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ASSESSMENT REPORT

Report No.: .....:	44948RRE.005
Approved by (name / position & signature) .....:	Firmado digitalmente por Alejandro Llamas Rodríguez Fecha: 2015.01.22 10:12:28 +01'00'
Issue date .....:	2015-01-22
Identification of item evaluated ....:	INTEL DUAL BAND WIRELESS – AC 3165
Trademark .....:	Not Supplied
Model and/or type reference .....:	3165NGW
Serial number .....:	n/a
Features .....:	802.11 a/b/g/n/ac Wireless LAN + BT 4.0
Other identifications	FCC: PD93165NG (factory install sku)
	FCC: PD93165NGU (user install allowed)
	IC: 1000M-3165NG
Description.....:	2x2 PCIe M.2 adapter card
Applicant .....:	INTEL MOBILE COMMUNICATIONS
Address .....:	100 Center Point Circle, Suite 200
	Columbia, South Carolina 29210 USA
CIF/NIF/Passport.....:	Not Supplied
Contact person.....:	Steve Hackett
Telephone .....:	803-216-2344
e-mail: .....:	steven.c.hackett@intel.com
Manufacturer .....:	INTEL MOBILE COMMUNICATIONS
Address .....:	100 Center Point Circle, Suite 200 Columbia, South Carolina, 29210 USA
CIF/NIF/Passport.....:	Not Supplied
Telephone / Fax.....:	803-216-2344

Assessment requested

Evaluation of the possibility of extending the test results of Intel module 7265NGW contained in the test report 41273RRF.001, dated 2014/03/12 to Intel module 3165NGW based on the similarity letter provided by INTEL (See Annex A).

Test Report 41273RRF.001 reference standards are:

USA FCC Part 15.247 10-1-12 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz.

USA FCC Part 15.209 10-1-12 Edition: Radiated emission limits; general requirements.

CANADA RSS-210 Issue 8 (December 2010).

CANADA RSS-Gen Issue 3 (December 2010).

ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices.

FCC part 15.247 and Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum System DA 00-705 Released March 30, 2000.

NOTE: The specifications in the new standard RSS-Gen Issue 4 (November 2014) applicable to the module are the same as the ones specified in the former version RSS-Gen Issue 3 (December 2010).

Report template No .....: FDT70_00

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Competences and guarantees

AT4 wireless guarantees the reliability of the data presented in this report.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the works executed. All information evaluated will be handled as confidential.

General conditions

1. This report is only referred to the item that has undergone the evaluation.

2. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.

3. This assessment report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Documents used

Documents undergoing used for the evaluation has been provided by: **The applicant**.

Title	Description	Reception date
41273RRF.001	Test Report. reference standard USA FCC Part 15.247, 15.209; CANADA RSS-210, RSS-Gen Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. Licence-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment. General Requirements and Information for the Certification of Radio Apparatus.	2014/12/15
Similarity Declaration letter	Similarity declaration between Intel® Dual Band Wireless-AC 7265, model 7265NGW and Intel® Dual Band Wireless-AC 3165, model 3165NGW	2014/12/15

Summary

Considering the differences between Intel® Dual Band Wireless-AC 7265, model 7265NGW and Intel® Dual Band Wireless-AC 3165, model 3165NGW declared by the client (see Annex A), we conclude that the following test results from 41273RRF.001 test report are fully applicable to model 3165NGW:

FCC 15.247 Subclause (a) (1). 20 dB Bandwidth and Carrier frequency separation / RSS-210 Clause A8.1 (b).

FCC 15.247 Subclause (a) (1) (iii). Number of hopping channels / RSS-210 Clause A8.1 (d).

FCC 15.247 Subclause (a) (1) (iii). Time of occupancy (Dwell Time) / RSS-210 Clause A8.1 (d).

FCC 15.247 Subclause (b). Maximum peak output power and antenna gain / RSS-210, Clause A8.4 (2).

FCC 15.247 Subclause (d). Emission limitations conducted (Transmitter) / RSS-210 Clause A8.5.

FCC 15.247 Subclause (d). Emission limitations radiated (Transmitter) / RSS-210 Clause A8.5.

See Annex B for test results extracted from 41273RRF.001 test report.

NOTE: The results presented in this Assessment Report apply only to the particular item under evaluation established in page 1 of this document.

ANNEX A: Similarity Declaration letter

Similarity Declaration between:

Intel® Dual Band Wireless-AC 7265, model 7265NGW

And

Intel® Dual Band Wireless-AC 3165, model 3165NGW.

To whom it may concern,

This statement letter is to declare that the two following products are exactly the same board, meaning same HW, same schematic, same layout, same BoM:

- Intel® Dual Band Wireless-AC 7265, model 7265NGW
- Intel® Dual Band Wireless-AC 3165, model 3165NGW

The only difference is disabling by EEprom all MIMO data rate for Intel® Dual Band Wireless-AC 3165, model 3165NGW (Please refer to below table for detailed data rate listing comparison)

Model 7265NGW supports 2 spatial streams and **Model 3165NGW** supports only 1 spatial stream.

IEEE 802.11n/ac Modulation Coding Schemes

HT MCS Index	Modulation and Coding Rate	Spatial Streams	Data Rate (MBPS) 20 MHz Chan No SGI	20 MHz Chan SGI	40 MHz Chan No SGI	40 MHz Chan SGI	80 MHz Chan No SGI	80 MHz Chan SGI	VHT MCS Index
0	BPSK 1/2	1	6.5	7.2	13.5	15.0	29.3	32.5	0
1	QPSK 1/2	1	13.0	14.4	27.0	30.0	58.5	65.0	1
2	QPSK 3/4	1	19.5	21.7	40.5	45.0	87.8	97.5	2
3	16-QAM 1/2	1	26.0	28.9	54.0	60.0	117.0	130.0	3
4	16-QAM 3/4	1	39.0	43.3	81.0	90.0	175.5	195.0	4
5	64-QAM 2/3	1	52.0	57.8	108.0	120.0	234.0	260.0	5
6	64-QAM 3/4	1	58.5	65.0	121.5	135.0	263.3	292.5	6
7	64-QAM 5/6	1	65.0	72.2	135.0	150.0	292.5	325.0	7
	256-QAM 3/4	1	78.0	86.7	162.0	180.0	351.0	390.0	8
	256-QAM 5/6	1	n/a	n/a	180.0	200.0	390.0	433.3	9
8	BPSK 1/2	2	13.0	14.4	27.0	30.0	58.5	65.0	0
9	QPSK 1/2	2	26.0	28.9	54.0	60.0	117.0	130.0	1
10	QPSK 3/4	2	39.0	43.3	81.0	90.0	175.5	195.0	2
11	16-QAM 1/2	2	52.0	57.8	108.0	120.0	234.0	260.0	3
12	16-QAM 3/4	2	78.0	86.7	162.0	180.0	351.0	390.0	4
13	64-QAM 2/3	2	104.0	115.6	216.0	240.0	468.0	520.0	5
14	64-QAM 3/4	2	117.0	130.0	243.0	270.0	526.5	585.0	6
15	64-QAM 5/6	2	130.0	144.4	270.0	300.0	585.0	650.0	7
	256-QAM 3/4	2	156.0	173.3	324.0	360.0	702.0	780.0	8
	256-QAM 5/6	2	n/a	n/a	360.0	400.0	780.0	866.7	9

Authorized signature by:

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ANNEX B: Test results that apply to model 3165NGW

ANNEX B CONTENT:

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TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 3.3 Vdc

Type of power supply = DC voltage from HMC/NGFF Testing board.

Type of antenna = External attachable PIFA antenna.

Declared Gain for antenna (maximum) = 3.24 dBi

TEST FREQUENCIES:

Lowest channel: 2402 MHz

Middle channel: 2441 MHz

Highest channel: 2480 MHz

For Bluetooth Basic and EDR operational modes the transmission is at CHAIN B RF output.

For radio testing purposes the card was installed in a test fixture. The test fixture is connected to a laptop computer and dc power supplied. The laptop computer was used to configure the EUT to continuously transmit at a specified output power with different modes and modulation schemes.

CONDUCTED MEASUREMENTS

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

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-25 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 (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º 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.

FCC Section 15.247 Subclause (a) (1) / RSS-210 Clause A8.1 (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

(See next plots)

Modulation: GFSK

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20 dB Spectrum bandwidth (kHz)	971.00	971.00	973.00
Measurement uncertainty (kHz)	±7		

Modulation: Π/4-DQPSK (2Mbps)

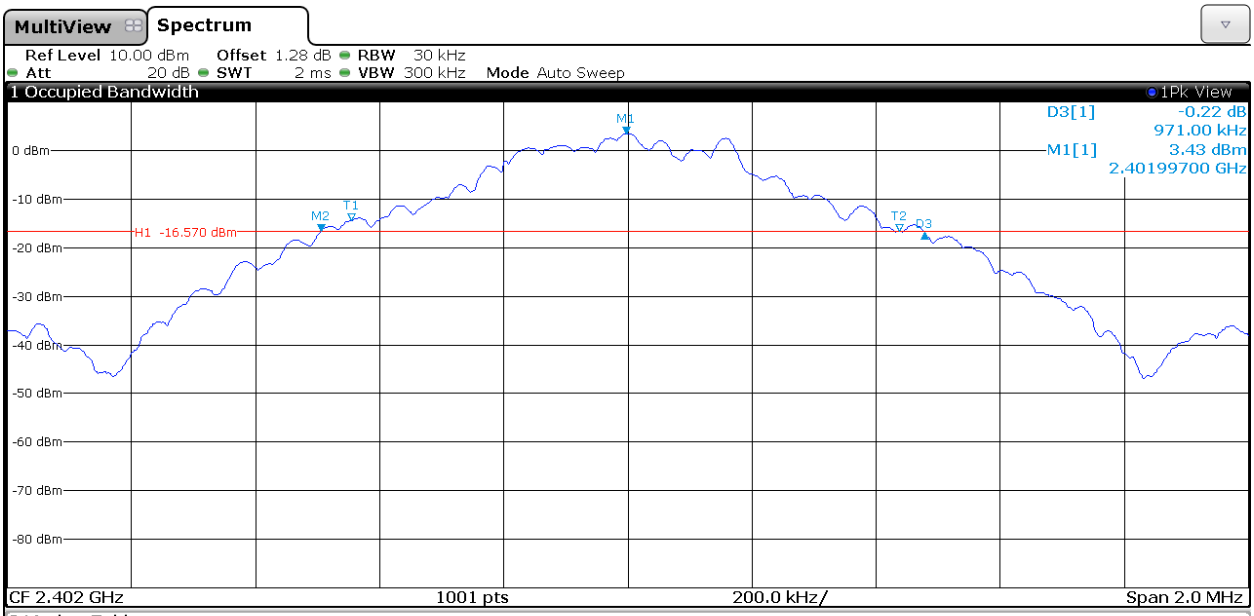
	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20 dB Spectrum bandwidth (kHz)	1424.60	1426.60	1432.60
Measurement uncertainty (kHz)	±7		

Modulation: 8-DPSK (3Mbps)

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20 dB Spectrum bandwidth (kHz)	1442.60	1444.60	1438.60
Measurement uncertainty (kHz)	±7		

Modulation: GFSK

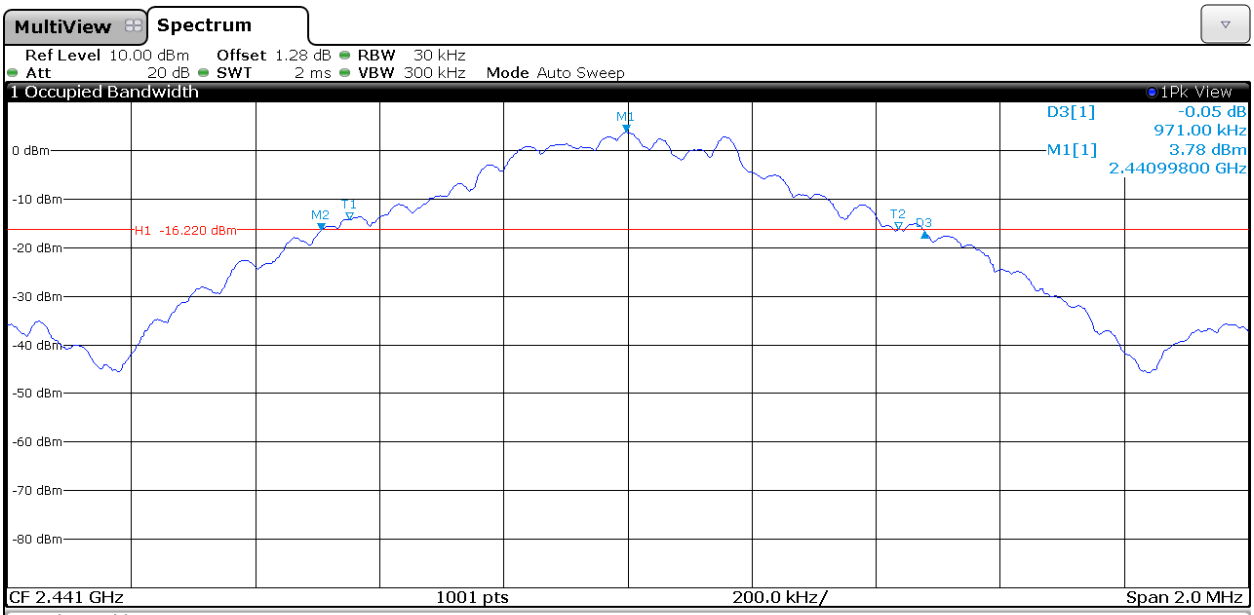
20 dB BANDWIDTH. Lowest Channel: 2402 MHz.



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.401997 GHz**	**3.43 dBm**		
T1		1	2.40155445 GHz	-14.47 dBm	Occ Bw	**883.116883117 kHz**
T2		1	2.40243756 GHz	-16.61 dBm		
M2		1	**2.4015065 GHz**	**-16.56 dBm**		
D3	M2	1	**971.0 kHz**	**-0.22 dB**		

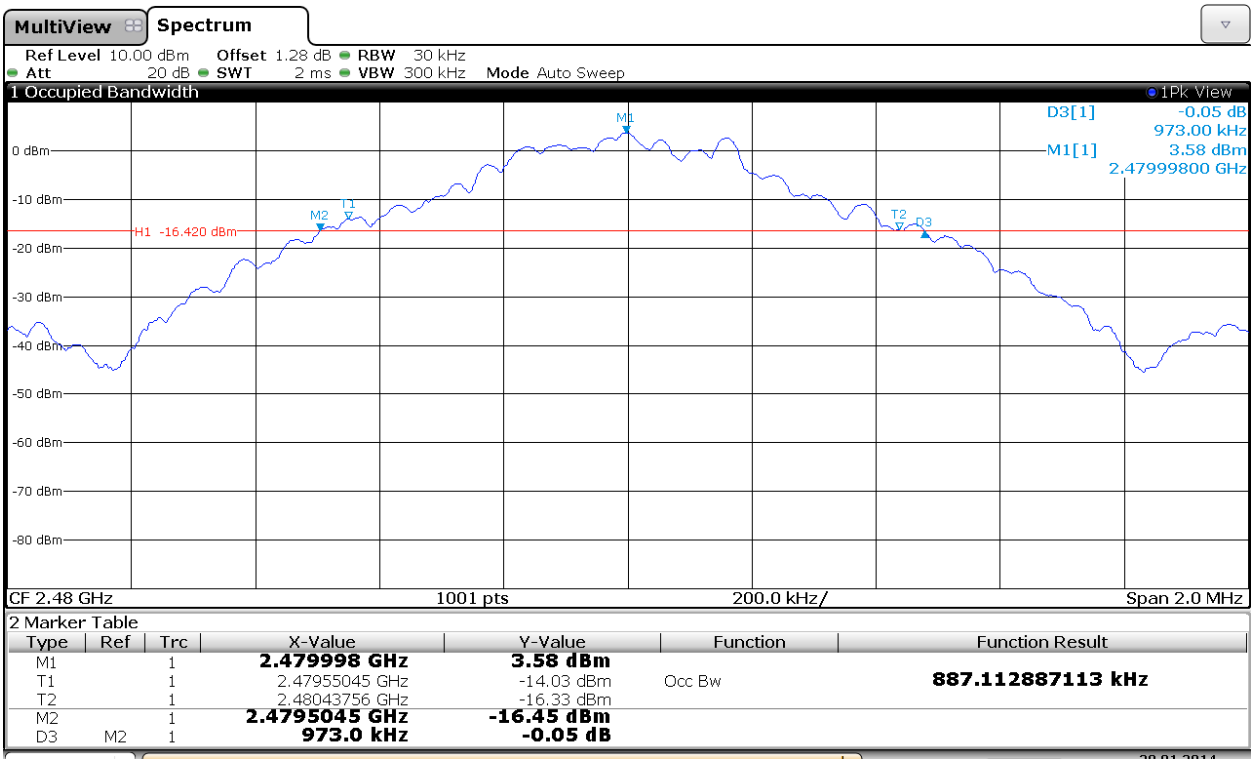
20 dB BANDWIDTH Middle Channel: 2441 MHz.



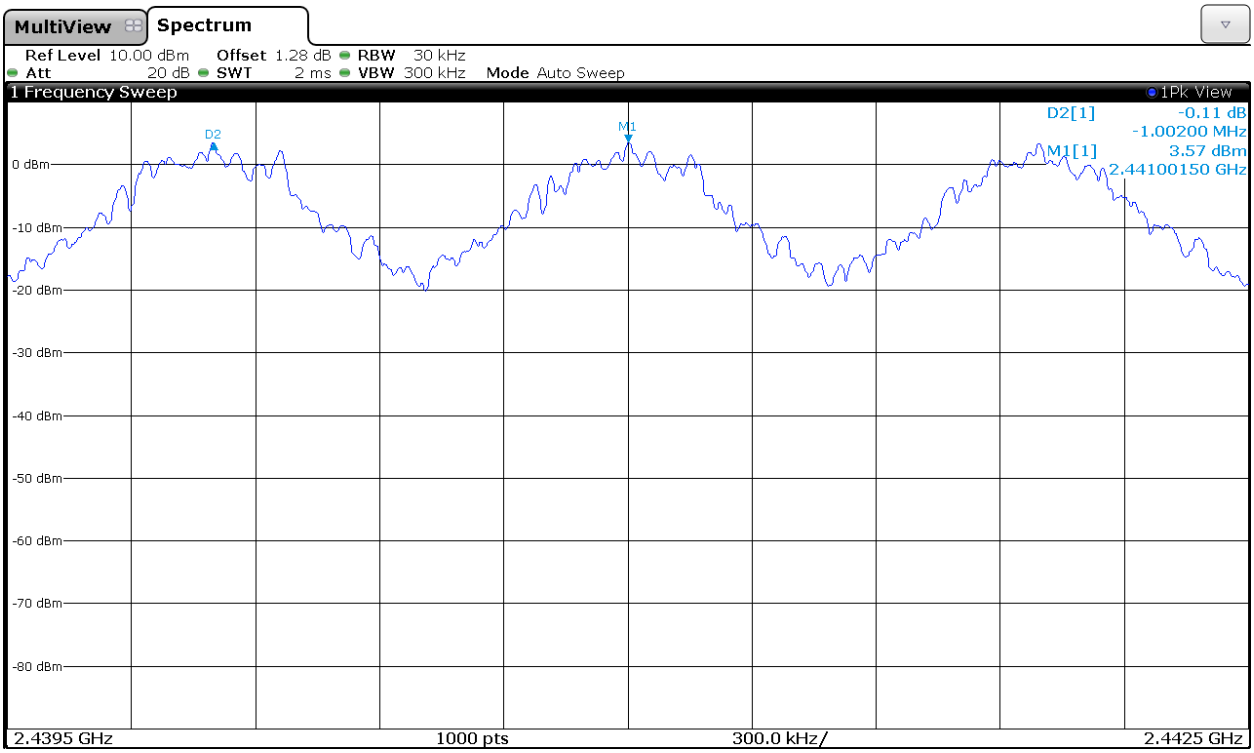
2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.440998 GHz**	**3.78 dBm**		
T1		1	2.44055245 GHz	-14.26 dBm	Occ Bw	**883.116883117 kHz**
T2		1	2.44143556 GHz	-16.32 dBm		
M2		1	**2.4405065 GHz**	**-16.51 dBm**		
D3	M2	1	**971.0 kHz**	**-0.05 dB**		

20 dB BANDWIDTH Highest Channel: 2480 MHz.



Carrier frequency separation

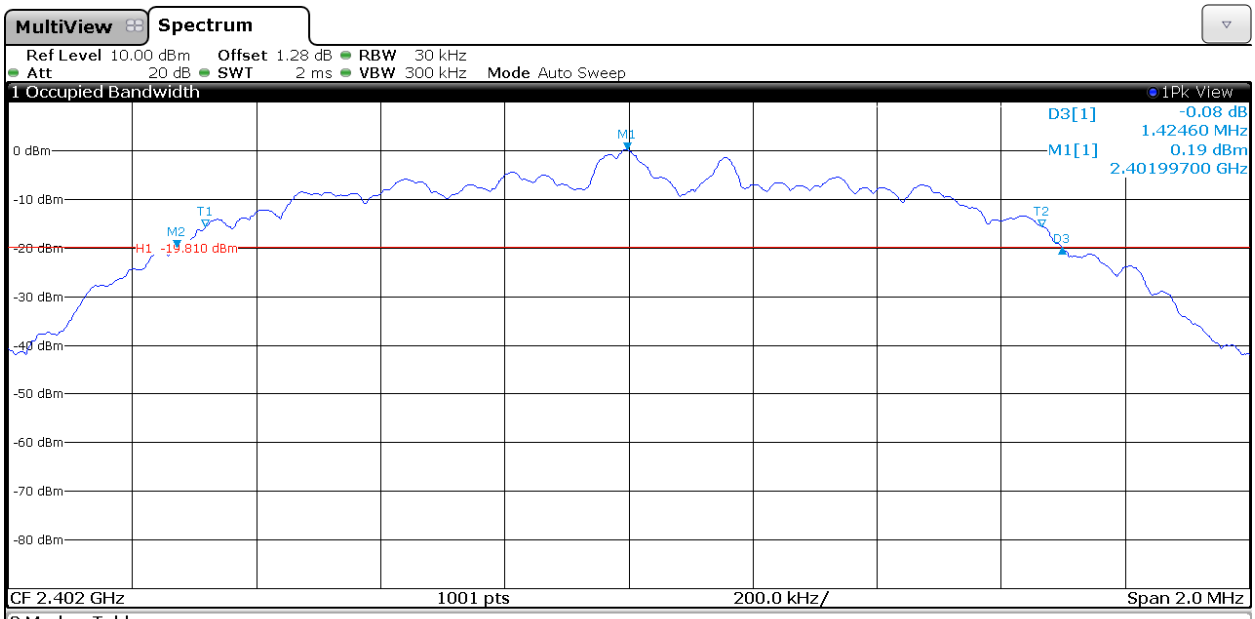


The hopping channel carrier frequencies are separated by a minimum of the 20 dB bandwidth of the hopping channel.

Verdict: PASS

Modulation: II/4-DQPSK

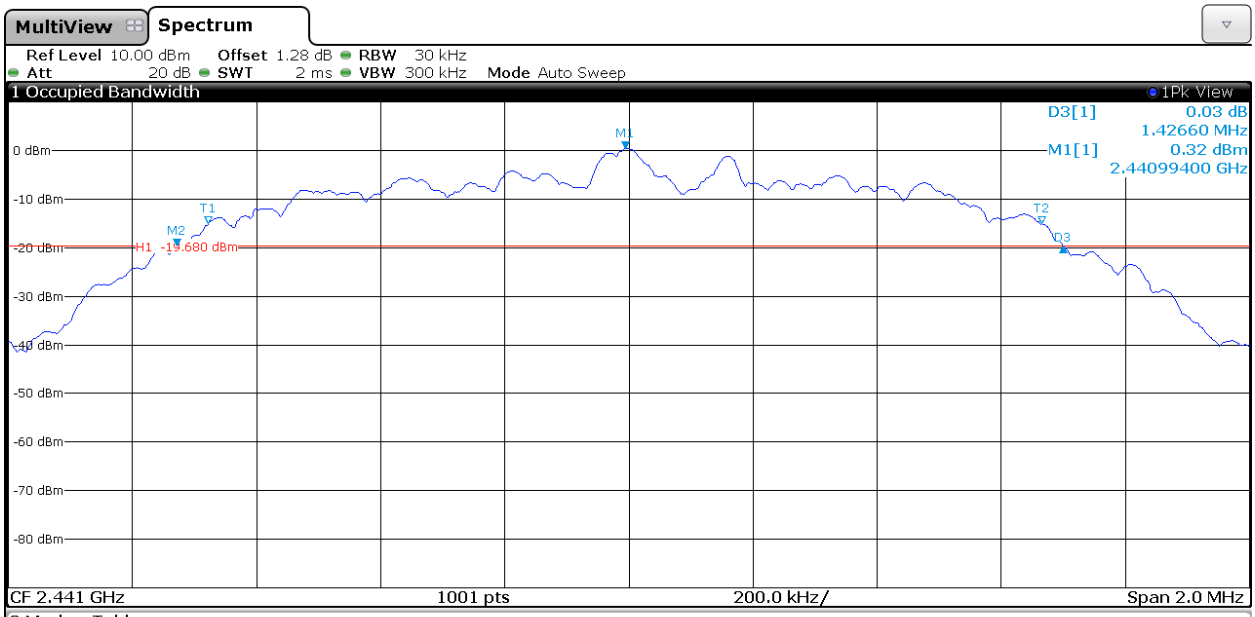
20 dB BANDWIDTH. Lowest Channel: 2402 MHz.



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.401997 GHz**	**0.19 dBm**		
T1		1	2.40131868 GHz	-15.67 dBm	Occ Bw	**1.346653347 MHz**
T2		1	2.40266533 GHz	-15.57 dBm		
M2		1	**2.4012727 GHz**	**-19.80 dBm**		
D3	M2	1	**1.4246 MHz**	**-0.08 dB**		

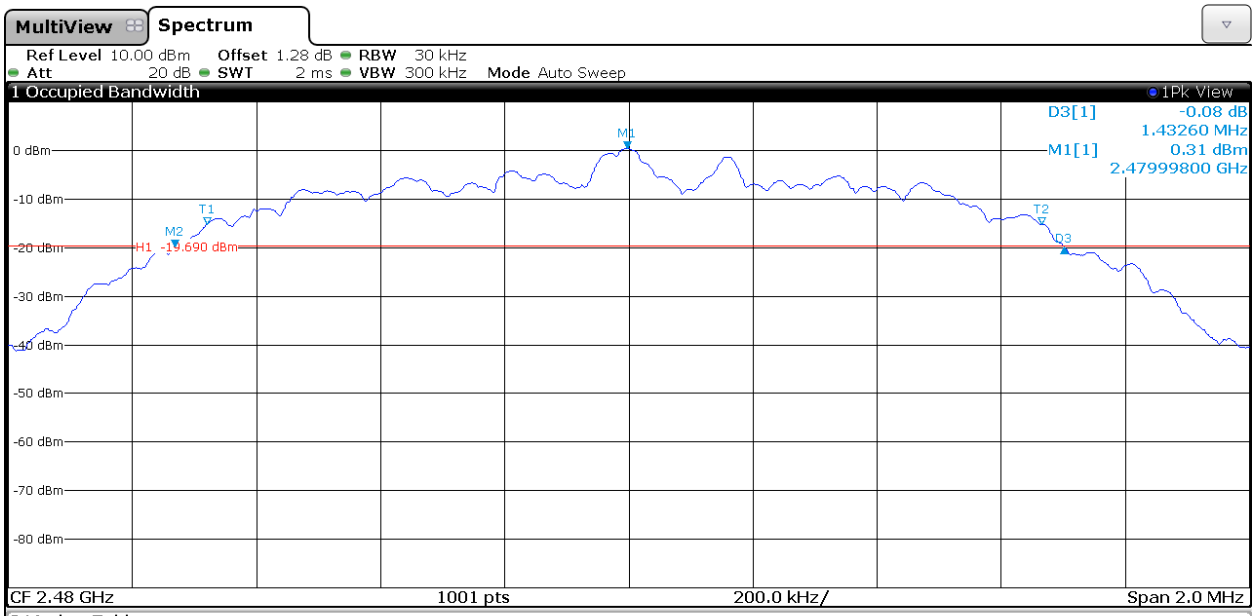
20 dB BANDWIDTH Middle Channel: 2441 MHz.



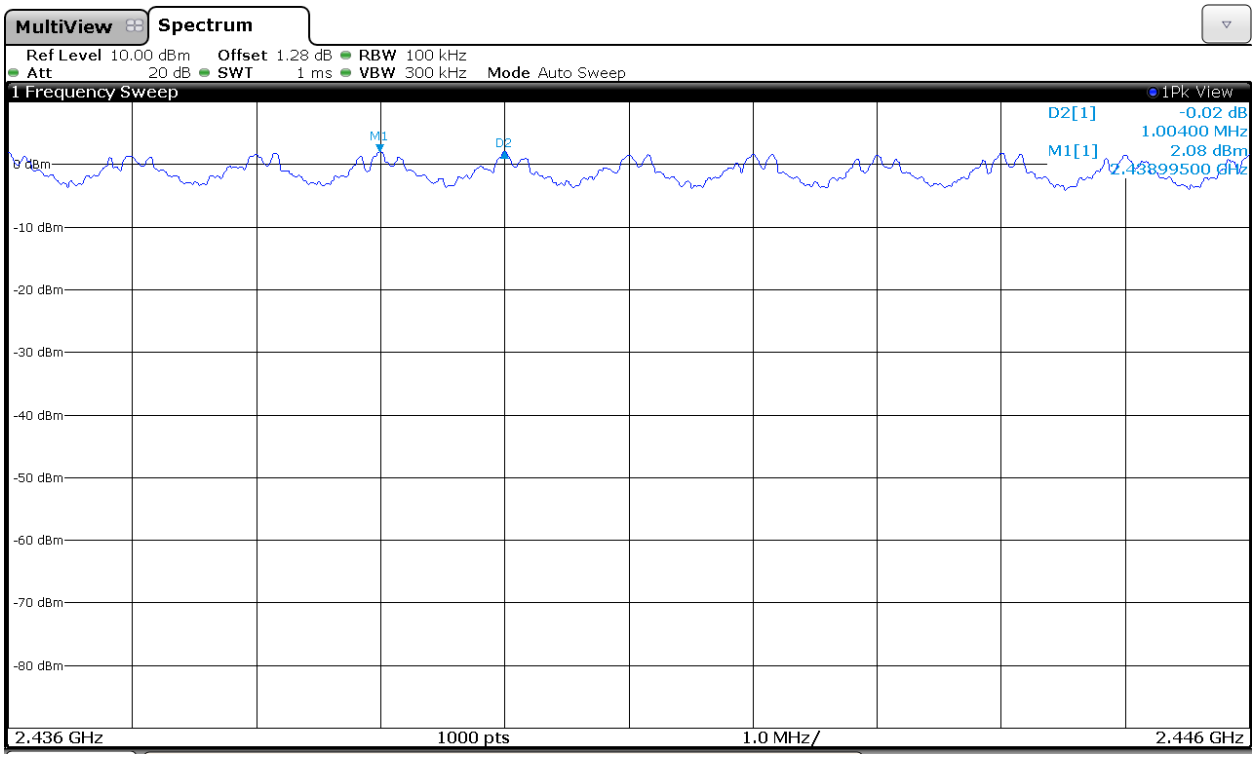
2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.440994 GHz**	**0.32 dBm**		
T1		1	2.44032268 GHz	-15.11 dBm	Occ Bw	**1.342657343 MHz**
T2		1	2.44166533 GHz	-15.15 dBm		
M2		1	**2.4402727 GHz**	**-19.71 dBm**		
D3	M2	1	**1.4266 MHz**	**0.03 dB**		

20 dB BANDWIDTH Highest Channel: 2480 MHz.



Carrier frequency separation

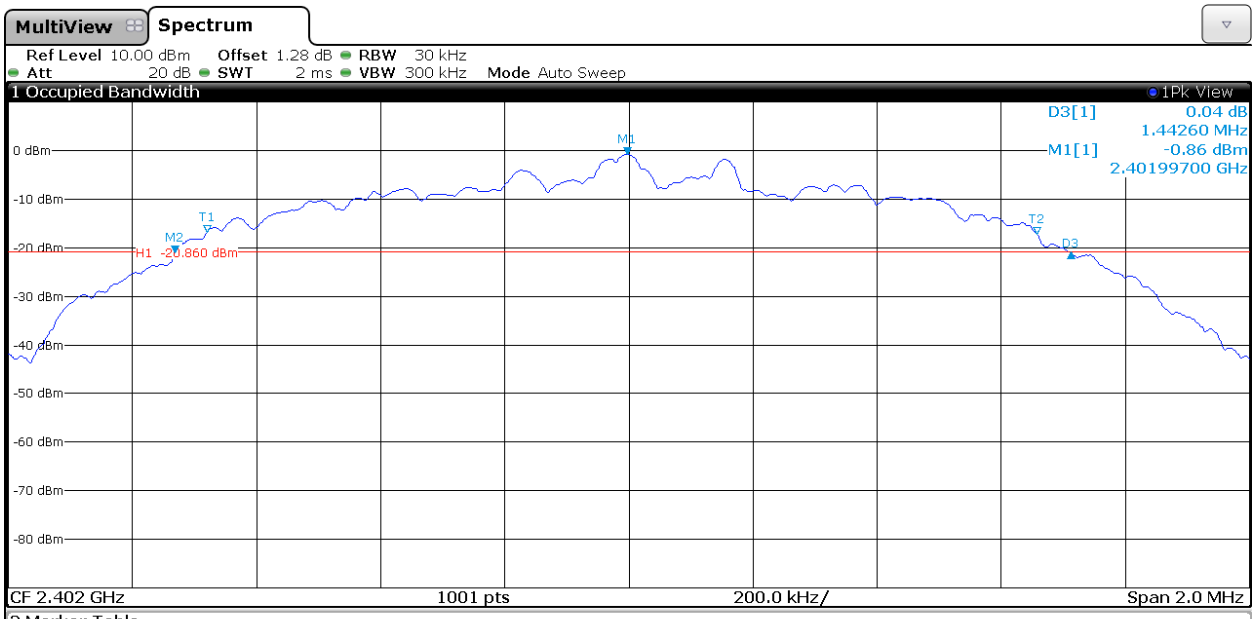


The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20 dB bandwidth of the hopping channel

Verdict: PASS

Modulation: 8-DPSK

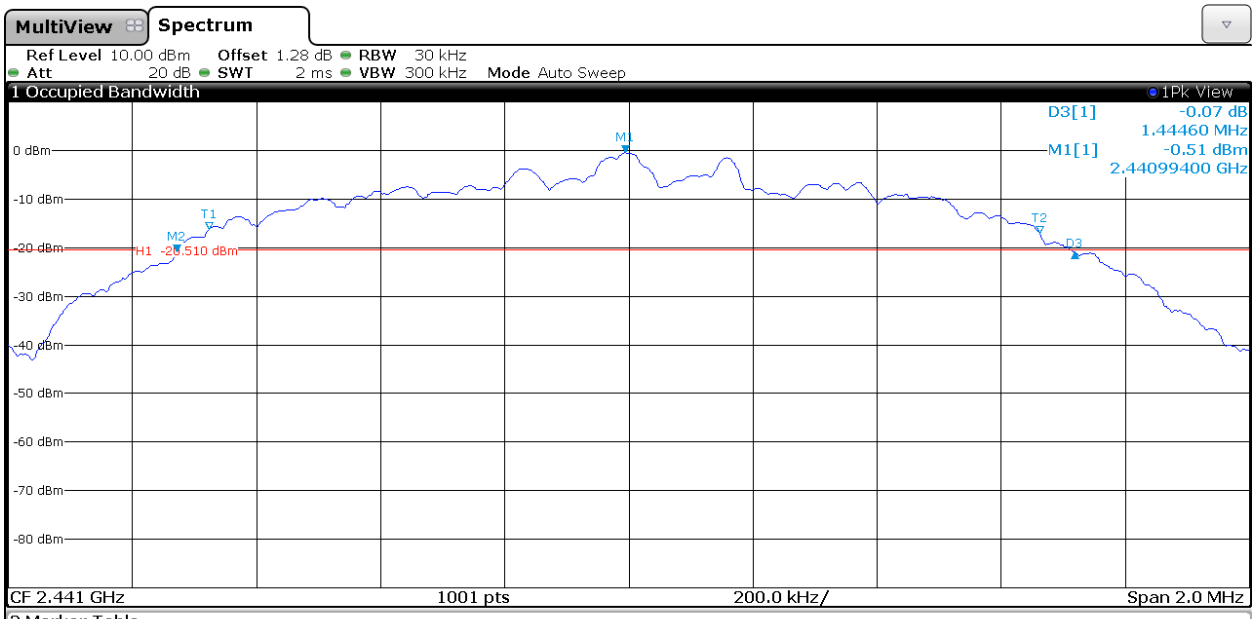
20 dB BANDWIDTH Lowest Channel: 2402 MHz.



