

Test report No:  
 NIE: 66084RRF.006


# 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	NTG6N ENTRY/MID.	
Other identification of the product	HW version: D9. SW version: E870. FCC ID: T8GNTG6NEM. IC: 6434A-NTG6NEM.	
(*) Features	FM, AM, DAB, USB, Bluetooth, WLAN, GPS.	
Applicant	HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH BECKER-GOERING-STR. 16; 76307 KARLSBAD 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 Amendment 1 (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. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.	
Summary	IN COMPLIANCE	
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager	 2021.03.12 13:24:43 +01'00'
Date of issue	2021-03-12	
Report template No	FDT08_23 (* "Data provided by the client")	

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## Competences and guarantees

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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.

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

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## General conditions

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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

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

## Data provided by the client

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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 the model NTG6N ENTRY/MID is an automotive head unit to be installed in cars with the following features: FM, AM, DAB, USB, Bluetooth, WLAN and GPS.

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
66084B/184	Automotive Infotainment System	NTG6N ENTRY/MID	HBM580M4997004	2021/01/22

Auxiliary elements used with the sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
54022/058	CAN Box	--	H0034761	2017/09/26
54022/133	Ethernet cable	--	H0034761	2017/10/19
54022/152	Harness	--	H0034761	2017/09/26
56848G/102	Antenna	--	--	2019/01/11
56848G/109	Antenna	--	--	2019/01/11
56848G/110	Antenna	--	--	2019/01/11
56848G/111	Antenna	--	--	2019/01/11

Sample S/01 has undergone the test(s): All Radiated tests indicated in Appendixes A, B.

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

Control N°	Description	Model	Serial N°	Date of reception
66084B/184	Automotive Infotainment System	NTG6N ENTRY/MID	HBM580M4997004	2021/01/22

Auxiliary elements used with the sample S/02:

Control N°	Description	Model	Serial N°	Date of reception
56848G/144	CAN Box	--	H0034731	2019/11/01
56848G/014	Ethernet cable	--	--	2019/01/11
56848G/050	Harness	--	--	2019/01/11

Sample S/02 has undergone the test(s): All Conducted tests indicated in Appendixes A, B.

## Test sample description

Ports.....:	Port name and description	Cable				
		Specified max length [m]	Attached during test	Shielded	Coupled to patient <sup>(3)</sup>	
	<i>Car Connector A</i>	>3m <sup>(x1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<i>Car Connector B</i>	>3m <sup>(x1)</sup>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<i>Display Connector CID/PIP / RVC</i>	>3m <sup>(x1)</sup>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	<i>USB Connector</i>	<3m <sup>(x2)</sup>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	<i>Eth Connector</i>	>3m <sup>(x1)</sup>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	<i>BT/WLAN-Antenna</i>	>3m <sup>(x1)</sup>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	<i>FM/AM, TV/SDARS Ant</i>	>3m <sup>(x1)</sup>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<i>GPS Antenna</i>	>3m <sup>(x1)</sup>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Supplementary information to the ports.....:	For EMC-Testing all cables should be connected to the connectors!					
Rated power supply .....	Voltage and Frequency	Reference poles				
		L1	L2	L3	N	PE
	<input type="checkbox"/> AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/> AC:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> DC: 12V Car battery / attenuator (9,5-15,5V normal operation)					
<input type="checkbox"/> DC:						
Rated Power .....	9,5-15,5V normal operation					
Clock frequencies.....:	see schematics					
Other parameters .....	FCC ID: T8GNTG6NH / IC: 6434A-NTG6NH					
Software version .....	E870					
Hardware version .....	D9					
Dimensions in cm (W x H x D) .....	182 x 78 x 160 mm					
Mounting position .....	<input type="checkbox"/>	Table top equipment				
	<input type="checkbox"/>	Wall/Ceiling mounted equipment				

	<input type="checkbox"/>	Floor standing equipment	
	<input type="checkbox"/>	Hand-held equipment	
	<input checked="" type="checkbox"/>	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	A247 905 69	Daimler OEM Displ.
	CAN-Box	-	HBAS
	Cable harness	-	HBAS
	BT/WLAN-Antenna	A247 905 83	Hirschmann
Documents as provided by the applicant.....:	Description	File name	Issue date
	Technical Description		

<sup>(3)</sup> Only for Medical Equipment

## Identification of the client

HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH  
 BECKER-GOERING-STR. 16; 76307 KARLSBAD GERMANY

## Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-01-28
Date (finish)	2021-02-26

## Document history

Report number	Date	Description
66084RRF.006	2021-03-12	First release.

## Environmental conditions

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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 %

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 %

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. = 75 %

## Remarks and comments

The tests have been performed by the technical personnel: Miguel Manuel López, Verónica Capilla, Cristina Calle and Pablo Redondo.

Used instrumentation:

### Conducted Measurements:

	Last Calibration	Due Calibration
1. Shielded room ETS LINDGREN S101	N.A.	N.A.
2. Signal Generator 8 KHz-6 GHz, ROHDE AND SCHWARZ SMB100B	2019/10	2021/10
3. Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV 40	2019/09	2021/09
4. OPEN SWITCH UNIT OSP120 ROHDE AND SCHWARZ	2019/10	2021/10
5. Digital multimeter FLUKE 179	2020/06	2021/06
6. DC Power Supply Keysight Technologies U8002A	N.A.	N.A.

### Radiated Measurements:

	Last Calibration	Due Calibration
1. Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N.A.	N.A.
2. Shielded Room ETS LINDGREN S101	N.A.	N.A.
3. Hybrid Bilog Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2020/10	2023/10
4. Pre-amplifier G>40dB 10MHz-6GHz Bonn Elektronik BLNA 0160-01N	2020/02	2021/02
5. EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2019/10	2021/10
6. Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2020/08	2023/08
7. Pre-amplifier, G>30 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-3A	2020/10	2021/10
8. Signal and spectrum analyzer 10Hz-40GHz Rhode and Schwarz FSV40	2019/10	2021/10
9. Broadband Horn antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2018/07	2021/07
10. Pre-amplifier, G>30 dB, 18-40 GHz BONN ELEKTRONIK BLMA 1840-1M	2019/02	2021/02
11. DC Power Supply Keysight Technologies U8002A	N.A.	N.A.
12. Digital Multimeter FLUKE 175	2020/11	2021/11



## Testing verdicts

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

## Summary

### 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.			

### WLAN 2.4 GHz (802.11 b/g/n20 1x1):

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)

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## TEST CONDITIONS

### POWER SUPPLY (V):

V nominal:	12 Vdc.
Type of Power Supply:	DC External (Car Battery).

### ANTENNA:

Type of Antenna:	External antenna.
Maximum Declared Antenna Gain:	+0.7 dBi (antenna gain regarding of cable/connector attenuation)

### 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 TS8997 system 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 1 m for the frequency range 17 GHz-26 GHz (18 GHz-40 GHz horn antenna).

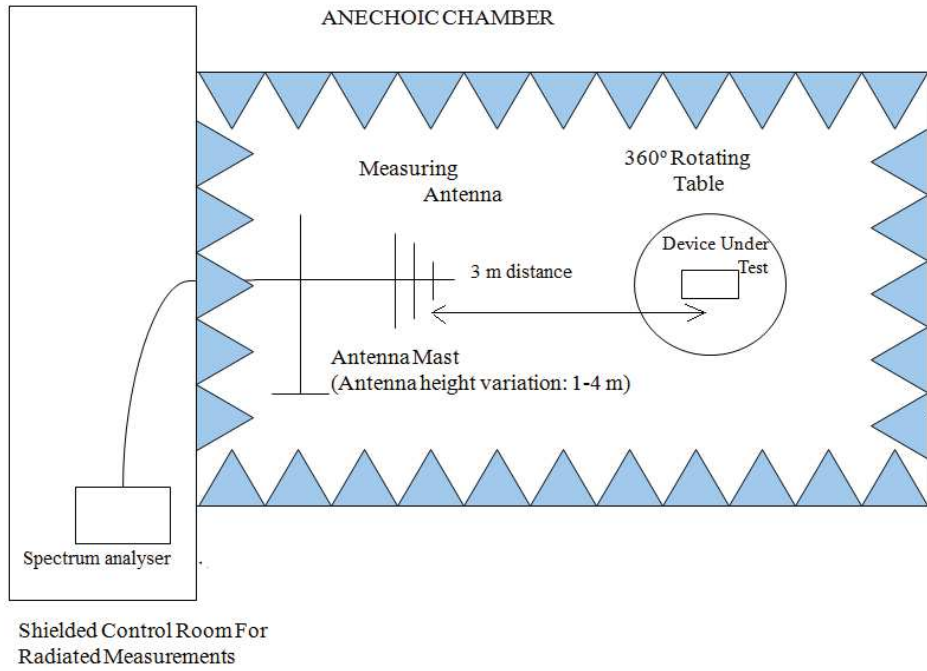
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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.

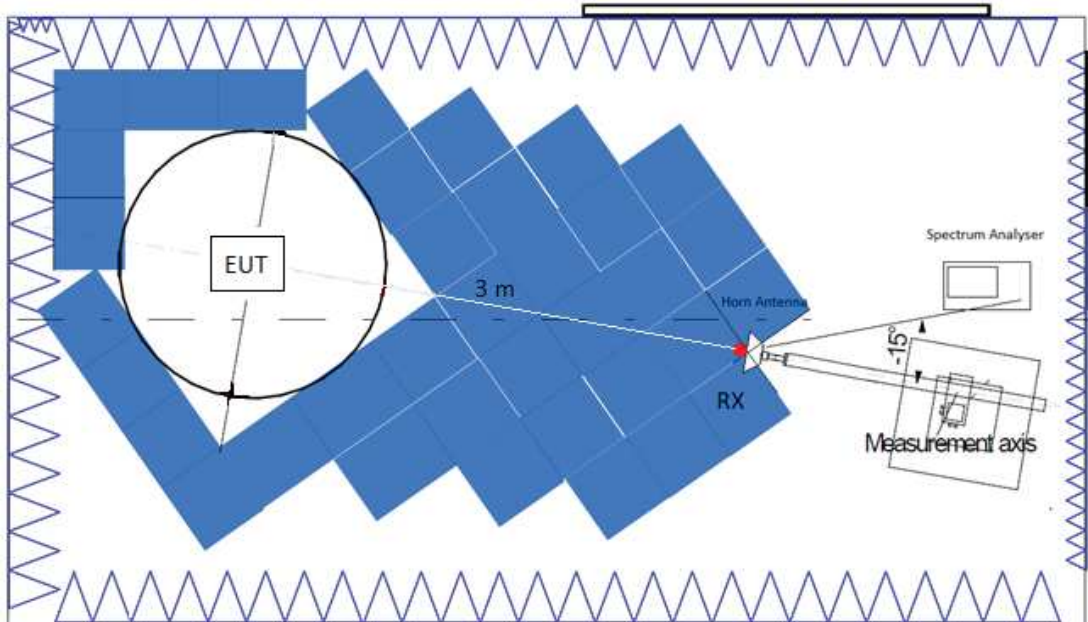
Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth / video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

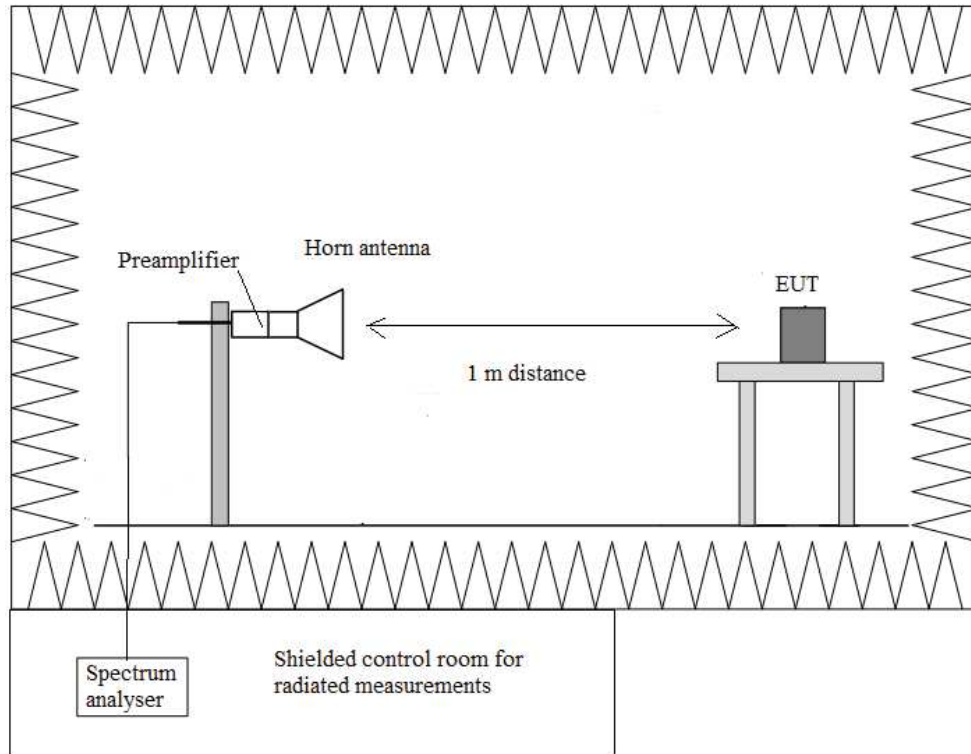
Radiated measurements setup from 30 MHz to 1 GHz:



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 (MHz)	0.930	0.925	0.930
99% Bandwidth (MHz)	0.875	0.870	0.870
Measurement uncertainty (%)	<±1.24		

- **Pi/4 DQPSK**

	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
20 dB Spectrum Bandwidth (MHz)	1.340	1.340	1.340
99% Bandwidth (MHz)	1.210	1.210	1.210
Measurement uncertainty (%)	<±1.24		

- **8DPSK**

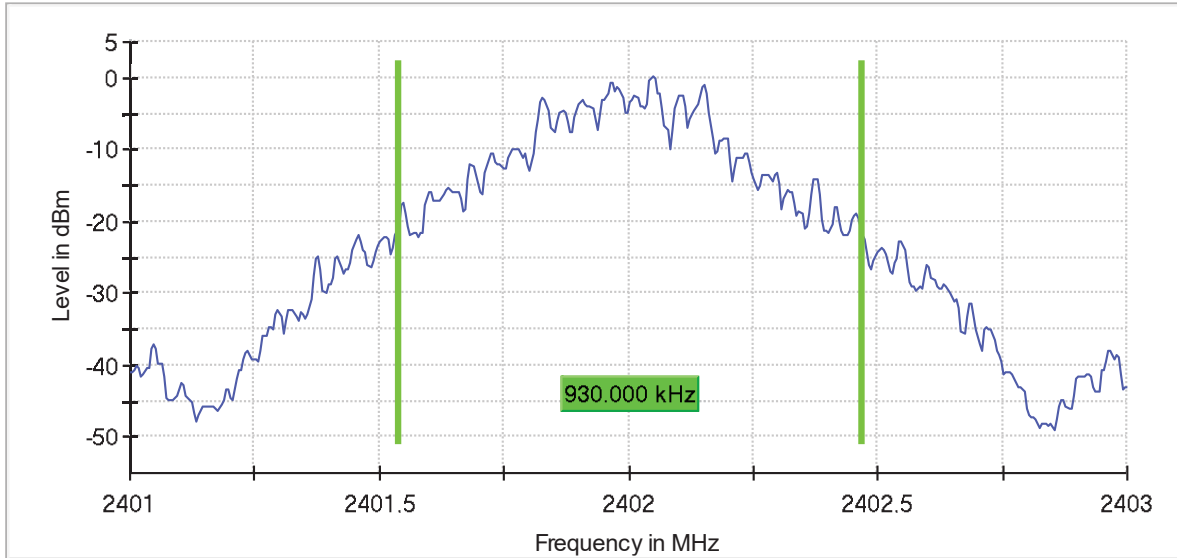
	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
20 dB Spectrum Bandwidth (MHz)	1.345	1.345	1.345
99% Bandwidth (MHz)	1.215	1.210	1.215
Measurement uncertainty (%)	<±1.24		

