DEKRA Testing and Certification, S.A.U.
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ENSAYOS Nº 51/LE147

Test report No:
NIE: 51929RRF.021

Partial Test Report

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

Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz.
Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.
General Requirements and Information for the Certification of Radio Apparatus.

(*) Identification of item tested	Headunit with radio and Bluetooth
(*) Trademark	Panasonic
(*) Model and /or type reference	MIB3E_MQB37w_BT
Other identification of the product	FCC ID: WUQ-MIB3VBT IC: 216R-MIB3VBT PN: 5FA.035.875 HW version: X85 SW version: X645
(*) Features	Bluetooth, FM, AM, DAB, USB.
Applicant	PANASONIC AUTOMOTIVE SYSTEMS EUROPE GMBH Robert Bosch Str. 27-29 – 63225 Langen - Germany
Test method requested, standard	USA FCC Part 15.247 10-1-18 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. -Emission limitations radiated (Transmitter). USA FCC Part 15.209 10-1-18 Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). -Emission limitations radiated (Transmitter). CANADA RSS-Gen Issue 5 (April 2018). 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.

Approved by (name / position & signature)	A. Llamas RF Lab. Manager Firmado digitalmente por ALEJANDRO LLAMAS RODRIGUEZ Fecha: 2019.09.27 08:46:49 +02'00'
Date of issue	2019-09-27
Report template No	FDT08_22 (*) “Data provided by the client”

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Competences and guarantees

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

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

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

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

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

DEKRA Testing and Certification S.A.U. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

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

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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.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

Uncertainty

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

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").

2. The sample consists of an Automotive head unit to be installed in cars with the following features: Bluetooth, FM, AM, DAB, USB.

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 results.

Usage of samples

Samples undergoing test have been selected by: The client.

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

Control Nº	Description	Model	Serial Nº	Date of reception
51929B/543	Head unit with radio and Bluetooth	MIB3E_MQB37w_BT	PM6-00121.02.19413E0003	2019/06/27
51292B/538	Harness	---	---	2019/06/05

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

Test sample description

Ports…… :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient(3)		
			☐	☐	☐		
Rated power supply ……:	Voltage and Frequency	Reference poles					
		L1	L2	L3	N	PE	
	☒ DC: 12 Vdc						
Rated Power ……:							
Clock frequencies ……:							
Other parameters……:							
Software version ……:	X645						
Hardware version……:	X85						
Dimensions in cm (W x H x D)….:							
Mounting position……:	☒ Other: Installed in cars						
Modules/parts ……:	Module/parts of test item	Type	Manufacturer				
Accessories (not part of the test item) ……:	Description	Type	Manufacturer				

Documents as provided by the applicant.....:	Description	File name	Issue date

(3) Only for Medical Equipment

Identification of the client

PANASONIC AUTOMOTIVE SYSTEMS EUROPE GMBH

Robert Bosch Str. 27-29 – 63225 Langen - Germany

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2019-07-18
Date (finish)	2019-07-25

Document history

Report number	Date	Description
51929RRF.021	2019-09-27	First release

Environmental conditions

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: Ignacio Cabra, Miguel Angel Torres and José Gabriel Pendón.

Used instrumentation:

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N.A.	N.A.
2.	EMI Test Receiver ROHDE AND SCHWARZ ESR7	2018/10	2020/10
3.	RF Pre-amplifier 40 dB, 10 MHz-6 GHz BONN ELEKTRONIK BLNA 0160-01N	2019/02	2020/08
4.	Biconical/Log Antenna ETS LINDGREN 3142E	2017/09	2020/09
5.	Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2018/02	2020/02
6.	RF Pre-amplifier 30 dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2019/04	2020/04
7.	RF Pre-amplifier, 30 dB, 18-40GHz BONN ELEKTRONIK BLMA 1840-1M	2019/02	2021/02
8.	Broadband Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2018/01	2021/01
9.	Broadband Horn antenna 18-40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2018/07	2021/07
10.	DC Power Supply Keysight Technologies U8002A	---	---
11.	Digital multimeter FLUKE 179	2019/06	2020/06

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**
Section 15.247 Subclause (a) (1) / RSS-247 5.1. (b)	20 dB Bandwidth and Carrier frequency separation	N/M	(1)
Section 15.247 Subclause (a)(1)(iii) / RSS-247 Clause 5.1 (d)	Number of hopping channels	N/M	(1)
Section 15.247 Subclause (a)(1)(iii) / RSS-247 Clause 5.1 (d)	Time of occupancy (Dwell Time)	N/M	(1)
Section 15.247 Subclause (b) / RSS-247 5.4. (b)	Maximum peak output power and antenna gain	N/M	(1)
Section 15.247 Subclause (d) / RSS-247 5.5.	Conducted Band-edge emissions compliance (Transmitter)	N/M	(1)
Section 15.247 Subclause (d) / RSS-247 5.5	Emission limitations conducted (Transmitter)	N/A	
Section 15.247 Subclause (d) / RSS-247 5.5.	Emission limitations radiated (Transmitter)	P	
Supplementary information and remarks: (1) Test not requested.			

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

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TEST CONDITIONS

POWER SUPPLY (V):

V nonimal: 12 Vdc.

Type of Power Supply: External power supply (Battery).

Type of Antenna: Internal antenna.

Declared Gain for antenna RF (maximum): 1.3 dBi

TEST FREQUENCIES:

Low Channel: 2402 MHz

Middle Channel: 2441 MHz

High Channel: 2480 MHz

RADIATED MEASUREMENTS

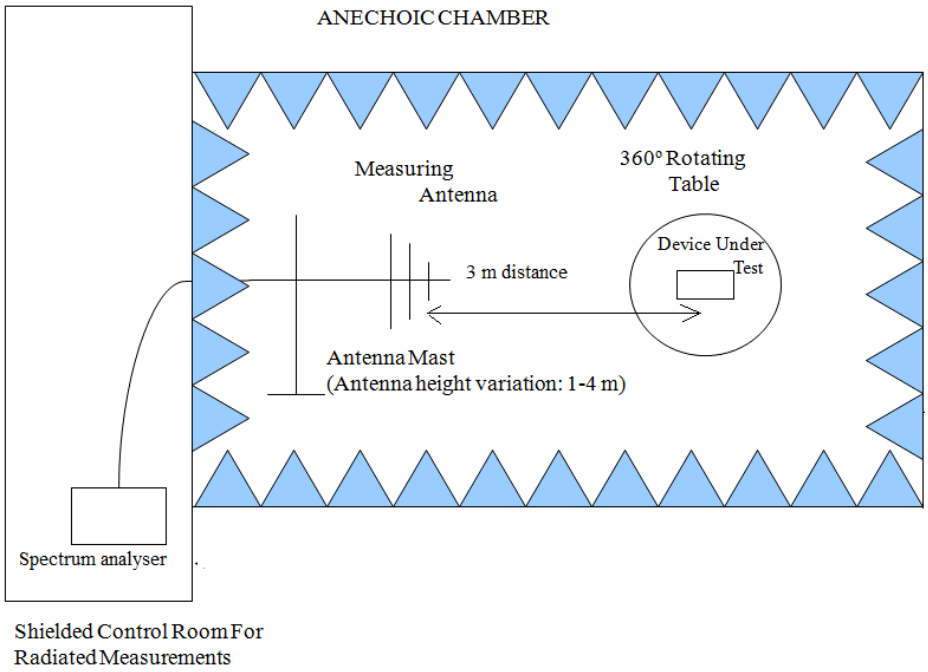
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz) is situated at a distance of 3 m and at a distance of 1m for the frequency range 1 GHz-26 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 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.

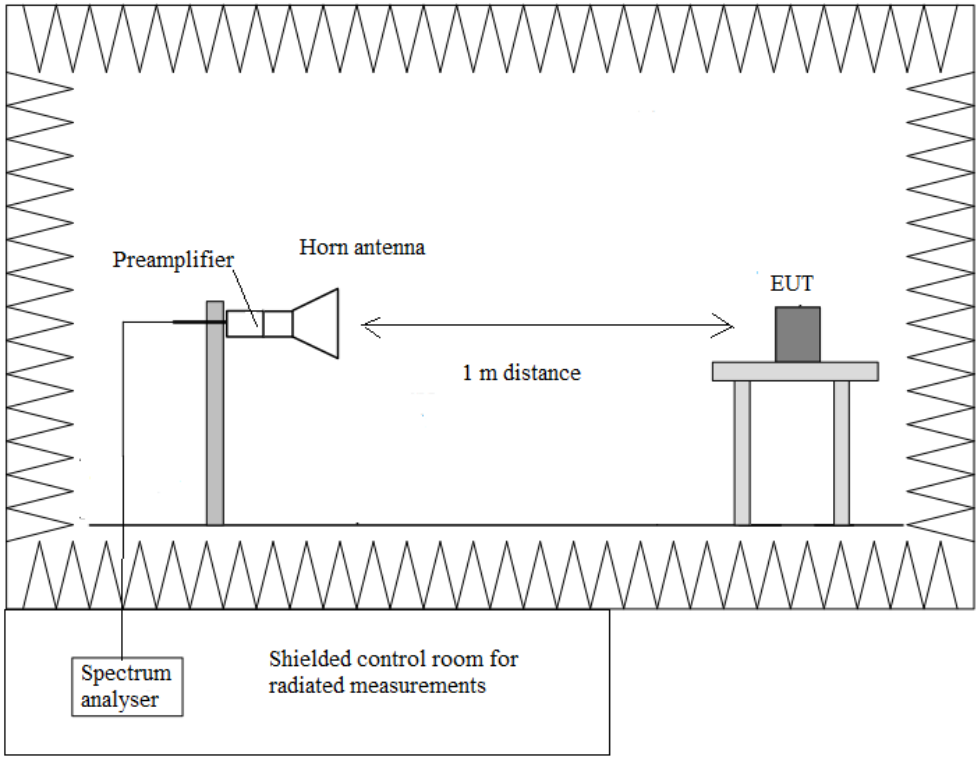
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find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

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

Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup f > 1 GHz:



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

SPECIFICATION:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 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 - 10000	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 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-26 GHz.

