

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	118.32	P
	DH3	Fig.90	260.12	P
	DH5	Fig.91	306.56	P

For $\pi/4$ DQPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.92	120.60	P
	DH3	Fig.93	260.65	P
	DH5	Fig.94	307.01	P

For 8DPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.95	120.91	P

	DH3	Fig.96	260.46	P
	DH5	Fig.97	306.72	P

Conclusion: PASS

Test graphs as below:

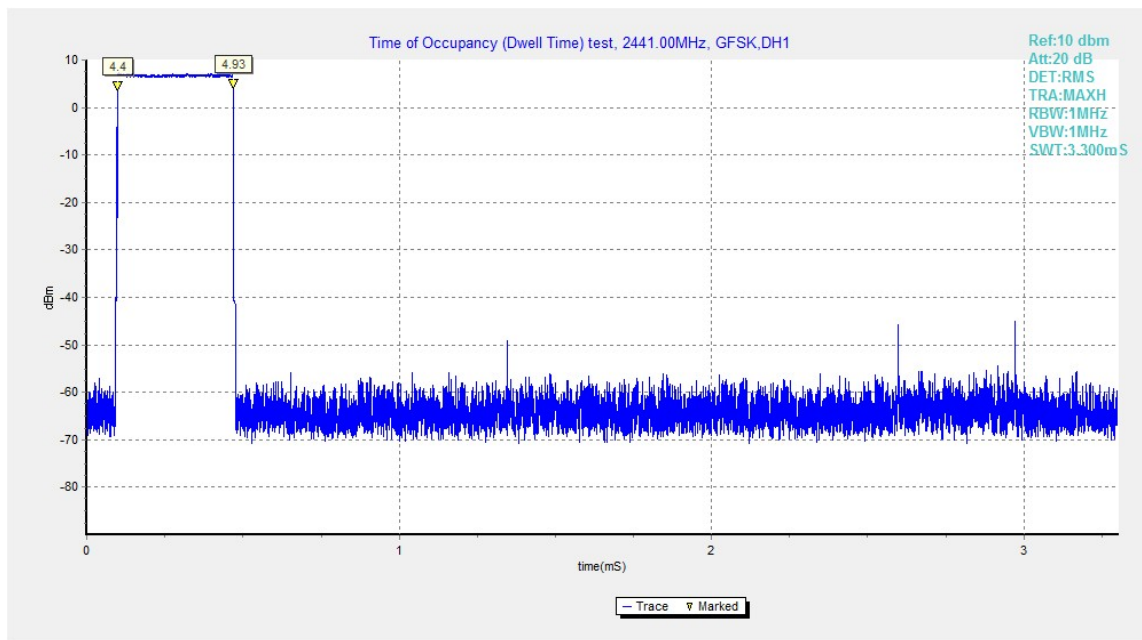


Fig.89. Time of occupancy (Dwell Time): Channel 39, Packet DH1

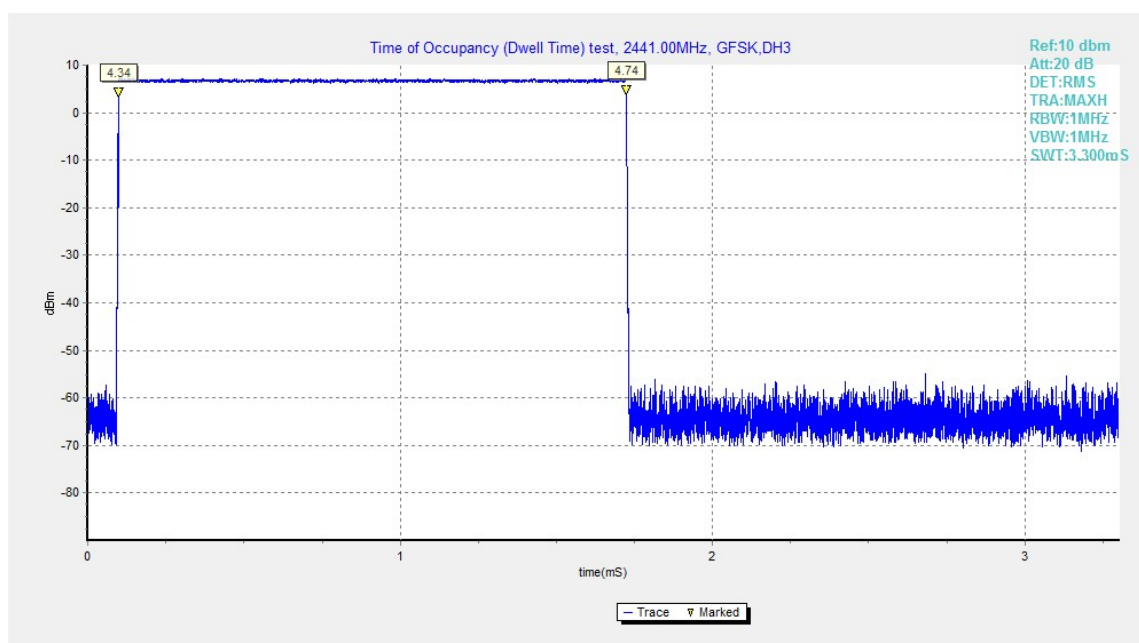


Fig.90. Time of occupancy (Dwell Time): Channel 39, Packet DH3

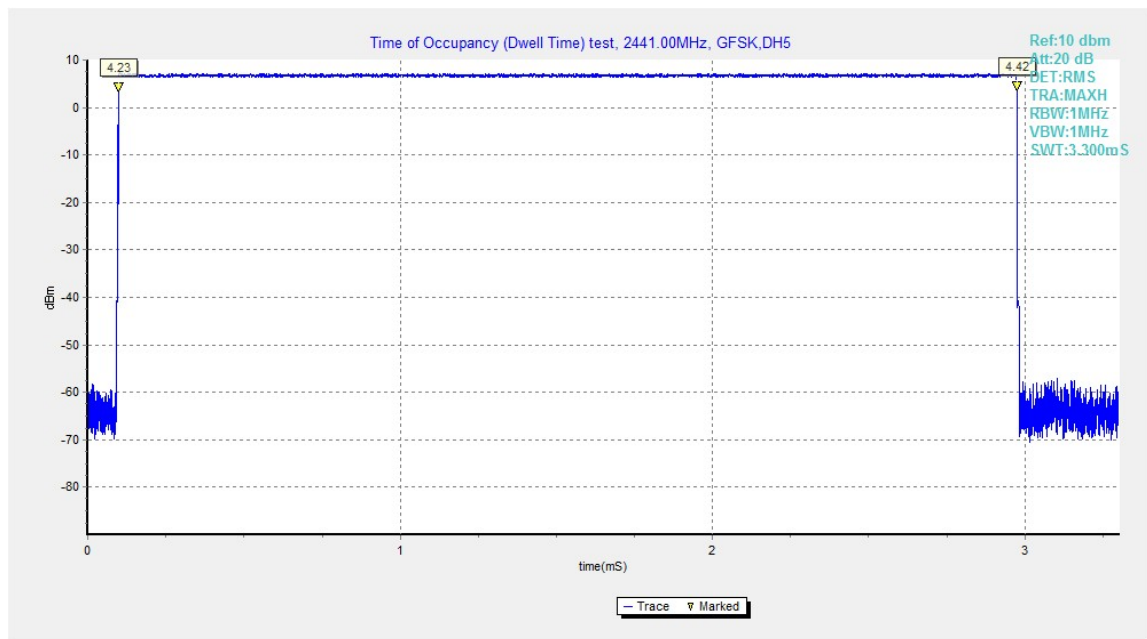


Fig.91. Time of occupancy (Dwell Time): Channel 39, Packet DH5

