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

SPECIFICATION:

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

RESULTS:

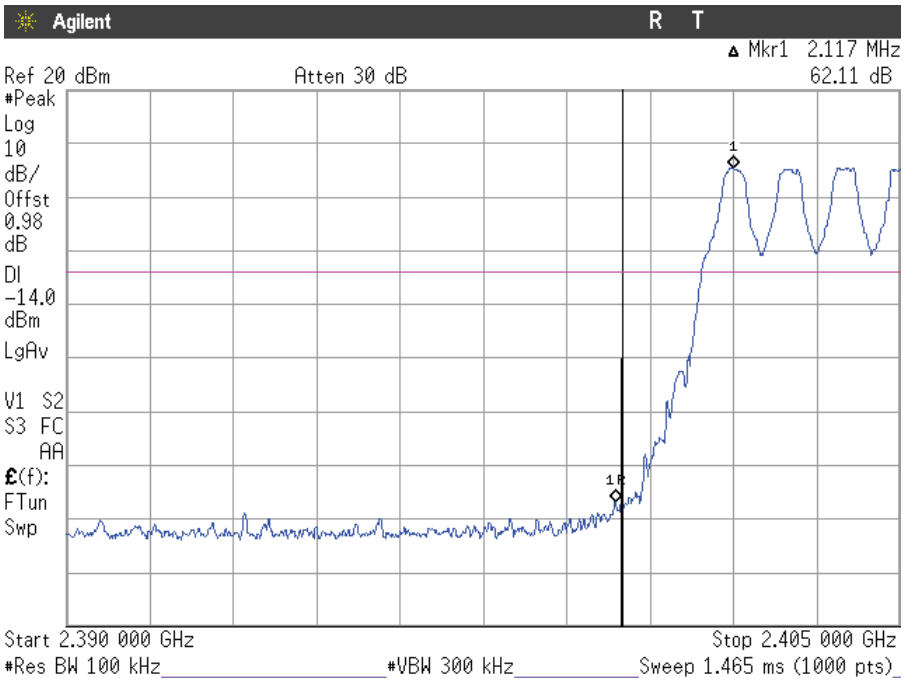
Radiated measurements were used to show compliance with the limits in the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

Measurement uncertainty (dB)	<±2.03

- **GFSK – Band-edge emissions compliance**

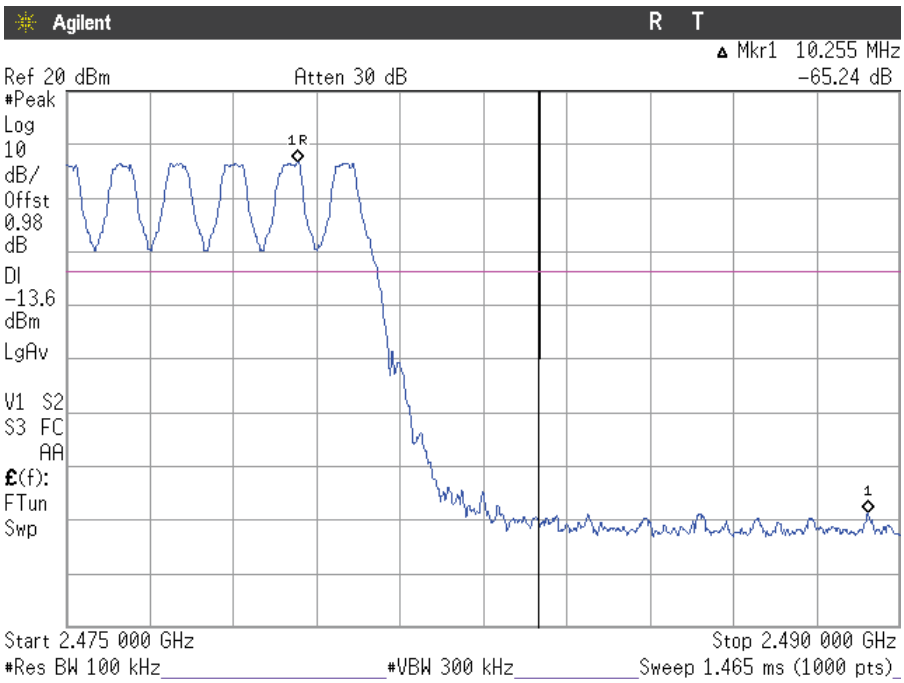
  - ❖ HOPPING ON:

    - Low Frequency Section 2402 MHz:



Verdict: PASS

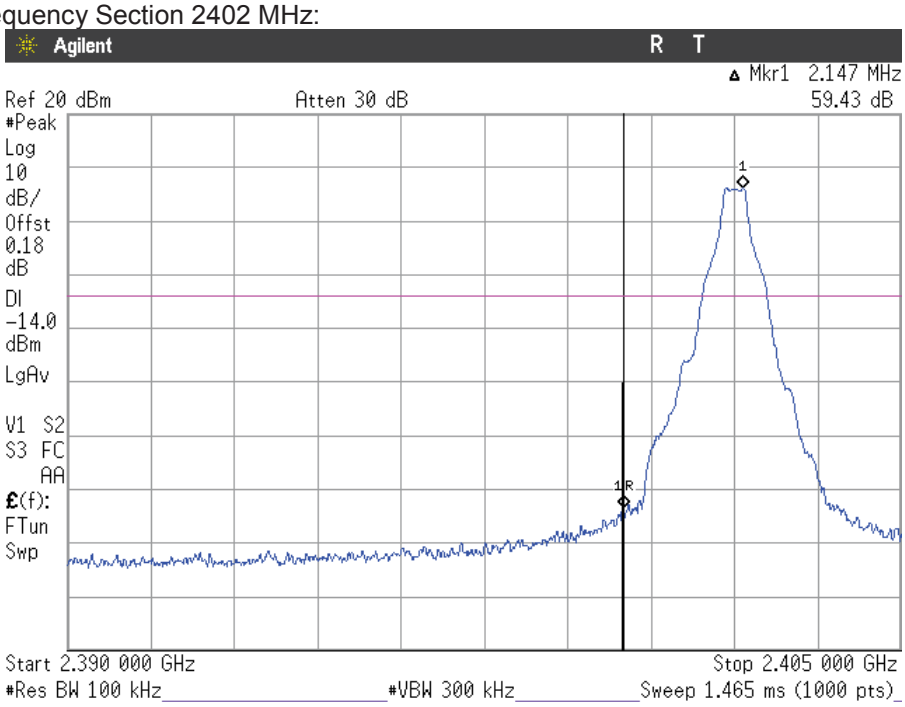
- High Frequency Section 2480 MHz:



Verdict: PASS

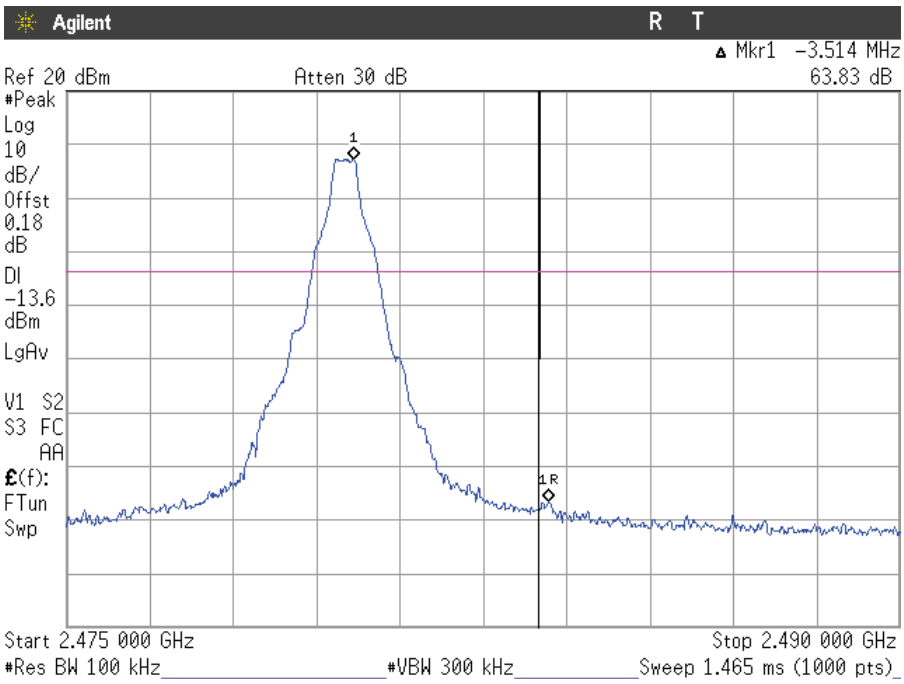
❖ HOPPING OFF:

- Low Frequency Section 2402 MHz:



Verdict: PASS

- High Frequency Section 2480 MHz:

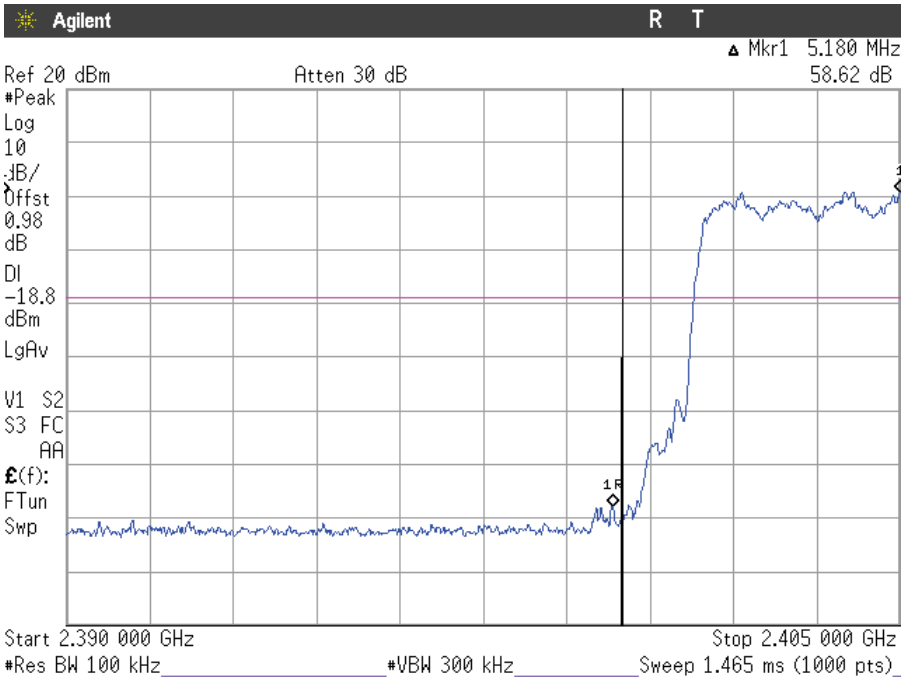


Verdict: PASS

- **Pi/4 DQPSK – Band-edge emissions compliance**

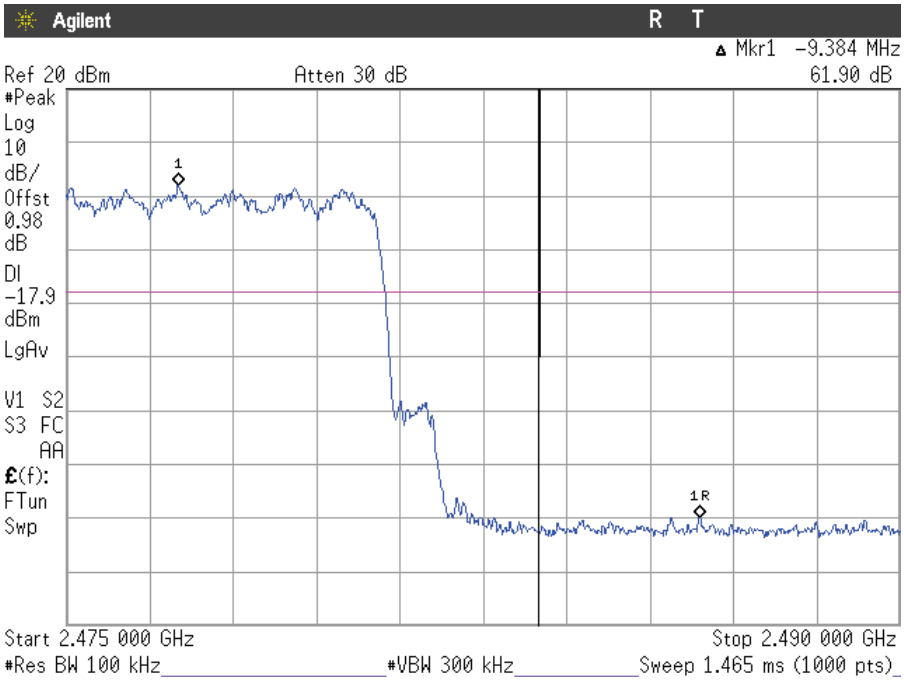
  - HOPPING ON:

    - Low Frequency Section 2402 MHz:



Verdict: PASS

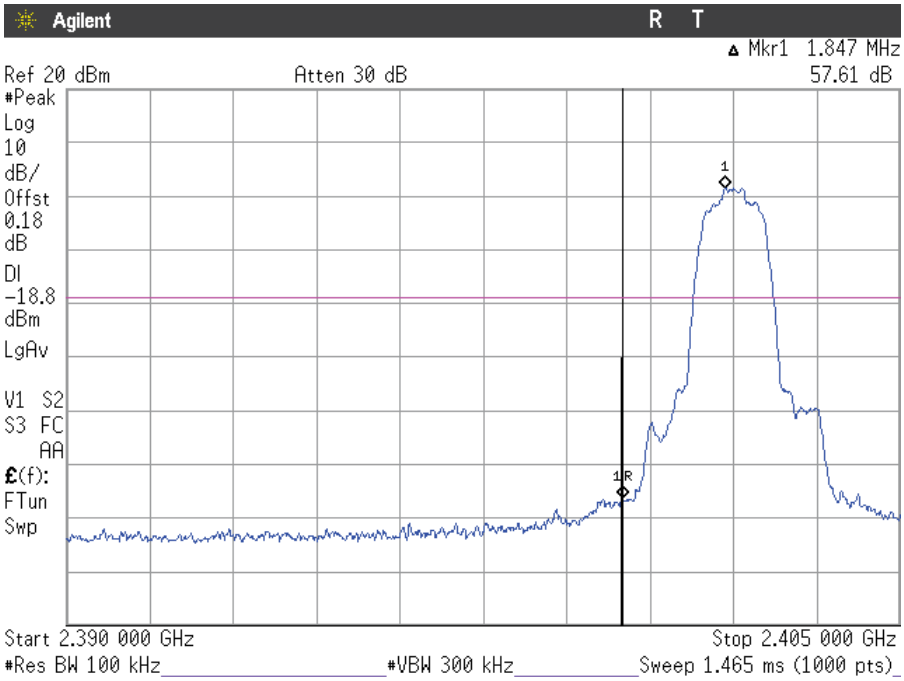
    - High Frequency Section 2480 MHz:



Verdict: PASS

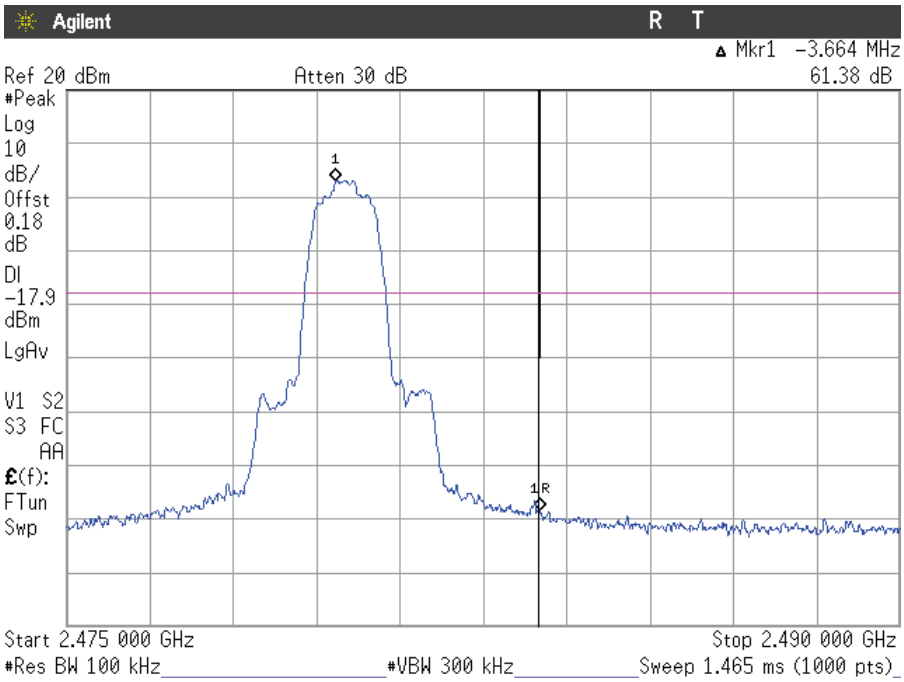
❖ HOPPING OFF:

- Low Frequency Section 2402 MHz:



Verdict: PASS

- High Frequency Section 2480 MHz:

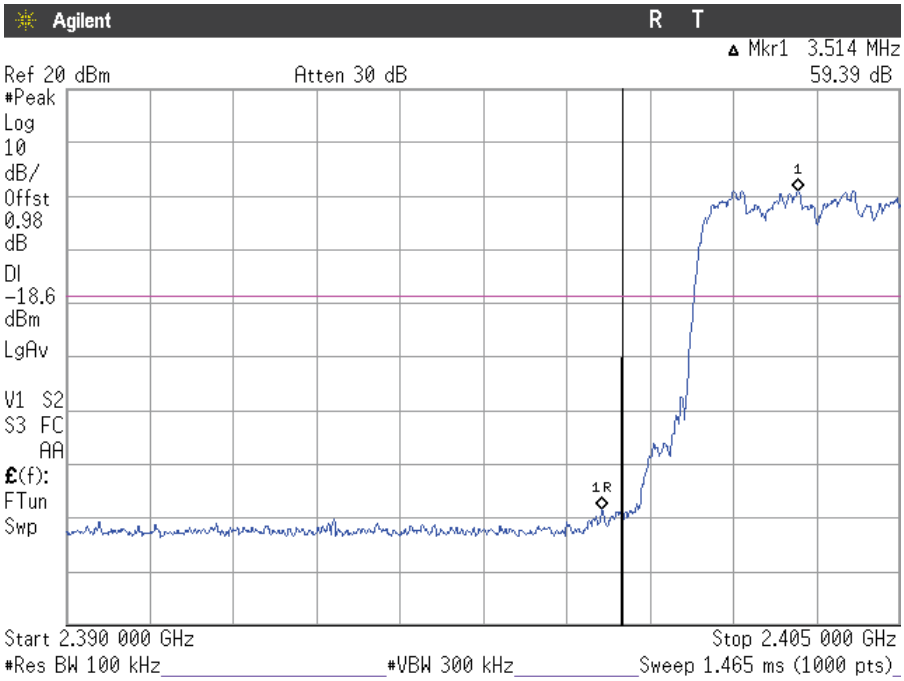


Verdict: PASS

- **8DPSK – Band-edge emissions compliance**

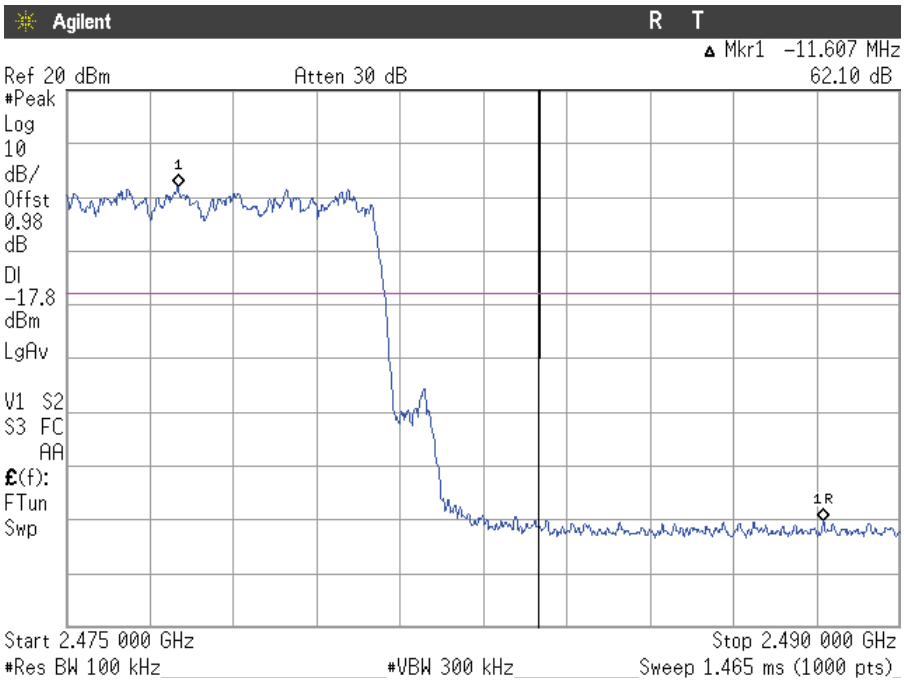
  - ❖ HOPPING ON:

    - Low Frequency Section 2402 MHz:



Verdict: PASS

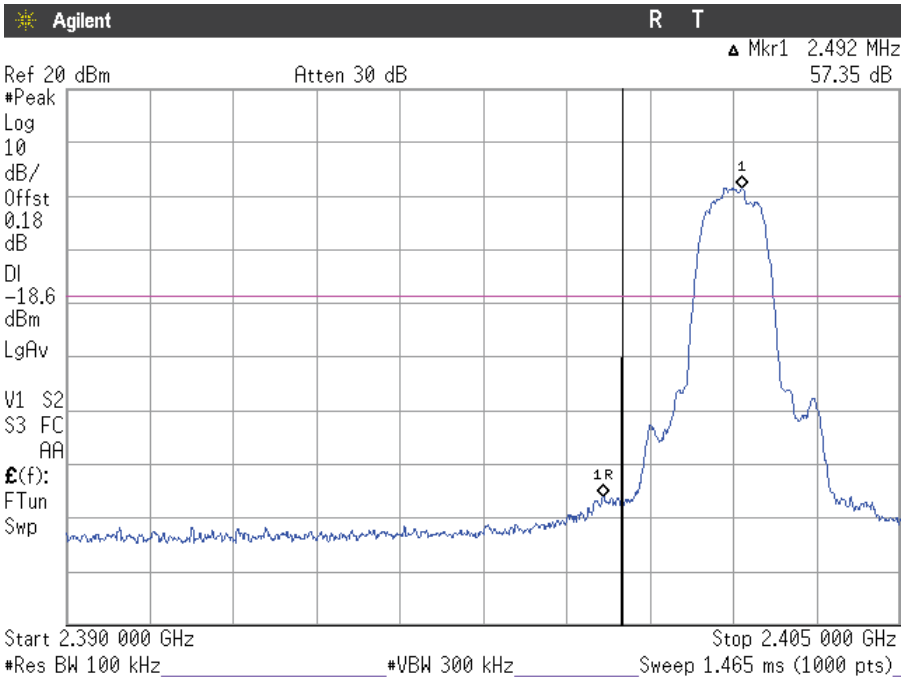
- High Frequency Section 2480 MHz:



Verdict: PASS

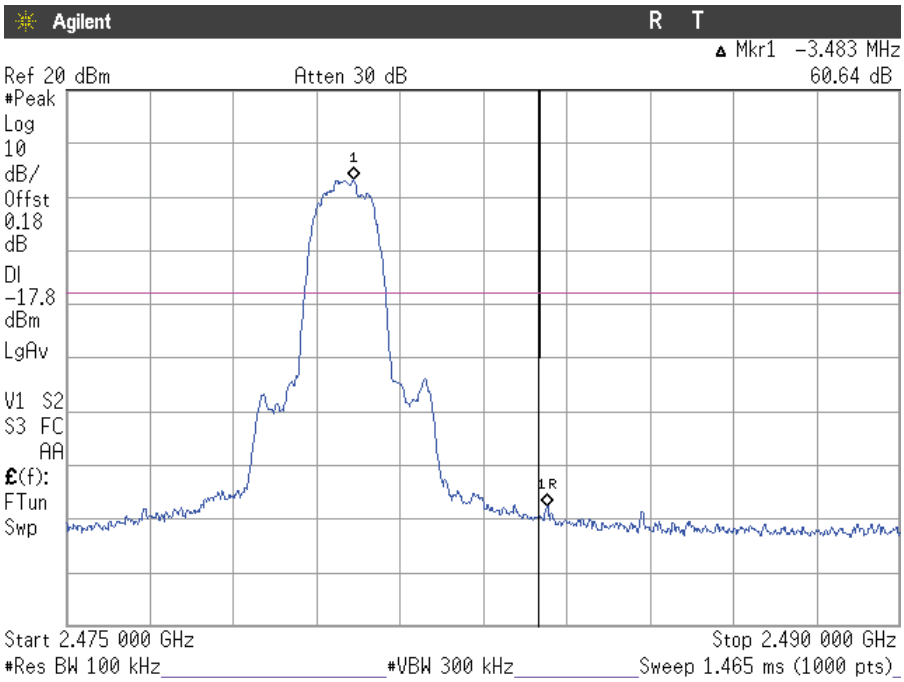
❖ HOPPING OFF:

- Low Frequency Section 2402 MHz:



Verdict: PASS

- High Frequency Section 2480 MHz:



Verdict: PASS

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)/RSS-Gen):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 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 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

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

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

Frequency range 30 MHz - 1 GHz:

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

Spurious levels operating (radiated) closest to limit.

