ch39
Memo :

		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	46.83	10.36	0.09	0.00	57.28	66.00	-8.72	Peak
2 av	0.50	24.62	10.56	0.10	0.00	35.28	46.00	-10.72	Average
3	0.50	36.83	10.56	0.10	0.00	47.49	56.00	-8.51	Peak
4	1.12	23.57	10.52	0.14	0.00	34.23	46.00	-11.77	Average
5	1.12	38.68	10.52	0.14	0.00	49.34	56.00	-6.66	Peak
6	2.32	24.29	10.52	0.15	0.00	34.96	46.00	-11.04	Average
7 pp	2.32	38.79	10.52	0.15	0.00	49.46	56.00	-6.54	Peak
8	3.72	38.14	10.52	0.14	0.00	48.80	56.00	-7.20	Peak
9	6.77	35.69	10.47	0.30	0.00	46.46	60.00	13.54	Peak

Π /4-DQPSK; traffic mode; Ch39

Neutral

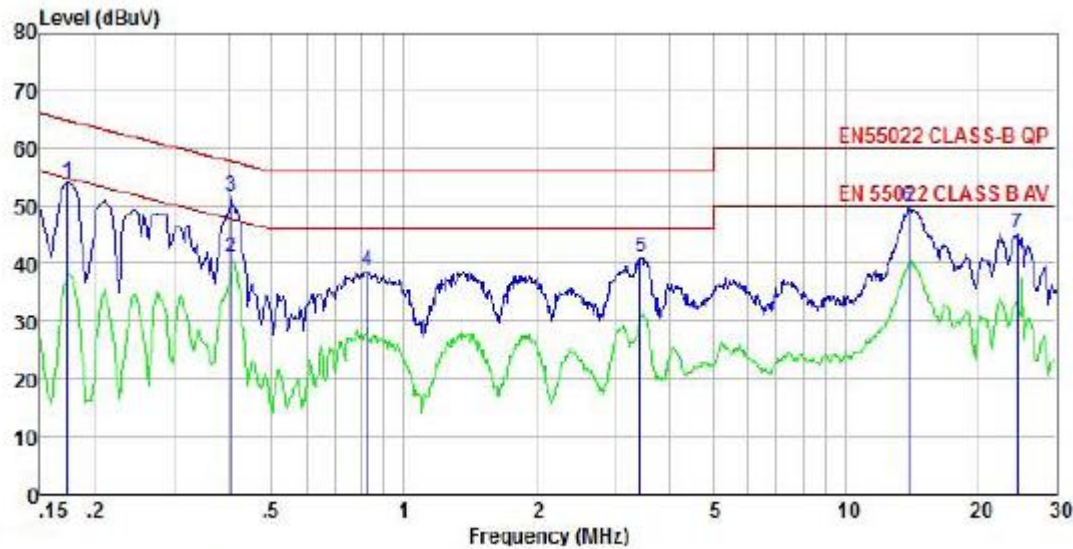


Site : chamber
Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : Pi/4-DPSK ch39
Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamplifier Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	pp	0.15	43.97	10.29	0.09	0.00	54.35	65.74	-11.39 Peak
2		0.20	40.95	10.43	0.22	0.00	51.60	63.45	-11.85 Peak
3		0.25	37.19	10.43	0.20	0.00	47.82	61.60	-13.78 Peak
4		1.22	32.44	10.31	0.14	0.00	42.89	56.00	-13.11 Peak
5		2.10	33.65	10.31	0.15	0.00	44.11	56.00	-11.89 Peak
6		7.21	32.95	10.34	0.31	0.00	43.60	60.00	-16.40 Peak

