TESTING CERT #3478.01

TEST REPORT

EUT Description	**Mobile Phone**
Brand Name	**Unimax Communications**
Model Name	**U307TG / MXG308**
Serial Number	**S/N: MB27560400118 / MB27560400064** (see section 4)
FCC ID	**FCC ID: P46-UMX35INT**
Antenna type	**N/A**
Hardware/Software Version	**HW Config: B1.1, SW: 01.37.ww39_p3.2016** **Test SW : Phone Tool version 218**
Date of Sample Receipt	**2016-03-02**
Date of Test Start/End	**2016-03-14 / 2016-06-21**
Features	**802.11 b/g/n Wireless LAN + Bluetooth v4.0 BDR/EDR/LE** (see section 5)

Applicant	**Unimax Communications**
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Contact Person	**Dan Gannon**
Telephone/Fax/ Email	**+1-949-748-7485 / dangannon18@gmail.com**

Reference Standards	**FCC CFR Title 47 Part 15C** (see section 1)

Test Report number	**160223-01.TR02**
Revision Control	**Rev. 01**

The test results relate only to the samples tested.
The test report shall not be reproduced in full, without written approval of the laboratory.

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Table of Contents

1. Standards, reference documents and applicable test methods 3

2. General conditions, competences and guarantees 3

3. Environmental Conditions 3

4. Test samples 4

5. EUT features 4

6. Remarks and comments 4

7. Test Verdicts summary 5

7.1. BT Basic Data Rate / Enhanced Data Rate 5

8. Document Revision History 5

Annex A. Test & System Description 6

A.1 Measurement system 6
A.2 Test Equipment List 8
A.3 Measurement Uncertainty Evaluation 9

Annex B. Test Results 10

B.1 20dB Bandwidth and Carrier frequency separation 10
B.2 Number of hopping channels 17
B.3 Time of Occupancy (Dwell Time) 21
B.4 Maximum Peak Output Power and antenna gain 28
B.5 Out-of-band emissions (conducted) 35
B.6 Radiated spurious emission 67

Annex C. Photographs 77

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1. Standards, reference documents and applicable test methods

1. FCC 47 CFR part 15 - Subpart C – §15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
2. FCC 47 CFR part 15 - Subpart C – §15.209 Radiated emission limits; general requirements.
3. Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems - DA 00-705 Released March 30, 2000
4. ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

2. General conditions, competences and guarantees

- ✓ Intel Mobile Communications Wireless RF Lab (Intel WRF Lab) is a testing laboratory accredited by the American Association for Laboratory Accreditation (A2LA).
- ✓ Intel Mobile Communications Wireless RF Lab (Intel WRF Lab) is an Accredited Test Firm listed by the FCC, with Designation Number FR0011.
- ✓ Intel WRF Lab only provides testing services and is committed to providing reliable, unbiased test results and interpretations.
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3. Environmental Conditions

- ✓ At the site where the measurements were performed the following limits were not exceeded during the tests:

Temperature	22.5ºC ± 2ºC
Humidity	40% ± 10%

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4. Test samples

Sample	Control #	Description	Model	Serial #	Date of reception	Note
#01	160223-01.S10	Mobile Phone	U307TG, Build B1.1	MB27560400118	2016-02-23	Used for conducted tests
	160223-01.S28	Dummy Battery UMX	U307TG	FH40A533000155	2016-02-23	
#02	160223-01.S04	Mobile Phone	U307TG, Build B1.1	MB27560400064	2016-03-02	Used for radiated tests
	160223-01.S15	Battery UMX	U307TG	FH40A533000382	2016-03-02	
	160218-01.S09	USB-Micro USB cable	NA	NA	2016-02-29	

NA: Not Applicable

5. EUT features

These are the detailed bands and modes supported by the Equipment Under Test:

802.11b/g/n	2.4GHz (2400.0 – 2483.5 MHz)
BDR/EDR/BLE 4.0	2.4GHz (2400.0 – 2483.5 MHz)

6. Remarks and comments

N/A

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7. Test Verdicts summary

7.1. BT Basic Data Rate / Enhanced Data Rate

FCC part	Test name	Verdict
15.247 (a) (1)	20dB Bandwidth and Carrier frequency separation	P
15.247 (a) (1) (iii)	Number of hopping channels	P
15.247 (a) (1) (iii)	Time of Occupancy (Dwell Time)	P
15.247 (b) (1)	Maximum Peak Output Power and antenna gain	P
15.247 (d)	Out-of-band Emissions (conducted)	P
15.247 (d), 15.209	Out-of-band Emissions (radiated)	P

P: Pass
F: Fail
NM: Not Measured
NA: Not Applicable

8. Document Revision History

Revision #	Date	Modified by	Details
Rev. 00	2016-05-31	Z. Ouachicha F. Sauvan	First Issue
Rev. 01	2016-06-22	O. Fargant F. Sauvan	• Added clarification about RBW and VBW used for spurious emission measurement in section B.5 and B.6. • Added restricted Band Edge results between 2310-2390 MHz in section B.5.

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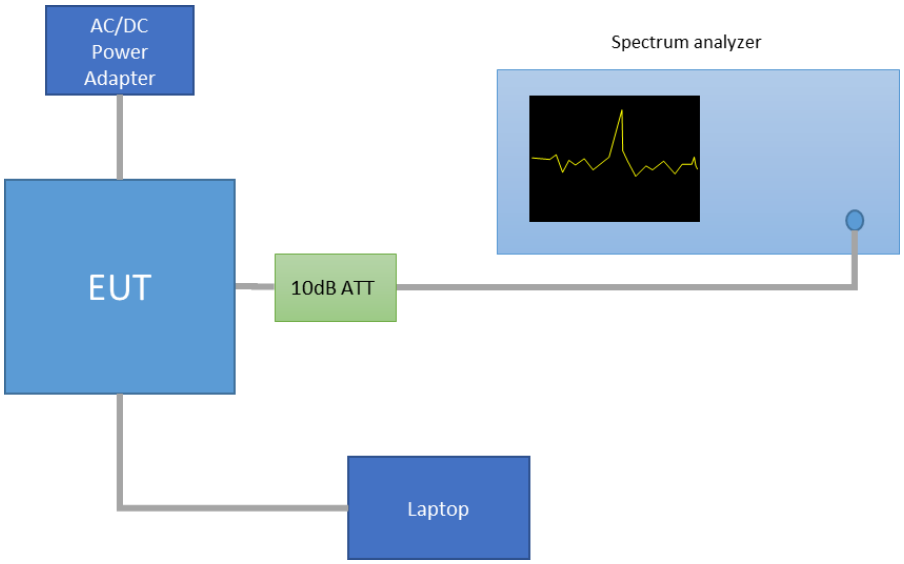
Annex A. Test & System Description

A.1 Measurement system

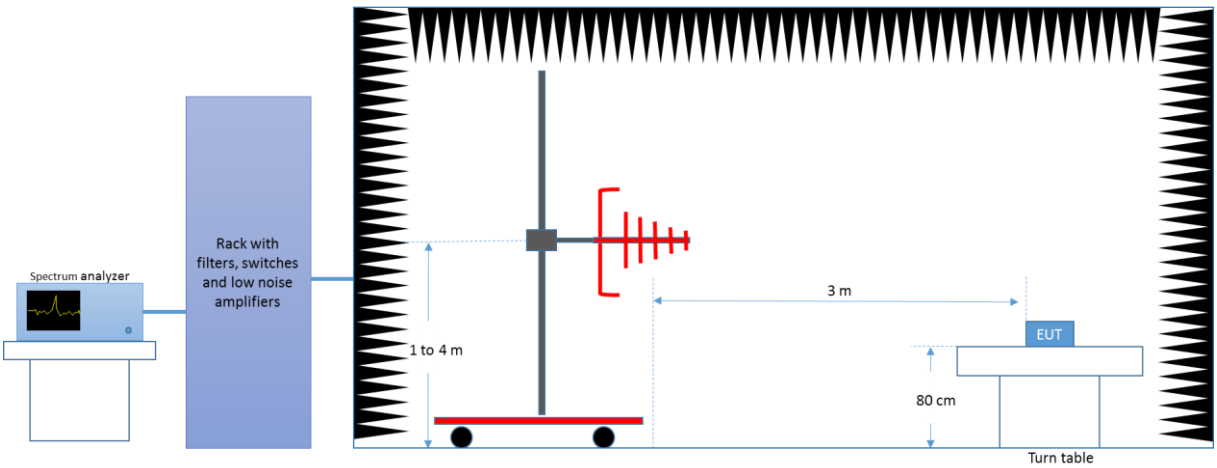
Measurements were performed using the following setups.

The DUT was installed in a test fixture and this test fixture is connected to a computer and AC/DC power adapter. The laptop computer was used to configure the EUT to continuously transmit at a specified output power using all different modes and modulation schemes.

Conducted Setup



Radiated Setup < 1GHz



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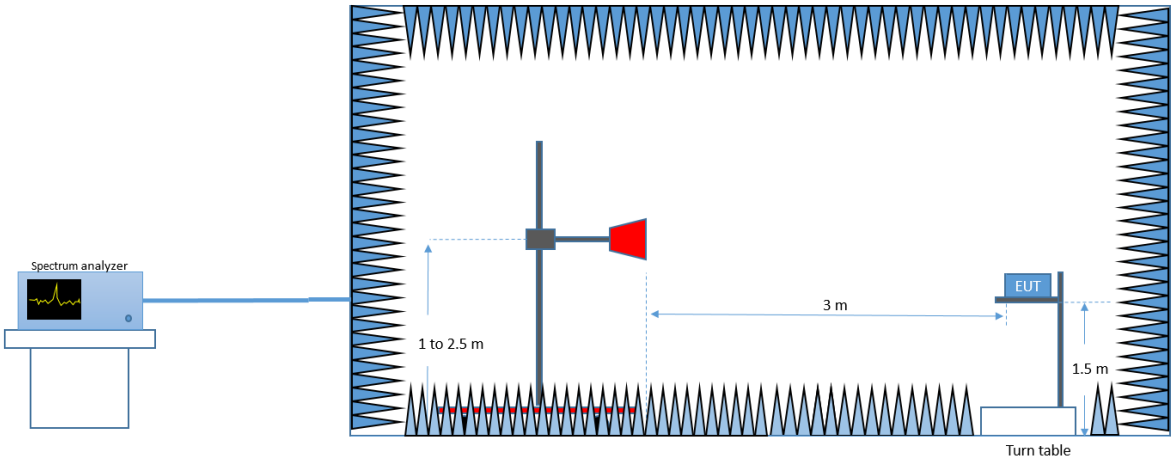
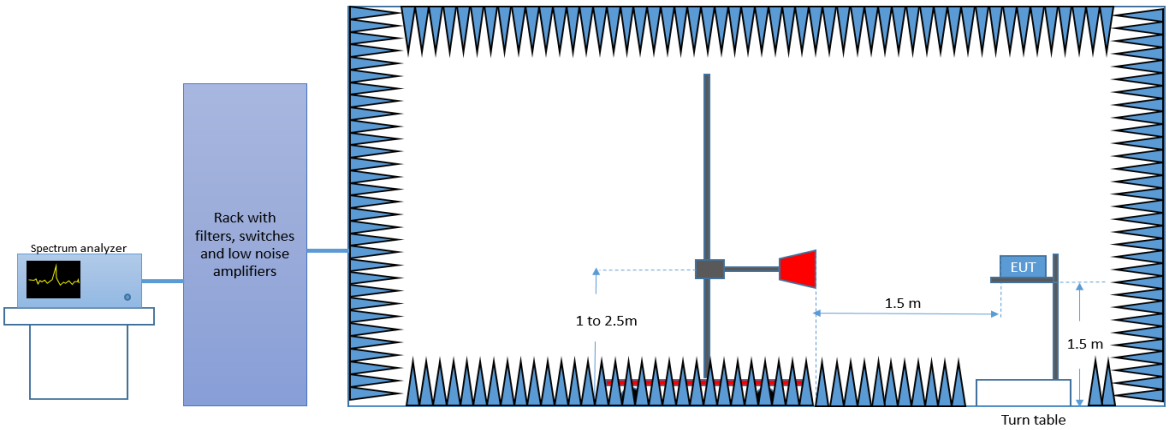
Radiated Setup 1GHz - 18GHz



Radiated Setup > 18GHz



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A.2 Test Equipment List

Conducted Setup

ID#	Device	Type/Model	Serial Number	Manufacturer	Cal. Date	Cal. Due Date
0316	Spectrum analyzer	FSV30	103309	Rohde & Schwarz	2015-03-20	2017-03-20
0293	DC Power Supply	E3640A	MY40006885	Agilent	NA	NA
0299	Digital Multimeter	34401A	US36065790	HP	2015-10-08	2017-10-08

