ENAC ENSAYOS Nº 51/LE147

FCC LISTED,
REGISTRATION NUMBER:
720267

Informe de ensayo nº:
Test report No:

NIE: 53101RRF.003A1

Test report (Modification 1)

USA FCC Part 15.247, 15.209

Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz.
Radiated emission limits; general requirements.

Identificación del objeto ensayado.....: Identification of item tested	Digital Handheld Terminal
Marca .....: Trade	PowerTrunk
Modelo y/o referencia tipo .....: Model and /or type reference	HTT-500-2
Other identification of the product .....:	FCC ID: WT7PTHTT500760D
HW version .....:	B model
SW version .....:	173402509091
Características .....: Features	---
Fabricante .....: Manufacturer	TELTRONIC, S.A.U. Polígono Malpica, Calle C/F-Oeste (50016). Zaragoza (SPAIN).
Método de ensayo solicitado, norma.....: Test method requested, standard	USA FCC Part 15.247 10-1-15 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 10-1-15 Edition: Radiated emission limits; general requirements. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Resultado.....: Summary	IN COMPLIANCE
Aprobado por (nombre / cargo y firma) .....: Approved by (name / position & signature)	R. López EMC Lab. Manager RAFAEL LÓPEZ MARTÍN Firmado digitalmente por RAFAEL LÓPEZ MARTÍN Fecha: 2017.05.24 10:55:48 +02'00'
Fecha de realización .....: Date of issue	2017-05-23
Formato de informe No. .....: Report template No	FDT11_19

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Competences and guarantees

DEKRA Testing and Certification 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 laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

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

DEKRA Testing and Certification 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 at the time of performance of the test.

DEKRA Testing and Certification 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.
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 and the Accreditation Bodies.

Uncertainty

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

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
52844B/013	Portable terminal	HTT-500-2	1PR001632GKC183 (NYPB-48)	2017-03-09
52844B/027	Antenna λ/4	300-00498	---	2017-03-09
52844B/022	Remote speaker microphone	300-00733	---	2017-03-09
52844B/032	Earpiece	300-00564	---	2017-03-09

1. Sample S/01 has undergone the test(s).

   All radiated tests indicated in appendix A.

Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
52844B/013	Portable terminal	HTT-500-2	1PR001632GKC183 (NYPB-48)	2017-03-09
52844B/026	Antenna λ/2	300-01938	---	2017-03-09
52844B/022	Remote speaker microphone	300-00733	---	2017-03-09
52844B/032	Earpiece	300-00564	---	2017-03-09

1. Sample S/02 has undergone the test(s).

   All radiated tests indicated in appendix A.

Sample S/03 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
52844B/013	Portable terminal	HTT-500-2	1PR001632GKC183 (NYPB-48)	2017-03-09
52844B/027	Antenna λ/4	300-00498	---	2017-03-09
52844B/033	RAC 2 Wire kit acoustic tube earhanger	300-01628	---	2017-03-09

1. Sample S/03 has undergone the test(s).

   All radiated tests indicated in appendix A.

Sample S/04 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
52844B/013	Portable terminal	HTT-500-2	1PR001632GKC183 (NYPB-48)	2017-03-09
52844B/026	Antenna λ/2	300-01938	---	2017-03-09
52844B/033	RAC 2 Wire kit acoustic tube earhanger	300-01628	---	2017-03-09

1. Sample S/04 has undergone the test(s).

   All radiated tests indicated in appendix A.

Sample S/05 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
52844B/013	Portable terminal	HTT-500-2	1PR001632GKC183 (NYPB-48)	2017-03-09
52844B/027	Antenna λ/4	300-00498	---	2017-03-09
52844B/029	Remote control unit	300-00301	---	2017-03-09
52844B/030	Covert inductive loop	300-00929	---	2017-03-09
52844B/031	Covert RAC lead	300-00735	---	2017-03-09

1. Sample S/05 has undergone the test(s).

   All radiated tests indicated in appendix A.

Sample S/06 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
52844B/013	Portable terminal	HTT-500-2	1PR001632GKC183 (NYPB-48)	2017-03-09
52844B/026	Antenna λ/2	300-01938	---	2017-03-09
52844B/029	Remote control unit	300-00301	---	2017-03-09
52844B/030	Covert inductive loop	300-00929	---	2017-03-09
52844B/031	Covert RAC lead	300-00735	---	2017-03-09

1. Sample S/06 has undergone the test(s).

   All radiated tests indicated in appendix A.

Test sample description

The test sample consists of a Digital handheld terminal for TETRA, TI D-LMR and P25 with external antenna, keypad and display. It can also include a Bluetooth module and a GPS receiver inside.

Identification of the client

TELTRONIC, S.A.U.

Polígono Malpica, Calle C/F-Oeste (50016). Zaragoza (SPAIN).

Testing period

The performed test started on 2017-03-29 and finished on 2017-03-30.

The tests have been performed at DEKRA Testing and Certification.

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 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

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 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 53101RRF.003 related with the same samples, in the next clauses and sub-clauses:

Clauses / Sub-clauses	Modification	Justification
Usage of samples/ Elements of sample S/03	Control nº, Description and model of element 52844B/026 are changed to “52844B/027”, “Antenna λ/4” and “300-00498”, respectively	Typo
Annex A / Test conditions	Description of type of antenna is changed from “external connectable antenna” to “integral antenna”	Bluetooth radio uses only integral antenna
Annex A / Sub-clause FCC Section 15.247 Subclause (d). Emission limitations radiated (Transmitter)	A missing incertainty value is added in the table of results for middle channel in the range 1-25 GHz and 8-DPSK modulation	Typo

This modification test report cancels and replaces the test report 53101RRF.003.

Remarks and comments

1: Used instrumentation:

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber ETS FACT3 200STP	N.A.	N.A.
2.	BiconicalLog antenna ETS LINDGREN 3142E	2015/06	2018/06
3.	Multi Device Controller EMCO 2090	N.A.	N.A.
4.	Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2016/11	2019/11
5.	Broadband Horn antenna 18-40 GHz SCHWARZBECK BBHA 9170	2014/03	2017/03
6.	EMI Test Receiver R&S ESU 26	2015/11	2017/11
7.	Spectrum analyser Rohde & Schwarz FSW50	2015/12	2017/12
8.	RF pre-amplifier 20 MHz-7 GHz PAM-0207	2016/09	2017/09
9.	RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-1M	2016/02	2018/02
10.	RF pre-amplifier BONN BLMA 1840-1M 18-40 GHz.	2015/12	2017/12

2: Test not requested. Only radiated emissions test was requested.

Testing verdicts

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

FCC PART 15 PARAGRAPH		VERDICT			
		NA	**P**	**F**	**NM**
FCC 15.247 Subclause (a) (1)	20 dB Bandwidth and Carrier frequency separation				NM[2]
FCC 15.247 Subclause (a)(1)(iii)	Number of hopping channels				NM[2]
FCC 15.247 Subclause (a)(1)(iii)	Time of occupancy (Dwell Time)				NM[2]
FCC 15.247 Subclause (b)	Maximum peak output power and antenna gain				NM[2]
FCC 15.247 Subclause (d)	Emission limitations conducted (Transmitter)				NM[2]
FCC 15.247 Subclause (d)	Emission limitations radiated (Transmitter)		P		

2: See remarks and comments.

Appendix A – Test result "Bluetooth EDR"

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TEST CONDITIONS

Power supply (V):

V_{nom} = 7.4 Vdc

V_{max} = N/A

V_{min} = N/A

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

Type of power supply = DC Voltage from rechargeable battery

Type of antenna = integral antenna

TEST FREQUENCIES:

Lowest channel: 2402 MHz

Middle channel: 2441 MHz

Highest channel: 2480 MHz

RADIATED MEASUREMENTS

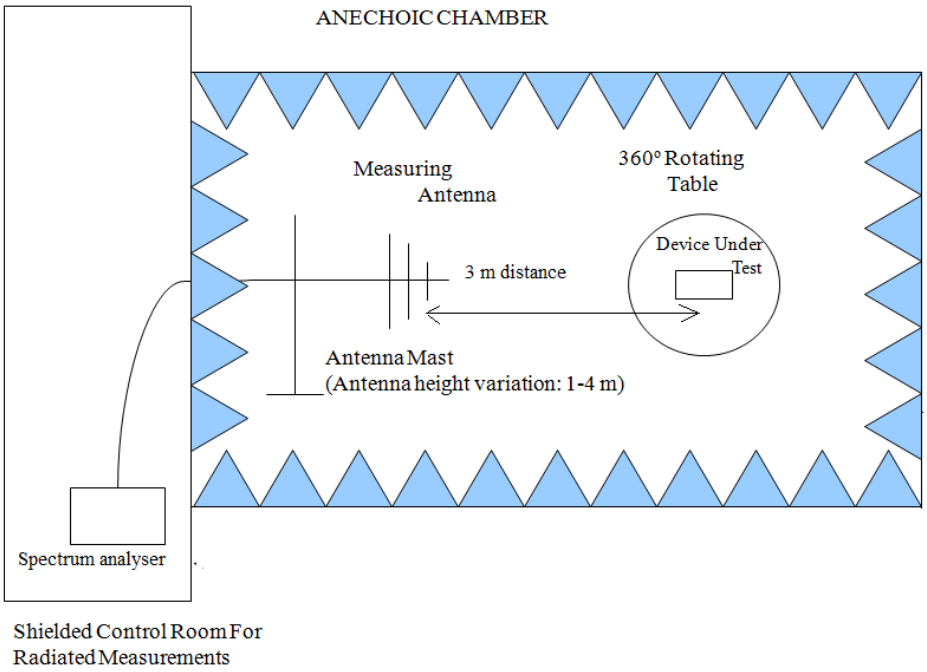
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40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

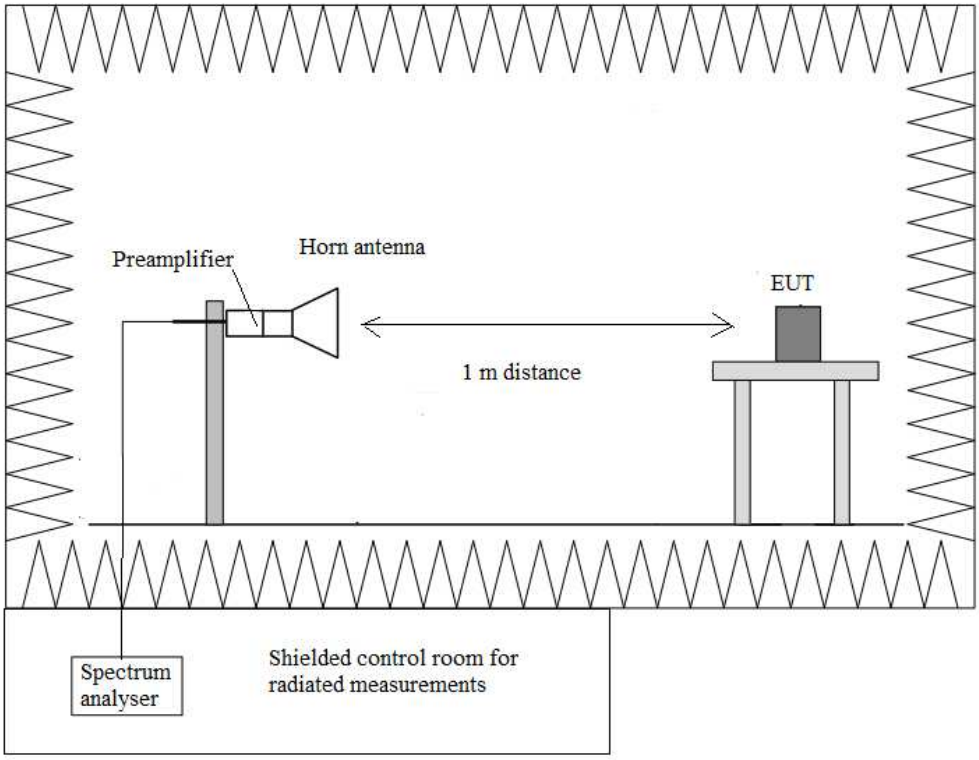
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

Radiated measurements setup f < 1 GHz



Radiated measurements setup f > 1 GHz



FCC Section 15.247 Subclause (d). 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)	-	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.

RESULTS:

The EUT can operate with three different accessories configuration and two types of attachable antenna:

Accessories configuration:

- Configuration 1: EUT with remote speaker microphone and earpiece.
- Configuration 2: EUT with wire kit acoustic tube earhanger.
- Configuration 3: EUT with covert RAC lead, remote control unit, covert inductive loop and shoulder harness.

Types of attachable antenna:

- ¼ wave antenna.
- ½ wave antenna.

A preliminary scan was performed to determine the worst case of accessories configuration and antenna.

Sample S/01 (Portable terminal, antenna λ/4, and accessories configuration 1 = remote speaker microphone and earpiece) was determined as the worst case. The following tables and plots show the results for this configuration.

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.

No spurious signals were found at less than 20 dB respect to the limit.

