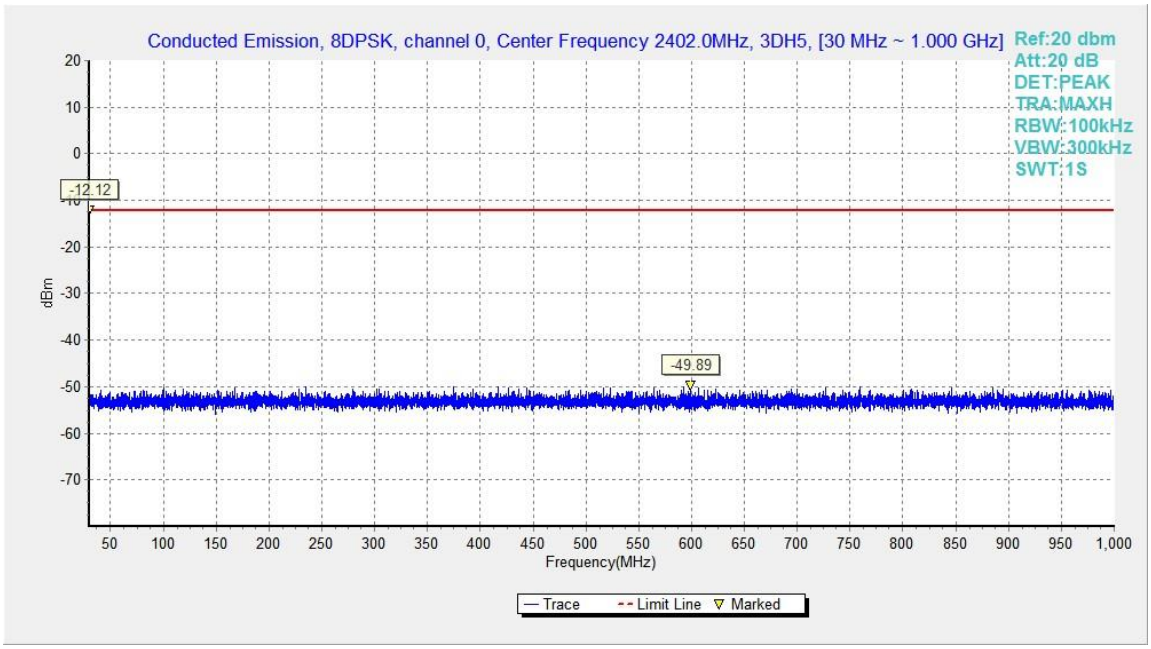


Fig.59. Conducted spurious emission: 8DPSK, Channel 0, 30MHz - 1GHz

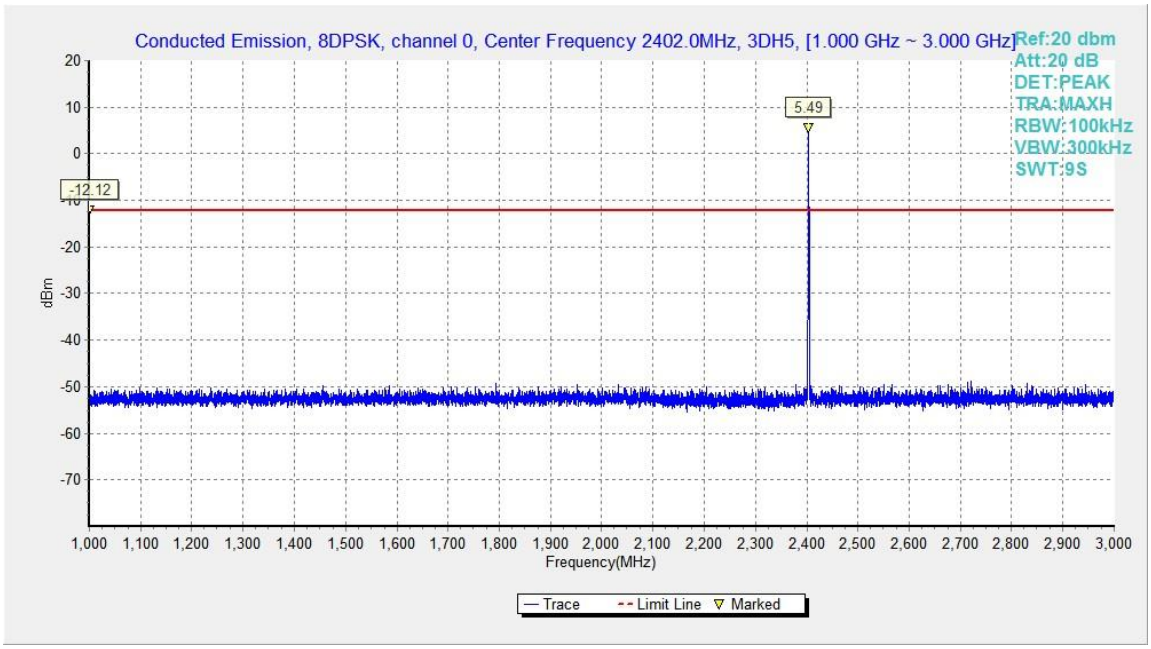


Fig.60. Conducted spurious emission: 8DPSK, Channel 0, 1GHz - 3GHz

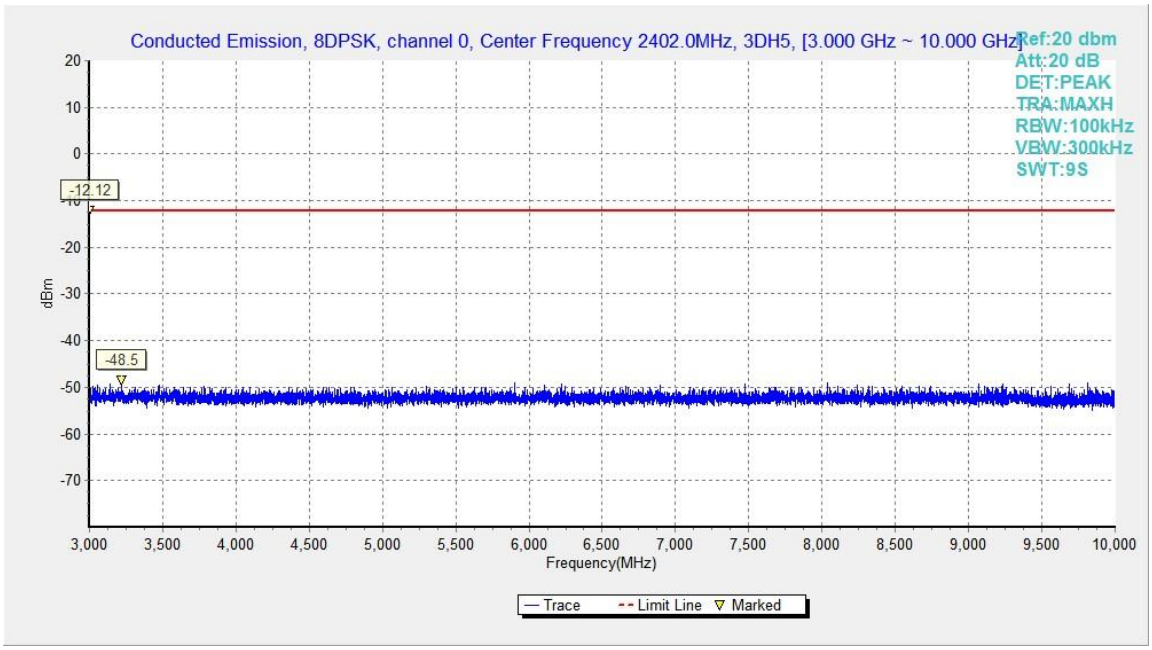


Fig.61. Conducted spurious emission: 8DPSK, Channel 0, 3GHz - 10GHz

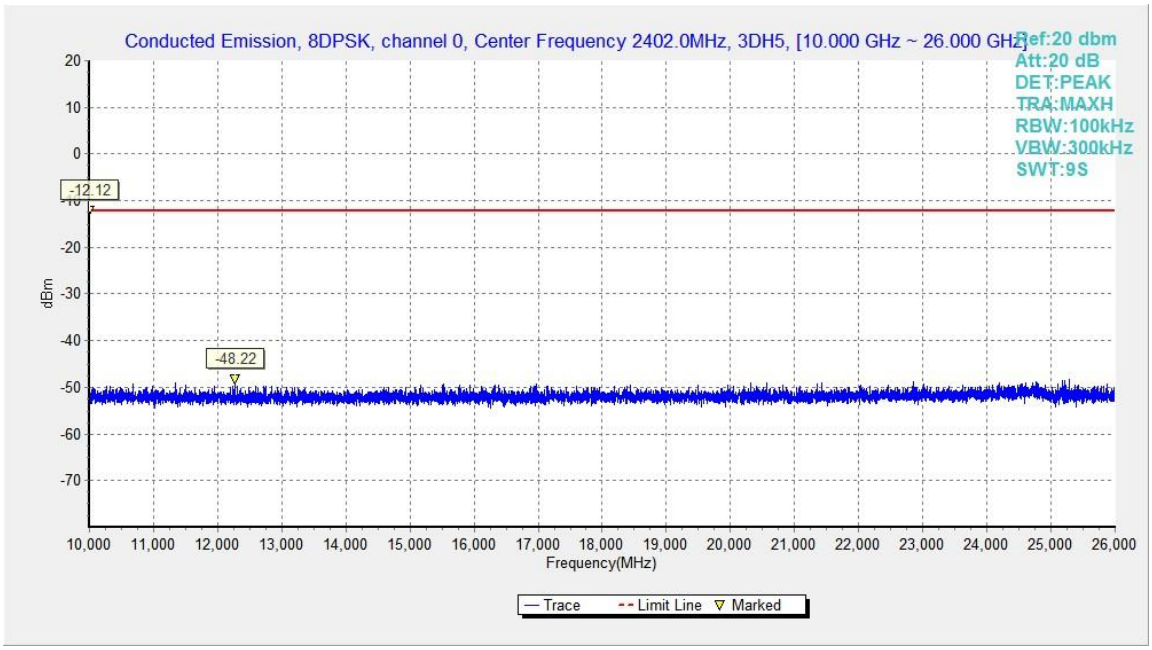


Fig.62. Conducted spurious emission: 8DPSK, Channel 0,10GHz - 26GHz

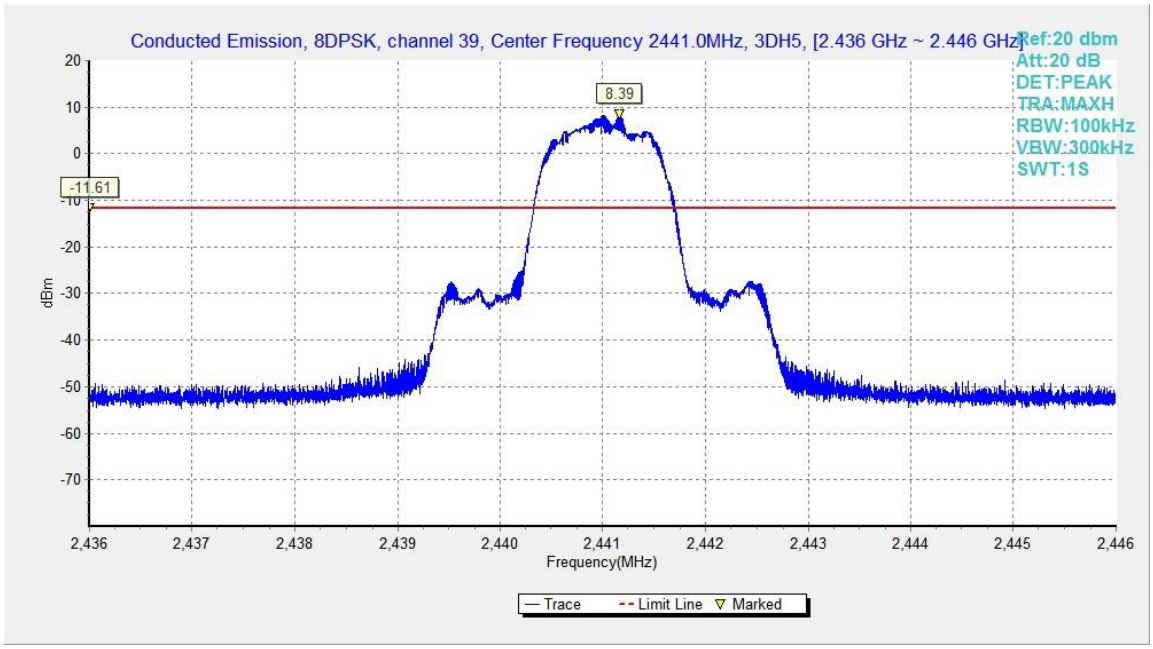


Fig.63. Conducted spurious emission: 8DPSK, Channel 39, 2441MHz

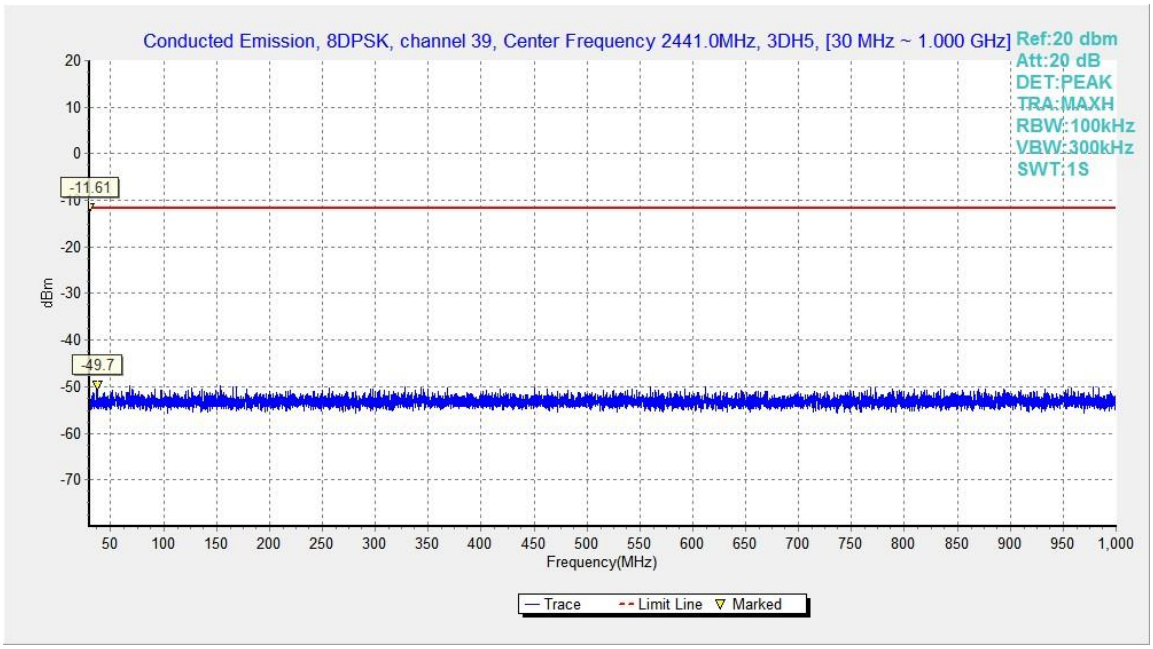


Fig.64. Conducted spurious emission: 8DPSK, Channel 39, 30MHz - 1GHz

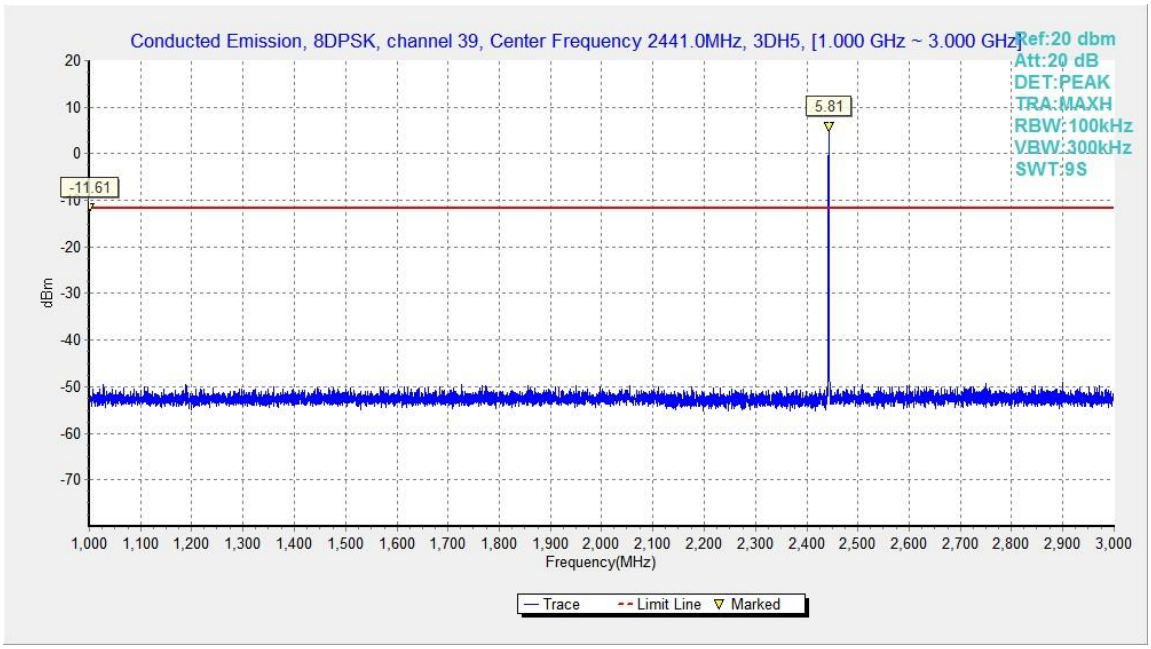


Fig.65. Conducted spurious emission: 8DPSK, Channel 39, 1GHz - 3GHz

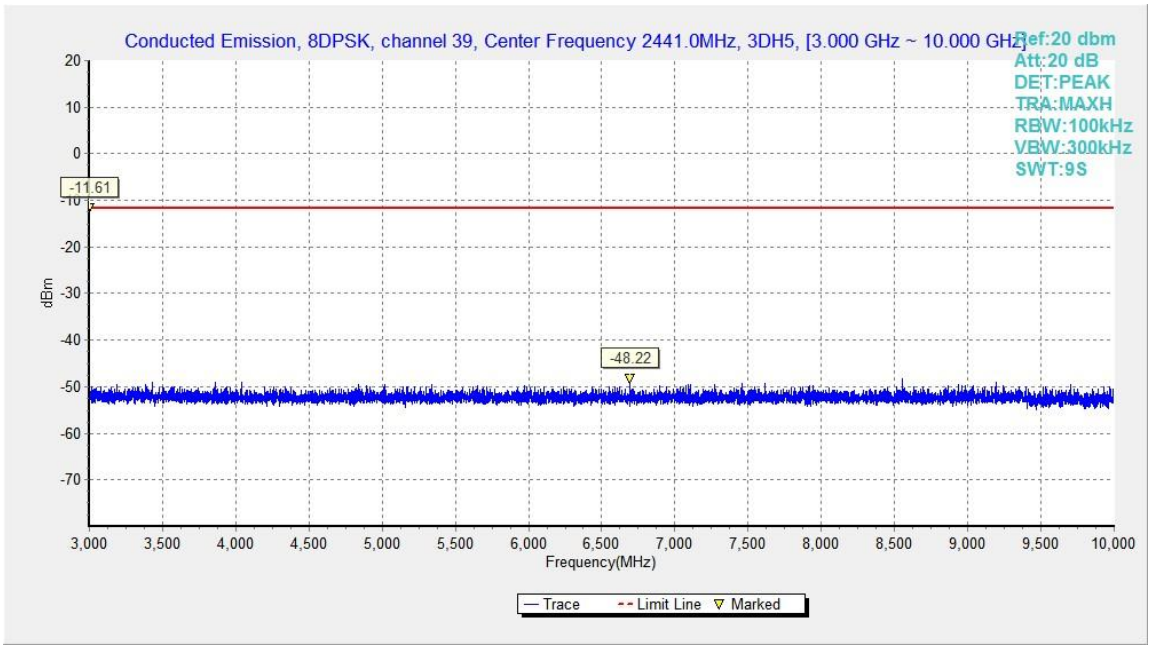


Fig.66. Conducted spurious emission: 8DPSK, Channel 39, 3GHz - 10GHz

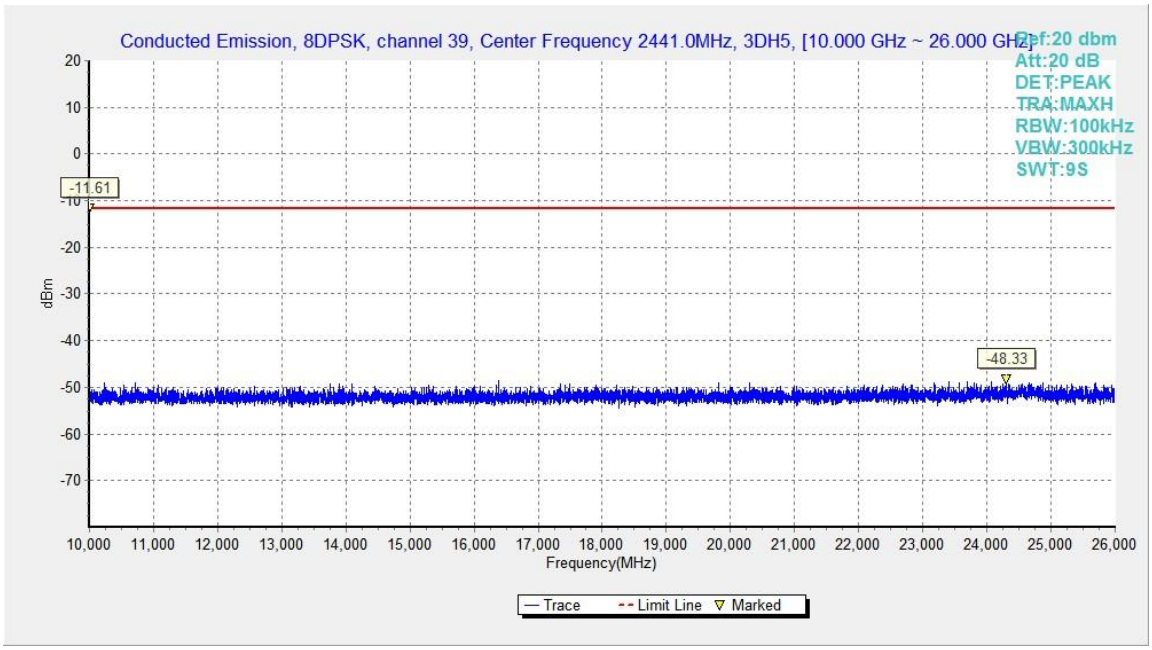


Fig.67. Conducted spurious emission: 8DPSK, Channel 39, 10GHz – 26GHz

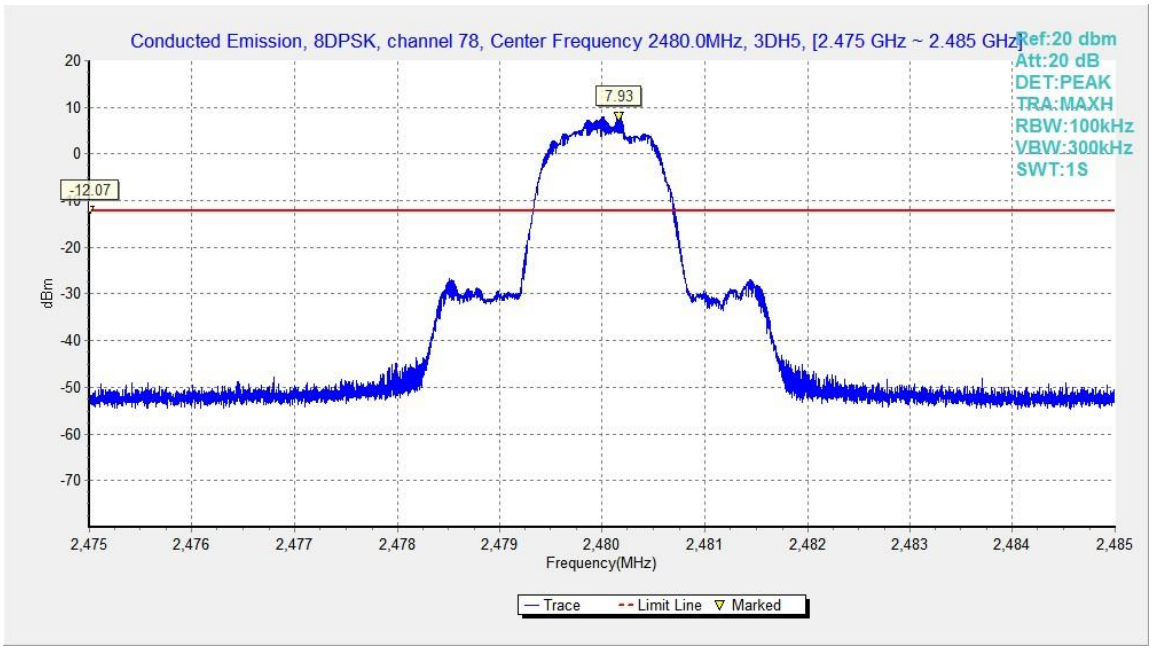


Fig.68. Conducted spurious emission: 8DPSK, Channel 78, 2480MHz

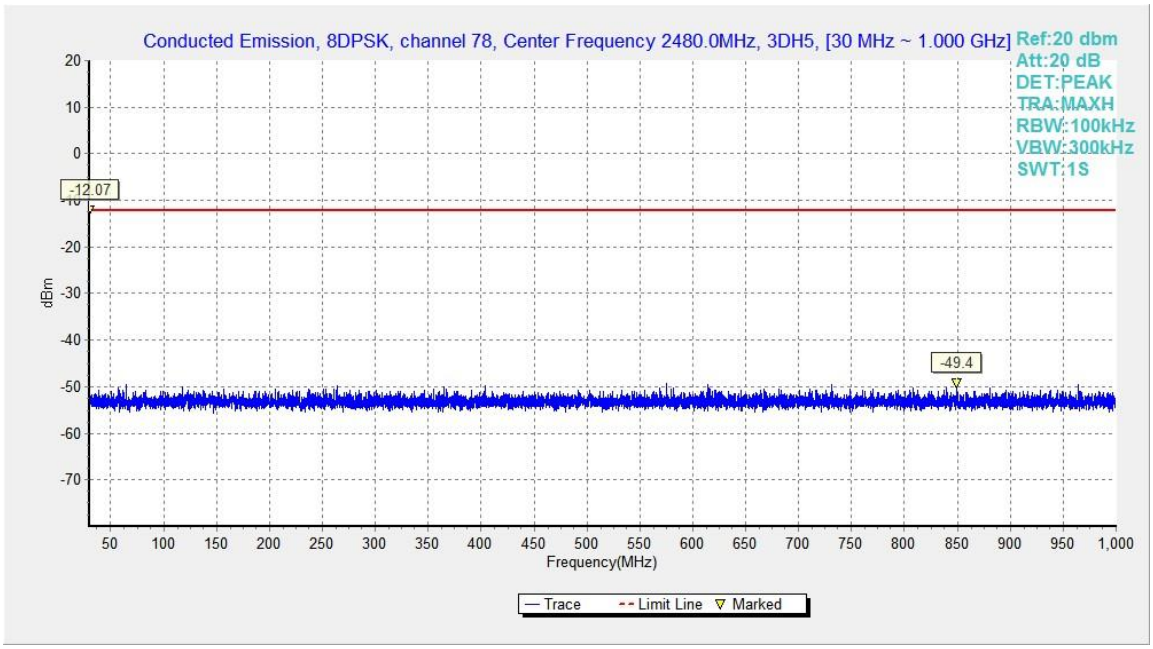


Fig.69. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz

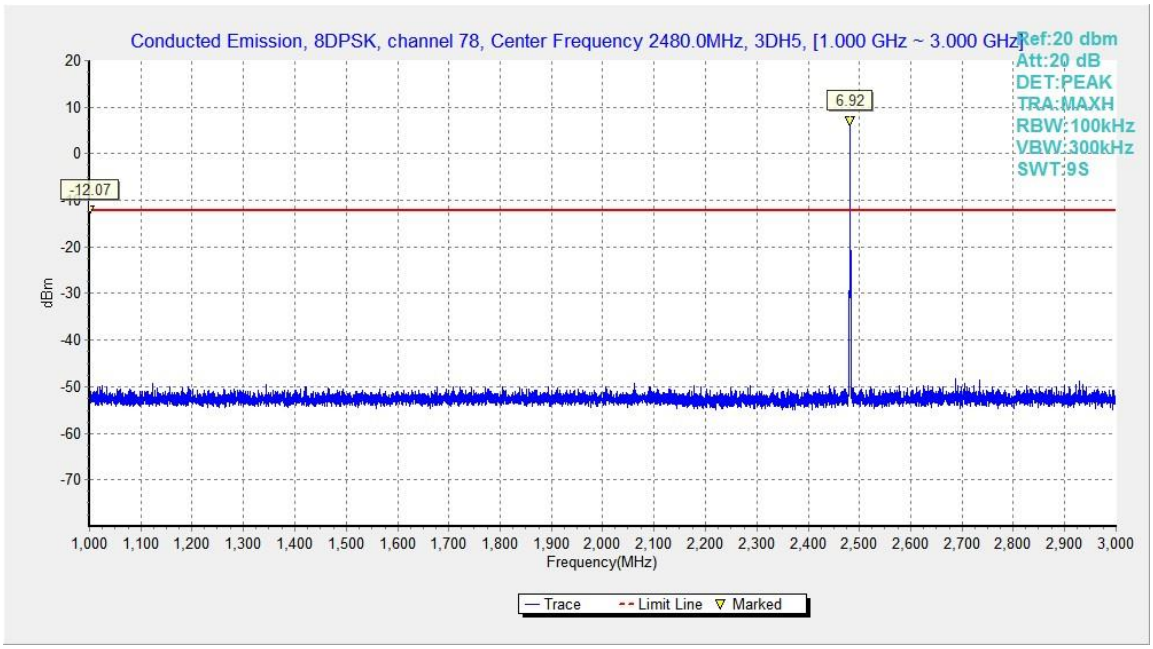


Fig.70. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

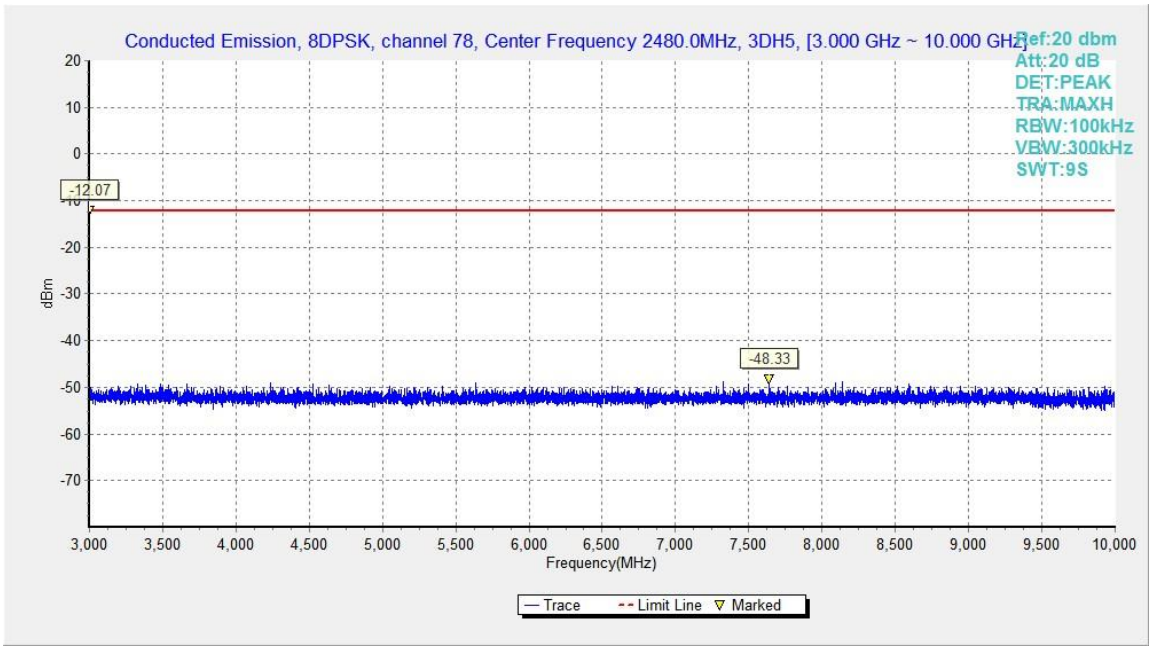


Fig.71. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

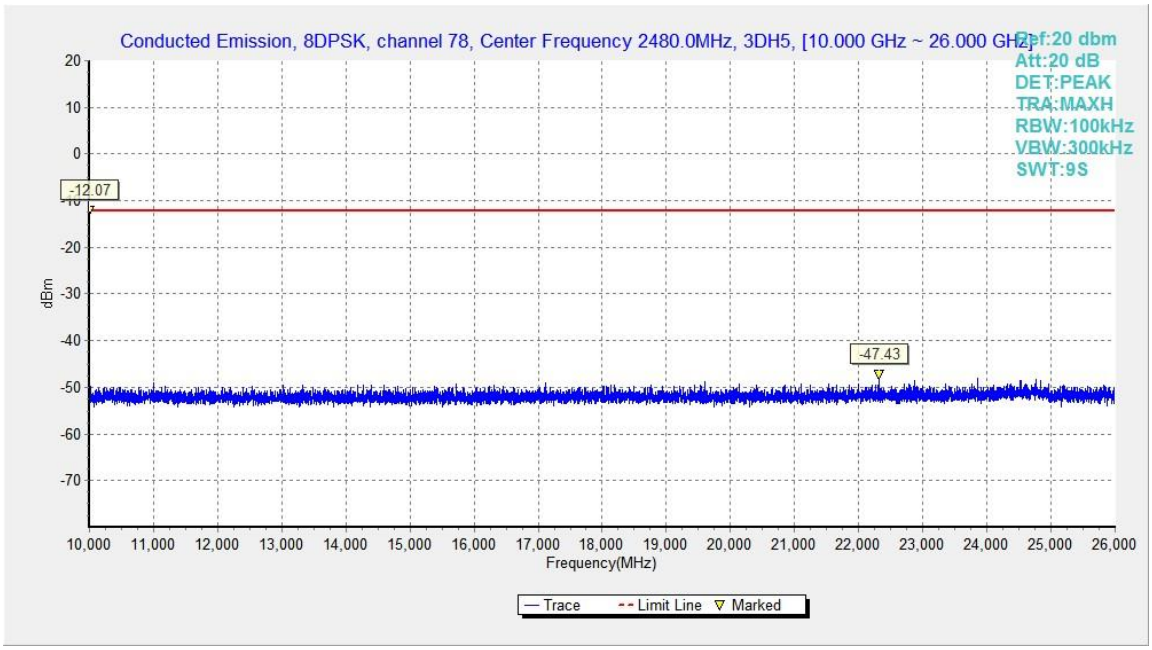


Fig.72. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

B.6. Transmitter Spurious Emission - Radiated

Method of Measurement: See ANSI C63.10-clause 6.4 &6.5 & 6.6

Measurement Limit:

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

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 (MHz)	Field strength(μV/m)	Measurement distance(m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30

Frequency of emission (MHz)	Field strength (uV/m)	Field strength (dBuV/m)	Measurement distance (m)
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Set up:

Tabletop devices shall be placed on a nonconducting platform with nominal top surface dimensions 1 m by 1.5 m. For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The EUT and transmitting antenna shall be centered on the turntable.

Note:

1. A "reference path loss" is established and the A_{Rpl} is the attenuation of “reference path loss”, and including the gain of receive antenna, 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:
Result=P_{Mea}+$A_{Rpl=}$ P_{Mea}+Cable Loss+Antenna Factor

2. The range of evaluated frequency is from 9 kHz to 26GHz. Measurement value showed here only up to 6 maximum emissions noted.

Peak Measurement results

GFSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2383.675	60.50	4.60	27.47	28.44	74.00	13.50	H
2387.411	60.41	4.61	27.48	28.33	74.00	13.59	V
4804.000	42.48	-35.05	33.98	43.55	74.00	31.52	H
7206.000	43.77	-33.04	35.52	41.29	74.00	30.23	H
9608.000	43.94	-32.21	36.32	39.83	74.00	30.06	V