Radiated Setup

ID#	Device	Type/Model	Serial Number	Manufacturer	Cal. Date	Cal. Due Date
0133	Spectrum analyzer	FSV40	101358	Rohde & Schwarz	2016-04-15	2018-04-15
0258	Spectrum analyzer	FSV30	101318	Rohde & Schwarz	2016-04-27	2018-04-27
0137	Log antenna 30 MHz – 1 GHz	3142E	00156946	ETS Lindgren	2015-12-11	2017-12-11
0138	Horn antenna 1 GHz – 6.4 GHz	3117	00157734	ETS Lindgren	2016-03-14	2018-03-14
0343	Horn Antenna 6.4 GHz – 18 GHz	3117-PA	00201542	ETS Lindgren	2015-07-16	2017-07-16
0334	Horn Antenna 10 GHz – 40 GHz	3116C	00169308	ETS Lindgren	2015-07-15	2017-07-15
0139	Horn Antenna 18 GHz - 26.5 GHz	114514	00167100	ETS Lindgren	2014-08-14	2016-08-14
0135	Semi Anechoic chamber	FACT 3	5720	ETS Lindgren	2016-04-28	2018-04-28
0337	Full Anechoic chamber	RFD_FA_100	5996	ETS Lindgren	2015-09-08	2017-09-08
0329	Measurement Software	EMC32	1300.7027.00 (100401)	Rohde & Schwarz	N/A	N/A
N/A	Measurement Software	EMC32	012109650000013B (009977)	Rohde & Schwarz	N/A	N/A
0292	DC Power Supply	E3648A	MY40003316	Agilent	N/A	N/A
0036	Multimeter	IDM 103	03902163	ISO-TECH	2016-01-28	2018-01-28

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A.3 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the below table:

Measurement type	Uncertainty [±dB]
Conducted Power (power meter)	± 1.0
Conducted spurious emission	± 2.9
Radiated test < 1GHz	± 3.8
Radiated test 1GHz -26 GHz	± 4.7

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Annex B. Test Results

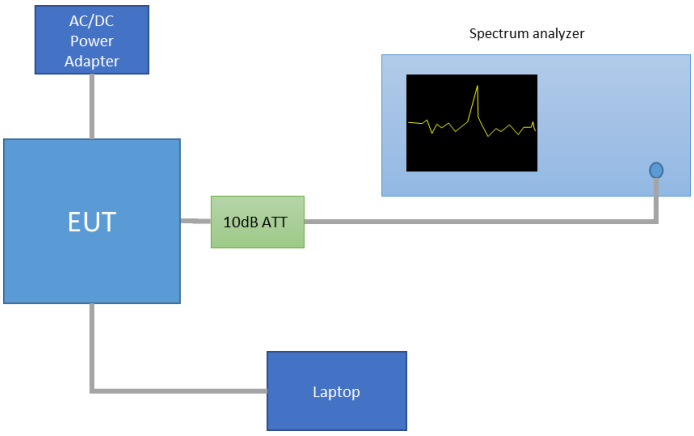
B.1 20dB Bandwidth and Carrier frequency separation

Test limits:

FCC part	Limits
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 procedure:

The setup below was used to measure the 20dB Bandwidth and Carrier frequency separation. The antenna terminal of the EUT is connected to the spectrum analyzer through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.



Results tables:

Mode	Channel Number	Frequency [MHz]	20dB BW [MHz]	Freq. Separation [kHz]
Basic Rate GFSK	0	2402	0.954	1000.00
	39	2441	0.908	
	78	2480	0.956	
EDR π/4-DQPSK	0	2402	1.398	1000.00
	39	2441	1.398	
	78	2480	1.419	
EDR 8-DPSK	0	2402	1.413	1000.00
	39	2441	1.411	
	78	2480	1.391	

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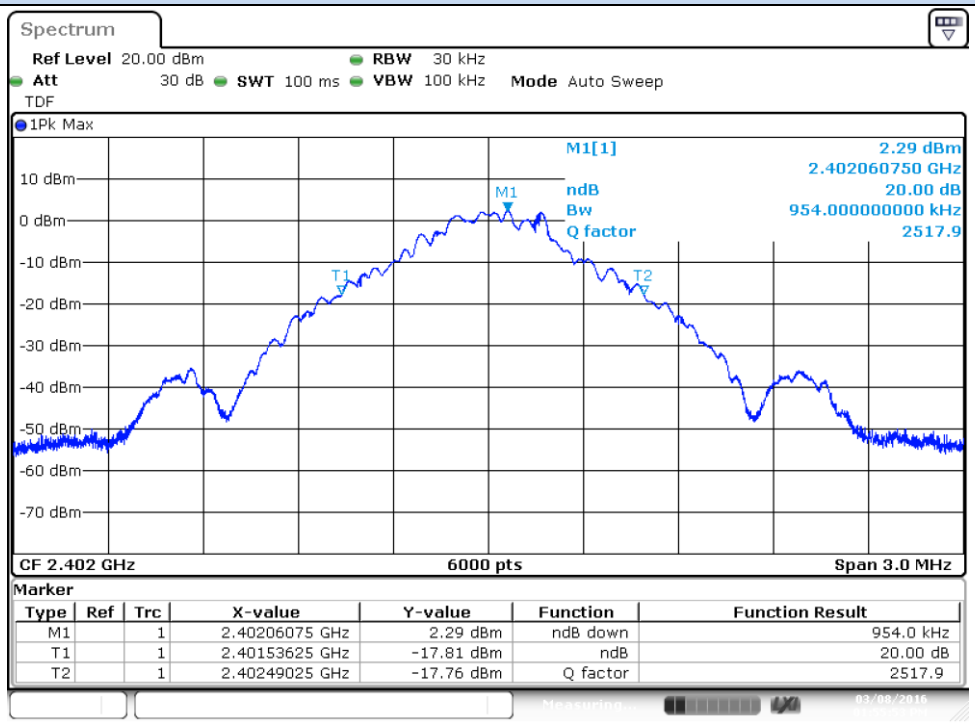
Results screenshot:

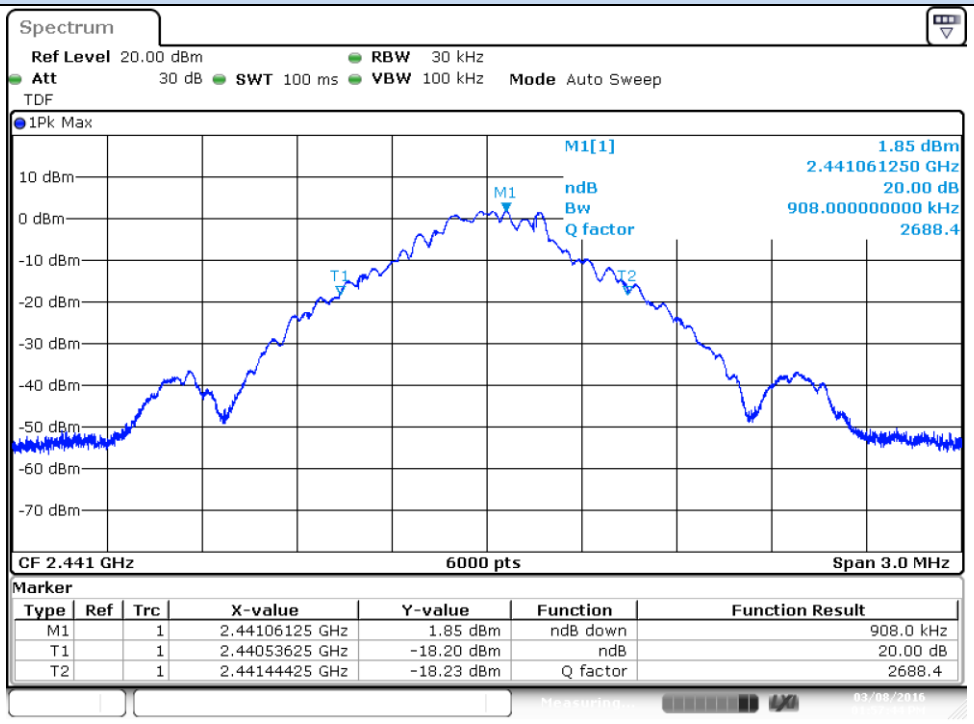
Basic Rate - GFSK

20dB BW - CH0



Date: 8.MAR.2016 13:55:52

20dB BW - CH39



Date: 8.MAR.2016 13:57:44

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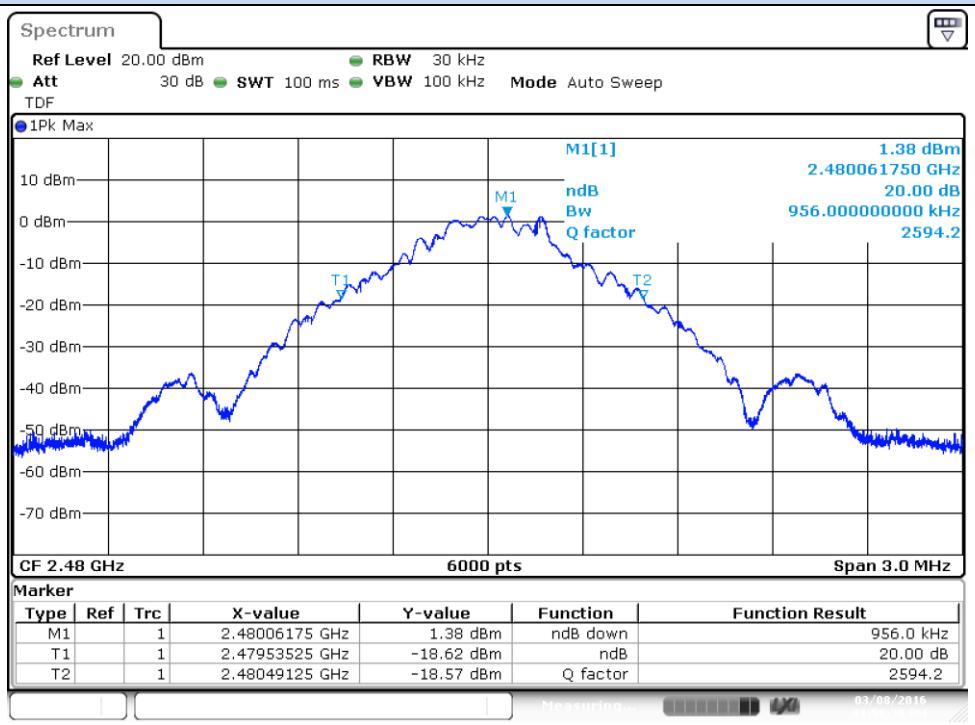
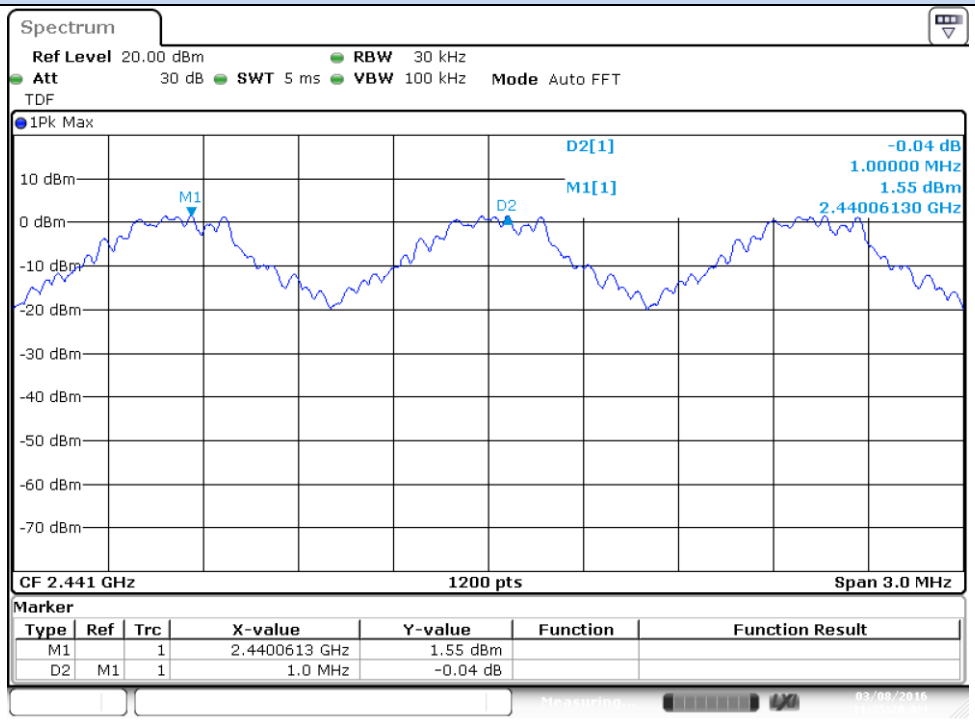
20dB BW - CH78



