

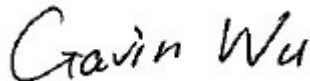


TEST REPORT

Report No.:	EM201200134-5	Application No.:	ZJ00014340
Applicant:	Harman International Industries, Incorporated		
Applicant Address:	8500 Balboa Blvd, Northridge, CA 91329, UNITED STATES		
Sample Description:	Speaker system		
Model:	JEMBE WIRELESS		
FCC ID	APIJEMBEWIGG		
Test Location:	EMC Laboratory of Guangzhou GRG Metrology and Test Co., Ltd.		
Test Specification:	FCC PART 15 Subpart C: 2010		
Test Date:	2012-03-20 ~ 2012-04-12		
Test Result:	<i>According to the kind and extend of tests performed the test item passed test specification.</i>		
Prepared By:	Reviewed By:	Approved By:	
Jane Cao/ Engineer	Angel Liu / Engineer	Gavin Wu / Manager	
			
Date:2012-04-18	Date:2012-04-18	Date:2012-04-18	
Other Aspects:			
/			
Abbreviations: ok / P = passed; fail / F = failed; n.a. / N = not applicable			
The test result in this test report refers exclusively to the presented test sample. This report shall not be reproduced except in full, without the written approval of GRGT.			

DIRECTIONS OF TEST

1. This station carries out test task according to the national regulation of verifications which can be traced to National Primary Standards and BIPM.
2. The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test result without the written permission of the test laboratory.
3. If there is any objection concerning the test, the client should inform the laboratory within 15 days from the date of receiving the test report.

1 Test Summary

Test	Test Requirement	Standard Paragraph	Result
Antenna Requirement	FCC PART 15C :2010	Section 15.247 (c)	PASS
Occupied Bandwidth	FCC PART 15C :2010	Section 15.247 (a1)	PASS
Carrier Frequencies Separated	FCC PART 15C :2010	Section 15.247(a)(1)	PASS
Hopping Channel Number	FCC PART 15C :2010	Section 15.247(a)(1)(iii)	PASS
Dwell Time	FCC PART 15C :2010	Section 15.247(a)(1)(iii)	PASS
Maximum Peak Output Power	FCC PART 15C :2010	Section 15.247(b)(1)	PASS
Conducted Emission	FCC PART 15C :2010	Section 15.207	PASS
Conducted Spurious Emission (30MHz to 25GHz)	FCC PART 15C :2010	Section 15.209 &15.247(d)	PASS
Radiated Spurious Emission (30MHz to 25GHz)	FCC PART 15C :2010	Section 15.209 &15.247(d)	PASS
Band Edges Measurement	FCC PART 15C :2010	Section 15.247 (d) &15.205	PASS

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2 General Information

2.1 Client Information

Applicant: Harman International Industries, Incorporated
 Address of Applicant: 8500 Balboa Blvd, Northridge, CA 91329, UNITED STATES

2.2 Manufacturer Information

Manufacturer: GuoGuang Electric Co.,LTD
 Address of Applicant: No.8 Jinghu Road,Xinhua Street,Huadu Reg,Guangzhou,510800 P.R.China

2.3 General Description of E.U.T.

Product Name: Speaker system
 Model: JEMBE WIRELESS
 Number of Channels 79 Channels
 Channel Separation 1 MHz
 Type of Modulation GFSK, 8DPSK, Pi/4 QPSK
 Dwell time Per channel is less than 0.4s.
 Antenna Type Integral
 Adapter: Have two models for using from different manufacturer.

Model 1 Product Name: Switching Adaptor
 Model Number: SSA-18W-12 US 120150
 Trade Mark: JBL
 Input: 100-240V~ 50/60Hz 0.6A
 Output: 12VDC 1.5A

Model 2 Product Name: Switching POWER SUPPLY
 Model Number: YJS020F-1201500D
 Trade Mark: JBL
 Input: 100-240V~ 50/60Hz 0500mA
 Output: 12VDC 1500mA

2.4 Description of Support Units

Name of Equipment	Manufacturer	Model	Serial Number
PC	Lenovo	X220i	42863FC

2.5 Standards Applicable for Testing

The standard used was FCC PART 15 Subpart C: 2010. ANSI C63.10:2009.

2.6 Test Location

All tests were performed at:

EMC Laboratory of Guangzhou GRG Metrology and Test Co., Ltd.
 No tests were sub-contracted.

2.7 Other Information Requested by the Customer

None.

2.8 Test Facility

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC Listed Lab No. 688188
China	CNAS No.L0446
China	DILAC No.DL175
Canada	8355A-1

3 Equipments Used during Test

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Conducted Emissions				
EMI Receiver	R&S	ESCI	100529	2012-06-16
L.I.S.N	SCHWARZBECK	NSLK 8127	8127450	2012-08-21
Cable	GRGT	GRGT1	GRGT1	2012-06-12
Dwell Time				
Receiver	R&S	ESU40	100106	2012-09-26
Restricted Bands				
Receiver	R&S	ESU40	100106	2012-09-26
Spurious Emissions				
Biconical Log-periodic Antenna	ETS.LINDGREN	3142C	00075971	2012-09-26
Pre-amplifier	HP	8447D OPT 010	2944A06252	2013-03-11
Pre-amplifier	Agilent	8449B	3008A01649	2013-03-11
Receiver	R&S	ESU40	100106	2012-06-09
Horn antenna	SCHWARZBECK	BBHA9120D	D752	2013-10-14
Cable	GRGT	GRGT2	GRGT2	2012-06-12
Number of Hopping Frequency				
Receiver	R&S	ESU40	100106	2012-09-26
Maximum Peak Output Power				
Receiver	R&S	ESU40	100106	2012-06-09
Band Edge				
Receiver	R&S	ESU40	100106	2012-09-26

4 Test Results

4.1 E.U.T. test conditions

Type of antenna: Integral

Operating Environment:

Temperature: 20.0 °C

Humidity: 52 % RH

Atmospheric Pressure: 1006 mbar

Test frequencies: According to the 15.31(m) Measurements on intentional radiators or receivers, other than TV broadcast receivers, shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near top and 1 near bottom
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom

EUT channels and frequencies list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	14	2416	28	2430
1	2403	15	2417	29	2431
2	2404	16	2418	30	2432
3	2405	17	2419	31	2433
4	2406	18	2420	32	2434
5	2407	19	2421	33	2435
6	2408	20	2422	34	2436
7	2409	21	2423	35	2437
8	2410	22	2424	36	2438
9	2411	23	2425	37	2439
10	2412	24	2426	38	2440
11	2413	25	2427	39	2441
12	2414	26	2428	40	2442
13	2415	27	2429	41	2443

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
42	2444	55	2457	68	2470
43	2445	56	2458	69	2471
44	2446	57	2459	70	2472
45	2447	58	2460	71	2473
46	2448	59	2461	72	2474
47	2449	60	2462	73	2475
48	2450	61	2463	74	2476
49	2451	62	2464	75	2477
50	2452	63	2465	76	2478
51	2453	64	2466	77	2479
52	2454	65	2467	78	2480
53	2455	66	2468		
54	2456	67	2469		

Test frequency is the lowest channel: 0 channel(2402MHz), middle channel: 39 channel(2441MHz) and highest channel: 78 channel(2480MHz)

4.2 Antenna Requirement

4.2.1 Standard requirement

15.203 requirement:

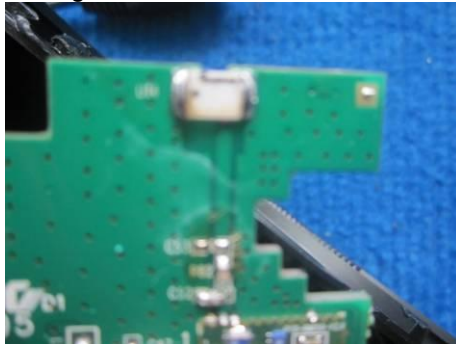
For intentional device, according to 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

15.247(c) (1)(i) requirement:

(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

4.2.2 EUT Antenna

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3 dBi.



Test result: The unit does meet the FCC requirements.

4.3 Occupied Bandwidth

Test Requirement: FCC Part 15 C
Test Method: Based on FCC Part15 C Section 15.247 & DA 00-705
Test Date: 2012-03-31
Test Status: Test in fixing operating frequency at lowest, Middle, highest channel.
Power supply: Connected with convert board powered by PC USB ports, and to fix frequency transmitting.

Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: Span = approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel;
3. Set the spectrum analyzer: RBW \geq 1% of the 20dB bandwidth (set 10kHz). VBW \geq RBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold.
4. Mark the peak frequency and -20dB points or 99% bandwidth.
5. bandwidth value is OBW value.

Remark:

Pre-test the 3 modulation to find GFSK and 8DPSK is worse case, so only record GFSK and 8DPSK test data.

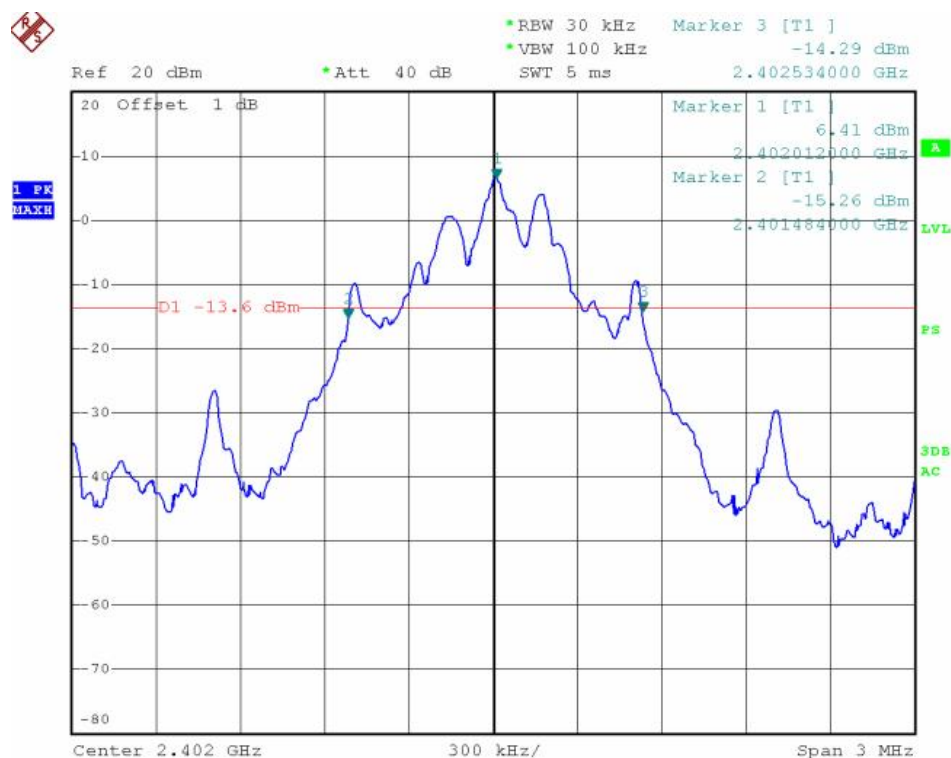
Test result:

For GFSK

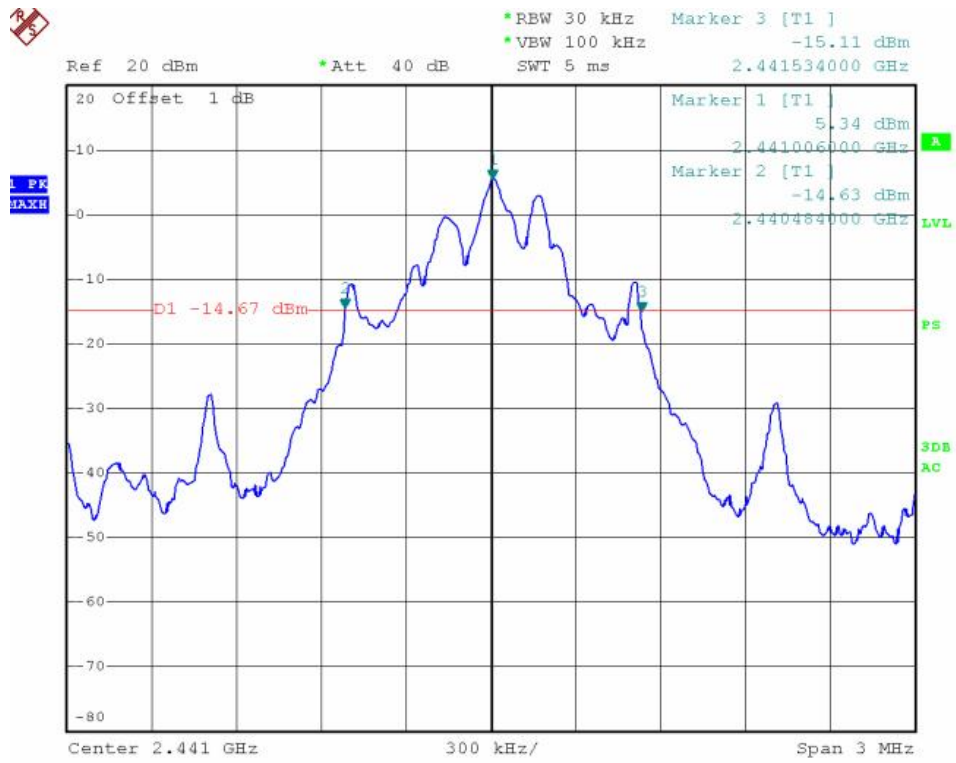
Frequency (GHz)	Test Channel	bandwidth
2.402	Lowest	1.050MHz
2.441	Middle	1.050MHz
2.480	Highest	1.050MHz

Result plot as follows:

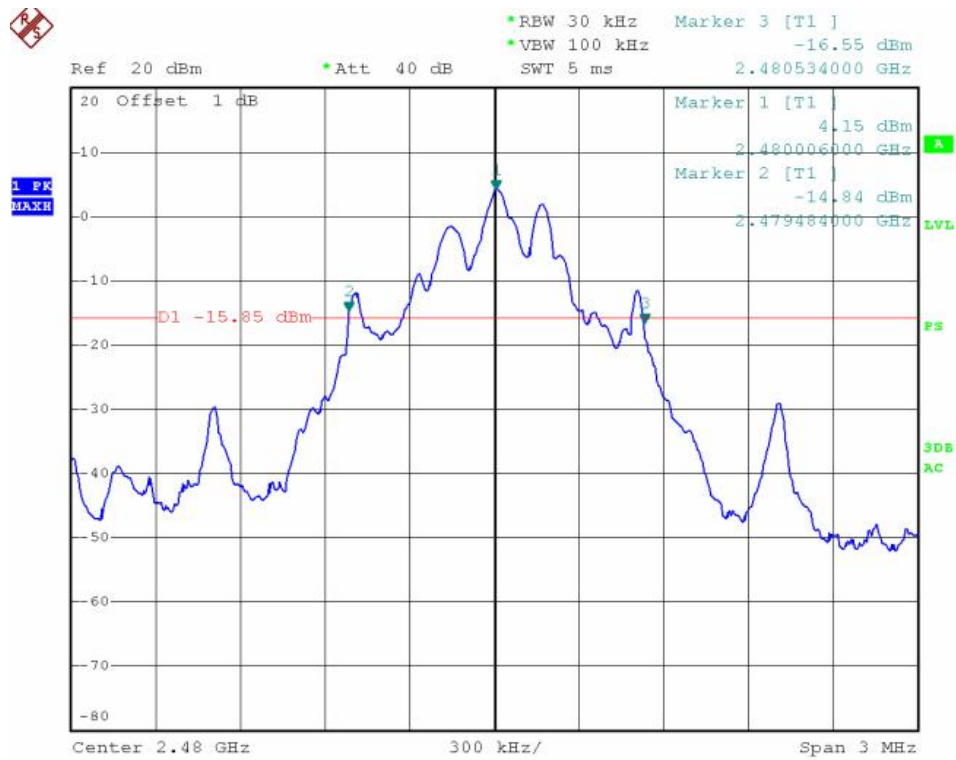
Lowest Channel:



Middle Channel:



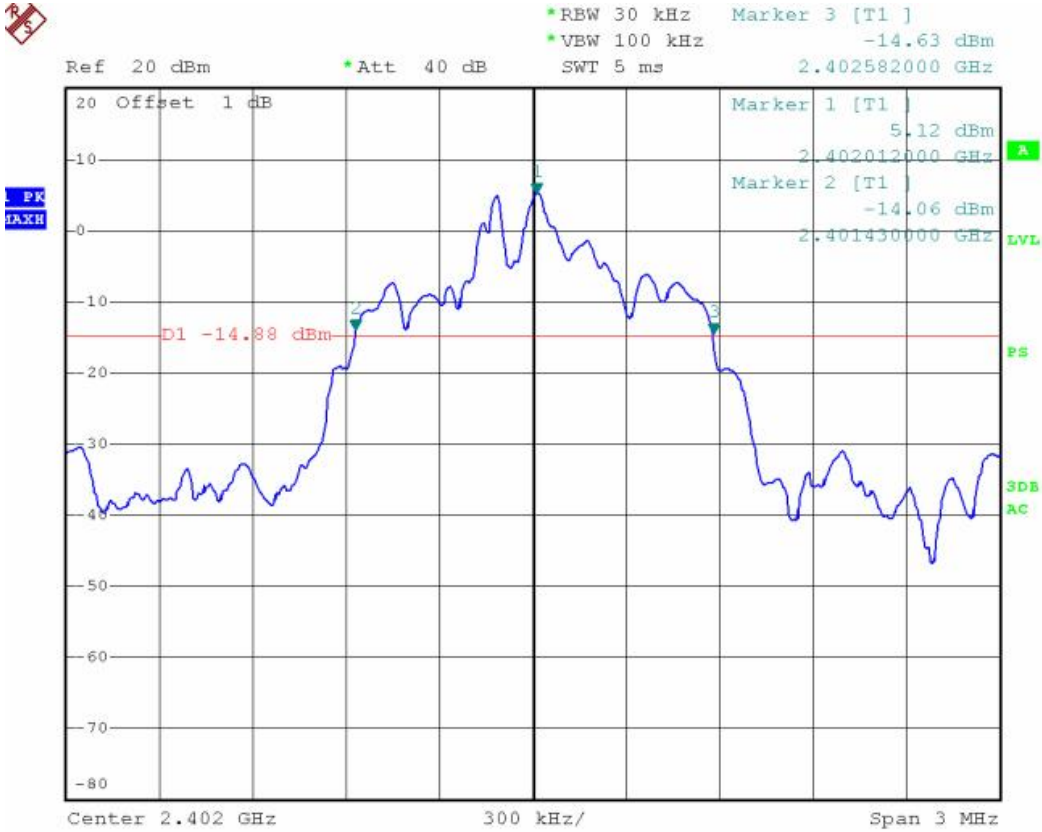
Highest Channel:



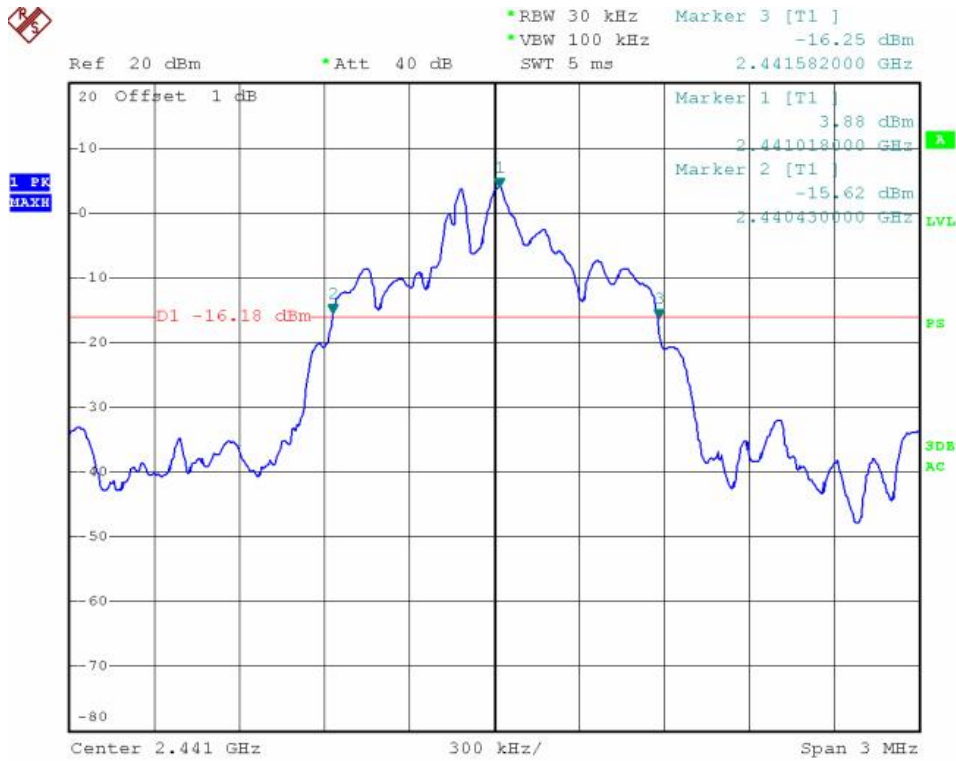
For 8DPSK

Frequency (GHz)	Test Channel	bandwidth
2.402	Lowest	1.152MHz
2.441	Middle	1.152MHz
2.480	Highest	1.152MHz

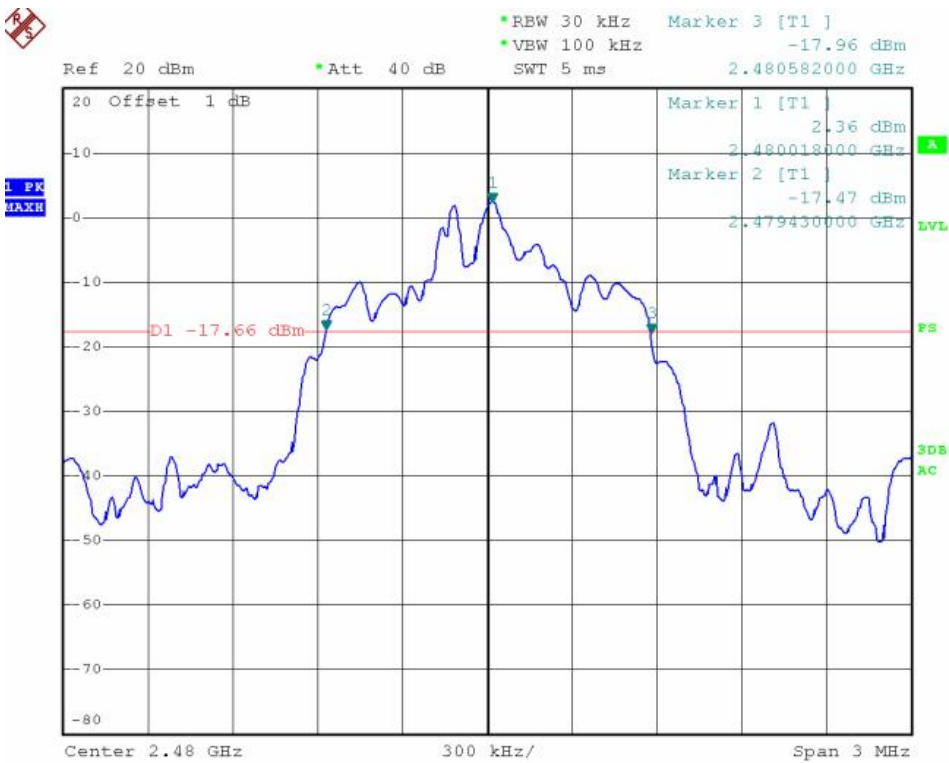
Lowest Channel:



Middle Channel:



Highest Channel:



4.4 Carrier Frequencies Separated

Test Requirement: FCC Part 15 C

Test Method: Based on FCC Part15 C Section 15.247 & DA 00-705

Test Date: 2012-03-31

Test requirements: Regulation 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.

Test Status: Test in hopping transmitting operating mode.

Power supply: Connected with convert board powered by PC USB ports, and to fix frequency transmitting.

Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW \geq 1% of the span (set 100 kHz). VBW \geq RBW , Span = 6MHz. Sweep = auto; Detector Function = Peak. Trace = Max,hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.