Verdict: PASS

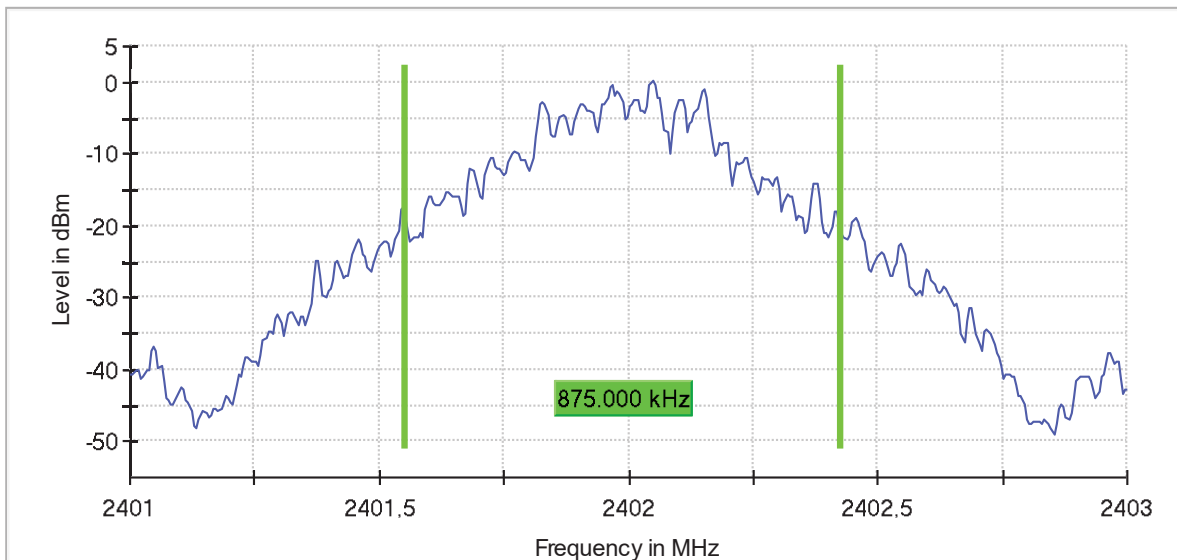
- **GFSK – Bandwidths**

- Low Channel:

20 dB Bandwidth



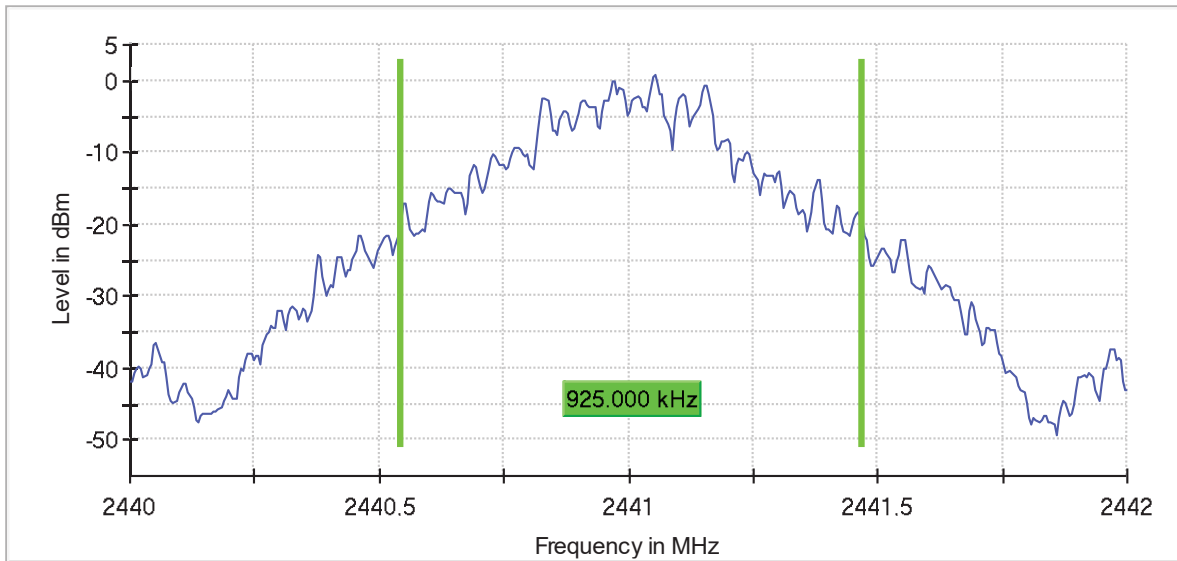
99 % Bandwidth



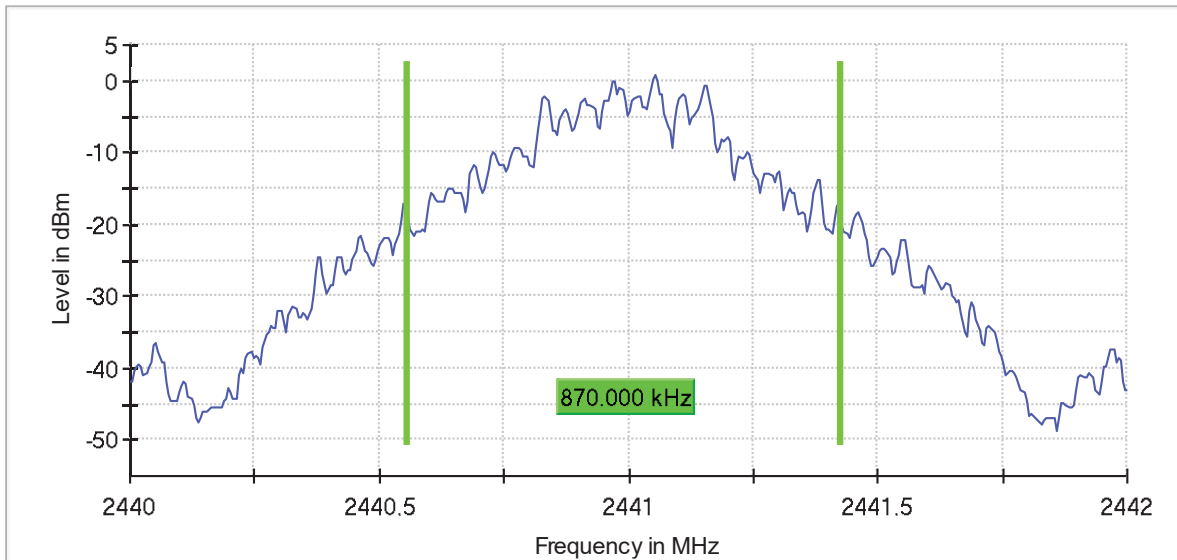


- Middle Channel:

20 dB Bandwidth

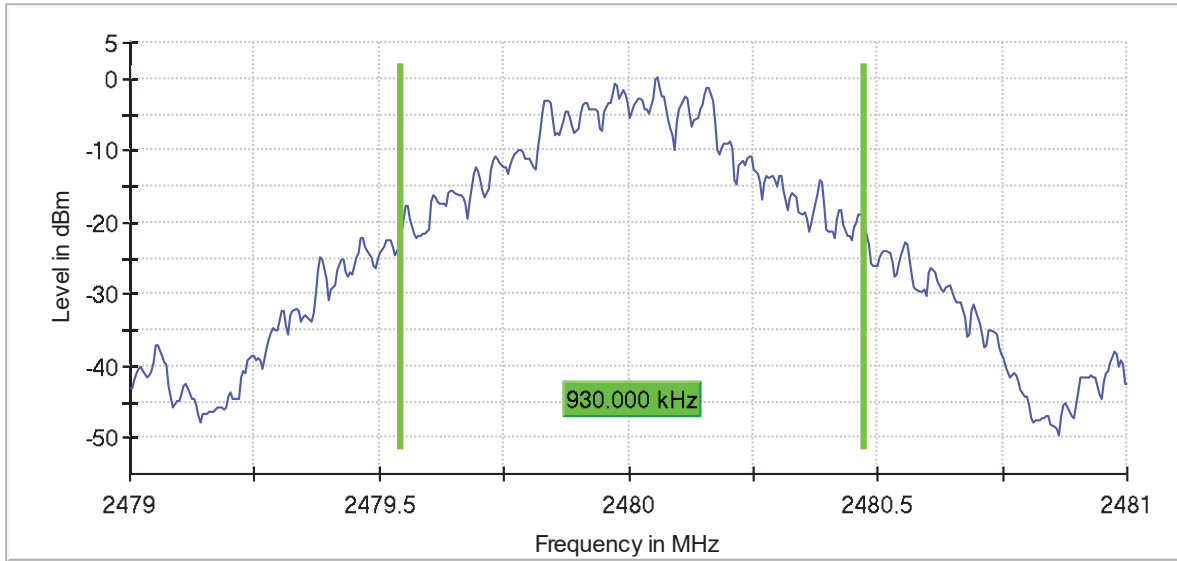


99 % Bandwidth

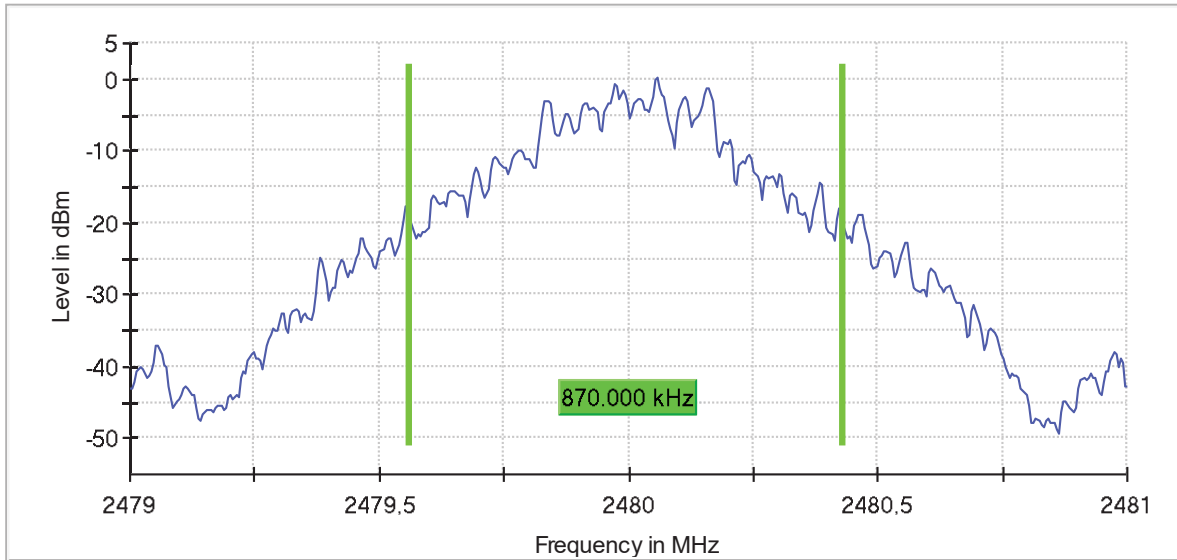


- High Channel:

20 dB Bandwidth

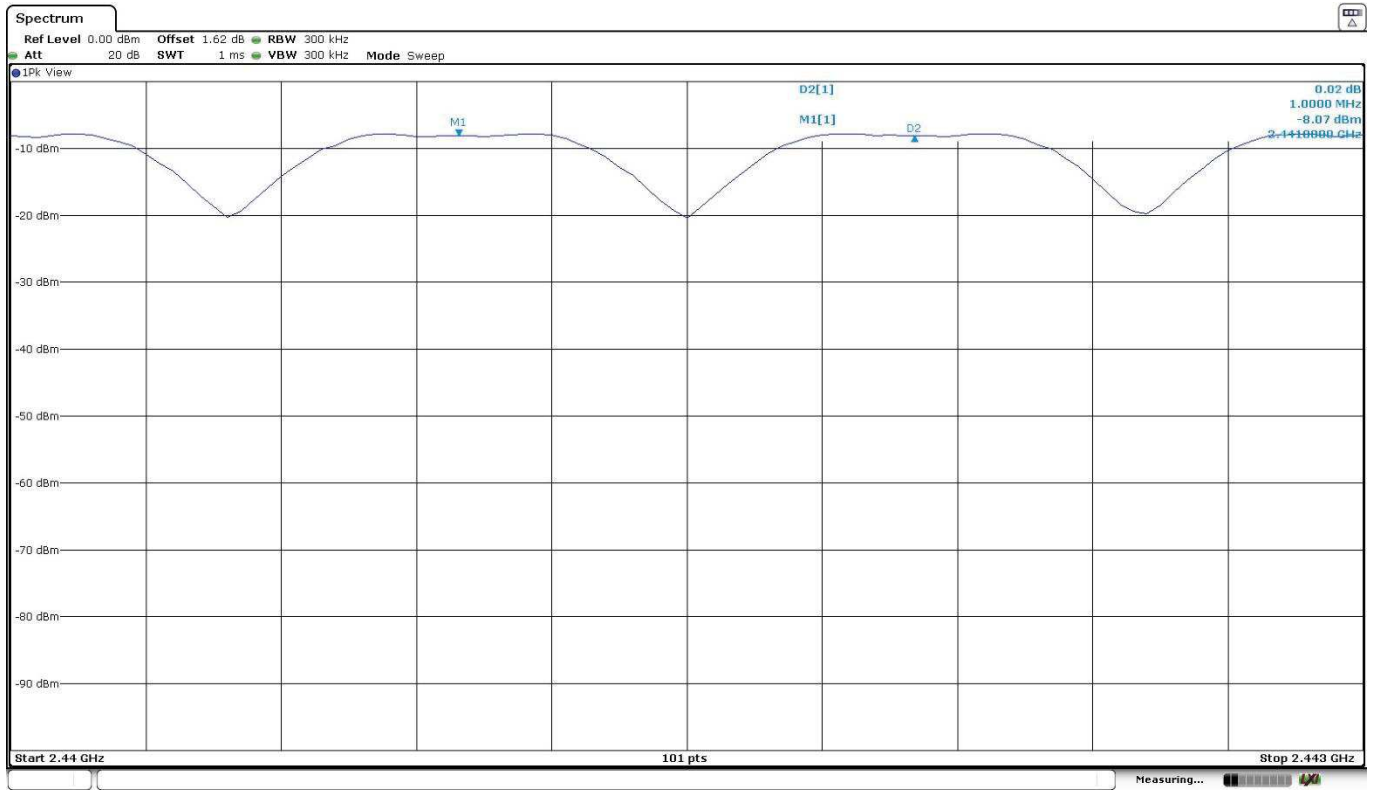


99 % Bandwidth



### Carrier frequency separation - GFSK

Carrier frequency separation:  MHz



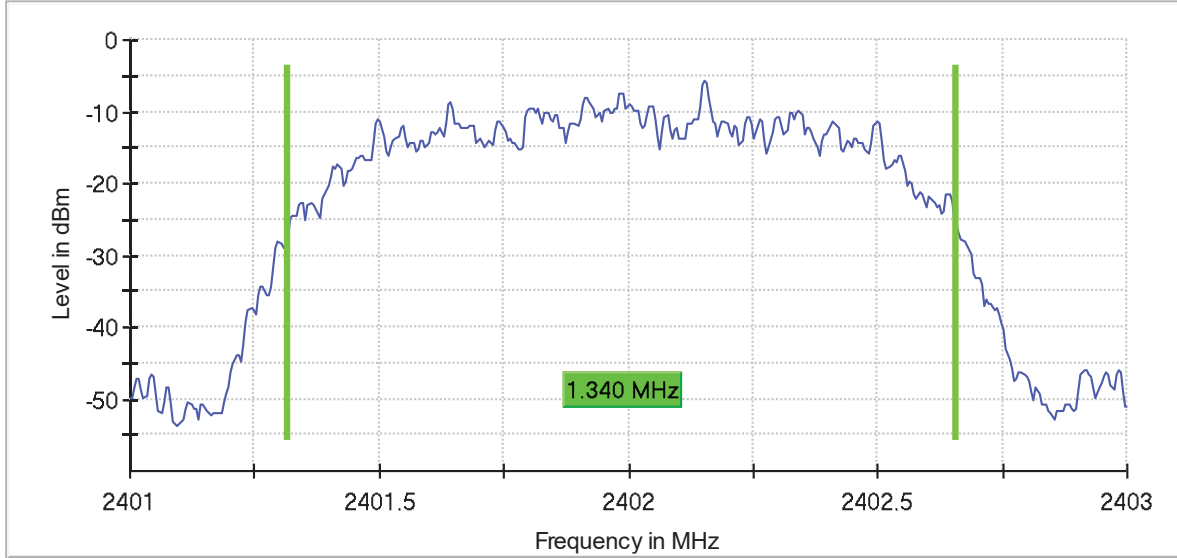
The hopping channel carrier frequencies are separated by a minimum two-thirds of the 20 dB bandwidth of the hopping channel.

