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Report No.: SHEM130700141601
 Page 1 of 78

FCC Part 15C TEST REPORT

Application No. :	SHEM1307001416RF
Applicant:	FEITIAN Technologies Co., Ltd.
FCC ID:	ZD3FTBR301
Equipment Under Test (EUT):	
NOTE: The following sample(s) submitted was/were identified on behalf of the client as	
Product Name:	Bluetooth Smart Card Reader
Brand Name:	N/A
Model:	bR301
Add Model No.:	N/A
Standards:	FCC PART 15 SUBPART C, Section 15.247:2012
Date of Receipt:	July 26, 2013
Date of Test:	August 19, 2013 to August 21, 2013
Date of Issue:	August 26, 2013
Test Result:	PASS *

* In the configuration tested, the EUT (Equipment under test) complied with the standards specified above.



Tony Wu

E&E Section Manager

SGS-CSTC (Shanghai) Co., Ltd.

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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2 Version

Revision Record				
Version	Chapter	Date	Modifier	Remark
00	/	August 26, 2013	/	Original

Authorized for issue by:			
Engineer		Zenger Zhang _____	<i>Zenger Zhang</i> _____
Clerk		Susie Liu _____	<i>Susie Liu</i> _____
Reviewer		Kenx Xu _____	<i>Kenx Xu</i> _____



3 Test Summary

Test Item	FCC Test Requirement	Test method	Result
Antenna Requirement	FCC Part 15, Subpart C Section 15.203/15.247 (c)	---	PASS
AC Power Line Conducted Emission	FCC Part 15, Subpart C Section 15.207	ANSI C63.10 (2009) Section 6.2	PASS
20dB Occupied Bandwidth	FCC Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2009) Section 6.9.1	PASS
Conducted Peak Output Power	FCC Part 15, Subpart C Section 15.247 (b)(1)	ANSI C63.10 (2009) Section 6.10.1	PASS
Carrier Frequencies Separation	FCC Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2009) Section 7.7.2	PASS
Hopping Channel Number	FCC Part 15, Subpart C Section 15.247 (b)	ANSI C63.10 (2009) Section 7.7.3	PASS
Dwell Time	FCC Part 15, Subpart C Section 15.247 (a)(1)	ANSI C63.10 (2009) Section 7.7.4	PASS
RF Conducted Spurious Emissions	FCC Part 15, Subpart C Section 15.247(d)	ANSI C63.10 (2009) Section 7.7.10	PASS
Radiated Spurious emissions	FCC Part 15, Subpart C Section 15.209 and Section 15.205	ANSI C63.10 (2009) Section 6.12	PASS
Radiated Band-edge	FCC Part 15, Subpart C Section 15.205	ANSI C63.10 (2009) Section 6.5	PASS

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5 General Information

5.1 Client Information

Applicant:	FEITIAN Technologies Co., Ltd.
Address of Applicant:	Floor 17th, Tower B, Huizhi Mansion, No.9 Xueqing Road Haidian District, Beijing, P.R.China
Manufacturer:	FEITIAN Technologies Co., Ltd.
Address of Manufacturer:	Floor 17th, Tower B, Huizhi Mansion, No.9 Xueqing Road Haidian District, Beijing, P.R.China
Factory:	FEITIAN Technologies Co., Ltd.
Address of Factory:	Floor 17th, Tower B, Huizhi Mansion, No.9 Xueqing Road Haidian District, Beijing, P.R.China

5.2 General Description of E.U.T.

Product Name	Bluetooth Smart Card Reader
Brand Name:	N/A
Model No:	bR301
Add Model No.:	N/A
Sample Type:	Portable production

5.3 Technical Specifications:

Operation Frequency:	2402MHz~2480MHz
Modulation Technique:	3.0+EDR
Modulation Technique:	Frequency Hopping Spread Spectrum(FHSS)
Modulation Type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channel:	79
Power Supply:	DC 3.7V
Antenna Type	Integral
Antenna Gain	2.0dBi
USB Cable:	About 80cm Length

5.4 Support Software for Testing

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Supplied by
Smart Card	N/A	N/A	Client

5.5 Details of Test Mode

Test Mode	Description of Test Mode
Transmitting mode	The EUT on continue transmitting.

5.6 Test Channel

Channel	Frequency (MHz)
Low Channel	2402
Middle Channel	2441
High Channel	2480

5.7 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.
No.588 West Jindu Road, Songjiang District, Shanghai, China.201612.

Tel: +86 21 6191 5666 Fax: +86 21 6191 5678

5.8 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing. Date of expiry: 2014-07-26.

- **FCC – Registration No.: 402683**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered and fully described in a report filed with the Federal Communications Commission (FCC). The acceptance letter from the FCC is maintained in our files. Registration No.: 402683, Expiry Date: 2015-02-22.

- **Industry Canada (IC) – IC Assigned Code: 8617A**

The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 8617A. Expiry Date: 2014-09-20.

- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-3868 and C-4336 respectively. Date of Registration: 2012-05-29. Date of Expiry: 2015-05-28.

6 Equipments Used during Test

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due date
1	EMI test receiver	Rohde & Schwarz	ESU40	100109	2013-02-23	2014-02-22
2	Horn Antenna	SCHWARZBECK	BBHA9120 D	9120D-679	2013-03-07	2014-03-06
3	Horn Antenna	Rohde & Schwarz	HF906	100284	2013-06-03	2014-06-01
4	ANTENNA	SCHWARZBECK	VULB9168	9168-313	2013-03-07	2014-03-06
5	Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 373	2013-03-07	2014-03-06
6	Ultra broadband antenna	Rohde & Schwarz	HL562	100227	2012-10-09	2013-10-08
7	Atmosphere pressure meter	Shanghai ZhongXuan Electronic Co;Ltd	BY -- 2009P	--	2012-10-09	2013-10-08
8	CLAMP METER	FLUKE	316	86080010	2013-06-03	2014-06-01
9	Thermo-Hygrometer	ZHICHEN	ZC1-2	01050033	2012-10-09	2013-10-08
10	Tunable Notch Filter	Wainwright instruments Gmbh	WRCT180 0.0/ 2000.0- 0.2/40- 5SSK	11	2013-06-03	2014-06-01
11	Tunable Notch Filter	Wainwright instruments Gmbh	WRCT800. 0/880.0- 0.2/40- 5SSK	9	2013-06-03	2014-06-01
12	High pass Filter	FSCW	HP 12/2800- 5AA2	19A45-02	2013-06-03	2014-06-01
13	Low noise amplifier	TESEQ	LNA6900	70133	2013-02-23	2014-02-22

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7 Test Results

7.1 E.U.T. test conditions

Test Power: DC 3.7V

Requirements: 15.31(e) 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. For battery operated equipment, the equipment tests shall be performed using a new battery.

Operating Environment:

Temperature: 20.0 -25.0 °C

Humidity: 35-75 % RH

Atmospheric Pressure: 992 -102.0 kPa

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

Pursuant to Part 15.31(c) For swept frequency equipment, measurements shall be made with the frequency sweep stopped at those frequencies chosen for the measurements to be reported.

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

7.2 Antenna Requirement

Standard requirement

15.203 requirement:

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

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.

EUT Antenna

The antenna is integrated on the main PCB and no consideration of replacement. The gain of the antenna is less than 2.0 dBi.

7.3 Conducted Emission Test

Test Requirement: FCC Part15C 15.207
Test date: August 19, 2013
Standard Applicable According to section 15.207, frequency 150KHz to 30MHz shall not exceed the limit table as below.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 [*]	56 to 46 [*]
0.5-5	56	46
5-30	60	50

EUT Setup

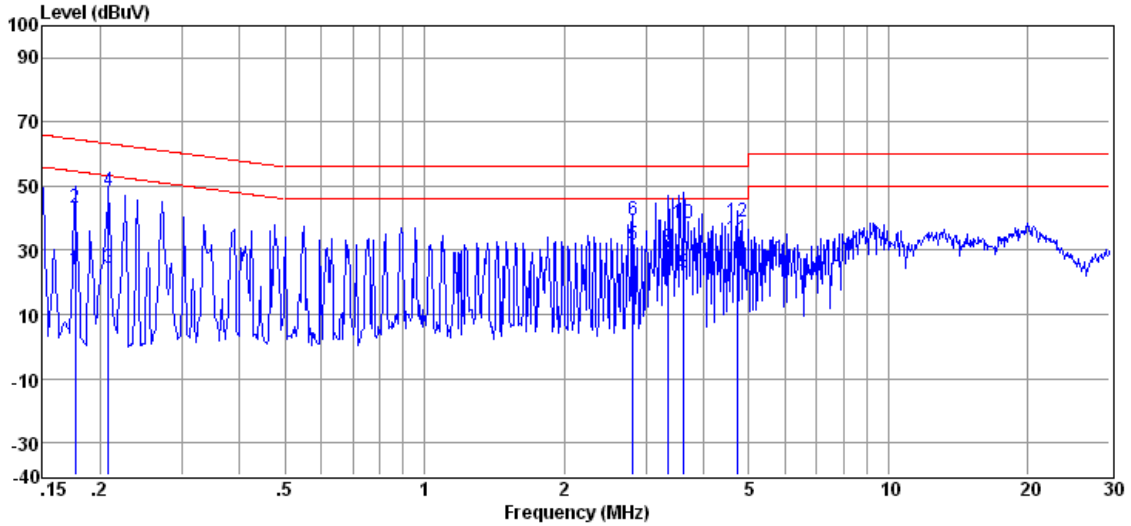
- 1.The conducted emission tests were performed in the test site,using the setup in accordance with the ANSI C63.10-2009.
- 2.EUT is charged with PC.The AC Power adaptor of PC was plug-in LISN.The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
- 3.The LISN was connected with 120V AC/60Hz power source (For Computer port).

Measurement Result

Operation mode: the EUT on continue transmitting mode.

Note:All test modes have been tested, below show the worst plots.

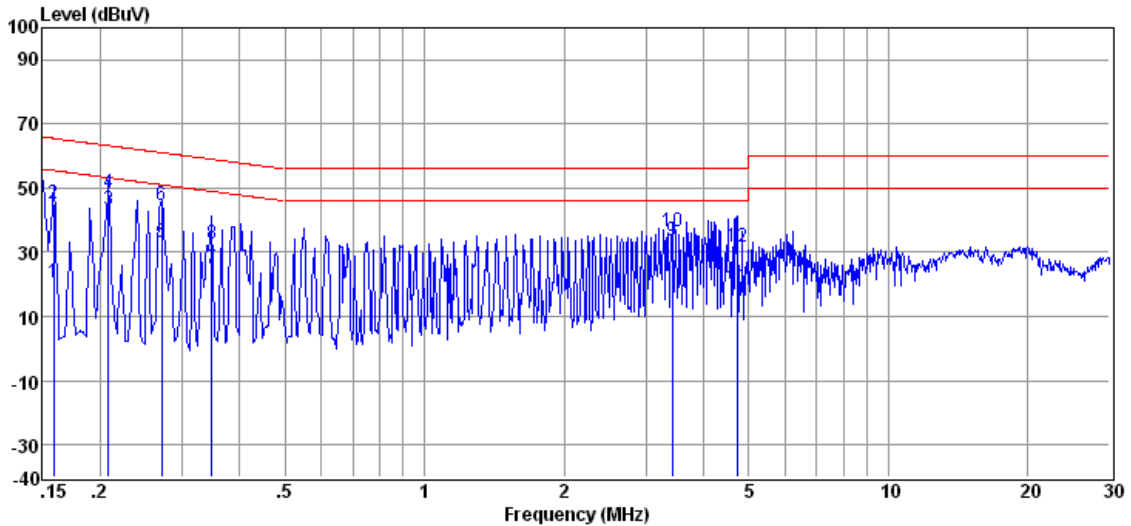
L line:



Item	Freq.	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBμV)	(dB)	(dB)	(dBμV)	(dBμV)	(dB)	
1	0.177	23.65	0.15	0.10	23.90	54.64	-30.74	Average
2	0.177	42.81	0.15	0.10	43.06	64.64	-21.58	QP
3	0.208	24.15	0.10	0.10	24.35	53.27	-28.92	Average
4	0.208	48.14	0.10	0.10	48.34	63.27	-14.93	QP
5	2.809	31.37	0.30	0.13	31.80	46.00	-14.20	Average
6	2.809	39.11	0.30	0.13	39.54	56.00	-16.46	QP
7	3.346	26.16	0.30	0.14	26.60	46.00	-19.40	Average
8	3.346	30.46	0.30	0.14	30.90	56.00	-25.10	QP
9	3.623	22.81	0.30	0.15	23.26	46.00	-22.74	Average
10	3.623	37.94	0.30	0.15	38.39	56.00	-17.61	QP
11	4.721	32.94	0.30	0.19	33.43	46.00	-12.57	Average
12	4.721	38.56	0.30	0.19	39.05	56.00	-16.95	QP



N Line:



Item	Freq.	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Detector
(Mark)	(MHz)	(dBμV)	(dB)	(dB)	(dBμV)	(dBμV)	(dB)	
1	0.159	20.42	0.18	0.10	20.70	55.52	-34.82	Average
2	0.159	44.82	0.18	0.10	45.10	65.52	-20.42	QP
3	0.208	43.02	0.10	0.10	43.22	53.27	-10.05	Average
4	0.208	48.28	0.10	0.10	48.48	63.27	-14.79	QP
5	0.272	32.82	0.10	0.10	33.02	51.07	-18.05	Average
6	0.272	44.47	0.10	0.10	44.67	61.07	-16.40	QP
7	0.348	24.76	0.10	0.10	24.96	49.00	-24.04	Average
8	0.348	32.38	0.10	0.10	32.58	59.00	-26.42	QP
9	3.417	33.22	0.24	0.15	33.61	46.00	-12.39	Average
10	3.417	36.22	0.24	0.15	36.61	56.00	-19.39	QP
11	4.721	18.73	0.21	0.19	19.13	46.00	-26.87	Average
12	4.721	31.15	0.21	0.19	31.55	56.00	-24.45	QP

7.4 20dB Occupied Bandwidth

Test Requirement: FCC Part 15 C Section 15.247 (a)(1)

Test Method: ANSI C63.10:2009 Clause 6.9.1

Test Date: August 20, 2013

Final Test Mode: Transmitting mode

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 the hopping channel;
3. Set the spectrum analyzer: RBW \geq 1% of the 20dB bandwidth (set 100kHz). VBW \geq RBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold.
4. Mark the peak frequency and -20dB points.

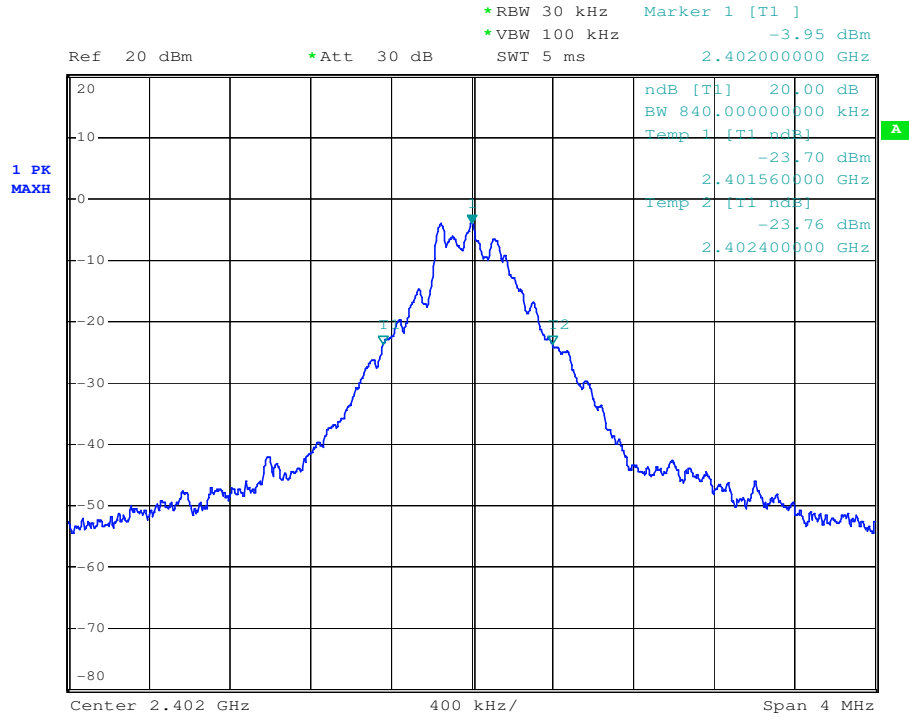
Test data

Test Channel	Channel Frequency (MHz)	Modulation	Bandwidth(MHz)
Low	2402	GFSK	0.840
Middle	2441	GFSK	0.844
High	2480	GFSK	0.840
Low	2402	$\pi/4$ DQPSK	1.232
Middle	2441	$\pi/4$ DQPSK	1.236
High	2480	$\pi/4$ DQPSK	1.220
Low	2402	8DPSK	1.212
Middle	2441	8DPSK	1.208
High	2480	8DPSK	1.208

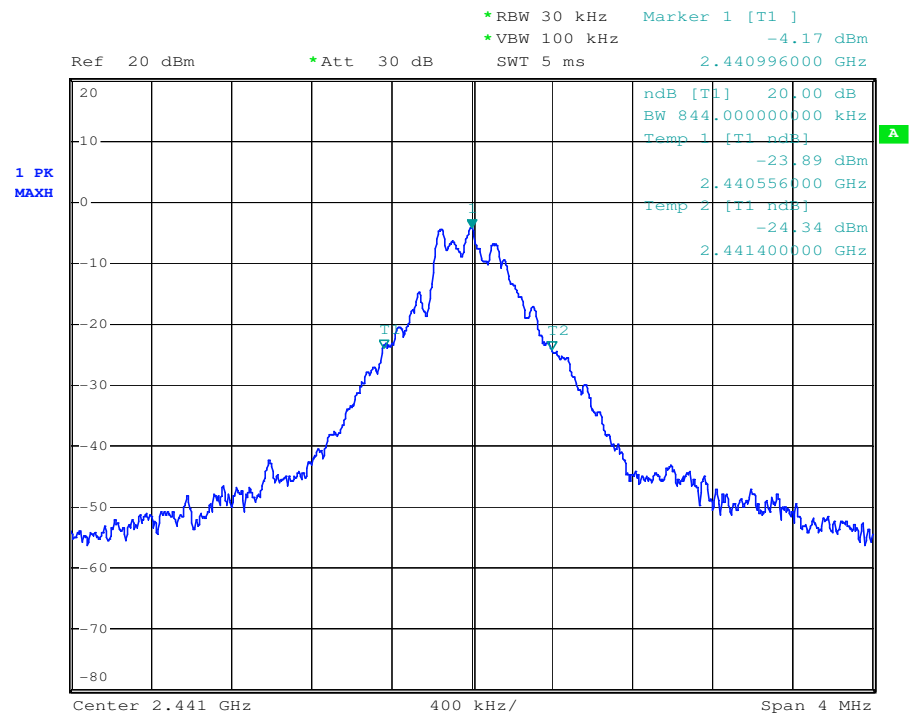


Test plot as follows:

Test mode:	GFSK	Test channel:	Lowest
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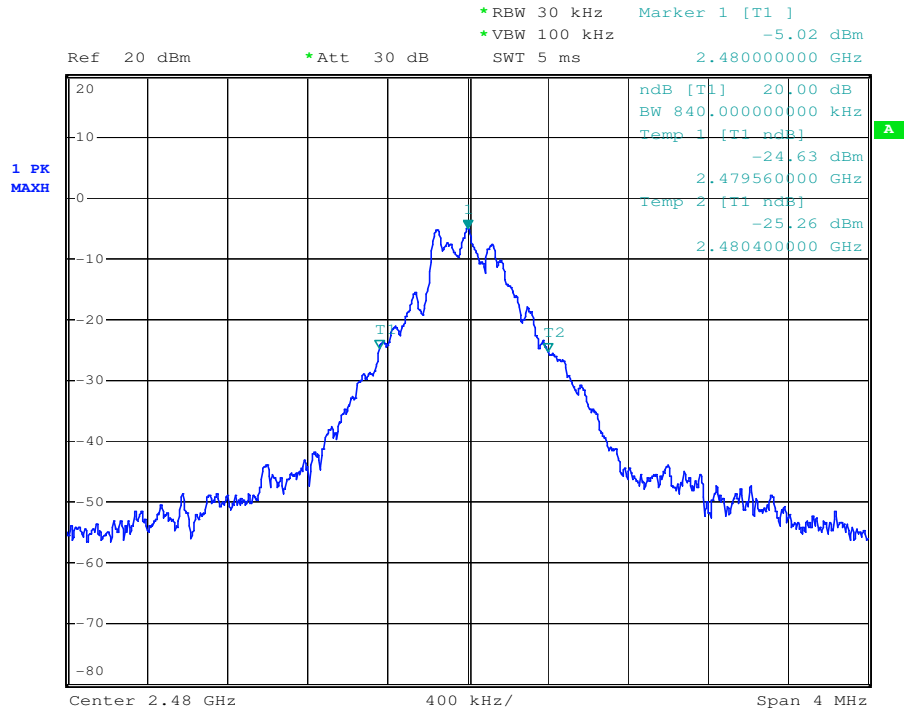


Test mode:	GFSK	Test channel:	Middle
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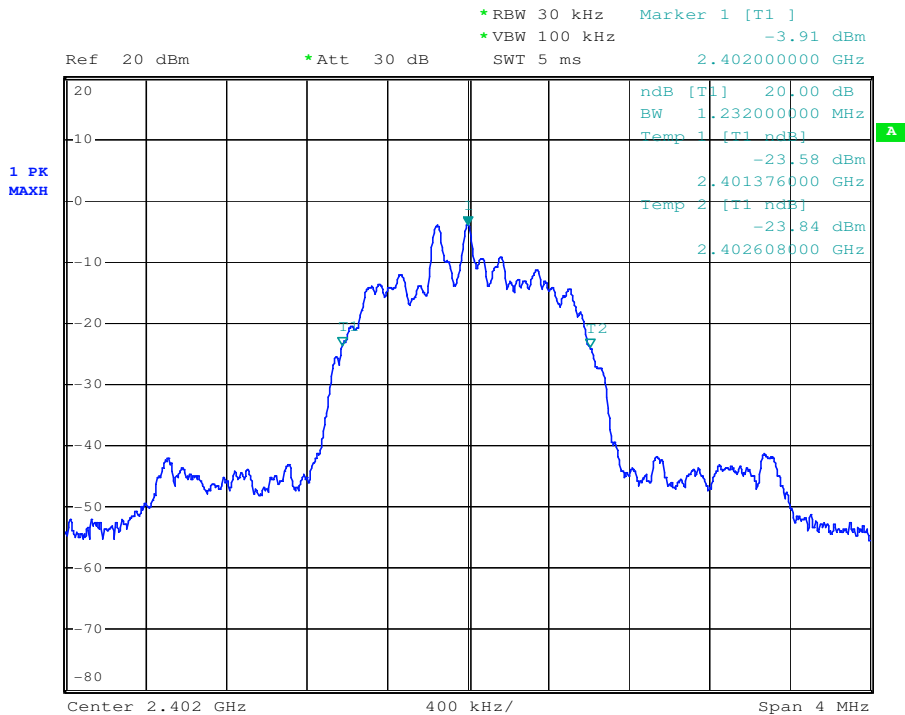




Test mode:	GFSK	Test channel:	Highest
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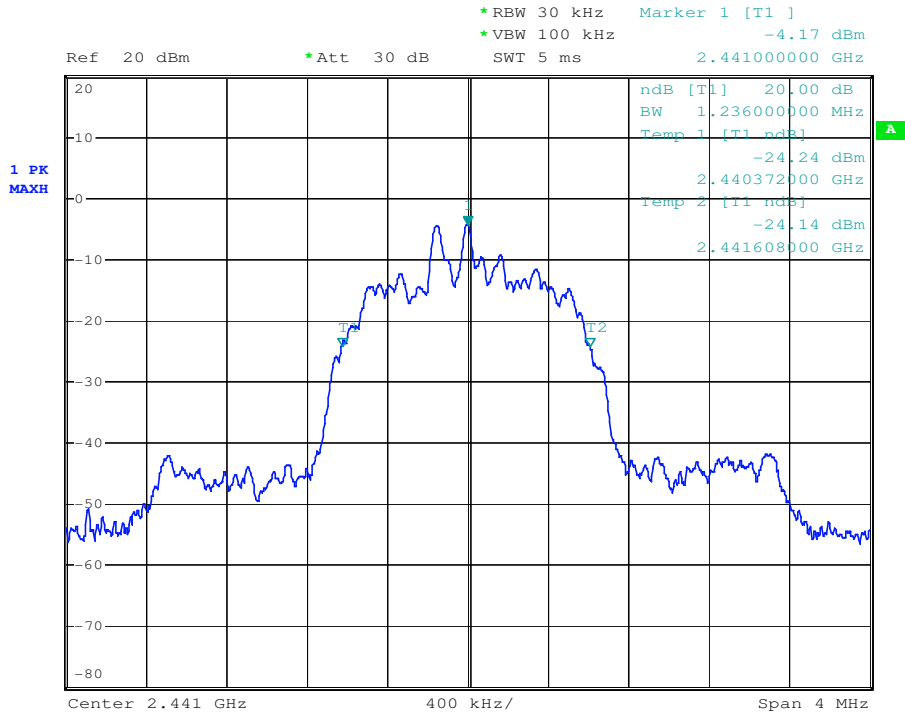