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

Frequency range 30 MHz - 1 GHz:

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)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
574.995	Quasi peak	36.7	V	<± 2.07
599.988	Quasi peak	41.4	V	<± 2.07
622.46	Quasi peak	32.6	V	<± 2.07

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

Modulation: GFSK (DH5)

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
2.287967	Peak	55.37	V	<± 4.88
	Average	51.97		<± 4.88
3.08983	Peak	47.30	V	<± 4.88
3.10150	Peak	47.36	H	<± 4.88
4.34703	Peak	51.51	V	<± 4.88
4.35310	Peak	50.80	H	<± 4.88
4.80343	Peak	46.97	V	<± 4.88
4.80437	Peak	42.97	H	<± 4.88
5.61730	Peak	43.78	V	<± 4.88
6.28043	Peak	42.14	H	<± 4.88
7.20583	Peak	48.26	V	<± 4.88

2. CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
1.86730	Peak	56.77	H	<± 4.88
	Average	37.51		<± 4.88
2.09463	Peak	57.57	V	<± 4.88
	Average	53.32		<± 4.88
3.09030	Peak	50.80	V	<± 4.88
4.33863	Peak	50.40	V	<± 4.88
4.87997	Peak	49.07	H	<± 4.88
6.2837	Peak	41.86	V	<± 4.88
7.31923	Peak	49.55	H	<± 4.88

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
1.86030	Peak	57.61	H	<± 4.88
	Average	39.18		<± 4.88
2.187167	Peak	54.63	V	<± 4.88
	Average	50.74		<± 4.88
3.10477	Peak	48.89	H	<± 4.88
4.34423	Peak	51.36	V	<± 4.88
4.95977	Peak	46.22	H	<± 4.88
7.44057	Peak	45.53		<± 4.88

Verdict: PASS

Modulation Π/4-DQPSK (2DH5)

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
2.28810	Peak	55.13	V	<± 4.88
	Average	51.34		<± 4.88
3.10757	Peak	47.35	V	<± 4.88
4.36477	Peak	50.02	H	<± 4.88
4.57570	Peak	45.15	H	<± 4.88
4.80390	Peak	44.47	H	<± 4.88

2. CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
1.87097	Peak	58.04	H	<± 4.88
	Average	37.45		<± 4.88
2.24443	Peak	56.50	V	<± 4.88
	Average	53.88		<± 4.88
3.10057	Peak	53.89	V	<± 4.88
4.33490	Peak	51.57	H	<± 4.88
4.87950	Peak	50.48	H	<± 4.88
7.31923	Peak	51.41	H	<± 4.88

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
1.86717	Peak	58.00	H	<± 4.88
	Average	38.54		<± 4.88
2.07343	Peak	57.05	V	<± 4.88
	Average	53.95		<± 4.88
3.10710	Peak	49.30	H	<± 4.88
4.34003	Peak	50.44	V	<± 4.88
4.96023	Peak	46.62	H	<± 4.88
6.22023	Peak	42.68	H	<± 4.88

Verdict: PASS

Modulation: 8-DPSK (3DH5)

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
2.13463	Peak	57.01	V	<± 4.88
	Average	53.45		<± 4.88
3.10897	Peak	46.80	V	<± 4.88
3.50423	Peak	39.97	V	<± 4.88
4.35217	Peak	51.23	V	<± 4.88
4.73623	Peak	46.16	H	<± 4.88

2. CHANNEL: MIDDLE (2441 MHz).

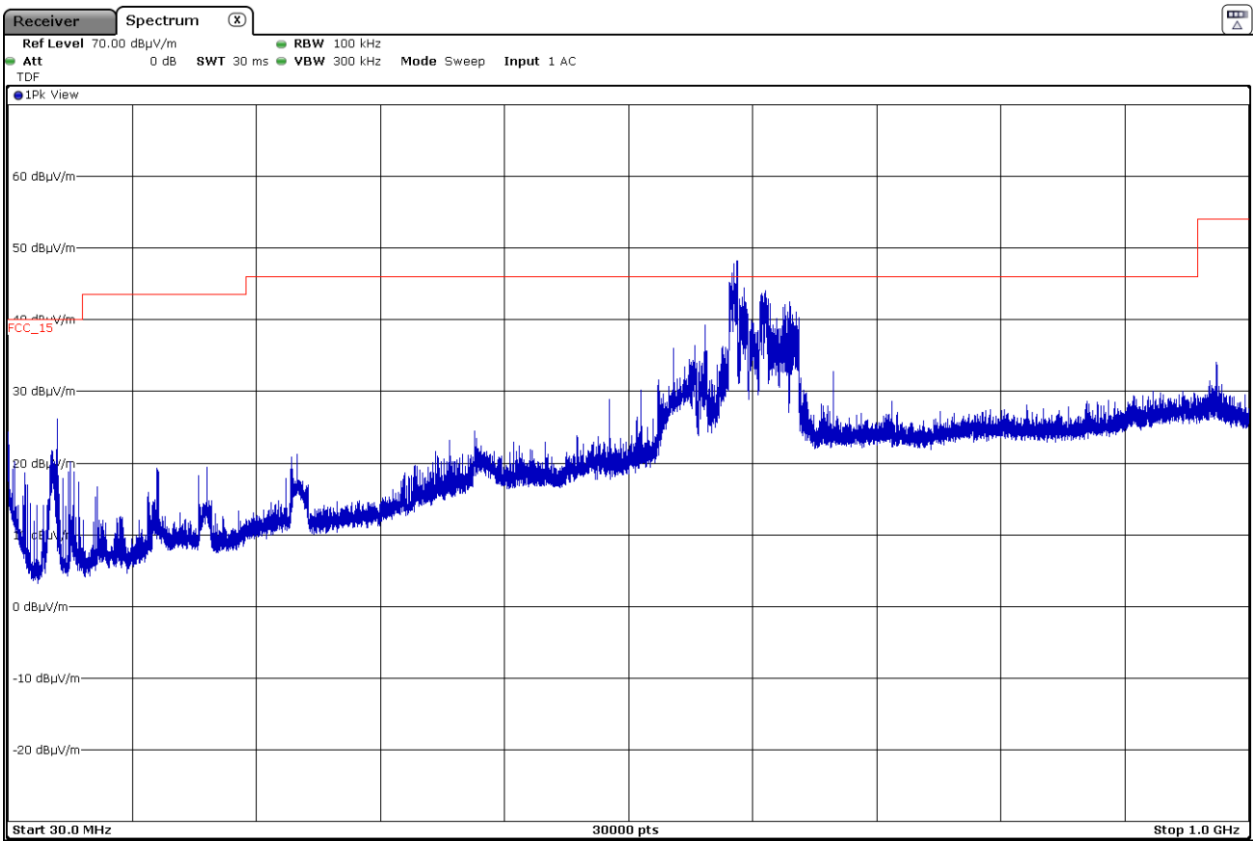
Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
1.86977	Peak	55.51	V	<± 4.88
	Average	38.12		<± 4.88
2.19517	Peak	56.77	V	<± 4.88
	Average	53.91		<± 4.88
3.09917	Peak	50.12	V	<± 4.88
3.50423	Peak	39.40	V	<± 4.88
4.33723	Peak	51.69	V	<± 4.88

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
1.85397	Peak	58.47	H	<± 4.88
	Average	40.56		<± 4.88
2.06950	Peak	56.83	V	<± 4.88
	Average	53.81		<± 4.88
3.11970	Peak	49.00	V	<± 4.88
3.50470	Peak	38.83	V	<± 4.88
4.36897	Peak	50.97	V	<± 4.88

Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz:

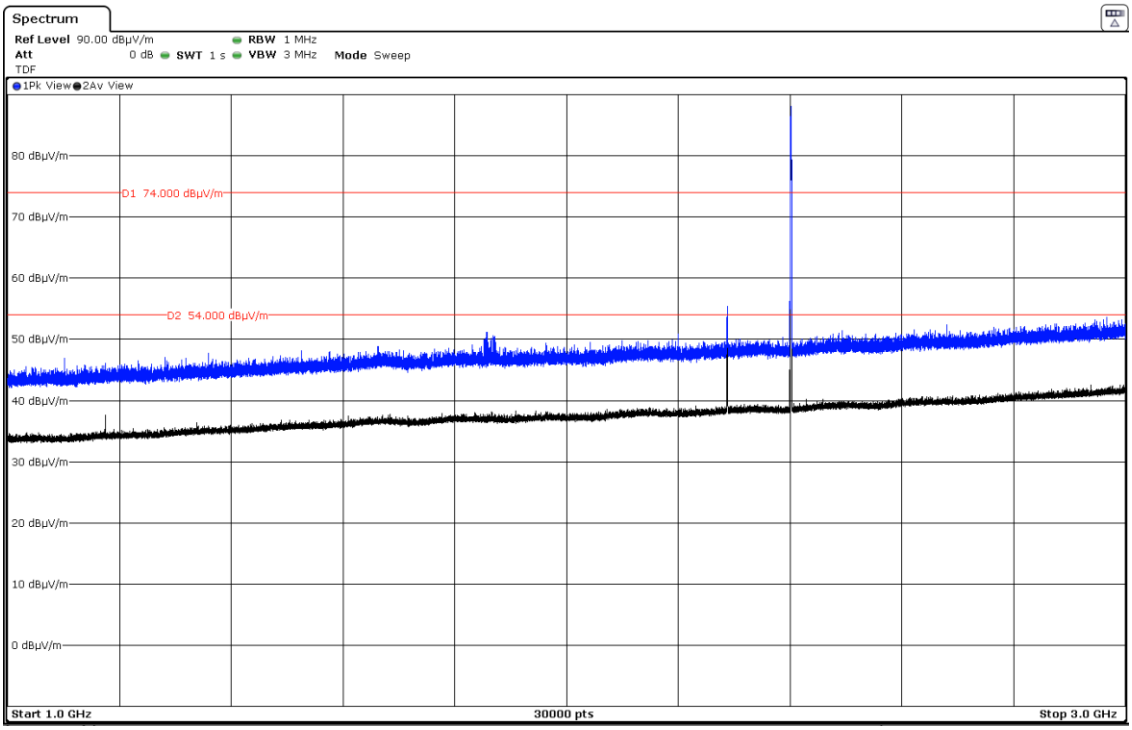


(This plot is valid for all three channels and all modulation modes).

