



FCC LISTED, REGISTRATION
NUMBER: 720267

Informe de ensayo nº:
Test report No:

IC LISTED REGISTRATION
NUMBER IC 4621A-1

NIE: 48193RRF.001A1

Test report (Modification 1)

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.

Identificación del objeto ensayado..... : Identification of item tested	Automotive Radio with Navigation
Marca Trademark	Panasonic
Modelo y/o referencia tipo Model and /or type reference	CA-170-CTPL-HS
Other identification of the product	S/N: T M9 8 6 00028 & T M9 8 6 00002 FCC ID: ACJ-CA-170-CTPLHS IC: 216B-CA170CTPLHS
Final HW version	VP4R MY17 US HW
Final SW version	VP4R MY17 US SW
Características Features	Navi, Tuner, SXM, GPS, Class D Amp, Modem, BT
Fabricante..... Manufacturer	Panasonic Automotive Systems Company of America 776 Highway 74 South, Peachtree City, GA 30269, USA.
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. CANADA RSS-247 Issue 1 (May 2015). CANADA RSS-Gen Issue 4 (November 2014). Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r05 dated 04/08/2016. 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)	Francisco Cañas Regulatory Lab Director
Fecha de realización Date of issue	2016-06-29
Formato de informe No..... Report template No	FDT11_18

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Competences and guarantees

AT4 wireless 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.

AT4 wireless 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 conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

AT4 wireless is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621A-1.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless 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 AT4 wireless at the time of performance of the test.

AT4 wireless 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.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of AT4 wireless.

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 AT4 wireless.
4. This test 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.

Uncertainty

Uncertainty (factor $k=2$) was calculated according to the AT4 wireless 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 N°	Description	Model	Serial N°	Date of reception
48193D/005	Connection cable	---	---	2016-04-05
48193D/033	Antenna Holder	81036-D	---	2016-04-05
48193D/034	Antenna	---	---	2016-04-05
48193D/060	Carplay telematic unit	CA-170-CTPL-HS	T M9 8 6 00028	2016-05-18
48193D/062	Faceplate	---	---	2016-05-18

Auxiliary elements used with the sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
48193D/010	PCB	---	---	2016-04-28
48193D/017	USB adaptor	---	---	2016-04-28
48193D/028	USB cable	---	---	2016-04-28
48193D/029	TTL cable	---	---	2016-04-28

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

All radiated tests indicated in appendix A and appendix B.

Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
48193D/005	Connection cable	---	---	2016-04-05
48193D/007	Carplay telematic unit with temporary antenna connector	CA-170-CTPL-HS	T M9 8 6 00002	2016-04-28

Auxiliary elements used with the sample S/02:

Control N°	Description	Model	Serial N°	Date of reception
48193D/010	PCB	---	---	2016-04-28
48193D/017	USB adaptor	---	---	2016-04-28
48193D/028	USB cable	---	---	2016-04-28
48193D/029	TTL cable	---	---	2016-04-28

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

All conducted tests indicated in appendix A and appendix B.

Test sample description

The test sample consists of a Radio (T1 J6, QNX6.6) with Navi, Tuner, SXM, GPS, Class D Amp, Modem, BT.

Identification of the client

Panasonic Automotive Systems Company of America
776 Highway 74 South, Peachtree City, GA 30269, USA

Testing period

The performed test started on 2016-05-23 and finished on 2016-05-31.

The tests have been performed at AT4 wireless.

Environmental conditions

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
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 °C Max. = 35 °C
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).

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 48193RRF.001 related with the same samples, in the next clauses and sub-clauses:

Clauses / Sub-clauses	Modification	Justification
Cover	The model has been deleted from Trademark	Typo error
Cover	Manufacturer's data has been actualized	Client's request

This modification test report cancels and replaces the test report 48193RRF.001

Remarks and comments

1: Used instrumentation:

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum analyser Agilent E4440A	2015/10	2017/10
2.	DC power supply R&S NGPE 40/40	2014/11	2017/11
3.	RF Bluetooth Test Set Anritsu MT8852B	N.A.	N.A.

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	2014/03	2017/03
3.	Multi Device Controller EMCO 2090	N.A.	N.A.
4.	Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2013/11	2016/11
5.	Broadband Horn antenna 18-40 GHz SCHWARZBECK BBHA 9170	2014/03	2017/03
6.	EMI Test Receiver R&S ESU 40	2016/03	2018/03
7.	Spectrum analyser Rohde & Schwarz FSW50	2015/12	2017/12
8.	RF pre-amplifier 10 MHz-6 GHz SCHWARZBECK BBV9743	2015/09	2016/09
9.	RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-1M	2016/02	2018/02
10.	RF pre-amplifier 18-40 GHz BONN ELEKTRONIK BLMA 1840-1M	2015/12	2017/12
11.	RF Bluetooth Test Set Anritsu MT8852B	N.A.	N.A.

Testing verdicts

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

1. - BTLE

FCC PART 15 PARAGRAPH / RSS-247		VERDICT			
		NA	P	F	NM
Section 15.247 Subclause (a) (2) / RSS-247 5.2. (1)	6 dB Bandwidth		P		
Section 15.247 Subclause (b) / RSS-247 5.4. (4)	Maximum output power and antenna gain		P		
Section 15.247 Subclause (d) / RSS-247 5.5	Emission limitations conducted (Transmitter)		P		
Section 15.247 Subclause (d) / RSS-247 5.5. ...	Band-edge emissions compliance (Transmitter)		P		
Section 15.247 Subclause (e) / RSS-247 5.2. (2)	Power spectral density		P		
Section 15.247 Subclause (d) / RSS-247 5.5. ...	Emission limitations radiated (Transmitter)		P		

2. - BT EDR

FCC PART 15 PARAGRAPH / RSS-247		VERDICT			
		NA	P	F	NM
FCC 15.247 Subclause (a) (1) / RSS-247 Clause 5.1 (2)	20 dB Bandwidth and Carrier frequency separation		P		
FCC 15.247 Subclause (a)(1)(iii) / RSS-247 Clause 5.1 (4)	Number of hopping channels		P		
FCC 15.247 Subclause (a)(1)(iii) / RSS-247 Clause 5.1 (4)	Time of occupancy (Dwell Time)		P		
FCC 15.247 Subclause (b) / RSS-247 Clause 5.4 (2)	Maximum peak output power and antenna gain		P		
FCC 15.247 Subclause (d) / RSS-247 Clause 5.5	Emission limitations conducted (Transmitter)		P		
FCC 15.247 Subclause (d) / RSS-247 Clause 5.5	Emission limitations radiated (Transmitter)		P		

Appendix A – Test result (Bluetooth Low Energy)

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TEST CONDITIONS

Power supply (V):

$V_{\text{nominal}} = 12.9 \text{ Vdc}$

Type of power supply = External power supply (Battery).

Type of antenna = Integral antenna.

Declared Gain for antenna (maximum) = 0 dBi

TEST FREQUENCIES:

Lowest channel: 2402 MHz

Middle channel: 2440 MHz

Highest channel: 2480 MHz

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is directly connected to the spectrum analyzer.



RADIATED MEASUREMENTS

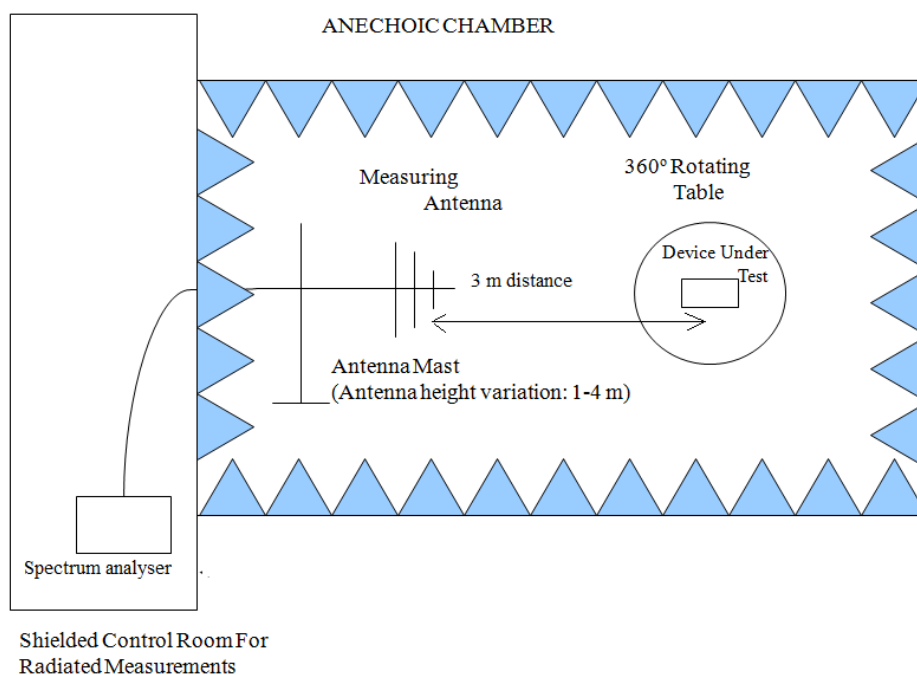
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40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

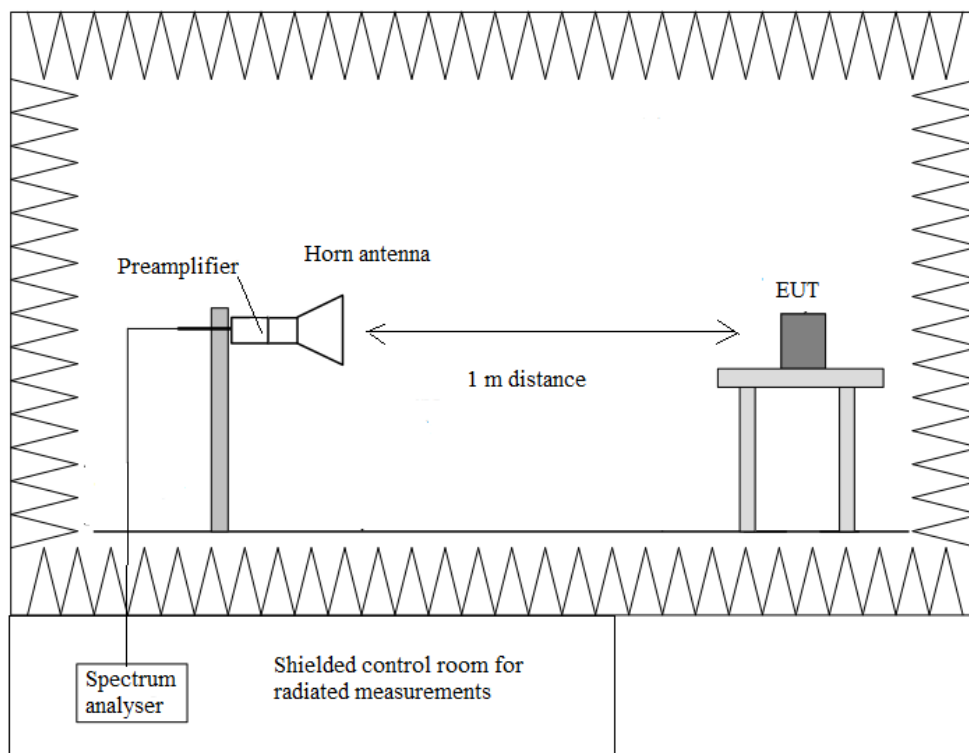
The equipment under test was set up on a non-conductive (wooden) platform 1.5 meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

Radiated measurements setup $f < 1$ GHz



Radiated measurements setup $f > 1$ GHz



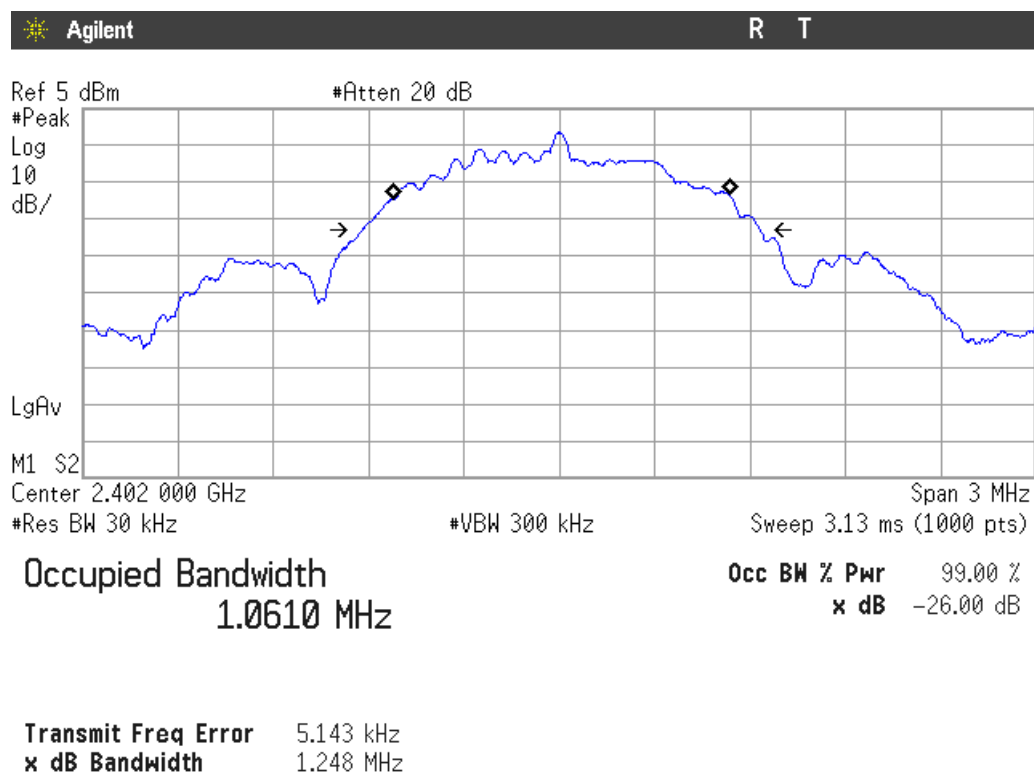
Occupied Bandwidth

RESULTS

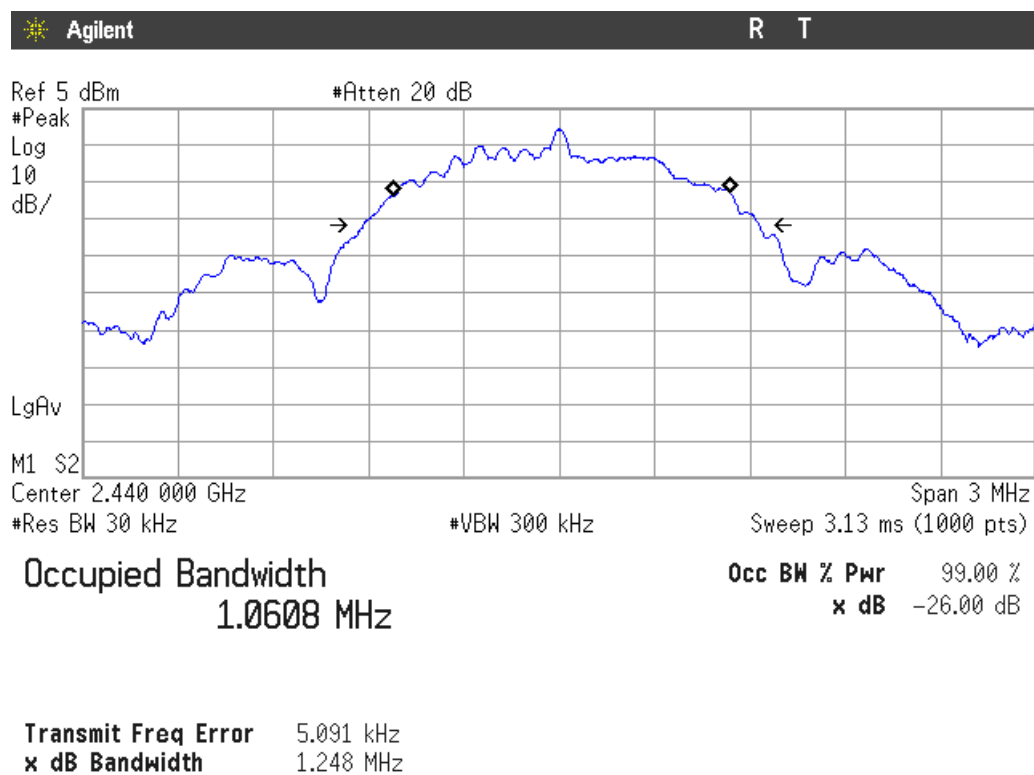
(see next plots).

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
99% bandwidth (MHz)	1.061	1.061	1.061
-26 dBc bandwidth (MHz)	1.248	1.248	1.251
Measurement uncertainty (kHz)	<± 5.0		

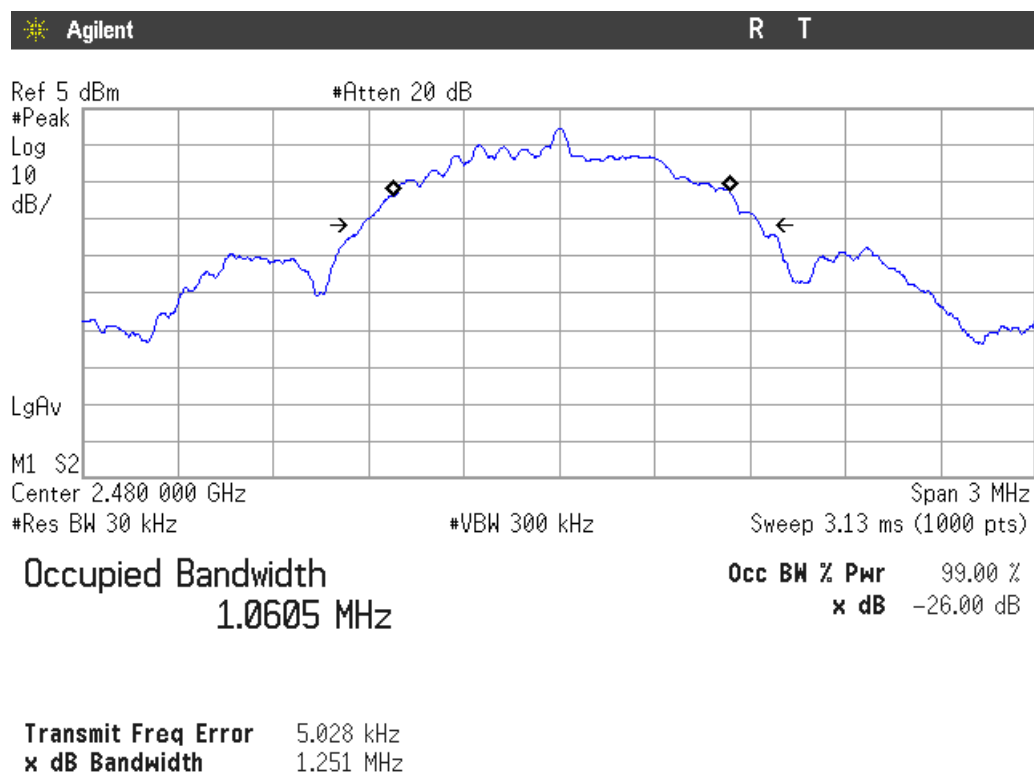
Lowest Channel



Middle Channel



Highest channel



Section 15.247 Subclause (a) (2) / RSS-247 5.2. (1). 6 dB Bandwidth

SPECIFICATION

The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

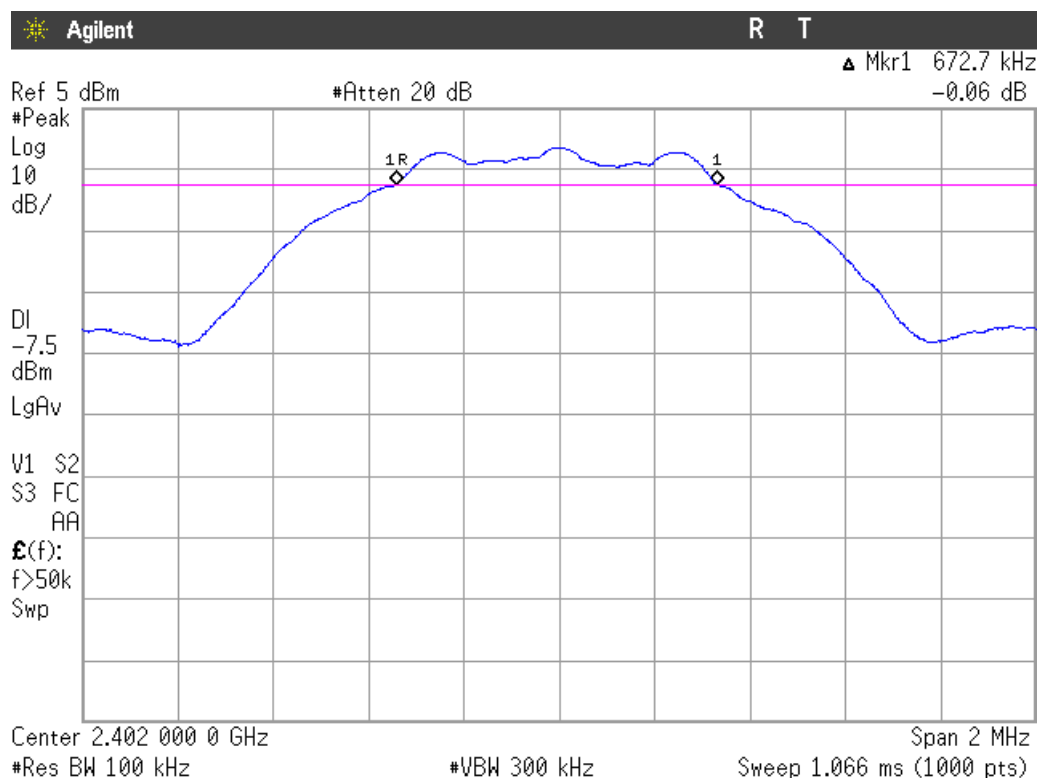
6 dB Bandwidth (see next plots).

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
6 dB Spectrum bandwidth (kHz)	672.7	678.7	680.7
Measurement uncertainty (kHz)	<±11.0		

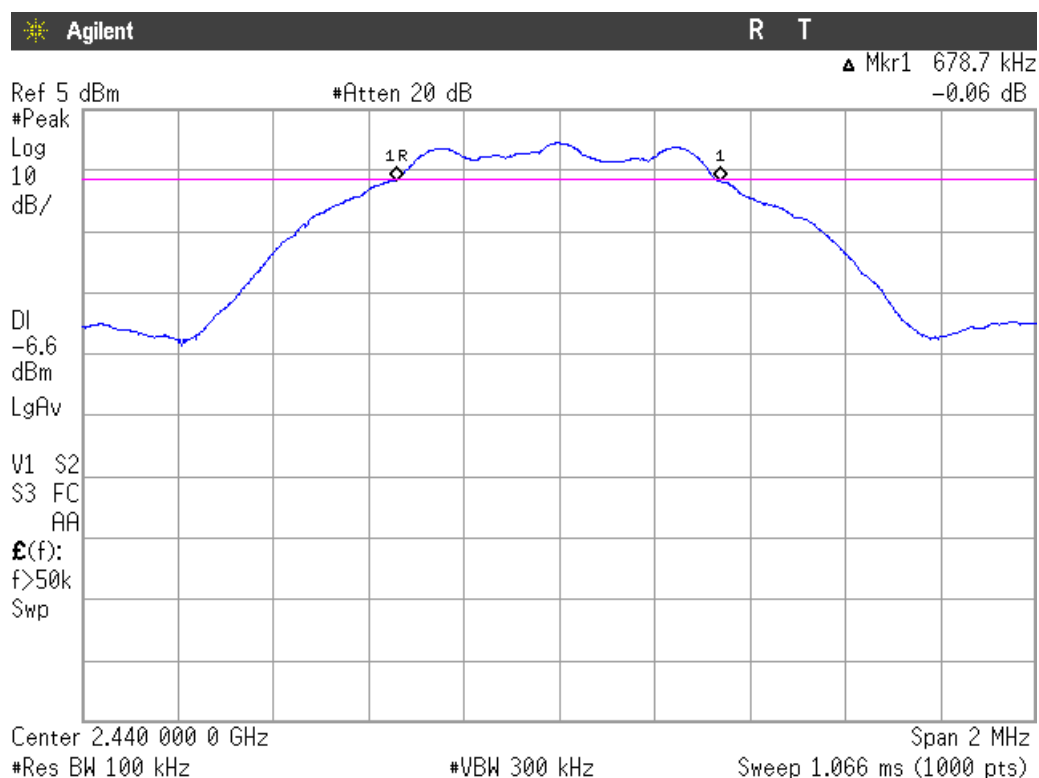
Verdict: PASS

6 dB BANDWIDTH.

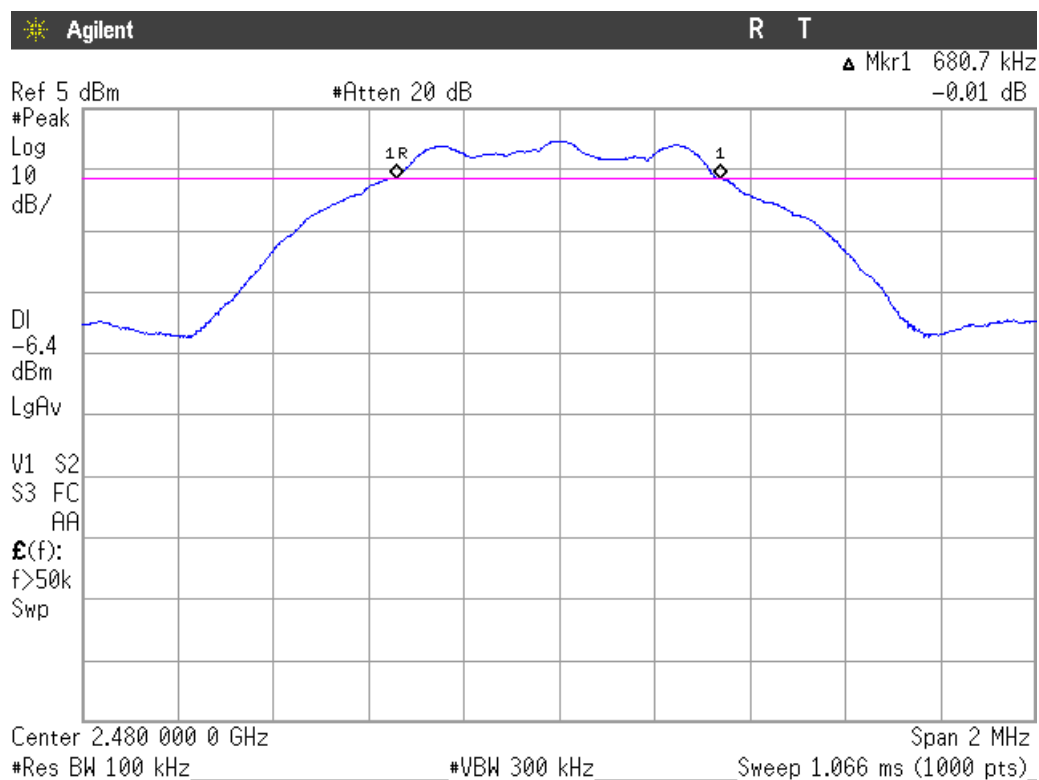
Lowest Channel



Middle Channel



Highest Channel



Section 15.247 Subclause (b) / RSS-247 5.4. (4). Maximum output power and antenna gain

SPECIFICATION

For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).

The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

RESULTS

The maximum peak conducted output power was measured using the method according to point 9.1.1. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r05 dated 04/08/2016.

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

MAXIMUM OUTPUT POWER. See next plots.

Maximum declared antenna gain: 0 dBi.

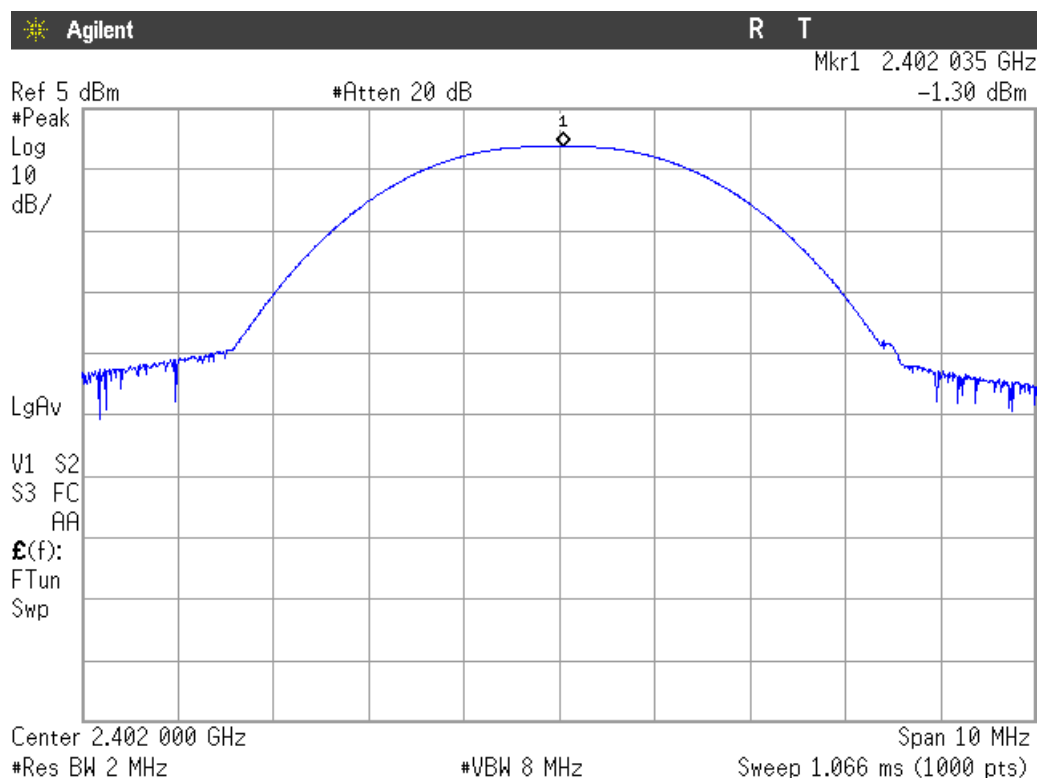
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	-1.30	-0.42	-0.17
Maximum EIRP power (dBm)	-1.30	-0.42	-0.17
Measurement uncertainty (dB)	<±0.78		

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.

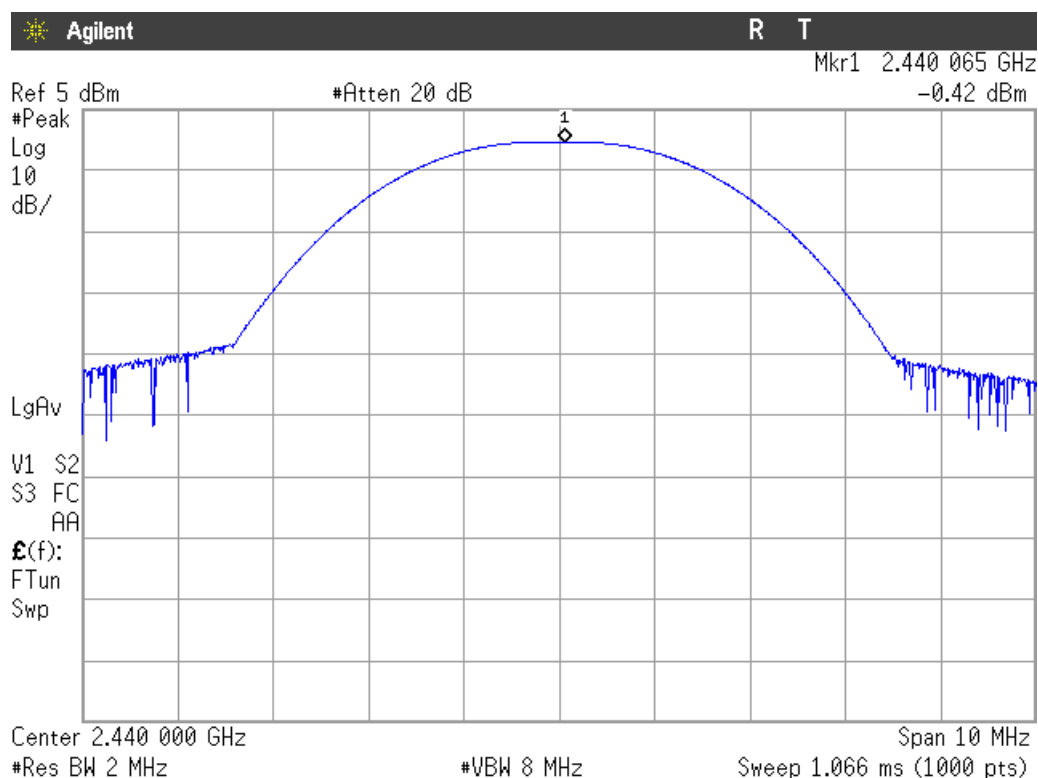
Verdict: PASS

CONDUCTED PEAK POWER.

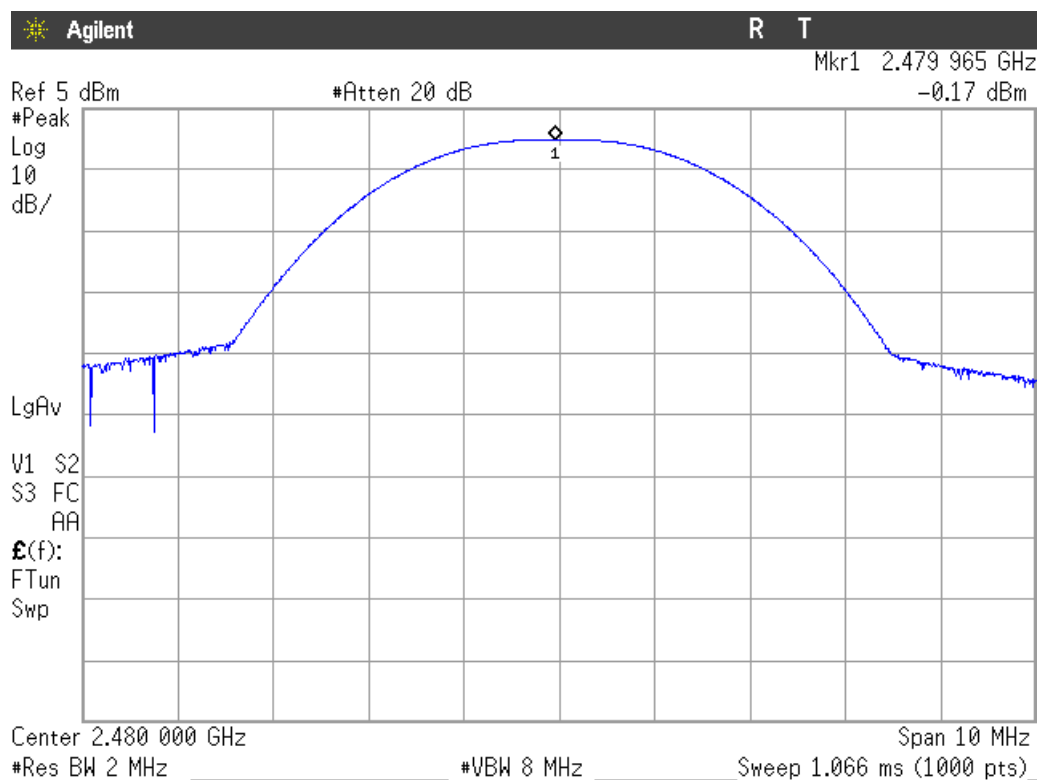
Lowest frequency



Middle frequency



Highest frequency



Section 15.247 Subclause (d) / RSS-247 5.5. Emission limitations conducted (Transmitter)

SPECIFICATION

In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

RESULTS:

Reference Level Measurement

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Reference Level Measurement (dBm)	-1.48	-0.59	-0.37
Measurement uncertainty (dB)	<±0.78		

Lowest frequency 2402 MHz:

All peaks are more than 20 dB below the limit.

Middle frequency 2440 MHz:

All peaks are more than 20 dB below the limit.

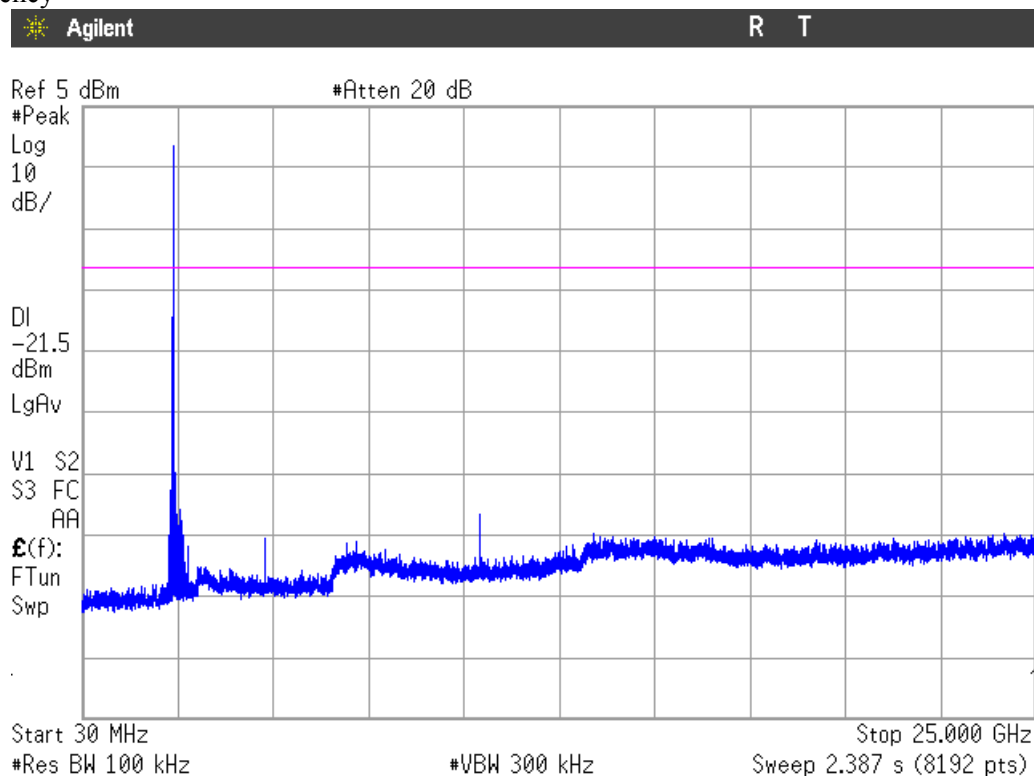
Highest frequency 2480 MHz:

All peaks are more than 20 dB below the limit.

Measurement uncertainty (dB): < 2.03

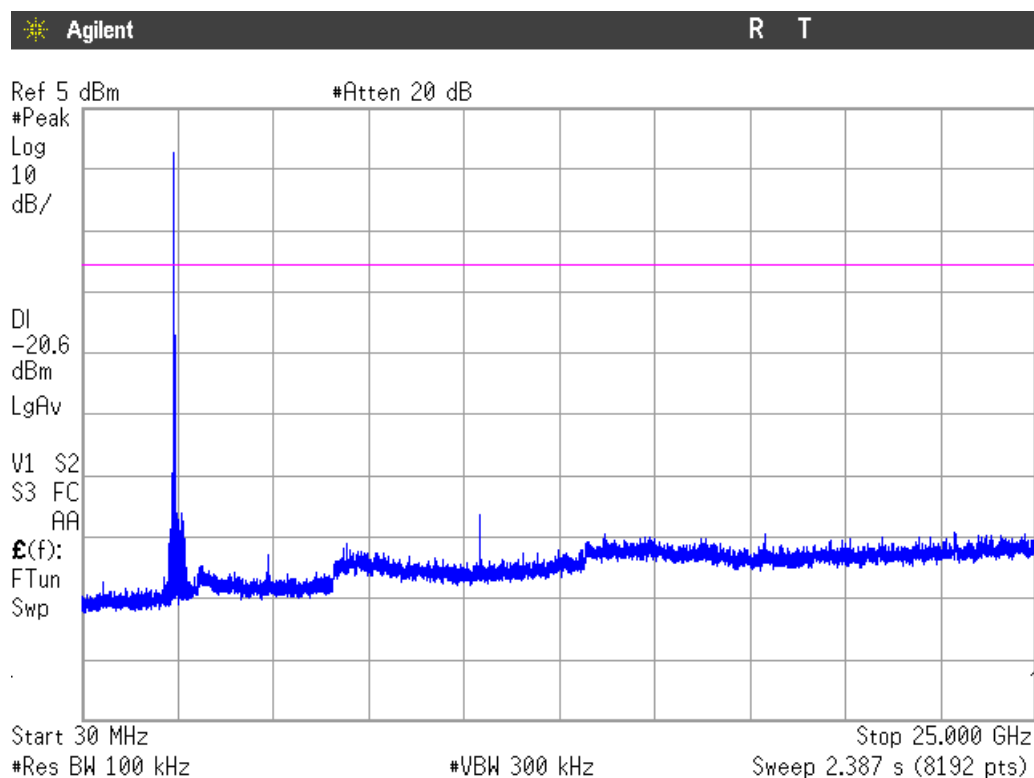
Verdict: PASS

Lowest frequency



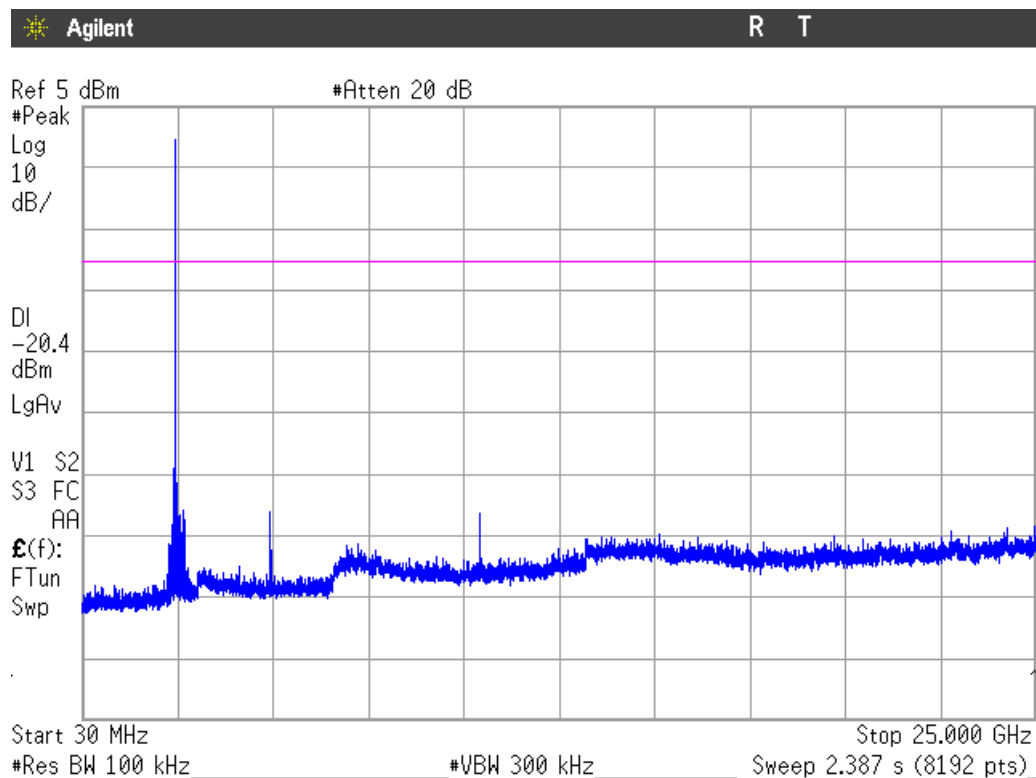
Note: The peak shown in the plot above the limit is the carrier frequency.

Middle frequency



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

Highest frequency



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

Section 15.247 Subclause (d) / RSS-247 5.5. Band-edge emissions compliance (Transmitter)

SPECIFICATION

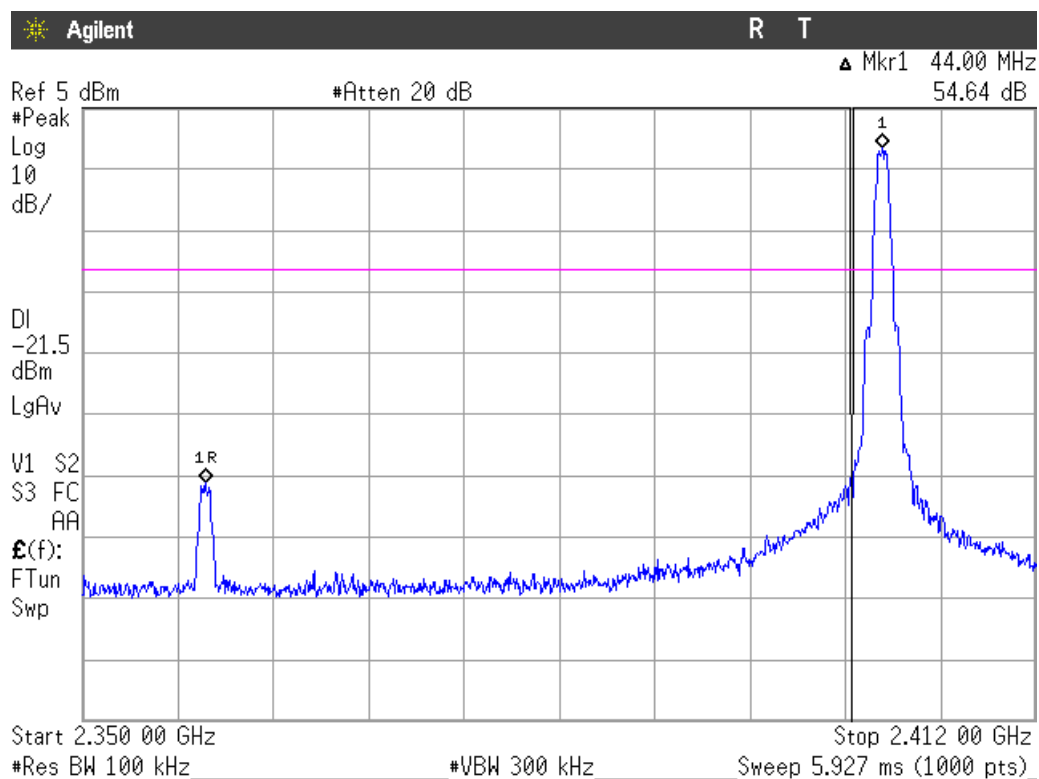
In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

RESULTS:

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

1. LOW FREQUENCY SECTION. CONDUCTED.

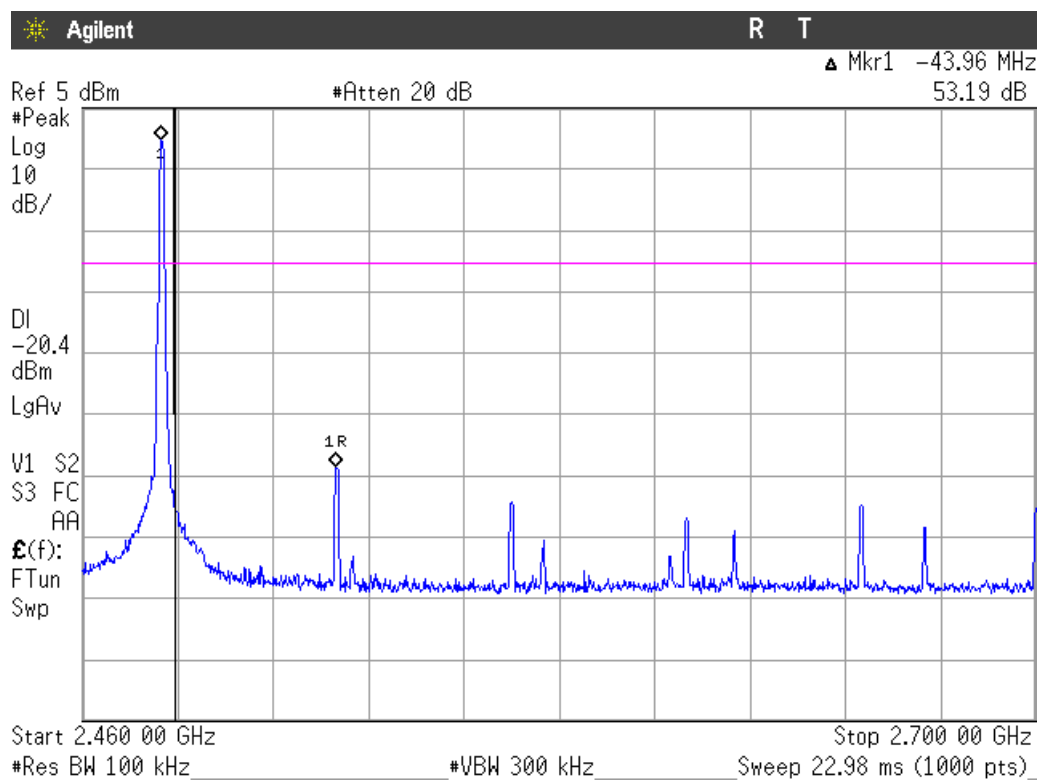
See next plot.



Verdict: PASS

2. HIGH FREQUENCY SECTION. CONDUCTED.

See next plot.



Measurement uncertainty (dB)	< ±2.03
------------------------------	---------

Verdict: PASS

Section 15.247 Subclause (e) / RSS-247 5.2. (2) Power spectral density

SPECIFICATION

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

The maximum power spectral density level in the fundamental emission was measured using the method PKPSD (Peak PSD) according to point 10.2. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v03r05 dated 04/08/2016.

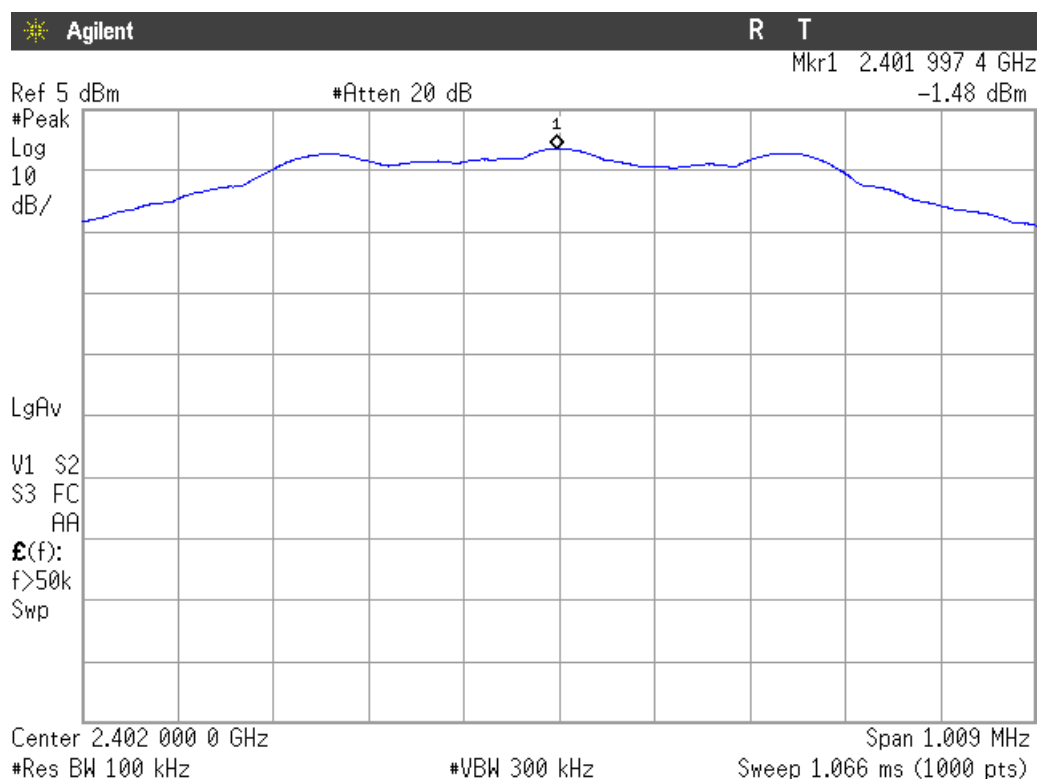
Power spectral density (see next plots).