Date: 8.MAR.2016 13:58:30

Freq. Separation



Date: 8.MAR.2016 11:35:20

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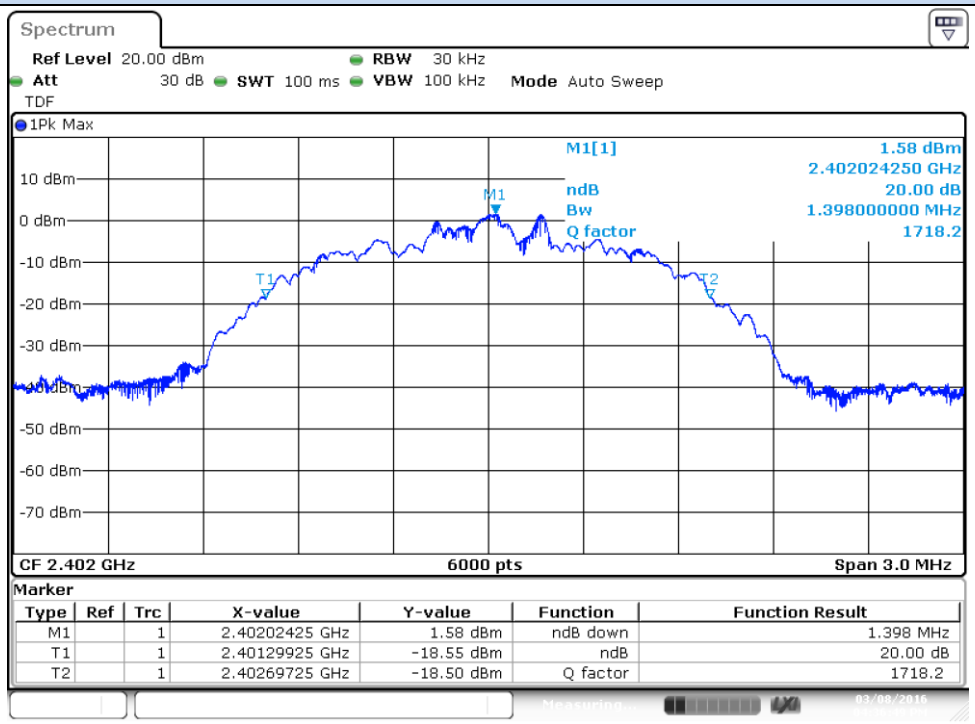
EDR – π/4-DQPSK

20dB BW - CH0

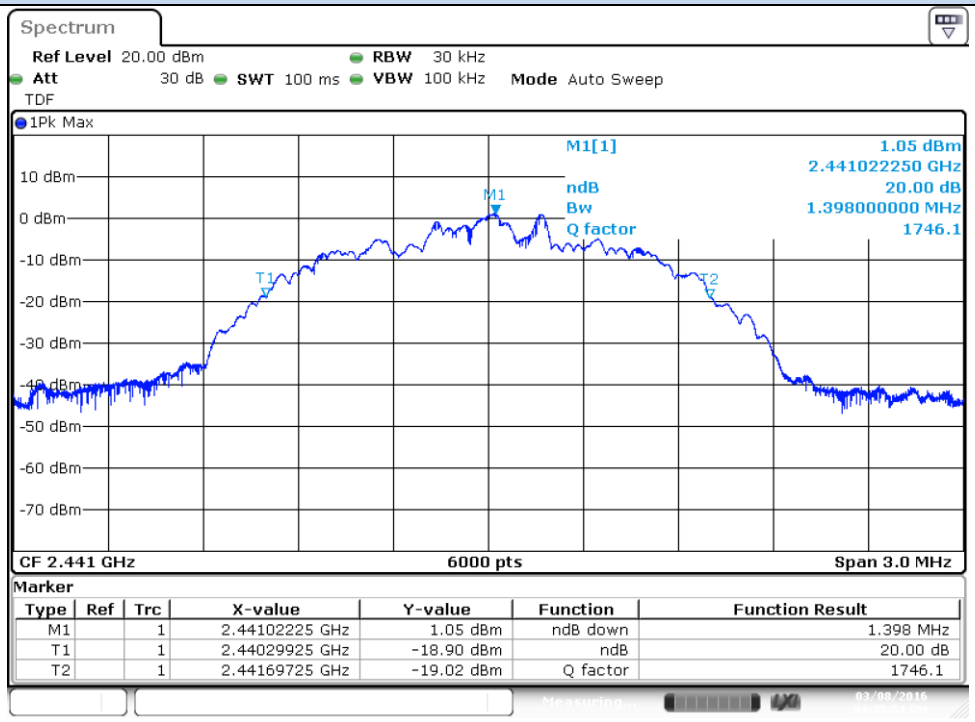


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40202425 GHz	1.58 dBm	ndB down	1.398 MHz
T1		1	2.40129925 GHz	-18.55 dBm	ndB	20.00 dB
T2		1	2.40269725 GHz	-18.50 dBm	Q factor	1718.2

Date: 8.MAR.2016 16:36:49

20dB BW - CH39



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.44102225 GHz	1.05 dBm	ndB down	1.398 MHz
T1		1	2.44029925 GHz	-18.90 dBm	ndB	20.00 dB
T2		1	2.44169725 GHz	-19.02 dBm	Q factor	1746.1

Date: 8.MAR.2016 16:35:51

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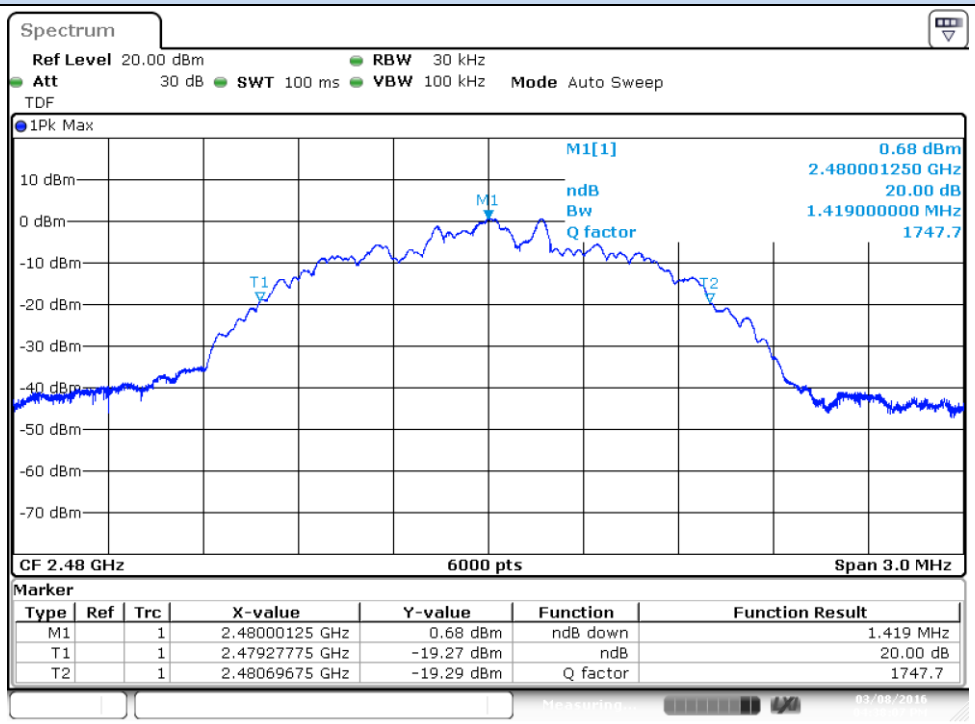
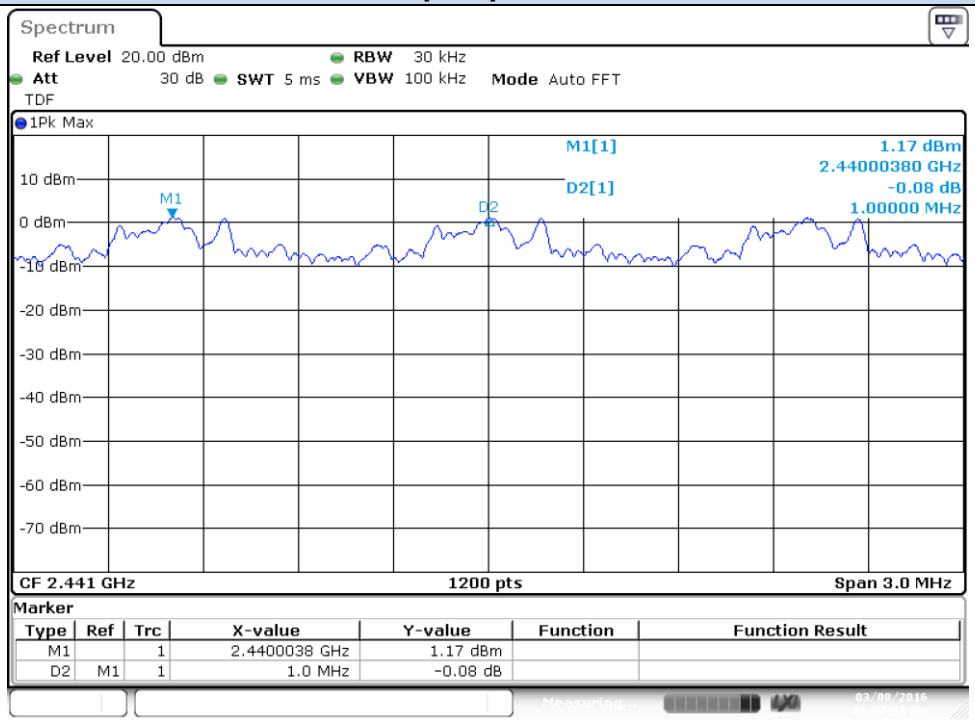
20dB BW - CH78



Date: 8.MAR.2016 16:38:07

Freq. Separation



Date: 8.MAR.2016 15:38:00

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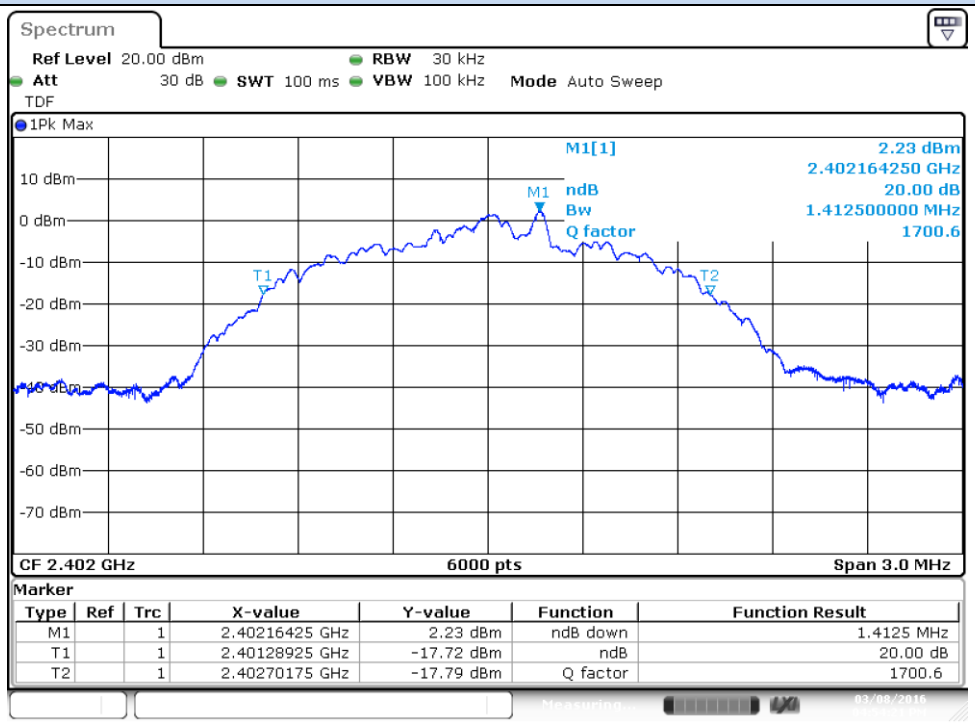
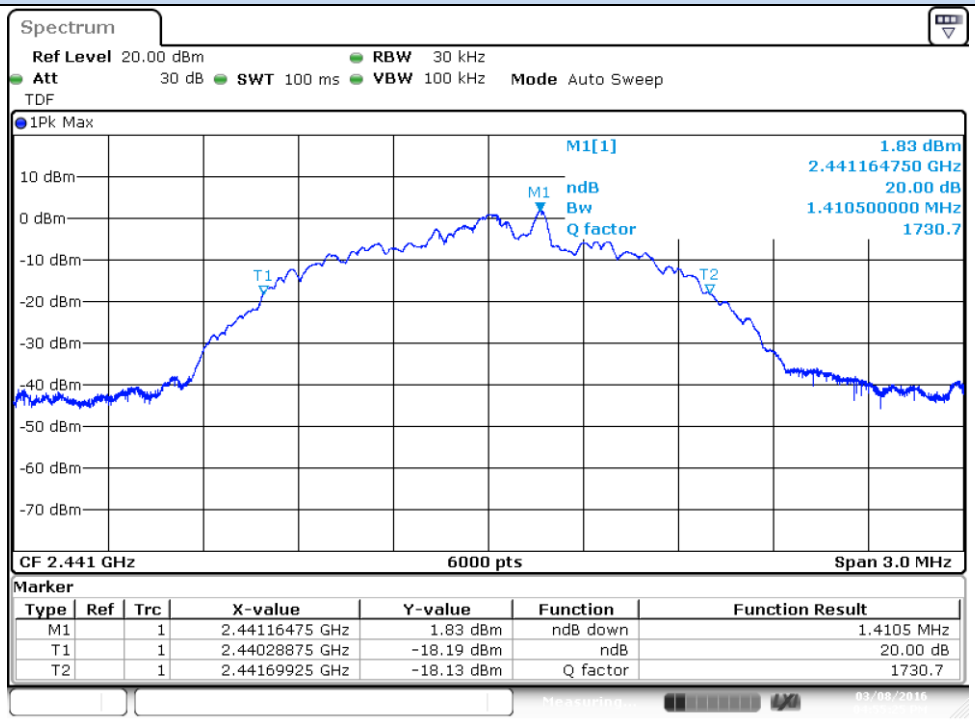
EDR – 8-DPSK