Frequency range 1 GHz-25 GHz

Modulation: GFSK

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
7.20625	V	Peak	45.25	± 4.87
8.80675	V	Peak	46.61	± 4.87
9.60775	V	Peak	50.78	± 4.87
12.01025	H	Peak	48.76	± 4.87

2. CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4.87975	V	Peak	40.57	± 4.87
7.32025	V	Peak	45.65	± 4.87
8.94625	V	Peak	44.92	± 4.87
9.75925	H	Peak	51.04	± 4.87

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48402	H	Peak	50.00	± 4.87
7.43975	V	Peak	45.56	± 4.87
9.91925	V	Peak	52.59	± 4.87
12.39925	V	Peak	47.87	± 4.87

Verdict: PASS

Modulation: Π/4-DQPSK

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
7.20575	V	Peak	44.27	± 4.87
9.60725	V	Peak	49.91	± 4.87

2. CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
7.32225	V	Peak	46.36	± 4.87
9.76425	H	Peak	48.98	± 4.87

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48359	H	Peak	55.11	± 4.87
		Average	44.26	± 4.87
7.44025	H	Peak	46.14	± 4.87
9.91875	V	Peak	52.03	± 4.87

Verdict: PASS

Modulation: 8-DPSK

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
7.20625	V	Peak	44.67	± 4.87
9.60825	H	Peak	48.21	± 4.87

2. CHANNEL: MIDDLE (2441 MHz).

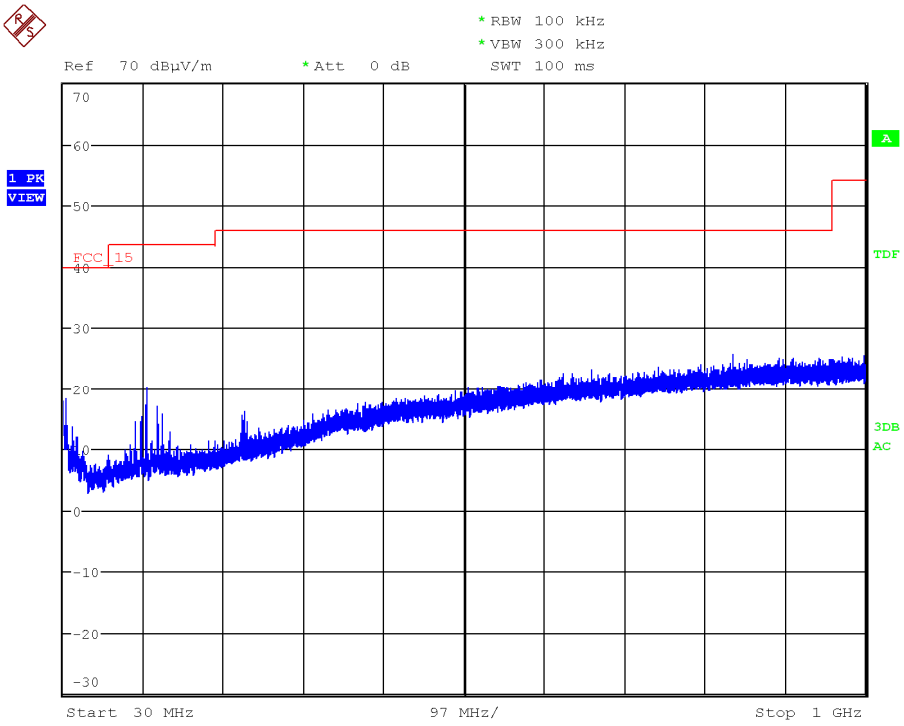
Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
7.32325	V	Peak	45.34	± 4.87
9.76375	V	Peak	50.18	± 4.87

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2.48355	H	Peak	55.84	± 4.87
		Average	43.99	± 4.87
3.30675	H	Peak	40.50	± 4.87
7.43925	V	Peak	45.47	± 4.87
9.91975	V	Peak	51.76	± 4.87

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

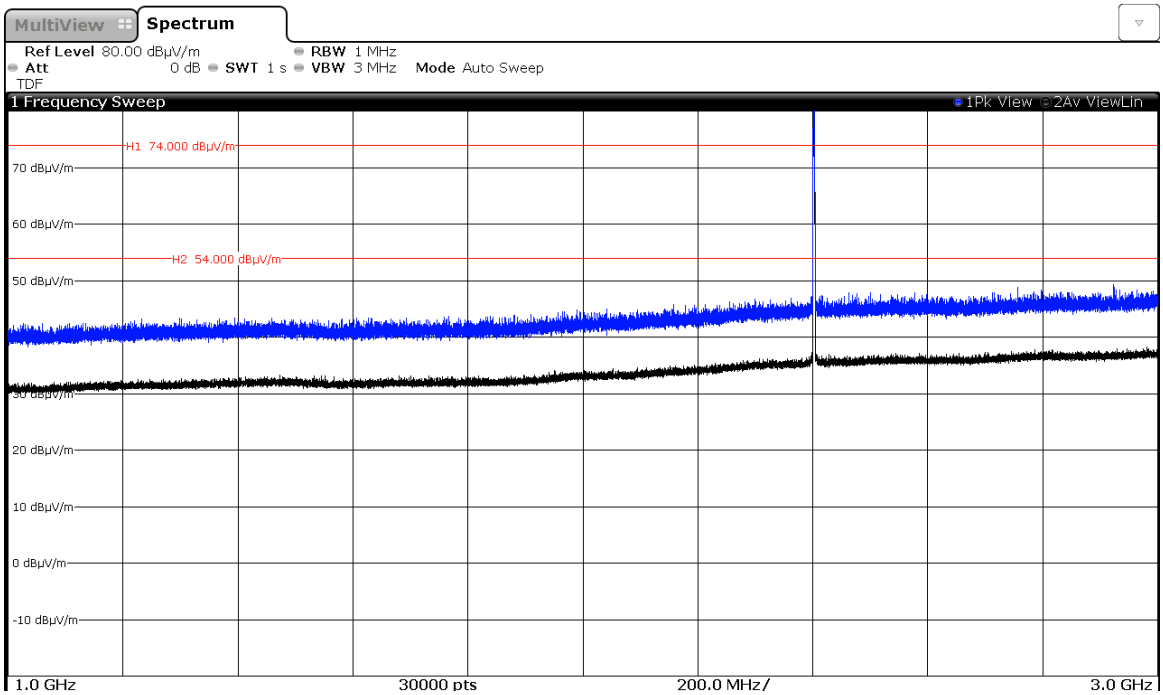


(This plot is valid for all three channels and all modulation modes).

FREQUENCY RANGE 1 GHz to 3 GHz.

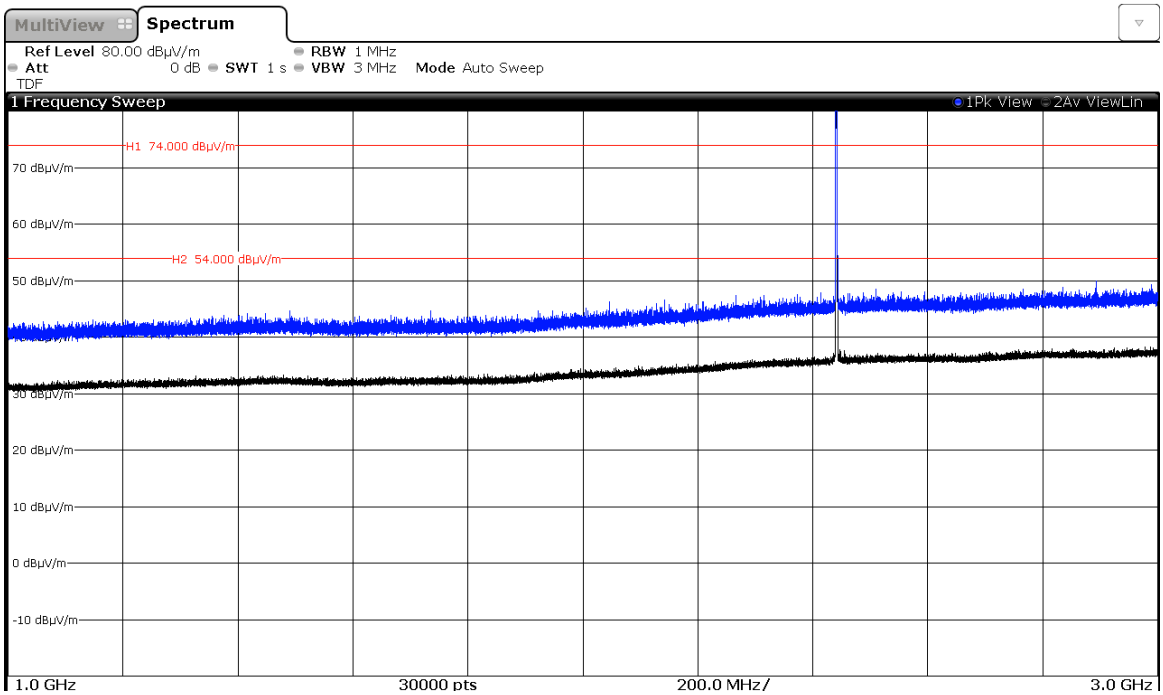
Modulation: GFSK

CHANNEL: Lowest (2402 MHz).



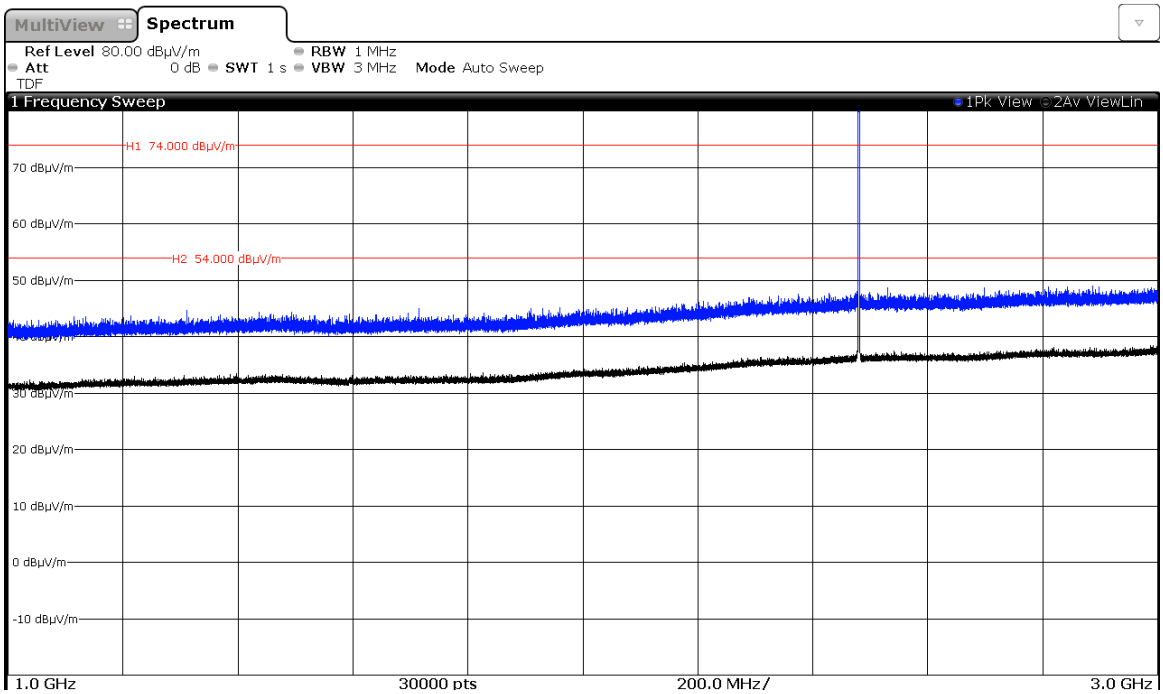
Note: The peak shown in the plot above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz).



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

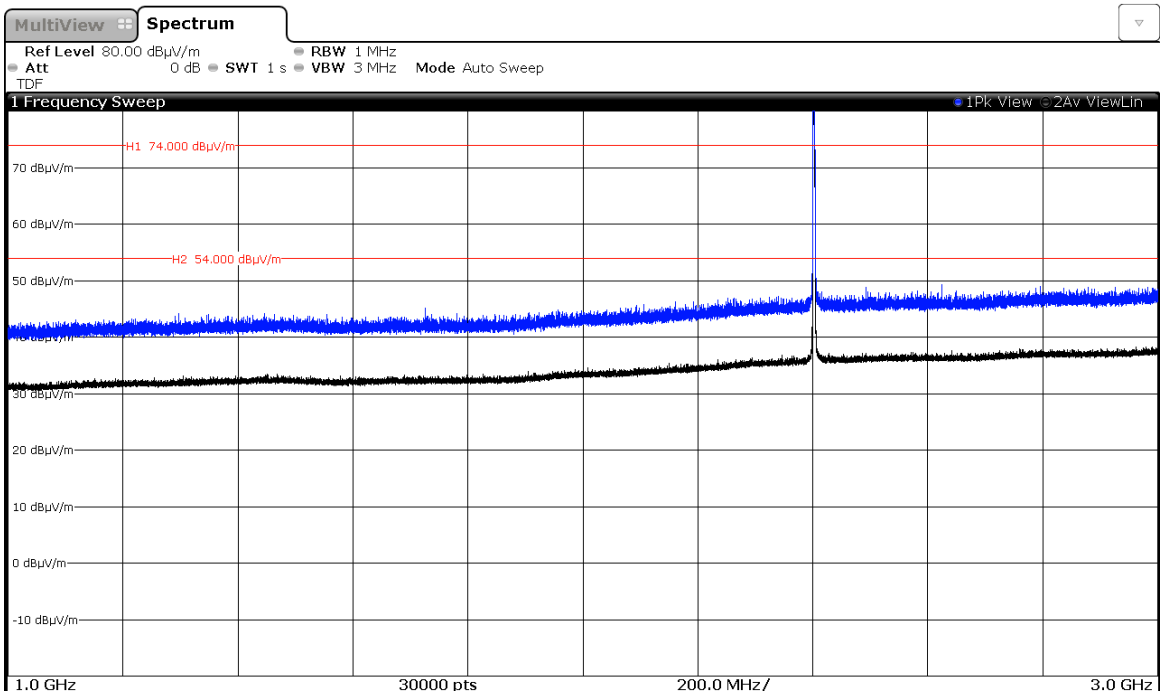
CHANNEL: Highest (2480 MHz).



