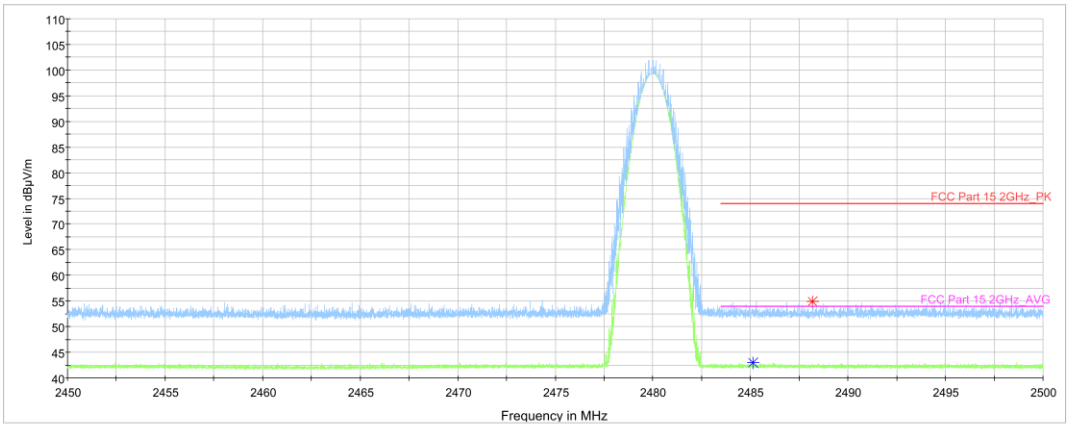

Fig.63. Frequency Band Edges: 8DPSK, Channel 78, 2.45 GHz - 2.50GHz

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B.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 ≥ 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	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	DH1	Fig.64	0.38	Fig.65	319	121.22	P
	DH3	Fig.66	1.63	Fig.67	111	180.93	P
	DH5	Fig.68	2.88	Fig.69	62	178.56	P

For π/4 DQPSK

Channel	Packet	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	2DH1	Fig.70	0.38	Fig.71	321	121.98	P
	2DH3	Fig.72	1.64	Fig.73	103	168.92	P
	2DH5	Fig.74	2.88	Fig.75	61	175.68	P

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For 8DPSK

Channel	Packet	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	3DH1	Fig.76	0.38	Fig.77	321	121.98	P
	3DH3	Fig.78	1.63	Fig.79	96	156.48	P
	3DH5	Fig.80	2.89	Fig.81	65	187.85	P

Conclusion: PASS

Test graphs as below:

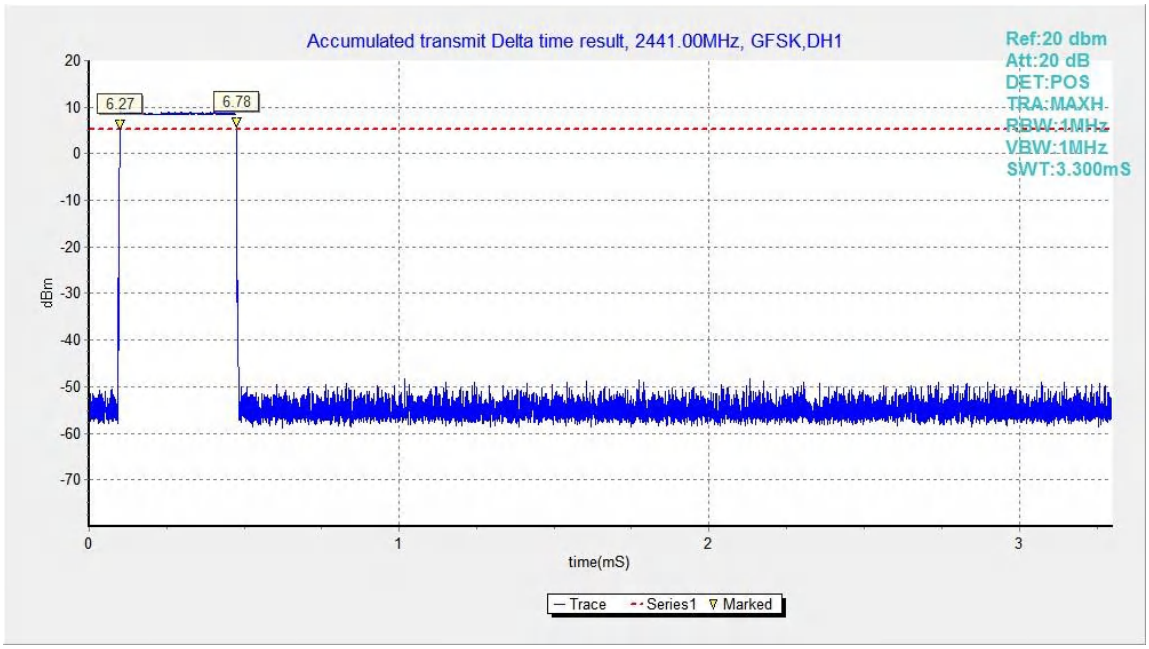

Fig.64. Time of occupancy (Dwell Time): Channel 39, Packet DH1

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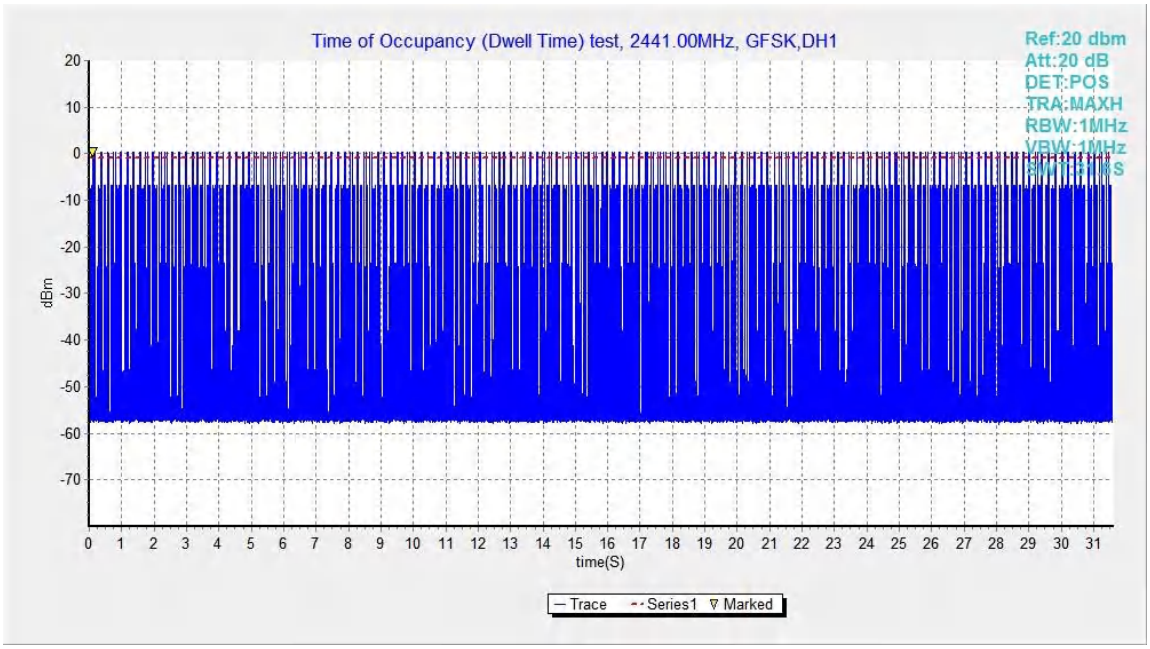

Fig.65. Number of Transmissions Measurement:Channel 39,Packet DH1

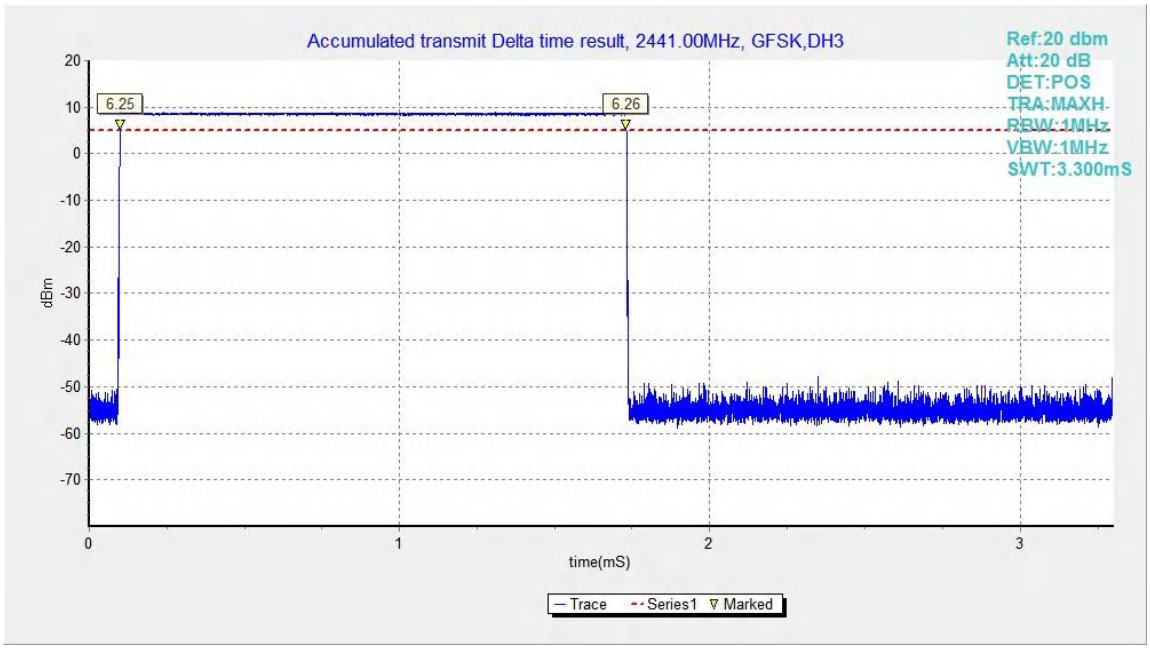

Fig.66. Time of occupancy (Dwell Time): Channel 39, Packet DH3

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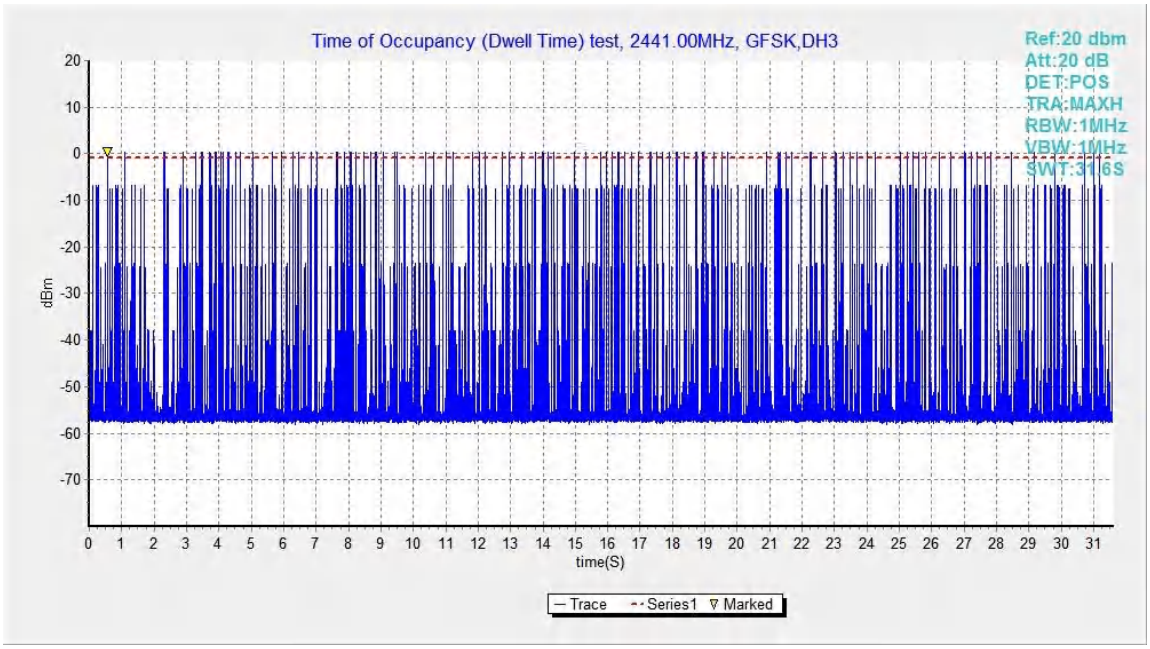