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Power spectral density (dBm)	-1.48	-0.61	-0.37
Measurement uncertainty (dB)	<±0.78		

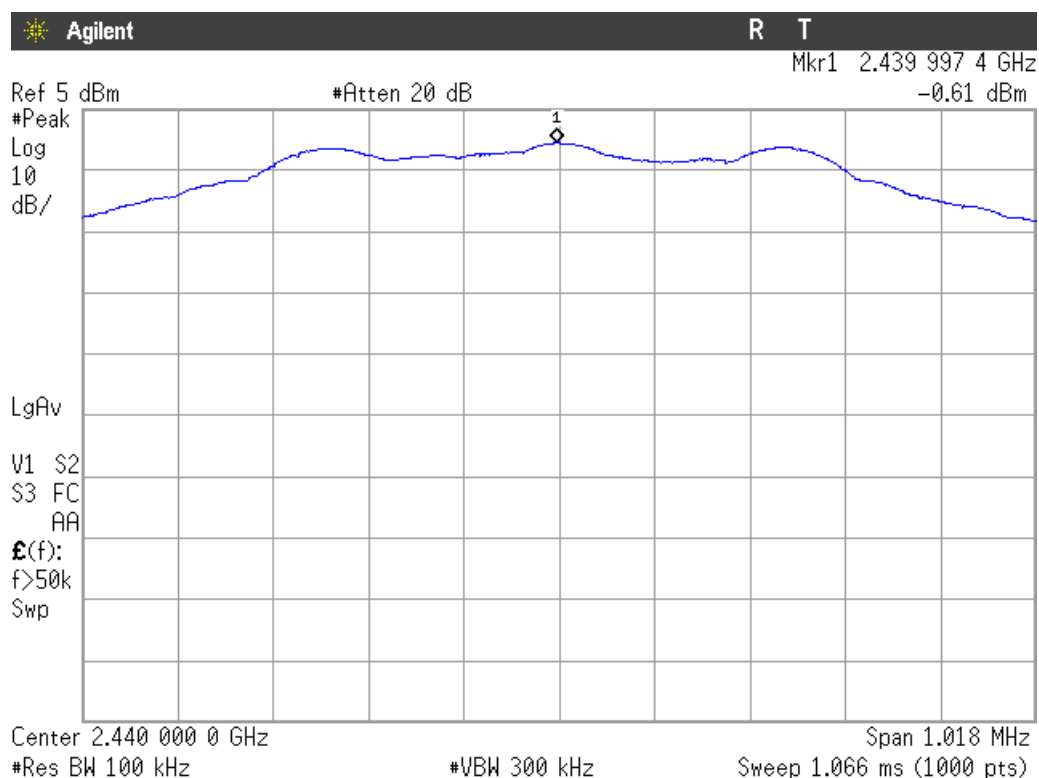
Verdict: PASS

POWER SPECTRAL DENSITY

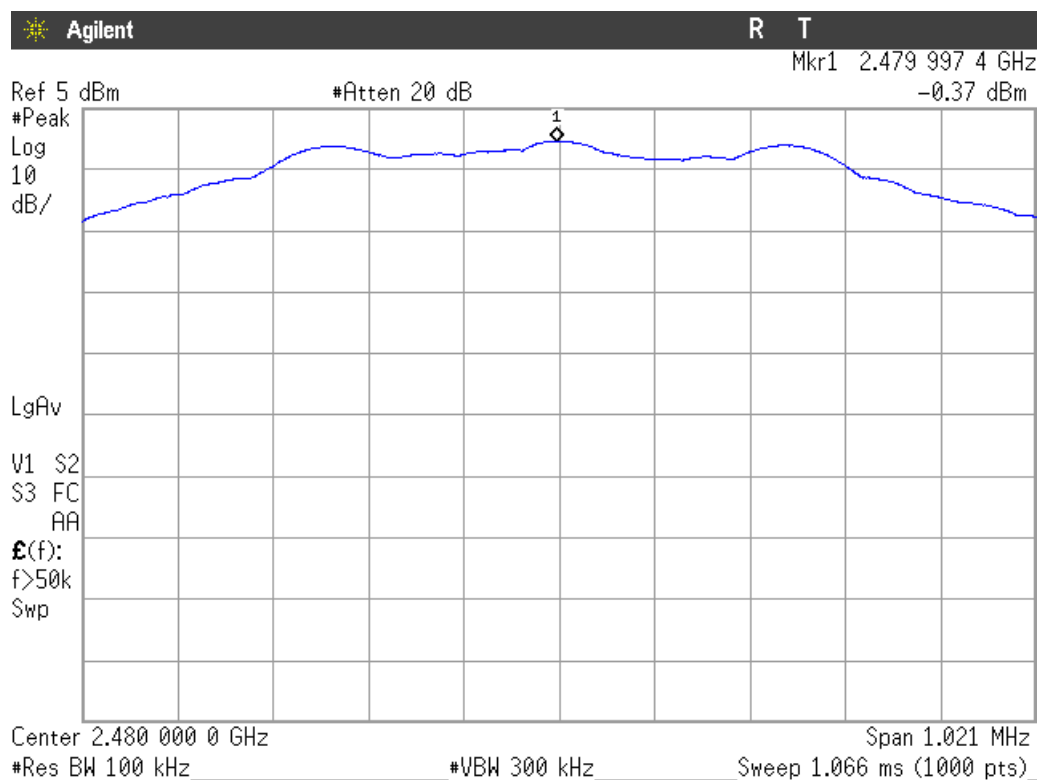
Lowest Channel



Middle Channel



Highest Channel



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

SPECIFICATION

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)) / RSS-Gen 8.9.:

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 situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

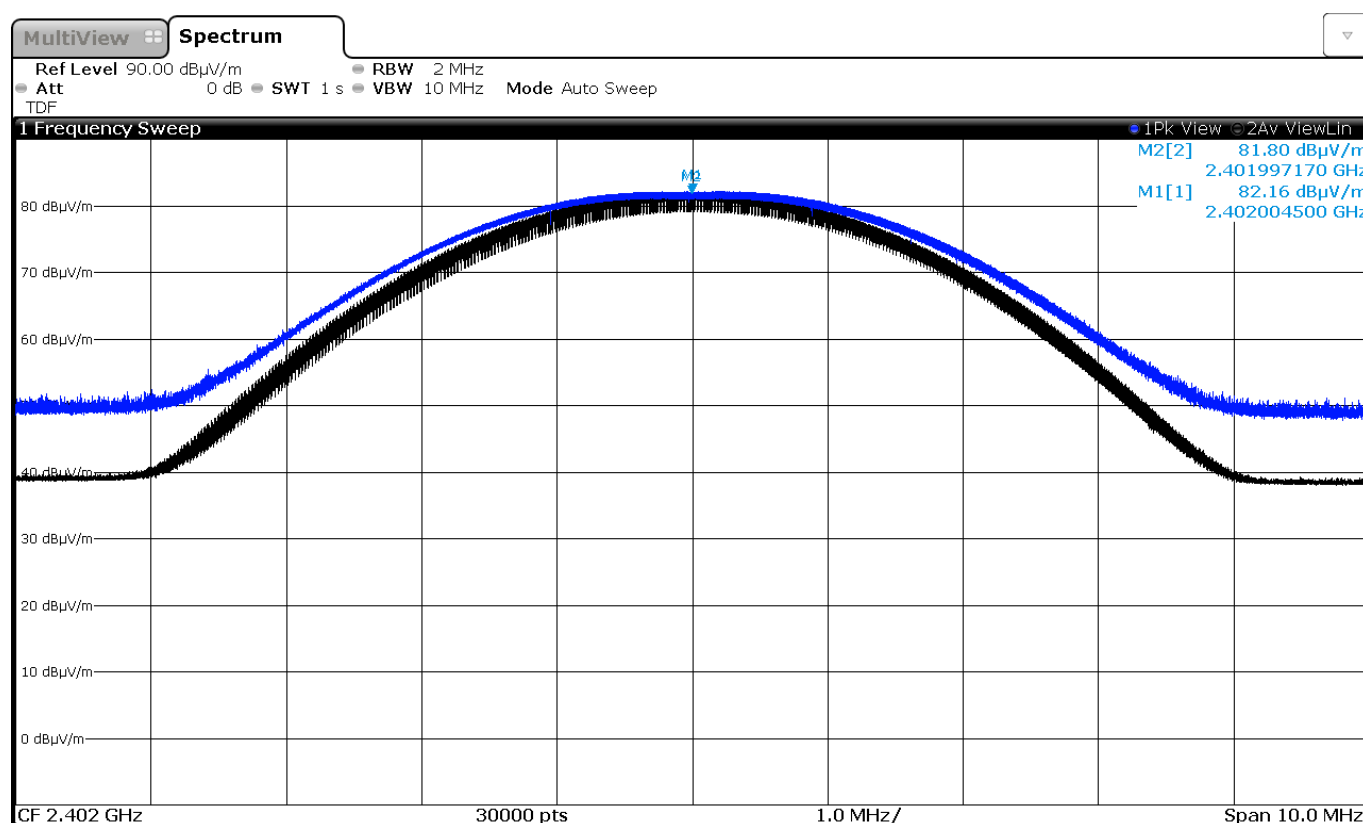
All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 GHz.

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.

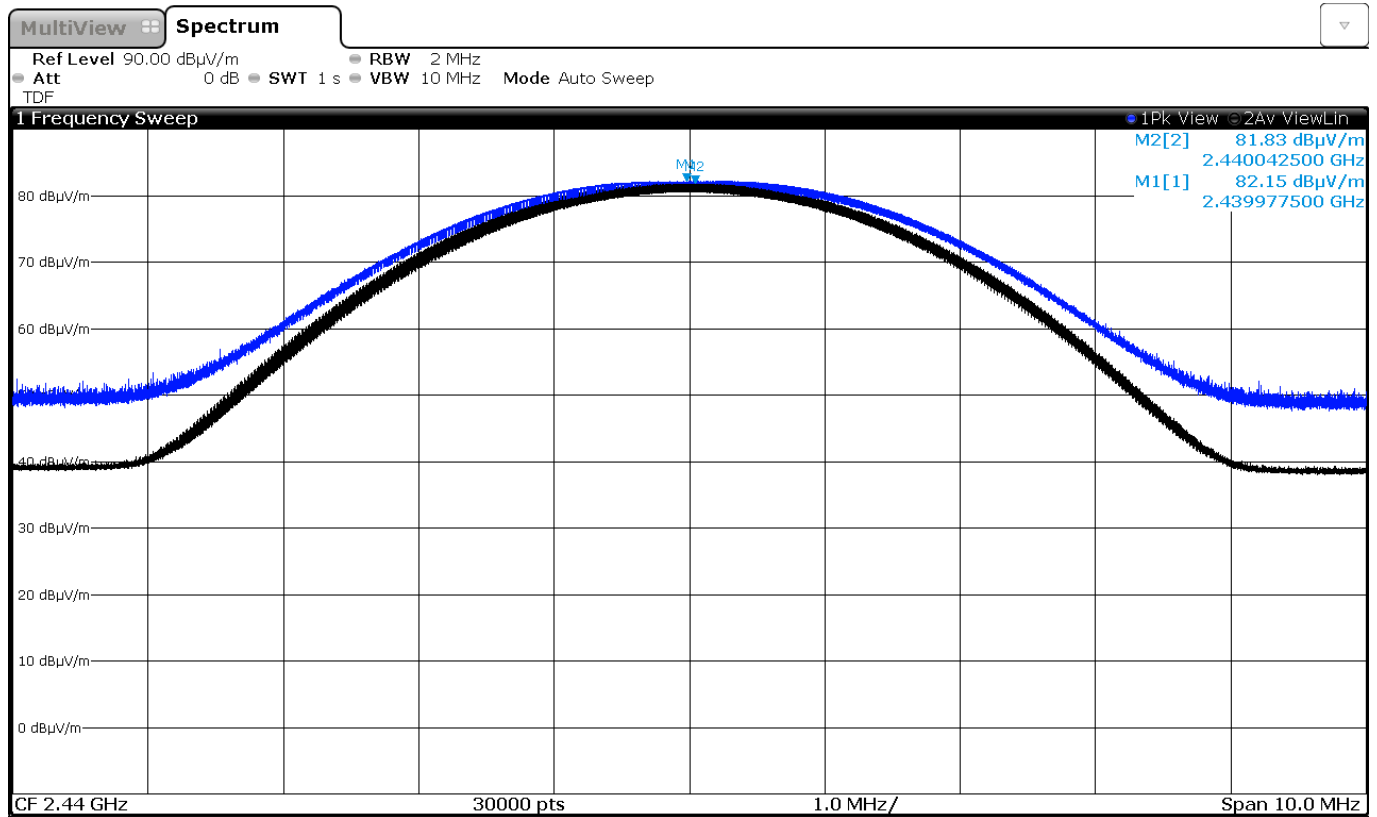
CARRIER FIELD STRENGTH

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Field strength (dB μ V/m) average	81.80	81.83	83.38
Field strength (dB μ V/m) peak	82.16	82.15	83.80
Measurement uncertainty (dB)	< $\pm$ 4.87		

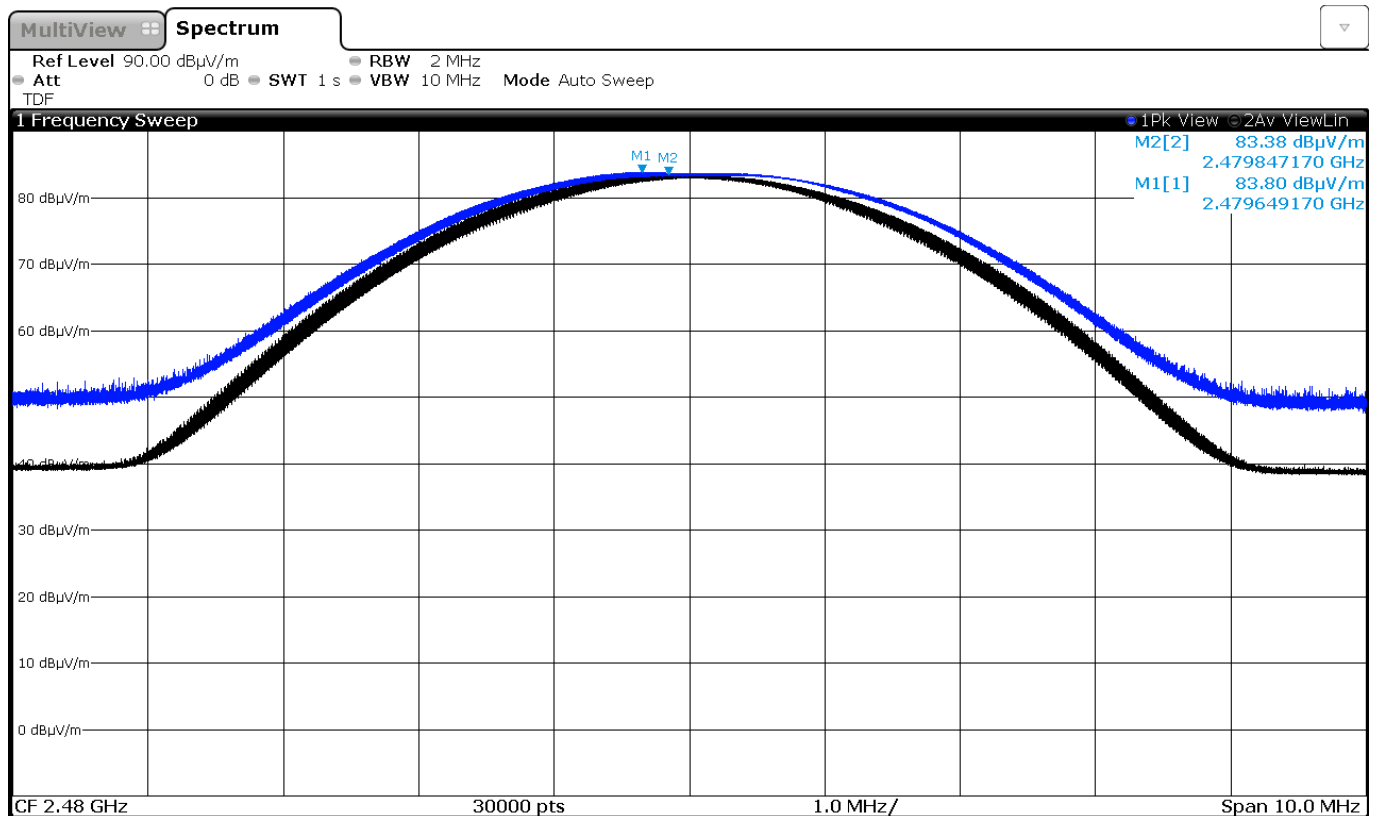
Lowest Channel



Middle Channel



Highest Channel



Frequency range 30 MHz-1000 MHz.

The spurious signals detected do not depend on the operating channel.

Spurious levels operating (radiated) closest to limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
56.093	V	Quasi-Peak	37.73	± 3.88
168.419	H	Quasi-Peak	40.03	± 3.88
224.582	V	Quasi-Peak	36.00	± 3.88
280.648	H	Quasi-Peak	34.84	± 3.88
392.974	V	Quasi-Peak	40.54	± 3.88
617.626	V	Quasi-Peak	35.85	± 3.88
665.641	H	Quasi-Peak	38.70	± 3.88
719.961	H	Quasi-Peak	36.31	± 3.88
768.073	V	Quasi-Peak	36.51	± 3.88
815.894	H	Quasi-Peak	46.99 (*)	± 3.88
912.021	H	Quasi-Peak	41.38	± 3.88
960.036	H	Quasi-Peak	38.84	± 3.88

(*): Emission in non-restricted frequency bands. The emission level is 20dBc below the carrier level.

Frequency range 1 GHz-25 GHz

The results in the next tables show the maximum measured levels in the 1-25 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz (see next plots).

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.

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
1.00723	H	Peak	48.13	± 4.87
1.10343	H	Peak	48.59	± 4.87
1.19943	V	Peak	47.66	± 4.87
1.29557	H	Peak	50.01	± 4.87
1.48837	H	Peak	47.68	± 4.87
1.91997	H	Peak	47.81	± 4.87
2.33000	V	Peak	48.46	± 4.87

2. CHANNEL: MIDDLE (2440 MHz).

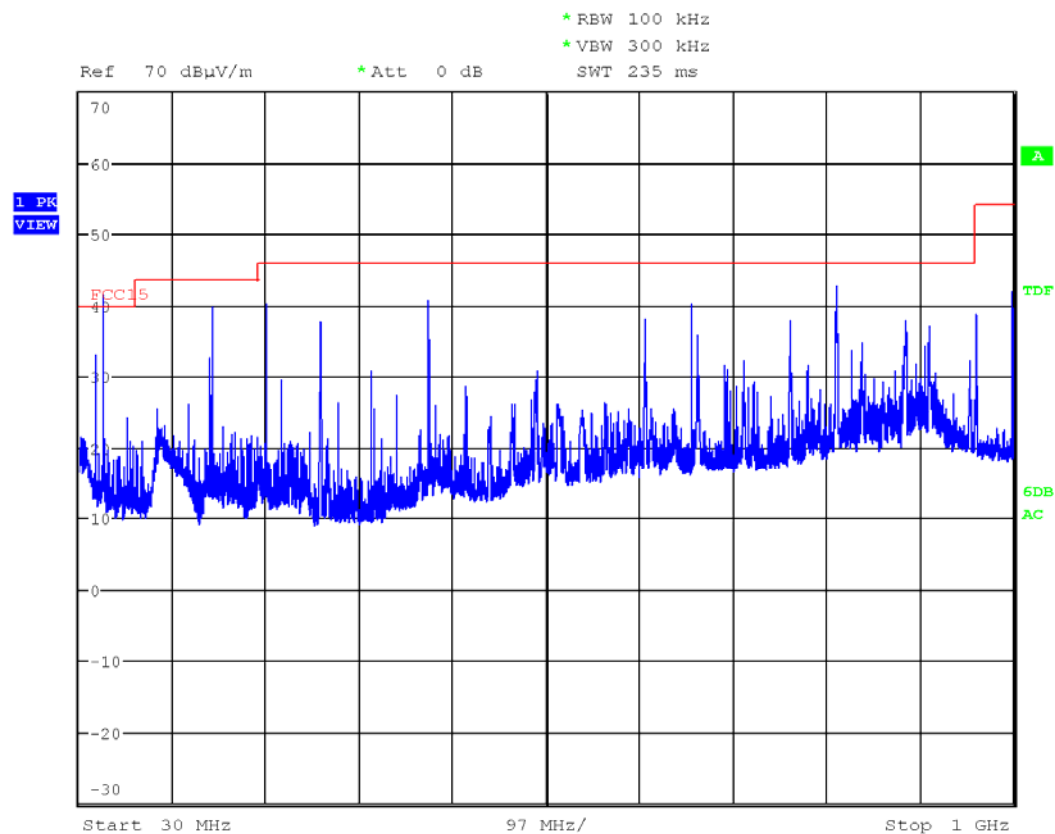
Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
1.0079	H	Peak	48.18	± 4.87
1.10557	H	Peak	48.63	± 4.87
1.19963	H	Peak	47.73	± 4.87
1.29530	H	Peak	50.32	± 4.87
1.39143	V	Peak	47.51	± 4.87
1.91983	H	Peak	47.65	± 4.87
2.32958	H	Peak	48.12	± 4.87

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
1.10517	H	Peak	49.14	± 4.87
1.19930	H	Peak	47.02	± 4.87
1.29497	H	Peak	50.10	± 4.87
1.39243	V	Peak	47.91	± 4.87
1.48843	H	Peak	47.30	± 4.87
1.92030	V	Peak	47.74	± 4.87
2.32943	V	Peak	48.11	± 4.87

Verdict: PASS

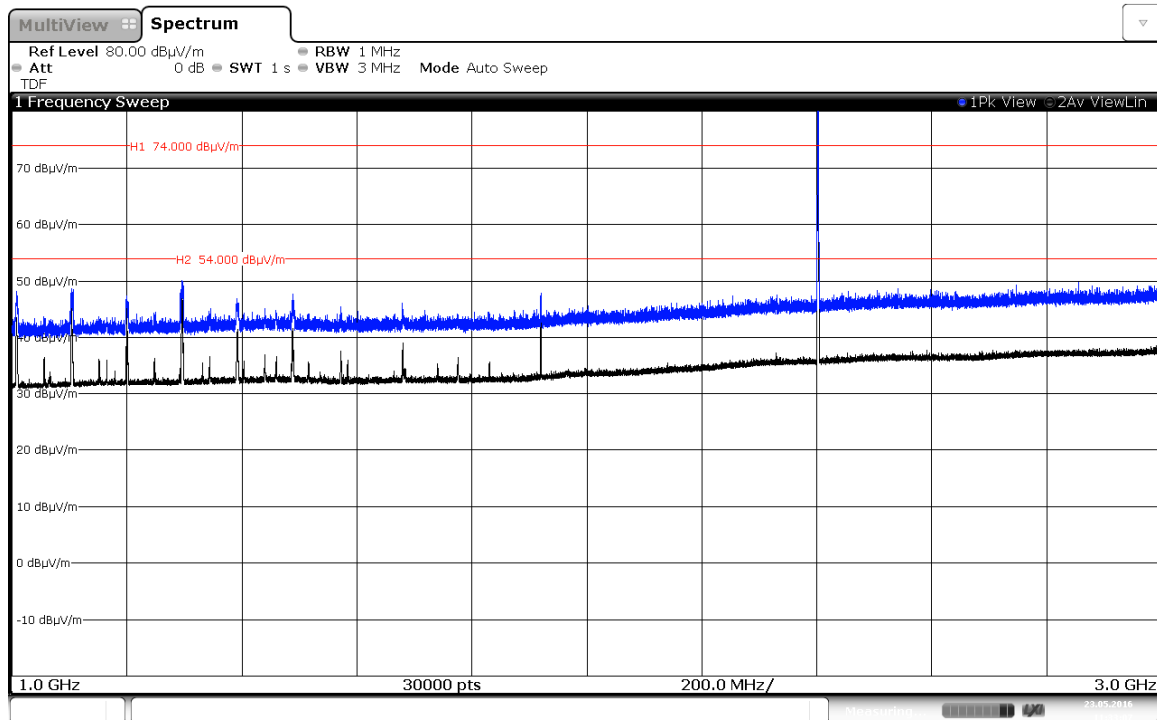
FREQUENCY RANGE 30 MHz-1000 MHz.



(This plot is valid for all three channels).

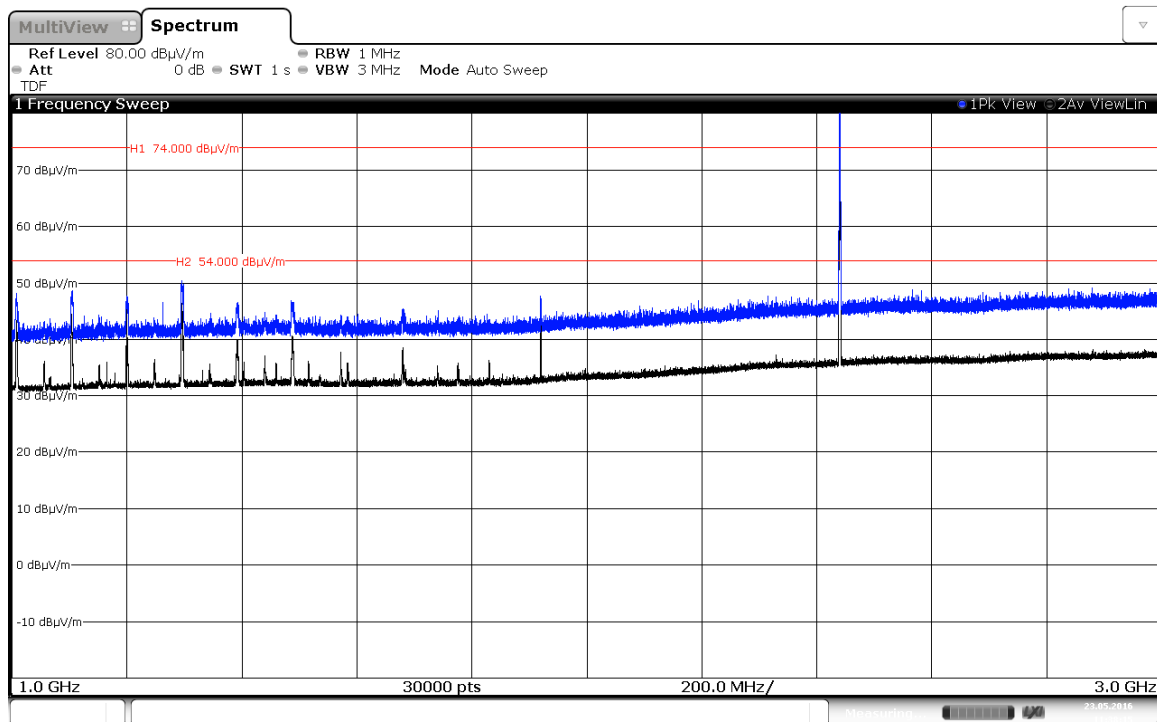
FREQUENCY RANGE 1 GHz to 3 GHz.

CHANNEL: Lowest (2402 MHz).



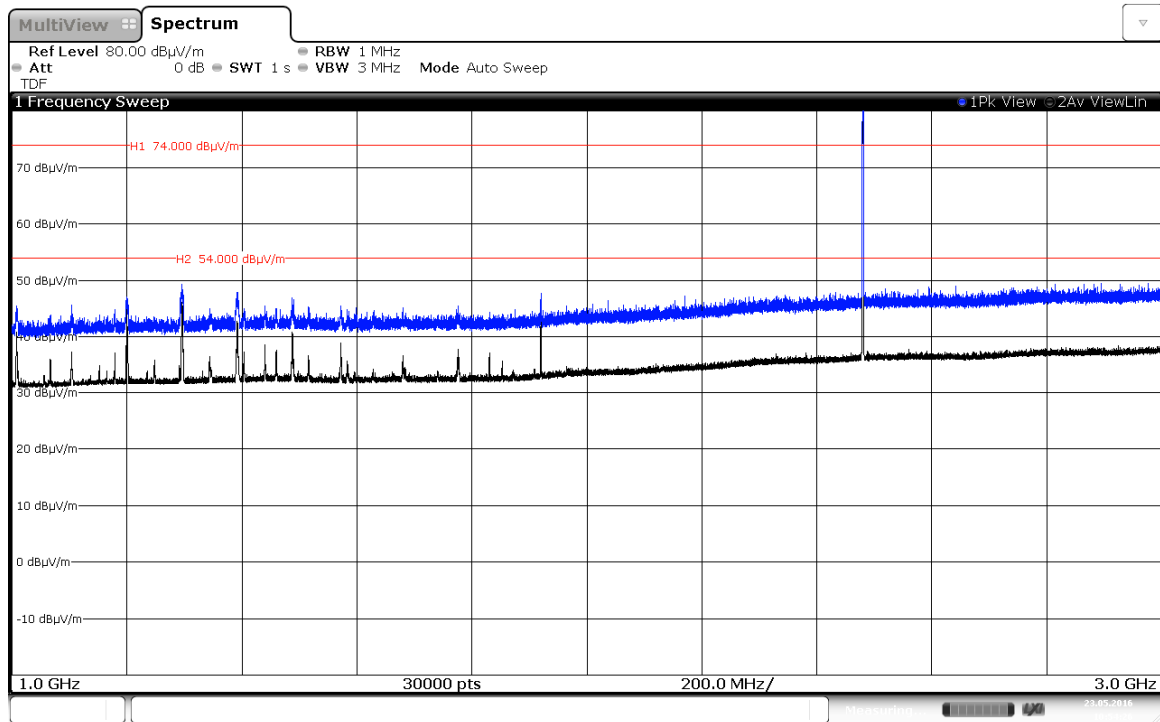
Note: The peak shown in the plot above the limit is the carrier frequency.

CHANNEL: Middle (2440 MHz).



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

CHANNEL: Highest (2480 MHz).

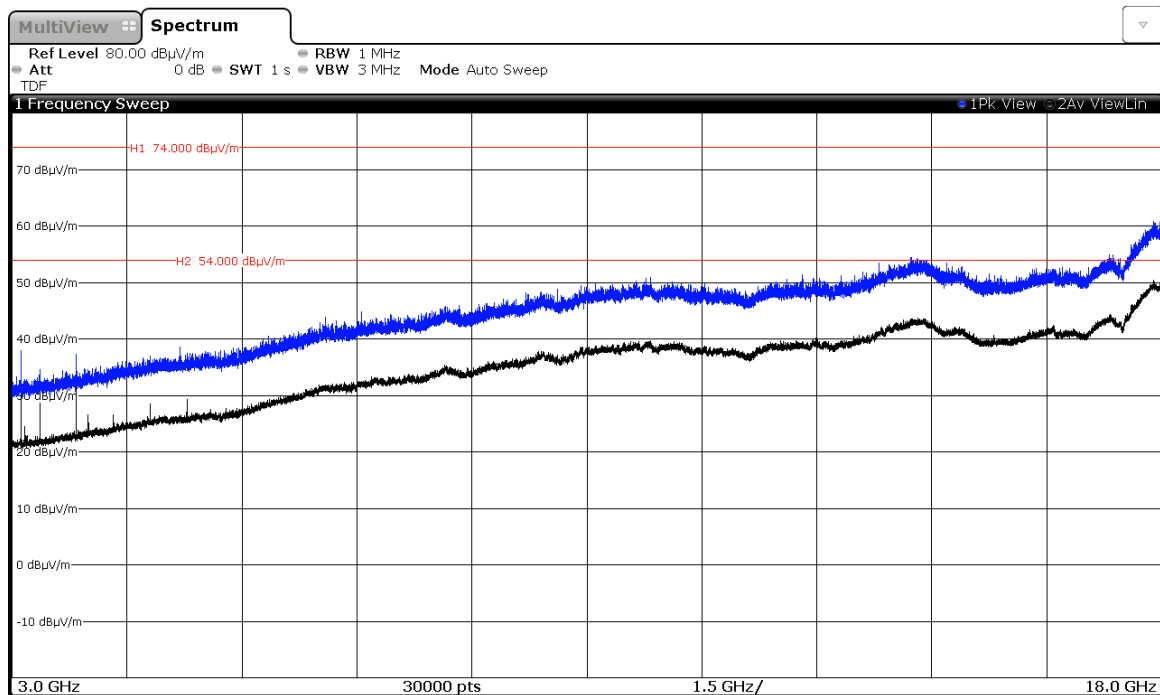


Date: 23.MAY.2016 10:54:26

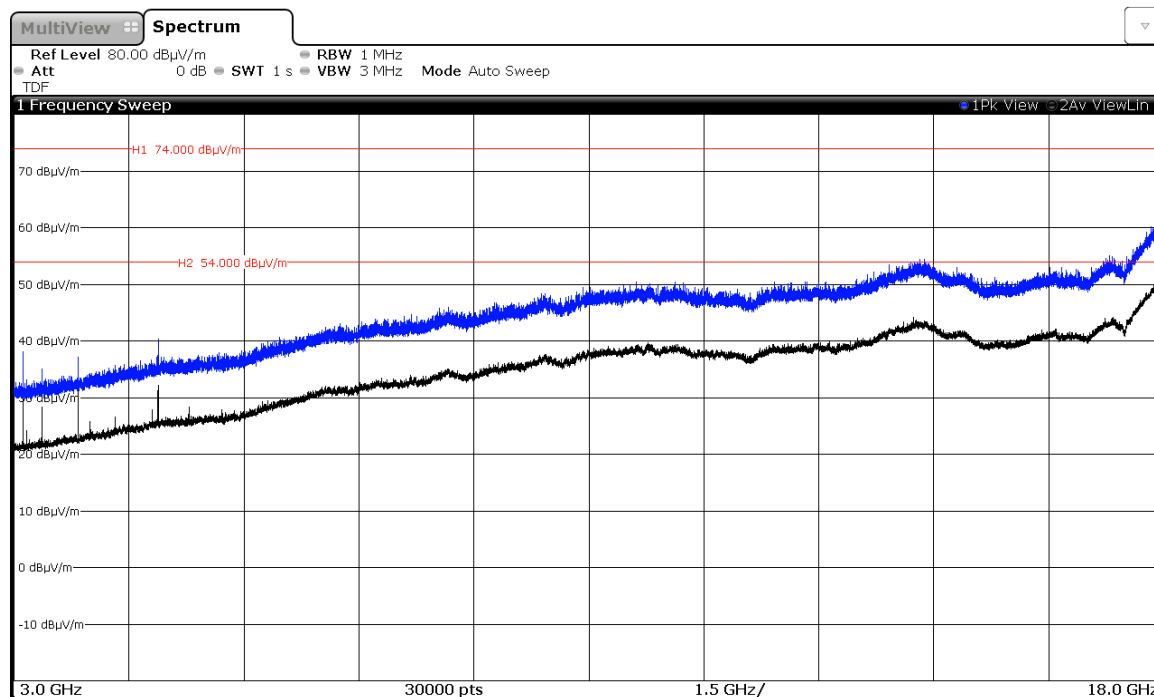
Note: The peak shown in the plot above the limit is the carrier frequency.

FREQUENCY RANGE 3 GHz to 18 GHz.

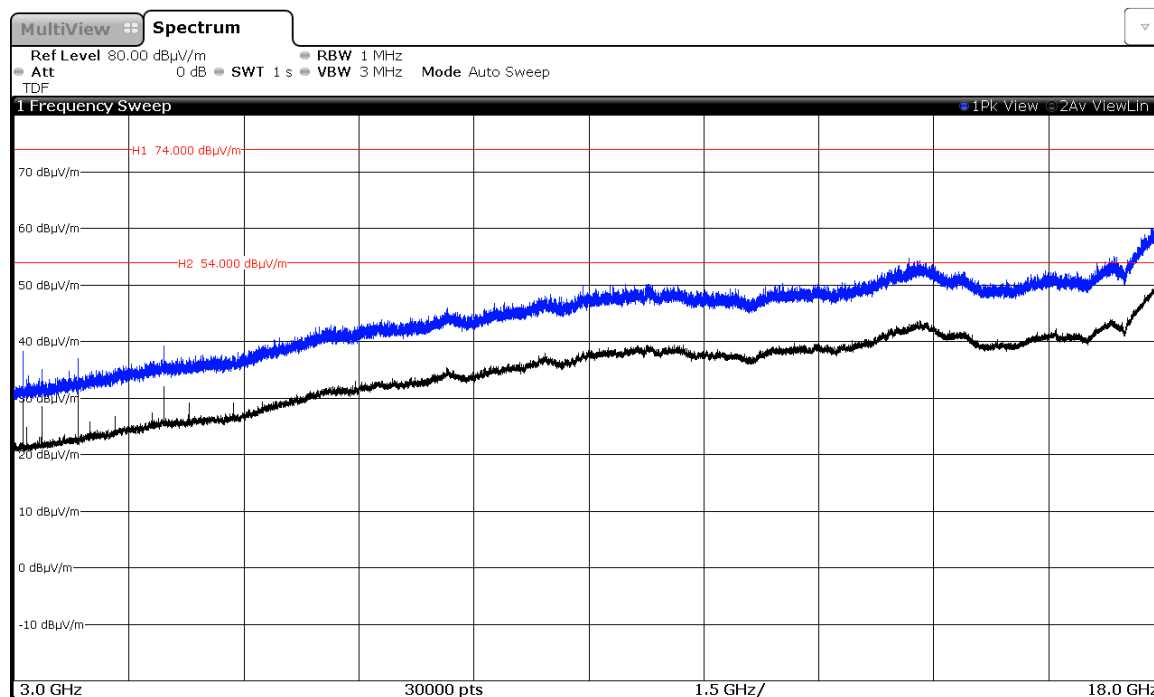
CHANNEL: Lowest (2402 MHz).



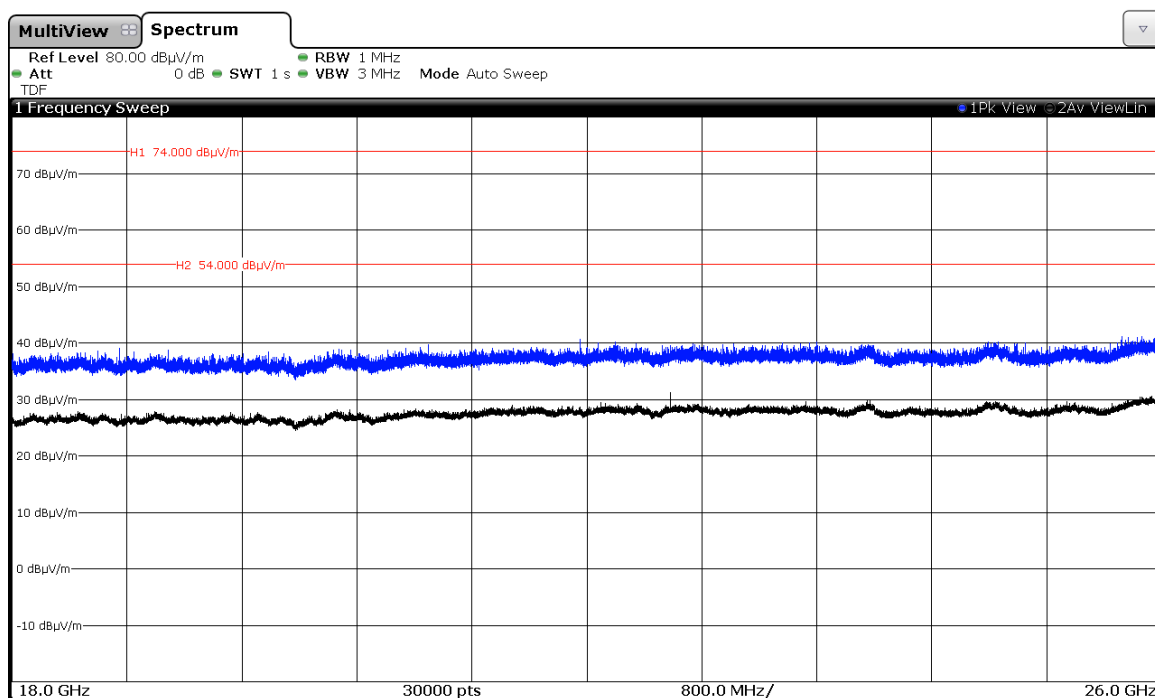
CHANNEL: Middle (2440 MHz).



CHANNEL: Highest (2480 MHz).



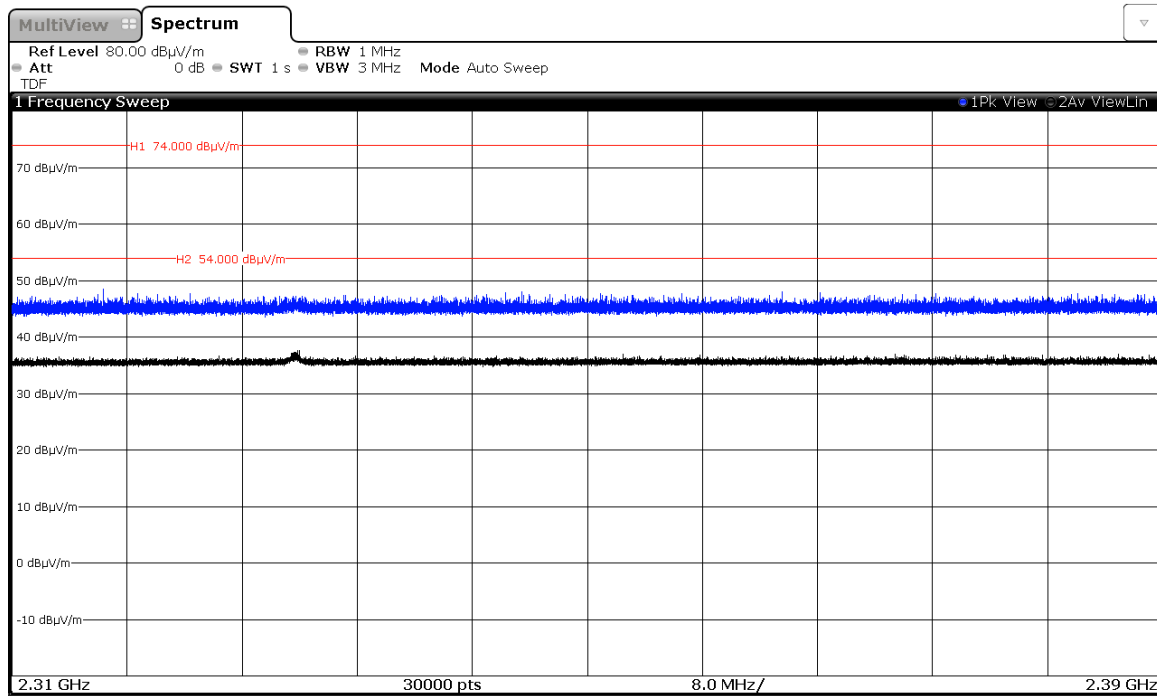
FREQUENCY RANGE 18 GHz to 26 GHz.



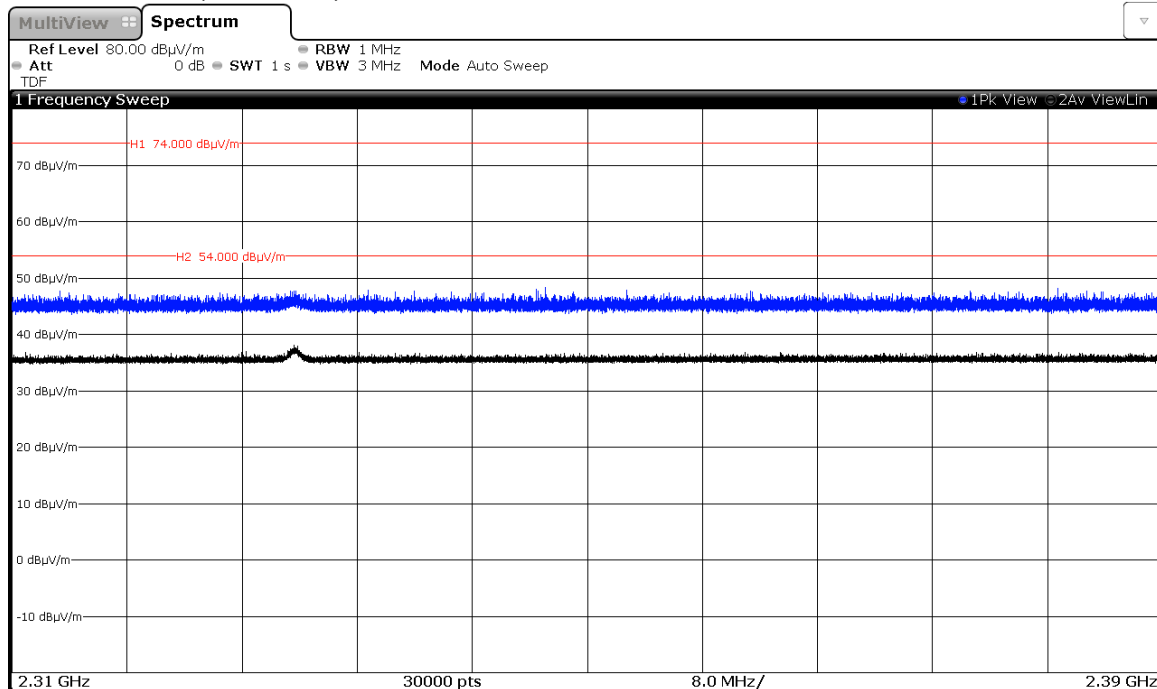
(This plot is valid for all three channels).

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

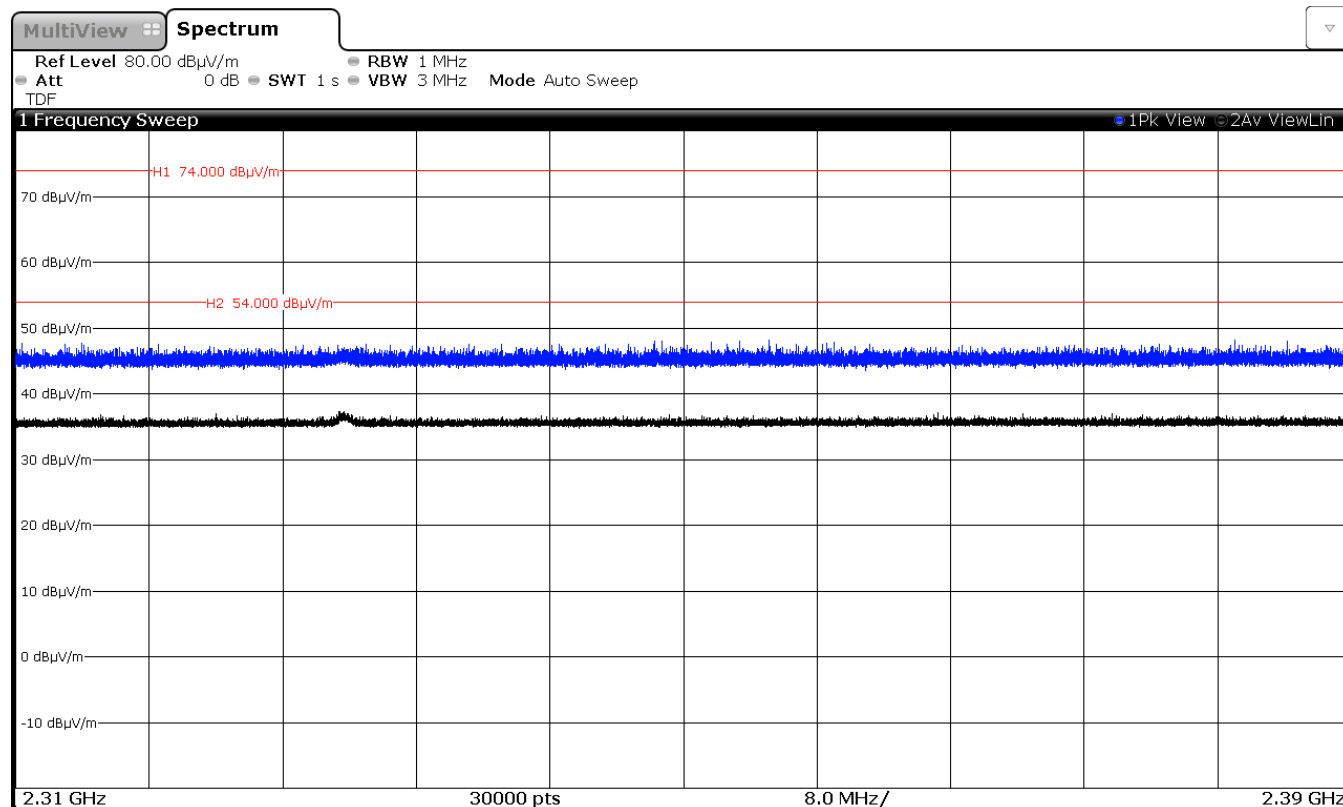
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2440 MHz).

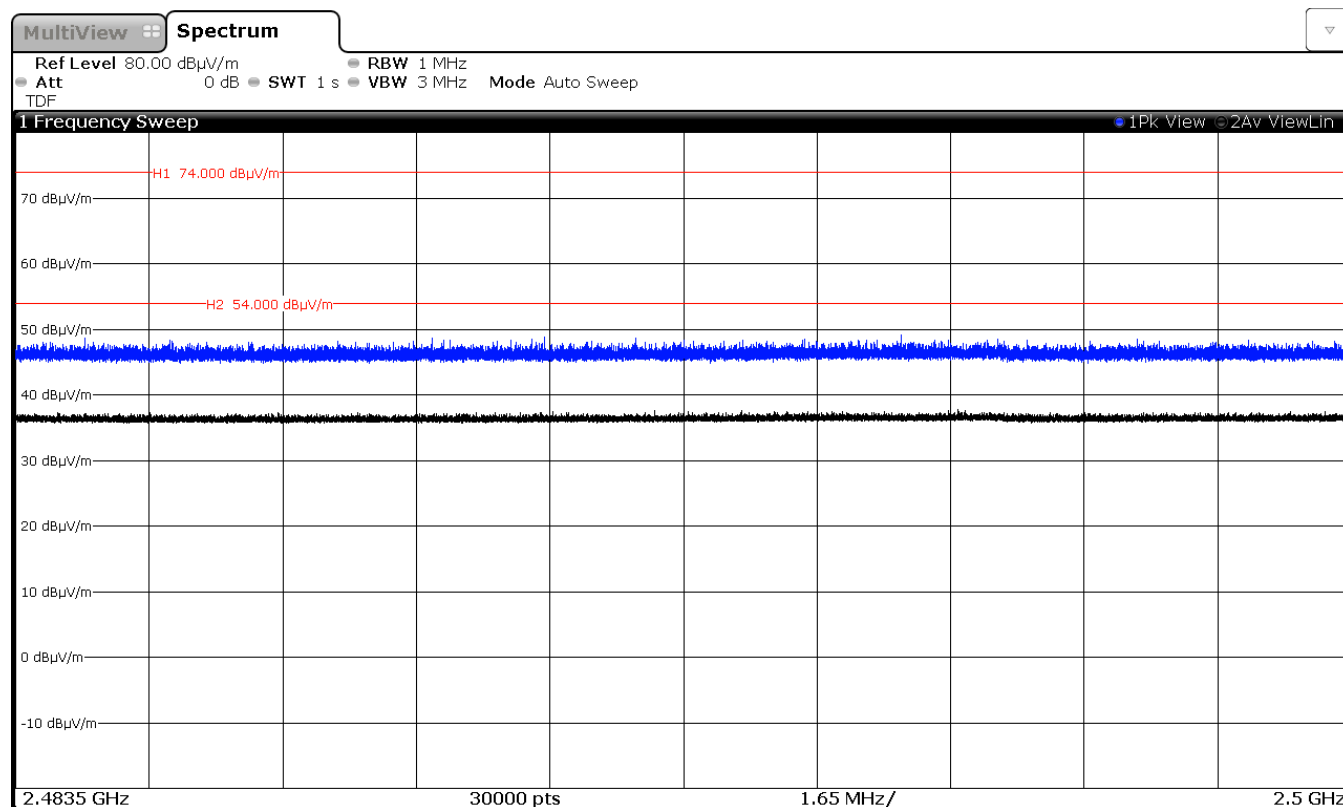


CHANNEL: Highest (2480 MHz).