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

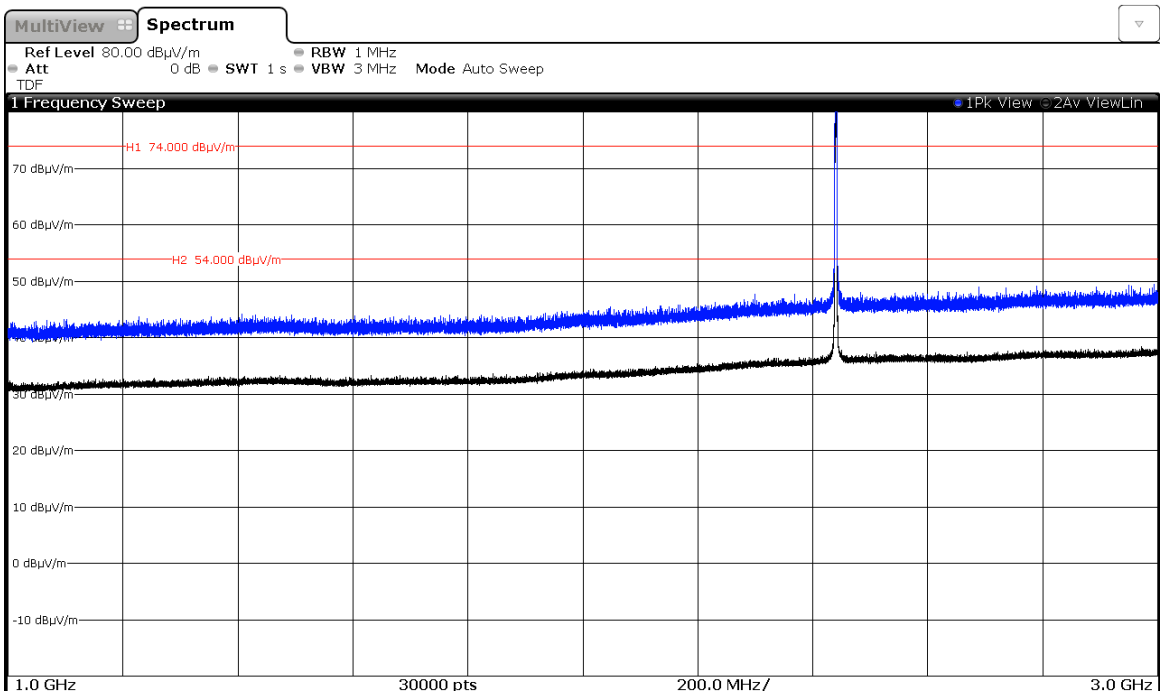
Modulation: Π/4-DQPSK

CHANNEL: Lowest (2402 MHz).



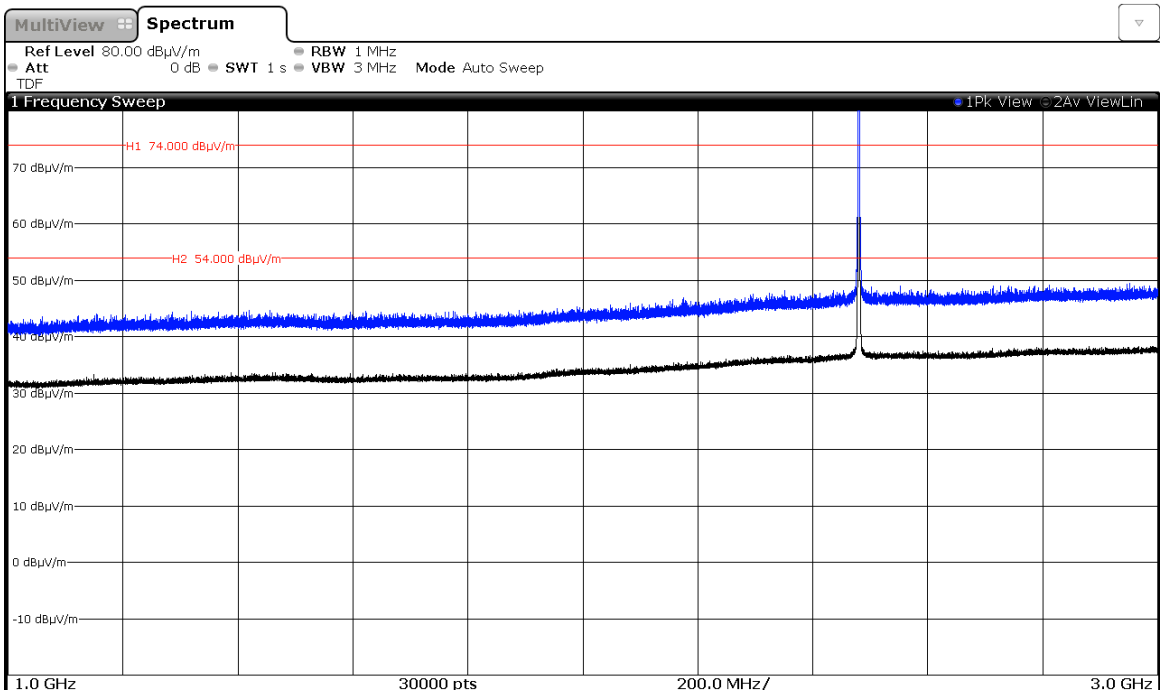
Note: The peak shown in the plot above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz).



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

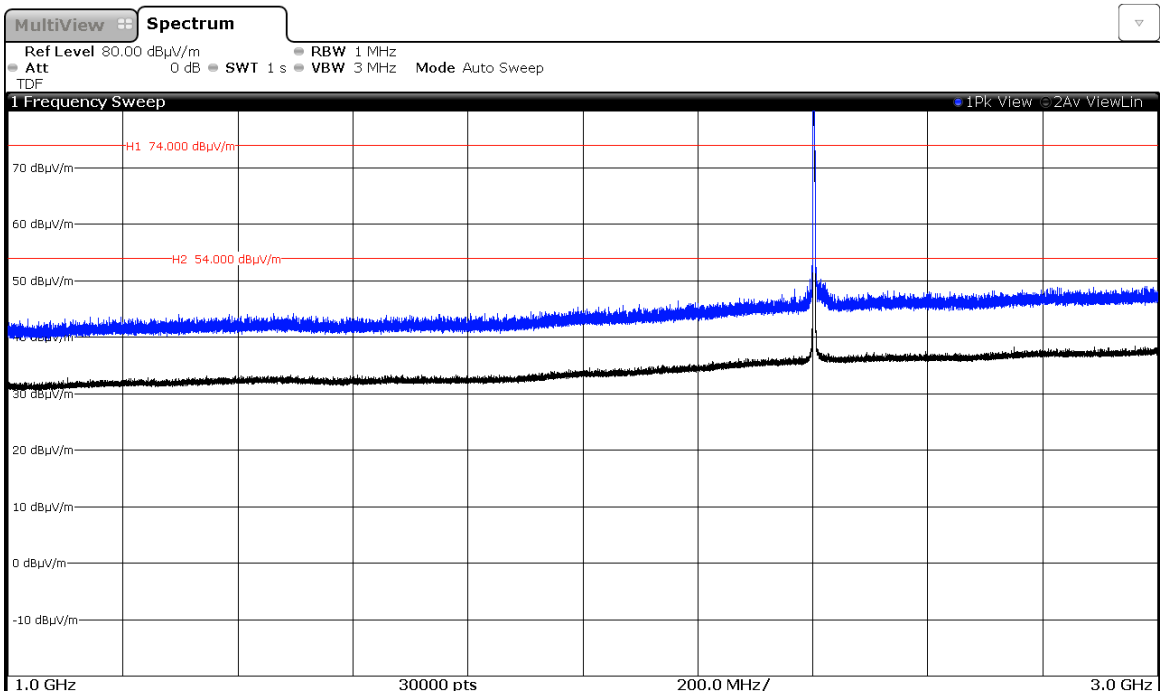
CHANNEL: Highest (2480 MHz).



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

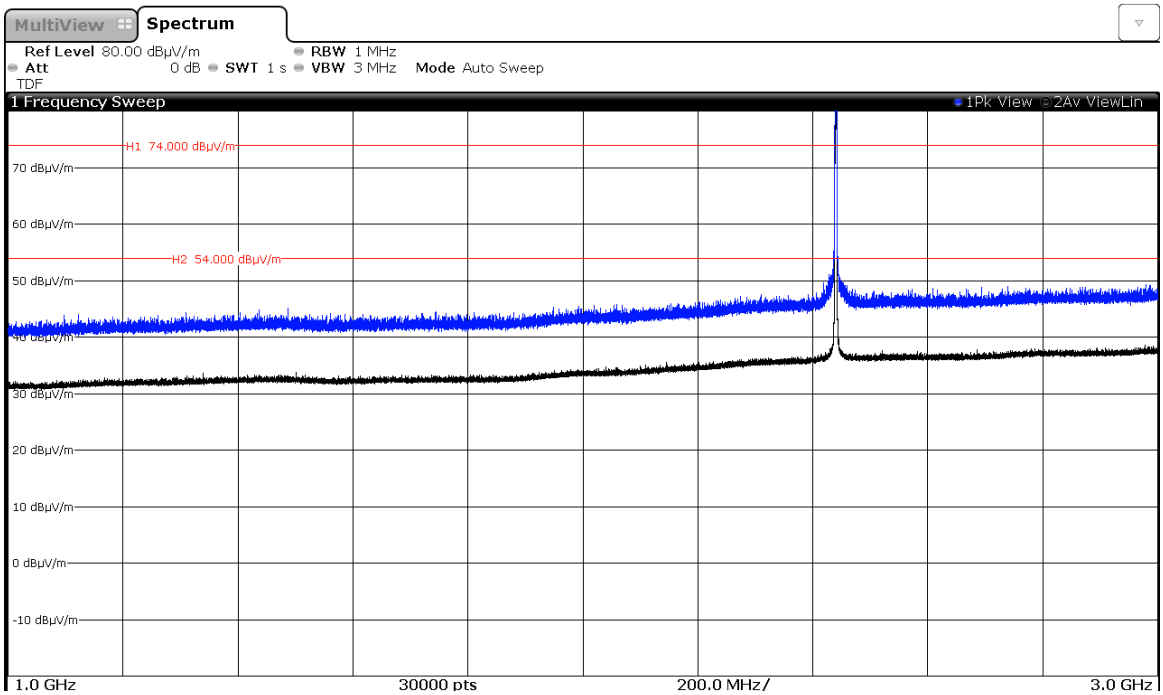
Modulation: 8-DPSK

CHANNEL: Lowest (2402 MHz).



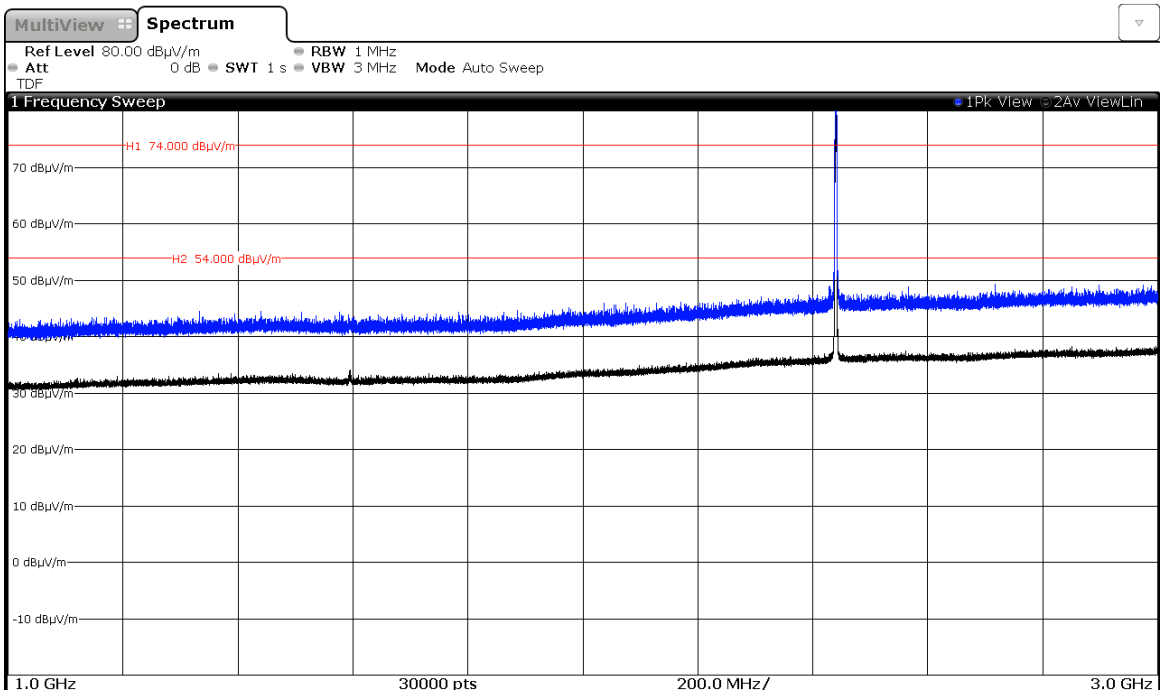
Note: The peak shown in the plot above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz).



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

CHANNEL: Highest (2480 MHz).

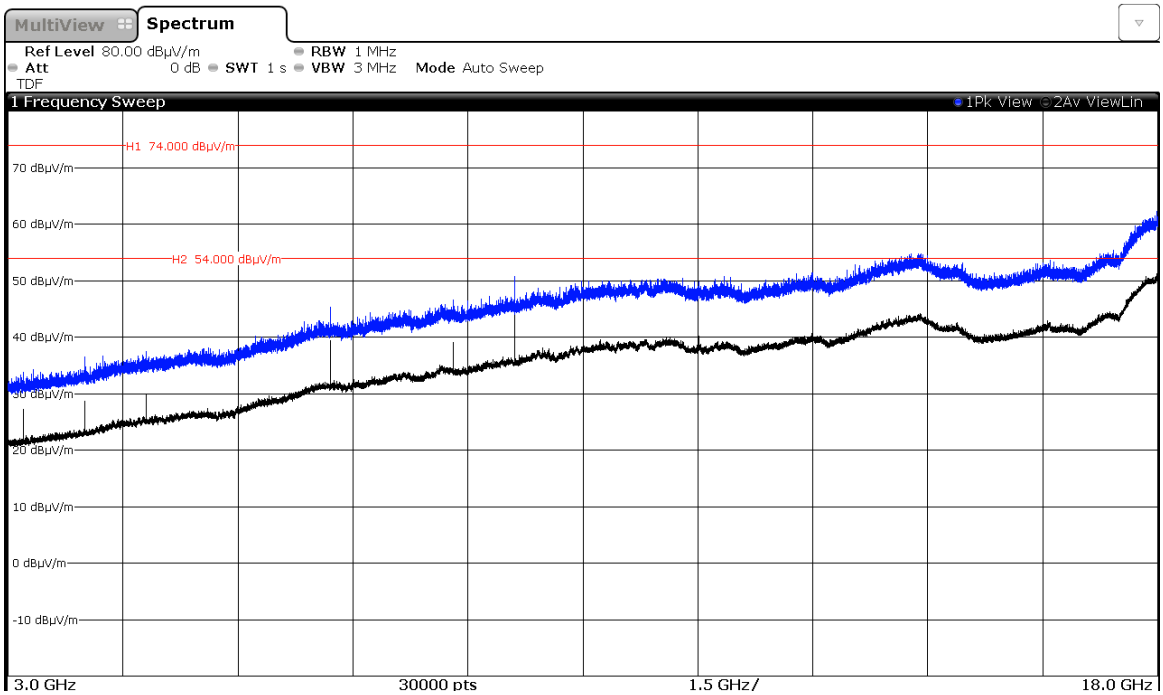


Note: The peak shown in the plot above the limit is the carrier frequency.