12010.000	46.97	-30.19	38.80	38.35	74.00	27.03	V

GFSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2366.800	45.60	-35.63	31.40	49.83	74.00	28.40	H
2514.600	46.12	-35.99	32.46	49.65	74.00	27.88	V
4882.000	41.69	-34.37	33.83	42.23	74.00	32.31	V
7323.000	43.15	-33.03	35.40	40.78	74.00	30.85	H
9764.000	44.87	-31.87	36.57	40.17	74.00	29.13	V
12205.000	48.83	-29.39	38.79	39.43	74.00	25.17	V

GFSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2484.503	62.15	4.65	27.80	29.70	74.00	11.85	H
2485.550	61.51	4.65	27.80	29.06	74.00	12.49	V
4960.000	41.96	-34.42	33.80	42.58	74.00	32.04	H
7440.000	42.21	-32.79	35.42	39.58	74.00	31.79	H
9920.000	44.34	-32.04	36.84	39.54	74.00	29.66	V
12400.000	46.91	-29.42	38.60	37.73	74.00	27.09	H

π/4 DQPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2386.912	61.17	4.61	27.47	29.09	74.00	12.83	V
2389.808	61.38	4.61	27.48	29.28	74.00	12.62	V
4804.000	41.73	-35.05	33.98	42.80	74.00	32.27	H
7206.000	43.45	-33.04	35.52	40.97	74.00	30.55	V
9608.000	44.32	-32.21	36.32	40.21	74.00	29.68	H
12010.000	46.55	-30.19	38.80	37.94	74.00	27.45	V

π/4 DQPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2342.400	45.40	-35.63	31.40	49.63	74.00	28.60	H
2514.000	46.63	-35.99	32.46	50.16	74.00	27.37	V
4882.000	41.69	-34.37	33.83	42.23	74.00	32.31	H
7323.000	42.78	-33.03	35.40	40.41	74.00	31.22	H
9764.000	44.02	-31.87	36.57	39.33	74.00	29.98	V
12205.000	47.48	-29.39	38.79	38.08	74.00	26.52	V

π/4 DQPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2483.943	61.56	4.65	27.80	29.11	74.00	12.44	V
2485.134	61.97	4.65	27.80	29.52	74.00	12.03	H
4960.000	41.07	-34.42	33.80	41.69	74.00	32.93	H
7440.000	43.38	-32.79	35.42	40.75	74.00	30.62	H
9920.000	45.51	-32.04	36.84	40.70	74.00	28.49	V
12400.000	47.35	-29.42	38.60	38.16	74.00	26.65	H

8DPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2384.208	60.78	4.60	27.47	28.71	74.00	13.22	V
2389.222	61.38	4.61	27.48	29.28	74.00	12.62	H
4804.000	41.77	-35.05	33.98	42.84	74.00	32.23	V
7206.000	44.20	-33.04	35.52	41.72	74.00	29.80	V
9608.500	45.77	-32.21	36.32	41.66	74.00	28.23	H
12009.500	47.99	-30.19	38.80	39.38	74.00	26.01	H

8DPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2358.600	45.27	-35.63	31.40	49.50	74.00	28.73	H
2518.400	46.56	-35.99	32.46	50.09	74.00	27.44	H
4882.000	42.03	-34.37	33.83	42.57	74.00	31.97	H
7323.000	44.44	-33.03	35.40	42.06	74.00	29.56	V
9764.500	45.02	-31.88	36.57	40.32	74.00	28.98	V
12205.500	47.49	-29.39	38.79	38.09	74.00	26.51	H

8DPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2484.509	61.83	4.65	27.80	29.38	74.00	12.17	V
2486.184	62.78	4.65	27.80	30.33	74.00	11.22	V
4960.000	42.71	-34.42	33.80	43.33	74.00	31.29	H
7440.000	44.51	-32.79	35.42	41.88	74.00	29.49	V
9919.500	45.55	-32.04	36.84	40.75	74.00	28.45	V
12400.500	47.38	-29.42	38.60	38.20	74.00	26.62	V

Average Measurement results

GFSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2380.293	46.65	4.59	27.46	14.60	54.00	7.35	V
2381.117	46.70	4.59	27.46	14.65	54.00	7.30	V