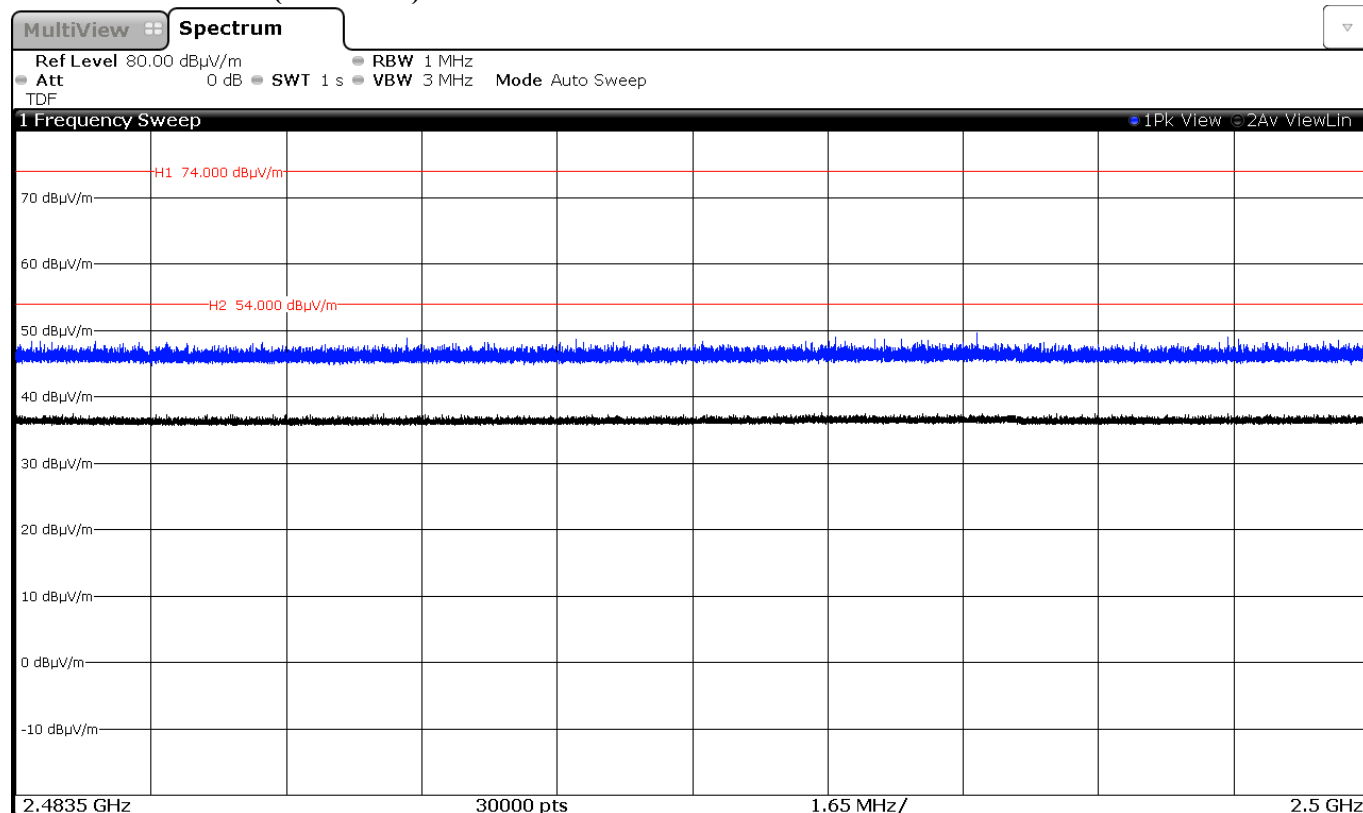


FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND).

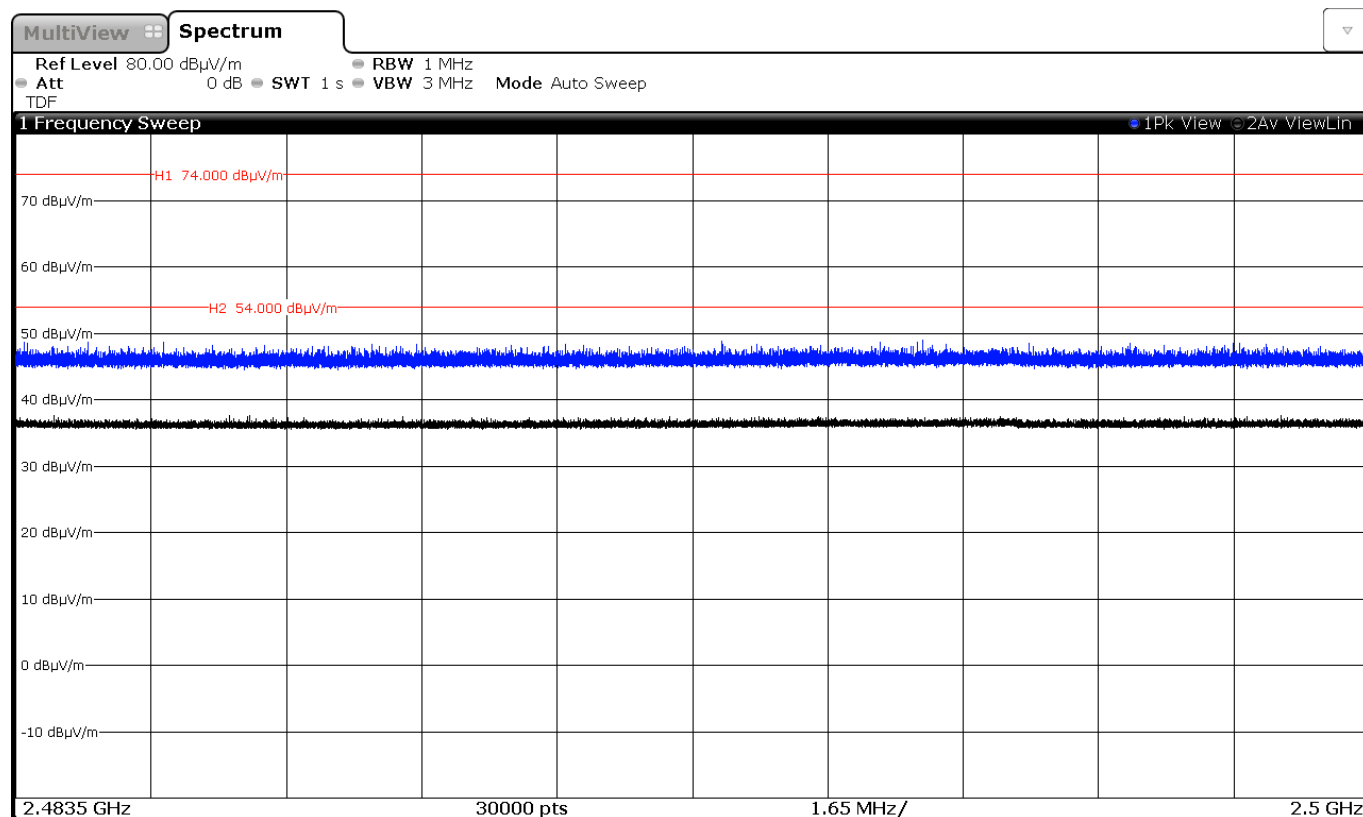
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2440 MHz).



CHANNEL: Highest (2480 MHz).



Appendix B – Test result (Bluetooth EDR)

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TEST CONDITIONS

Power supply (V):

$V_{\text{nominal}} = 12.9 \text{ Vdc}$

Type of power supply = External power supply (Battery).

Type of antenna: Integral antenna

Declared Gain for antenna (maximum) = 0 dBi

TEST FREQUENCIES:

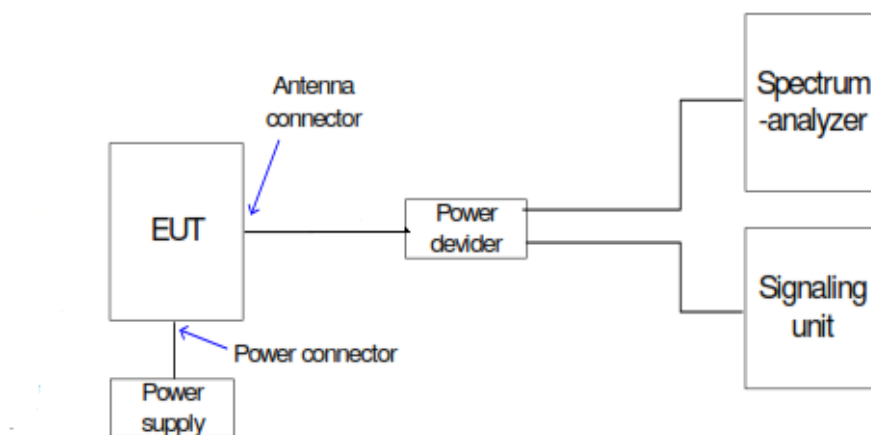
Lowest channel: 2402 MHz

Middle channel: 2441 MHz

Highest channel: 2480 MHz

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to a Bluetooth signalling unit (Bluetooth test set) and to the spectrum analyzer using a 6 dB power splitter. The reading in the spectrum analyzer is corrected taking into account the power splitter loss.



The DC supply voltage is applied using an external calibrated power supply.

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.

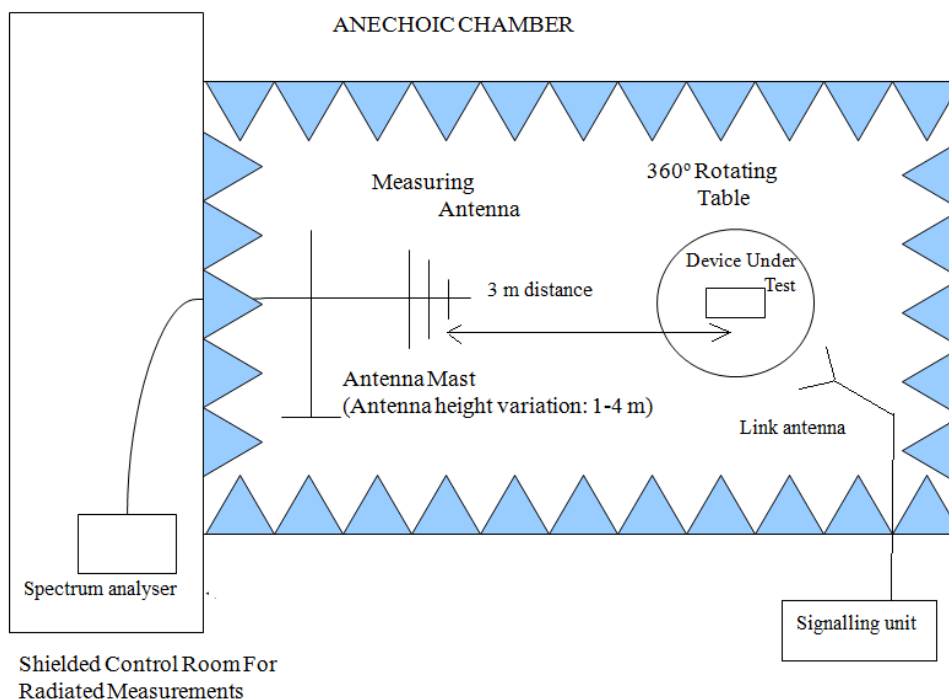
The equipment under test was set up on a non-conductive (wooden) platform 1.5 meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission.

It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

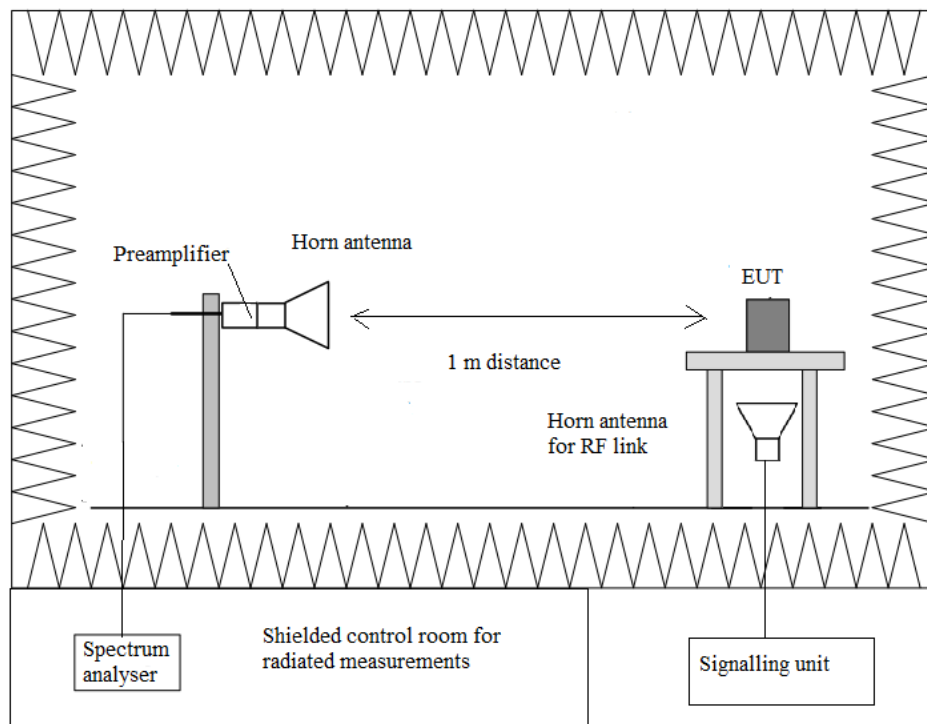
Measurements were made in both horizontal and vertical planes of polarization.

An additional horn antenna is used to control the equipment under test with the Bluetooth signalling unit (Bluetooth test set).

Radiated measurements setup $f < 1$ GHz



Radiated measurements setup $f > 1$ GHz



FCC Section 15.247 Subclause (a) (1) / RSS-247 Clause 5.1 (2). 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)	1027	1015	1024
Measurement uncertainty (kHz)	<±5.00		

Modulation: Π/4-DQPSK (2Mbps)

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20 dB Spectrum bandwidth (kHz)	1290	1291	1289
Measurement uncertainty (kHz)	<±5.00		

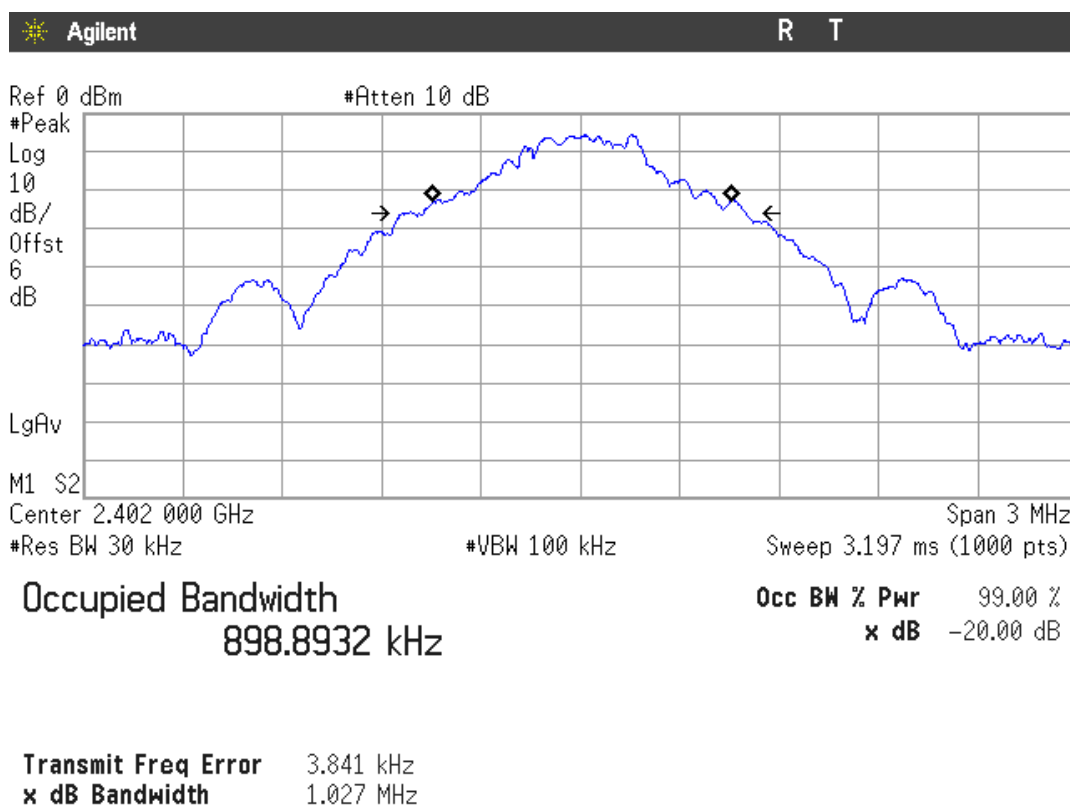
Modulation: 8-DPSK (3Mbps)

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20 dB Spectrum bandwidth (kHz)	1300	1300	1302
Measurement uncertainty (kHz)	<±5.00		

Modulation: GFSK

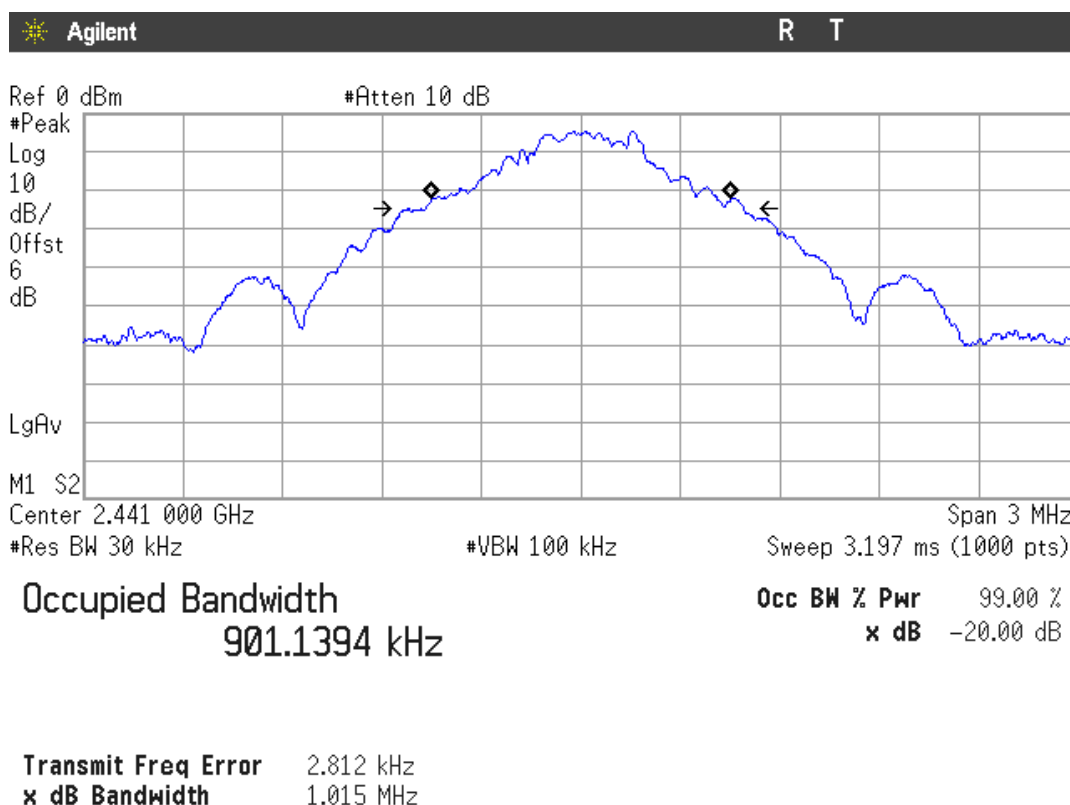
20 dB BANDWIDTH.

Lowest Channel: 2402 MHz.



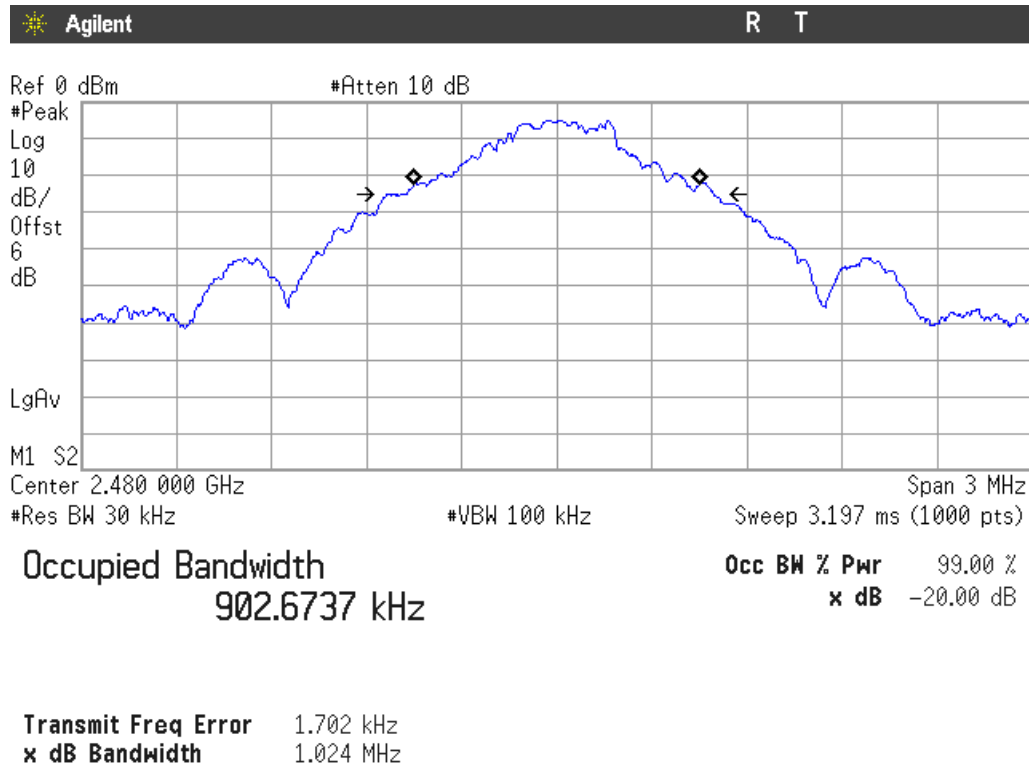
20 dB BANDWIDTH

Middle Channel: 2441 MHz.

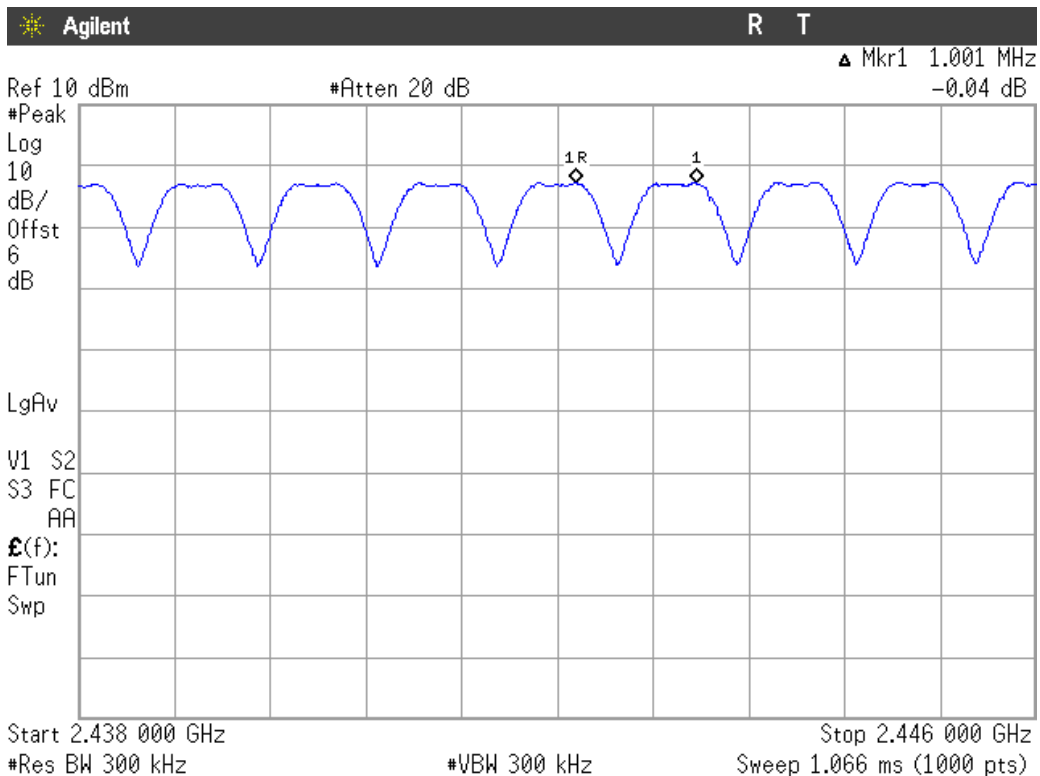


20 dB BANDWIDTH

Highest Channel: 2480 MHz.



Carrier frequency separation



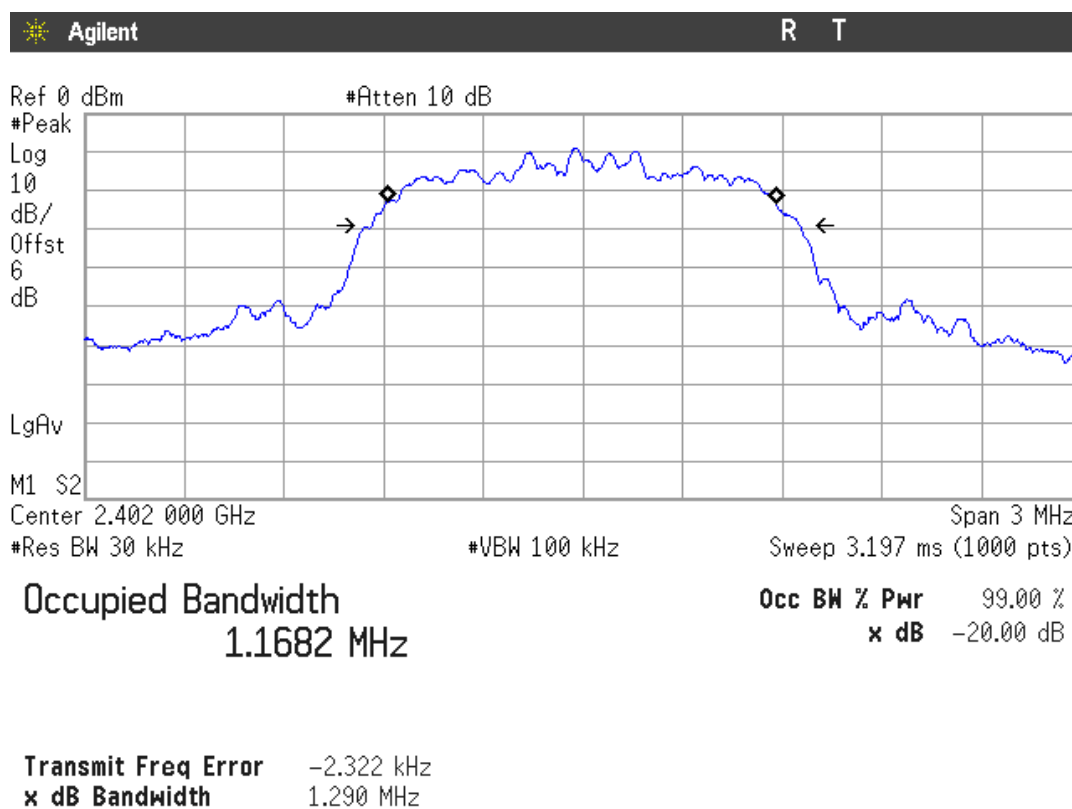
The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20 dB bandwidth of the hopping channel.

Verdict: PASS

Modulation: $\Pi/4$ -DQPSK

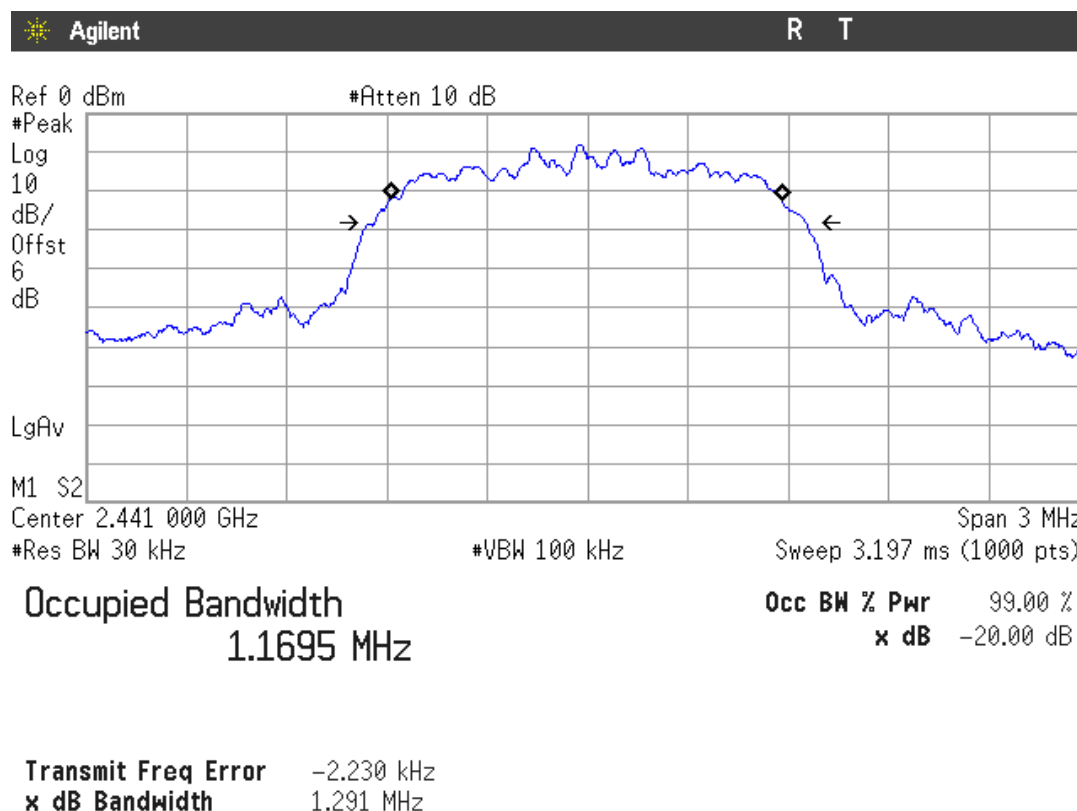
20 dB BANDWIDTH.

Lowest Channel: 2402 MHz.



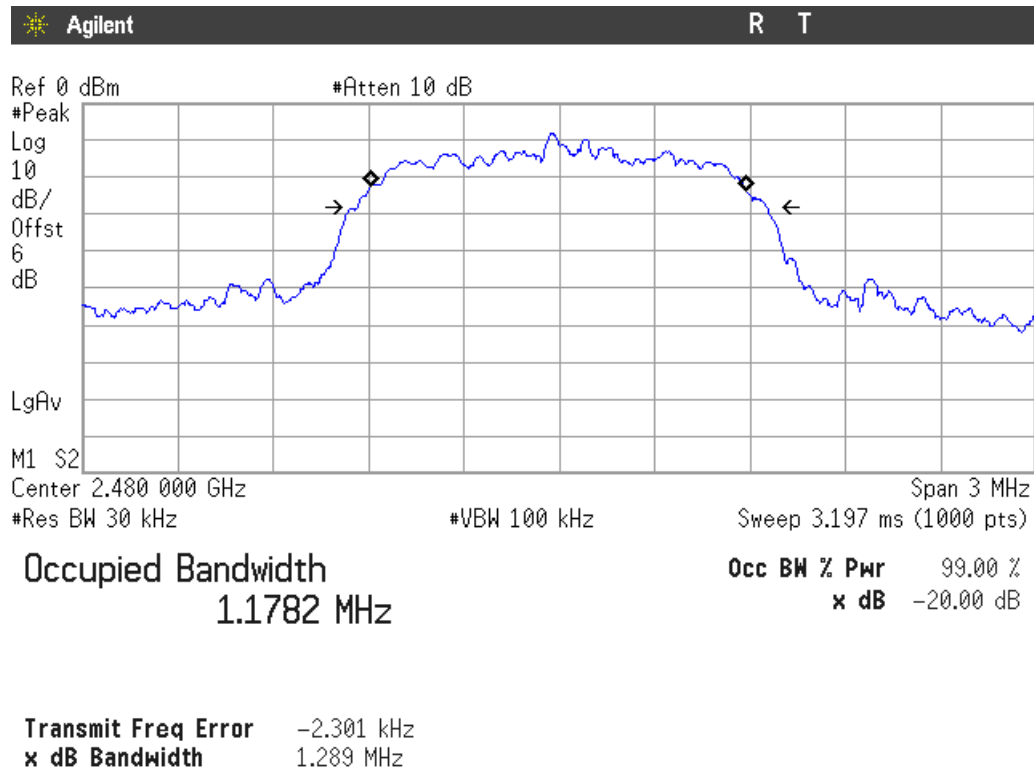
20 dB BANDWIDTH

Middle Channel: 2441 MHz.

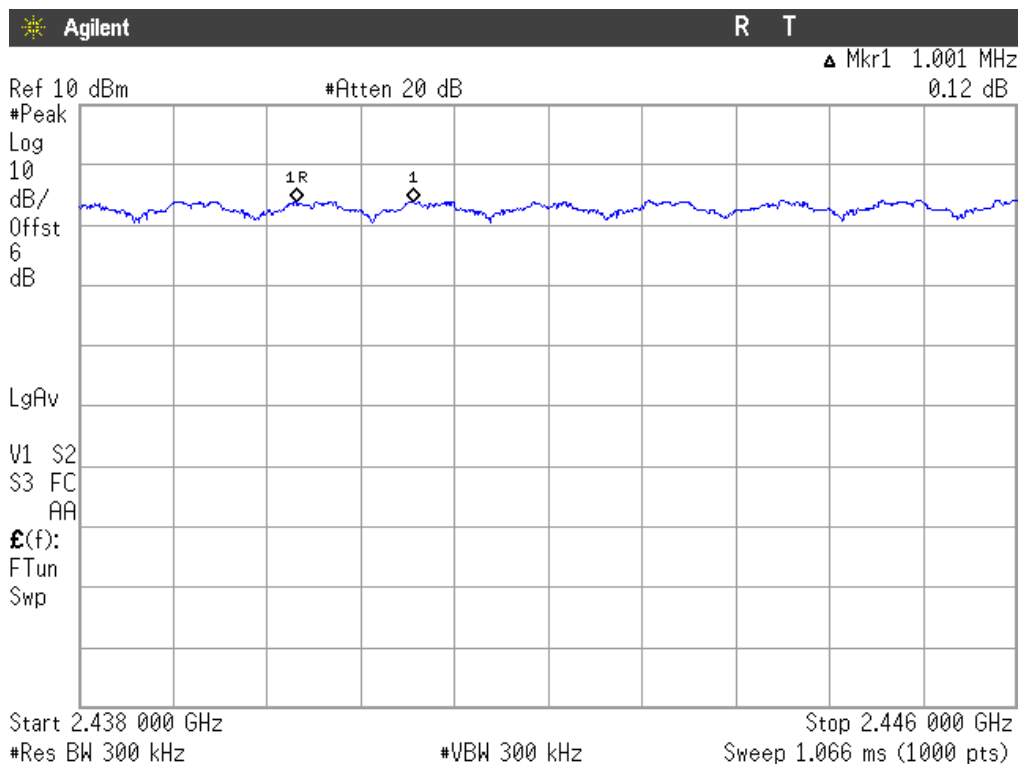


20 dB BANDWIDTH

Highest Channel: 2480 MHz.



Carrier frequency separation



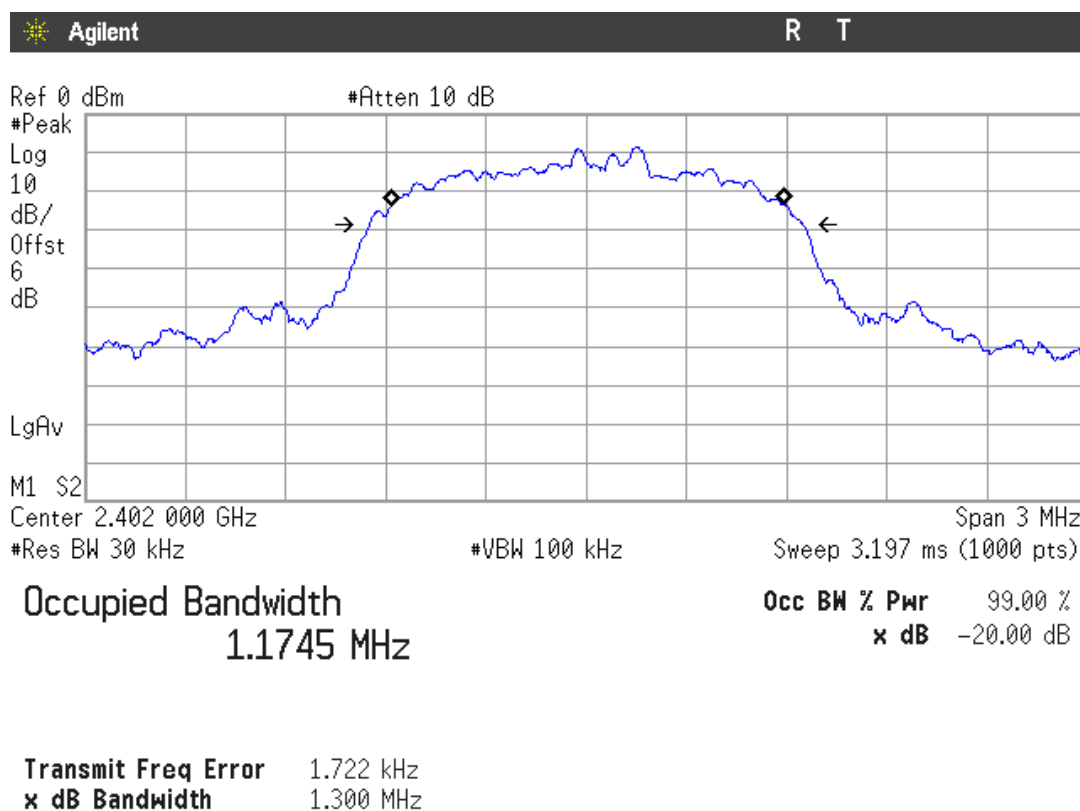
The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20 dB bandwidth of the hopping channel

Verdict: PASS

Modulation: 8-DPSK

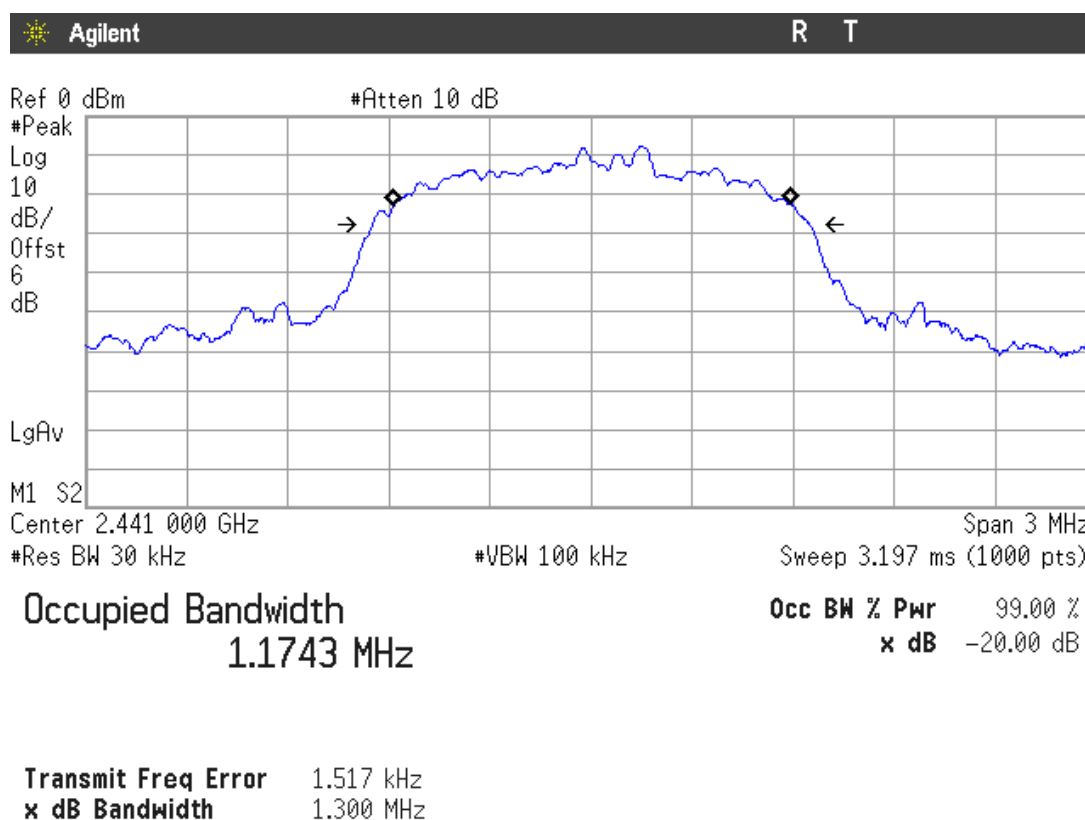
20 dB BANDWIDTH

Lowest Channel: 2402 MHz.



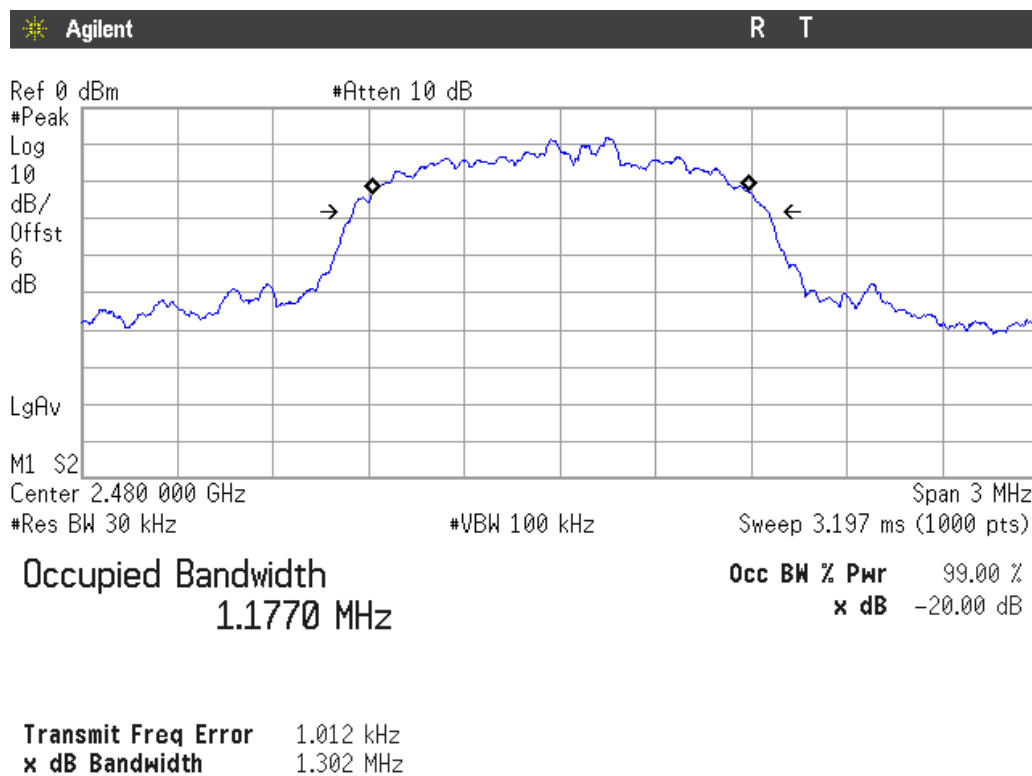
20 dB BANDWIDTH

Middle Channel: 2441 MHz.

