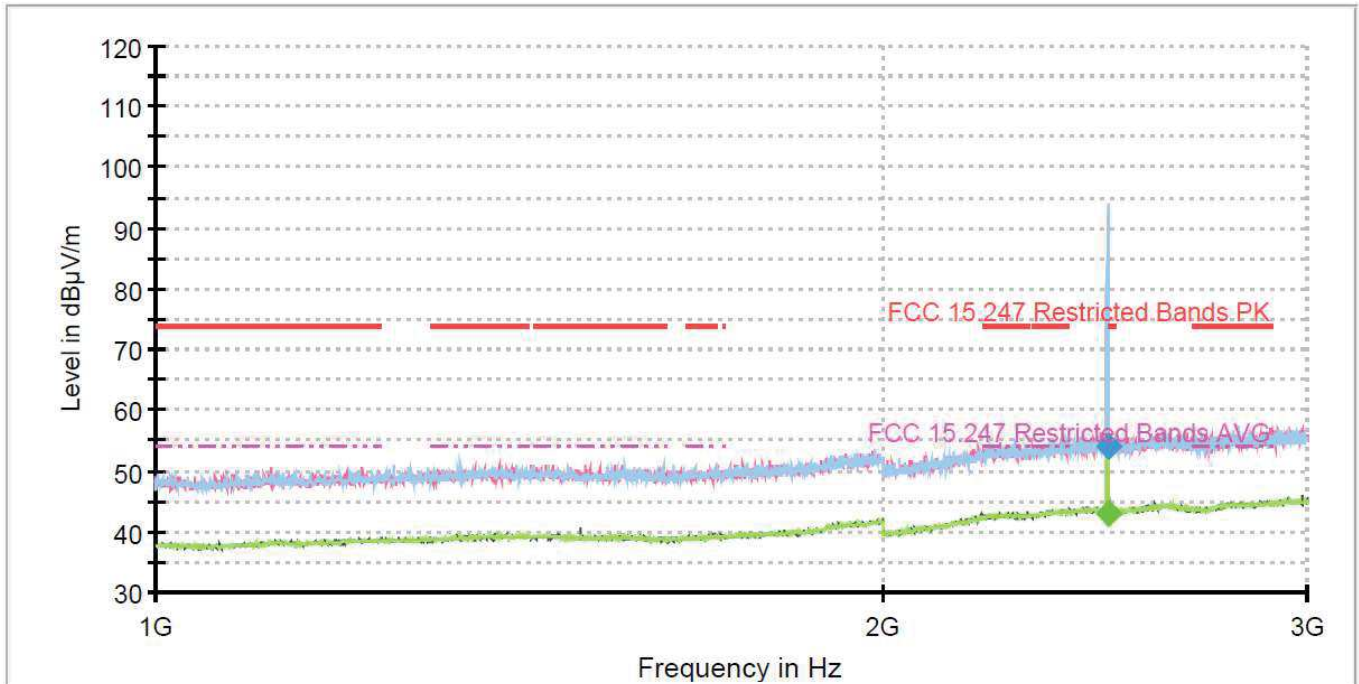


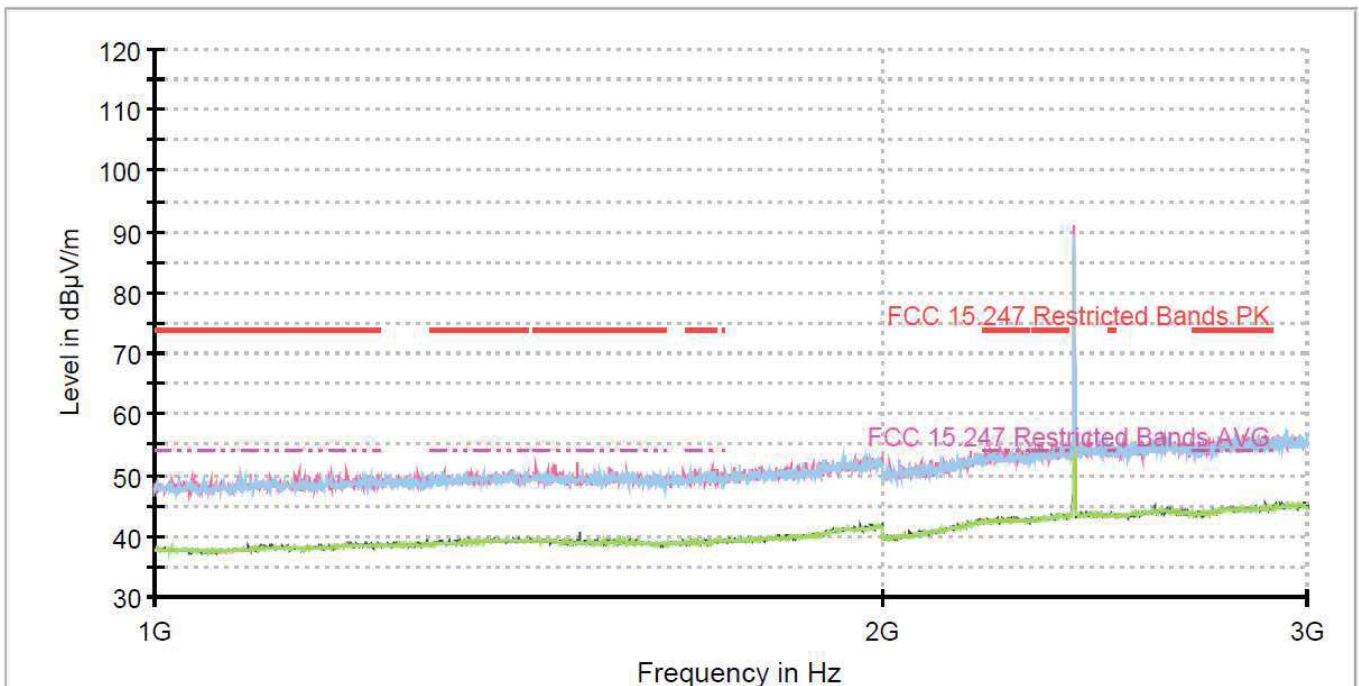
- High Channel:



The peak above the limit is the carrier frequency.

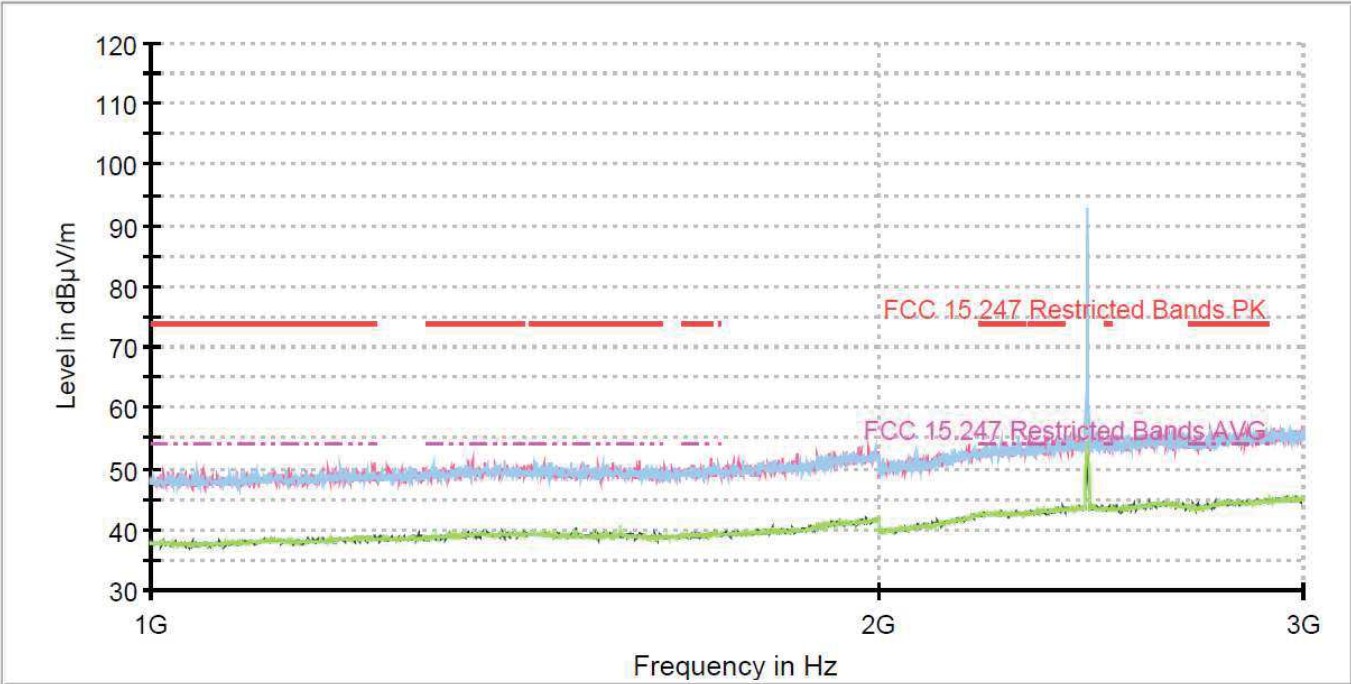
- **Pi/4-DQPSK modulation (2DH5)**

- Low Channel:



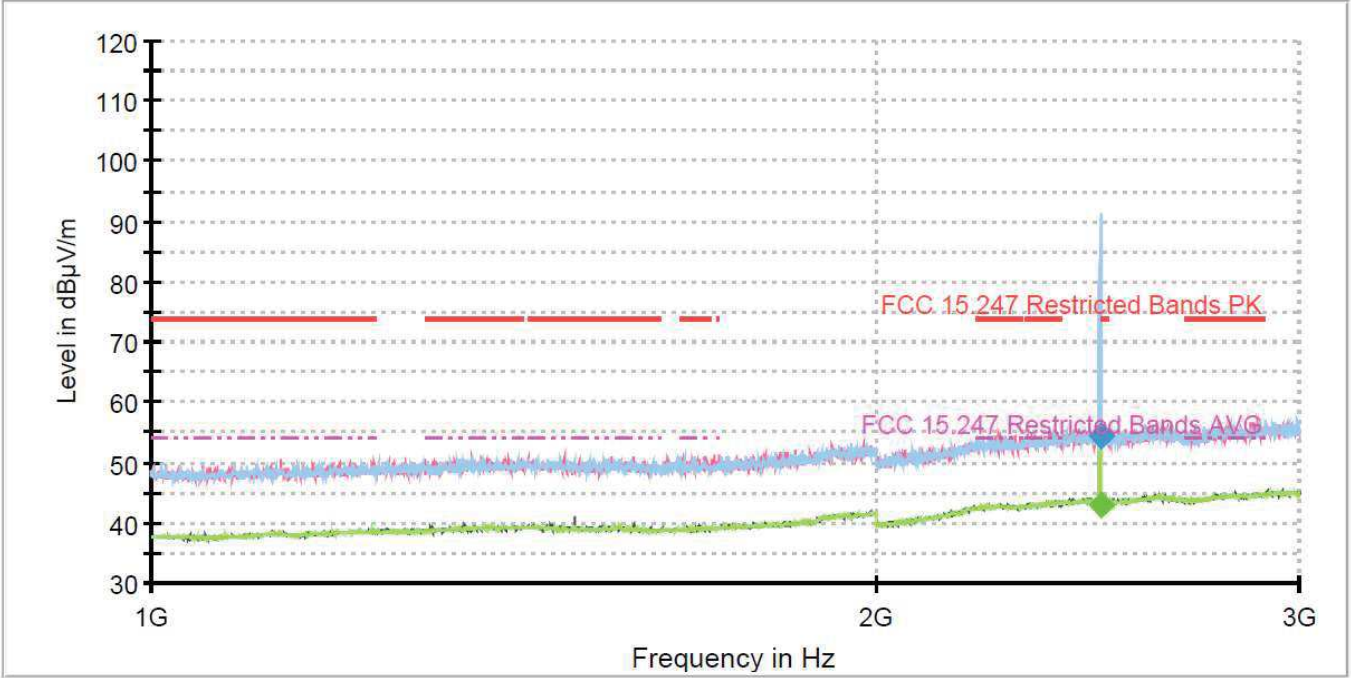
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

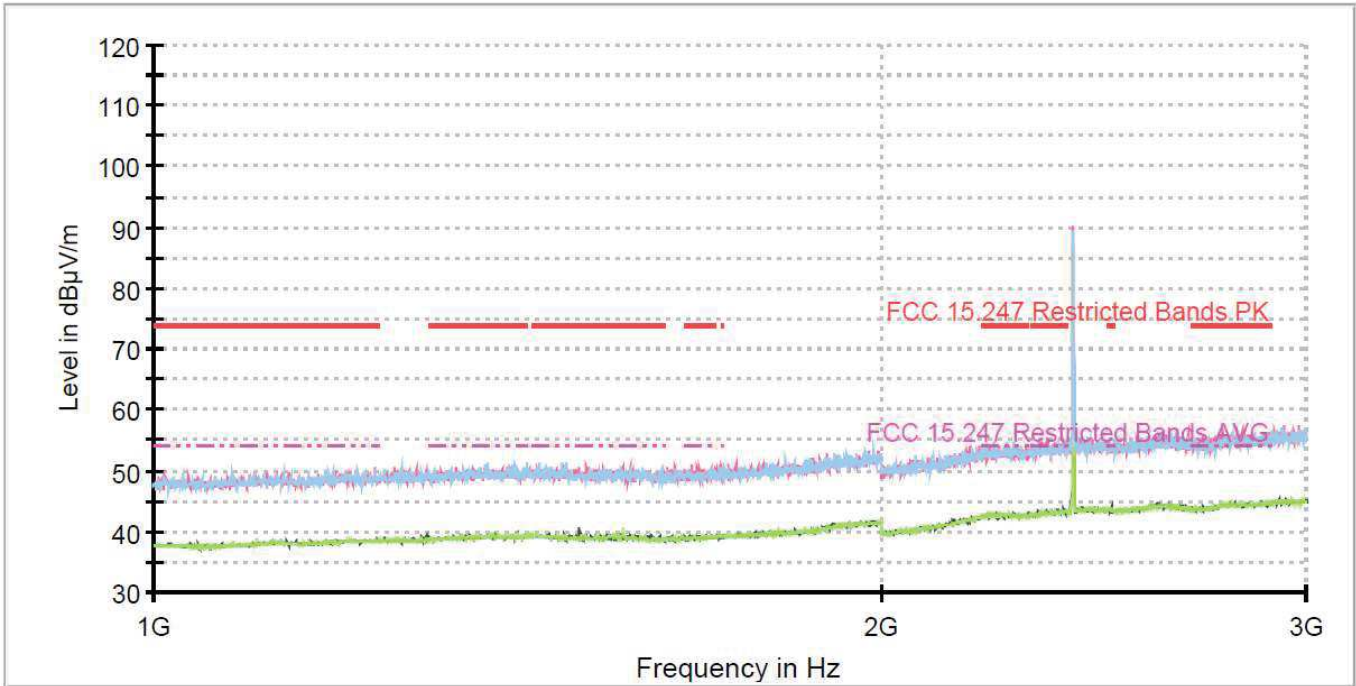
- High Channel:



The peak above the limit is the carrier frequency.

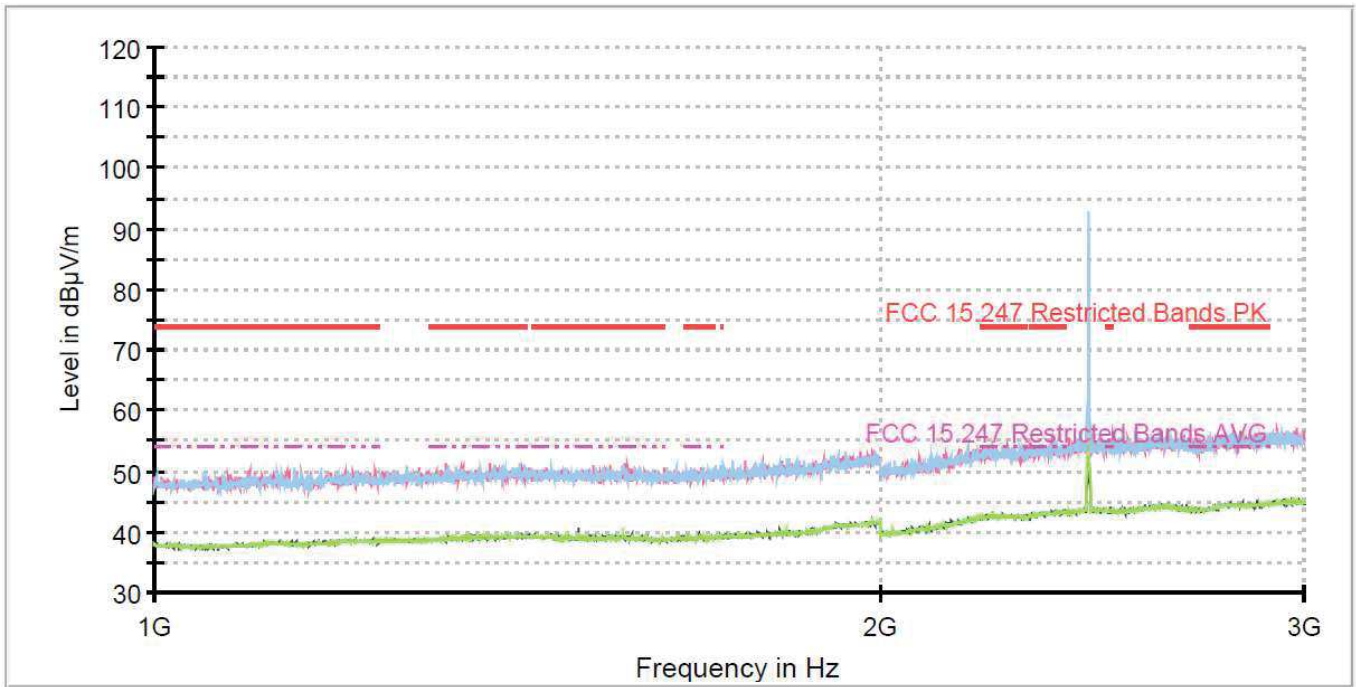
• 8-DPSK modulation (3DH5)

- Low Channel:



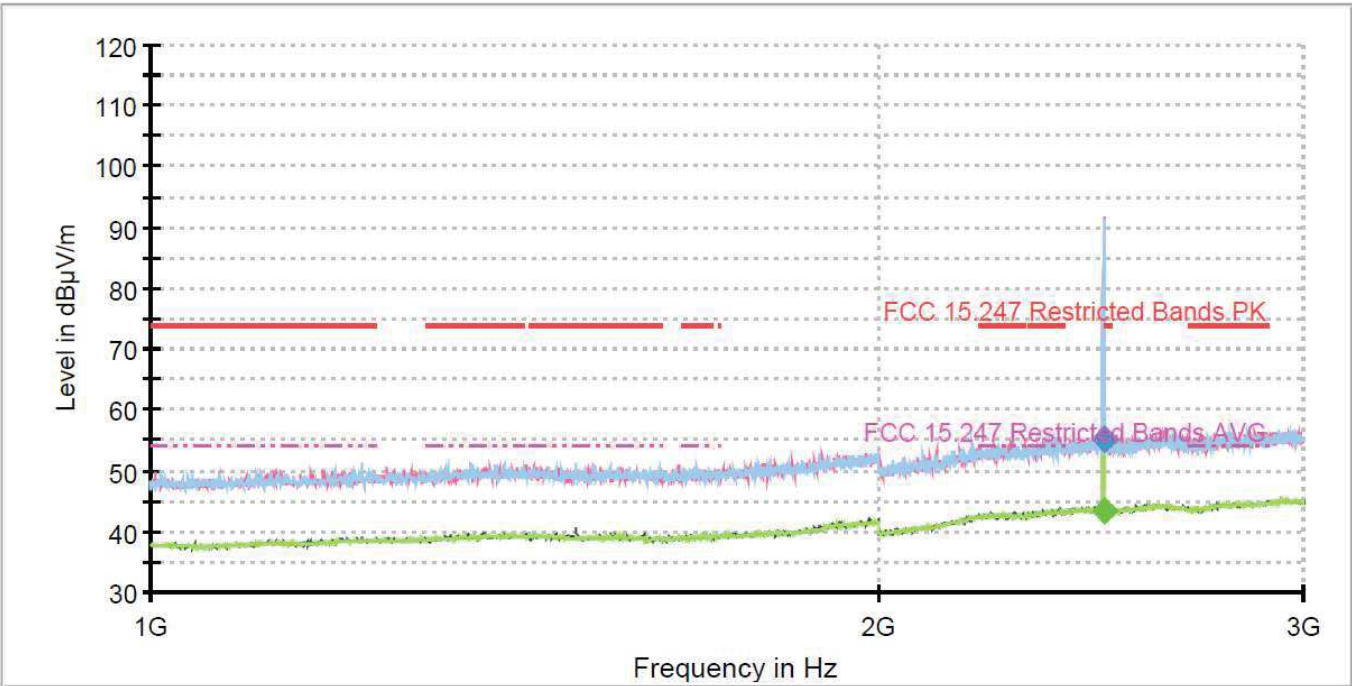
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

- High Channel:

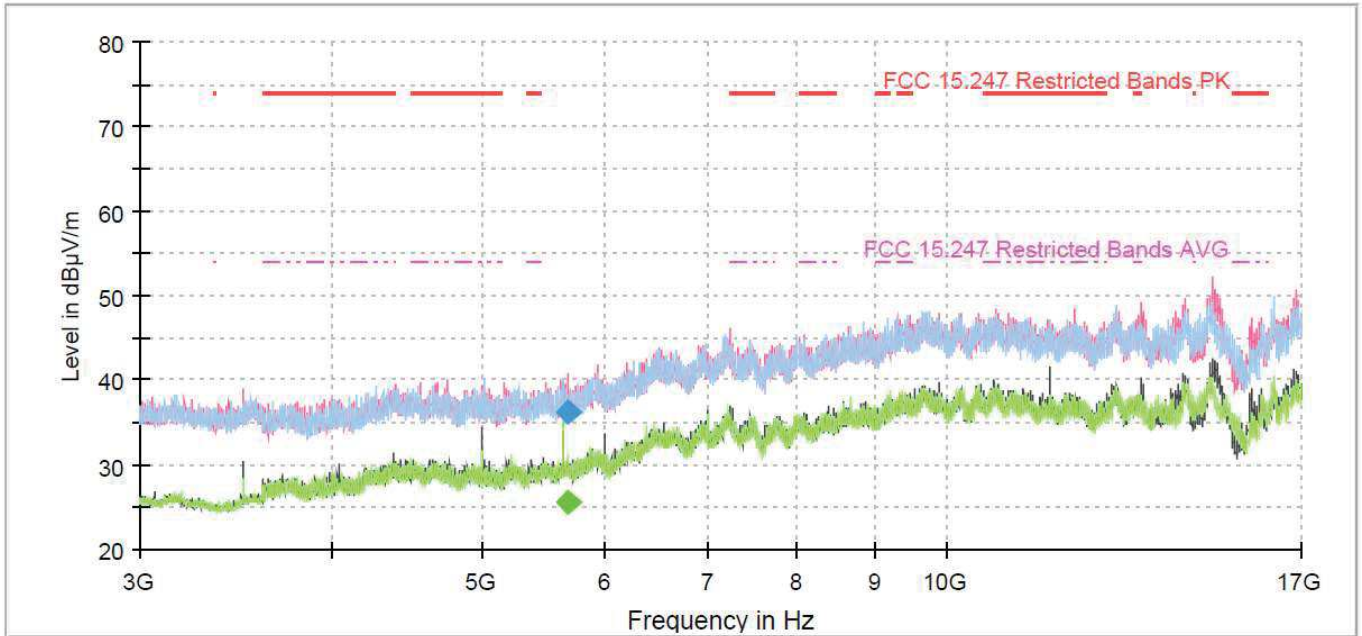


The peak above the limit is the carrier frequency.

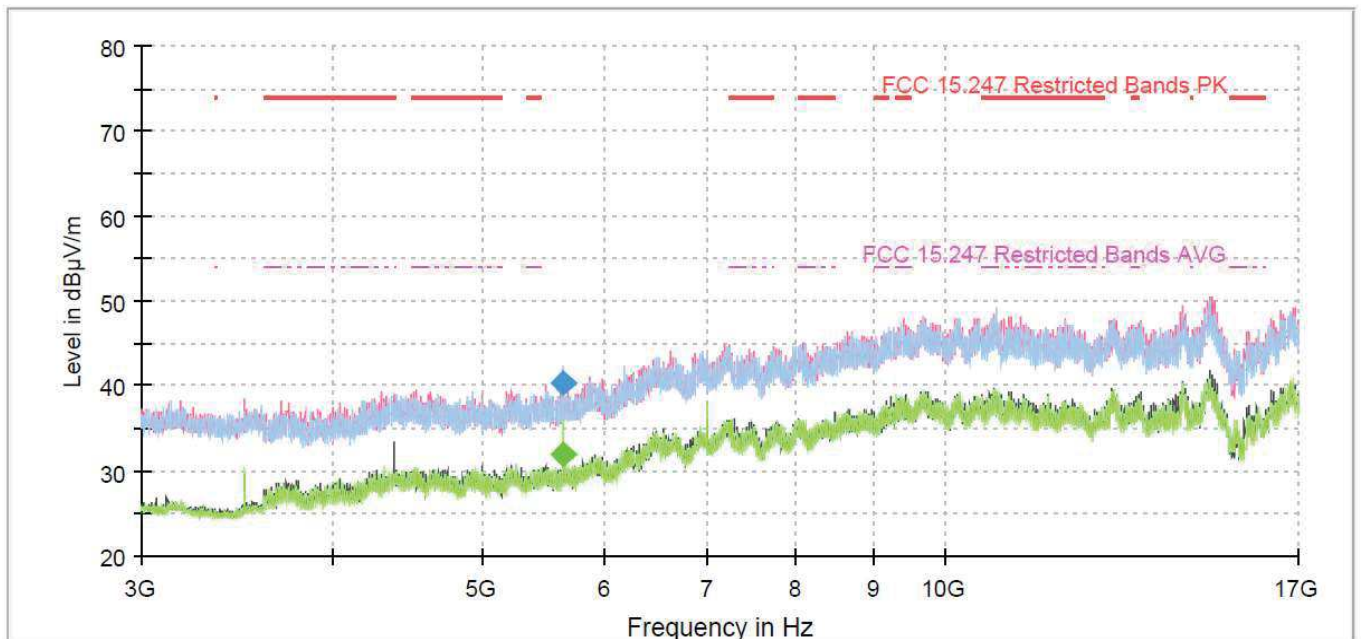
FREQUENCY RANGE 3 - 17 GHz:

- **GFSK modulation (DH5)**

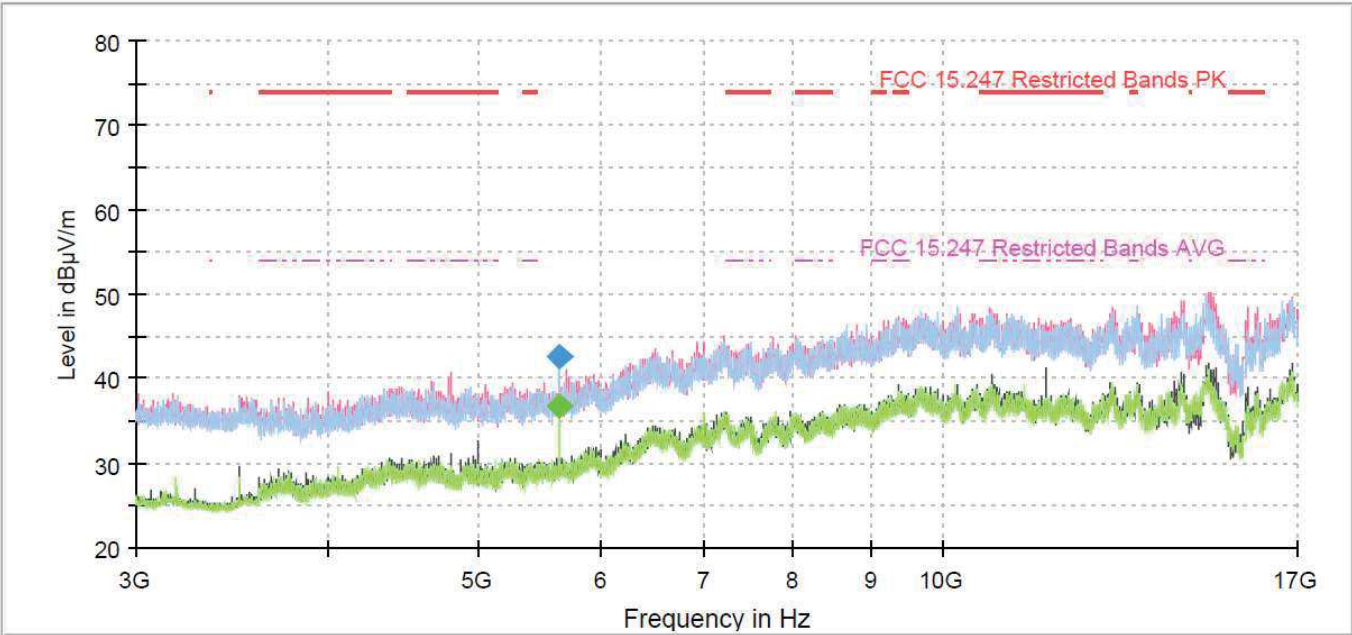
- Low Channel:



- Middle Channel:

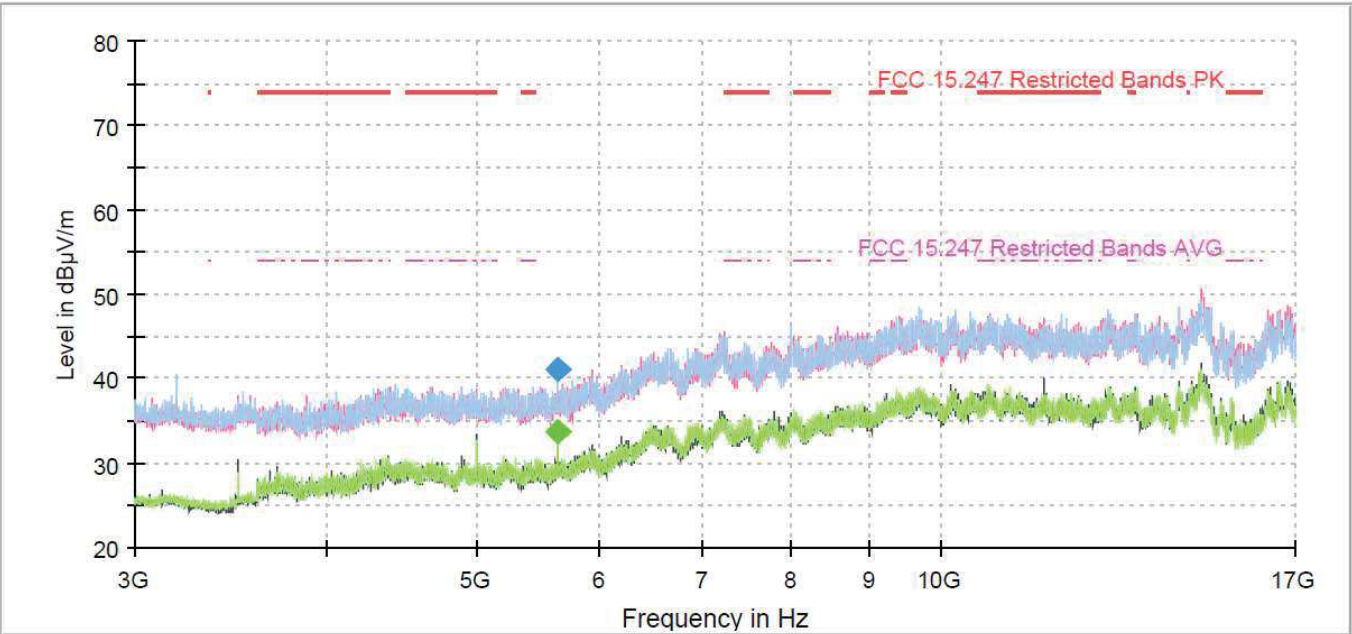


- High Channel:

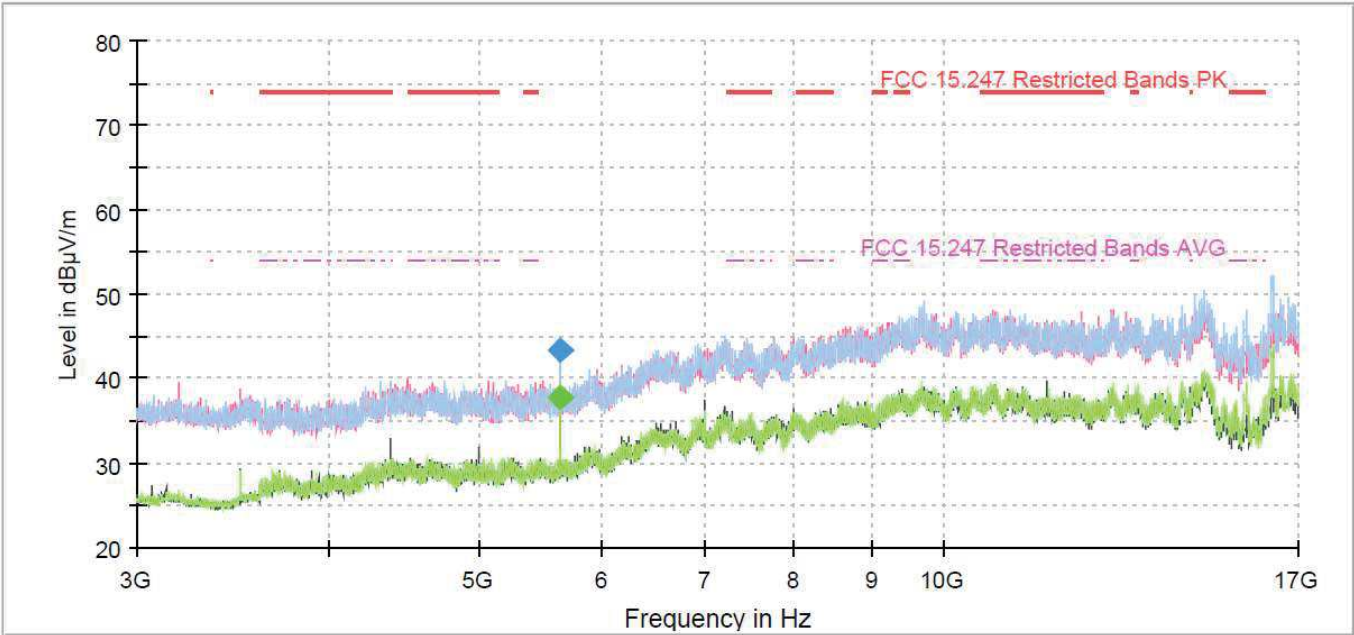


• Pi/4-DQPSK modulation (2DH5)