Fig.67. Number of Transmissions Measurement:Channel 39,Packet DH3

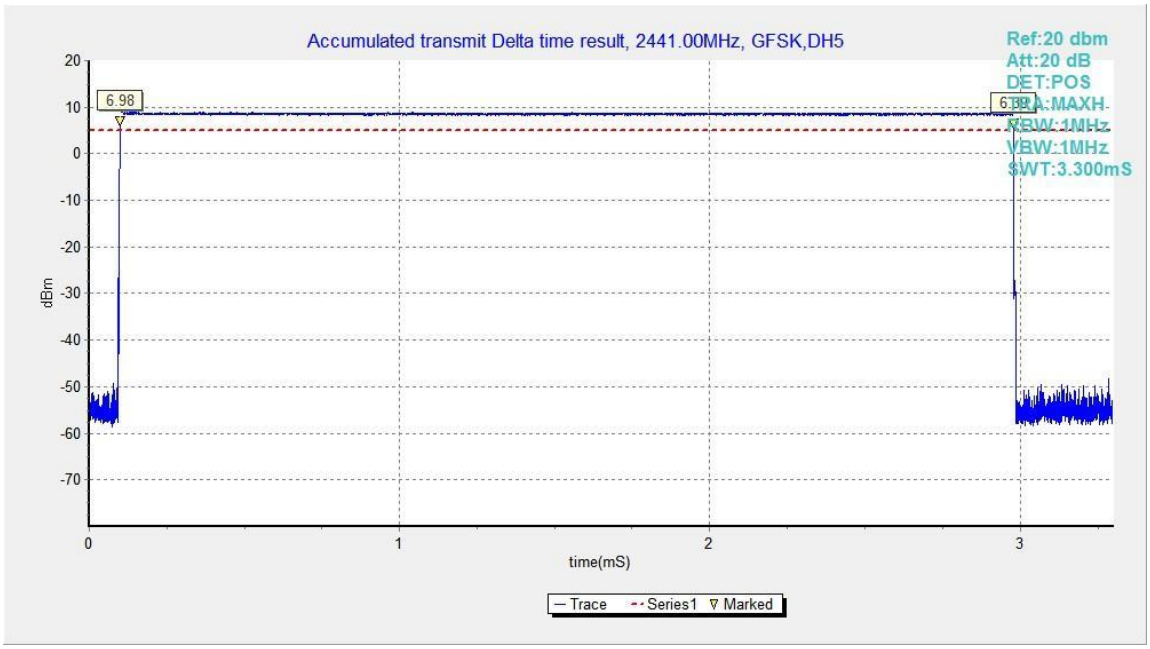

Fig.68. Time of occupancy (Dwell Time): Channel 39, Packet DH5

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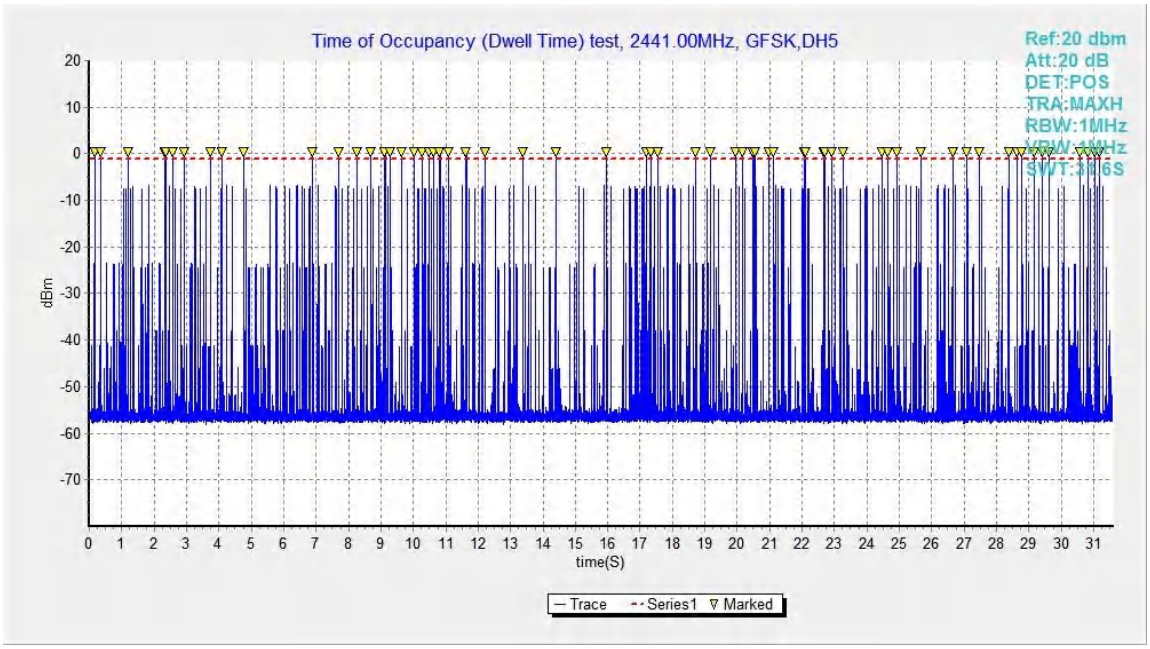

Fig.69. Number of Transmissions Measurement:Channel 39,Packet DH5

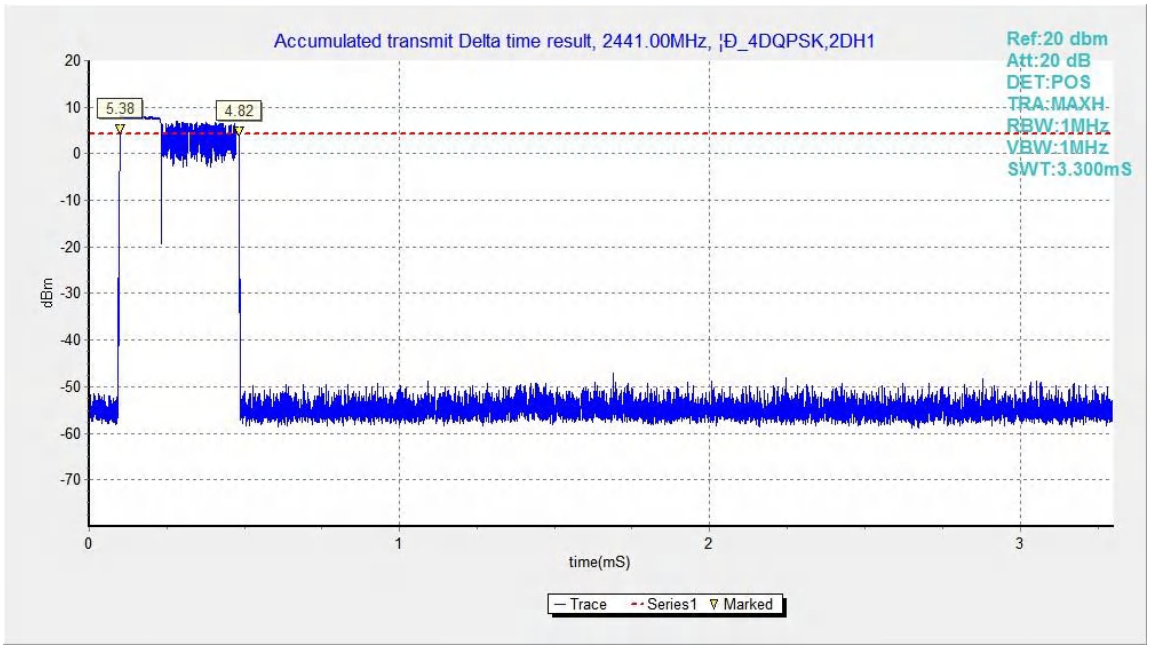

Fig.70. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

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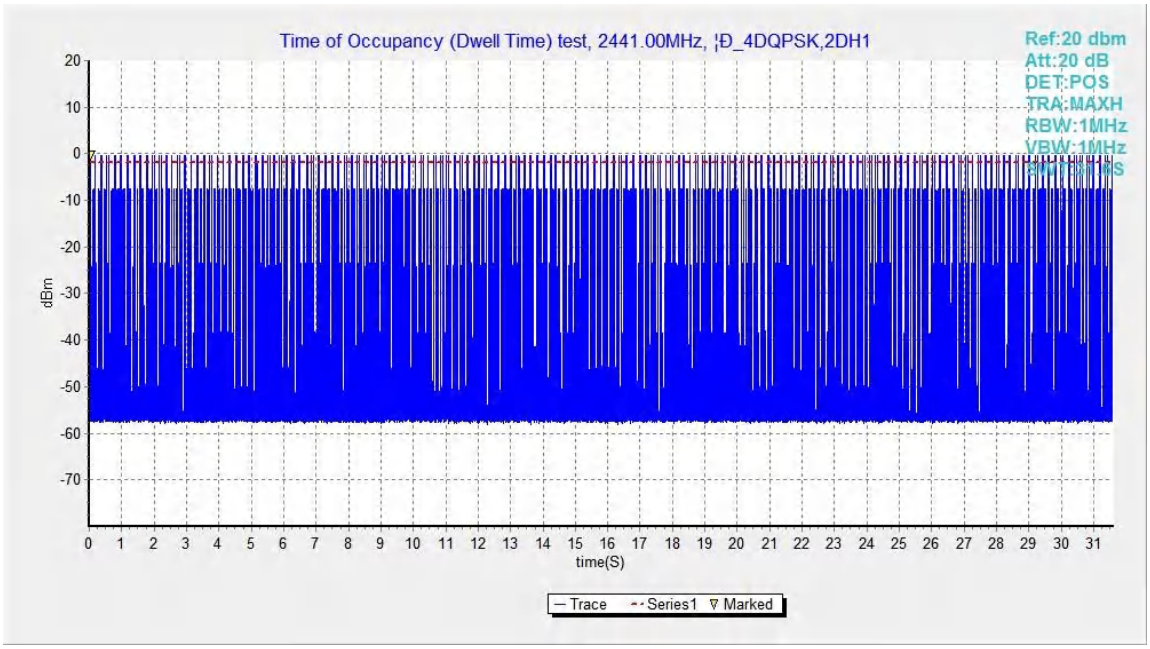

Fig.71. Number of Transmissions Measurement:Channel 39,Packet 2-DH1

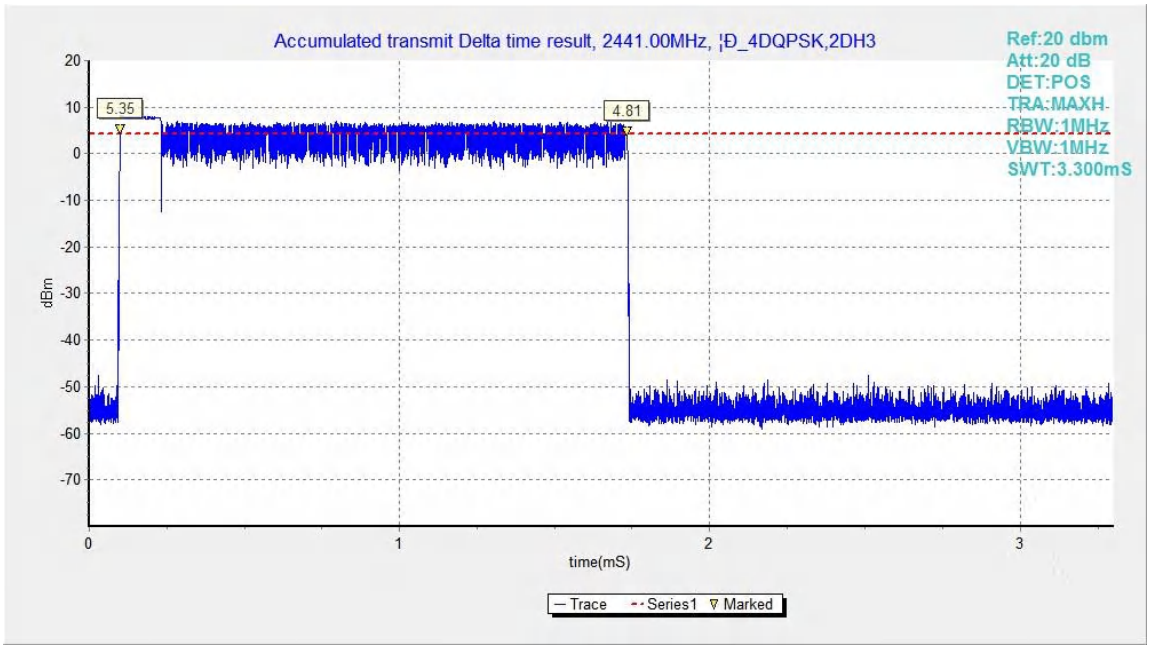

Fig.72. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3

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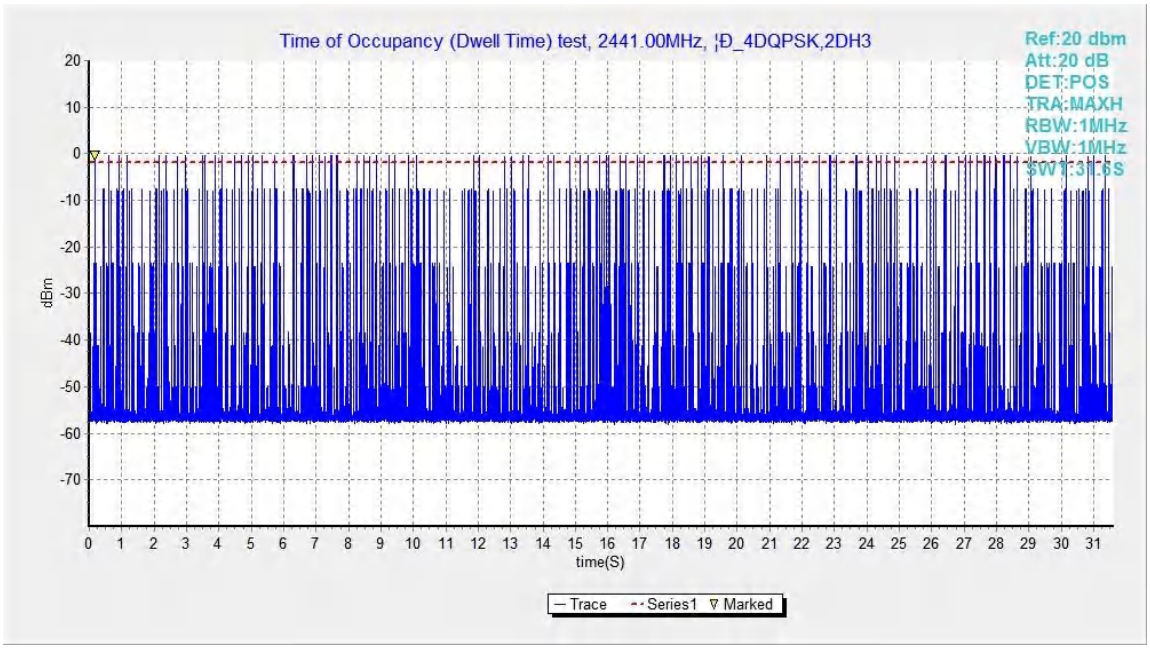

