

TEST REPORT

EUT Description	WLAN and BT, 1x1 PCIe M.2 1216 SD adapter card
Brand Name	Intel® Wireless-AC 9462
Model Name	9462D2W
FCC ID	PD99462D2
ISED ID	1000M-9462D2
Date of Test Start/End	2017-11-13 / 2017-11-30
Features	802.11ac, Dual Band, 1x1 Wi-Fi + Bluetooth® 5, Diversity Antenna (see section 5)

Applicant	Intel Mobile Communications
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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)
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Test Report identification	170919-01.TR05
Revision Control	Rev. 00 This test report revision replaces any previous test report revision (see section 8)

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	9
A.3 MEASUREMENT UNCERTAINTY EVALUATION	10
Annex B. Test Results	11
B.1 20dB BANDWIDTH AND CARRIER FREQUENCY SEPARATION	11
B.2 NUMBER OF HOPPING CHANNELS	19
B.3 TIME OF OCCUPANCY (DWELL TIME)	26
B.4 MAXIMUM PEAK OUTPUT POWER ANTENNA GAIN	34
B.5 OUT-OF-BAND EMISSION (CONDUCTED)	39
B.6 RADIATED SPURIOUS EMISSION	89
Annex C. Photographs	110
C.1 TEST SETUP	110
C.2 TEST SAMPLE	112

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. ANSI C63.10-2013 - American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
4. DA 00-705 Released March 30, 2000 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
5. RSS-247 Issue 2 - Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
6. 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	21 °C ± 3 °C
Humidity	35 % ± 10 %

4. Test samples

Sample	Control #	Description	Model	Serial #	Date of receipt	Note
#01	170919-01.S41	Module	9462D2W	WFM 3413E86E6045	2017-10-05	Used for Conducted Tests
	170524-02.S15	Extender Board	PCB00609_01	6092416-442	2017-05-30	
	170000-01.S01	Laptop	Latitude E5470	DPBLCM2	2017-03-28	
	170220-04.S04	Adapter 1216SD to M.2	JfP Adapter M2	N/A	2017-04-10	
#02	170919-01.S46	Module	9462 D2W	WFM:3413E86E603B	2017-10-05	Used for Radiated Tests (From 30MHz to 1GHz)
	170220-02.S03	Extender Board	PCB00609_01	6092416-446	2017-02-20	
	170000-01.S13	Laptop	Latitude E5470	FT6LMC2	2017-05-30	
	170727-02.S11	Adapter 1216SD to M.2	JfP Adapter M2	N/A	2017-08-09	
#03	170919-01.S48	Module	9462 D2W	WFM:3413E86E5FE1	2017-10-05	Used for Radiated Tests (From 1GHz to 26.5GHz)
	170220-02.S04	Extender Board	PCB00609_01	6092416-493	2017-02-20	
	170801-01.S10	Laptop	Latitude E7470	7KNOXF2	2017-09-13	
	170727-02.S13	Adapter 1216SD to M.2	JfP Adapter M2	N/A	2017-08-09	

5. EUT Features

Brand Name	Intel® Wireless-AC 9462			
Model Name	9462D2W			
FCC ID	PD99462D2			
ISED ID	1000M-9462D2			
Software Version	10.1739.0-06012			
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)		
Antenna Information	5.6GHz (5470.0 – 5725.0 MHz)	5.8GHz (5725.0 – 5850.0 MHz)		
	Bluetooth 5	2.4GHz (2400.0 – 2483.5 MHz)		
	CHAIN A Div1: PIFA antenna. WiFi 2.4GHz & 5GHz and BT CHAIN A Div2: PIFA antenna. WiFi 2.4GHz & 5GHz and BT			
Additional Information	-			

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	Out-of-band Emissions (conducted)	P
15.247 (d) 15.209	RSS-247 Clause 5.5 RSS GEN Clause 8.9	Out-of-band Emissions (radiated)	P

8. Document Revision History

Revision #	Date	Modified by	Revision Details
Rev.00	2017-12-06	A.Sayoud I.Kharrat	First Issue

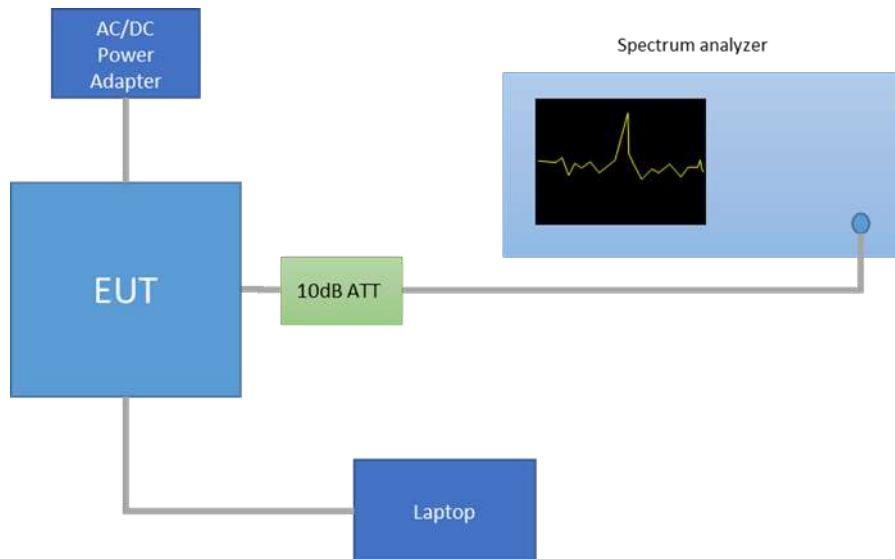
Annex A. Test & System Description

A.1 Measurement System

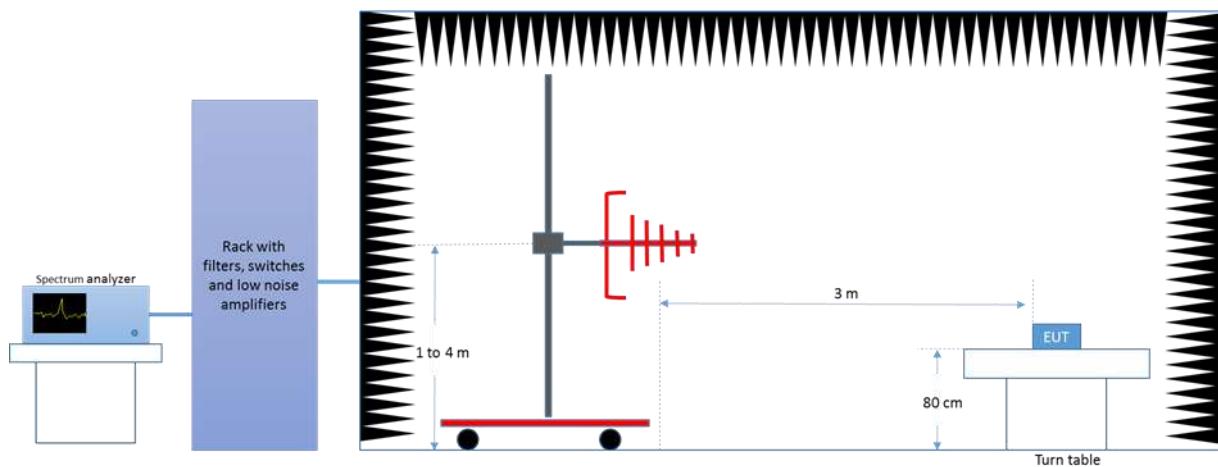
Measurements were performed using the following setups.

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.

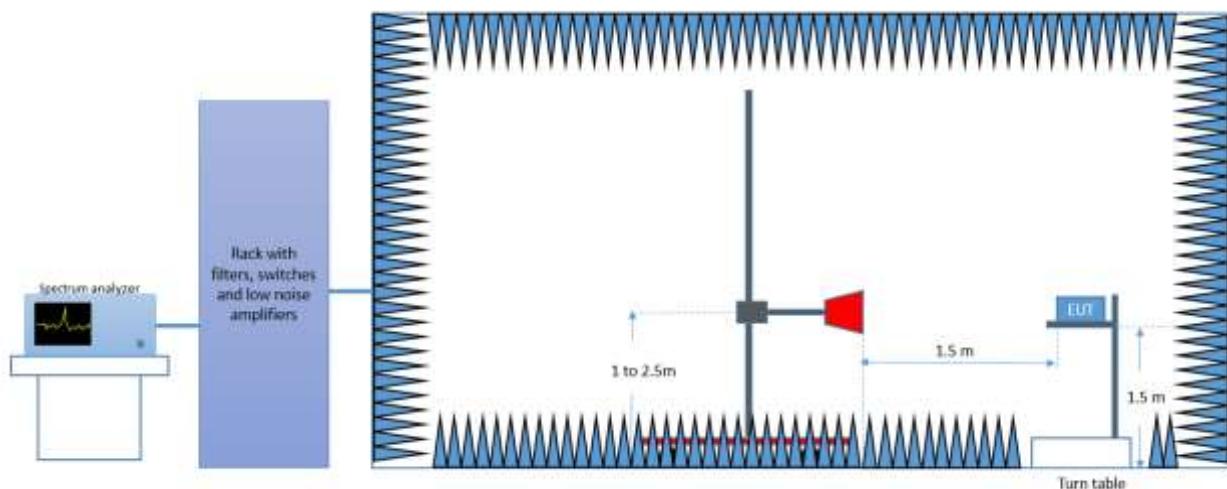
Conducted Setup



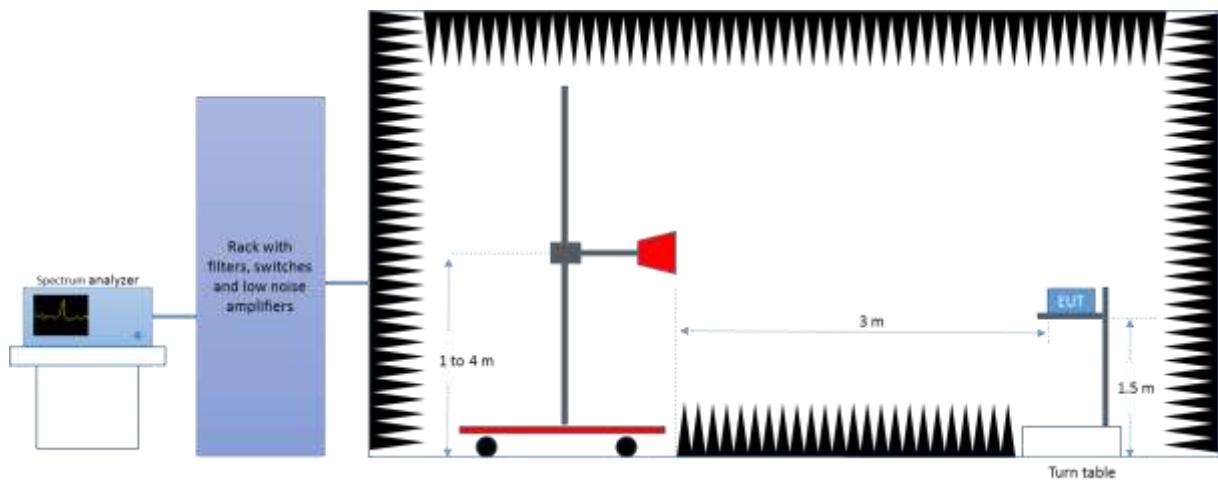
Radiated Setup 30 MHz - 1GHz

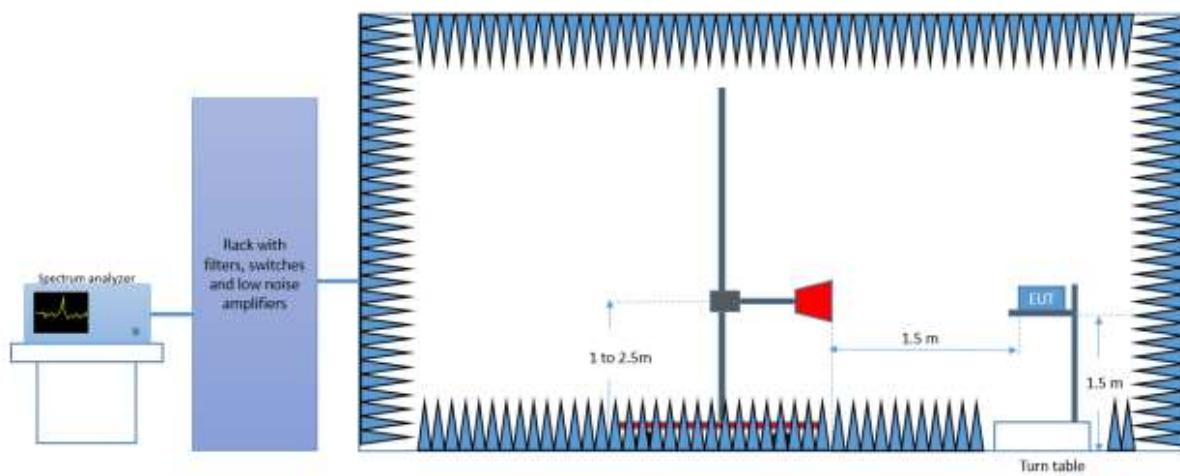


Radiated Setup 1 GHz – 6.4 GHz



Radiated Setup 6.4GHz – 18 GHz



Radiated Setup 18 GHz -26.5 GHz

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	2017-09-22	2019-09-22

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
0141	Double Ridged Horn Antenna 1 GHz – 18 GHz	3117	00157736	ETS Lindgren	2016-04-13	2018-04-13
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	2016-04-14	2018-04-14
0138	Horn antenna 1 GHz – 6.4 GHz	3117	00152266	ETS Lindgren	2016-03-14	2018-03-14
0334	Double Ridged Horn Antenna 18 GHz – 40 GHz	3116C-PA	00196308	ETS Lindgren	2017-08-22	2019-08-22
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

A.3 Measurement Uncertainty Evaluation

The system uncertainty evaluation is shown in the below table:

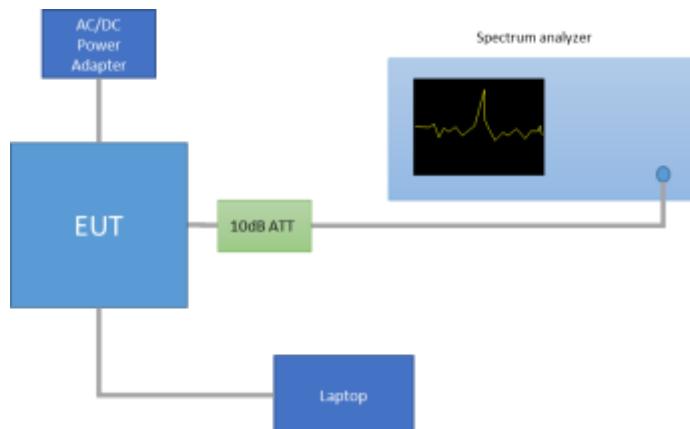
Measurement type	Uncertainty [±dB]
Conducted Power	±1.0
Conducted Spurious Emission	±2.9
Radiated tests <1GHz	±3.8
Radiated tests 1GHz - 40 GHz	±4.7

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:

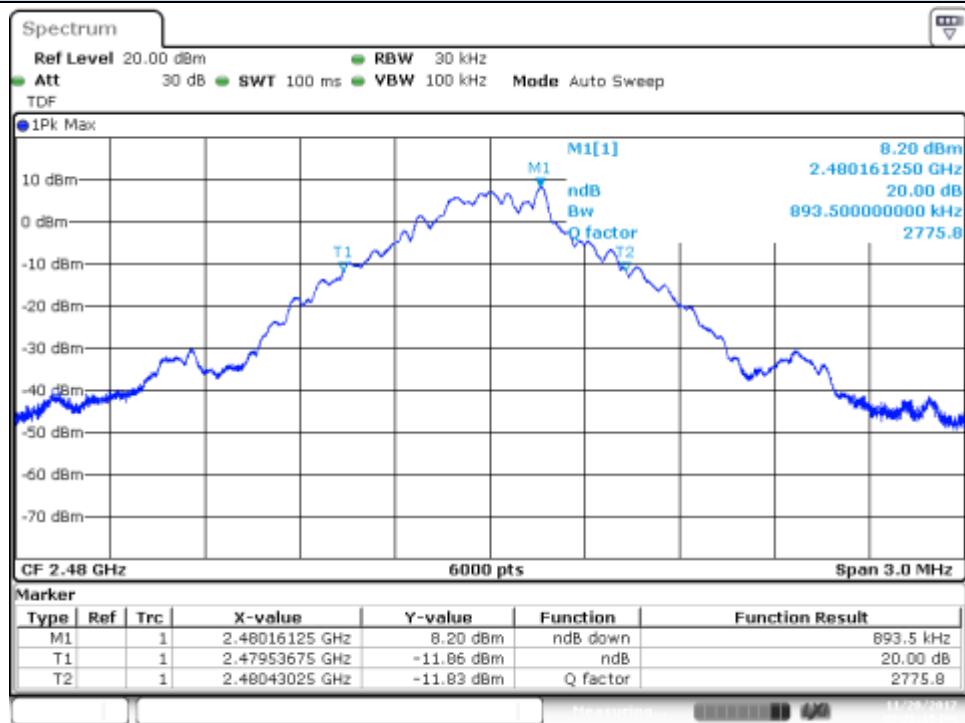
Mode	Packet type	Antenna	Channel Number	Frequency [MHz]	20dB BW [MHz]	Freq. Separation [kHz]
Basic Rate GFSK	DH5	Chain A Div1	0	2402	0.889	1000
			39	2441	0.820	
			78	2480	0.894	
Basic Rate GFSK	DH5	Chain A Div2	0	2402	0.843	1000
			39	2441	0.889	
			78	2480	0.821	
EDR $\pi/4$ -DQPSK	2DH5	Chain A Div1	0	2402	1.411	1000
			39	2441	1.415	
			78	2480	1.415	
EDR $\pi/4$ -DQPSK	2DH5	Chain A Div2	0	2402	1.407	1000
			39	2441	1.414	
			78	2480	1.414	
EDR 8-DPSK	3DH5	Chain A Div1	0	2402	1.410	1000
			39	2441	1.429	
			78	2480	1.421	
EDR 8-DPSK	3DH5	Chain A Div2	0	2402	1.410	1000
			39	2441	1.416	
			78	2480	1.414	

Max Value

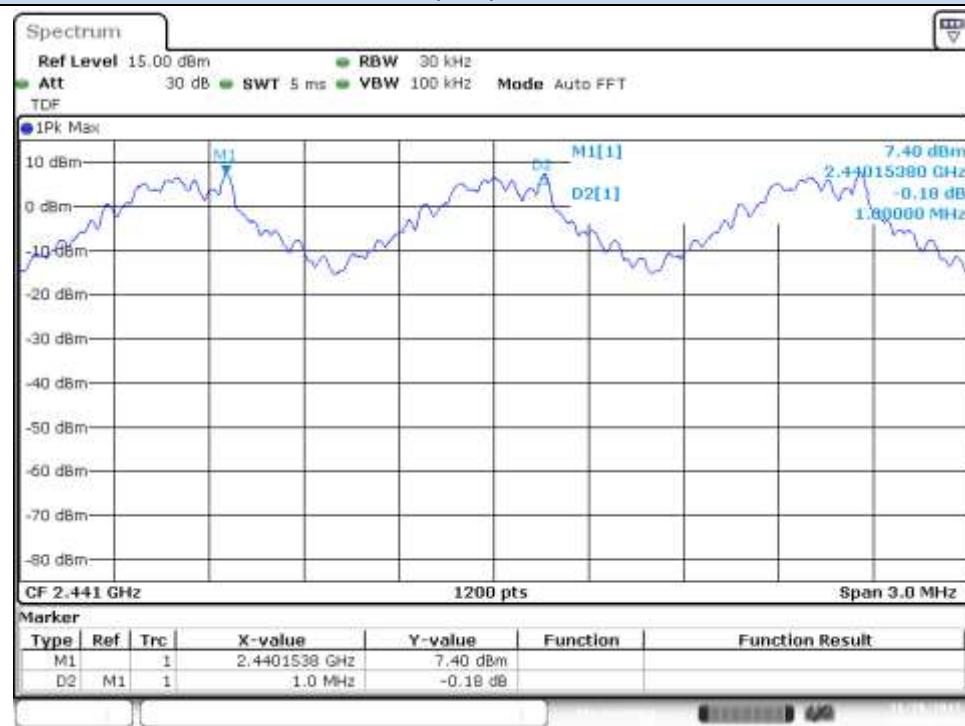
Results screenshot

CHAIN A DIV1_Basic Rate - GFSK

20dB BW – CH78

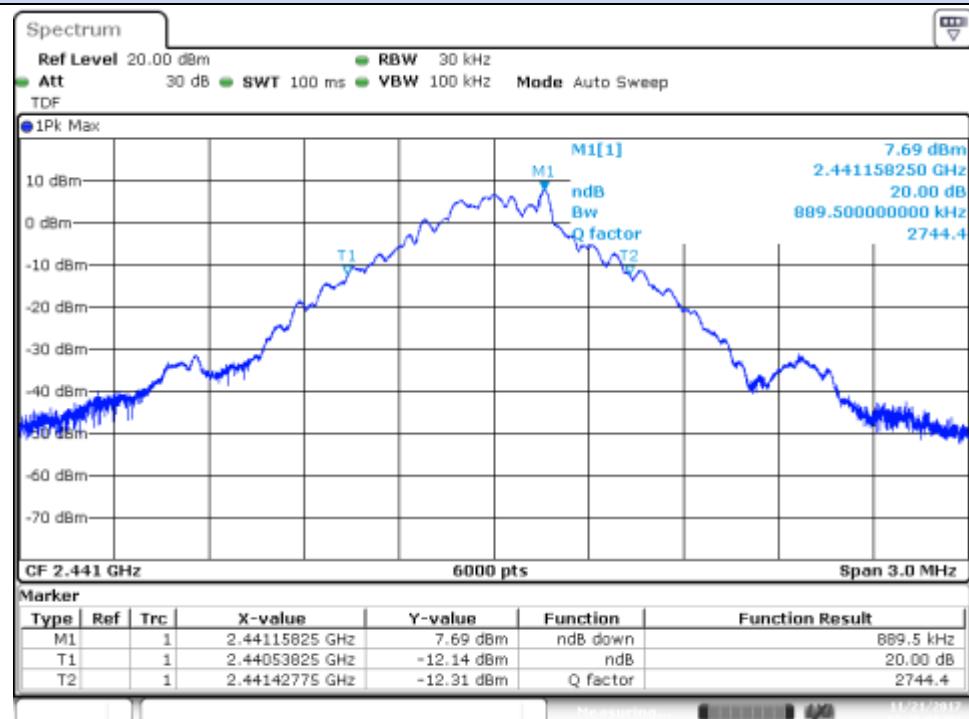


Freq. Separation

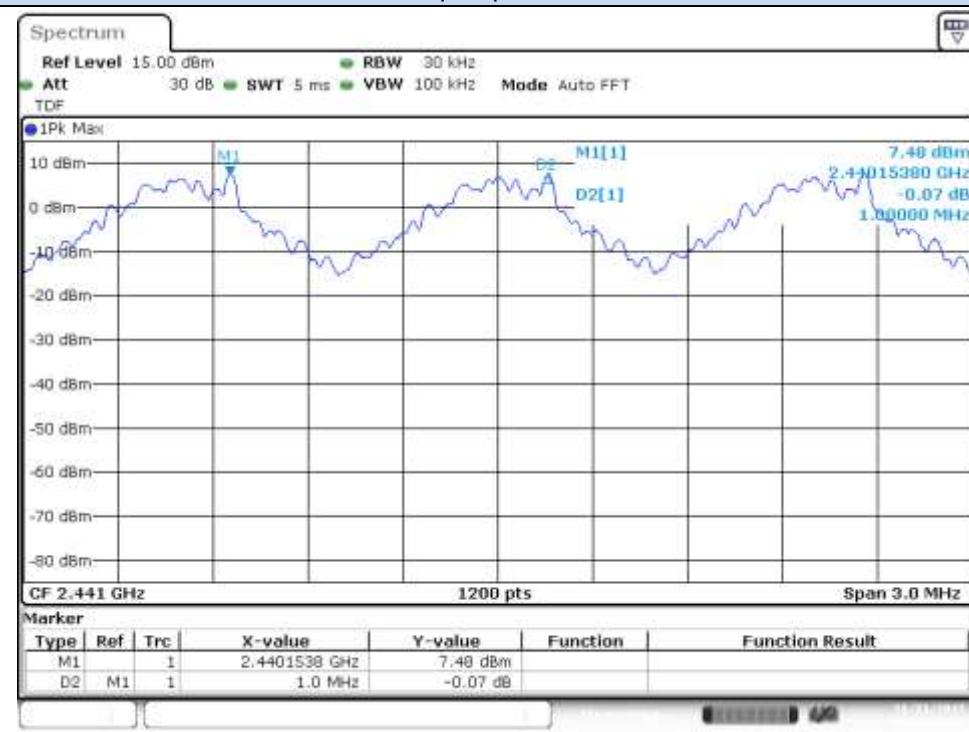


CHAIN A DIV2_Basic Rate - GFSK

20dB BW – CH39

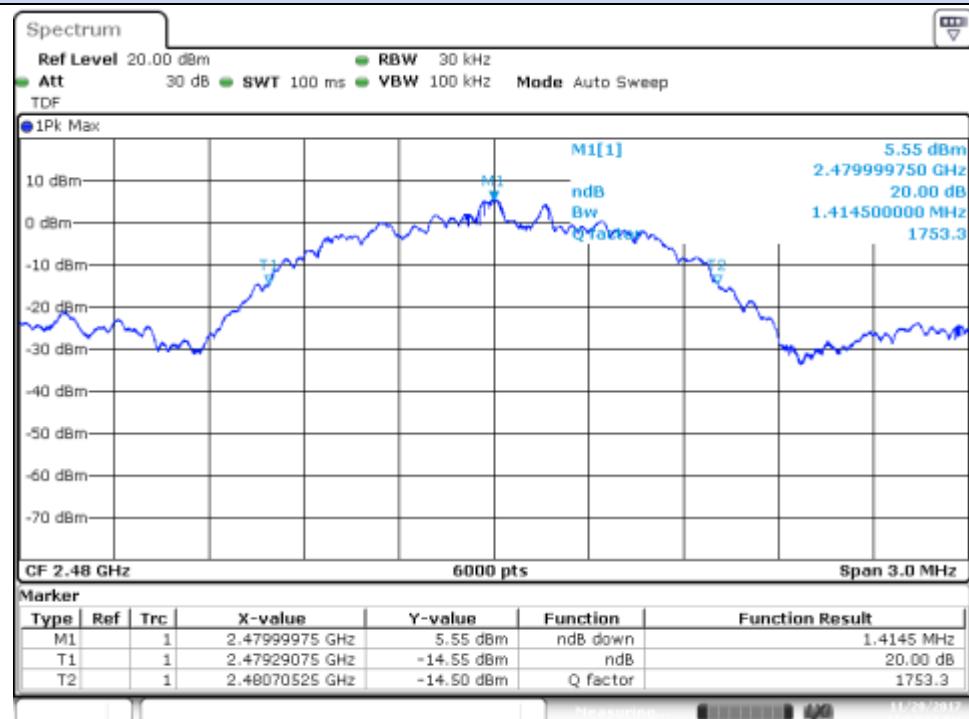


Freq. Separation

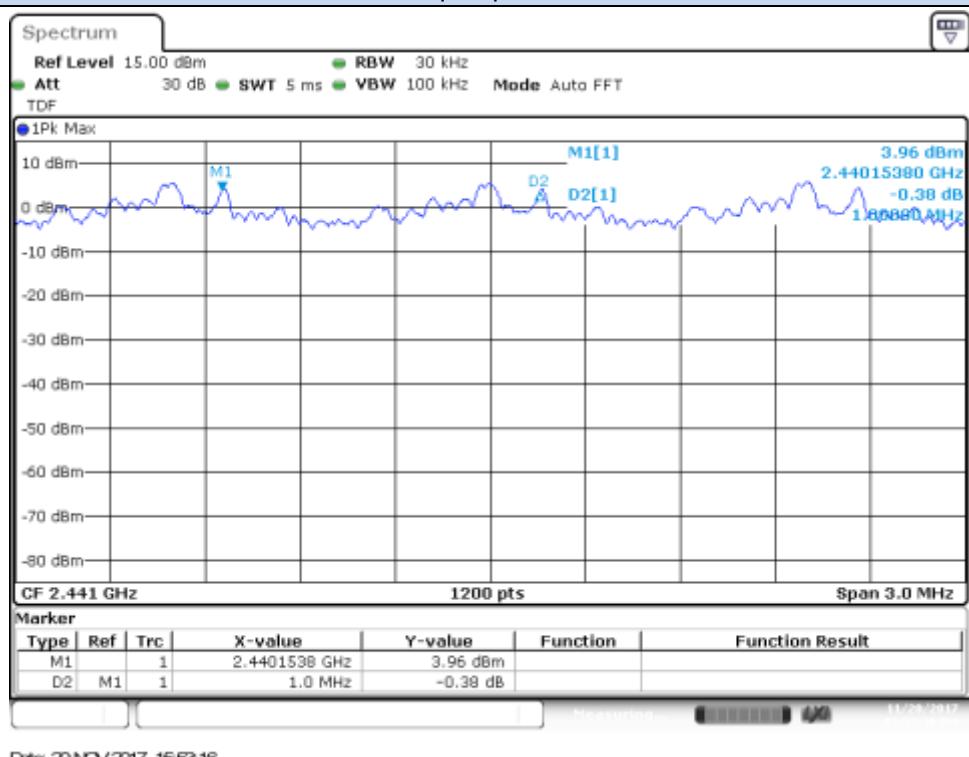


CHAIN A DIV1_EDR – π/4-DQPSK

20dB BW – CH78

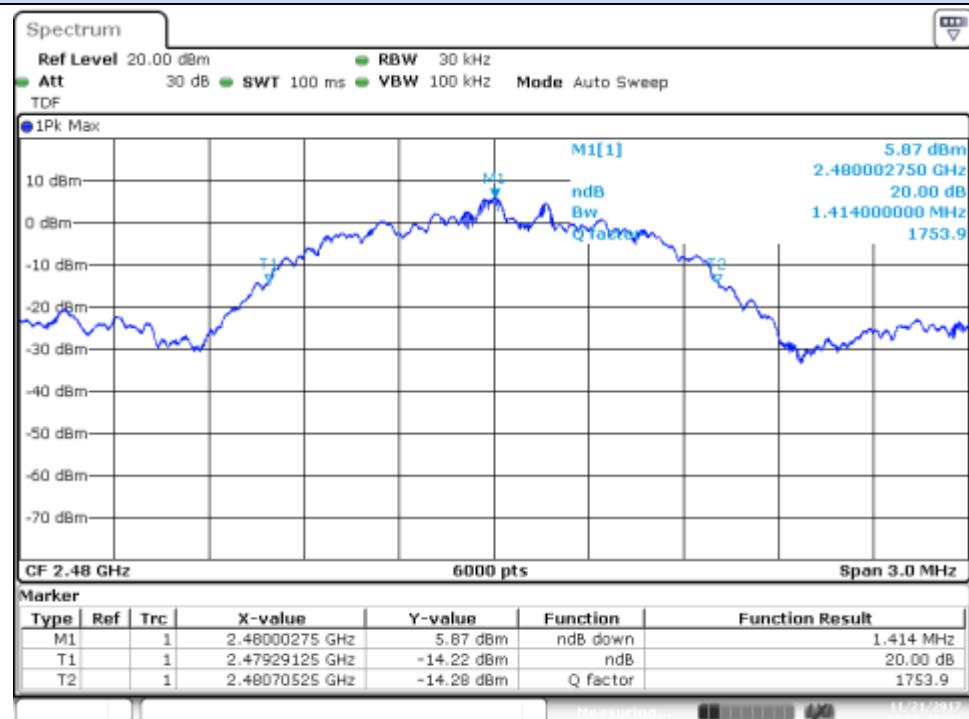


Freq. Separation

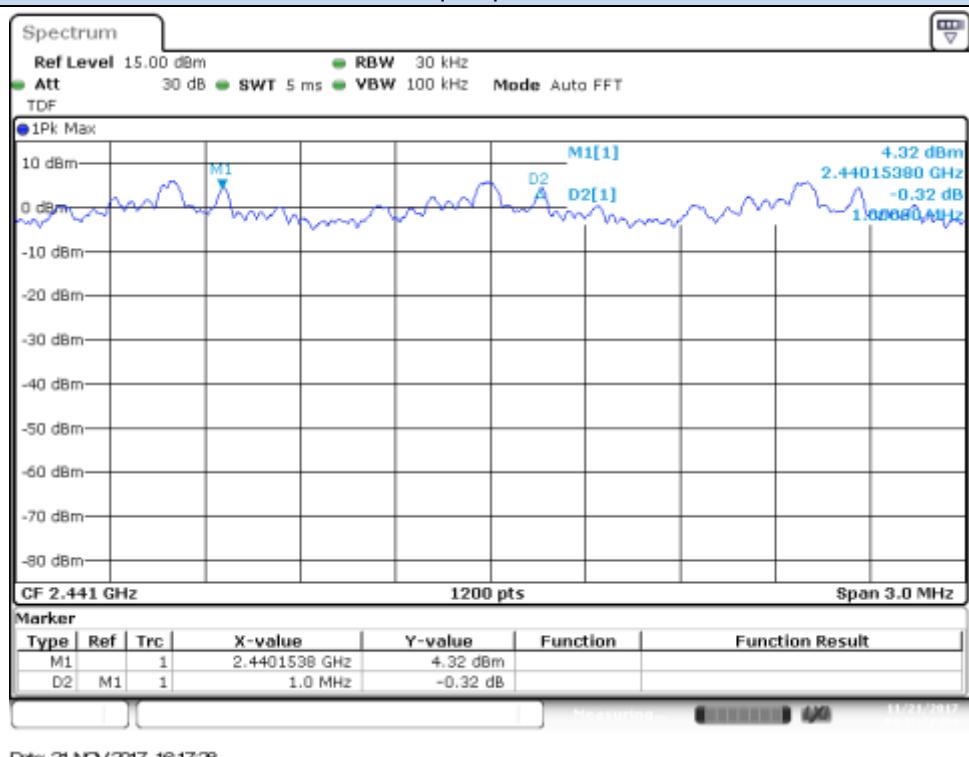


CHAIN A DIV2_EDR – π/4-DQPSK

20dB BW – CH78

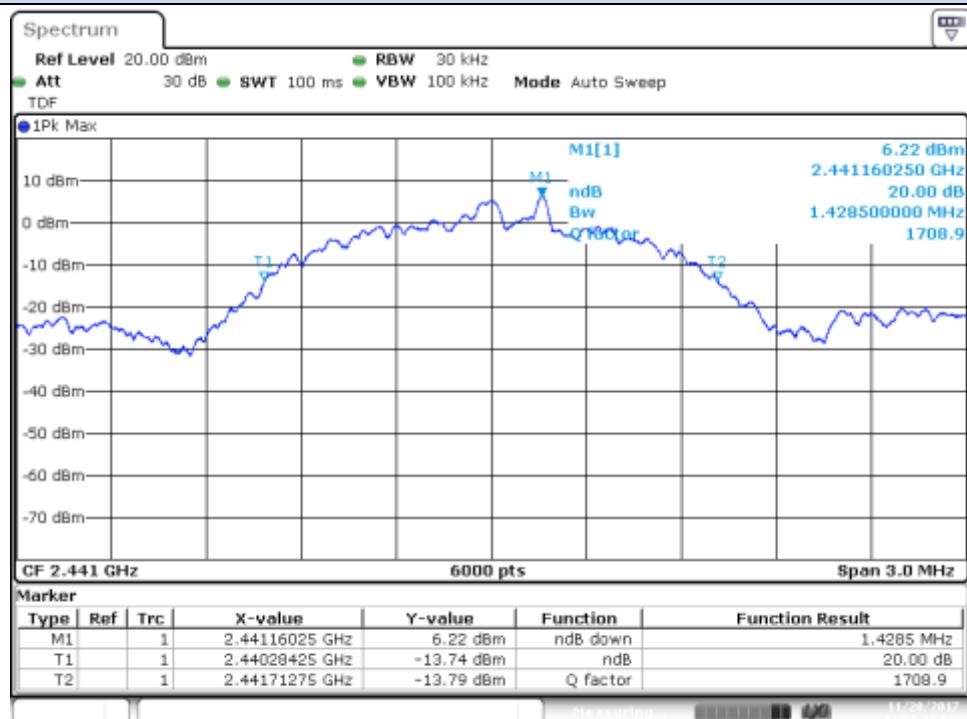


Freq. Separation

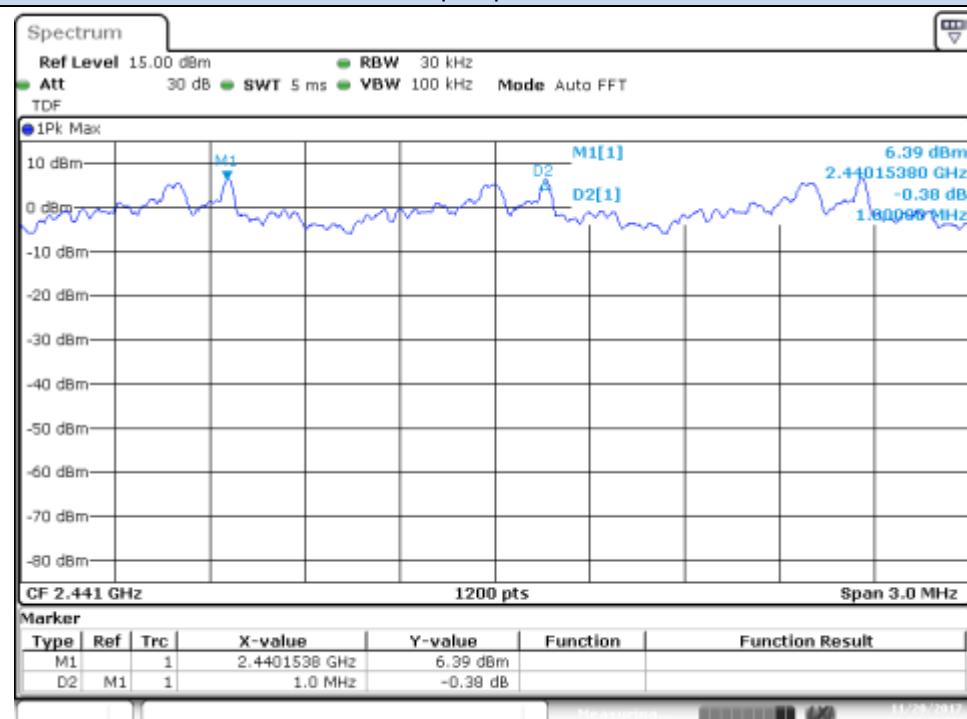


CHAIN A DIV1_EDR – 8-DPSK

20dB BW – CH39

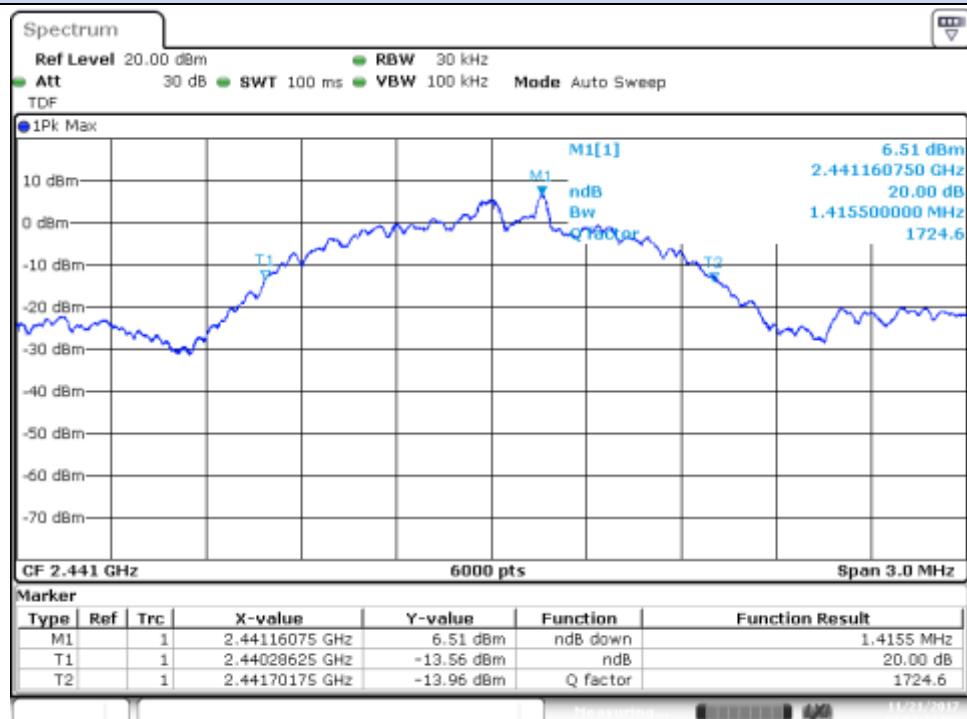


Freq. Separation

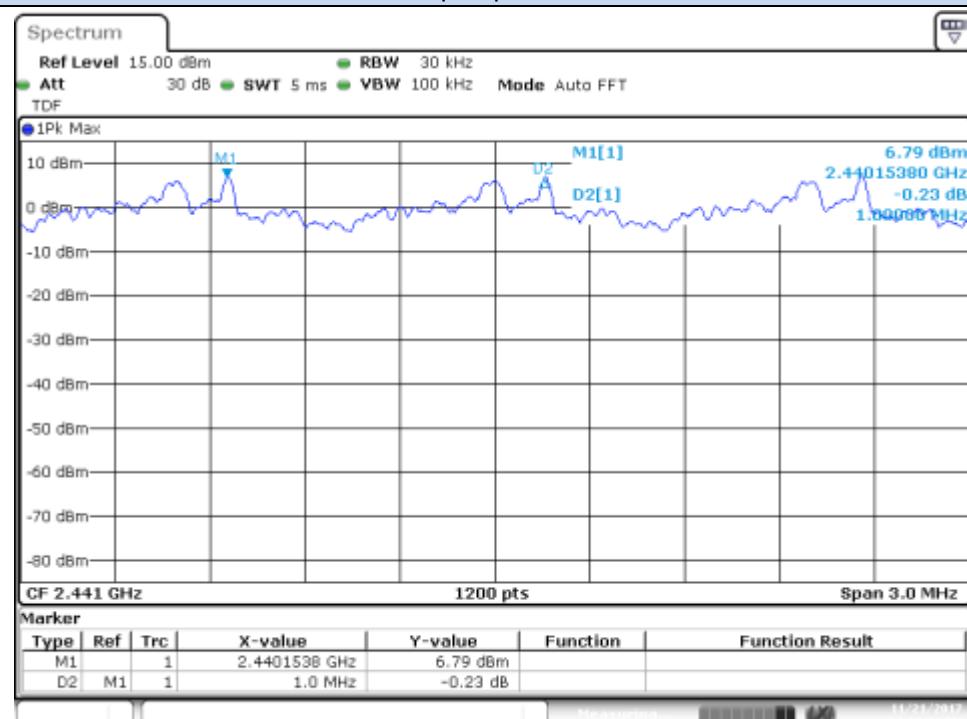


CHAIN A DIV2_EDR – 8-DPSK

20dB BW – CH39



Freq. Separation



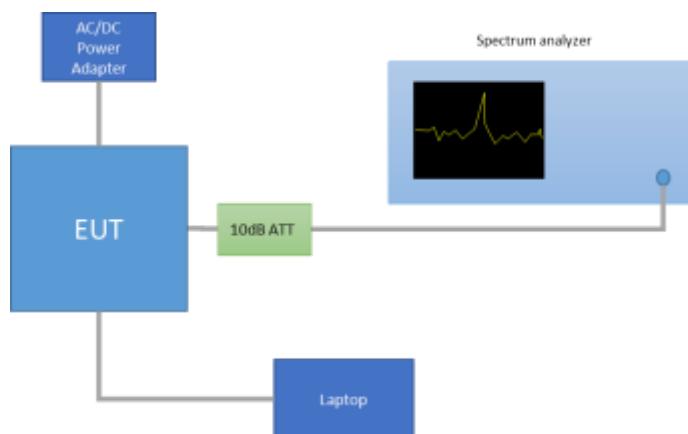
B.2 Number of hopping channels

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 analyzer through an attenuator, and the spectrum analyzer reading is compensated to include the RF path loss.