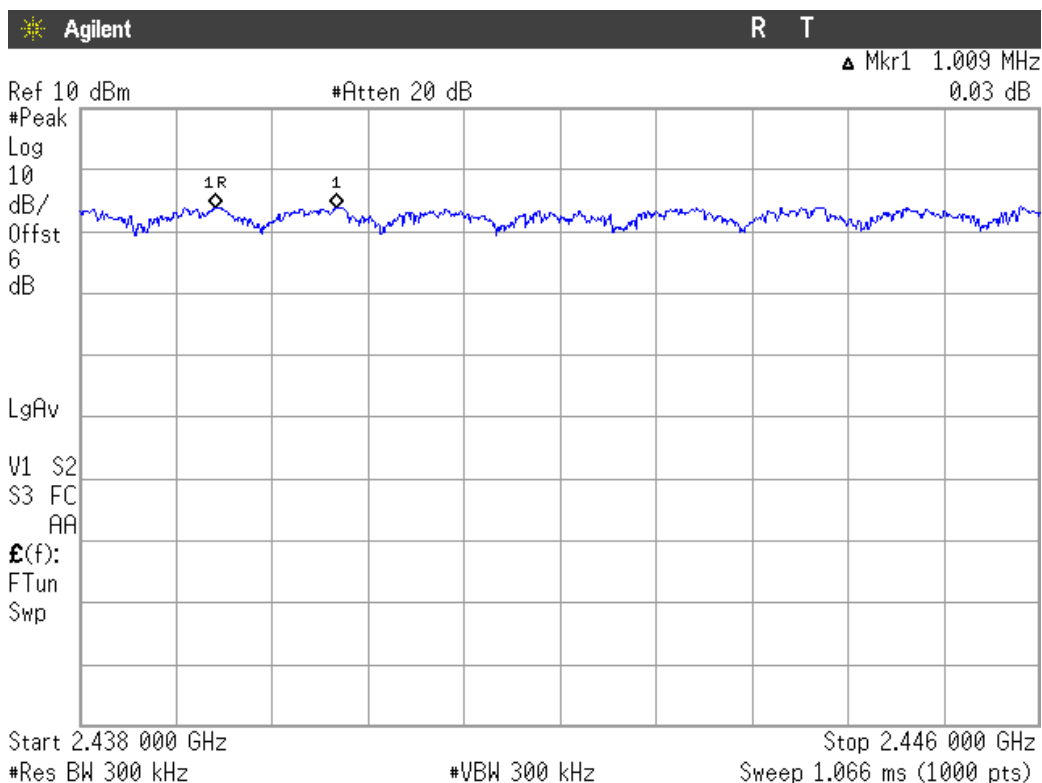


20 dB BANDWIDTH

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

FCC Section 15.247 Subclause (a) (1) (iii) / RSS-247 Clause 5.1 (4). Number of hopping channels

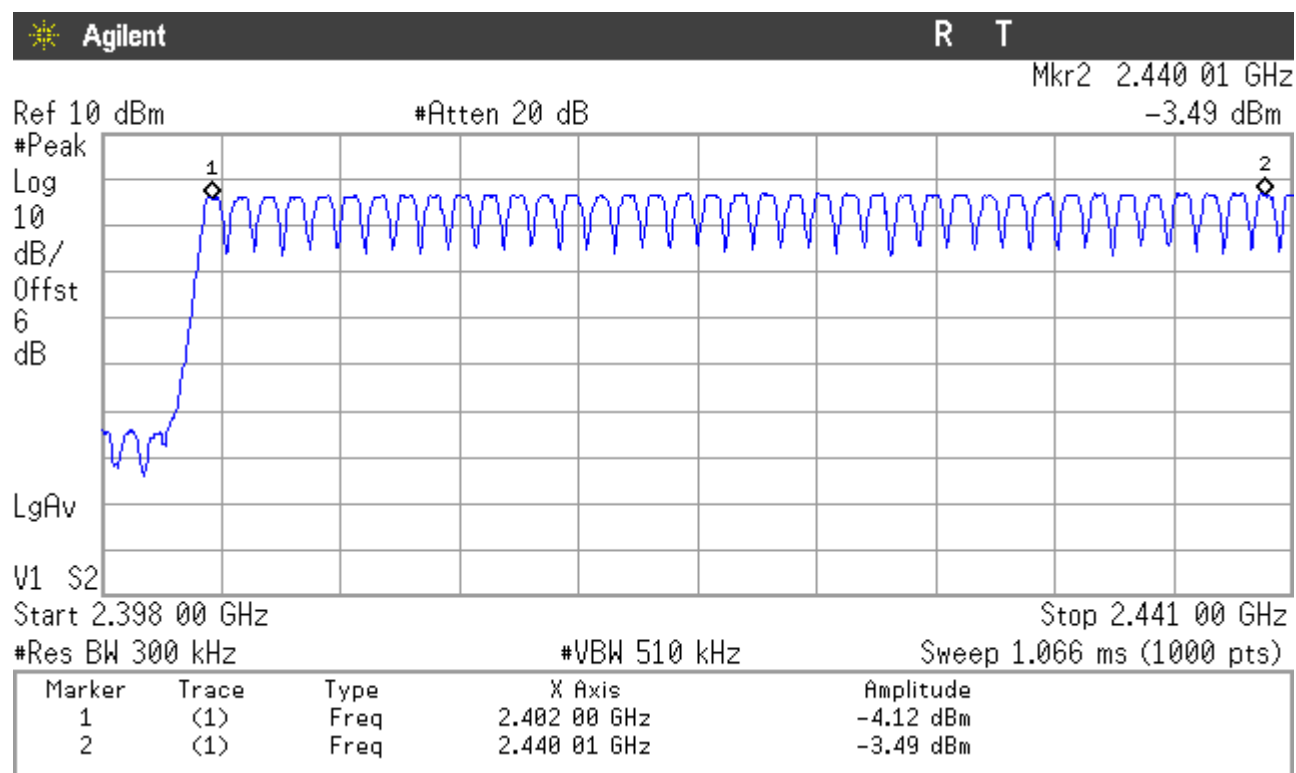
SPECIFICATION

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

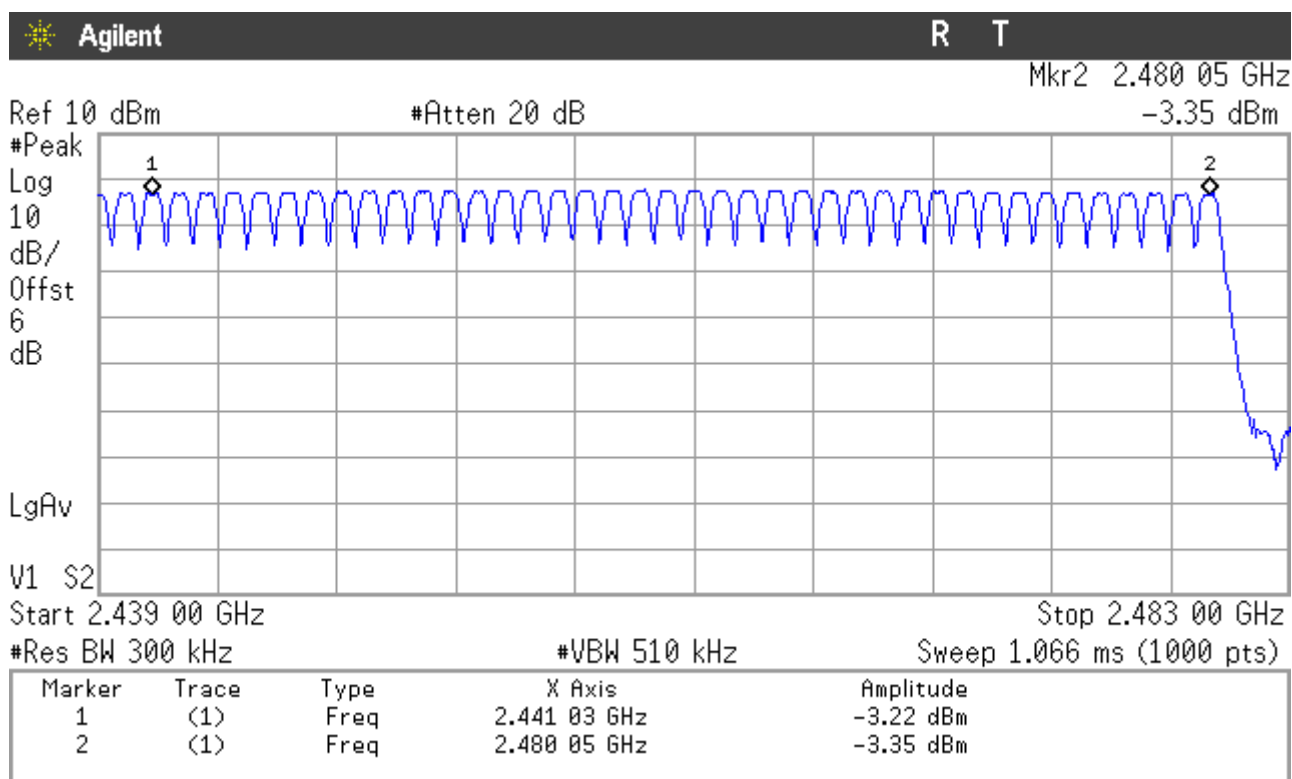
RESULTS

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

Modulation: GFSK



Number of hopping frequencies: 39

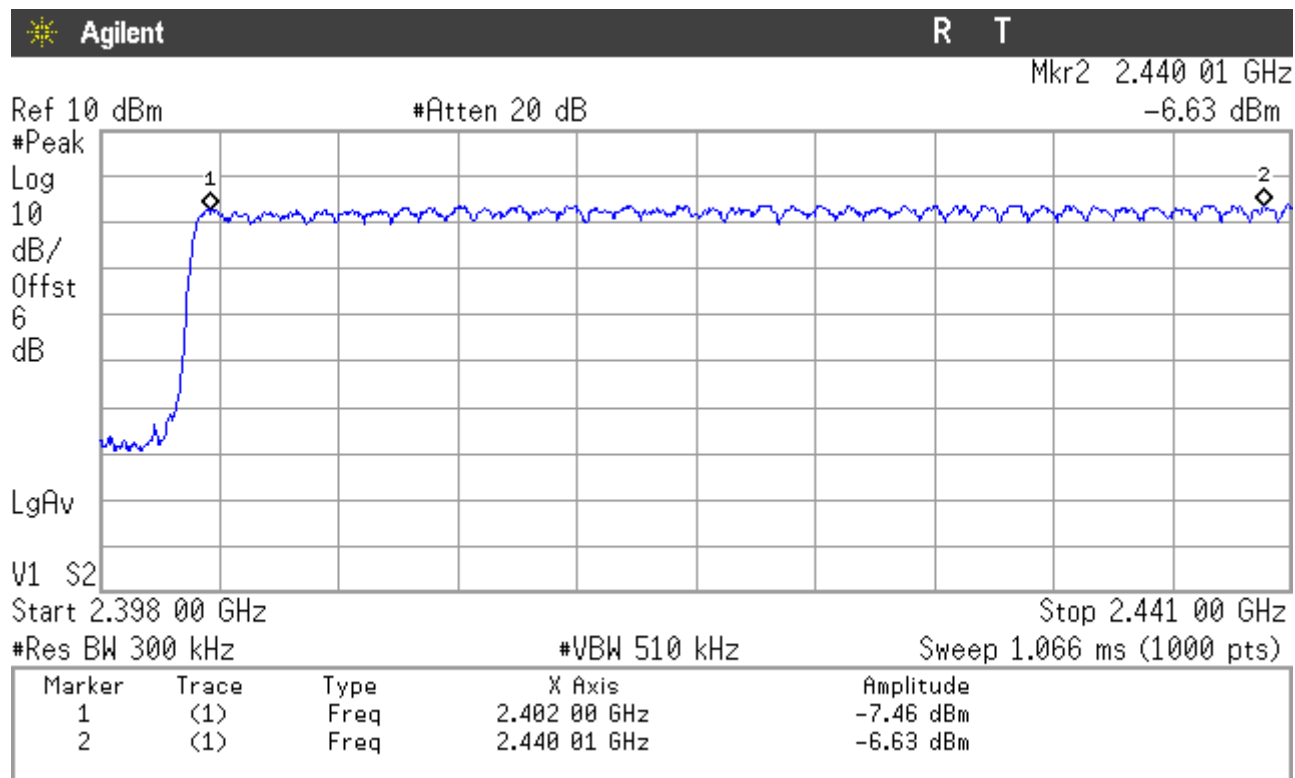


Number of hopping frequencies: 40

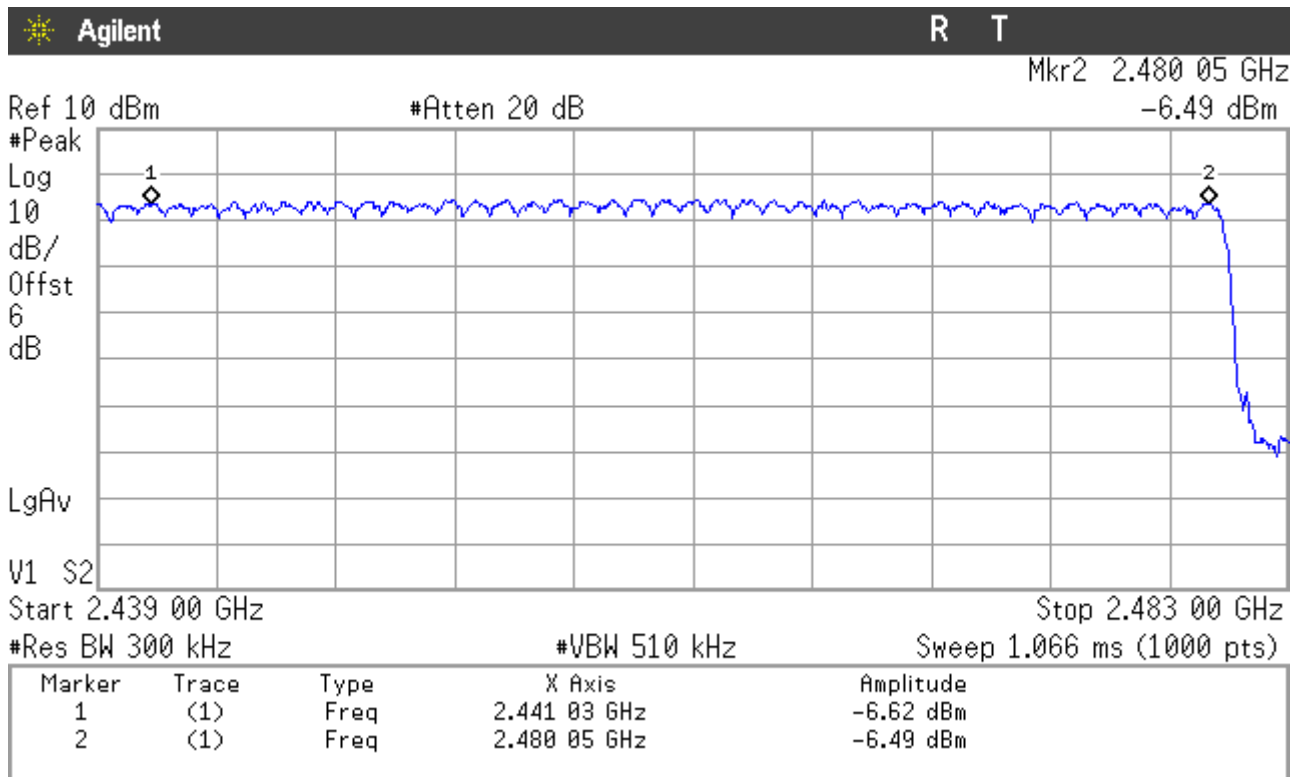
Total number of hopping frequencies: 79

Verdict: PASS

Modulation: $\Pi/4$ -DQPSK



Number of hopping frequencies: 39

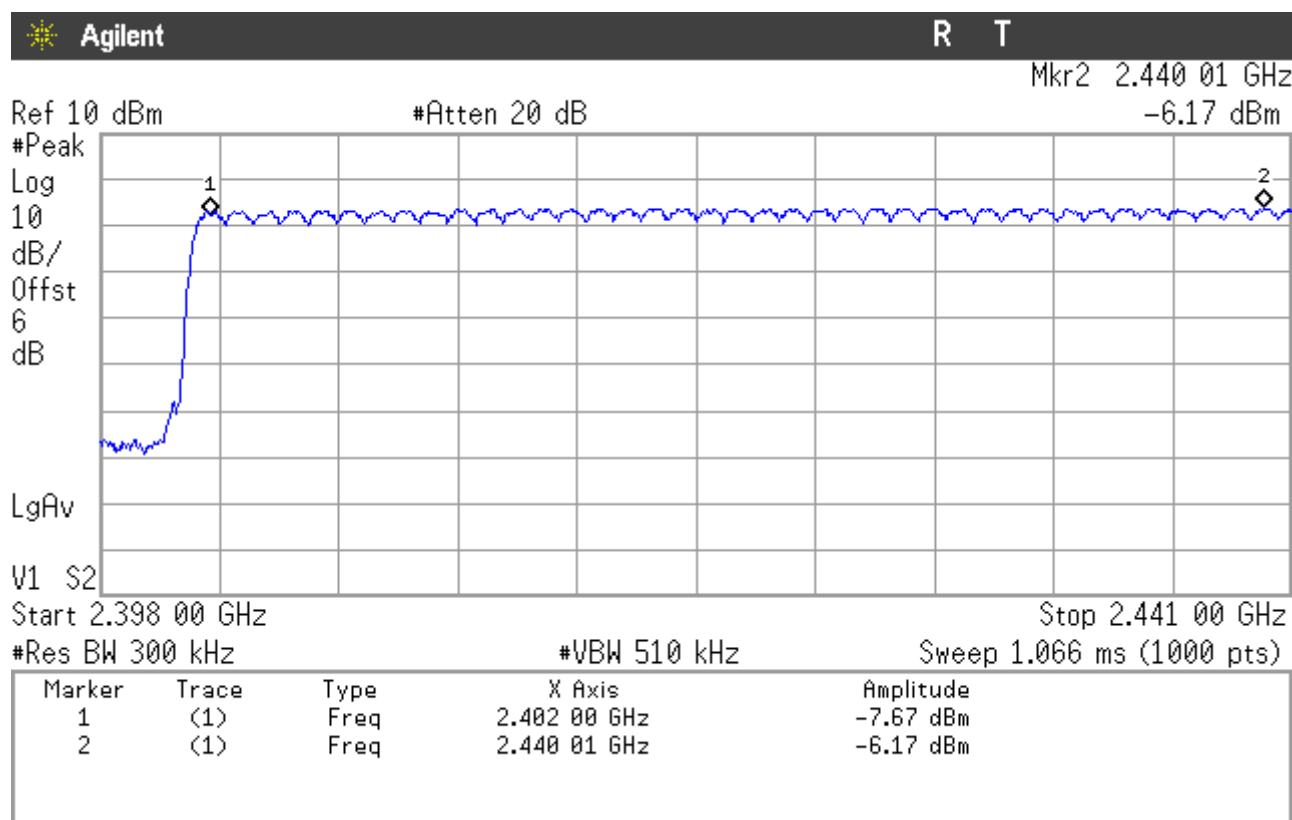


Number of hopping frequencies: 40

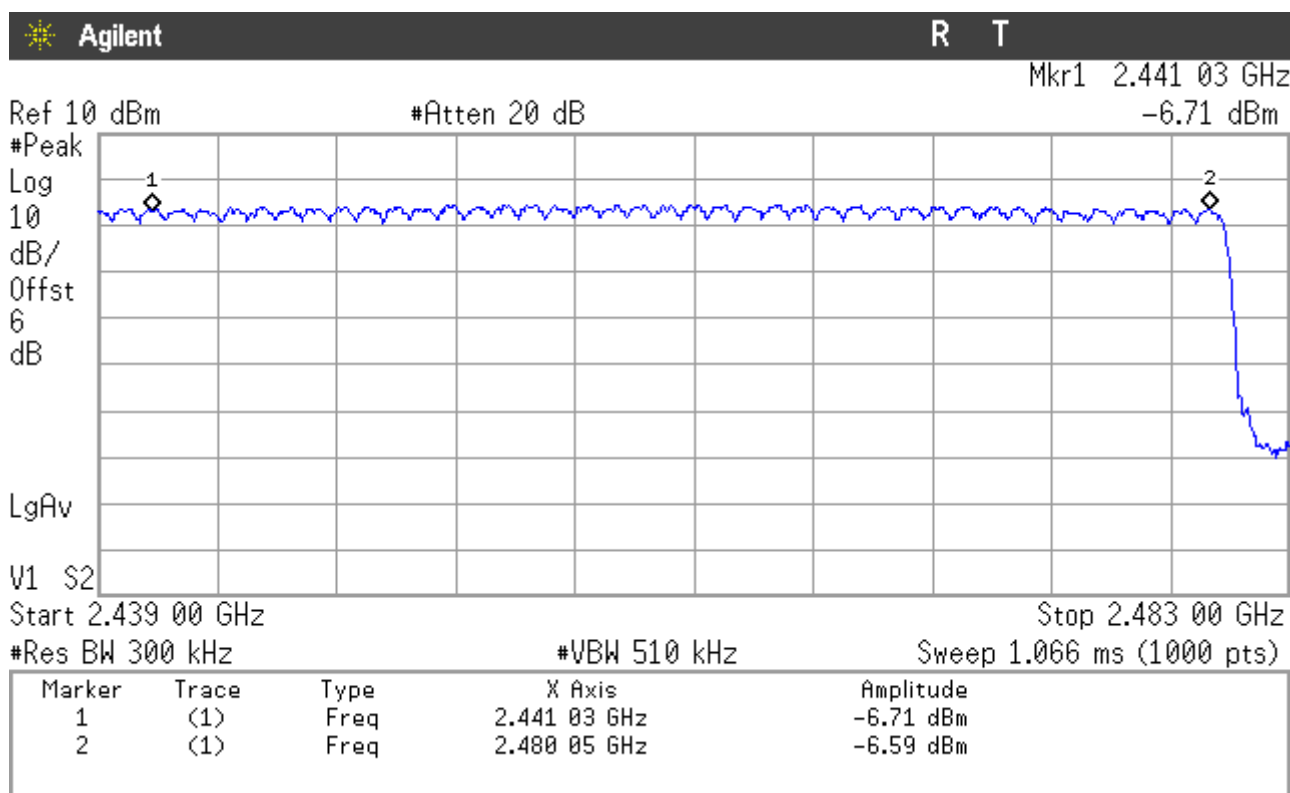
Total number of hopping frequencies: 79

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-247 Clause 5.1 (4). Time of occupancy (Dwell Time)

SPECIFICATION

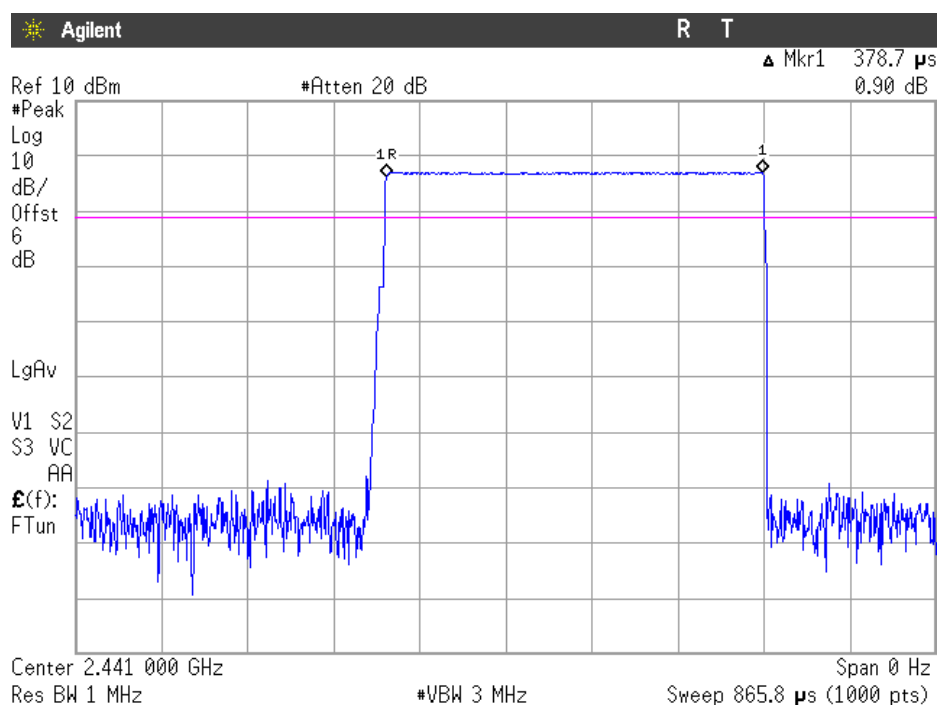
The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed = $0.4 \times 79 = 31.6$ seconds.

RESULTS

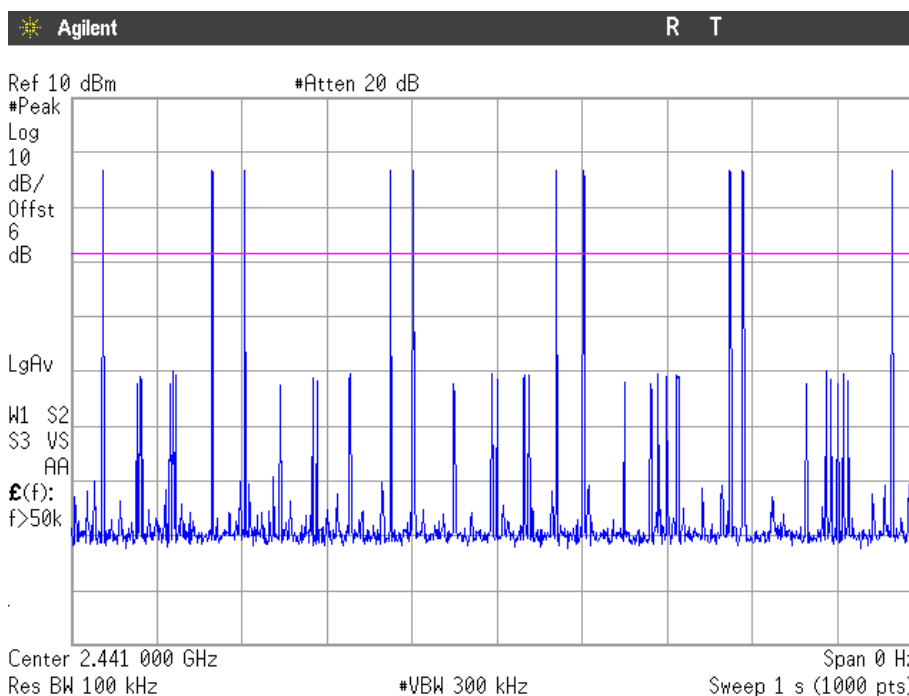
Modulation: GFSK

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

- Tx- time per hop = 378.7 μ s (see next plot).



- Number of hops over a period of 1 seconds = 10 (see next plot).



Number of hops in the period specified in the requirements = (10 hops) x (31.6 s / 1 s) = 316 hops.

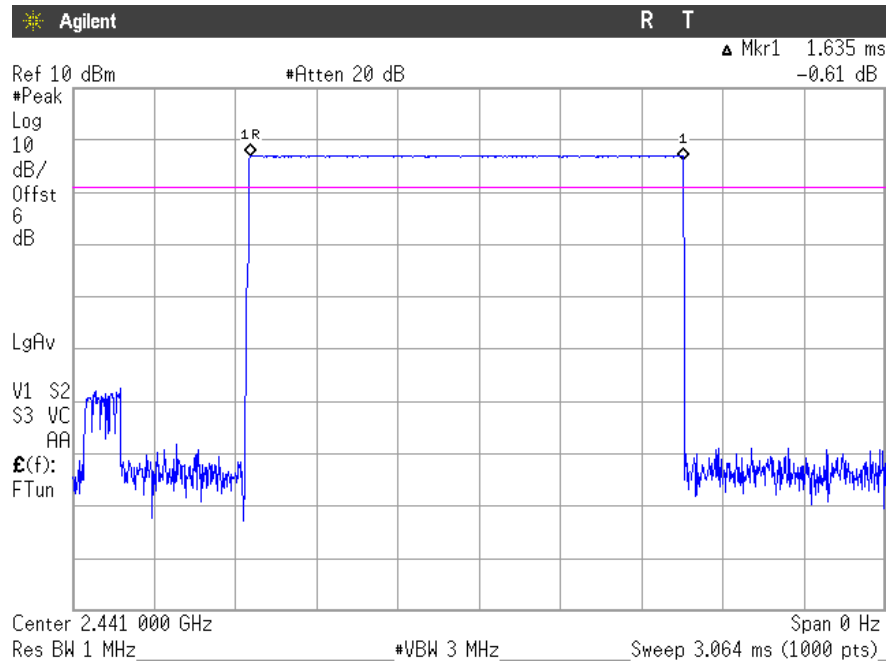
Averaging time of occupancy = 378.7 μ s x 316 hops = 119.67 ms per 31.6 seconds.

Measurement uncertainty (%)	< $\pm$ 0.01
-----------------------------	--------------

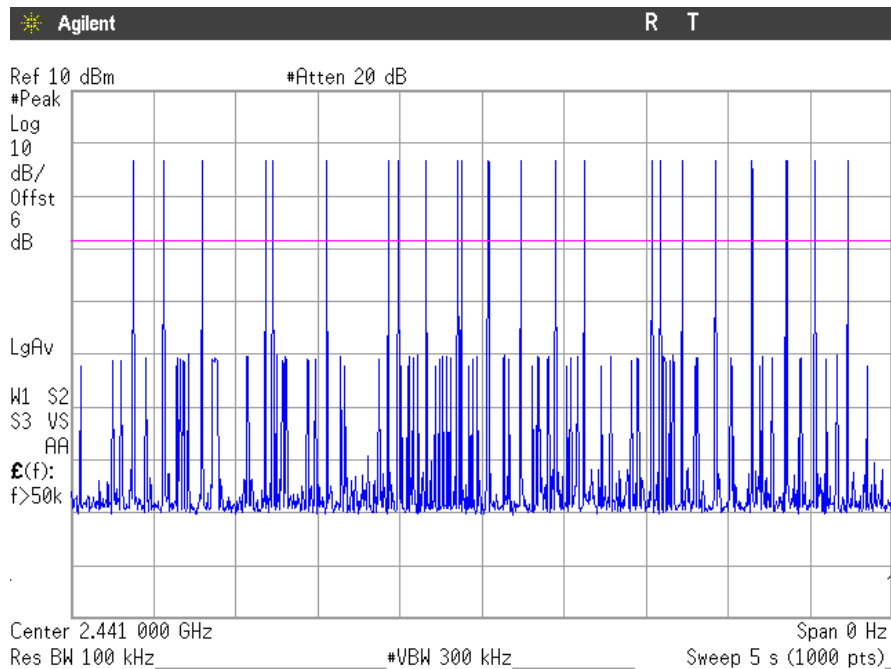
Verdict: PASS

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

- Tx- time per hop = 1.635 ms (see next plot).



- Number of hops over a period of 5 seconds = 23 (see next plot).



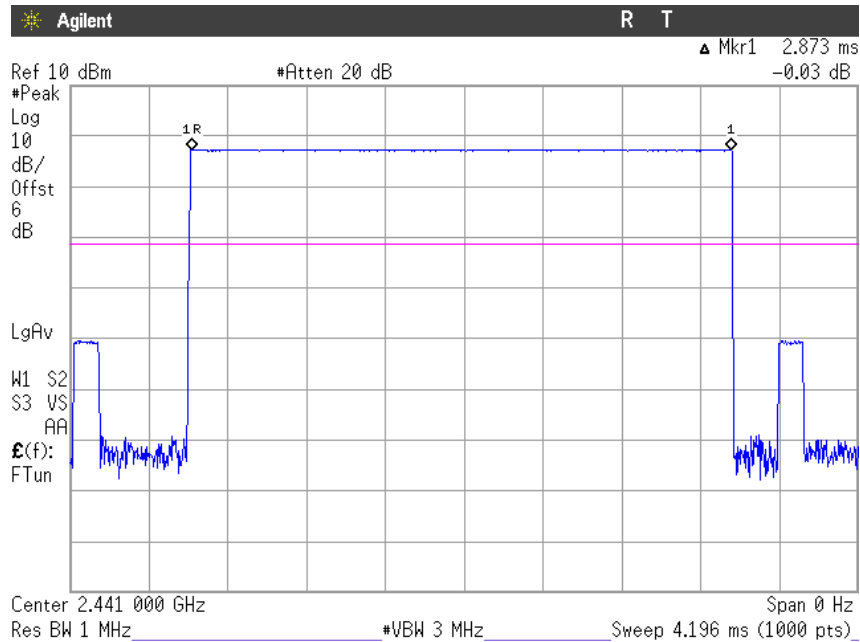
Number of hops in the period specified in the requirements = (23 hops) x (31.6 s / 5 s) = 145.36 hops.
Averaging time of occupancy = 1.635 ms x 145.36 hops = 237.66 ms per 31.6 seconds.

Measurement uncertainty (%)	<±0.01
-----------------------------	--------

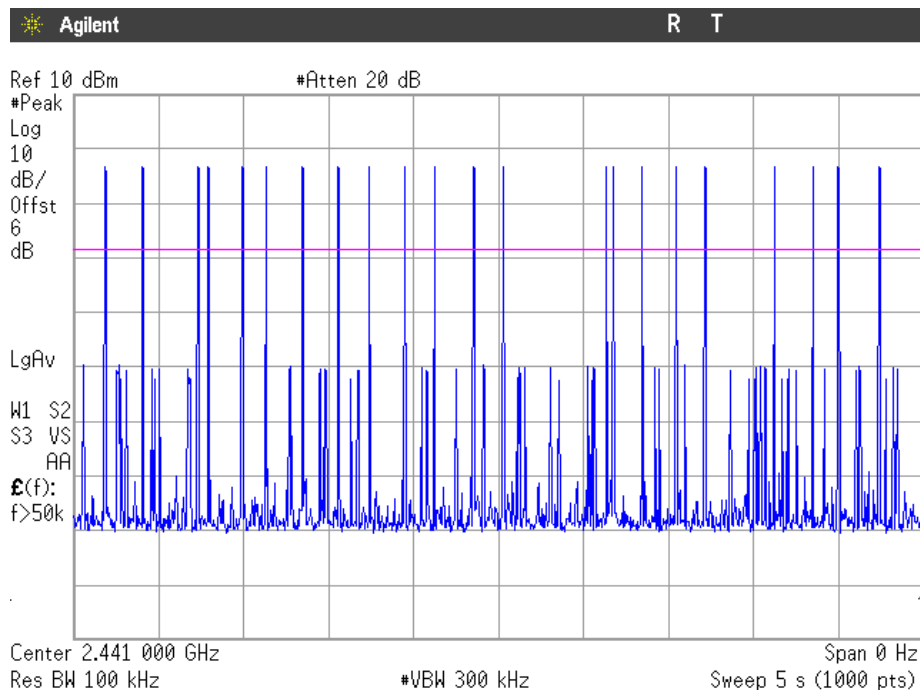
Verdict: PASS

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

- Tx- time per hop = 2.873 ms (see next plot).



- Number of hops over a period of 5 seconds = 22 (see next plot).



Number of hops in the period specified in the requirements = (22 hops) x (31.6 s / 5 s) = 139.04 hops.
Averaging time of occupancy = 2.873 ms x 139.04 hops = 399.46 ms per 31.6 seconds.

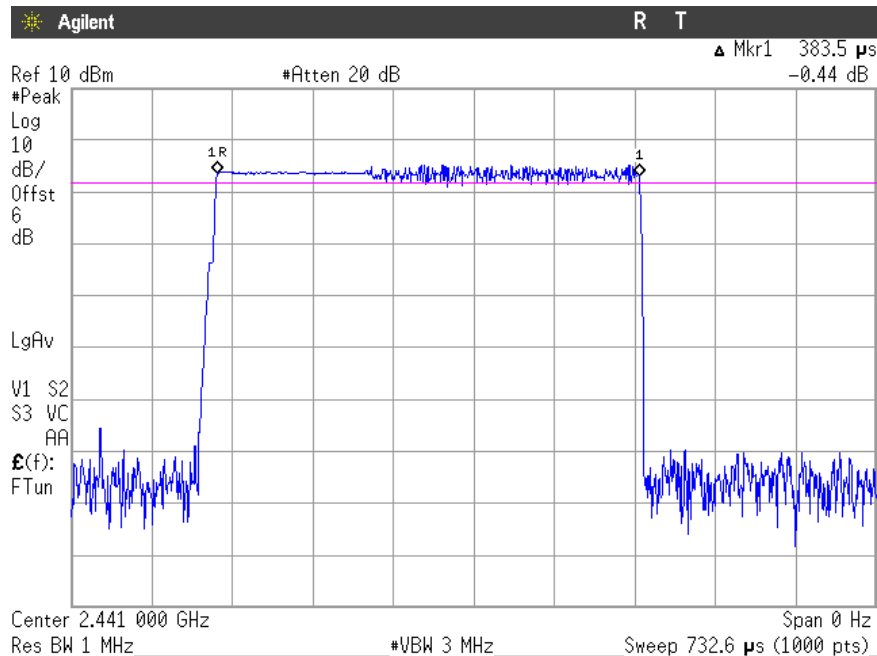
Measurement uncertainty (%)	<±0.01
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Verdict: PASS

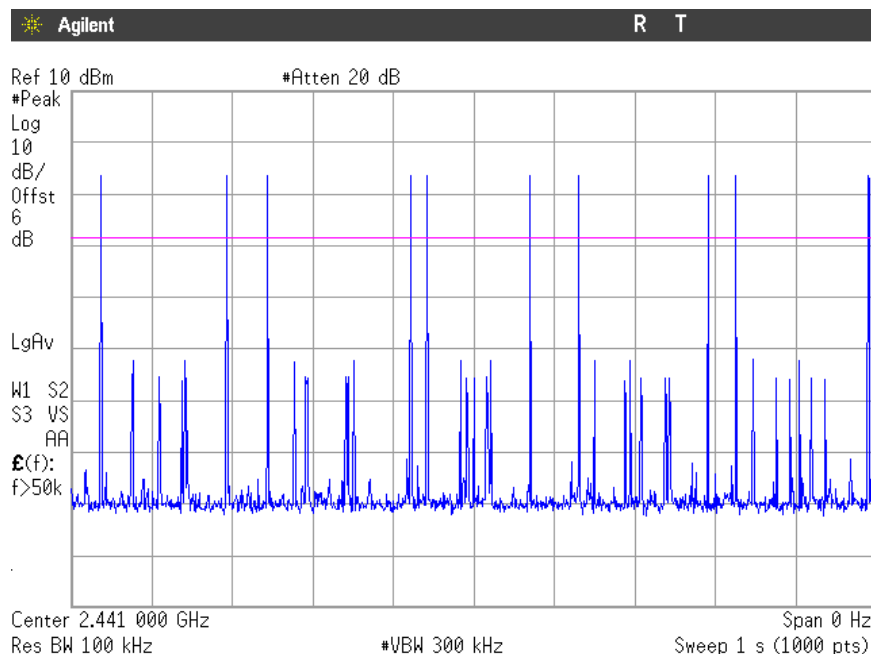
Modulation: Π/4-DQPSK

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

- Tx- time per hop = 383.5 μs (see next plot).



- Number of hops over a period of 1 second = 10 (see next plot).



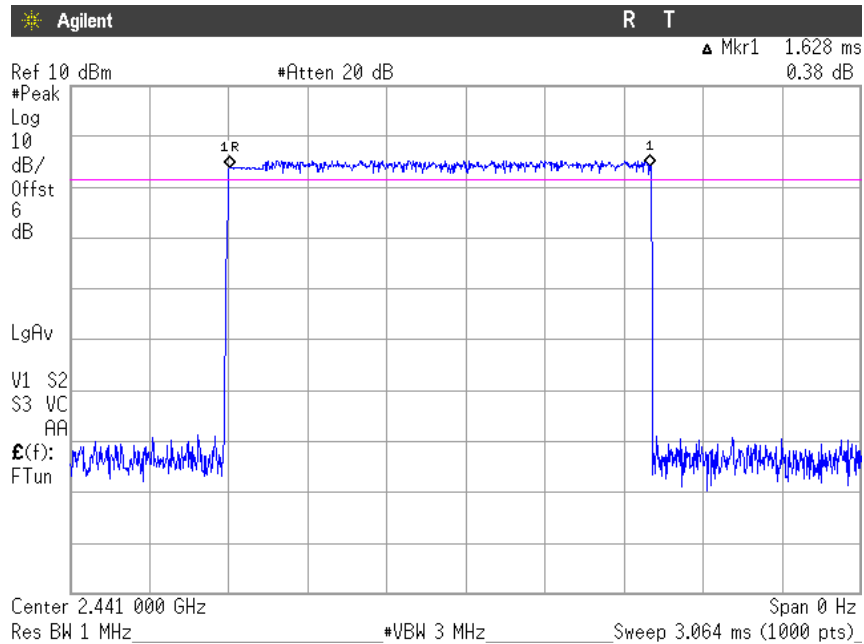
Number of hops in the period specified in the requirements = (10 hops) x (31.6 s / 1 s) = 316 hops.
Averaging time of occupancy = 383.5 μs x 316 hops = 121.19 ms per 31.6 seconds.

Measurement uncertainty (%)	<±0.01
-----------------------------	--------

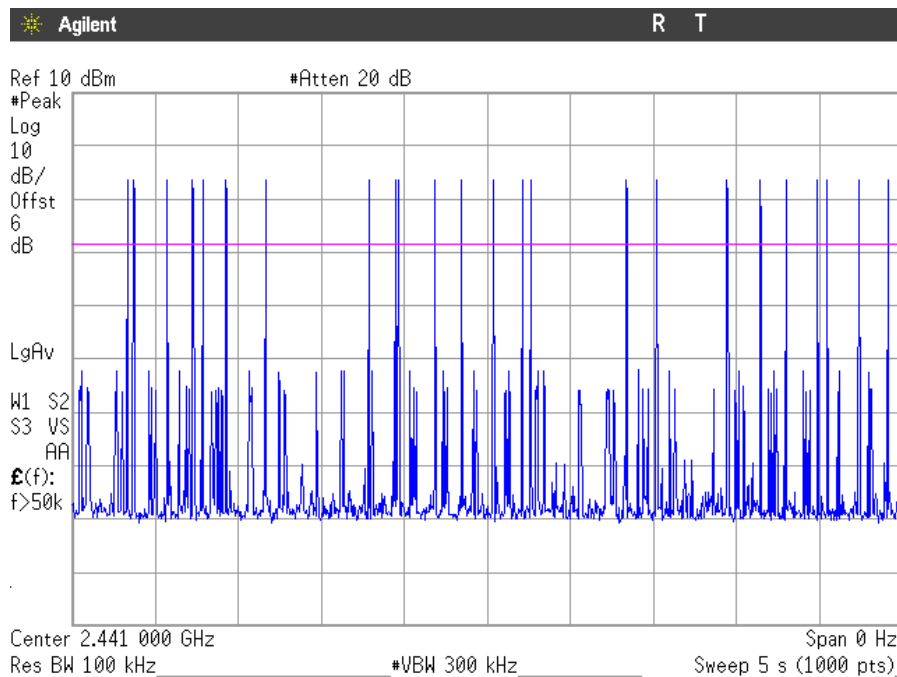
Verdict: PASS

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

- Tx- time per hop = 1.628 ms (see next plot).



- Number of hops over a period of 5 seconds = 24 (see next plot).



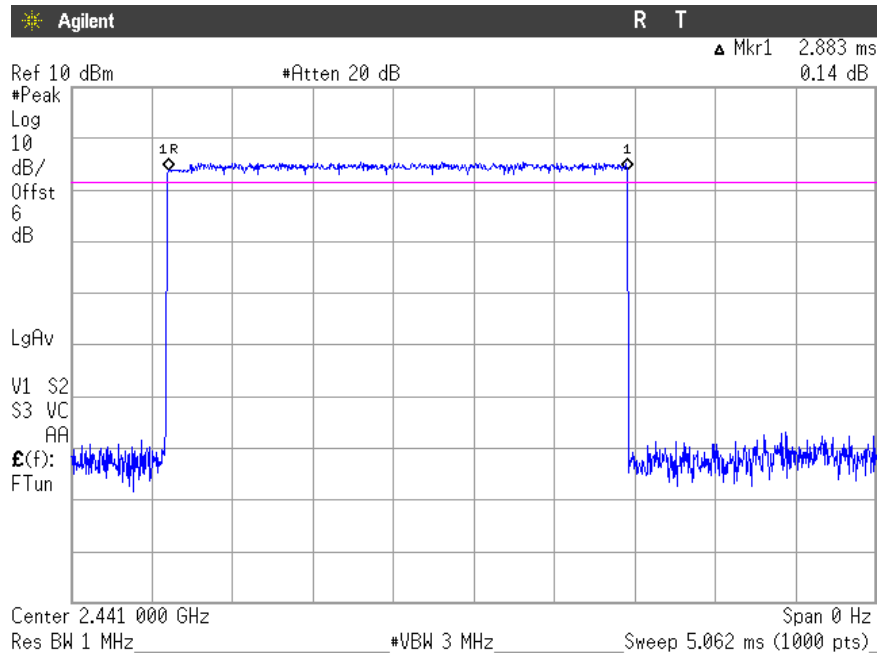
Number of hops in the period specified in the requirements = (24 hops) x (31.6 s / 5 s) = 151.68 hops.
Averaging time of occupancy = 1.628 ms x 151.68 hops = 246.94 ms per 31.6 seconds.

Measurement uncertainty (%)	<±0.01
-----------------------------	--------

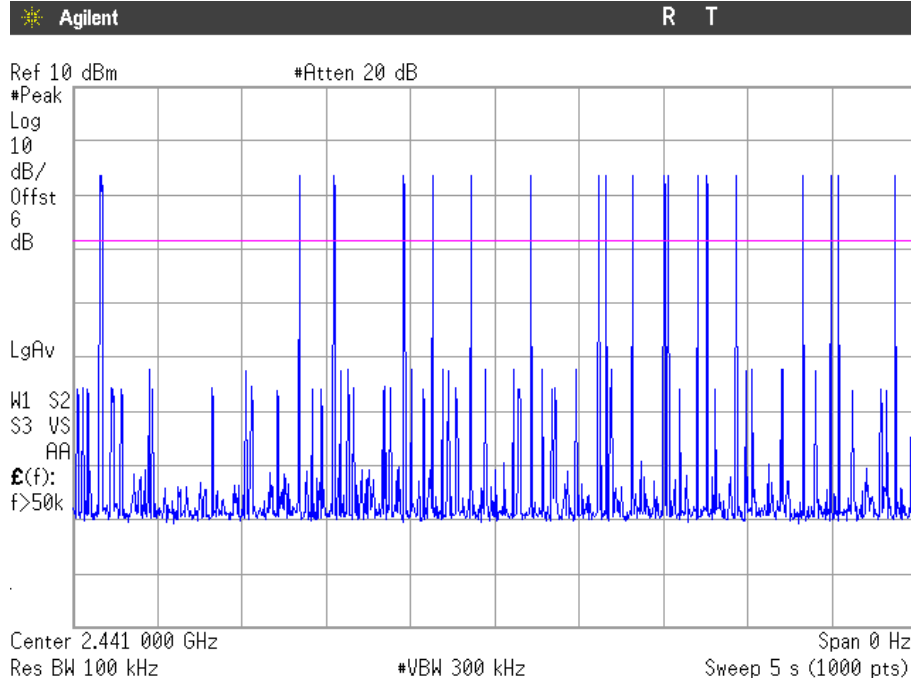
Verdict: PASS

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

- Tx- time per hop = 2.883 ms (see next plot).



- Number of hops over a period of 5 seconds = 19 (see next plot).



Number of hops in the period specified in the requirements = (19 hops) x (31.6 s / 5 s) = 120.1 hops.
Averaging time of occupancy = 2.883 ms x 120.1 hops = 346.19 ms per 31.6 seconds.

Measurement uncertainty (%)

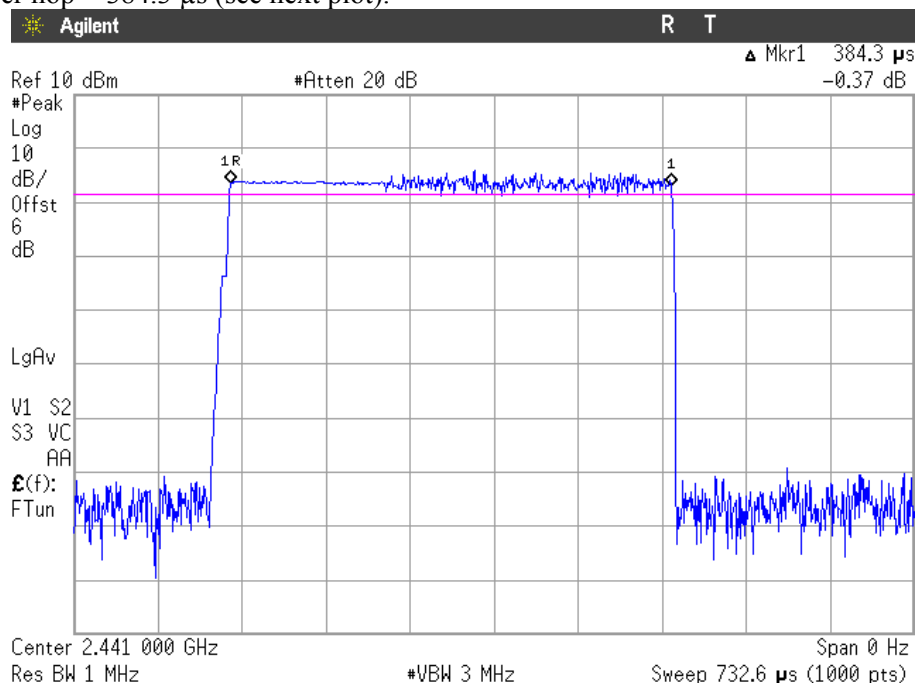
<±0.01

Verdict: PASS

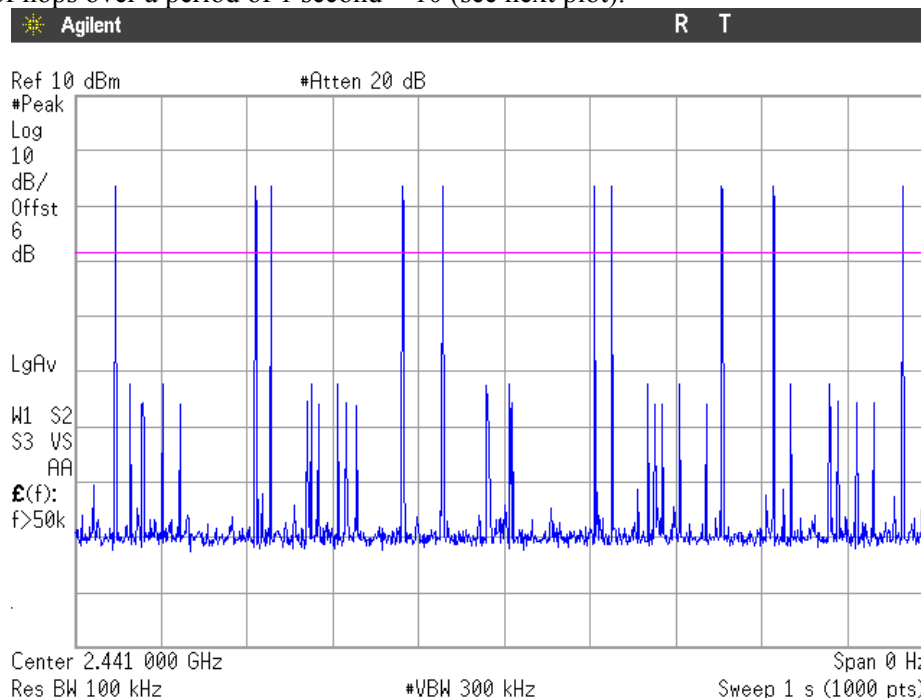
Modulation: 8-DPSK

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

- Tx- time per hop = 384.3 μ s (see next plot).



- Number of hops over a period of 1 second = 10 (see next plot).



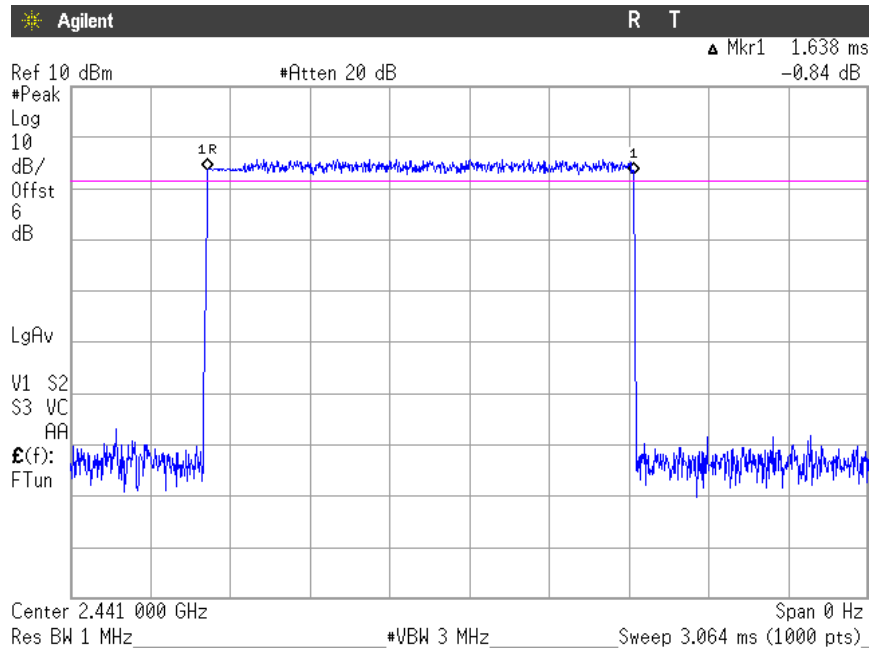
Number of hops in the period specified in the requirements = (10 hops) x (31.6 s / 1 s) = 316 hops.
Averaging time of occupancy = 384.3 μ s x 316 hops = 121.44 ms per 31.6 seconds.

Measurement uncertainty (%)	<±0.01
-----------------------------	--------

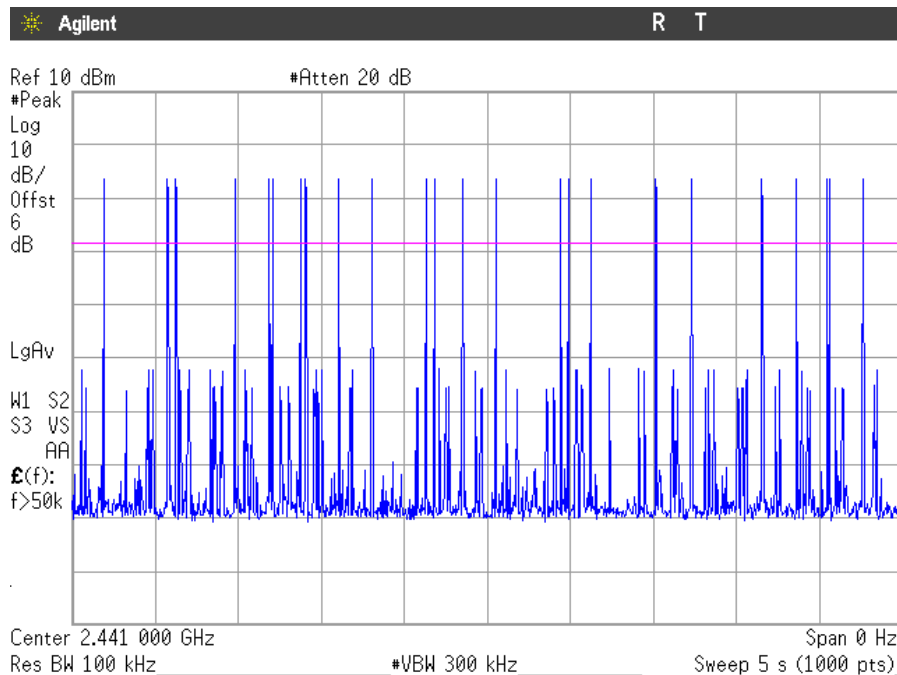
Verdict: PASS

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

- Tx- time per hop = 1.638 ms (see next plot).



- Number of hops over a period of 5 seconds = 24 (see next plot).



Number of hops in the period specified in the requirements = (24 hops) x (31.6 s / 5 s) = 151.68 hops.
Averaging time of occupancy = 1.638 ms x 151.68 hops = 248.45 ms per 31.6 seconds.