Fig.73. Number of Transmissions Measurement:Channel 39,Packet 2-DH3

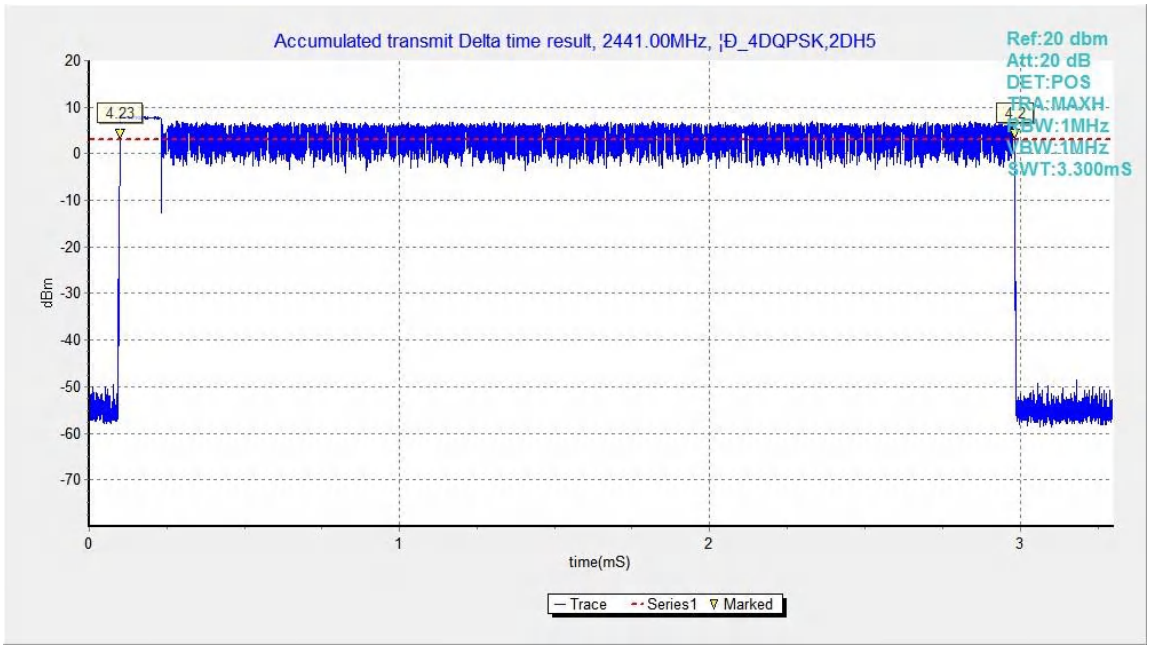

Fig.74. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

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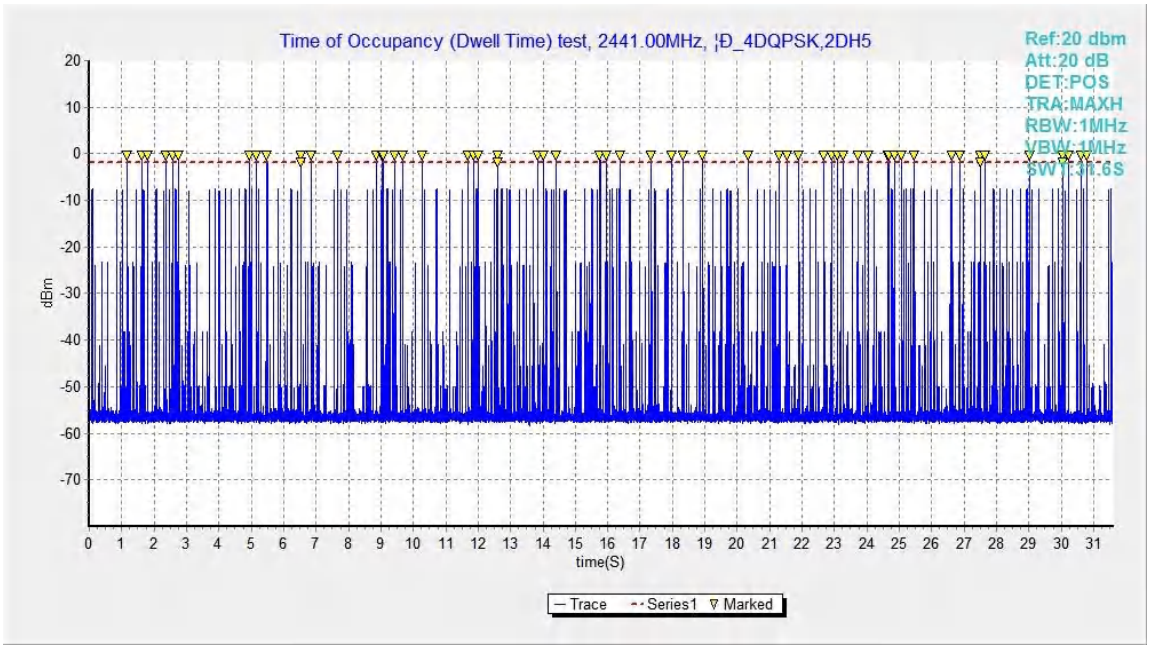

Fig.75. Number of Transmissions Measurement:Channel 39,Packet 2-DH5

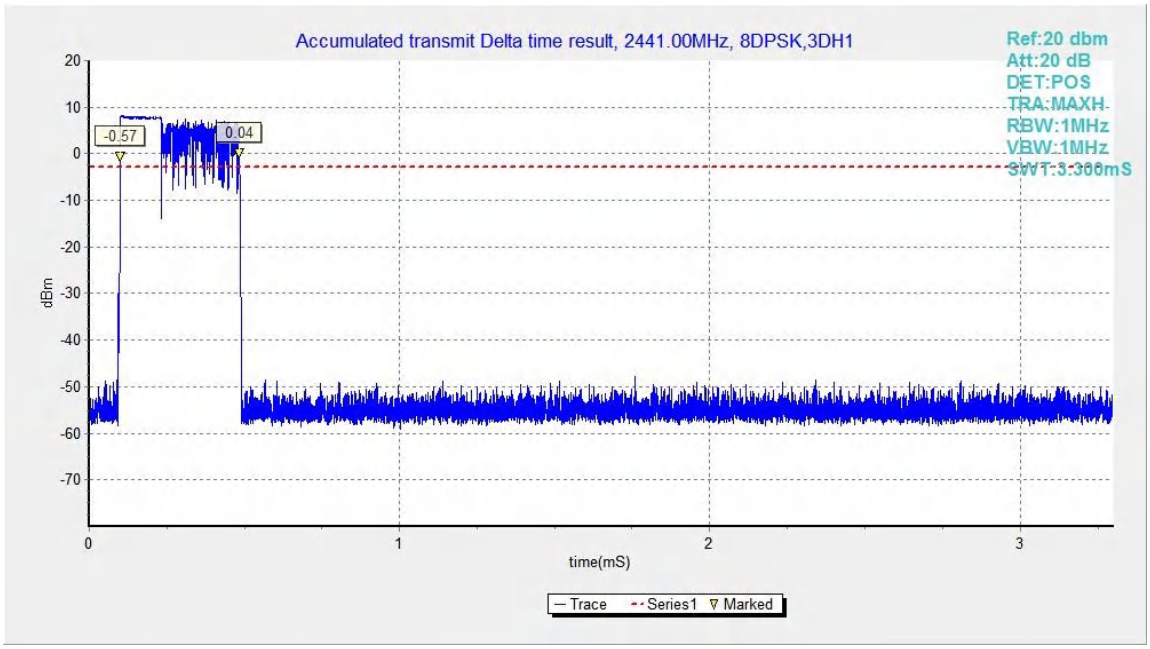

Fig.76. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1

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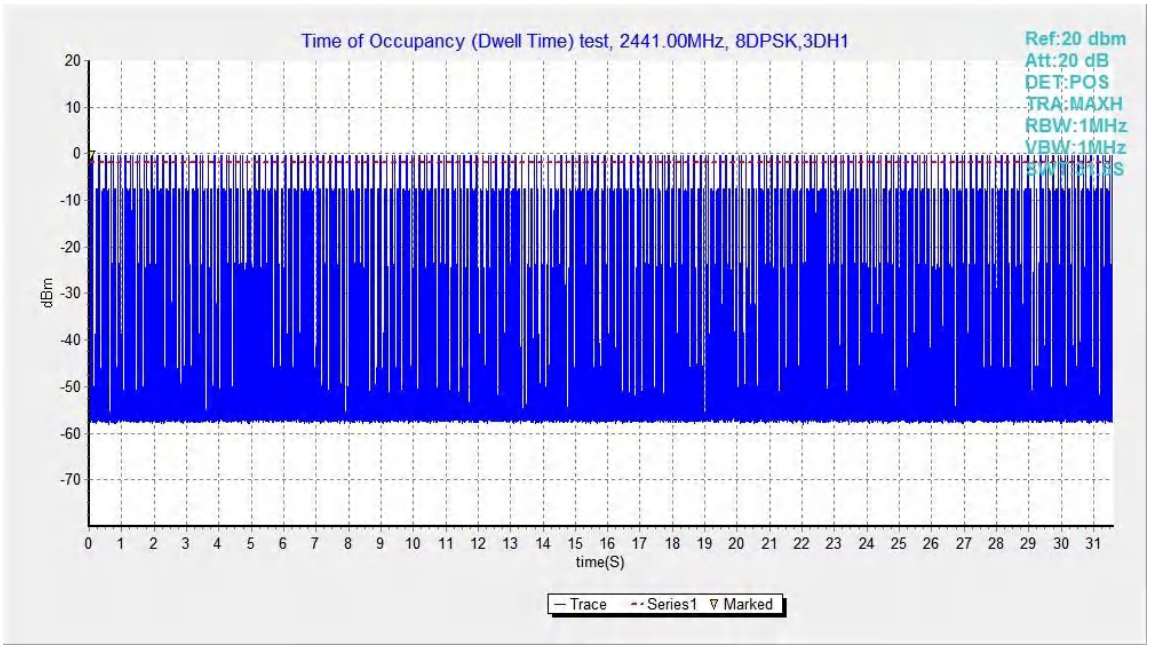