Remark:

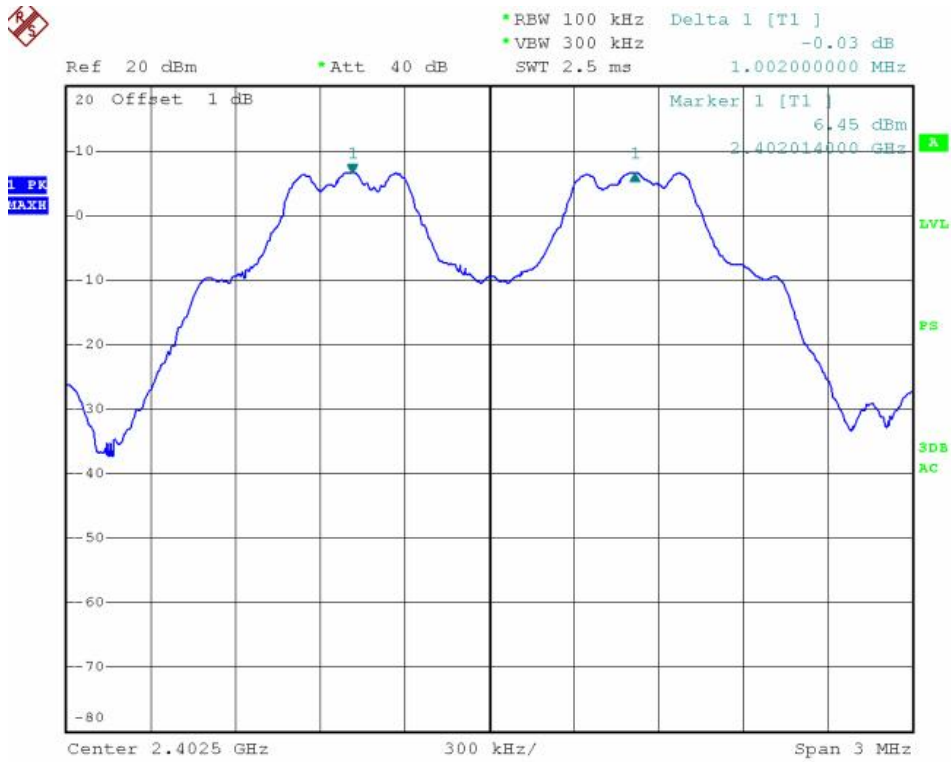
Pre-test the 3 modulation to find GFSK and 8DPSK is worse case, so only record GFSK and 8DPSK test data.

Test result:

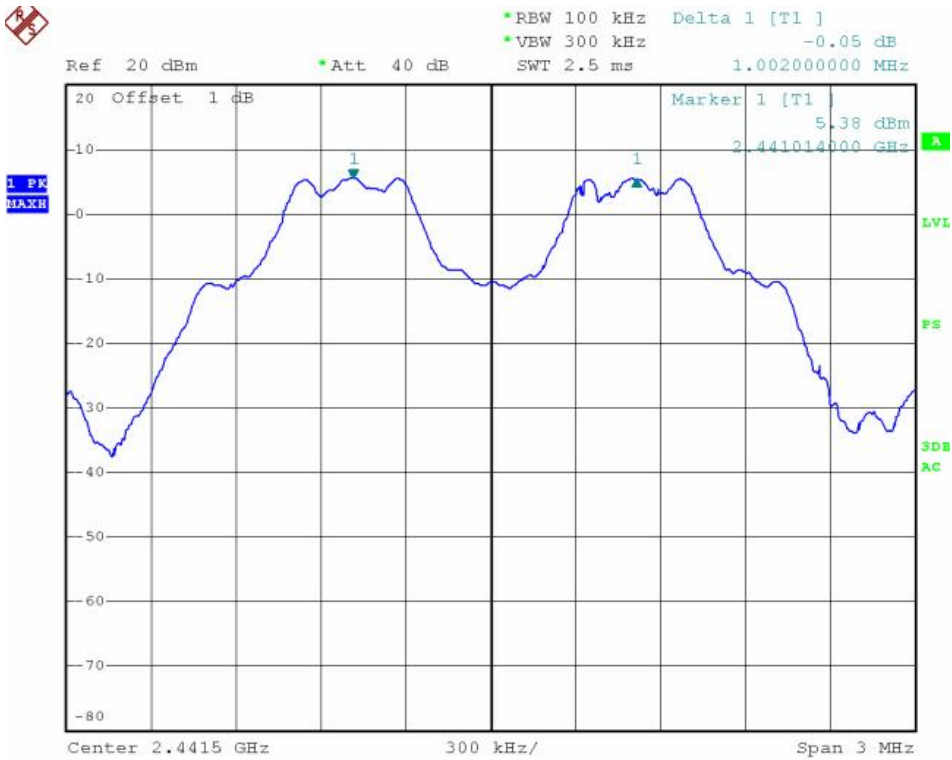
Mode	Test Channel	Carrier Frequencies Separated	PASS/FAIL
GFSK	Lower Channels (channel 0 and channel 1)	1.002MHz	Pass
	Middle Channels (channel 39 and channel 40)	1.002MHz	Pass
	Upper Channels (channel 77 and channel 78)	1.008MHz	Pass
8DPSK	Lower Channels (channel 0 and channel 1)	1.002MHz	Pass
	Middle Channels (channel 39 and channel 40)	1.002MHz	Pass
	Upper Channels (channel 77 and channel 78)	1.002MHz	Pass

For GFSK

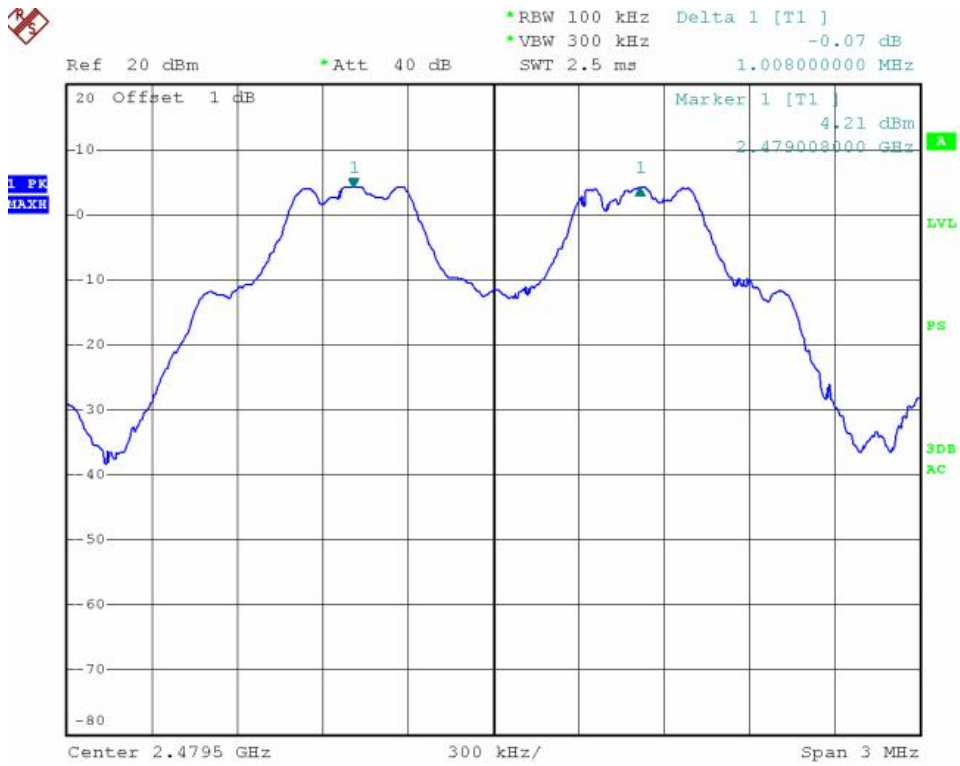
Lowest Channels:



Middle Channels:

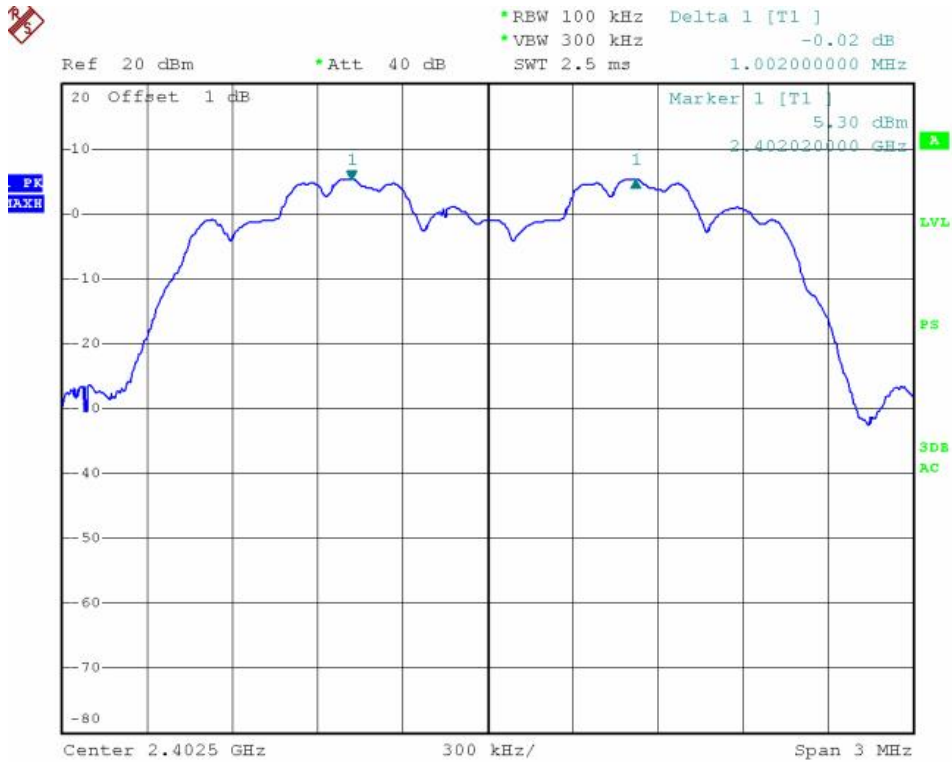


Highest Channels:

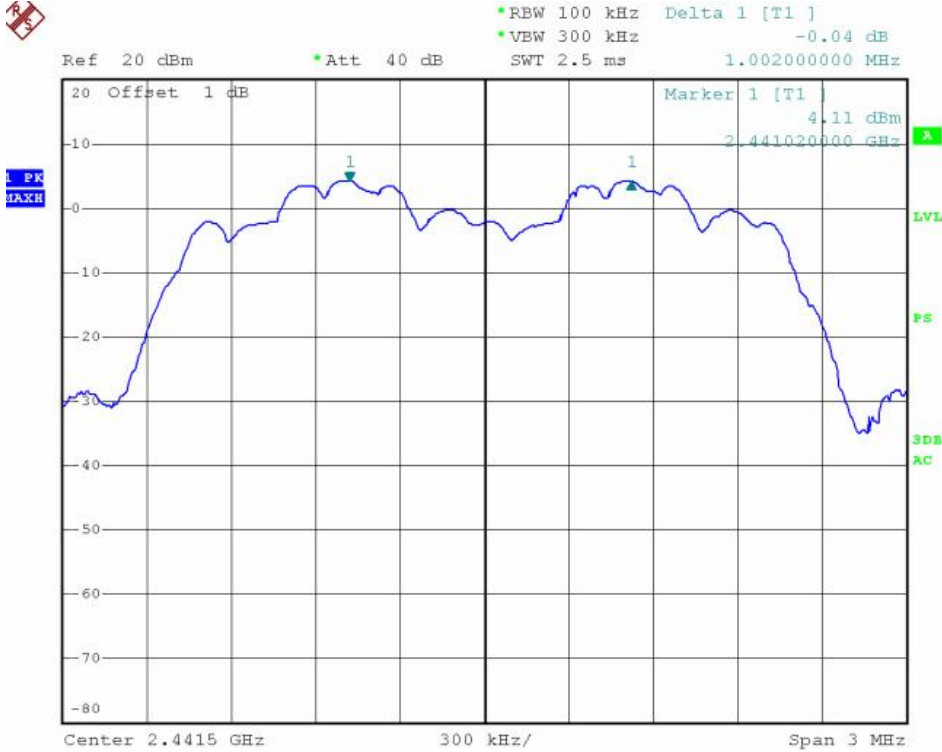


For 8DPSK

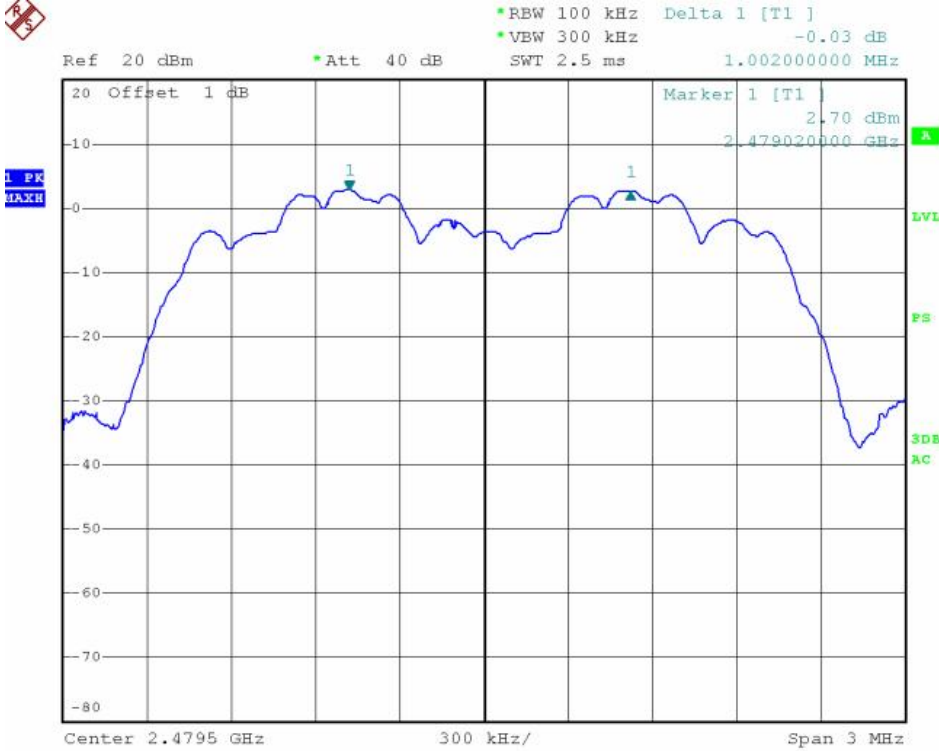
Lowest Channels:



Middle Channels:



Highest Channels:



Test result: The unit does meet the FCC requirements.

4.5 Hopping Channel Number

Test Requirement: FCC Part15 C

Test Method: Based on FCC Part15 C Section 15.247 & DA 00-705

Test Date: 2012-03-31

Requirements: Regulation 15.247 (a) (1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

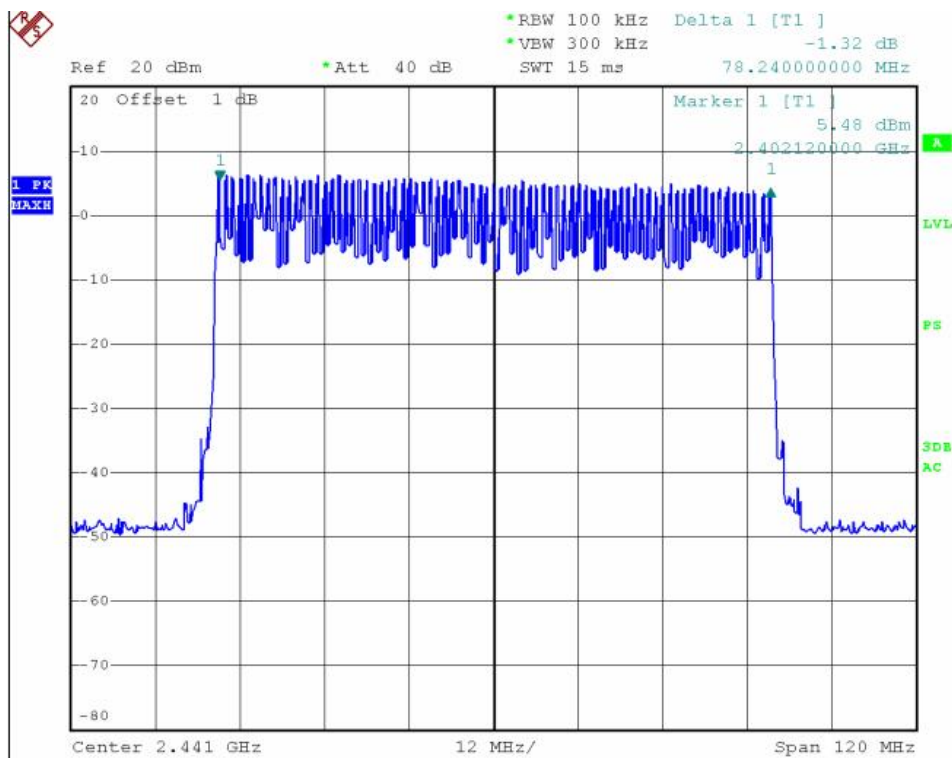
Test Status: Test in hopping transmitting operating mode.

Power supply: Connected with convert board powered by PC USB ports, and to fix frequency transmitting.

Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 300 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. 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. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: start frequency = 2400MHz. stop frequency = 2483.5MHz. Submit the test result graph.

Test result: Total channels are 79 channels.



Test result: The unit does meet the FCC requirements.

4.6 Dwell Time

Test Requirement:	FCC Part 15 C
Test Method:	Based on FCC Part15 C Section 15.247 & DA 00-705
Test Date:	2012-04-11
Test requirements:	Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
Test Status:	Test in hopping transmitting operating mode.
Power supply:	Connected with convert board powered by PC USB ports, and to fix frequency transmitting.

Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0. centered on a hopping channel;
3. Set RBW = 1MHz and VBW = 3MHz. Sweep = as necessary to capture the entire dwell time per hopping channel. Detector Function = Peak. Trace = Max hold;
4. 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. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s). An oscilloscope may be used instead of a spectrum analyzer.

Test Results:

The test period: $T = 0.4 \text{ Second/Channel} \times 79 \text{ Channel} = 31.6 \text{ s}$

1. Channel 0: 2.402GHz

$$\text{DH1 time slot} = 0.394 \text{ (ms)} * (1600/(2*79)) * 31.6 = 126.080 \text{ ms}$$

$$\text{DH3 time slot} = 1.648 \text{ (ms)} * (1600/(4*79)) * 31.6 = 263.680 \text{ ms}$$

$$\text{DH5 time slot} = 2.928 \text{ (ms)} * (1600/(6*79)) * 31.6 = 312.320 \text{ ms}$$

$$2\text{DH1 time slot} = 0.403 \text{ (ms)} * (1600/(2*79)) * 31.6 = 128.960 \text{ ms}$$

$$2\text{DH3 time slot} = 1.664 \text{ (ms)} * (1600/(4*79)) * 31.6 = 266.240 \text{ ms}$$

$$2\text{DH5 time slot} = 1.712 \text{ (ms)} * (1600/(6*79)) * 31.6 = 182.610 \text{ ms}$$

$$3\text{DH1 time slot} = 0.394 \text{ (ms)} * (1600/(2*79)) * 31.6 = 126.080 \text{ ms}$$

$$3\text{DH3 time slot} = 1.648 \text{ (ms)} * (1600/(4*79)) * 31.6 = 263.680 \text{ ms}$$

$$3\text{DH5 time slot} = 2.912 \text{ (ms)} * (1600/(6*79)) * 31.6 = 310.600 \text{ ms}$$

2. Channel 39: 2.441GHz

$$\text{DH1 time slot} = 0.394 \text{ (ms)} * (1600/(2*79)) * 31.6 = 126.080 \text{ ms}$$

$$\text{DH3 time slot} = 1.664 \text{ (ms)} * (1600/(4*79)) * 31.6 = 266.240 \text{ ms}$$

$$\text{DH5 time slot} = 2.912 \text{ (ms)} * (1600/(6*79)) * 31.6 = 310.600 \text{ ms}$$

$$2\text{DH1 time slot} = 0.403 \text{ (ms)} * (1600/(2*79)) * 31.6 = 128.960 \text{ ms}$$

$$2\text{DH3 time slot} = 1.664 \text{ (ms)} * (1600/(4*79)) * 31.6 = 266.240 \text{ ms}$$

$$2\text{DH5 time slot} = 1.712 \text{ (ms)} * (1600/(6*79)) * 31.6 = 182.610 \text{ ms}$$

3DH1 time slot = $0.403(\text{ms}) * (1600/(2*79)) * 31.6 = 128.960 \text{ ms}$
 3DH3 time slot = $1.680(\text{ms}) * (1600/(4*79)) * 31.6 = 268.800 \text{ ms}$
 3DH5 time slot = $2.912 (\text{ms}) * (1600/(6*79)) * 31.6 = 310.600 \text{ ms}$

3. Channel 78: 2.480GHz

DH1 time slot = $0.403 * (1600/(2*79)) * 31.6 = 128.960 \text{ ms}$
 DH3 time slot = $1.664 (\text{ms}) * (1600/(4*79)) * 31.6 = 266.240 \text{ ms}$
 DH5 time slot = $2.912 (\text{ms}) * (1600/(6*79)) * 31.6 = 310.600 \text{ ms}$
 2DH1 time slot = $0.403 * (1600/(2*79)) * 31.6 = 128.960 \text{ ms}$
 2DH3 time slot = $1.648 (\text{ms}) * (1600/(4*79)) * 31.6 = 263.680 \text{ ms}$
 2DH5 time slot = $1.696 (\text{ms}) * (1600/(6*79)) * 31.6 = 180.900 \text{ ms}$
 3DH1 time slot = $0.403 * (1600/(2*79)) * 31.6 = 128.960 \text{ ms}$
 3DH3 time slot = $1.680(\text{ms}) * (1600/(4*79)) * 31.6 = 268.800 \text{ ms}$
 3DH5 time slot = $2.912 (\text{ms}) * (1600/(6*79)) * 31.6 = 310.600 \text{ ms}$

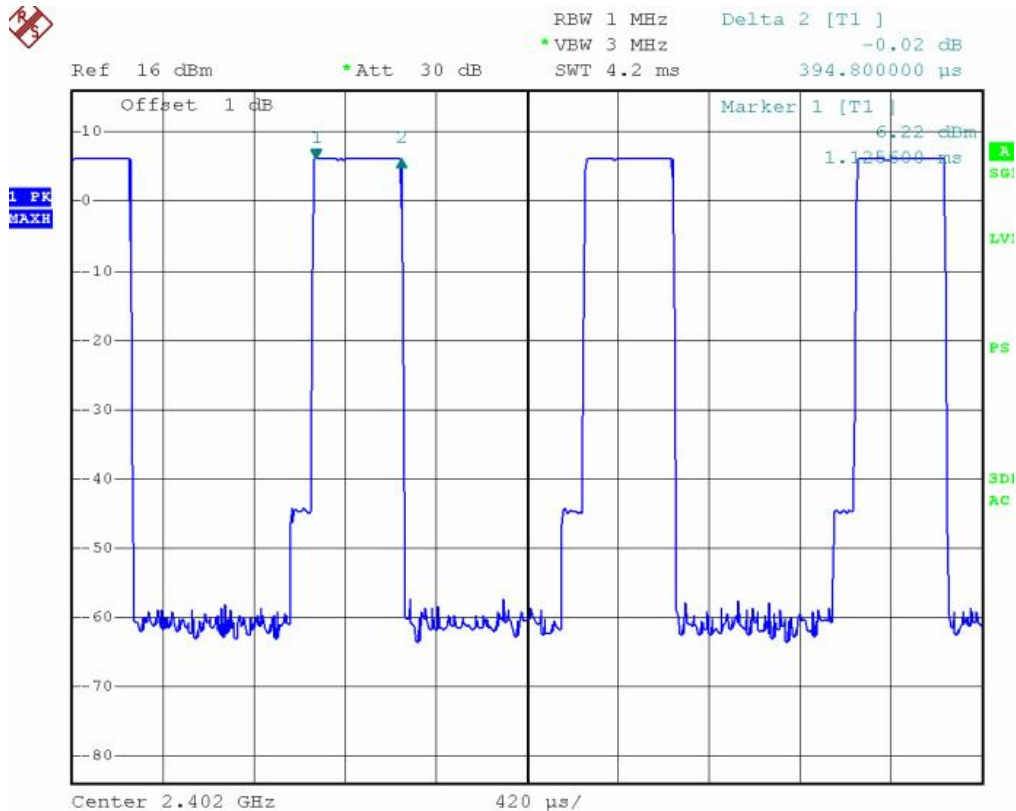
The results are not greater than 0.4 seconds.

The unit does meet the FCC requirements.