20dB BW - CH0



Date: 8.MAR.2016 16:54:21

20dB BW - CH39



Date: 8.MAR.2016 16:55:26

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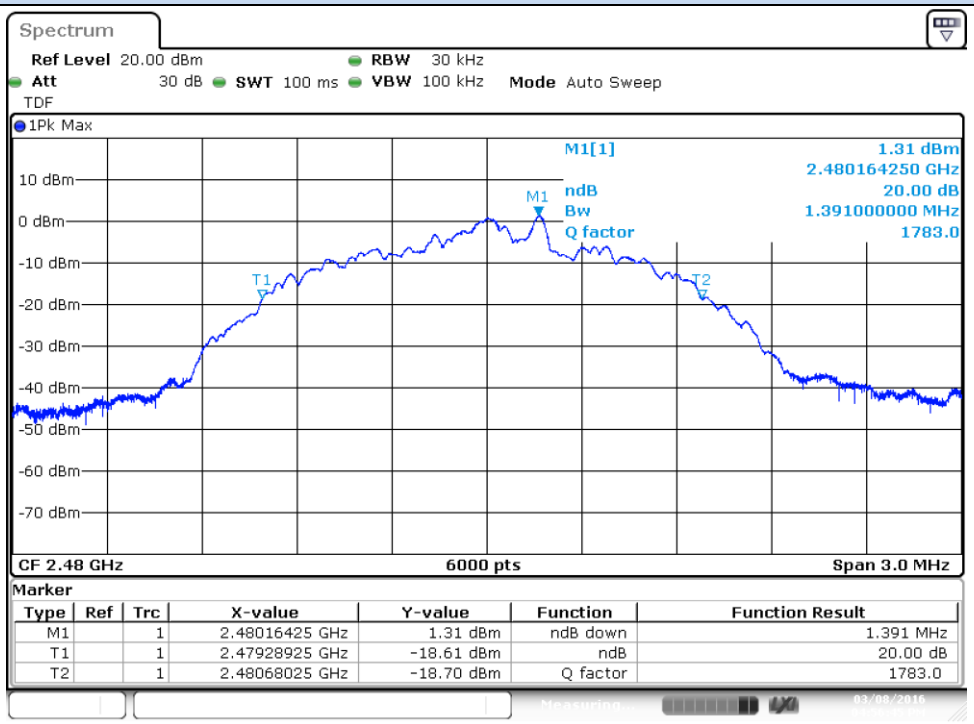
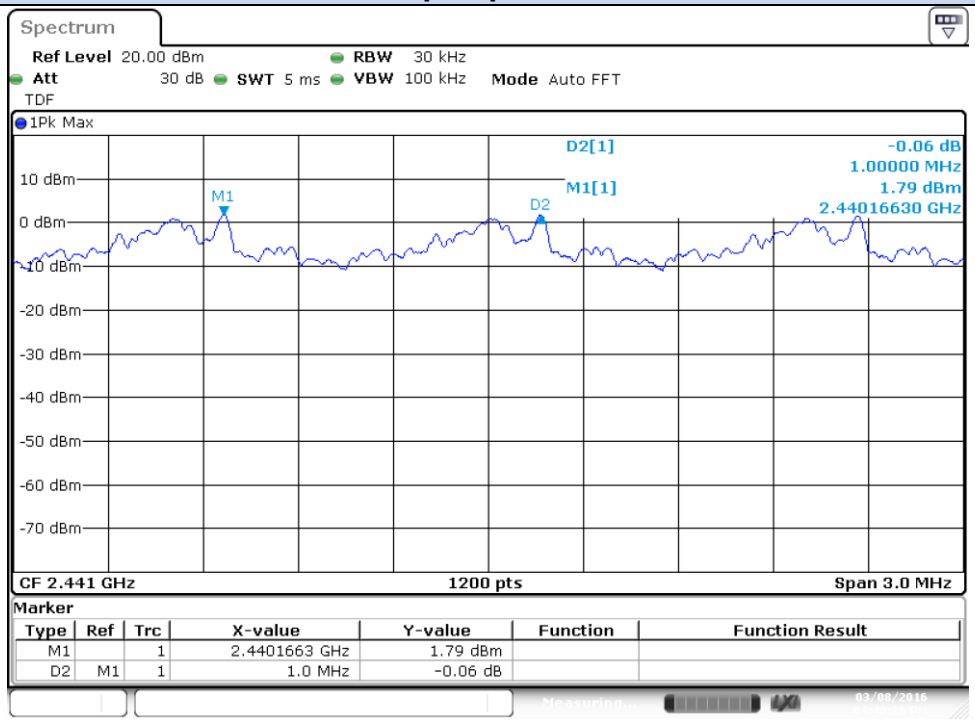
20dB BW - CH78



Date: 8.MAR.2016 16:56:45

Freq. Separation



Date: 8.MAR.2016 16:40:26

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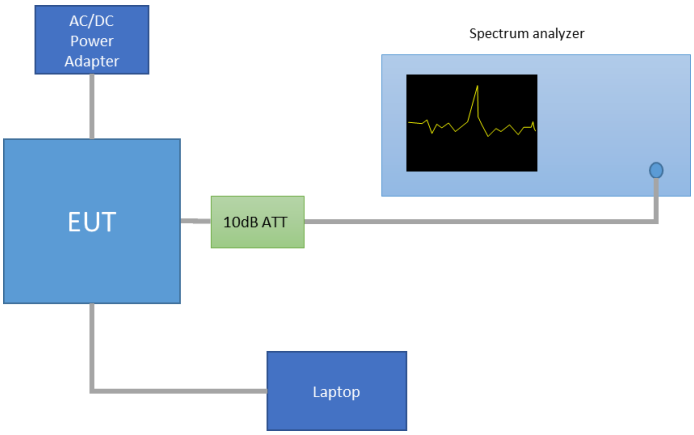
B.2 Number of hopping channels

Test limits:

FCC part	Limits
15.247 (a) (1) (iii)	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

Test procedure:

The setup below was used to measure the number of hopping channels. The antenna terminal of the EUT is connected to the spectrum through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.



Results tables:

Mode	Number of hopping channels
Basic Rate GFSK	79
EDR π/4-DQPSK	79
EDR 8-DPSK	79

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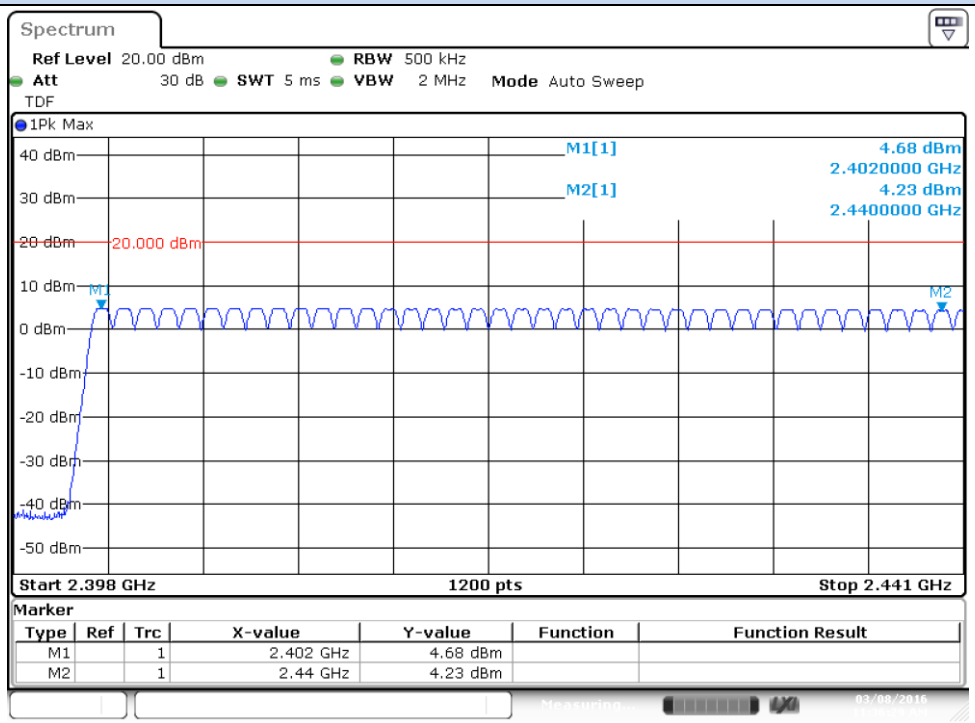
Results screenshot:

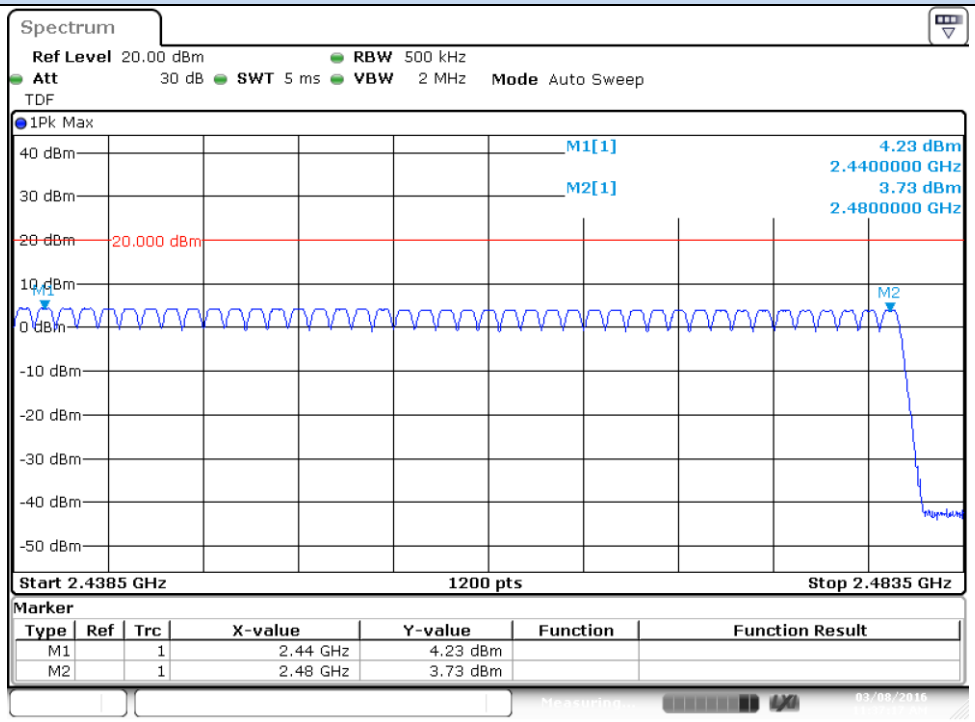
Number of hopping channels

Basic Rate – GFSK



Date: 8.MAR.2016 11:36:29

Basic Rate - GFSK



Date: 8.MAR.2016 11:37:17

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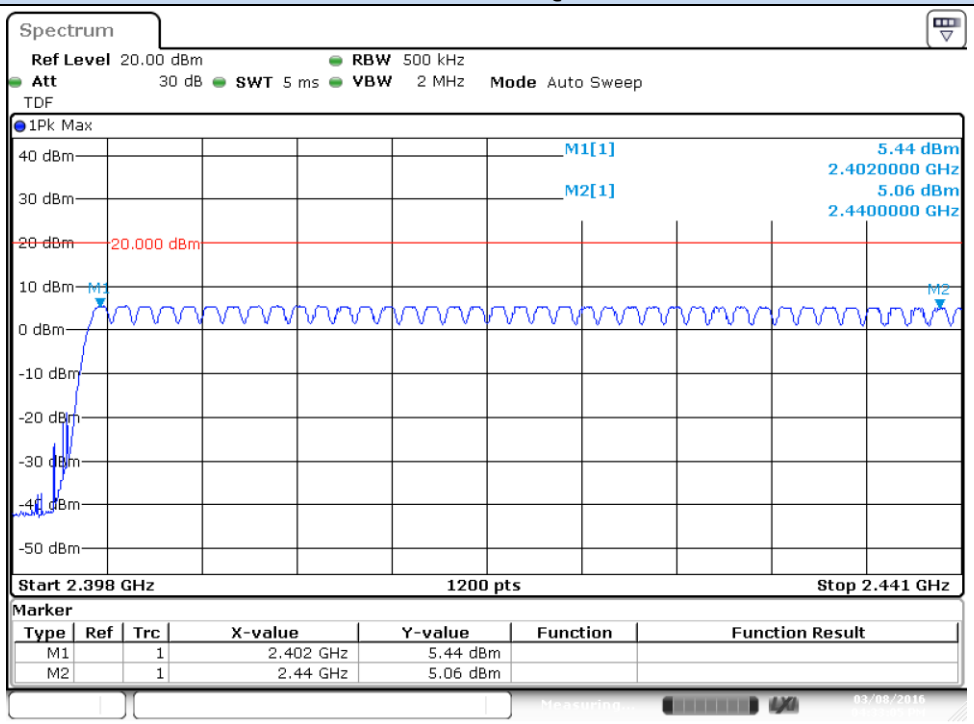
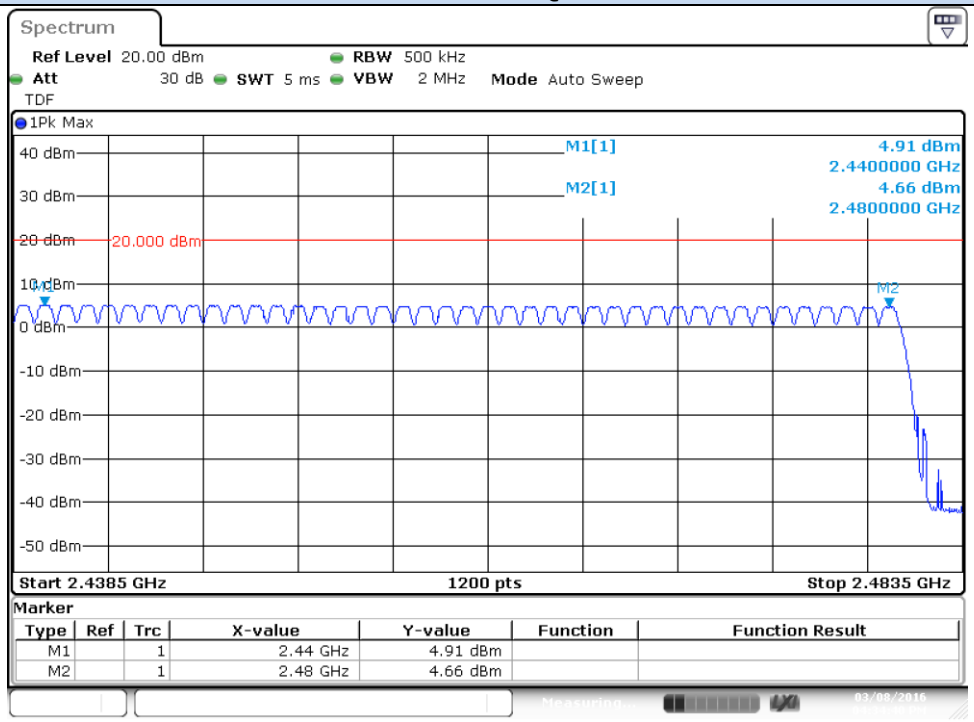
EDR – π/4-DQPSK



