CERTIFICATE #3478.01

TEST REPORT

EUT Description	**WLAN and BT, 1x1 PCIe M.2 1216 SD adapter card**
Brand Name	**Intel® Wireless-AC 9461**
Model Name	**9461D2W**
FCC ID	**PD99461D2**
ISED ID	**1000M-9461D2**
Date of Test Start/End	**2017-08-20 / 2017-09-01**
Features	**802.11 a/b/g/n/ac Wireless LAN + Bluetooth 5** (see section 5)

Applicant	**Intel Mobile Communications**
Address	**100 Center Point Circle, Suite 200** **Columbia, South Carolina 29210** **USA**
Contact Person	**Steven Hackett**
Telephone/Fax/ Email	**steven.c.hackett@intel.com**

Reference Standards	**FCC CFR Title 47 Part 15 C** **RSS-247 issue 2, RSS-Gen issue 4** (see section 1)

Test Report identification	**170727-02.TR05**
Revision Control	**Rev. 00** **This test report revision replaces any previous test report revision** (see section 0)

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

Issued by

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Gregory ROUSTAN
(Test Engineer Lead)

Reviewed by

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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 – §15.207 Conducted emission limits
3. FCC 47 CFR part 15 - Subpart C – §15.209 Radiated emission limits; general requirements.
4. ANSI C63.10-2013 - American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
5. DA 00-705 Released March 30, 2000 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
6. RSS-247 Issue 2 - Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
7. RSS-Gen Issue 4 - General Requirements for Compliance of Radio Apparatus.

2. General conditions, competences and guarantees

- ✓ Intel Mobile Communications France SAS Wireless RF Lab (Intel WRF Lab) is an ISO/IEC 17025:2005 testing laboratory accredited by the American Association for Laboratory Accreditation (A2LA) with the certificate number 3478.01.
- ✓ Intel Mobile Communications France SAS Wireless RF Lab (Intel WRF Lab) is an Accredited Test Firm recognized by the FCC, with Designation Number FR0011.
- ✓ Intel Mobile Communications France SAS Wireless RF Lab (Intel WRF Lab) is a Registered Test Site listed by ISED, with ISED Assigned Code 1000Y.
- ✓ Intel WRF Lab only provides testing services and is committed to providing reliable, unbiased test results and interpretations.
- ✓ Intel WRF Lab is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.
- ✓ Intel WRF Lab has developed calibration and proficiency programs for its measurement equipment to ensure correlated and reliable results to its customers.
- ✓ This report is only referred to the item that has undergone the test.
- ✓ This report does not imply an approval of the product by the Certification Bodies or competent Authorities.

3. Environmental Conditions

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

Temperature	22.5ºC ± 0.5ºC
Humidity	57% ± 5%

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#01	170727-02.S01	Module	9461D2W	WFM 3413E86B17D7	2017-07-28	Used for conducted tests
	170524-02.S15	Extender Board	PCB00609_01	6092416-442	2017-05-30	
	170220-04.S04	Adapter 1216SD to M.2	JfP Adapter M2	N/A	2017-04-10	
	170000-01.S04	Laptop	Latitude E5470	DMRKMC2	2017-05-10	
#02	170727-02.S05	Module	9461D2W	WFM 3413E86B1809	2017-07-21	Used for radiated tests
	170727-02.S11	Adapter 1216SD to M.2	JfP Adapter M2	N/A	2017-08-09	
	170220-02.S03	Extender Board	PCB00609_01	6092416-446	2017-02-20	
	170000-01.S13	Laptop	Latitude E5470	FT6LMC2	2017-04-25	
#03	170727-02.S02	Module	9461D2W	WFM 3413E86B181D	2017-07-28	Used for AC power-line conducted emission measurements
	170524-02.S13	Extender Board	PCB00609_01	6092416-418	2017-02-20	
	170727-02.S12	Adapter 1216SD to M.2	JfP Adapter M2	N/A	2017-08-09	
	170000-01.S02	Laptop	Latitude E5470	21HTPF2	2017-04-25	

5. EUT Features

Brand Name	Intel® Wireless-AC 9461
Model Name	9461D2W
FCC	PD99461D2
ISED ID	1000M-9461D2
Software Version	10.1731.0-05646
Driver Version	99.0.28.6
Prototype / Production	Production
Supported Radios	802.11b/g/n 2.4GHz (2400.0 – 2483.5 MHz) 802.11a/n/ac 5.2GHz (5150.0 – 5350.0 MHz) 5.6GHz (5470.0 – 5725.0 MHz) 5.8GHz (5725.0 – 5850.0 MHz) Bluetooth 5 2.4GHz (2400.0 – 2483.5 MHz)
Antenna Information	**WLAN/BT:** Slot antenna. WiFi 2.4GHz & 5GHz BT (DRTU CHAIN A)

6. Remarks and comments

N/A

7. Test Verdicts summary

7.1. BT Basic Data Rate / Enhanced Data Rate

FCC part	RSS part	Test name	Verdict
15.247 (a) (1)	RSS-247 Clause 5.1 (a) and (b)	20dB Bandwidth and Carrier frequency separation	P
15.247 (a) (1) (iii)	RSS-247 Clause 5.1 (d)	Number of hopping channels	P
15.247 (a) (1) (iii)	RSS-247 Clause 5.1 (d)	Time of Occupancy (Dwell Time)	P
15.247 (b) (1)	RSS-247 Clause 5.4 (b)	Maximum Peak Output Power and antenna gain	P
15.247 (d)	RSS-247 Clause 5.5 RSS-GEN Clause 8.9	Out-of-band Emissions (conducted)	P
15.209(a)	RSS-GEN Clause 8.9	Out-of-band Emissions (radiated)	P
15.407 (6) 15.207	RSS-GEN Clause 8.8	AC power-line conducted emission measurements	P

8. Document Revision History

Revision #	Date	Modified by	Revision Details
Rev. 00	2017-09-12	BLavenant	First Issue

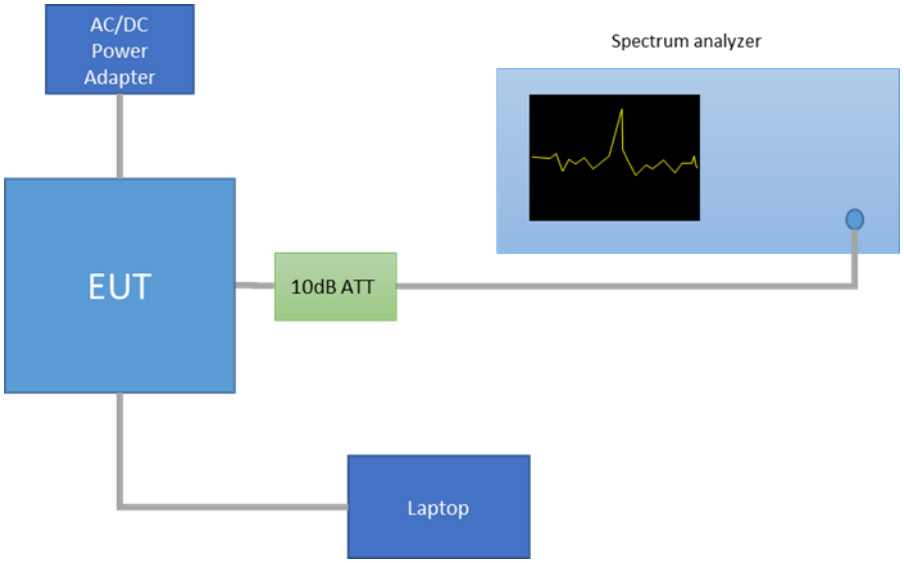
Annex A. Test & System Description

A.1 Measurement System

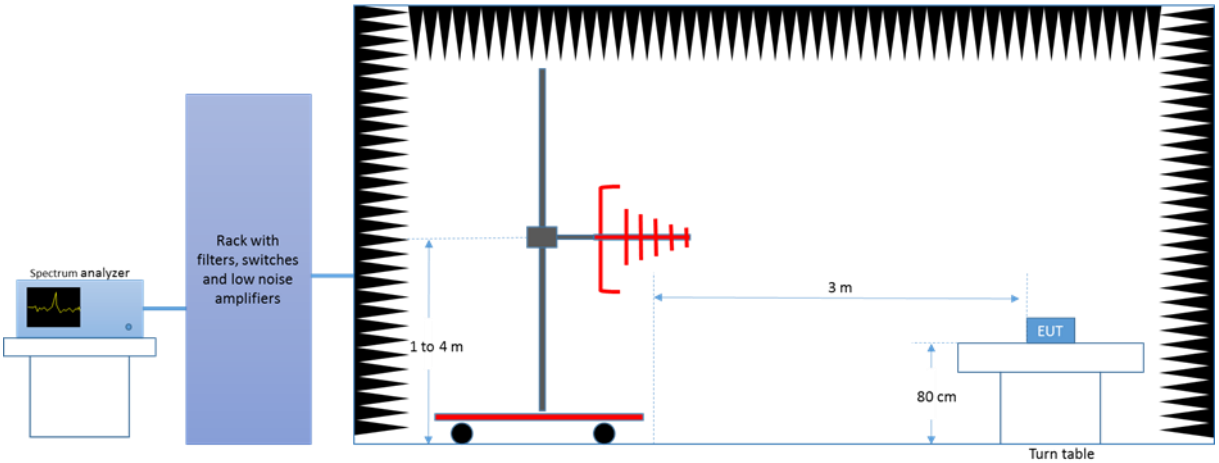
Measurements were performed using the following setups.

The DUT was installed in a test fixture and this test fixture is connected to a laptop 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.

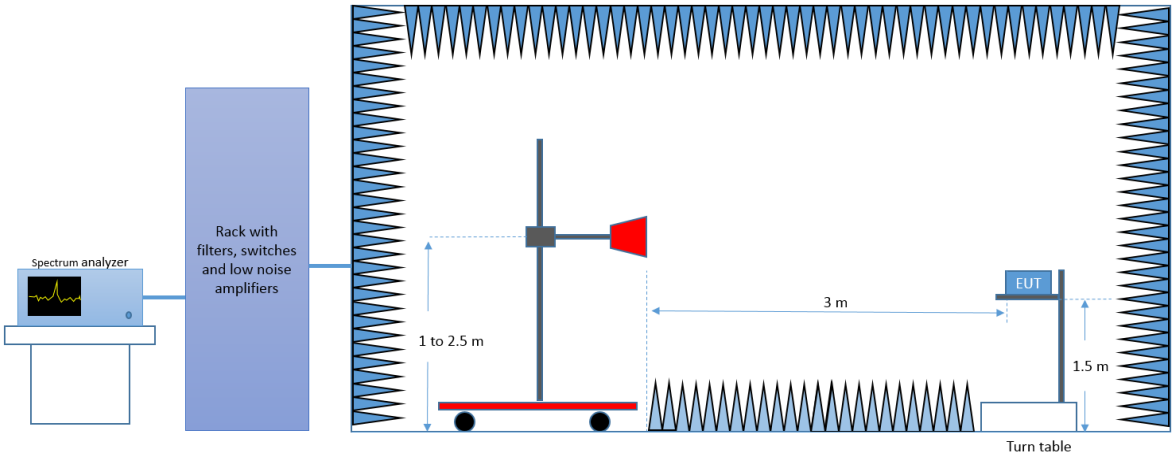
Conducted Setup



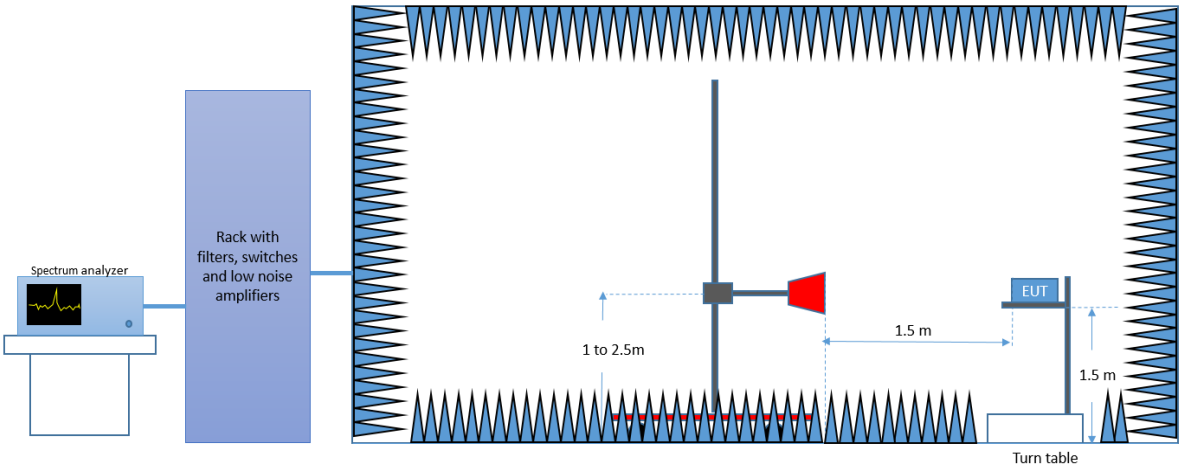
Radiated Setup < 1GHz



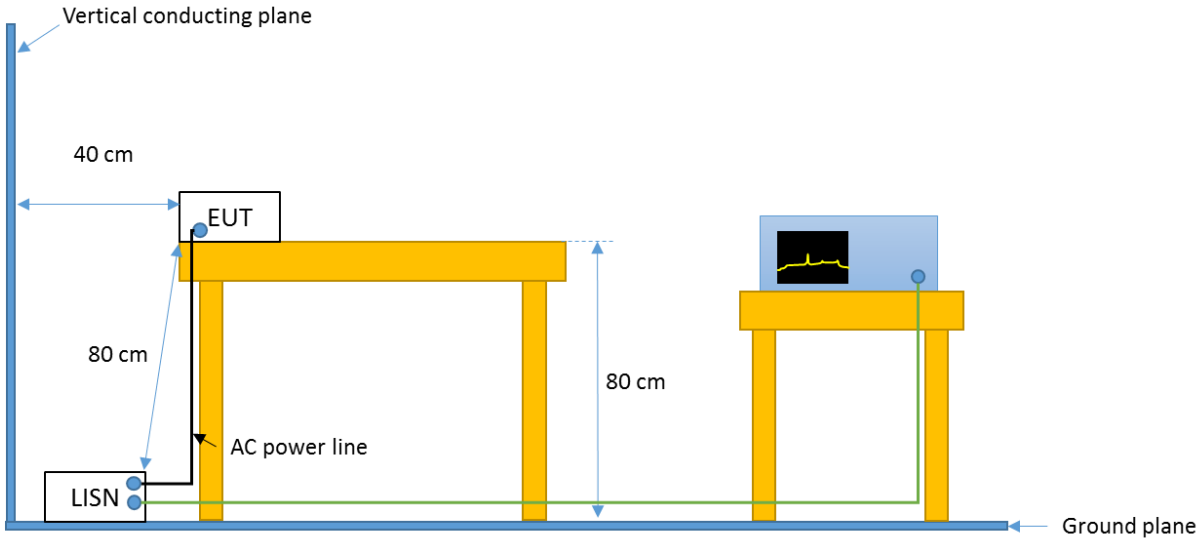
Radiated Setup 1 GHz – 18 GHz



Radiated Setup 18 GHz – 25 GHz



AC power-line conducted emission Setup 150 kHz – 30 MHz



A.2 Test Equipment List

Conducted Setup

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0316	Spectrum analyzer	FSV30	103309	Rohde & Schwarz	2017-01-30	2019-01-30

Radiated Setup-1

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0133	Spectrum analyzer	FSV40	101358	Rohde & Schwarz	2016-04-15	2018-04-15
0137	Log antenna 30 MHz – 1 GHz	3142E	00156946	ETS Lindgren	2015-12-11	2017-12-11
0139	Horn Antenna 18 GHz - 26.5 GHz	114514	00167100	ETS Lindgren	2016-03-16	2018-03-16
0135	Semi Anechoic chamber	FACT 3	5720	ETS Lindgren	2016-04-28	2018-04-28
0530	Measurement Software	EMC32	100623	Rohde & Schwarz	N/A	N/A
0296	Power Supply	6673A	MY41000318	Agilent	N/A	N/A
0346	Multimeter	34401A	US36054685	HP	2016-02-04	2018-02-04

N/A: Not Applicable

Radiated Setup-2

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0420	Spectrum analyzer	FSV40	101556	Rohde & Schwarz	2016-04-15	2018-04-15
0138	Horn antenna 1 GHz – 6.4 GHz	3117	00152266	ETS Lindgren	2016-03-14	2018-03-14
0141	Double Ridge Horn Antenna 1 GHz – 18 GHz	3117	00157736	ETS Lindgren	2016-04-13	2018-04-13
0409	PreAmplifier	3117-PA	00157993	ETS Lindgren	N/A	N/A
0337	Full Anechoic chamber	RFD_FA_100	5996	ETS Lindgren	2016-04-28	2018-04-28
0329	Measurement Software	EMC32	100401	Rohde & Schwarz	N/A	N/A

N/A: Not Applicable

Radiated Setup - shared equipments

ID#	Device	Type/Model	Serial #	Manufacturer	Cal. Date	Cal. Due Date
0014	Power Sensor	NRP-Z57	101280	Rohde & Schwarz	2017-04-25	2019-04-25

AC power-line conducted emission Setup

ID#	Device	Type/Model	Serial Number	Manufacturer	Cal. Date	Cal. Due Date
0027	Measurement software	EMC32	1300.7010.02	Rohde & Schwarz	NA	NA
0317	Spectrum Analyzer	FSV30	103308	Rohde & Schwarz	2017-08-05	2019-08-05
0532	LISN	ENV216	101321	Rohde & Schwarz	2016-09-13	2018-09-13
0607	LISN	ENV216	101342	Rohde & Schwarz	2017-09-06	2018-09-06
0538	Transformer	Monophase	TIMM3.15	Montelem	NA	NA
0095	Millivoltmeter	2000	4009301	KEITHLEY	2015-10-26	2017-10-26
0624	AC power source	61604	SM135546	CHROMA	NA	NA
0346	Multimeter	34401A	US36054685	HP	2016-02-04	2018-02-04

N/A: Not Applicable

A.3 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the below table:

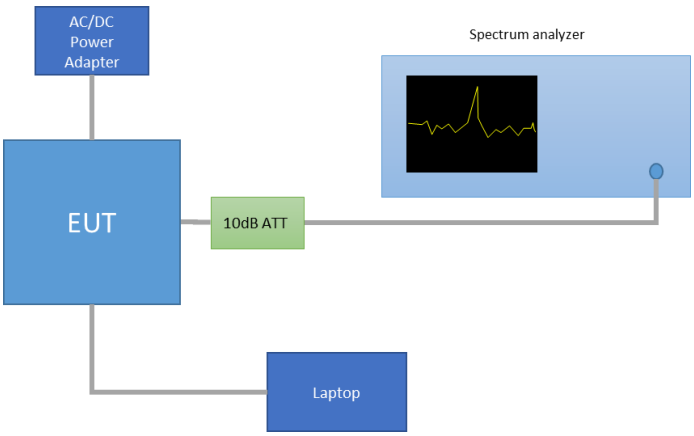
Measurement type	Uncertainty [±dB]
Conducted Power	±1.0
Conducted Spurious Emission	±2.9
Radiated tests <1GHz	±3.8
Radiated tests 1GHz - 40 GHz	±4.7
AC power-line conducted emission	±1.45

Annex B. Test Results

B.1 20dB Bandwidth and carrier frequency separation

Test limits

FCC part	RSS part	Limits
15.247 (a) (1)	RSS-247 Clause 5.1 (a) and (b)	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.



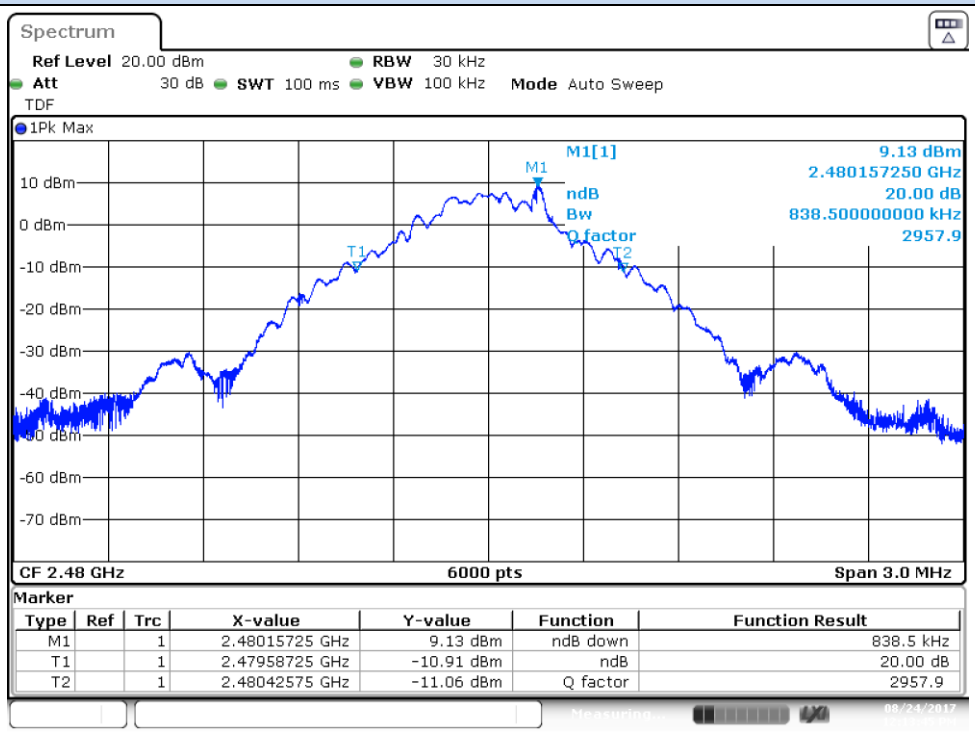
Results tables:

Mode	Channel Number	Frequency [MHz]	20dB BW [MHz]	Freq. Separation [kHz]
Basic Rate GFSK	0	2402	0.825	1000
	39	2441	0.832	
	78	2480	0.839	
EDR π/4-DQPSK	0	2402	1.456	1000
	39	2441	1.453	
	78	2480	1.427	
EDR 8-DPSK	0	2402	1.409	1000
	39	2441	1.411	
	78	2480	1.415	