4804.000	29.33	-35.05	33.98	30.40	54.00	24.67	V
7206.000	31.52	-33.04	35.52	29.03	54.00	22.48	V
9608.000	32.37	-32.21	36.32	28.27	54.00	21.63	V
12010.000	35.02	-30.19	38.80	26.40	54.00	18.98	H

GFSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2428.062	46.93	4.65	27.67	14.61	54.00	7.07	V
2453.530	47.60	4.67	27.80	15.13	54.00	6.40	V
4882.000	29.72	-34.37	33.83	30.26	54.00	24.28	V
7323.000	31.50	-33.03	35.40	29.13	54.00	22.50	V
9764.000	32.75	-31.87	36.57	28.05	54.00	21.25	H
12205.000	35.62	-29.39	38.79	26.21	54.00	18.38	V

GFSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2488.256	47.38	4.64	27.80	14.93	54.00	6.62	V
2492.306	47.39	4.63	27.80	14.96	54.00	6.61	V
4960.000	29.62	-34.42	33.80	30.24	54.00	24.38	V
7440.000	31.02	-32.79	35.42	28.40	54.00	22.98	V
9920.000	32.74	-32.04	36.84	27.94	54.00	21.26	V
12400.000	35.36	-29.42	38.60	26.18	54.00	18.64	H

π/4 DQPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2384.250	46.55	4.60	27.47	14.48	54.00	7.45	V
2389.012	46.56	4.61	27.48	14.47	54.00	7.44	V
4804.000	29.33	-35.05	33.98	30.41	54.00	24.67	H
7206.000	31.50	-33.04	35.52	29.01	54.00	22.50	V
9608.000	32.40	-32.21	36.32	28.29	54.00	21.60	V
12010.000	35.12	-30.19	38.80	26.51	54.00	18.88	V

π/4 DQPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2428.900	46.93	4.65	27.67	14.60	54.00	7.07	V
2452.143	47.48	4.67	27.80	15.00	54.00	6.52	V
4882.000	30.01	-34.37	33.83	30.55	54.00	23.99	H
7323.000	31.53	-33.03	35.40	29.15	54.00	22.47	V
9764.000	32.69	-31.87	36.57	27.99	54.00	21.31	V
12205.000	35.60	-29.39	38.79	26.19	54.00	18.40	V

π/4 DQPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2491.650	47.30	4.63	27.80	14.87	54.00	6.70	V
2495.343	47.50	4.62	27.80	15.07	54.00	6.50	V
4960.000	29.31	-34.42	33.80	29.93	54.00	24.69	H
7440.000	30.87	-32.79	35.42	28.25	54.00	23.13	H
9920.000	32.73	-32.04	36.84	27.93	54.00	21.27	V
12400.000	35.23	-29.42	38.60	26.04	54.00	18.77	V

8DPSK Ch 0

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2309.531	46.77	4.56	27.24	14.97	54.00	7.23	V
2319.581	46.90	4.54	27.28	15.09	54.00	7.10	V
4804.000	29.25	-35.05	33.98	30.33	54.00	24.75	V
7206.000	31.48	-33.04	35.52	29.00	54.00	22.52	H
9608.000	32.49	-32.21	36.32	28.38	54.00	21.51	V
12010.000	35.29	-30.19	38.80	26.68	54.00	18.71	V

8DPSK Ch 39

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2422.350	47.08	4.65	27.63	14.80	54.00	6.92	V
2451.225	47.72	4.67	27.80	15.25	54.00	6.28	V
4882.000	29.75	-34.37	33.83	30.29	54.00	24.25	V
7323.000	31.36	-33.03	35.40	28.98	54.00	22.64	H
9764.000	32.45	-31.87	36.57	27.76	54.00	21.55	H
12205.000	35.46	-29.39	38.79	26.06	54.00	18.54	H

8DPSK Ch 78

Frequency (MHz)	Measurement Result (dBuV/m)	Cable Loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Pol. (H/V)
2495.418	47.55	4.62	27.80	15.12	54.00	6.45	V
2500.143	47.55	4.63	27.80	15.12	54.00	6.45	V
4960.000	29.23	-34.42	33.80	29.86	54.00	24.77	V
7440.000	30.89	-32.79	35.42	28.27	54.00	23.11	H
9920.000	32.73	-32.04	36.84	27.93	54.00	21.27	H
12400.000	35.25	-29.42	38.60	26.07	54.00	18.75	V