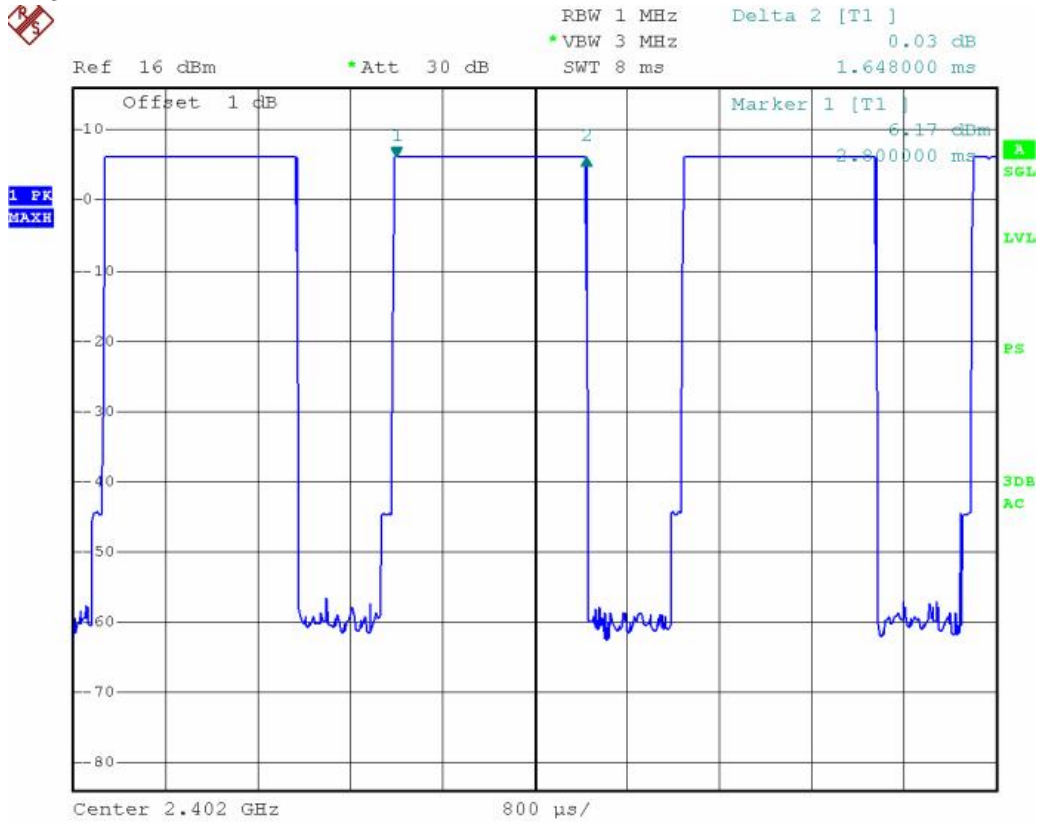
Please refer the graph as below:

1. Lowest channel (2.402 GHz):

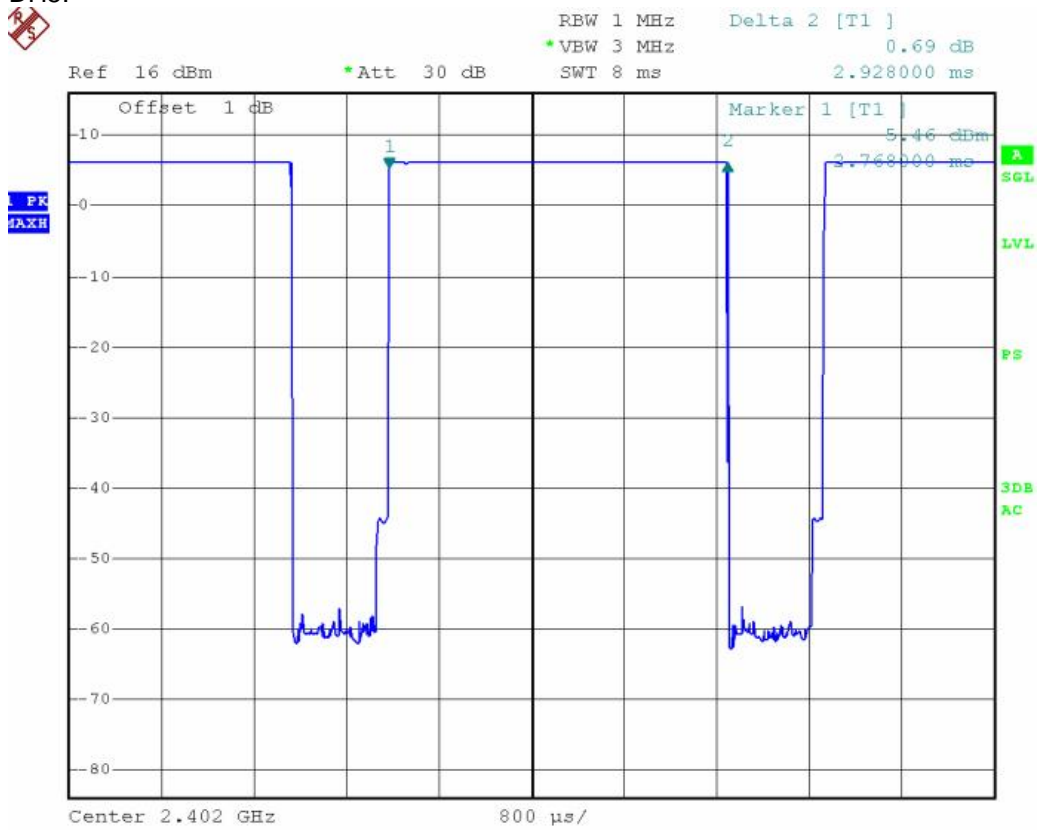
DH1



DH3:



DH5:



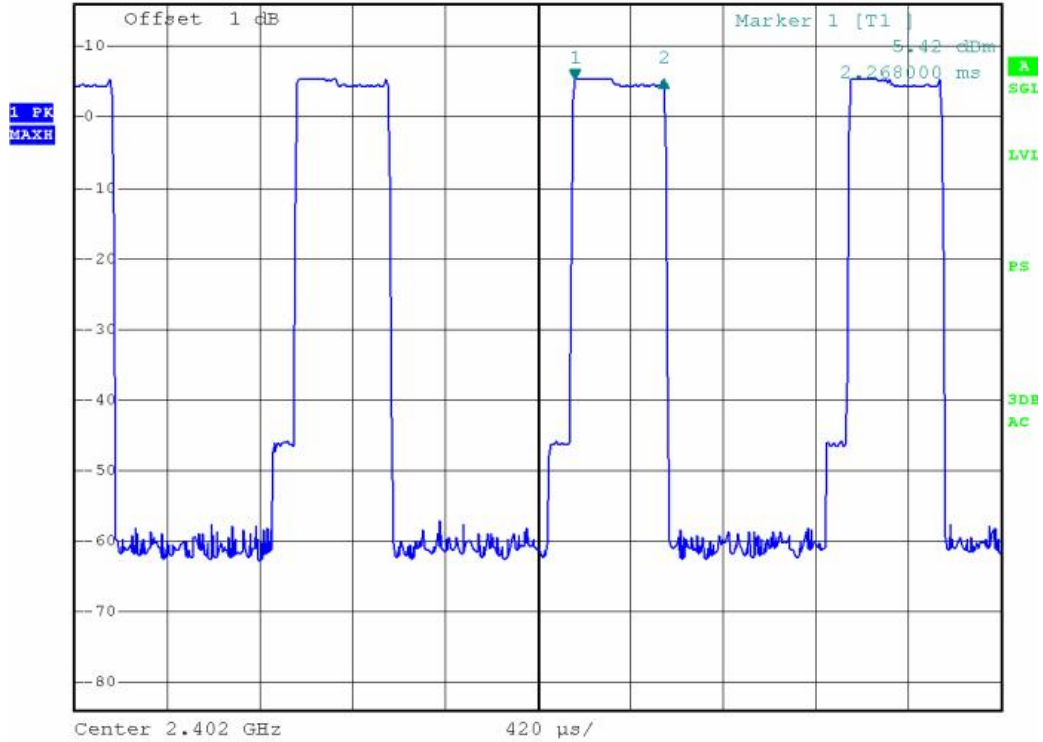
2DH1



RBW 1 MHz Delta 2 [T1]
*VBW 3 MHz -0.11 dB
SWT 4.2 ms 403.200000 μ s

Ref 16 dBm

*Att 30 dB



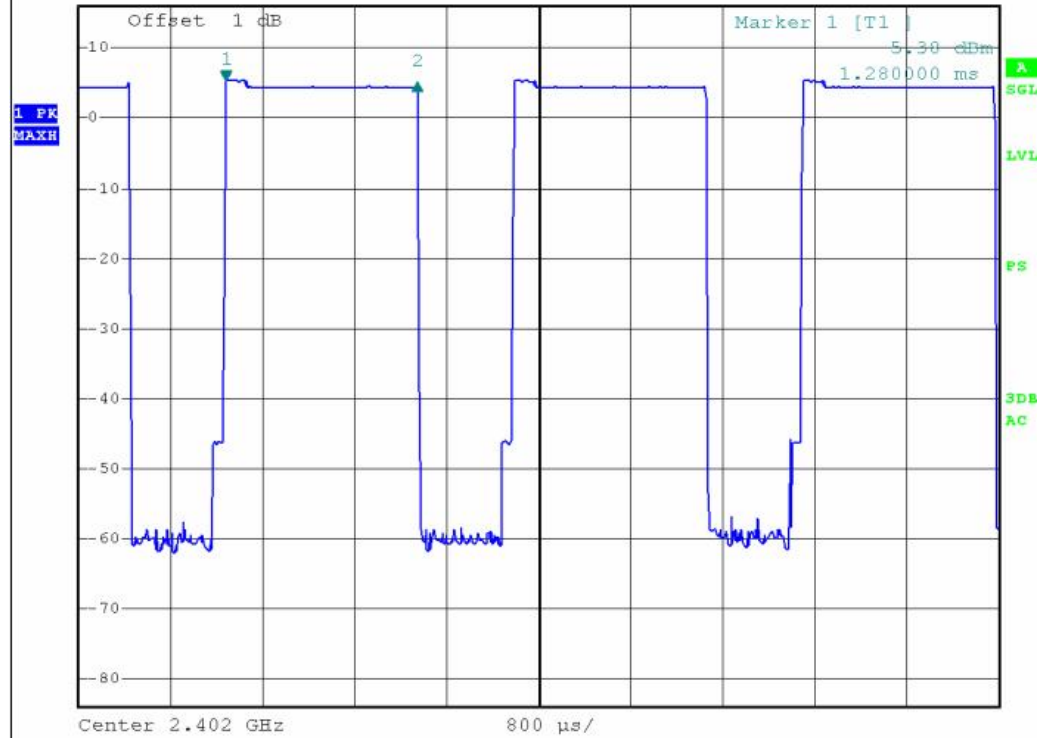
2DH3



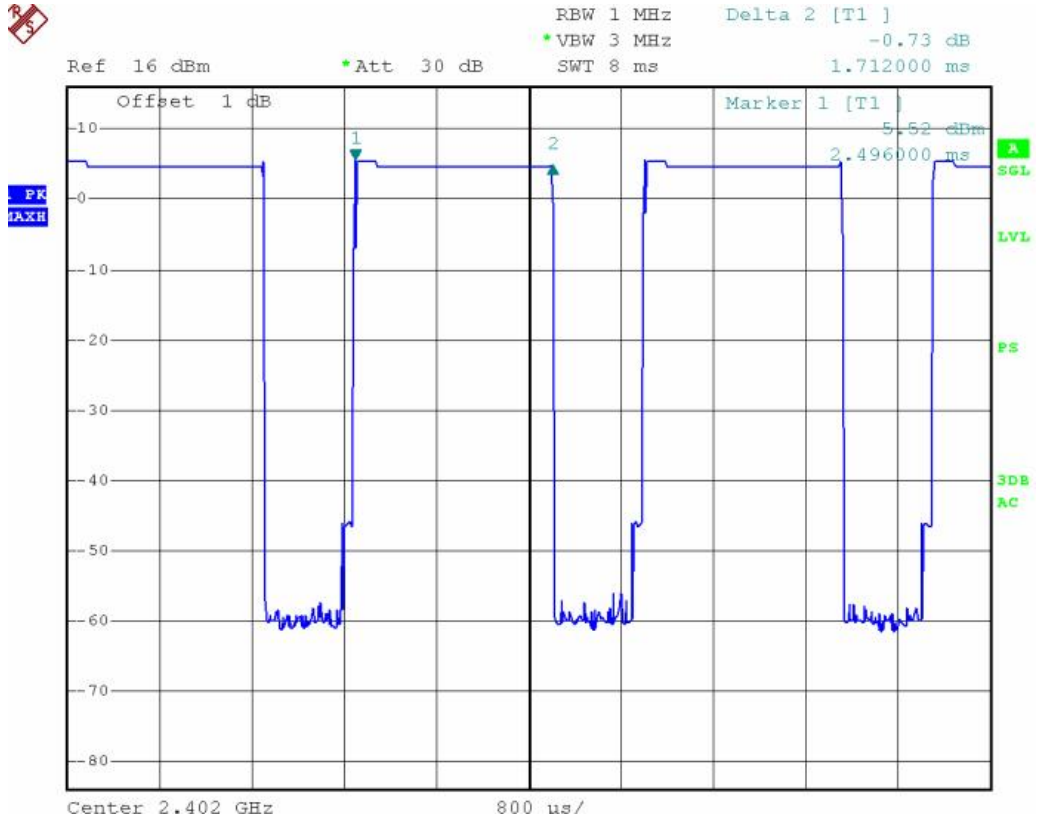
RBW 1 MHz Delta 2 [T1]
*VBW 3 MHz -0.38 dB
SWT 8 ms 1.664000 ms