Fig.77. Number of Transmissions Measurement:Channel 39,Packet 3-DH1

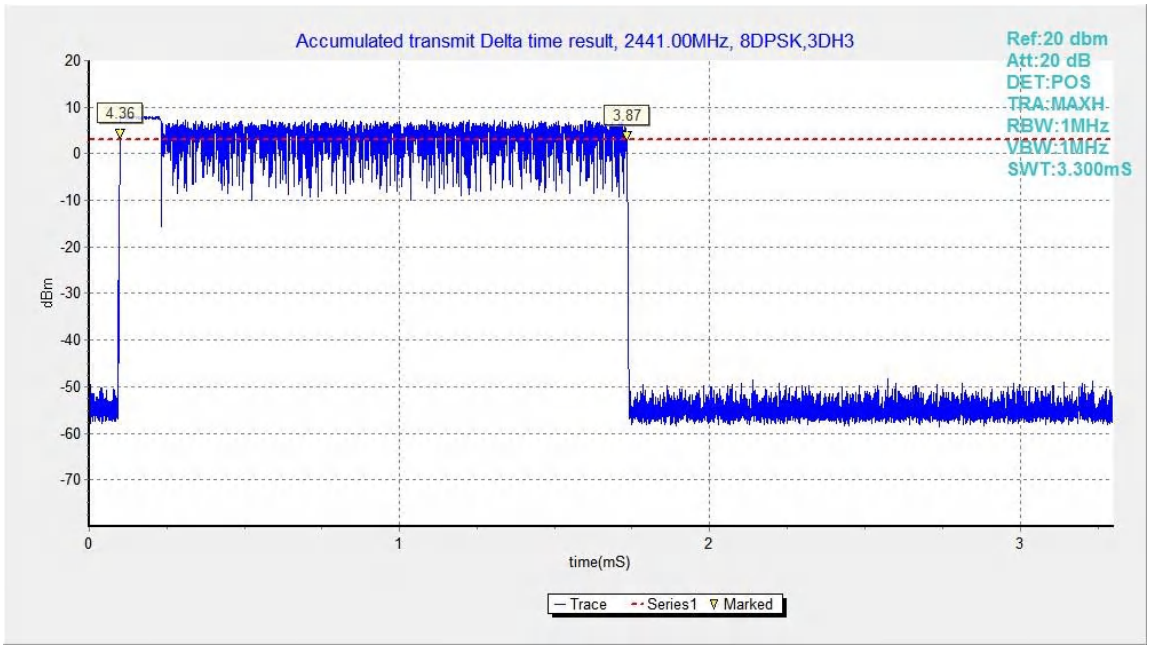

Fig.78. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

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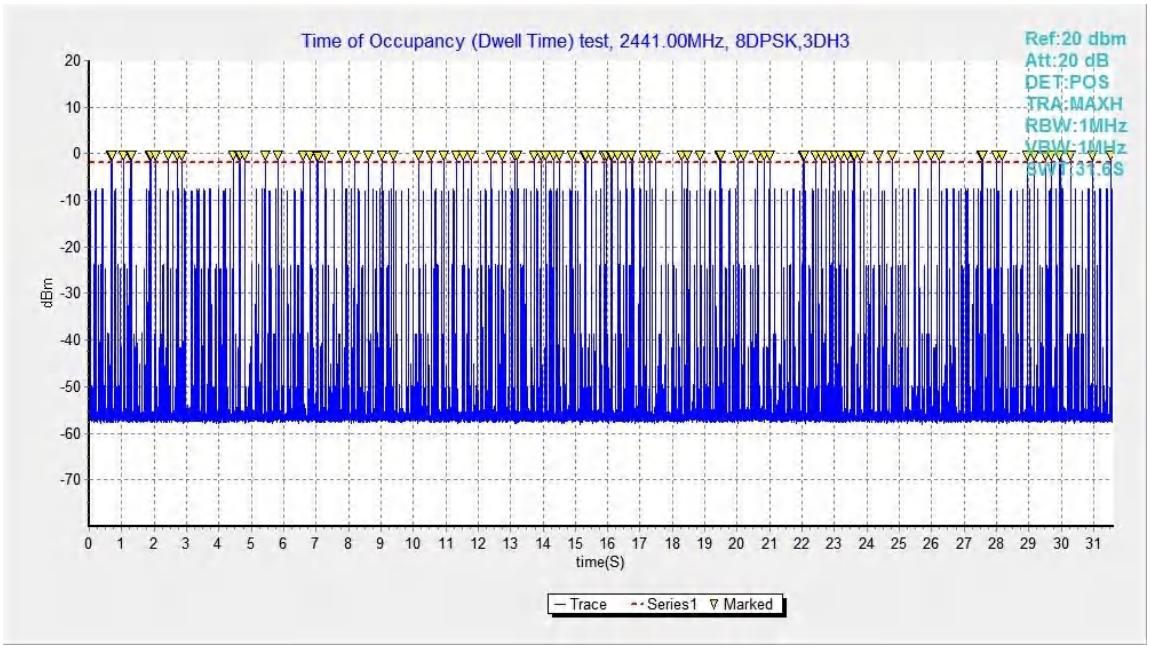

Fig.79. Number of Transmissions Measurement:Channel 39,Packet 3-DH3

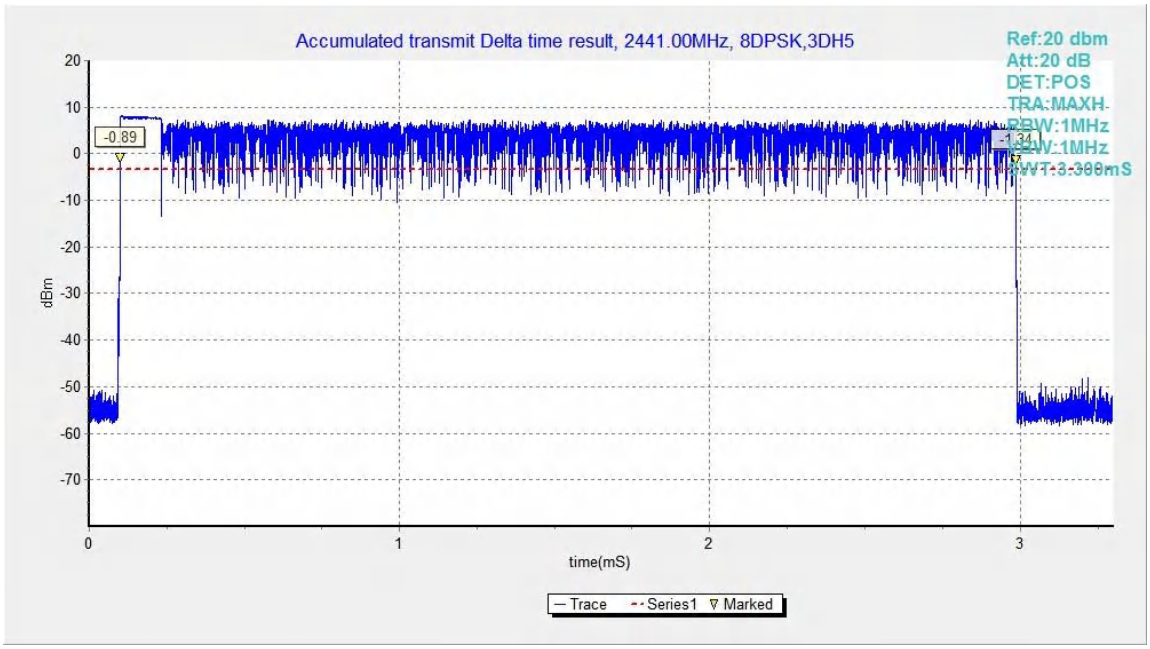

Fig.80. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

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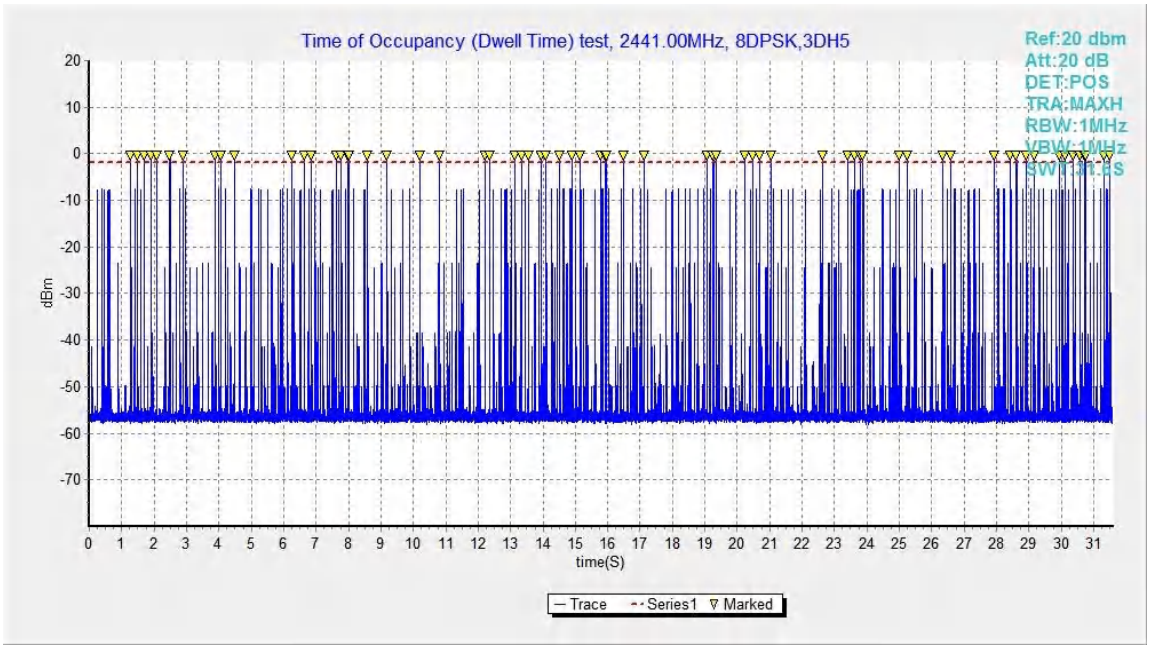

Fig.81. Number of Transmissions Measurement:Channel 39,Packet 3-DH5

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B.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.82	941.25	NA
39	Fig.83	939.00	NA
78	Fig.84	954.75	NA

Forπ/4 DQPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.85	1219.50	NA
39	Fig.86	1255.50	NA
78	Fig.87	1221.75	NA

For 8DPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.88	1257.75	NA
39	Fig.89	1257.75	NA
78	Fig.90	1257.75	NA

Conclusion: NA

Test graphs as below:

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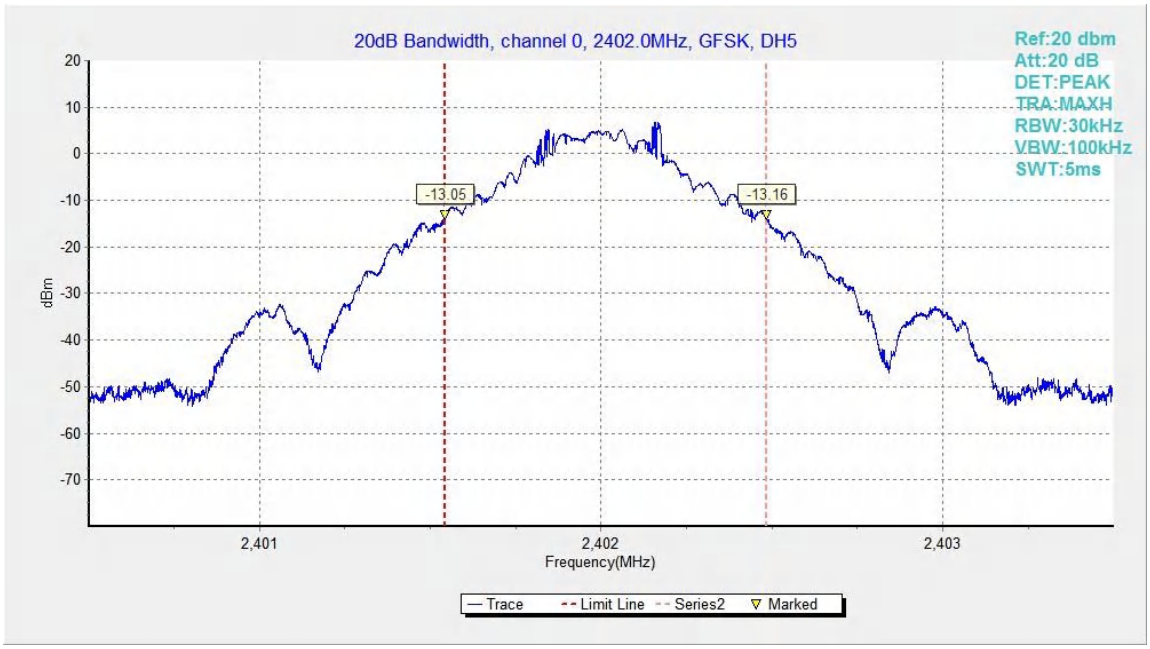