8-DPSK traffic mode Ch39

Line

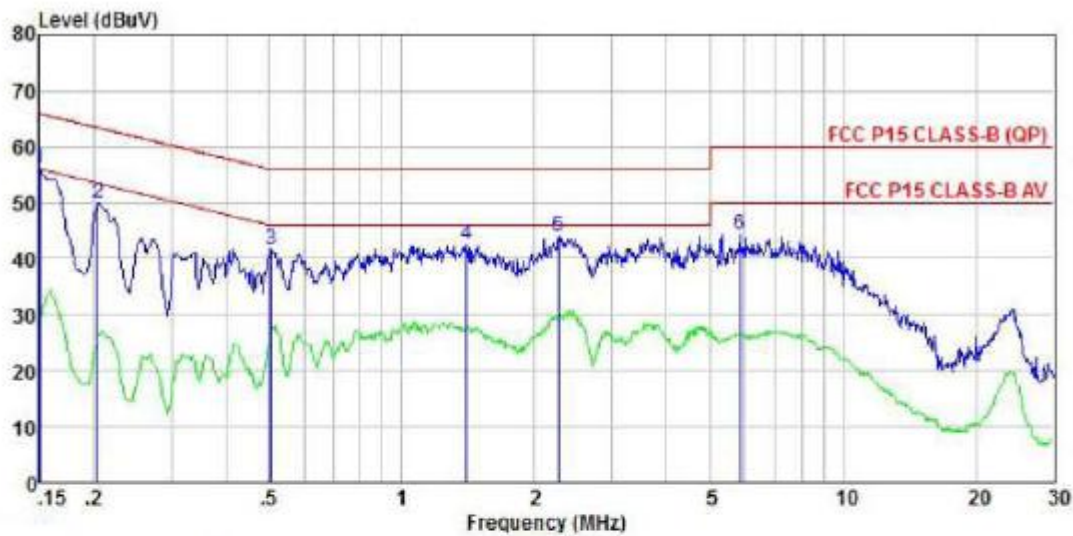


Site : chamber
Condition : EN55022 CLASS-B QP ENV216(L)-20120730 LINE
EUT :
Model Name :
Temp/Humi : 22℃ /53 %
Power Rating: AC 230V/50Hz
Mode : BT 8DPSK CH39
Memo :

	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	43.49	10.52	0.09	0.00	54.10	64.86	-10.76	Peak
2	0.41	30.29	10.54	0.14	0.00	40.97	47.73	-6.76	Average
3	0.41	40.94	10.54	0.14	0.00	51.62	57.73	-6.11	QP
4	0.83	28.07	10.45	0.13	0.00	38.65	56.00	-17.35	Peak
5	3.44	30.36	10.52	0.15	0.00	41.03	56.00	-14.97	Peak
6	13.91	39.12	10.50	0.20	0.00	49.82	60.00	-10.18	Peak
7	24.53	34.66	10.48	0.12	0.00	45.26	60.00	-14.74	Peak

8-DPSK traffic mode Ch39

Neutral



Site : chamber
Condition : FCC P15 CLASS-B (QP) ENV216(N)-20120730 NEUTRAL
EUT :
Model Name :
Temp/Humi : 23 °C /52 %
Power Rating: AC 120V/60Hz
Mode : BT 8DPSK CH39
Memo :

	Freq	Read Level	LISN Factor	Cable Loss	Preamplifier Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	pp	0.15	45.61	10.29	0.09	0.00	55.99	66.00	-10.01 Peak
2		0.20	39.35	10.43	0.22	0.00	50.00	63.45	-13.45 Peak
3		0.50	31.22	10.42	0.10	0.00	41.74	56.00	-14.26 Peak
4		1.40	32.00	10.31	0.14	0.00	42.45	56.00	-13.55 Peak
5		2.27	33.58	10.32	0.15	0.00	44.05	56.00	-11.95 Peak
6		5.87	33.87	10.33	0.22	0.00	44.42	60.00	-15.58 Peak

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

Please refer to the file named “N72 WXYZ_Part22&24 15C Setup Photos”.

APPENDIX 2 PHOTOGRAPHS OF EUT

Please refer to the files named “N72 WXYZ _EUT External Photos” and “N72 WXYZ _EUT Internal Photos”.

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