FREQUENCY RANGE 1 - 3 GHz:

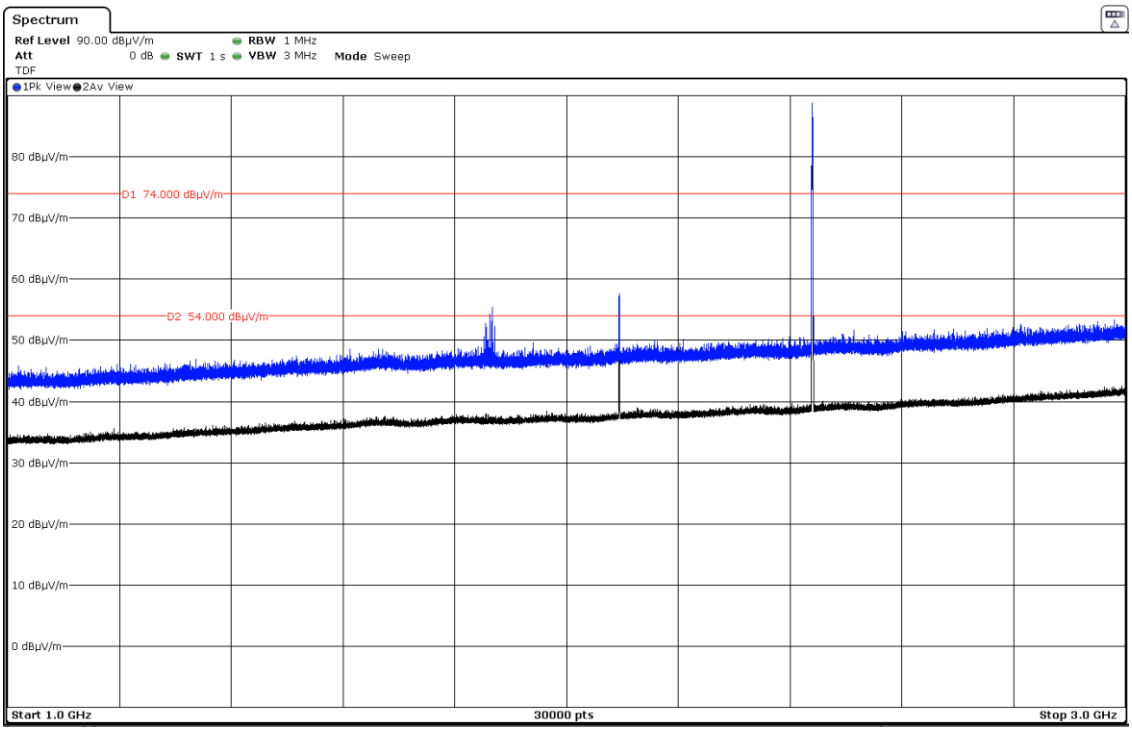
Modulation: GFSK (DH5)

CHANNEL: Lowest (2402 MHz)



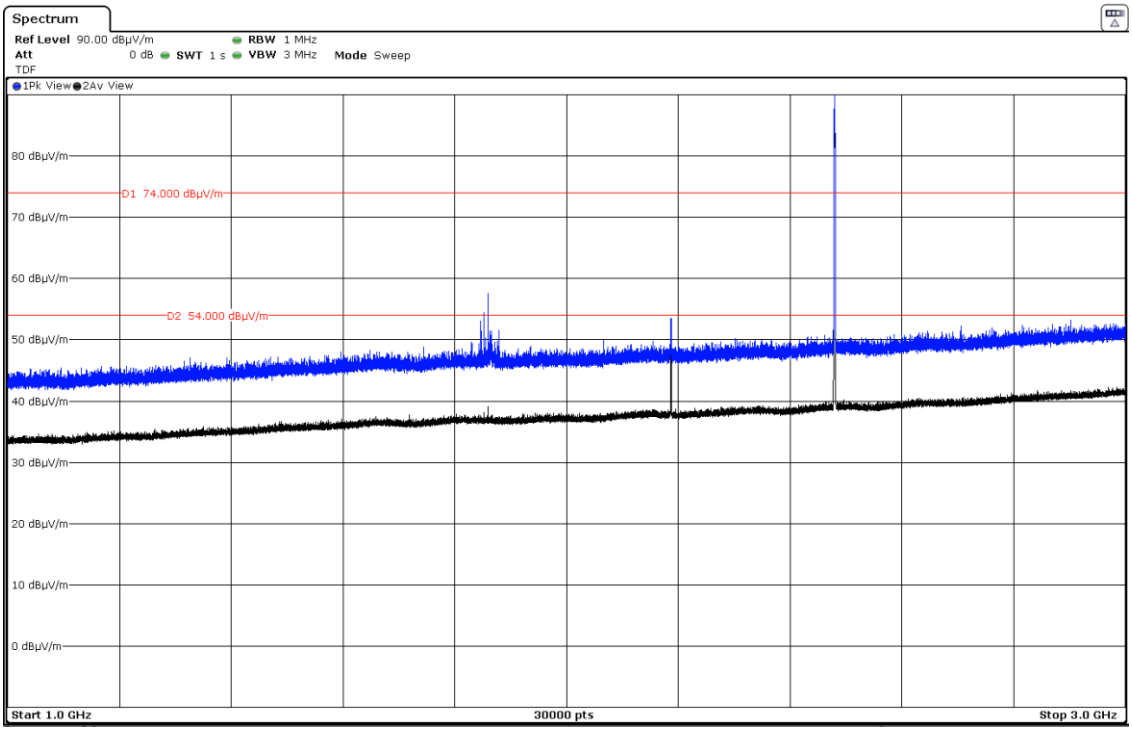
The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz)



The peak above the limit is the carrier frequency.

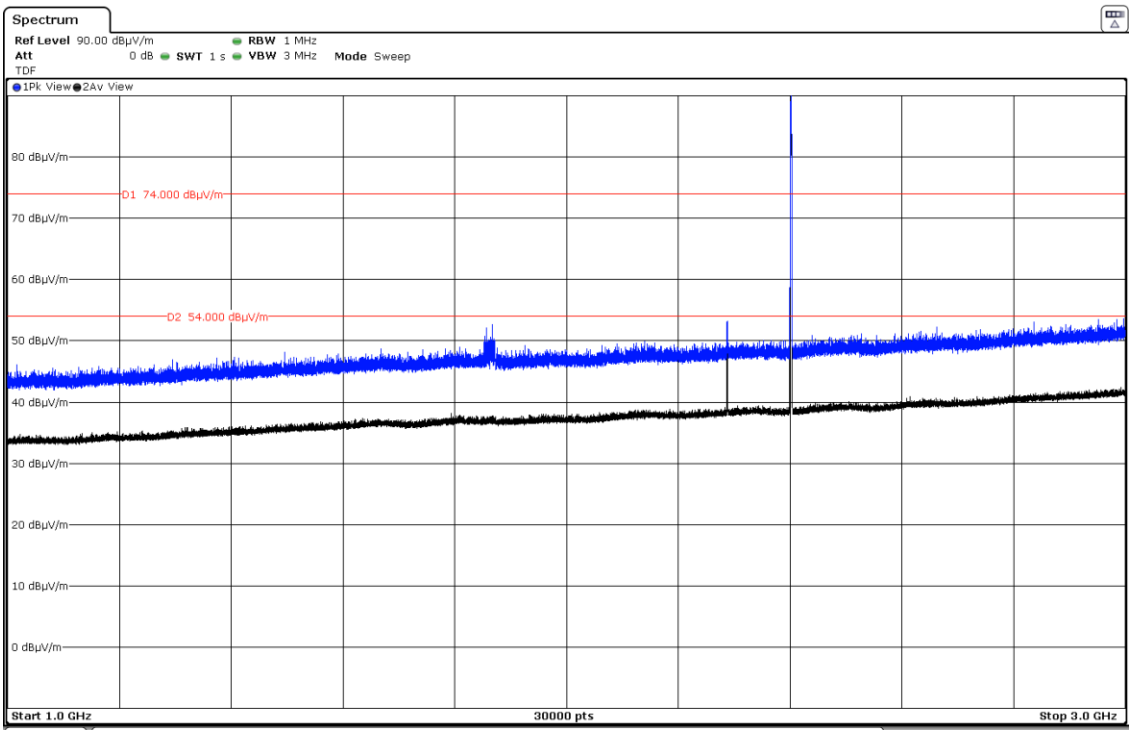
CHANNEL: Highest (2480 MHz)



The peak above the limit is the carrier frequency.

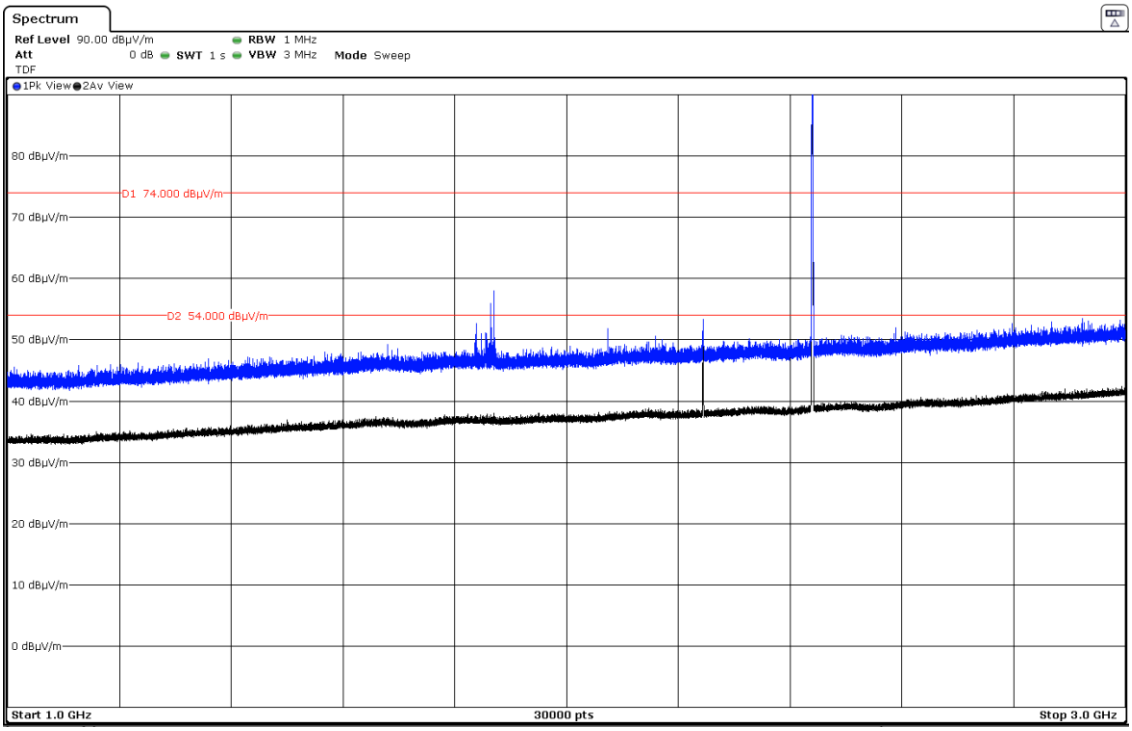
Modulation: Π/4-DQPSK (2DH5)

CHANNEL: Lowest (2402 MHz)



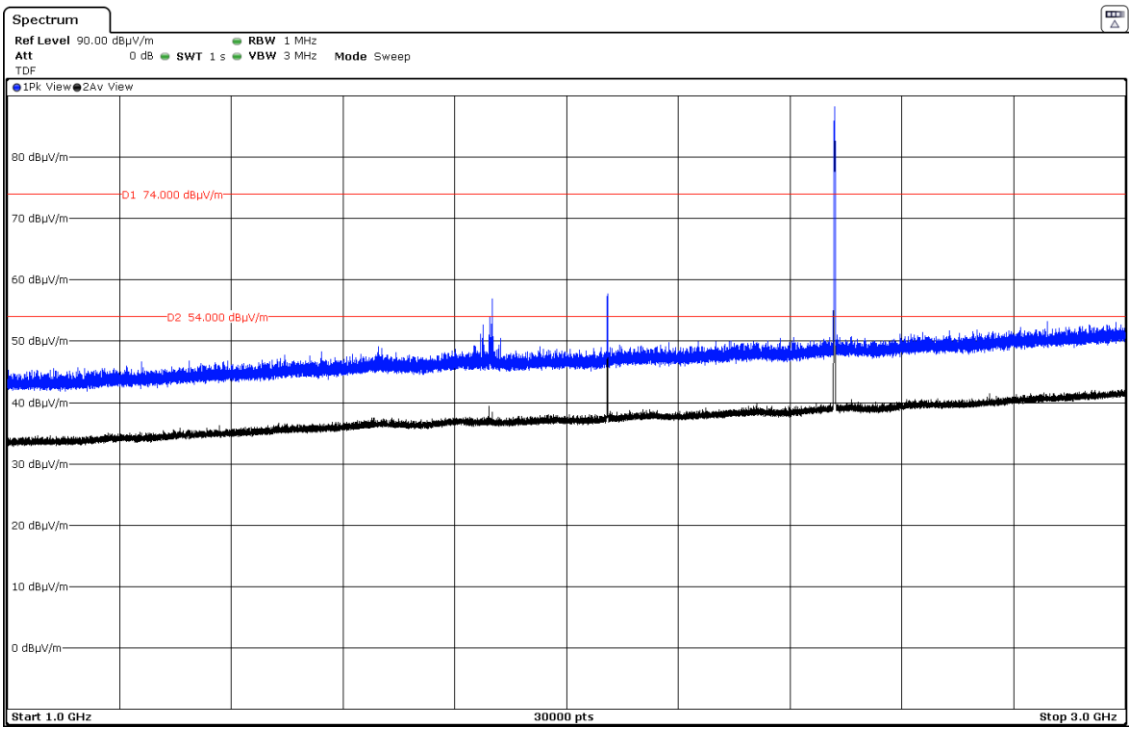
The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz)



The peak above the limit is the carrier frequency.