Conclusion: Pass

B.7. 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.73	0.38	Fig.74	319	121.22	P
	DH3	Fig.75	1.64	Fig.76	111	182.04	P
	DH5	Fig.77	2.89	Fig.78	65	187.85	P

For π/4 DQPSK

Channel	Packet	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	2DH1	Fig.79	0.39	Fig.80	320	124.08	P
	2DH3	Fig.81	1.64	Fig.82	105	172.2	P
	2DH5	Fig.83	2.89	Fig.84	64	184.96	P

For 8DPSK

Channel	Packet	Pulse time (ms)		Number of Transmissions		Dwell Time (ms)	Conclusion
39	3DH1	Fig.85	0.39	Fig.86	321	125.19	P
	3DH3	Fig.87	1.64	Fig.88	99	162.36	P
	3DH5	Fig.89	2.89	Fig.90	60	173.4	P

Conclusion: PASS

Test graphs as below:

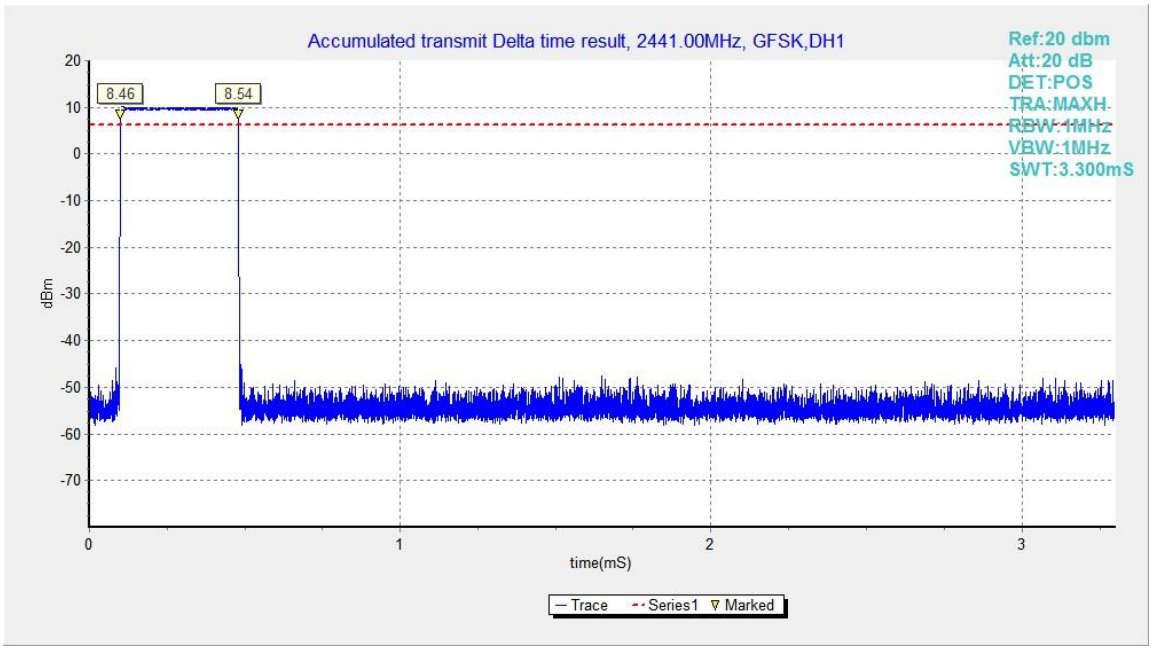


Fig.73. Time of occupancy (Dwell Time): Channel 39, Packet DH1

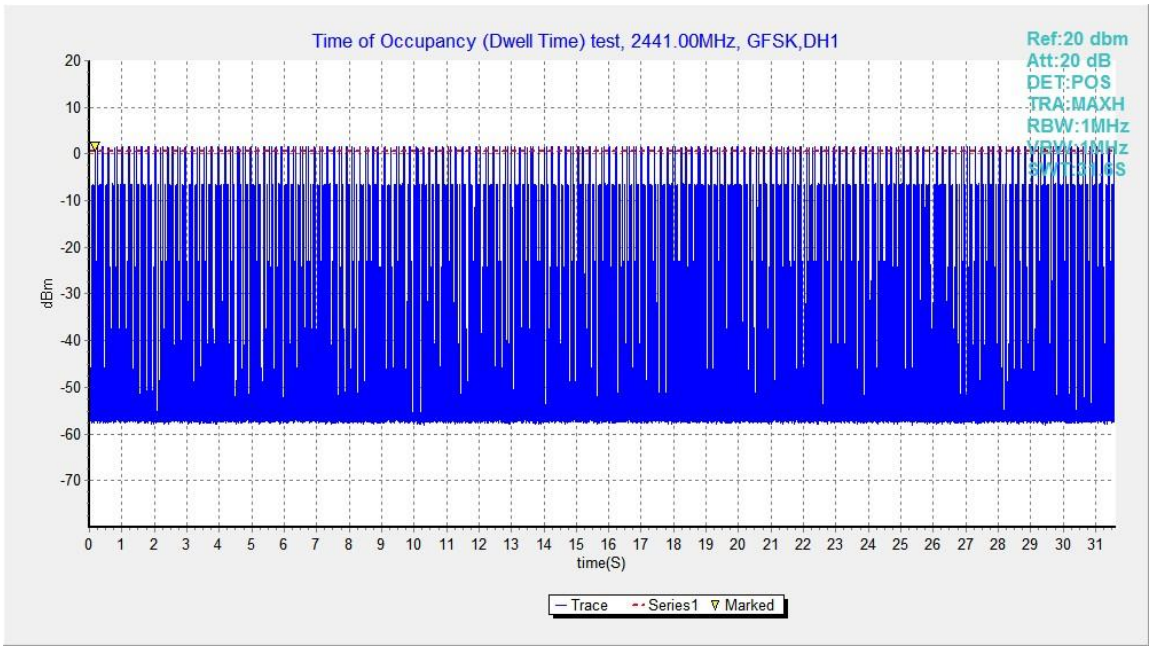


Fig.74. Number of Transmissions Measurement: Channel 39,Packet DH1

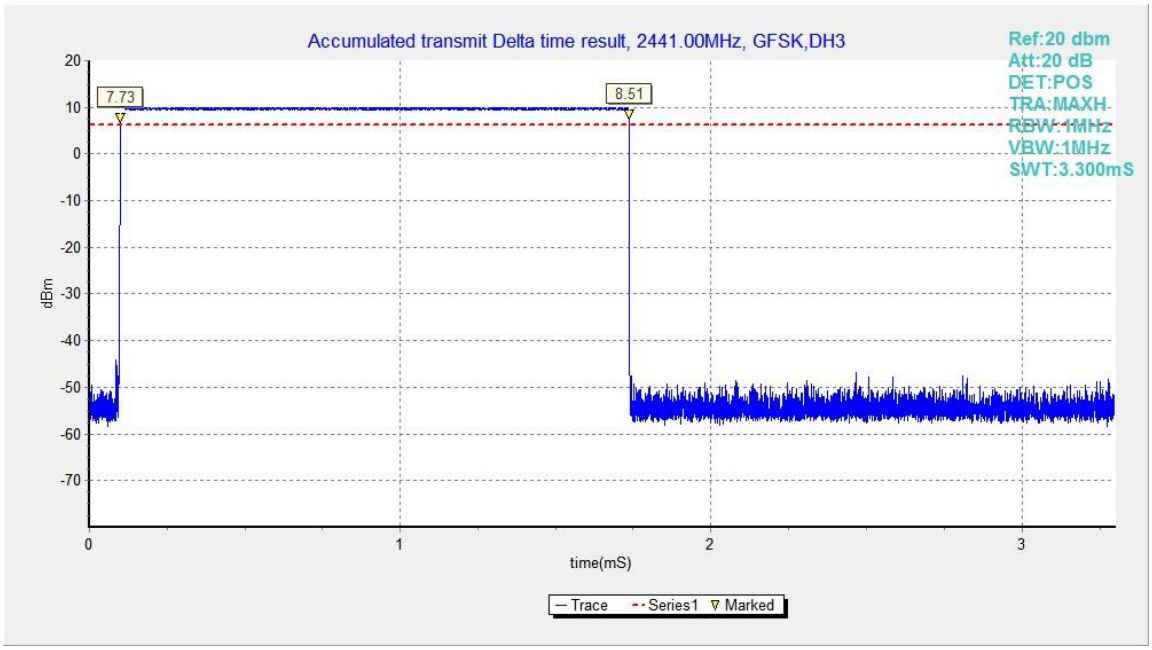