Results screenshot

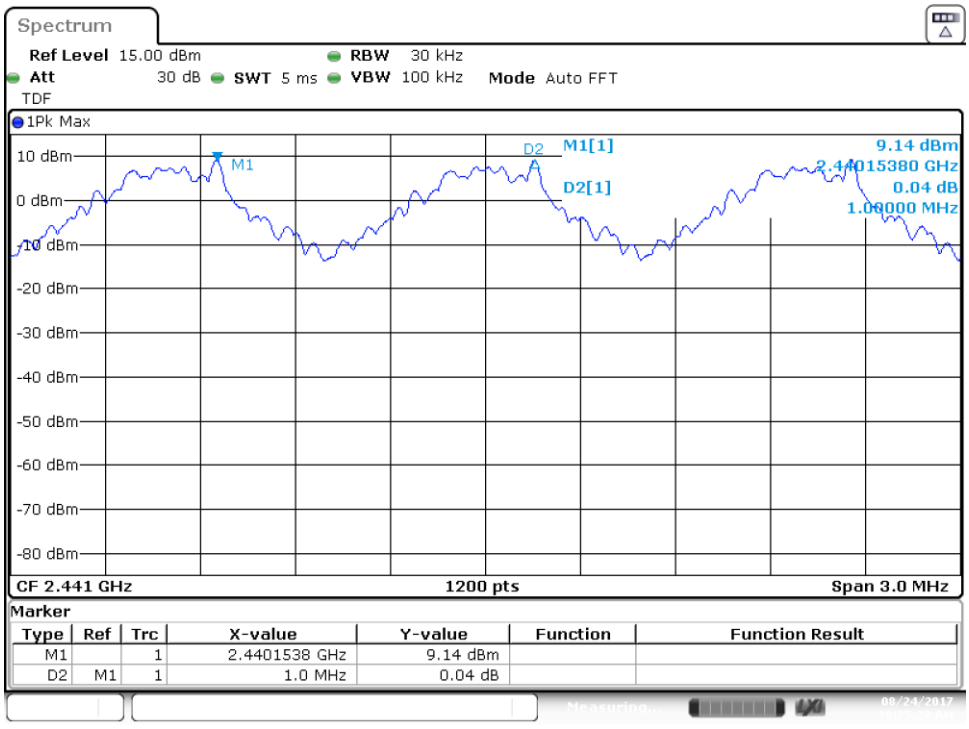
Basic Rate - GFSK

20dB BW – CH78



Date: 24.AUG.2017 12:13:46

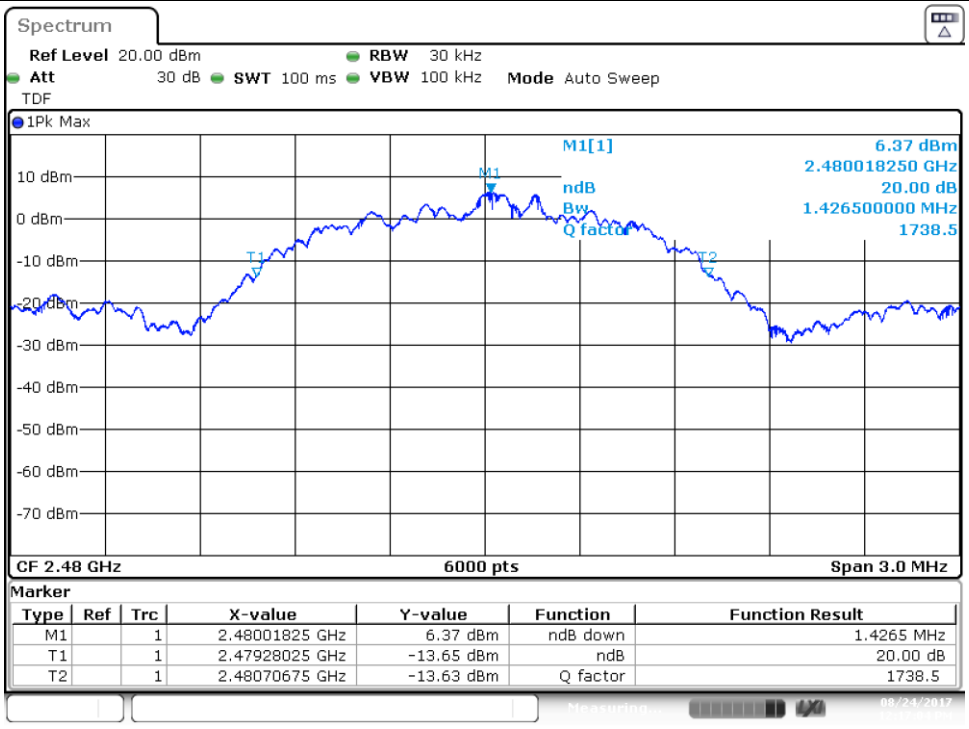
Freq. Separation



Date: 24.AUG.2017 10:25:28

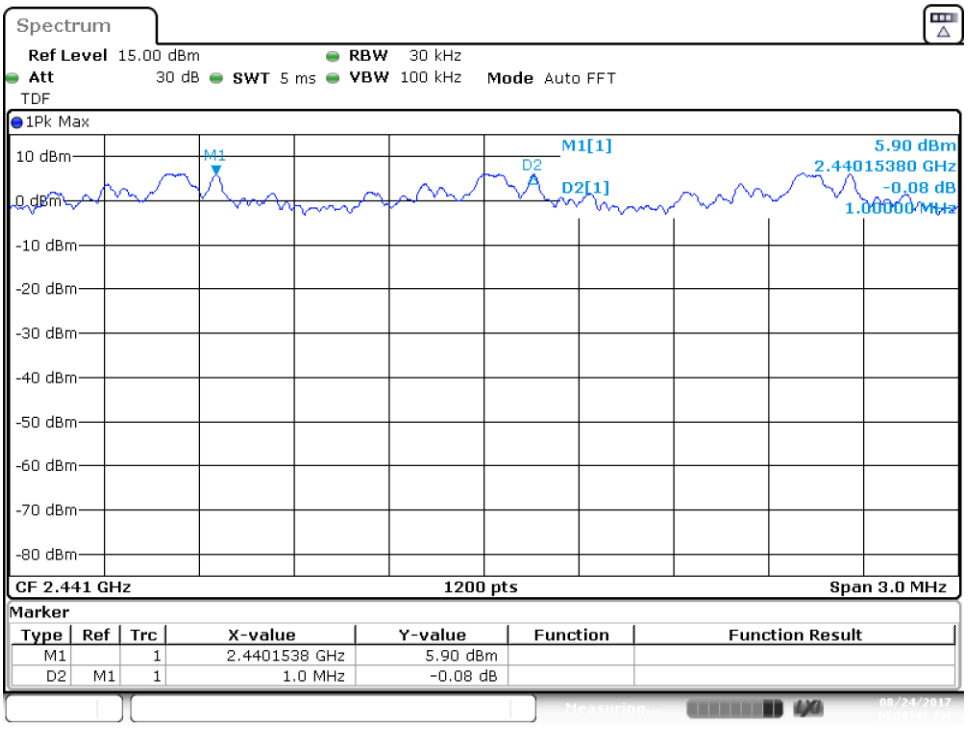
EDR – π/4-DQPSK

20dB BW – CH78



Date: 24.AUG.2017 12:17:04

Freq. Separation



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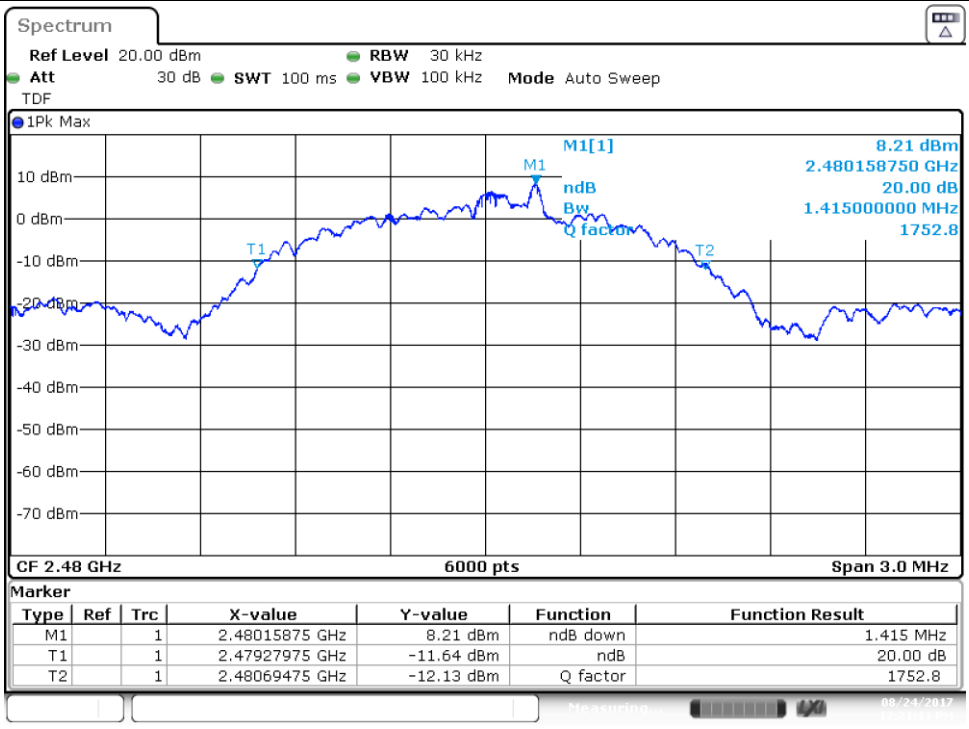
EDR – 8-DPSK

20dB BW – CH78



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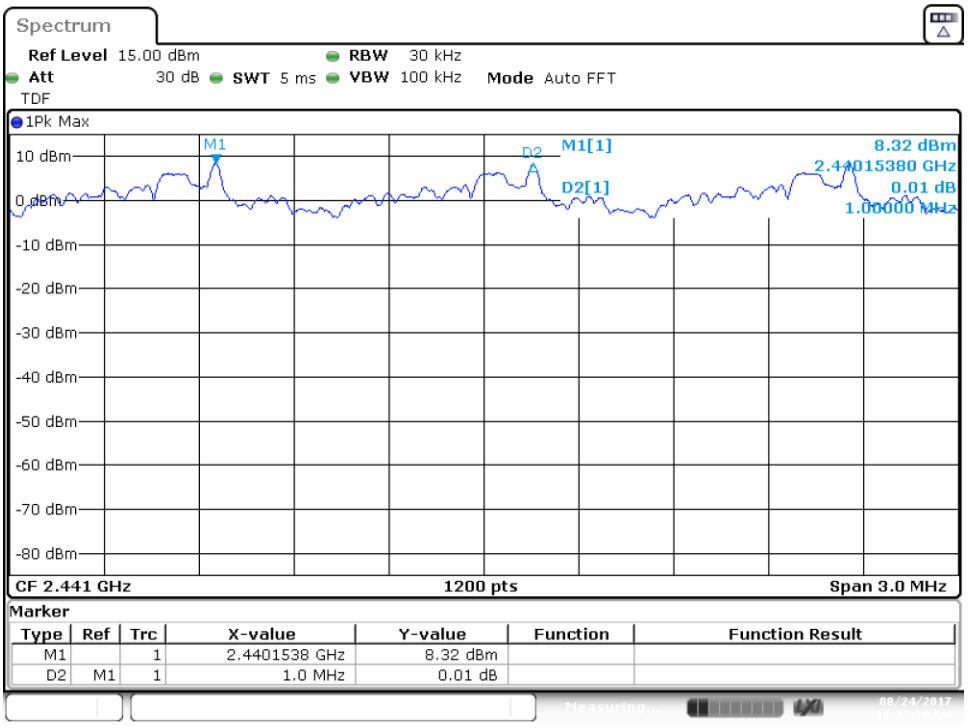
Freq. Separation



Date: 24.AUG.2017 10:32:31

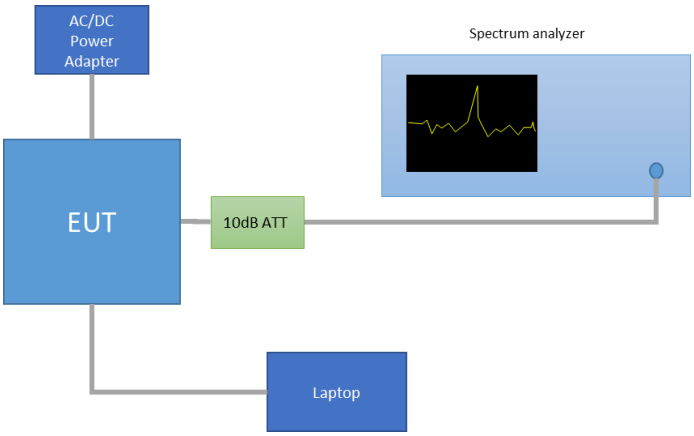
B.2 Number of hopping channels

Test limits

FCC part	RSS part	Limits
15.247 (a) (1) (iii)	RSS-247 Clause 5.1 (d)	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.

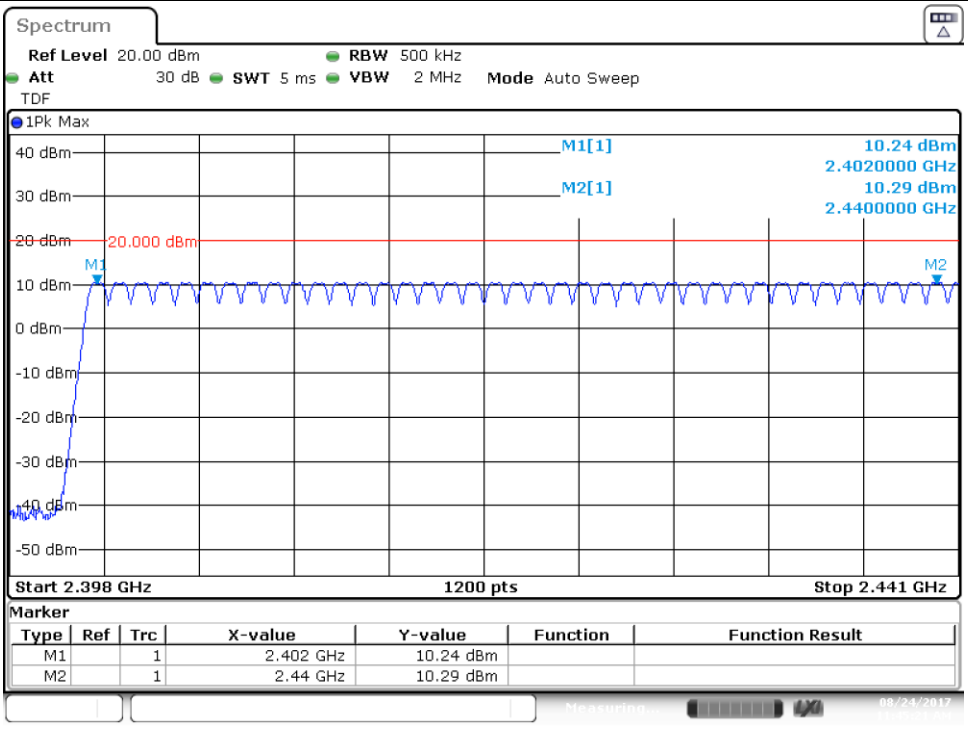


Results tables

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

Number of hopping channels

Basic Rate – GFSK



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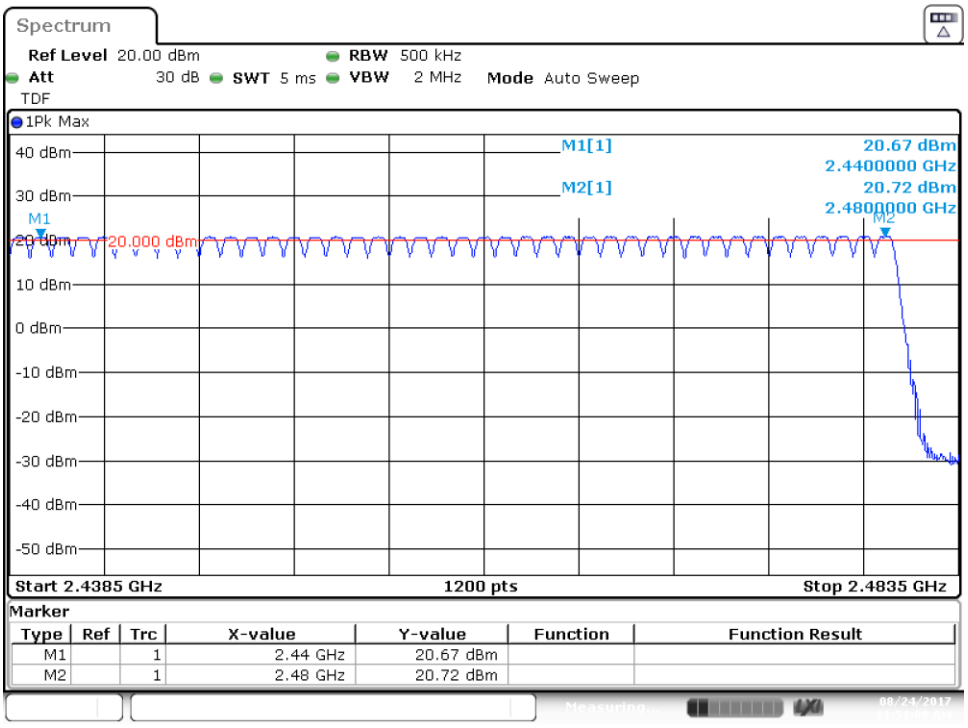
Basic Rate – GFSK



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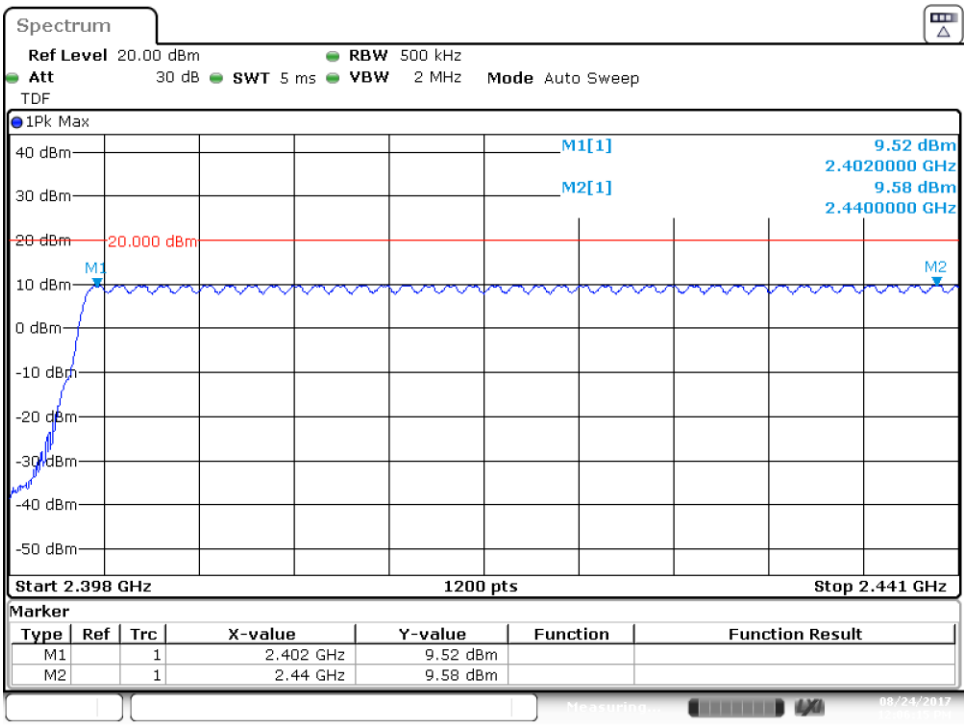
EDR – π/4-DPSK



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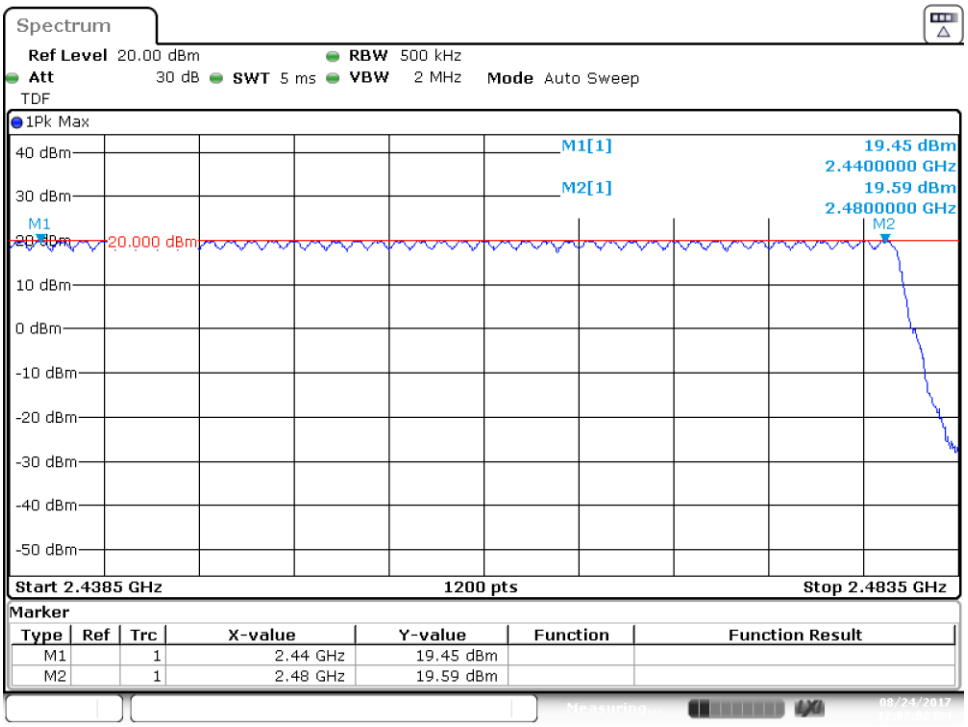
EDR – π/4-DPSK



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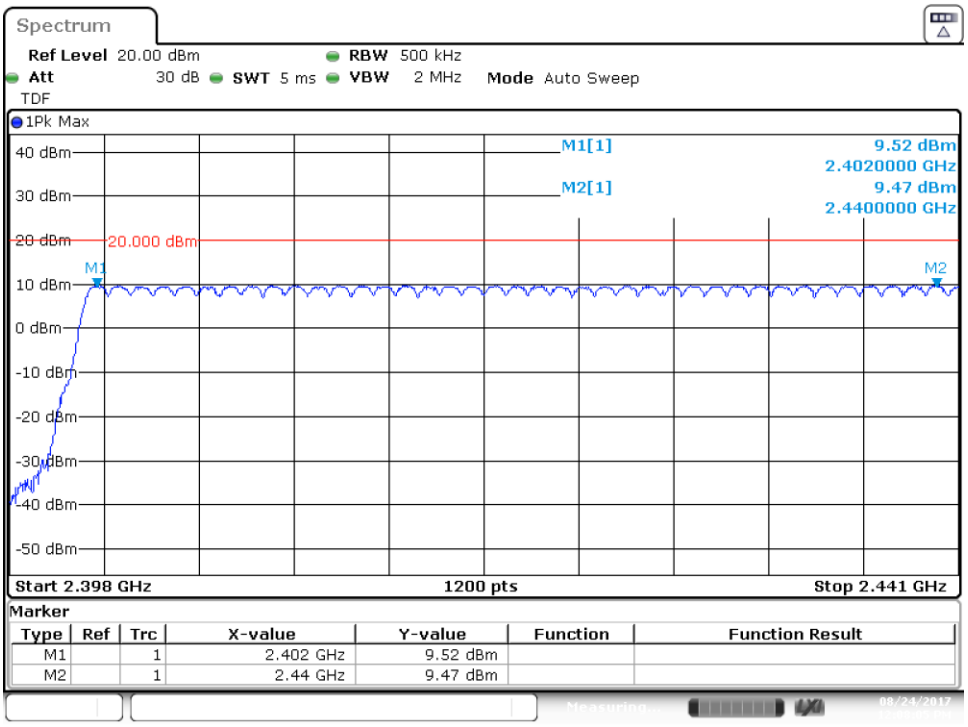
EDR – 8-DPSK



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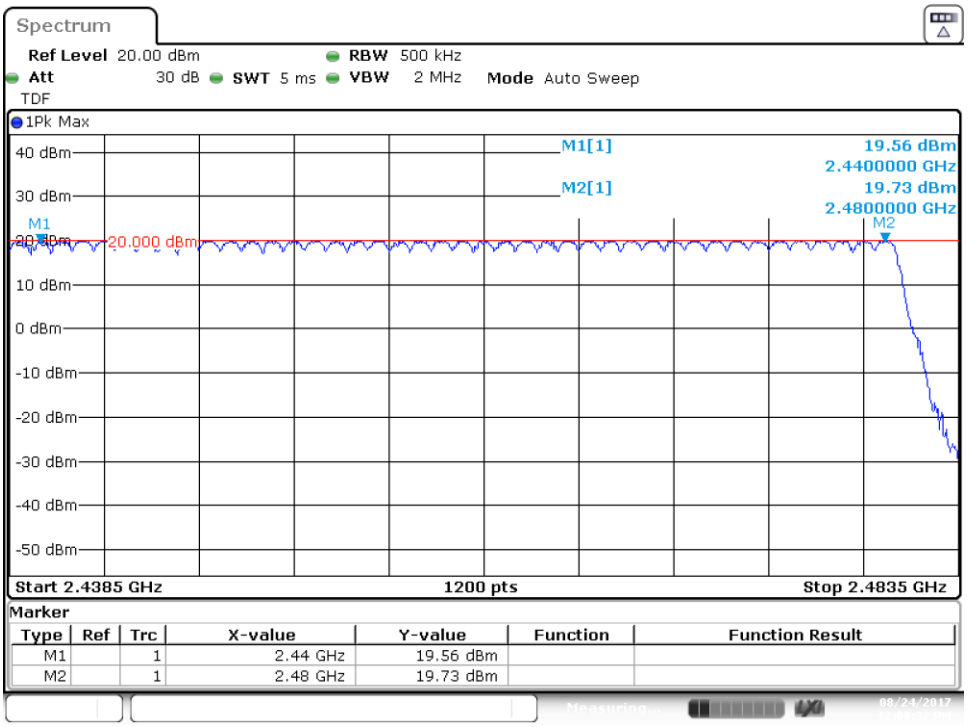
EDR – 8-DPSK



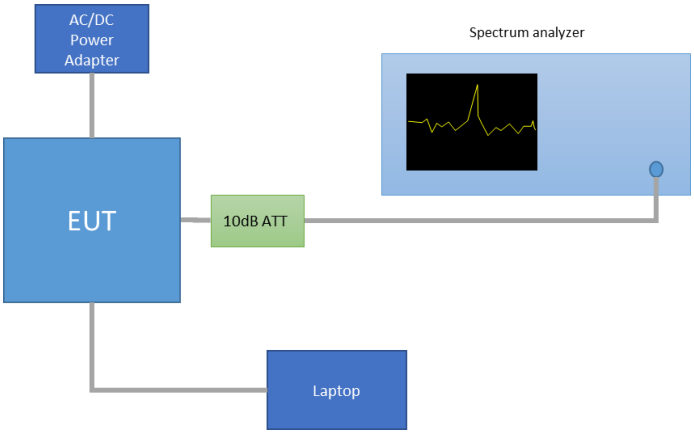
Date: 24.AUG.2017 12:08:32

B.3 Time of Occupancy (Dwell Time)

FCC part	RSS part	Limits
15.247 (a) (1) (iii)	RSS-247 Clause 5.1 (d)	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 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.