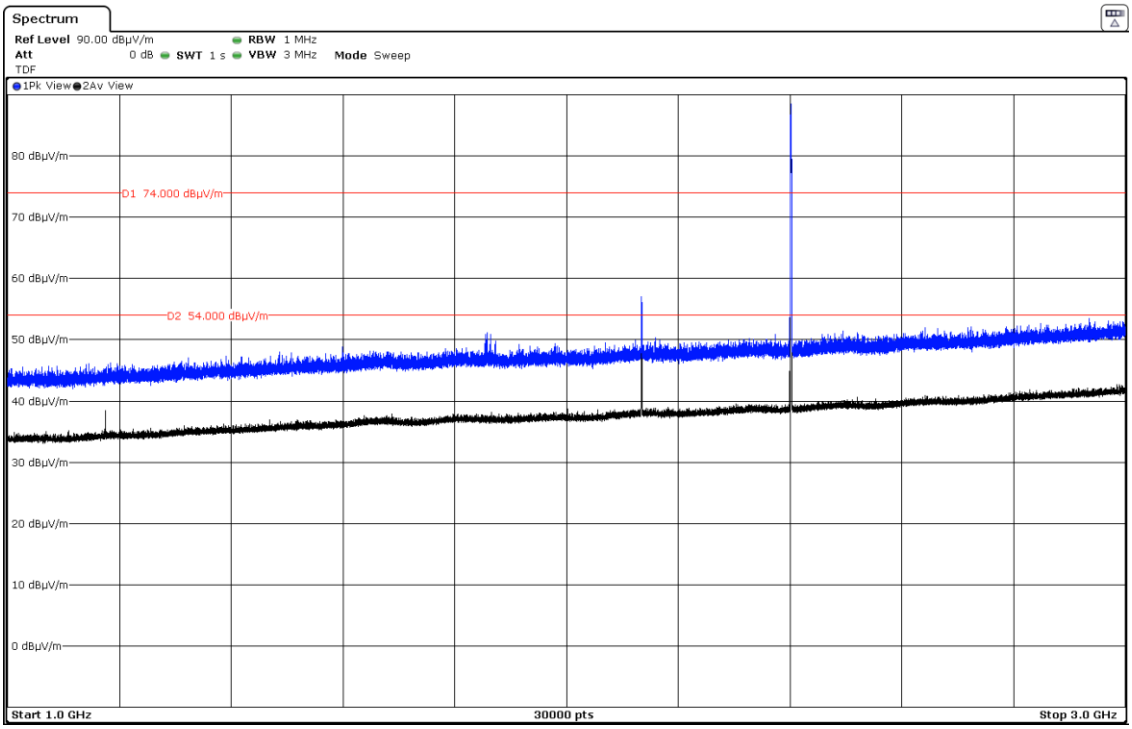
CHANNEL: Highest (2480 MHz)



The peak above the limit is the carrier frequency.

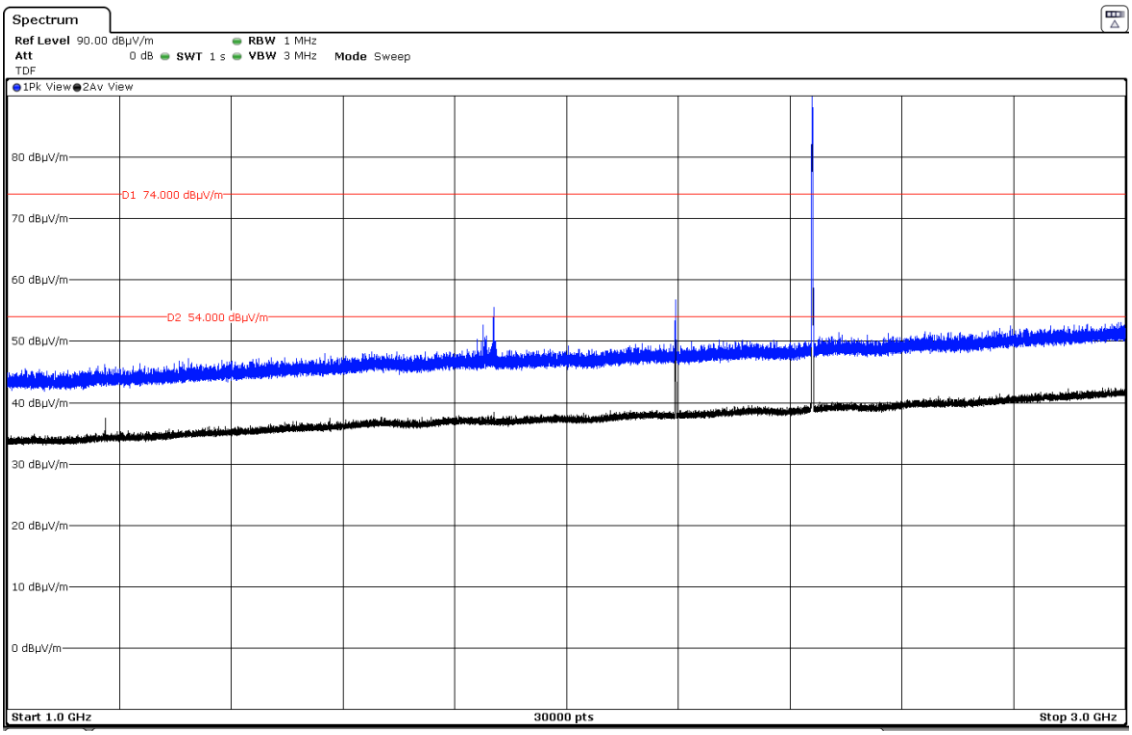
Modulation: 8-DPSK (3DH5)

CHANNEL: Lowest (2402 MHz)



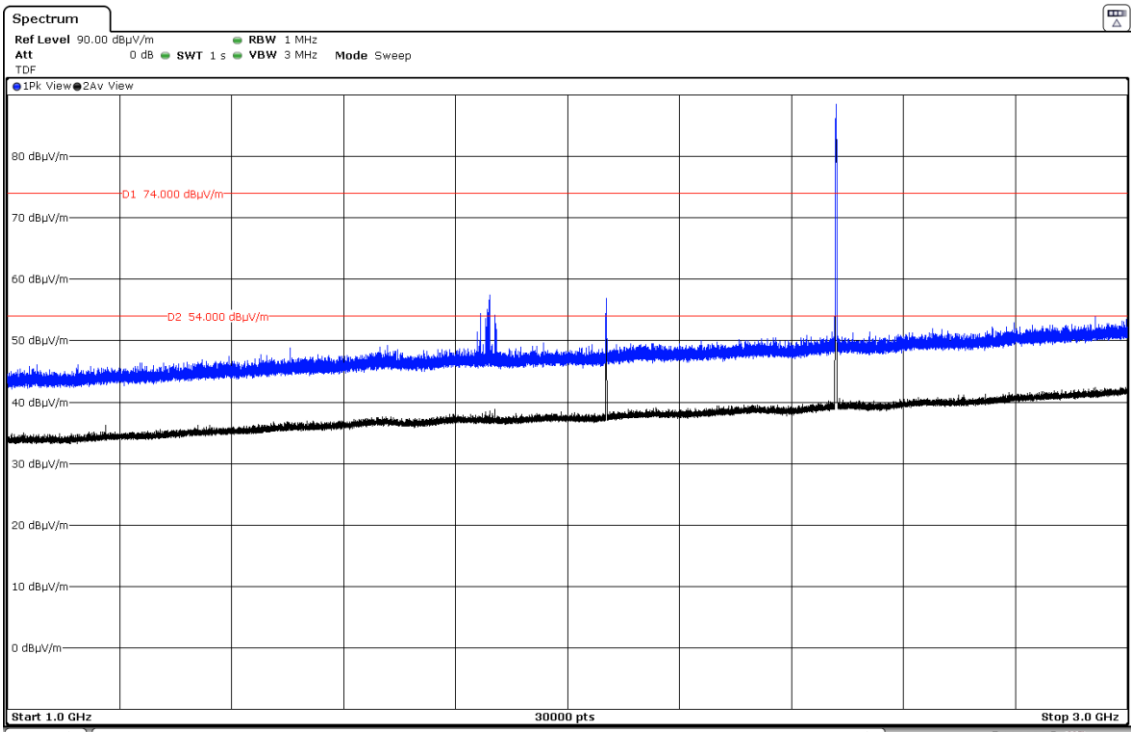
The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz)



The peak above the limit is the carrier frequency.