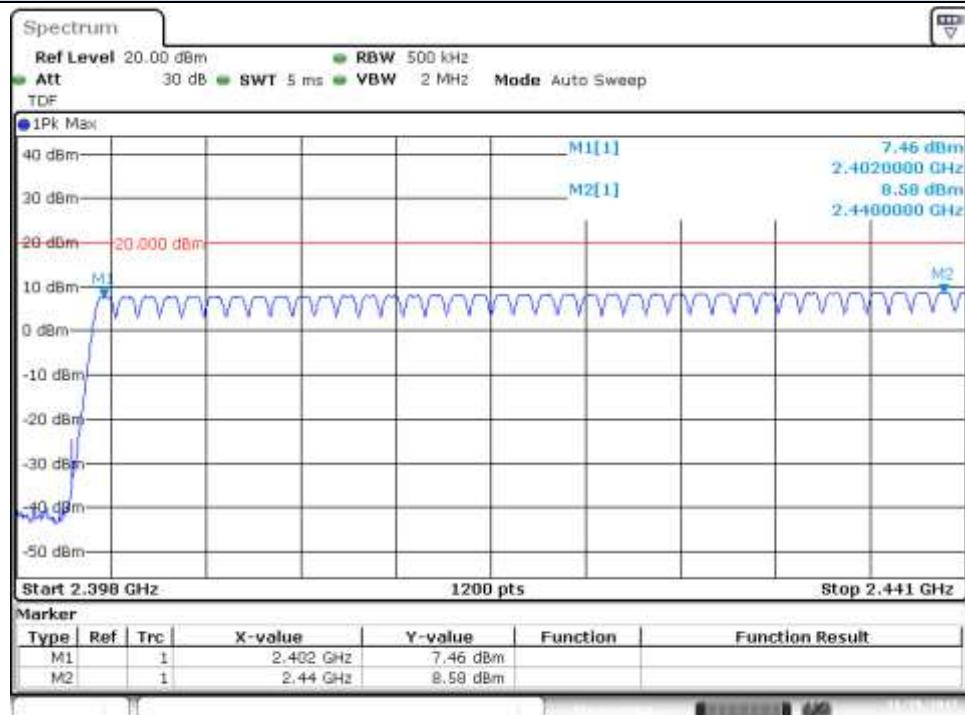


Results tables

Mode	Packet Type	Number of hopping channels
Basic Rate GFSK	DH5	79
EDR π/4-DQPSK	2DH5	79
EDR 8-DPSK	3DH5	79

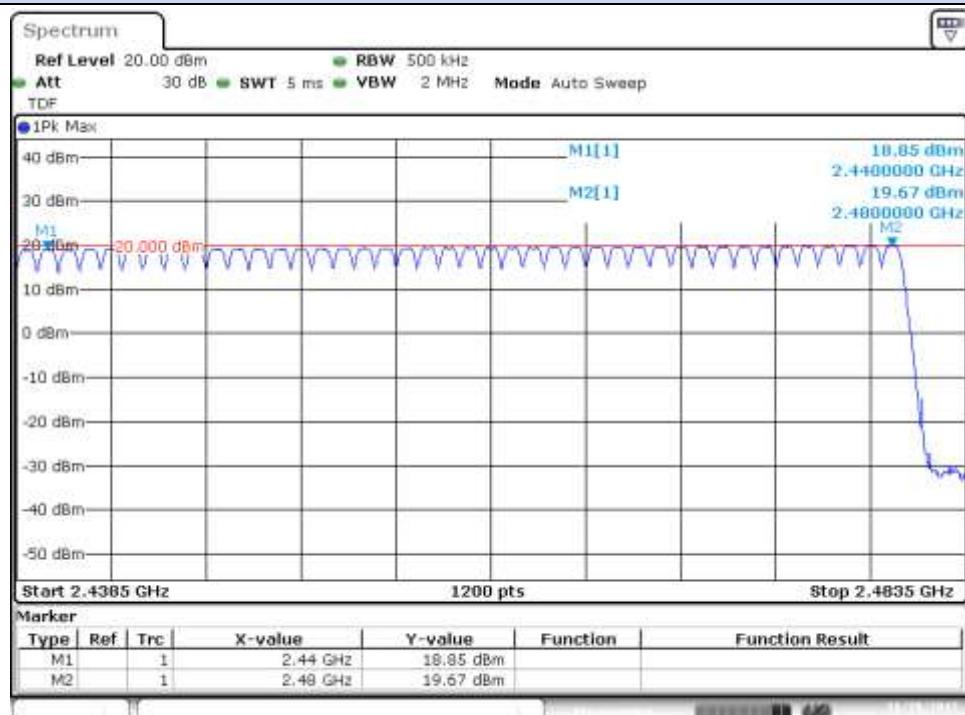
CHAIN A DIV1_Number of hopping channels

Basic Rate – GFSK

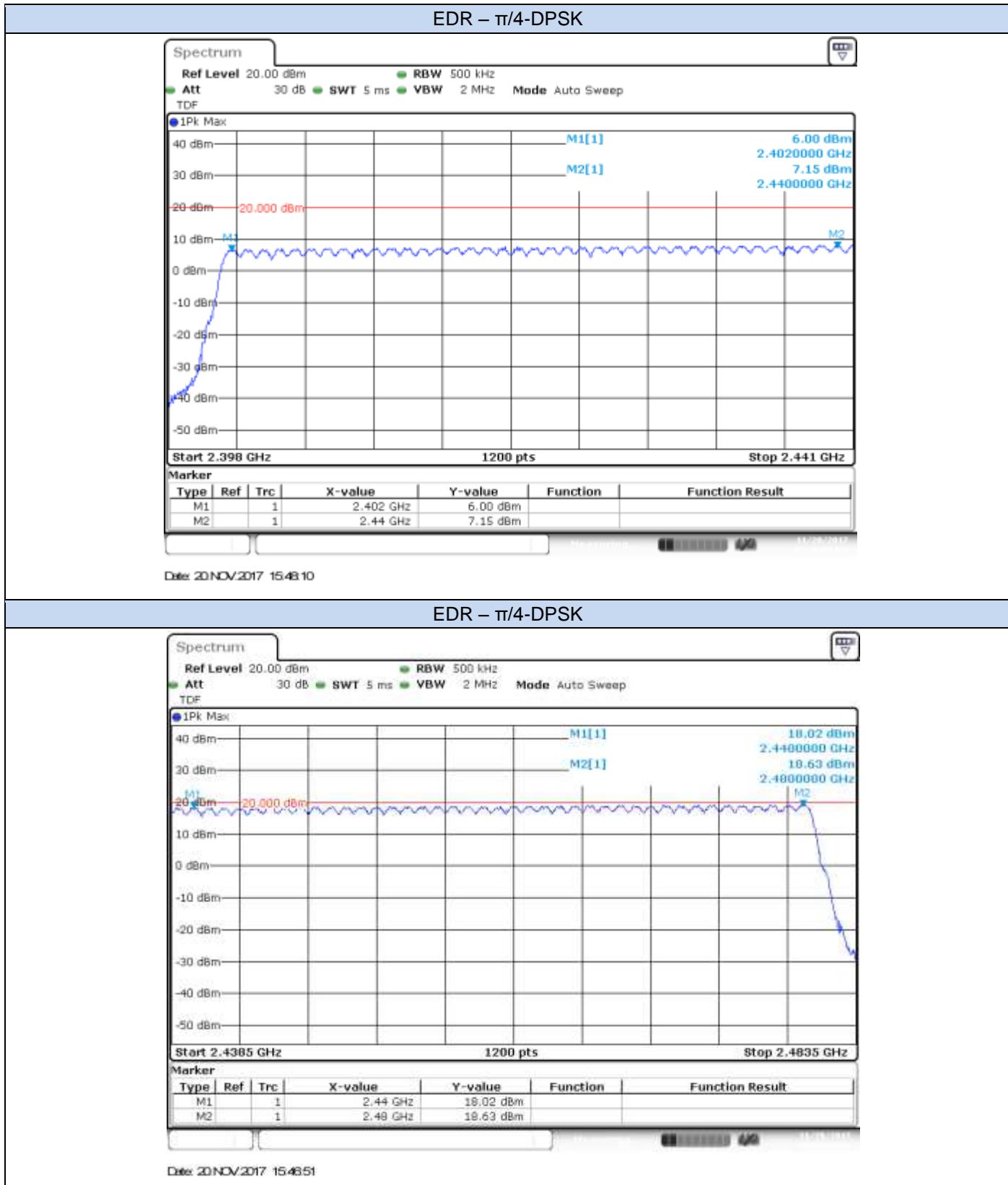


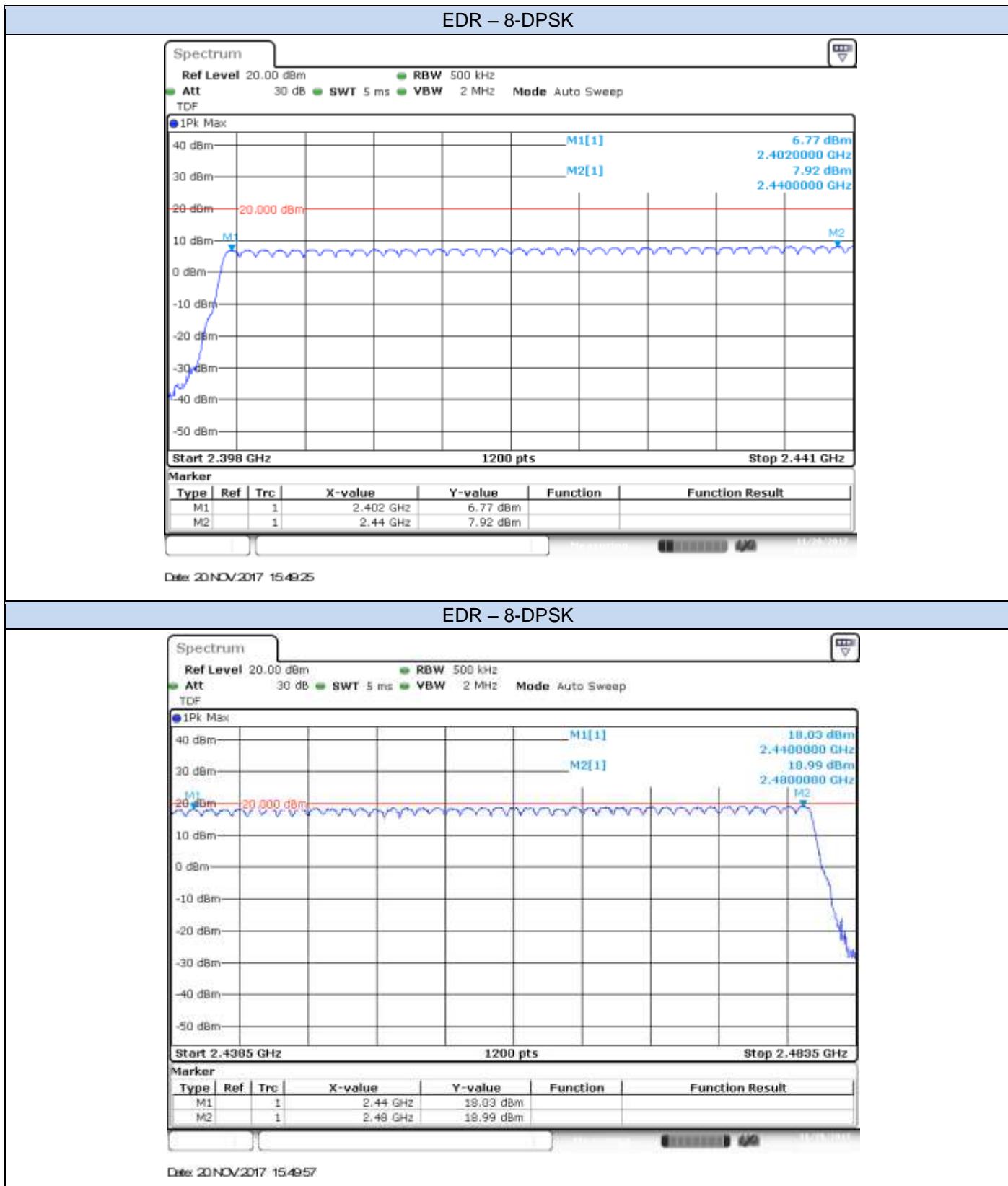
Date: 20 NOV 2017 15:43:15

Basic Rate – GFSK



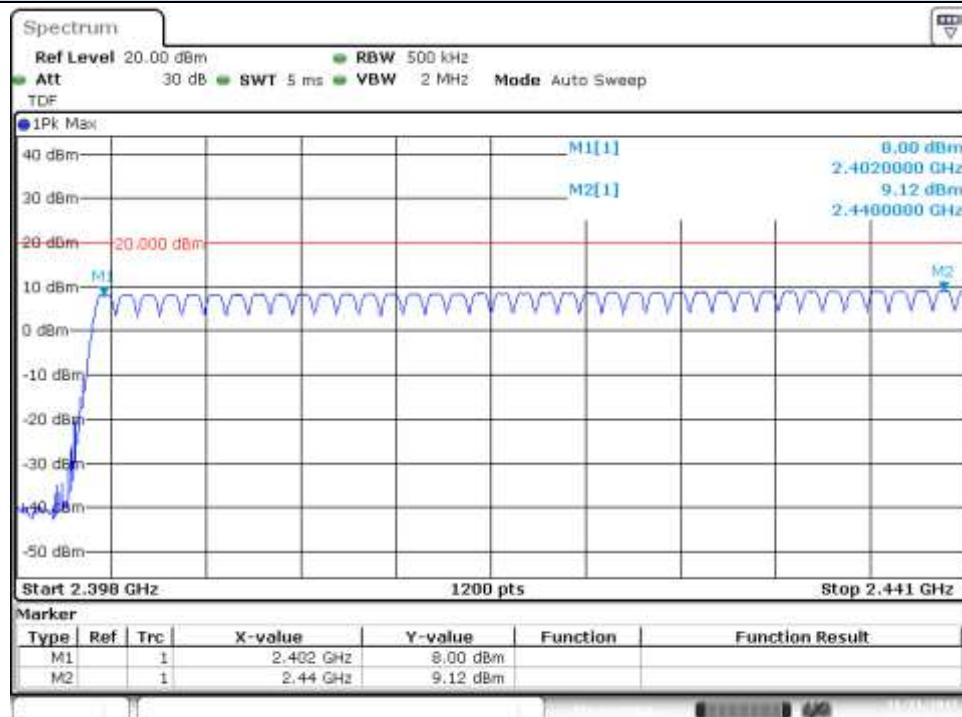
Date: 20 NOV 2017 15:46:50



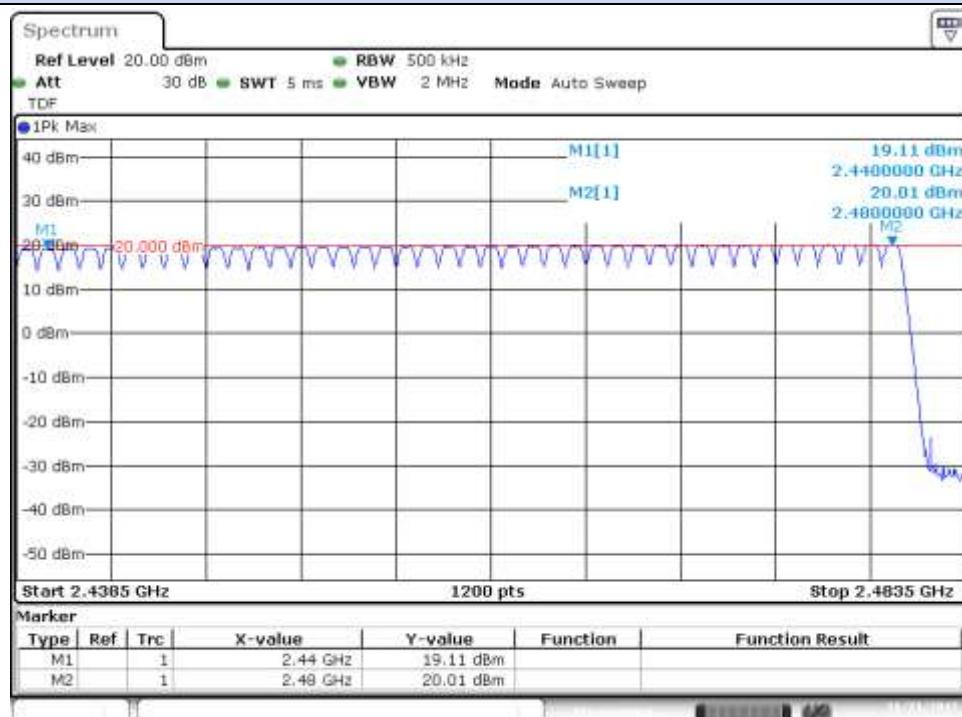


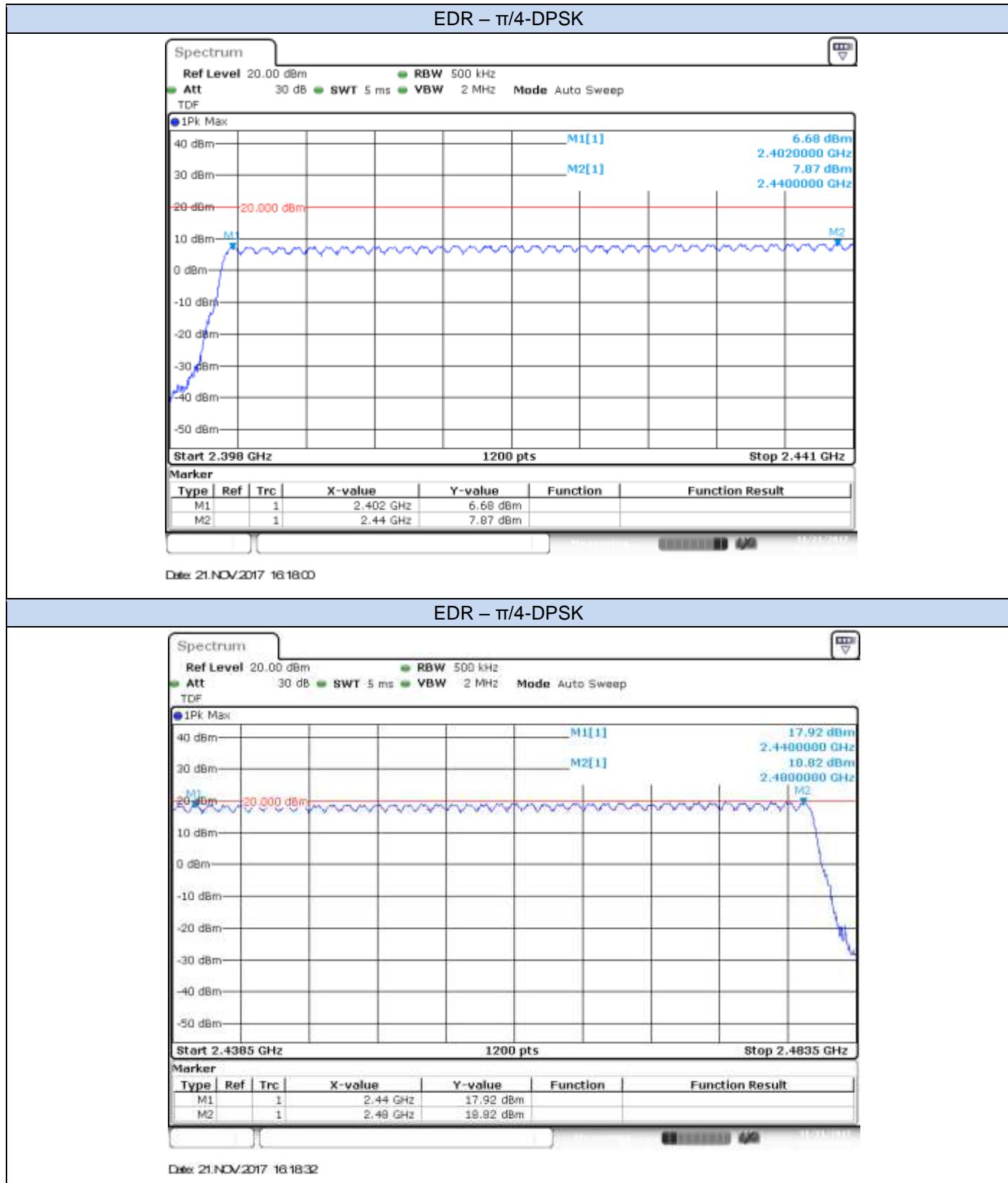
CHAIN A DIV2_Number of hopping channels

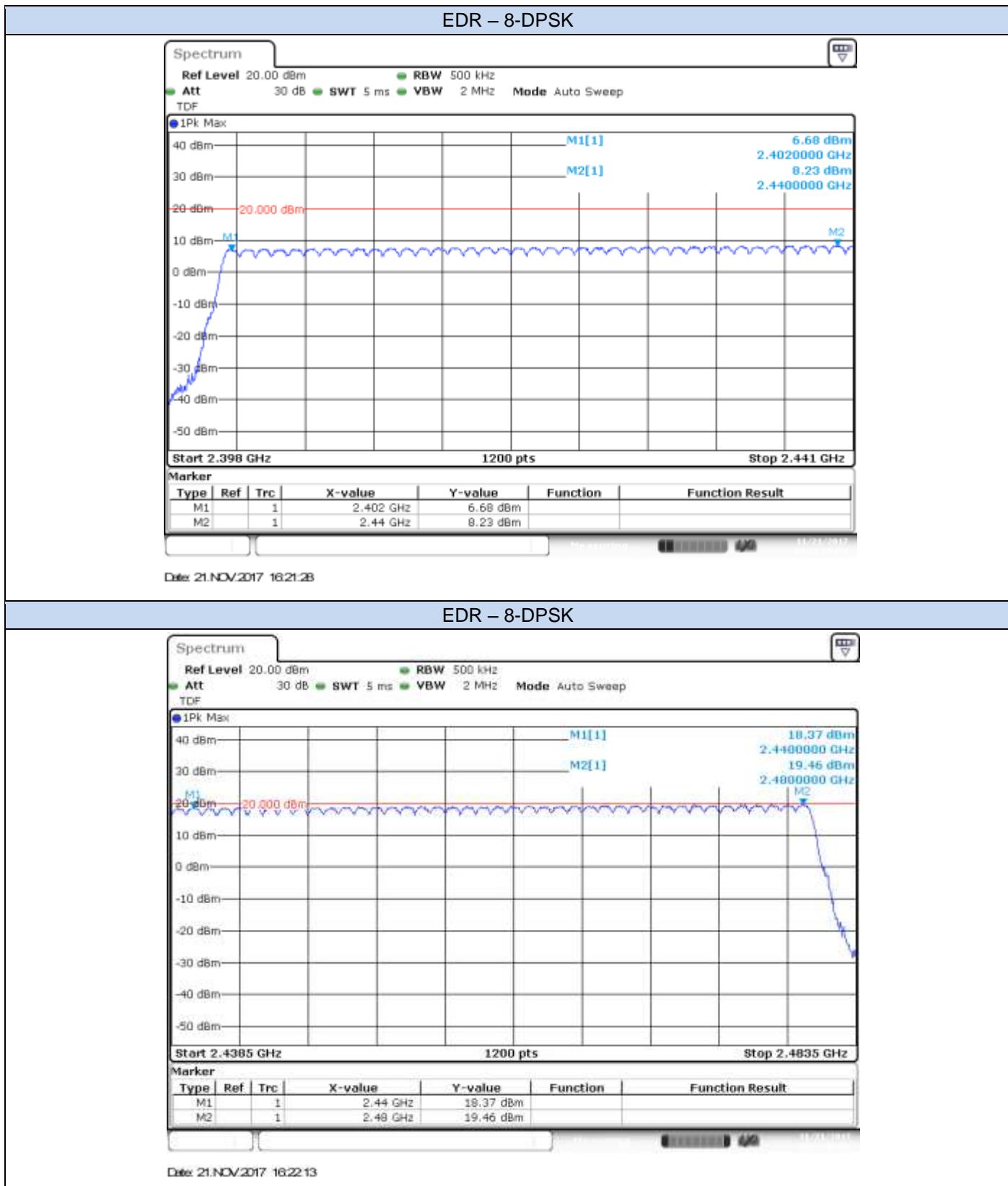
Basic Rate – GFSK



Basic Rate – GFSK





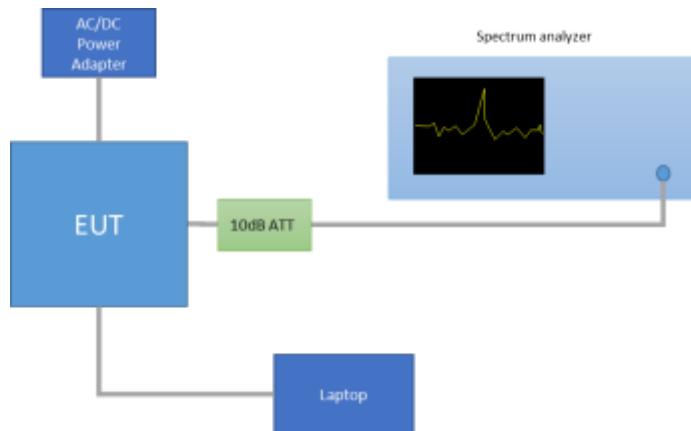


B.3 Time of Occupancy (Dwell Time)

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 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 $625\mu\text{s}$.

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 $0.4 \times 79 = 31.6$ seconds, each channel appears $10.13 \times 31.6 = 320.11$ times.

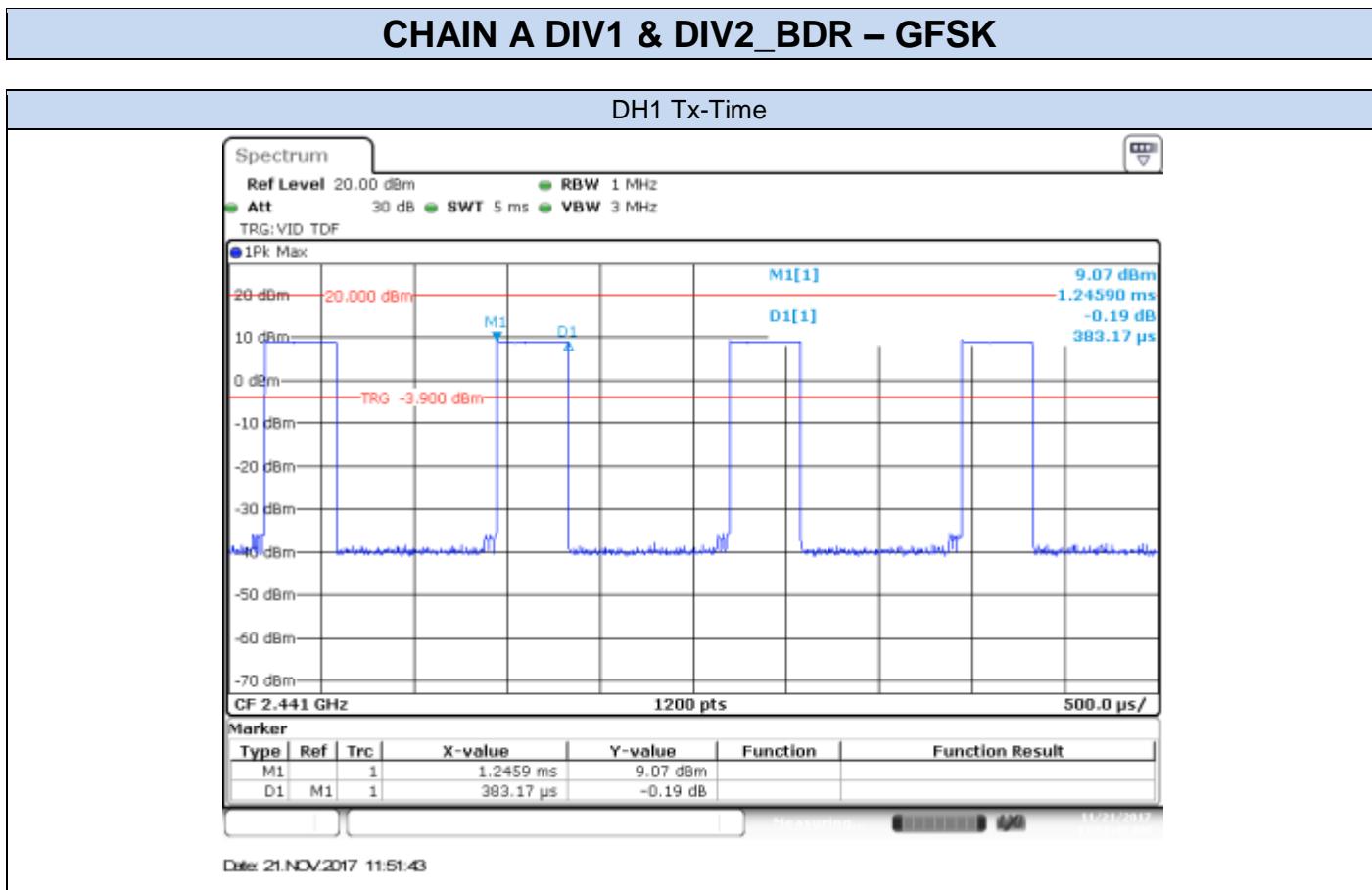
A DH3 packet, with independence of the modulation, needs 3 time slots for transmitting and 1 time slot for receiving. Then, the system makes in the worst case $1600/4 = 400$ hops per second with 79 channels. So each channel appears $400/79 = 5.1$ times per second and, for a period of $0.4 \times 79 =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

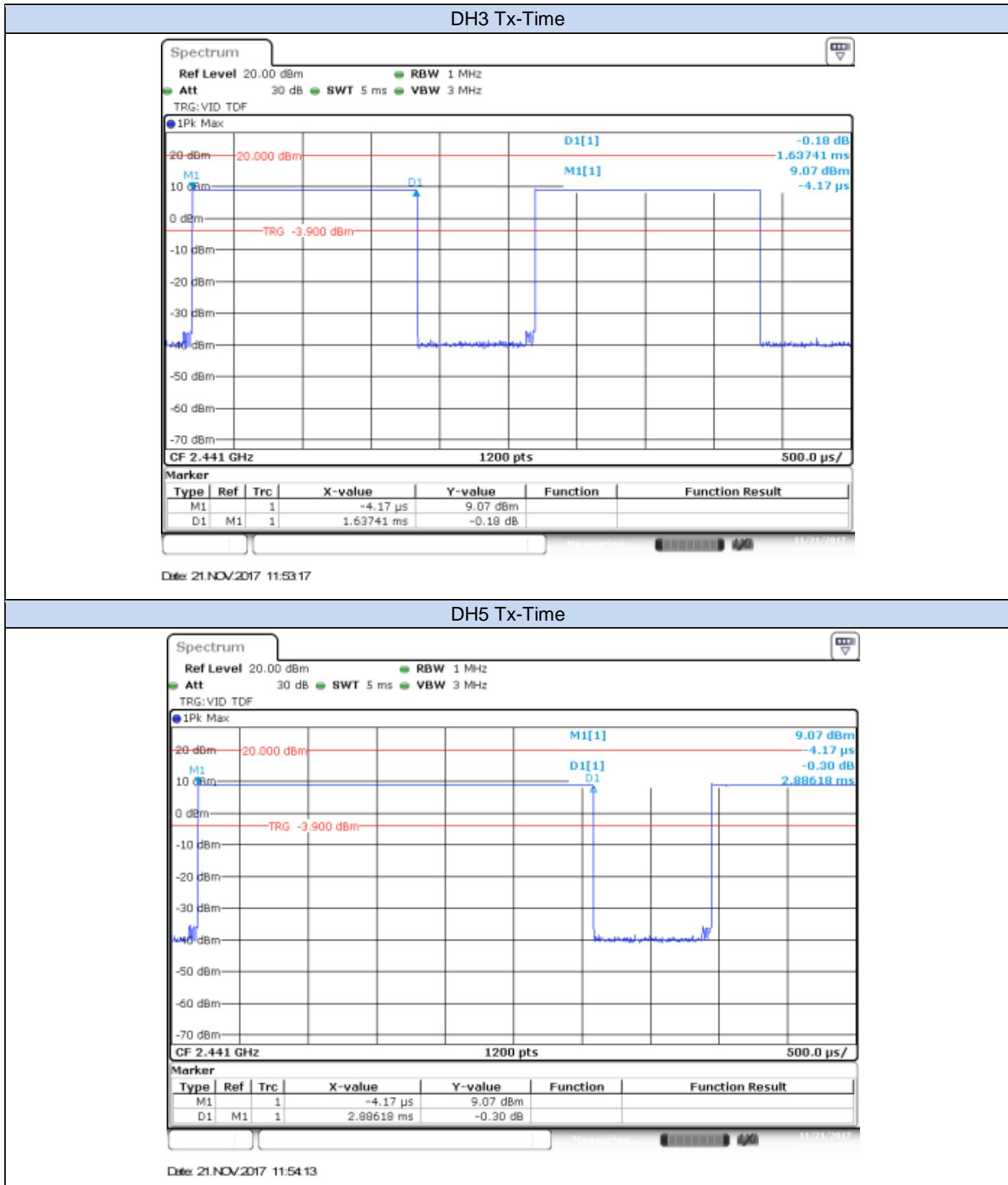
A DH5 packet, with independence of the modulation, needs 5 time slots for transmitting and 1 time slot for receiving. Then, the system makes in the worst case $1600/6 = 266.67$ hops per second with 79 channels. So each channel appears $266.67/79 = 3.37$ times per second and, for a period of $0.4 \times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

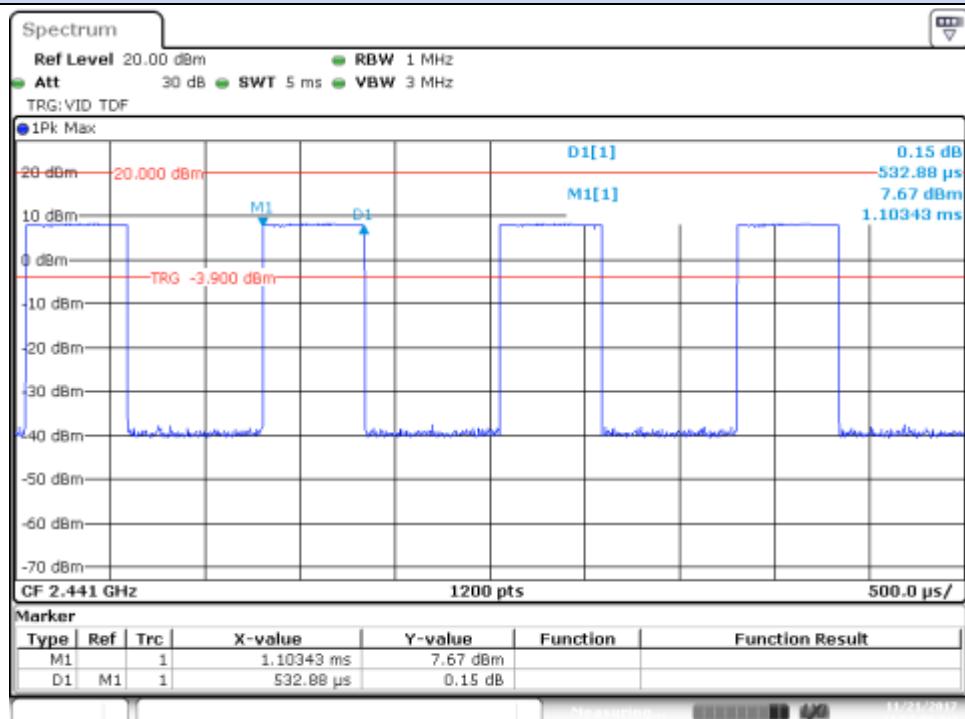
Mode	Antenna	Packet Type	Times of appearance	Tx-time [ms]	Dwell Time [ms]	
Basic Rate GFSK	Chain A Div 1 & Div 2	DH1	320.11	0.383	122.657	
		DH3	161.16	1.637	263.885	
		DH5	106.49	2.886	307.349	
EDR π/4-DQPSK		2-DH1	320.11	0.533	170.580	
		2-DH3	161.16	1.783	287.318	
		2-DH5	106.49	2.890	307.747	
EDR 8-DPSK		3-DH1	320.11	0.569	182.143	
		3-DH3	161.16	1.636	263.609	
		3-DH5	106.49	2.890	307.747	