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.401997 GHz**	**-0.86 dBm**		
T1		1	2.40132068 GHz	-16.76 dBm	Occ Bw	**1.336663337 MHz**
T2		1	2.40265734 GHz	-17.33 dBm		
M2		1	**2.4012687 GHz**	**-20.98 dBm**		
D3	M2	1	**1.4426 MHz**	**0.04 dB**		

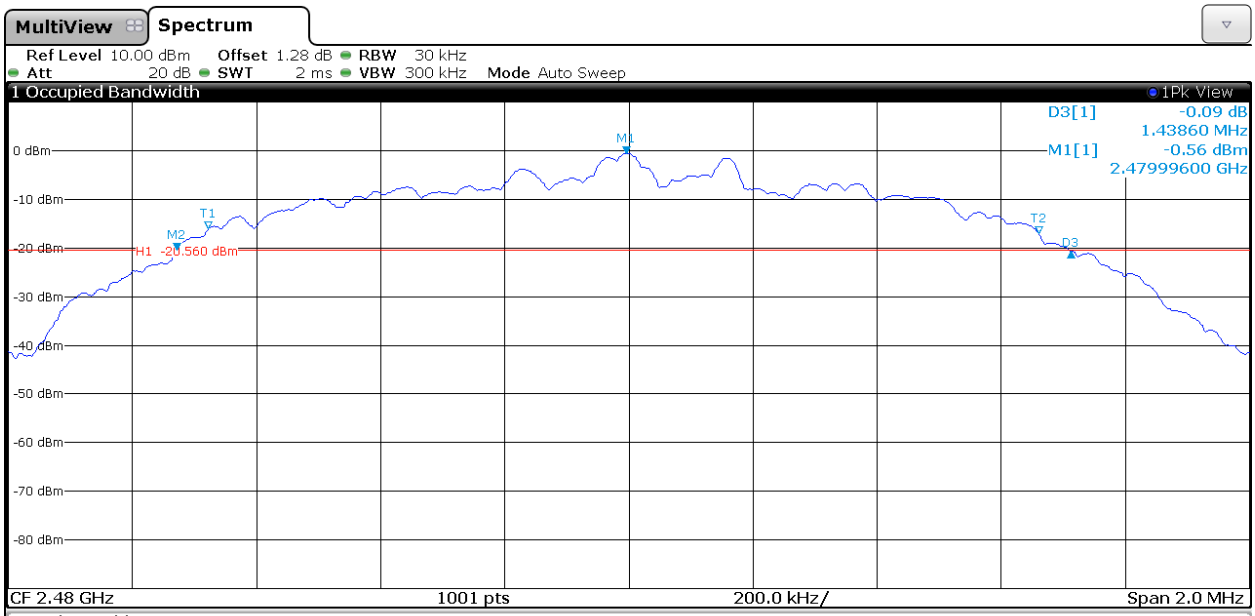
20 dB BANDWIDTH Middle Channel: 2441 MHz.



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.440994 GHz**	**-0.51 dBm**		
T1		1	2.44032468 GHz	-16.24 dBm	Occ Bw	**1.336663337 MHz**
T2		1	2.44166134 GHz	-17.06 dBm		
M2		1	**2.4402727 GHz**	**-20.84 dBm**		
D3	M2	1	**1.4446 MHz**	**-0.07 dB**		

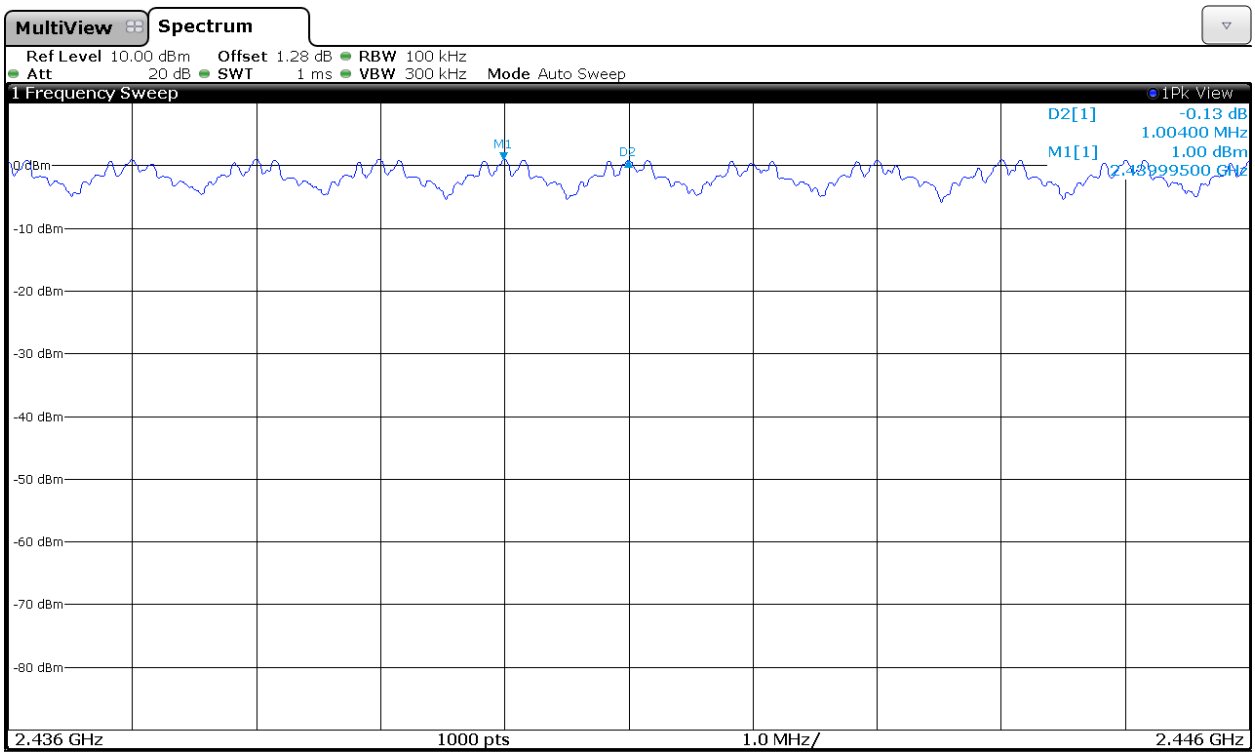
20 dB BANDWIDTH Highest Channel: 2480 MHz.



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.479996 GHz**	**-0.56 dBm**		
T1		1	2.47932268 GHz	-16.10 dBm	Occ Bw	**1.336663337 MHz**
T2		1	2.48065934 GHz	-17.10 dBm		
M2		1	**2.4792727 GHz**	**-20.55 dBm**		
D3	M2	1	**1.4386 MHz**	**-0.09 dB**		

Carrier frequency separation



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

Verdict: PASS

FCC Section 15.247 Subclause (a) (1) (iii) / RSS-210 Clause A8.1 (d). Number of hopping channels

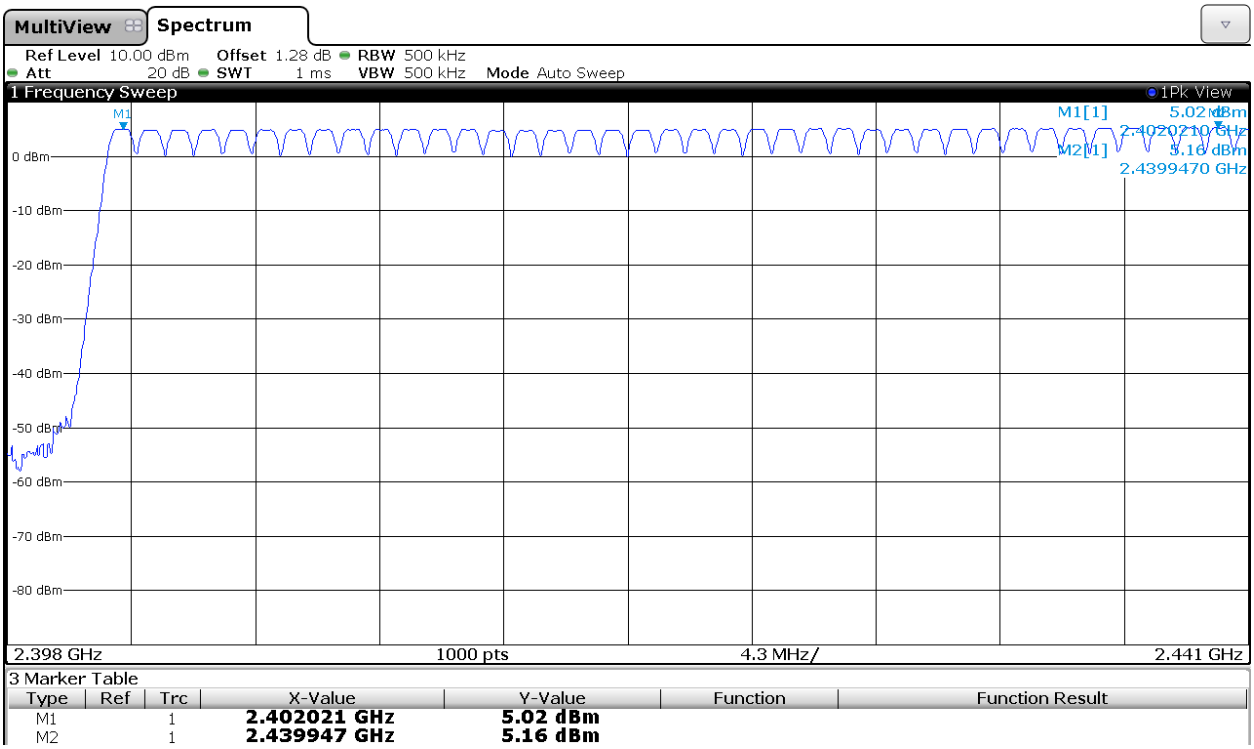
SPECIFICATION

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

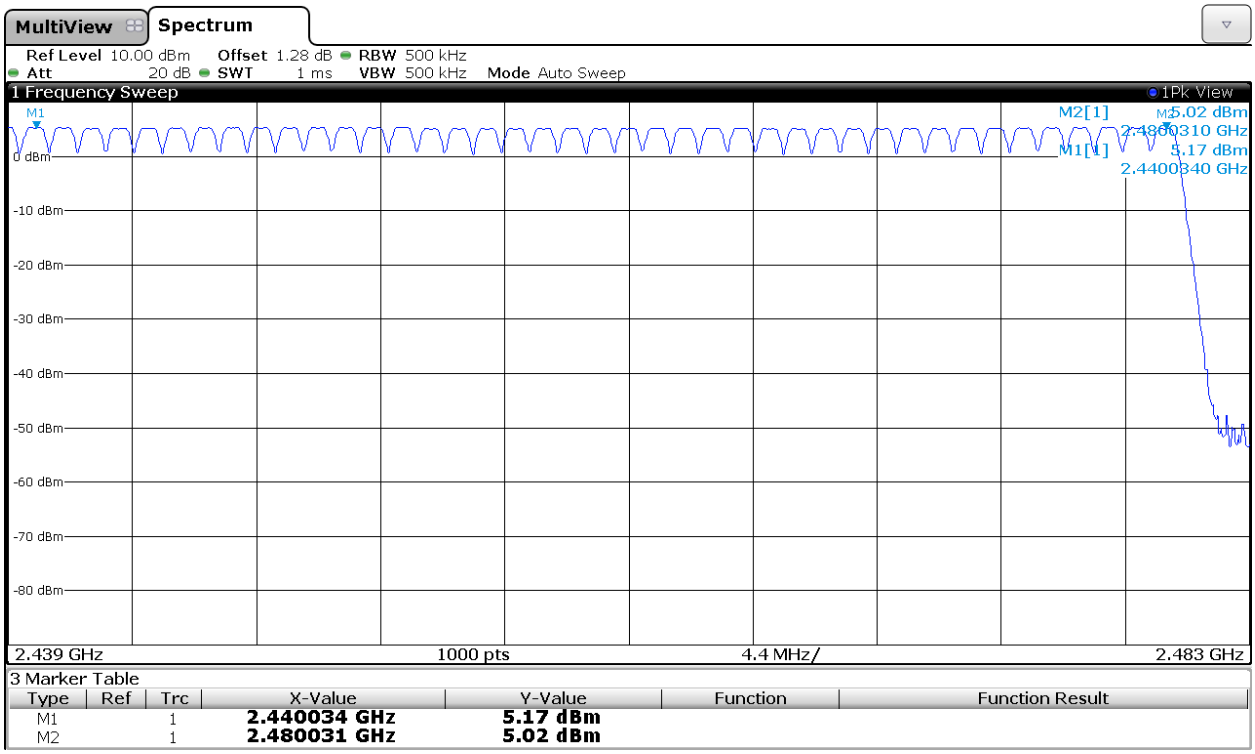
RESULTS

The number of hopping channels is 79 for all three modes (see next plots).

Modulation: GFSK



Number of hopping frequencies: 39

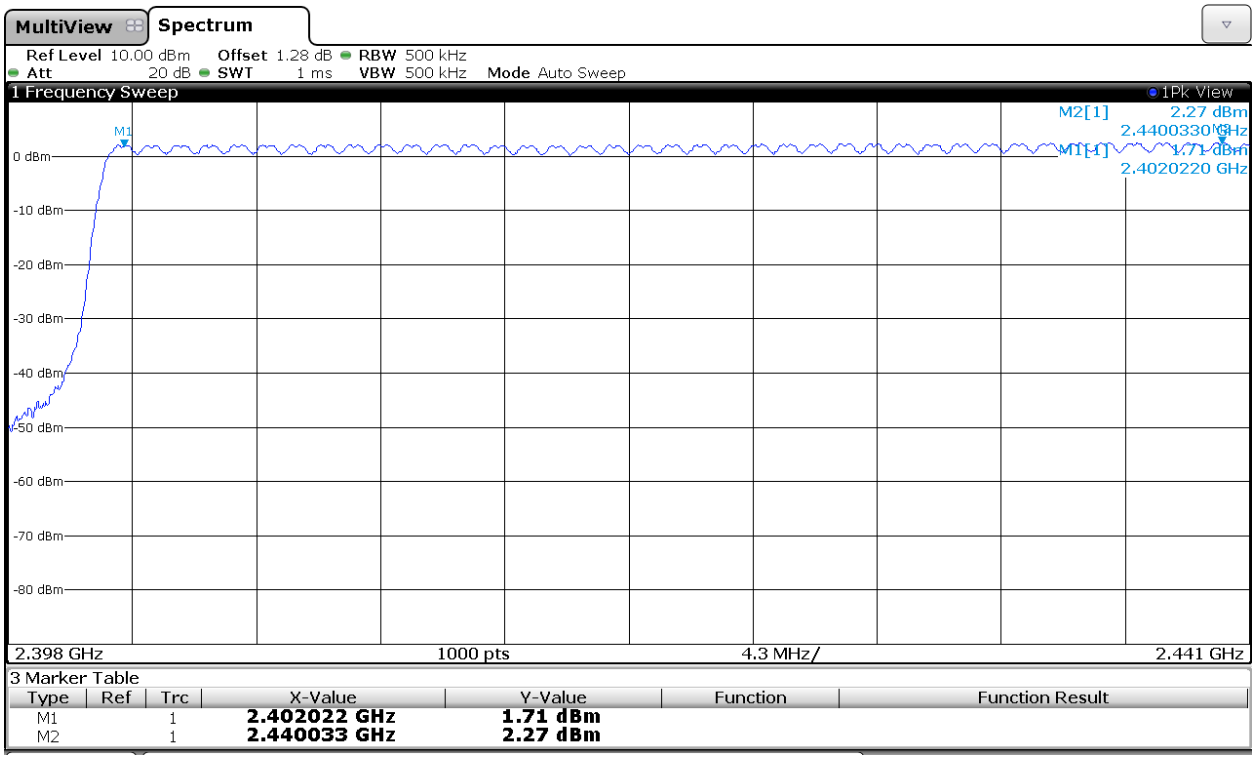


Number of hopping frequencies: 40

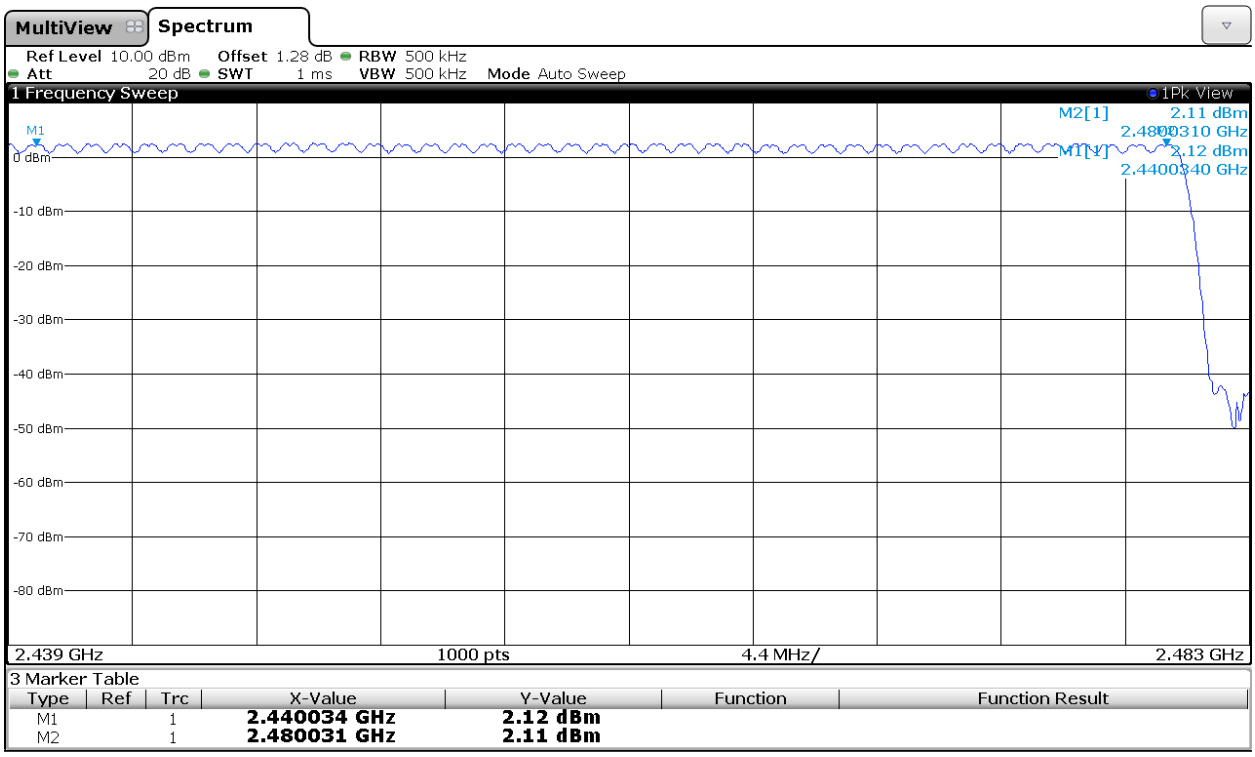
Total number of hopping frequencies: 79

Verdict: PASS

Modulation: II/4-DQPSK



Number of hopping frequencies: 39

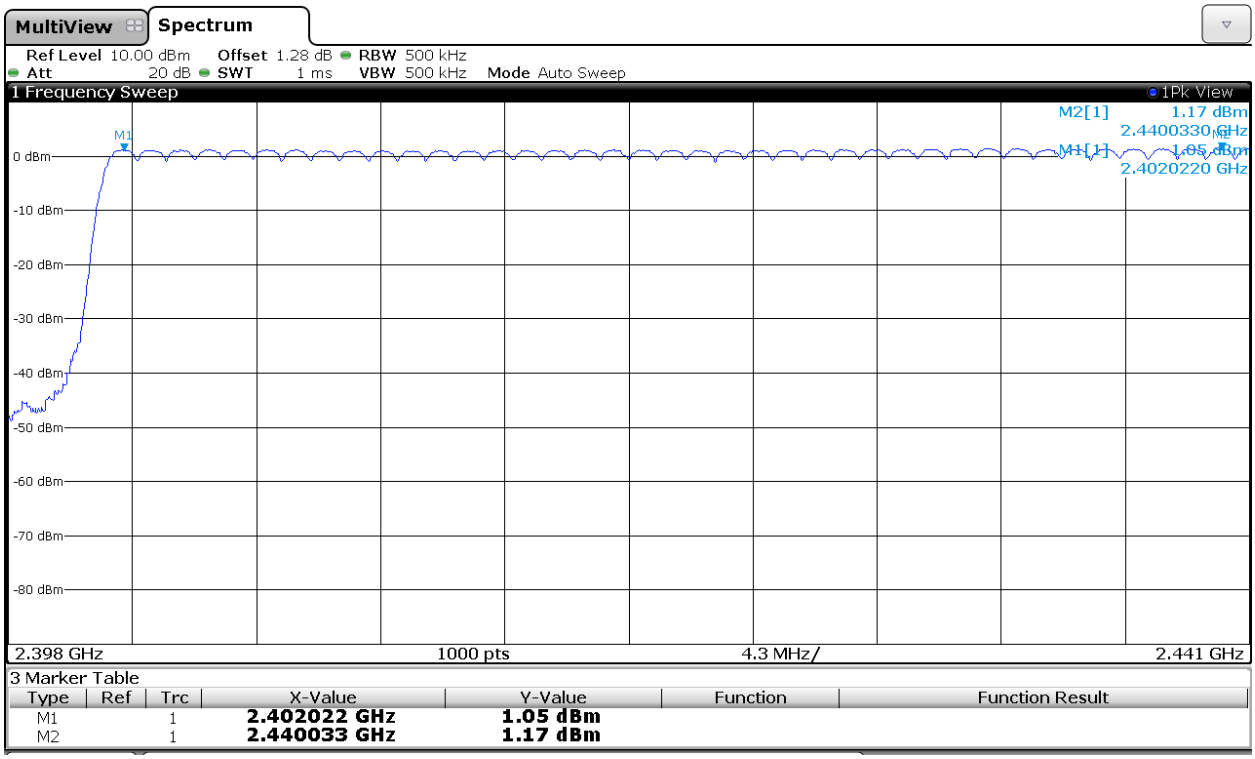


Number of hopping frequencies: 40

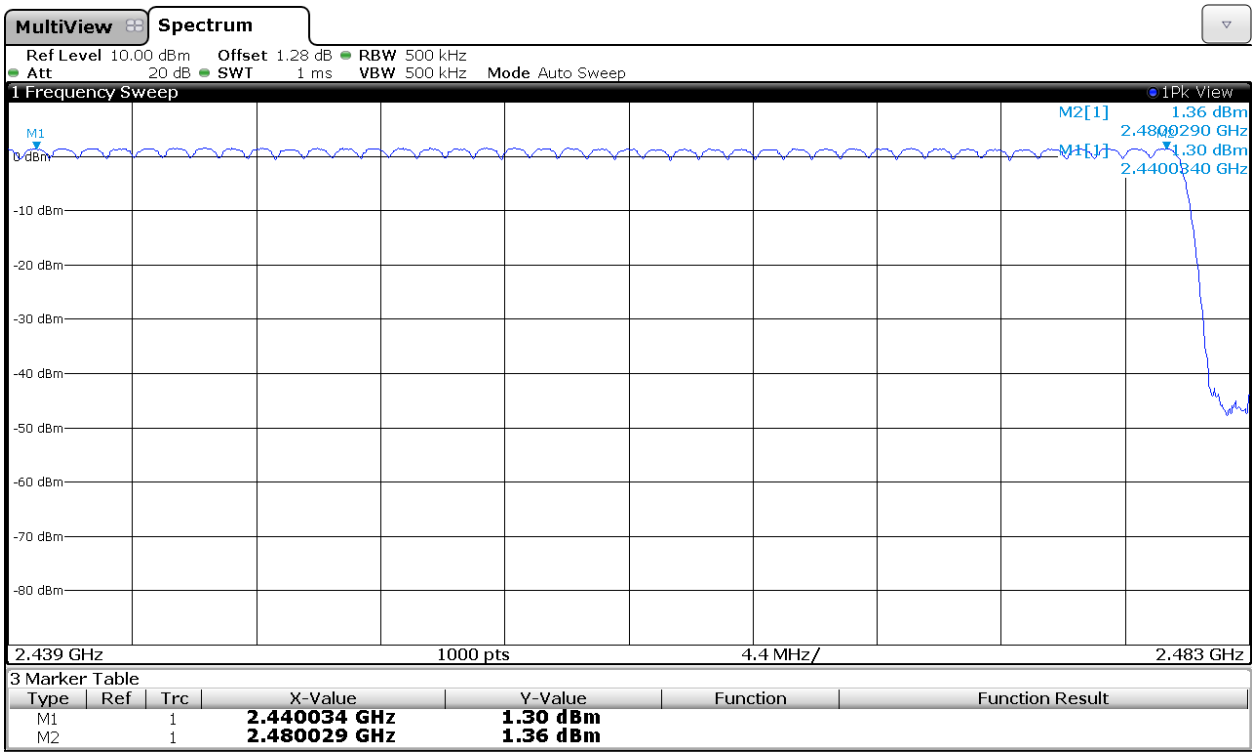
Total number of hopping frequencies: 79

Verdict: PASS

Modulation: 8-DPSK



Number of hopping frequencies: 39



Number of hopping frequencies: 40

Total number of hopping frequencies: 79

Verdict: PASS

FCC Section 15.247 Subclause (a) (1) (iii) / RSS-210 Clause A8.1 (d). Time of occupancy (Dwell Time)

SPECIFICATION

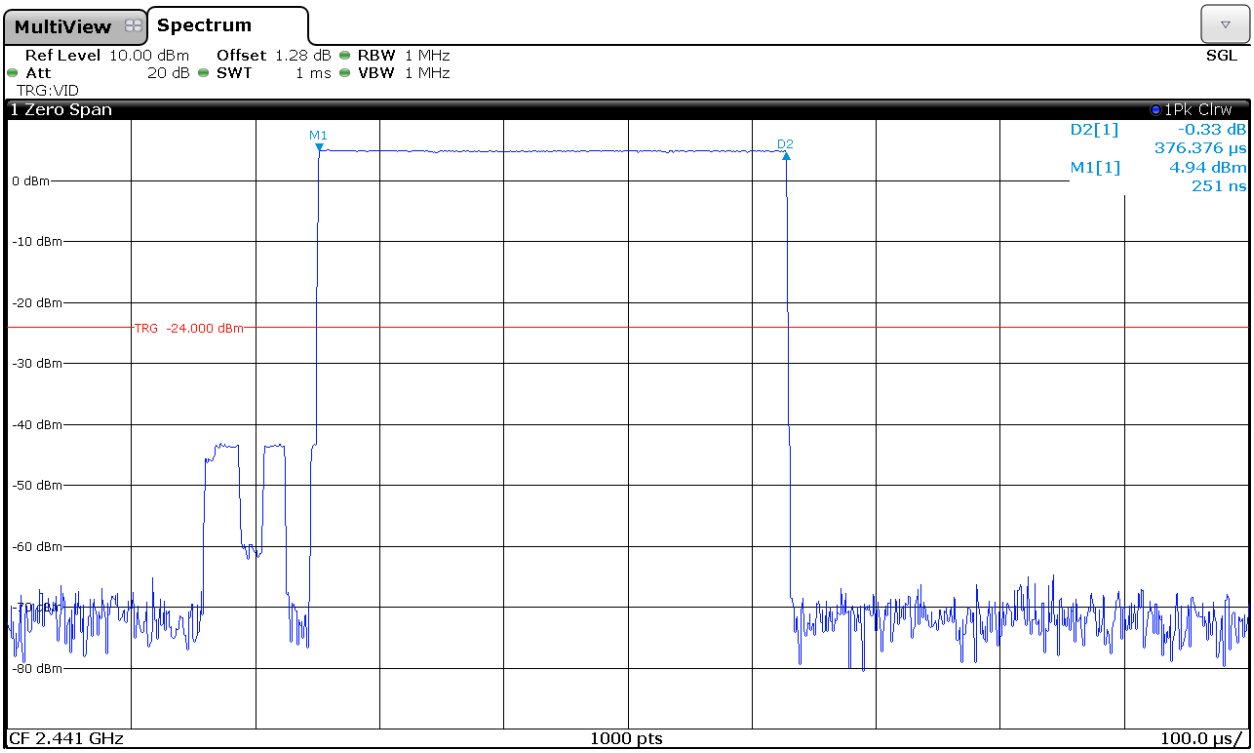
The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed = 0.4 x 79= 31.6 seconds.

RESULTS

Modulation: GFSK

1. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH1.

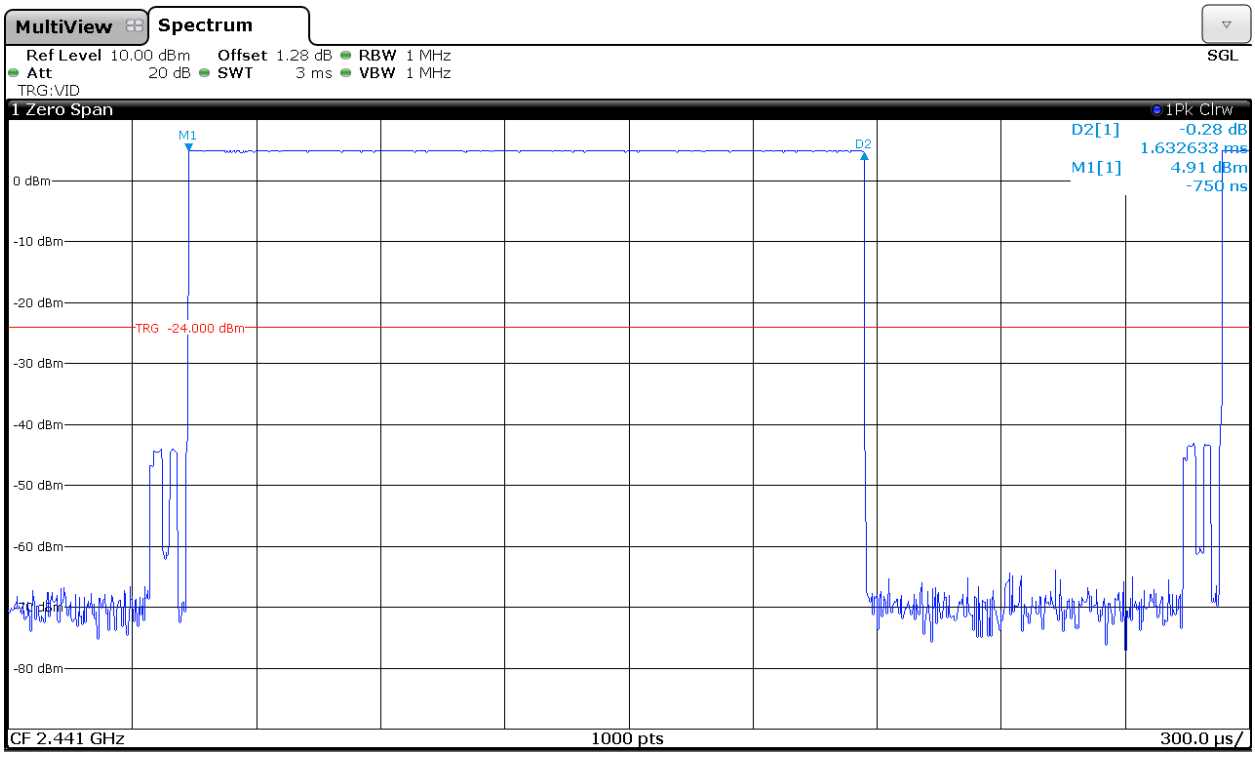
The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/2 = 800 hops per second with 79 channels. So you have each channel 800/79 = 10.13 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 10.13 x 31.6 = 320.11 times of appearance.
Each Tx-time per appearance is 376.38 µs (see next plot).
So we have 320.11 x 376.38 µs = 120.48 ms per 31.6 seconds.



Verdict: PASS

2. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH3.

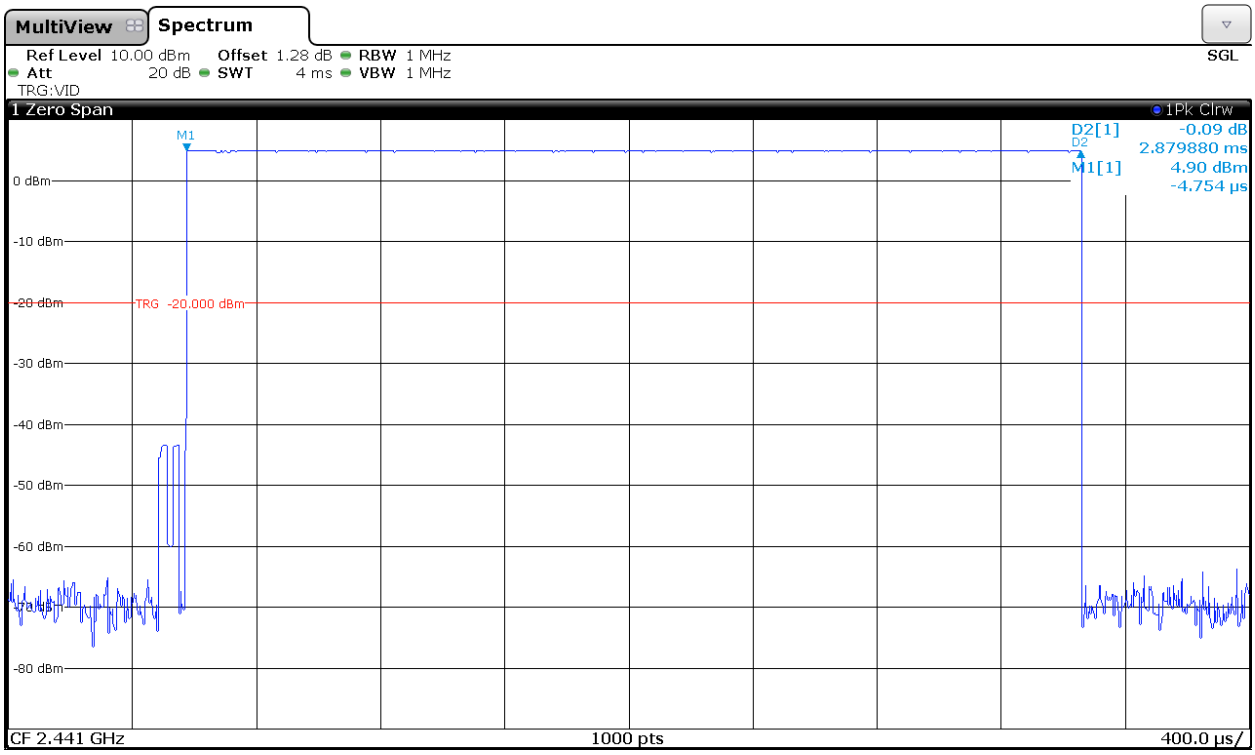
A DH3 Packet needs 3 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/4 = 400 hops per second with 79 channels. So you have each channel 400/79 = 5.1 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 5.1 x 31.6 = 161.16 times of appearance.
Each Tx-time per appearance is 1.633 ms (see next plot).
So we have 161.16 x 1.633 ms = 263.17 ms per 31.6 seconds.



Verdict: PASS

3. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH5.

A DH5 Packet needs 5 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/6 = 266.67 hops per second with 79 channels. So you have each channel 266.67/79 = 3.37 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 3.37 x 31.6 = 106.49 times of appearance.
Each Tx-time per appearance is 2.880 ms (see next plot).
So we have 106.49 x 2.880 ms = 306.69 ms per 31.6 seconds.

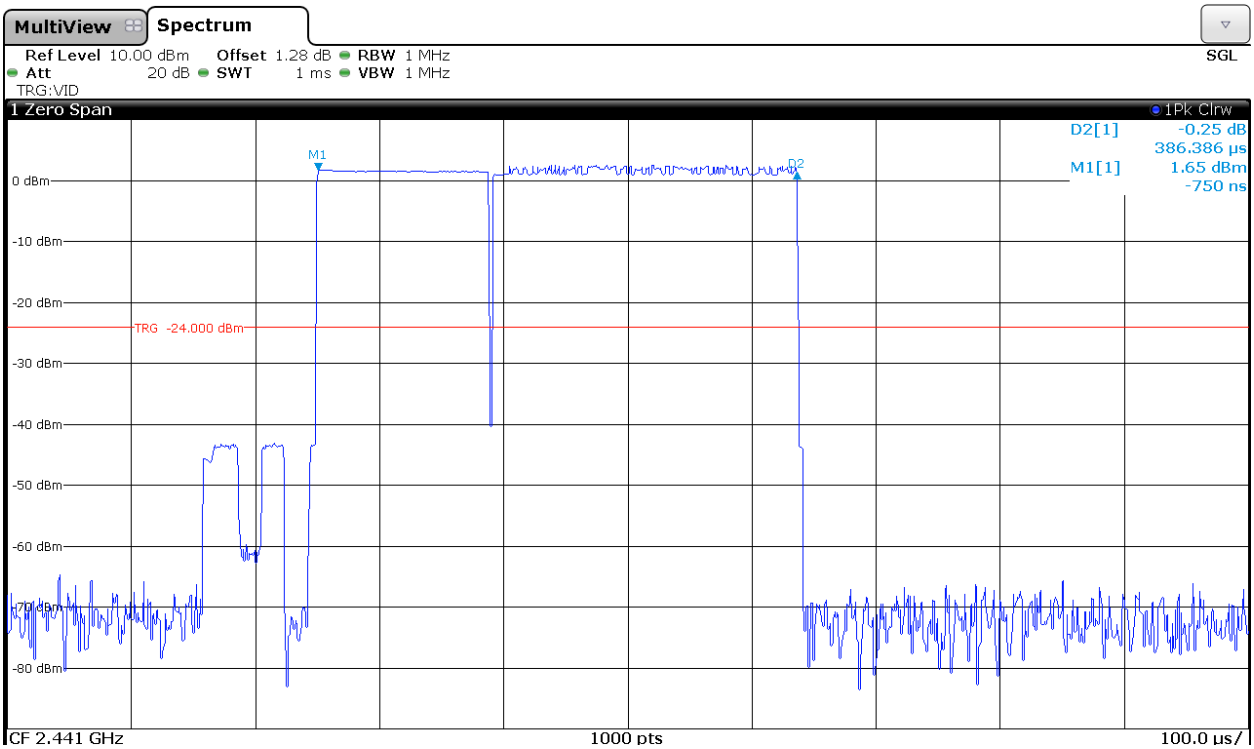


Verdict: PASS

Modulation: Π/4-DQPSK

1. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH1.