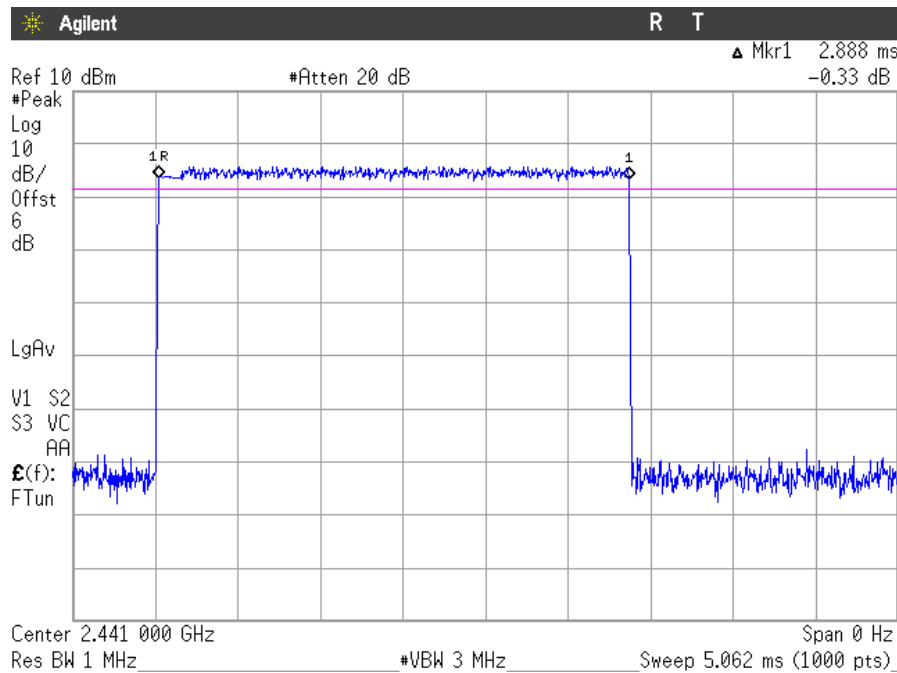
Measurement uncertainty (%)

<±0.01

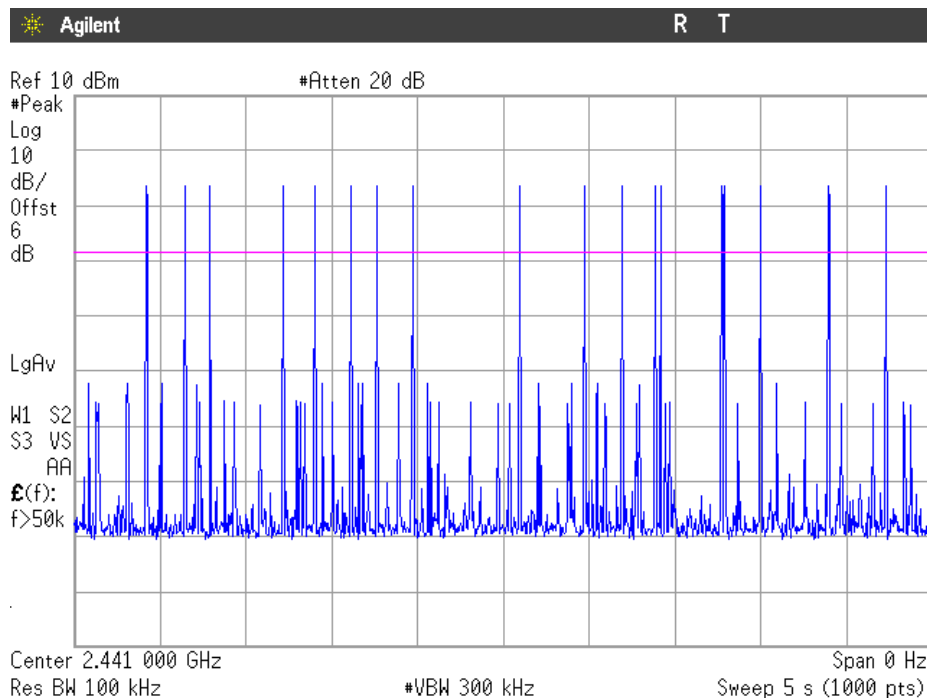
Verdict: PASS

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

- Tx- time per hop = 2.888 ms (see next plot).



- Number of hops over a period of 5 seconds = 18 (see next plot).



Number of hops in the period specified in the requirements = (18 hops) x (31.6 s / 5 s) = 113.76 hops.
Averaging time of occupancy = 2.888 ms x 113.76 hops = 328.54 ms per 31.6 seconds.

Measurement uncertainty (%)	<±0.01
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Verdict: PASS

FCC Section 15.247 Subclause (b) / RSS-247 Clause 5.4 (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). The e.i.r.p. shall not exceed 4 W (RSS-247).

MAXIMUM OUTPUT POWER. See next plots.

Declared maximum antenna gain: 0 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)	-1.88	-1.08	-1.09
Maximum EIRP power (dBm)	-1.88	-1.08	-1.09
Measurement uncertainty (dB)	<±0.78		

Modulation: Π/4-DQPSK (2Mbps)

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum peak power (dBm)	-2.98	-2.20	-2.27
Maximum EIRP power (dBm)	-2.98	-2.20	-2.27
Measurement uncertainty (dB)	<±0.78		

Modulation: 8-DPSK (3Mbps)

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum peak power (dBm)	-2.66	-1.84	-1.89
Maximum EIRP power (dBm)	-2.66	-1.84	-1.89
Measurement uncertainty (dB)	<±0.78		

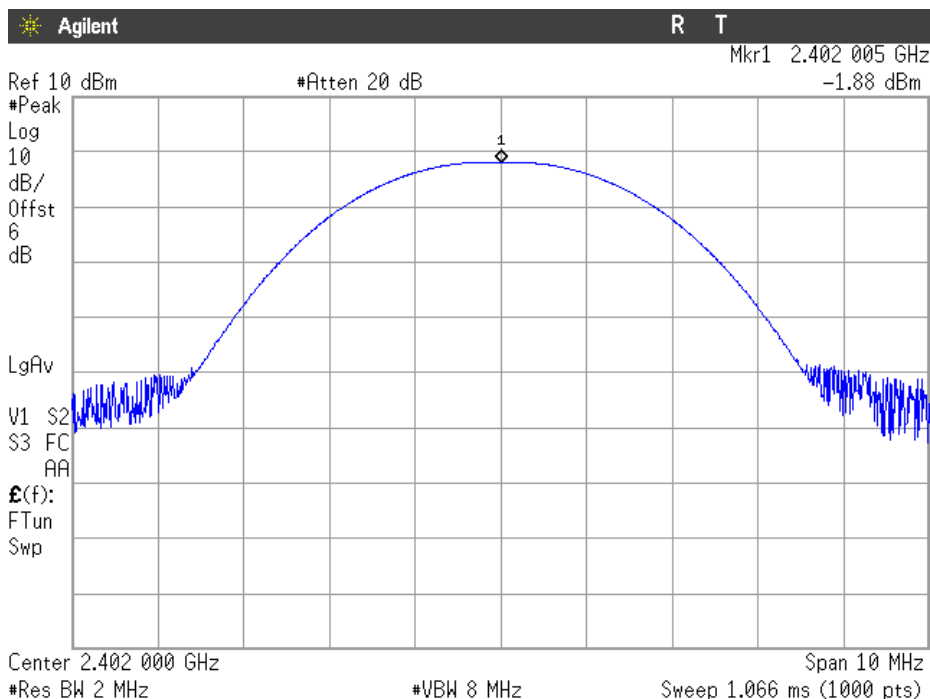
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

Verdict: PASS

PEAK OUTPUT POWER (CONDUCTED).

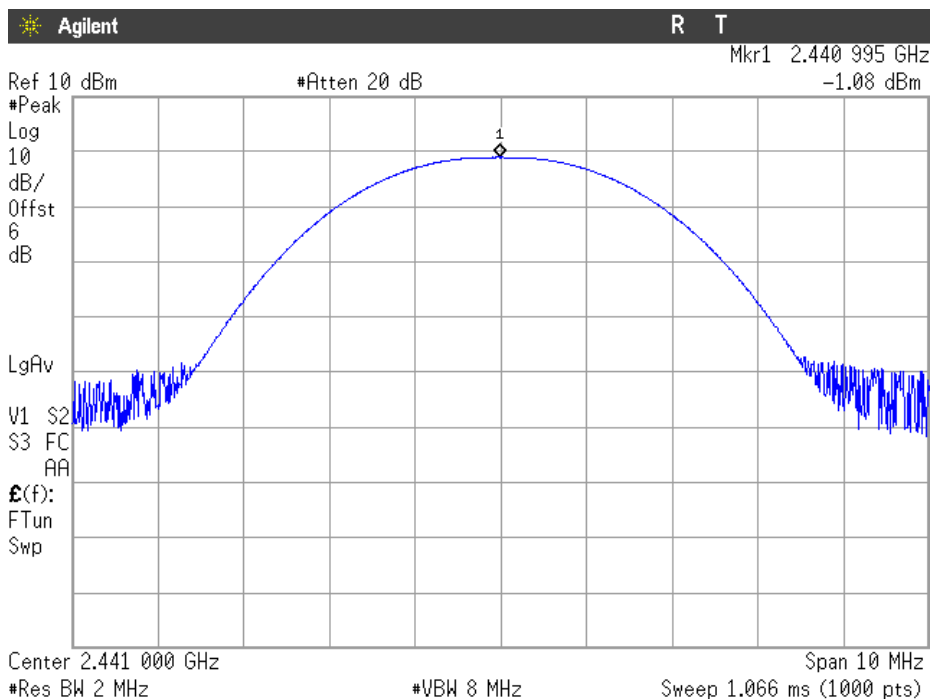
Modulation: GFSK

Lowest Channel: 2402 MHz.



Modulation: GFSK

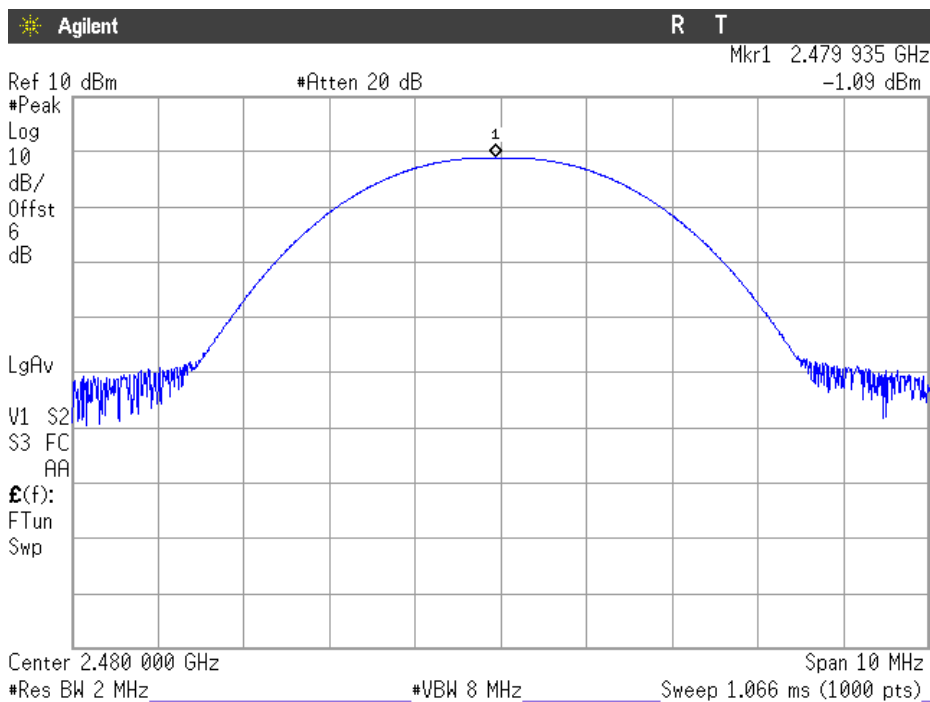
Middle Channel: 2441 MHz.



PEAK OUTPUT POWER (CONDUCTED).

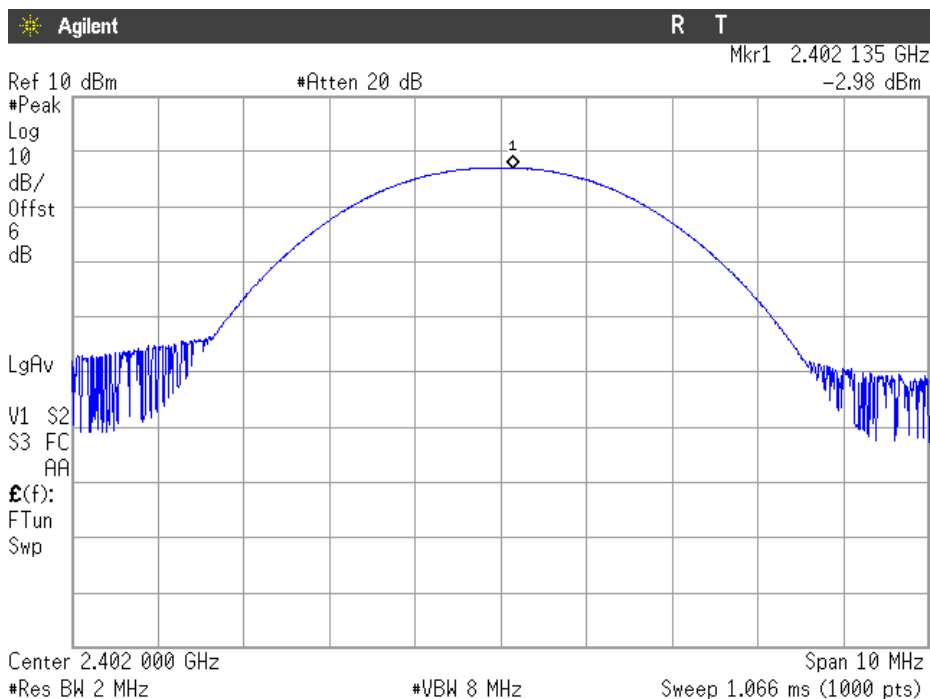
Modulation: GFSK

Highest Channel: 2480 MHz.



Modulation: $\Pi/4$ -DQPSK

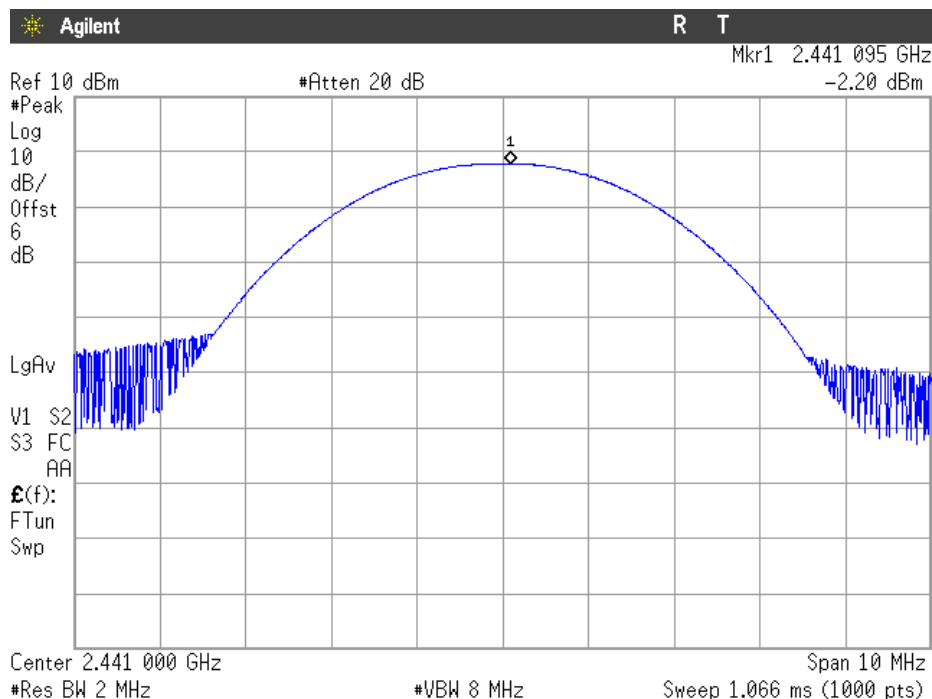
Lowest Channel: 2402 MHz



PEAK OUTPUT POWER (CONDUCTED)

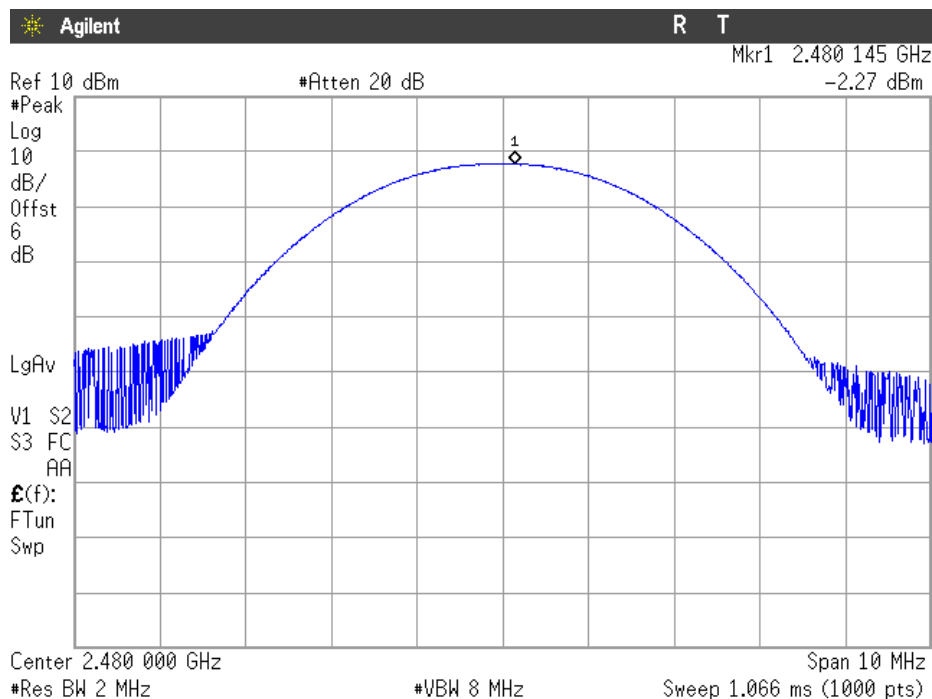
Modulation: $\Pi/4$ -DQPSK

Middle Channel: 2441 MHz.



Modulation: $\Pi/4$ -DQPSK

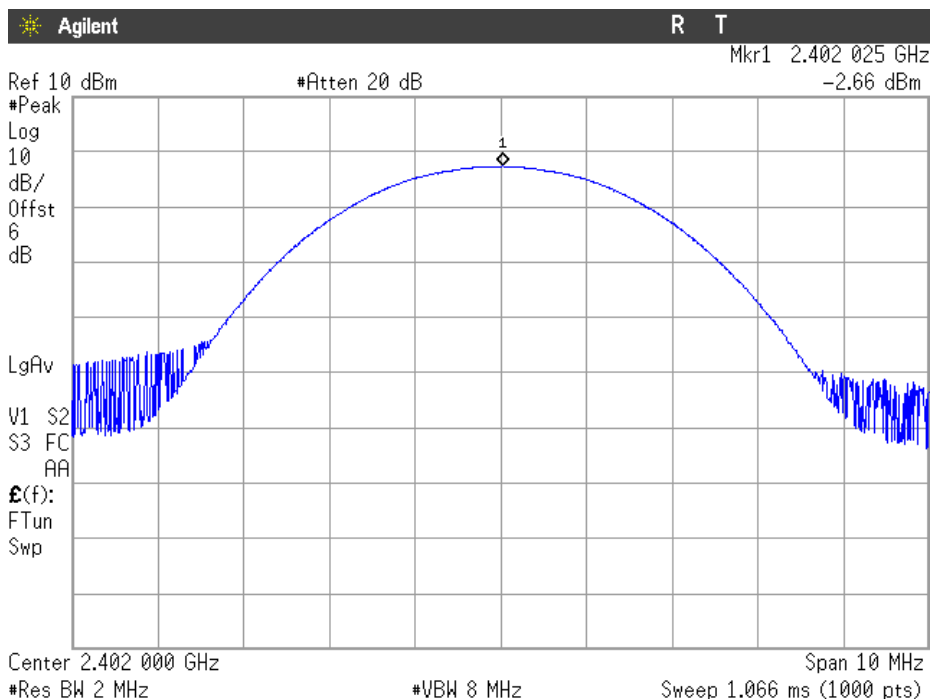
Highest Channel: 2480 MHz.



PEAK OUTPUT POWER (CONDUCTED).

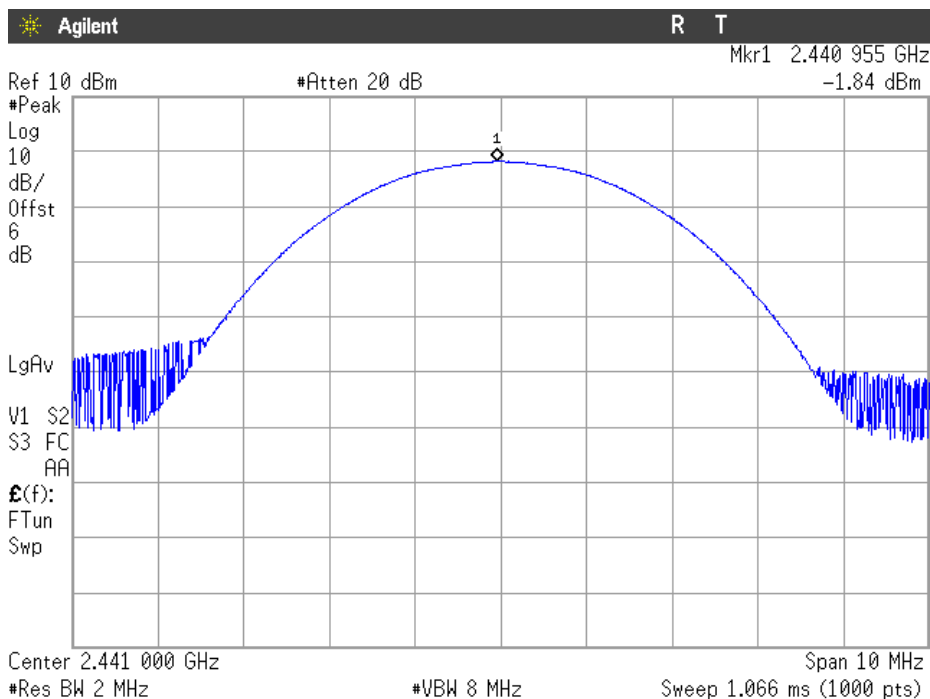
Modulation: 8-DPSK

Lowest Channel: 2402 MHz



Modulation: 8-DPSK

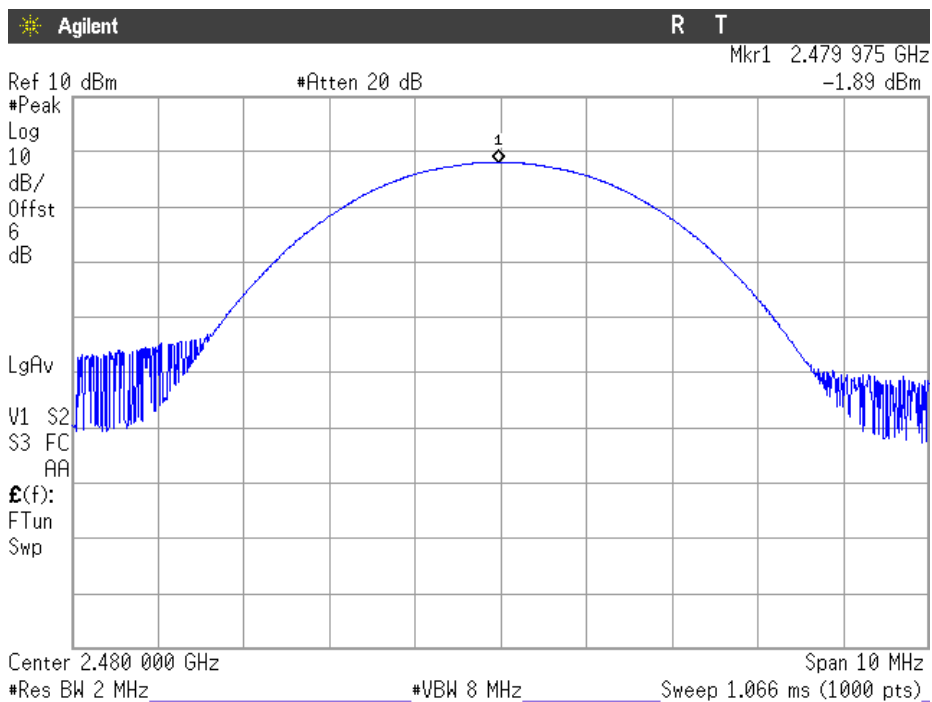
Middle Channel: 2441 MHz.



PEAK OUTPUT POWER (CONDUCTED).

Modulation: 8-DPSK

Highest Channel: 2480 MHz.



FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Band-edge compliance of conducted emissions (Transmitter)

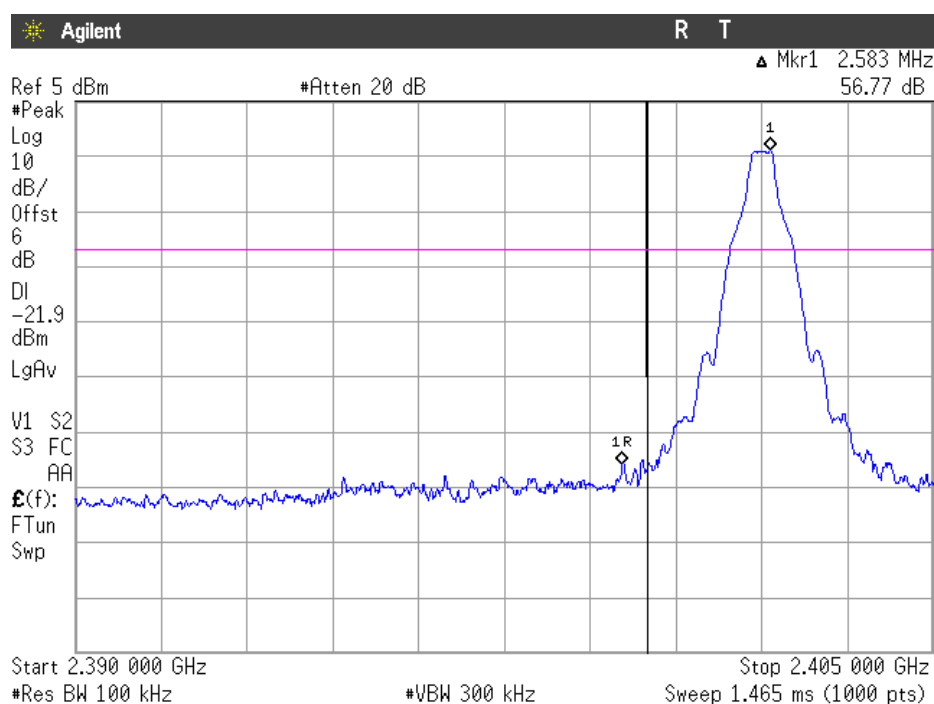
SPECIFICATION

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:

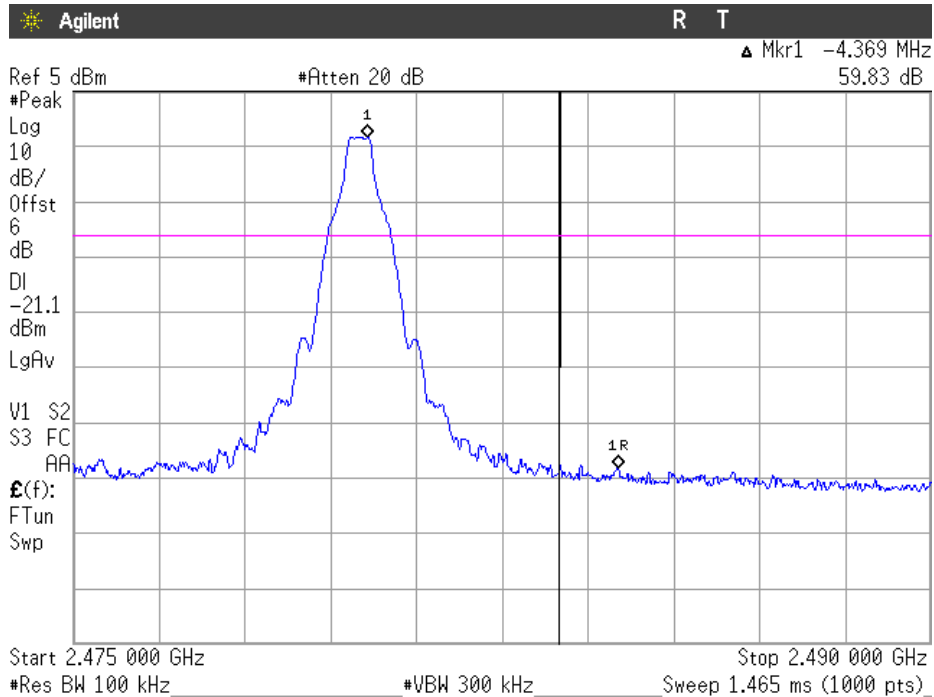
Modulation: GFSK

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



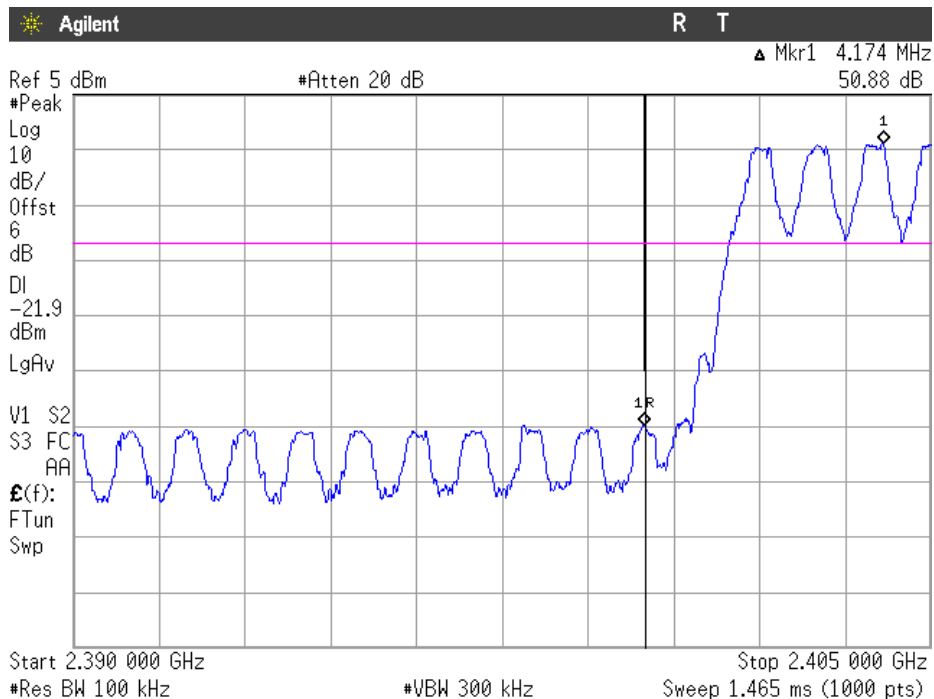
Verdict: PASS

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



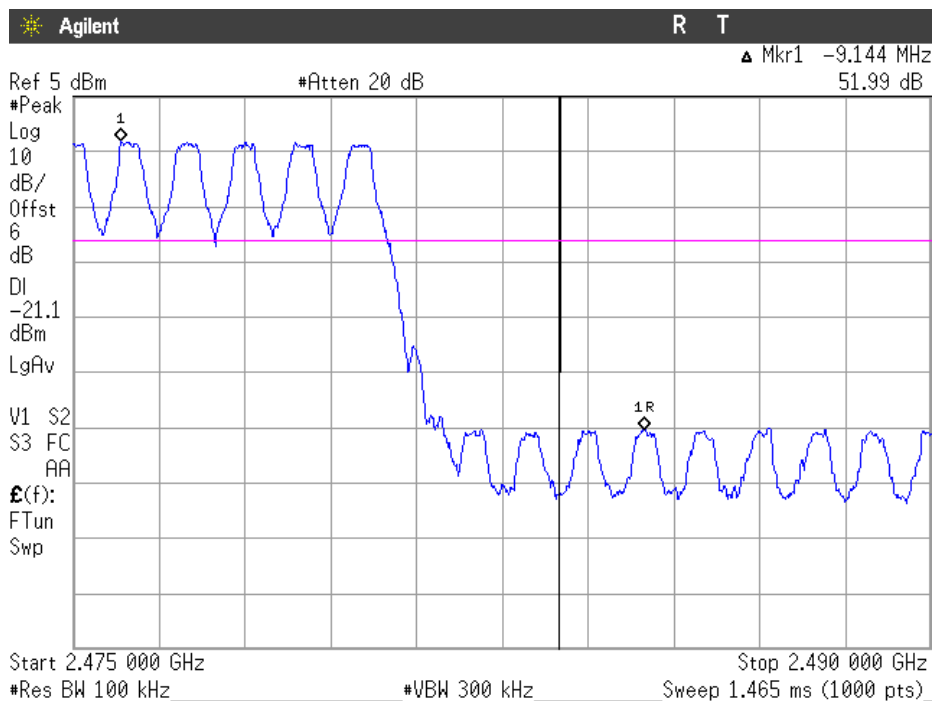
Verdict: PASS

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



Verdict: PASS

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

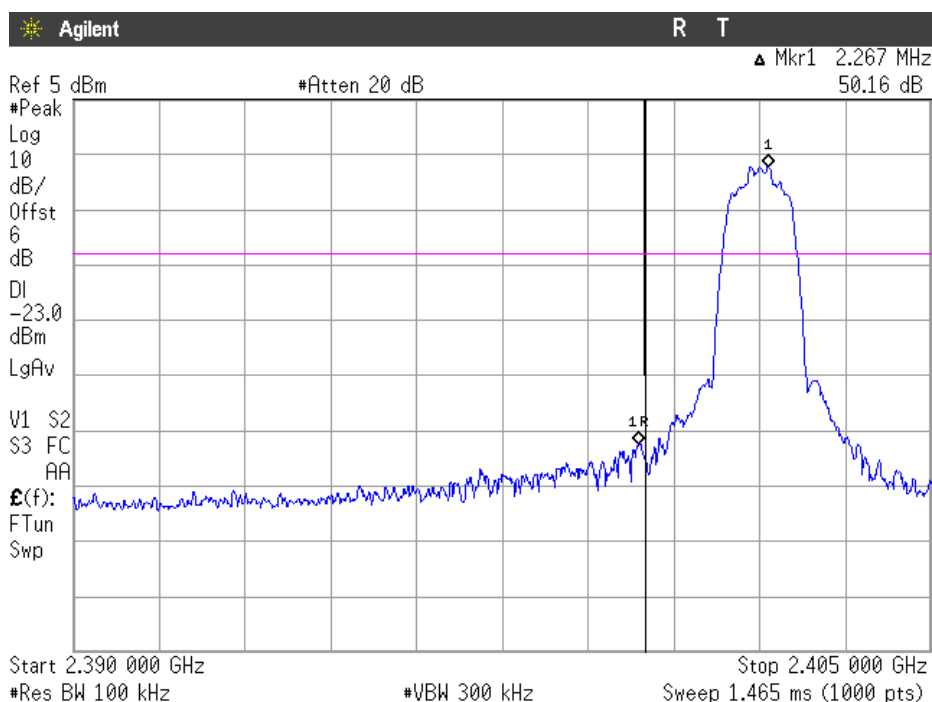


Verdict: PASS

Measurement uncertainty (dB)	<±2.03
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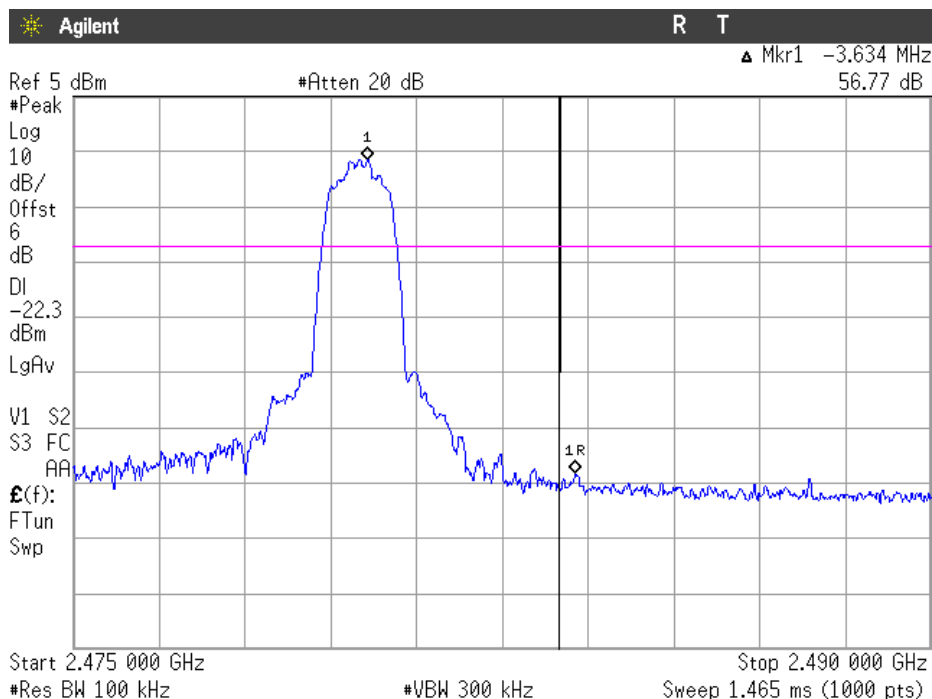
Modulation: $\Pi/4$ -DQPSK

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



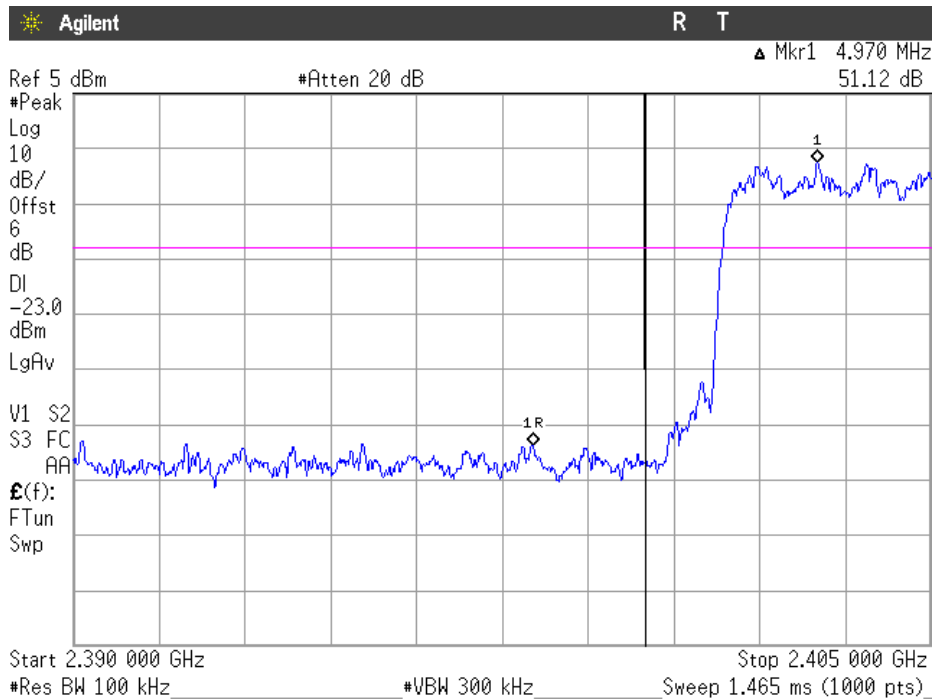
Verdict: PASS

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



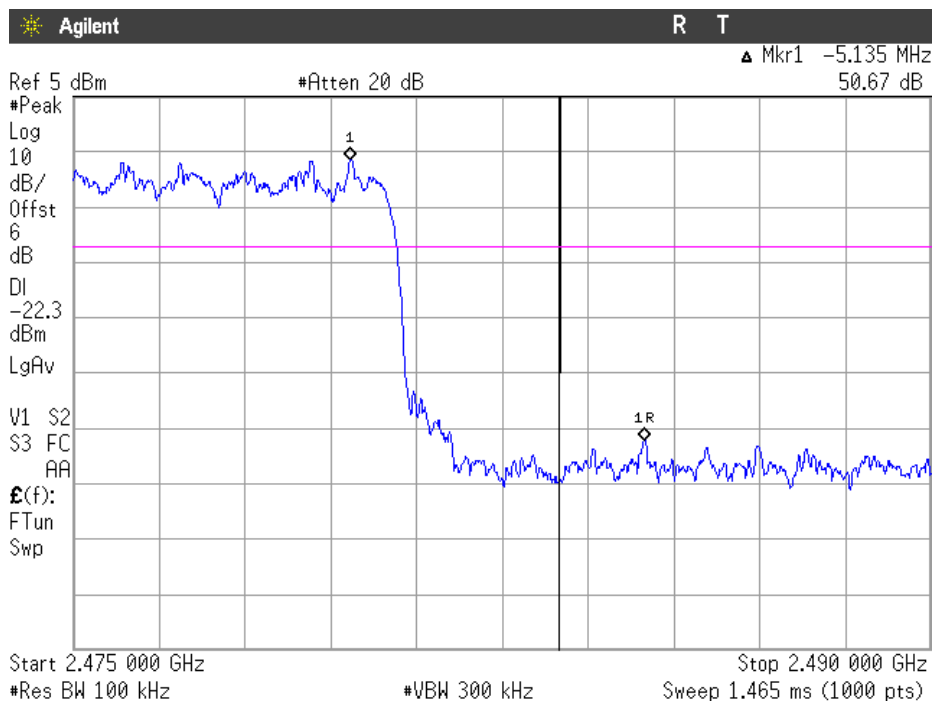
Verdict: PASS

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



Verdict: PASS

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

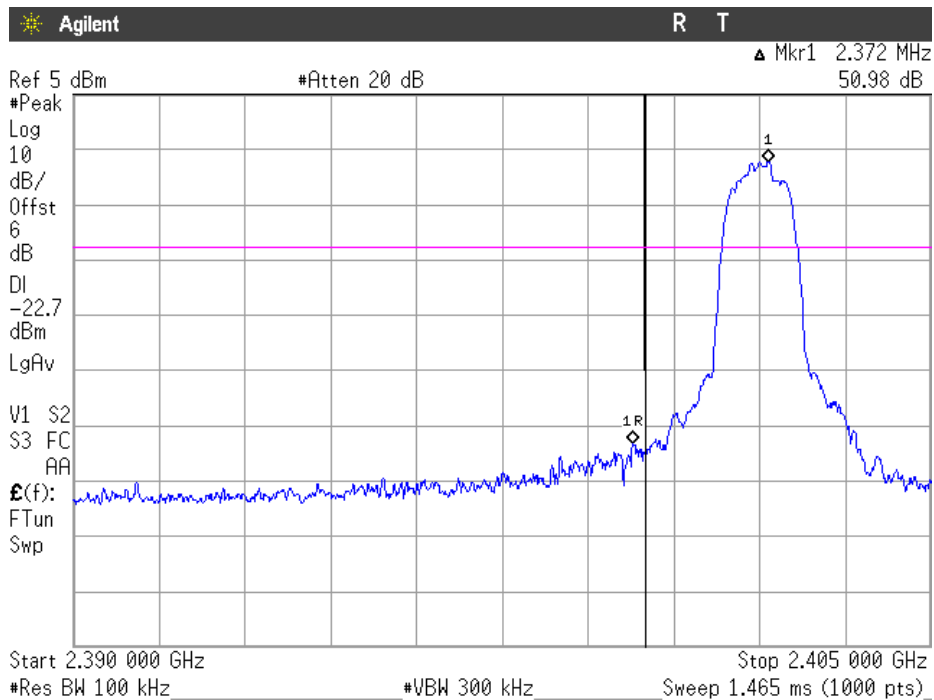


Verdict: PASS

Measurement uncertainty (dB)	<±2.03
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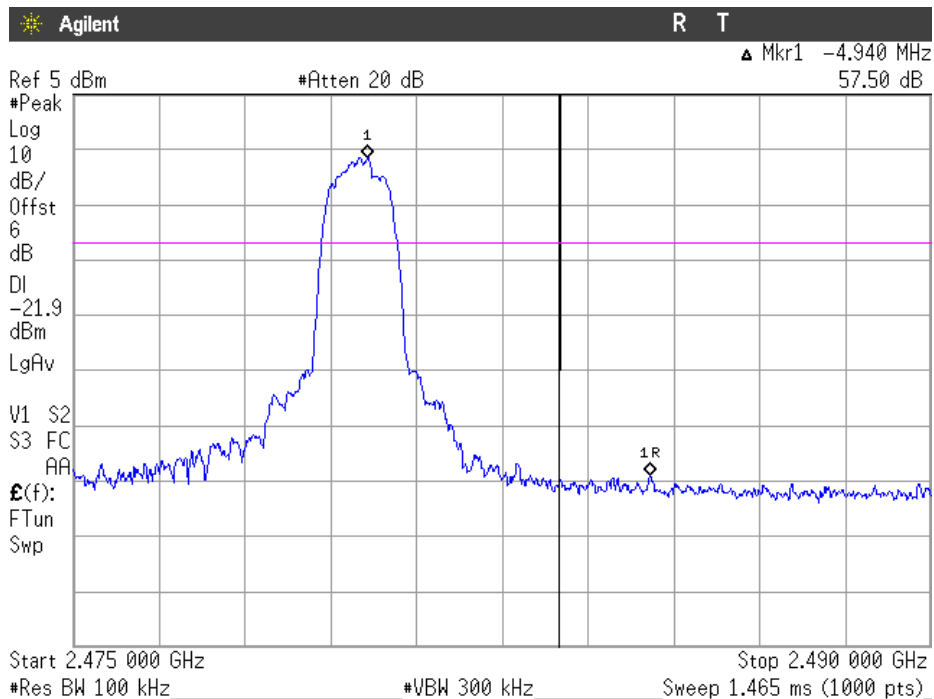
Modulation: 8-DPSK

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



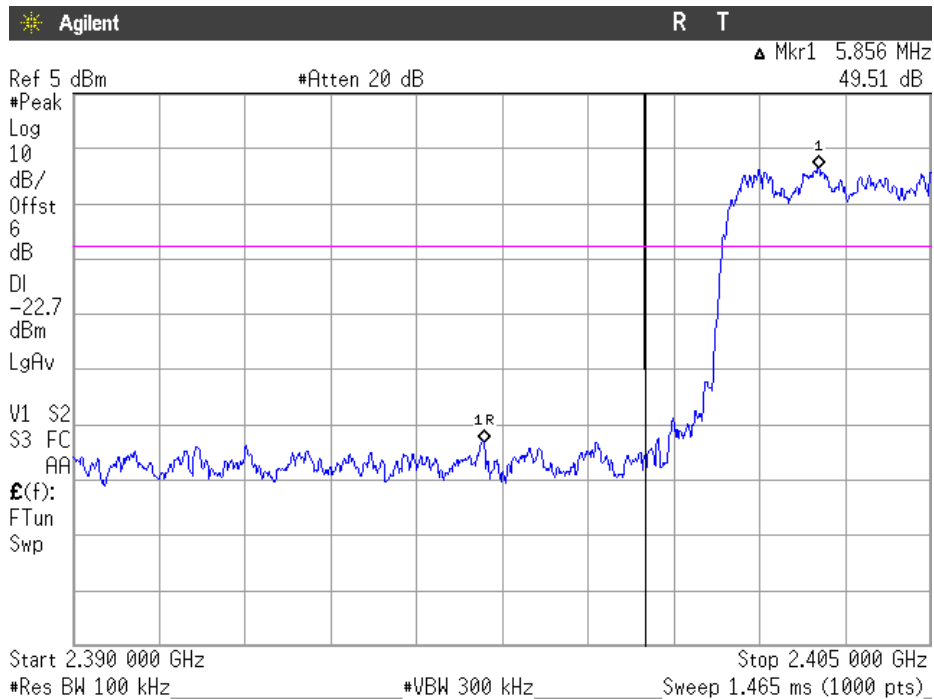
Verdict: PASS

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



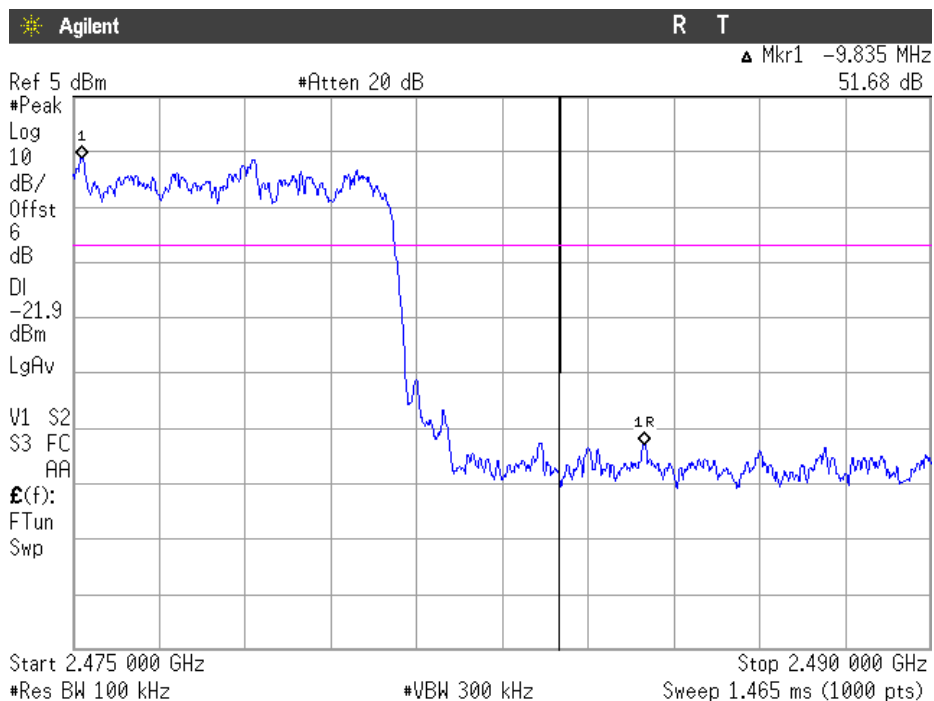
Verdict: PASS

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



Verdict: PASS

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



Verdict: PASS

Measurement uncertainty (dB)	<±2.03
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FCC Section 15.247 Subclause (d) / RSS-247 Clause 5.5. Emission limitations conducted (Transmitter)

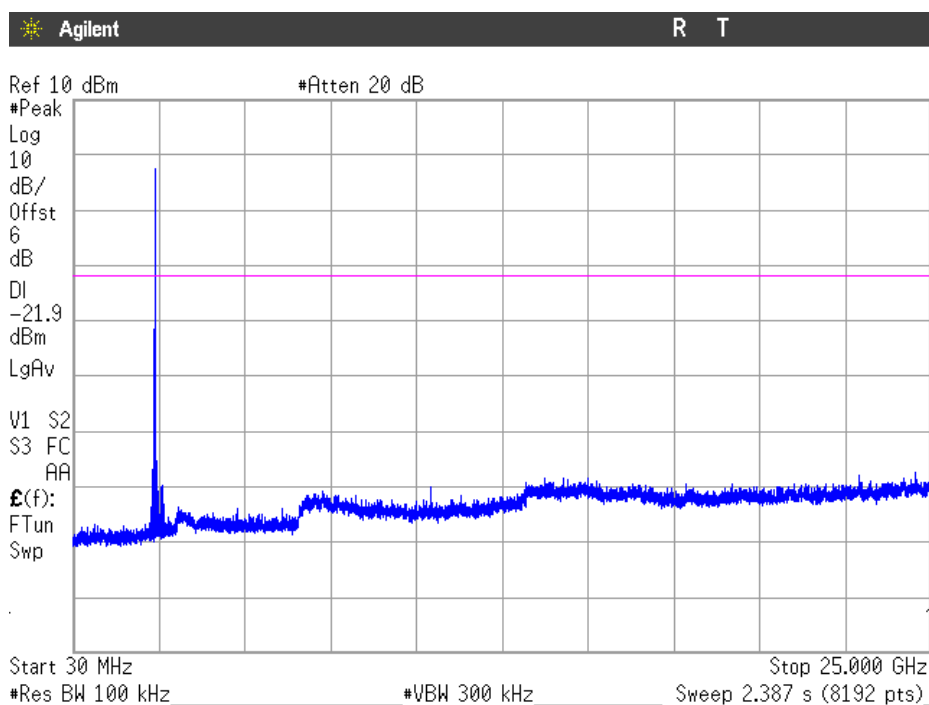
SPECIFICATION

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

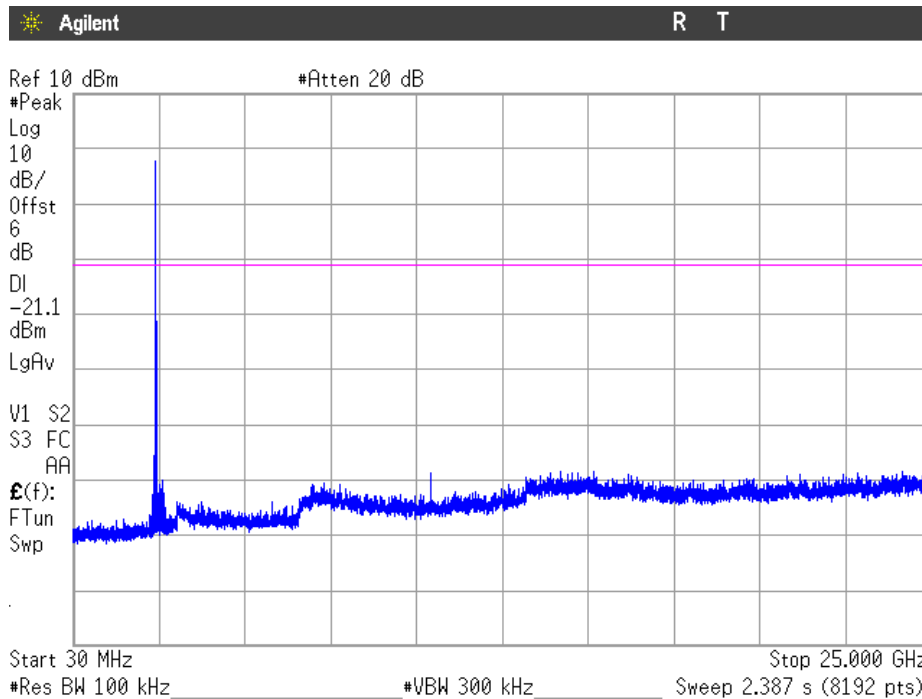
1. LOWEST CHANNEL (2402 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

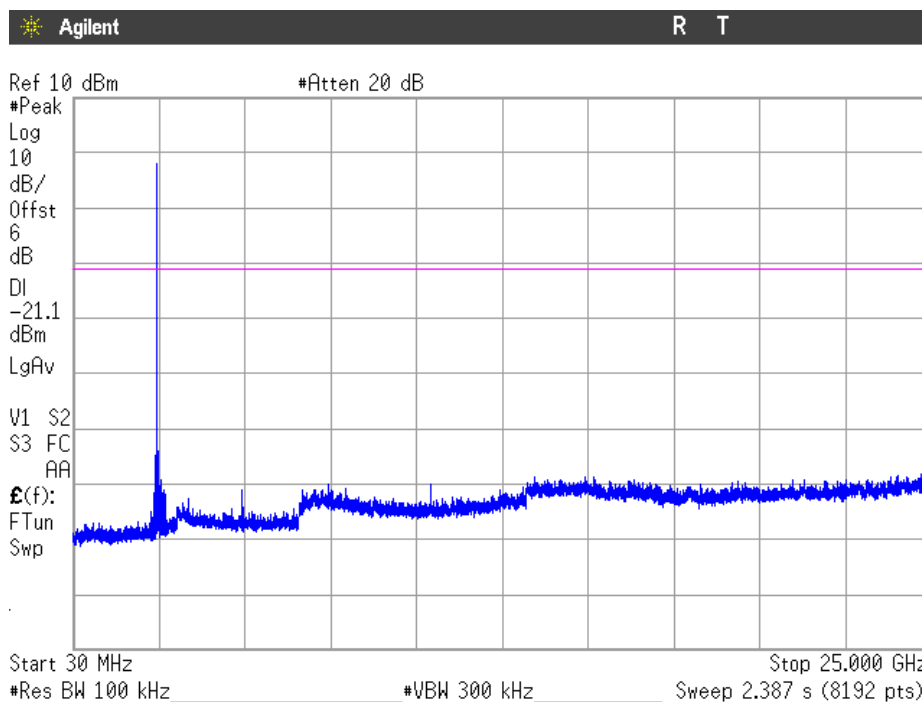
2. MIDDLE CHANNEL (2441 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

3. HIGH CHANNEL (2480 MHz): 30 MHz-25 GHz (see next plot).



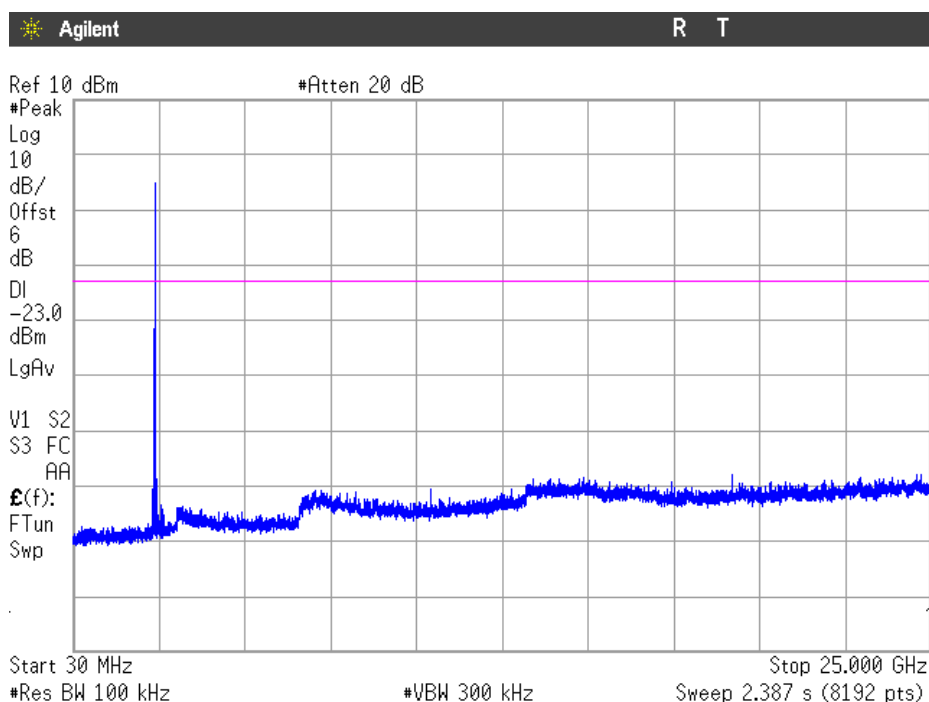
Note: The peak above the limits is the carrier frequency.