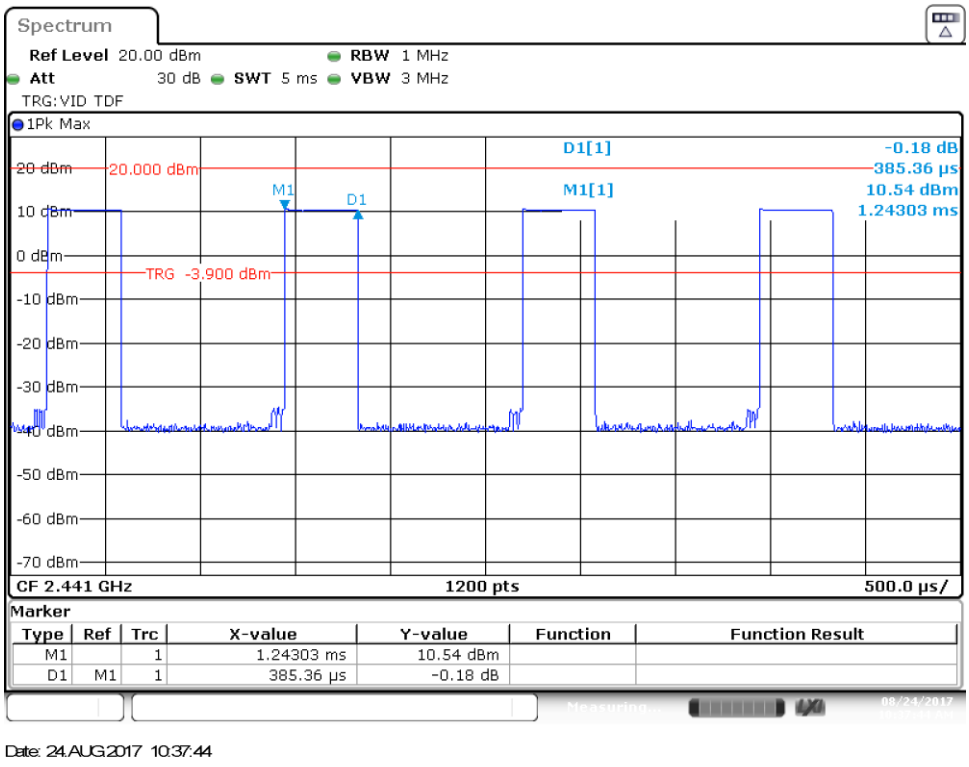
Results tables

Mode	Packet Type	Times of appearance	Tx-time [ms]	Dwell Time [ms]
Basic Rate GFSK	DH1	320.11	0.386	123.562
	DH3	161.16	1.637	263.819
	DH5	106.49	1.641	174.750
EDR π/4-DQPSK	2-DH1	320.11	0.532	170.299
	2-DH3	161.16	1.641	264.464
	2-DH5	106.49	2.890	307.756
EDR 8-DPSK	3-DH1	320.11	0.530	169.658
	3-DH3	161.16	1.638	263.980
	3-DH5	106.49	2.890	307.756

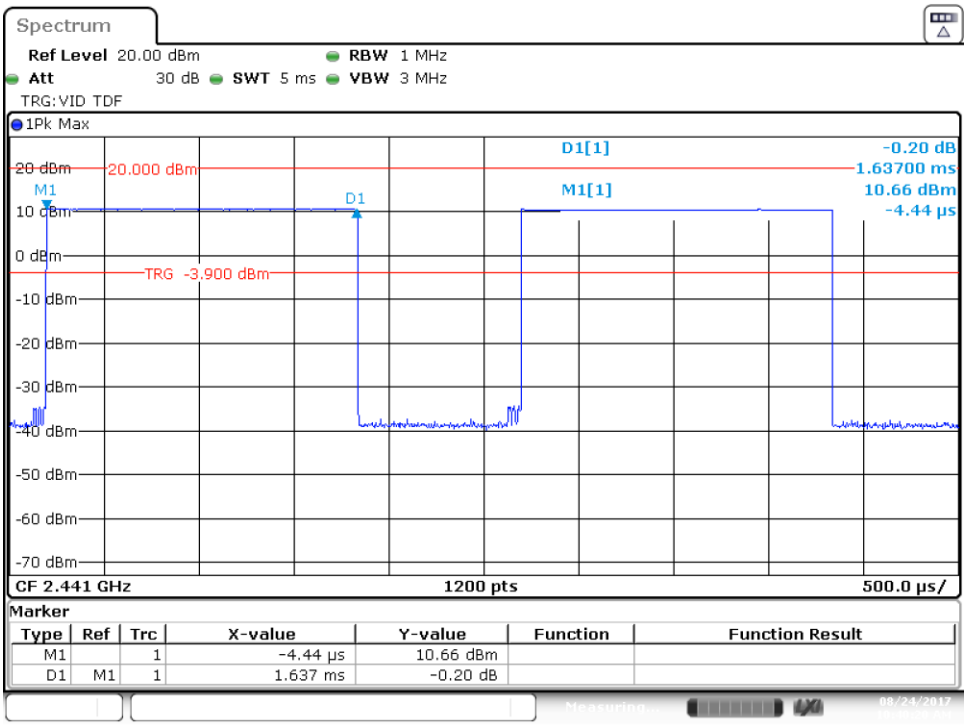
Results Screenshot:

BDR – GFSK

DH1 Tx-Time



DH3 Tx-Time



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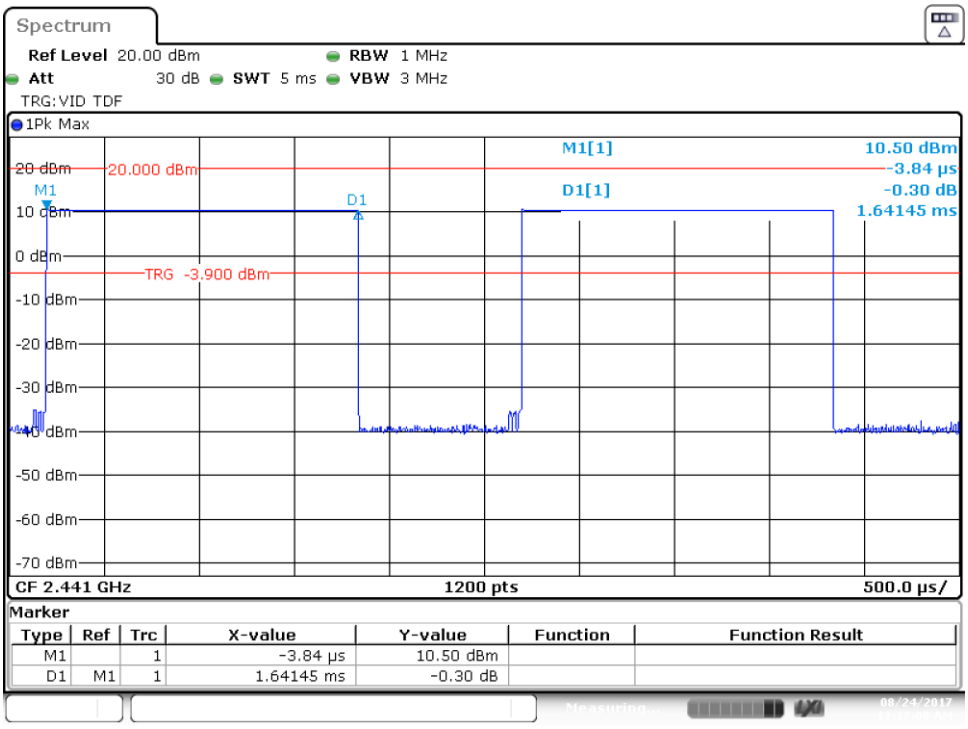
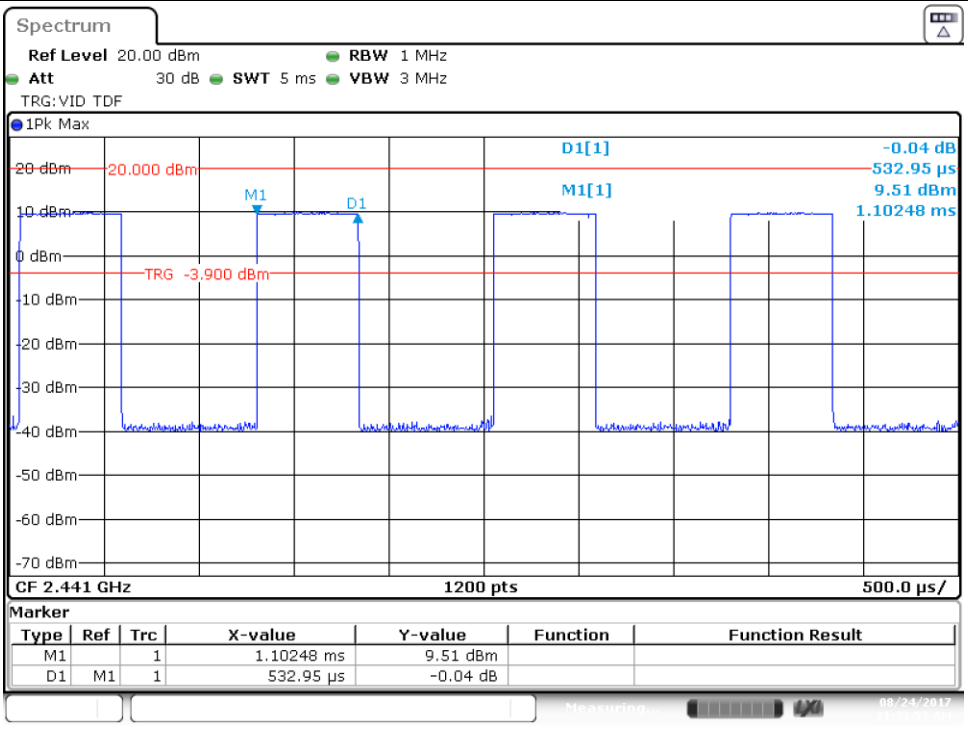
DH5 Tx-Time



Date: 24.AUG.2017 11:17:00

EDR – π/4-DQPSK

2-DH1 Tx-Time



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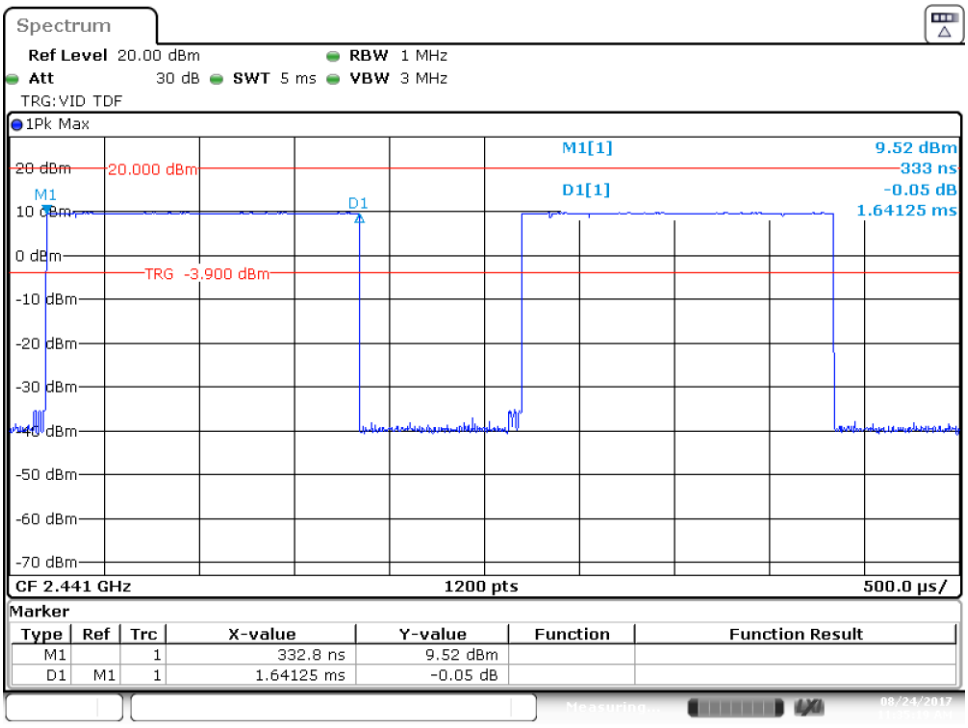
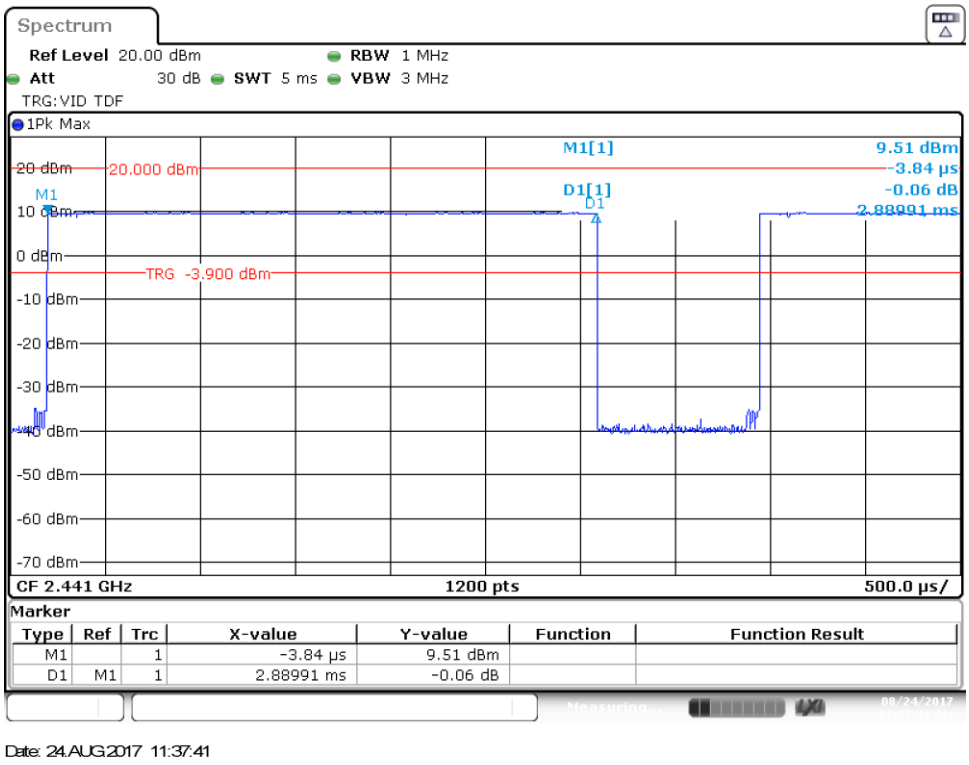
2-DH3 Tx-Time



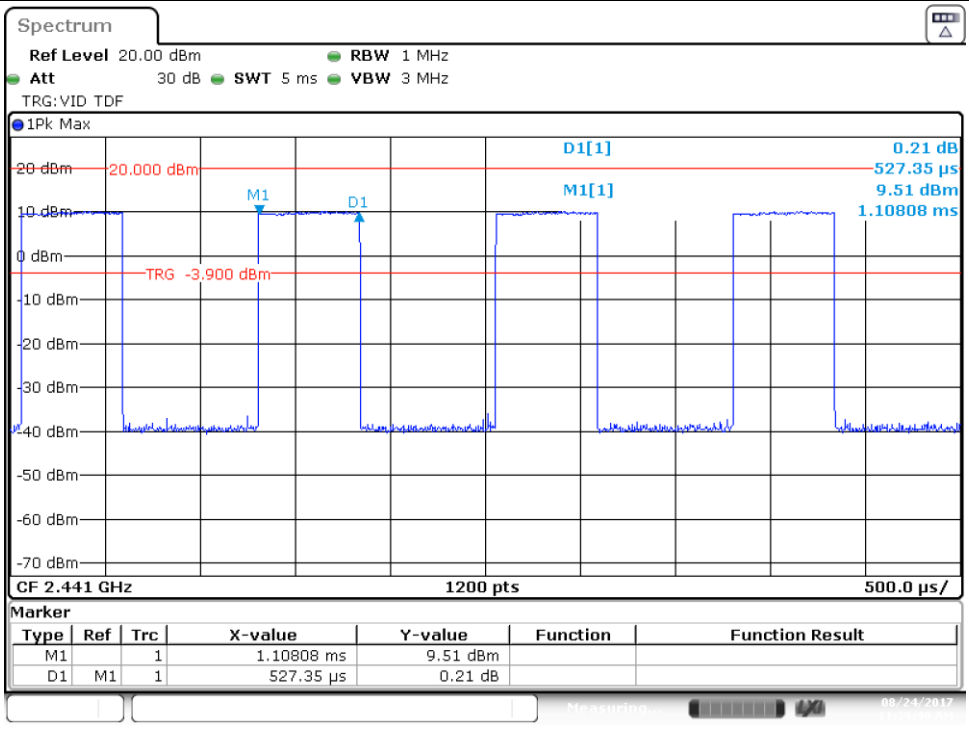
Date: 24.AUG.2017 11:35:19

2-DH5 Tx-Time



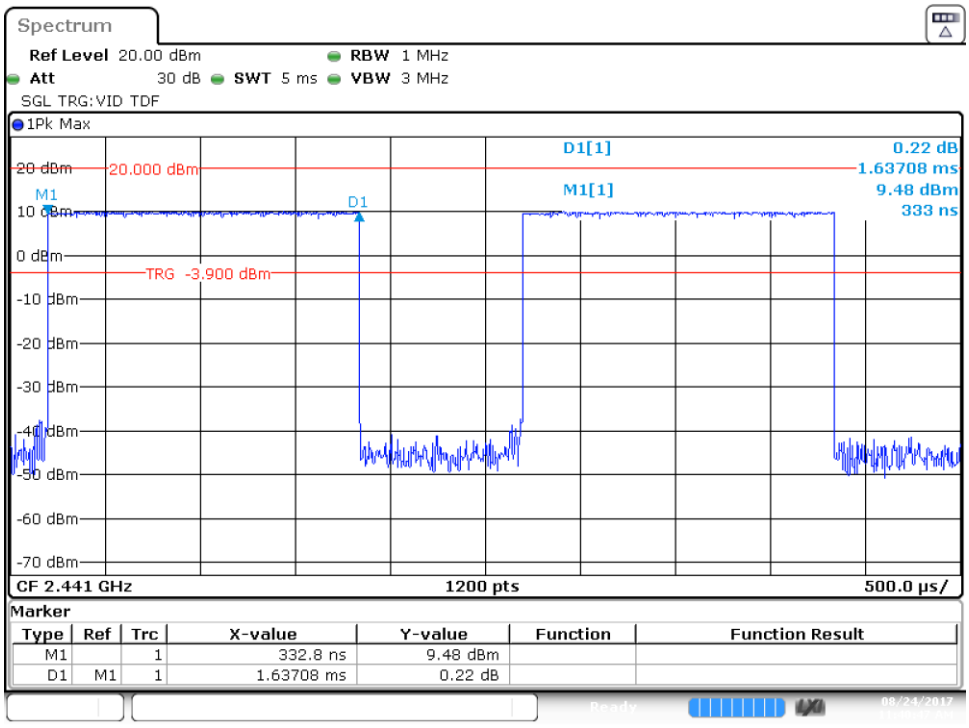
EDR – 8-DPSK

3-DH1 Tx-Time



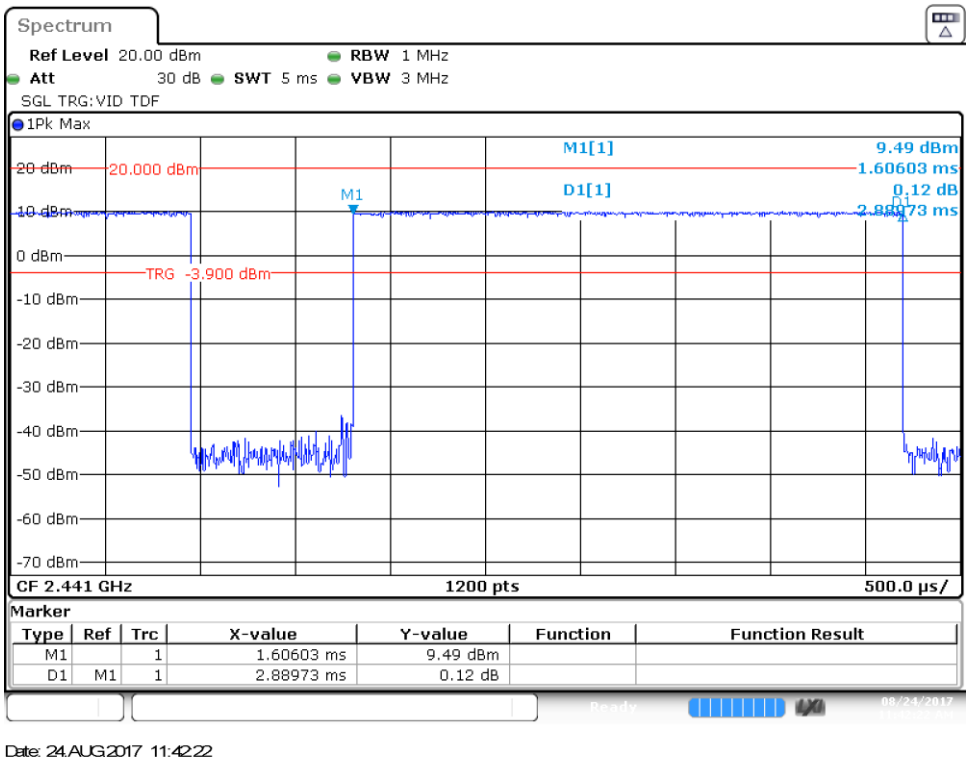
Date: 24.AUG.2017 11:39:40

3-DH3 Tx-Time



Date: 24.AUG.2017 11:40:47

3-DH5 Tx-Time



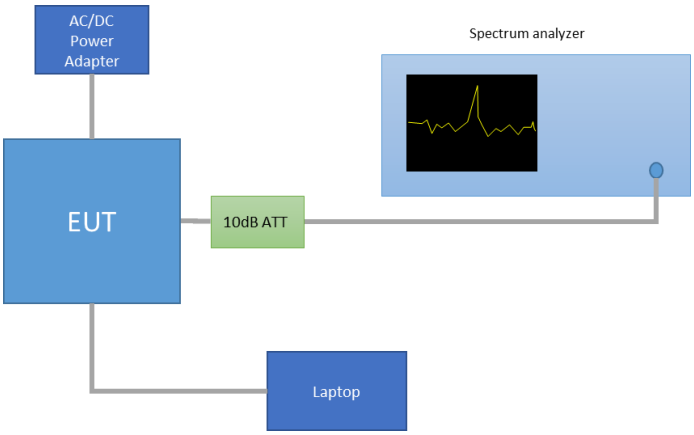
B.4 Maximum Peak Output Power antenna gain

Test Limits

FCC part	RSS part	Limits
15.247 (b) (1)	RSS-247 Clause 5.4 (b)	(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 through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.



The declared maximum antenna gain is 3.24dBi.

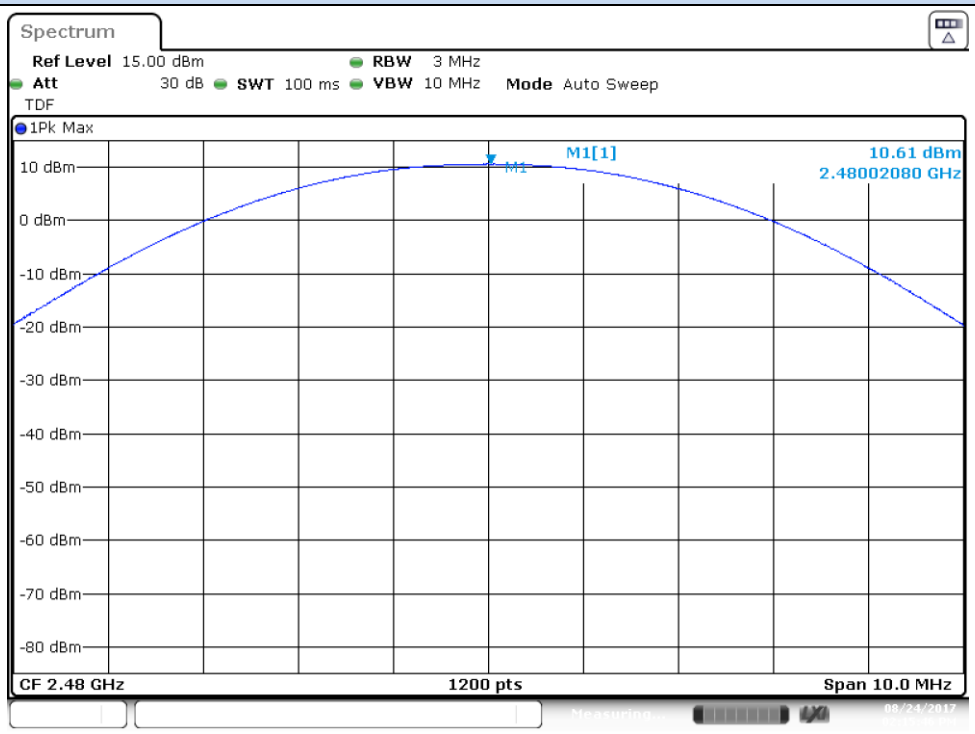
Results tables

Mode	Channel Number	Frequency [MHz]	Peak Power [dBm]	Peak Power [mW]	Peak Power EIRP [dBm]	Peak Power EIRP [mW]
Basic Rate GFSK	0	2402	10.59	11.46	13.83	24.15
	39	2441	10.51	11.25	13.75	23.71
	78	2480	10.61	11.51	13.85	24.27
EDR π/4-DQPSK	0	2402	10.22	10.52	13.46	22.18
	39	2441	10.14	10.33	13.38	21.78
	78	2480	10.24	10.57	13.48	22.28
EDR 8-DPSK	0	2402	10.27	10.64	13.51	22.44
	39	2441	10.19	10.45	13.43	22.03
	78	2480	10.29	10.69	13.53	22.54

Results Screenshot

Basic Rate - GFSK

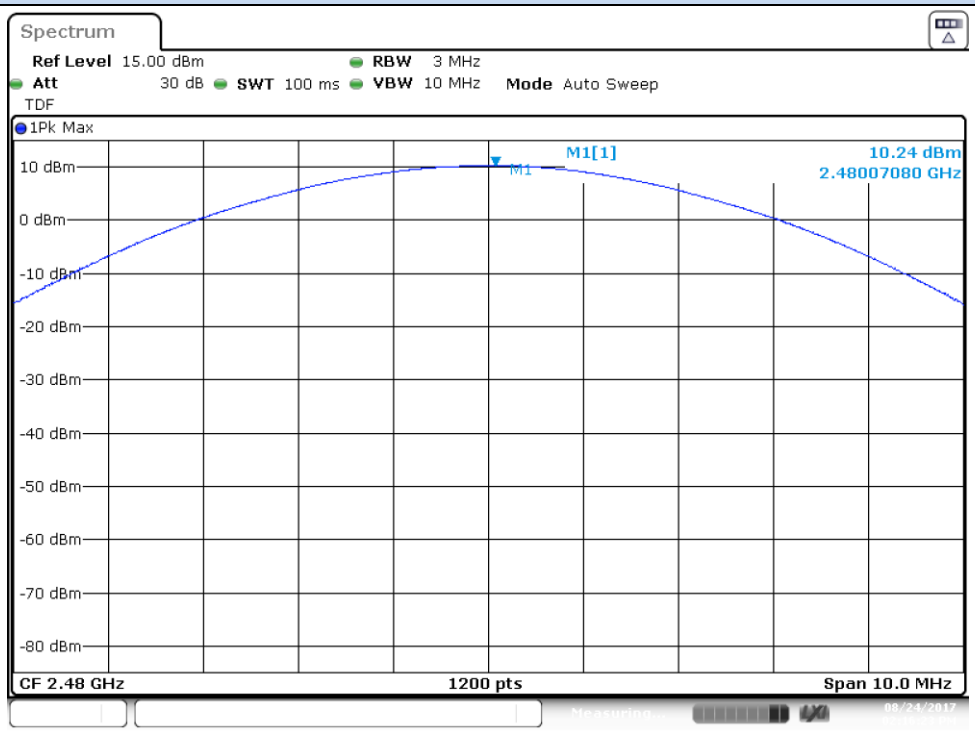
Peak Power – CH78



Date: 24.AUG.2017 14:15:46

EDR – π/4-DQPSK

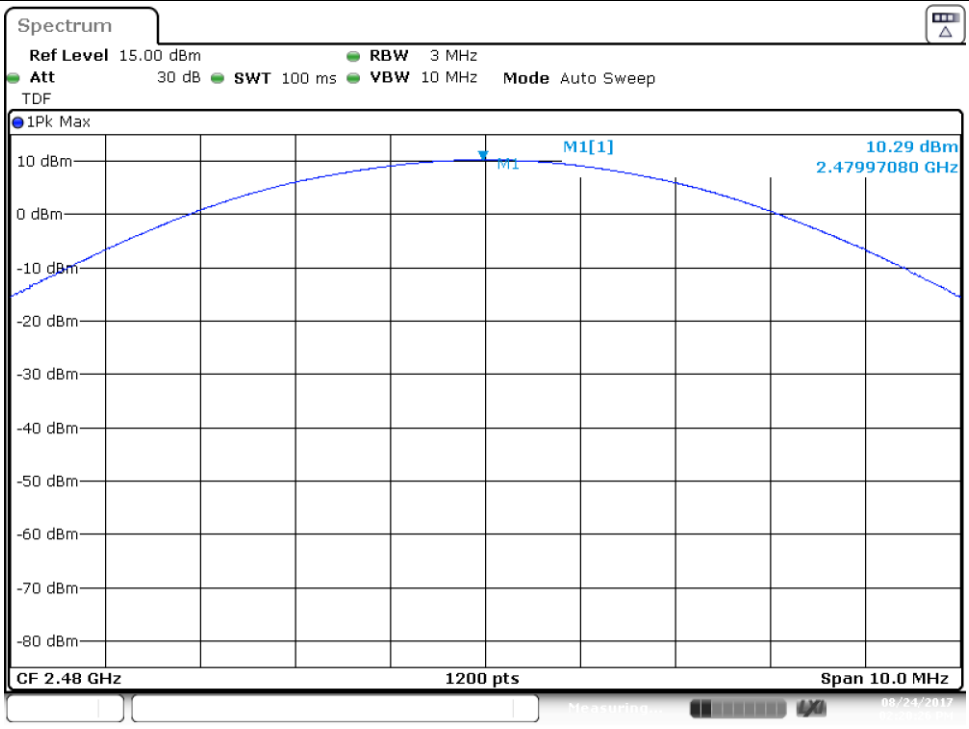
Peak Power – CH78



Date: 24.AUG.2017 14:16:23

EDR – 8-DPSK

Peak Power – CH78



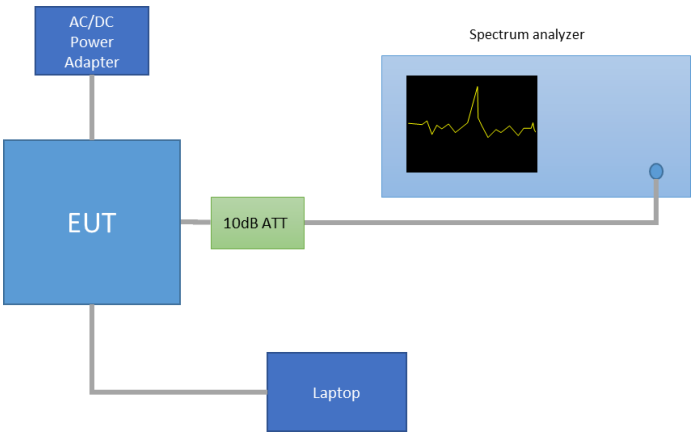
B.5 Out-of-band emission (conducted)

Test limits

FCC part	RSS part	Limits
15.247 (d)	RSS-247 Clause 5.5	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 procedure

The setup below was used to measure the out-of-band emissions (conducted). 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.