Date: 8.MAR.2016 16:33:06

EDR – π/4-DQPSK



Date: 8.MAR.2016 16:34:40

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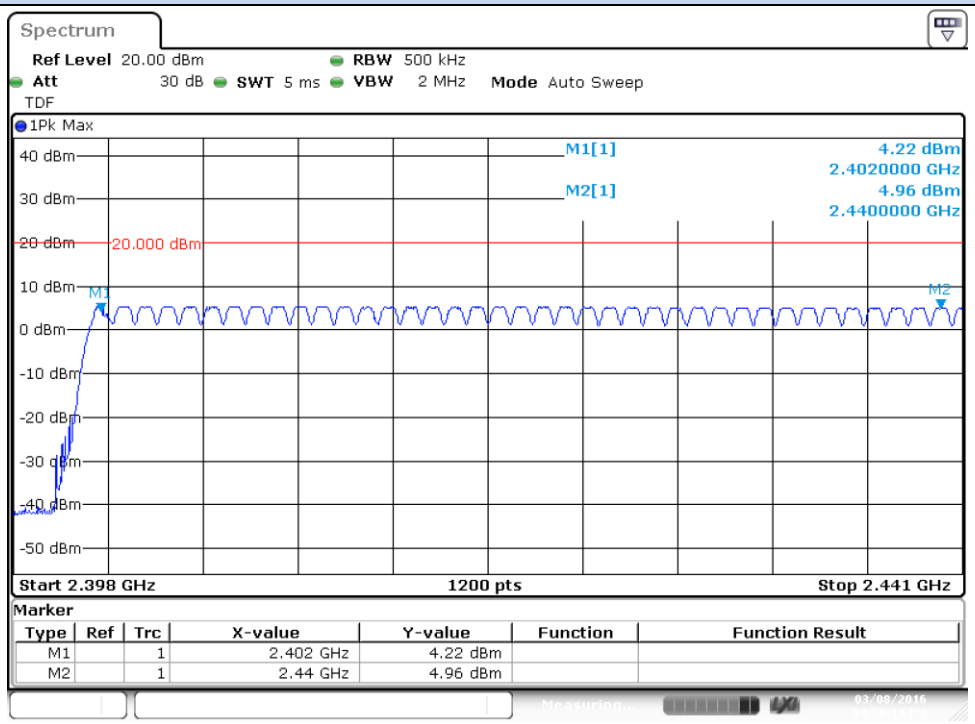
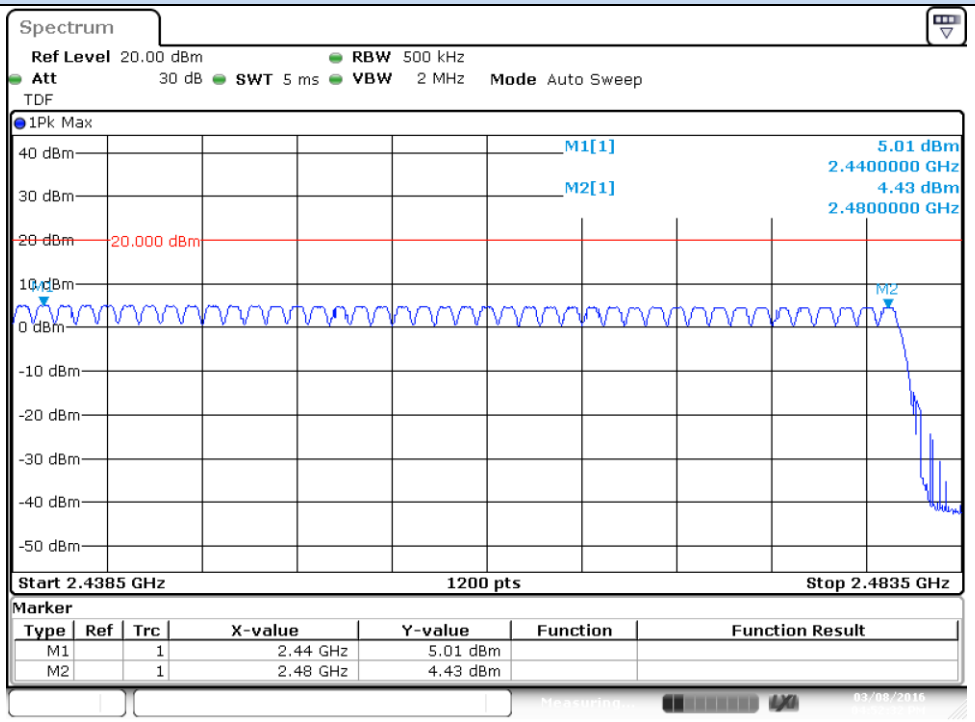
EDR – 8-DPSK



Date: 8.MAR.2016 16:50:14

EDR – 8-DPSK



Date: 8.MAR.2016 16:52:32

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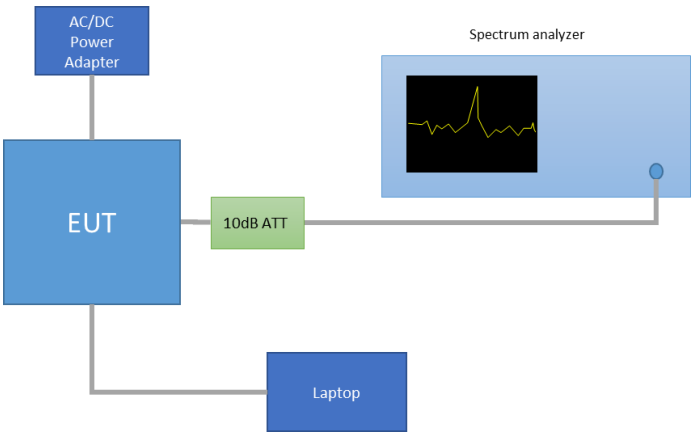
B.3 Time of Occupancy (Dwell Time)

Test limits:

FCC part	Limits
15.247 (a) (1) (iii)	The average time of occupancy (Dwell Time) 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.

Test procedure:

The setup below was used to measure the dwell time. The antenna terminal of the EUT is connected to the spectrum analyzer through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.



In the worst case, the system makes 1600 hops per second with 79 channels, providing a 1 timeslot length of 625µs.
A DH1 packet, with independence of the modulation, needs 1 time slot for transmitting and 1 time slot for receiving. Then, the system makes in the worst case 1600/2 = 800 hops per second with 79 channels. So each channel appears 800/79 = 10.13 times per second and, for a period of 0.4 x 79 = 31.6 seconds, each channel appears 10.13 x 31.6 = 320.11 times.

A DH3 packet, with independence of the modulation, needs 3 time slots for transmitting and 1 time slot for receiving. Then, the system makes in the worst case 1600/4 = 400 hops per second with 79 channels. So each channel appears 400/79 = 5.1 times per second and, for a period of 0.4 x 79 = 31.6 seconds, each channel appears 5.1 x 31.6 = 161.16 times.

A DH5 packet, with independence of the modulation, needs 5 time slots for transmitting and 1 time slot for receiving. Then, the system makes in the worst case 1600/6 = 266.67 hops per second with 79 channels. So each channel appears 166.67/79 = 3.37 times per second and, for a period of 0.4 x 79 = 31.6 seconds, each channel appears 3.37 x 31.6 = 106.49 times.

Thus, the total time of occupancy is obtained by multiplying the calculated maximum number of appearances per packet type and the measured Tx-time, as shown in the results screenshots.

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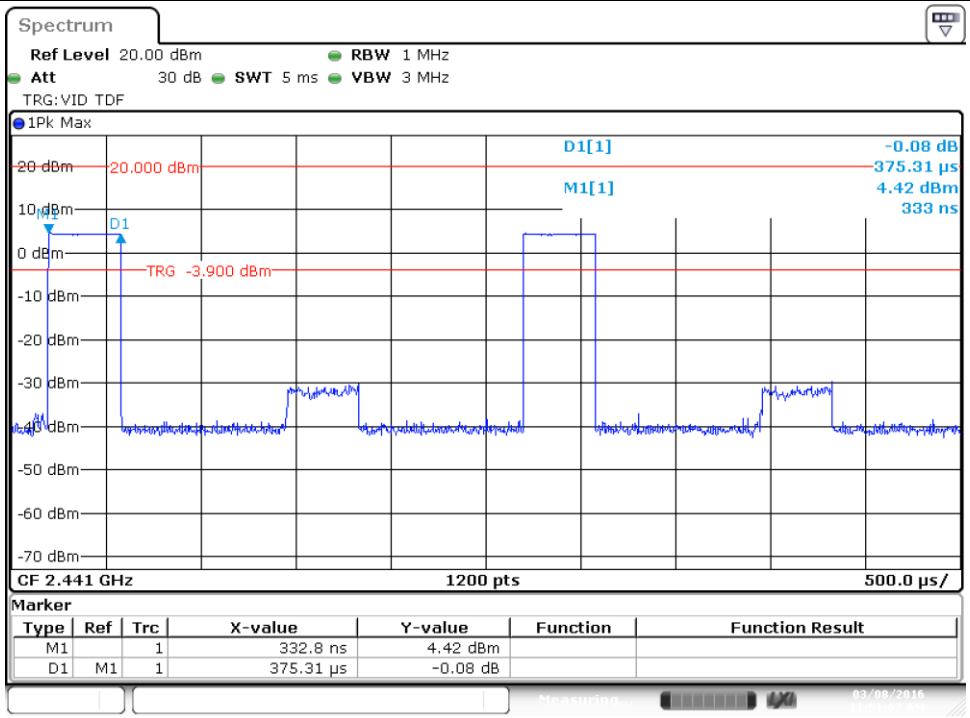
Results tables:

Mode	Packet Type	Times of appearance	Tx-time [ms]	Dwell Time [ms]
Basic Rate GFSK	DH1	320.11	0.375	120.04
	DH3	161.16	1.635	263.50
	DH5	106.49	2.882	306.90
EDR π/4-DQPSK	2-DH1	320.11	0.388	124.20
	2-DH3	161.16	1.639	264.14
	2-DH5	106.49	2.886	307.33
EDR 8-DPSK	3-DH1	320.11	0.388	124.20
	3-DH3	161.16	1.639	264.14
	3-DH5	106.49	2.890	307.76

Results Screenshot:

BDR – GFSK

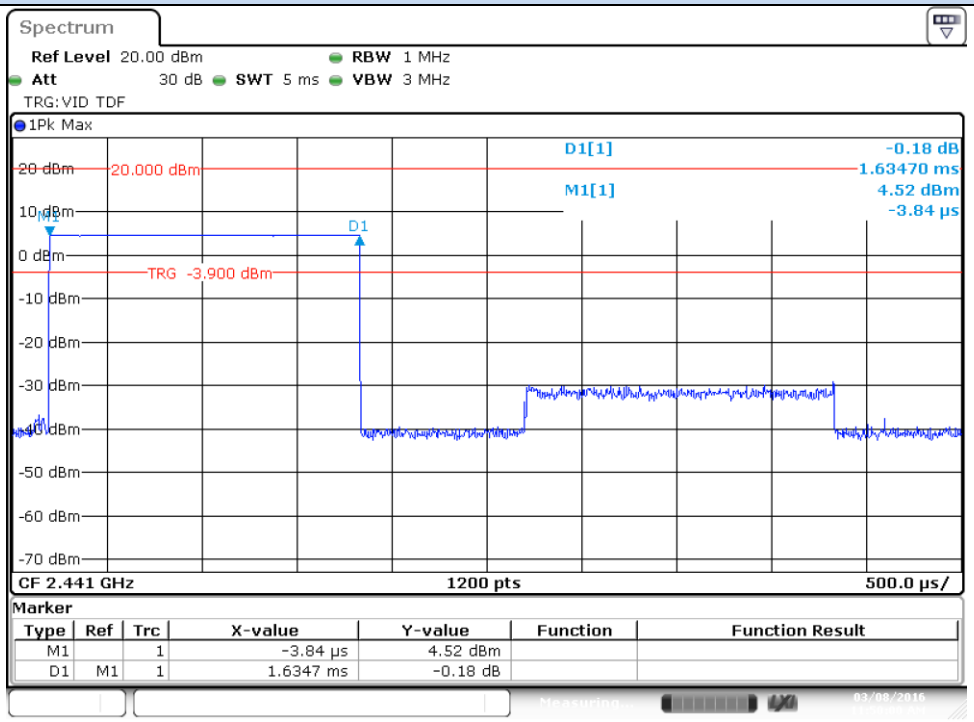
DH1 Tx-time



Date: 8.MAR.2016 11:51:08

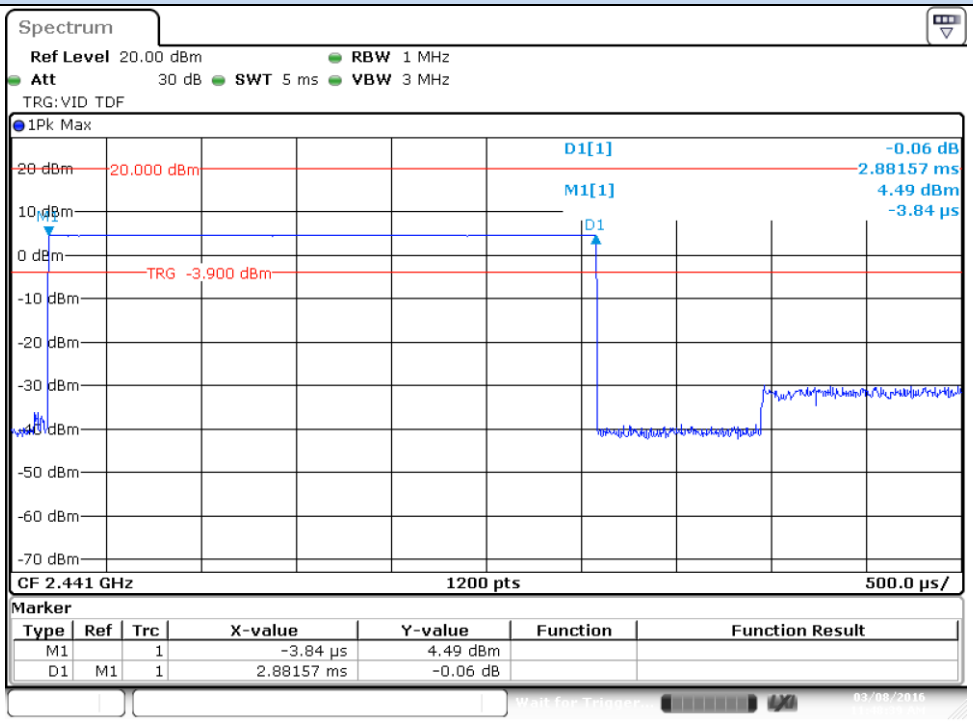
Printed copies are not controlled documents

DH3 Tx-time



Date: 8.MAR.2016 11:50:01

DH5 Tx-time



Date: 8.MAR.2016 11:48:39

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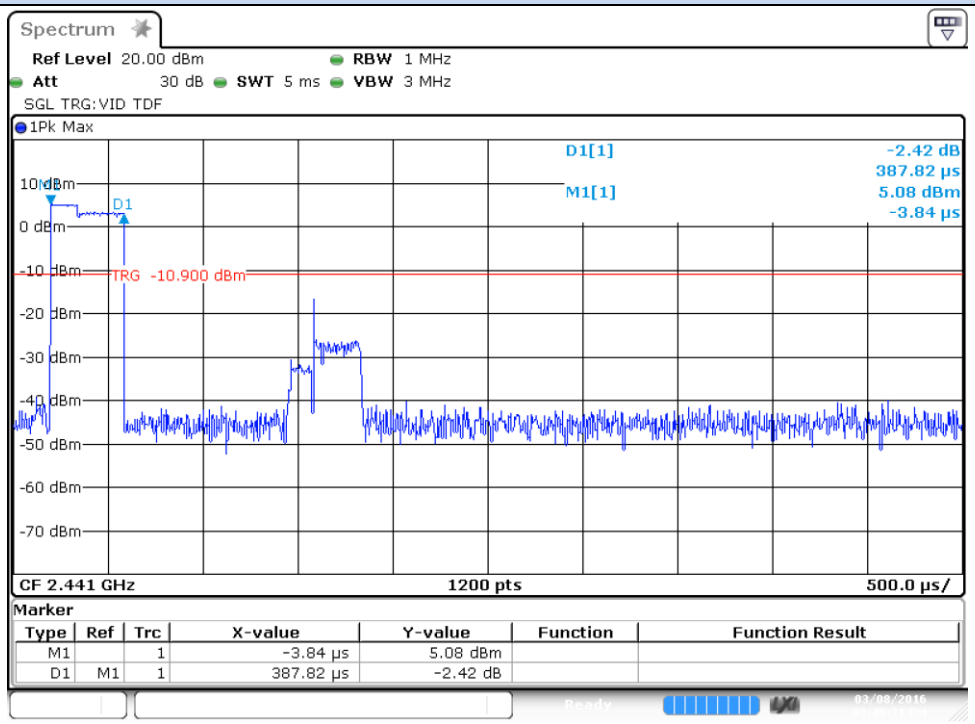
EDR – π/4-DQPSK

2-DH1 Tx-time



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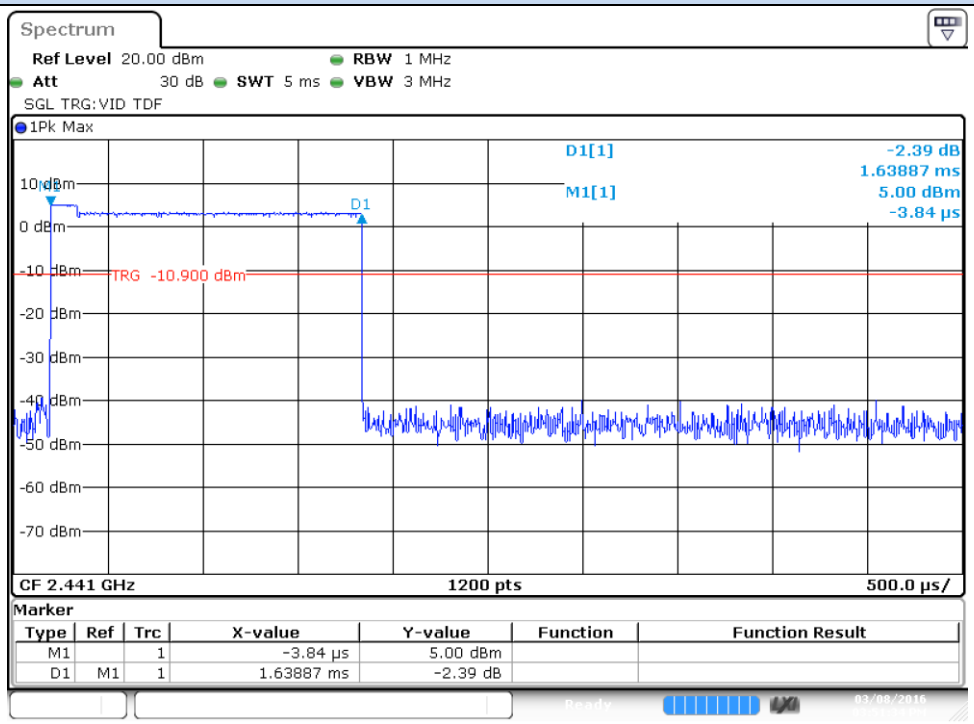
2-DH3 Tx-time



Date: 8.MAR.2016 15:51:34

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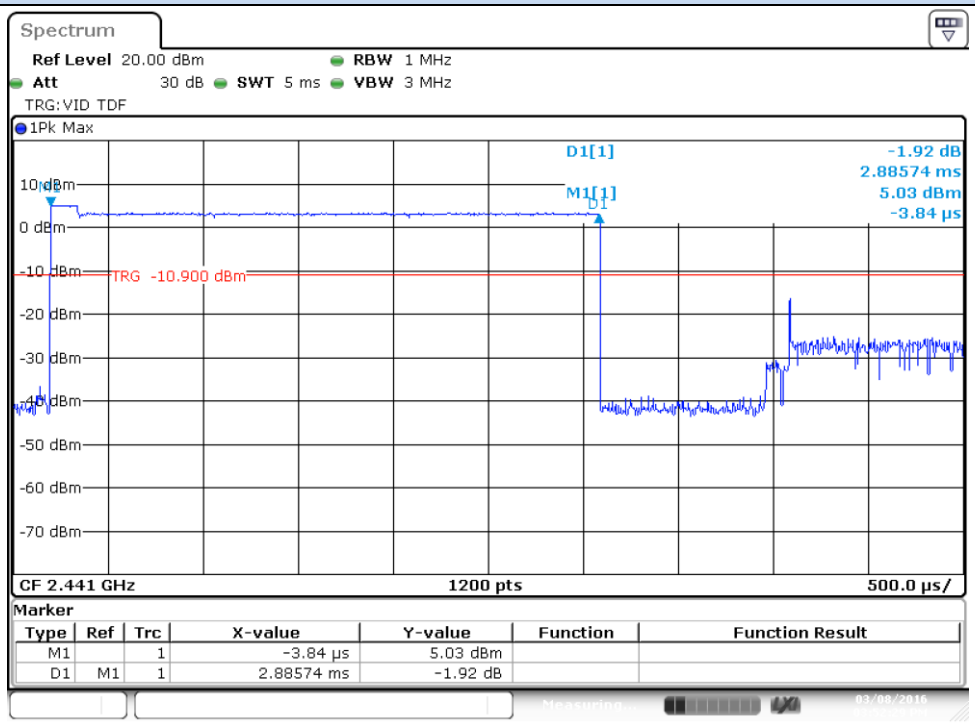
2-DH5 Tx-time



Date: 8.MAR.2016 15:52:29

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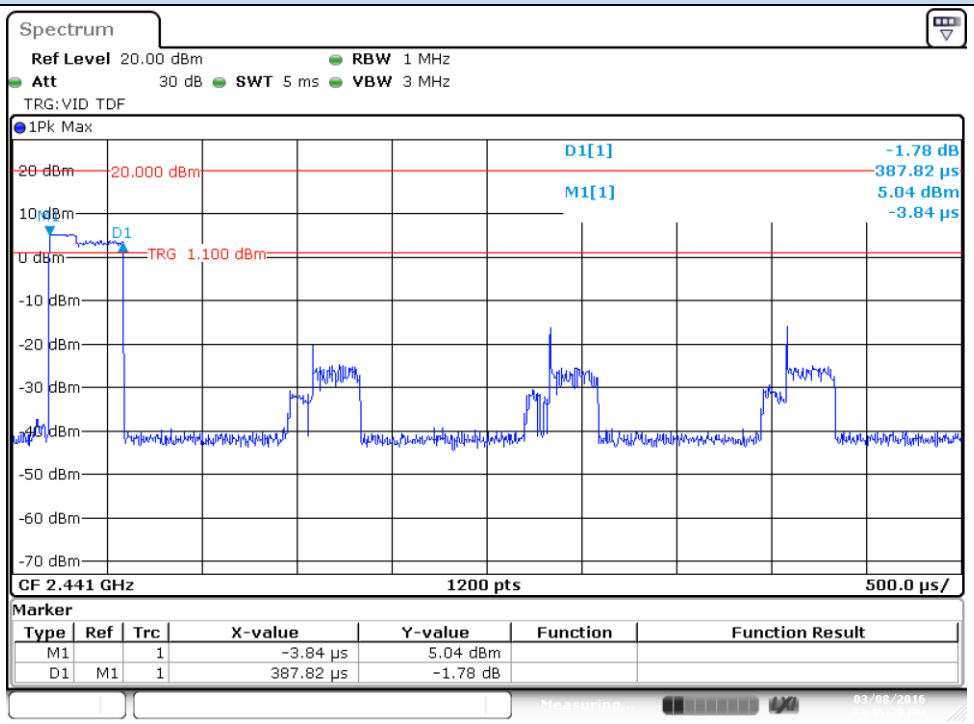
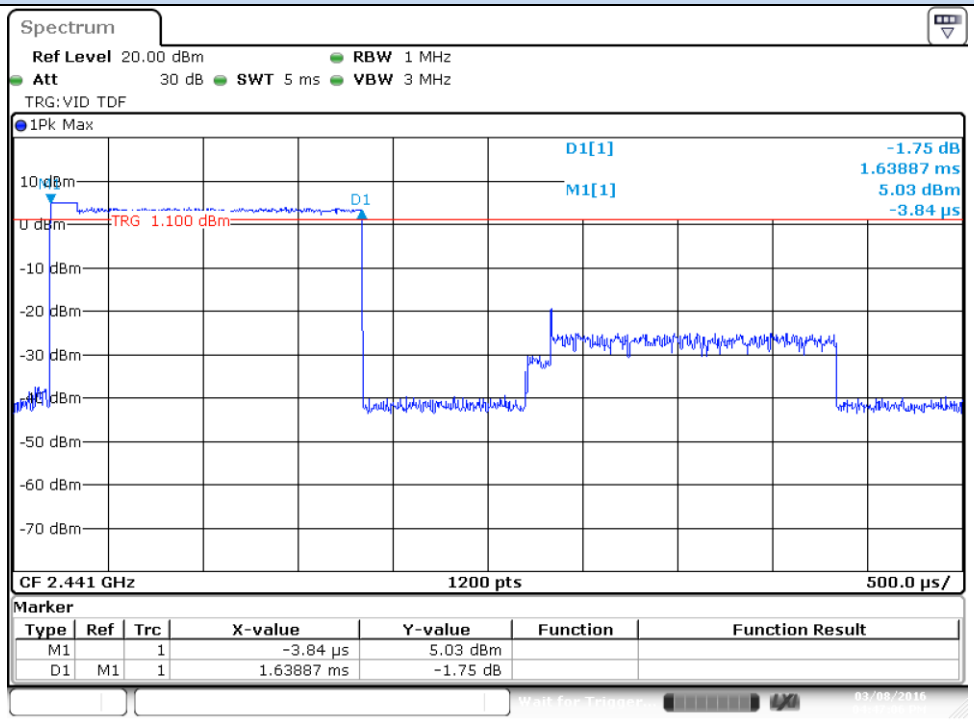
EDR – 8-DPSK