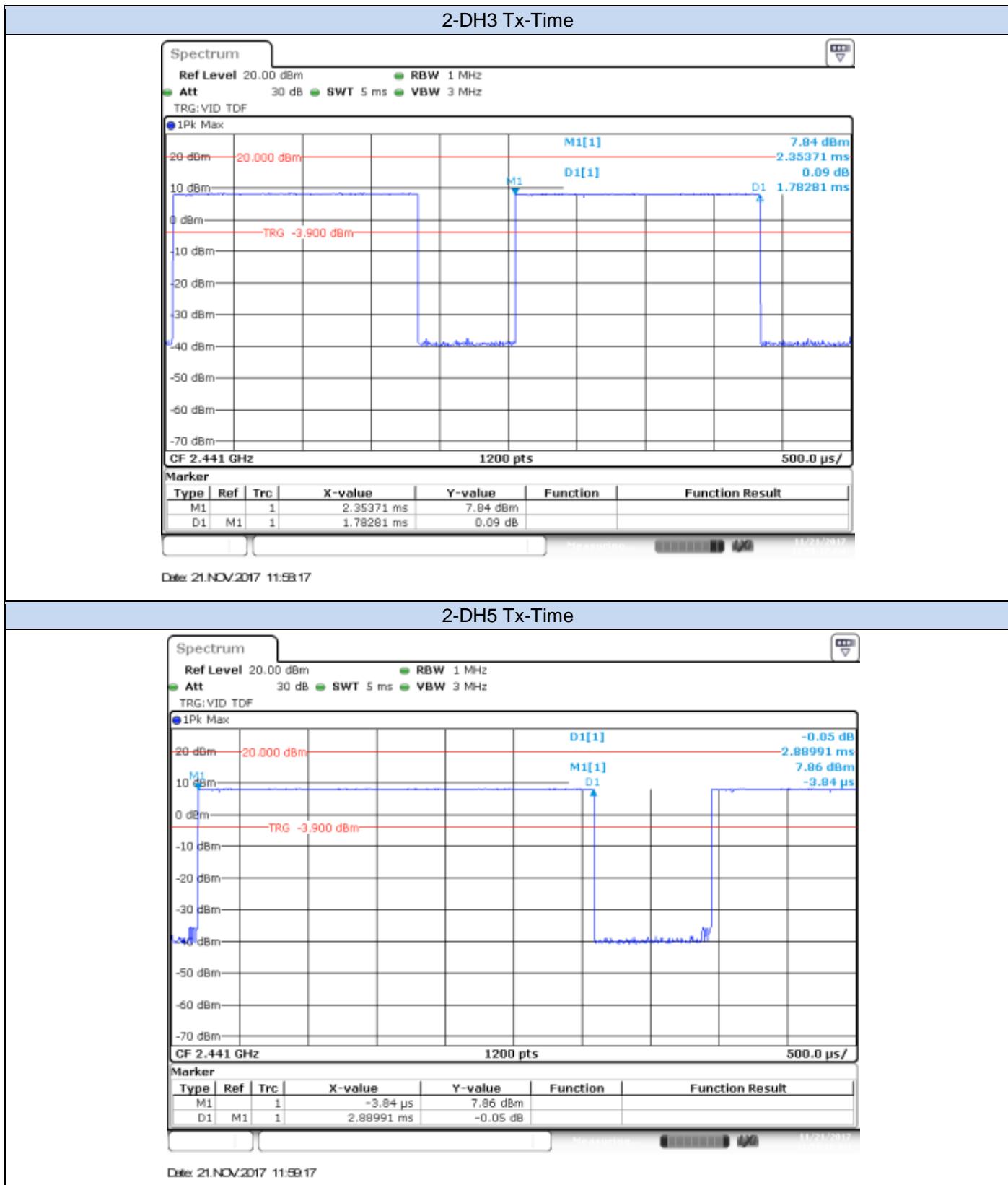
Results Screenshot:



CHAIN A DIV1 & DIV2_EDR – $\pi/4$ -DQPSK

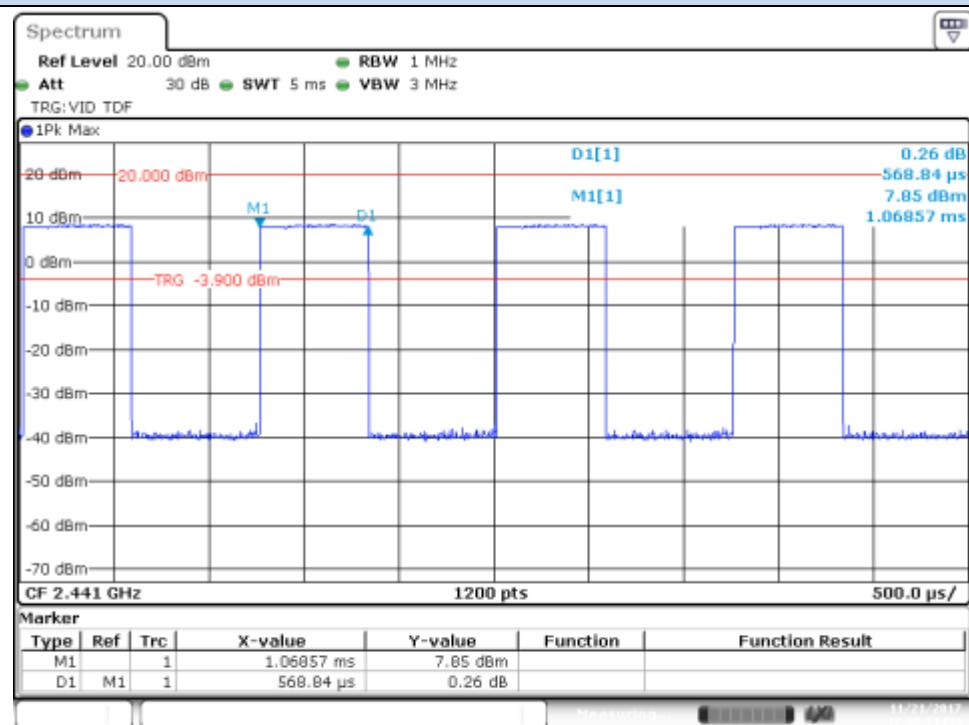
2-DH1 Tx-Time

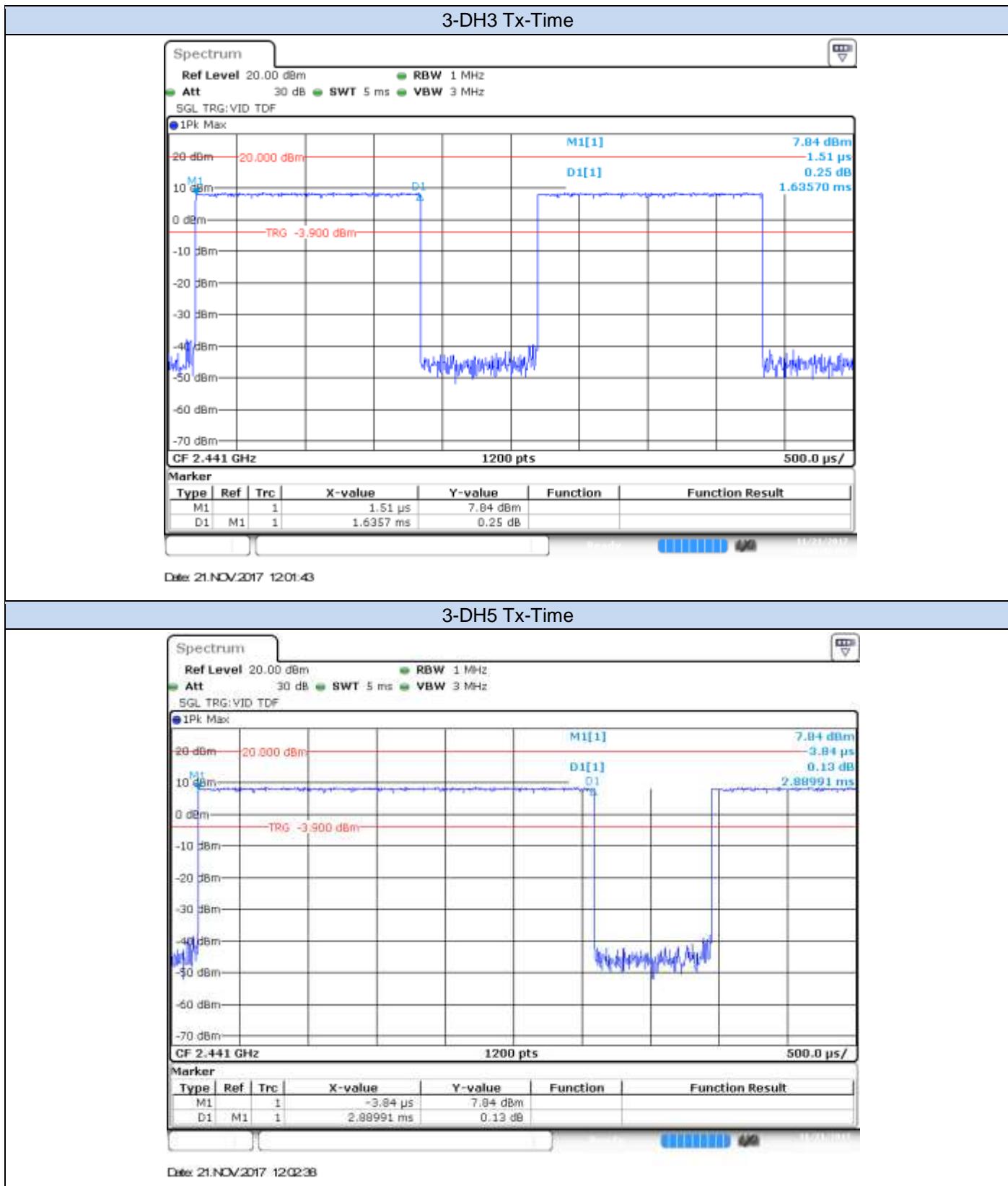




CHAIN A DIV1 & DIV2_EDR – 8-DPSK

3-DH1 Tx-Time





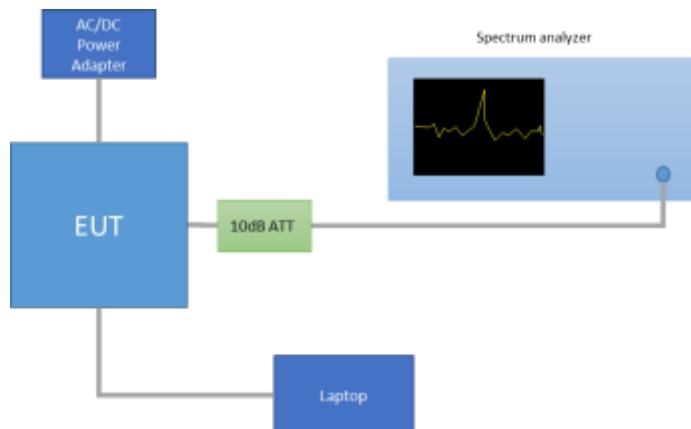
B.4 Maximum Peak Output Power antenna gain

Test Limits

FCC part	RSS part	Limits
15.247 (b) (1)	RSS-247 Clause 5.4 (b)	<p>(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:</p> <p>(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. (...)</p> <p>(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.</p>

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.

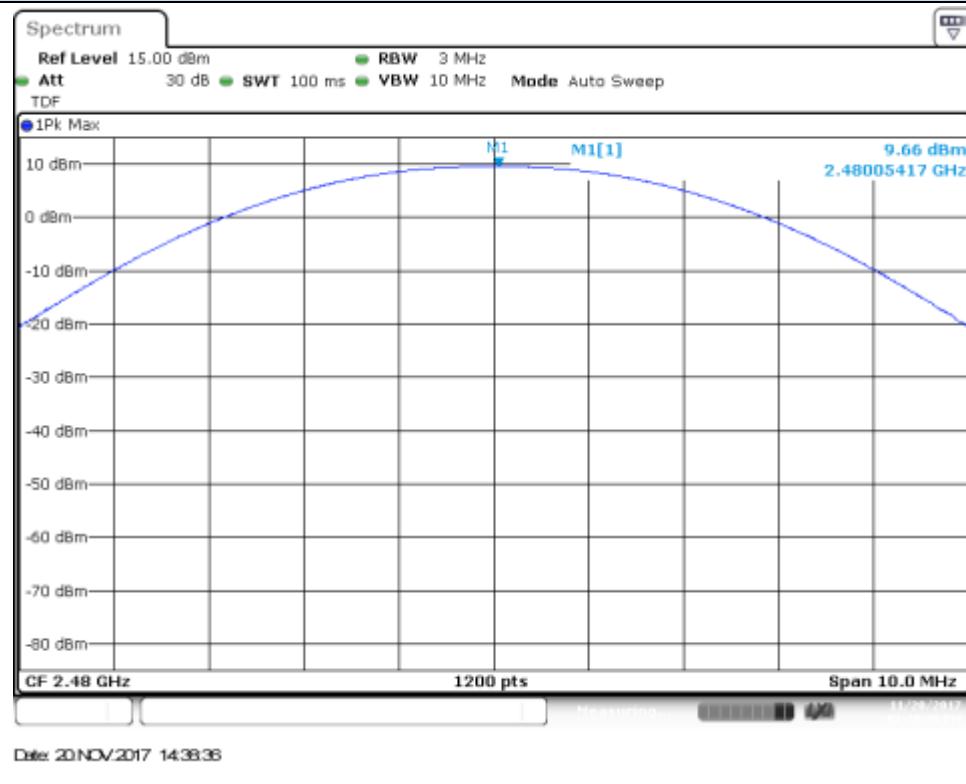
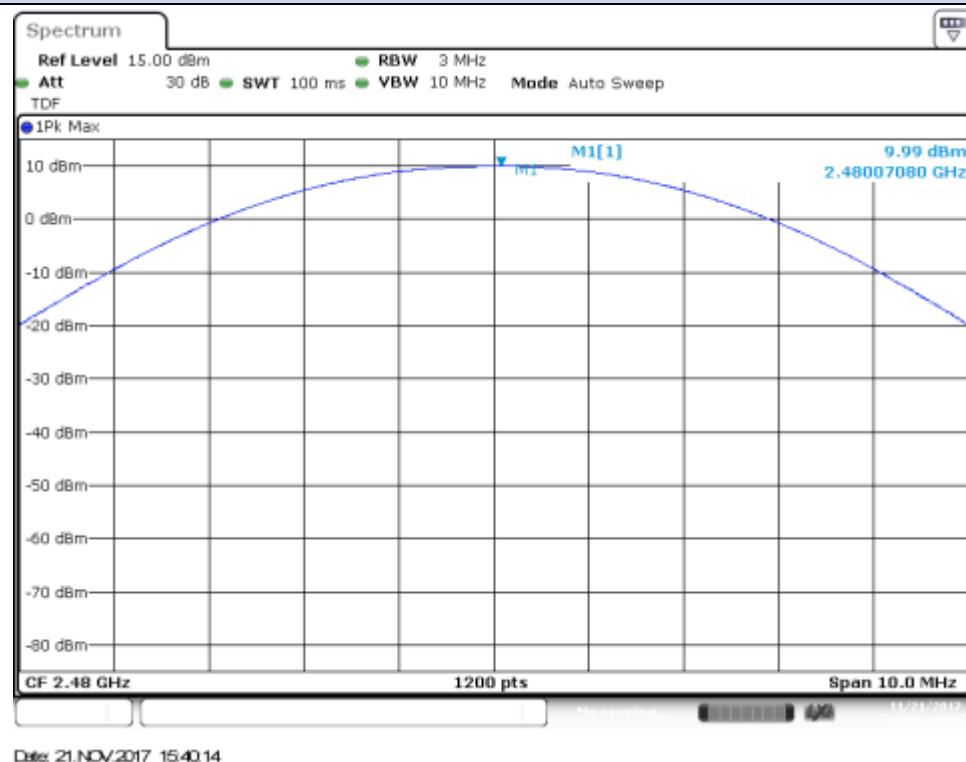


The declared maximum antenna gain is 3.24dBi.

Results tables

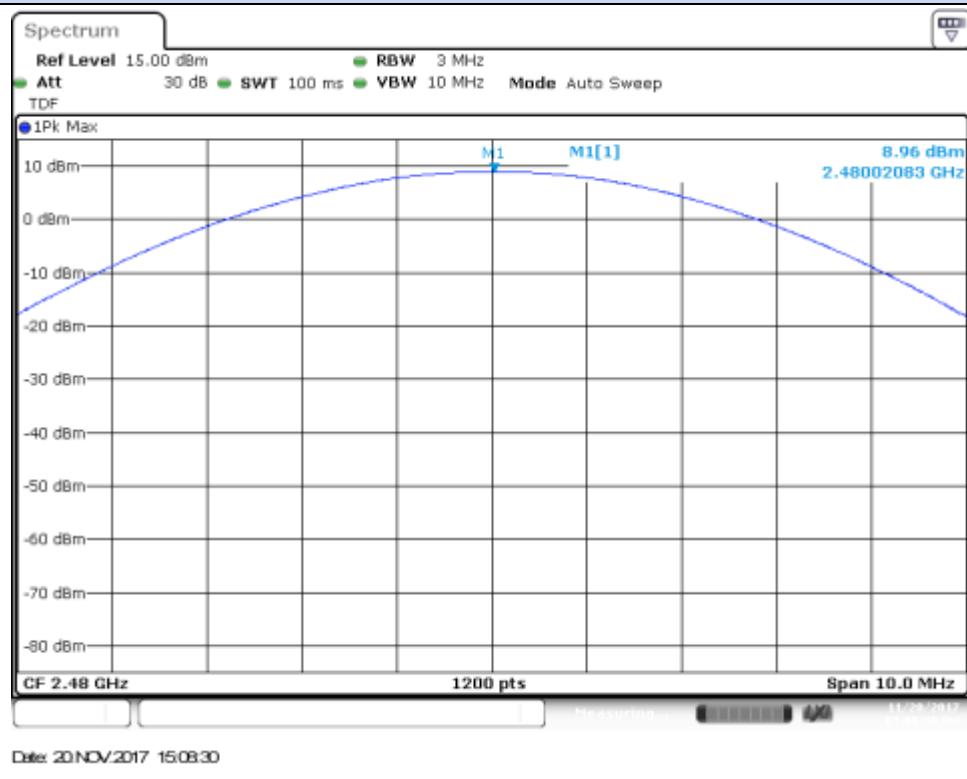
Mode	Packet Type	Antenna	Channel Number	Frequency [MHz]	Peak Power [dBm]	Peak Power [mW]	Peak Power EIRP [dBm]	Peak Power EIRP [mW]
Basic Rate GFSK	DH5	Chain A Div 1	0	2402	7.91	6.18	11.15	13.03
			39	2441	8.93	7.82	12.17	16.48
			78	2480	9.66	9.25	12.90	19.50
EDR $\pi/4$ -DQPSK	2DH5	Chain A Div 1	0	2402	7.58	5.73	10.82	12.08
			39	2441	8.34	6.82	11.58	14.39
			78	2480	8.96	7.87	12.20	16.60
EDR 8-DPSK	3DH5	Chain A Div 1	0	2402	4.54	2.84	7.78	6.00
			39	2441	8.37	6.87	11.61	14.49
			78	2480	9.02	7.98	12.26	16.83
Basic Rate GFSK	DH5	Chain A Div 2	0	2402	8.24	6.67	11.48	14.06
			39	2441	9.19	8.30	12.43	17.50
			78	2480	9.99	9.98	13.23	21.04
EDR $\pi/4$ -DQPSK	2DH5	Chain A Div 2	0	2402	7.89	6.15	11.13	12.97
			39	2441	8.64	7.31	11.88	15.42
			78	2480	9.34	8.59	12.58	18.11
EDR 8-DPSK	3DH5	Chain A Div 2	0	2402	7.90	6.17	11.14	13.00
			39	2441	8.69	7.40	11.93	15.60
			78	2480	9.40	8.71	12.64	18.37

Max Value

Results Screenshot
CHAIN A DIV1_Basic Rate - GFSK
Peak Power – CH78

CHAIN A DIV2_Basic Rate - GFSK
Peak Power – CH78


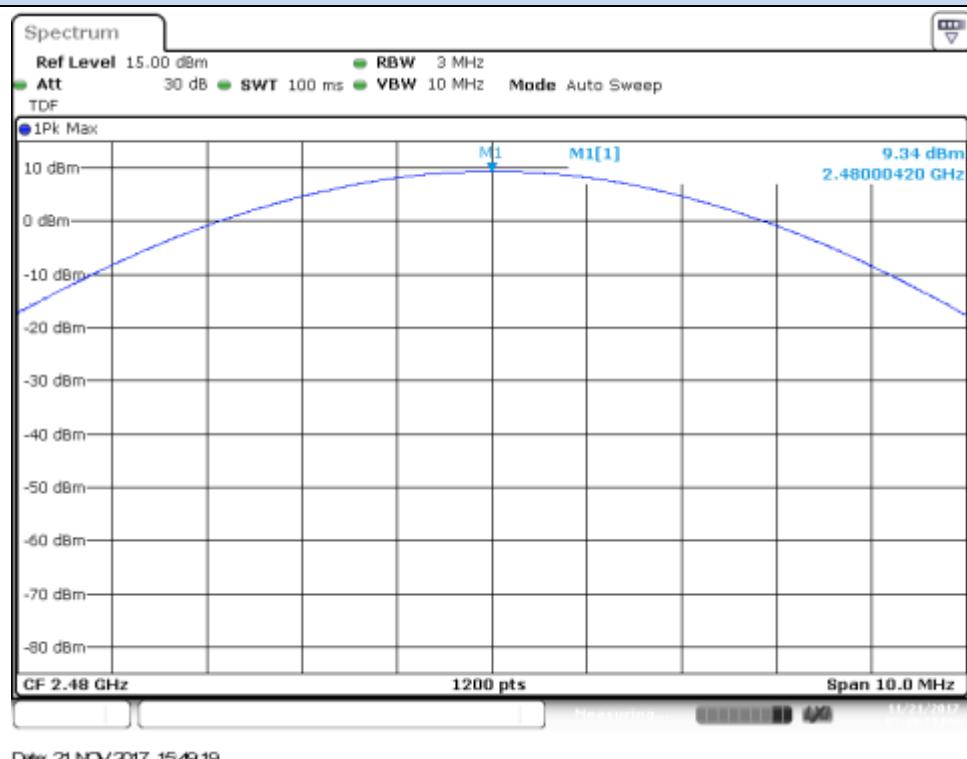
CHAIN A DIV1_EDR – $\pi/4$ -DQPSK

Peak Power – CH78



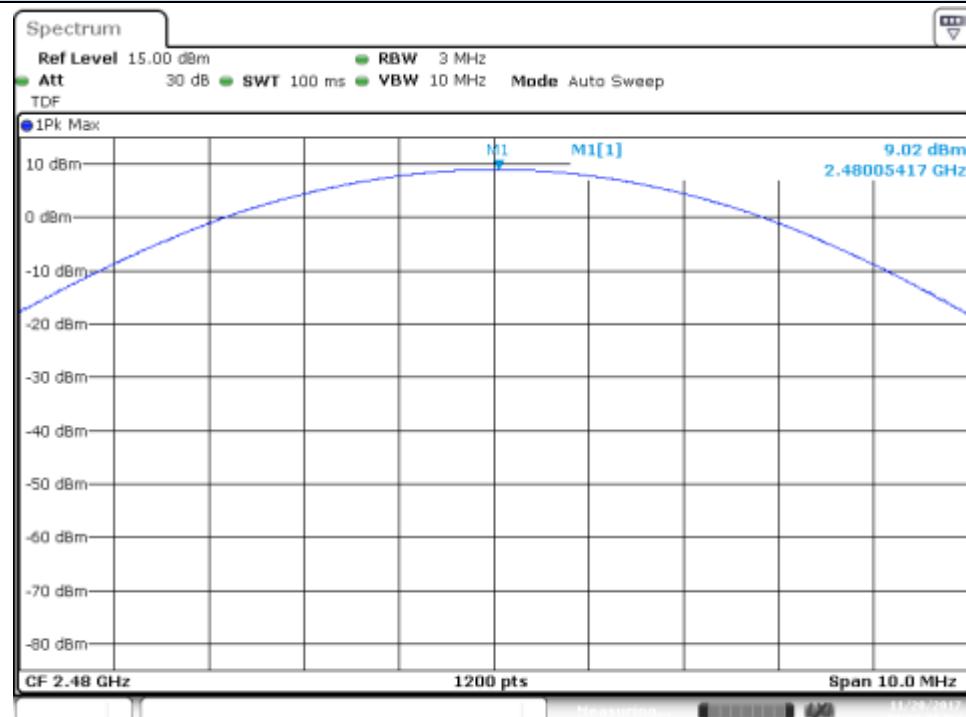
CHAIN A DIV2_EDR – $\pi/4$ -DQPSK

Peak Power – CH78



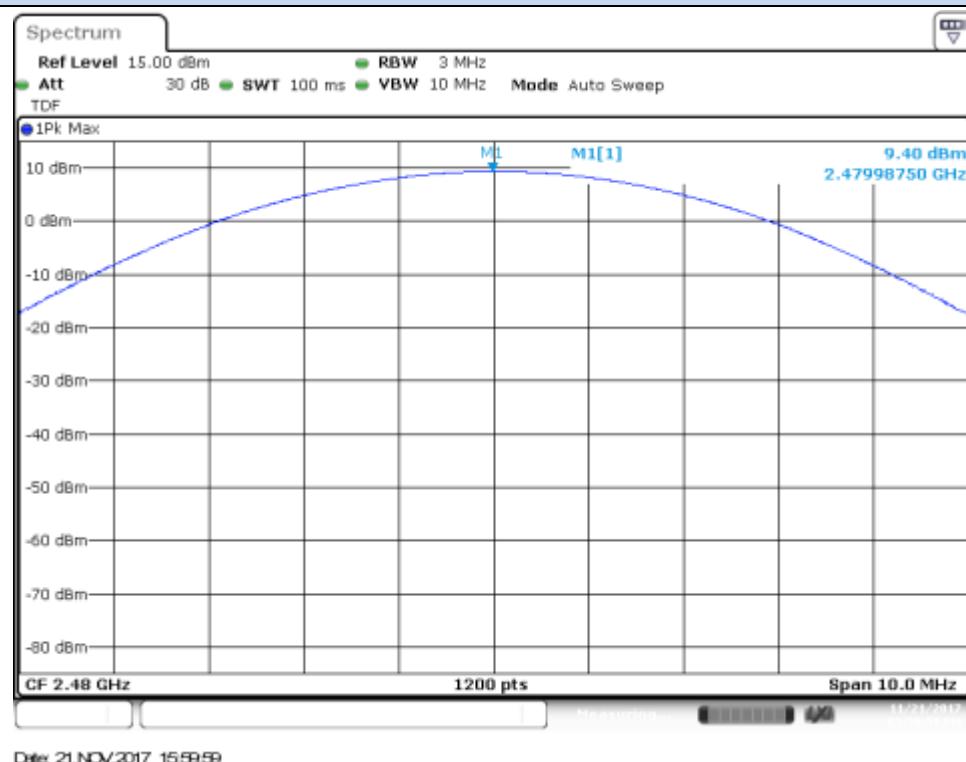
CHAIN A DIV1_EDR – 8-DPSK

Peak Power – CH78



CHAIN A DIV2_EDR – 8-DPSK

Peak Power – CH78



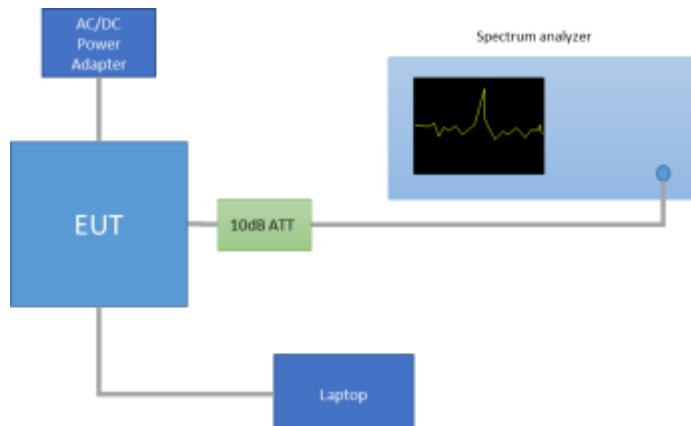
B.5 Out-of-band emission (conducted)

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.



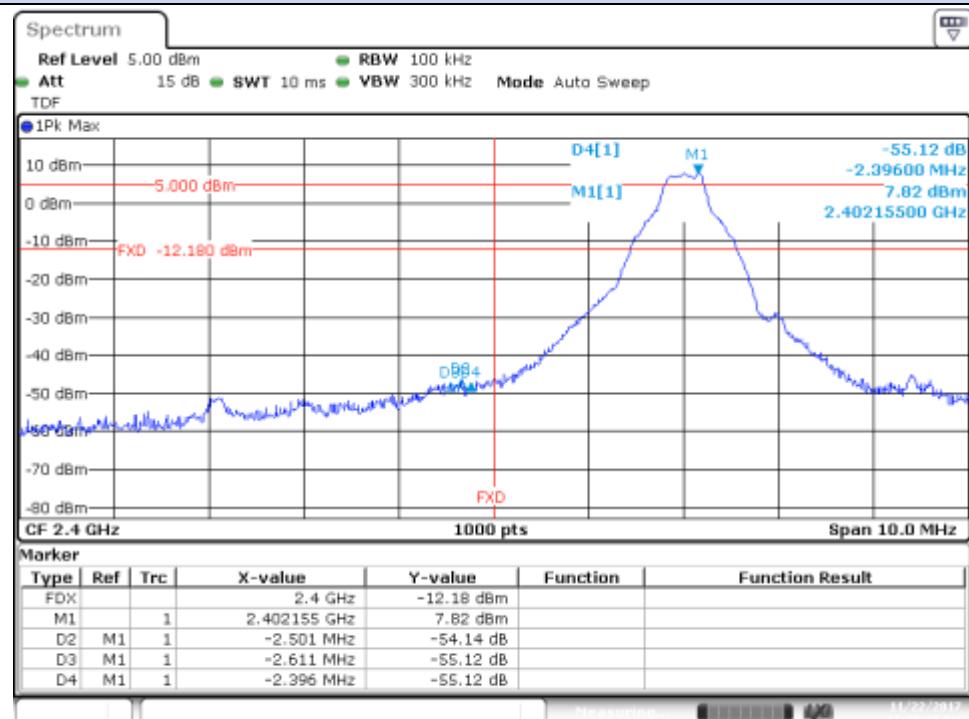
Note: these PSD_{Peak} values are shown just as a reference for the compliance of the Out-of-band Measurements. Thus the RBW used for these measurements was 100 kHz.

Results tables

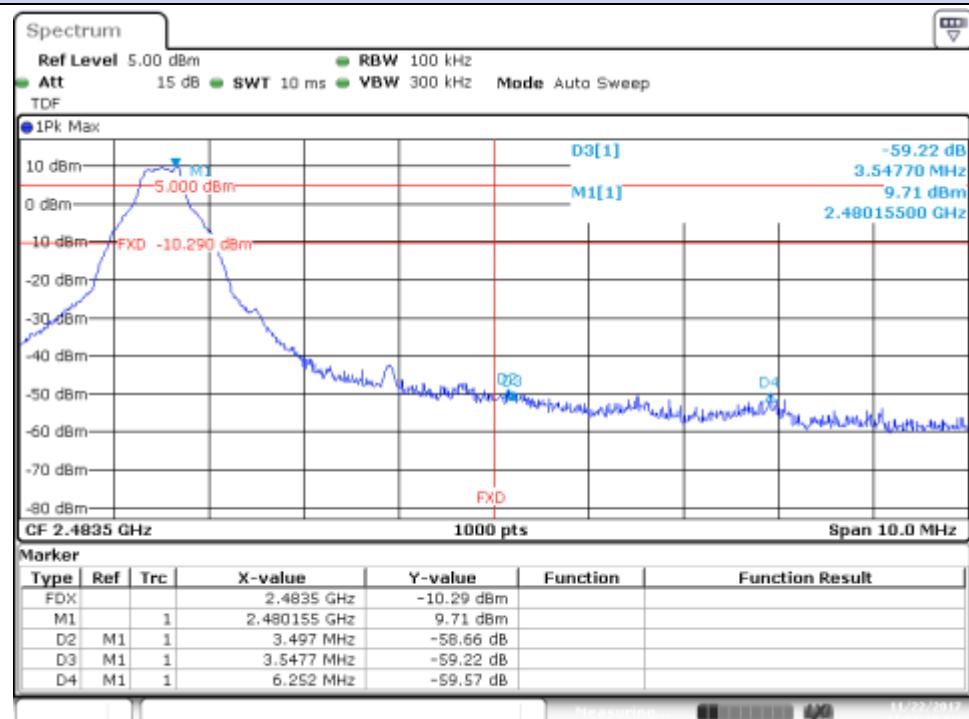
Mode	Packet Type	Antenna	CH	Frequency [MHz]	PSD Peak [dBm]	
Basic Rate - GFSK	DH5	Chain A Div 1	0	2402	7.82	
			39	2441	8.88	
			78	2480	9.71	
EDR – π/4-DQPSK	2DH5		0	2402	7.04	
			39	2441	7.75	
			78	2480	8.27	
	3DH5		0	2402	7.05	
			39	2441	7.77	
			78	2480	8.30	
Basic Rate - GFSK	DH5	Chain A Div 2	0	2402	7.96	
			39	2441	8.96	
			78	2480	9.82	
EDR – π/4-DQPSK	2DH5		0	2402	6.88	
			39	2441	7.75	
			78	2480	8.27	
	3DH5		0	2402	7.04	
			39	2441	7.82	
			78	2480	8.36	