Fig.75. Time of occupancy (Dwell Time): Channel 39, Packet DH3

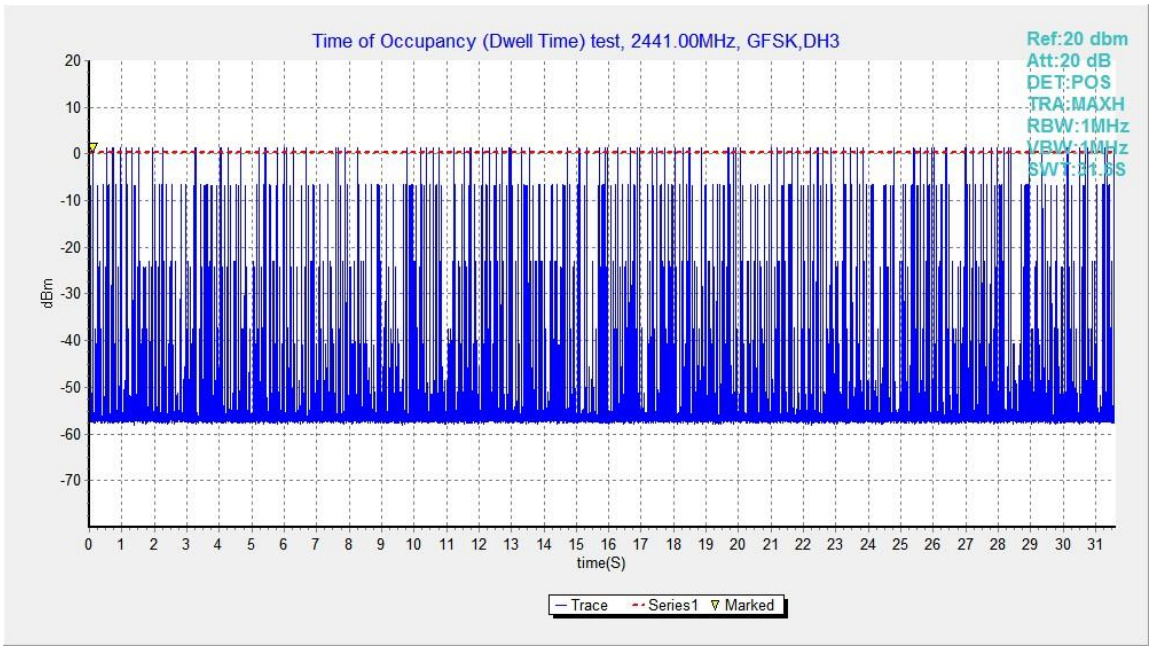


Fig.76. Number of Transmissions Measurement: Channel 39,Packet DH3

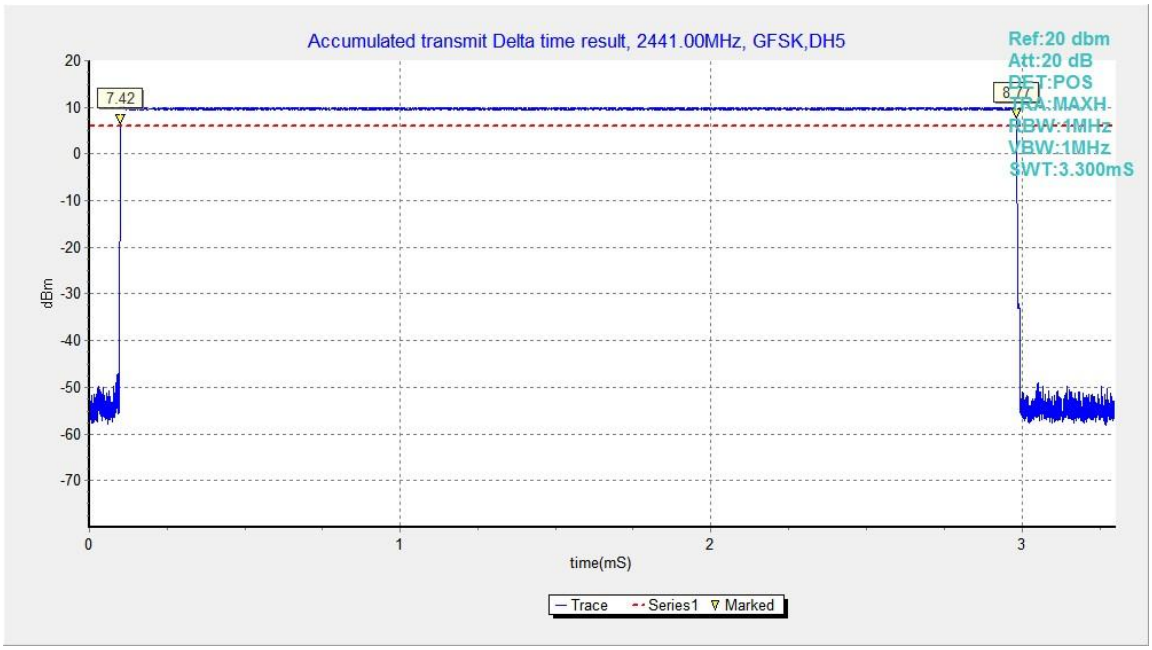


Fig.77. Time of occupancy (Dwell Time): Channel 39, Packet DH5

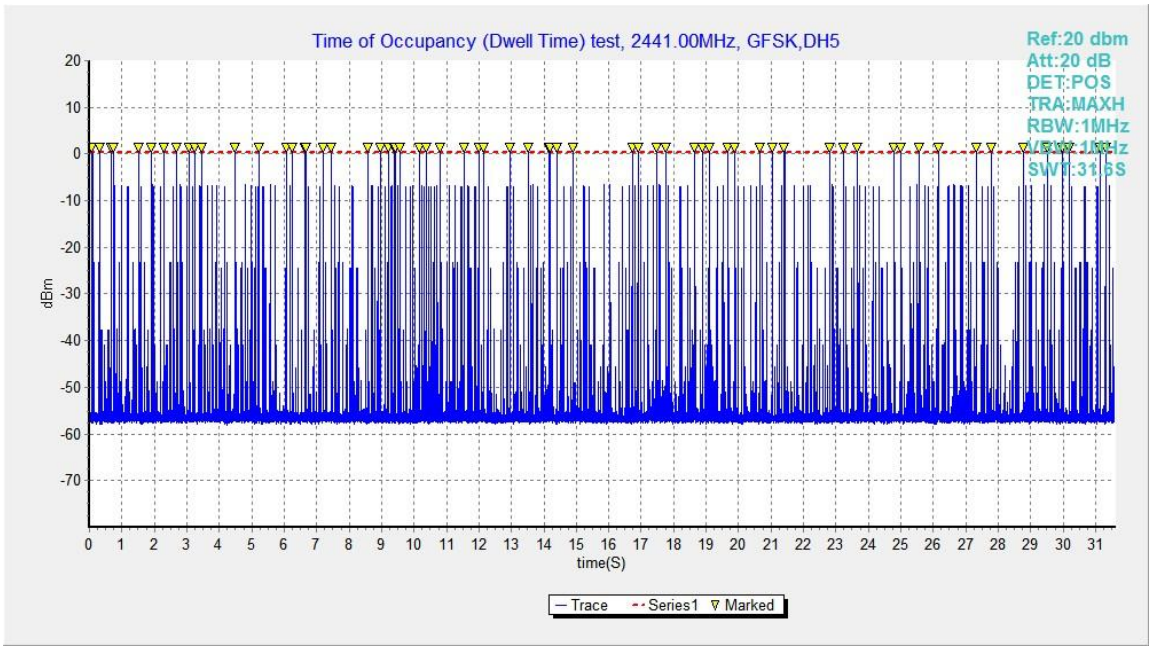


Fig.78. Number of Transmissions Measurement: Channel 39,Packet DH5

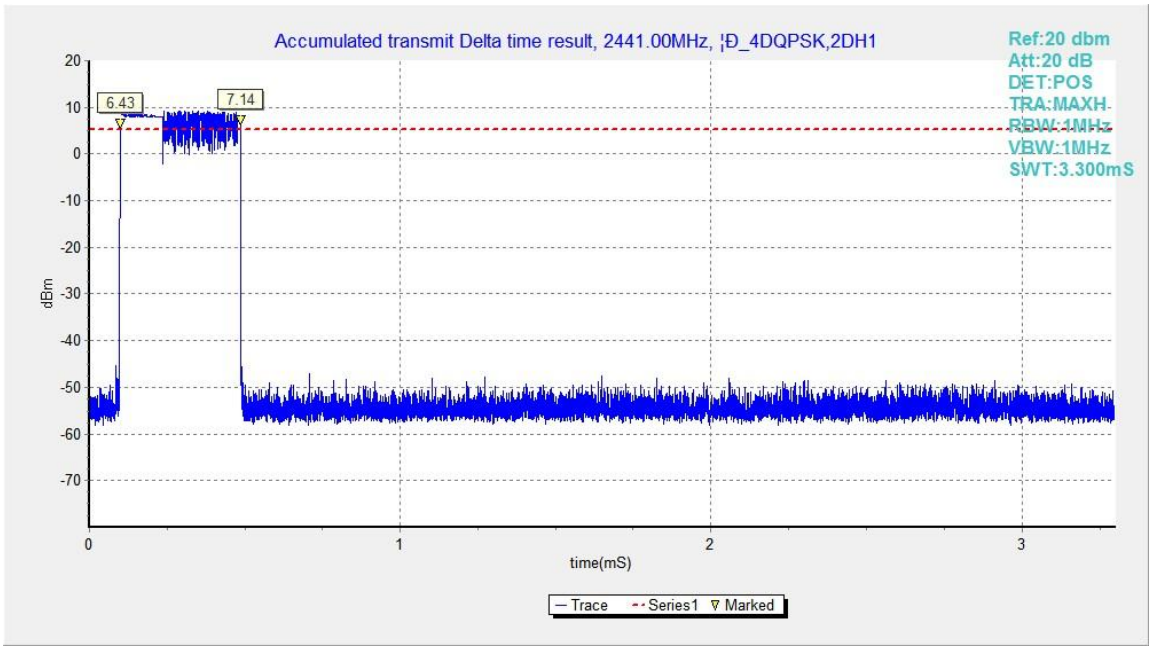


Fig.79. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

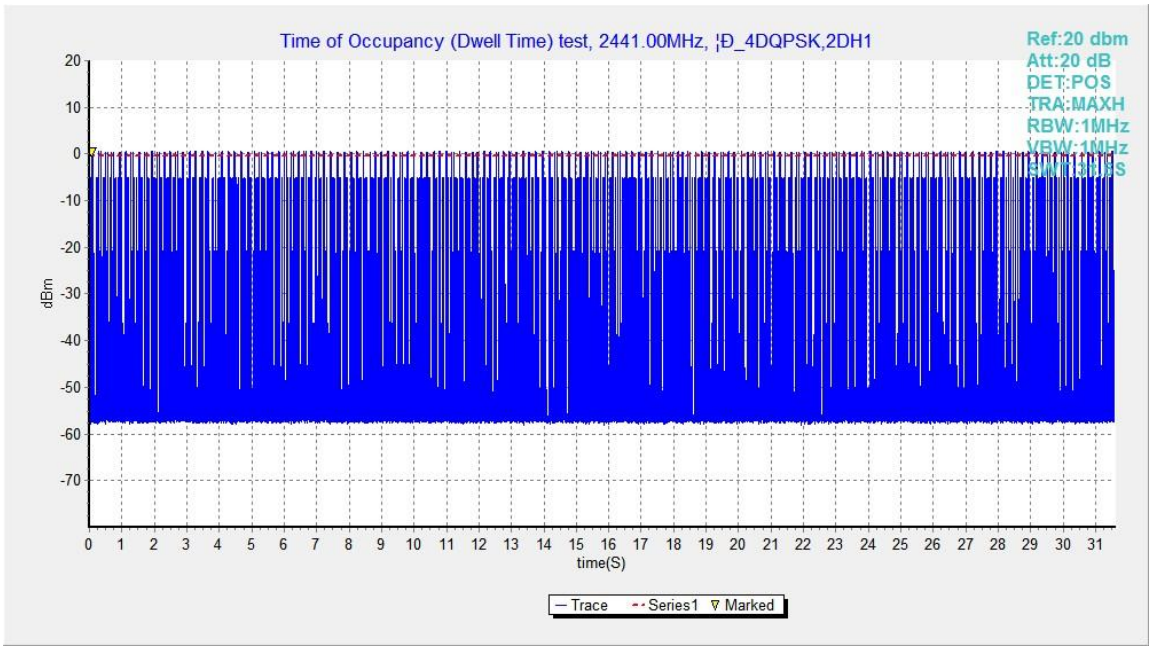


Fig.80. Number of Transmissions Measurement: Channel 39,Packet 2-DH1

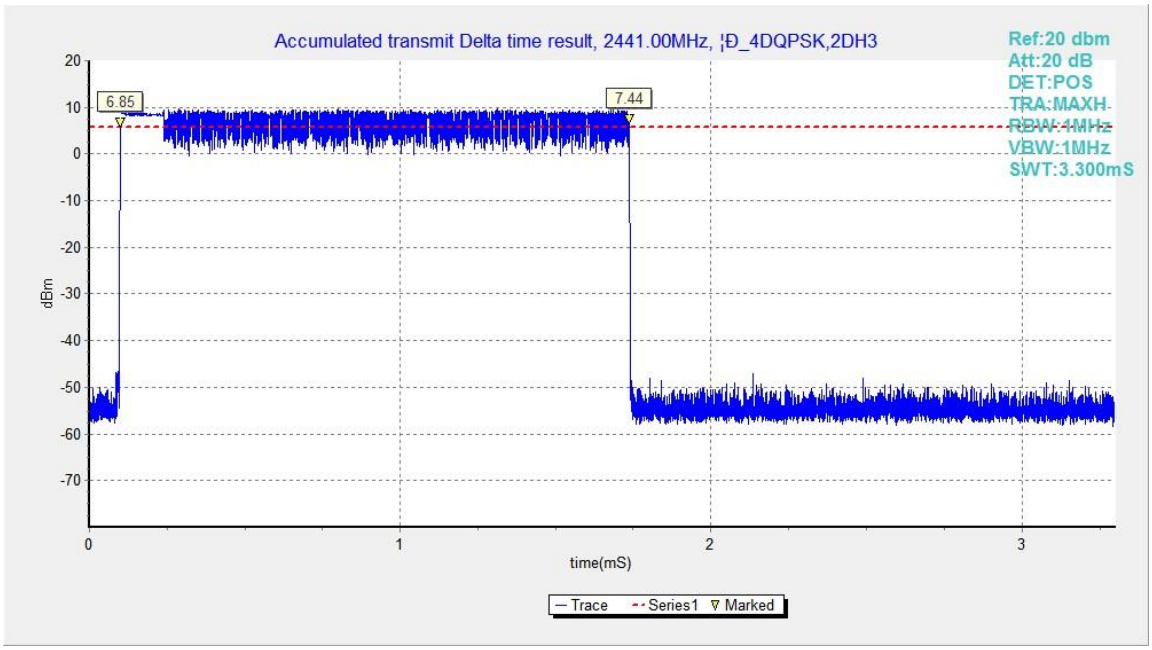


Fig.81. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3

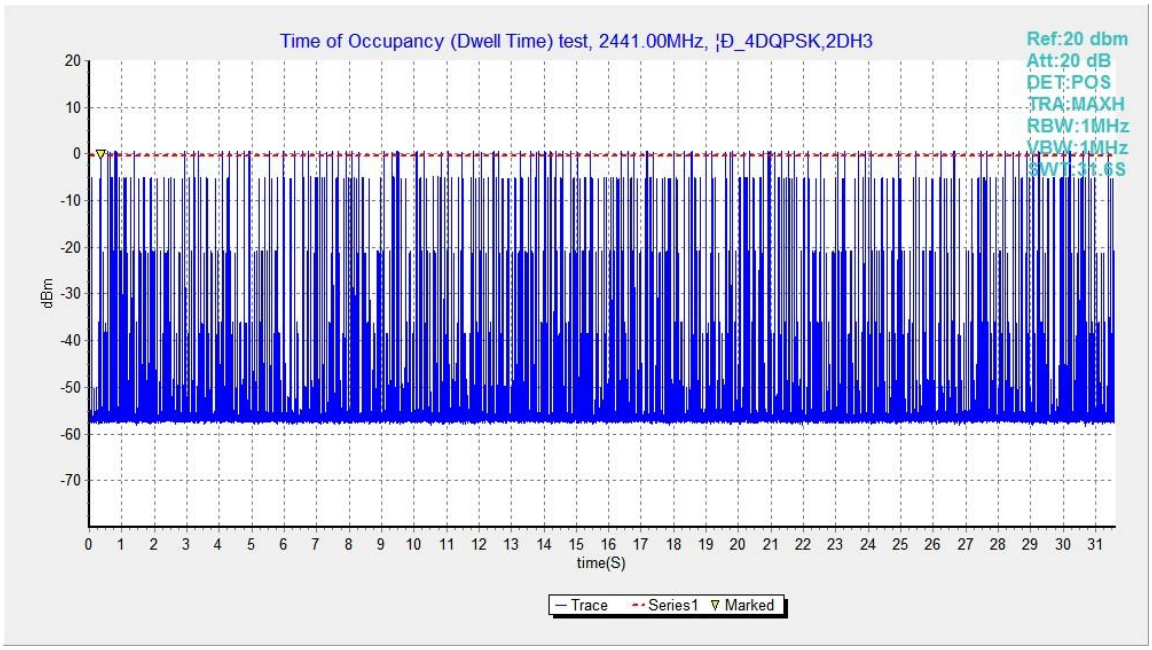


Fig.82. Number of Transmissions Measurement: Channel 39,Packet 2-DH3

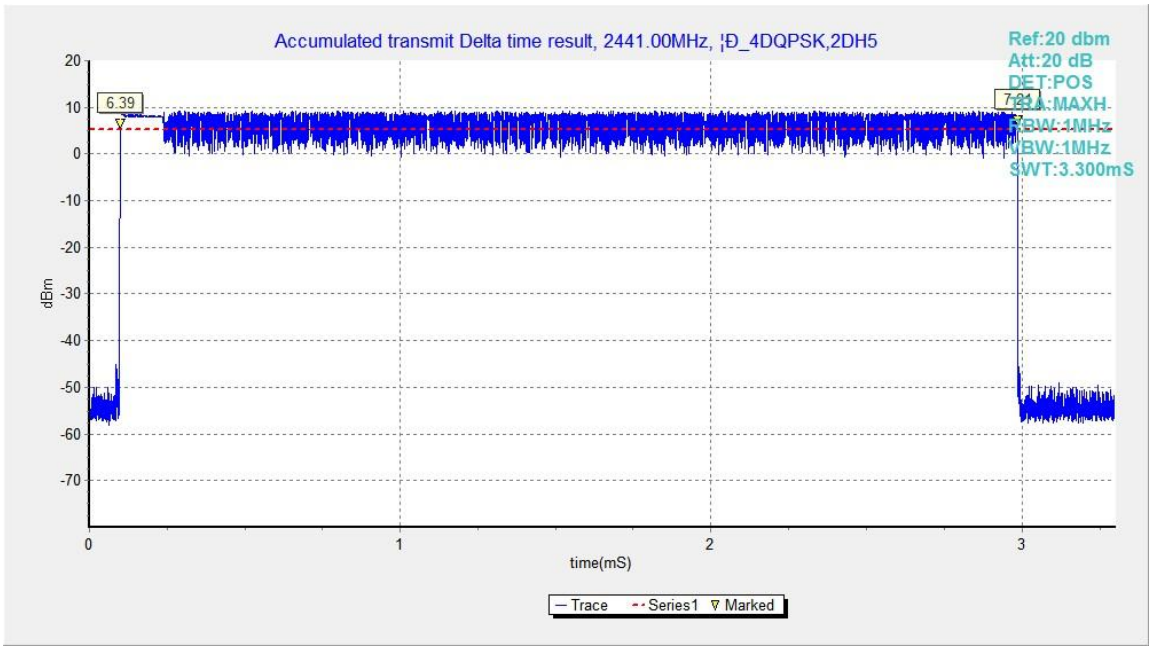


Fig.83. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