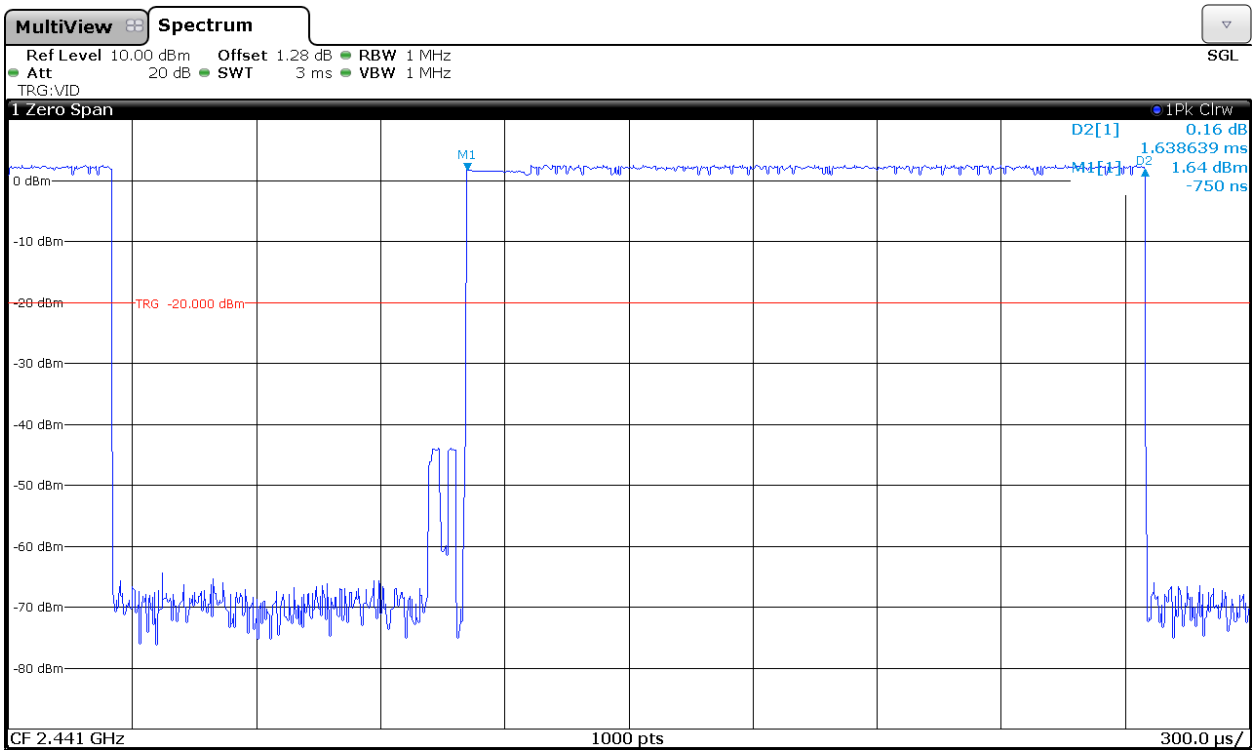
The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/2 = 800 hops per second with 79 channels. So you have each channel 800/79 = 10.13 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 10.13 x 31.6 = 320.11 times of appearance.
Each Tx-time per appearance is 386.39 µs (see next plot).
So we have 320.11 x 386.39 µs =123.69 ms per 31.6 seconds.



Verdict: PASS

2. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH3.

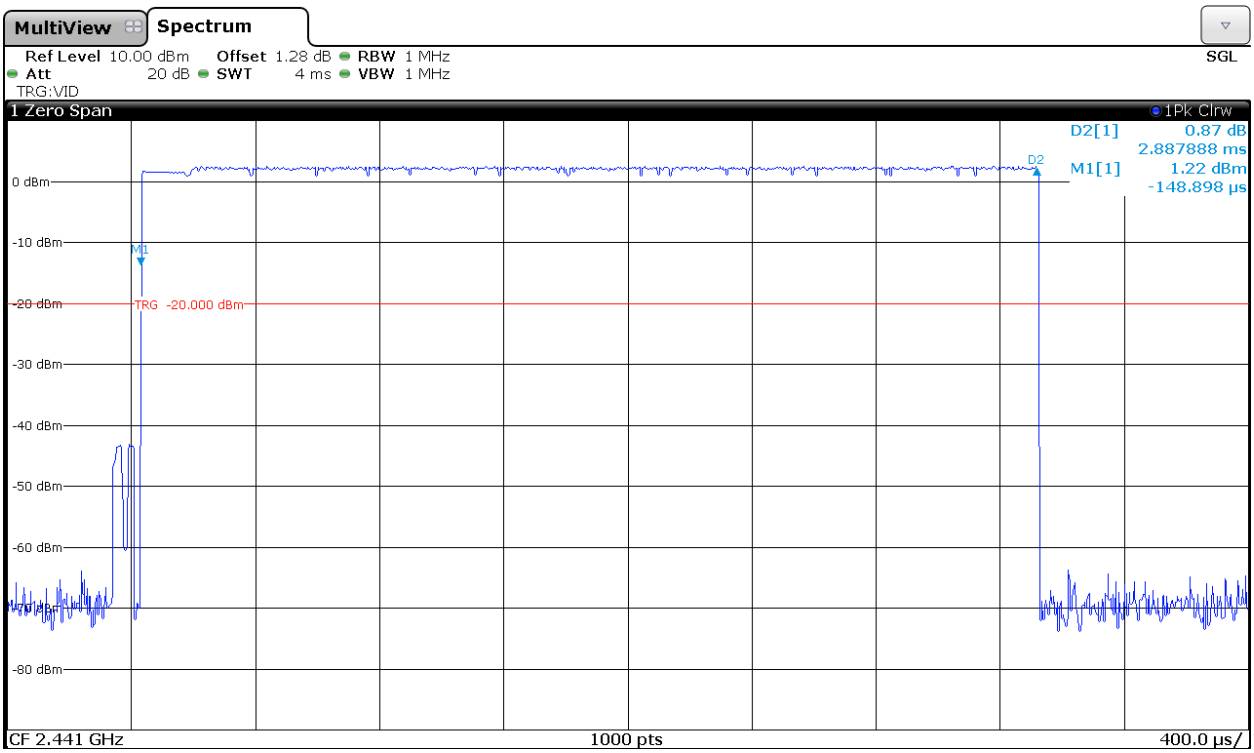
A DH3 Packet needs 3 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/4 = 400 hops per second with 79 channels. So you have each channel 400/79 = 5.1 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 5.1 x 31.6 = 161.16 times of appearance.
Each Tx-time per appearance is 1.639 ms (see next plot).
So we have 161.16 x 1.639 ms = 264.14 ms per 31.6 seconds.



Verdict: PASS

3. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH5.

A DH5 Packet needs 5 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/6 = 266.67 hops per second with 79 channels. So you have each channel 266.67/79 = 3.37 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 3.37 x 31.6 = 106.49 times of appearance.
Each Tx-time per appearance is 2.888 ms (see next plot).
So we have 106.49 x 2.888 ms = 307.54 ms per 31.6 seconds.

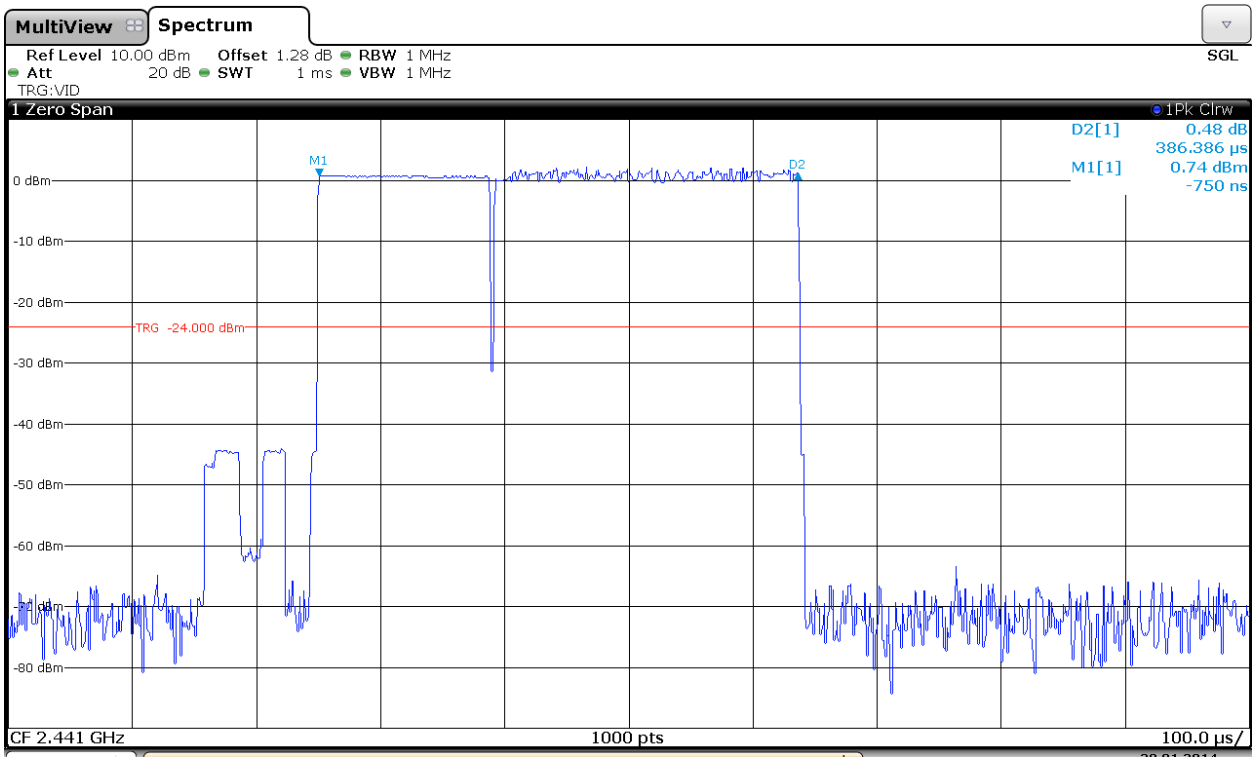


Verdict: PASS

Modulation: 8-DPSK

1. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH1.

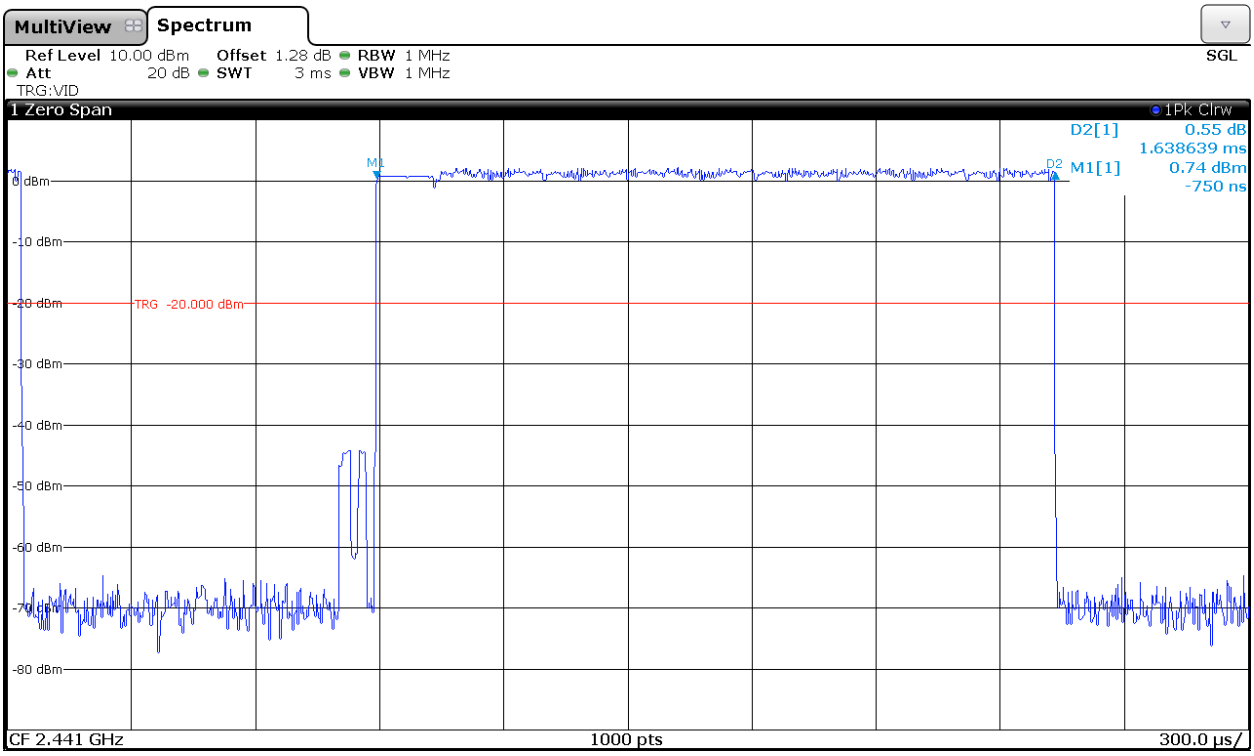
The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/2 = 800 hops per second with 79 channels. So you have each channel 800/79 = 10.13 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 10.13 x 31.6 = 320.11 times of appearance.
Each Tx-time per appearance is 386.39 µs (see next plot).
So we have 320.11 x 386.39 µs =123.69 ms per 31.6 seconds.



Verdict: PASS

2. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH3.

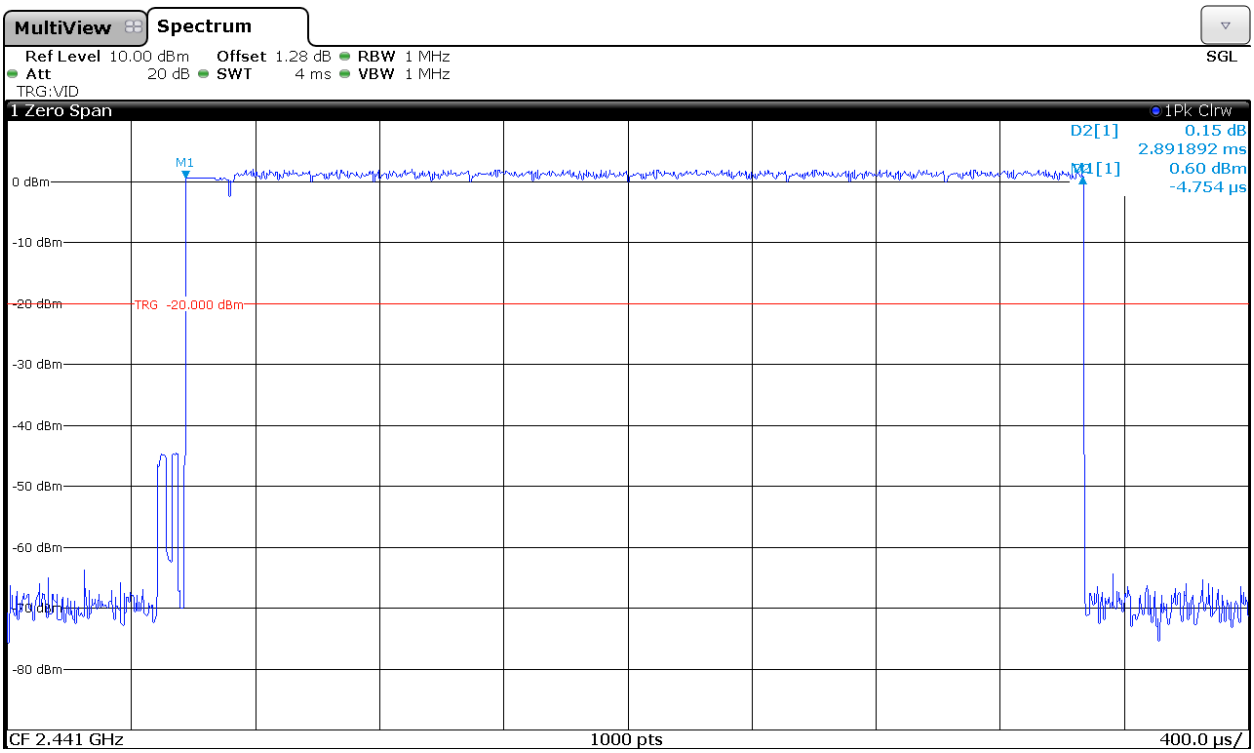
A DH3 Packet needs 3 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/4 = 400 hops per second with 79 channels. So you have each channel 400/79 = 5.1 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 5.1 x 31.6 = 161.16 times of appearance.
Each Tx-time per appearance is 1.639 ms (see next plot).
So we have 161.16 x 1.639 ms = 264.14 ms per 31.6 seconds.



Verdict: PASS

3. TIME OF OCCUPANCY (DWELL TIME) FOR PACKET TYPE DH5.

A DH5 Packet needs 5 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/6 = 266.67 hops per second with 79 channels. So you have each channel 266.67/79 = 3.37 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 3.37 x 31.6 = 106.49 times of appearance.
Each Tx-time per appearance is 2.892 ms (see next plot).
So we have 106.49 x 2.892 ms = 307.97 ms per 31.6 seconds.



Verdict: PASS

FCC Section 15.247 Subclause (b) / RSS-210 Clause A8.4 (2). 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).

RESULTS

MAXIMUM OUTPUT POWER. See next plots.

Declared maximum antenna gain: 3.24 dBi.

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

Modulation: GFSK

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum peak power (dBm)	5.11	5.34	5.37
Maximum EIRP power (dBm)	8.35	8.58	8.61
Measurement uncertainty (dB)	±1.2		

Modulation: Π/4-DQPSK (2Mbps)

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum peak power (dBm)	3.97	4.23	4.38
Maximum EIRP power (dBm)	7.21	7.47	7.62
Measurement uncertainty (dB)	±1.2		

Modulation: 8-DPSK (3Mbps)

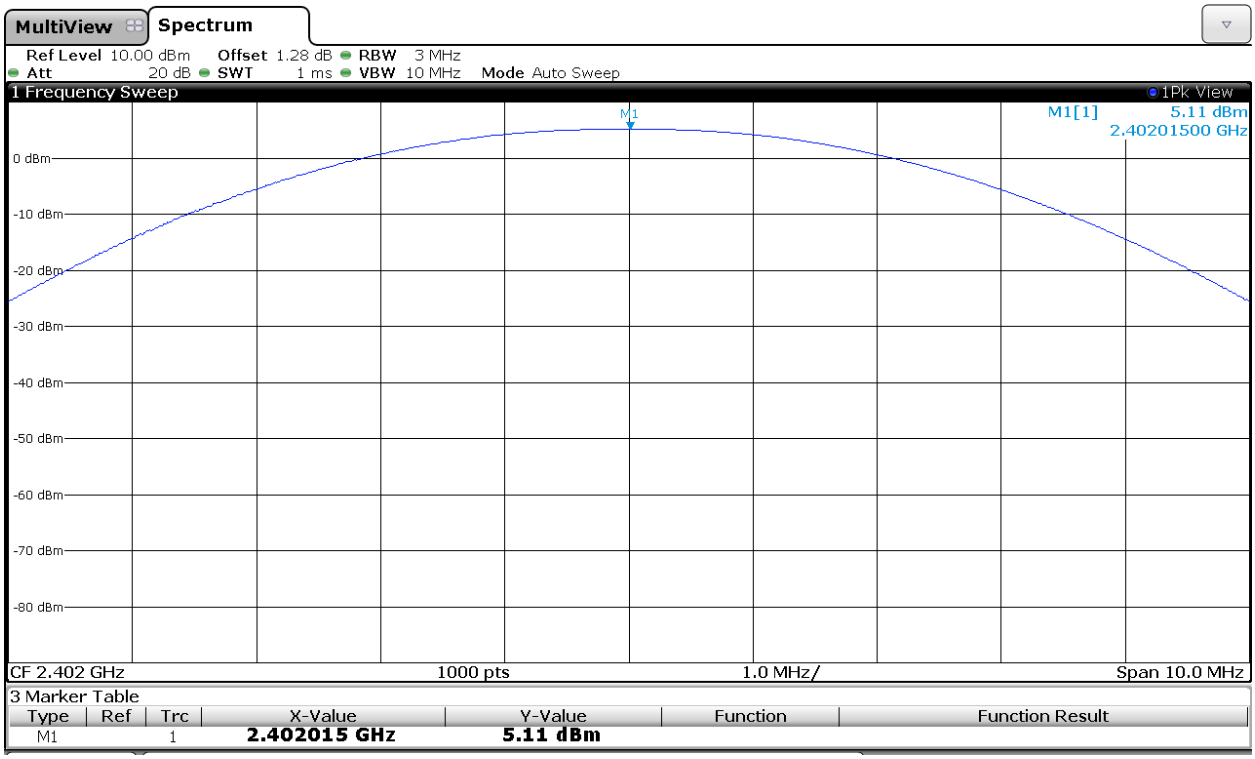
	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum peak power (dBm)	3.35	3.61	3.55
Maximum EIRP power (dBm)	6.59	6.85	6.79
Measurement uncertainty (dB)	±1.2		

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.

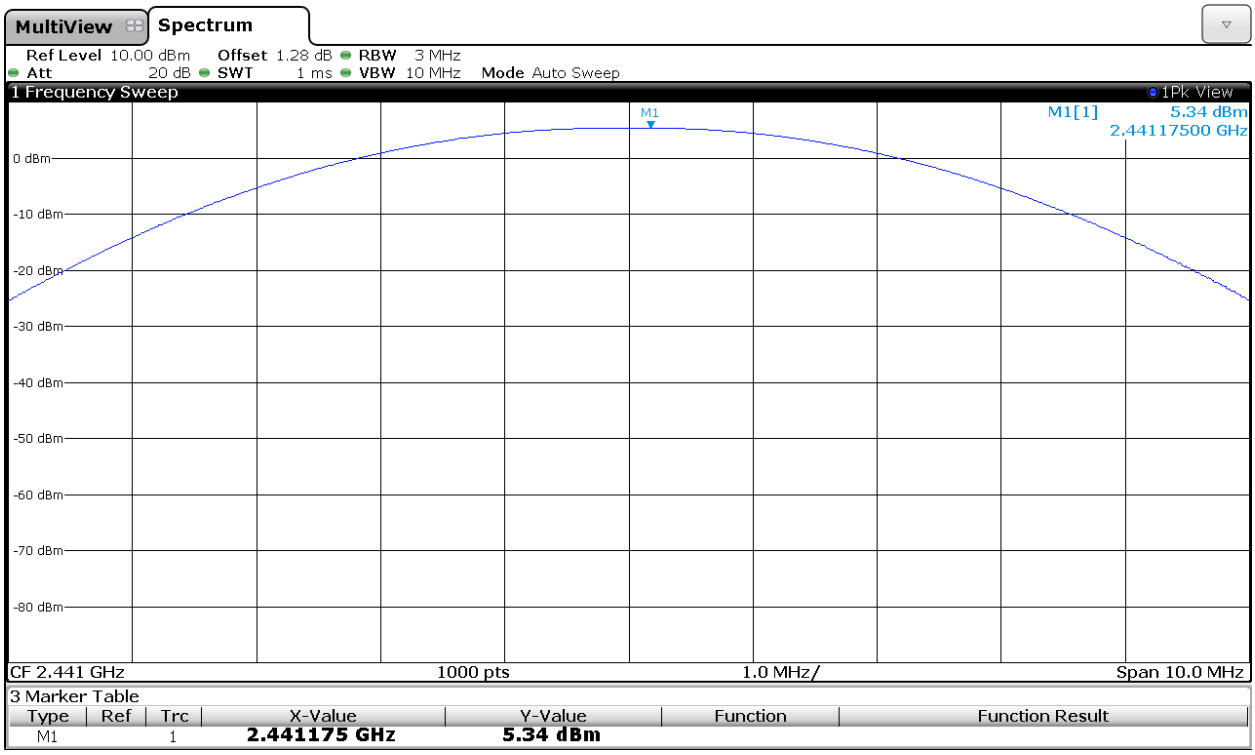
Verdict: PASS

PEAK OUTPUT POWER (CONDUCTED).

Modulation: GFSK Lowest Channel: 2402 MHz.

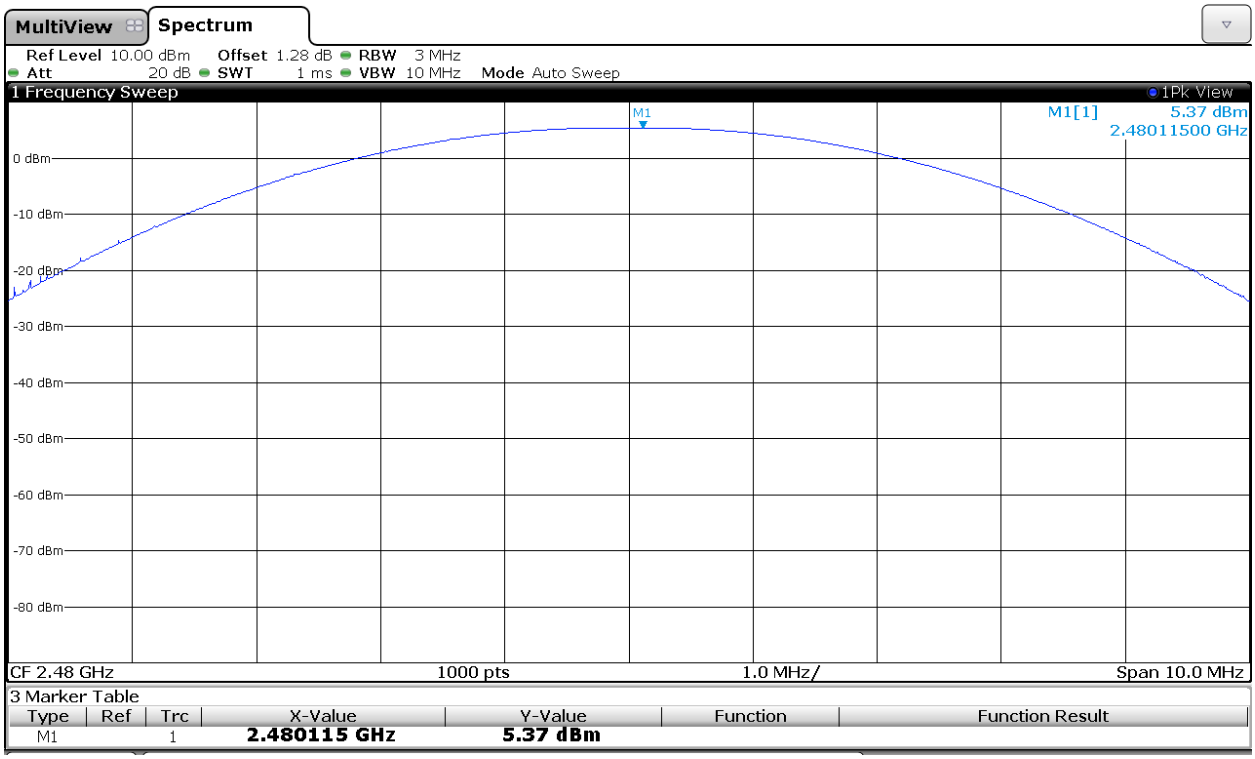


Modulation: GFSK Middle Channel: 2441 MHz.

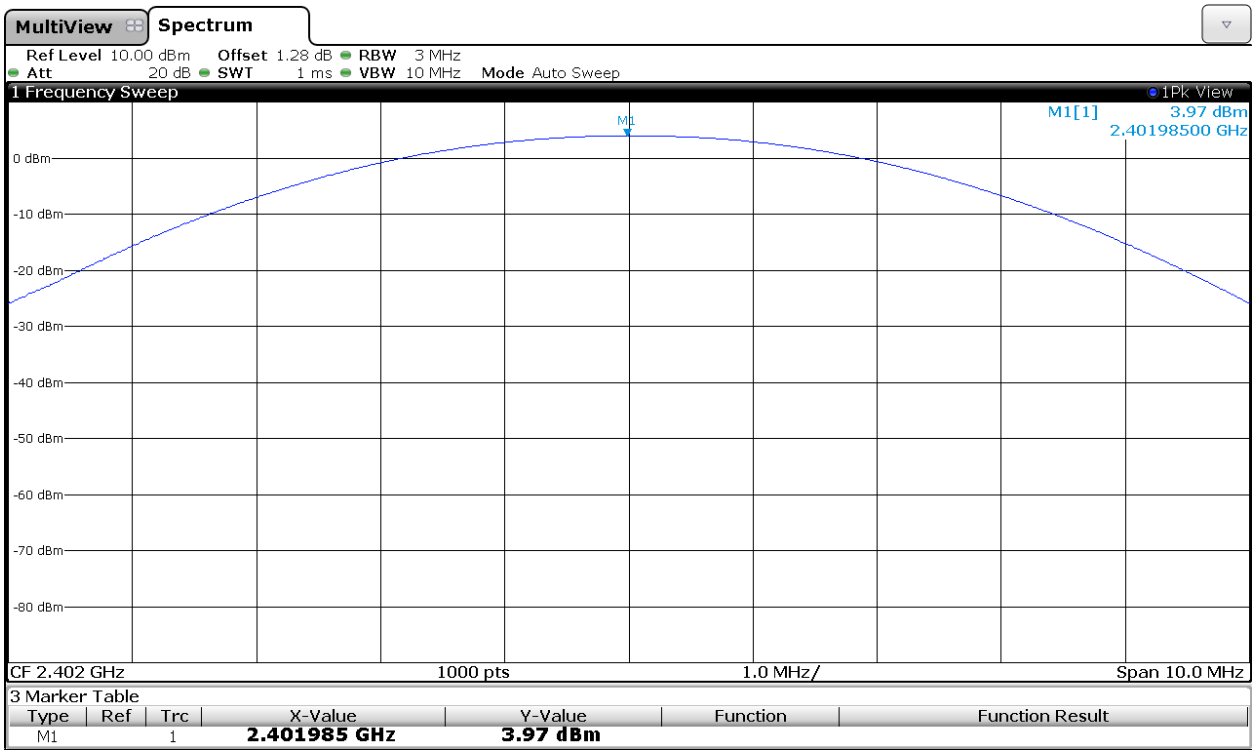


PEAK OUTPUT POWER (CONDUCTED).

Modulation: GFSK Highest Channel: 2480 MHz.

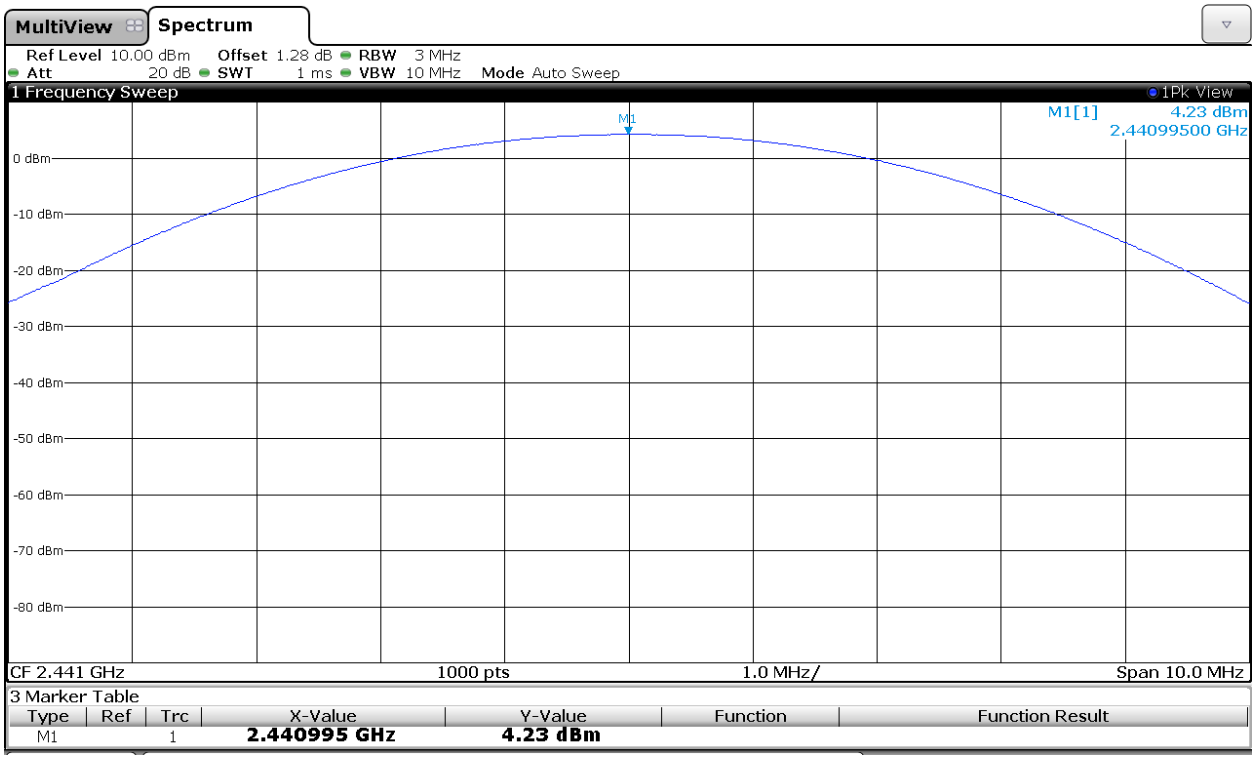


Modulation: Π/4-DQPSK Lowest Channel: 2402 MHz

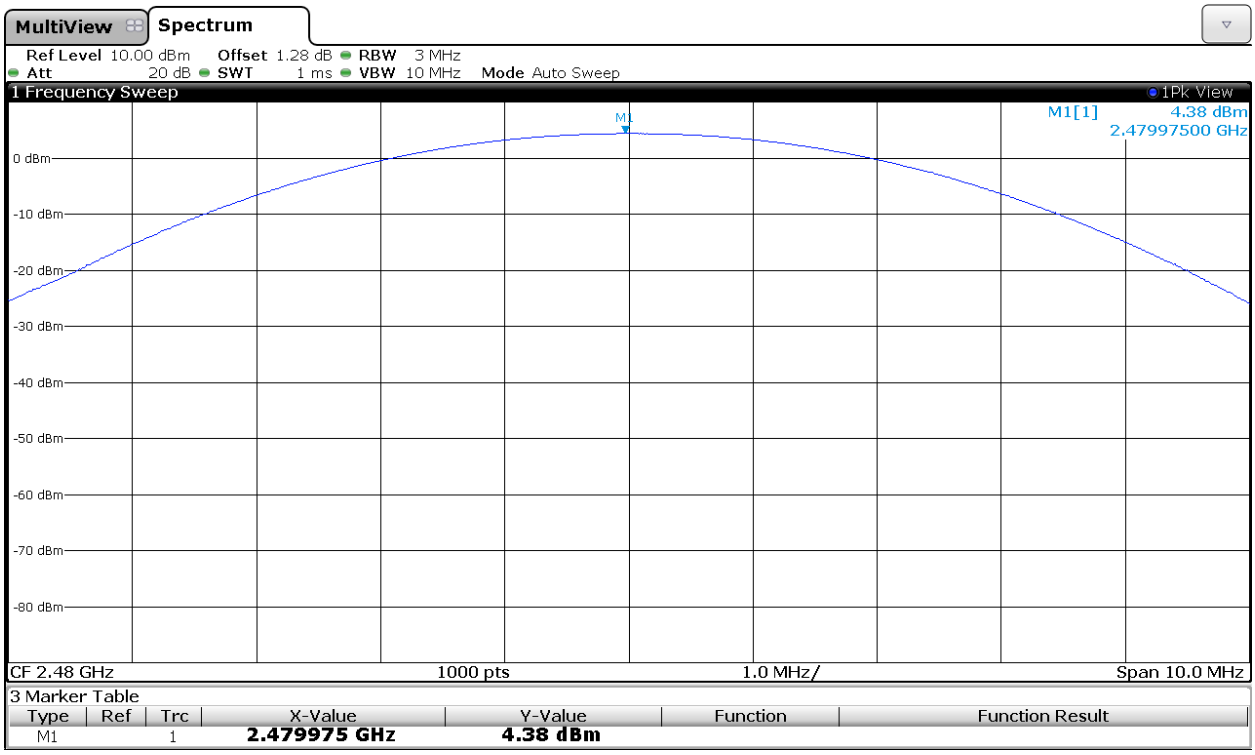


PEAK OUTPUT POWER (CONDUCTED)

Modulation: Π/4-DQPSK Middle Channel: 2441 MHz.