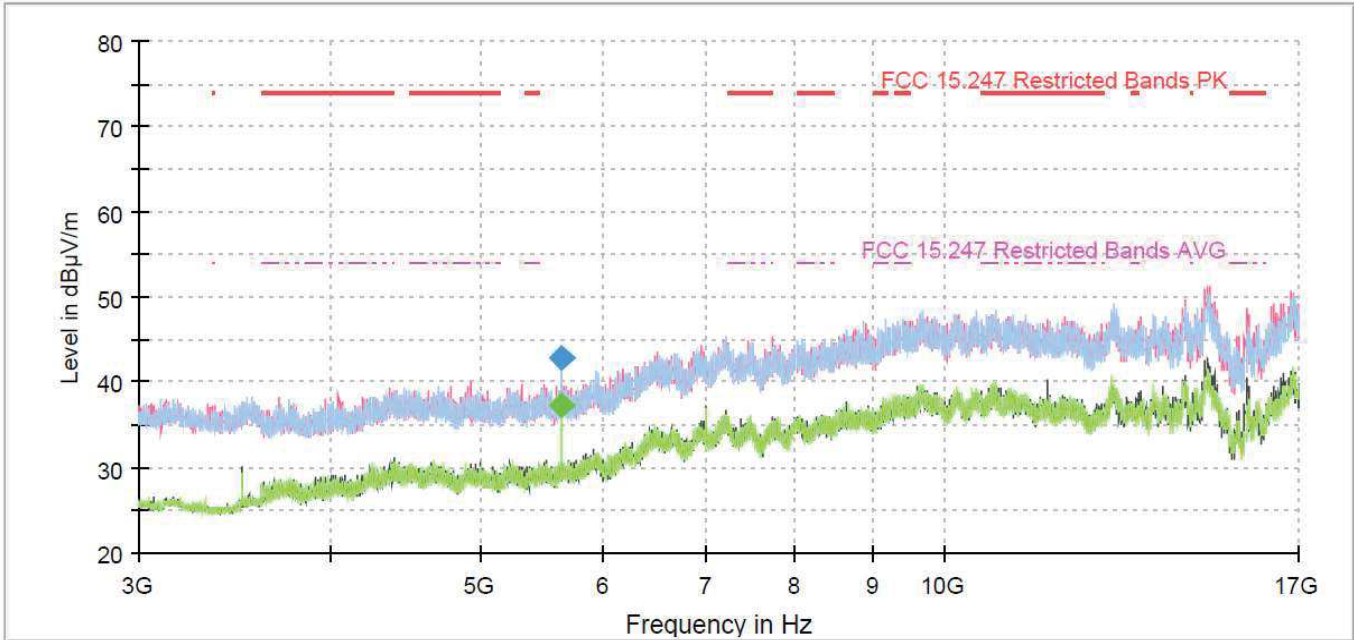
- Low Channel:



- Middle Channel:

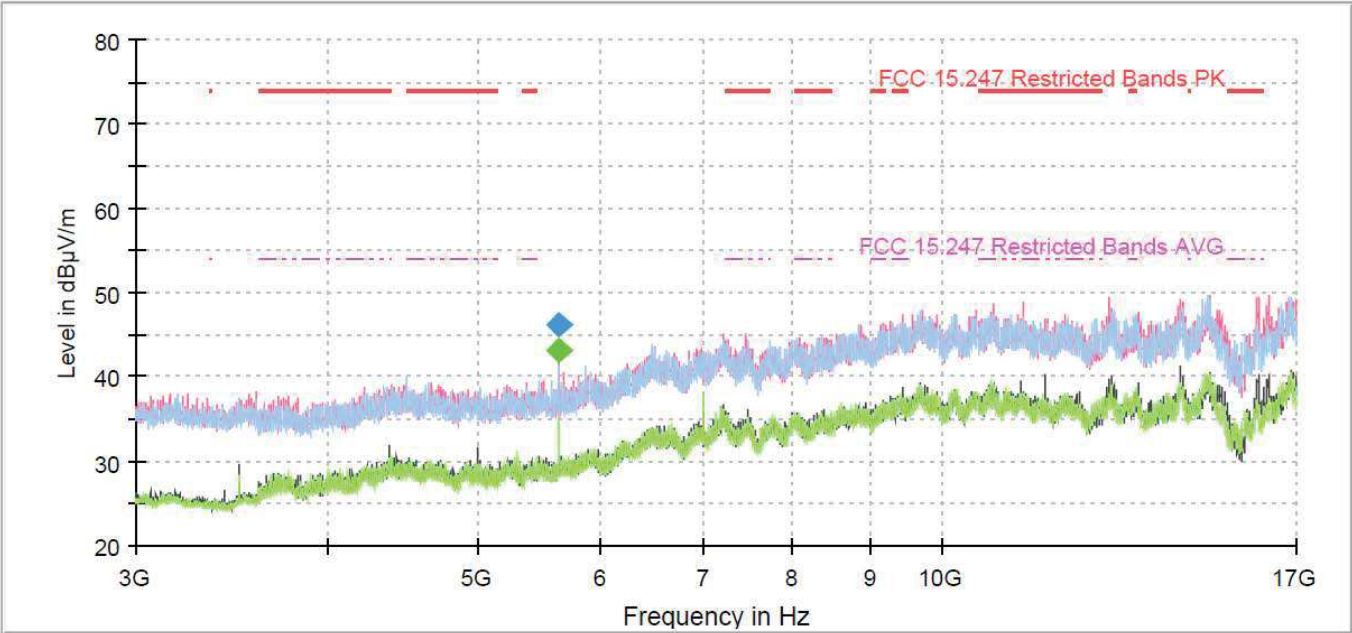


- High Channel:

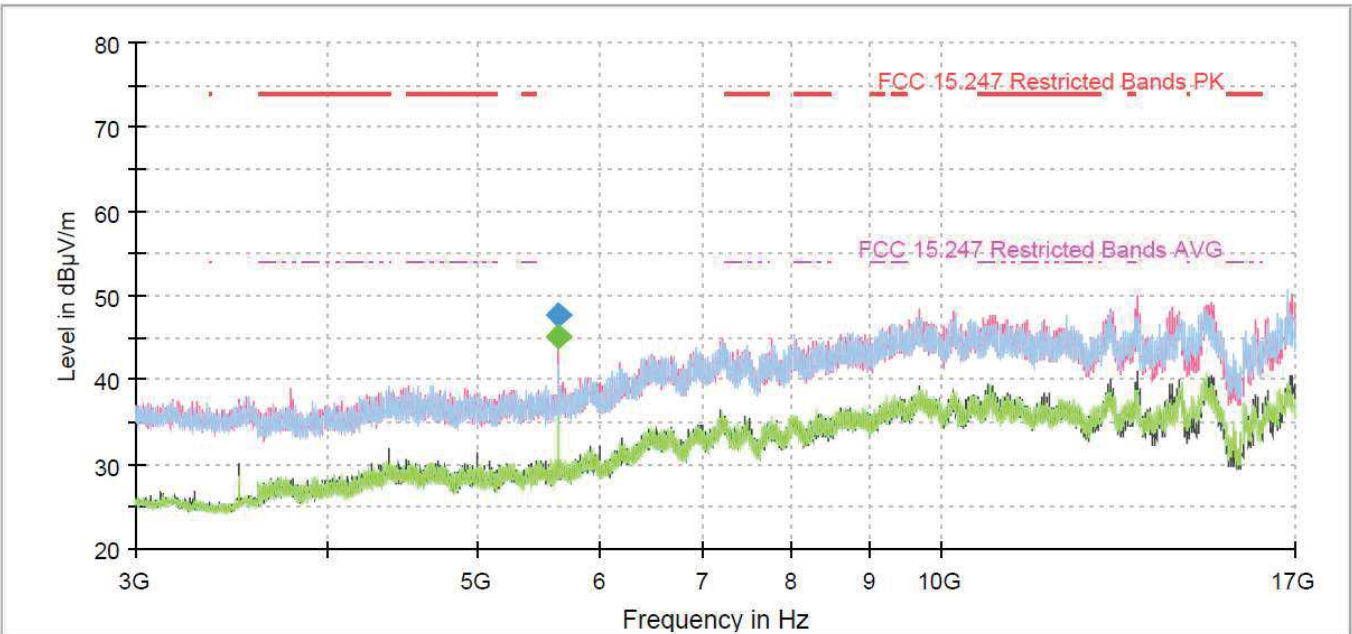


• 8-DPSK modulation (3DH5)

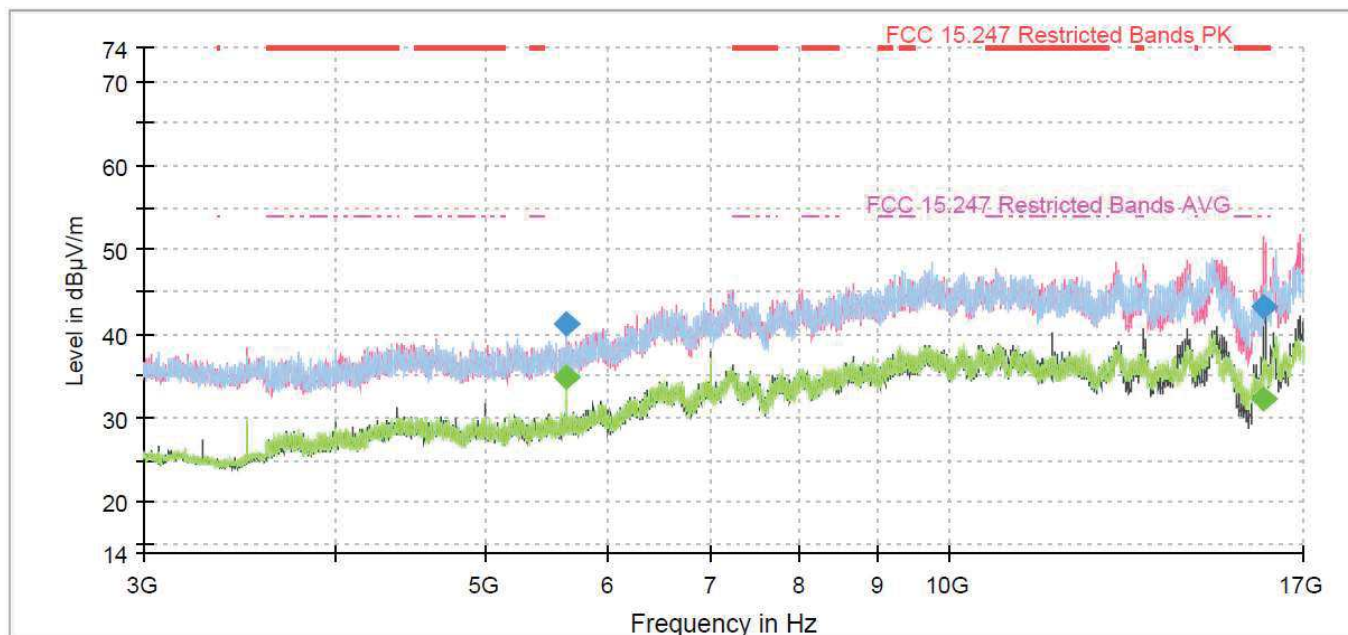
- Low Channel:



- Middle Channel:

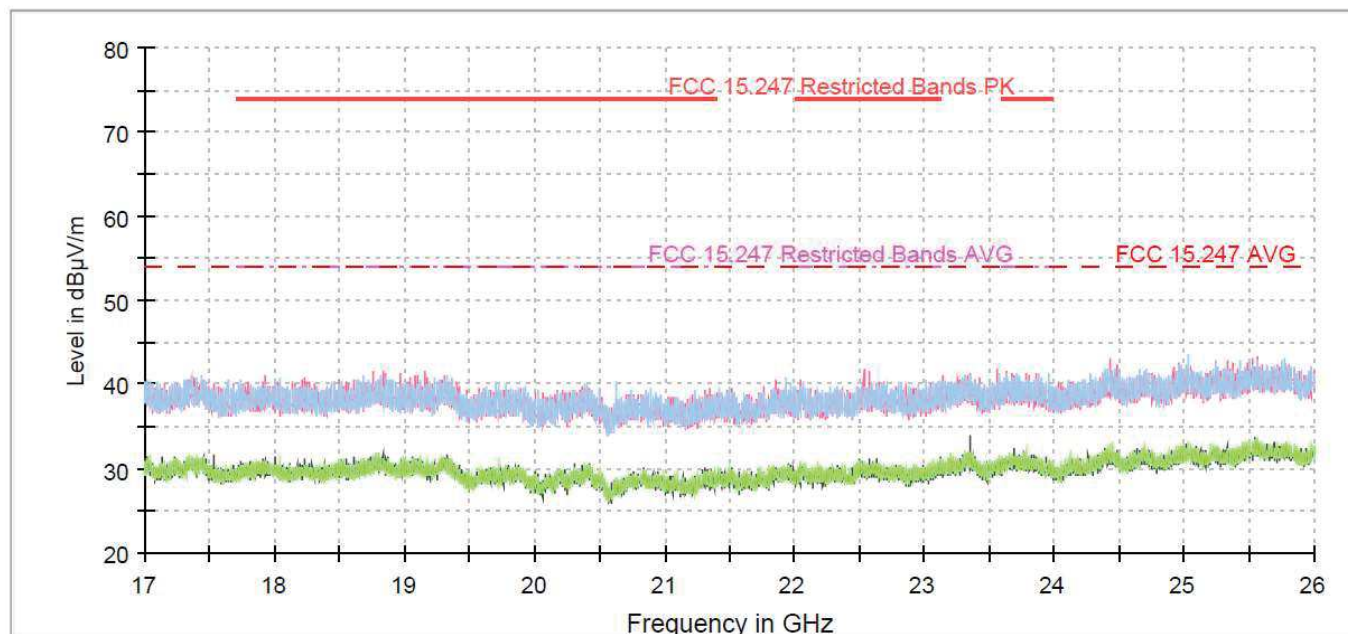


- High Channel:



FREQUENCY RANGE 17 - 26 GHz:

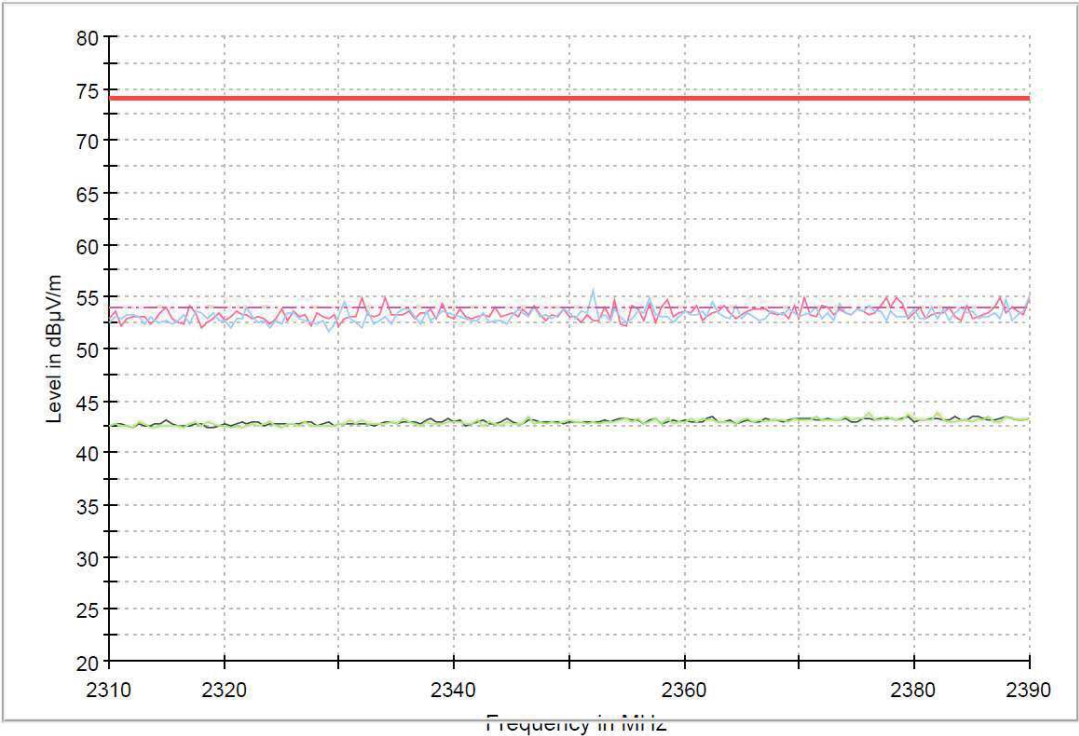
This plot is valid for the Low, Middle and High Channels and all the modulation modes.



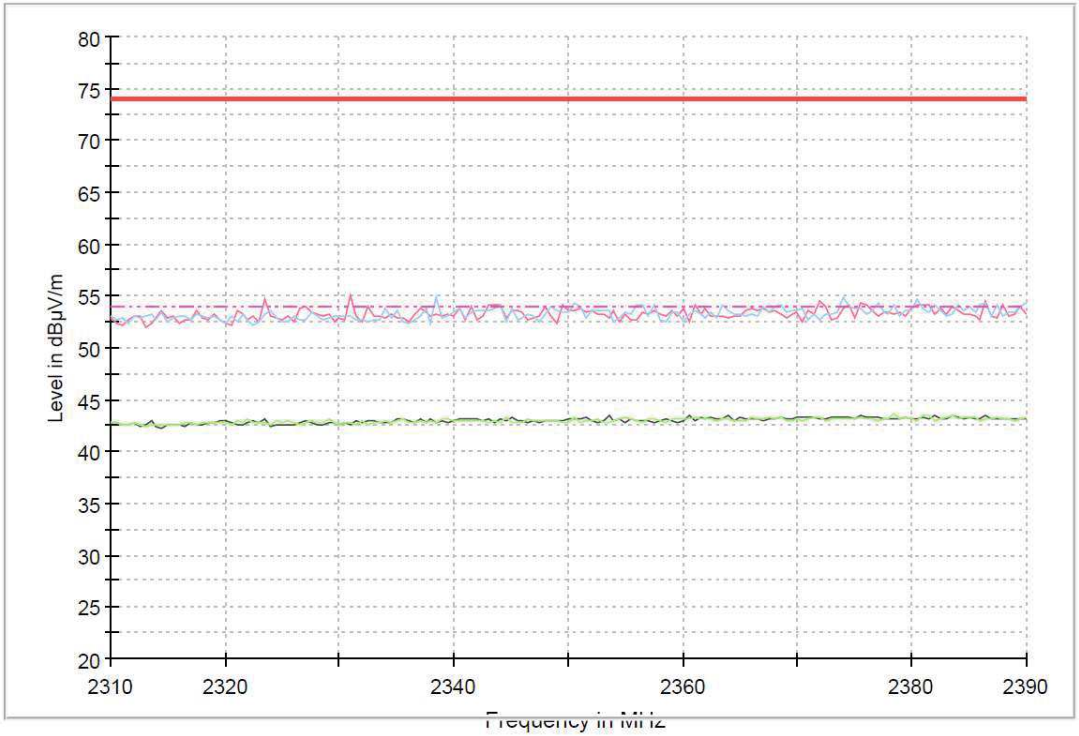
FREQUENCY RANGE 2.31-2.39 GHz:

- GFSK modulation (DH5)