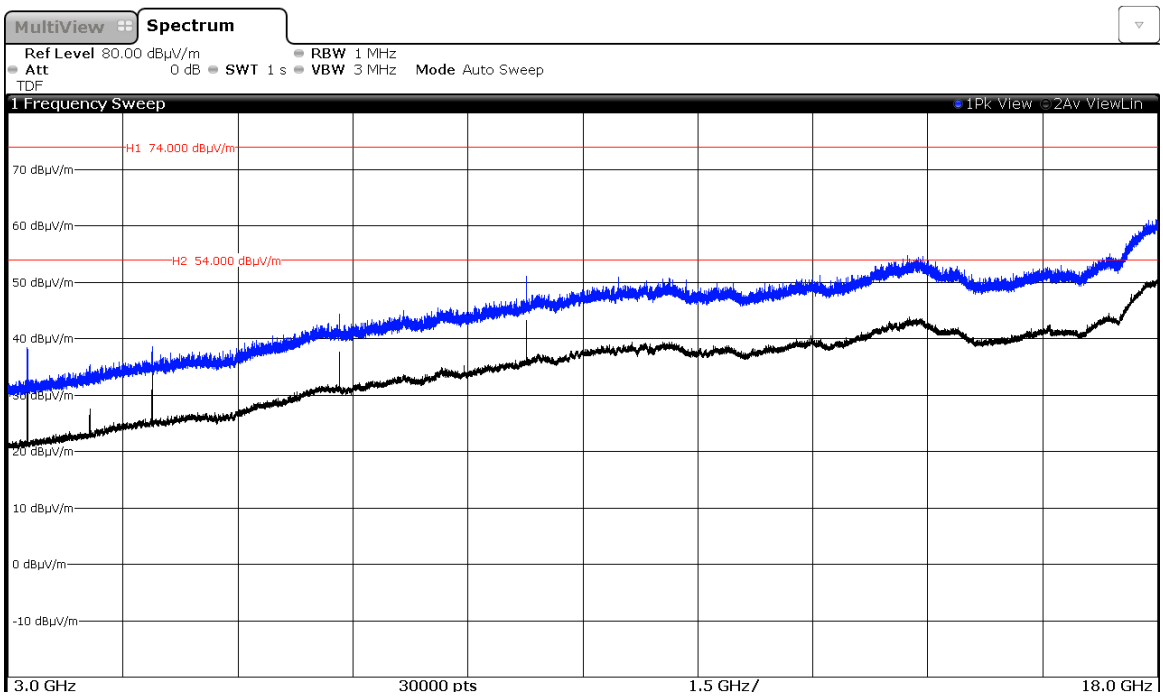
FREQUENCY RANGE 3 GHz to 18 GHz.

Modulation: GFSK

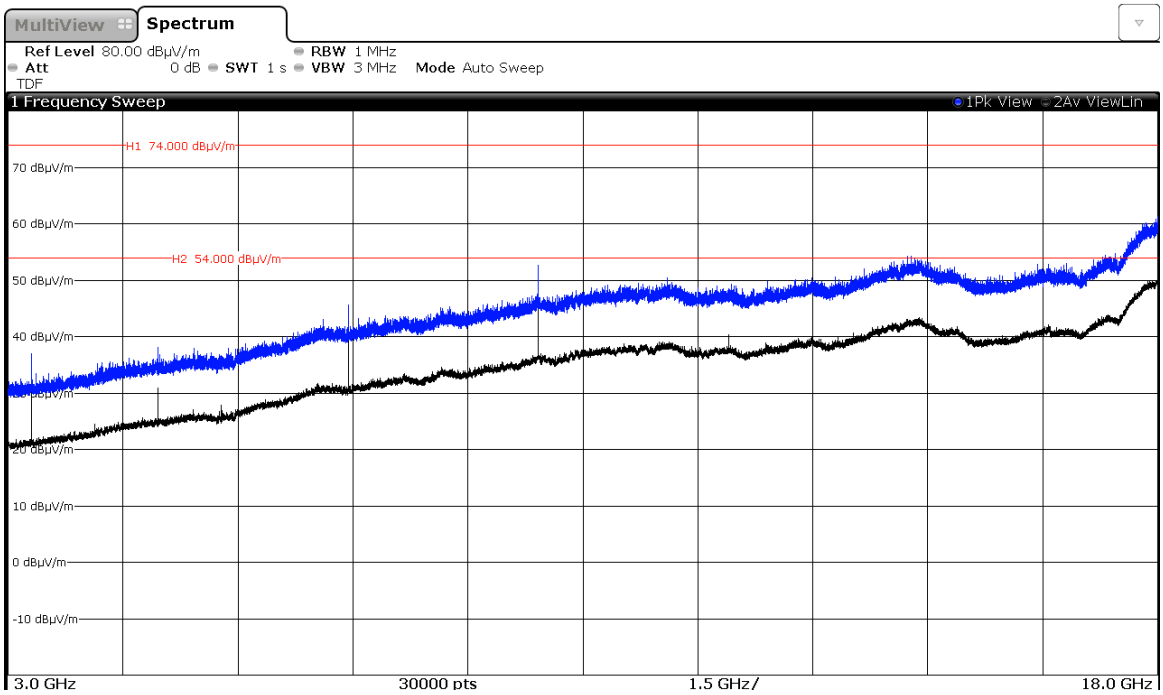
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2441 MHz).

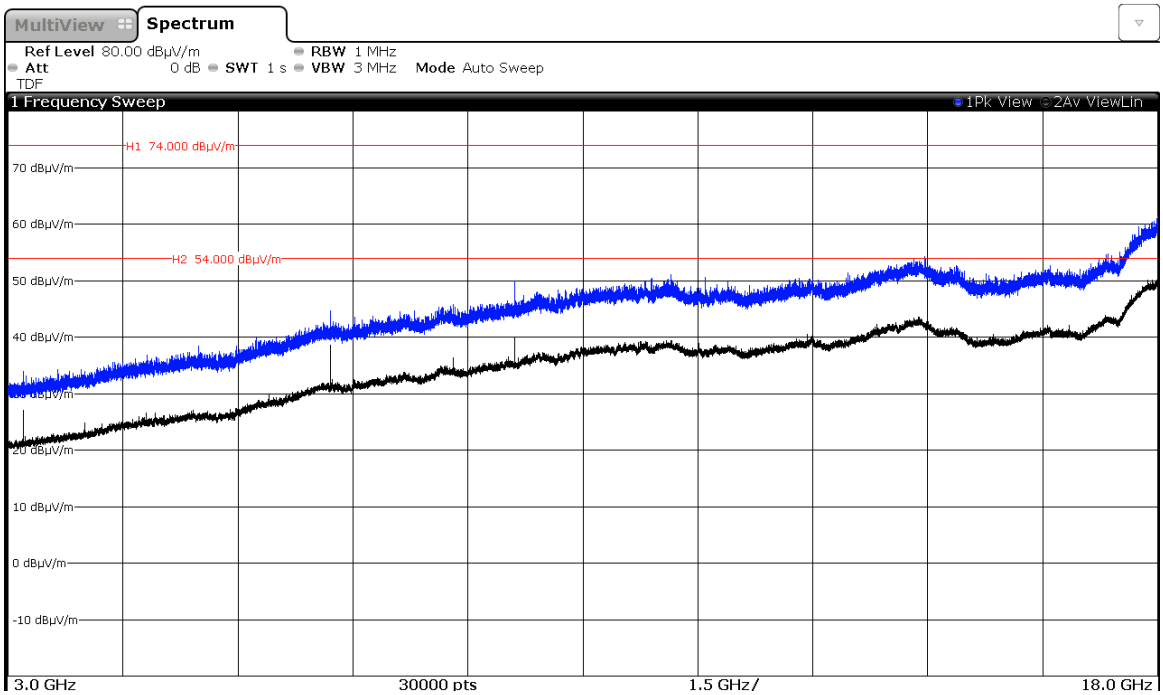


CHANNEL: Highest (2480 MHz).

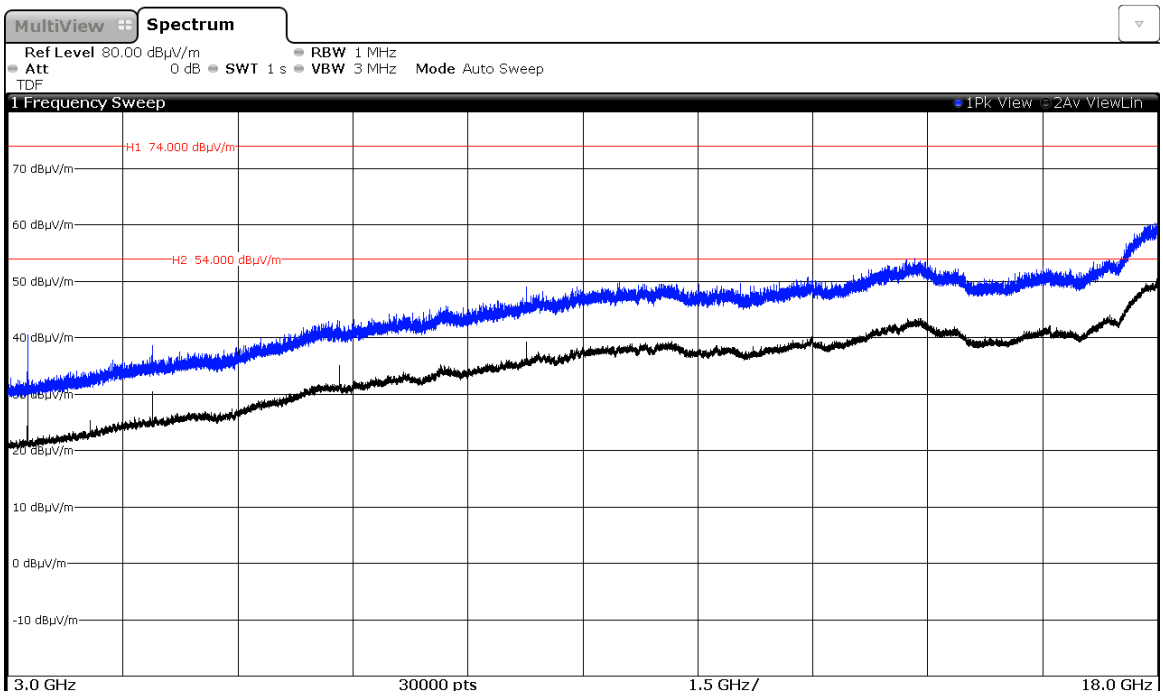


Modulation: Π/4-DQPSK

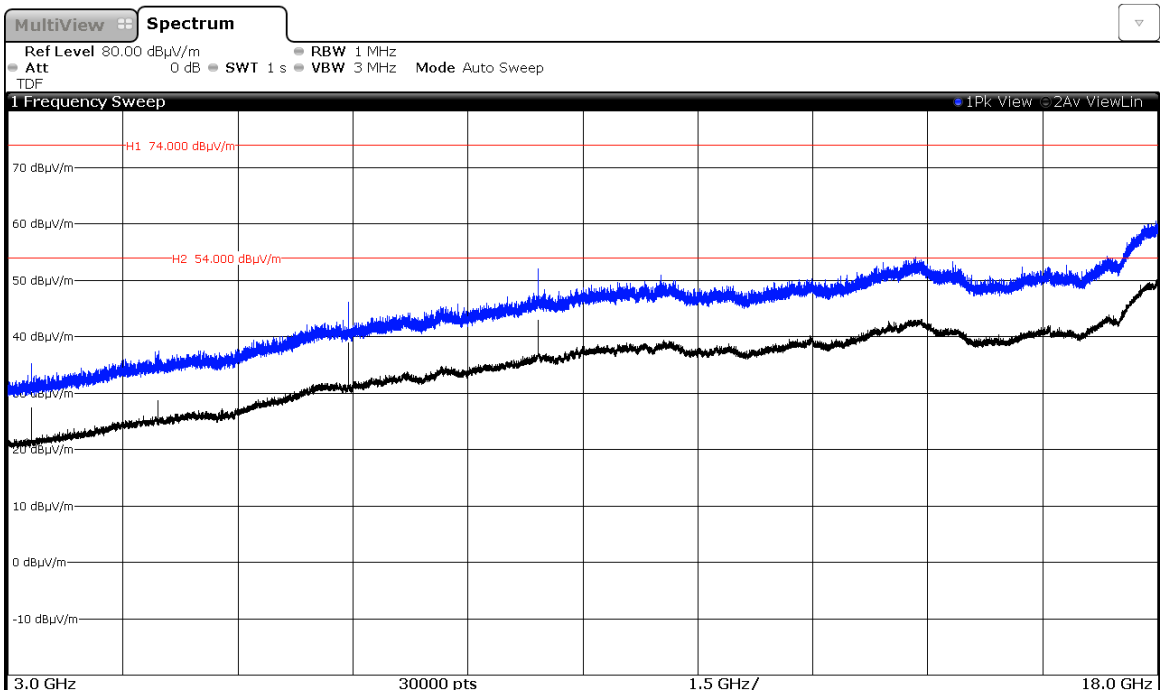
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2441 MHz).