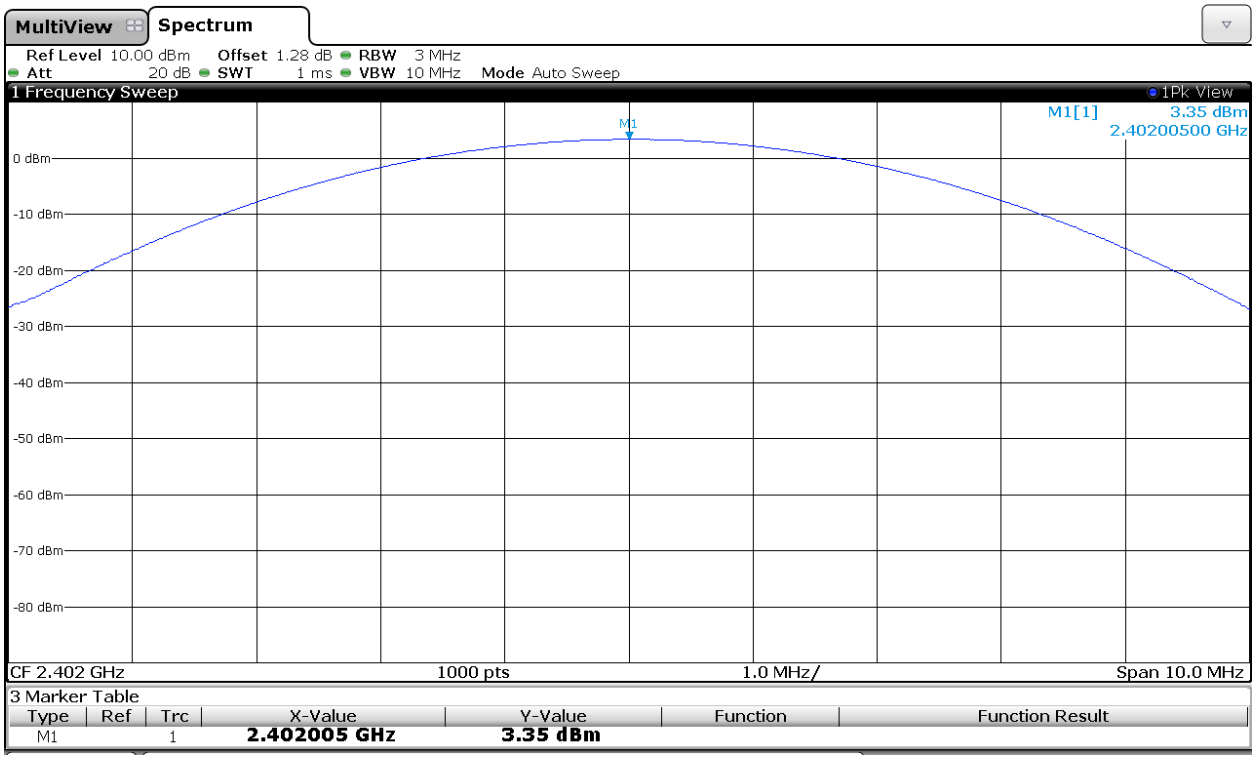


Modulation: Π/4-DQPSK Highest Channel: 2480 MHz.

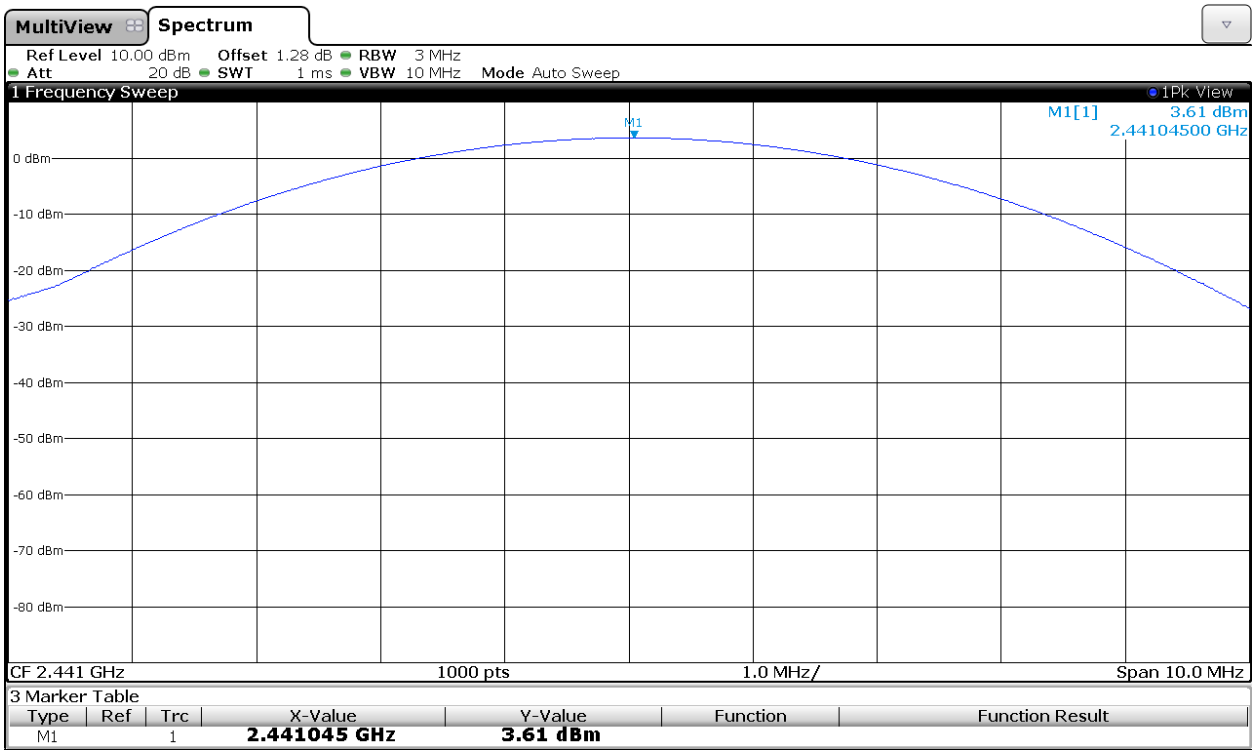


PEAK OUTPUT POWER (CONDUCTED).

Modulation: 8-DPSK Lowest Channel: 2402 MHz

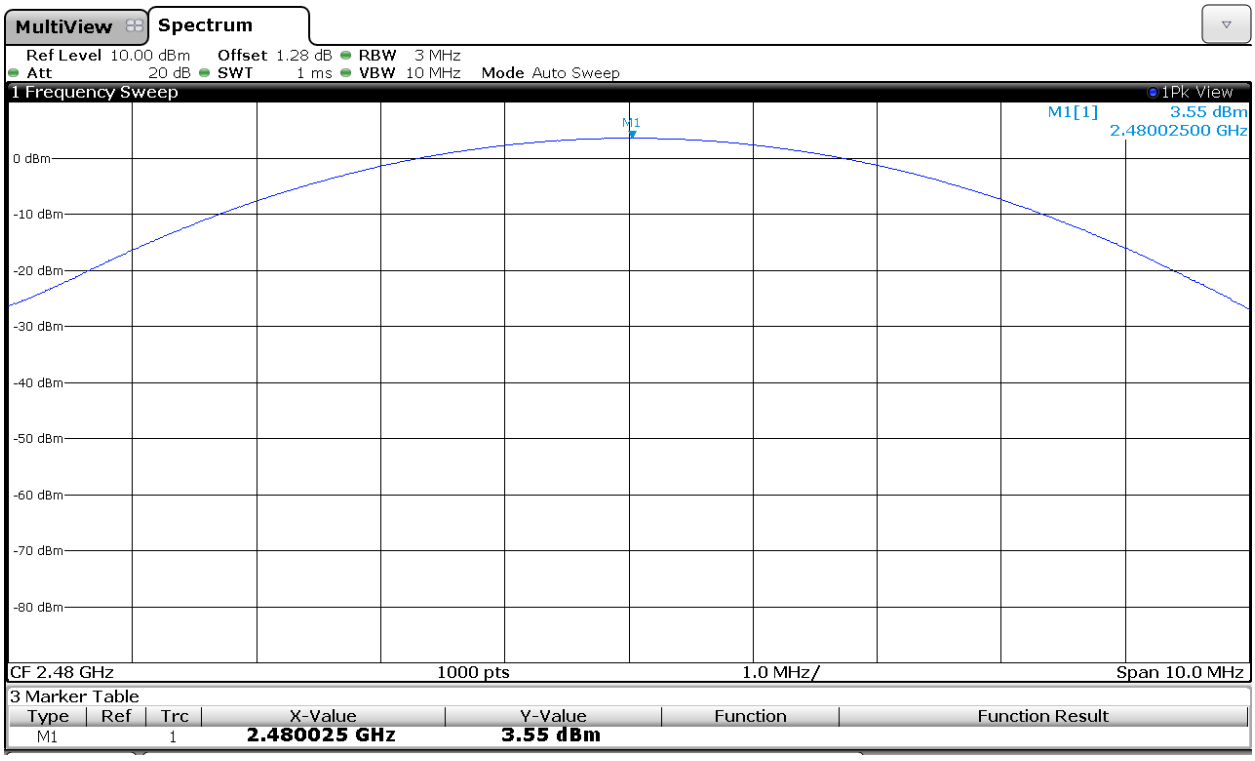


Modulation: 8-DPSK Middle Channel: 2441 MHz.



PEAK OUTPUT POWER (CONDUCTED).

Modulation: 8-DPSK Highest Channel: 2480 MHz.



FCC Section 15.247 Subclause (d) / RSS-210 Clause A8.5. Band-edge compliance of conducted emissions (Transmitter)

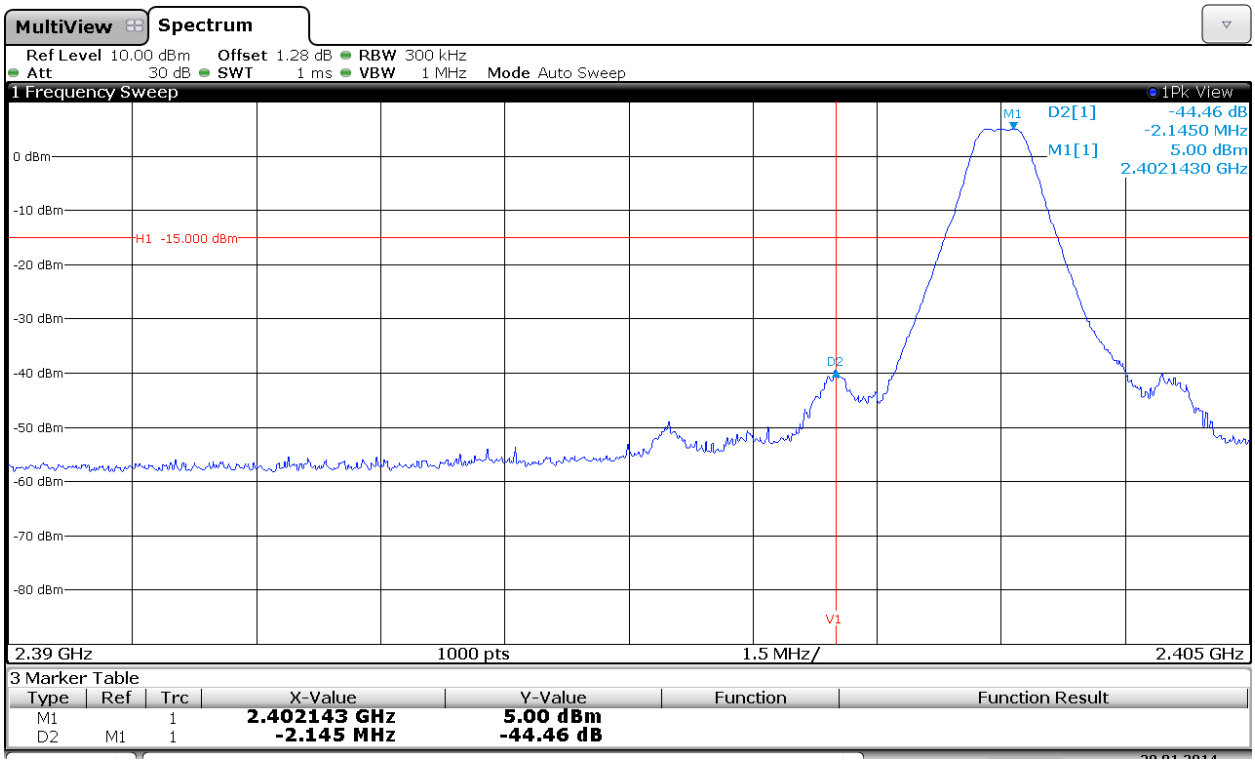
SPECIFICATION

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

RESULTS:

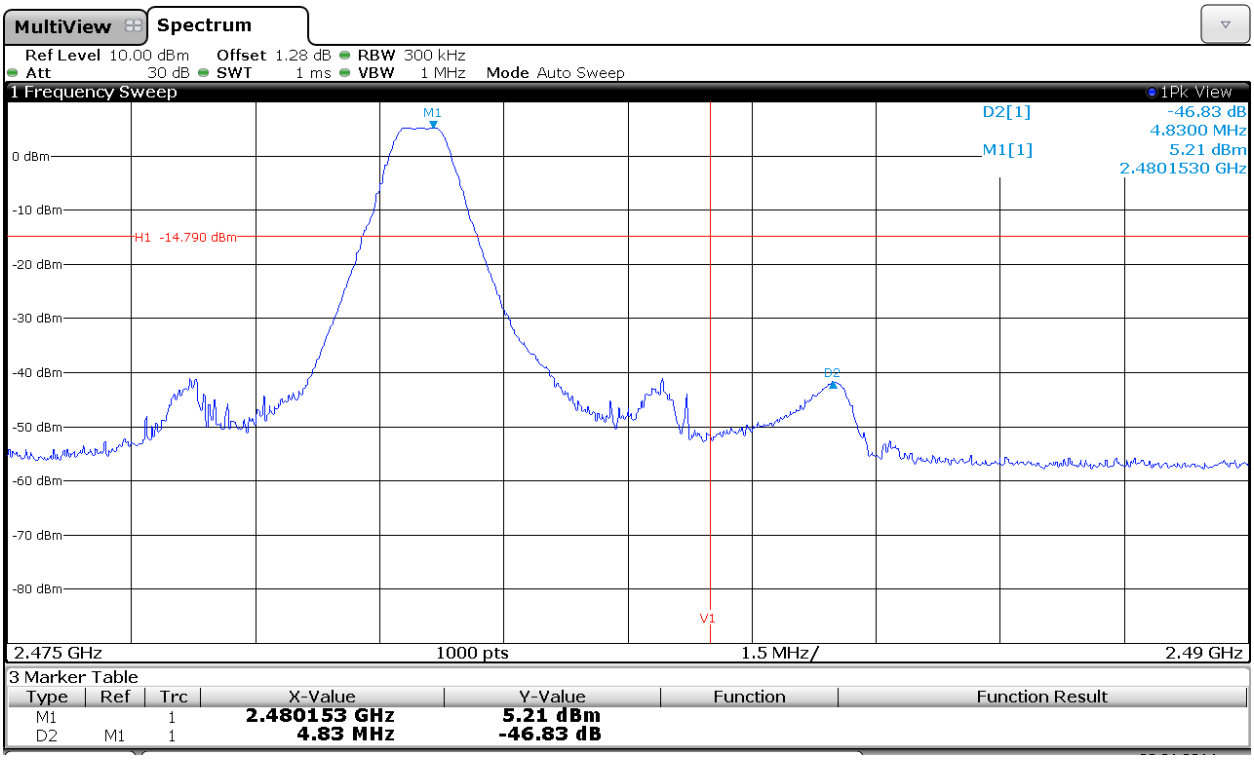
Modulation: GFSK

1. LOW FREQUENCY SECTION 2402 MHz (HOPPING OFF). See next plot.



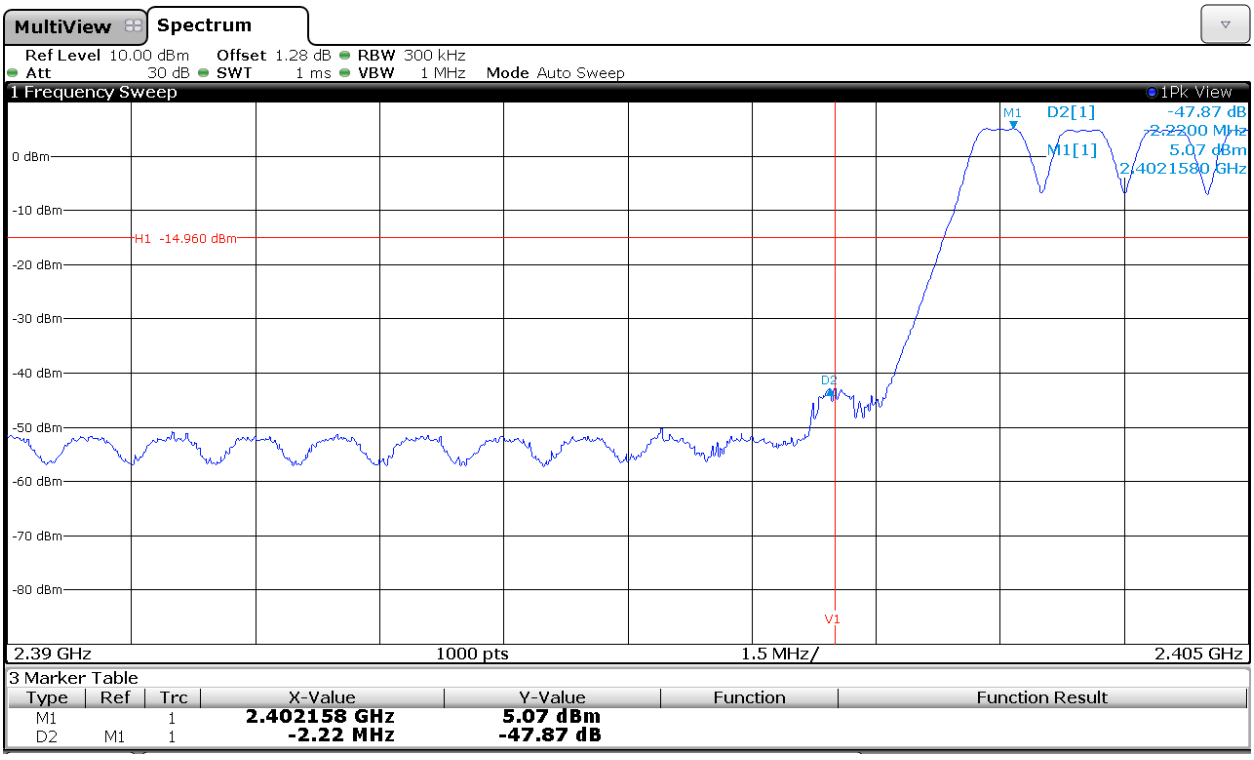
Verdict: PASS

2. HIGH FREQUENCY SECTION 2480 MHz (HOPPING OFF). See next plot.



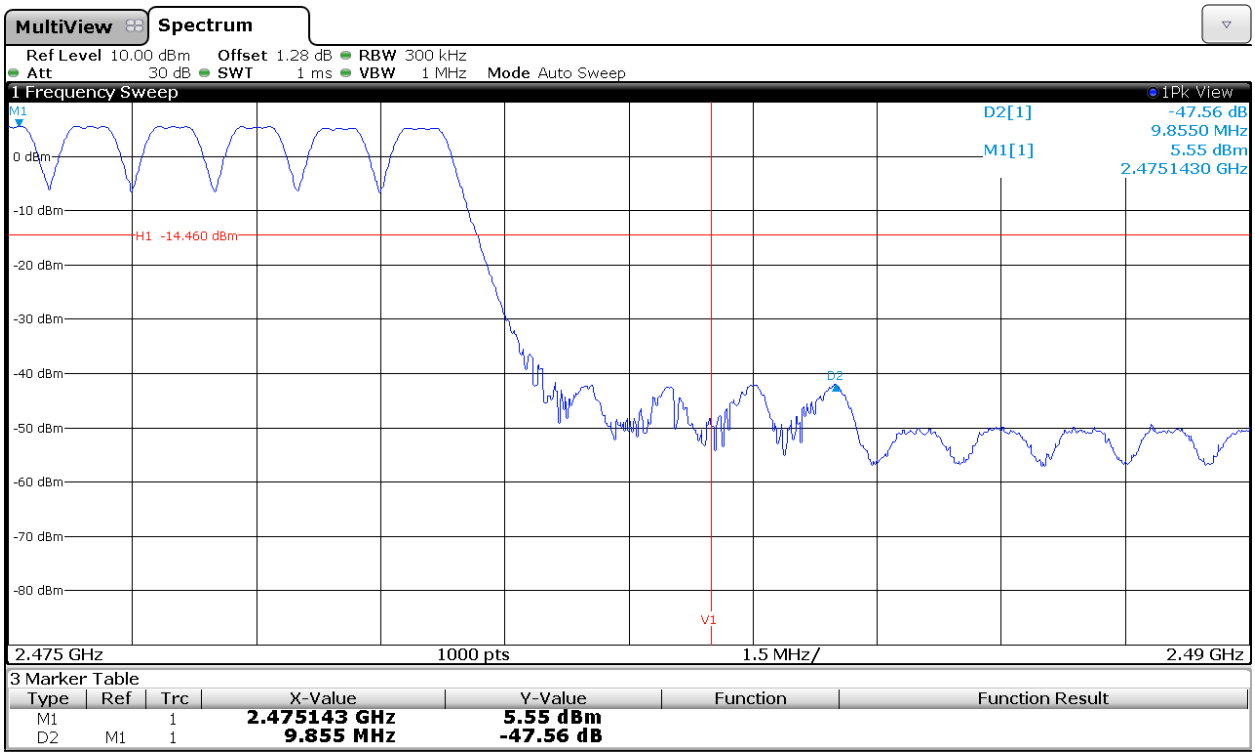
Verdict: PASS

3. LOW FREQUENCY SECTION (HOPPING ON). See next plot.



Verdict: PASS

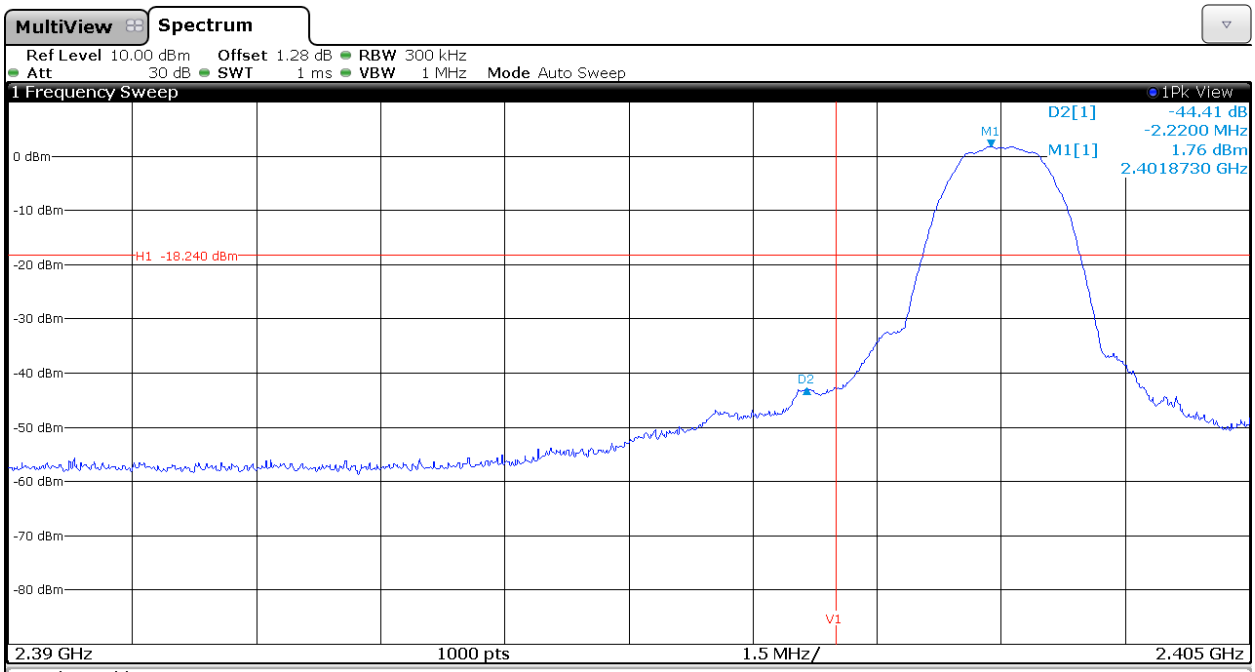
4. HIGH FREQUENCY SECTION (HOPPING ON). See next plot.



Verdict: PASS

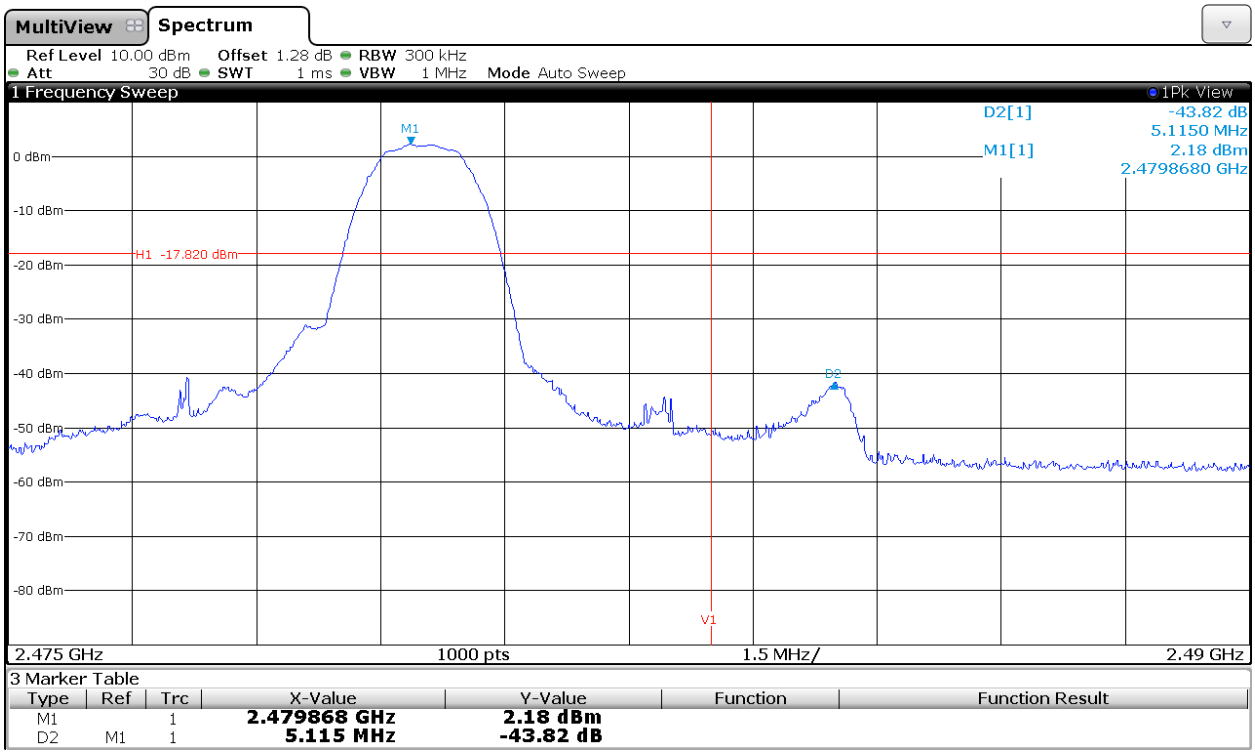
Modulation: Π/4-DQPSK

1. LOW FREQUENCY SECTION 2402 MHz (HOPPING OFF). See next plot.



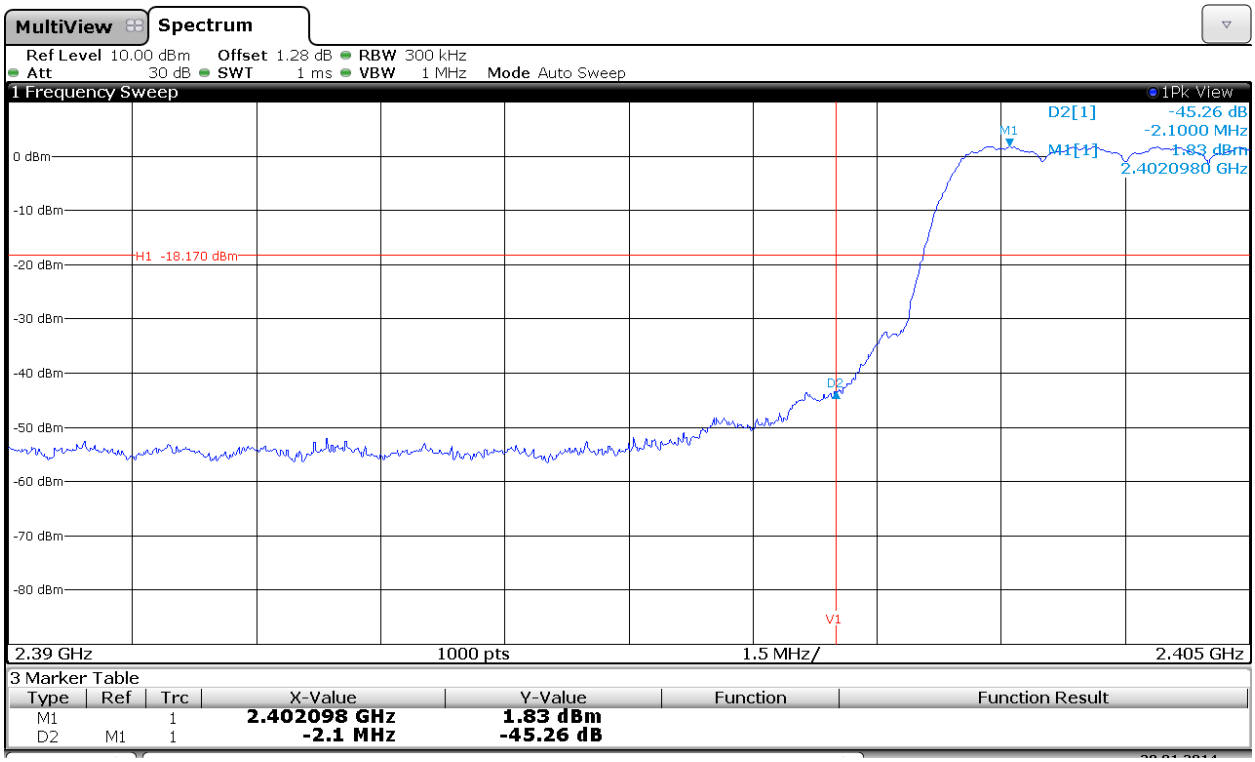
Verdict: PASS

2. HIGH FREQUENCY SECTION 2480 MHz (HOPPING OFF). See next plot.



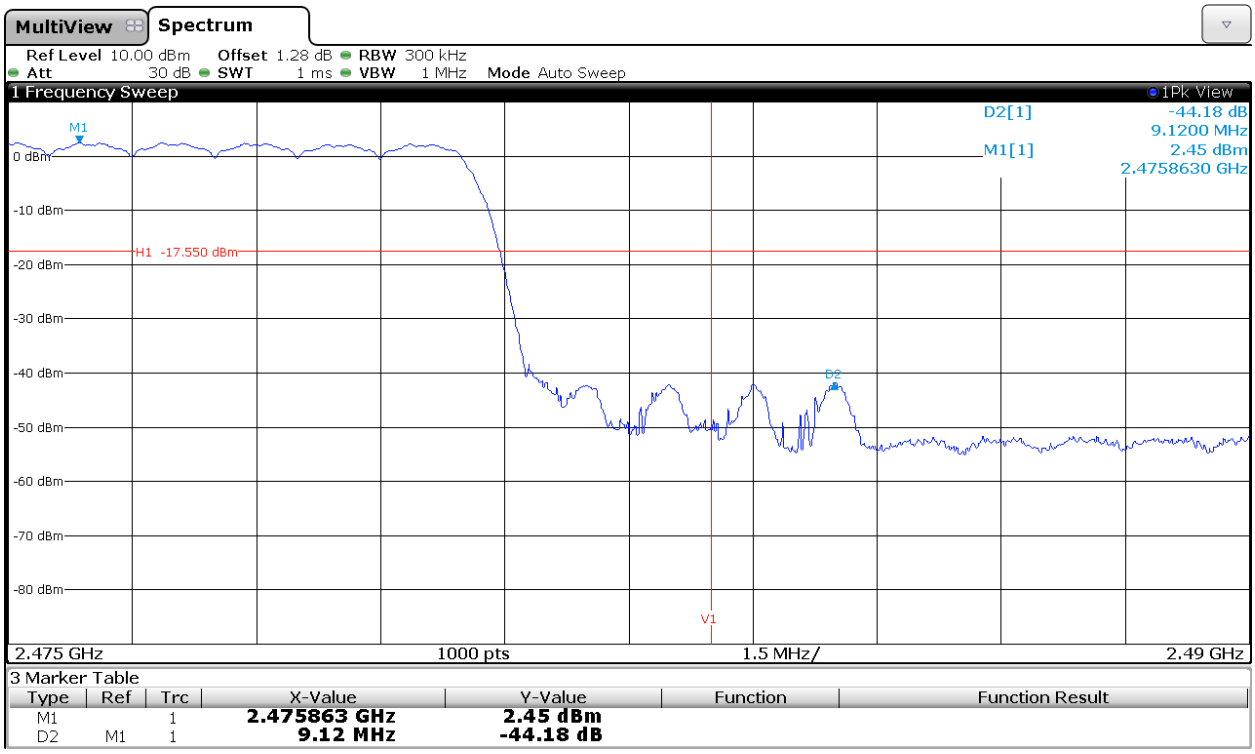
Verdict: PASS

3. LOW FREQUENCY SECTION (HOPPING ON). See next plot.



Verdict: PASS

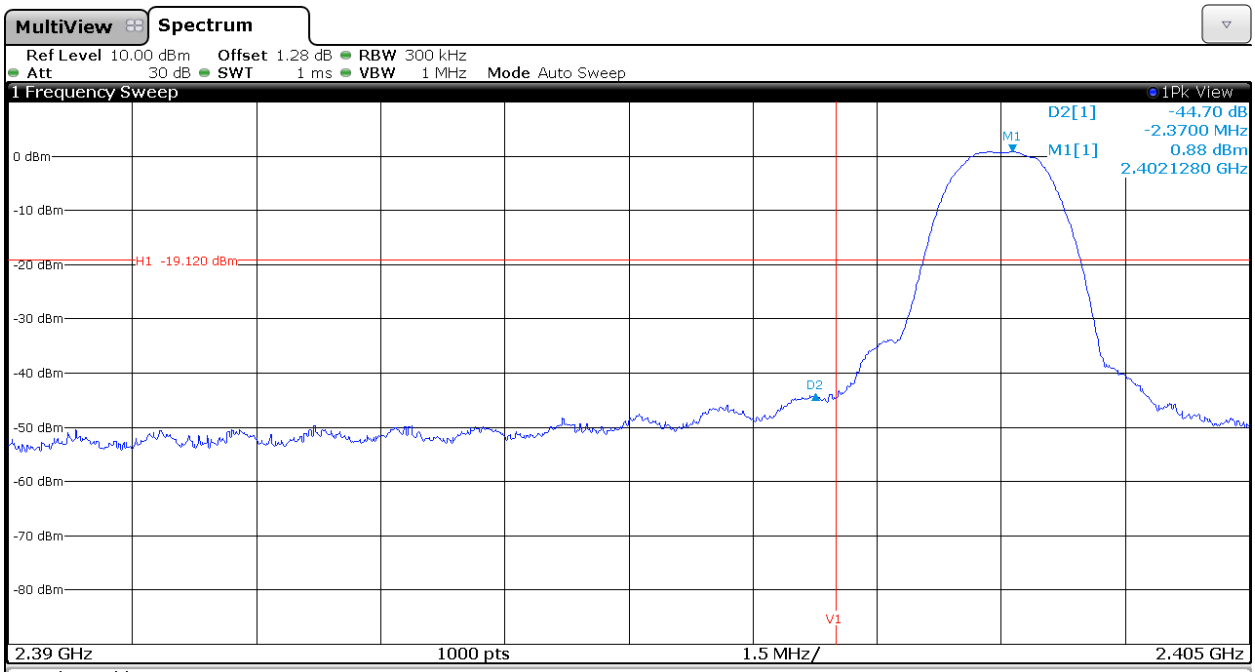
4. HIGH FREQUENCY SECTION (HOPPING ON). See next plot.



