



Test report No:
NIE: 61152RRF.001

Test Report

USA FCC Part 15.247, 15.209
CANADA RSS-247, RSS-Gen

Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz.

Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.

General Requirements and Information for the Certification of Radio Apparatus.

(*) Identification of item tested	Automotive Infotainment System
(*) Trademark	Mercedes-Benz
(*) Model and /or type reference	NTG7 HIGH LFT2
Other identification of the product	HW version: D5 SW version: E17.100 FCC ID: 2AOUZNTG7HIGHLFT2 IC: 23650-NTG7HIGHLFT2
(*) Features	FM/AM/DAB/DVBT USB, Bluetooth, WLAN, GNSS
Applicant	CONTINENTAL AUTOMOTIVE GMBH VDO-Strasse 1, 64832 Babenhausen, Germany
Test method requested, standard	USA FCC Part 15.247 (10-1-19) Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-19) Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (March 2019). Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. Guidance for Emission Testing of Transmitters with Multiple Outputs in the Same Band 662911 D01 Multiple Transmitter Output v02r01 dated 10/31/2013. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Carlos Luque RF Lab. Supervisor 74841983Y Firmado digitalmente por JOSE CARLOS LUQUE (C:A29507456) Fecha: 2020.08.14 10:44:39 +02'00'
Date of issue	2020-08-12
Report template No	FDT08_22 (*) "Data provided by the client"

Index

Competences and guarantees3

General conditions.....3

Uncertainty.....3

Data provided by the client3

Usage of samples3

Test sample description.....5

Identification of the client7

Testing period and place7

Document history.....7

Environmental conditions8

Remarks and comments.....9

Testing verdicts.....10

Summary10

Appendix A: Test results. Bluetooth EDR (GFSK, Pi/4-DQPSK, 8DPSK)11

Appendix B: Test results. 802.11 bgn20 2x2.....72

Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. 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.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Testing and Certification S.A.U.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample of NTG7 HIGH LFT2 is an Automotive head unit to be installed in cars with the following features: FM/AM/DAB/DVBT, USB, Bluetooth, WLAN and GNSS.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of result.

Usage of samples

Samples undergoing test have been selected by: The client.

- Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
61152E/034	Automotive Infotainment System	NTG7 HIGH LFT2	COM634LB0000003	2020/03/24
61152E/035	Harness	--	--	2020/03/24

Auxiliary elements used with the Sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
61152E/036	SMA Adapter Cable	--	--	2020/03/24

Sample S/01 has undergone the following test(s): All Conducted tests indicated in Appendix A.

- Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
61152E/031	Automotive Infotainment System	NTG7 HIGH LFT2	COM634LB0000002	2020/03/24
61152E/035	Harness	--	--	2020/03/24

Auxiliary elements used with the Sample S/02:

Control N°	Description	Model	Serial N°	Date of reception
61152E/036	SMA Adapter Cable	--	--	2020/03/24

Sample S/02 has undergone the following test(s): The Conducted tests for SISO techniques indicated in Appendix B.

- Sample S/03 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
61152E/030	Automotive Infotainment System	NTG7 HIGH LFT2	COM634LB0000004	2020/03/24
61152E/038	Harness	--	--	2020/03/24

Auxiliary elements used with the Sample S/03:

Control N°	Description	Model	Serial N°	Date of reception
61152E/039	SMA Adapter Cable	--	--	2020/03/24

Sample S/03 has undergone the following test(s): All Conducted tests for MIMO technique indicated in Appendix B.

- Sample S/04 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
61152E/040	Automotive Infotainment System	NTG7 HIGH LFT2	COM634LB0000001	2020/03/26
61152E/032	Harness	--	--	2020/03/24
60268/125	RF Cable with 4 Antennas	--		2019/09/30

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	Car Connector A	>3m ^(x1)	☒	☐	☐		
	Car Connector B	>3m ^(x1)	☒	☐	☐		
	Display Connector CID/PIP / RVC	>3m ^(x1)	☒	☒	☐		
	USB Connector	<3m ^(x2)	☒	☒	☐		
	Eth Connector	>3m ^(x1)	☒	☐	☐		
	BT/WLAN-Antenna	>3m ^(x1)	☒	☒	☐		
	FM/AM, TV/SDARS Ant	>3m ^(x1)	☒	☒	☐		
GNSS Antenna	>3m ^(x1)	☒	☒	☐			
Supplementary information to the ports..... :							
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 12V Car battery / attenuator (9,5-15,5V normal operation)					
☐	DC:						
Rated Power	9,5-15,5V normal operation						
Clock frequencies.....	see schematics						

Other parameters	See Technical Description		
Software version	E17.100		
Hardware version	D5		
Dimensions in cm (W x H x D)	182 x 78 x 160 mm		
Mounting position	☐	Table top equipment	
	☐	Wall/Ceiling mounted equipment	
	☐	Floor standing equipment	
	☐	Hand-held equipment	
	☒	Other: automotive headunit	
Modules/parts.....	Module/parts of test item	Type	Manufacturer
	n/a	-	
		-	
		-	
		-	
Accessories (not part of the test item)	Description	Type	Manufacturer
	Display	-	LG.
	HARMANeco RasPi / headless	-	HBAS
	Cable harness	-	HBAS
	BT/WLAN-Antenna	-	Hirschmann
Documents as provided by the applicant.....	Description	File name	Issue date
	Technical Description	Technical Description NTG7_A15 200324 SOP2 AllVariant.doc	

⁽³⁾ Only for Medical Equipment

Identification of the client

CONTINENTAL AUTOMOTIVE GMBH
VDO-Strasse 1, 64832 Babenhausen, Germany

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-03-25
Date (finish)	2020-05-13

Document history

Report number	Date	Description
61152RRF.001	2020-08-12	First release

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 35 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Javier Miguel Nadales, José Gabriel Pendón, Miguel Ángel Torres.

Used instrumentation:

Conducted Measurements:

		Last Calibration	Due Calibration
1.	901-1205-UN00 ZONEDIRECTOR Controller, RUCKUS WIRELESS 901-1205-UN00	N.A.	N.A.
2.	Shielded Room ETS LINDGREN S101	N.A.	N.A.
3.	DC Power Supply 30V/3A 90W, GW INSTEK GPS-3030D	N.A.	N.A.
4.	Spectrum Analyzer PSA 3Hz-26.5 GHz AGILENT TECHNOLOGIES E4440A	2019/11	2021/11
5.	Digital multimeter FLUKE 179	2019/09	2020/09
6.	DC Power Supply 30V/5A 150W AGILENT TECHNOLOGIES, U8002A	N.A.	N.A.
7.	Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2020/03	2022/03

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber FRANKONIA SAC-3	N.A.	N.A.
2.	Shielded Room FRANKONIA	N.A.	N.A.
3.	Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2018/07	2021/07
4.	RF Pre-amplifier 40 dB, 10 MHz - 6 GHz BONN ELEKTRONIK BLNA 0160-01N	N.A.	N.A.
5.	DC Power Supply, 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N.A.	N.A.
6.	Digital Multimeter FLUKE 179	2019/06	2020/06
7.	Horn Antenna 1-18GHz SCHWARZBECK MESS- ELEKTRONIK BBHA 9120 D	2018/06	2021/06
8.	Horn Antenna 18-40GHz SCHWARZBECK BBHA 9170	2018/07	2021/07
9.	Pre-amplifier, G>55dB 1-18GHz NARDA AMF-7D-01001800-22-10P	2019/12	2020/12
10.	Pre-amplifier, G>30dB 18-40GHz BONN ELEKTRONIK BLMA 1840-1M	2019/02	2021/02
11.	EMI Receiver ROHDE AND SCHWARZ ESU40	2019/09	2021/09

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

Summary

1. Bluetooth EDR

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		Verdict	Remark
15.247 (a) (1) / RSS-247 5.1. (b)	20 dB 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) / RSS-247 5.4. (b)	Maximum peak output power and antenna gain	P	
15.247 (d) / RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	P	
15.247 (d) / RSS-247 5.5.	Emission limitations radiated (Transmitter)	P	
<u>Supplementary information and remarks:</u> None.			

2. WLAN 2.4 GHz (802.11 b/g/n20 2x2).

FCC PART 15 PARAGRAPH / RSS-247			
Requirement – Test case		Verdict	Remark
15.247 (a) (2) / RSS-247 5.2. (a)	6 dB Bandwidth	P	
15.247 (b) / RSS-247 5.4. (d)	Maximum output power and antenna gain	P	
15.247 (d) / RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	P	
15.247 (e) / RSS-247 5.2. (b)	Power spectral density	P	
15.247 (d) / RSS-247 5.5.	Emission limitations radiated (Transmitter)	P	
<u>Supplementary information and remarks:</u> None.			

Appendix A: Test results. Bluetooth EDR (GFSK, Pi/4-DQPSK, 8DPSK)

TEST CONDITIONS	13
FCC 15.247 (a) (1) / RSS-247 5.1. (b) 20 dB Bandwidth and Carrier frequency separation	16
FCC 15.247 (a)(1)(iii) / RSS-247 5.1 (d) Number of hopping channels	23
FCC 15.247 (a)(1)(iii) / RSS-247 5.1 (d) Time of occupancy (Dwell Time).....	26
FCC 15.247 (b) / RSS-247 5.4 (b) Maximum peak output power and antenna gain	32
FCC 15.247 (d) / RSS-247 5.5. Band-edge emissions compliance (Transmitter)	38
FCC 15.247 (d) / RSS-247 5.5. Emission limitations radiated. (Transmitter).....	45

TEST CONDITIONS

POWER SUPPLY (V):

V nominal:	12 Vdc.
Type of Power Supply:	External power supply (Car Battery).
Type of Antenna:	External antenna.
Maximum Declared Antenna Gain:	+1.8 dBi (Antenna gain plus antenna cable loss).

TEST FREQUENCIES:

Low Channel:	2402 MHz
Middle Channel:	2441 MHz
High Channel:	2480 MHz

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it is connected to the spectrum analyser using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.



The DC supply voltage is applied using an external calibrated power supply with a multimeter.

RADIATED MEASUREMENTS:

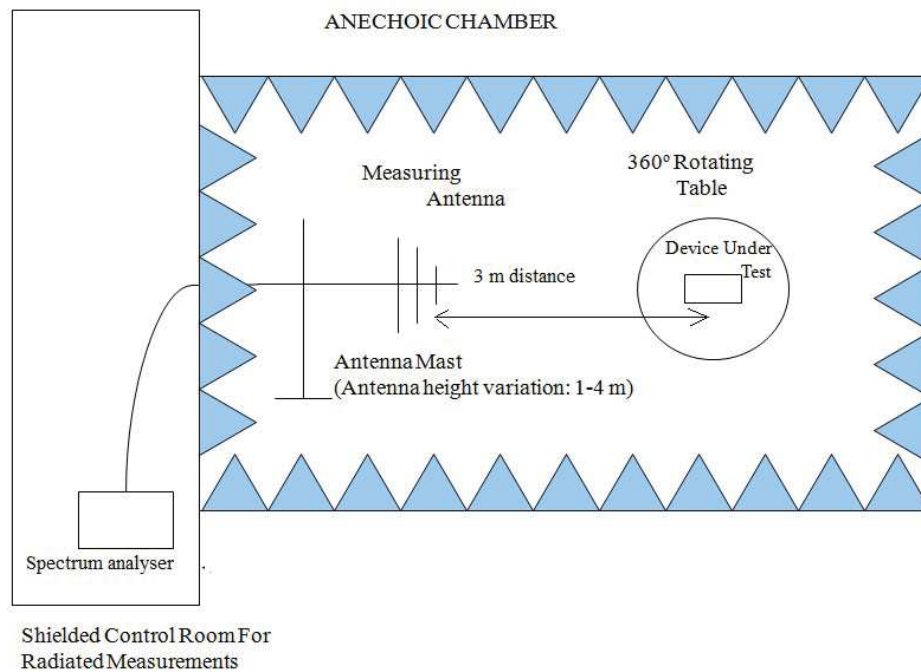
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz) and 1 GHz-18 GHz Double ridge horn antenna is situated at a distance of 3 m and a distance of 1m for the frequency range 17 GHz-26 GHz (18 GHz-40 GHz horn antenna).

For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

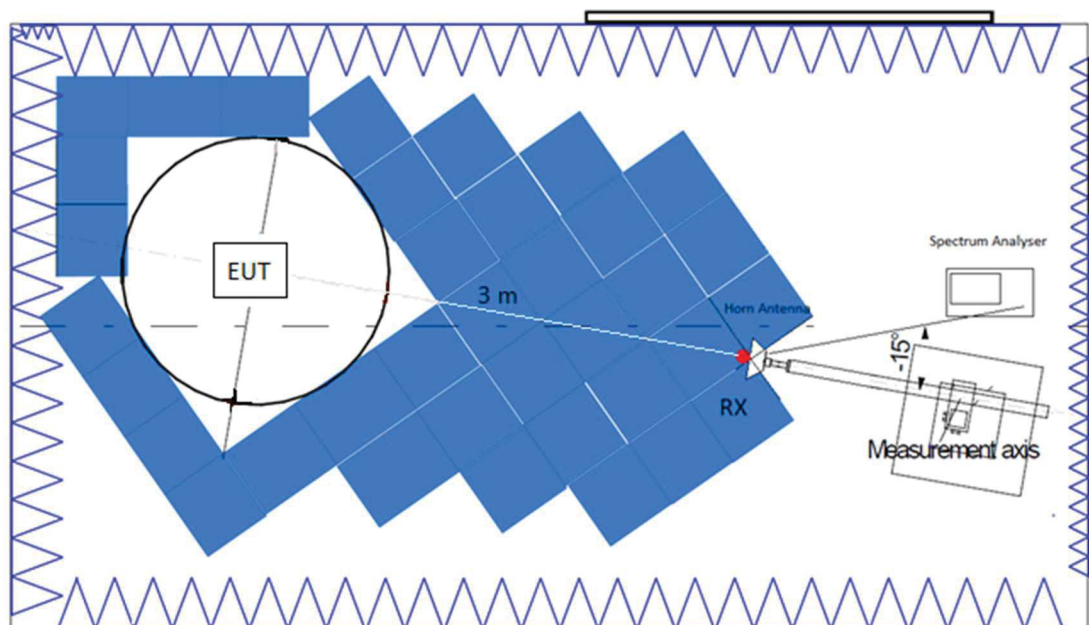
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

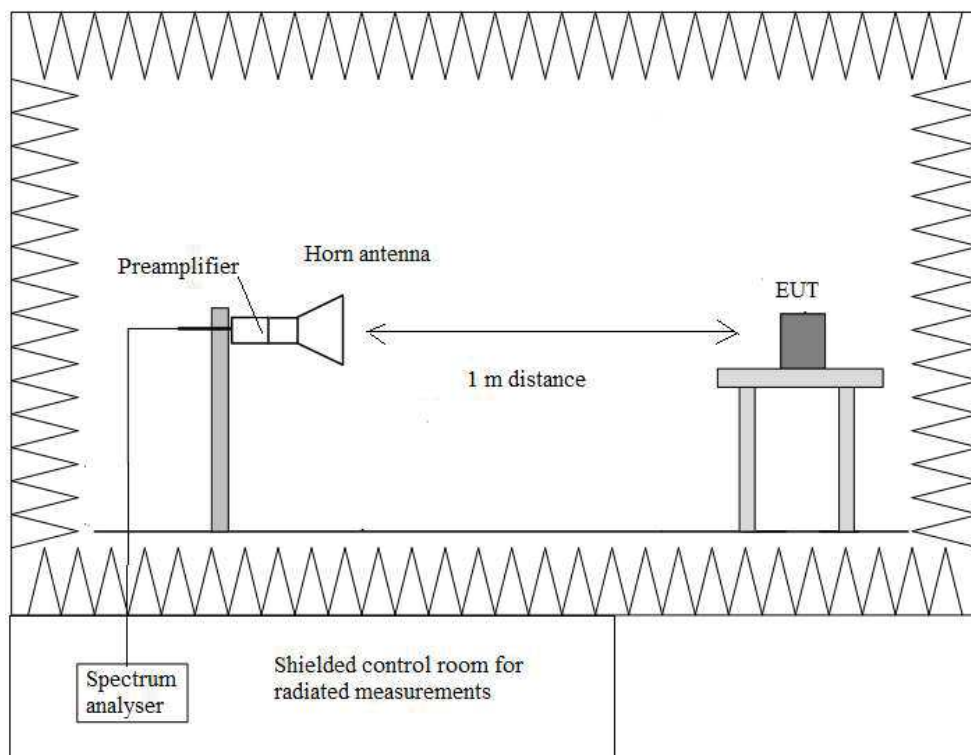
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



FCC 15.247 (a) (1) / RSS-247 5.1. (b) 20 dB Bandwidth and Carrier frequency separation

SPECIFICATION:

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:

- GFSK**

	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
20 dB Spectrum Bandwidth (kHz)	942.414	944.879	944.888
99% Bandwidth (kHz)	878.8375	879.3096	878.354
Measurement uncertainty (kHz)	<±12.15		