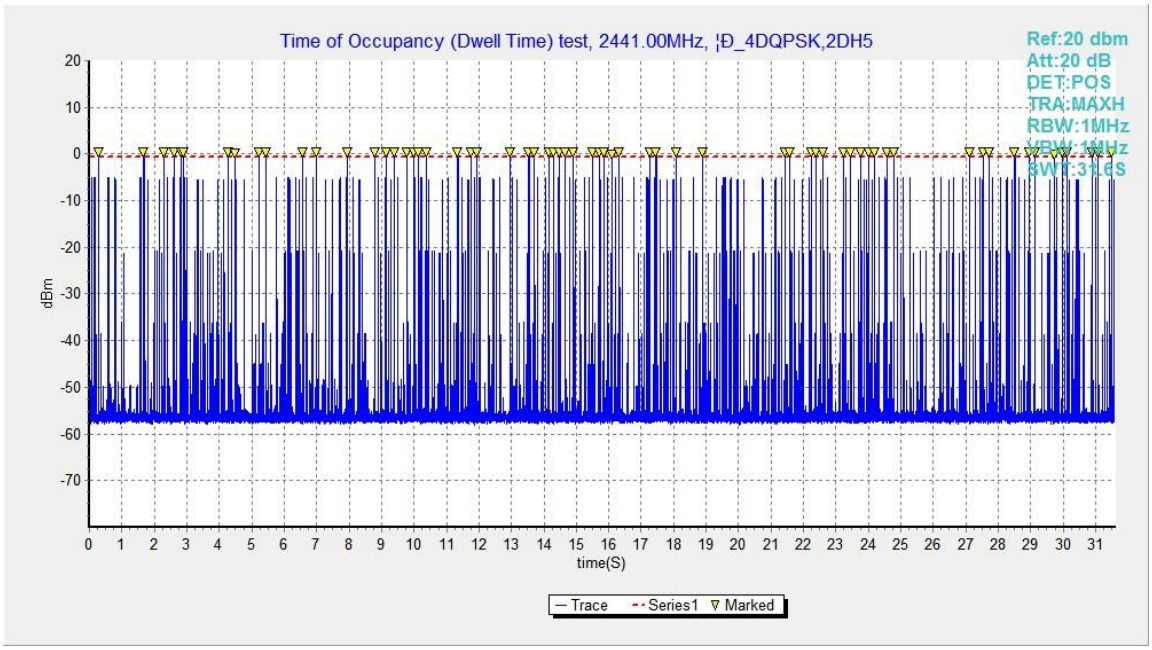


Fig.84. Number of Transmissions Measurement: Channel 39,Packet 2-DH5

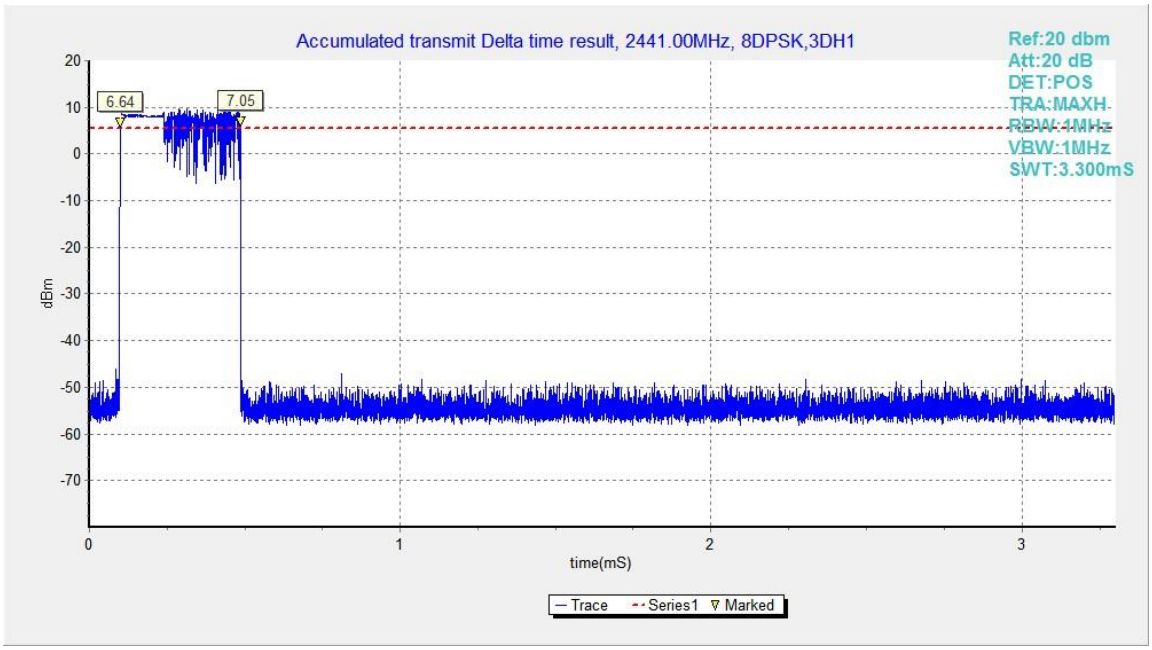


Fig.85. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1

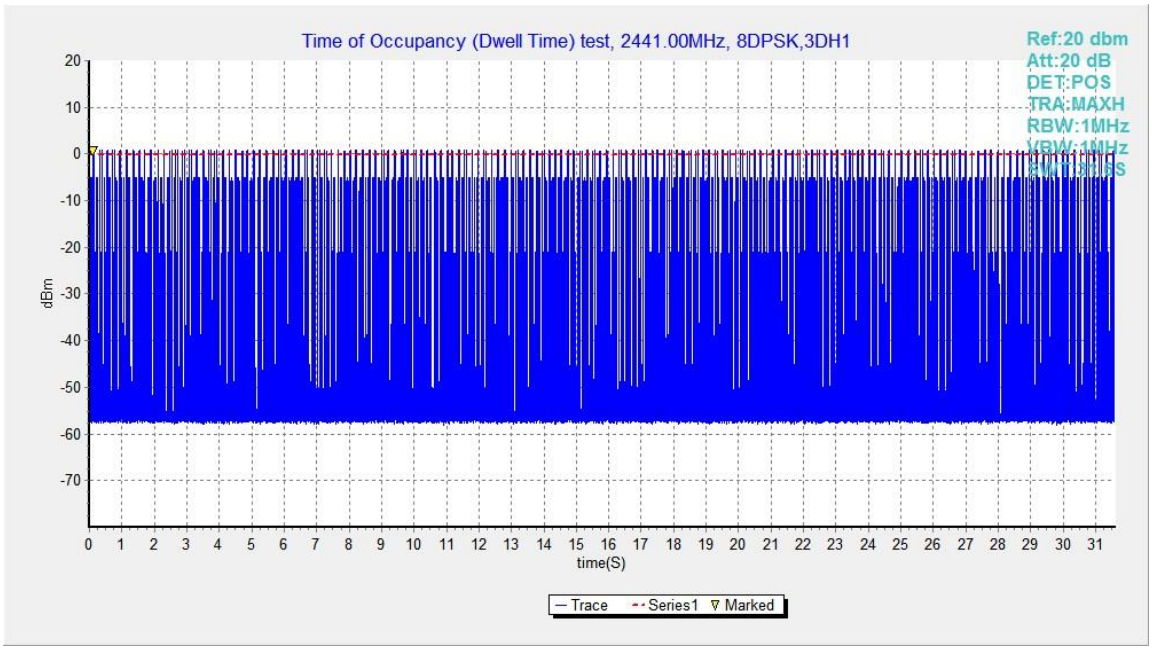


Fig.86. Number of Transmissions Measurement: Channel 39,Packet 3-DH1

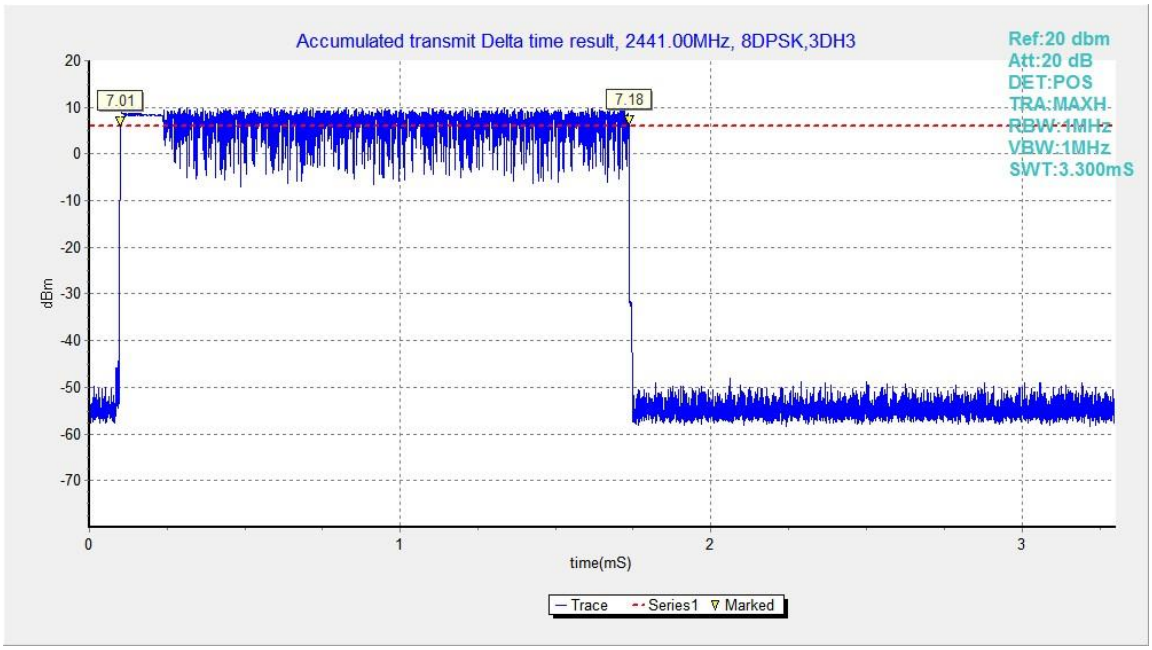


Fig.87. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

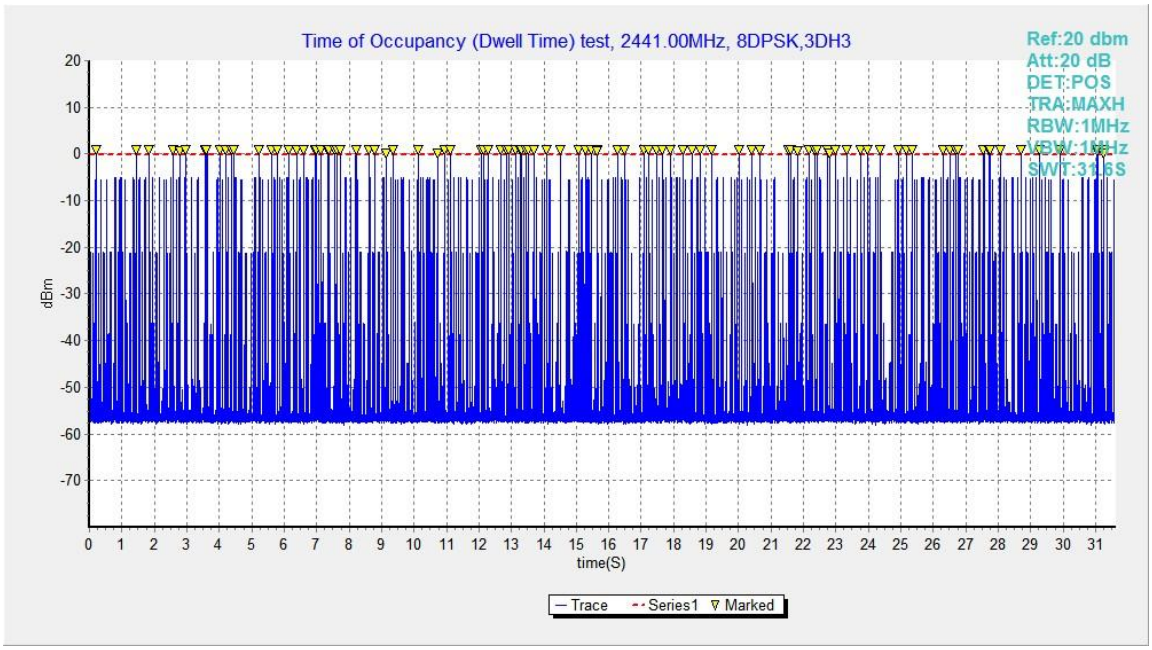


Fig.88. Number of Transmissions Measurement: Channel 39,Packet 3-DH3

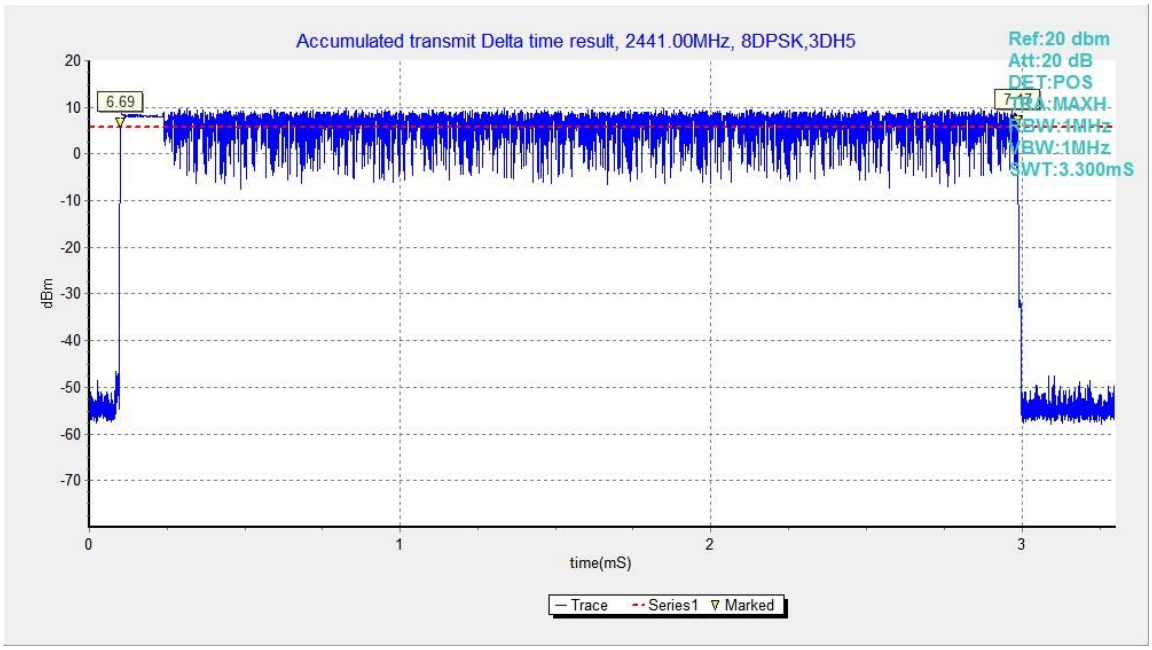


Fig.89. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

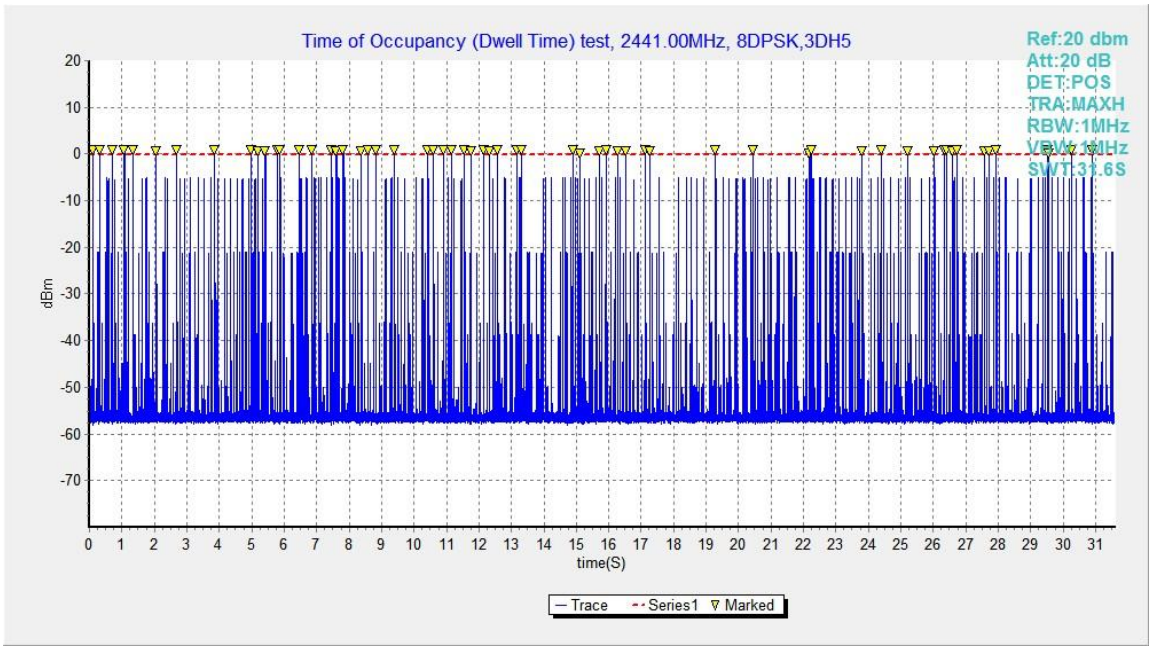


Fig.90. Number of Transmissions Measurement: Channel 39,Packet 3-DH5

B.8. 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.91	918.75	NA
39	Fig.92	923.25	NA
78	Fig.93	920.25	NA