Fig.82. 20dB Bandwidth: GFSK, Channel 0

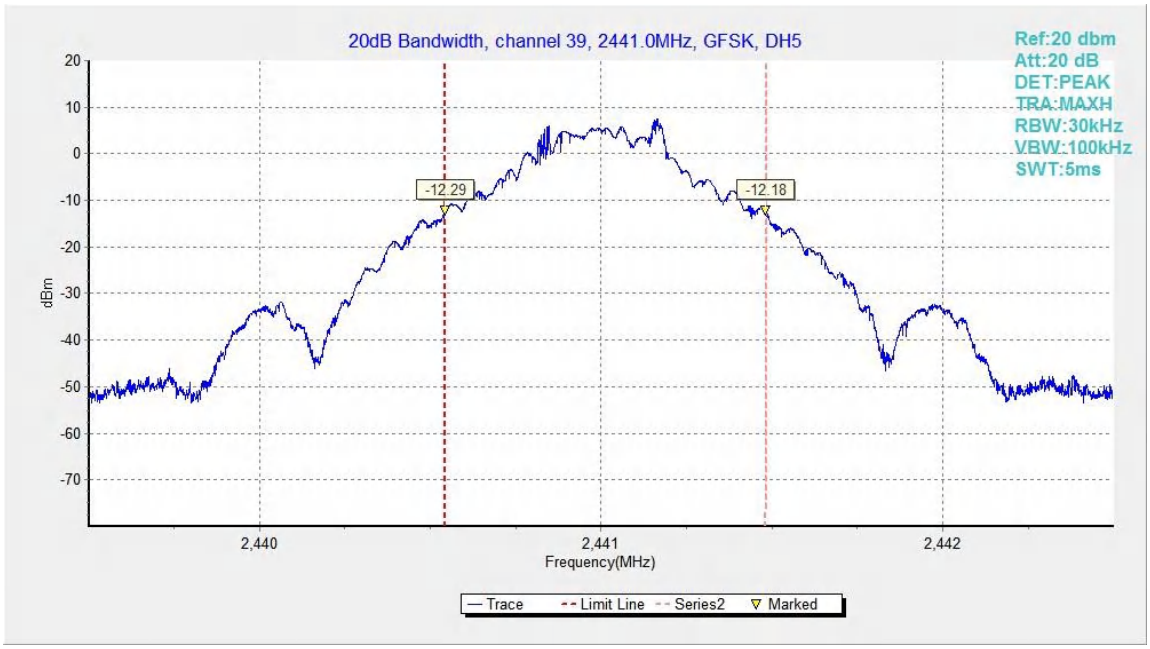

Fig.83. 20dB Bandwidth: GFSK, Channel 39

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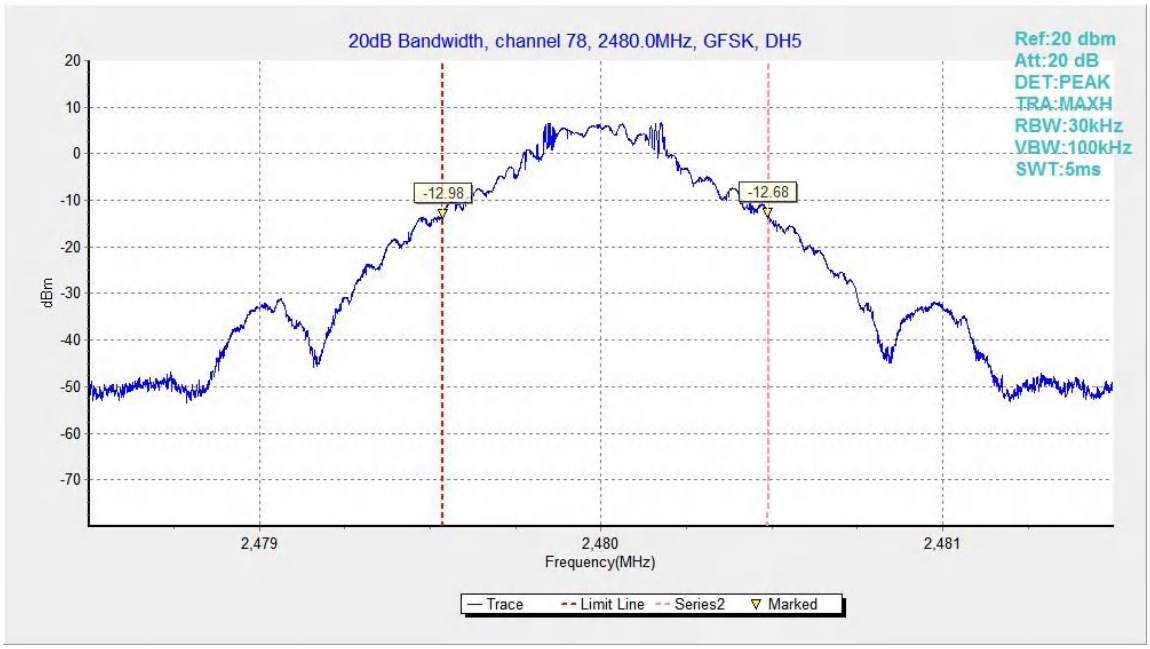

Fig.84. 20dB Bandwidth: GFSK, Channel 78

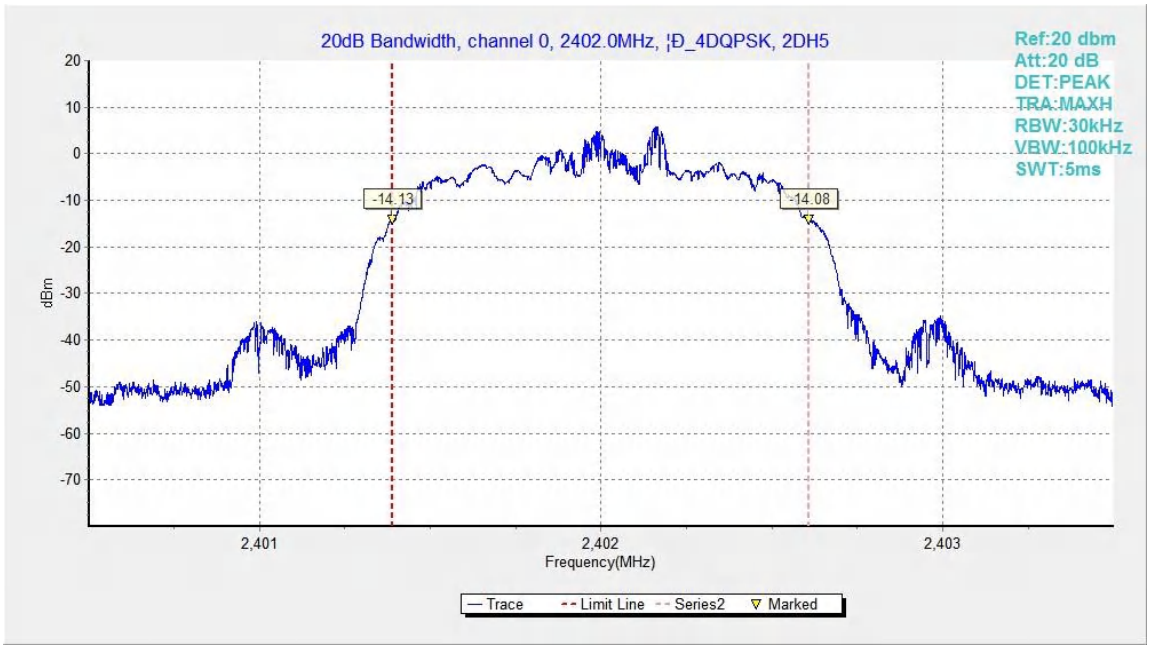

Fig.85. 20dB Bandwidth: π/4 DQPSK, Channel 0

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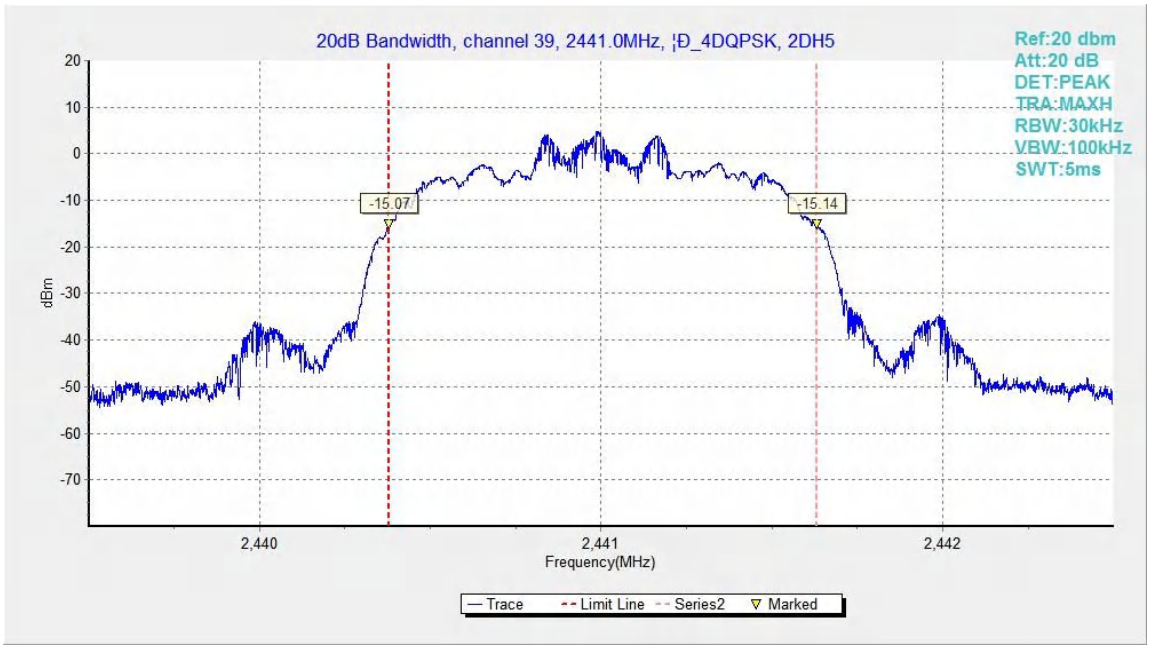

Fig.86. 20dB Bandwidth: π/4 DQPSK, Channel 39

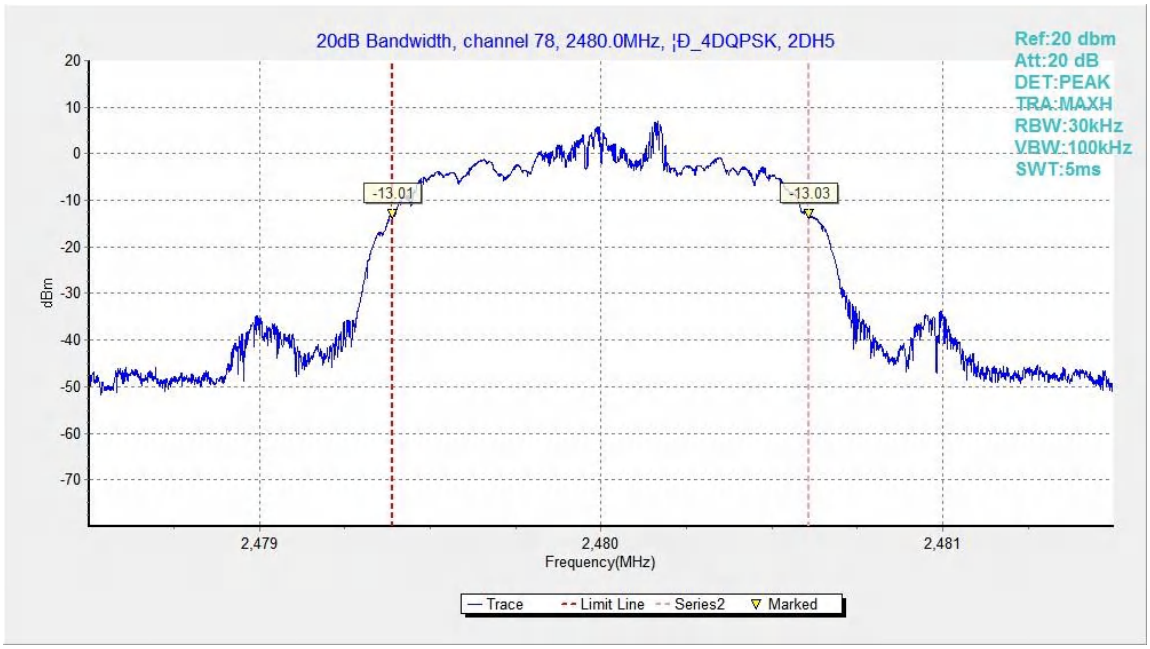

Fig.87. 20dB Bandwidth: π/4 DQPSK, Channel 78

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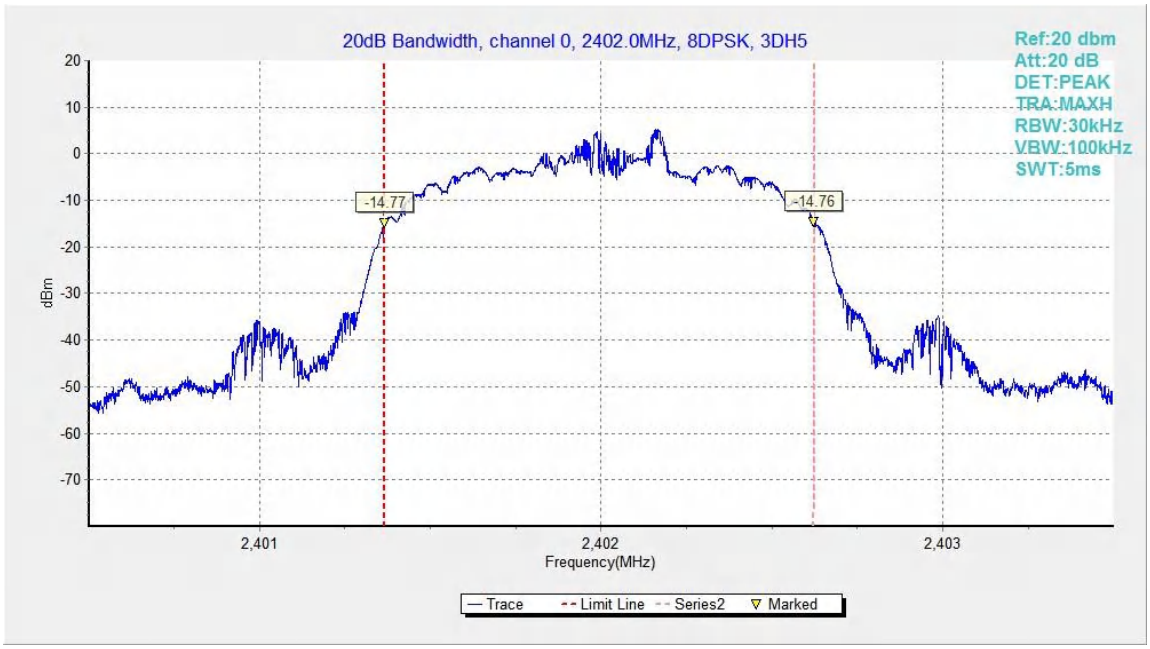

