

Fig. 48 Conducted Spurious Emission (8DPSK, Ch78, 3GHz-10 GHz)

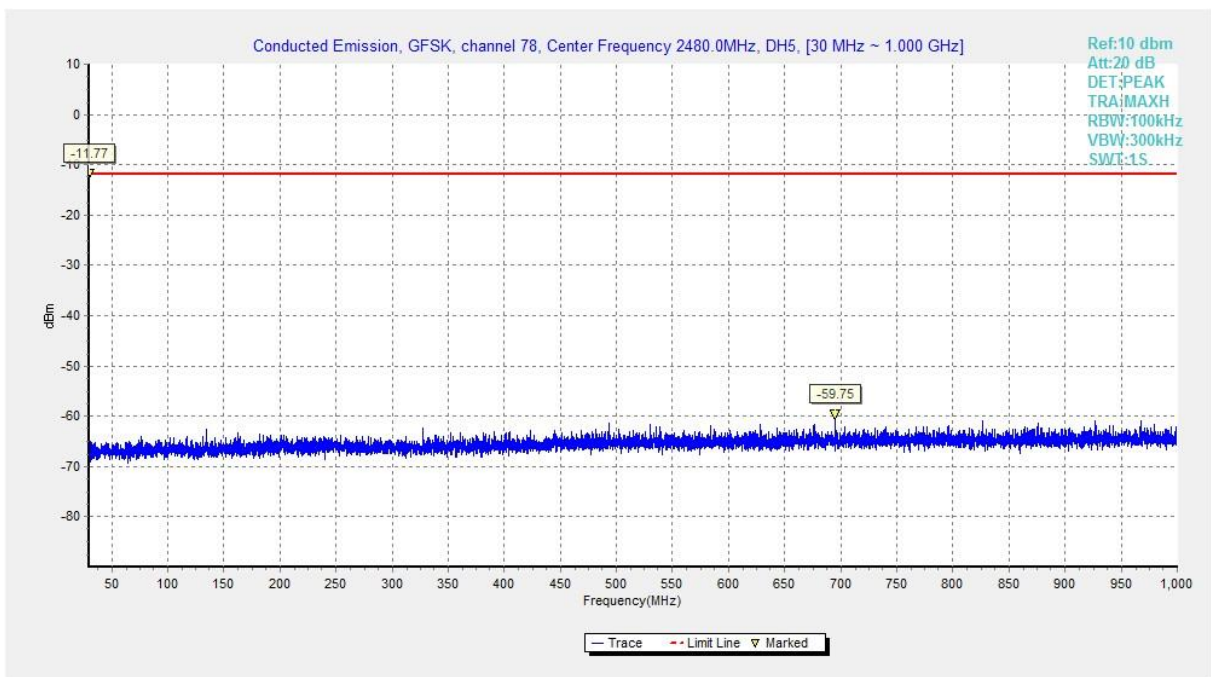


Fig. 49 Conducted Spurious Emission (All channel, 30 MHz-1 GHz)

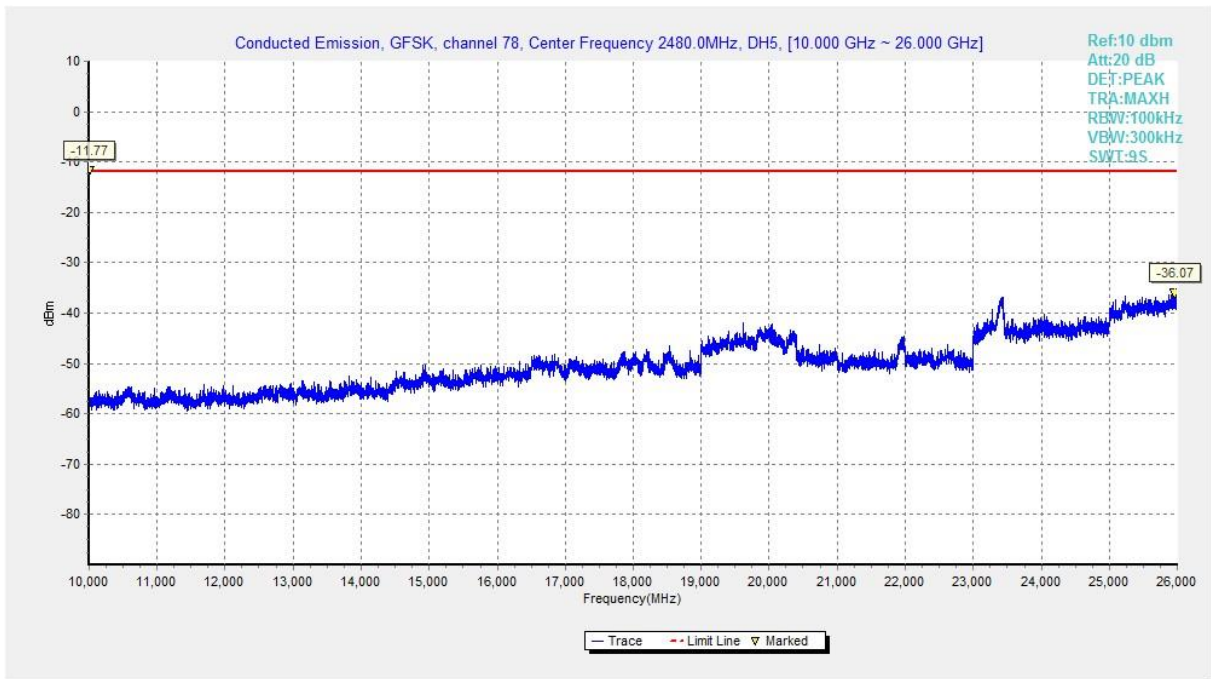


Fig. 50 Conducted Spurious Emission All channel, 10 GHz-26 GHz,)

#### A.4 Radiated Emission

##### Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247, 15.205, 15.209	20dB below peak output power

In addition, 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)).

##### Limit in restricted band:

Frequency of emission (MHz)	Field strength( $\mu$ V/m)	Measurement distance(meters)
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	3
88-216	150	3
216-960	200	3
Above 960	500	3

##### Test Condition:

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	120kHz/300kHz	5
1000-4000	1MHz/3MHz	15
4000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

**Note:** According to the performance evaluation, the radiated emission margin of EUT is over 20dB in the band from 9kHz to 30MHz. Therefore, the measurement starts from 30MHz to tenth harmonic.

The measurement results include the horizontal polarization and vertical polarization measurements.

**Measurement Results:**

Mode	Channel	Frequency Range	Test Results	Conclusion
GFSK	0	1 GHz ~18 GHz	Fig.51	<b>P</b>
	39	1 GHz ~18 GHz	Fig.52	<b>P</b>
	78	1 GHz ~18 GHz	Fig.53	<b>P</b>
	Restricted Band(CH0)	2.38 GHz ~ 2.45 GHz	Fig.54	<b>P</b>
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.55	<b>P</b>
$\pi/4$ DQPSK	0	1 GHz ~18 GHz	Fig.56	<b>P</b>
	39	1 GHz ~18 GHz	Fig.57	<b>P</b>
	78	1 GHz ~18 GHz	Fig.58	<b>P</b>
	Restricted Band (CH0)	2.38 GHz ~ 2.45 GHz	Fig.59	<b>P</b>
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.60	<b>P</b>
8DPSK	0	1 GHz ~18 GHz	Fig.61	<b>P</b>
	39	1 GHz ~18 GHz	Fig.62	<b>P</b>
	78	1 GHz ~18 GHz	Fig.63	<b>P</b>
	Restricted Band (CH0)	2.38 GHz ~ 2.45 GHz	Fig.64	<b>P</b>
	Restricted Band (CH78)	2.45 GHz ~ 2.5 GHz	Fig.65	<b>P</b>
/	All channels	9 kHz ~30 MHz	Fig.66	<b>P</b>
		30 MHz ~1 GHz	Fig.67	<b>P</b>
		18 GHz ~26.5 GHz	Fig.68	<b>P</b>

**Worst Case Result**
**GFSK CH78 (1-18GHz)**

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Pol	Corr. (dB/m)
5630.500000	51.04	74.00	22.96	H	15.6
6164.500000	50.04	74.00	23.96	H	18.7
12421.587500	45.37	74.00	28.63	V	11.4
14469.375000	45.95	74.00	28.05	H	13.0
15818.625000	48.93	74.00	25.07	H	14.7
17838.125000	48.87	74.00	25.13	V	16.7

Frequency (MHz)	Average (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Pol	Corr. (dB/m)
5629.000000	38.99	54.00	15.01	H	15.6
6206.500000	41.25	54.00	12.75	H	18.8
12438.787500	34.94	54.00	19.06	H	11.4
14499.562500	36.73	54.00	17.27	V	13.0
15768.312500	38.07	54.00	15.93	H	14.5
17824.562500	38.68	54.00	15.32	H	16.7



**$\pi/4$  DQPSK CH78 (1-18GHz)**

Frequency (MHz)	MaxPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Pol	Corr. (dB/m)
5706.500000	48.94	74.00	25.06	H	15.8
6200.500000	52.15	74.00	21.85	V	18.8
14491.687500	46.57	74.00	27.43	H	13.0
15817.750000	48.47	74.00	25.53	V	14.7
16990.687500	49.84	74.00	24.16	H	16.5
17951.437500	47.63	74.00	26.37	H	16.5

Frequency (MHz)	Average (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Pol	Corr. (dB/m)
5800.500000	39.18	54.00	14.82	V	16.2
6204.500000	41.31	54.00	12.69	H	18.8
14409.437500	36.53	54.00	17.47	V	13.0
15795.437500	38.19	54.00	15.81	H	14.6
16818.312500	38.23	54.00	15.77	V	16.0
17818.000000	38.48	54.00	15.52	V	16.7

**8DPSK CH78 (1-18GHz)**

Frequency (MHz)	MaxPeak (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Pol	Corr. (dB/m)
5514.500000	48.42	74.00	25.58	H	15.2
6245.500000	51.38	74.00	22.62	V	18.5
14402.437500	47.74	74.00	26.26	H	13.0
15743.812500	48.05	74.00	25.95	H	14.4
17011.250000	49.12	74.00	24.88	V	16.6
17913.812500	47.71	74.00	26.29	V	16.6

Frequency (MHz)	Average (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Pol	Corr. (dB/m)
5660.000000	38.77	54.00	15.23	V	15.7
6200.000000	41.75	54.00	12.25	V	18.8
14452.312500	36.73	54.00	17.27	H	13.0
15801.125000	37.99	54.00	16.01	H	14.6
16992.000000	39.04	54.00	14.96	V	16.5
17811.000000	38.12	54.00	15.88	H	16.7

**Note:**

A "reference path loss" is established and the  $A_{Rpl}$  is the attenuation of "reference path loss", and Antenna Factor, the gain of the preamplifier, the cable loss.  $P_{Mea}$  is the field strength recorded from the instrument. The measurement results are obtained as described below:

$$\text{Result} = P_{Mea} + \text{Cable Loss} + \text{Antenna Factor} - \text{Gain of the preamplifier.}$$

**See below for test graphs.**

**Conclusion: Pass**

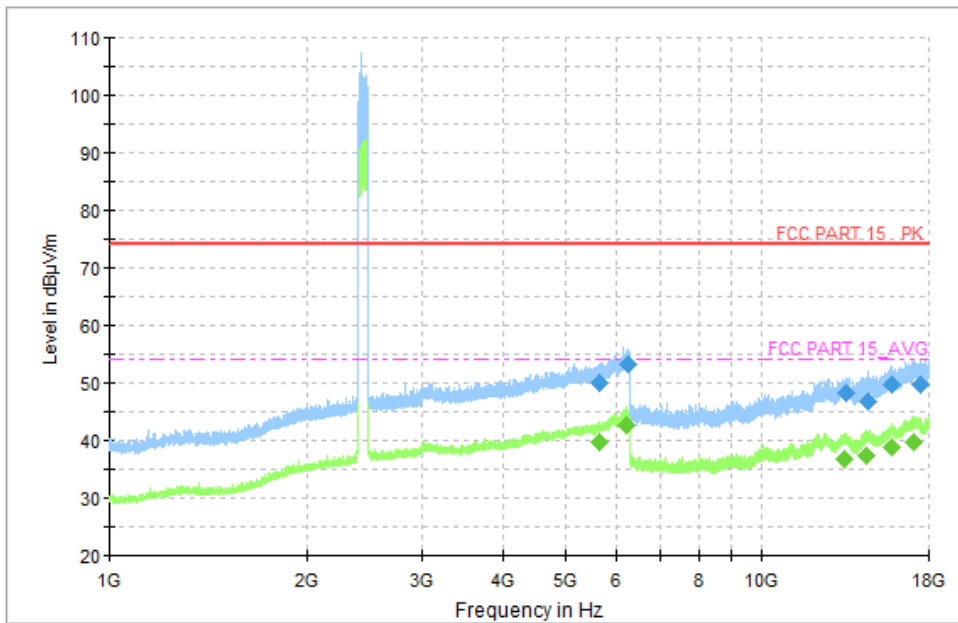


Fig. 51 Radiated Spurious Emission (GFSK, Ch0, 1 GHz ~18 GHz)

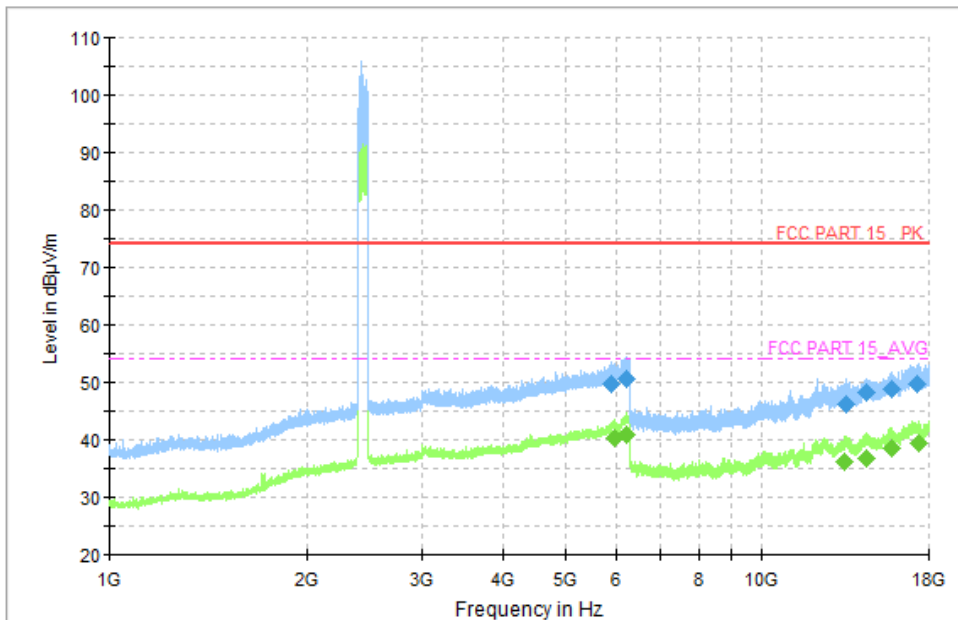


Fig. 52 Radiated Spurious Emission (GFSK, Ch39, 1 GHz ~18 GHz)