Verdict: PASS

Measurement uncertainty (dB)	<±2.03
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Modulation: $\Pi/4$ -DQPSK

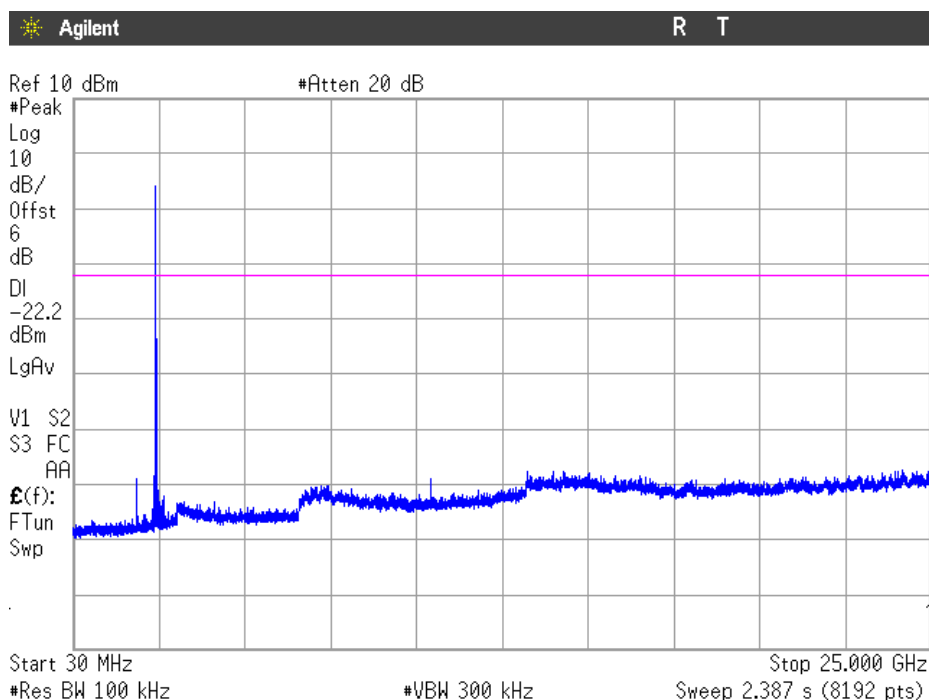
1. LOWEST CHANNEL (2402 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

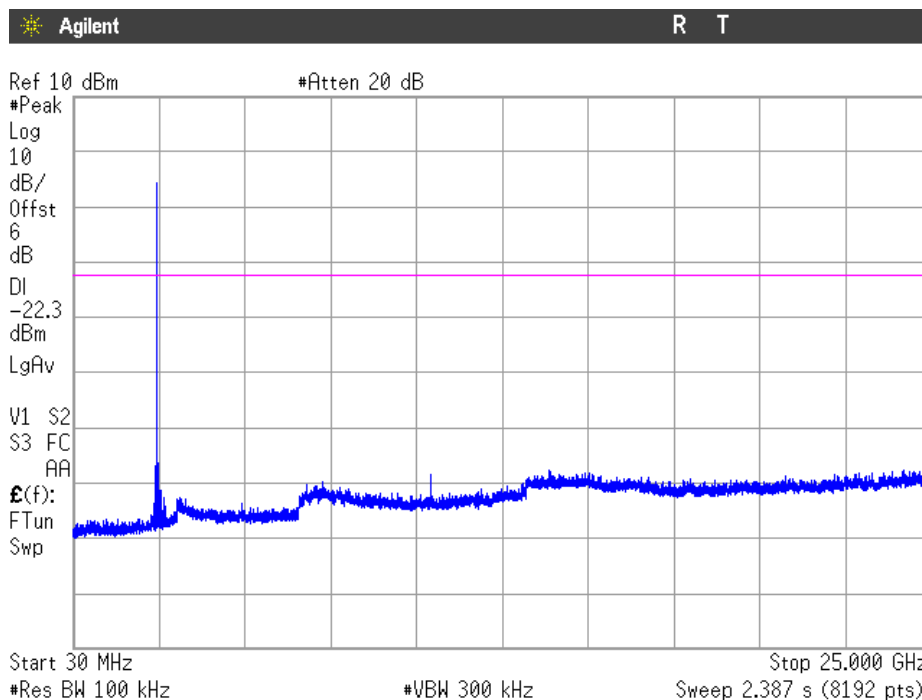
2. MIDDLE CHANNEL (2441 MHz): 30 MHz-25 GHz (see next plot).



Note: The peaks above the limits are the carrier frequencies.

Verdict: PASS

3. HIGH CHANNEL (2480 MHz): 30 MHz-25 GHz (see next plot).



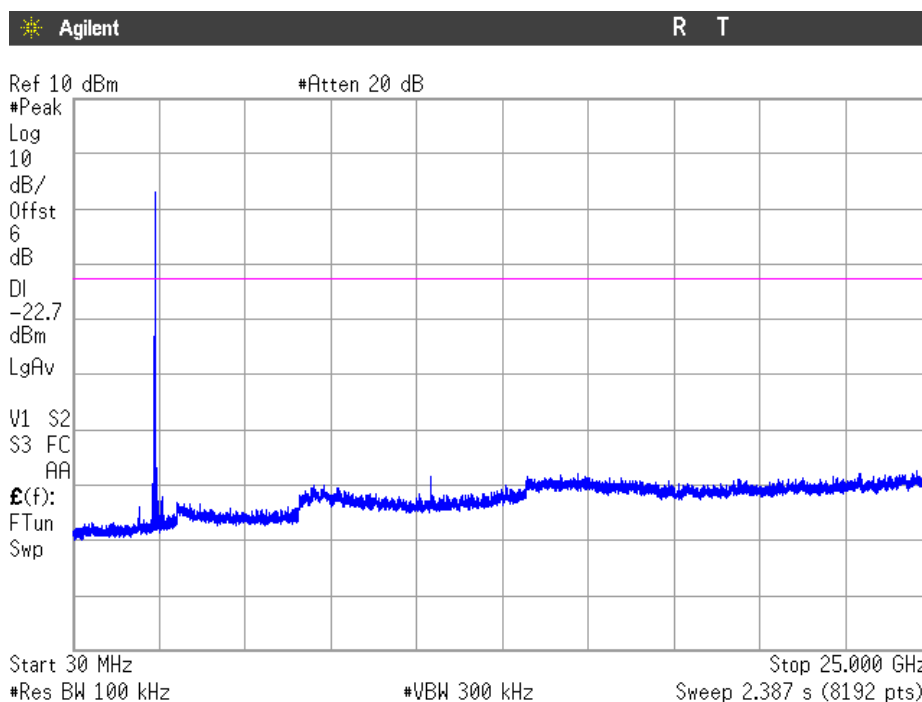
Note: The peak above the limit is the carrier frequency.

Verdict: PASS

Measurement uncertainty (dB)	<±2.03
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Modulation: 8-DPSK

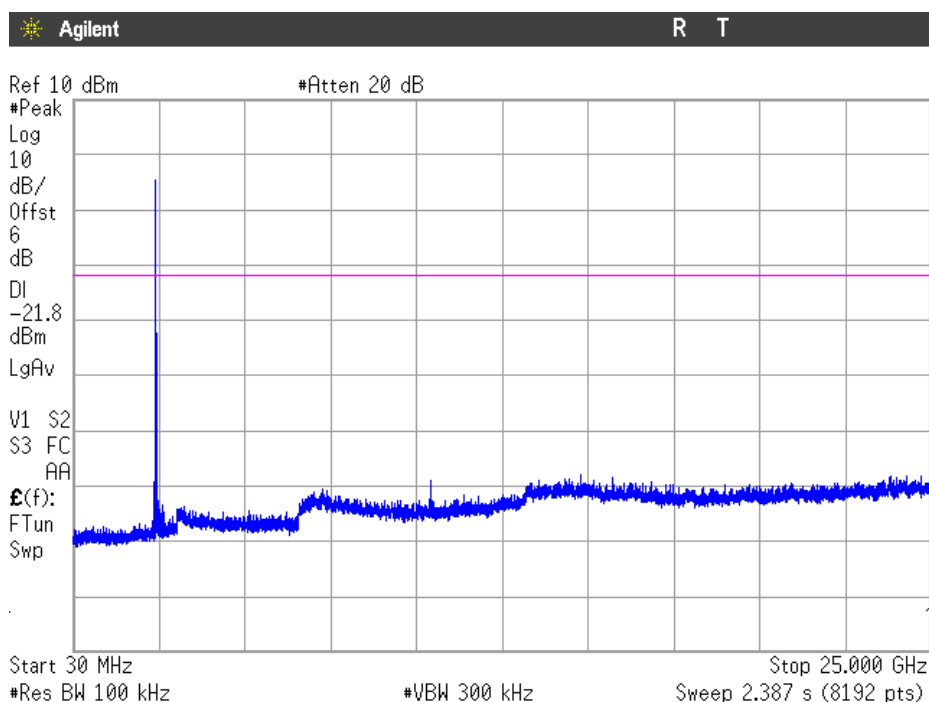
1. LOWEST CHANNEL (2402 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

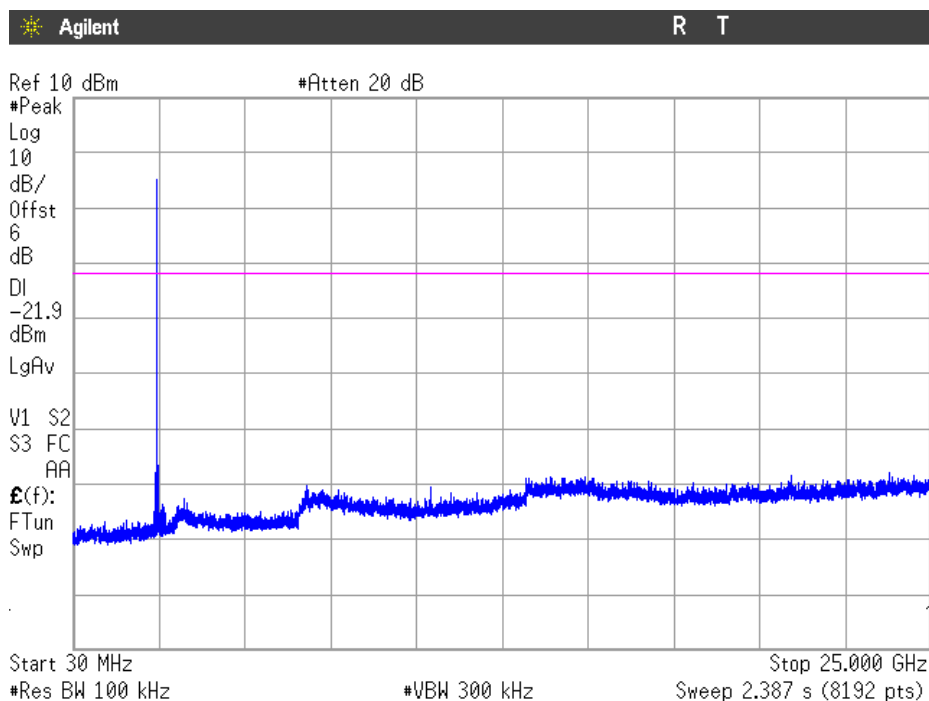
2. MIDDLE CHANNEL (2441 MHz): 30 MHz-25 GHz (see next plot).



Note: The peaks above the limit are the carrier frequencies.

Verdict: PASS

3. HIGH CHANNEL (2480 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

Measurement uncertainty (dB)	<±2.03
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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 §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.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-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.

CARRIER FIELD STRENGTH

Modulation: GFSK

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Field strength (dB μ V/m) average	82.03	82.50	84.29
Field strength (dB μ V/m) peak	82.38	82.83	84.64
Measurement uncertainty (dB)	< $\pm$ 4.87		

Modulation: $\Pi/4$ -DQPSK

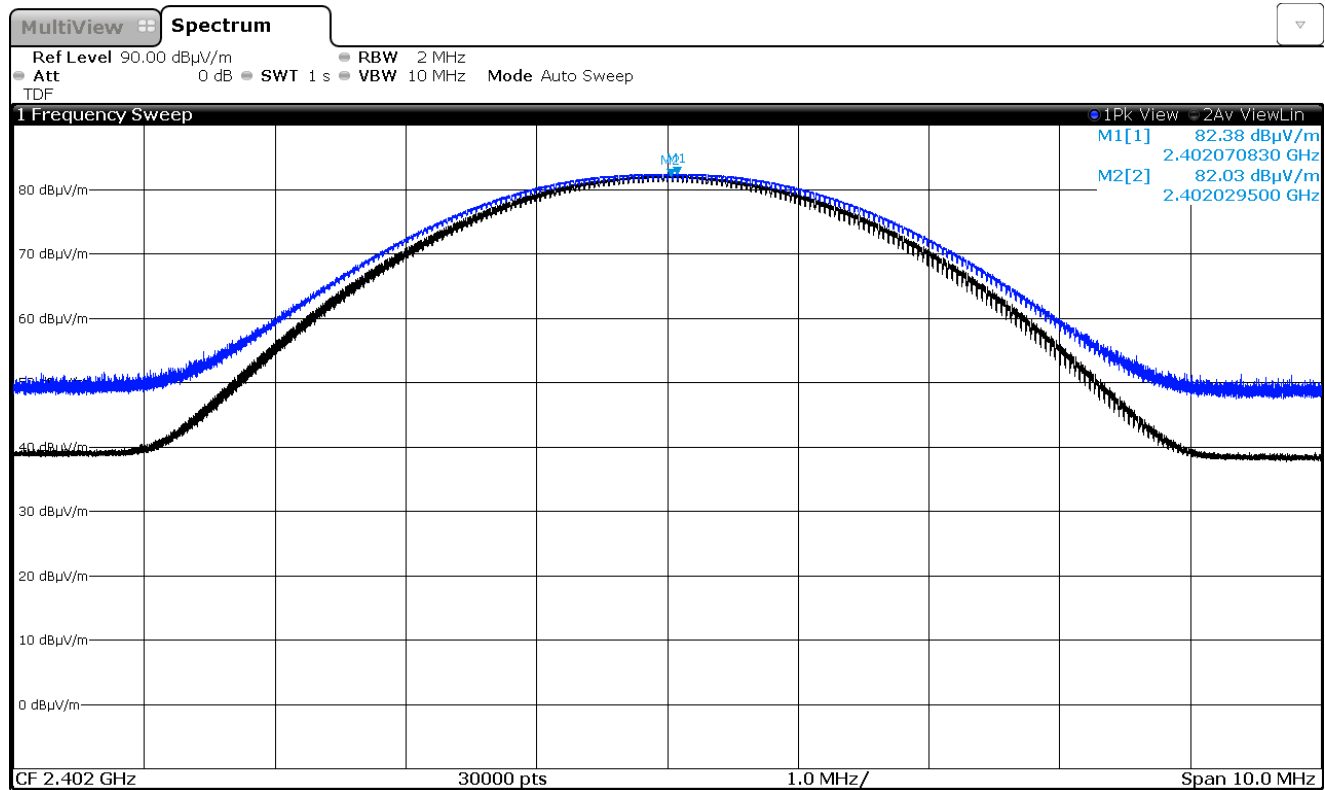
	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Field strength (dB μ V/m) average	79.40	80.27	82.16
Field strength (dB μ V/m) peak	80.98	81.50	83.20
Measurement uncertainty (dB)	< $\pm$ 4.87		

Modulation: 8-DPSK

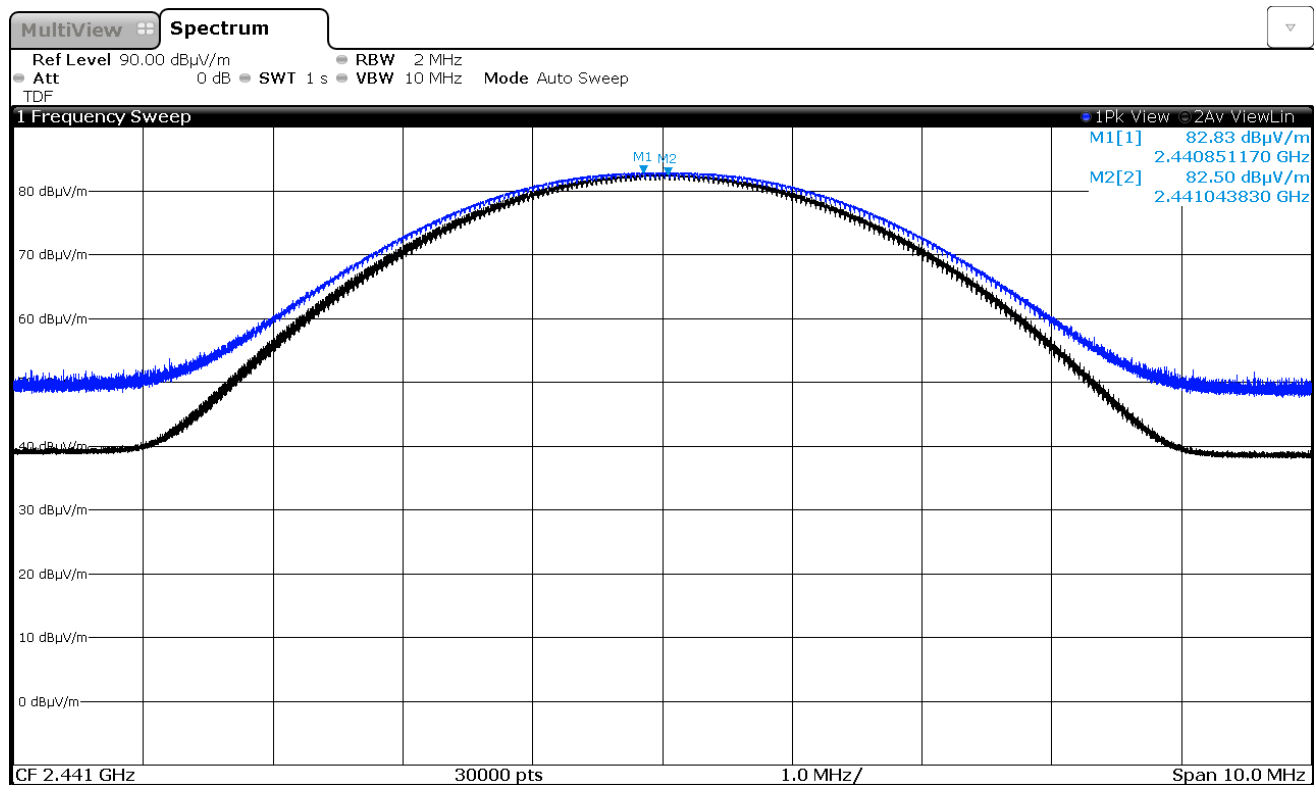
	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Field strength (dB μ V/m) average	80.65	81.46	80.74
Field strength (dB μ V/m) peak	81.44	82.19	83.53
Measurement uncertainty (dB)	< $\pm$ 4.87		

Modulation: GFSK

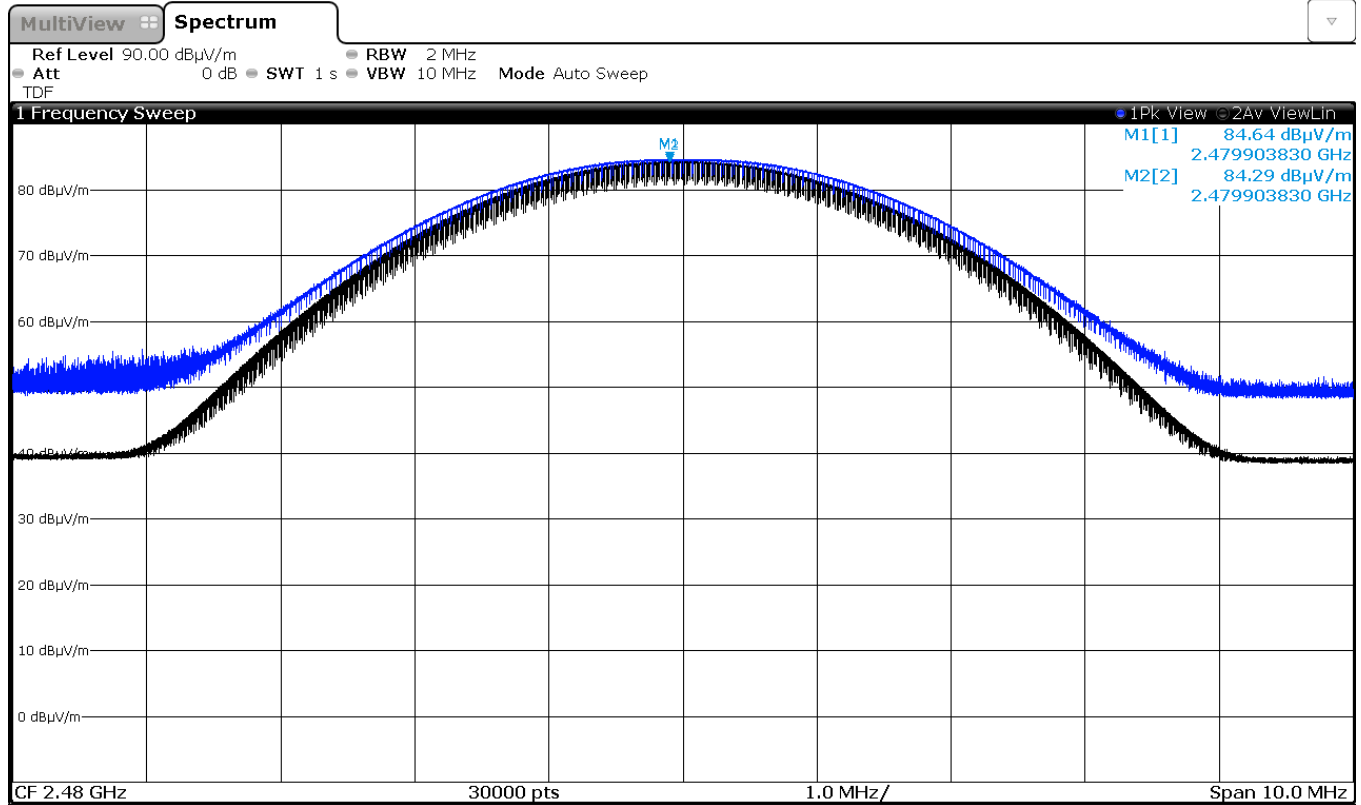
Lowest Channel



Middle Channel

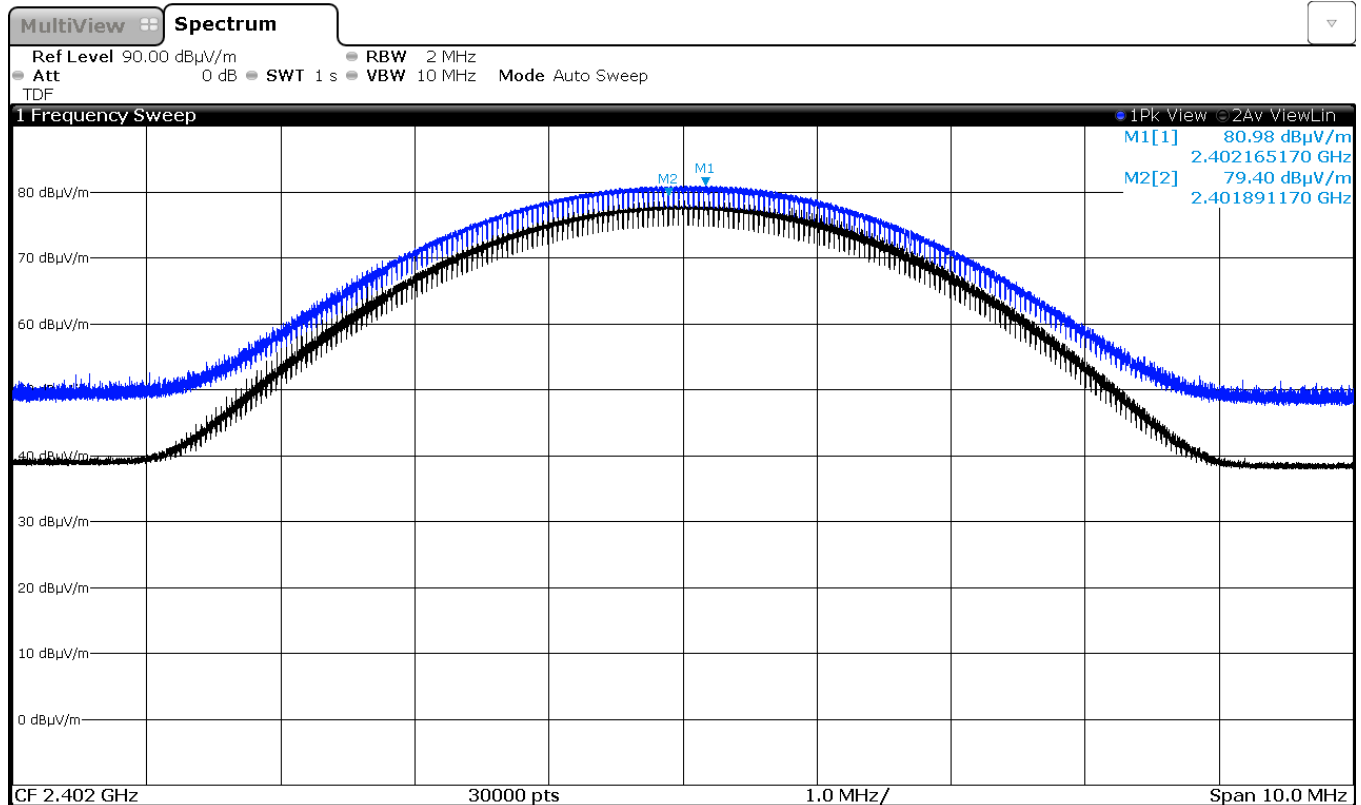


Highest Channel

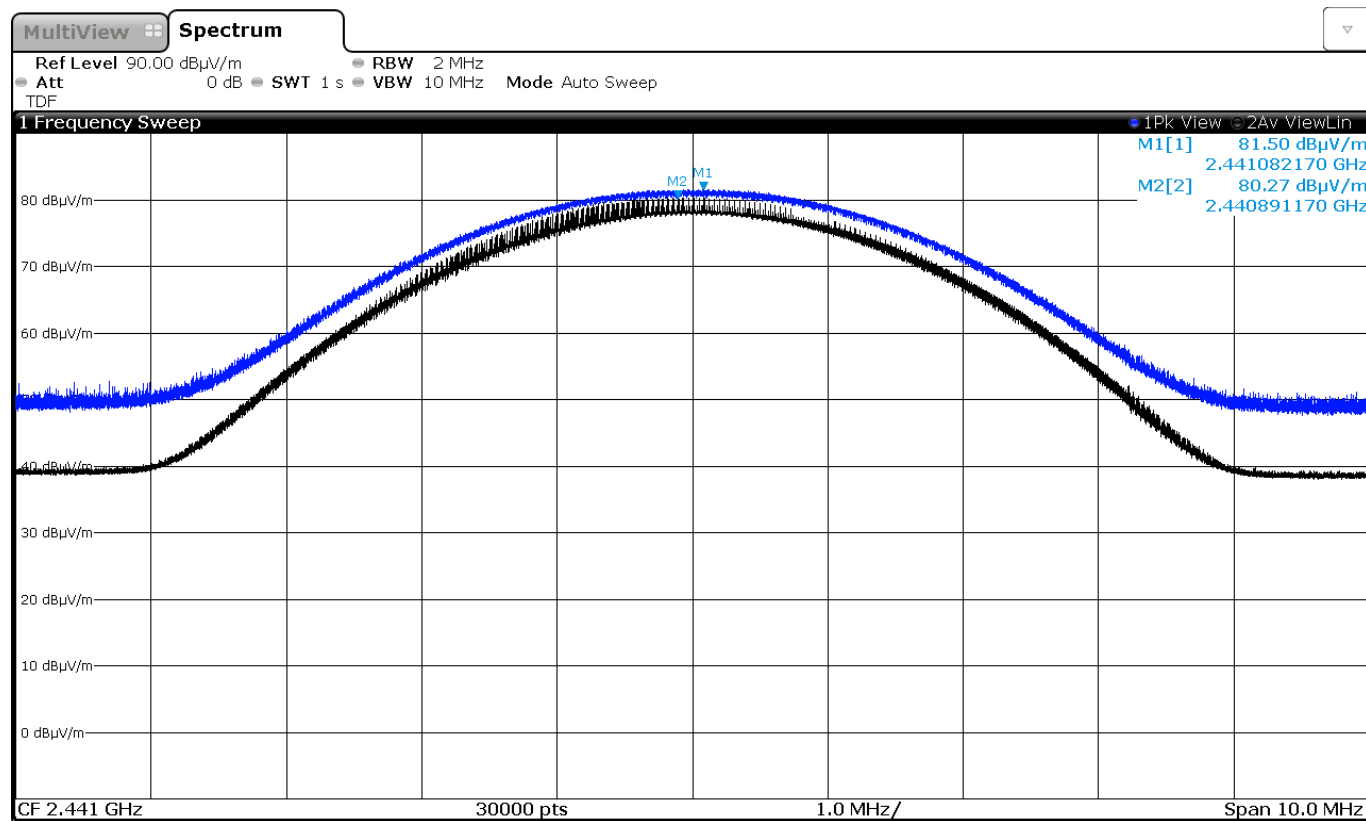


Modulation: $\Pi/4$ -DQPSK

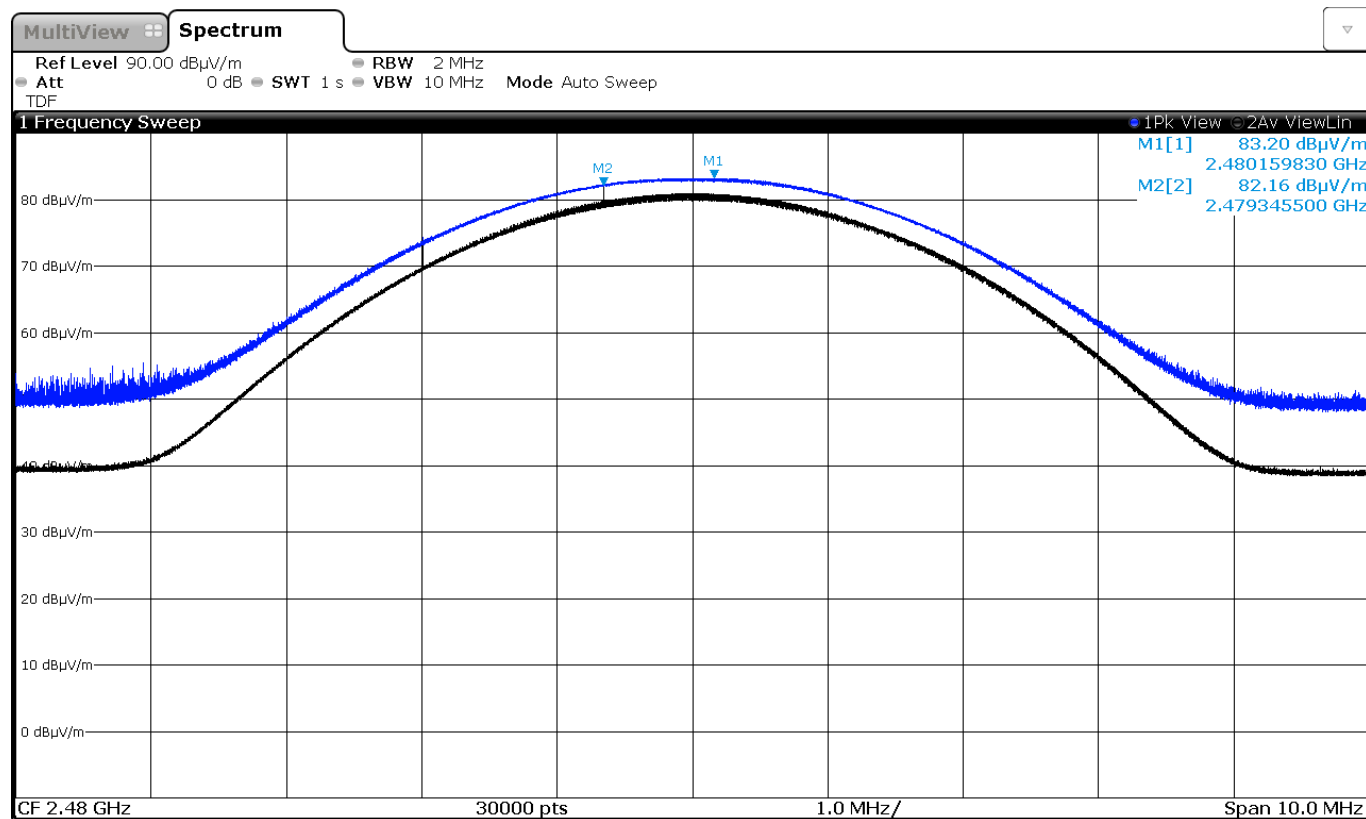
Lowest Channel



Middle Channel

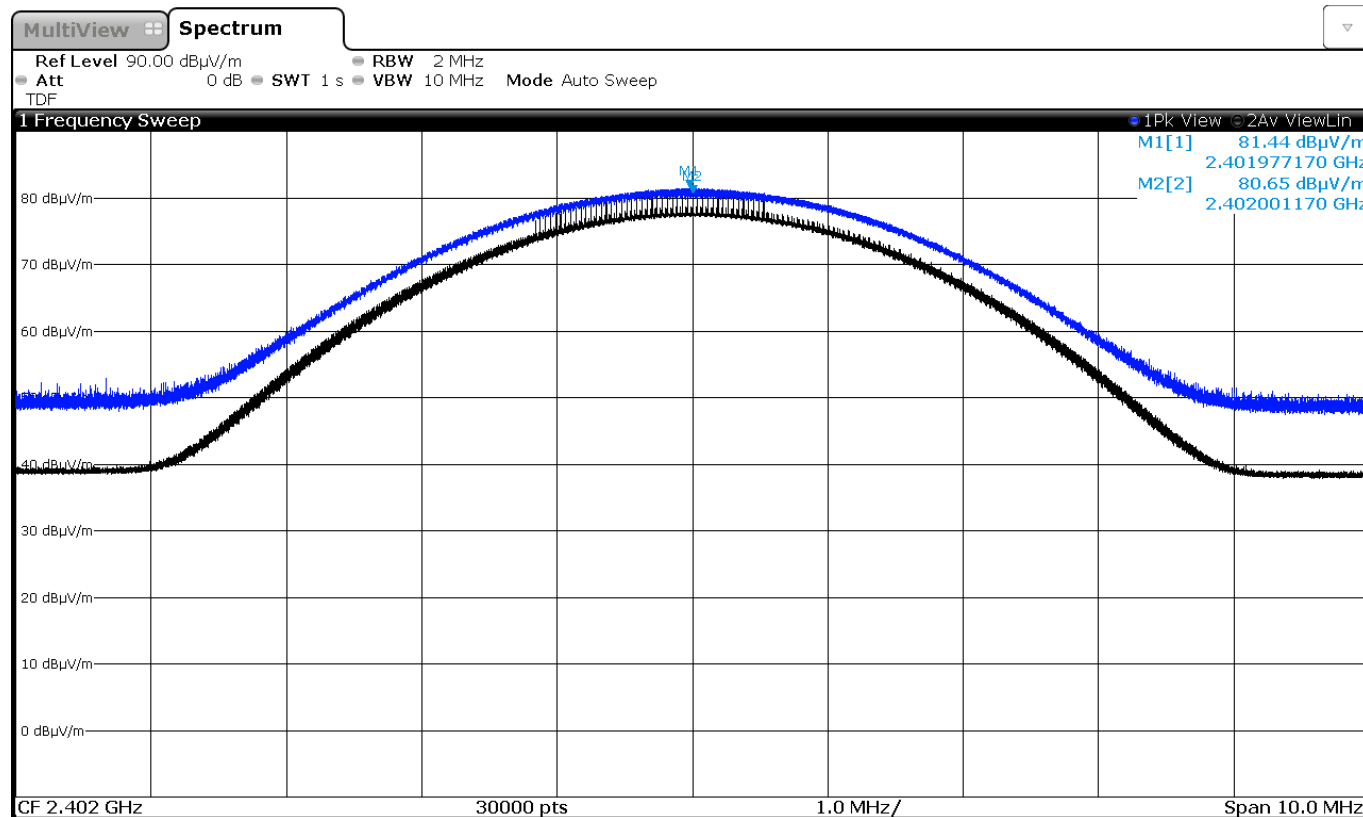


Highest Channel

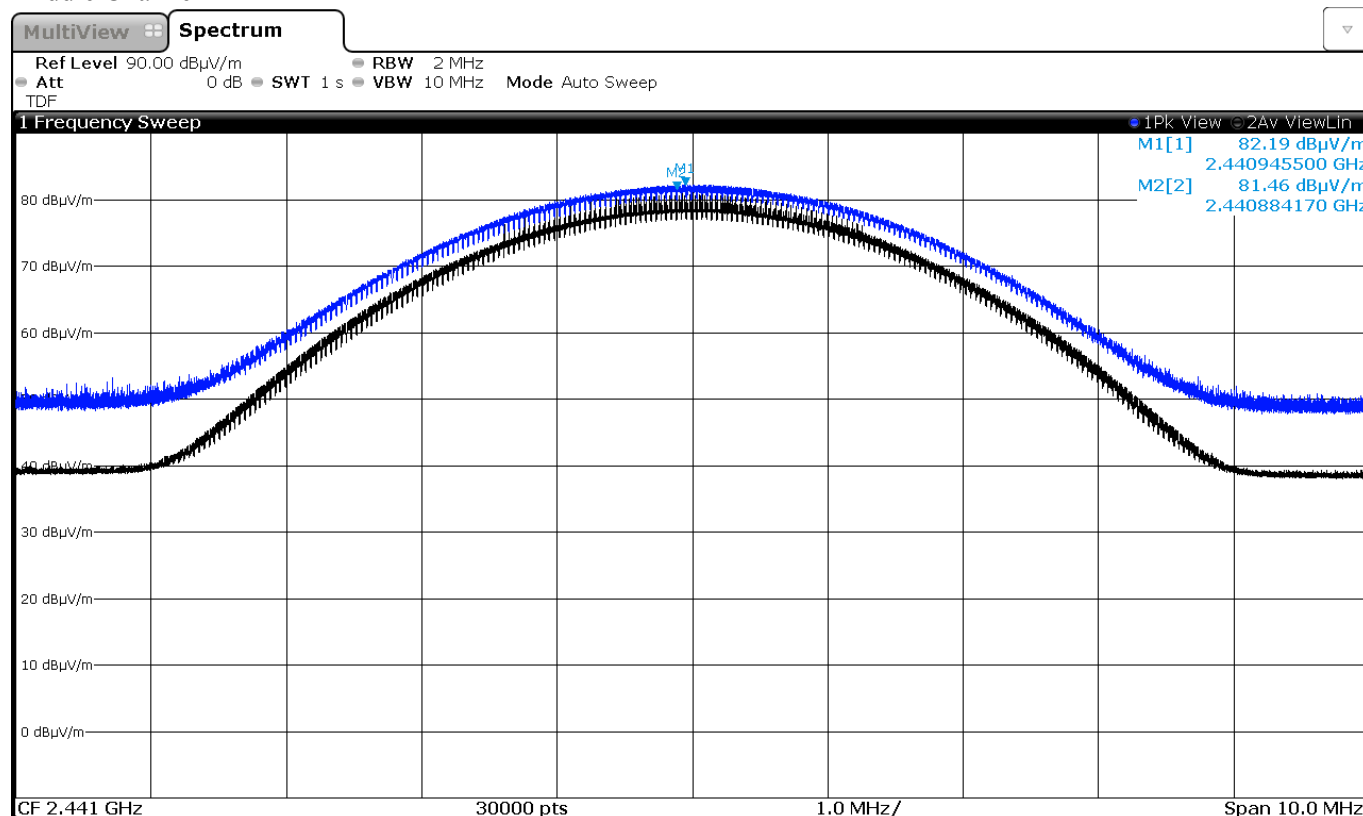


Modulation: 8-DPSK

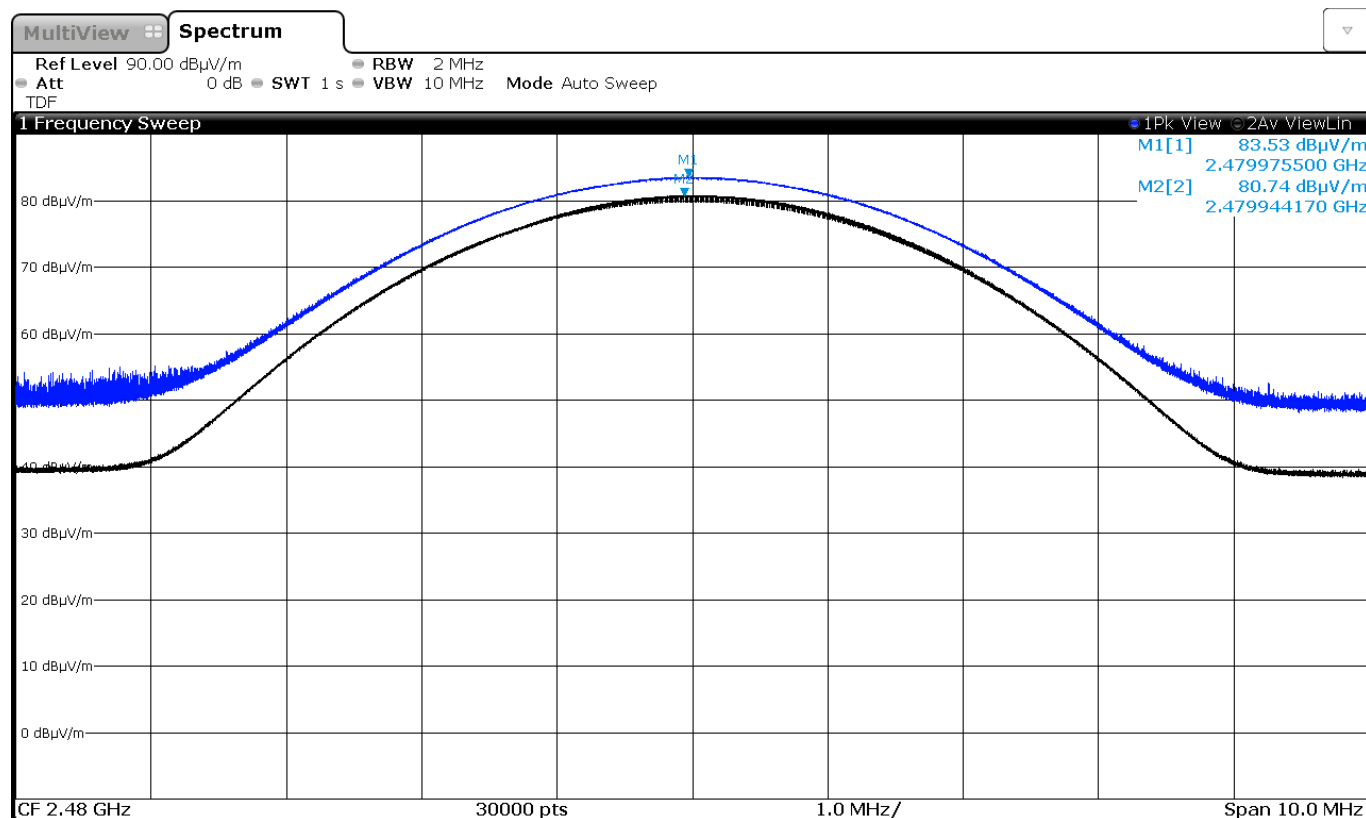
Lowest Channel



Middle Channel



Highest Channel



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)
53.280	V	Quasi-Peak	40.75(*)	± 3.88
93.244	V	Quasi-Peak	42.58	± 3.88
99.937	H	Quasi-Peak	34.33	± 3.88
119.919	H	Quasi-Peak	32.54	± 3.88
392.974	V	Quasi-Peak	35.14	± 3.88
665.641	H	Quasi-Peak	36.15	± 3.88
768.073	H	Quasi-Peak	36.68	± 3.88
816.088	H	Quasi-Peak	45.74	± 3.88
998.448	V	Quasi-Peak	36.98	± 3.88

(*): Emission in non-restricted frequency bands. The emission level is 20dBc below the carrier levels.

