FCC LISTED, REGISTRATION NUMBER: 905266 **IC LISTED REGISTRATION NUMBER** **IC 4621A-1**	**AT4 wireless, S.A.** Parque Tecnológico de Andalucía, c/ Severo Ochoa nº 2 29590 Campanillas/ Málaga/ España Tel. 952 61 91 00 - Fax 952 61 91 13 MÁLAGA, C.I.F. A29 507 456 Registro Mercantil de Málaga,Tomo 1169, Libro 82, Folio 133, Hoja MA3729

TEST REPORT

REFERENCE STANDARD:

USA FCC Part 15.247, 15.209

CANADA RSS-210, RSS-Gen

Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz.

Licence-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment.

General Requirements and Information for the Certification of Radio Apparatus.

NIE ..... :	38386RRF.002
Approved by (name / position & signature) ..... :	A. Llamas / RF Lab. Manager
Elaboration date ..... :	2013-07-09

Alejandro Llamas Rodríguez
Firmado digitalmente por Alejandro Llamas Rodríguez
Fecha: 2013.07.09 14:44:44 +02'00'
.....

Identification of item tested ..... :	Radio car with Bluetooth handsfree
Brand name ..... :	Panasonic
Model and/or type reference ..... :	NTG5*1 US
Serial number ..... :	522PA1404D00300362
Other identification of the product ..... :	Hw version: CN-MP04E0AE Sw version: A218 902 21 01 FCC ID: WUQ-NTG5STAR1 IC ID: 216R-NTG5STAR1
Features ..... :	Bluetooth Specification ver 2.1+EDR
Description ..... :	Radio car with a Bluetooth module which is connected to an external antenna via antenna connector (no internal antenna is present)

Applicant ..... :	Panasonic Automotive Systems Europe GmbH
Address ..... :	Robert-Bosch-Str.27-29, Langen 63225, Germany
CIF/NIF/Passport ..... :	DE813890706
Contact person:	Mr. Dai Kimura
Telephone / Fax ..... :	+ 49 711 79723 476 / + 49 711 79723 488
e-mail: ..... :	dai.kimura@eu.panasonic.com

Test samples supplier ..... :	Same as applicant

Manufacturer ..... :	Same as applicant

Test method requested .....:	See Standard
Standard .....:	USA FCC Part 15.247 10-01-10 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 10-01-10 Edition: Radiated emission limits; general requirements. CANADA RSS-210 Issue 8 (December 2010). CANADA RSS-Gen Issue 3 (December 2010). FCC part 15.247 and Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum System DA 00-705 Released March 30, 2000. ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices.
Test procedure .....:	PERF010
Non-standardized test method .....:	N/A
Used instrumentation .....:	

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum analyser Agilent PSA E4440A	2012/02	2014/02

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber IR 11. BS	N.A.	N.A.
2.	Control Chamber IR 12.BC	N.A.	N.A.
3.	Hybrid Bilog antenna Sunol Sciences Corporation JB6	2011/05	2014/05
4.	Antenna mast EM 1072 NMT	N.A.	N.A.
5.	Rotating table EM 1084-4. ON	N.A.	N.A.
6.	Double-ridge Guide Horn antenna 1-18 GHz HP 11966E	2011/05	2014/05
7.	Double-ridge Guide Horn antenna 18-40 GHz Agilent 119665J	2011/09	2014/09
8.	EMI Test Receiver R&S ESIB26	2011/11	2013/11
9.	RF pre-amplifier Miteq JS4-12002600-30-5A.	2012/07	2014/07
10.	Multi Device Controller EMCO 2090	N.A.	N.A.
11.	Spectrum Analyzer Agilent E4440A	2012/02	2014/02
12.	RF pre-amplifier Miteq AFS5-04001300-15-10P-6.	2012/07	2014/07
13.	RF pre-amplifier Schaffner CPA 9231A.	2011/06	2013/06

Report template No. .....: FDT08_14

INDEX

Competences and guarantees

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 conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 905266.

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 programme 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.

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: Procedimiento para el cálculo de incertidumbres de medida.

Usage of samples

Samples undergoing test have been selected by: **the client**.

Sample M/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
38386/138	Bluetooth device with antenna connector	NTG5*1 US	522PA1404D00300362	29/04/2013
38386/04	Antenna	---	---	27/03/2013
38386/02	Power supply cable	---	---	27/03/2013

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

   All tests indicated in annex A.

Testing period

The performed test started on 2013-05-03 and finished on 2013-05-13.

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. = 21.5 ºC Max. = 23.1 ºC
Relative humidity	Min. = 45.2 % Max. = 47.3 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

In the semianechoic chamber (21 meters x 11 meters x 8 meters), the following limits were not exceeded during the test.

Temperature	Min. = 19.8 ºC Max. = 21.7 ºC
Relative humidity	Min. = 46 % Max. = 52 %
Air pressure	Min. = 1020 mbar Max. = 1020 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 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. = 25.2 ºC Max. = 25.9 ºC
Relative humidity	Min. = 32.1 % Max. = 36.2 %
Air pressure	Min. = 1019 mbar Max. = 1019 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

Summary

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

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

Remarks and comments

1.- No comments.

Testing verdicts

Not applicable .....: NA

Pass.....: P

Fail .....: F

Not measured.....: NM

FCC PART 15 / RSS-210 PARAGRAPH	VERDICT			
	NA	P	F	NM
FCC 15.247 Subclause (a) (1). 20 dB Bandwidth and Carrier frequency separation / RSS-210 Clause A8.1 (b)		P		
FCC 15.247 Subclause (a) (1) (iii). Number of hopping channels / RSS-210 Clause A8.1 (d)		P		
FCC 15.247 Subclause (a) (1) (iii). Time of occupancy (Dwell Time) / RSS-210 Clause A8.1 (d)		P		
FCC 15.247 Subclause (b). Maximum peak output power (radiated) and antenna gain / RSS-210, Clause A8.4 (2)		P		
FCC 15.247 Subclause (c). Band-edge of radiated emissions (Transmitter) / RSS-210 Clauses 2.2 & A8.5		P		
FCC 15.247 Subclause (c). Emission limitations conducted (Transmitter) / RSS-210 Clauses 2.2 & A8.5		P		
FCC 15.247 Subclause (c). Emission limitations radiated (Transmitter) / RSS-210 Clauses 2.2 & A8.5		P		

APPENDIX A: Test result

INDEX

TEST CONDITIONS

Power supply (V):

V_n = 12.0 Vdc

V_{min} = N/A

V_{max} = N/A

Type of power supply: External power supply by car battery.

TEST FREQUENCIES:

Lowest channel: 2402 MHz

Middle channel: 2441 MHz

Highest channel: 2480 MHz

The test set-up was made in accordance to the general provisions of ANSI C63.4: 2009.

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 one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

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

SPECIFICATION

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

RESULTS

(See next plots)

Modulation: GFSK

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20 dB Spectrum bandwidth (kHz)	812.567	812.782	804.574
Measurement uncertainty (kHz)	±11		

Modulation: Π/4-DQPSK (2Mbps)

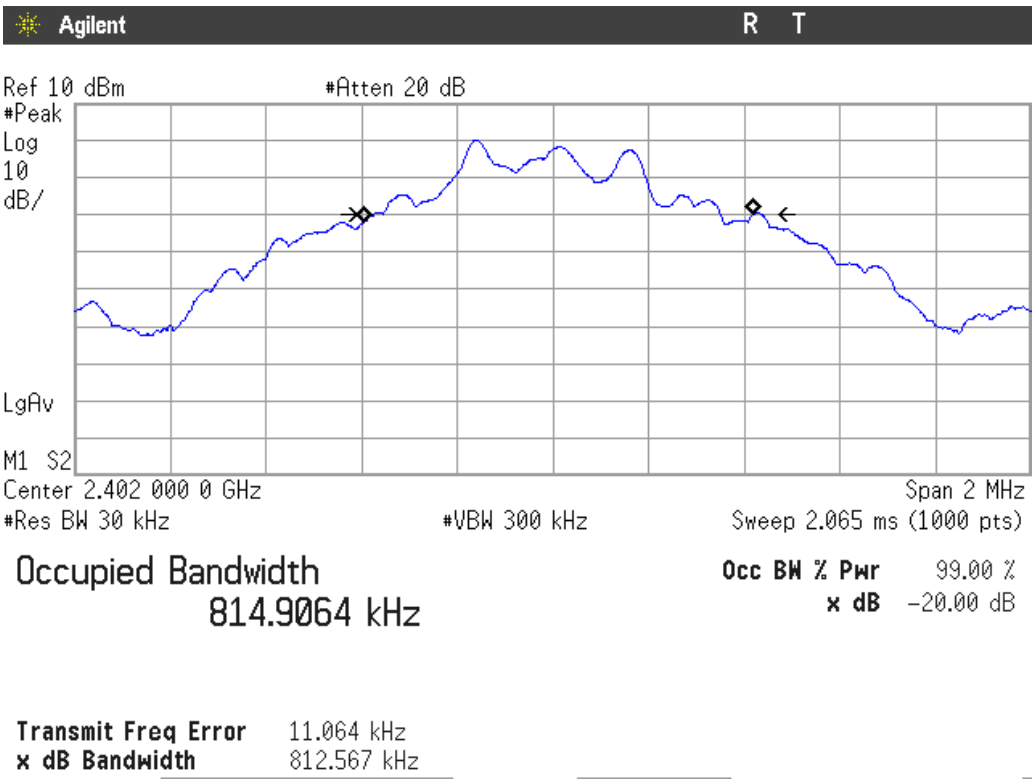
	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20 dB Spectrum bandwidth (kHz)	1125	1126	1123
Measurement uncertainty (kHz)	±11		

Modulation: 8-DPSK (3Mbps)

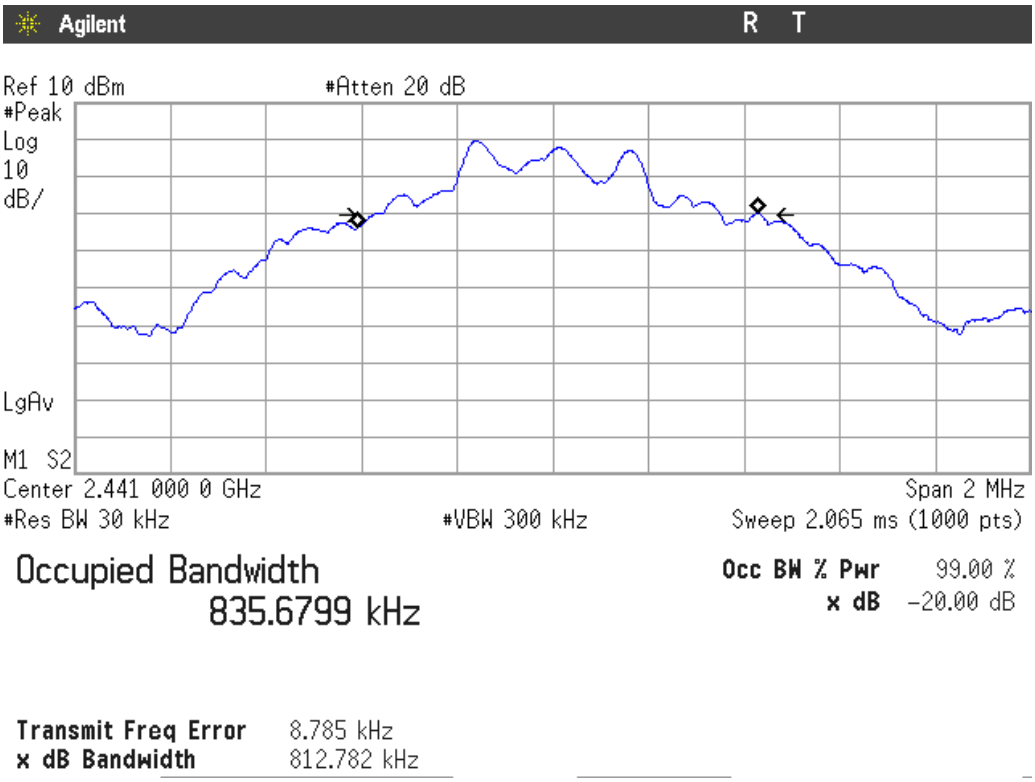
	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20 dB Spectrum bandwidth (kHz)	1142	1144	1141
Measurement uncertainty (kHz)	±11		

Modulation: GFSK

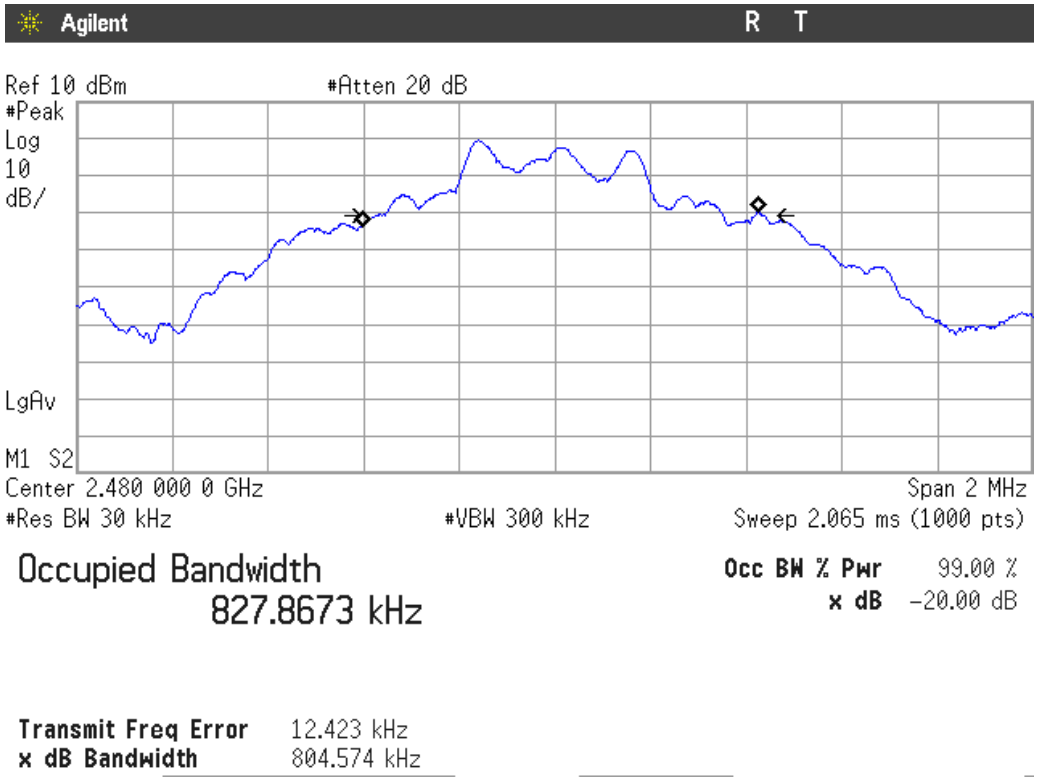
20 dB BANDWIDTH. Lowest Channel: 2402 MHz.



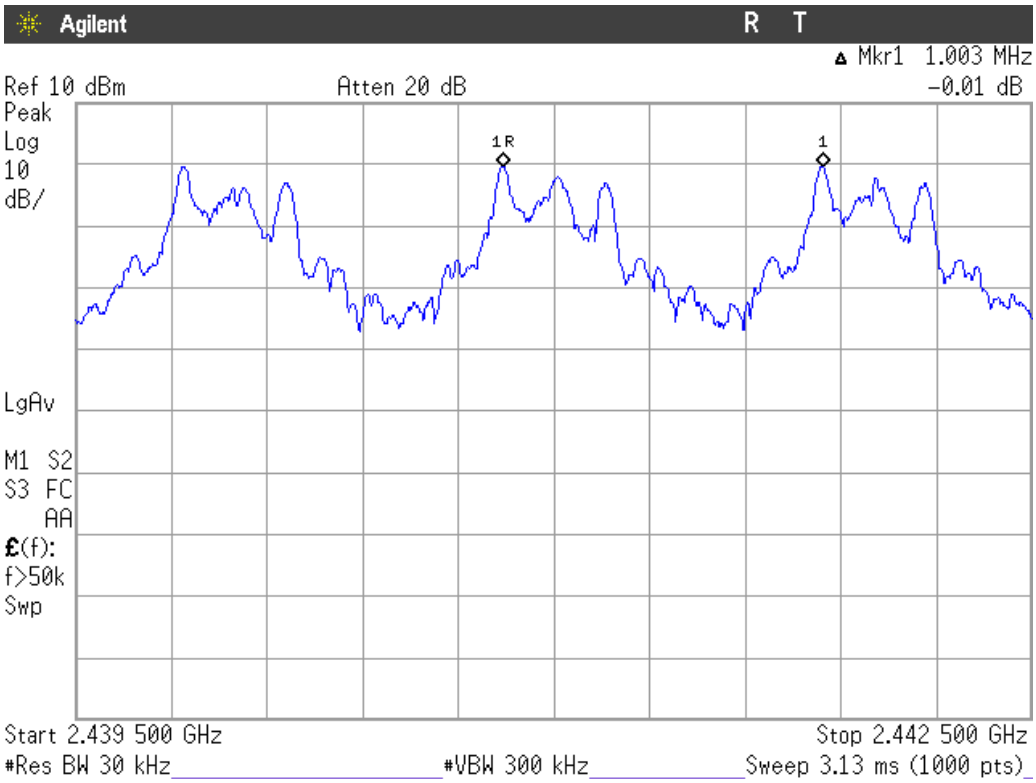
20 dB BANDWIDTH Middle Channel: 2441 MHz.



20 dB BANDWIDTH Highest Channel: 2480 MHz.



Carrier frequency separation

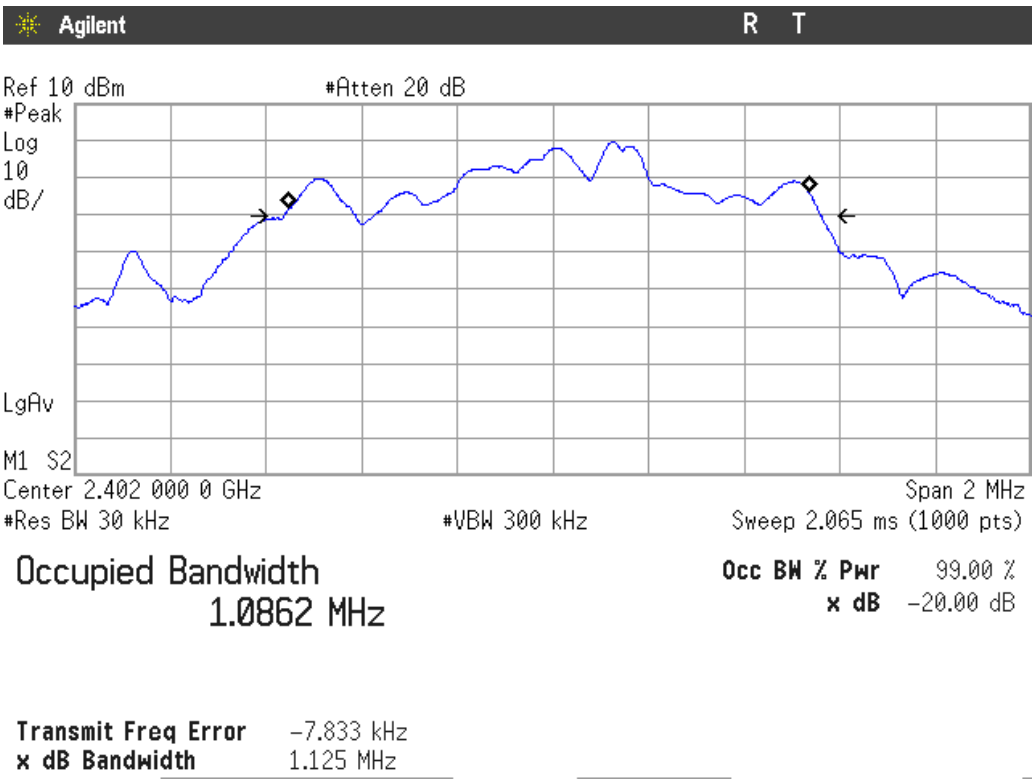


The hopping channel carrier frequencies are separated by a minimum of the 20 dB bandwidth of the hopping channel.

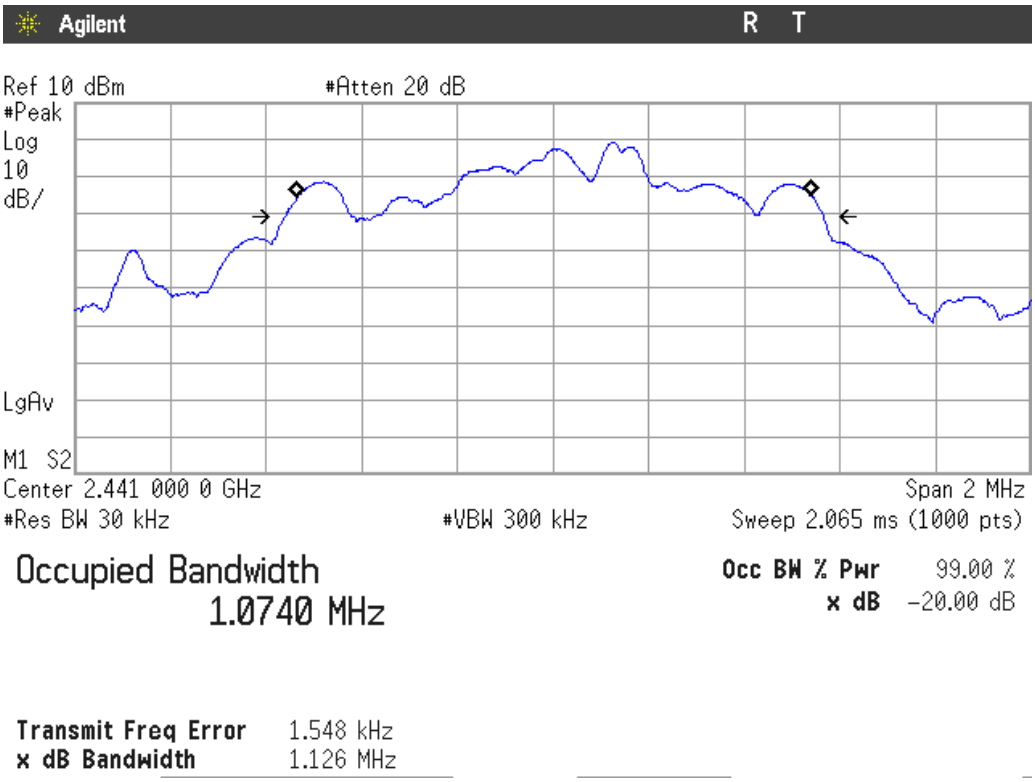
Verdict: PASS

Modulation: II/4-DQPSK

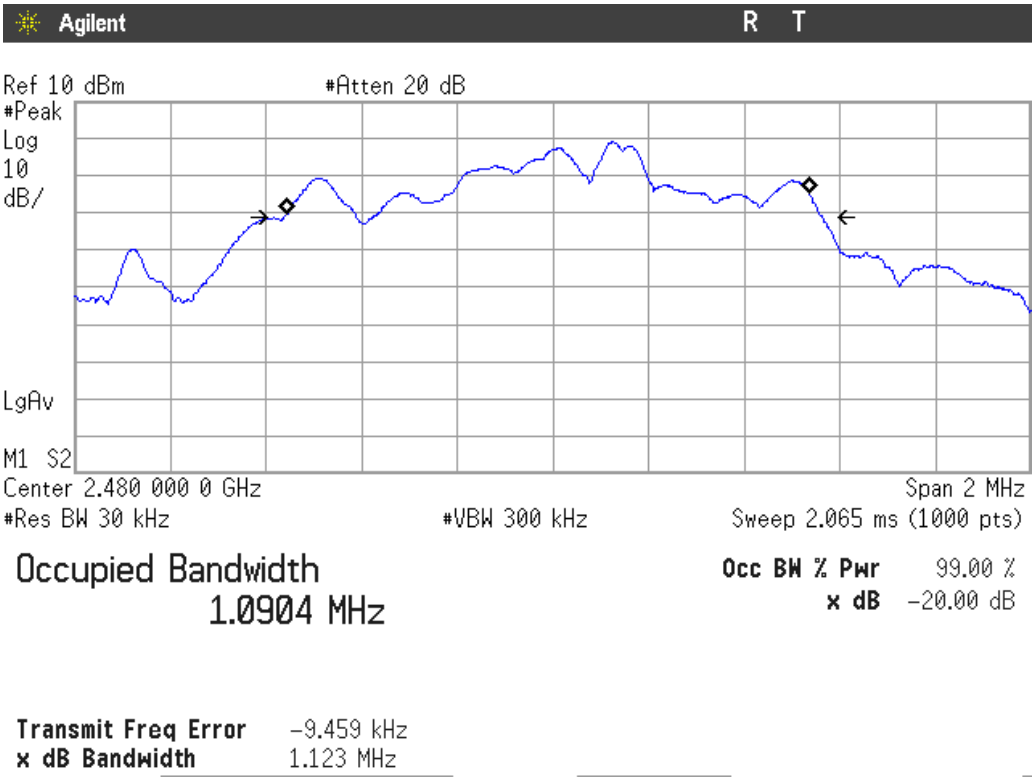
20 dB BANDWIDTH. Lowest Channel: 2402 MHz.



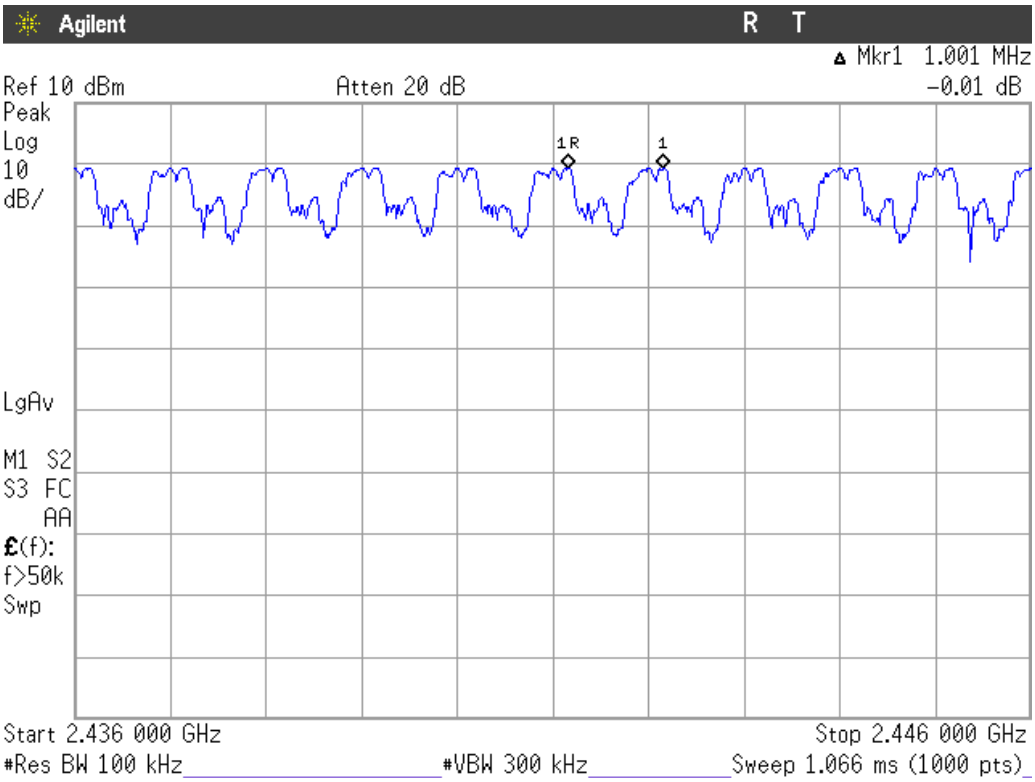
20 dB BANDWIDTH Middle Channel: 2441 MHz.



20 dB BANDWIDTH Highest Channel: 2480 MHz.



Carrier frequency separation

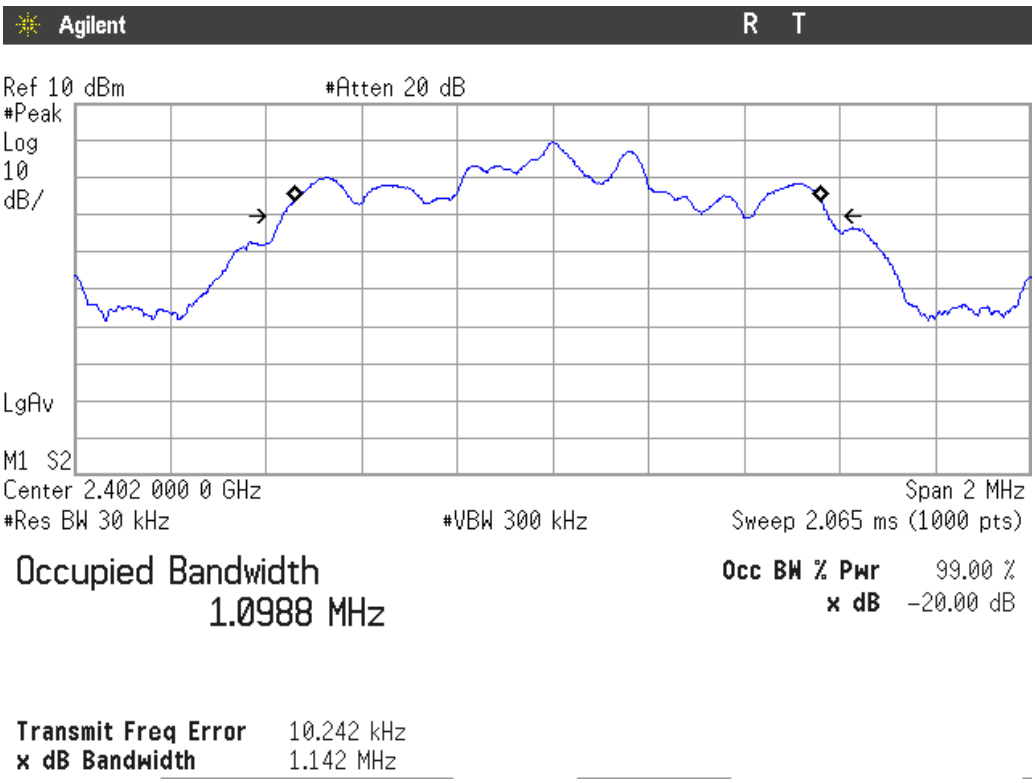


The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20 dB bandwidth of the hopping channel

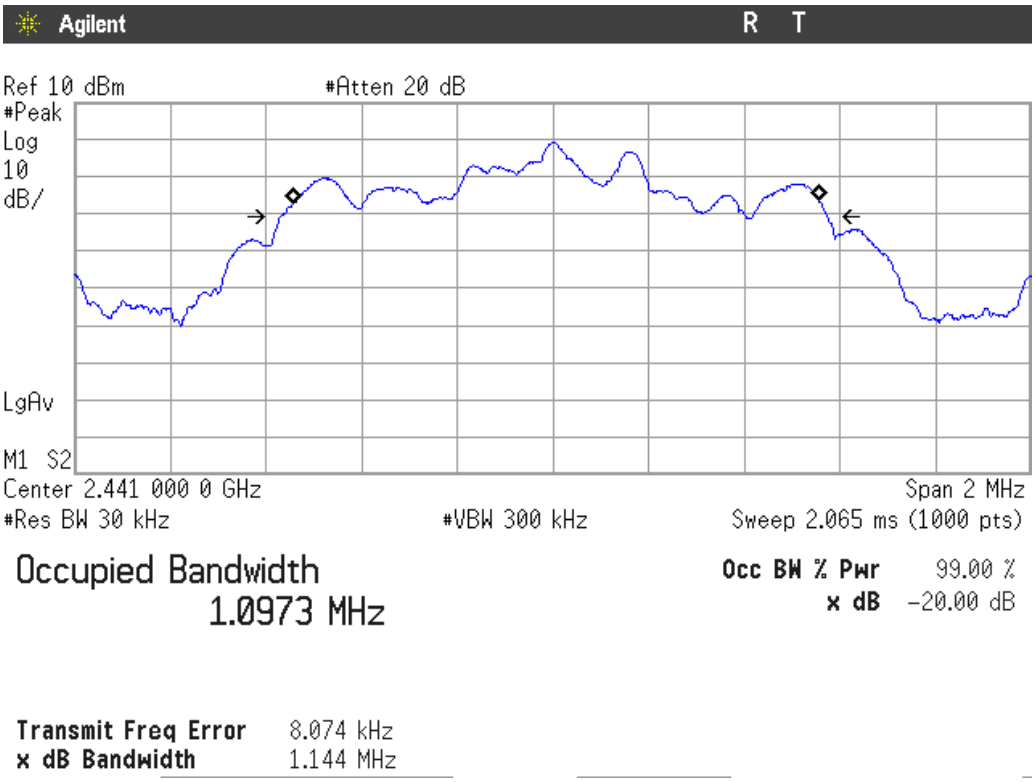
Verdict: PASS

Modulation: 8-DPSK

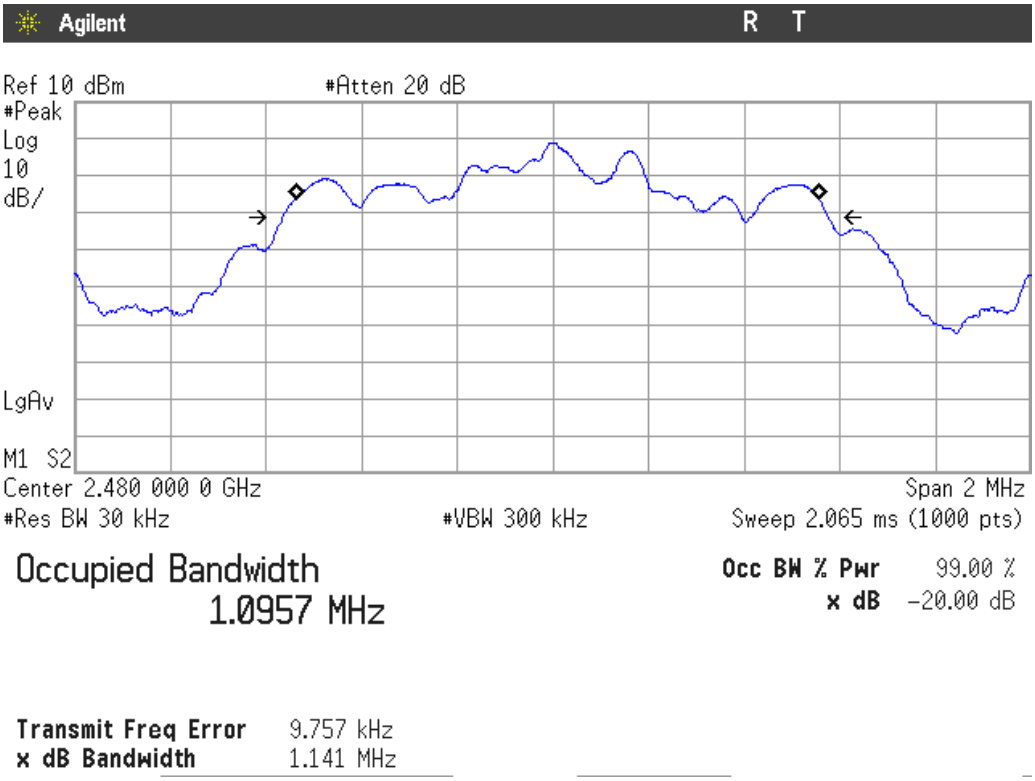
20 dB BANDWIDTH Lowest Channel: 2402 MHz.