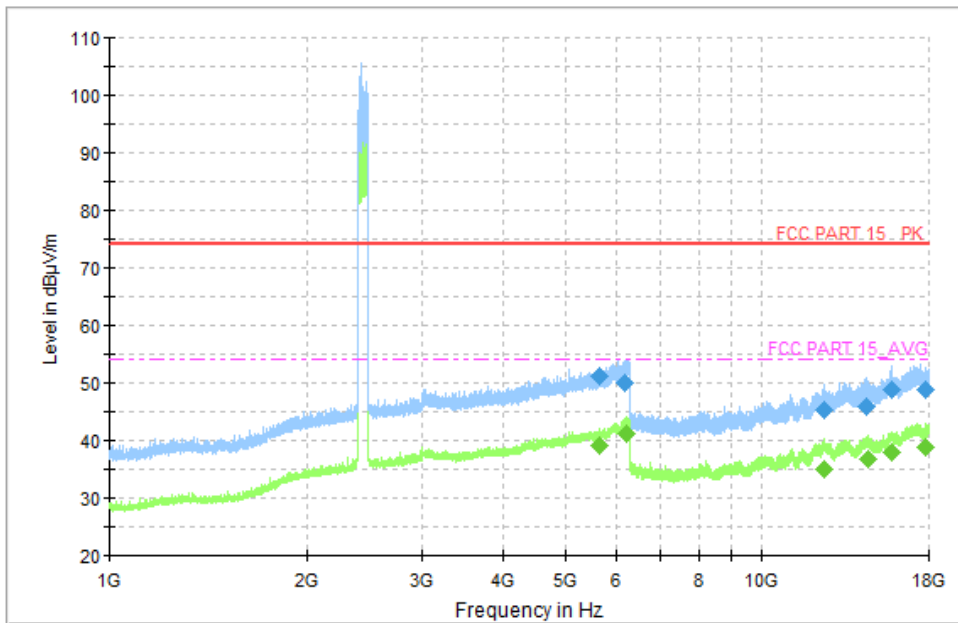


Fig. 53 Radiated Spurious Emission (GFSK, Ch78, 1 GHz ~18 GHz)

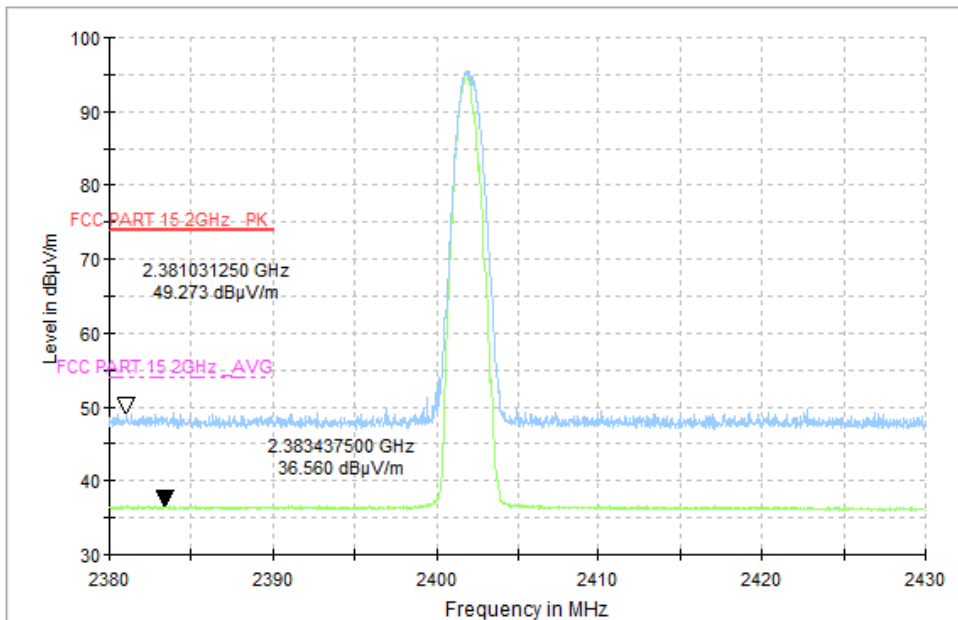


Fig. 54 Radiated Band Edges (GFSK, Ch0, 2380GHz~2450GHz)

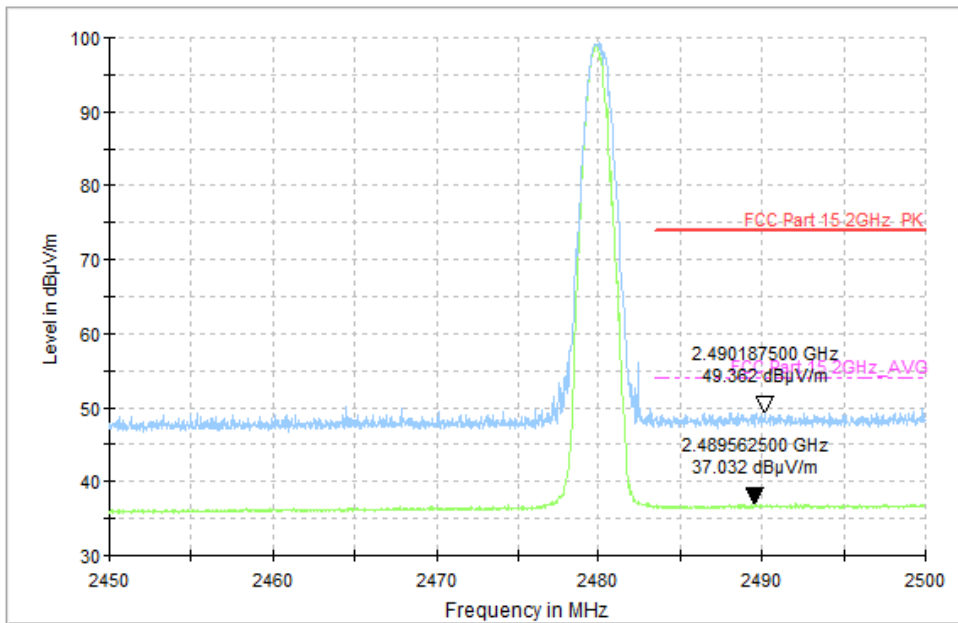


Fig. 55 Radiated Band Edges (GFSK, Ch78, 2450GHz~2500GHz)

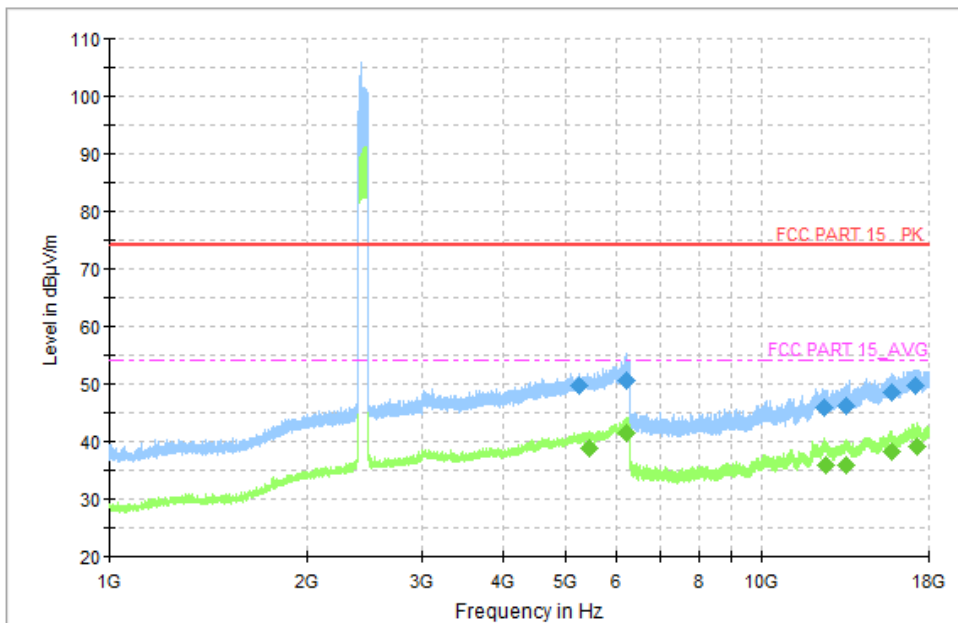


Fig. 56 Radiated Spurious Emission ( $\pi/4$  DQPSK, Ch0, 1 GHz ~18 GHz)



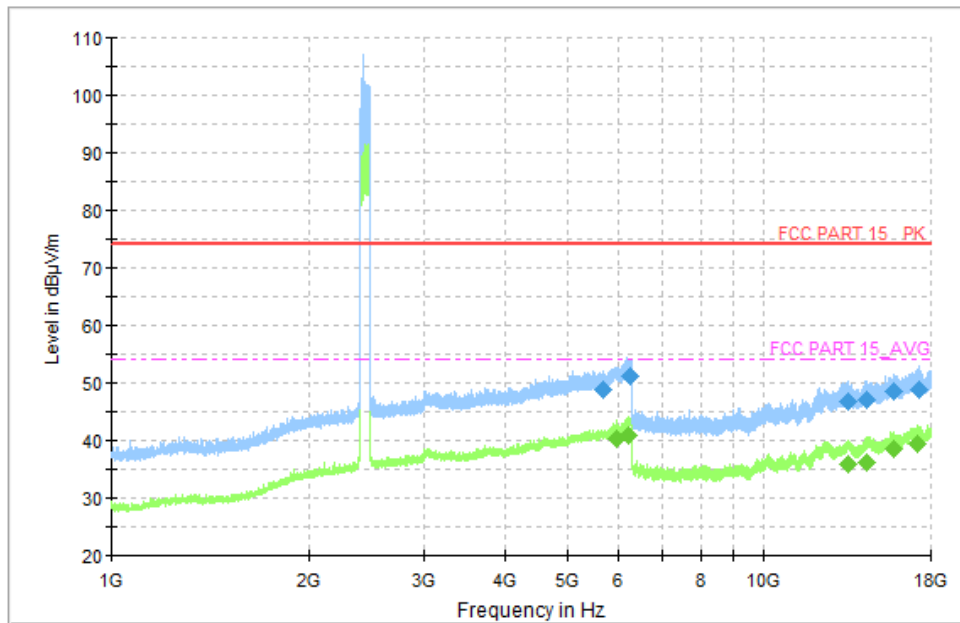


Fig. 57 Radiated Spurious Emission ( $\pi/4$  DQPSK, Ch39, 1 GHz ~18 GHz)

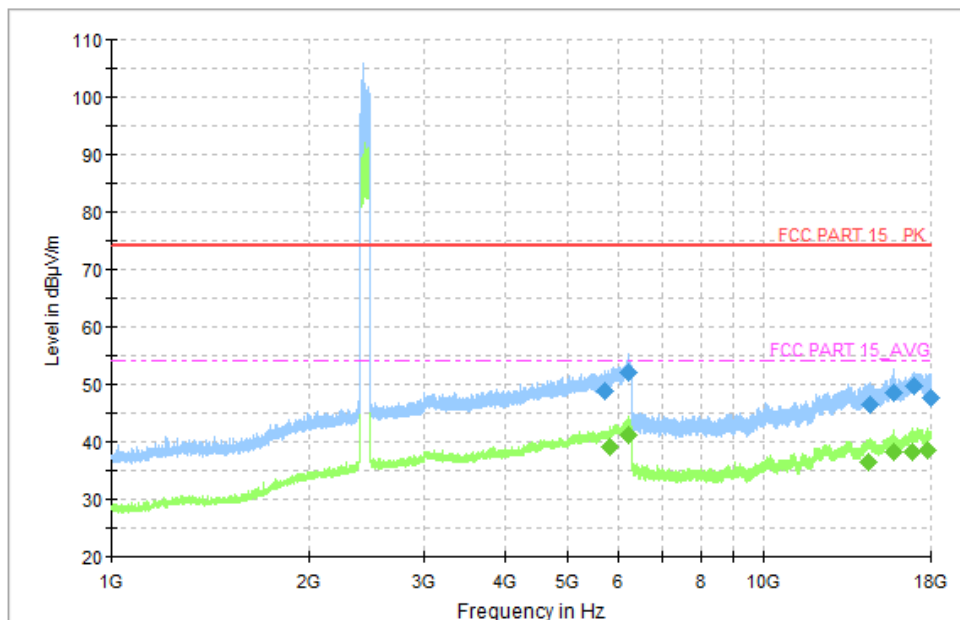


Fig. 58 Radiated Spurious Emission ( $\pi/4$  DQPSK, Ch78, 1 GHz ~18 GHz)

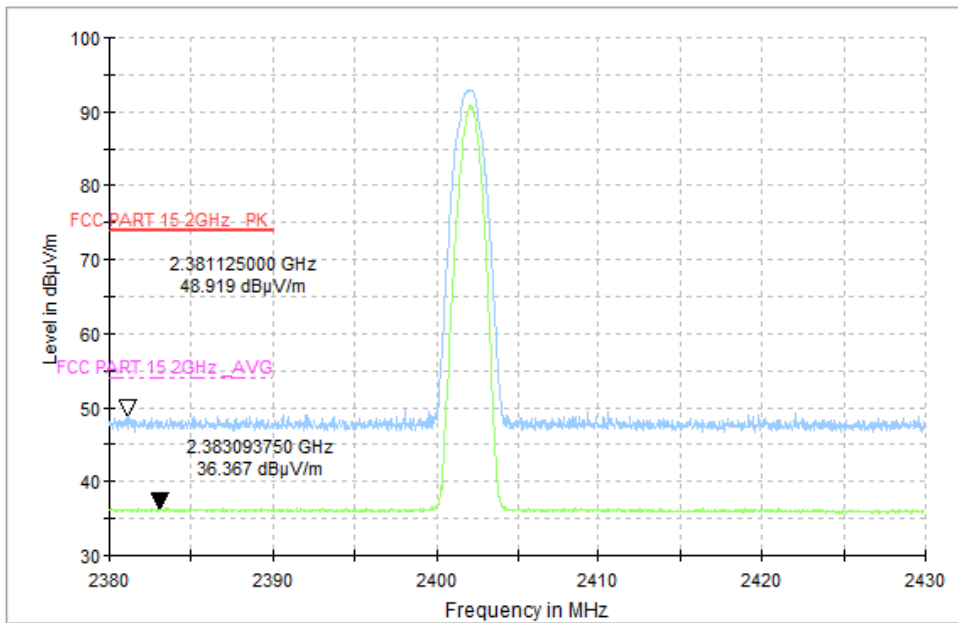


Fig. 59 Radiated Band Edges ( $\pi/4$  DQPSK, Ch0, 2380GHz~2450GHz)