3-DH1 Tx-time



Date: 8.MAR.2016 16:45:29

3-DH3 Tx-time



Date: 8.MAR.2016 16:47:06

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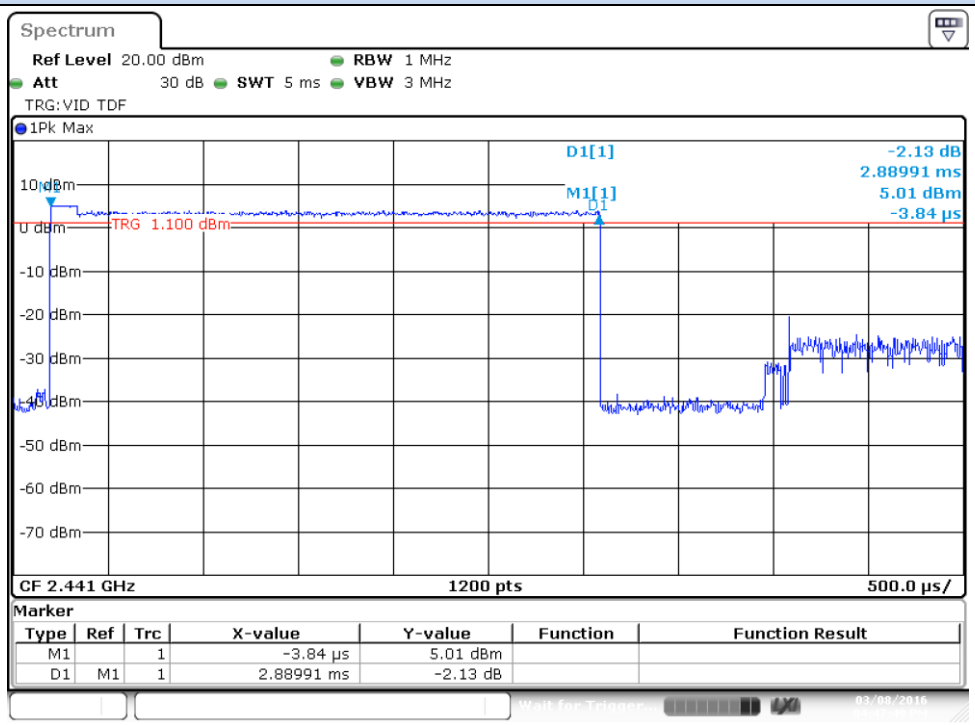
3-DH5 Tx-time



Date: 8.MAR.2016 16:47:49

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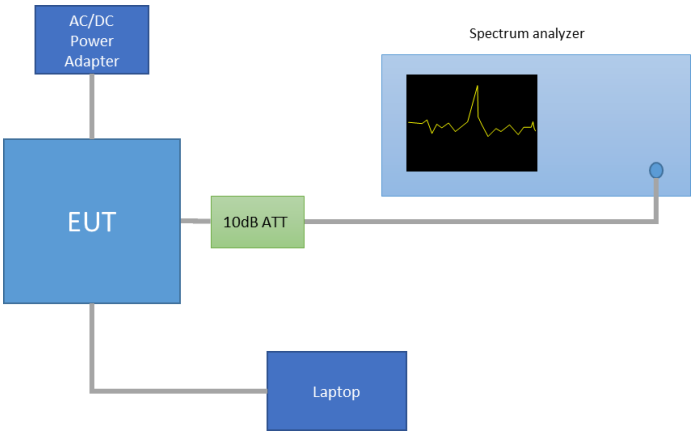
B.4 Maximum Peak Output Power and antenna gain

Test limits:

FCC part	Limits
15.247 (b) (1)	(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (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. (…) (4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.

Test procedure:

The setup below was used to measure the maximum peak output power. The antenna terminal of the EUT is connected to the spectrum analyzer through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.



The maximum declared antenna gain is 1.5dBi.

Results tables:

Mode	Channel Number	Frequency [MHz]	Peak Power [dBm]
Basic Rate GFSK	0	2402	5.20
	39	2441	4.76
	78	2480	4.30
EDR π/4-DQPSK	0	2402	5.45
	39	2441	5.08
	78	2480	4.70
EDR 8-DPSK	0	2402	5.43
	39	2441	5.07
	78	2480	4.62

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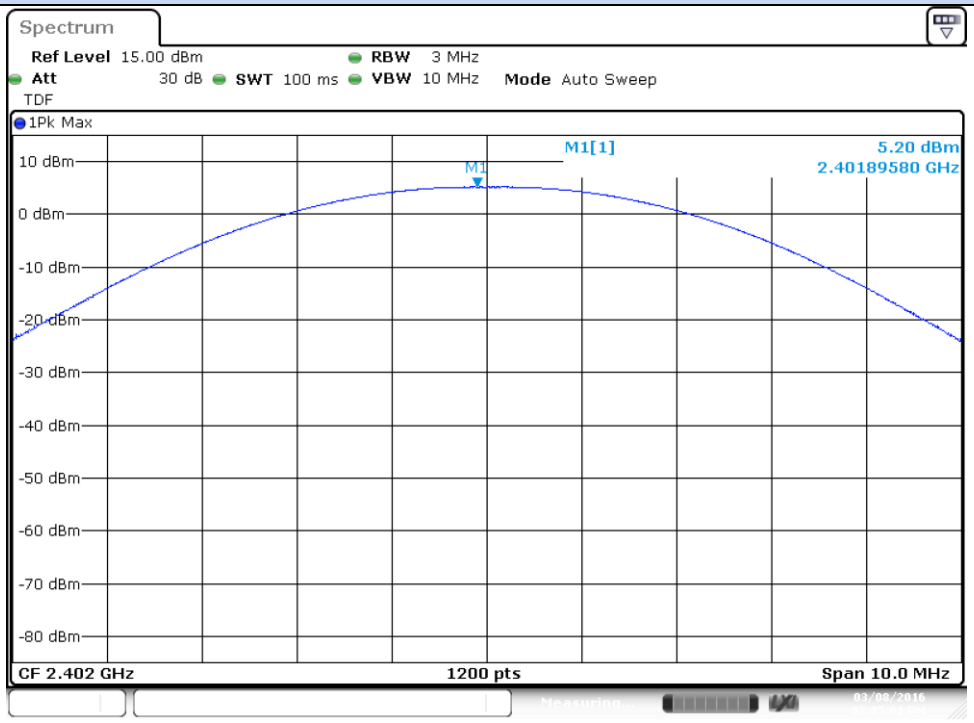
Results Screenshot:

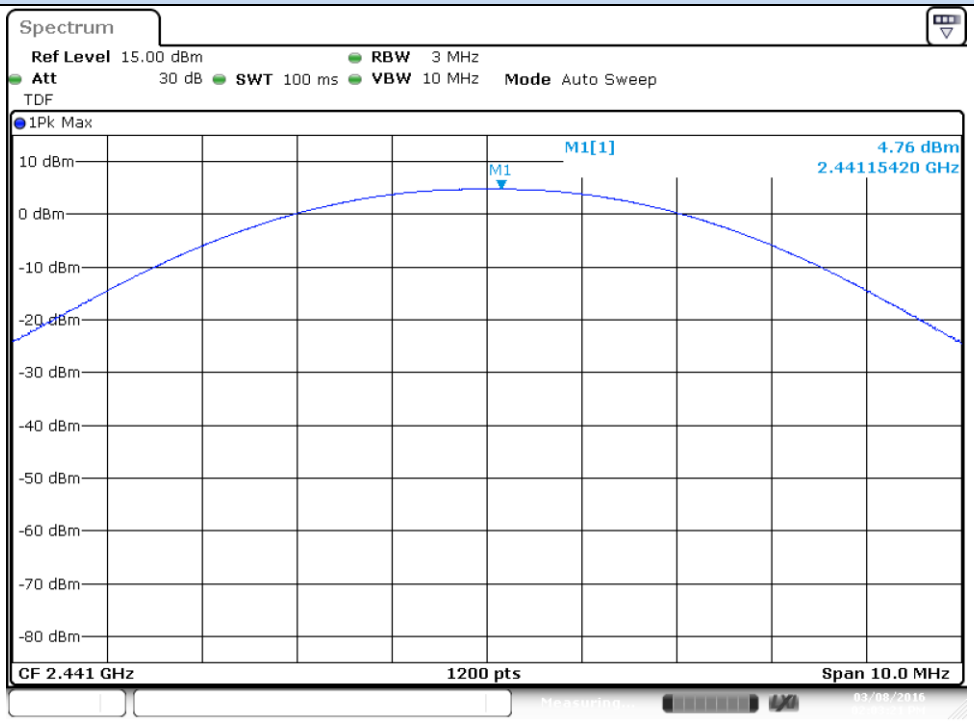
Basic Rate - GFSK

Peak Power - CH0



Date: 8.MAR.2016 14:05:01

Peak Power - CH39



Date: 8.MAR.2016 14:03:21

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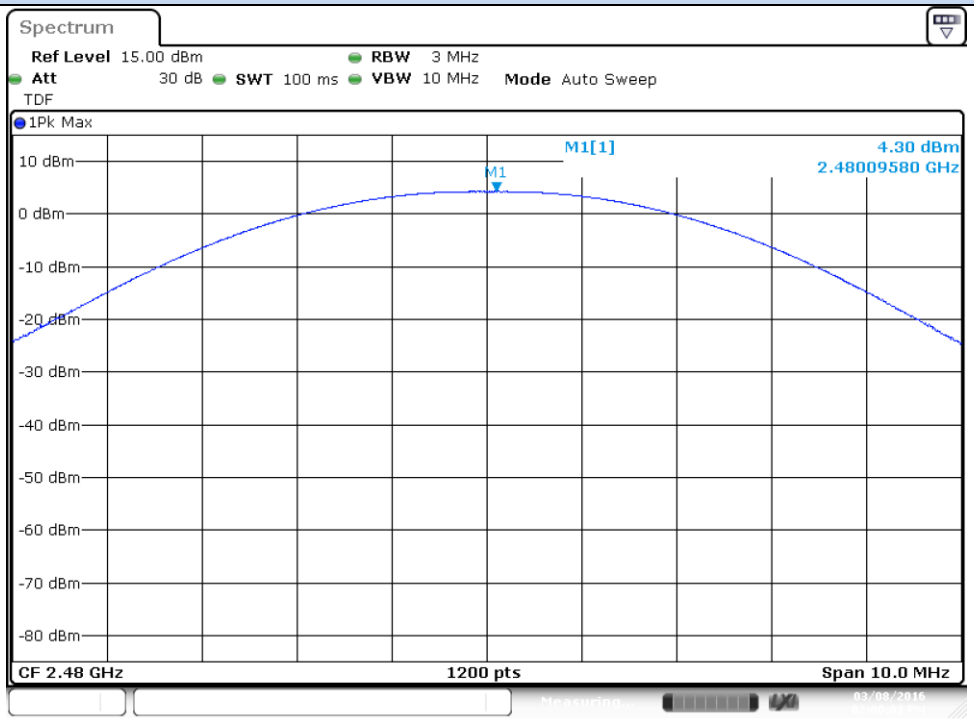
Peak Power - CH78