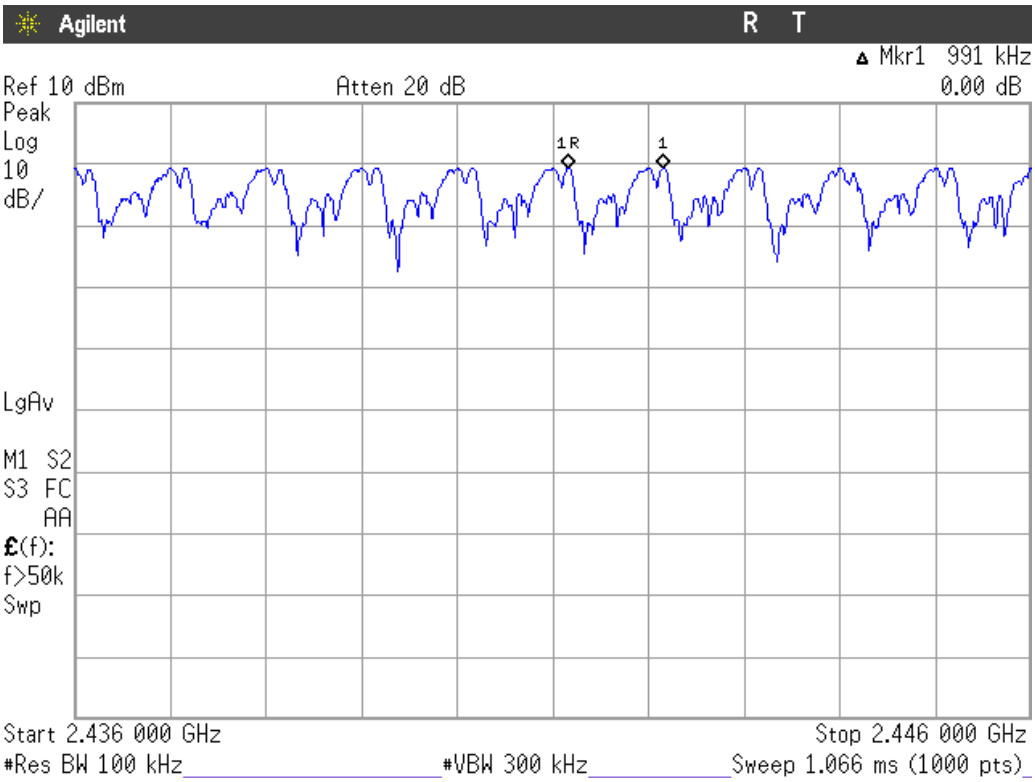
20 dB BANDWIDTH Middle Channel: 2441 MHz.



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

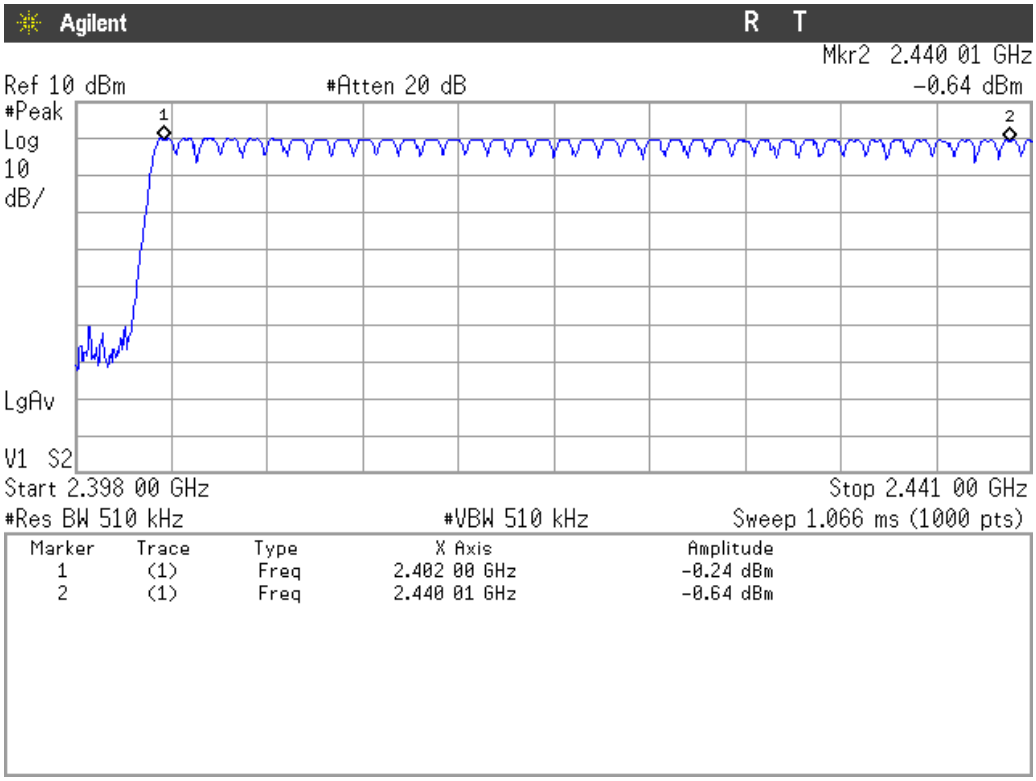
SPECIFICATION

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

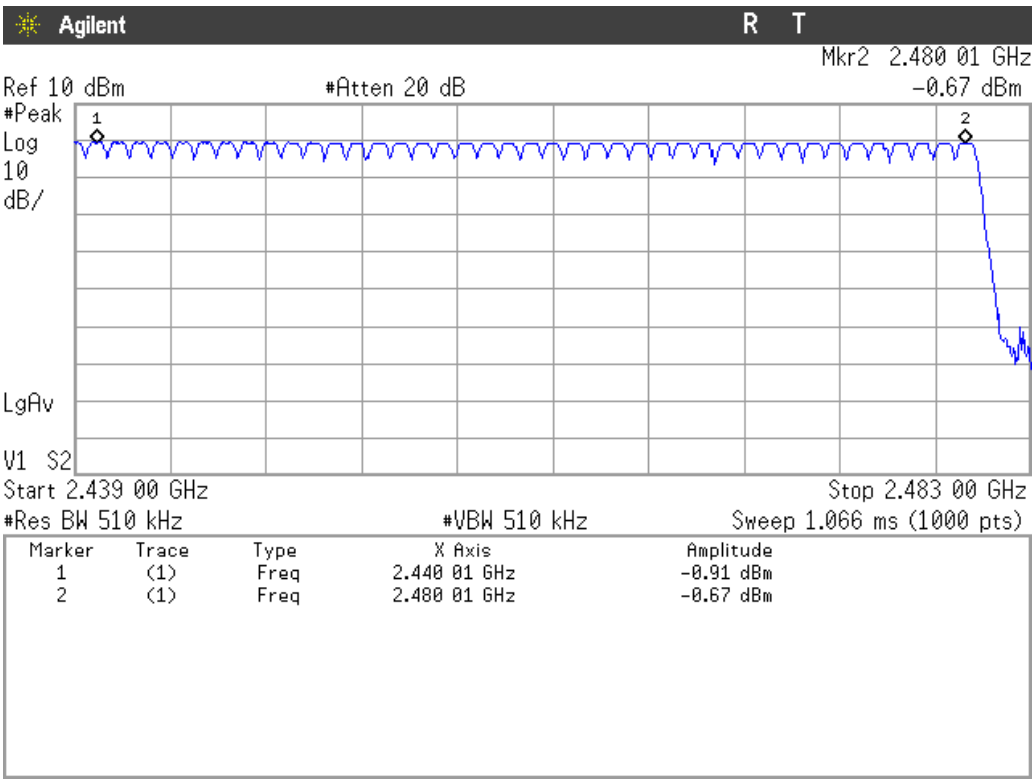
RESULTS

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

Modulation: GFSK



Number of hopping frequencies: 39

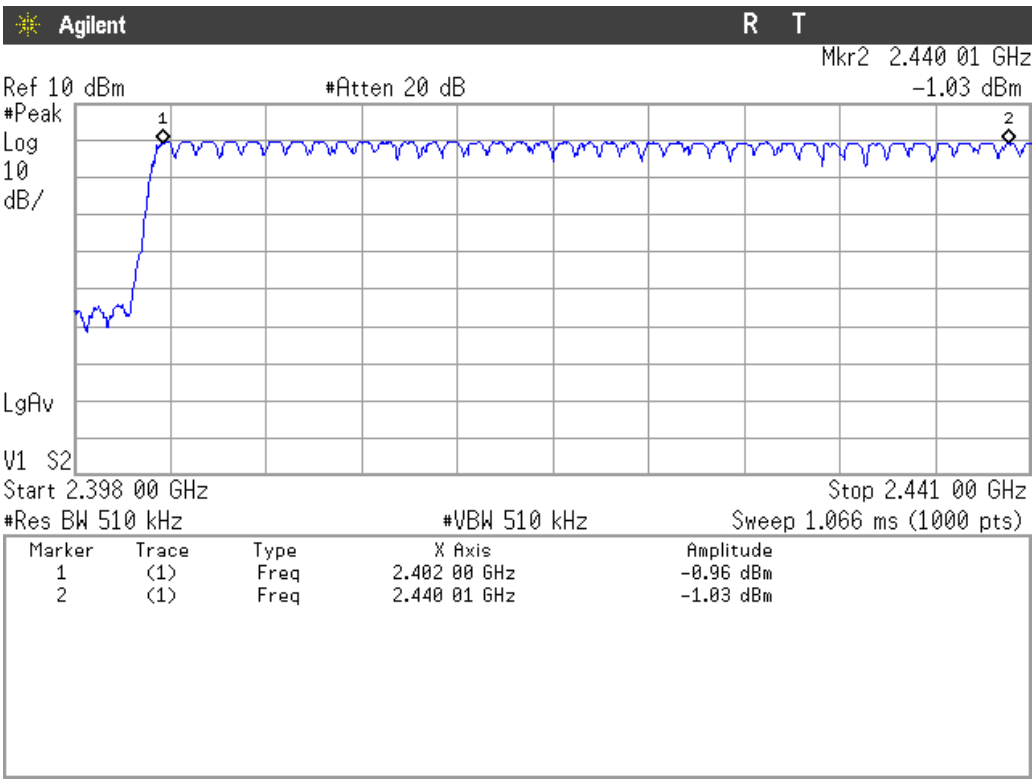


Number of hopping frequencies: 40

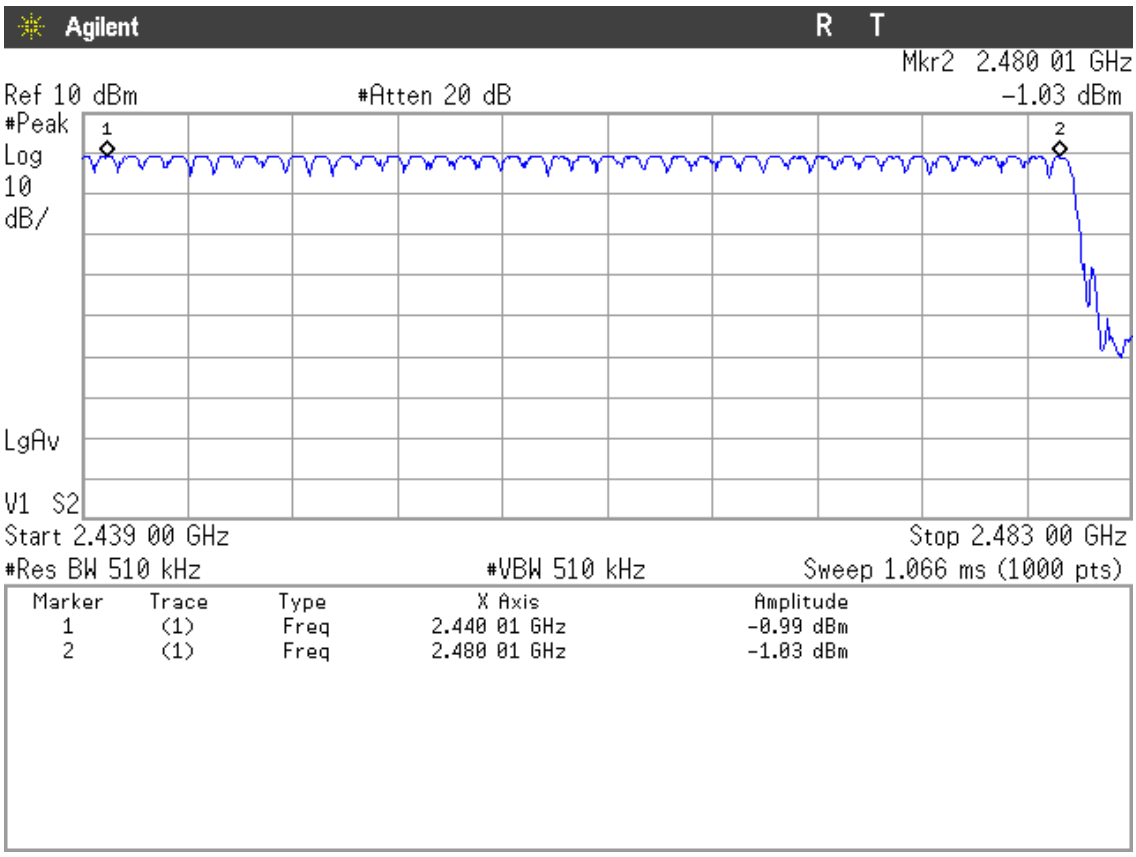
Total number of hopping frequencies: 79

Verdict: PASS

Modulation: Π/4-DQPSK



Number of hopping frequencies: 39

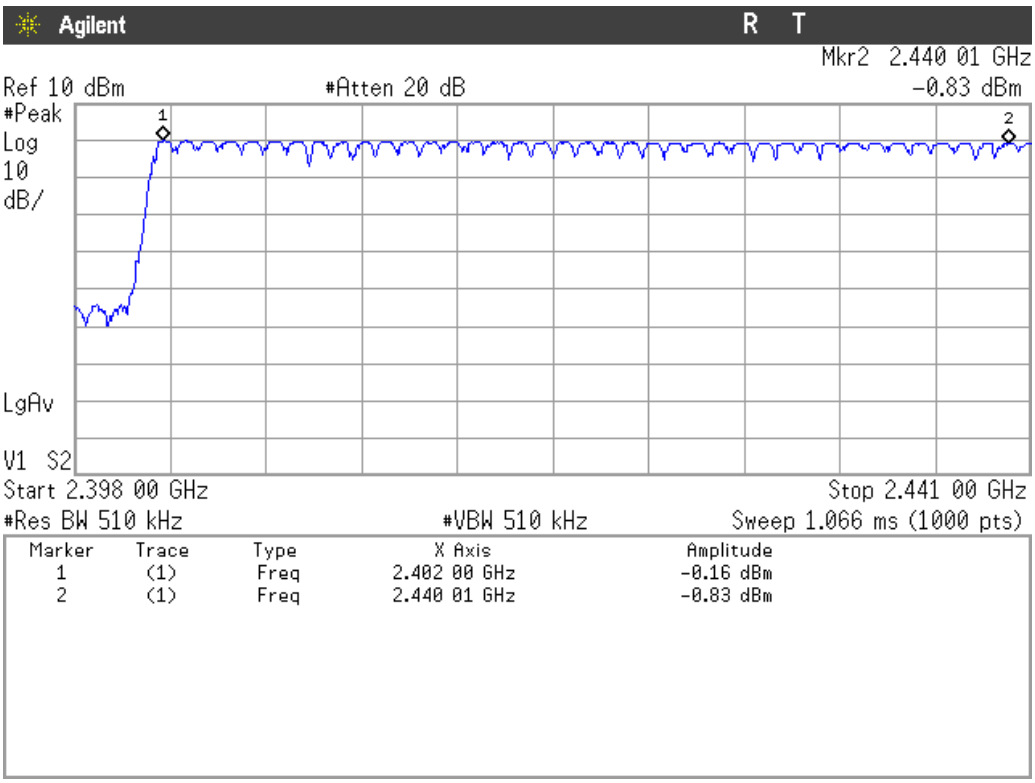


Number of hopping frequencies: 40

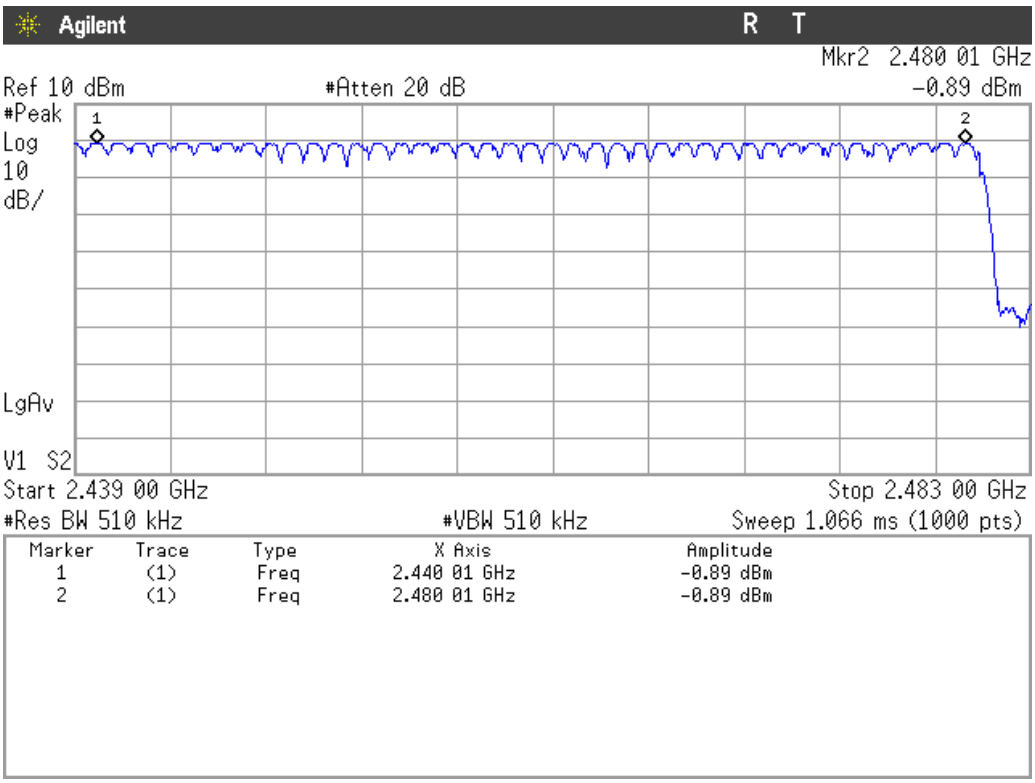
Total number of hopping frequencies: 79

Verdict: PASS

Modulation: 8-DPSK



Number of hopping frequencies: 39



Number of hopping frequencies: 40

Total number of hopping frequencies: 79

Verdict: PASS

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

SPECIFICATION

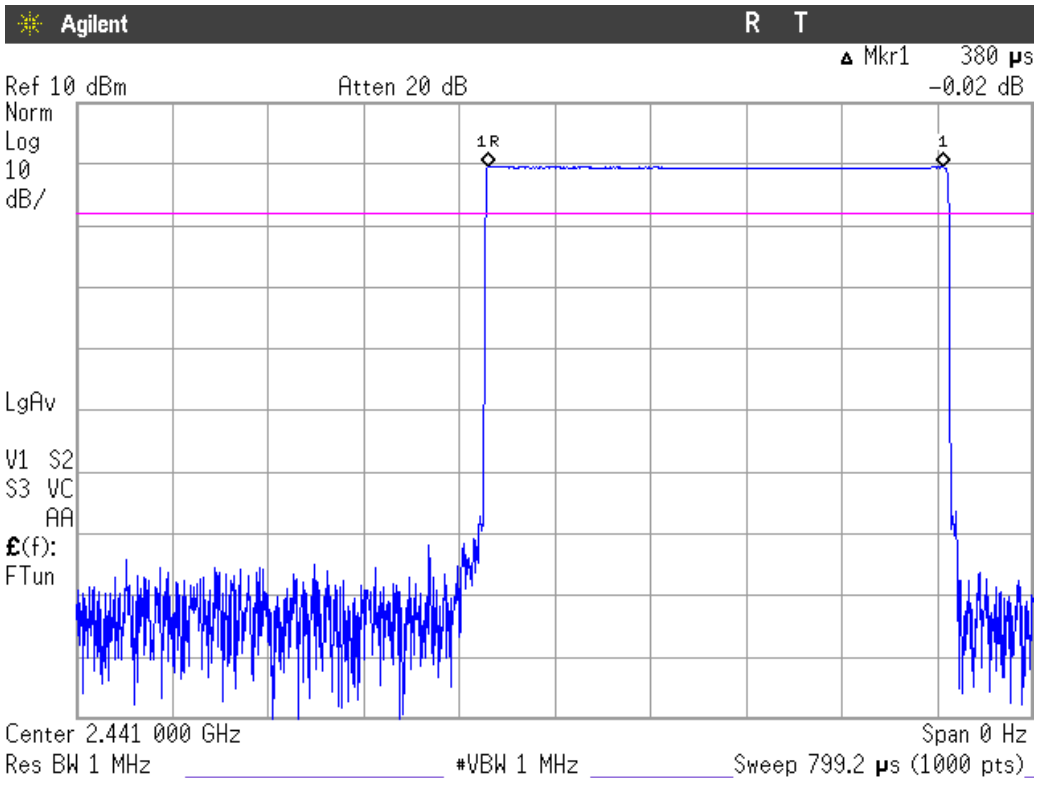
The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed = 0.4 x 79= 31.6 seconds.

RESULTS

Modulation: GFSK

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

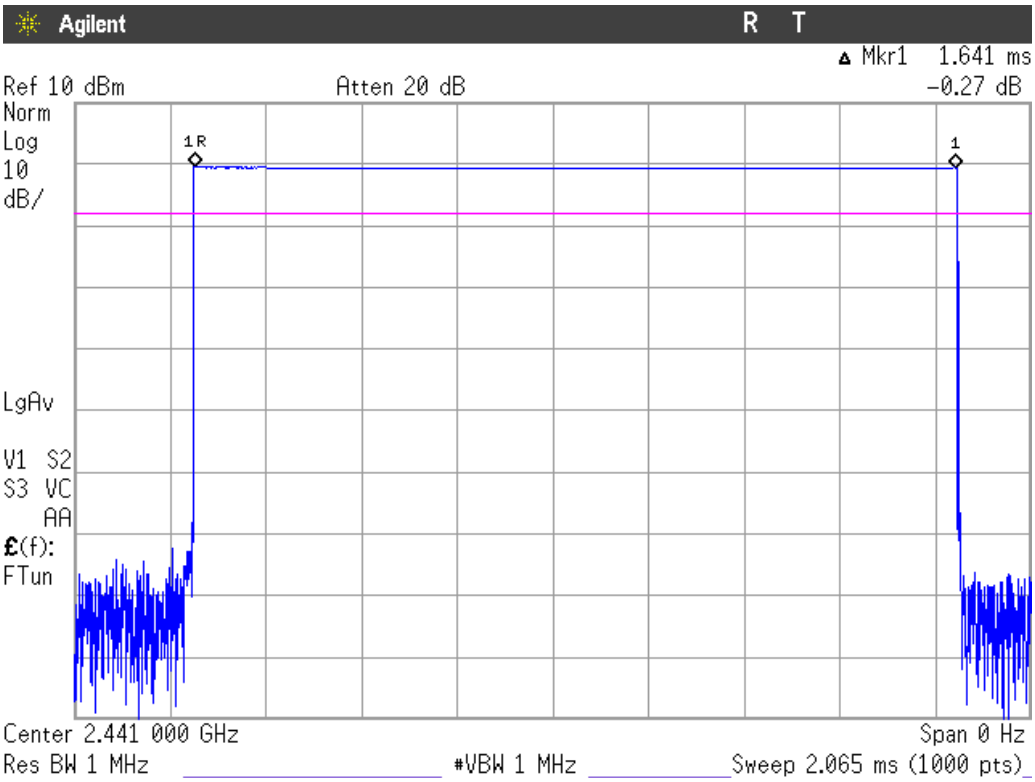
The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/2 = 800 hops per second with 79 channels. So you have each channel 800/79 = 10.13 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 10.13 x 31.6 = 320.11 times of appearance.
Each Tx-time per appearance is 380 µs (see next plot).
So we have 320.11 x 380 µs = 121.64 ms per 31.6 seconds.



Verdict: PASS

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

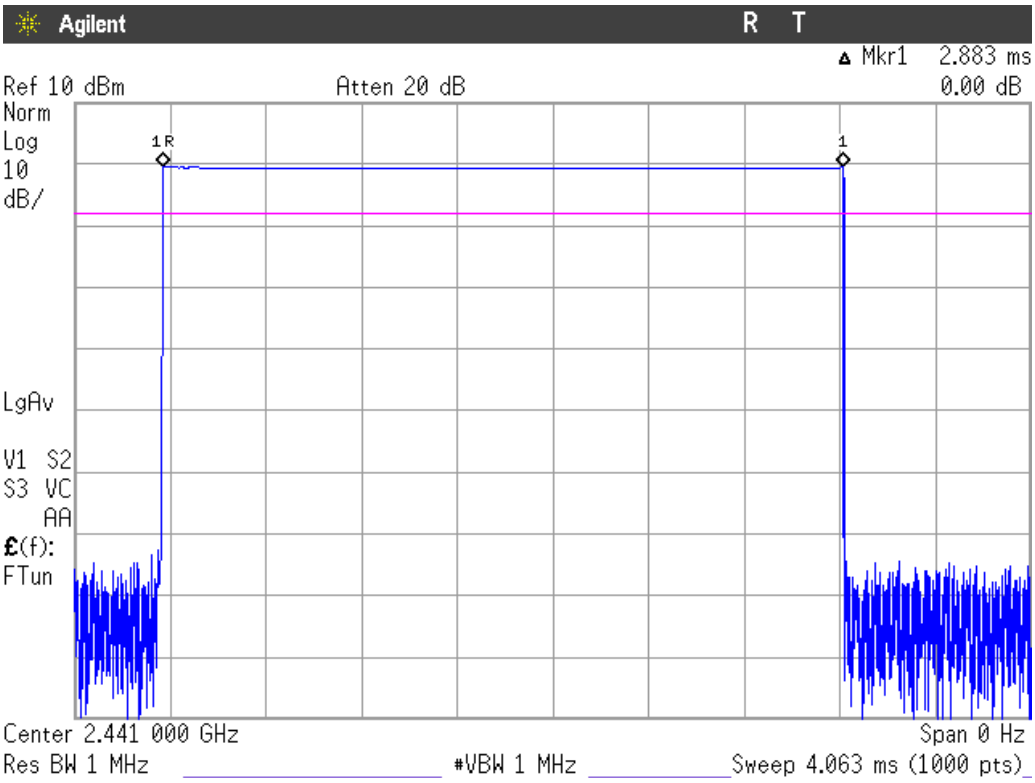
A DH3 Packet needs 3 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/4 = 400 hops per second with 79 channels. So you have each channel 400/79 = 5.1 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 5.1 x 31.6 = 161.16 times of appearance.
Each Tx-time per appearance is 1.641 ms (see next plot).
So we have 161.16 x 1.641 ms = 264.46 ms per 31.6 seconds.



Verdict: PASS

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

A DH5 Packet needs 5 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/6 = 266.67 hops per second with 79 channels. So you have each channel 266.67/79 = 3.37 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 3.37 x 31.6 = 106.49 times of appearance.
Each Tx-time per appearance is 2.883 ms (see next plot).
So we have 106.49 x 2.883 ms = 307.01 ms per 31.6 seconds.

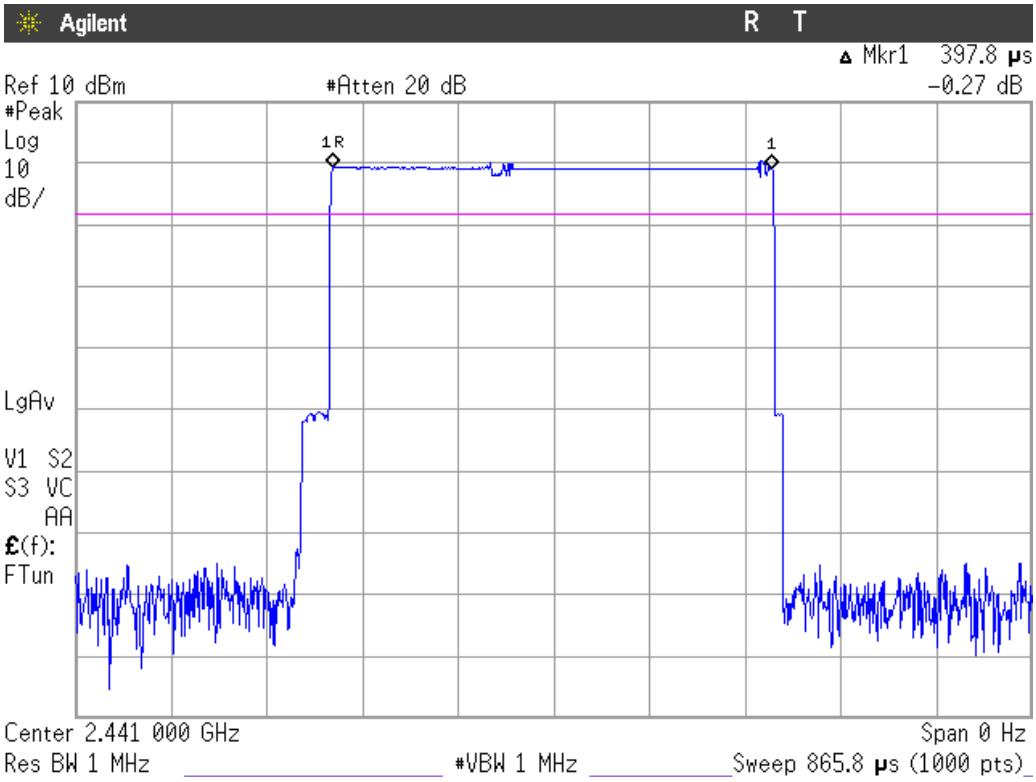


Verdict: PASS

Modulation: Π/4-DQPSK

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

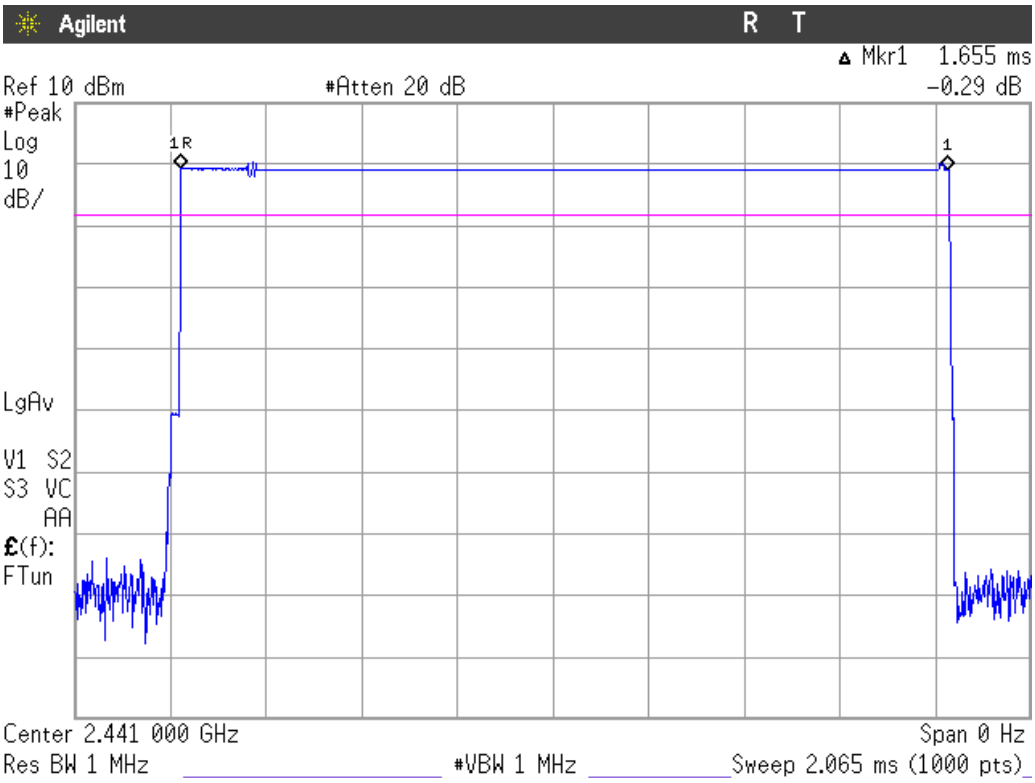
The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/2 = 800 hops per second with 79 channels. So you have each channel 800/79 = 10.13 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 10.13 x 31.6 = 320.11 times of appearance.
Each Tx-time per appearance is 397.8 µs (see next plot).
So we have 320.11 x 397.8 µs =127.34 ms per 31.6 seconds.