- Pi/4 DQPSK**

	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
20 dB Spectrum Bandwidth (kHz)	1360	1360	1360
99% Bandwidth (kHz)	1205.2	1206.2	1206.3
Measurement uncertainty (kHz)	<±12.15		

- 8DPSK**

	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
20 dB Spectrum Bandwidth (kHz)	1318	1318	1317
99% Bandwidth (kHz)	1206	1207.4	1207.1
Measurement uncertainty (kHz)	<±12.15		

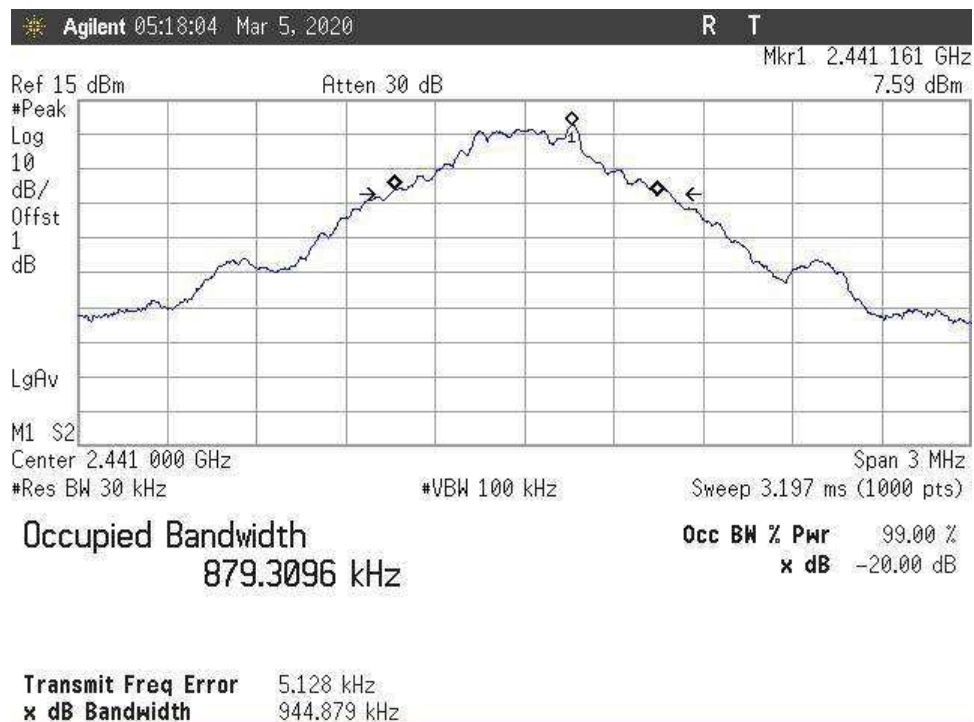
Verdict: PASS

• GFSK – Bandwidths

- Low Channel:



- Middle Channel:

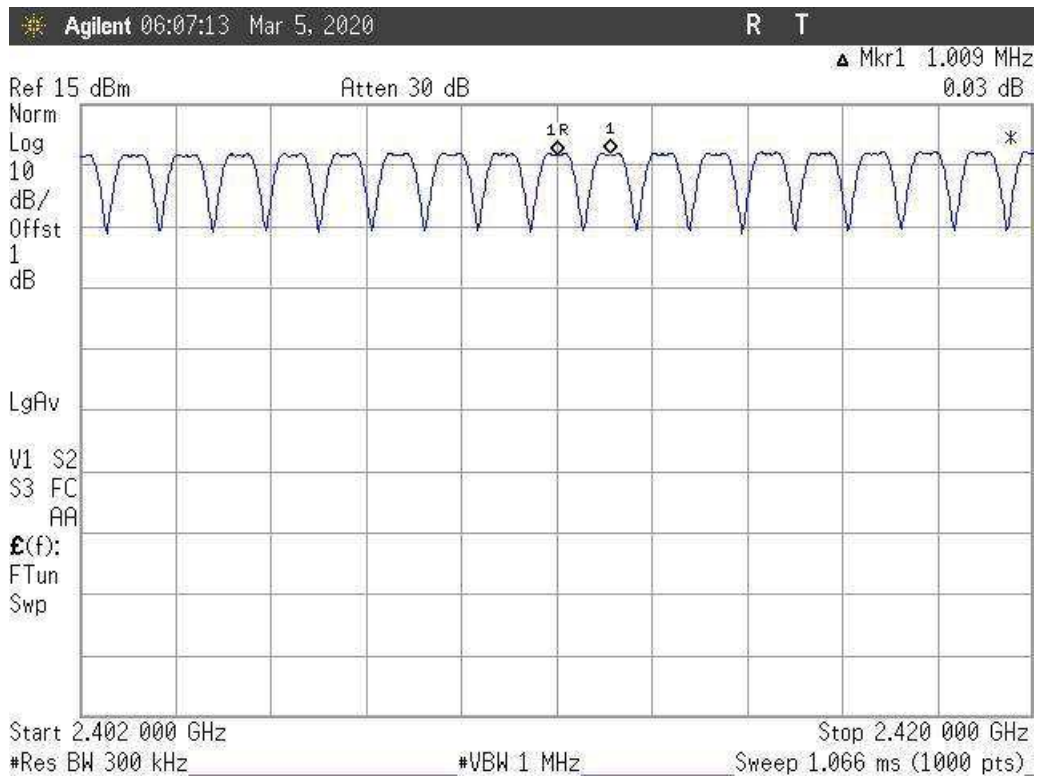


- High Channel:



Carrier frequency separation - GFSK

Carrier frequency separation: kHz

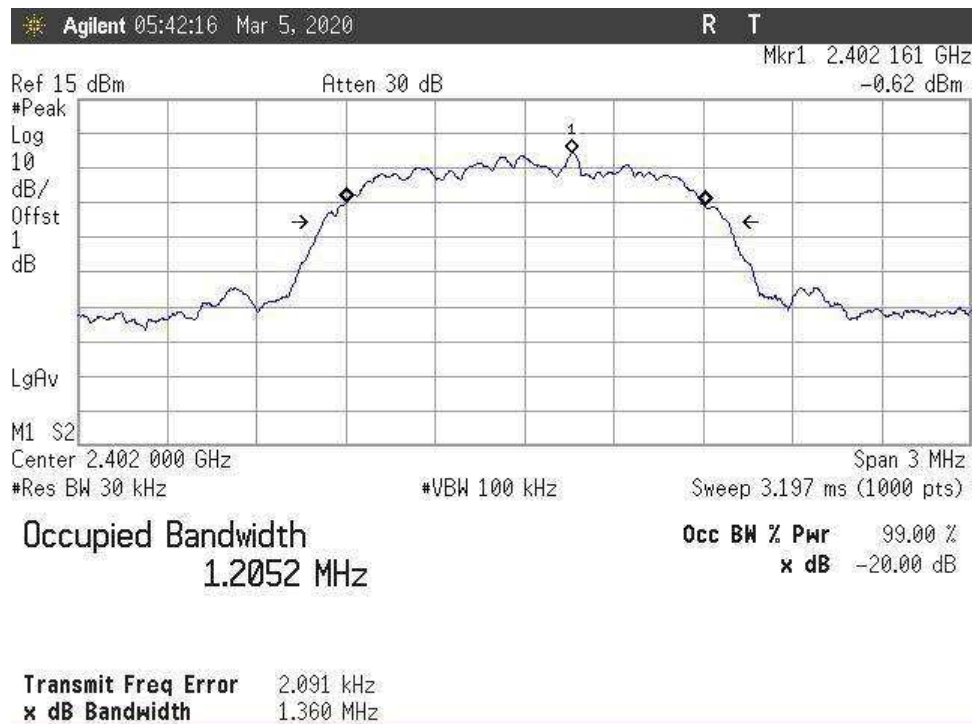


The hopping channel carrier frequencies are separated by a minimum two-thirds of the 20 dB bandwidth of the hopping channel.

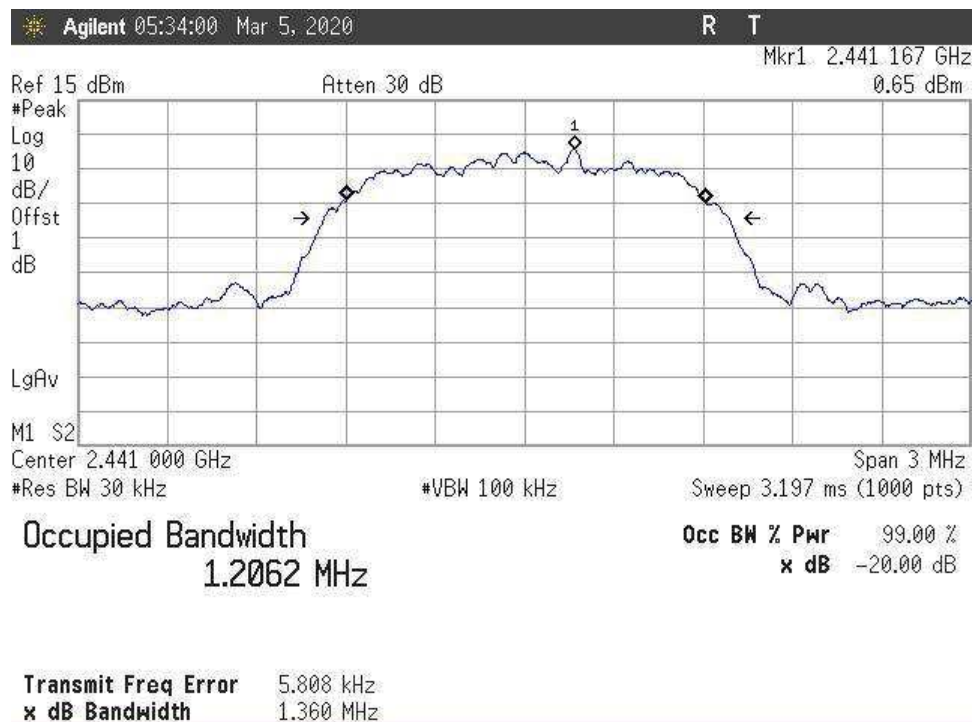
Verdict: PASS

• Pi/4 DQPSK – Bandwidths

- Low Channel:



- Middle Channel:

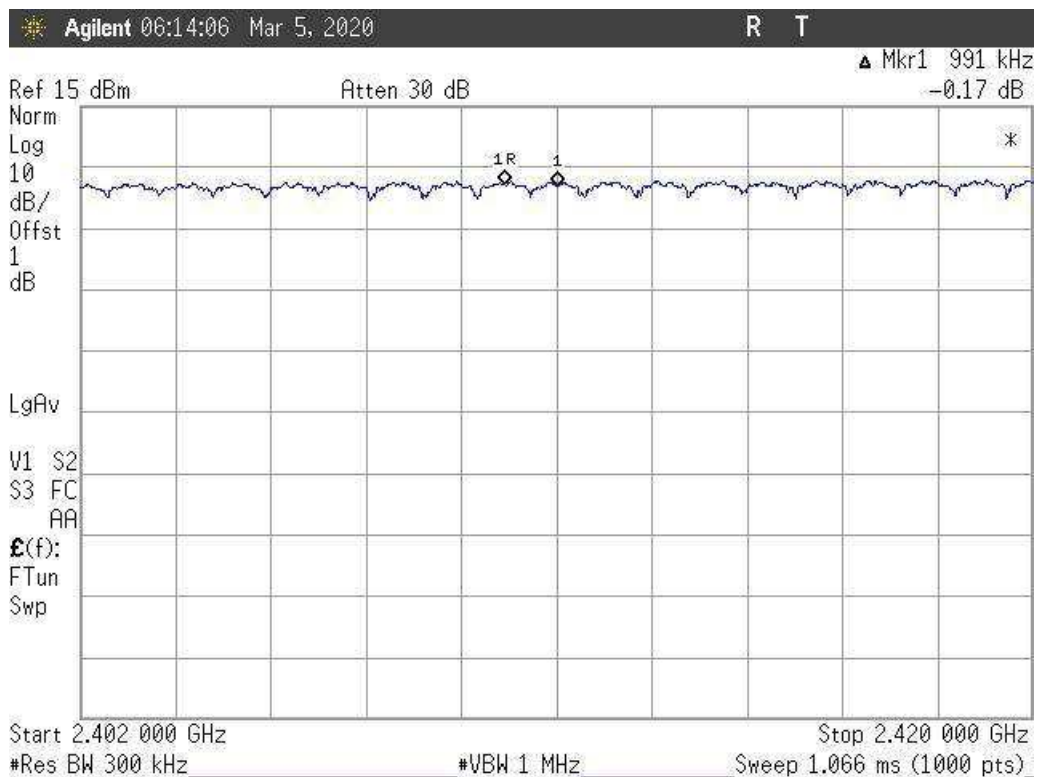


- High Channel:



Carrier frequency separation - Pi/4 DQPSK

Carrier frequency separation: kHz

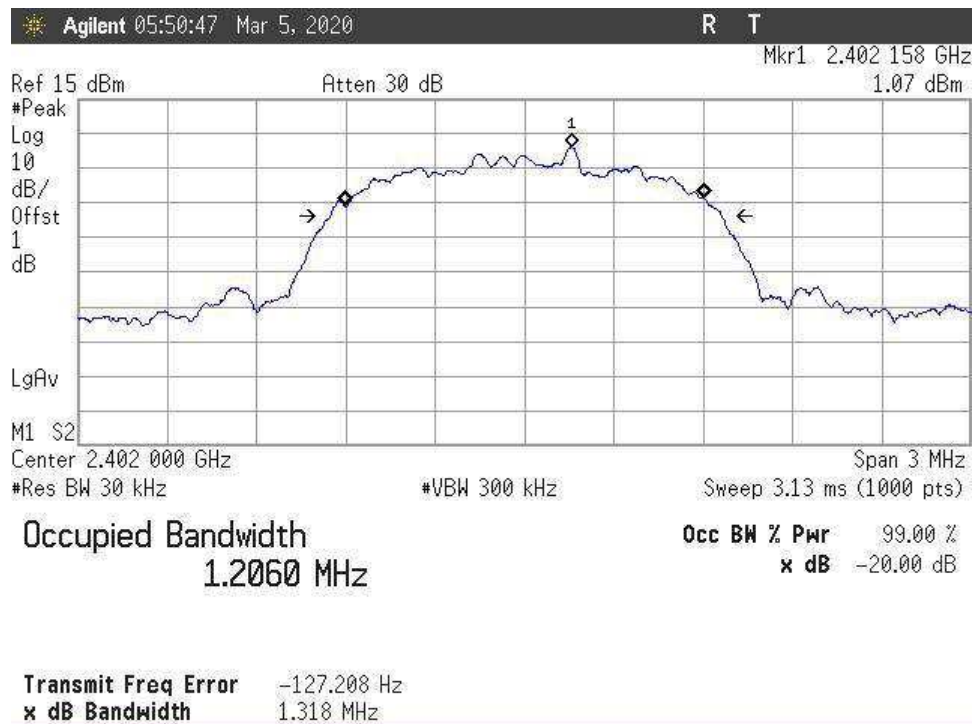


The hopping channel carrier frequencies are separated by a minimum two-thirds of the 20 dB bandwidth of the hopping channel.

