

GFSK Ch 78 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2484.150	42.0	-11.2	53.2	H
17986.875	50.1	27.9	22.2	H
17997.188	50.1	27.9	22.2	V
17991.094	50.0	27.9	22.1	H
17990.625	49.9	27.9	22.0	H
17991.563	49.9	27.9	22.0	H

 $\pi/4$ DQPSK Ch 0 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2389.660	41.7	-11.1	52.8	H
17983.594	49.9	27.9	22.0	H
17988.281	49.9	27.9	22.0	V
17983.125	49.8	27.9	21.9	H
17990.156	49.8	27.9	21.9	H
17999.531	49.7	27.9	21.8	H

 $\pi/4$ DQPSK Ch 39 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17983.125	49.8	27.9	21.9	H
17997.188	49.7	27.9	21.8	H
17979.844	49.6	27.9	21.7	V
17994.844	49.6	27.9	21.7	H
17998.594	49.6	27.9	21.7	H
17996.250	49.5	27.9	21.6	H

 $\pi/4$ DQPSK Ch 78 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.385	41.8	-11.2	53.0	H
17986.875	50.1	27.9	22.2	H
17997.188	50.1	27.9	22.2	V
17991.094	50.0	27.9	22.1	H
17990.625	49.9	27.9	22.0	H
17991.563	49.9	27.9	22.0	H

8DPSK Ch 0 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2387.320	41.9	-11.1	53.0	H
17994.375	50.0	27.9	22.1	H
17993.438	50.0	27.9	22.1	V
17991.563	49.9	27.9	22.0	H
17998.594	49.9	27.9	22.0	H
17986.875	49.8	27.9	21.9	H

8DPSK Ch 39 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17990.156	50.0	27.9	22.1	H
17997.531	50.0	26.8	51.1	H
17999.531	49.9	27.9	22.0	V
17994.844	49.8	27.9	21.9	H
17991.563	49.7	27.9	21.8	H
17993.438	49.7	27.9	21.8	H

8DPSK Ch 78 - Average

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2490.200	42.1	-11.2	53.3	H
17993.438	50.2	27.9	22.3	H
17990.625	50.0	27.9	22.1	V
17997.656	49.9	27.9	22.0	H
17980.313	49.9	27.9	22.0	H
17999.531	49.8	27.9	21.9	H

GFSK Ch 0 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	PMea(dBuv/m)	Polarization
2389.135	54.2	-11.1	65.3	H
17967.656	61.0	27.9	33.1	H
17982.188	60.6	27.9	32.7	V
17991.563	60.6	27.9	32.7	H
17984.063	60.5	27.9	32.6	H
17979.844	60.3	27.9	32.4	H

GFSK Ch 39 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17989.688	61.0	27.9	33.1	H
17988.750	60.8	27.9	32.9	H
17992.969	60.6	27.9	32.7	V
17998.594	60.5	27.9	32.6	H
17988.281	60.2	27.9	32.3	H
17990.625	60.1	27.9	32.2	H

GFSK Ch 78 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.840	54.3	-11.2	65.500	H
17973.281	60.8	27.9	32.900	H
17999.531	60.5	27.9	32.600	V
17992.500	60.5	27.9	32.600	H
17987.344	60.5	27.9	32.600	H
17991.563	60.3	27.9	32.400	H

$\pi/4$ DQPSK Ch 0 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2390.145	54.3	-11.1	65.4	H
17967.656	61.0	27.9	33.1	H
17982.188	60.6	27.9	32.7	V
17991.563	60.6	27.9	32.7	H
17984.063	60.5	27.9	32.6	H
17979.844	60.3	27.9	32.4	H

 $\pi/4$ DQPSK Ch 39 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17989.688	61.0	27.9	33.1	H
17988.750	60.8	27.9	32.9	H
17992.969	60.6	27.9	32.7	V
17998.594	60.5	27.9	32.6	H
17988.281	60.2	27.9	32.3	H
17990.625	60.1	27.9	32.2	H

 $\pi/4$ DQPSK Ch 78 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2483.425	53.7	-11.2	64.9	H
17973.281	60.8	27.9	32.9	H
17999.531	60.5	27.9	32.6	V
17992.500	60.5	27.9	32.6	H
17987.344	60.5	27.9	32.6	H
17991.563	60.3	27.9	32.4	H

8DPSK Ch 0 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
2380.780	53.5	-11.1	64.6	H
17984.063	61.0	27.9	33.1	H
17987.344	60.8	27.9	32.9	V
17999.063	60.7	27.9	32.8	H
17985.000	60.4	27.9	32.5	H
17983.125	60.2	27.9	32.3	H

8DPSK Ch 39 - Peak

Frequency(MHz)	Result(dBuv/m)	ARPL (dB)	Pmea(dBuv/m)	Polarization
17988.750	60.9	27.9	33.0	H
17990.625	60.6	27.9	32.7	H
17982.188	60.5	27.9	32.6	V
17995.781	60.4	27.9	32.5	H
17994.375	60.4	27.9	32.5	H
17991.275	60.4	26.9	61.0	H

8DPSK Ch 78 - Peak

Frequency(MHz)	Result(dBuV/m)	ARPL (dB)	Pmea(dBuV/m)	Polarization
2490.115	54.4	-11.2	65.6	H
17996.719	61.1	27.9	33.2	H
17990.625	60.9	27.9	33.0	V
17988.281	60.8	27.9	32.9	H
17983.594	60.7	27.9	32.8	H
17975.625	60.4	27.9	32.5	H

Sample calculation: 8DPSK Ch 78 - Peak, 2490.115 MHz

$$\text{Peak ERP(dBm)} = \text{PMea}(65.6 \text{ dBuV/m}) + \text{ARPl} (-11.2 \text{ dB}) = 54.4 \text{ dBuV/m}$$

Conclusion: PASS

Test graphs as below:

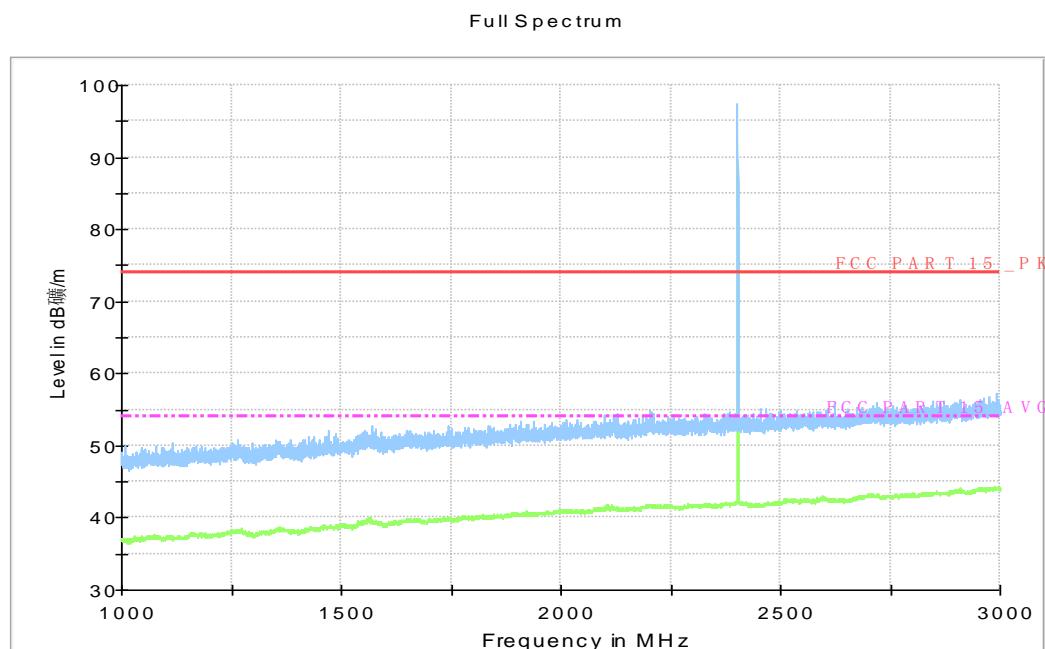


Fig.58. Radiated emission: GFSK, Channel 0, 1 GHz - 3 GHz

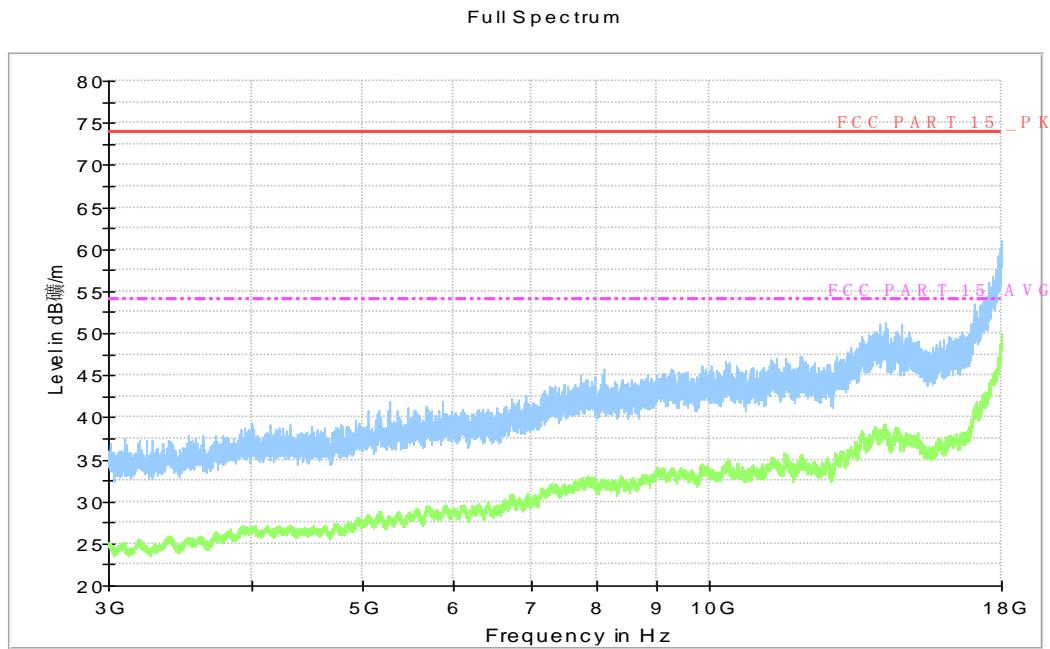


Fig.59. Radiated emission: GFSK, Channel 0, 3 GHz - 18 GHz

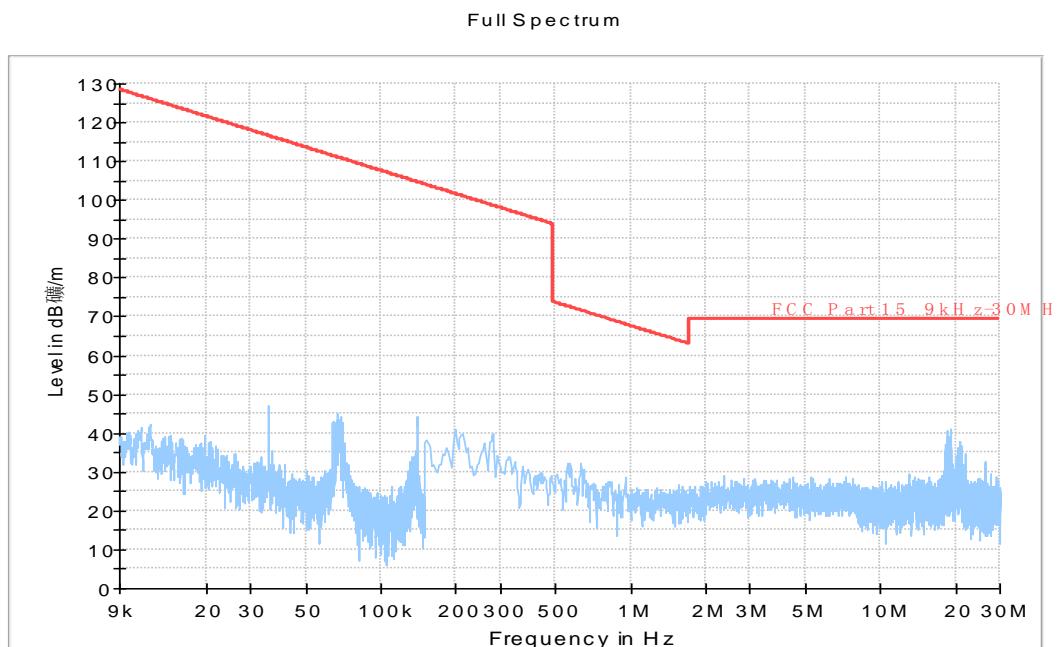


Fig.60. Radiated emission: GFSK, Channel 39, 9 kHz - 30 MHz

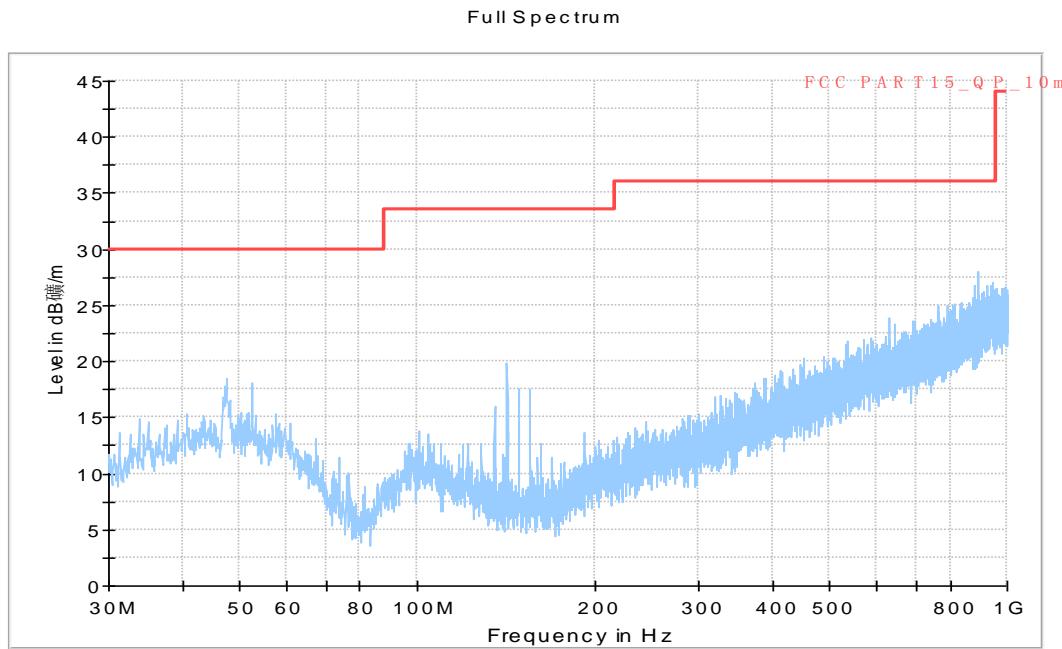


Fig.61. Radiated emission: GFSK, Channel 39, 30 MHz - 1 GHz

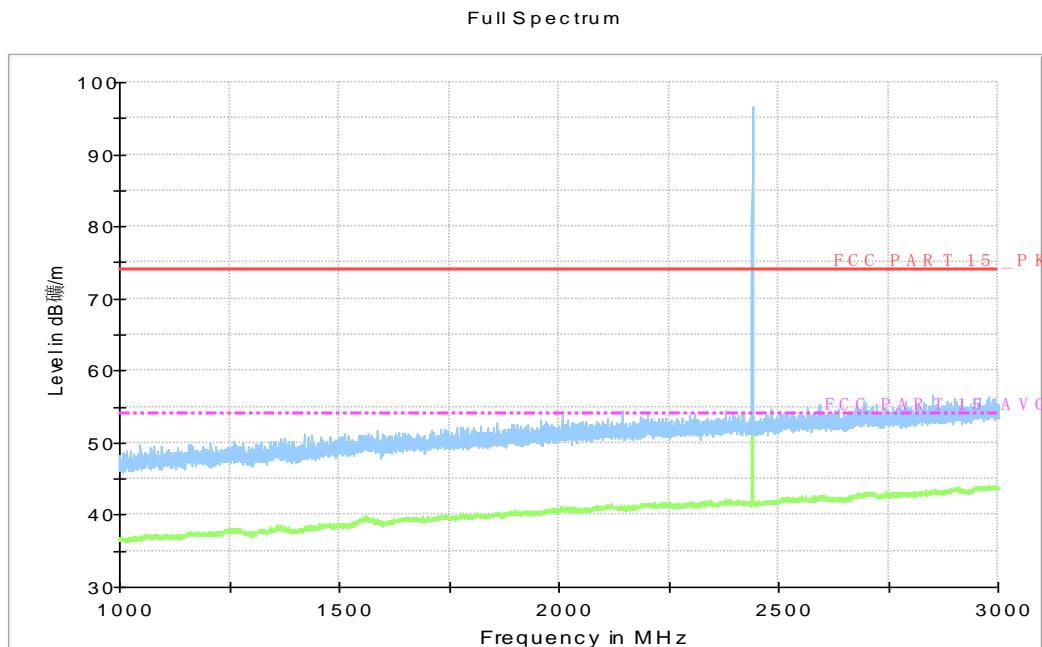


Fig.62. Radiated emission: GFSK, Channel 39, 1 GHz - 3 GHz

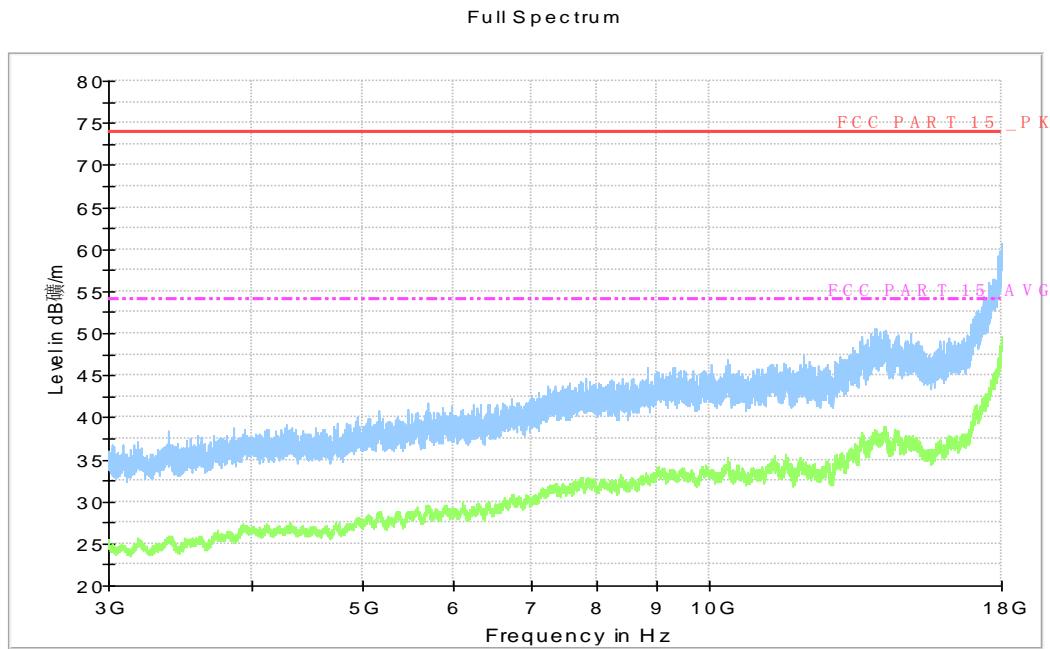


Fig.63. Radiated emission: GFSK, Channel 39, 3 GHz - 18 GHz

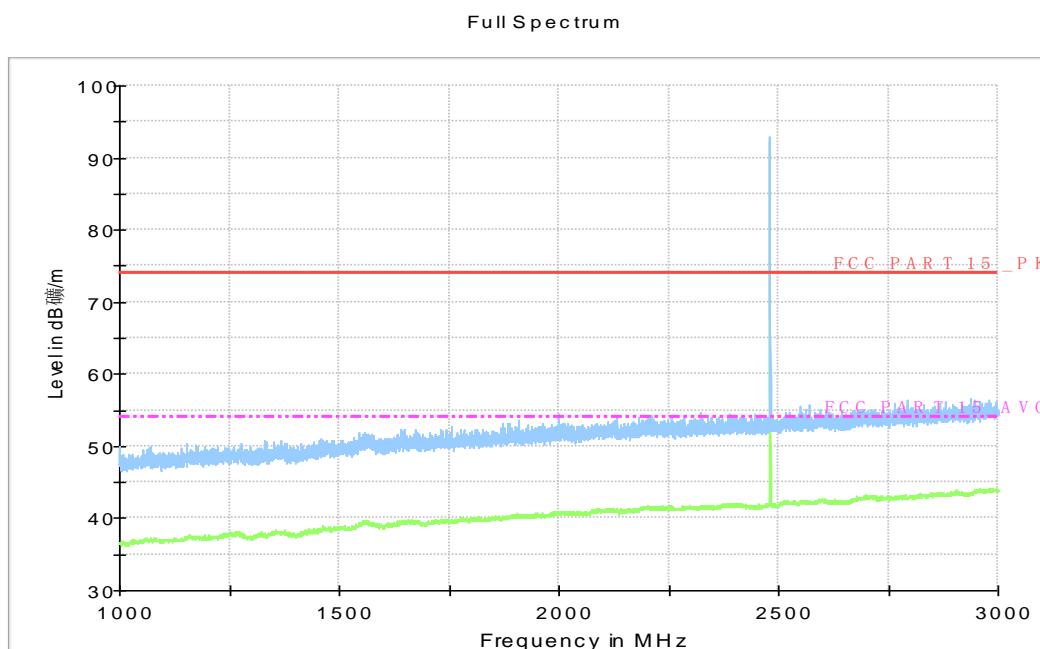


Fig.64. Radiated emission: GFSK, Channel 78, 1 GHz - 3 GHz

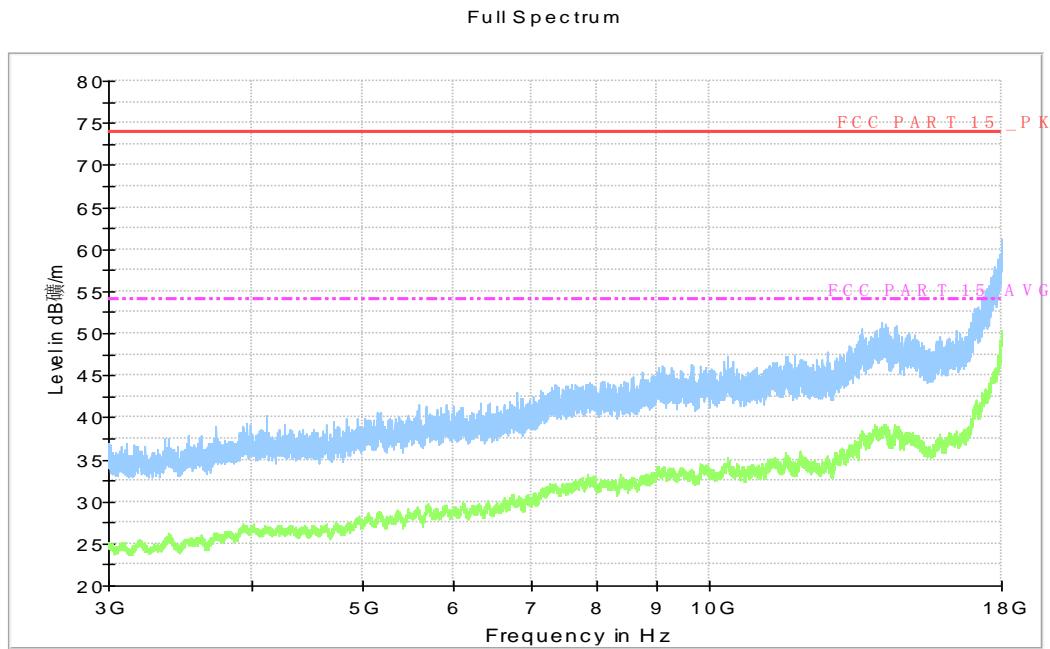


Fig.65. Radiated emission: GFSK, Channel 78, 3 GHz - 18 GHz

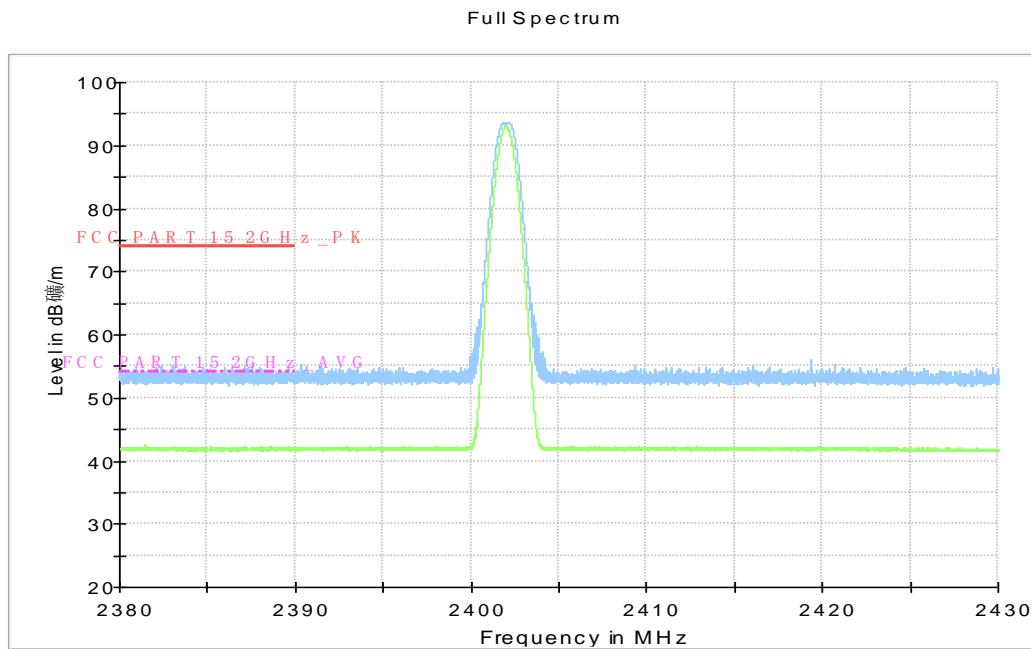


Fig.66. Radiated emission (Power): GFSK, low channel

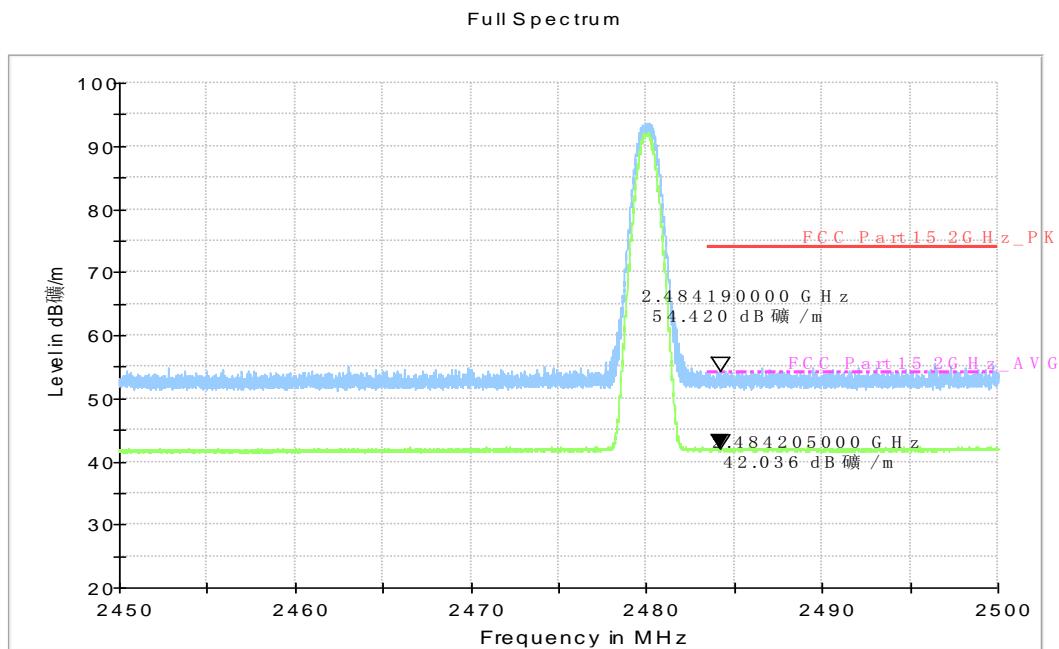


Fig.67. Radiated emission (Power) GFSK, high channel

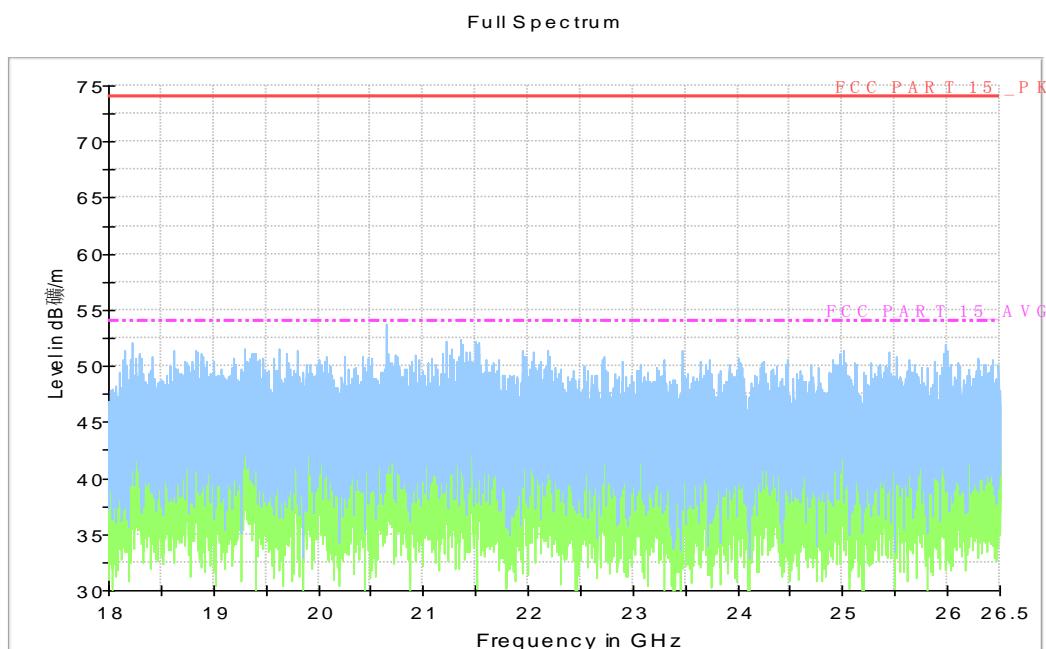
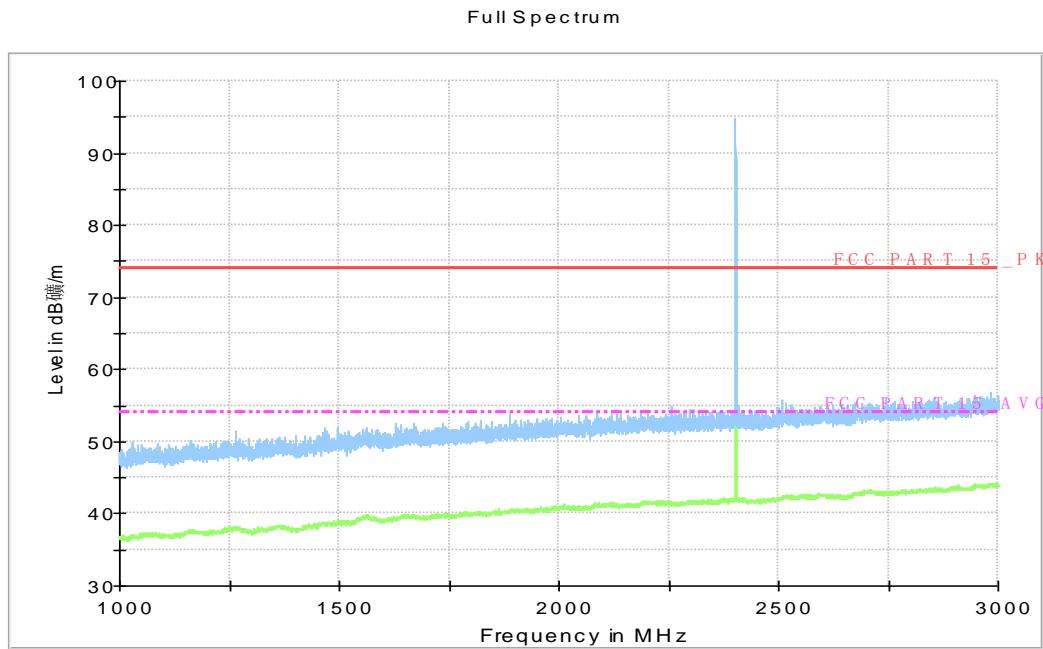
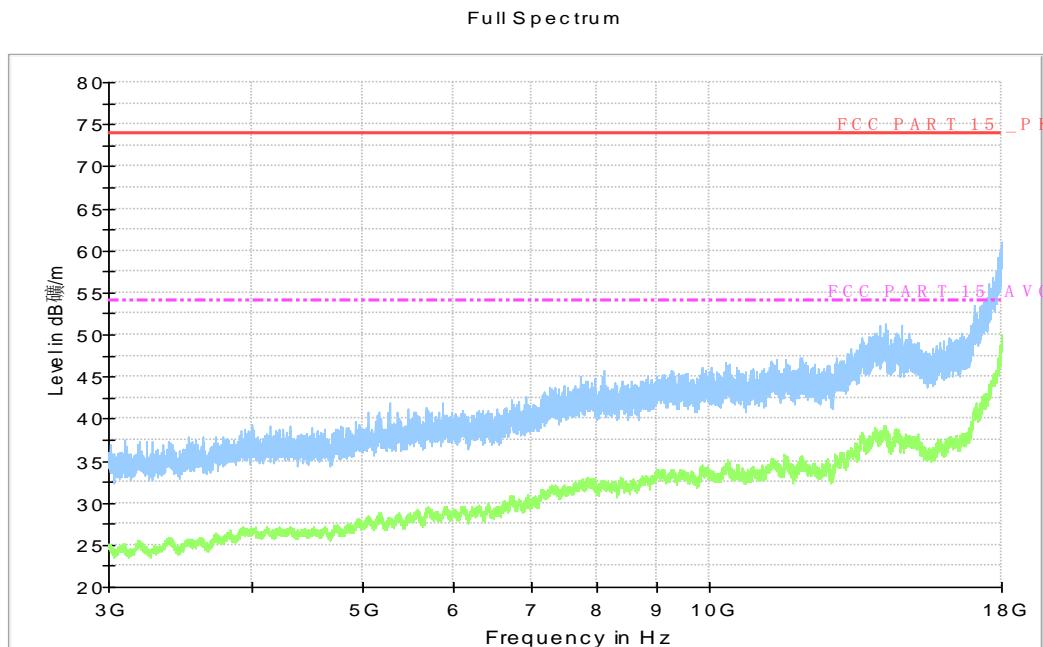


Fig.68. Radiated emission: GFSK, 18 GHz - 26 GHz

Fig.69. Radiated emission: $\pi/4$ DQPSK, Channel 0, 1 GHz - 3 GHzFig.70. Radiated emission: $\pi/4$ DQPSK, Channel 0, 3 GHz - 18 GHz

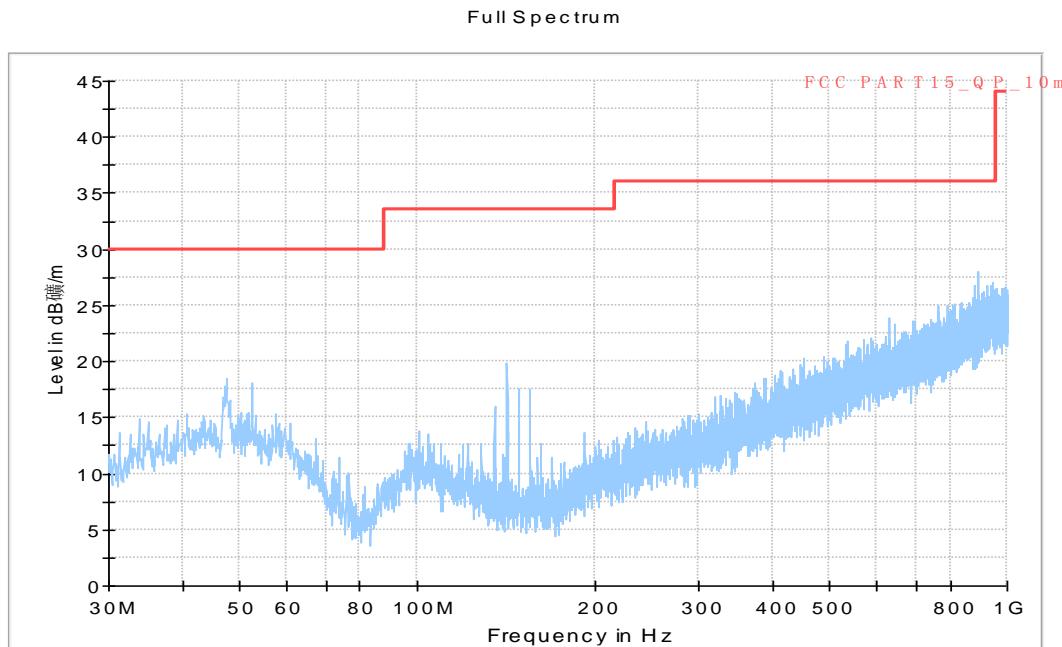


Fig.71. Radiated emission: $\pi/4$ DQPSK, Channel 39, 30 MHz - 1 GHz

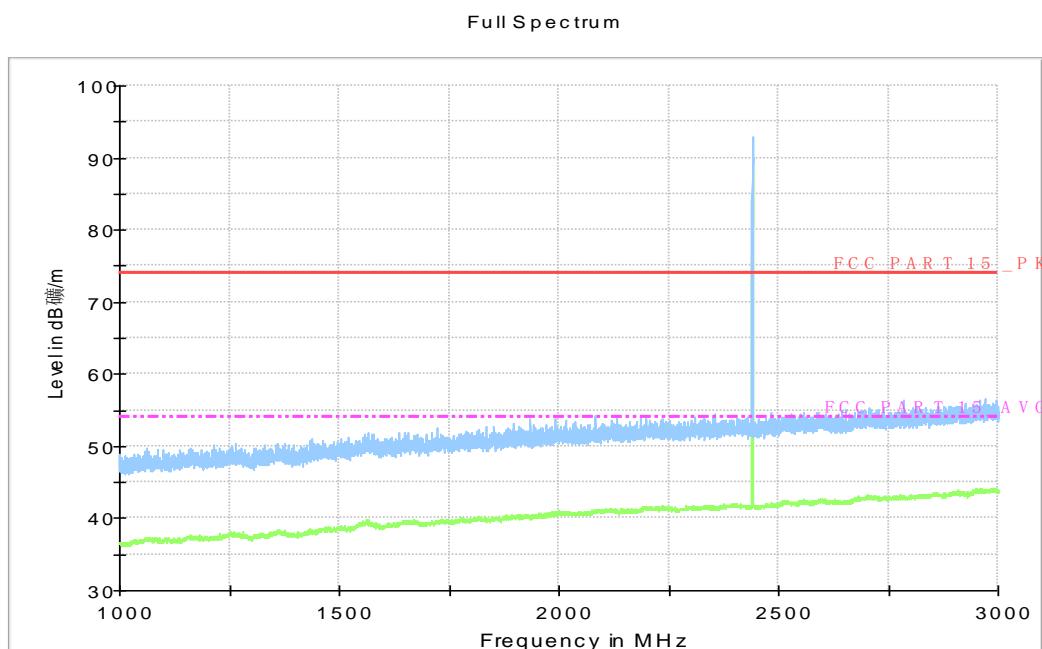


Fig.72. Radiated emission: $\pi/4$ DQPSK, Channel 39, 1 GHz - 3 GHz

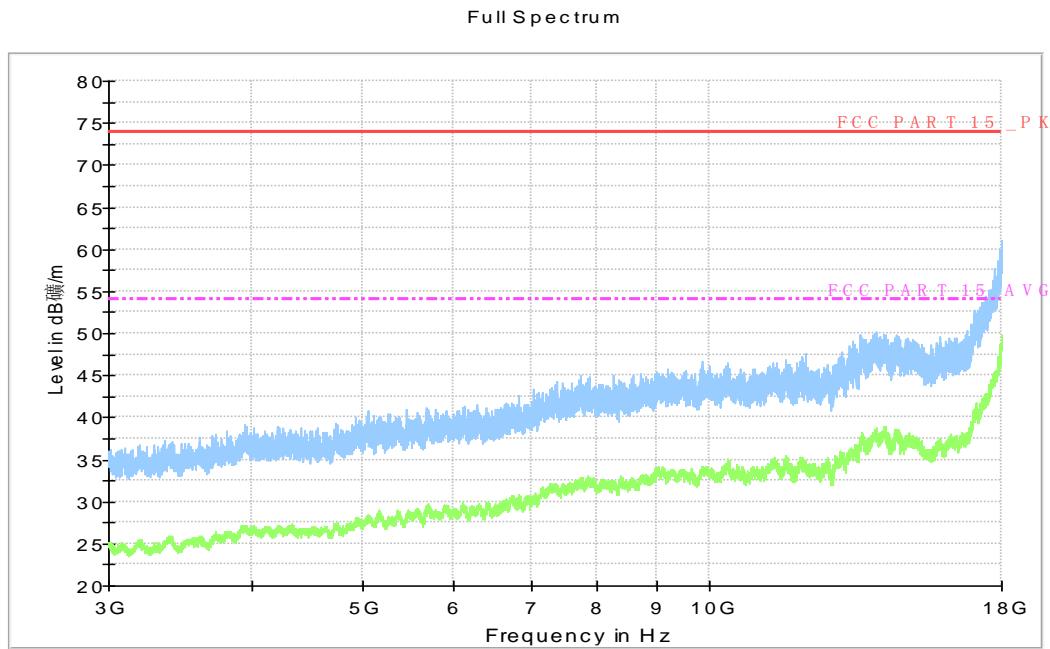


Fig.73. Radiated emission: $\pi/4$ DQPSK, Channel 39, 3 GHz - 18 GHz

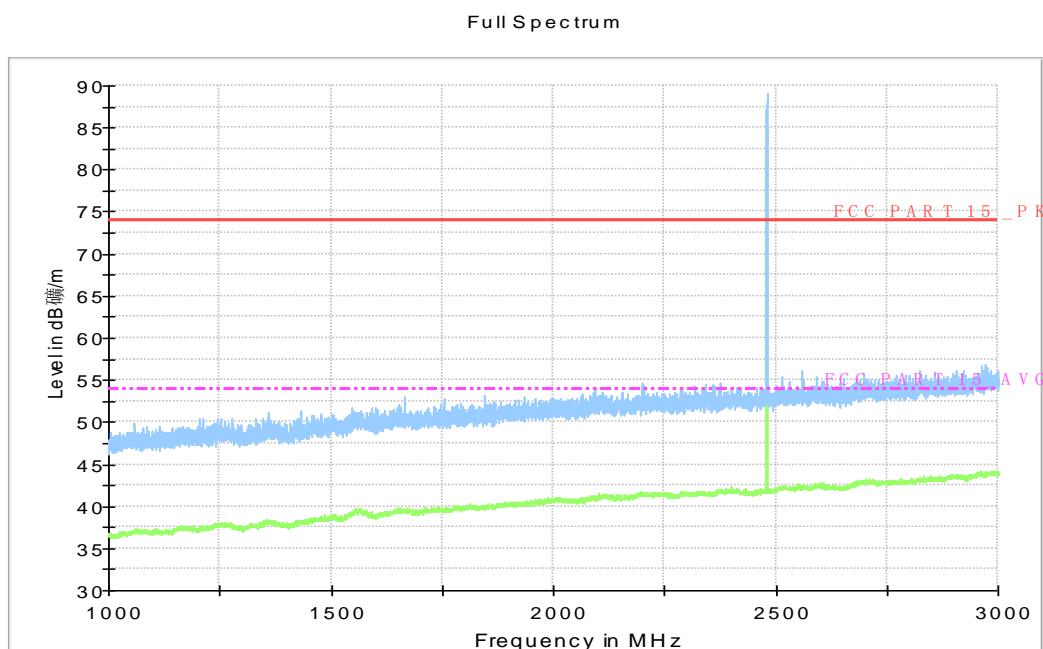


Fig.74. Radiated emission: $\pi/4$ DQPSK, Channel 78, 1 GHz - 3 GHz

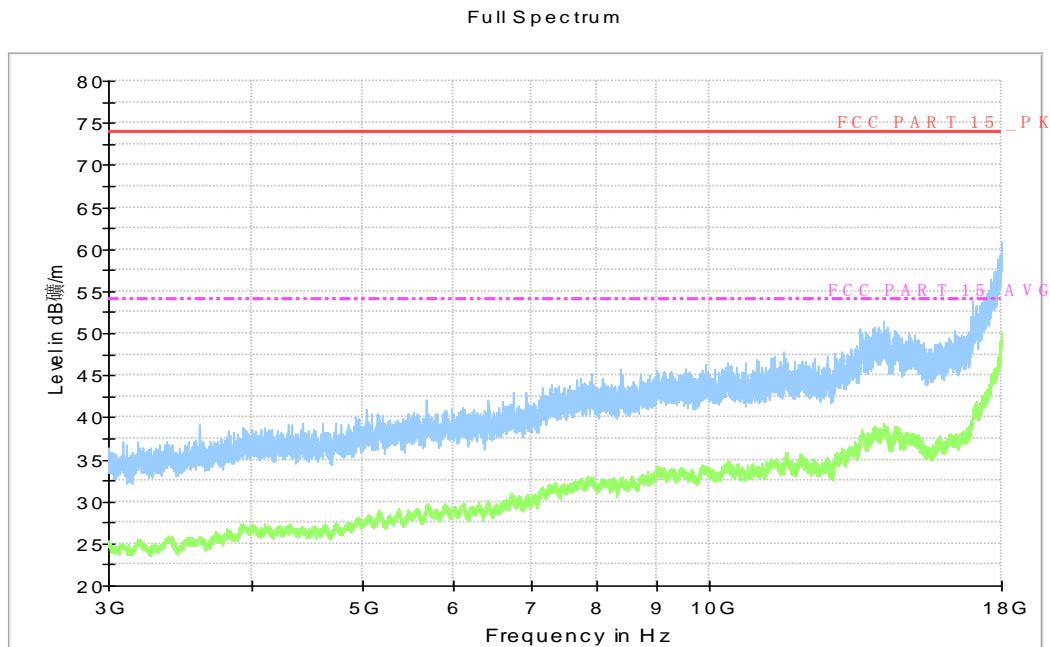


Fig.75. Radiated emission: $\pi/4$ DQPSK, Channel 78, 3 GHz - 18 GHz

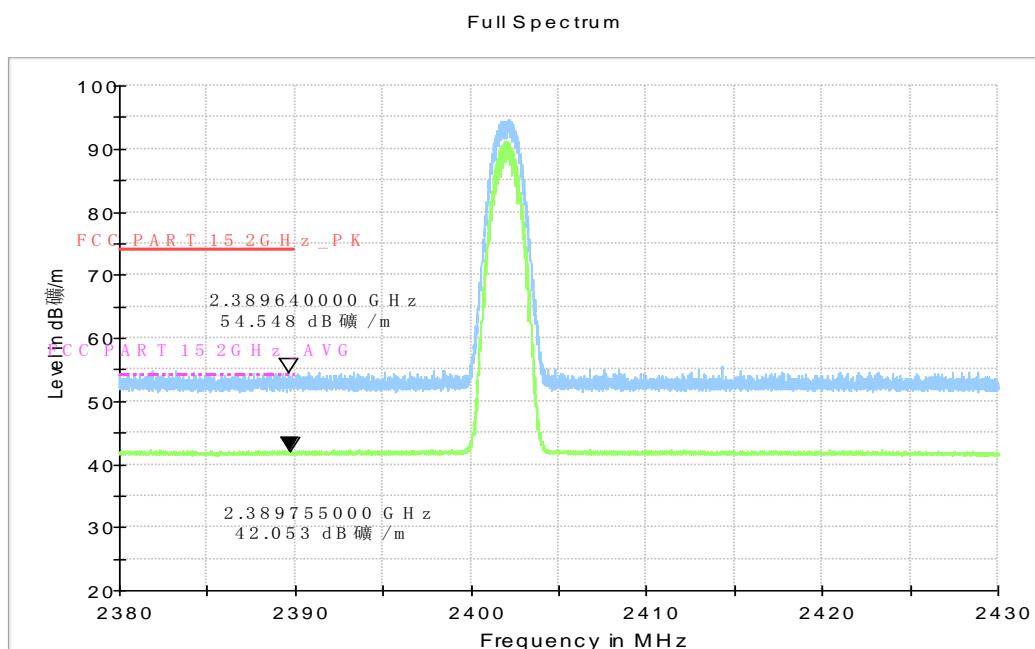


Fig.76. Radiated emission (Power): $\pi/4$ DQPSK, low channel

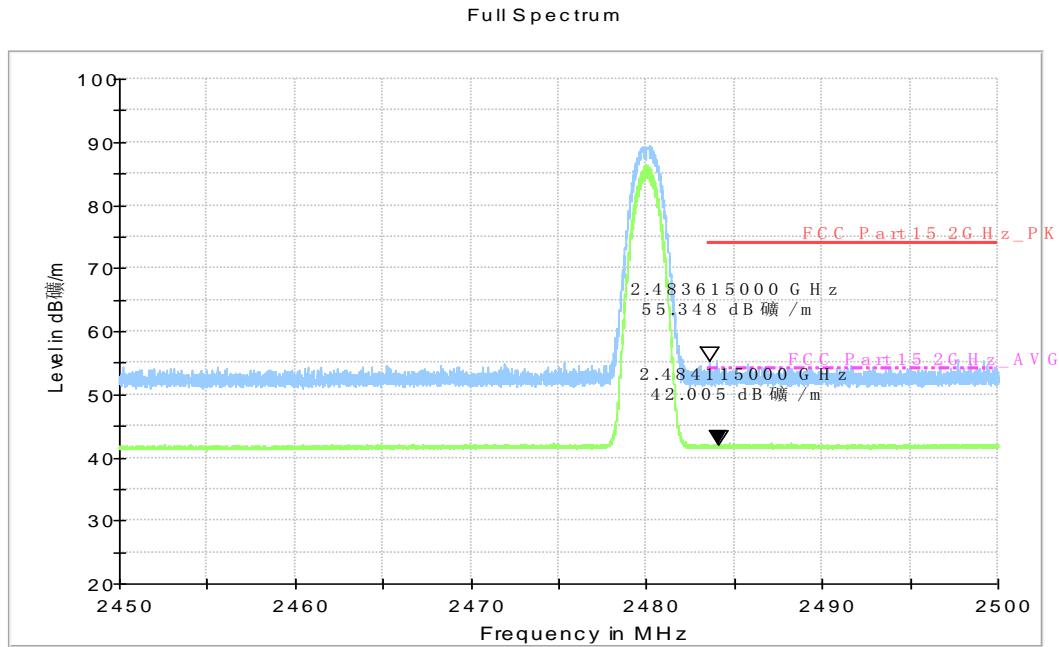


Fig.77. Radiated emission (Power): $\pi/4$ DQPSK, high channel

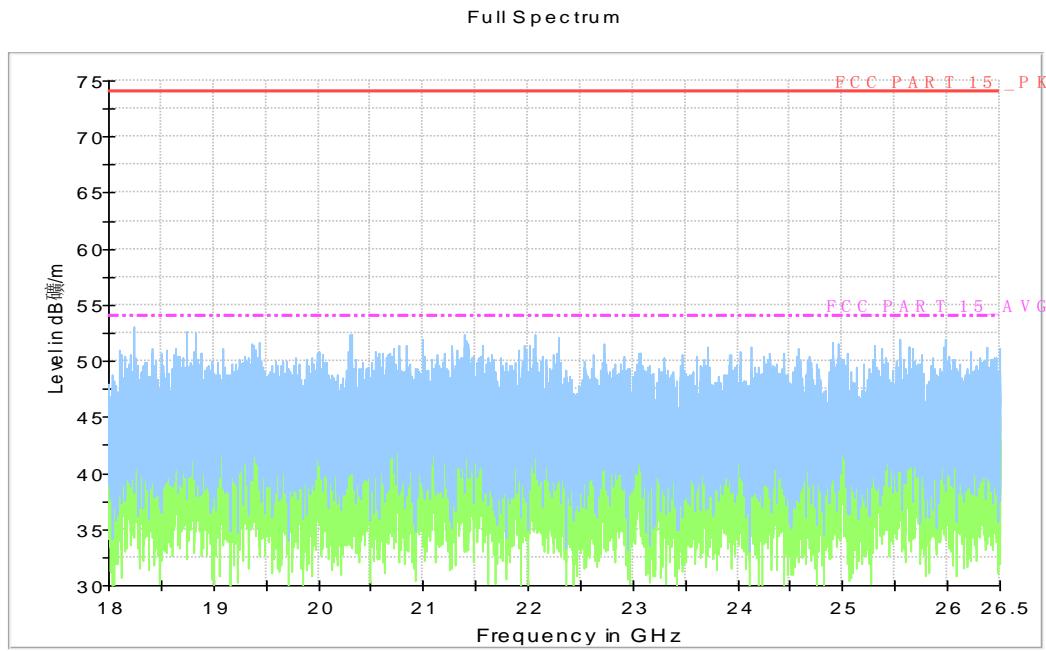


Fig.78. Radiated emission: $\pi/4$ DQPSK, 18 GHz - 26 GHz

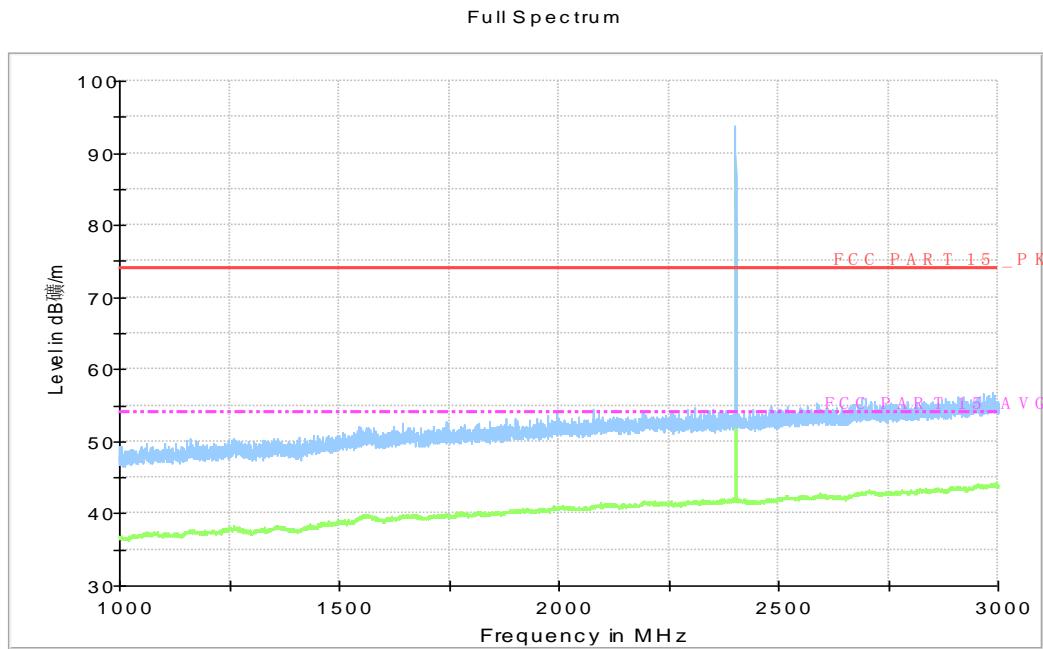


Fig.79. Radiated emission: 8DPSK, Channel 0, 1 GHz - 3 GHz

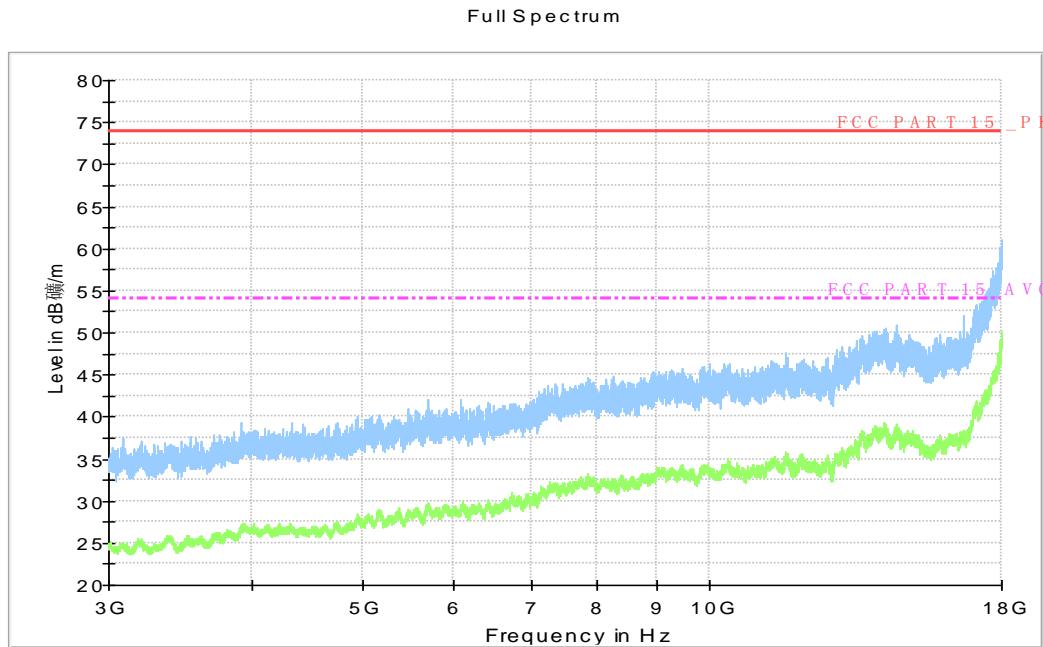


Fig.80. Radiated emission: 8DPSK, Channel 0, 3 GHz - 18 GHz

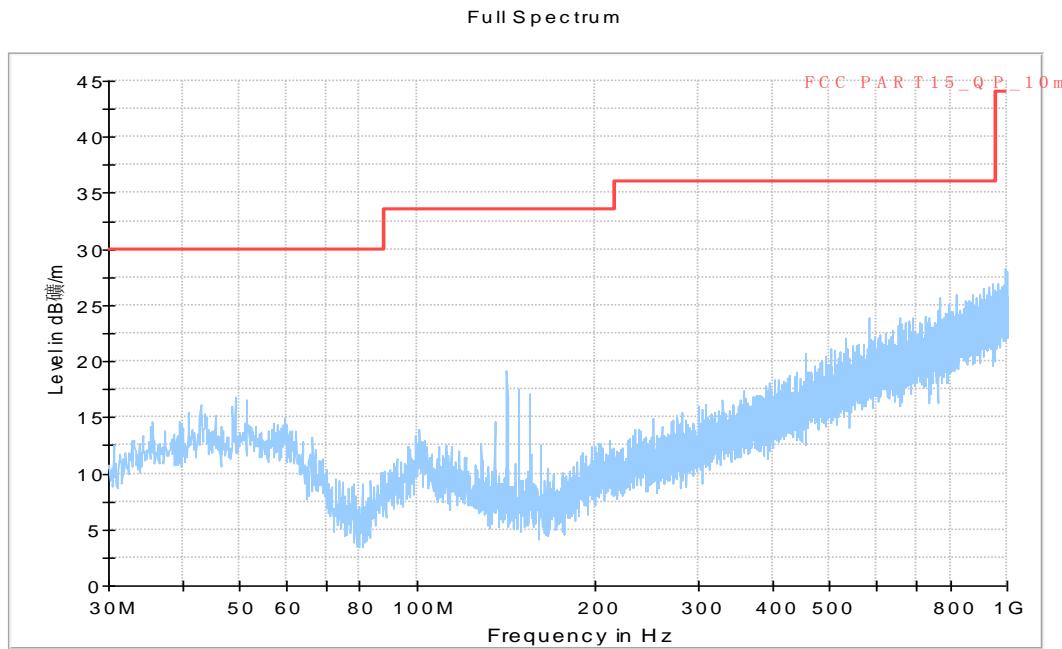


Fig.81. Radiated emission: 8DPSK, Channel 39, 30 MHz - 1 GHz

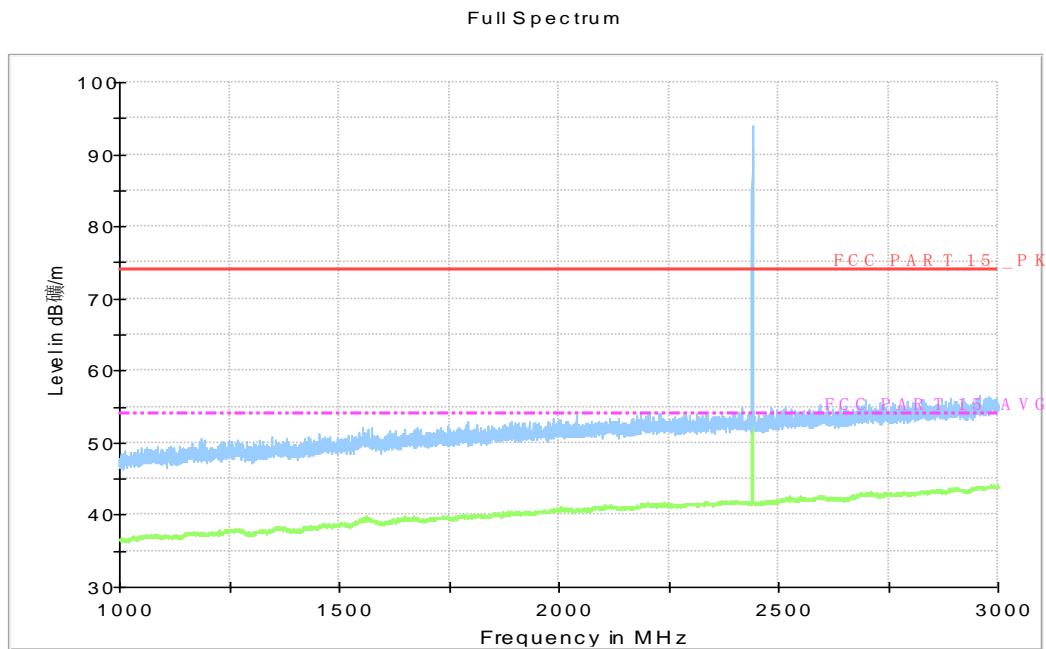


Fig.82. Radiated emission: 8DPSK, Channel 39, 1 GHz - 3 GHz

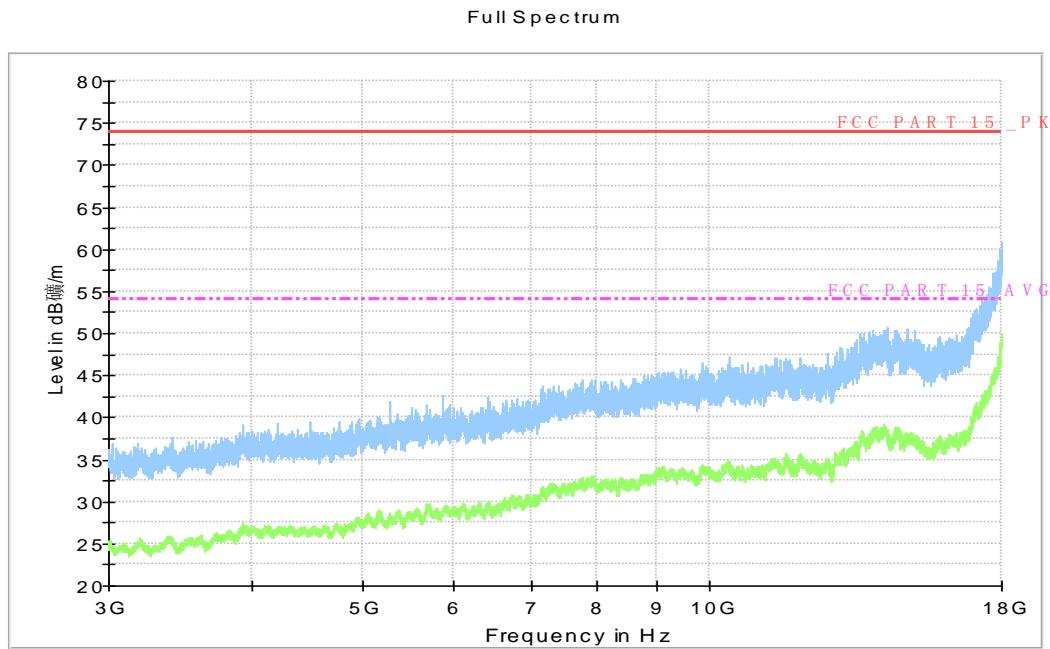


Fig.83. Radiated emission: 8DPSK, Channel 39, 3 GHz - 18 GHz

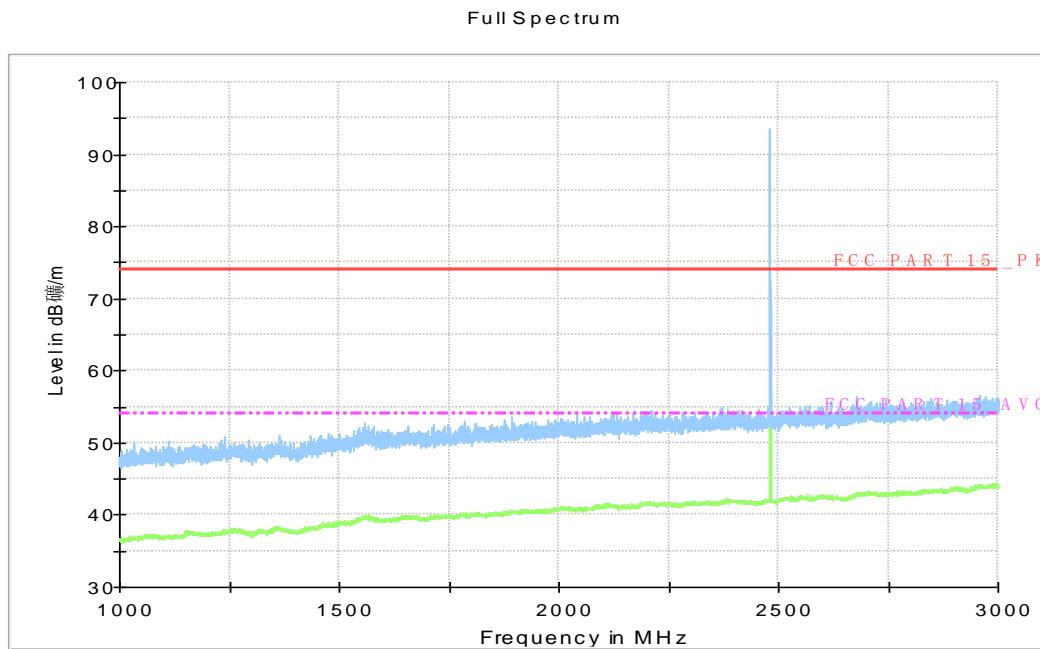


Fig.84. Radiated emission: 8DPSK, Channel 78, 1 GHz - 3 GHz

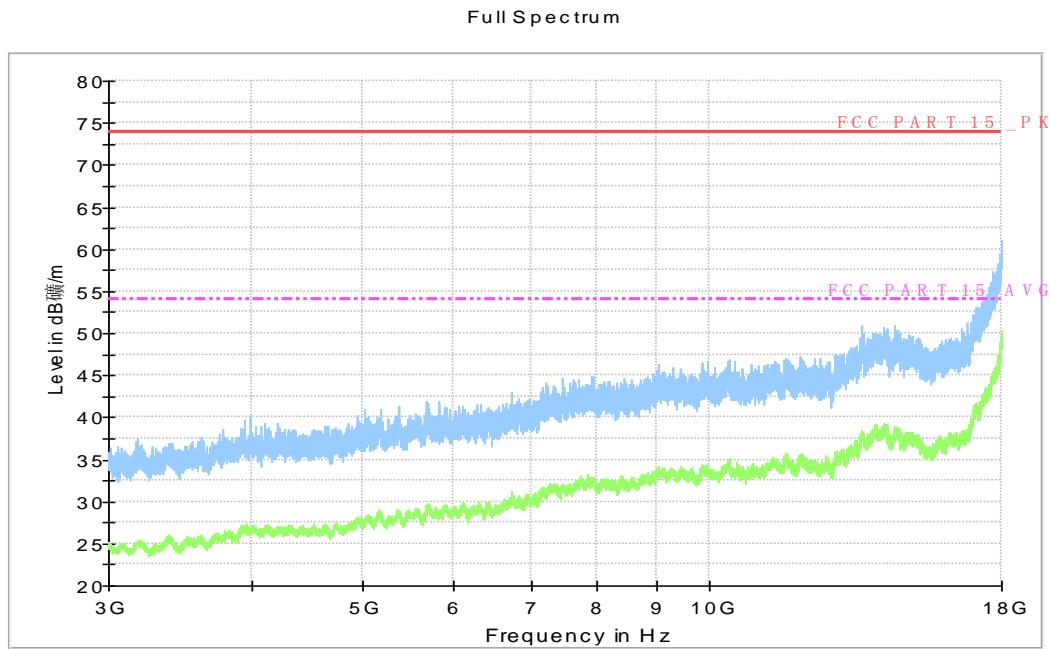


Fig.85. Radiated emission: 8DPSK, Channel 78, 3 GHz - 18 GHz

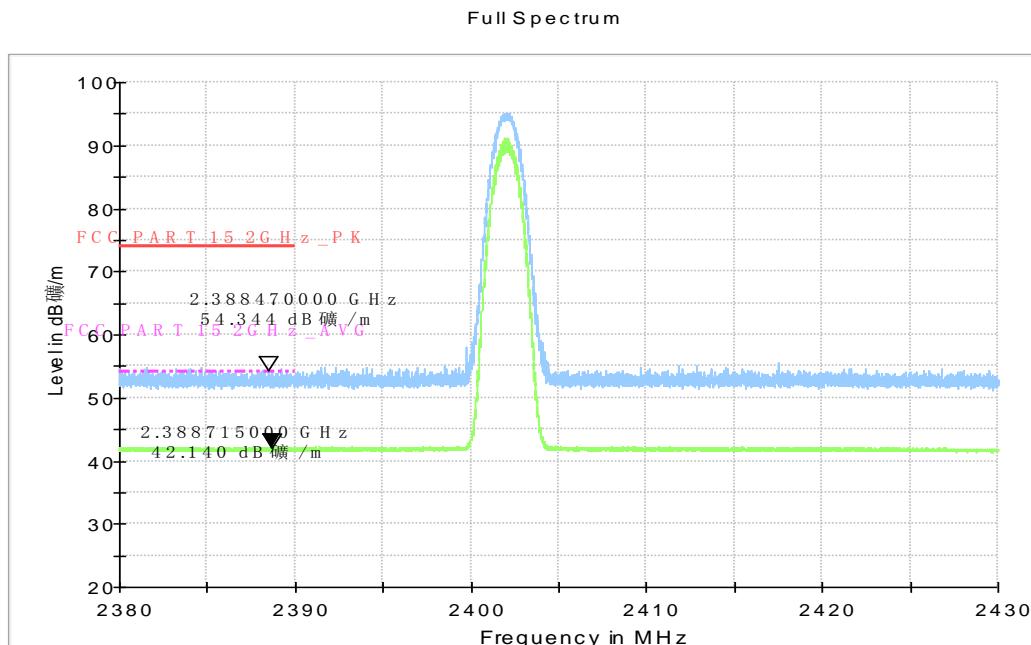


Fig.86. Radiated emission (Power): 8DPSK, low channel

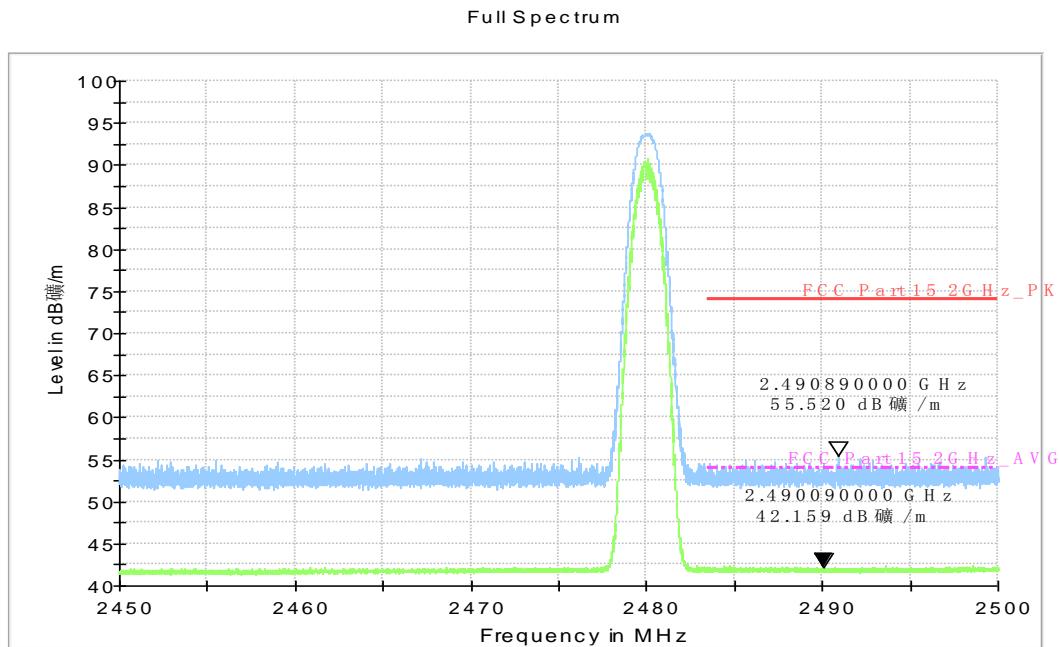


Fig.87. Radiated emission (Power): 8DPSK, high channel

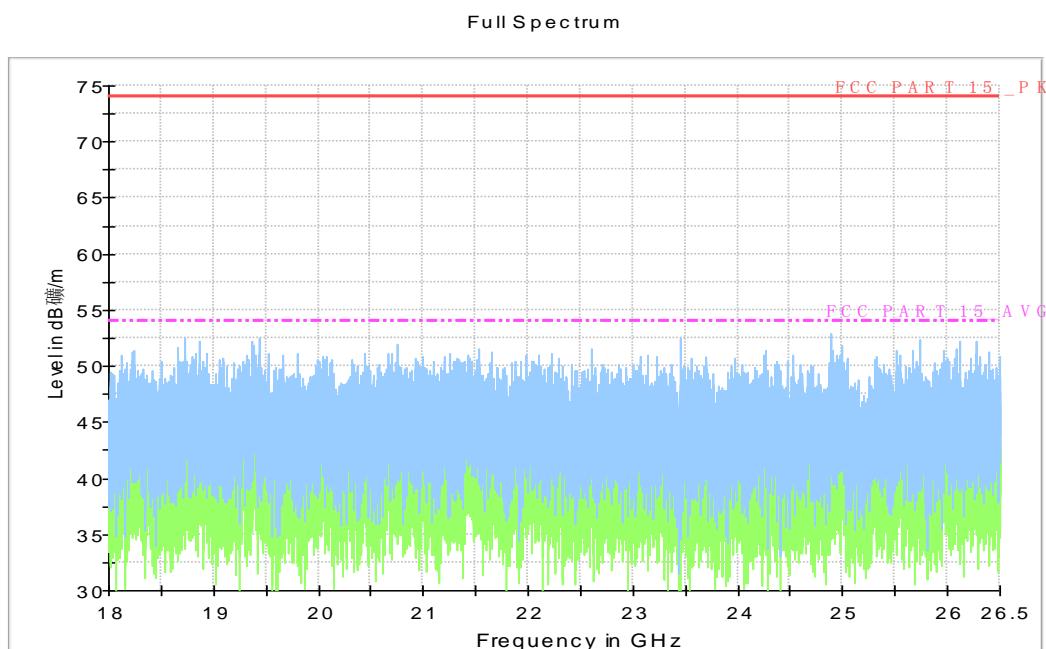


Fig.88. Radiated emission: 8DPSK, 18 GHz - 26 GHz

A.6. Time of Occupancy (Dwell Time)

Method of Measurement: See ANSI C63.10-clause 7.8.4

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

- Span = zero span, centered on a hopping channel
- RBW = 1 MHz
- VBW \geq RBW
- Sweep = as necessary to capture the entire dwell time per hopping channel
- Detector function = peak
- Trace = max hold

Measure a pulse time in time domain at middle frequency and then count the hopping number in 31.6s(which equals with 0.4 multiply 79) of middle frequency ,then multiply the pulse time and hopping number and record them.

Measurement Limit:

Standard	Limit (ms)
FCC 47 CFR Part 15.247(a) (1)(iii)	< 400

Measurement Result:

For GFSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.89	121.59	P
		Fig.90		
	DH3	Fig.91	170.28	P
		Fig.92		
	DH5	Fig.93	150.04	P
		Fig.94		

For $\pi/4$ DQPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.95	123.97	P
		Fig.96		
	DH3	Fig.97	157.67	P
		Fig.98		
	DH5	Fig.99	166.74	P
		Fig.100		

For 8DPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.101	119.33	P
		Fig.102		
	DH3	Fig.103	171.56	P

		Fig.104		
DH5		Fig.105		204.05
		Fig.106		P

Conclusion: PASS

Test graphs as below:

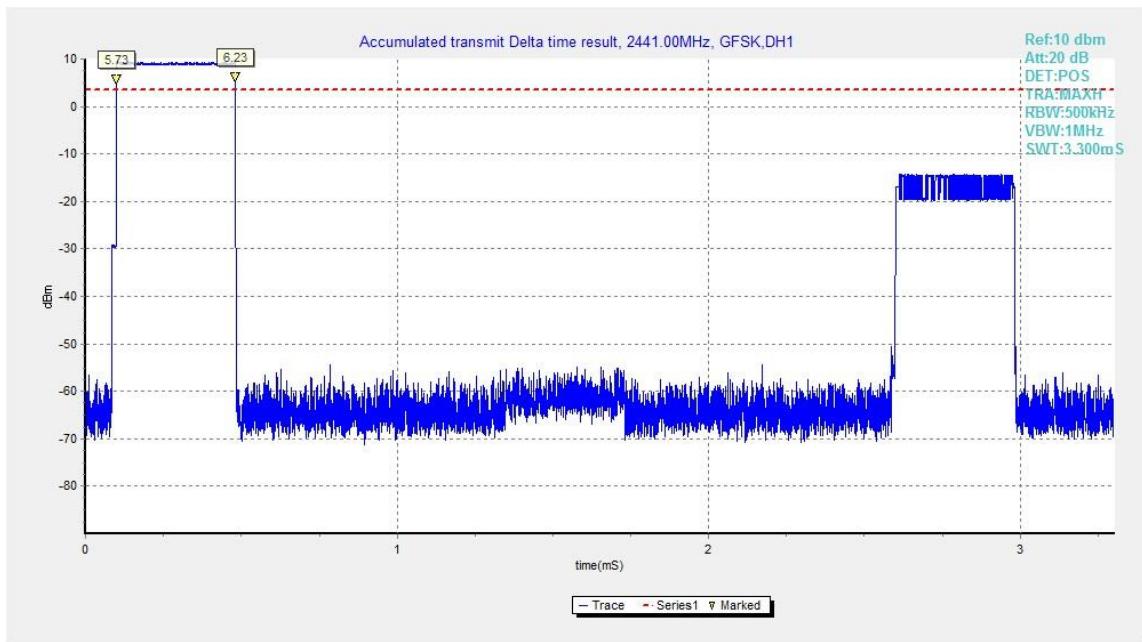


Fig.89. Time of occupancy (Dwell Time): Channel 39, Packet DH1

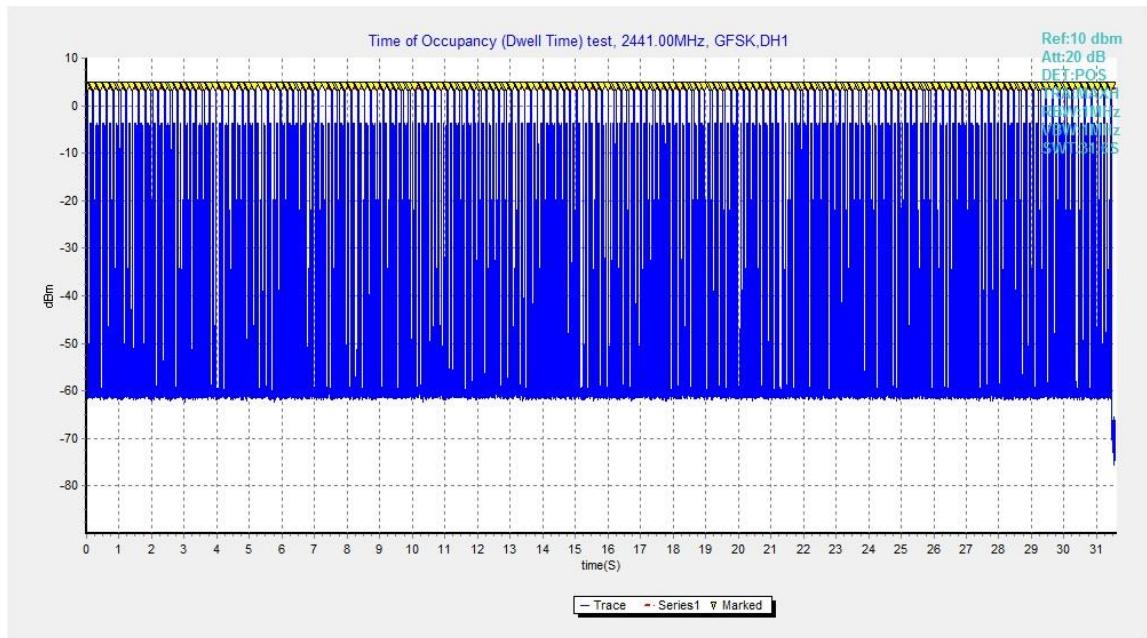


Fig.90. Number of Transmissions Measurement:Channel 39,Packet DH1

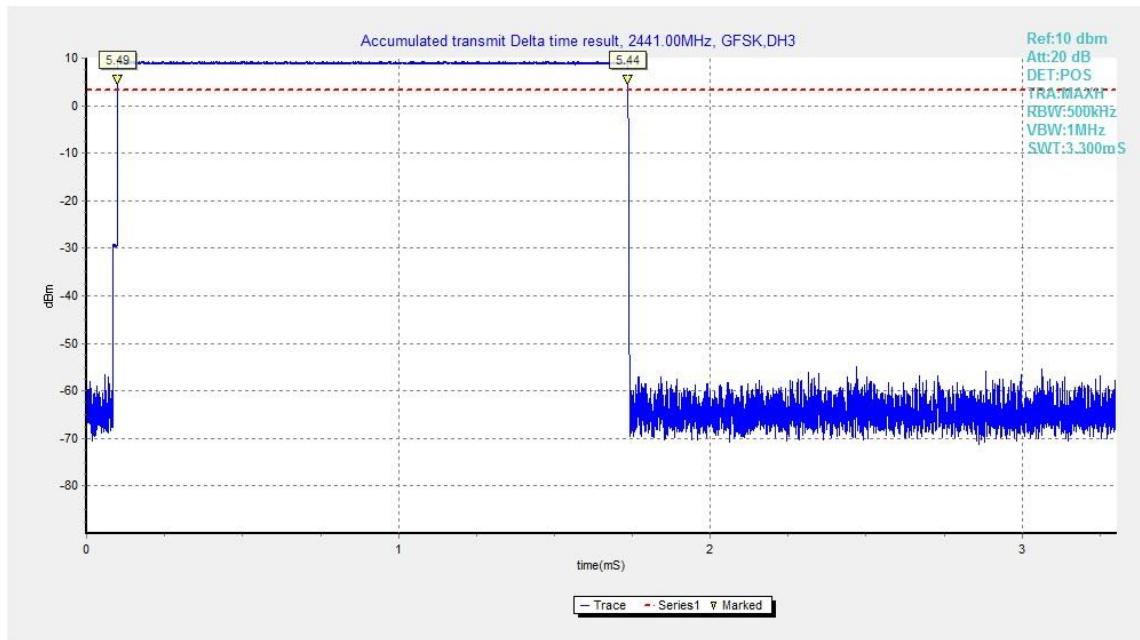


Fig.91. Time of occupancy (Dwell Time): Channel 39, Packet DH3

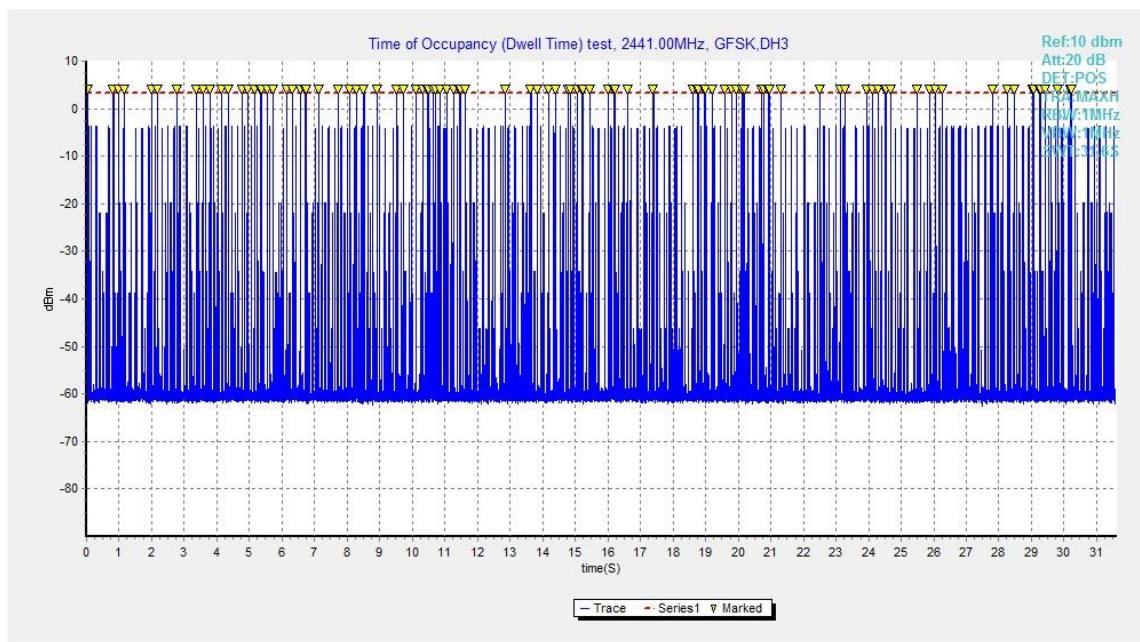


Fig.92. Number of Transmissions Measurement:Channel 39,Packet DH3

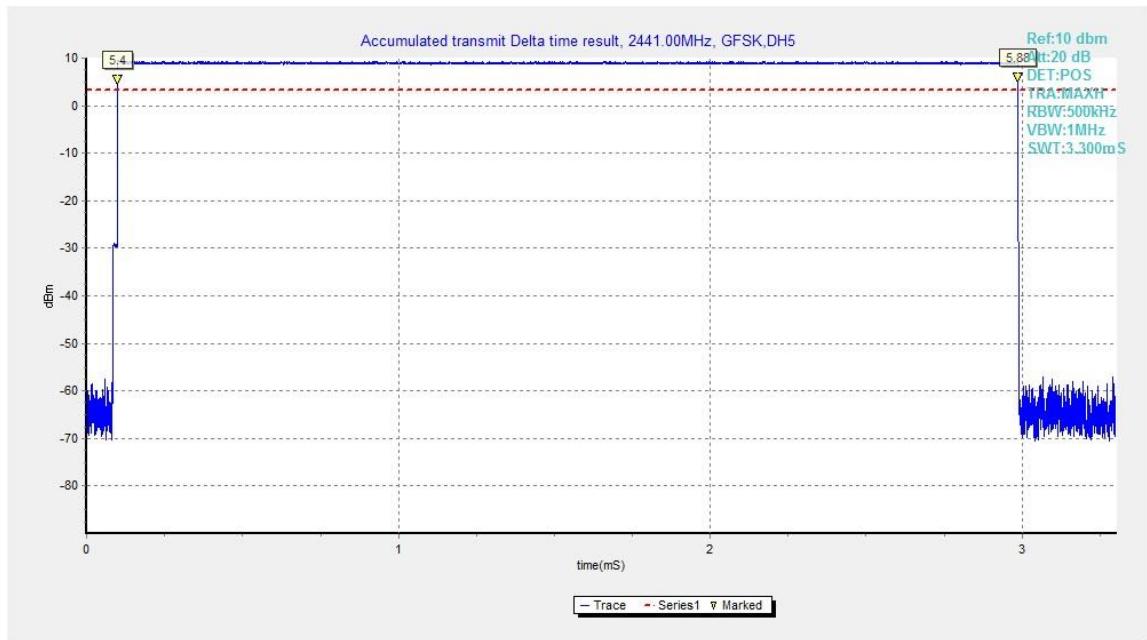


Fig.93. Time of occupancy (Dwell Time): Channel 39, Packet DH5

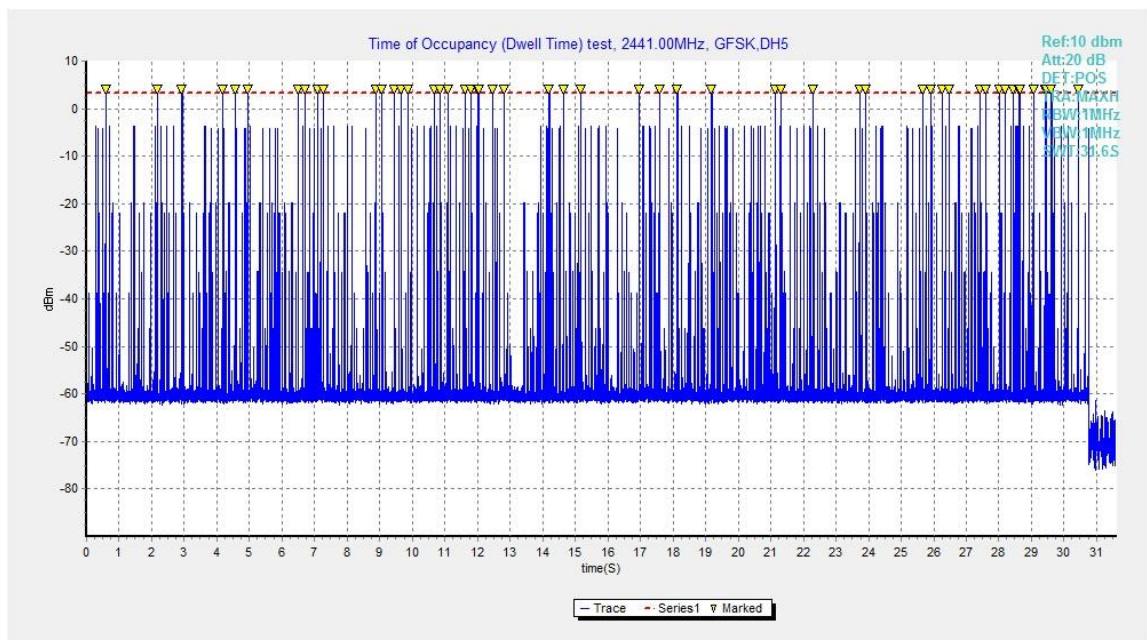


Fig.94. Number of Transmissions Measurement:Channel 39,Packet DH5

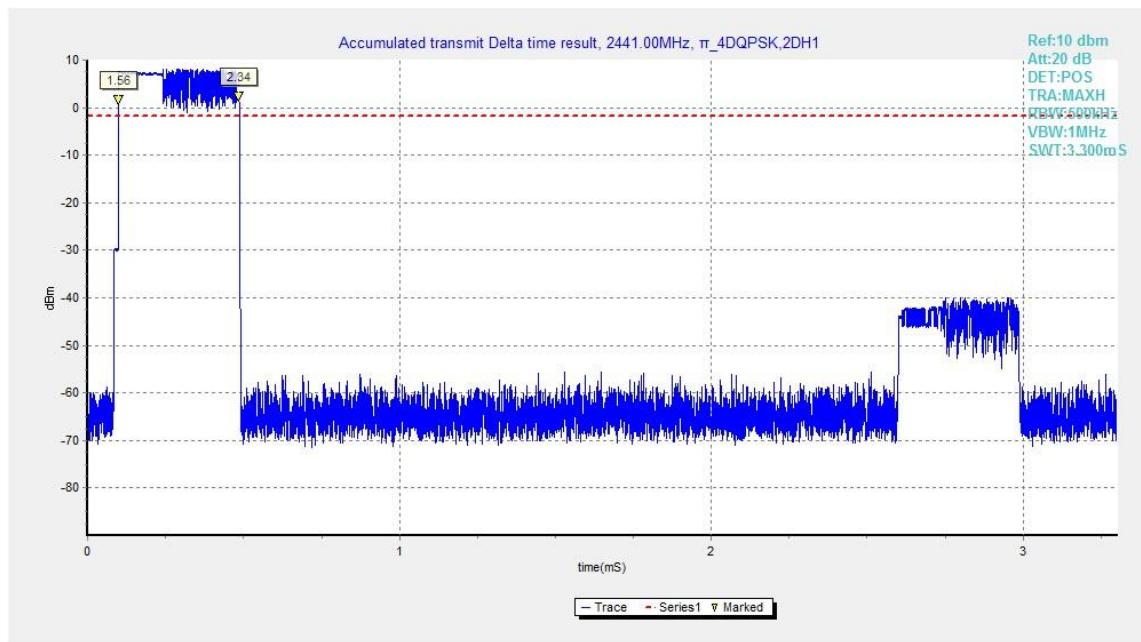


Fig.95. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

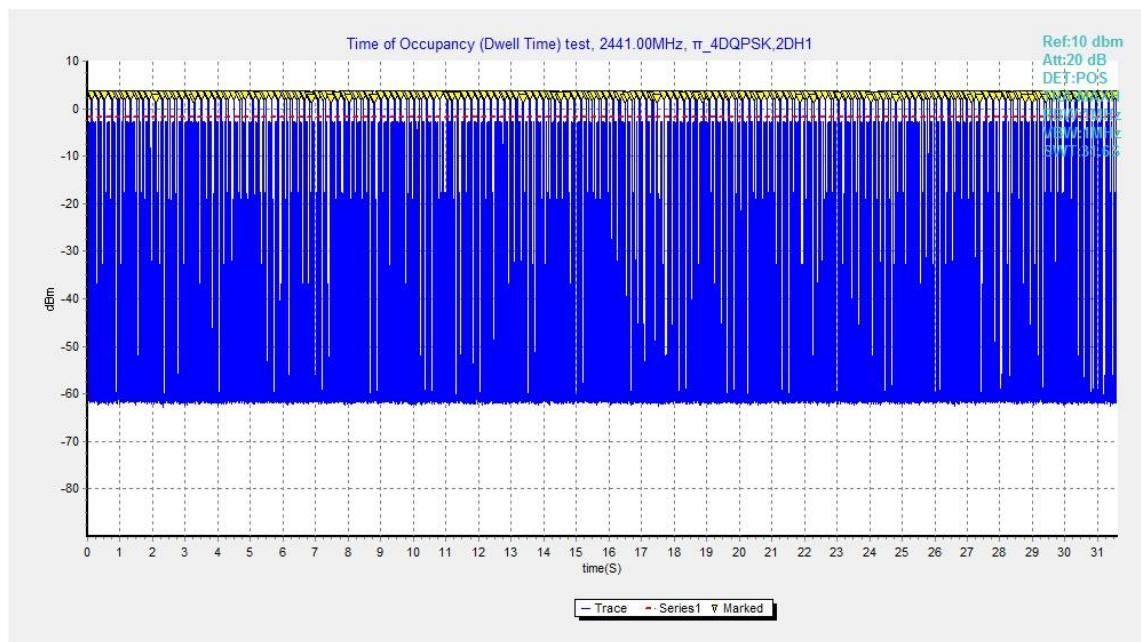


Fig.96. Number of Transmissions Measurement: Channel 39, Packet 2-DH1

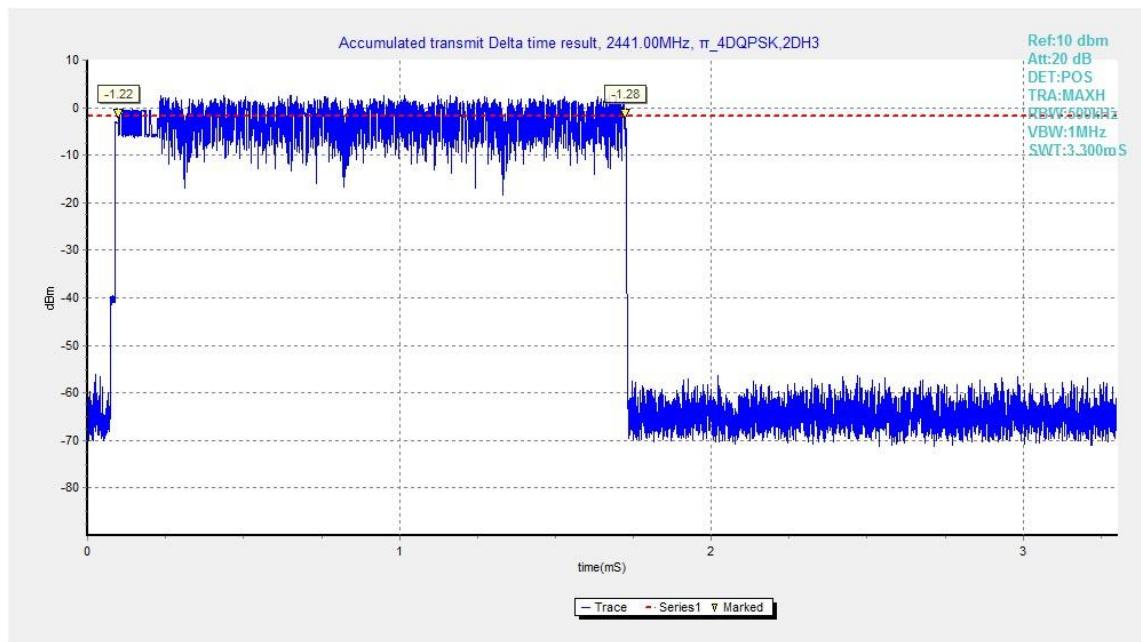


Fig.97. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3

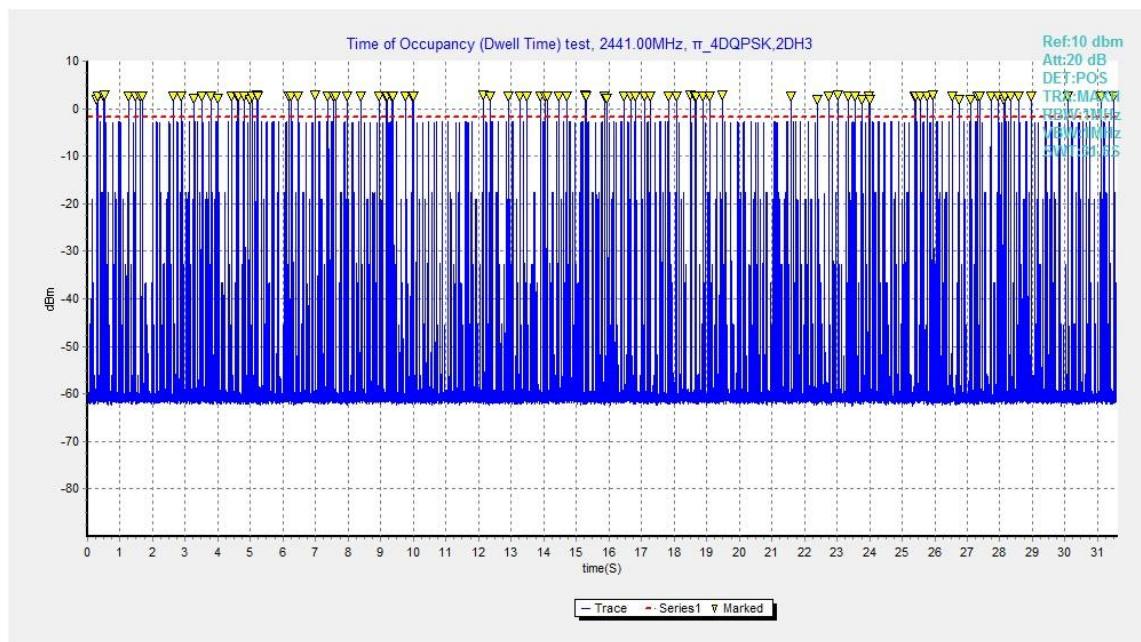


Fig.98. Number of Transmissions Measurement:Channel 39,Packet 2-DH3

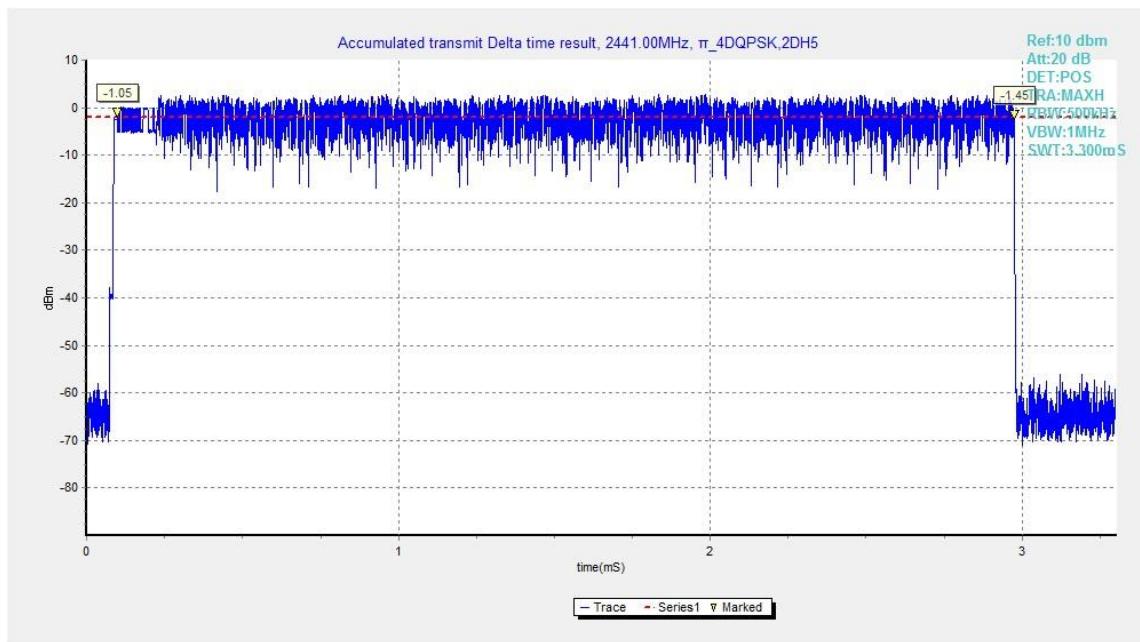


Fig.99. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

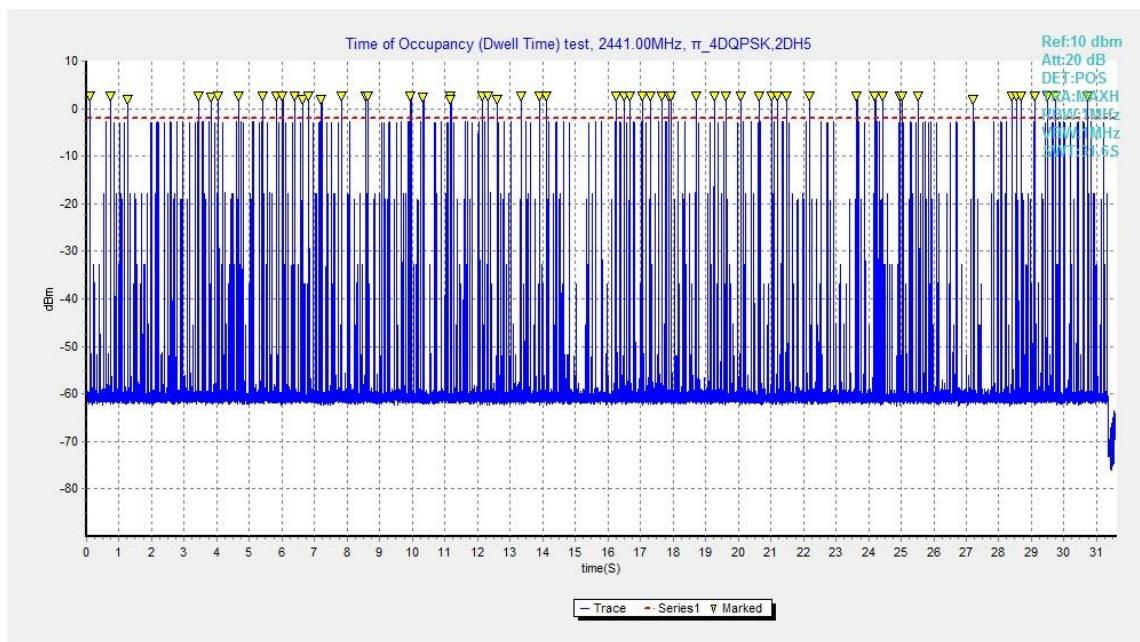


Fig.100. Number of Transmissions Measurement:Channel 39,Packet 2-DH5

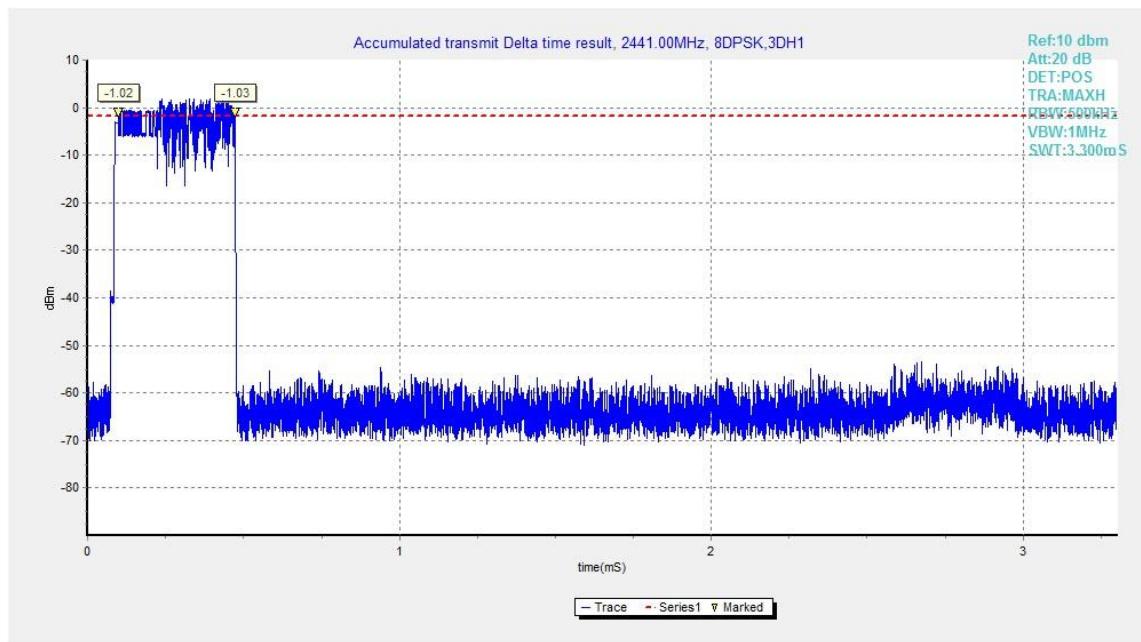


Fig.101. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1



Fig.102. Number of Transmissions Measurement:Channel 39,Packet 3-DH1

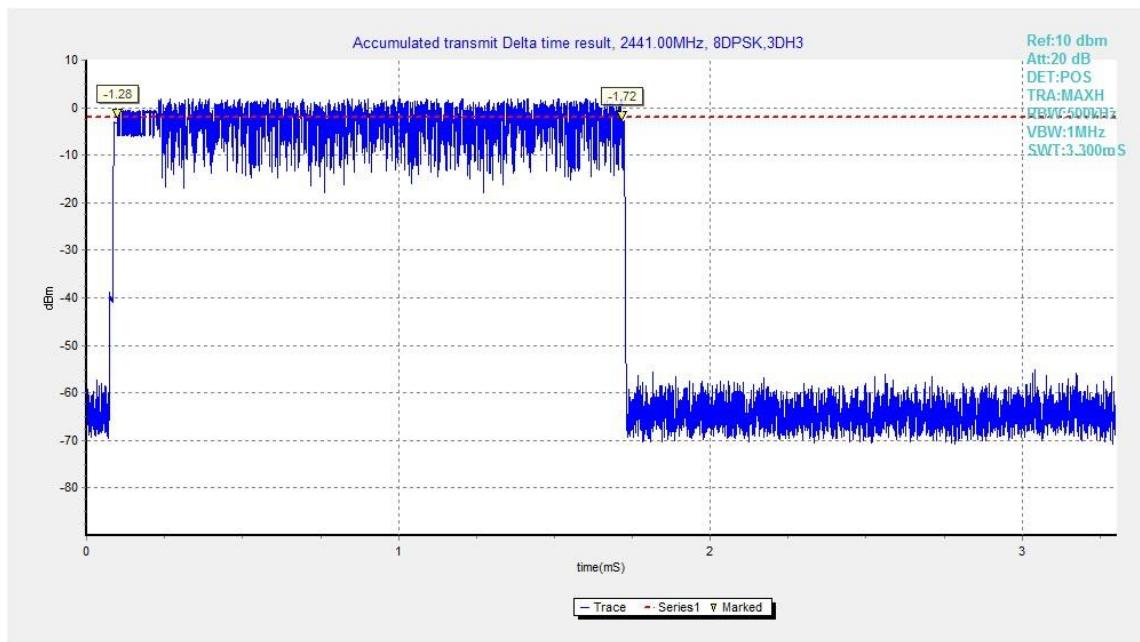


Fig.103. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

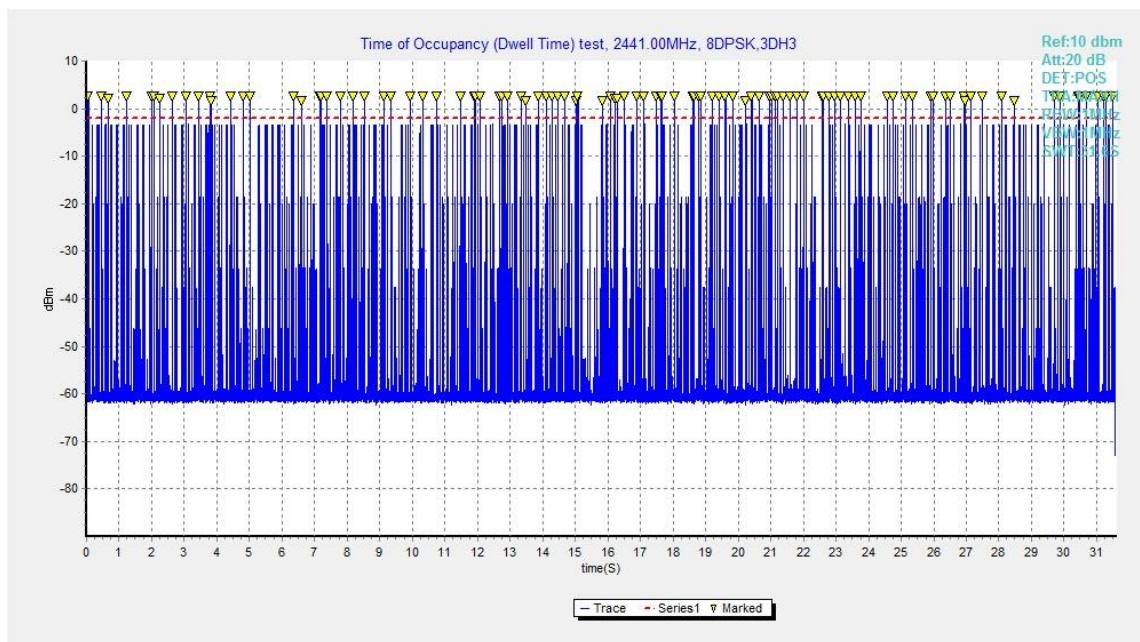


Fig.104. Number of Transmissions Measurement:Channel 39,Packet 3-DH3

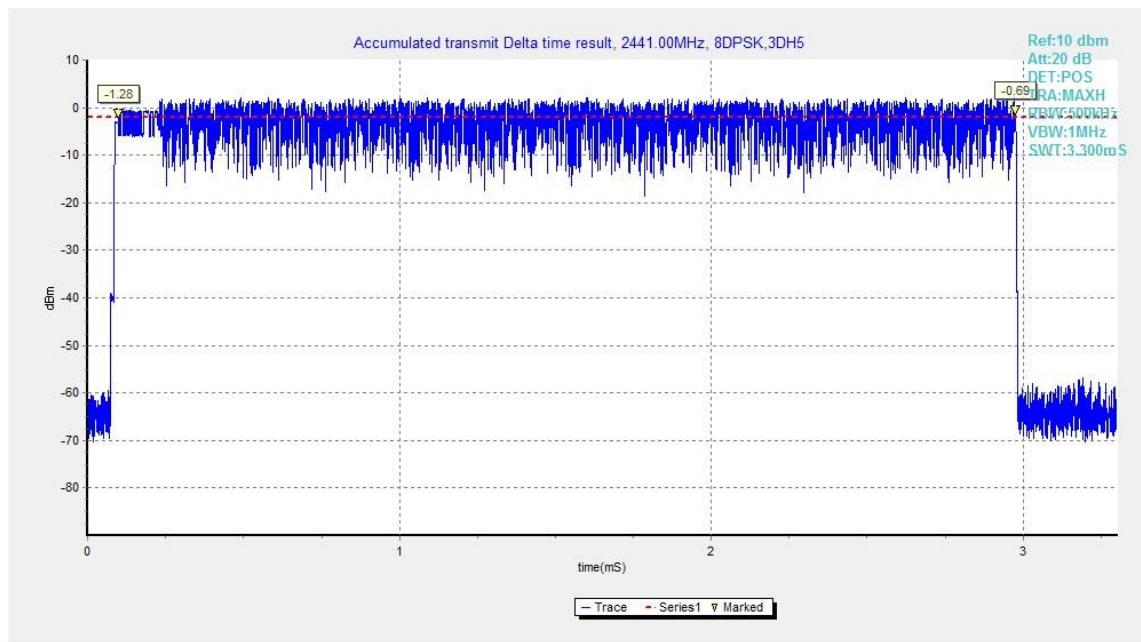


Fig.105. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

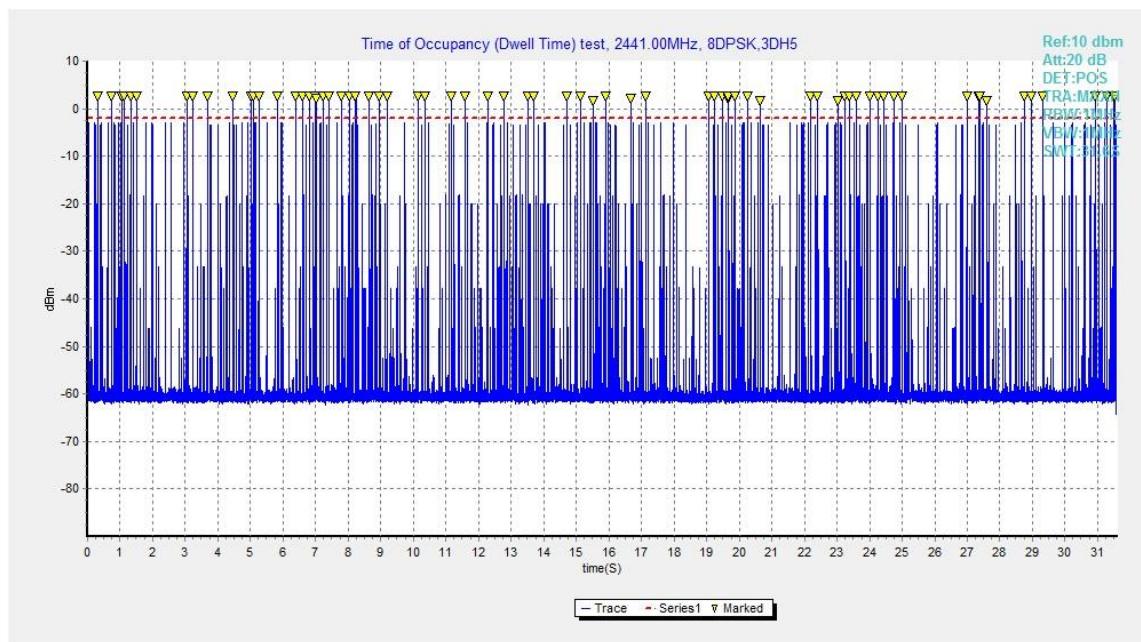


Fig.106. Number of Transmissions Measurement:Channel 39,Packet 3-DH3

A.7. 20dB Bandwidth

Method of Measurement: See ANSI C63.10-clause 6.9.2

Measurement Procedure - Unwanted Emissions

1. Set RBW = 30kHz.
2. Set VBW = 100 kHz.
3. Set span to 3MHz
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(a)(1)	NA *

Use NdB Down function of the SA to measure the 20dB Bandwidth

* Comment: This test case is not required according to the latest FCC 47 CFR Part 15.247. But the test results are necessary for “carrier frequency separation” test case, in Annex A.8.

Measurement Results:

For GFSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.107	948.00	NA
39	Fig.108	939.00	NA
78	Fig.109	940.50	NA

For π/4 DQPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.110	1308.75	NA
39	Fig.111	1281.00	NA
78	Fig.112	1311.75	NA

For 8DPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.113	1278.75	NA
39	Fig.114	1296.75	NA
78	Fig.115	1296.75	NA

Conclusion: NA

Test graphs as below:

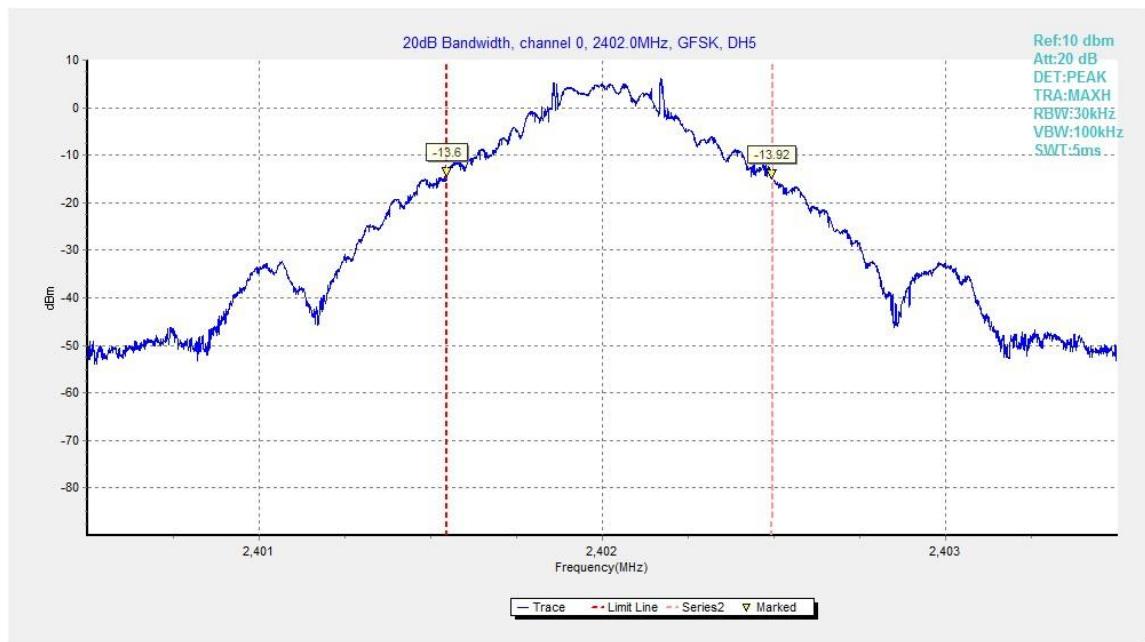


Fig.107. 20dB Bandwidth: GFSK, Channel 0

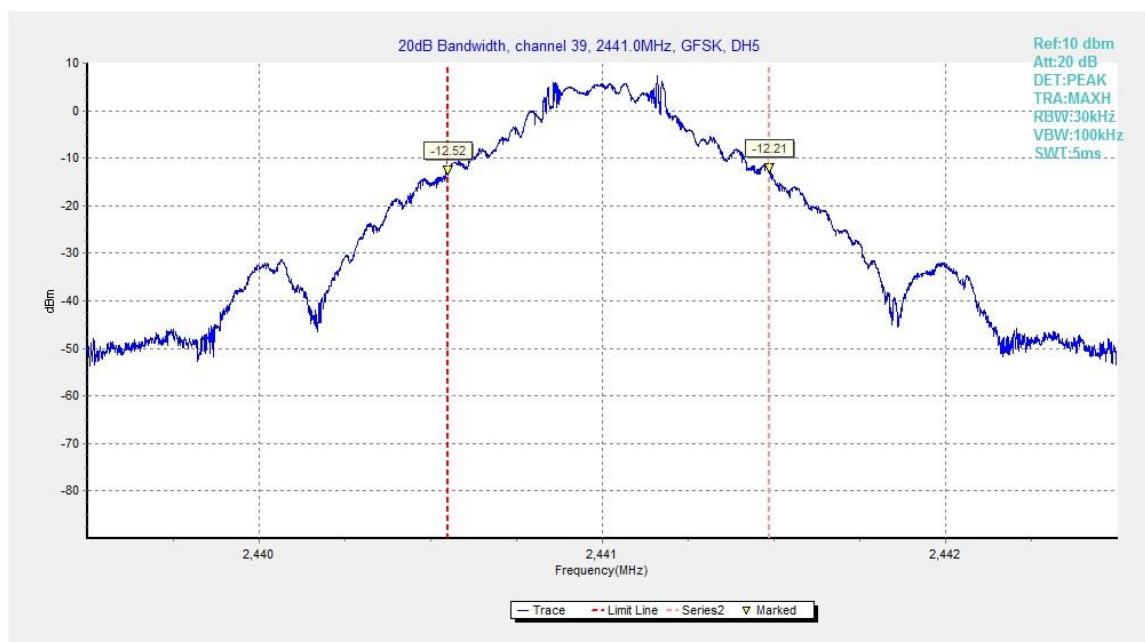


Fig.108. 20dB Bandwidth: GFSK, Channel 39

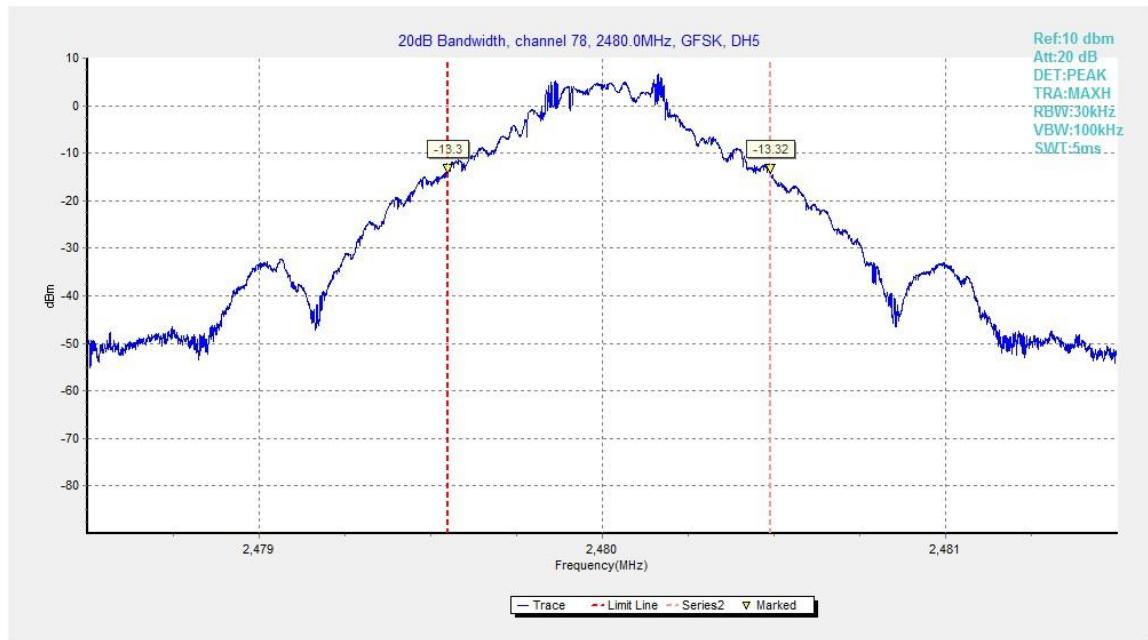


Fig.109. 20dB Bandwidth: GFSK, Channel 78

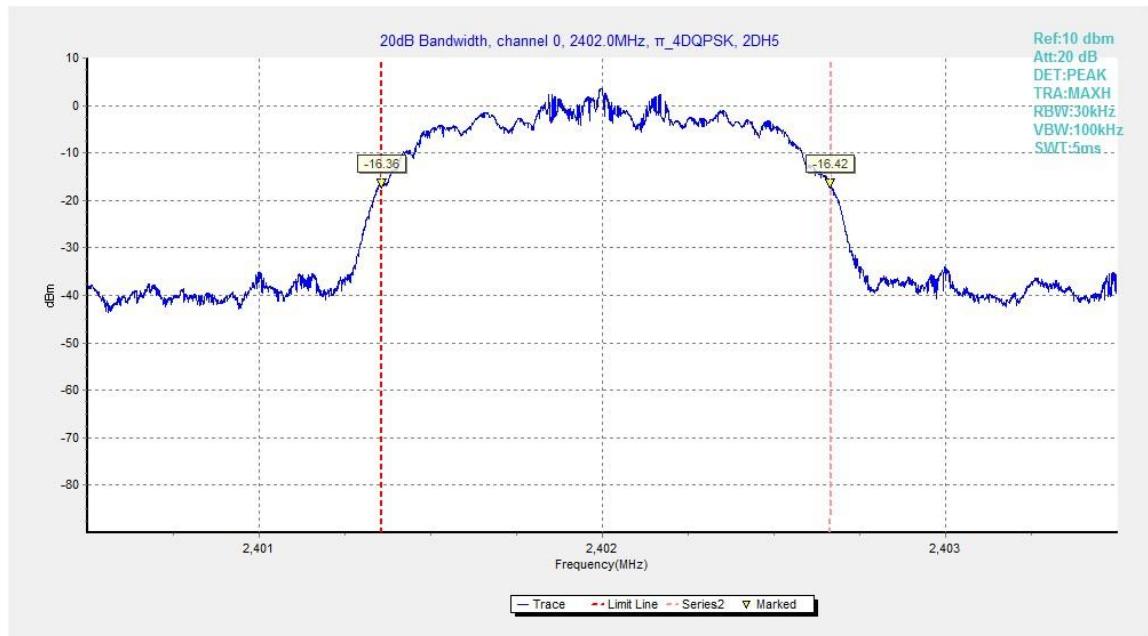


Fig.110. 20dB Bandwidth: $\pi/4$ DQPSK, Channel 0

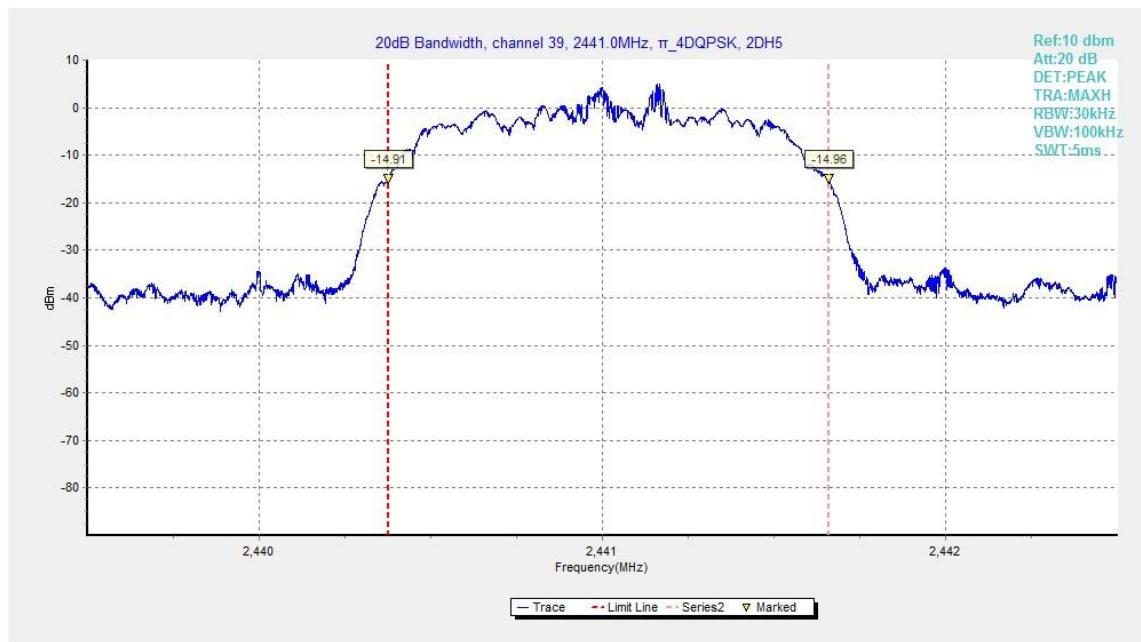


Fig.111. 20dB Bandwidth: $\pi/4$ DQPSK, Channel 39

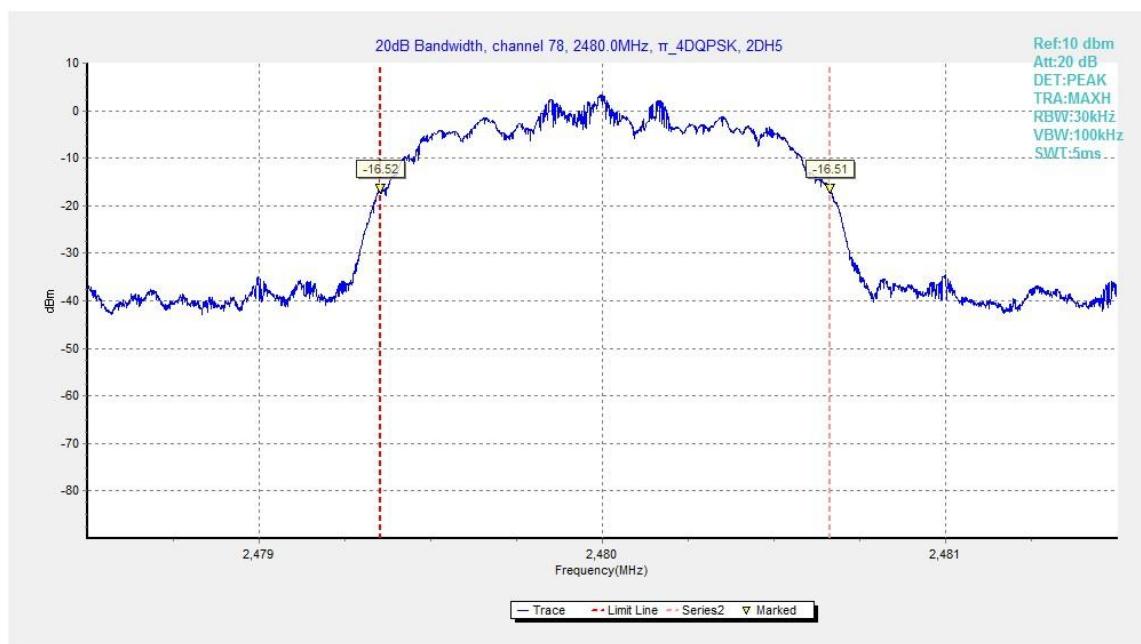


Fig.112. 20dB Bandwidth: $\pi/4$ DQPSK, Channel 78

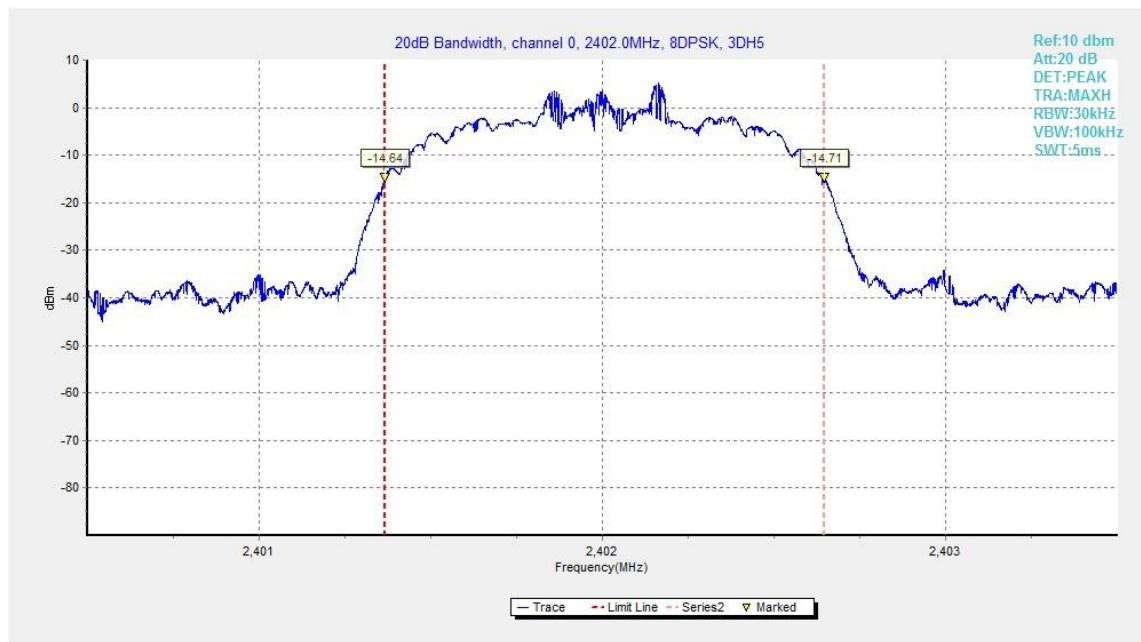


Fig.113. 20dB Bandwidth: 8DPSK, Channel 0

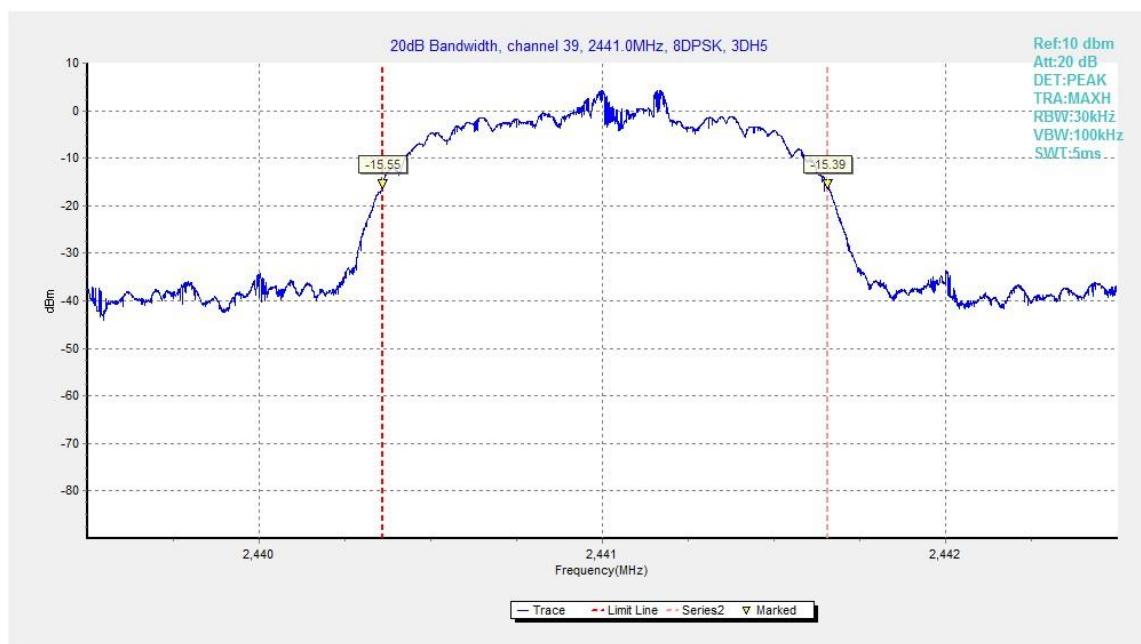


Fig.114. 20dB Bandwidth: 8DPSK, Channel 39

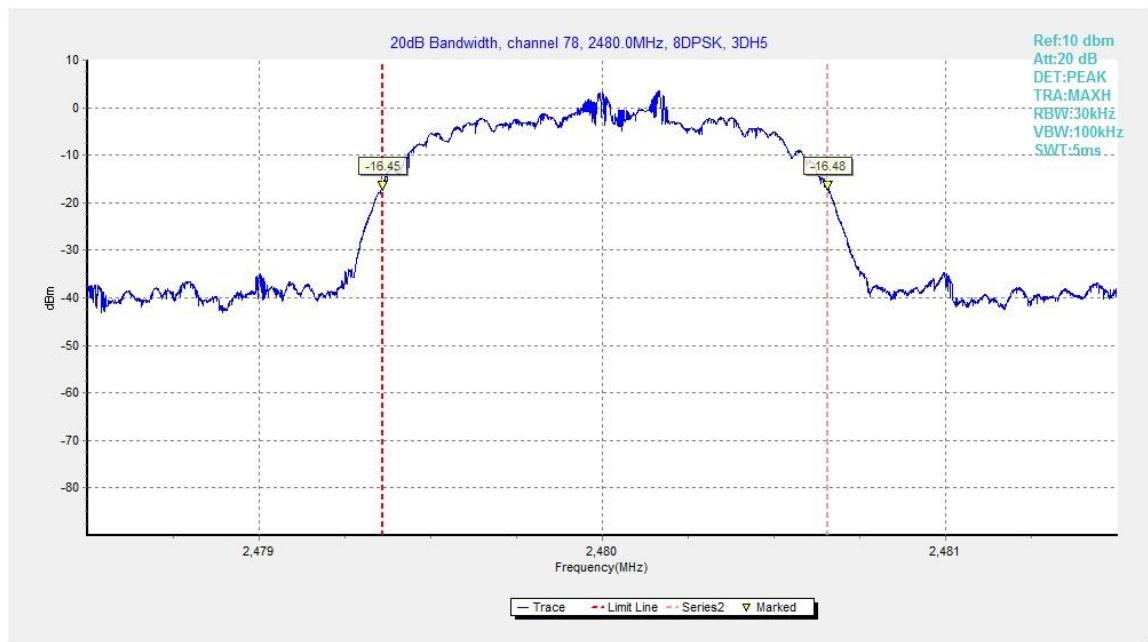


Fig.115. 20dB Bandwidth: 8DPSK, Channel 78

A.8. Carrier Frequency Separation

Method of Measurement: See ANSI C63.10-clause 7.8.2

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

- Span = 3MHz
- RBW=300kHz
- VBW=300kHz
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Allow the trace to stabilize

Search the peak marks of the middle frequency and adjacent channel, then record the separation between them.

* Comment: This limit should be over 25 kHz or $(2/3) * 20\text{dB}$ bandwidth, whichever is greater.

Measurement Limit:

Standard	Limit(kHz)
FCC 47 CFR Part 15.247(a)(1)	over 25 kHz or $(2/3) * 20\text{dB}$ bandwidth

Measurement Result:

For GFSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.116	1150.50	P

For $\pi/4$ DQPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.117	996.00	P

For 8DPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.118	1002.75	P

Conclusion: PASS

Test graphs as below:

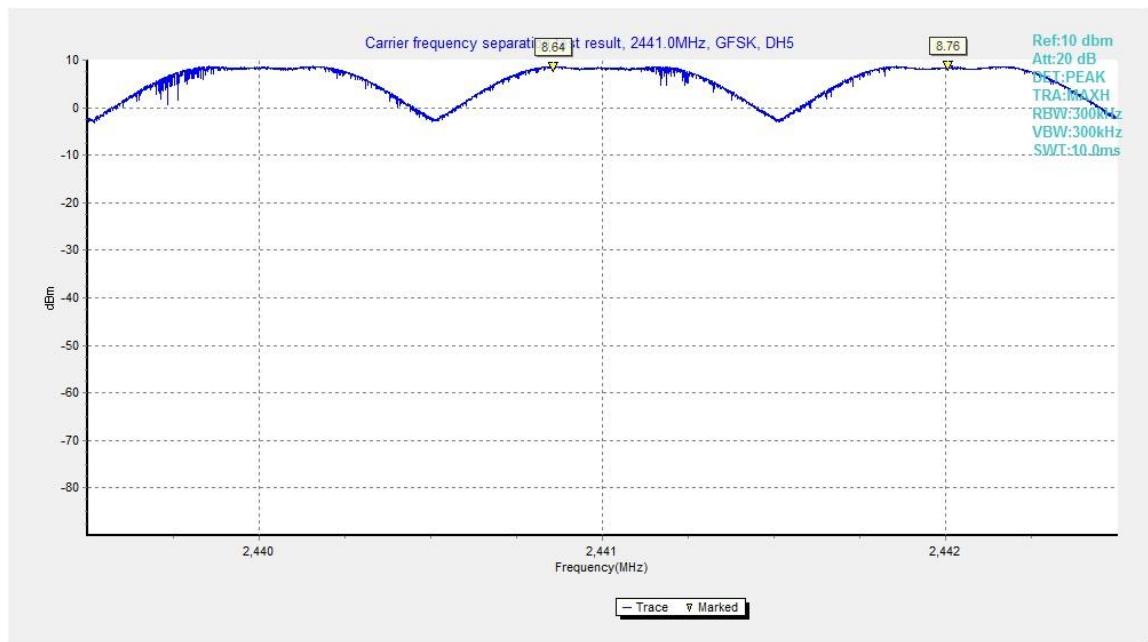


Fig.116. Carrier frequency separation measurement: GFSK, Channel 39

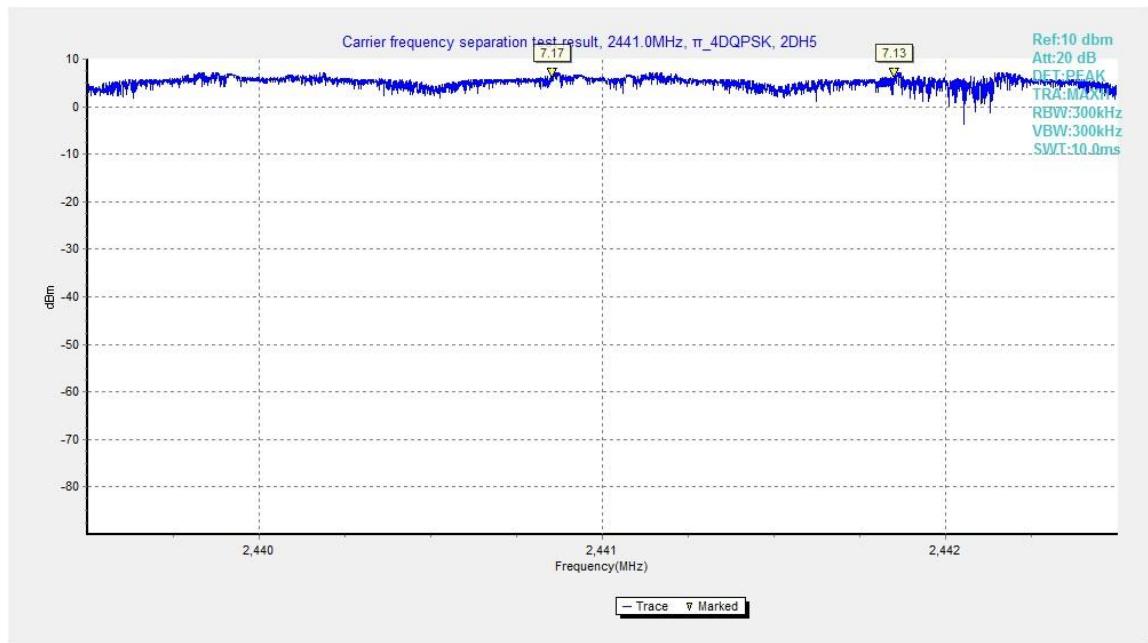


Fig.117. Carrier frequency separation measurement: π/4 DQPSK, Channel 39

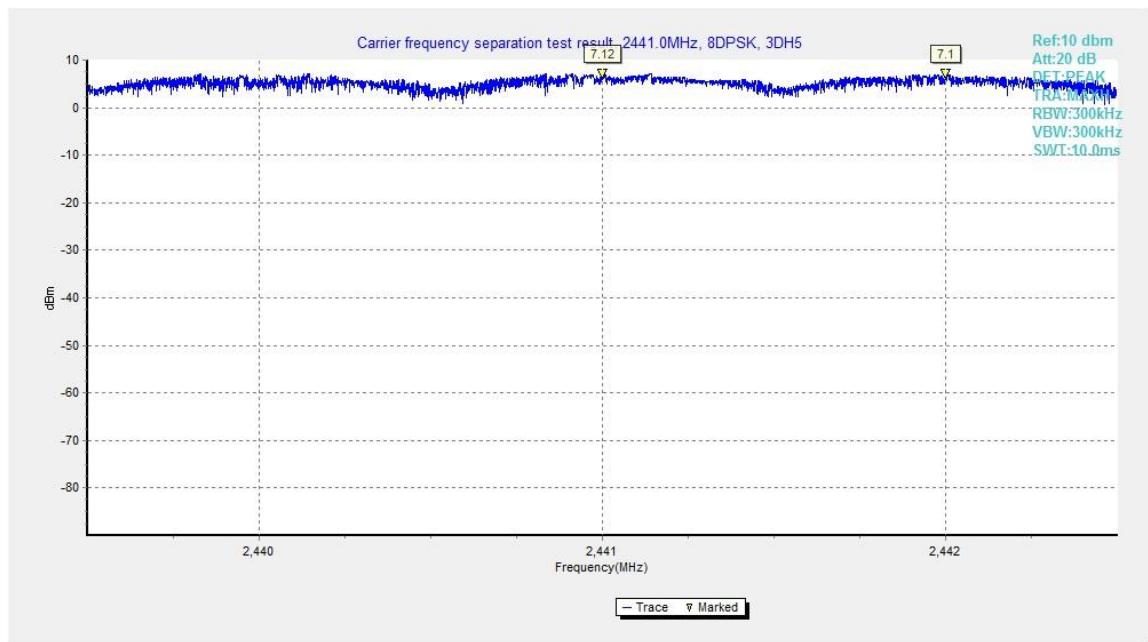


Fig.118. Carrier frequency separation measurement: 8DPSK, Channel 39

A.9. Number of Hopping Channels

Method of Measurement: See ANSI C63.10-clause 7.8.3

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

- Span = the frequency band of operation
- RBW = 500kHz
- VBW = 500kHz
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Allow the trace to stabilize

It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(a) (1)(iii)	At least 15 non-overlapping channels

Measurement Result:

For GFSK

Channel	Number of hopping channels	Conclusion
0~39	Fig.119	
40~78	Fig.120	P

For 4 DQPSK

Channel	Number of hopping channels	Conclusion
0~39	Fig.121	
40~78	Fig.122	P

For 8DPSK

Channel	Number of hopping channels	Conclusion
0~39	Fig.123	
40~78	Fig.124	P

Conclusion: PASS

Test graphs as below:

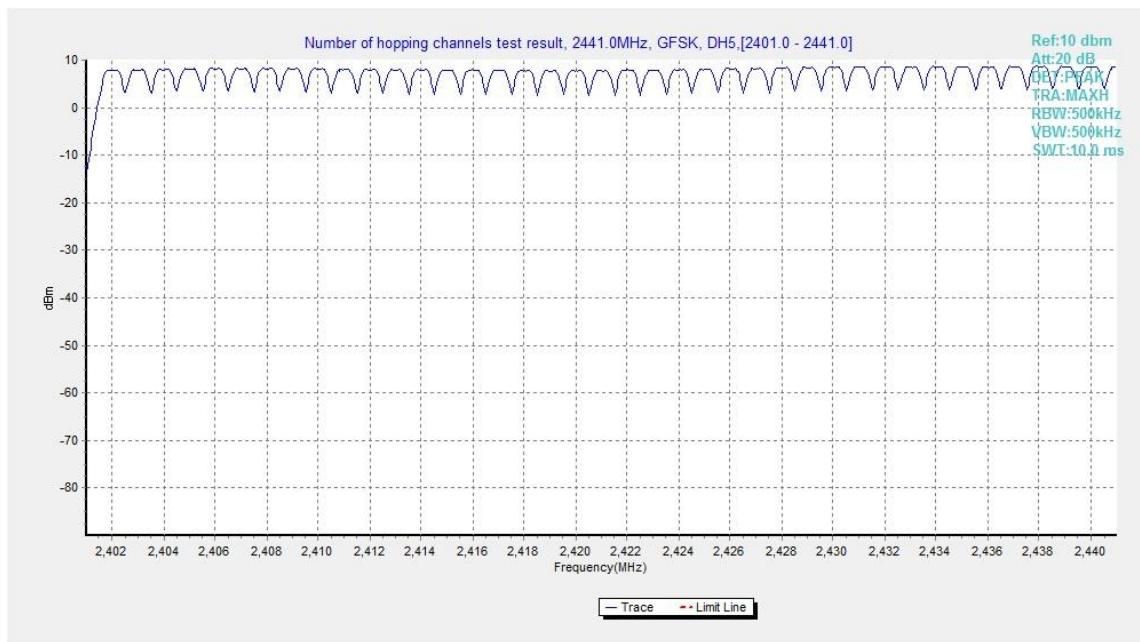


Fig.119. Number of hopping frequencies: GFSK, Channel 0 - 39

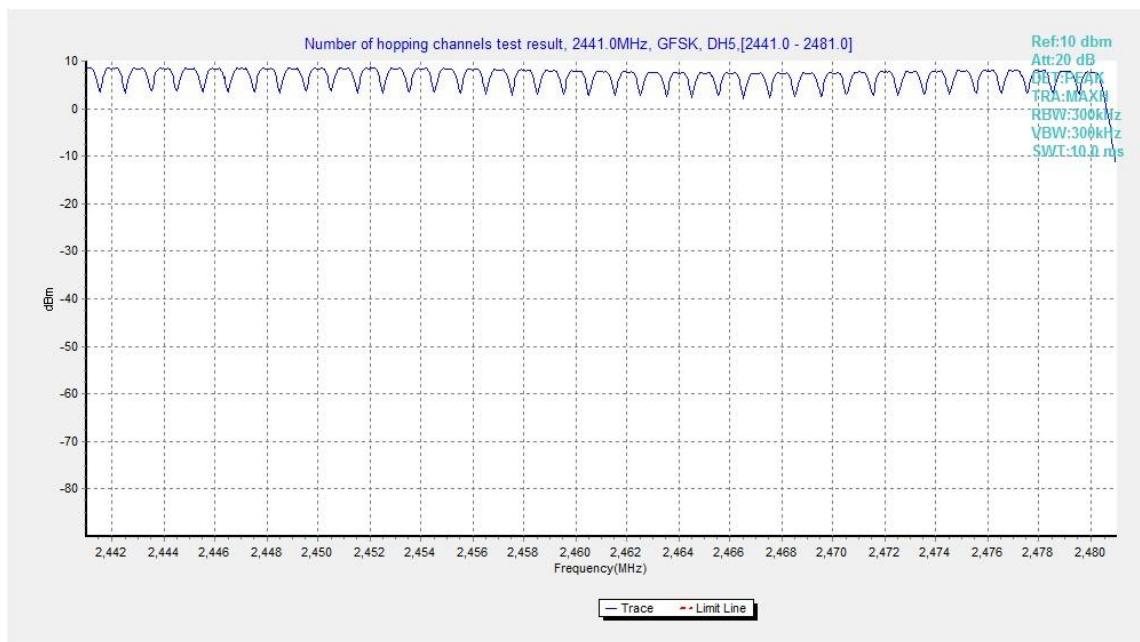


Fig.120. Number of hopping frequencies: GFSK, Channel 40 - 78

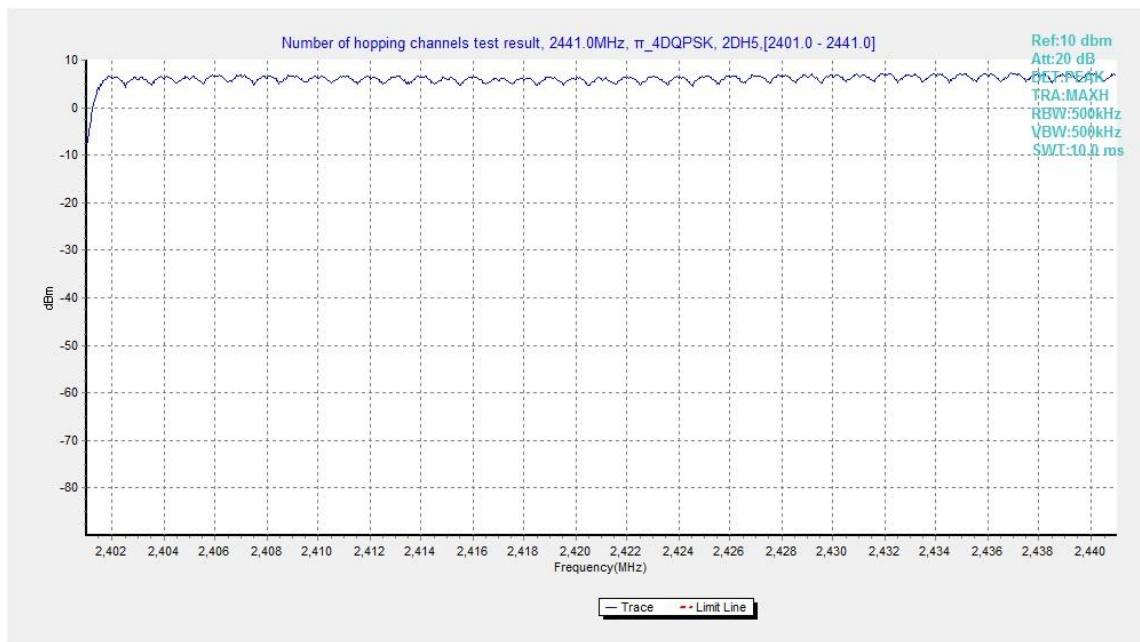


Fig.121. Number of hopping frequencies: $\pi/4$ DQPSK, Channel 0 - 39



Fig.122. Number of hopping frequencies: $\pi/4$ DQPSK, Channel 40 - 78



Fig.123. Number of hopping frequencies: 8DPSK, Channel 0 - 39



Fig.124. Number of hopping frequencies: 8DPSK, Channel 40 - 78

A.10. AC Powerline Conducted Emission

Test Condition

Voltage (V)	Frequency (Hz)
120	60

Measurement Result and limit:

Bluetooth (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dB μ V)	Conclusion
0.15 to 0.5	66 to 56	P
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.

Bluetooth (Average Limit)

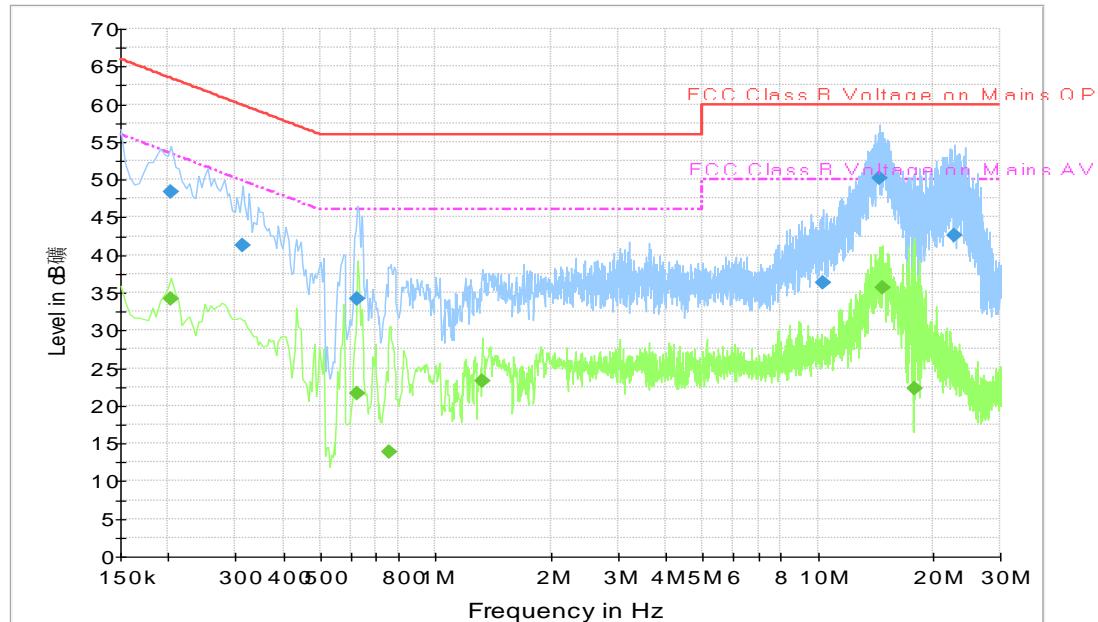
Frequency range (MHz)	Average Limit (dB μ V)	Conclusion
0.15 to 0.5	56 to 46	P
0.5 to 5	46	
5 to 30	50	

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

The measurement is made according to ANSI C63.10

Conclusion: PASS

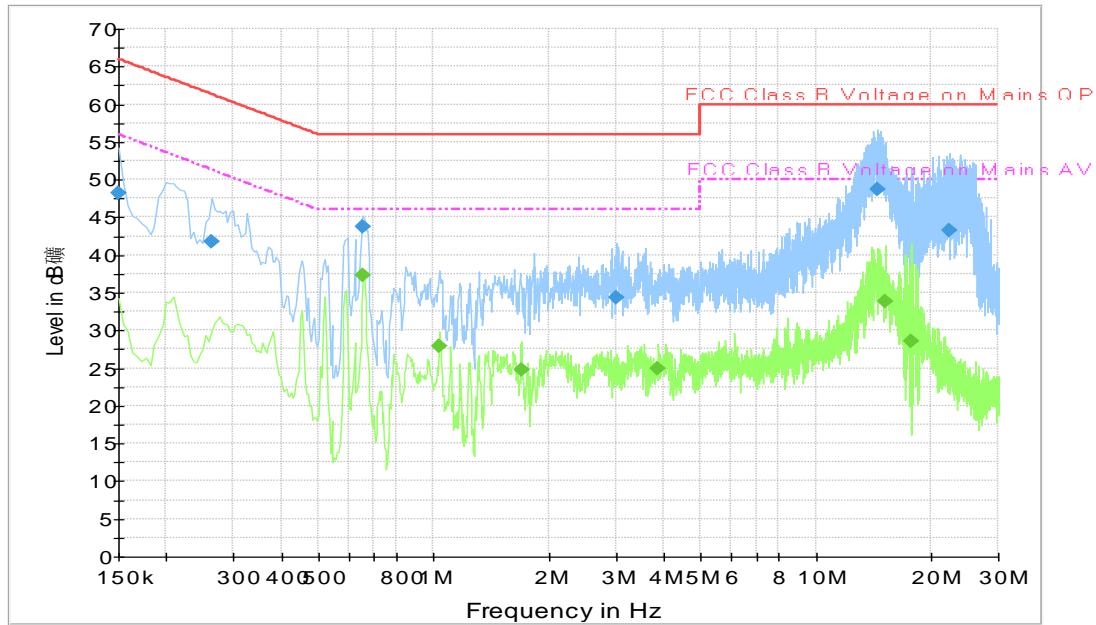
Test graphs as below:

Traffic (CBA0060AGHC1):

Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.204000	48.4	2000.0	9.000	On	L1	19.8	15.1	63.4
0.312000	41.2	2000.0	9.000	On	L1	19.8	18.7	59.9
0.622500	34.2	2000.0	9.000	On	L1	19.8	21.8	56.0
10.302000	36.3	2000.0	9.000	On	N	19.8	23.7	60.0
14.460000	50.1	2000.0	9.000	On	N	19.8	9.9	60.0
22.830000	42.7	2000.0	9.000	On	L1	20.0	17.3	60.0

Final Result 2

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.204000	34.1	2000.0	9.000	On	L1	19.8	19.3	53.4
0.627000	21.6	2000.0	9.000	On	N	19.8	24.4	46.0
0.757500	13.8	2000.0	9.000	On	N	19.8	32.2	46.0
1.324500	23.3	2000.0	9.000	On	L1	19.7	22.7	46.0
14.748000	35.7	2000.0	9.000	On	N	19.8	14.3	50.0
17.866500	22.4	2000.0	9.000	On	L1	19.9	27.6	50.0

Idle (CBA0060AGHC1):

Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.150000	48.2	2000.0	9.000	On	N	20.2	17.8	66.0
0.262500	41.7	2000.0	9.000	On	N	19.8	19.6	61.4
0.654000	43.7	2000.0	9.000	On	N	19.8	12.3	56.0
2.998500	34.4	2000.0	9.000	On	L1	19.1	21.6	56.0
14.568000	48.7	2000.0	9.000	On	L1	19.8	11.3	60.0
22.321500	43.3	2000.0	9.000	On	L1	20.0	16.7	60.0

Final Result 2

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.654000	37.3	2000.0	9.000	On	L1	19.8	8.7	46.0
1.036500	27.9	2000.0	9.000	On	L1	19.7	18.1	46.0
1.693500	24.8	2000.0	9.000	On	N	19.7	21.2	46.0
3.871500	25.0	2000.0	9.000	On	N	19.5	21.0	46.0
15.126000	33.8	2000.0	9.000	On	N	19.8	16.2	50.0
17.754000	28.5	2000.0	9.000	On	N	19.9	21.5	50.0