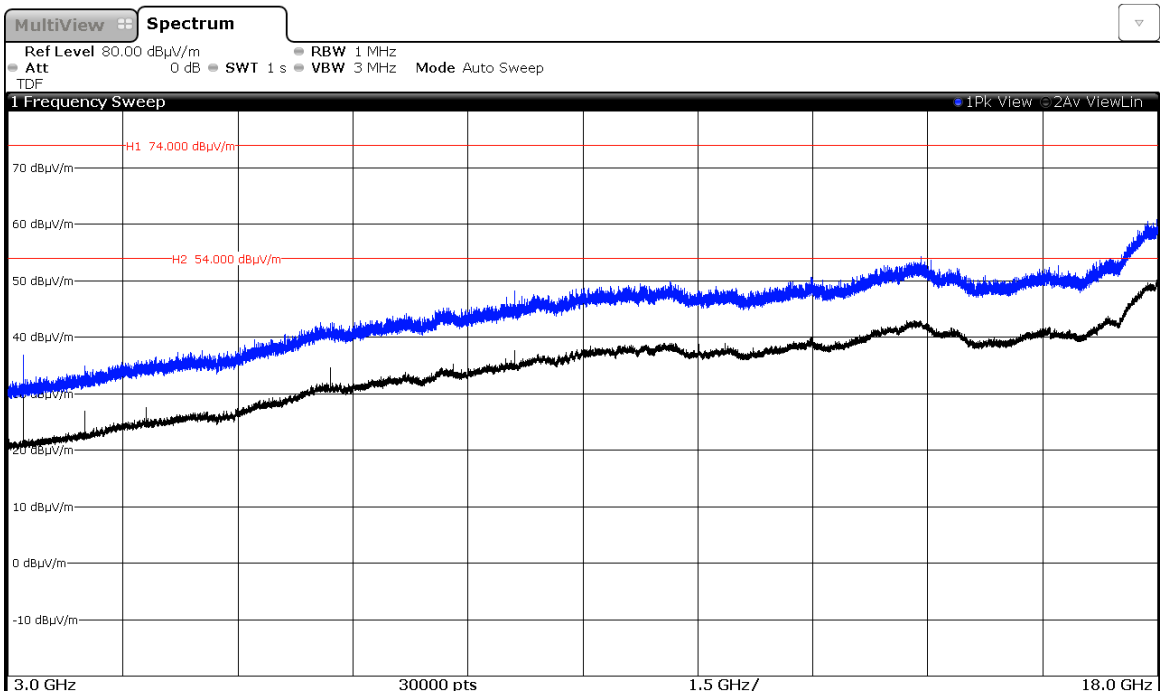


CHANNEL: Highest (2480 MHz).

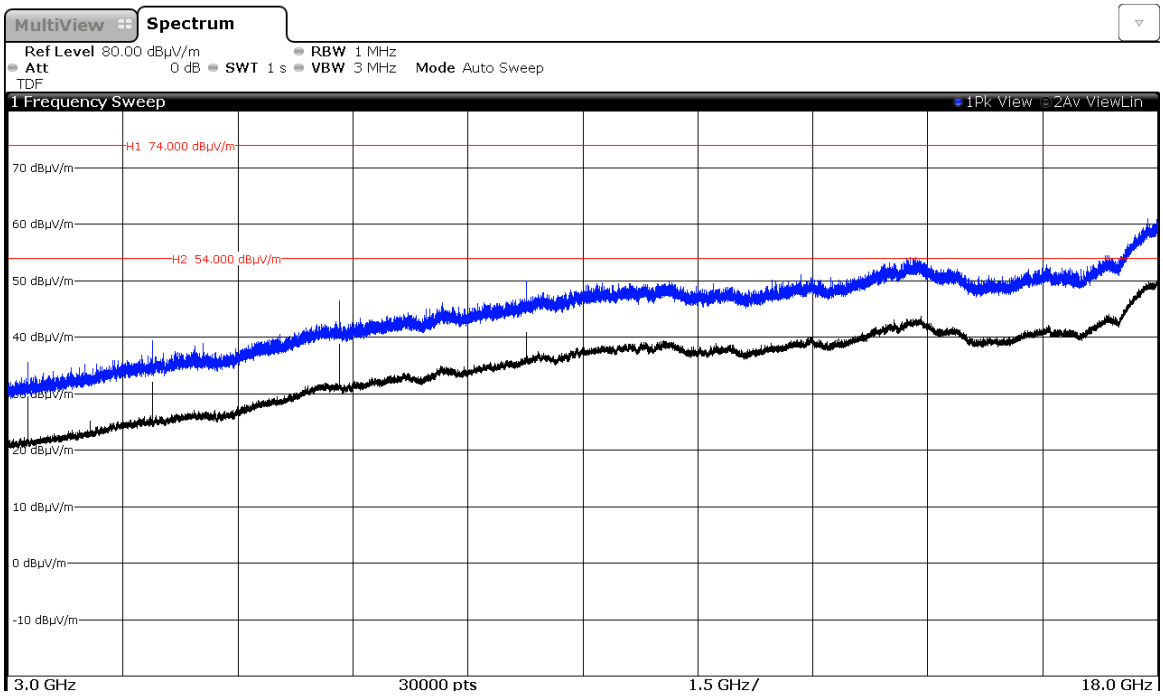


Modulation: 8-DPSK

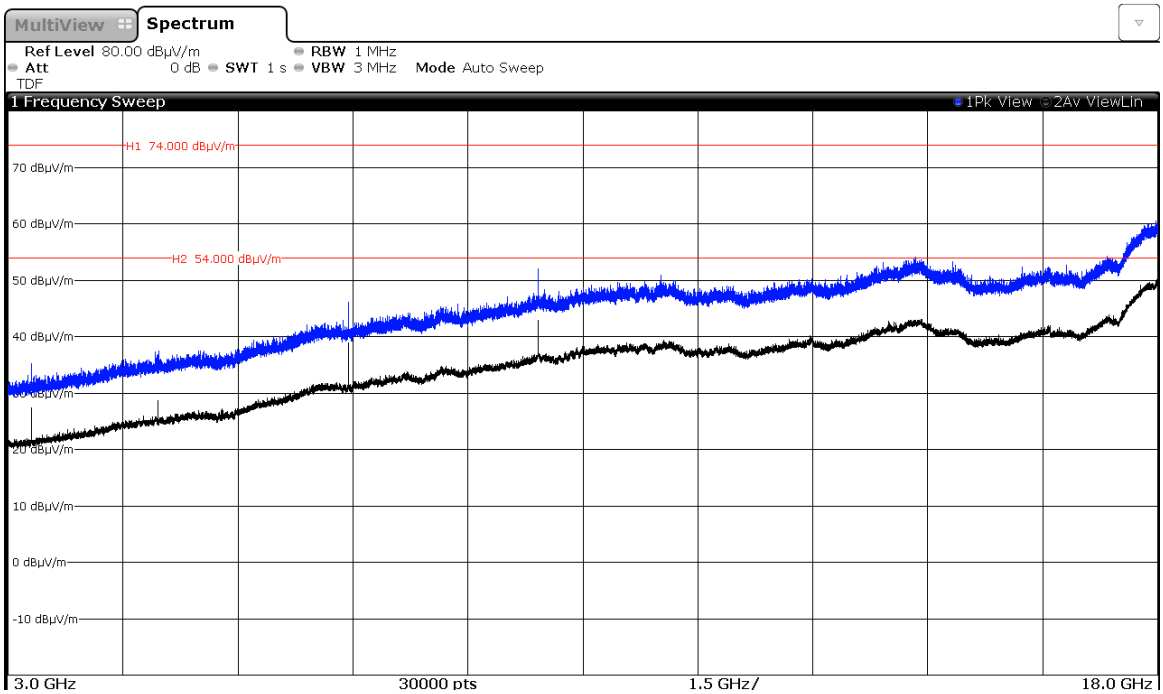
CHANNEL: Lowest (2402 MHz).



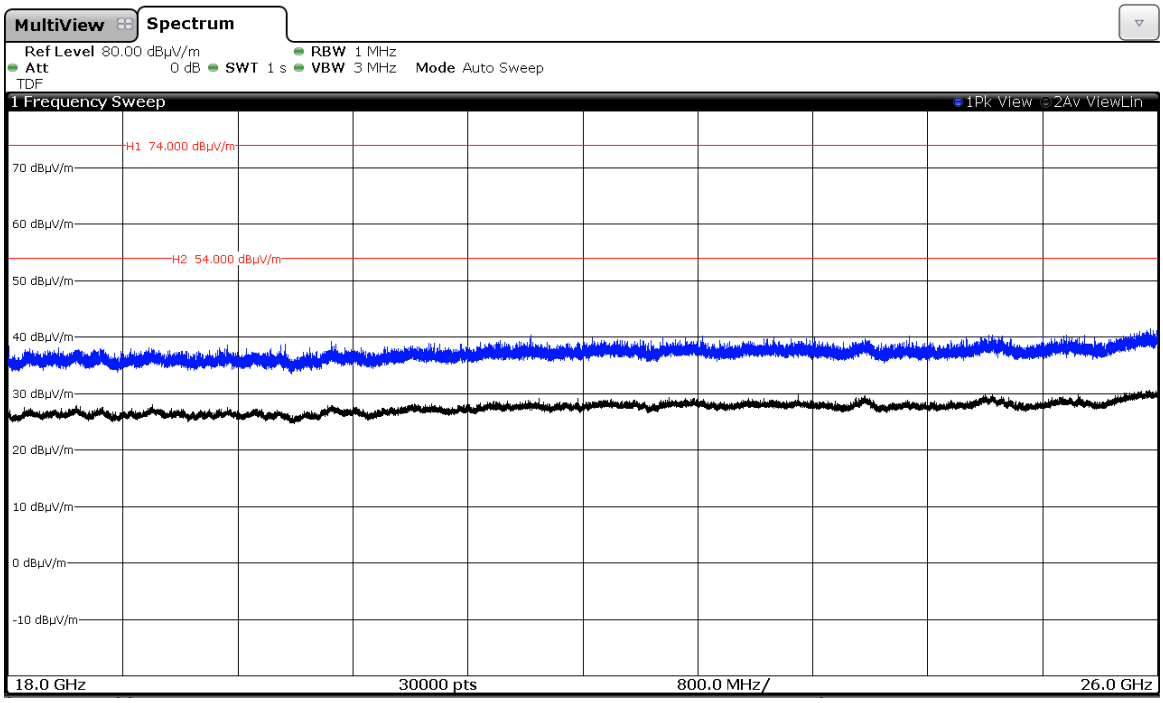
CHANNEL: Middle (2441 MHz).



CHANNEL: Highest (2480 MHz).



FREQUENCY RANGE 18 GHz to 25 GHz.

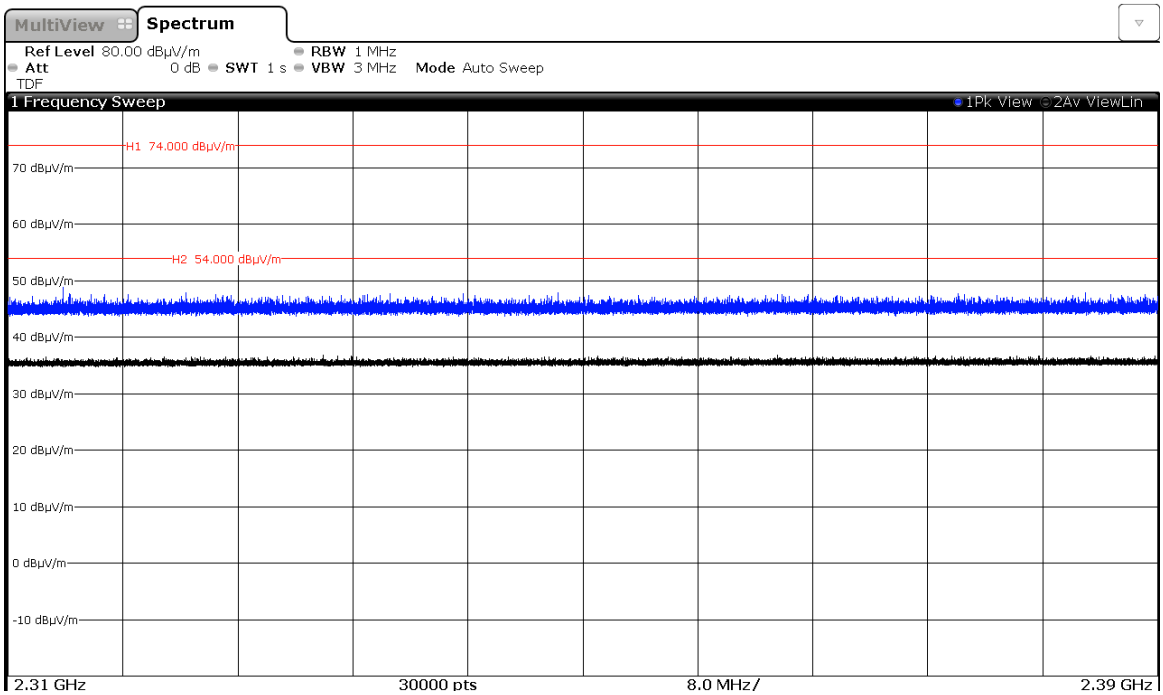


(This plot is valid for all three channels and all modulation modes).

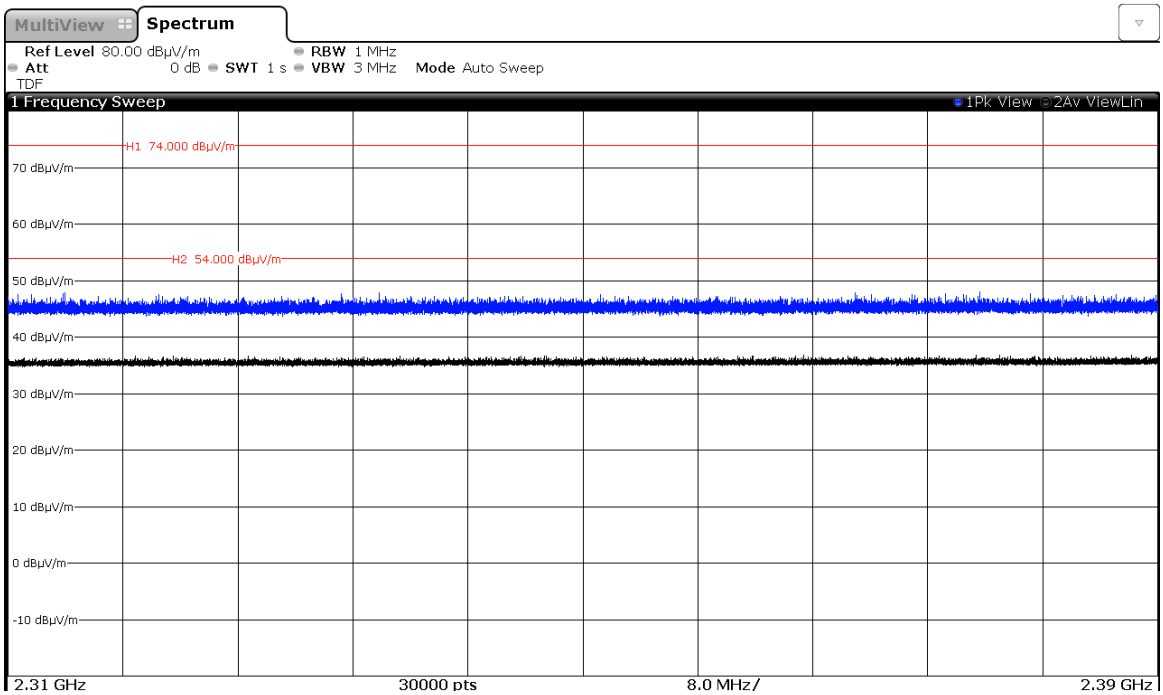
FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)

CHANNEL: Lowest (2402 MHz).