Verdict: PASS

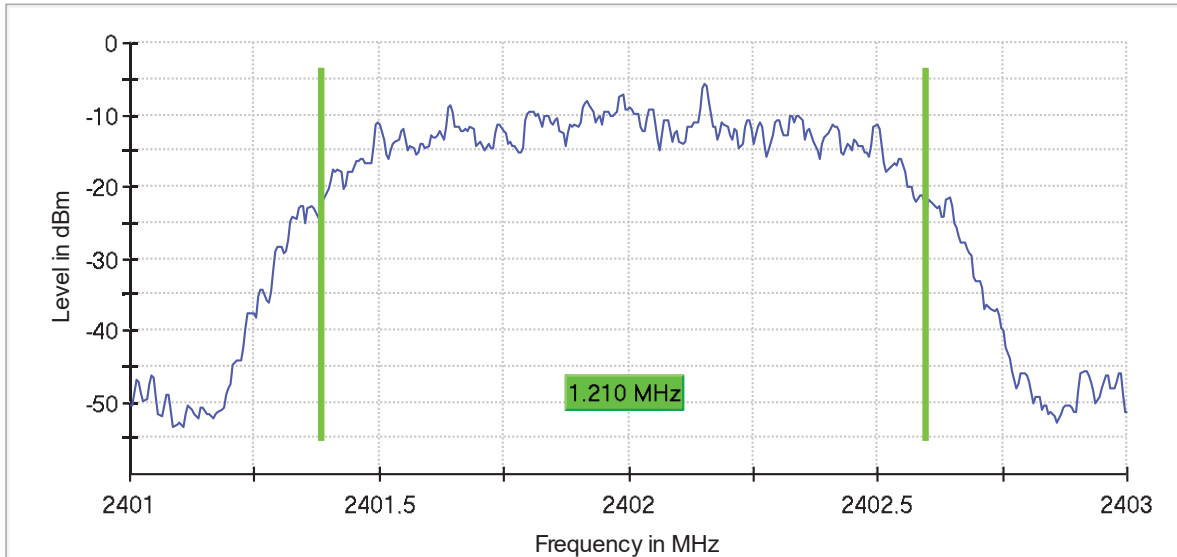
- **Pi/4 DQPSK – Bandwidths**

- Low Channel:

20 dB Bandwidth

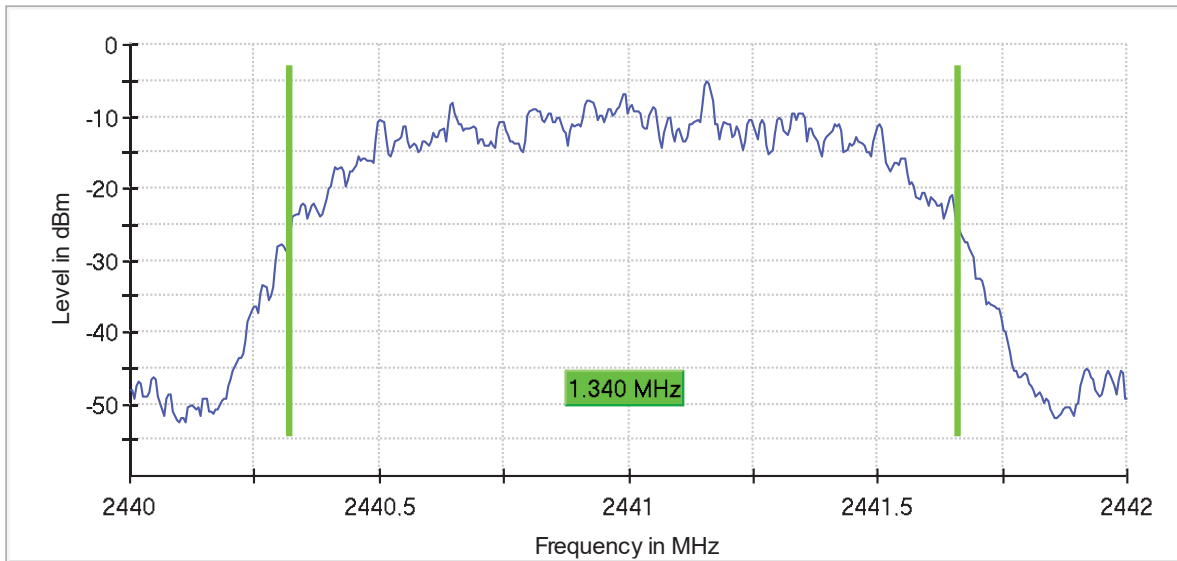


99 % Bandwidth

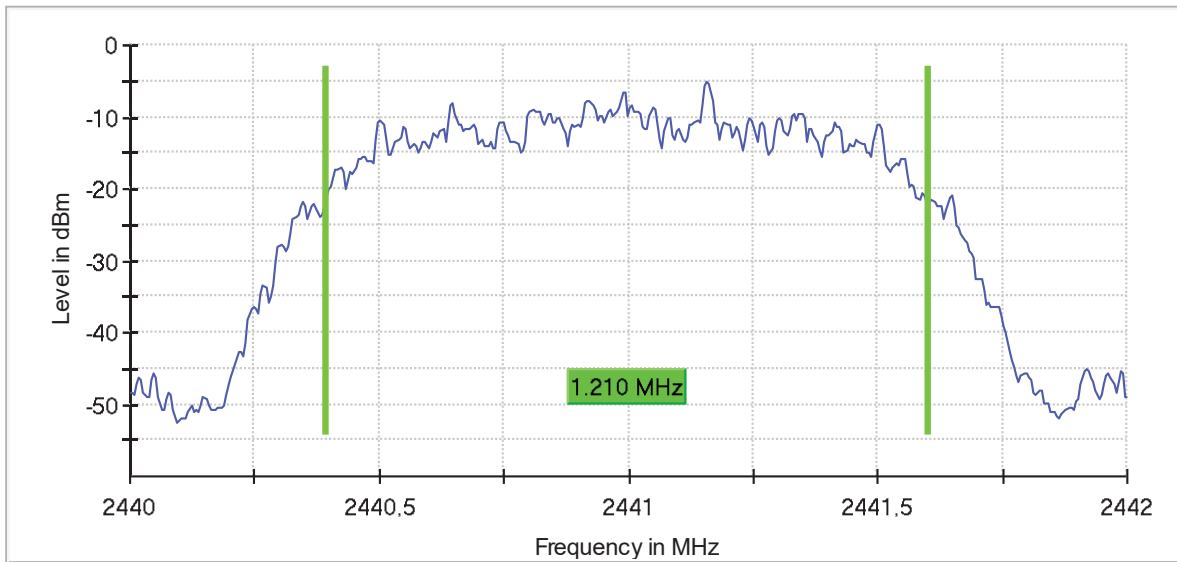


- Middle Channel:

20 dB Bandwidth

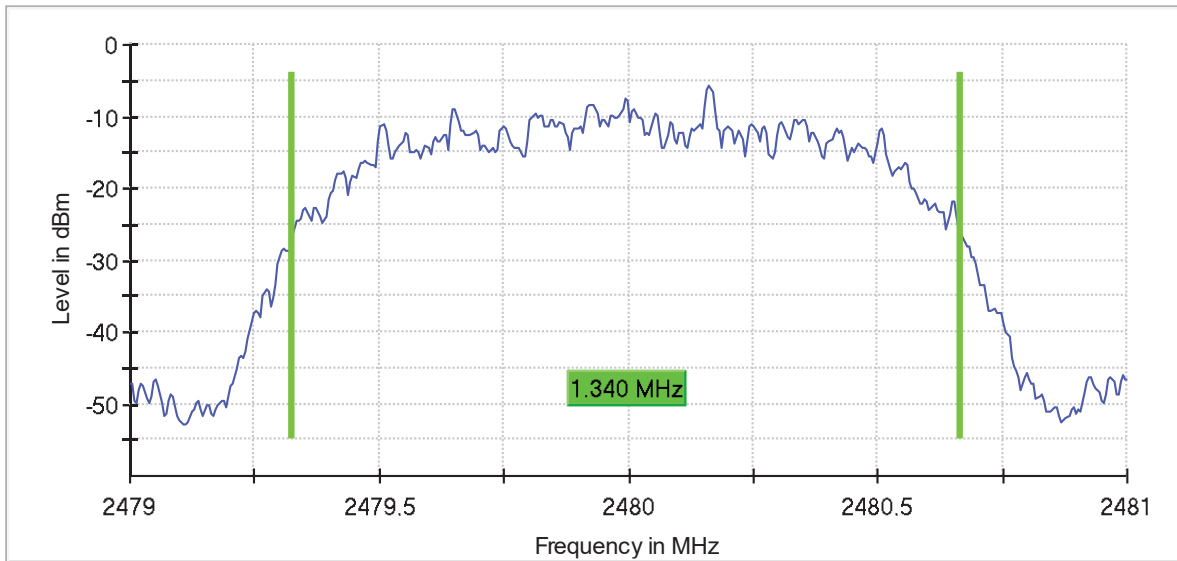


99 % Bandwidth

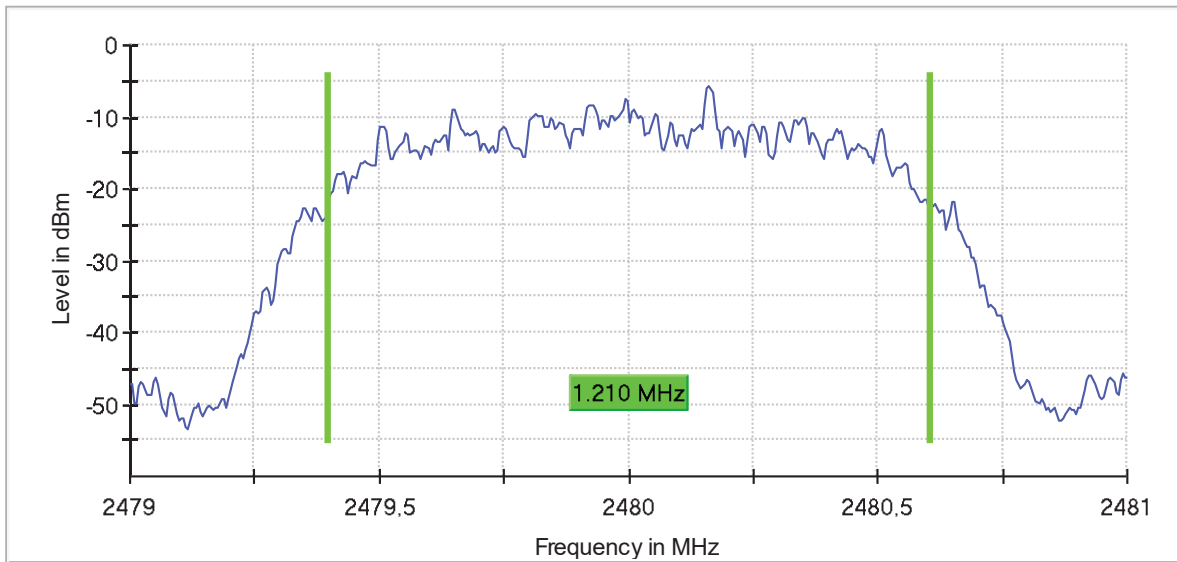


- High Channel:

20 dB Bandwidth



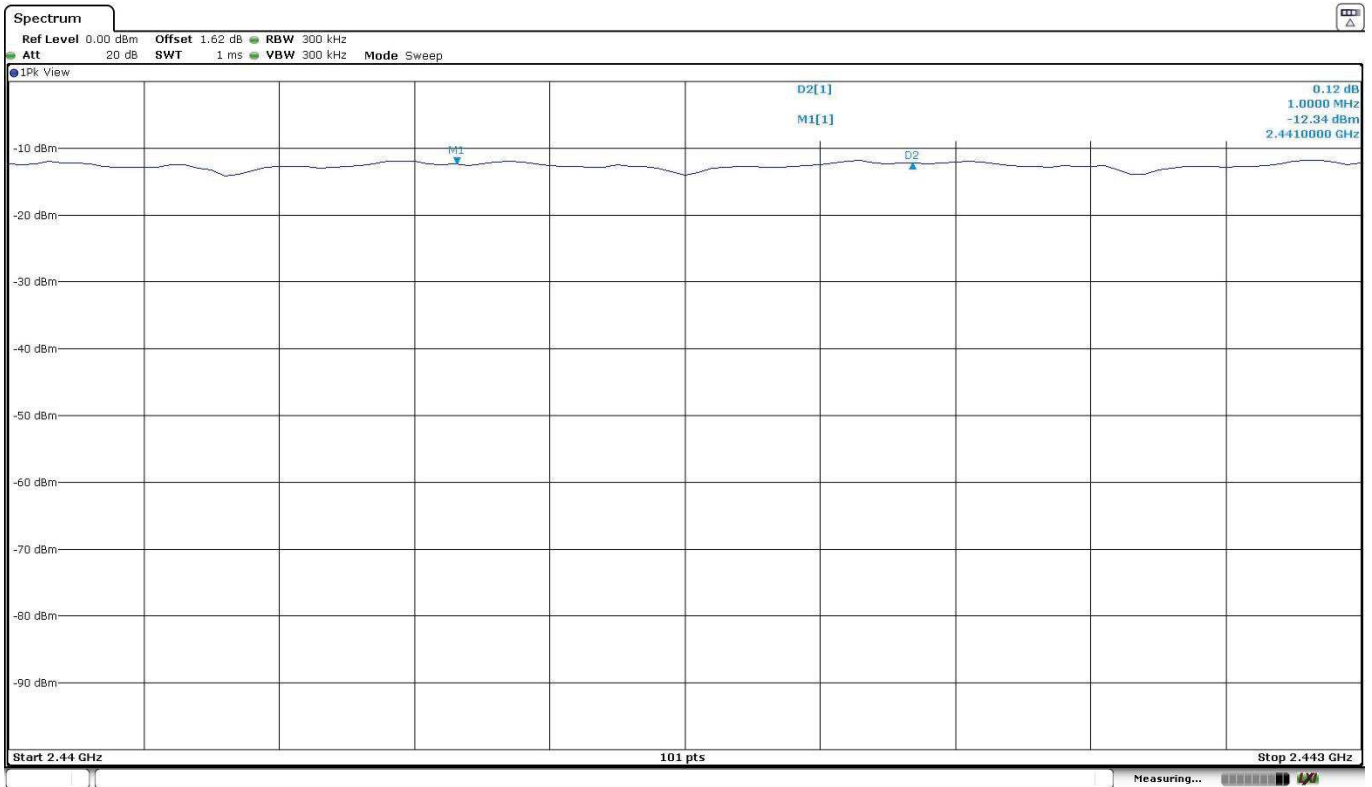
99 % Bandwidth



### Carrier frequency separation - Pi/4 DQPSK

Carrier frequency separation:  MHz

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

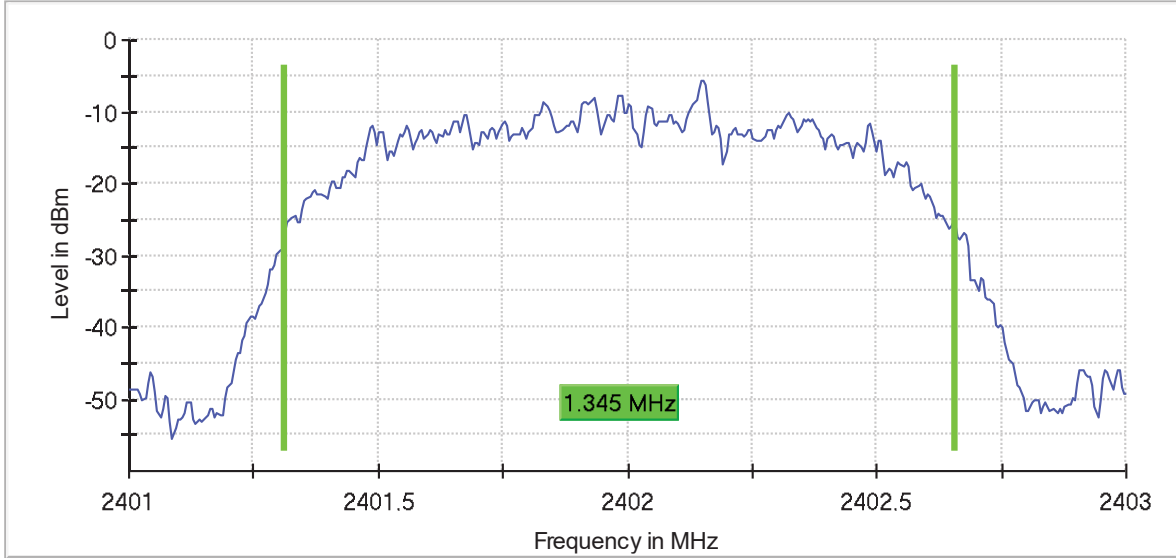


Verdict: PASS

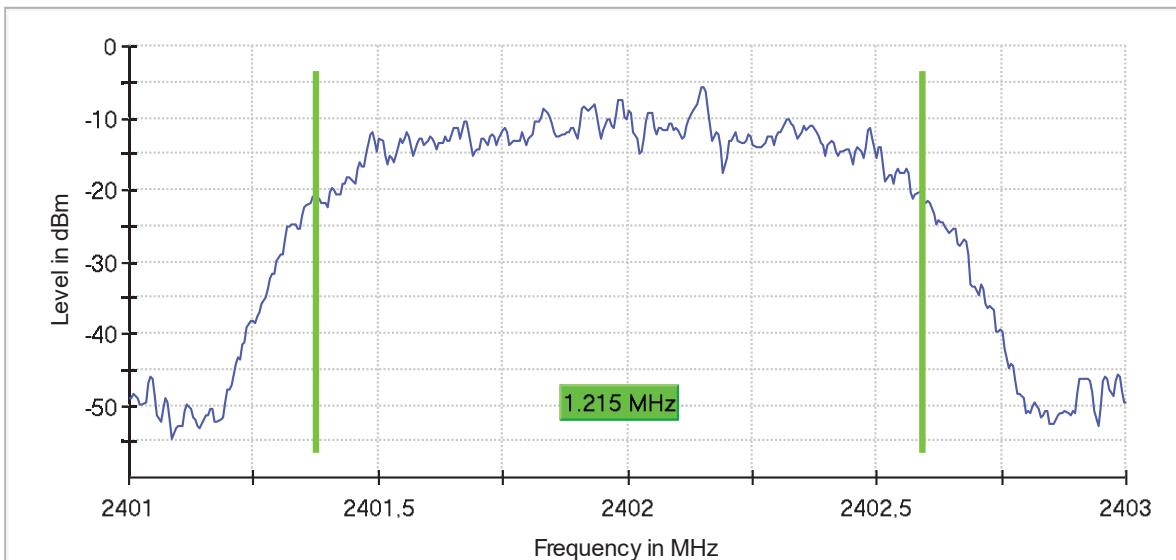
- **8DPSK – Bandwidths**

- Low Channel:

20 dB Bandwidth



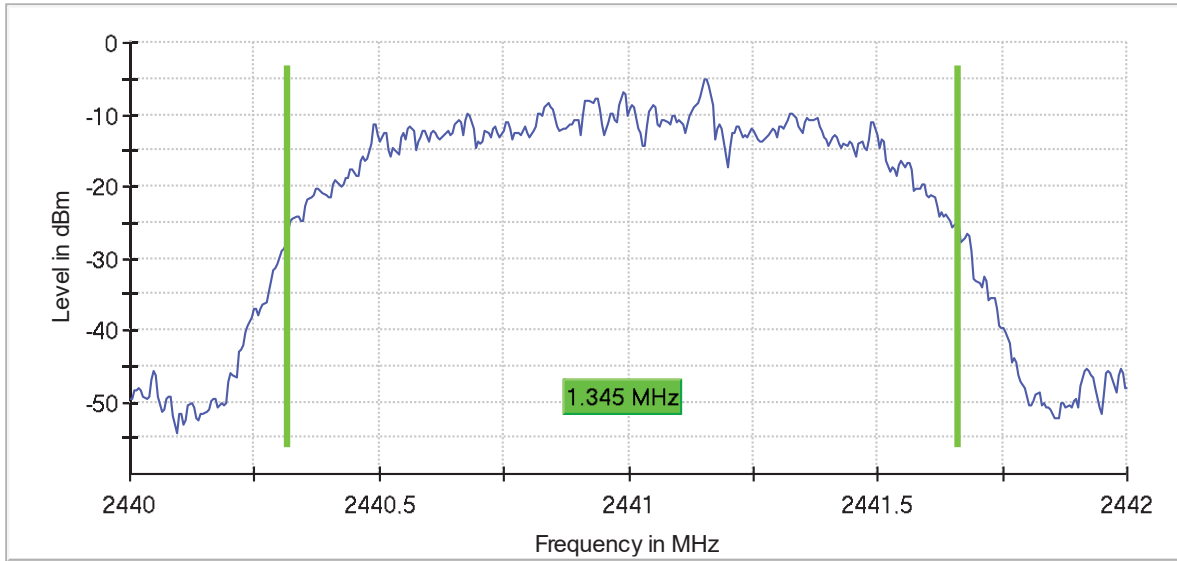
99 % Bandwidth



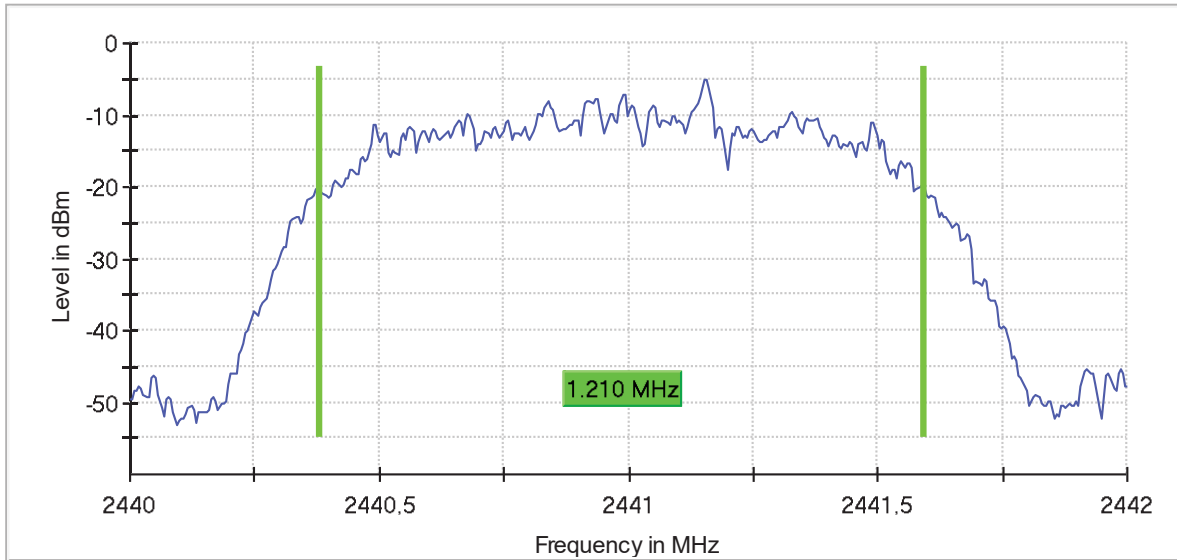


- Middle Channel:

20 dB Bandwidth

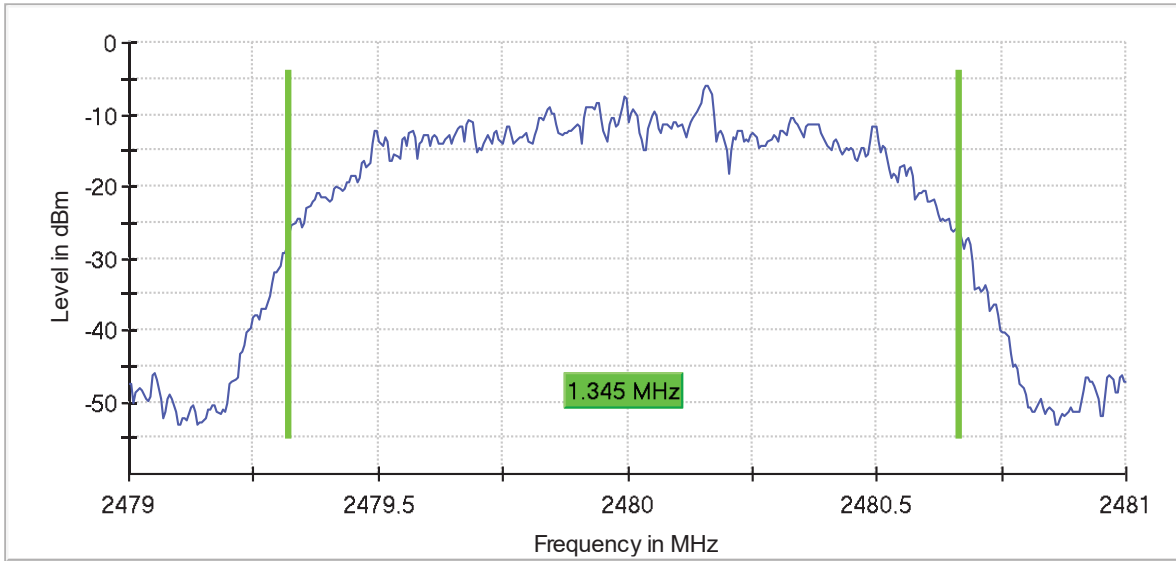


99 % Bandwidth

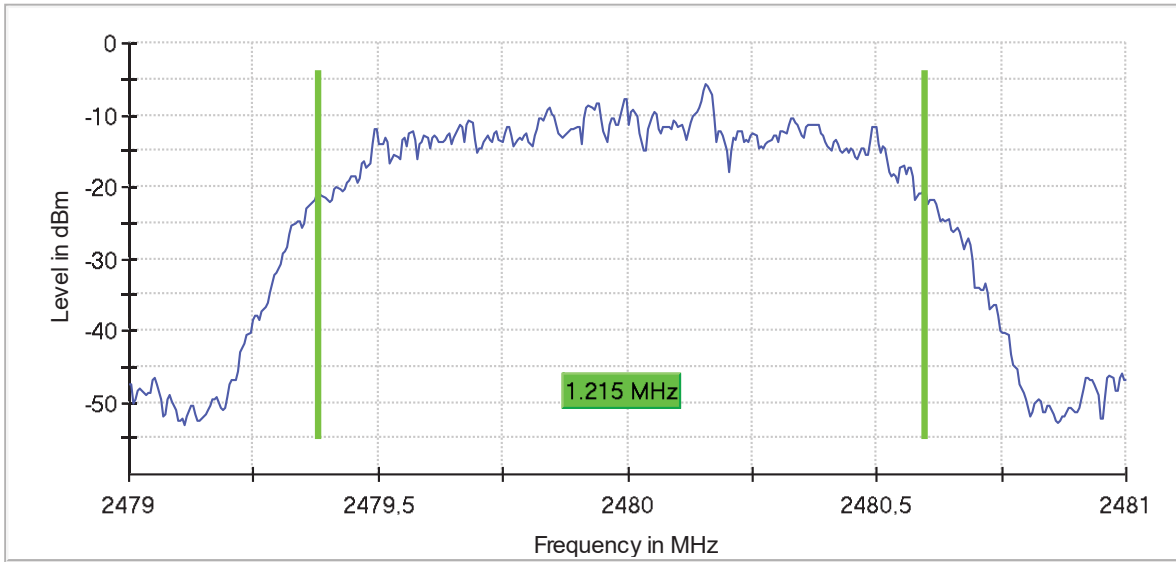


- High Channel:

20 dB Bandwidth



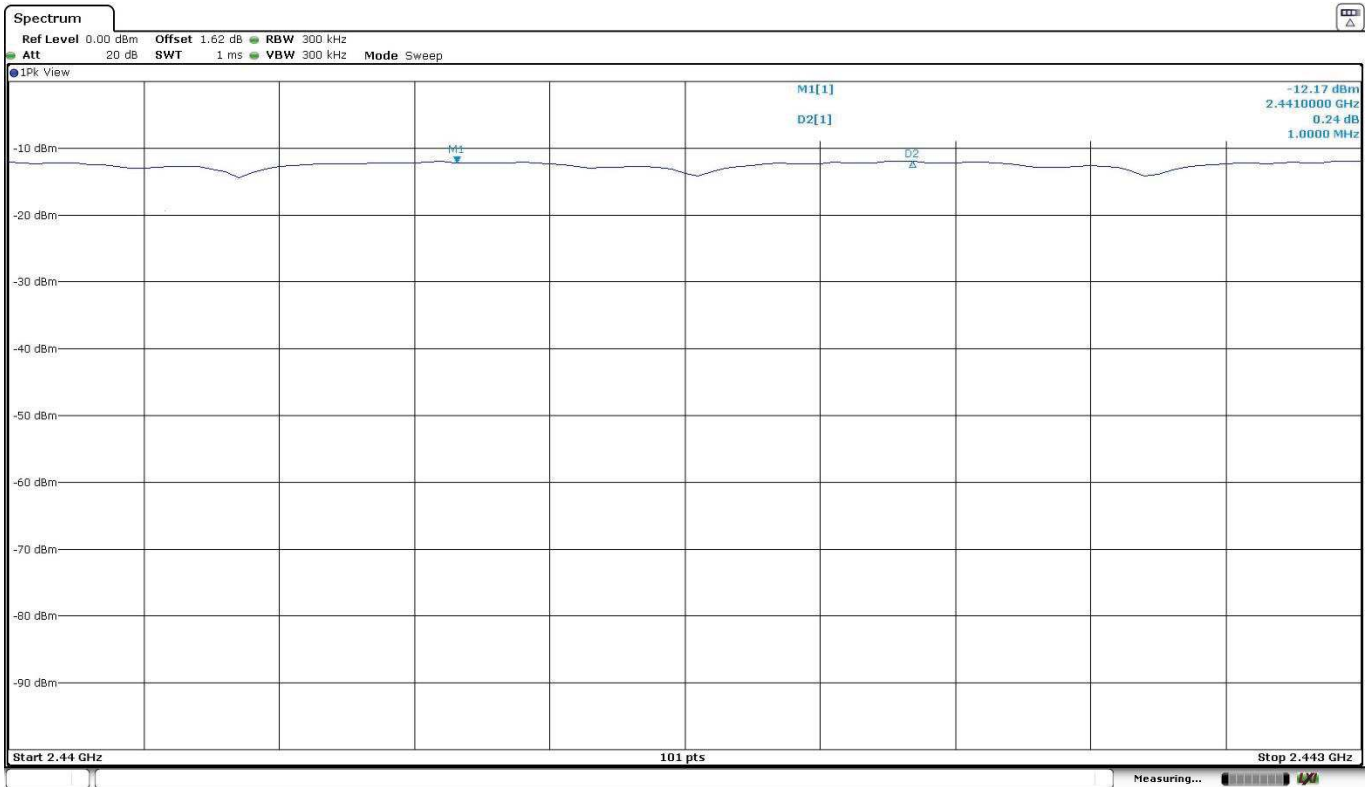
99 % Bandwidth



### Carrier frequency separation - 8DPSK

Carrier frequency separation:  MHz

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

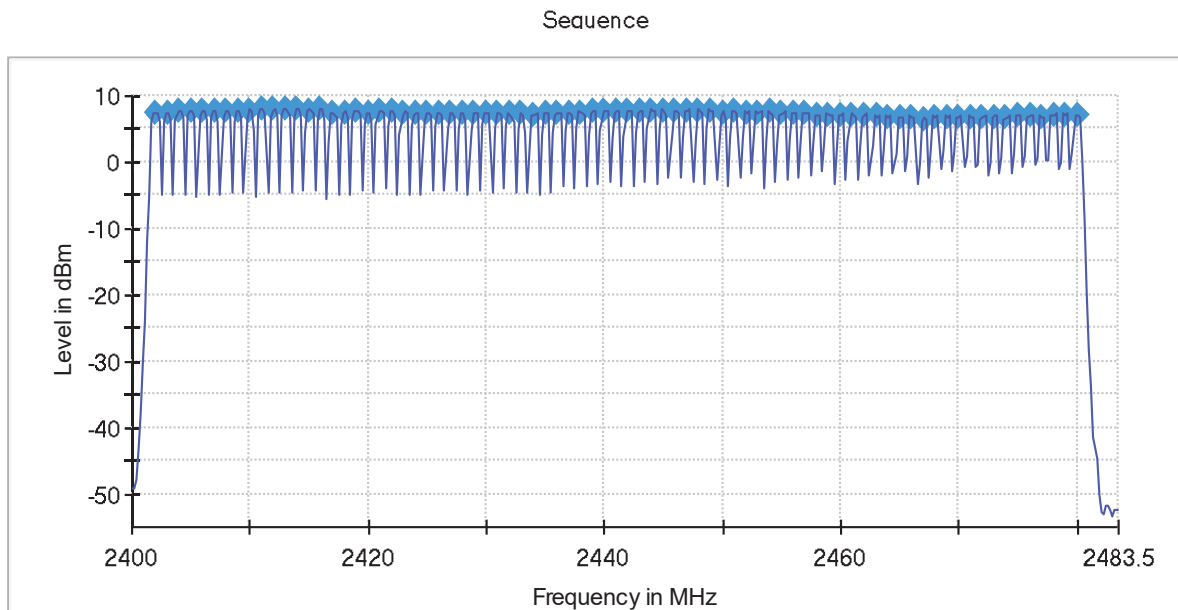
### SPECIFICATION:

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.