Fig.88. 20dB Bandwidth: 8DPSK, Channel 0

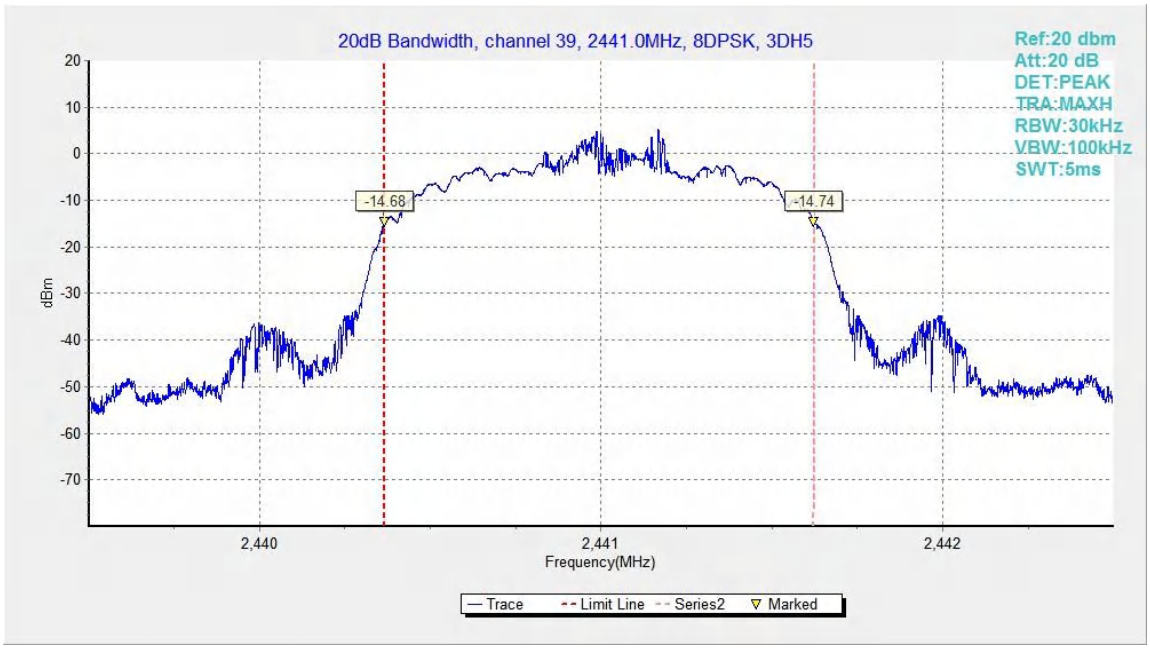

Fig.89. 20dB Bandwidth: 8DPSK, Channel 39

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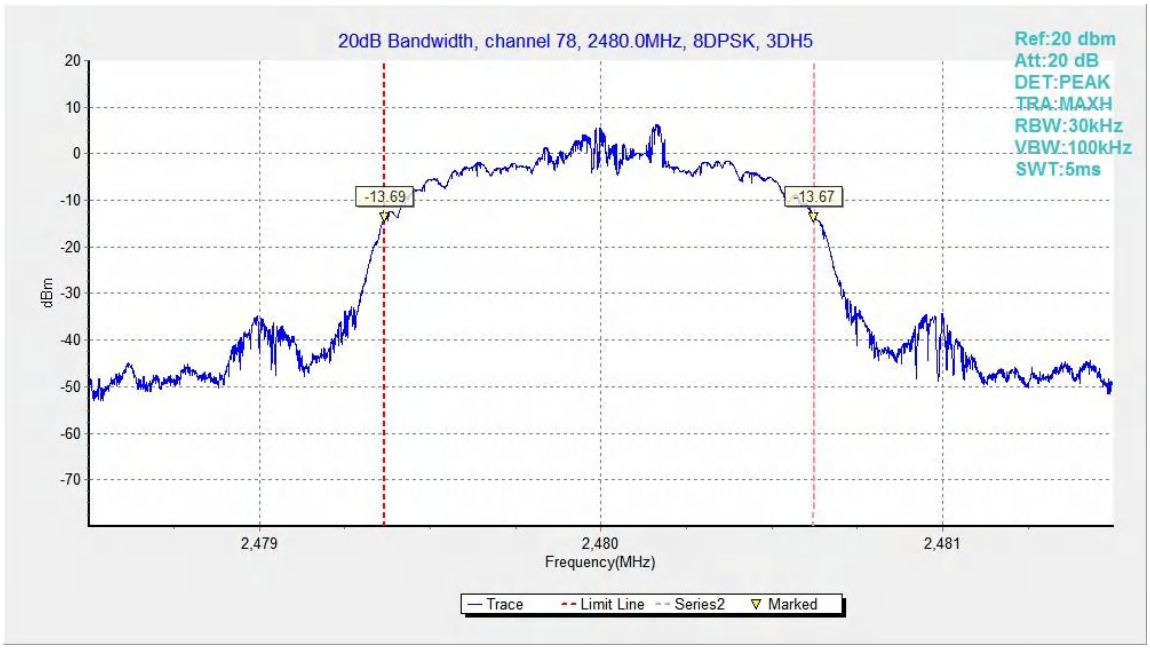

Fig.90. 20dB Bandwidth: 8DPSK, Channel 78

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B.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) * 20dB bandwidth, whichever is greater.

Measurement Limit:

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

Measurement Result:

For GFSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.91	1005.00	P

For π/4 DQPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.92	1290.75	P

For 8DPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.93	982.50	P

Conclusion: PASS

Test graphs as below:

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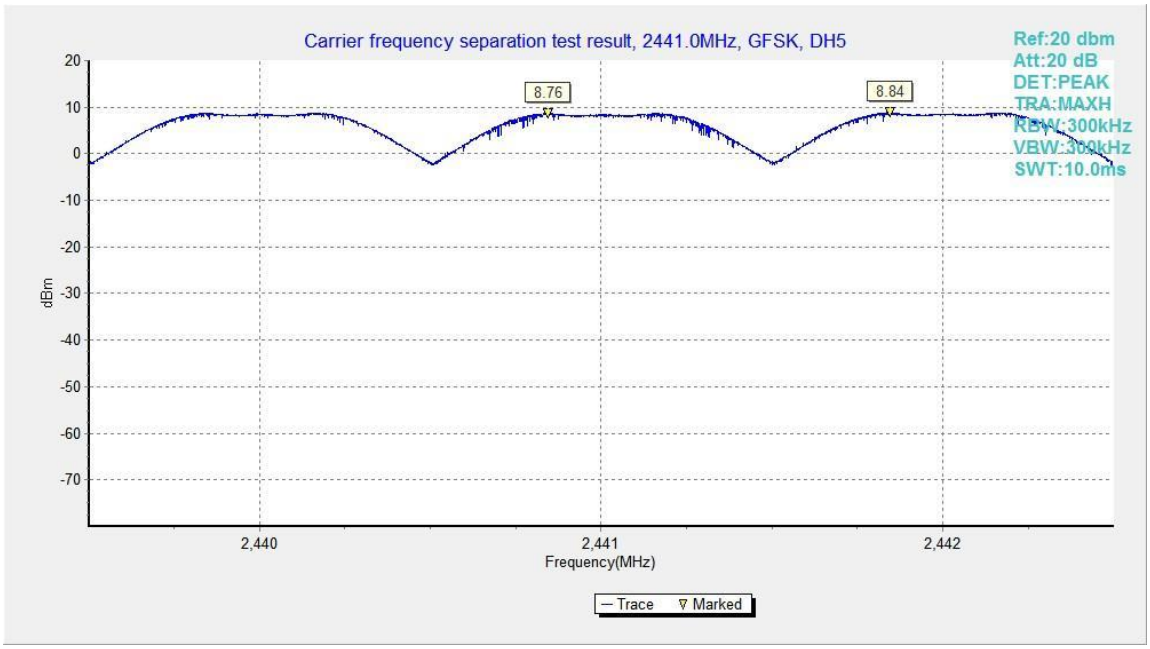

Fig.91. Carrier frequency separation measurement: GFSK, Channel 39

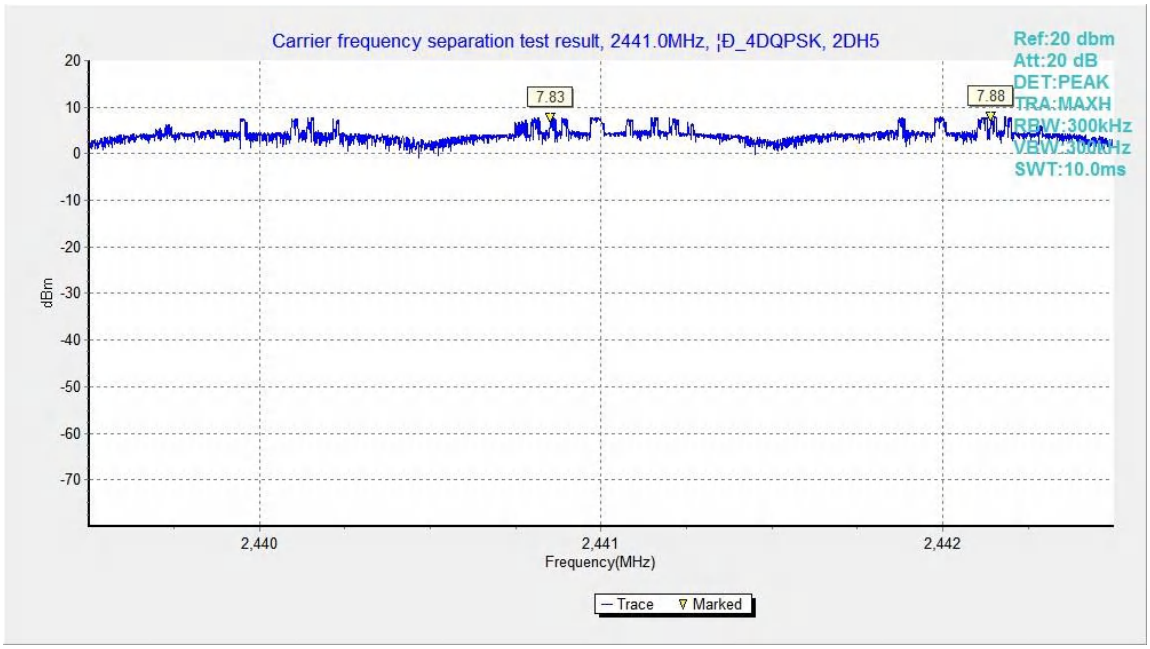

Fig.92. Carrier frequency separation measurement: π/4 DQPSK, Channel 39

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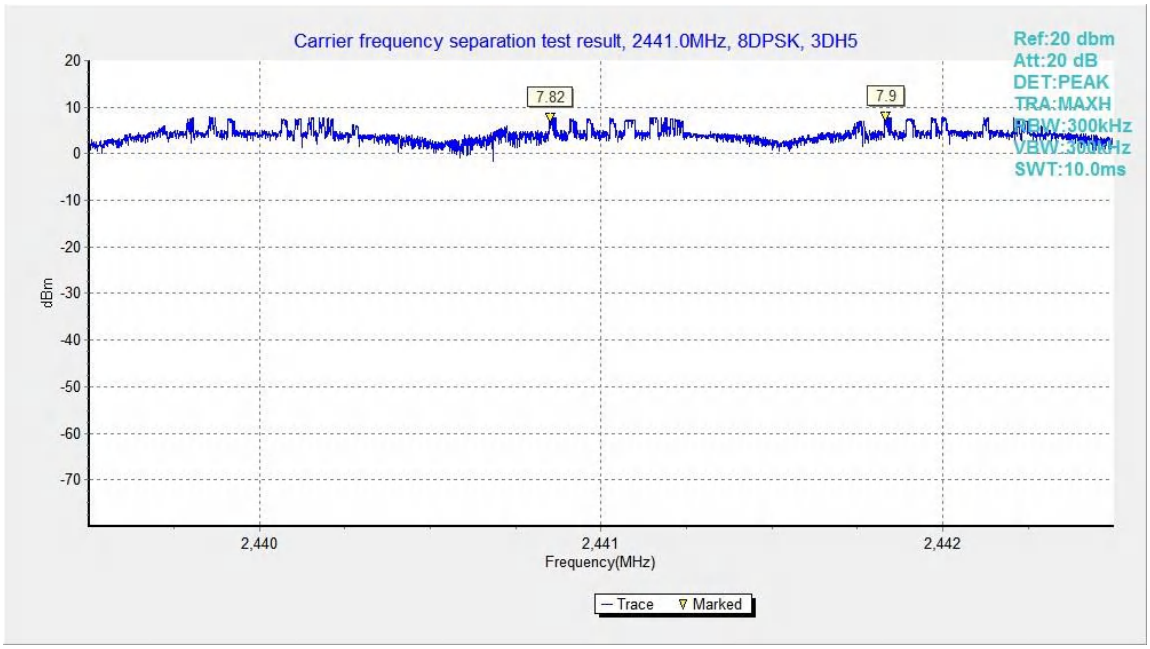