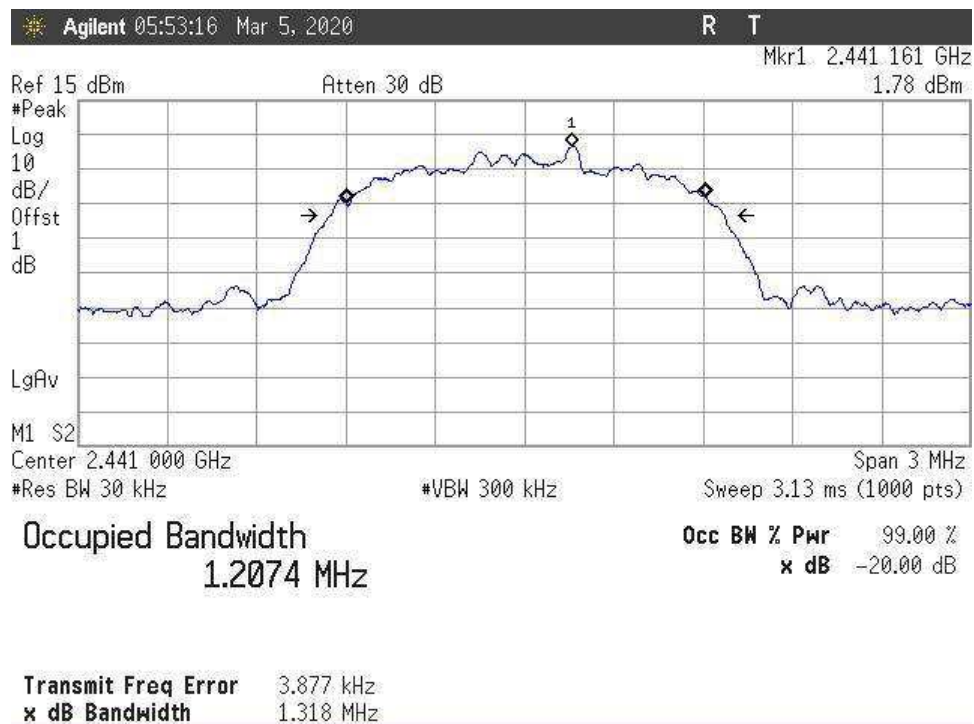
Verdict: PASS

• 8DPSK – Bandwidths

- Low Channel:



- Middle Channel:

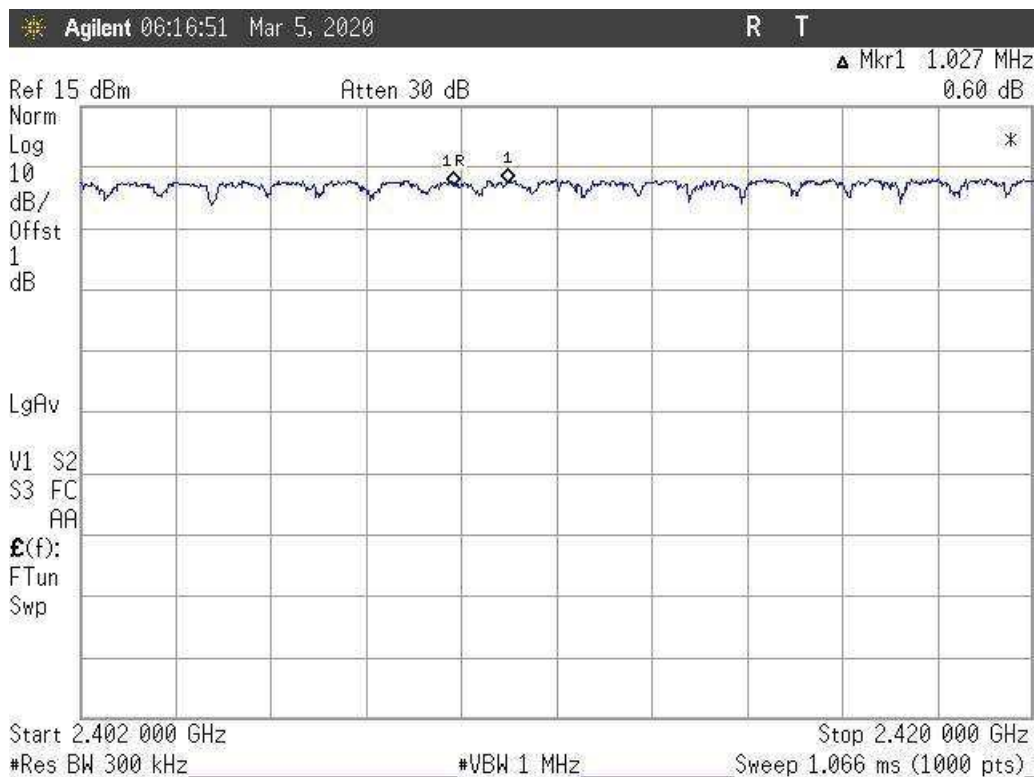


- High Channel:



Carrier frequency separation - 8DPSK

Carrier frequency separation: kHz



The hopping channel carrier frequencies are separated by a minimum two-thirds of the 20 dB bandwidth of the hopping channel.

Verdict: PASS

FCC 15.247 (a)(1)(iii) / RSS-247 5.1 (d) Number of hopping channels

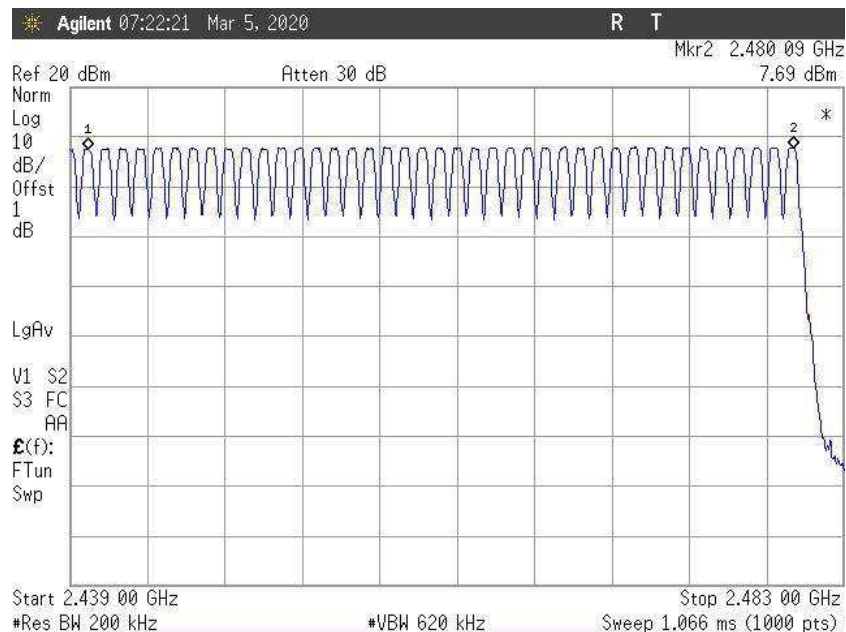
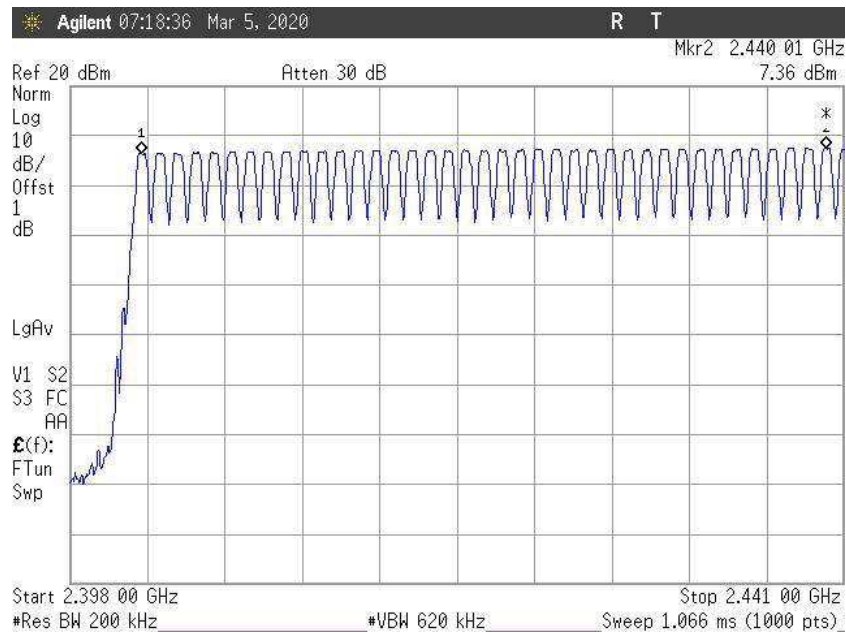
SPECIFICATION:

Frequency hopping system in the 2400-2483.5 MHz band shall use at least 15 channels.

RESULTS:

The number of hopping channels is 79 for all three modes.

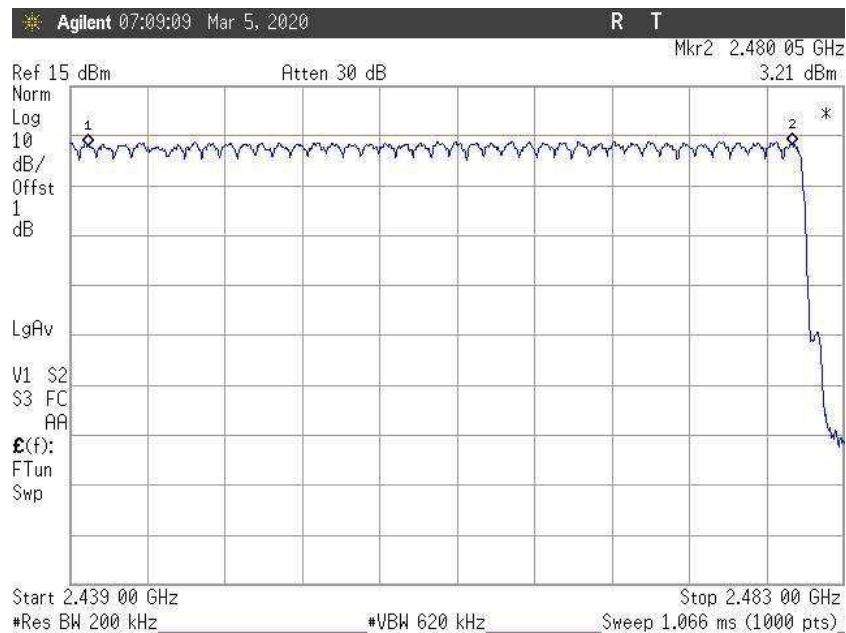
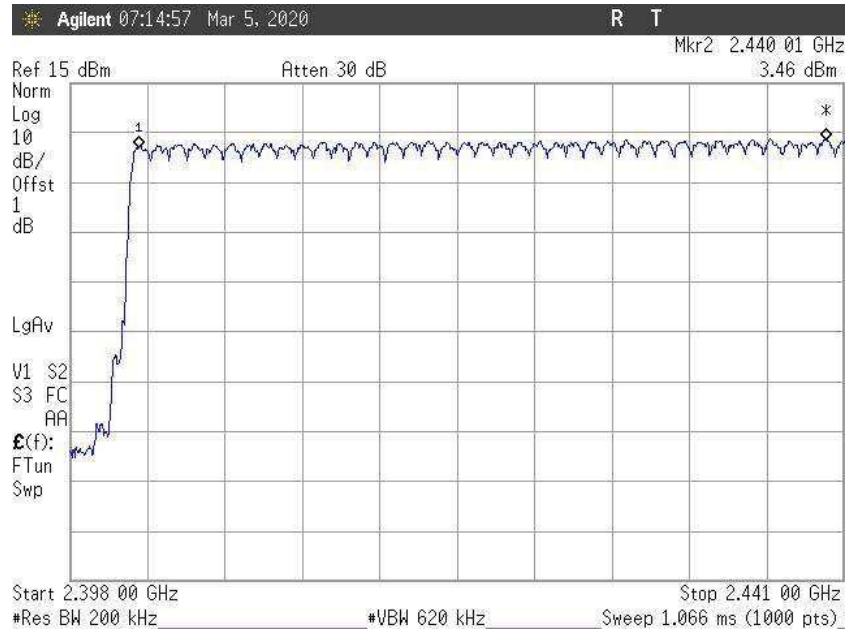
- GFSK – Number of hopping channels**



Total number of hopping channels: 79

Verdict: PASS

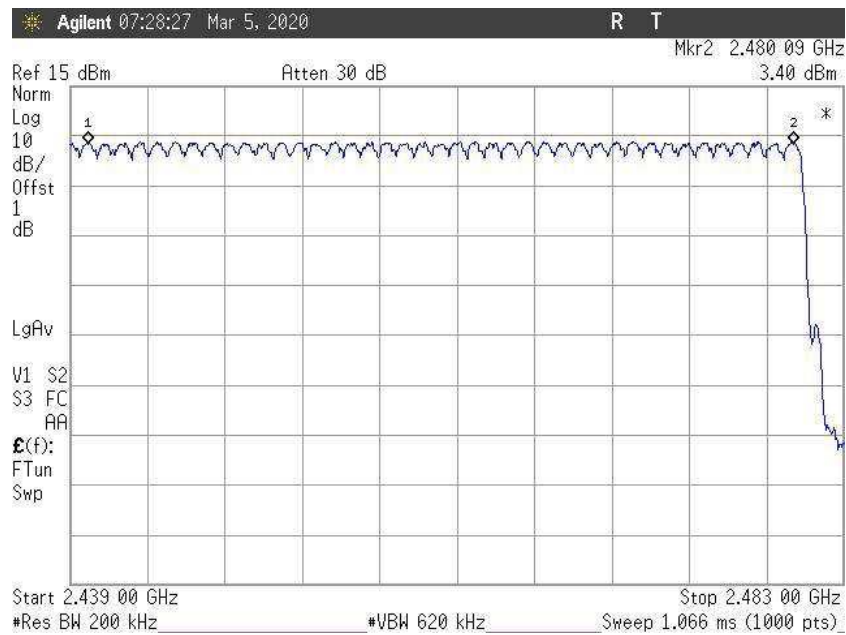
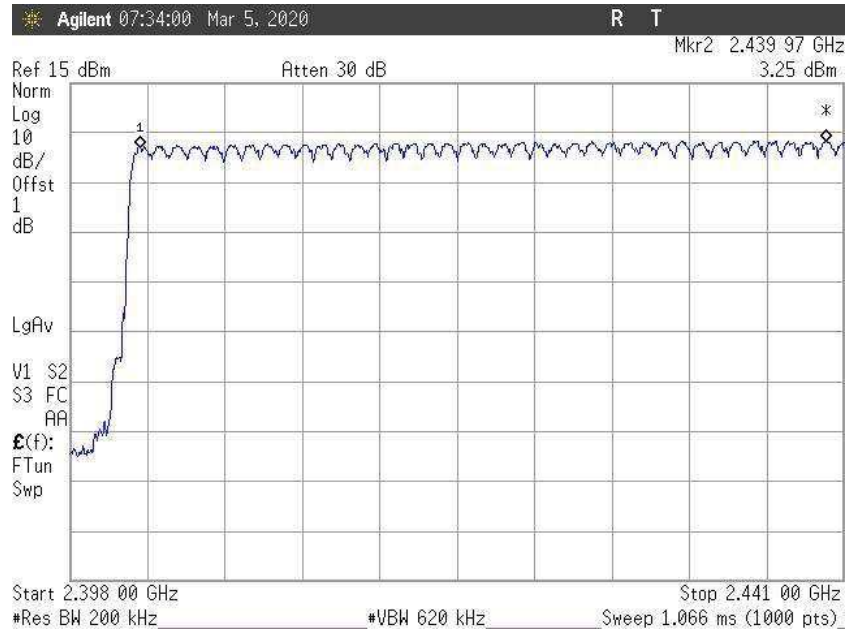
- **Pi/4 DQPSK – Number of hopping channels**



Total number of hopping channels: 79

Verdict: PASS

- 8DPSK – Number of hopping channels



Total number of hopping channels: 79

Verdict: PASS

FCC 15.247 (a)(1)(iii) / RSS-247 5.1 (d) Time of occupancy (Dwell Time)

SPECIFICATION:

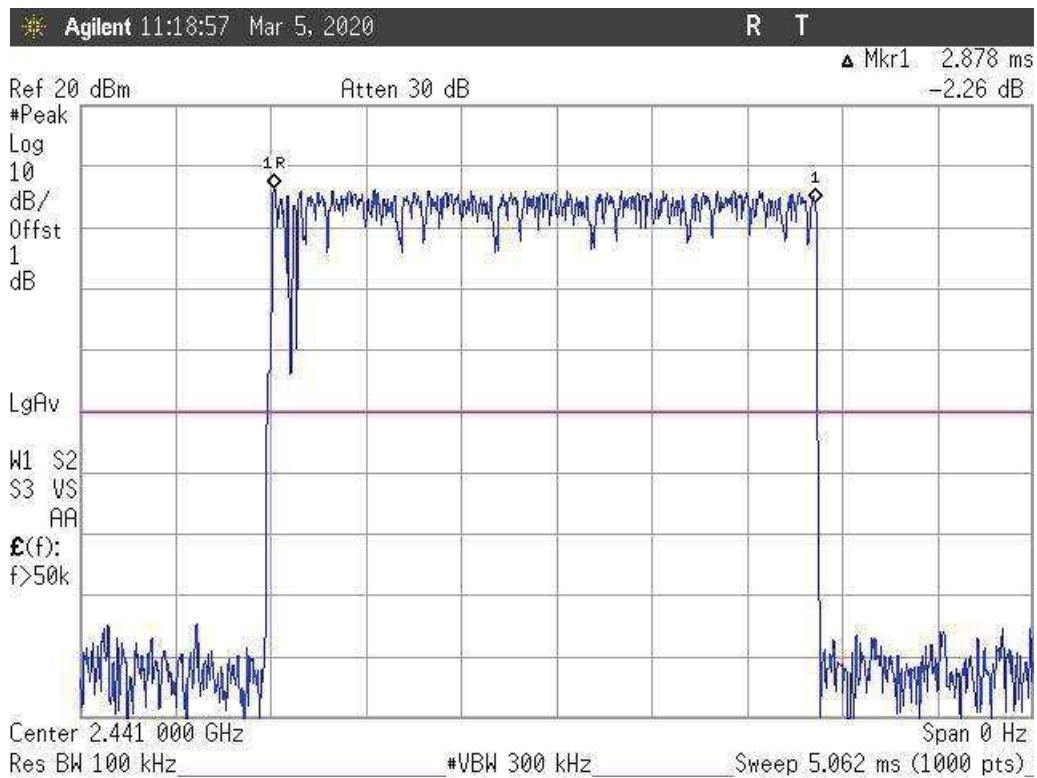
The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed = $0.4 \times 79 = 31.6$ seconds.