Test mode:	$\pi/4$ DQPSK	Test channel:	Lowest
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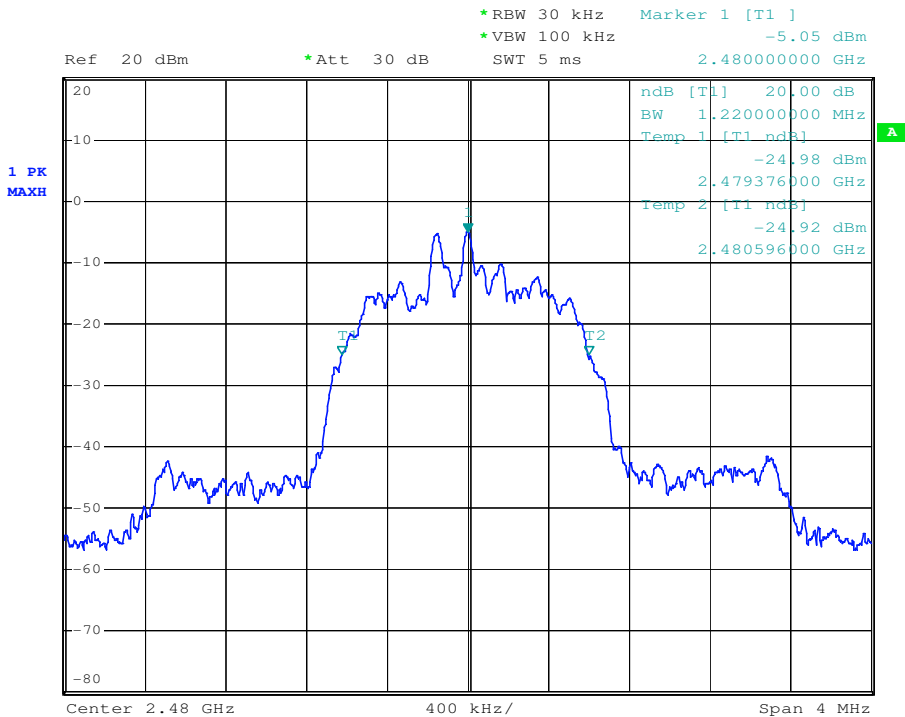




Test mode:	$\pi/4$ DQPSK	Test channel:	Middle
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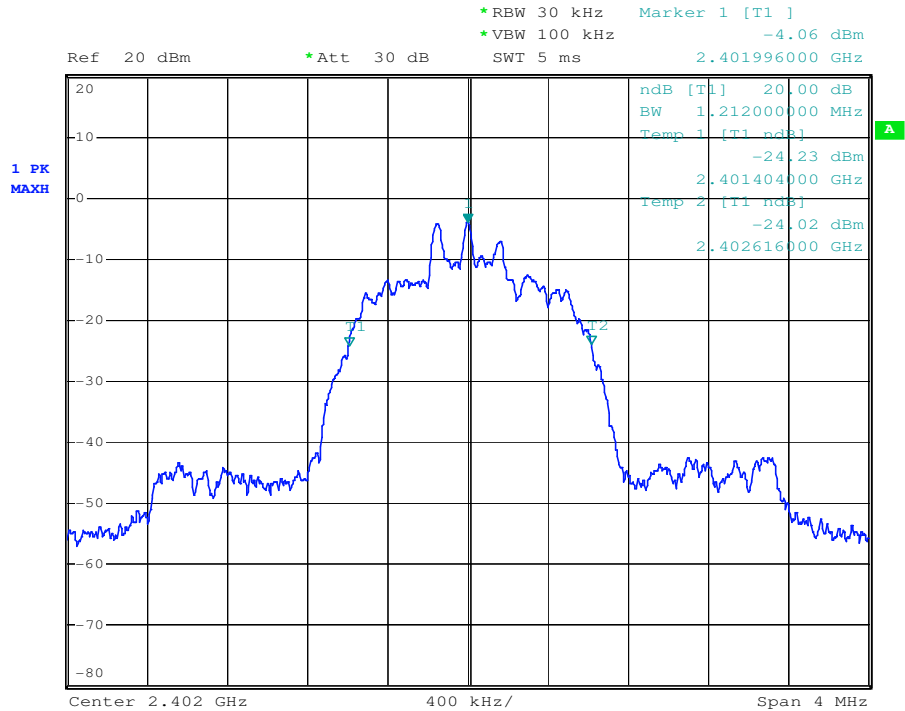


Test mode:	$\pi/4$ DQPSK	Test channel:	Highest
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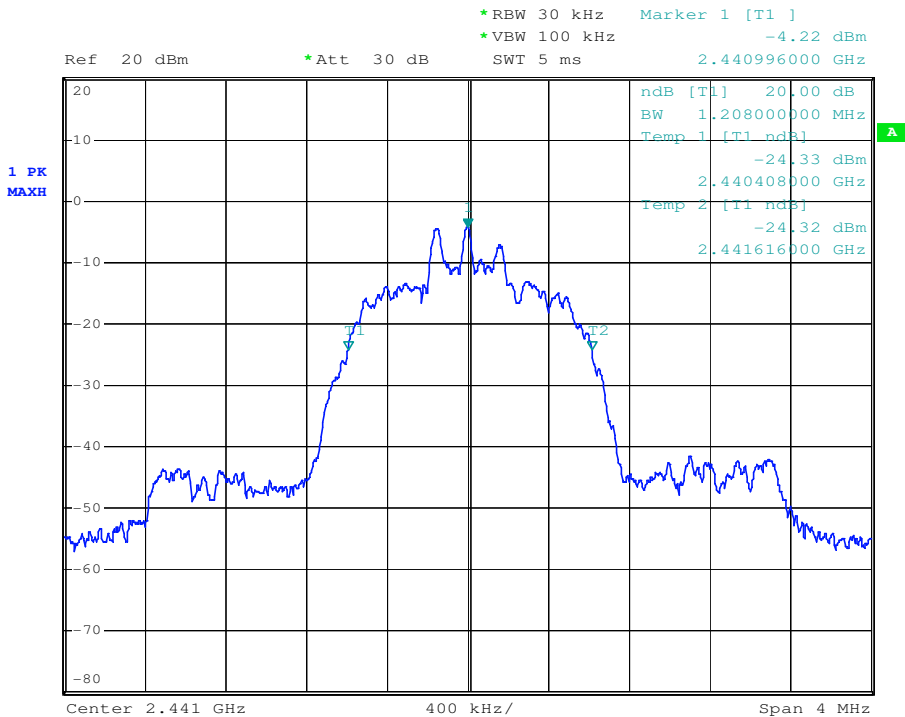




Test mode:	8DPSK	Test channel:	Lowest
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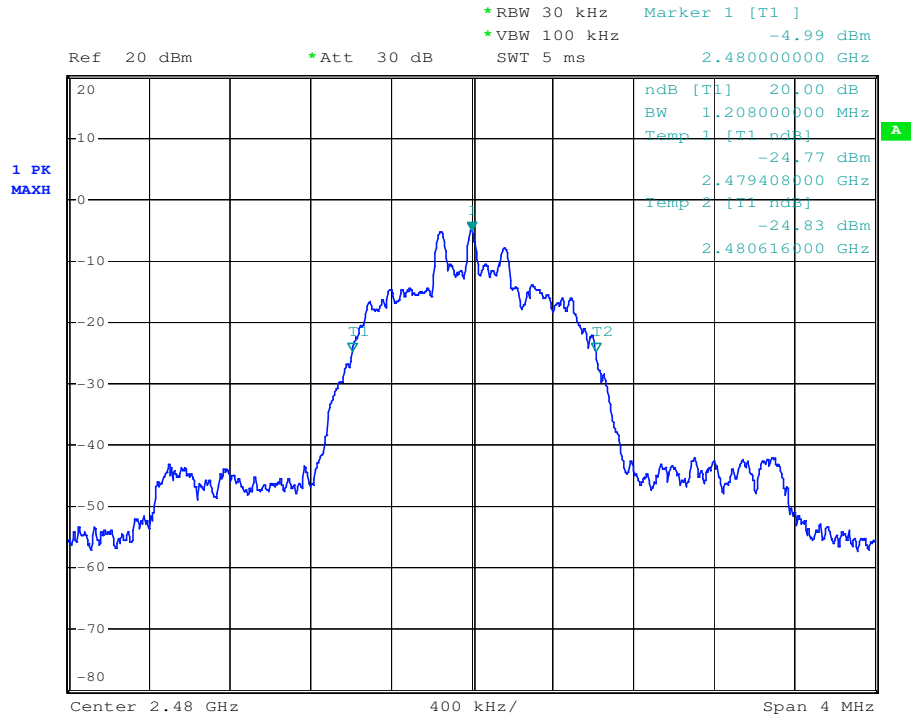


Test mode:	8DPSK	Test channel:	Middle
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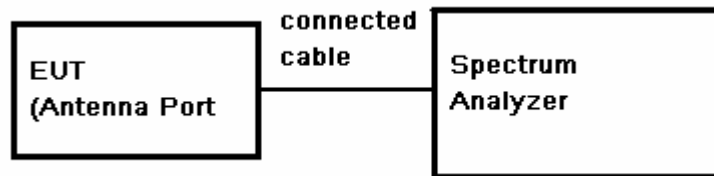


Test mode:	8DPSK	Test channel:	Highest
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7.5 Conducted Peak Output Power

Test Requirement:	FCC Part 15.247 Section 15.247(b)(1)
Test Method:	ANSI C64.10:2009 Section 6.10.1
Test Date:	August 20, 2013
Test Result:	Pass
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 0.125 watt (20.0dBm) limit applies.
Final Test Mode:	Transmitting mode
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 = 10 MHz, Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, middle and highest channel individually. Record the max value.

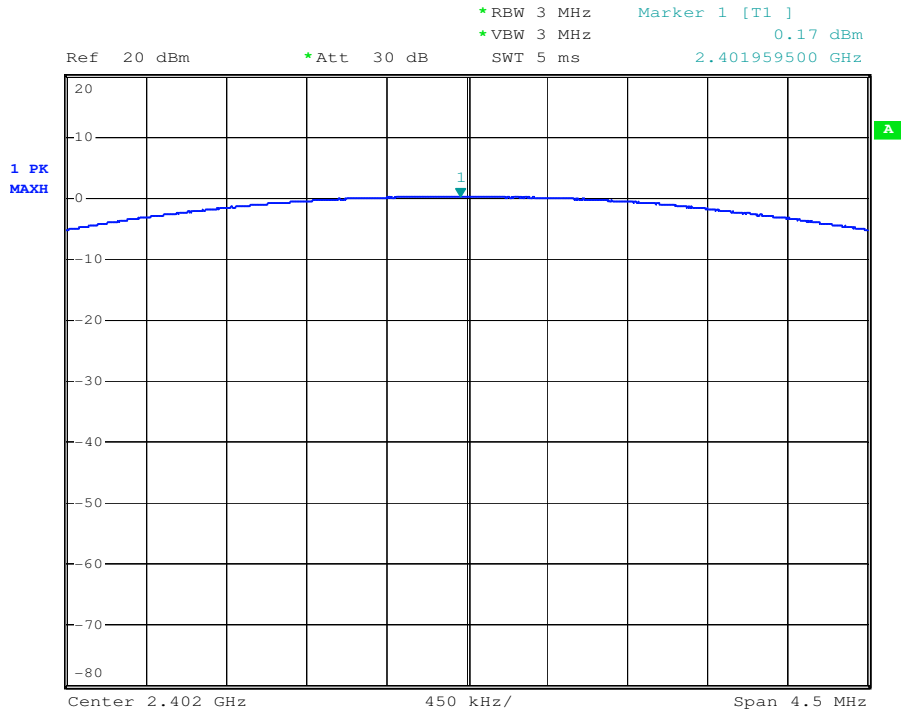
Test Results record:

Test Channel	Modulation	Fundamental Frequency (MHz)	Reading Power (dBm)	Cable Loss (dB)	Output Peak Power(dBm)	Limit (dBm)	Margin (dB)
Lowest	GFSK	2402	0.17	1.5	1.67	20	18.33
Middle	GFSK	2441	-0.11	1.5	1.39	20	18.61
Highest	GFSK	2480	-1.28	1.5	0.22	20	19.78
Lowest	$\pi/4$ DQPSK	2402	0.11	1.5	2.01	20	17.99
Middle	$\pi/4$ DQPSK	2441	-0.10	1.5	1.80	20	18.20
Highest	$\pi/4$ DQPSK	2480	-1.30	1.5	0.60	20	19.40
Lowest	8DPSK	2402	0.24	1.5	2.14	20	17.86
Middle	8DPSK	2441	-0.09	1.5	1.81	20	18.19
Highest	8DPSK	2480	-1.19	1.5	0.71	20	19.29

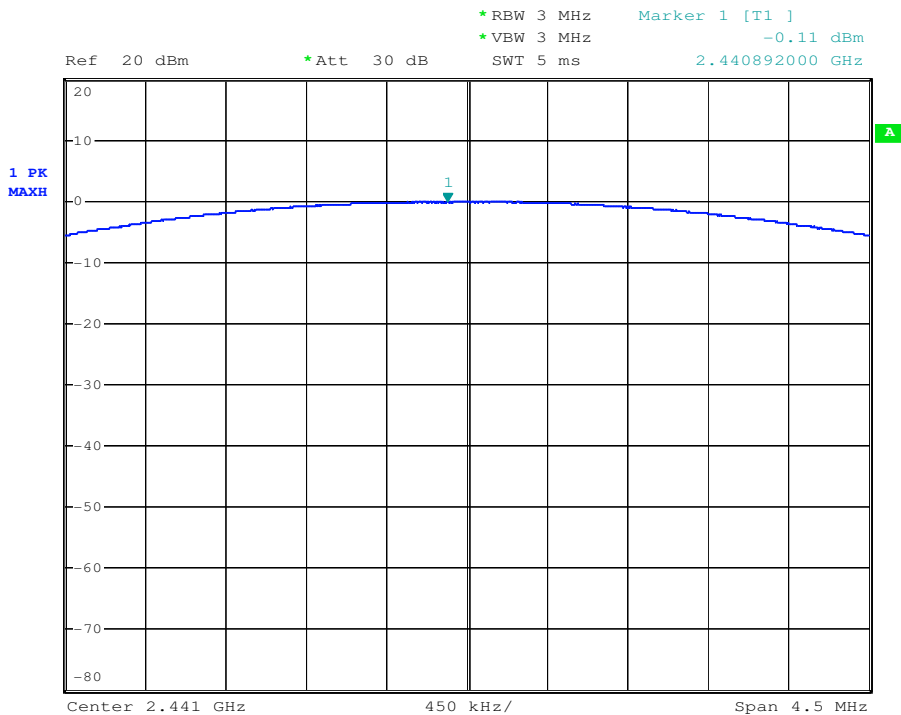


Test result plot as follows:

Test mode:	GFSK	Test channel:	Lowest
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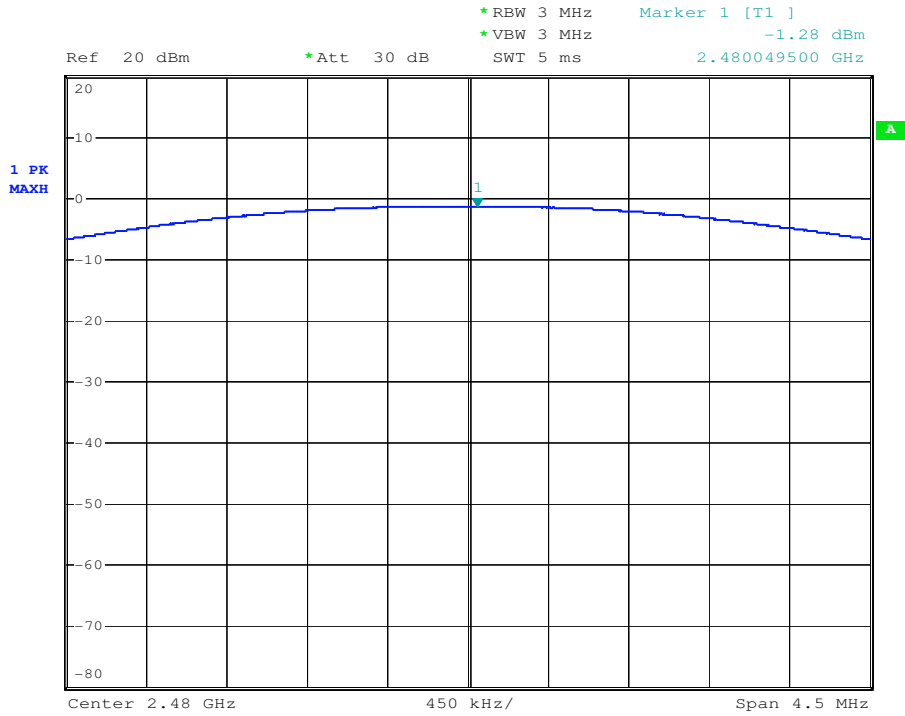


Test mode:	GFSK	Test channel:	Middle
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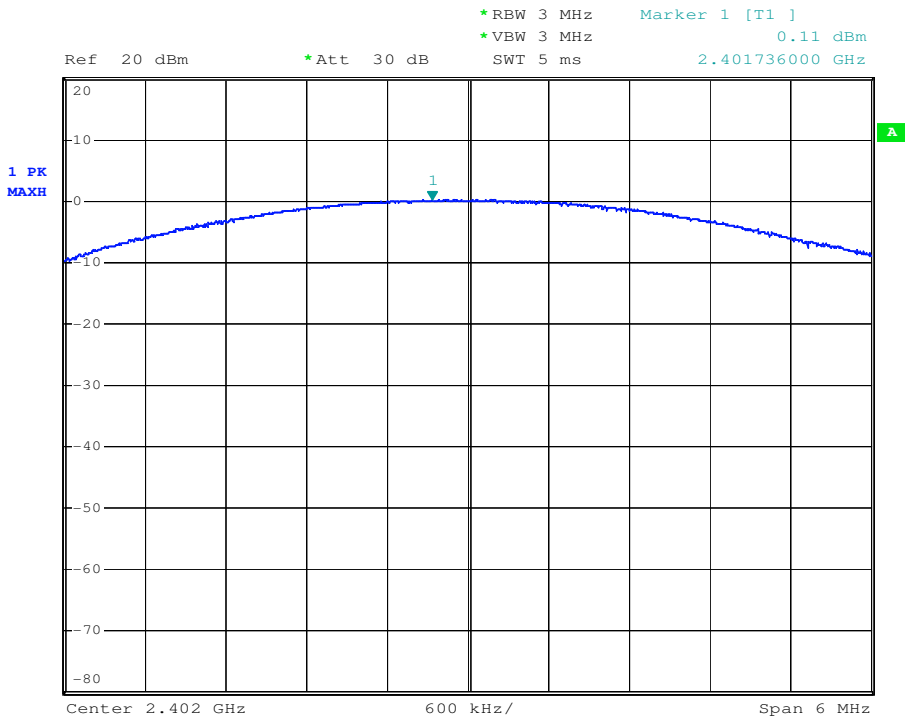




Test mode:	GFSK	Test channel:	Highest
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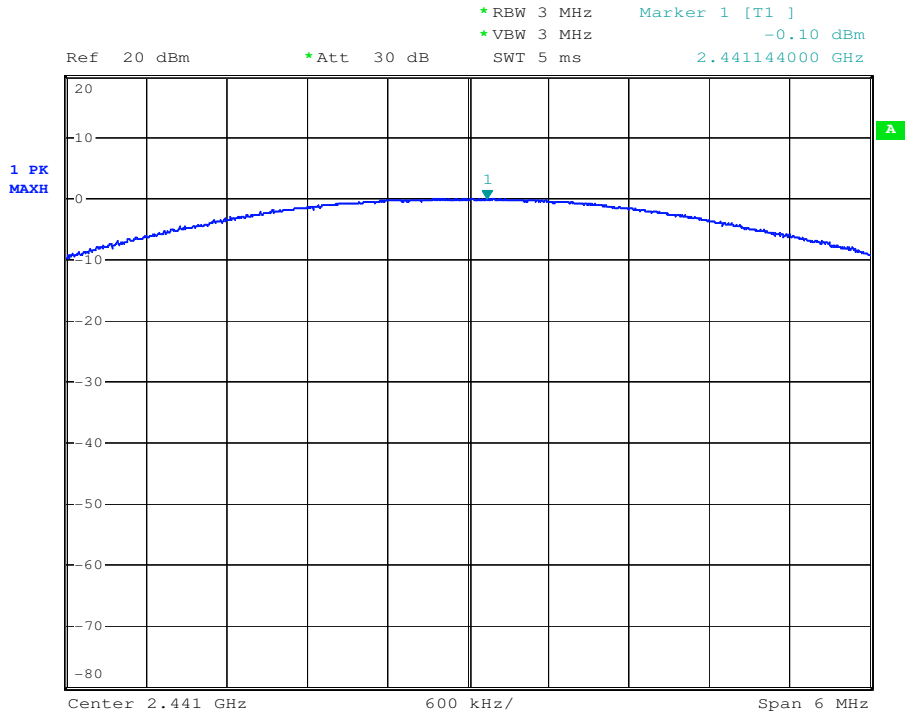


Test mode:	$\pi/4$ DQPSK	Test channel:	Lowest
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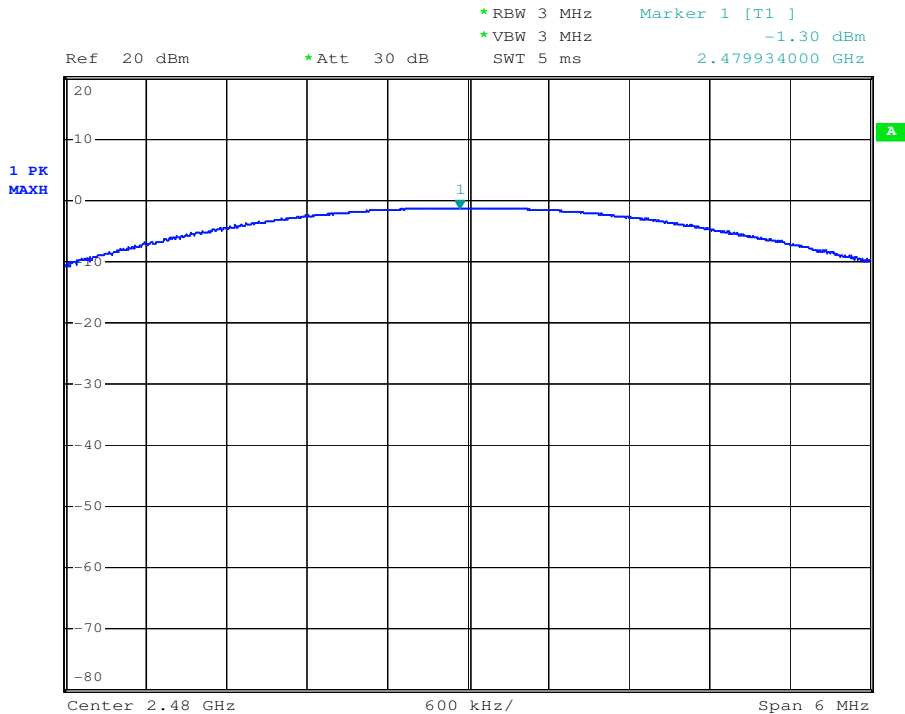




Test mode:	$\pi/4$ DQPSK	Test channel:	Middle
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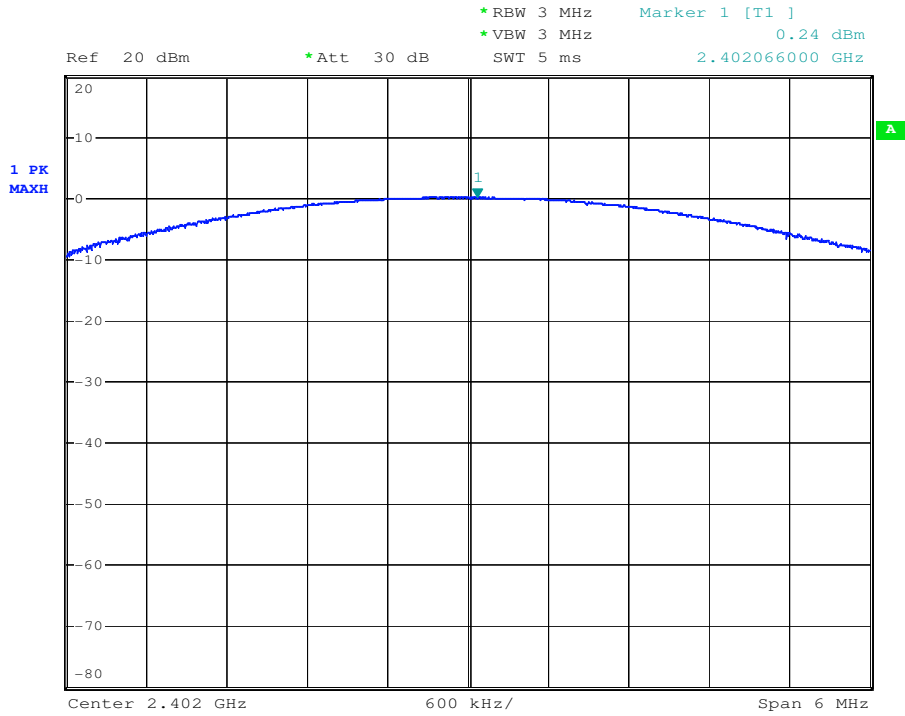