Verdict: PASS

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

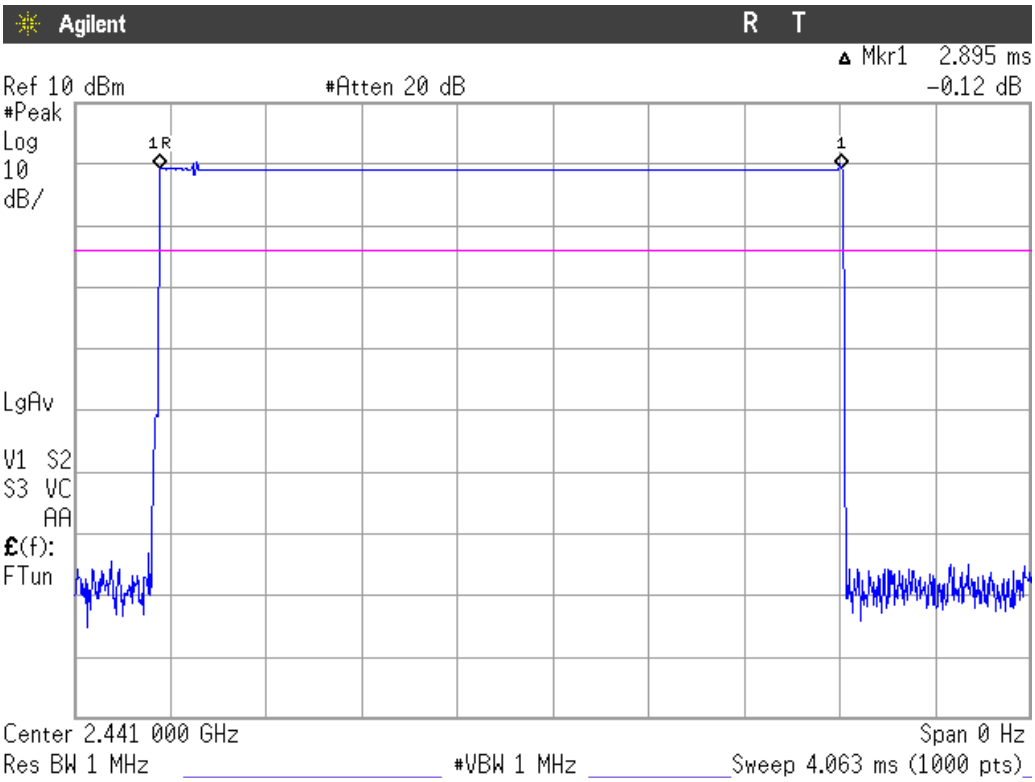
A DH3 Packet needs 3 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/4 = 400 hops per second with 79 channels. So you have each channel 400/79 = 5.1 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 5.1 x 31.6 = 161.16 times of appearance.
Each Tx-time per appearance is 1.655 ms (see next plot).
So we have 161.16 x 1.655 ms = 266.72 ms per 31.6 seconds.



Verdict: PASS

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

A DH5 Packet needs 5 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/6 = 266.67 hops per second with 79 channels. So you have each channel 266.67/79 = 3.37 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 3.37 x 31.6 = 106.49 times of appearance.
Each Tx-time per appearance is 2.895 ms (see next plot).
So we have 106.49 x 2.895 ms = 308.29 ms per 31.6 seconds.

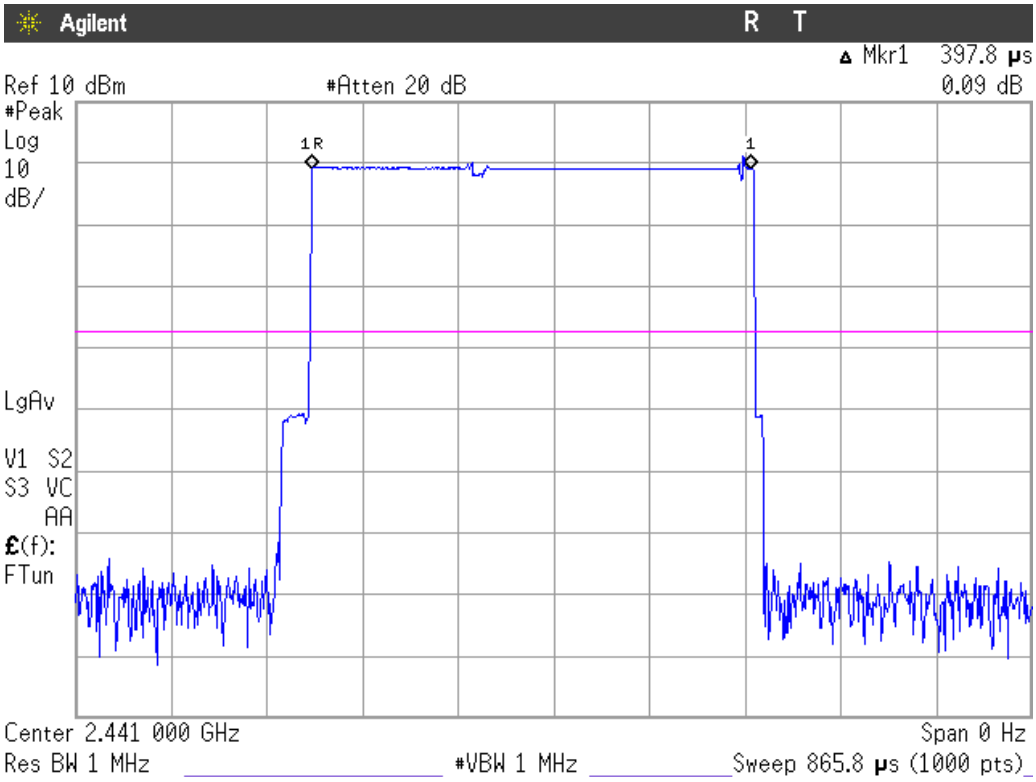


Verdict: PASS

Modulation: 8-DPSK

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

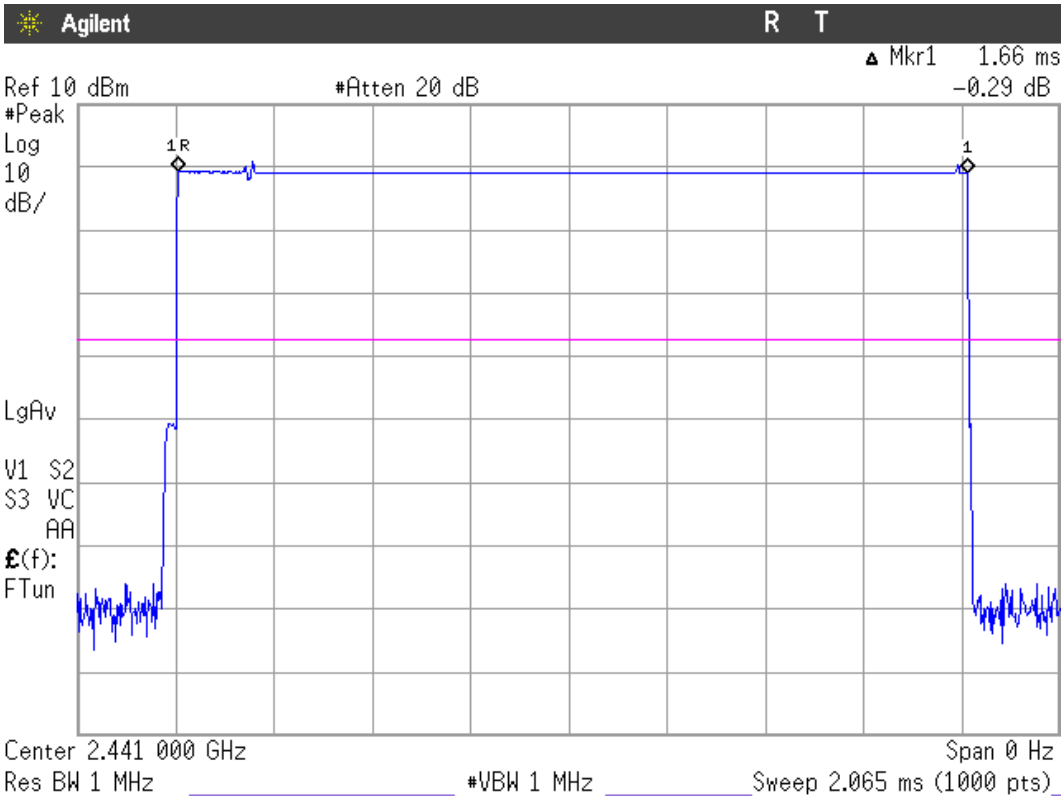
The system makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet need 1 time slot for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/2 = 800 hops per second with 79 channels. So you have each channel 800/79 = 10.13 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 10.13 x 31.6 = 320.11 times of appearance.
Each Tx-time per appearance is 397.8 µs (see next plot).
So we have 320.11 x 397.8 µs =127.34 ms per 31.6 seconds.



Verdict: PASS

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

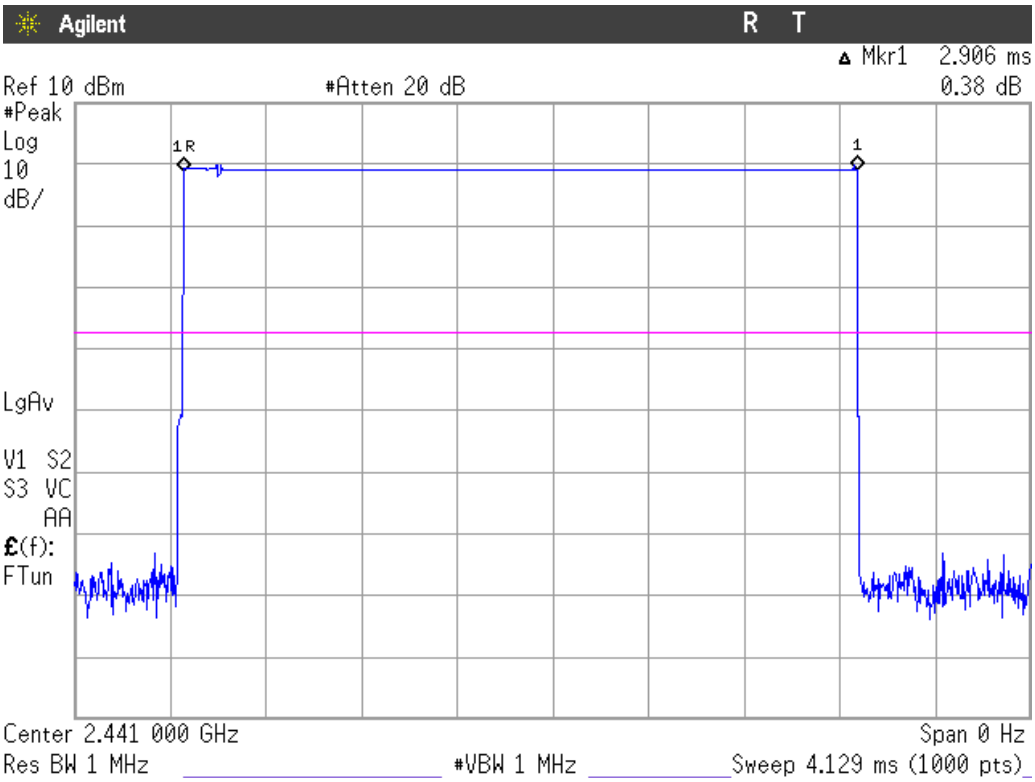
A DH3 Packet needs 3 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/4 = 400 hops per second with 79 channels. So you have each channel 400/79 = 5.1 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 5.1 x 31.6 = 161.16 times of appearance.
Each Tx-time per appearance is 1.66 ms (see next plot).
So we have 161.16 x 1.66 ms = 267.52 ms per 31.6 seconds.



Verdict: PASS

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

A DH5 Packet needs 5 time slots for transmitting and 1 time slot for receiving. Then the system makes worst case 1600/6 = 266.67 hops per second with 79 channels. So you have each channel 266.67/79 = 3.37 times per second and so for a period of 0.4 x 79 = 31.6 seconds you have 3.37 x 31.6 = 106.49 times of appearance.
Each Tx-time per appearance is 2.906 ms (see next plot).
So we have 106.49 x 2.906 ms = 309.46 ms per 31.6 seconds.



Verdict: PASS

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

SPECIFICATION

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels: 1 watt (30 dBm).

RESULTS

MAXIMUM OUTPUT POWER. See next plots.

Declared maximum antenna gain: 2.4 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)	-0.12	-0.39	-0.51
Maximum EIRP power (dBm)	2.28	2.01	1.89
Measurement uncertainty (dB)	±1.5		

Modulation: Π/4-DQPSK (2Mbps)

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum peak power (dBm)	1.58	1.47	1.32
Maximum EIRP power (dBm)	3.98	3.87	3.72
Measurement uncertainty (dB)	±1.5		

Modulation: 8-DPSK (3Mbps)

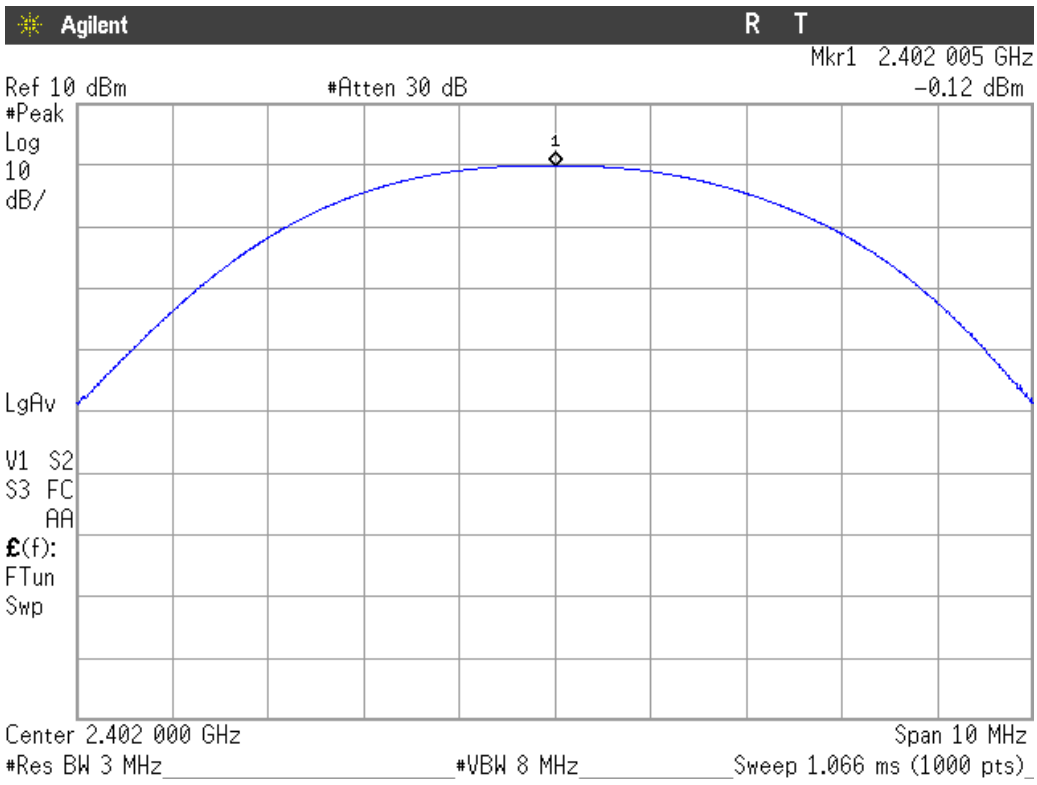
	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum peak power (dBm)	1.58	1.46	1.47
Maximum EIRP power (dBm)	3.98	3.86	3.87
Measurement uncertainty (dB)	±1.5		

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

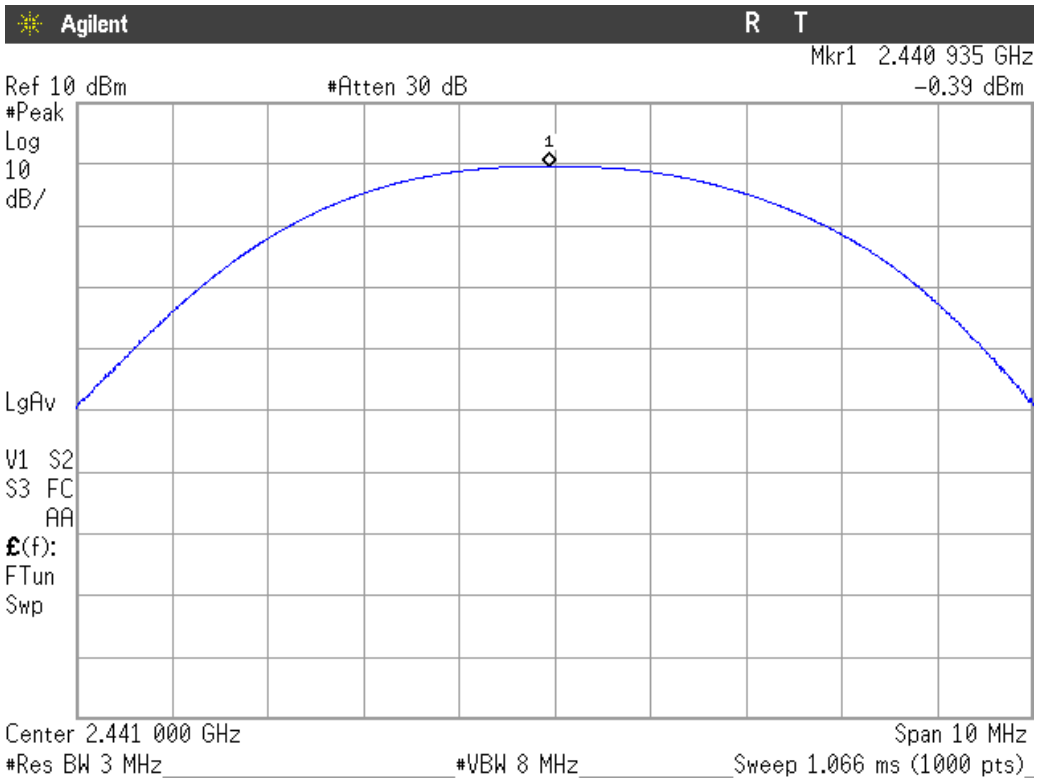
Verdict: PASS

PEAK OUTPUT POWER (CONDUCTED).

Modulation: GFSK Lowest Channel: 2402 MHz.

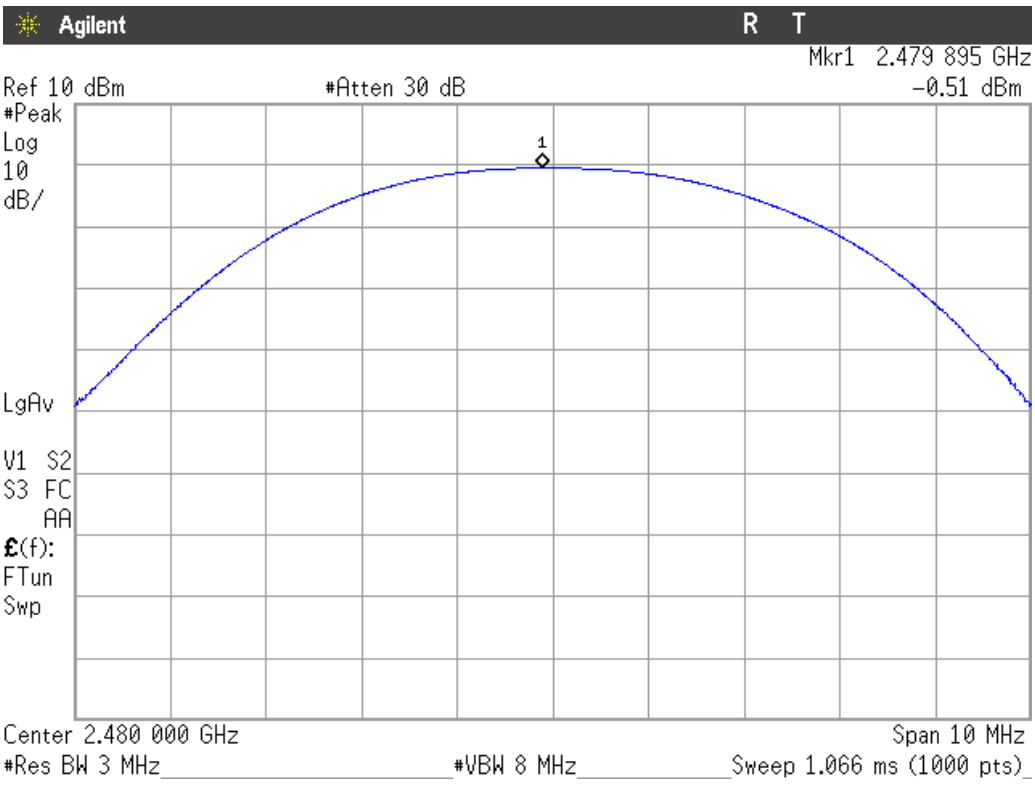


Modulation: GFSK Middle Channel: 2441 MHz.

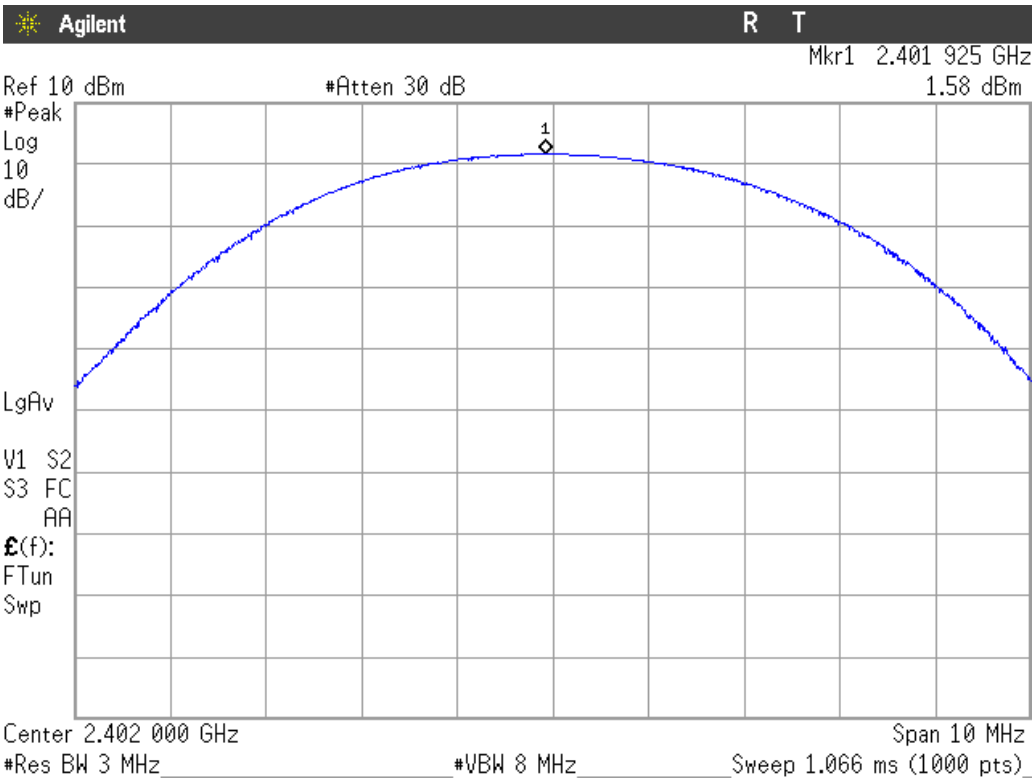


PEAK OUTPUT POWER (CONDUCTED).

Modulation: GFSK Highest Channel: 2480 MHz.

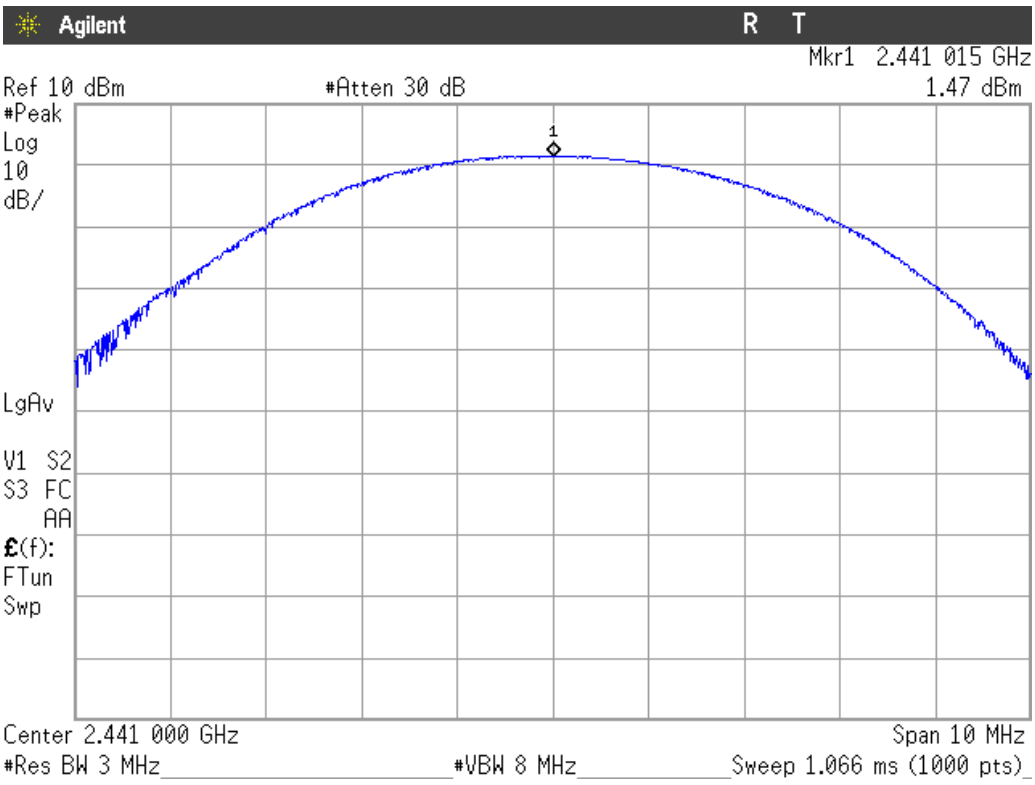


Modulation: Π/4-DQPSK Lowest Channel: 2402 MHz

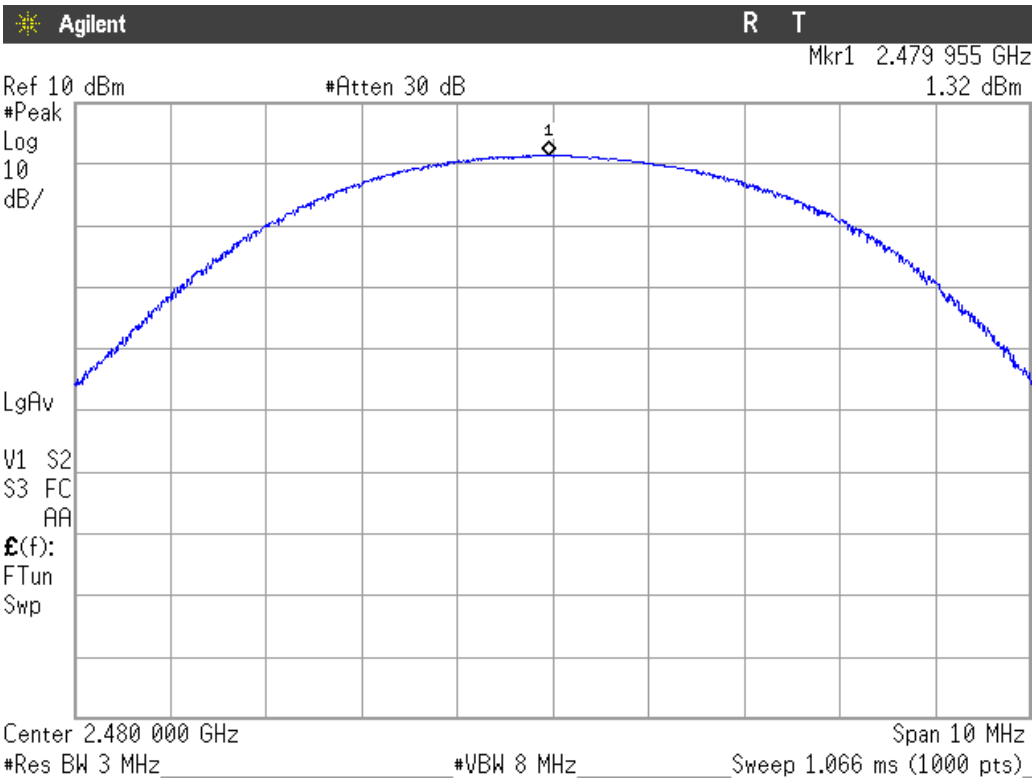


PEAK OUTPUT POWER (CONDUCTED)

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

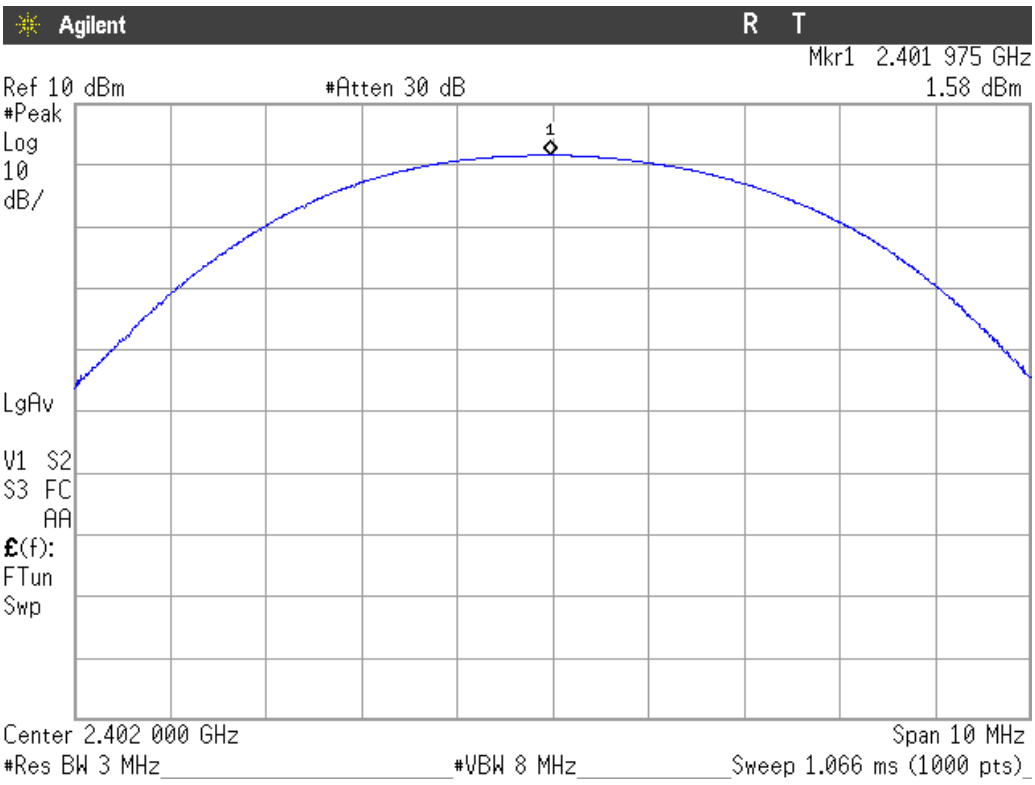


Modulation: Π/4-DQPSK Highest Channel: 2480 MHz.