Spurious frequency (MHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
37.776	Quasi peak	29.20	V	<± 3.88
884.780	Quasi peak	34.90	V	<± 3.88
890.277	Quasi peak	33.20	V	<± 3.88

Frequency range 1 - 26 GHz:

The results in the next tables show the maximum measured levels in the 1-26 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

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

Modulation: GFSK (DH5)

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
4.8963	Peak	40.56	V	<± 3.70
5.37463	Peak	40.22	V	<± 3.70

2. CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
4.8833	Peak	43.71	V	<± 3.70
5.37463	Peak	40.65	V	<± 3.70

2. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
4.4819	Peak	46.01	V	<± 3.70
4.8958	Peak	40.07	V	<± 3.70
5.37463	Peak	40	V	<± 3.70

Verdict: PASS

Modulation Π/4-DQPSK (2DH5)

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
4.48003	Peak	42.92	V	<± 3.70
5.37463	Peak	39.80	V	<± 3.70
5.73303	Peak	37.13	V	<± 3.70

2. CHANNEL: MIDDLE (2441 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
4.48003	Peak	41.62	V	<± 3.70
4.89583	Peak	39.49	V	<± 3.70
5.37463	Peak	40.23	V	<± 3.70

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
4.48517	Peak	42.42	V	<± 3.70
4.8963	Peak	38.33	V	<± 3.70
5.37463	Peak	40.48	V	<± 3.70

Verdict: PASS

Modulation: 8-DPSK (3DH5)

1. CHANNEL: LOWEST (2402 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
4.48143	Peak	45.75	V	<± 3.70
4.8963	Peak	38.86	V	<± 3.70
5.37463	Peak	40.35	V	<± 3.70

2. CHANNEL: MIDDLE (2441 MHz).

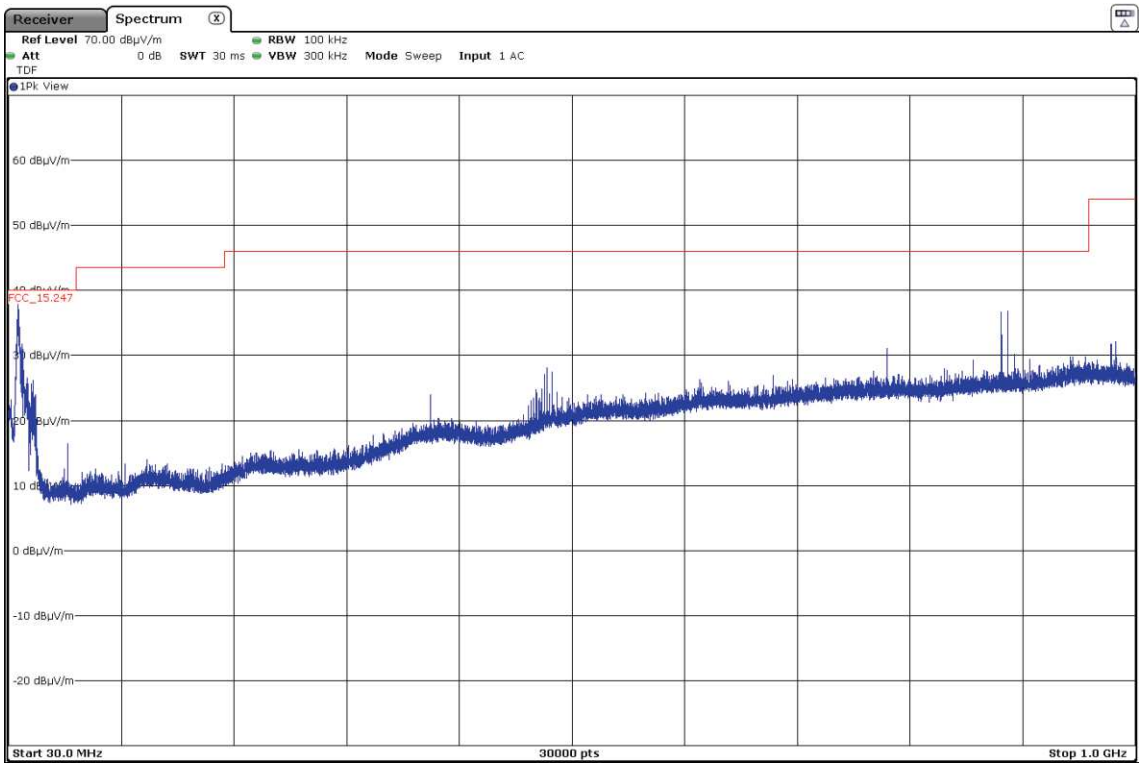
Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
4.48097	Peak	45.42	V	<± 3.70
4.8963	Peak	38.42	V	<± 3.70
5.3751	Peak	40.01	V	<± 3.70

3. CHANNEL: HIGHEST (2480 MHz).

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
4.8963	Peak	39.74	V	<± 3.70
5.37463	Peak	39.60	V	<± 3.70
5.82263	Peak	38.21	V	<± 3.70

Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz:

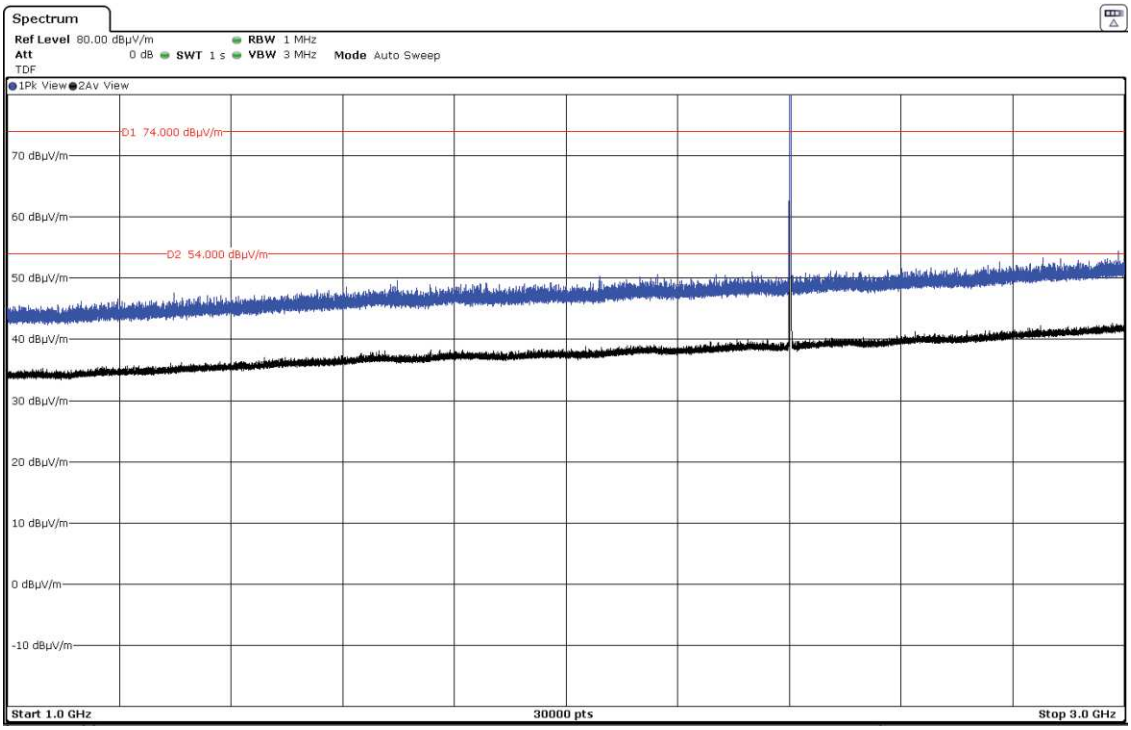


(This plot is valid for all three channels and all modulation modes).

FREQUENCY RANGE 1 - 3 GHz:

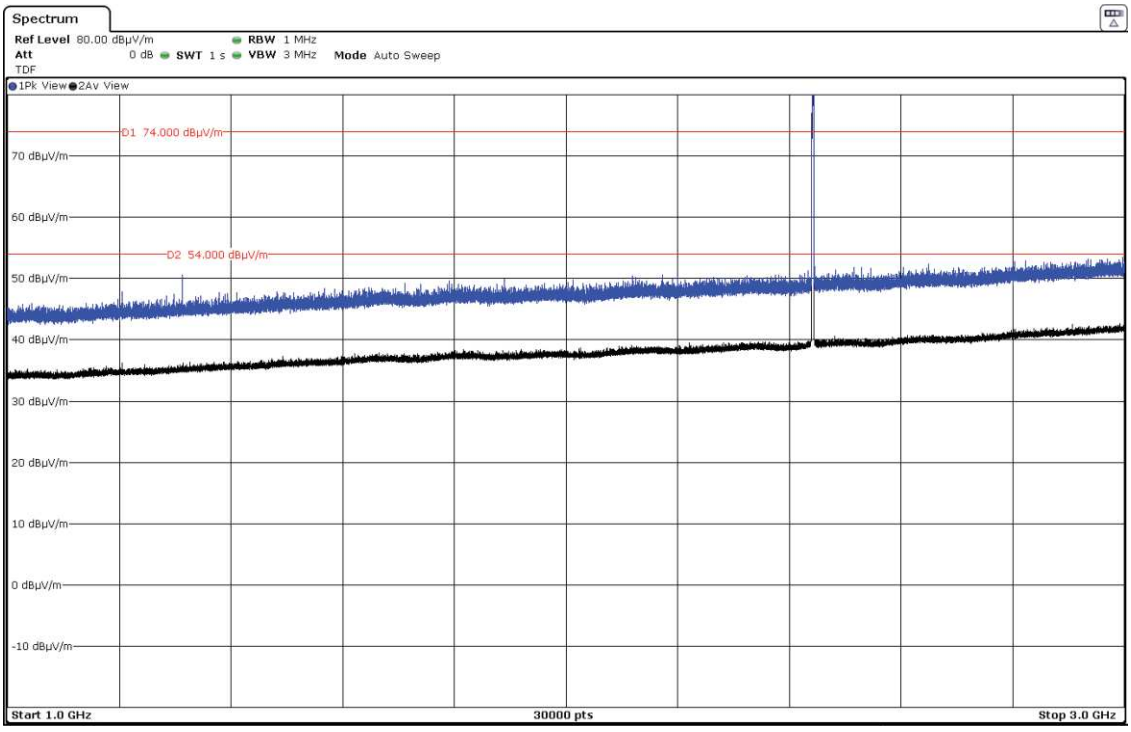
Modulation: GFSK (DH5)

CHANNEL: Lowest (2402 MHz)