Ref 16 dBm

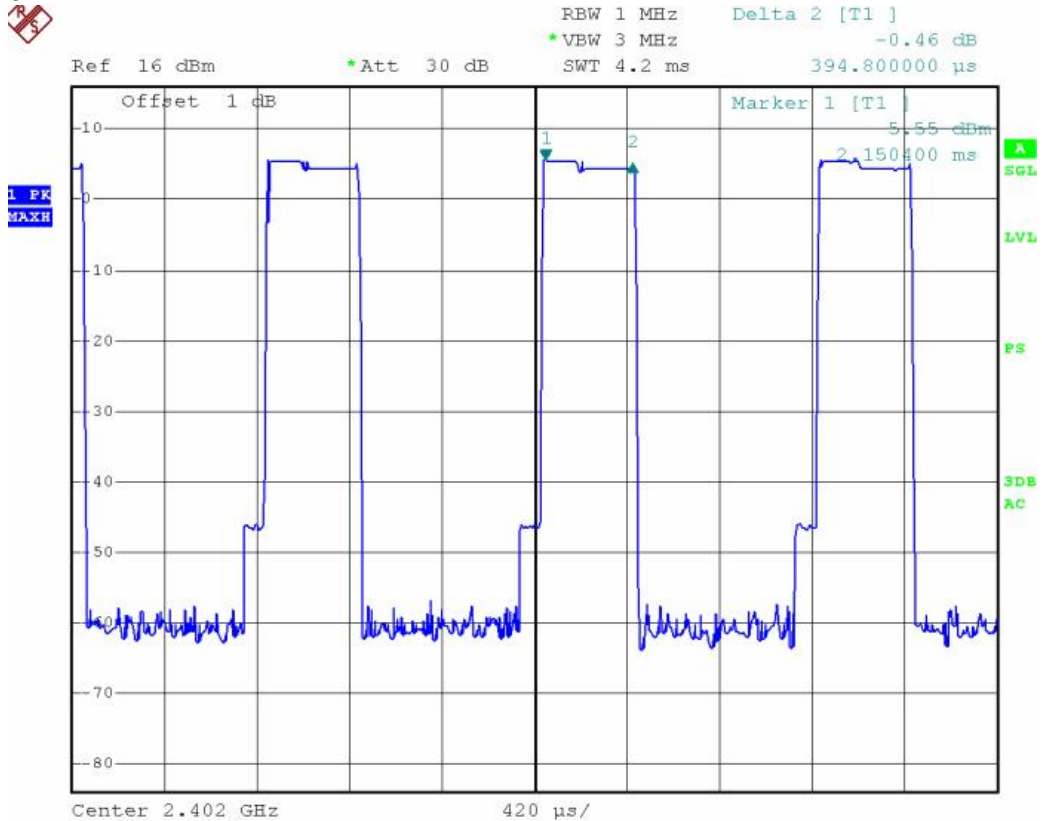
*Att 30 dB



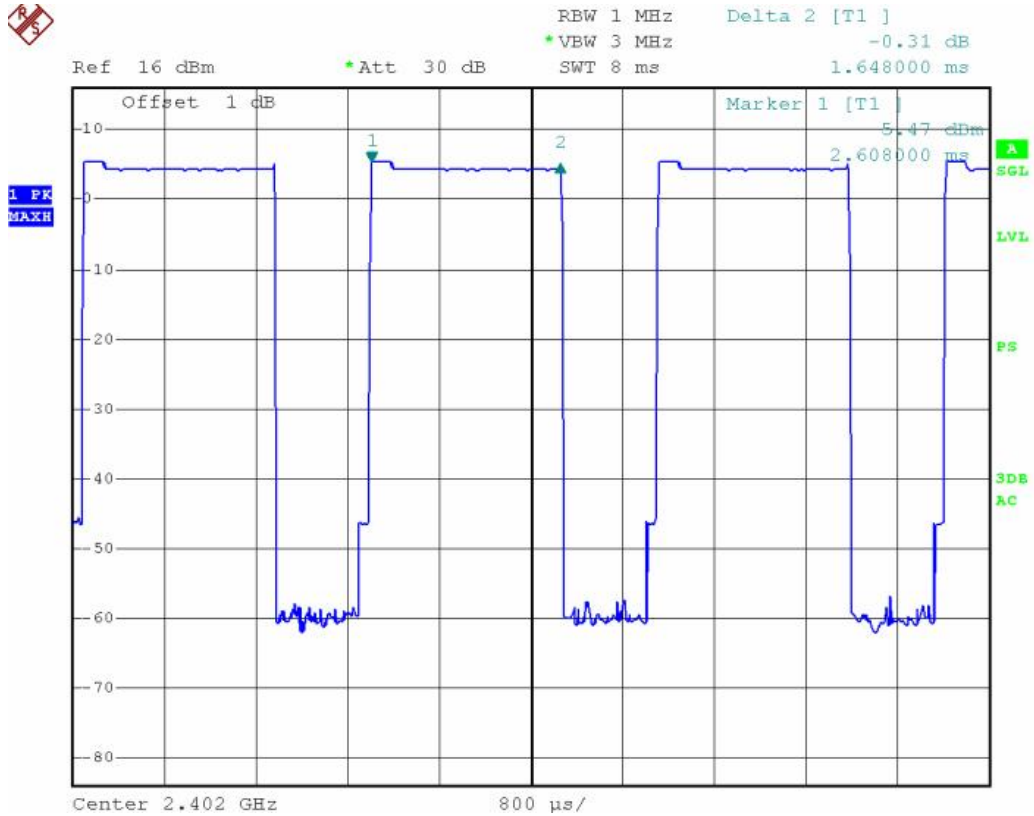
2DH5



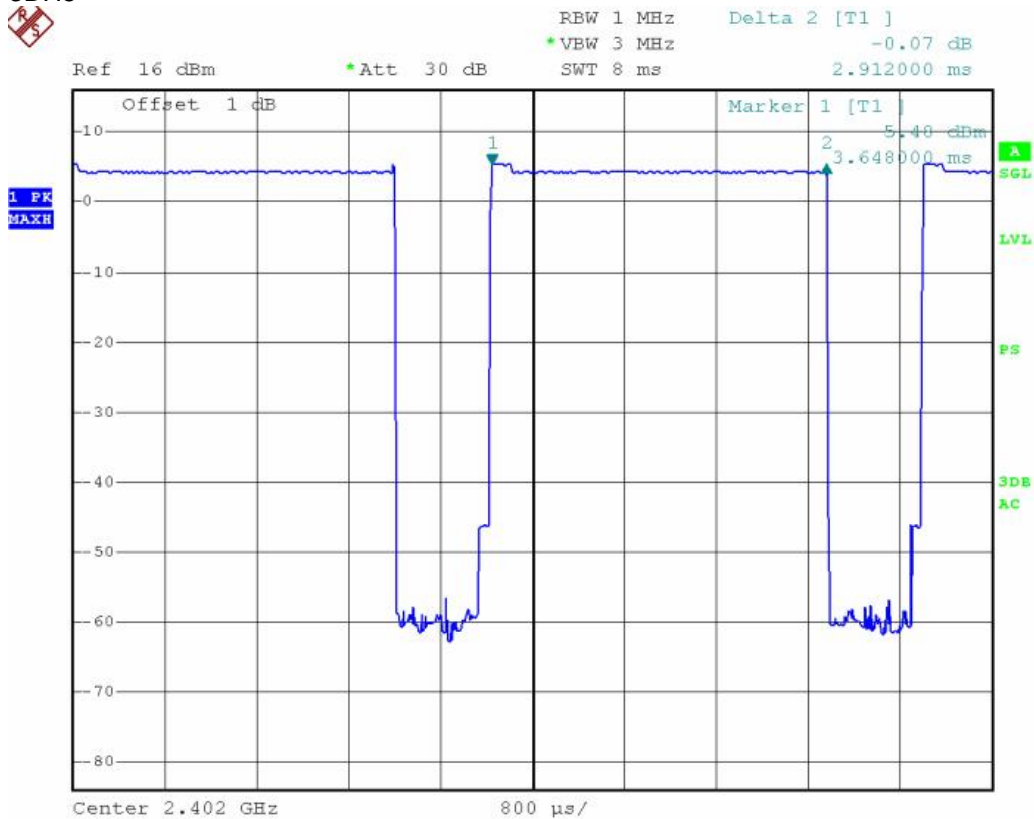
3DH1



3DH3

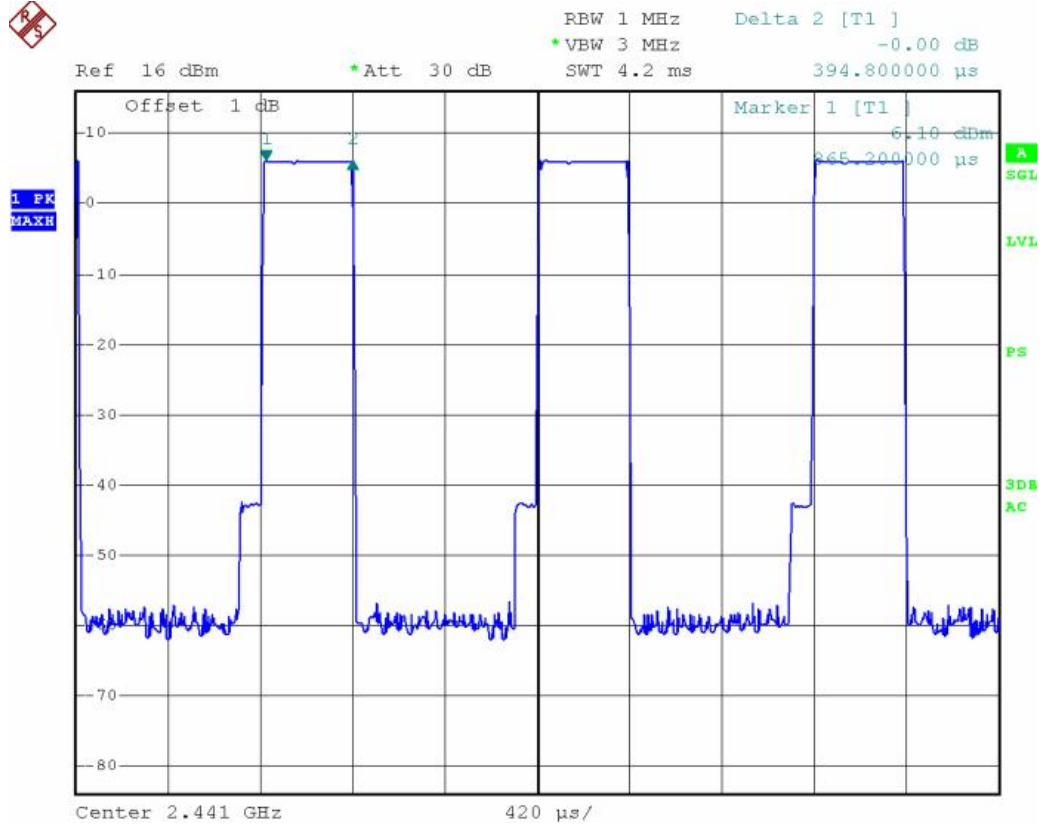


3DH5

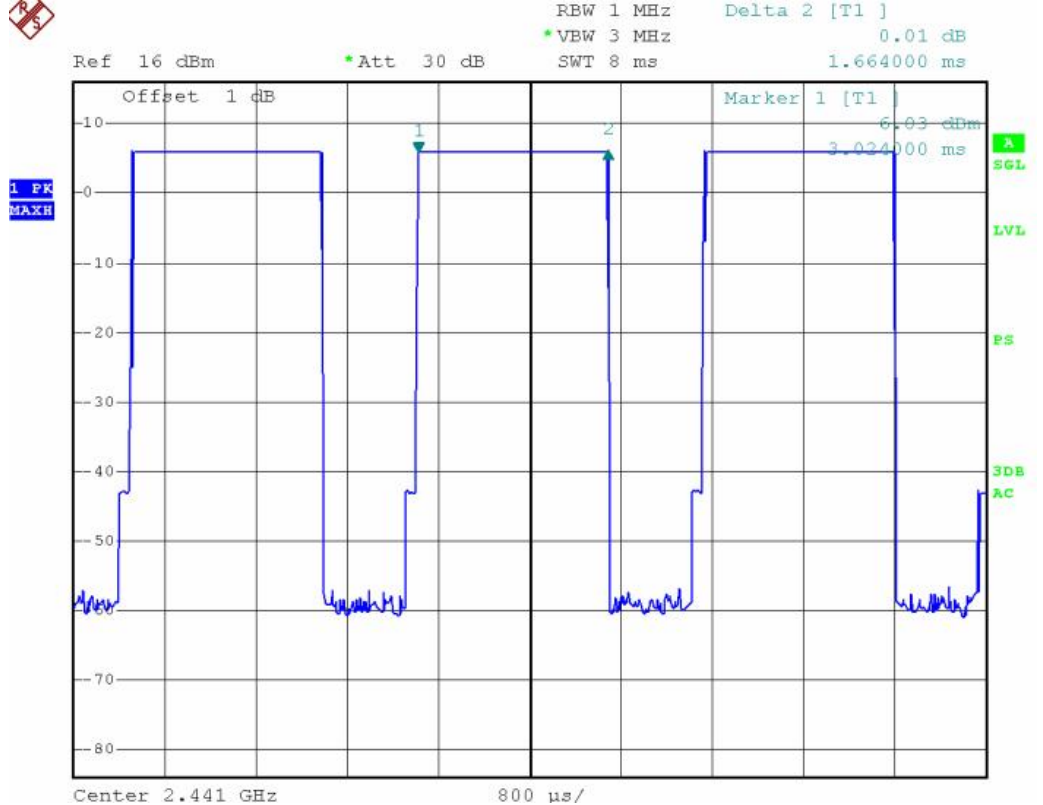


2. Middle Channel (2.441GHz)

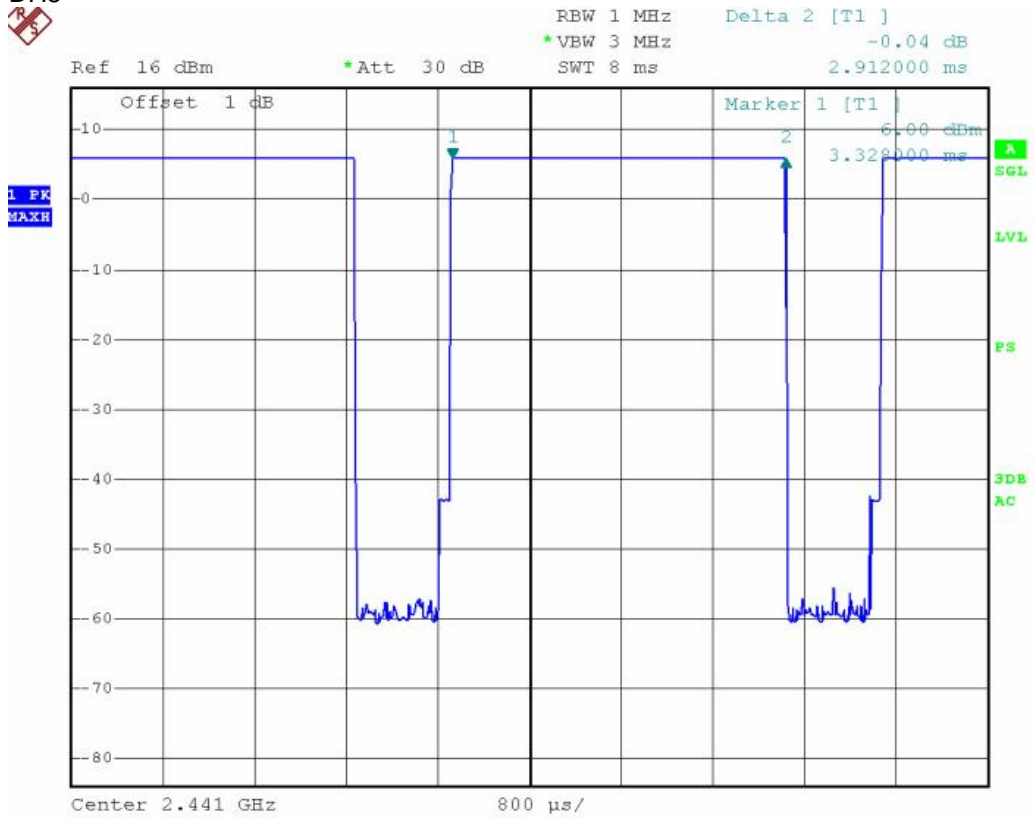
DH1



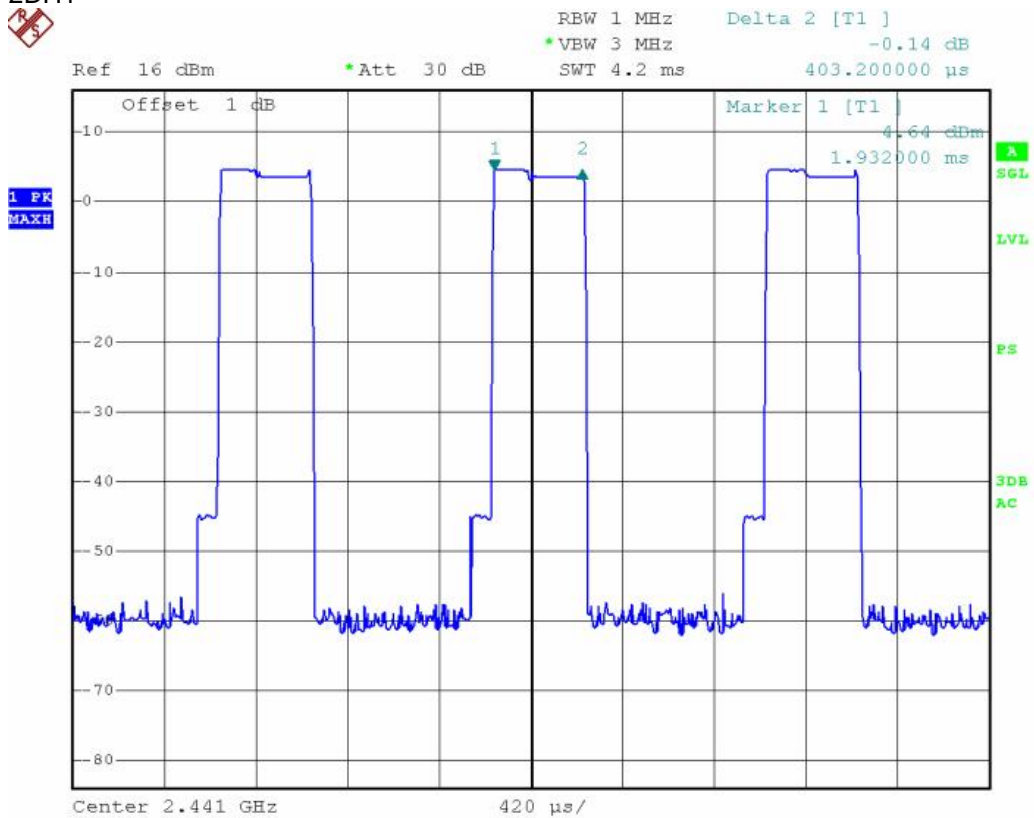
DH3



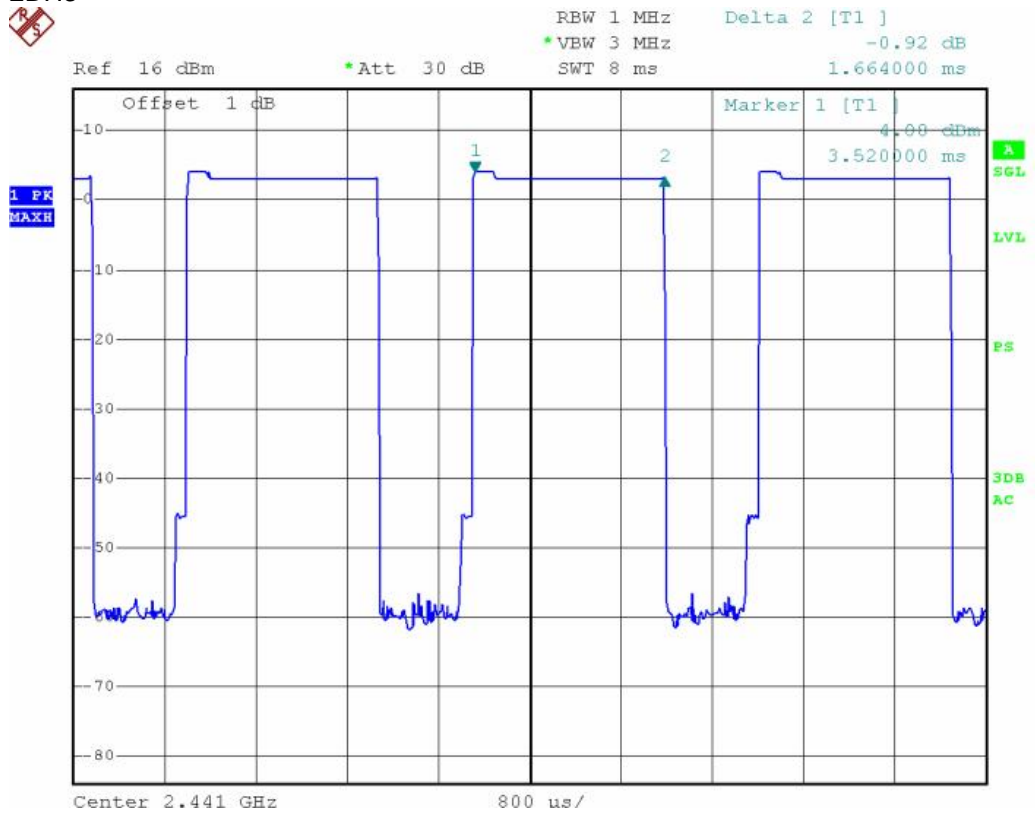
DH5



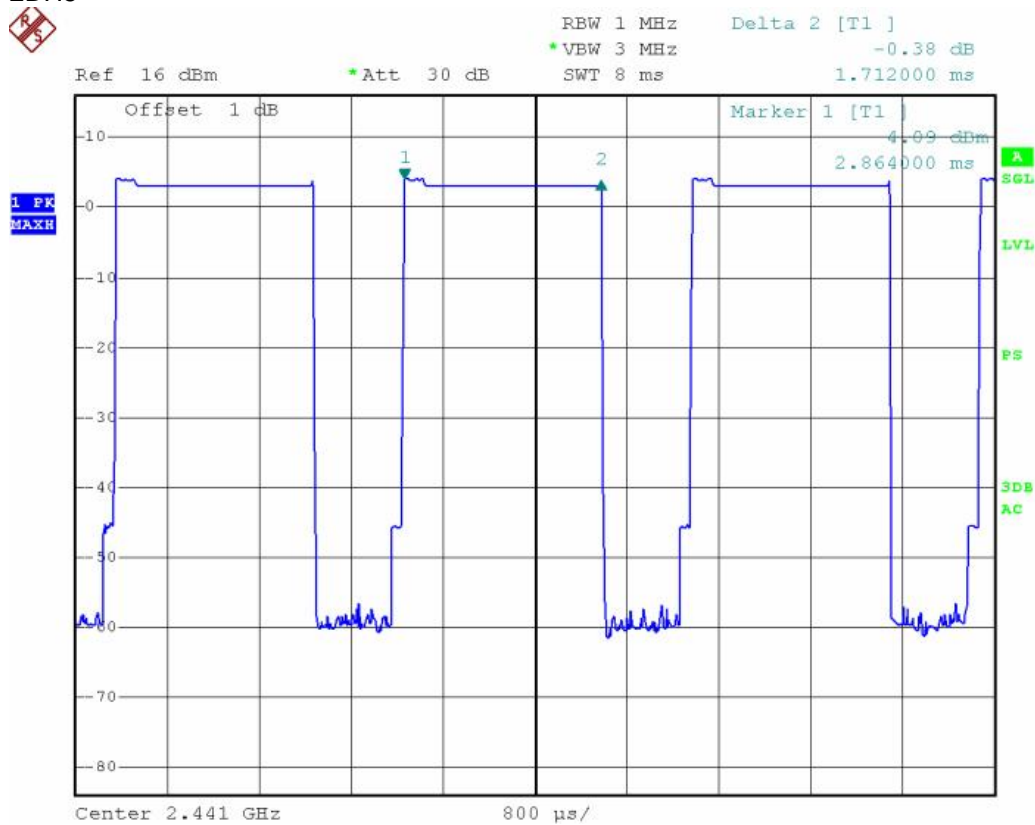
2DH1



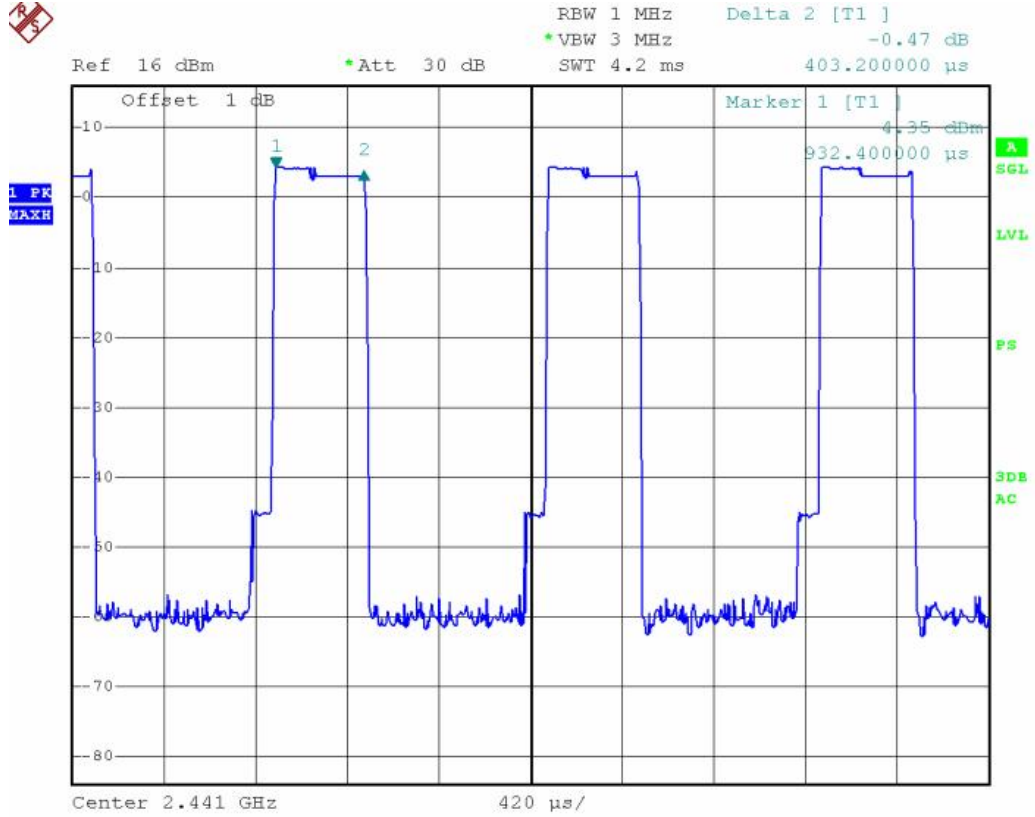
2DH3



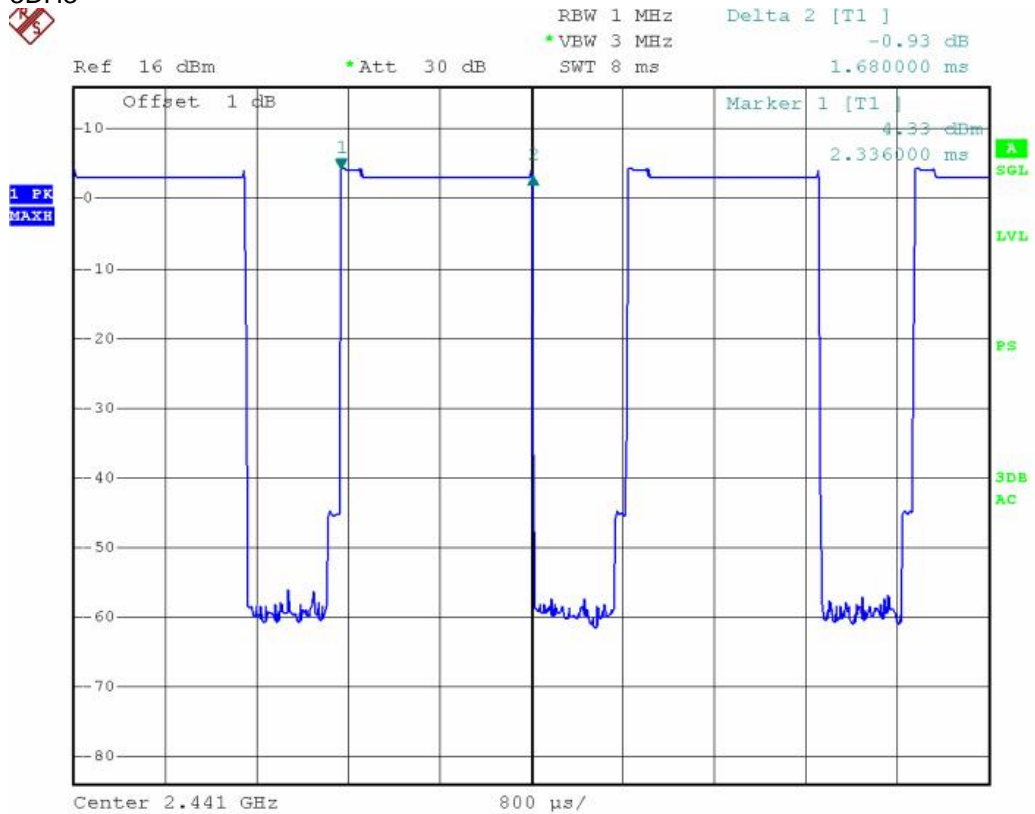
2DH5

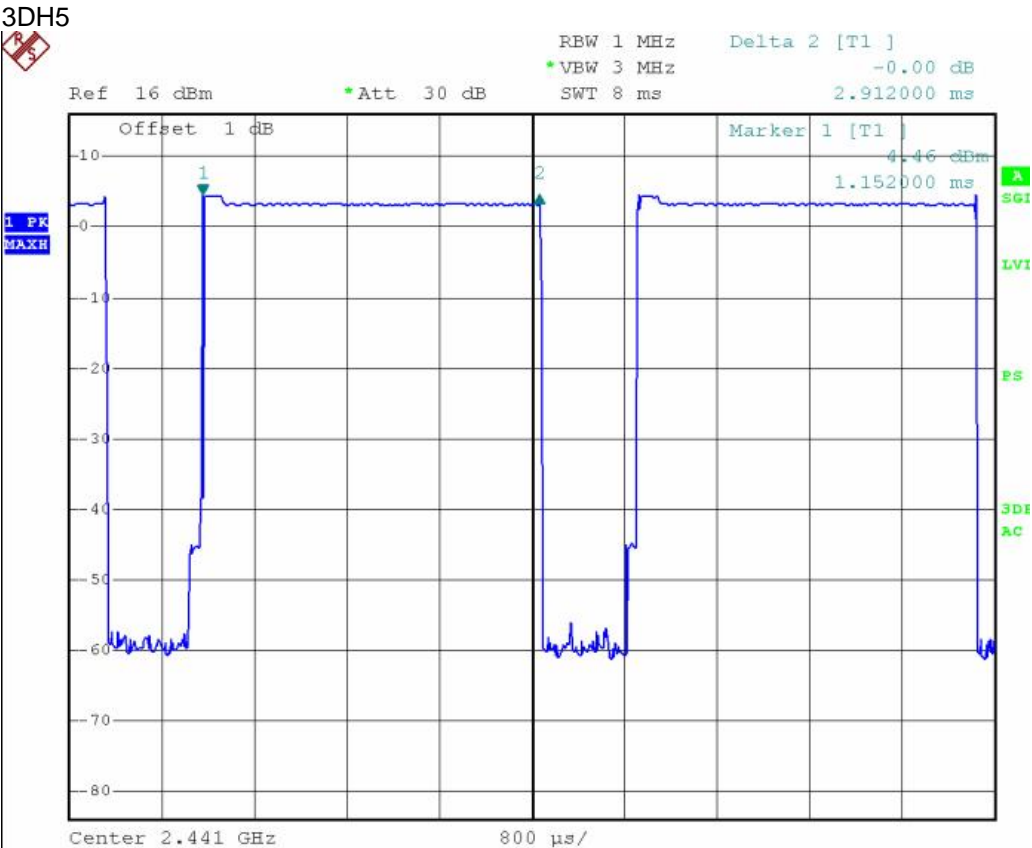


3DH1

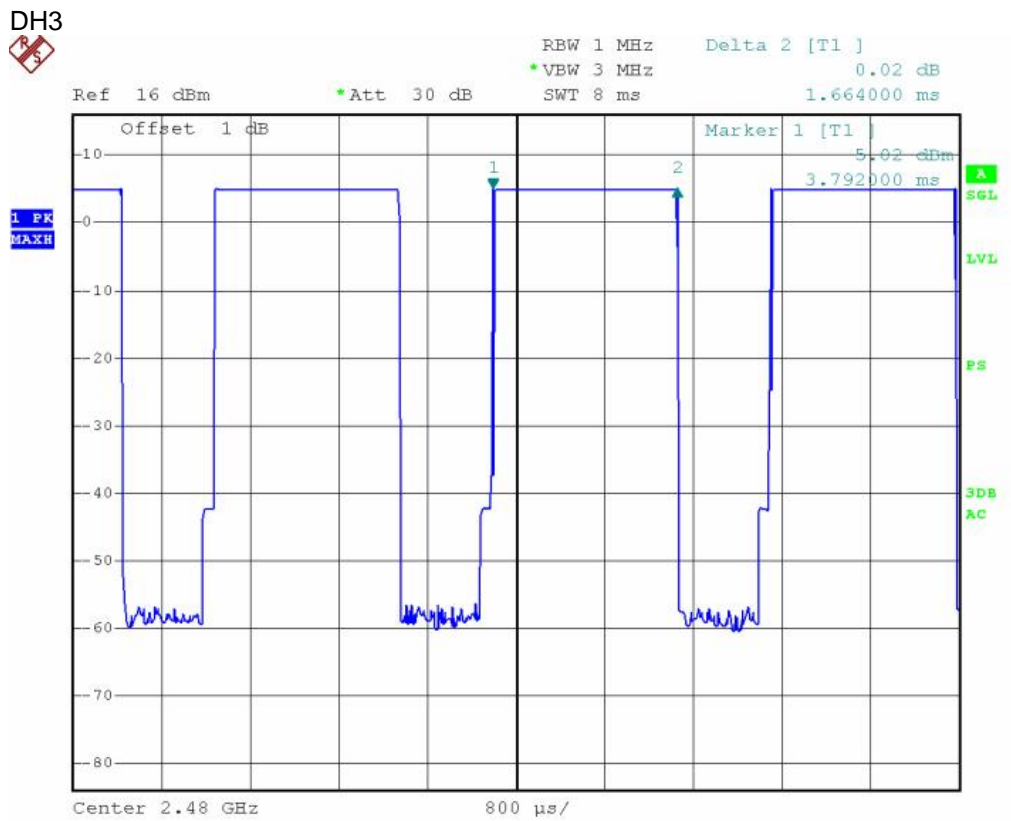
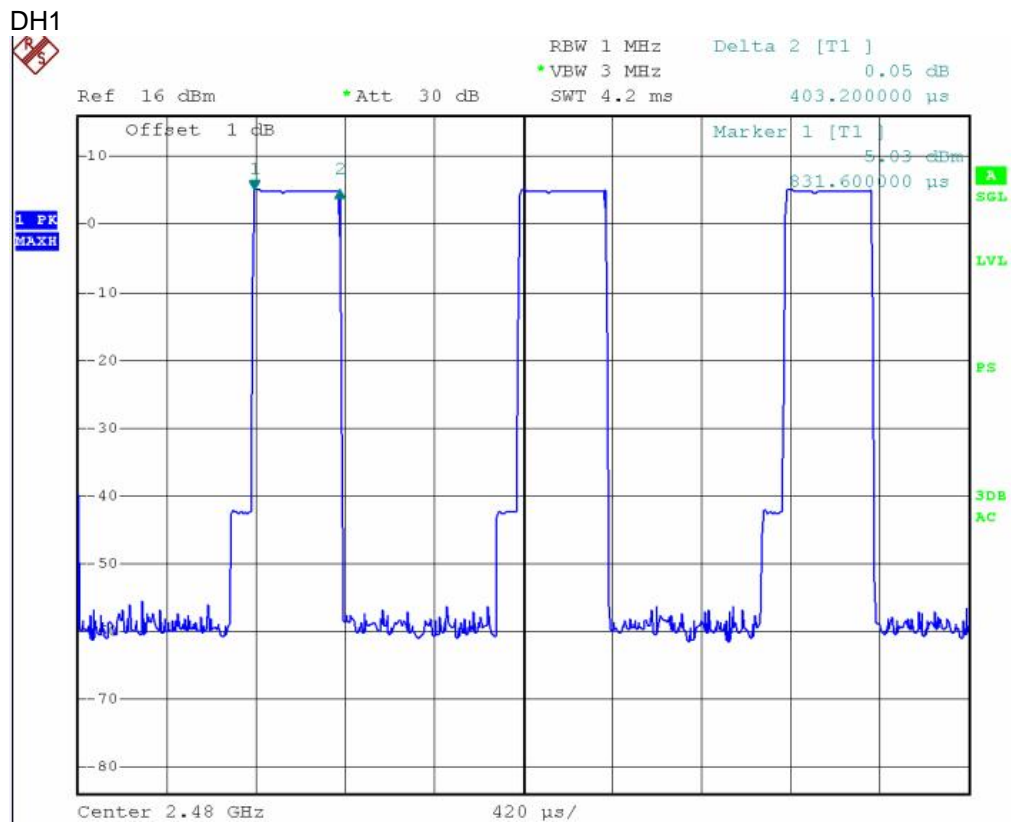