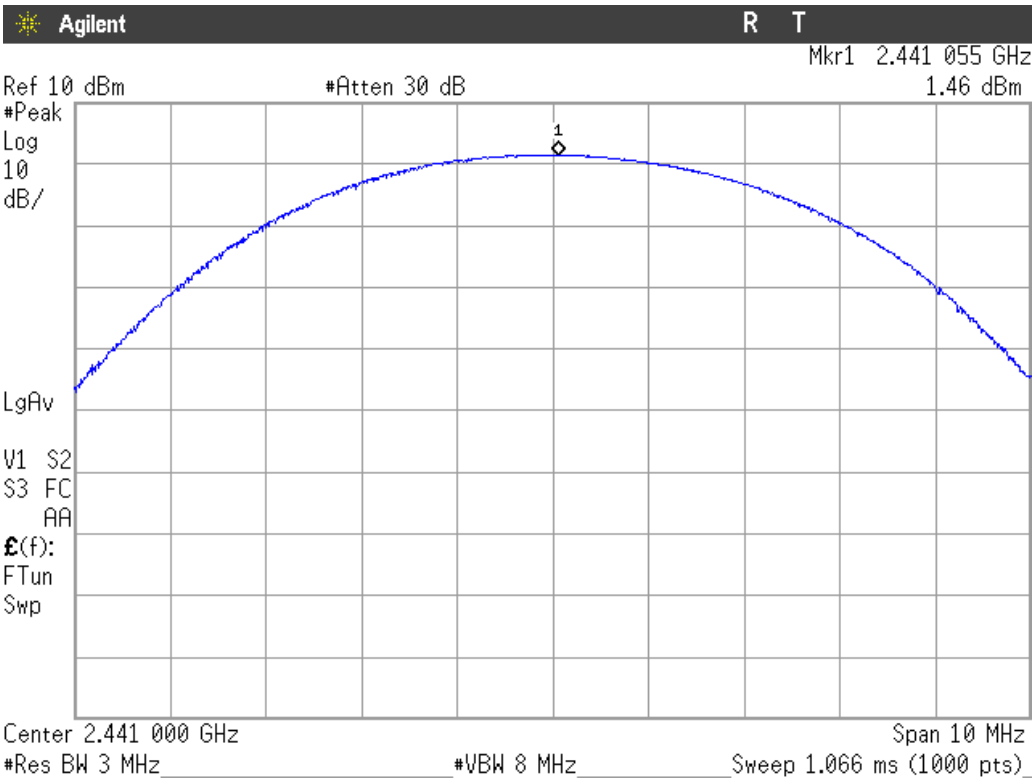


PEAK OUTPUT POWER (CONDUCTED).

Modulation: 8-DPSK Lowest Channel: 2402 MHz

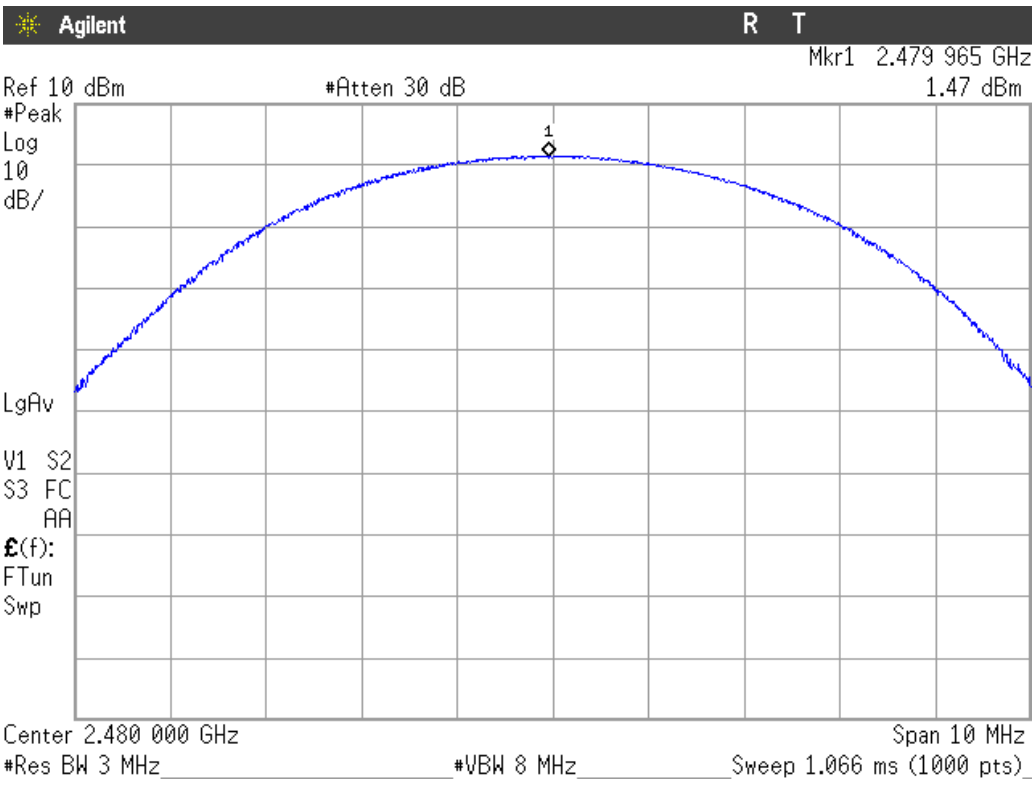


Modulation: 8-DPSK Middle Channel: 2441 MHz.



PEAK OUTPUT POWER (CONDUCTED).

Modulation: 8-DPSK Highest Channel: 2480 MHz.



FCC Section 15.247 Subclause (d) / RSS-210 Clauses 2.2 & A8.5. Band-edge compliance of conducted emissions (Transmitter)

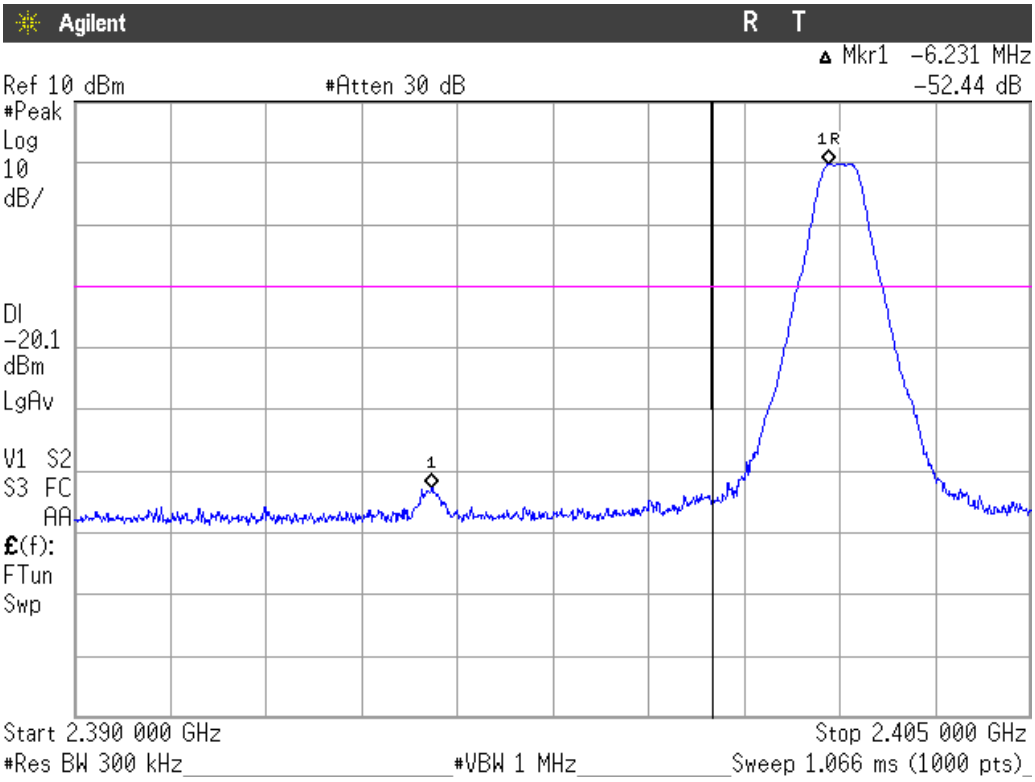
SPECIFICATION

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

RESULTS:

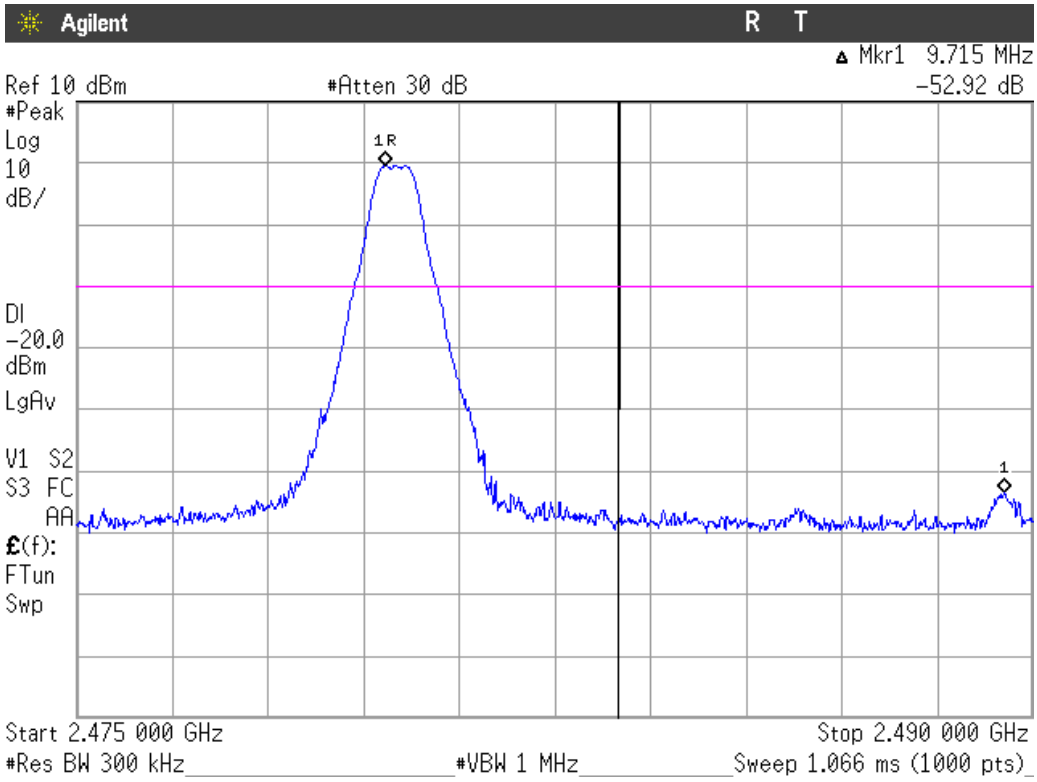
Modulation: GFSK

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



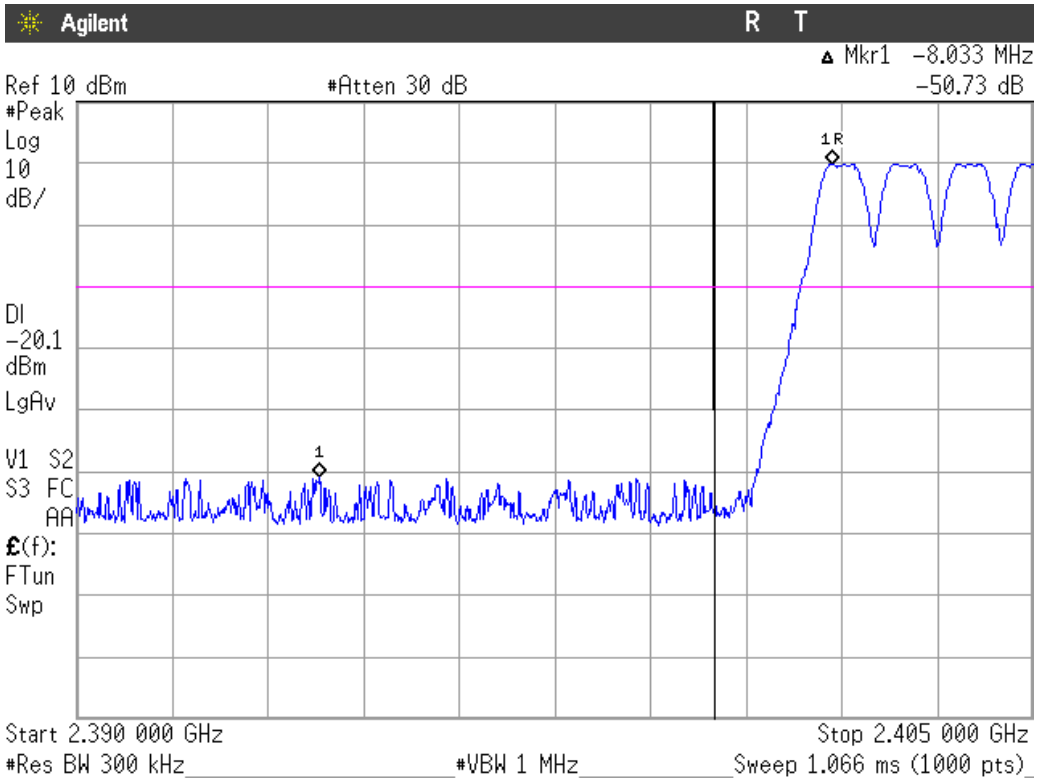
Verdict: PASS

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



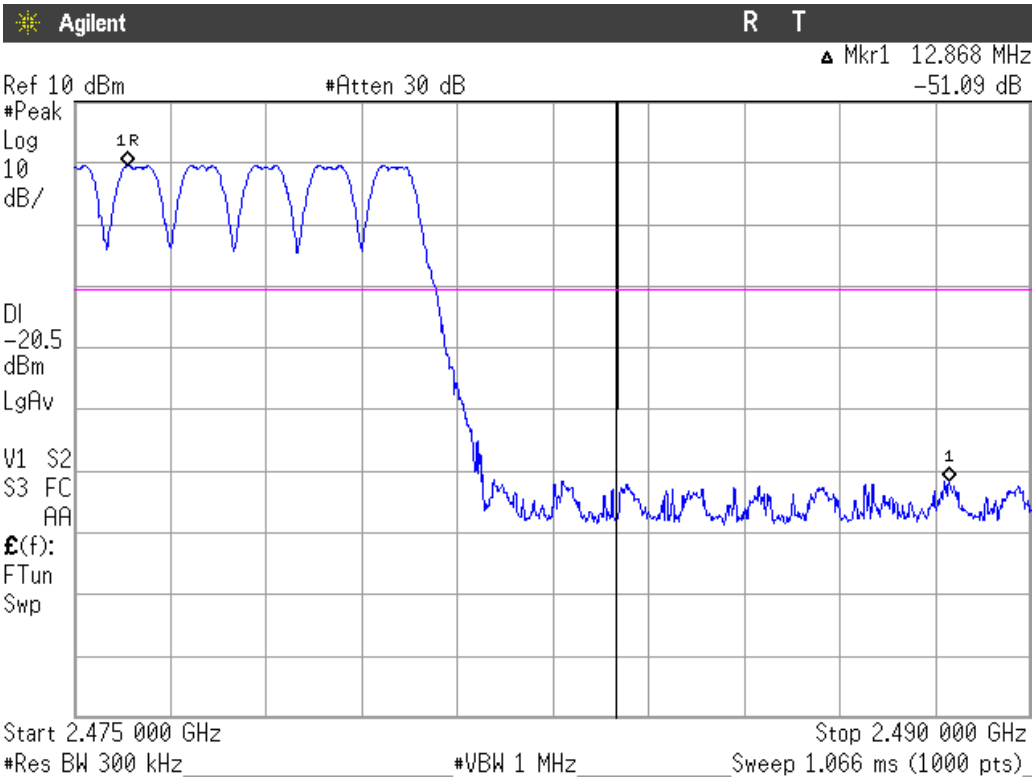
Verdict: PASS

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



Verdict: PASS

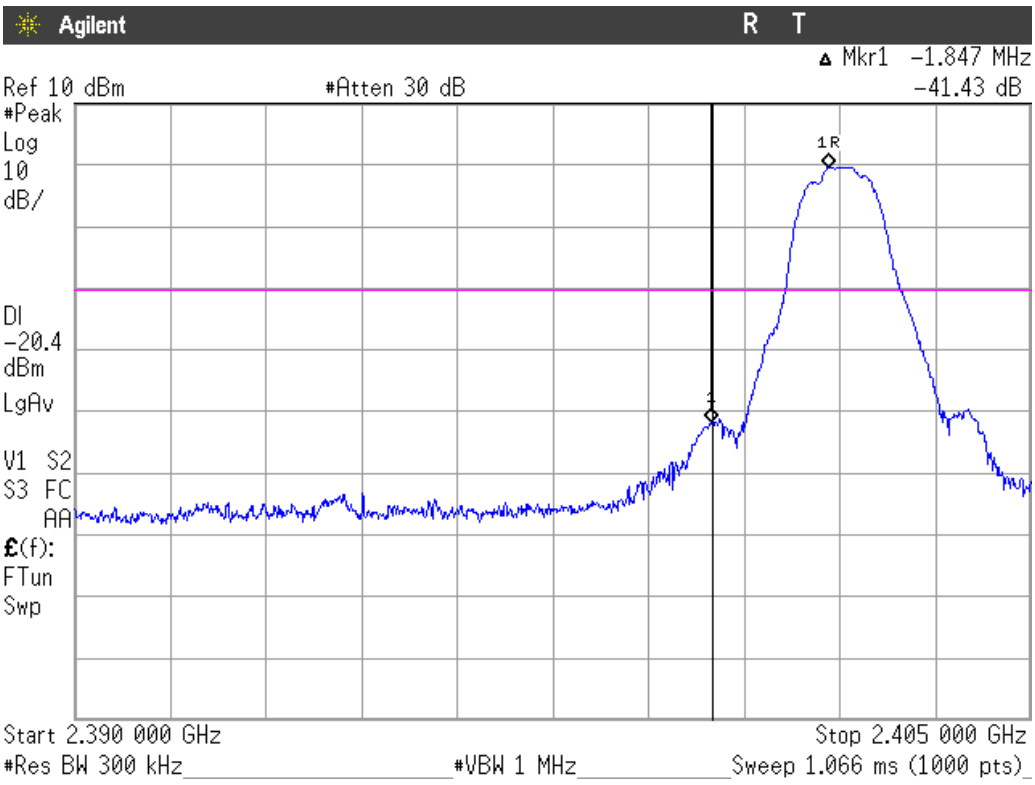
4. HIGH FREQUENCY SECTION (HOPPING ON). See next plot.



Verdict: PASS

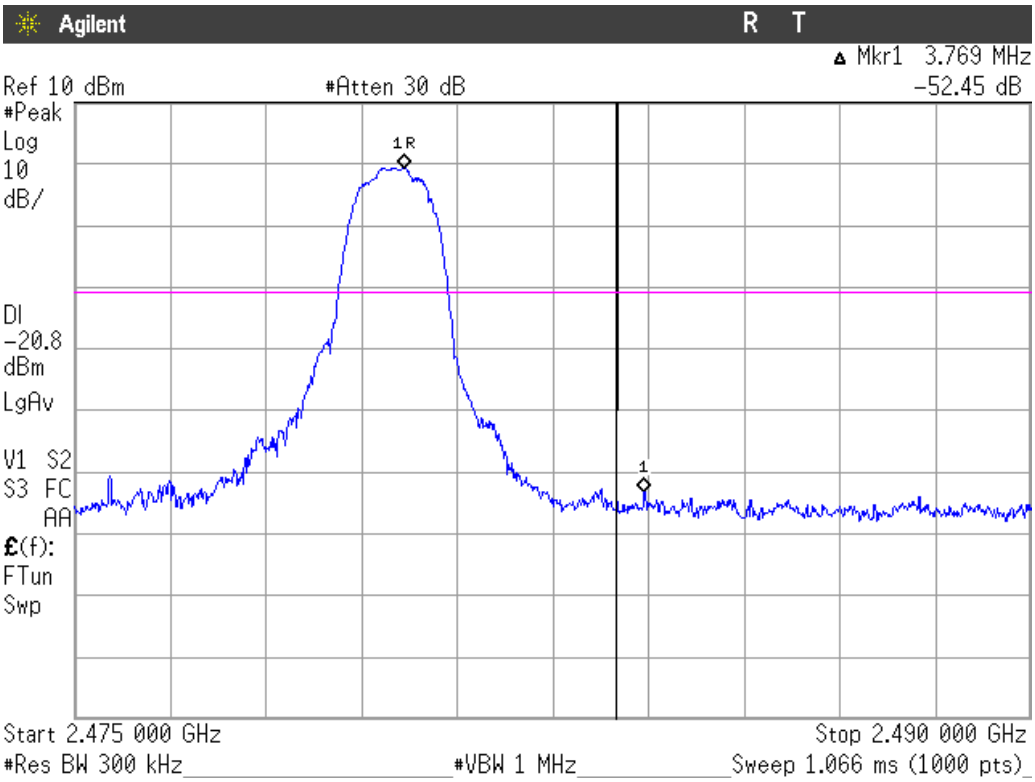
Modulation: II/4-DQPSK

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



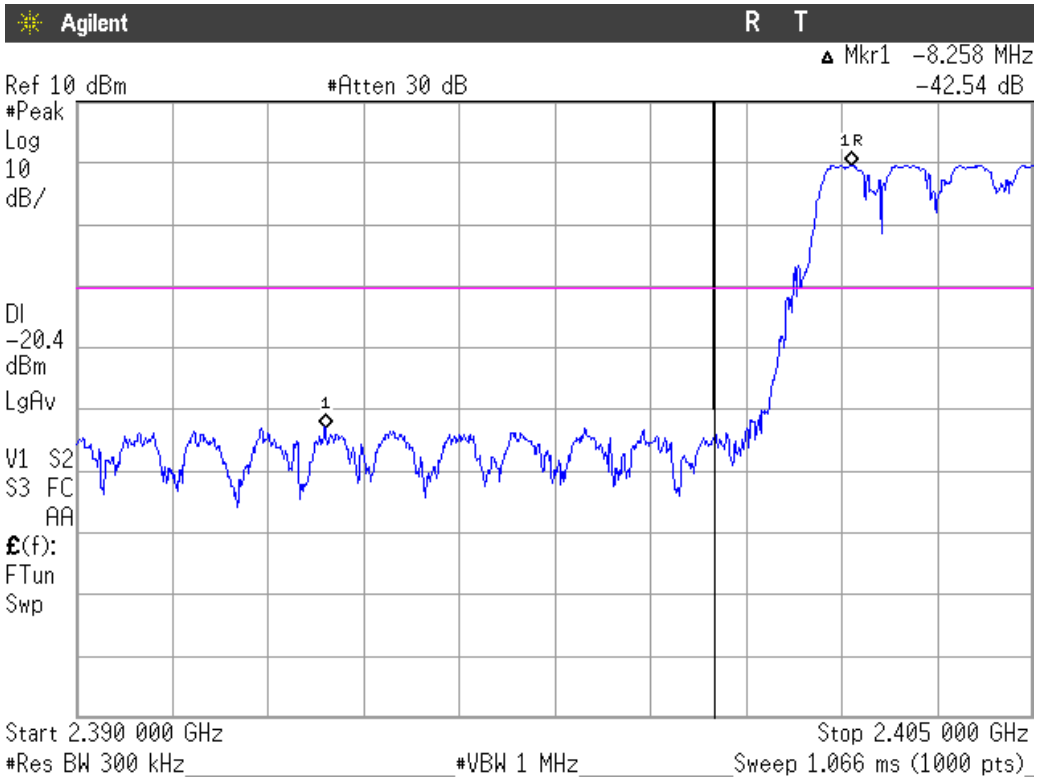
Verdict: PASS

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



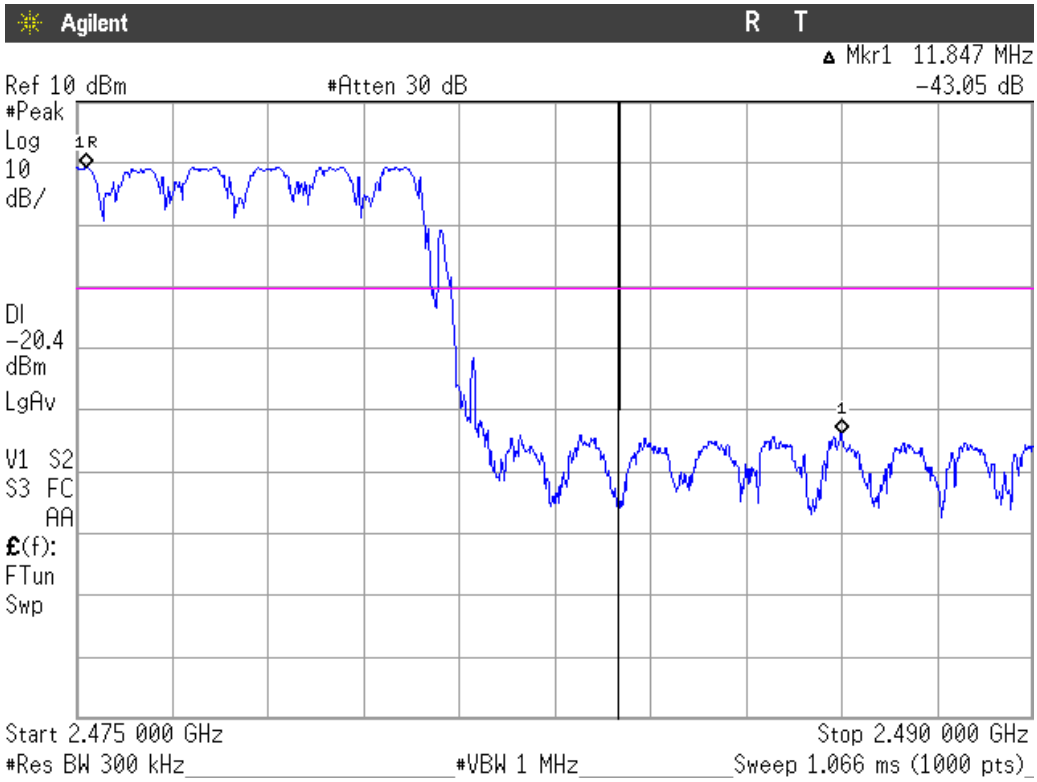
Verdict: PASS

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



Verdict: PASS

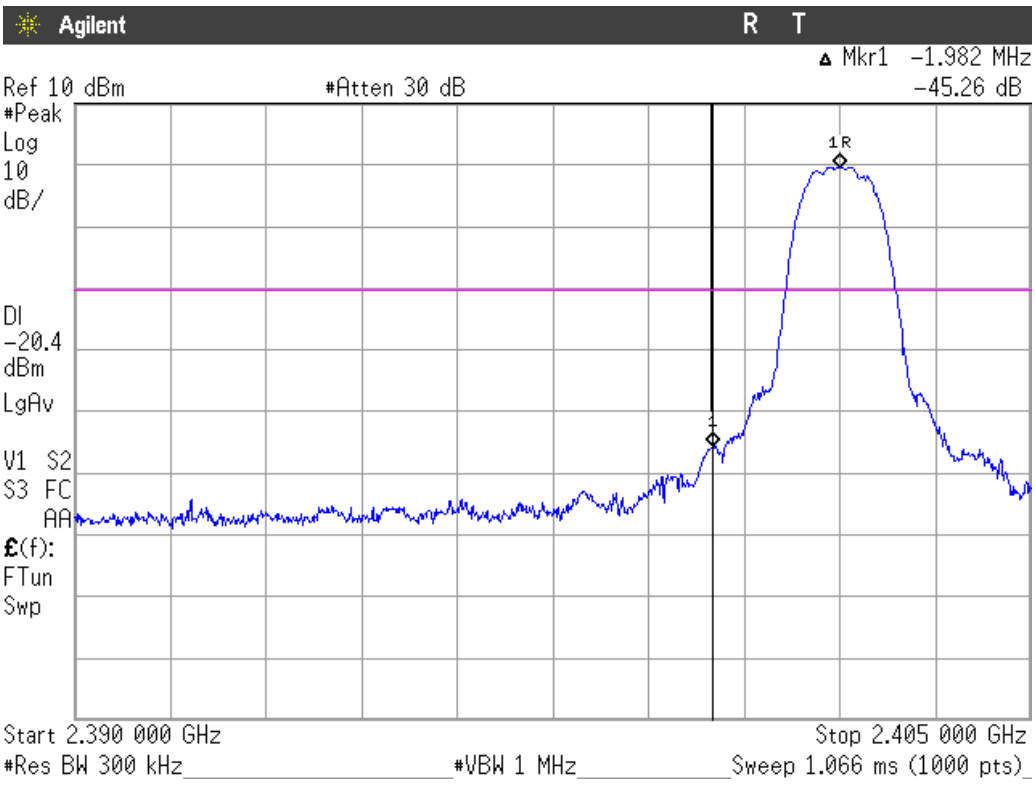
4. HIGH FREQUENCY SECTION (HOPPING ON). See next plot.