CHANNEL: Highest (2480 MHz)

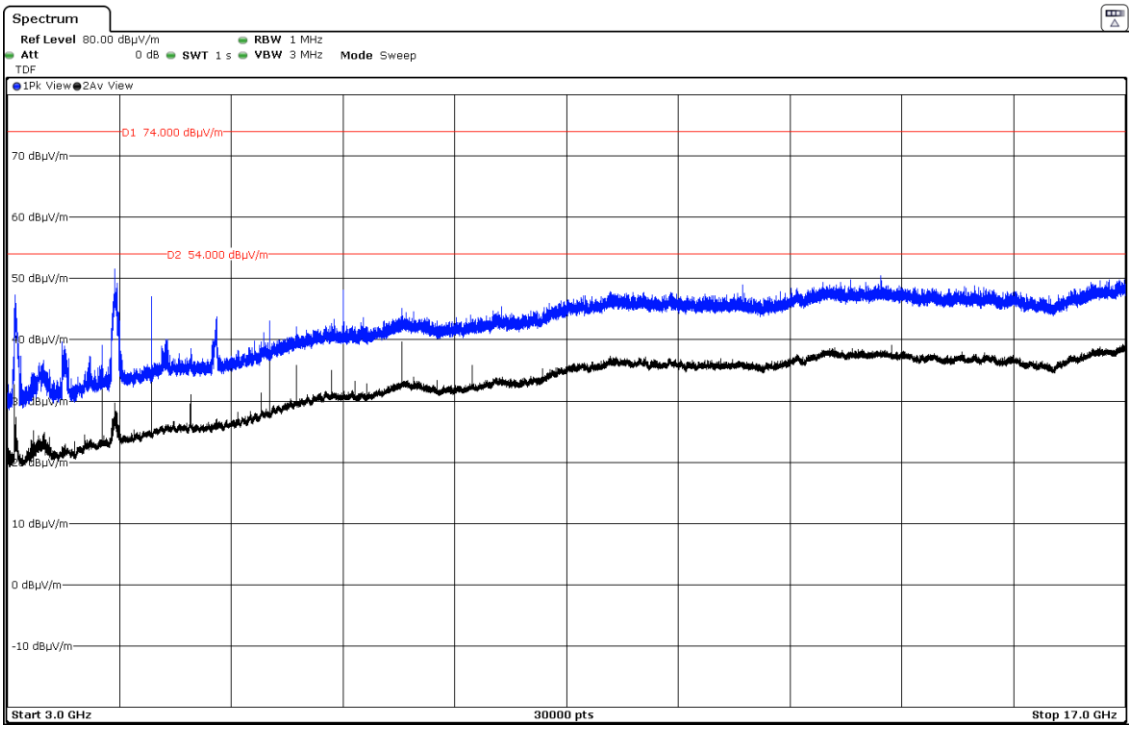


The peak above the limit is the carrier frequency.

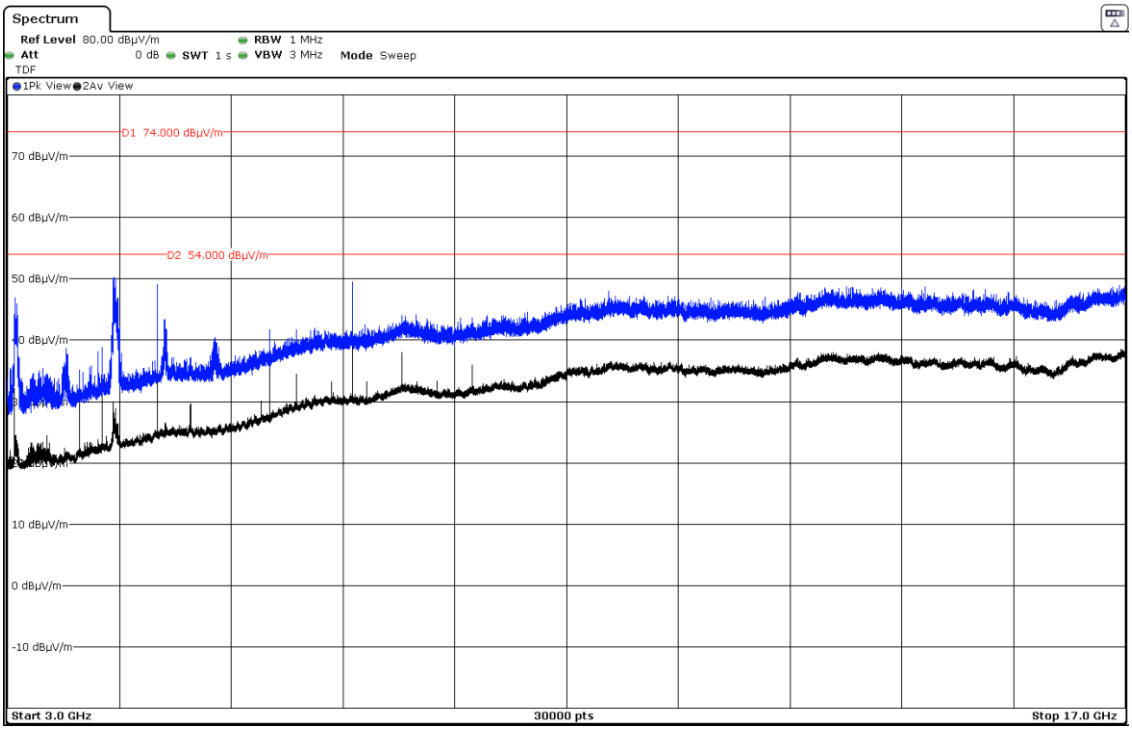
FREQUENCY RANGE 3 - 17 GHz:

Modulation: GFSK (DH5)

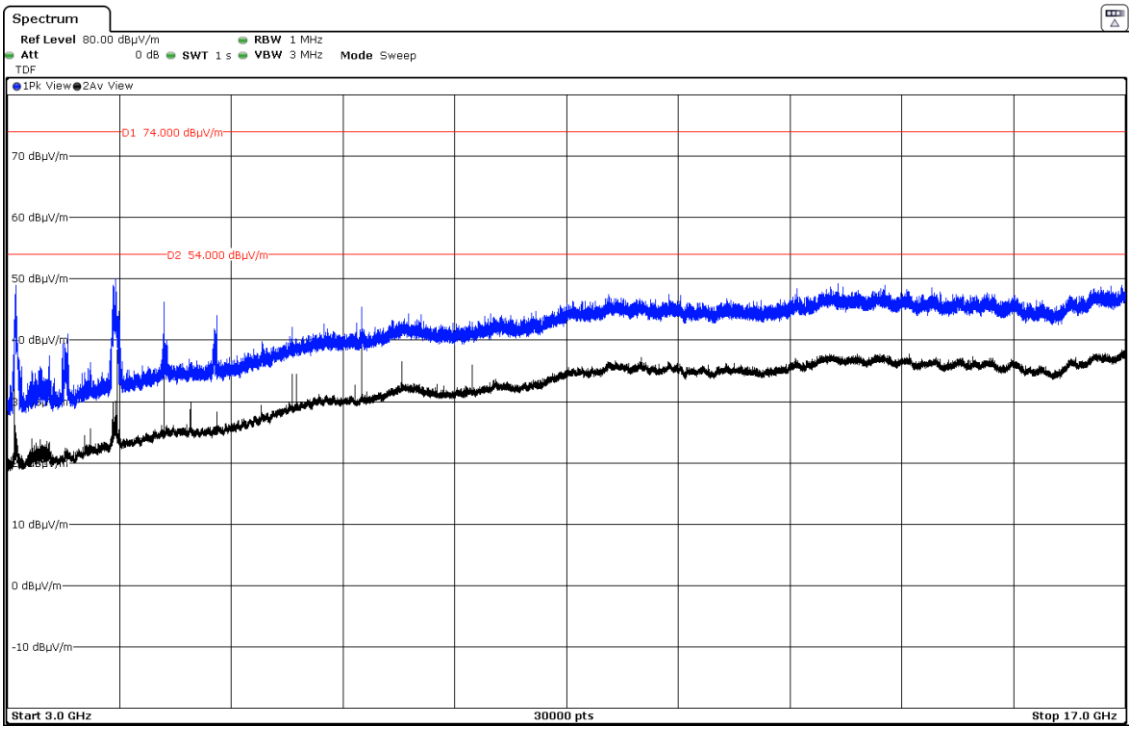
CHANNEL: Lowest (2402 MHz)



CHANNEL: Middle (2441 MHz)

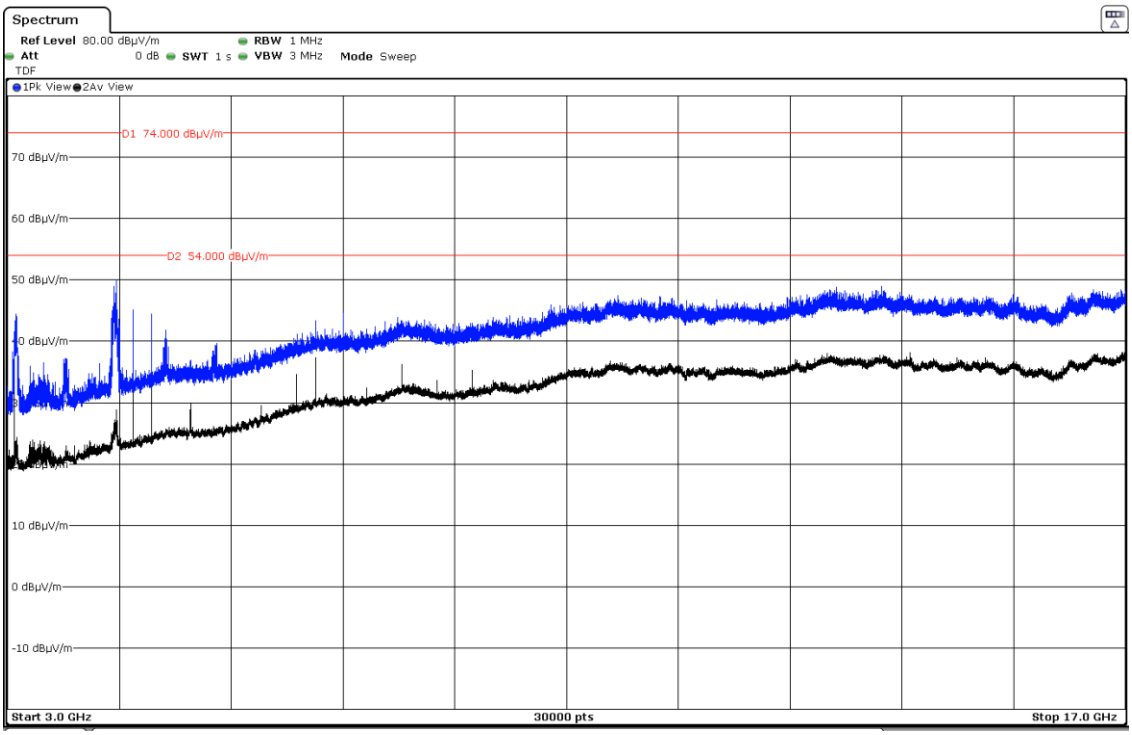


CHANNEL: Highest (2480 MHz)