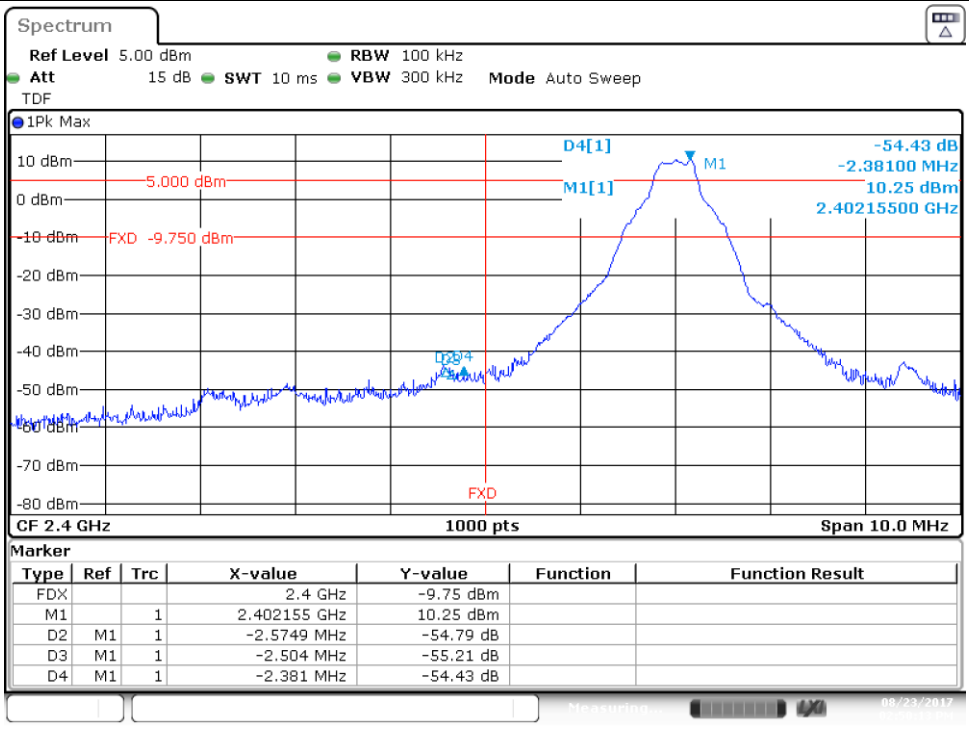


Note: these PSD_{Peak} values are shown just as a reference for the compliance of the Out-of-band Measurements. Thus the RBW used for these measurements was 100 kHz.

Mode	**CH**	**Frequency [MHz]**	**PSD Peak [dBm]**
Basic Rate - GFSK	0	2402	10.25
	39	2441	10.24
	78	2480	10.38
EDR – π/4-DQPSK	0	2402	9.17
	39	2441	9.29
	78	2480	9.43
EDR – 8-DPSK	0	2402	9.39
	39	2441	9.32
	78	2480	9.47

Basic Rate - GFSK

BE Low Freq Section – CH0

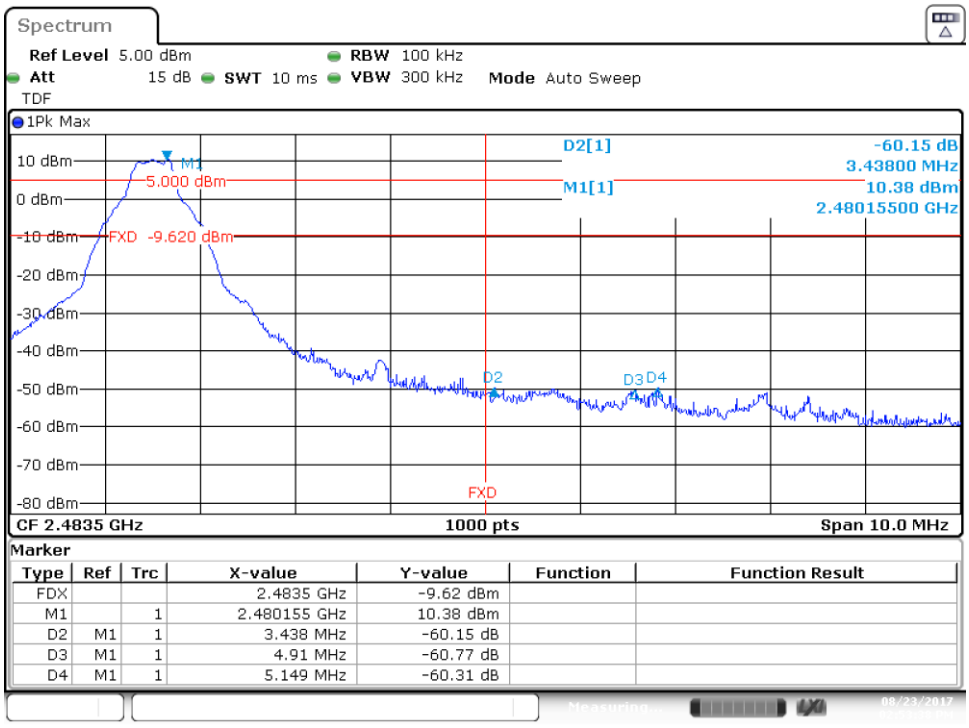


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.4 GHz	-9.75 dBm		
M1		1	2.402155 GHz	10.25 dBm		
D2	M1	1	-2.5749 MHz	-54.79 dB		
D3	M1	1	-2.504 MHz	-55.21 dB		
D4	M1	1	-2.381 MHz	-54.43 dB		

Date: 23.AUG.2017 14:50:13

BE High Freq Section – CH78

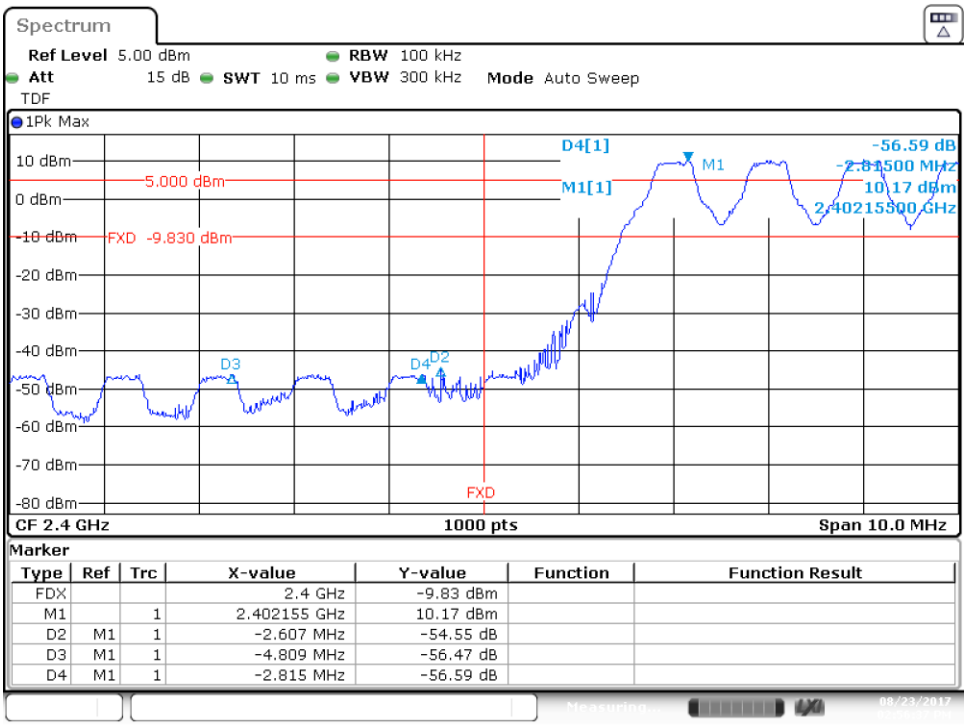


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.4835 GHz	-9.62 dBm		
M1		1	2.480155 GHz	10.38 dBm		
D2	M1	1	3.438 MHz	-60.15 dB		
D3	M1	1	4.91 MHz	-60.77 dB		
D4	M1	1	5.149 MHz	-60.31 dB		

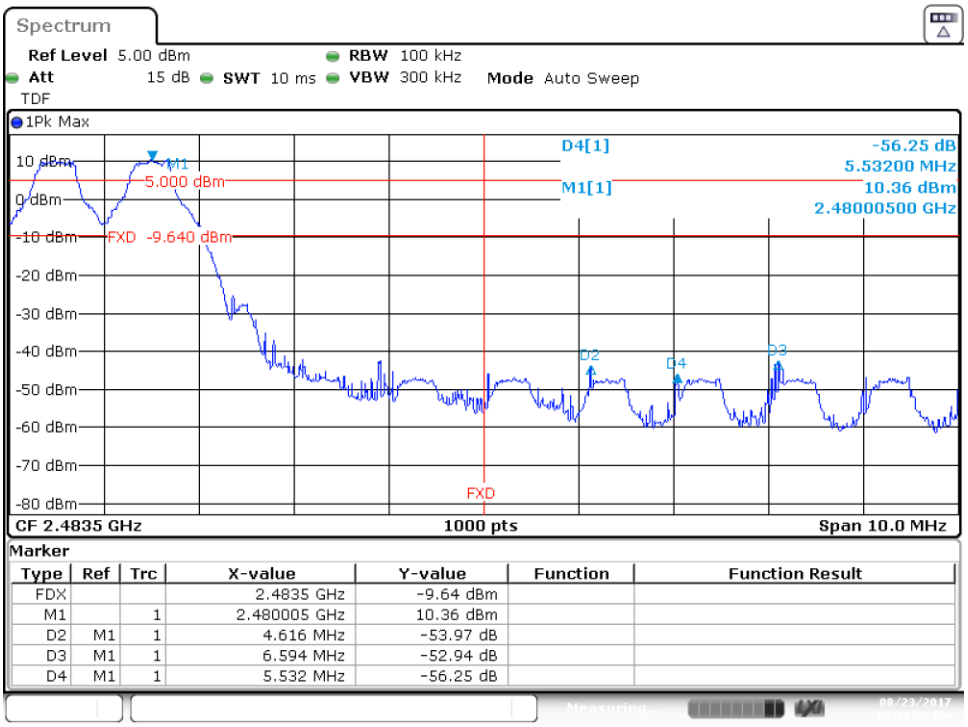
Date: 23.AUG.2017 14:53:38

BE Low Freq Section – Hopping



Date: 23.AUG.2017 14:56:37

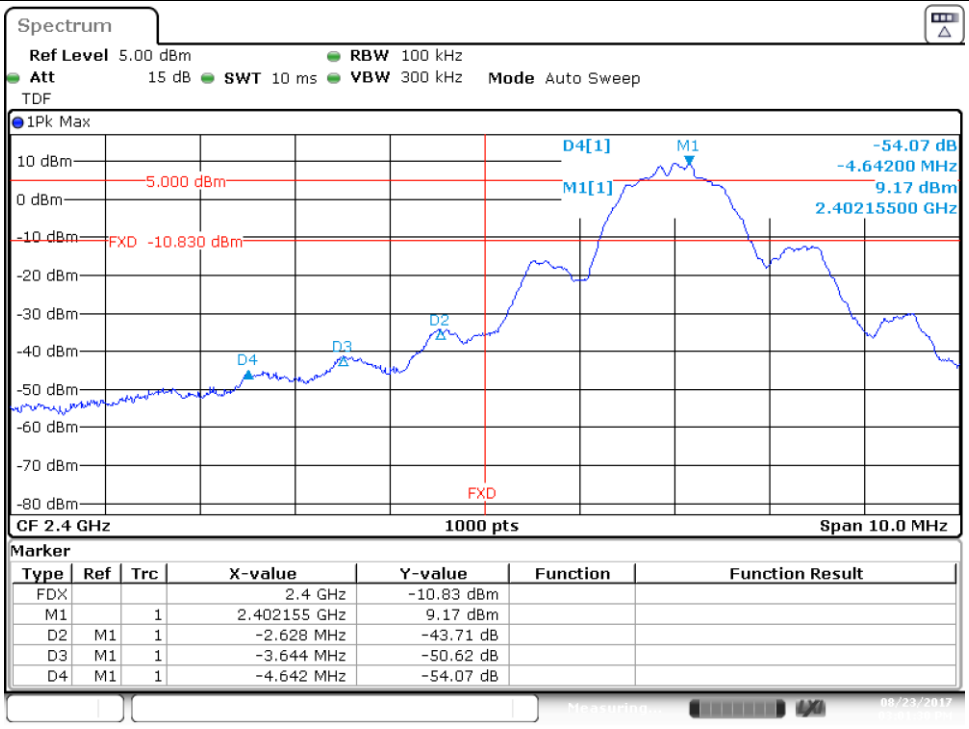
BE High Freq Section – Hopping



Date: 23.AUG.2017 14:58:36

EDR – π/4-DQPSK

BE Low Freq Section – CH0

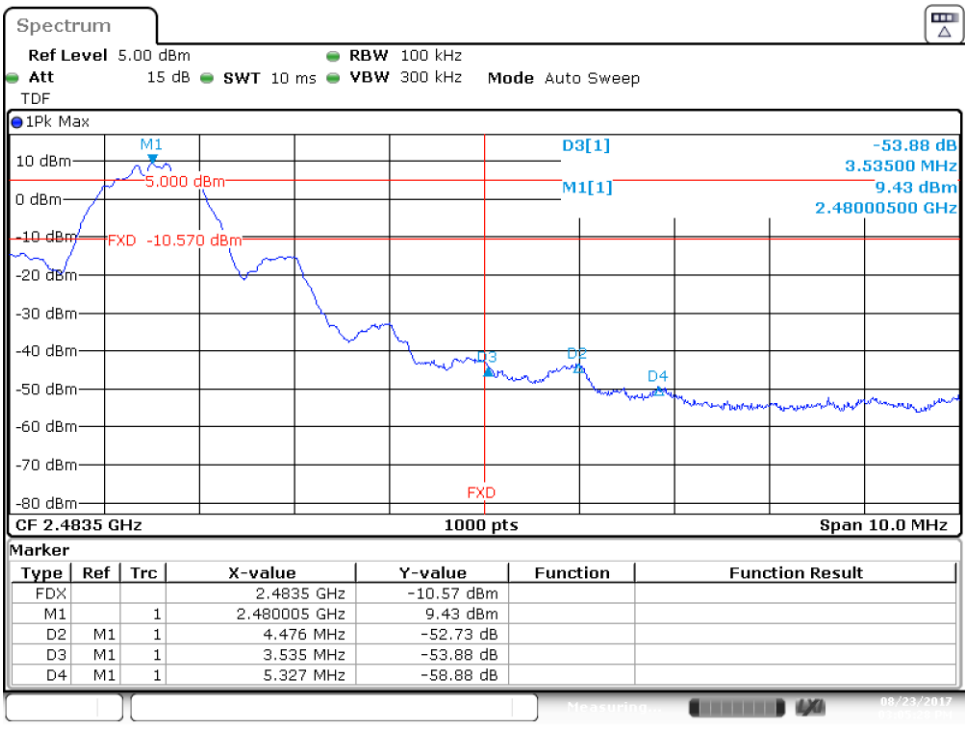


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.4 GHz	-10.83 dBm		
M1		1	2.402155 GHz	9.17 dBm		
D2	M1	1	-2.628 MHz	-43.71 dB		
D3	M1	1	-3.644 MHz	-50.62 dB		
D4	M1	1	-4.642 MHz	-54.07 dB		

Date: 23.AUG.2017 15:01:31

BE High Freq Section – CH78

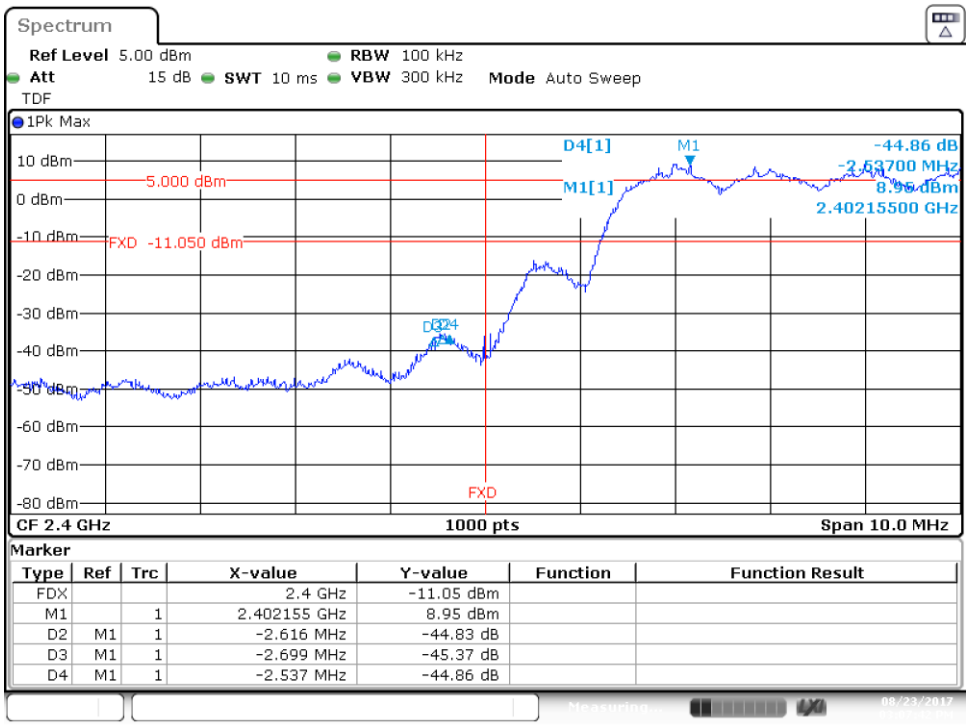


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.4835 GHz	-10.57 dBm		
M1		1	2.480005 GHz	9.43 dBm		
D2	M1	1	4.476 MHz	-52.73 dB		
D3	M1	1	3.535 MHz	-53.88 dB		
D4	M1	1	5.327 MHz	-58.88 dB		

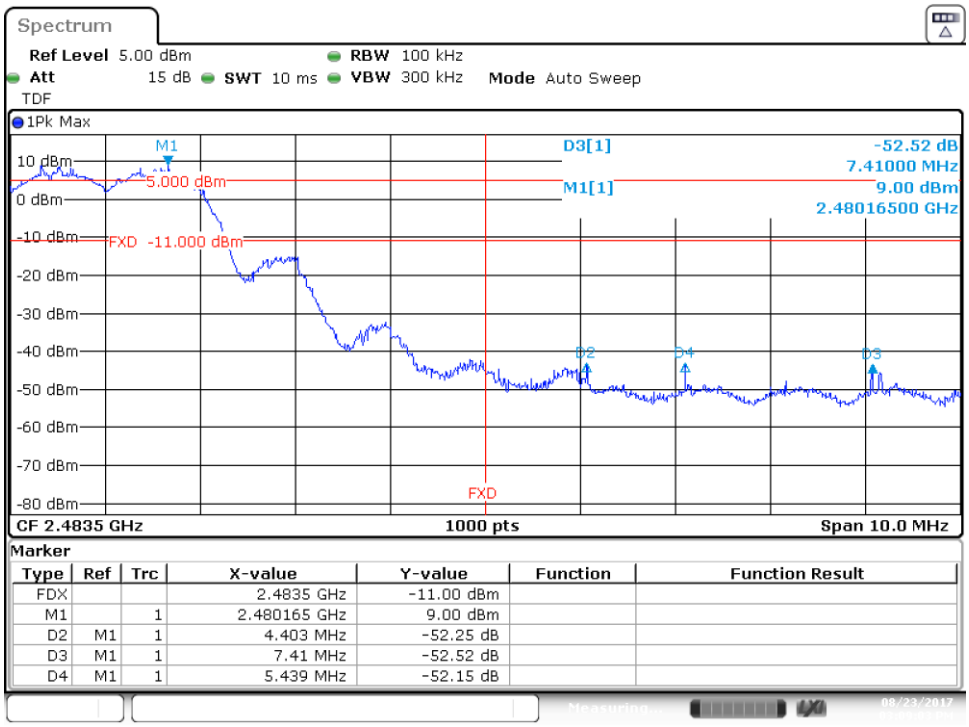
Date: 23.AUG.2017 15:05:28

BE Low Freq Section – Hopping



Date: 23.AUG.2017 15:07:42

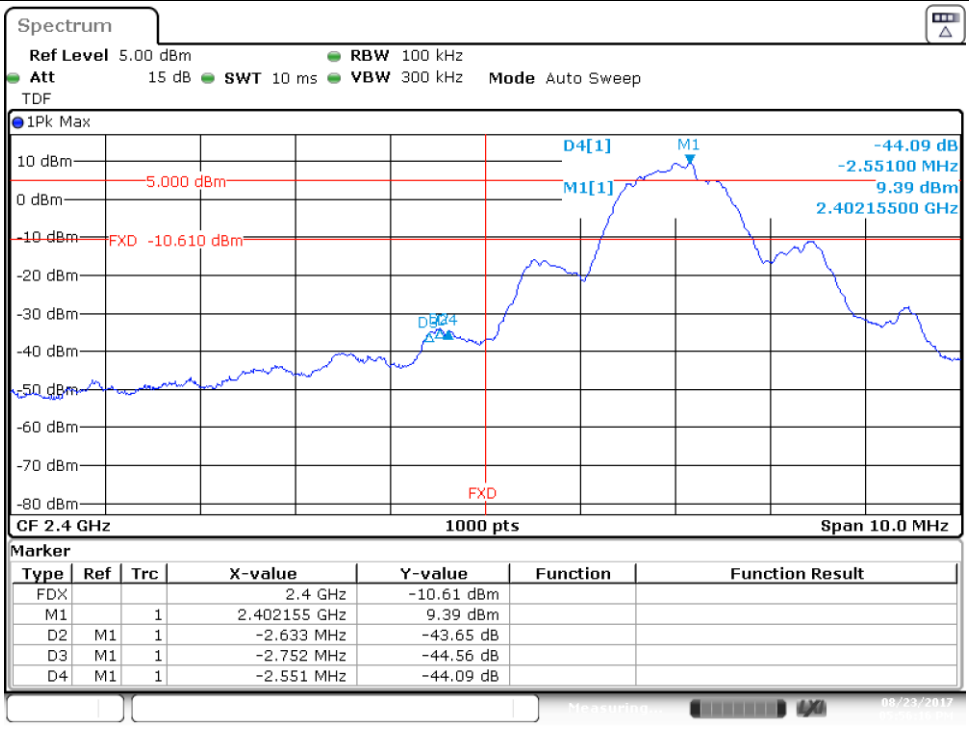
BE High Freq Section – Hopping



Date: 23.AUG.2017 15:09:03

EDR – 8-DPSK

BE Low Freq Section – CH0

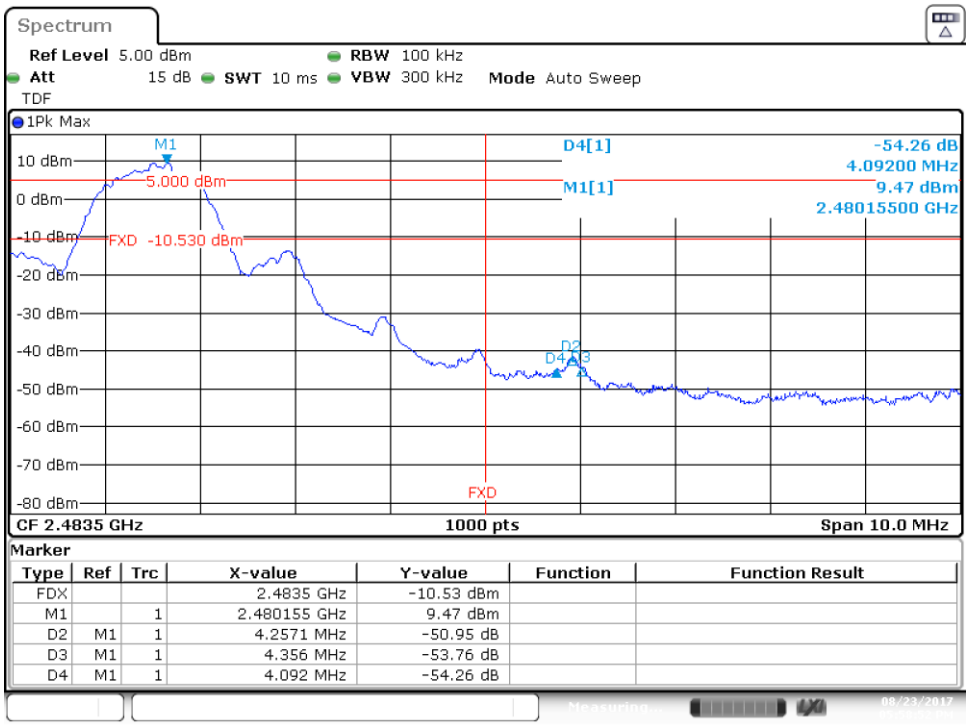


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.4 GHz	-10.61 dBm		
M1		1	2.402155 GHz	9.39 dBm		
D2	M1	1	-2.633 MHz	-43.65 dB		
D3	M1	1	-2.752 MHz	-44.56 dB		
D4	M1	1	-2.551 MHz	-44.09 dB		