3DH3

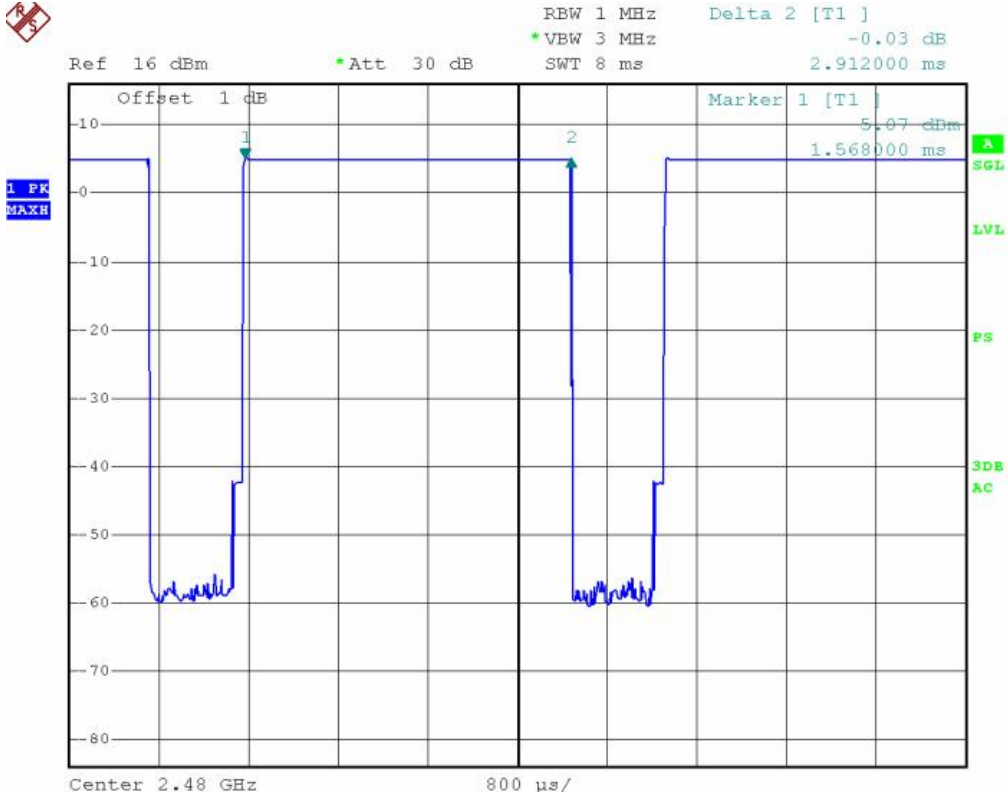




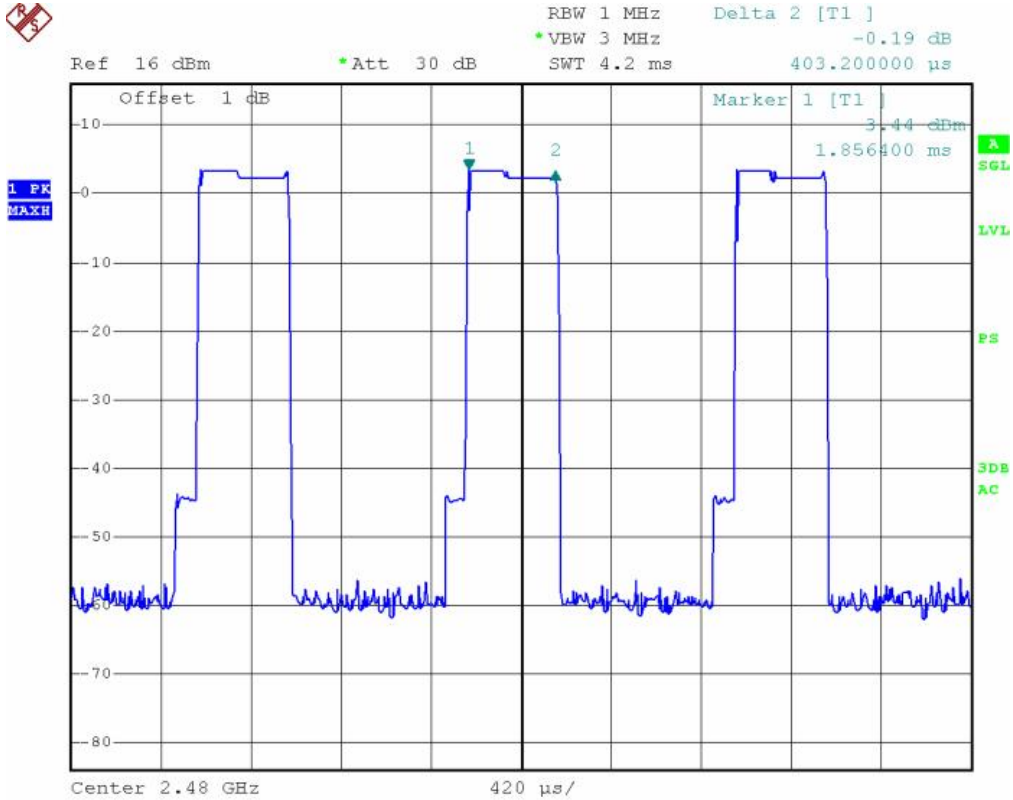
3. Highest channel (2.480GHz)



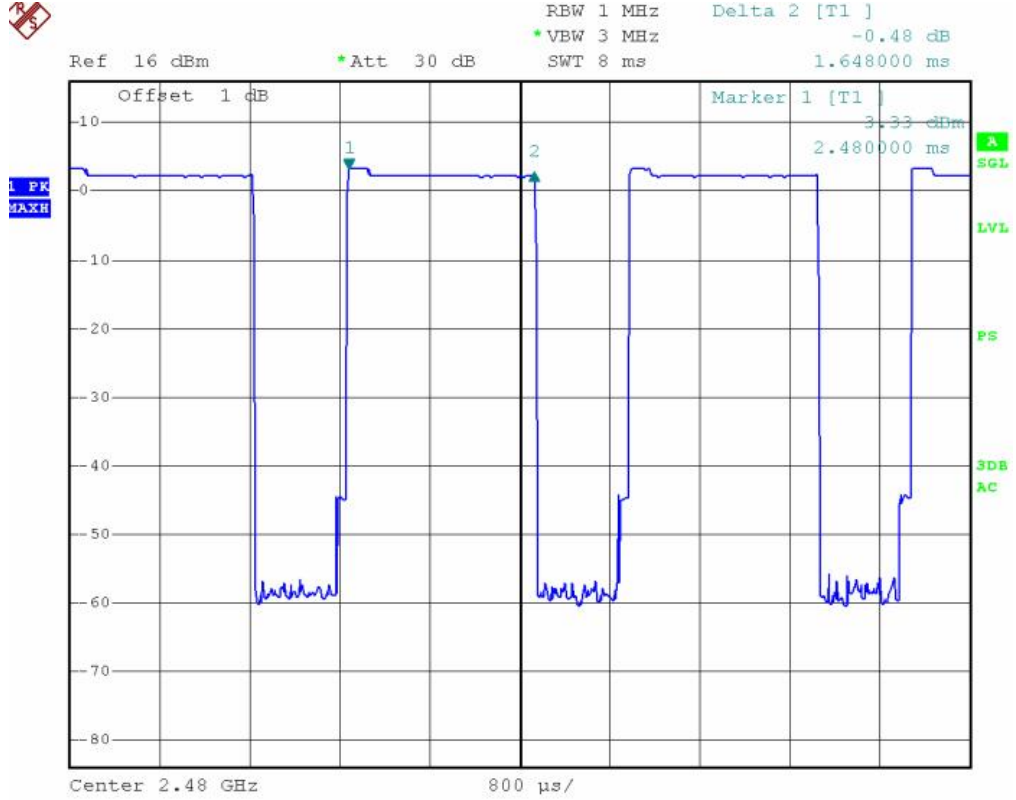
DH5



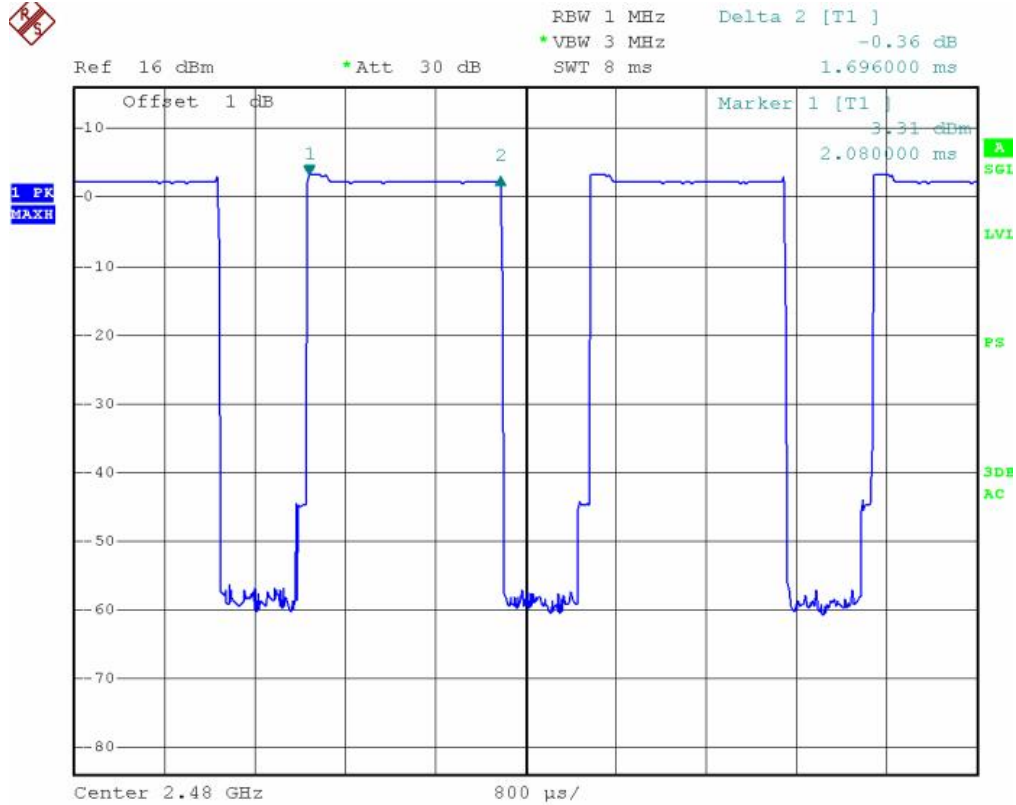
2DH1



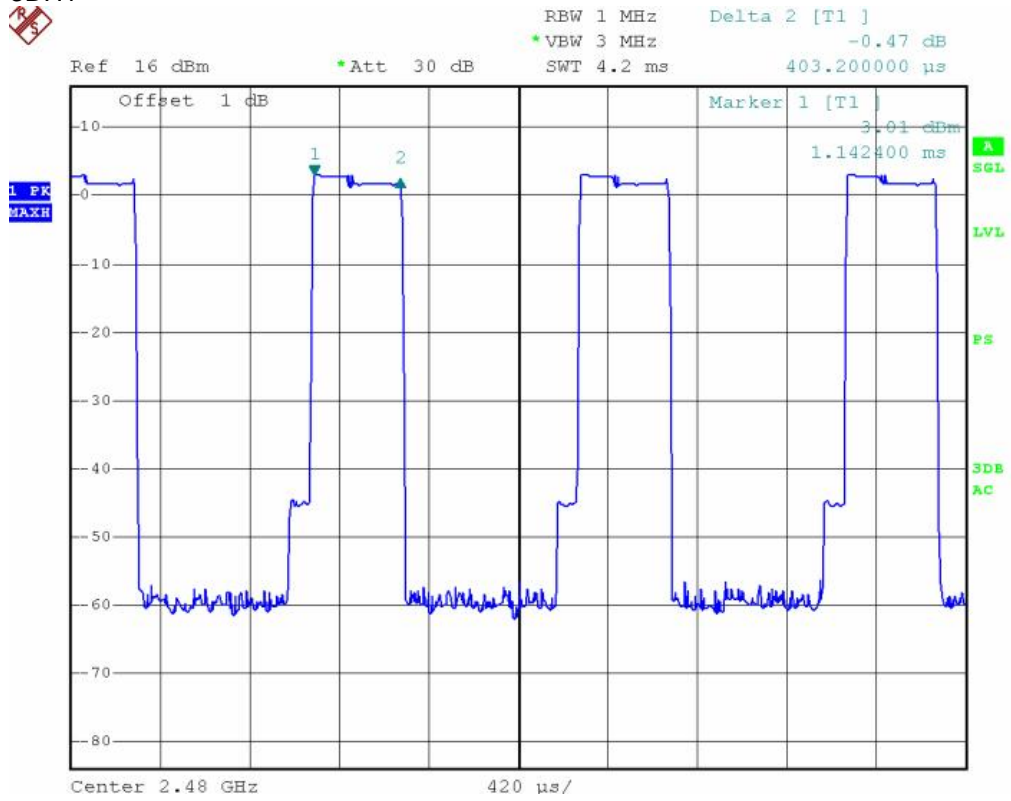
2DH3



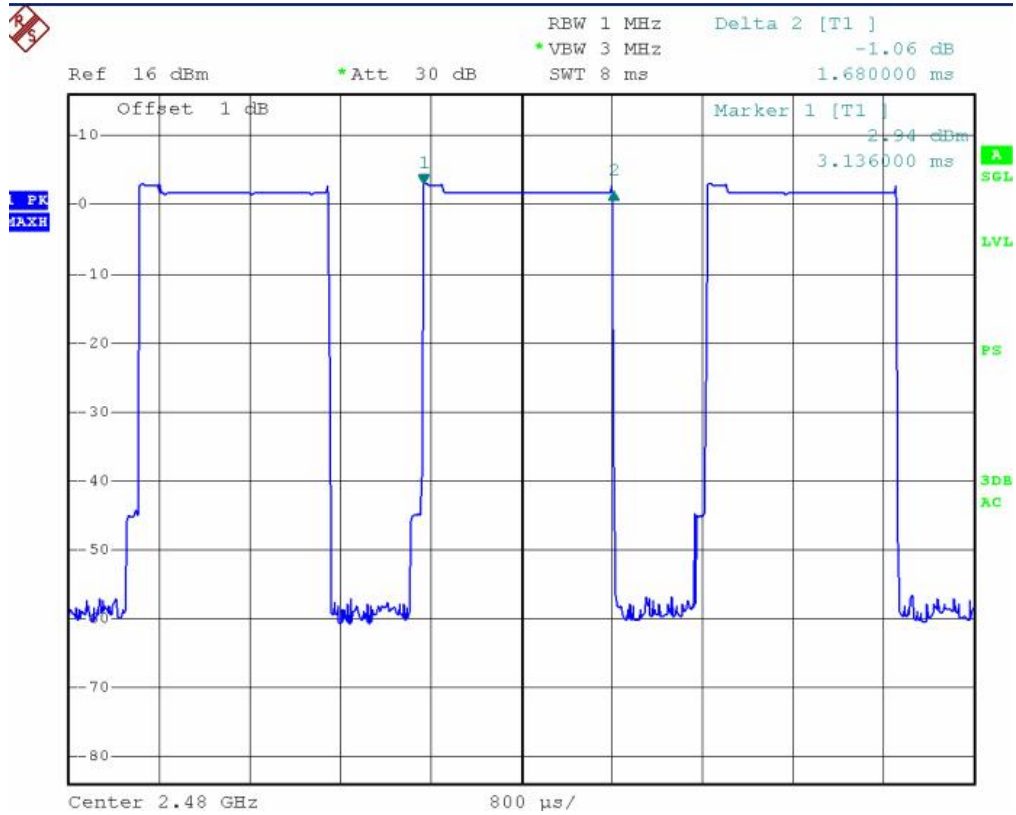
2DH5



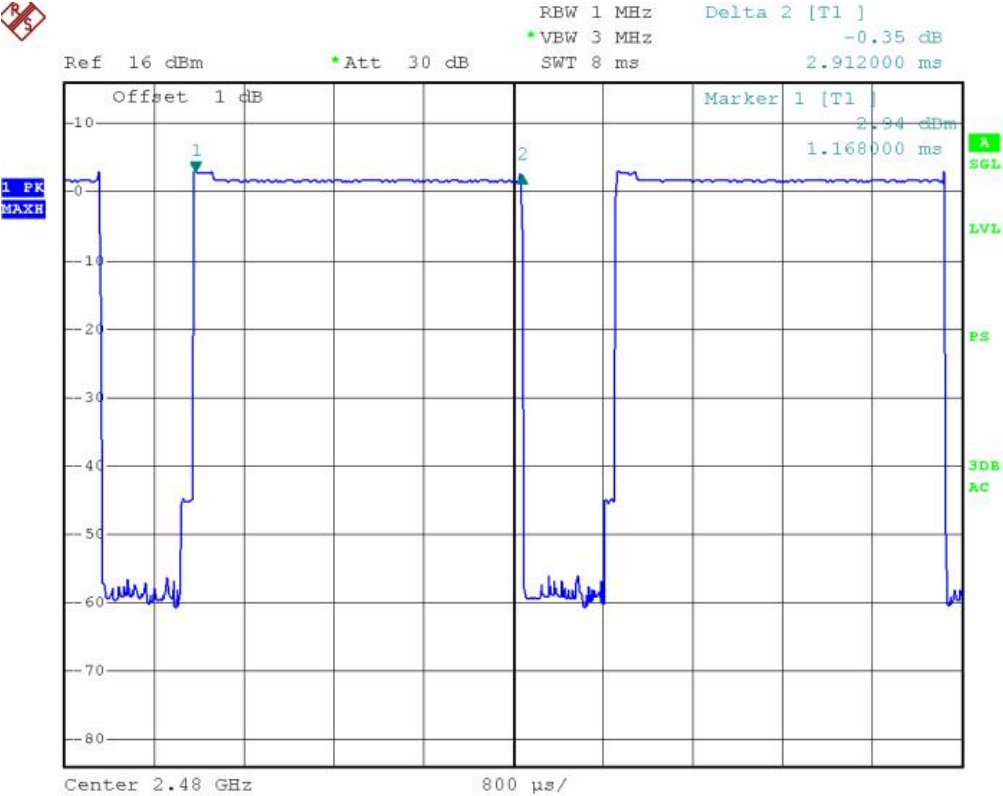
3DH1



3DH3



3DH5



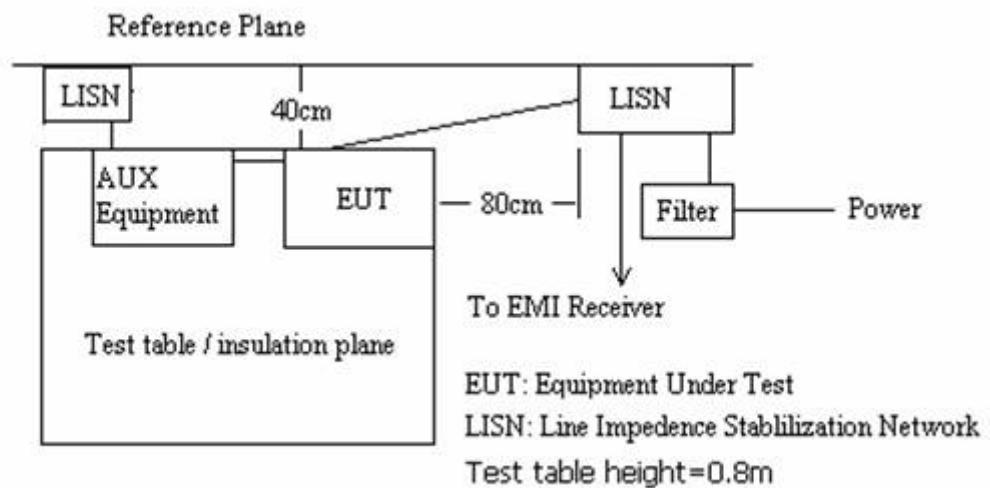
4.7 Conducted Emission Measurement

Test Requirement:	FCC Part 15.207
Test Method:	ANSI C63.10: 2009
Test Date:	2012-03-29
Frequency Range:	150KHz to 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak if maximised peak within 6dB of Quasi-Peak limit
EUT Operation:	Pretest the EUT in 3 modulations to find GFSK and 8DPSK is worse case, so only record 8DPSK test data.

An initial pre-scan was performed on the live and neutral lines with peak detector.