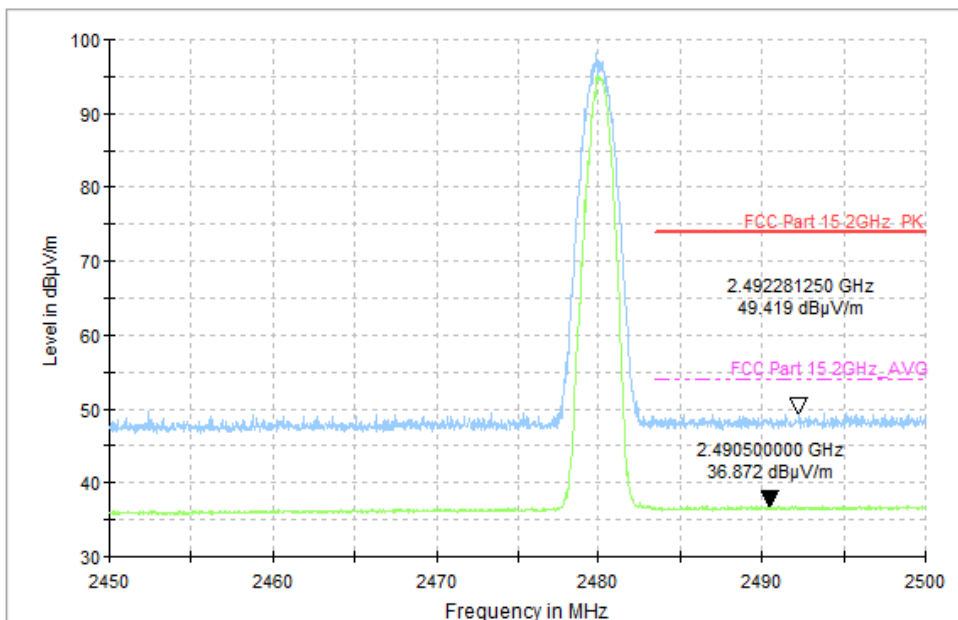


Fig. 60 Radiated Band Edges ( $\pi/4$  DQPSK, Ch78, 2450GHz~2500GHz)

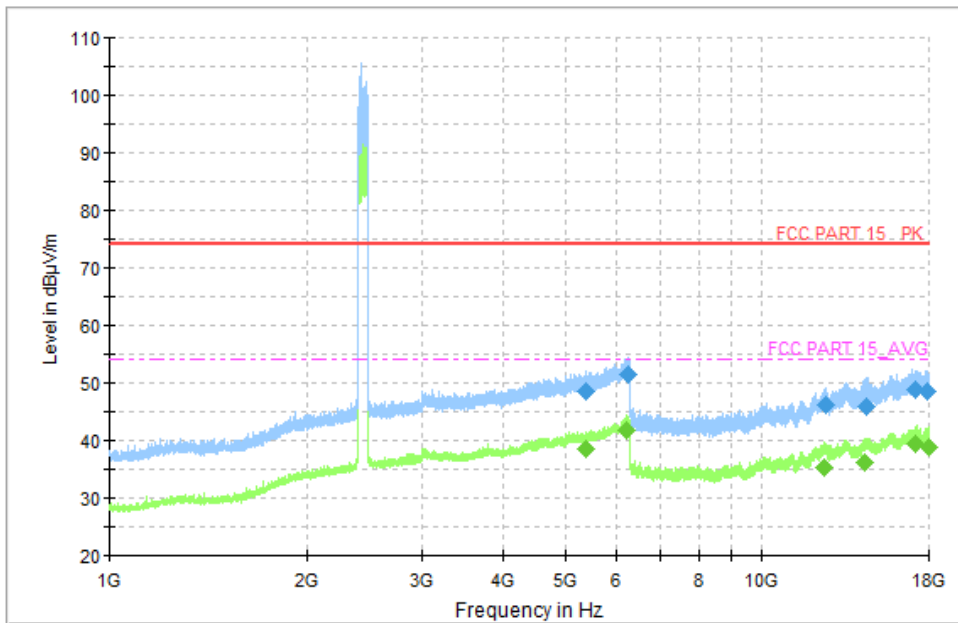


Fig. 61 Radiated Spurious Emission (8DPSK, Ch0, 1 GHz ~18 GHz)

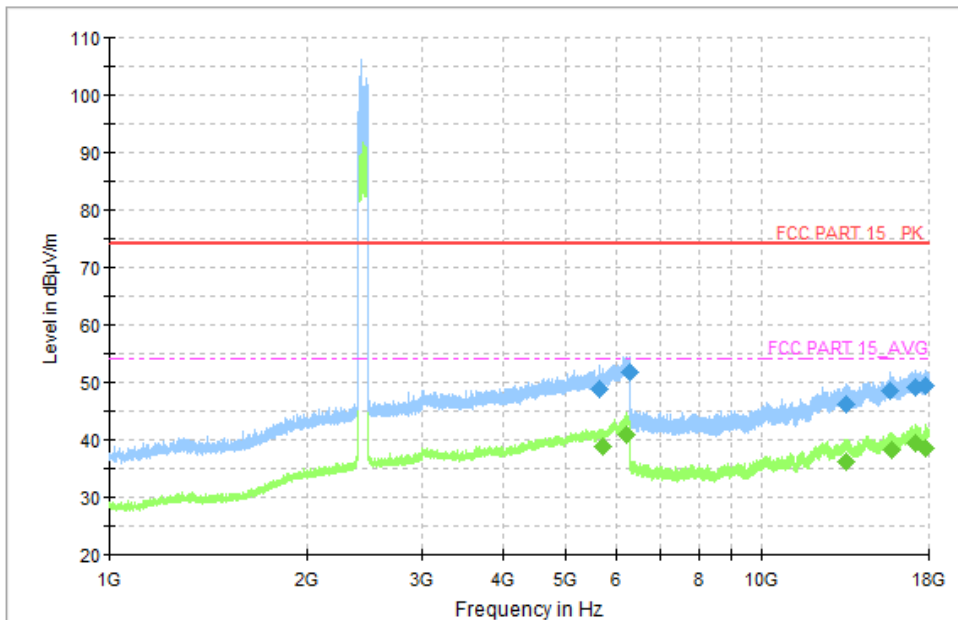


Fig. 62 Radiated Spurious Emission (8DPSK, Ch39, 1 GHz ~18 GHz)

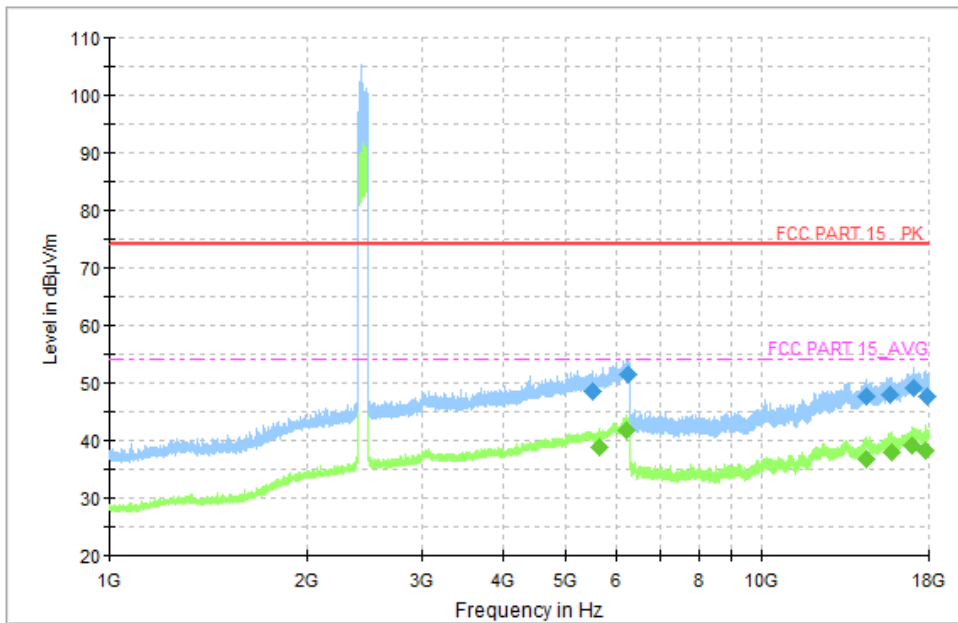


Fig. 63 Radiated Spurious Emission (8DPSK, Ch78, 1 GHz ~18 GHz)

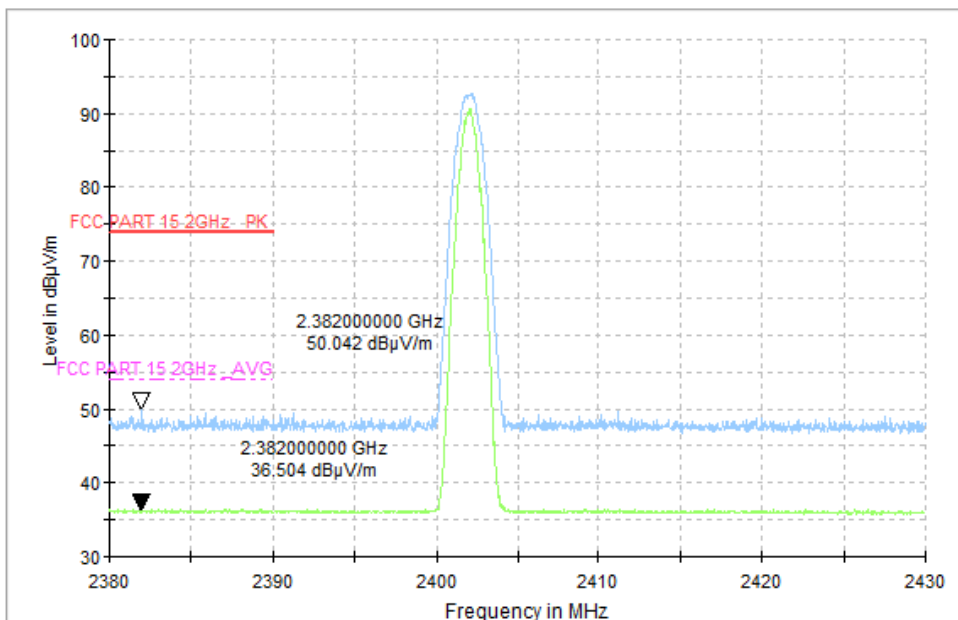


Fig. 64 Radiated Band Edges (8DPSK, Ch0, 2380GHz~2450GHz)

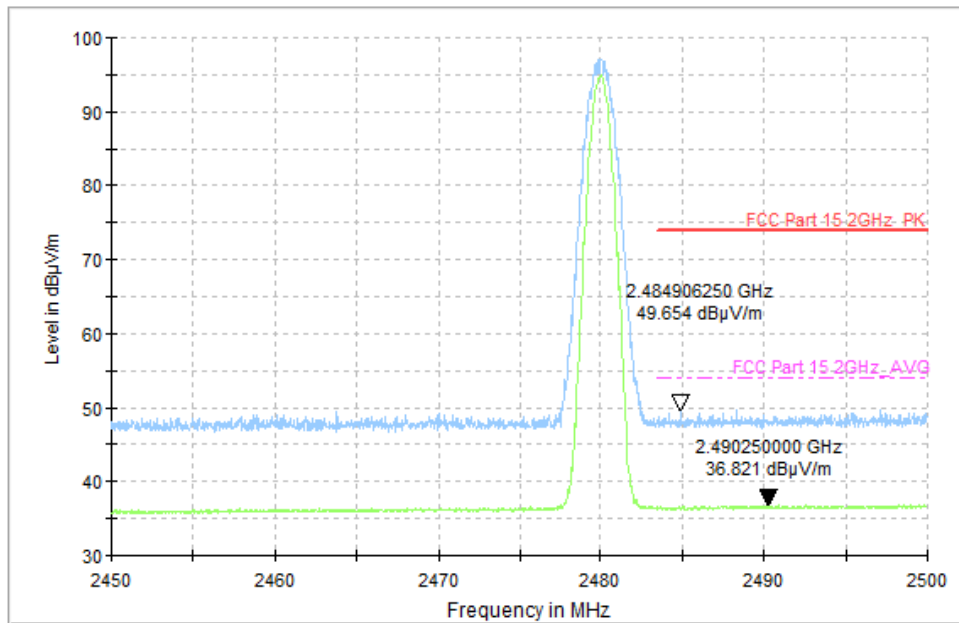


Fig. 65 Radiated Band Edges (8DPSK, Ch78, 2450GHz~2500GHz)

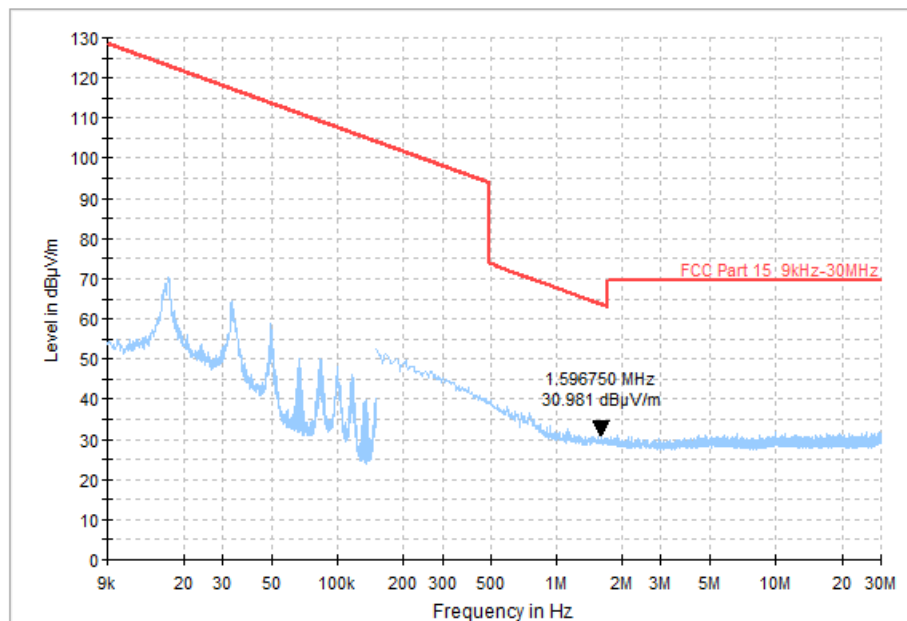


Fig. 66 Radiated Spurious Emission (All Channels, 9 kHz ~30 MHz)