Date: 23.AUG.2017 17:56:17

BE High Freq Section – CH78

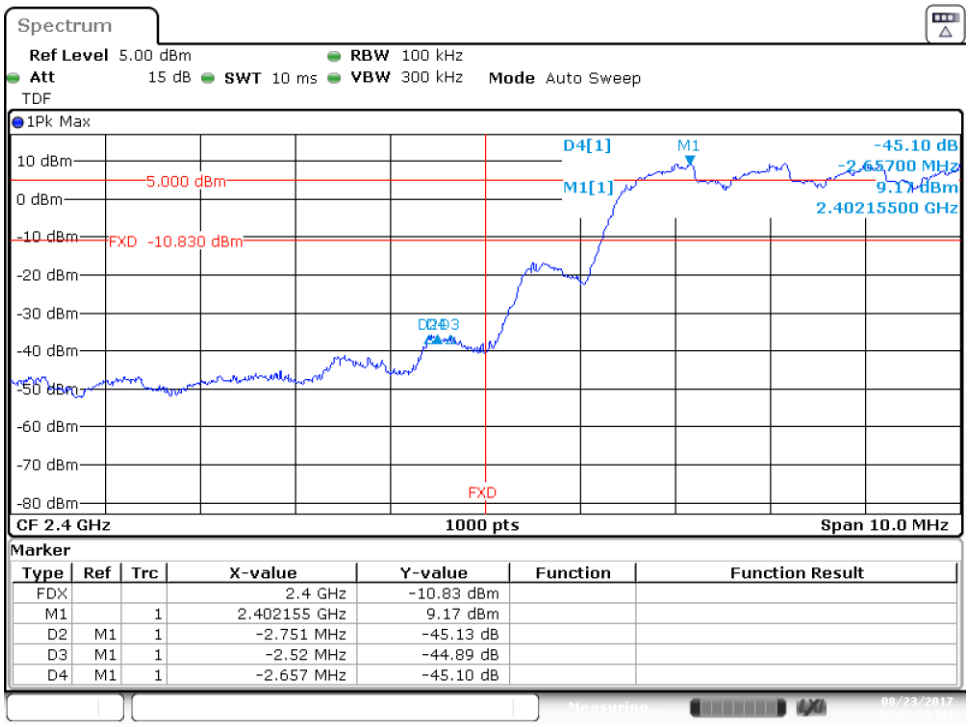


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			2.4835 GHz	-10.53 dBm		
M1		1	2.480155 GHz	9.47 dBm		
D2	M1	1	4.2571 MHz	-50.95 dB		
D3	M1	1	4.356 MHz	-53.76 dB		
D4	M1	1	4.092 MHz	-54.26 dB		

Date: 23.AUG.2017 17:58:53

BE Low Freq Section – Hopping



Date: 23.AUG.2017 18:07:59

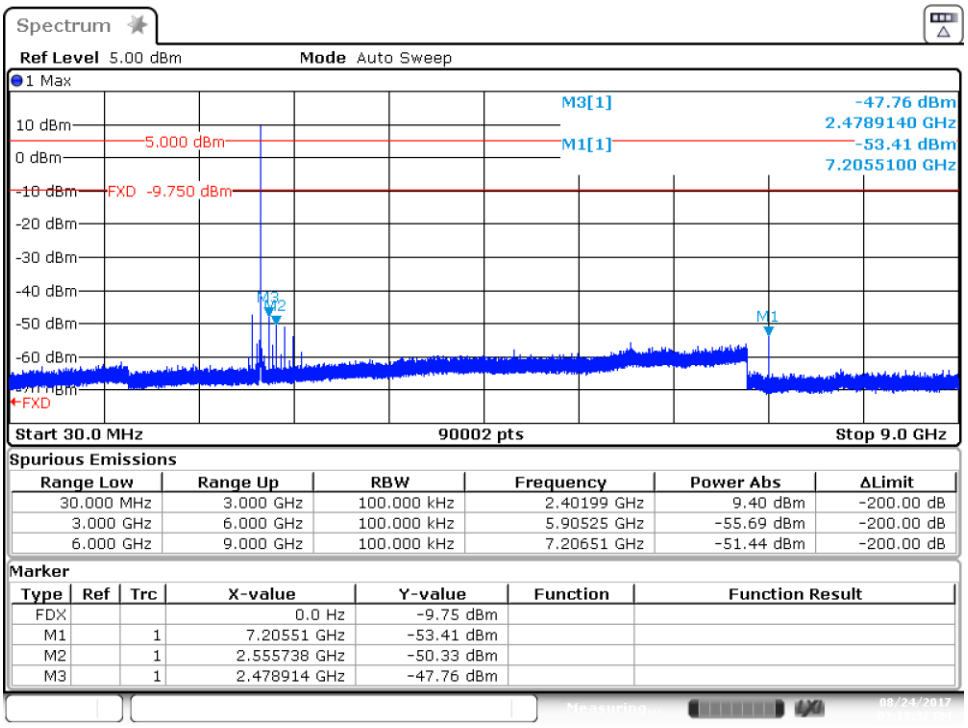
BE High Freq Section – Hopping

Date: 23.AUG.2017 18:02:42

Conducted Spurious results Screenshot

Basic Rate - GFSK

Cond Spur – CH0 (30MHz - 9GHz)



Spurious Emissions

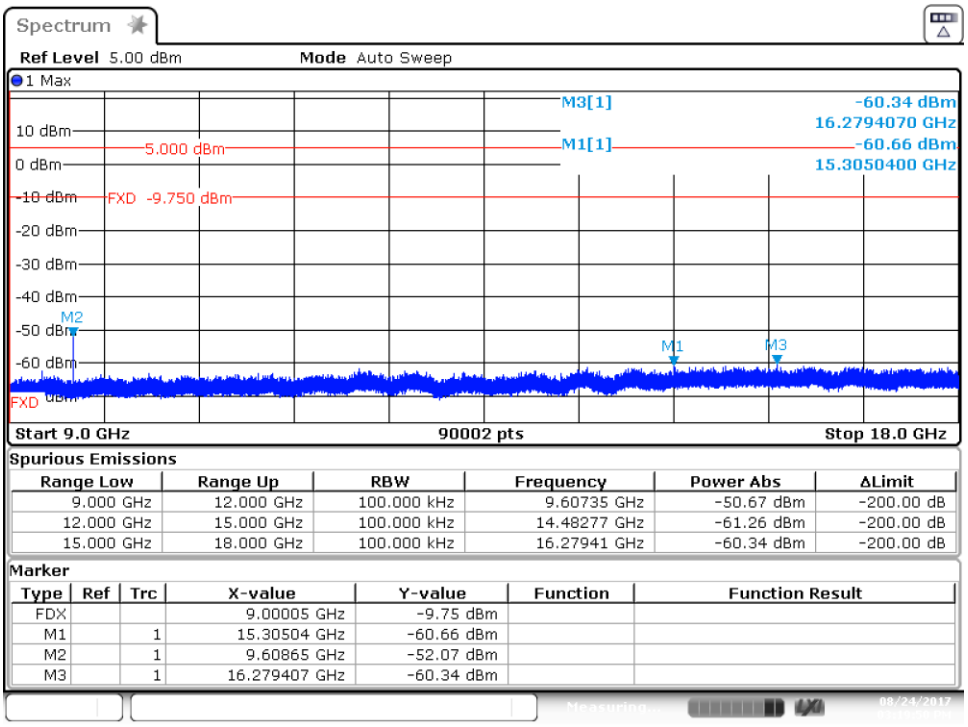
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.40199 GHz	9.40 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.90525 GHz	-55.69 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	7.20651 GHz	-51.44 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-9.75 dBm		
M1		1	7.20551 GHz	-53.41 dBm		
M2		1	2.555738 GHz	-50.33 dBm		
M3		1	2.478914 GHz	-47.76 dBm		

Date: 24.AUG.2017 15:18:32

Cond Spur – CH0 (9GHz - 18GHz)



Spurious Emissions

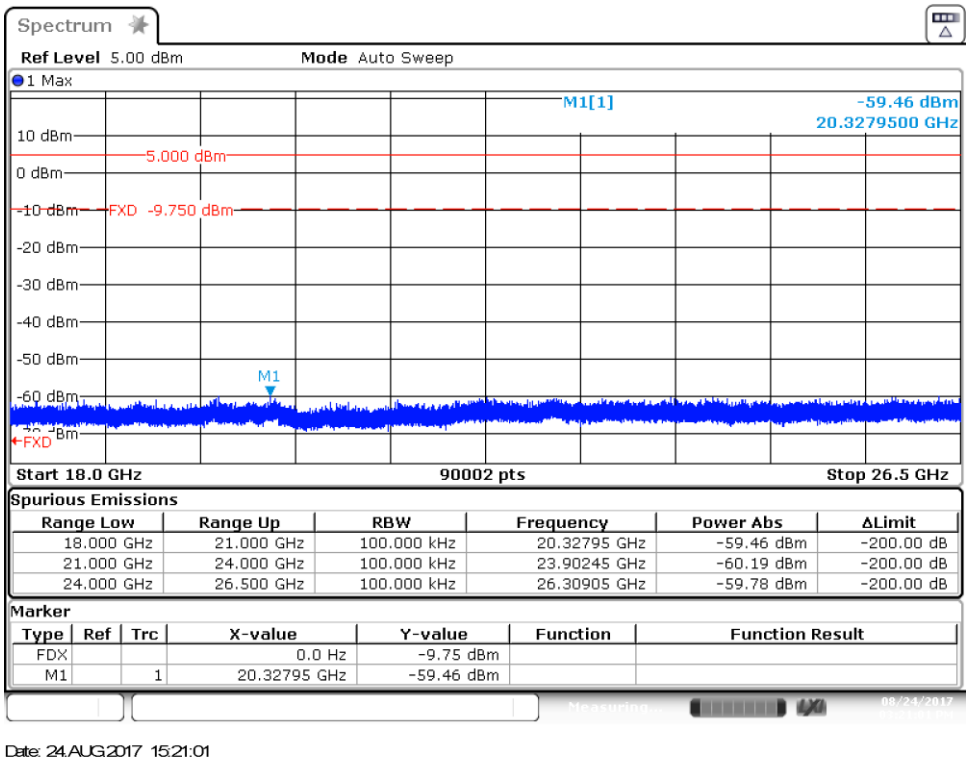
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	9.60735 GHz	-50.67 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.48277 GHz	-61.26 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	16.27941 GHz	-60.34 dBm	-200.00 dB

Marker

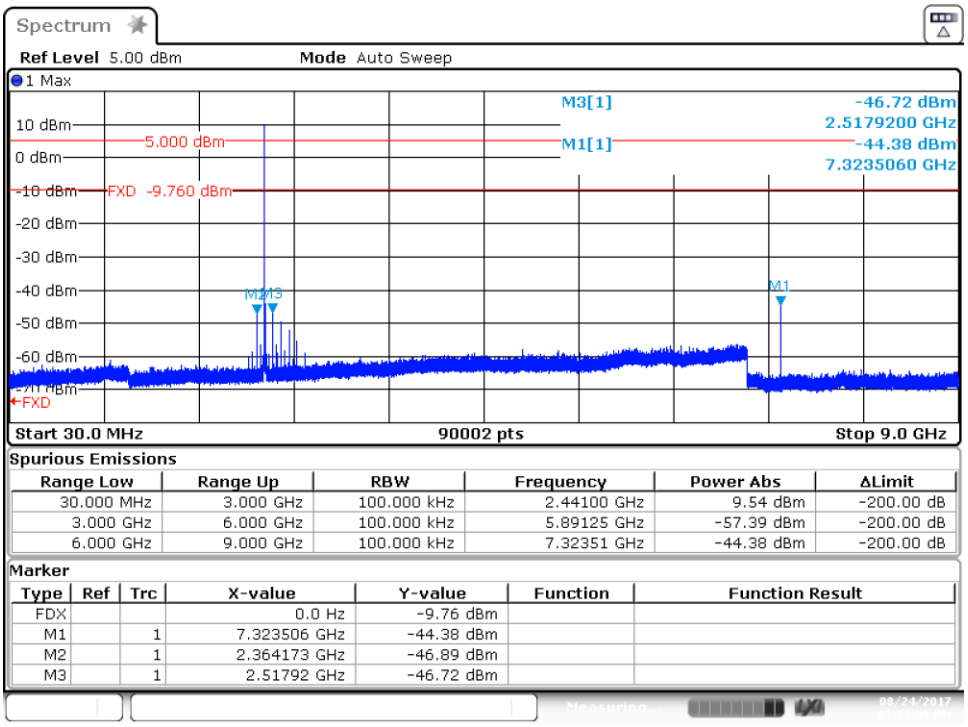
Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			9.00005 GHz	-9.75 dBm		
M1		1	15.30504 GHz	-60.66 dBm		
M2		1	9.60865 GHz	-52.07 dBm		
M3		1	16.279407 GHz	-60.34 dBm		

Date: 24.AUG.2017 15:19:50

Cond Spur – CH0 (18GHz – 26.5GHz)



Cond Spur – CH39 (30MHz - 9GHz)



Spurious Emissions

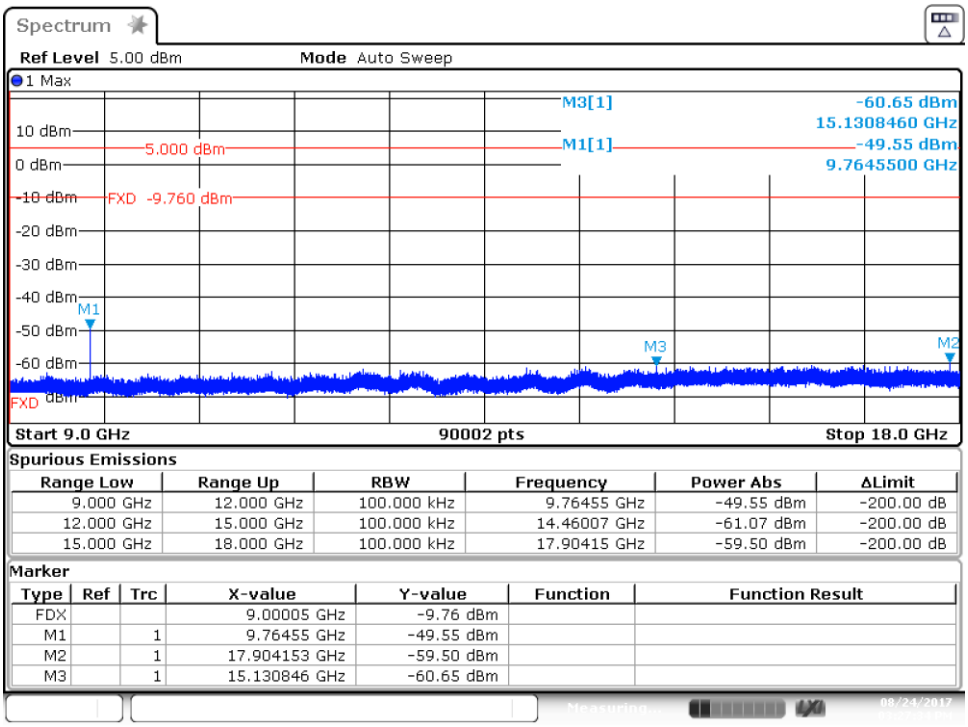
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.44100 GHz	9.54 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.89125 GHz	-57.39 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	7.32351 GHz	-44.38 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-9.76 dBm		
M1		1	7.323506 GHz	-44.38 dBm		
M2		1	2.364173 GHz	-46.89 dBm		
M3		1	2.51792 GHz	-46.72 dBm		

Date: 24.AUG.2017 15:24:39

Cond Spur – CH39 (9GHz - 18GHz)



Spurious Emissions

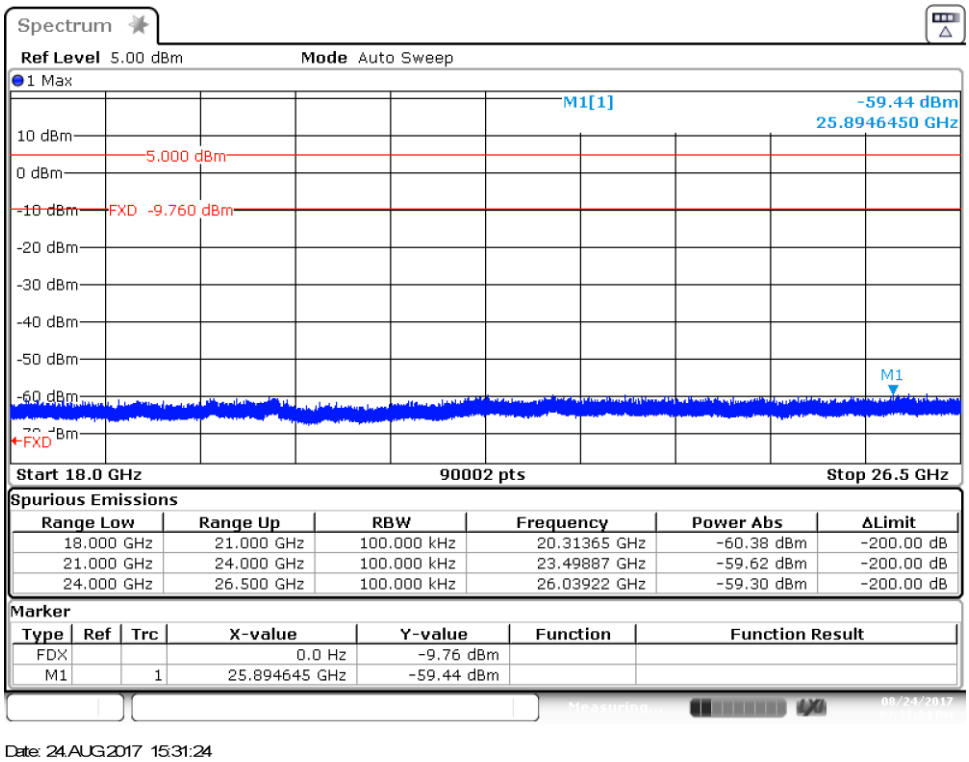
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	9.76455 GHz	-49.55 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.46007 GHz	-61.07 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.90415 GHz	-59.50 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			9.00005 GHz	-9.76 dBm		
M1		1	9.76455 GHz	-49.55 dBm		
M2		1	17.904153 GHz	-59.50 dBm		
M3		1	15.130846 GHz	-60.65 dBm		

Date: 24.AUG.2017 15:27:34

Cond Spur – CH39 (18GHz – 26.5GHz)



Spurious Emissions

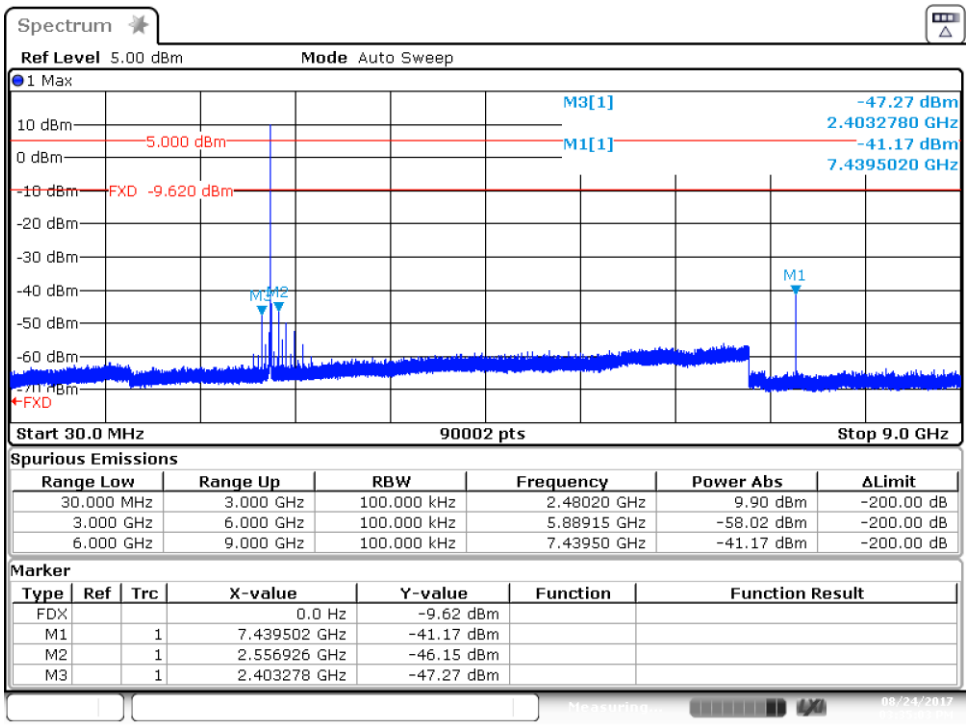
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
18.000 GHz	21.000 GHz	100.000 kHz	20.31365 GHz	-60.38 dBm	-200.00 dB
21.000 GHz	24.000 GHz	100.000 kHz	23.49887 GHz	-59.62 dBm	-200.00 dB
24.000 GHz	26.500 GHz	100.000 kHz	26.03922 GHz	-59.30 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-9.76 dBm		
M1		1	25.894645 GHz	-59.44 dBm		

Date: 24.AUG.2017 15:31:24

Cond Spur – CH78 (30MHz - 9GHz)



Spurious Emissions

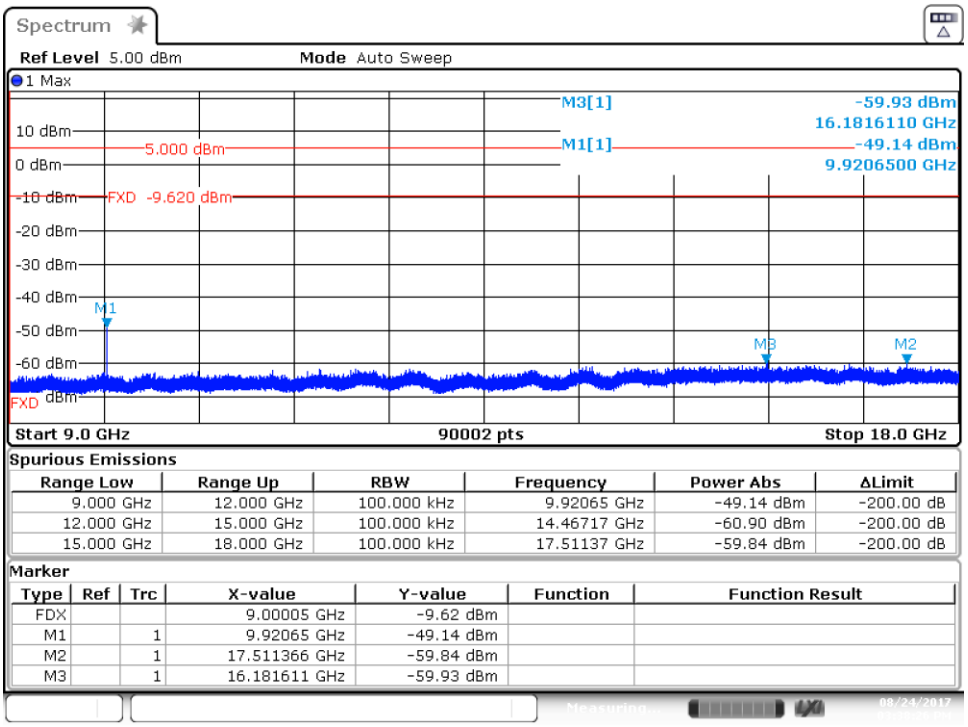
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.48020 GHz	9.90 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.88915 GHz	-58.02 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	7.43950 GHz	-41.17 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-9.62 dBm		
M1		1	7.439502 GHz	-41.17 dBm		
M2		1	2.556926 GHz	-46.15 dBm		
M3		1	2.403278 GHz	-47.27 dBm		