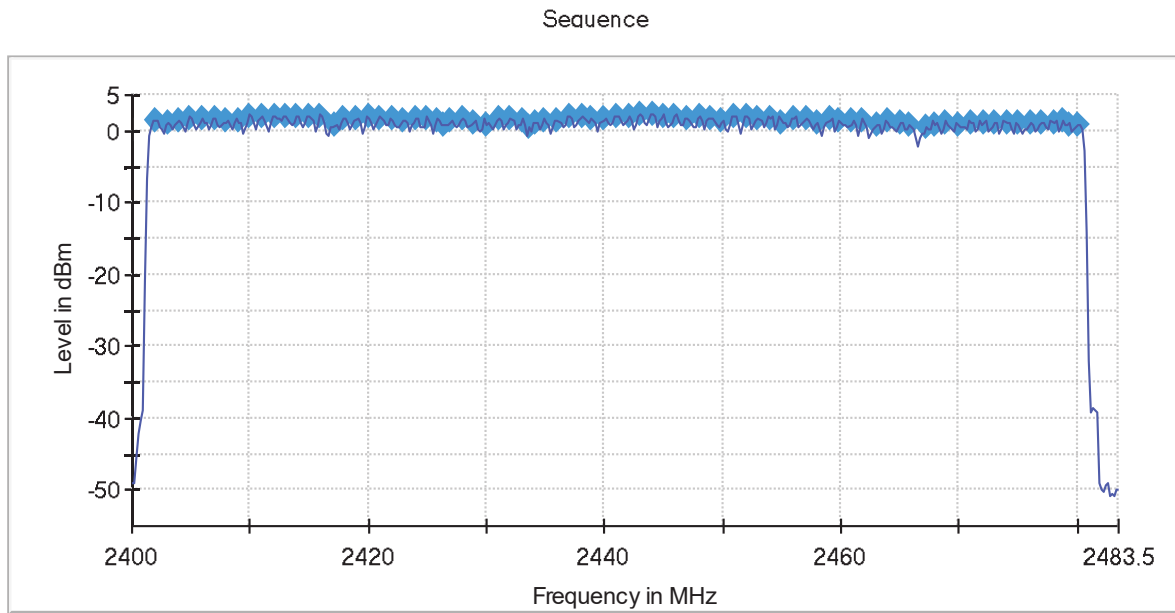
- **GFSK – Number of hopping channels:**



**Total number of hopping channels: 79**

Verdict: PASS

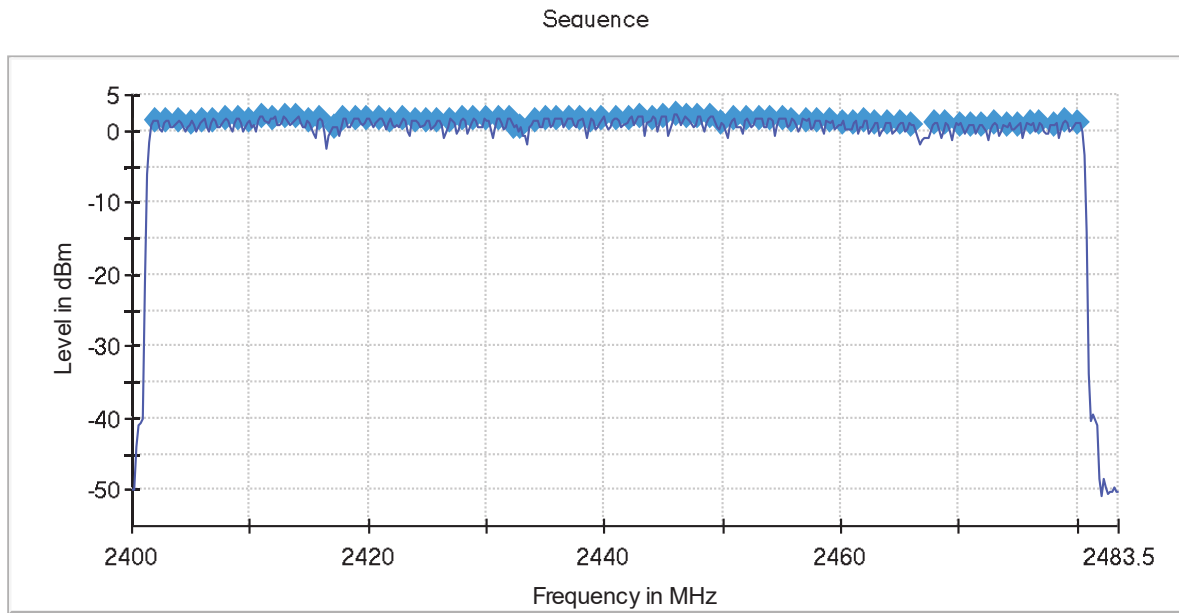
- **Pi/4 DQPSK – Number of hopping channels:**



**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 x 79= 31.6 seconds.

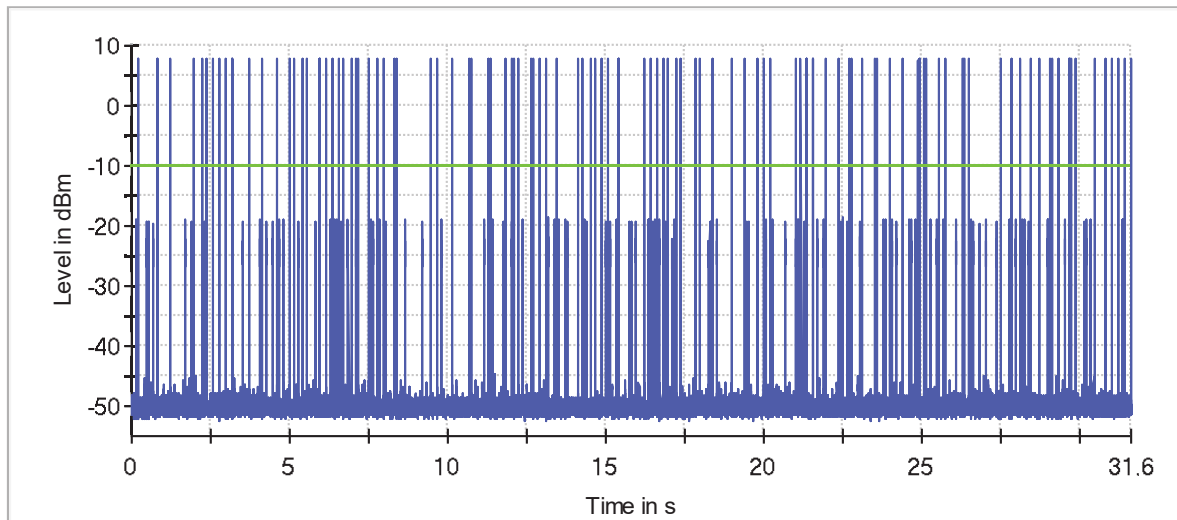
**RESULTS:**

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

- Time of Occupancy:

Nº of hops over the period	110
Average Time of Occupancy	321.710 ms

Time of Channel Occupancy



— Trace      — Threshold

Measurement uncertainty (%)	<±0.53
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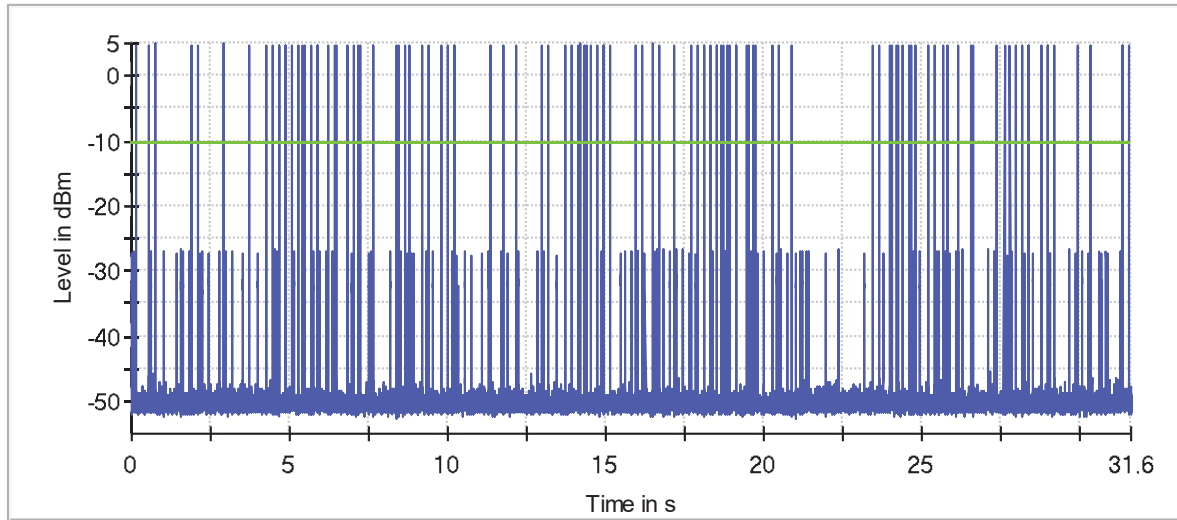
Verdict: PASS

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

- Time of Occupancy:

Nº of hops over the period	110
Average Time of Occupancy	318.080 ms

Time of Channel Occupancy



— Trace    — Threshold

Measurement uncertainty (%)	<±0.53
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Verdict: PASS

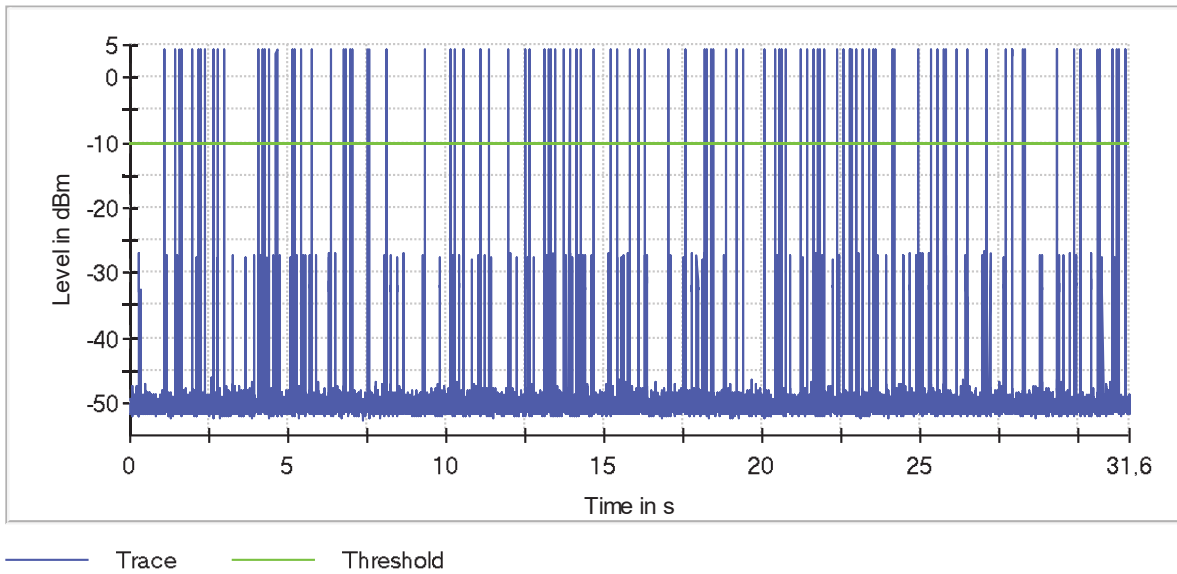


• 8DPSK (packet type 3DH5) – Time of Occupancy (Dwell Time)

- Time of Occupancy:

Nº of hops over the period	105
Average Time of Occupancy	309.020 ms

Time of Channel Occupancy



Measurement uncertainty (%)	<±0.53
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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: +0.7 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**

Peak Conducted Output Power	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
Maximum Conducted Power (dBm)	6.0	6.4	5.8
Maximum EIRP Power (dBm)	6.7	7.1	6.5
Measurement uncertainty (dB)	<±0.80		

- **Pi/4 DQPSK**

Peak Conducted Output Power	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
Maximum Conducted Power (dBm)	3.9	4.3	3.6
Maximum EIRP Power (dBm)	4.6	5.0	4.3
Measurement uncertainty (dB)	<±0.80		

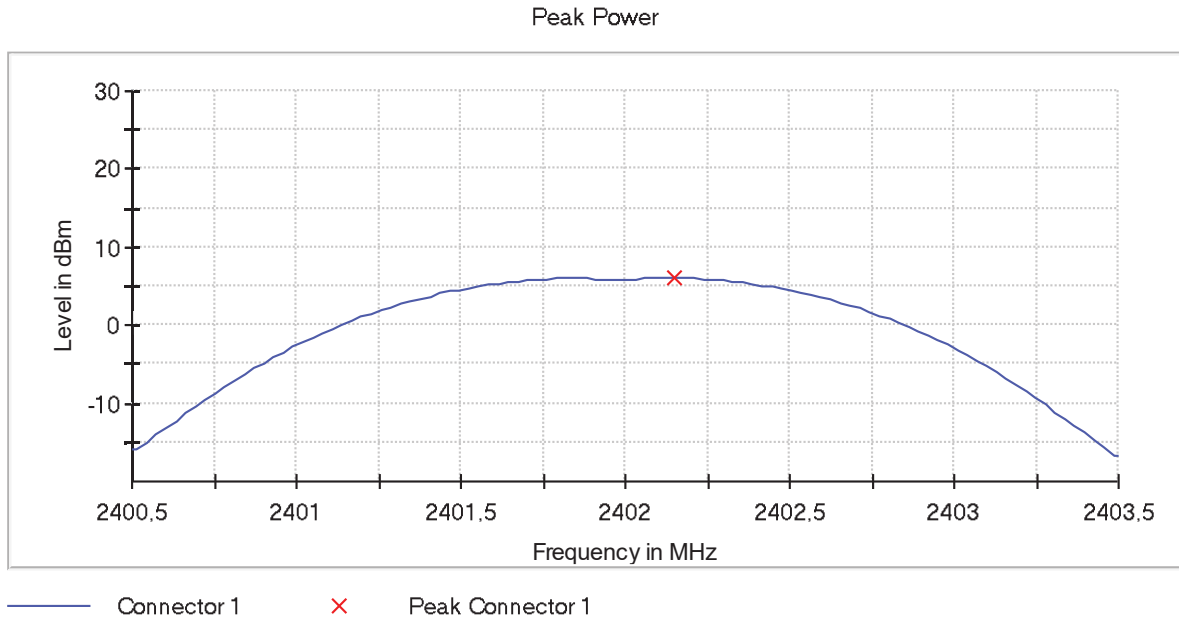
- **8DPSK**

Peak Conducted Output Power	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
Maximum Conducted Power (dBm)	4.4	4.7	3.8
Maximum EIRP Power (dBm)	5.7	5.4	4.5
Measurement uncertainty (dB)	<±0.80		