RESULTS:

• GFSK (packet type DH5) – Time of Occupancy (Dwell Time)

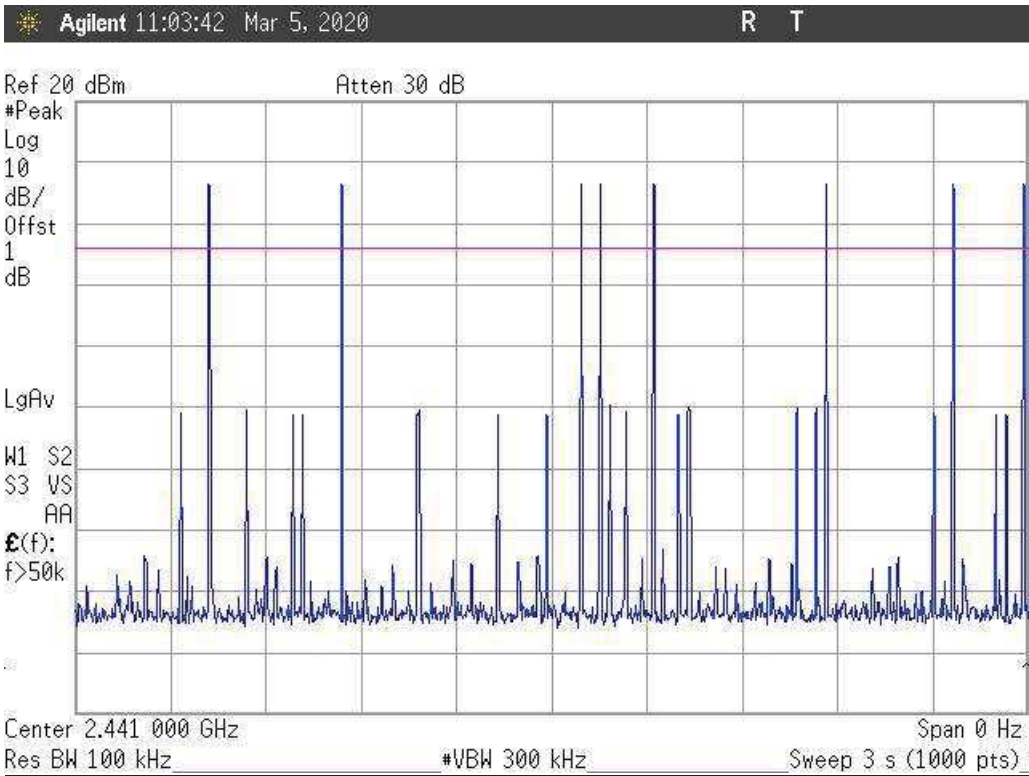
- Transmit Time per Hop:

2.878 ms



Time of Occupancy:

Nº of hops on spectrum analyzer	8
Nº of hops over the period	84.26666667
Average Time of Occupancy	242.5194667 ms



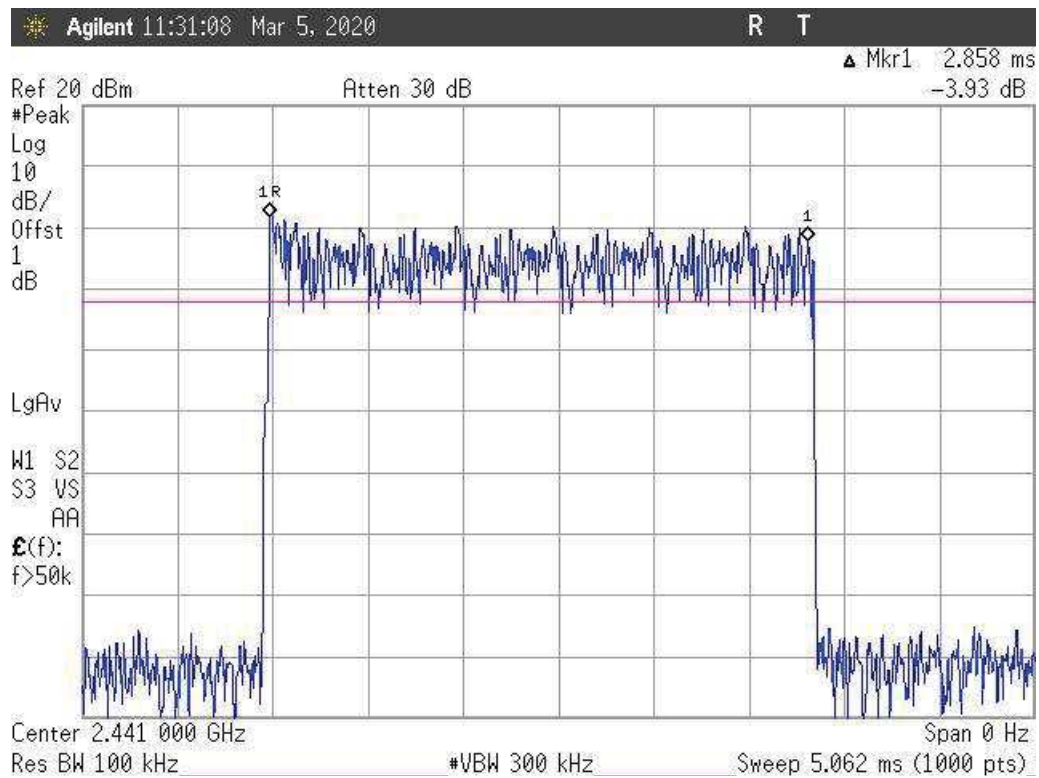
Measurement uncertainty (ms)	<±0.546
------------------------------	---------

Verdict: PASS

• **Pi/4 DQPSK (packet type 2DH5) – Time of Occupancy (Dwell Time)**

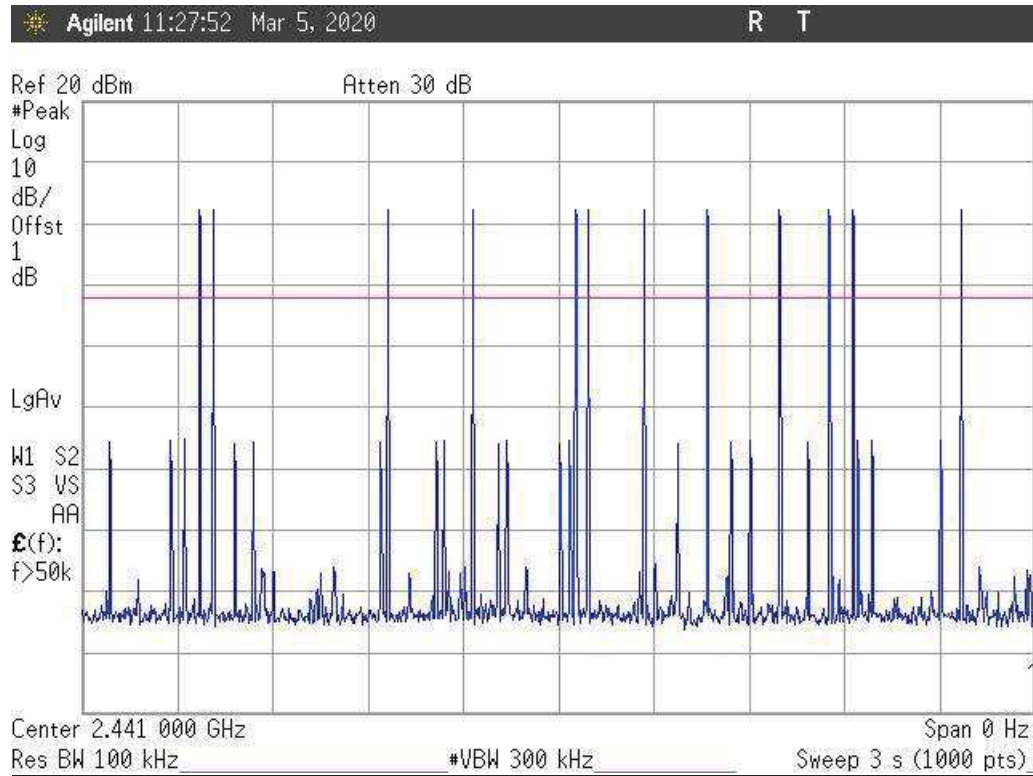
- Transmit Time per Hop:

2.858 ms



Time of Occupancy:

Nº of hops on spectrum analyzer	12	
Nº of hops over the period	126.4	
Average Time of Occupancy	361.2512	ms



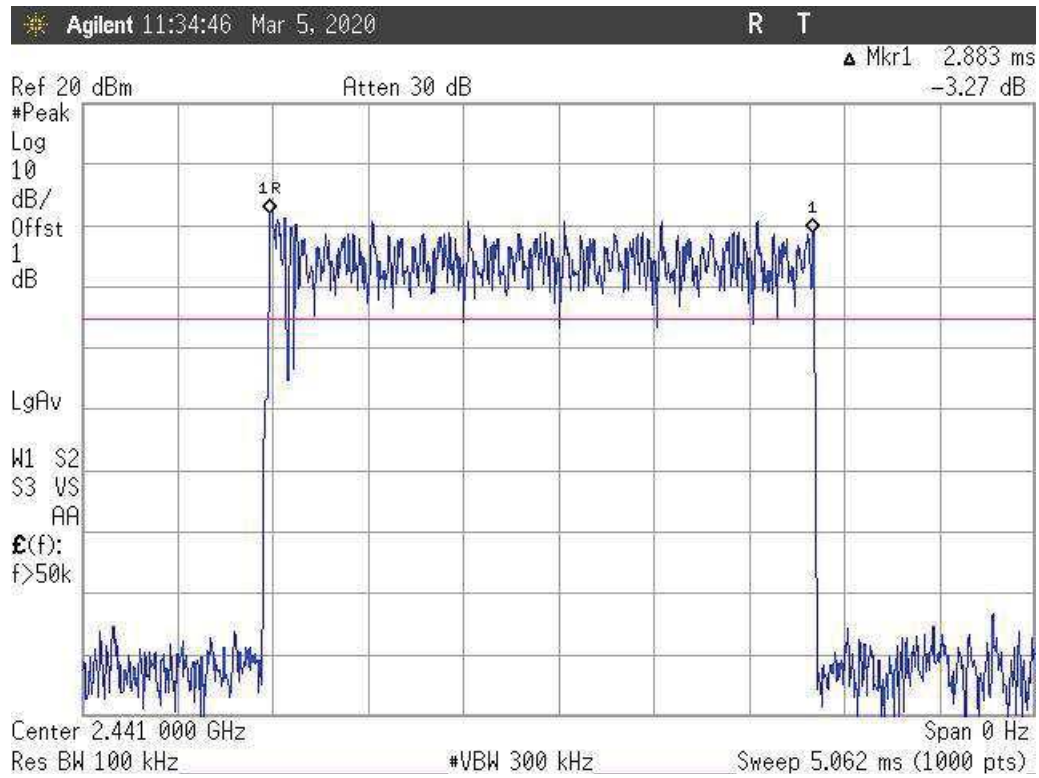
Measurement uncertainty (ms)	<±0.546
------------------------------	---------

Verdict: PASS

• **8DPSK (packet type 3DH5) – Time of Occupancy (Dwell Time)**

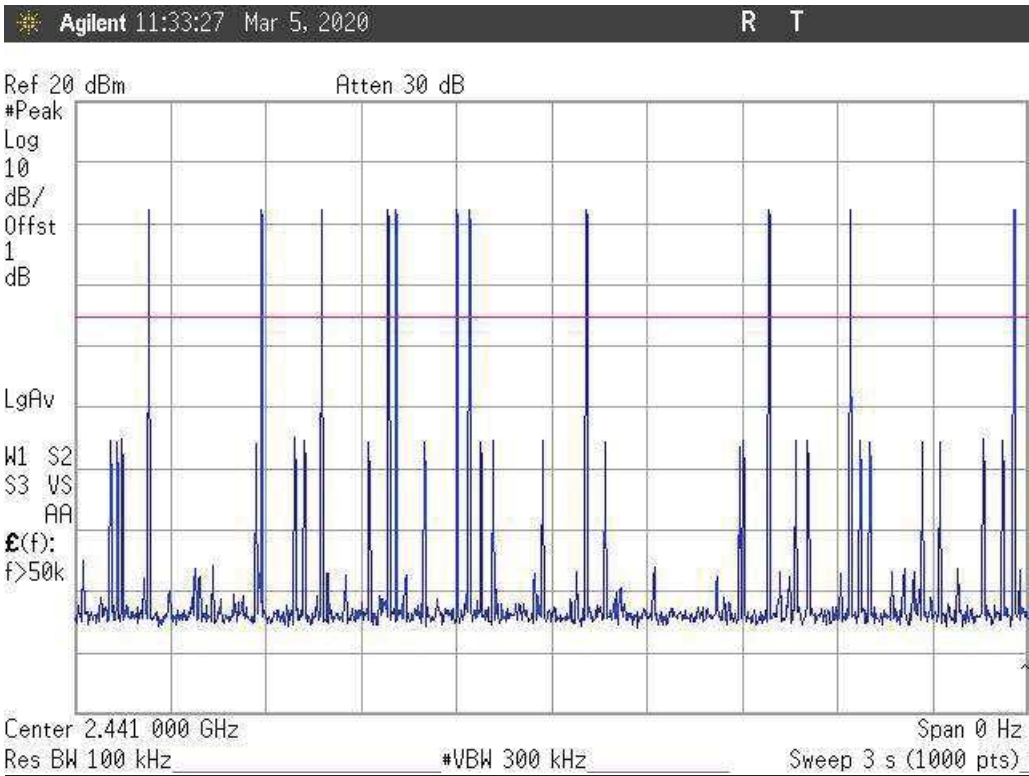
- Transmit Time per Hop:

2.883 ms



Time of Occupancy:

Nº of hops on spectrum analyzer	11
Nº of hops over the period	115.8666667
Average Time of Occupancy	334.0436 ms



Measurement uncertainty (ms)	<±0.546
------------------------------	---------

Verdict: PASS

FCC 15.247 (b) / RSS-247 5.4 (b) Maximum peak output power and antenna gain

SPECIFICATION:

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels: 1 watt (30 dBm). The e.i.r.p. shall not exceed 4 W (RSS-247).

RESULTS:

The EIRP power (dBm) is calculated by adding the maximum declared antenna gain to the measured conducted power.

Maximum Declared Antenna Gain: +1.8 dBi

The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

- **GFSK (1 Mbps)**

Peak Conducted Output Power	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
Maximum Conducted Power (dBm)	6.2	7.74	7.81
Maximum EIRP Power (dBm)	8	9.54	9.61
Measurement uncertainty (dB)	<±2.92		

- **Pi/4 DQPSK (2 Mbps)**

Peak Conducted Output Power	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
Maximum Conducted Power (dBm)	4.12	5.27	5.15
Maximum EIRP Power (dBm)	5.92	7.07	6.95
Measurement uncertainty (dB)	<±2.92		

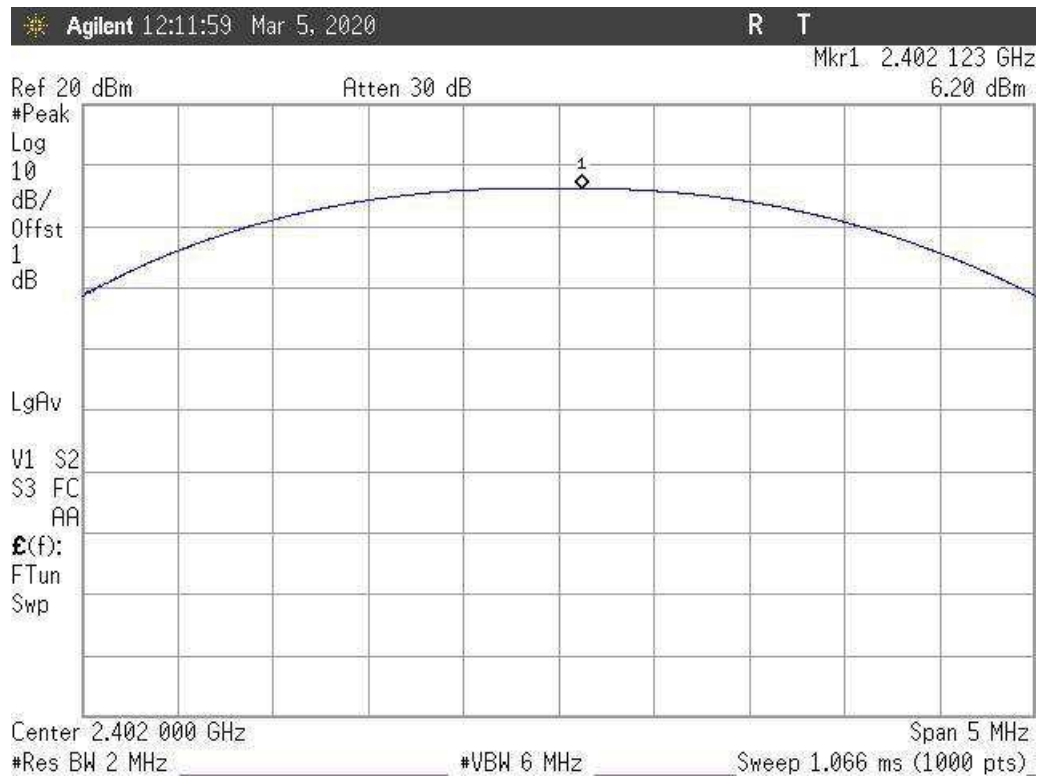
- **8DPSK (3 Mbps)**

Peak Conducted Output Power	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
Maximum Conducted Power (dBm)	4.89	5.89	6.04
Maximum EIRP Power (dBm)	6.69	7.69	7.84
Measurement uncertainty (dB)	<±2.92		