Verdict: PASS

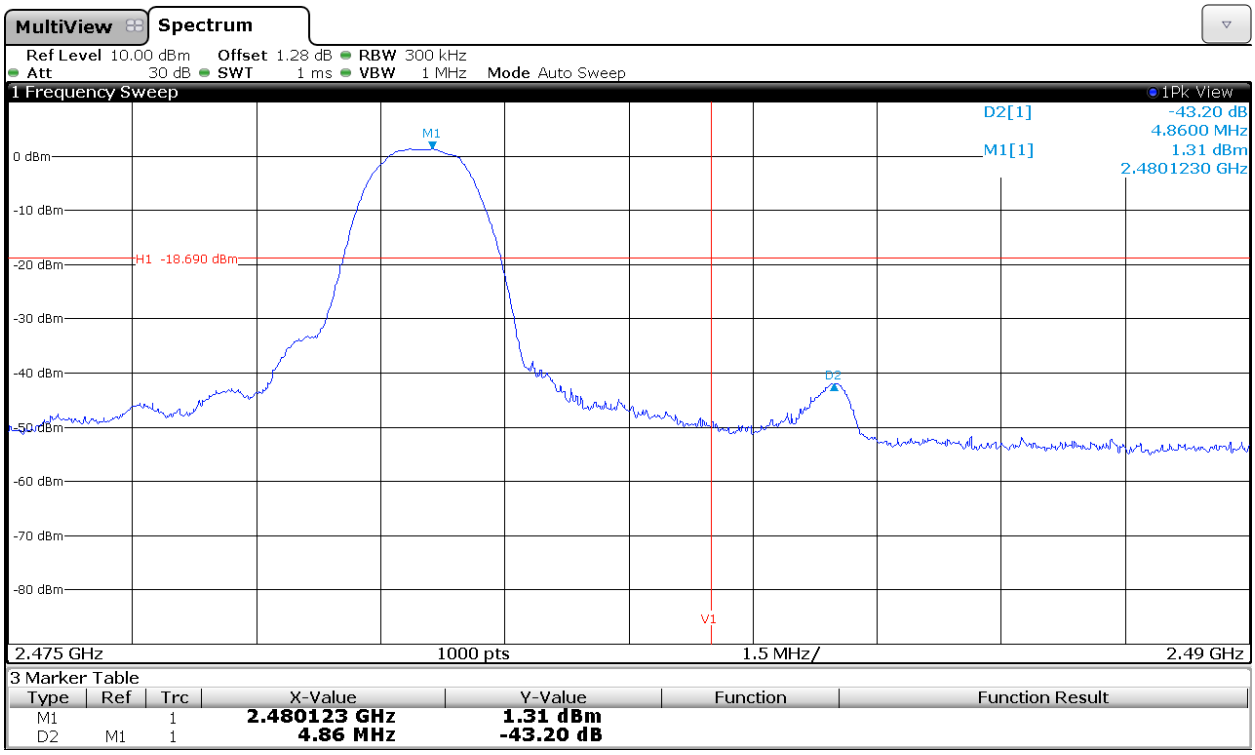
Modulation: 8-DPSK

1. LOW FREQUENCY SECTION 2402 MHz (HOPPING OFF). See next plot.



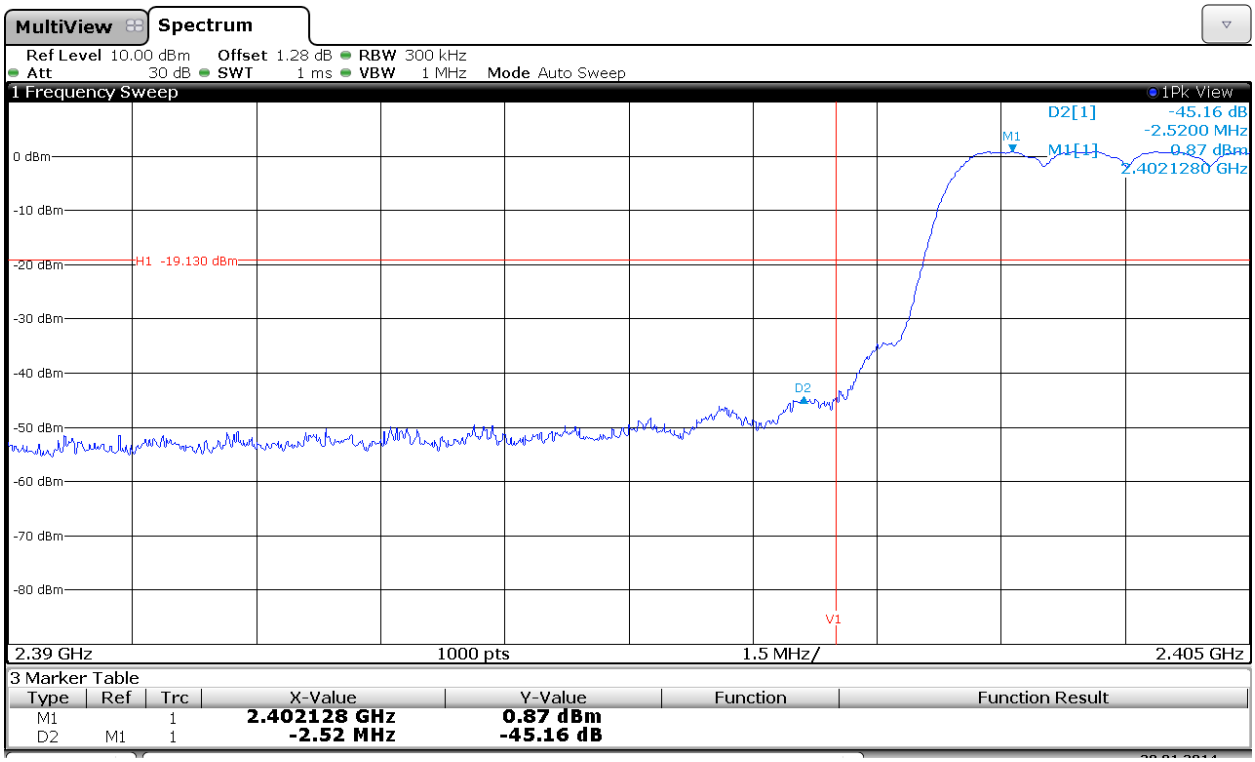
Verdict: PASS

2. HIGH FREQUENCY SECTION 2480 MHz (HOPPING OFF). See next plot.



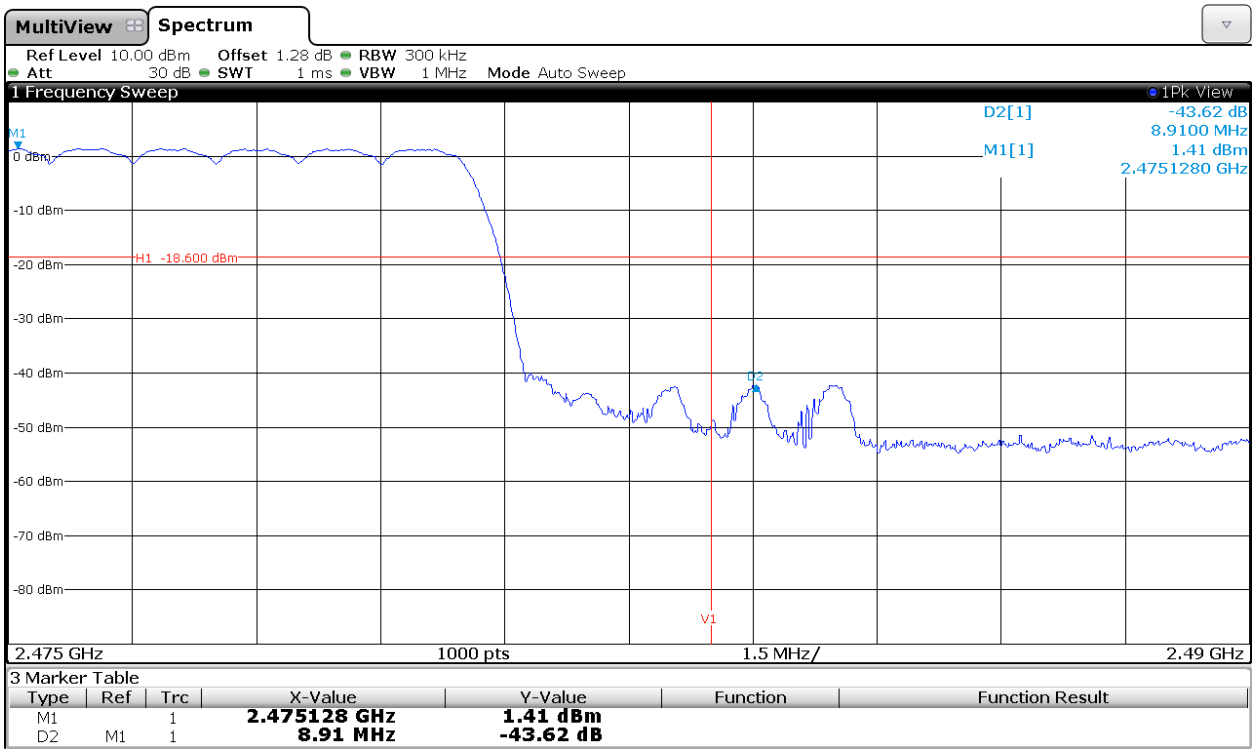
Verdict: PASS

3. LOW FREQUENCY SECTION (HOPPING ON). See next plot.



Verdict: PASS

4. HIGH FREQUENCY SECTION (HOPPING ON). See next plot.



Verdict: PASS

FCC Section 15.247 Subclause (d) / RSS-210 Clause A8.5. Emission limitations conducted (Transmitter)

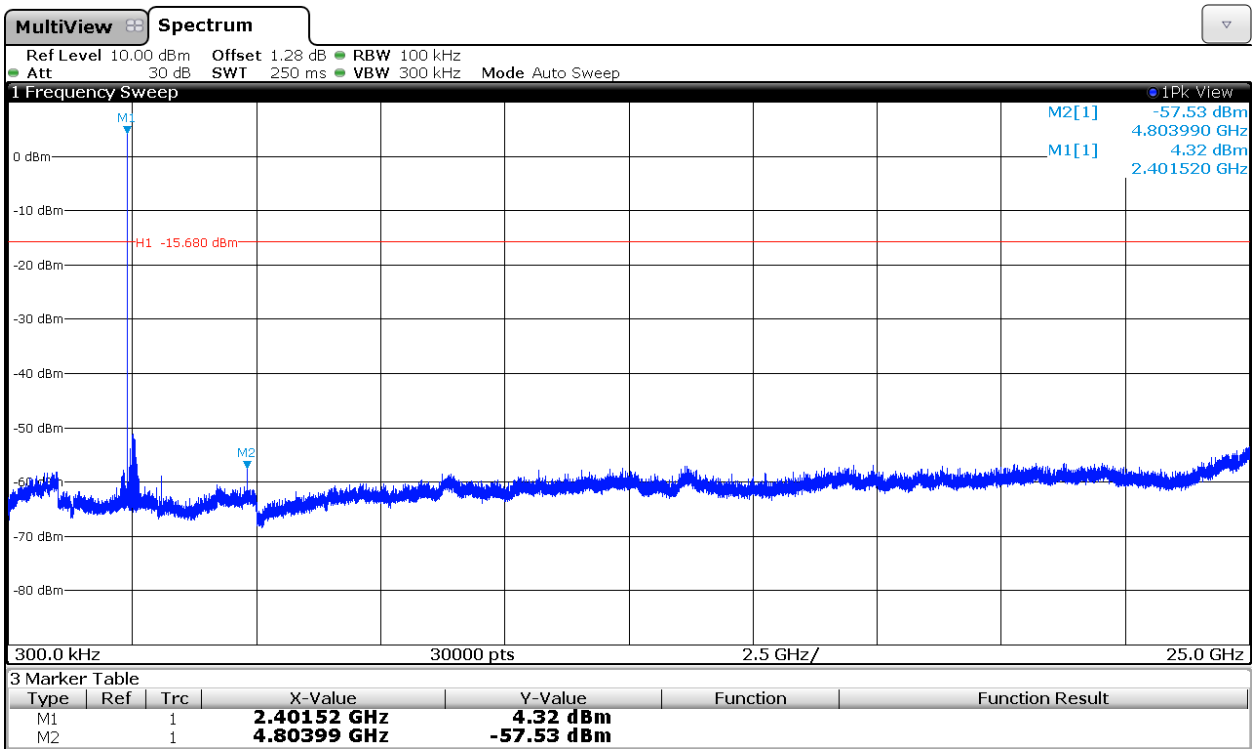
SPECIFICATION

In any 100 kHz bandwidths outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

RESULTS:

Modulation: GFSK

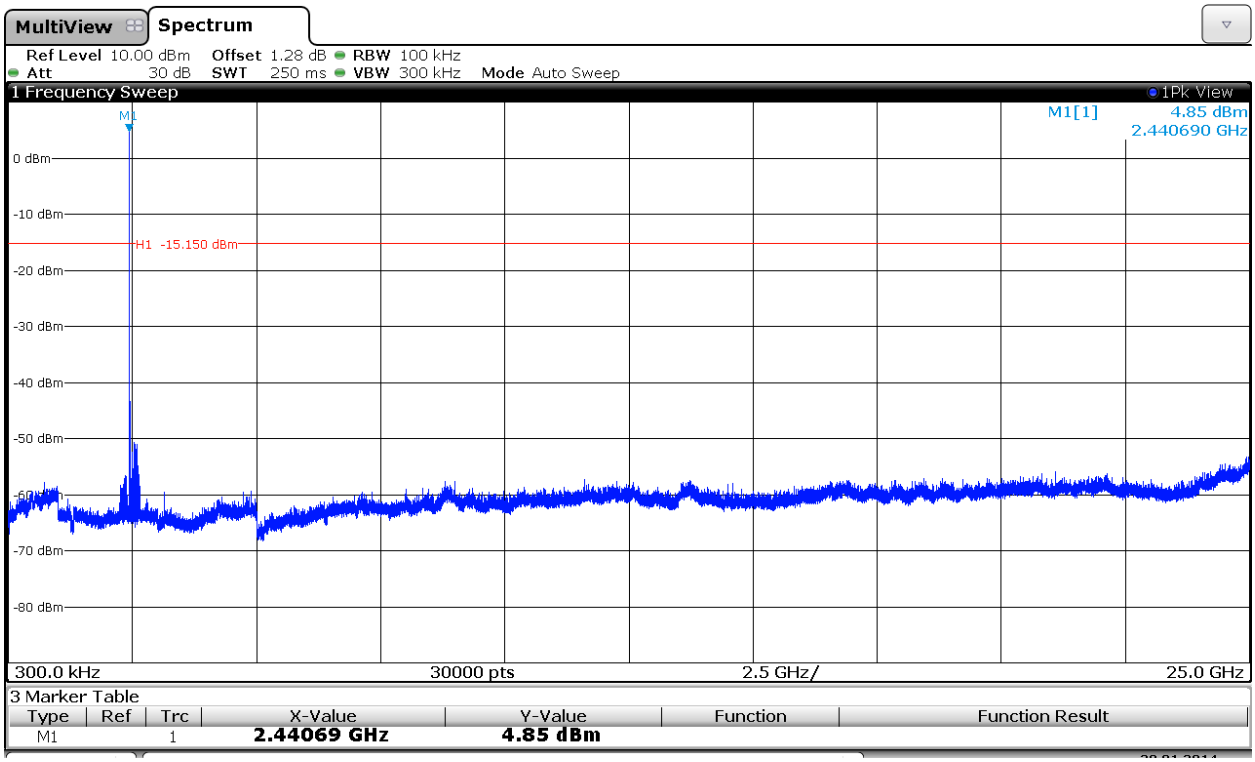
1. LOWEST CHANNEL (2402 MHz): 300 kHz-25 GHz (see next plot).



Note: The peak above the limit is the carrier frequency.

Verdict: PASS

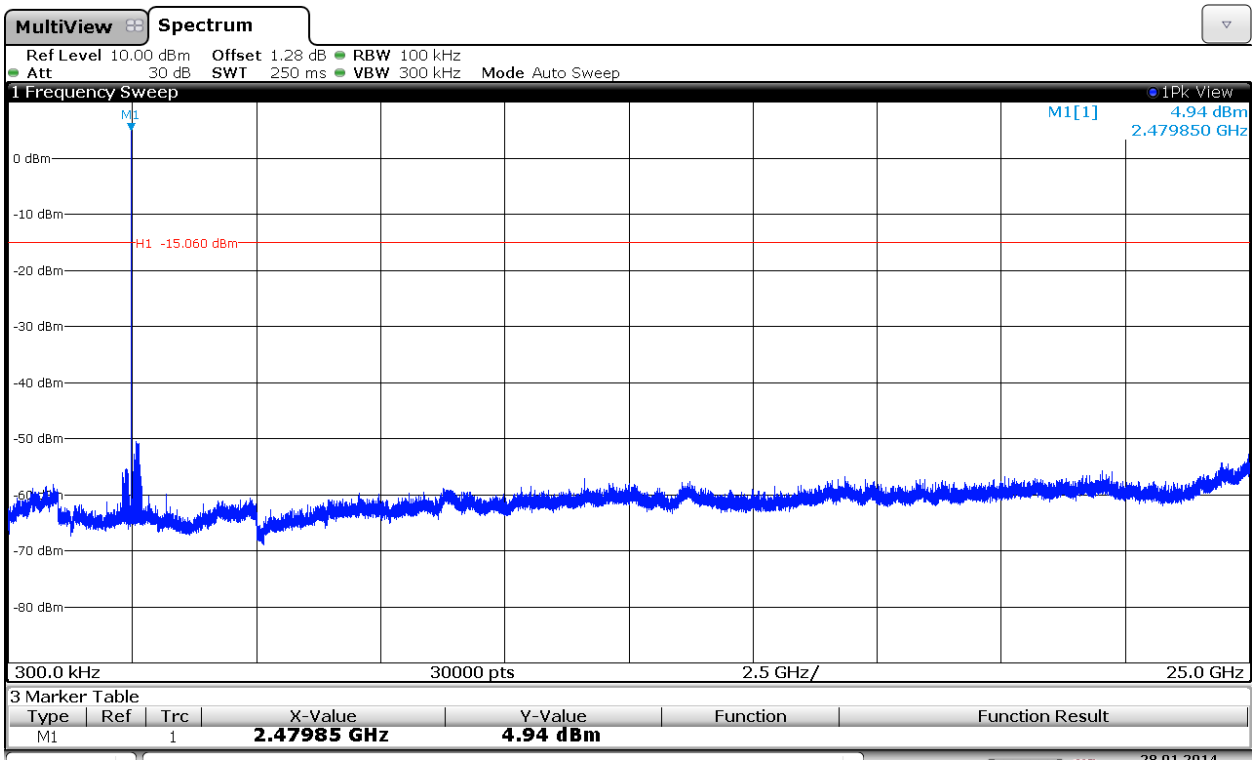
2. MIDDLE CHANNEL (2441 MHz): 300 kHz-25 GHz (see next plot).



Note: The peak above the limit is the carrier frequency.

Verdict: PASS

3. HIGH CHANNEL (2480 MHz): 300 kHz-25 GHz (see next plot).

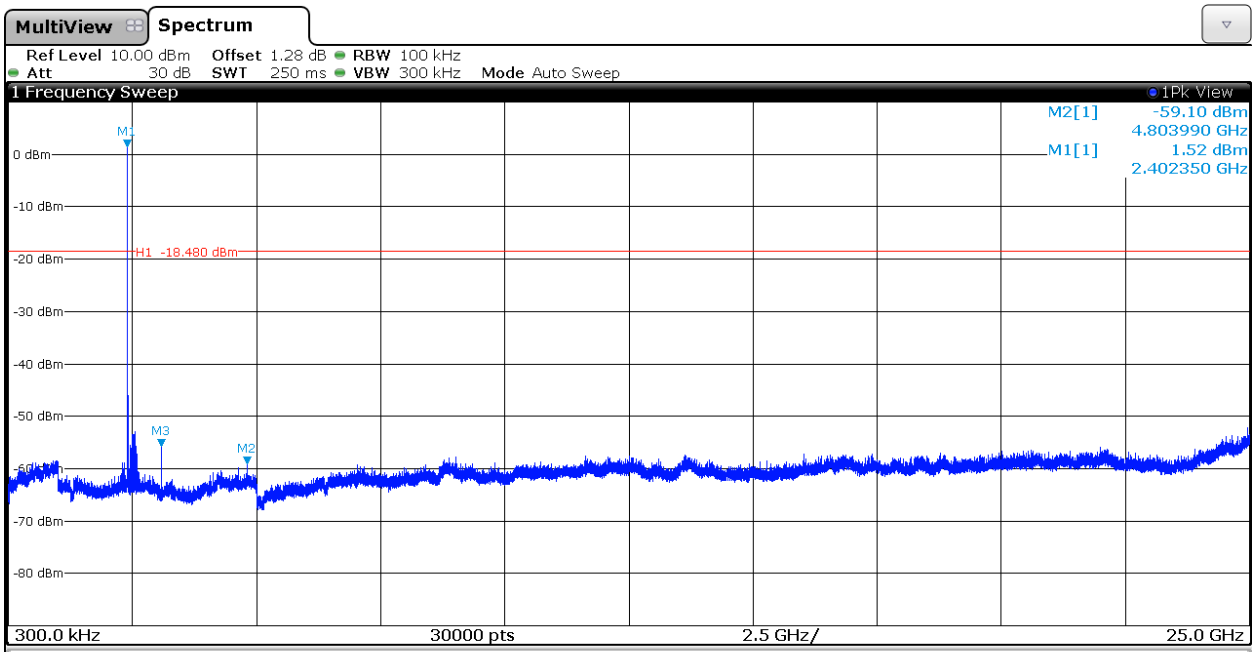


Note: The peak above the limit is the carrier frequency.

Verdict: PASS

Modulation: Π/4-DQPSK

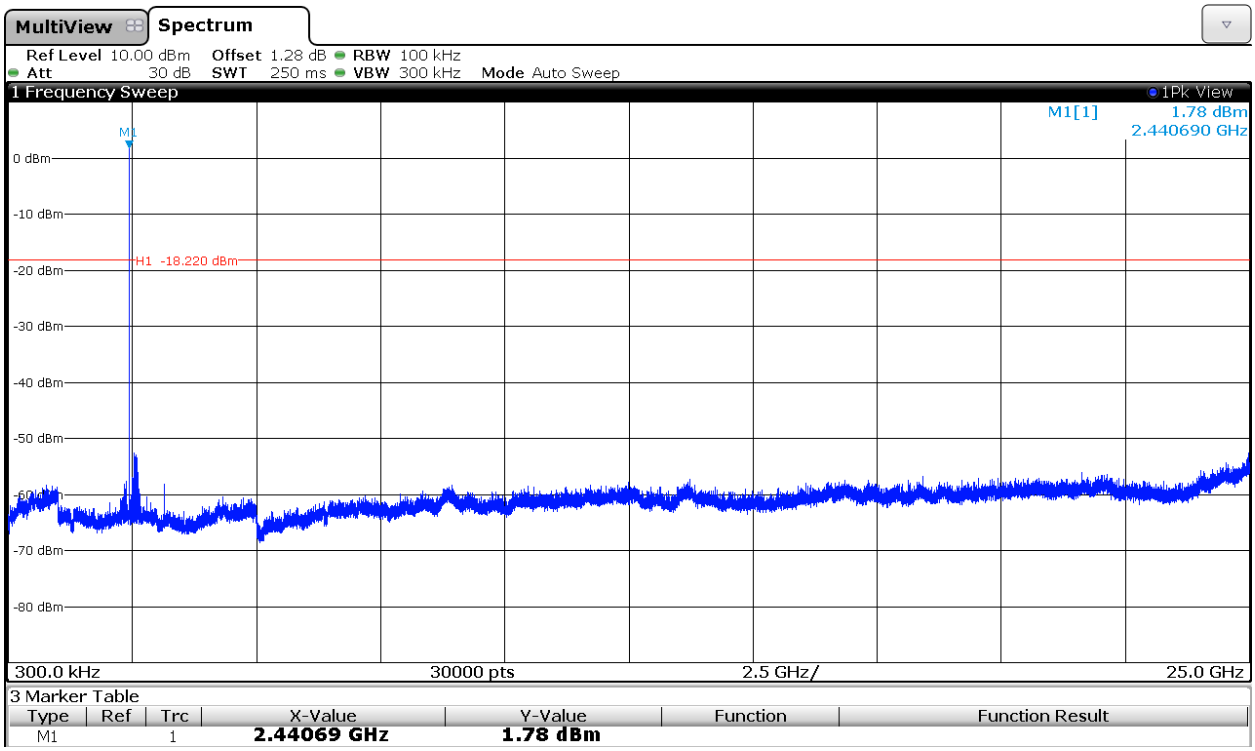
1. LOWEST CHANNEL (2402 MHz): 300 kHz-25 GHz (see next plot).



Note: The peak above the limits is the carrier frequency.

Verdict: PASS

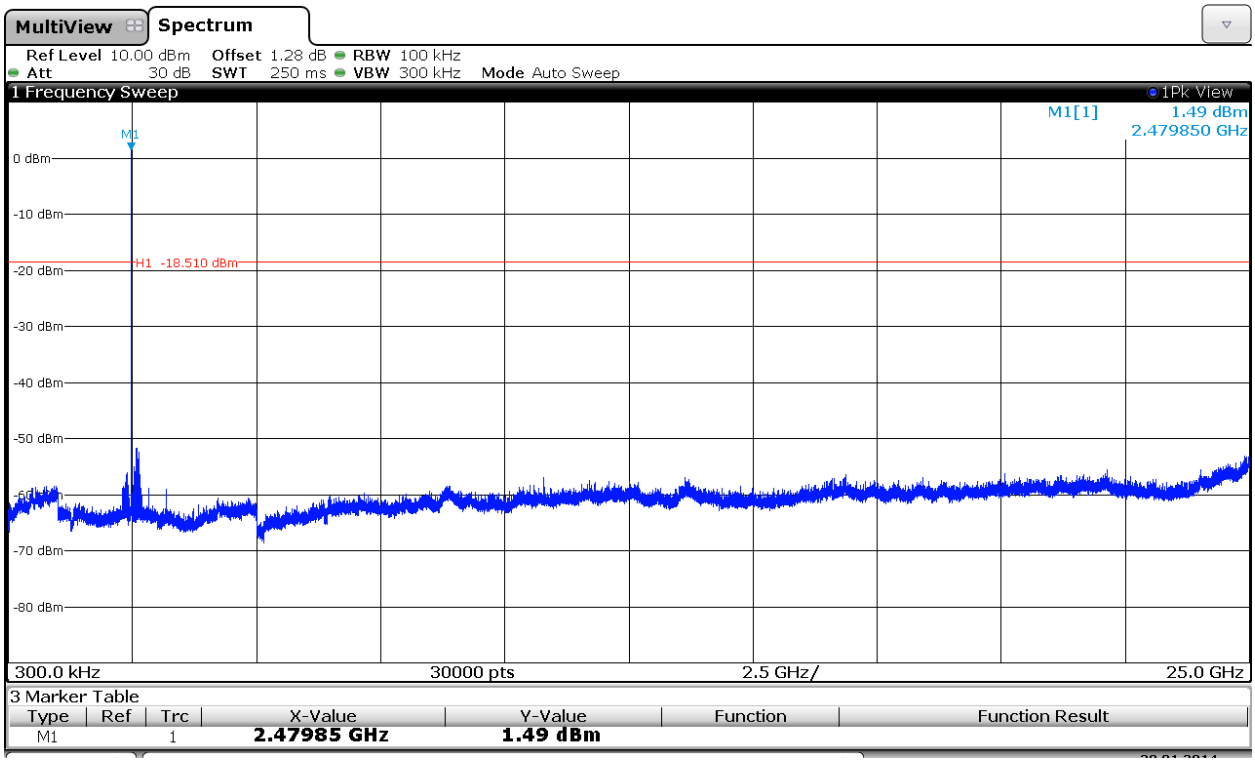
2. MIDDLE CHANNEL (2441 MHz): 300 kHz-25 GHz (see next plot).



Note: The peak above the limits is the carrier frequency.

Verdict: PASS

3. HIGH CHANNEL (2480 MHz): 300 kHz-25 GHz (see next plot).

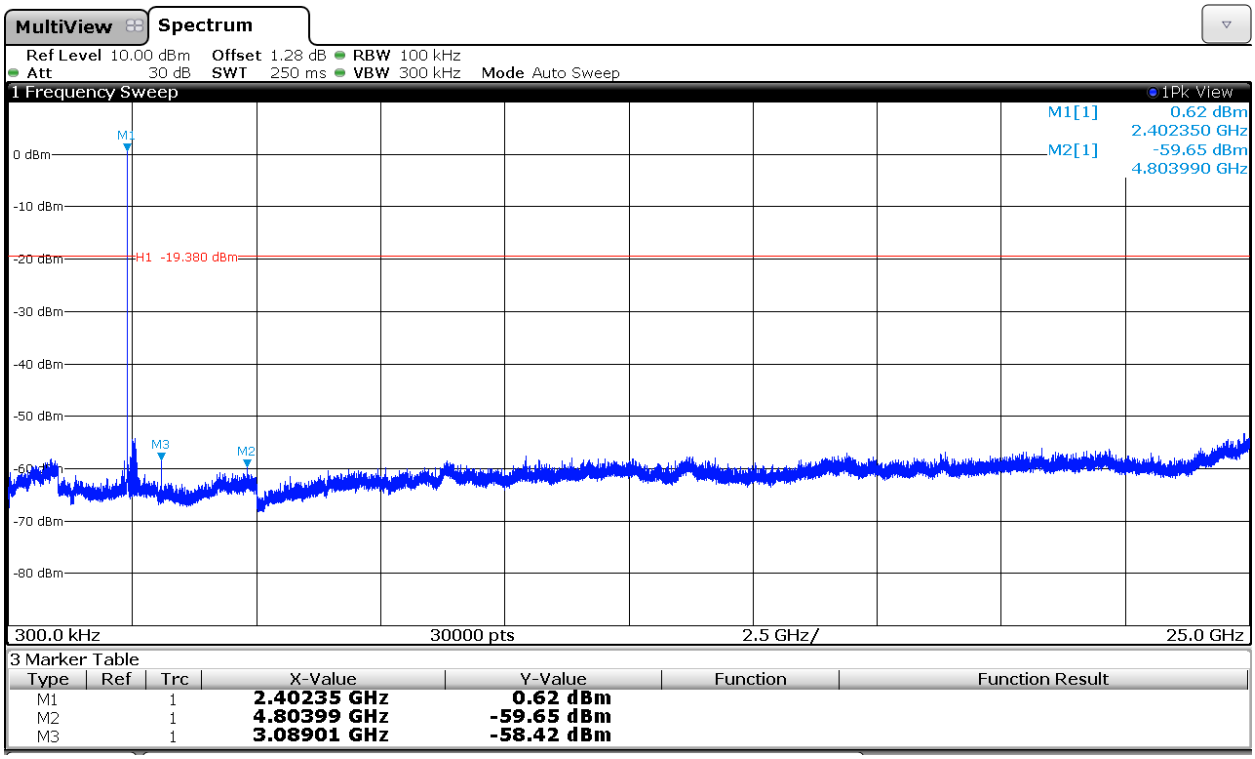


Note: The peak above the limit is the carrier frequency.

Verdict: PASS

Modulation: 8-DPSK

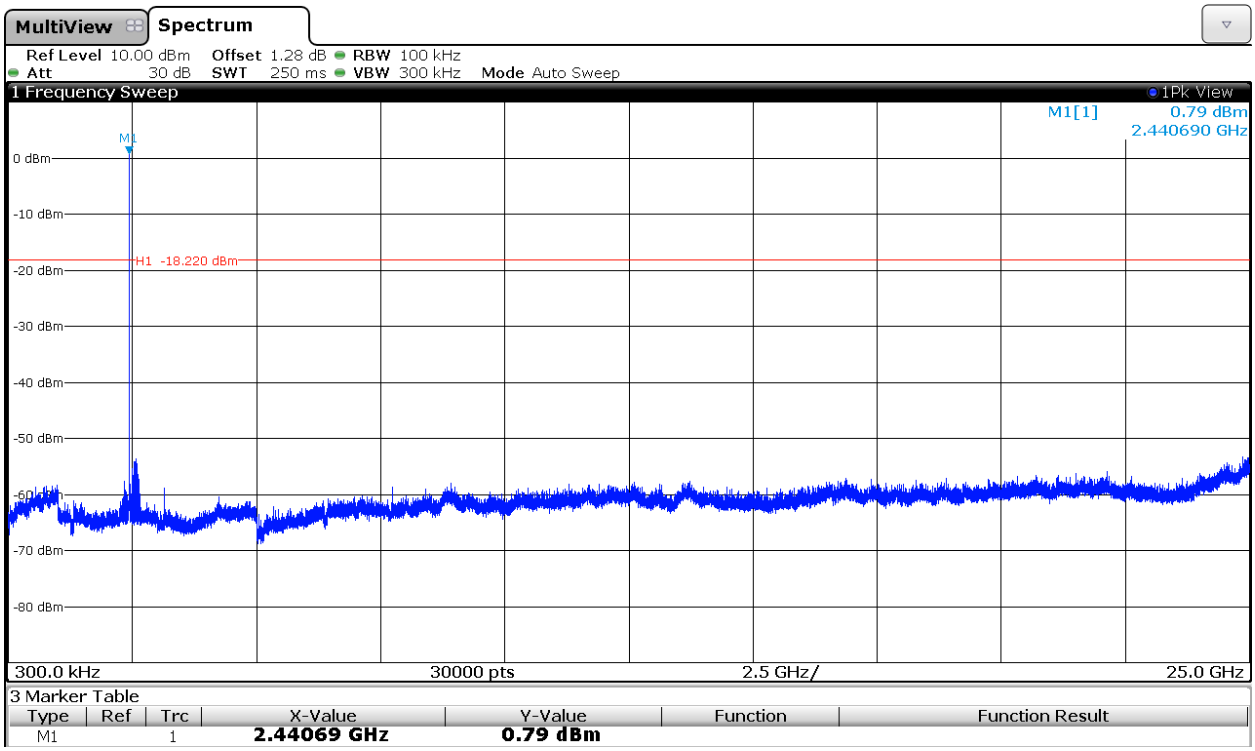
1. LOWEST CHANNEL (2402 MHz): 300 kHz-25 GHz (see next plot).



Note: The peak above the limits is the carrier frequency.

Verdict: PASS

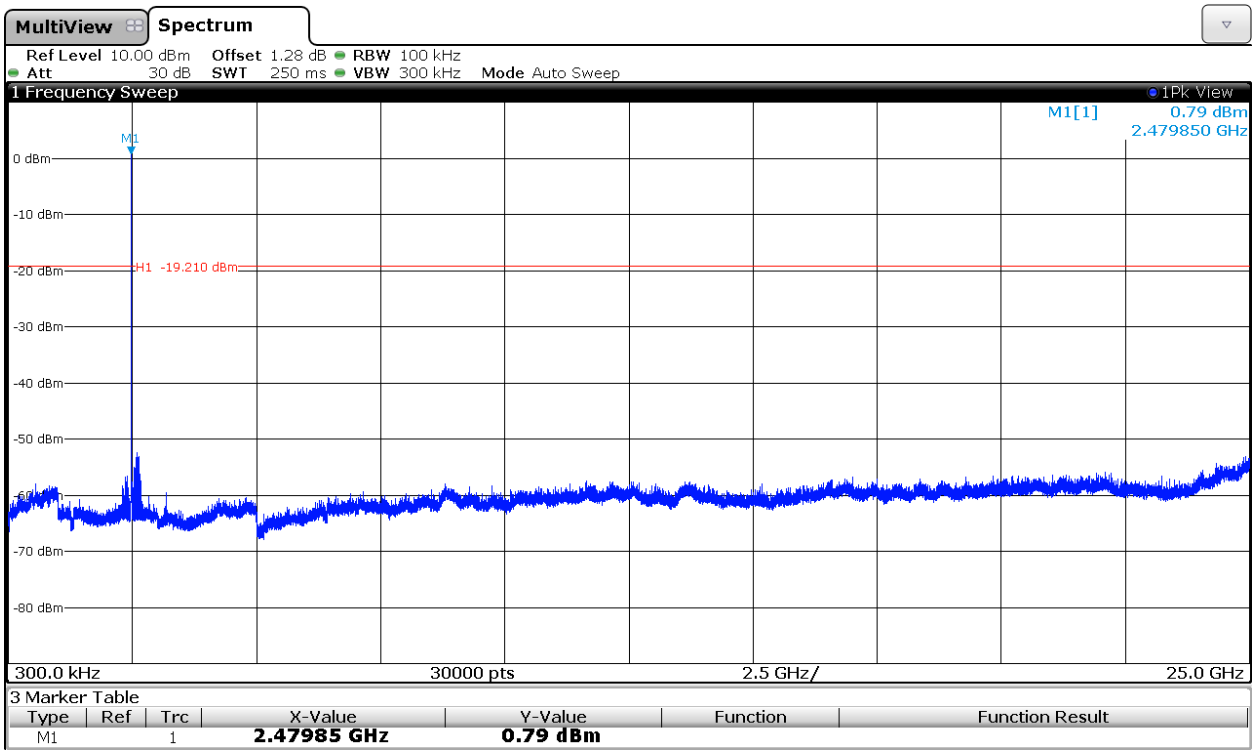
2. MIDDLE CHANNEL (2441 MHz): 300 kHz-25 GHz (see next plot).