Frequency range 1 GHz-25 GHz

The results in the next tables show the maximum measured levels in the 1-25 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz (see next plots).

Modulation: GFSK

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
1.19910	H	Peak	47.25	± 4.87
		Average	41.17	
1.29557	V	Peak	49.16	± 4.87
		Average	44.32	
1.39190	V	Peak	48.15	± 4.87
		Average	43.45	
1.91997	V	Peak	46.69	± 4.87
		Average	41.61	
2.32970	V	Peak	49.21	± 4.87
		Average	40.03	
3.11825	V	Peak	38.23	± 4.87
		Average	34.47	

2. CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
1.10310	H	Peak	48.66	± 4.87
		Average	43.77	
1.19910	H	Peak	47.61	± 4.87
		Average	42.84	
1.29543	V	Peak	49.26	± 4.87
		Average	44.11	
1.39397	V	Peak	48.16	± 4.87
		Average	43.11	
1.48690	H	Peak	47.71	± 4.87
		Average	41.74	
1.92017	V	Peak	46.36	± 4.87
		Average	41.37	
2.32983	V	Peak	48.22	± 4.87
		Average	39.76	
3.11825	V	Peak	37.60	± 4.87
		Average	34.51	

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
1.10577	H	Peak	48.58	± 4.87
		Average	44.00	
1.20017	H	Peak	47.24	± 4.87
		Average	42.18	
1.29477	V	Peak	49.62	± 4.87
		Average	45.44	
1.39110	V	Peak	48.25	± 4.87
		Average	43.51	
1.48983	H	Peak	47.36	± 4.87
		Average	40.60	
1.92010	V	Peak	46.14	± 4.87
		Average	41.22	
2.32995	V	Peak	48.59	± 4.87
		Average	40.09	
3.11825	V	Peak	37.36	± 4.87
		Average	34.54	

Verdict: PASS

Modulation: $\Pi/4$ -DQPSK

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
1.10377	H	Peak	48.56	± 4.87
		Average	44.55	
1.19950	H	Peak	47.50	± 4.87
		Average	42.21	
1.29470	V	Peak	49.49	± 4.87
		Average	44.57	
1.39023	V	Peak	47.74	± 4.87
		Average	43.44	
1.48937	H	Peak	47.09	± 4.87
		Average	42.30	
1.92010	V	Peak	46.09	± 4.87
		Average	40.89	
2.32958	V	Peak	49.33	± 4.87
		Average	40.52	
3.11825	V	Peak	37.84	± 4.87
		Average	34.61	

2. CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
1.10370	H	Peak	48.77	± 4.87
		Average	44.30	
1.20130	H	Peak	47.60	± 4.87
		Average	42.71	
1.29603	V	Peak	49.02	± 4.87
		Average	45.48	
1.39143	V	Peak	48.01	± 4.87
		Average	43.66	
1.49057	H	Peak	47.43	± 4.87
		Average	41.95	
1.92017	V	Peak	47.32	± 4.87
		Average	41.37	
2.32957	H	Peak	48.31	± 4.87
		Average	38.97	
3.11825	V	Peak	37.73	± 4.87
		Average	34.65	

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dB μ V/m)	Measurement Uncertainty (dB)
1.10577	H	Peak	48.75	± 4.87
		Average	44.05	
1.20017	H	Peak	47.37	± 4.87
		Average	44.10	
1.29477	V	Peak	49.75	± 4.87
		Average	45.21	
1.39110	V	Peak	48.27	± 4.87
		Average	42.81	
1.48983	H	Peak	47.41	± 4.87
		Average	40.60	
1.92010	V	Peak	46.19	± 4.87
		Average	41.41	
2.32946	V	Peak	45.45	± 4.87
		Average	38.07	
2.48354	V	Peak	58.62	± 4.87
		Average	36.42	

Verdict: PASS

Modulation: 8-DPSK

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
1.10390	H	Peak	48.34	± 4.87
		Average	44.91	
1.20037	H	Peak	47.58	± 4.87
		Average	42.36	
1.29590	V	Peak	49.03	± 4.87
		Average	45.71	
1.39217	V	Peak	47.89	± 4.87
		Average	45.71	
1.48790	H	Peak	47.06	± 4.87
		Average	42.84	
1.92010	V	Peak	46.86	± 4.87
		Average	41.02	
2.32946	V	Peak	47.55	± 4.87
		Average	39.98	
3.11825	V	Peak	37.53	± 4.87
		Average	34.51	

2. CHANNEL: MIDDLE (2441 MHz).

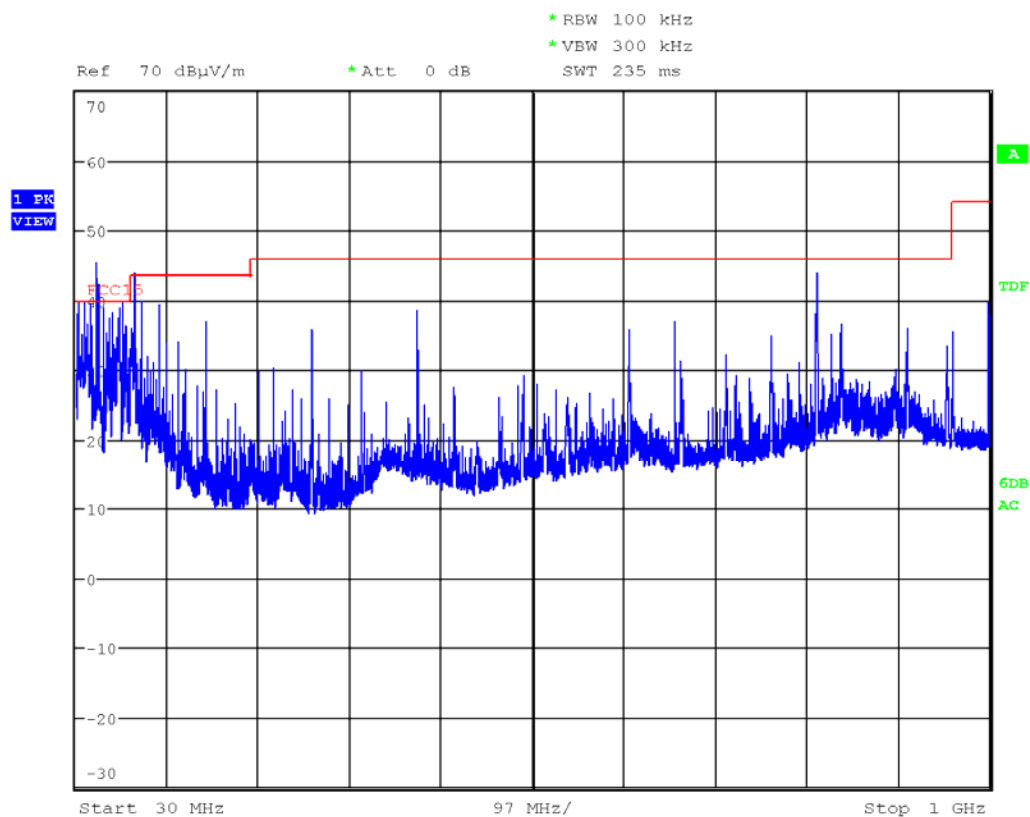
Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
1.10497	H	Peak	48.80	± 4.87
		Average	44.86	
1.20000	H	Peak	47.32	± 4.87
		Average	42.26	
1.29637	V	Peak	49.00	± 4.87
		Average	45.72	
1.39197	V	Peak	47.94	± 4.87
		Average	43.69	
1.49050	H	Peak	47.37	± 4.87
		Average	42.86	
1.92030	V	Peak	46.68	± 4.87
		Average	41.25	
2.32957	H	Peak	48.36	± 4.87
		Average	40.26	
3.11825	V	Peak	38.22	± 4.87
		Average	34.77	

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
1.10577	H	Peak	48.70	± 4.87
		Average	44.01	
1.20017	H	Peak	47.45	± 4.87
		Average	44.18	
1.29477	V	Peak	49.62	± 4.87
		Average	45.20	
1.39110	V	Peak	48.35	± 4.87
		Average	42.86	
1.48983	H	Peak	47.49	± 4.87
		Average	40.64	
1.92010	V	Peak	46.29	± 4.87
		Average	41.50	
2.32963	V	Peak	46.06	± 4.87
		Average	38.41	
2.37420	H	Peak	46.56	± 4.87
		Average	39.08	
2.48352	V	Peak	60.12	± 4.87
		Average	37.02	
3.11825	H	Peak	38.09	± 4.87
		Average	33.67	
4.94575	H	Peak	40.02	± 4.87
		Average	36.01	

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

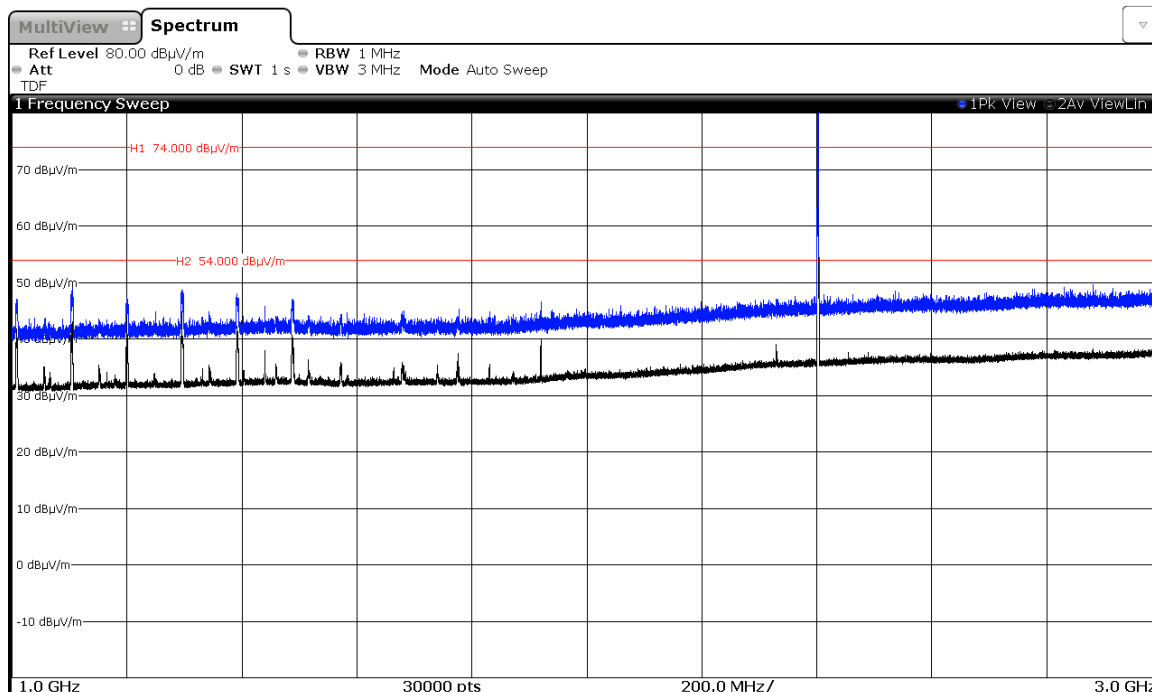


(This plot is valid for all three channels and all modulation modes).

FREQUENCY RANGE 1 GHz to 3 GHz.

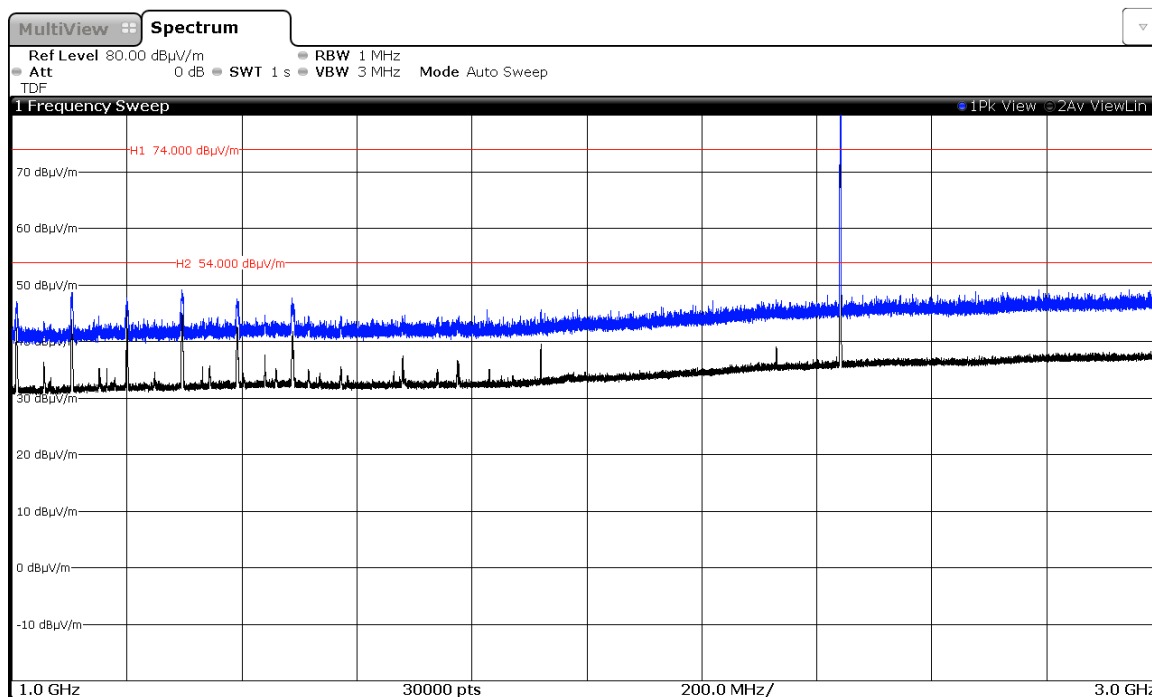
Modulation: GFSK

CHANNEL: Lowest (2402 MHz).



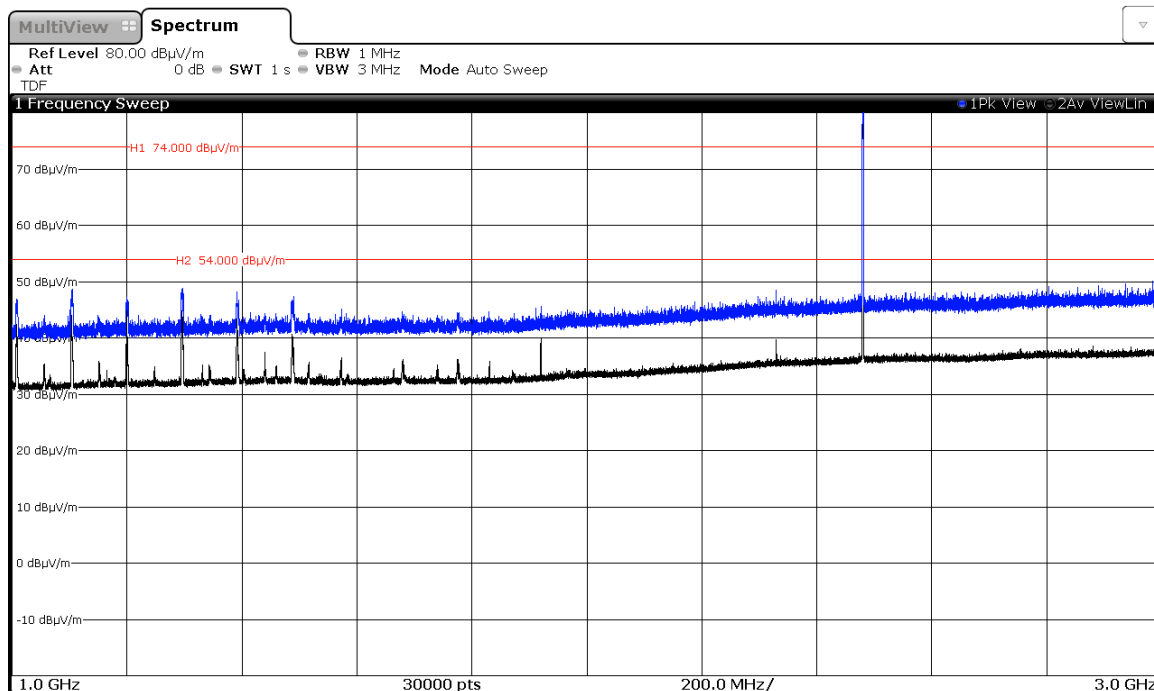
Note: The peak shown in the plot above the limits is the carrier frequency.

CHANNEL: Middle (2441 MHz).



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

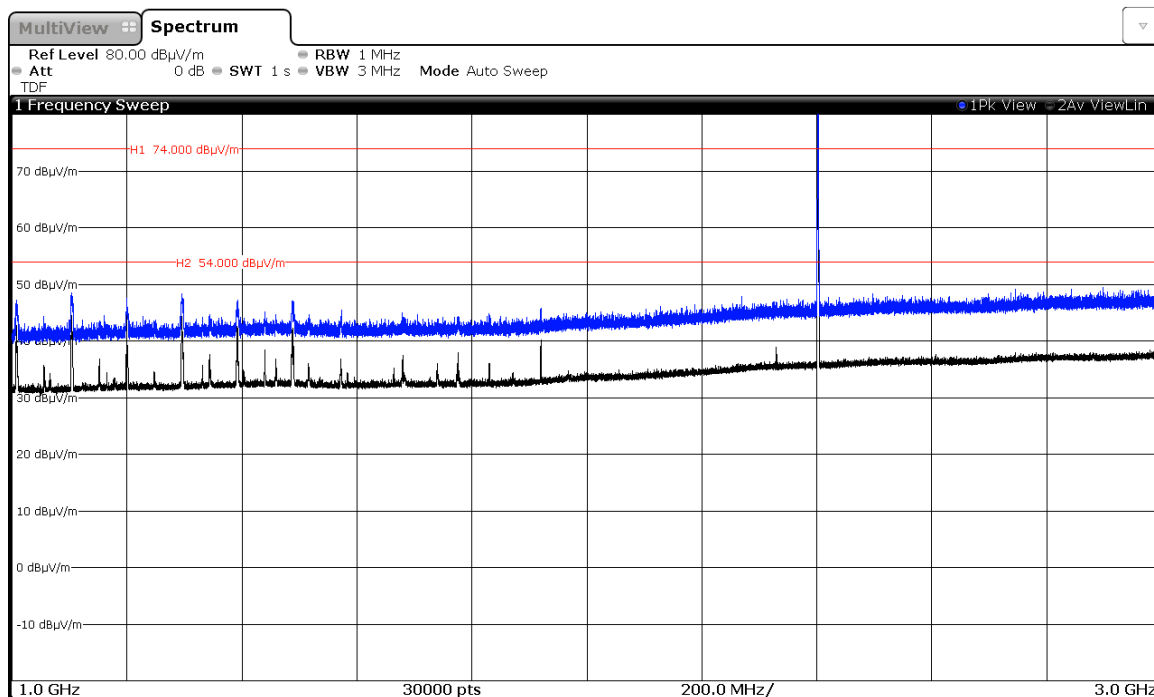
CHANNEL: Highest (2480 MHz).



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

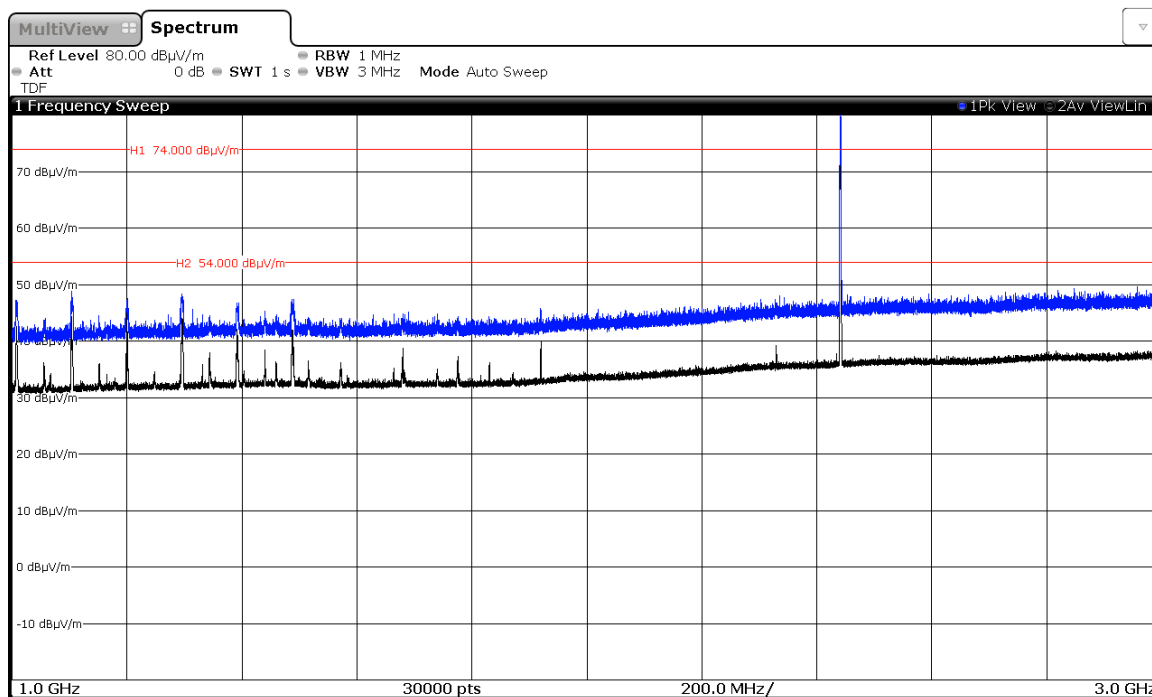
Modulation: $\Pi/4$ -DQPSK

CHANNEL: Lowest (2402 MHz).



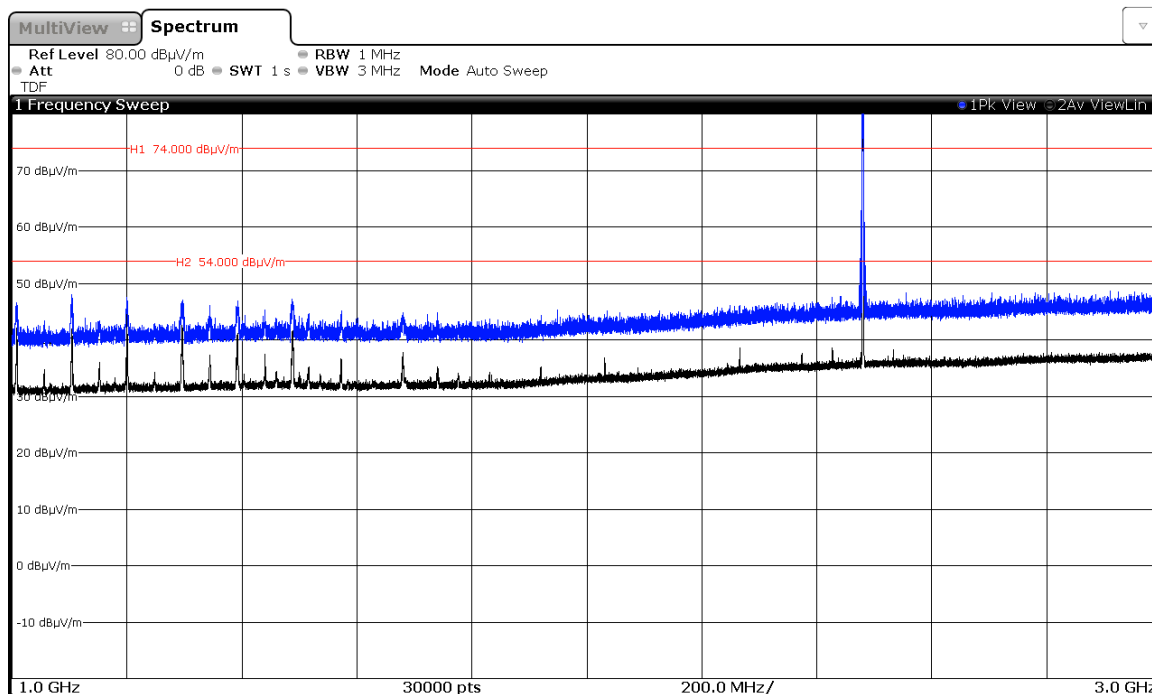
Note: The peak shown in the plot above the limits is the carrier frequency.

CHANNEL: Middle (2441 MHz).



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

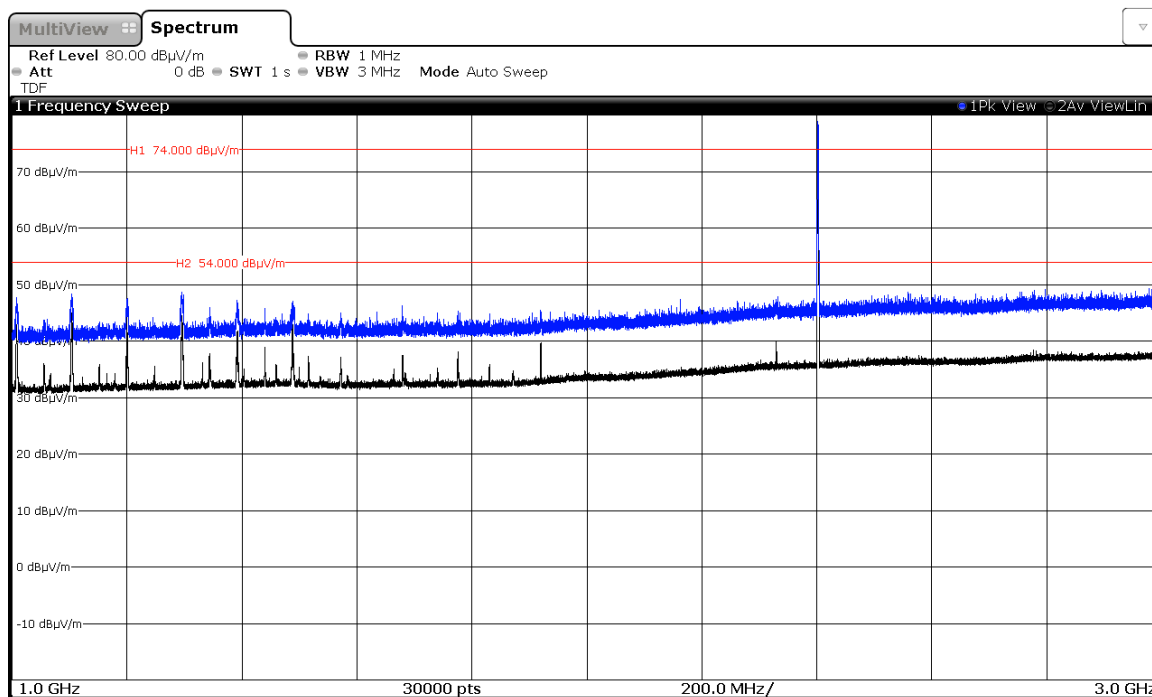
CHANNEL: Highest (2480 MHz).



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

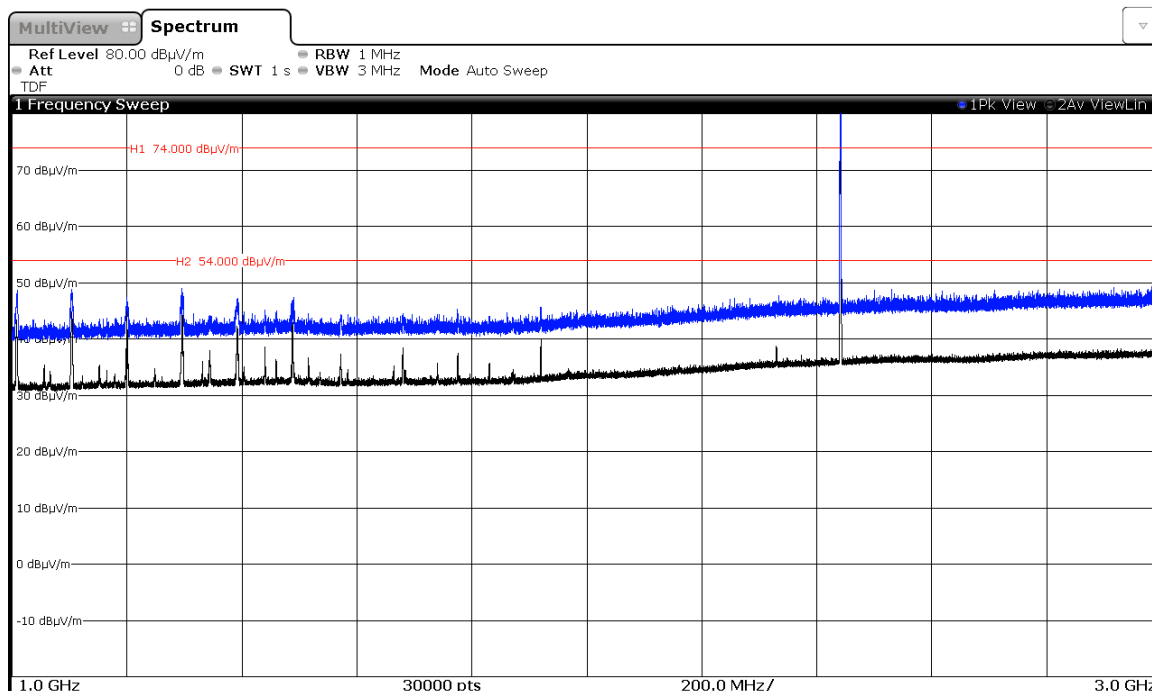
Modulation: 8-DPSK

CHANNEL: Lowest (2402 MHz).



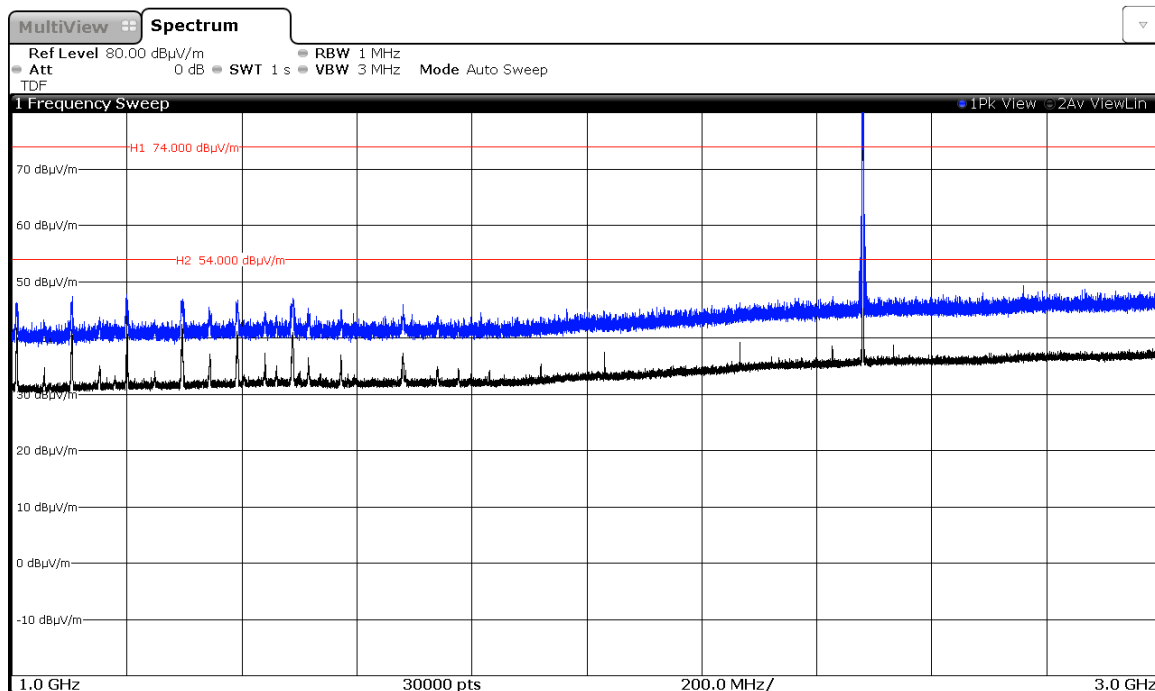
Note: The peak shown in the plot above the limits is the carrier frequency.

CHANNEL: Middle (2441 MHz).



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

CHANNEL: Highest (2480 MHz).

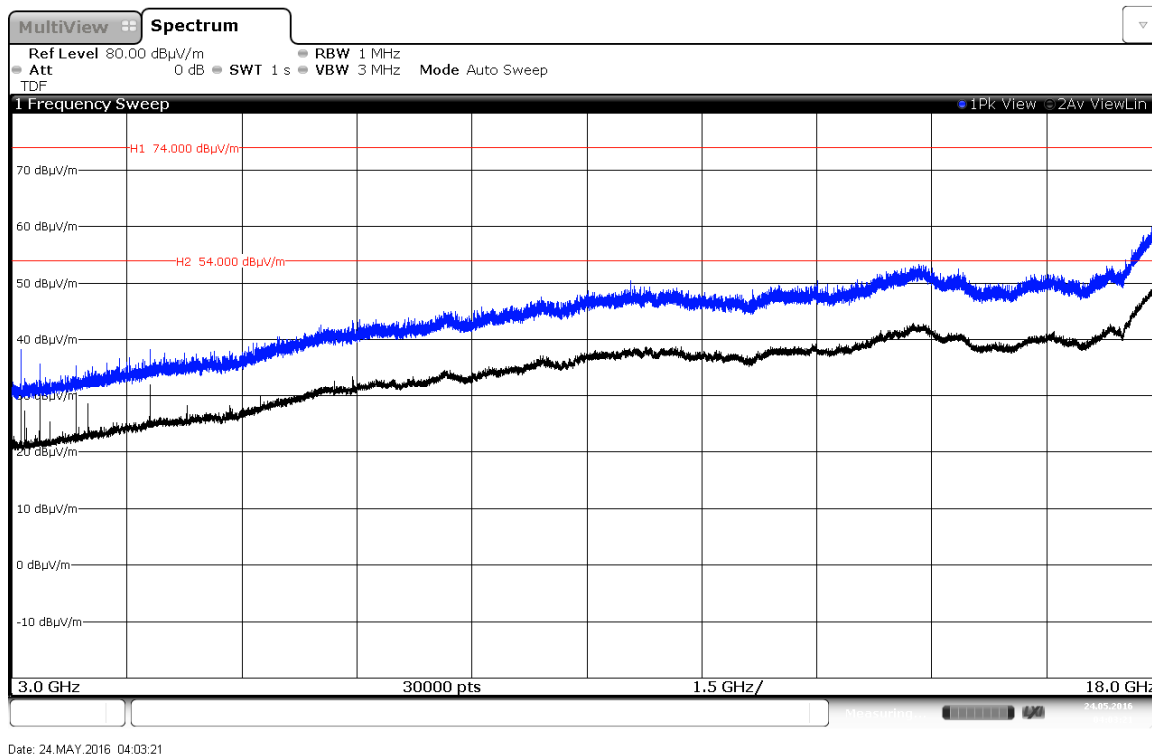


Note: The peak shown in the plot above the limits is the carrier frequency.

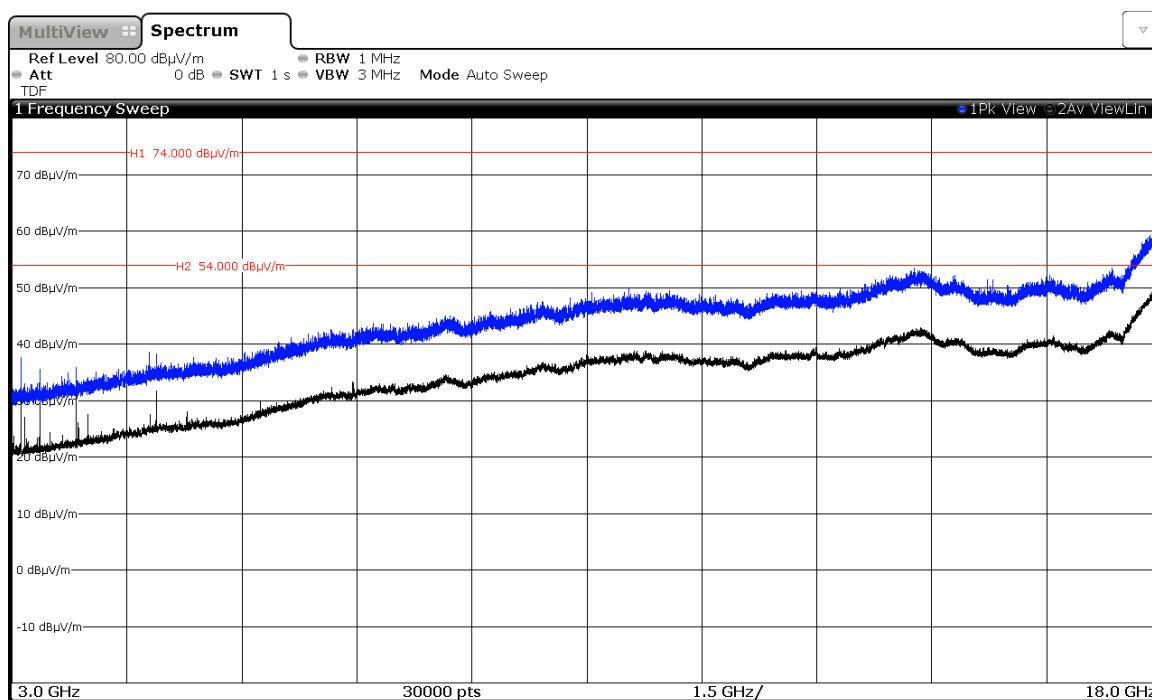
FREQUENCY RANGE 3 GHz to 18 GHz.

Modulation: GFSK

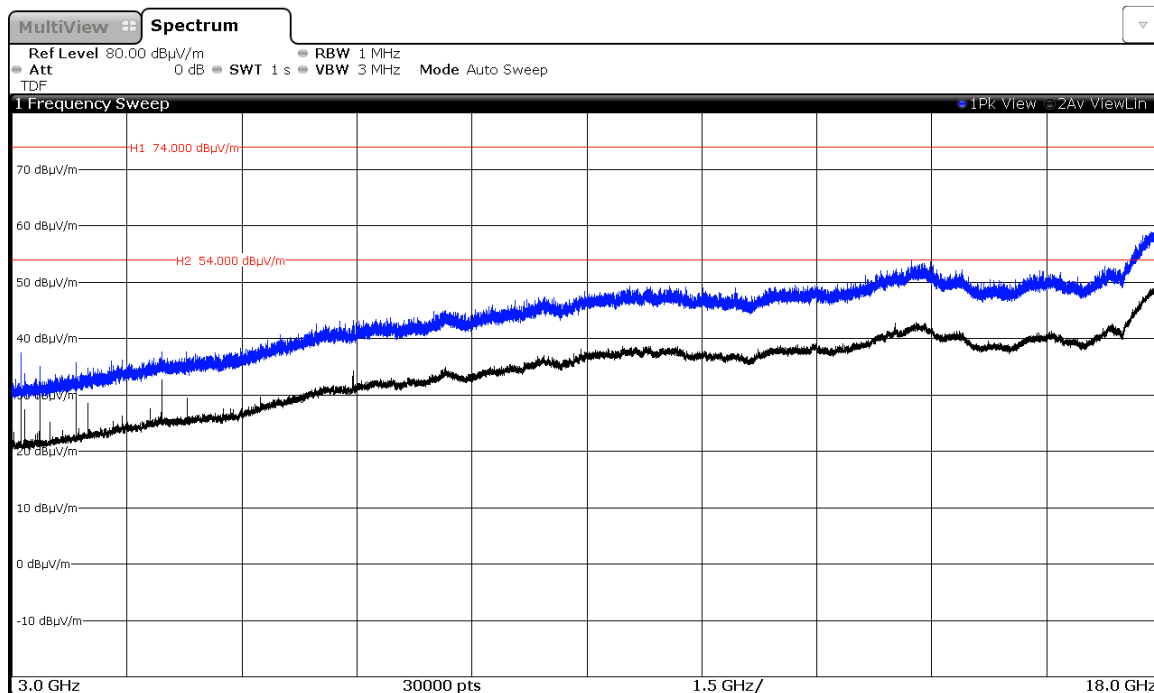
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2441 MHz).

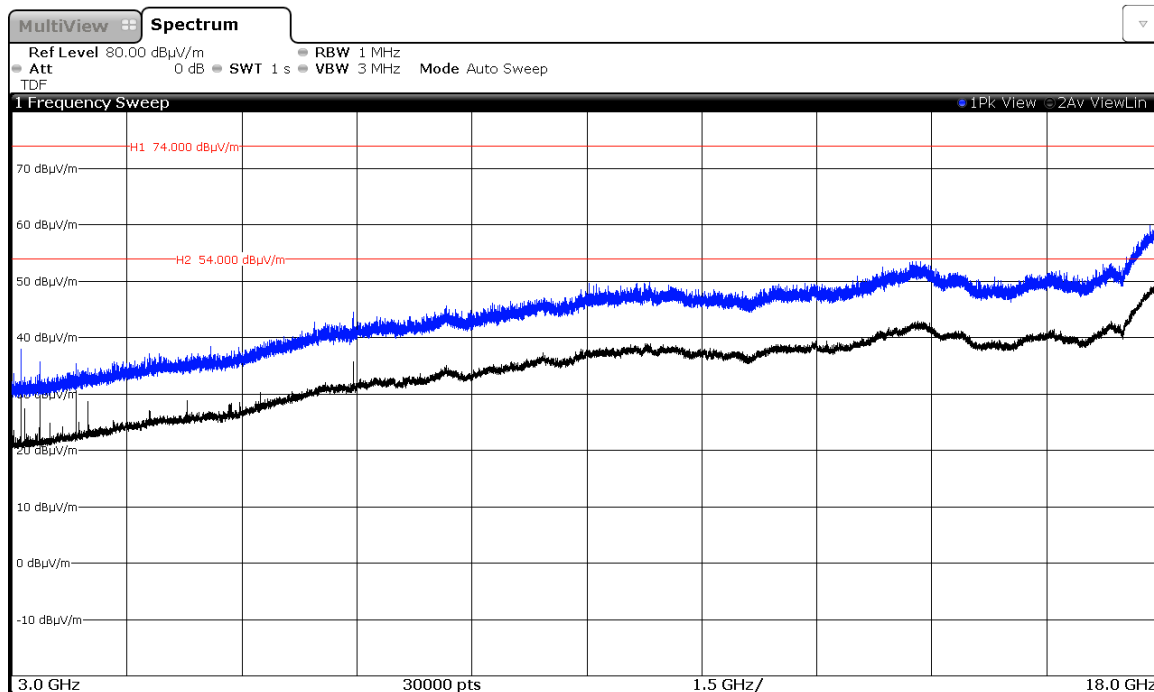


CHANNEL: Highest (2480 MHz).

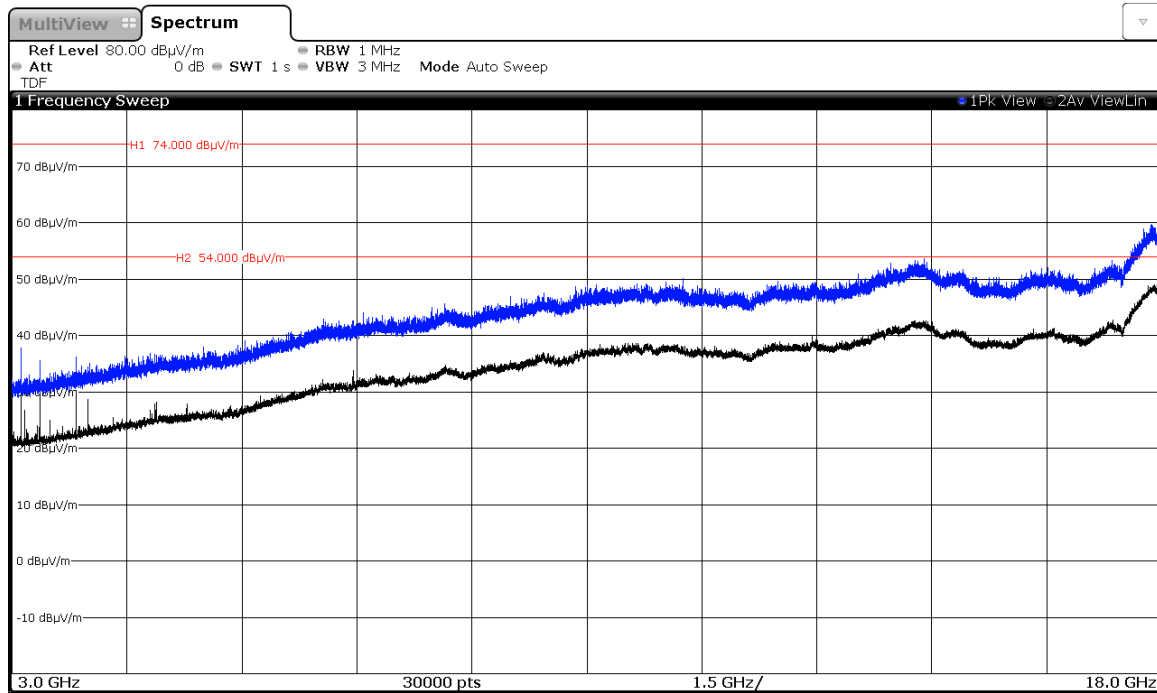


Modulation: $\pi/4$ -DQPSK

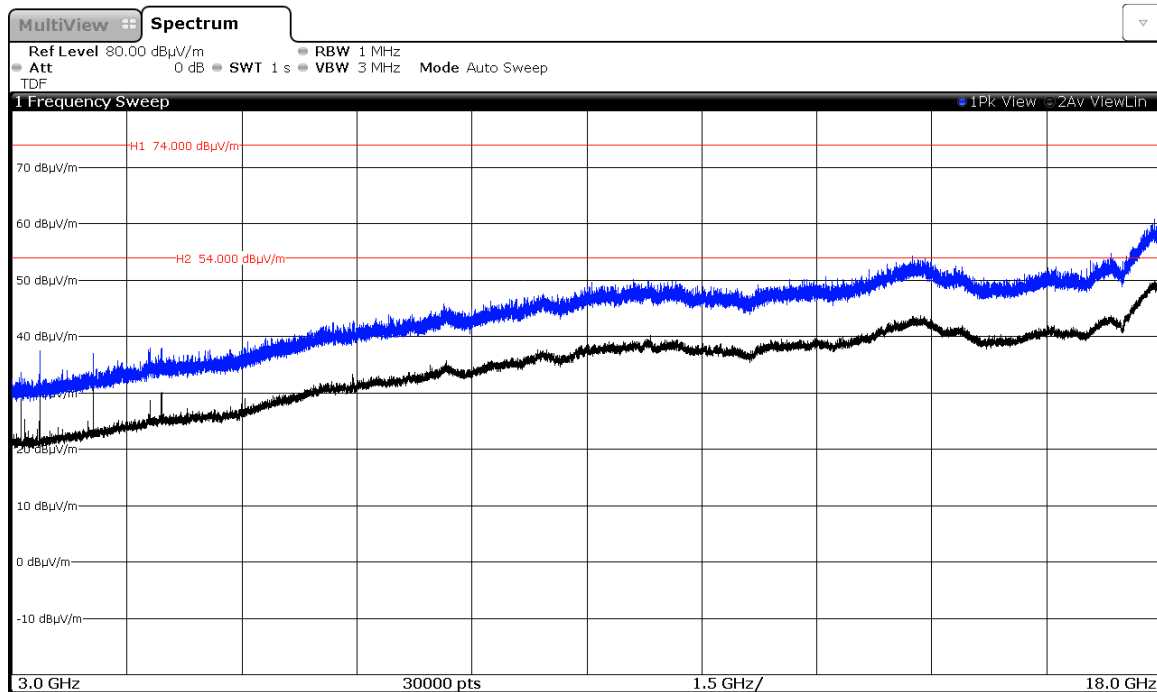
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2441 MHz).

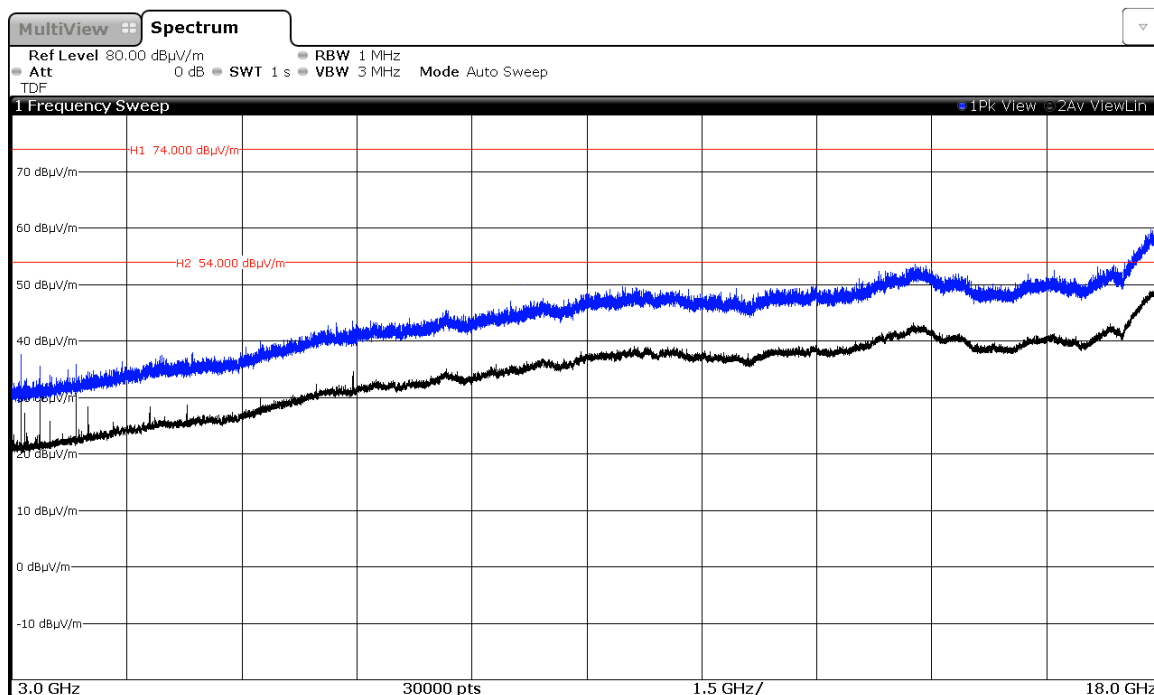


CHANNEL: Highest (2480 MHz).