Fig.93. Carrier frequency separation measurement: 8DPSK, Channel 39

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B.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.94	79	P
40~78	Fig.95		

Forπ/4 DQPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.96	79	P
40~78	Fig.97		

For 8DPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.98	79	P
40~78	Fig.99		

Conclusion: PASS

Test graphs as below:

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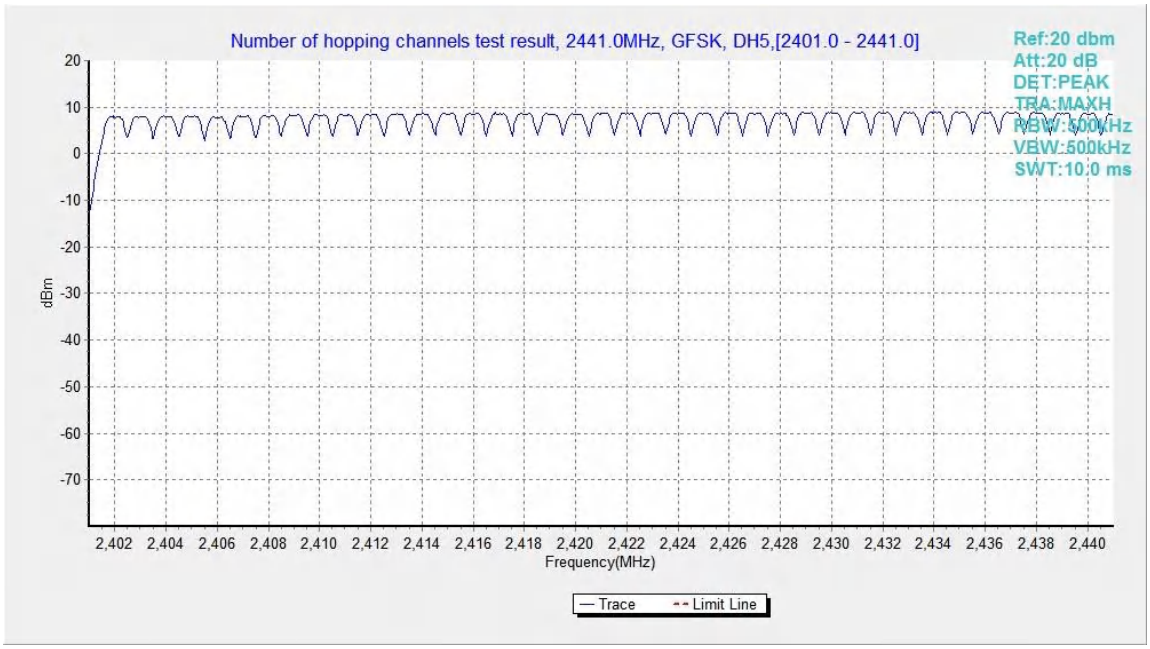

Fig.94. Number of hopping frequencies: GFSK, Channel 0 - 39

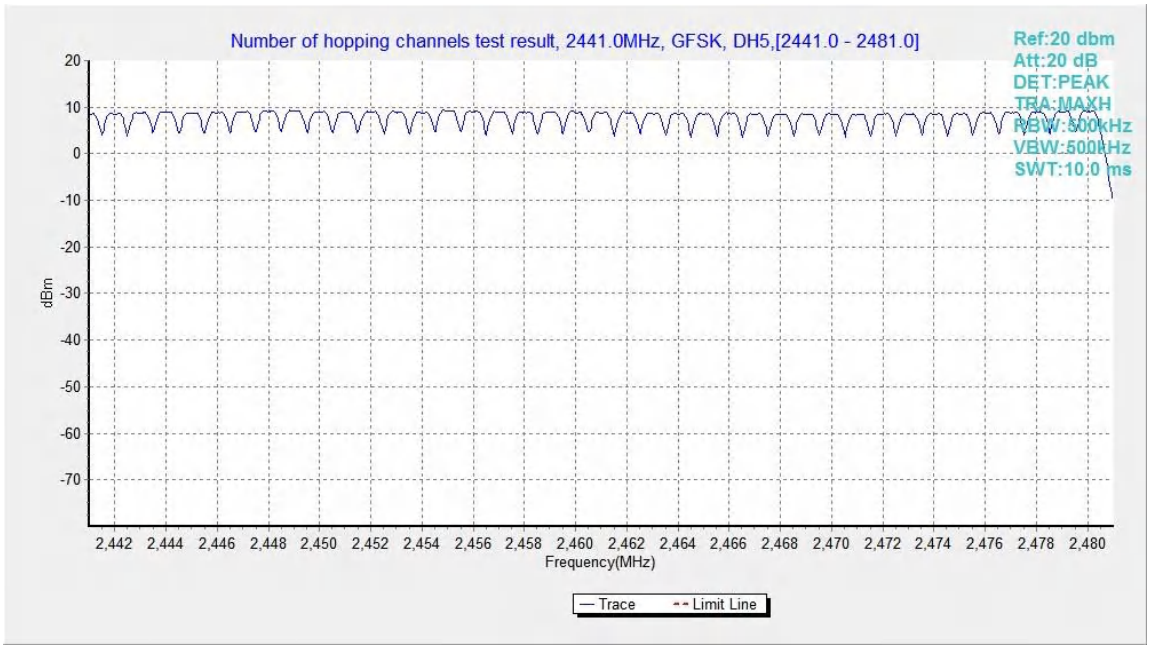

Fig.95. Number of hopping frequencies: GFSK, Channel 40 - 78

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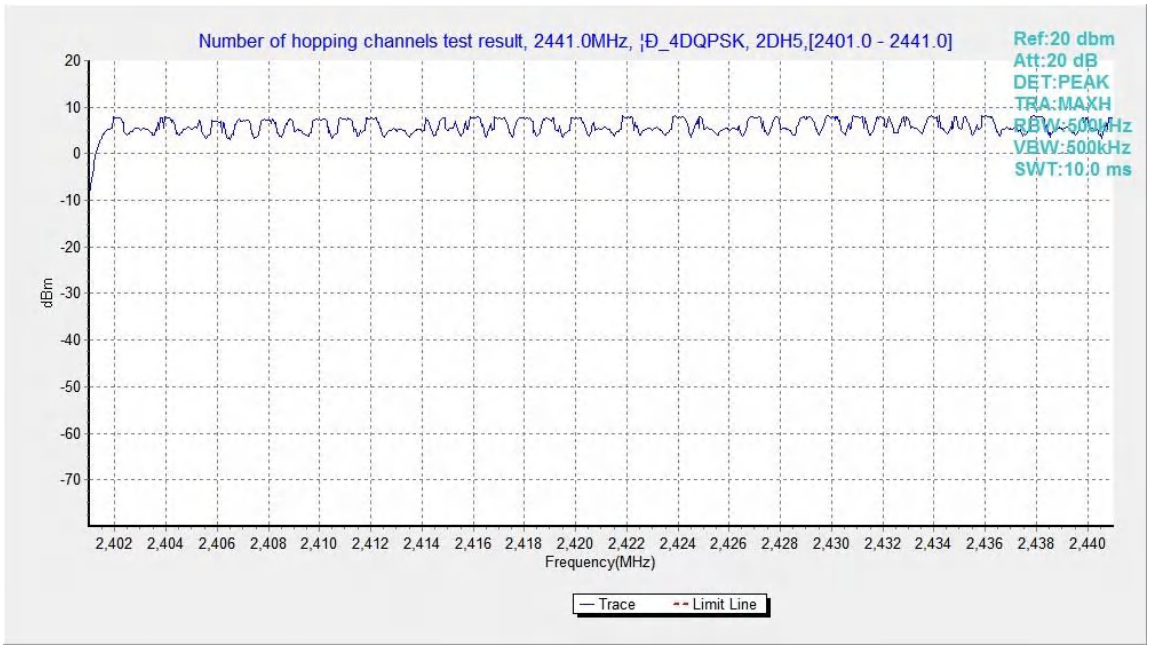

Fig.96. Number of hopping frequencies: π/4 DQPSK, Channel 0 - 39

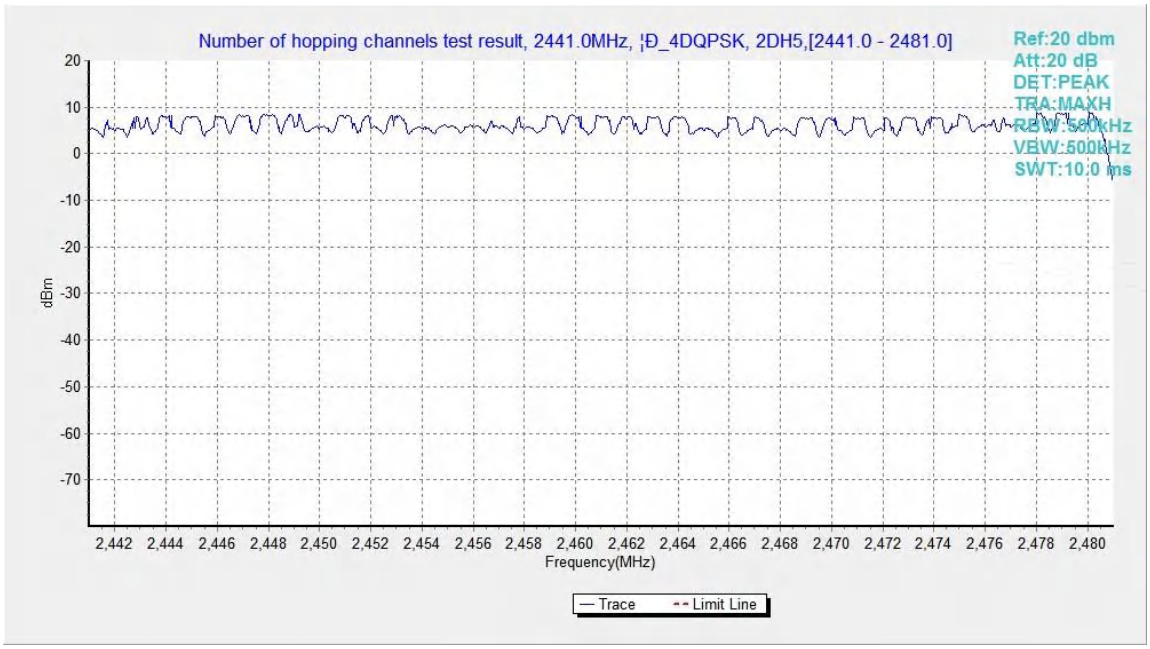

Fig.97. Number of hopping frequencies: π/4 DQPSK, Channel 40 - 78

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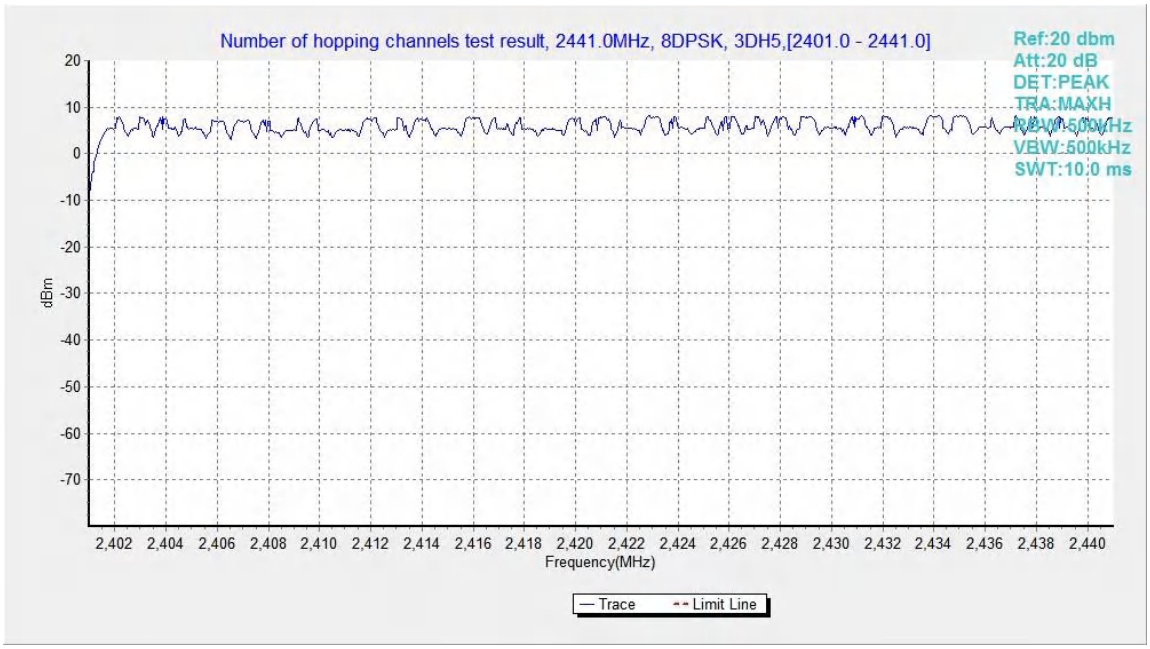