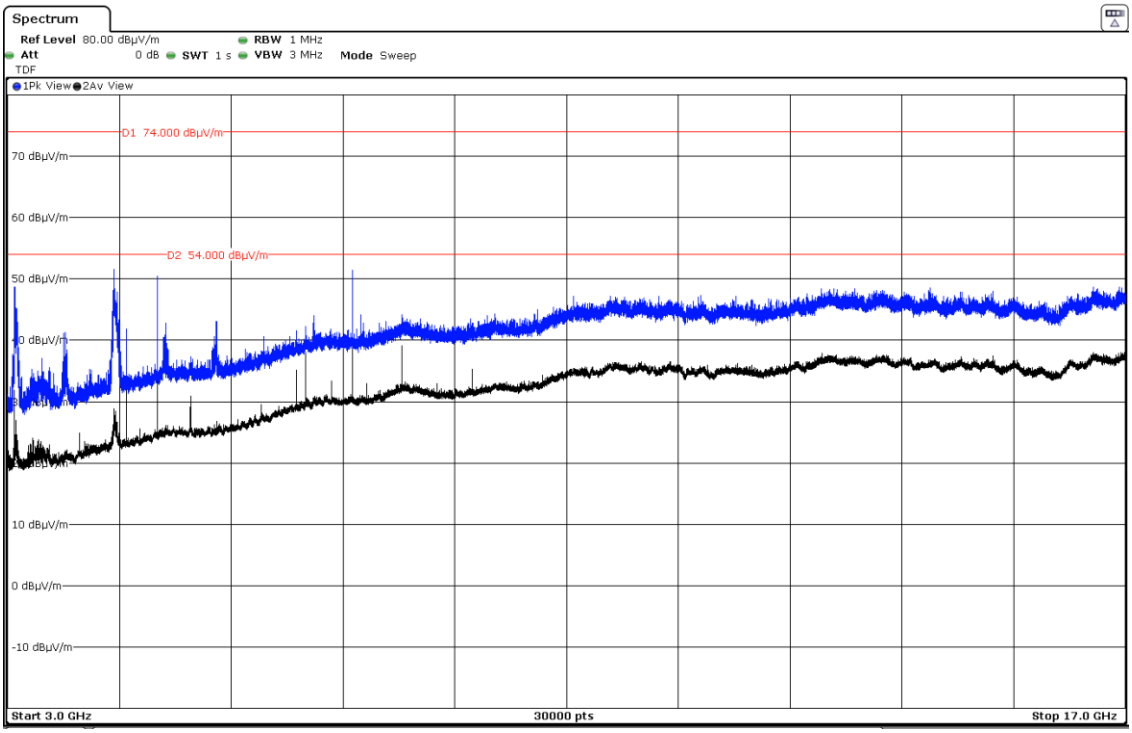


Modulation: Π/4-DQPSK (2DH5)

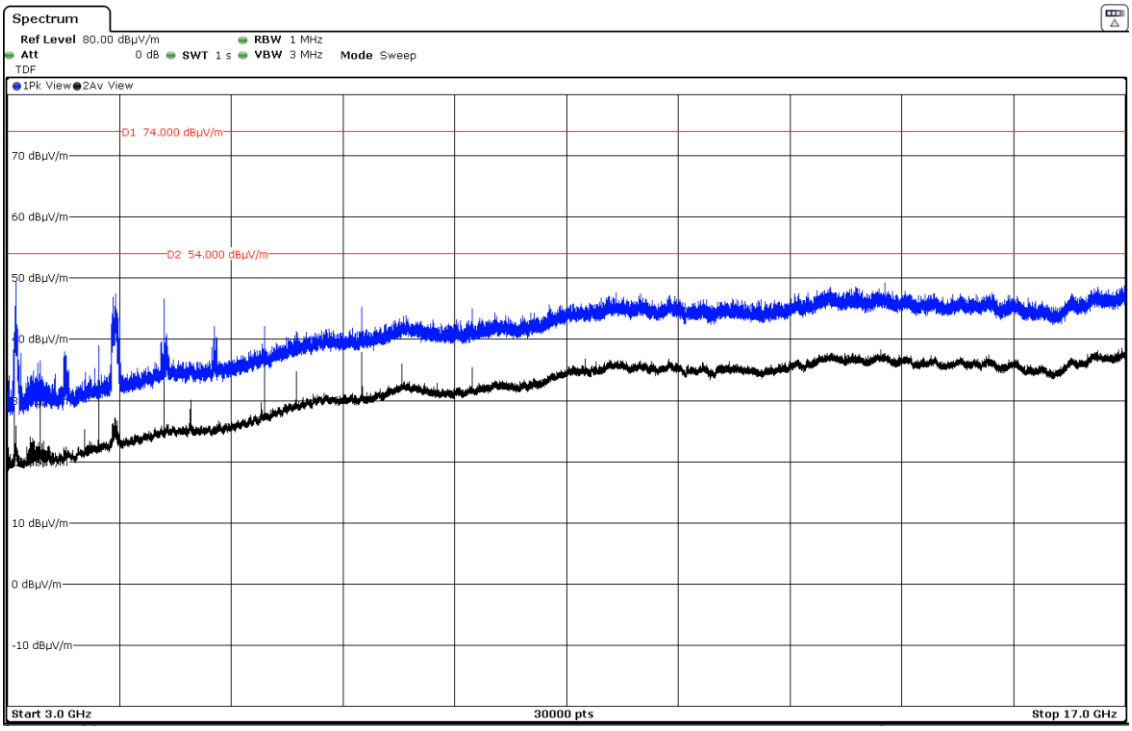
CHANNEL: Lowest (2402 MHz)



CHANNEL: Middle (2441 MHz)

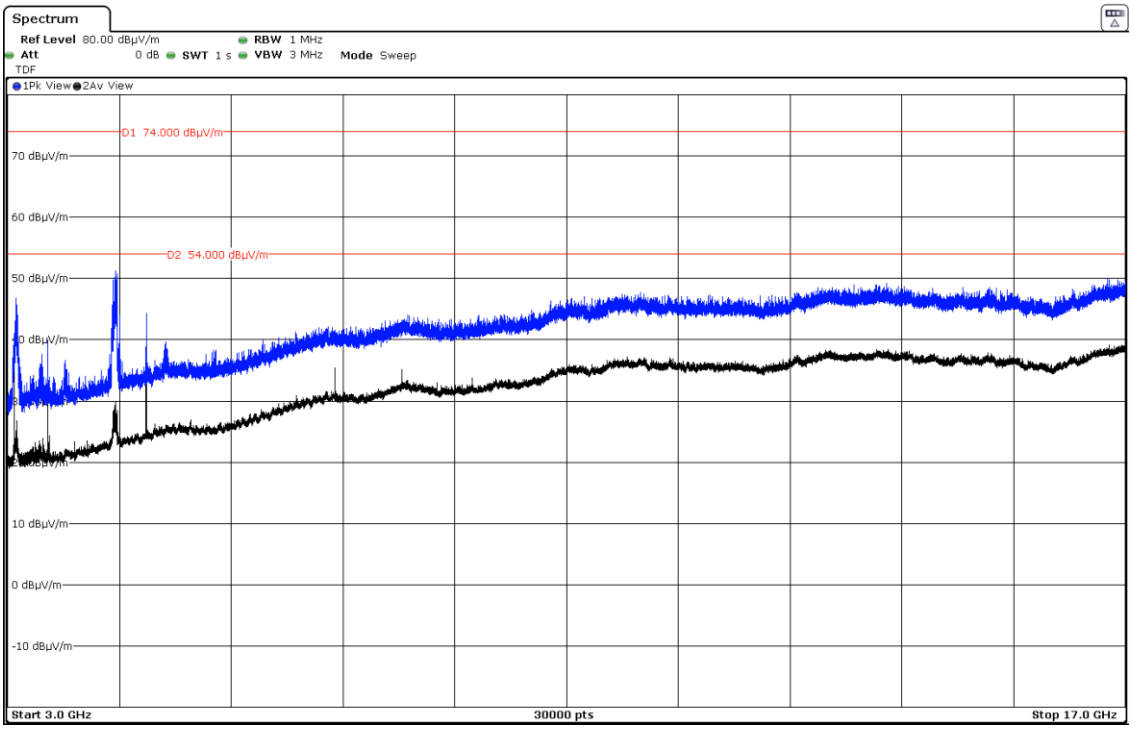


CHANNEL: Highest (2480 MHz)

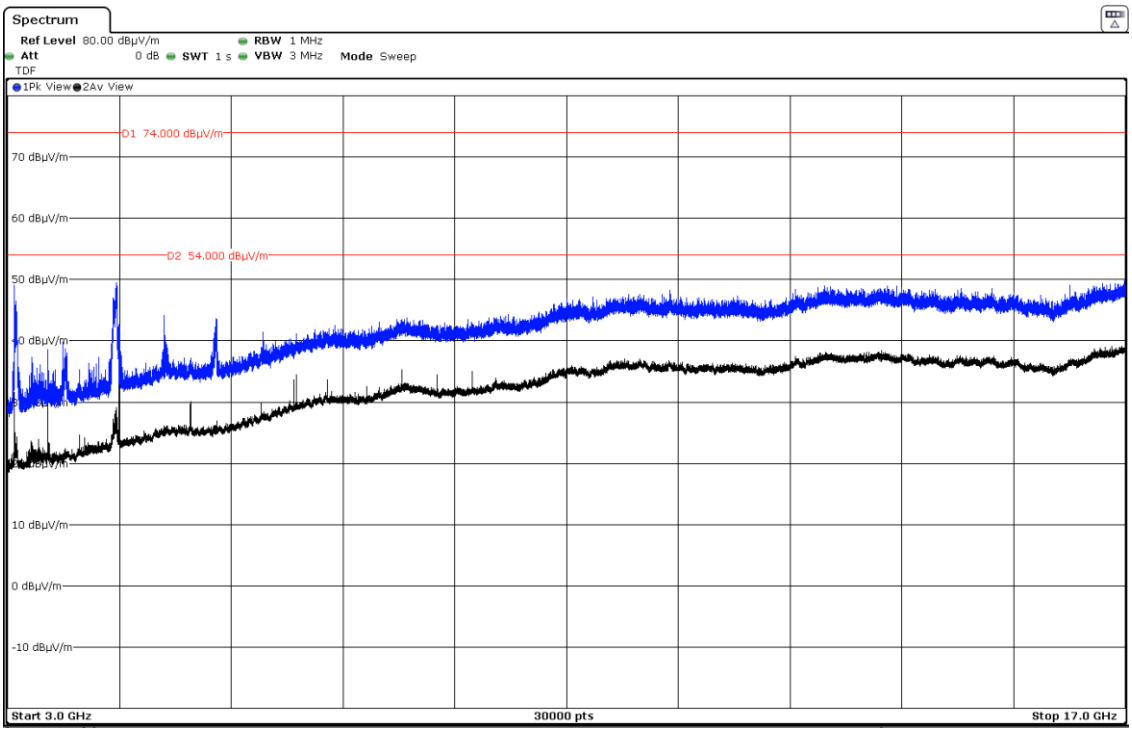


Modulation: 8-DPSK (3DH5)