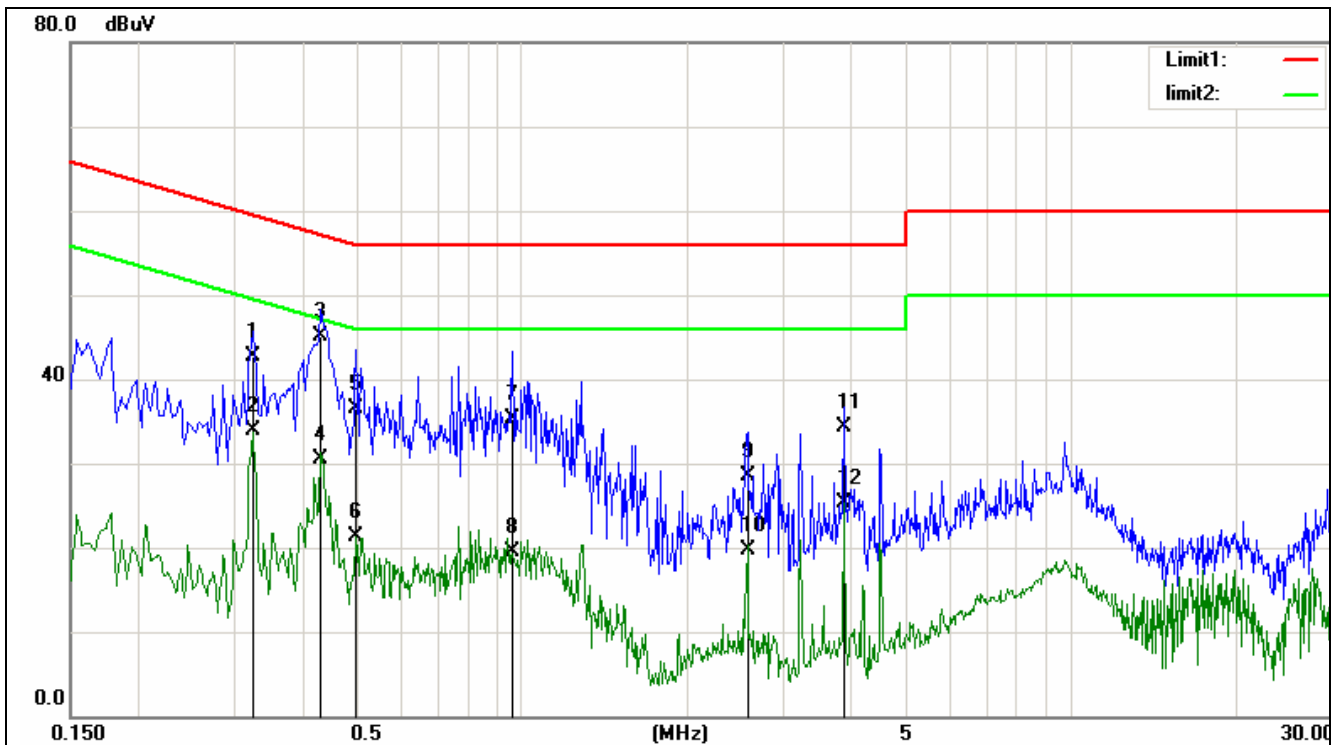
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Plan View of Test Setup



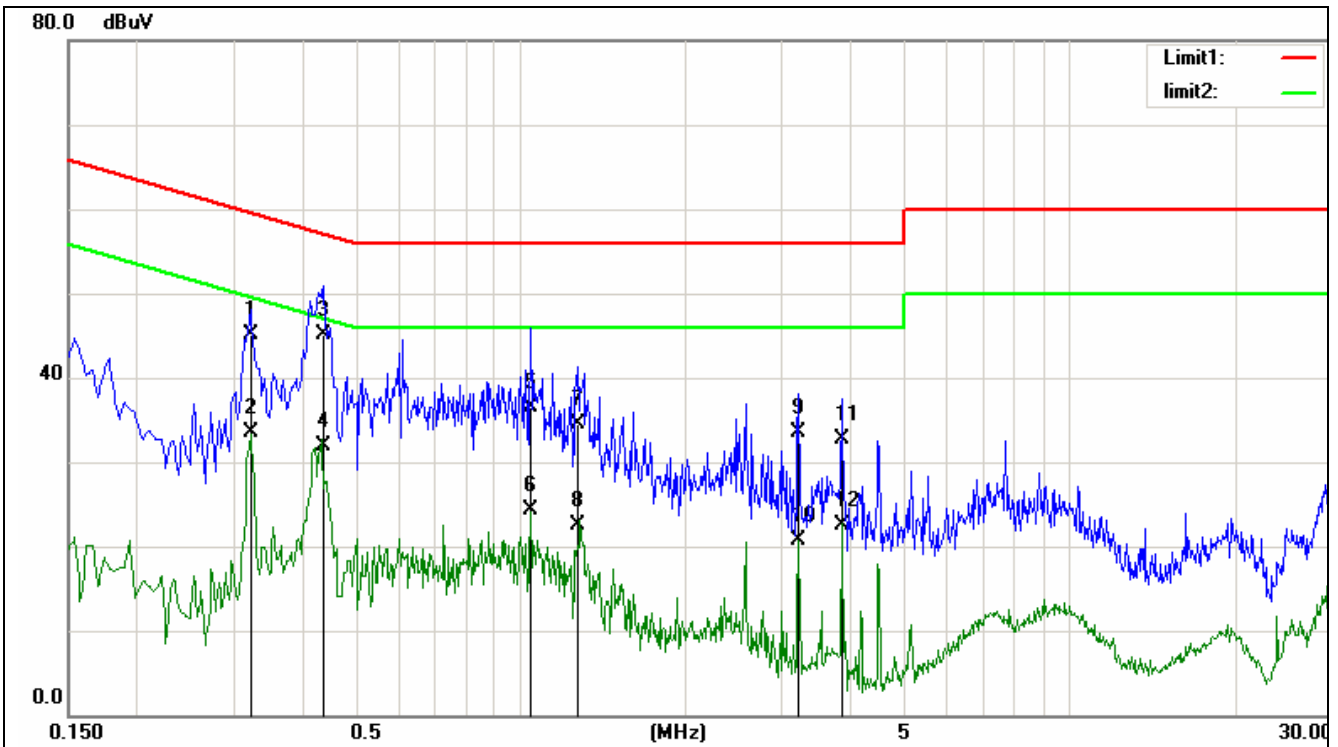
Test Results

Test Result:	Pass	Probe:	N
Standard:	FCC PART 15 class B_QP	Power Source:	AC 120V/60Hz
Test item:	Conduction Test	Date:	2012-3-29
Temp./Hum.(%RH):	22/50%RH	Time:	15:10:04
EUT:	Speaker system	Model:	JEMBE WIRELESS
Note:	Test the EUT in transmitting mode		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.3220	41.93	0.87	42.80	59.65	-16.85	QP
2	0.3220	33.03	0.87	33.90	49.65	-15.75	AVG
3	0.4300	44.52	0.68	45.20	57.25	-12.05	QP
4	0.4300	29.92	0.68	30.60	47.25	-16.65	AVG
5	0.4980	36.05	0.55	36.60	56.03	-19.43	QP
6	0.4980	20.75	0.55	21.30	46.03	-24.73	AVG
7	0.9620	34.89	0.41	35.30	56.00	-20.70	QP
8	0.9620	19.09	0.41	19.50	46.00	-26.50	AVG
9	2.5700	27.89	0.71	28.60	56.00	-27.40	QP
10	2.5700	19.09	0.71	19.80	46.00	-26.20	AVG
11	3.8580	33.68	0.62	34.30	56.00	-21.70	QP
12	3.8580	24.78	0.62	25.40	46.00	-20.60	AVG

Test Result:	Pass	Probe:	L1
Standard:	FCC PART 15 class B_QP	Power Source:	AC 230V/50Hz
Test item:	Conduction Test	Date:	2012-3-29
Temp./Hum.(%RH):	22/50%RH	Time:	15:17:49
EUT:	Speaker system	Model:	JEMBE WIRELESS
Note:	Test the EUT in transmitting mode		

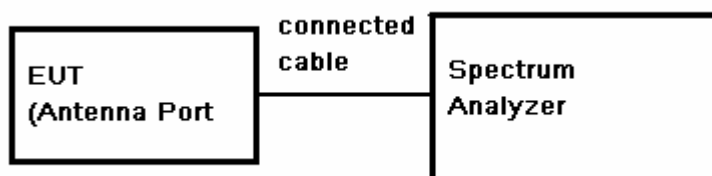


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.3220	44.33	0.87	45.20	59.65	-14.45	QP
2	0.3220	32.63	0.87	33.50	49.65	-16.15	AVG
3	0.4380	44.54	0.66	45.20	57.10	-11.90	QP
4	0.4380	31.34	0.66	32.00	47.10	-15.10	AVG
5	1.0460	36.08	0.42	36.50	56.00	-19.50	QP
6	1.0460	23.88	0.42	24.30	46.00	-21.70	AVG
7	1.2740	34.06	0.54	34.60	56.00	-21.40	QP
8	1.2740	21.96	0.54	22.50	46.00	-23.50	AVG
9	3.2139	32.88	0.62	33.50	56.00	-22.50	QP
10	3.2139	20.18	0.62	20.80	46.00	-25.20	AVG
11	3.8540	32.17	0.63	32.80	56.00	-23.20	QP
12	3.8540	21.87	0.63	22.50	46.00	-23.50	AVG

4.8 Maximum Peak Output Power

Test Requirement:	FCC Part 15.247 & DA 00-705
Test Method:	Base on ANSI 63.10: 2009
Test Date:	2012-03-31
Test Limit:	Regulation 15.247 (b)(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts. Refer to the result "Hopping channel number" of this document. The 1 watt (30.0dBm) limit applies.
Test mode:	Test in fixing frequency transmitting mode.
Power supply:	Connected with convert board powered by PC USB ports, and to fix frequency transmitting.

Test Configuration:



Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

Remark:

1. Pre-test the 3 modulation to find GFSK and 8DPSK is worse case, so only record GFSK and 8DPSK test data.
2. Cable loss = 1.0dB, the receiver offset loss 1.0dB

Test Result:

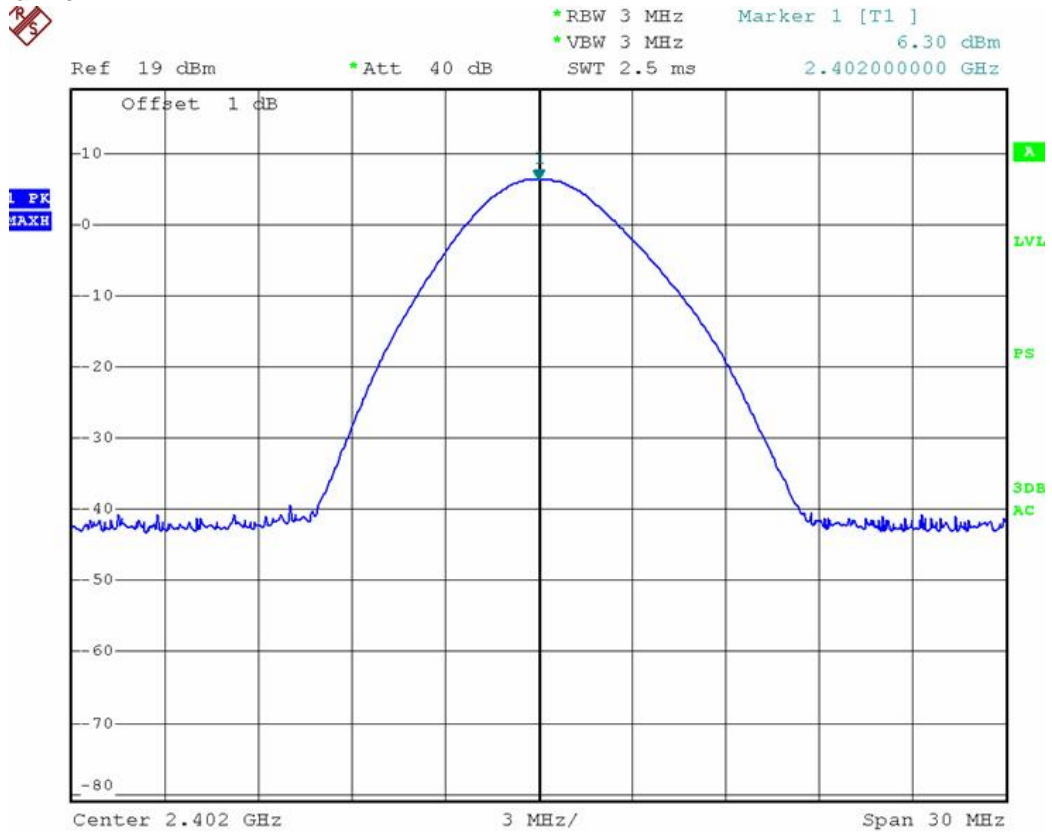
For GFSK:

Test Channel	Fundamental Frequency (GHz)	Max Output Power (dBm)	Limit (dBm)	Margin (dB)
Lowest	2.402	6.30	30.0	23.70
Middle	2.441	5.27	30.0	24.73
Highest	2.480	4.08	30.0	25.92

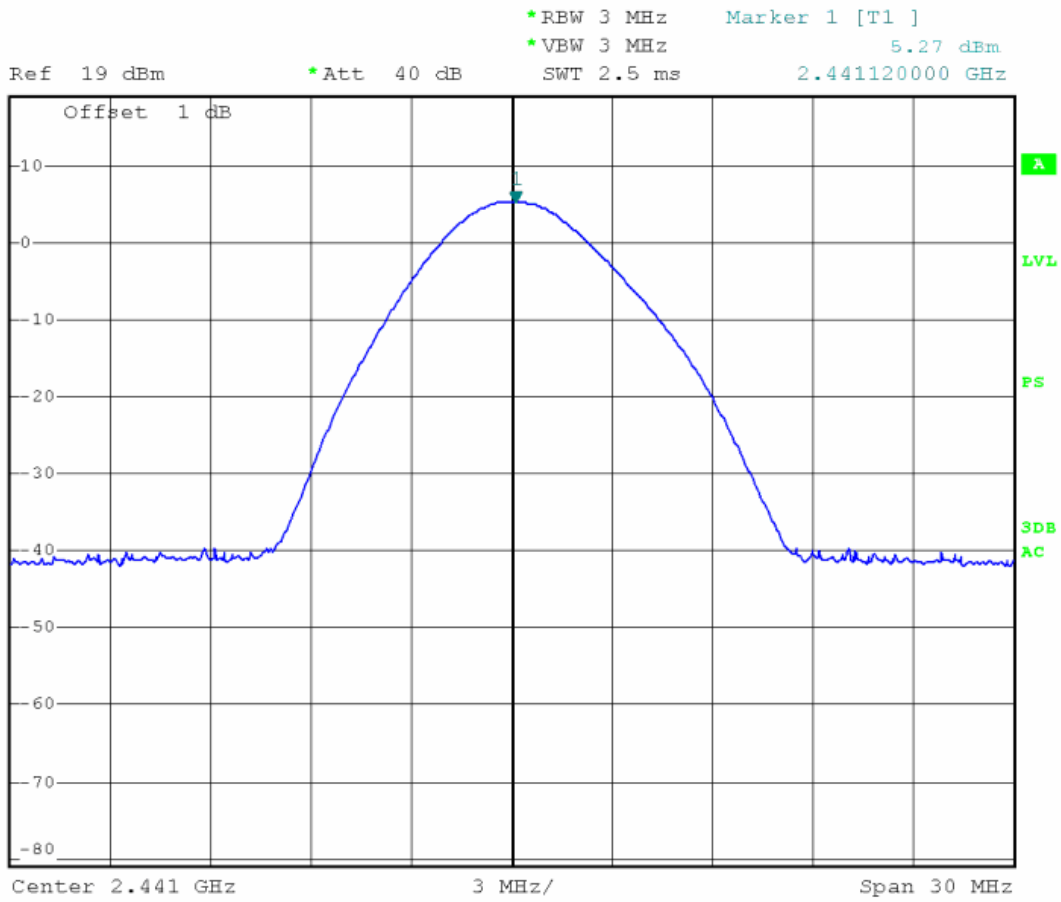
Test result: The unit does meet the FCC requirements.

Test result plot as follows:

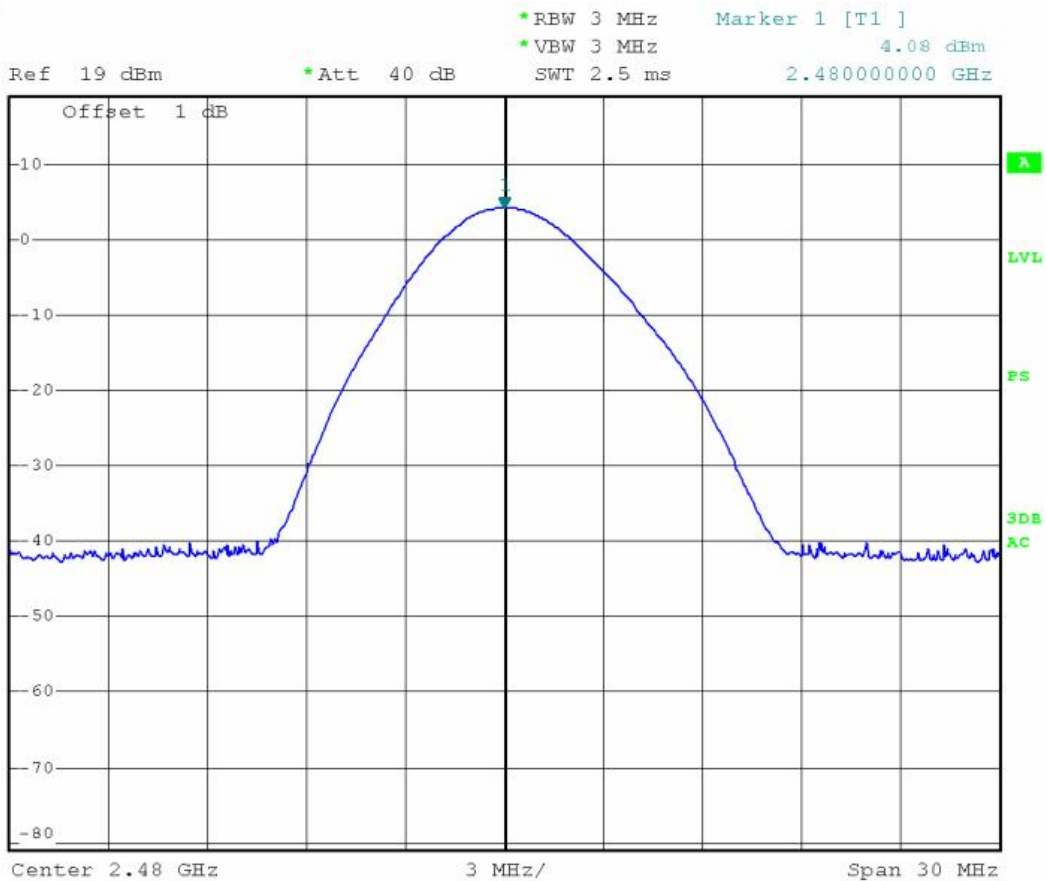
Lowest Channel:



Middle Channel:



Highest Channel:



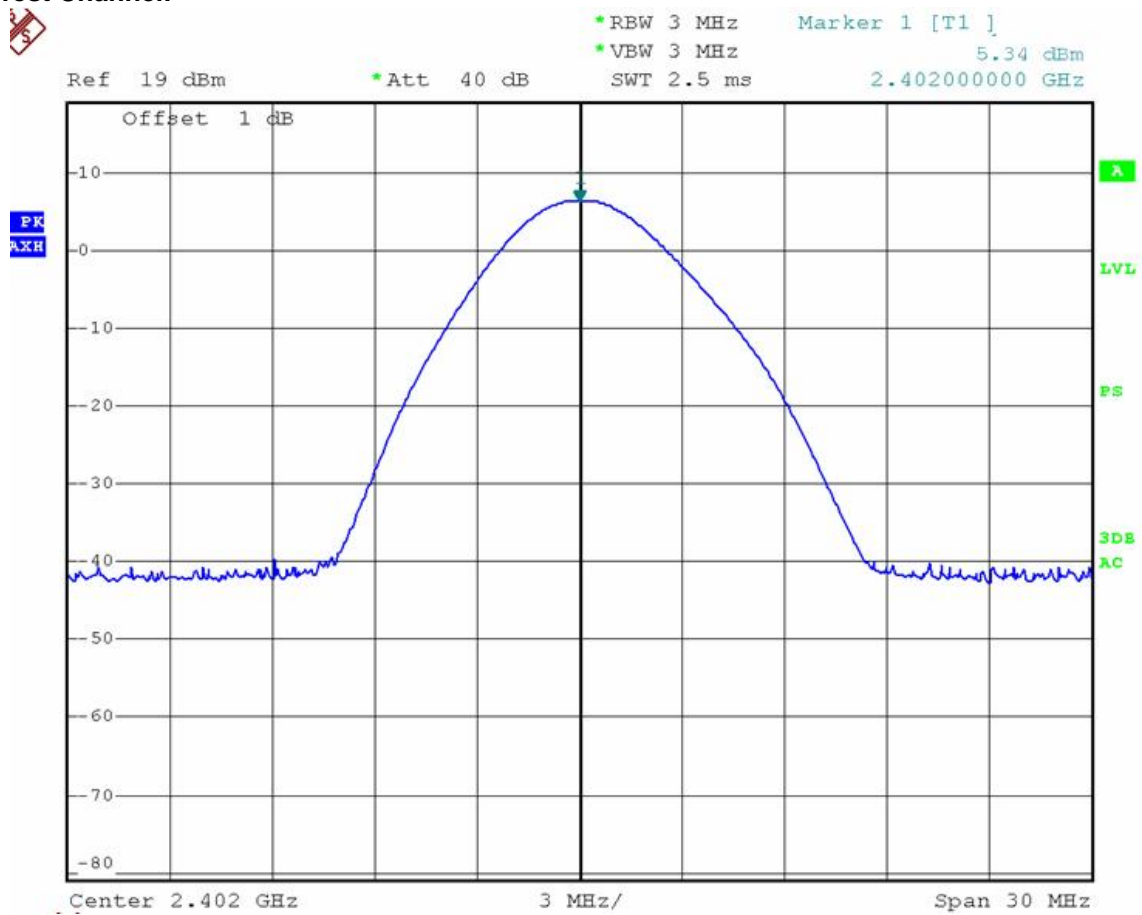
For 8DPSK:

Test Channel	Fundamental Frequency (GHz)	Max Output Power (dBm)	Limit (dBm)	Margin (dB)
Lowest	2.402	5.34	30.0	24.66
Middle	2.441	4.17	30.0	25.83
Highest	2.480	2.75	30.0	27.25

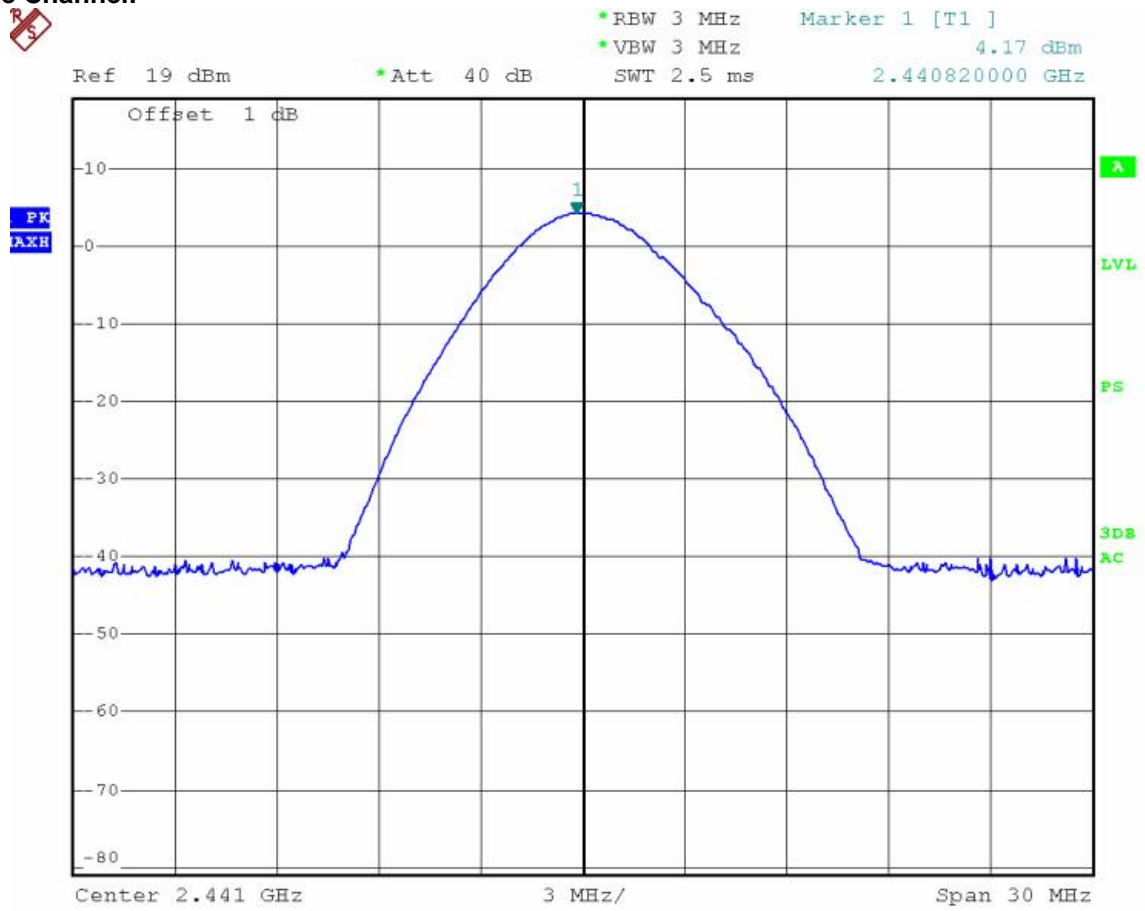
Test result: The unit does meet the FCC requirements.