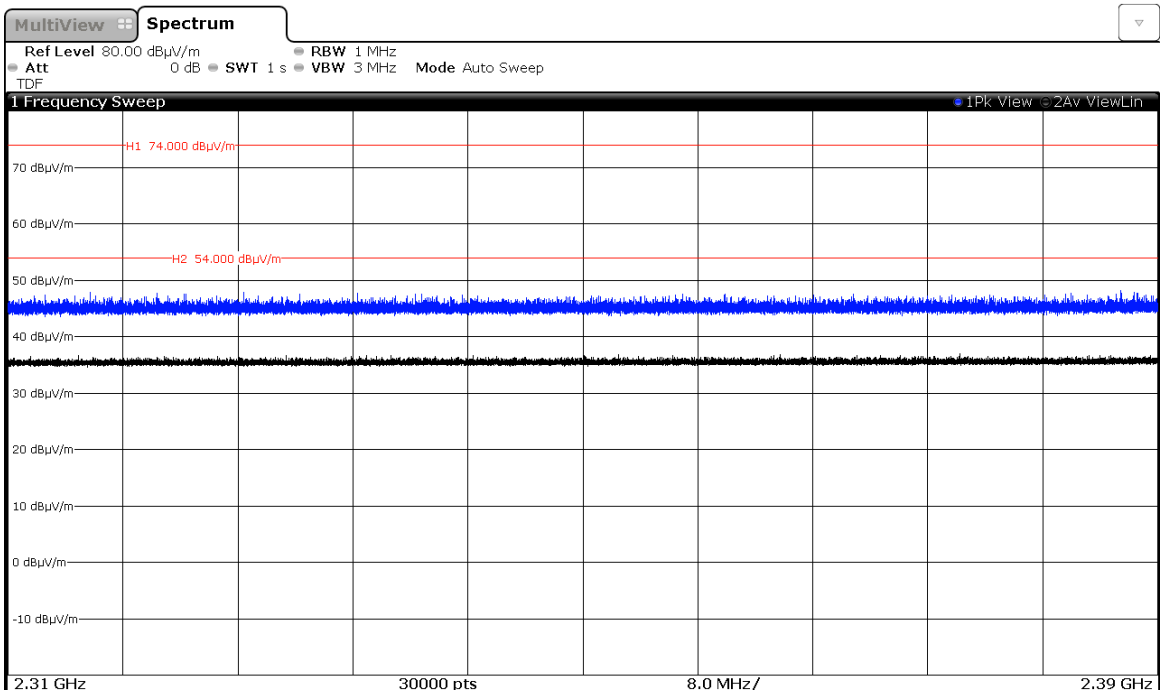
Modulation: GFSK



Modulation: Π/4-DQPSK

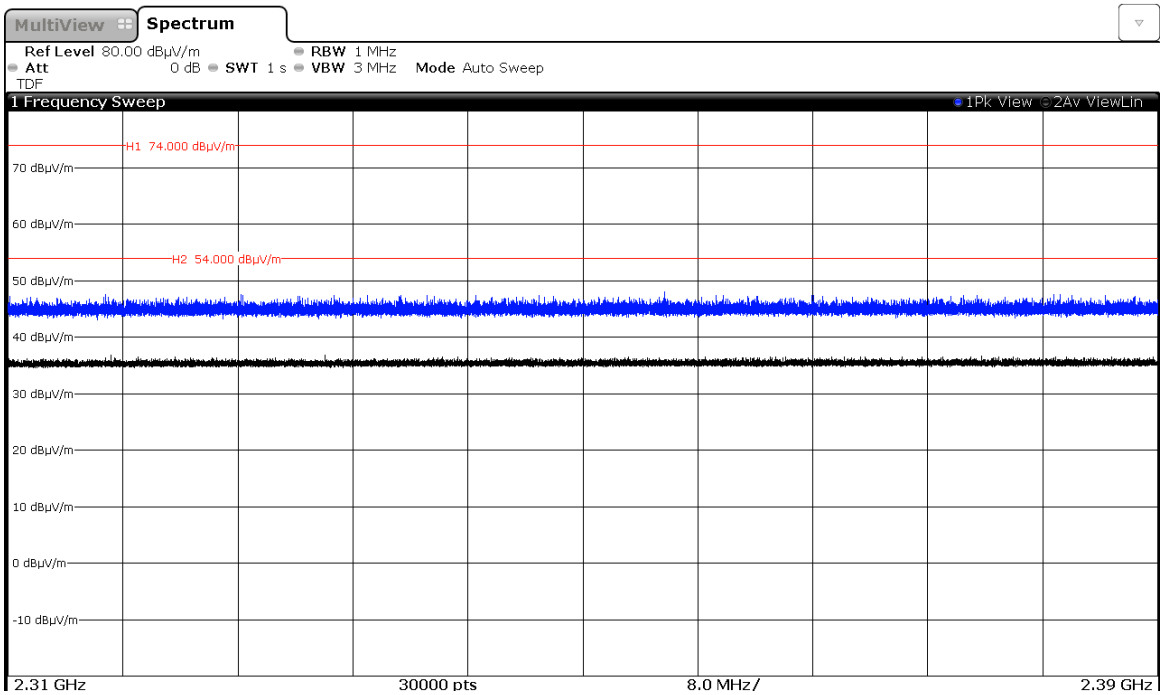


Modulation: 8-DPSK

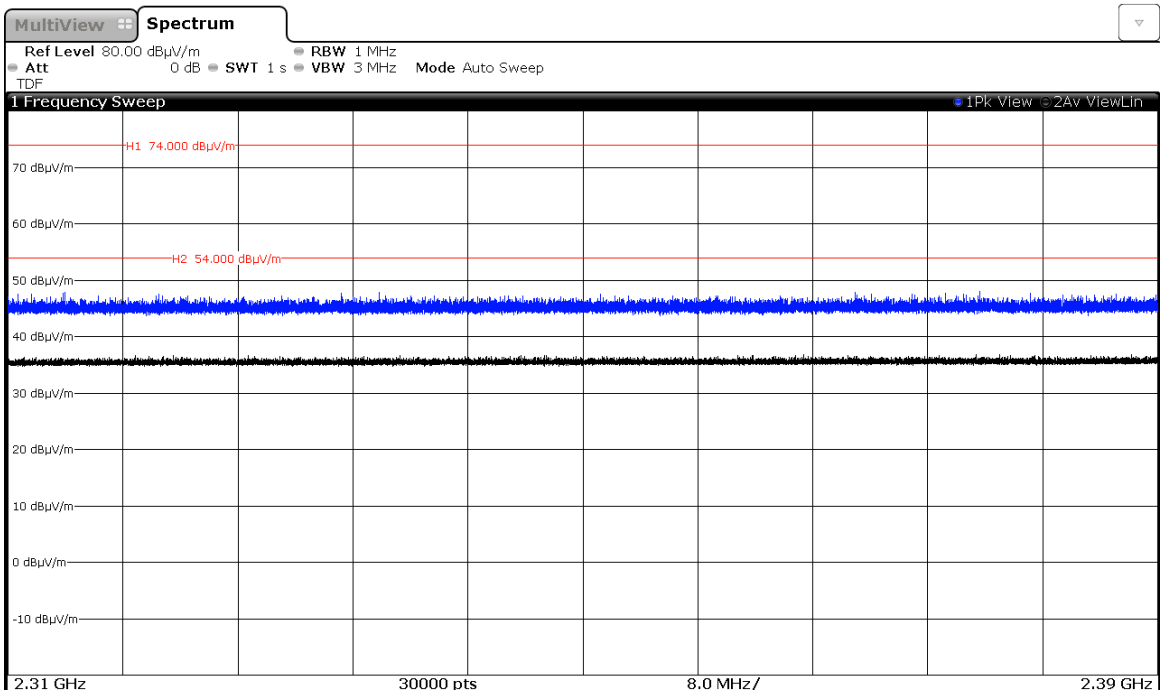


CHANNEL: Middle (2441 MHz).