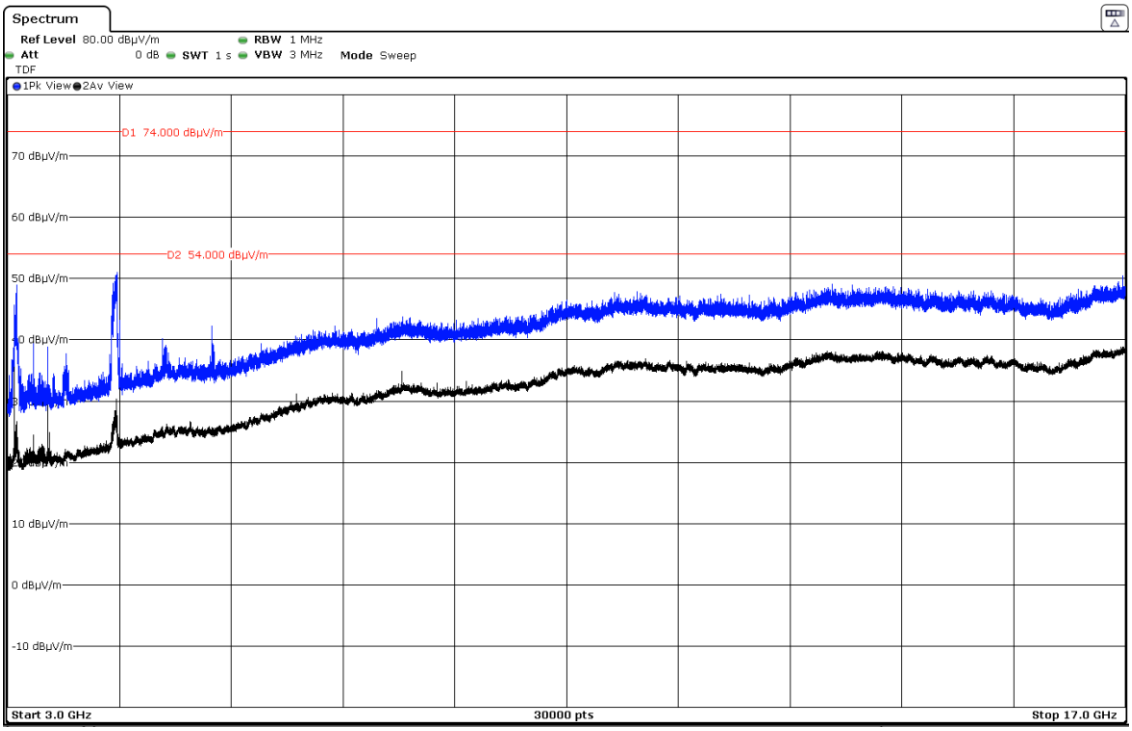
CHANNEL: Lowest (2402 MHz)



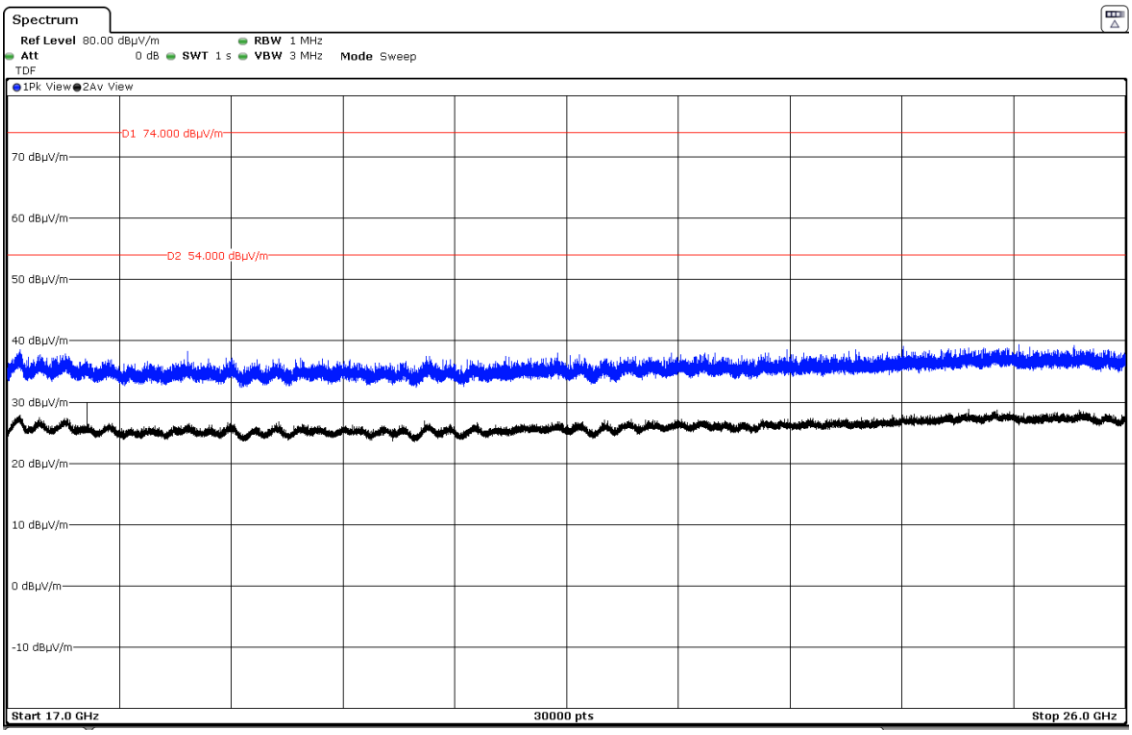
CHANNEL: Middle (2441 MHz)



CHANNEL: Highest (2480 MHz)



FREQUENCY RANGE 17 - 26 GHz:

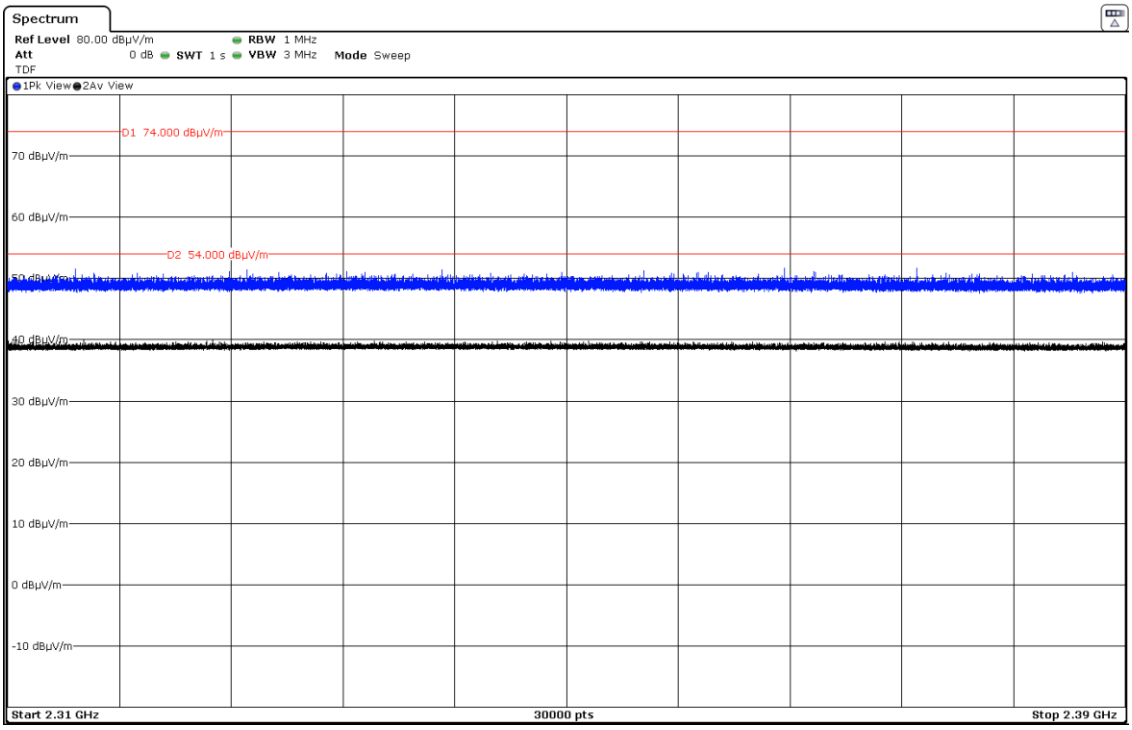


(This plot is valid for all three channels and all modulation modes).

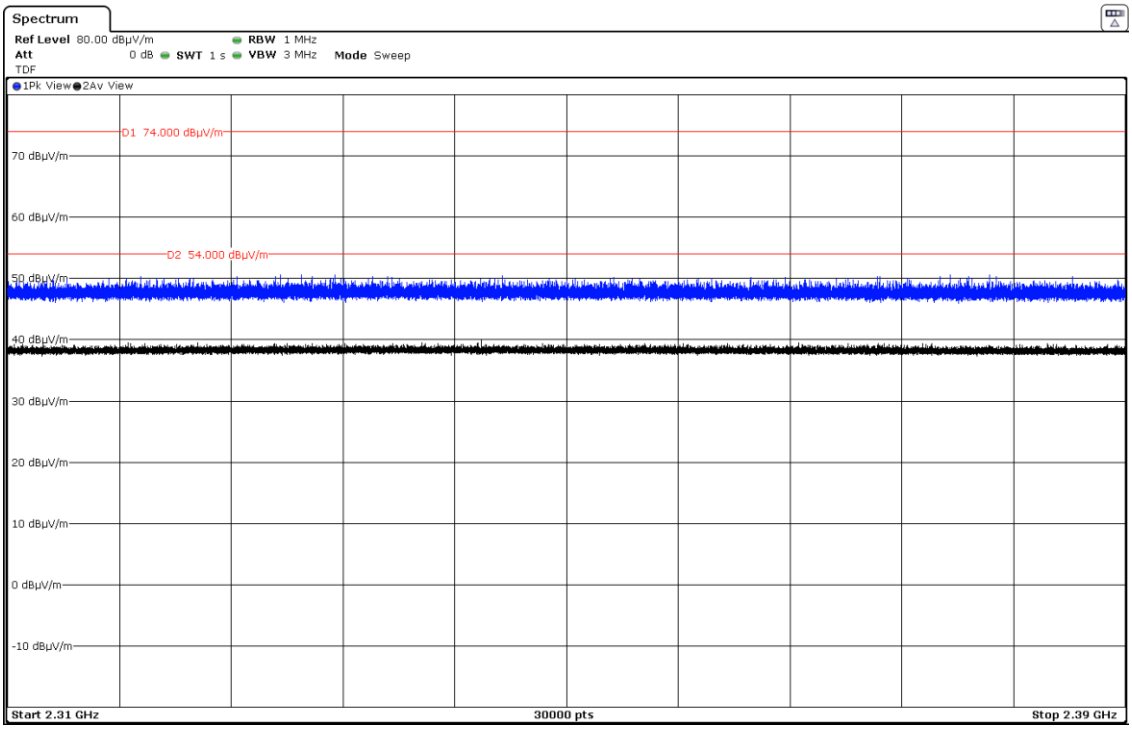
FREQUENCY RANGE 2.31-2.39 GHz (Restricted Band 1):

CHANNEL: Lowest (2402 MHz)