For π/4 DQPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.94	1278.75	NA
39	Fig.95	1286.25	NA
78	Fig.96	1276.50	NA

For 8DPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.97	1281.00	NA
39	Fig.98	1297.50	NA
78	Fig.99	1299.00	NA

Conclusion: NA

Test graphs as below:

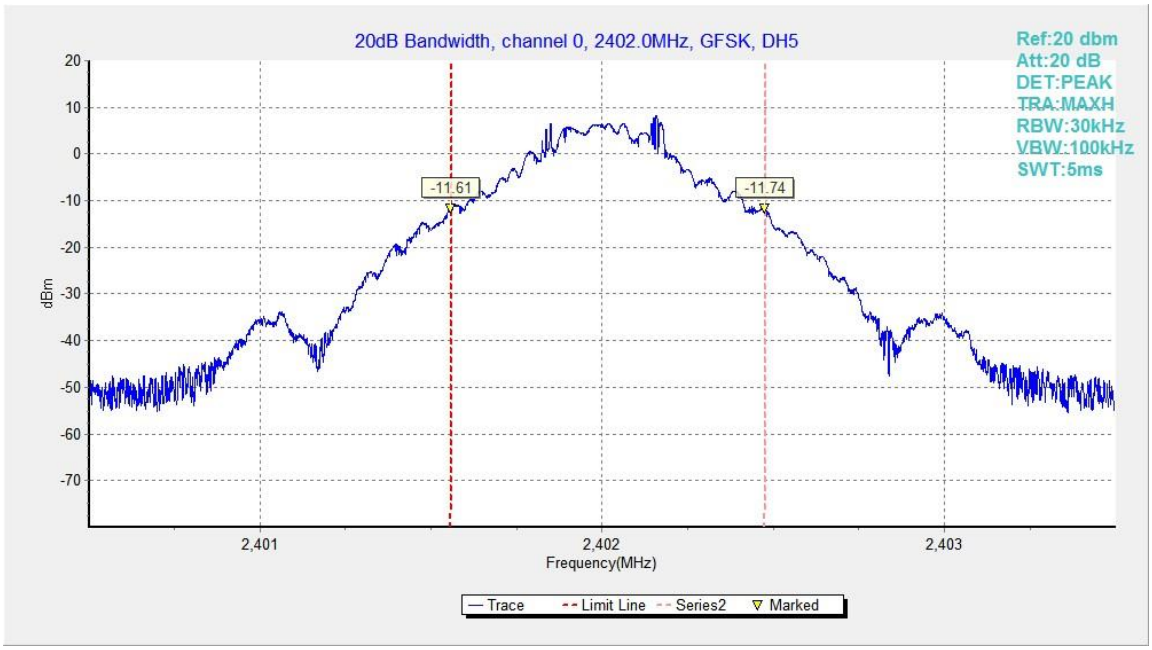


Fig.91. 20dB Bandwidth: GFSK, Channel 0

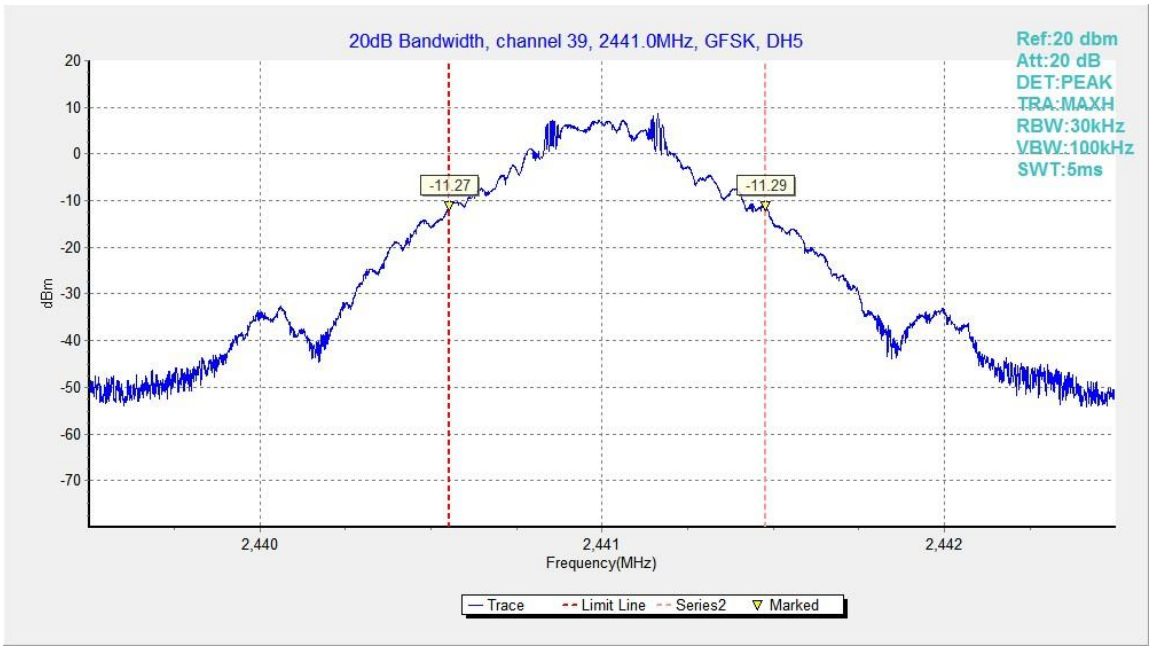


Fig.92. 20dB Bandwidth: GFSK, Channel 39

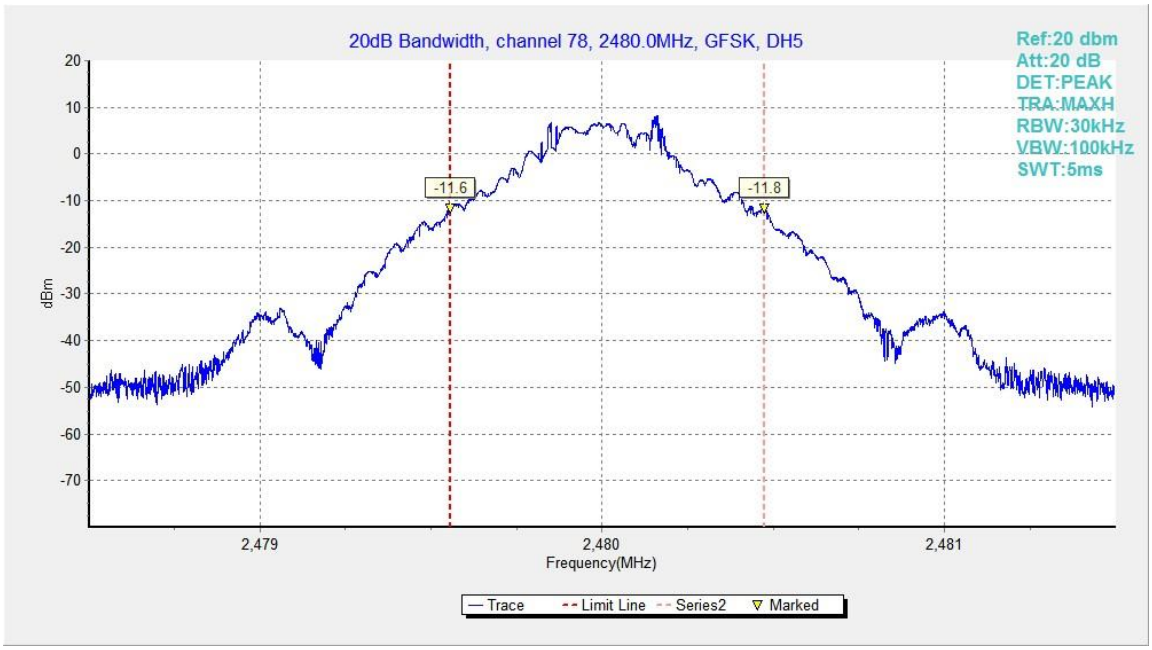


Fig.93. 20dB Bandwidth: GFSK, Channel 78

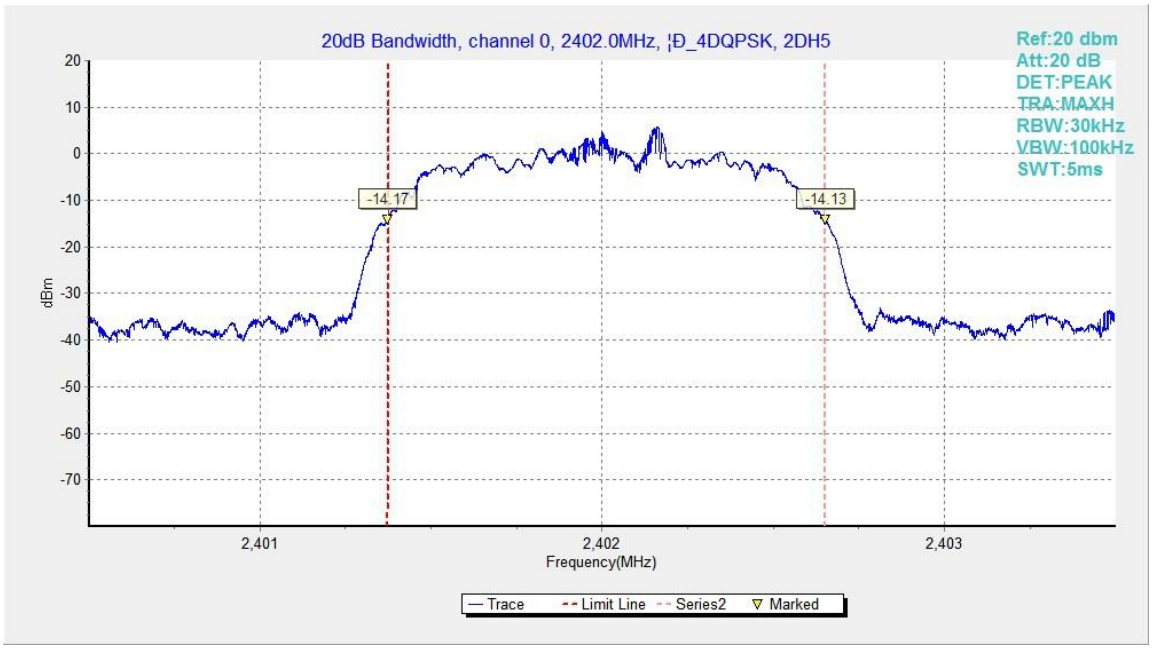


Fig.94. 20dB Bandwidth: π/4 DQPSK, Channel 0

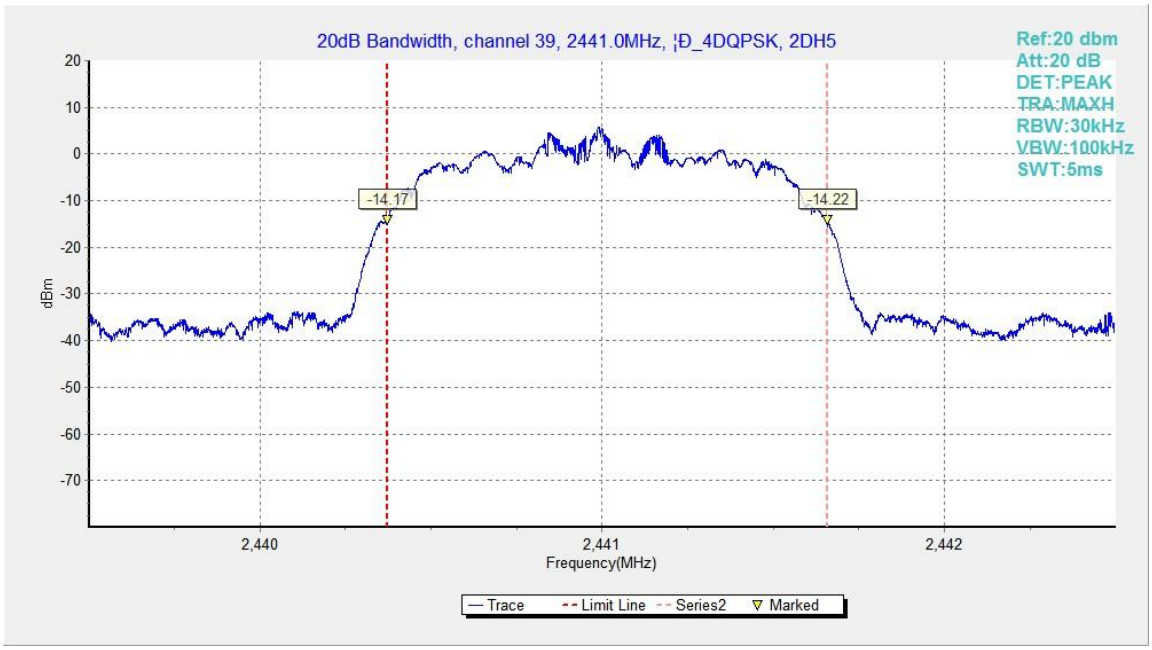


Fig.95. 20dB Bandwidth: π/4 DQPSK, Channel 39

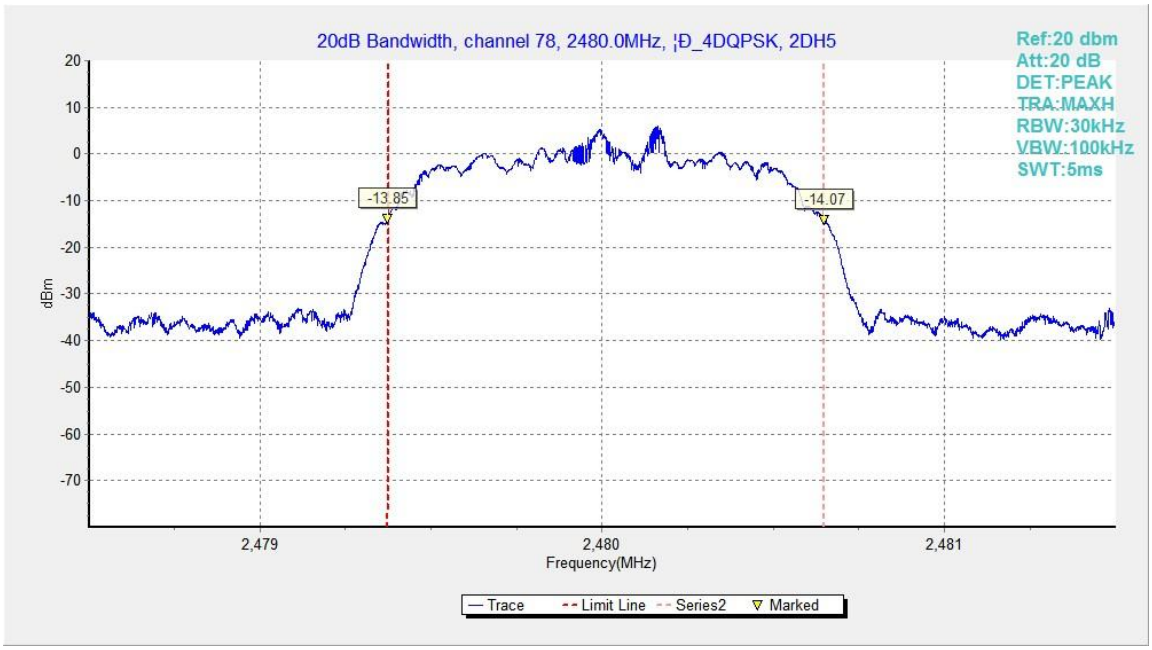


Fig.96. 20dB Bandwidth: π/4 DQPSK, Channel 78