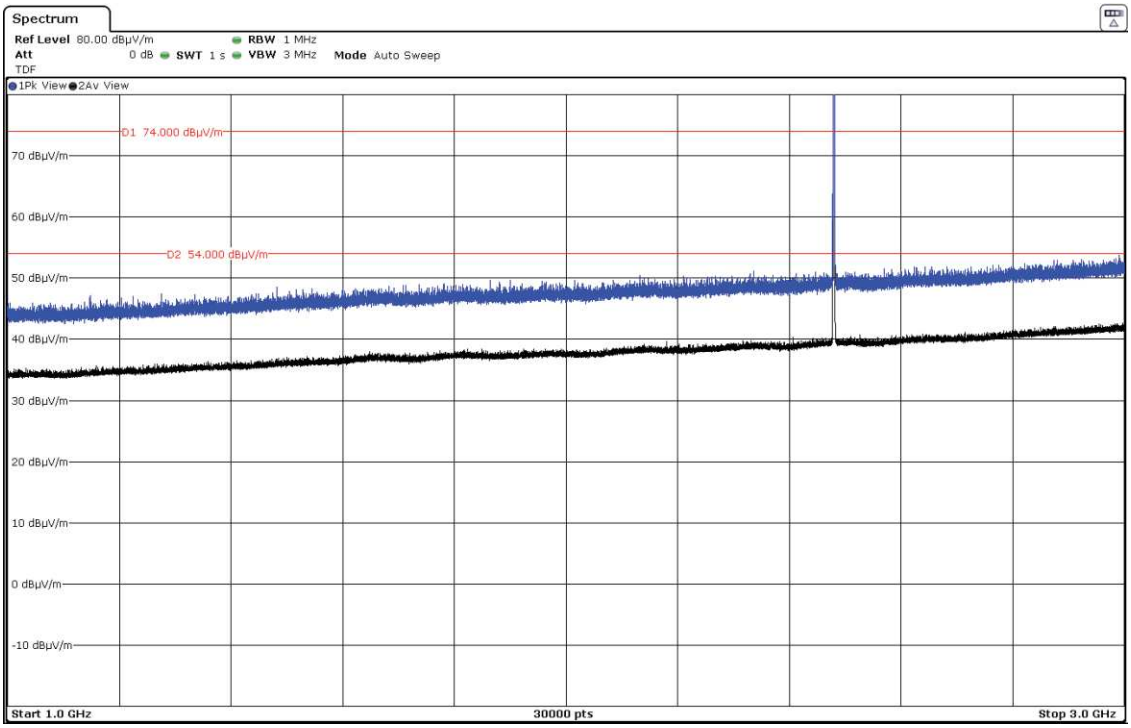
The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz)



The peak above the limit is the carrier frequency.

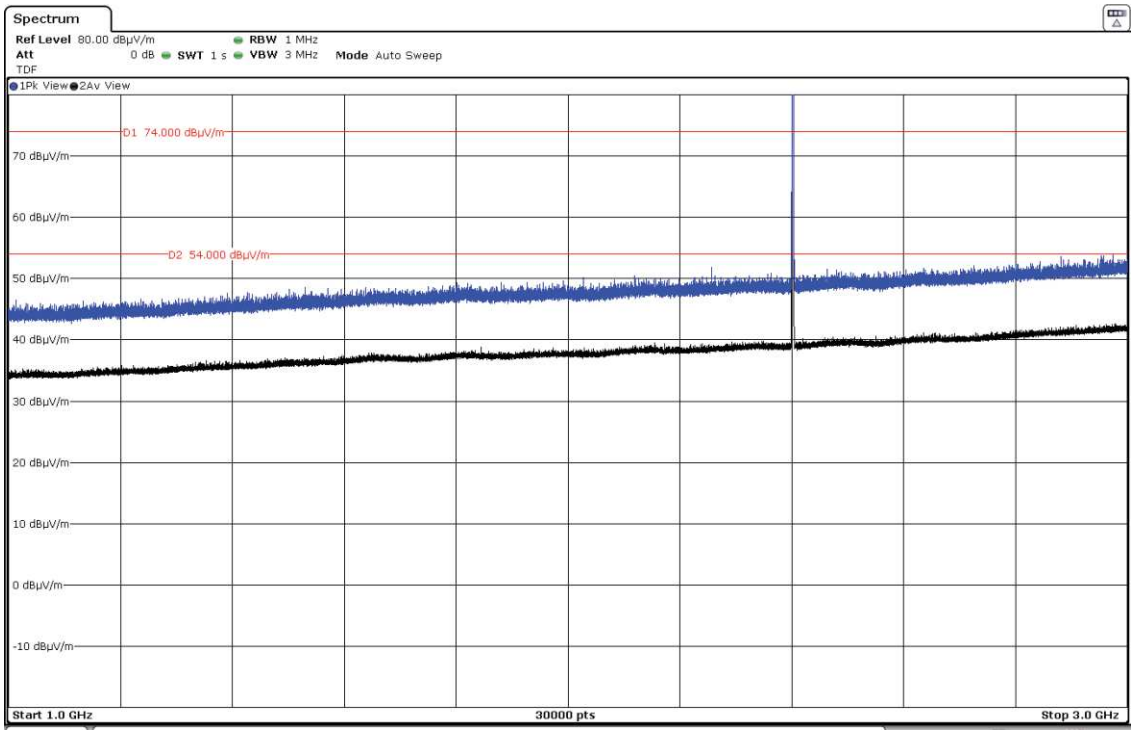
CHANNEL: Highest (2480 MHz)



The peak above the limit is the carrier frequency.

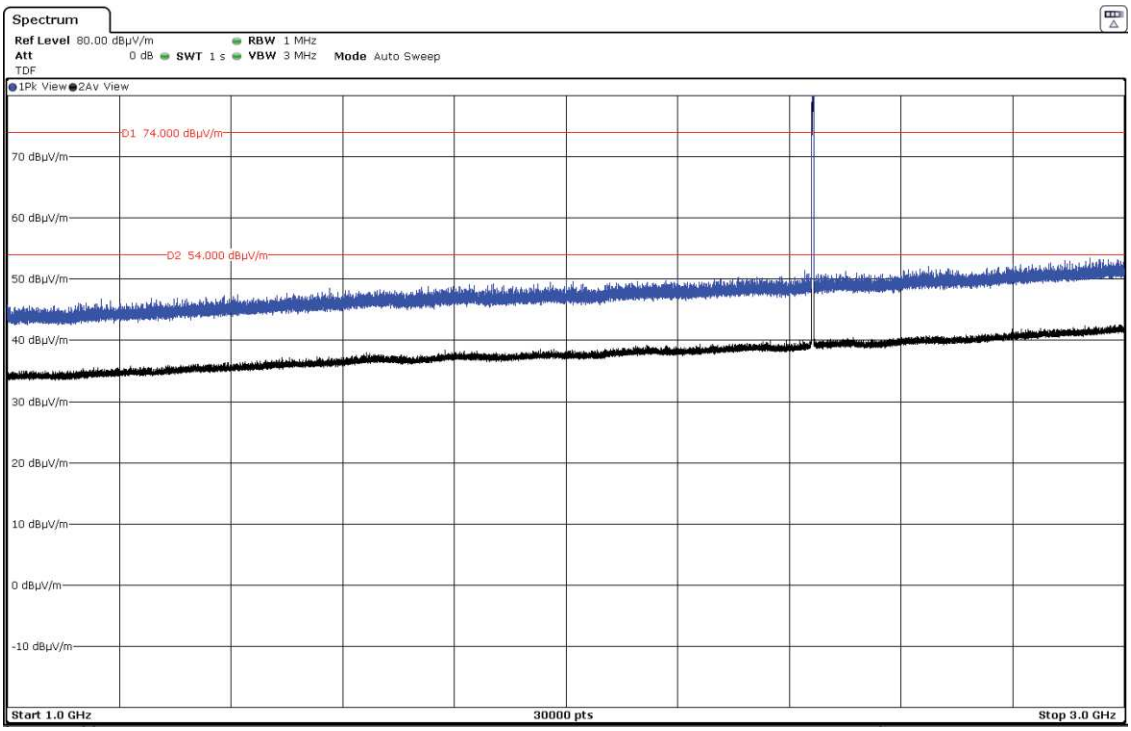
Modulation: Π/4-DQPSK (2DH5)

CHANNEL: Lowest (2402 MHz)



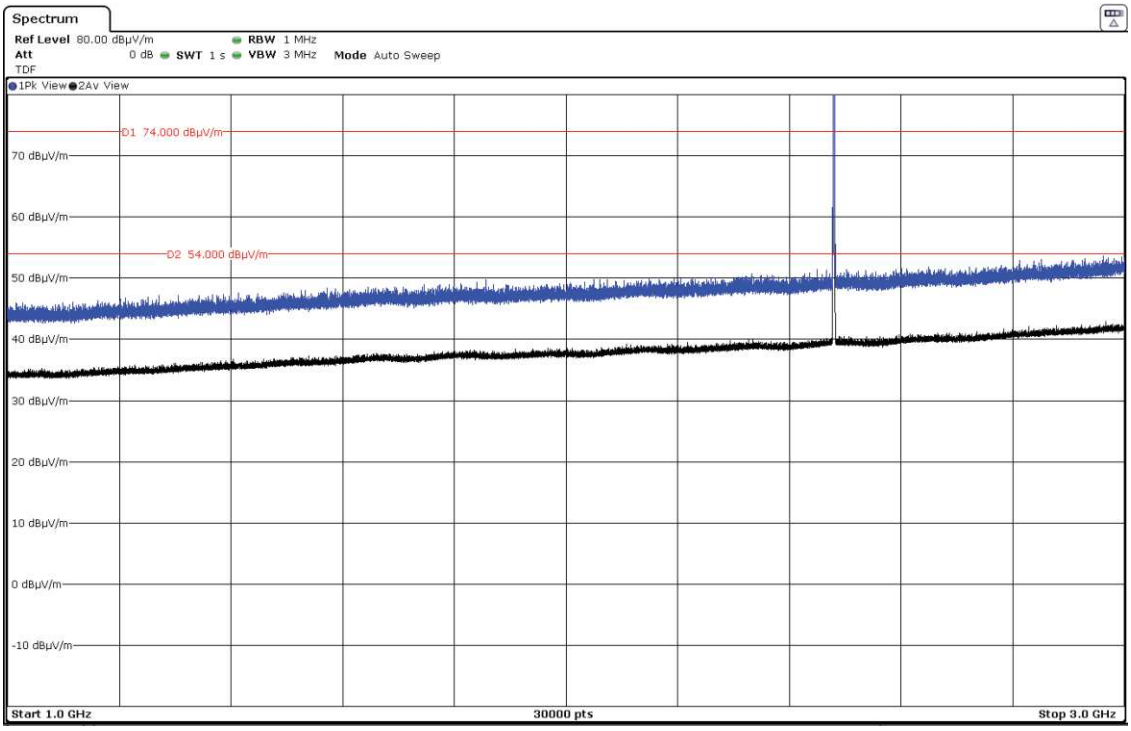
The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz)



The peak above the limit is the carrier frequency.

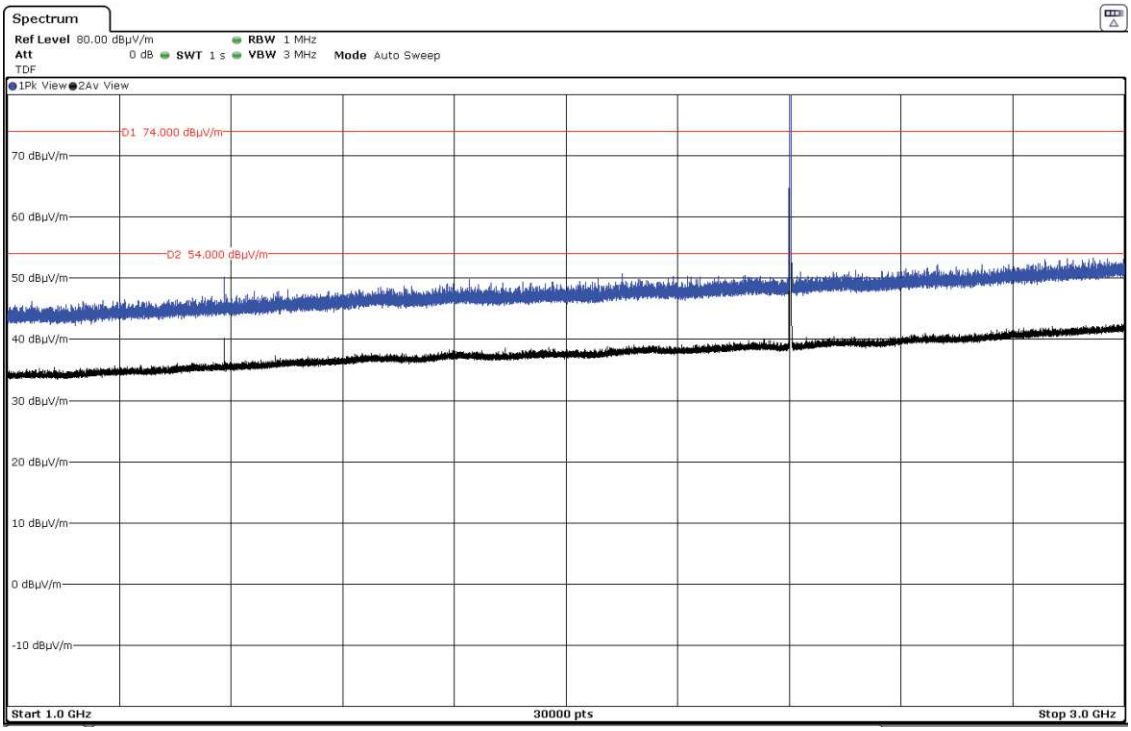
CHANNEL: Highest (2480 MHz)



The peak above the limit is the carrier frequency.