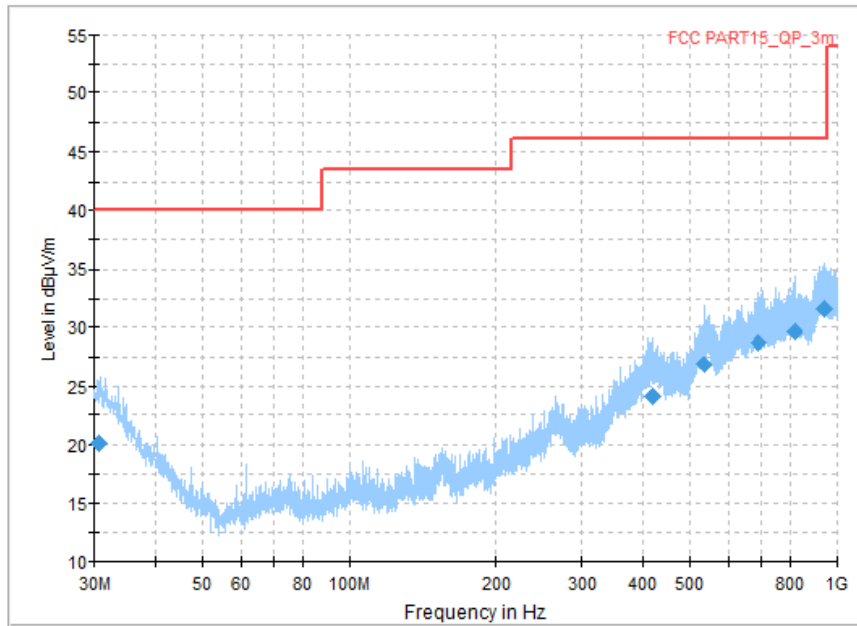


Fig. 67 Radiated Spurious Emission (All Channels, 30 MHz ~1 GHz)

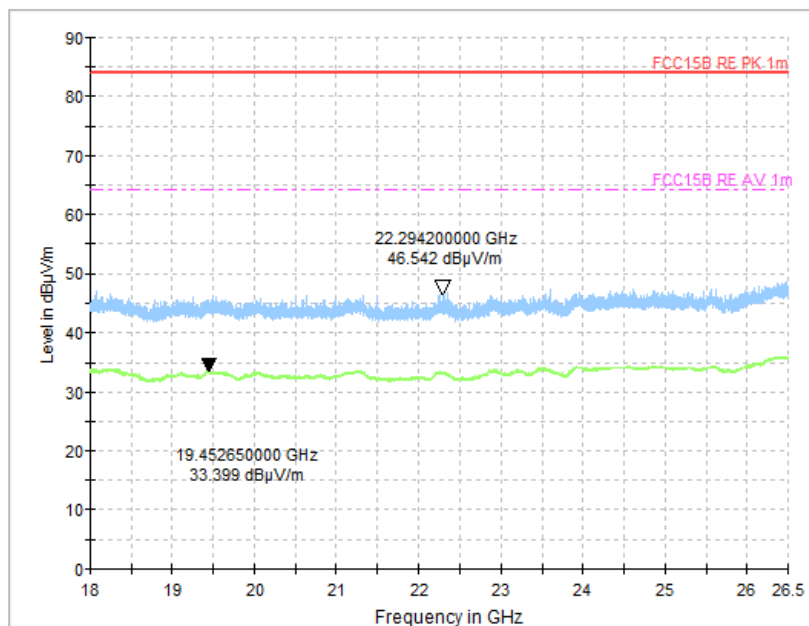


Fig. 68 Radiated Spurious Emission (All Channels, 18 GHz ~26.5 GHz)

### A.5 20dB Bandwidth

**Measurement Limit:**

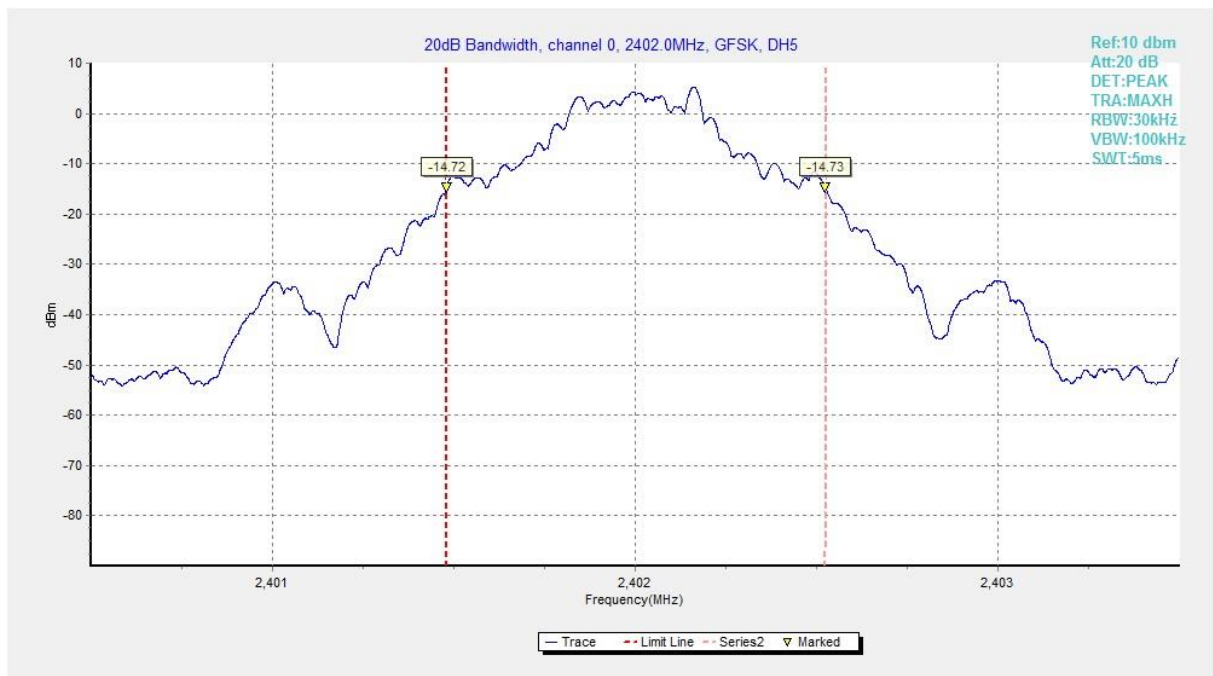
Standard	Limit (kHz)
FCC 47 CFR Part 15.247 (a)	/

**Measurement Result:**

Mode	Channel	20dB Bandwidth ( kHz)		conclusion
		Fig.	Value	
GFSK	0	Fig.69	1045.50	/
	39	Fig.70	947.25	
	78	Fig.71	1043.25	
$\pi/4$ DQPSK	0	Fig.72	1254.00	/
	39	Fig.73	1261.50	
	78	Fig.74	1271.25	
8DPSK	0	Fig.75	1257.75	/
	39	Fig.76	1262.25	
	78	Fig.77	1278.00	

See below for test graphs.

**Conclusion: PASS**



**Fig. 69 20dB Bandwidth (GFSK, Ch 0)**

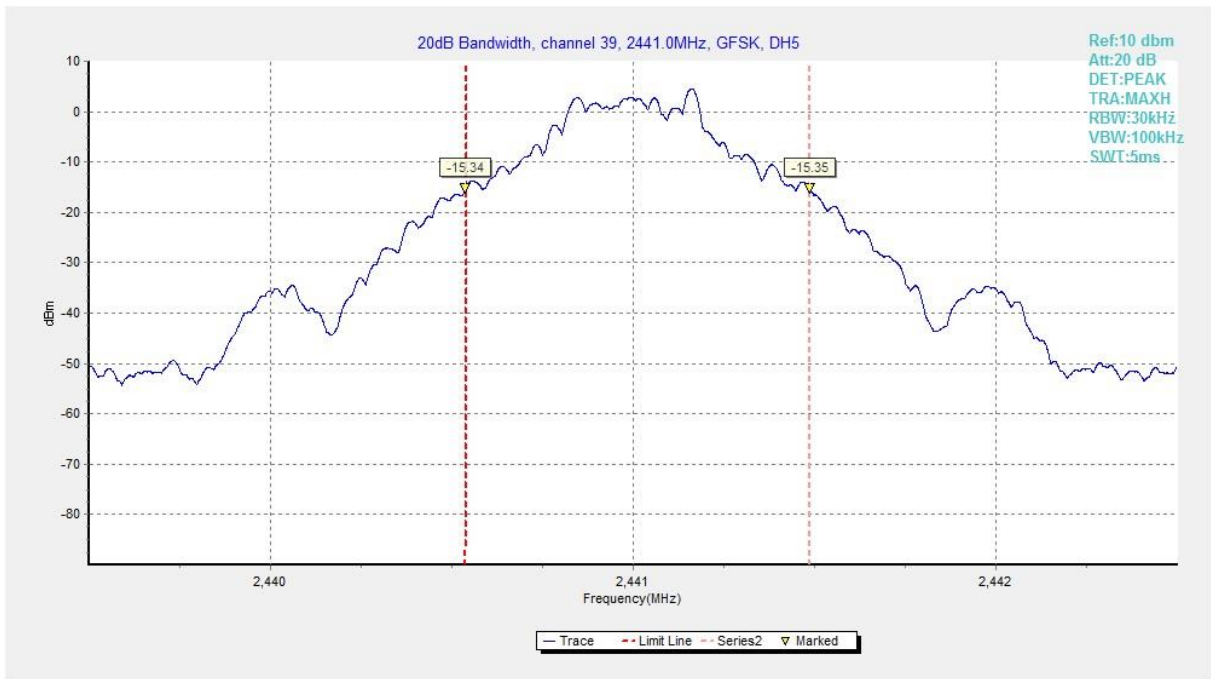


Fig. 70 20dB Bandwidth (GFSK, Ch 39)

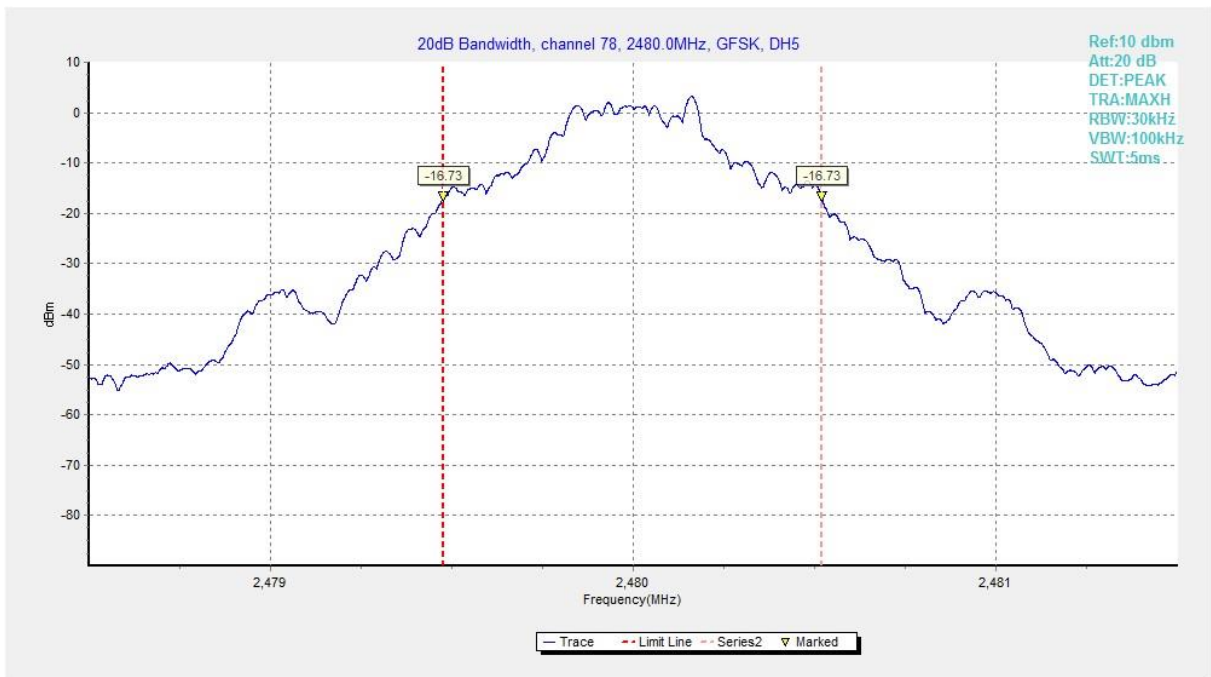


Fig. 71 20dB Bandwidth (GFSK, Ch 78)



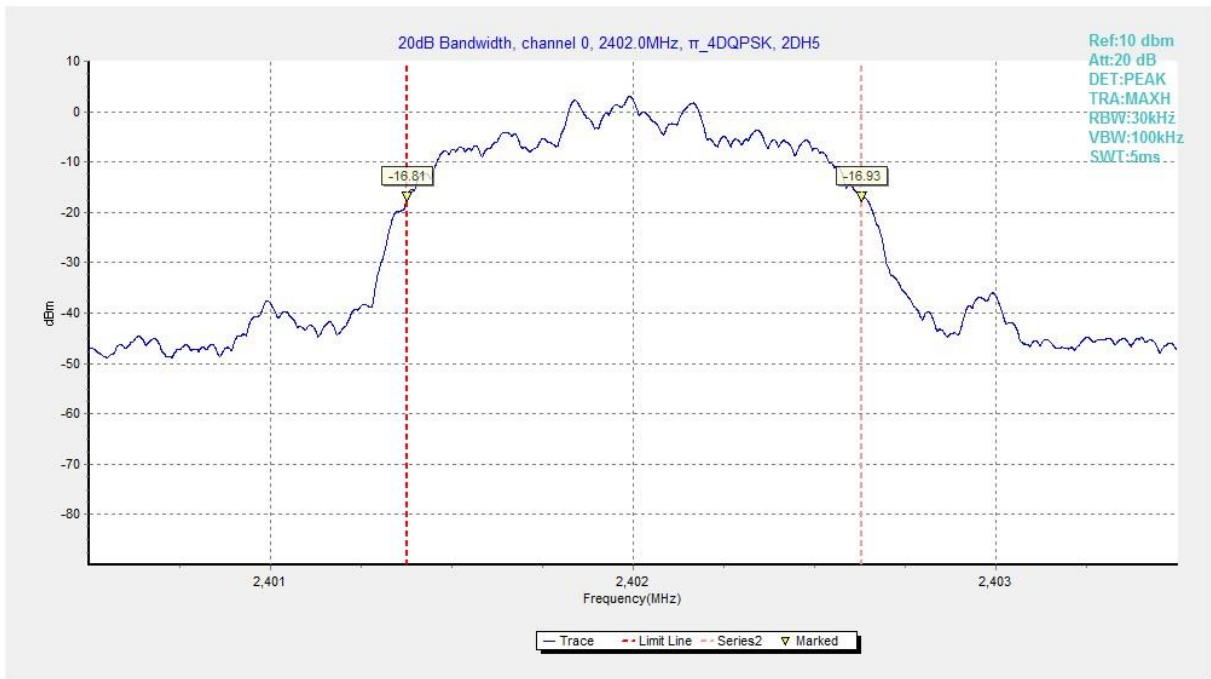


Fig. 72 20dB Bandwidth ( $\pi$ /4 DQPSK, Ch 0)

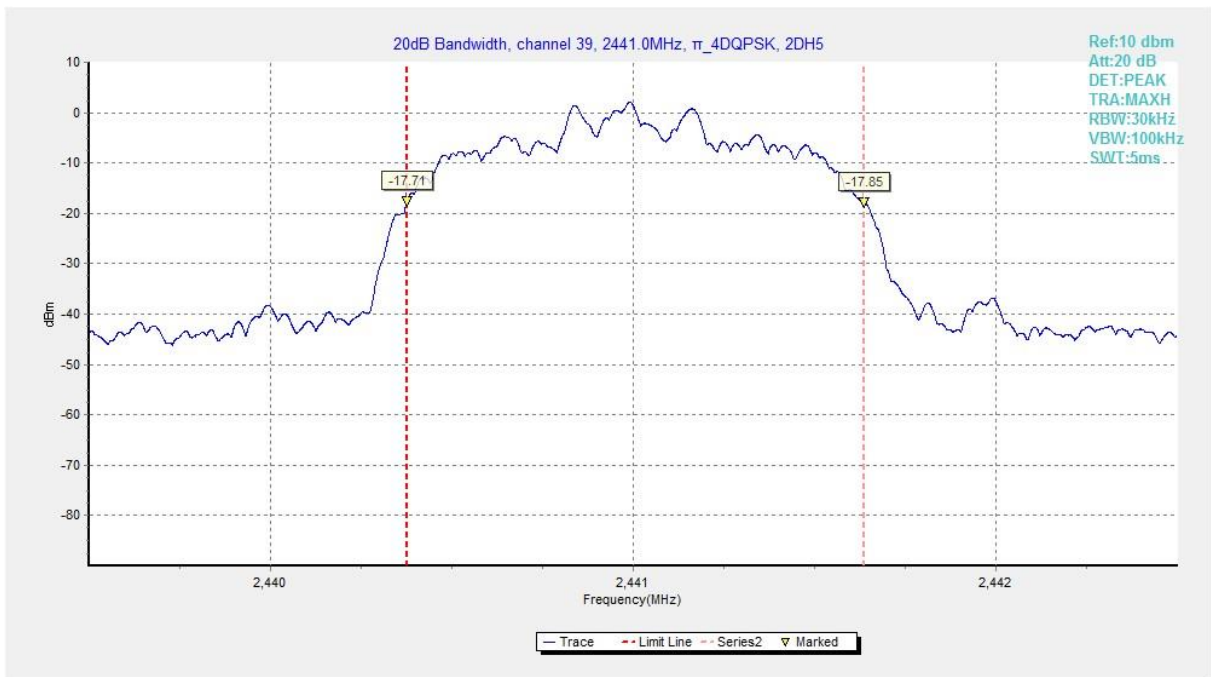


Fig. 73 20dB Bandwidth ( $\pi$ /4 DQPSK, Ch 39)

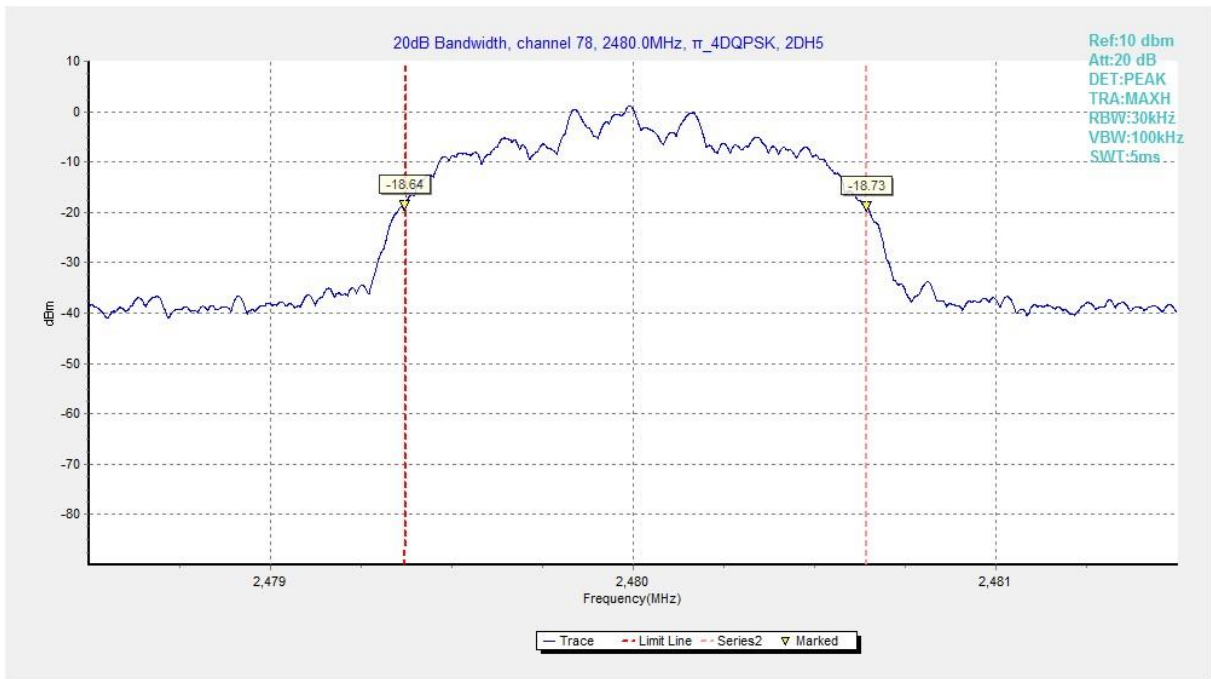


Fig. 74 20dB Bandwidth ( $\pi/4$  DQPSK, Ch 78)

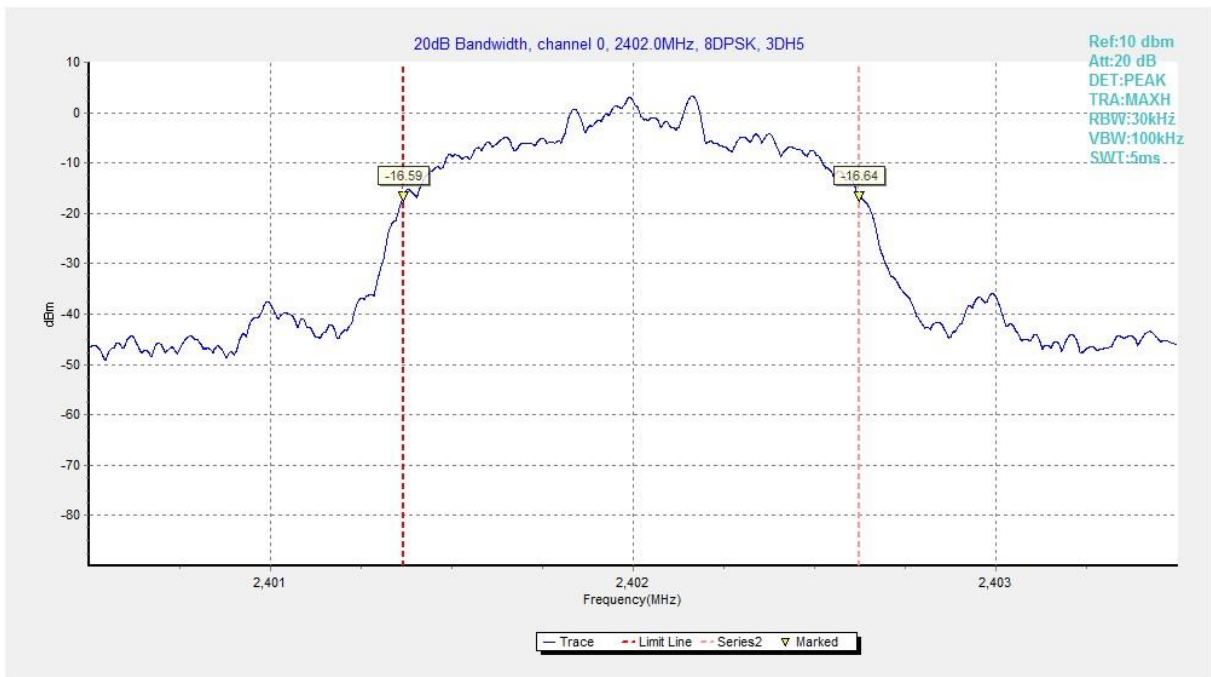


Fig. 75 20dB Bandwidth (8DPSK, Ch 0)

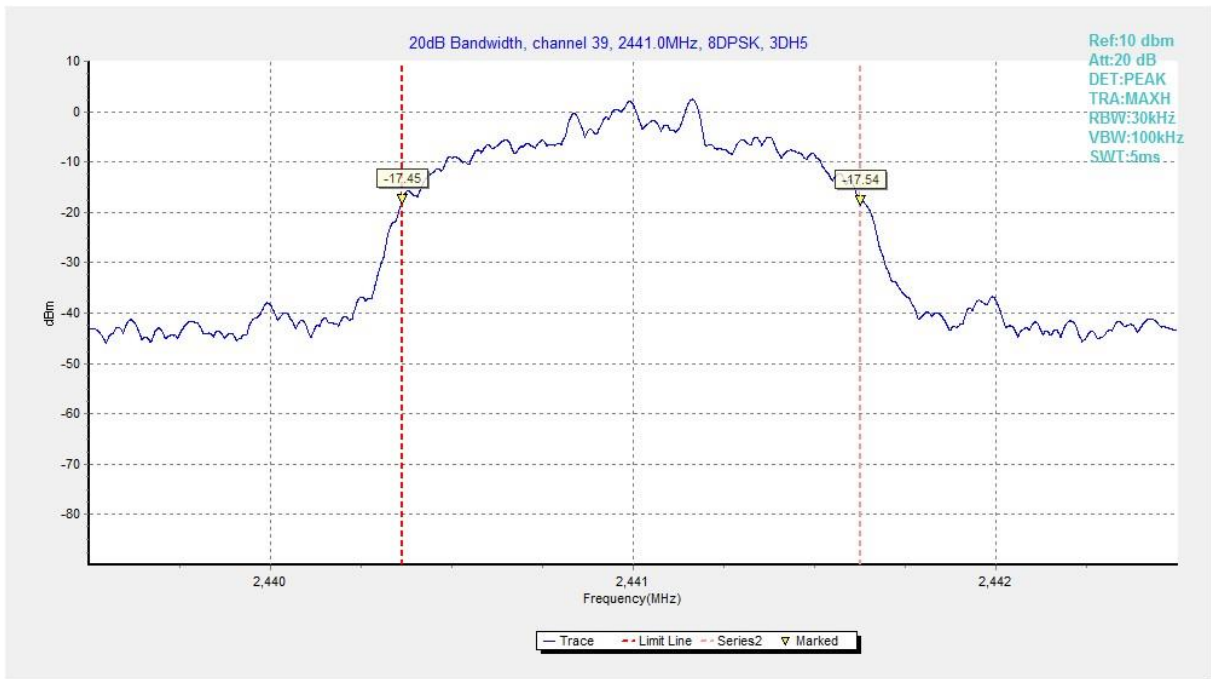


Fig. 76 20dB Bandwidth (8DPSK, Ch 39)

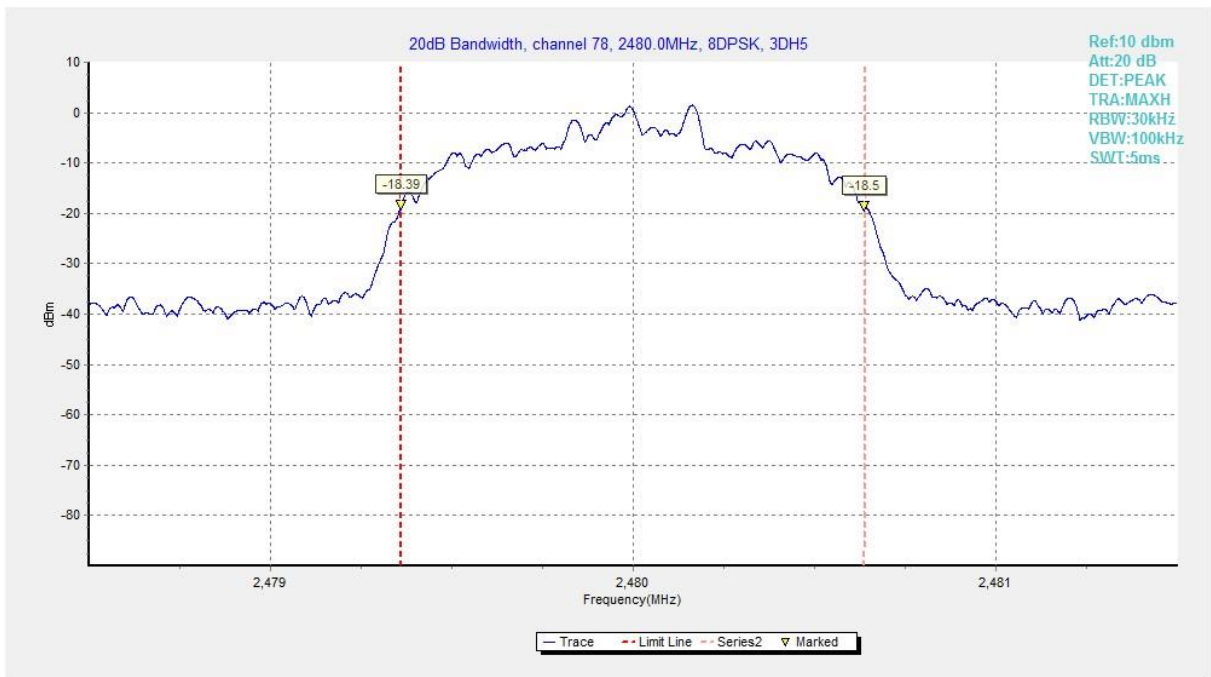


Fig. 77 20dB Bandwidth (8DPSK, Ch 78)



### A.6 Time of Occupancy (Dwell Time)

**Measurement Limit:**

Standard	Limit
FCC 47 CFR Part 15.247(a)	< 400 ms

**Measurement Results:**

Mode	Channel	Packet	Dwell Time(ms)		Conclusion
GFSK	39	DH5	Fig.78	307.35	<b>P</b>
			Fig.79		
$\pi/4$ DQPSK	39	2-DH5	Fig.80	307.37	<b>P</b>
			Fig.81		
8DPSK	39	3-DH5	Fig.82	307.37	<b>P</b>
			Fig.83		

See below for test graphs.

**Conclusion: Pass**

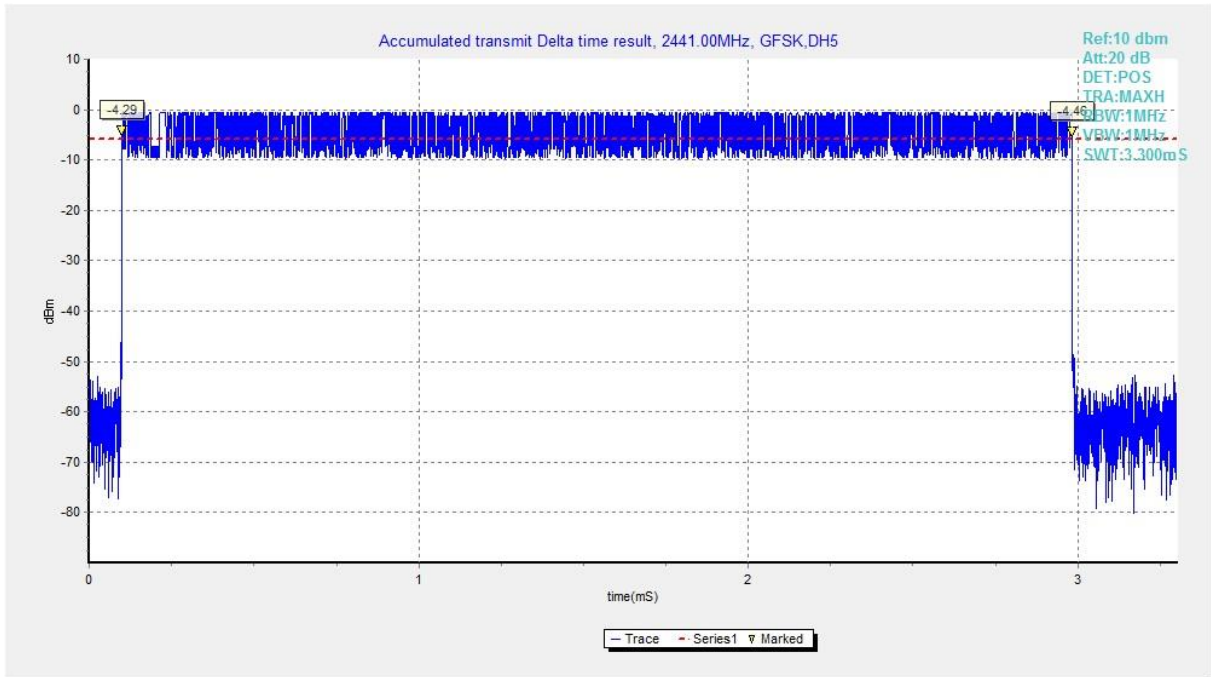


Fig. 78 Time of Occupancy (Dwell Time) (GFSK, Ch39)



Fig. 79 Time of Occupancy (Dwell Time) (GFSK, Ch39)



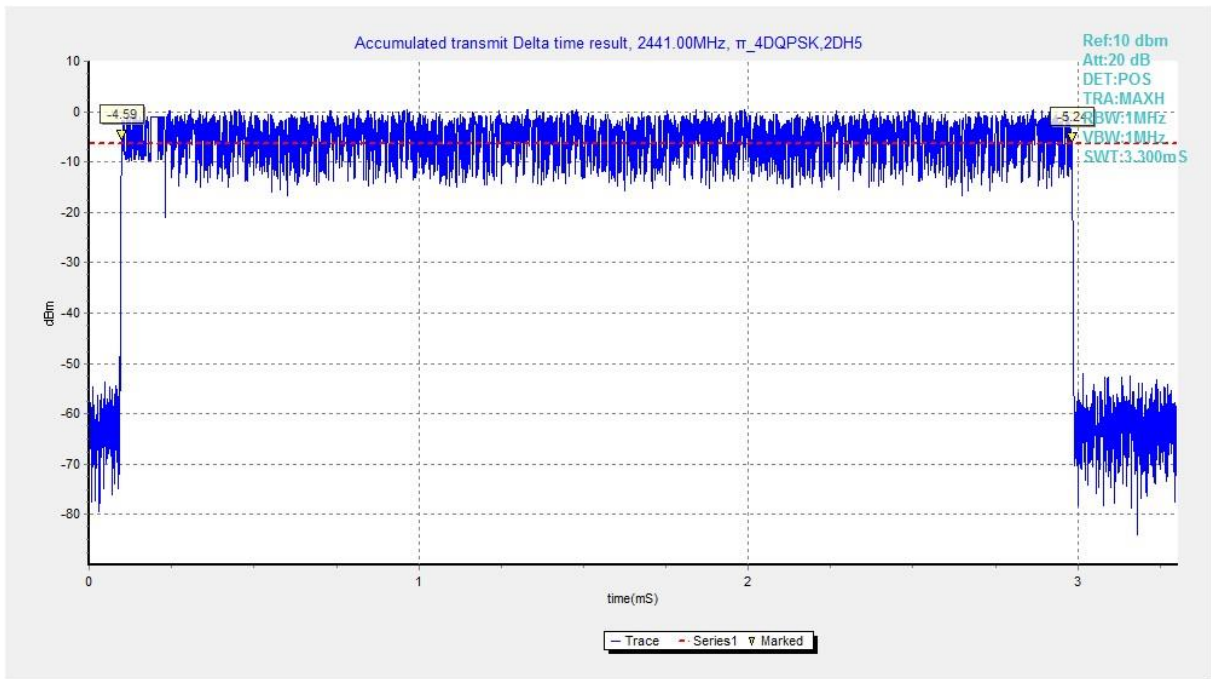


Fig. 80 Time of Occupancy(Dwell Time) ( $\pi$  /4 DQPSK, Ch39)

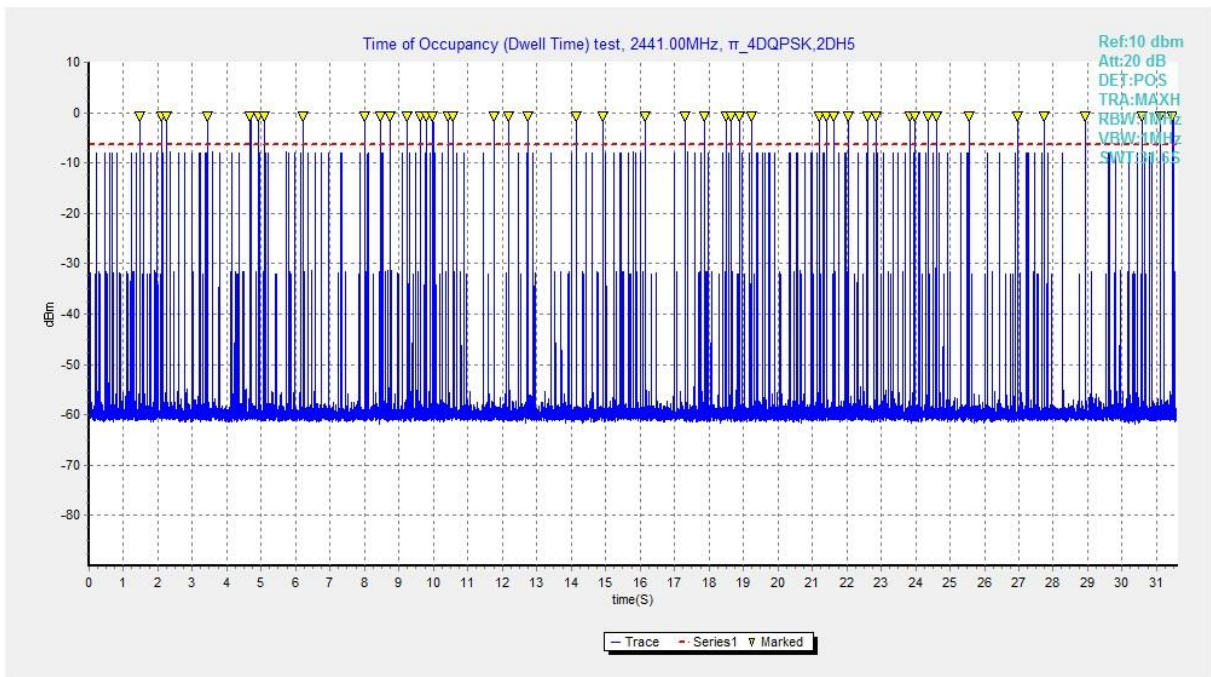


Fig. 81 Time of Occupancy(Dwell Time) ( $\pi$  /4 DQPSK, Ch39)

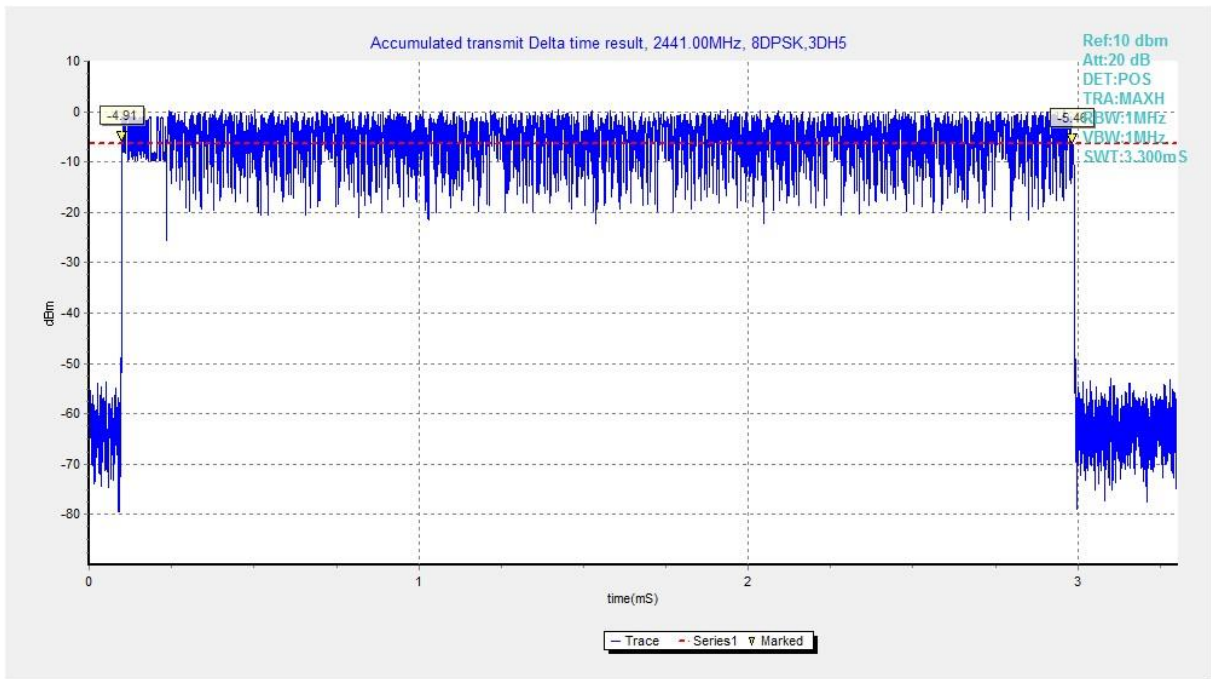


Fig. 82 Time of Occupancy (Dwell Time) (8DPSK, Ch39)

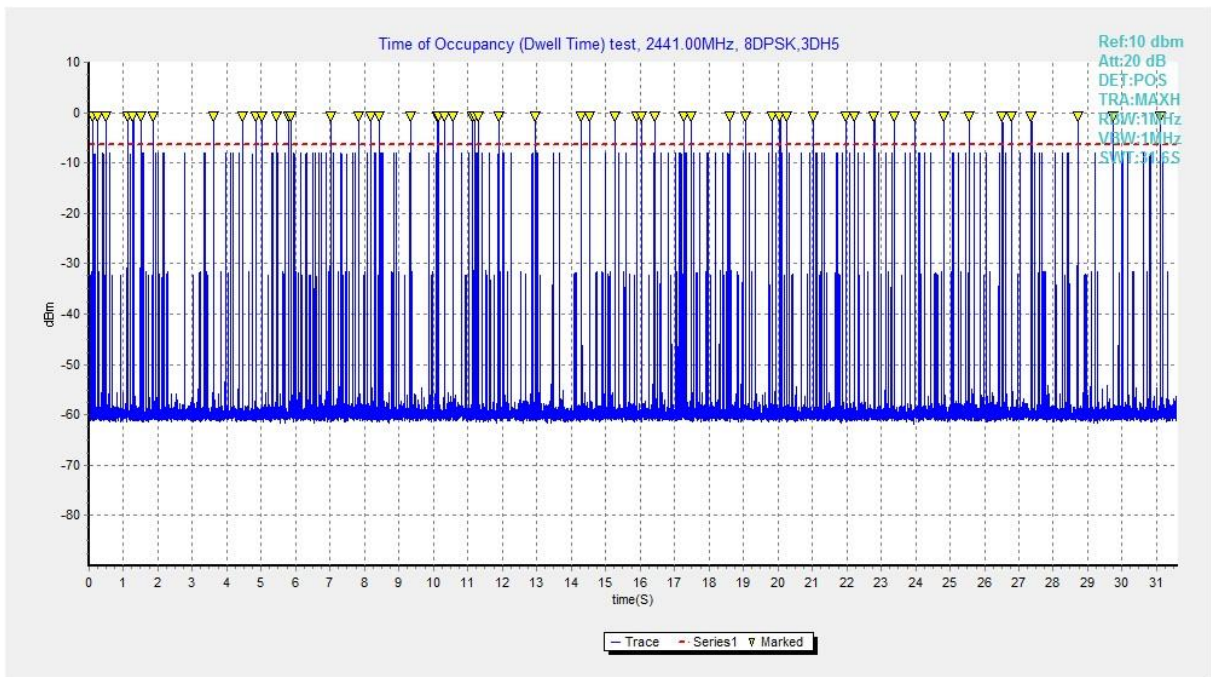


Fig. 83 Time of Occupancy (Dwell Time) (8DPSK, Ch39)



### A.7 Number of Hopping Channels

**Measurement Limit:**

Standard	Limit
FCC 47 CFR Part 15.247(a)	At least 15 non-overlapping channels

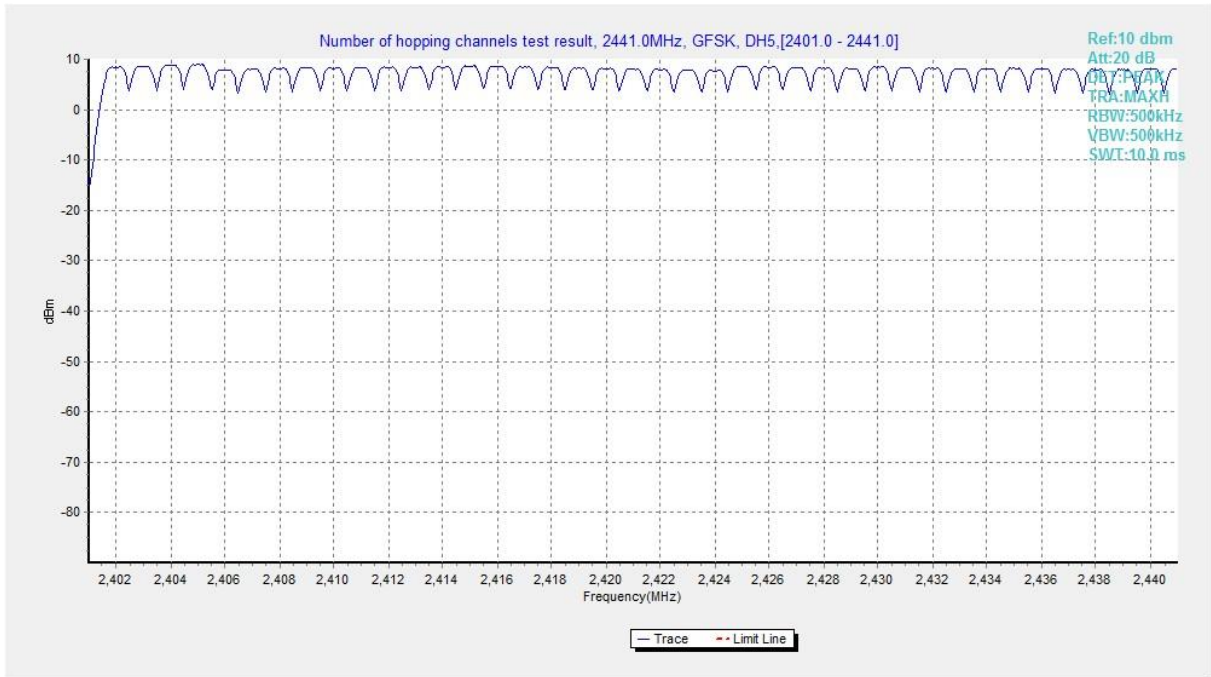
**Measurement Results:**

Mode	Packet	Number of hopping		Test result	Conclusion
GFSK	DH5	Fig.84	Fig.85	79	<b>P</b>
$\pi/4$ DQPSK	2-DH5	Fig.86	Fig.87	79	<b>P</b>
8DPSK	3-DH5	Fig.88	Fig.89	79	<b>P</b>

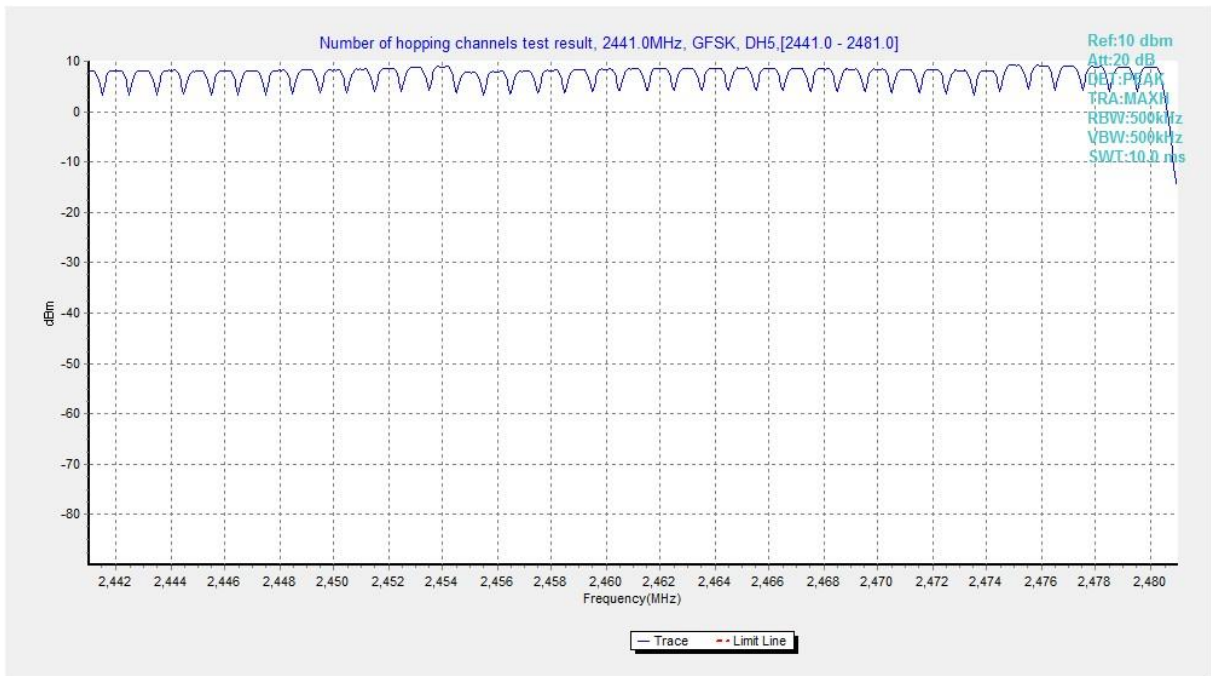
See below for test graphs.

**Conclusion: Pass**





**Fig. 84 Hopping channel ch0~39 (GFSK, Ch39)**



**Fig. 85 Hopping channel ch39~78 (GFSK, Ch39)**

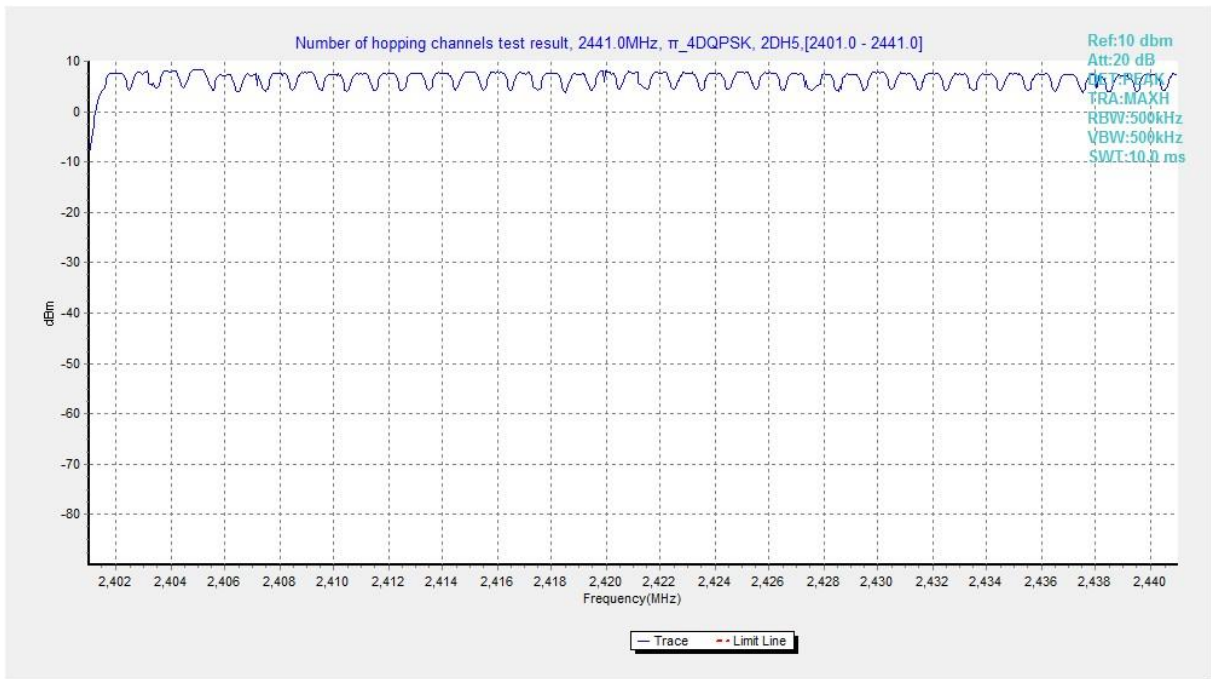


Fig. 86 Hopping channel ch0~39 ( $\pi/4$  DQPSK, Ch39)

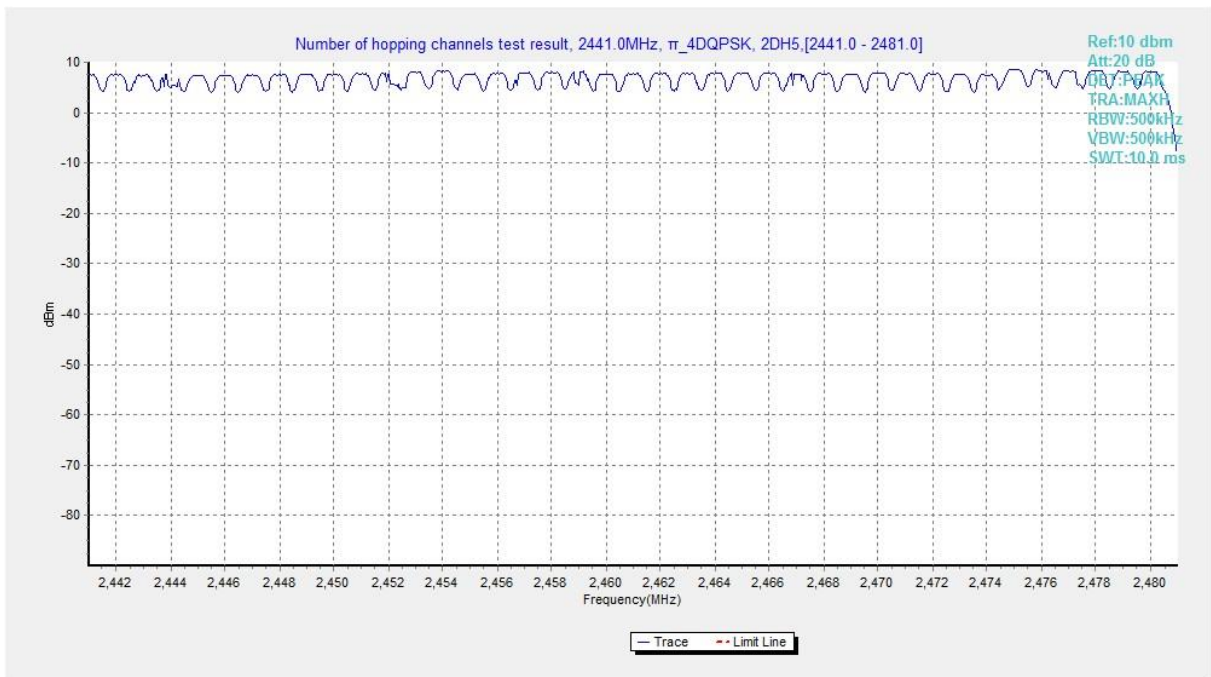
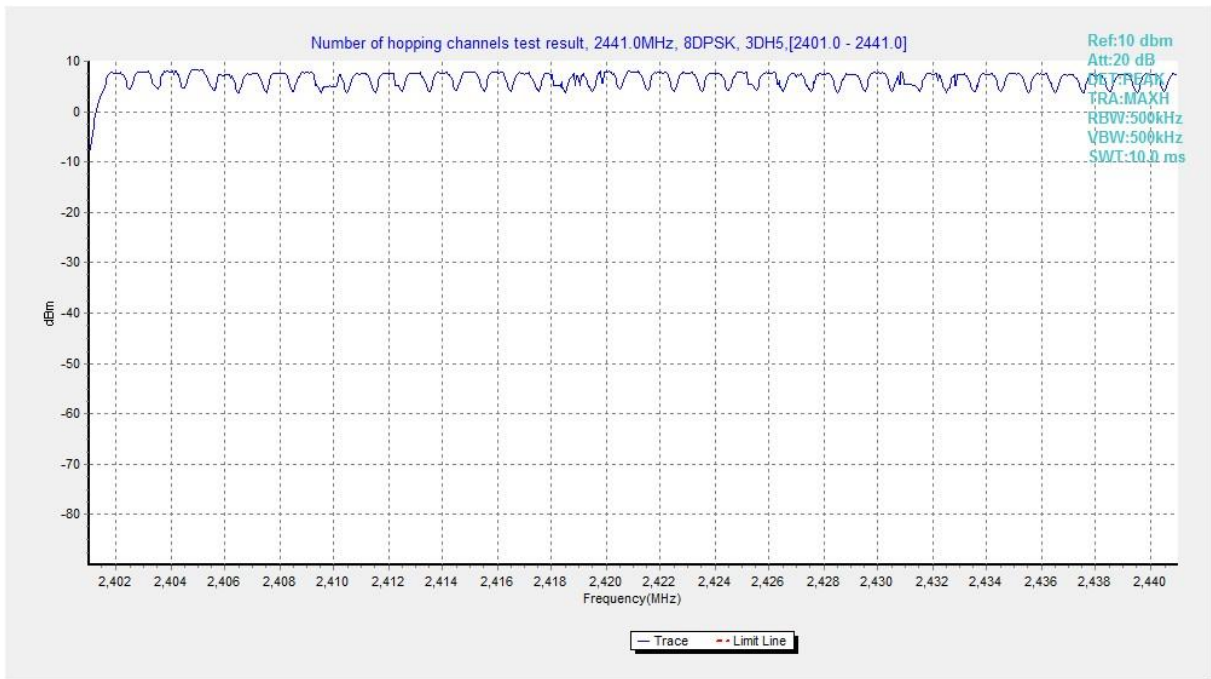
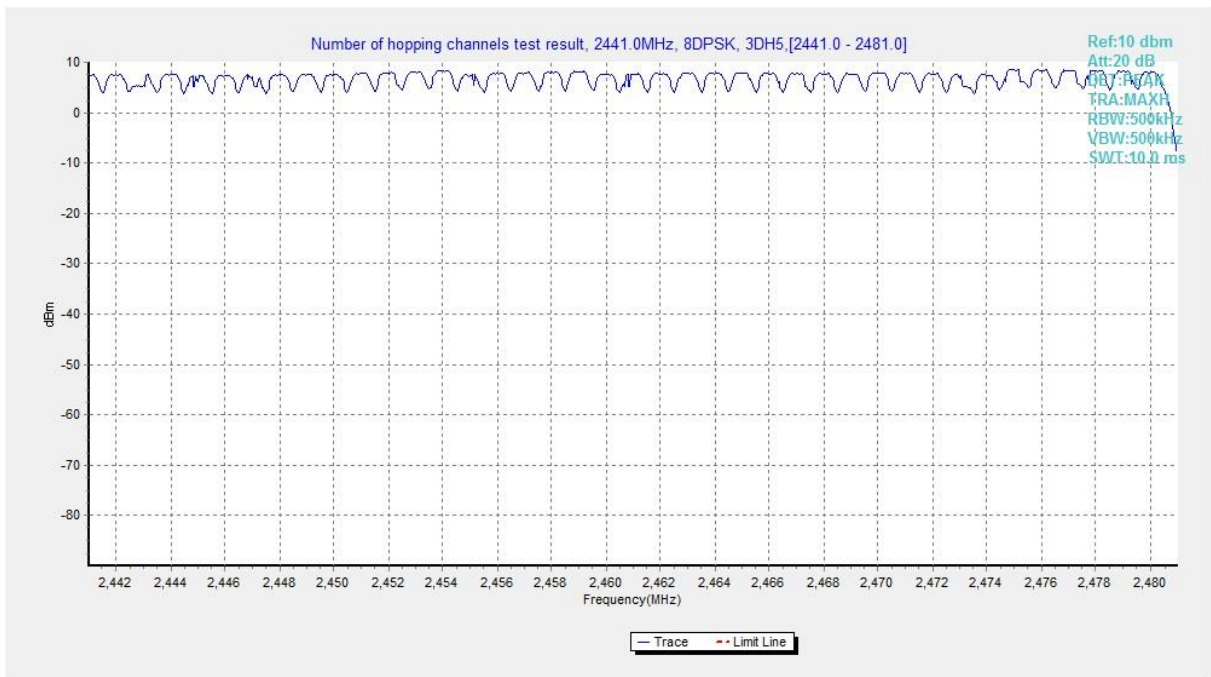


Fig. 87 Hopping channel ch39~78 ( $\pi/4$  DQPSK, Ch39)



**Fig. 88 Hopping channel ch0~39 (8DPSK, Ch39)**



**Fig. 89 Hopping channel ch39~78 (8DPSK, Ch39)**

### A.8 Carrier Frequency Separation

**Measurement Limit:**

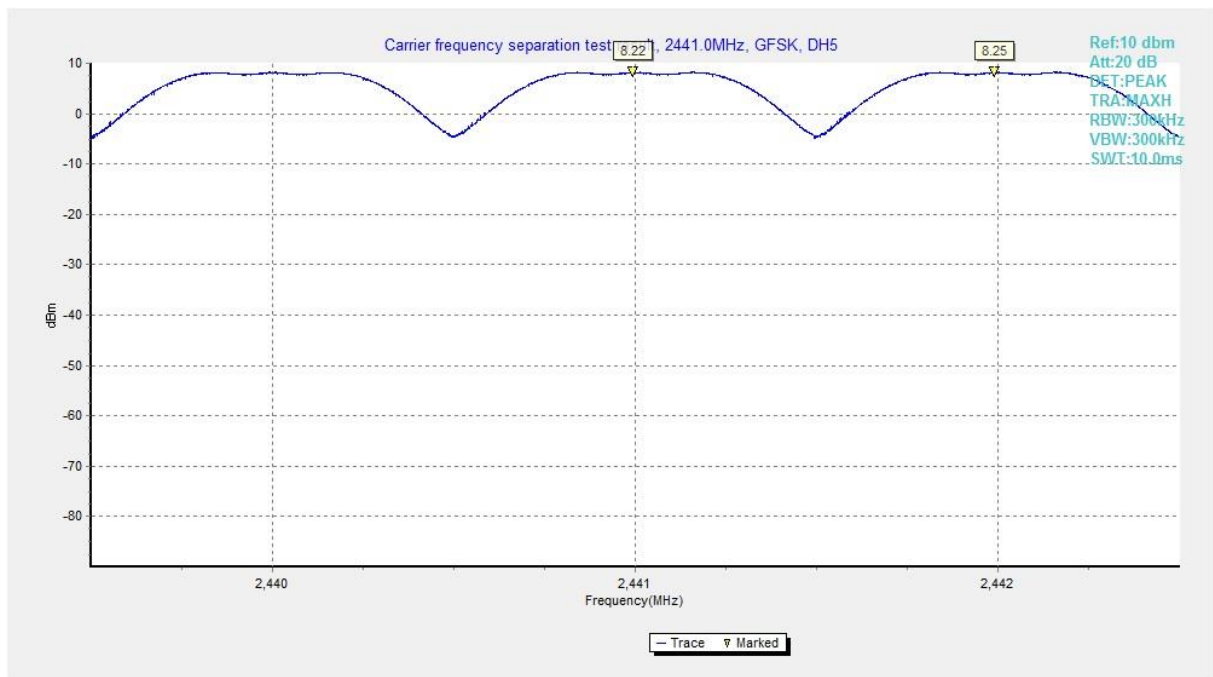
Standard	Limit
FCC 47 CFR Part 15.247(a)	By a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater

**Measurement Results:**

Mode	Channel	Packet	Separation of hopping channels	Test result (kHz)	Conclusion
GFSK	39	DH5	Fig.90	995.25	P
$\pi/4$ DQPSK	39	2-DH5	Fig.91	996.00	P
8DPSK	39	3-DH5	Fig.92	1005.75	P

See below for test graphs.

**Conclusion: Pass**



**Fig. 90 Carrier Frequency Separation (GFSK, Ch39)**

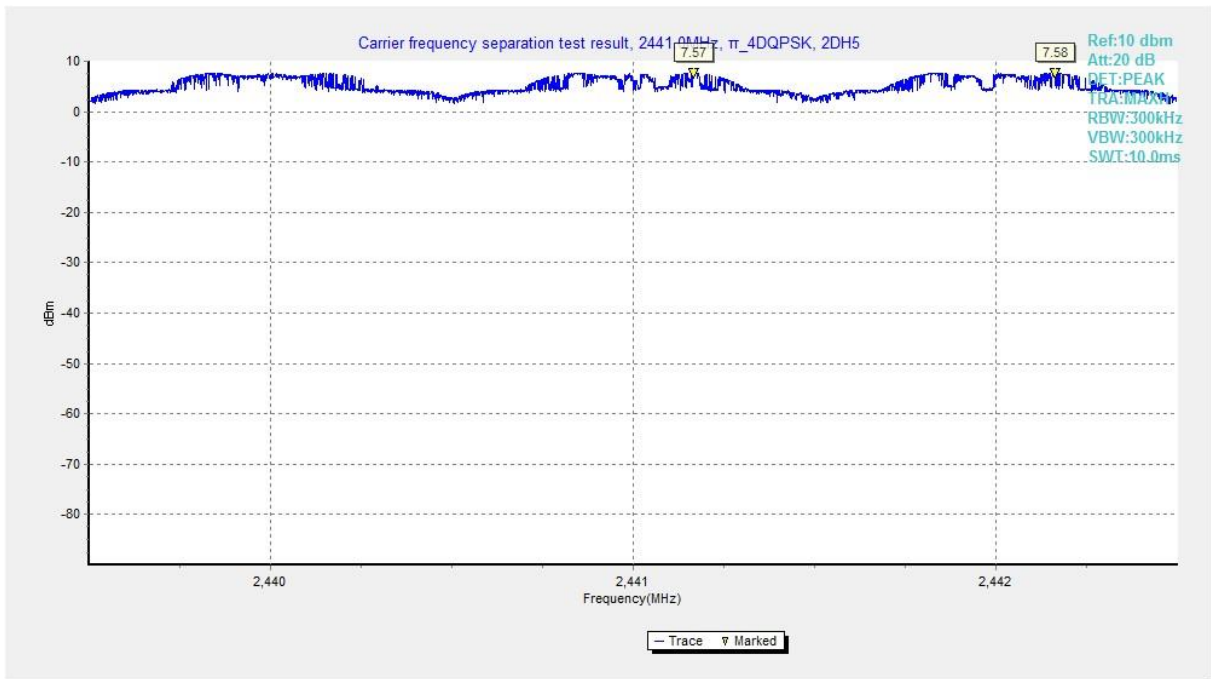


Fig. 91 Carrier Frequency Separation ( $\pi/4$  DQPSK, Ch39)

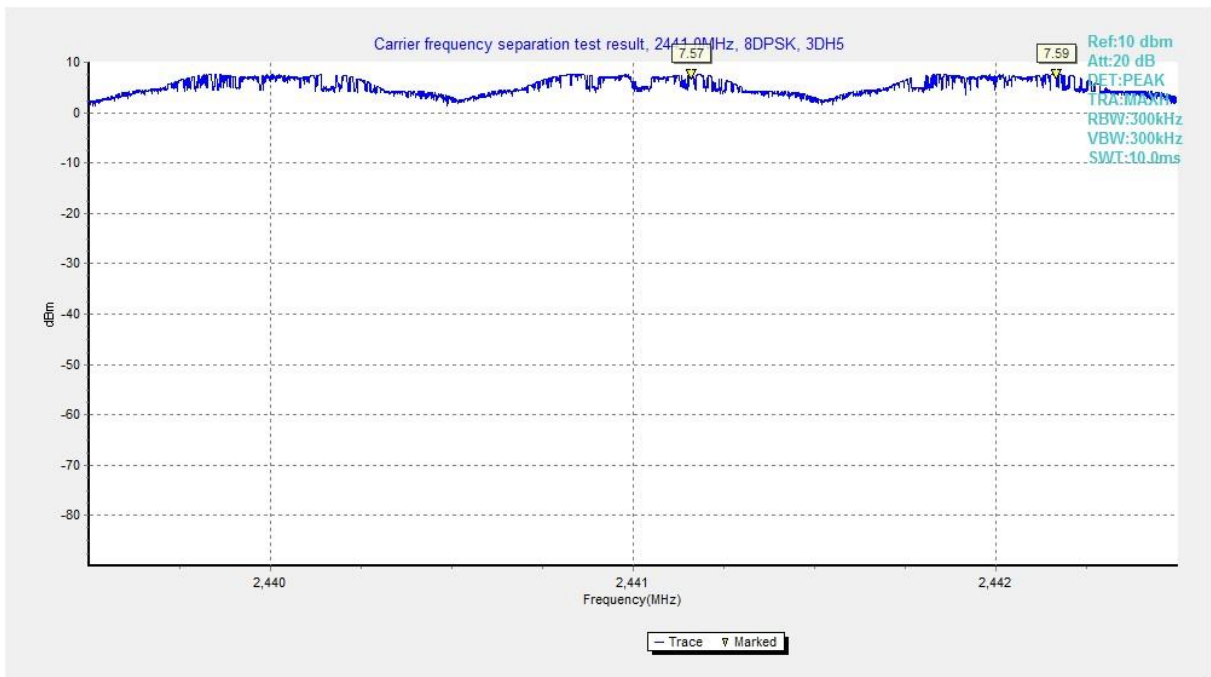


Fig. 92 Carrier Frequency Separation (8DPSK, Ch39)



**A.9 AC Power line Conducted Emission**

**Test Condition:**

Voltage (V)	Frequency (Hz)
120	60

**Measurement Result and limit:**

BT (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)		Conclusion
		Traffic	Idle	
0.15 to 0.5	66 to 56	Fig.93	Fig.94	<b>P</b>
0.5 to 5	56			
5 to 30	60			

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

BT (Average Limit)

Frequency range (MHz)	Average-peak Limit (dB $\mu$ V)	Result (dB $\mu$ V)		Conclusion
		Traffic	Idle	
0.15 to 0.5	56 to 46	Fig.93	Fig.94	<b>P</b>
0.5 to 5	46			
5 to 30	50			

NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

**Note:** The measurement results include the L1 and N measurements.

**See below for test graphs.**

**Conclusion: Pass**



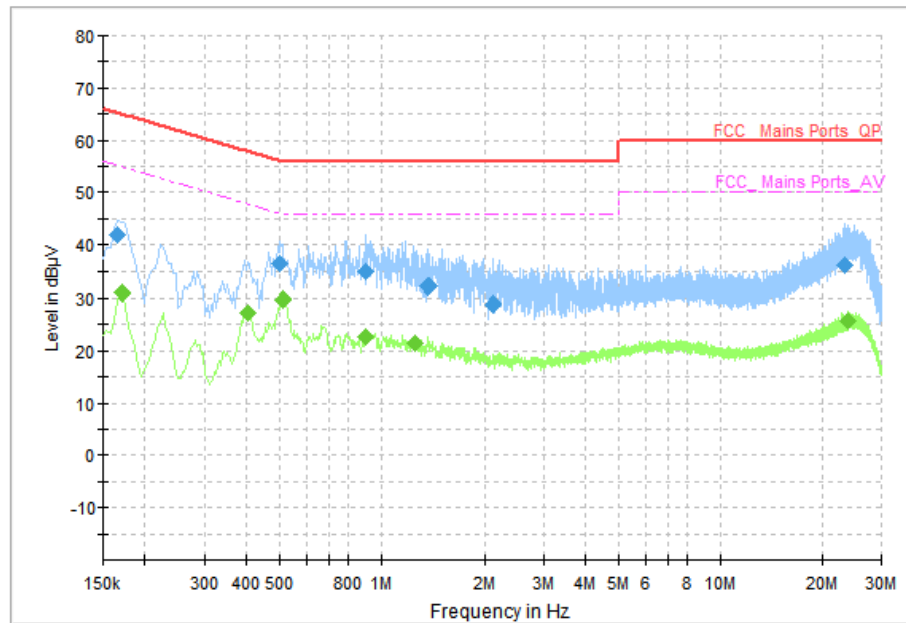


Fig. 93 AC Powerline Conducted Emission (Traffic)

**Measurement Results: Quasi Peak**

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.166000	41.97	65.16	23.19	L1	ON	10
0.502000	36.51	56.00	19.49	N	ON	10
0.902000	34.98	56.00	21.02	N	ON	10
1.378000	32.15	56.00	23.85	N	ON	10
2.126000	28.77	56.00	27.23	N	ON	10
23.446000	36.14	60.00	23.86	N	ON	10

**Measurement Results: Average**

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.170000	30.99	54.96	23.97	N	ON	10
0.402000	27.36	47.81	20.46	L1	ON	10
0.514000	29.84	46.00	16.16	L1	ON	10
0.902000	22.77	46.00	23.23	N	ON	10
1.262000	21.61	46.00	24.39	N	ON	10
23.818000	25.73	50.00	24.27	N	ON	10

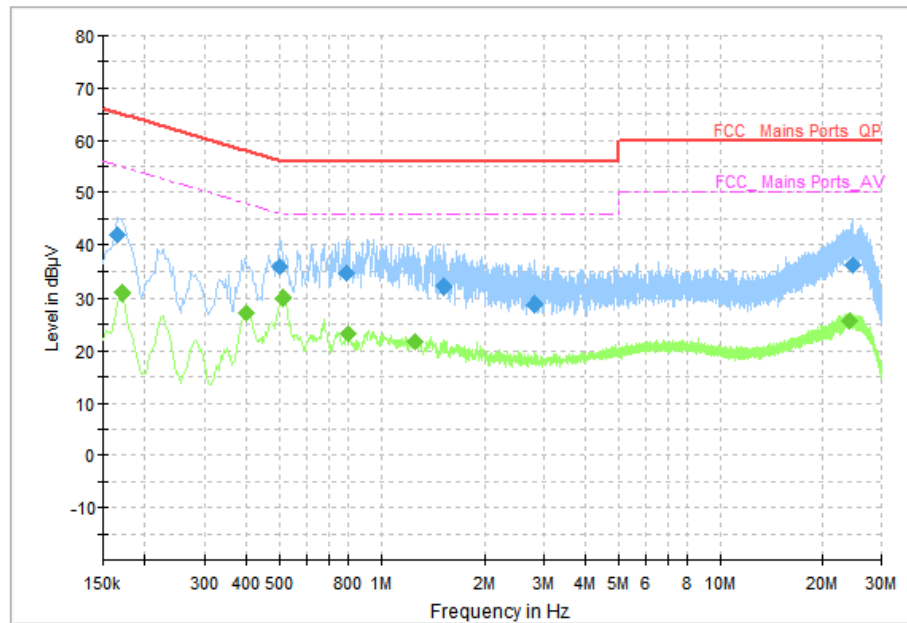


Fig. 94 AC Power line Conducted Emission (Idle)

**Measurement Results: Quasi Peak**

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.166000	41.84	65.16	23.32	N	ON	10
0.498000	35.71	56.03	20.32	N	ON	10
0.790000	34.58	56.00	21.42	N	ON	10
1.510000	32.04	56.00	23.96	N	ON	10
2.802000	28.82	56.00	27.18	N	ON	10
24.626000	36.11	60.00	23.89	N	ON	10

**Measurement Results: Average**

Frequency (MHz)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.170000	30.83	54.96	24.13	L1	ON	10
0.398000	27.25	47.90	20.65	L1	ON	10
0.514000	29.86	46.00	16.14	L1	ON	10
0.798000	23.21	46.00	22.79	N	ON	10
1.258000	21.65	46.00	24.35	N	ON	10
24.034000	25.87	50.00	24.13	N	ON	10

\*\*\*END OF REPORT\*\*\*