Note: The peak above the limit is the carrier frequency.

Verdict: PASS

3. HIGH CHANNEL (2480 MHz): 300 kHz-25 GHz (see next plot).



Note: The peak above the limit is the carrier frequency.

Verdict: PASS

FCC Section 15.247 Subclause (d) / RSS-210 Clause A8.5. 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)):

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)	-	300
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.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º 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-1000 MHz and at distance of 1m for the frequency range 1 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-1000 MHz.

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

Spurious levels operating (radiated) closest to limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
32.91	V	Quasi-peak	30.33	±4.12
81.41	V	Quasi-peak	28.64	±4.12
143.49	V	Quasi-peak	36.52	±4.12
165.80	V	Quasi-peak	37.88	±4.12

Frequency range 1 GHz-25 GHz

Modulation: GFSK

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.3422	H	Peak	46.06	± 4.0
	H	Average	34.79	± 4.0
2.4943	H	Peak	46.61	± 4.0
	H	Average	35.05	± 4.0
2.5021	H	Peak	47.93	± 4.0
	H	Average	38.97	± 4.0
2.5218	H	Peak	47.94	± 4.0
	H	Average	39.09	± 4.0
4.8040	V	Peak	48.37	± 4.0
	V	Average	46.73	± 4.0

2. CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.3809	H	Peak	47.76	± 4.0
	H	Average	35.71	± 4.0
2.4934	H	Peak	47.13	± 4.0
	H	Average	35.05	± 4.0
2.5412	H	Peak	48.07	± 4.0
	H	Average	39.90	± 4.0
2.5611	H	Peak	48.41	± 4.0
	H	Average	39.11	± 4.0
4.8819	V	Peak	47.79	± 4.0
	V	Average	46.27	± 4.0

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.3800	H	Peak	46.31	± 4.0
	H	Average	36.37	± 4.0
2.4835	H	Peak	47.55	± 4.0
	H	Average	35.50	± 4.0
2.5801	H	Peak	48.03	± 4.0
	H	Average	38.72	± 4.0
2.6401	H	Peak	47.52	± 4.0
	H	Average	39.13	± 4.0
3.1885	V	Peak	32.89	± 4.0
	V	Average	27.54	± 4.0
4.9601	V	Peak	45.90	± 4.0
	V	Average	44.23	± 4.0

Verdict: PASS

Modulation: Π/4-DQPSK

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.3420	H	Peak	47.03	± 4.0
	H	Average	34.59	± 4.0
2.4953	H	Peak	46.68	± 4.0
	H	Average	35.04	± 4.0
2.5019	H	Peak	47.60	± 4.0
	H	Average	37.46	± 4.0
2.5206	H	Peak	47.67	± 4.0
	H	Average	37.65	± 4.0
3.0885	V	Peak	34.08	± 4.0
	V	Average	27.60	± 4.0
4.8039	V	Peak	45.34	± 4.0
	V	Average	41.95	± 4.0

2. CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.3810	H	Peak	46.10	± 4.0
	H	Average	35.03	± 4.0
2.4943	H	Peak	47.42	± 4.0
	H	Average	35.02	± 4.0
2.5407	H	Peak	49.24	± 4.0
	H	Average	38.09	± 4.0
2.5609	H	Peak	48.13	± 4.0
	H	Average	37.44	± 4.0
3.1384	V	Peak	33.33	± 4.0
	V	Average	26.89	± 4.0
4.8820	V	Peak	44.13	± 4.0
	V	Average	40.59	± 4.0

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.3801	H	Peak	46.98	± 4.0
	H	Average	35.54	± 4.0
2.4835	H	Peak	48.21	± 4.0
	H	Average	36.19	± 4.0
2.5399	H	Peak	47.06	± 4.0
	H	Average	37.25	± 4.0
2.6400	H	Peak	47.58	± 4.0
	H	Average	37.85	± 4.0
3.1886	V	Peak	35.77	± 4.0
	V	Average	30.04	± 4.0
4.9600	V	Peak	43.09	± 4.0
	V	Average	38.73	± 4.0

Verdict: PASS

Modulation: 8-DPSK

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.3220	H	Peak	46.31	± 4.0
	H	Average	34.47	± 4.0
2.4950	H	Peak	47.51	± 4.0
	H	Average	34.99	± 4.0
2.5021	H	Peak	47.55	± 4.0
	H	Average	37.26	± 4.0
2.5222	H	Peak	48.47	± 4.0
	H	Average	37.38	± 4.0
3.0882	V	Peak	33.75	± 4.0
	V	Average	26.88	± 4.0
4.8040	V	Peak	45.52	± 4.0
	V	Average	40.76	± 4.0

2. CHANNEL: MIDDLE (2441 MHz).

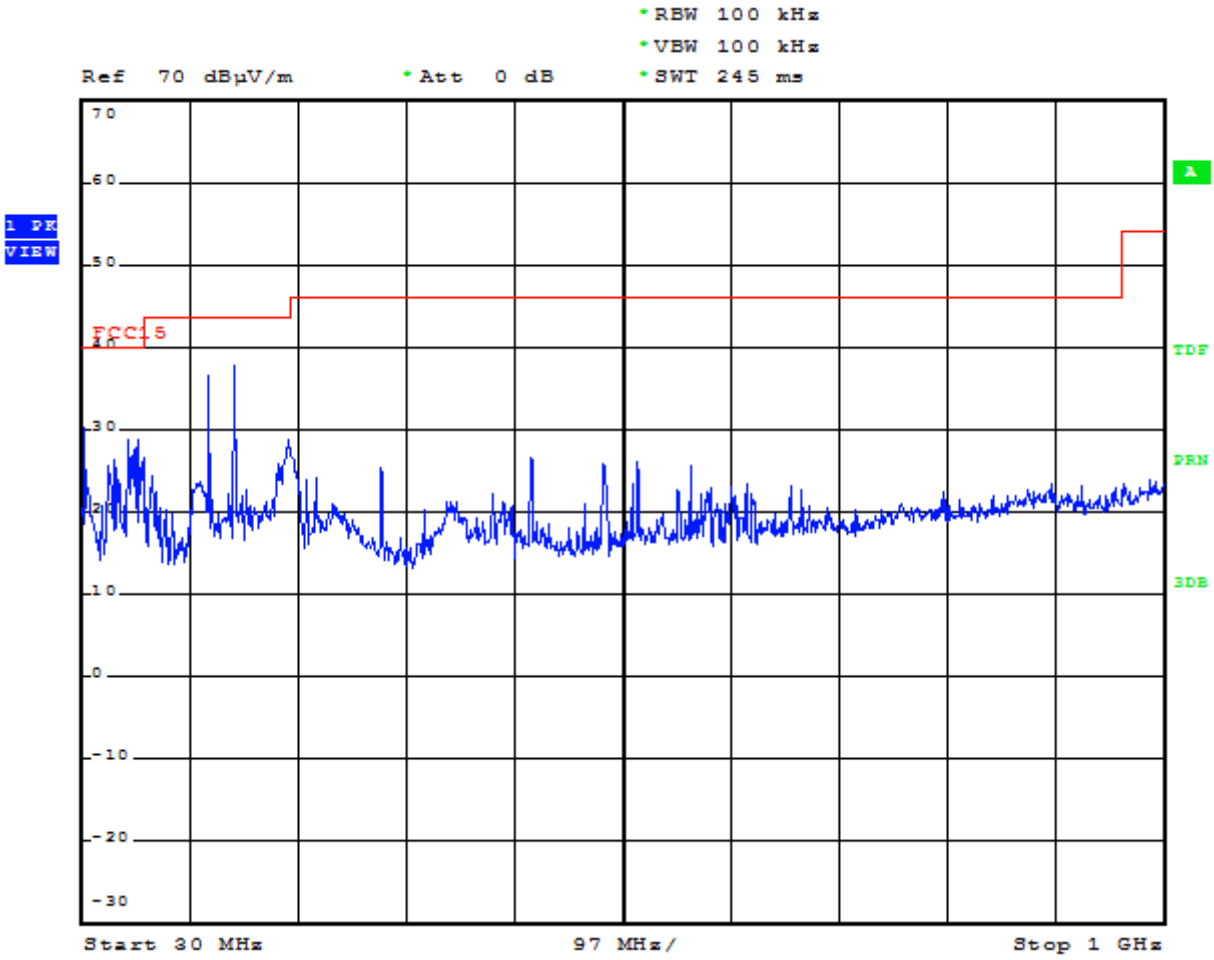
Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.3809	H	Peak	46.80	± 4.0
	H	Average	35.81	± 4.0
2.4953	H	Peak	46.73	± 4.0
	H	Average	35.05	± 4.0
2.5411	H	Peak	47.94	± 4.0
	H	Average	38.33	± 4.0
2.5610	H	Peak	47.90	± 4.0
	H	Average	38.08	± 4.0
3.1385	V	Peak	33.36	± 4.0
	V	Average	26.09	± 4.0
4.8821	V	Peak	43.66	± 4.0
	V	Average	38.92	± 4.0

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
2.3800	H	Peak	46.64	± 4.0
	H	Average	36.39	± 4.0
2.4835	H	Peak	49.40	± 4.0
	H	Average	36.59	± 4.0
2.5800	H	Peak	47.51	± 4.0
	H	Average	37.70	± 4.0
2.6201	H	Peak	47.49	± 4.0
	H	Average	37.76	± 4.0
2.6400	H	Peak	48.05	± 4.0
	H	Average	38.95	± 4.0
3.1885	V	Peak	35.69	± 4.0
	V	Average	29.24	± 4.0
4.9601	V	Peak	41.97	± 4.0
	V	Average	37.24	± 4.0

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

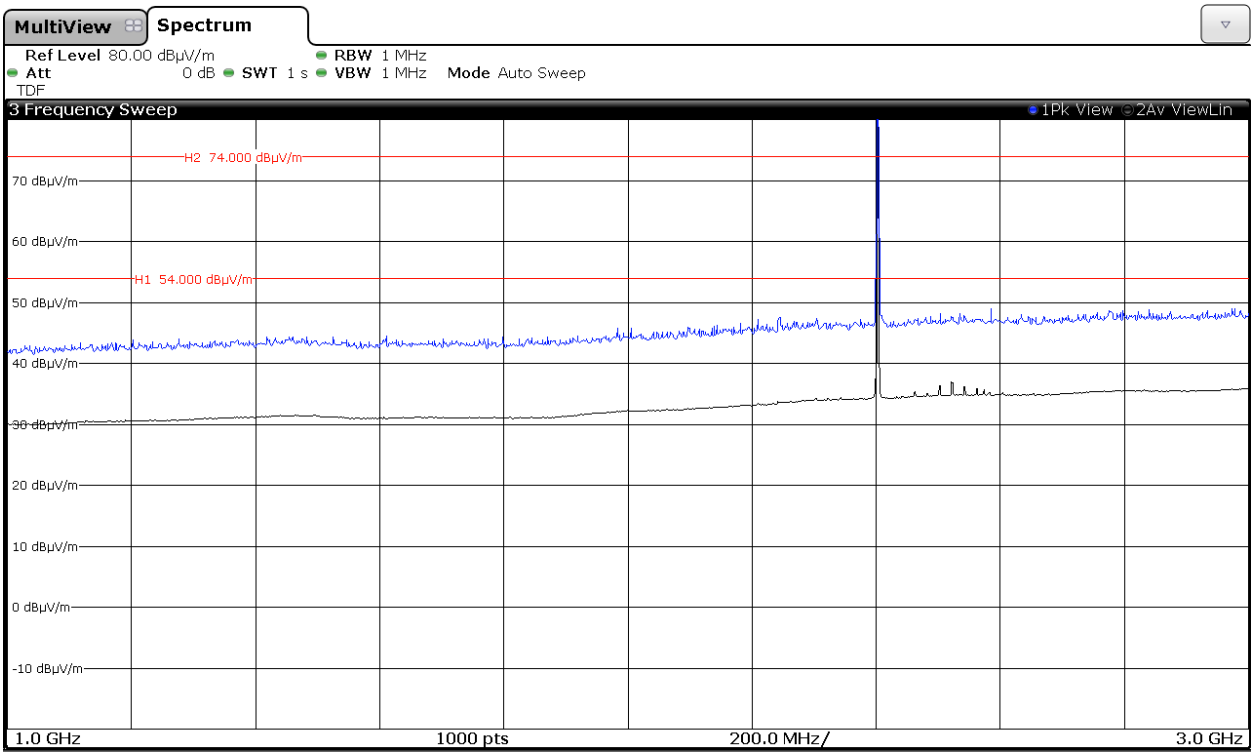


(This plot is valid for all three channels and all modulation modes).

FREQUENCY RANGE 1 GHz to 3 GHz.

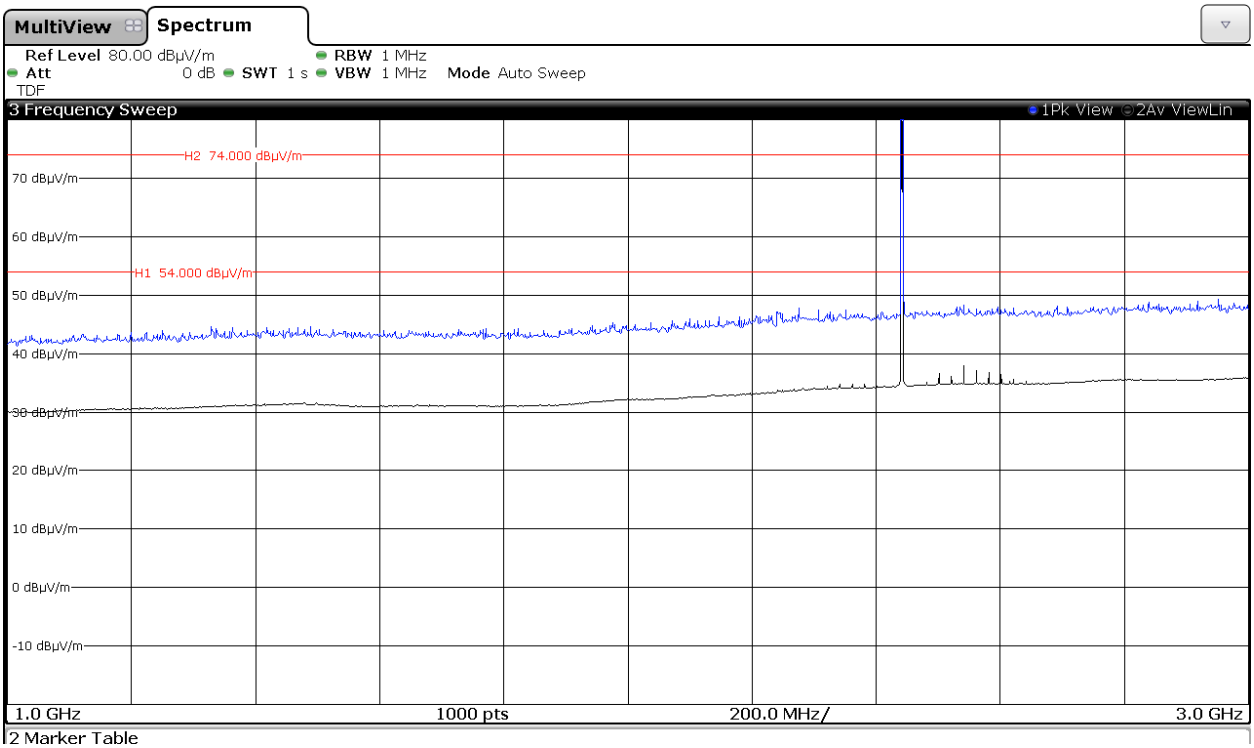
Modulation: GFSK

CHANNEL: Lowest (2402 MHz).



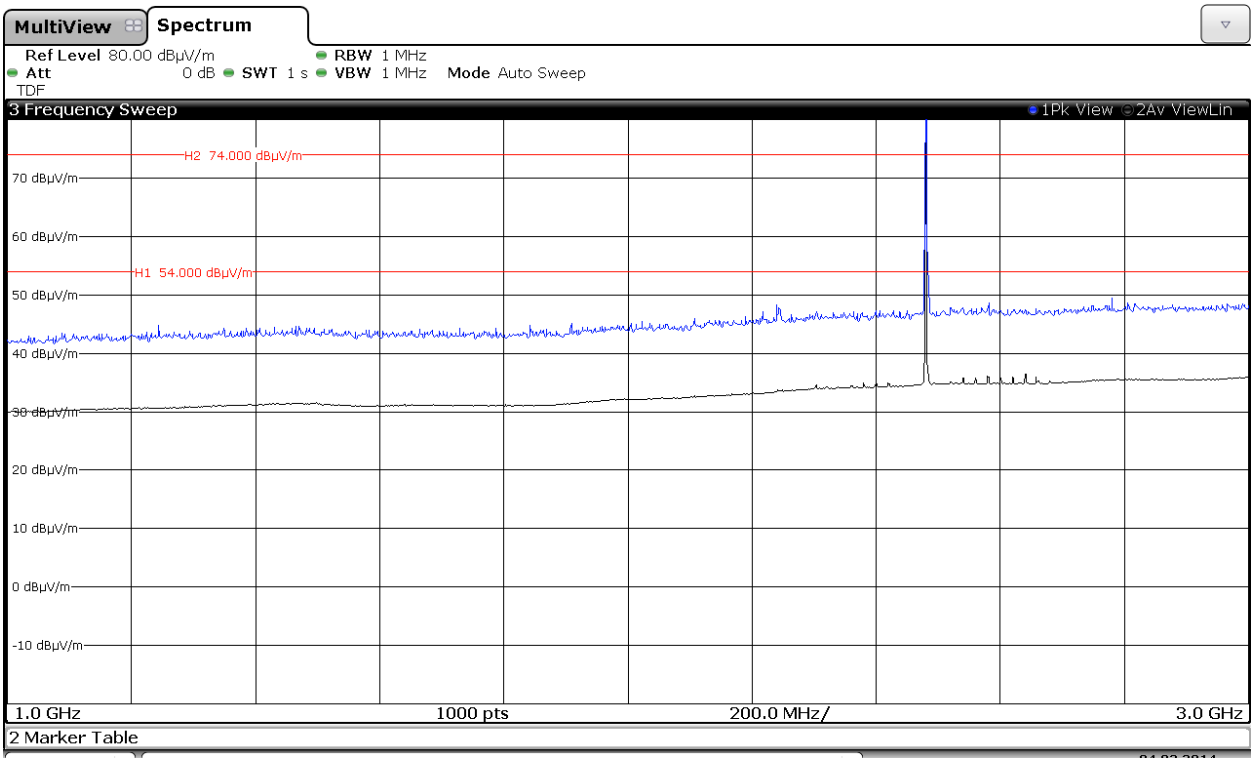
Note: The peak shown in the plot is the carrier frequency.

CHANNEL: Middle (2441 MHz).



Note: The peak shown in the plot is the carrier frequency.

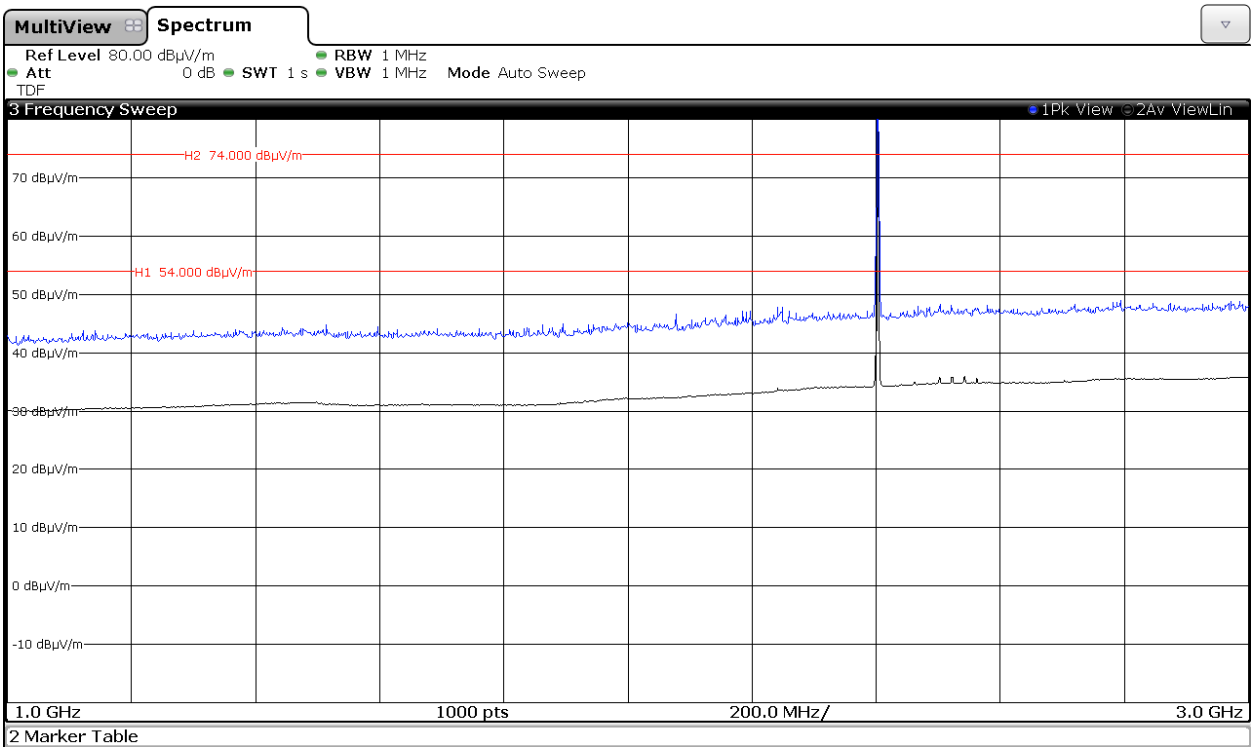
CHANNEL: Highest (2480 MHz).



Note: The peak shown in the plot is the carrier frequency.

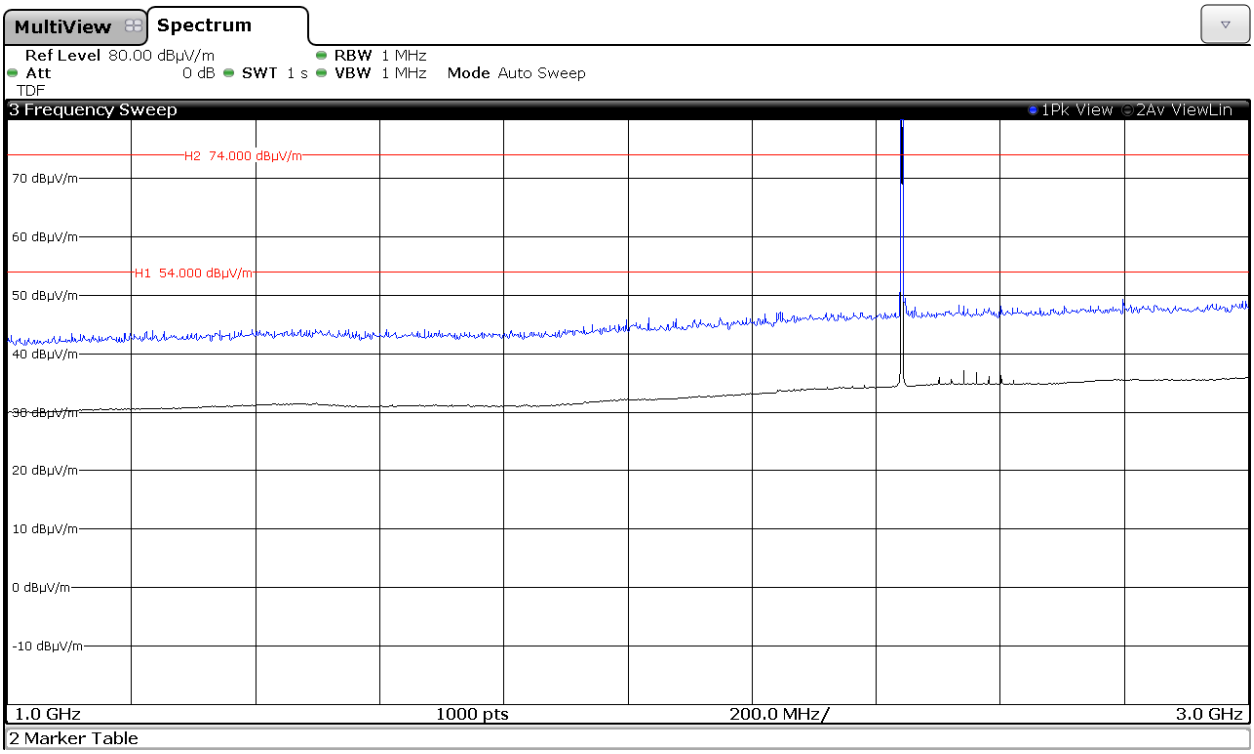
Modulation: Π/4-DQPSK

CHANNEL: Lowest (2402 MHz).



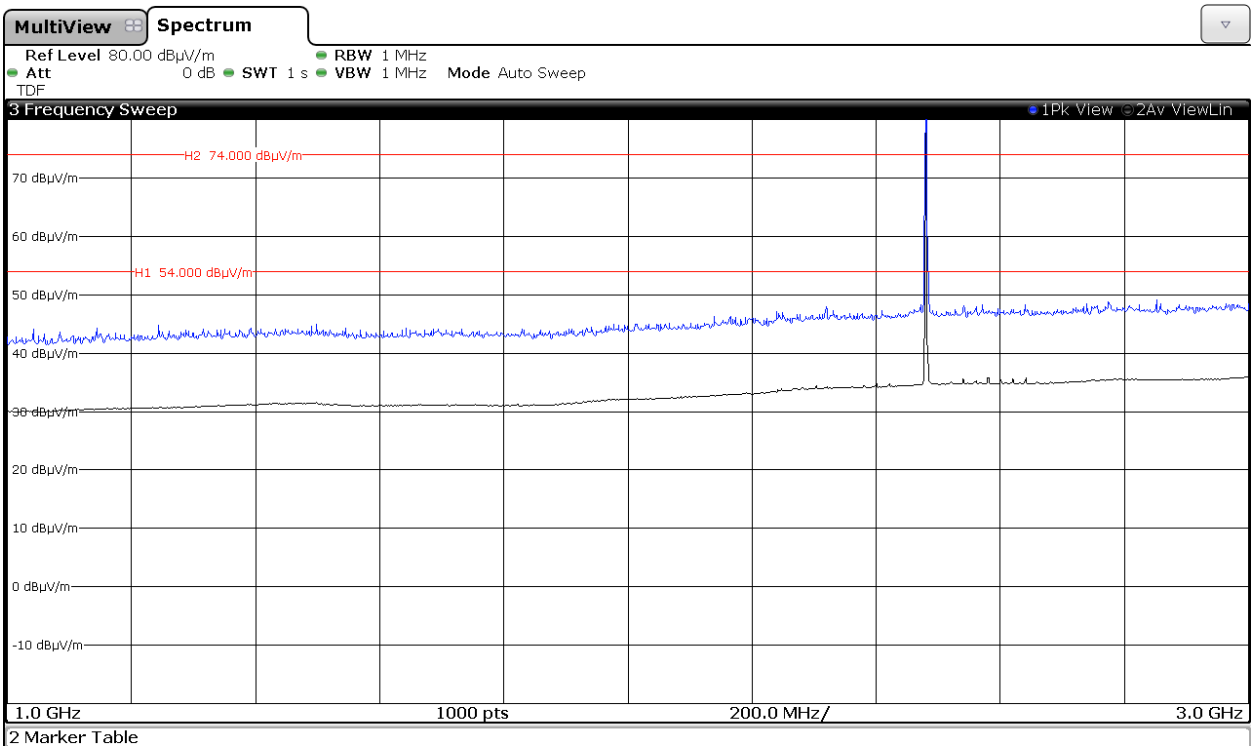
Note: The peak shown in the plot is the carrier frequency.

CHANNEL: Middle (2441 MHz).



Note: The peak shown in the plot is the carrier frequency.

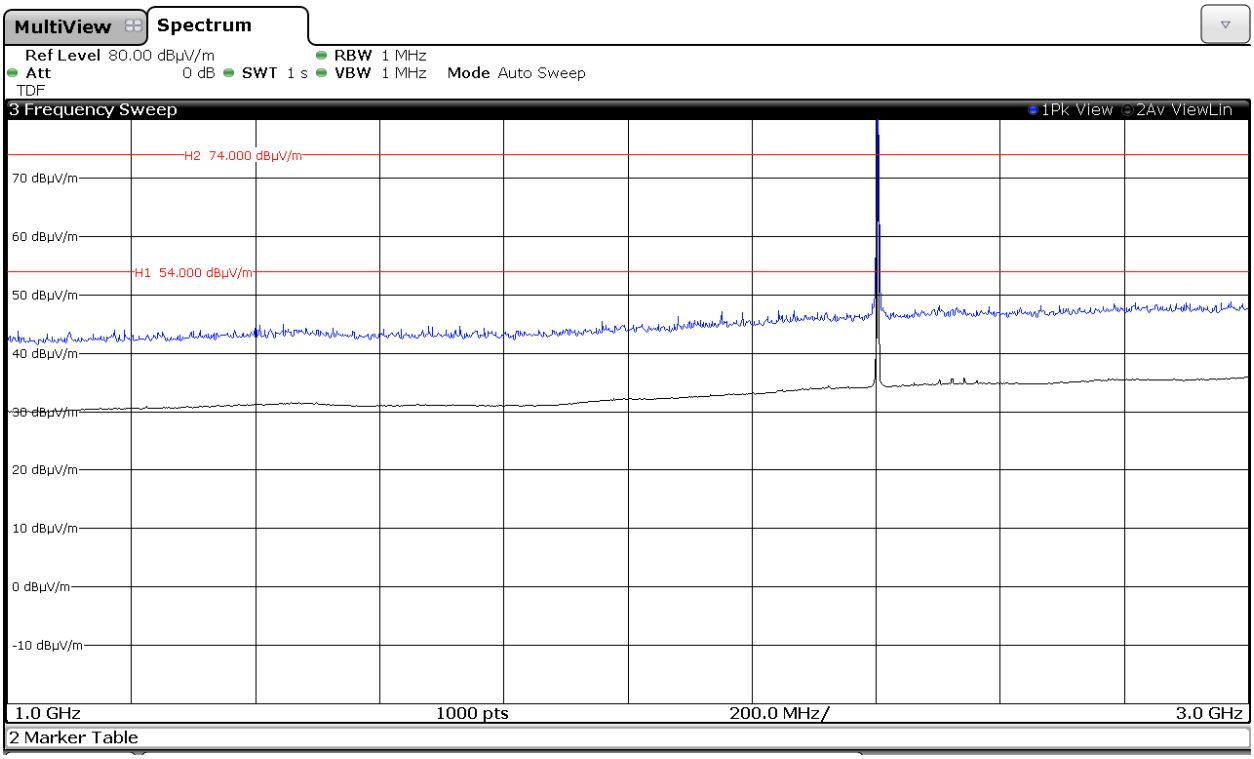
CHANNEL: Highest (2480 MHz).



Note: The peak shown in the plot is the carrier frequency.

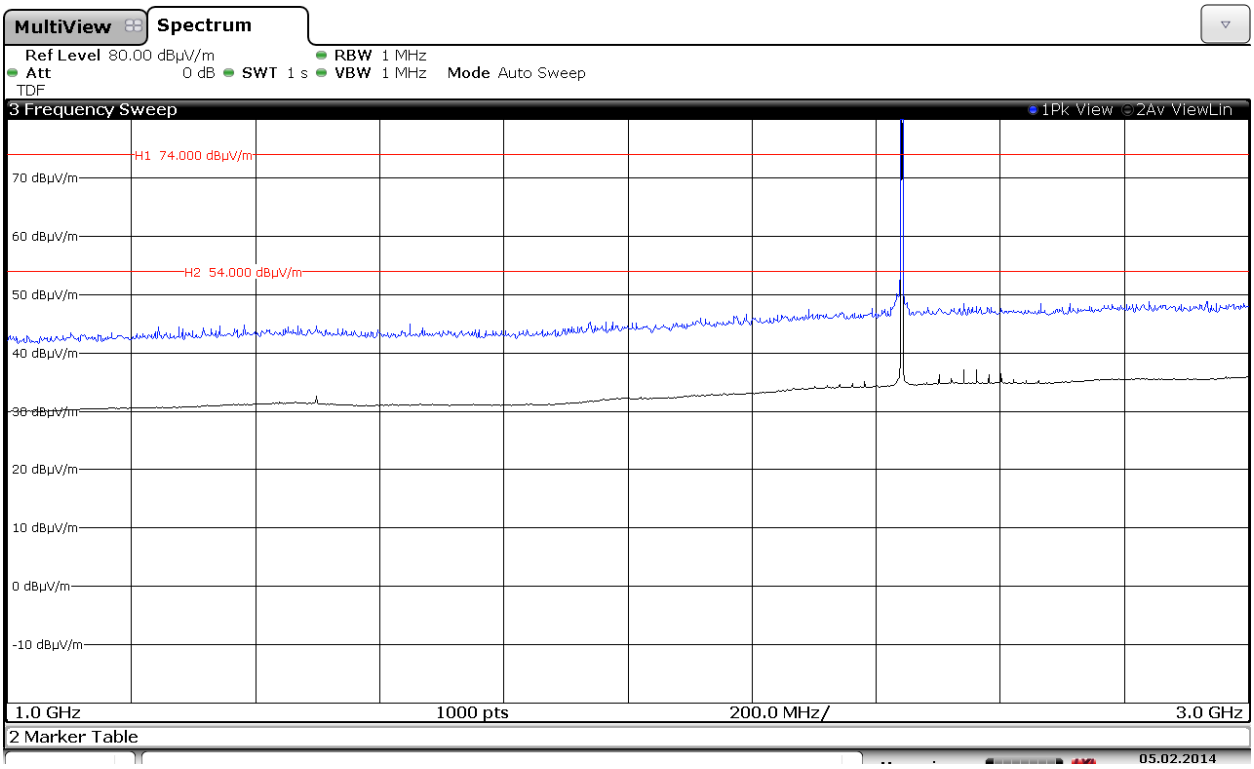
Modulation: 8-DPSK

CHANNEL: Lowest (2402 MHz).



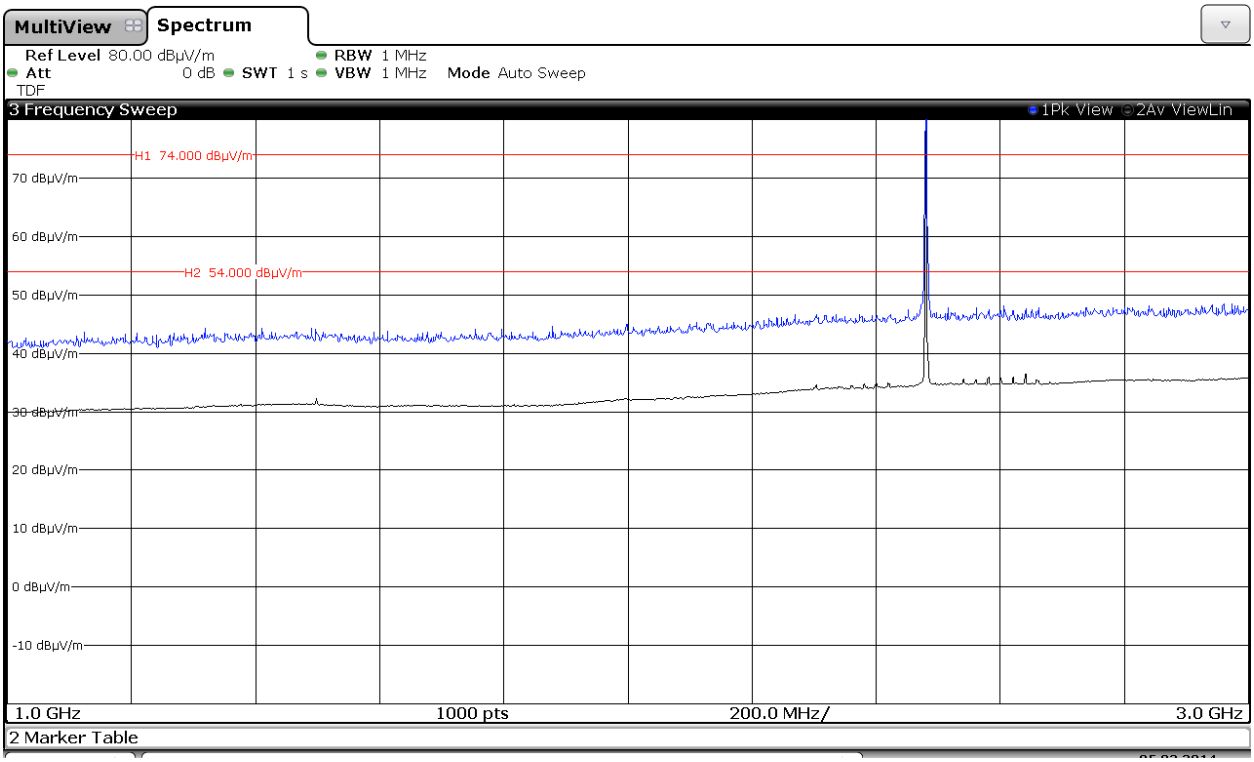
Note: The peak shown in the plot is the carrier frequency.