Verdict: PASS

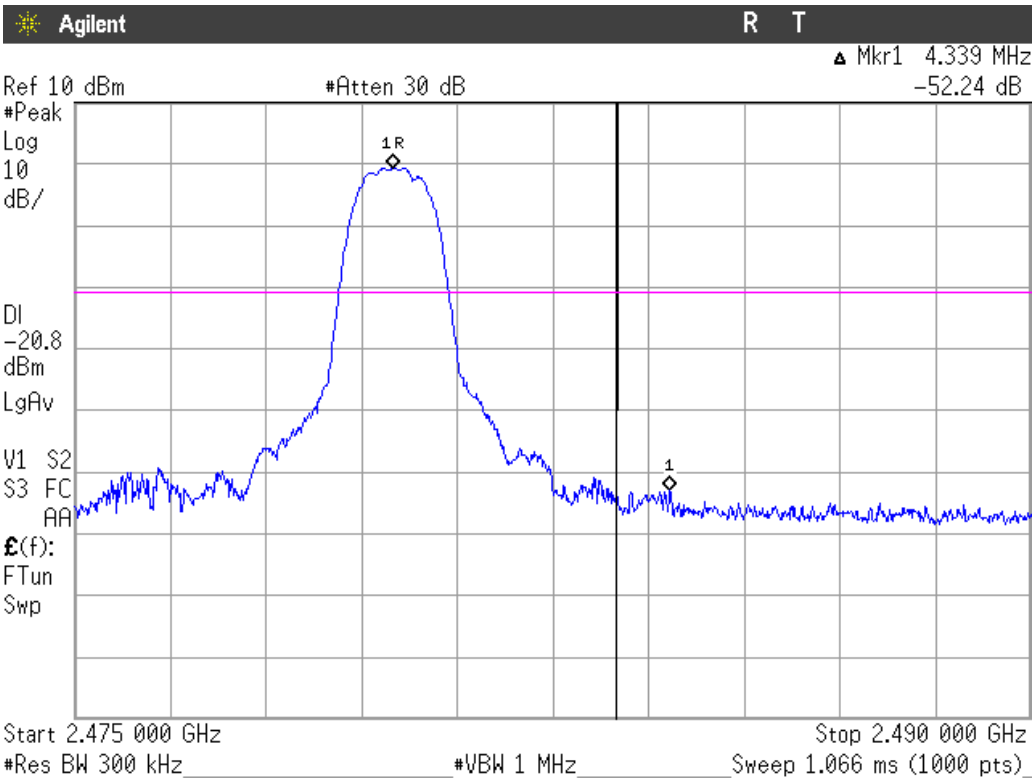
Modulation: 8-DPSK

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



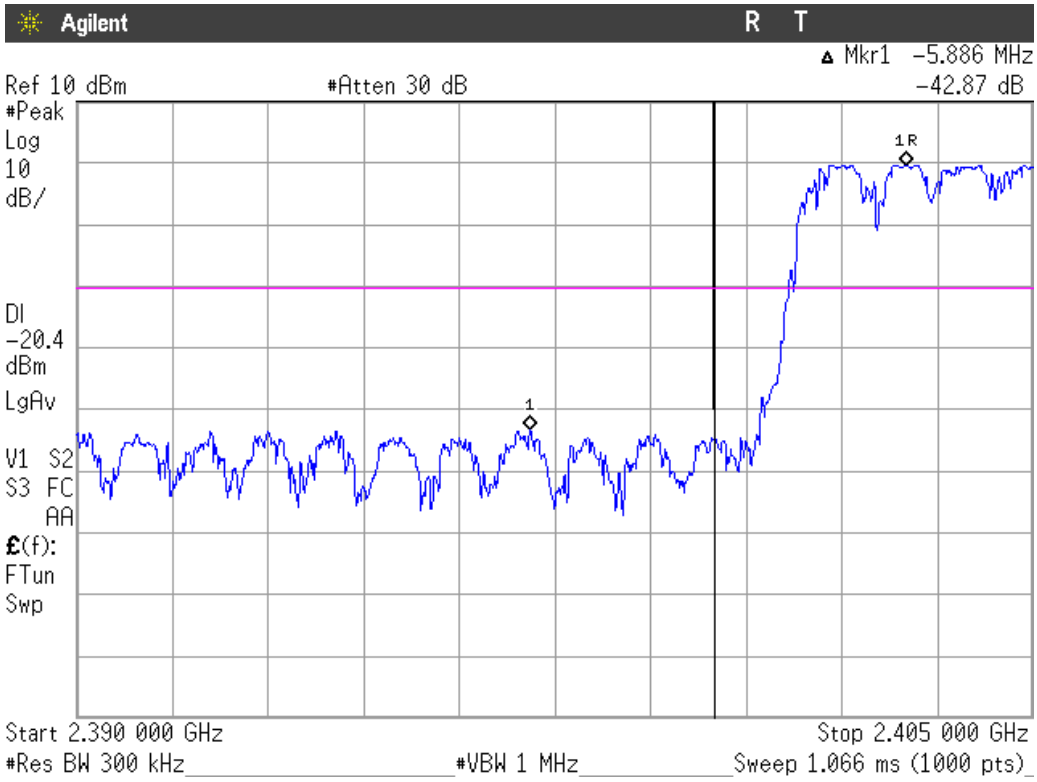
Verdict: PASS

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



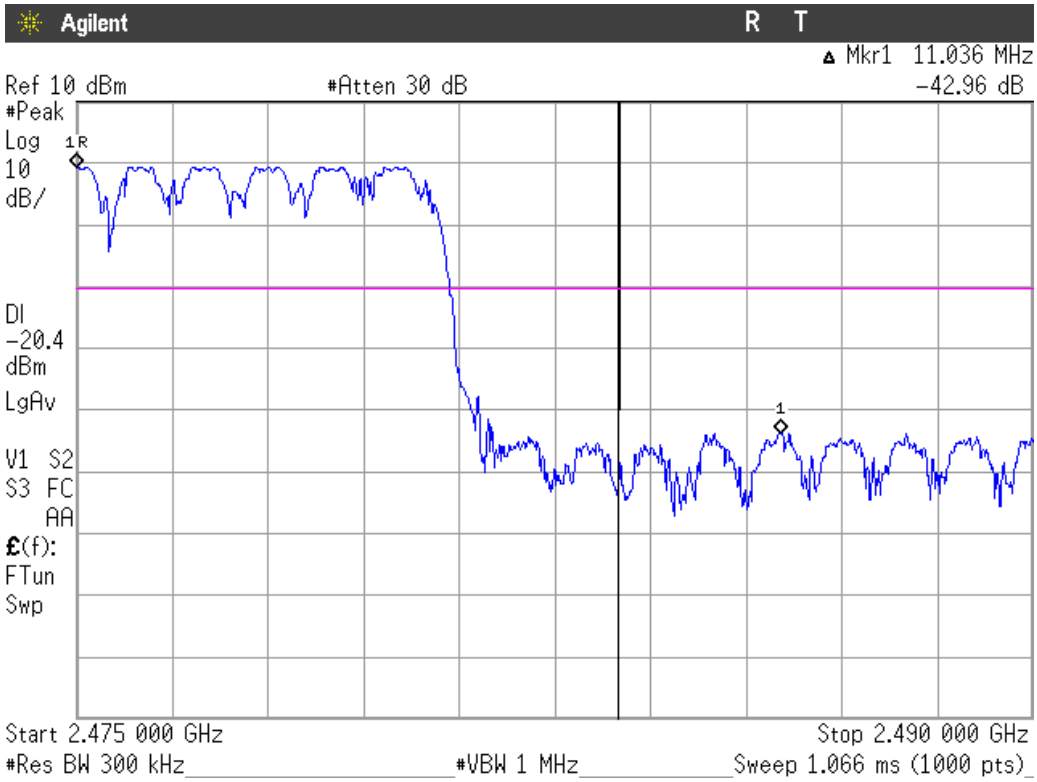
Verdict: PASS

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



Verdict: PASS

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



Verdict: PASS

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

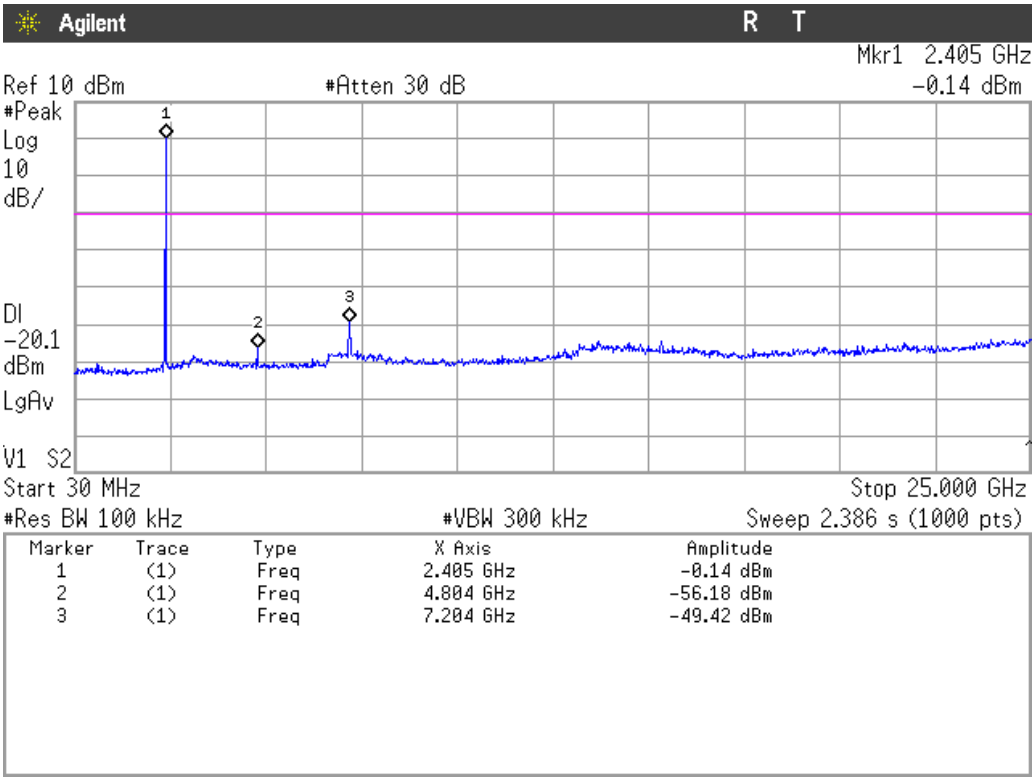
SPECIFICATION

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

RESULTS:

Modulation: GFSK

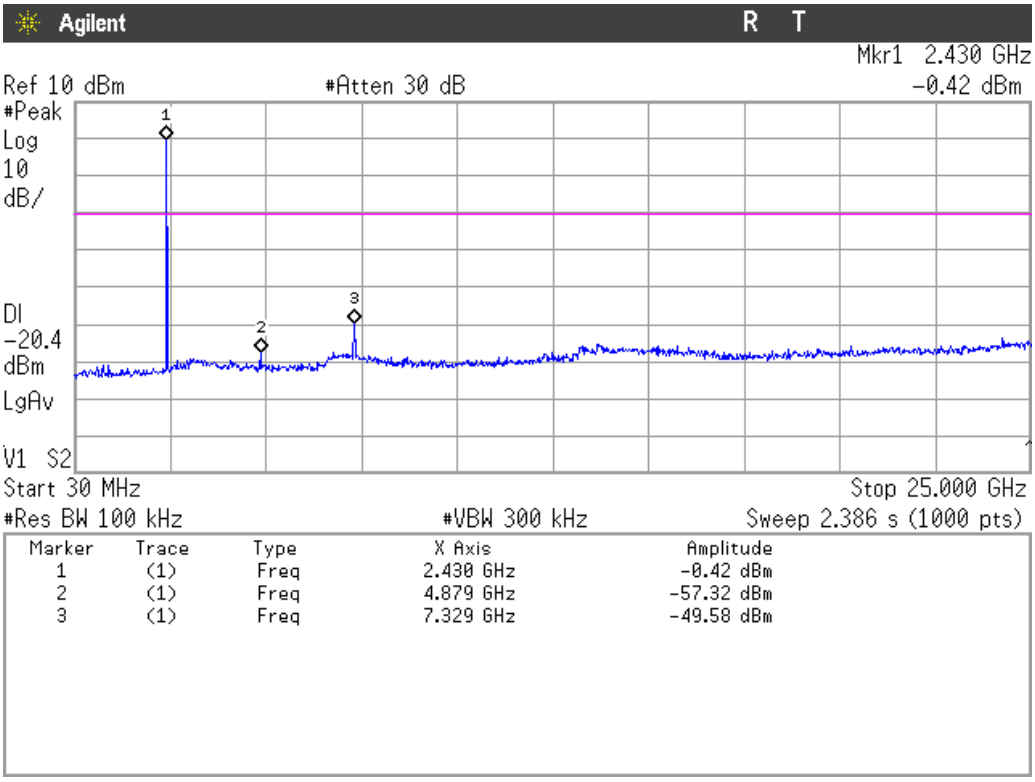
1. LOWEST CHANNEL (2402 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

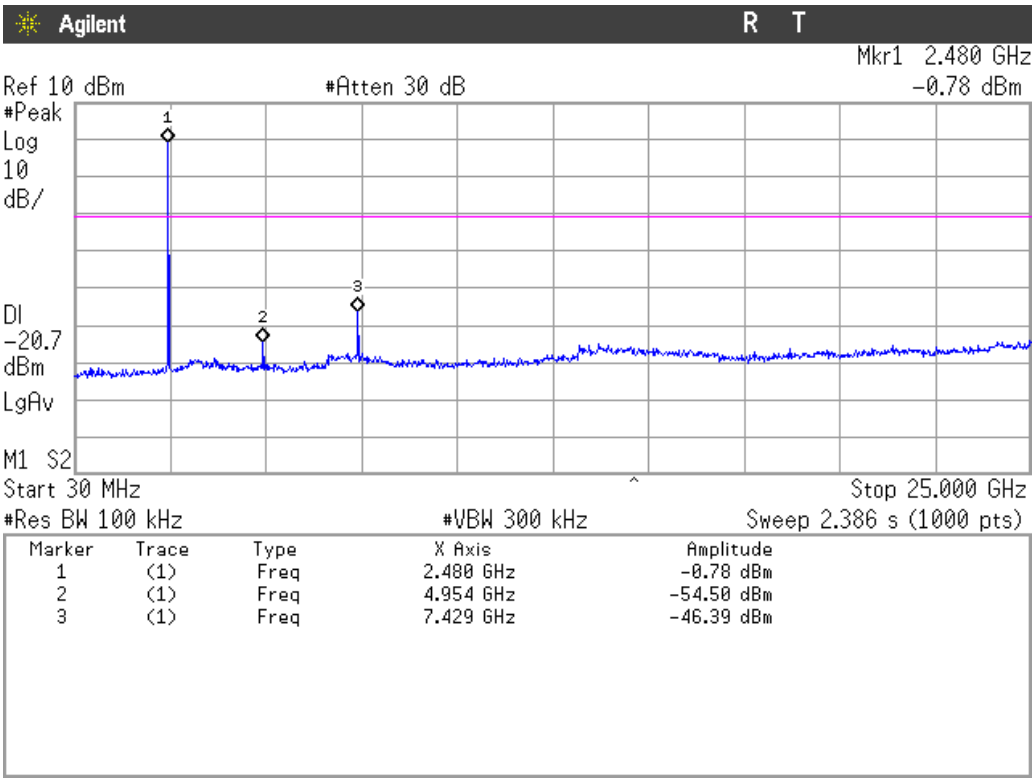
2. MIDDLE CHANNEL (2441 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

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

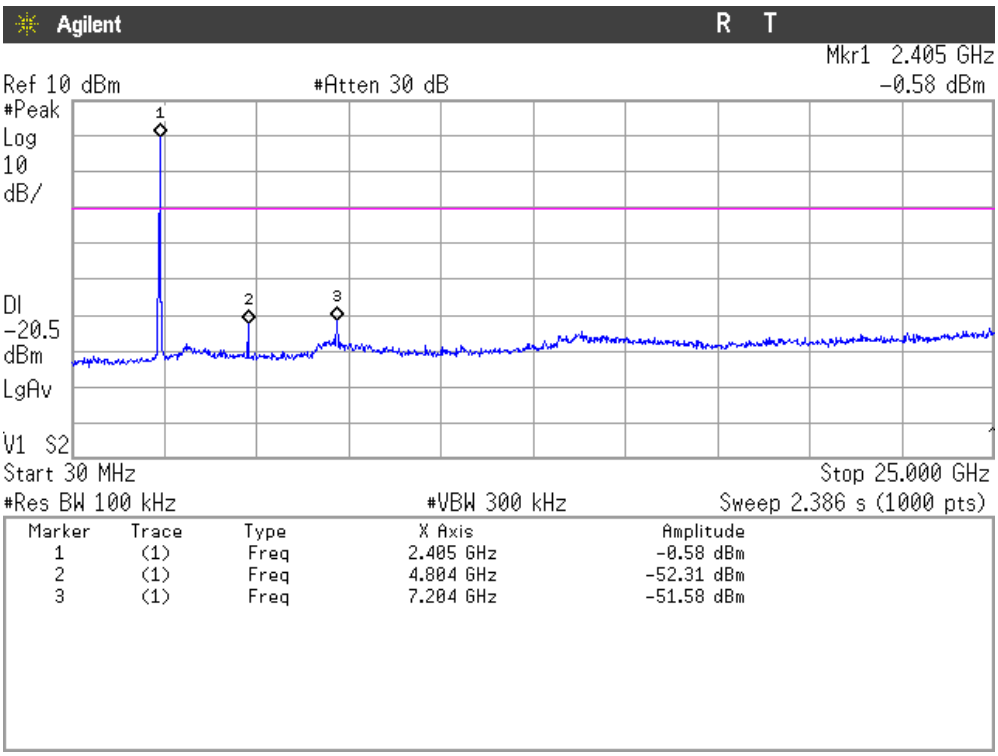


Note: The peak above the limit is the carrier frequency.

Verdict: PASS

Modulation: II/4-DQPSK

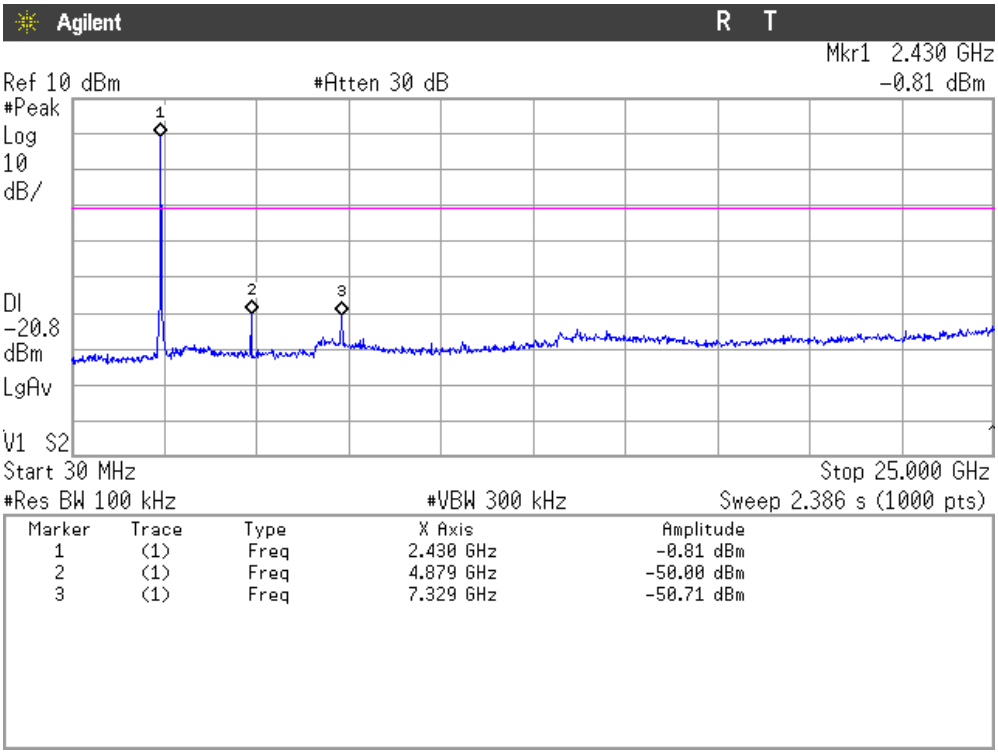
1. LOWEST CHANNEL (2402 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

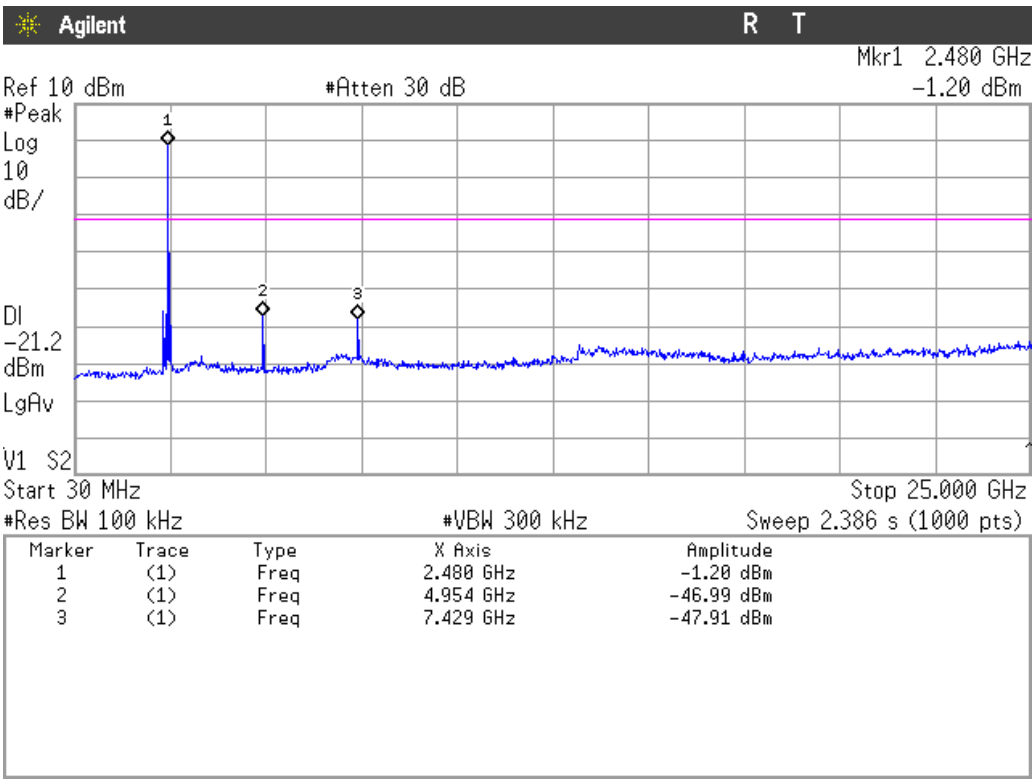
2. MIDDLE CHANNEL (2441 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

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

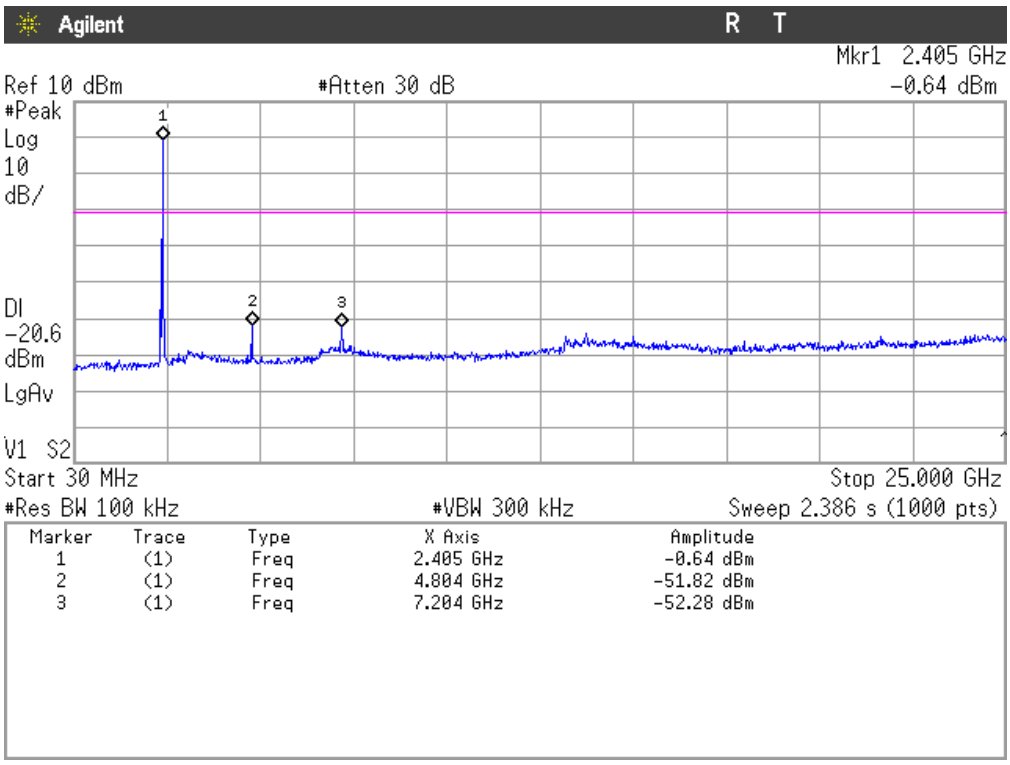


Note: The peak above the limit is the carrier frequency.

Verdict: PASS

Modulation: 8-DPSK

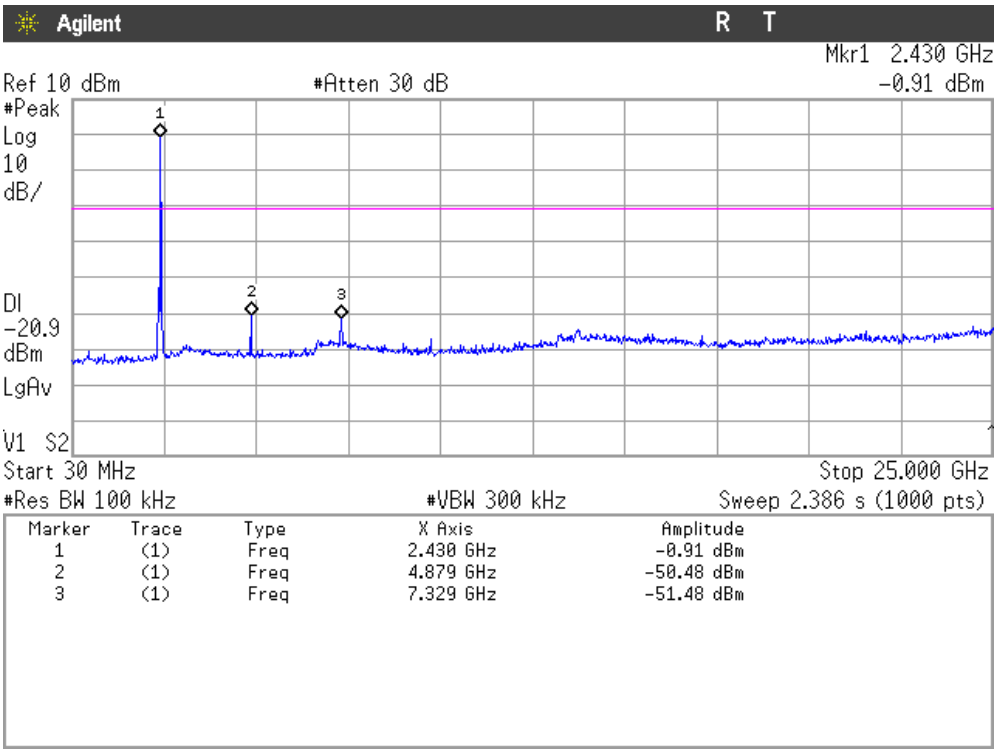
1. LOWEST CHANNEL (2402 MHz): 30 MHz-25 GHz (see next plot).



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

Verdict: PASS

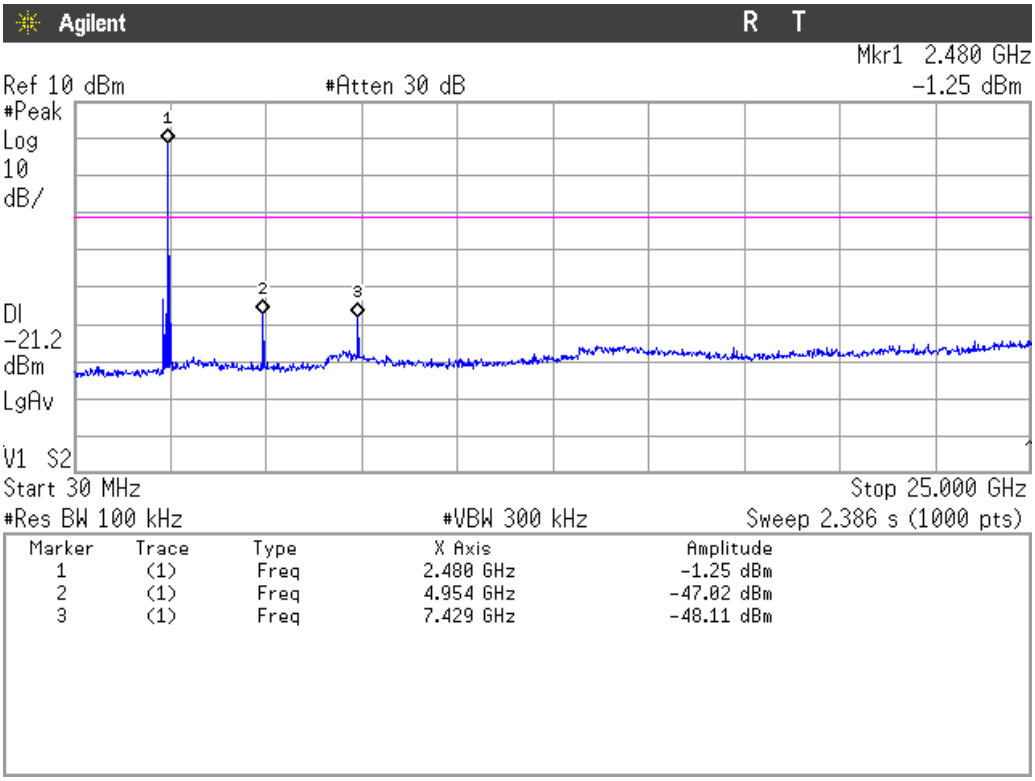
2. MIDDLE CHANNEL (2441 MHz): 30 MHz-25 GHz (see next plot).



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

FCC Section 15.247 Subclause (d) / RSS-210 Clauses 2.2. & A8.5. Emission limitations radiated (Transmitter)

SPECIFICATION

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

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

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

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

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

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

The equipment transmits continuously in the selected channel so it is not necessary a duty cycle correction factor.

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)
30.00	V	Quasi-peak	28.14	±3.8
356.20	H	Quasi-peak	39.50	±3.8
762.10	H	Quasi-peak	36.63	±3.8
771.80	V	Quasi-peak	40.08	±3.8

Frequency range 1 GHz-25 GHz

Modulation: GFSK

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1.5245	H	Peak	49.88	± 4.0
	H	Average	44.76	± 4.0
2.38888	H	Peak	47.08	± 4.0
	H	Average	37.47	± 4.0
2.497919	H	Peak	49.62	± 4.0
	H	Average	37.86	± 4.0
4.80362	H	Peak	46.38	± 4.0
	H	Average	44.76	± 4.0
7.205515	H	Peak	50.38	± 4.0
	H	Average	47.94	± 4.0

2. CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1.5245	H	Peak	50.68	± 4.0
	H	Average	44.68	± 4.0
2.36165	H	Peak	48.60	± 4.0
	H	Average	37.07	± 4.0
2.487745	H	Peak	47.07	± 4.0
	H	Average	38.05	± 4.0
7.32244	H	Peak	46.50	± 4.0
	H	Average	45.02	± 4.0

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1.5245	H	Peak	50.52	± 4.0
	H	Average	44.69	± 4.0
2.37551	H	Peak	47.49	± 4.0
	H	Average	47.24	± 4.0
2.489661	H	Peak	47.38	± 4.0
	H	Average	40.27	± 4.0
2.496003	H	Peak	47.12	± 4.0
	H	Average	38.95	± 4.0
4.95964	H	Peak	45.28	± 4.0
	H	Average	43.06	± 4.0
7.43950	H	Peak	48.60	± 4.0
	H	Average	46.15	± 4.0

Verdict: PASS

Modulation: Π/4-DQPSK

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1.52450	H	Peak	50.92	± 4.0
	H	Average	45.50	± 4.0
2.35288	H	Peak	47.11	± 4.0
	H	Average	39.70	± 4.0
2.36197	H	Peak	51.00	± 4.0
	H	Average	44.16	± 4.0
2.38840	H	Peak	54.32	± 4.0
	H	Average	37.31	± 4.0
2.489925	H	Peak	47.75	± 4.0
	H	Average	38.09	± 4.0
4.80426	H	Peak	48.14	± 4.0
	H	Average	46.45	± 4.0
7.206385	H	Peak	47.32	± 4.0
	H	Average	45.06	± 4.0

2. CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1.52450	H	Peak	50.86	± 4.0
	H	Average	45.09	± 4.0
2.35645	H	Peak	52.30	± 4.0
	H	Average	37.38	± 4.0
2.38640	H	Peak	56.10	± 4.0
	H	Average	38.16	± 4.0
2.39000	H	Peak	47.90	± 4.0
	H	Average	40.49	± 4.0
2.491956	H	Peak	48.22	± 4.0
	H	Average	41.55	± 4.0
4.88219	H	Peak	49.87	± 4.0
	H	Average	48.36	± 4.0
7.32349	H	Peak	45.59	± 4.0
	H	Average	41.91	± 4.0

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1.52450	H	Peak	50.27	± 4.0
	H	Average	45.04	± 4.0
2.35661	H	Peak	51.39	± 4.0
	H	Average	37.38	± 4.0
2.38816	H	Peak	55.05	± 4.0
	H	Average	38.01	± 4.0
2.486176	H	Peak	46.91	± 4.0
	H	Average	39.57	± 4.0
2.494731	H	Peak	53.65	± 4.0
	H	Average	38.03	± 4.0
4.96032	H	Peak	51.12	± 4.0
	H	Average	49.52	± 4.0
7.44040	H	Peak	45.77	± 4.0
	H	Average	43.25	± 4.0

Verdict: PASS

Modulation: 8-DPSK

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1.52450	H	Peak	50.17	± 4.0
	H	Average	44.97	± 4.0
2.35624	H	Peak	54.21	± 4.0
	H	Average	37.71	± 4.0
2.36185	H	Peak	52.25	± 4.0
	H	Average	43.86	± 4.0
2.38822	H	Peak	54.62	± 4.0
	H	Average	38.40	± 4.0
2.39891	H	Peak	52.26	± 4.0
	H	Average	38.78	± 4.0
2.49886	H	Peak	49.22	± 4.0
	H	Average	37.89	± 4.0
4.80402	H	Peak	46.60	± 4.0
	H	Average	45.89	± 4.0
7.206015	H	Peak	48.26	± 4.0
	H	Average	45.36	± 4.0

2. CHANNEL: MIDDLE (2441 MHz).

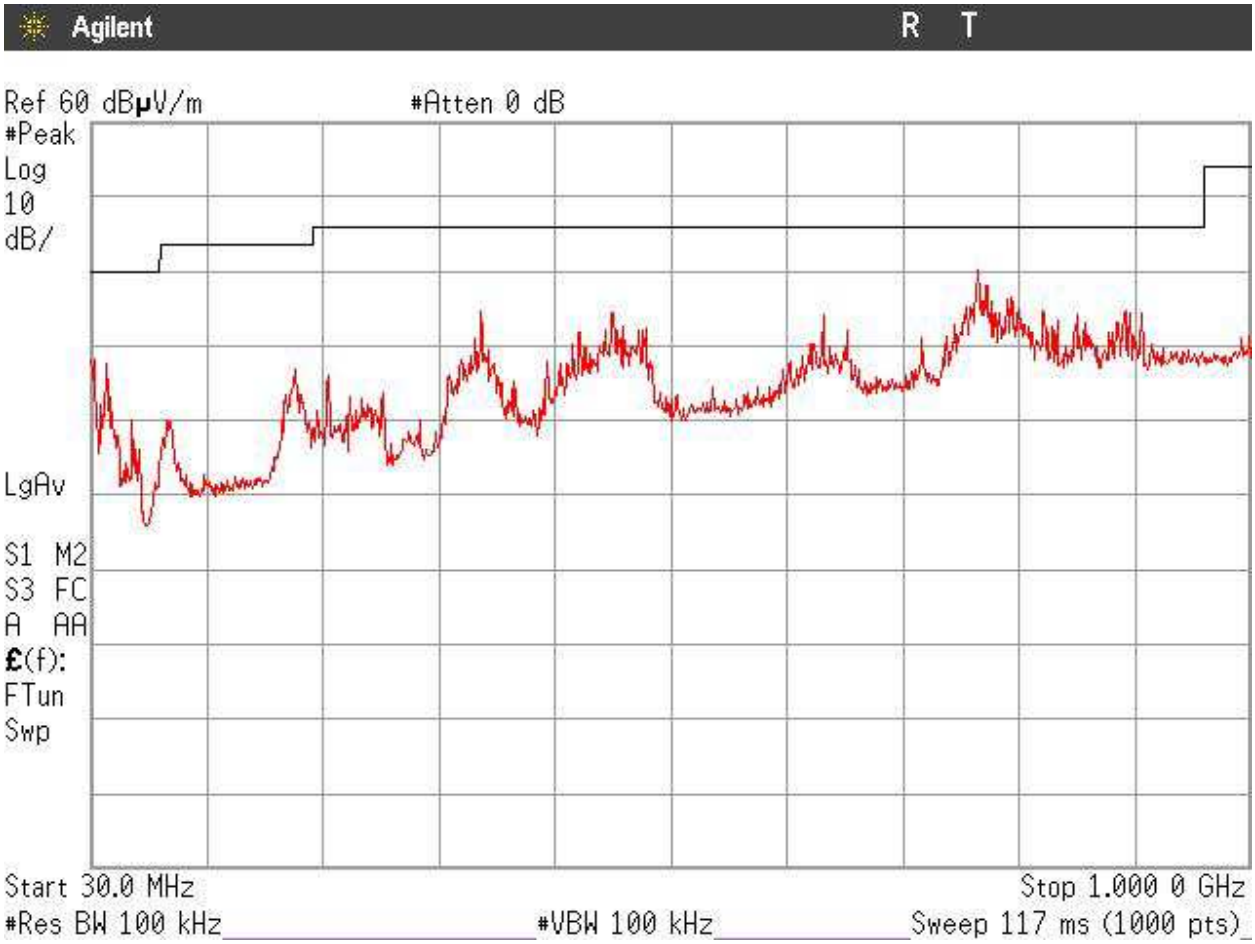
Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1.52450	H	Peak	49.88	± 4.0
	H	Average	44.34	± 4.0
2.35621	H	Peak	54.06	± 4.0
	H	Average	37.58	± 4.0
2.38816	H	Peak	54.96	± 4.0
	H	Average	37.97	± 4.0
2.49174	H	Peak	47.75	± 4.0
	H	Average	39.46	± 4.0
4.88196	H	Peak	49.54	± 4.0
	H	Average	49.16	± 4.0
7.32296	H	Peak	46.94	± 4.0
	H	Average	42.73	± 4.0

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
1.52450	H	Peak	50.47	± 4.0
	H	Average	44.20	± 4.0
2.35629	H	Peak	51.71	± 4.0
	H	Average	37.77	± 4.0
2.38824	H	Peak	53.85	± 4.0
	H	Average	38.07	± 4.0
2.483698	H	Peak	49.73	± 4.0
	H	Average	39.65	± 4.0
2.51950	H	Peak	51.84	± 4.0
	H	Average	44.20	± 4.0
4.96005	H	Peak	50.52	± 4.0
	H	Average	49.81	± 4.0
7.44000	H	Peak	46.49	± 4.0
	H	Average	44.97	± 4.0

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

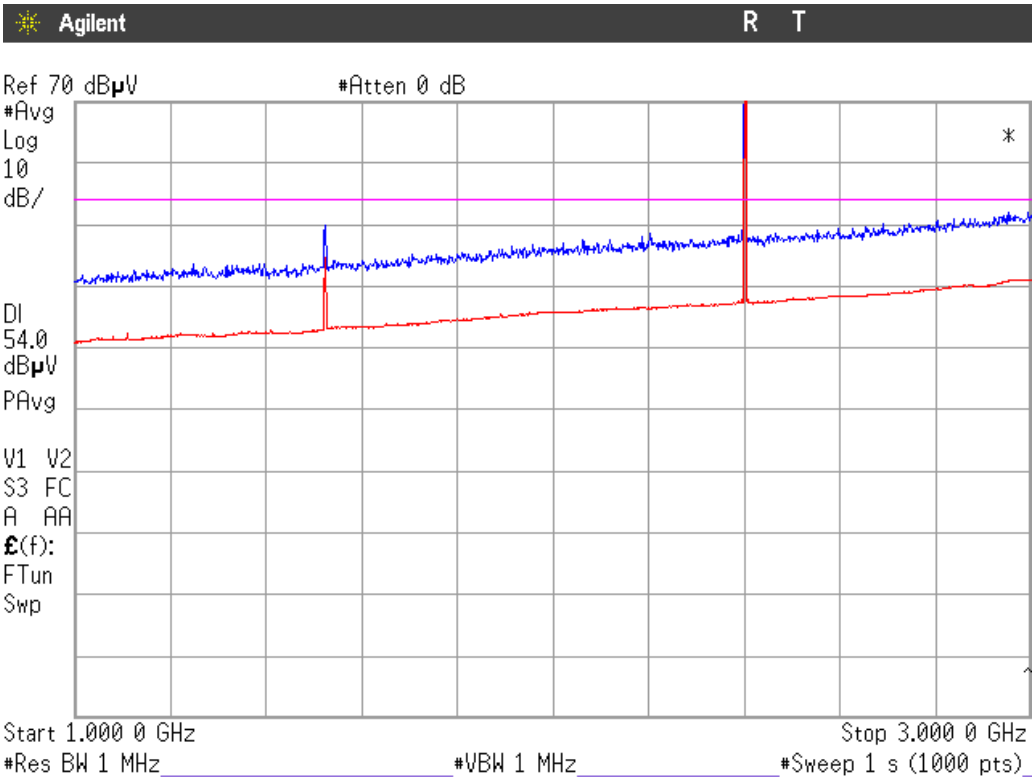


(This plot is valid for all three channels and all modulation modes).

FREQUENCY RANGE 1 GHz to 3 GHz.

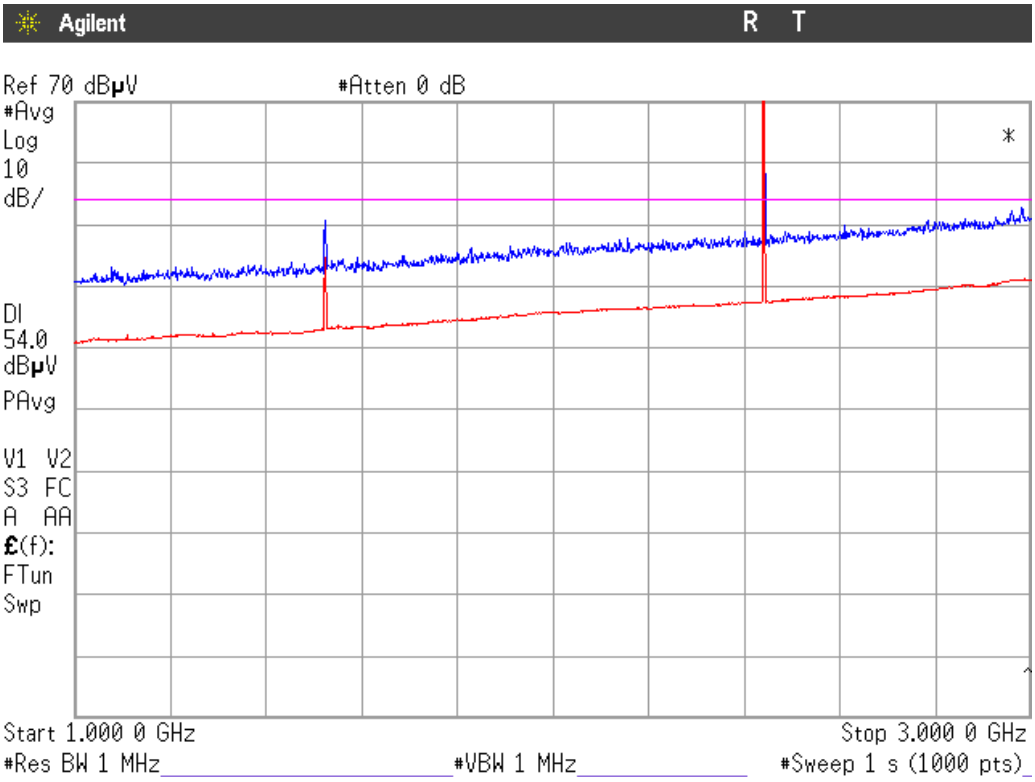
Modulation: GFSK

CHANNEL: Lowest (2402 MHz).



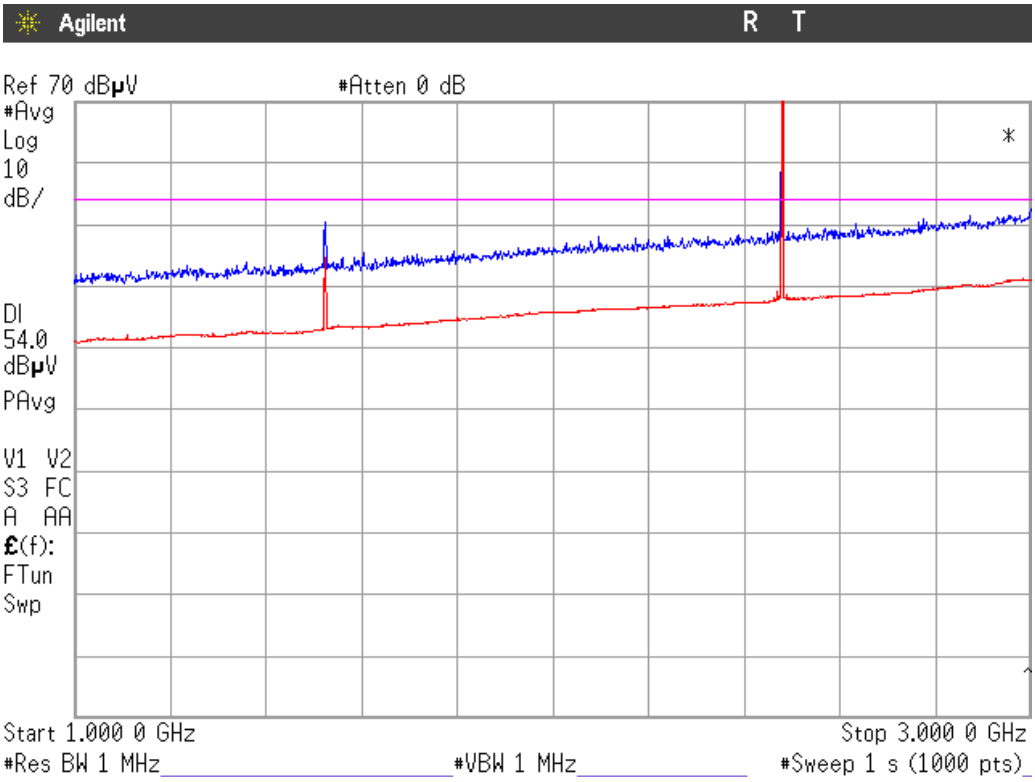
Note: The peak shown in the plot is the carrier frequency.

CHANNEL: Middle (2441 MHz).



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

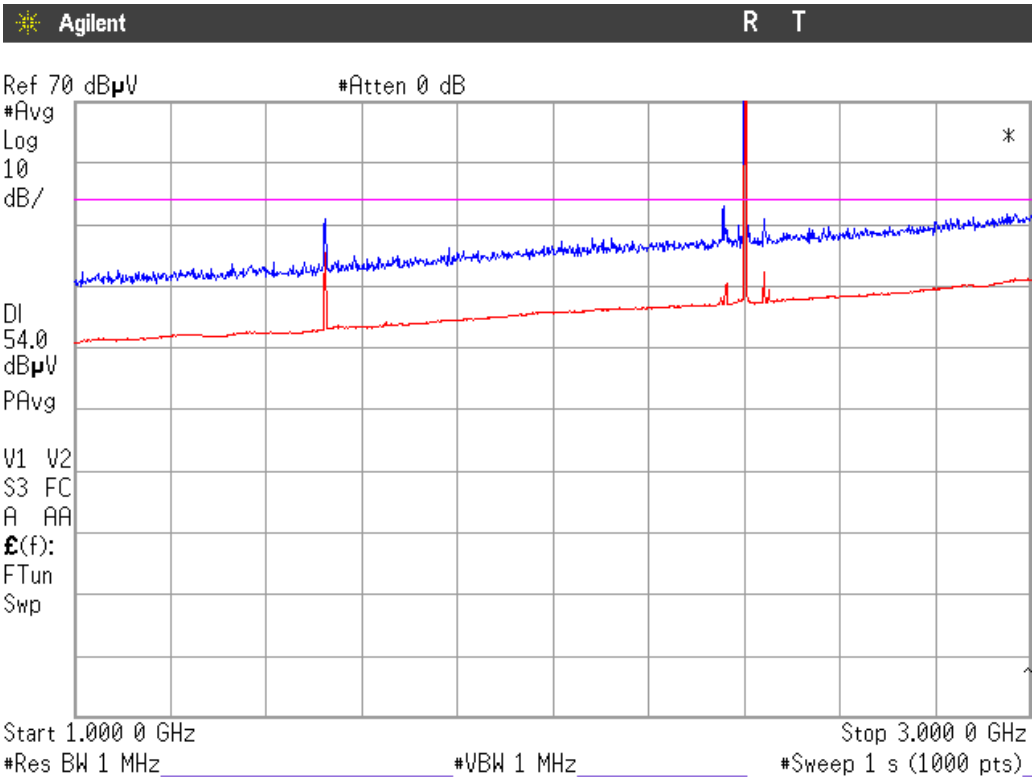
CHANNEL: Highest (2480 MHz).



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

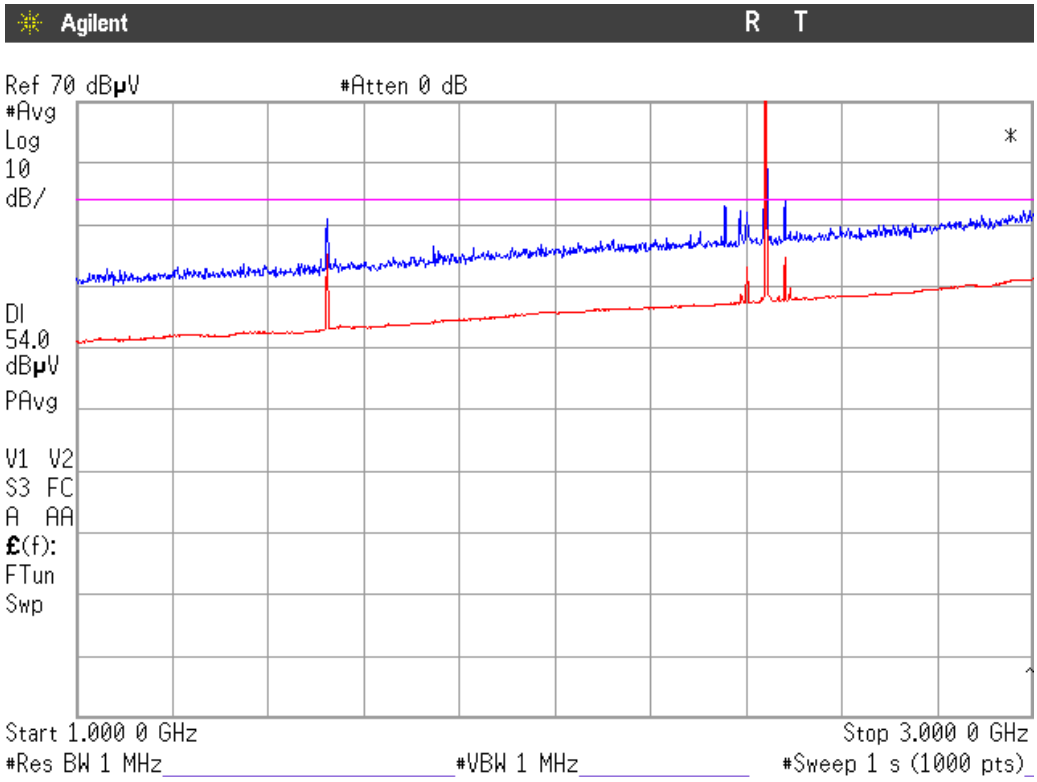
Modulation: II/4-DQPSK

CHANNEL: Lowest (2402 MHz).



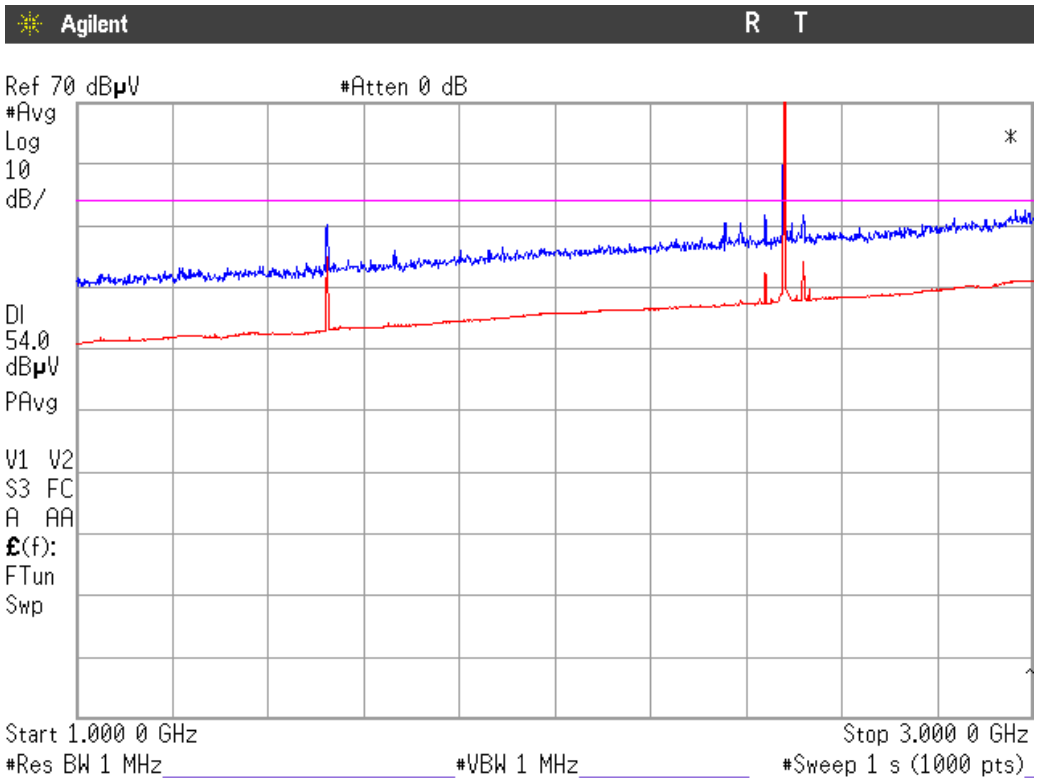
Note: The peak shown in the plot is the carrier frequency.

CHANNEL: Middle (2441 MHz).



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

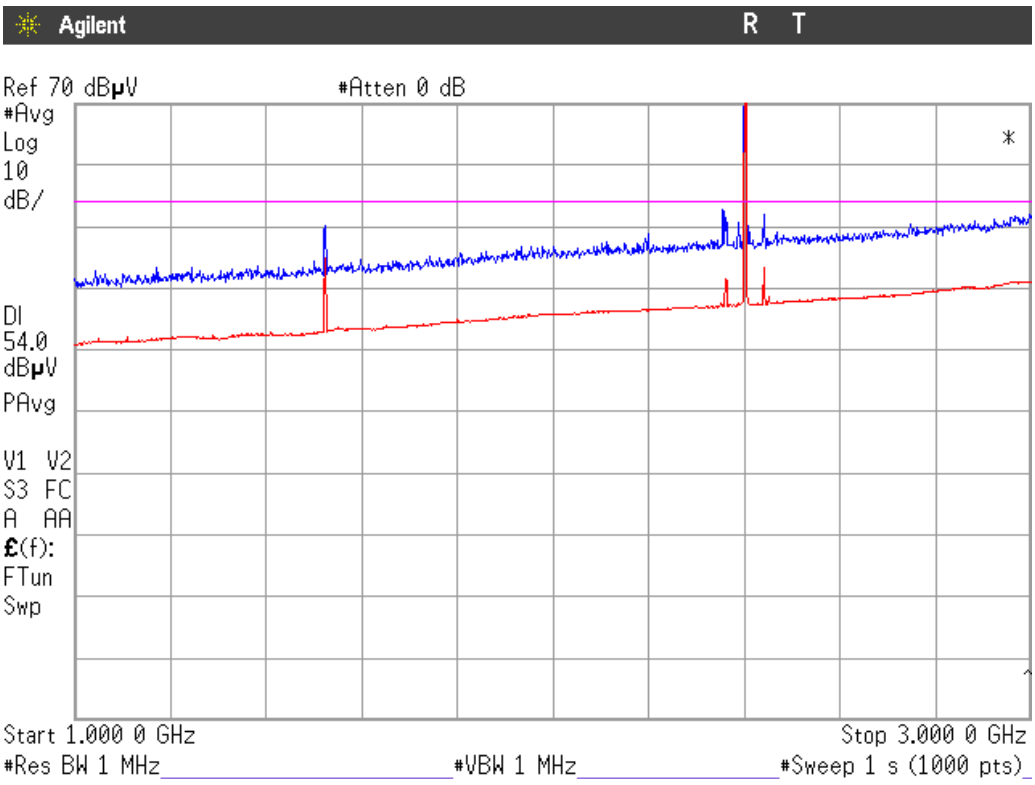
CHANNEL: Highest (2480 MHz).



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

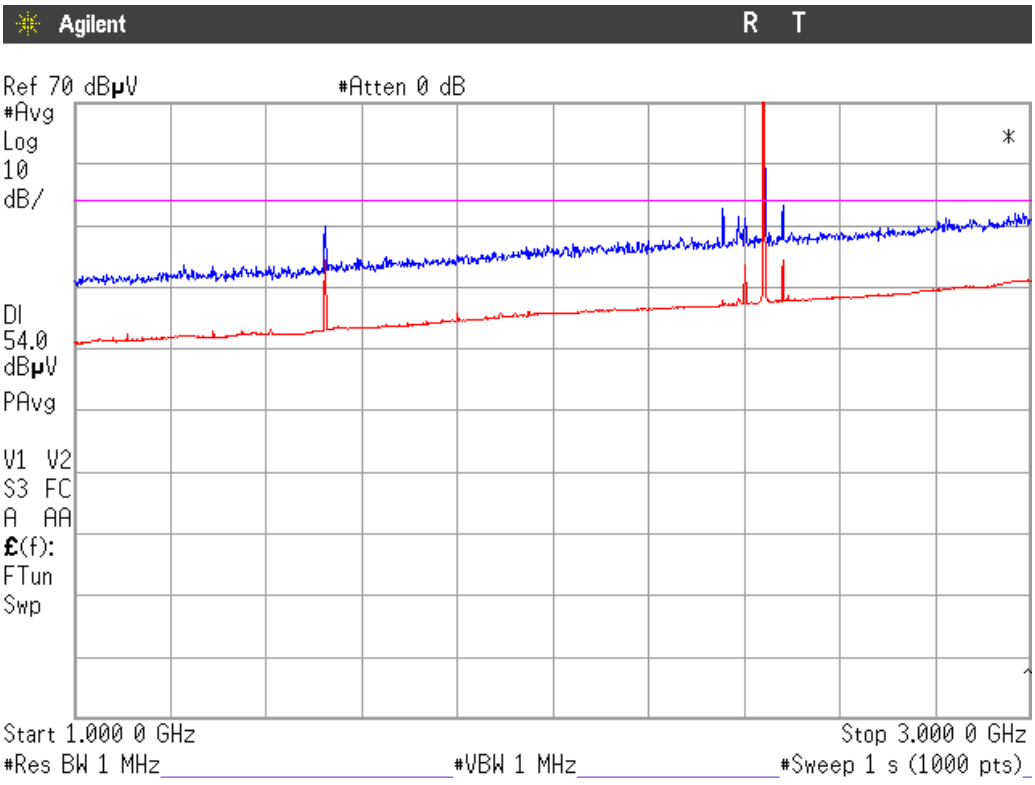
Modulation: 8-DPSK

CHANNEL: Lowest (2402 MHz).



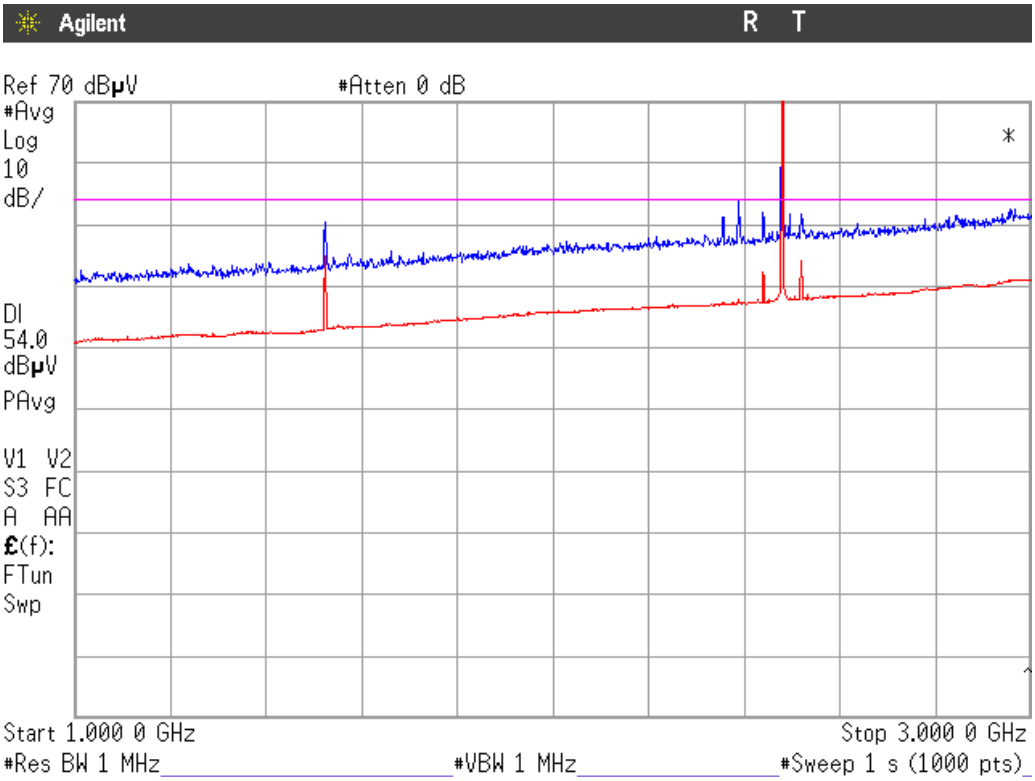
Note: The peak shown in the plot is the carrier frequency.

CHANNEL: Middle (2441 MHz).



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

CHANNEL: Highest (2480 MHz).

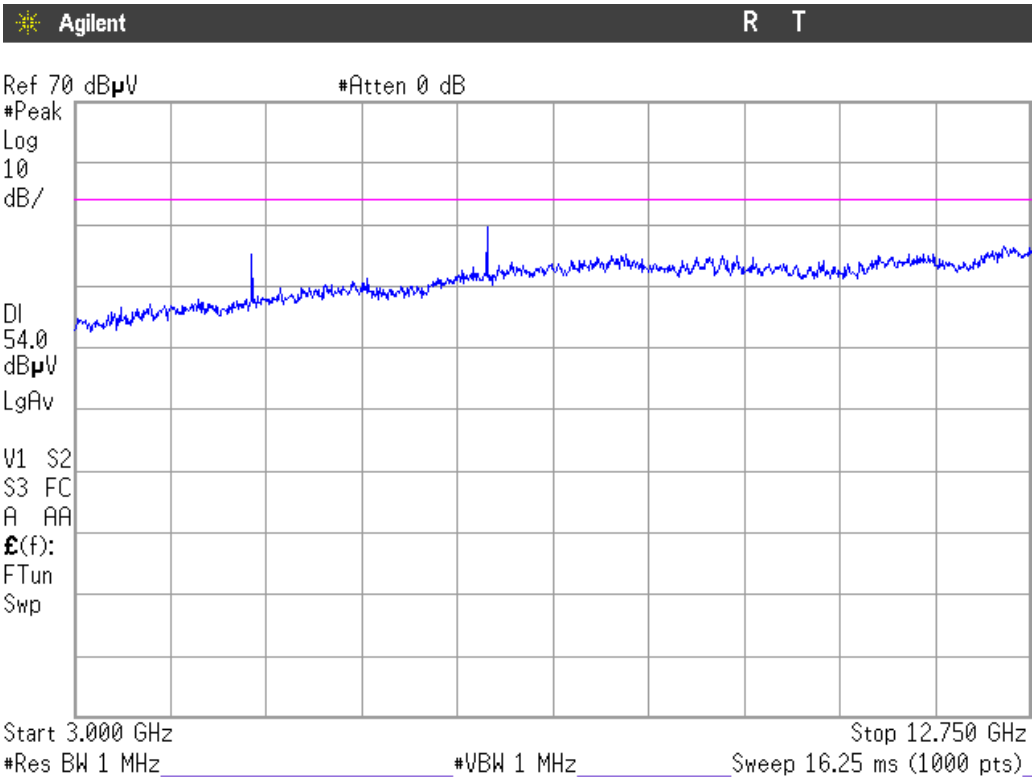


Note: The peak shown in the plot is the carrier frequency.

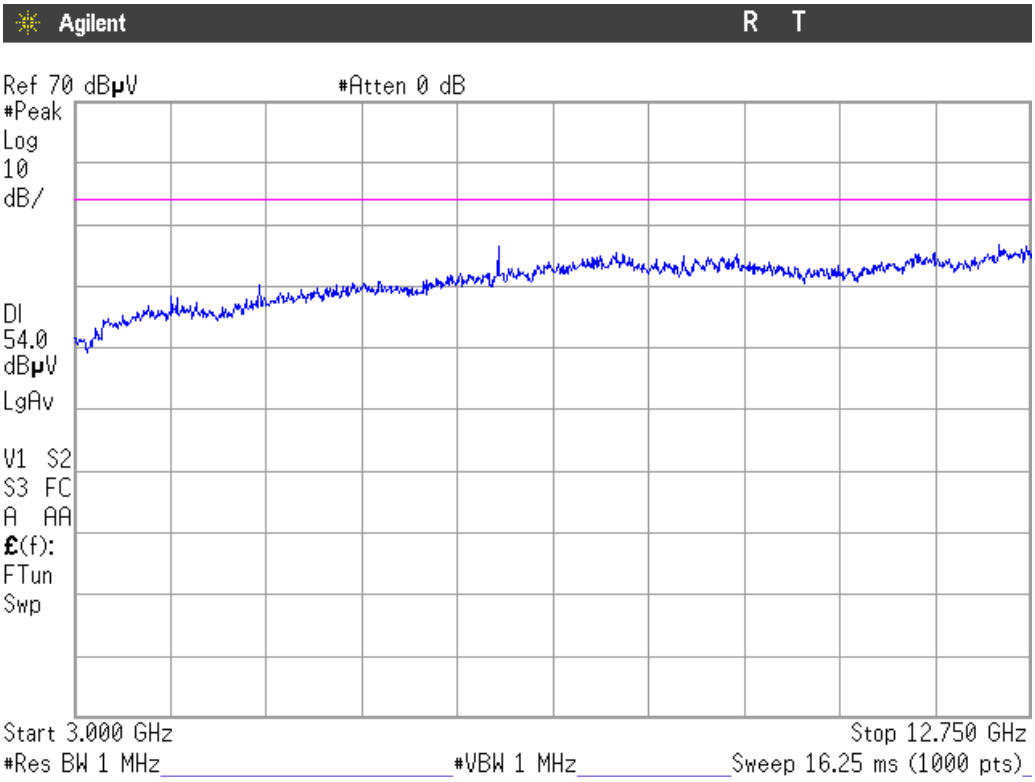
FREQUENCY RANGE 3 GHz to 12.75 GHz.

Modulation: GFSK

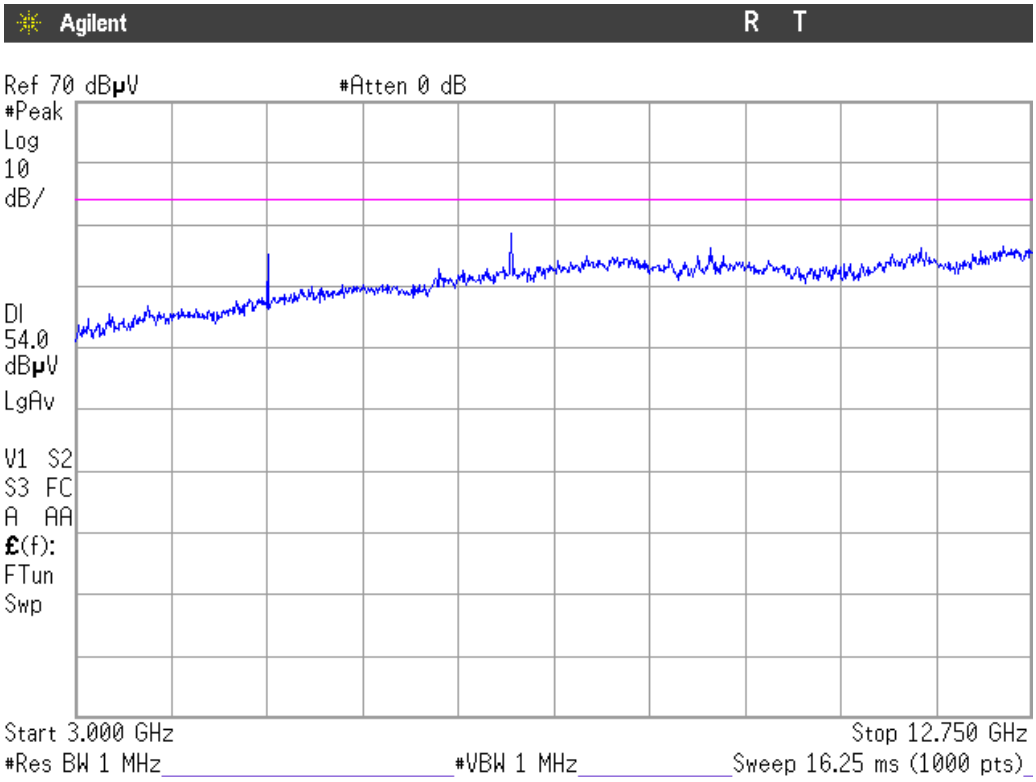
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2441 MHz).

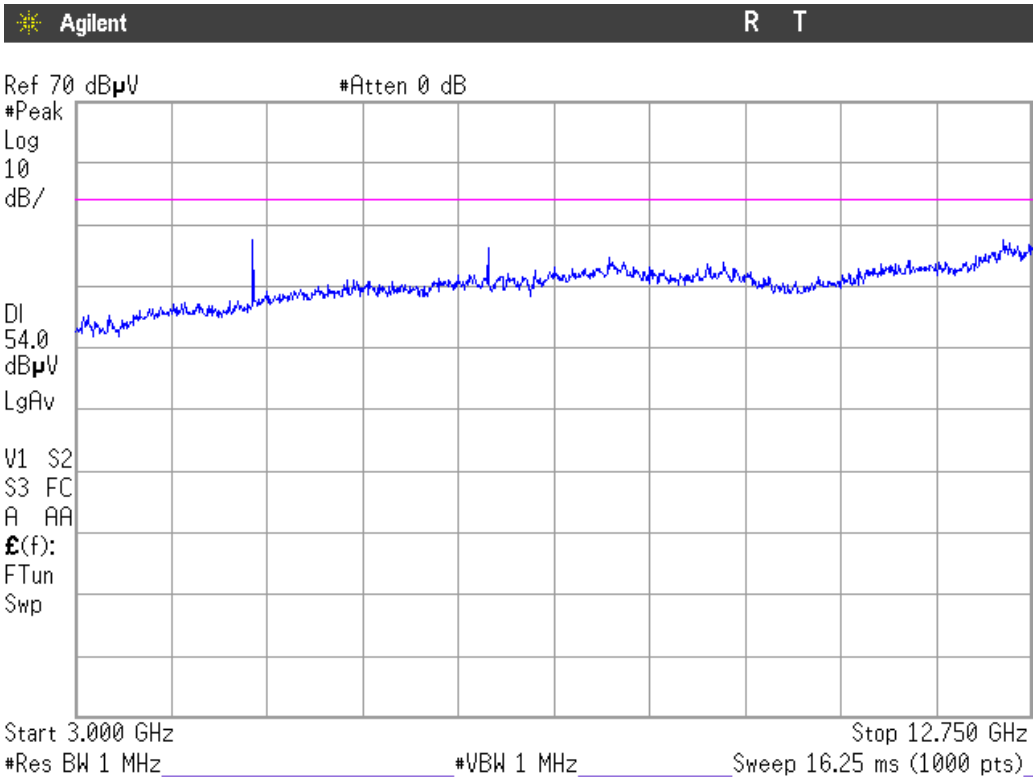


CHANNEL: Highest (2480 MHz).

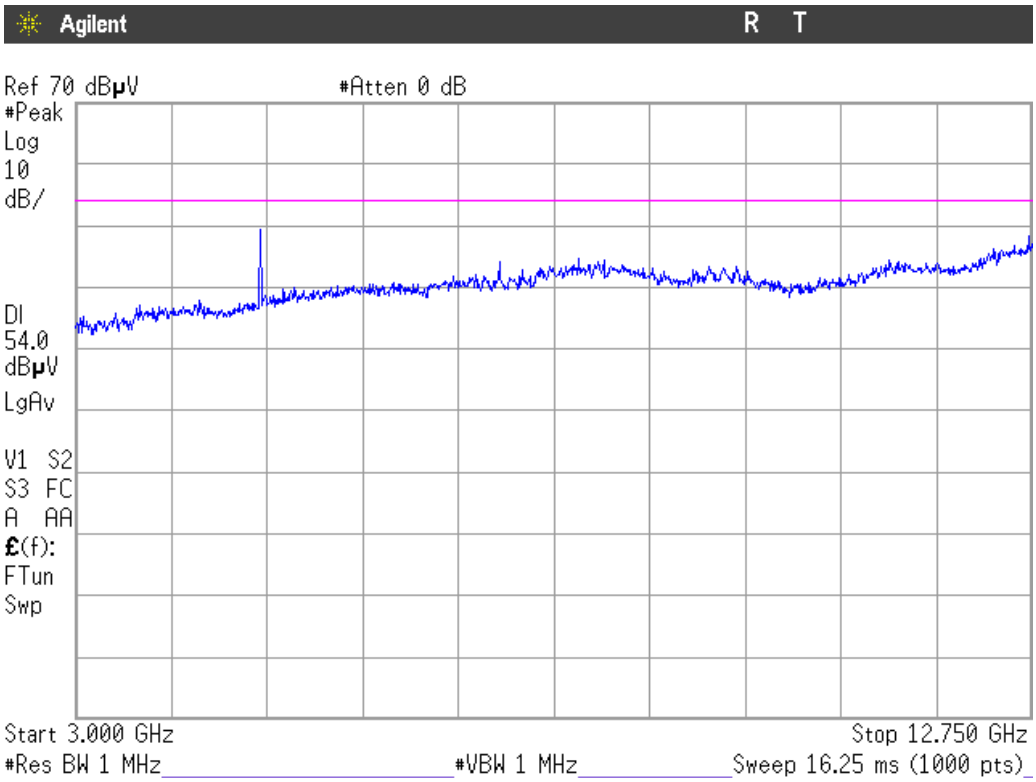


Modulation: II/4-DQPSK

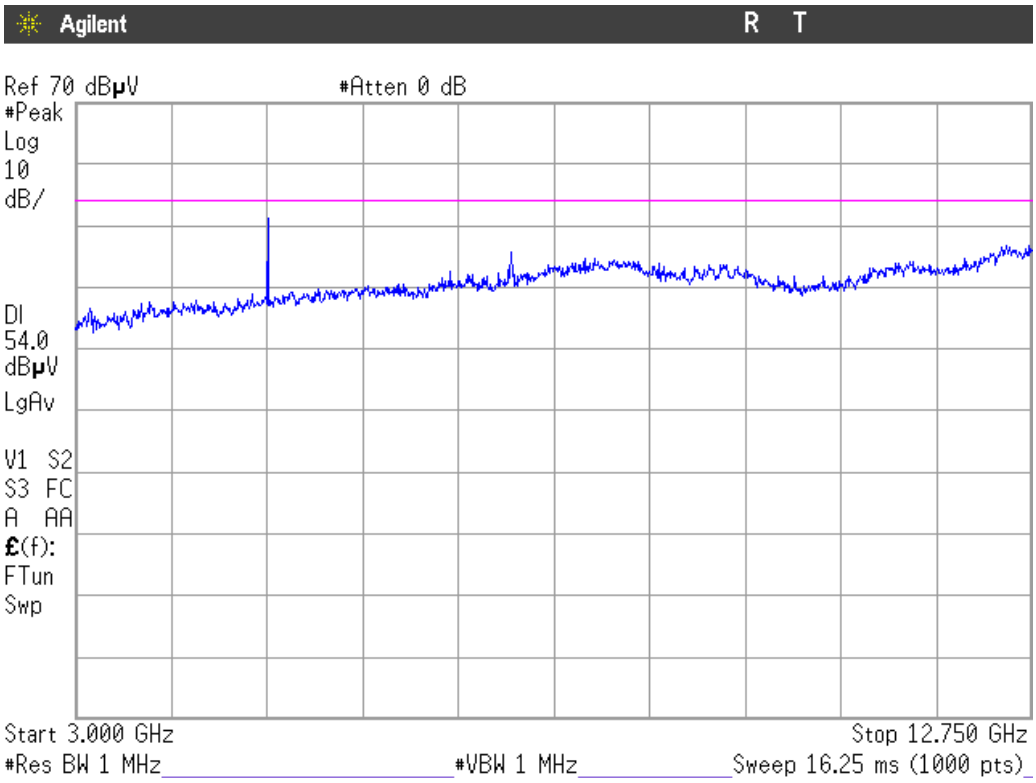
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2441 MHz).

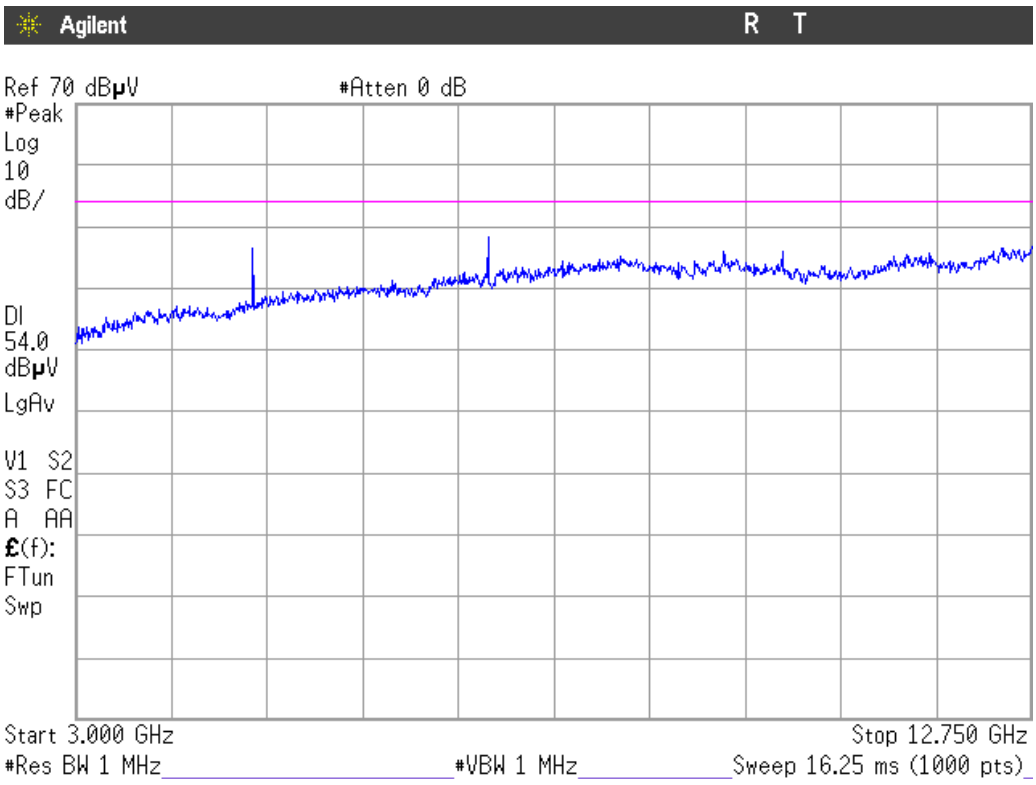


CHANNEL: Highest (2480 MHz).

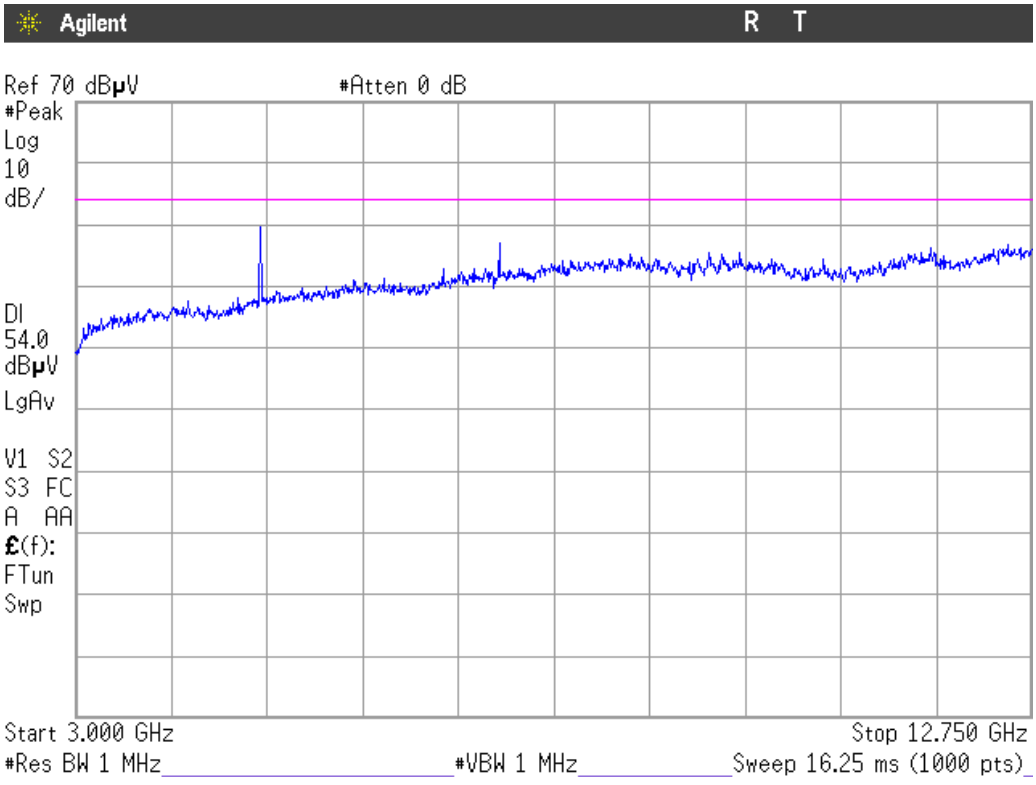


Modulation: 8-DPSK

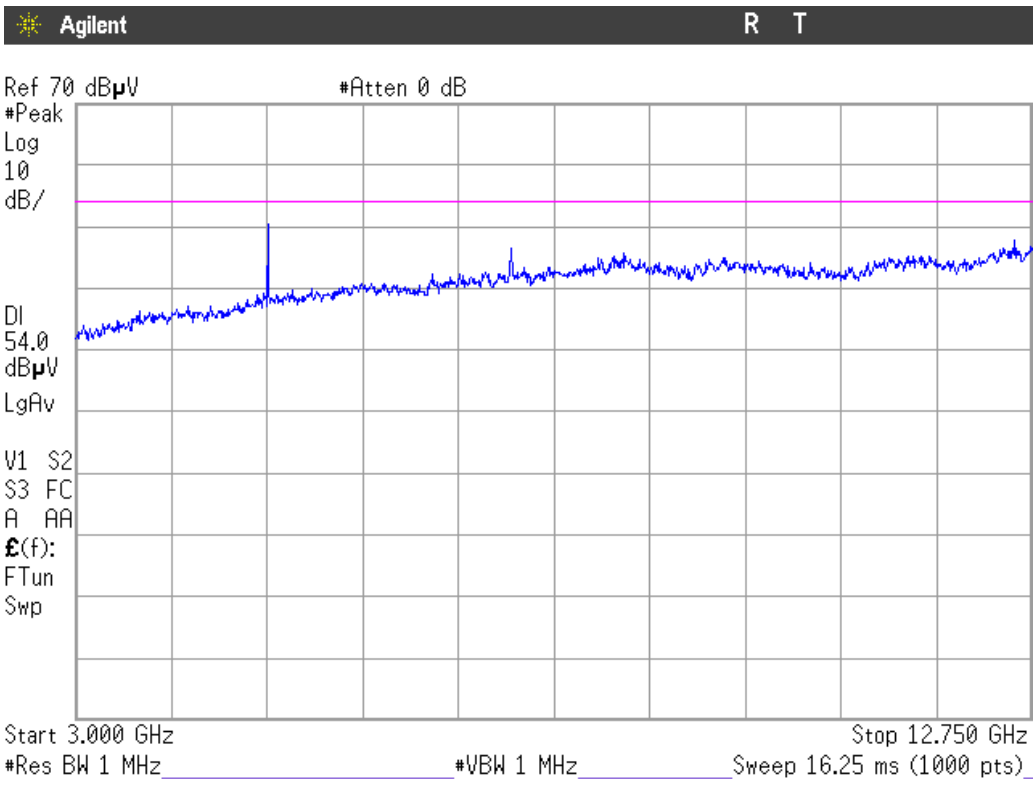
CHANNEL: Lowest (2402 MHz).



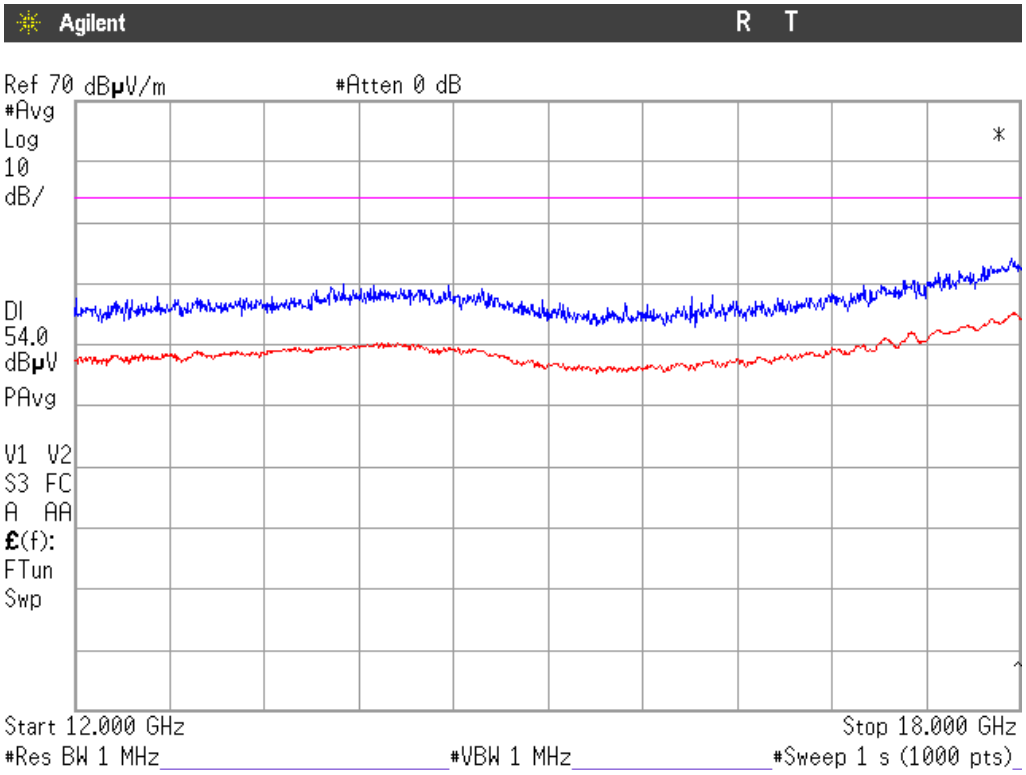
CHANNEL: Middle (2441 MHz).



CHANNEL: Highest (2480 MHz).

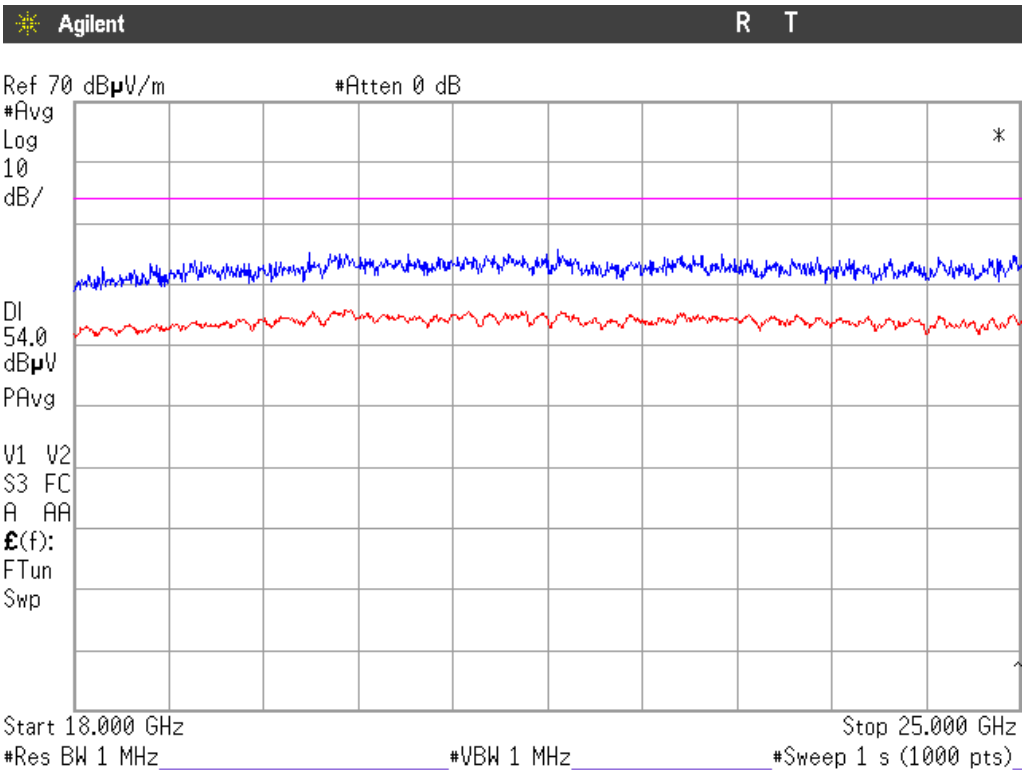


FREQUENCY RANGE 12.75 GHz to 18 GHz.



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

FREQUENCY RANGE 18 GHz to 25 GHz.

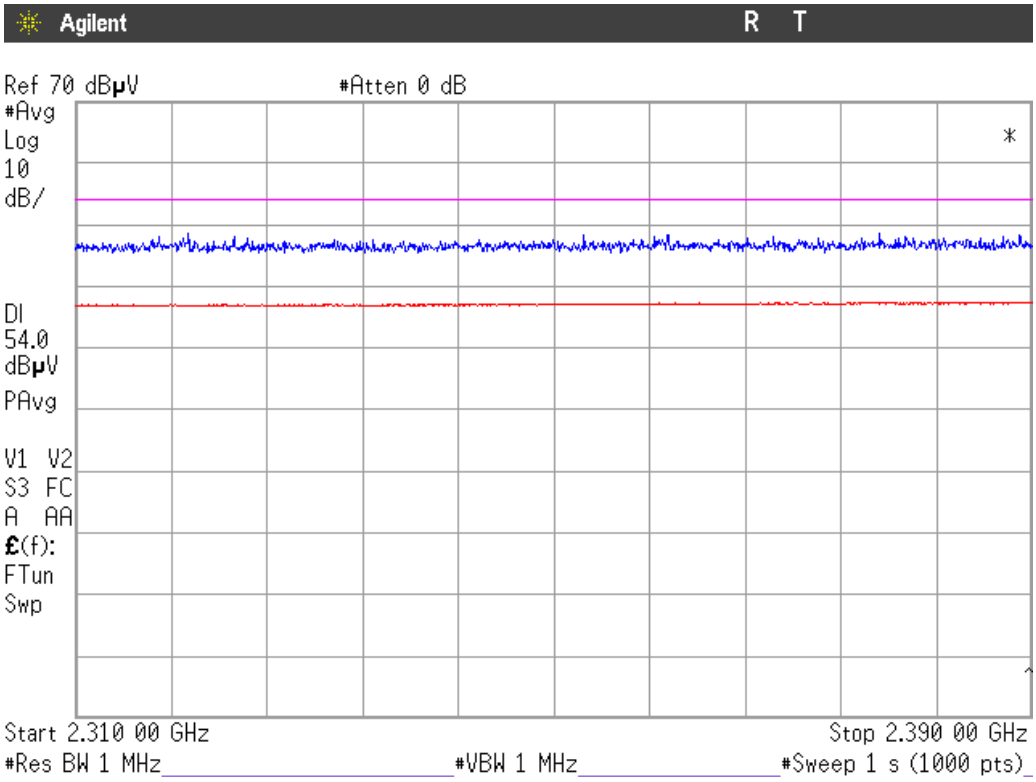


(This plot is valid for all three channels and all modulation modes).

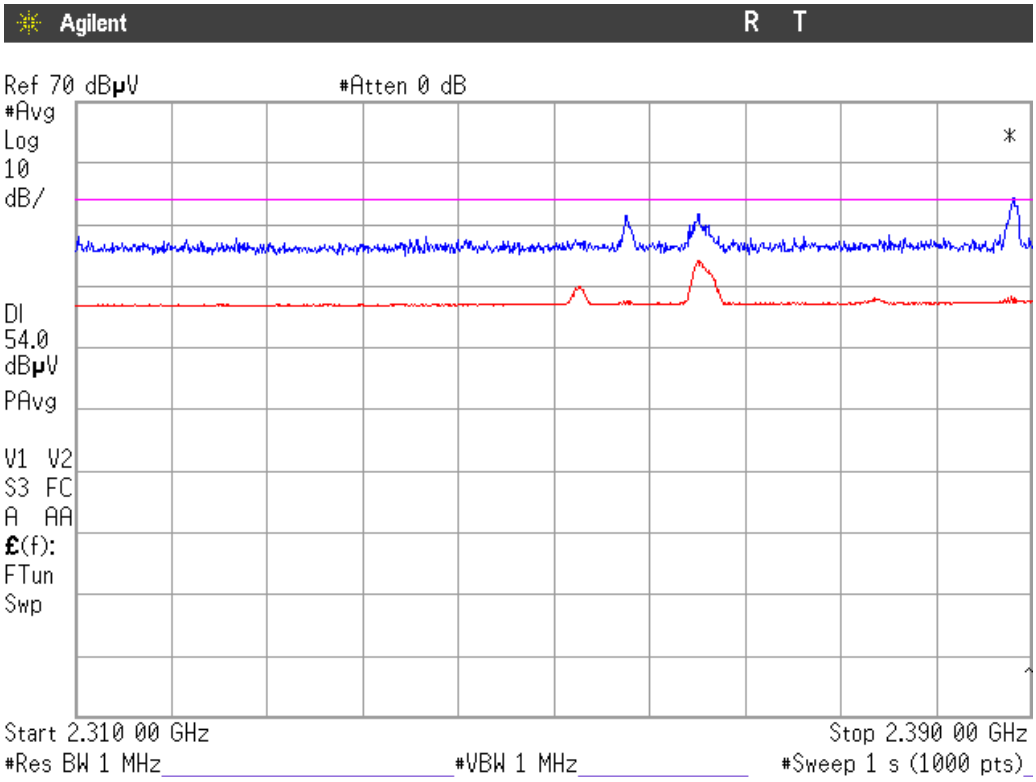
FREQUENCY RANGE 2.31 GHz to 2.39 GHz. (RESTRICTED BAND)

CHANNEL: Lowest

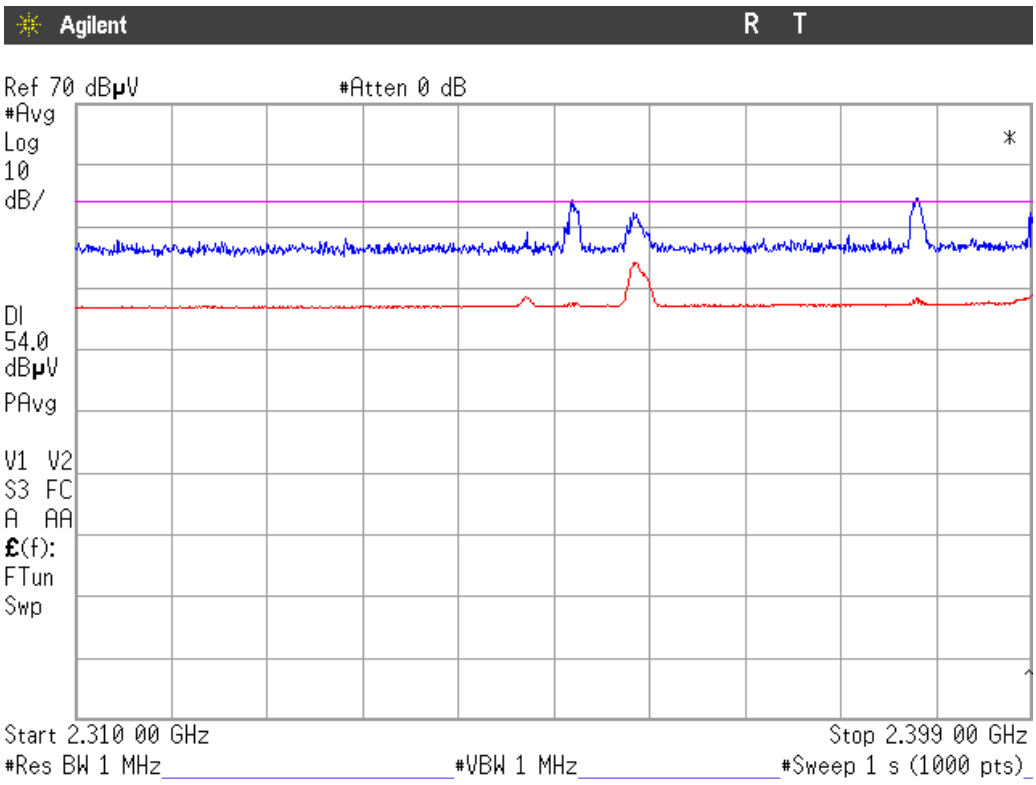
Modulation: GFSK



Modulation: II/4-DQPSK

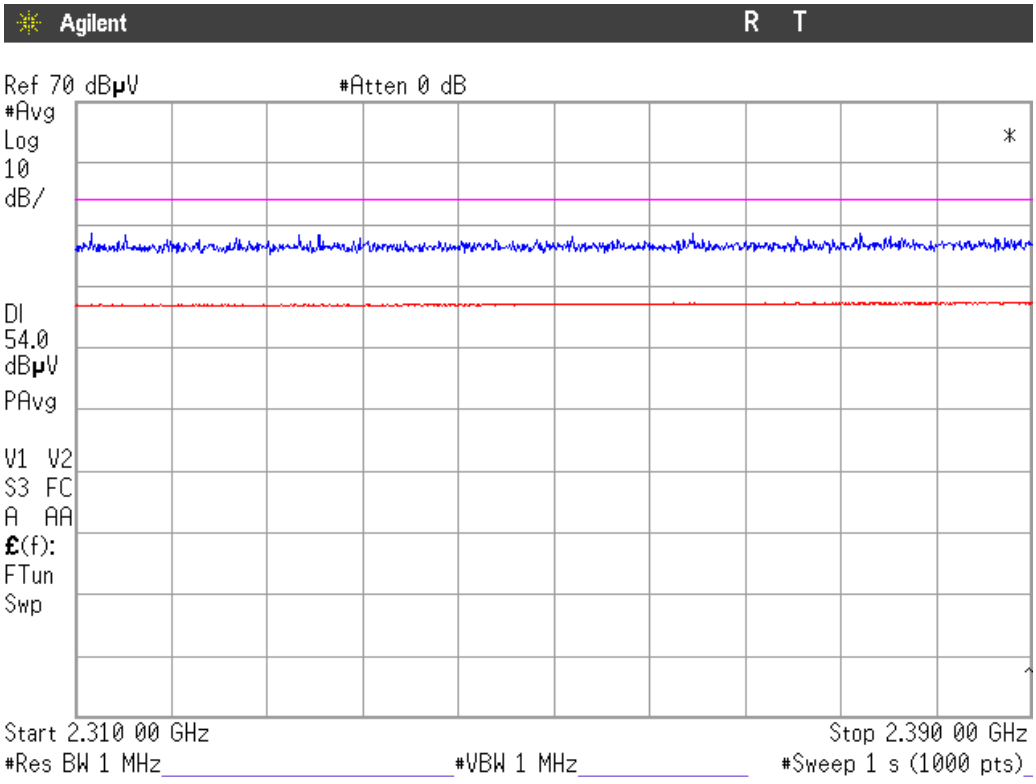


Modulation: 8-DPSK

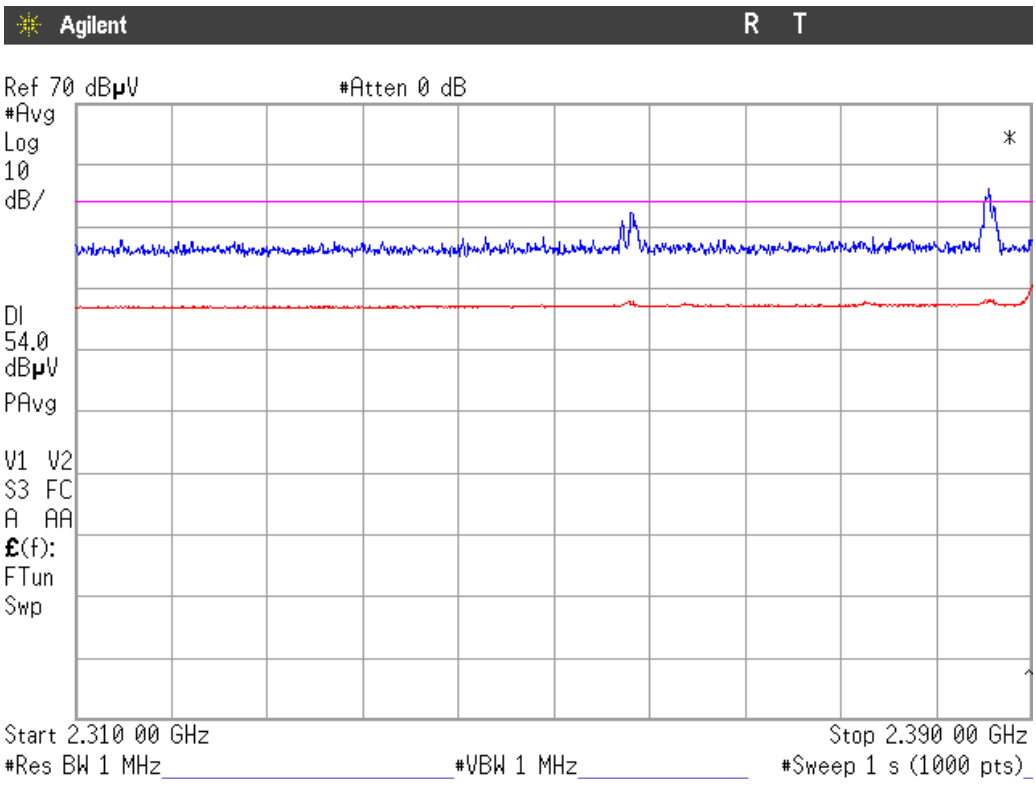


CHANNEL: Middle

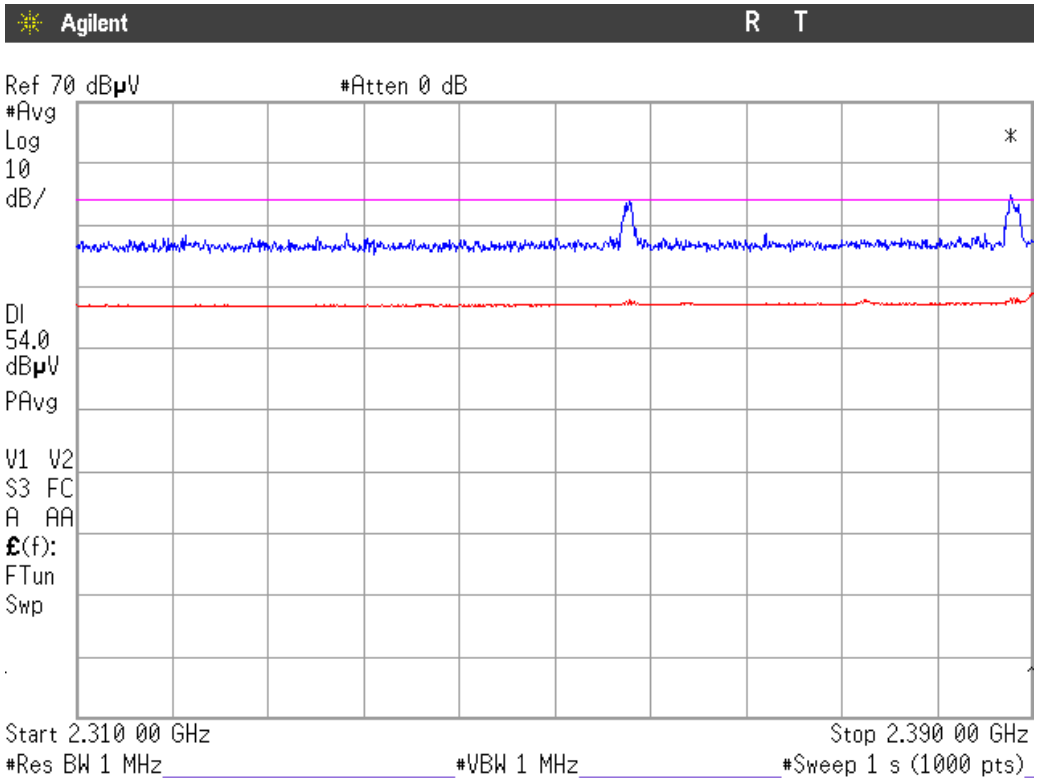
Modulation: GFSK



Modulation: Π/4-DQPSK

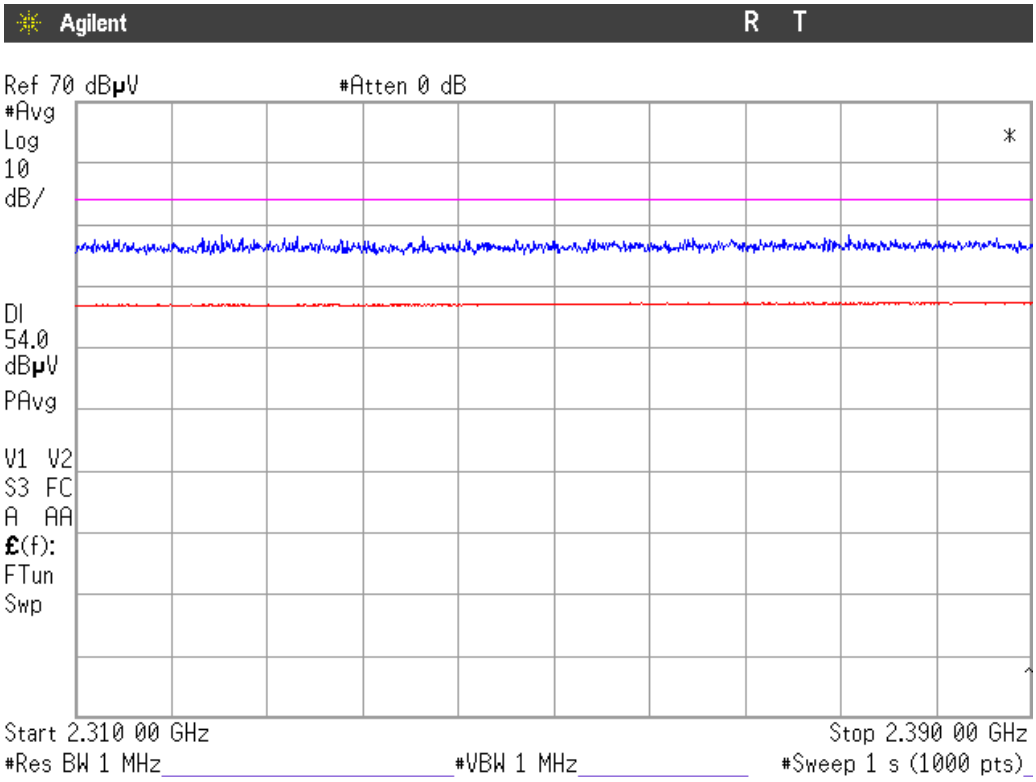


Modulation: 8-DPSK

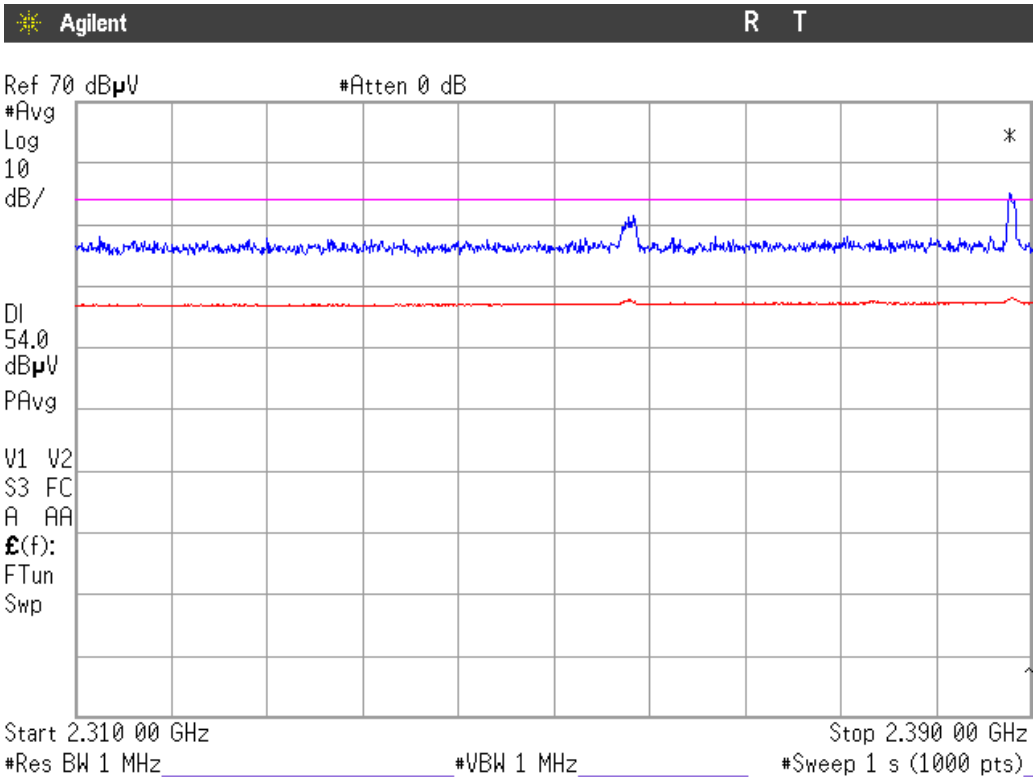


CHANNEL: Highest

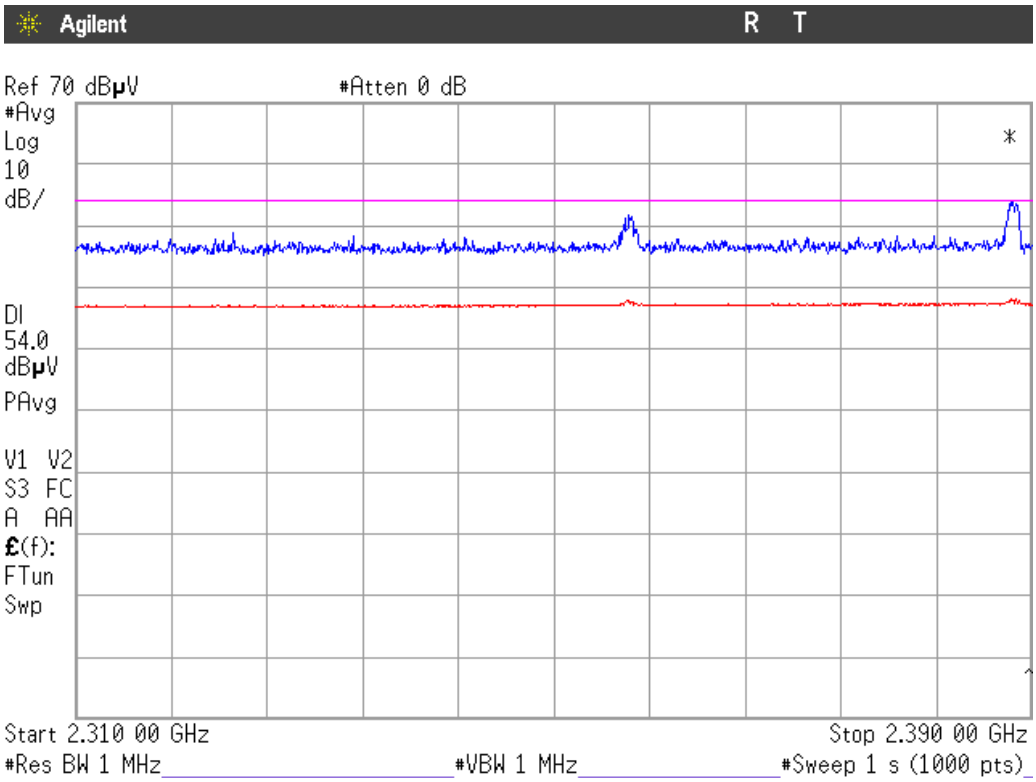
Modulation: GFSK



Modulation: II/4-DQPSK



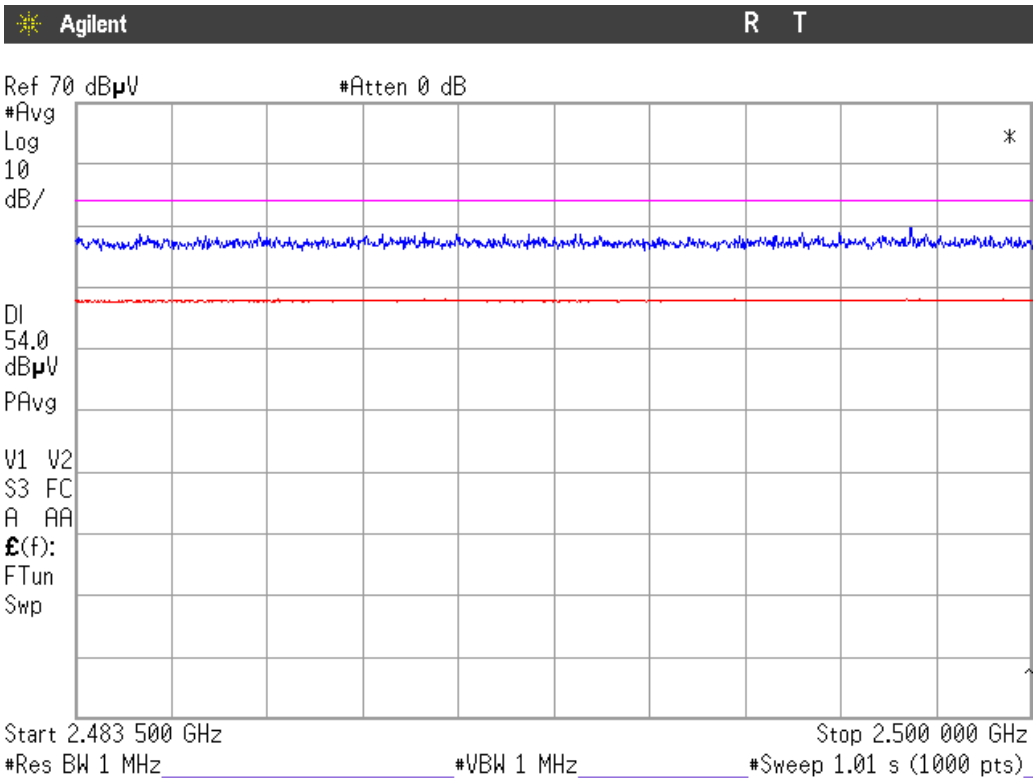
Modulation: 8-DPSK



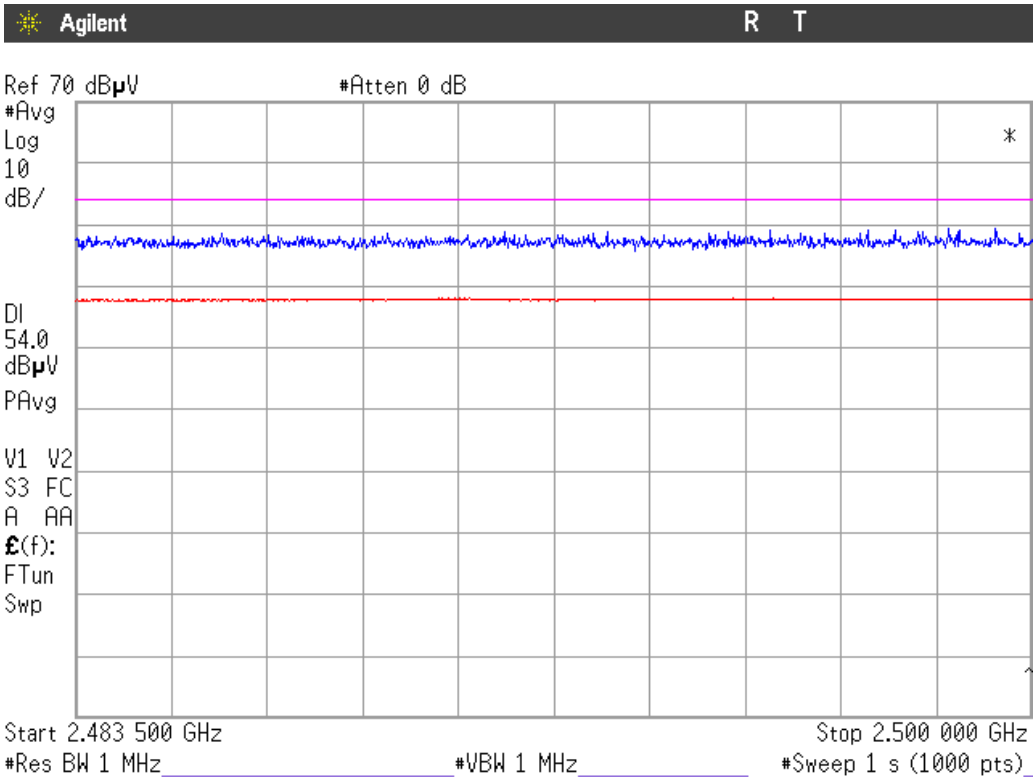
FREQUENCY RANGE 2.4835 GHz to 2.5 GHz. (RESTRICTED BAND)

CHANNEL: Lowest (2402 MHz).

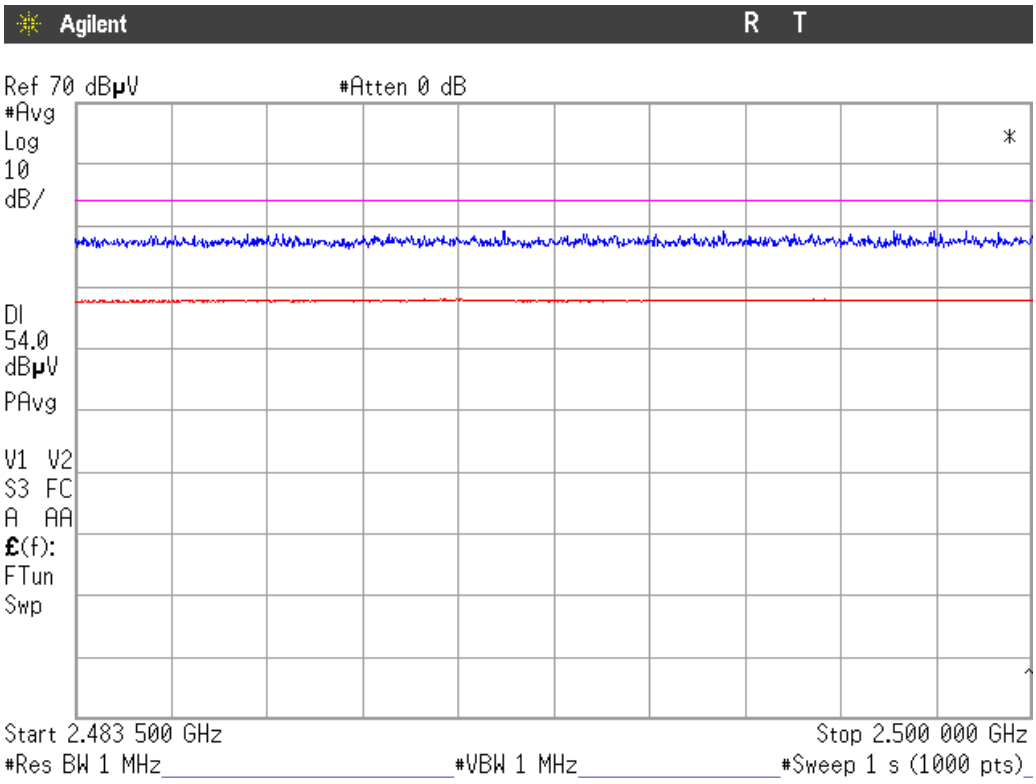
Modulation: GFSK



Modulation: II/4-DQPSK

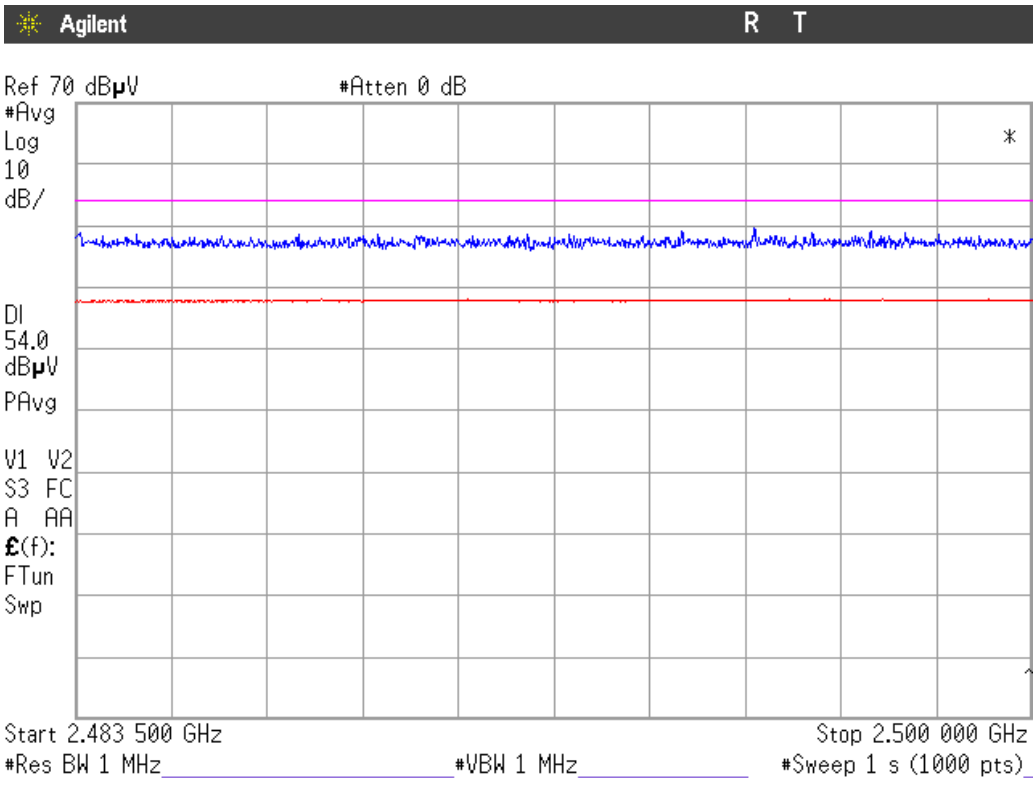


Modulation: 8-DPSK

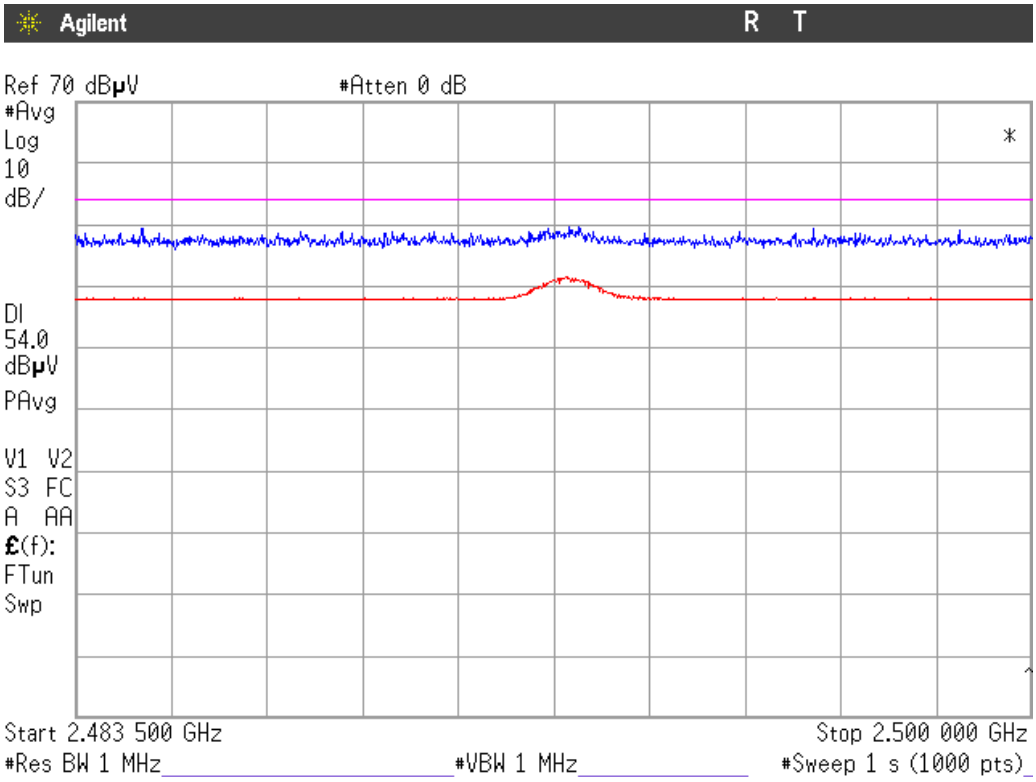


CHANNEL: Middle

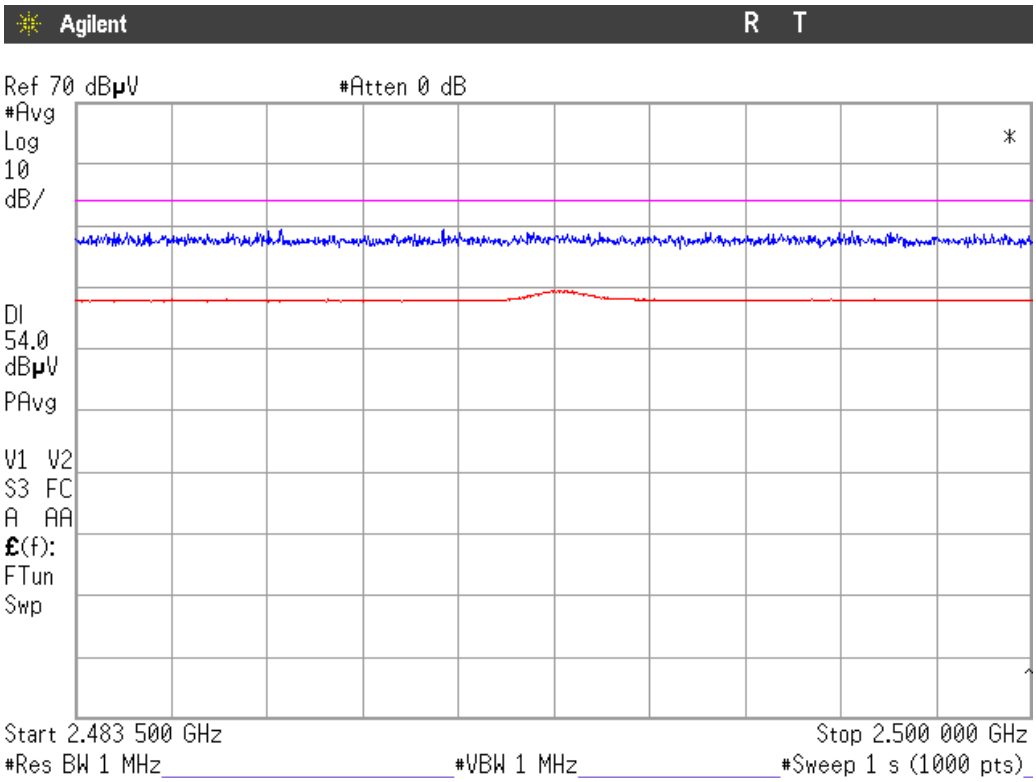
Modulation: GFSK



Modulation: Π/4-DQPSK

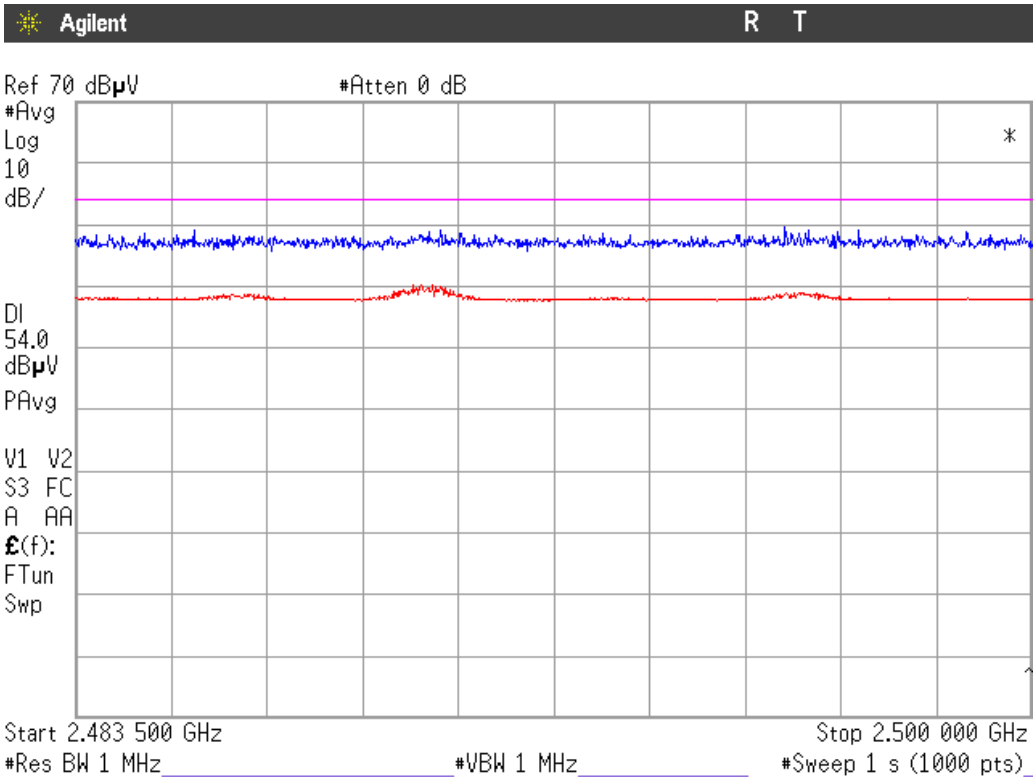


Modulation: 8-DPSK

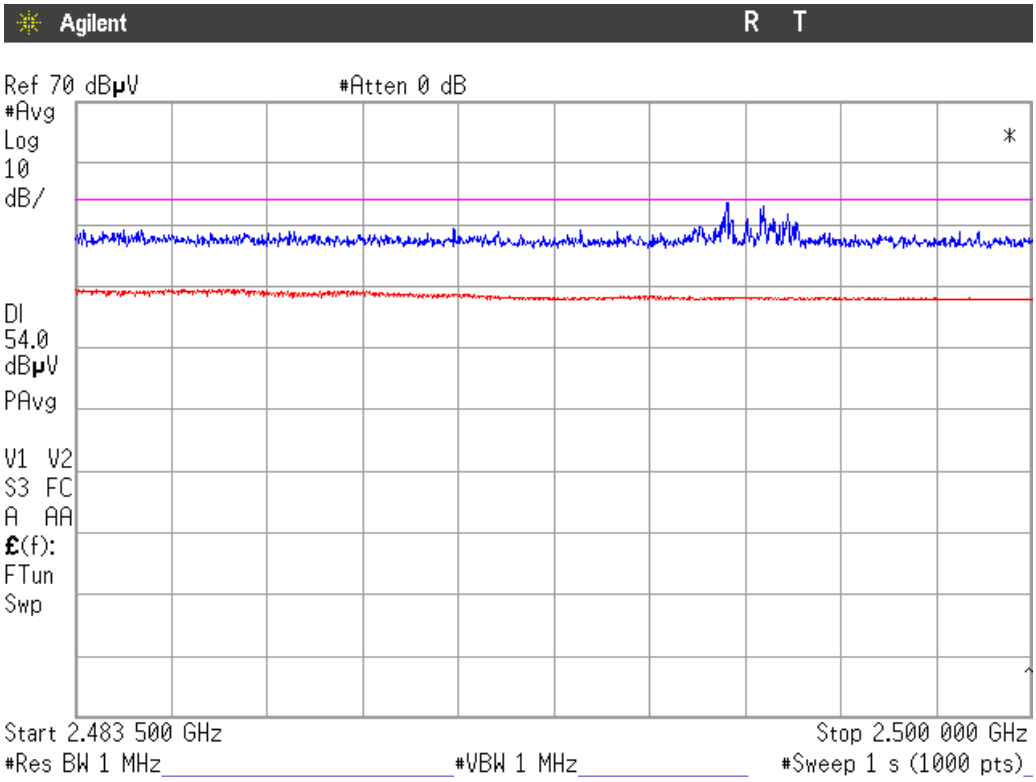


CHANNEL: Highest (2480 MHz).

Modulation: GFSK



Modulation: II/4-DQPSK



Modulation: 8-DPSK