

Test report No:
NIE: 66084RRF.018A1

Test Report

USA FCC Part 15.247, 15.209

CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Automotive infotainment System
(*) Trademark	Mercedes-Benz
(*) Model and /or type reference	NTG6N HIGH
Other identification of the product	HW version: D9 SW version: E870 FCC ID: T8GNTG6NH1 IC: 6434A-NTG6NH1
(*) Features	FM, AM, DAB, TV, USB, UFS, 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)	José Carlos Luque RF Lab. Supervisor 
Date of issue	2021-04-26
Report template No	FDT08_23 (*) "Data provided by the client"

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Appendix B: Test results. 802.11 bgn20 1x172

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.

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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.

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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.
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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 the model NTG6N HIGH is an Automotive head unit to be installed in cars with the following features: FM, AM, DAB, TV, USB, UFS, Bluetooth, WLAN, 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/019	Automotive infotainment System	NTG6N HIGH	HBM249L4974002	2020/12/23
56848G/050	Harness	--	--	2019/01/11

Auxiliary elements used with the Sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
56848G/014	Ethernet Cable	--	--	2019/01/08
56848G/144	HMI-CAN Box	--	H0034731	2019/01/11

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

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

Control N°	Description	Model	Serial N°	Date of reception
66084B/017	Automotive infotainment System	NTG6N HIGH	HBM249L974004	2020/12/23
56848G/050	Harness	--	--	2019/01/11

Auxiliary elements used with the Sample S/02:

Control N°	Description	Model	Serial N°	Date of reception
56848G/014	Ethernet Cable	--	--	2019/01/08
56848G/144	HMI-CAN Box	--	H0034731	2019/01/11

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

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)	☒	☒	☐	
GPS Antenna	>3m ^(x1)	☒	☒	☐			
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
	☐ 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	FCC ID: T8GNTG6NH1 / IC: 6434A-NTG6NH1						
Software version	E412.007						
Hardware version	D4 / Serial Product						
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		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						

⁽³⁾ 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)	2021-01-11
Date (finish)	2021-03-17

Document history

Report number	Date	Description
66084RRF.018	2021-04-13	First release.
66084RRF.018A1	2021-04-26	Second release. This report is modified due to FCC ID/IC update. This modification test report cancels and replaces the test report 66084RRF.018.

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 %

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: Verónica García, José Manuel Jiménez, Miguel Ángel Torres.

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.	Vector Signal Generator 8 kHz - 6 GHz ROHDE AND SCHWARZ SMBV100B	2019/10	2021/10
4.	Signal and Spectrum Analyzer 10 Hz - 40 GHz ROHDE AND SCHWARZ FSV40	2019/09	2021/09
5.	Wireless Connectivity Tester BW 160 MHz ROHDE AND SCHWARZ CMW270	2020/11	2021/11
6.	Open Switch Unit ROHDE AND SCHWARZ OSP120	2019/10	2021/10
7.	Open Switch Unit up to 18 GHz ROHDE AND SCHWARZ OSP 150	2019/09	2021/09
8.	DC Power Supply 40V/40A Rohde & Schwarz NGPE40	2018/03	2021/03
9.	Digital Multimeter FLUKE 179	2020/10	2021/10

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 Preamplifier 40 dB, 10 MHz - 6 GHz BONN ELEKTRONIK BLNA 0160-01N	2020/10	2021/10
5.	EMI Test Receiver 20Hz-40GHz ROHDE AND SCHWARZ ESU40	2019/09	2021/09
6.	DC Power Supply 150V/22A, AGILENT TECHNOLOGIES N8740A	N.A.	N.A.
7.	Digital Multimeter FLUKE 175	2020/11	2021/11
8.	Horn Antenna 1-18GHz SCHWARZBECK MESS- ELEKTRONIK BBHA 9120 D	2018/06	2021/06
9.	Horn Antenna 18 - 40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2018/07	2021/07
10.	Preamplifier, G>55dB 1-18GHz NARDA AMF-7D-01001800-22-10P	2020/05	2021/05
11.	Low Noise Amplifier G>30dB, 18 - 40 GHz BONN ELEKTRONIK BLMA 1840-1M	2019/02	2021/02

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	
Supplementary information and remarks: None.			

2. 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	
Supplementary information and remarks: None.			

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

TEST CONDITIONS	11
FCC 15.247 (a) (1) / RSS-247 5.1. (b) 20 dB Bandwidth and Carrier frequency separation	14
FCC 15.247 (a)(1)(iii) / RSS-247 5.1 (d) Number of hopping channels	27
FCC 15.247 (a)(1)(iii) / RSS-247 5.1 (d) Time of occupancy (Dwell Time)	30
FCC 15.247 (b) / RSS-247 5.4 (b) Maximum peak output power and antenna gain	33
FCC 15.247 (d) / RSS-247 5.5. Band-edge emissions compliance (Transmitter)	39
FCC 15.247 (d) / RSS-247 5.5. Emission limitations radiated. (Transmitter)	46

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 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 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).

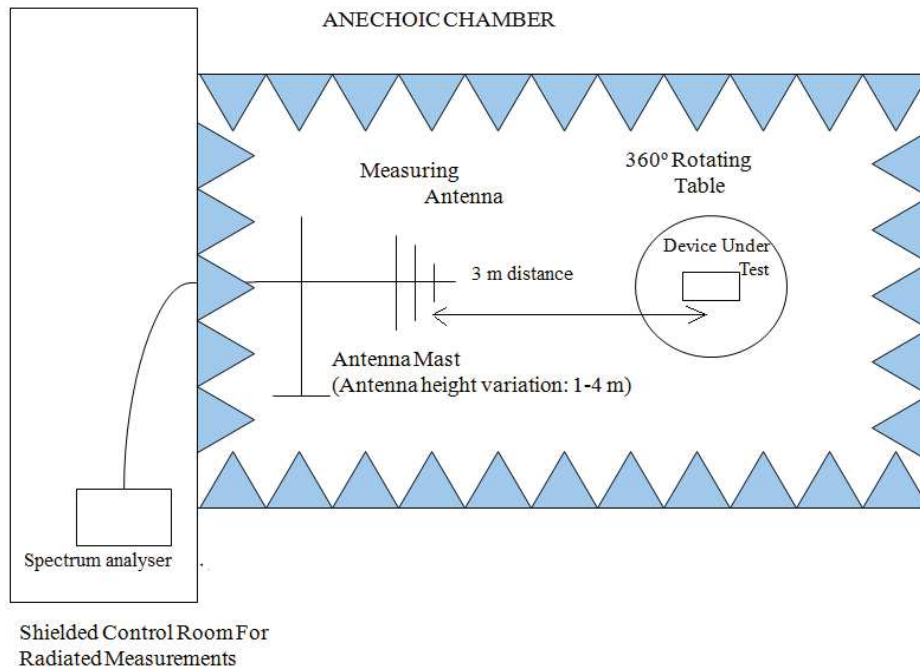
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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.

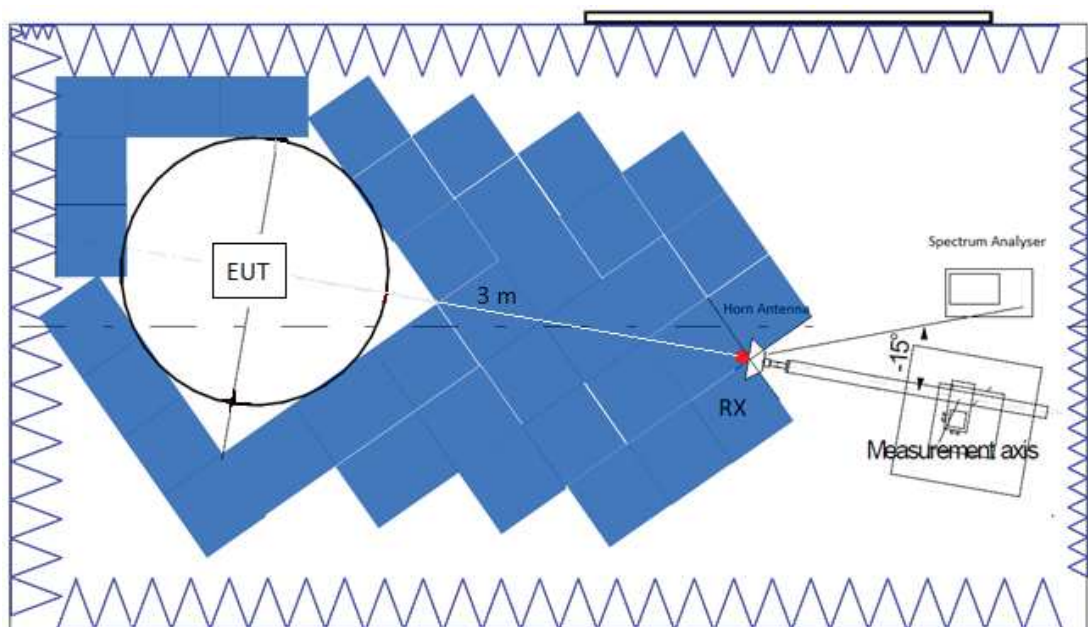
Measurements were made in both horizontal and vertical planes of polarization.

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.

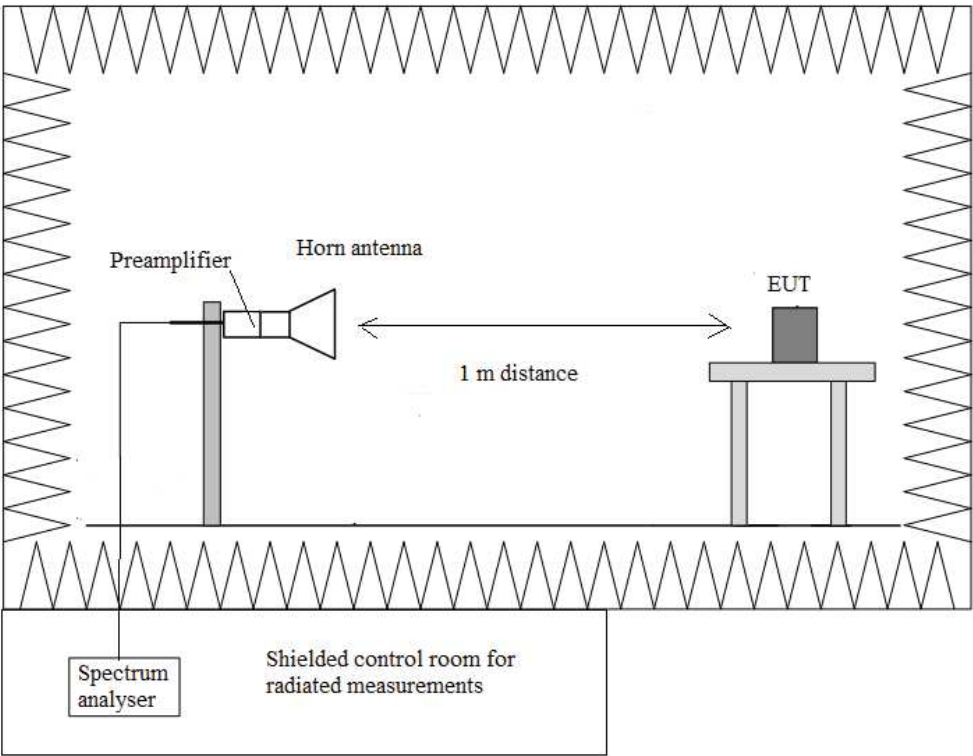
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17\text{ GHz}$:



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)	0.930000	0.930000	0.930000
99% Bandwidth (MHz)	0.870000	0.870000	0.870000
Measurement uncertainty (%)	<±1.24		

- Pi/4 DQPSK:**

	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
20 dB Spectrum Bandwidth (MHz)	1.345000	1.340000	1.340000
99% Bandwidth (MHz)	1.205000	1.210000	1.210000
Measurement uncertainty (%)	<±1.24		

- 8DPSK:**

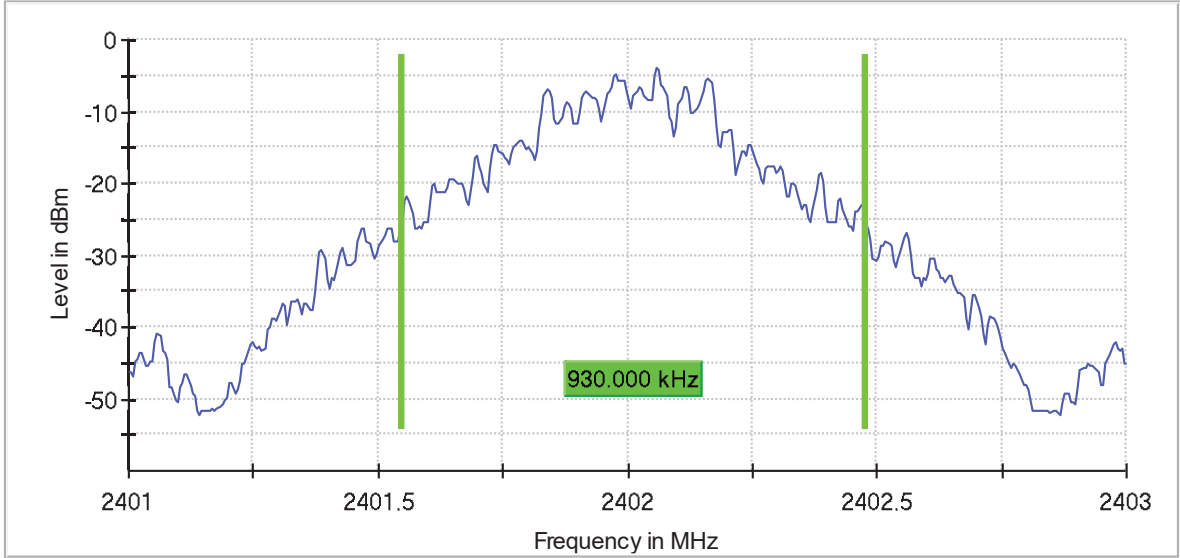
	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
20 dB Spectrum Bandwidth (MHz)	1.350000	1.350000	1.350000
99% Bandwidth (MHz)	1.215000	1.215000	1.215000
Measurement uncertainty (%)	<±1.24		

Verdict: PASS

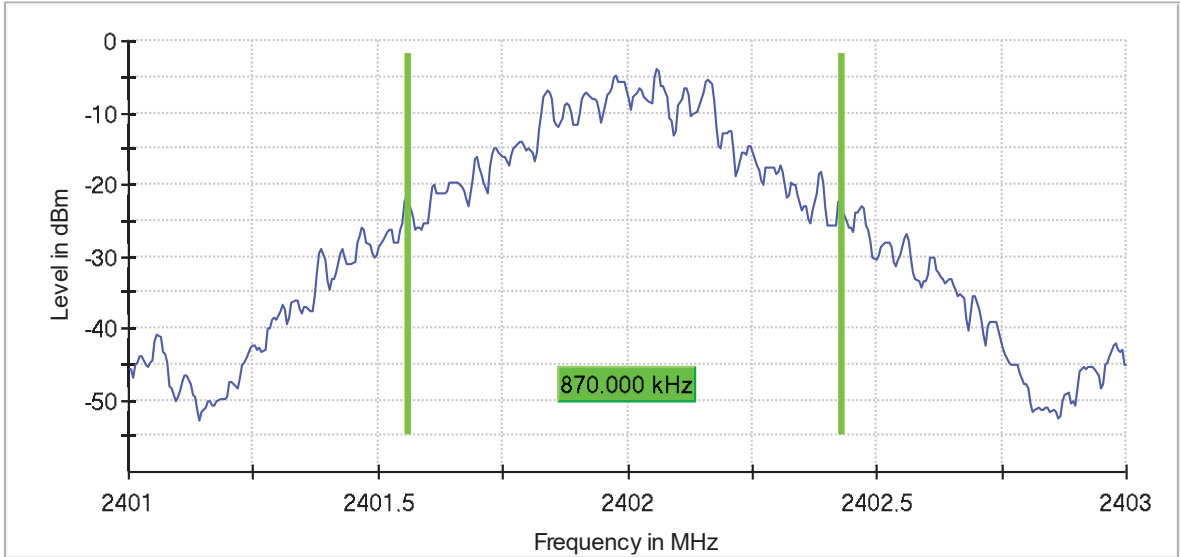
GFSK – Bandwidths

- Low Channel:

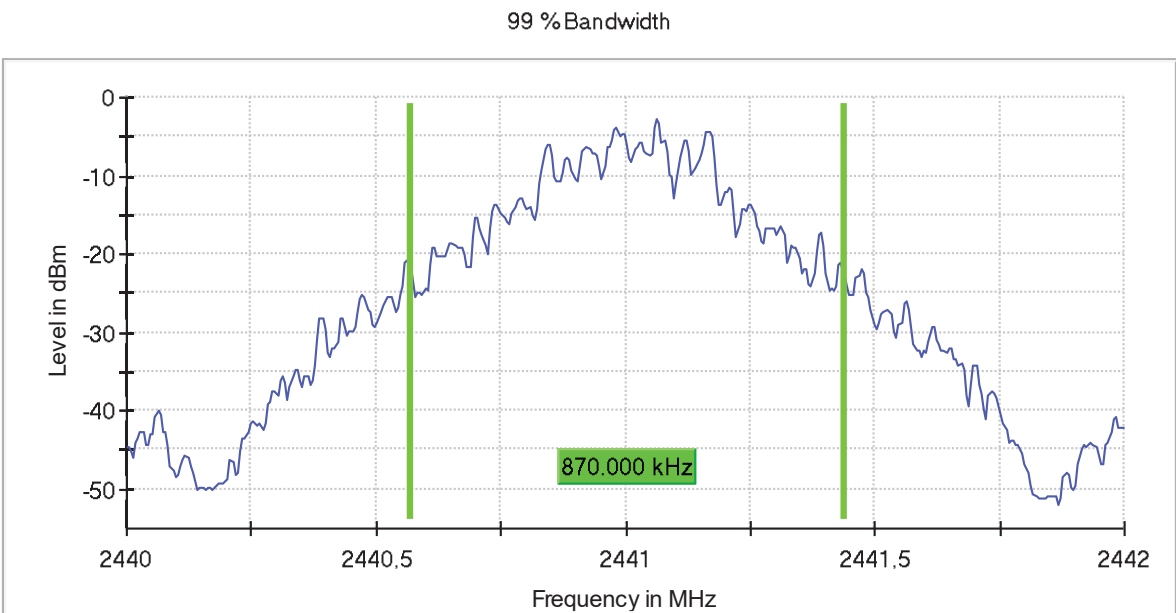
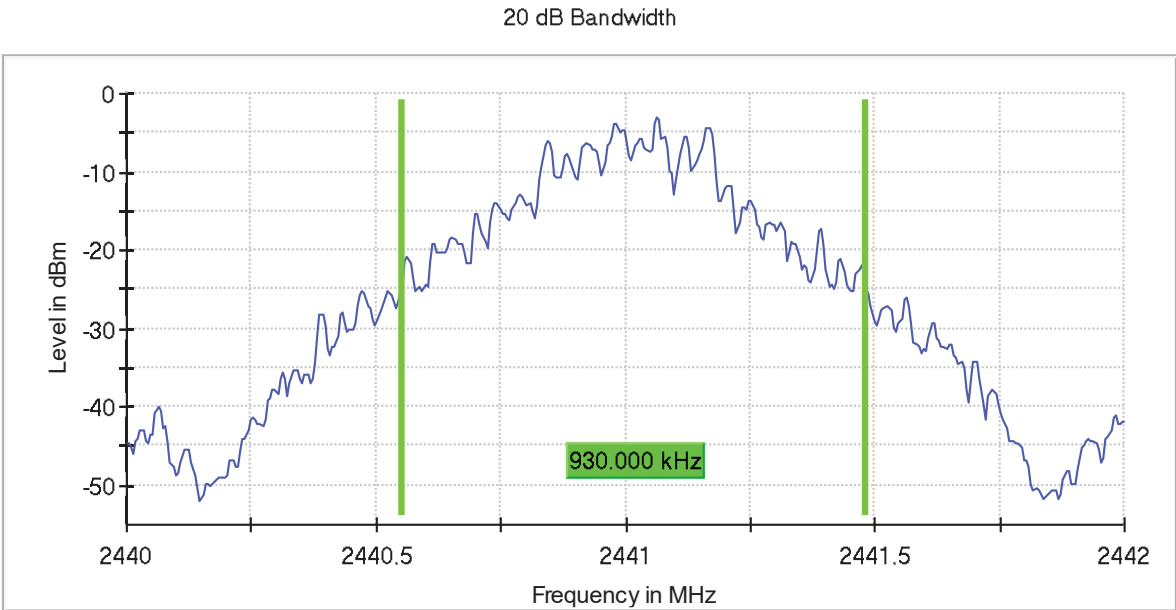
20 dB Bandwidth



99 % Bandwidth

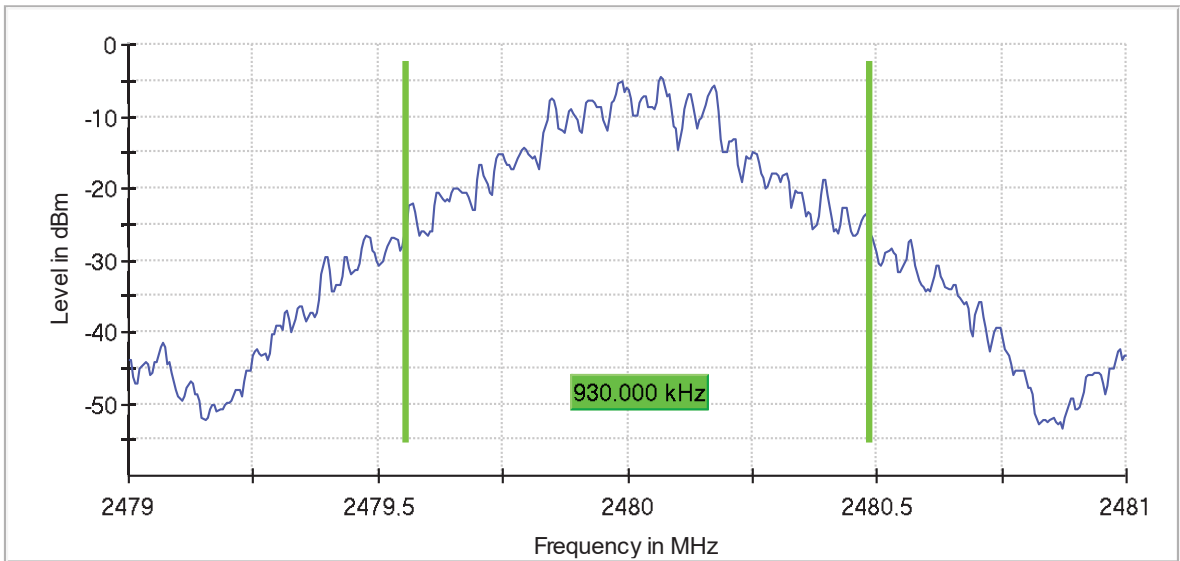


- Middle Channel:

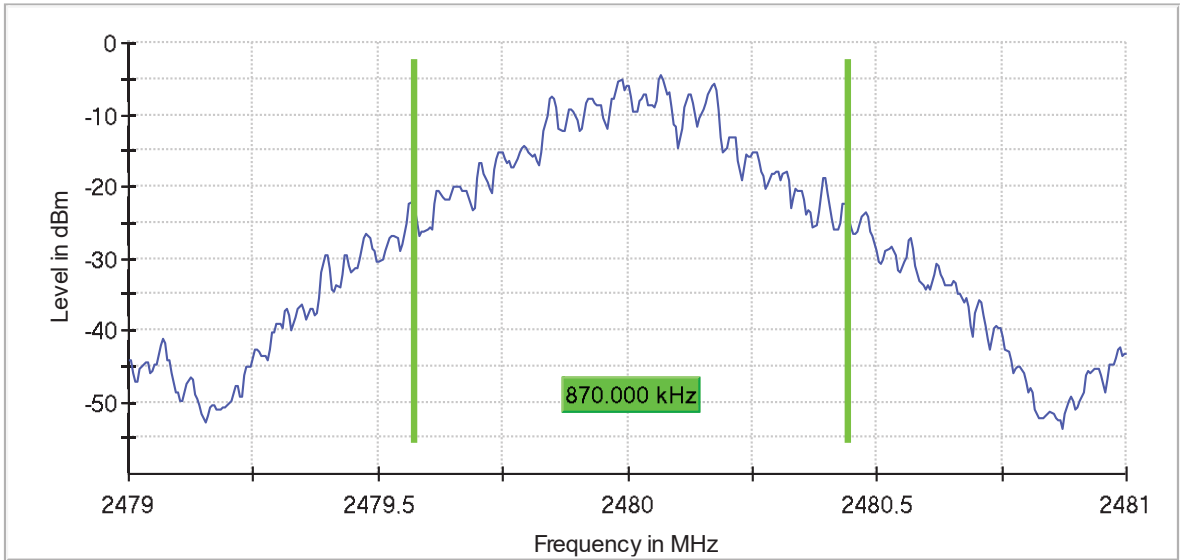


- High Channel:

20 dB Bandwidth



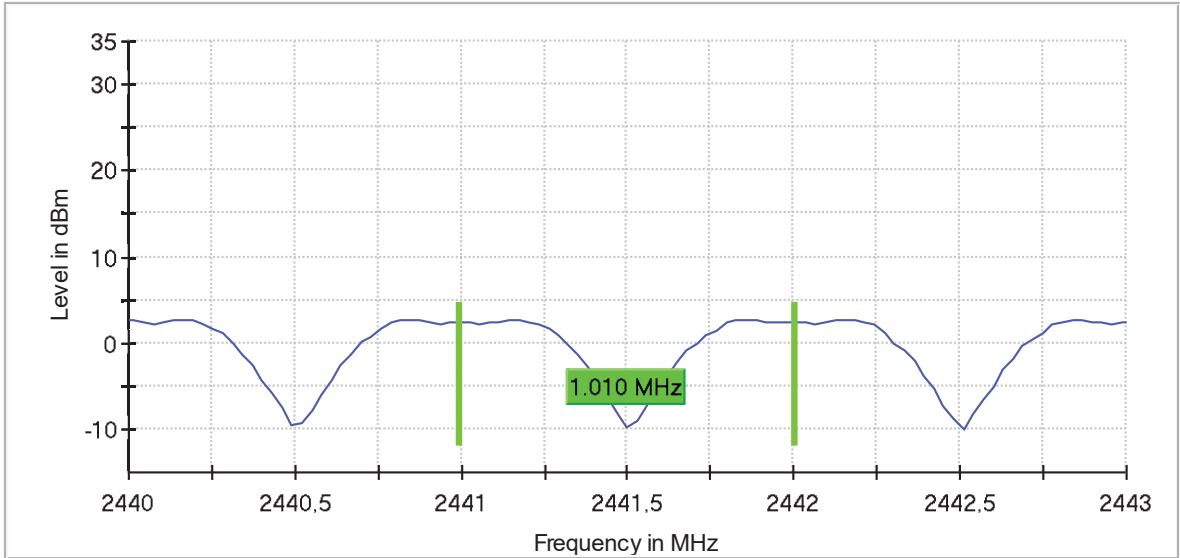
99 % Bandwidth



Carrier frequency separation - GFSK

Carrier frequency separation: 1.009900 MHz

CFS



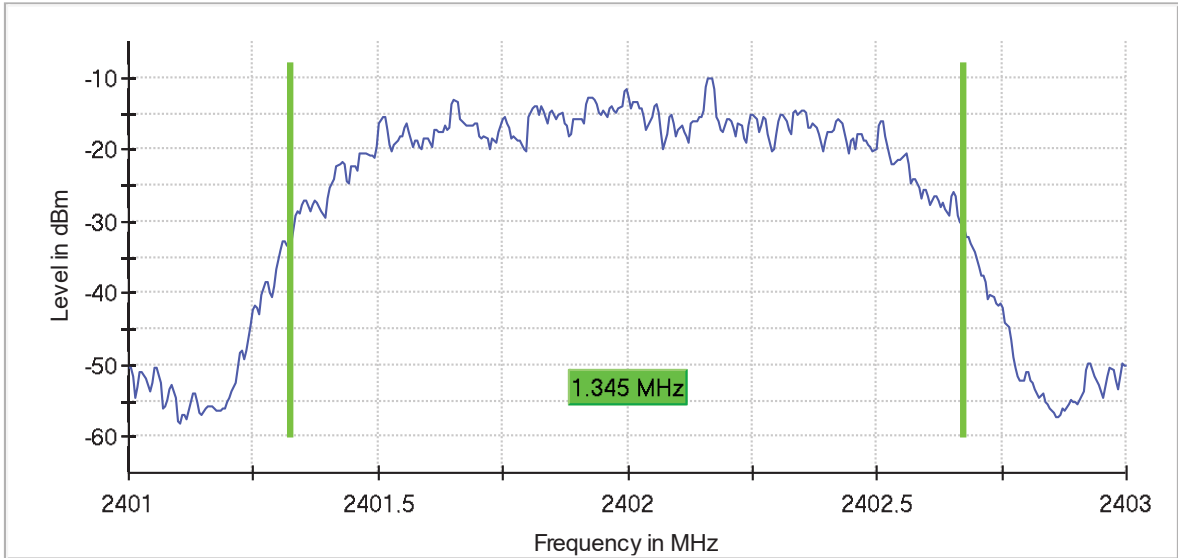
The hopping channel carrier frequencies are separated by a minimum two-thirds of the 20 dB bandwidth of the hopping channel.

Verdict: PASS

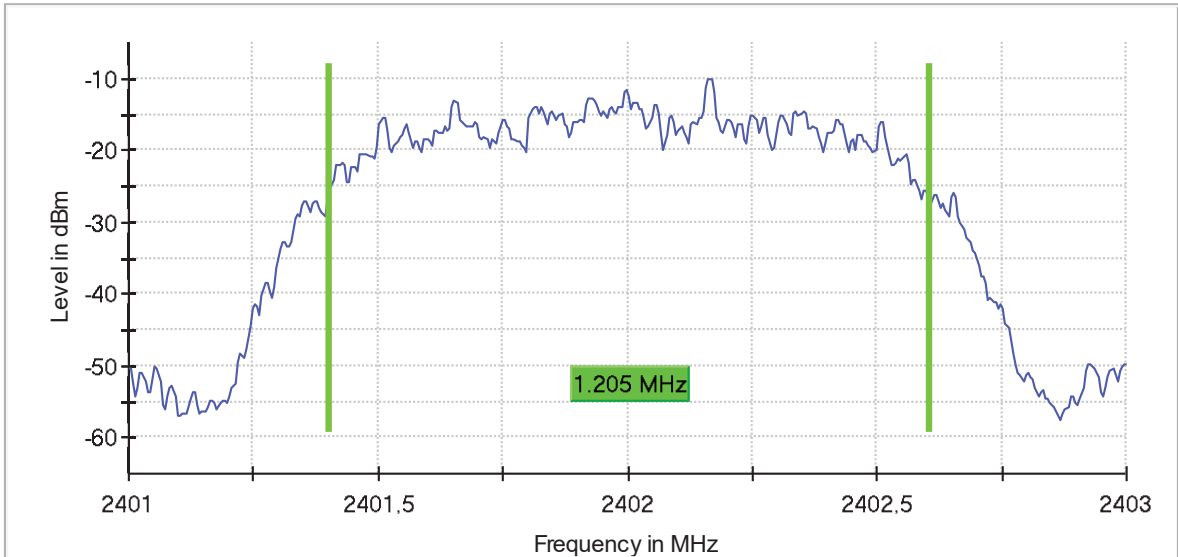
• **PI/4 DQPSK – Bandwidths**

- Low Channel:

20 dB Bandwidth

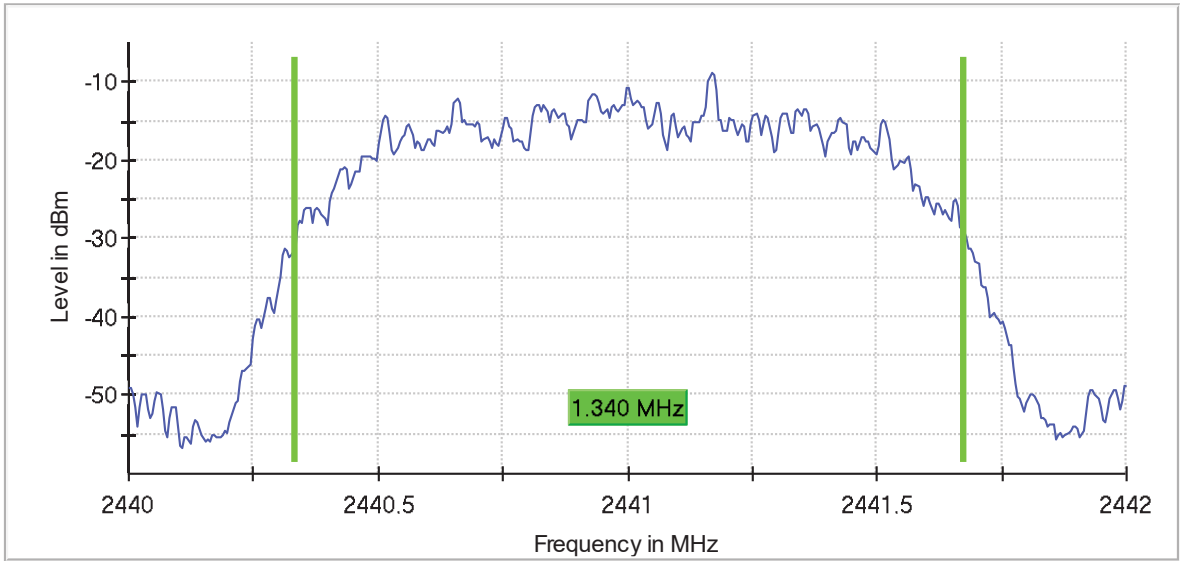


99 % Bandwidth

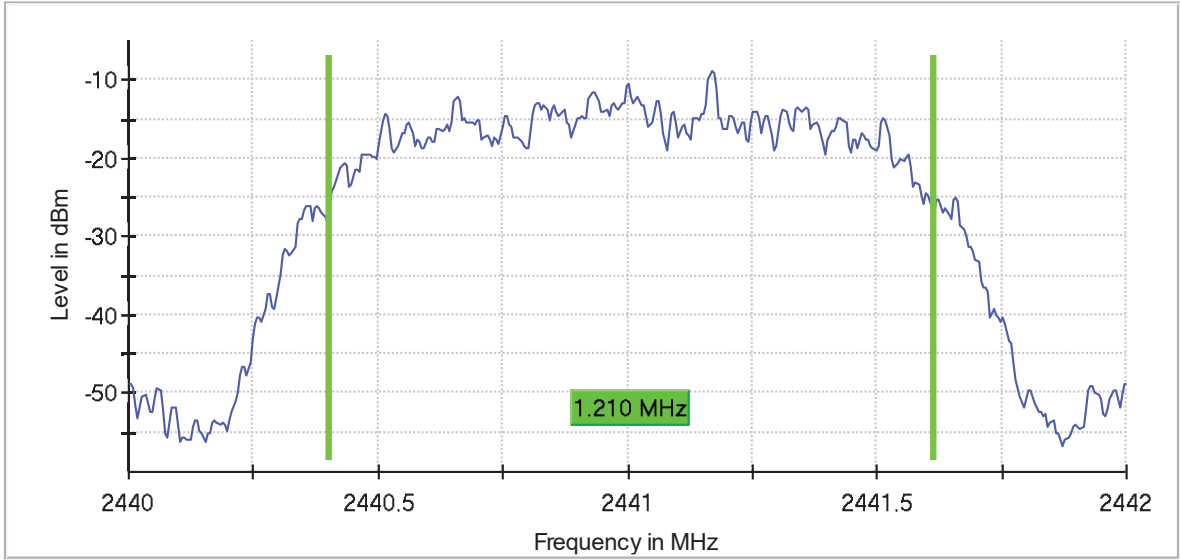


- Middle Channel:

20 dB Bandwidth

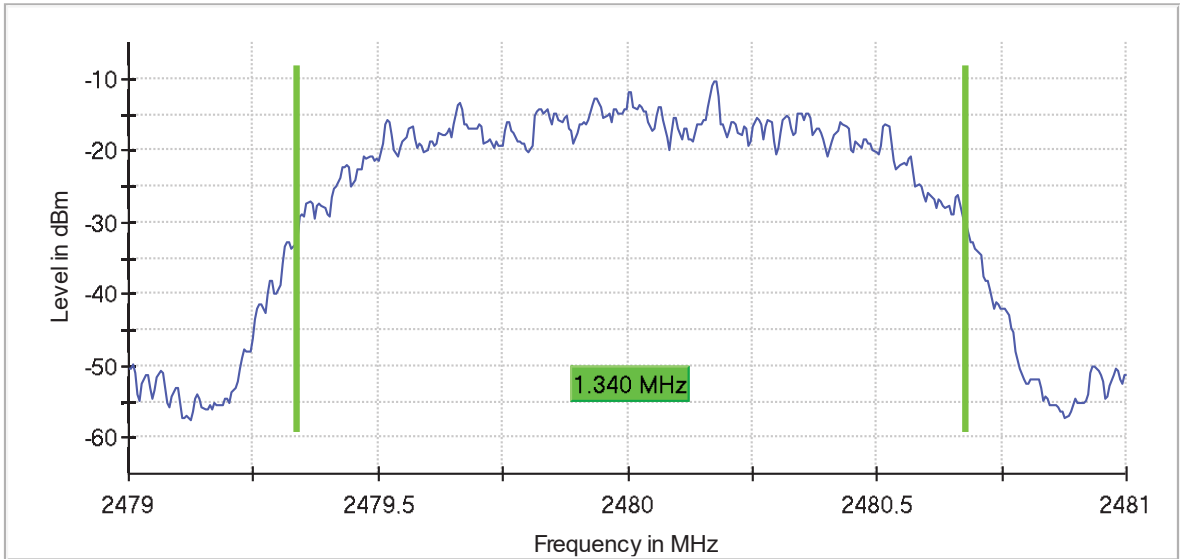


99 % Bandwidth

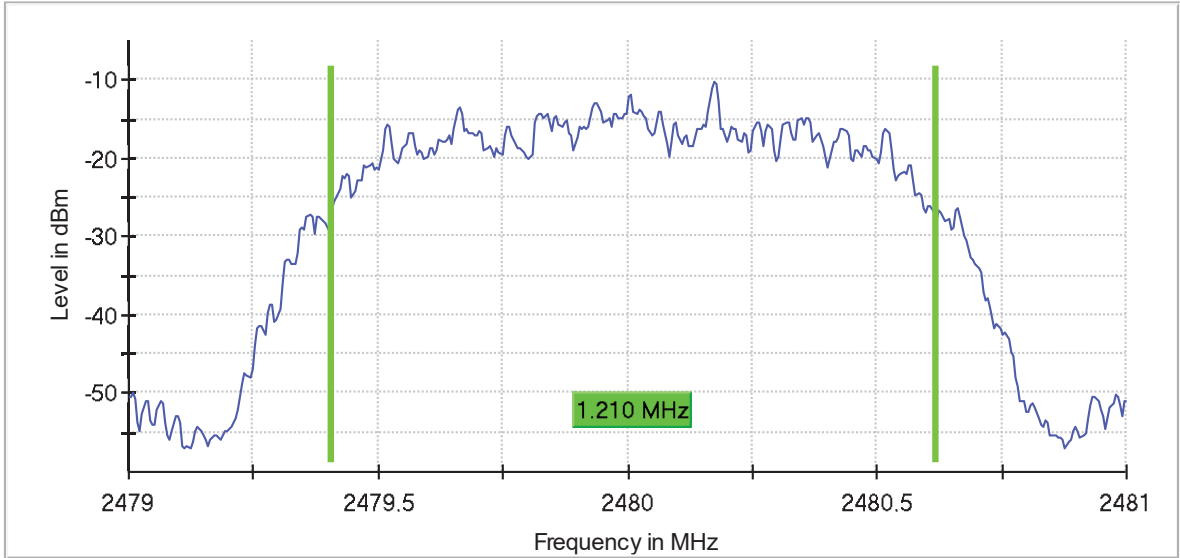


- High Channel:

20 dB Bandwidth



99 % Bandwidth



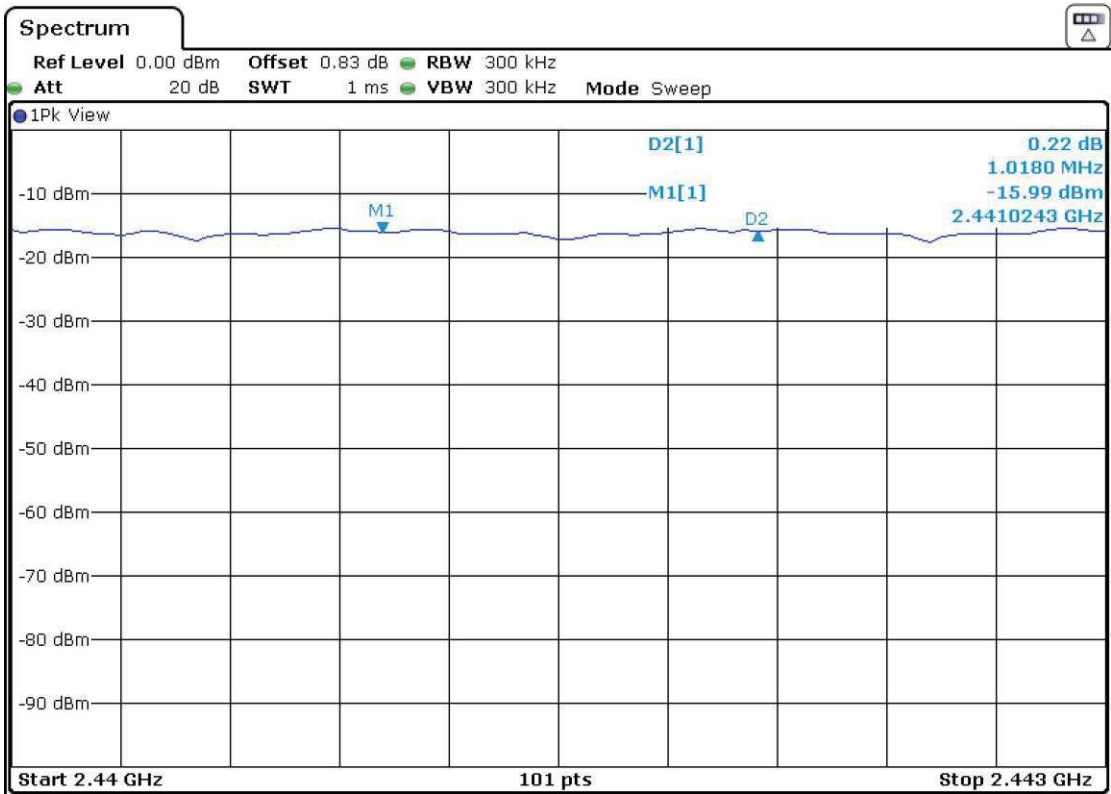
Carrier frequency separation - Pi/4 DQPSK

Carrier frequency separation:

1.018

 MHz

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



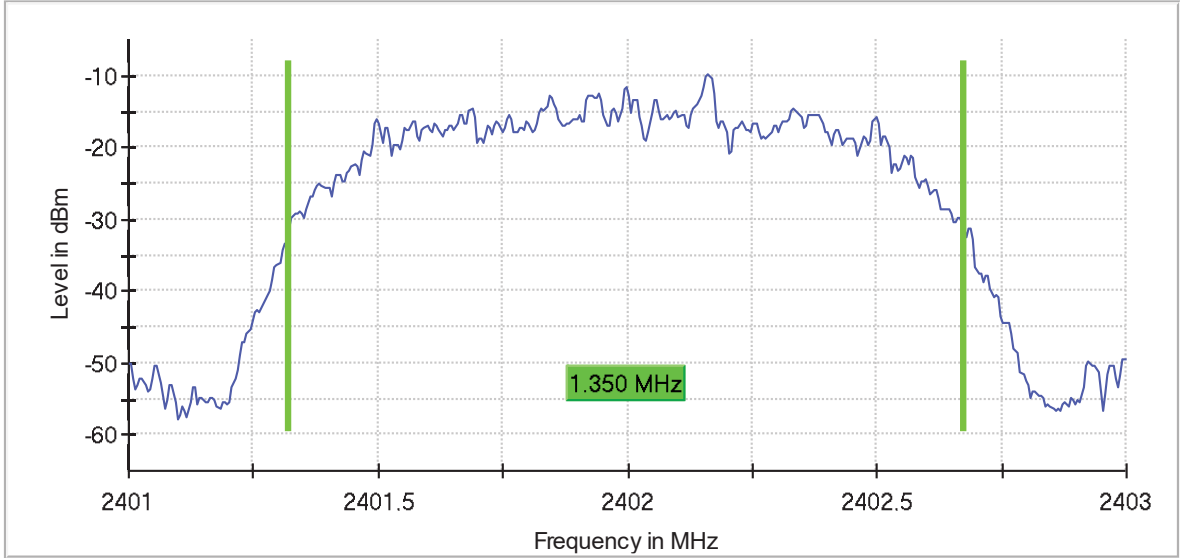
The hopping channel carrier frequencies are separated by a minimum two-thirds of the 20 dB bandwidth of the hopping channel.

Verdict: PASS

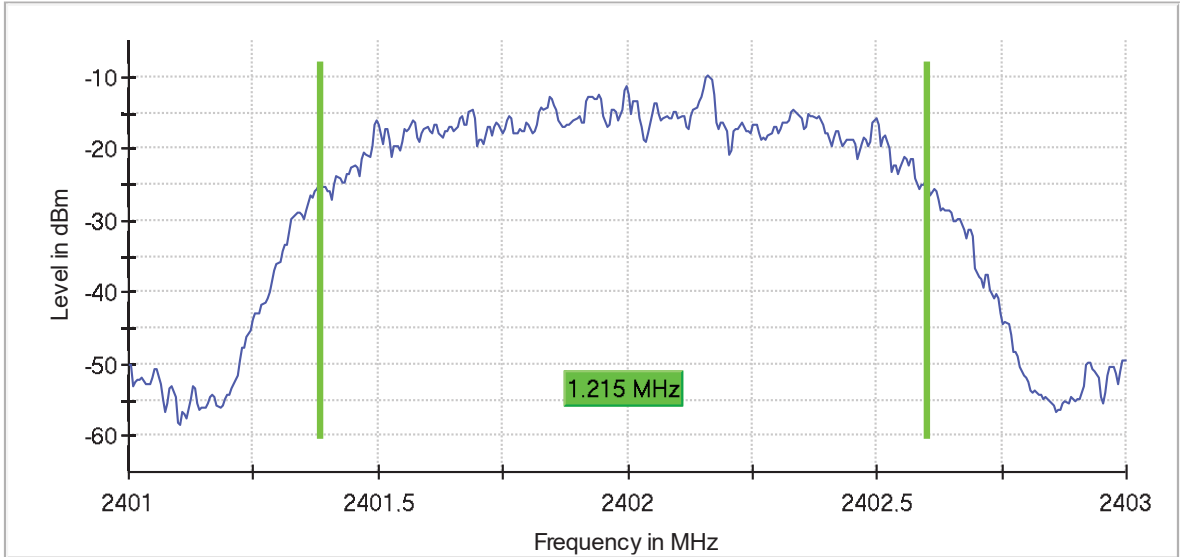
• 8DPSK – Bandwidths

- Low Channel:

20 dB Bandwidth

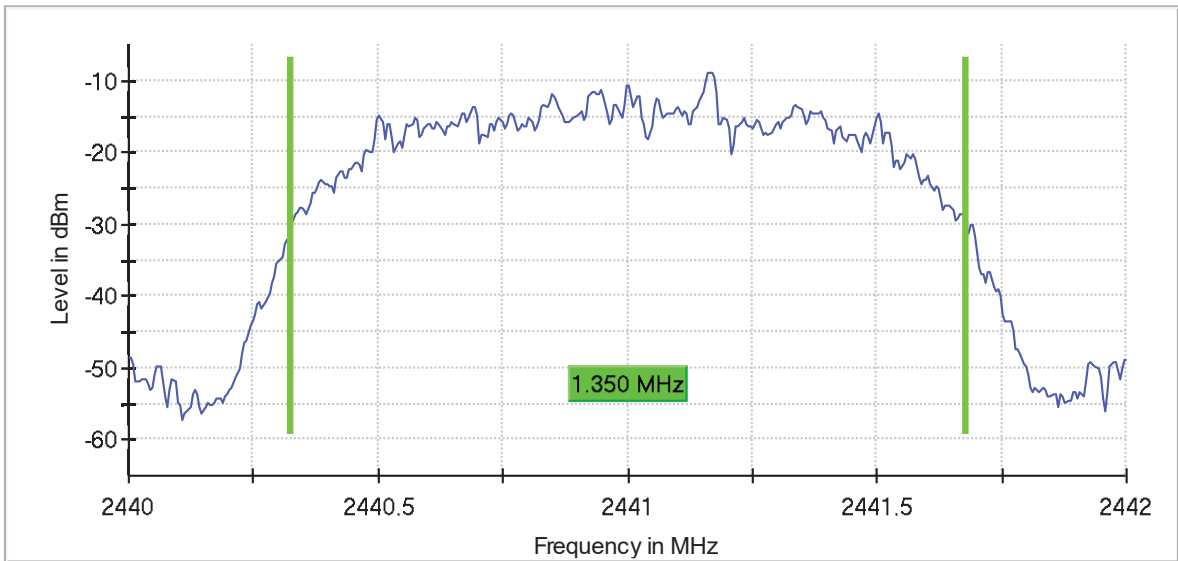


99 % Bandwidth

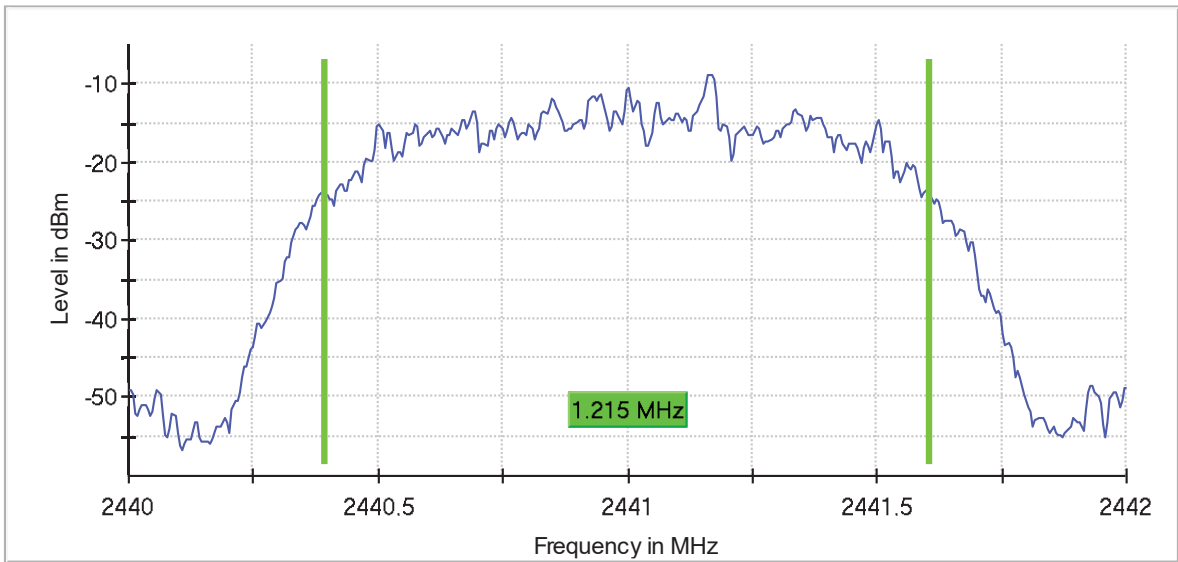


- Middle Channel:

20 dB Bandwidth

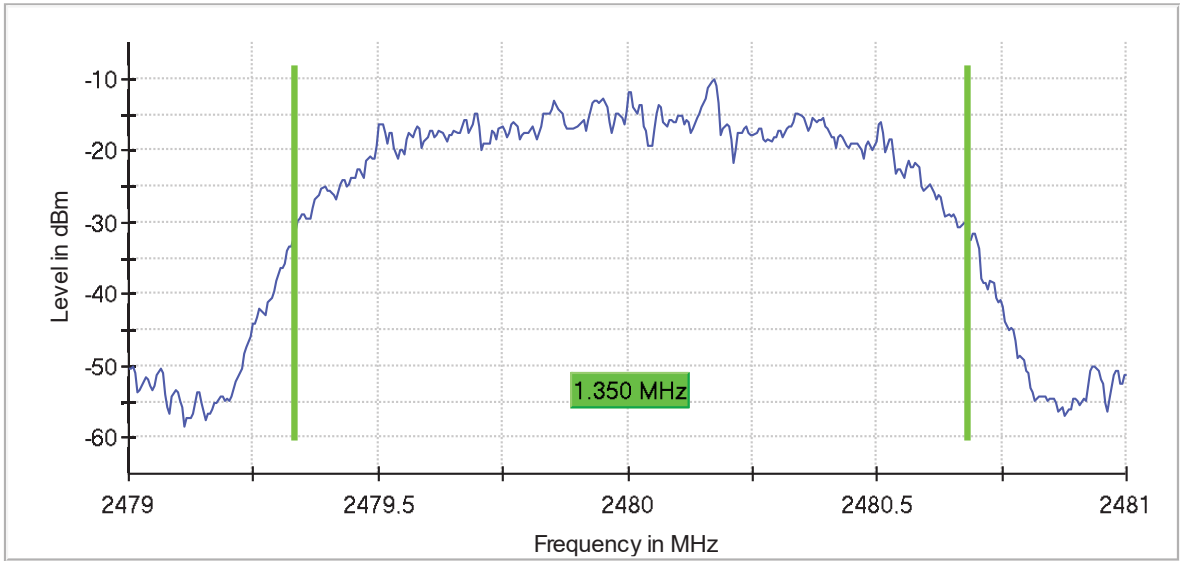


99 % Bandwidth

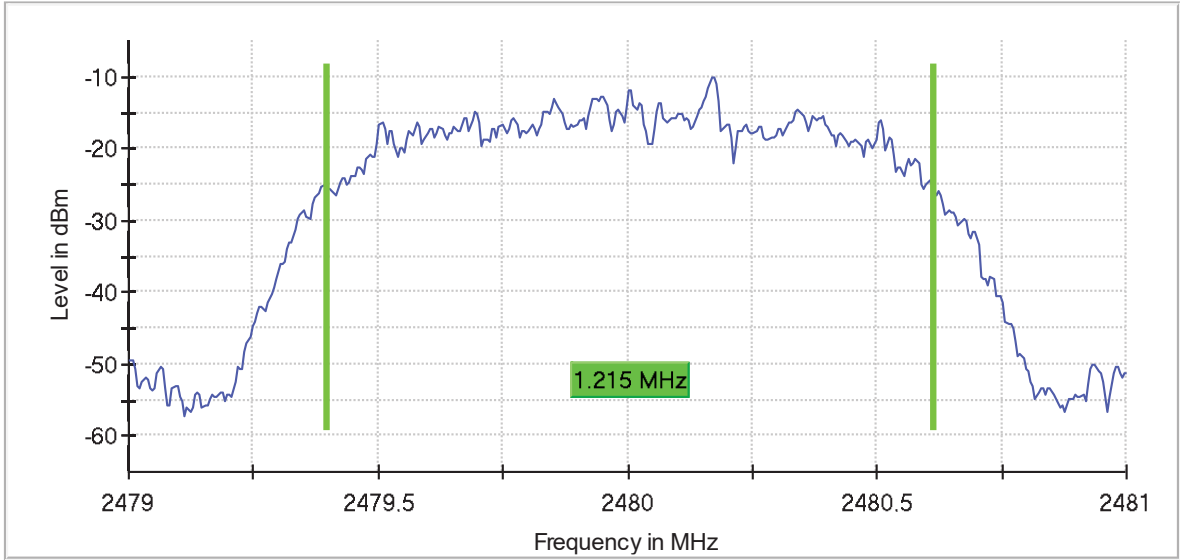


- High Channel:

20 dB Bandwidth



99 % Bandwidth



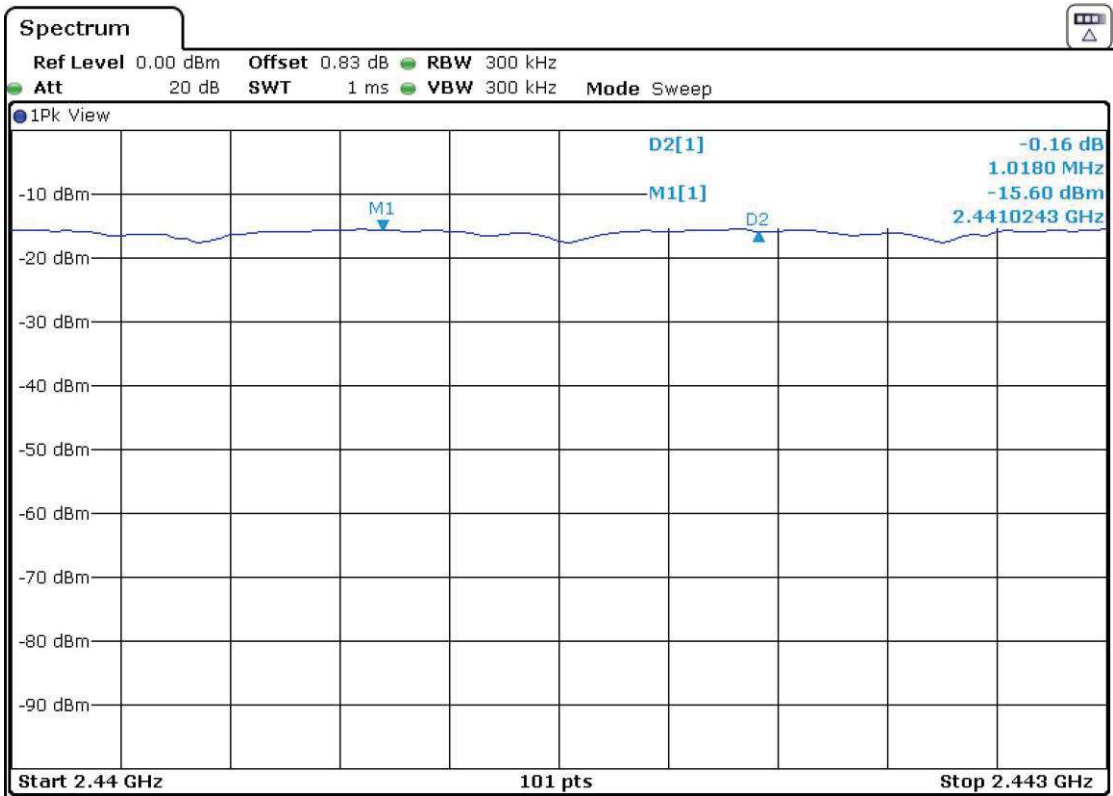
Carrier frequency separation - 8DPSK

Carrier frequency separation:

1.018

 MHz

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



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

Verdict: PASS

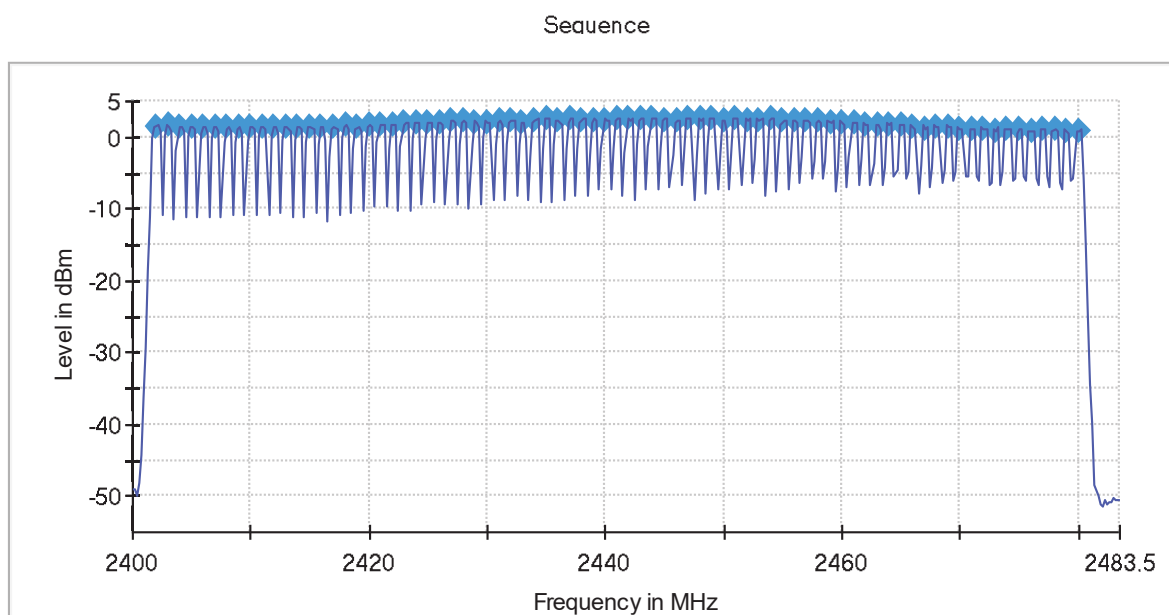
FCC 15.247 (a)(1)(iii) / RSS-247 5.1 (d) Number of hopping channels

SPECIFICATION:

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

RESULTS:

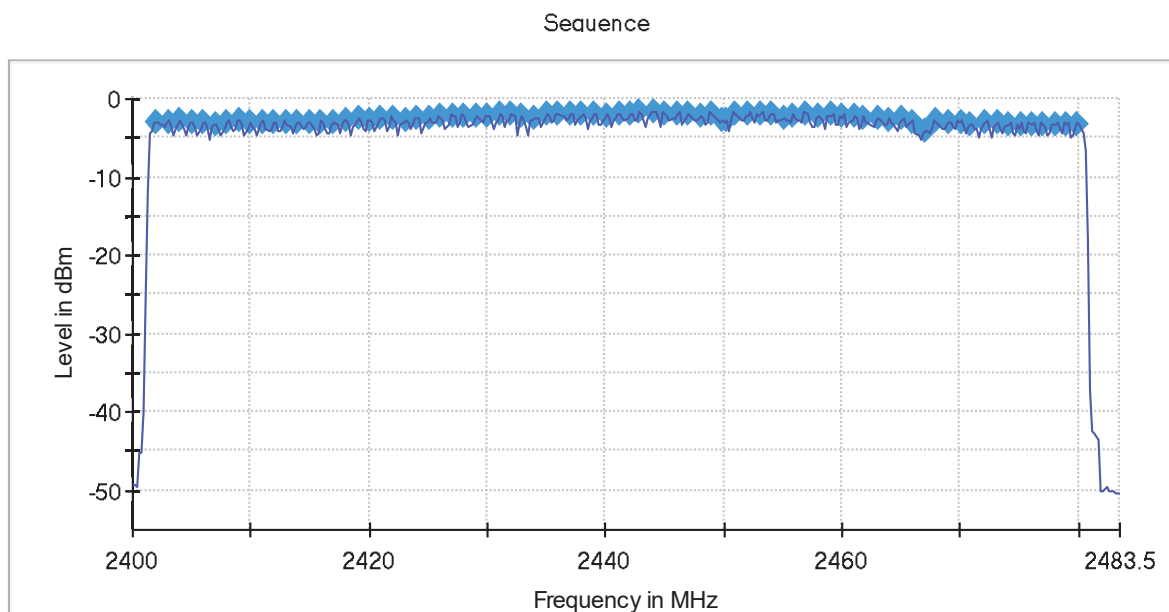
- **GFSK – Number of hopping channels:**