Date: 24.AUG.2017 15:35:03

Cond Spur – CH78 (9GHz - 18GHz)



Spurious Emissions

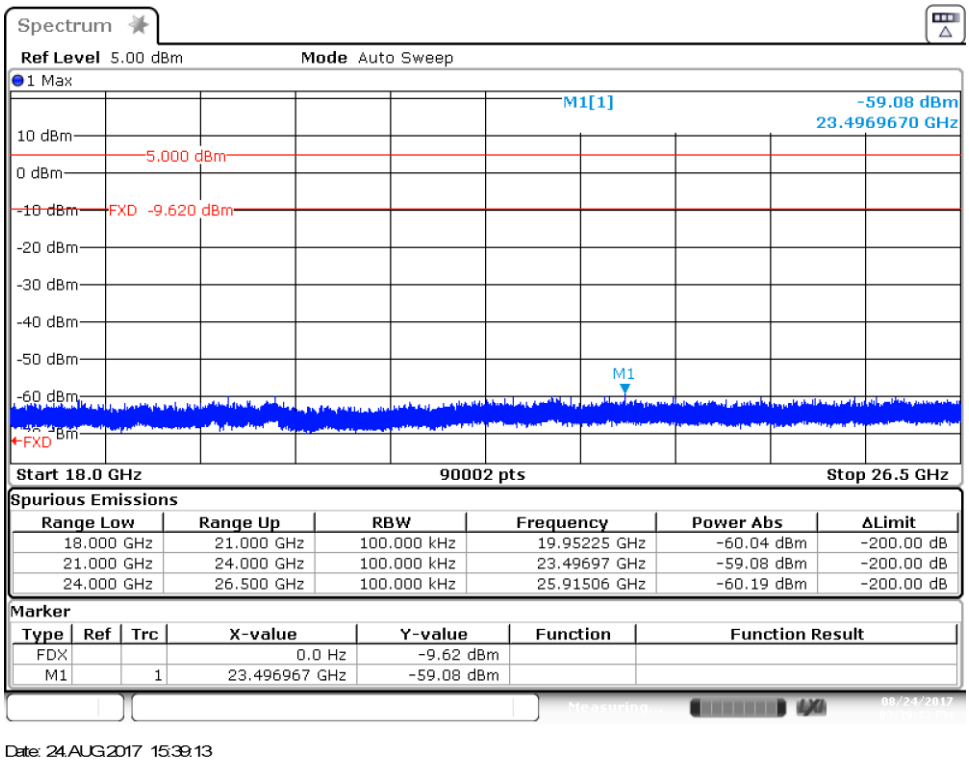
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	9.92065 GHz	-49.14 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.46717 GHz	-60.90 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.51137 GHz	-59.84 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			9.00005 GHz	-9.62 dBm		
M1		1	9.92065 GHz	-49.14 dBm		
M2		1	17.511366 GHz	-59.84 dBm		
M3		1	16.181611 GHz	-59.93 dBm		

Date: 24.AUG.2017 15:38:26

Cond Spur – CH78 (18GHz – 26.5GHz)



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
18.000 GHz	21.000 GHz	100.000 kHz	19.95225 GHz	-60.04 dBm	-200.00 dB
21.000 GHz	24.000 GHz	100.000 kHz	23.49697 GHz	-59.08 dBm	-200.00 dB
24.000 GHz	26.500 GHz	100.000 kHz	25.91506 GHz	-60.19 dBm	-200.00 dB

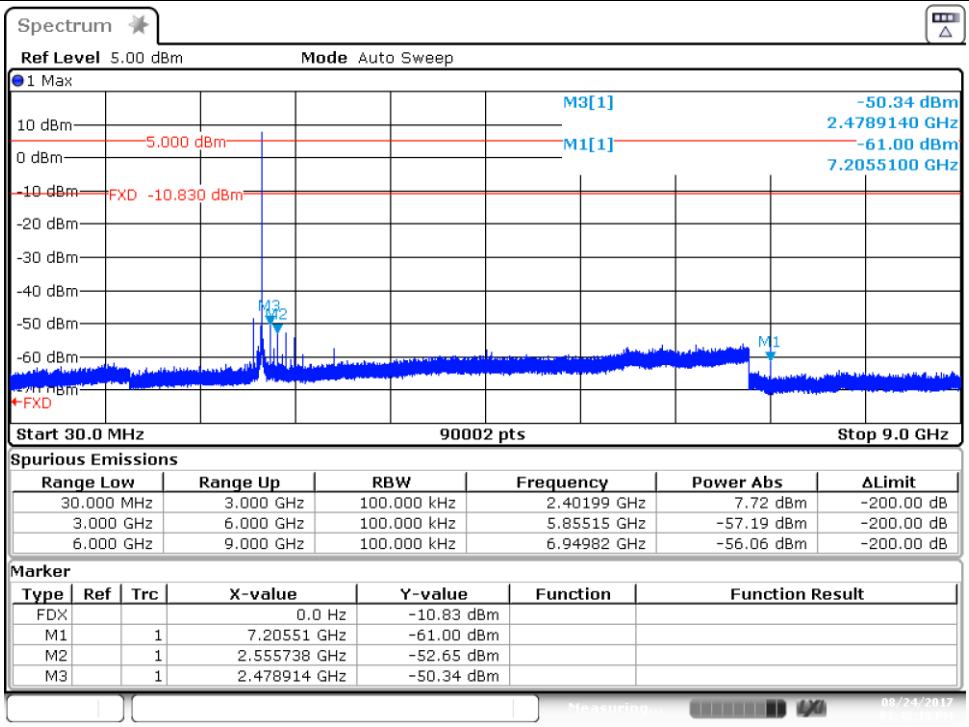
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-9.62 dBm		
M1		1	23.496967 GHz	-59.08 dBm		

Date: 24.AUG.2017 15:39:13

EDR – π/4-DQPSK

Cond Spur – CH0 (30MHz - 9GHz)



Spurious Emissions

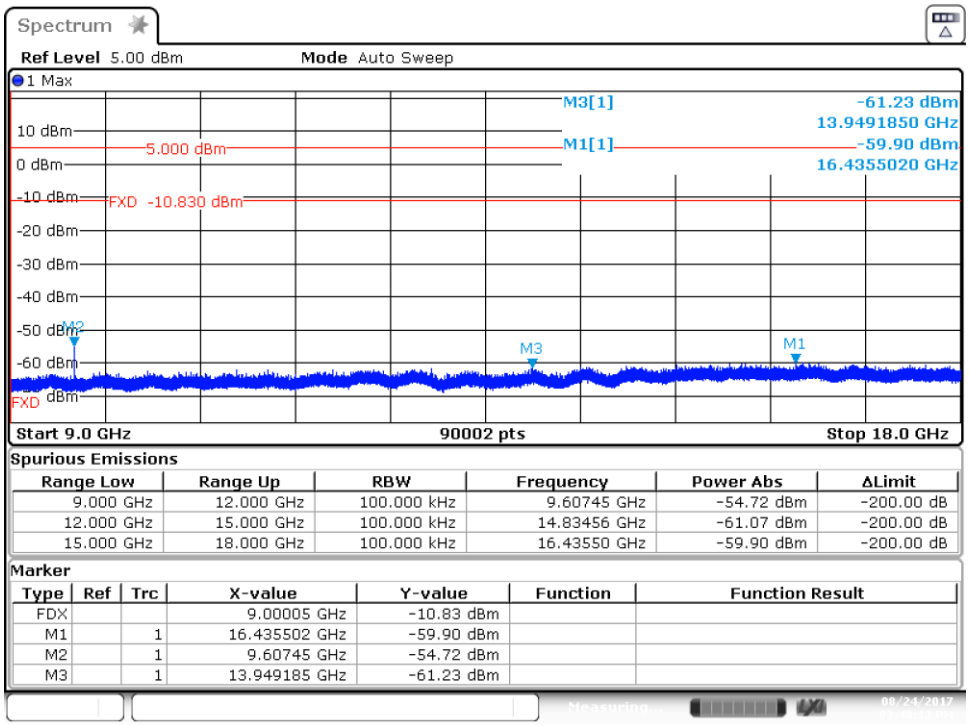
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.40199 GHz	7.72 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.85515 GHz	-57.19 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	6.94982 GHz	-56.06 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-10.83 dBm		
M1		1	7.20551 GHz	-61.00 dBm		
M2		1	2.555738 GHz	-52.65 dBm		
M3		1	2.478914 GHz	-50.34 dBm		

Date: 24.AUG.2017 15:42:18

Cond Spur – CH0 (9GHz - 18GHz)



Spurious Emissions

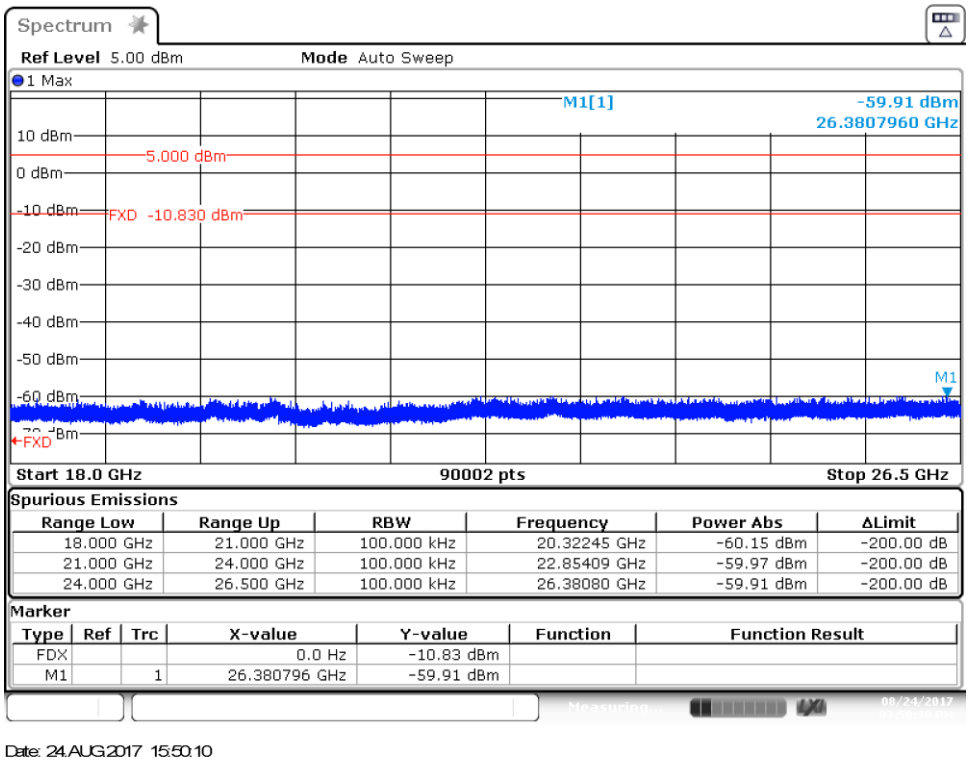
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	9.60745 GHz	-54.72 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.83456 GHz	-61.07 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	16.43550 GHz	-59.90 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			9.00005 GHz	-10.83 dBm		
M1		1	16.435502 GHz	-59.90 dBm		
M2		1	9.60745 GHz	-54.72 dBm		
M3		1	13.949185 GHz	-61.23 dBm		

Date: 24.AUG.2017 15:48:12

Cond Spur – CH0 (18GHz – 26.5GHz)



Spurious Emissions

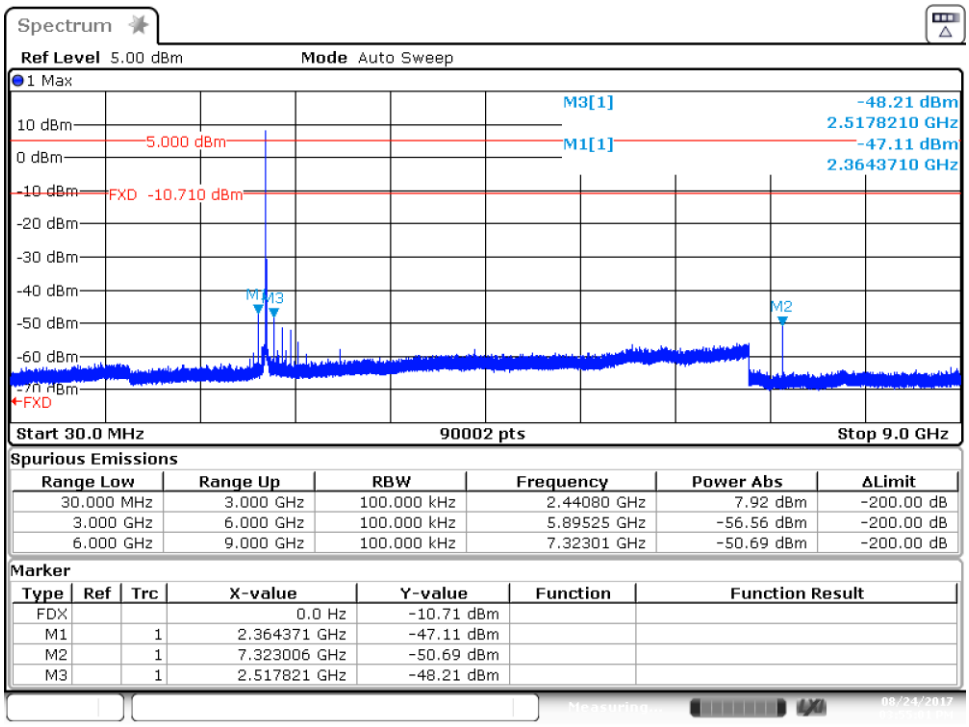
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
18.000 GHz	21.000 GHz	100.000 kHz	20.32245 GHz	-60.15 dBm	-200.00 dB
21.000 GHz	24.000 GHz	100.000 kHz	22.85409 GHz	-59.97 dBm	-200.00 dB
24.000 GHz	26.500 GHz	100.000 kHz	26.38080 GHz	-59.91 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-10.83 dBm		
M1		1	26.380796 GHz	-59.91 dBm		

Date: 24.AUG.2017 15:50:10

Cond Spur – CH39 (30MHz - 9GHz)



Spurious Emissions

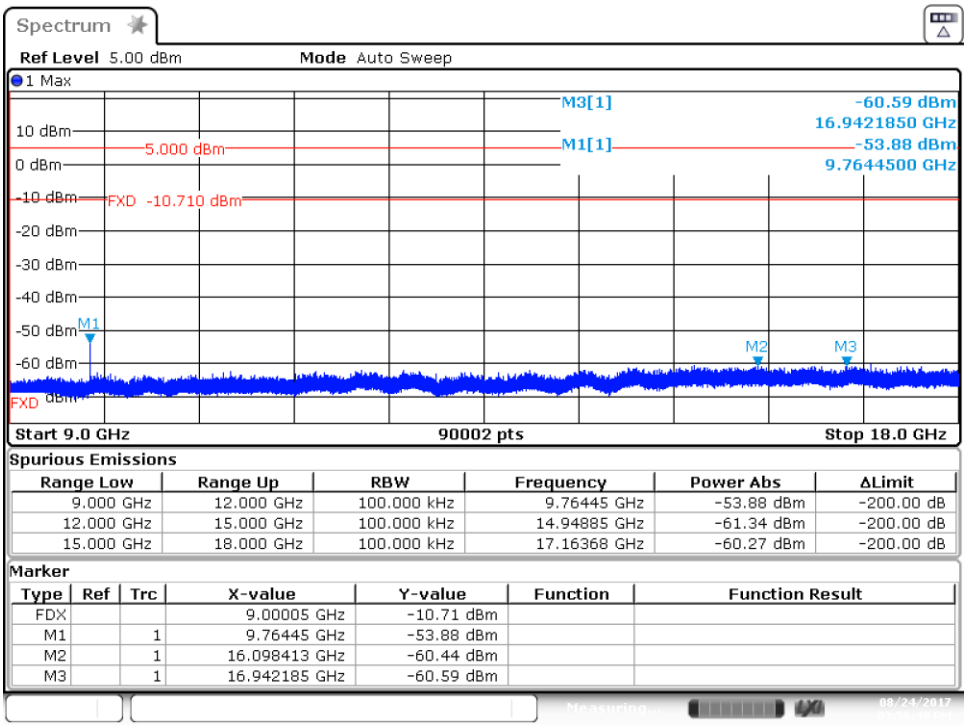
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.44080 GHz	7.92 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.89525 GHz	-56.56 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	7.32301 GHz	-50.69 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-10.71 dBm		
M1		1	2.364371 GHz	-47.11 dBm		
M2		1	7.323006 GHz	-50.69 dBm		
M3		1	2.517821 GHz	-48.21 dBm		

Date: 24.AUG.2017 15:55:02

Cond Spur – CH39 (9GHz - 18GHz)



Spurious Emissions

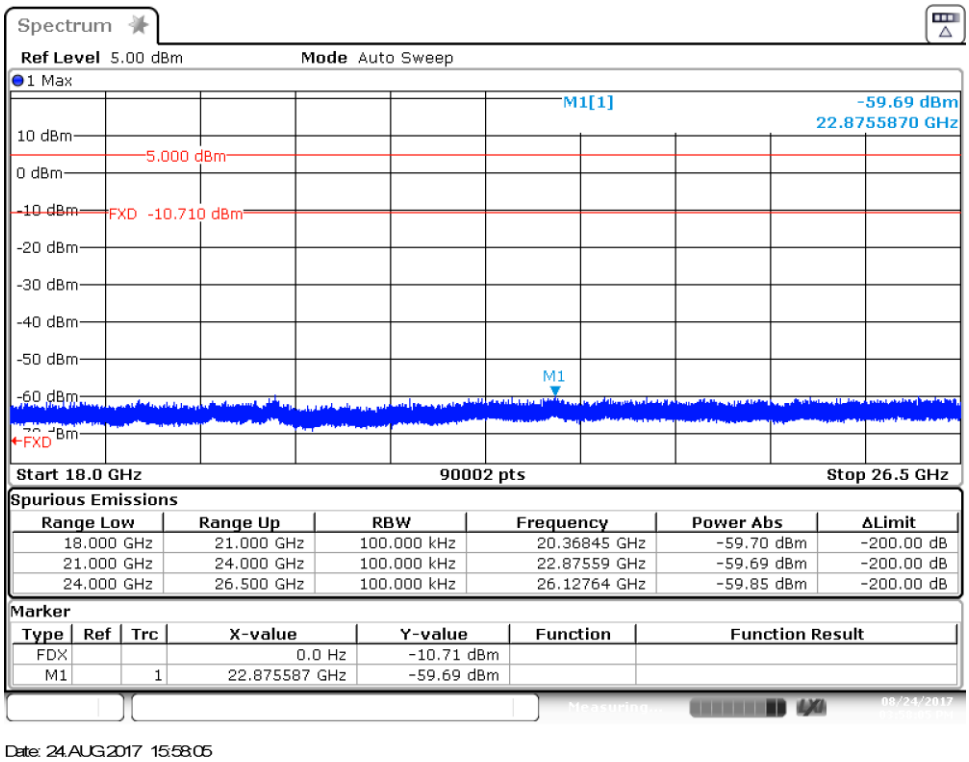
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	9.76445 GHz	-53.88 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.94885 GHz	-61.34 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.16368 GHz	-60.27 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			9.00005 GHz	-10.71 dBm		
M1		1	9.76445 GHz	-53.88 dBm		
M2		1	16.098413 GHz	-60.44 dBm		
M3		1	16.942185 GHz	-60.59 dBm		

Date: 24.AUG.2017 15:56:49

Cond Spur – CH39 (18GHz – 26.5GHz)



Spurious Emissions

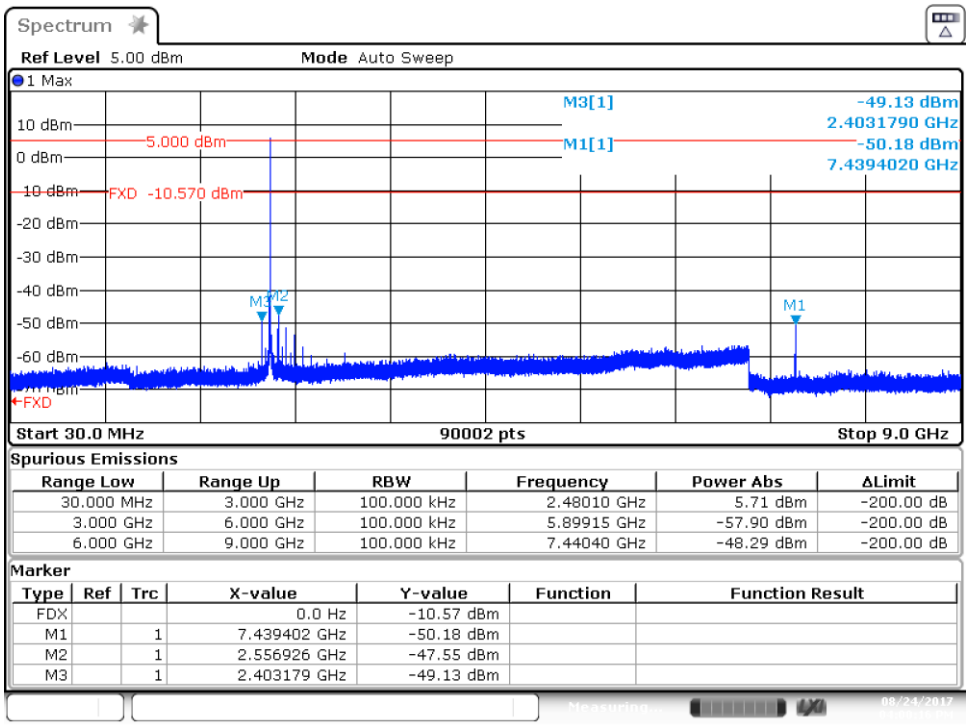
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
18.000 GHz	21.000 GHz	100.000 kHz	20.36845 GHz	-59.70 dBm	-200.00 dB
21.000 GHz	24.000 GHz	100.000 kHz	22.87559 GHz	-59.69 dBm	-200.00 dB
24.000 GHz	26.500 GHz	100.000 kHz	26.12764 GHz	-59.85 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-10.71 dBm		
M1		1	22.875587 GHz	-59.69 dBm		

Date: 24.AUG.2017 15:58:05

Cond Spur – CH78 (30MHz - 9GHz)



Spurious Emissions

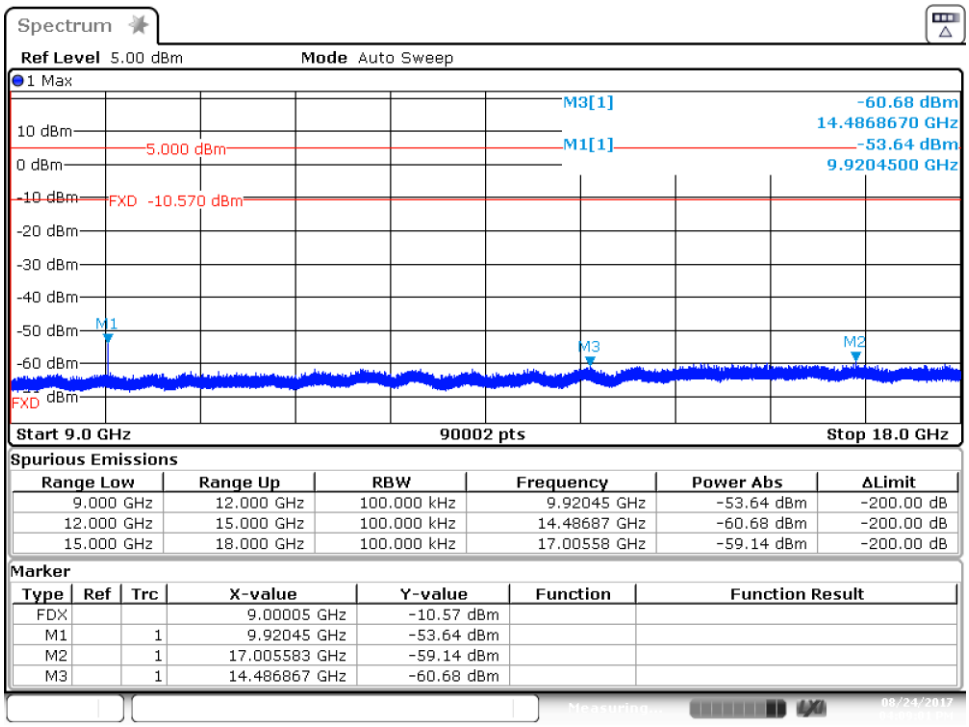
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.48010 GHz	5.71 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.89915 GHz	-57.90 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	7.44040 GHz	-48.29 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-10.57 dBm		
M1		1	7.439402 GHz	-50.18 dBm		
M2		1	2.556926 GHz	-47.55 dBm		
M3		1	2.403179 GHz	-49.13 dBm		

Date: 24.AUG.2017 16:00:15

Cond Spur – CH78 (9GHz - 18GHz)