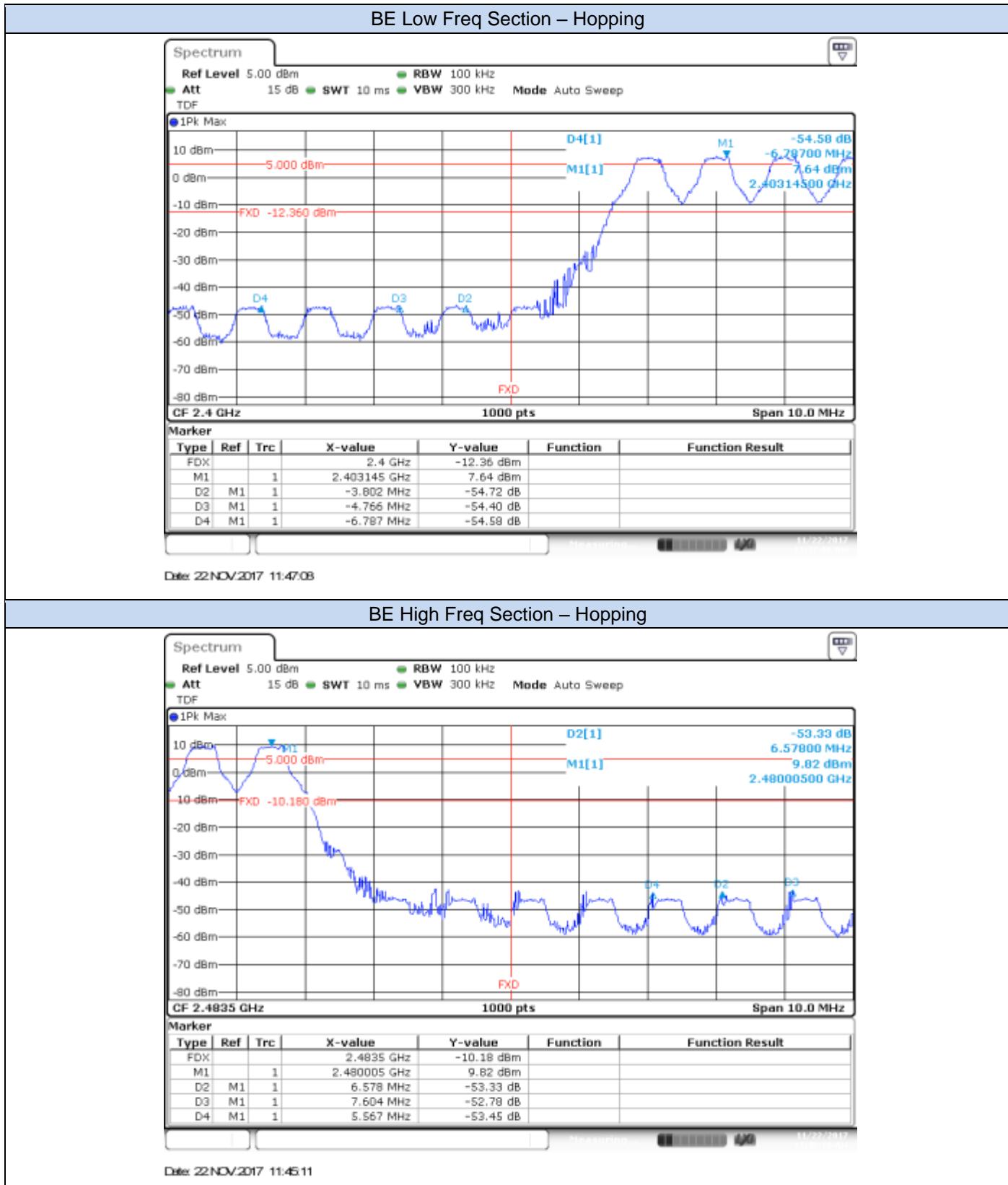
CHAIN A DIV1_Basic Rate - GFSK

BE Low Freq Section – CH0



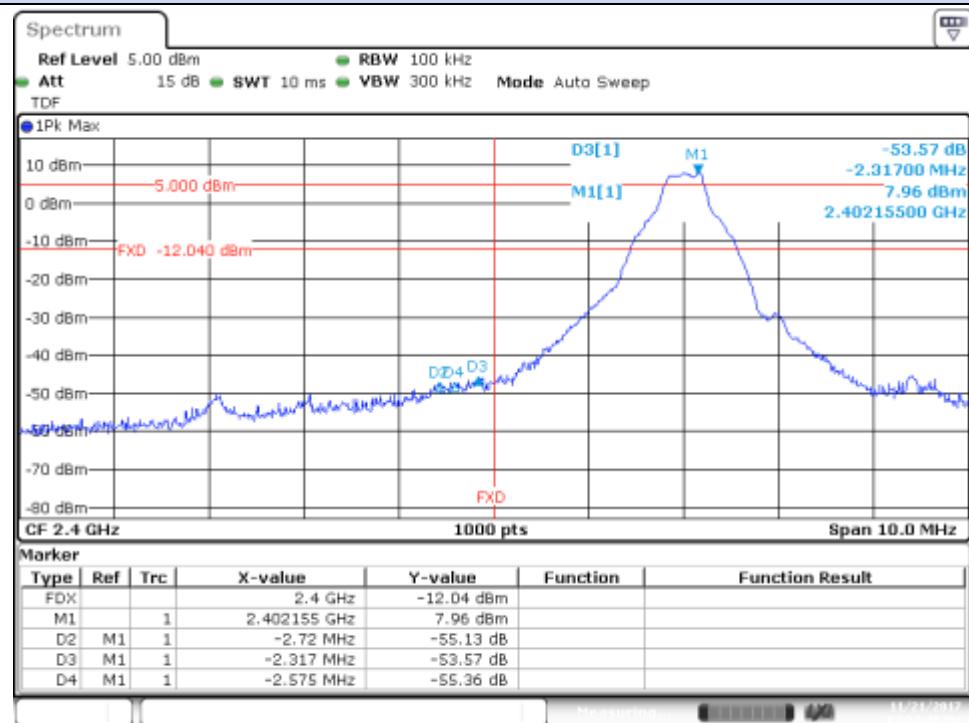
BE High Freq Section – CH78



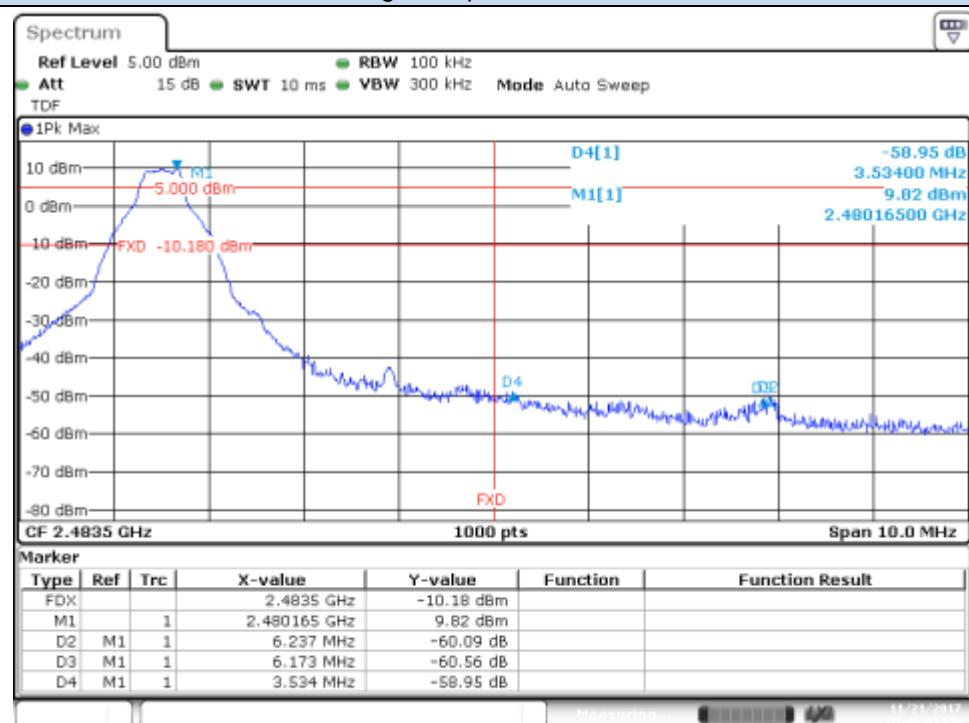


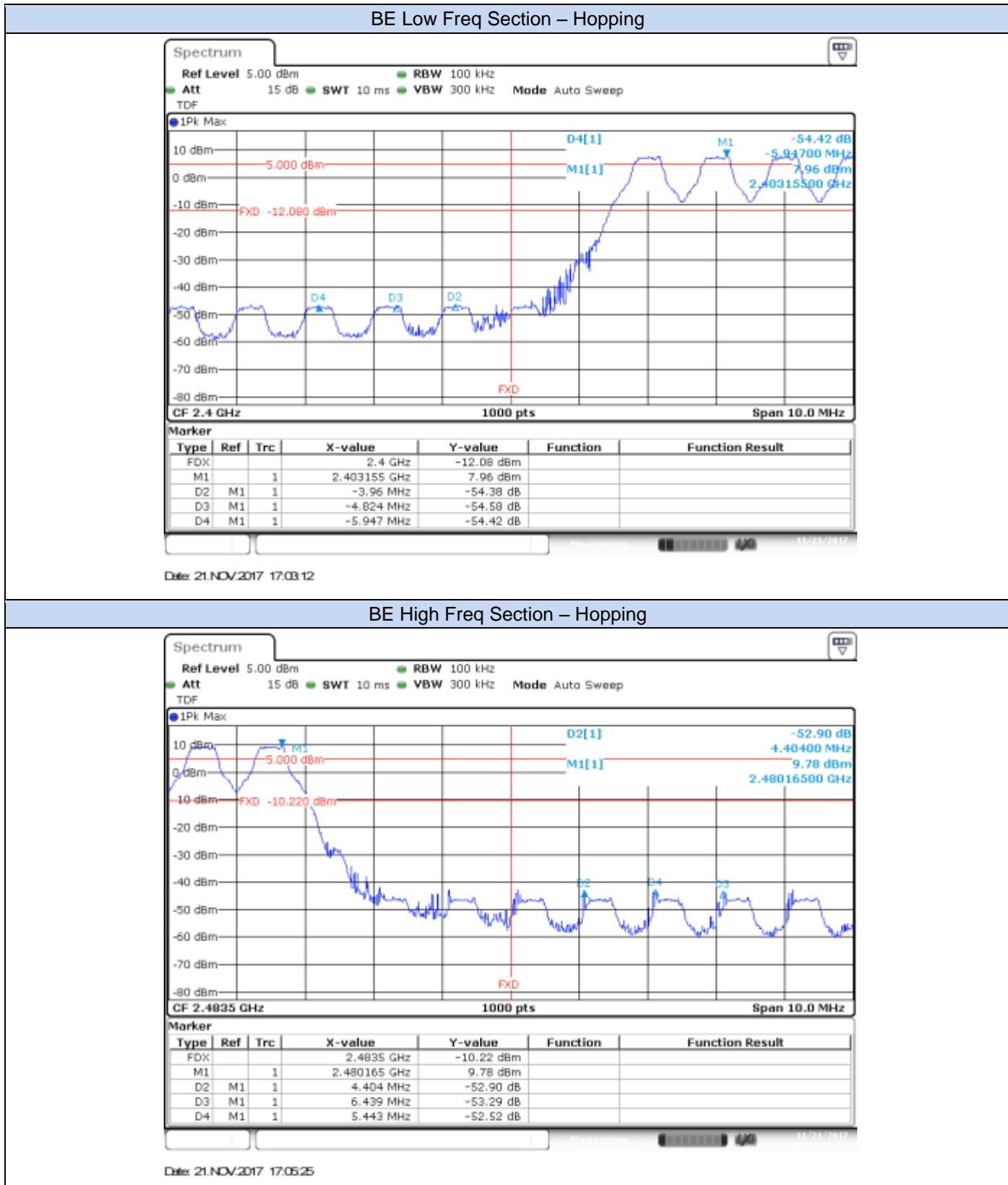
CHAIN A DIV2_Basic Rate - GFSK

BE Low Freq Section – CH0



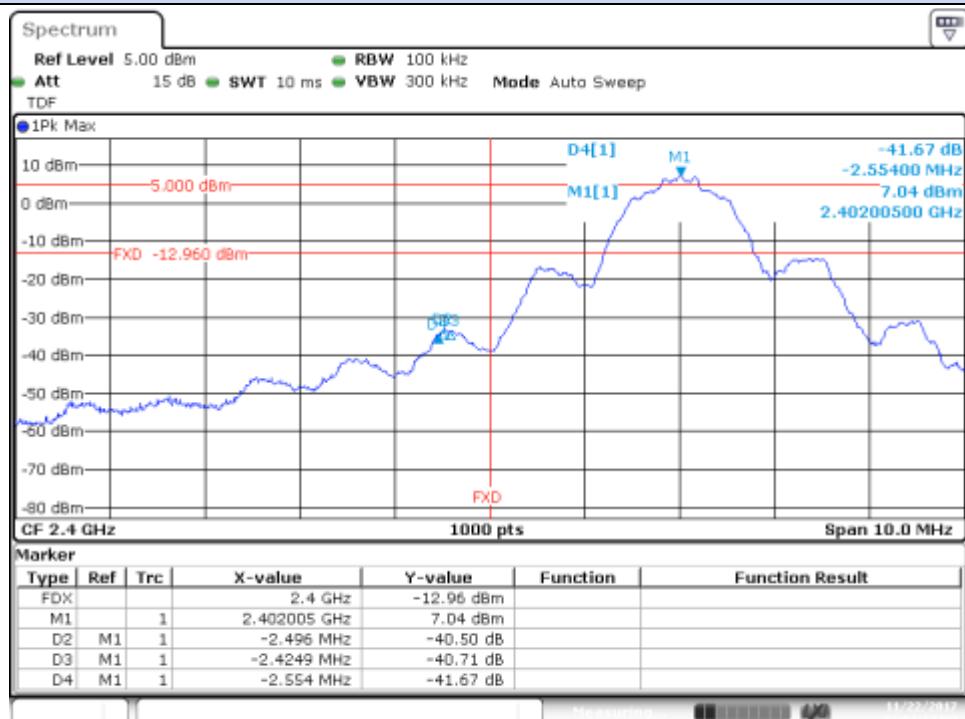
BE High Freq Section – CH78



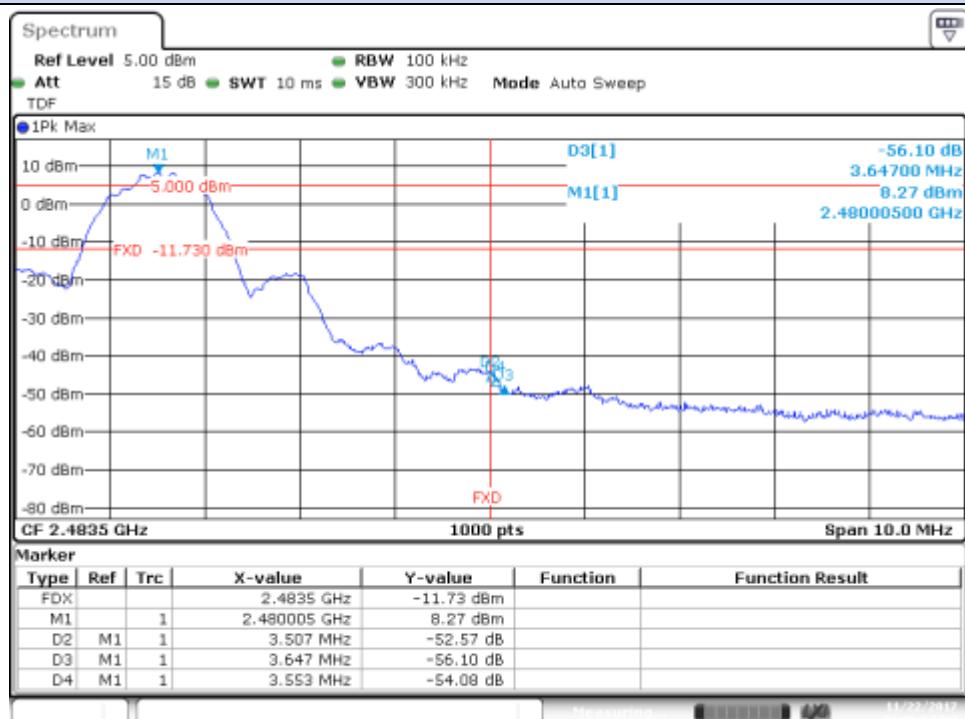


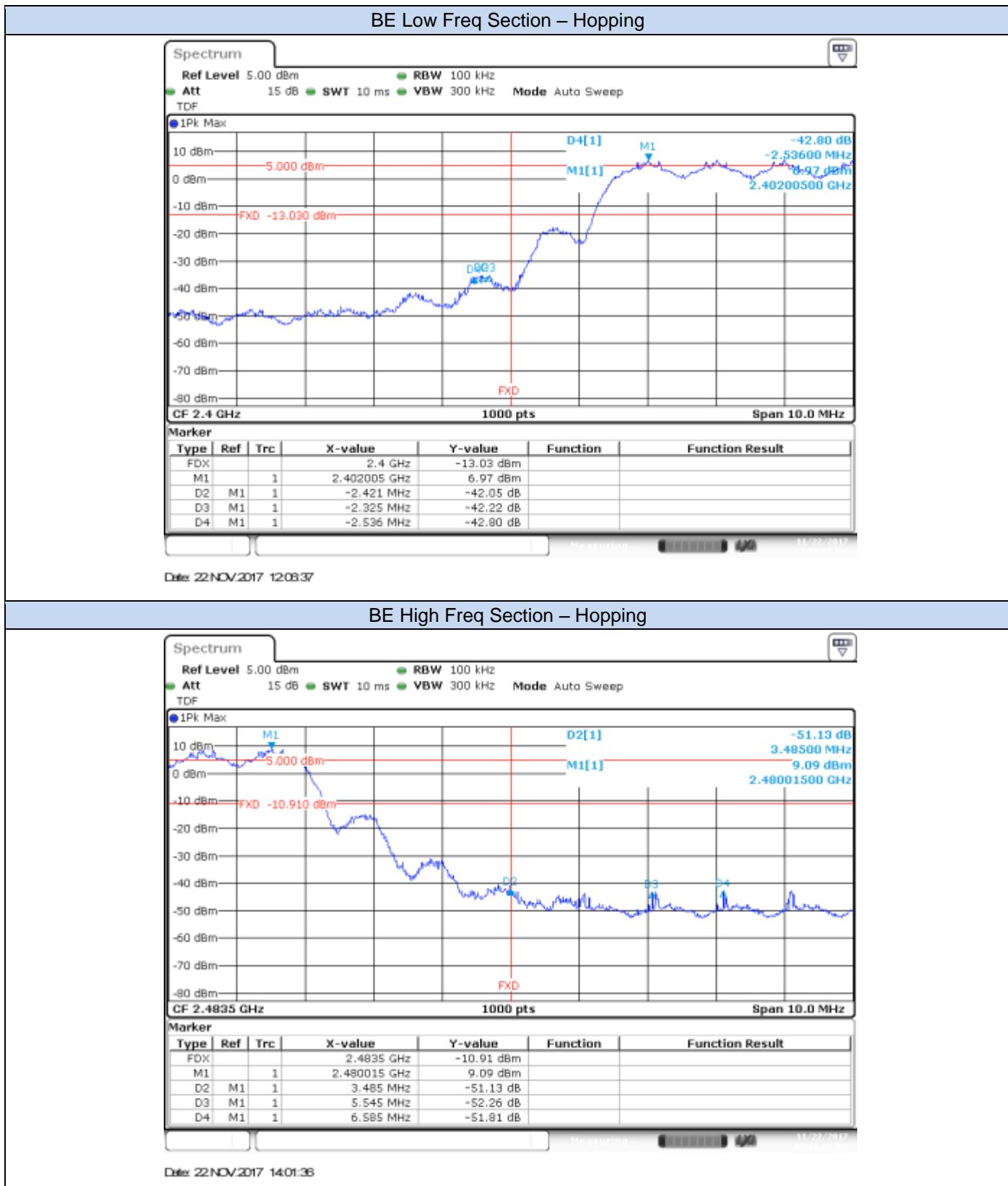
CHAIN A DIV1_EDR – $\pi/4$ -DQPSK

BE Low Freq Section – CH0



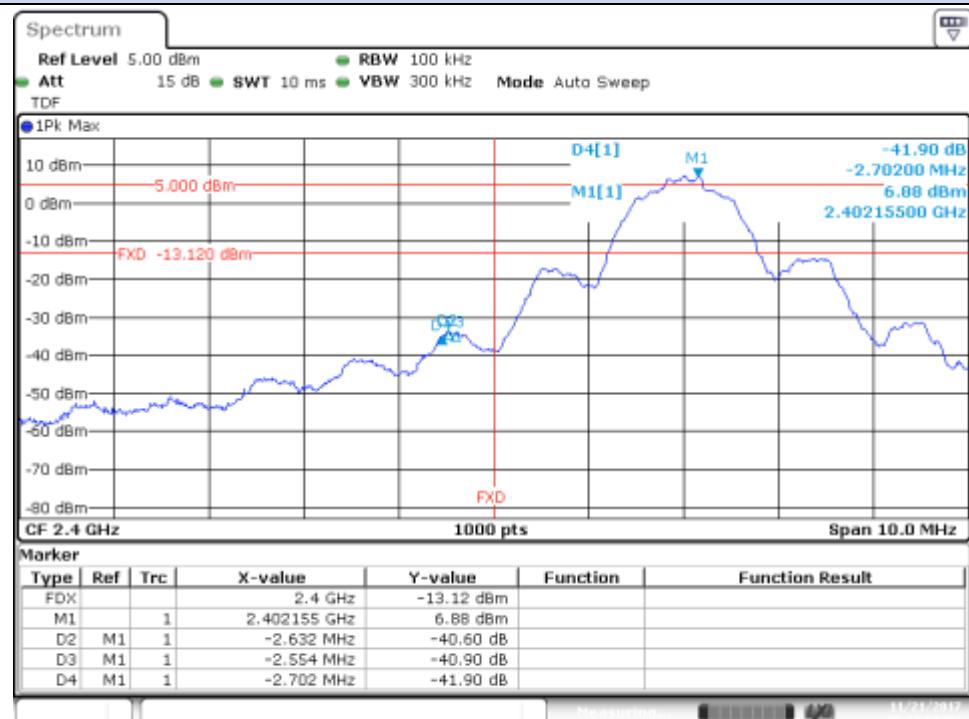
BE High Freq Section – CH78



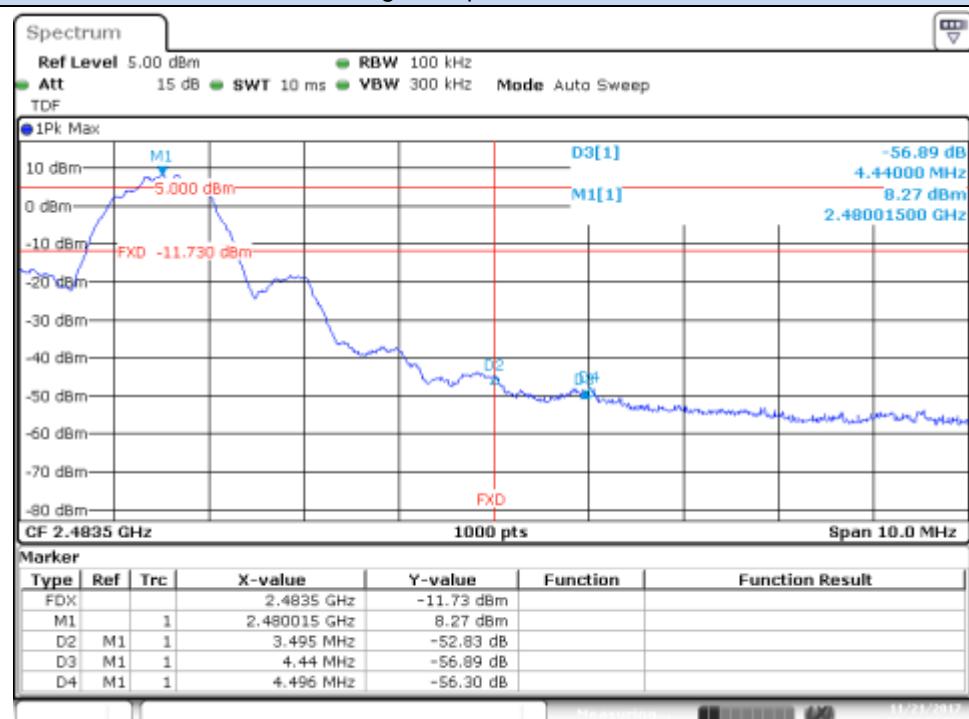


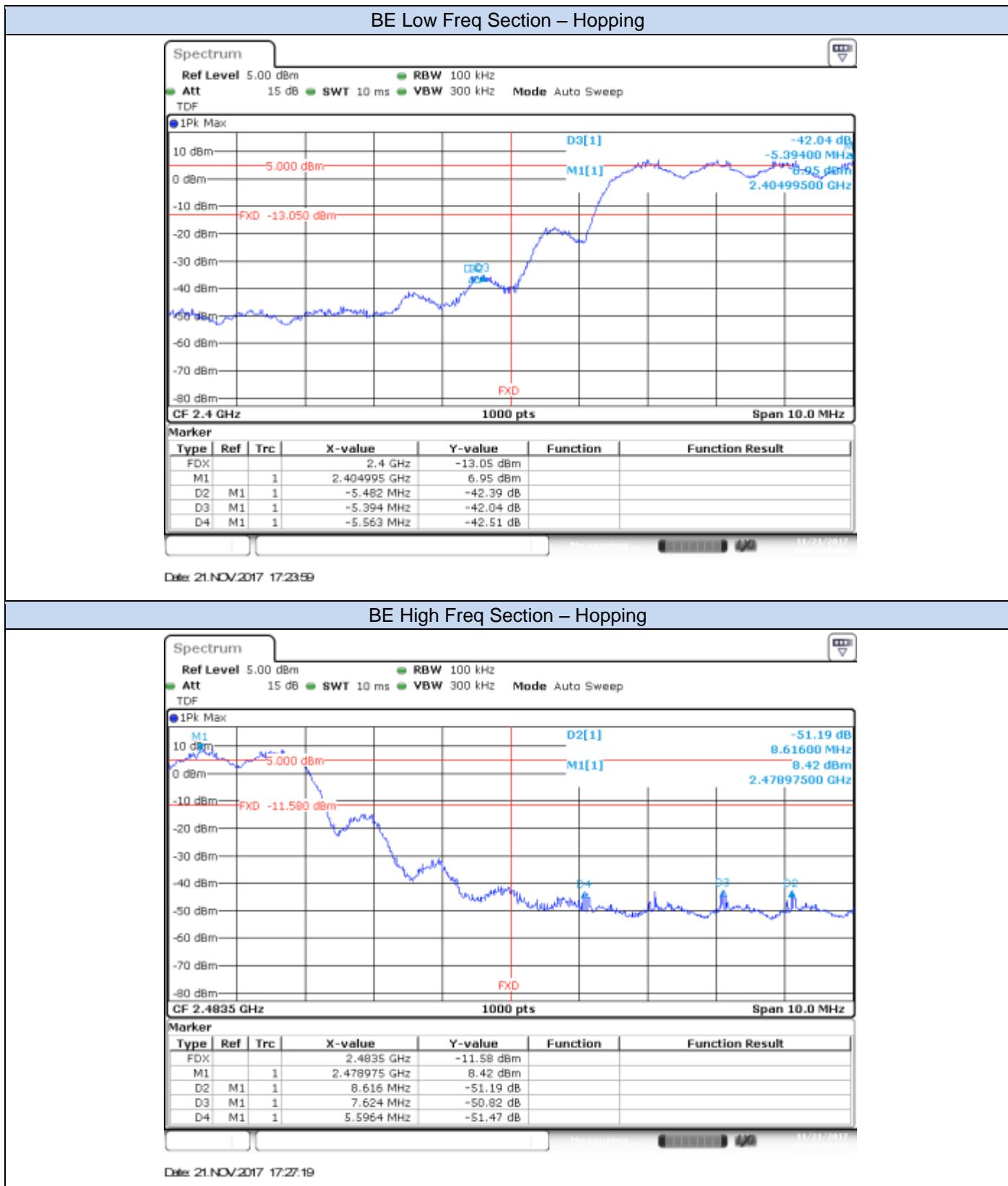
CHAIN A DIV2_EDR – π/4-DQPSK

BE Low Freq Section – CH0



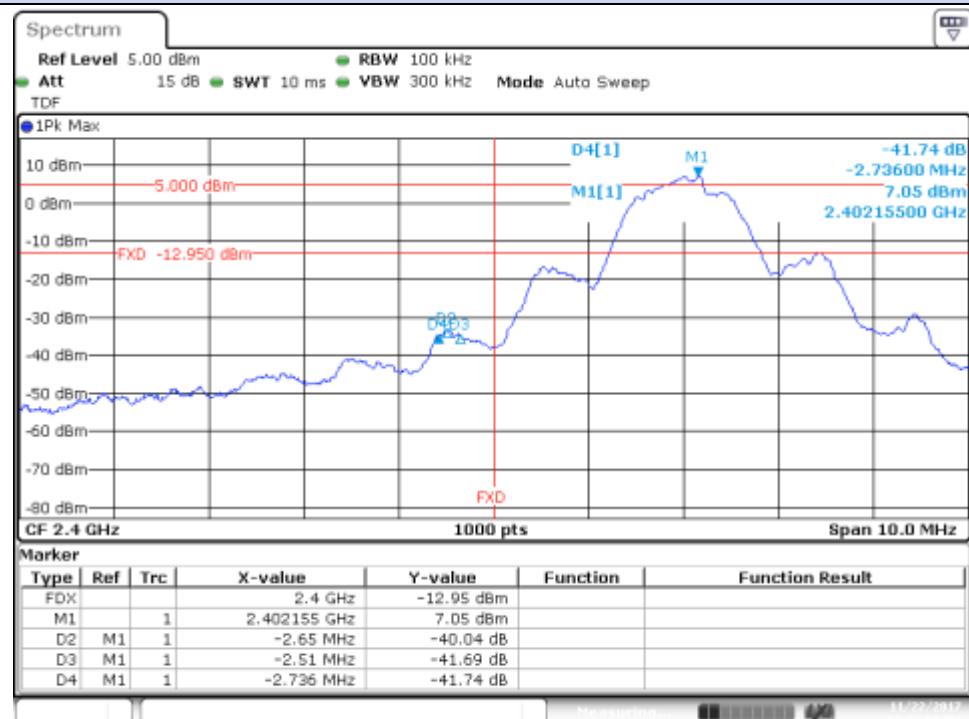
BE High Freq Section – CH78



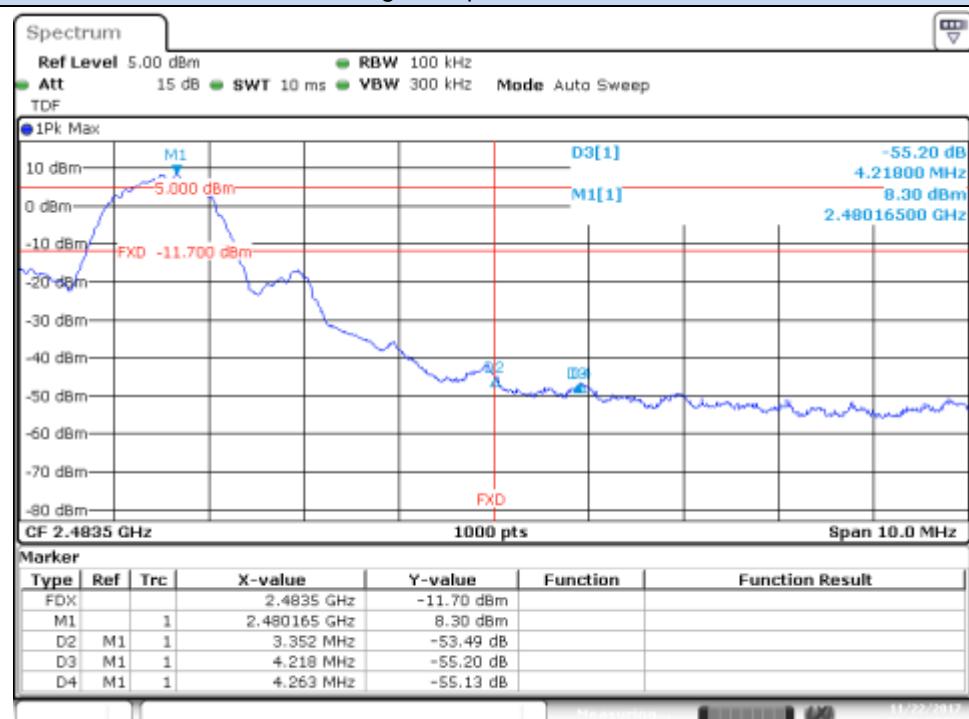


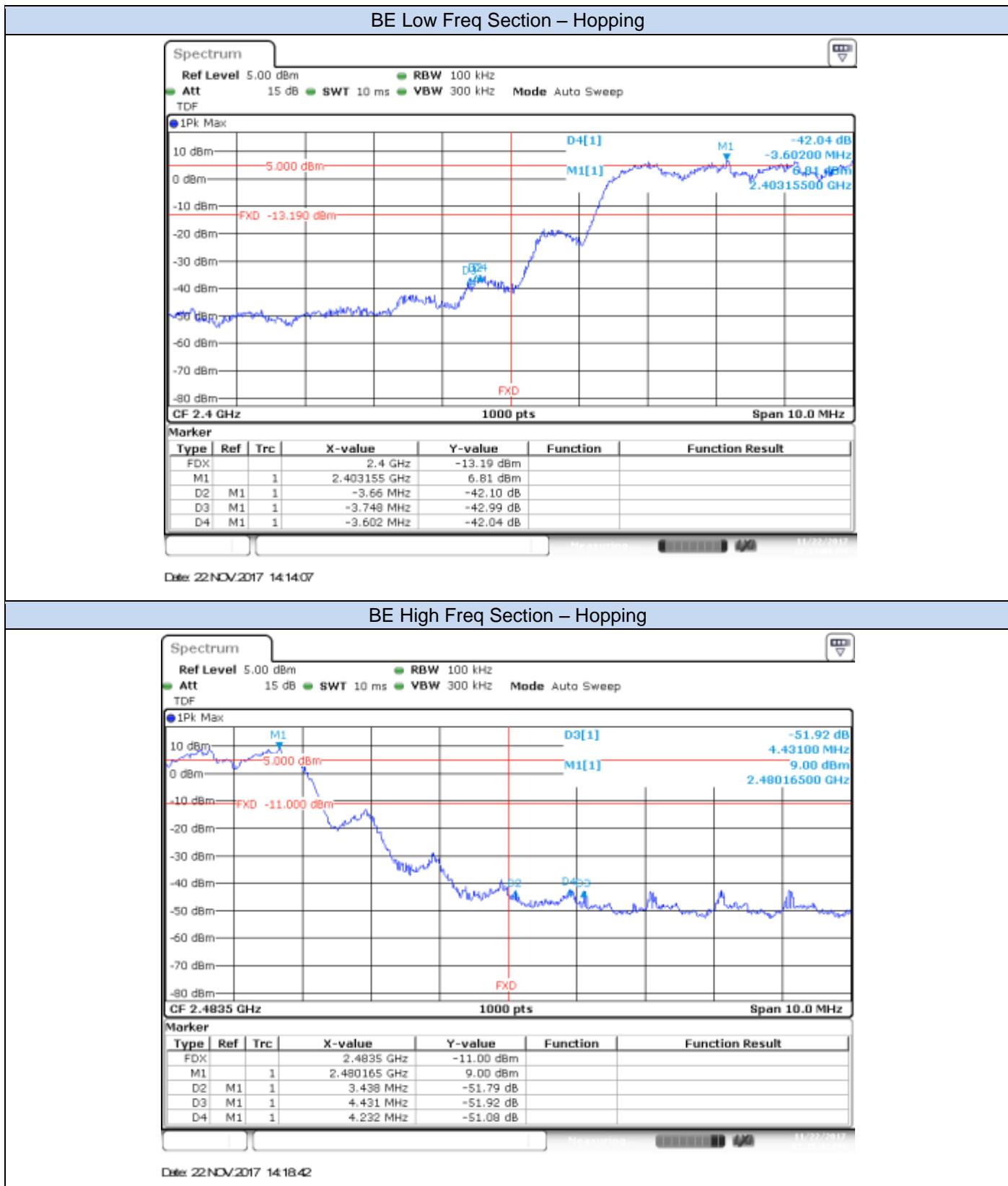
CHAIN A DIV1_EDR – 8-DPSK

BE Low Freq Section – CH0



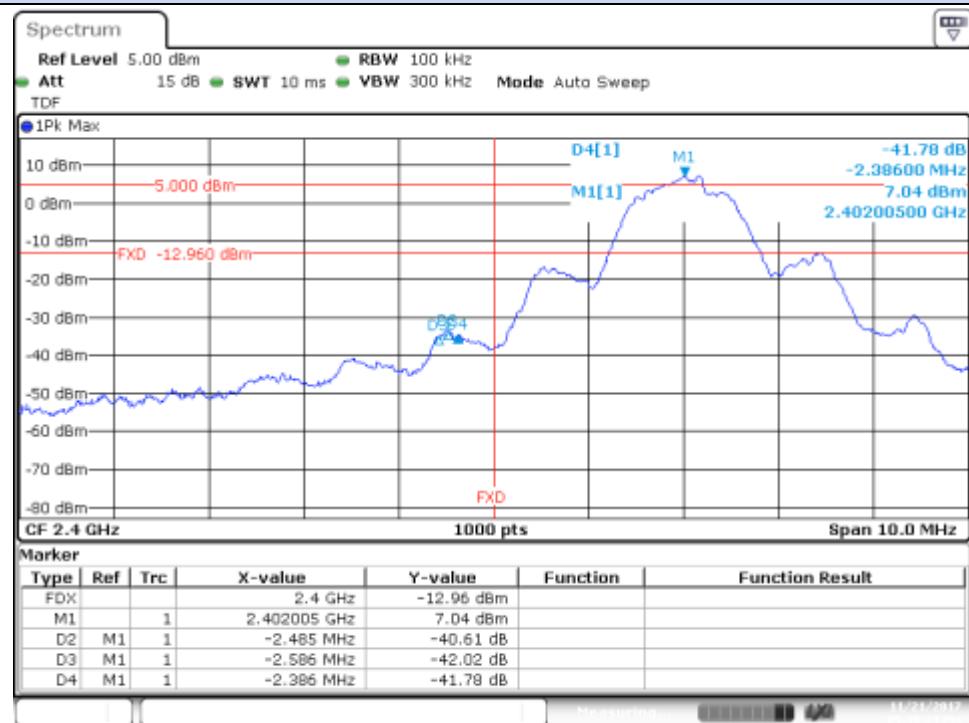
BE High Freq Section – CH78