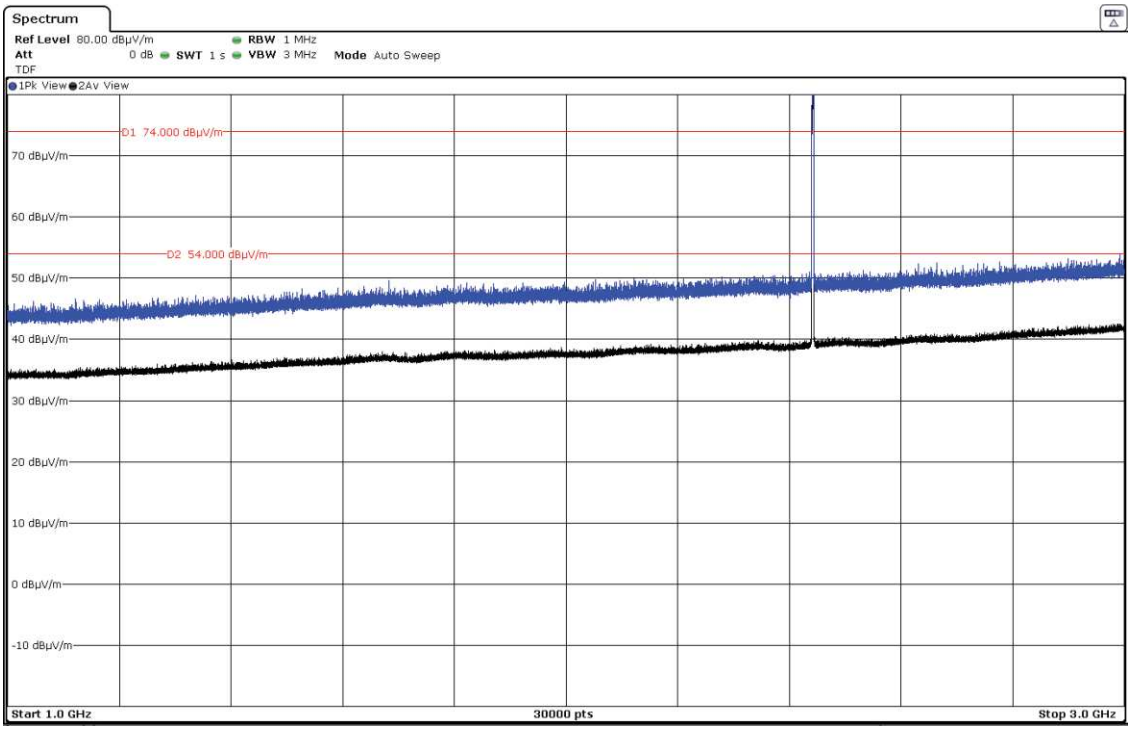
Modulation: 8-DPSK (3DH5)

CHANNEL: Lowest (2402 MHz)



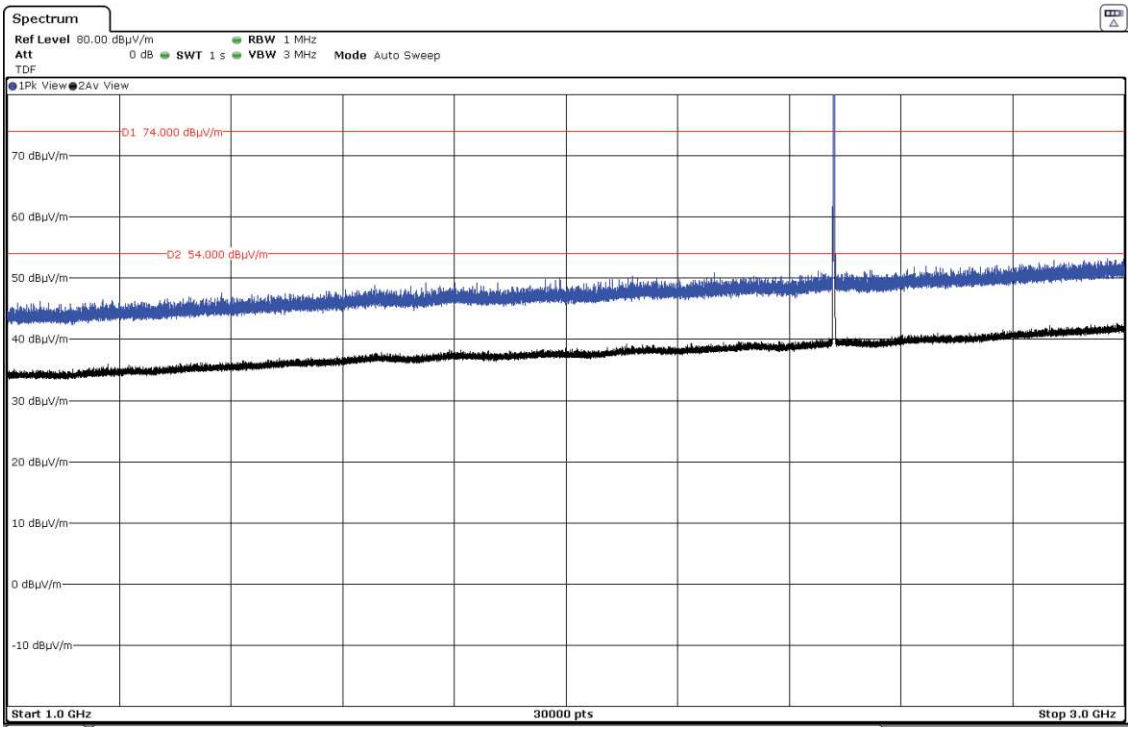
The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz)



The peak above the limit is the carrier frequency.

CHANNEL: Highest (2480 MHz)

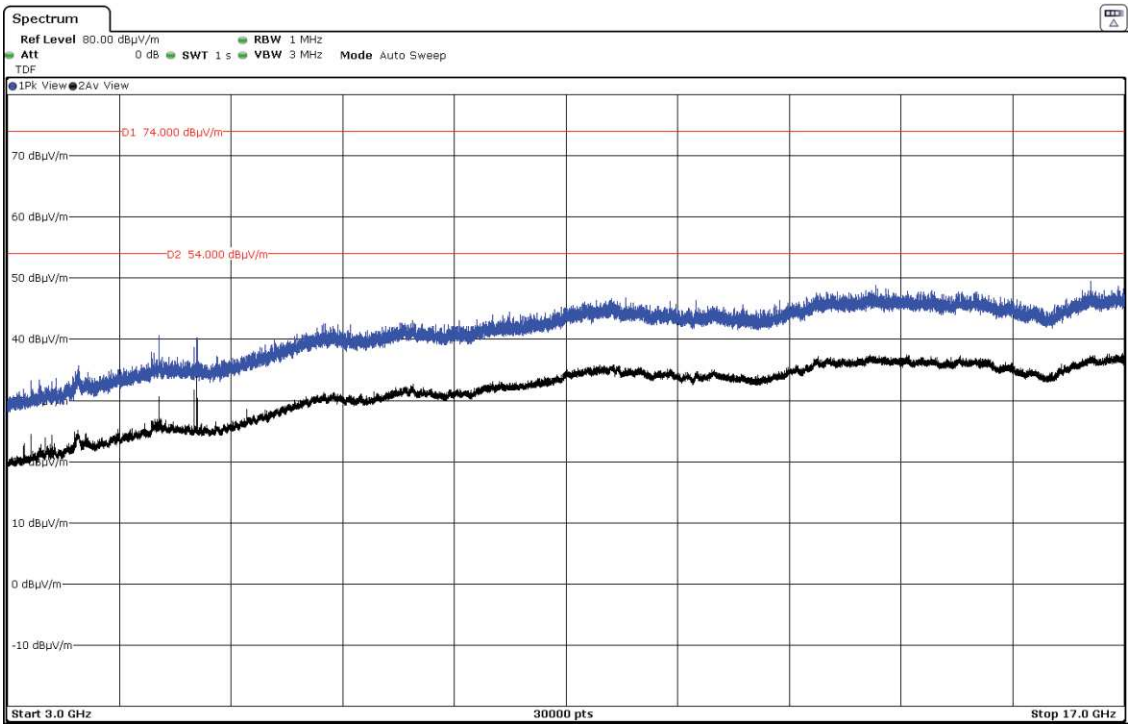


The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 17 GHz:

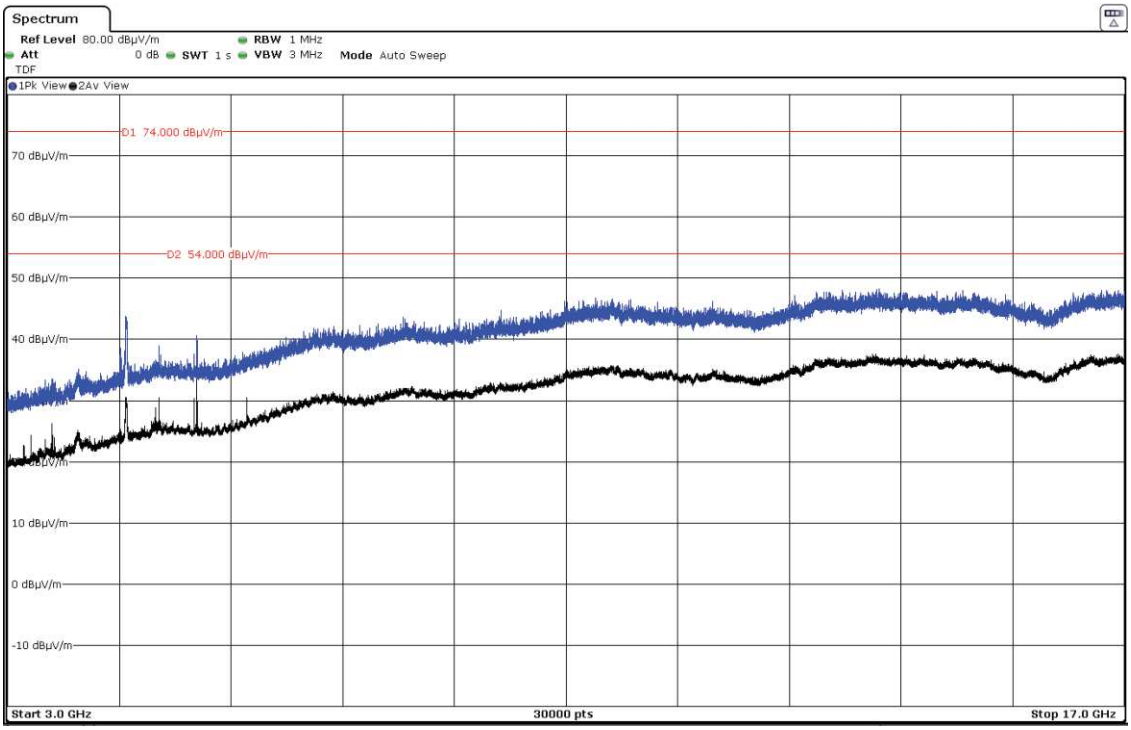
Modulation: GFSK (DH5)