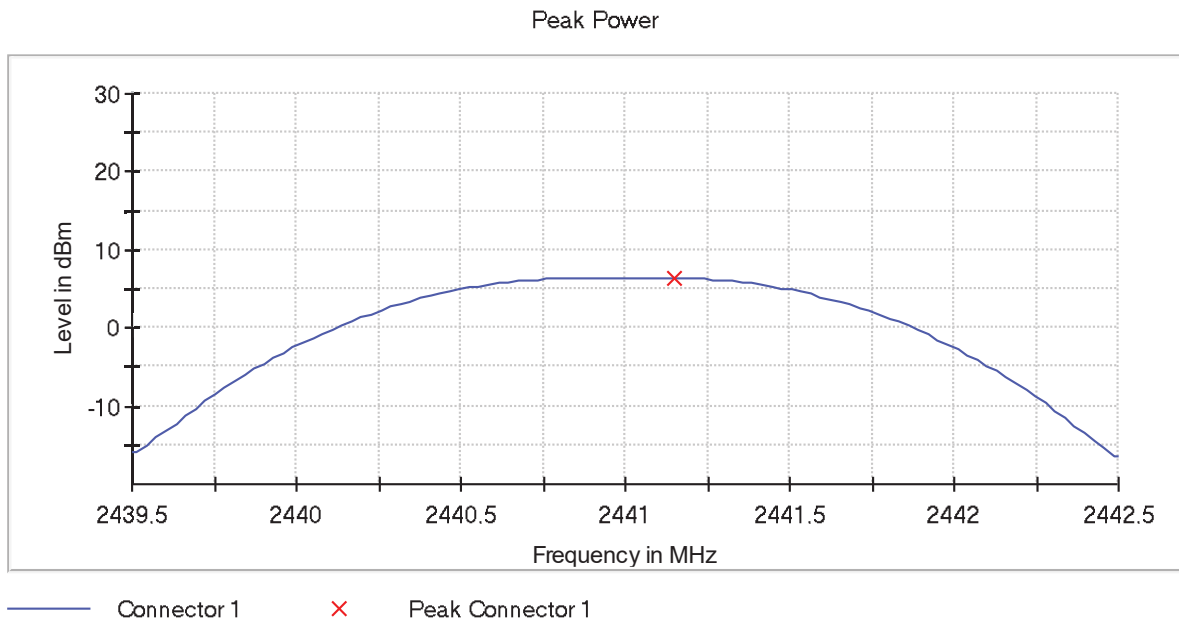
Verdict: PASS

- **GFSK – Peak Output Power**

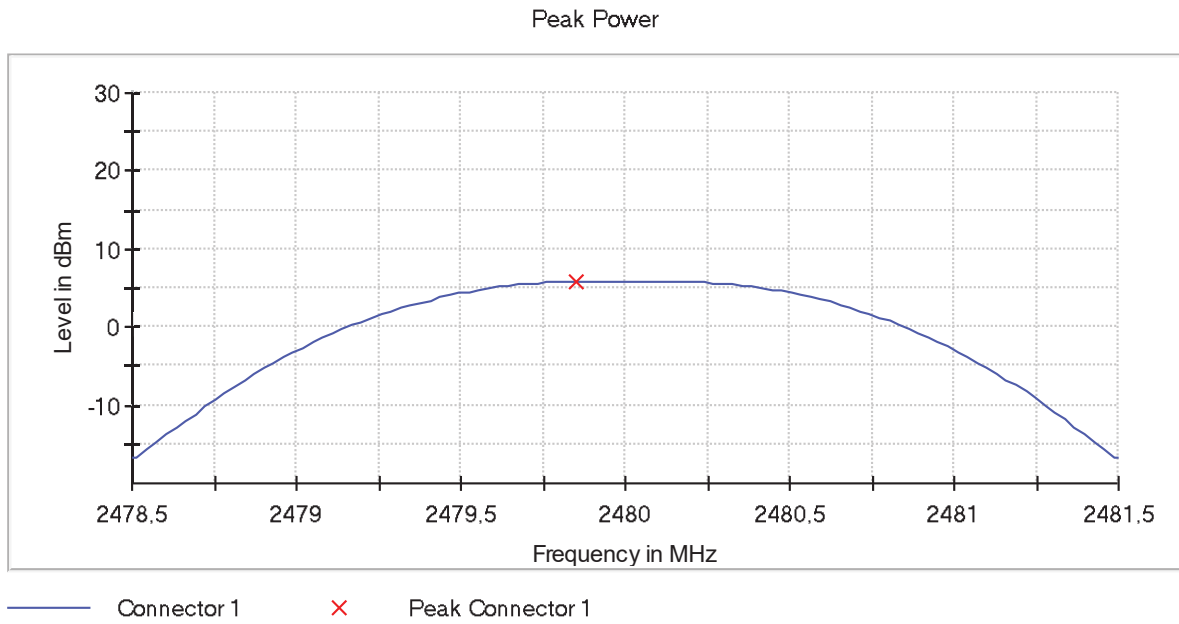
- Low Channel:



- Middle Channel:

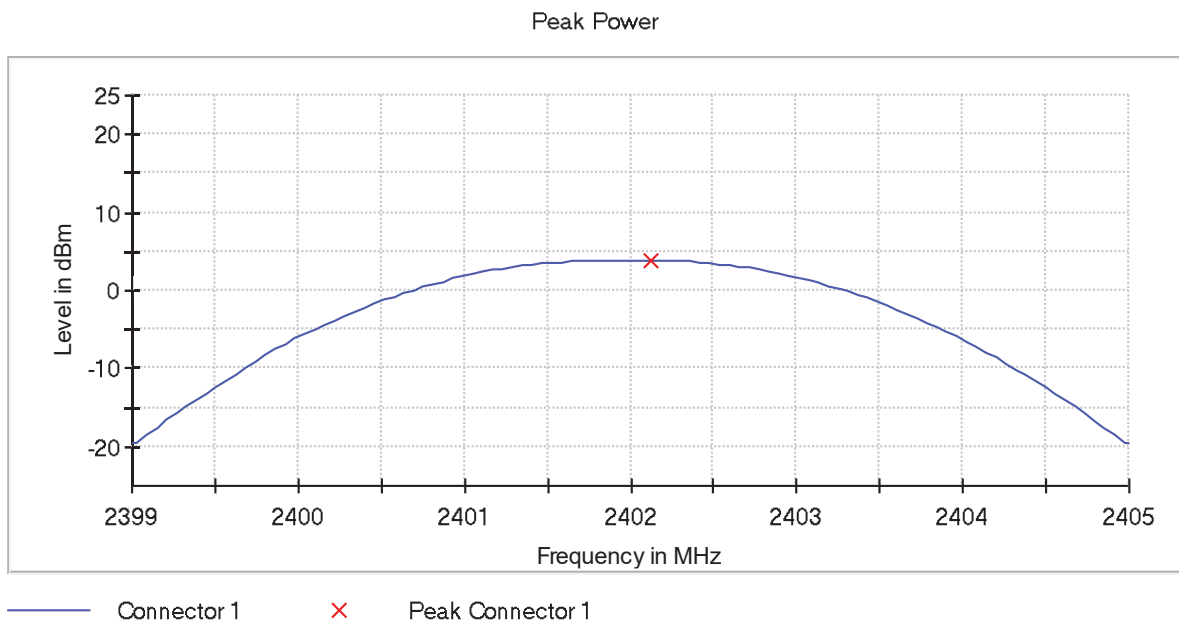


- High Channel:

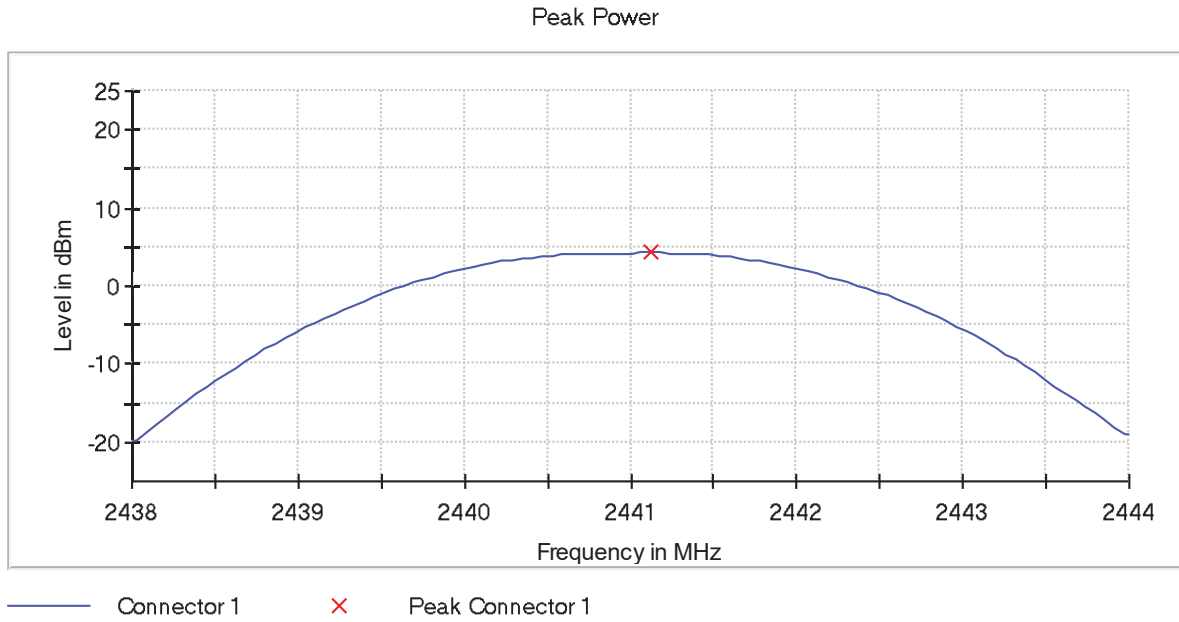


• Pi/4 DQPSK – Peak Output Power

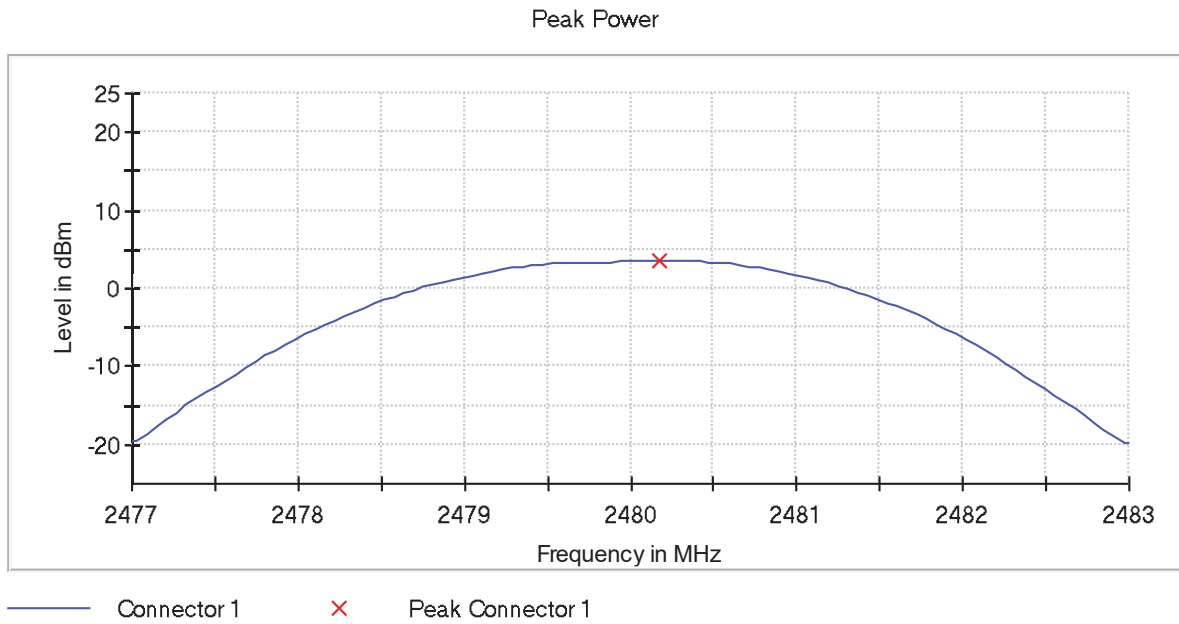
- Low Channel:



- Middle Channel:

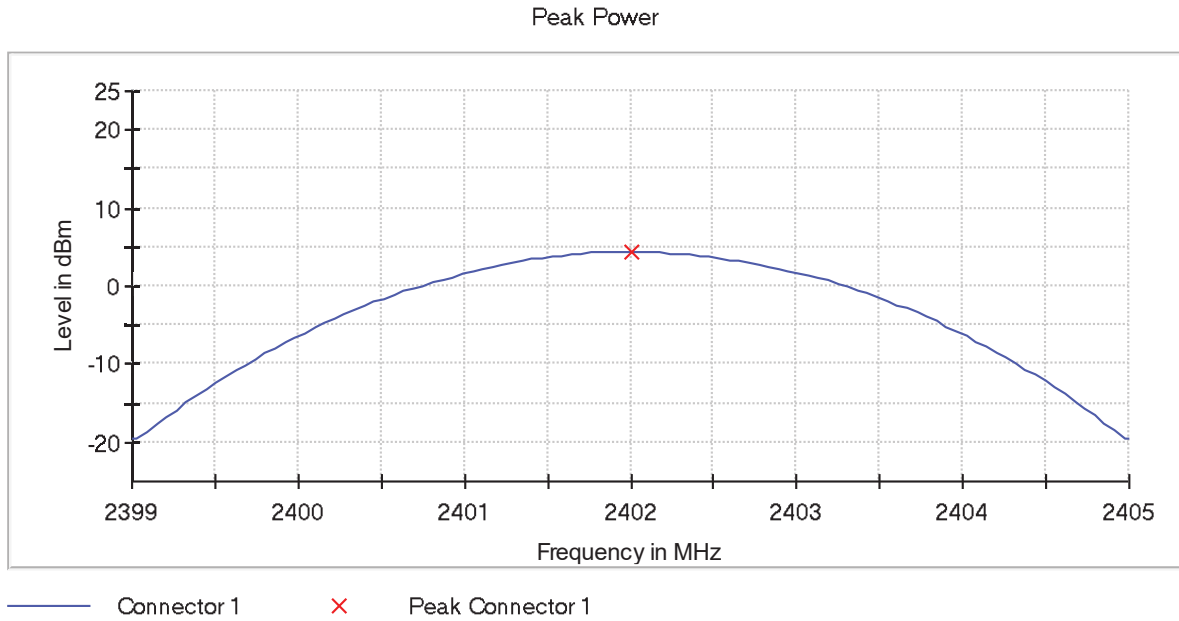


- High Channel:

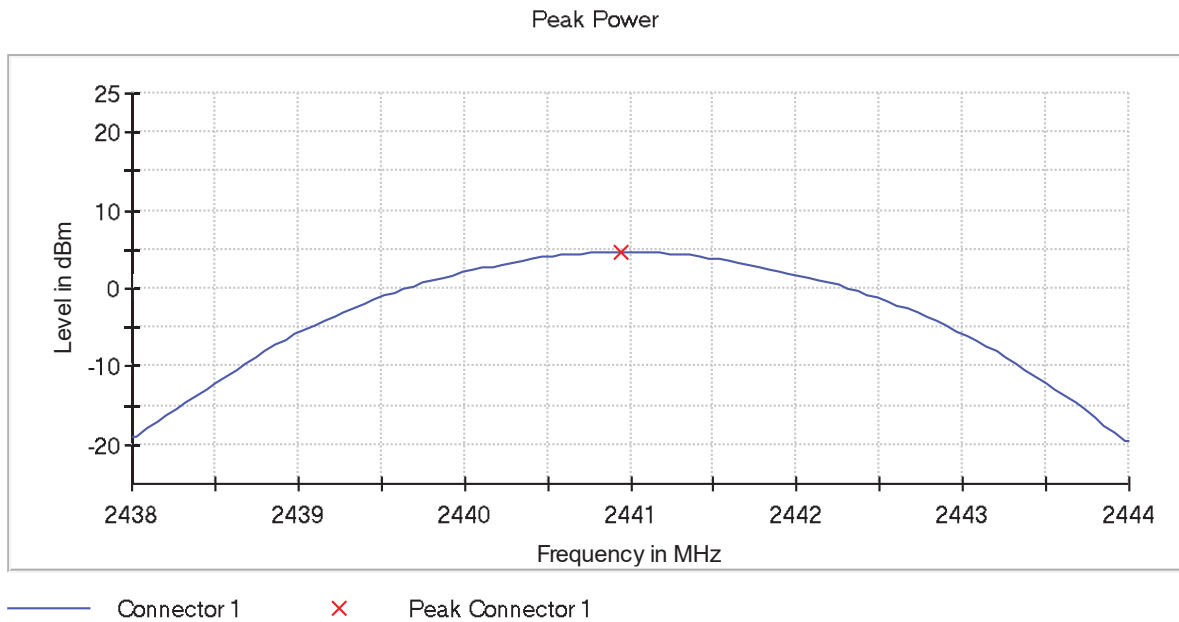


• 8DPSK – Peak Output Power

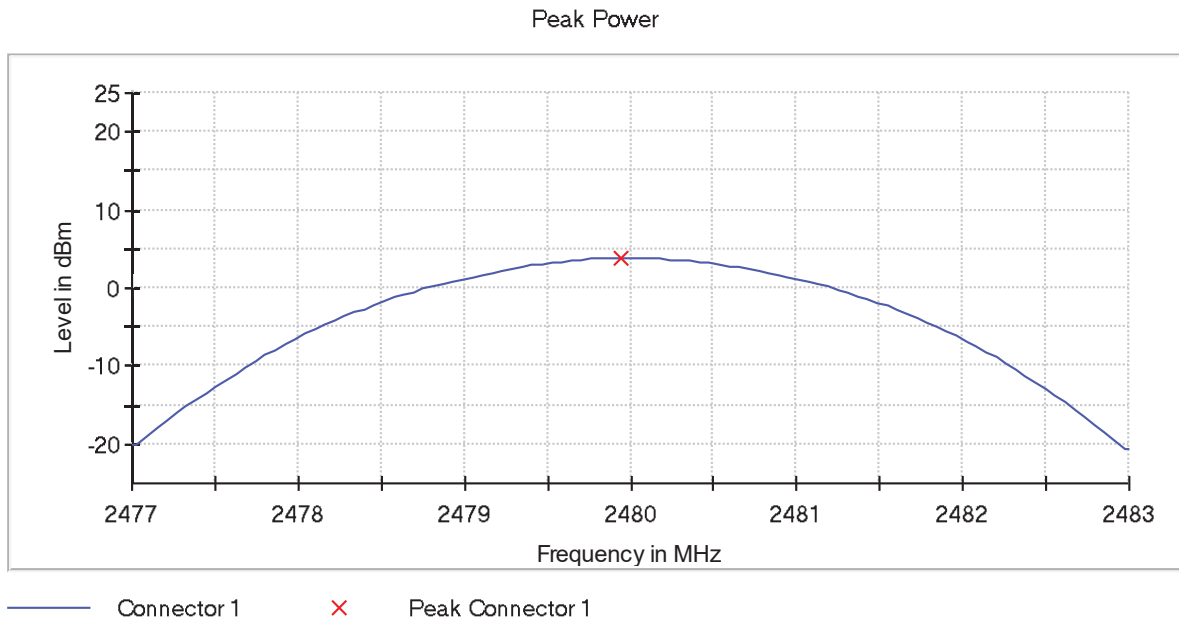
- Low Channel:



- Middle Channel:



- High Channel:



## FCC 15.247 (d) / RSS-247 5.5. Band-edge emissions compliance (Transmitter)

### SPECIFICATION:

Emissions outside the frequency band in which the intentional radiator is operating shall be at least 20 dB below the highest level of the desired power.