CHANNEL: Middle (2441 MHz).



Note: The peak shown in the plot is the carrier frequency.

CHANNEL: Highest (2480 MHz).

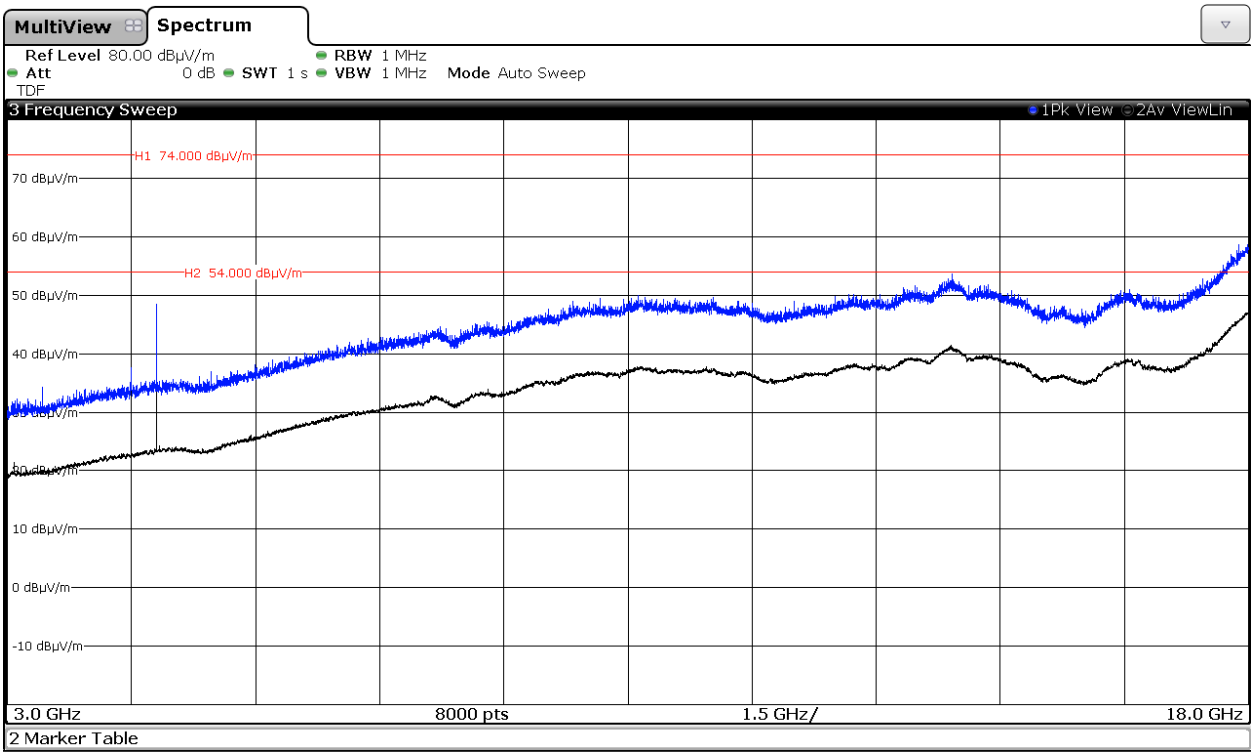


Note: The peak shown in the plot is the carrier frequency.

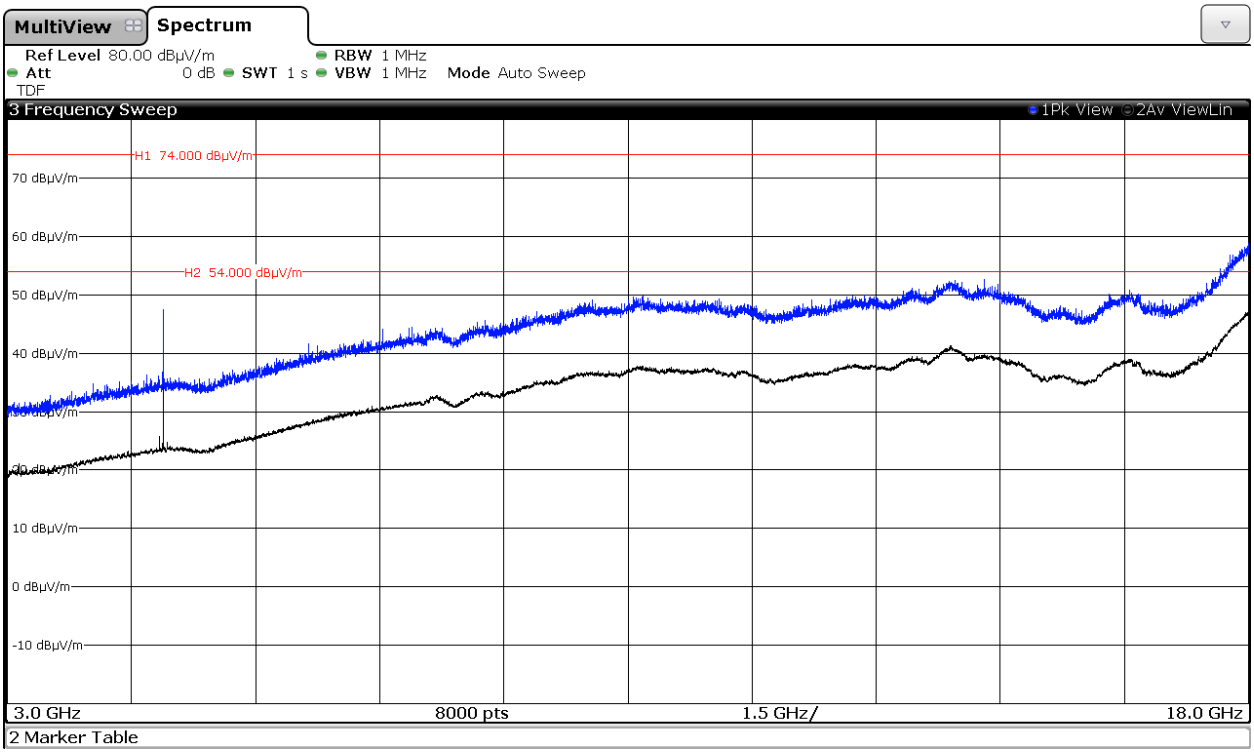
FREQUENCY RANGE 3 GHz to 18 GHz.

Modulation: GFSK

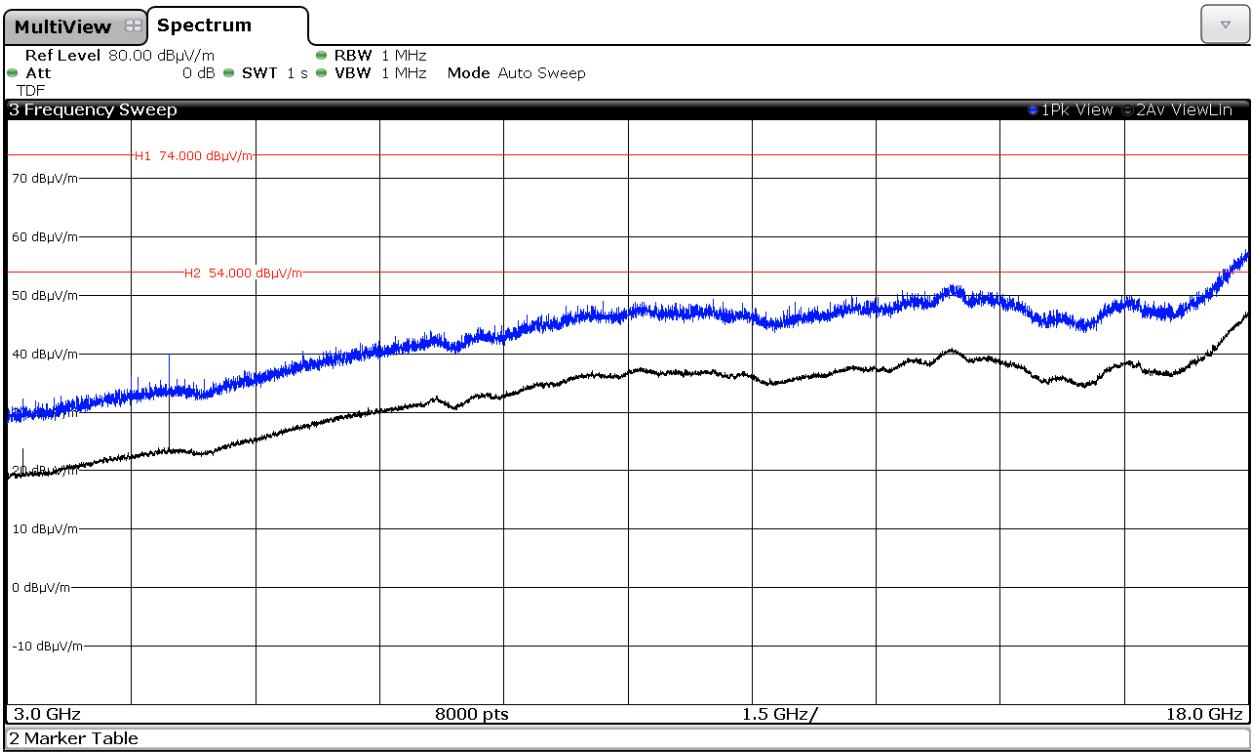
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2441 MHz).

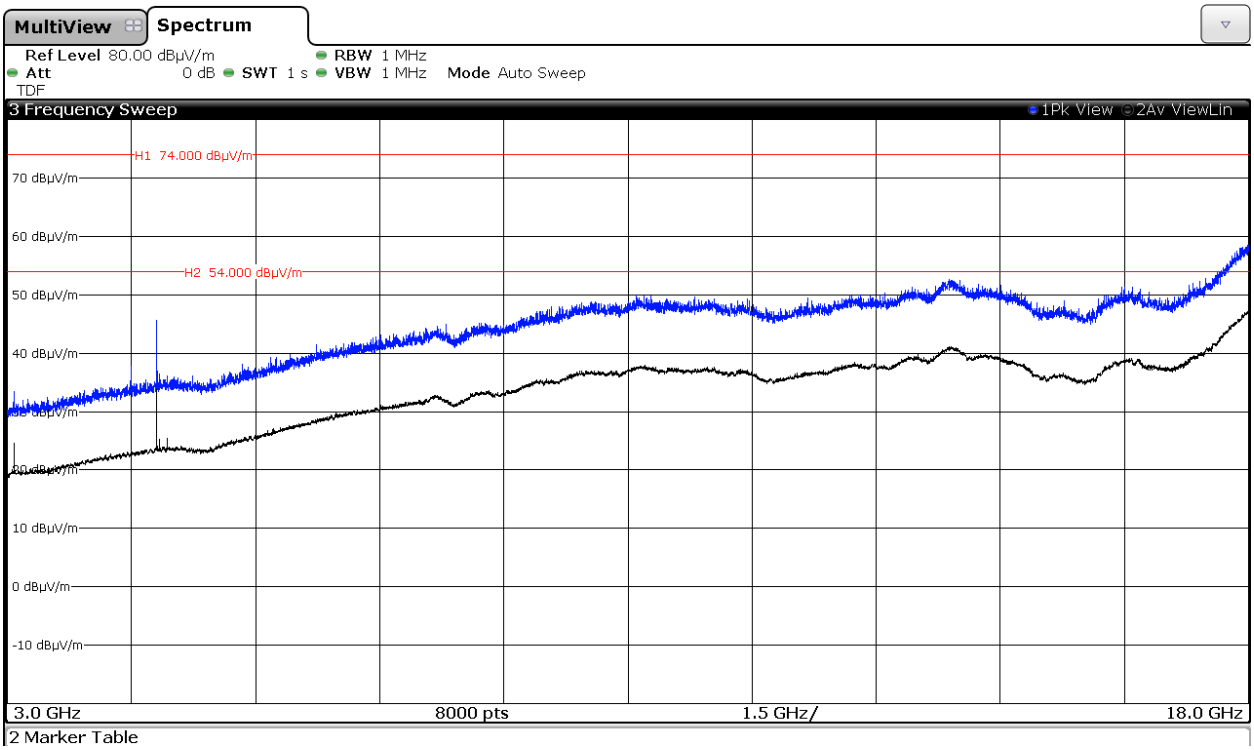


CHANNEL: Highest (2480 MHz).

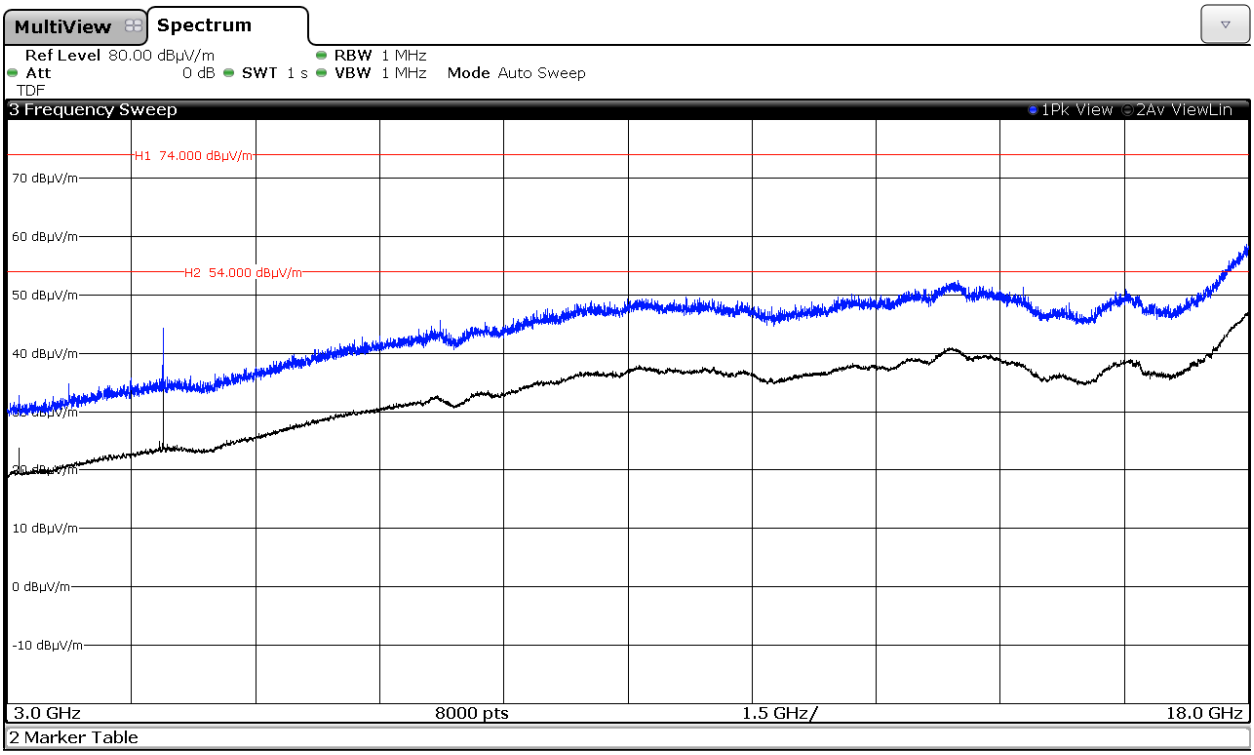


Modulation: II/4-DQPSK

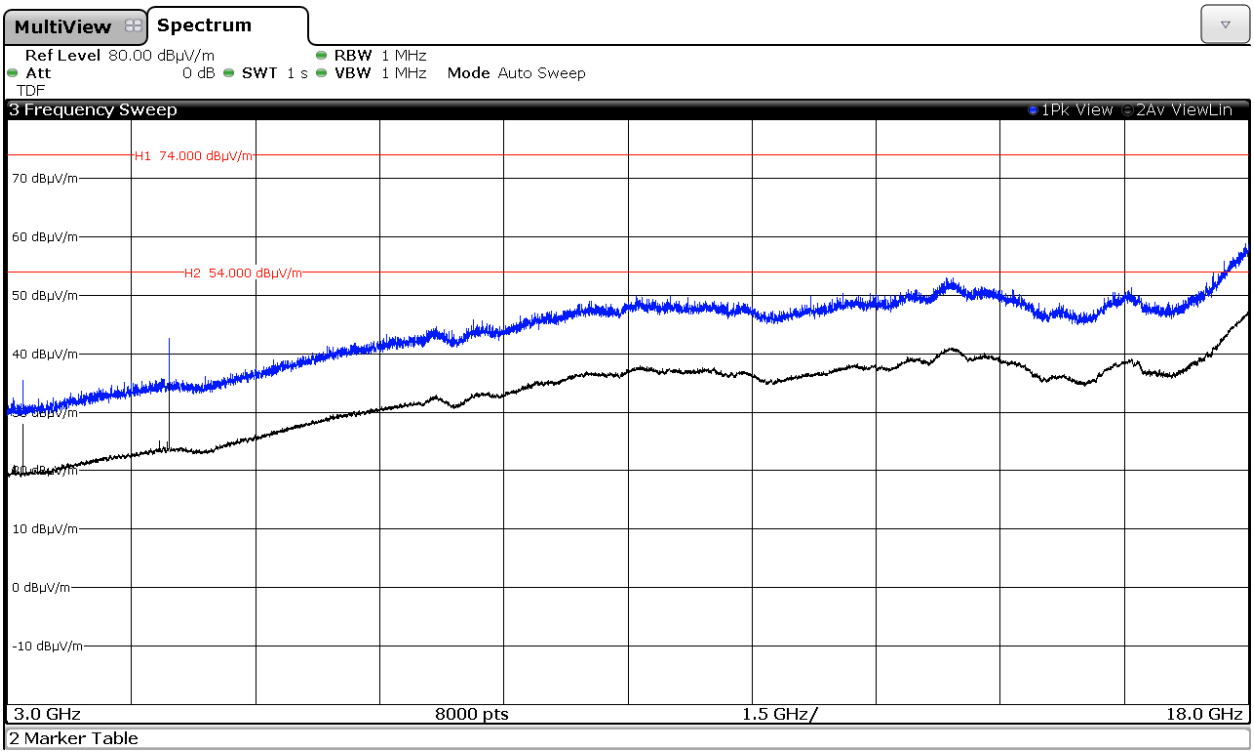
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2441 MHz).

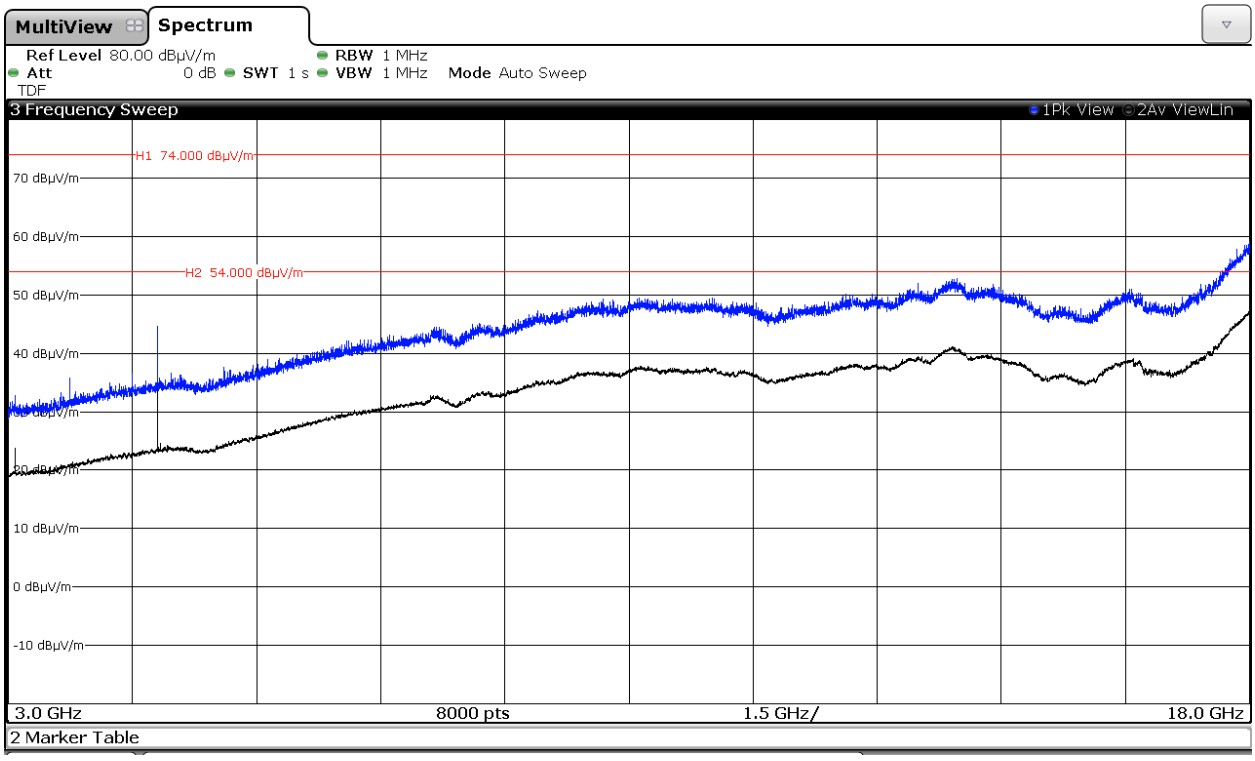


CHANNEL: Highest (2480 MHz).

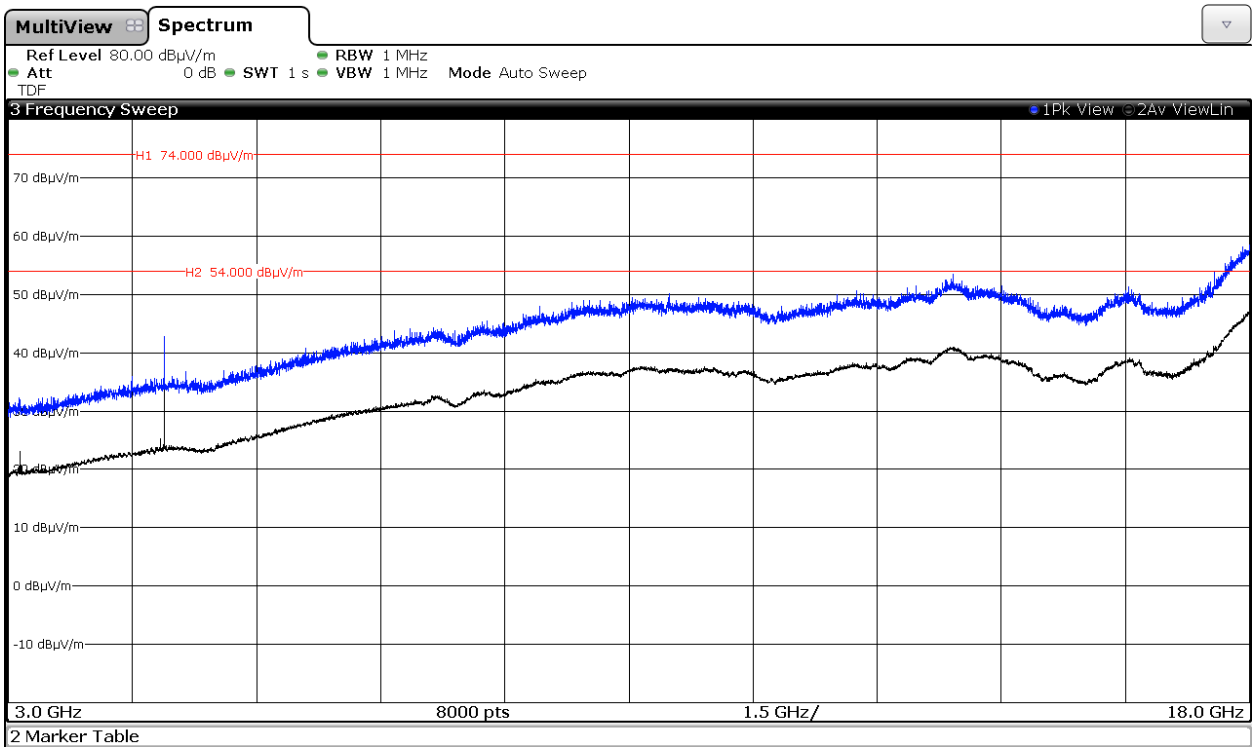


Modulation: 8-DPSK

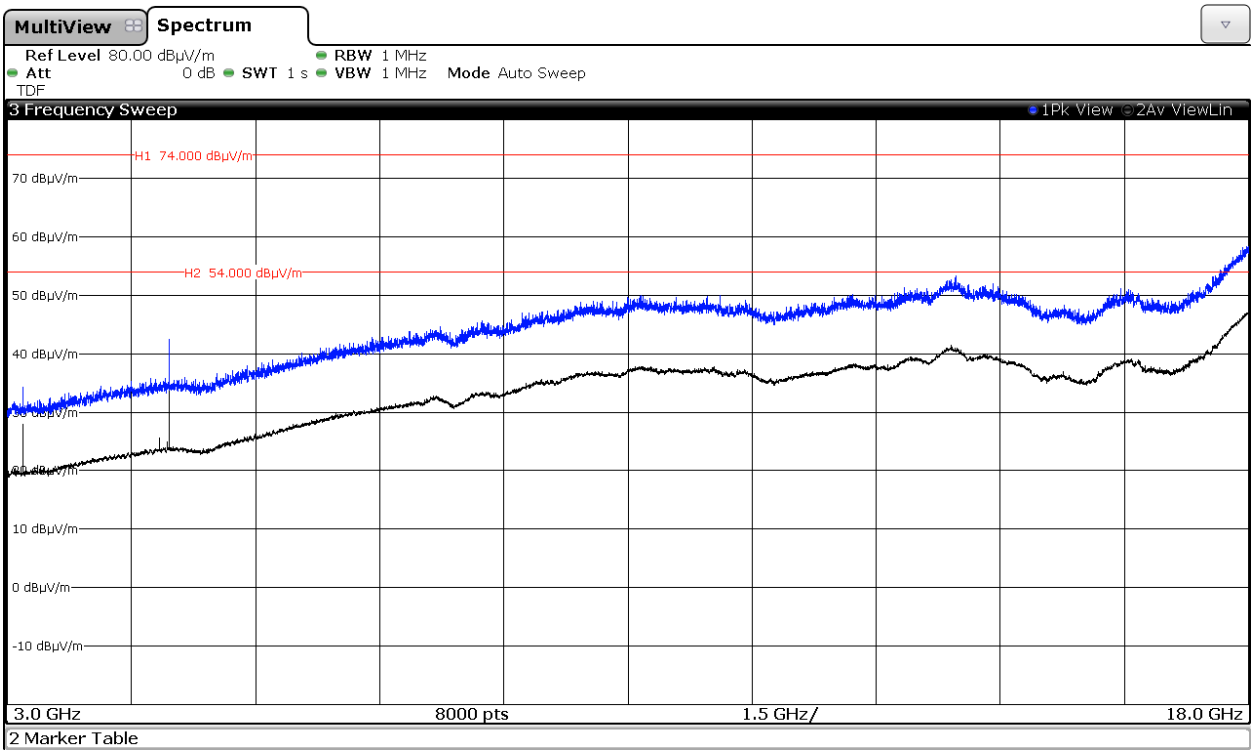
CHANNEL: Lowest (2402 MHz).



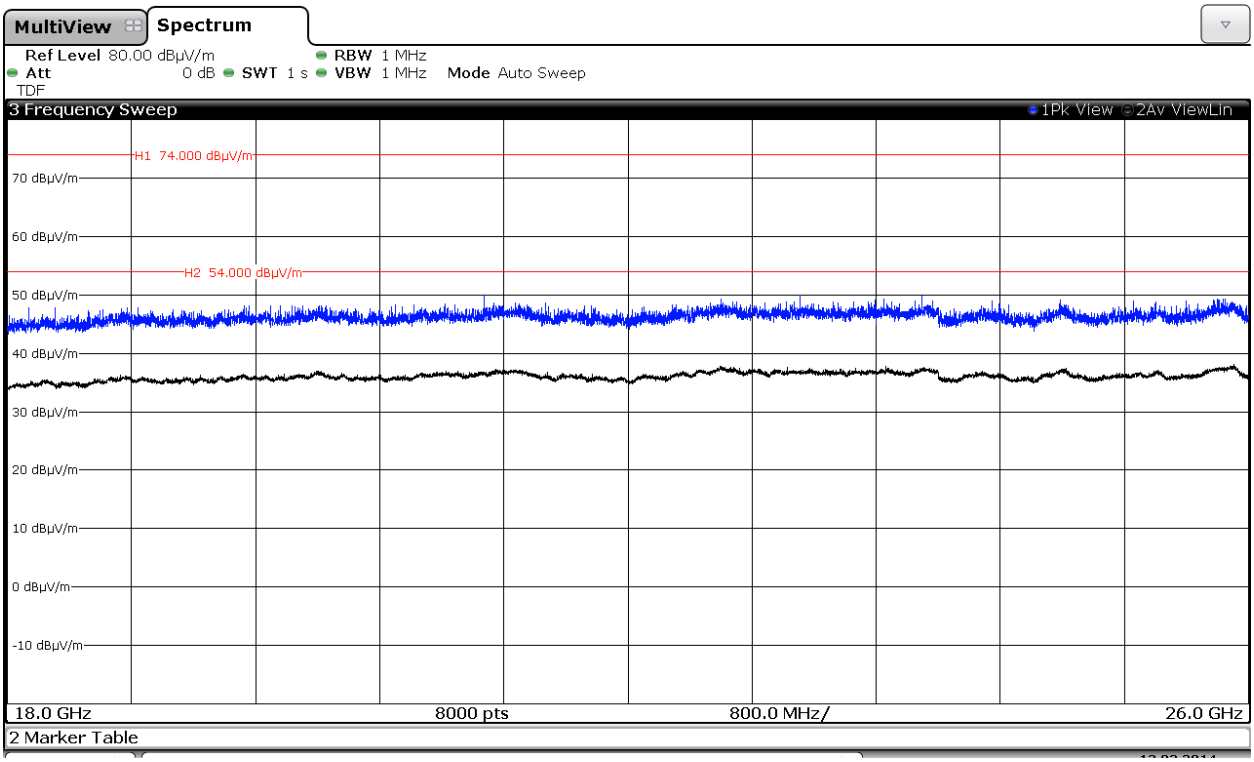
CHANNEL: Middle (2441 MHz).



CHANNEL: Highest (2480 MHz).



FREQUENCY RANGE 18 GHz to 25 GHz.

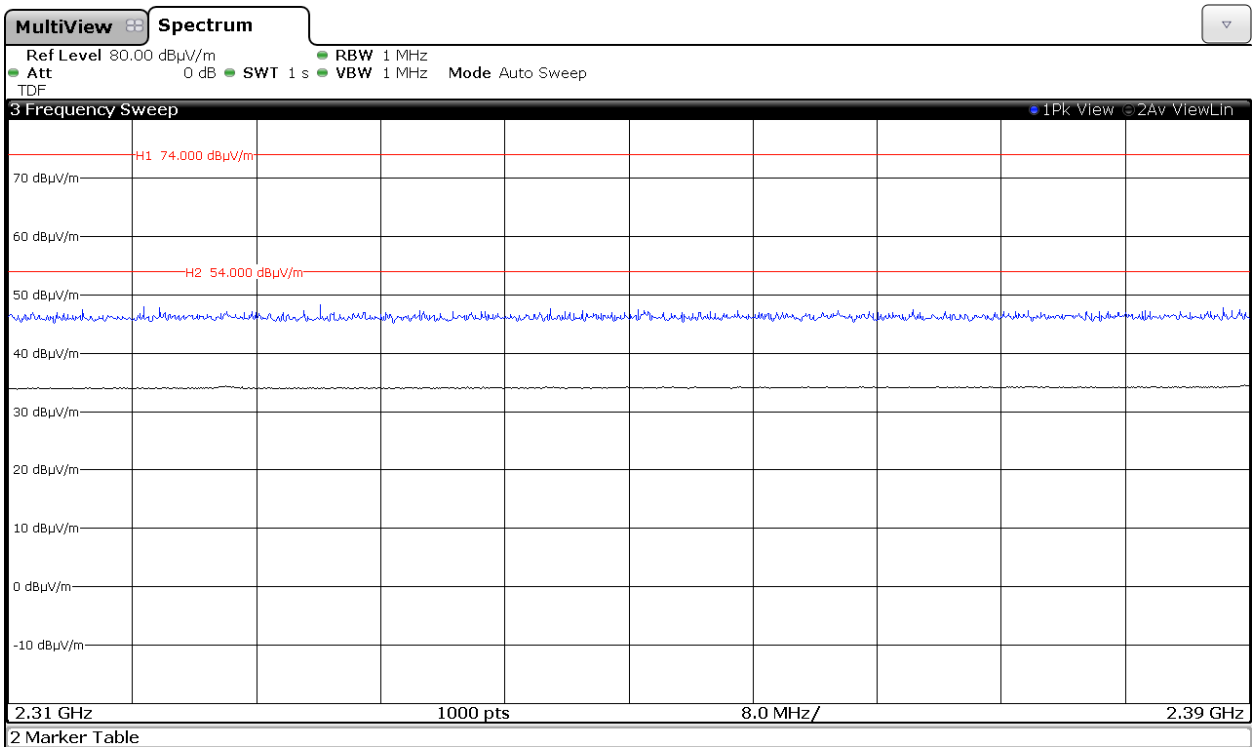


(This plot is valid for all three channels and all modulation modes).