CHANNEL: Lowest (2402 MHz)



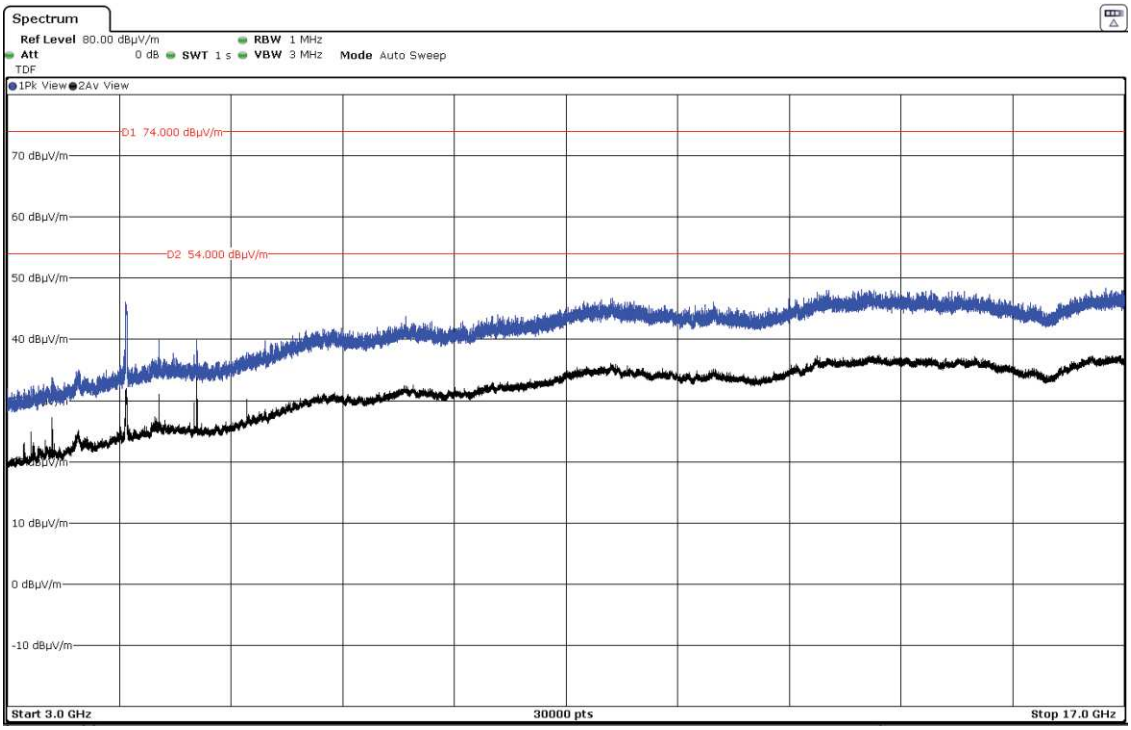
The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz)



The peak above the limit is the carrier frequency.

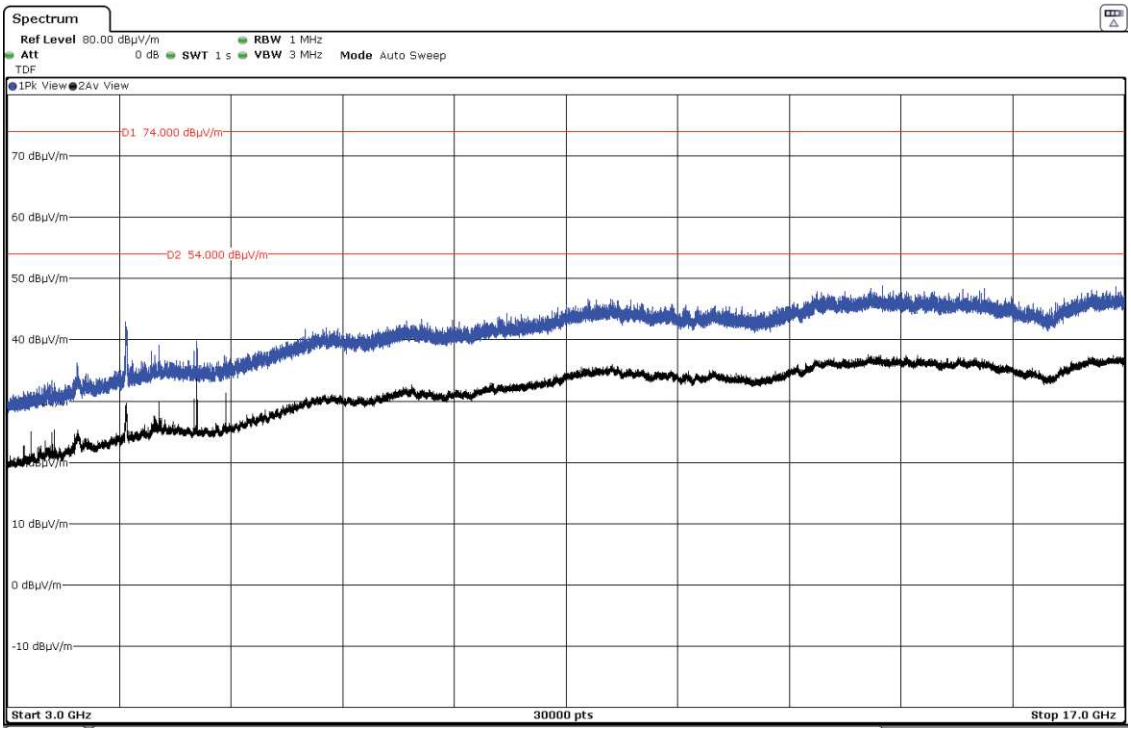
CHANNEL: Highest (2480 MHz)



The peak above the limit is the carrier frequency.

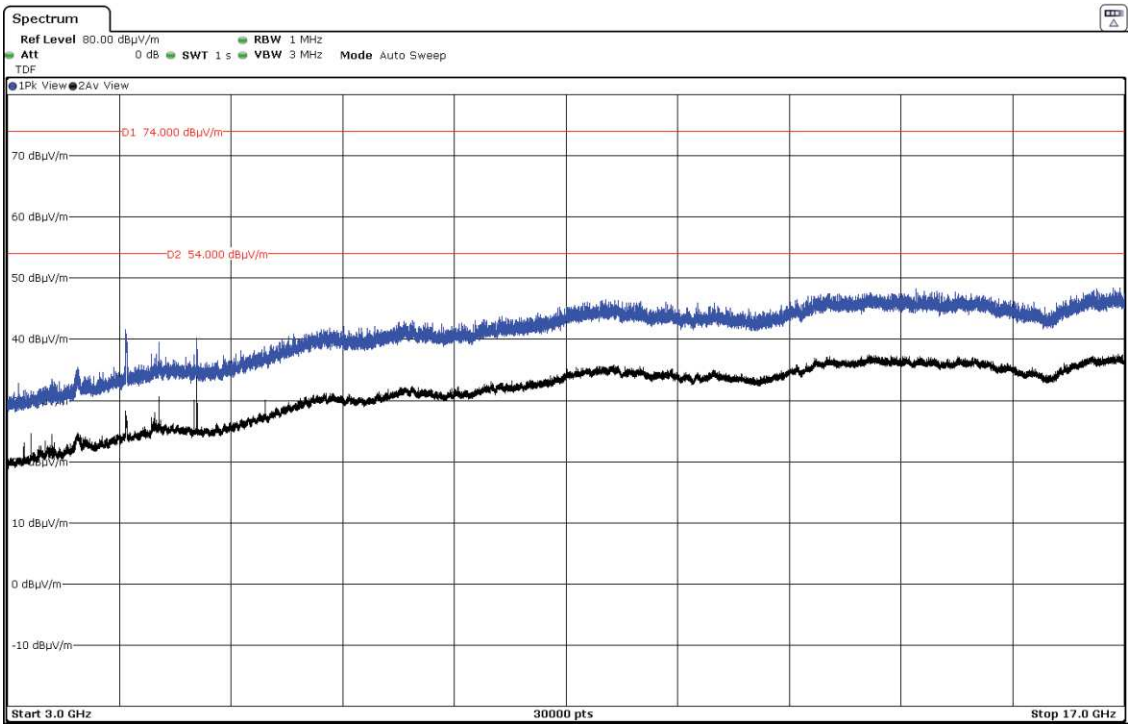
Modulation: Π/4-DQPSK (2DH5)

CHANNEL: Lowest (2402 MHz)



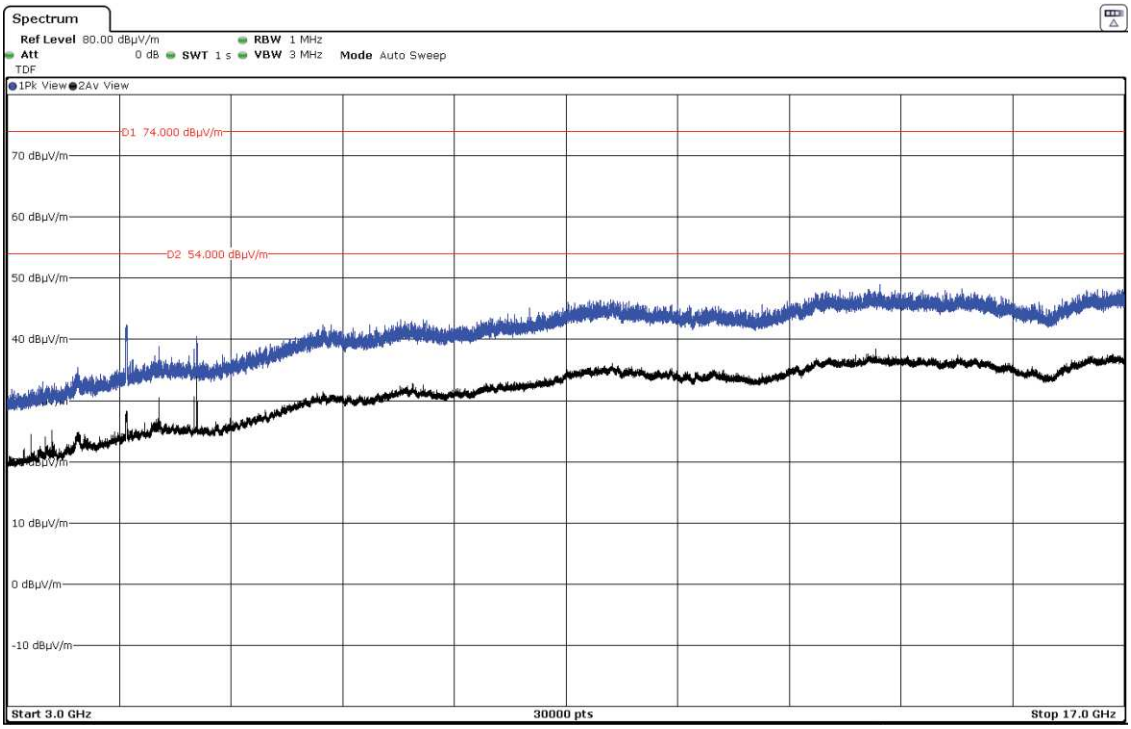
The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz)



The peak above the limit is the carrier frequency.