Test mode:	$\pi/4$ DQPSK	Test channel:	Highest
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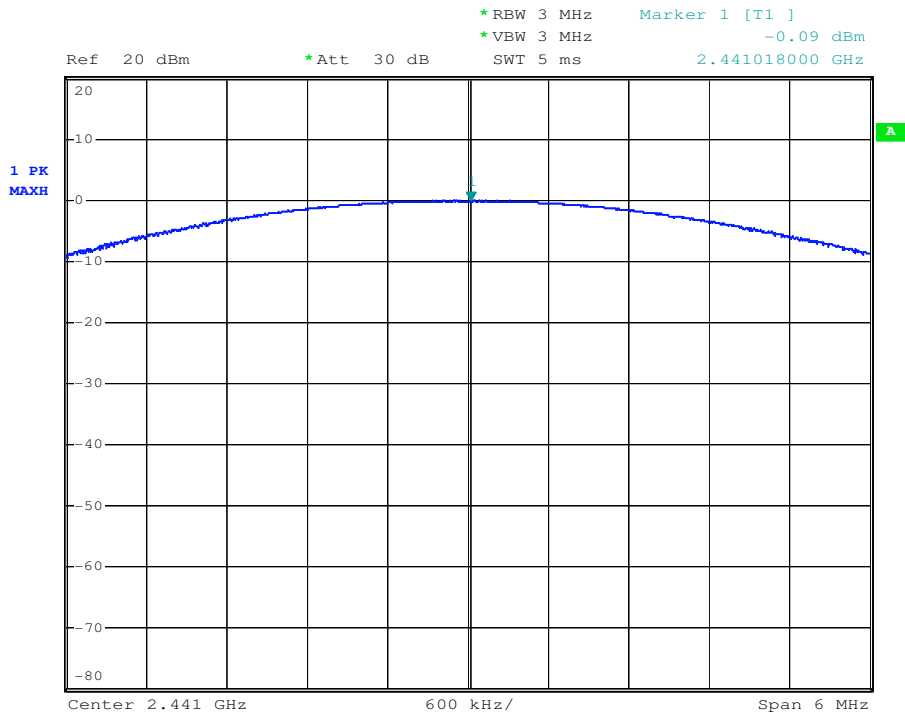




Test mode:	8DPSK	Test channel:	Lowest
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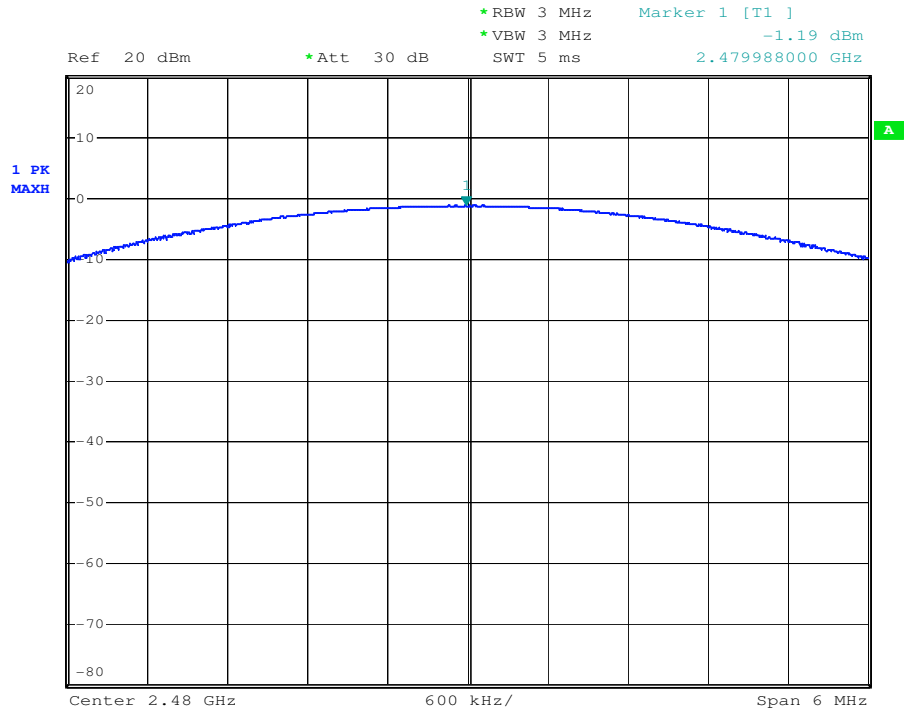


Test mode:	8DPSK	Test channel:	Middle
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Test mode:	8DPSK	Test channel:	Highest
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7.6 Carrier Frequencies Separated

Test Requirement: FCC Part 15 C Section 15.247 (a)(1)
Test Method: ANSI C63.10:2009 Clause 7.7.2
Test Date: August 21, 2013
Limit: 0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test result: Pass
Final Test Mode: Transmitting mode

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 = 3MHz. 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.

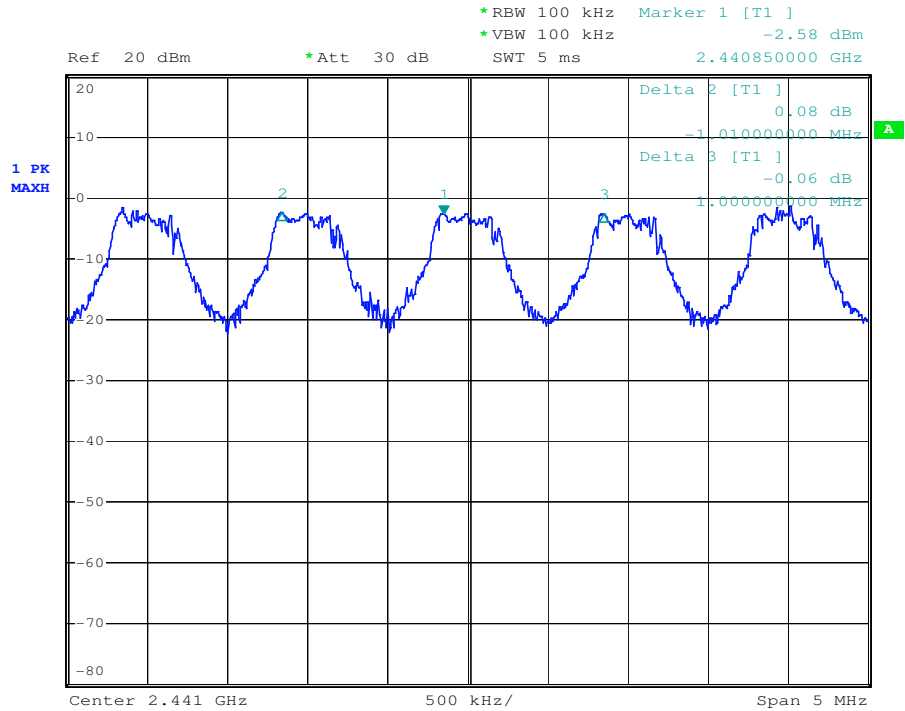
Test Channel	Modulation	Carrier Frequencies Separated (MHz)	Limit (25kHz or two-thirds of the 20 dB bandwidth)	Results
Middle Channels (channel 39 and channel 40)	GFSK	1.010	25kHz/563kHz	PASS
Middle Channels (channel 39 and channel 40)	$\pi/4$ DQPSK	1.015	25kHz/824kHz	PASS
Middle Channels (channel 39 and channel 40)	8DPSK	1.000	25kHz/808kHz	PASS

Note: 20dB bandwidth reference Section 7.4

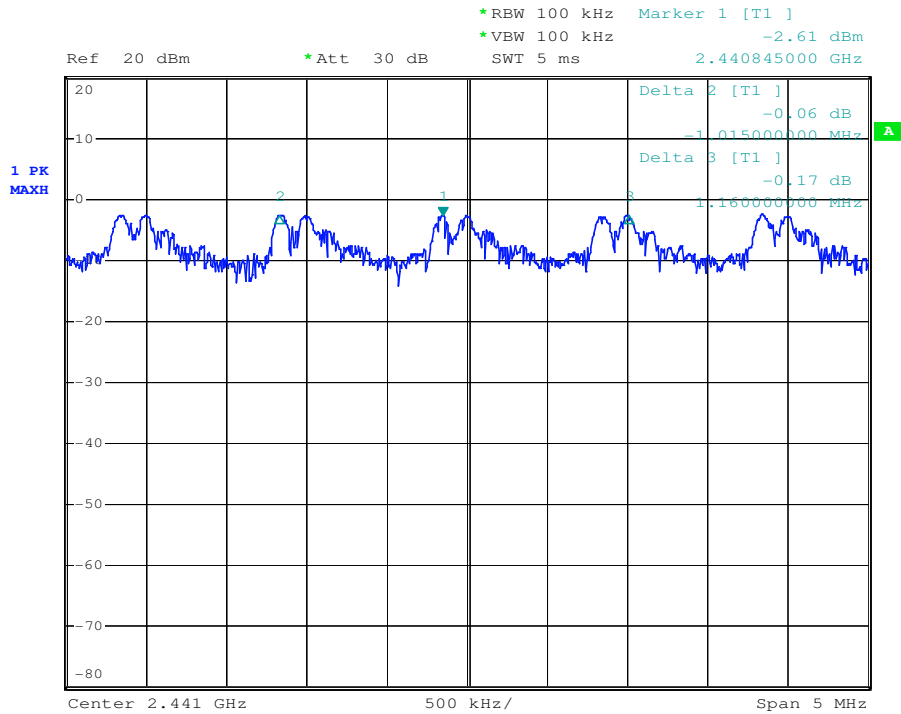


Test plot as follows:

Test mode:	GFSK		
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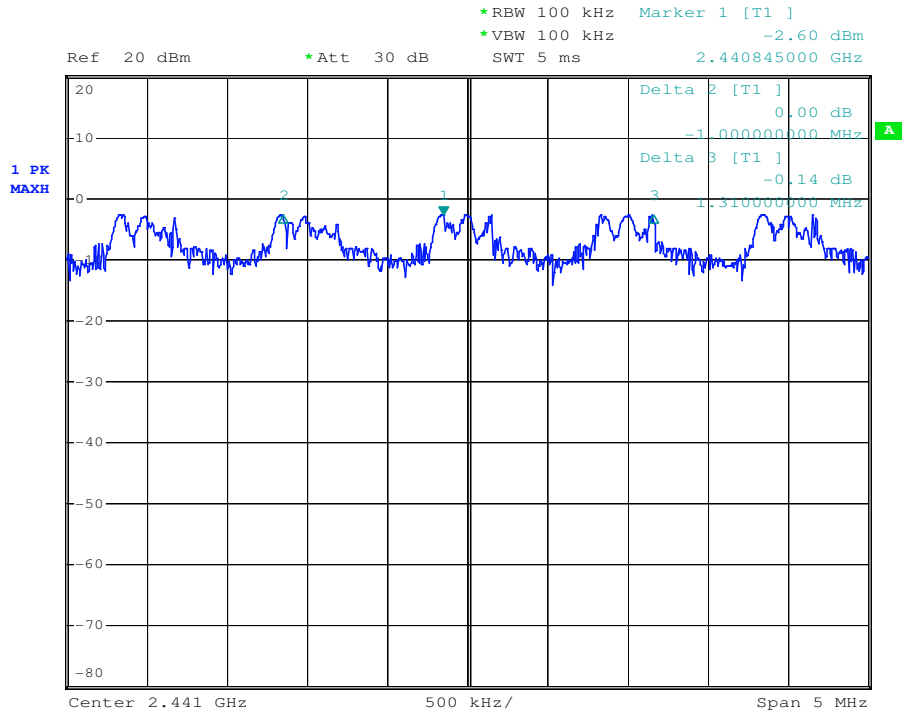


Test mode:	$\pi/4$ DQPSK		
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Test mode:	8DPSK		
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7.7 Hopping Channel Number

Test Requirement: FCC Part15 C Section 15.247(b)

Test Method: ANSI C63.10:2009 Clause 7.7.3

Test Date: August 21, 2013

Limit: At least 15 channels

Test Result: Pass

Test Mode: Transmitting mode

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.

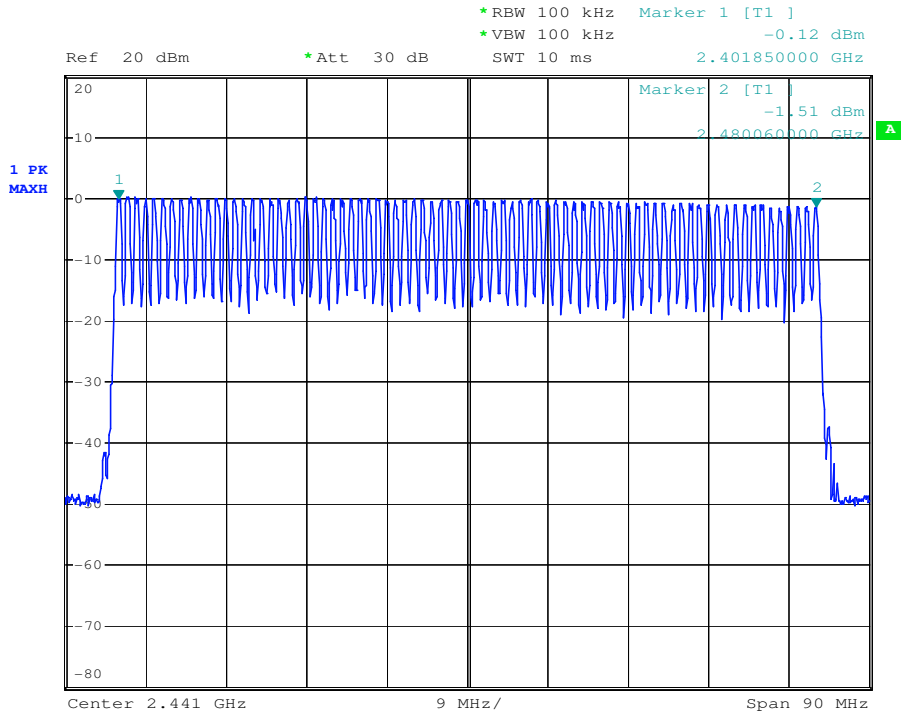
Measurement Data

Mode	Hopping channel numbers	Limit	Results
8DPSK	79	≥15	Pass
GFSK	79	≥15	Pass
π/4DQPSK	79	≥15	Pass

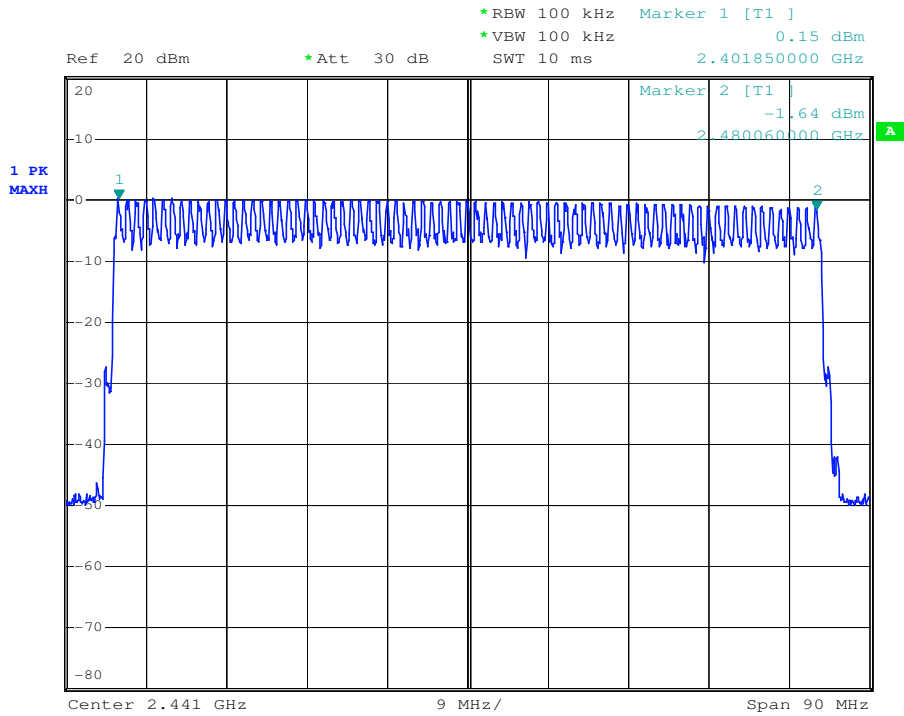


Test plot as follows:

Test mode:	GFSK		
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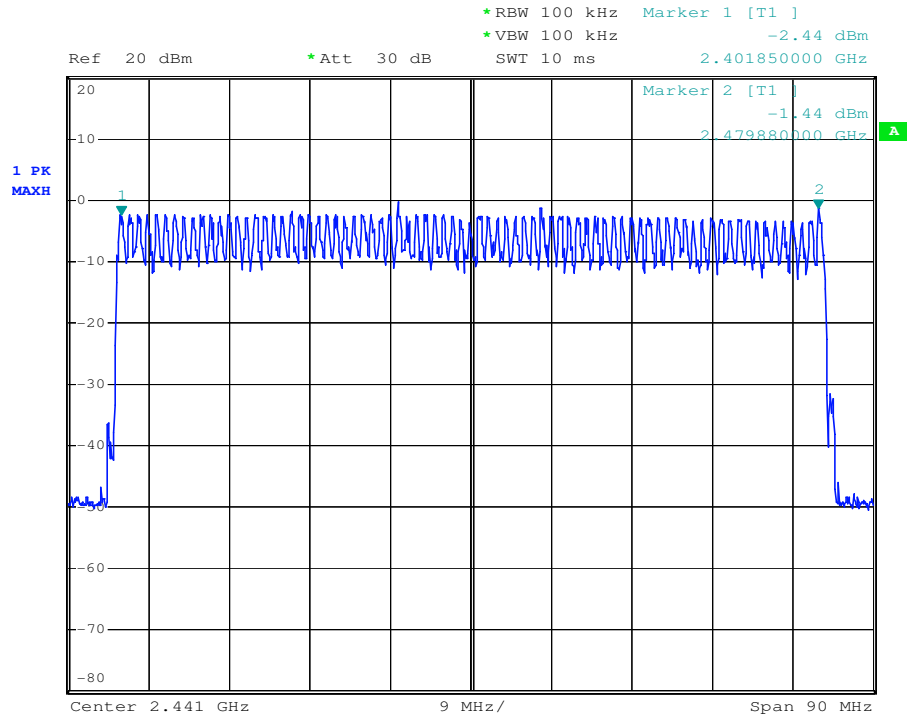


Test mode:	$\pi/4$ DQPSK		
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Test mode:	8DPSK		
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7.8 Dwell Time

Test Requirement: FCC Part 15 C Section 15.247(a)(1)
Test Method: ANSI C63.10:2009 Clause 7.7.4
Test Date: August 21, 2013
Limit: 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: Hopping transmitting with all kind of modulation.
Test Result: Pass
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. Use Emission width*No. of Hopping Channels in 31.6s to determine the dwell time.

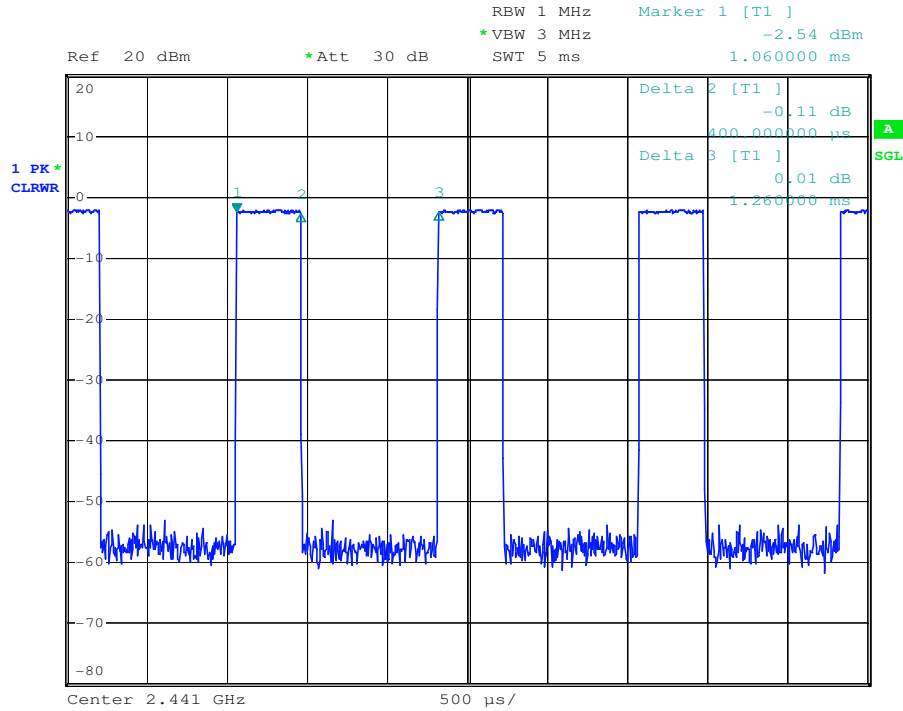
Frequency (MHz)	Modulation	Packet	Emission Width (ms)	Number of Hopping Channel in 31.6s	Average Time of Occupancy(s)	Limit(s)	Result
2441	GFSK	DH1	0.400	101	0.040	0.4	Pass
		DH3	1.640	123	0.202	0.4	Pass
		DH5	2.900	92	0.267	0.4	Pass
	π/4DQPSK	DH1	0.410	221	0.091	0.4	Pass
		DH3	1.650	141	0.232	0.4	Pass
		DH5	2.910	89	0.259	0.4	Pass
	8DPSK	DH1	0.390	162	0.063	0.4	Pass
		DH3	1.640	133	0.218	0.4	Pass
		DH5	2.880	105	0.302	0.4	Pass



Test plot as follows::

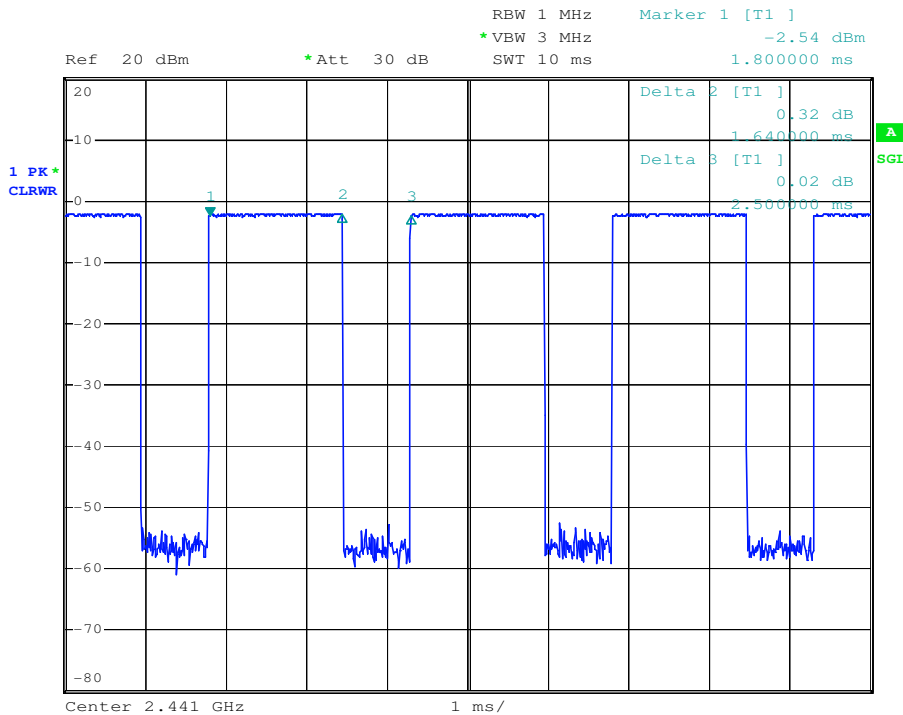
Frequency 2441MHz:

Modulation: GFSK-DH1



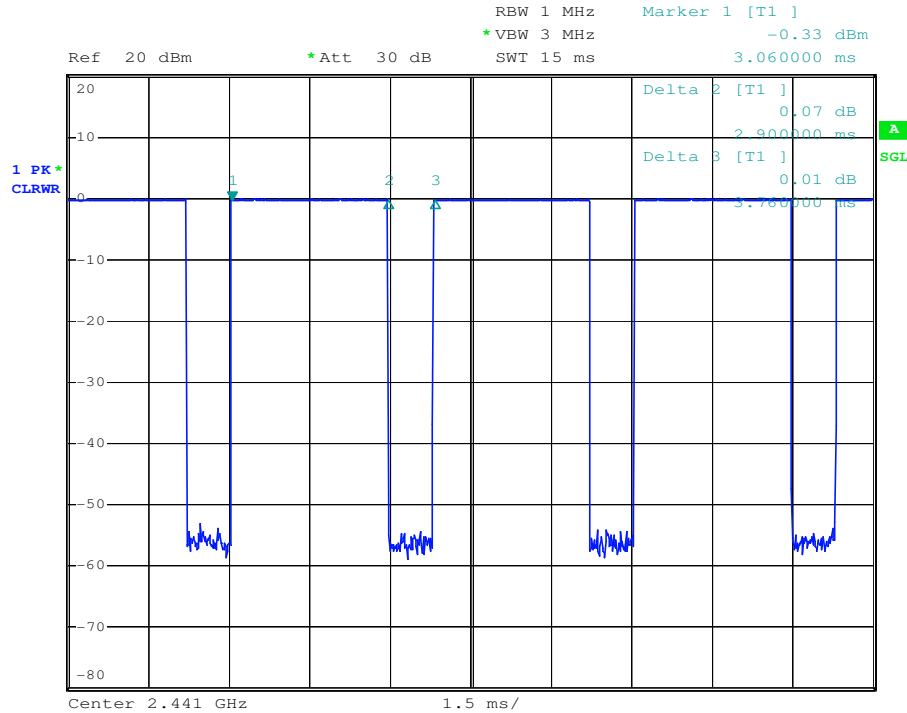
Frequency 2441MHz:

Modulation: GFSK- DH3

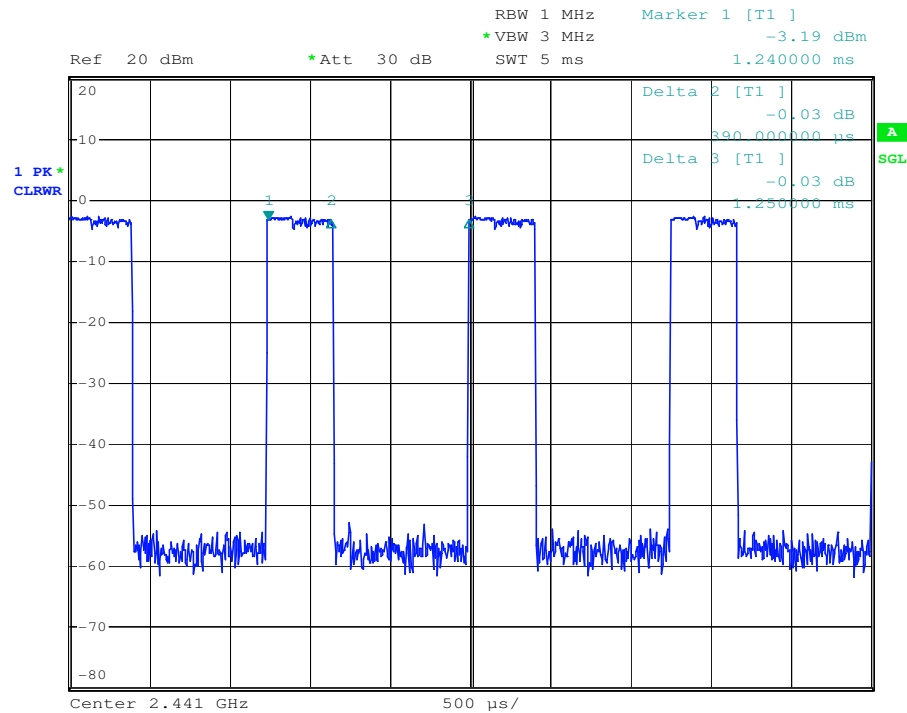




Frequency 2441MHz: Modulation: GFSK- DH5

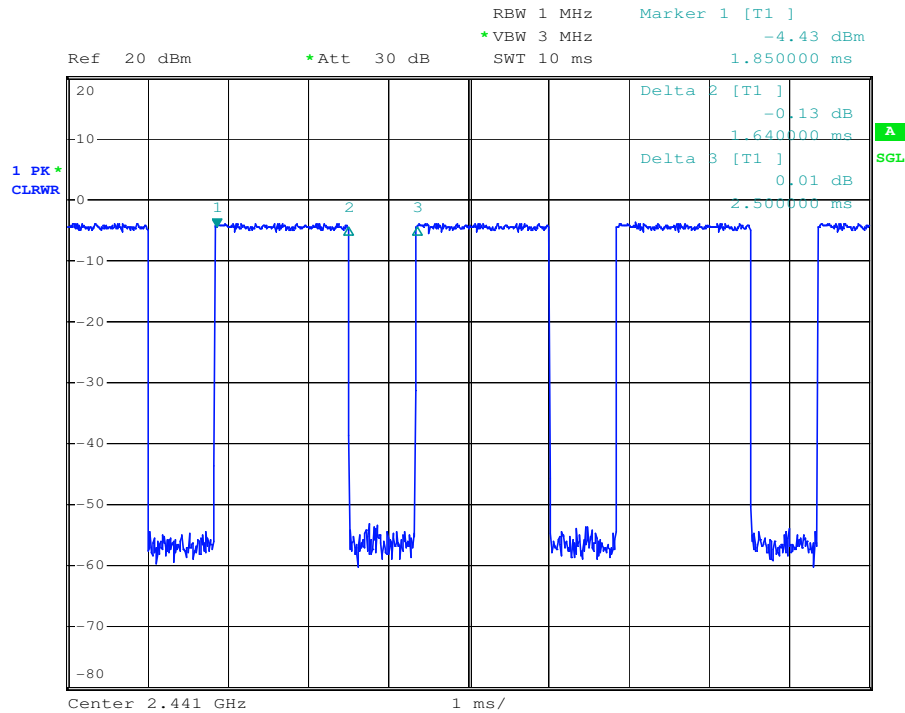


Frequency 2441MHz: Modulation: $\pi/4$ DQPSK -DH1

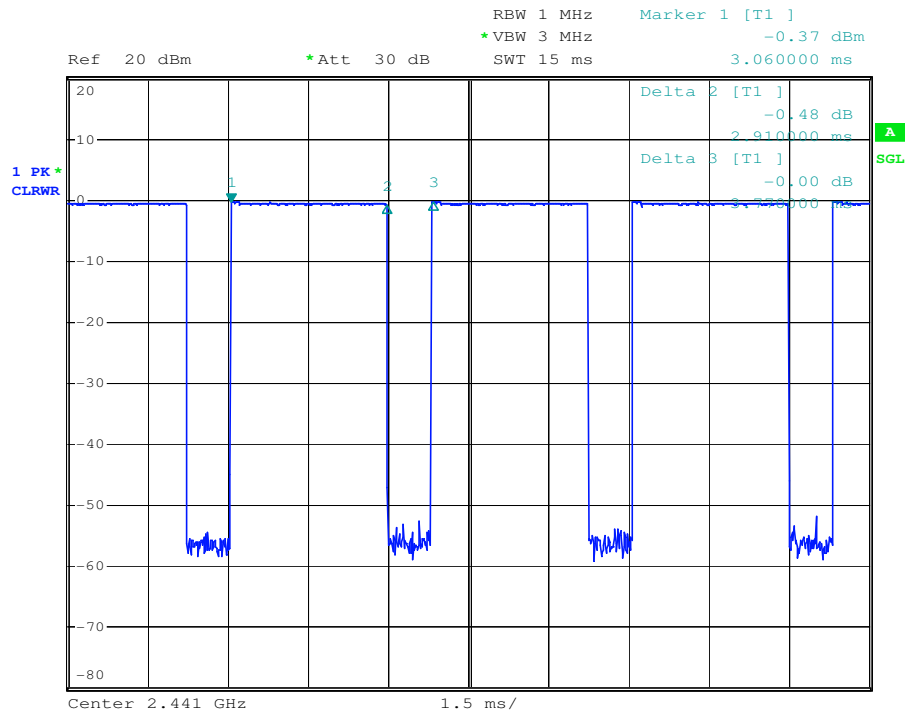




Frequency 2441MHz: Modulation: $\pi/4$ DQPSK - DH3

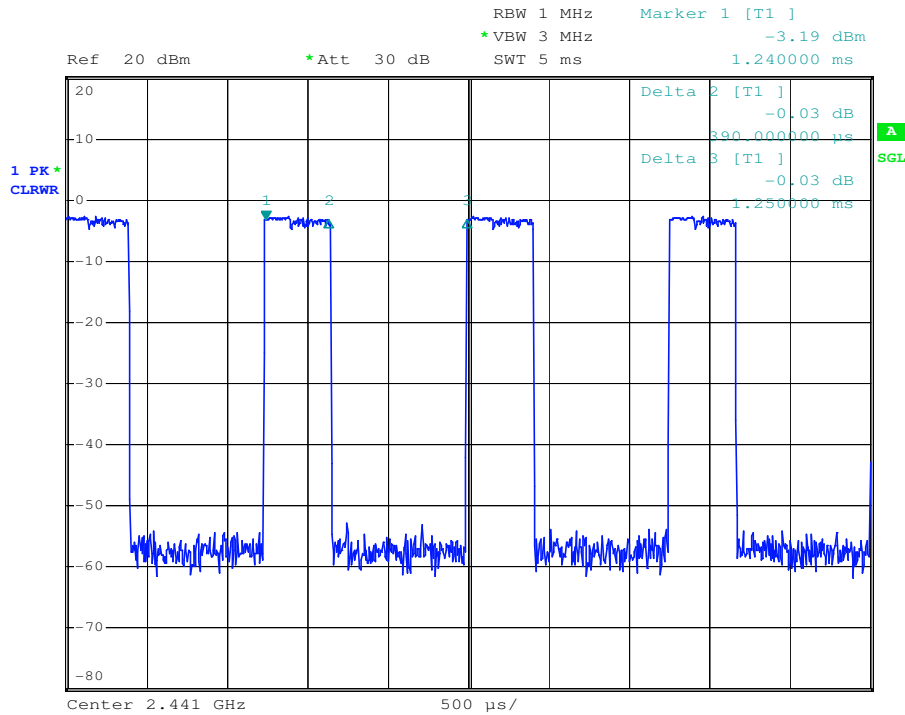


Frequency 2441MHz: Modulation: $\pi/4$ DQPSK - DH5

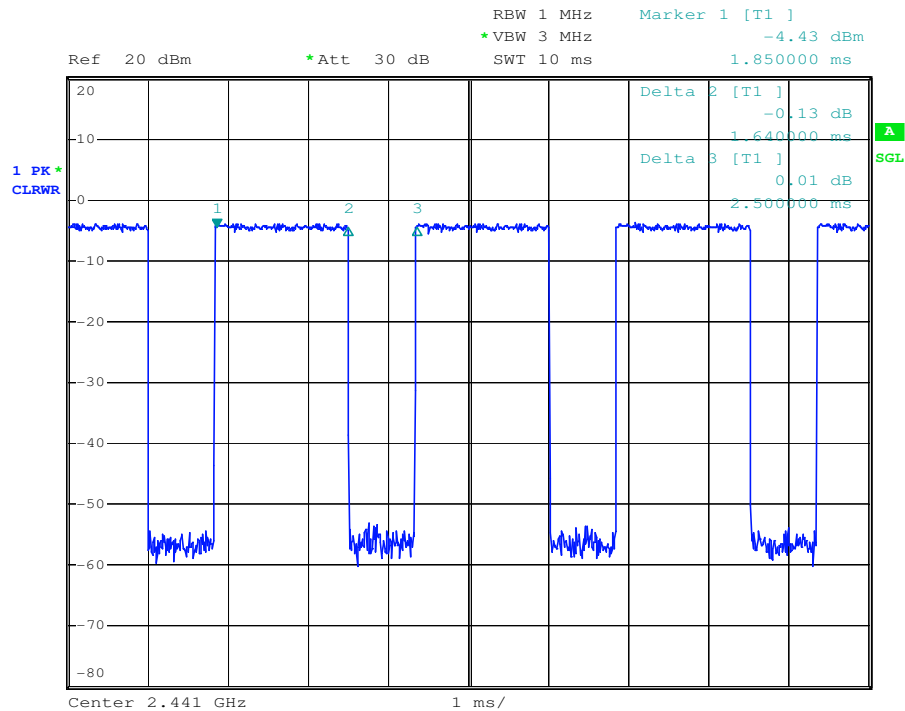




Frequency 2441MHz: Modulation: 8DPSK -DH1



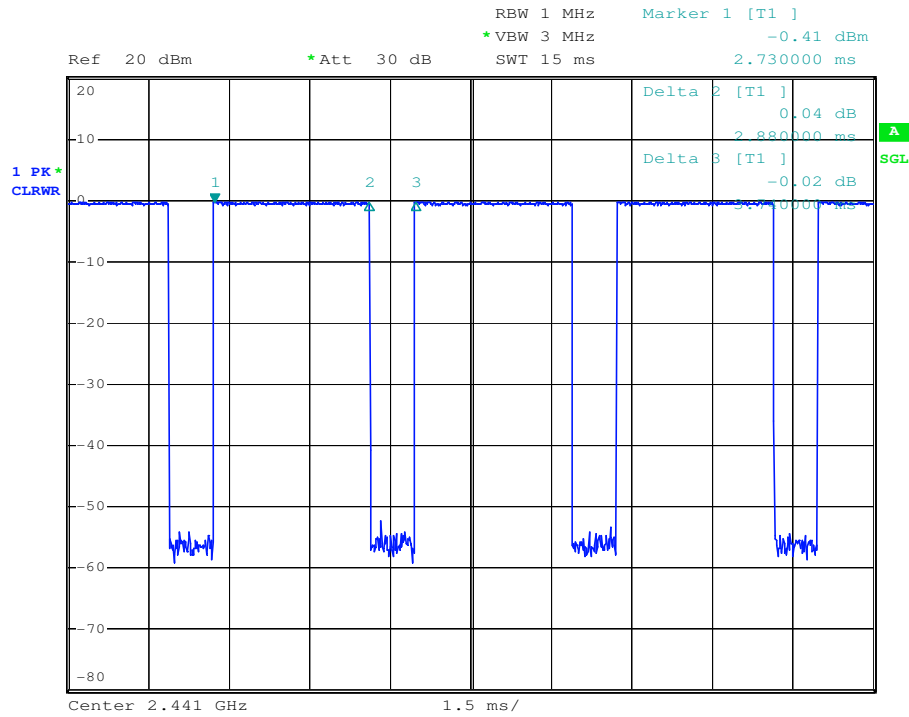
Frequency 2441MHz: Modulation: 8DPSK - DH3





Frequency 2441MHz:

Modulation: 8DPSK - DH5



7.9 Conducted Spurious Emissions

Test Requirement: FCC Part 15 Section 15.247(d)

Test Method: ANSI C63.10:2009 Clause 7.7.10

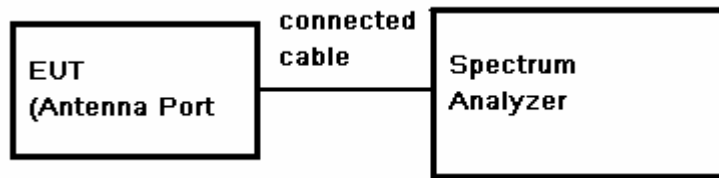
Test Date: August 21, 2013

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 Status: Test the lowest, Middle, highest channel.
Remark: GFSK Modulation mode is the worst case (from the pre-test found GFSK modulation is the worst case).

Test Result: Pass

Test Configuration:



Test Procedure:

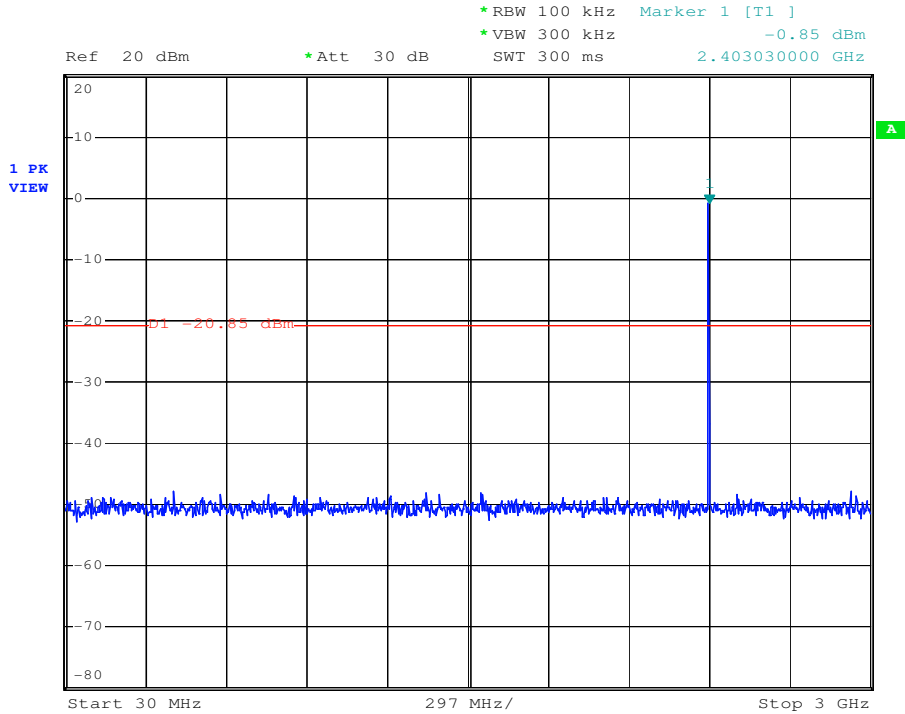
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100KHz. VBW >= RBW. Sweep = auto; Detector Function = Peak (Max. hold).



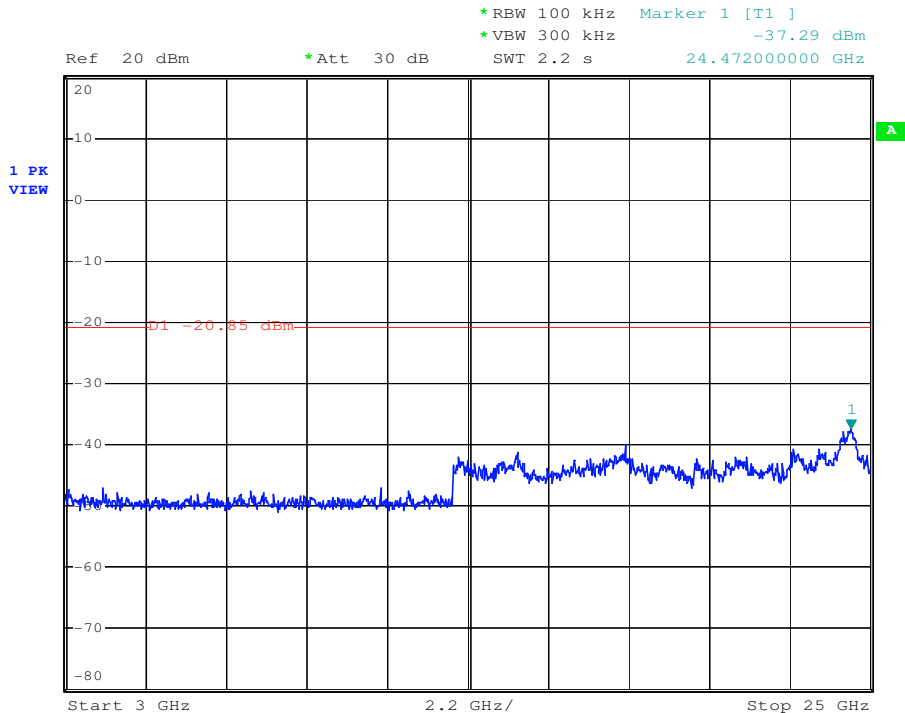
Test plot as follows:

Test mode:	GFSK	Test channel:	Lowest
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30MHz-3GHz:



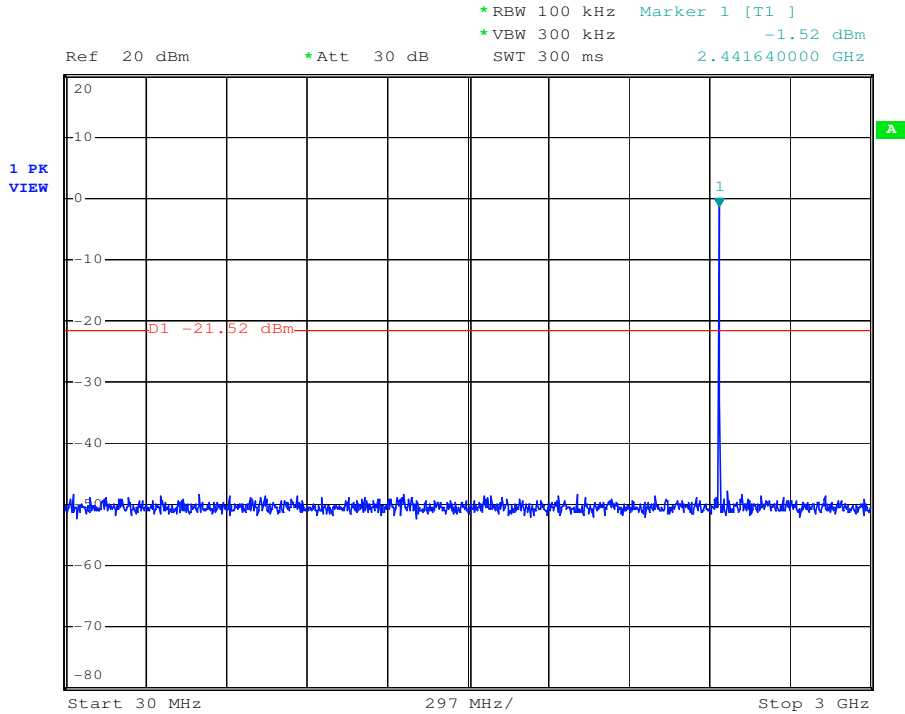
3GHz-25GHz:



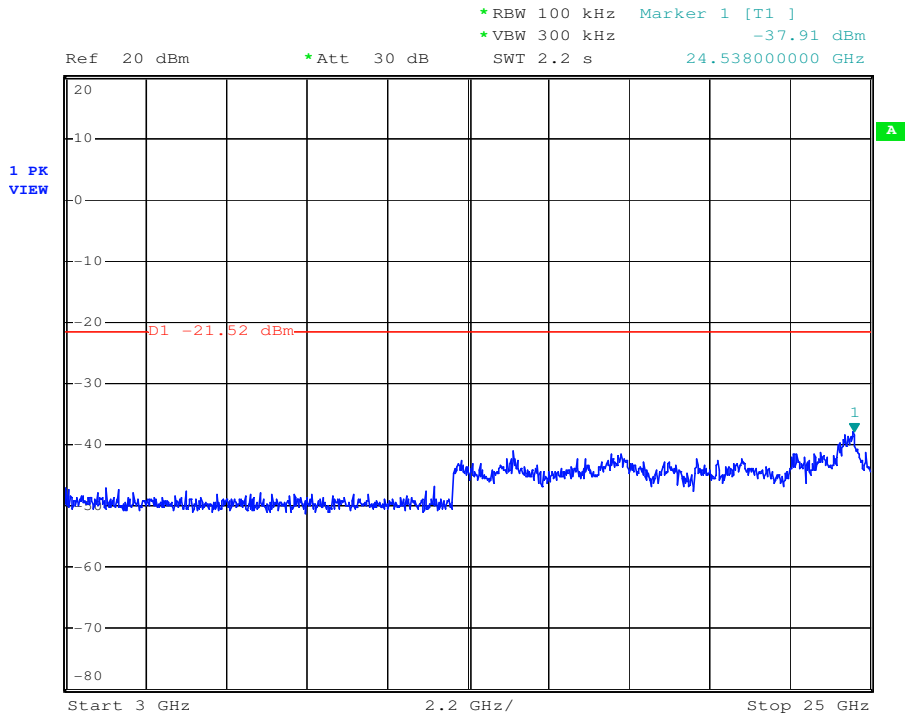


Test mode:	GFSK	Test channel:	Middle
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30MHz-3GHz:



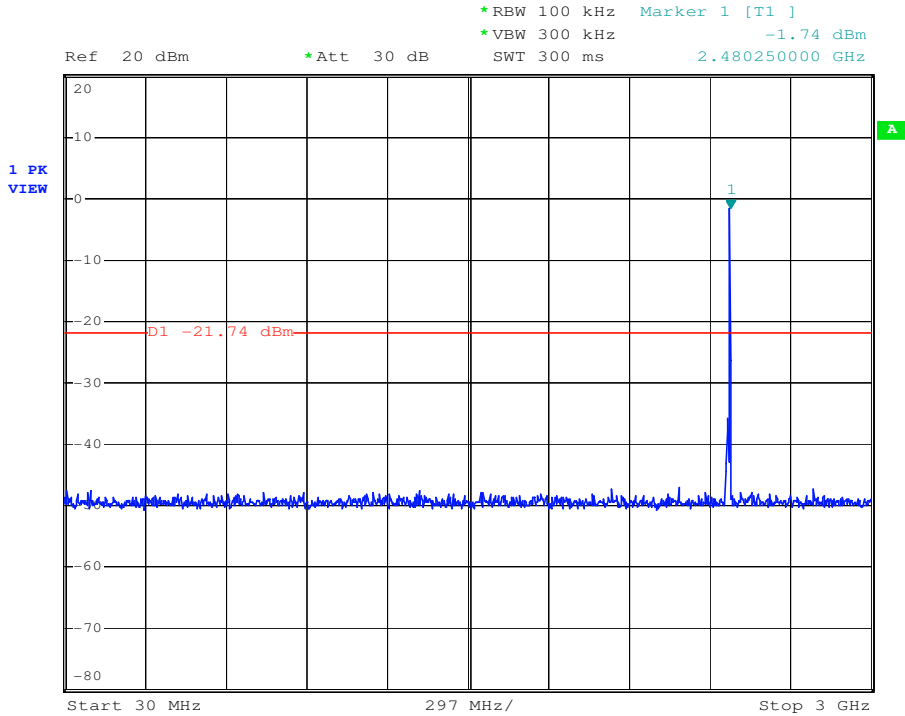
3GHz-25GHz:



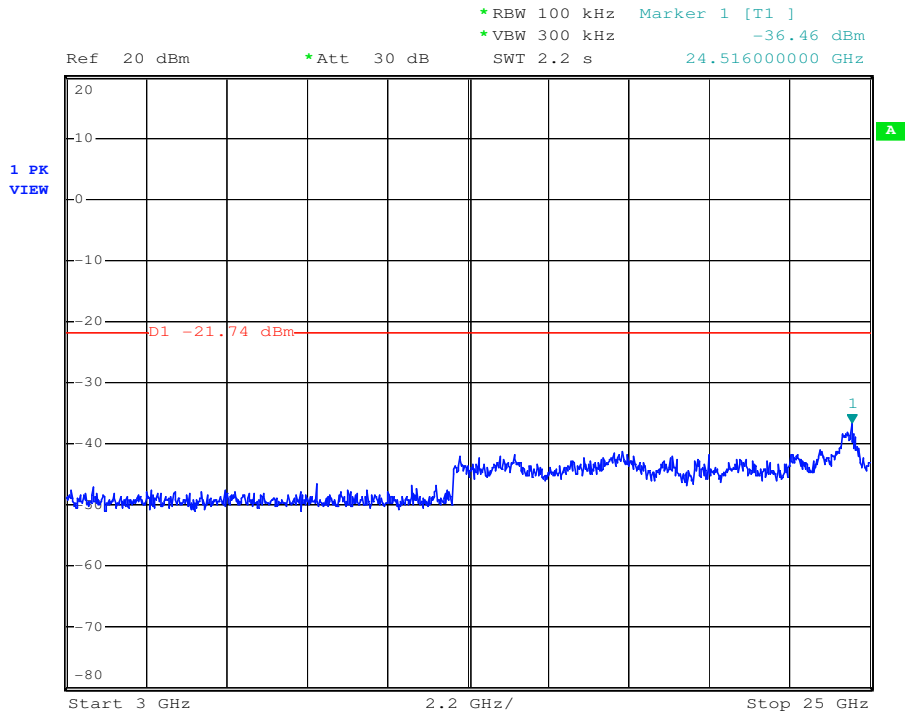


Test mode:	GFSK	Test channel:	Highest
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30MHz-3GHz:



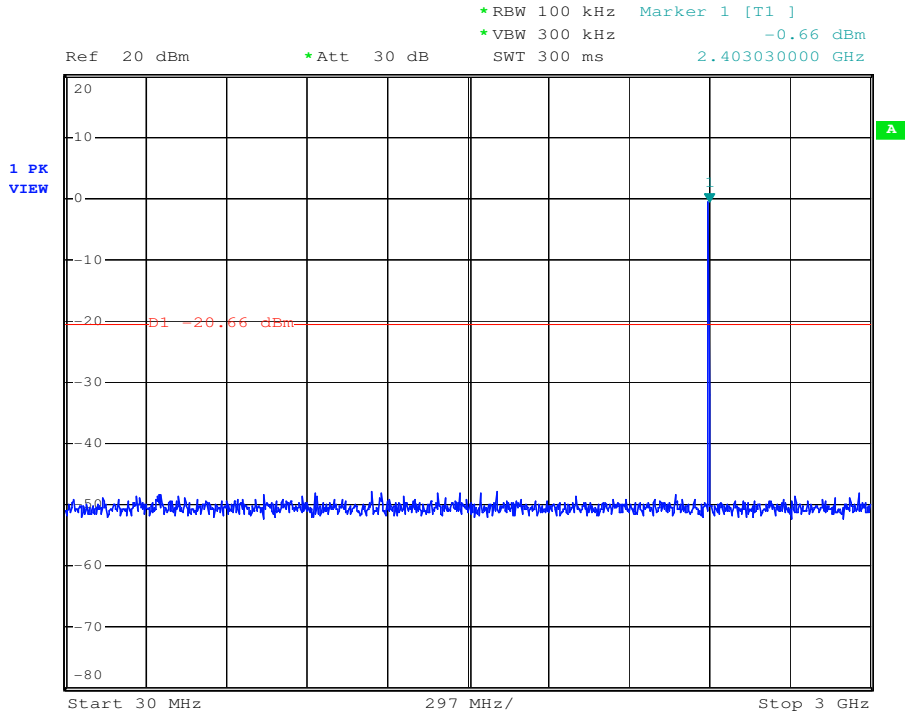
3GHz-25GHz:



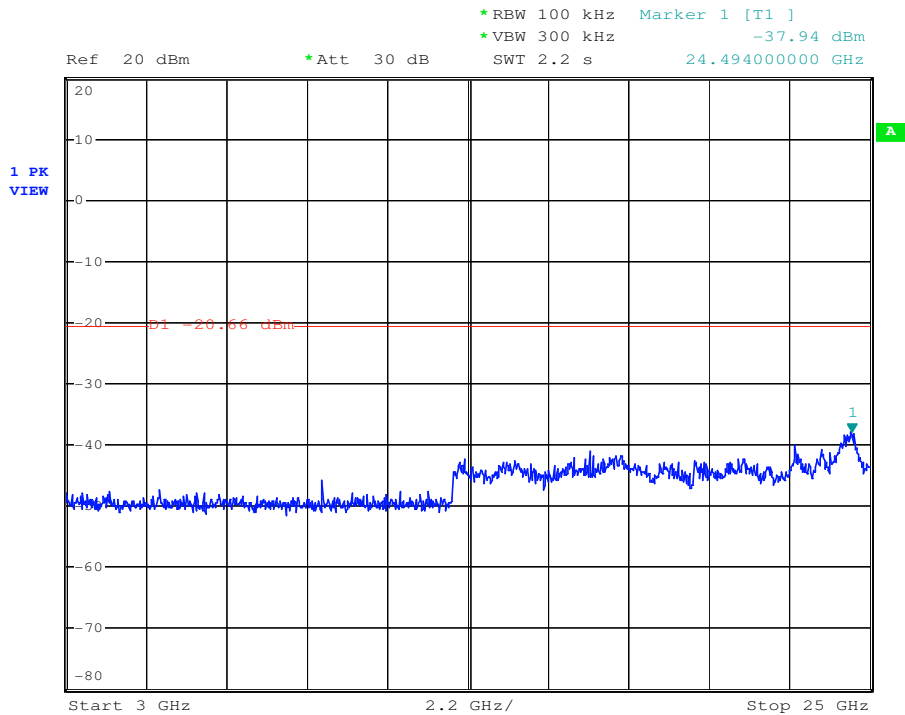


Test mode:	$\pi/4$ DQPSK	Test channel:	Lowest
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30MHz-3GHz:



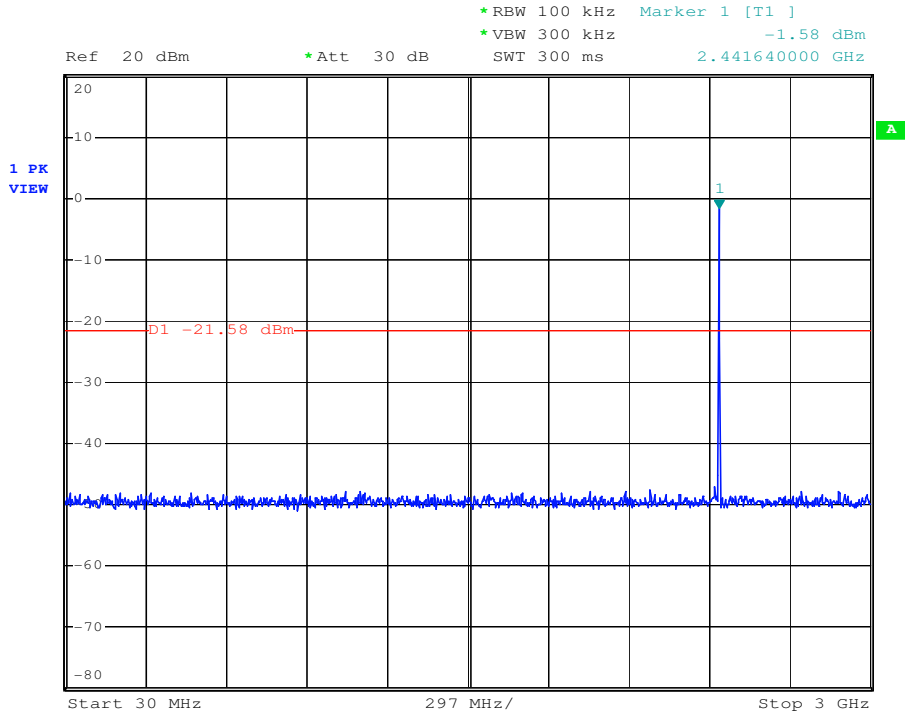
3GHz-25GHz:



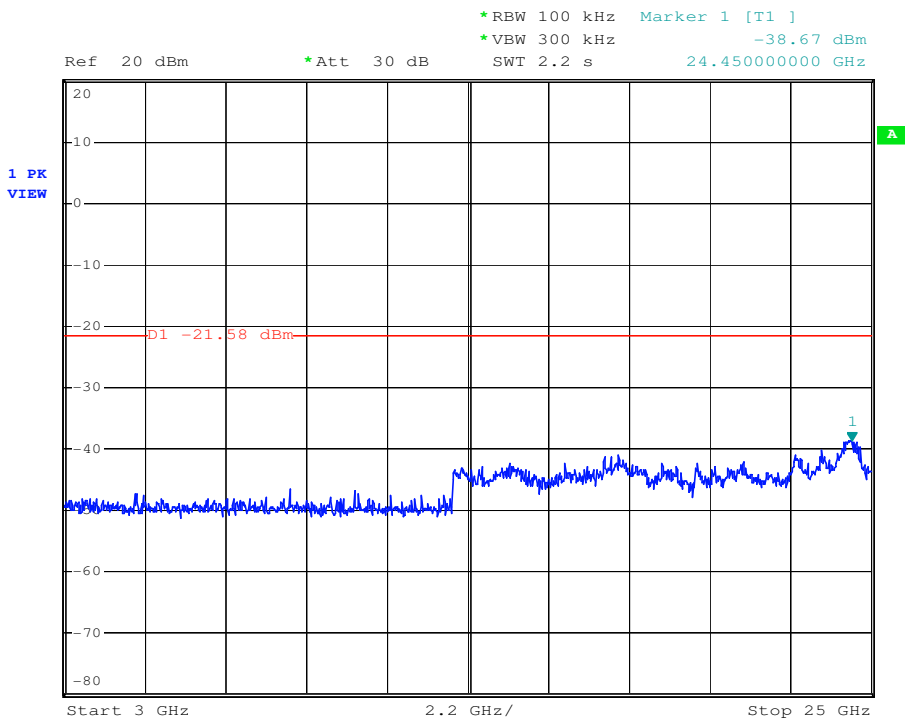


Test mode:	$\pi/4$ DQPSK	Test channel:	Middle
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30MHz-3GHz:



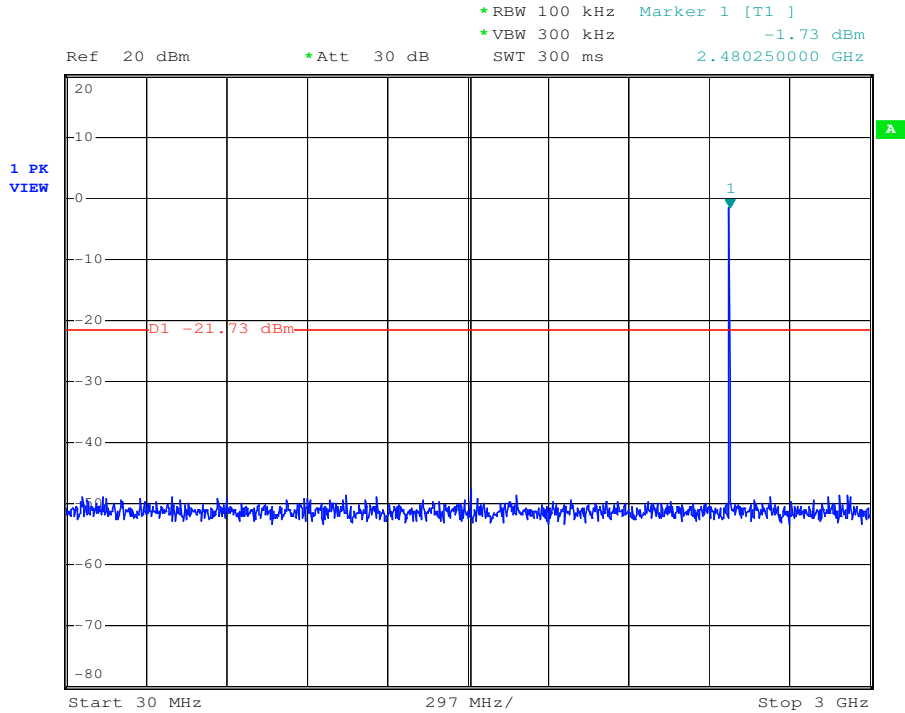
3GHz-25GHz:



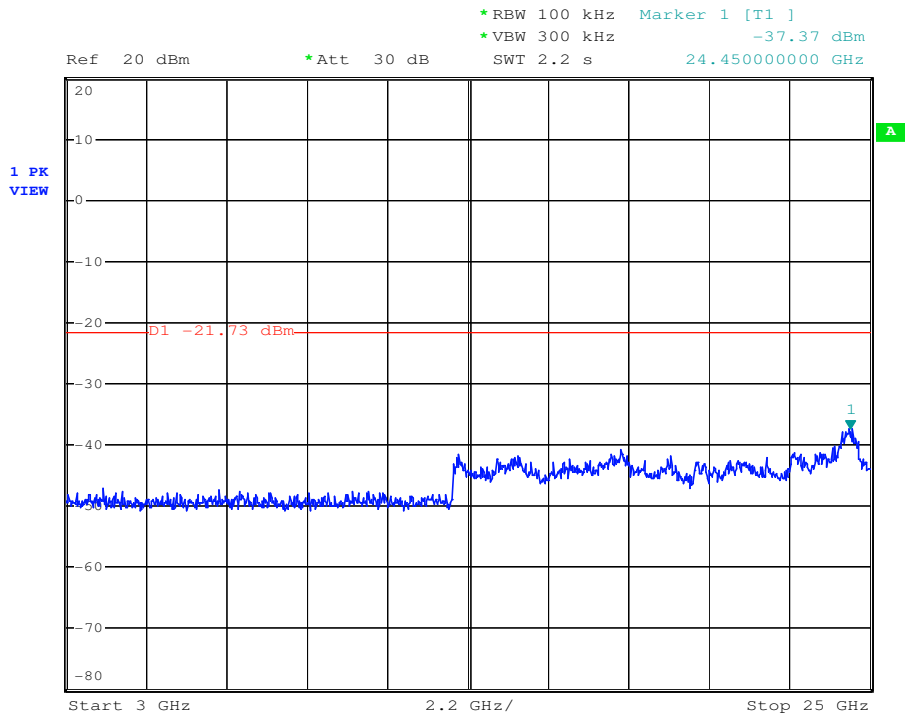


Test mode:	$\pi/4$ DQPSK	Test channel:	High
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30MHz-3GHz:



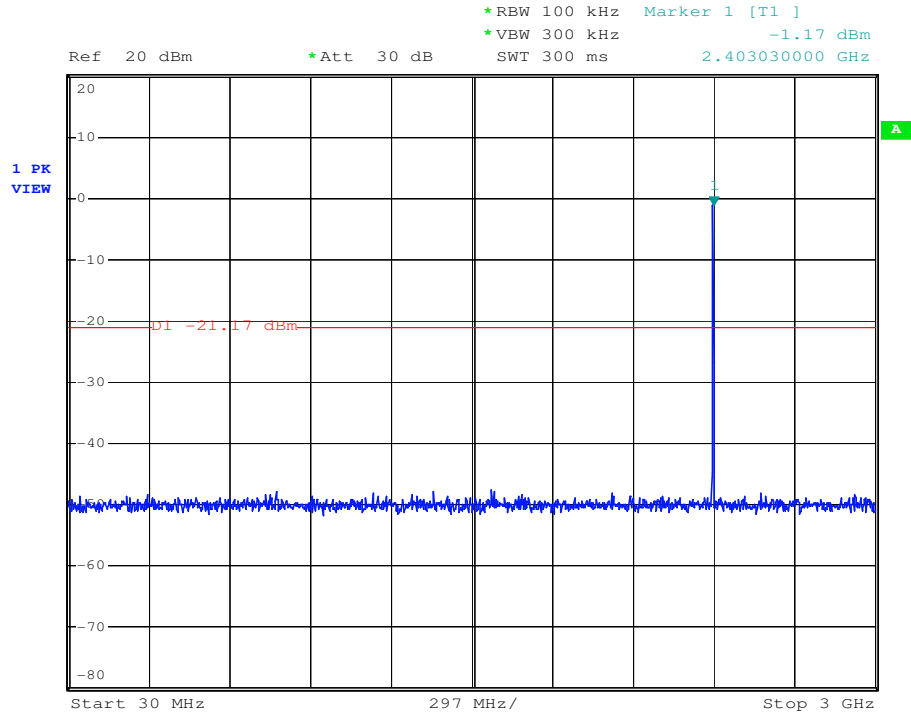
3GHz-25GHz:



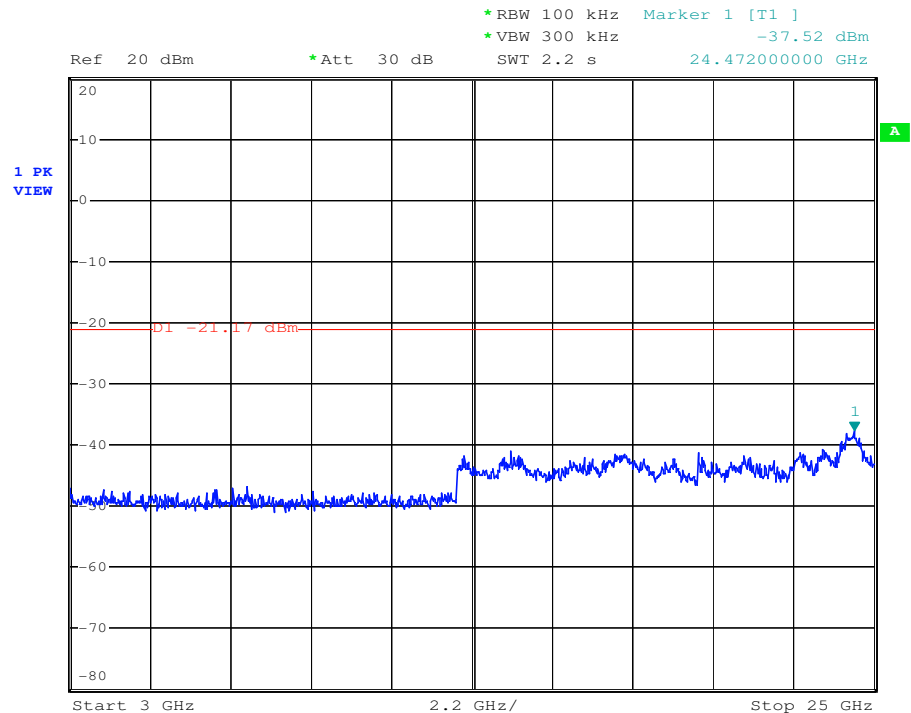


Test mode:	8DPSK	Test channel:	Lowest
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30MHz-3GHz:



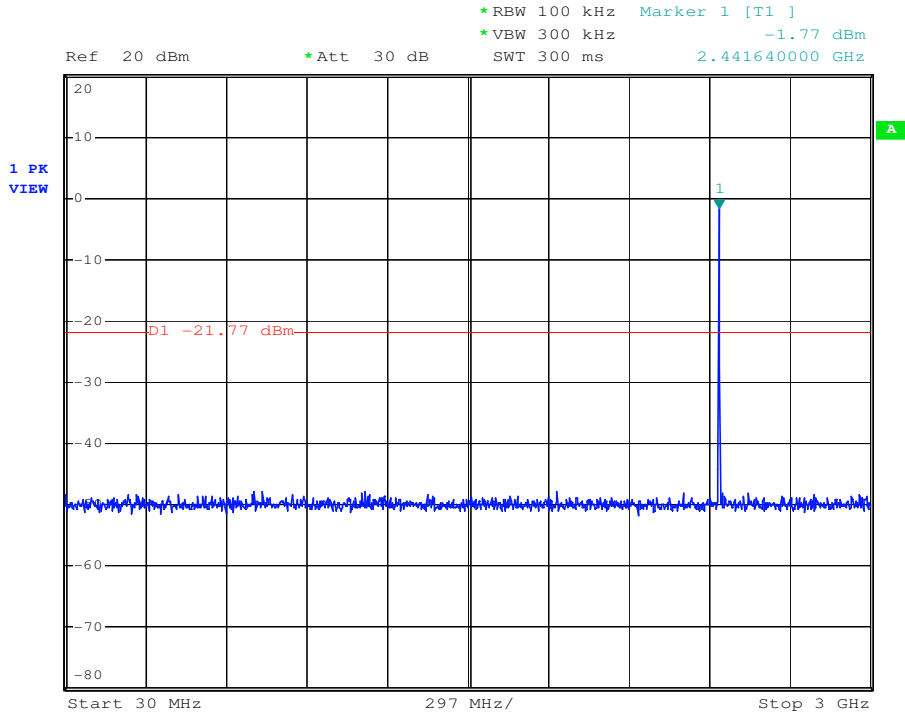
3GHz-25GHz:



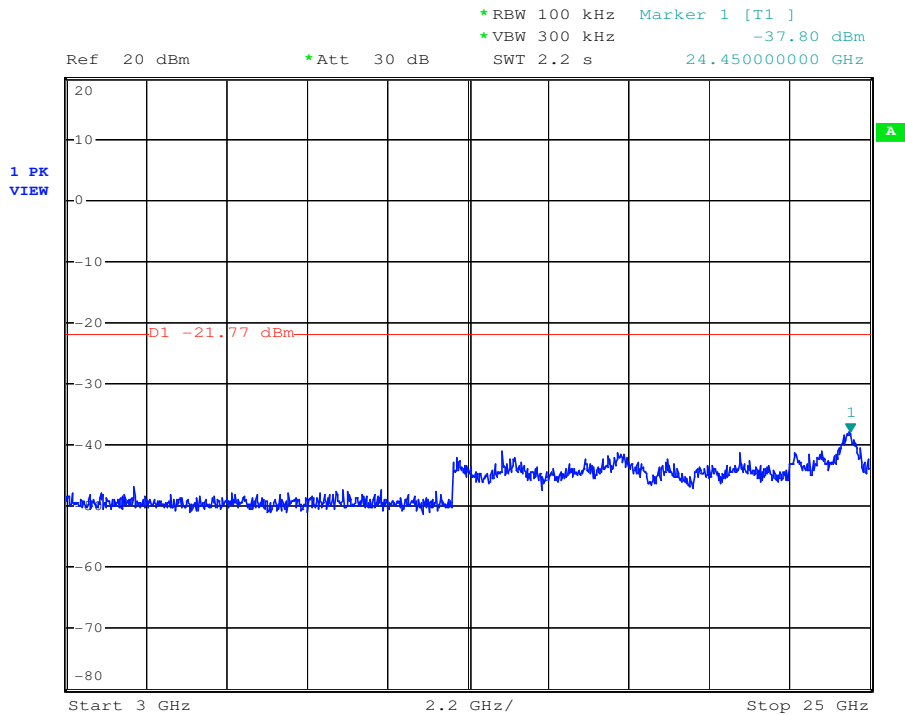


Test mode:	8DPSK	Test channel:	Middle
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30MHz-3GHz:



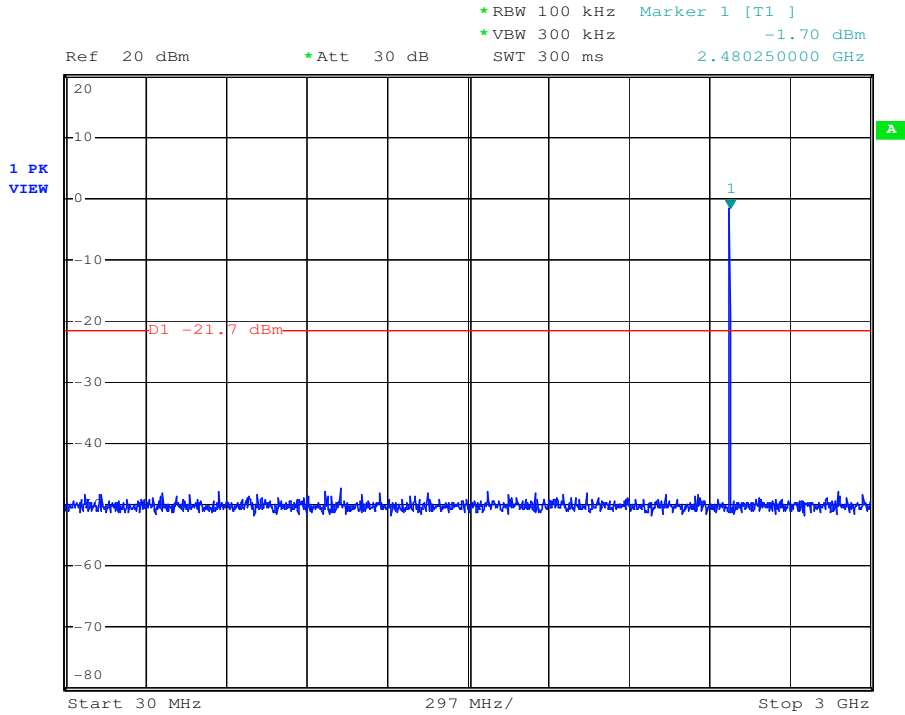
3GHz-25GHz:



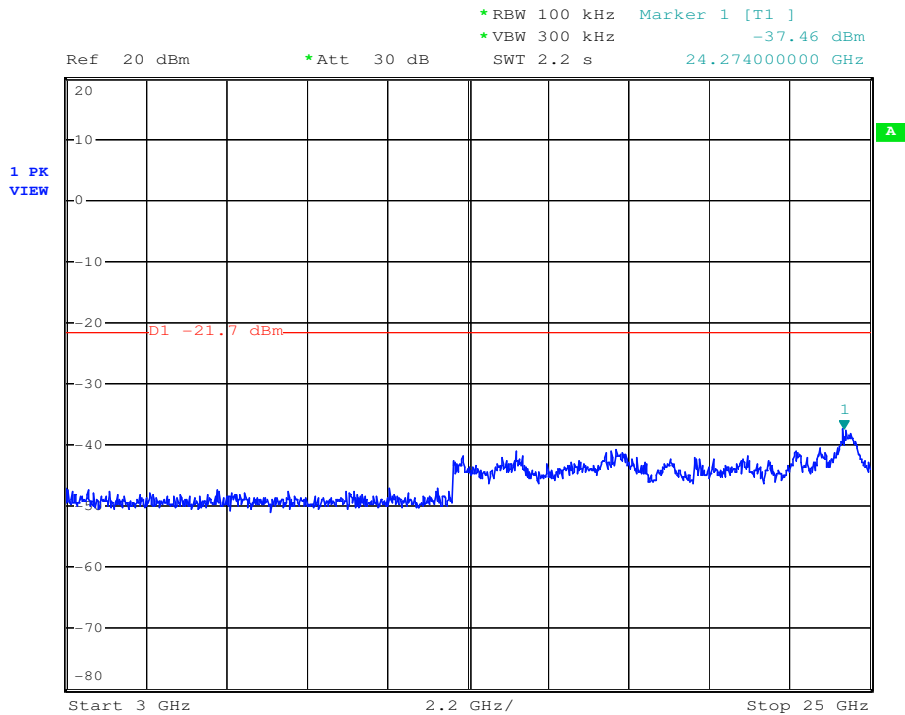


Test mode:	8DPSK	Test channel:	High
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30MHz-3GHz:



3GHz-25GHz:



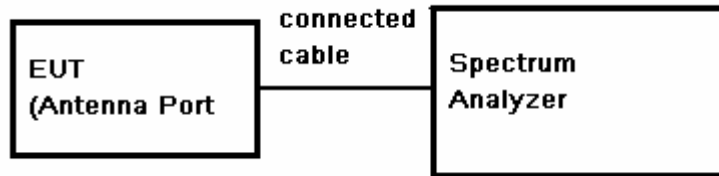
7.10 Conducted Band-edge

Test Requirement: FCC Part 15 Section 15.247(d)
Test Method: ANSI C63.10:2009 Clause 7.7.10
Test Date: August 21, 2013
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.

Final Test Mode: Transmitting mode

Test Result: Pass

Test Configuration:



Test Procedure:

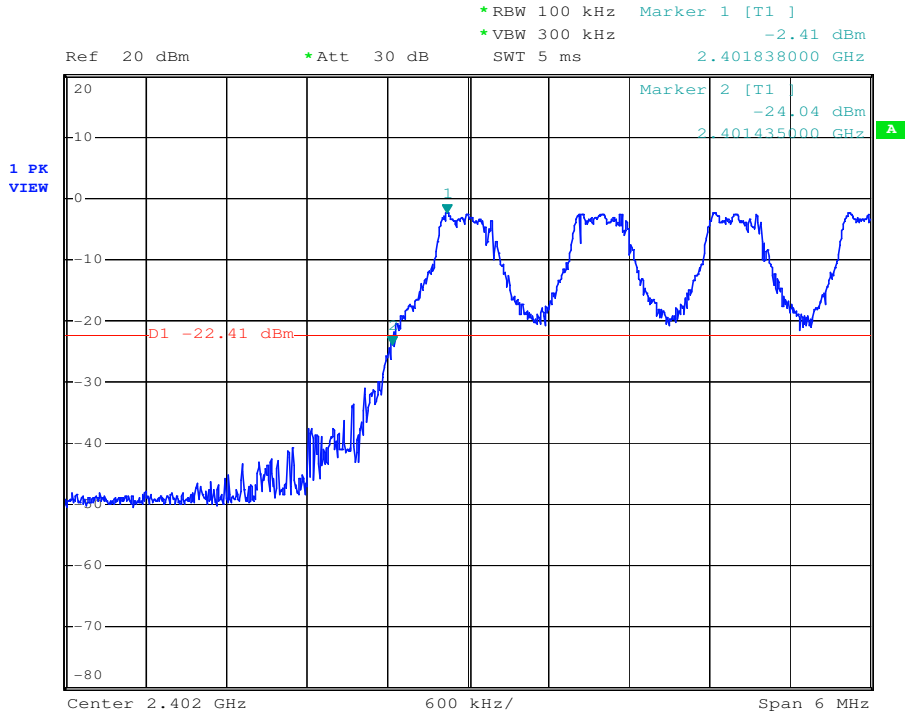
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100KHz. VBW >= RBW. Sweep = auto; Detector Function = Peak (Max. hold).



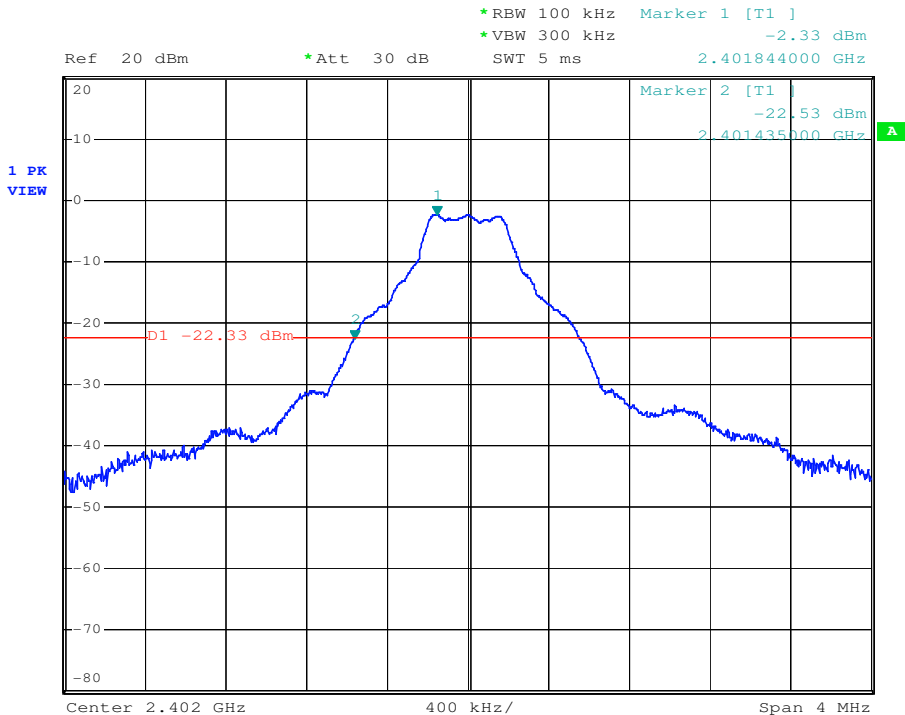
Test plot as follows:

Test mode:	GFSK	Test channel:	Lowest
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For Hopping:



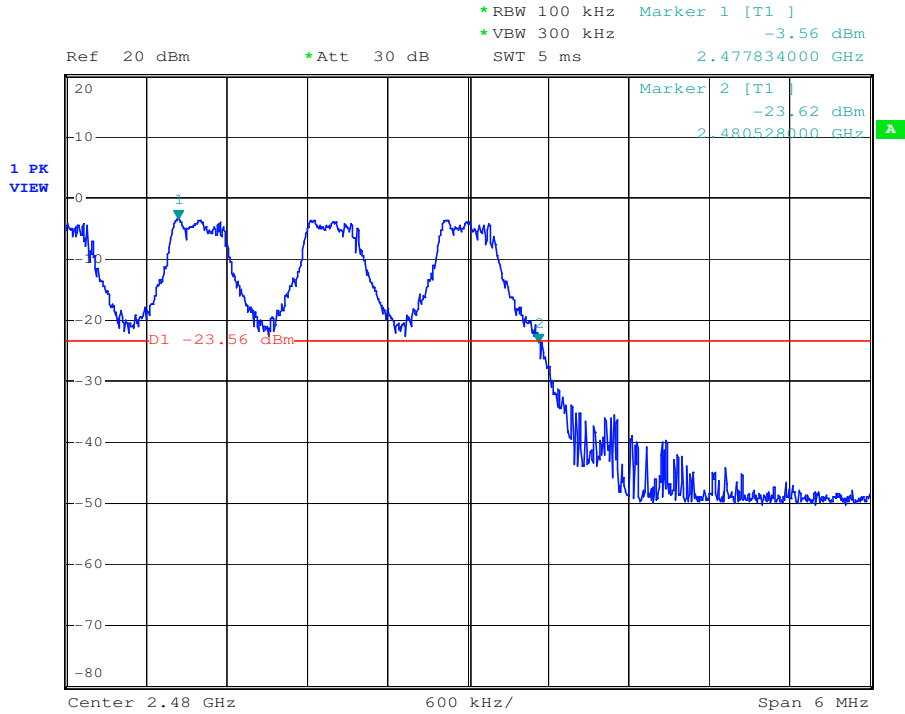
For Static:



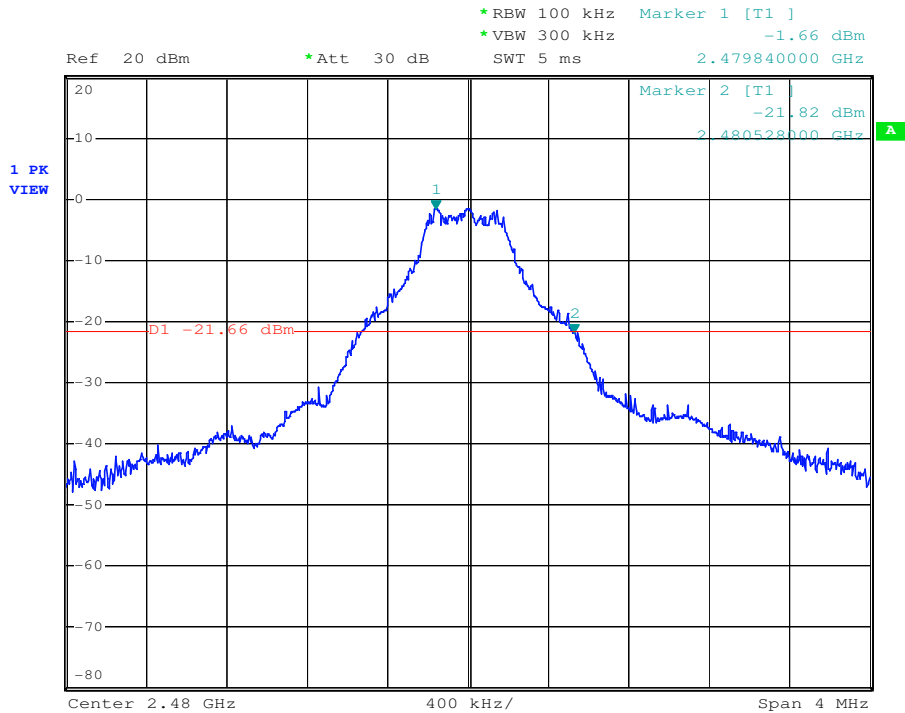


Test mode:	GFSK	Test channel:	Highest
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For Hopping:



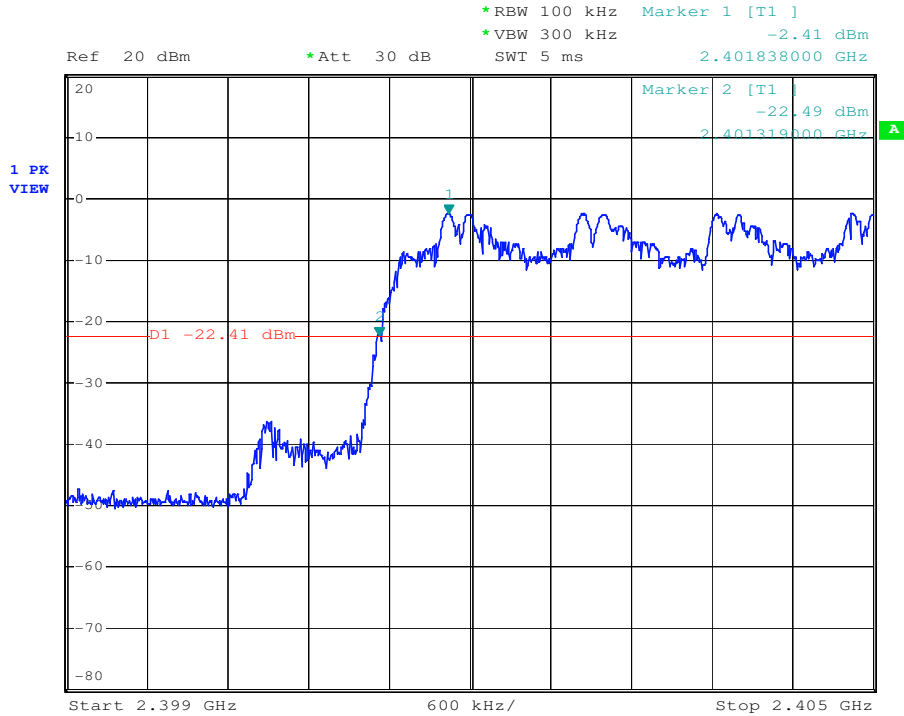
For Static:



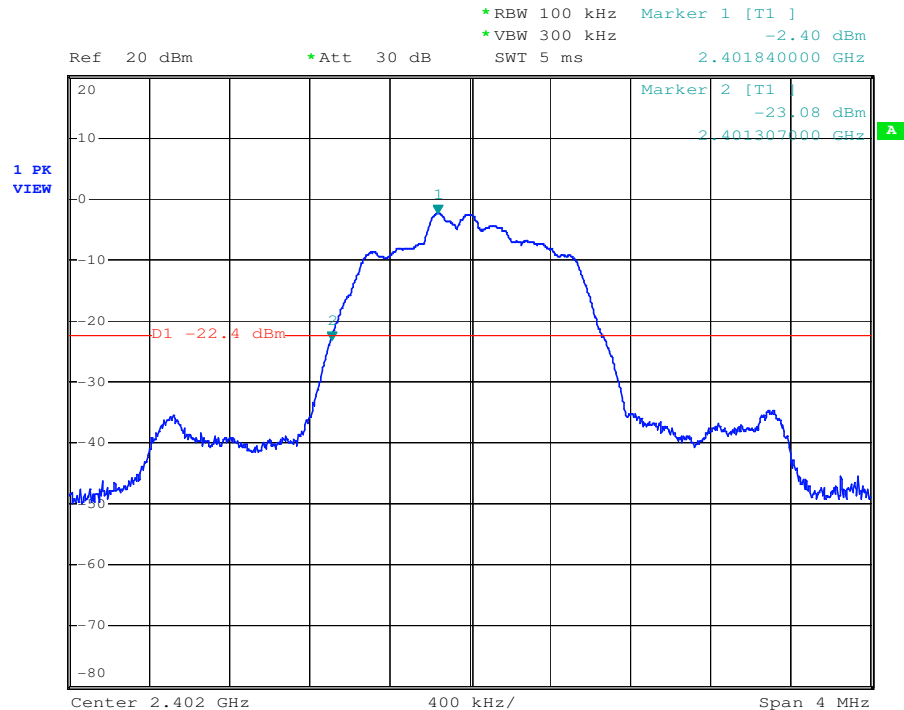


Test mode:	$\pi/4$ DQPSK	Test channel:	Lowest
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For Hopping:



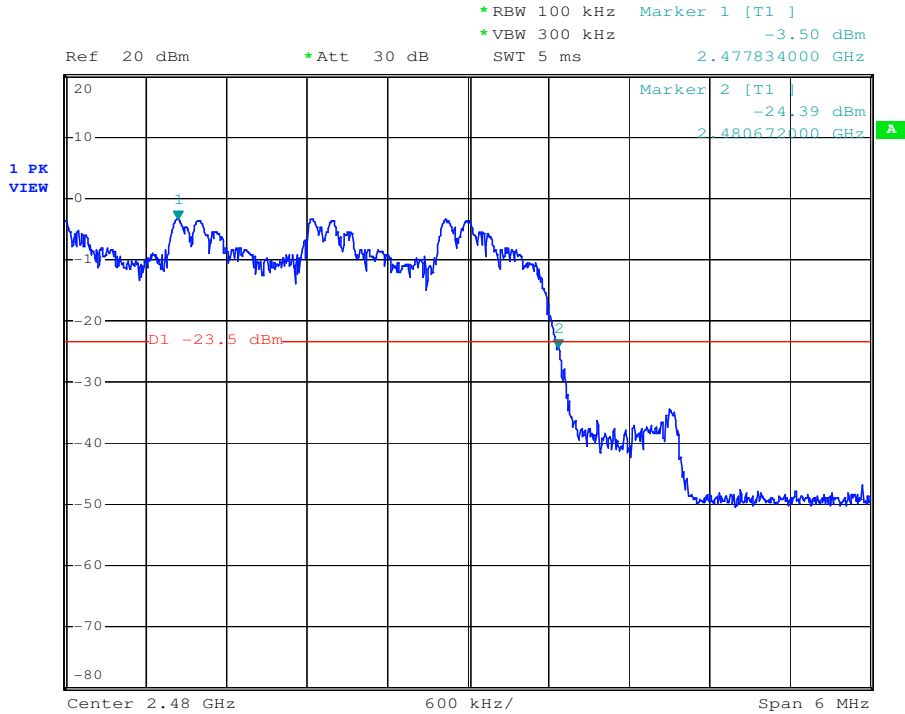
For Static:



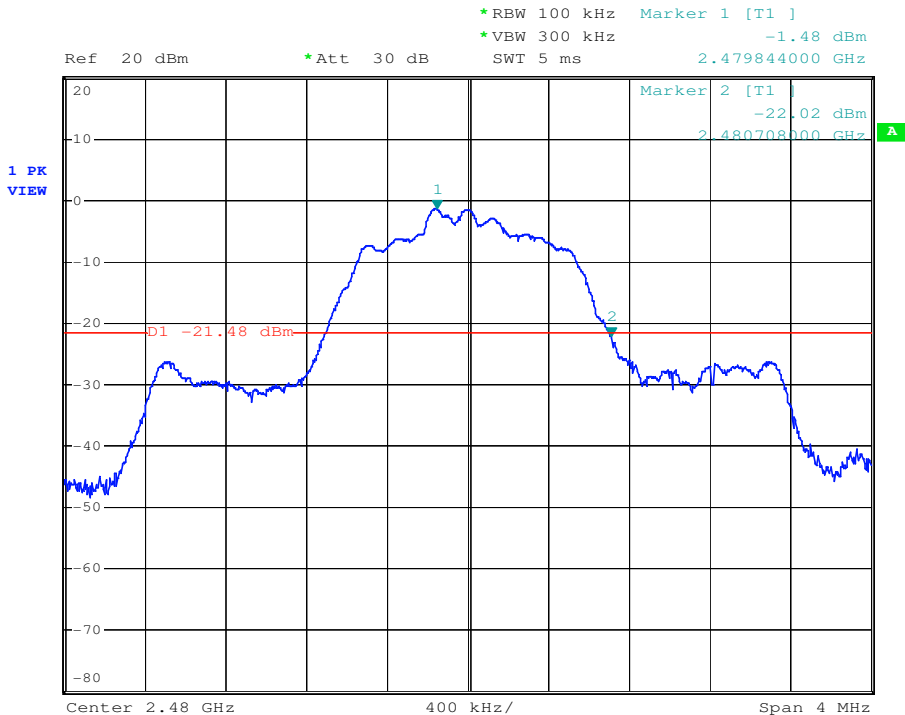


Test mode:	$\pi/4$ DQPSK	Test channel:	Highest
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For Hopping:



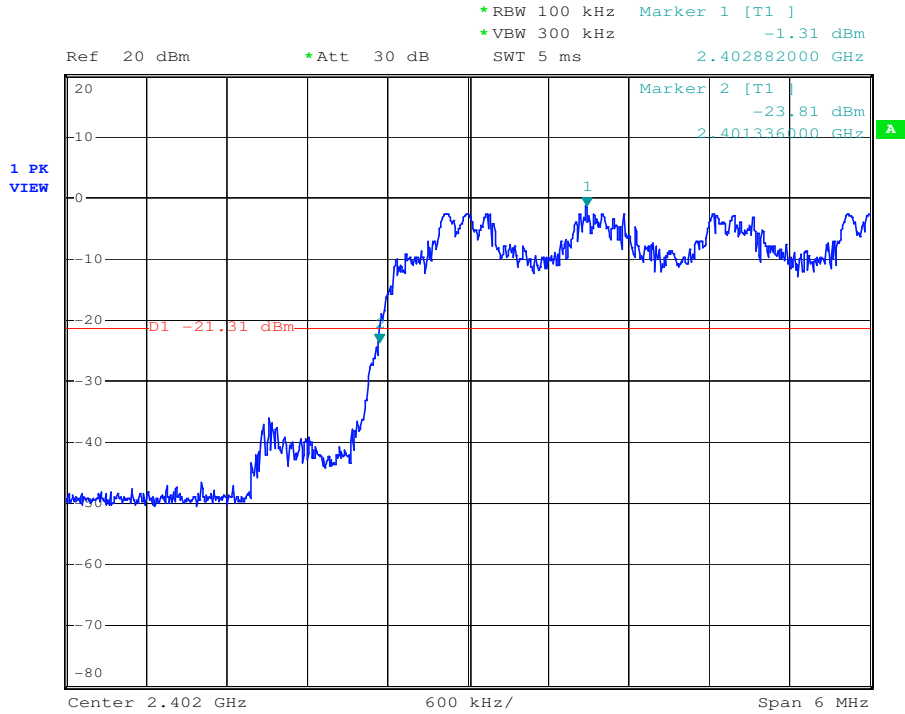
For Static:



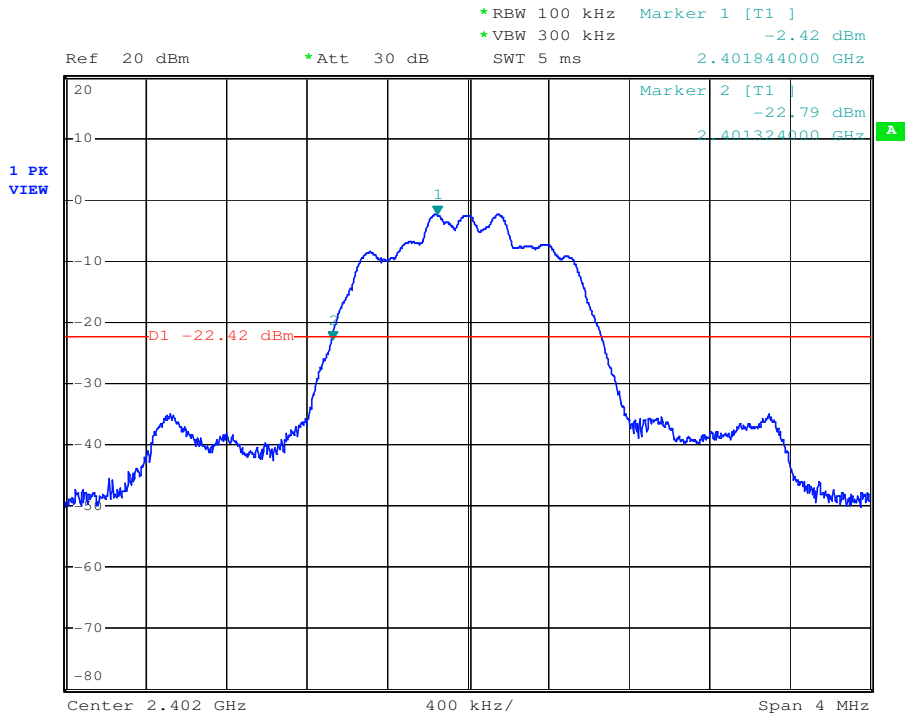


Test mode:	8DPSK	Test channel:	Lowest
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For Hopping:



For Static:





Test mode:	8DPSK	Test channel:	Highest
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For Hopping:



For Static:





7.11 Radiated Spurious Emissions

Test Requirement:	FCC Part 15 Section 15.209 and Section 15.205
Test Method:	ANSI C63.10:2009 Clause 6.12
Test Date:	August 19, 2013
Final Test Mode:	Transmitting mode
Test site/setup:	Measurement Distance: 3m (Semi-Anechoic Chamber) Test instrumentation resolution bandwidth 120 kHz and Quasi-Peak detector applies (30 MHz - 1000 MHz). For PK value: RBW = 1 MHz for $f \geq 1$ GHz VBW \geq RBW; Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for $f \geq 1$ GHz VBW = 10Hz; Sweep = auto Detector function = peak Trace = max hold Receive antenna scan height 1 m - 4 m. polarization Vertical / Horizontal
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

Test Configuration:

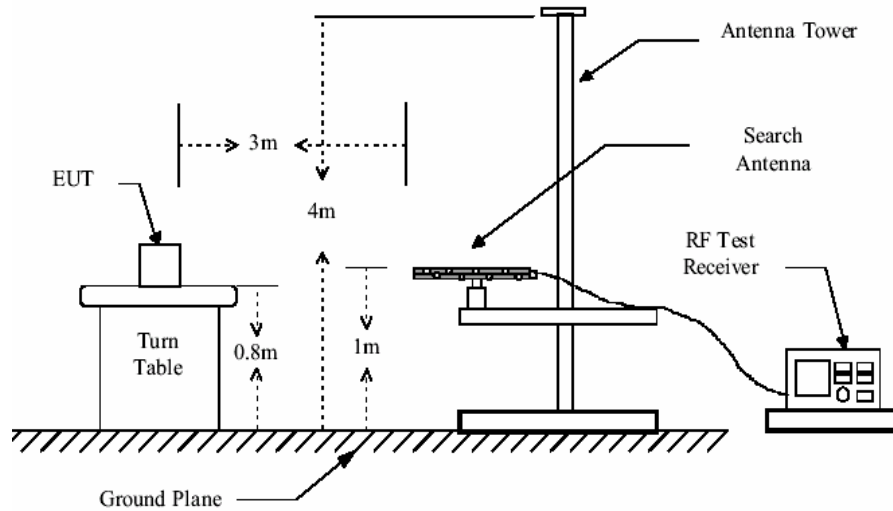


Figure 1. 30MHz to 1GHz radiated emissions test configuration

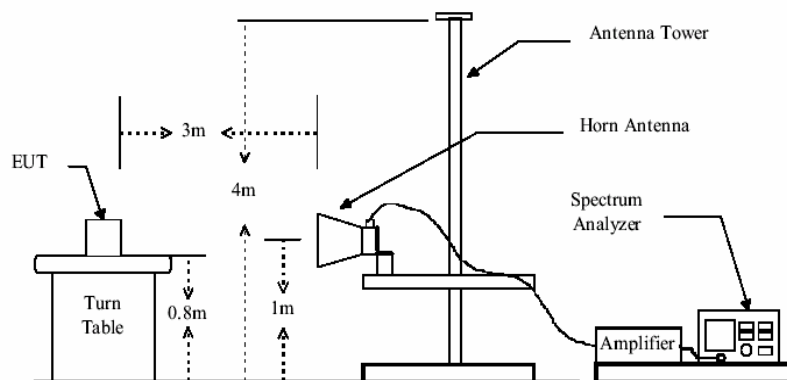


Figure 2. Above 1GHz radiated emissions test configuration

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. The worst case emissions were reported.

Low noise amplifier was used below 1GHz, High pass Filter was used above 3GHz.

Between 1G and 3GHz, we did not use any amplifier or filter.

Pre-test was performed on GFSK and EDR mode with charging mode and only battery power mode, Compliance test was performed on worst case (GFSK mode).

Test were performed for three spatial orthogonal (X, Y, Z), the worst test data (X orthogonal)

was submitted.

1) 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 5rd harmonic.

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.

The test only perform the EUT in transmitting status since the test frequencies were over 1GHz only required transmitting status.

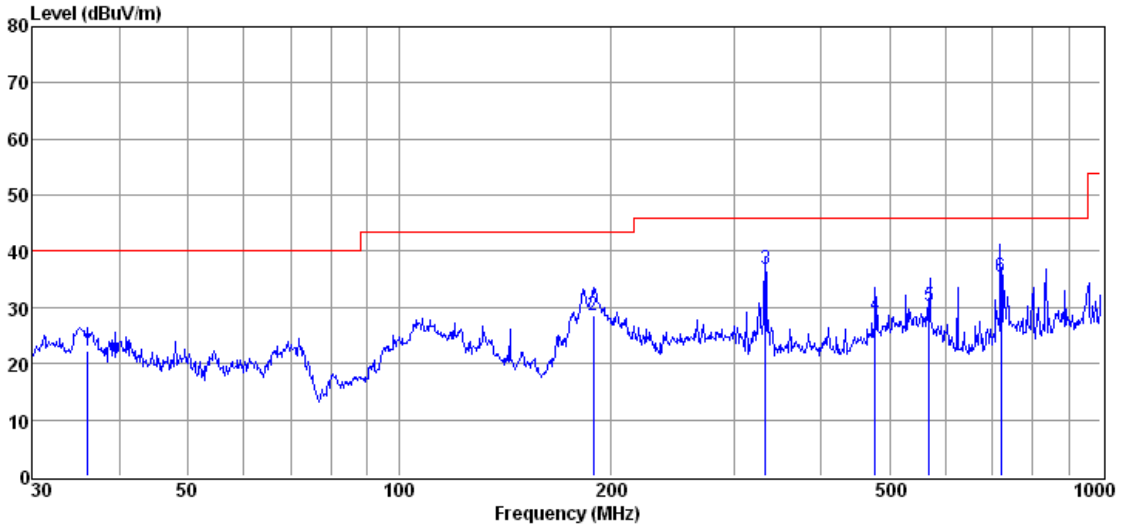
Below show the worst Test results:

30MHz to 1GHz

Transmitting mode

8DPSK

Test Antenna Status: Vertical

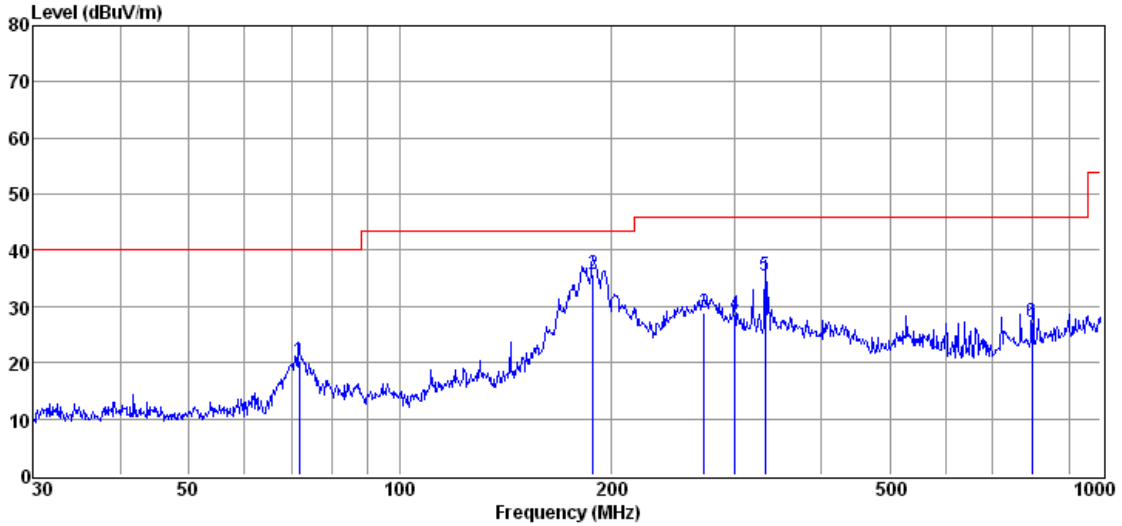


Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
36.00	33.99	12.58	24.70	0.50	22.37	40.00	-17.63	QP	Vertical
189.01	41.92	9.84	24.60	1.46	28.62	43.50	-14.88	QP	Vertical
332.82	46.15	13.26	24.50	2.07	36.98	46.00	-9.02	QP	Vertical
476.92	34.21	16.32	24.39	2.54	28.68	46.00	-17.32	QP	Vertical
569.90	33.10	18.46	24.22	2.81	30.15	46.00	-15.85	QP	Vertical
720.15	35.27	20.96	24.10	3.22	35.35	46.00	-10.65	QP	Vertical

Transmitting mode

8DPSK

Test Antenna Status: Horizontal



Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
71.78	33.84	10.44	24.70	0.81	20.39	40.00	-19.61	QP	Horizontal
188.62	49.09	9.89	24.60	1.45	35.83	43.50	-7.67	QP	Horizontal
271.67	39.94	11.54	24.50	1.83	28.81	46.00	-17.19	QP	Horizontal
300.48	38.60	12.41	24.50	1.95	28.46	46.00	-17.54	QP	Horizontal
332.33	44.53	13.25	24.50	2.06	35.34	46.00	-10.66	QP	Horizontal
797.79	25.54	22.18	24.00	3.44	27.16	46.00	-18.84	QP	Horizontal



1GHz-12GHz:

Transmitting mode		8DPSK	Test Channel:		Low	Test Antenna:		Horizontal
Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	
1	4783.50	39.66	7.34	47.00	54	7.00	peak	
2	7192.25	38.22	10.29	48.51	54	5.49	peak	
3	9612.75	36.77	13.55	50.32	54	3.68	peak	

Transmitting mode		8DPSK	Test Channel:		Low	Test Antenna:		Vertical
Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	
1	4783.50	39.31	7.69	47.00	54	7.00	peak	
2	7192.25	38.13	10.34	48.47	54	5.53	peak	
3	9612.75	37.11	14.00	51.11	54	2.89	peak	

Transmitting mode		8DPSK	Test Channel:		Middle	Test Antenna:		Horizontal
Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	
1	4865.75	39.12	8.01	47.13	54	6.87	peak	
2	7309.75	39.77	10.69	50.46	54	3.54	peak	
3	9765.50	37.44	13.92	51.36	54	2.64	peak	

Transmitting mode		8DPSK	Test Channel:		Middle	Test Antenna:		Vertical
Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	
1	4865.75	38.84	8.34	47.18	54	6.82	peak	
2	7309.75	39.75	10.84	50.59	54	3.41	peak	
3	9765.50	37.27	14.43	51.70	54	2.30	peak	



Transmitting mode		8DPSK	Test Channel:		High	Test Antenna:		Horizontal
Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	
1	4983.25	40.16	8.41	48.57	54	5.43	peak	
2	7450.75	38.44	11.14	49.58	54	4.42	peak	
3	9906.50	37.40	14.05	51.45	54	2.55	peak	

Transmitting mode		8DPSK	Test Channel:		High	Test Antenna:		Vertical
Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	
1	4983.25	39.54	8.72	48.26	54	5.74	peak	
2	7450.75	39.07	11.40	50.47	54	3.53	peak	
3	9906.50	36.33	14.61	50.94	54	3.06	peak	

Test Level =Receiver Reading + Antenna Factor + Cable Loss –Preamplifier 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.

7.12 Band edge (Radiated Emission)

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:	ANSI 63.10:2009 Clause 6.12
Test Date:	August 19, 2013
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:	For PK value: RBW = 1 MHz for $f \geq 1$ GHz VBW \geq RBW; Sweep = auto Detector function = peak Trace = max hold For AV value: RBW = 1 MHz for $f \geq 1$ GHz VBW =10Hz; Sweep = auto Detector function = peak Trace = max hold

According to section,15.35(b) 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.

Pre-test were performed for there spatial orthogonal(X, Y, Z), the worst test data (X orthogonal) was submitted.

Pre-test was performed on GFSK and EDR mode with charging mode and only battery power mode, Compliance test was performed on worse case (8DPSK mode).

Test Result: The EUT does meet the FCC requirements.

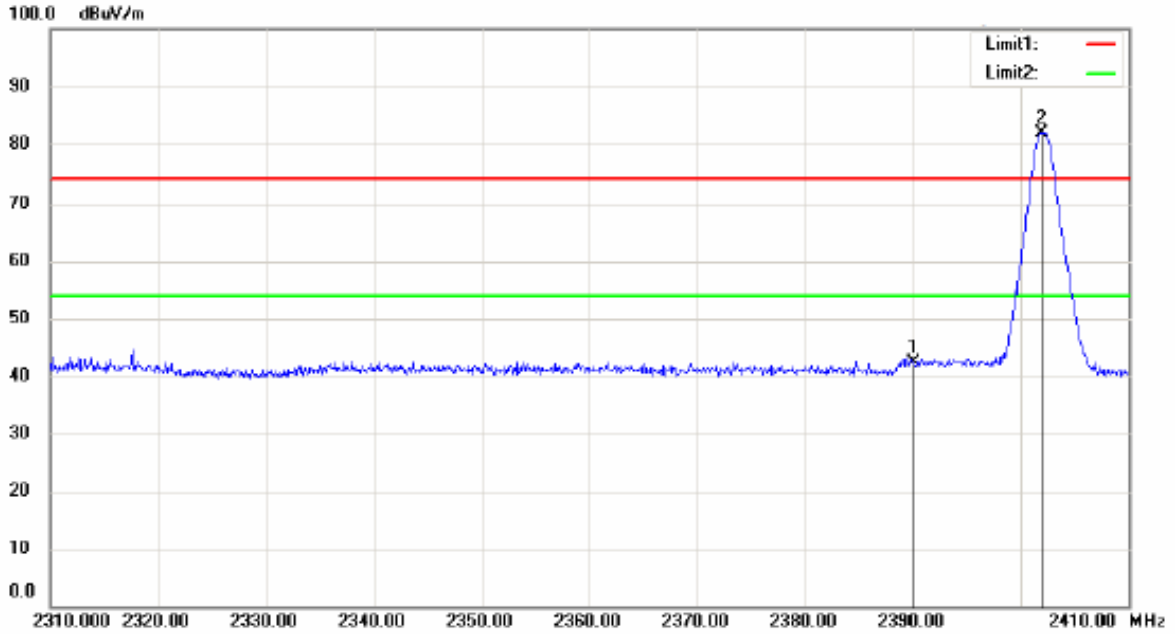


Measurement Result:

CH Low 2402MHz Radiated Bandedge

Modulation: GFSK

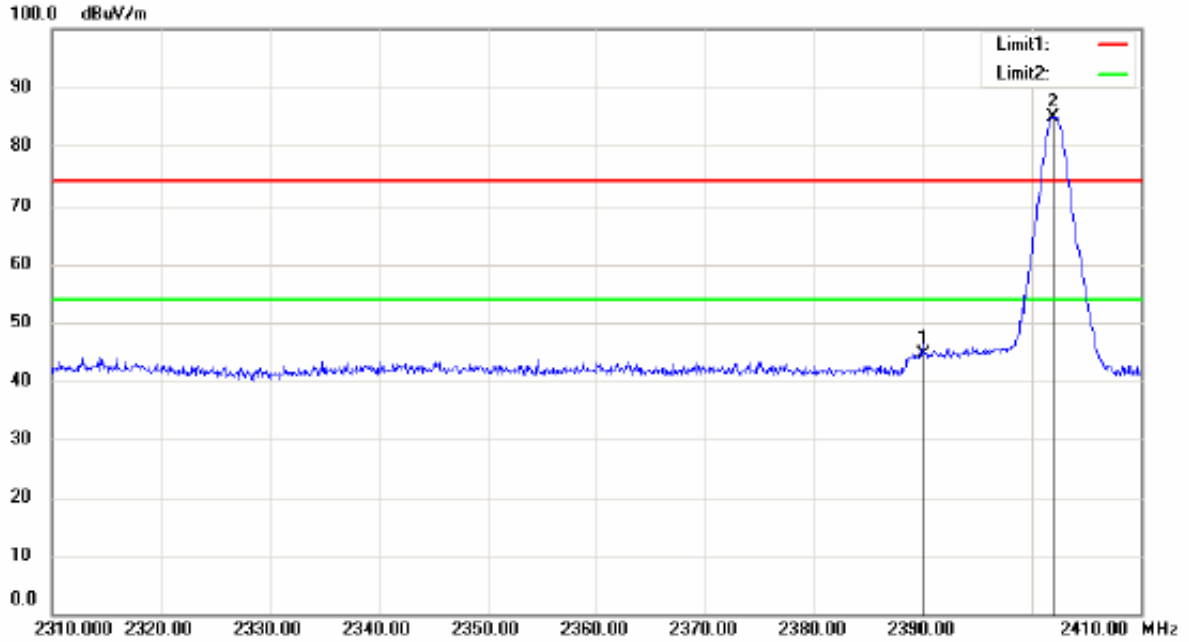
Horizontal, Peak Detector:



MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dB uV/m)	Limit (dB uV/m)	Margin (dB)	Detector
1	2390.000	43.63	-1.25	42.38	54	11.62	Peak
2	2401.900	83.30	-1.30	82.00	54	-28.00	Peak



Vertical, Peak Detector:



MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dB uV/m)	Limit (dB uV/m)	Margin (dB)	Detector
1	2390.000	45.52	-0.98	44.54	54	9.46	Peak
2	2401.900	85.93	-1.04	84.89	54	-30.89	Peak

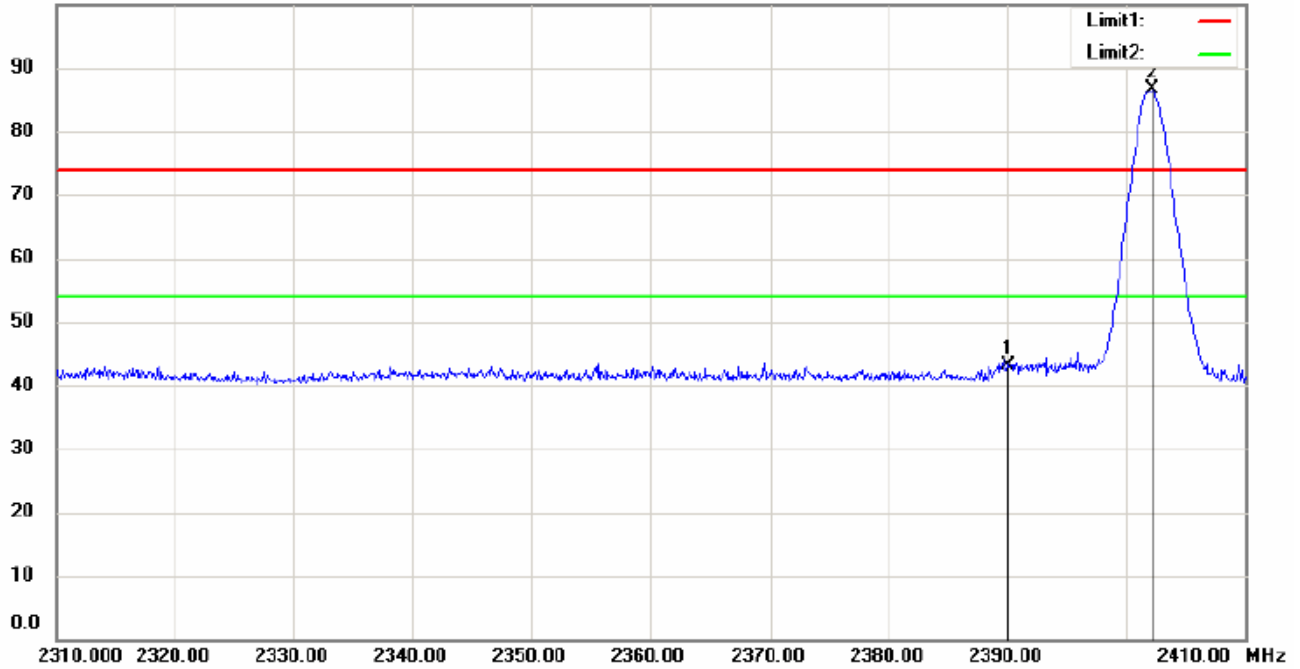


CH Low 2402MHz Radiated Bandedge

Modulation: $\pi/4$ DQPSK

Horizontal, Peak Detector:

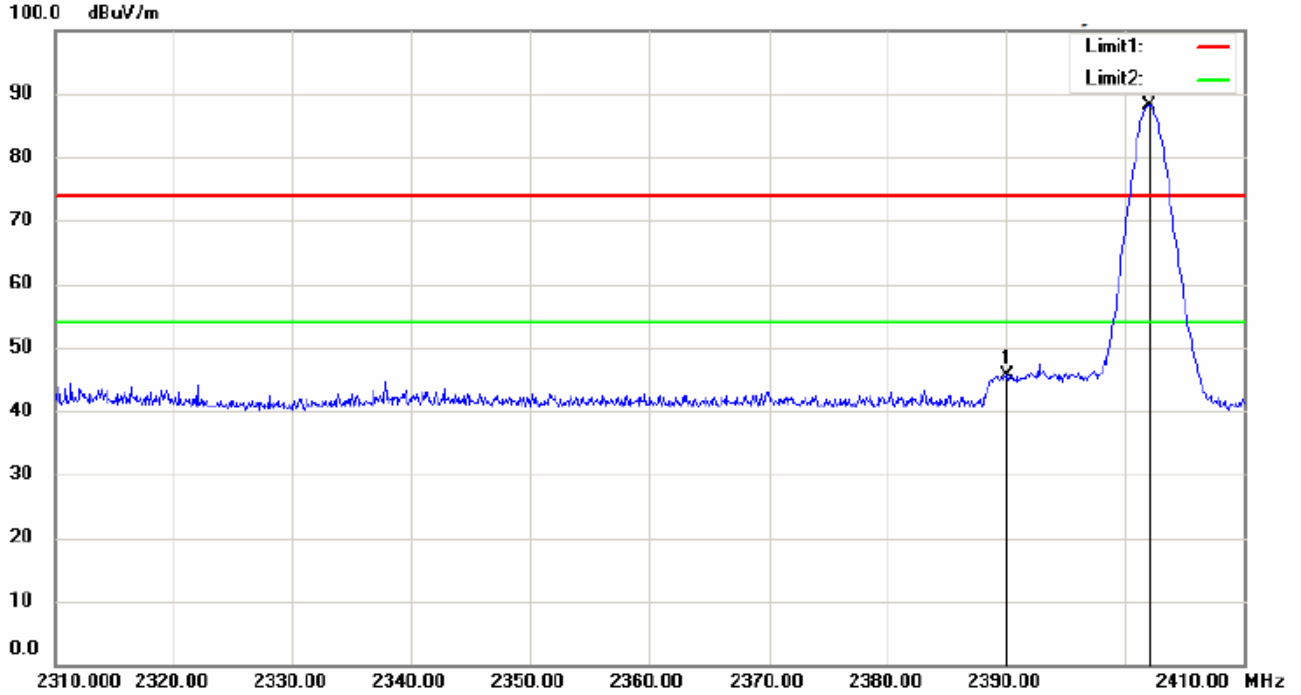
100.0 dBuV/m



MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dB uV/m)	Limit (dB uV/m)	Margin (dB)	Detector
1	2390.000	44.38	-1.25	43.13	54	10.87	Peak
2	2402.200	87.85	-1.31	86.54	54	-32.54	Peak



Vertical, Peak Detector:



MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dB uV/m)	Limit (dB uV/m)	Margin (dB)	Detector
1	2390.000	46.69	-0.98	45.71	54	8.29	Peak
2	2402.000	89.13	-1.04	88.09	54	-34.09	Peak