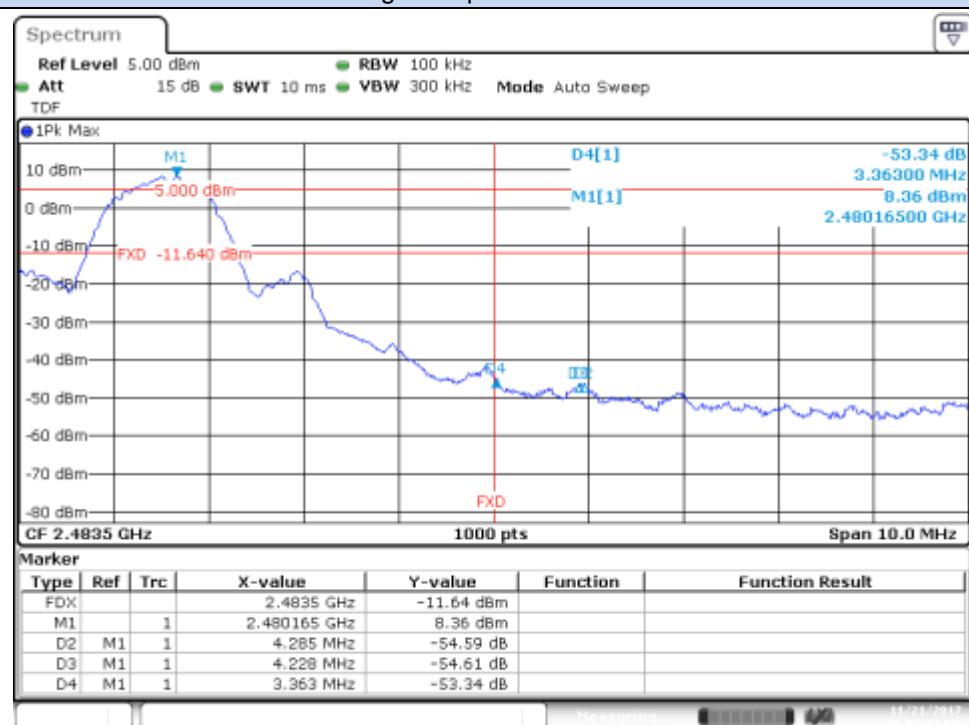


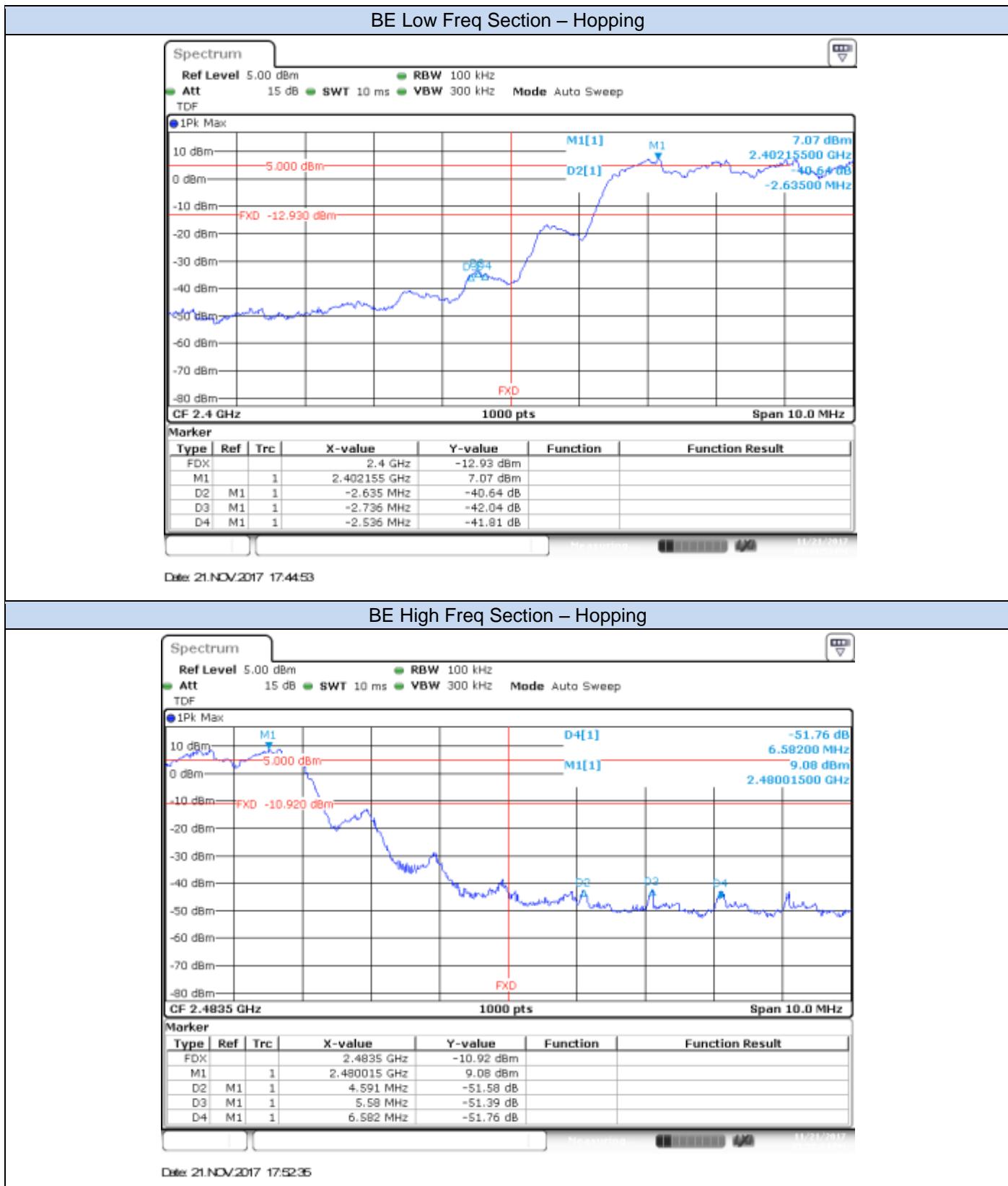
CHAIN A DIV2_EDR – 8-DPSK

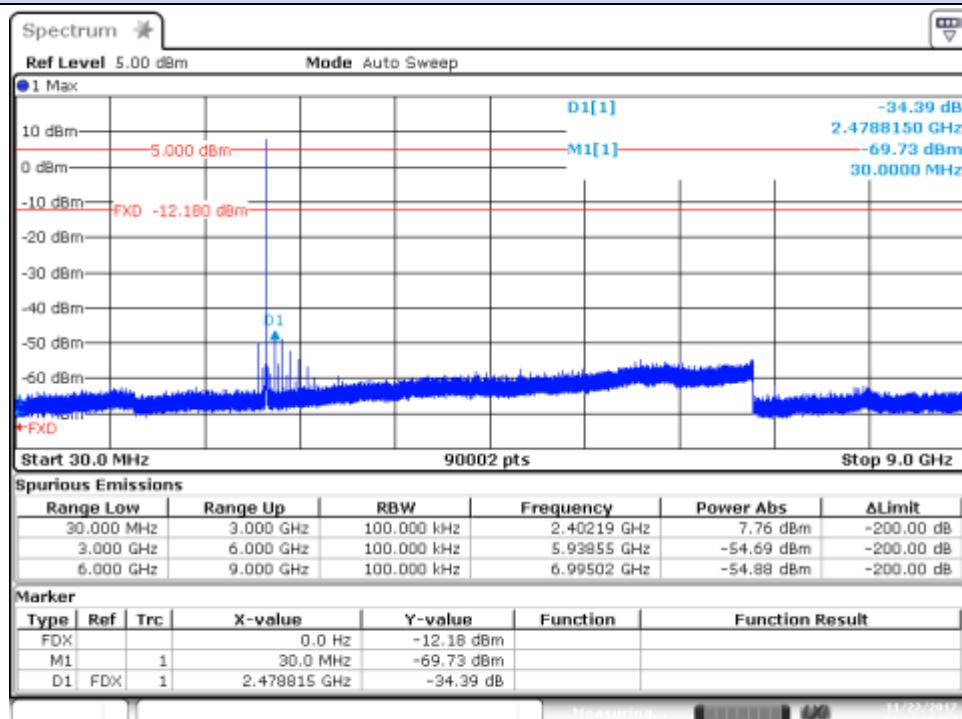
BE Low Freq Section – CH0



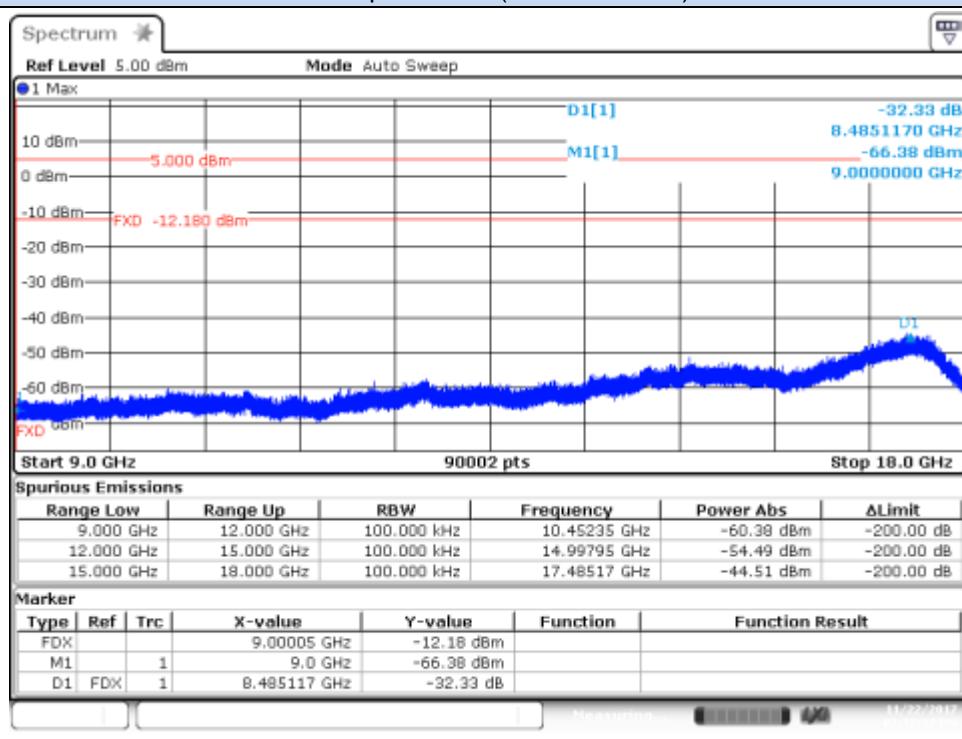
BE High Freq Section – CH78



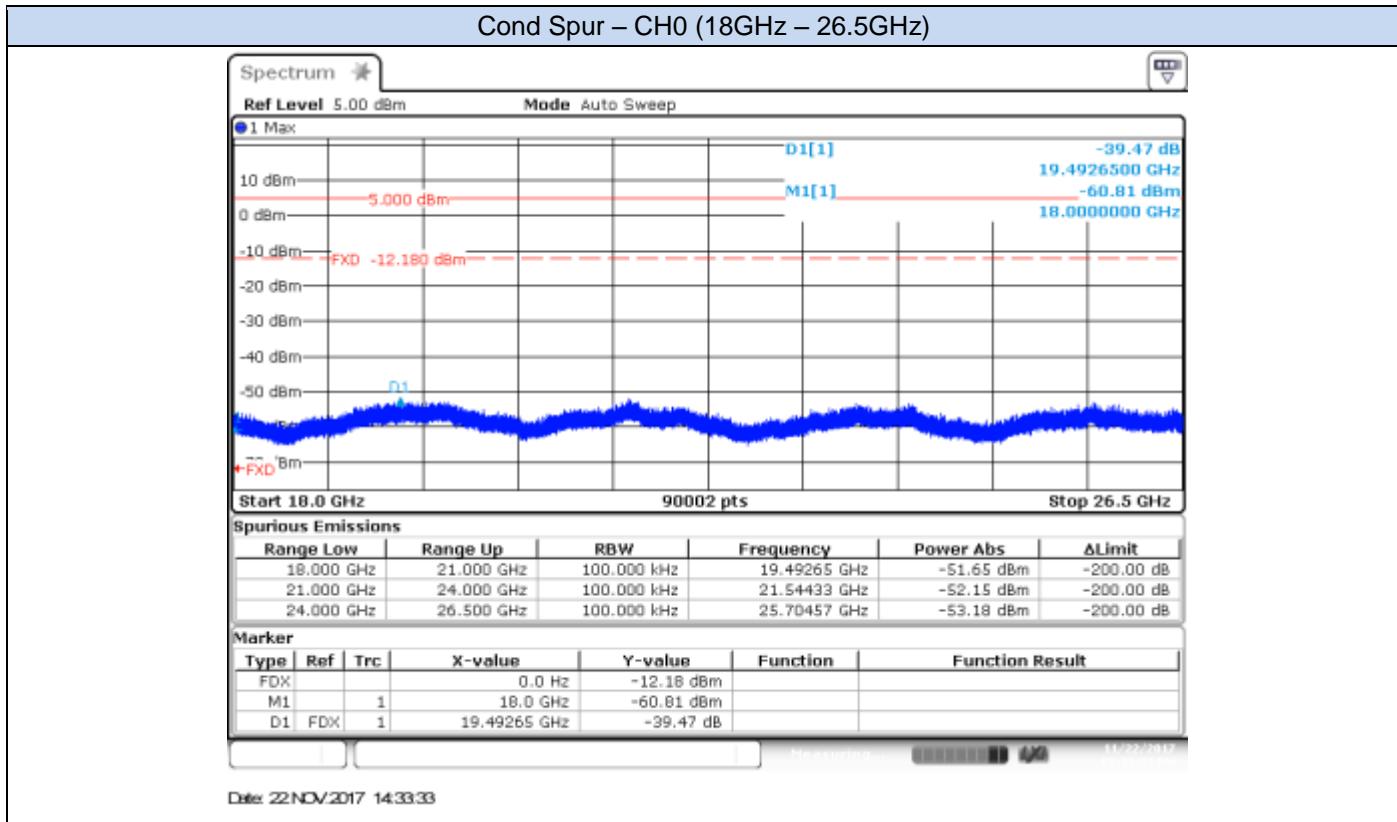


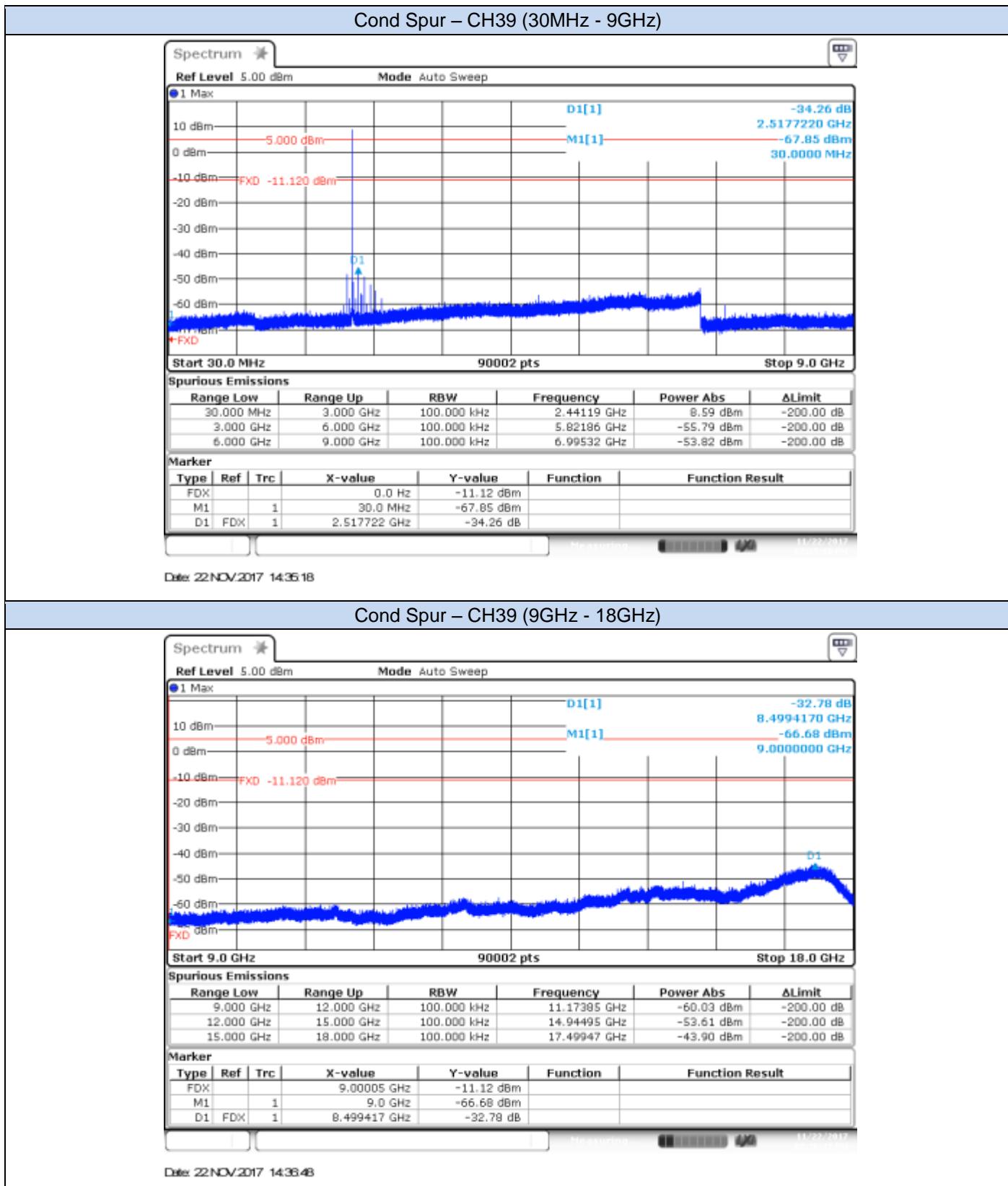
Conducted Spurious results Screenshot
CHAIN A DIV1_Basic Rate - GFSK
Cond Spur – CH0 (30MHz - 9GHz)


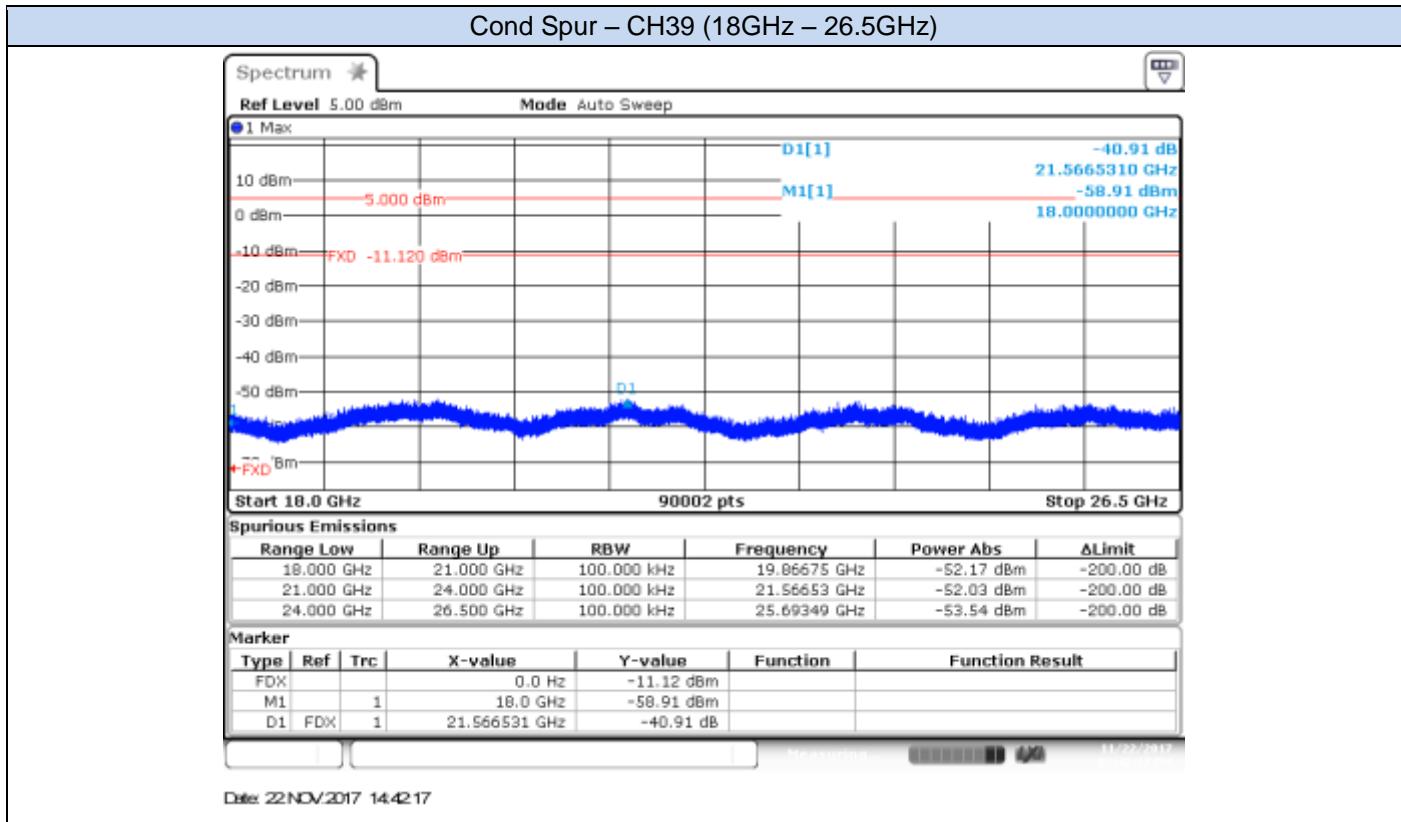
Date: 22 NOV 2017 14:30:58

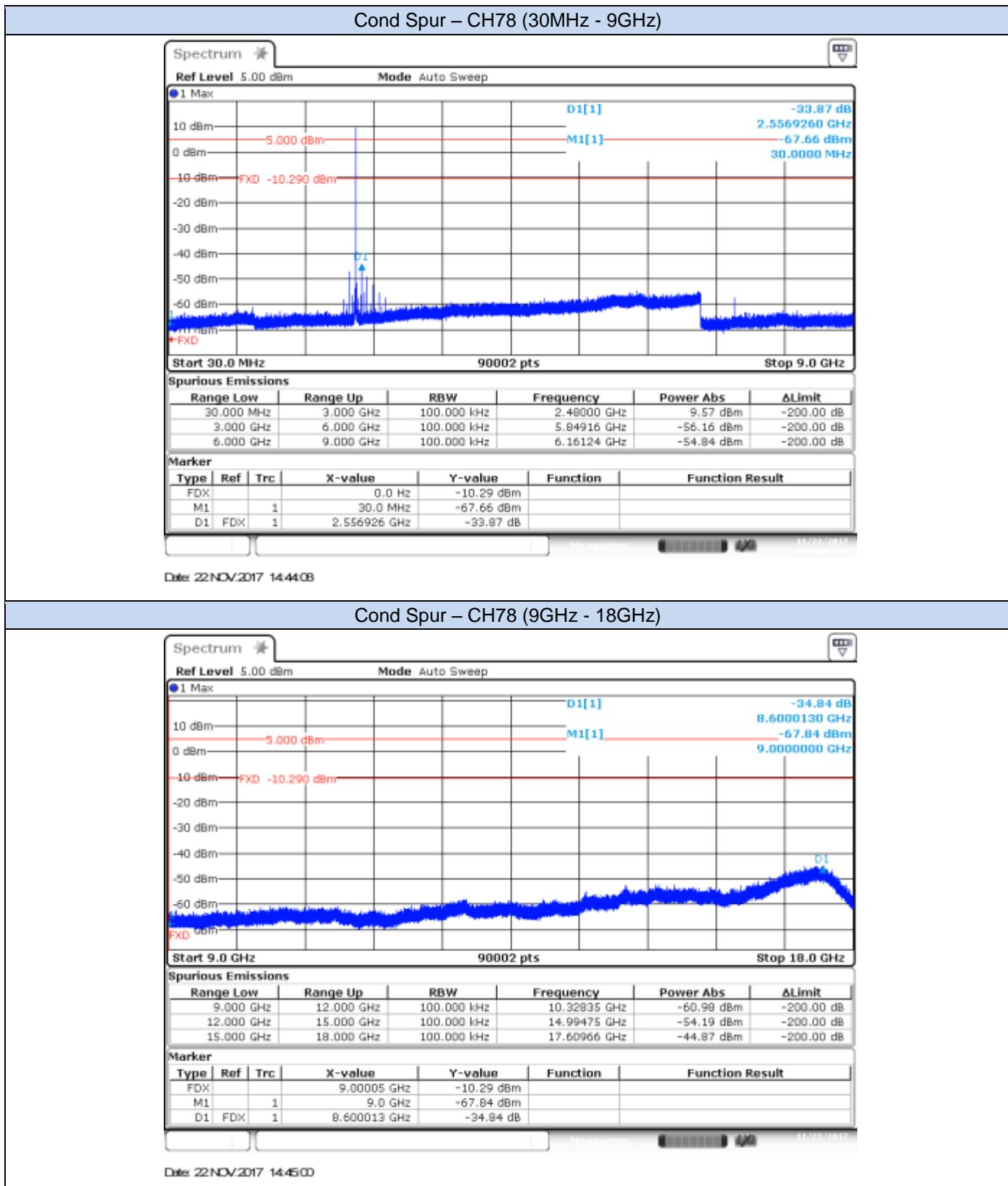
Cond Spur – CH0 (9GHz - 18GHz)


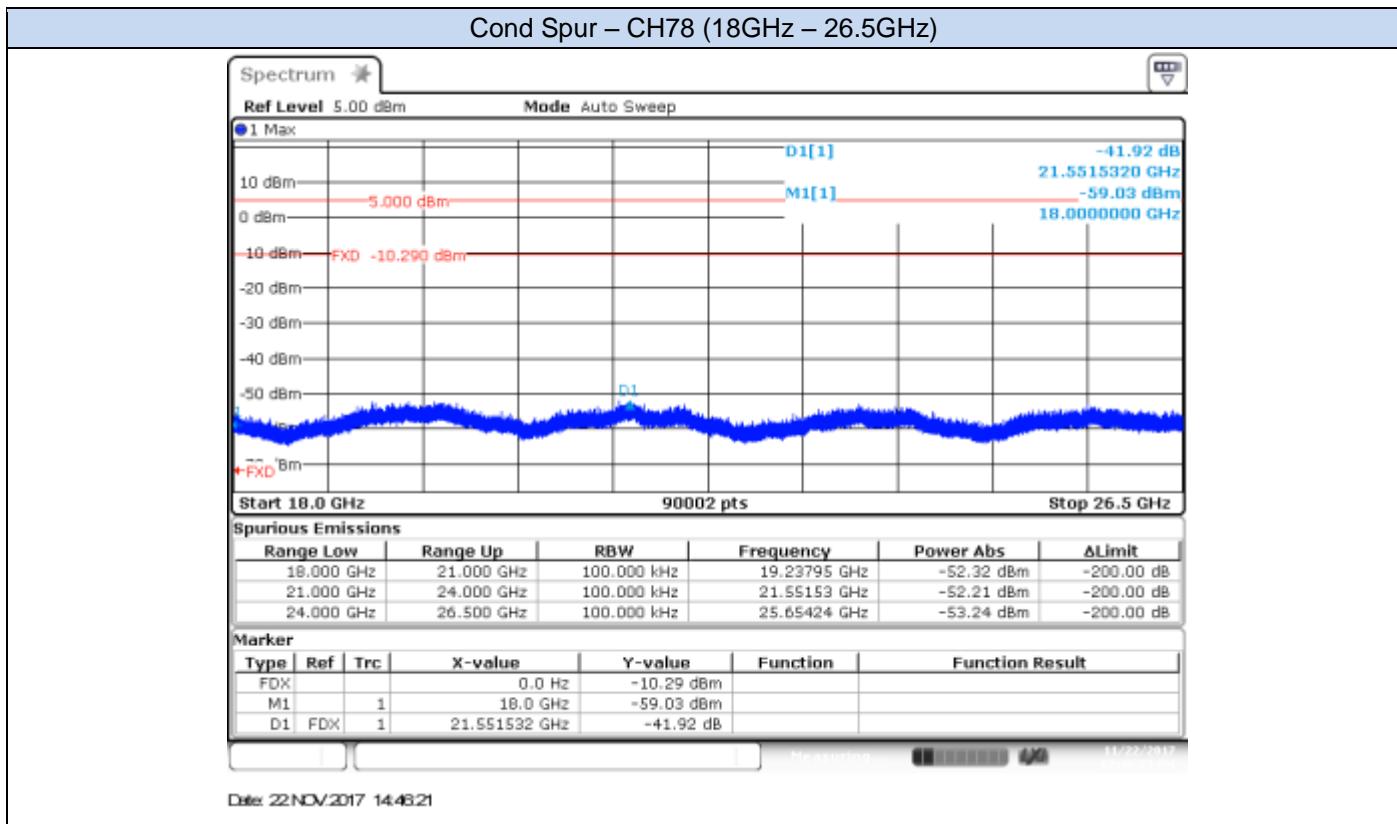
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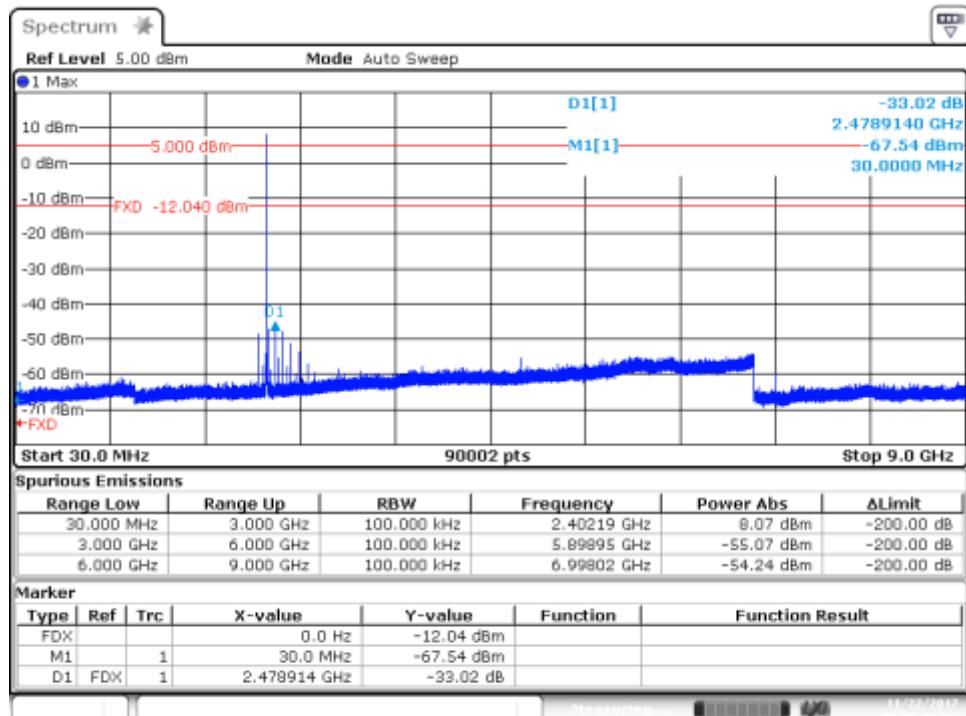




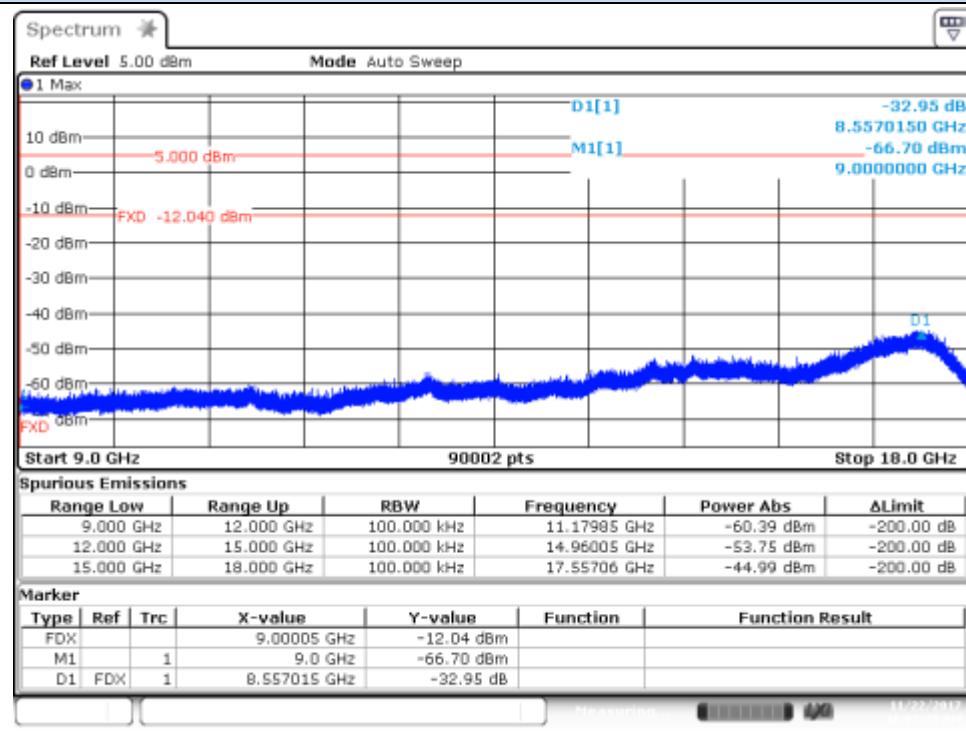


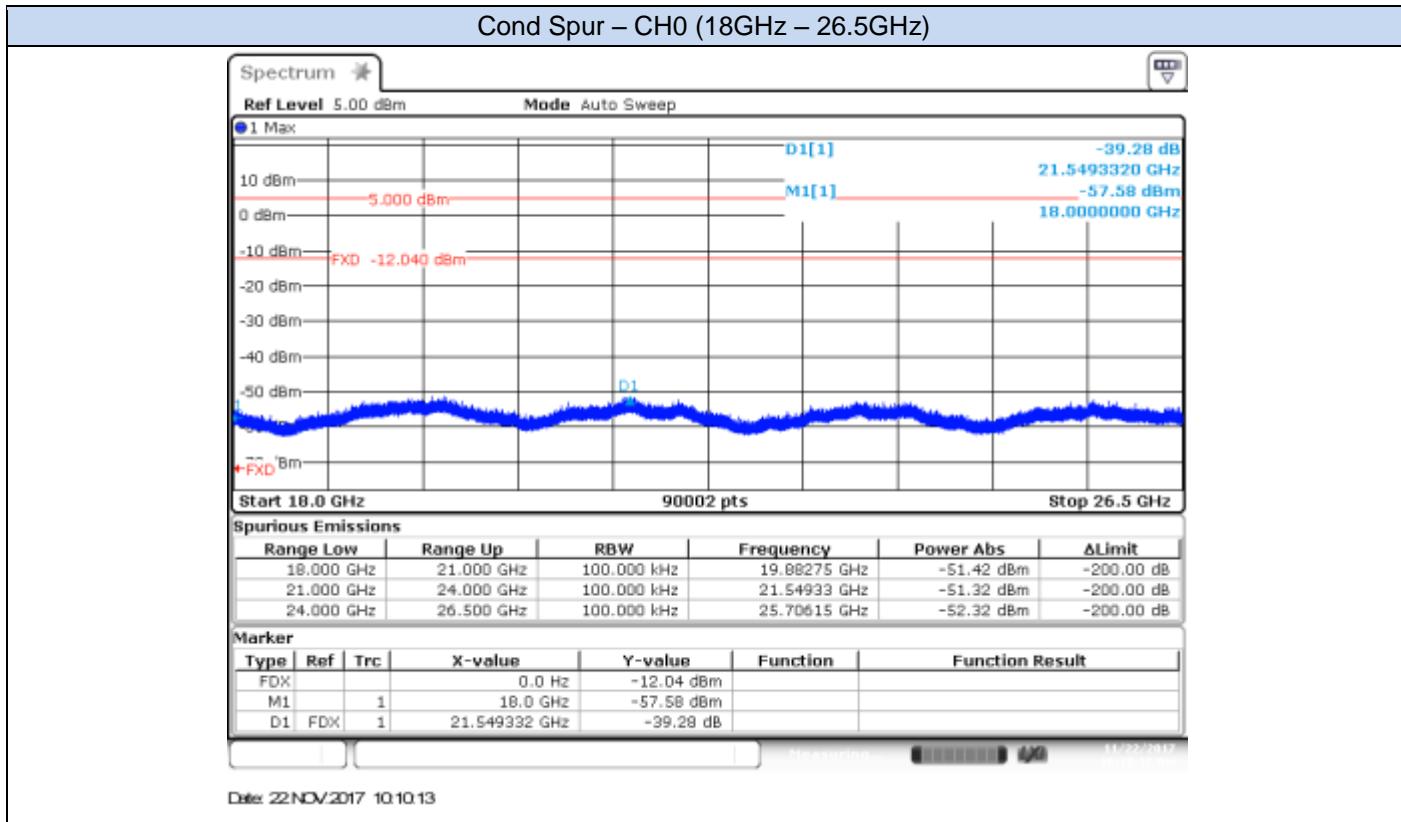
CHAIN A DIV2_Basic Rate - GFSK

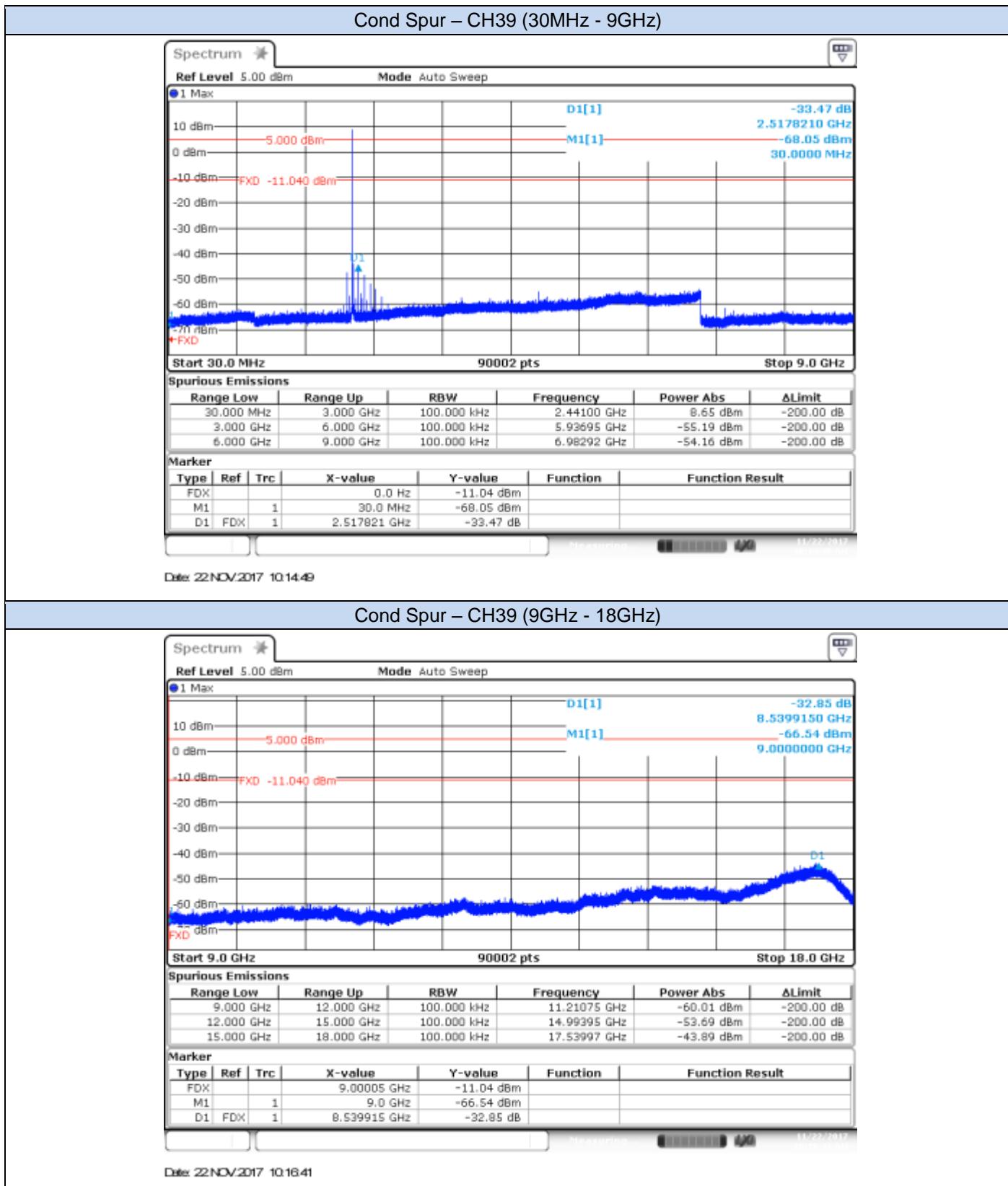
Cond Spur – CH0 (30MHz - 9GHz)

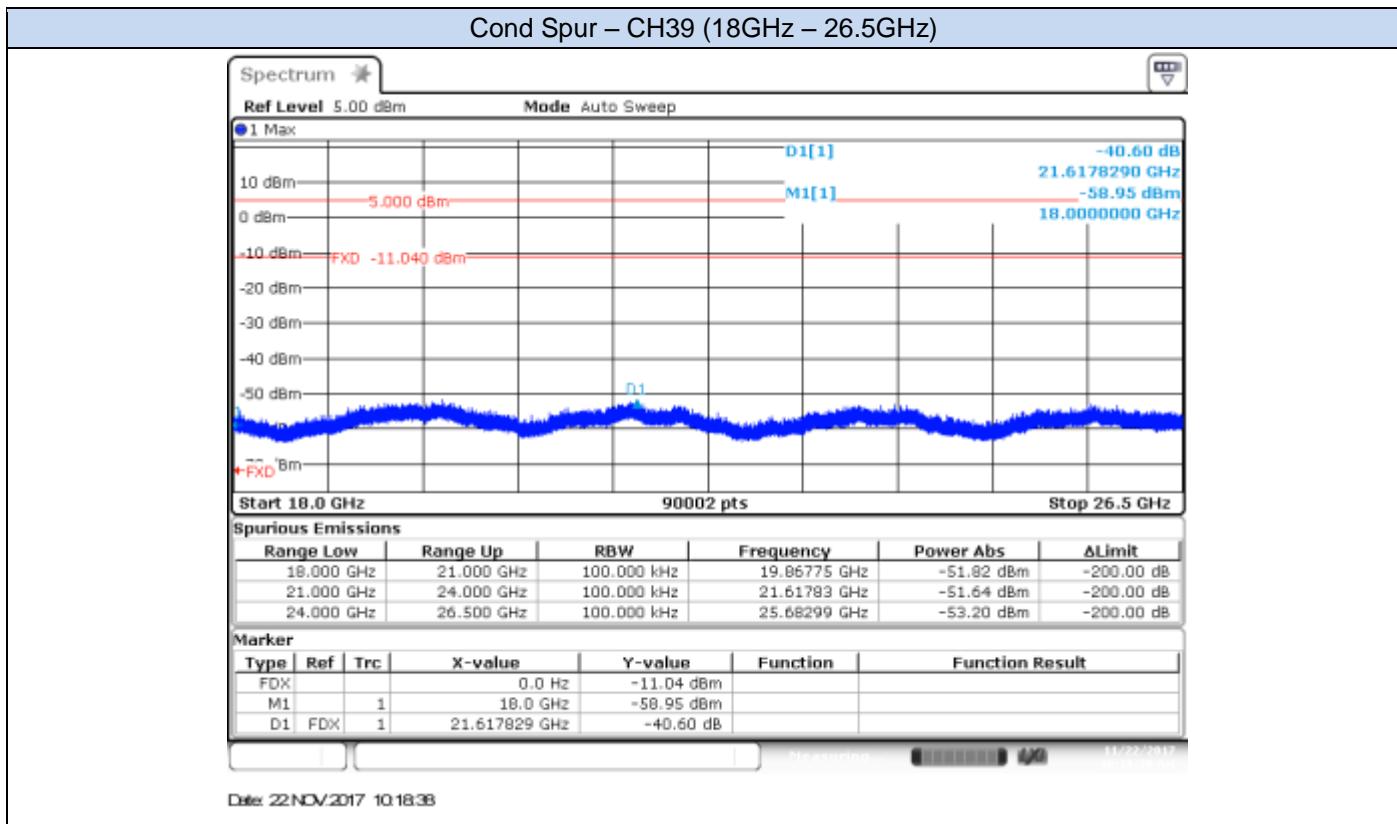


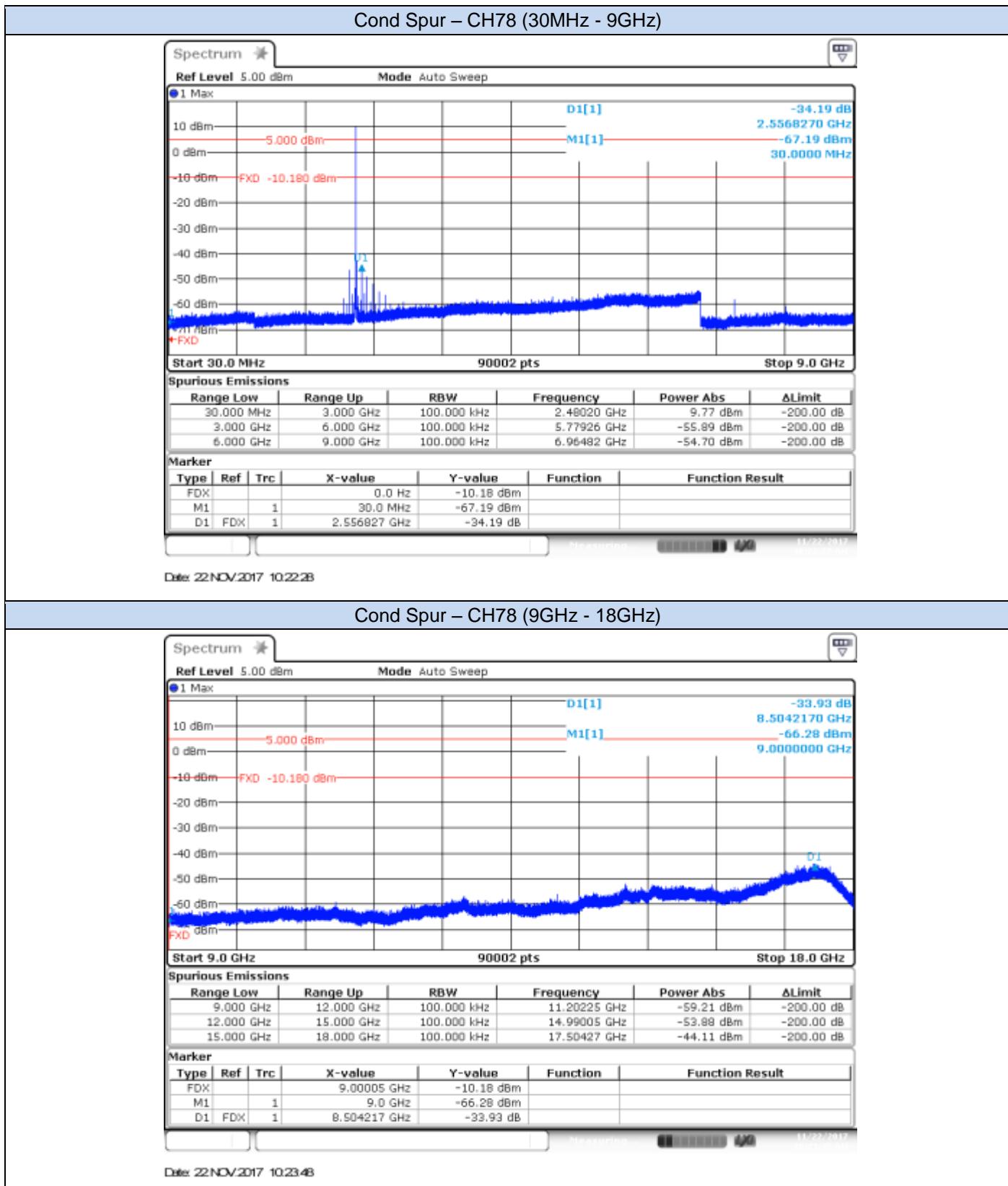
Cond Spur – CH0 (9GHz - 18GHz)