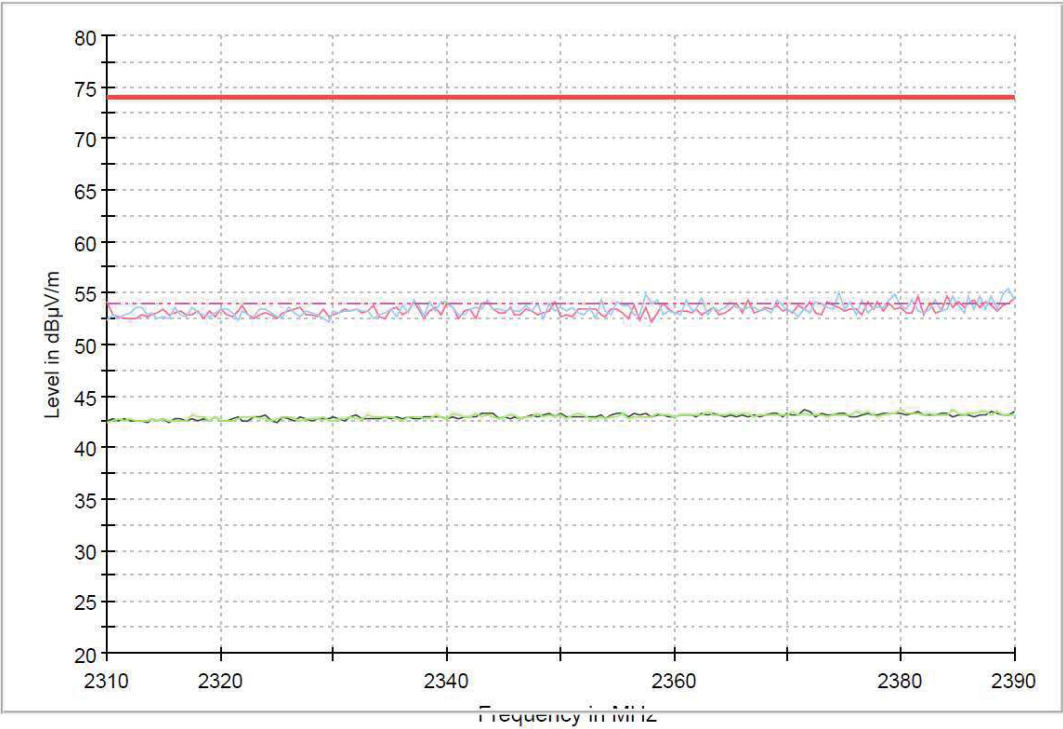
- Low Channel:



- Middle Channel:

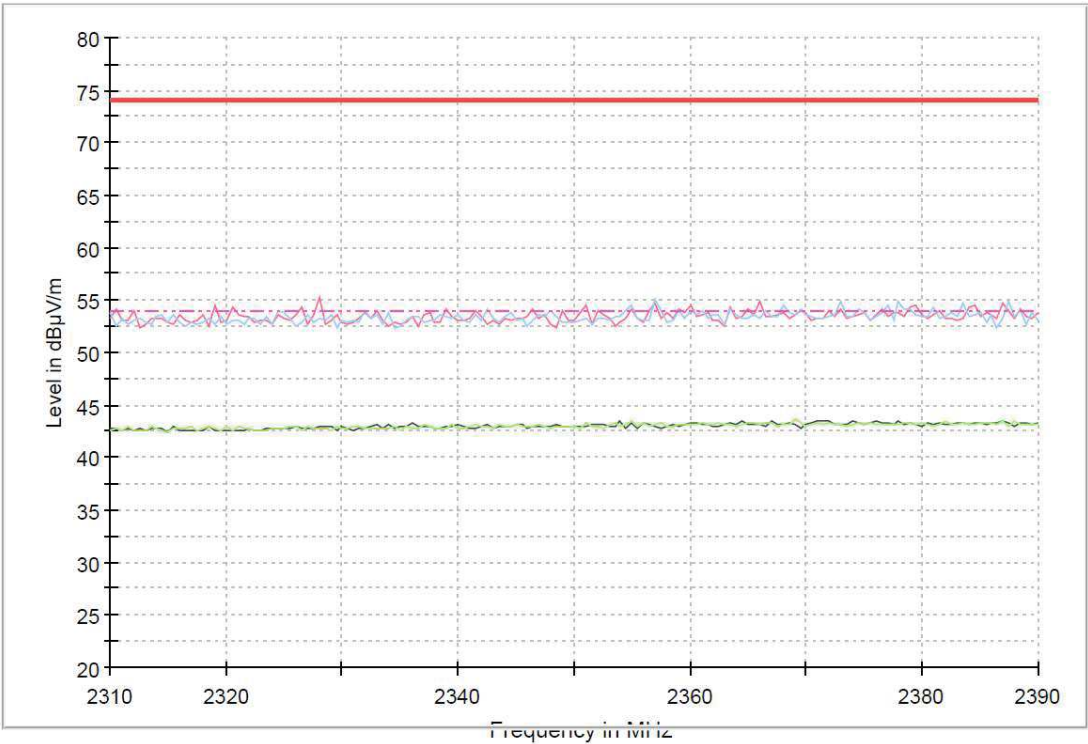


- High Channel:

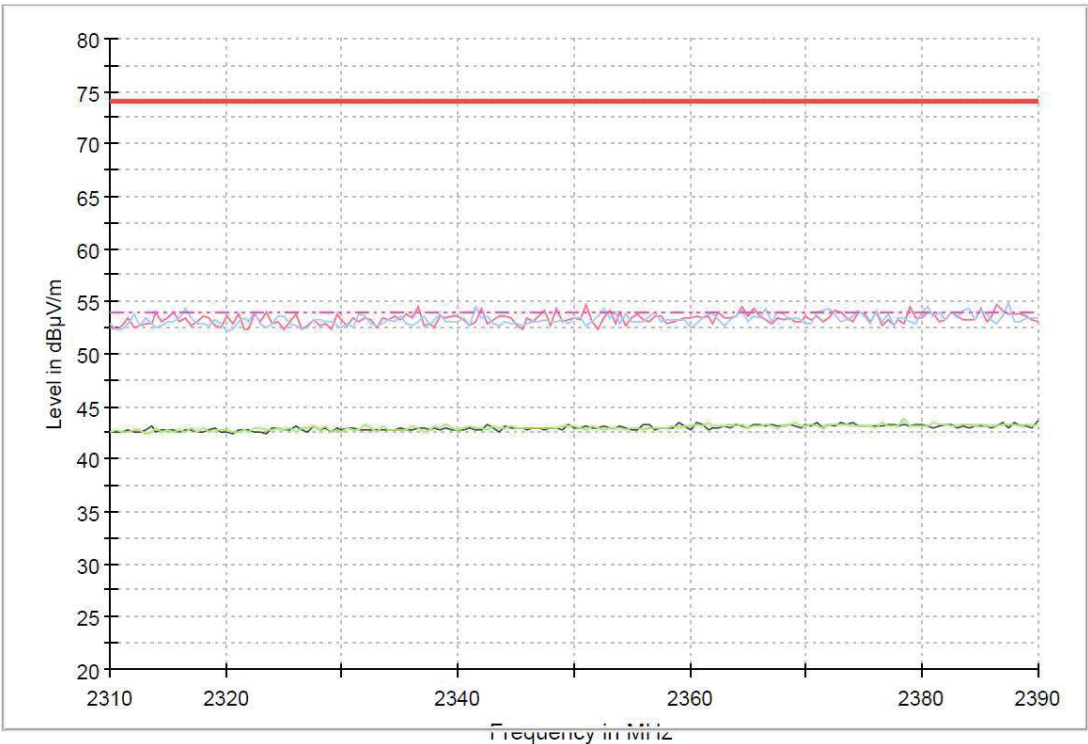


• **PI/4-DQPSK modulation (2DH5)**

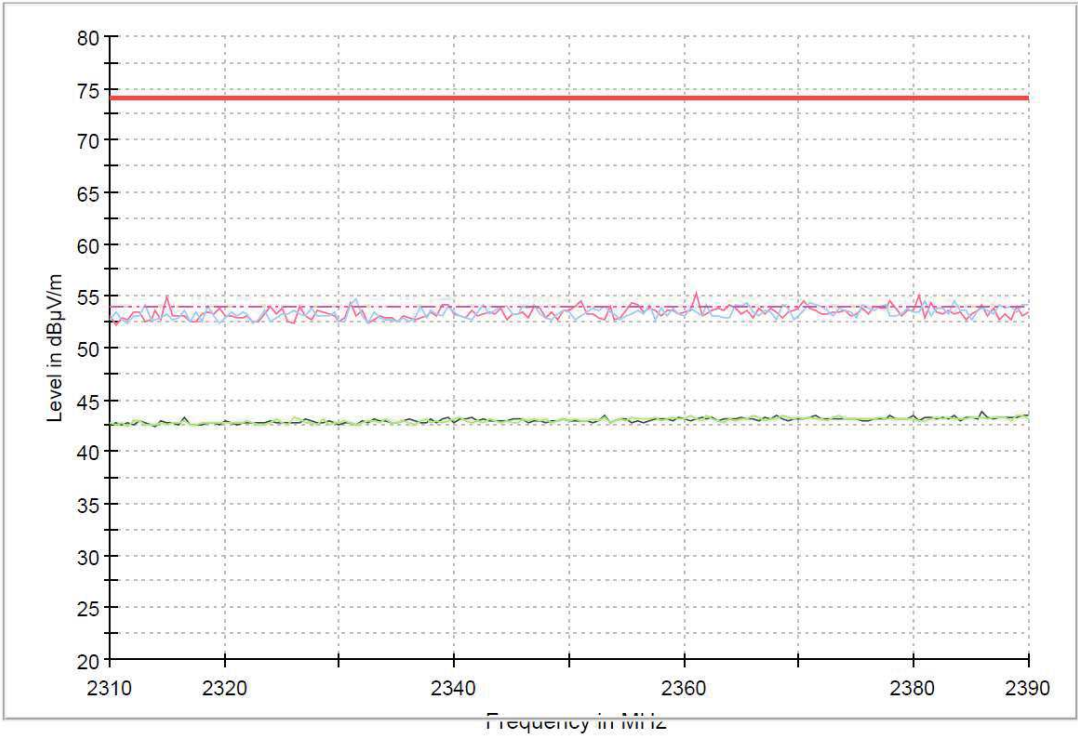
- Low Channel:



- Middle Channel:

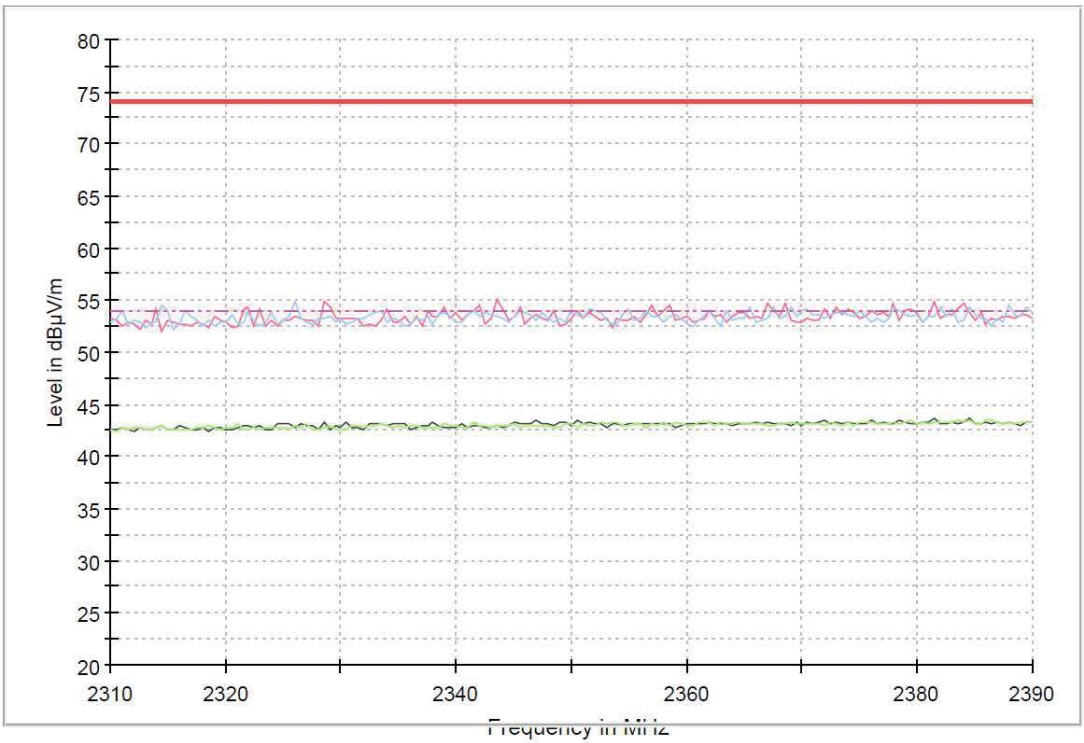


- High Channel:

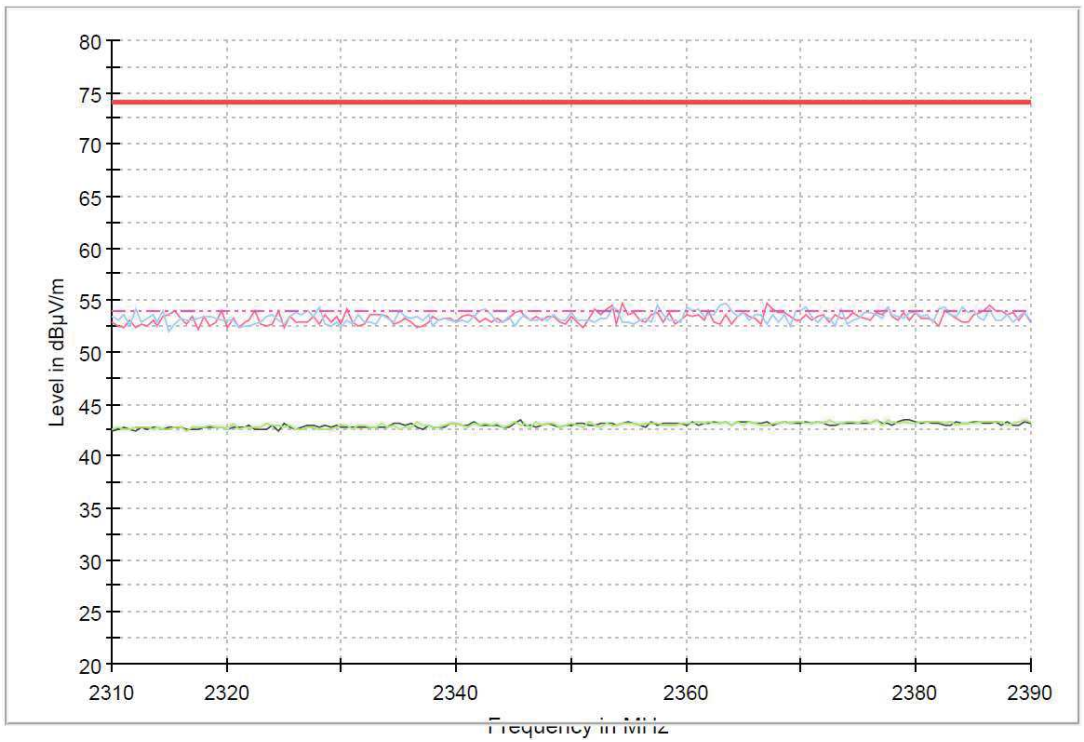


• 8-DPSK modulation (3DH5)

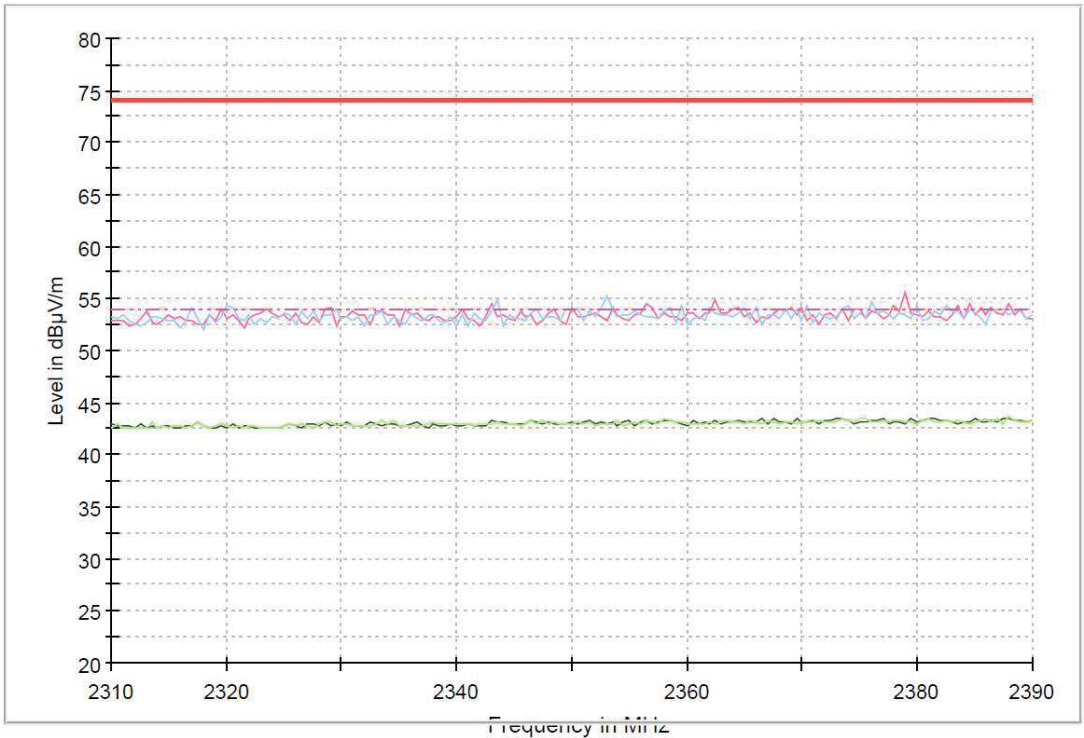
- Low Channel:



- Middle Channel:



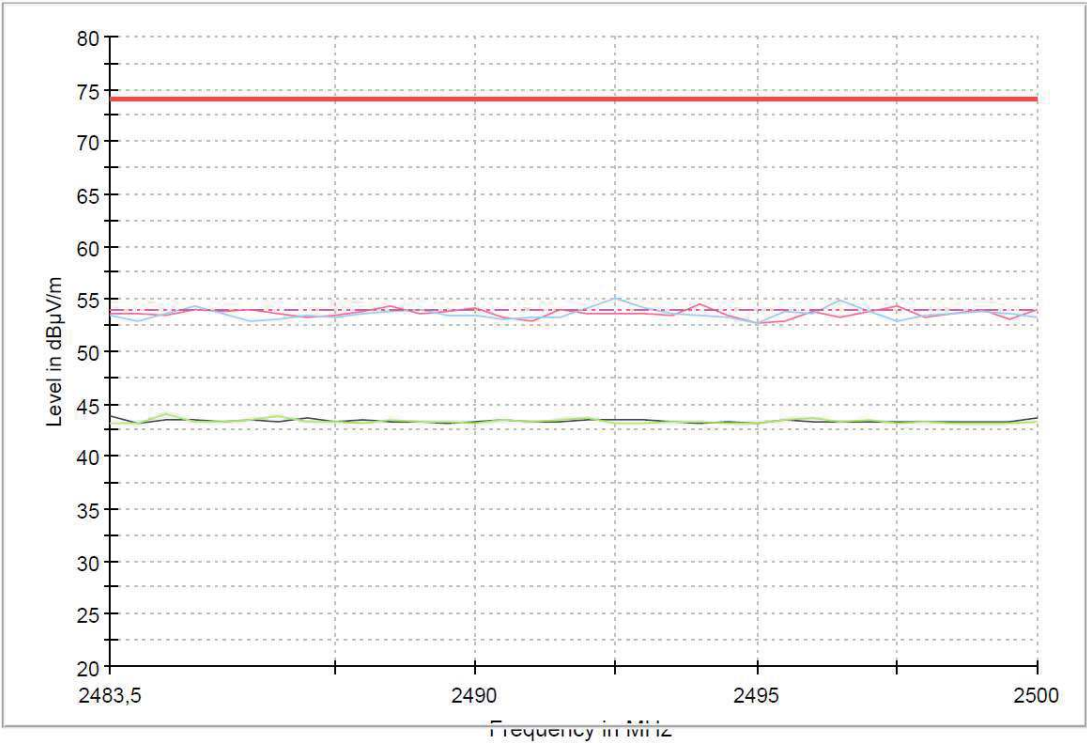
- High Channel:



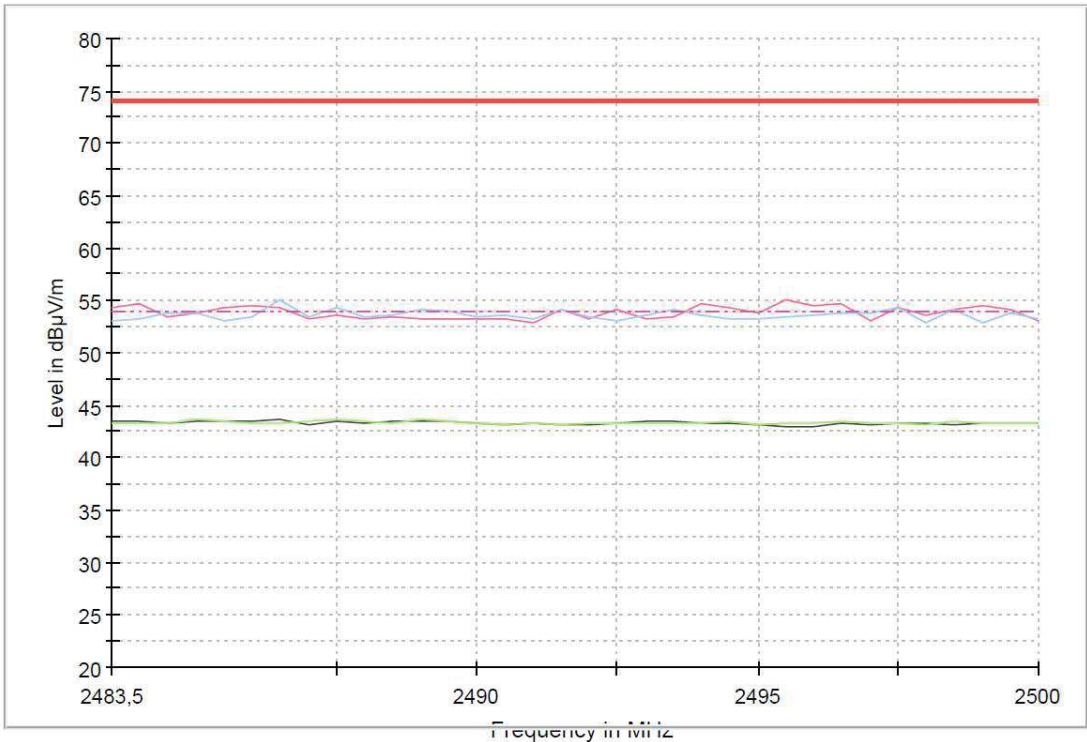
FREQUENCY RANGE 2.4835-2.5 GHz:

- GFSK modulation (DH5)

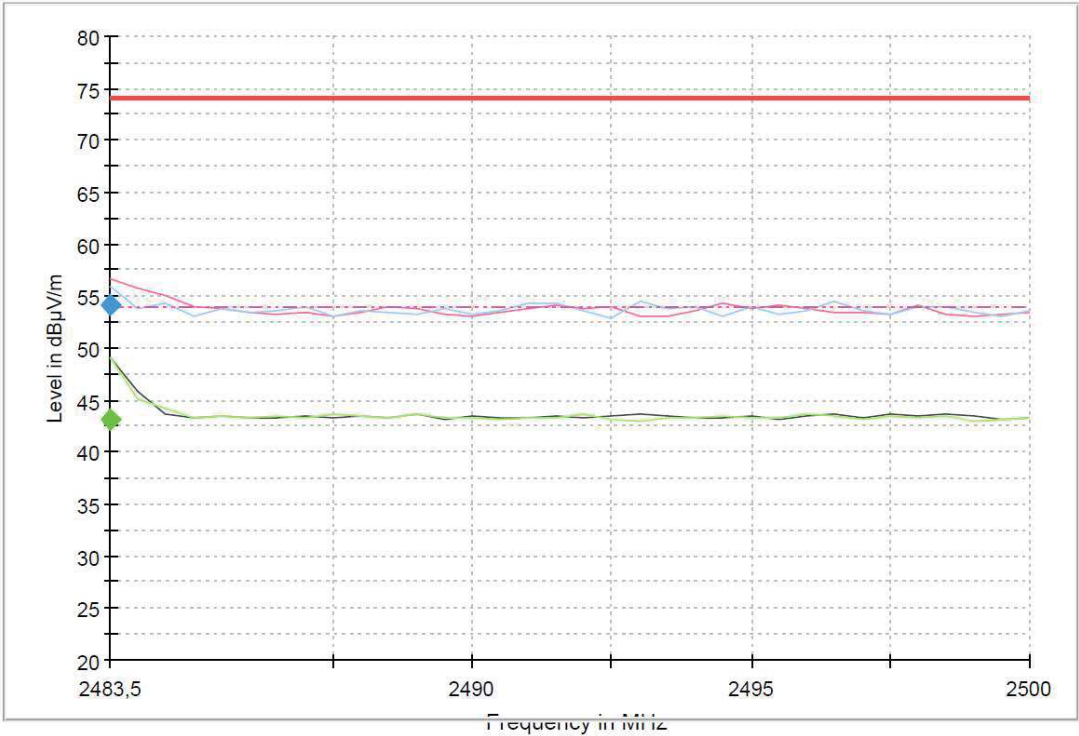
- Low Channel:



- Middle Channel:

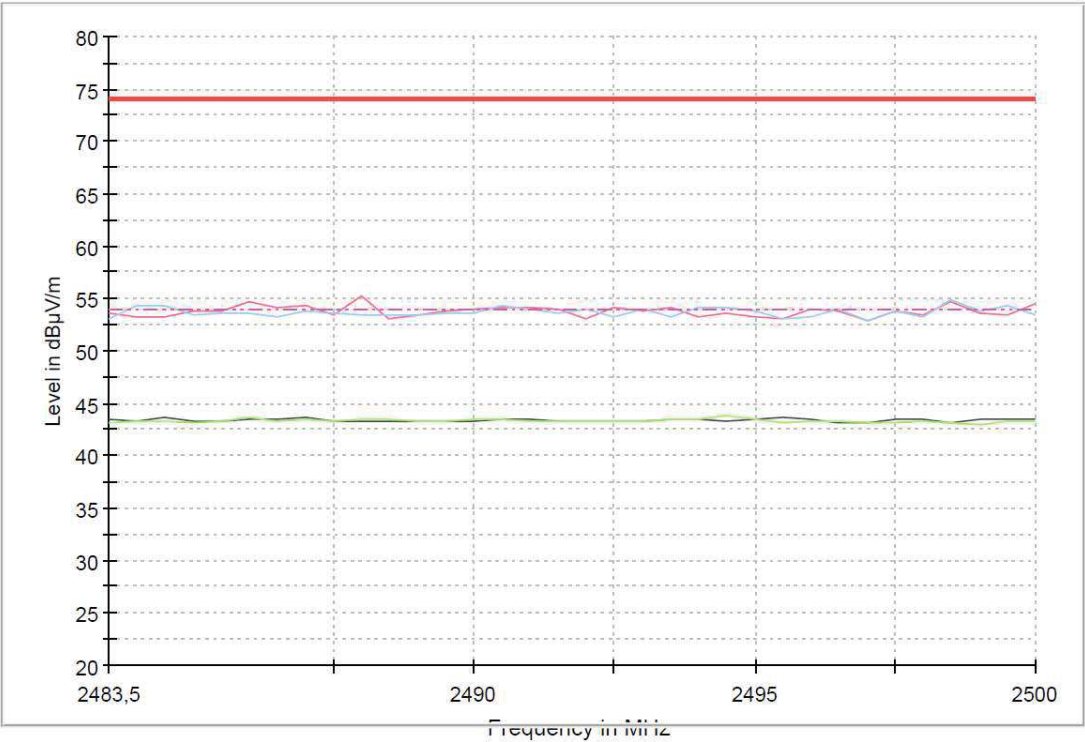


- High Channel:

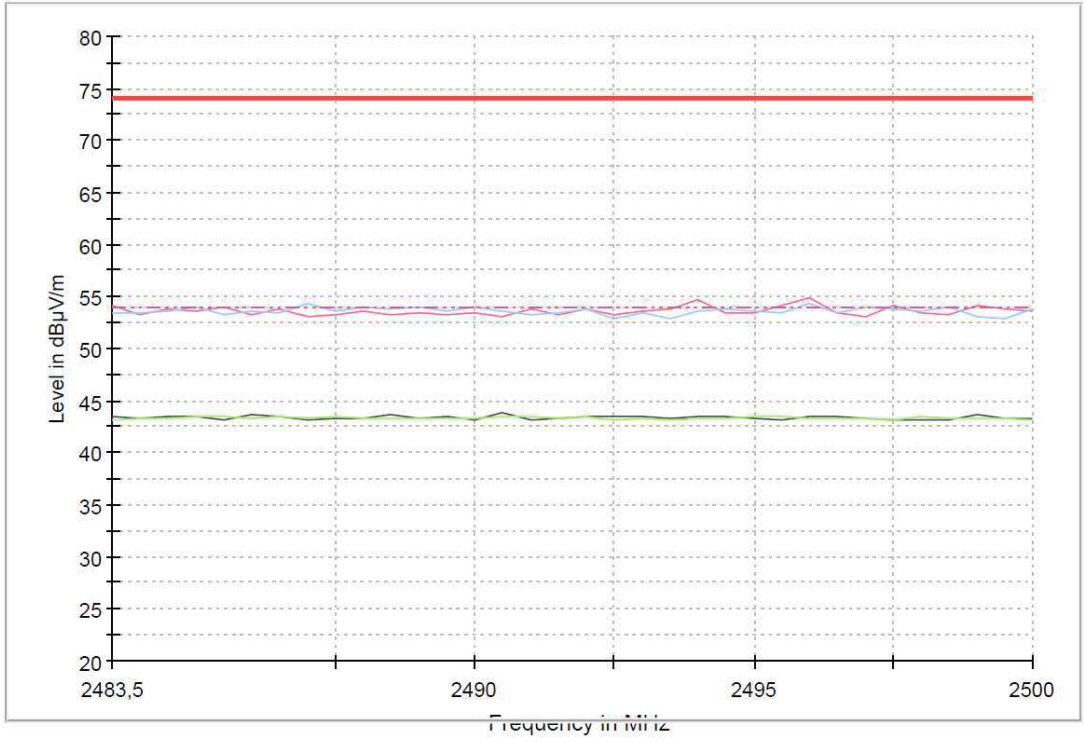


• **PI/4-DQPSK modulation (2DH5)**

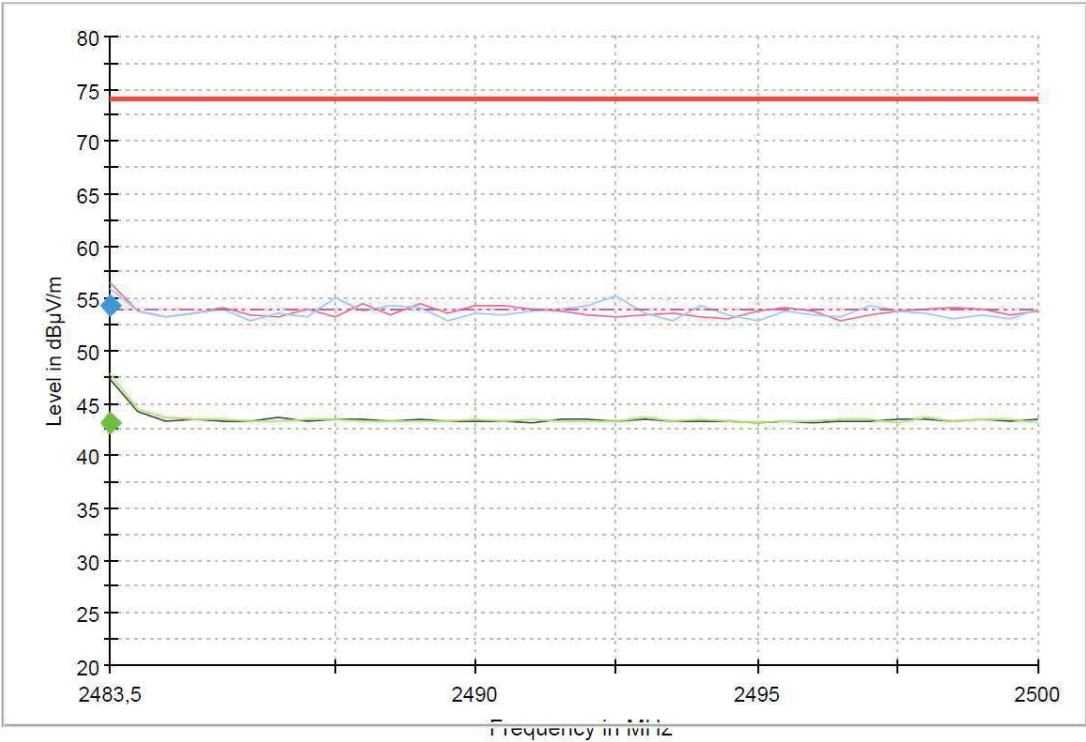
- Low Channel:



- Middle Channel:

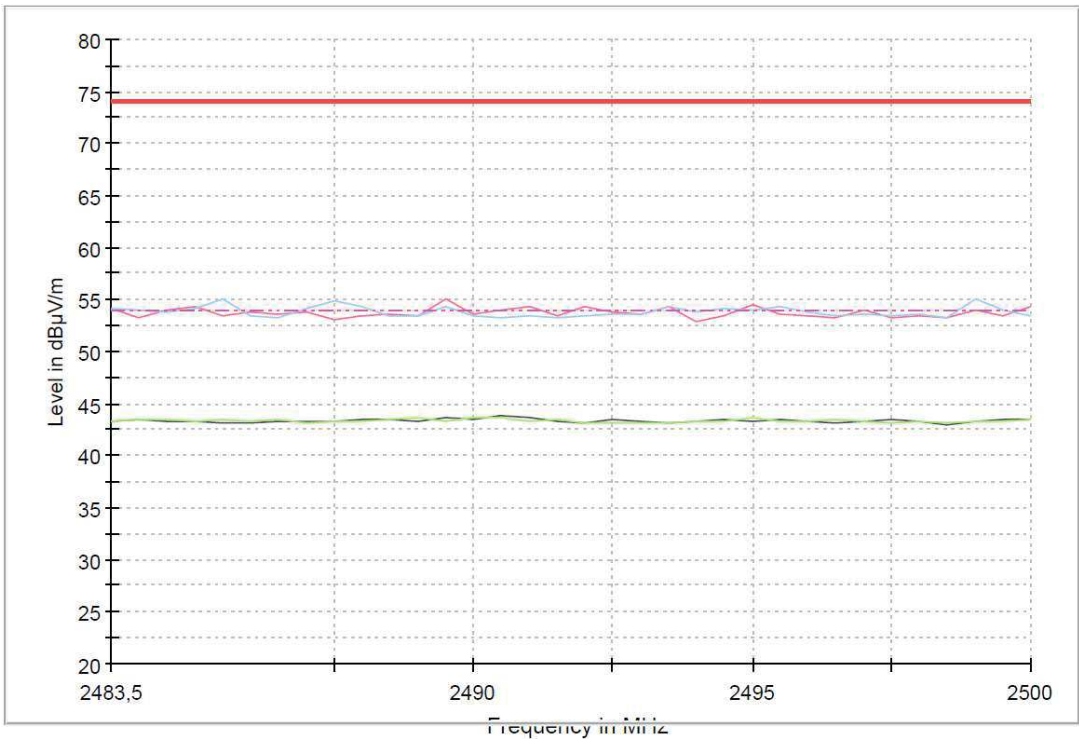


- High Channel:

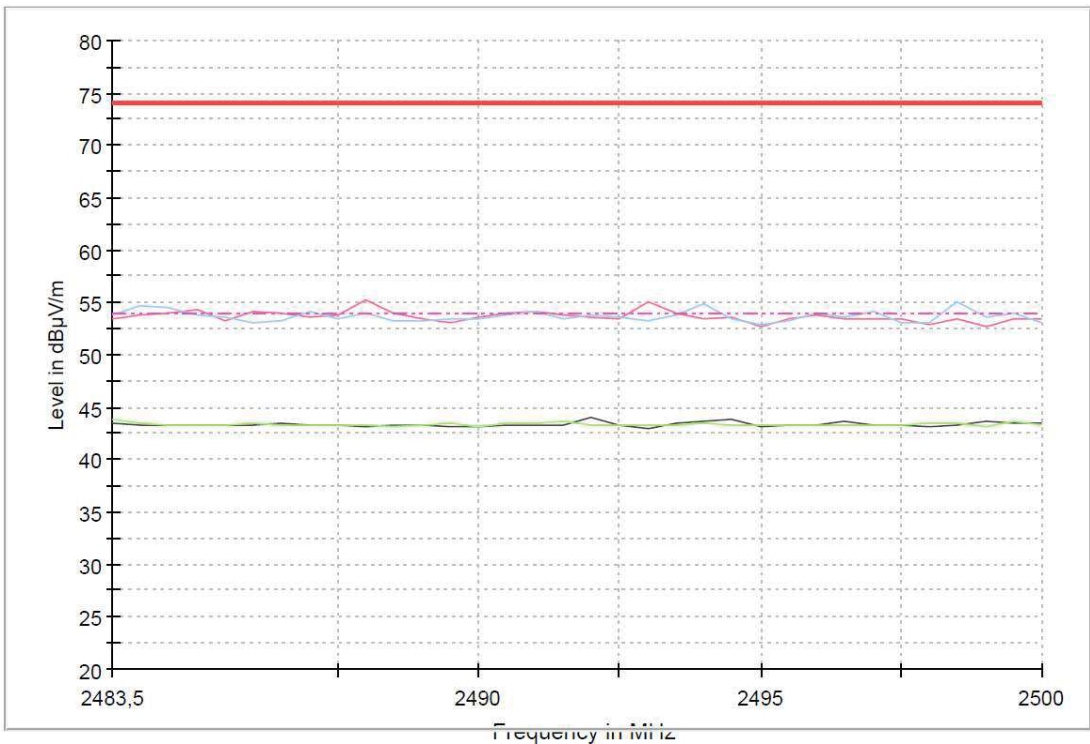


• 8-DPSK modulation (3DH5)

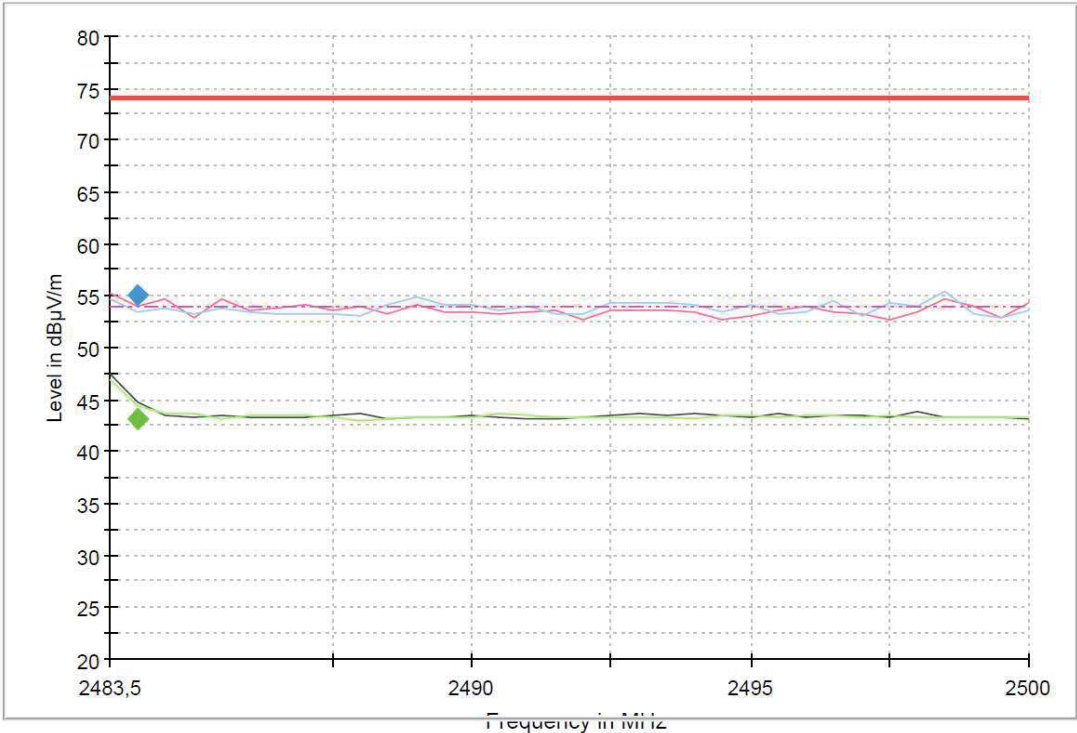
- Low Channel:



- Middle Channel:



- High Channel:



Appendix B: Test results. 802.11 bgn20 2x2

TEST CONDITIONS

POWER SUPPLY (V):

V nominal:	12 Vdc
Type of Power Supply:	DC voltage from external power supply (car battery).

ANTENNAS:

Type of Antenna:	External.
Maximum Declared Antenna Gain:	
CORE1_Port4:	+2.4 dBi
CORE0_Port2:	-0.3 dBi

Directional Antenna Gain Calculations for CDD MIMO:

For 2Tx CDD MIMO modes, in accordance with KDB 662911 D01 v02r01 Section F)2)f(ii), directional gain was calculated as (worst case):

$N_{ss} = 1$, $N_{ANT} = 2$, $G_{CORE1} = 2.4$ dBi, $G_{CORE1} = -0.3$ dBi

$$\begin{aligned} \text{Directional Gain} &= 10 \log \left[\frac{\sum_{f=1}^{N_{ss}} \left(\sum_{k=1}^{N_{ANT}} g_{f,k} \right)^2}{N_{ANT}} \right] = 10 \log \left[\frac{\sum_{f=1}^1 \left(\sum_{k=1}^2 g_{f,k} \right)^2}{2} \right] \\ &= 10 \log \left[\frac{(g_{1,1} + g_{1,2})^2}{2} \right] = 10 \log \left[\frac{\left(10^{\frac{G_1}{20}} + 10^{\frac{G_2}{20}} \right)^2}{2} \right] = 10 \log \left[\frac{\left(10^{\frac{-0.3}{20}} + 10^{\frac{2.4}{20}} \right)^2}{2} \right] = +4.16 \text{ dBi} \end{aligned}$$

TEST FREQUENCIES:

For 802.11b/g/n20:

Low Channel (1):	2412 MHz
Middle Channel (6):	2437 MHz
High Channel (11):	2462 MHz

The sample was used to configure the EUT to continuously transmit at a specified output power in all channels with different modes and modulation schemes.

The field strength at the band edges was evaluated for each mode for the channel under test.

During transmitter test the EUT was being controlled by the SW tool to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

The EUT has four separate antennas which correspond to one port of the equipment.

For the Transmitter Minimum 6 dB Bandwidth test, only SISO modes were tested since the bandwidth does not change depending on chains used.

The data rates of 1Mb/s for 802.11b, 6.5Mb/s for 802.11g, MCS0 for 802.11n20 were selected based on preliminary testing that identified those rates corresponding to the worst cases for output power and band edge levels at restricted bands.

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyser using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.



RADIATED MEASUREMENTS

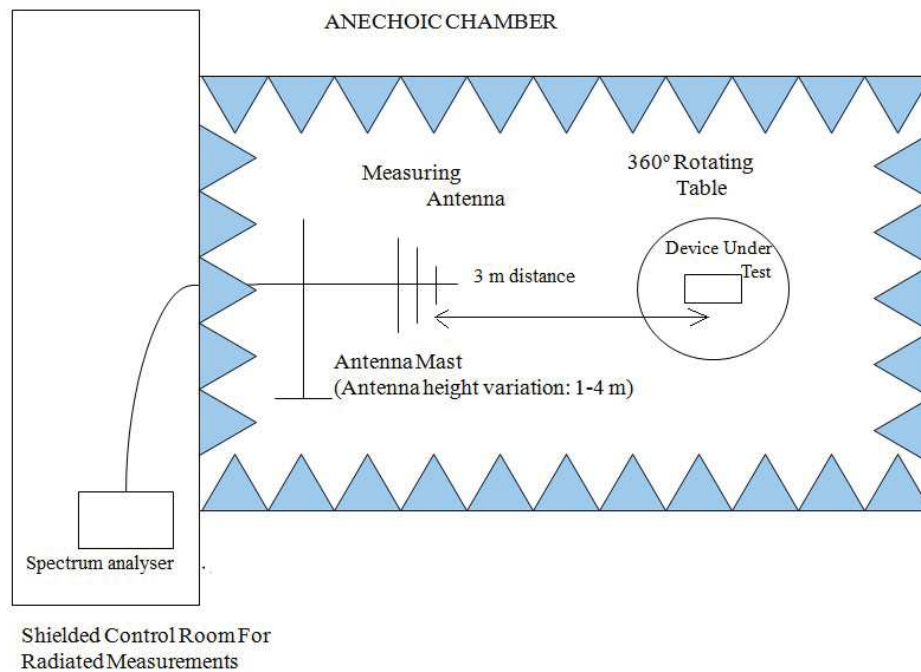
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz) and 1 GHz-18 GHz Double ridge horn antenna is situated at a distance of 3 m and a distance of 1m for the frequency range 17 GHz-26 GHz (18 GHz-40 GHz horn antenna).

For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

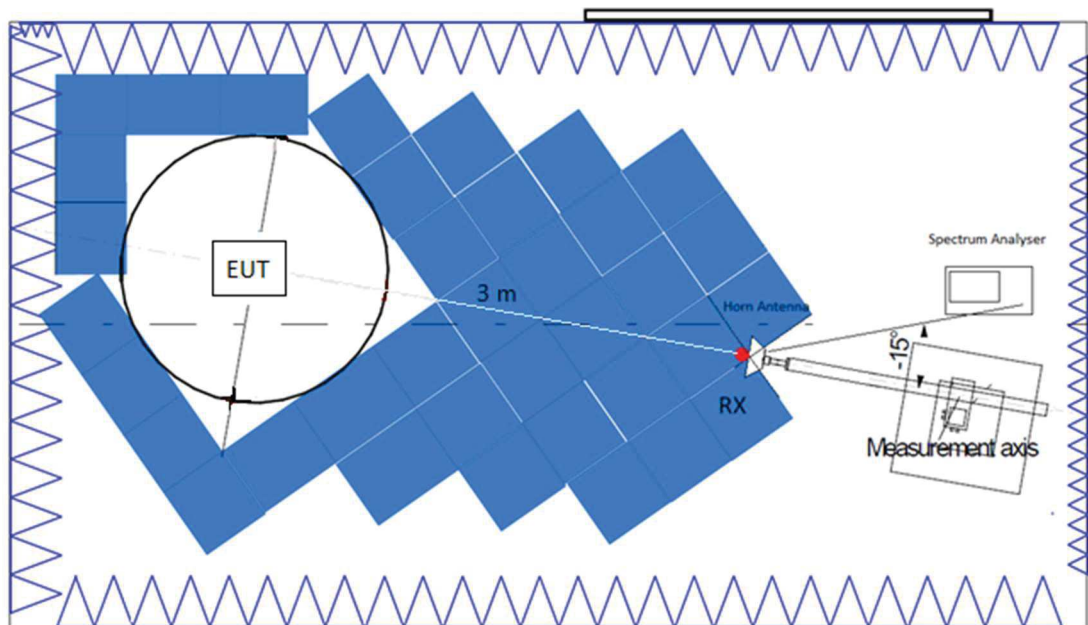
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find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

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

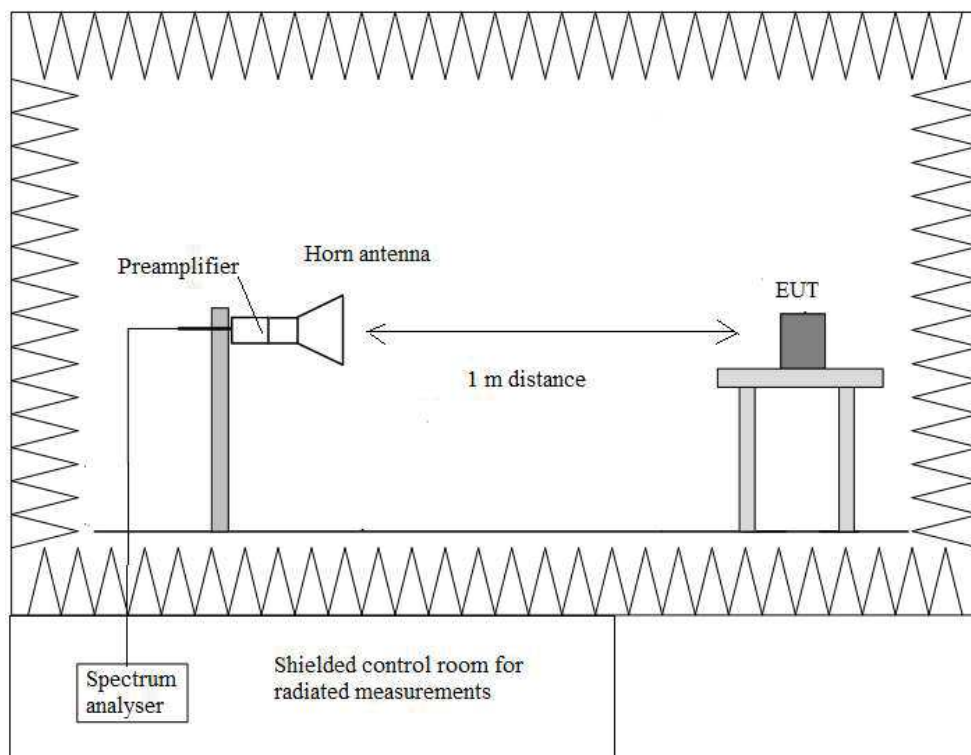
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



Occupied Bandwidth

RESULTS:

SISO case CORE1_Port4 Antenna and SISO case CORE0_Port2 Antenna.
MIMO case is CORE1_Port4 Antenna & CORE0_Port2 Antenna.

SISO CORE1_Port4 Antenna:

- **Mode 802.11 b:**

	Low Channel 2412 MHz	Middle Channel 2437 MHz	High Channel 2462 MHz
99% bandwidth (MHz)	10.1437	10.2546	10.2213
-26 dBc bandwidth (MHz)	13.345	13.779	13.46
Measurement uncertainty (kHz)	<± 140.5		

- **Mode 802.11 g:**

	Low Channel 2412 MHz	Middle Channel 2437 MHz	High Channel 2462 MHz
99% bandwidth (MHz)	16.8098	16.9257	16.9055
-26 dBc bandwidth (MHz)	21.262	21.445	21.316
Measurement uncertainty (kHz)	<± 140.5		

- **Mode 802.11 n20**

	Low Channel 2412 MHz	Middle Channel 2437 MHz	High Channel 2462 MHz
99% bandwidth (MHz)	18.0389	17.9799	18.0134
-26 dBc bandwidth (MHz)	21.59	21.254	21.528
Measurement uncertainty (kHz)	<± 140.5		

Verdict: PASS

SISO CORE0_Port2 Antenna:

- **Mode 802.11 b:**

	Low Channel 2412 MHz	Middle Channel 2437 MHz	High Channel 2462 MHz
99% bandwidth (MHz)	10.1823	10.1723	10.2093
-26 dBc bandwidth (MHz)	13.767	13.759	13.738
Measurement uncertainty (kHz)	<± 140.5		

- **Mode 802.11 g:**

	Low Channel 2412 MHz	Middle Channel 2437 MHz	High Channel 2462 MHz
99% bandwidth (MHz)	16.7779	16.8199	16.8375
-26 dBc bandwidth (MHz)	21.235	21.316	21.374
Measurement uncertainty (kHz)	<± 140.5		

- **Mode 802.11 n20**

	Low Channel 2412 MHz	Middle Channel 2437 MHz	High Channel 2462 MHz
99% bandwidth (MHz)	17.9287	17.9683	17.9203
-26 dBc bandwidth (MHz)	21.532	21.649	21.674
Measurement uncertainty (kHz)	<± 140.5		

Verdict: PASS

MIMO – CORE1_Port4 Antenna & CORE0_Port2 Antenna:

- **Mode 802.11 b**

	Low Channel		Middle Channel		High Channel	
	CORE1_ Port4	CORE0_ Port2	CORE1_ Port4	CORE0_ Port2	CORE1_ Port4	CORE0_ Port2
99% bandwidth (MHz)	10.23	10.21	10.25	10.24	10.24	10.21
-26 dBc bandwidth (MHz)	13.41	13.4	14.19	14.23	14.17	14.16
Measurement uncertainty (kHz)	<± 42.35					

- **Mode 802.11 g**

	Low Channel		Middle Channel		High Channel	
	CORE1_ Port4	CORE0_ Port2	CORE1_ Port4	CORE0_ Port2	CORE1_ Port4	CORE0_ Port2
99% bandwidth (MHz)	16.85	16.89	16.8	16.87	16.8	16.88
-26 dBc bandwidth (MHz)	21.4	21.36	21.413	21.39	21.37	21.48
Measurement uncertainty (kHz)	<± 42.35					

- **Mode 802.11 n20**

	Low Channel		Middle Channel		High Channel	
	CORE1_ Port4	CORE0_ Port2	CORE1_ Port4	CORE0_ Port2	CORE1_ Port4	CORE0_ Port2
99% bandwidth (MHz)	17.73	18.03	17.73	18.12	17.75	18.07
-26 dBc bandwidth (MHz)	21.37	21.72	21.45	21.83	21.48	21.75
Measurement uncertainty (kHz)	<± 42.35					