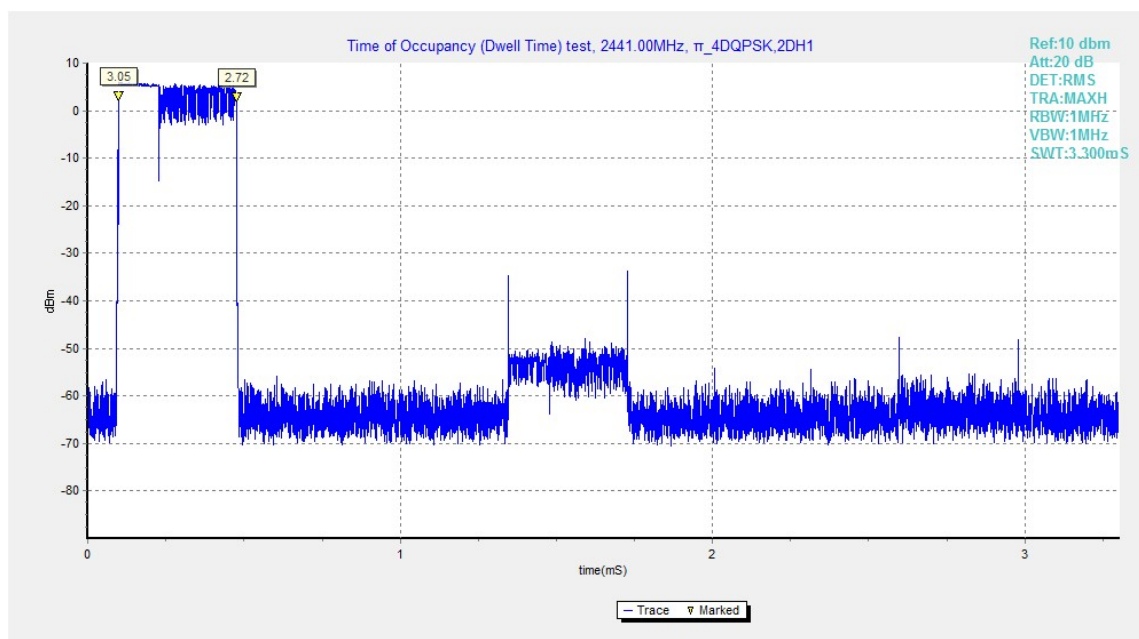


Fig.92. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

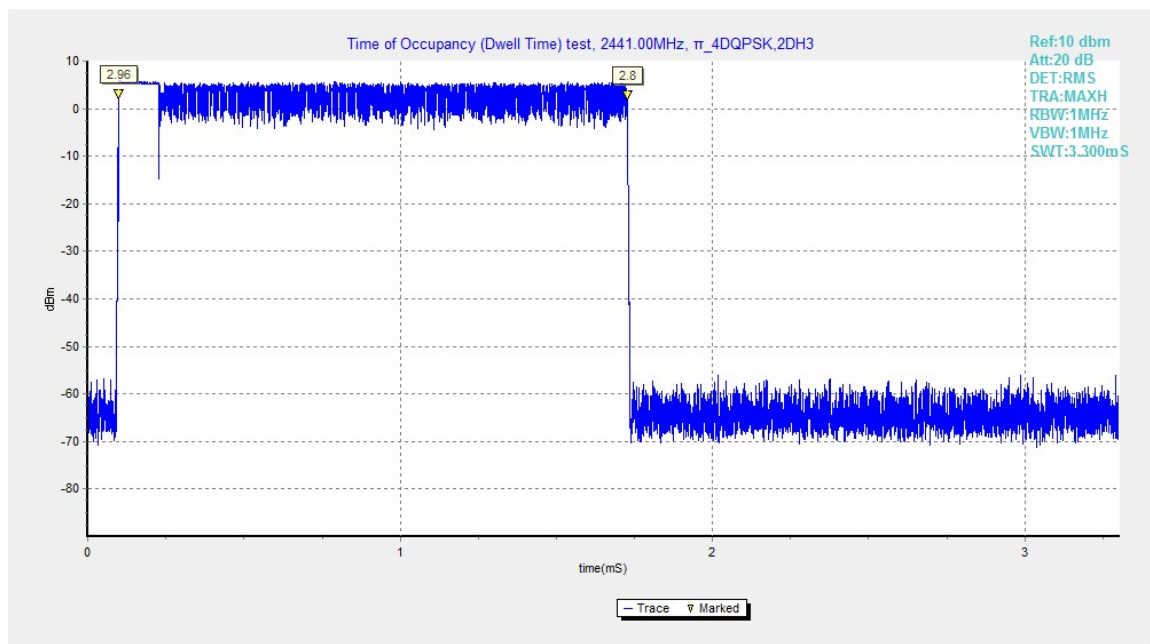


Fig.93. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3



Fig.94. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

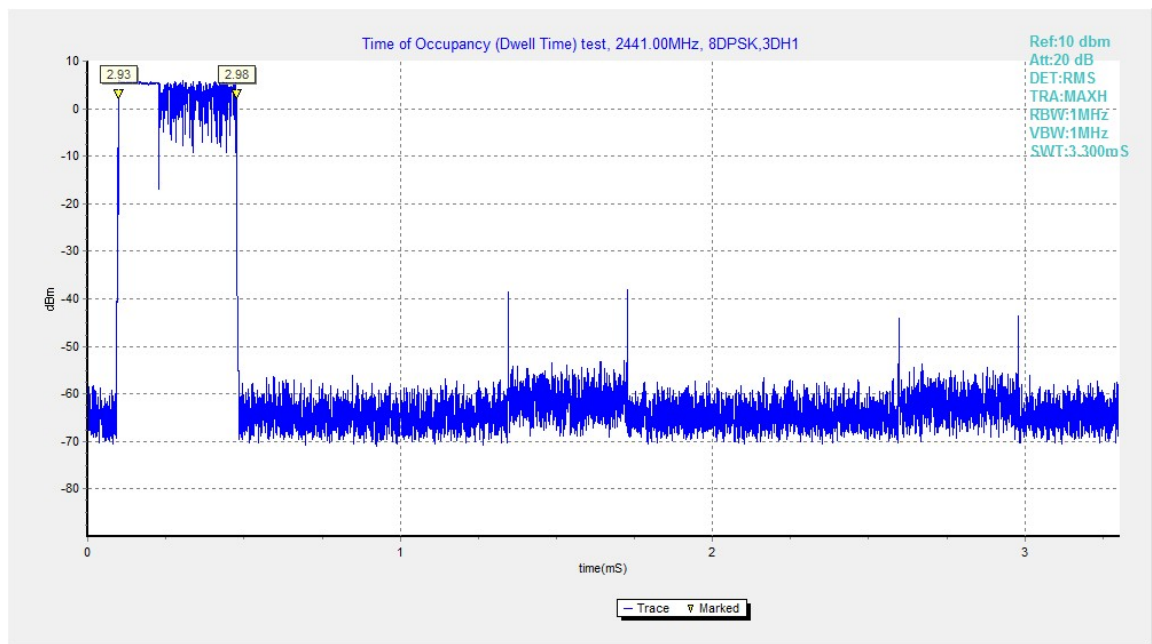


Fig.95. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1

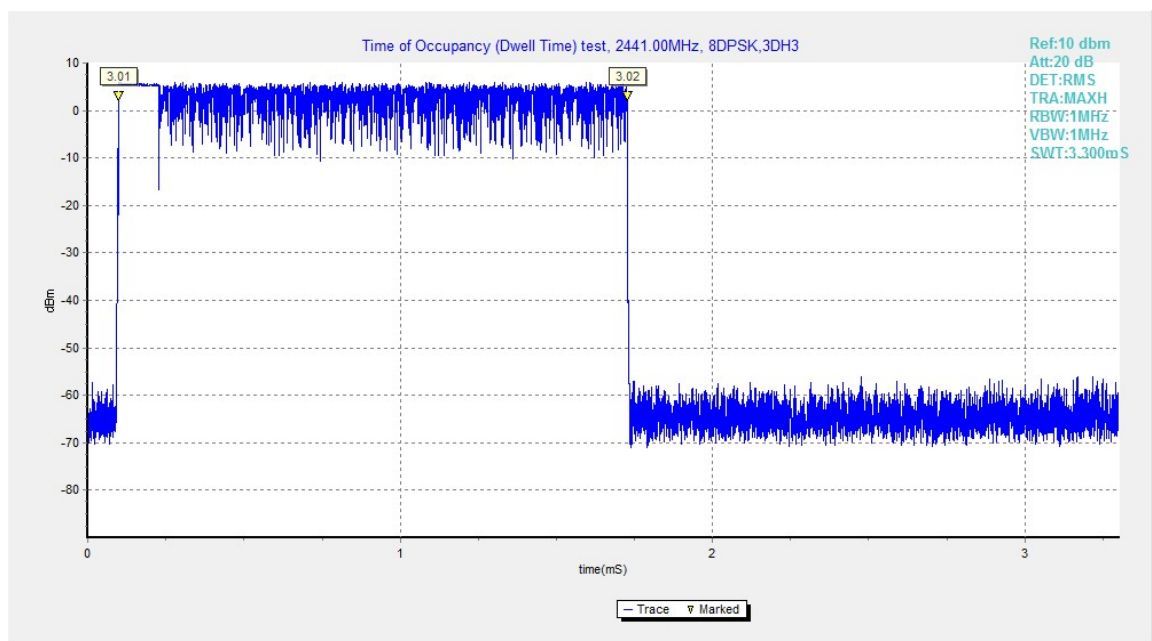


Fig.96. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

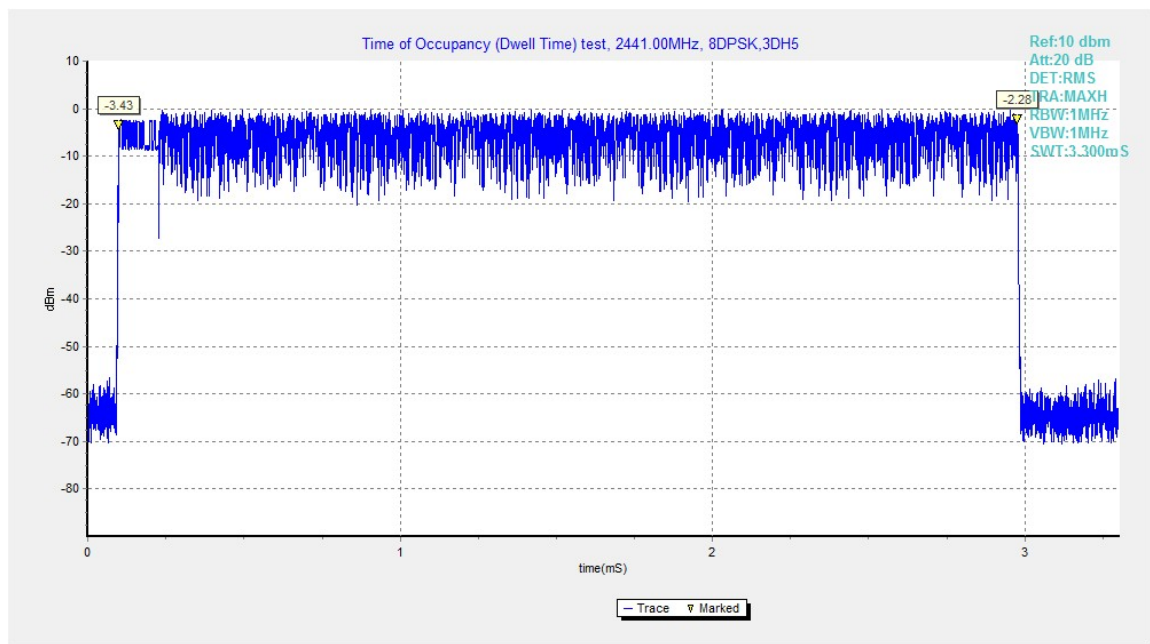


Fig.97. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

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.98	950.00	NA
39	Fig.99	949.00	NA
78	Fig.100	946.00	NA