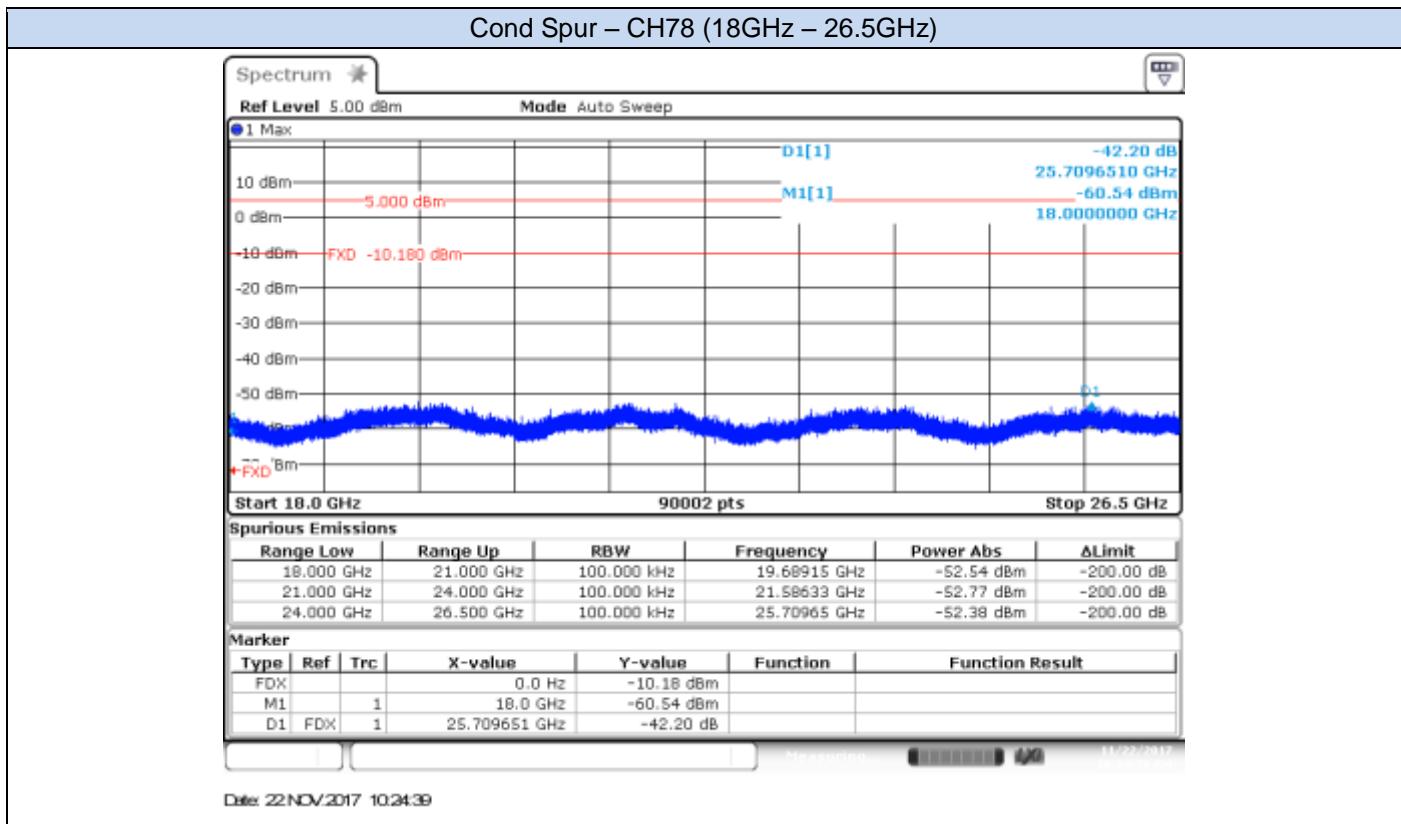






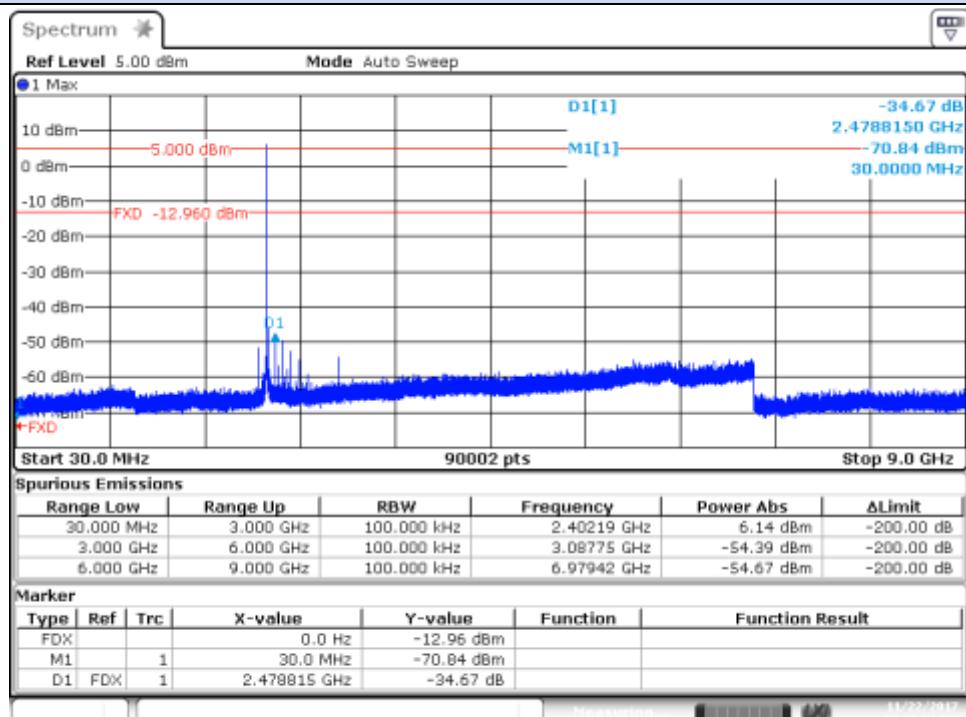






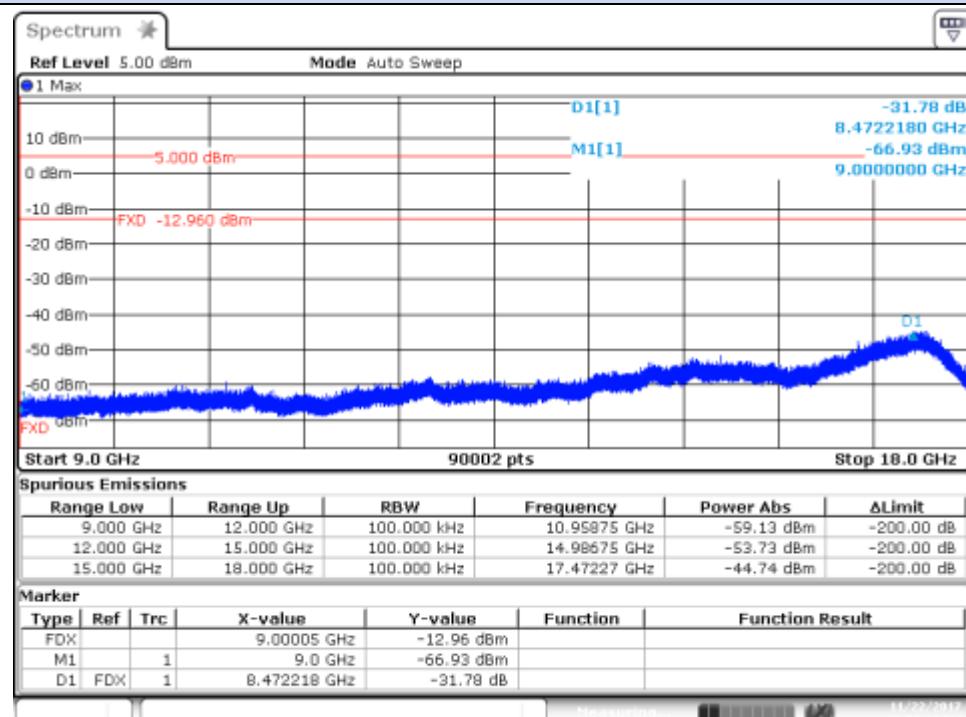
CHAIN A DIV1_EDR – π/4-DQPSK

Cond Spur – CH0 (30MHz - 9GHz)

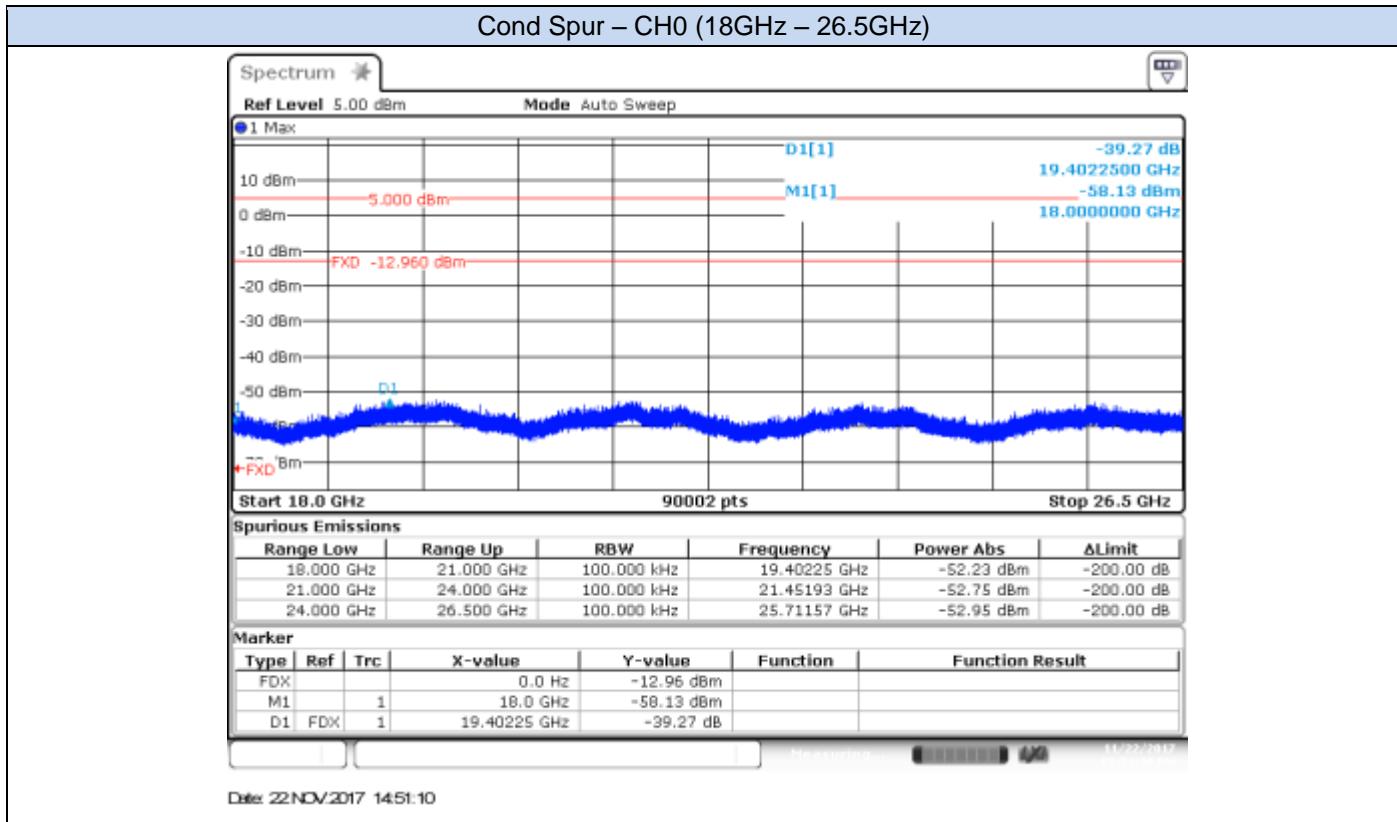


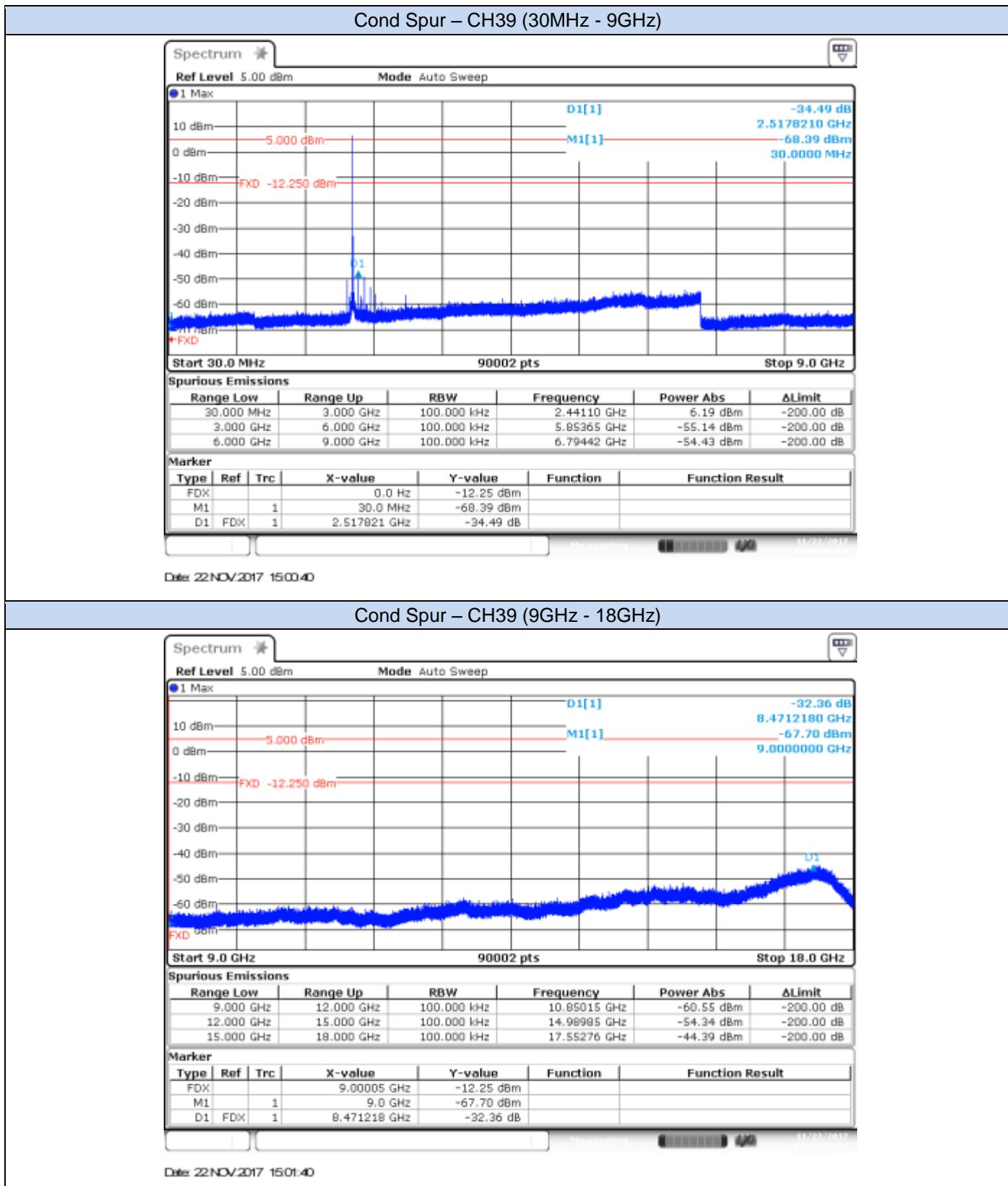
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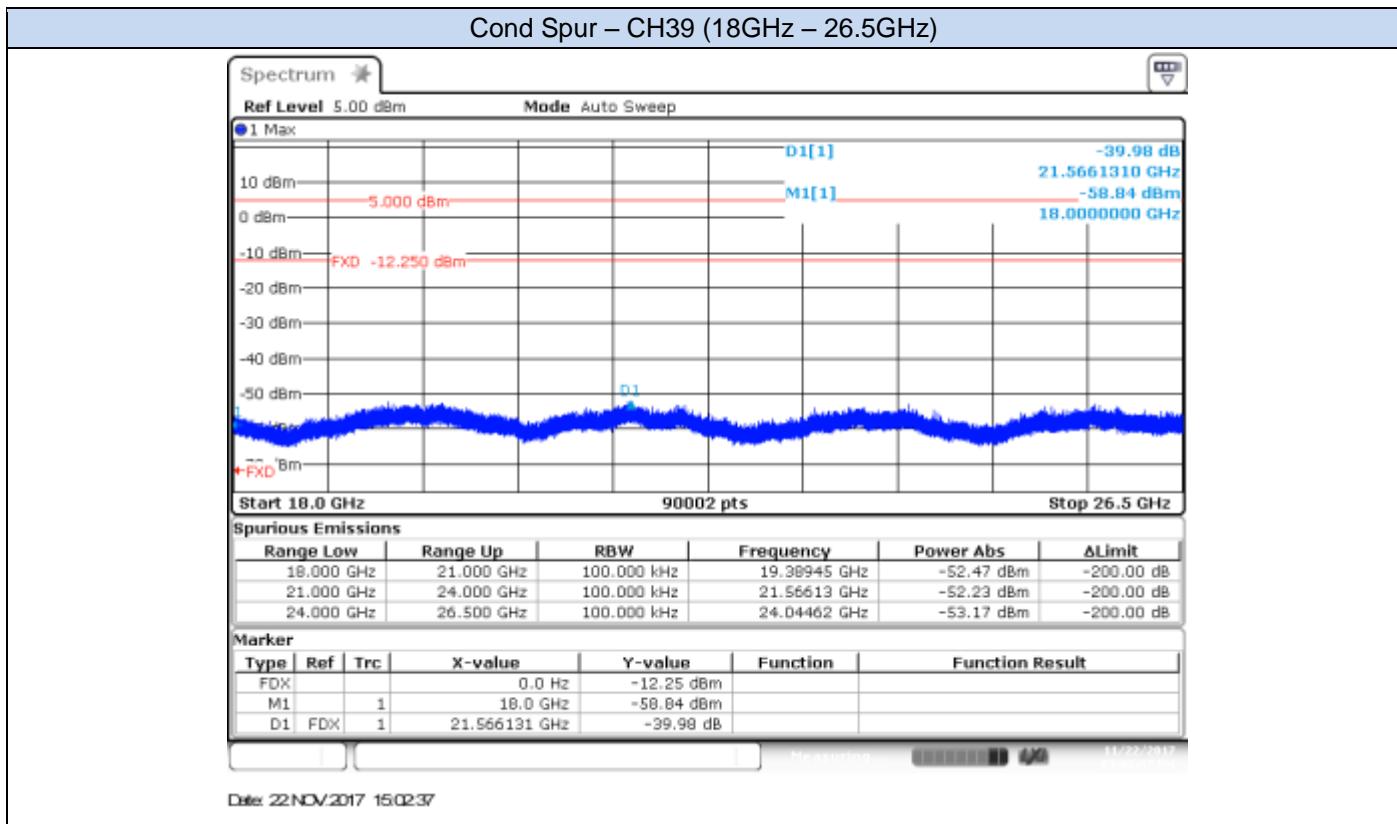
Cond Spur – CH0 (9GHz - 18GHz)

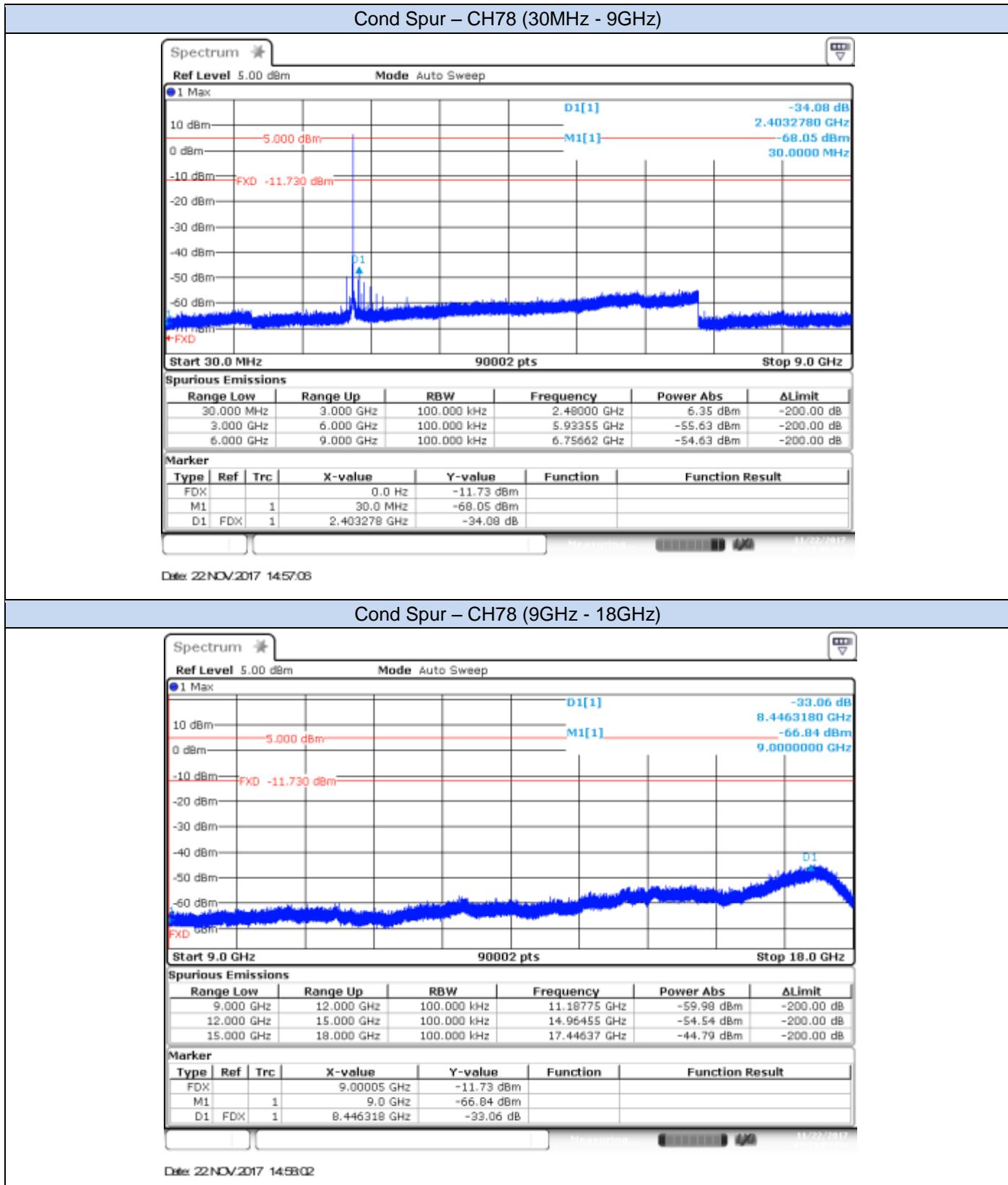


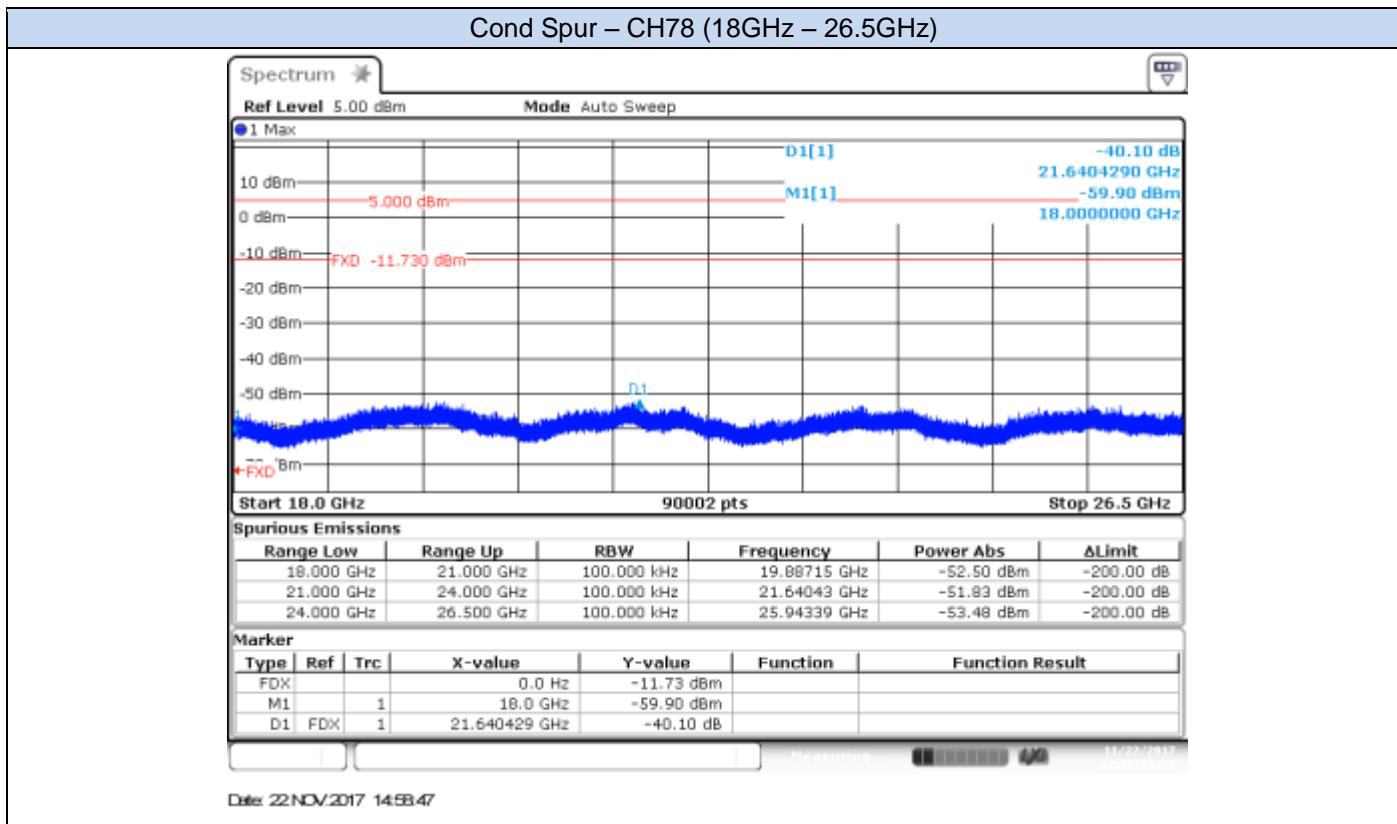
Date: 22 NOV 2017 14:50:13





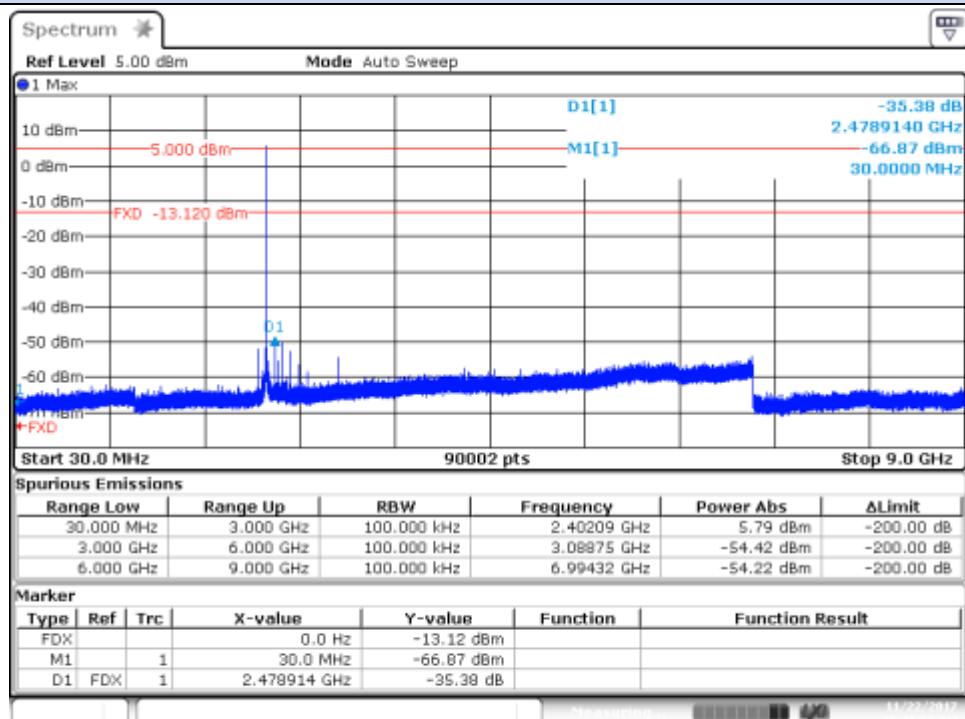




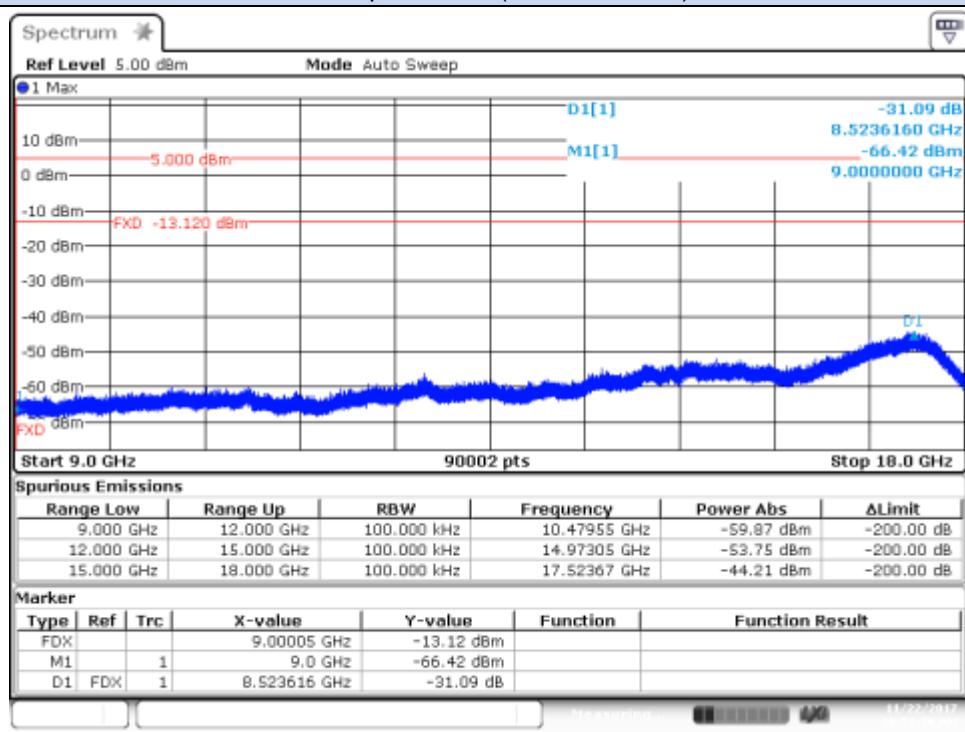


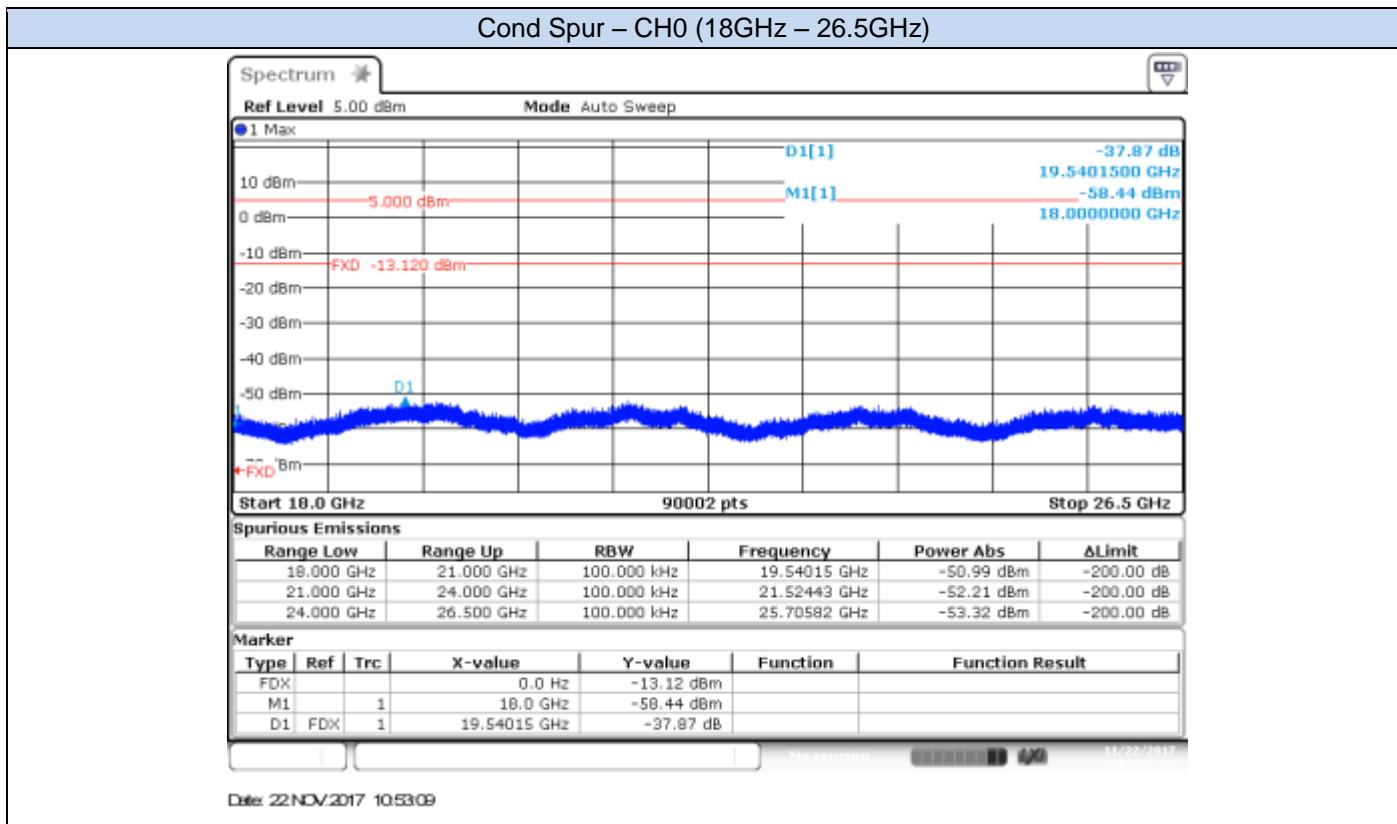
CHAIN A DIV2_EDR – π/4-DQPSK

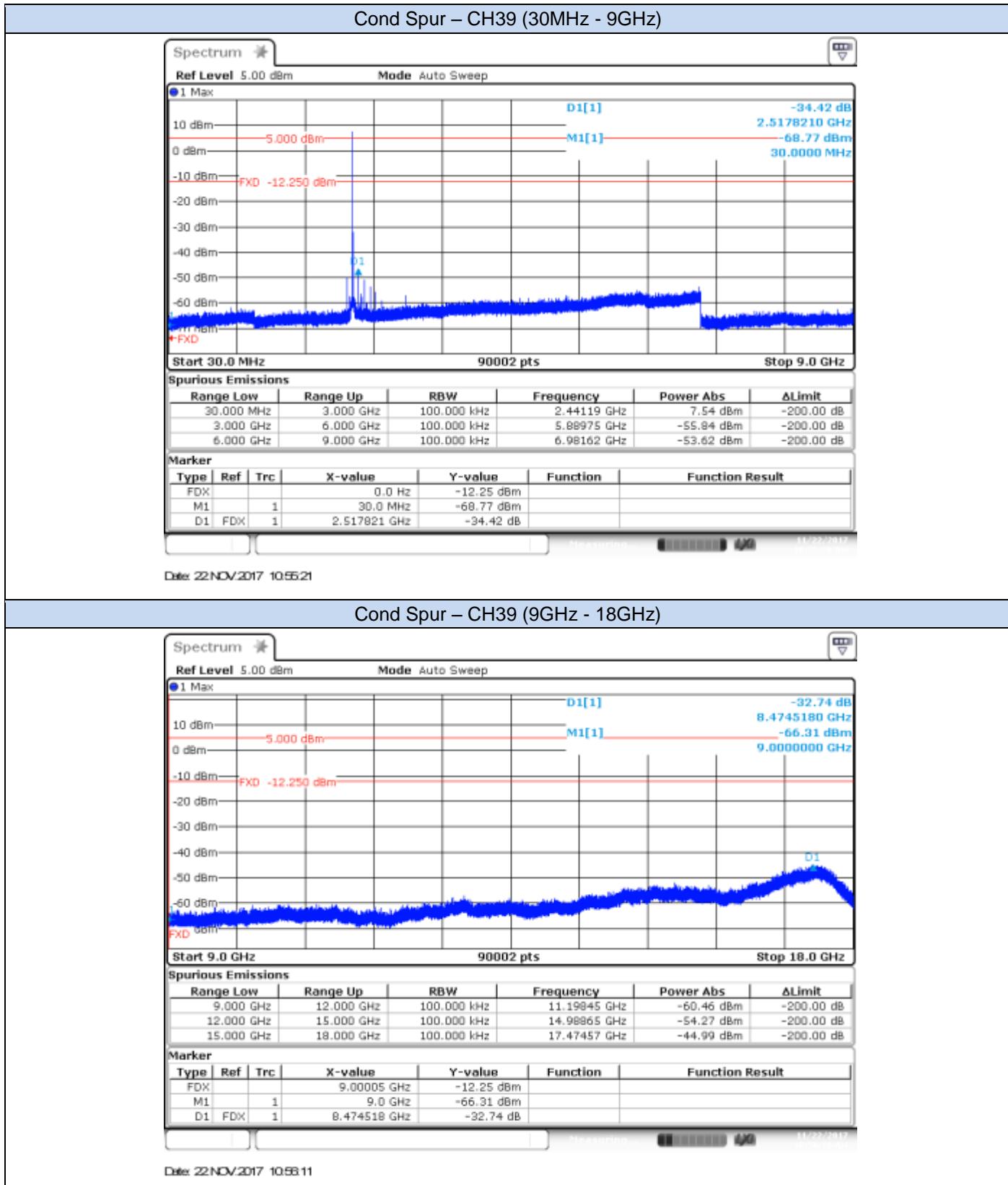
Cond Spur – CH0 (30MHz - 9GHz)