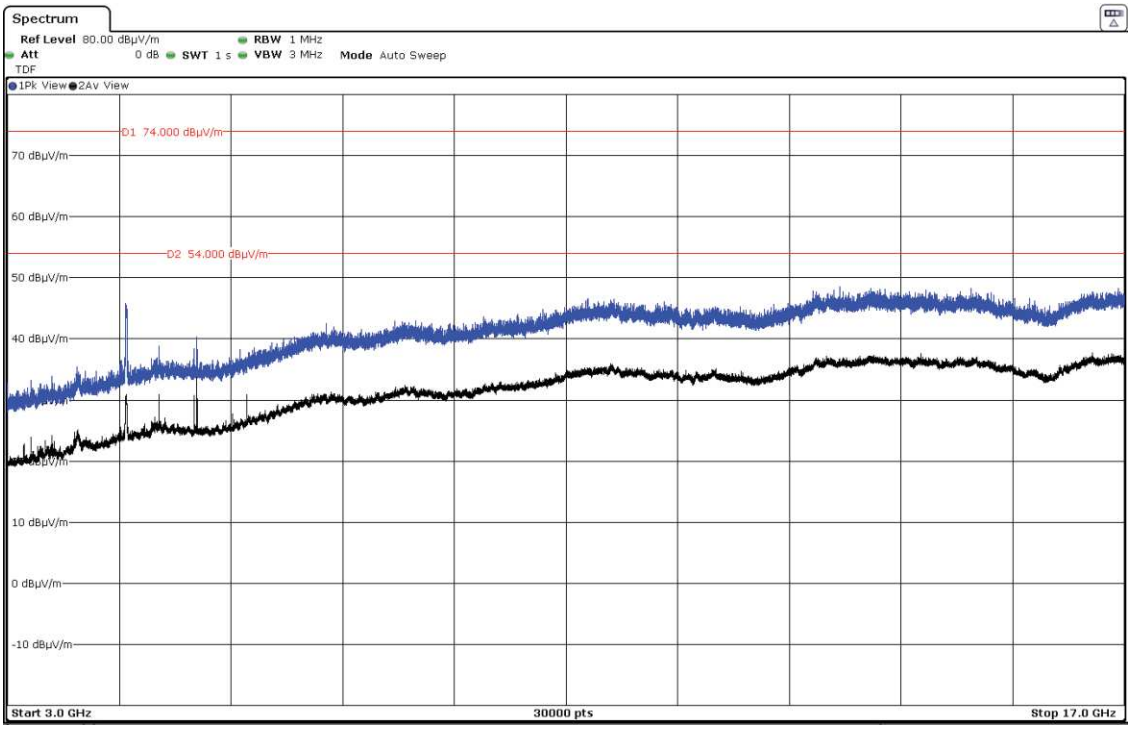
CHANNEL: Highest (2480 MHz)



The peak above the limit is the carrier frequency.

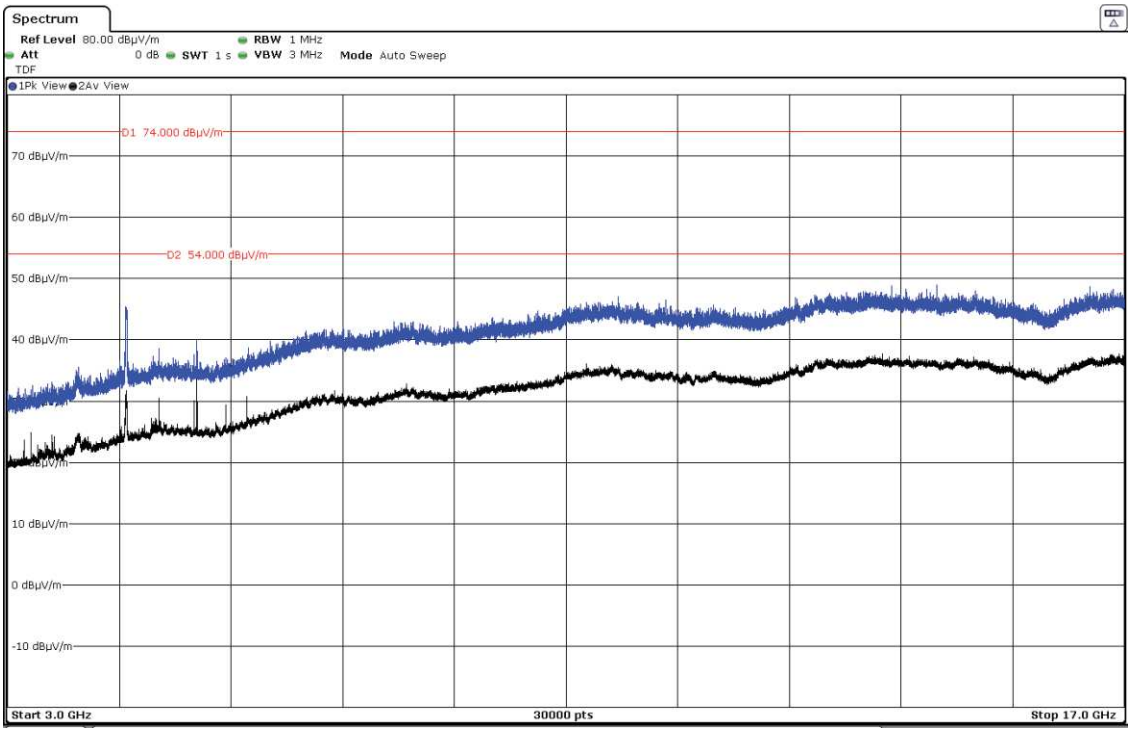
Modulation: 8-DPSK (3DH5)

CHANNEL: Lowest (2402 MHz)



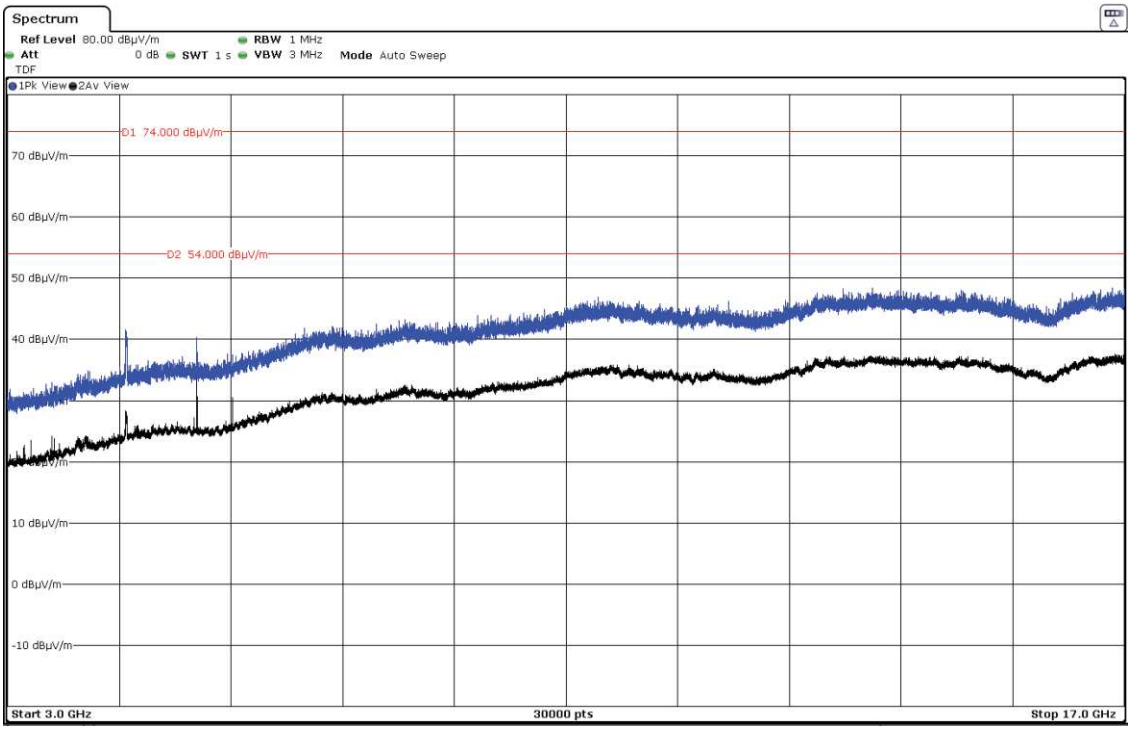
The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz)



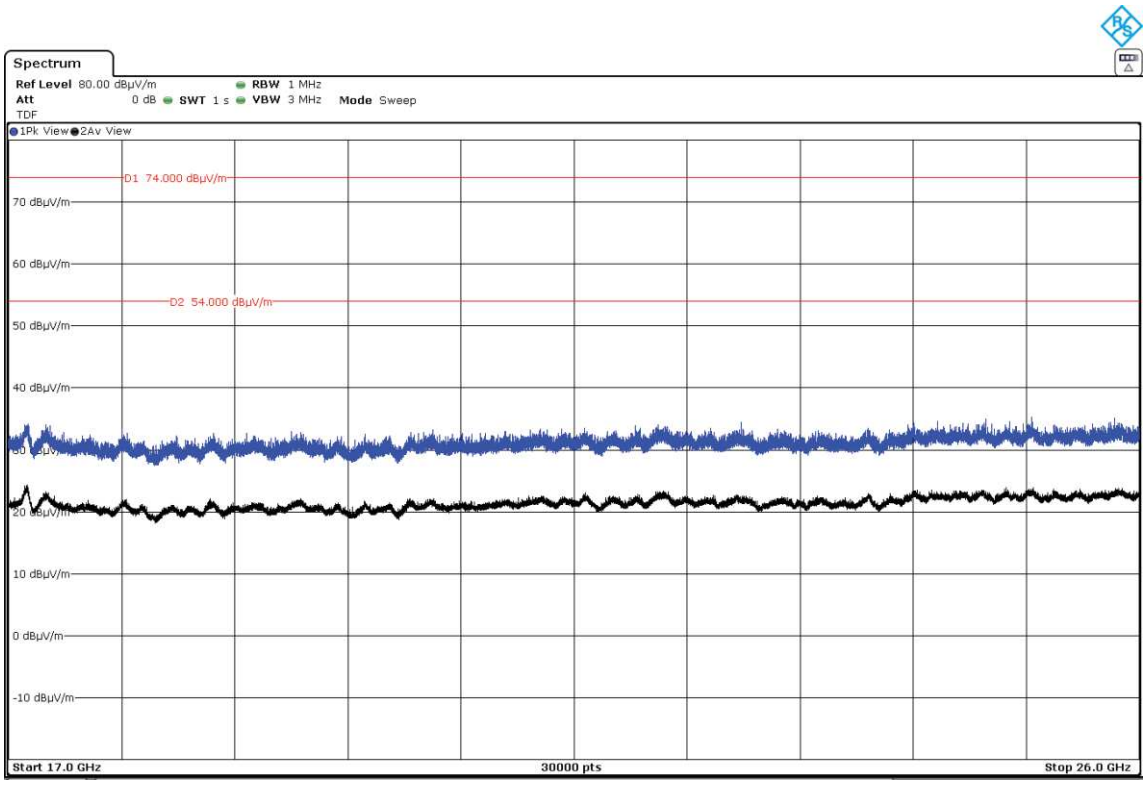
The peak above the limit is the carrier frequency.

CHANNEL: Highest (2480 MHz)



The peak above the limit is the carrier frequency.

FREQUENCY RANGE 17 - 26 GHz:

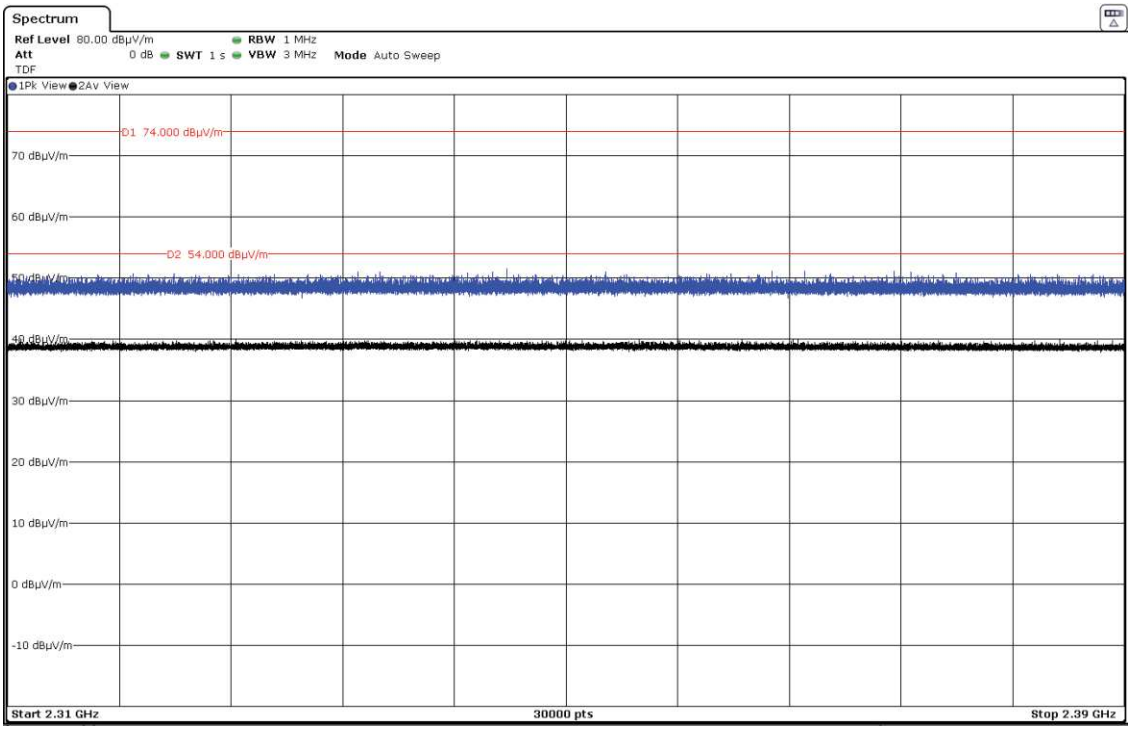


(This plot is valid for all three channels and all modulation modes).