Spurious Emissions

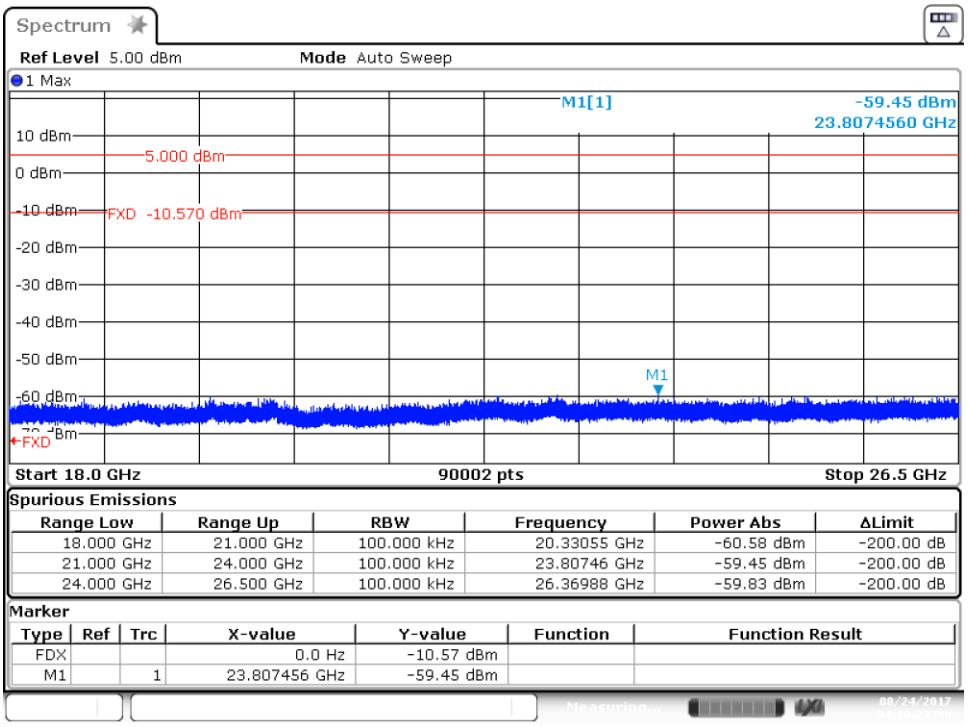
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	9.92045 GHz	-53.64 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.48687 GHz	-60.68 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.00558 GHz	-59.14 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			9.00005 GHz	-10.57 dBm		
M1		1	9.92045 GHz	-53.64 dBm		
M2		1	17.005583 GHz	-59.14 dBm		
M3		1	14.486867 GHz	-60.68 dBm		

Date: 24.AUG.2017 16:09:01

Cond Spur – CH78 (18GHz – 26.5GHz)



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
18.000 GHz	21.000 GHz	100.000 kHz	20.33055 GHz	-60.58 dBm	-200.00 dB
21.000 GHz	24.000 GHz	100.000 kHz	23.80746 GHz	-59.45 dBm	-200.00 dB
24.000 GHz	26.500 GHz	100.000 kHz	26.36988 GHz	-59.83 dBm	-200.00 dB

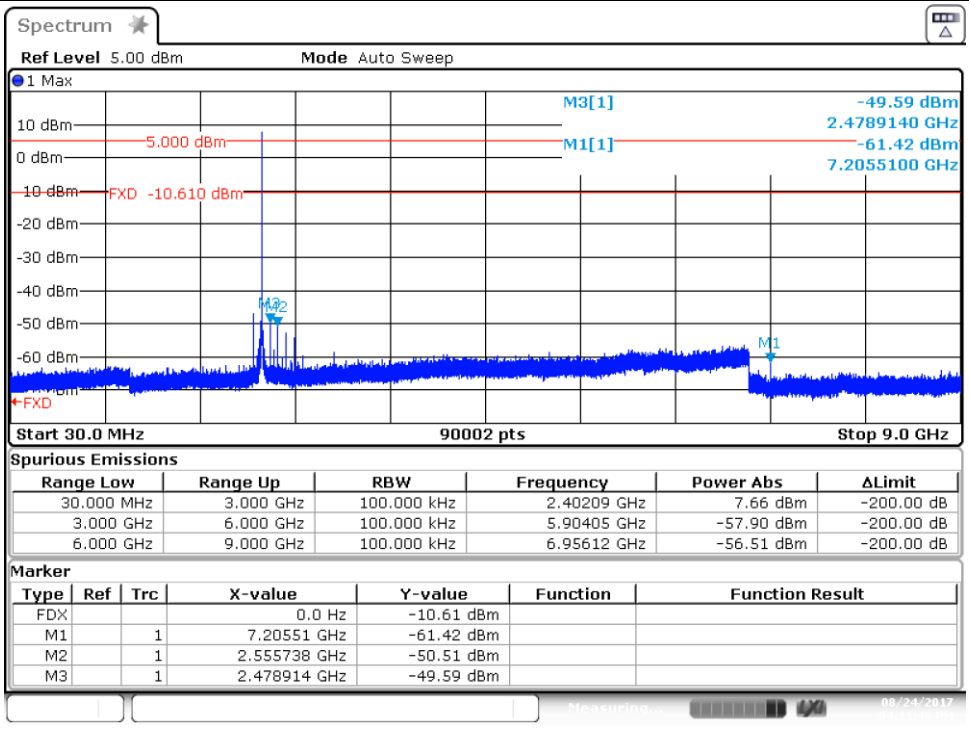
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-10.57 dBm		
M1		1	23.807456 GHz	-59.45 dBm		

Date: 24.AUG.2017 16:10:24

EDR – 8-DPSK

Cond Spur – CH0 (30MHz - 9GHz)



Spurious Emissions

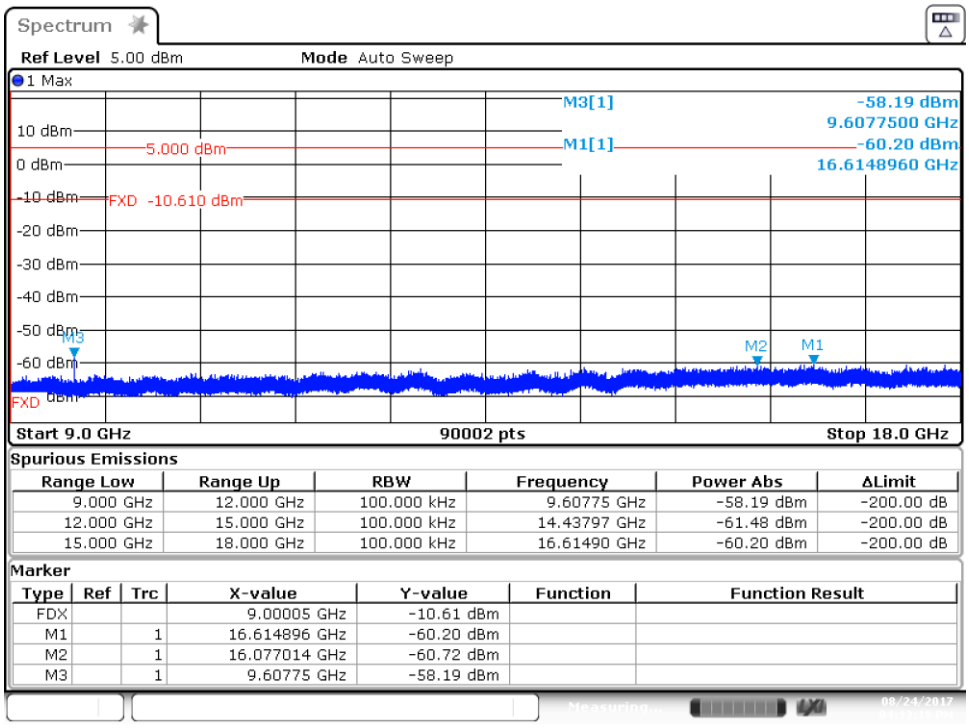
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.40209 GHz	7.66 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.90405 GHz	-57.90 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	6.95612 GHz	-56.51 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-10.61 dBm		
M1		1	7.20551 GHz	-61.42 dBm		
M2		1	2.555738 GHz	-50.51 dBm		
M3		1	2.478914 GHz	-49.59 dBm		

Date: 24.AUG.2017 16:11:46

Cond Spur – CH0 (9GHz - 18GHz)



Spurious Emissions

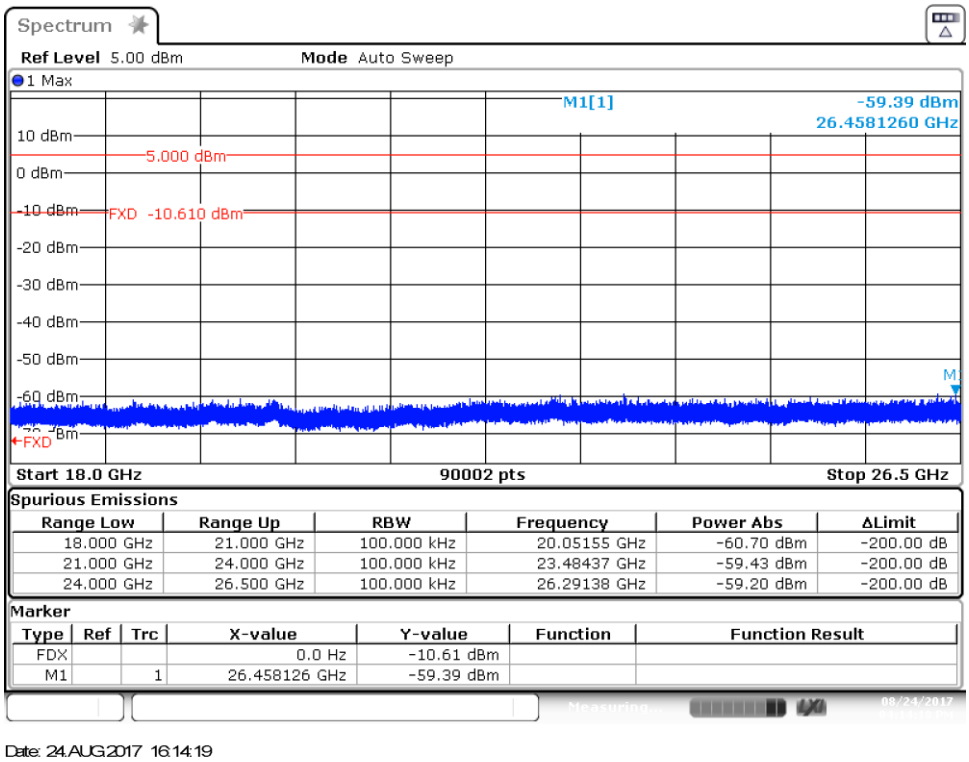
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	9.60775 GHz	-58.19 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.43797 GHz	-61.48 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	16.61490 GHz	-60.20 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			9.00005 GHz	-10.61 dBm		
M1		1	16.614896 GHz	-60.20 dBm		
M2		1	16.077014 GHz	-60.72 dBm		
M3		1	9.60775 GHz	-58.19 dBm		

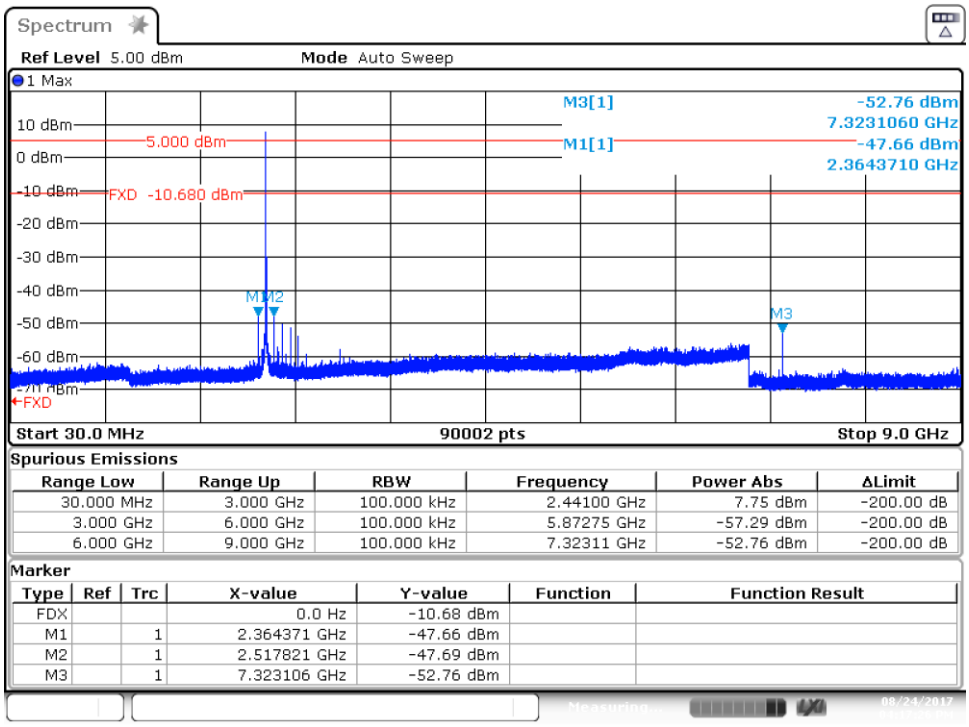
Date: 24.AUG.2017 16:13:19

Cond Spur – CH0 (18GHz – 26.5GHz)



Date: 24.AUG.2017 16:14:19

Cond Spur – CH39 (30MHz - 9GHz)



Spurious Emissions

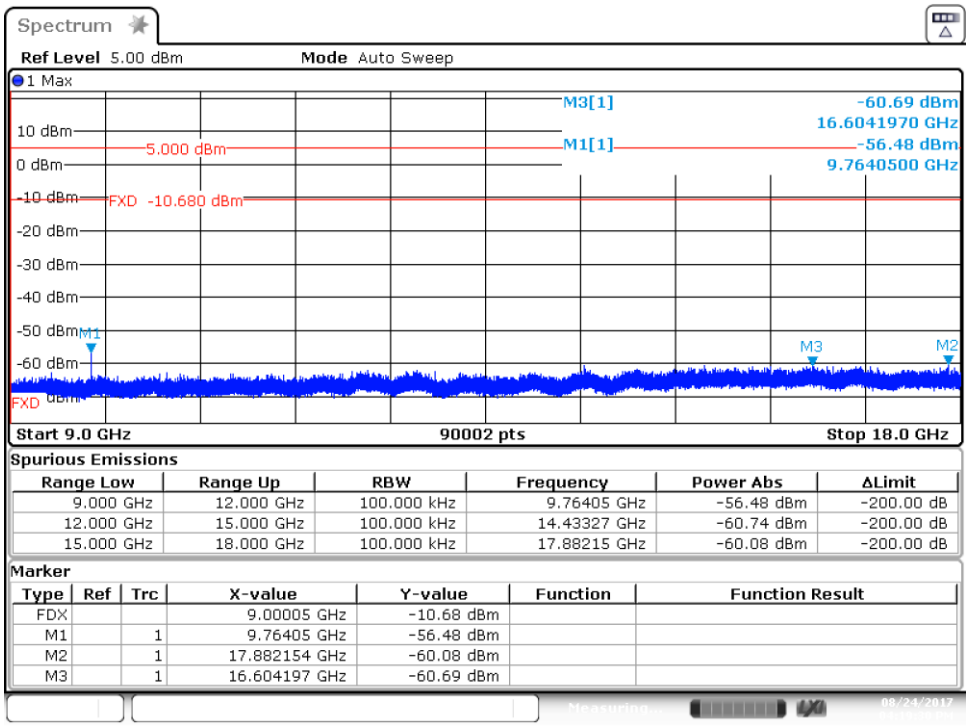
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.44100 GHz	7.75 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.87275 GHz	-57.29 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	7.32311 GHz	-52.76 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-10.68 dBm		
M1		1	2.364371 GHz	-47.66 dBm		
M2		1	2.517821 GHz	-47.69 dBm		
M3		1	7.323106 GHz	-52.76 dBm		

Date: 24.AUG.2017 16:17:26

Cond Spur – CH39 (9GHz - 18GHz)



Spurious Emissions

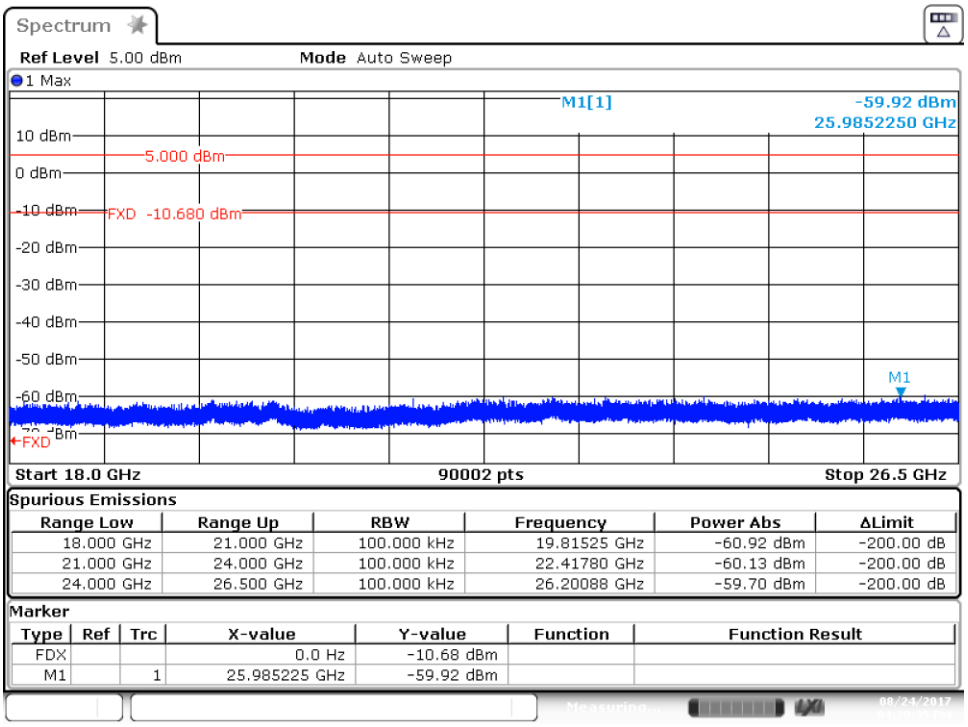
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	9.76405 GHz	-56.48 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	14.43327 GHz	-60.74 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.88215 GHz	-60.08 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			9.00005 GHz	-10.68 dBm		
M1		1	9.76405 GHz	-56.48 dBm		
M2		1	17.882154 GHz	-60.08 dBm		
M3		1	16.604197 GHz	-60.69 dBm		

Date: 24.AUG.2017 16:19:29

Cond Spur – CH39 (18GHz – 26.5GHz)



Spurious Emissions

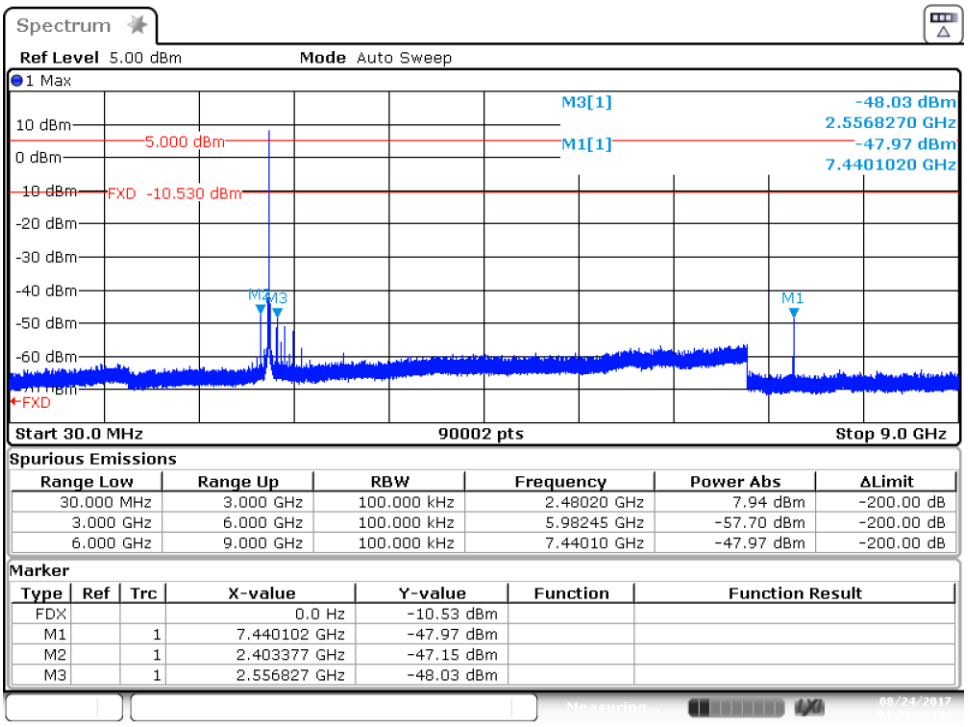
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
18.000 GHz	21.000 GHz	100.000 kHz	19.81525 GHz	-60.92 dBm	-200.00 dB
21.000 GHz	24.000 GHz	100.000 kHz	22.41780 GHz	-60.13 dBm	-200.00 dB
24.000 GHz	26.500 GHz	100.000 kHz	26.20088 GHz	-59.70 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-10.68 dBm		
M1		1	25.985225 GHz	-59.92 dBm		

Date: 24.AUG.2017 16:20:36

Cond Spur – CH78 (30MHz - 9GHz)



Spurious Emissions

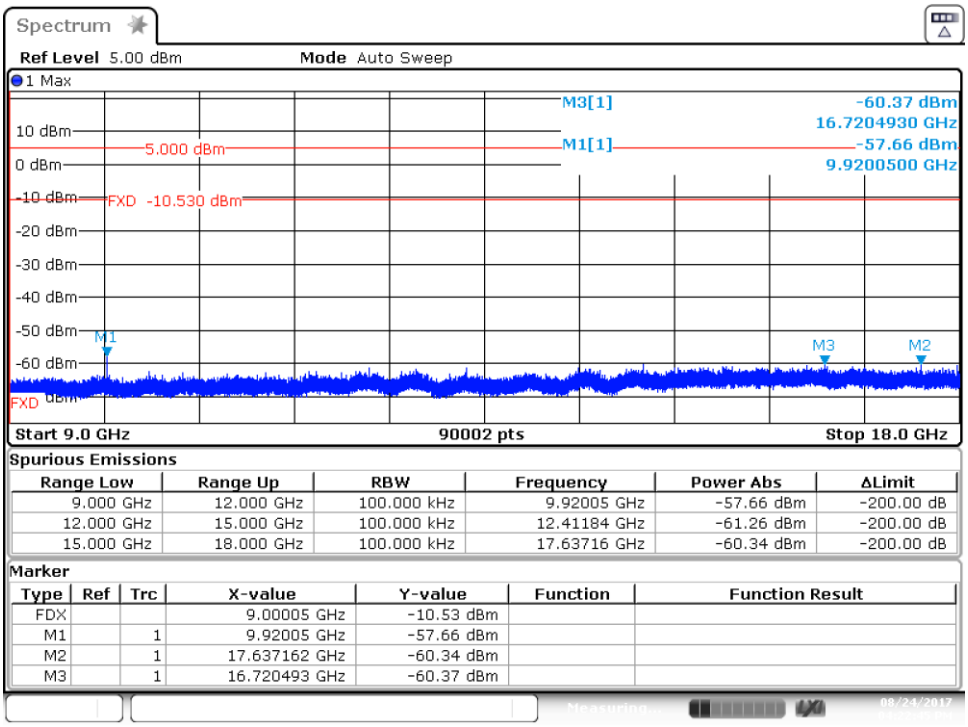
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
30.000 MHz	3.000 GHz	100.000 kHz	2.48020 GHz	7.94 dBm	-200.00 dB
3.000 GHz	6.000 GHz	100.000 kHz	5.98245 GHz	-57.70 dBm	-200.00 dB
6.000 GHz	9.000 GHz	100.000 kHz	7.44010 GHz	-47.97 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-10.53 dBm		
M1		1	7.440102 GHz	-47.97 dBm		
M2		1	2.403377 GHz	-47.15 dBm		
M3		1	2.556827 GHz	-48.03 dBm		

Date: 24.AUG.2017 16:24:22

Cond Spur – CH78 (9GHz - 18GHz)



Spurious Emissions

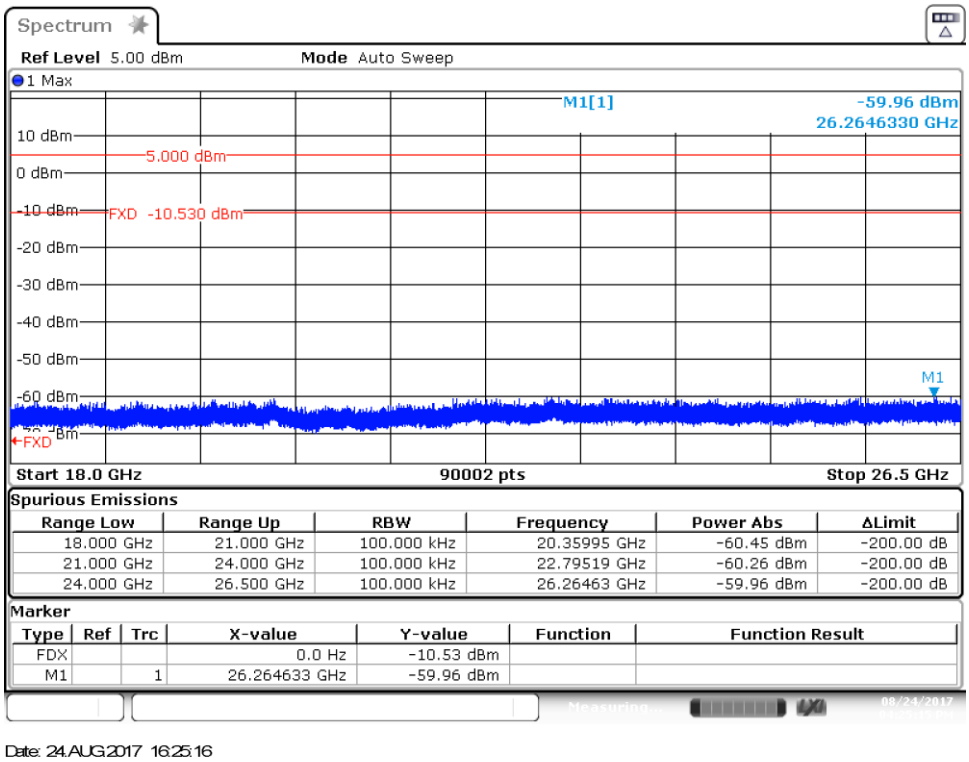
Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
9.000 GHz	12.000 GHz	100.000 kHz	9.92005 GHz	-57.66 dBm	-200.00 dB
12.000 GHz	15.000 GHz	100.000 kHz	12.41184 GHz	-61.26 dBm	-200.00 dB
15.000 GHz	18.000 GHz	100.000 kHz	17.63716 GHz	-60.34 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			9.00005 GHz	-10.53 dBm		
M1		1	9.92005 GHz	-57.66 dBm		
M2		1	17.637162 GHz	-60.34 dBm		
M3		1	16.720493 GHz	-60.37 dBm		