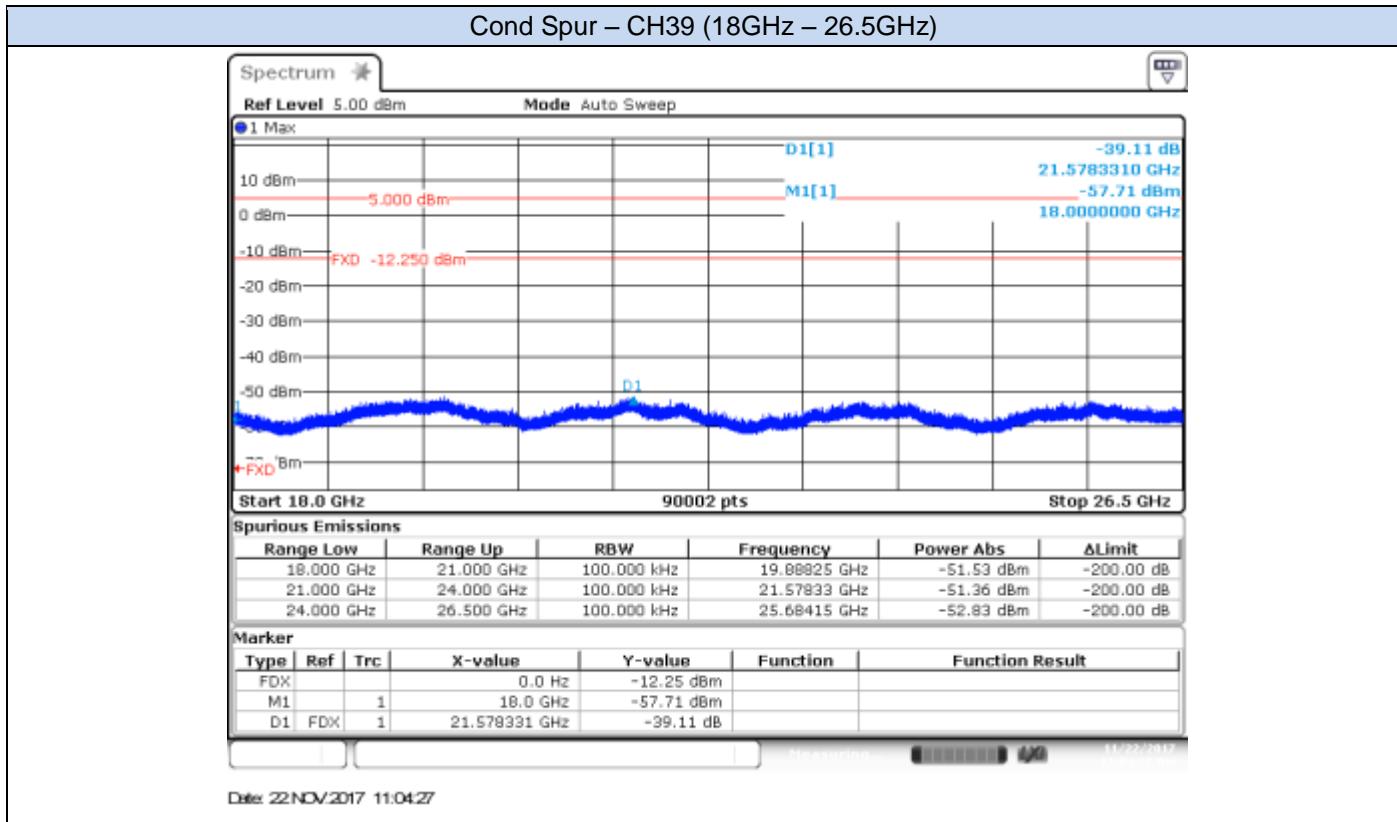


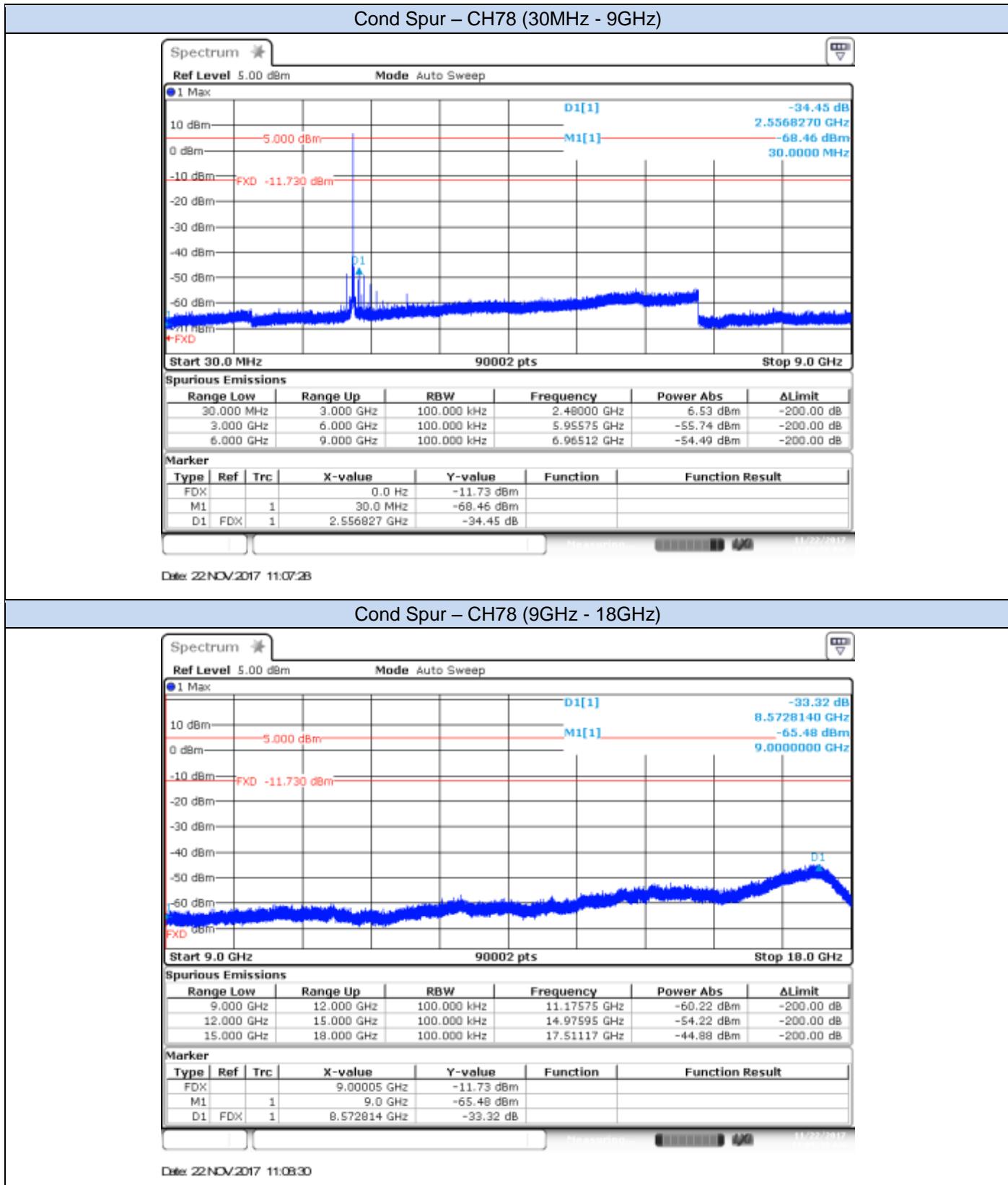
Cond Spur – CH0 (9GHz - 18GHz)

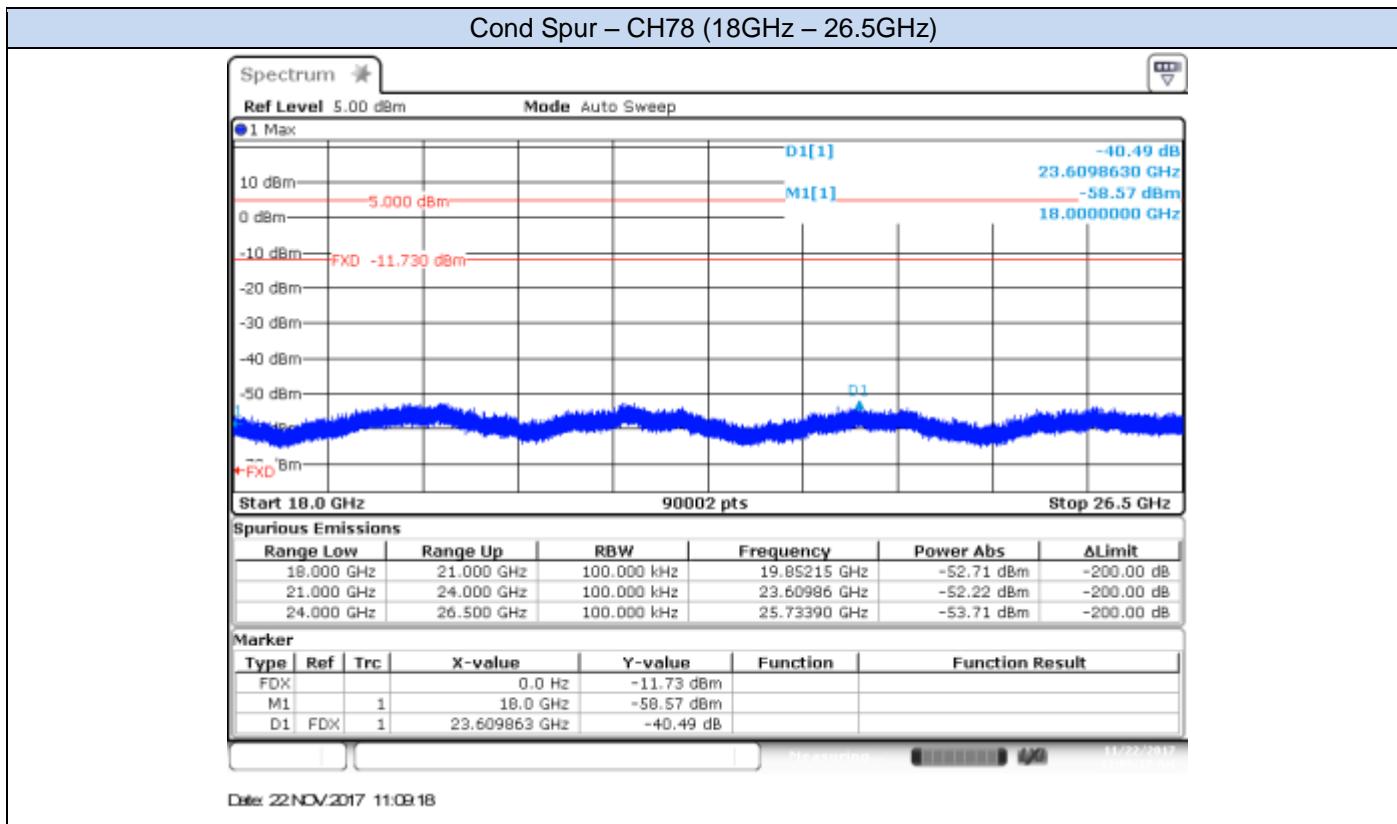






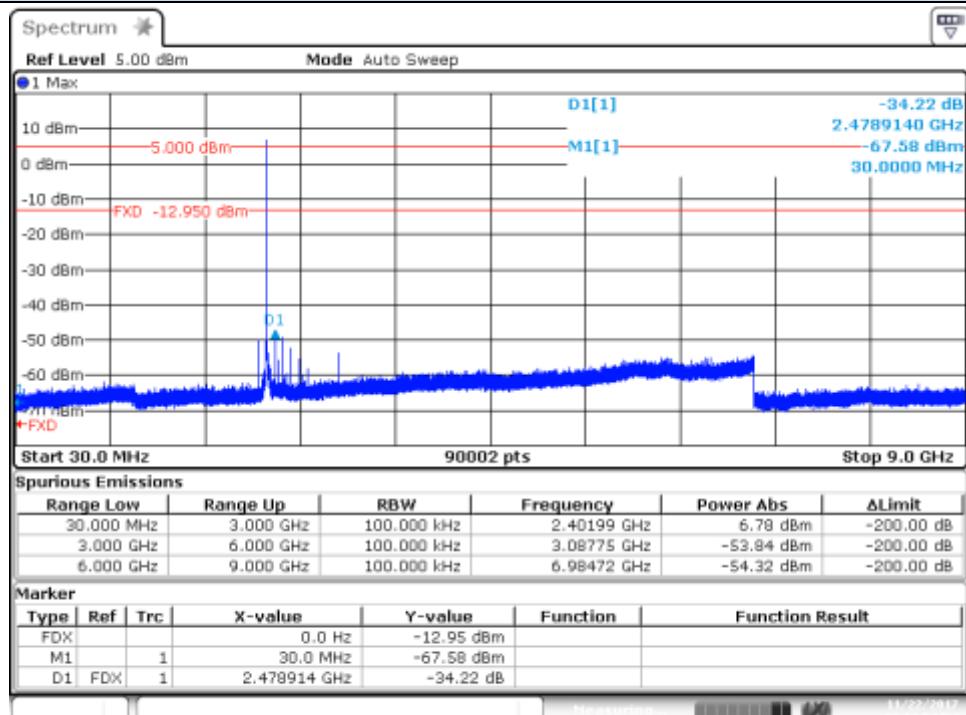






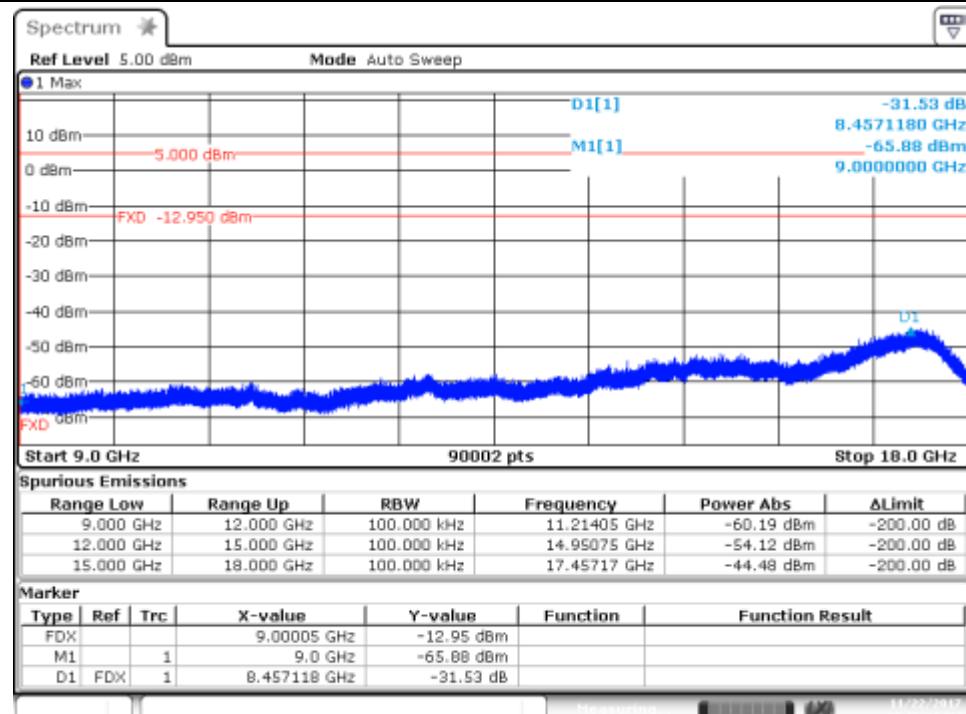
CHAIN A DIV1_EDR – 8-DPSK

Cond Spur – CH0 (30MHz - 9GHz)

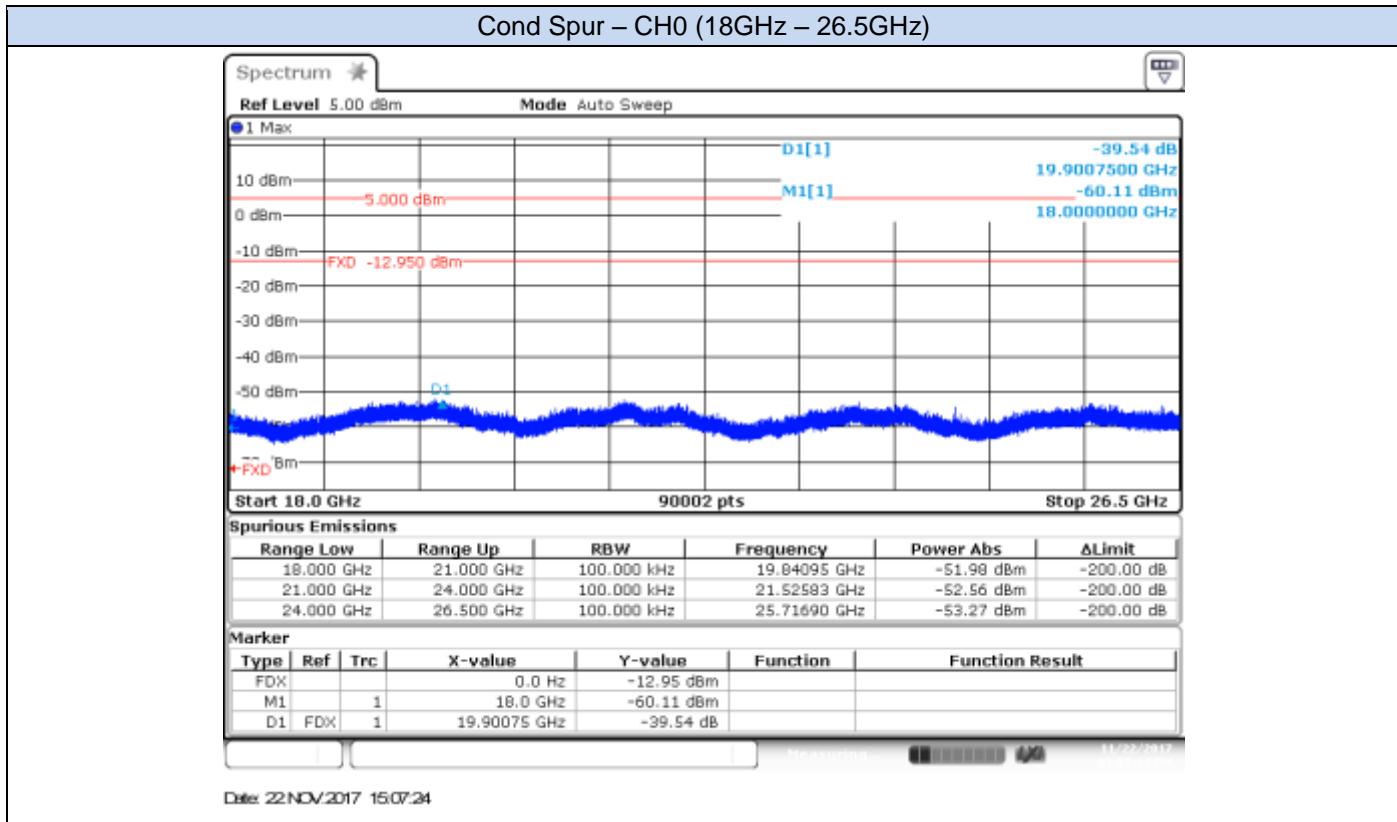


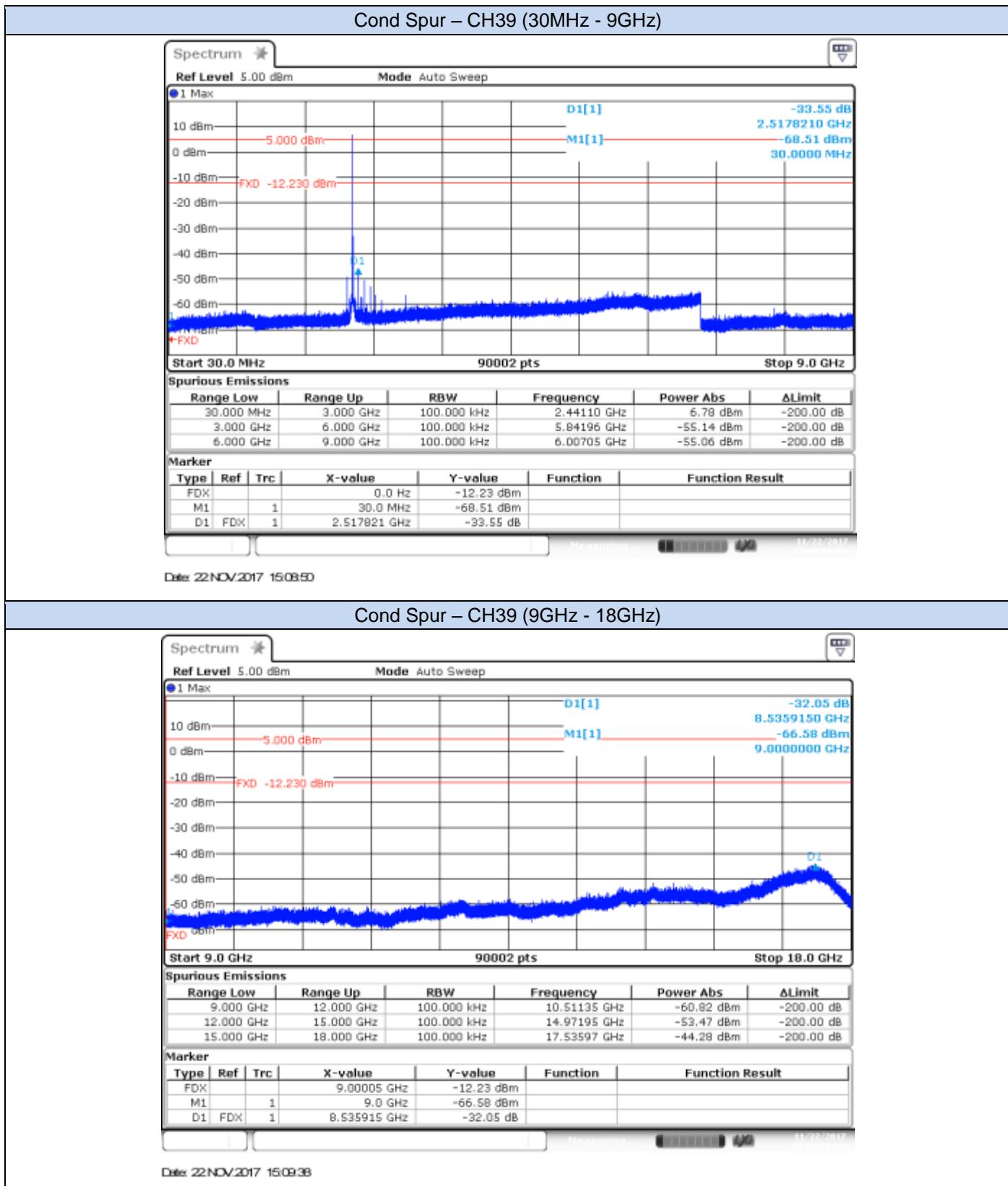
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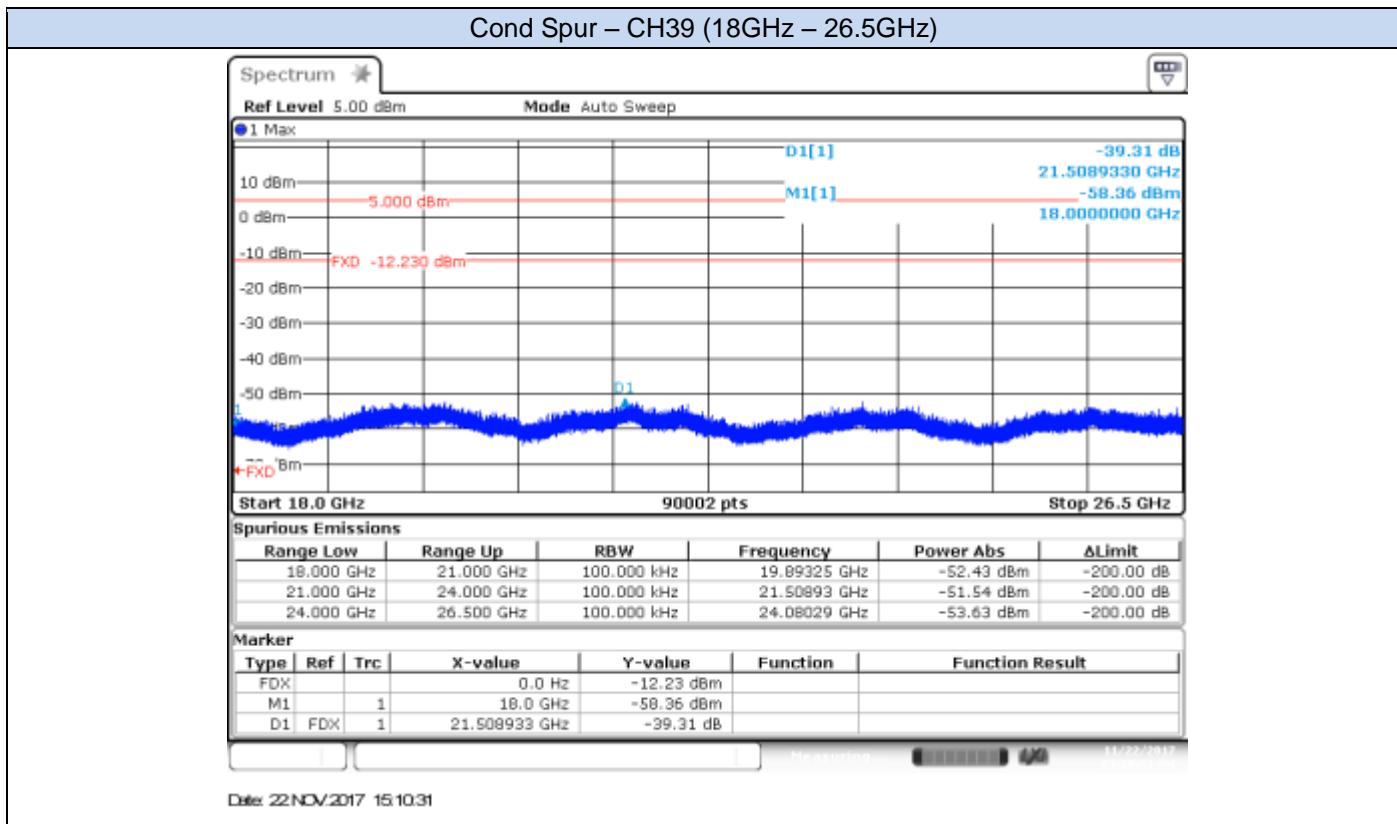
Cond Spur – CH0 (9GHz - 18GHz)

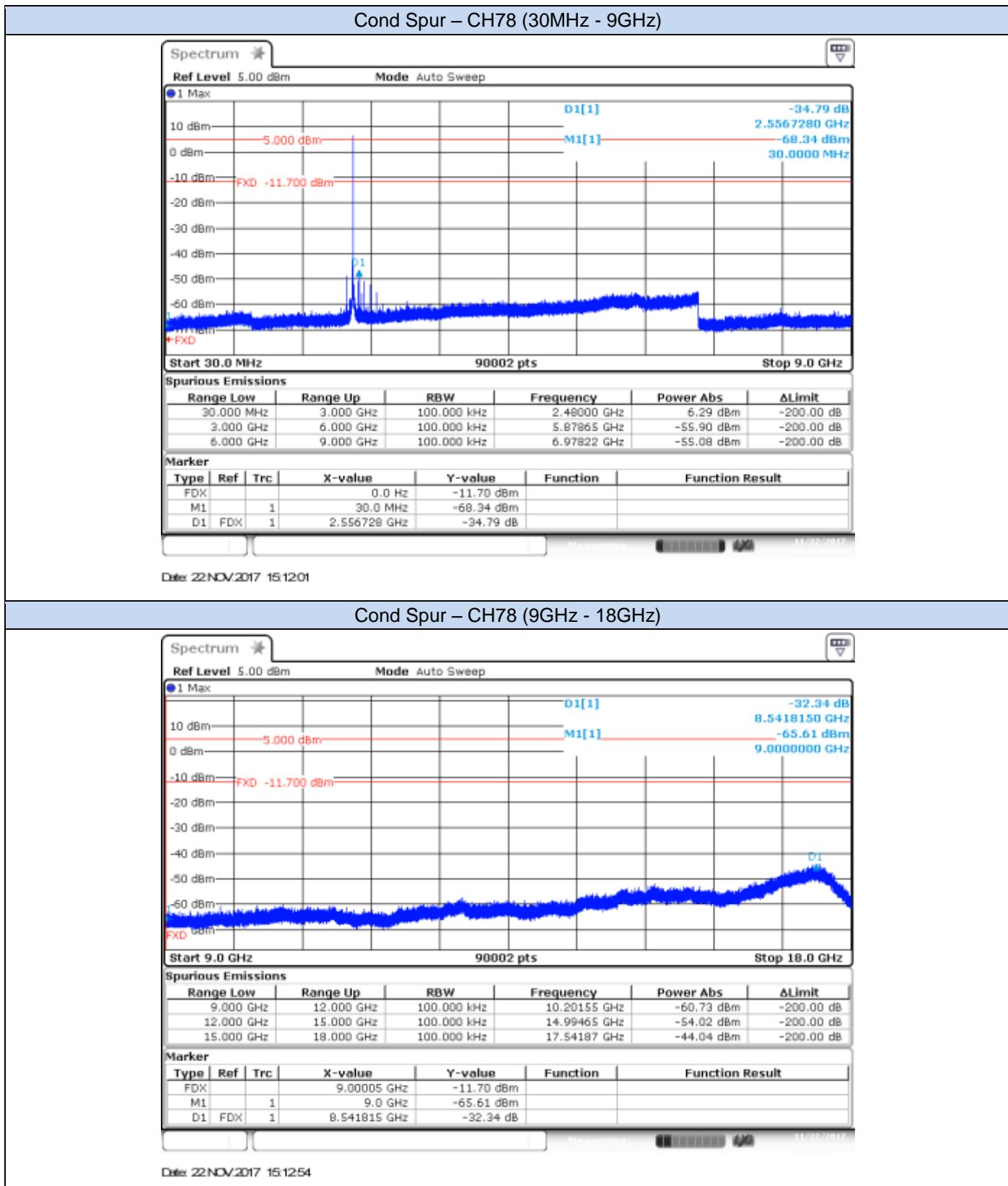


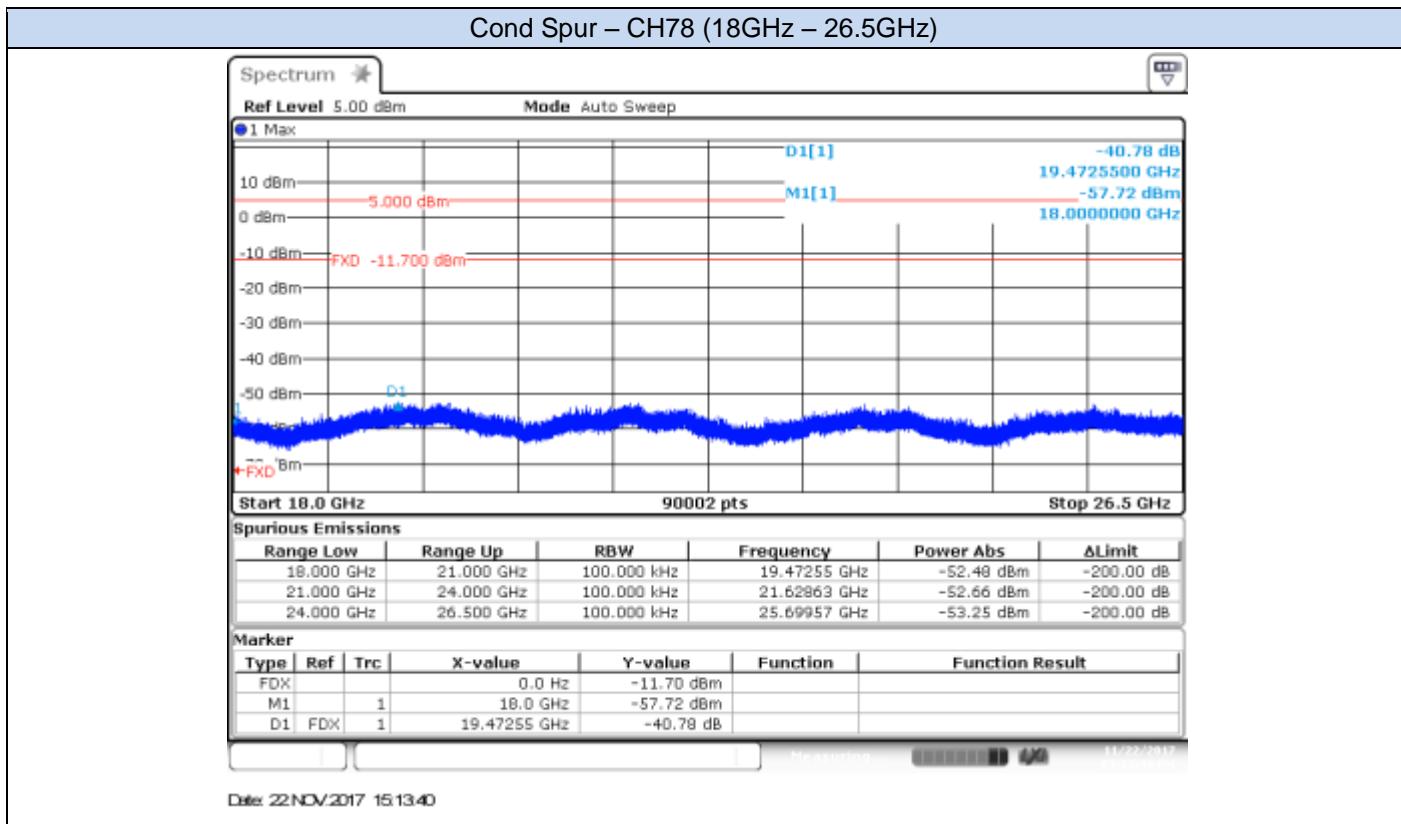
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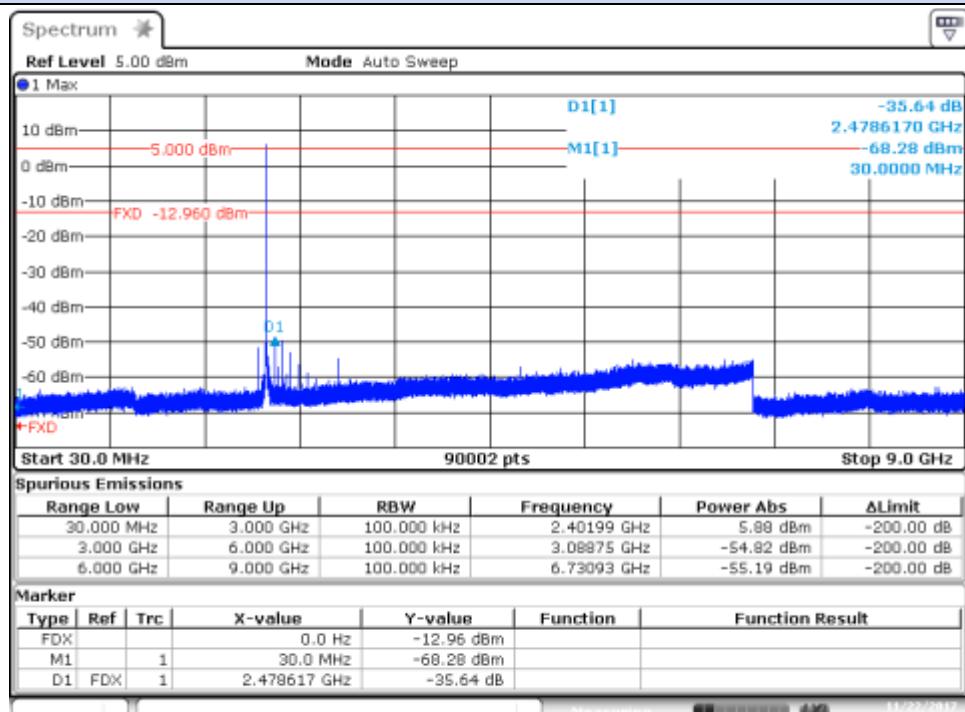