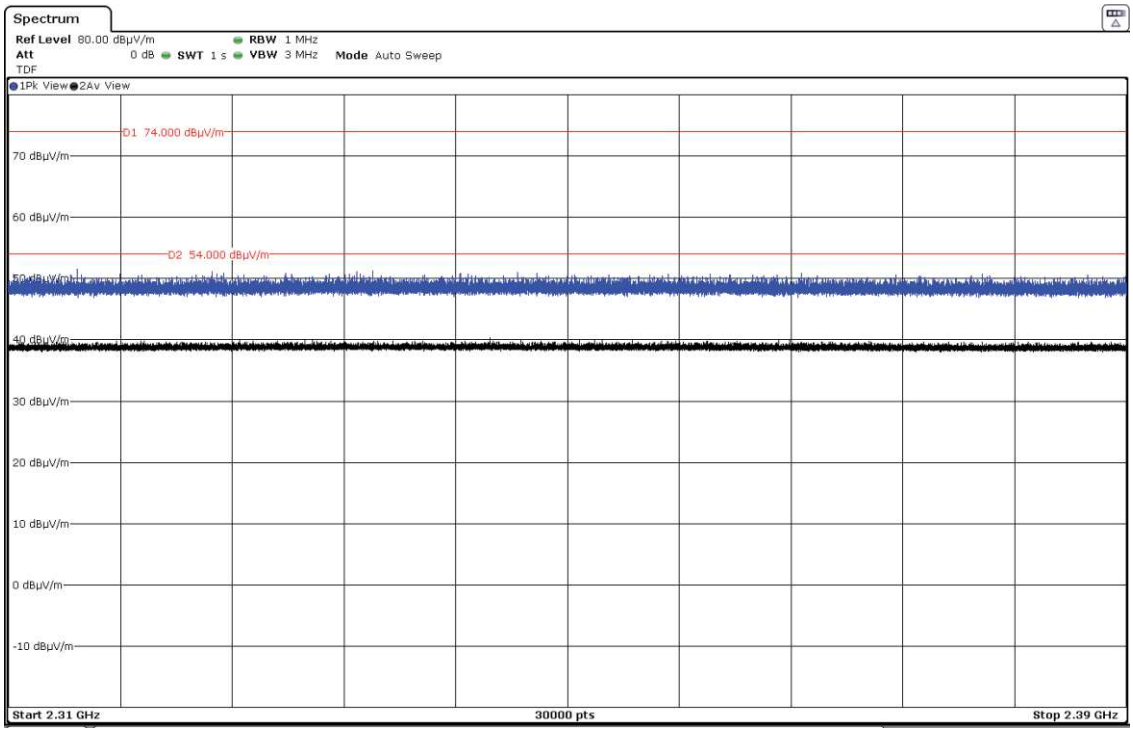
FREQUENCY RANGE 2.31-2.39 GHz (Restricted Band 1):

CHANNEL: Lowest (2402 MHz)

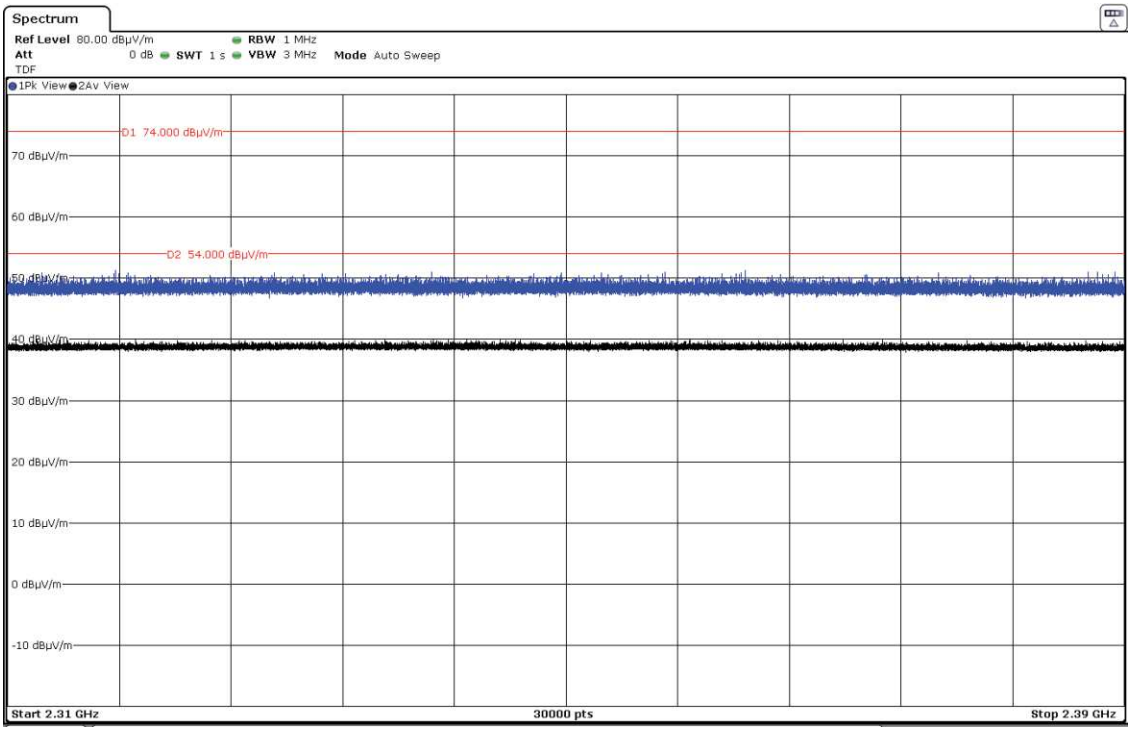
Modulation: GFSK (DH5)



Modulation: Π/4-DQPSK (2DH5)



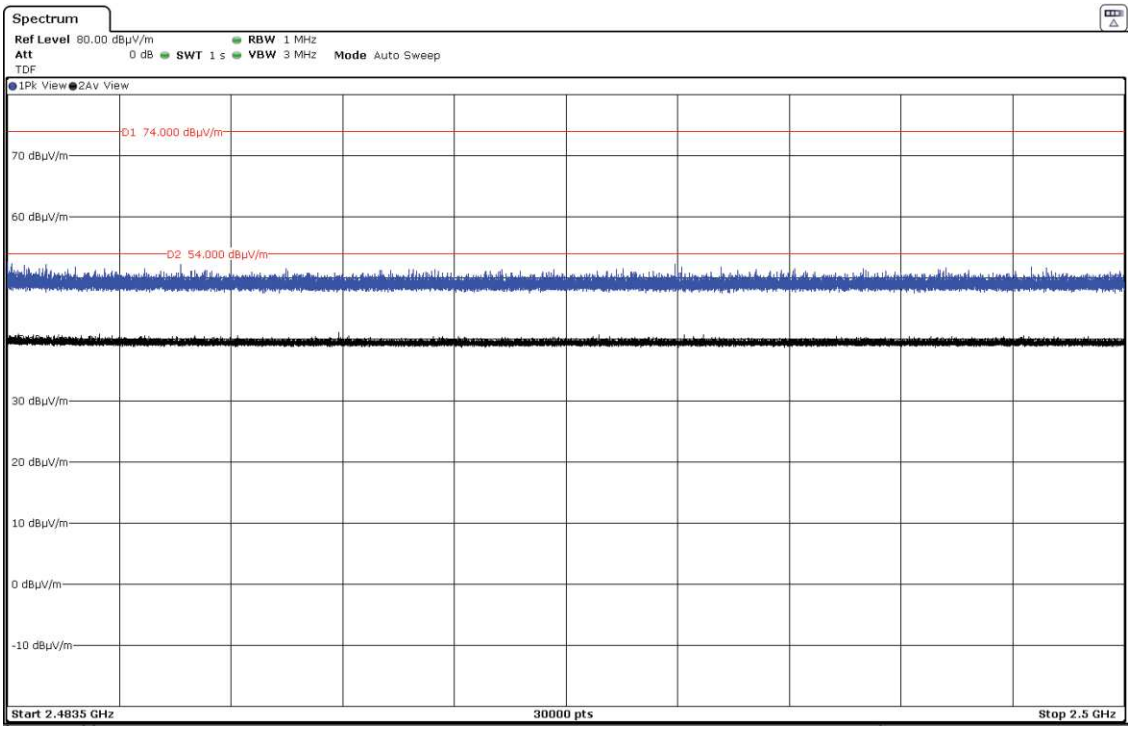
Modulation: 8-DPSK (3DH5)



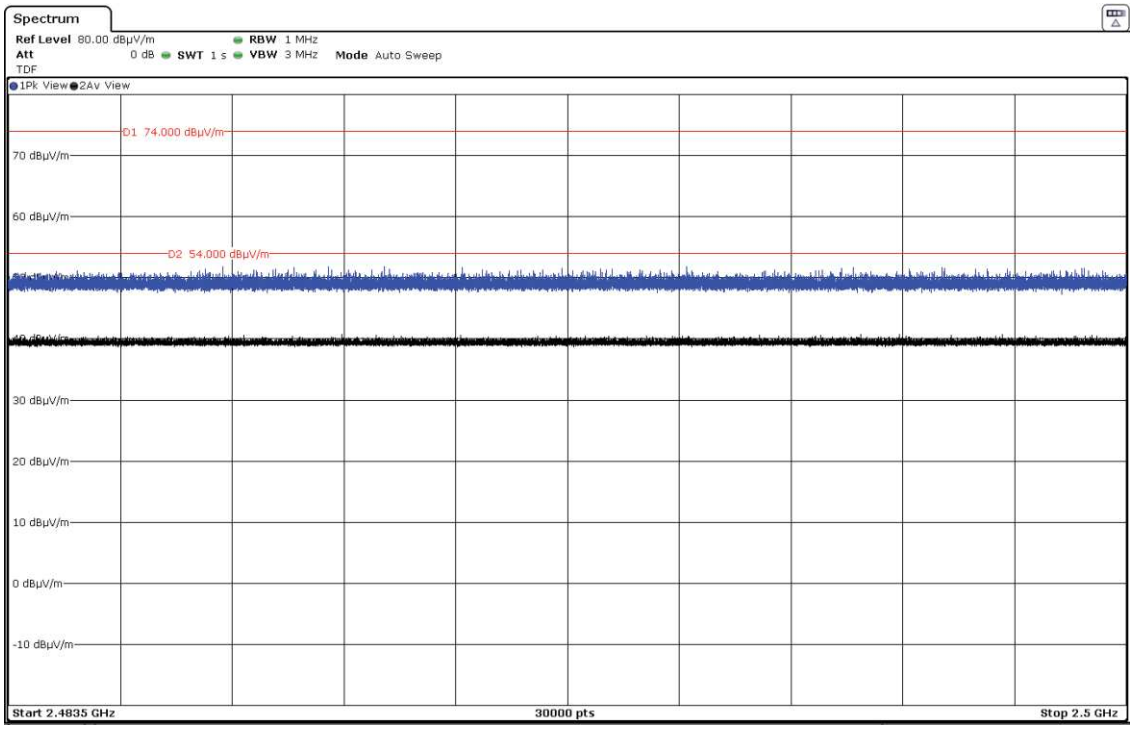
FREQUENCY RANGE 2.4835-2.5 GHz (Restricted Band 2):

CHANNEL: Highest (2480 MHz)

Modulation: GFSK (DH5)



Modulation: Π/4-DQPSK (2DH5)



Modulation: 8-DPSK (3DH5)