Total number of hopping channels: 79

Verdict: PASS

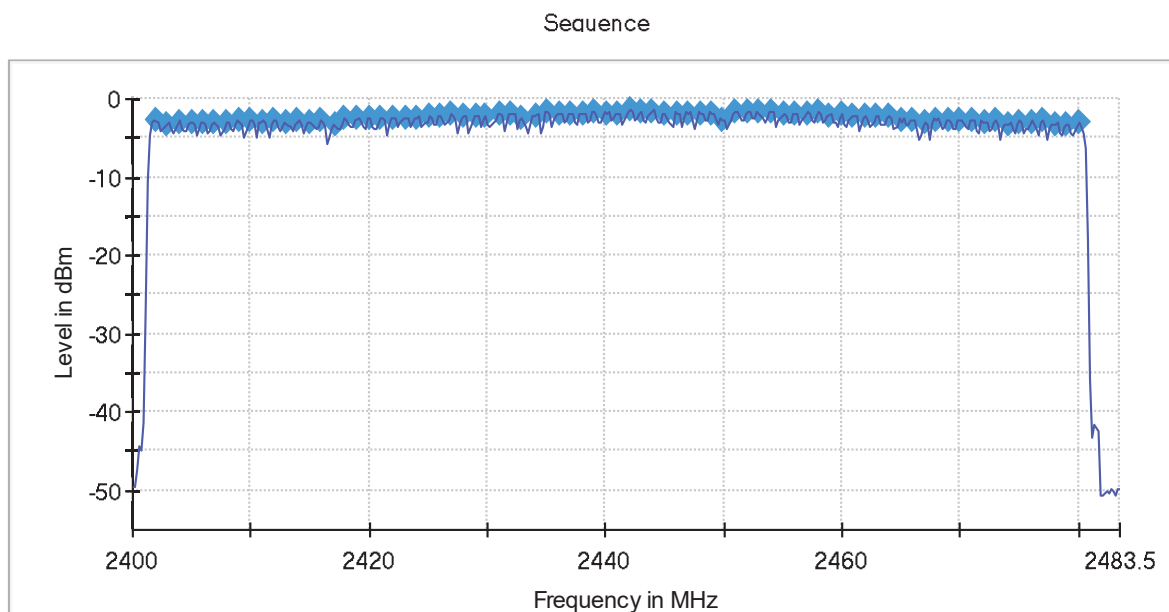
- **Pi/4 DQPSK – Number of hopping channels:**



Total number of hopping channels: 80

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:

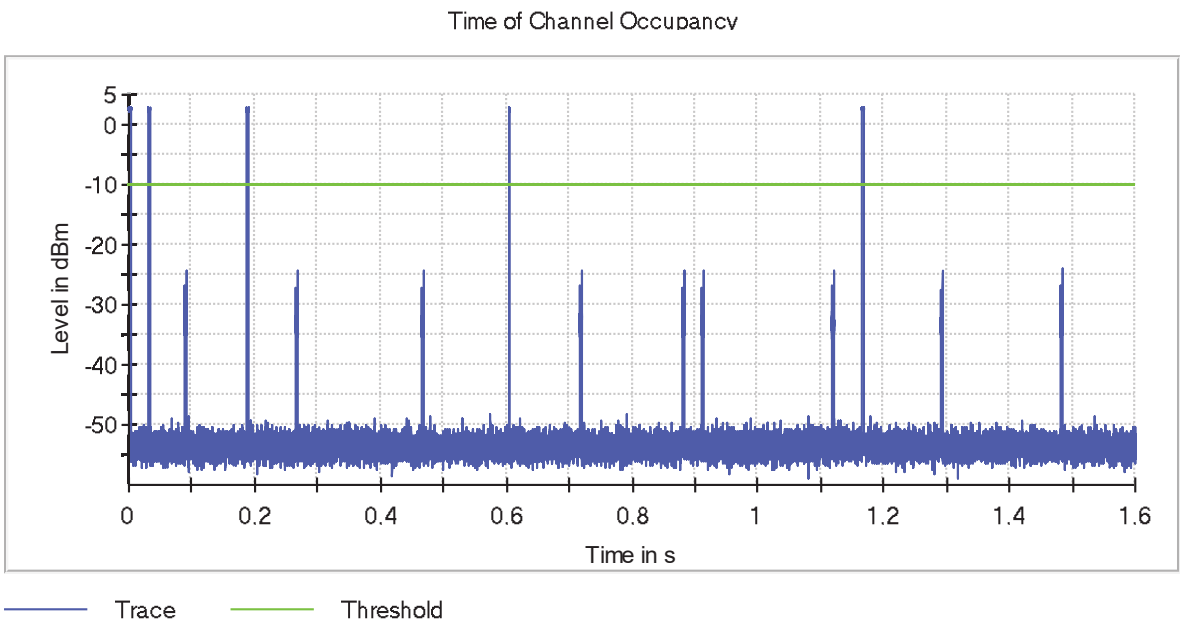
The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed = 0.4 x 79= 31.6 seconds.

RESULTS:

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

- Time of Occupancy:

Nº of hops over the period	3
Average Time of Occupancy	14.064 ms



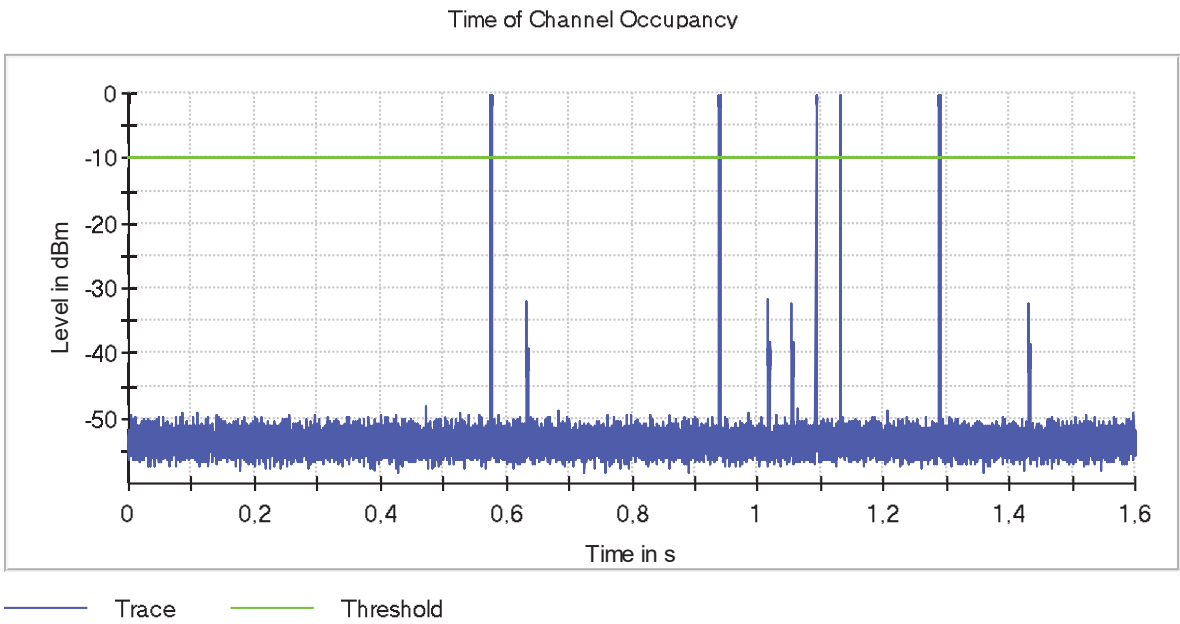
Measurement uncertainty (ms)	<±0.546
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Verdict: PASS

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

- Time of Occupancy:

Nº of hops over the period	4
Average Time of Occupancy	12.797 ms



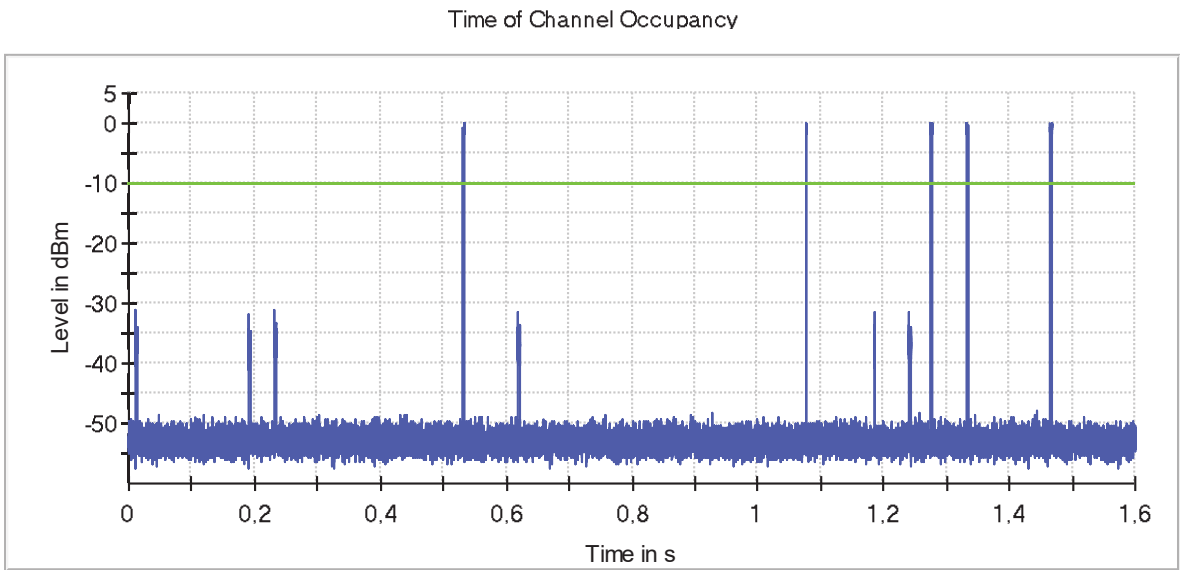
Measurement uncertainty (ms)	<±0.546
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Verdict: PASS

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

- Time of Occupancy:

Nº of hops over the period	4
Average Time of Occupancy	13.131 ms



Trace Threshold

Measurement uncertainty (ms)	<±0.546
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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:**

	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
Peak Conducted Output Power (dBm)	1.8	2.8	1.3
Maximum EIRP Power (dBm)	2.5	3.5	2.0
Measurement uncertainty (dB)	<±0.80		

- Pi/4 DQPSK:**

	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
Peak Conducted Output Power (dBm)	-0.7	0.5	-0.8
Maximum EIRP Power (dBm)	0.0	1.2	-0.1
Measurement uncertainty (dB)	<±0.80		

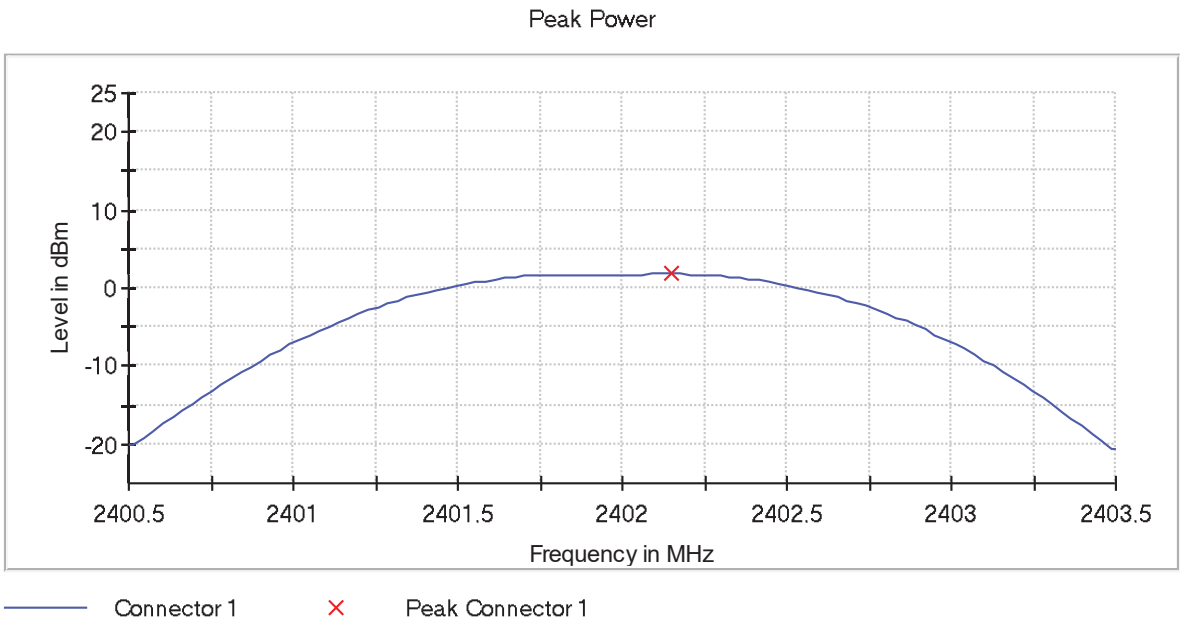
- 8DPSK:**

	Low Channel 2402 MHz	Middle Channel 2441 MHz	High Channel 2480 MHz
Peak Conducted Output Power (dBm)	0.2	1.0	-0.2
Maximum EIRP Power (dBm)	0.9	1.7	0.5
Measurement uncertainty (dB)	<±0.80		

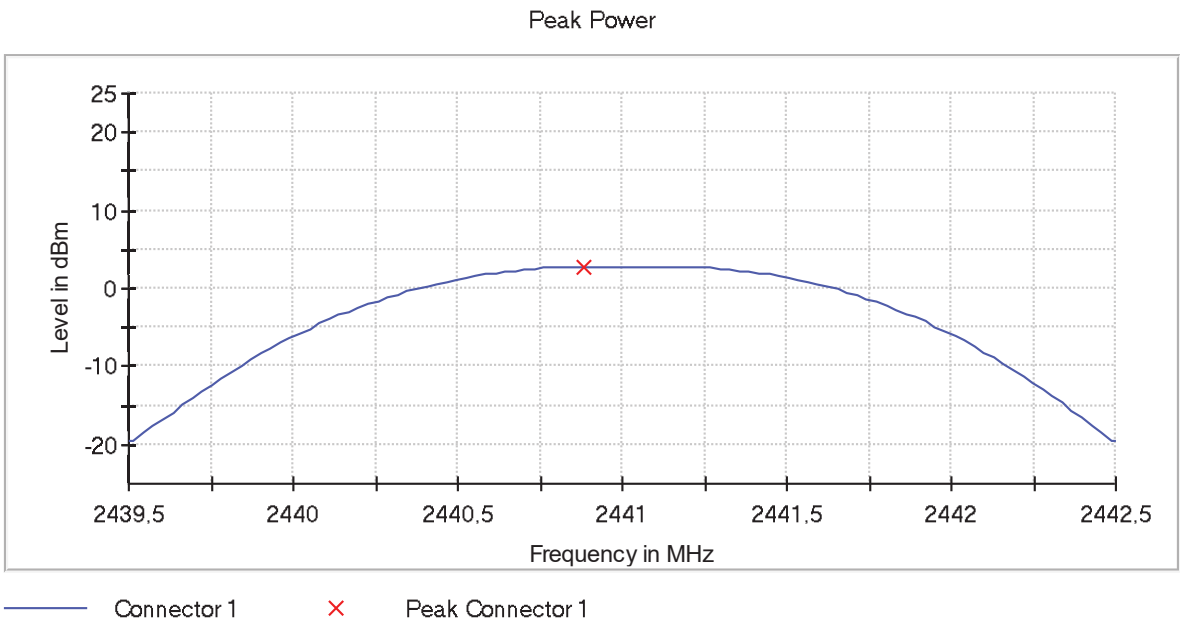
Verdict: PASS

• GFSK – Peak Output Power

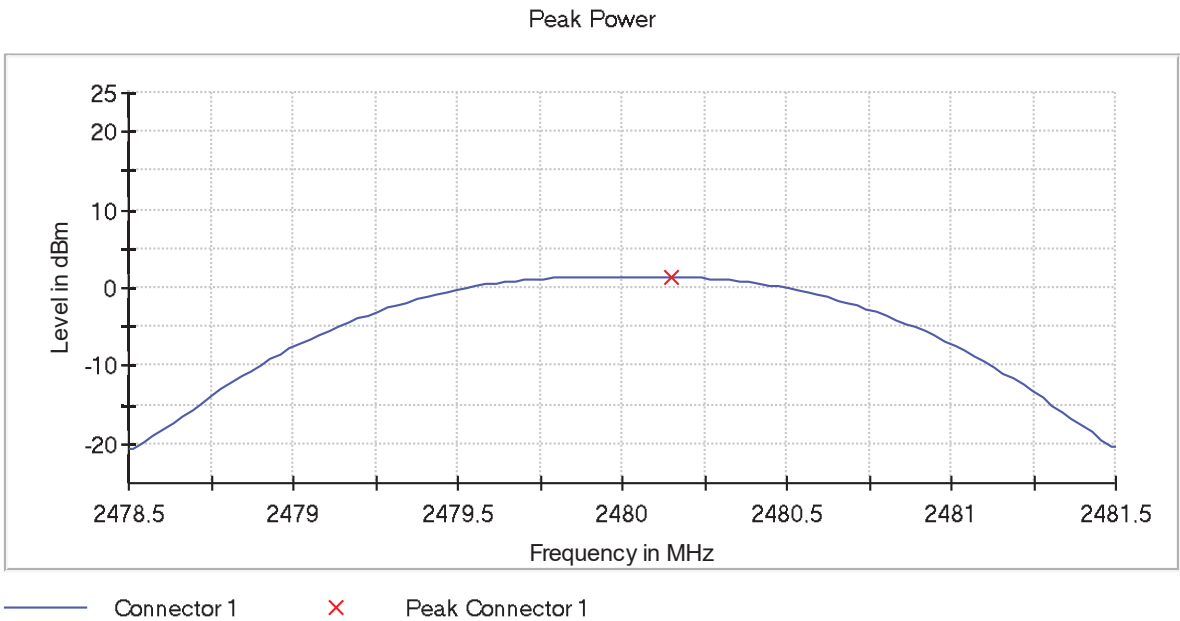
- Low Channel:



- Middle Channel:

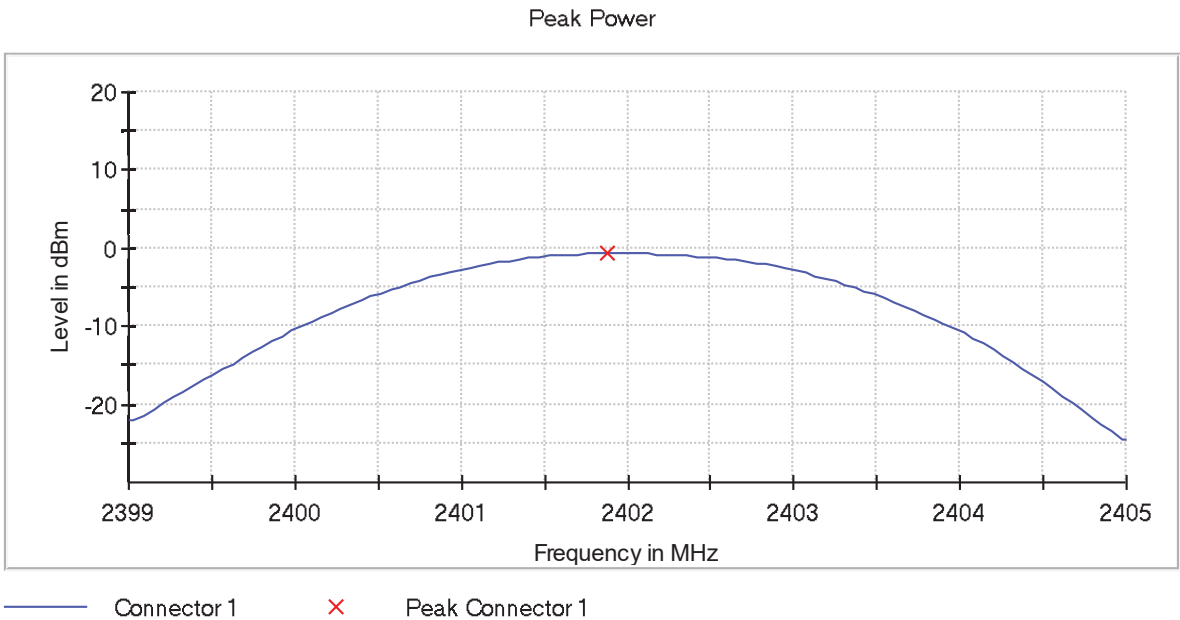


- High Channel:

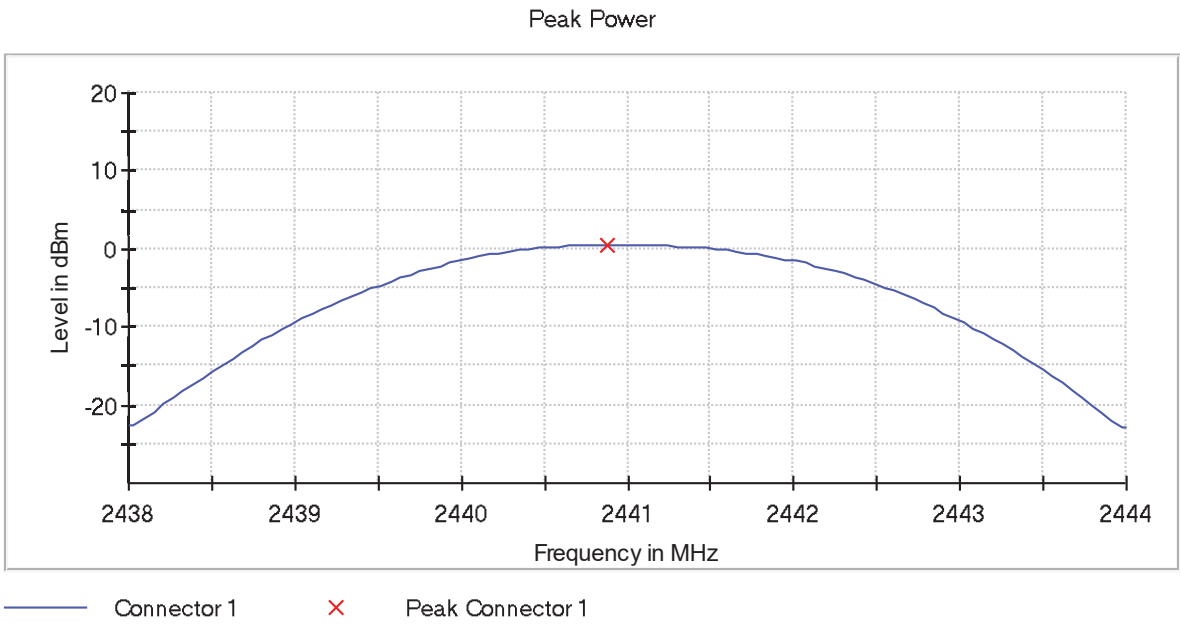


• Pi/4 DQPSK – Peak Output Power

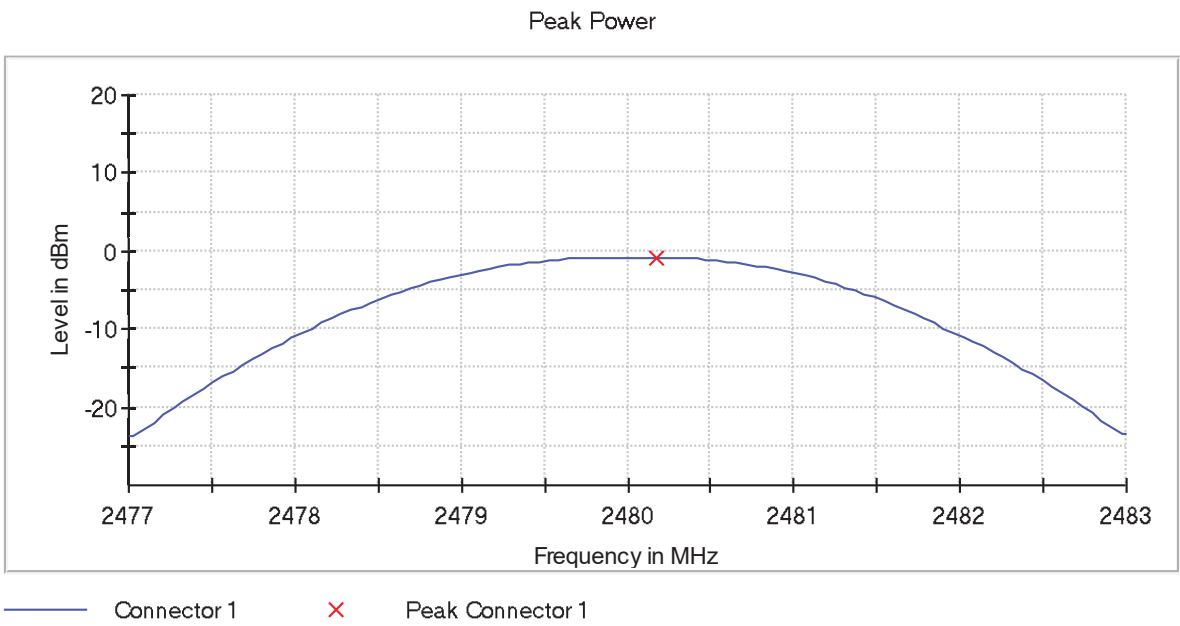
- Low Channel:



- Middle Channel:

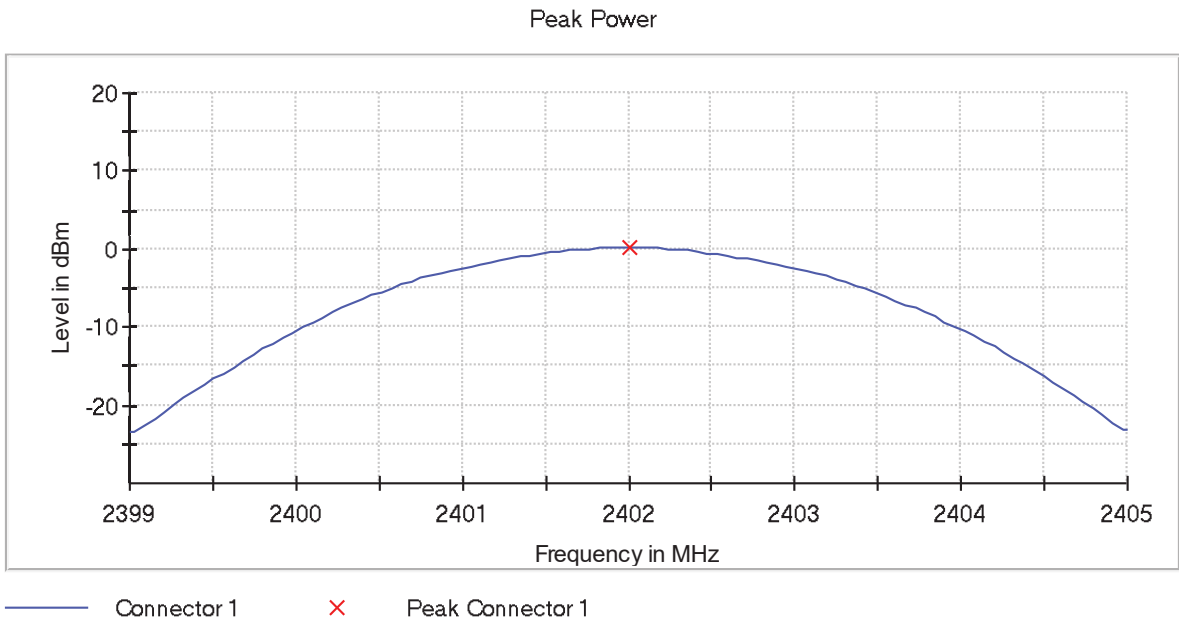


- High Channel:

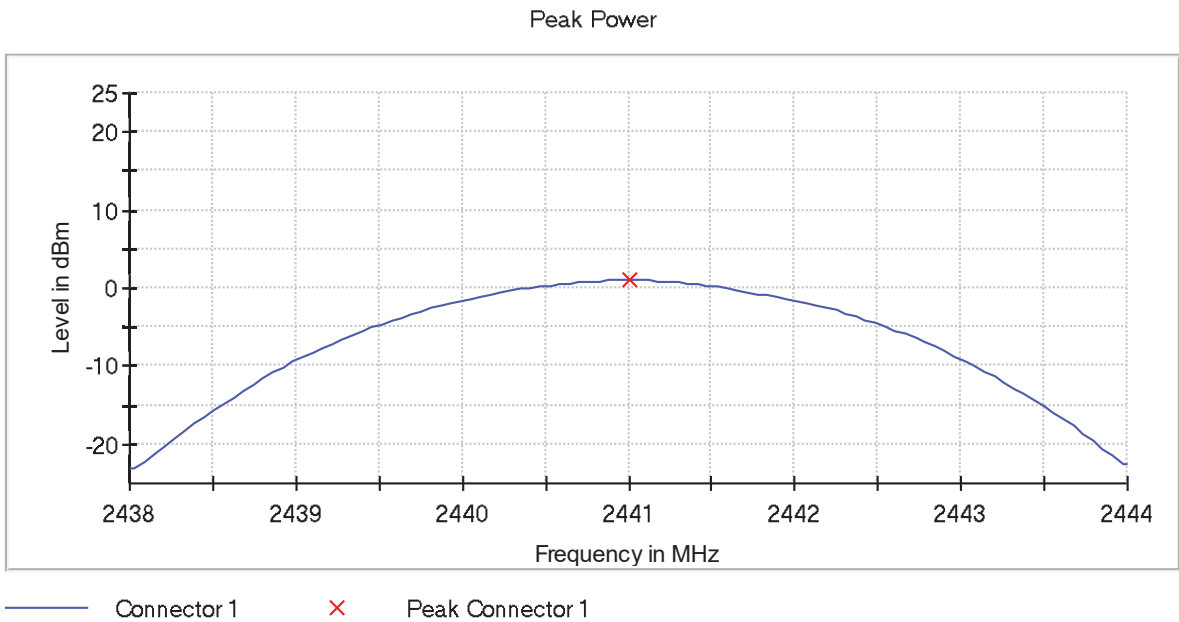


• 8DPSK – Peak Output Power

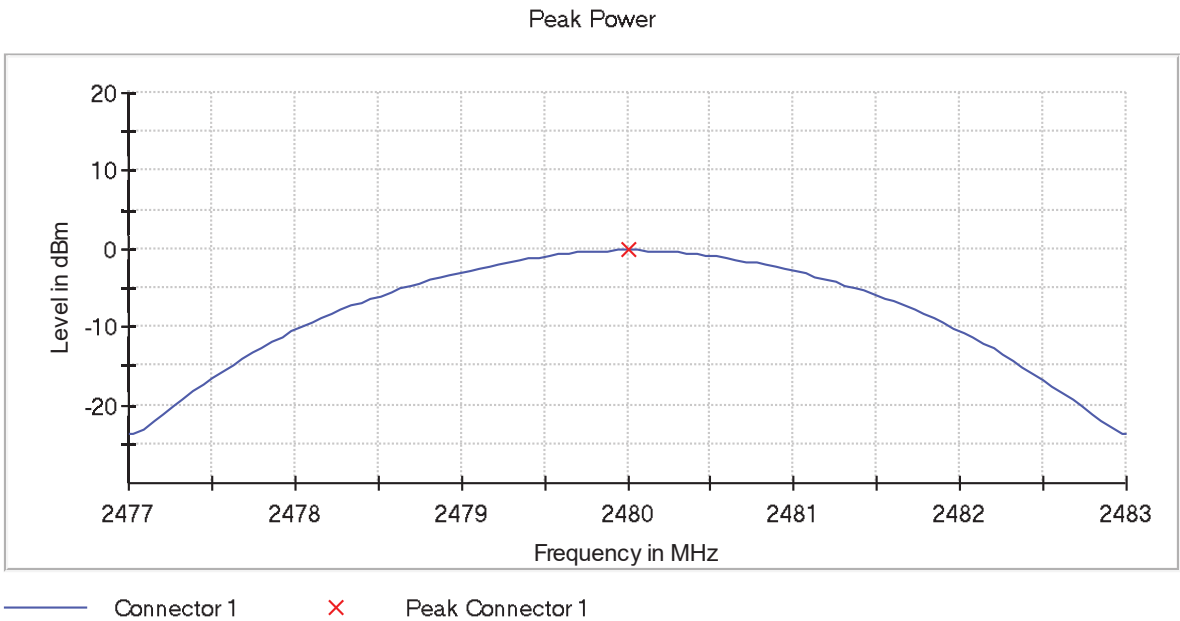
- Low Channel:



- 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:

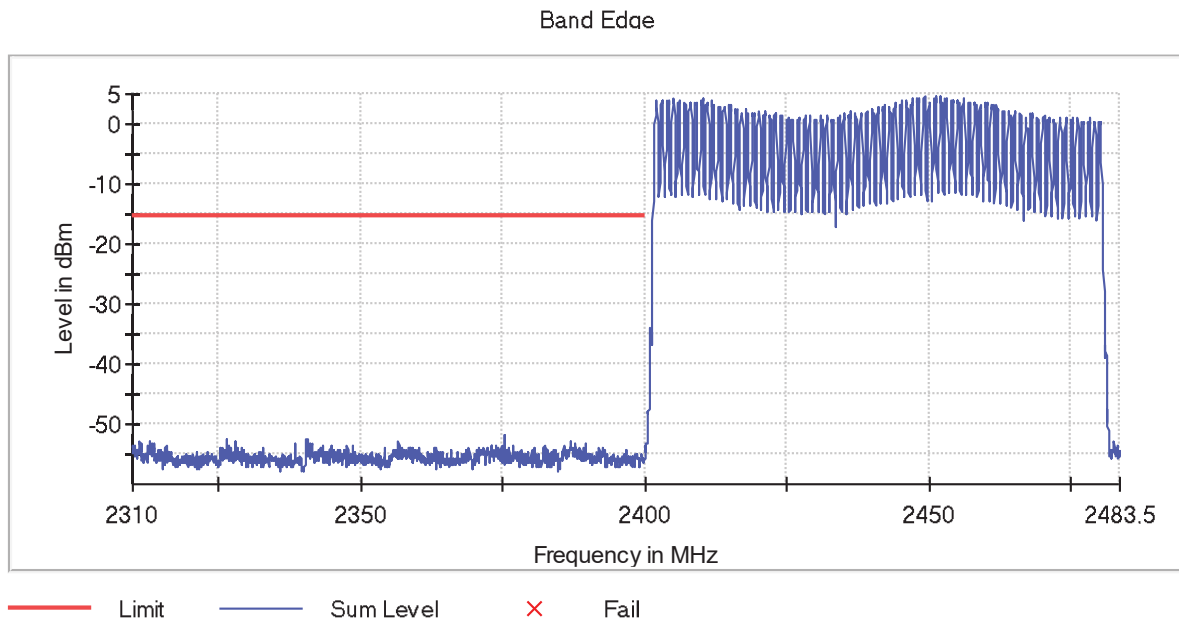
Radiated measurements were used to show compliance with the limits in the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Measurement uncertainty (dB)	<±0.89
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- **GFSK – Band-edge emissions compliance:**

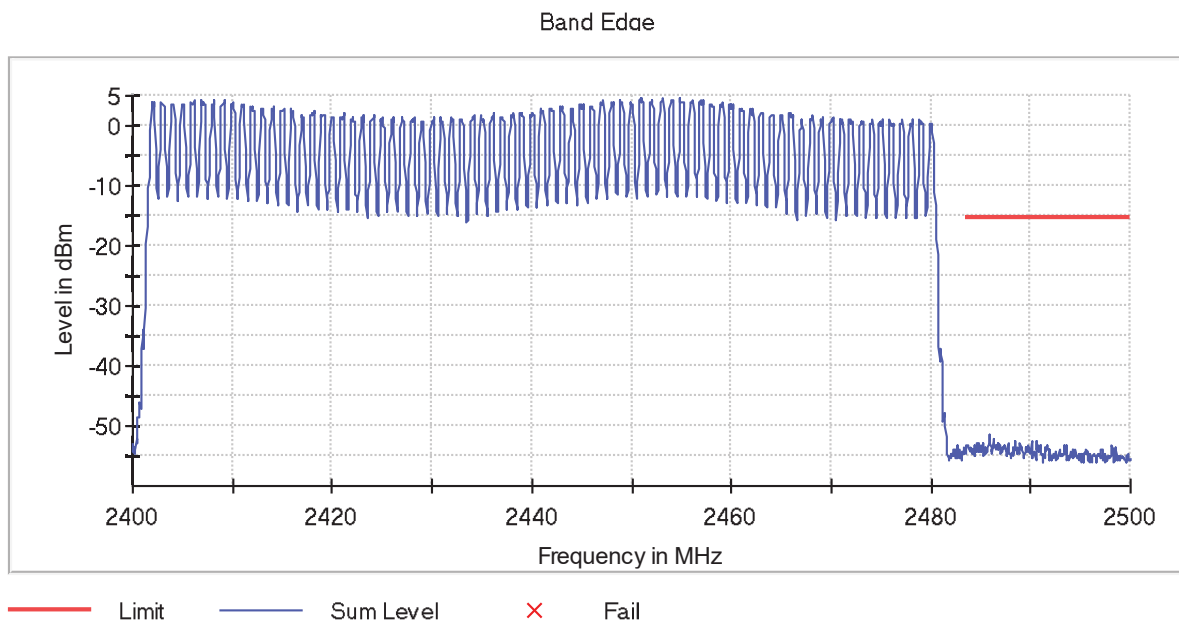
- HOPPING ON:

- Low Frequency Section 2402 MHz:



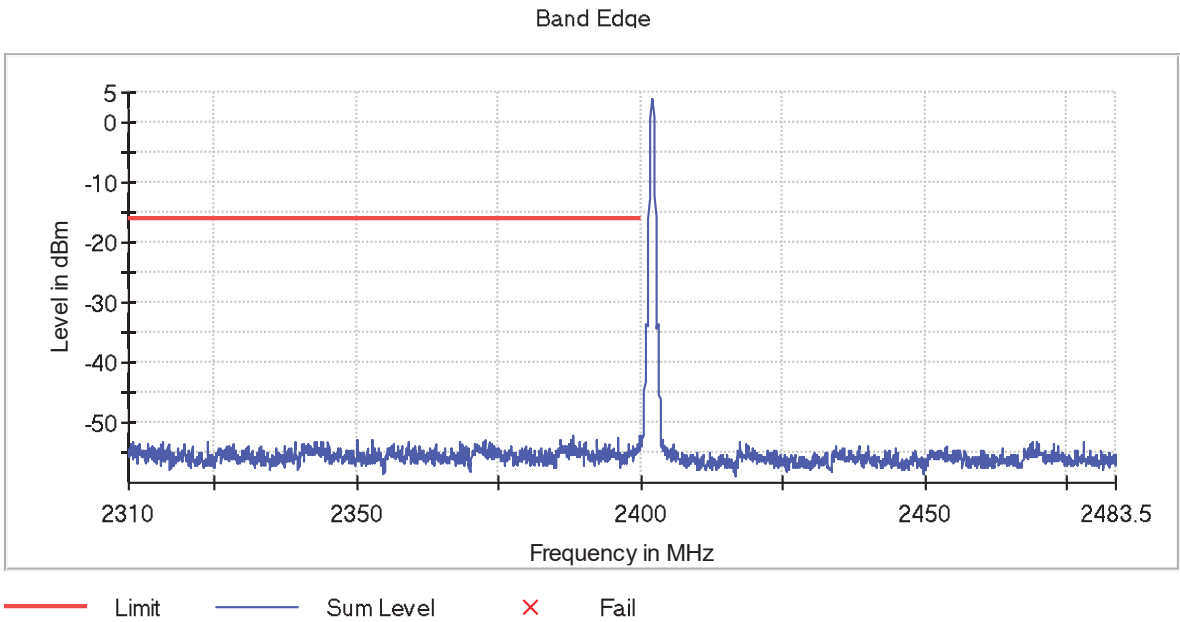
Verdict: PASS

- High Frequency Section 2480 MHz:



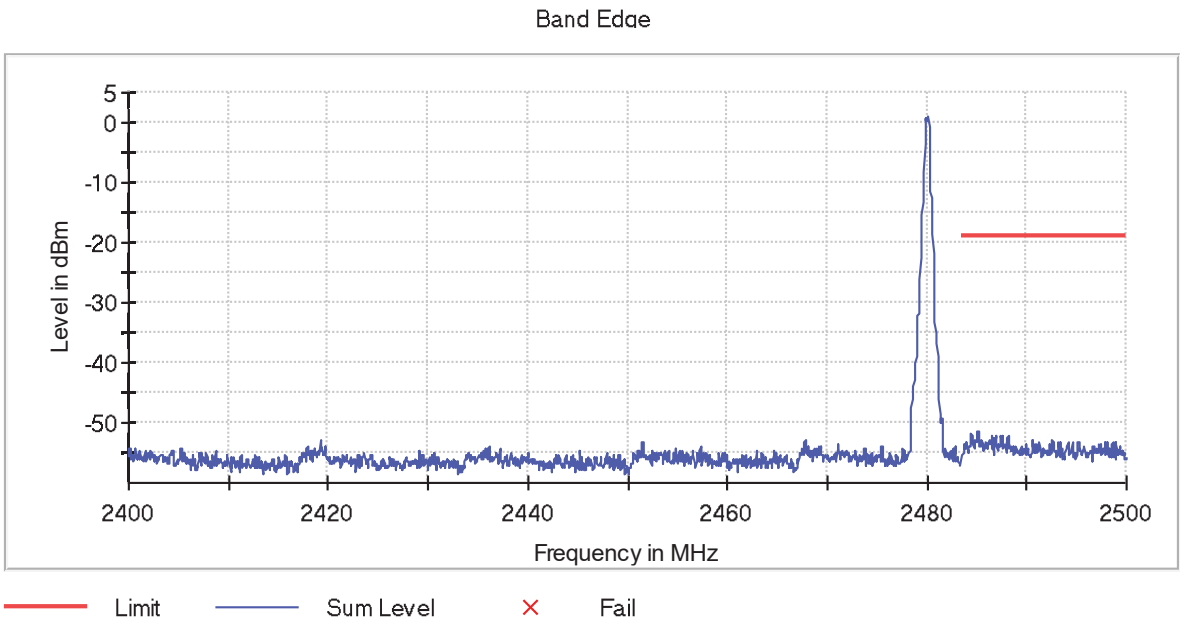
Verdict: PASS

- HOPPING OFF:
 - Low Frequency Section 2402 MHz:



Verdict: PASS

- High Frequency Section 2480 MHz:

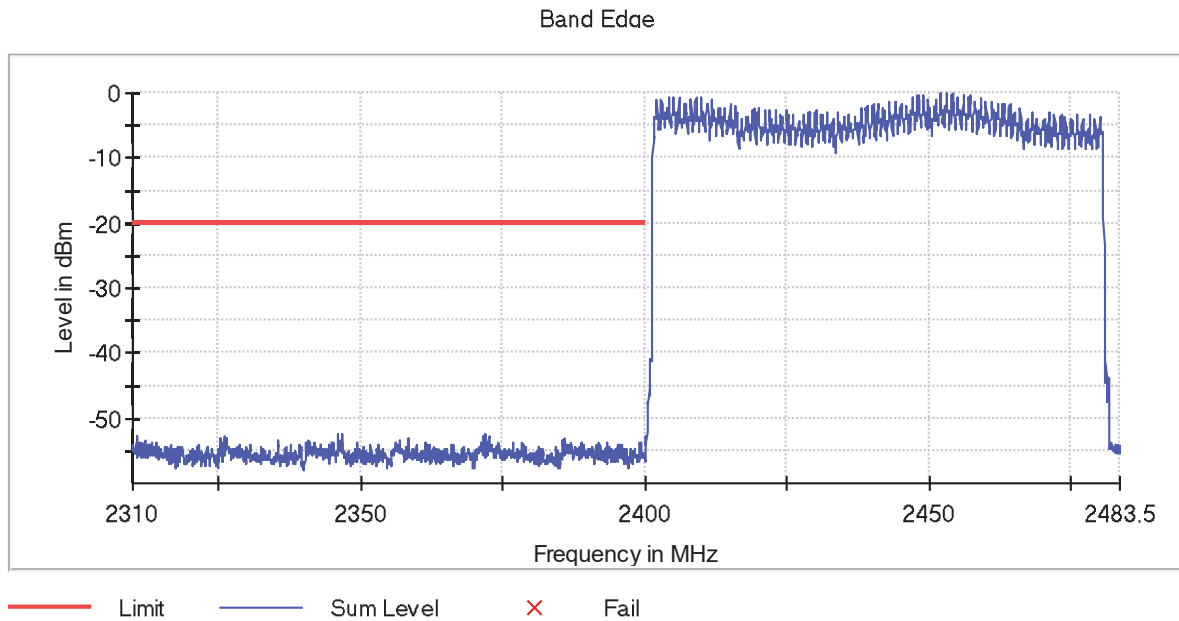


Verdict: PASS

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

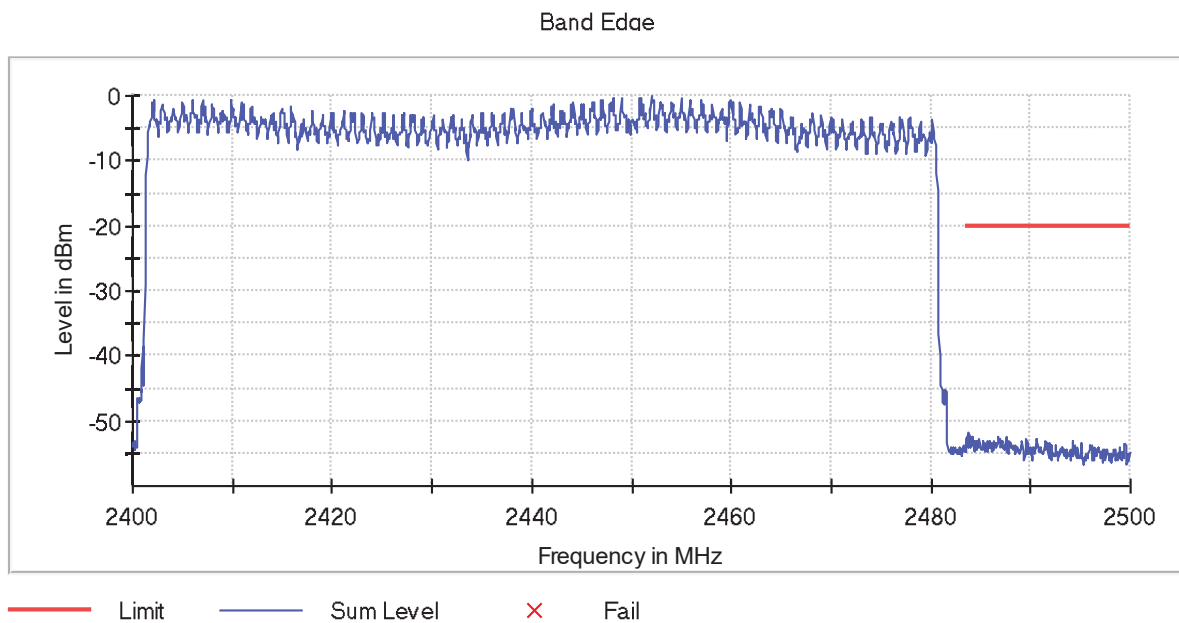
- HOPPING ON:

- Low Frequency Section 2402 MHz:



Verdict: PASS

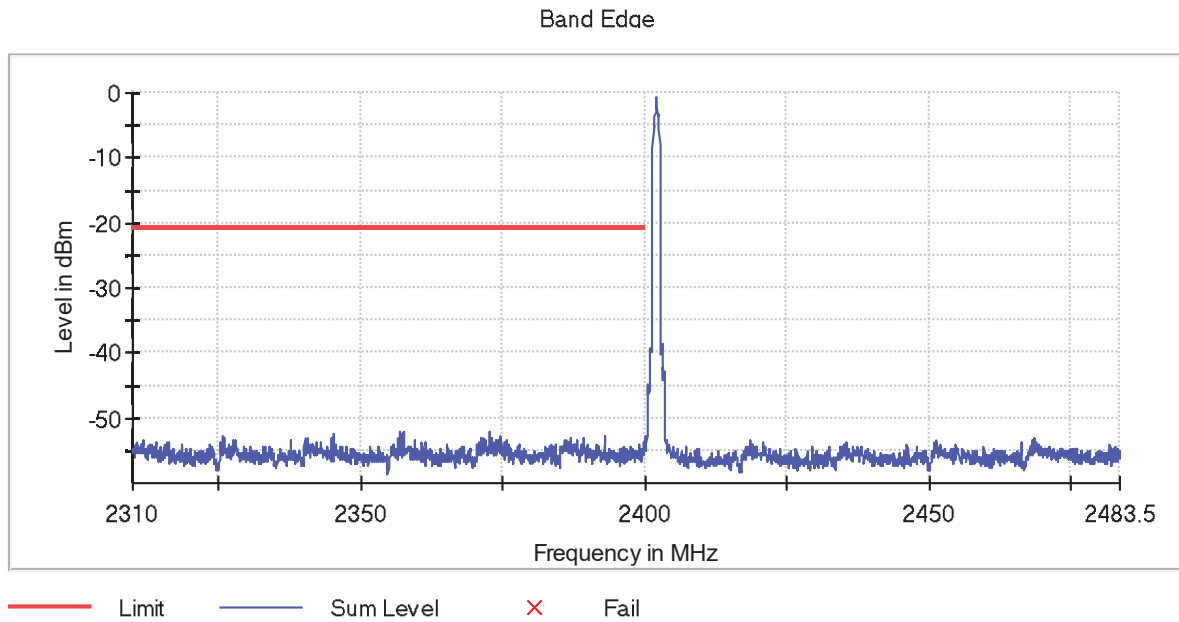
- High Frequency Section 2480 MHz:



Verdict: PASS

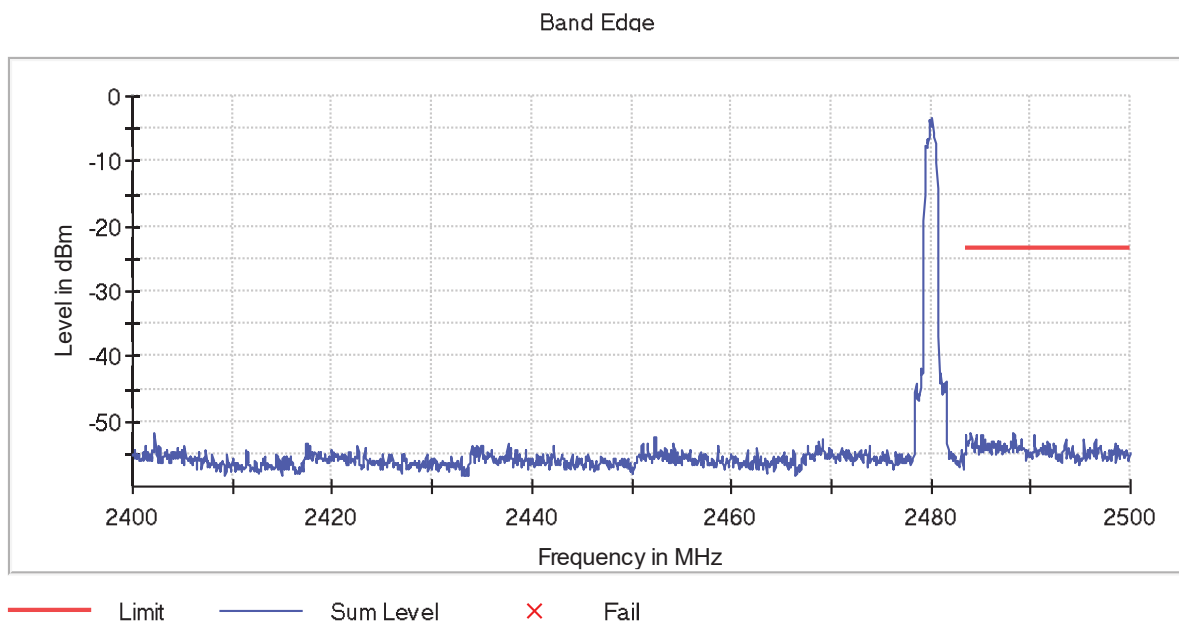
- HOPPING OFF:

- Low Frequency Section 2402 MHz:



Verdict: PASS

- High Frequency Section 2480 MHz:

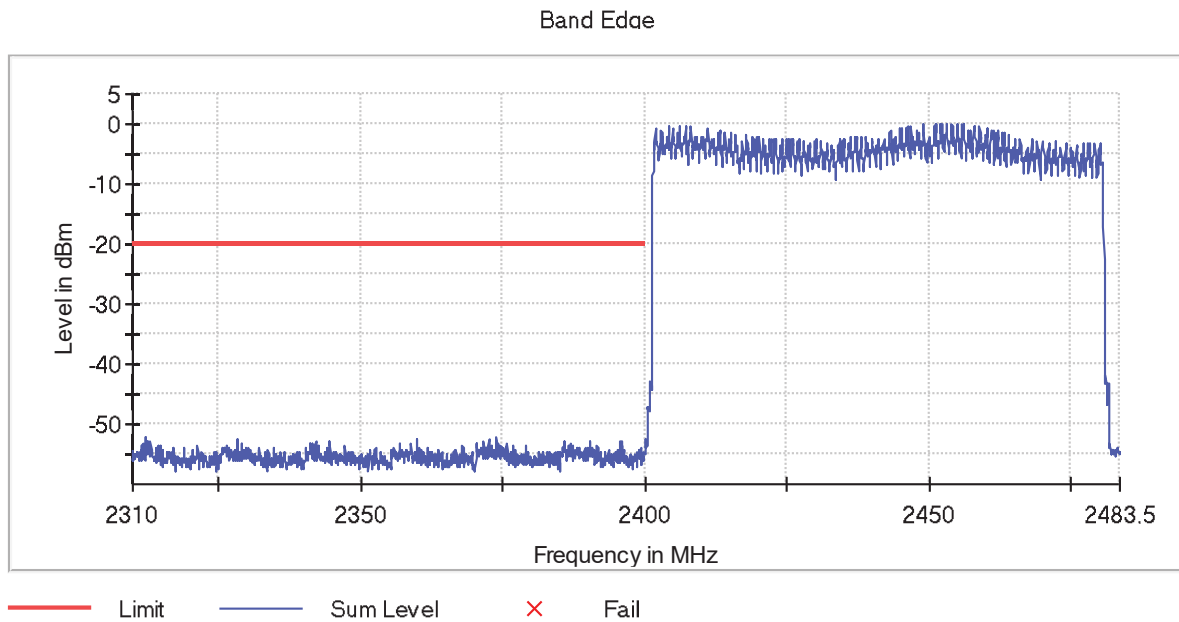


Verdict: PASS

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

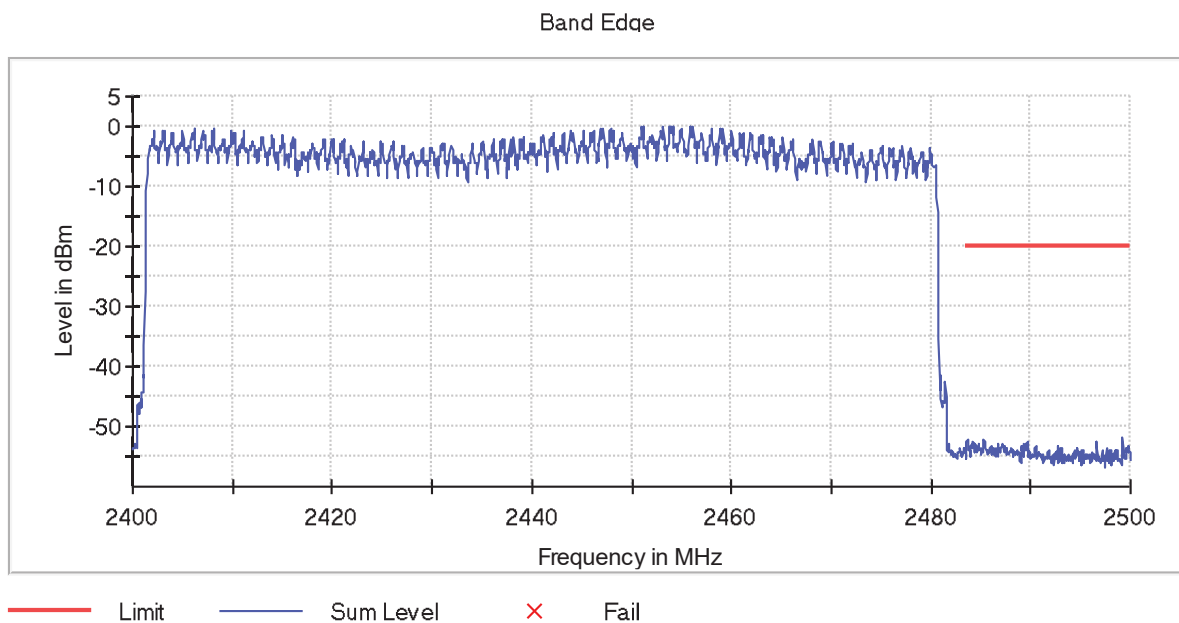
- HOPPING ON:

- Low Frequency Section 2402 MHz:



Verdict: PASS

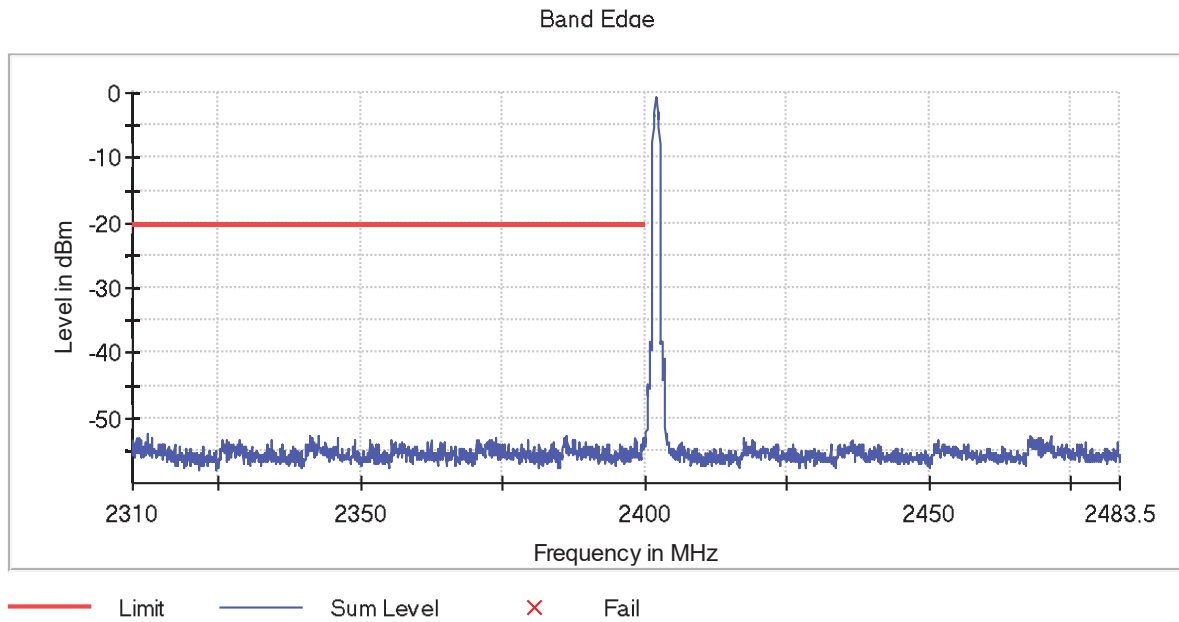
- High Frequency Section 2480 MHz:



Verdict: PASS

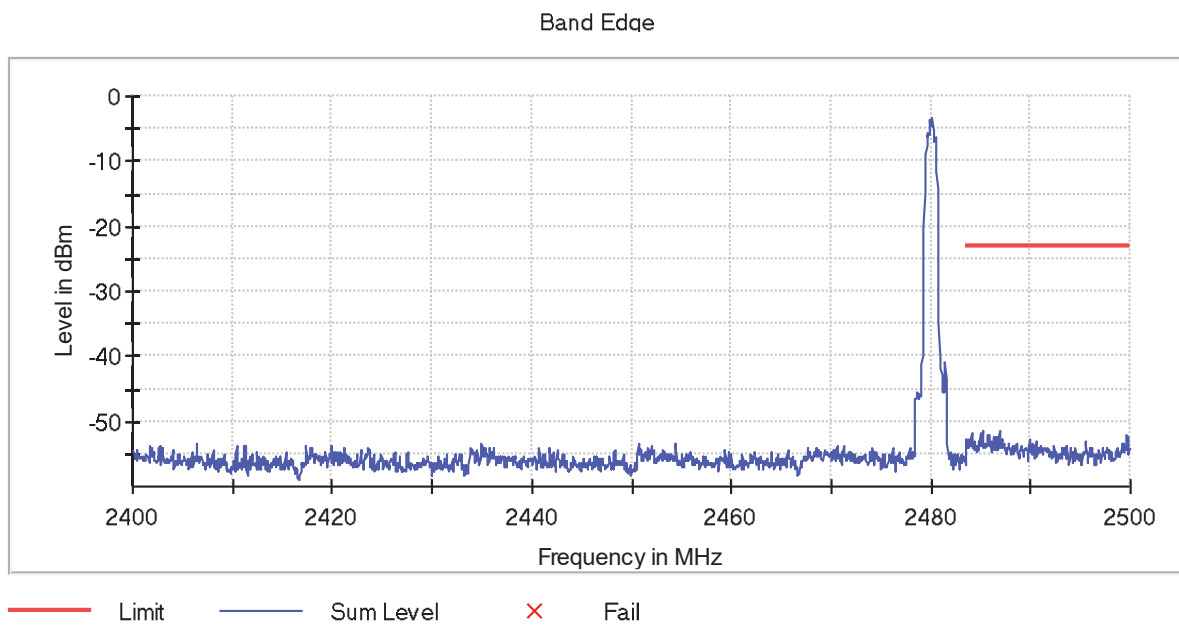
- HOPPING OFF:

- 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 1 m 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 at less than 20 dB below the limit:

Spurious frequency (MHz)	Emission Level (dBµV/m)	Polarization	Detector	Measurement Uncertainty (dB)
557.4860	31.28	H	Quasi-peak	<± 5.10
884.7640	33.43	H	Quasi-peak	<± 5.10

Measurement Uncertainty: <± 5.10 dB

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 dB μ V/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 (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.3740	46.41	V	Peak	< $\pm$ 5.13

- MIDDLE CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
5.3740	46.72	H	Peak	< $\pm$ 5.13

- HIGH CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.4835	58.32	V	Peak	< $\pm$ 5.13
	46.38		Average	< $\pm$ 5.13
2.4959	56.74	V	Peak	< $\pm$ 5.13
	43.53		Average	< $\pm$ 5.13
3.9960	41.73	V	Peak	< $\pm$ 5.13
5.3740	47.35	H	Peak	< $\pm$ 5.13

Measurement Uncertainty (dB): 1 GHz $\leq$ f $\leq$ 17 GHz: < $\pm$ 5.13
17 GHz $\leq$ f $\leq$ 26 GHz: < $\pm$ 5.08

Verdict: PASS

• **PI/4-DQPSK modulation (2-DH5):**

- LOW CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
3.1970	42.59	H	Peak	$\leq \pm 5.13$
5.3740	47.16	H	Peak	$\leq \pm 5.13$

- MIDDLE CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
3.1930	43.48	V	Peak	$\leq \pm 5.13$
5.3415	42.02	V	Peak	$\leq \pm 5.13$
5.3750	47.47	H	Peak	$\leq \pm 5.13$

- HIGH CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.4835	58.00	V	Peak	$\leq \pm 5.13$
	45.19		Average	$\leq \pm 5.13$
3.1965	44.60	H	Peak	$\leq \pm 5.13$
5.3735	46.30	V	Peak	$\leq \pm 5.13$

Measurement Uncertainty (dB): 1 GHz $\leq f \leq$ 17 GHz: $\leq \pm 5.13$
17 GHz $\leq f \leq$ 26 GHz: $\leq \pm 5.08$

Verdict: PASS

• **8-DPSK modulation (3-DH5):**

- LOW CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
3.1980	43.82	V	Peak	$\leq \pm 5.13$
5.3745	48.18	H	Peak	$\leq \pm 5.13$

- MIDDLE CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
3.1940	44.87	H	Peak	$\leq \pm 5.13$
3.9925	41.91	H	Peak	$\leq \pm 5.13$
5.3745	46.58	V	Peak	$\leq \pm 5.13$

- HIGH CHANNEL. Spurious frequencies closest to the limit:

Spurious frequency (GHz)	Emission Level (dB μ V/m)	Polarization	Detector	Measurement Uncertainty (dB)
2.4835	58.35	V	Peak	$\leq \pm 5.13$
	45.64		Average	$\leq \pm 5.13$
3.1970	41.81	H	Peak	$\leq \pm 5.13$
3.9900	42.47	V	Peak	$\leq \pm 5.13$
5.3745	48.88	H	Peak	$\leq \pm 5.13$
8.4630	49.10	V	Peak	$\leq \pm 5.13$

Measurement Uncertainty (dB): 1 GHz $\leq f \leq$ 17 GHz: $\leq \pm 5.13$
17 GHz $\leq f \leq$ 26 GHz: $\leq \pm 5.08$

Verdict: PASS