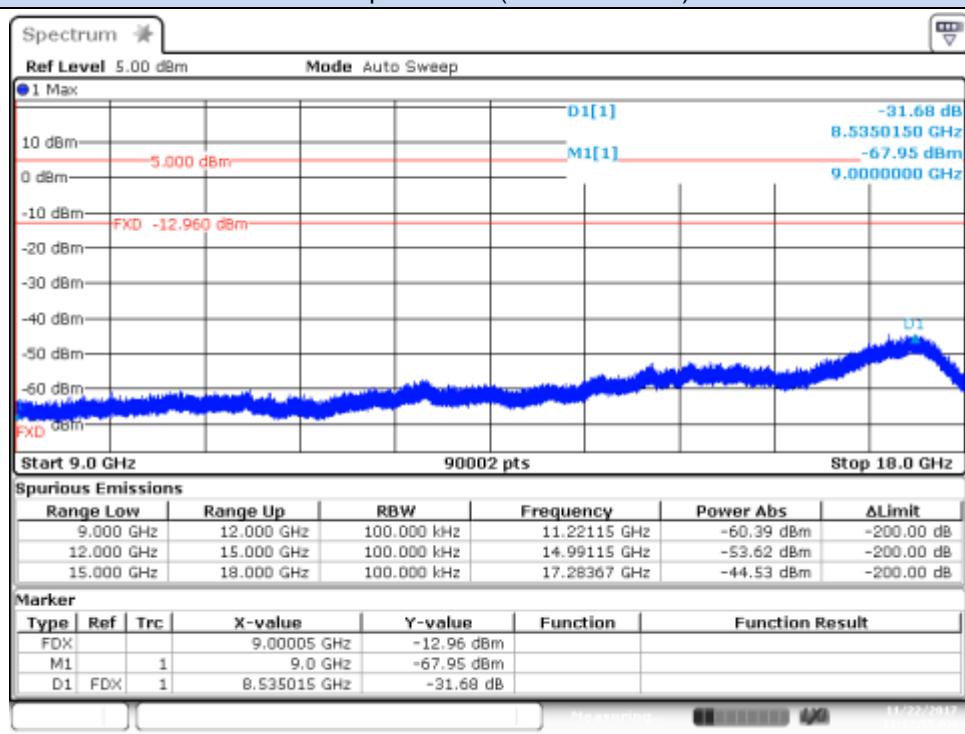


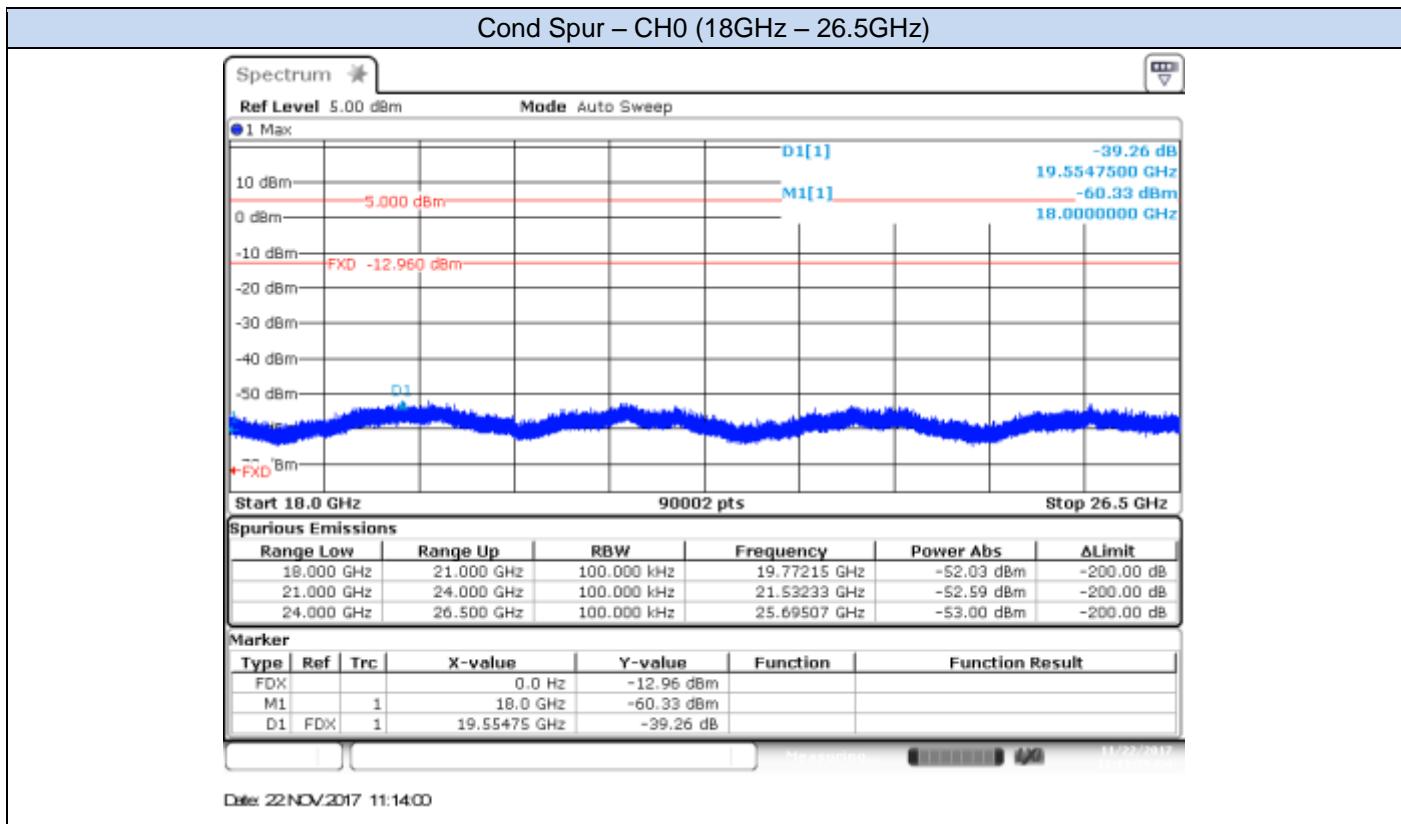
CHAIN A DIV2_EDR – 8-DPSK

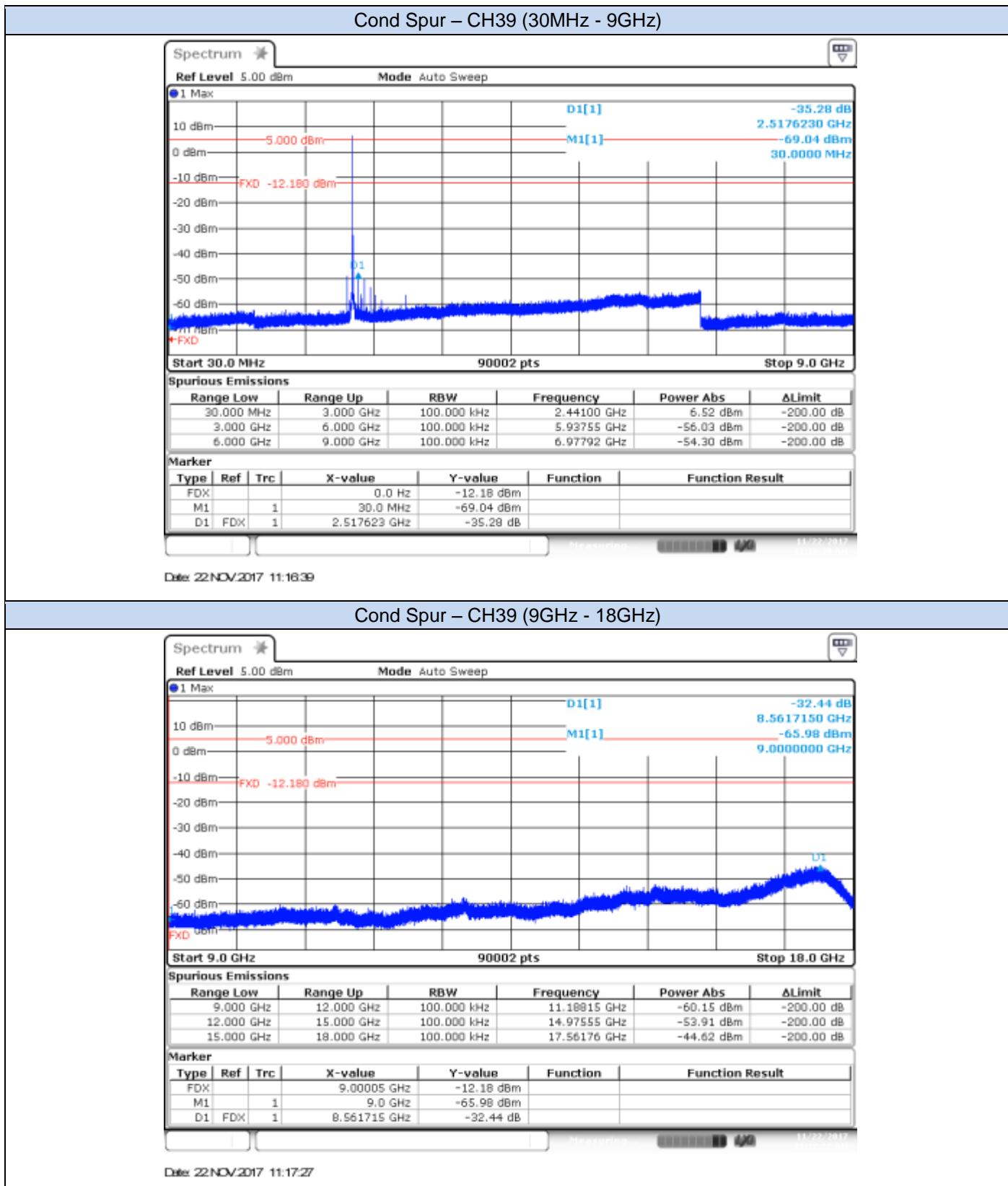
Cond Spur – CH0 (30MHz - 9GHz)

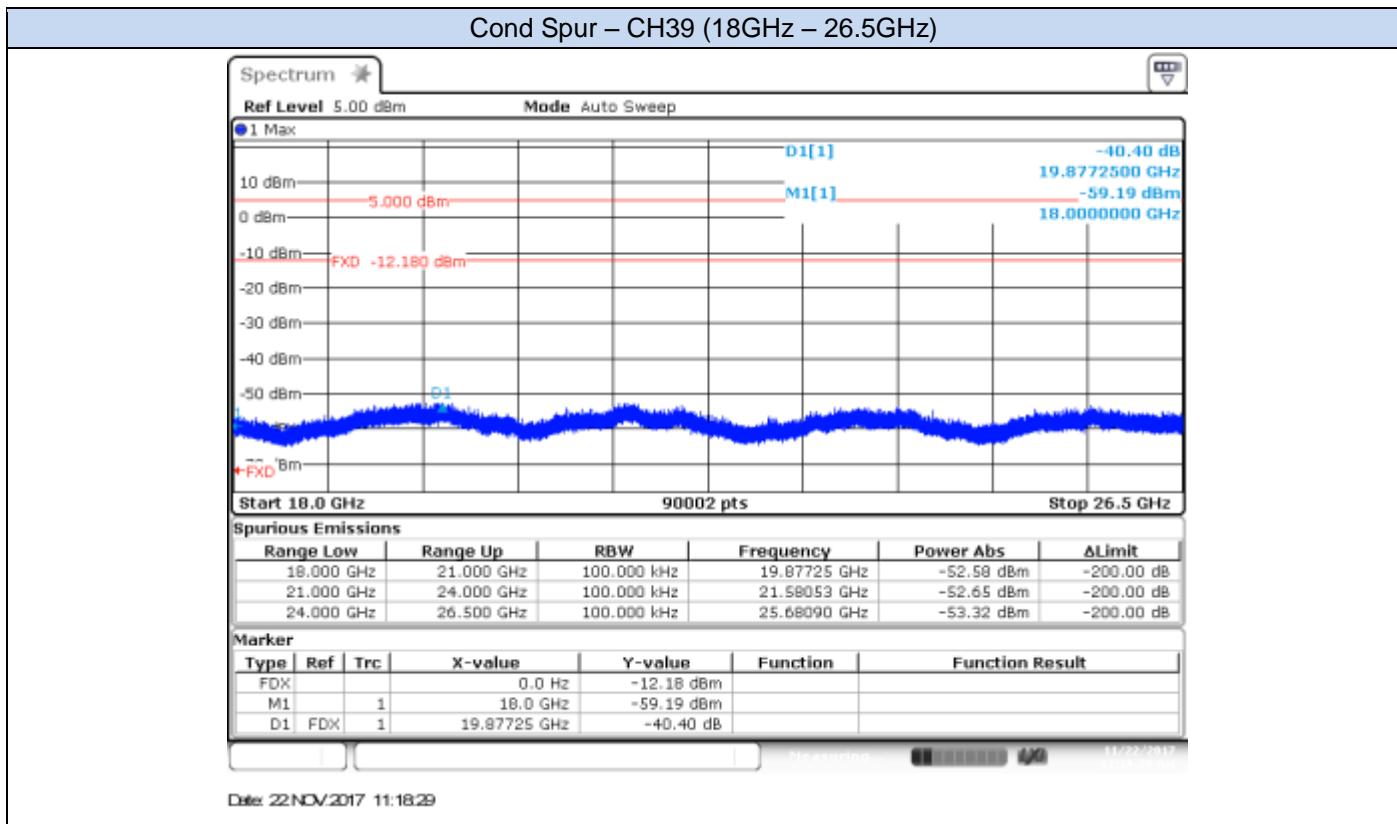


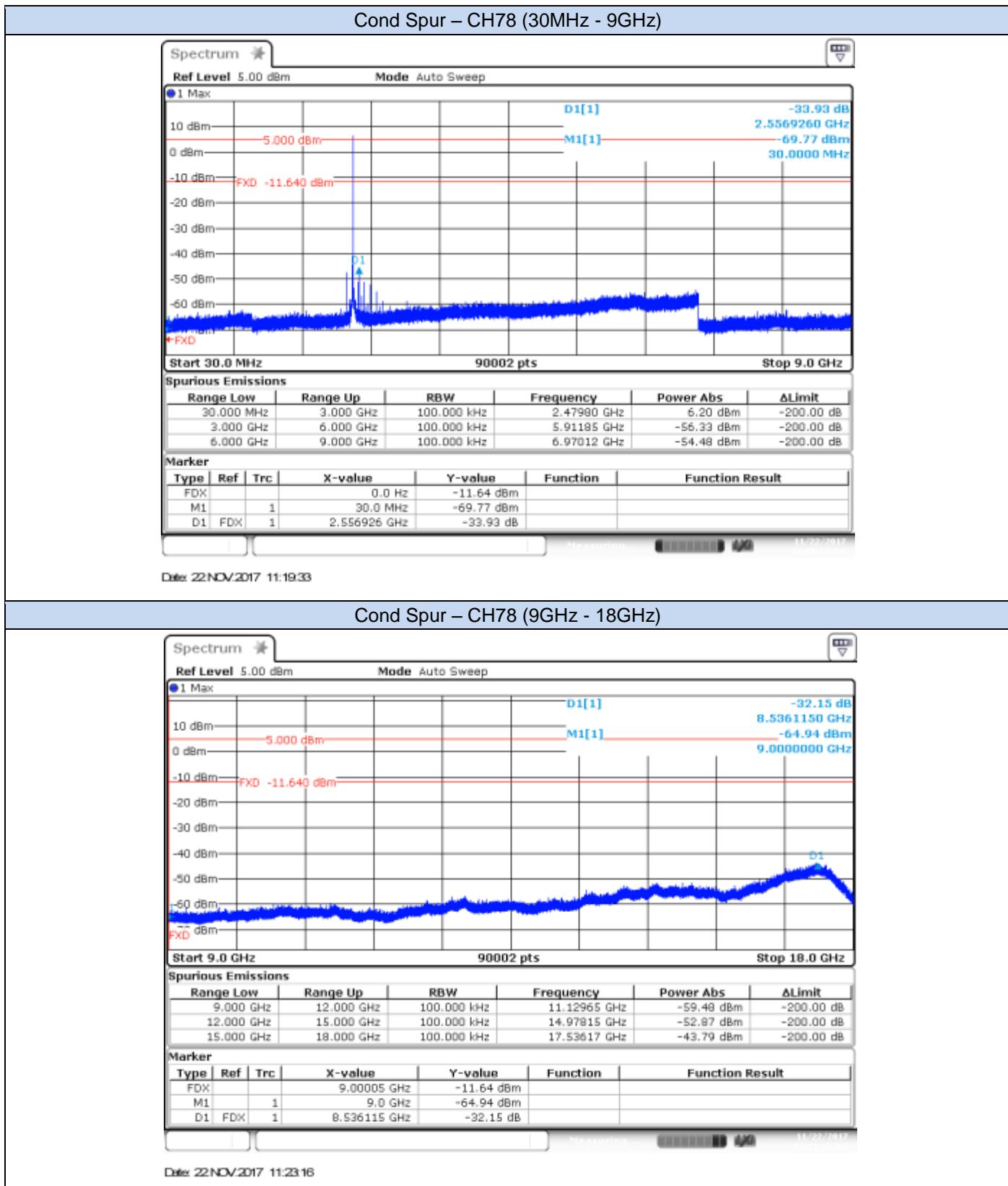
Cond Spur – CH0 (9GHz - 18GHz)

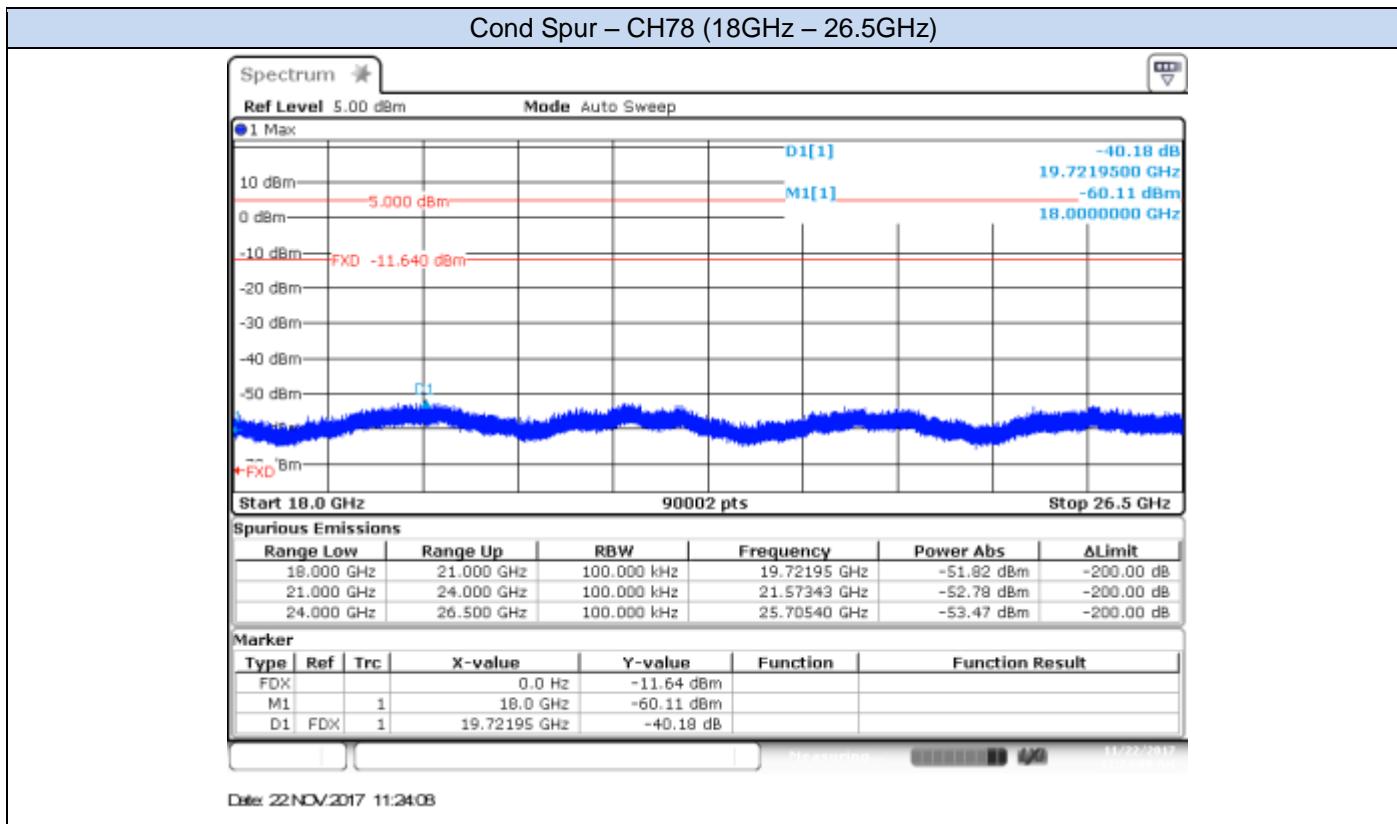












B.6 Radiated spurious emission

Standards references

FCC part	RSS part	Limits			
15.247 (d) 15.209 (a)	RSS-247 Clause 5.5 RSS GEN Clause 8.9	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):			
Freq Range (MHz)	Field Strength (μ V/m)	Field Strength (dB μ V/m)	Meas. Distance (m)		
30-88	100	40	3		
88-216	150	43.5	3		
216-960	200	46	3		
Above 960	500	54	3		

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.

Test procedure:

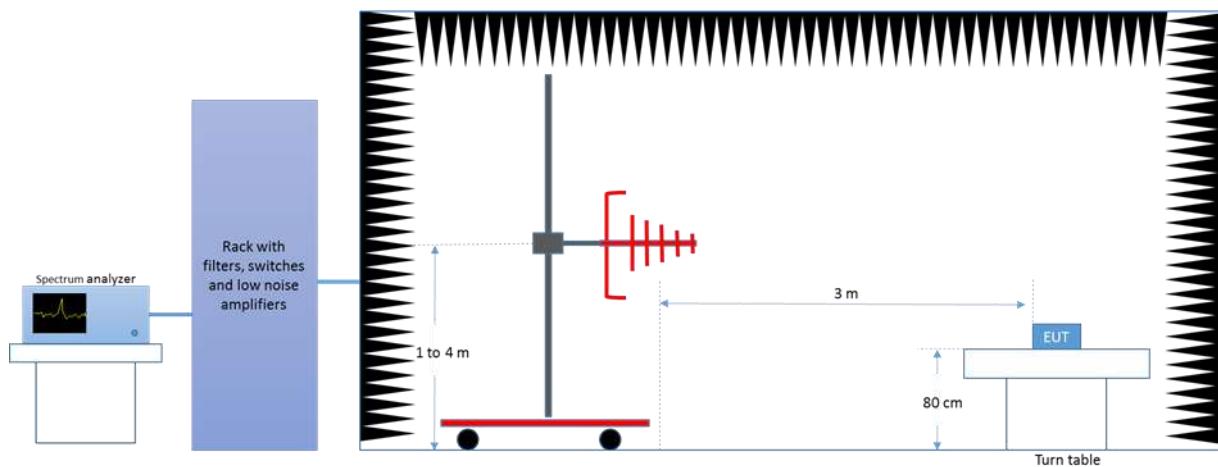
The setups below were used to measure the radiated spurious emissions.

Depending of the frequency range and bands being tested, different antennas and filters were used.

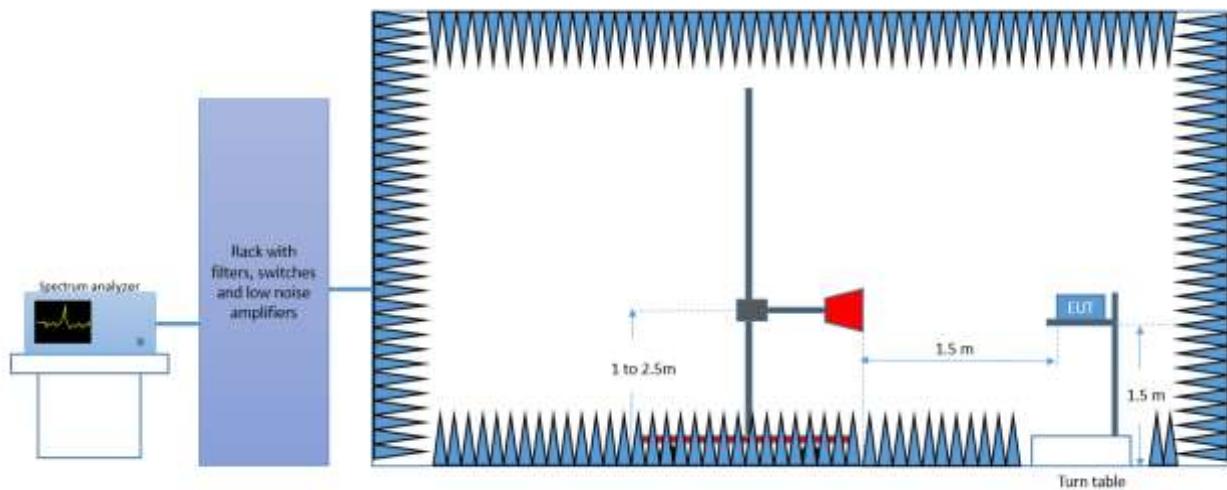
The final measurement is done by varying the antenna height as indicated in the setups below for each band, the EUT azimuth over 360° and for both Vertical and Horizontal polarizations.

The radiated spurious emission was measured on the worst case configuration found.

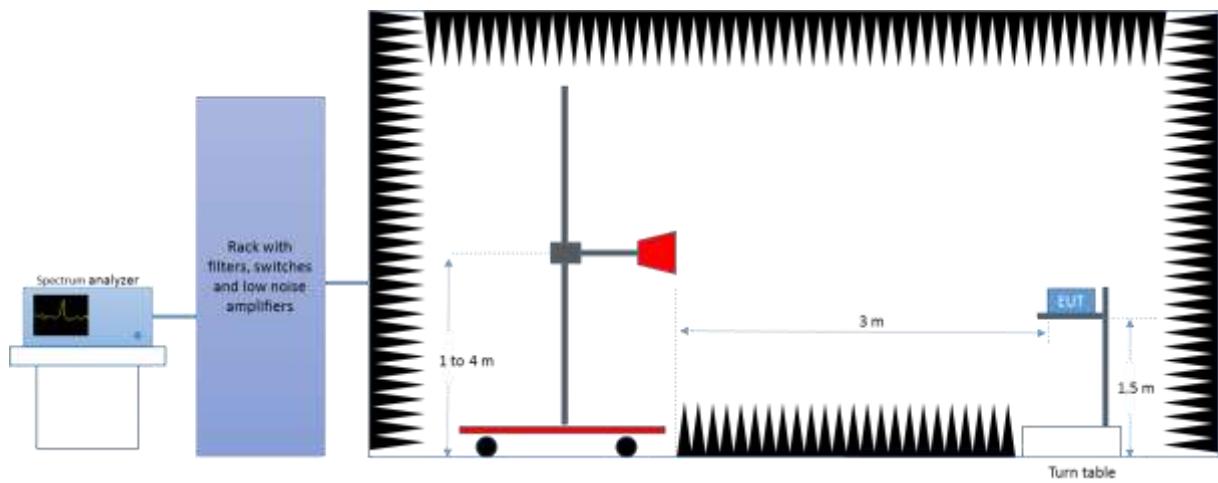
Radiated Setup 30MHz - 1GHz

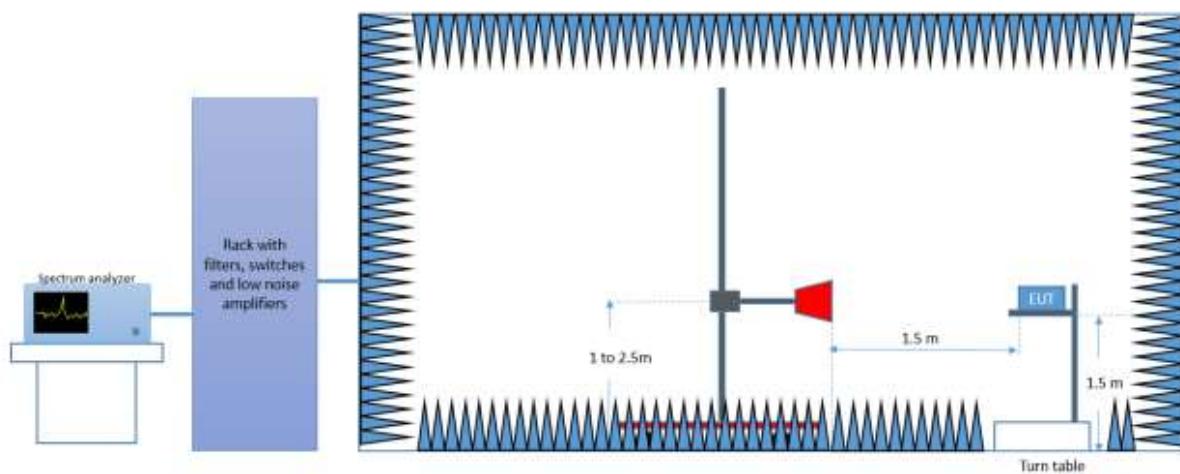


Radiated Setup 1 GHz – 6.4 GHz



Radiated Setup 6.4GHz – 18 GHz



Radiated Setup 18 GHz – 26.5 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 $\text{dB}\mu\text{V}/\text{m}$

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

λ is the wavelength of the emission under investigation [$300/f_{\text{MHz}}$], 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:

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

where

$E_{\text{SpecLimit}}$ is the field strength of the emission at the distance specified by the limit, in $\text{dB}\mu\text{V}/\text{m}$

E_{Meas} is the field strength of the emission at the measurement distance, in $\text{dB}\mu\text{V}/\text{m}$

D_{Meas} is the measurement distance, in m

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

Test Results**30 MHz – 26.5 GHz, BR – GFSK Chain A Div1****Radiated Spurious – CH0 DH5**

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
32.6	29.3	---	40.0	10.7
59.3	23.1	---	40.0	16.9
110.9	26.9	---	43.5	16.6
227.9	29.7	---	46.0	16.3
322.6	38.6	---	46.0	7.4
859.3	39.4	---	46.0	6.6
2324.4	55.8	---	74.0	18.2
2325.3	---	46.5	54.0	7.5
2555.6	---	45.1	54.0	9.0
2632.5	---	44.1	54.0	9.9
7205.7	---	51.6	54.0	2.4
7206.2	56.1	---	74.0	17.9
9607.9	50.9	---	74.0	23.1
9608.4	---	44.0	54.0	10.0
23100.3	---	37.0	54.0	17.0
23103.6	47.5	---	74.0	26.5

Radiated Spurious – CH39 DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
39.1	27.7	---	40.0	12.3
79.0	23.2	---	40.0	16.8
112.0	27.8	---	43.5	15.7
138.2	25.5	---	43.5	18.0
225.9	30.7	---	46.0	15.3
576.0	35.3	---	46.0	10.7
1113.4	---	41.0	54.0	13.0
1151.9	---	40.2	54.0	13.8
1190.3	---	43.1	54.0	10.9
2364.1	---	47.8	54.0	6.2
2517.8	---	49.2	54.0	4.8
2517.8	56.7	---	74.0	17.3
2594.7	---	44.8	54.0	9.2
2671.3	---	45.0	54.0	9.0
2671.9	57.5	---	74.0	16.5
9761.6	48.0	---	74.0	26.0
9764.0	---	38.1	54.0	15.9
23088.6	47.2	---	74.0	26.8
23100.3	---	37.5	54.0	16.5

Radiated Spurious – CH78 DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
39.1	26.4	---	40.0	13.6
58.5	23.2	---	40.0	16.8
71.9	23.0	---	40.0	17.0
99.5	27.6	---	43.5	15.9
138.2	25.1	---	43.5	18.4
225.2	30.5	---	46.0	15.5
1113.4	---	41.2	54.0	12.8
1151.9	---	40.1	54.0	13.9
1190.0	51.4	---	74.0	22.6
1190.3	---	42.7	54.0	11.3
2556.6	57.1	---	74.0	16.9
2556.9	---	48.0	54.0	6.0
2633.8	---	45.4	54.0	8.6
2710.3	---	44.5	54.0	9.5
19841.1	---	37.6	54.0	16.4
19841.9	47.3	---	74.0	26.7
23067.3	47.5	---	74.0	26.5
23100.3	---	37.5	54.0	16.5

30 MHz – 26.5 GHz, BR – GFSK Chain A Div2

Radiated Spurious – CH0 DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
39.2	26.7	---	40.0	13.3
72.0	25.0	---	40.0	15.0
138.3	27.5	---	43.5	16.0
143.7	26.0	---	43.5	17.5
280.4	33.5	---	46.0	12.5
576.0	34.8	---	46.0	11.2
1113.4	---	41.3	54.0	12.7
1113.8	51.7	---	74.0	22.3
1151.9	---	40.3	54.0	13.7
1190.3	---	42.8	54.0	11.2
1190.3	51.5	---	74.0	22.5
2325.3	---	45.8	54.0	8.2
2555.6	---	44.0	54.0	10.0
2632.8	---	44.2	54.0	9.9
7205.2	---	44.9	54.0	9.1
7205.2	52.5	---	74.0	21.5
9607.9	---	43.5	54.0	10.5
9607.9	51.6	---	74.0	22.4
19217.1	---	35.5	54.0	18.5
21486.3	48.1	---	74.0	25.9

Radiated Spurious – CH39 DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
39.2	26.9	---	40.0	13.1
72.0	23.3	---	40.0	16.7
111.1	25.5	---	43.5	18.0
138.3	26.8	---	43.5	16.7
216.0	27.8	---	43.5	15.7
576.0	34.8	---	46.0	11.2
1113.4	---	41.0	54.0	13.0
1151.9	---	40.3	54.0	13.7
1190.3	---	42.7	54.0	11.3
2364.4	---	46.1	54.0	7.9
2517.2	56.1	---	74.0	17.9
2517.8	---	46.1	54.0	7.9
2594.7	---	44.4	54.0	9.6
2671.6	---	45.2	54.0	8.8
2671.6	56.4	---	74.0	17.6
9761.1	50.2	---	74.0	23.8
9764.0	---	37.2	54.0	16.8
19526.9	---	34.5	54.0	19.5
19527.3	45.9	---	74.0	28.1
22000.0	---	34.8	54.0	19.2
22000.4	45.5	---	74.0	28.5

Radiated Spurious – CH78 DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
39.1	28.0	---	40.0	12.0
71.8	23.7	---	40.0	16.3
111.0	24.7	---	43.5	18.8
137.1	27.9	---	43.5	15.6
225.5	29.9	---	46.0	16.1
576.0	35.3	---	46.0	10.7
1113.4	---	41.2	54.0	12.8
1113.4	51.6	---	74.0	22.4
1151.9	---	40.2	54.0	13.8
1190.3	52.0	---	74.0	22.0
1190.3	---	43.1	54.0	10.9
2556.9	---	46.0	54.0	8.1
2633.8	---	45.6	54.0	8.4
2710.3	---	44.2	54.0	9.8
9894.5	47.4	---	74.0	26.6
9919.6	---	36.5	54.0	17.5
19841.1	46.9	---	74.0	27.1
19841.1	---	36.3	54.0	17.7
21536.9	48.2	---	74.0	25.8
22857.6	---	35.5	54.0	18.5

30 MHz – 26.5 GHz, EDR – π/4-DQPSK Chain A Div1**Radiated Spurious – CH0 2DH5**

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
58.8	23.0	---	40.0	17.0
71.9	23.3	---	40.0	16.8
111.1	24.2	---	43.5	19.3
137.1	26.5	---	43.5	17.0
216.0	26.5	---	46.0	19.5
576.0	34.6	---	46.0	11.5
1113.4	---	41.1	54.0	12.9
1151.9	---	40.3	54.0	13.8
1190.3	51.5	---	74.0	22.5
1190.3	---	42.7	54.0	11.3
2325.3	---	45.1	54.0	8.9
2325.6	55.3	---	74.0	18.7
2478.8	---	46.8	54.0	7.2
2555.3	---	44.7	54.0	9.3
23100.3	---	38.3	54.0	15.7
23805.6	48.8	---	74.0	25.2

Radiated Spurious – CH39 2DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
39.1	27.5	---	40.0	12.5
71.9	24.6	---	40.0	15.4
111.0	24.4	---	43.5	19.1
137.1	27.0	---	43.5	16.5
251.1	32.0	---	46.0	14.0
576.0	35.4	---	46.0	10.6
1113.4	---	41.0	54.0	13.0
1151.9	---	40.2	54.0	13.8
1190.3	---	42.9	54.0	11.1
2364.1	---	45.9	54.0	8.1
2364.1	55.6	---	74.0	18.4
2517.5	56.0	---	74.0	18.0
2517.8	---	47.4	54.0	6.6
2594.7	---	44.6	54.0	9.4
2671.6	---	44.2	54.0	9.8
23100.3	---	37.3	54.0	16.7
23820.3	48.7	---	74.0	25.3

Radiated Spurious – CH78 2DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
71.9	24.7	---	40.0	15.3
111.8	25.2	---	43.5	18.3
138.1	26.4	---	43.5	17.1
216.0	27.3	---	43.5	16.2
456.0	32.8	---	46.0	13.2
576.0	35.4	---	46.0	10.6
1113.4	---	41.1	54.0	12.9
1151.9	---	40.2	54.0	13.8
1190.3	---	43.1	54.0	10.9
2364.1	---	45.6	54.0	8.4
2517.8	---	47.4	54.0	6.6
2518.1	56.3	---	74.0	17.7
2594.4	---	44.3	54.0	9.7
2671.6	---	44.8	54.0	9.2
23099.9	---	37.0	54.0	17.0
23821.4	48.5	---	74.0	25.5

30 MHz – 26.5 GHz, EDR – π/4-DQPSK Chain A Div 2**Radiated Spurious – CH0 2DH5**

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
39.1	26.6	---	40.0	13.4
71.8	23.0	---	40.0	17.0
111.2	25.2	---	43.5	18.3
138.1	24.6	---	43.5	19.0
263.9	26.9	---	46.0	19.1
576.0	35.4	---	46.0	10.6
1113.4	---	40.9	54.0	13.1
1151.9	---	40.4	54.0	13.6
1190.3	---	42.7	54.0	11.3
1190.6	51.6	---	74.0	22.4
2325.3	---	44.8	54.0	9.2
2478.8	---	45.4	54.0	8.6
2631.3	57.0	---	74.0	17.0
2632.5	---	44.5	54.0	9.5
22825.8	48.2	---	74.0	25.8
23807.9	---	35.6	54.0	18.4

Radiated Spurious – CH39 2DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
39.1	26.8	---	40.0	13.2
71.9	24.2	---	40.0	15.8
111.2	25.6	---	43.5	17.9
137.3	26.5	---	43.5	17.0
216.0	27.3	---	46.0	18.7
576.1	34.0	---	46.0	12.0
1112.8	51.2	---	74.0	22.8
1113.4	---	41.1	54.0	12.9
1151.6	---	40.2	54.0	13.8
1190.0	51.4	---	74.0	22.6
1190.3	---	42.9	54.0	11.1
2364.4	---	45.2	54.0	8.8
2364.4	55.6	---	74.0	18.4
2517.8	---	45.3	54.0	8.7
2594.4	---	44.4	54.0	9.6
2671.6	---	45.0	54.0	9.0
22200.6	48.5	---	74.0	25.5
23797.8	---	35.7	54.0	18.3

Radiated Spurious – CH78 2DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
72.0	23.8	---	40.0	16.2
111.9	26.4	---	43.5	17.1
216.0	28.1	---	46.0	17.9
297.8	32.0	---	46.0	14.0
456.0	32.9	---	46.0	13.1
576.0	35.4	---	46.0	10.6
1113.4	---	41.0	54.0	13.0
1151.9	---	40.3	54.0	13.7
1190.3	---	42.9	54.0	11.1
2556.6	---	44.9	54.0	9.1
2633.8	---	45.3	54.0	8.7
2710.6	---	44.3	54.0	9.7
3411.6	59.2	---	74.0	14.8
22892.9	---	35.5	54.0	18.5
24180.6	48.7	---	74.0	25.3

30 MHz – 26.5 GHz, EDR – 8-DPSK Chain A Div1**Radiated Spurious – CH0 3DH5**

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
72.2	24.0	---	40.0	16.0
111.0	25.4	---	43.5	18.1
137.0	25.3	---	43.5	18.2
231.1	30.6	---	46.0	15.4
456.0	32.7	---	46.0	13.3
576.0	34.9	---	46.0	11.1
1113.4	---	41.3	54.0	12.8
1151.9	---	40.3	54.0	13.7
1190.3	---	43.2	54.0	10.8
1190.6	51.4	---	74.0	22.6
2325.6	---	45.1	54.0	8.9
2555.9	---	44.9	54.0	9.1
2632.2	---	44.0	54.0	10.0
23050.4	48.6	---	74.0	25.4
23100.3	---	37.6	54.0	16.4

Radiated Spurious – CH39 3DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
71.9	23.5	---	40.0	16.5
110.9	25.7	---	43.5	17.8
137.0	24.5	---	43.5	19.0
216.0	28.0	---	43.5	15.5
456.0	32.1	---	46.0	13.9
576.0	33.6	---	46.0	12.4
1113.4	---	41.2	54.0	12.8
1151.9	---	40.1	54.0	13.9
1190.3	---	42.8	54.0	11.2
2364.1	---	45.8	54.0	8.2
2517.8	---	47.5	54.0	6.5
2518.8	56.7	---	74.0	17.3
2594.7	---	44.5	54.0	9.5
2671.6	---	44.4	54.0	9.6
23100.3	---	37.4	54.0	16.6
23108.1	47.2	---	74.0	26.8

Radiated Spurious – CH78 3DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
71.9	23.3	---	40.0	16.8
110.9	27.7	---	43.5	15.8
136.9	25.8	---	43.5	17.7
216.0	27.5	---	43.5	16.0
456.0	32.3	---	46.0	13.7
576.0	34.8	---	46.0	11.2
1113.4	---	41.0	54.0	13.0
1190.3	---	43.0	54.0	11.0
1190.3	52.2	---	74.0	21.8
2557.2	---	46.1	54.0	7.9
2633.8	---	44.9	54.0	9.1
21507.3	48.6	---	74.0	25.4
23099.9	---	37.5	54.0	16.5

30 MHz – 26.5 GHz, EDR – 8-DPSK Chain A Div2**Radiated Spurious – CH0 3DH5**

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
72.0	23.9	---	40.0	16.1
110.9	26.1	---	43.5	17.4
137.0	25.9	---	43.5	17.6
216.0	27.8	---	43.5	15.7
456.0	32.5	---	46.0	13.5
576.0	34.7	---	46.0	11.3
1113.4	---	41.4	54.0	12.6
1151.9	---	40.5	54.0	13.5
1190.3	---	42.9	54.0	11.1
2325.0	---	45.0	54.0	9.0
2325.3	55.7	---	74.0	18.4
2555.6	---	43.8	54.0	10.2
2632.5	---	44.2	54.0	9.8
3257.8	59.2	---	74.0	14.8
21503.1	47.9	---	74.0	26.1
22000.0	---	34.6	54.0	19.4

Radiated Spurious – CH39 3DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
71.8	24.7	---	40.0	15.3
105.3	23.0	---	43.5	20.5
111.0	26.2	---	43.5	17.3
138.1	25.1	---	43.5	18.4
216.0	27.1	---	46.0	18.9
576.0	34.0	---	46.0	12.0
1113.4	---	41.2	54.0	12.8
1151.9	---	40.3	54.0	13.7
1190.3	51.2	---	74.0	22.8
1190.3	---	42.7	54.0	11.3
2364.1	---	45.0	54.0	9.0
2517.8	---	45.6	54.0	8.4
2671.3	---	44.5	54.0	9.5
3413.4	59.6	---	74.0	14.4
23783.1	---	35.4	54.0	18.6
23786.9	47.8	---	74.0	26.2

Radiated Spurious – CH78 3DH5

Frequency	MaxPeak	Avg	Limit	Margin
MHz	dBuV/m	dBuV/m	dBuV/m	dB
71.9	24.1	---	40.0	15.9
110.8	25.6	---	43.5	17.9
138.1	25.7	---	43.5	17.8
143.5	24.1	---	43.5	19.4
216.0	27.8	---	43.5	15.7
576.0	33.9	---	46.0	12.2
2545.9	56.3	---	74.0	17.7
2556.9	---	45.2	54.0	8.8
2633.8	---	45.2	54.0	8.8
2646.6	56.3	---	74.0	17.7
21373.4	48.3	---	74.0	25.7
22000.0	---	34.5	54.0	19.5