### RESULTS:

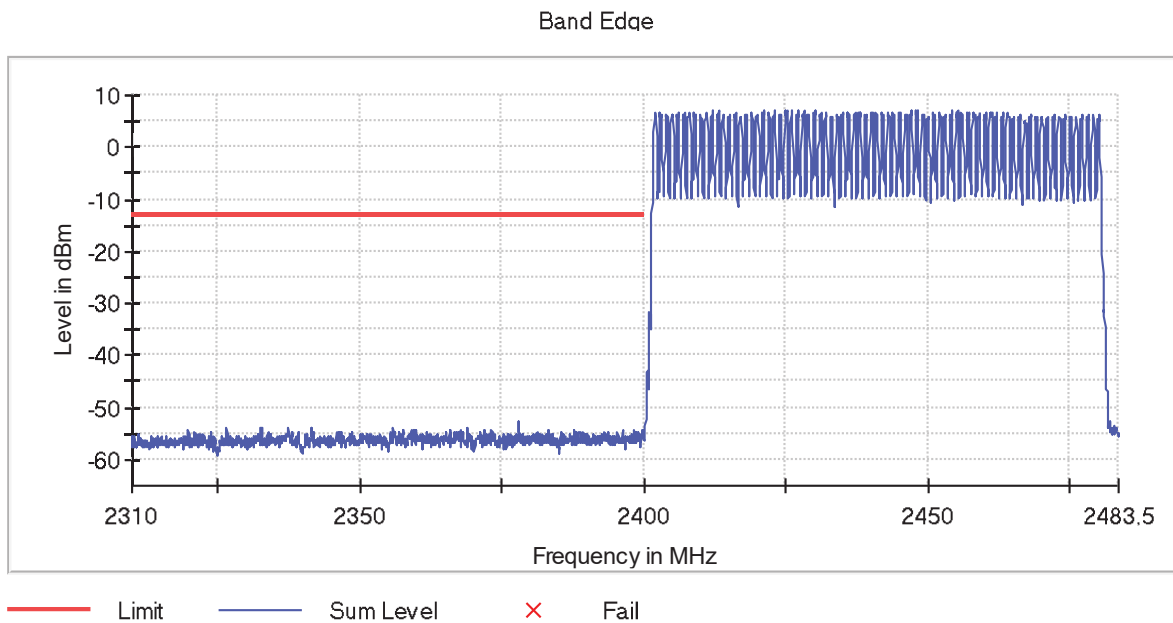
Radiated measurements were used to show compliance with the limits in the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Measurement uncertainty (dB)	<±1.53
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- **GFSK – Band-edge emissions compliance:**

- ❖ HOPPING ON:

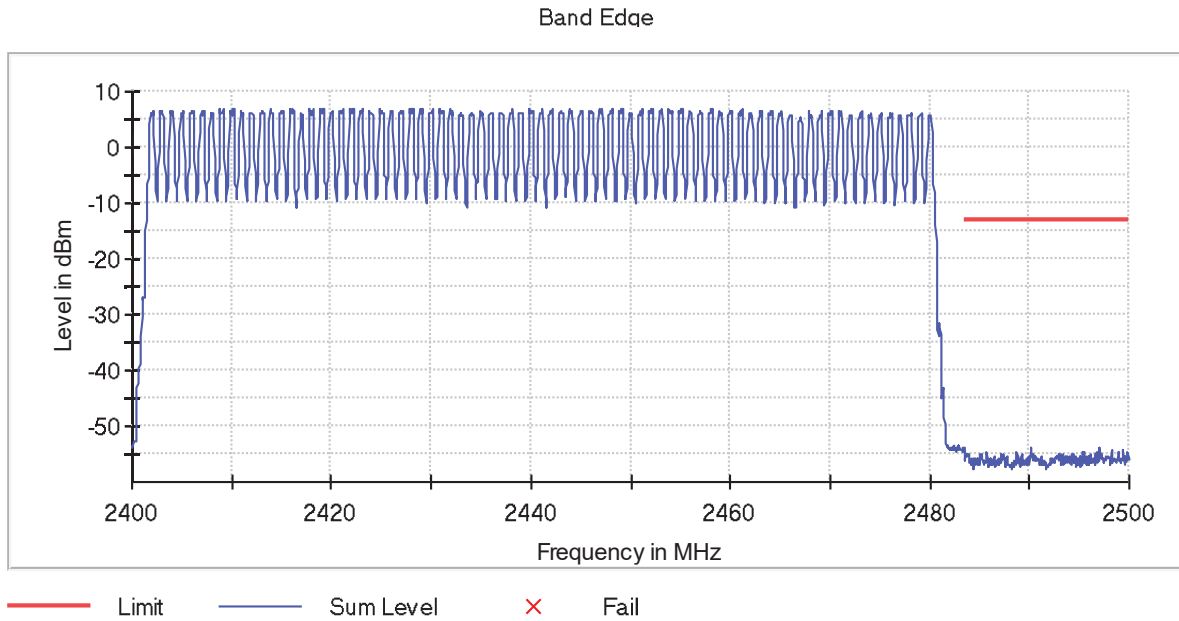
- Low Frequency Section 2402 MHz:



Verdict: PASS



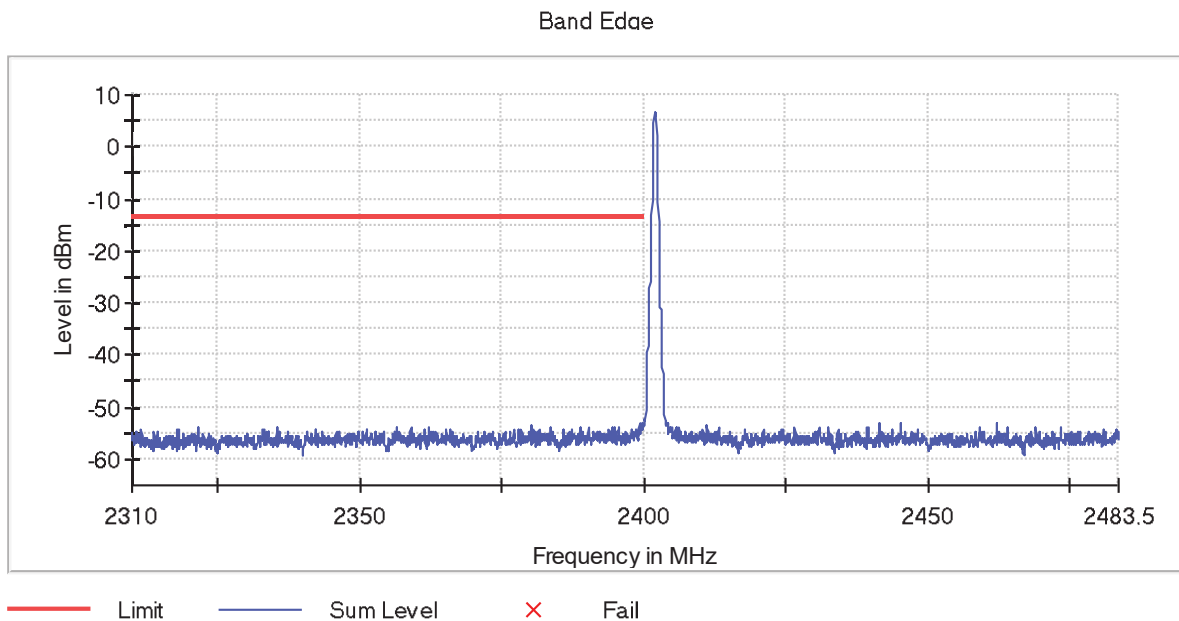
▪ High Frequency Section 2480 MHz:



Verdict: PASS

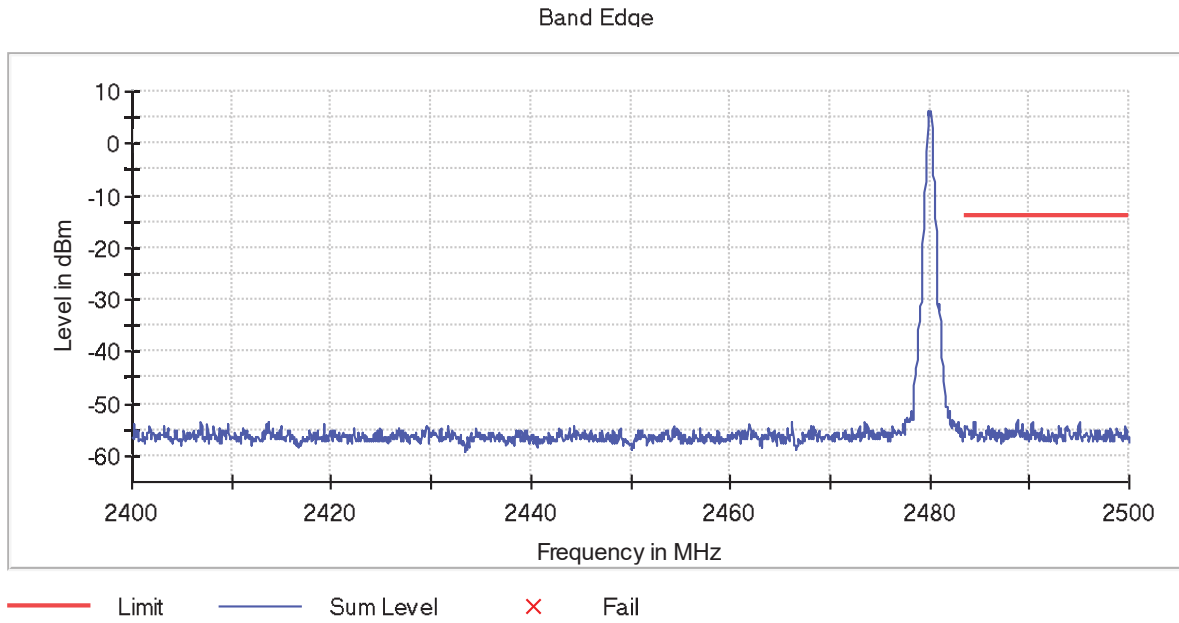
❖ HOPPING OFF:

▪ Low Frequency Section 2402 MHz:



Verdict: PASS

▪ High Frequency Section 2480 MHz:

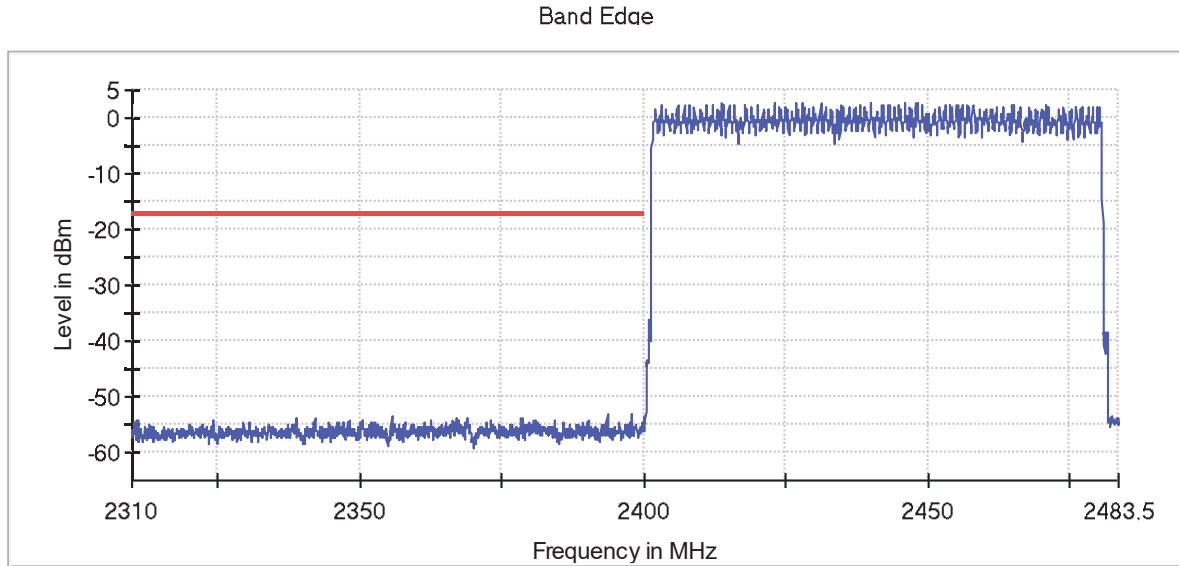


Verdict: PASS

• **Pi/4 DQPSK – Band-edge emissions compliance:**

❖ HOPPING ON:

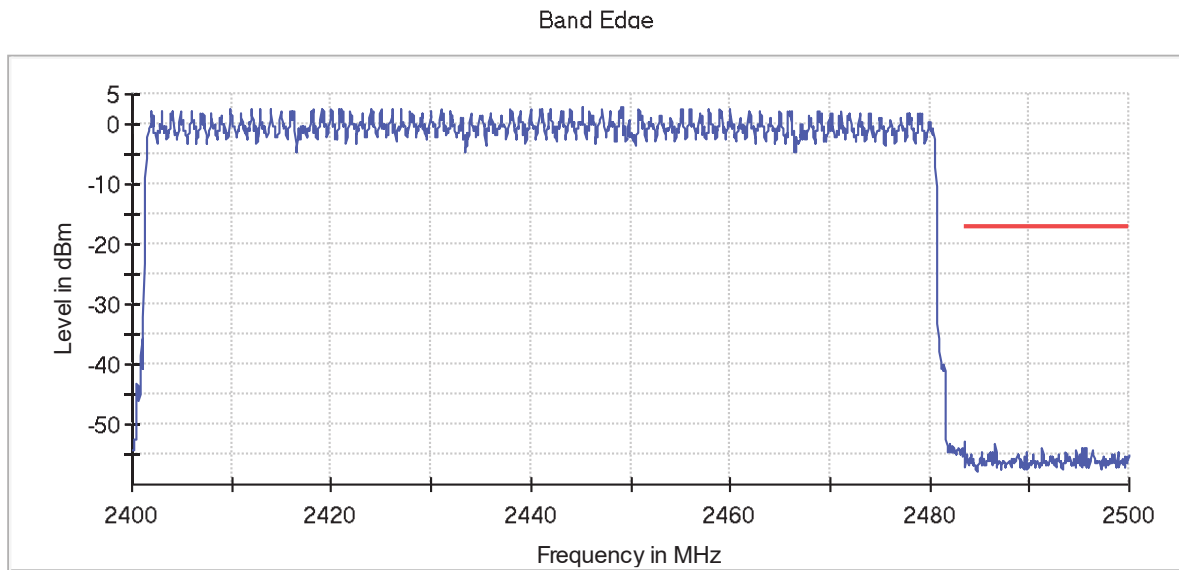
- Low Frequency Section 2402 MHz:



— Limit    — Sum Level    × Fail

Verdict: PASS

- High Frequency Section 2480 MHz:

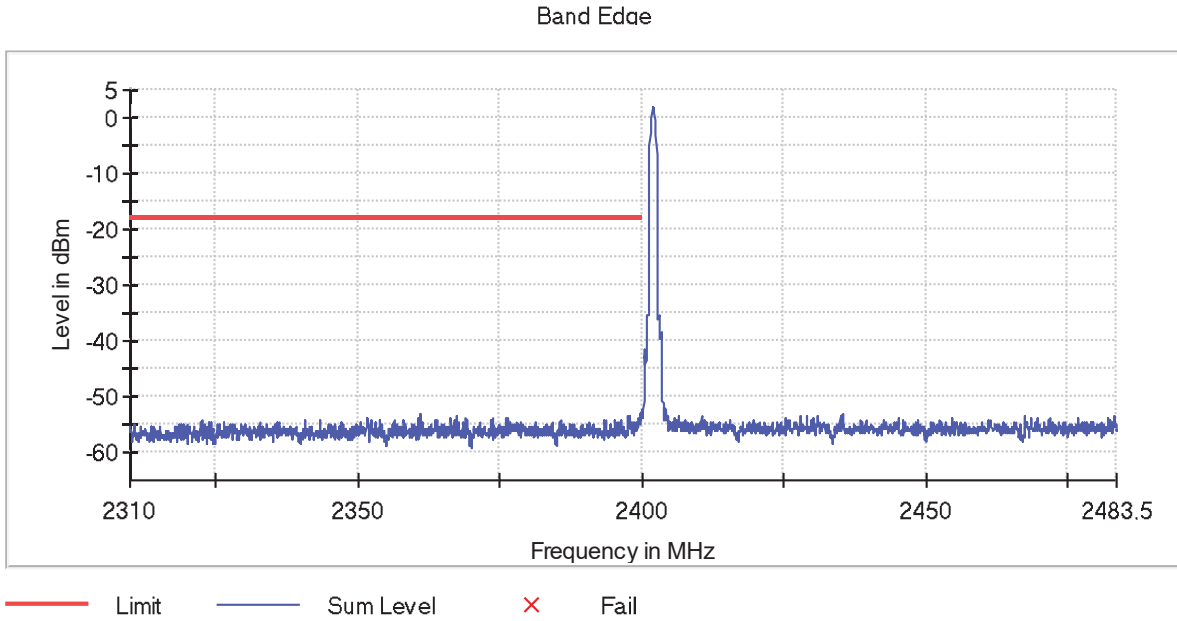


— Limit    — Sum Level    × Fail

Verdict: PASS

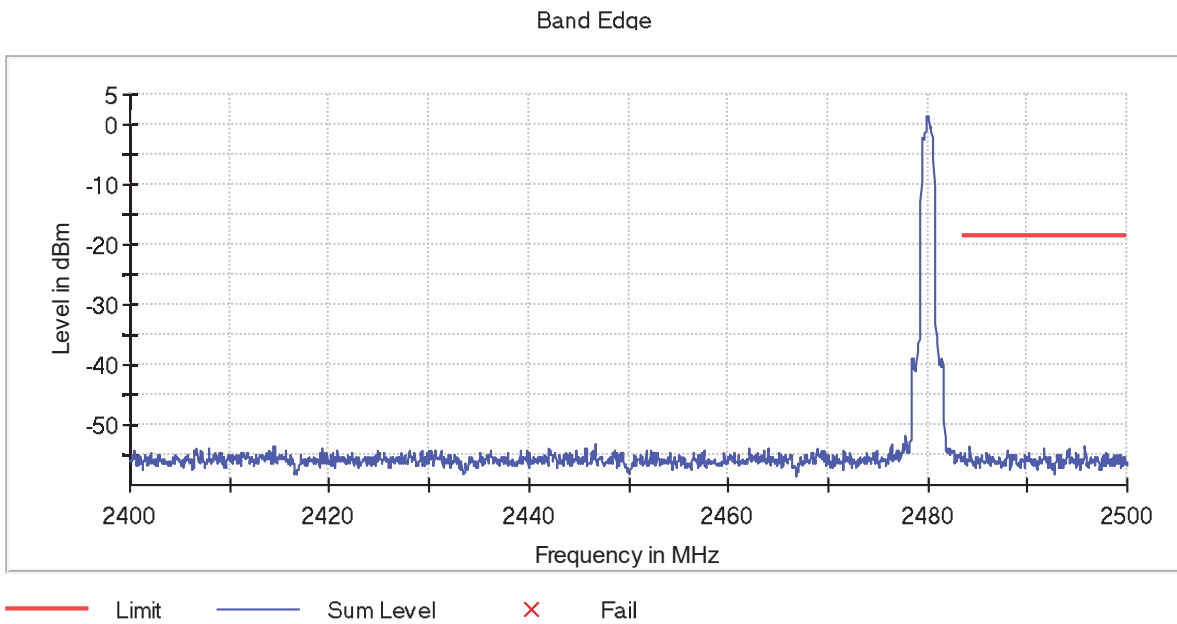
❖ HOPPING OFF:

- Low Frequency Section 2402 MHz:



Verdict: PASS

- High Frequency Section 2480 MHz:

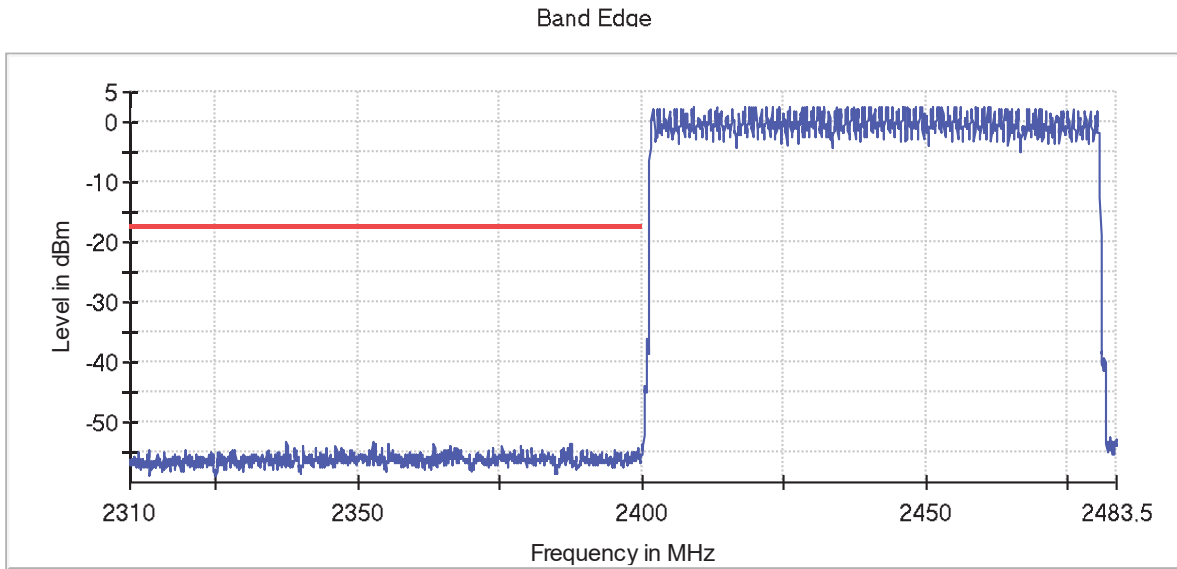


Verdict: PASS

• **8DPSK – Band-edge emissions compliance:**

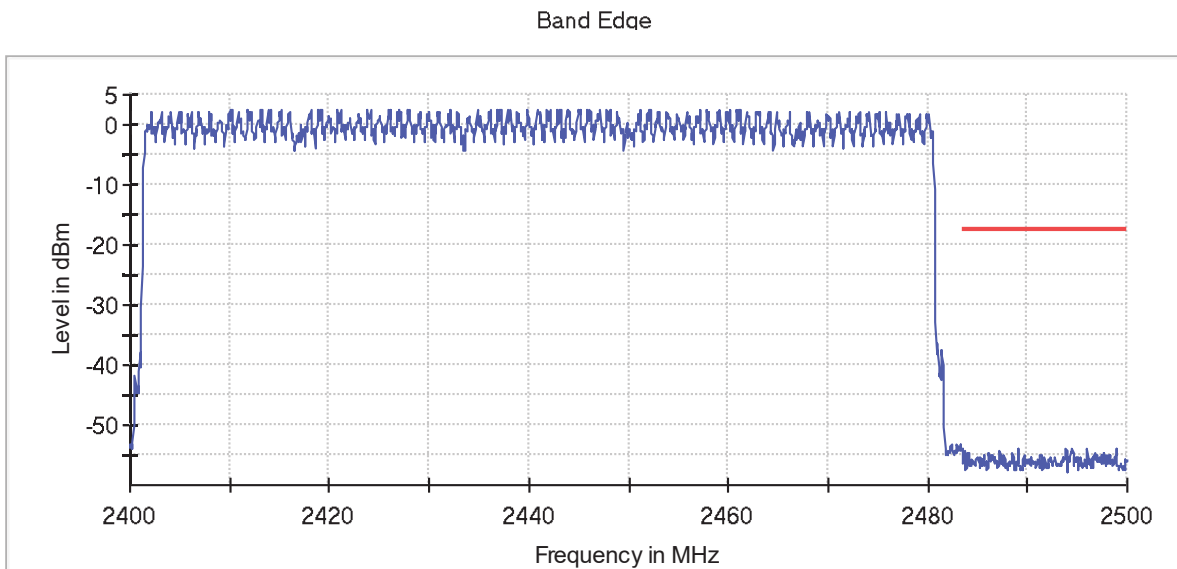
❖ **HOPPING ON:**

- **Low Frequency Section 2402 MHz:**



Verdict: PASS

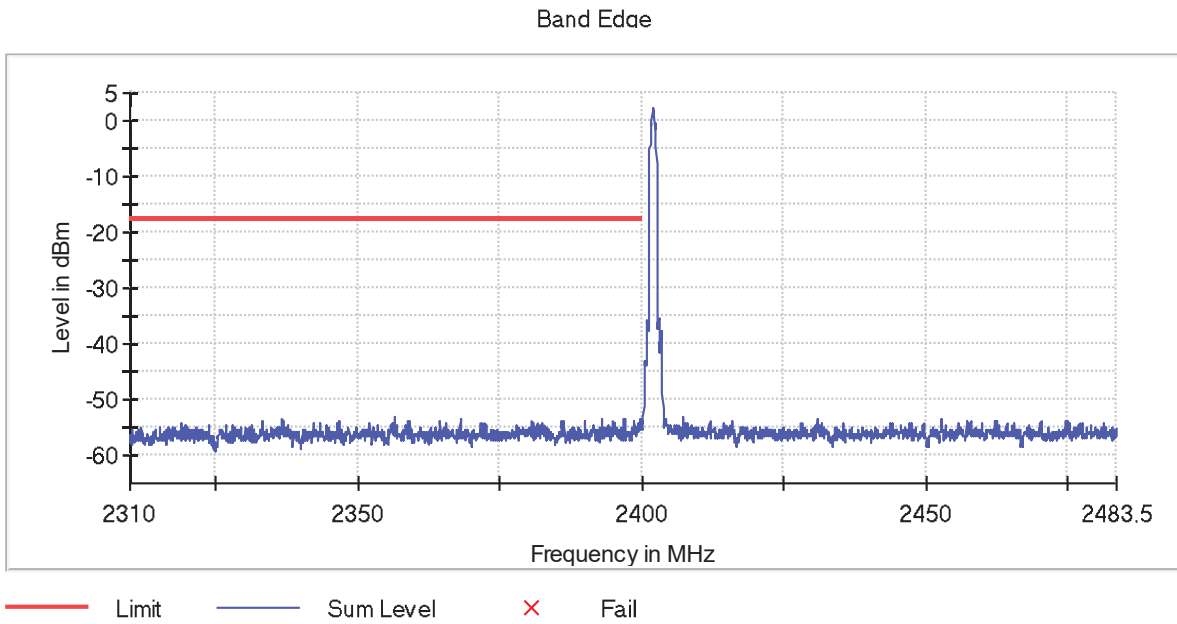
- **High Frequency Section 2480 MHz:**



Verdict: PASS

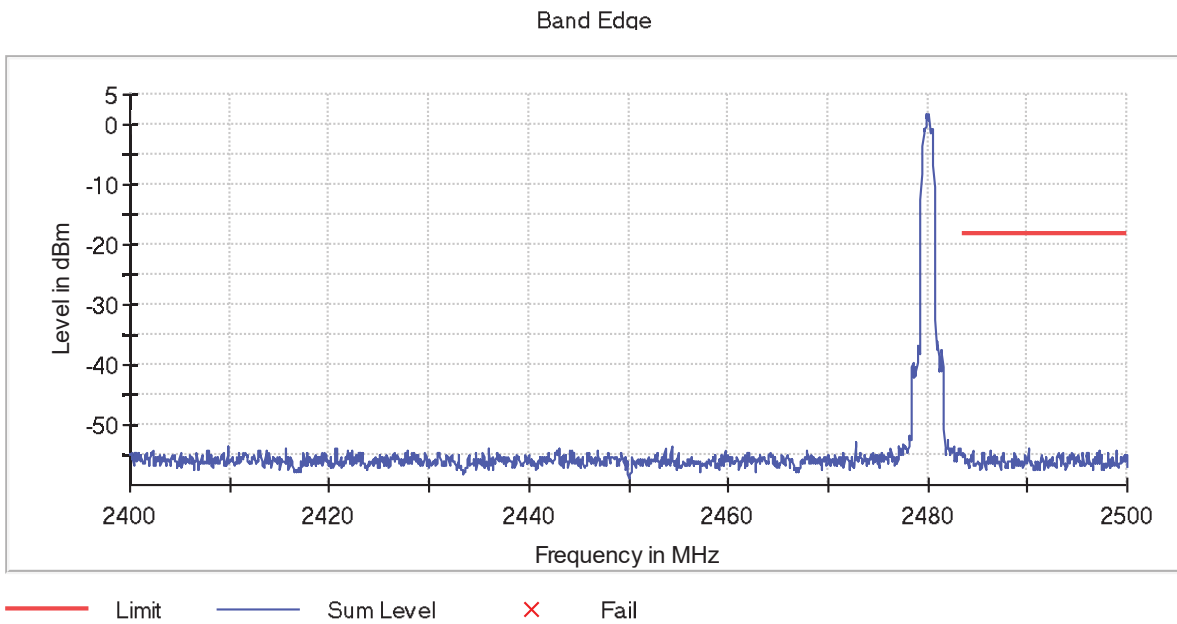
❖ HOPPING OFF:

- 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 ( $\mu\text{V}/\text{m}$ )	Field strength ( $\text{dB}\mu\text{V}/\text{m}$ )	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 1 m for the frequency range 17 GHz-26 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 at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level ( $\text{dB}\mu\text{V}/\text{m}$ )	Polarization	Detector	Measurement Uncertainty (dB)
688.1450	29.33	H	Quasi-peak	$<\pm 5.08$
786.4545	29.89	H	Quasi-peak	$<\pm 5.08$
884.7640	35.53	V	Quasi-peak	$<\pm 5.08$

**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 closest to the limit:

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.3740	46.10	V	Peak	<± 5.13

- MIDDLE CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.3740	46.17	V	Peak	<± 5.13

- HIGH CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.3740	46.19	V	Peak	<± 5.13

Measurement Uncertainty (dB): 1 GHz ≤ f ≤ 3 GHz: <± 4.11  
 3 GHz < f ≤ 17 GHz: <± 5.13  
 17 GHz < f ≤ 26 GHz: <± 4.81

Verdict: PASS



• **Pi/4-DQPSK modulation (2-DH5):**

- LOW CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.3740	43.83	H	Peak	<± 5.13

- MIDDLE CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.3740	43.79	H	Peak	<± 5.13

- HIGH CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.3740	43.79	H	Peak	<± 5.13

Measurement Uncertainty (dB): 1 GHz ≤ f ≤ 3 GHz: <± 4.11  
 3 GHz < f ≤ 17 GHz: <± 5.13  
 17 GHz < f ≤ 26 GHz: <± 4.81

Verdict: PASS

• **8-DPSK modulation (3-DH5):**

- LOW CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB $\mu$ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.3740	43.78	H	Peak	< $\pm$ 5.13

- MIDDLE CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB $\mu$ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.3740	44.02	H	Peak	< $\pm$ 5.13

- HIGH CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB $\mu$ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.3740	43.93	H	Peak	< $\pm$ 5.13

Measurement Uncertainty (dB): 1 GHz  $\leq$  f  $\leq$  3 GHz: < $\pm$  4.11  
 3 GHz < f  $\leq$  17 GHz: < $\pm$  5.13  
 17 GHz < f  $\leq$  26 GHz: < $\pm$  4.81

Verdict: PASS