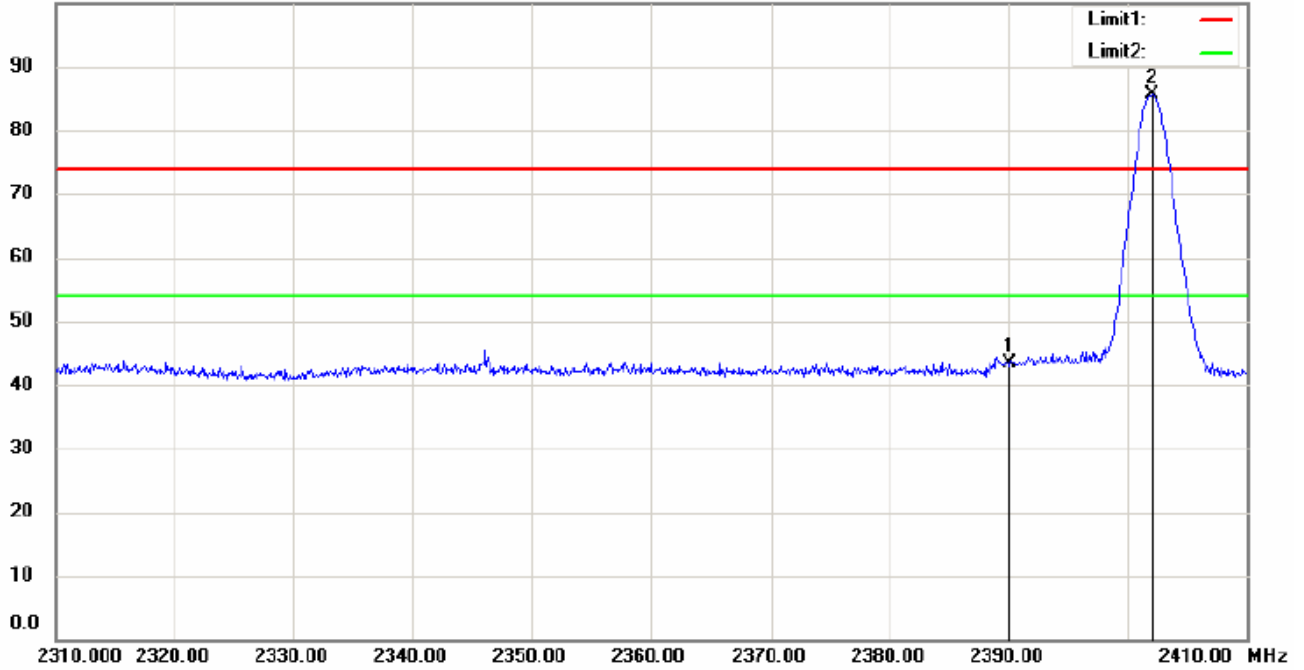


CH Low 2402MHz Radiated Bandedge

Modulation: 8DPSK

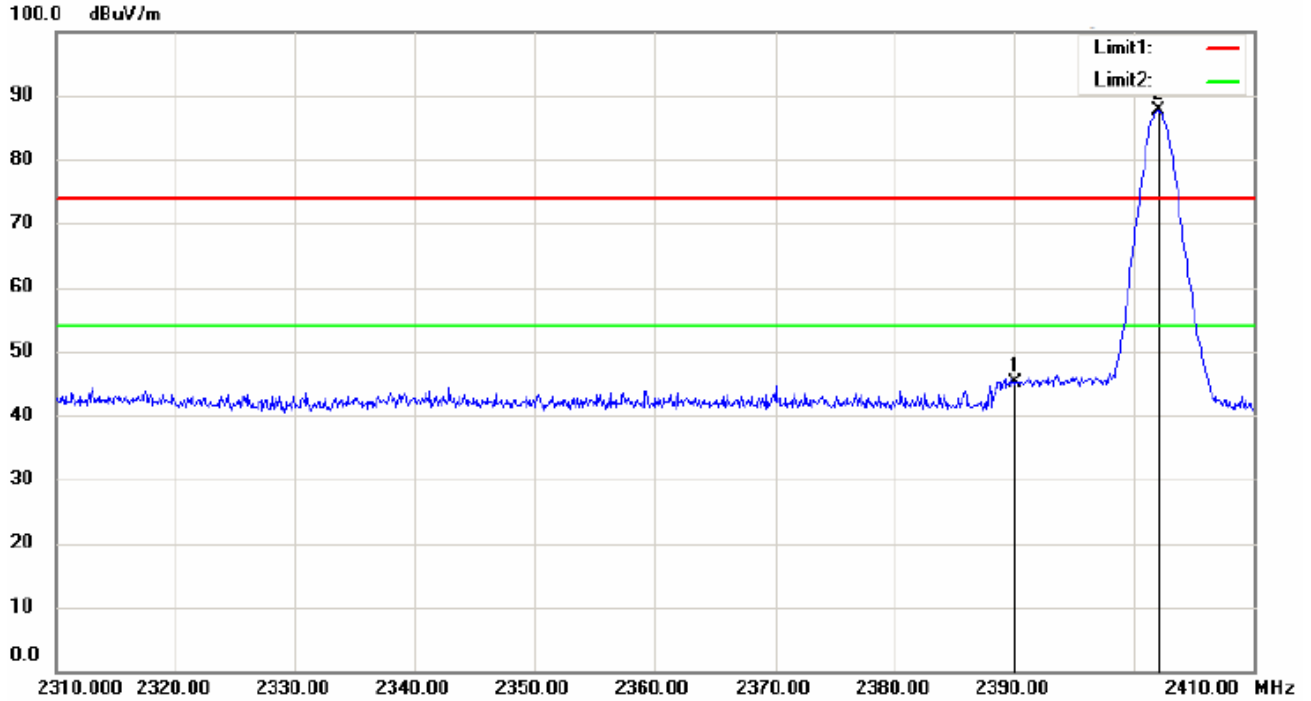
Horizontal, Peak Detector:

100.0 dBuV/m



MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dB uV/m)	Limit (dB uV/m)	Margin (dB)	Detector
1	2390.000	44.60	-1.25	43.35	54	10.65	Peak
2	2402.000	86.89	-1.30	85.59	54	-31.59	Peak

Vertical, Peak Detector:



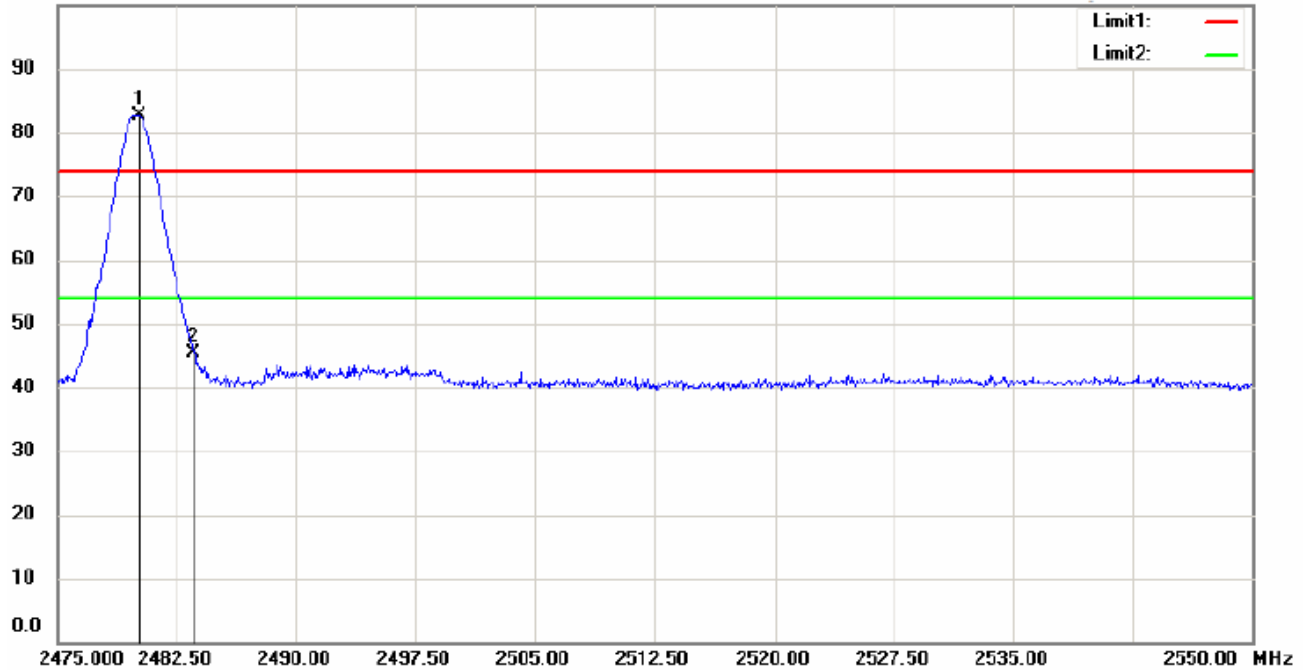
MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dB uV/m)	Limit (dB uV/m)	Margin (dB)	Detector
1	2390.000	46.18	-0.98	45.20	54	8.80	Peak
2	2402.100	88.60	-1.05	87.55	54	-33.55	Peak

CH Low 2480MHz Radiated Bandedge

Modulation: GFSK

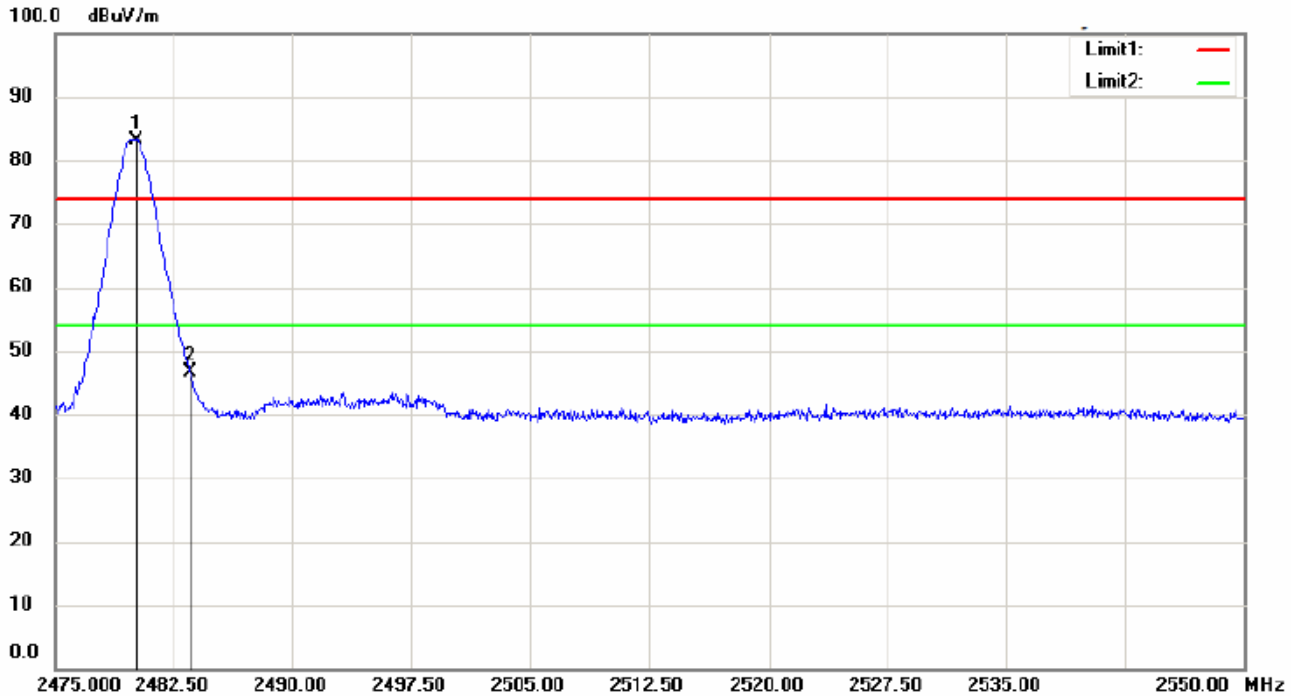
Horizontal, Peak Detector:

100.0 dBuV/m



MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dB uV/m)	Limit (dB uV/m)	Margin (dB)	Detector
1	2480.100	84.21	-1.61	82.60	54	-28.60	Peak
2	2483.500	46.97	-1.62	45.35	54	8.65	Peak

Vertical, Peak Detector:



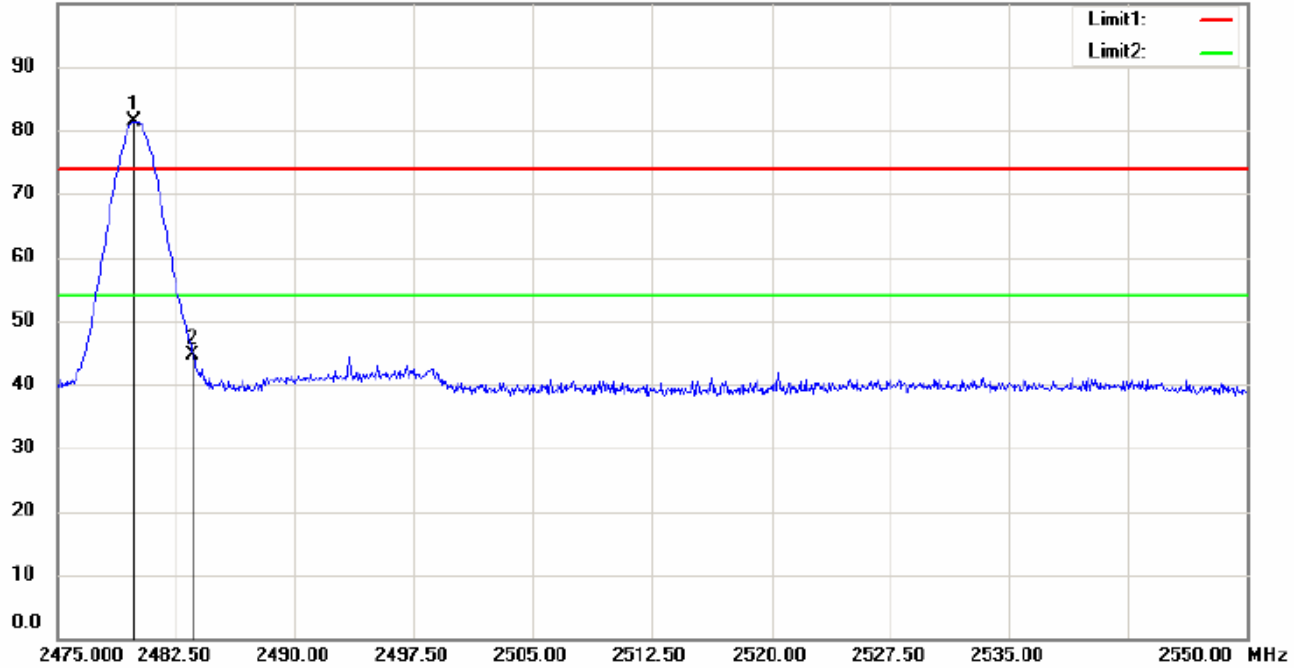
MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dB uV/m)	Limit (dB uV/m)	Margin (dB)	Detector
1	2480.100	84.65	-1.40	83.25	54	-29.25	Peak
2	2483.500	48.10	-1.41	46.69	54	7.31	Peak

CH Low 2480MHz Radiated Bandedge

Modulation: $\pi/4$ DQPSK

Horizontal, Peak Detector:

100.0 dBuV/m

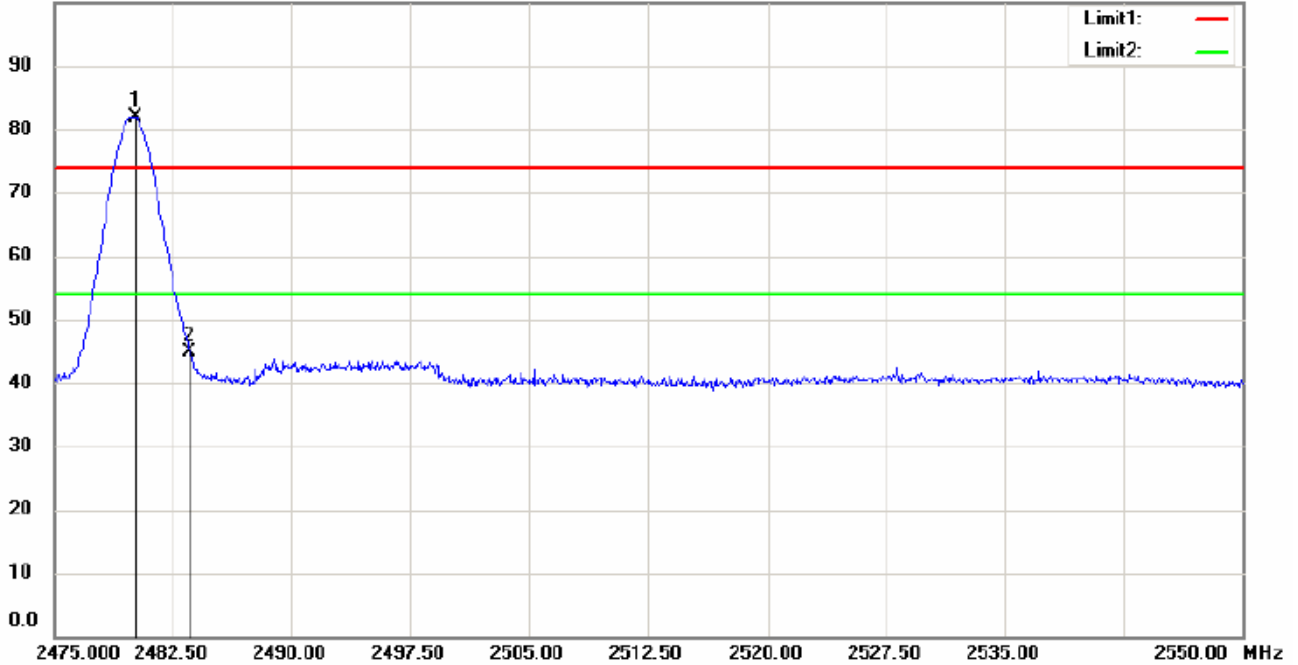


MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dB uV/m)	Limit (dB uV/m)	Margin (dB)	Detector
1	2479.800	83.07	-1.61	81.46	54	-27.46	Peak
2	2483.500	46.25	-1.62	44.63	54	9.37	Peak



Vertical, Peak Detector:

100.0 dBuV/m



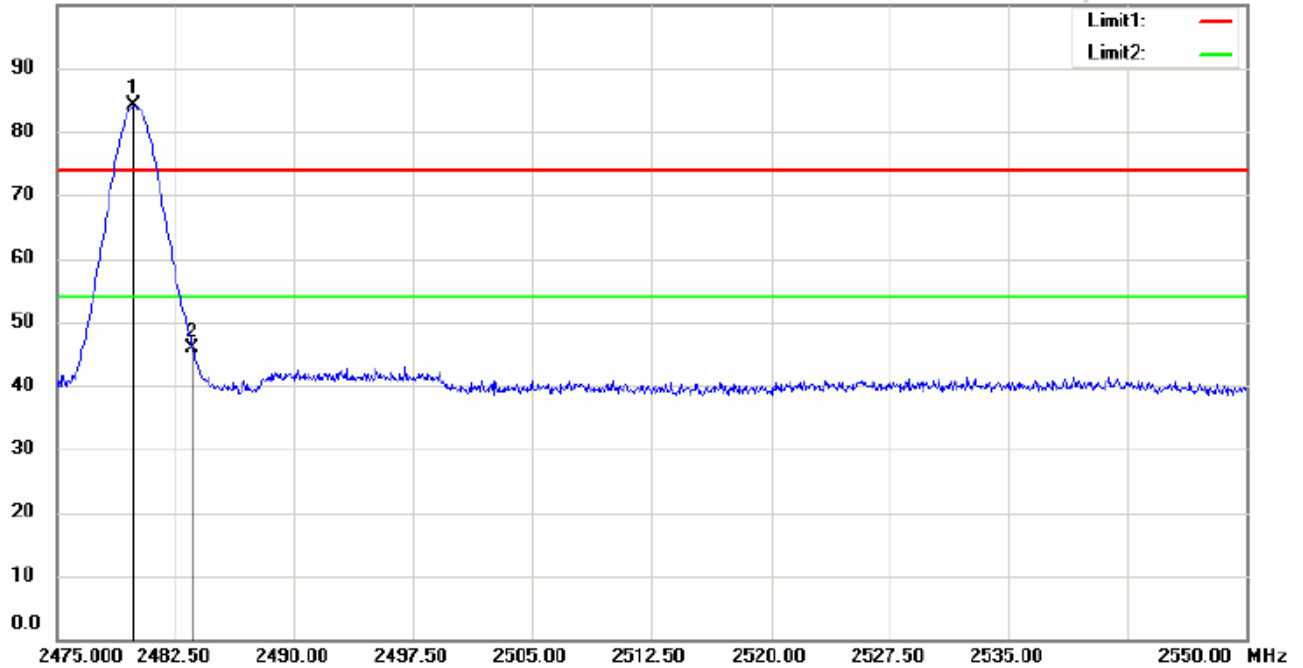
MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dB uV/m)	Limit (dB uV/m)	Margin (dB)	Detector
1	2480.100	83.39	-1.40	81.99	54	-27.99	Peak
2	2483.500	46.40	-1.41	44.99	54	9.01	Peak

CH Low 2480MHz Radiated Bandedge

Modulation: 8DPSK

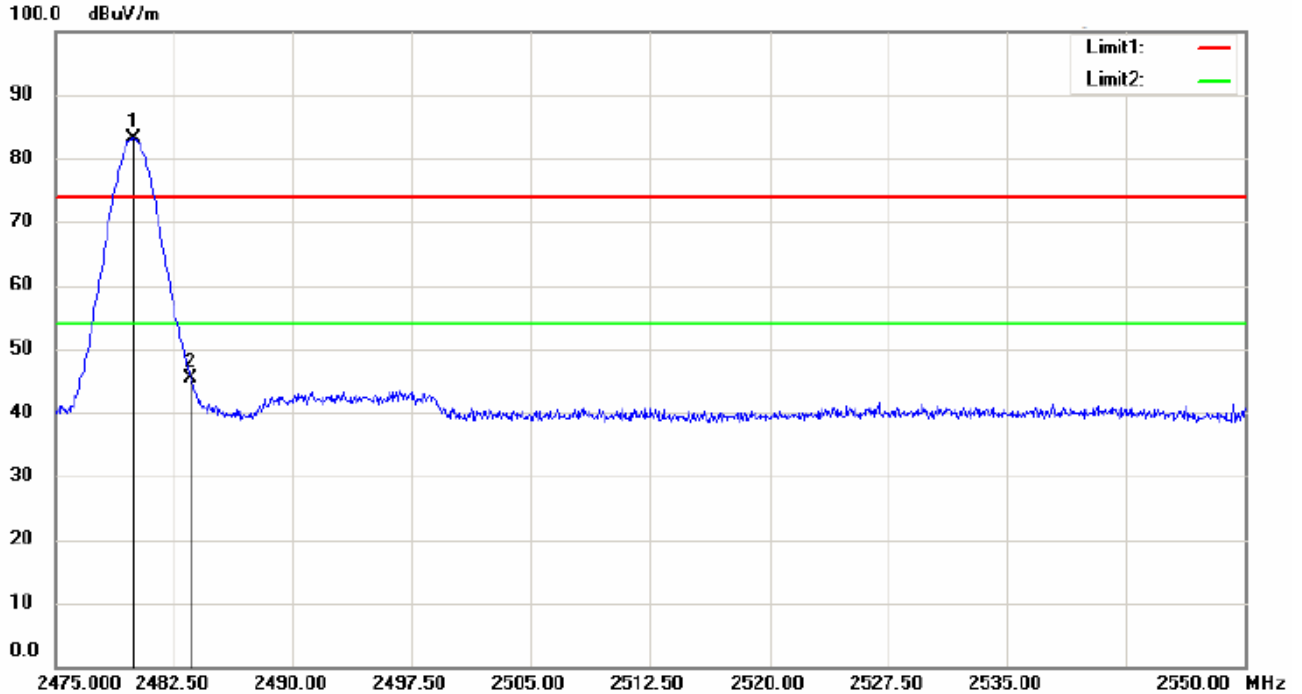
Horizontal, Peak Detector:

100.0 dBuV/m



MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dB uV/m)	Limit (dB uV/m)	Margin (dB)	Detector
1	2479.875	85.68	-1.61	84.07	54	-30.07	Peak
2	2483.500	47.55	-1.62	45.93	54	8.07	Peak

Vertical, Peak Detector:



MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dB uV/m)	Limit (dB uV/m)	Margin (dB)	Detector
1	2479.950	84.47	-1.40	83.07	54	-29.07	Peak
2	2483.500	46.86	-1.41	45.45	54	8.55	Peak

Note: The Peak Emission is below the Average Limit, so the Average Emission doesn't need to be test.

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

Test Level = Receiver Reading + Antenna Factor + Cable Loss- Preamplifier Factor

All frequencies within the "Restricted bands" have been evaluated to compliance. Section 15.205 Restricted bands of operation.

Except as shown in paragraph 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		



8 Test Setup Photographs

Refer to the < bR301_Test Setup photos>.

9 EUT Constructional Details

Refer to the < bR301_External Photos > & < bR301_Internal Photos >.

End of Report