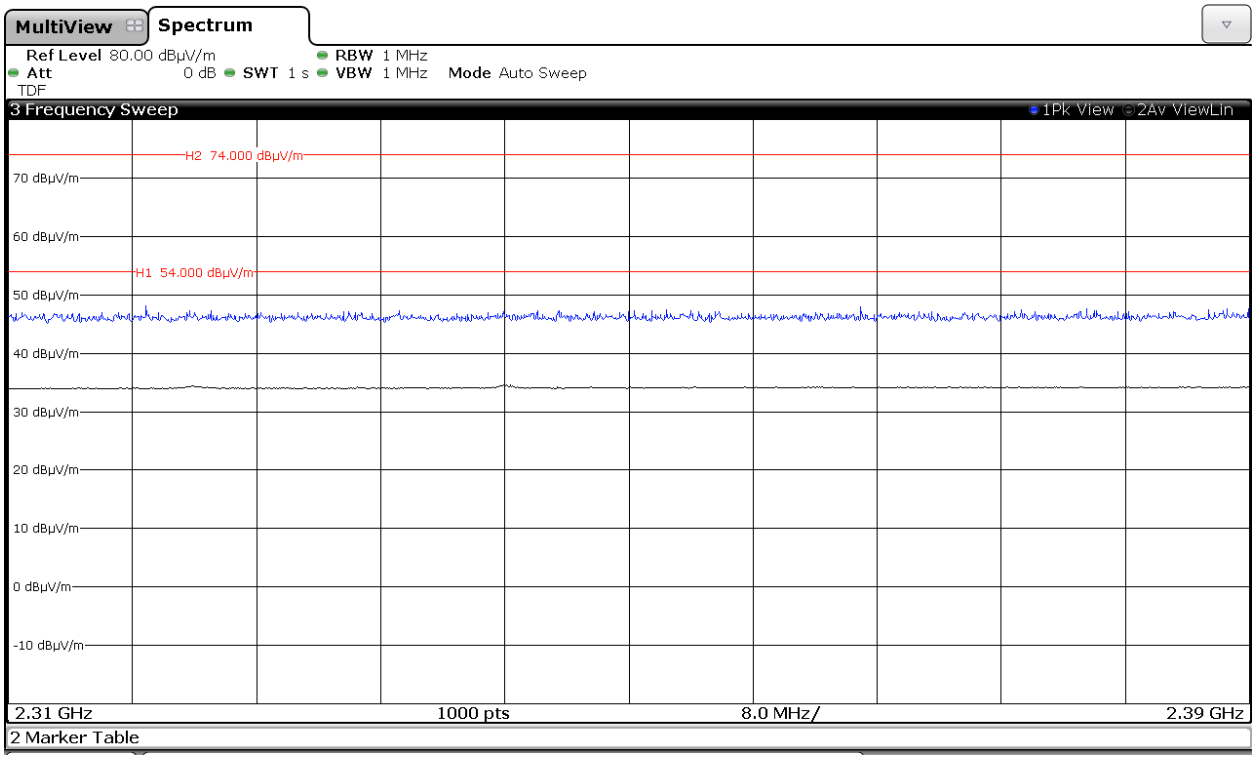
FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)

CHANNEL: Lowest

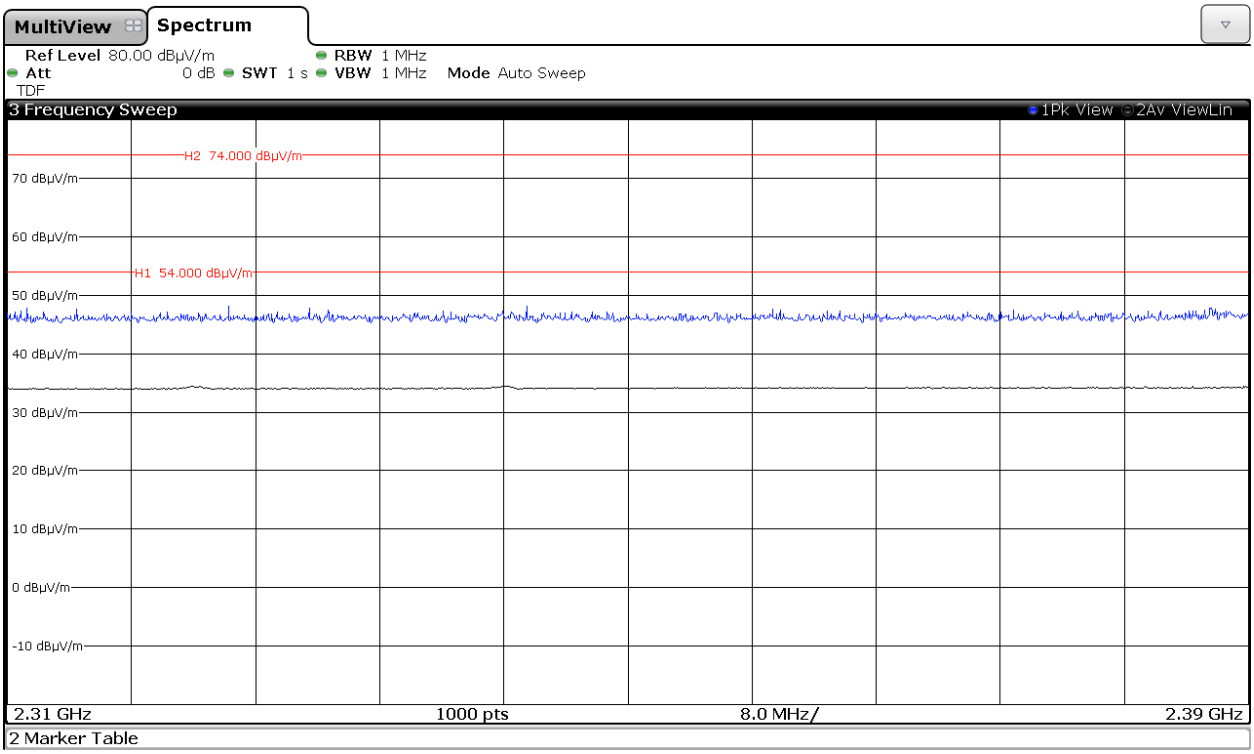
Modulation: GFSK



Modulation: Π/4-DQPSK

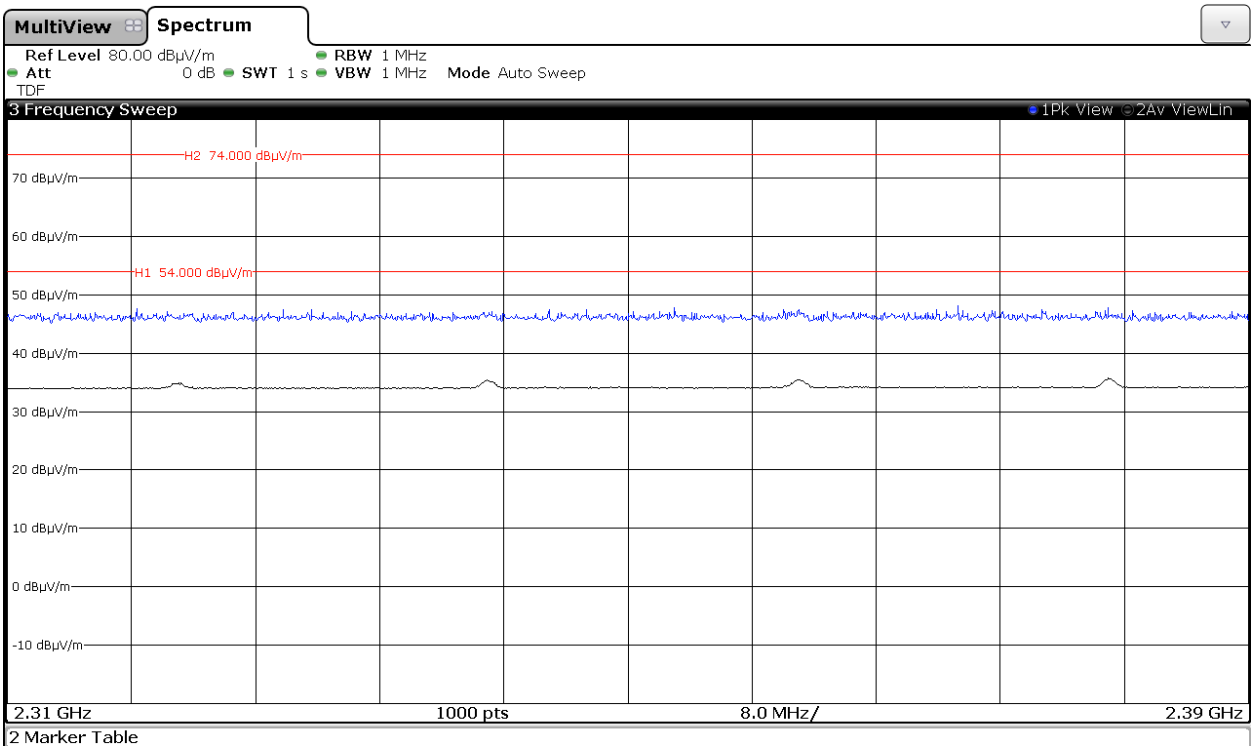


Modulation: 8-DPSK

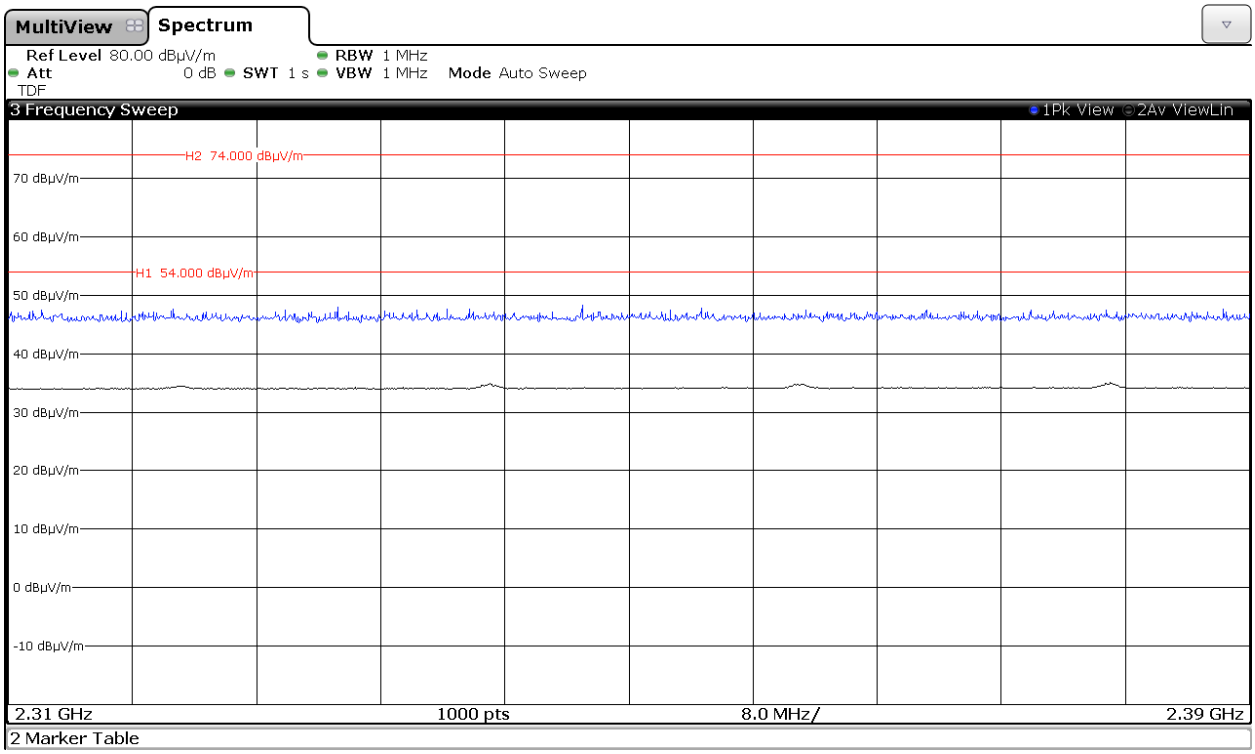


CHANNEL: Middle

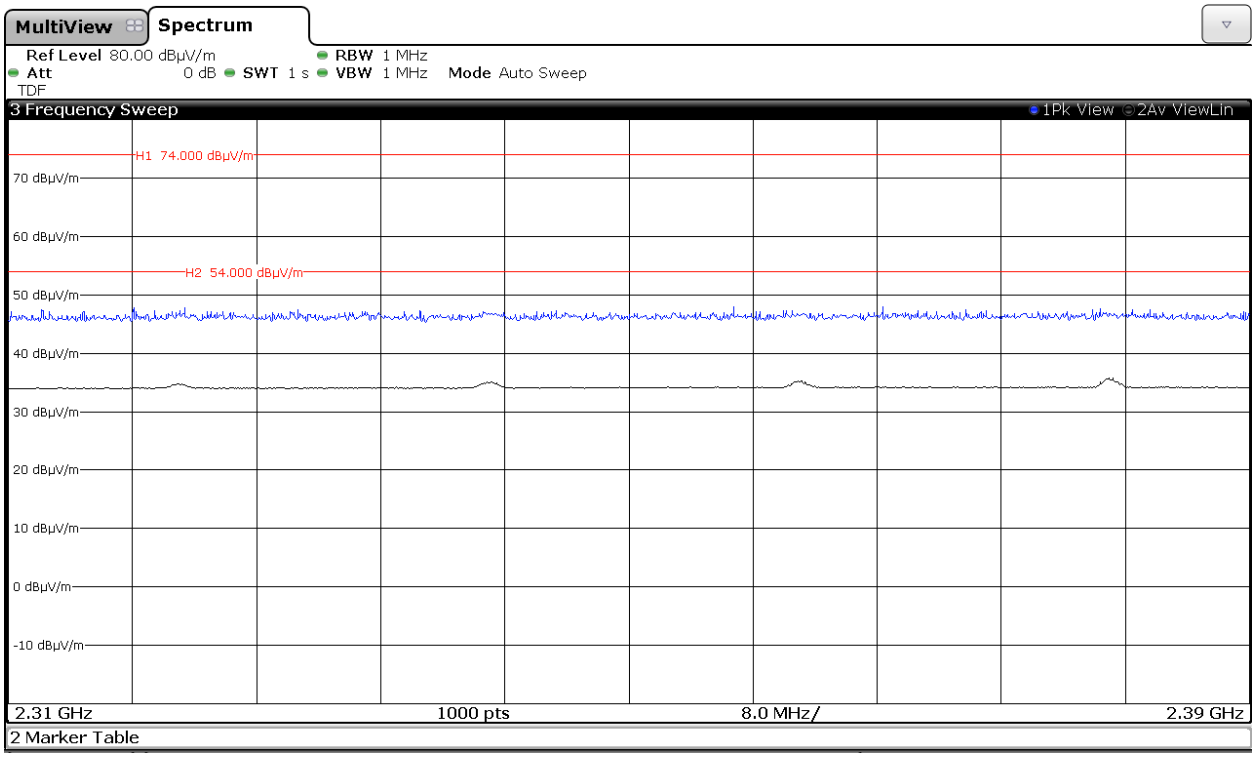
Modulation: GFSK



Modulation: Π/4-DQPSK

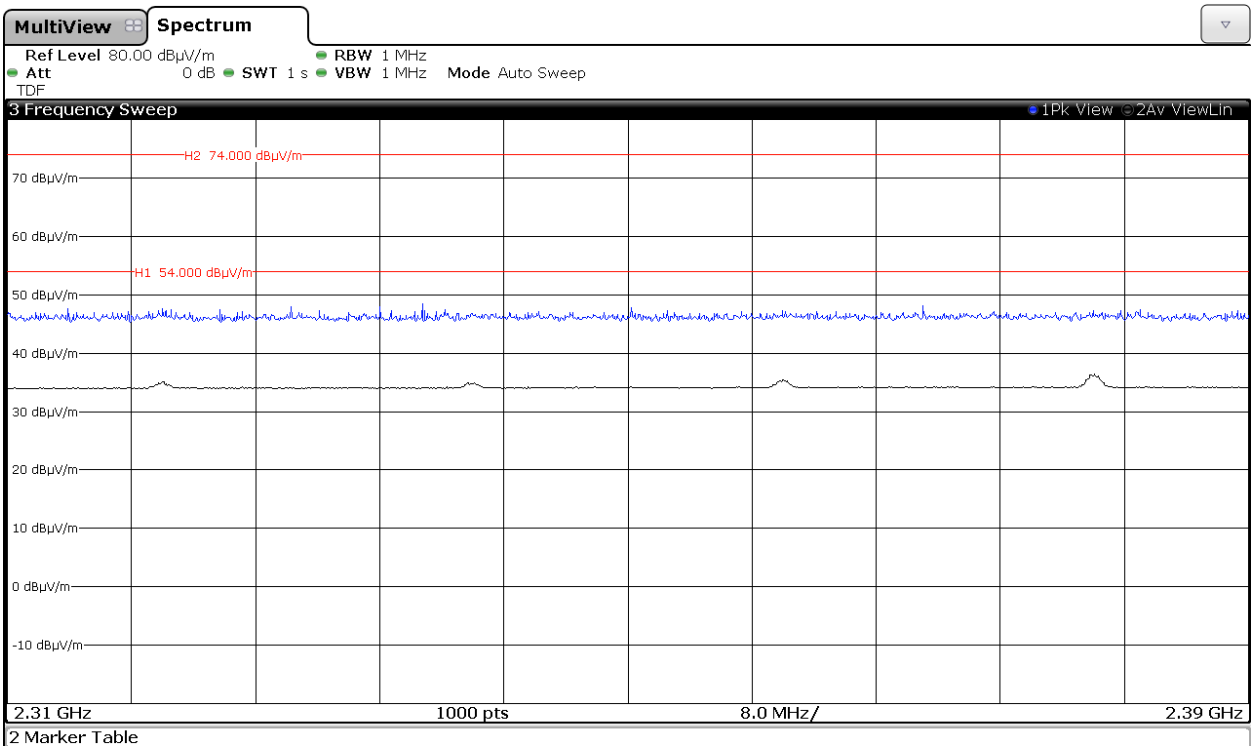


Modulation: 8-DPSK

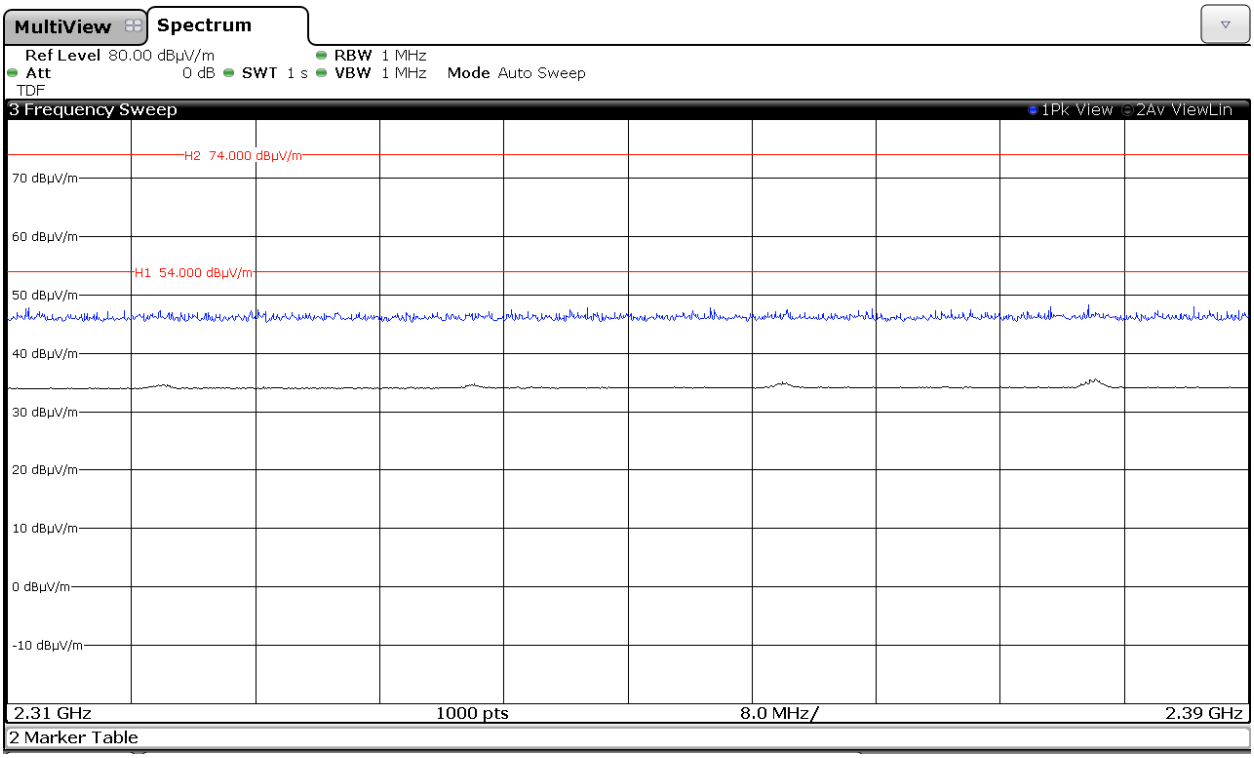


CHANNEL: Highest

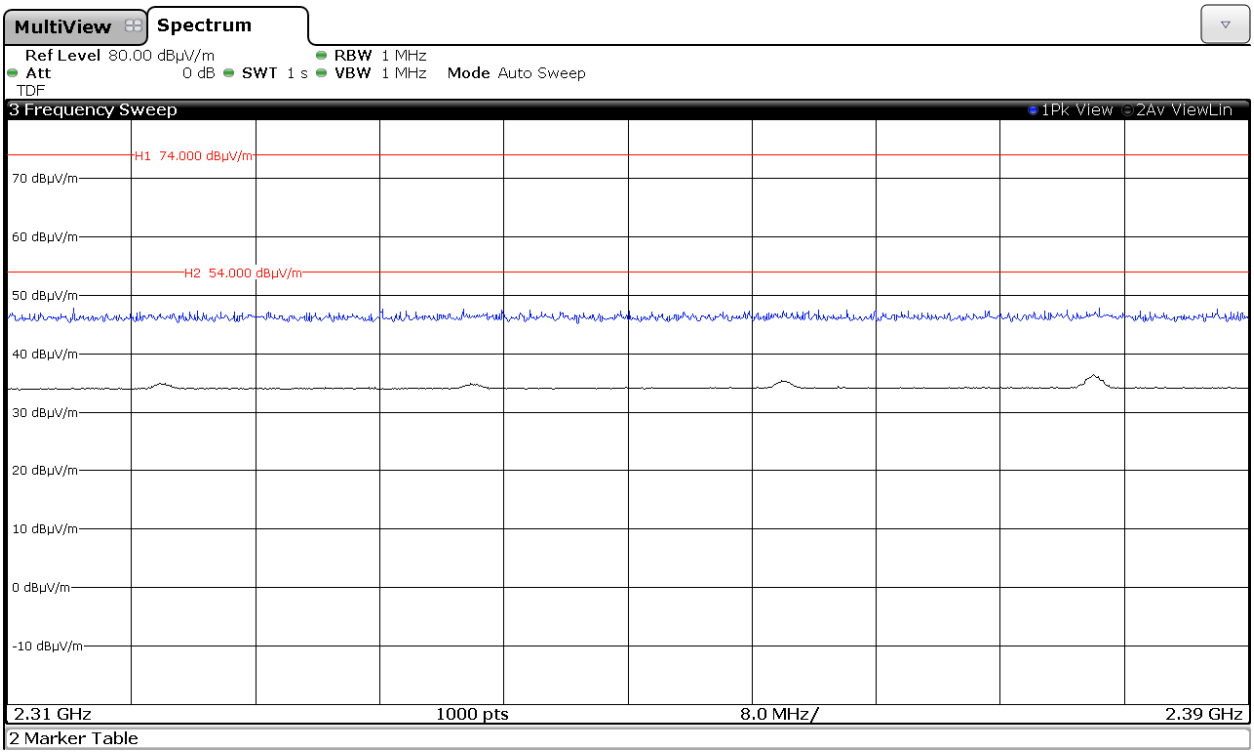
Modulation: GFSK



Modulation: Π/4-DQPSK

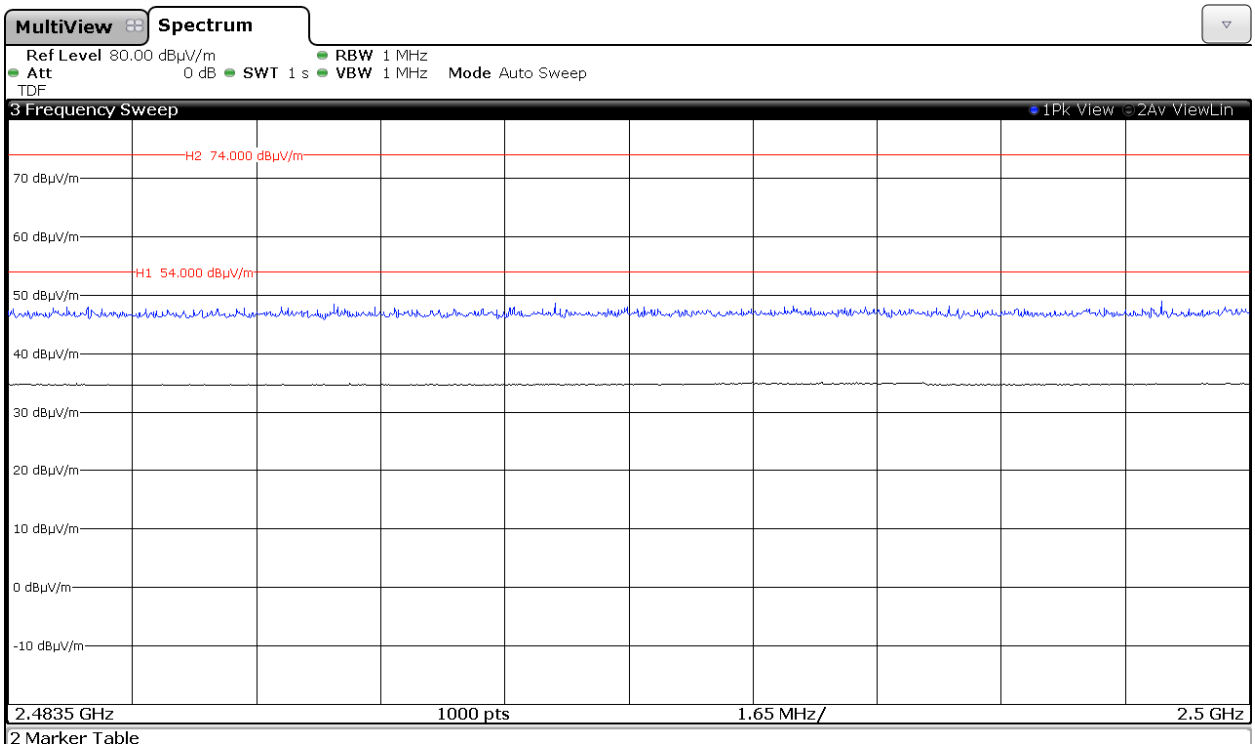


Modulation: 8-DPSK



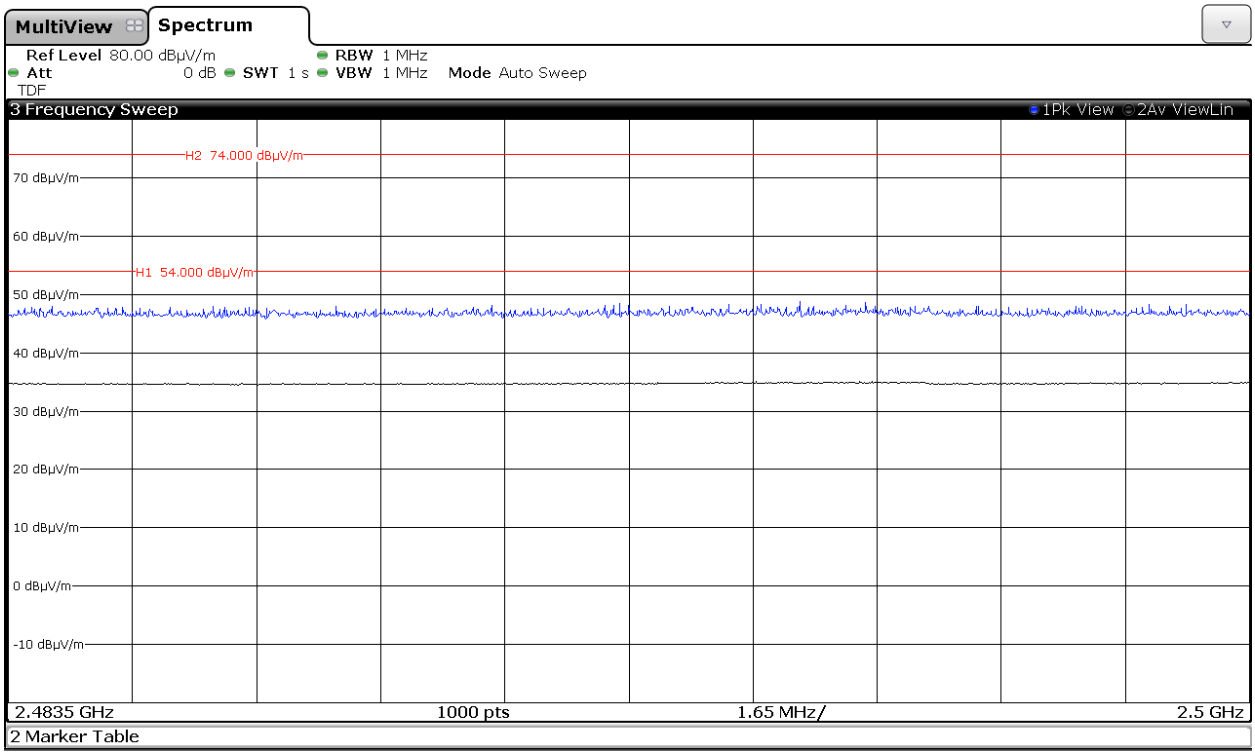
FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)

CHANNEL: Lowest



(This plot is valid for all modulation modes).

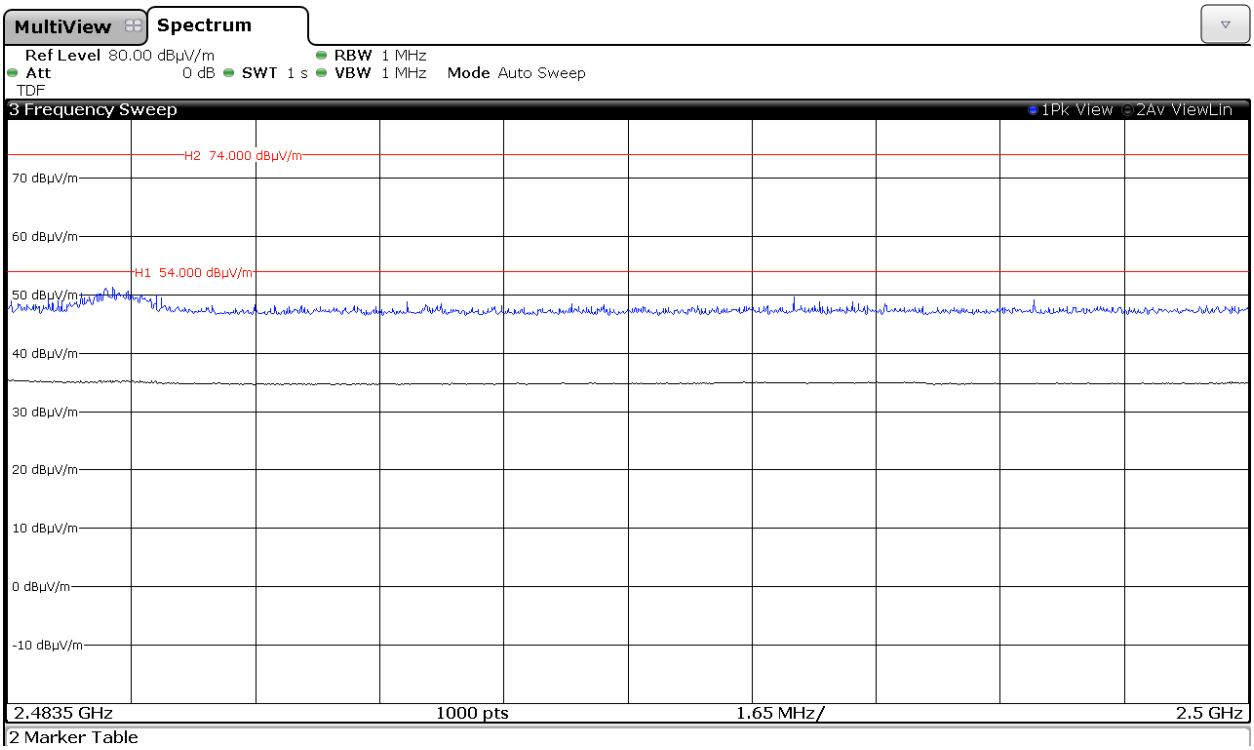
CHANNEL: Middle



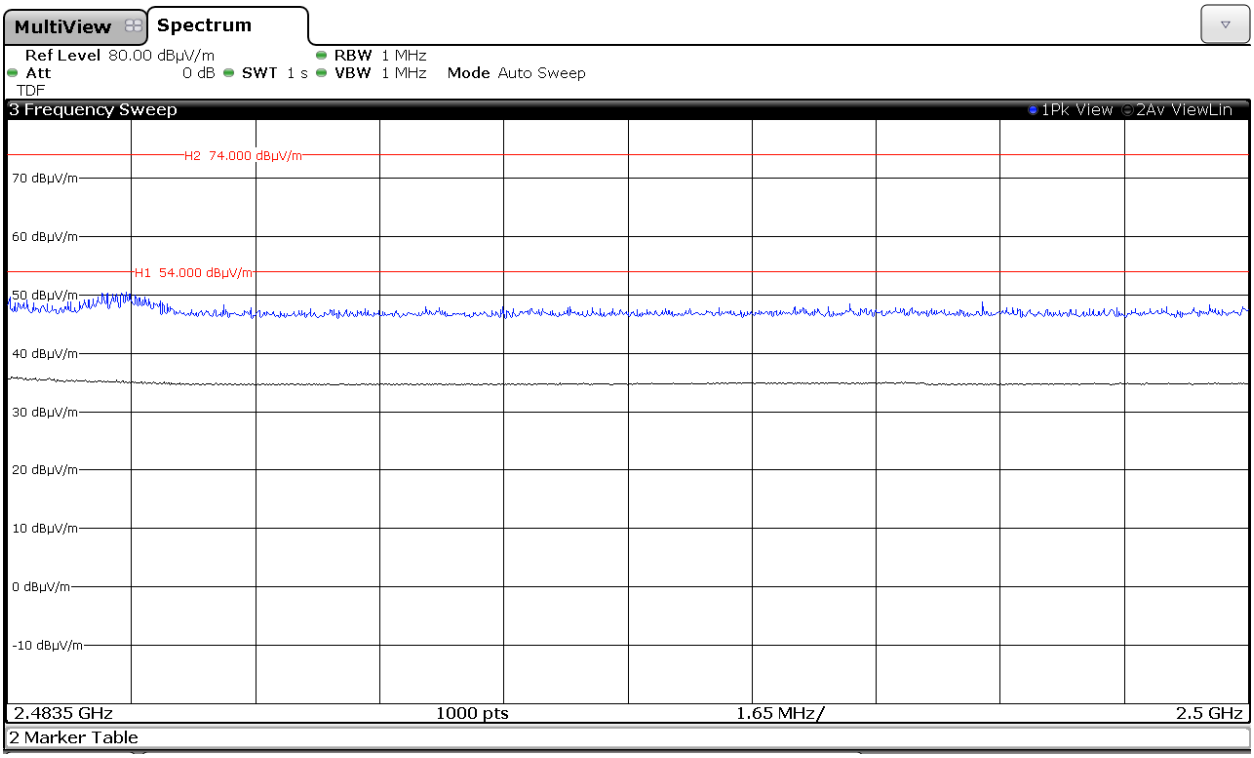
(This plot is valid for all modulation modes).

CHANNEL: Highest

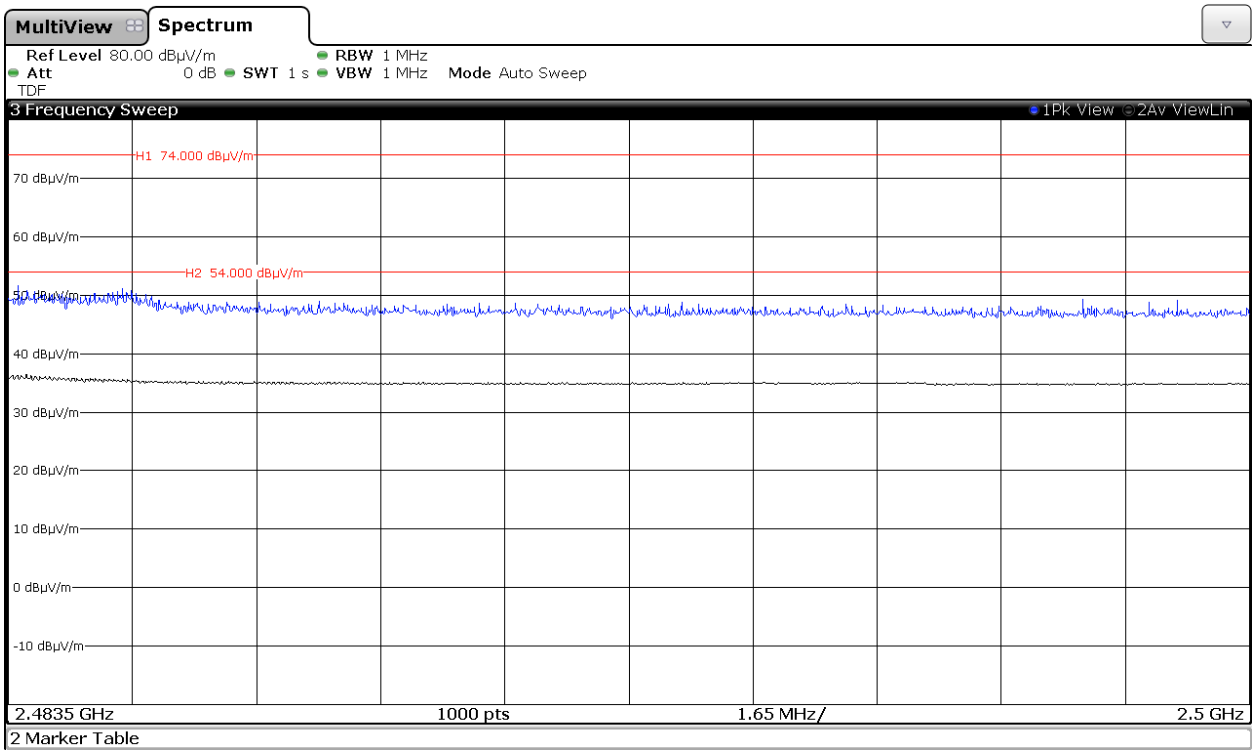
Modulation: GFSK



Modulation: Π/4-DQPSK



Modulation: 8-DPSK



Summary

Considering the results of the performed test according to standard USA FCC Parts 15.247 and 15.209 / Canada RSS-210, the item under test is **IN COMPLIANCE** with the requested specifications specified in the standard.

NOTE: The results presented in this Test Report apply only to the particular item under test established in page 1 of this document, as presented for test on the date(s) shown in section, "USAGE OF SAMPLES, TESTING PERIOD AND ENVIRONMENTAL CONDITIONS".

Remarks and comments

1.- No comments.

List of equipment used during the test

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum analyser Rohde & Schwarz FSW50	2013/10	2015/10

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber IR 11. BS	N.A.	N.A.
2.	Control Chamber IR 12.BC	N.A.	N.A.
3.	Hybrid Bilog antenna Sunol Sciences Corporation JB6	2011/05	2014/05
4.	Antenna mast EM 1072 NMT	N.A.	N.A.
5.	Rotating table EM 1084-4. ON	N.A.	N.A.
6.	Double-ridge Guide Horn antenna 1-18 GHz HP 11966E	2011/05	2014/05
7.	Double-ridge Guide Horn antenna 18-40 GHz Agilent 119665J	2011/09	2014/09
8.	EMI Test Receiver R&S ESPI3	2013/12	2015/12
9.	RF pre-amplifier Miteq JS4-12002600-30-5A.	2012/07	2014/07
10.	Multi Device Controller EMCO 2090	N.A.	N.A.
11.	Spectrum analyser Rohde & Schwarz FSW50	2013/10	2015/10
12.	RF pre-amplifier Schwarzbeck BBV 9718	2014/02	2015/02
13.	RF pre-amplifier Schaffner CPA 9231A.	2013/06	2015/06