Fig.98. Number of hopping frequencies: 8DPSK, Channel 0 - 39

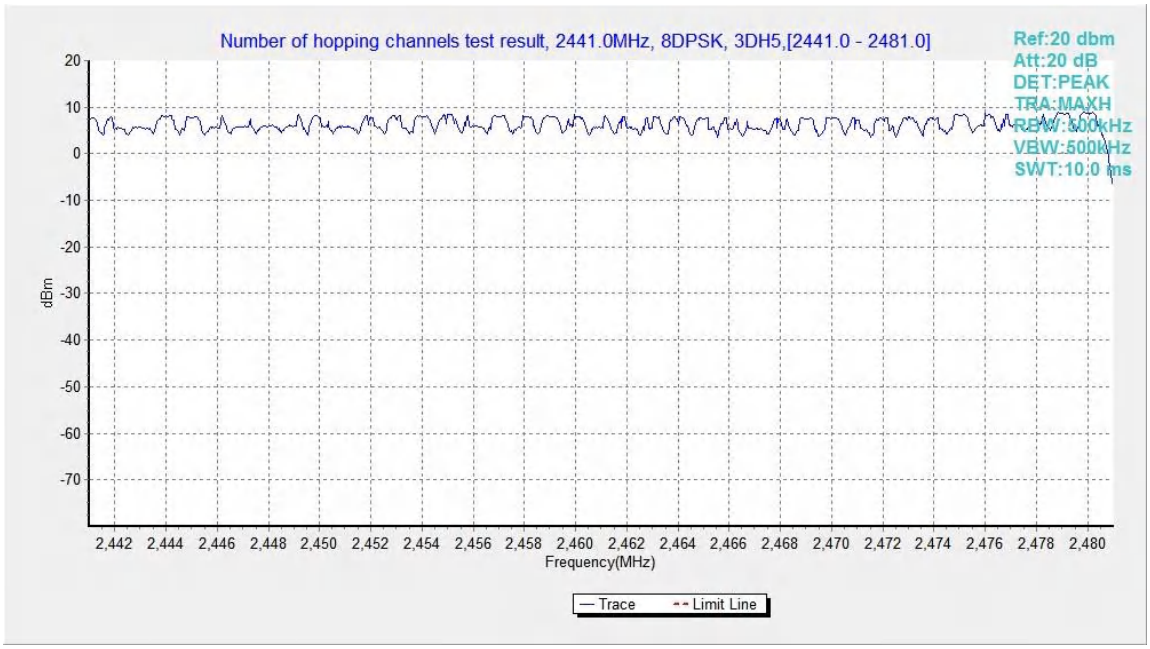

Fig.99. Number of hopping frequencies: 8DPSK, Channel 40 - 78

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B.10. AC Powerline Conducted Emission

Summary

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section

Method of Measurement:

See Clause 6.2 of ANSI C63.10 specifically.

See Clause 4 and Clause 5 of ANSI C63.10 generally.

The conducted emissions from the AC port of the EUT are measured in a shielding room. The EUT is connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection was performed. The measurements were performed with a quasi-peak detector and if required, an average detector.

The conducted emission measurements were made with the following detector of the test receiver:Quasi-Peak / Average Detector.

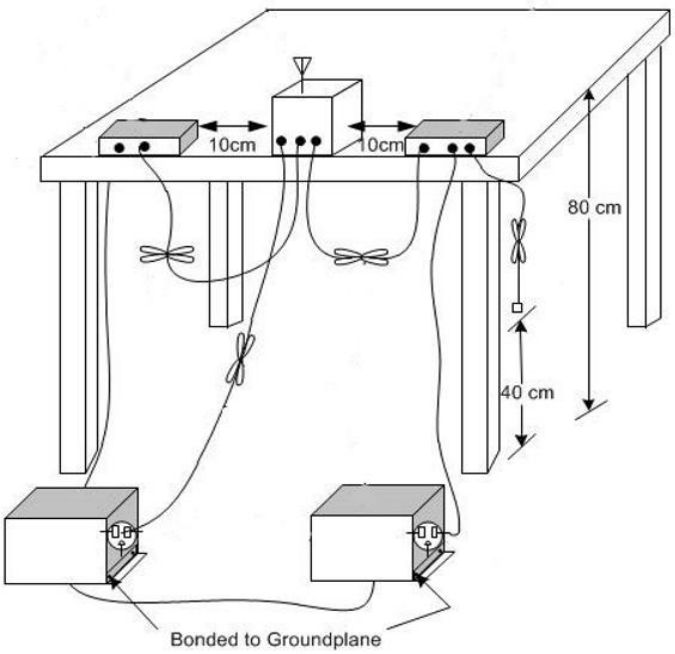
The measurement bandwidth is:

Frequency of Emission (MHz)	RBW/IF bandwidth
0.15-30	9kHz

Test Condition:

Voltage（V）	Frequency（Hz）
120	60

Test setup



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Measurement Result and limit:

Bluetooth (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Result (dBμV)		Conclusion
		With charger		
		bluetooth	Idle	
0.15 to 0.5	66 to 56	Fig.B.10.1	Fig.B.10.2	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 (dBμV)	Result (dBμV)		Conclusion
		With charger		
		bluetooth	Idle	
0.15 to 0.5	56 to 46	Fig.B.10.1	Fig.B.10.2	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.				

Conclusion: Pass

Test graphs as below:

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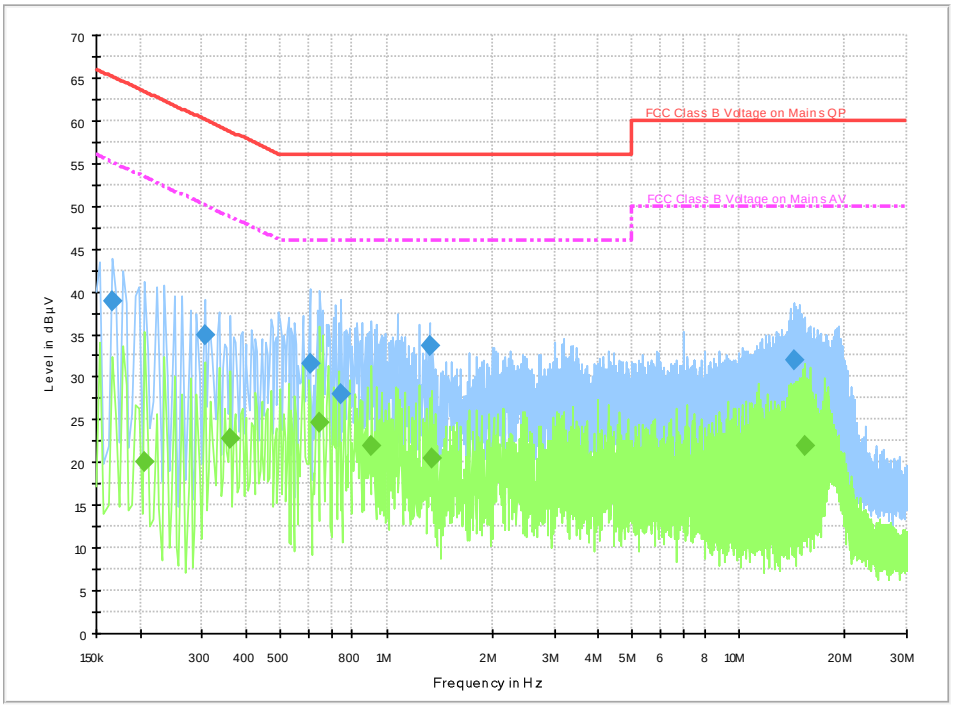

Fig.B.10.1 AC Powerline Conducted Emission-bluetooth

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.166000	**39.0**	**2000.0**	**9.000**	**On**	**N**	**19.8**	**26.2**	**65.2**	
0.306000	**35.0**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**25.1**	**60.1**	
0.606000	**31.6**	**2000.0**	**9.000**	**On**	**N**	**19.9**	**24.4**	**56.0**	
0.746000	**28.0**	**2000.0**	**9.000**	**On**	**N**	**19.8**	**28.0**	**56.0**	
1.326000	**33.6**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**22.4**	**56.0**	
14.458000	**32.0**	**2000.0**	**9.000**	**On**	**N**	**19.8**	**28.0**	**60.0**	

Final Result 2

Frequency (MHz)	CAverage(dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.206000	**20.1**	**2000.0**	**9.000**	**On**	**N**	**19.8**	**33.2**	**53.4**	
0.362000	**22.7**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**25.9**	**48.7**	
0.646000	**24.6**	**2000.0**	**9.000**	**On**	**N**	**19.8**	**21.4**	**46.0**	
0.910000	**21.8**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**24.2**	**46.0**	
1.338000	**20.4**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**25.6**	**46.0**	
15.370000	**22.0**	**2000.0**	**9.000**	**On**	**L1**	**20.0**	**28.0**	**50.0**	

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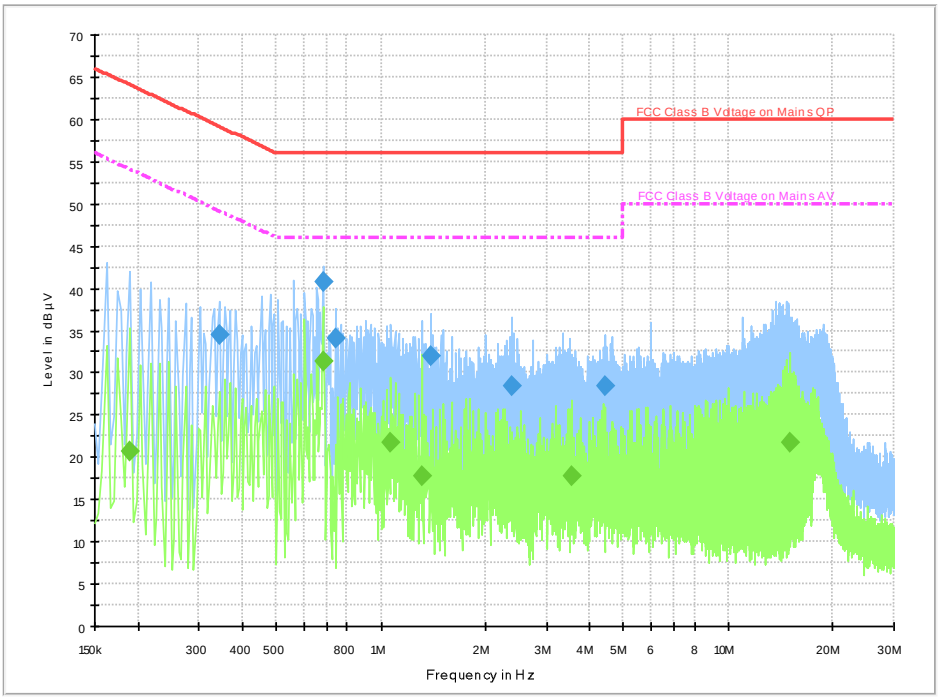

Fig.B.10.2 AC Powerline Conducted Emission-Idle

Note: The graphic result above is the maximum of the measurements for both phase line and neutral line.

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.342000	**34.5**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**24.6**	**59.2**	
0.682000	**40.8**	**2000.0**	**9.000**	**On**	**L1**	**20.0**	**15.2**	**56.0**	
0.738000	**34.1**	**2000.0**	**9.000**	**On**	**N**	**19.8**	**21.9**	**56.0**	
1.390000	**31.9**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**24.1**	**56.0**	
2.386000	**28.4**	**2000.0**	**9.000**	**On**	**L1**	**19.8**	**27.6**	**56.0**	
4.442000	**28.3**	**2000.0**	**9.000**	**On**	**L1**	**19.8**	**27.7**	**56.0**	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.190000	**20.7**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**33.3**	**54.0**	
0.682000	**31.4**	**2000.0**	**9.000**	**On**	**L1**	**20.0**	**14.6**	**46.0**	
1.070000	**21.6**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**24.4**	**46.0**	
1.318000	**17.7**	**2000.0**	**9.000**	**On**	**L1**	**19.9**	**28.3**	**46.0**	
3.538000	**17.8**	**2000.0**	**9.000**	**On**	**L1**	**19.8**	**28.2**	**46.0**	
15.118000	**21.8**	**2000.0**	**9.000**	**On**	**L1**	**20.0**	**28.2**	**50.0**	

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B.11.Antenna Requirement

The antenna of the device is permanently attached. There are no provisions for connection to an external antenna.
The unit complies with the requirement of FCC Part 15.203.

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ANNEX C: Accreditation Certificate

Accredited Laboratory

A2LA has accredited

TELECOMMUNICATION TECHNOLOGY LABS, CAICT

Beijing, People's Republic of China

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 26th day of June 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 7049.01
Valid to July 31, 2024

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

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

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