Date: 24.AUG.2017 16:22:46

Cond Spur – CH78 (18GHz – 26.5GHz)



Spurious Emissions

Range Low	Range Up	RBW	Frequency	Power Abs	ΔLimit
18.000 GHz	21.000 GHz	100.000 kHz	20.35995 GHz	-60.45 dBm	-200.00 dB
21.000 GHz	24.000 GHz	100.000 kHz	22.79519 GHz	-60.26 dBm	-200.00 dB
24.000 GHz	26.500 GHz	100.000 kHz	26.26463 GHz	-59.96 dBm	-200.00 dB

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
FDX			0.0 Hz	-10.53 dBm		
M1		1	26.264633 GHz	-59.96 dBm		

Date: 24.AUG.2017 16:25:16

B.6 Radiated spurious emission

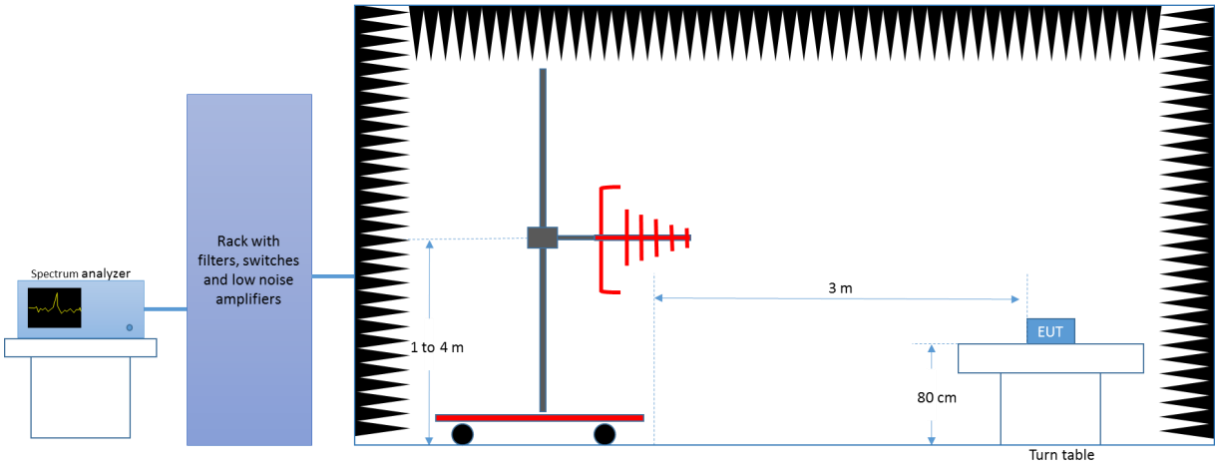
Standards references

<table>
<tr><th>FCC part</th><th>RSS part</th><th>Limits</th></tr>
<tr><td>15.247 (d)</td><td>RSS-247
Clause 5.5</td><td>Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a):
<table>
<tr><th>Freq Range (MHz)</th><th>Field Stregth (µV/m)</th><th>Field Stregth (dBµV/m)</th><th>Meas. Distance (m)</th></tr>
<tr><td>30-88</td><td>100</td><td>40</td><td>3</td></tr>
<tr><td>88-216</td><td>150</td><td>43.5</td><td>3</td></tr>
<tr><td>216-960</td><td>200</td><td>46</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>54</td><td>3</td></tr>
</table>
The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
For average radiated emission measurements above 1000 MHz, there is also a limit specified when measuring with peak detector function, corresponding to 20 dB above the indicated values in the table.</td></tr>
</table>

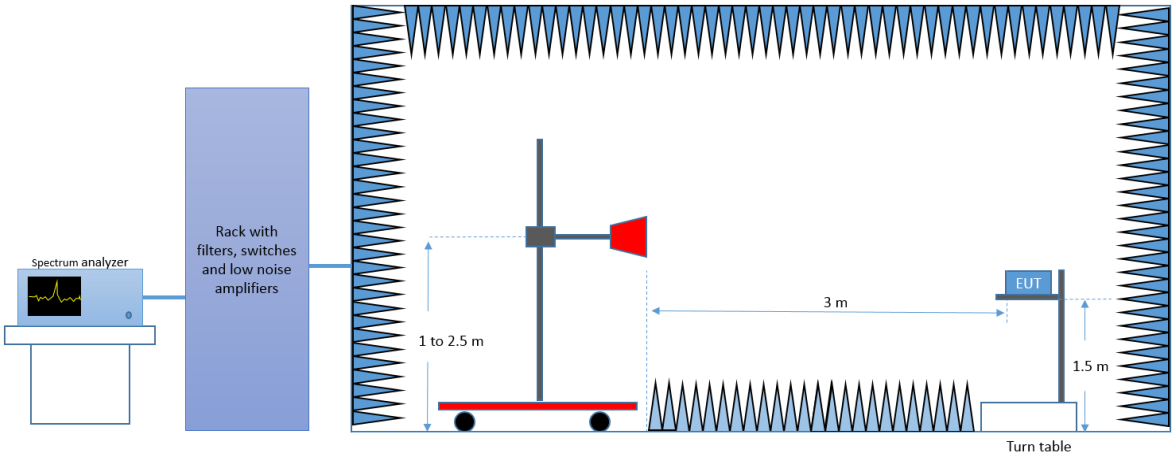
Test procedure:

The setups below were used to measure the radiated spurious emissions.
Depending of the frequency range and bands being tested, different antennas and filters were used.
The final measurement is done by varying the antenna height as indicated in the setups below for each band, the EUT azimuth over 360º and for both Vertical and Horizontal polarizations.
The radiated spurious emission was measured on the worst case configuration found.

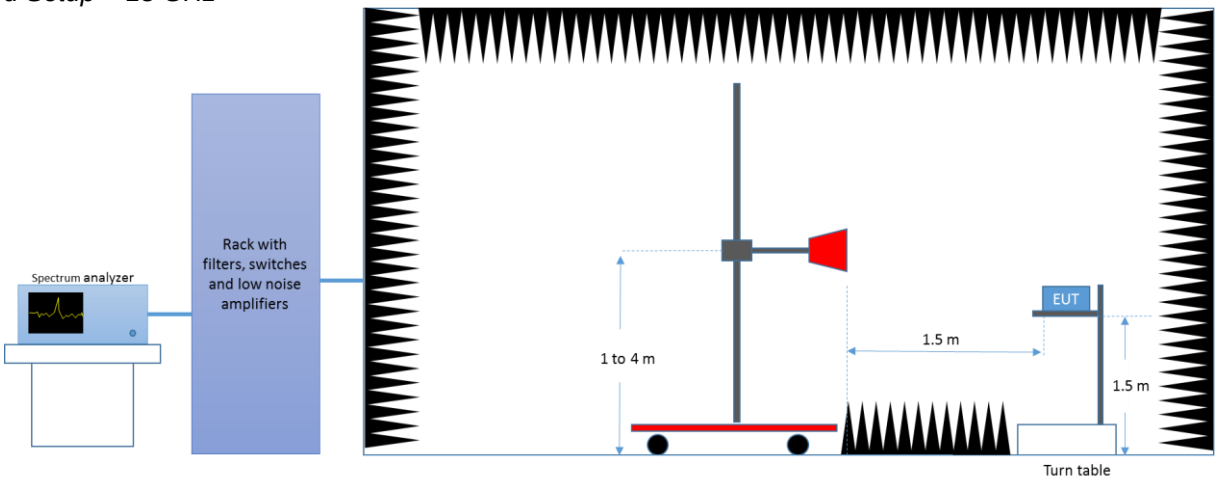
Radiated Setup < 1GHz



Radiated Setup 1 GHz - 18 GHz



Radiated Setup > 18 GHz



Sample Calculation

The field strength is deduced from the radiated measurement using the following equation:

$$E = 126.8 - 20\log(\lambda) + P - G$$

where

E is the field strength of the emission at the measurement distance, in dBµV/m

P is the power measured at the output of the test antenna, in dBm

λ is the wavelength of the emission under investigation [300/f_{MHz}], in m

G is the gain of the test antenna, in dBi

NOTE – The measured power P includes all applicable instrument correction factors up to the connection to the test

Antenna e.g. cable losses, amplifier gains.

For field strength measurements made at other than the distance at which the applicable limit is specified, the field strength of the emission at the distance specified by the limit is deduced as follows:

$$E_{SpecLimit} = E_{Meas} + 20\log(D_{Meas}/D_{SpecLimit})$$

where

$E_{SpecLimit}$ is the field strength of the emission at the distance specified by the limit, in dBµV/m

E_{Meas} is the field strength of the emission at the measurement distance, in dBµV/m

D_{Meas} is the measurement distance, in m

$D_{SpecLimit}$ is the distance specified by the limit, in m

Test Results

30 MHz – 25 GHz, BR – GFSK

Radiated Spurious – CH0 DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
62.5	32.4	---	40.0	7.6
99.6	34.3	---	43.6	9.3
264.0	31.3	---	46.0	14.7
1168.8	52.4	---	74.0	21.7
1187.5	---	41.4	54.0	12.7
2325.3	---	45.6	54.0	8.4
2325.9	55.3	---	74.0	18.7
2479.1	---	46.2	54.0	7.8
2499.4	56.3	---	74.0	17.7
5557.9	57.8	---	74.0	16.2
5575.0	---	46.2	54.0	7.8
7206.2	---	32.2	54.0	21.8
17645.2	59.0	---	74.0	15.0
17980.2	62.1	---	74.0	12.0
18000.0	---	**49.6**	54.0	4.4
19216.4	43.6	---	74.0	30.4
19216.9	---	35.6	54.0	18.4
23099.5	42.4	---	74.0	31.6
23100.0	---	34.3	54.0	19.7

Radiated Spurious – CH39 DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
62.5	31.4	---	40.0	8.6
1187.5	---	41.2	54.0	12.8
1207.5	52.9	---	74.0	21.1
2364.1	---	46.8	54.0	7.2
2384.7	56.5	---	74.0	17.5
2511.3	56.3	---	74.0	17.7
2517.8	---	46.5	54.0	7.5
5574.2	---	45.7	54.0	8.3
5580.8	58.6	---	74.0	15.4
7322.7	---	41.6	54.0	12.4
7323.2	49.3	---	74.0	24.7
14646.6	---	40.9	54.0	13.1
17971.0	61.4	---	74.0	12.6
19526.7	---	37.5	54.0	16.5
19526.7	45.9	---	74.0	28.1
23100.0	---	34.3	54.0	19.7
23100.0	42.4	---	74.0	31.6

Radiated Spurious – CH78 DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
62.5	27.0	---	40.0	13.0
1140.3	52.3	---	74.0	21.8
1187.8	---	40.8	54.0	13.2
2403.1	---	47.4	54.0	6.6
2425.0	56.8	---	74.0	17.2
2556.9	56.7	---	74.0	17.3
2556.9	---	47.0	54.0	7.0
5586.9	---	45.9	54.0	8.2
5652.5	59.1	---	74.0	14.9
7439.7	---	37.2	54.0	16.8
9920.1	---	39.2	54.0	14.8
17488.6	58.6	---	74.0	15.4
17957.5	61.6	---	74.0	12.4
19838.8	---	36.1	54.0	17.9
19840.7	44.3	---	74.0	29.7
23100.0	---	34.4	54.0	19.6
23100.0	43.3	---	74.0	30.7

30 MHz – 25 GHz, EDR – π/4-DQPSK

Radiated Spurious – CH0 2DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
62.5	29.6	---	40.0	10.4
1155.6	52.5	---	74.0	21.5
1187.5	---	40.4	54.0	13.6
2323.4	56.2	---	74.0	17.9
2325.0	---	45.7	54.0	8.3
2439.7	56.9	---	74.0	17.1
2478.4	---	45.6	54.0	8.4
5586.9	---	45.6	54.0	8.4
5591.6	57.9	---	74.0	16.2
17917.8	60.4	---	74.0	13.6
17976.8	---	**49.4**	54.0	4.6
17986.5	61.2	---	74.0	12.9
17999.0	---	49.3	54.0	4.7
23100.0	---	34.6	54.0	19.4
23100.0	42.5	---	74.0	31.5

Radiated Spurious – CH39 2DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
62.5	32.4	---	40.0	7.6
62.5	---	30.8	40.0	9.2
2364.4	---	47.3	54.0	6.7
2517.8	---	46.8	54.0	7.2
2594.4	---	45.8	54.0	8.2
3248.8	59.8	---	74.0	14.2
6003.1	61.0	---	74.0	13.0
7322.7	---	37.6	54.0	16.4
9763.5	---	34.9	54.0	19.1
17974.4	62.0	---	74.0	12.0
17998.1	62.1	---	74.0	12.0
19526.7	43.4	---	74.0	30.6
19527.2	---	33.0	54.0	21.0
23099.5	43.7	---	74.0	30.3
23100.0	---	34.4	54.0	19.6

Radiated Spurious – CH78 2DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
62.5	26.7	---	40.0	13.3
2403.4	---	47.5	54.0	6.5
2403.4	57.4	---	74.0	16.6
2556.9	---	47.4	54.0	6.6
6238.0	61.3	---	74.0	12.7
7439.7	---	33.7	54.0	20.3
9920.1	---	36.3	54.0	17.8
17961.8	61.3	---	74.0	12.7
17987.0	61.4	---	74.0	12.6
19839.8	43.0	---	74.0	31.0
19840.7	---	32.3	54.0	21.7
23100.0	---	34.7	54.0	19.3
23100.0	42.7	---	74.0	31.3

30 MHz – 25 GHz, EDR – 8-DPSK

Radiated Spurious – CH0 3DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
62.5	33.9	---	40.0	6.2
1187.8	---	40.5	54.0	13.6
1228.8	52.5	---	74.0	21.5
2325.0	56.0	---	74.0	18.0
2325.6	---	45.1	54.0	8.9
2467.2	56.9	---	74.0	17.1
2478.8	---	45.8	54.0	8.2
5585.8	---	45.6	54.0	8.4
6052.4	61.1	---	74.0	12.9
17955.5	61.1	---	74.0	12.9
17984.1	---	49.3	54.0	4.7
17993.7	---	49.5	54.0	4.6
17997.1	61.7	---	74.0	12.3
19216.0	---	32.6	54.0	21.4
19216.0	43.0	---	74.0	31.0
23100.0	---	34.9	54.0	19.1
23100.5	42.4	---	74.0	31.7

Radiated Spurious – CH39 3DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
62.5	34.5	---	40.0	5.5
2363.8	56.8	---	74.0	17.2
2364.1	---	47.0	54.0	7.0
2517.8	---	47.0	54.0	7.0
2518.1	57.2	---	74.0	16.8
7322.7	46.0	---	74.0	28.0
7322.7	---	37.6	54.0	16.4
17981.6	61.5	---	74.0	12.5
17999.5	---	49.6	54.0	4.4
19528.1	---	34.0	54.0	20.0
19528.1	43.2	---	74.0	30.8
23100.0	42.5	---	74.0	31.6
23100.0	---	34.8	54.0	19.2

Radiated Spurious – CH78 3DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBµV/m	dBµV/m	dBµV/m	dB
62.5	35.4	---	40.0	4.6
2403.1	---	47.4	54.0	6.6
2556.9	---	47.9	54.0	6.1
3440.3	59.6	---	74.0	14.5
6346.0	61.3	---	74.0	12.7
7439.7	---	33.3	54.0	20.7
9919.6	---	36.1	54.0	17.9
17961.3	61.2	---	74.0	12.8
17991.3	61.7	---	74.0	12.3
19839.8	---	32.5	54.0	21.5
19839.8	42.3	---	74.0	31.7
23100.0	42.2	---	74.0	31.8
23100.0	---	34.8	54.0	19.2

B.7 AC power-line conducted emission

Standard references:

<table>
<tr><th>FCC part</th><th>RSS part</th><th>Limits</th></tr>
<tr><td>15.207
15.407 (6)</td><td>RSS-GEN,
Clause 8.8</td><td>Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.
<table>
<tr><th rowspan="2">Frequency of emission (MHz)</th><th colspan="2">Conducted limit (dBµV)</th></tr>
<tr><th>Quasi-peak</th><th>Average</th></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
*Decreases with the logarithm of the frequency.</td></tr>
</table>

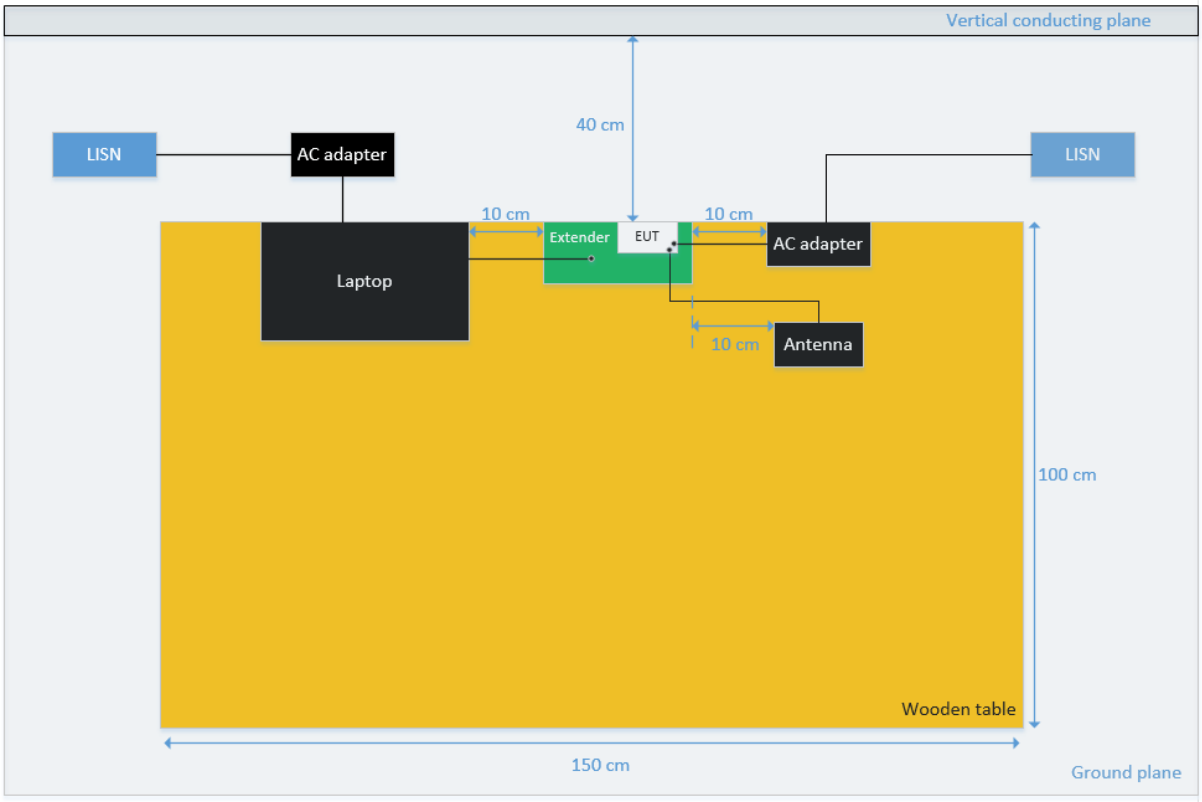
Test procedure:

The EUT and peripherals are placed on a wooden table with a nominal size of 1.0 m by 1.5 m, raised 80 cm above the reference ground plane. The EUT is connected to AC-Power line through a Line Impedance Stabilization Network (LISN) to accommodate a 50 Ω/50 µH coupling impedance for the measurement system. The EUT control PC is considered as a peripheric and therefore is connected to a second LISN which has the measurement port connected to a 50 ohms impedance.

Each measurement is done for each current-carrying conductor (Line and Neutral) at the end plug of the EUT power cord. The EUT is tested for several transmission modes (frequency channel, modulation, etc.) and the result providing the maximum measured emission is reported.

The exploratory measurement is done over the frequency range from 150 kHz to 30 MHz, while the measurement receiver is recording the Peak and Average signal at 10 kHz steps in Max Hold mode. The cables manipulation is performed within the range of likely configurations to determine the maximum emission. Once the EUT cable configuration, arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is found the six highest AC power-line conducted emissions relative to 20 dB of the limit are reported as the final measurement. If fewer than six emission frequencies are within 20 dB of the limit, the noise level is reported. For the final measurement, the measurement receiver records the Quasi Peak values with 9 kHz resolution bandwidth and the average values with 10 kHz resolution bandwidth.

EUT arrangement for AC power-line conducted emission tests



Sample Calculation:

The measured level at the spectrum analyzer in dBuV is corrected by a transducer factor taking into account the losses of the RF cable and the LISN as follows:

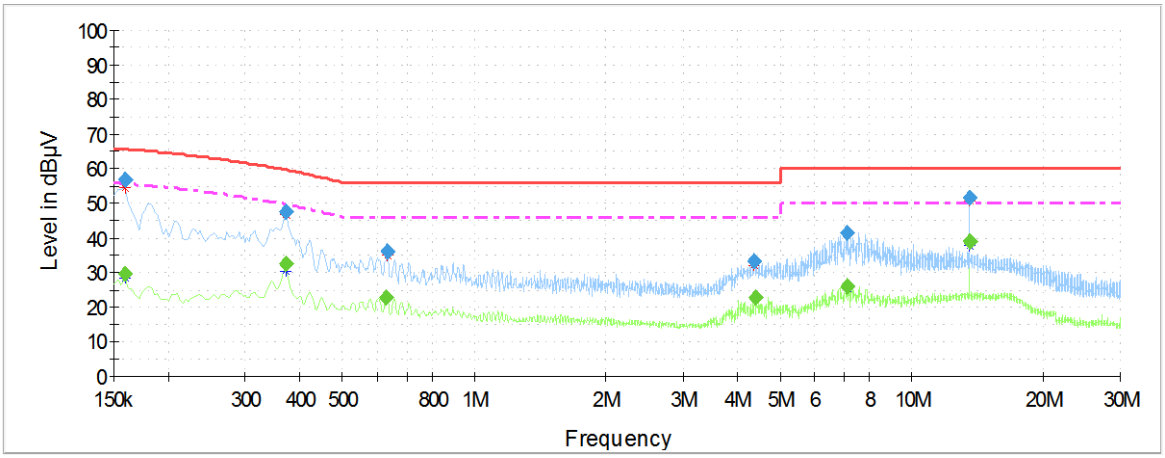
Conducted Emission level (dBuV) = SA_{Level} + $RFCable_{Losses}$ + $LISN_{Losses}$

Where:
SA_{Level} is the voltage level displayed on the measurement receiver, in dBuV.
$RFCable_{Losses}$ is the value of the cable losses between the LISN and the measurement receiver, in dB.
$LISN_{Losses}$ is the value of the insertion losses of the LISN, in dB.

Test Results:

150kHz – 30MHz, all mode

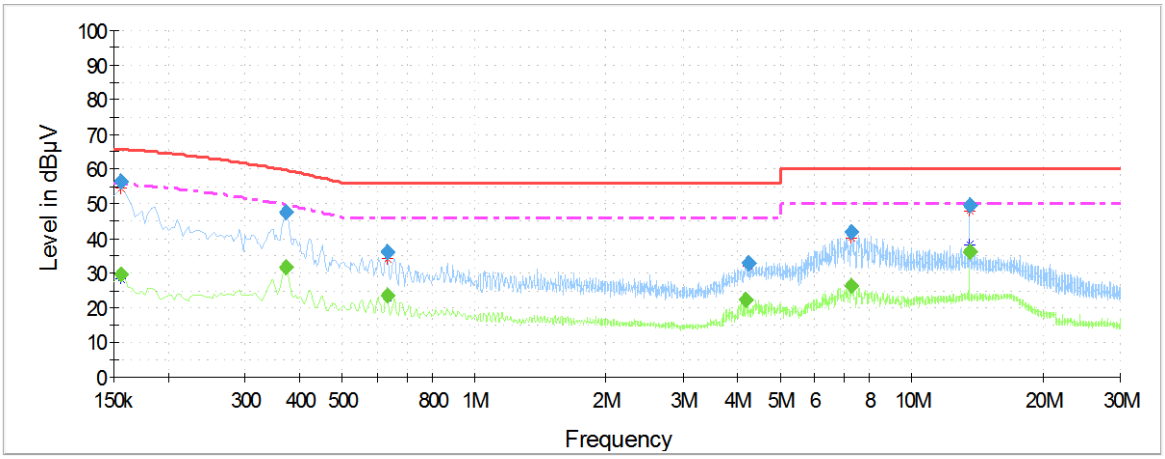
AC power-line conducted – Phase L1



Frequency	Max Peak	Avg	Limit	Margin
MHz	dBµV	dBµV	dBµV	dB
0.16	56.8	--	65.7	8.9
0.16	--	29.7	55.7	26
0.37	47.5	--	59.7	12.2
0.37	--	32.3	49.7	17.4
0.63	36.3	--	56.0	19.7
0.63	--	22.8	46.0	23.2
4.36	33.2	--	60.0	26.8
4.36	--	22.9	50.0	27.1
7.09	41.2	--	60.0	18.8
7.09	--	26.2	50.0	23.8
13.56	51.5	--	60.0	8.5
13.56	--	38.9	50.0	11.1

Note: The emissions found do not change with the modulation and/or frequency.

AC power-line conducted – Neutral N



Peak measurements Avg measurements Limit FCC Ouasi-Peak Limit FCC Avg

Frequency	Max Peak	Avg	Limit	Margin
MHz	dBµV	dBµV	dBµV	dB
0.16	56.6	--	65.8	9.2
0.16	--	29.8	55.8	26
0.37	47.7	--	59.7	12
0.37	--	31.7	49.7	18
0.63	36.3	--	56.0	19.7
0.63	--	23.7	46.0	22.3
4.22	32.8	--	60.0	27.2
4.22	--	22.4	50.0	27.6
7.28	42.0	--	60.0	18
7.28	--	26.2	50.0	23.8
13.56	49.8	--	60.0	10.2
13.56	--	36.3	50.0	13.7

Note: The emissions found do not change with the modulation and/or frequency.