Verdict: PASS

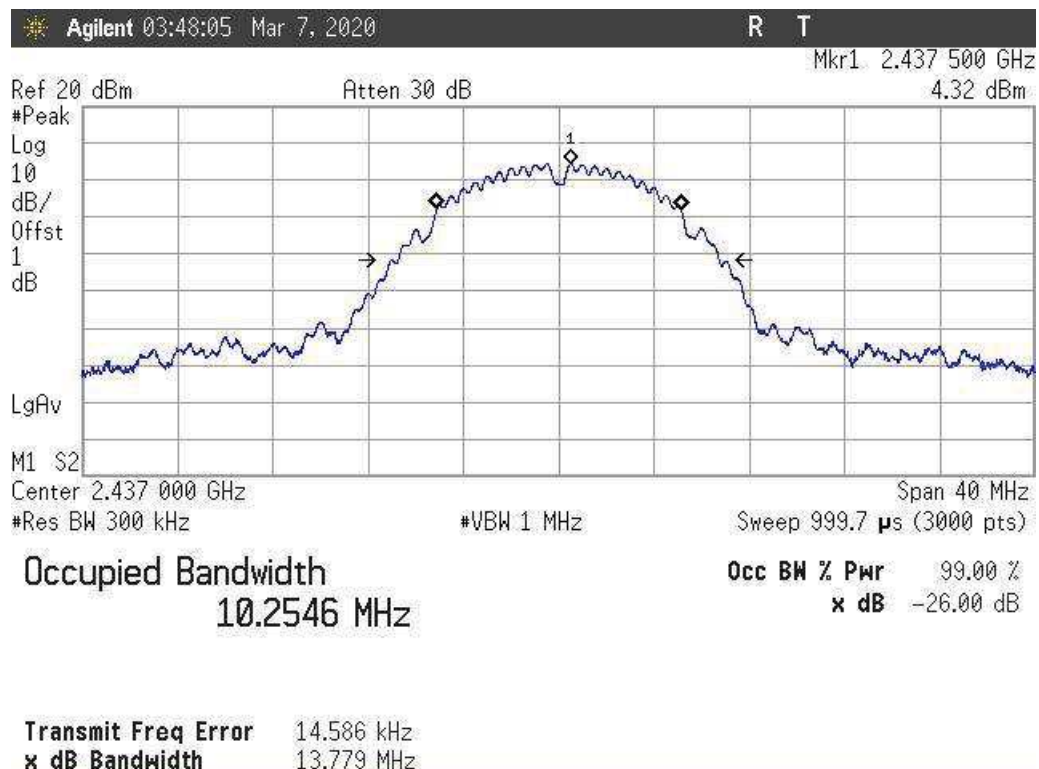
SISO CORE1_Port4 Antenna:

- **Mode 802.11 b – Occupied Bandwidth**

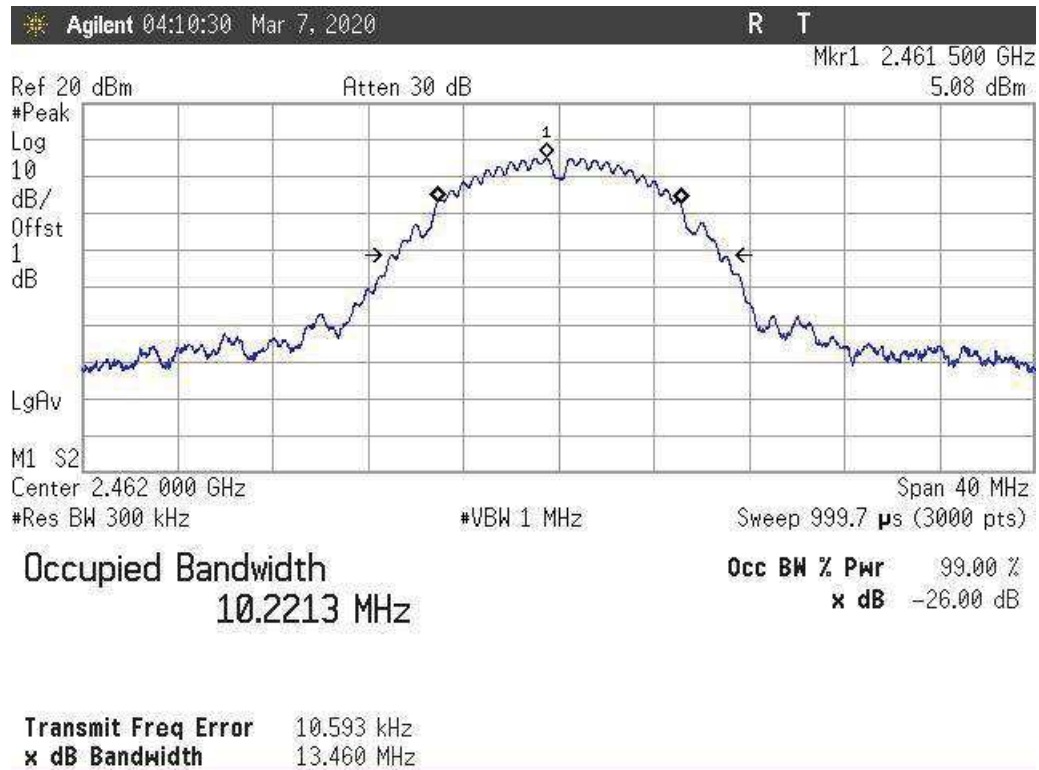
- Low Channel:



- Middle Channel:

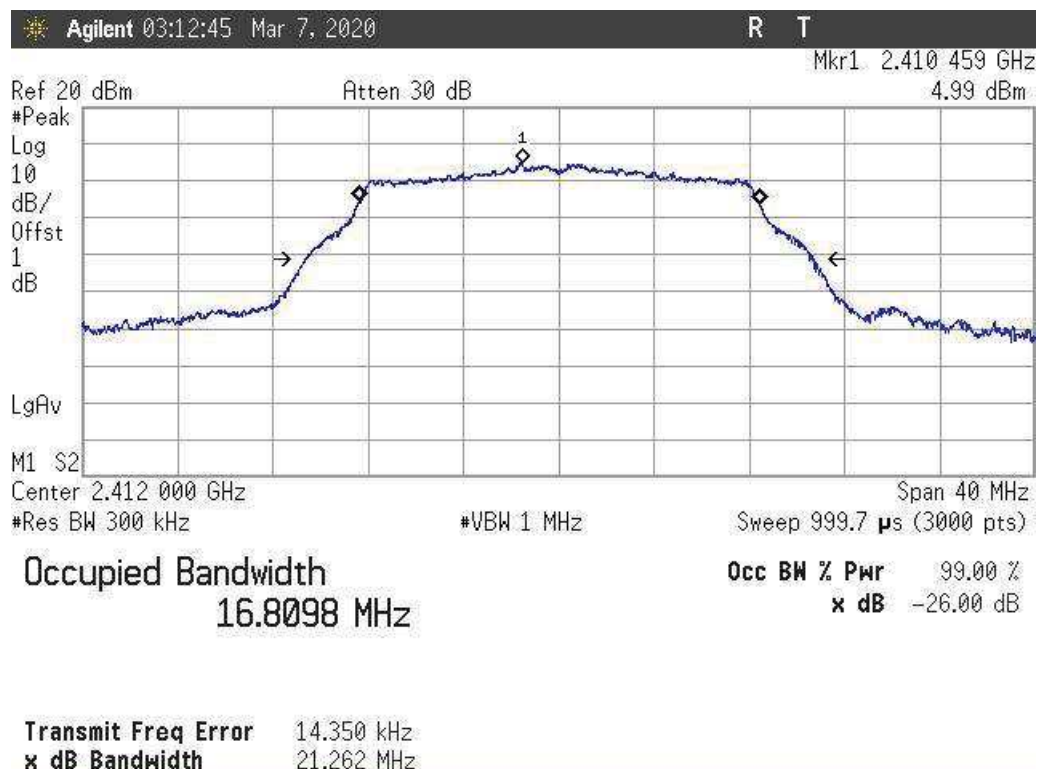


- High Channel:

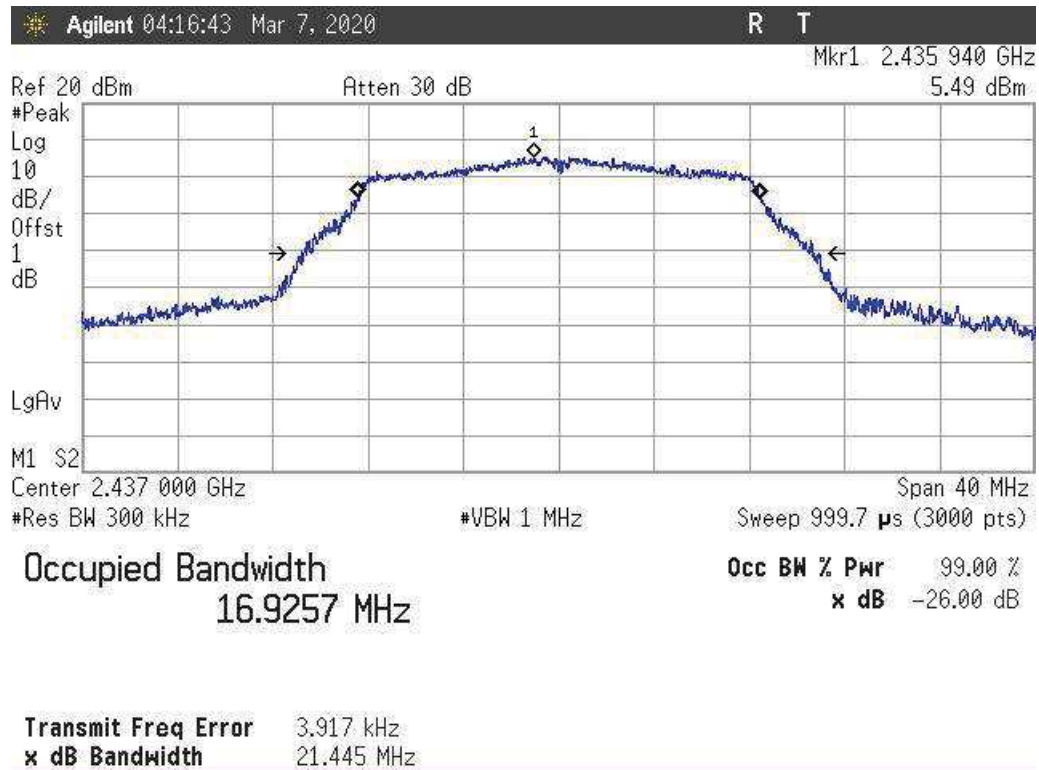


- Mode 802.11 g – Occupied Bandwidth

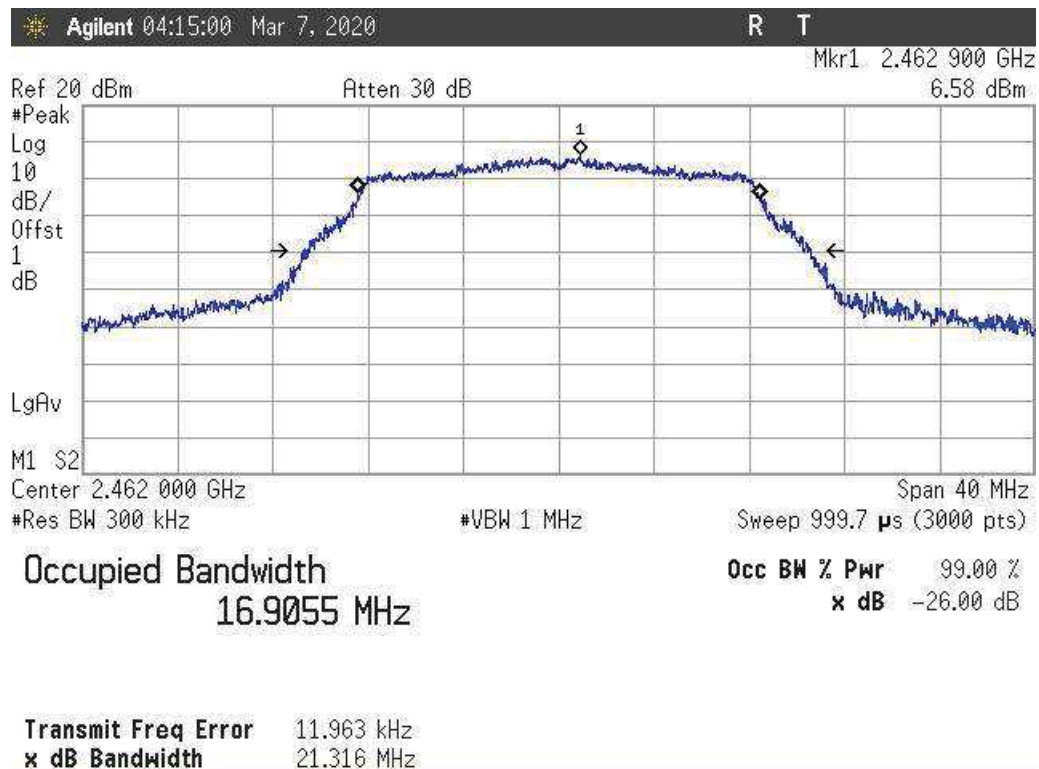
- Low Channel:



- Middle Channel:

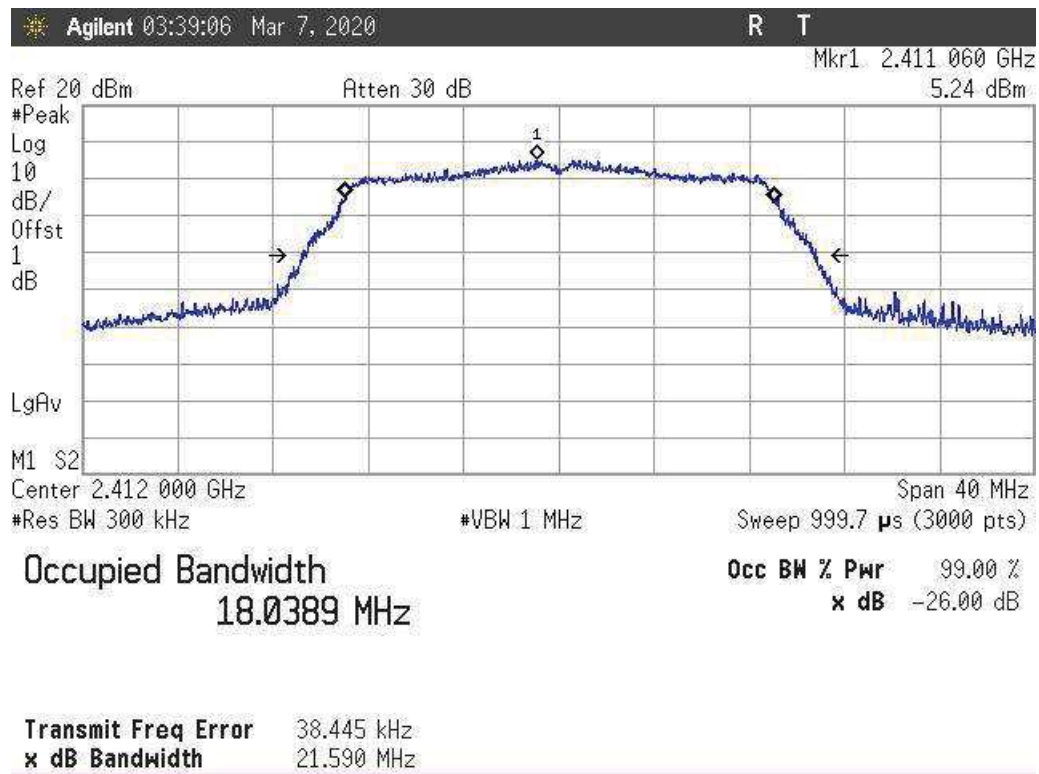


- High Channel:

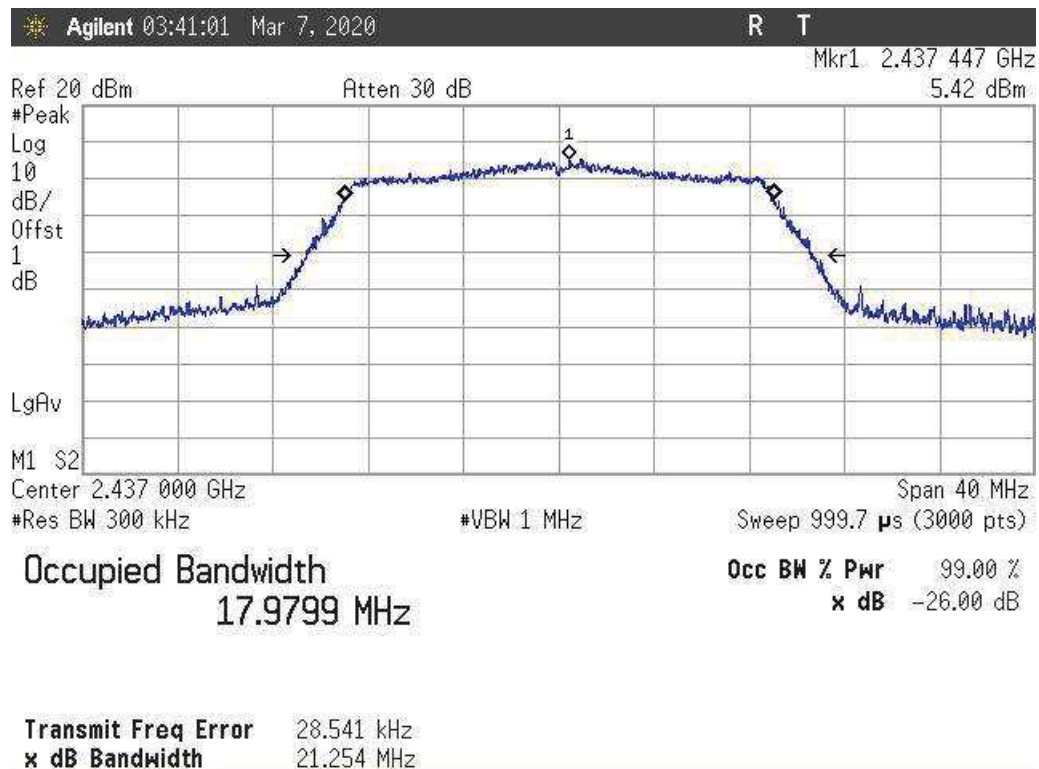


- **Mode 802.11 n20 – Occupied Bandwidth**

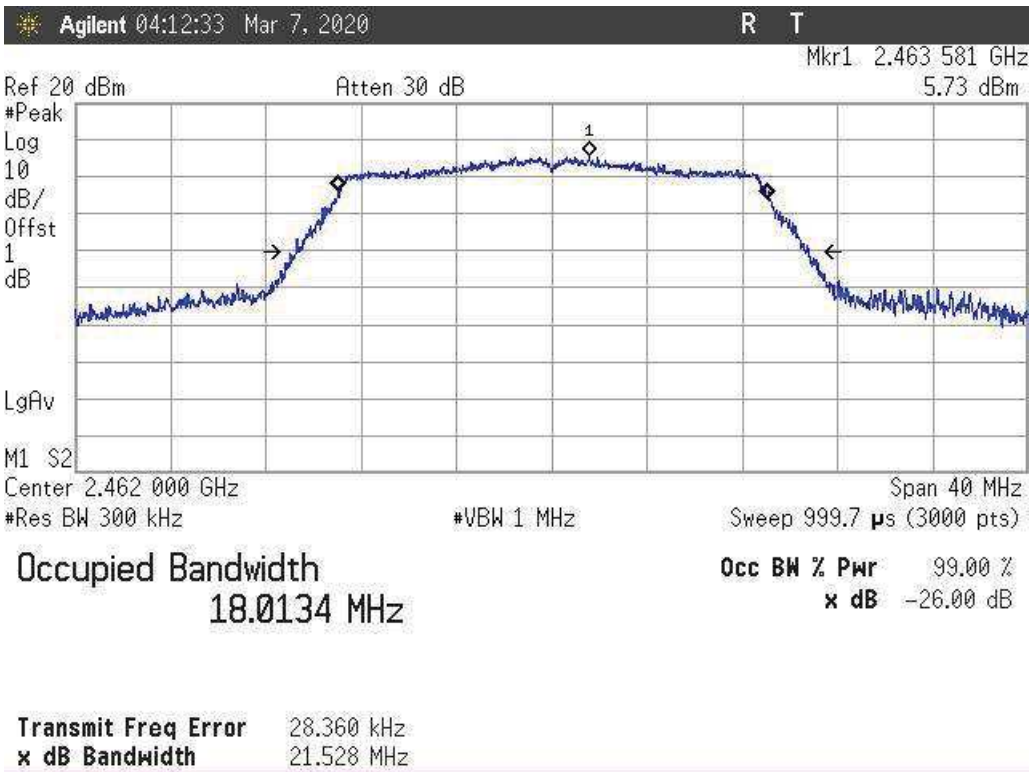
- Low Channel:



- Middle Channel:



- High Channel:



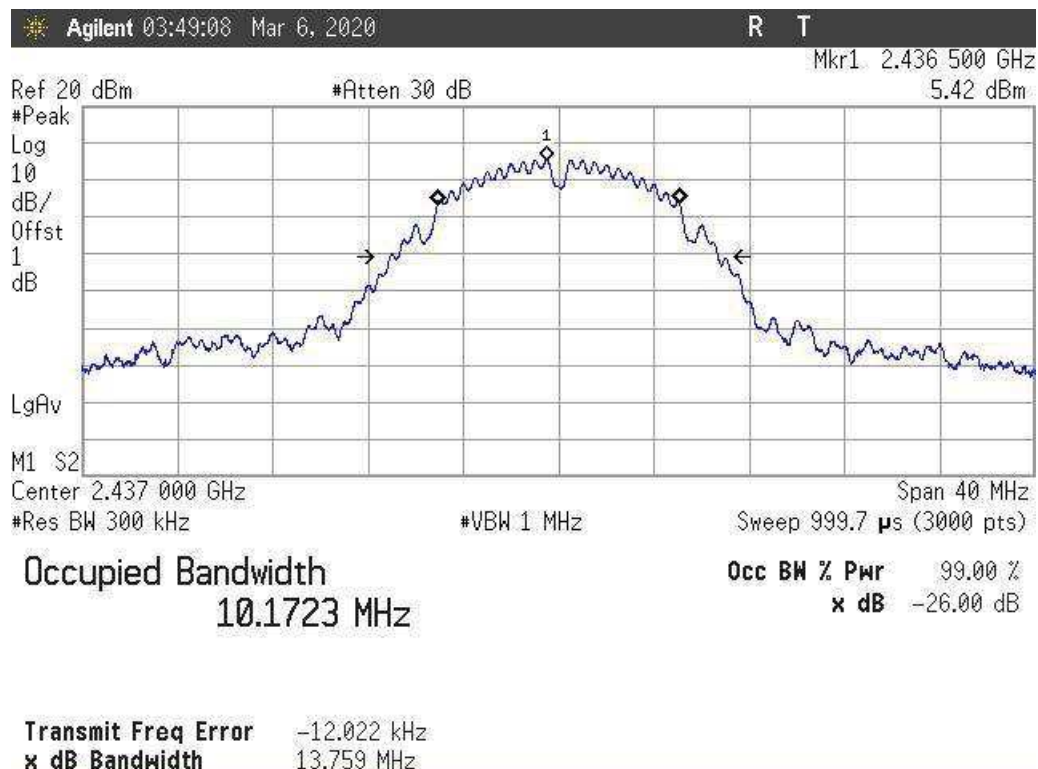
SISO CORE0_Port2 Antenna:

- **Mode 802.11 b – Occupied Bandwidth**

- Low Channel:



- Middle Channel:

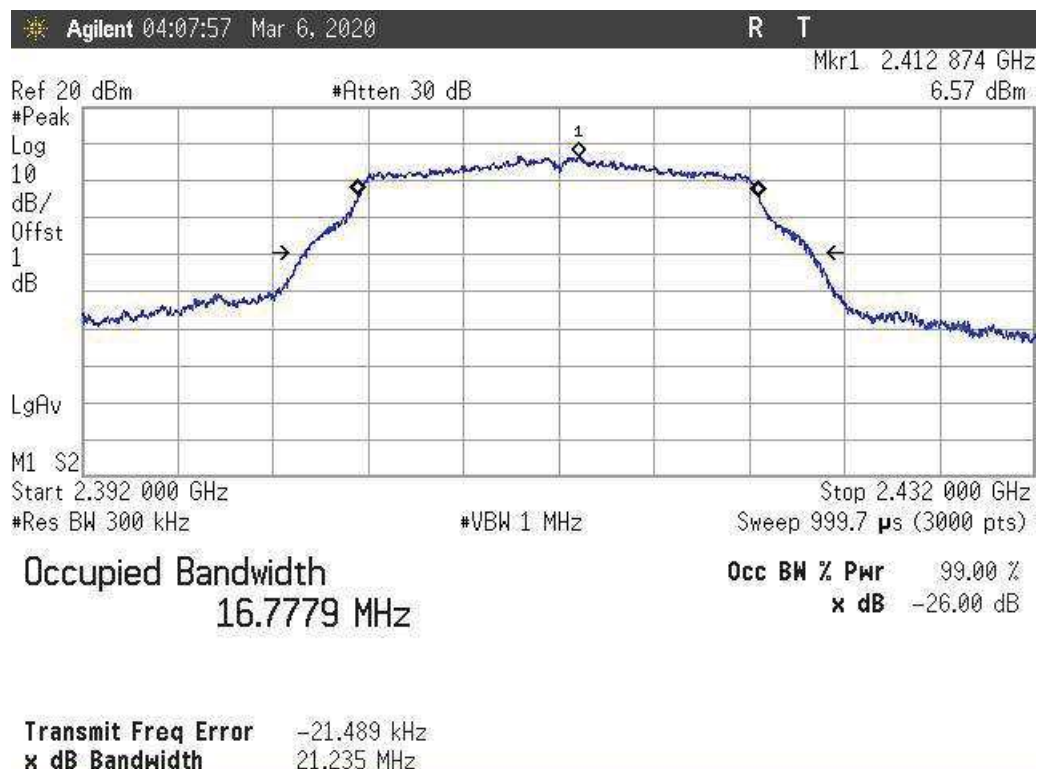


- High Channel:

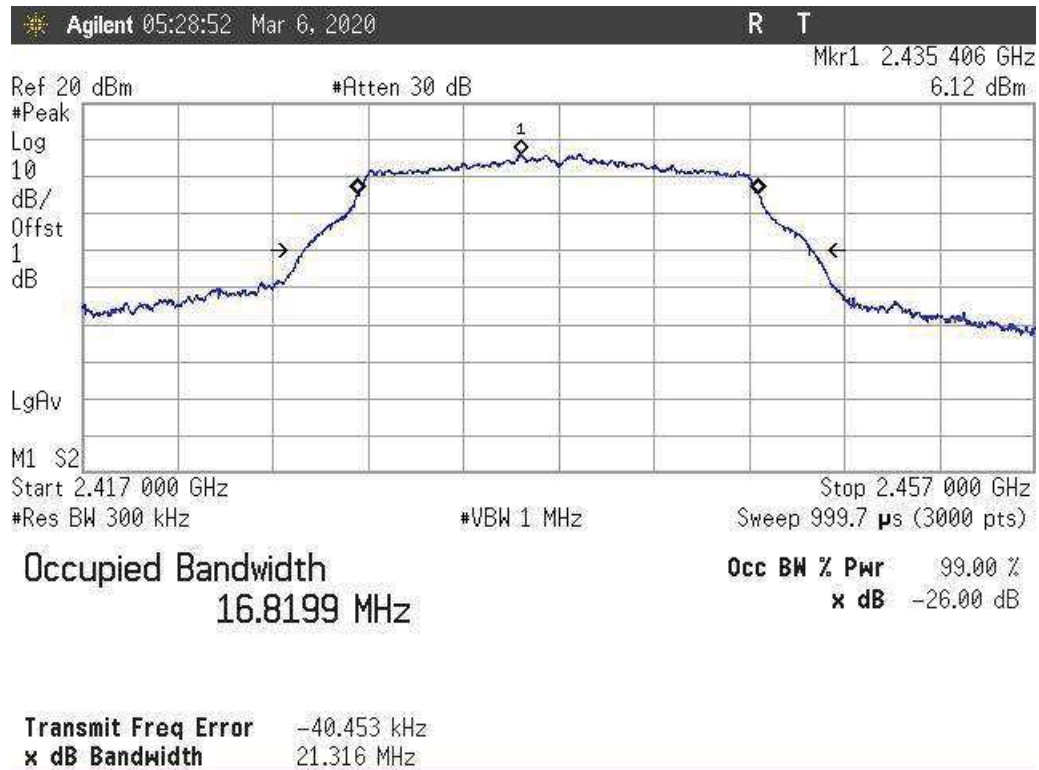


- Mode 802.11 g – Occupied Bandwidth

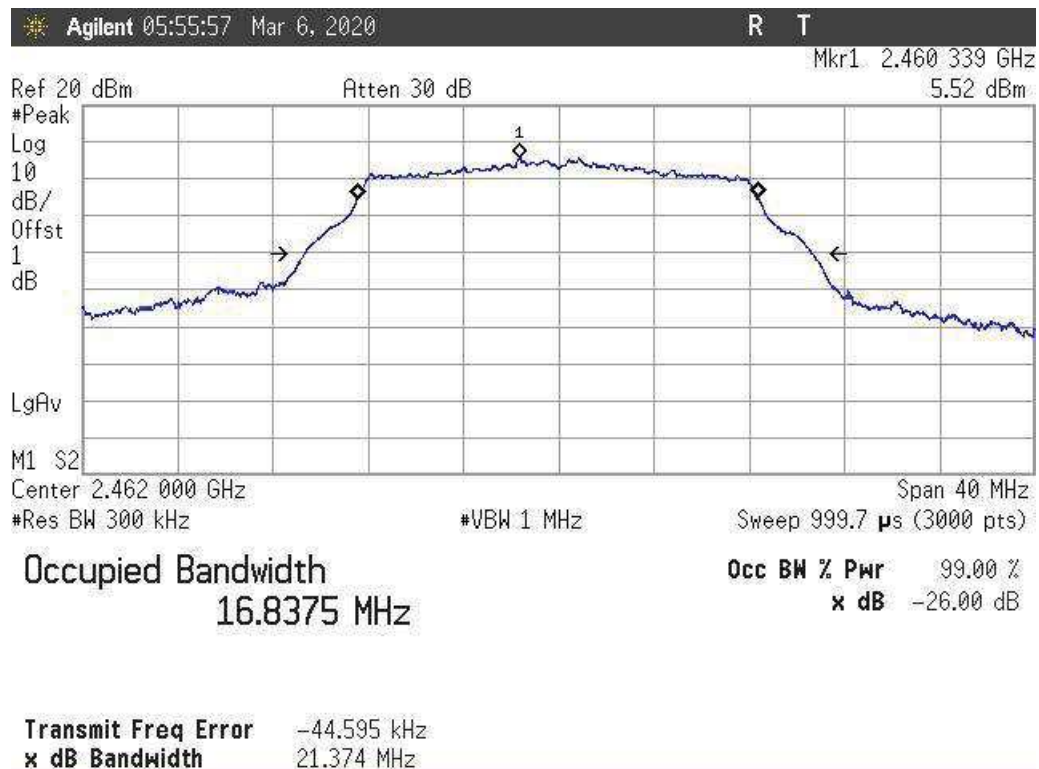
- Low Channel:



- Middle Channel:

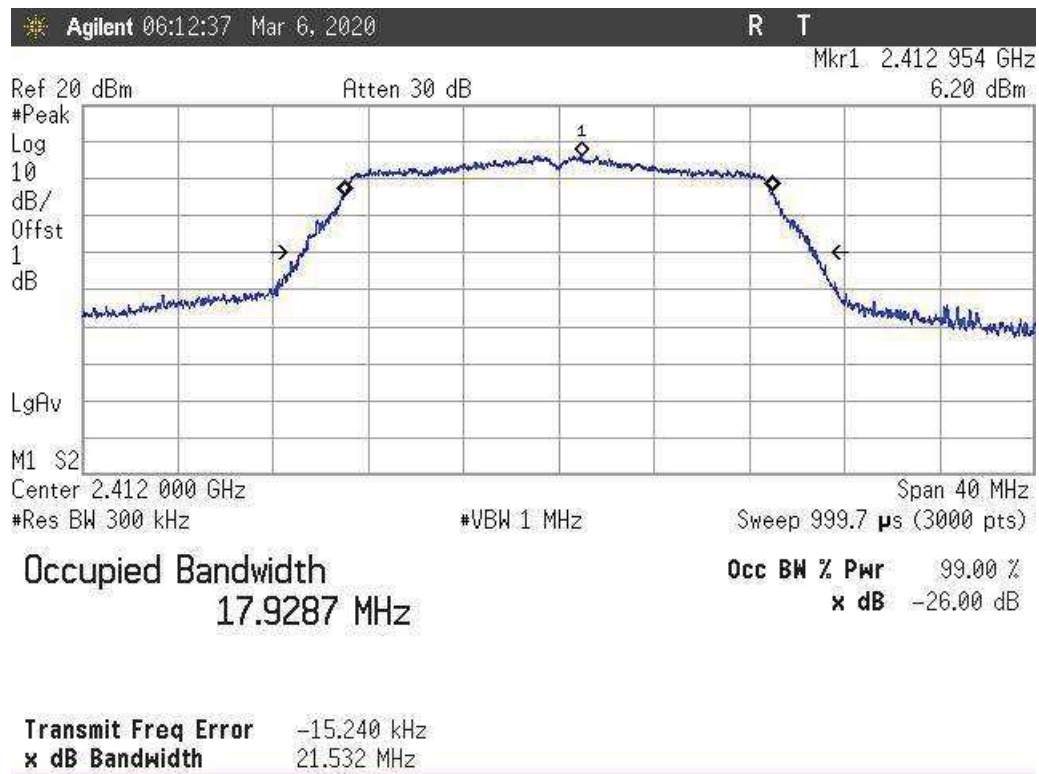


- High Channel:

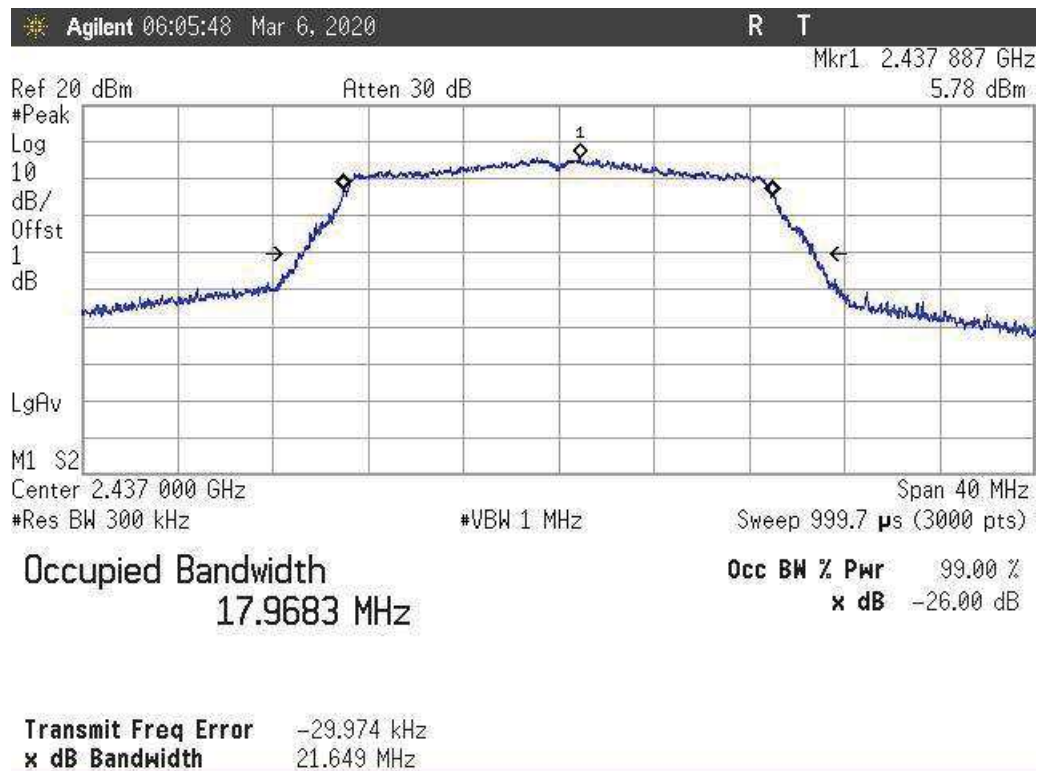


- **Mode 802.11 n20 – Occupied Bandwidth**

- Low Channel:



- Middle Channel:



- High Channel:

