

Fig.97. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

## 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	938.00	NA
39	Fig.108	945.00	NA
78	Fig.109	941.00	NA

#### For π/4 DQPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.110	1317.00	NA
39	Fig.111	1277.00	NA
78	Fig.112	1308.00	NA

#### For 8DPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.113	1277.00	NA
39	Fig.114	1293.00	NA
78	Fig.115	1276.00	NA

**Conclusion: NA**

**Test graphs as below:**

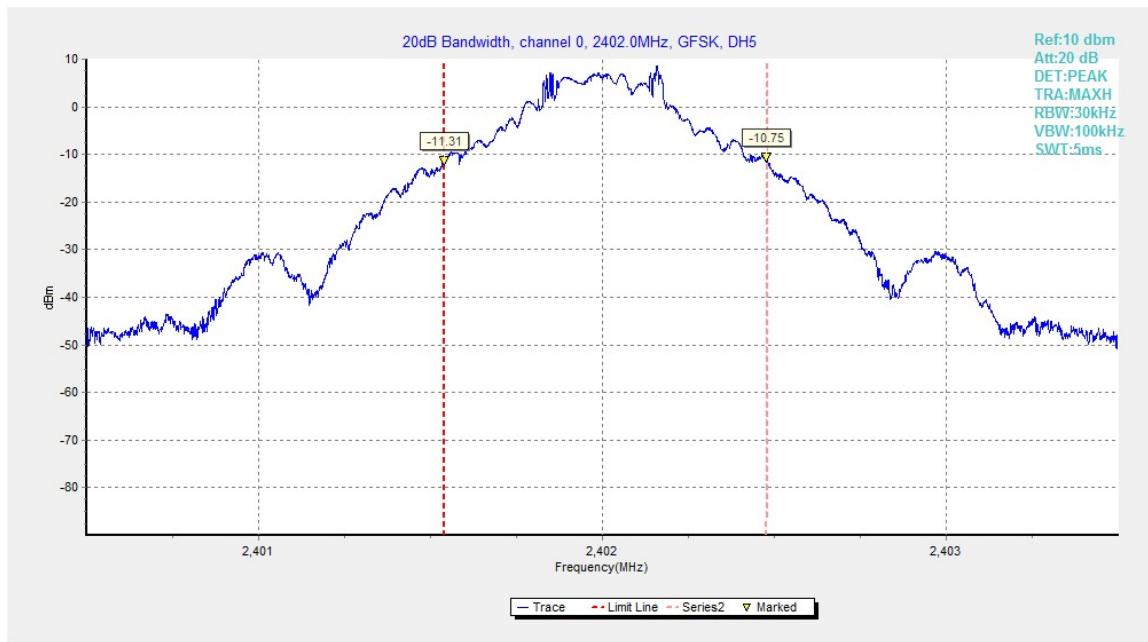


Fig.98. 20dB Bandwidth: GFSK, Channel 0

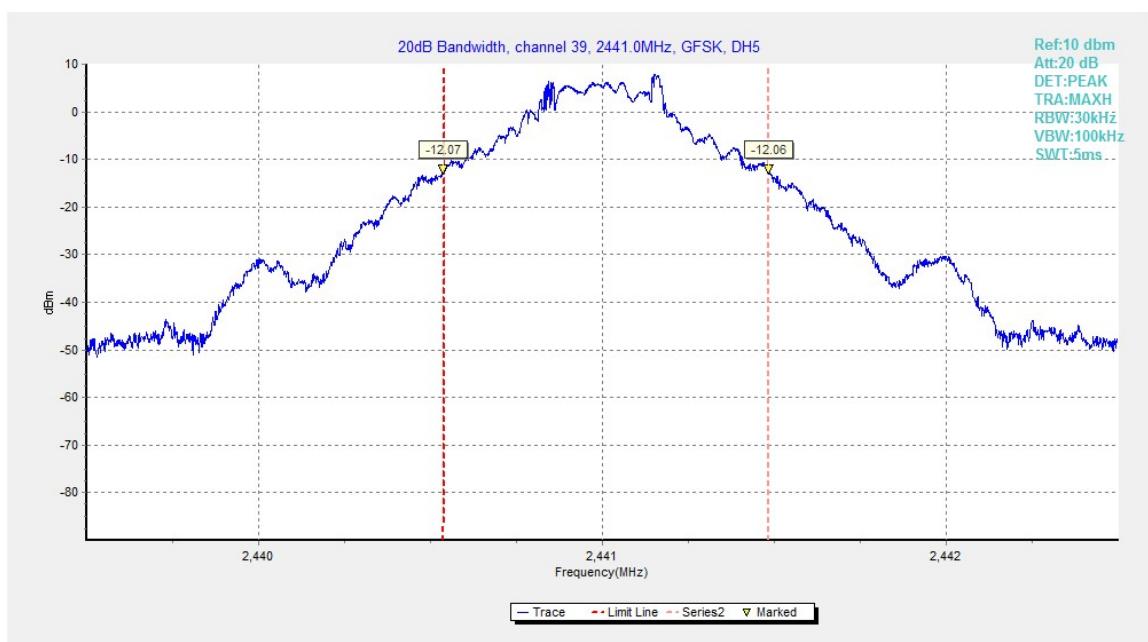


Fig.99. 20dB Bandwidth: GFSK, Channel 39

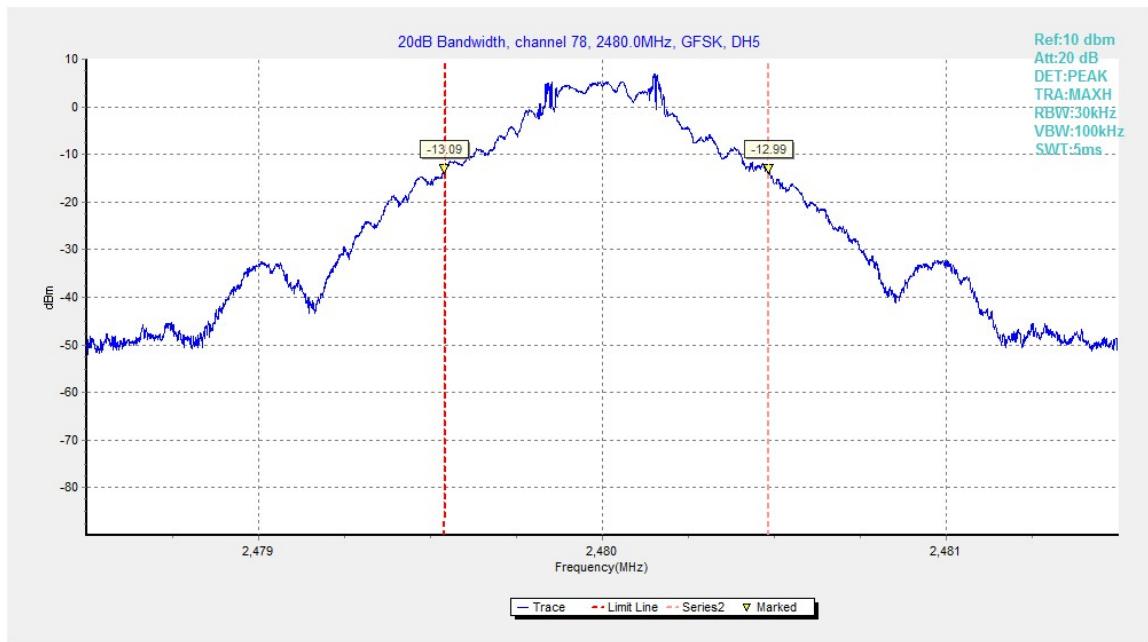


Fig.100. 20dB Bandwidth: GFSK, Channel 78

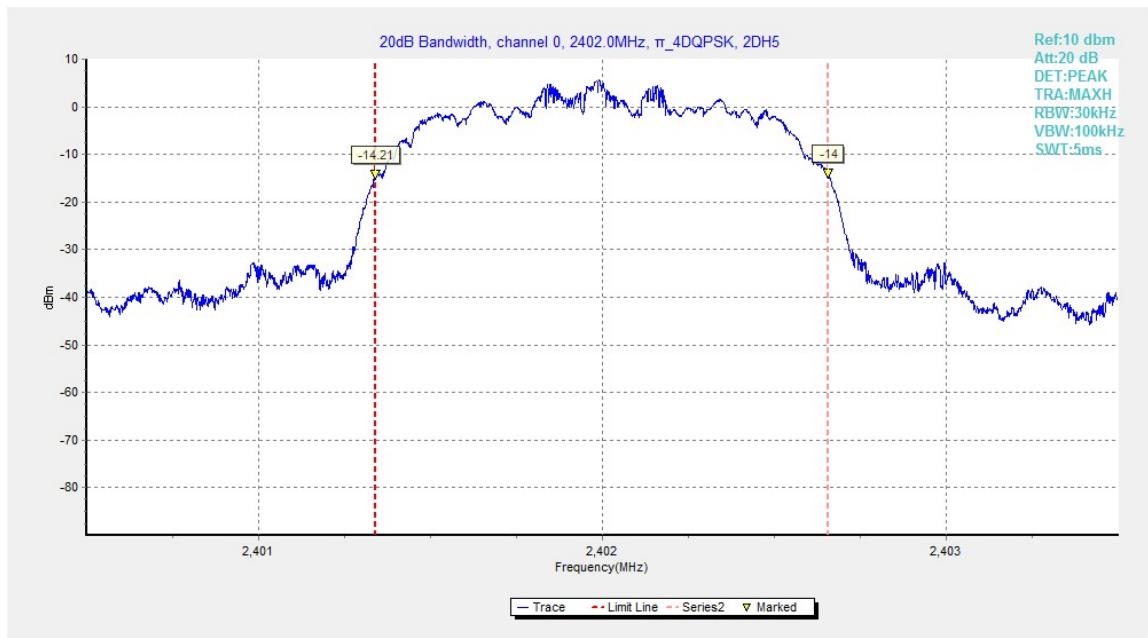
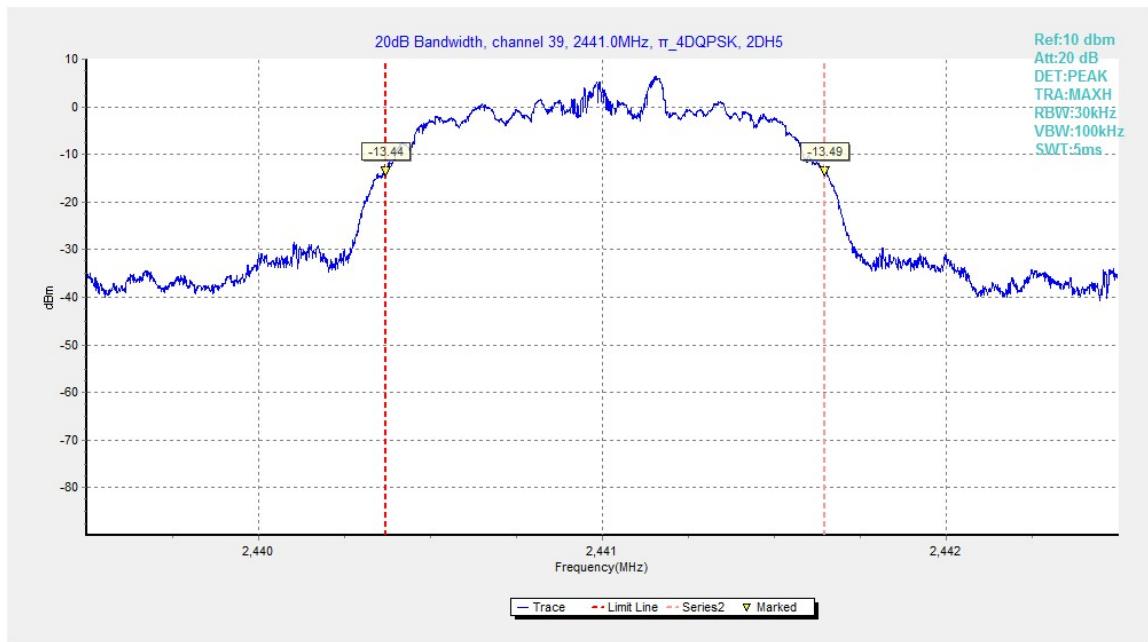
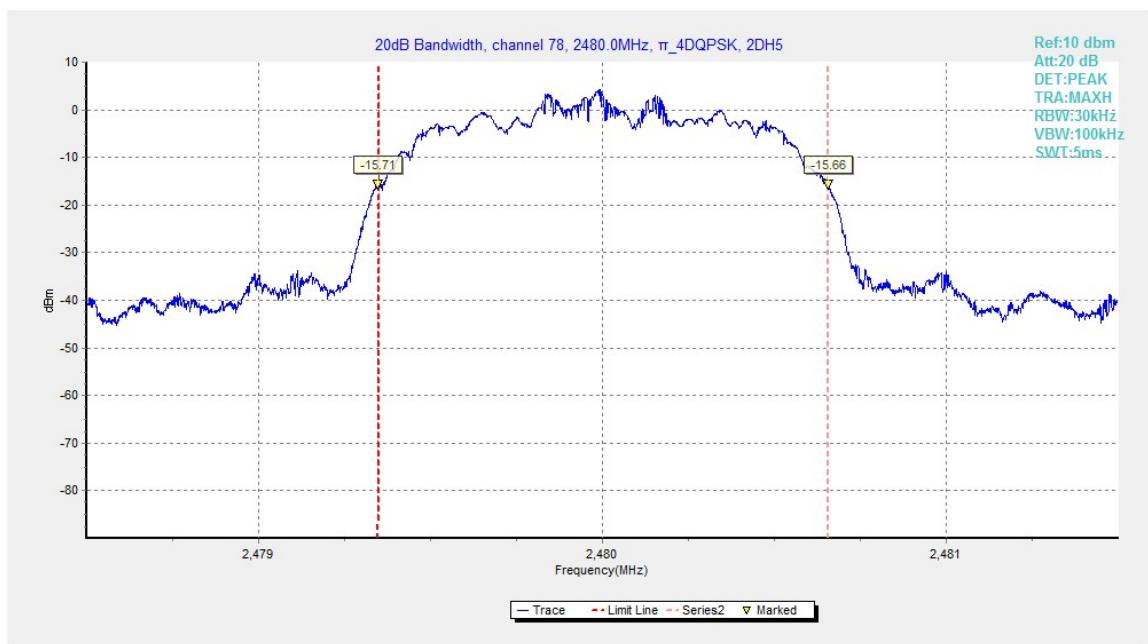


Fig.101. 20dB Bandwidth:  $\pi/4$  DQPSK, Channel 0


 Fig.102. 20dB Bandwidth:  $\pi/4$  DQPSK, Channel 39

 Fig.103. 20dB Bandwidth:  $\pi/4$  DQPSK, Channel 78

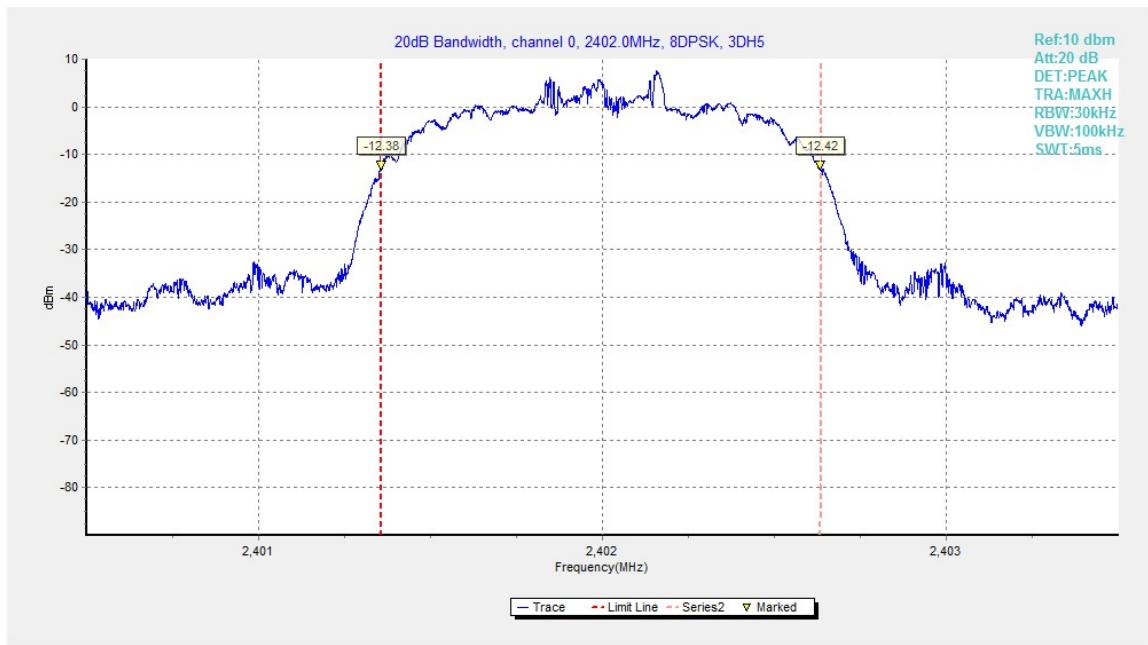


Fig.104. 20dB Bandwidth: 8DPSK, Channel 0

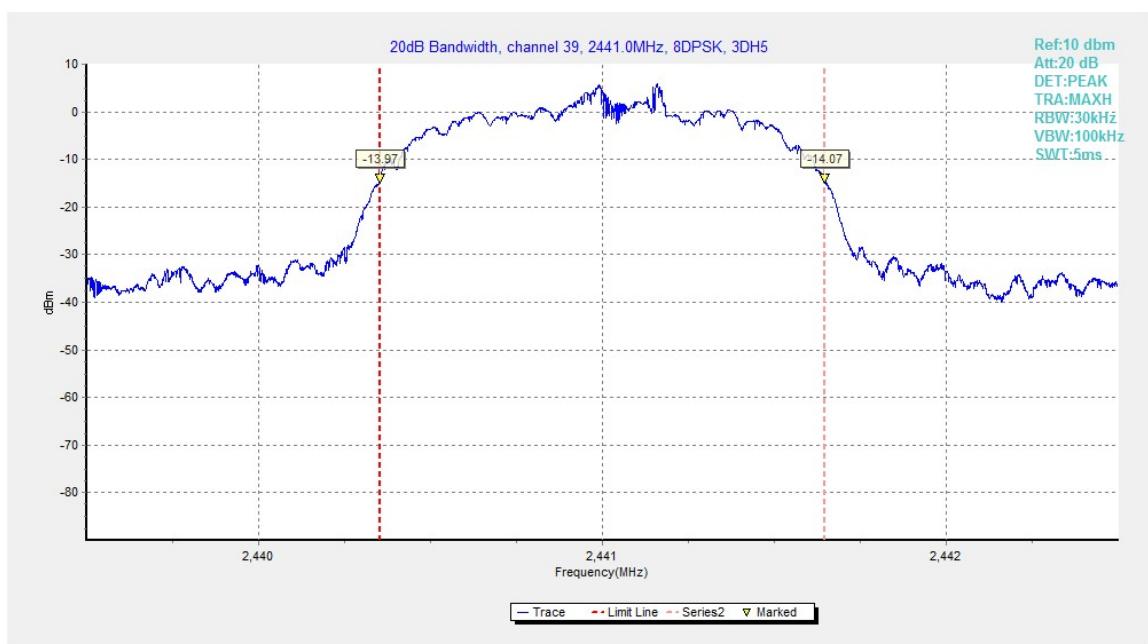


Fig.105. 20dB Bandwidth: 8DPSK, Channel 39

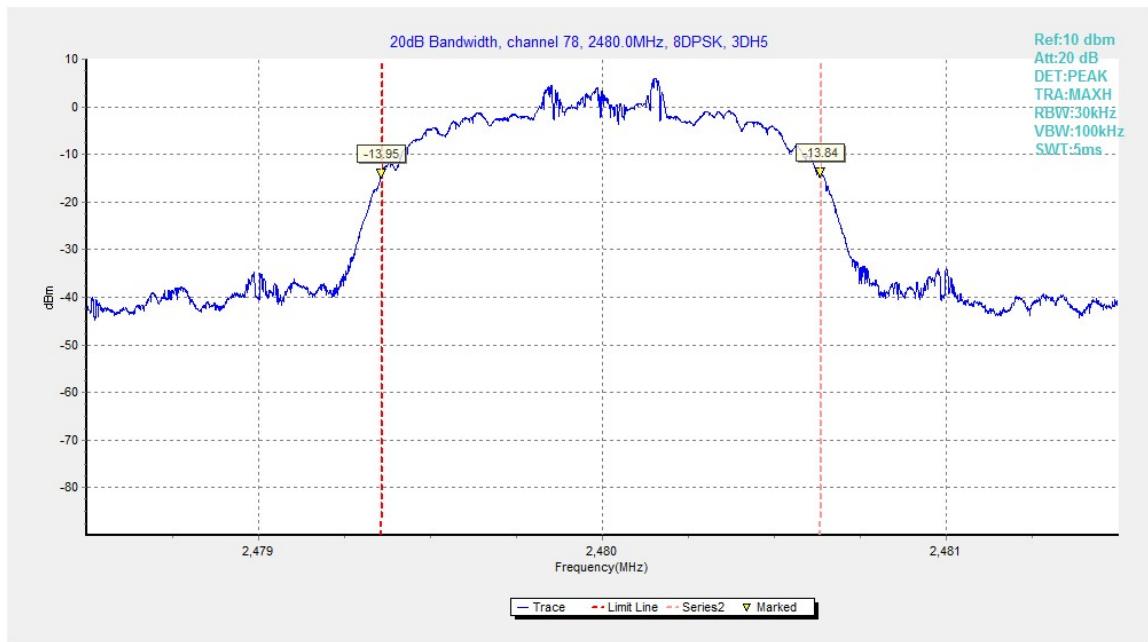


Fig.106. 20dB Bandwidth: 8DPSK, Channel 78

## 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	974.00	P

##### For $\pi/4$ DQPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.117	1166.00	P

##### For 8DPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.118	1126.00	P

**Conclusion: PASS**

**Test graphs as below:**

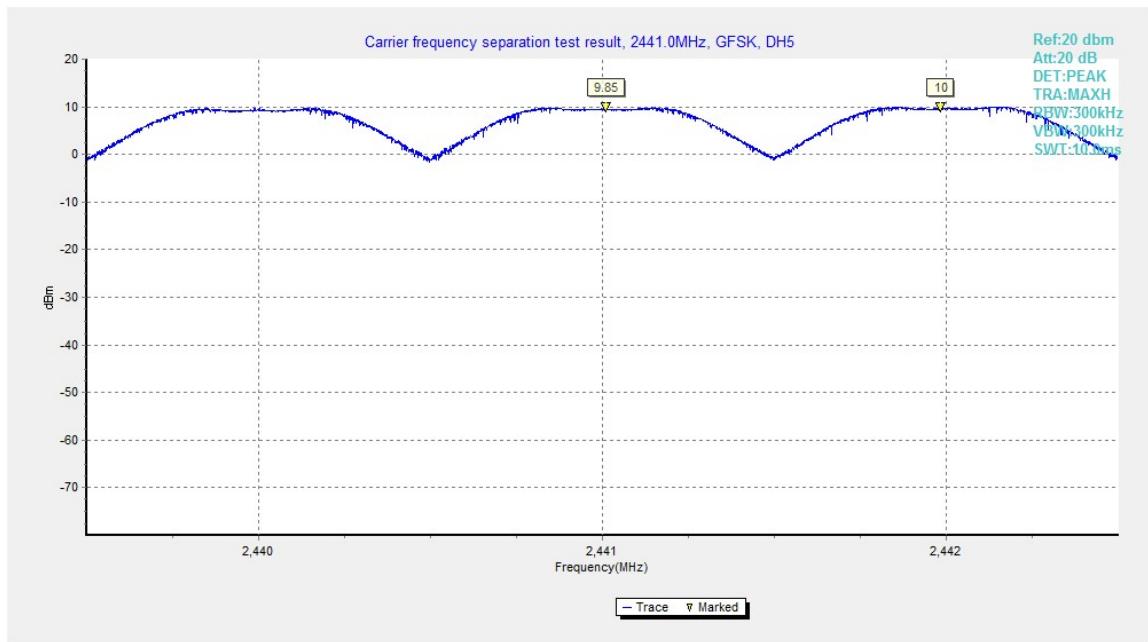


Fig.107. Carrier frequency separation measurement: GFSK, Channel 39

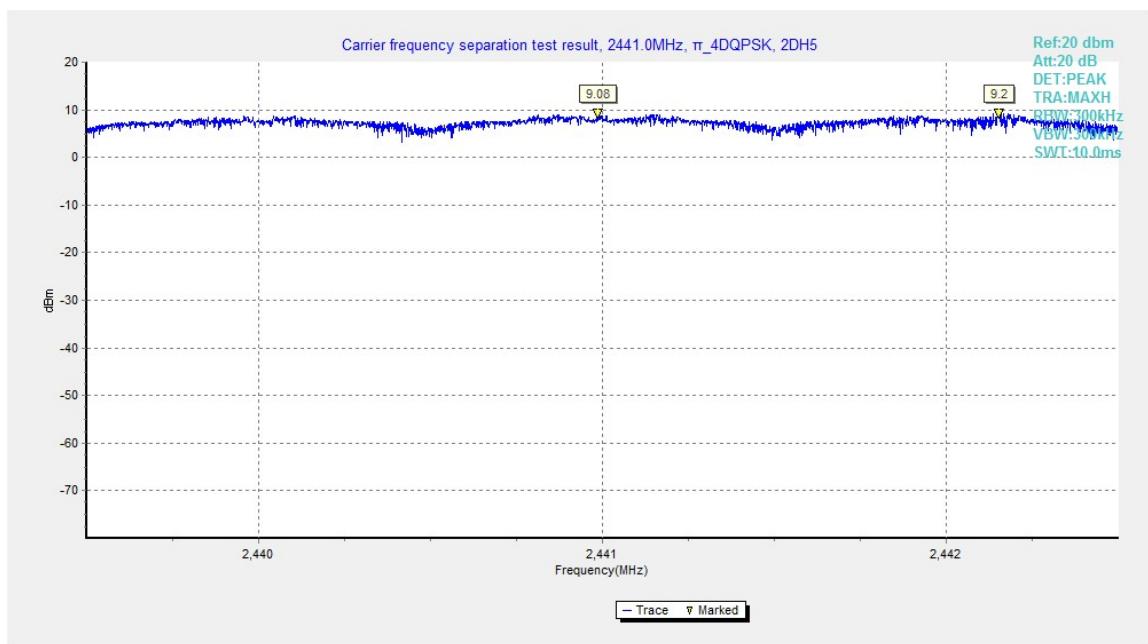


Fig.108. Carrier frequency separation measurement:  $\pi/4$  DQPSK, Channel 39

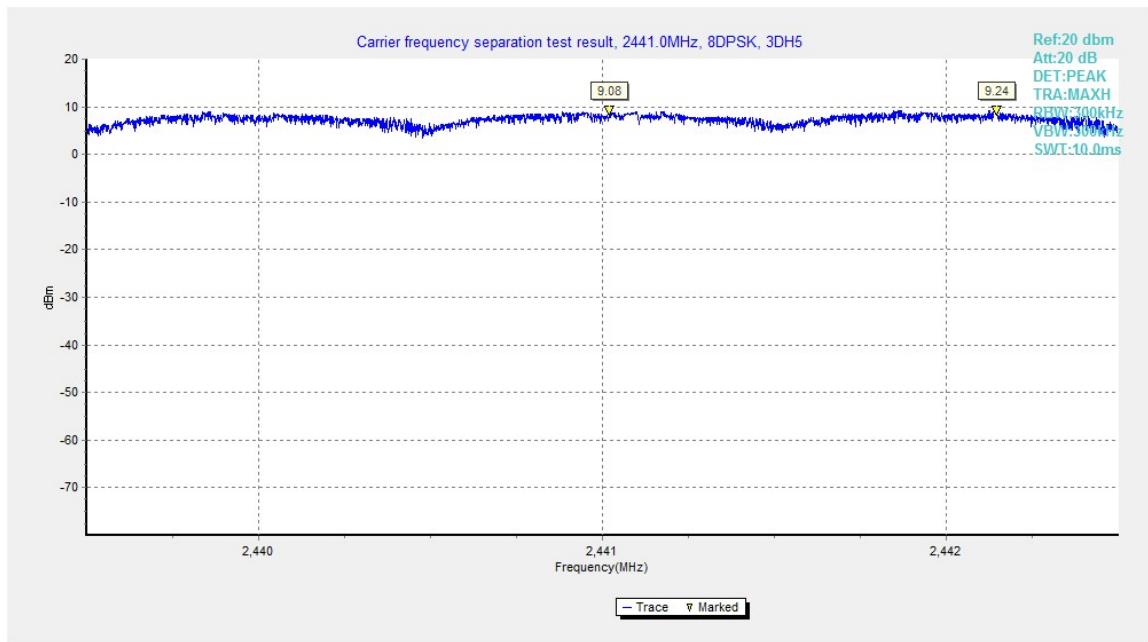


Fig.109. Carrier frequency separation measurement: 8DPSK, Channel 39

## 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 π/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:

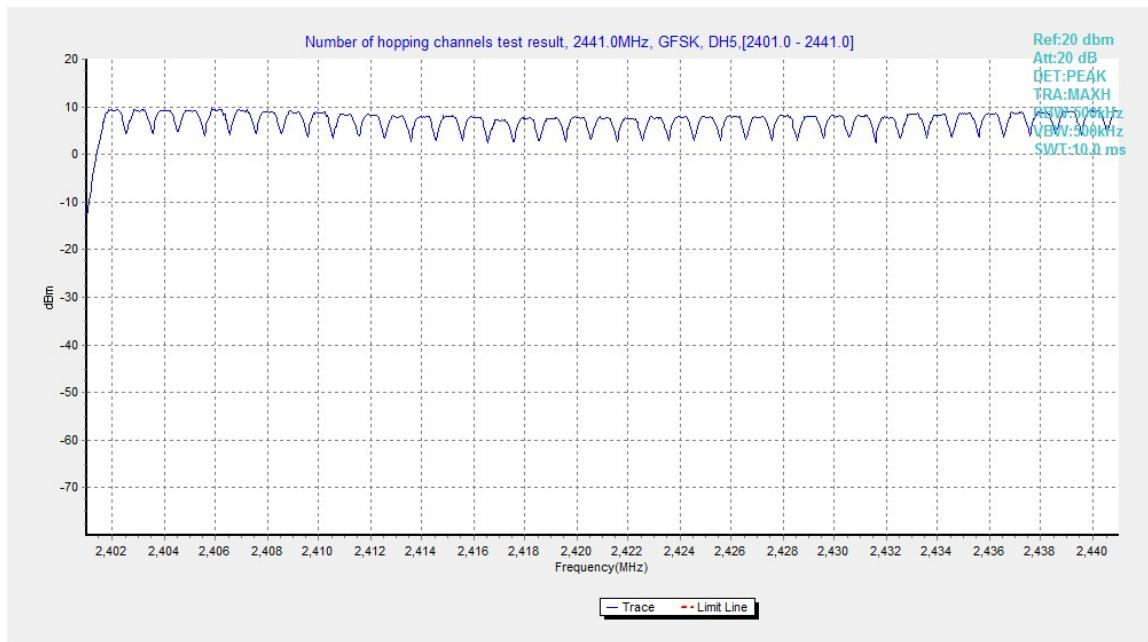


Fig.110. Number of hopping frequencies: GFSK, Channel 0 - 39

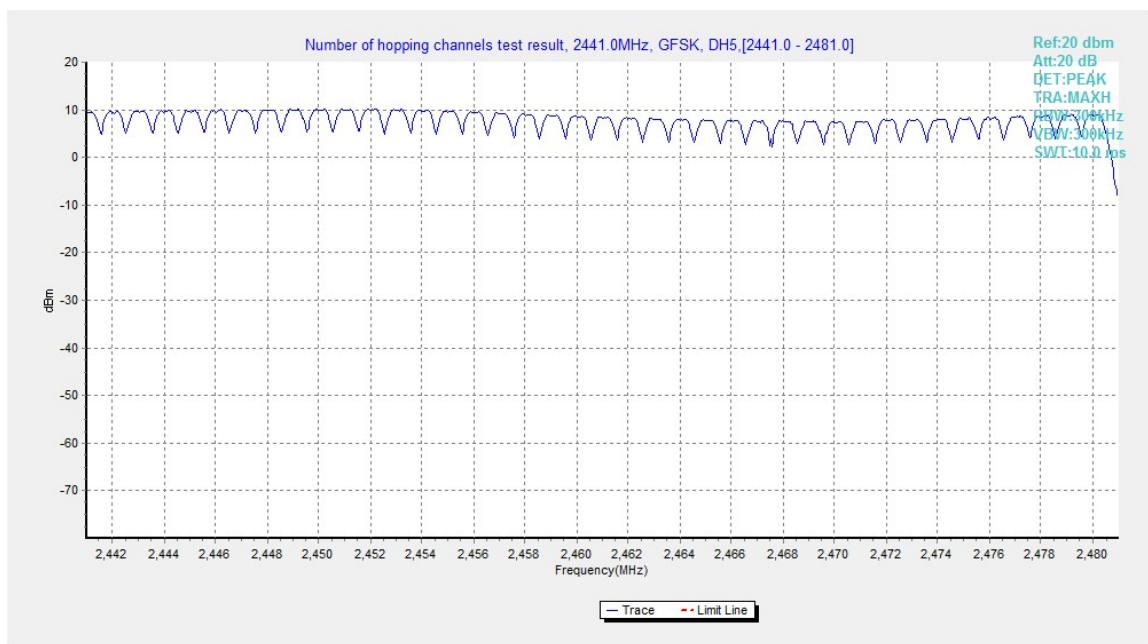
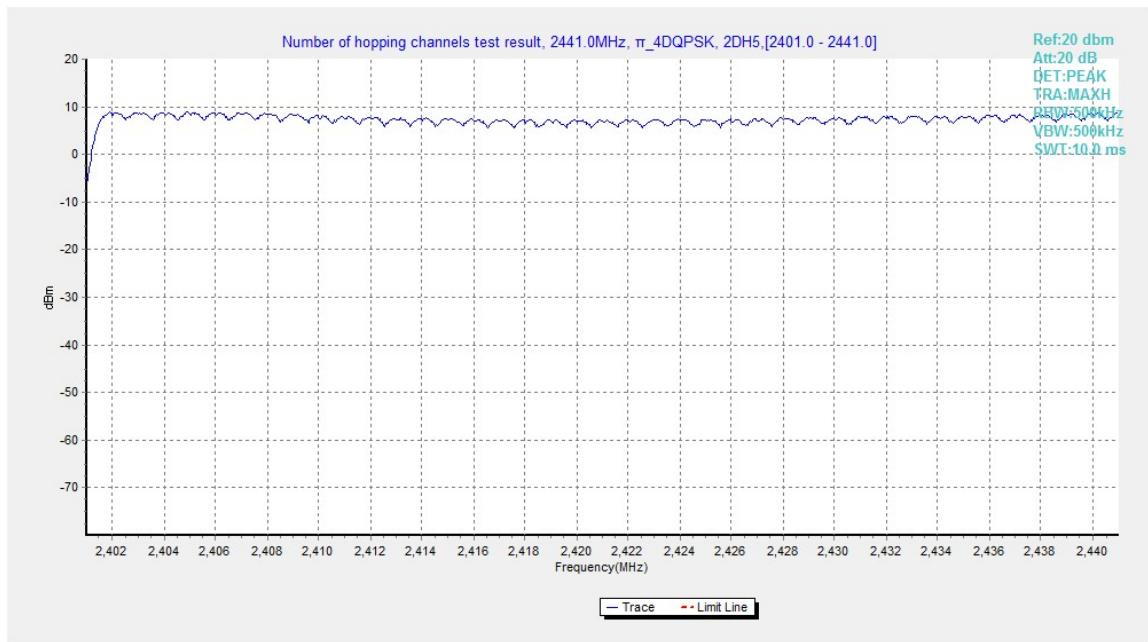
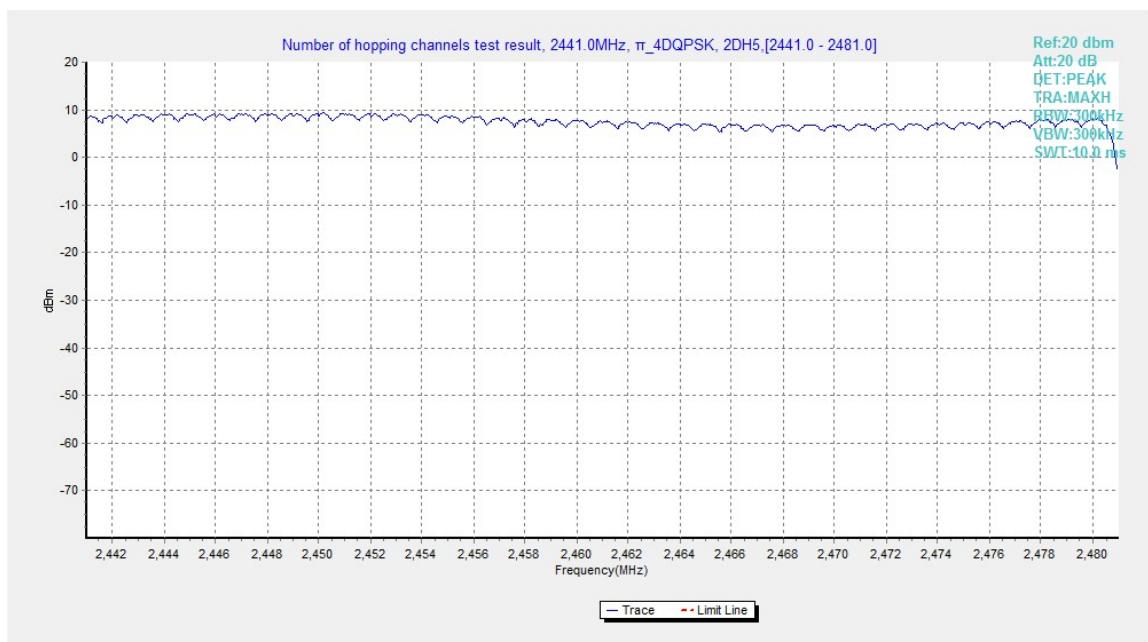


Fig.111. Number of hopping frequencies: GFSK, Channel 40 - 78


 Fig.112. Number of hopping frequencies:  $\pi/4$  DQPSK, Channel 0 - 39

 Fig.113. Number of hopping frequencies:  $\pi/4$  DQPSK, Channel 40 - 78

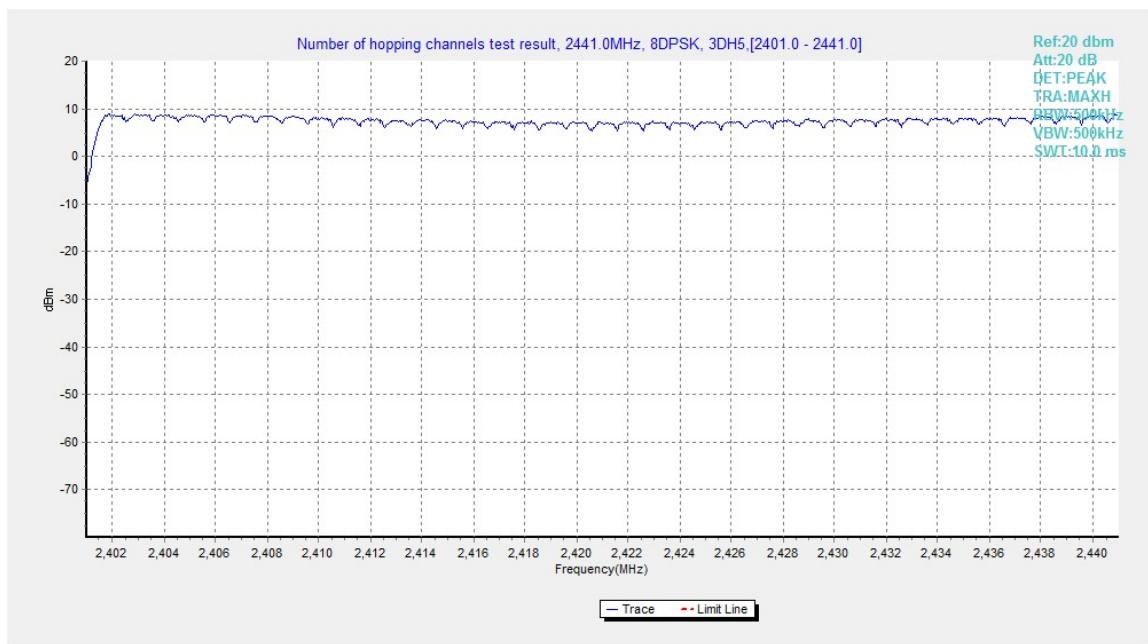


Fig.114. Number of hopping frequencies: 8DPSK, Channel 0 - 39

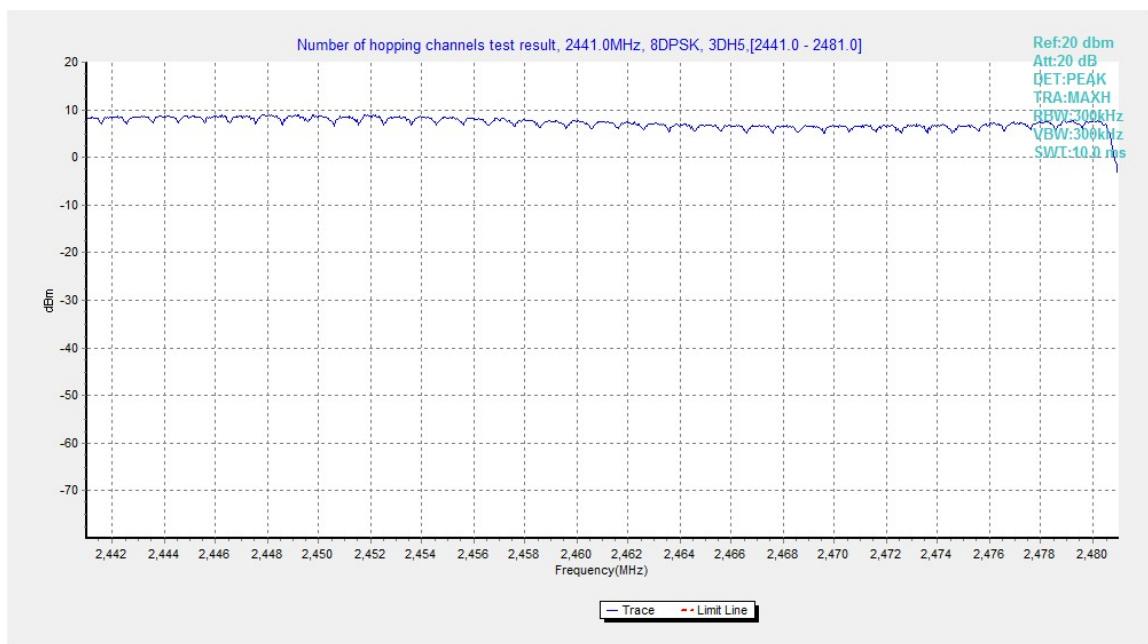


Fig.115. Number of hopping frequencies: 8DPSK, Channel 40 - 78

## 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 $\mu$ 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 $\mu$ V)	Conclusion
0.15 to 0.5	56 to 46	P
0.5 to 5	46	
5 to 30	50	

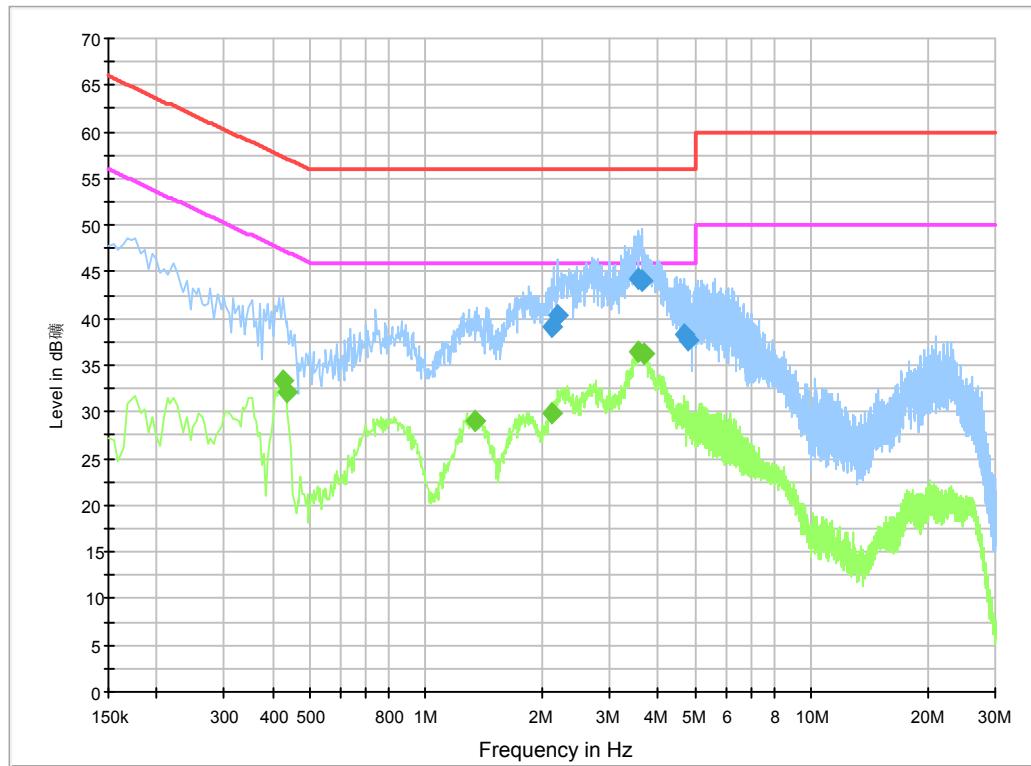
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

The measurement is made according to ANSI C63.10

**Conclusion: PASS**

**Test graphs as below:**

Traffic:



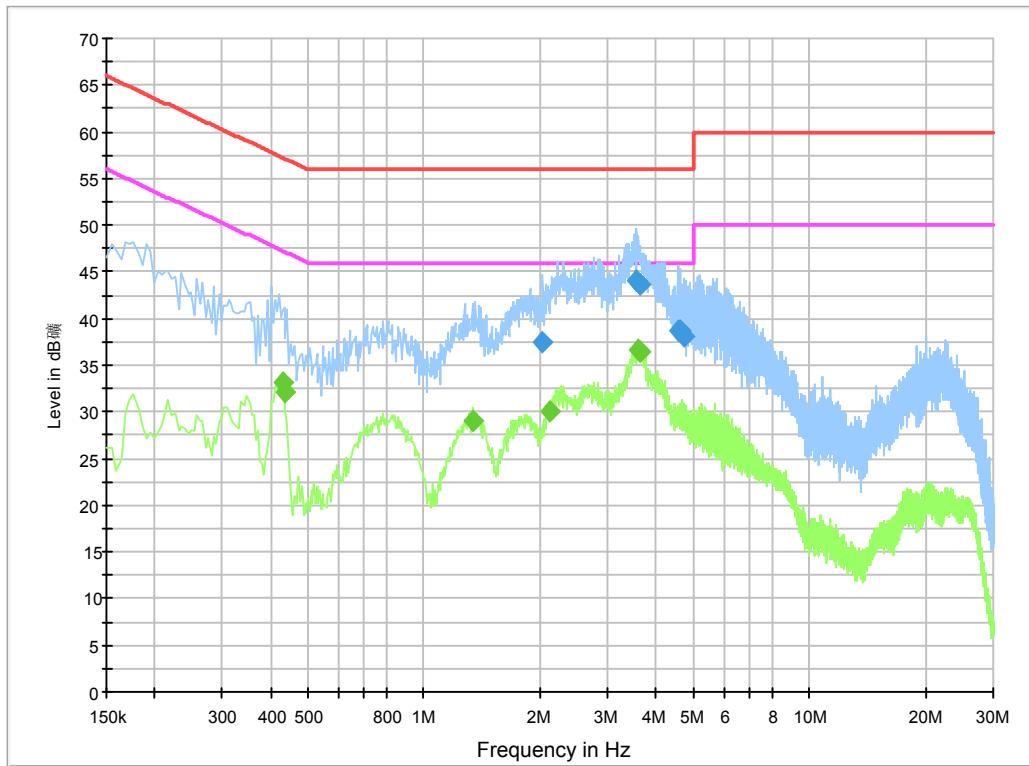
## Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
2.116500	39.2	2000.0	9.000	On	L1	10.4	16.8	56.0
2.197500	40.4	2000.0	9.000	On	L1	10.4	15.6	56.0
3.574500	44.3	2000.0	9.000	On	L1	10.4	11.7	56.0
3.628500	44.0	2000.0	9.000	On	L1	10.4	12.0	56.0
4.699500	38.4	2000.0	9.000	On	L1	10.5	17.6	56.0
4.807500	37.7	2000.0	9.000	On	L1	10.5	18.3	56.0

## Final Result 2

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.424500	33.4	2000.0	9.000	On	N	10.4	14.0	47.4
0.433500	32.1	2000.0	9.000	On	N	10.4	15.1	47.2
1.333500	29.1	2000.0	9.000	On	N	10.4	16.9	46.0
2.112000	29.8	2000.0	9.000	On	L1	10.4	16.2	46.0
3.556500	36.4	2000.0	9.000	On	L1	10.4	9.6	46.0
3.678000	36.1	2000.0	9.000	On	L1	10.4	9.9	46.0

Idle:



## Final Result 1

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
2.035500	37.6	2000.0	9.000	On	L1	10.4	18.4	56.0
3.561000	44.1	2000.0	9.000	On	L1	10.4	11.9	56.0
3.633000	43.7	2000.0	9.000	On	L1	10.4	12.3	56.0
4.551000	38.8	2000.0	9.000	On	L1	10.5	17.2	56.0
4.623000	38.7	2000.0	9.000	On	L1	10.5	17.3	56.0
4.735500	38.2	2000.0	9.000	On	L1	10.5	17.8	56.0

## Final Result 2

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.429000	33.1	2000.0	9.000	On	N	10.4	14.2	47.3
0.433500	32.1	2000.0	9.000	On	N	10.4	15.1	47.2
1.347000	29.1	2000.0	9.000	On	N	10.4	16.9	46.0
2.116500	30.1	2000.0	9.000	On	L1	10.4	15.9	46.0
3.601500	36.6	2000.0	9.000	On	L1	10.4	9.4	46.0
3.651000	36.4	2000.0	9.000	On	L1	10.4	9.6	46.0

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