For $\pi/4$ DQPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.101	1291.00	NA
39	Fig.102	1285.00	NA
78	Fig.103	1279.00	NA

For 8DPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.104	1264.00	NA
39	Fig.105	1292.00	NA
78	Fig.106	1269.00	NA

Conclusion: NA

Test graphs as below:

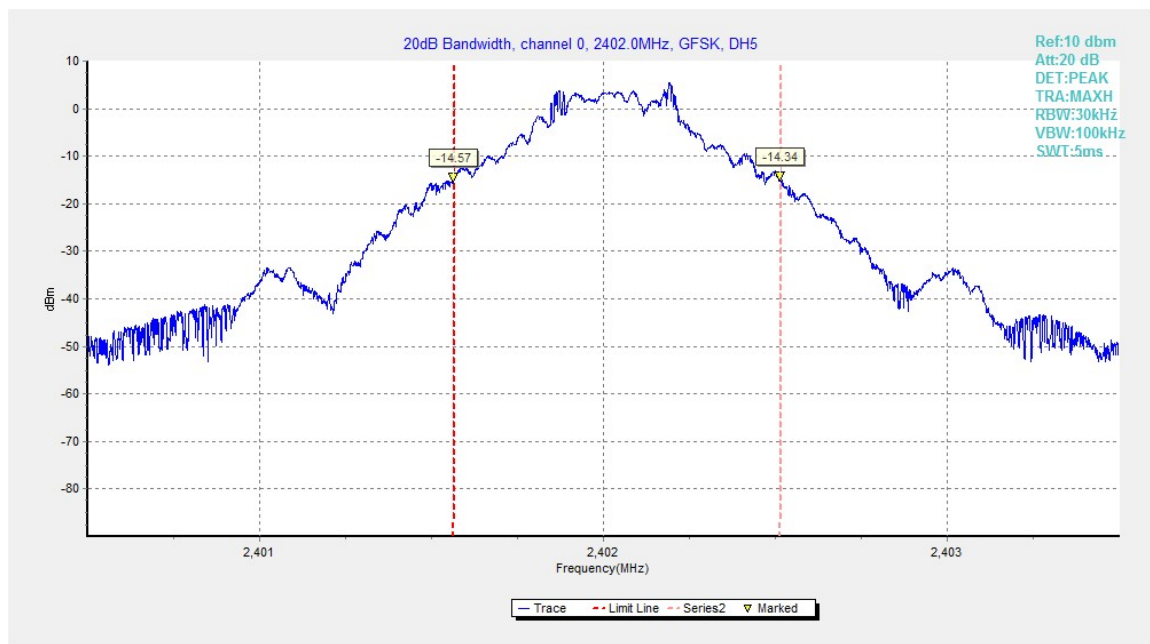


Fig.98. 20dB Bandwidth: GFSK, Channel 0

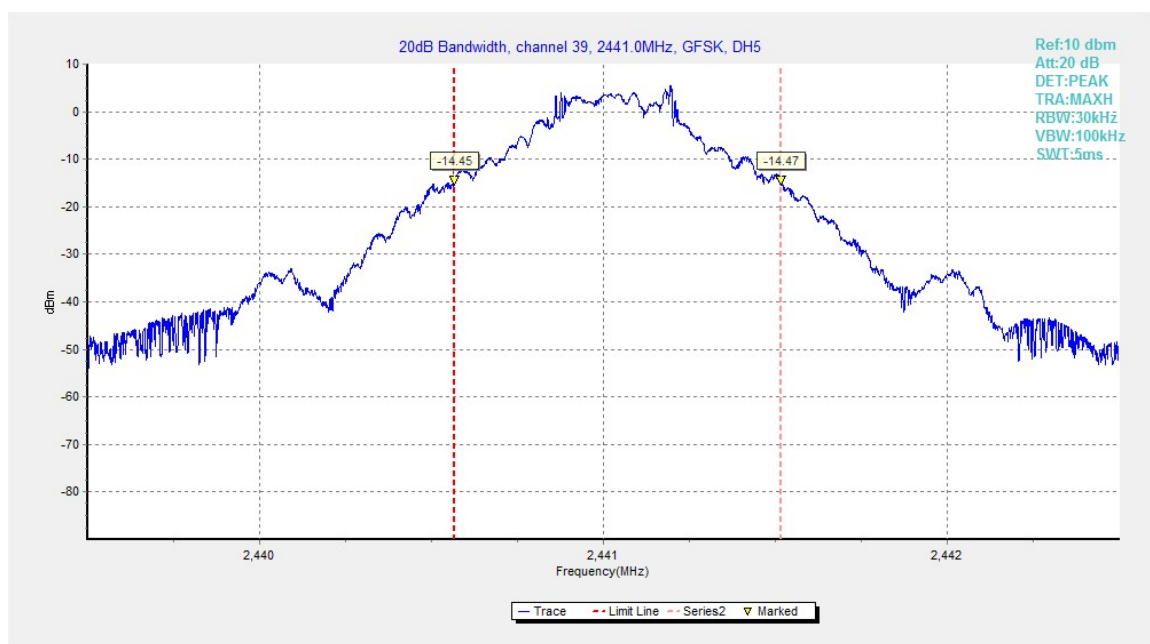


Fig.99. 20dB Bandwidth: GFSK, Channel 39

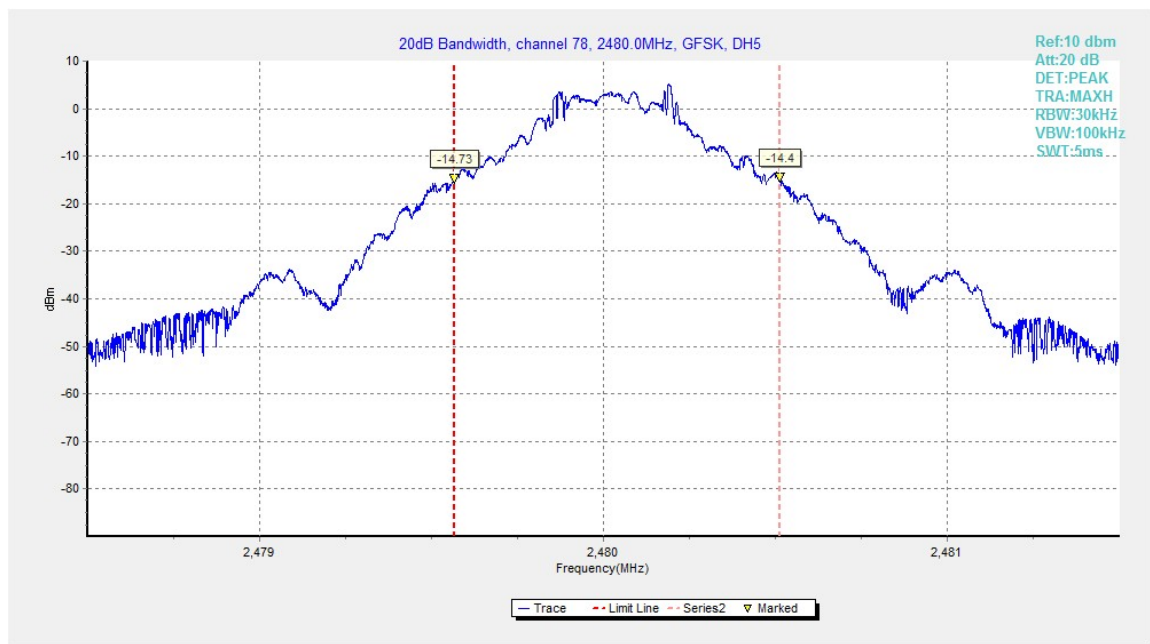


Fig.100. 20dB Bandwidth: GFSK, Channel 78

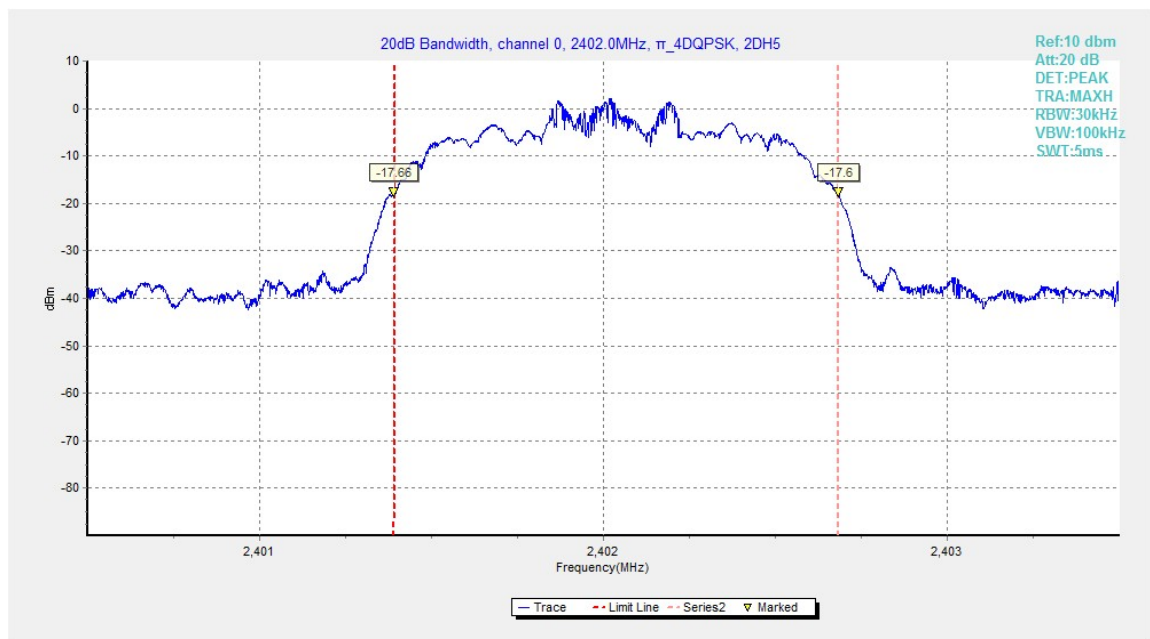


Fig.101. 20dB Bandwidth: $\pi/4$ DQPSK, Channel 0

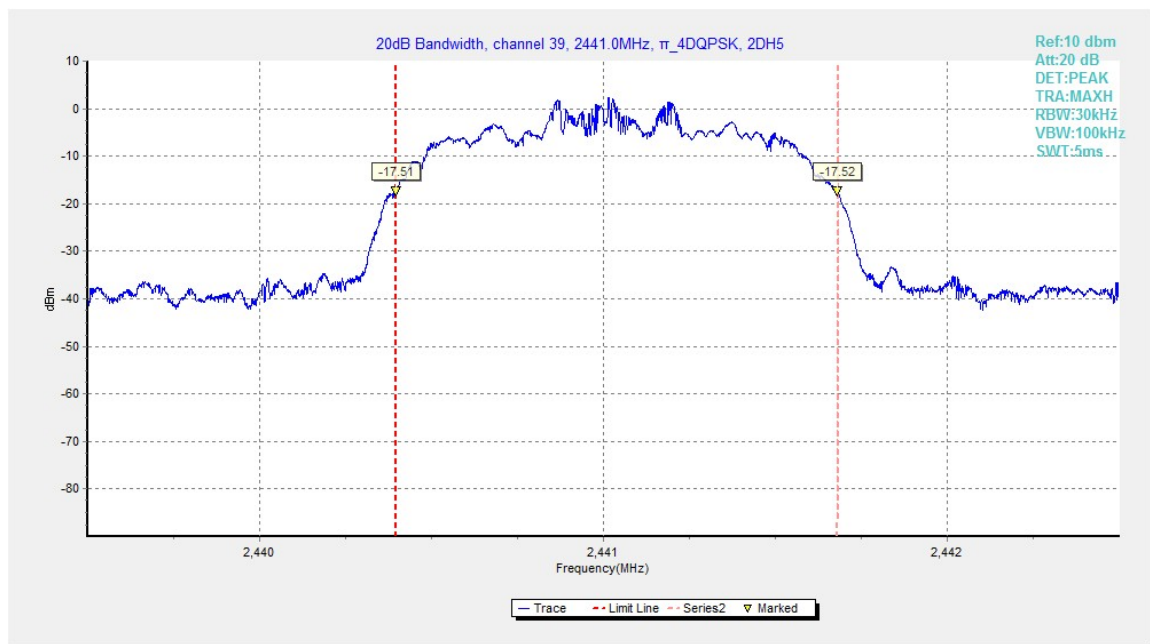