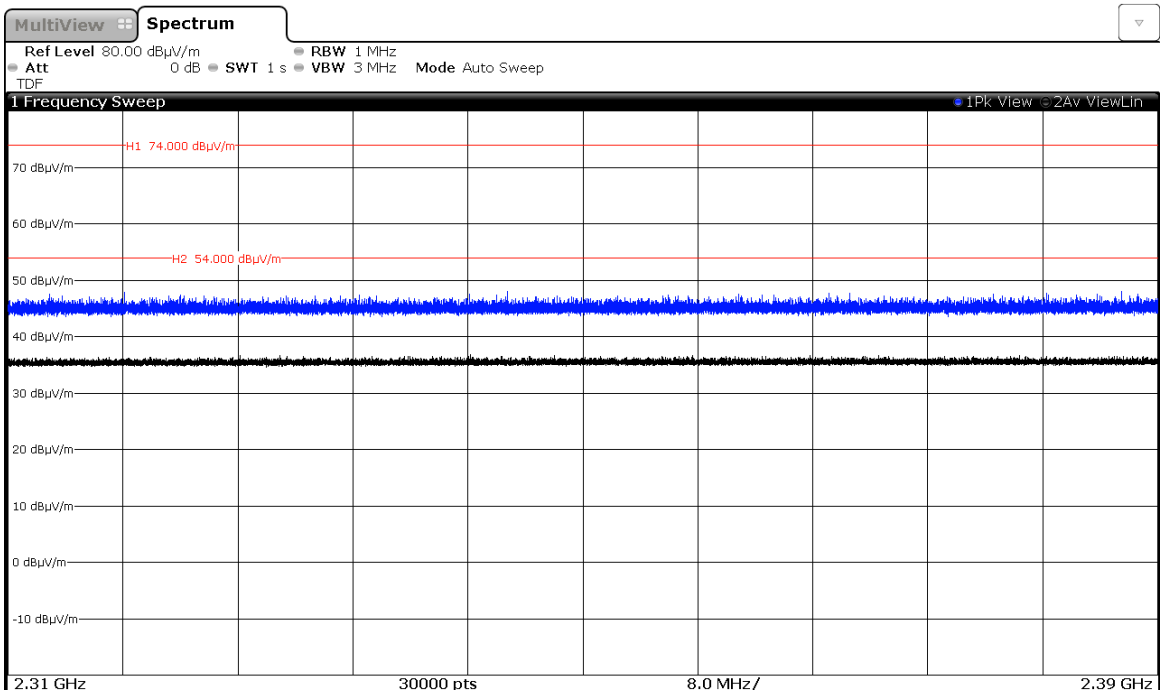
Modulation: GFSK



Modulation: Π/4-DQPSK

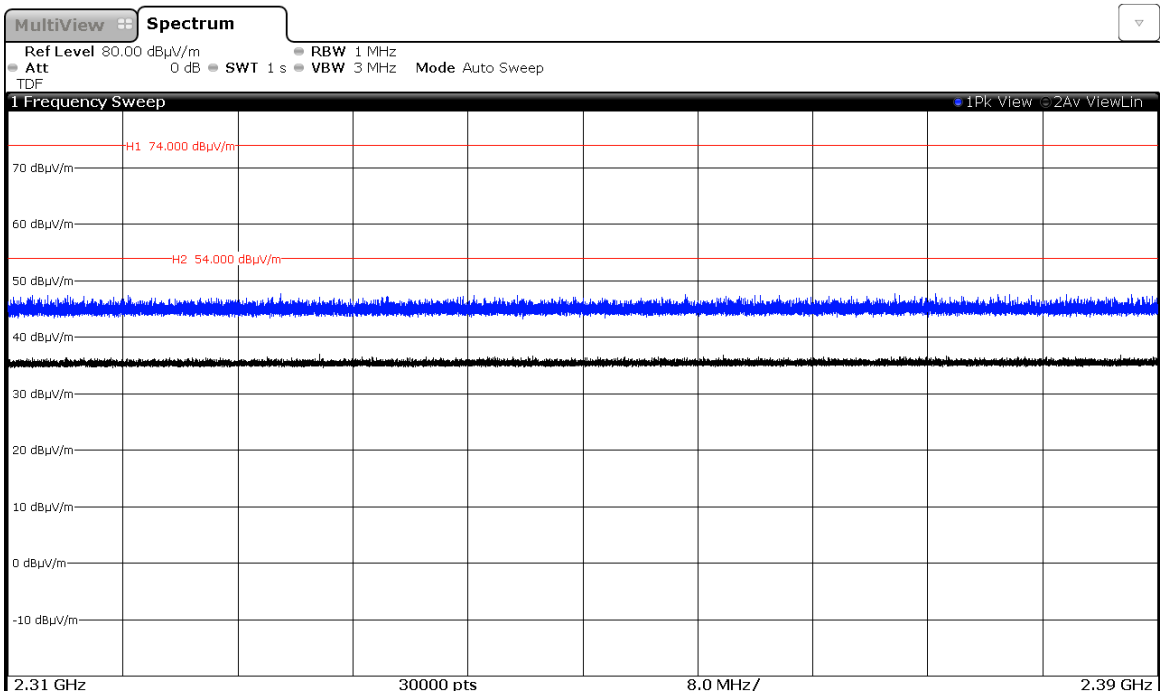


Modulation: 8-DPSK

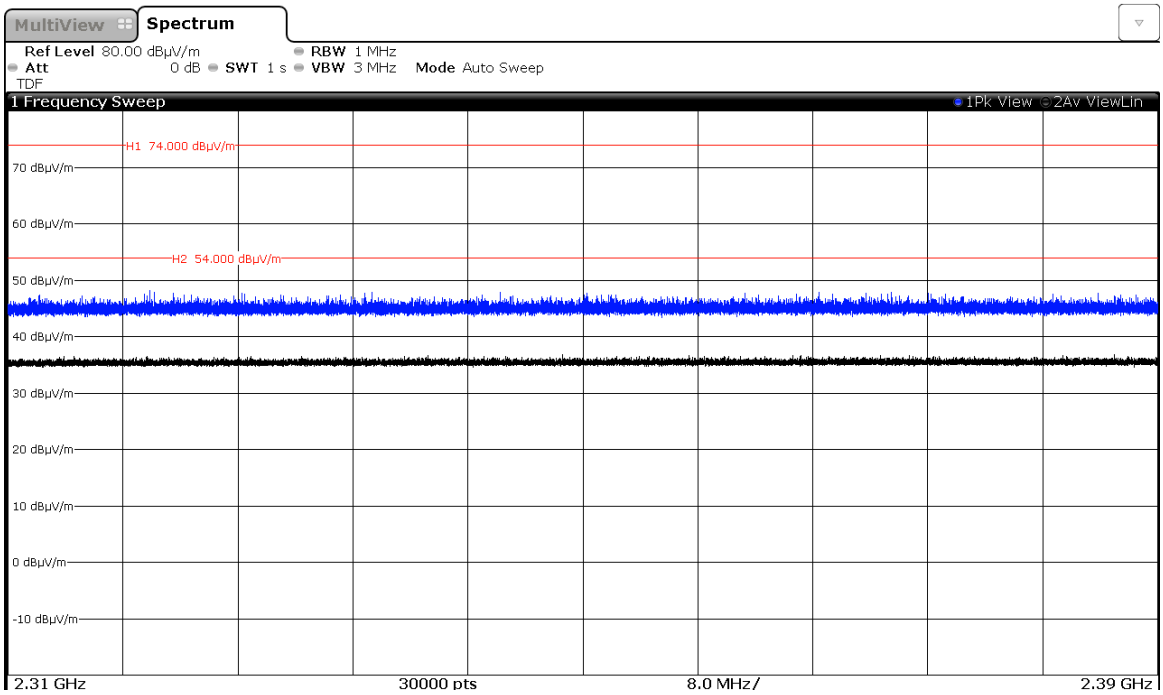


CHANNEL: Highest (2480 MHz).

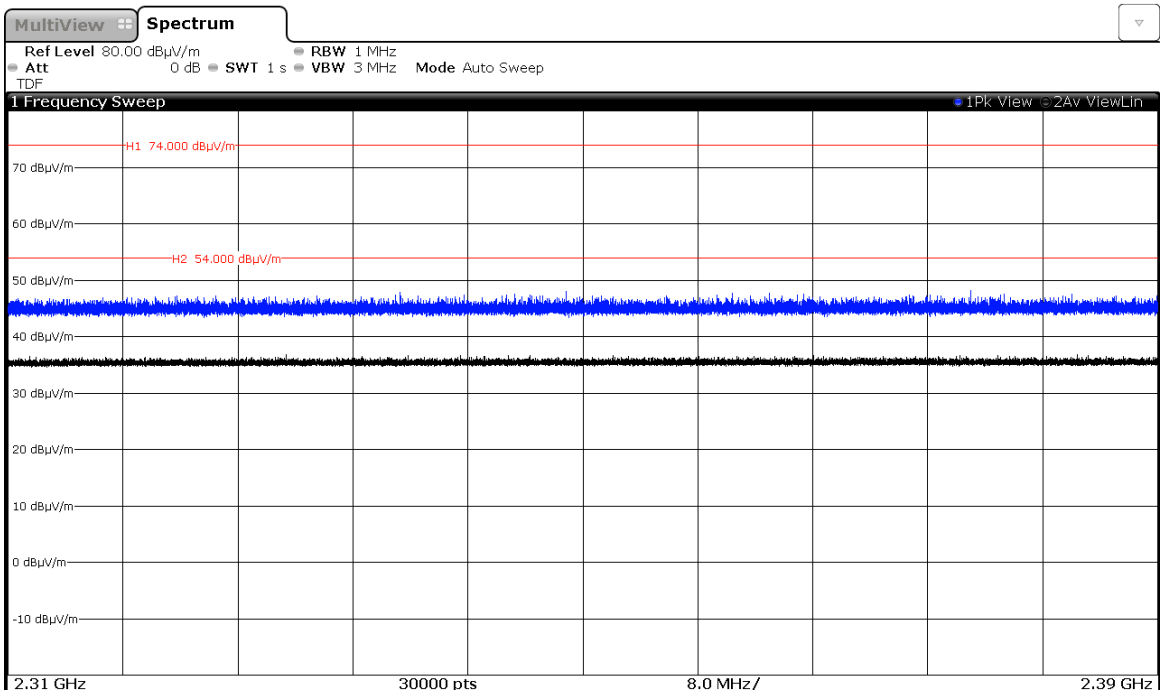
Modulation: GFSK



Modulation: Π/4-DQPSK



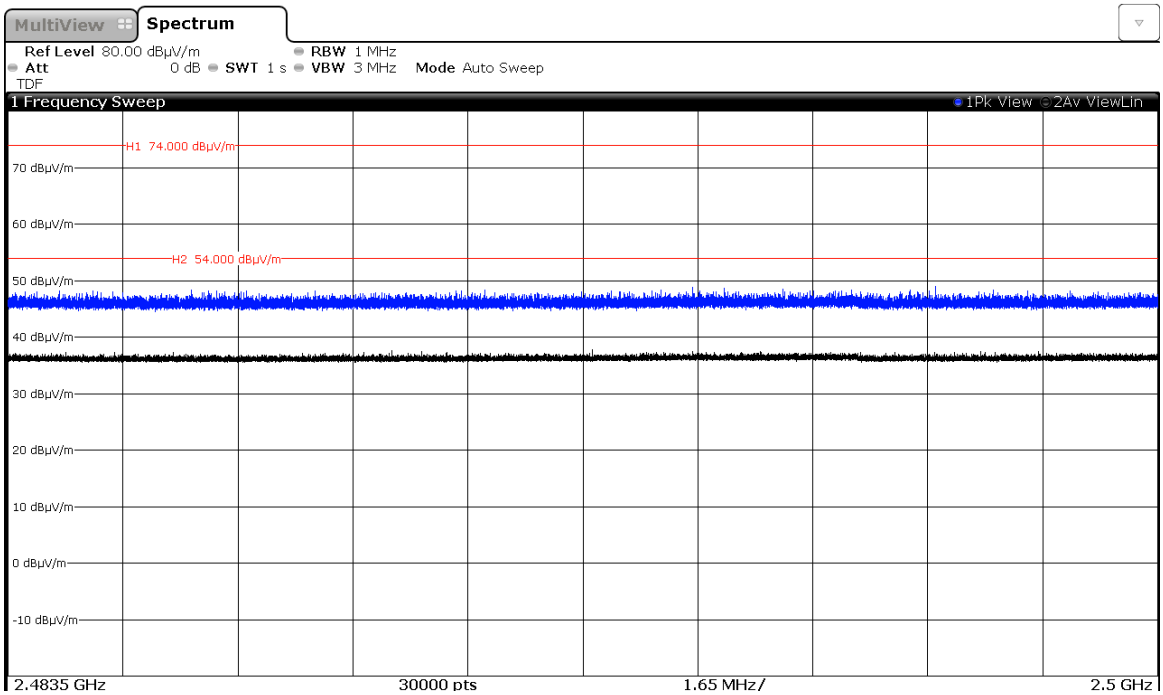
Modulation: 8-DPSK



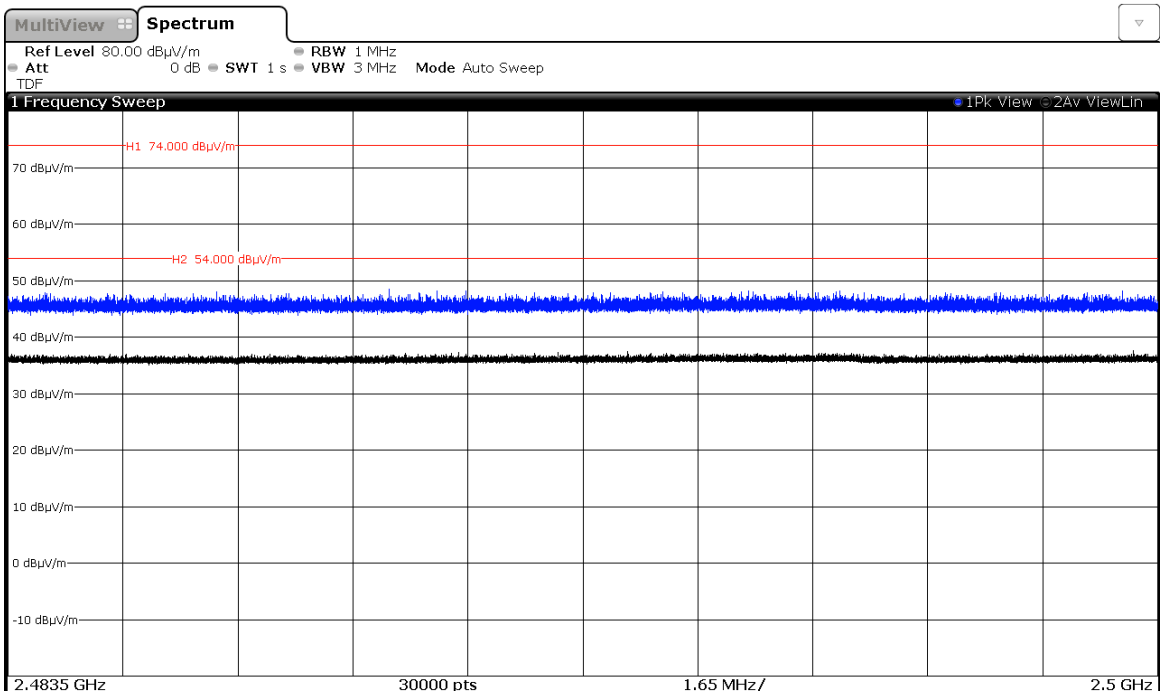
FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)

CHANNEL: Lowest (2402 MHz).