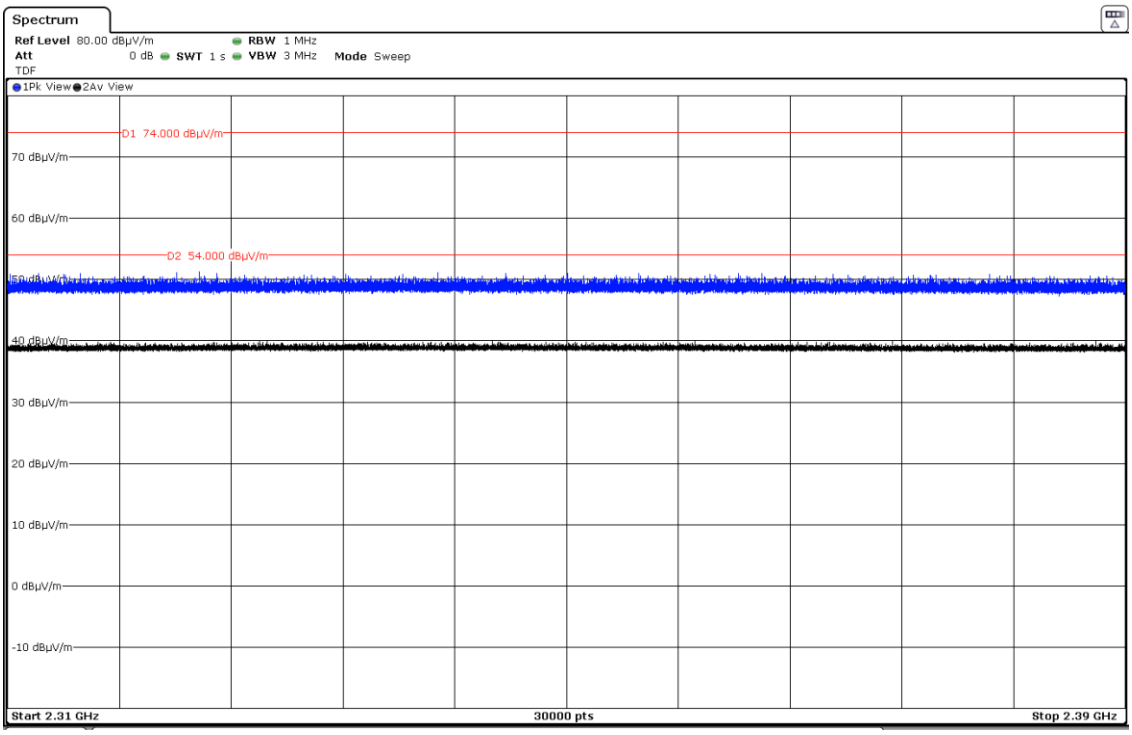
Modulation: GFSK (DH5)



Modulation: Π/4-DQPSK (2DH5)



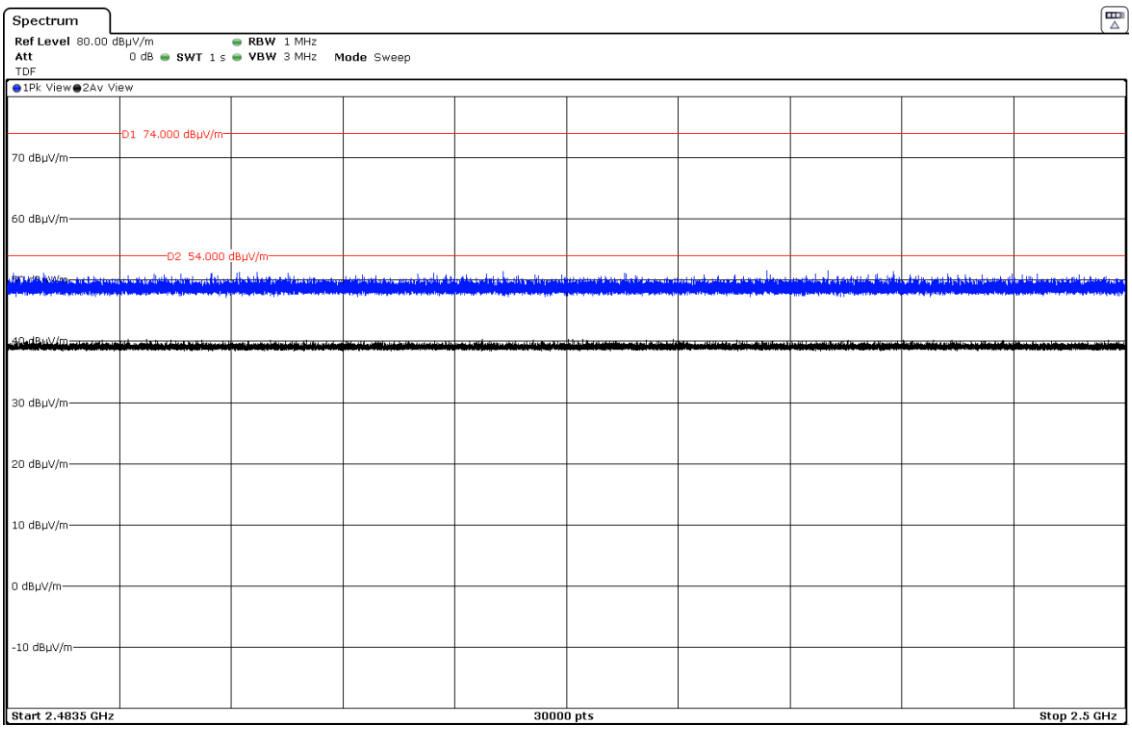
Modulation: 8-DPSK (3DH5)



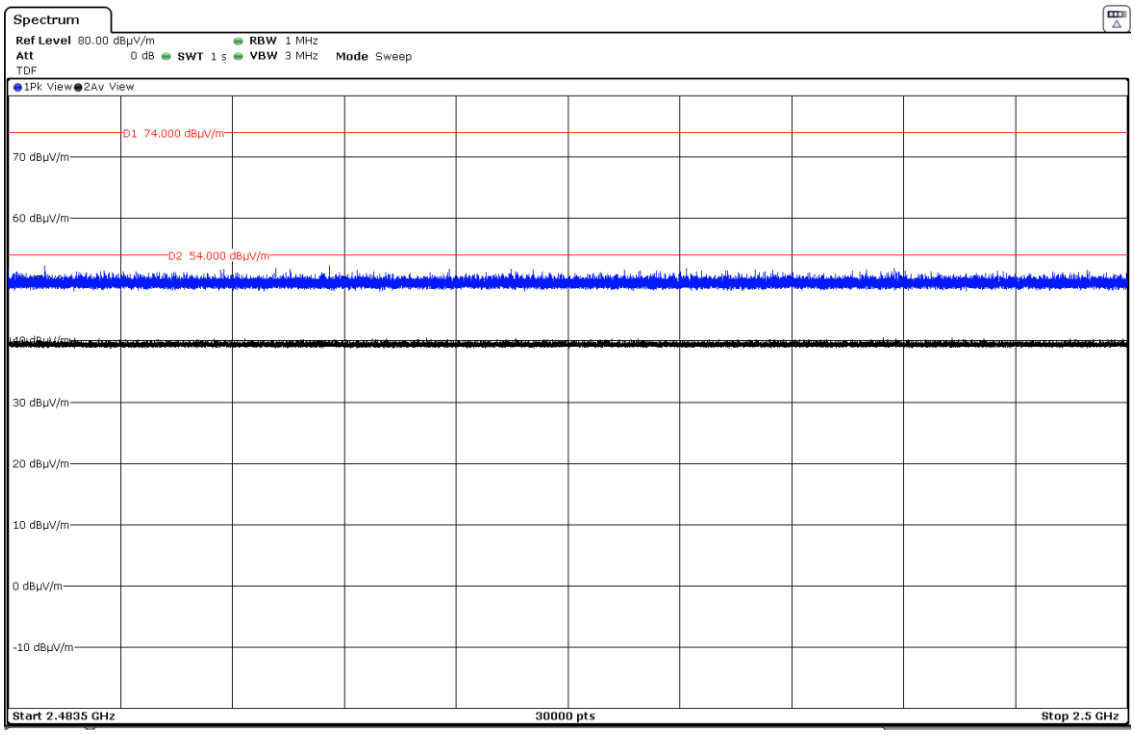
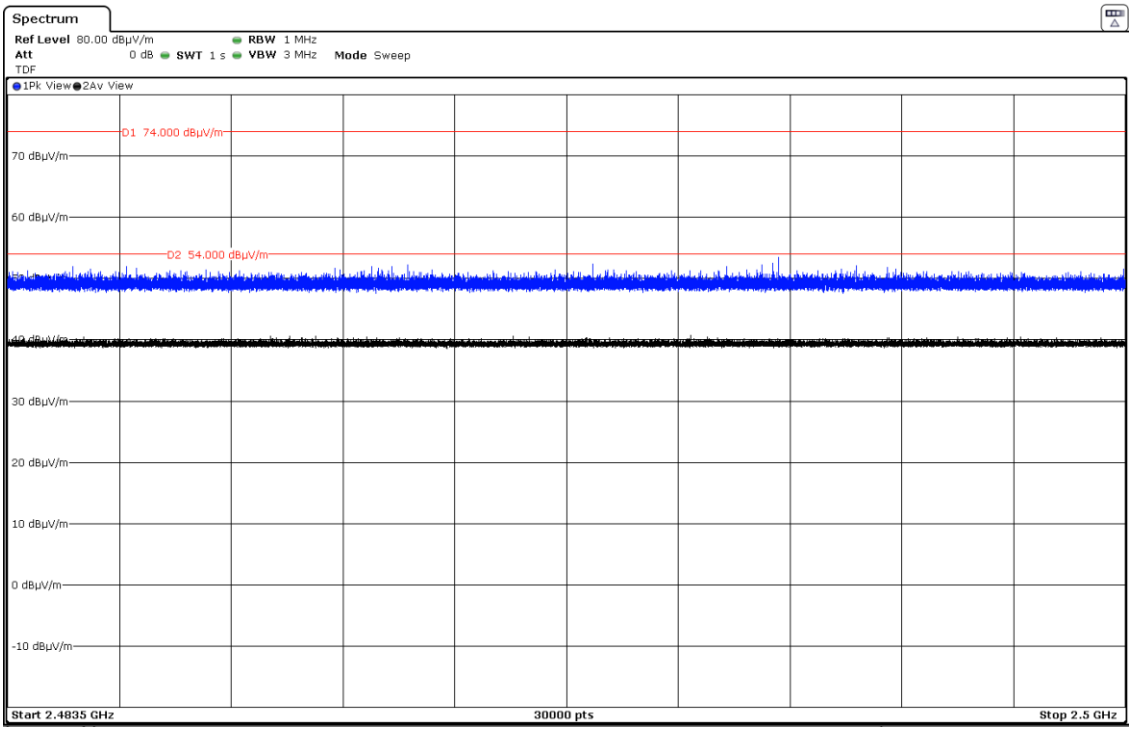
FREQUENCY RANGE 2.4835-2.5 GHz (Restricted Band 2):

CHANNEL: Highest (2480 MHz)

Modulation: GFSK (DH5)



Modulation: Π/4-DQPSK (2DH5)



Modulation: 8-DPSK (3DH5)