Date: 8.MAR.2016 14:00:01

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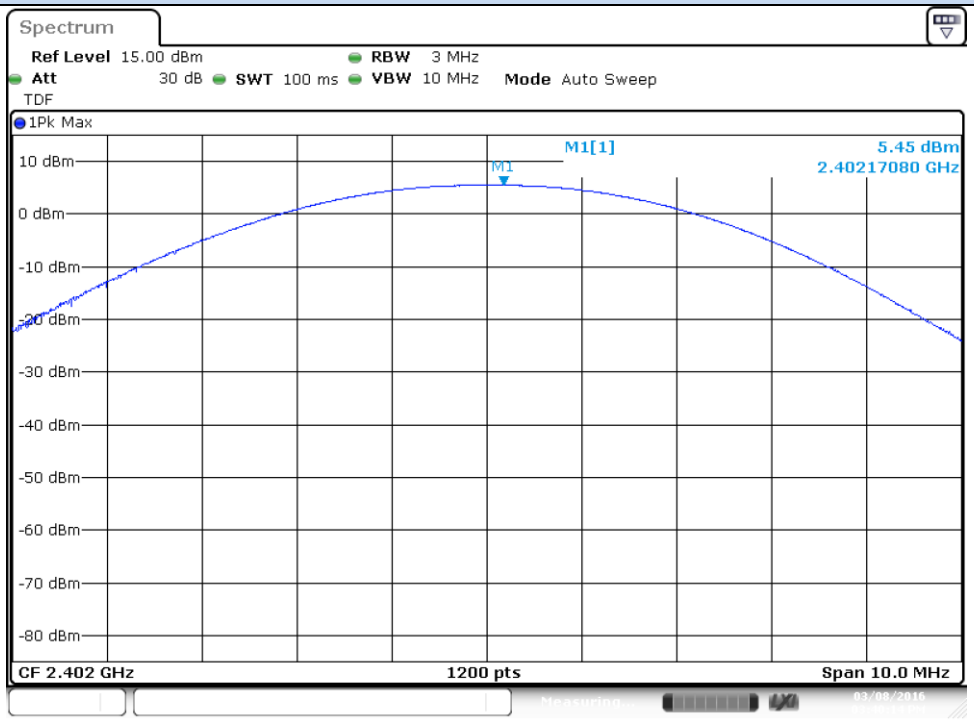
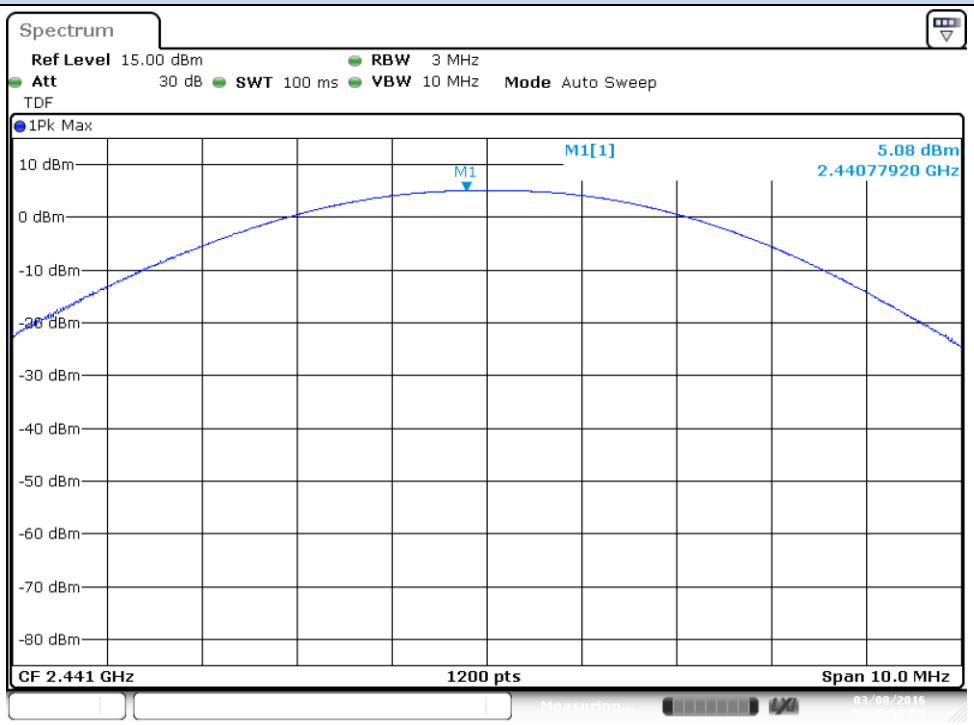
EDR – π/4-DQPSK

Peak Power - CH0



Date: 8.MAR.2016 15:40:14

Peak Power - CH39



Date: 8.MAR.2016 15:40:54

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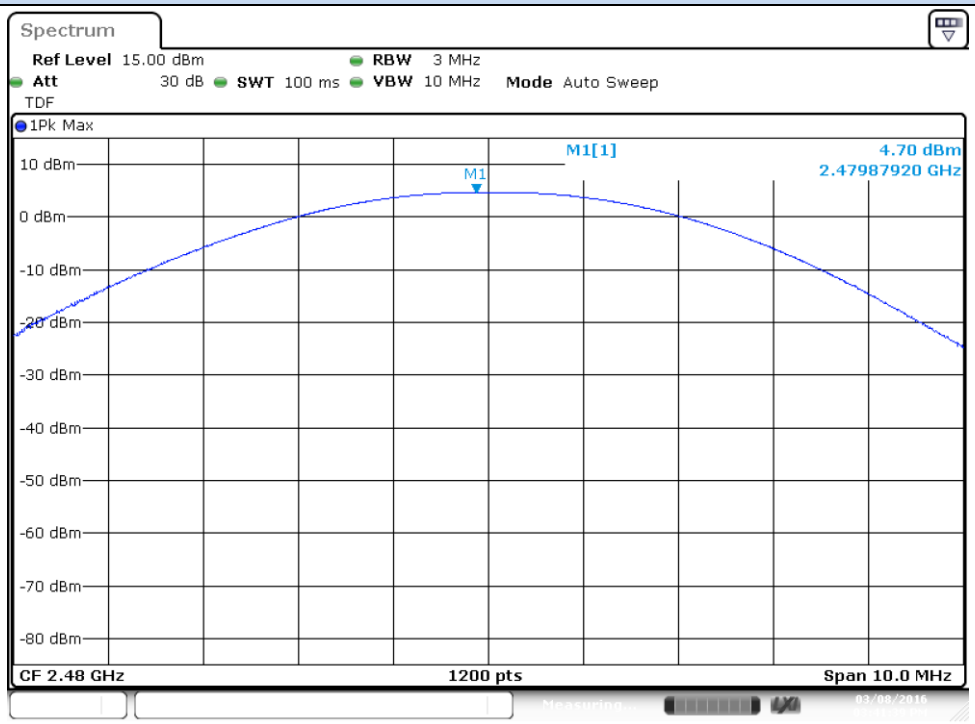
Peak Power - CH78



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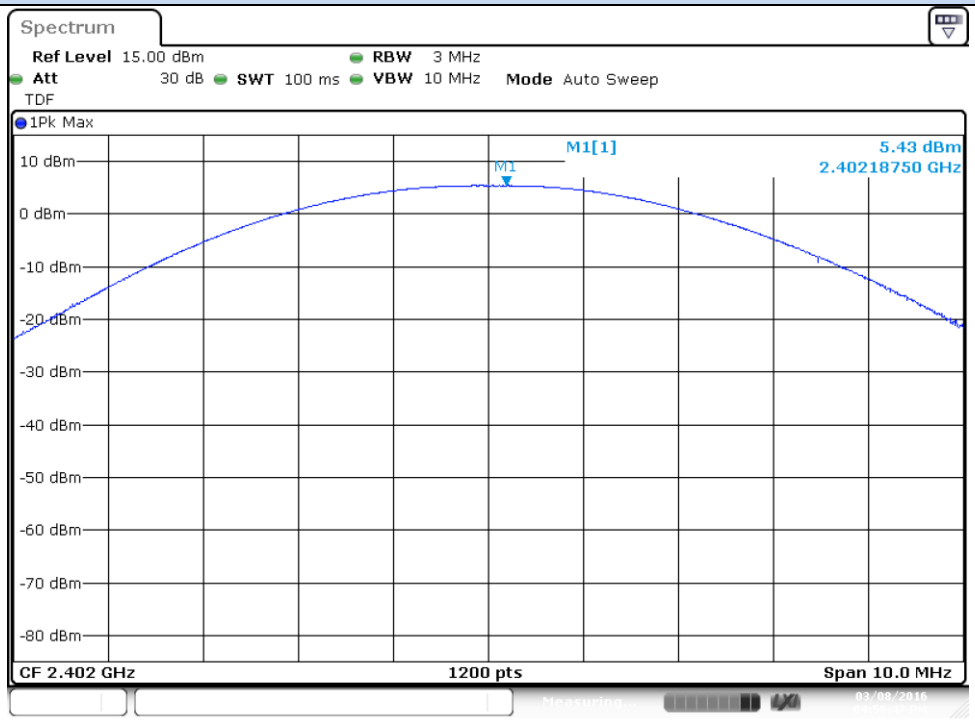
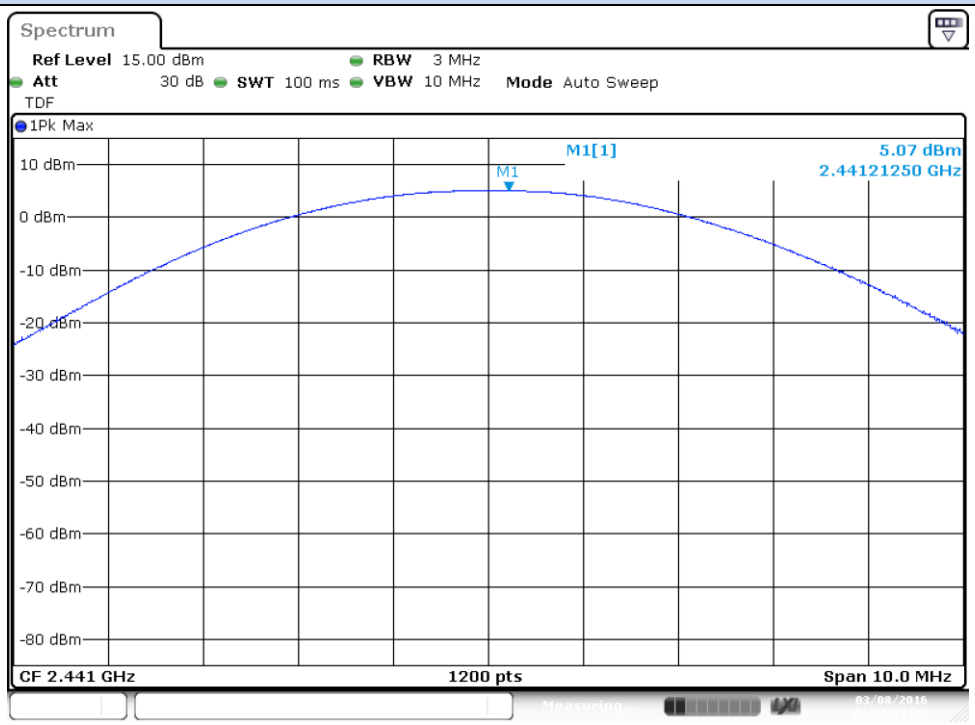
EDR – 8-DPSK

Peak Power - CH0



Date: 8.MAR.2016 16:58:48

Peak Power - CH39



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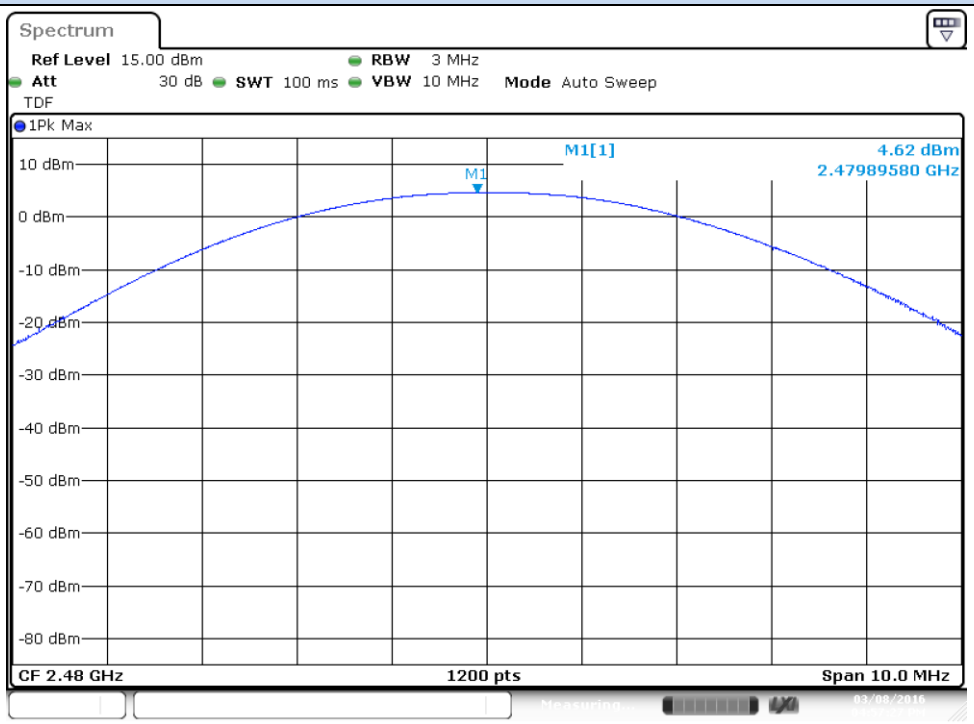
Peak Power - CH78



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