Fig.102. 20dB Bandwidth: $\pi/4$ DQPSK, Channel 39

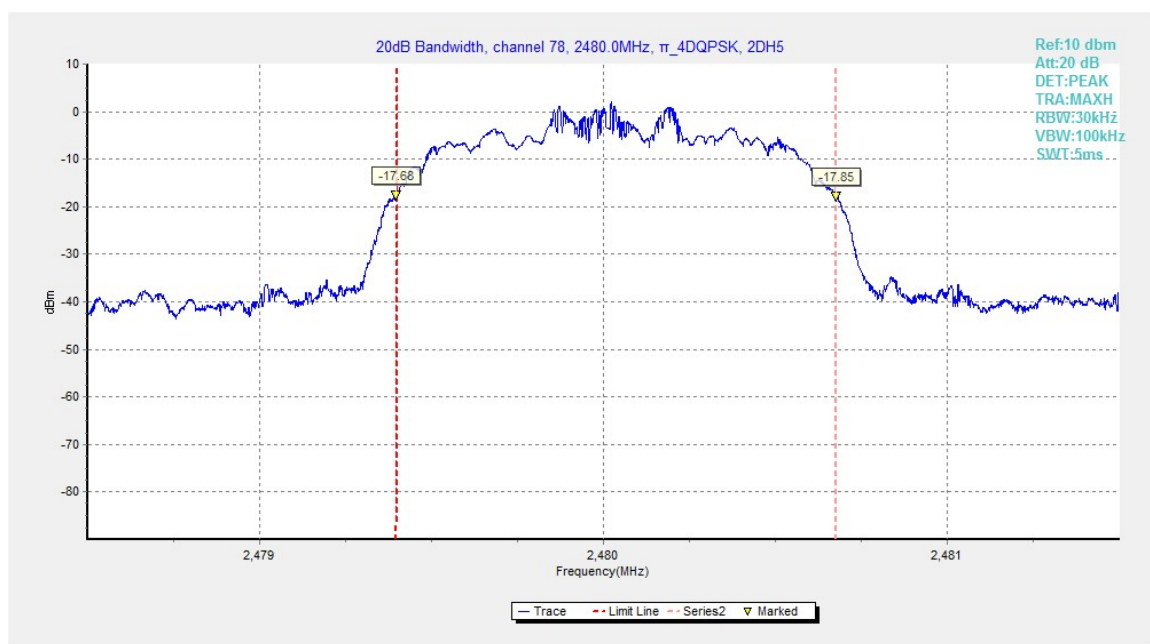


Fig.103. 20dB Bandwidth: $\pi/4$ DQPSK, Channel 78

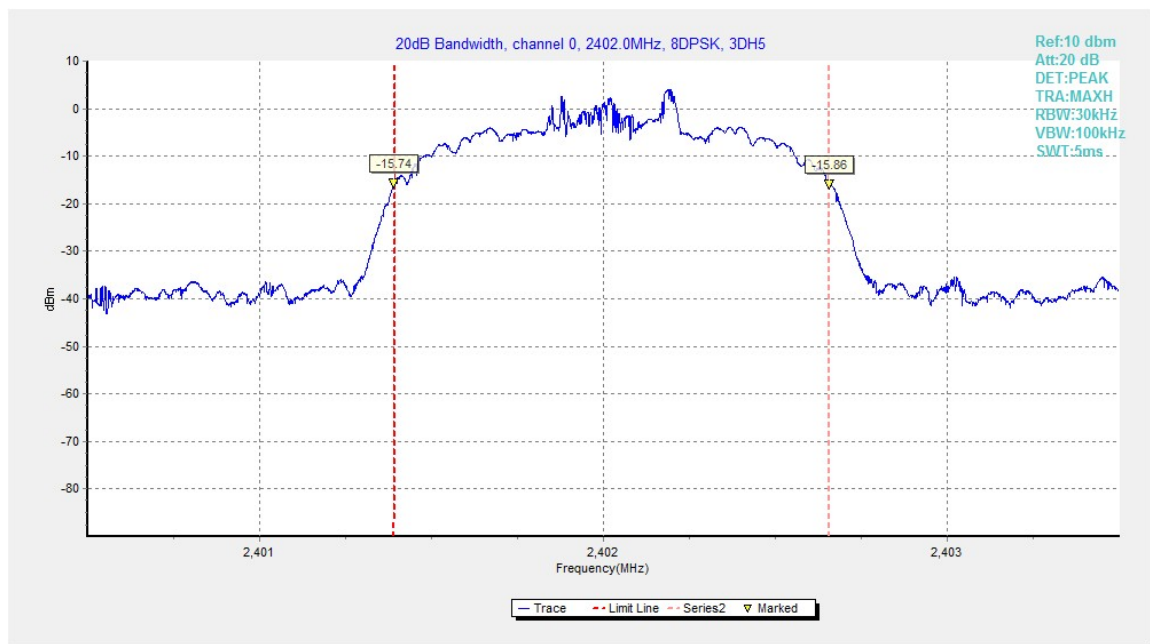


Fig.104. 20dB Bandwidth: 8DPSK, Channel 0

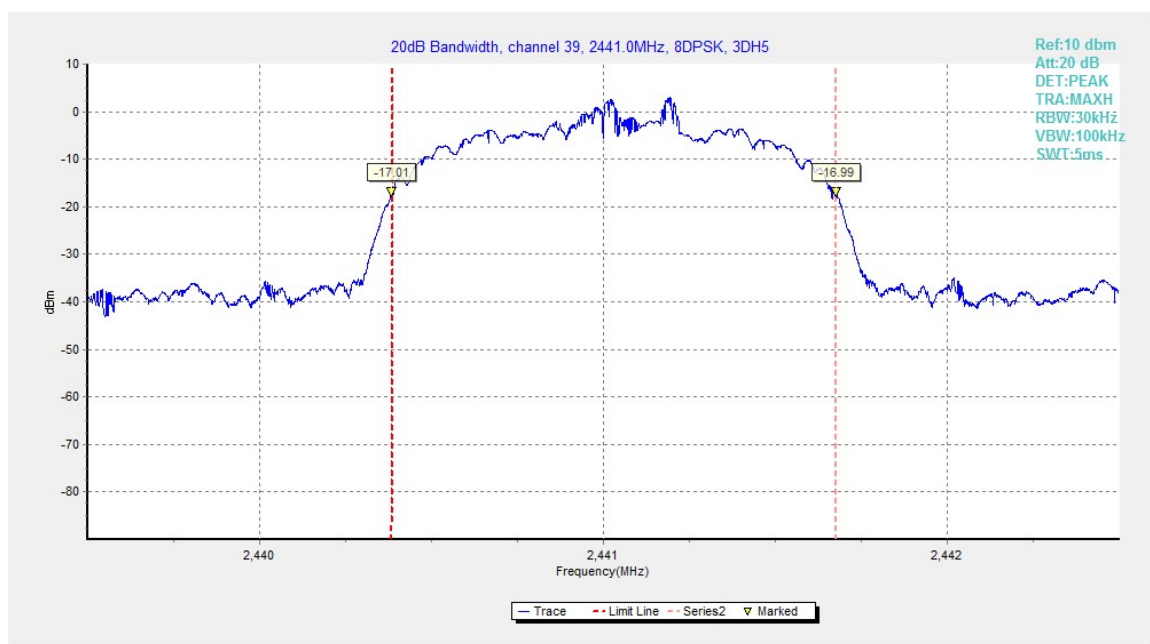


Fig.105. 20dB Bandwidth: 8DPSK, Channel 39

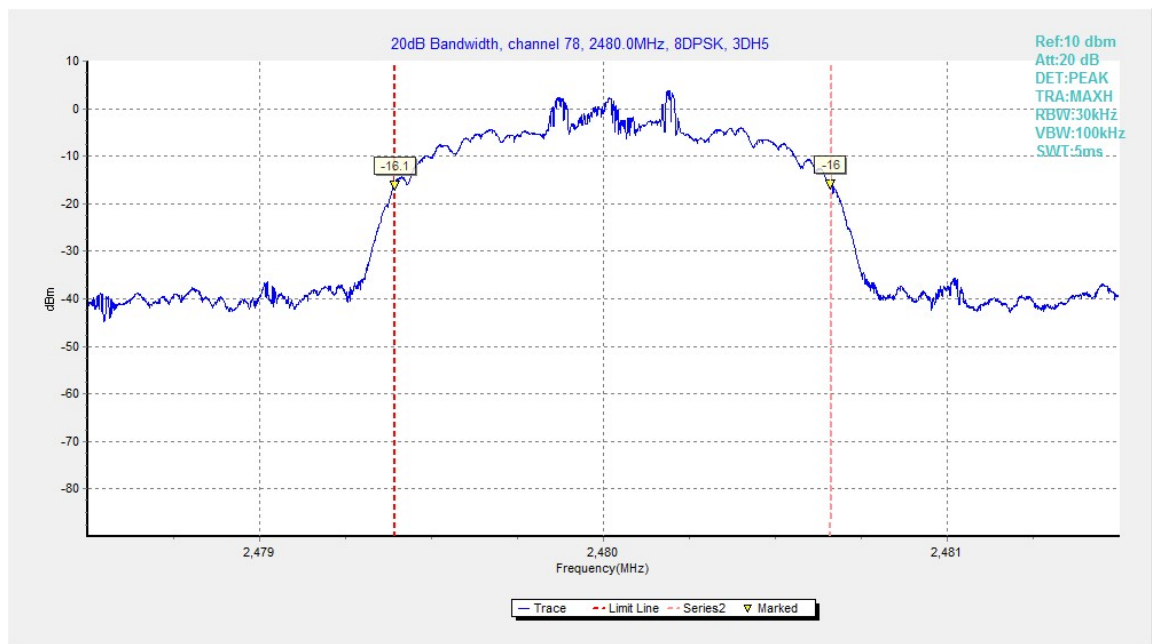


Fig.106. 20dB Bandwidth: 8DPSK, Channel 78

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.107	1311.00	P

For $\pi/4$ DQPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.108	1144.00	P

For 8DPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.109	998.00	P

Conclusion: PASS

Test graphs as below:

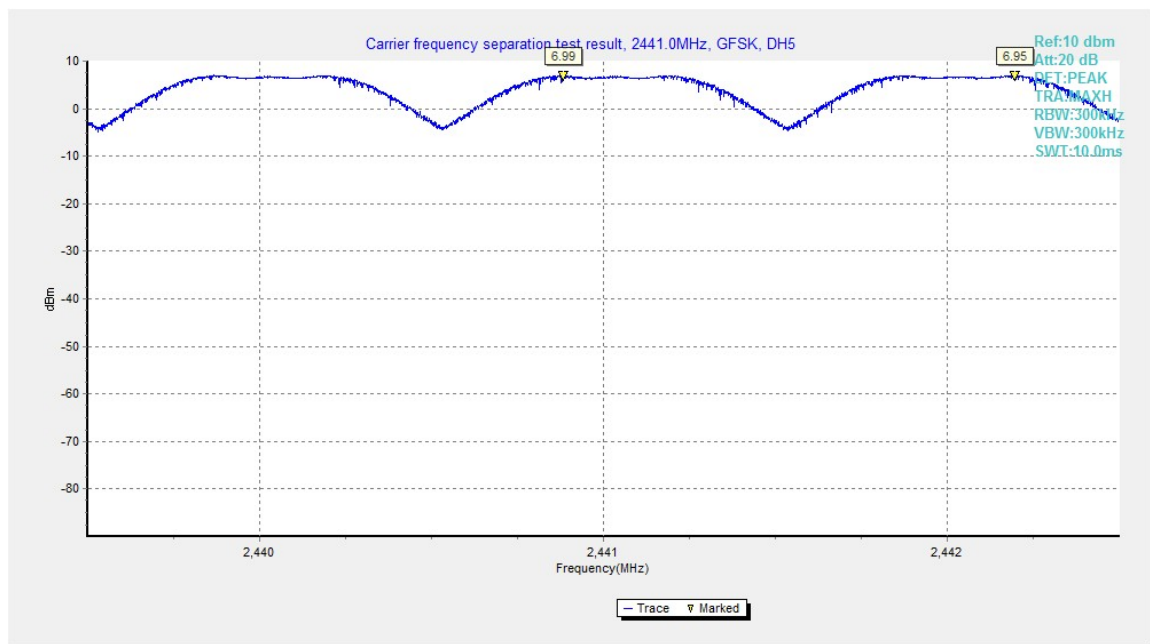


Fig.107. Carrier frequency separation measurement: GFSK, Channel 39

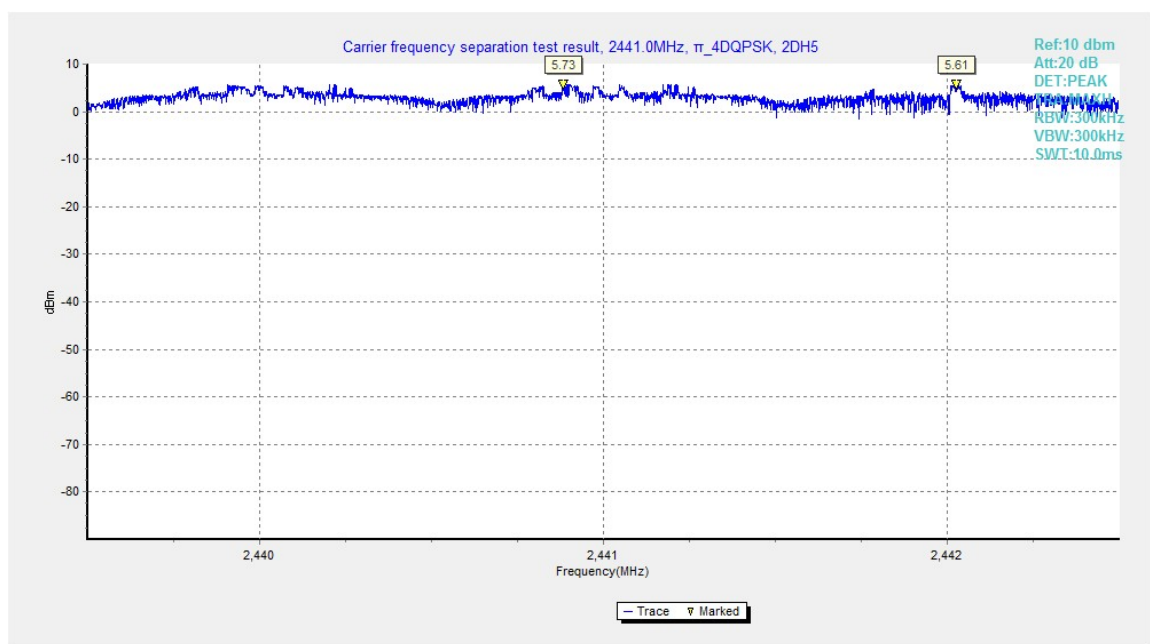


Fig.108. Carrier frequency separation measurement: $\pi/4$ DQPSK, Channel 39

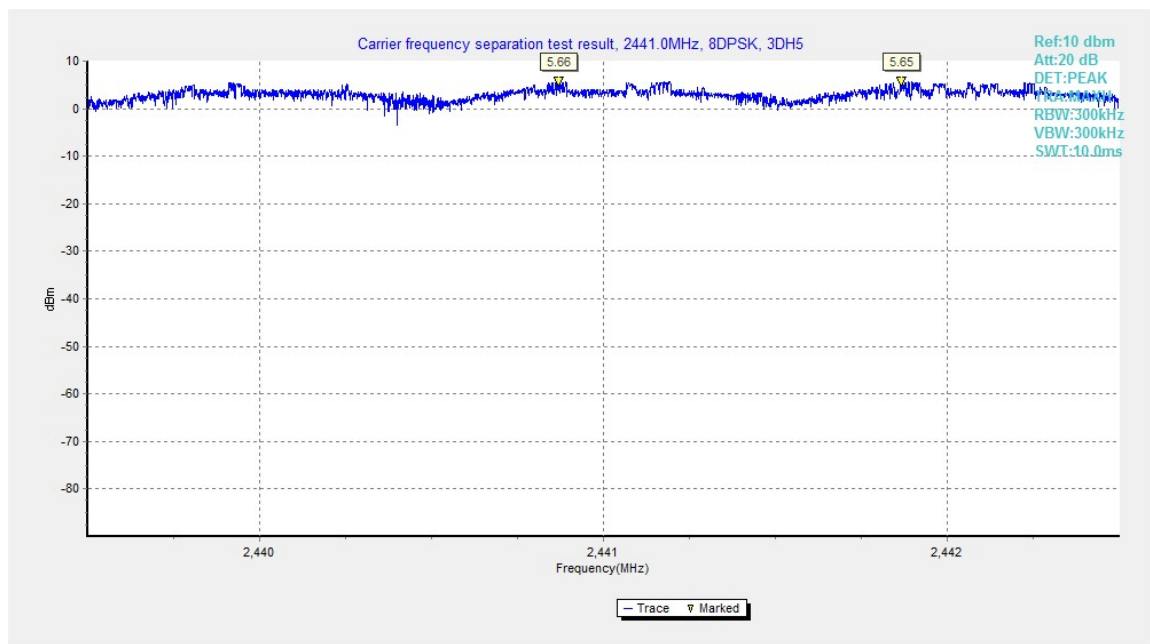


Fig.109. Carrier frequency separation measurement: 8DPSK, Channel 39

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.110	79	P
40~78	Fig.111		

For $\pi/4$ DQPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.112	79	P
40~78	Fig.113		

For 8DPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.114	79	P
40~78	Fig.115		

Conclusion: PASS

Test graphs as below:

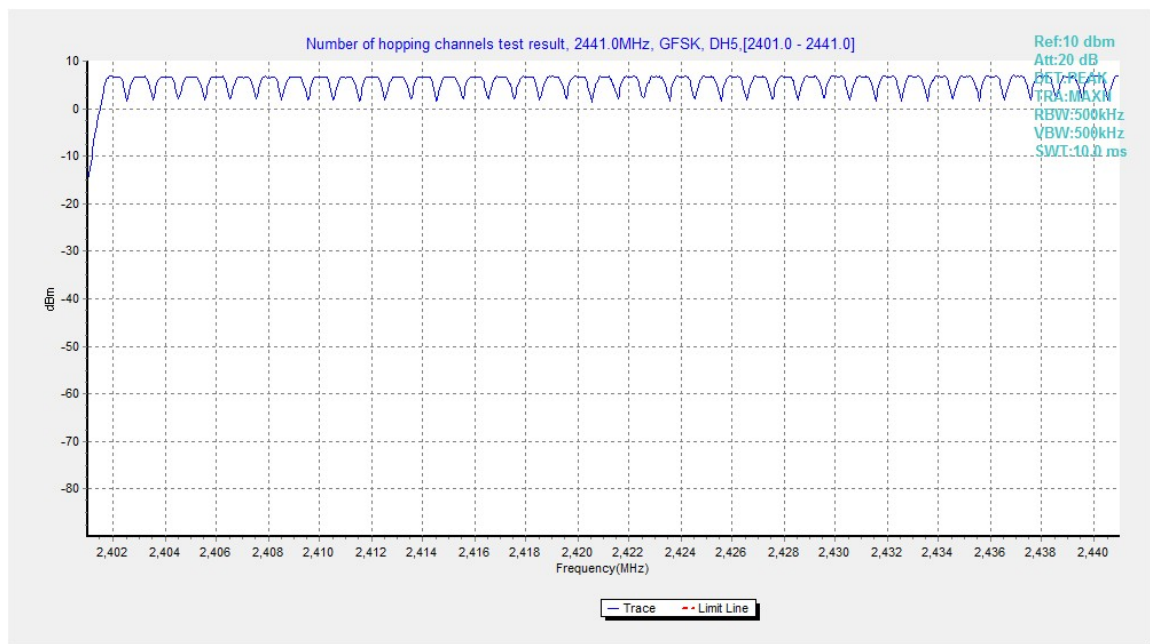


Fig.110. Number of hopping frequencies: GFSK, Channel 0 - 39

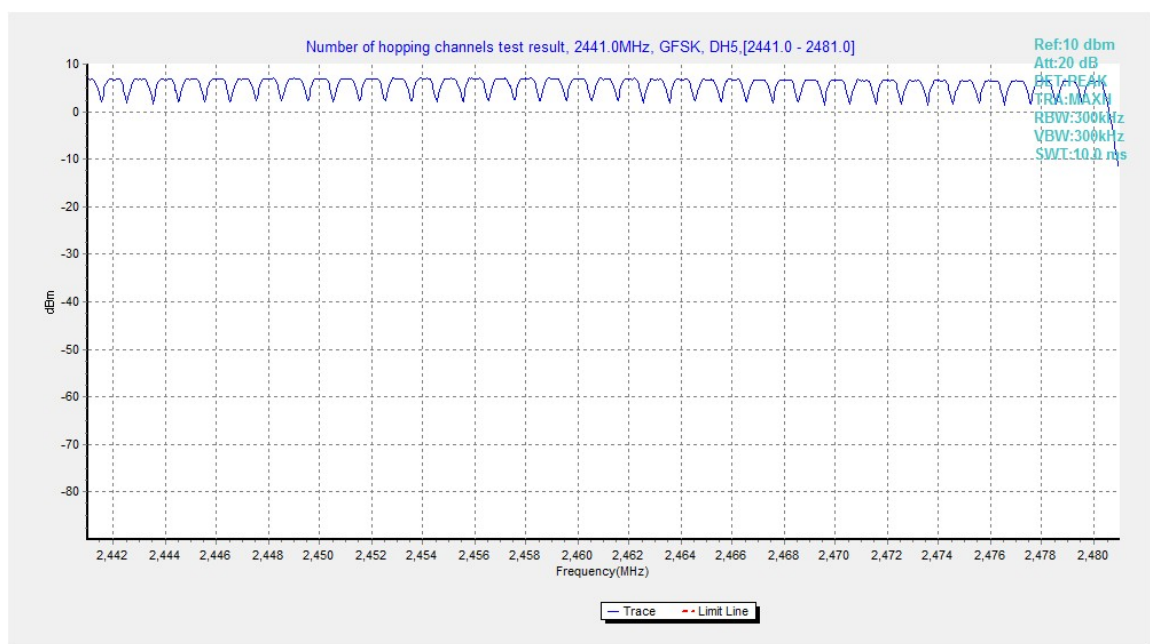


Fig.111. Number of hopping frequencies: GFSK, Channel 40 - 78

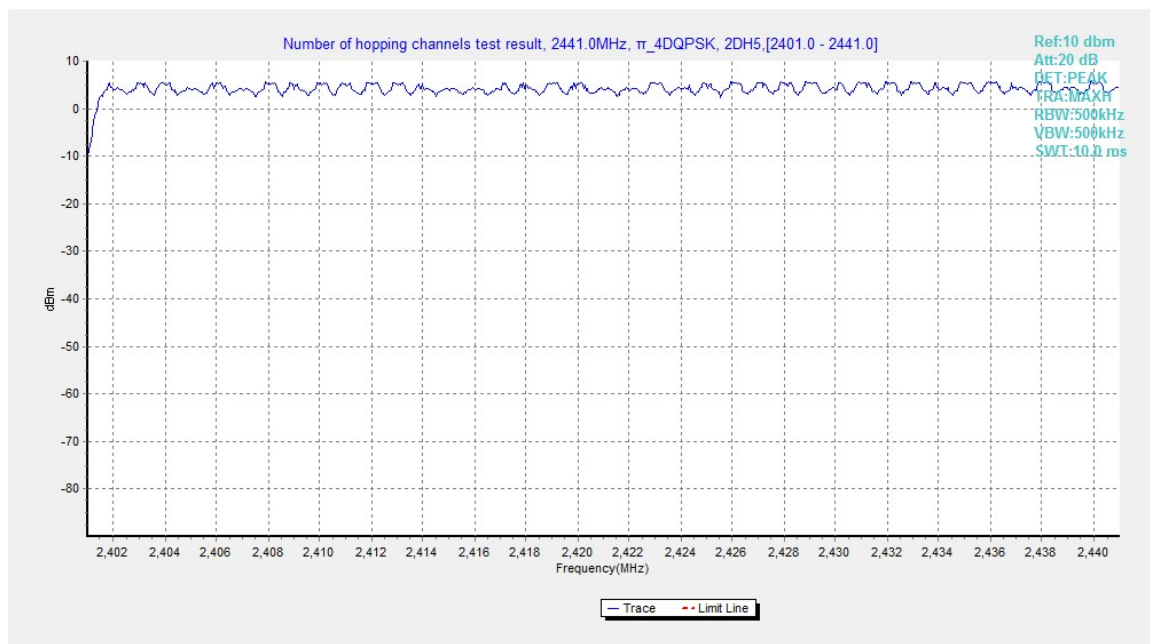


Fig.112. Number of hopping frequencies: $\pi/4$ DQPSK, Channel 0 - 39

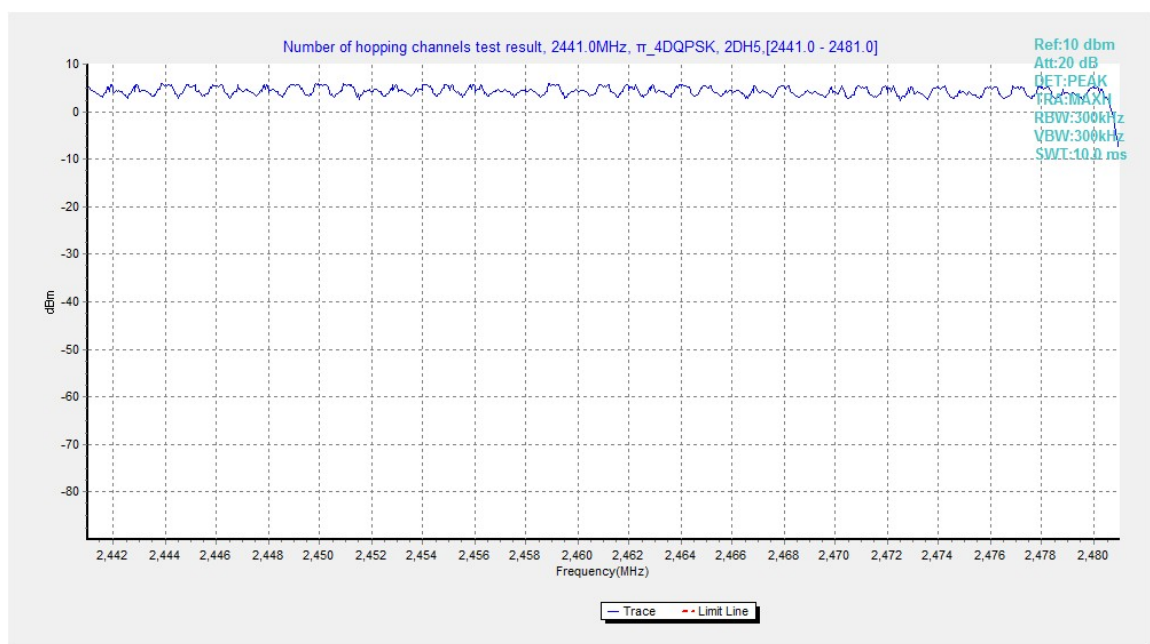


Fig.113. Number of hopping frequencies: $\pi/4$ DQPSK, Channel 40 - 78

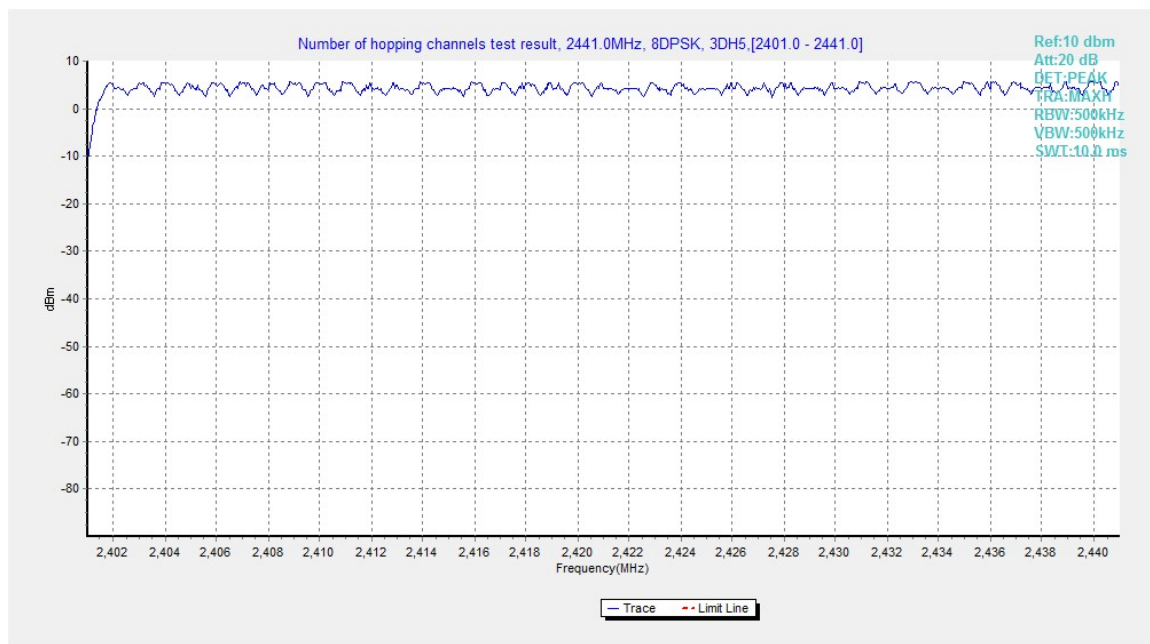


Fig.114. Number of hopping frequencies: 8DPSK, Channel 0 - 39

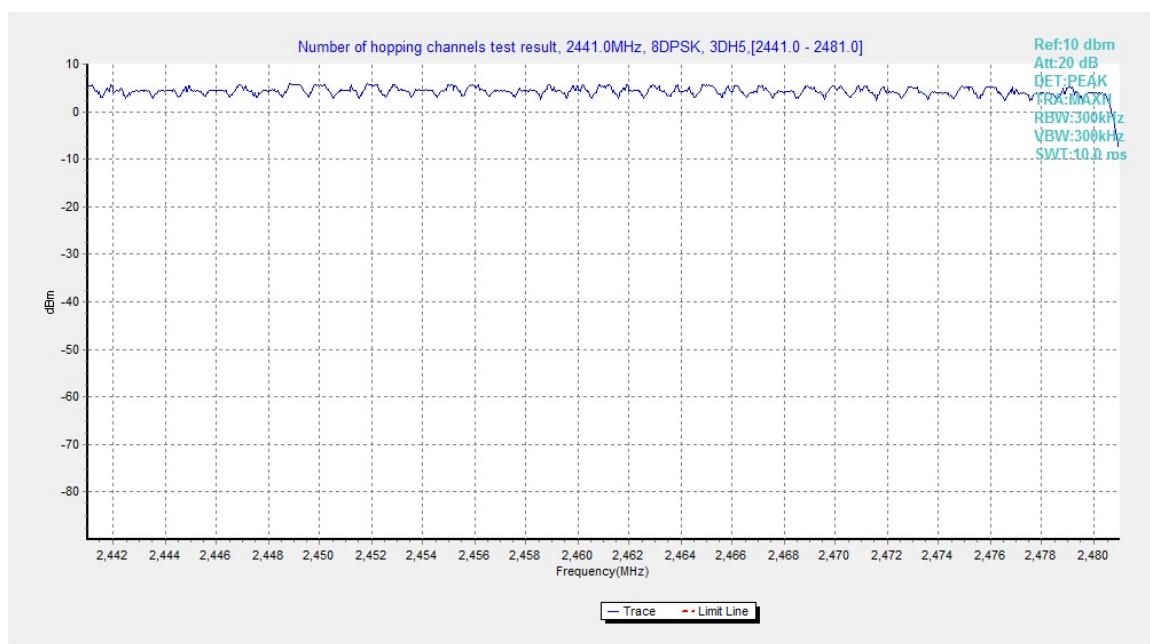


Fig.115. Number of hopping frequencies: 8DPSK, Channel 40 - 78

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 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	

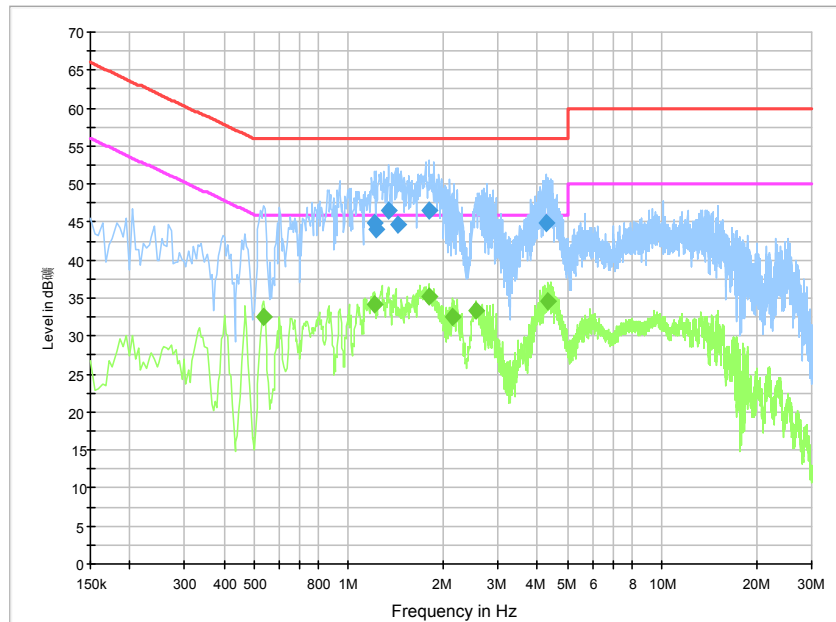
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

The measurement is made according to ANSI C63.10

Conclusion: PASS

Test graphs as below:

Traffic: Set.10



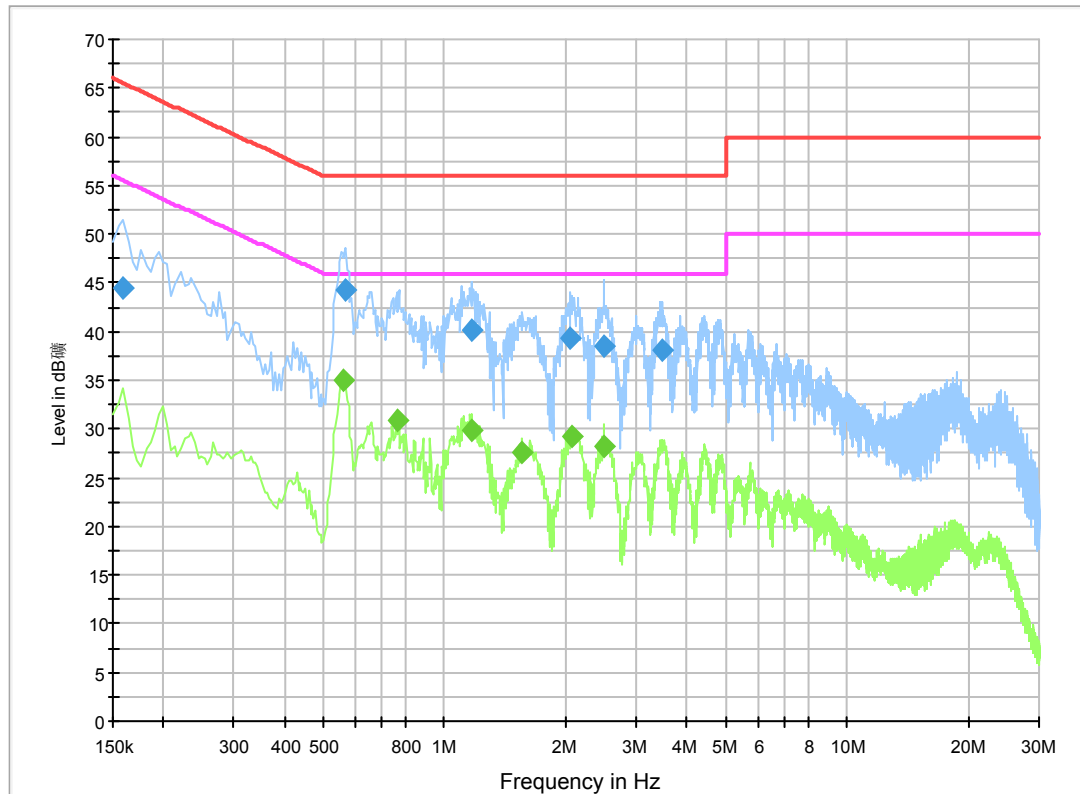
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
1.212000	44.8	GND	N	10.4	11.2	56.0
1.225500	44.0	GND	N	10.4	12.0	56.0
1.342500	46.5	GND	L1	10.3	9.5	56.0
1.437000	44.6	GND	L1	10.3	11.4	56.0
1.806000	46.6	GND	L1	10.4	9.4	56.0
4.281000	44.8	GND	N	10.5	11.2	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.537000	32.5	GND	N	10.4	13.5	46.0
1.203000	34.1	GND	N	10.4	11.9	46.0
1.806000	35.2	GND	L1	10.4	10.8	46.0
2.157000	32.5	GND	L1	10.4	13.5	46.0
2.548500	33.3	GND	N	10.5	12.7	46.0
4.344000	34.5	GND	L1	10.5	11.5	46.0

Traffic: Set.11



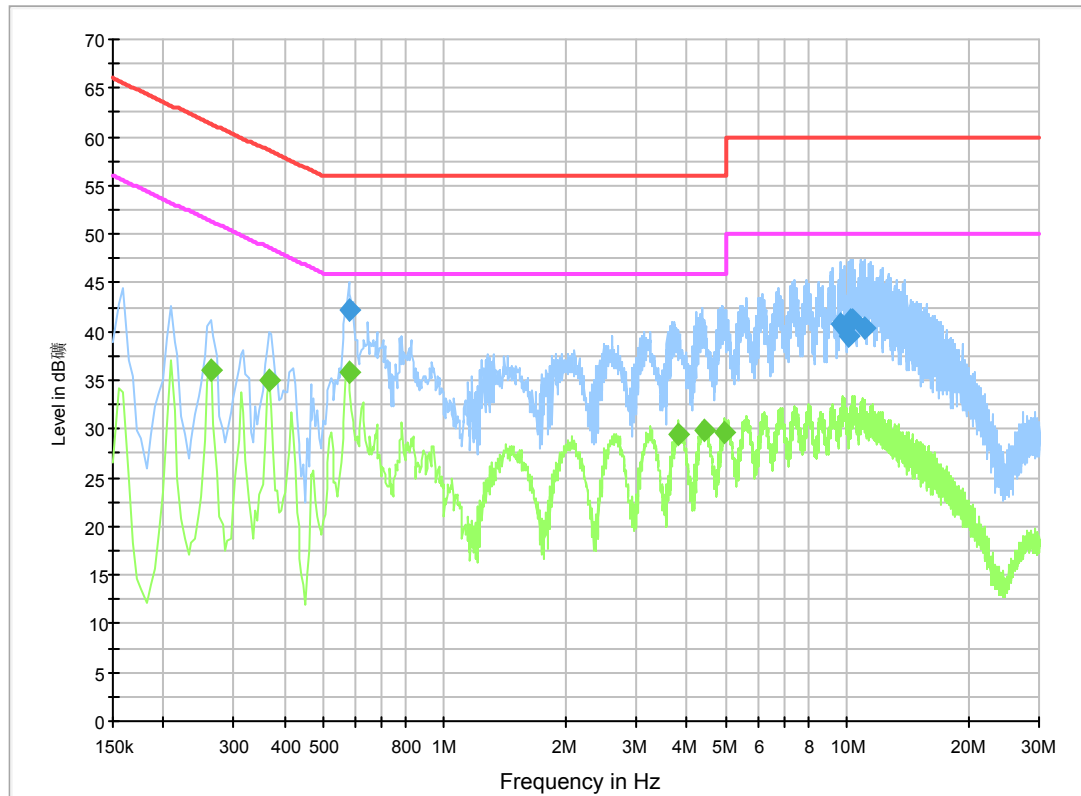
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.159000	44.5	GND	L1	10.3	21.0	65.5
0.568500	44.4	GND	N	10.4	11.6	56.0
1.167000	40.2	GND	N	10.4	15.8	56.0
2.058000	39.4	GND	N	10.5	16.6	56.0
2.490000	38.5	GND	L1	10.4	17.5	56.0
3.466500	38.0	GND	N	10.5	18.0	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.559500	35.1	GND	N	10.4	10.9	46.0
0.762000	30.9	GND	N	10.4	15.1	46.0
1.167000	29.9	GND	N	10.4	16.1	46.0
1.563000	27.7	GND	L1	10.3	18.3	46.0
2.071500	29.1	GND	N	10.5	16.9	46.0
2.490000	28.2	GND	L1	10.4	17.8	46.0

Traffic: Set.12



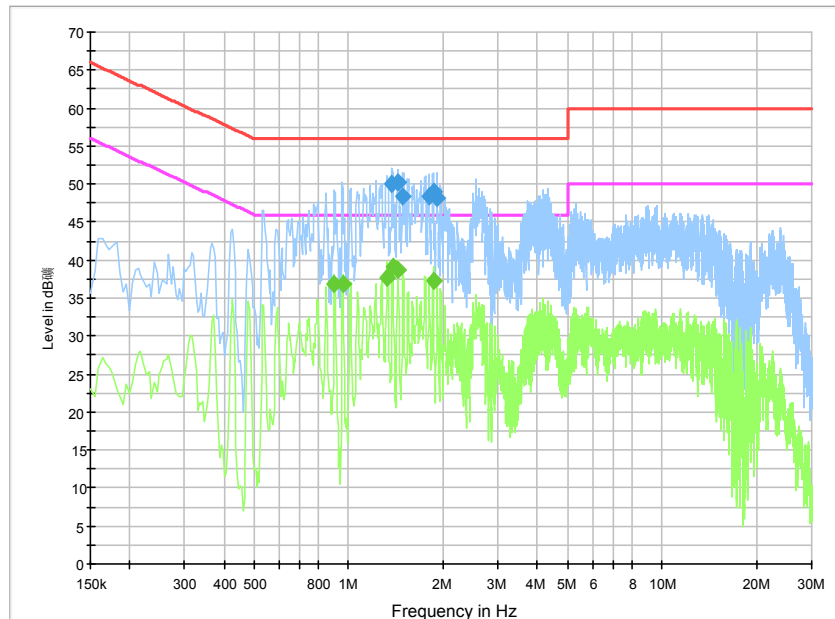
Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.577500	42.3	GND	N	10.4	13.7	56.0
9.649500	40.7	GND	L1	10.7	19.3	60.0
10.140000	39.5	GND	N	10.7	20.5	60.0
10.243500	41.1	GND	L1	10.7	18.9	60.0
10.288500	41.3	GND	N	10.7	18.7	60.0
11.017500	40.4	GND	L1	10.7	19.6	60.0

Final Result 2

Frequency (MHz)	Average (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.262500	36.1	GND	L1	10.3	15.2	51.4
0.366000	34.9	GND	L1	10.3	13.7	48.6
0.577500	35.8	GND	N	10.4	10.2	46.0
3.813000	29.4	GND	N	10.5	16.6	46.0
4.402500	29.8	GND	N	10.5	16.2	46.0
4.956000	29.7	GND	N	10.6	16.3	46.0

Idle:Set.10



Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
1.378500	50.1	GND	L1	10.3	5.9	56.0
1.437000	50.3	GND	L1	10.3	5.7	56.0
1.486500	48.3	GND	N	10.4	7.7	56.0
1.801500	48.5	GND	N	10.4	7.5	56.0
1.860000	49.1	GND	L1	10.4	6.9	56.0
1.909500	48.1	GND	L1	10.4	7.9	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.901500	36.9	GND	N	10.4	9.1	46.0
0.960000	36.9	GND	N	10.4	9.1	46.0
1.324500	37.6	GND	N	10.4	8.4	46.0
1.383000	39.2	GND	N	10.4	6.8	46.0
1.437000	38.7	GND	L1	10.3	7.3	46.0
1.860000	37.3	GND	L1	10.4	8.7	46.0

END OF REPORT