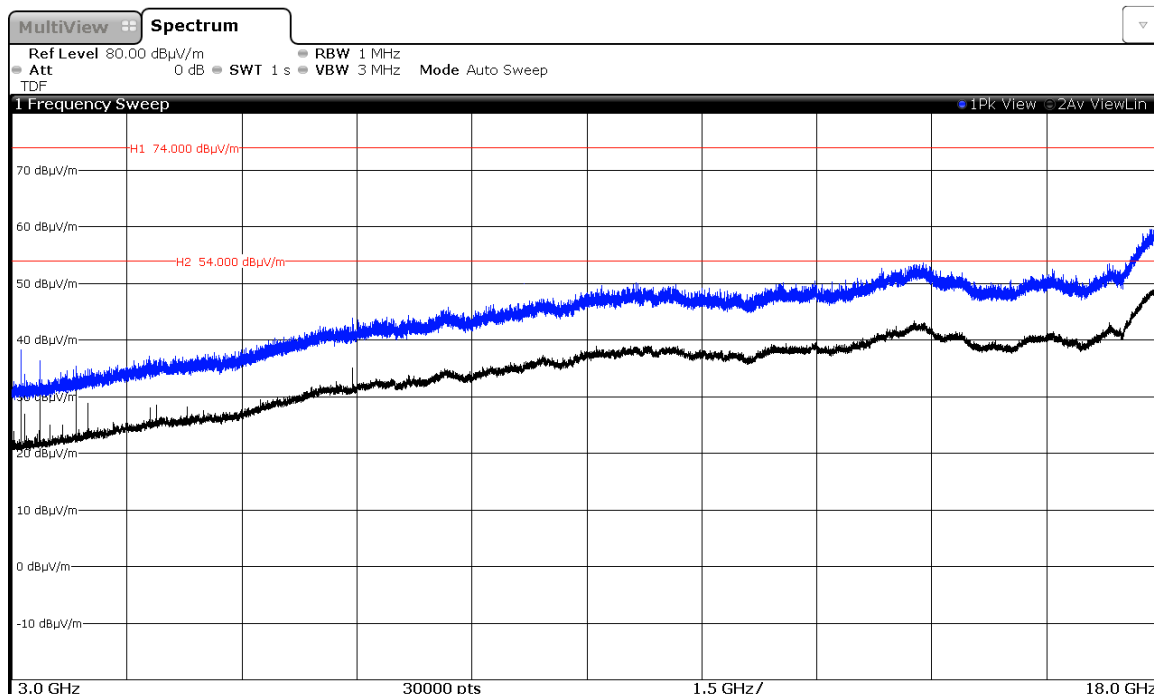


Modulation: 8-DPSK

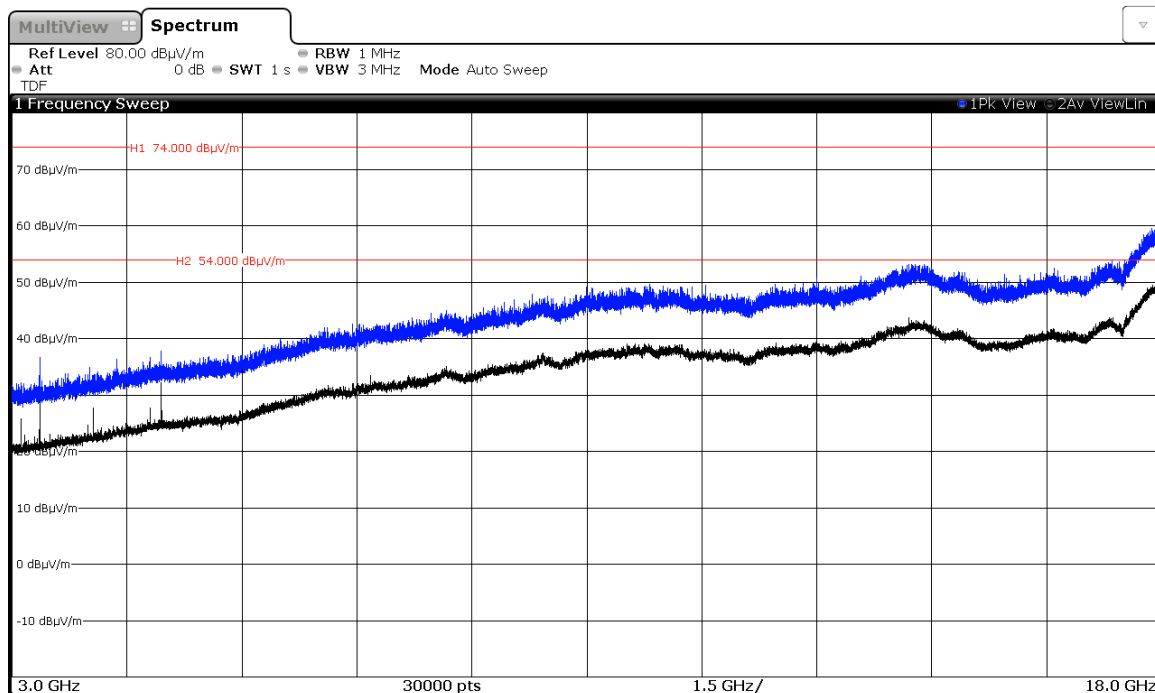
CHANNEL: Lowest (2402 MHz).



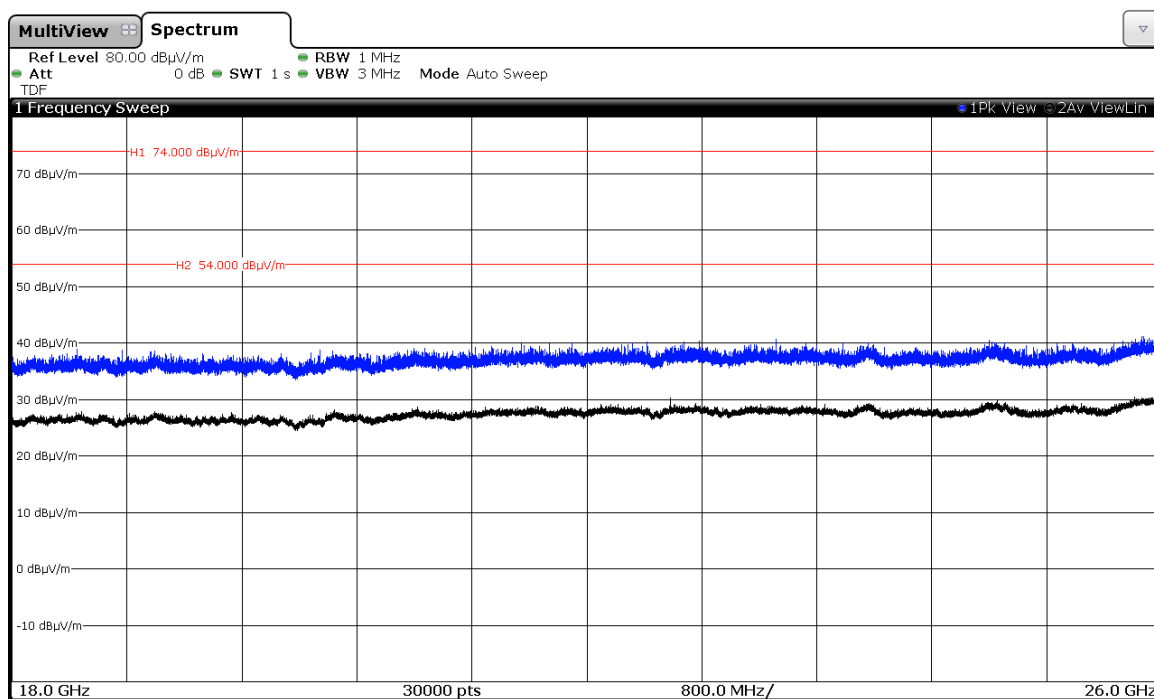
CHANNEL: Middle (2441 MHz).



CHANNEL: Highest (2480 MHz).



FREQUENCY RANGE 18 GHz to 26 GHz.

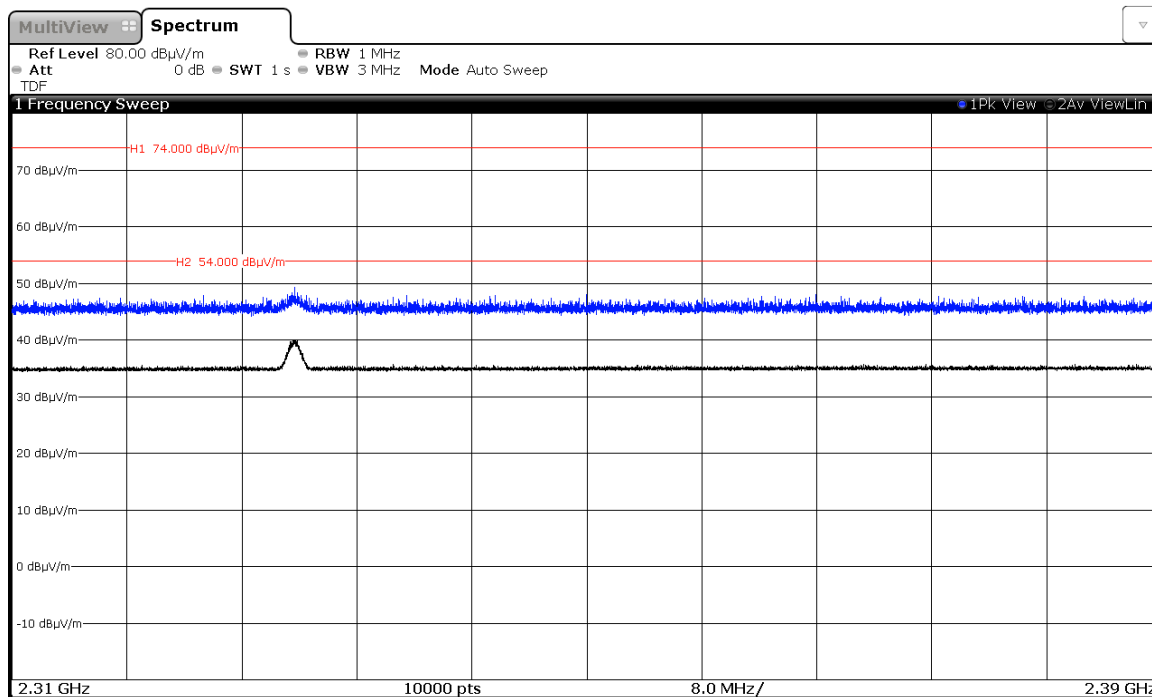


(This plot is valid for all three channels and all modulation modes).

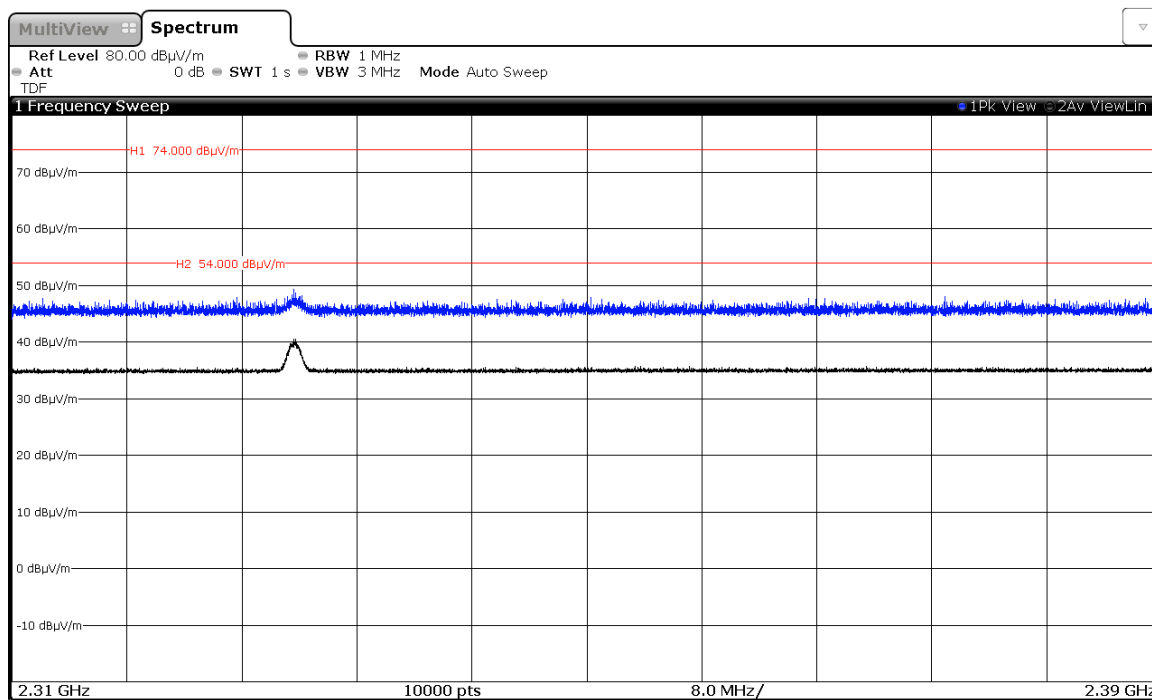
FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)

CHANNEL: Lowest

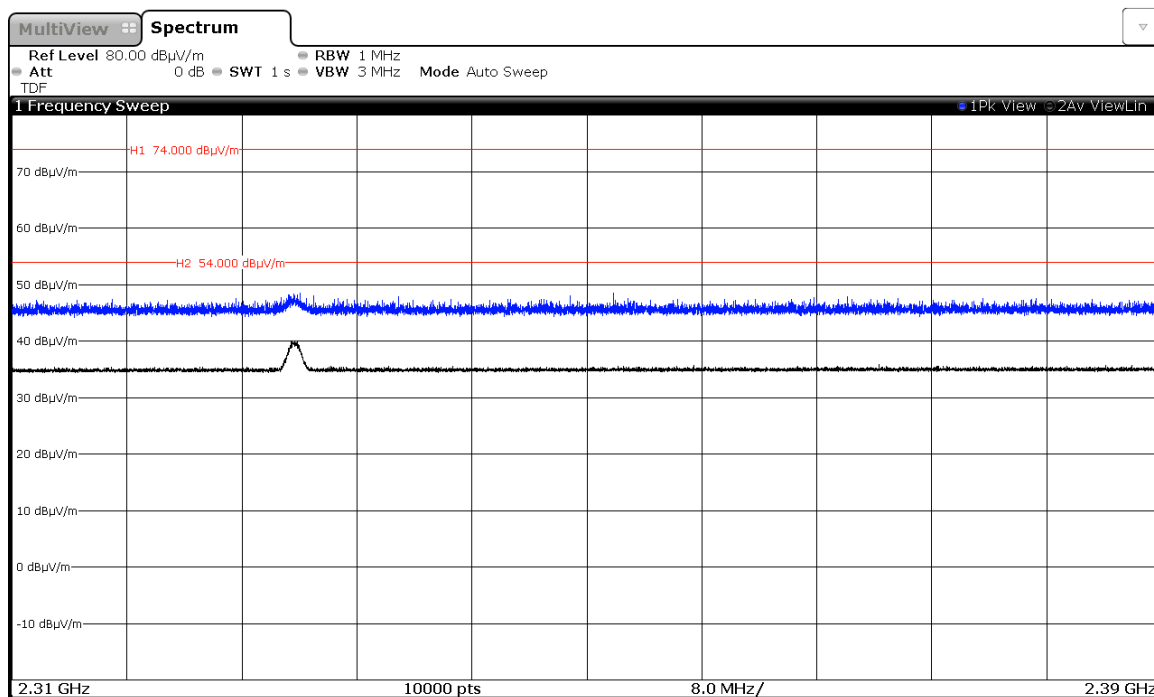
Modulation: GFSK



Modulation: $\Pi/4$ -DQPSK

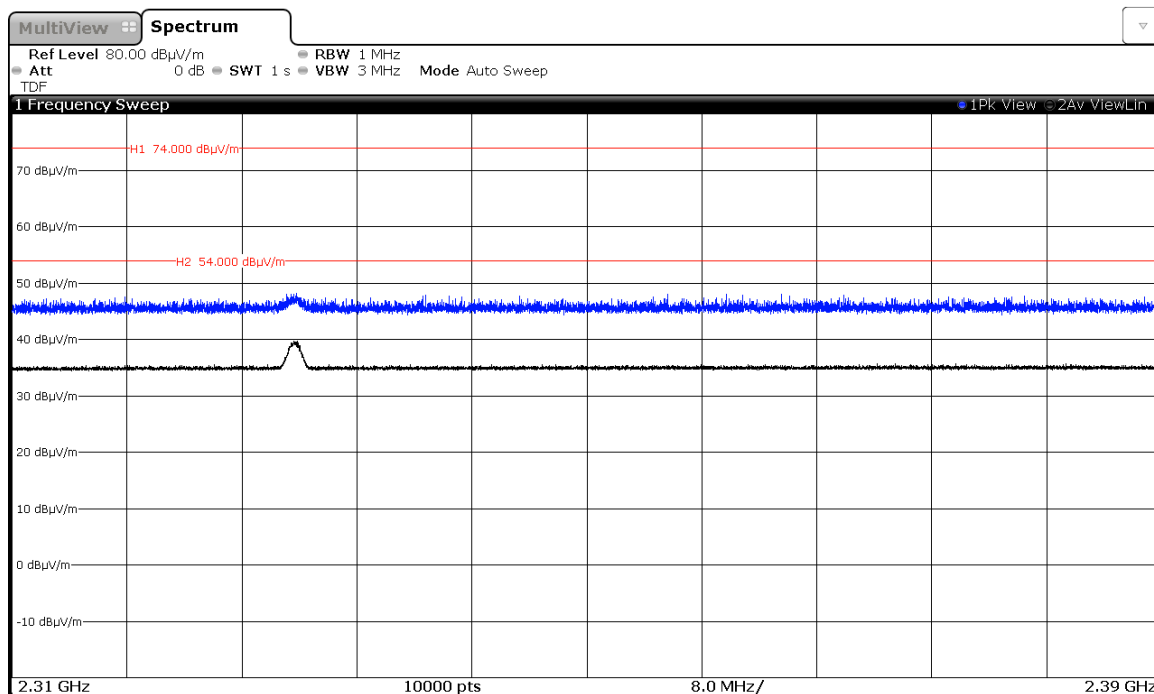


Modulation: 8-DPSK

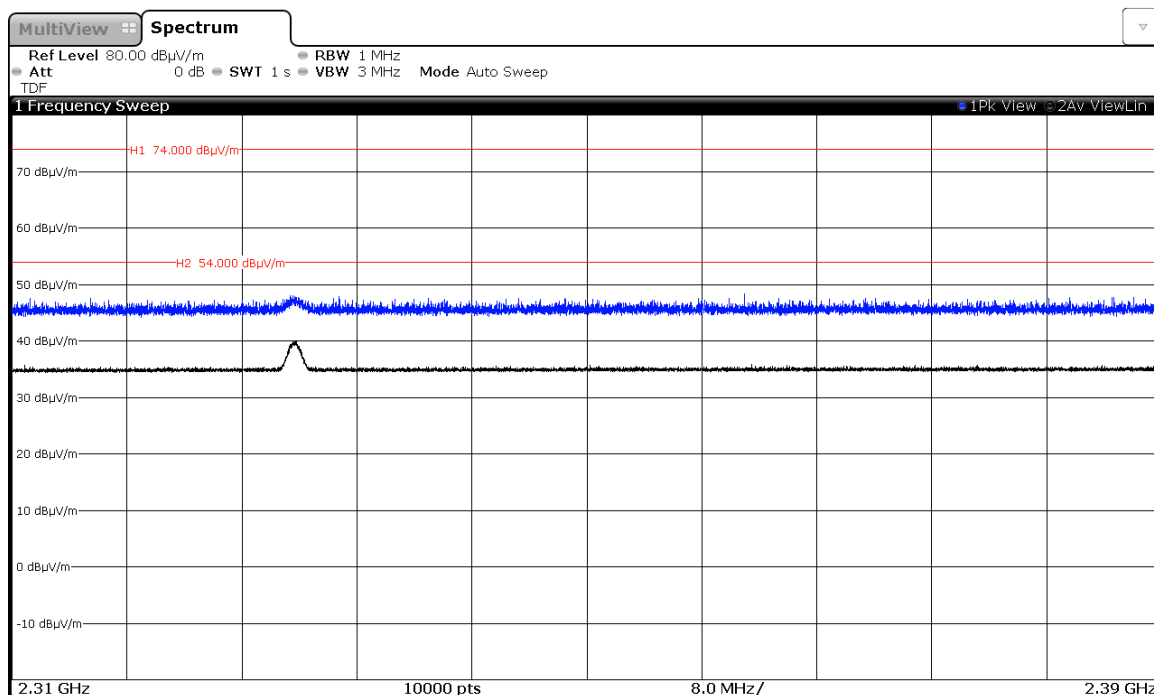


CHANNEL: Middle

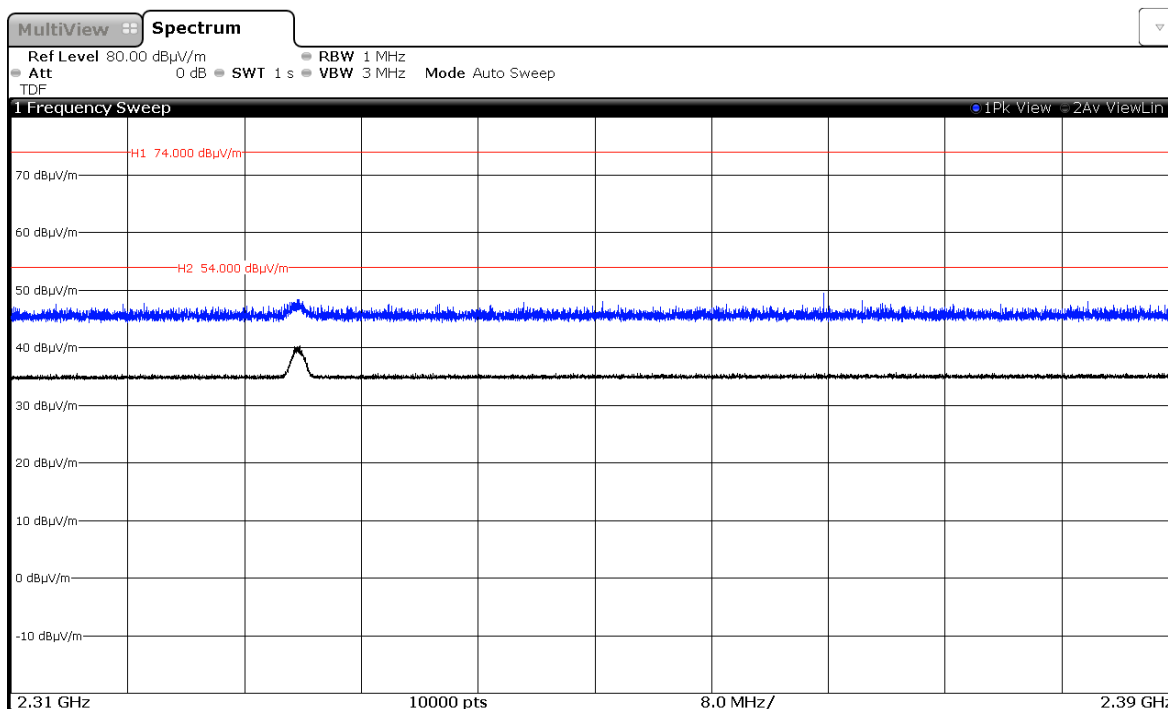
Modulation: GFSK



Modulation: $\Pi/4$ -DQPSK

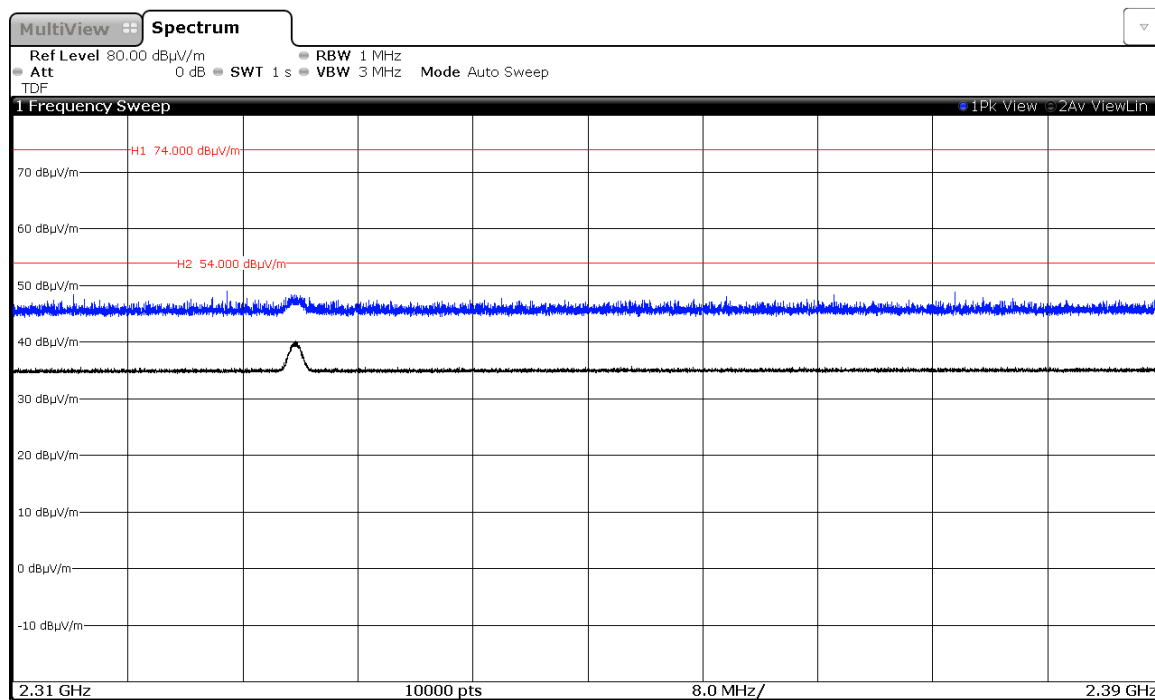


Modulation: 8-DPSK

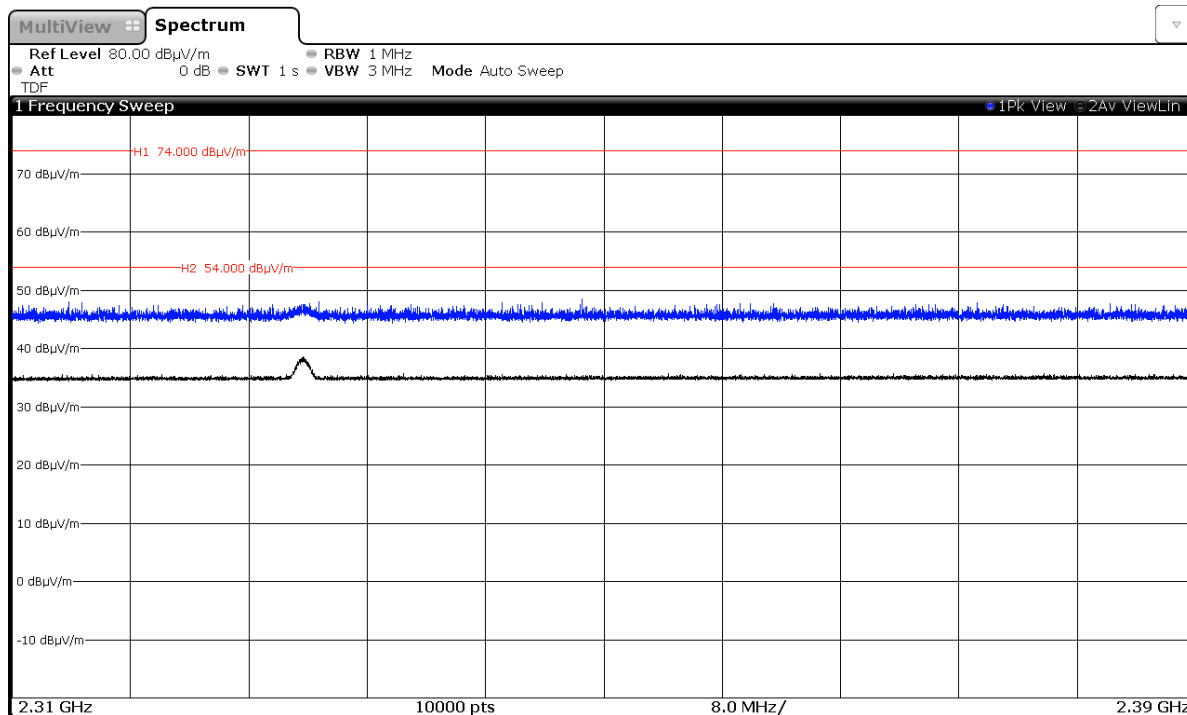


CHANNEL: Highest

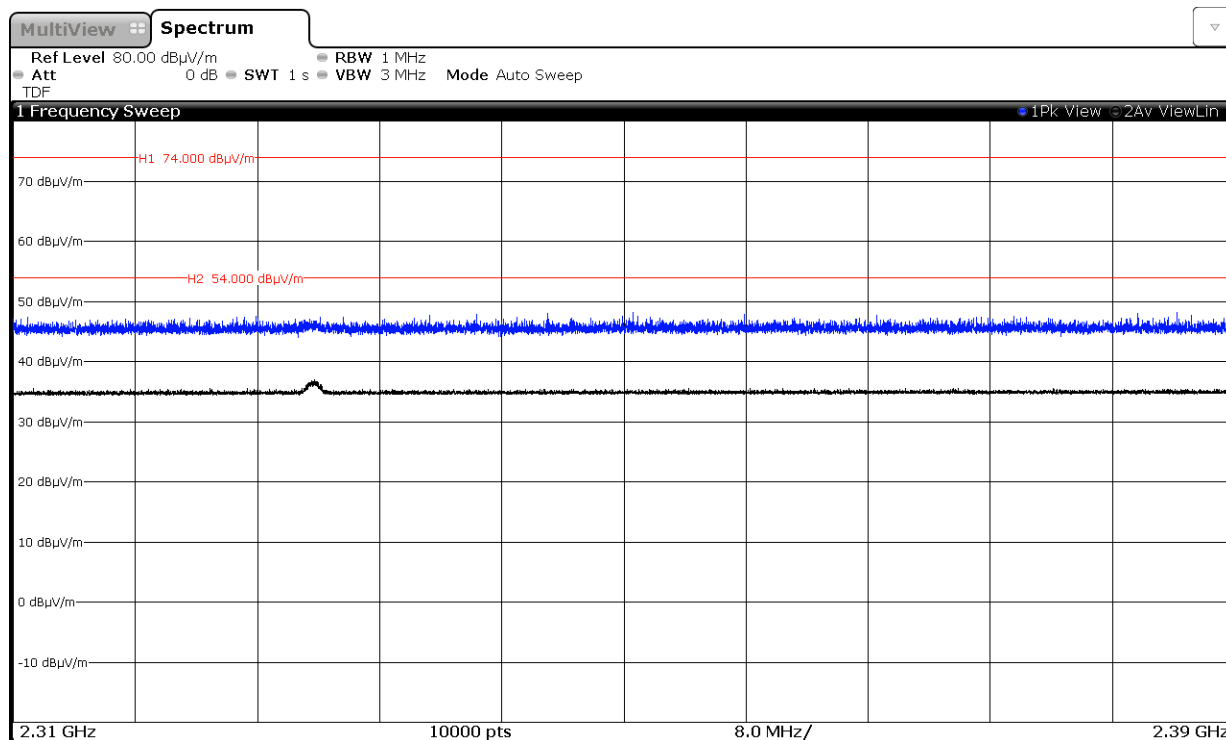
Modulation: GFSK



Modulation: $\Pi/4$ -DQPSK



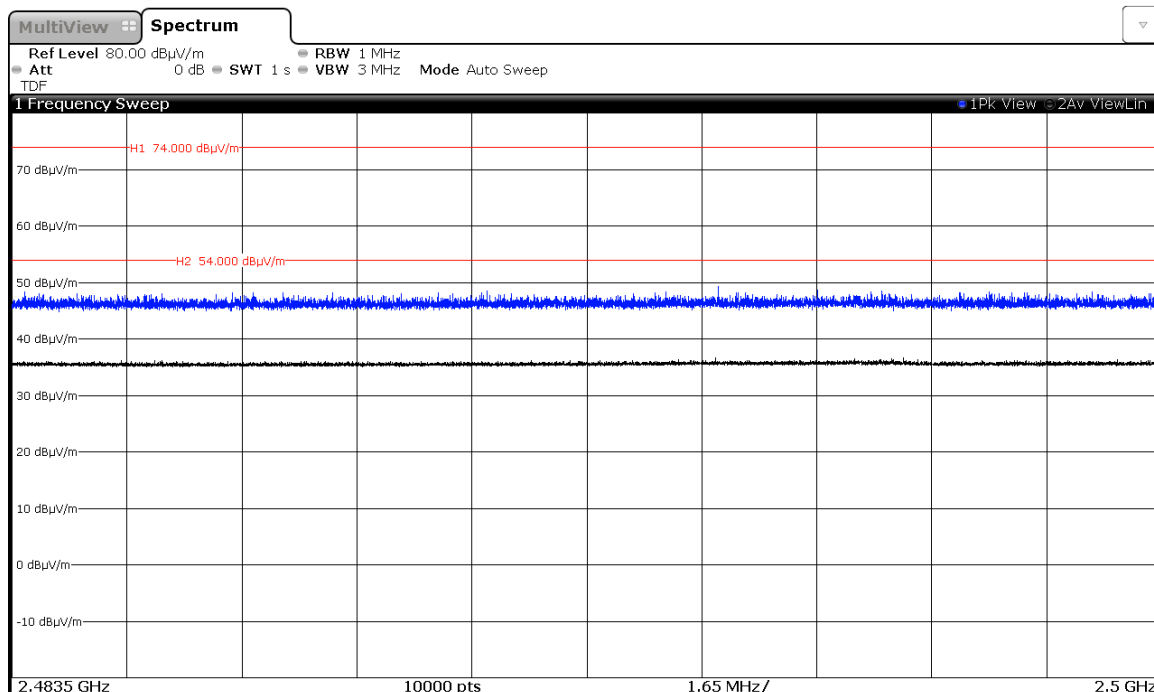
Modulation: 8-DPSK



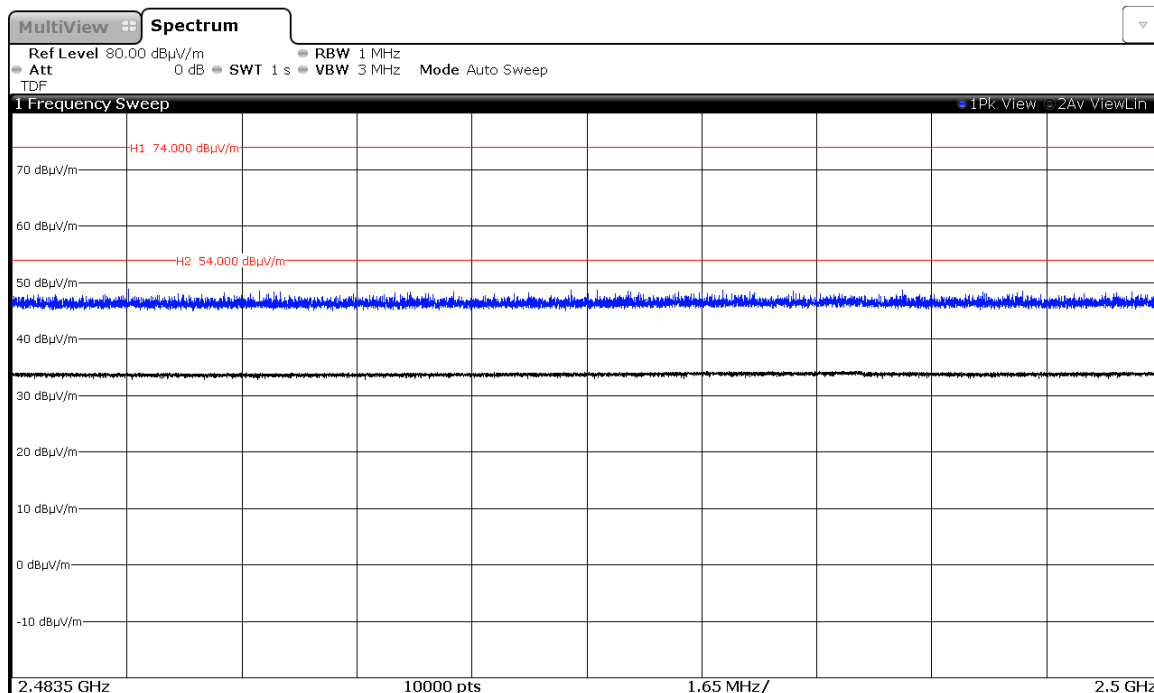
FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)

CHANNEL: Lowest

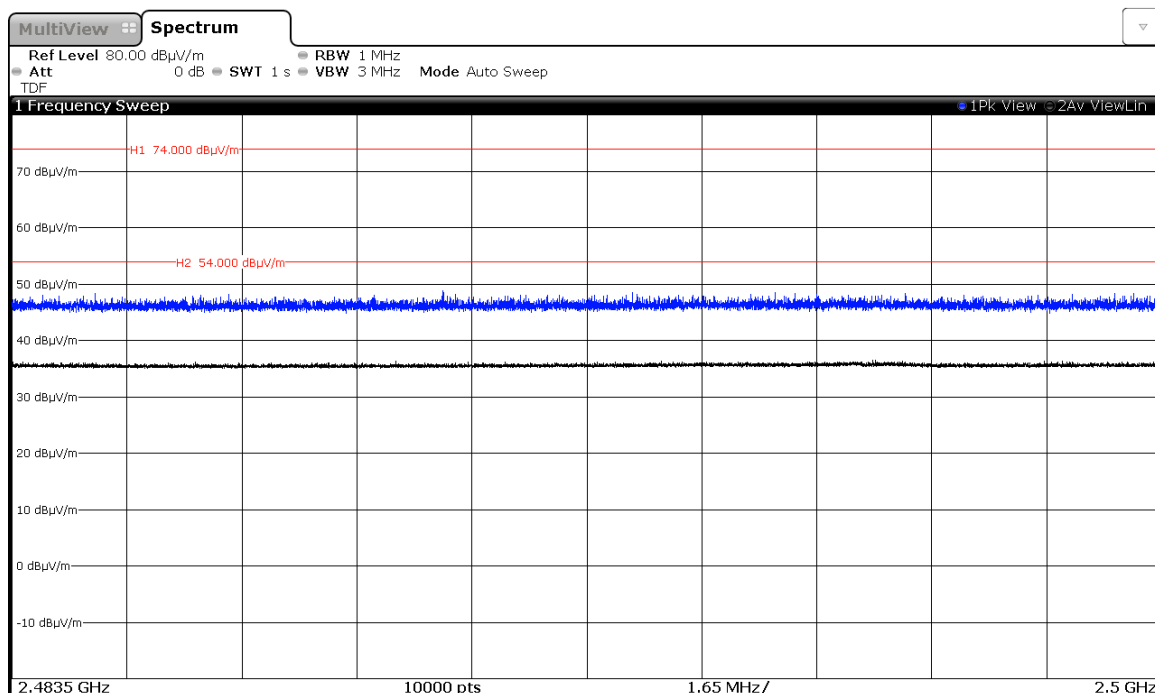
Modulation: GFSK



Modulation: Π/4-DQPSK

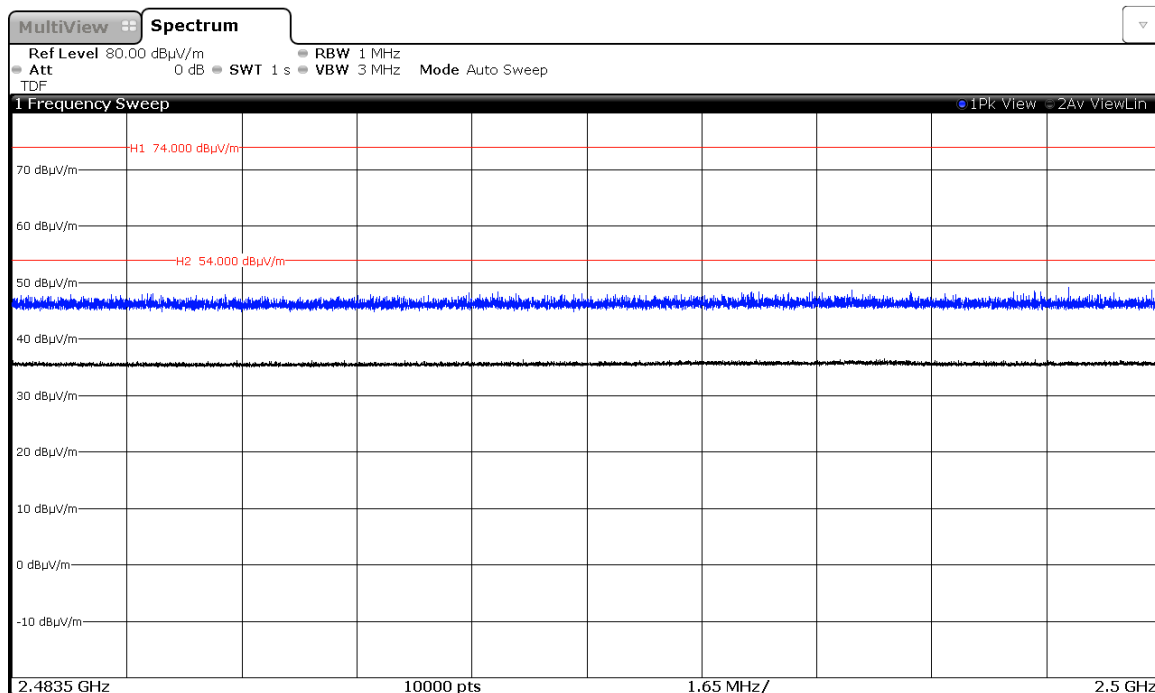


Modulation: 8-DPSK

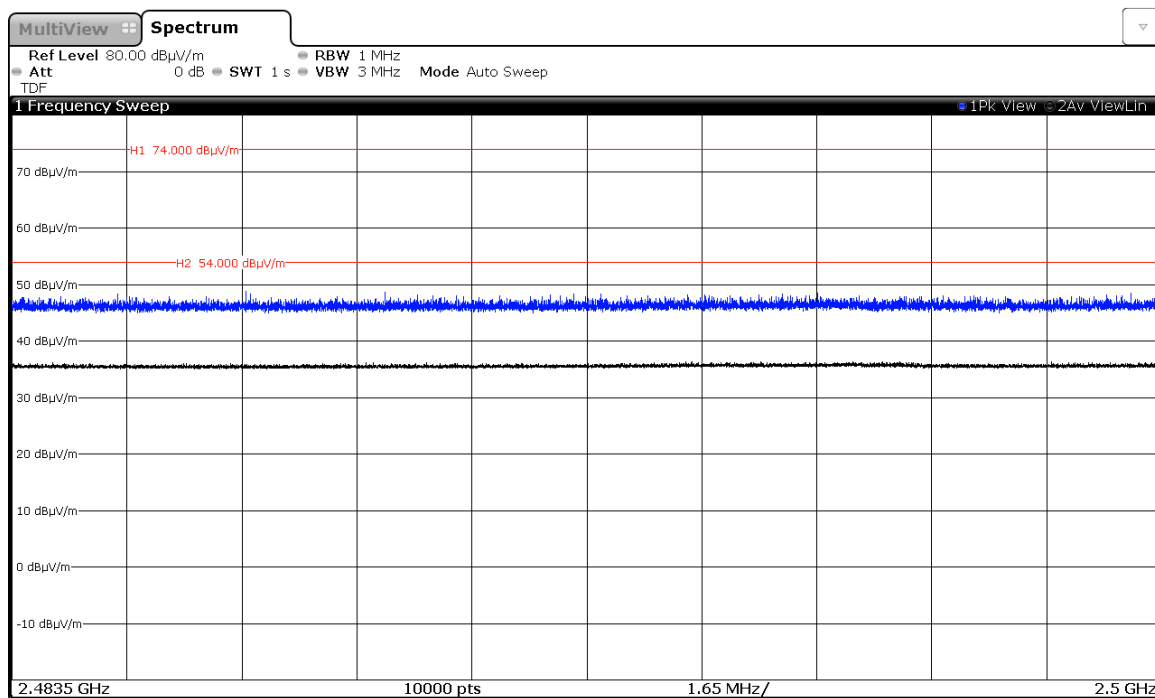


CHANNEL: Middle

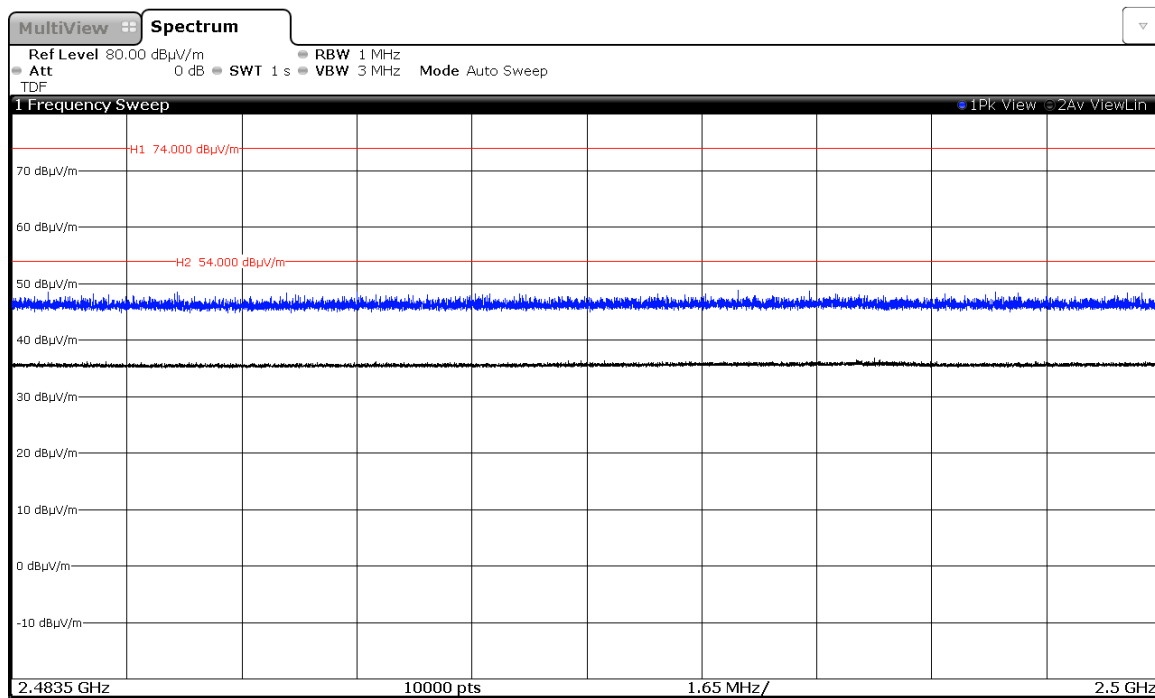
Modulation: GFSK



Modulation: $\Pi/4$ -DQPSK

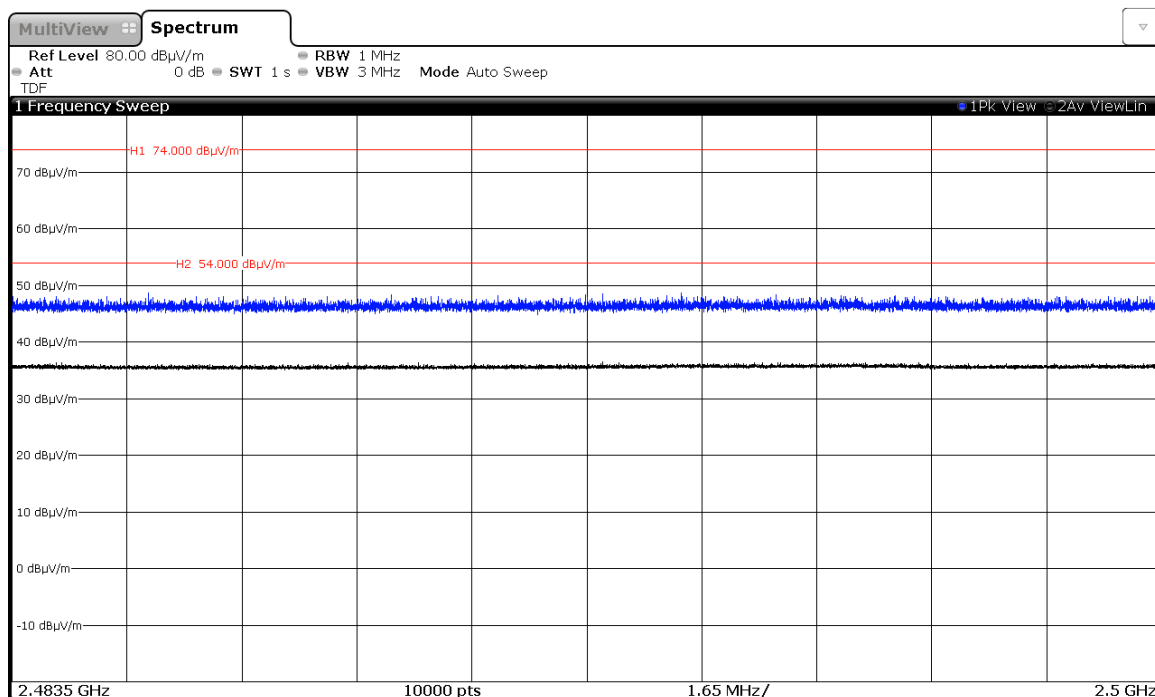


Modulation: 8-DPSK

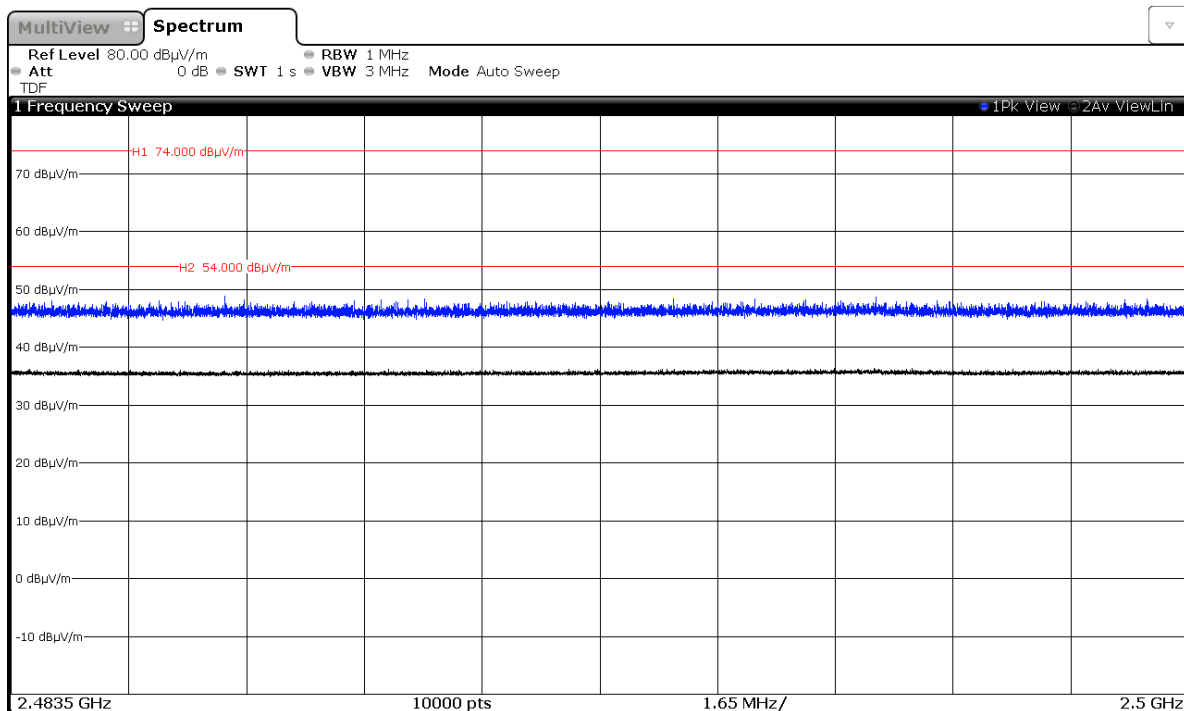


CHANNEL: Highest

Modulation: GFSK



Modulation: $\Pi/4$ -DQPSK



Modulation: 8-DPSK