Test result plot as follows:

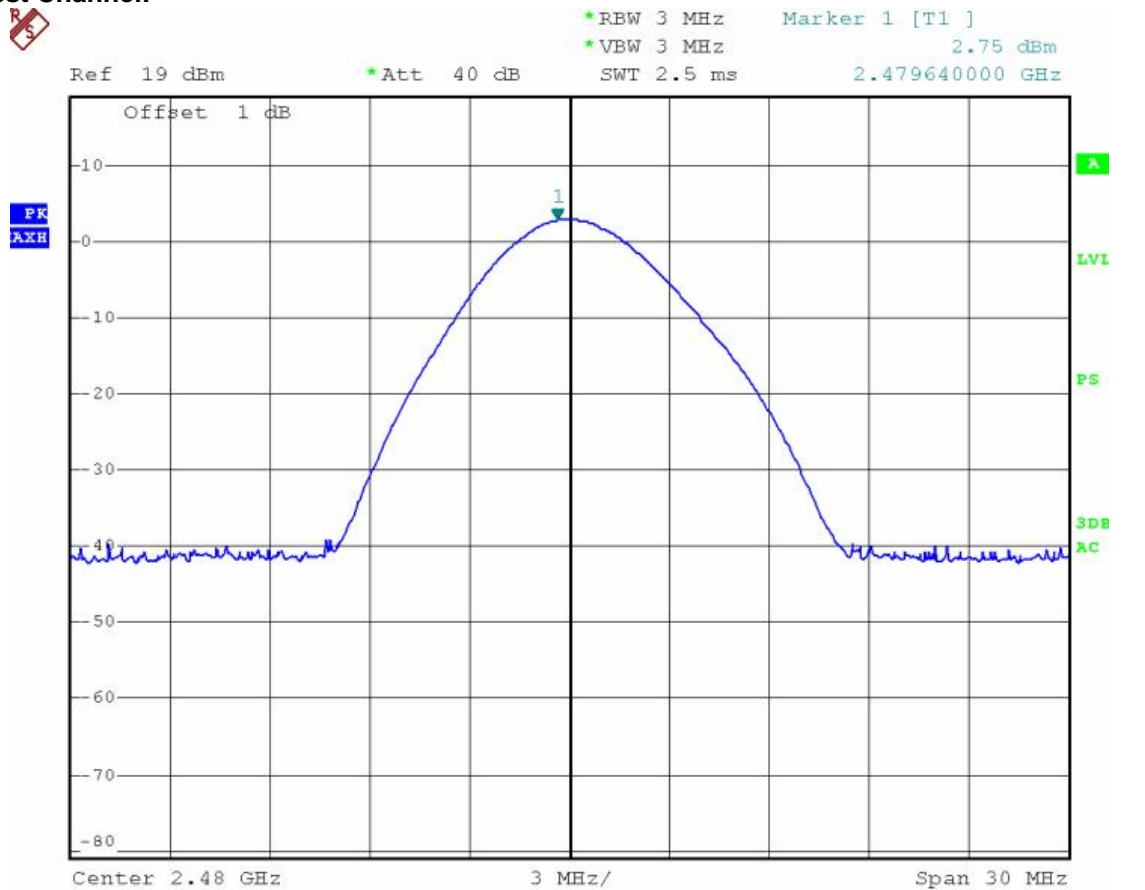
Lowest Channel:



Middle Channel:



Highest Channel:



4.9 Conducted Spurious Emissions

Test Requirement: FCC Part 15.247

Test Method: Based on FCC Part 15 C Section 15.247

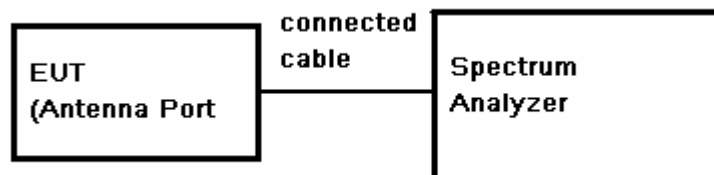
Test Date: 2012-03-31

Power supply: Connected with convert board powered by PC USB ports, and to fix frequency transmitting.

Test requirements: (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Status: Test the lowest, Middle, highest channel.

Test Configuration:



Test Procedure:

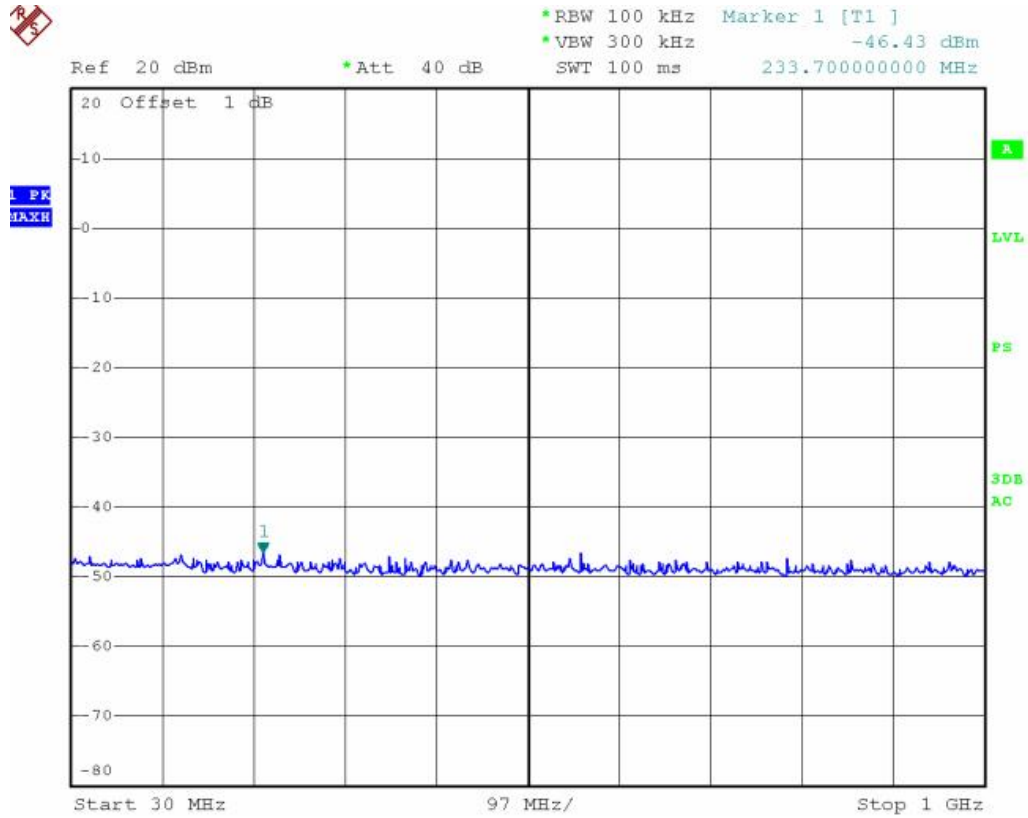
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: Sweep = auto; Detector Function = Peak (Max. hold).

Test result plot as follows:

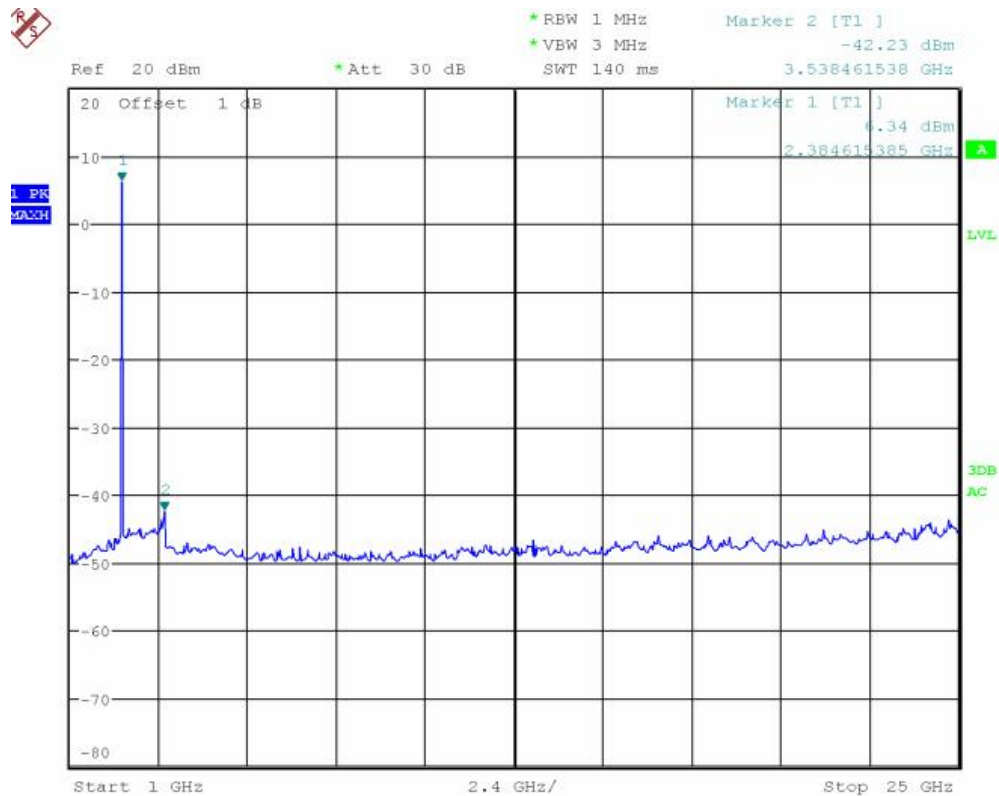
For GFSK

Lowest Channel:

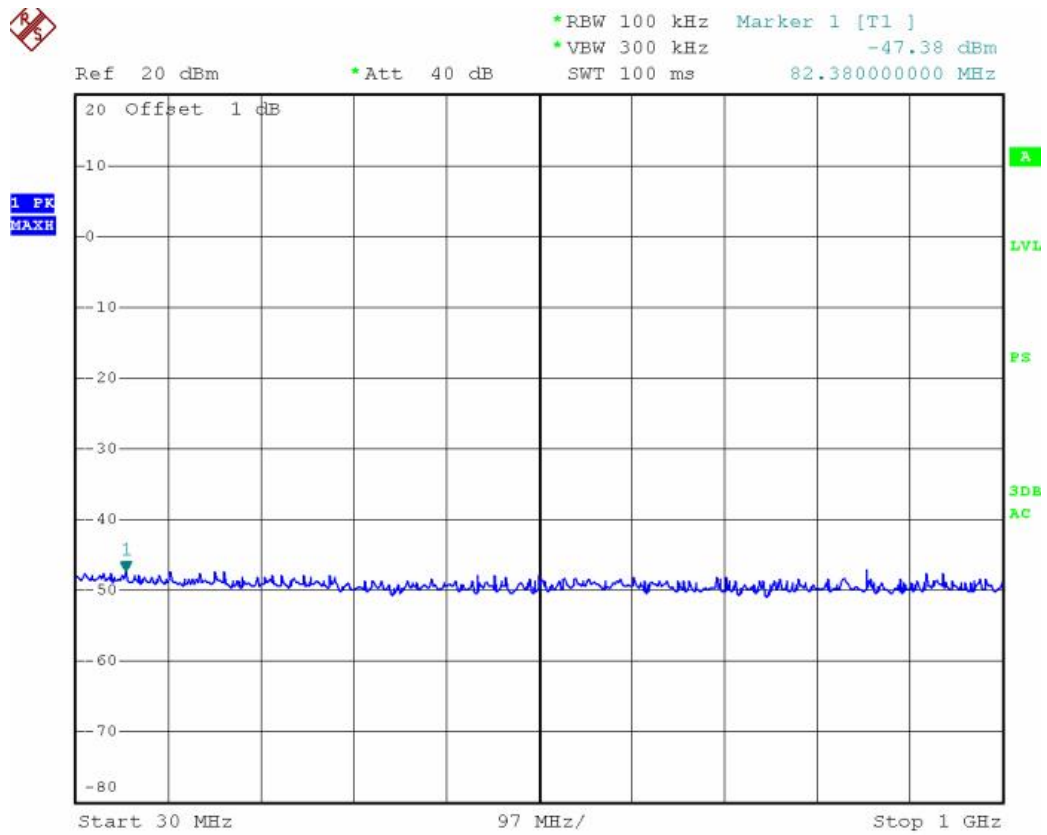
30M to 1GHz



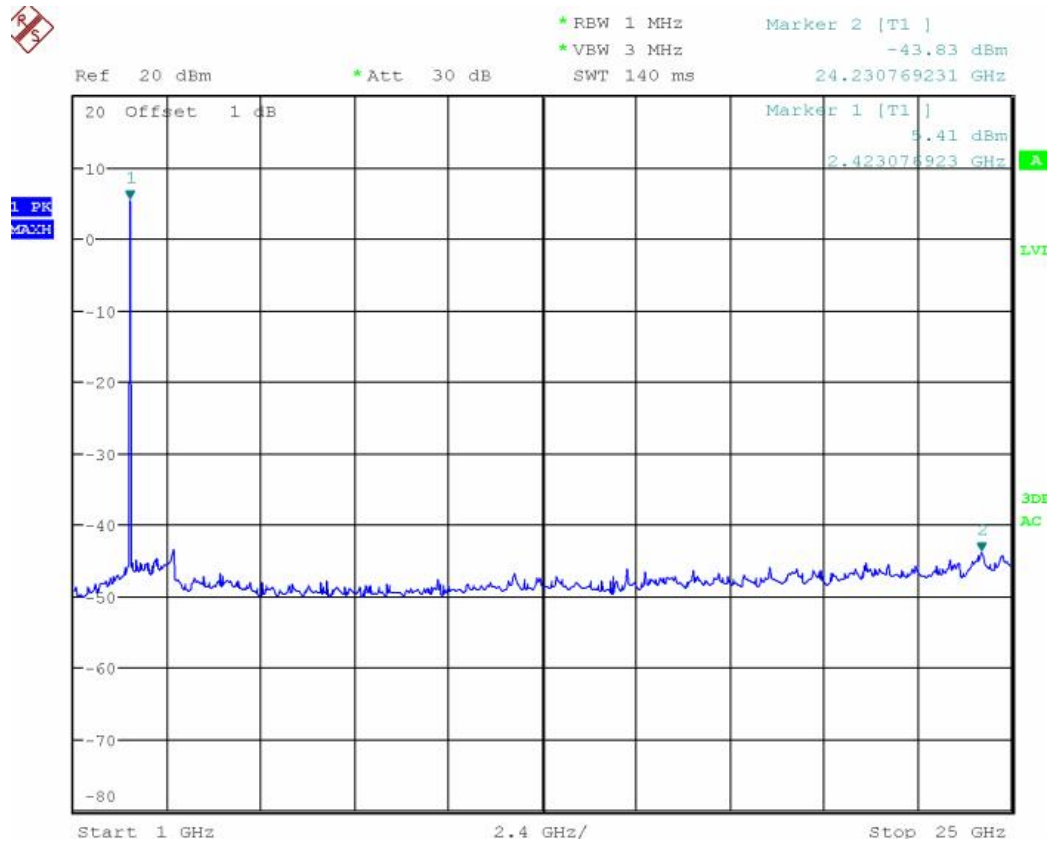
1G to 25GHz



Middle Channel:
30M to 1GHz



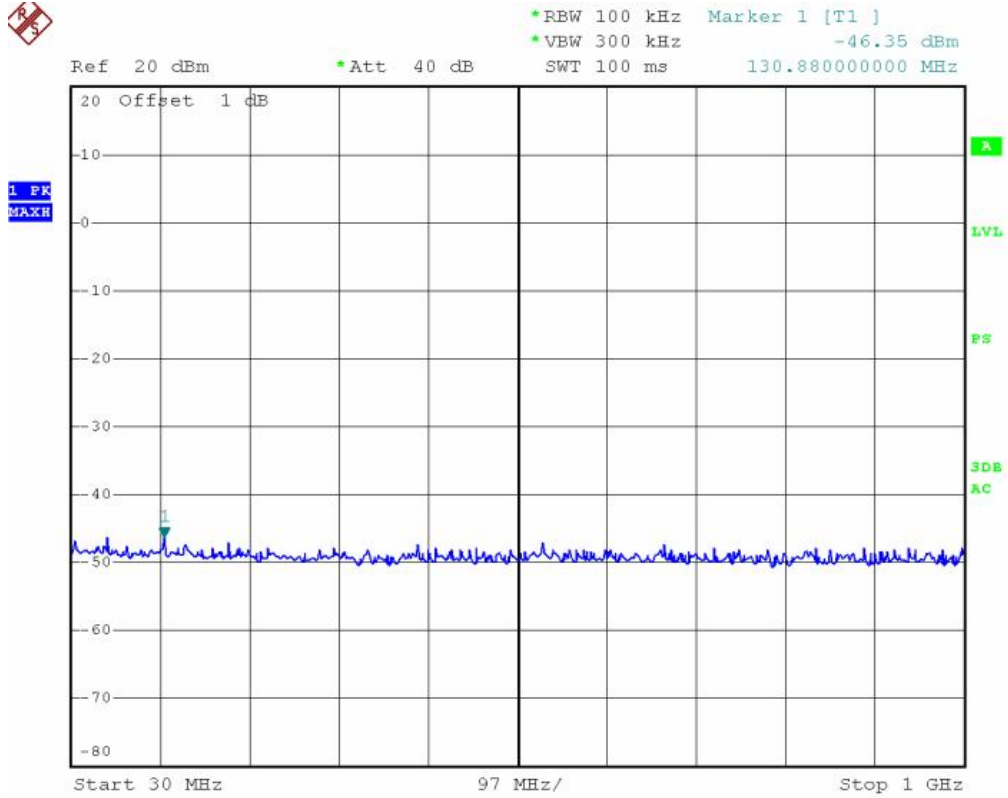
1G to 25GHz



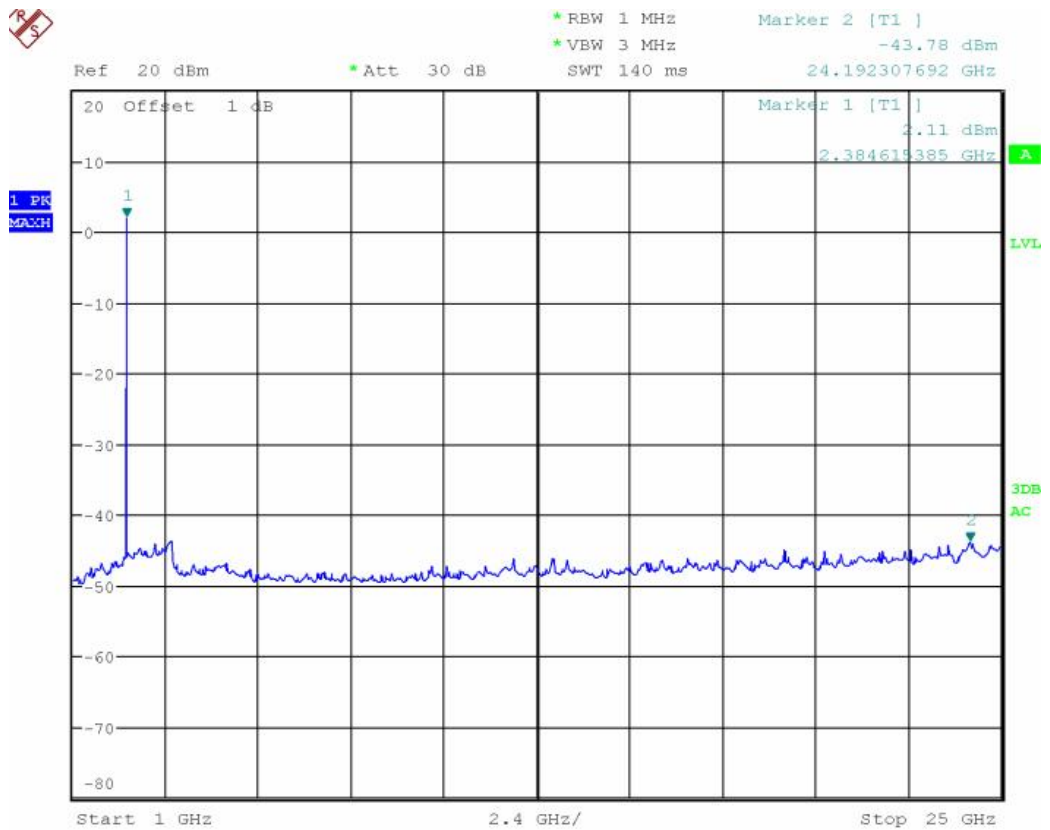
For 8DPSK

Lowest Channel:

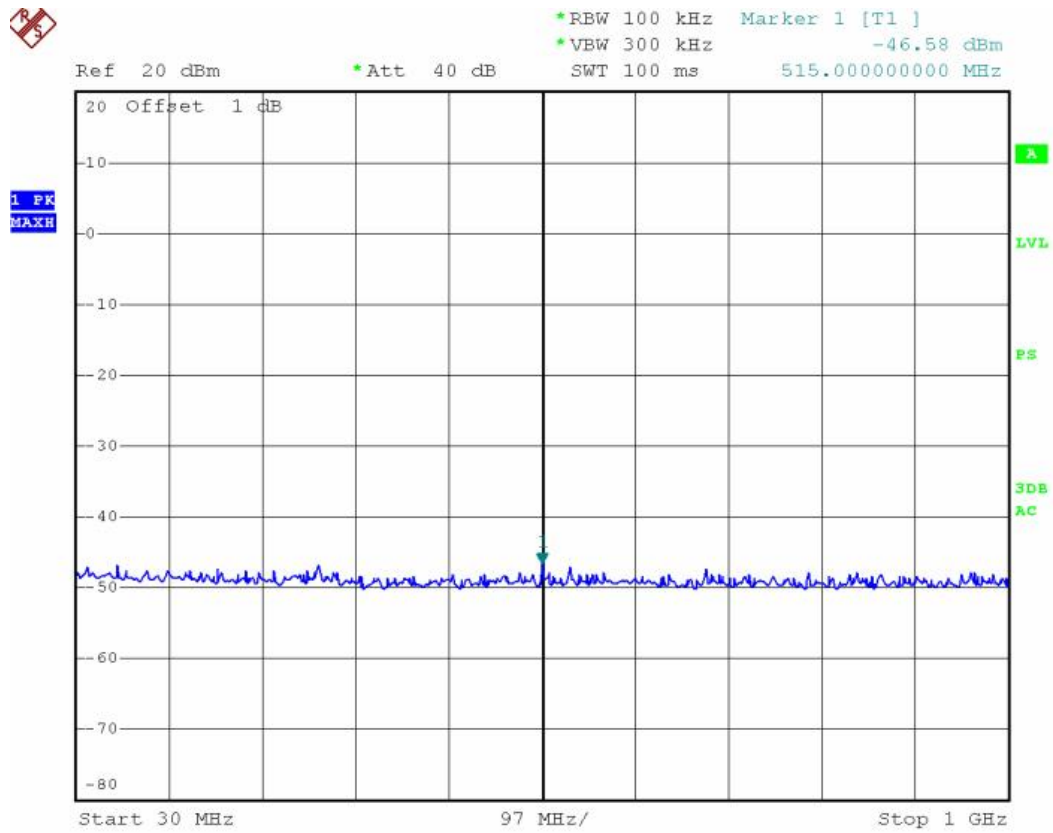
30M to 1GHz



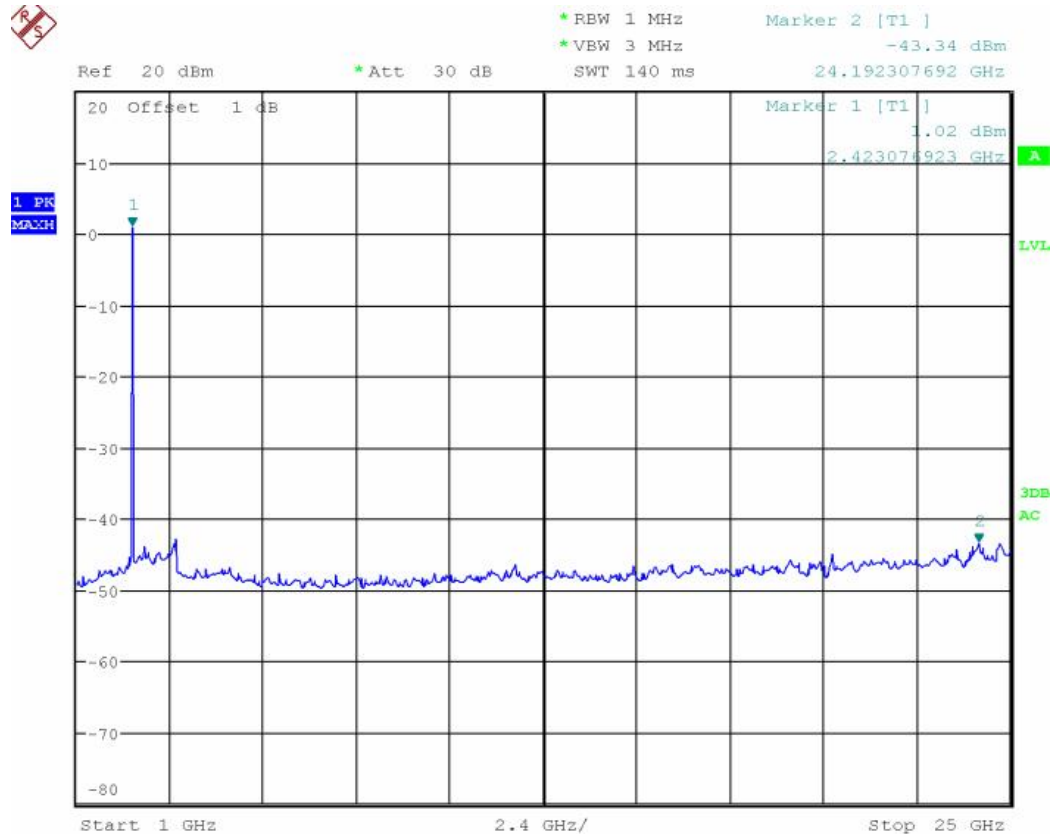
1G to 25GHz



Middle Channel:
30M to 1GHz

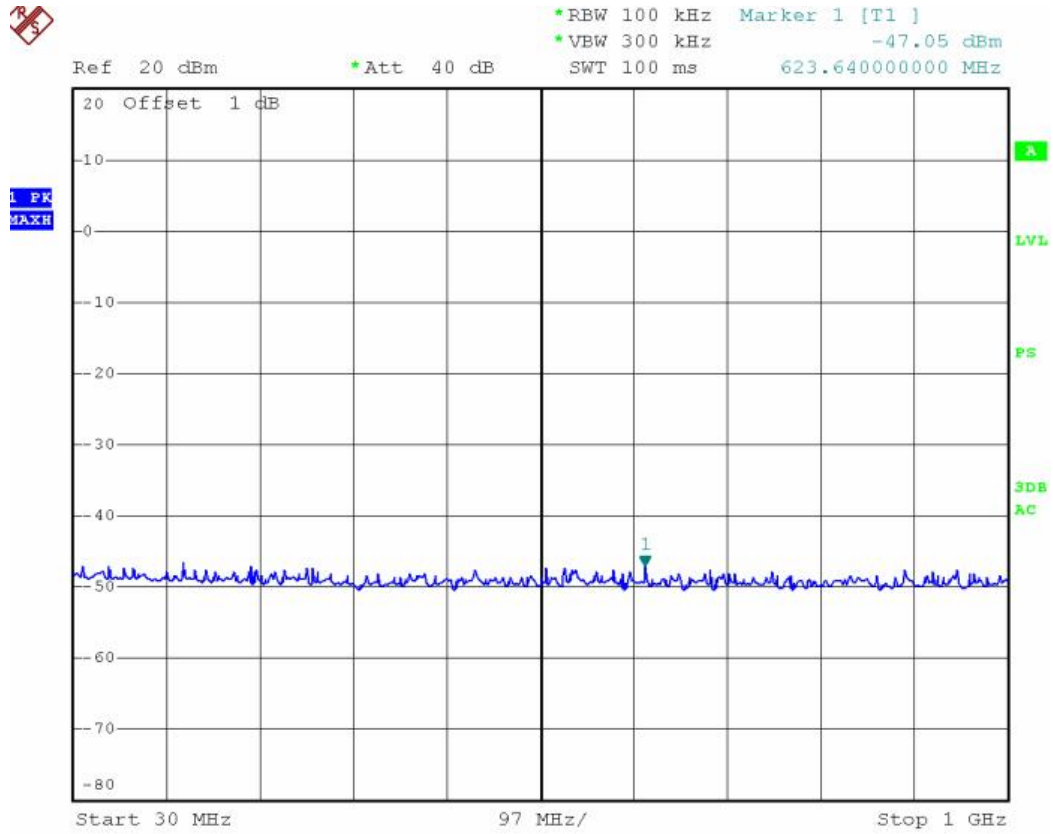


1G to 25GHz

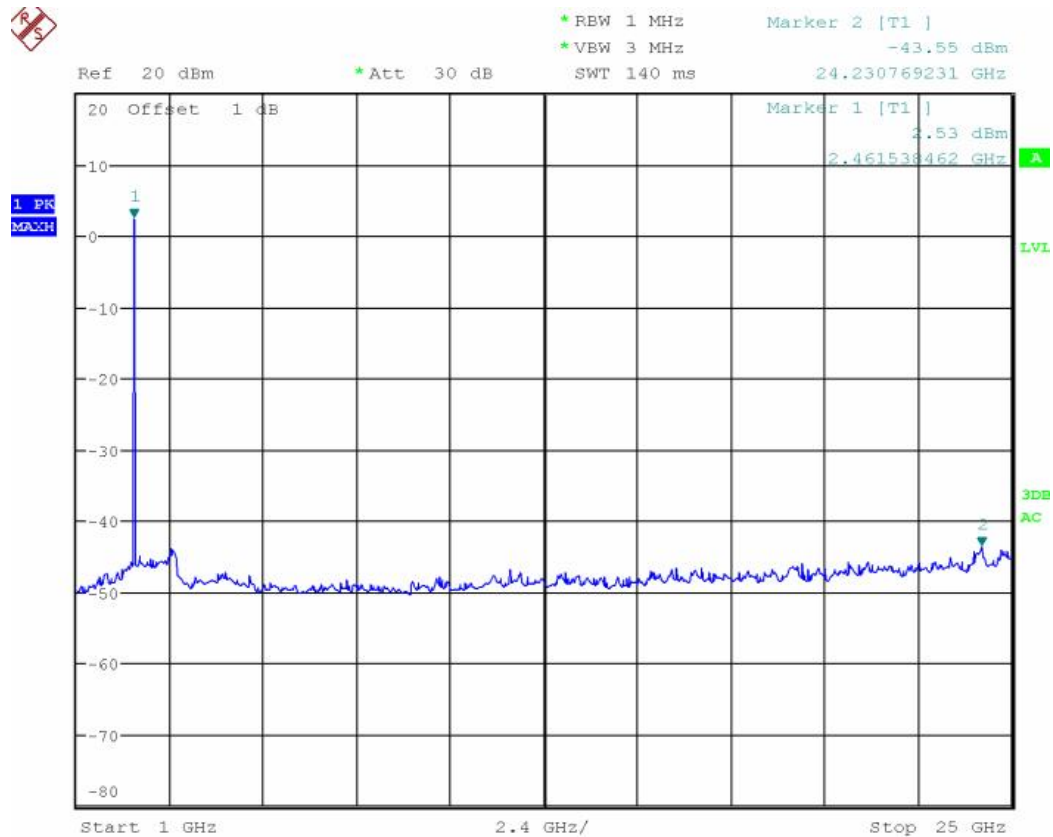


Highest Channel

30M to 1GHz

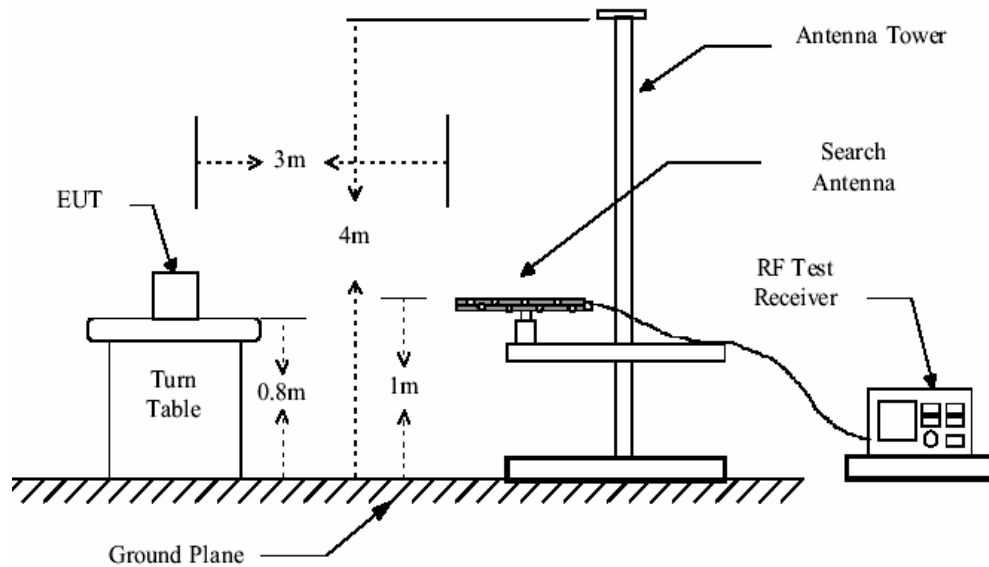
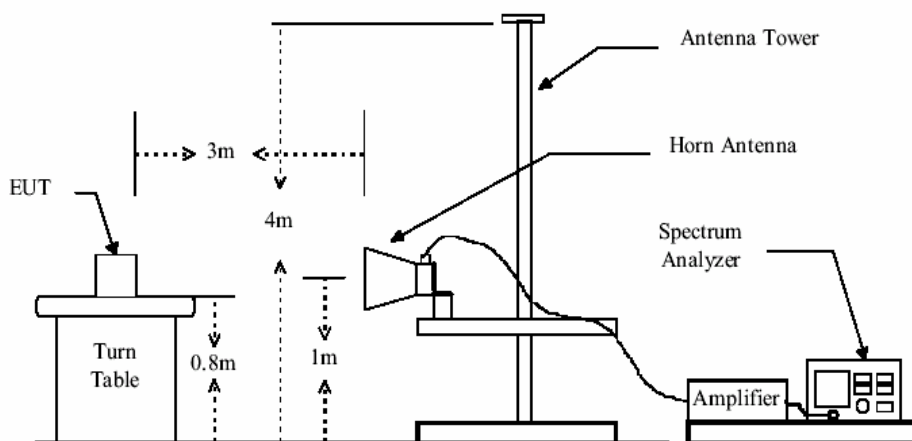


1G to 25GHz



4.10 Radiated Spurious Emissions

Test Requirement:	FCC 15.247(d) & 15.209
Test Method:	ANSI C63.10 section 8 & 13
Test Date:	2012-03-31
Test Status:	Test in fixing frequency transmitting mode.
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber) Test instrumentation resolution bandwidth 120 kHz and Quasi-Peak detector applies (30 MHz – 1000 MHz). 1MHz resolution bandwidth and Peak and Average-Peak detector apply (1000 MHz – 25GHz). Receive antenna scan height 1 m – 4 m. polarization Vertical / Horizontal
Power supply:	Connected with convert board powered by PC USB ports, and to fix frequency transmitting.
15.209 Limit:	40.0 dB μ V/m between 30MHz & 88MHz 43.5 dB μ V/m between 88MHz & 216MHz 46.0 dB μ V/m between 216MHz & 960MHz 54.0 dB μ V/m above 960MHz 1G ~26.5GHz, 74dB μ V/m in Peak, 54.0 dB μ V/m in AV.
15.247(d) limit:	(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that Contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Configuration:**Figure 1. 30MHz to 1GHz radiated emissions test configuration****Figure 2. Above 1GHz radiated emissions test configuration**

Test Procedure: The procedure used was ANSI Standard C63.10-2009. The receiver was scanned from 30MHz to 25GHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Pre-test for normal mode and EDR mode, to find the EDR is the worst case.
The worst case emissions were reported.

Test Results

1. Low Frequency 2402MHz

30MHz~1GHz Spurious Emissions .Quasi-Peak Measurement

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	226.8324	19.78	12.81	32.59	46.00	-13.41	Vertical
2	134.5048	27.76	8.91	36.67	43.50	-6.83	Horizontal
3	137.5624	25.30	9.06	34.36	43.50	-9.14	Horizontal
4	191.6416	22.91	11.45	34.36	43.50	-9.14	Horizontal

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	1602.941	41.62	2.49	44.11	74.00	-29.89	Horizontal
2	2403.142	46.40	5.52	51.92	74.00	-22.08	Horizontal
3	1602.941	38.98	2.49	41.47	74.00	-32.53	Vertical
4	2403.142	41.48	5.52	47.00	74.00	-27.00	Vertical

AV Measurement:

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	1602.941	40.35	2.49	42.84	54.00	-11.16	Horizontal
2	2403.142	43.36	5.52	48.88	54.00	-5.12	Horizontal
3	1602.941	37.65	2.49	40.14	54.00	-13.86	Vertical
4	2403.142	38.40	5.52	43.92	54.00	-10.08	Vertical

The field strength is calculated by adding the Antenna Factor. Correct Factor.

The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Correct Factor

2. Middle Frequency 2441MHz

30MHz~1GHz Spurious Emissions .Quasi-Peak Measurement

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	226.8324	21.02	12.81	33.83	46.00	-12.17	Vertical
2	127.1547	27.61	8.72	36.33	43.50	-7.17	Horizontal
3	168.4062	26.19	10.54	36.73	43.50	-6.77	Horizontal
4	191.6416	24.04	11.45	35.49	43.50	-8.01	Horizontal
5	277.6921	21.01	14.37	35.38	46.00	-10.62	Horizontal

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	1628.542	42.05	2.57	44.62	74.00	-29.39	Horizontal
2	2441.524	44.27	5.71	49.98	74.00	-24.02	Horizontal
3	1628.542	40.02	2.57	42.59	74.00	-31.41	Vertical
4	2441.524	41.52	5.71	47.23	74.00	-26.77	Vertical

AV Measurement:

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	1628.542	41.12	2.57	43.69	54.00	-10.31	Horizontal
2	2441.524	42.43	5.71	48.14	54.00	-5.86	Horizontal
3	1628.542	37.50	2.57	40.07	54.00	-13.93	Vertical
4	2441.524	38.87	5.71	44.58	54.00	-9.42	Vertical

The field strength is calculated by adding the Antenna Factor. Correct Factor.

The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Correct Factor

3. High Frequency 2480MHz

30MHz~1GHz Spurious Emissions .Quasi-Peak Measurement

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	271.5198	21.12	14.19	35.31	46.00	-10.69	Vertical
2	127.8713	28.13	8.72	36.85	43.50	-6.65	Horizontal
3	137.5624	29.38	9.06	38.44	43.50	-5.06	Horizontal
4	168.4062	26.88	10.54	37.42	43.50	-6.08	Horizontal

1~25 GHz Harmonics & Spurious Emissions. Peak & Average Measurement

Peak Measurement:

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	1654.553	41.76	2.66	44.42	74.00	-29.58	Horizontal
2	2480.519	43.19	5.88	49.07	74.00	-24.93	Horizontal
3	1654.553	39.64	2.66	42.30	74.00	-31.70	Vertical
4	2480.519	42.06	5.88	47.94	74.00	-26.06	Vertical

AV Measurement:

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Antenna polarization
1	1654.553	40.34	2.66	43.00	54.00	-11.00	Horizontal
2	2480.519	41.56	5.88	47.44	54.00	-6.56	Horizontal
3	1654.553	38.23	2.66	40.89	54.00	-13.11	Vertical
4	2480.519	40.21	5.88	46.09	54.00	-7.91	Vertical

The field strength is calculated by adding the Antenna Factor. Correct Factor.

The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Correct Factor

Remark: No any other emissions level which are attenuated less than 20dB below the limit.

According to 15.31(o), The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this Part.

Hence there no other emissions have been reported.

Remark:

- 1). N/A: For this intentional radiator operates below 25 GHz. The spectrum shall be investigated to the tenth harmonic of the highest fundamental frequency. And above the third harmonic of this intentional radiator, the disturbance is very low. So the test result only displays to 3rd harmonic.
- 2). As shown in Section, for frequencies above 1000 MHz. the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.
- 3). The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.

Test result: The unit does meet the requirements.

4.10.1 Radiated Emissions which fall in the restricted bands

Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	Base on ANSI 63.10
Test Date:	2012-03-31
Measurement Distance:	3m (Semi-Anechoic Chamber)
Limit:	40.0 dB μ V/m between 30MHz & 88MHz; 43.5 dB μ V/m between 88MHz & 216MHz; 46.0 dB μ V/m between 216MHz & 960MHz; 54.0 dB μ V/m above 960MHz.
Detector:	Peak for pre-scan: 100kHz resolution bandwidth and 100kHz video bandwidth within 1GHz. 1MHz resolution bandwidth and 1MHz video bandwidth above 1GHz

Section 15.205 Restricted bands of operation.

(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 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	
13.36 - 13.41	322 - 335.4		

Test Result:

Pretest the Bluetooth normal mode and EDR mode, record EDR mode date

The field strength was measured with an EMI measuring receiver and 1 MHz RBW / VBW for peak and with 1MHz RBW / 10Hz VBW for average at a distance of 3m.

Max field strength in 3m distance:**Horizontal:**

No.	Frequency	PK Reading	AV Reading	Correct	Peak	Average
	(MHz)	(dBuV/m)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)
1	2390.000	38.25	35.16	5.88	44.13	41.04
2	2483.500	36.65	34.12	5.02	41.67	39.14

Vertical:

No.	Frequency	PK Reading	AV Reading	Correct	Peak	Average
	(MHz)	(dBuV/m)	(dBuV/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)
1	2390.000	40.12	37.58	5.88	46.00	43.46
2	2483.500	39.95	36.36	5.02	44.97	4.38

Remark: No any other emission which fall in restricted bands can be detected and be reported.

4.11 Band Edges Requirement

Test Requirement: FCC Part 15 C

Test Method: Based on ANSI 63.10

Operation within the band 2400 – 2483.5 MHz

Test Date: 2012-03-31

Power supply: Connected with convert board powered by PC USB ports, and to fix frequency transmitting.

Requirements: Section 15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required.

Method of Measurement: Set RBW of spectrum analyzer to 100 kHz and VBW of spectrum analyzer to 300 kHz with suitable frequency span including 100 kHz bandwidth from band edge.

The band edges was measured and recorded.

GFSK and 8DPSK mode:

The band edges was measured and recorded Result:

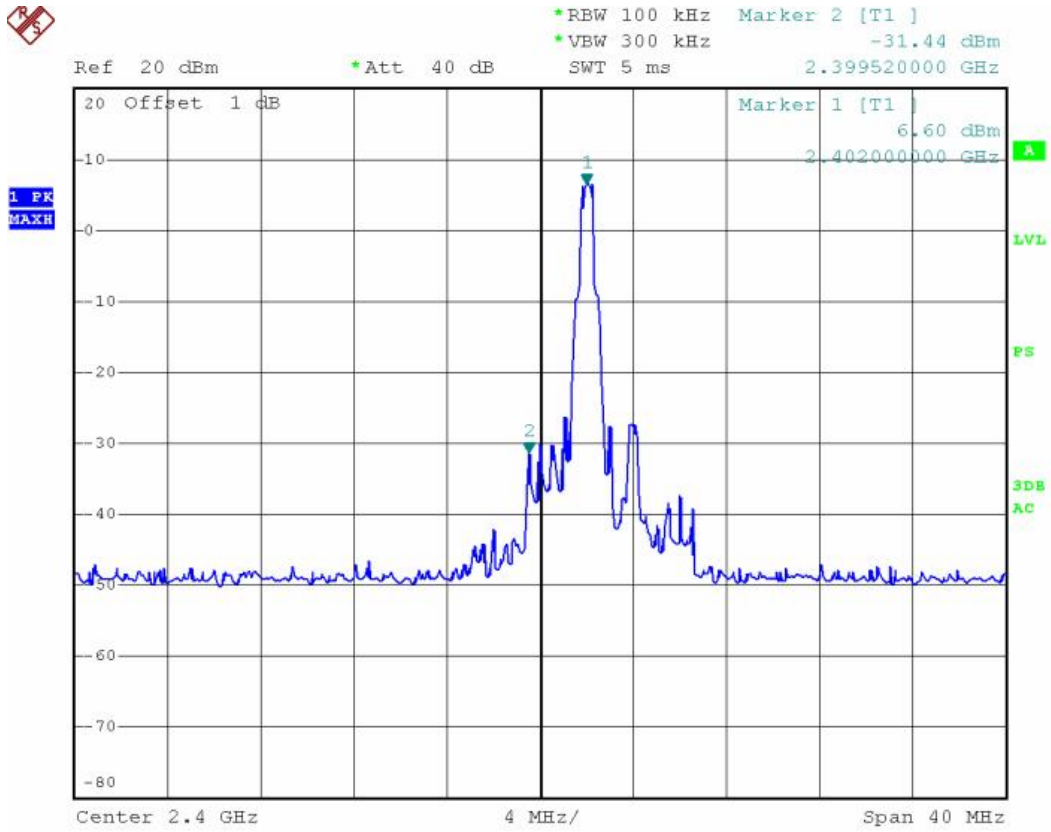
The Lower Edges attenuated more than 20dB.

The Upper Edges attenuated more than 20dB.

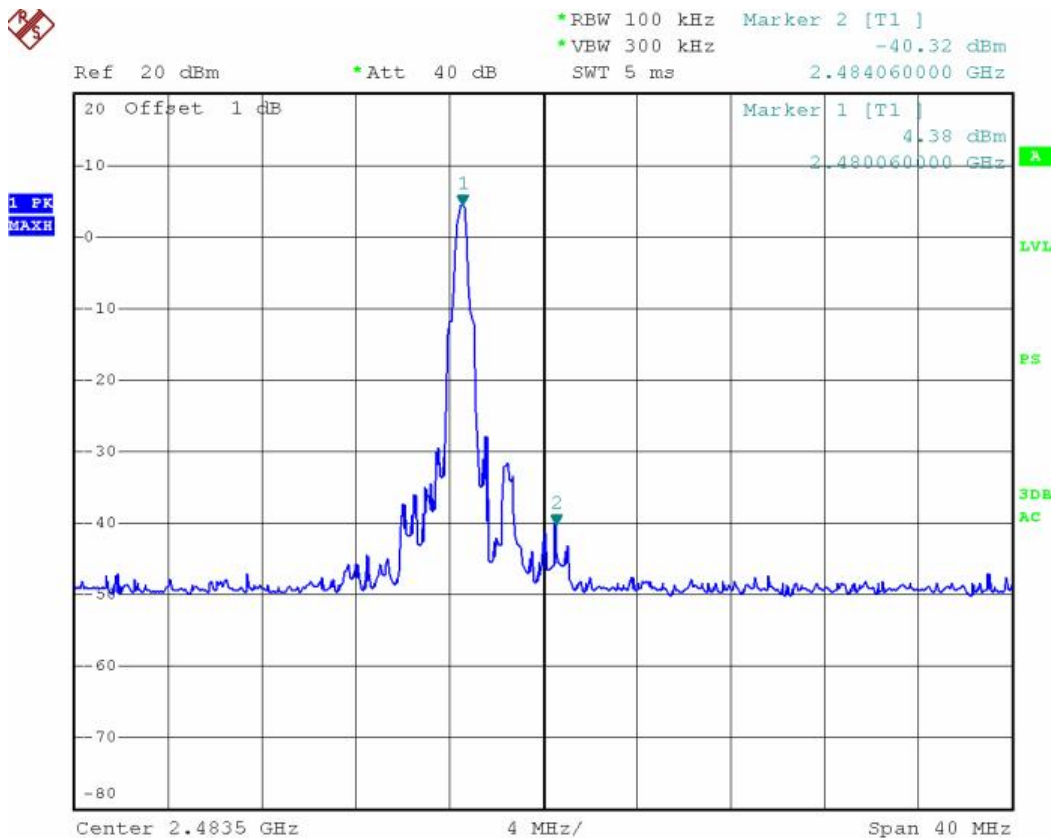
The graph as below. Represents the emissions take for this device.

For GFSK

Lowest Channel

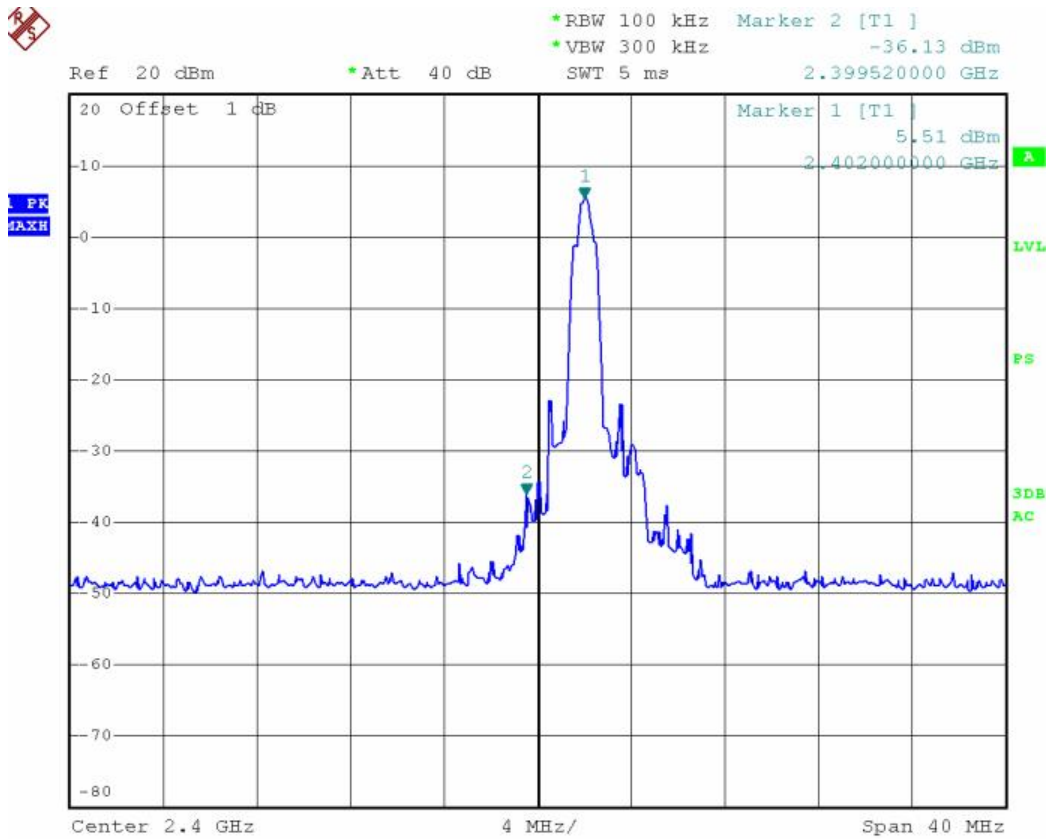


Highest Channel



For 8DPSK

Lowest Channel



Highest Channel