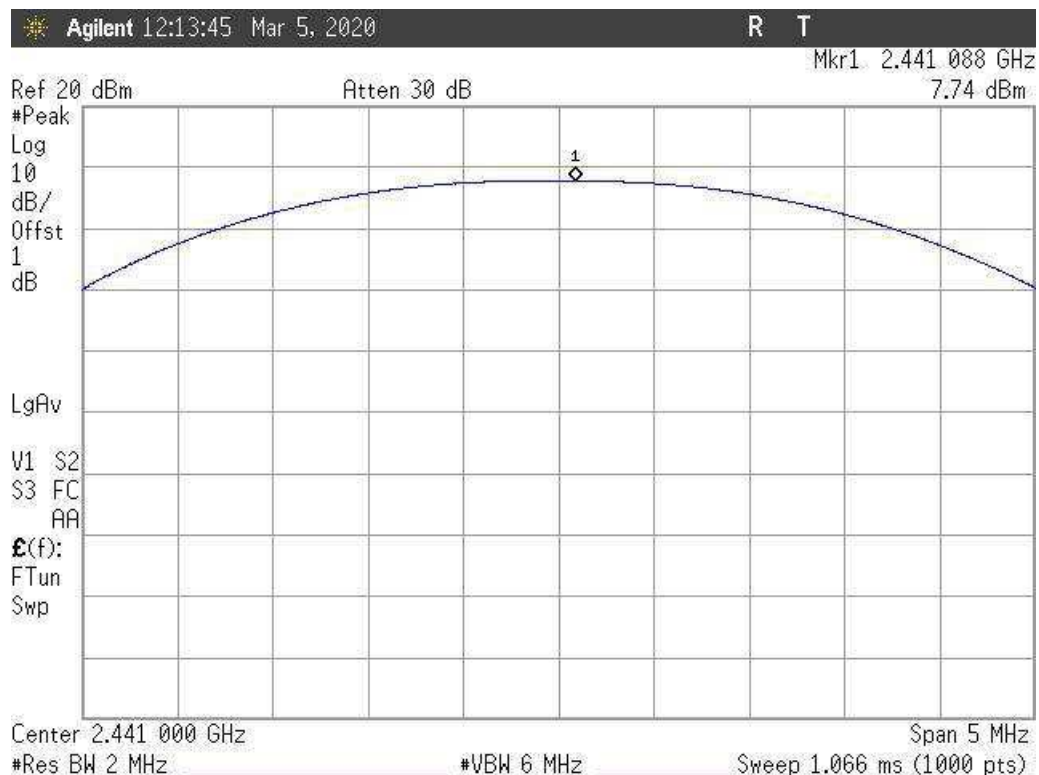
Verdict: PASS

- **GFSK – Peak Output Power**

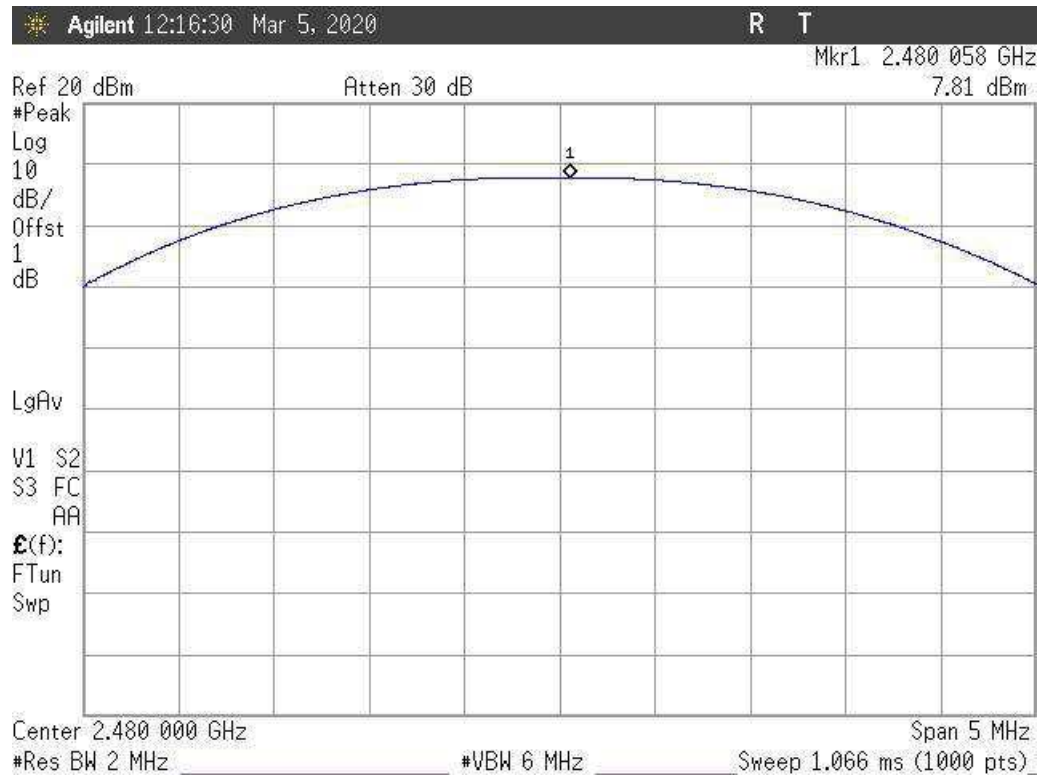
- Low Channel:



- Middle Channel:

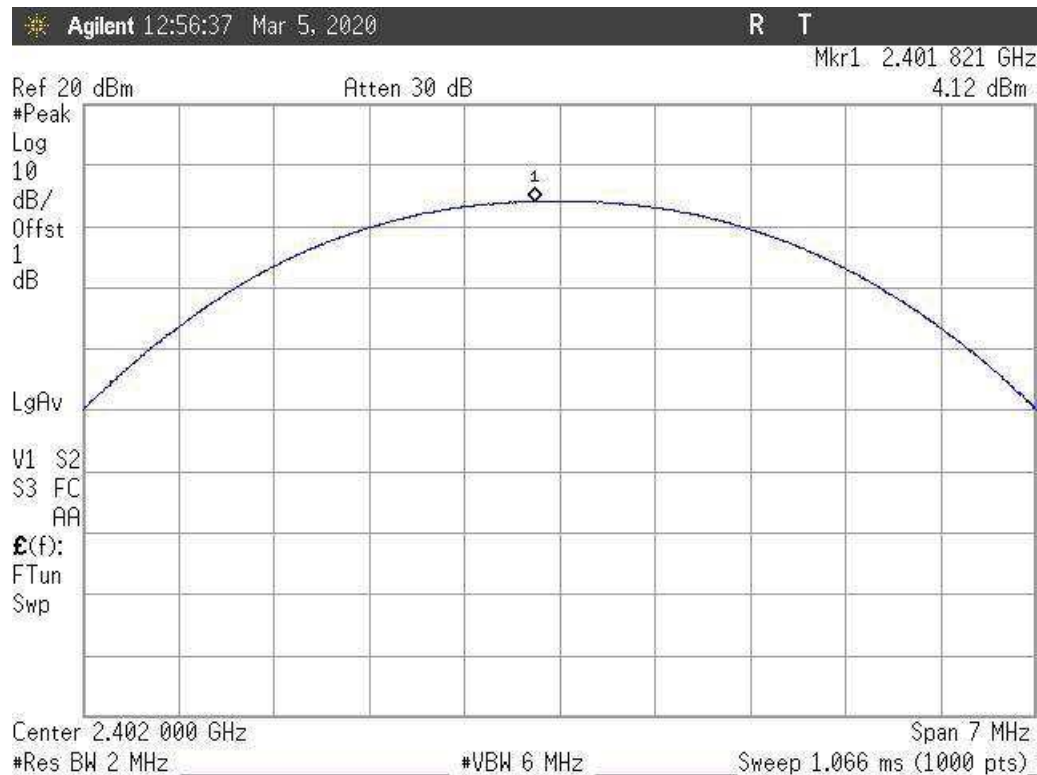


- High Channel:

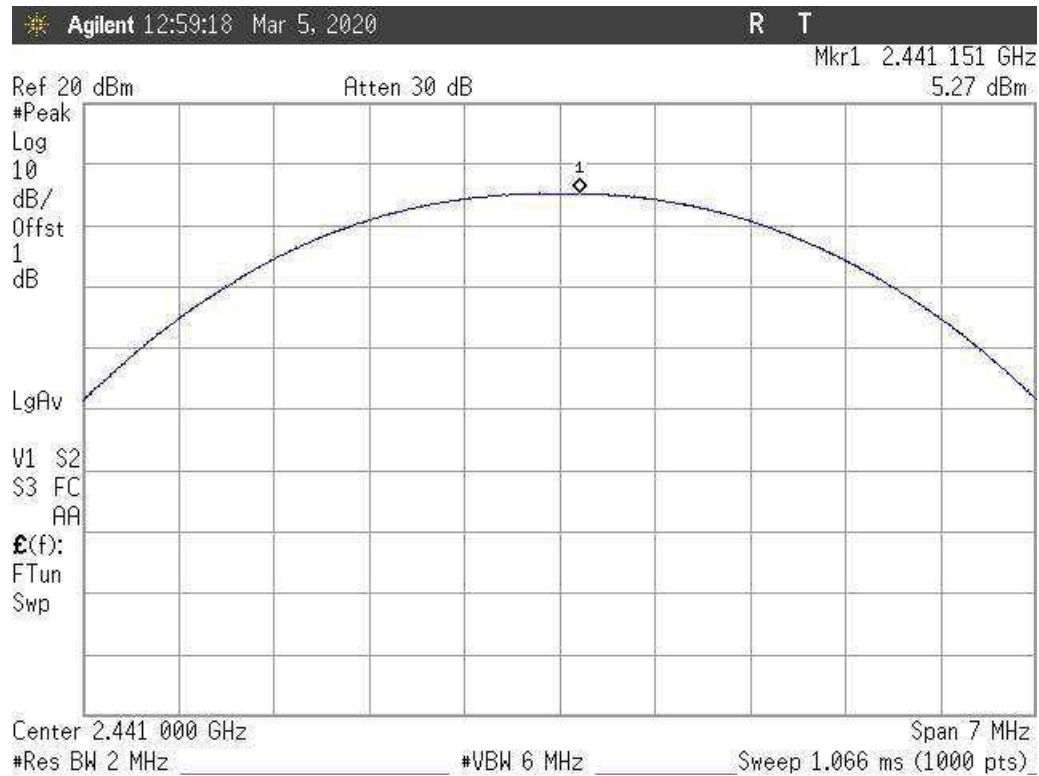


• Pi/4 DQPSK – Peak Output Power

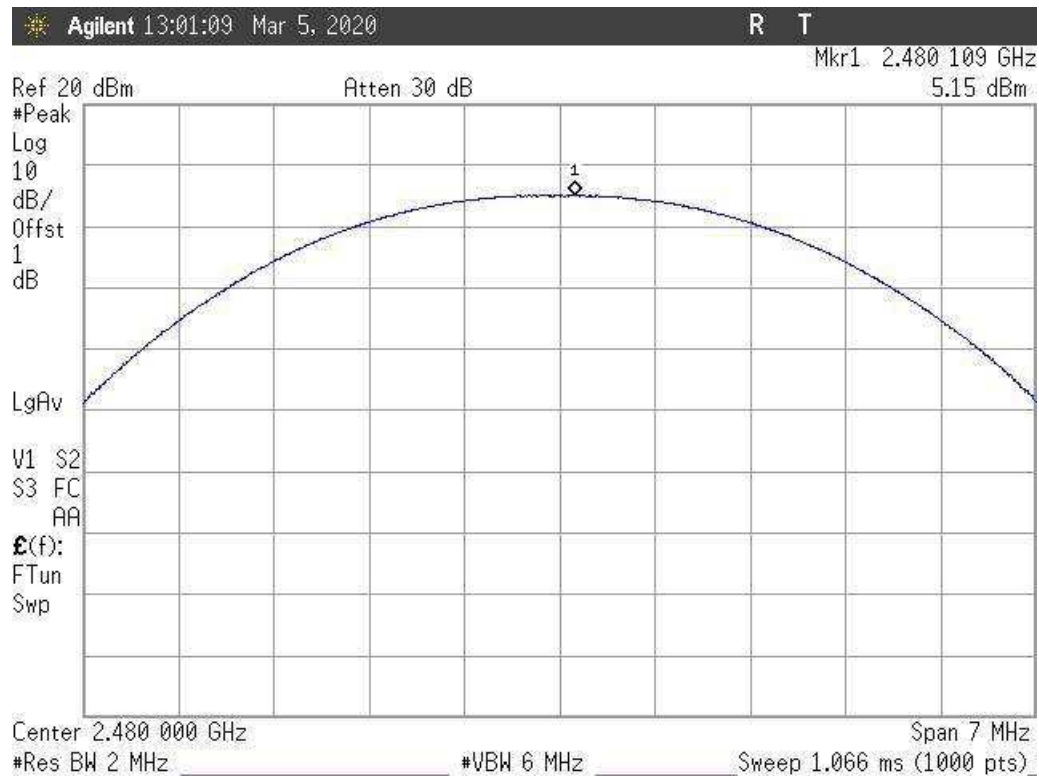
- Low Channel:



- Middle Channel:

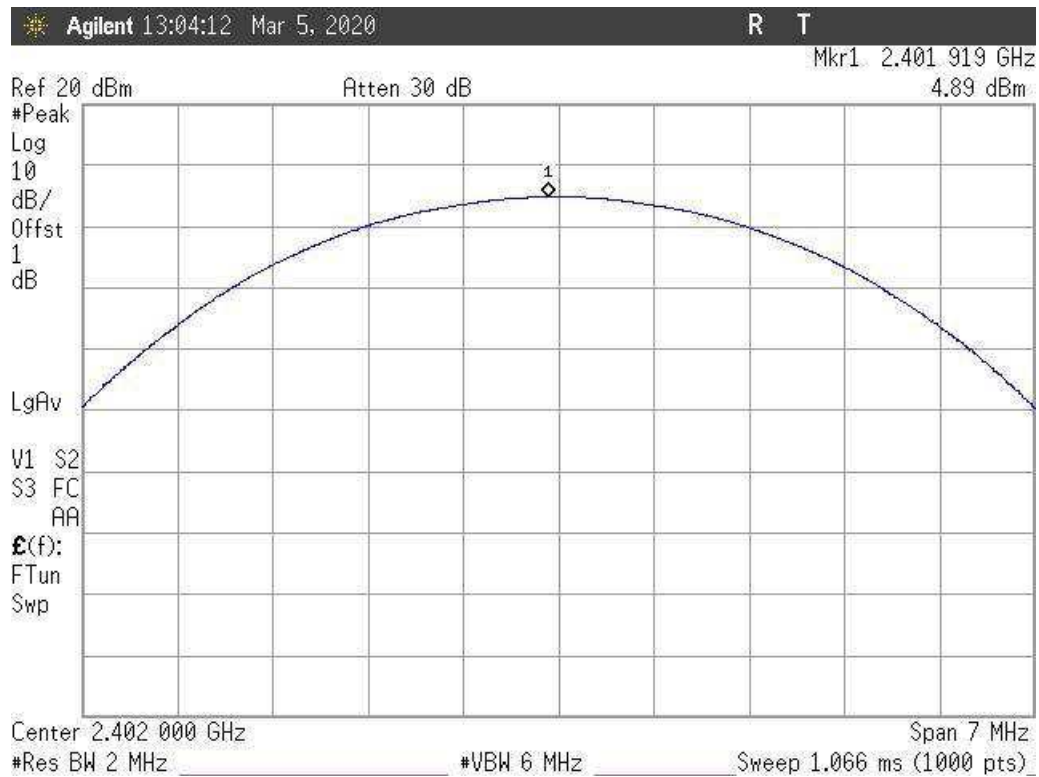


- High Channel:

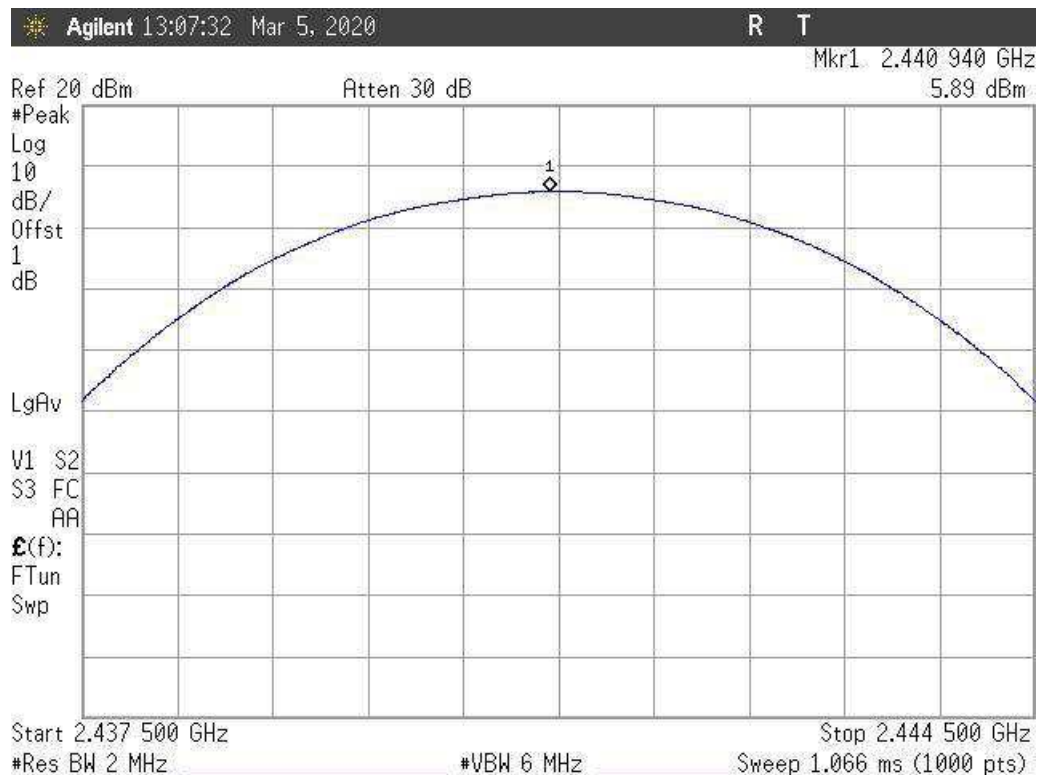


• 8DPSK – Peak Output Power

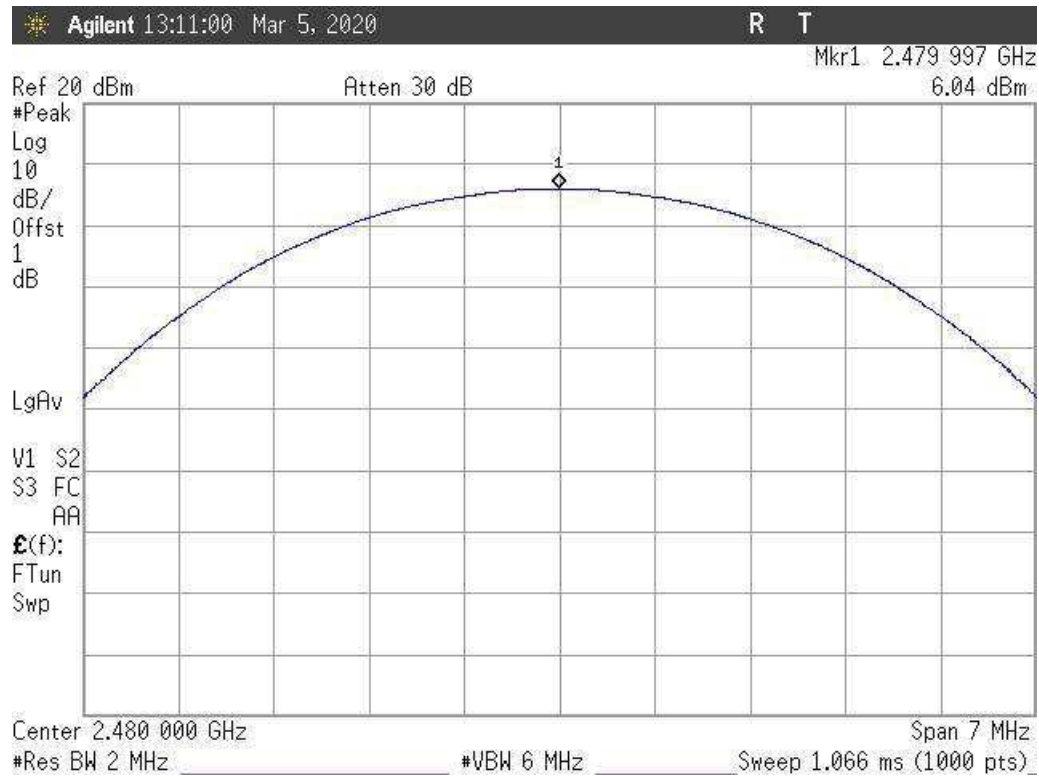
- Low Channel:



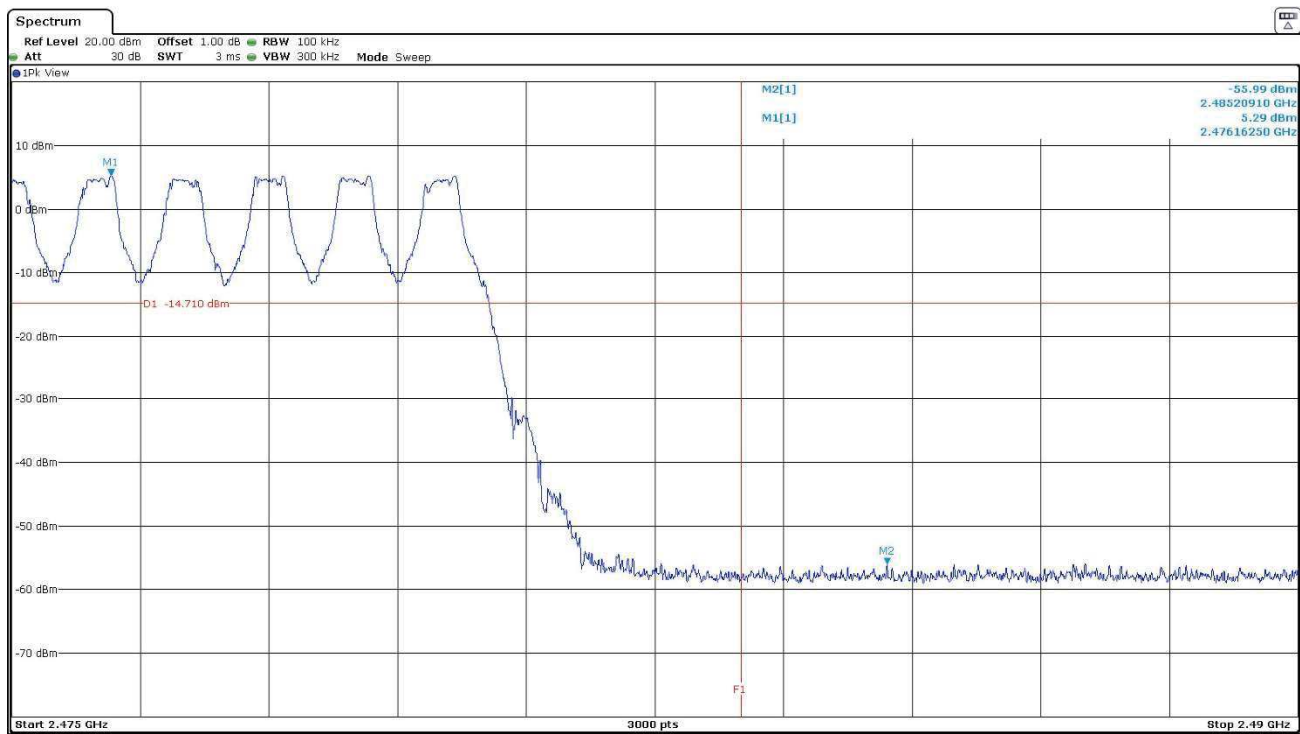
- Middle Channel:



- High Channel:



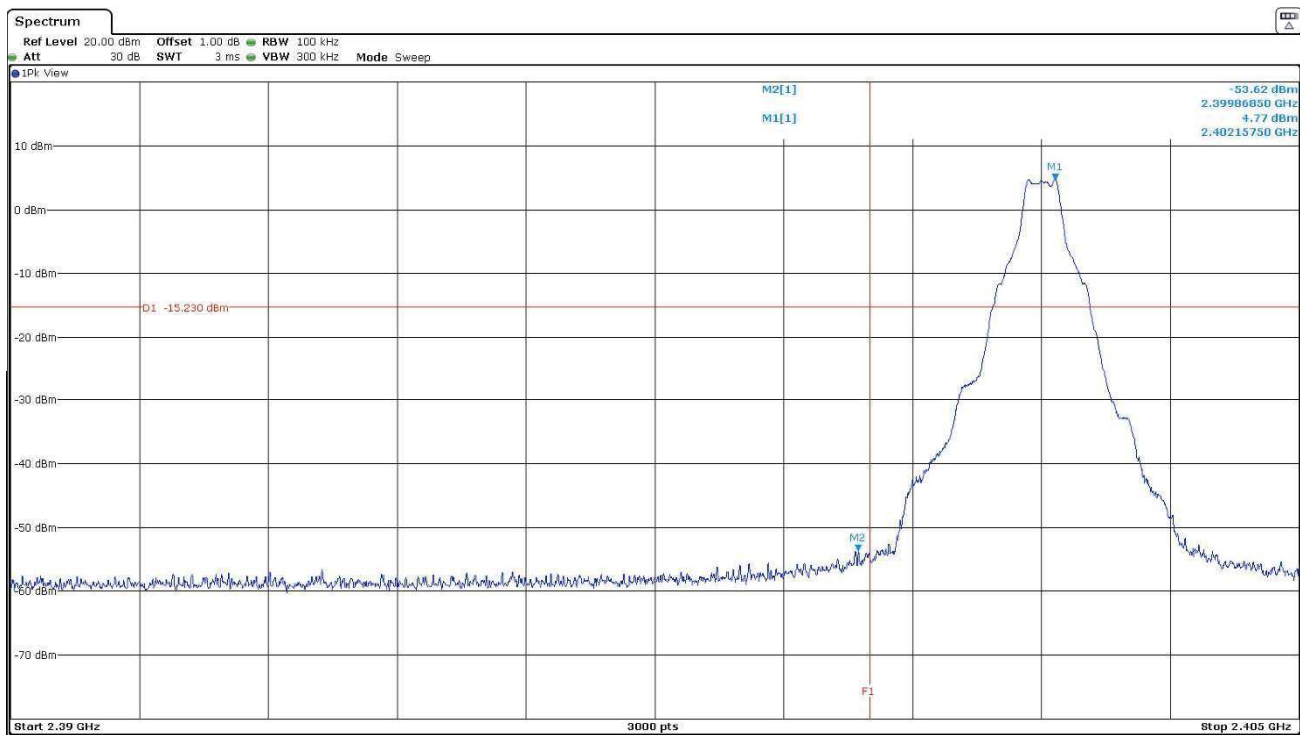
High Frequency Section 2480 MHz:



Verdict: PASS

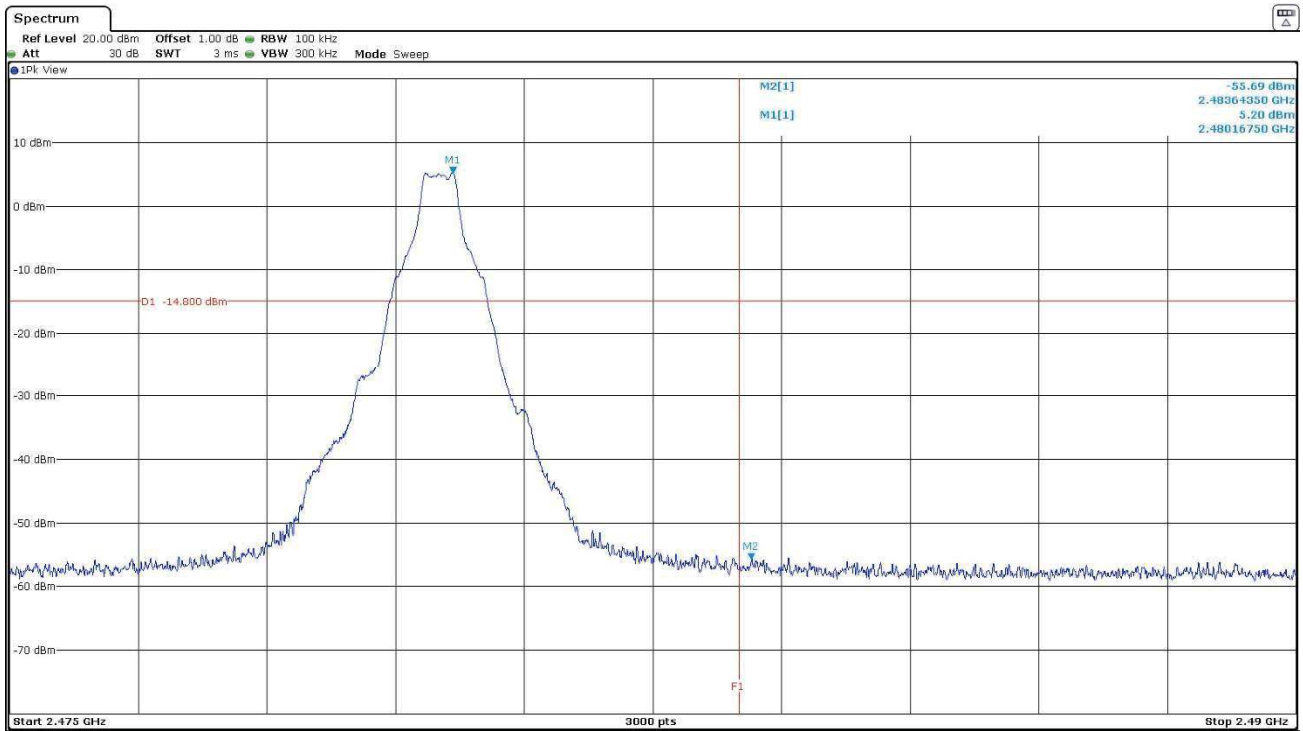
HOPPING OFF:

Low Frequency Section 2402 MHz:



Verdict: PASS

▪ High Frequency Section 2480 MHz:

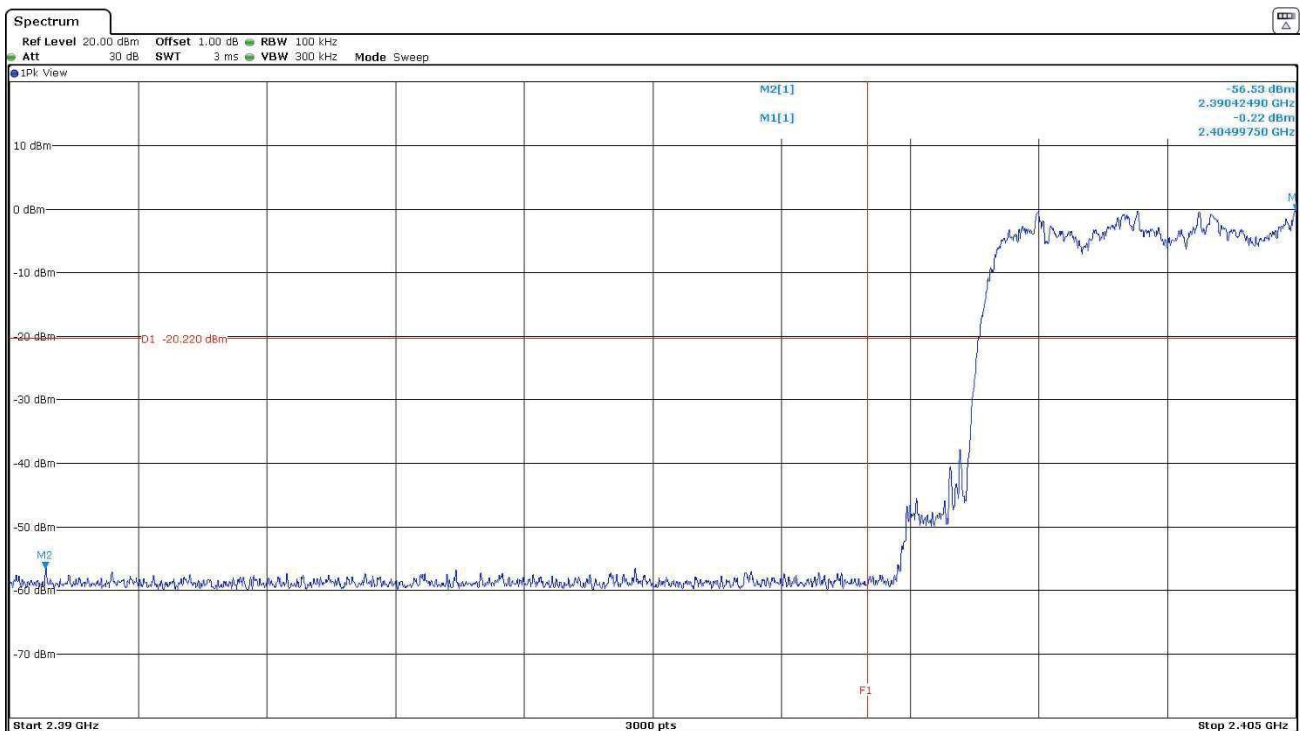


Verdict: PASS

• Pi/4 DQPSK – Band-edge emissions compliance

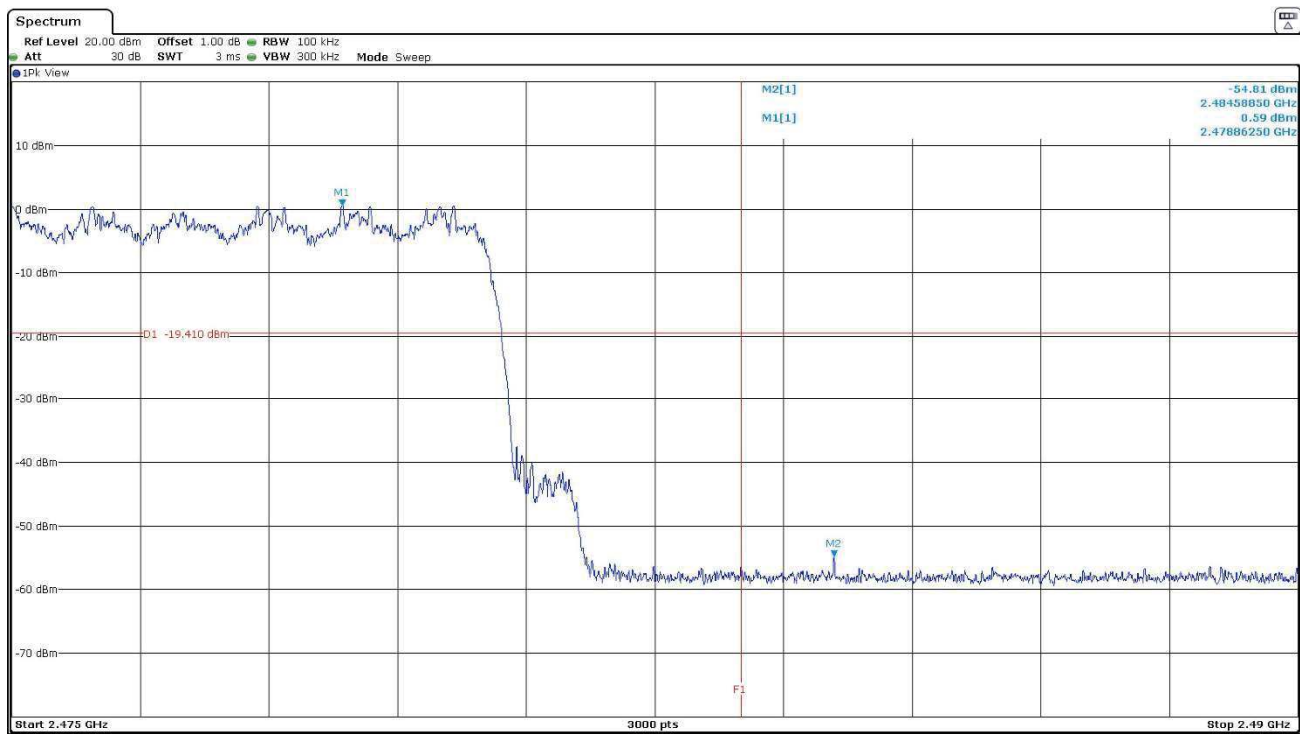
❖ HOPPING ON:

▪ Low Frequency Section 2402 MHz:



Verdict: PASS

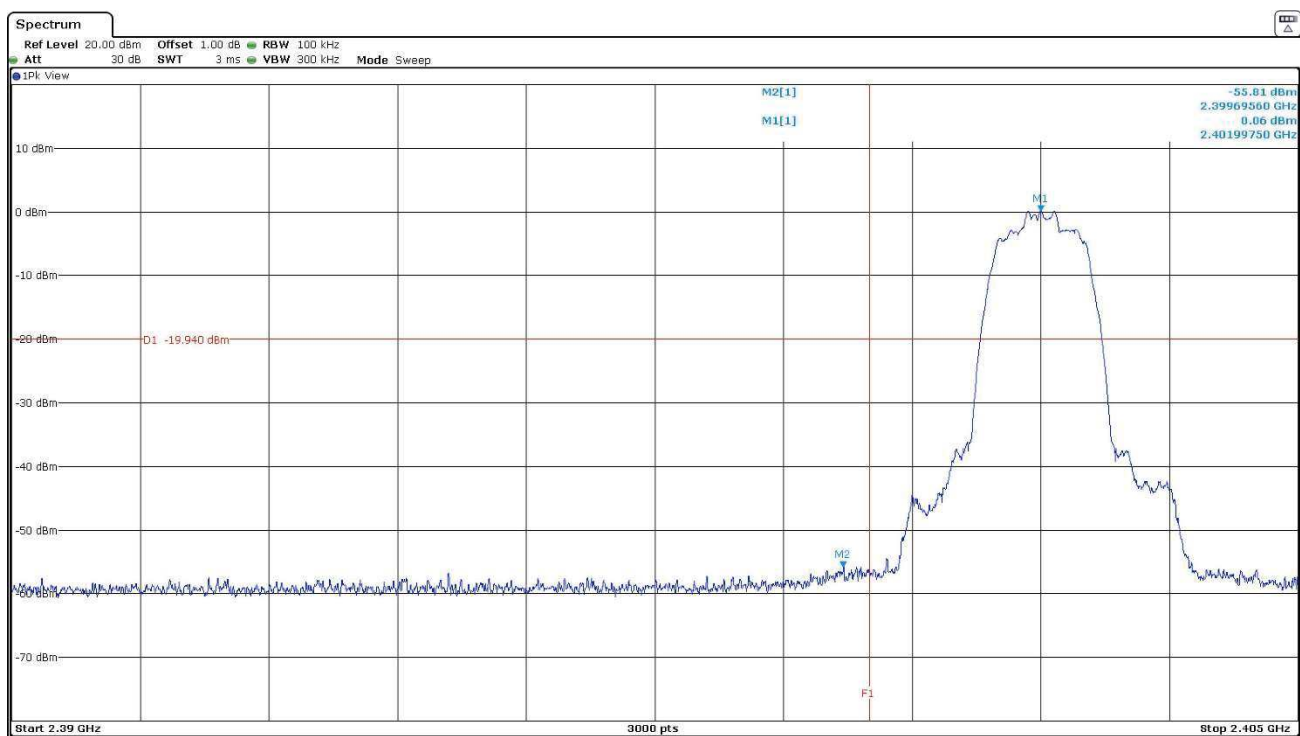
High Frequency Section 2480 MHz:



Verdict: PASS

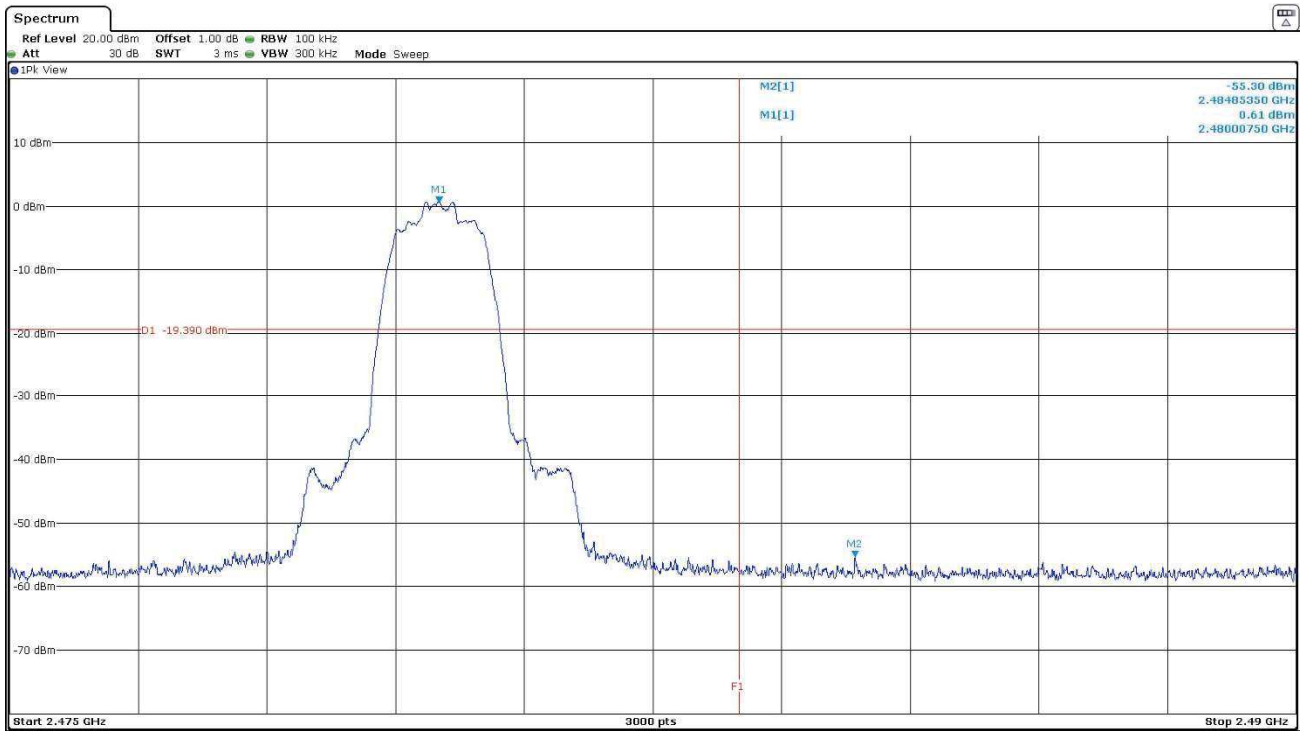
HOPPING OFF:

Low Frequency Section 2402 MHz:



Verdict: PASS

▪ High Frequency Section 2480 MHz:

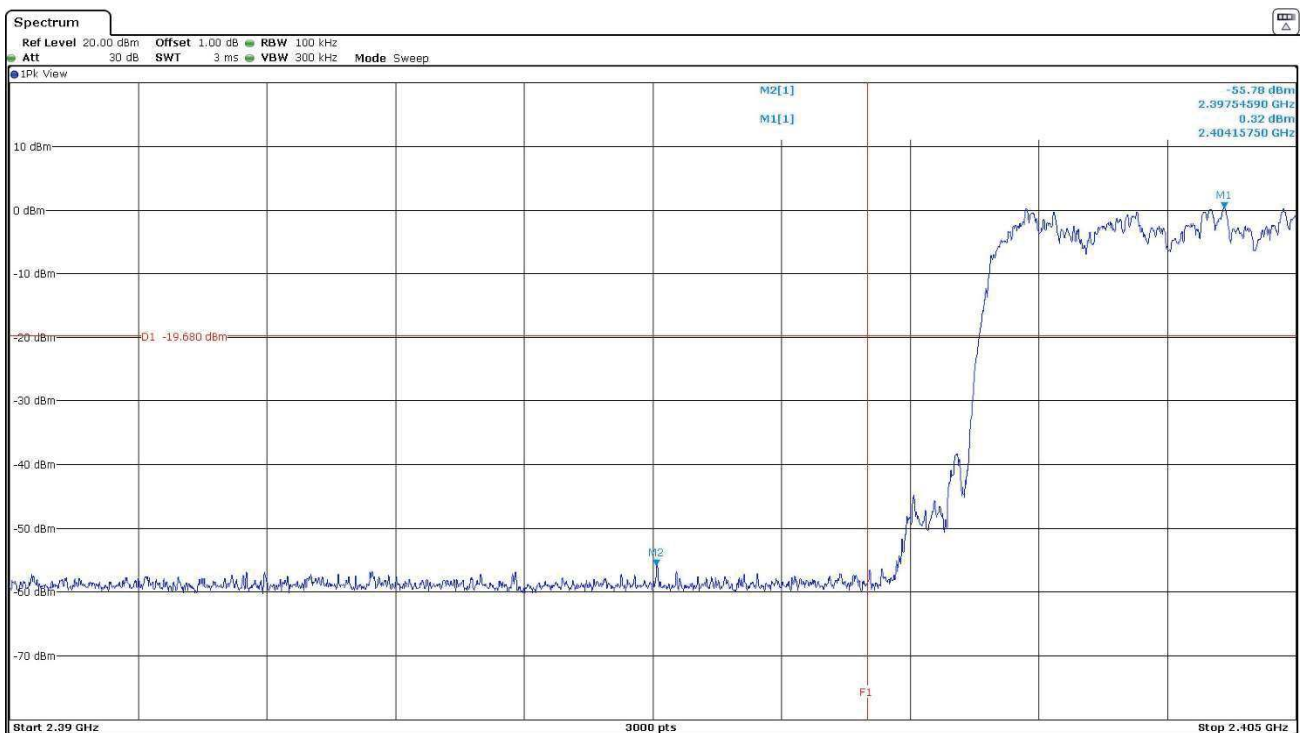


Verdict: PASS

• 8DPSK – Band-edge emissions compliance

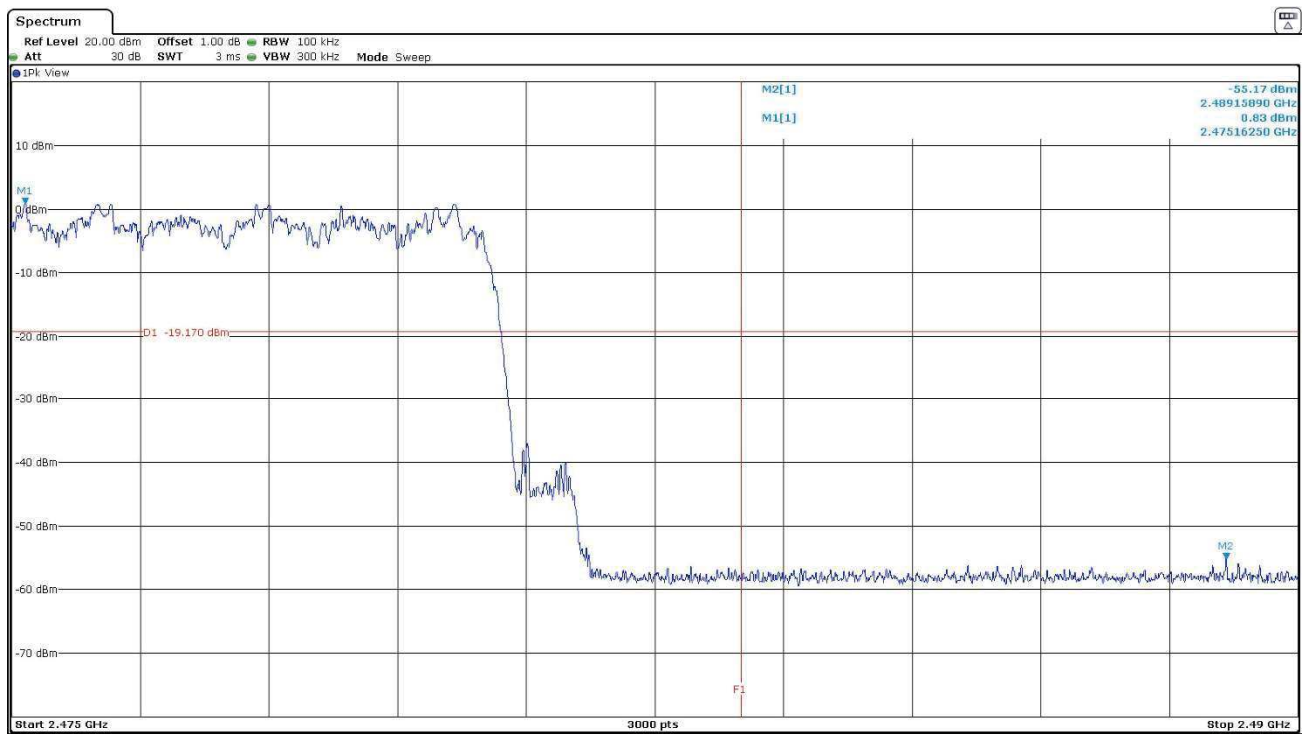
❖ HOPPING ON:

▪ Low Frequency Section 2402 MHz:



Verdict: PASS

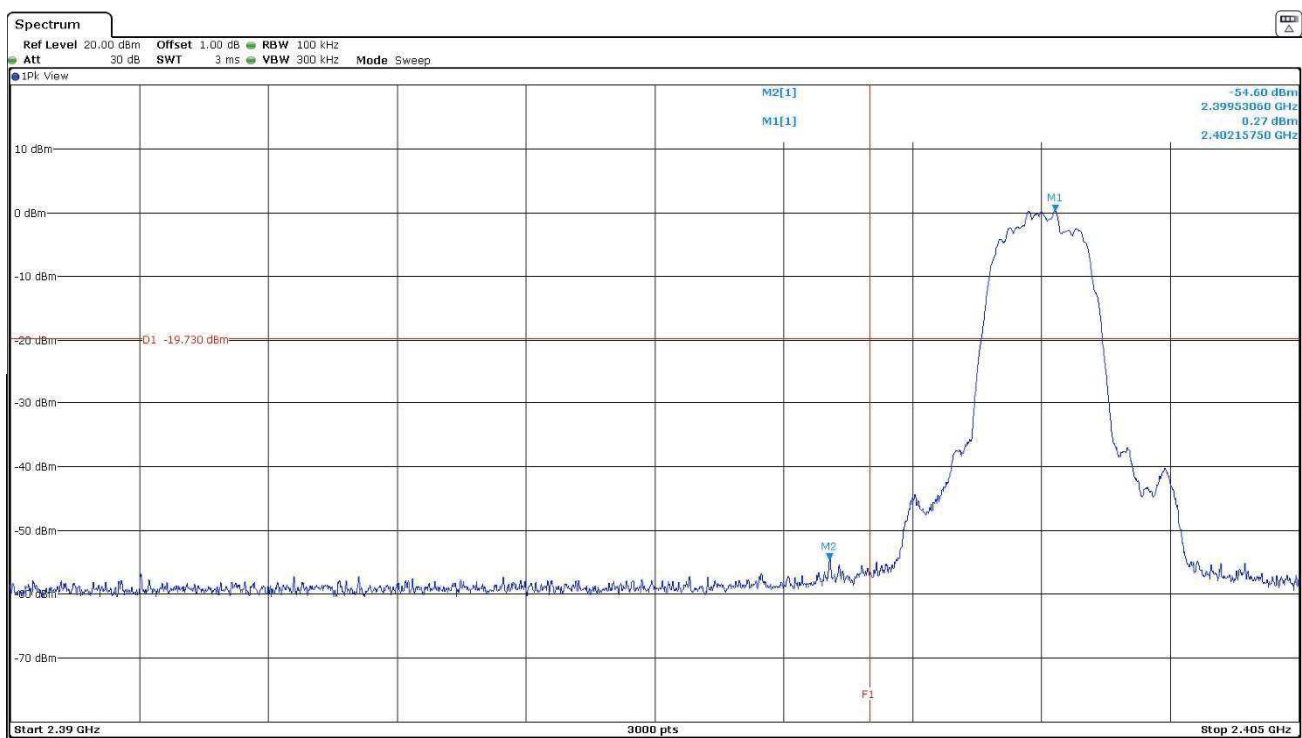
High Frequency Section 2480 MHz:



Verdict: PASS

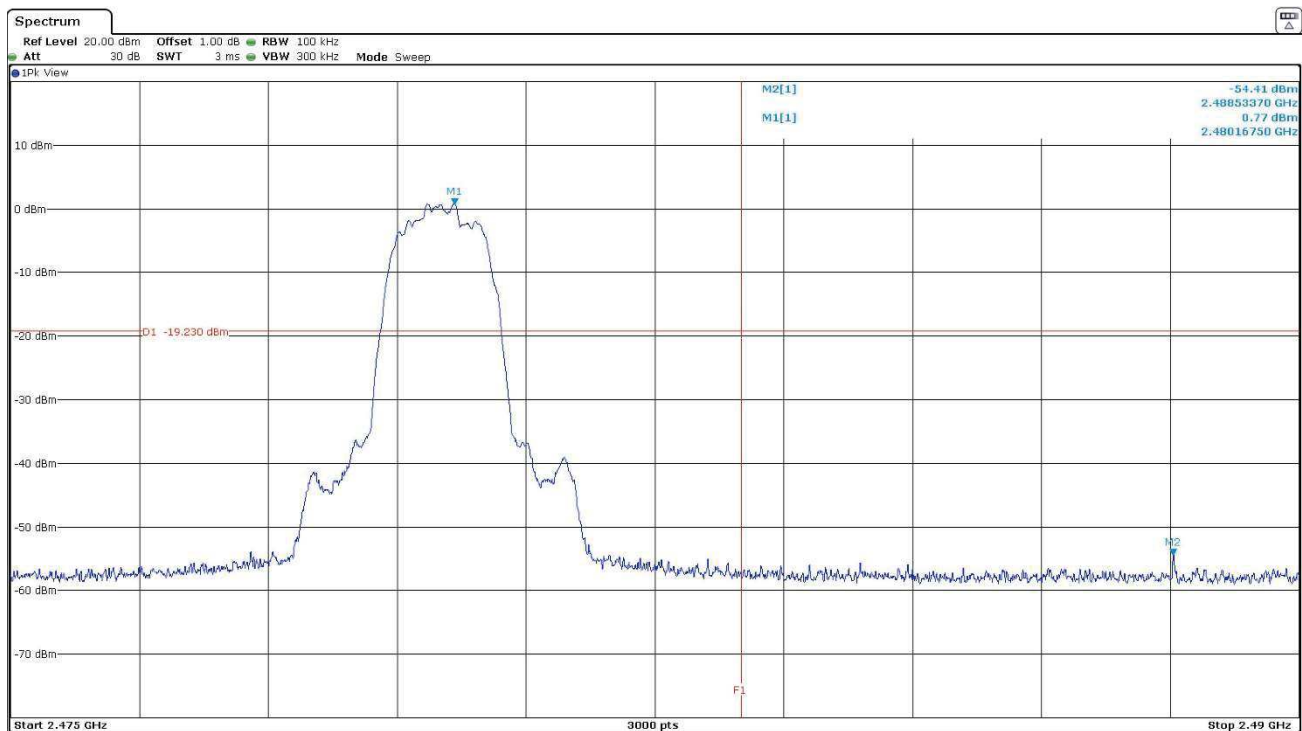
HOPPING OFF:

Low Frequency Section 2402 MHz:



Verdict: PASS

High Frequency Section 2480 MHz:



Verdict: PASS

FCC 15.247 (d) / RSS-247 5.5. Emission limitations radiated. (Transmitter)

SPECIFICATION:

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) (see §15.205(c)/RSS-Gen):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	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 corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-17 GHz and at distance of 1m for the frequency range 17 GHz-25 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Frequency range 30 MHz - 1 GHz:

The spurious frequencies detected below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

Spurious frequencies operating detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBμV/m)	Limit (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
500.01	37.52	46	H	Quasi-peak	<± 5.08
576.98	25.13	46	V	Quasi-peak	<± 5.08
625.05	19.34	46	V	Quasi-peak	<± 5.08
781.17	19.97	46	H	Quasi-peak	<± 5.08
875.02	29.55	46	H	Quasi-peak	<± 5.08

Frequency range 1 - 26 GHz:

The results in the next tables show the maximum measured levels in the 1-26 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Spurious frequencies with peak levels above the average limit (54 dBμV/m at 3 m) are measured with average detector for checking compliance with the average limit.

• GFSK modulation (DH5)

- LOW CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.69	36.33	V	Peak	<±5.13

- MIDDLE CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.6455	40.21	H	Peak	<±5.13

- HIGH CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.4835	54.11	V	Peak	<±4.11
	43.15		Average	<±4.11
5.6455	42.71	H	Peak	<±5.13

Verdict: PASS

- **PI/4-DQPSK modulation (2-DH5)**

- LOW CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.6455	41.15	H	Peak	<±5.13

- MIDDLE CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.6455	43.32	V	Peak	<±5.13

- HIGH CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.4835	54.33	H	Peak	<±4.11
	43.1		Average	<±4.11
5.6455	42.96	V	Peak	<±5.13

Verdict: PASS

• **8-DPSK modulation (3DH5)**

- LOW CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.6455	46.26	V	Peak	<±5.13

- MIDDLE CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.646	47.82	V	Peak	<±5.13

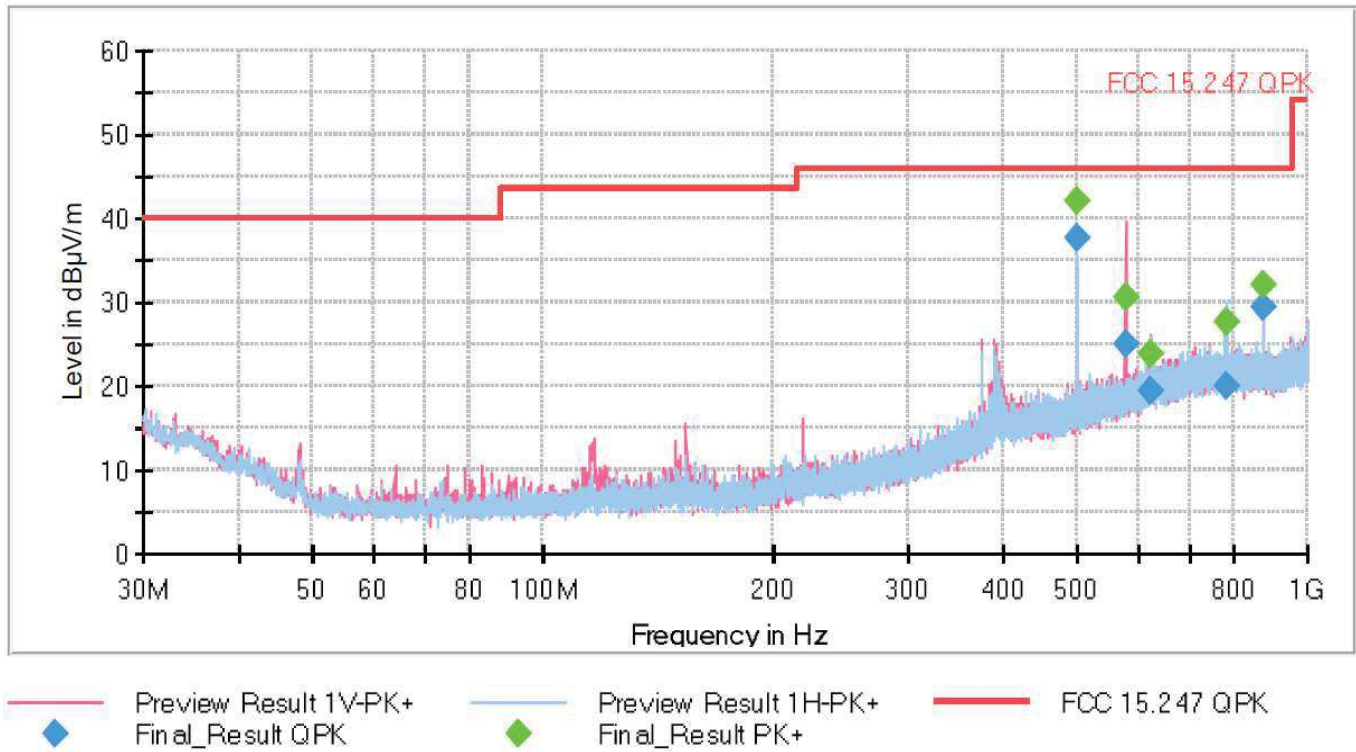
- HIGH CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBμV/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.484	55.15	H	Peak	<±4.11
	43.22		Average	<±4.11
16.048	43.36	V	Peak	<±5.13
5.645	41.22	H	Peak	<±5.13

Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz:

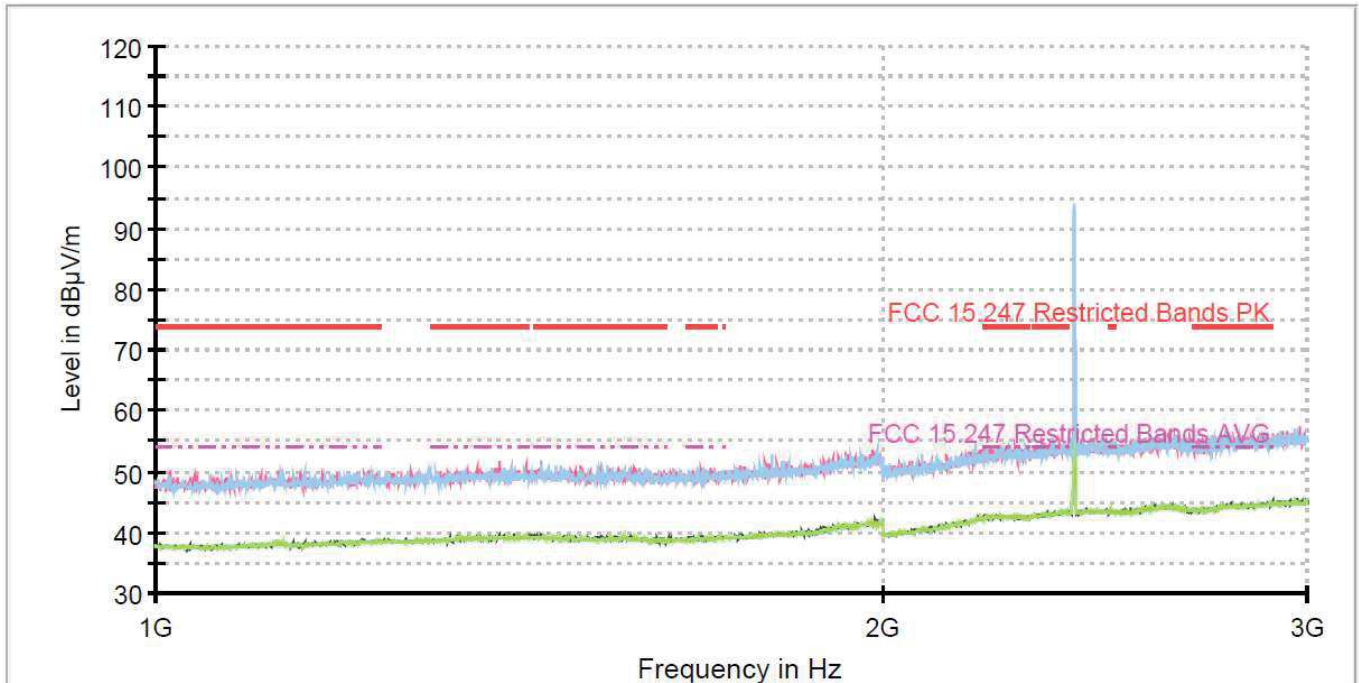
This plot is valid for the Low, Middle and High Channels and all the modulation modes.



FREQUENCY RANGE 1 - 3 GHz:

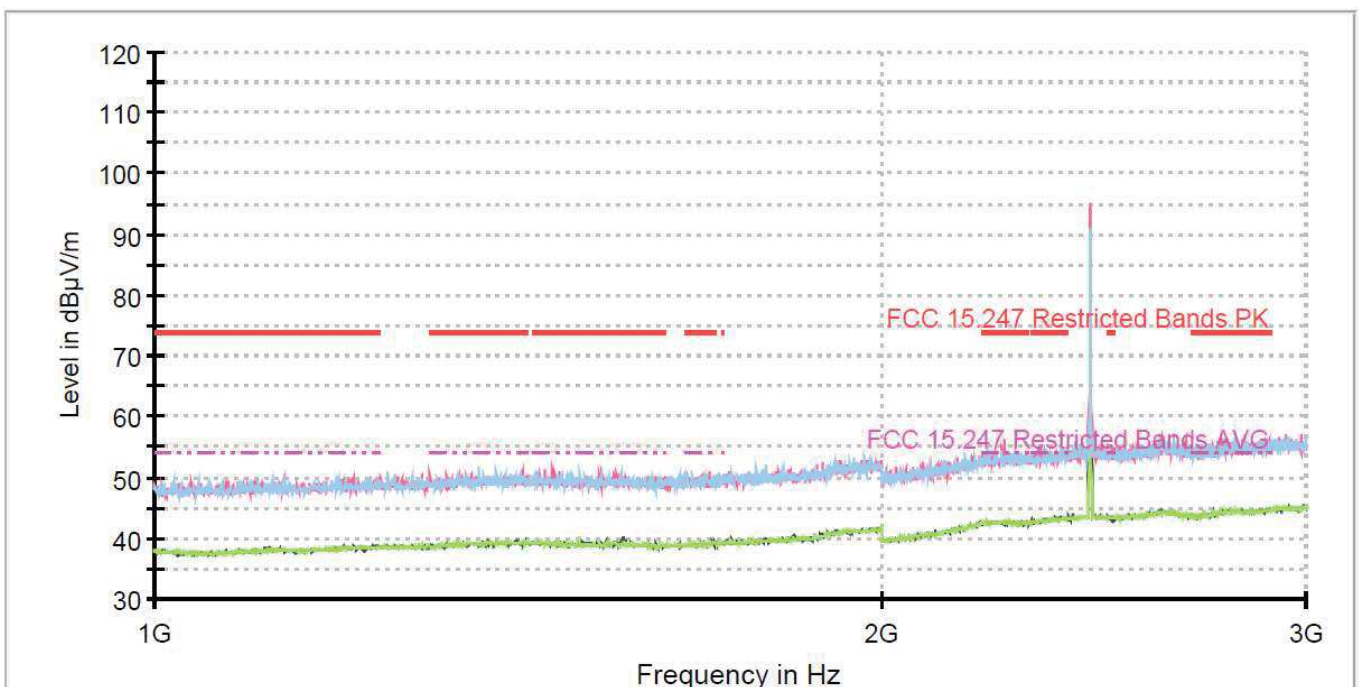
- **GFSK modulation (DH5)**

- Low Channel:



The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.