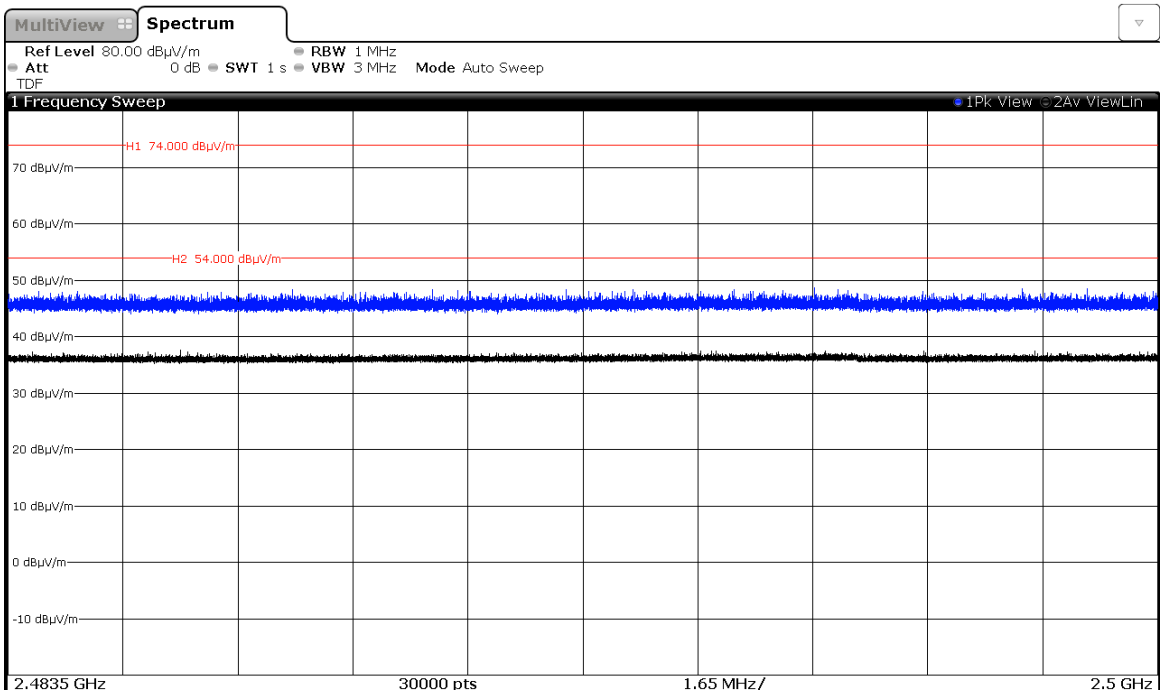
Modulation: GFSK



Modulation: Π/4-DQPSK

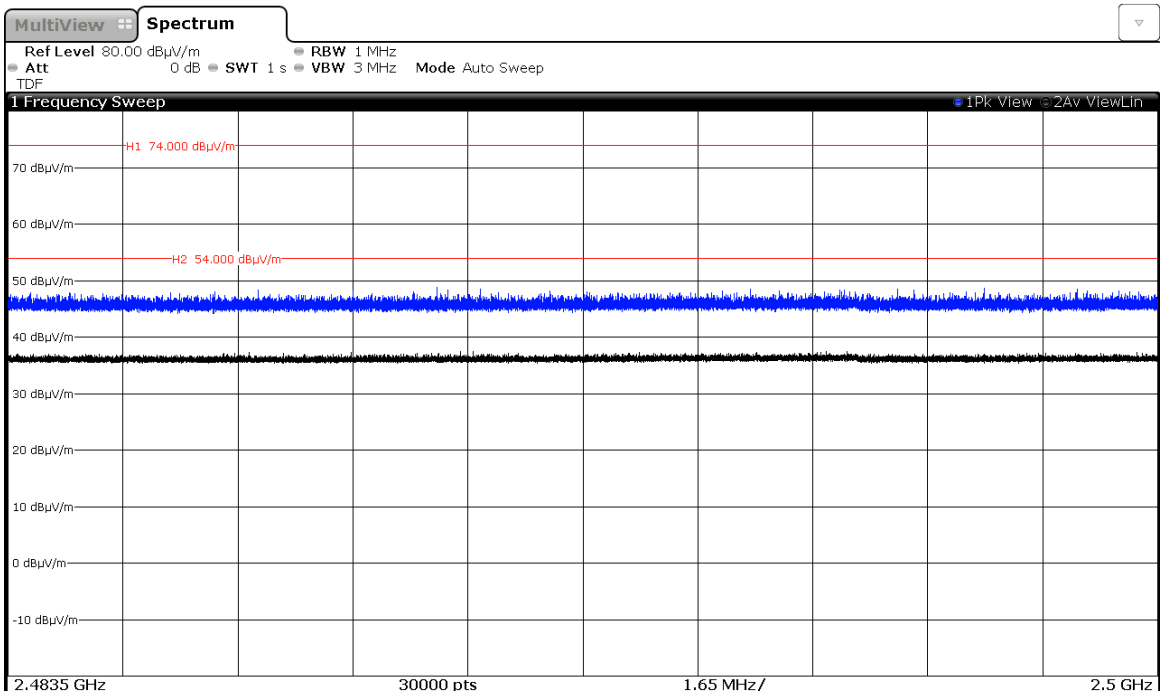


Modulation: 8-DPSK

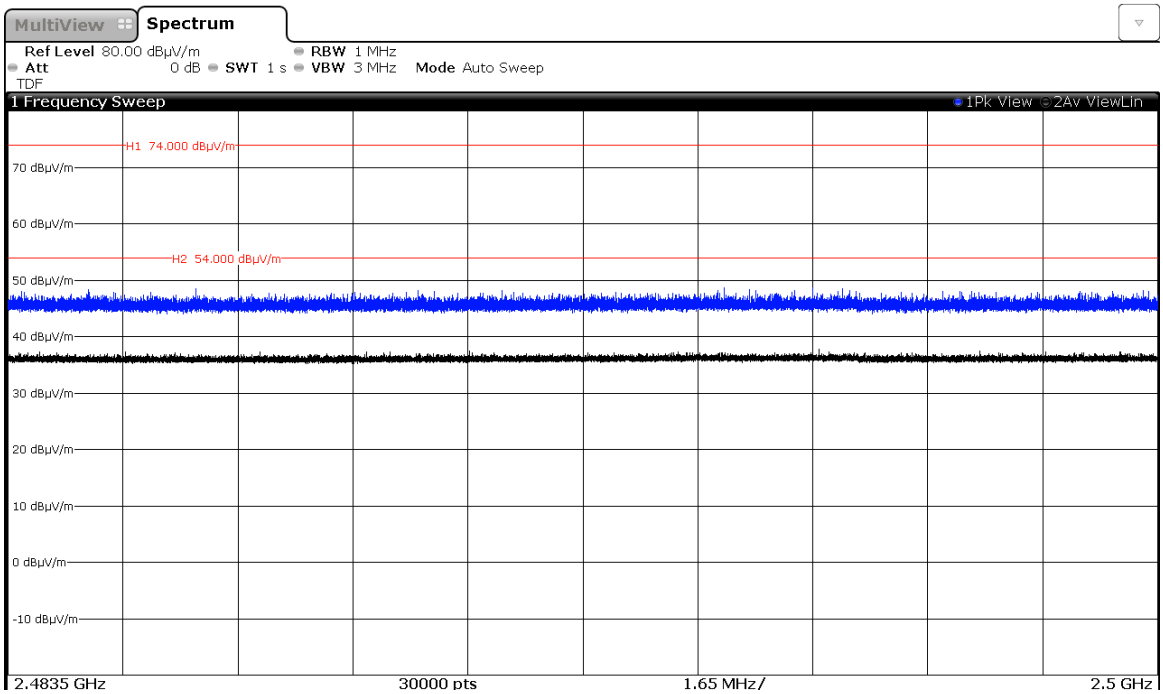


CHANNEL: Middle (2441 MHz).

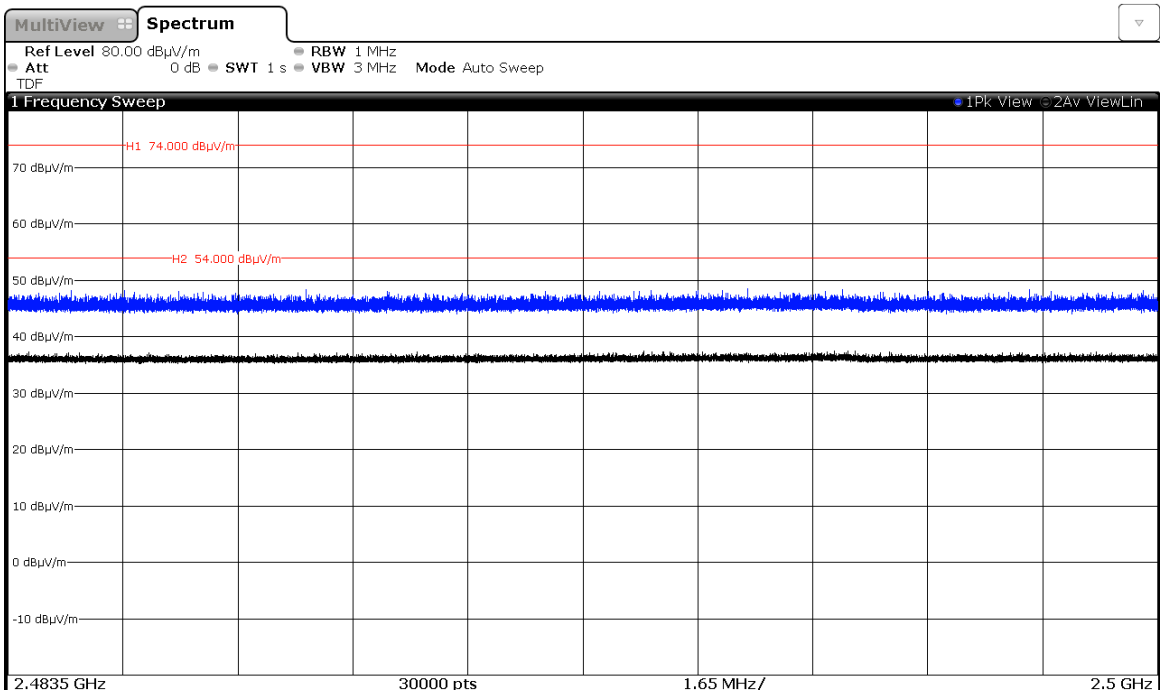
Modulation: GFSK



Modulation: Π/4-DQPSK

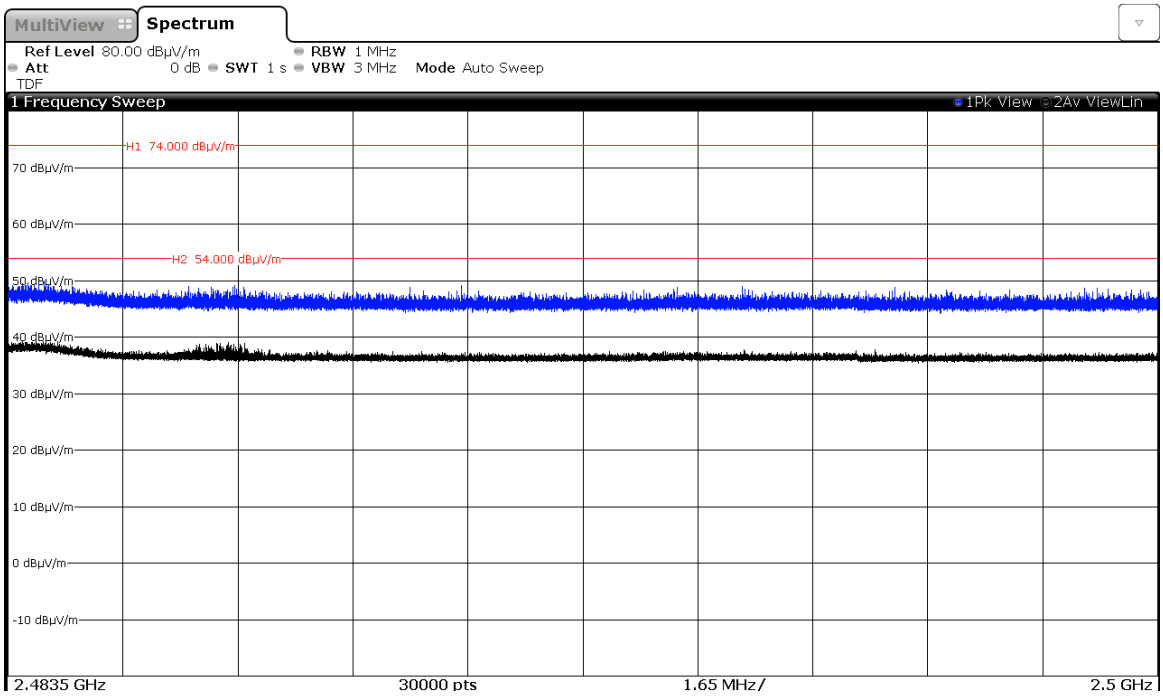


Modulation: 8-DPSK

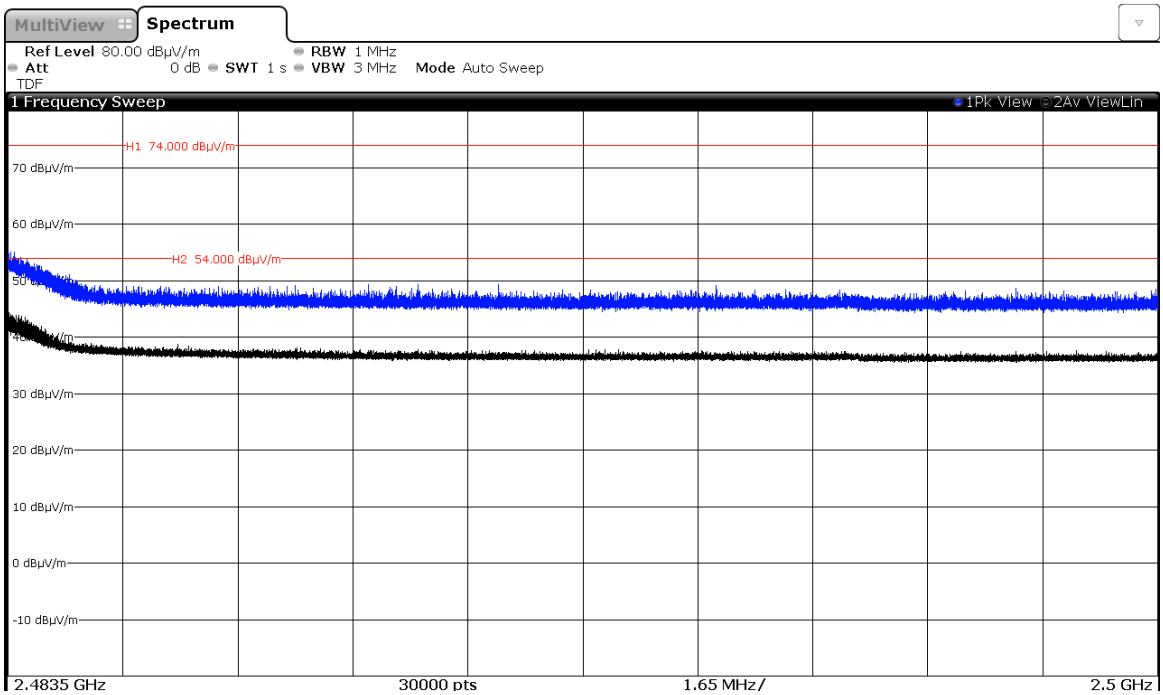
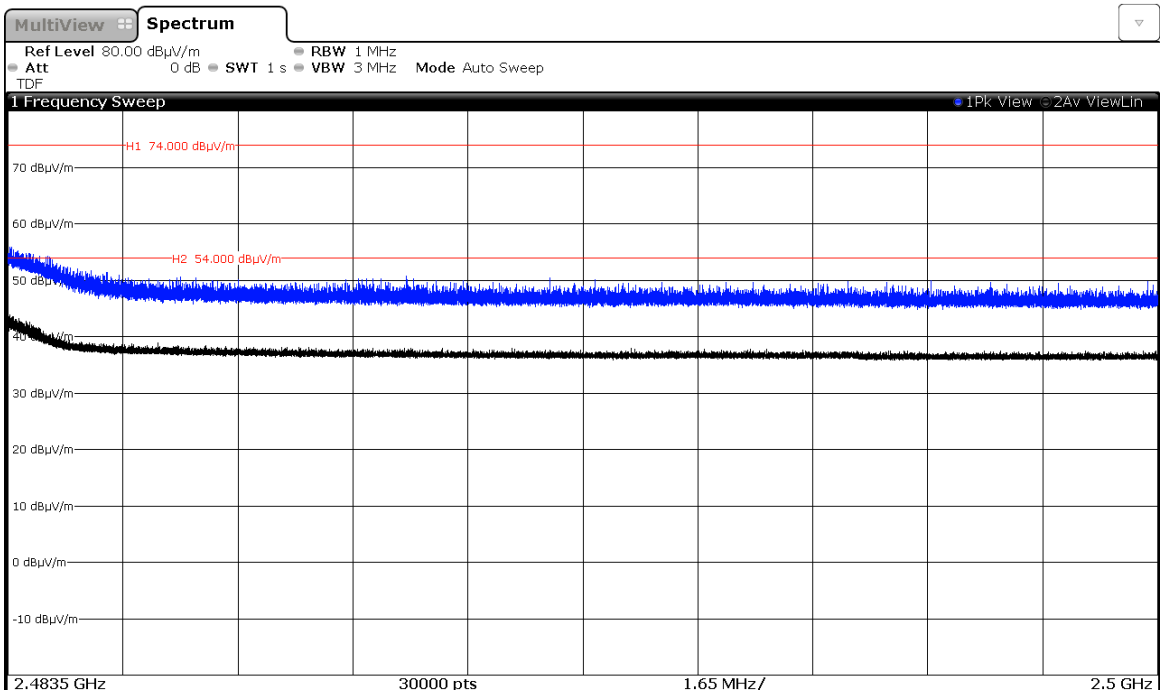


CHANNEL: Highest (2480 MHz).

Modulation: GFSK



Modulation: Π/4-DQPSK



Modulation: 8-DPSK