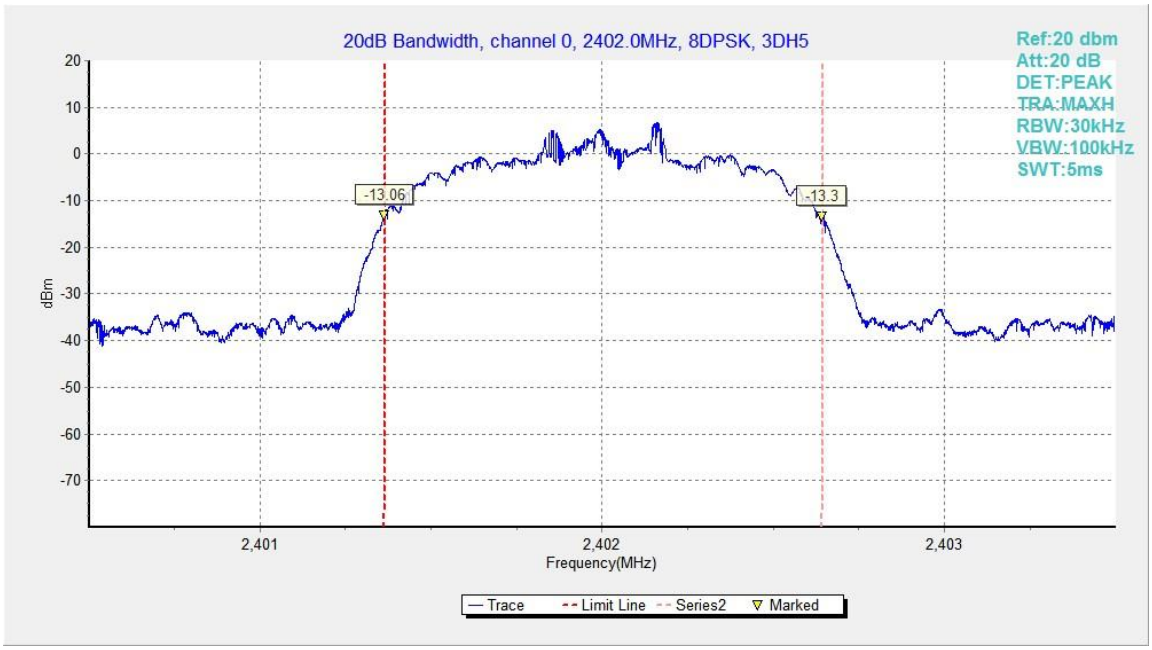


Fig.97. 20dB Bandwidth: 8DPSK, Channel 0

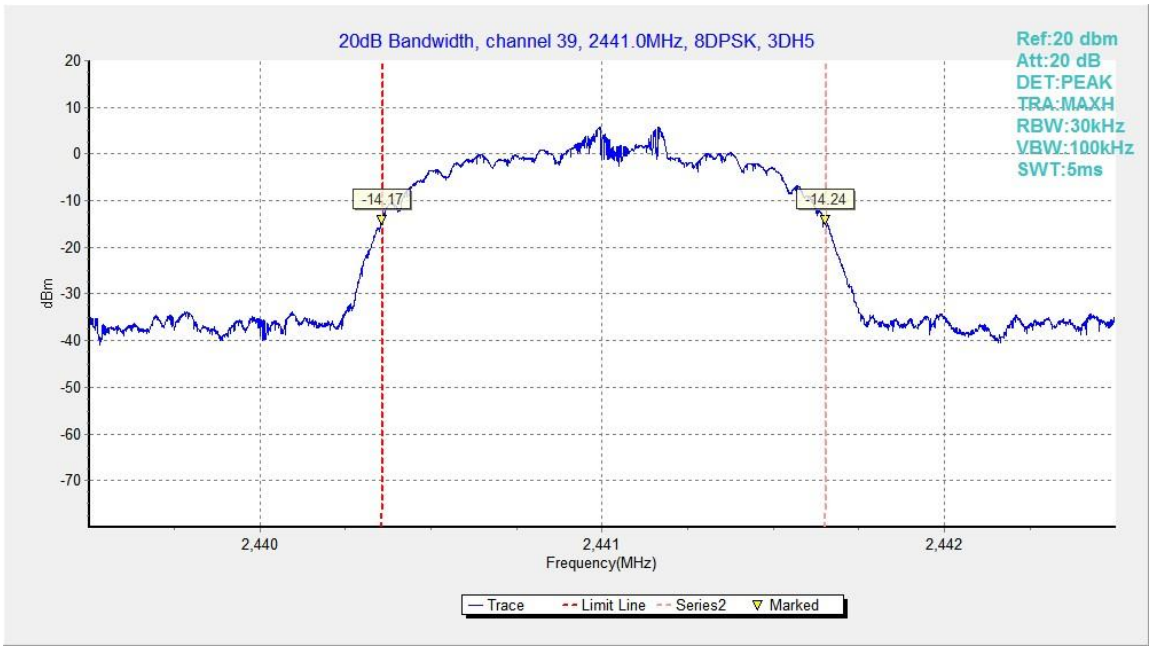


Fig.98. 20dB Bandwidth: 8DPSK, Channel 39

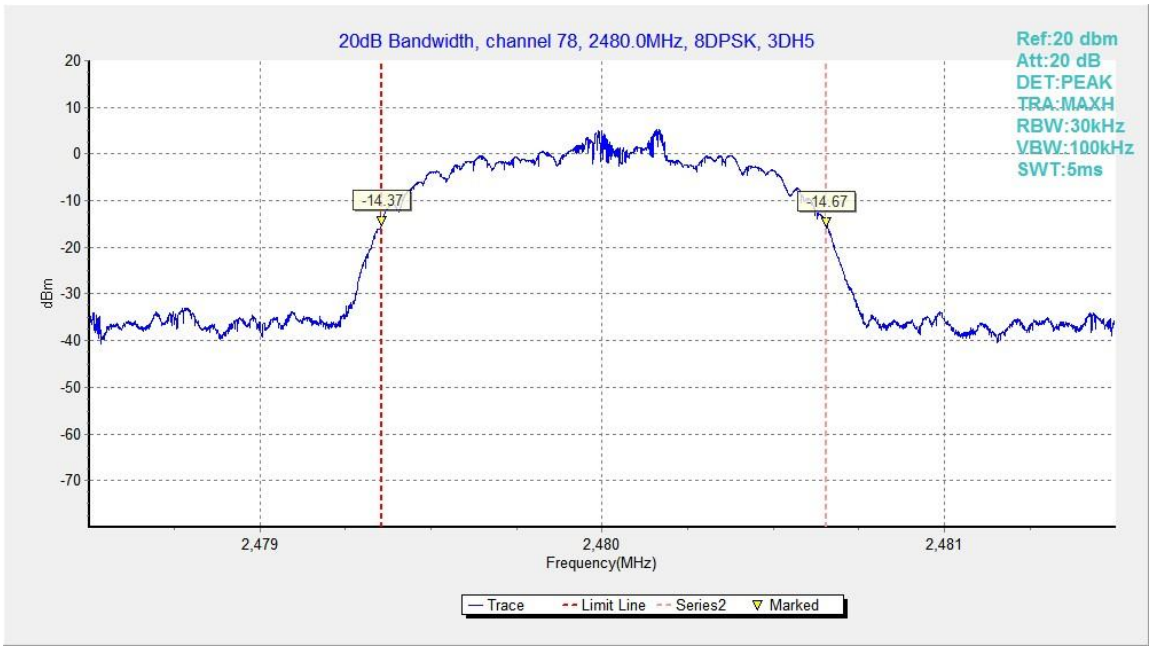


Fig.99. 20dB Bandwidth: 8DPSK, Channel 78

B.9. 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.100	1131.75	P

For π/4 DQPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.101	984.75	P

For 8DPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.102	1005.75	P

Conclusion: PASS

Test graphs as below:

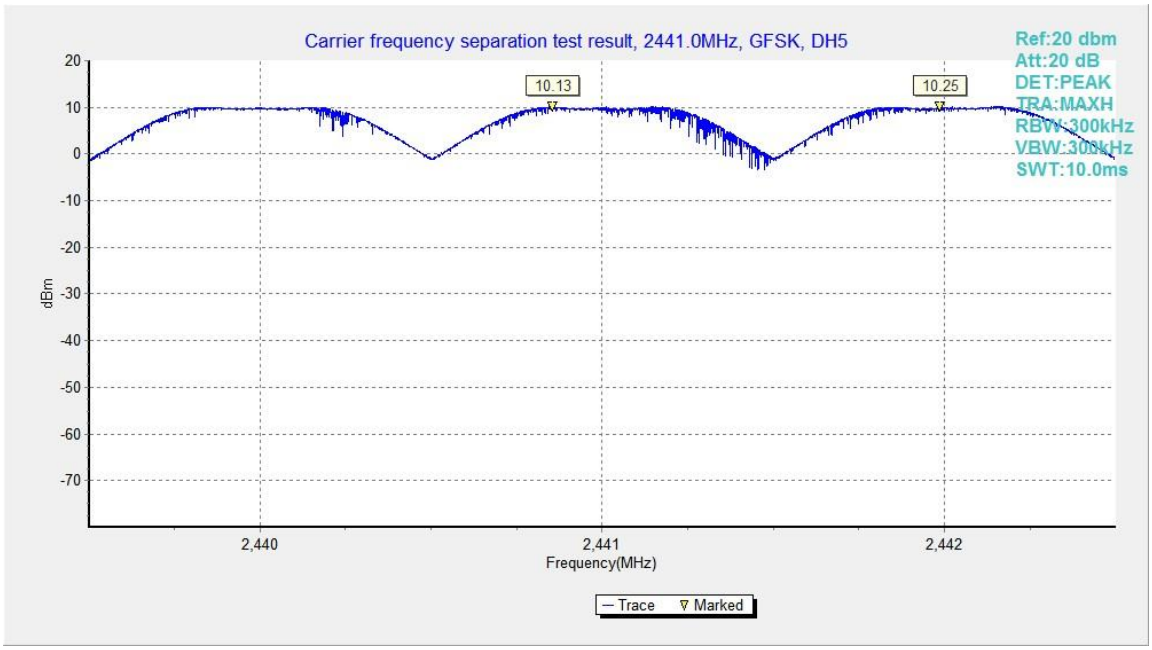


Fig.100. Carrier frequency separation measurement: GFSK, Channel 39

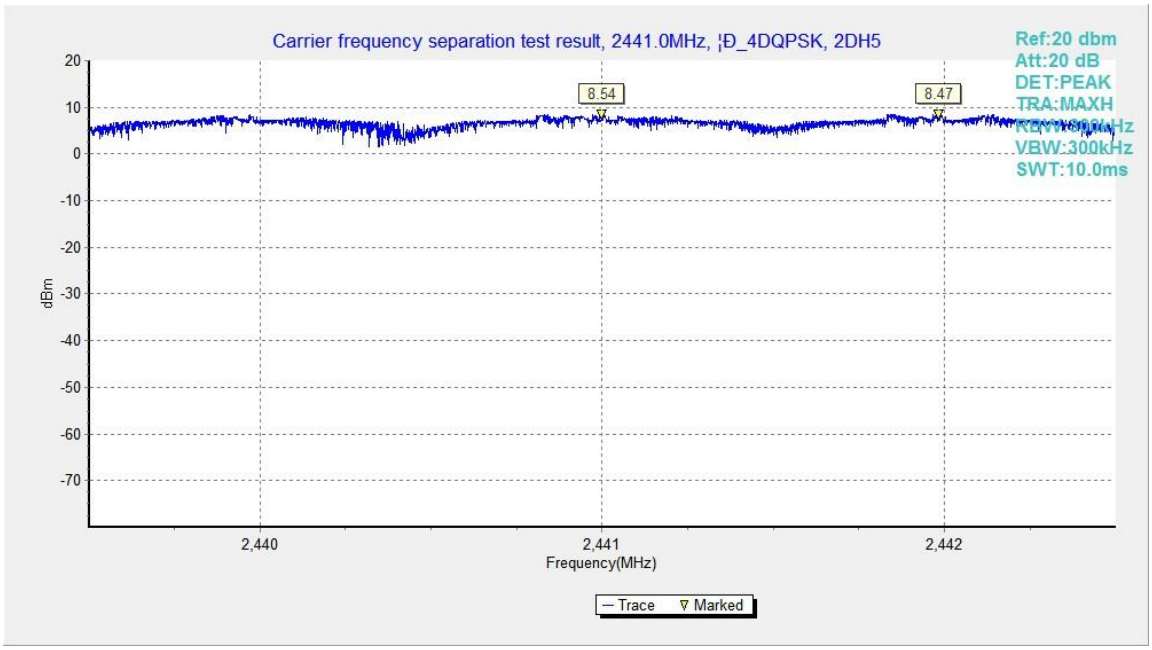


Fig.101. Carrier frequency separation measurement: π/4 DQPSK, Channel 39

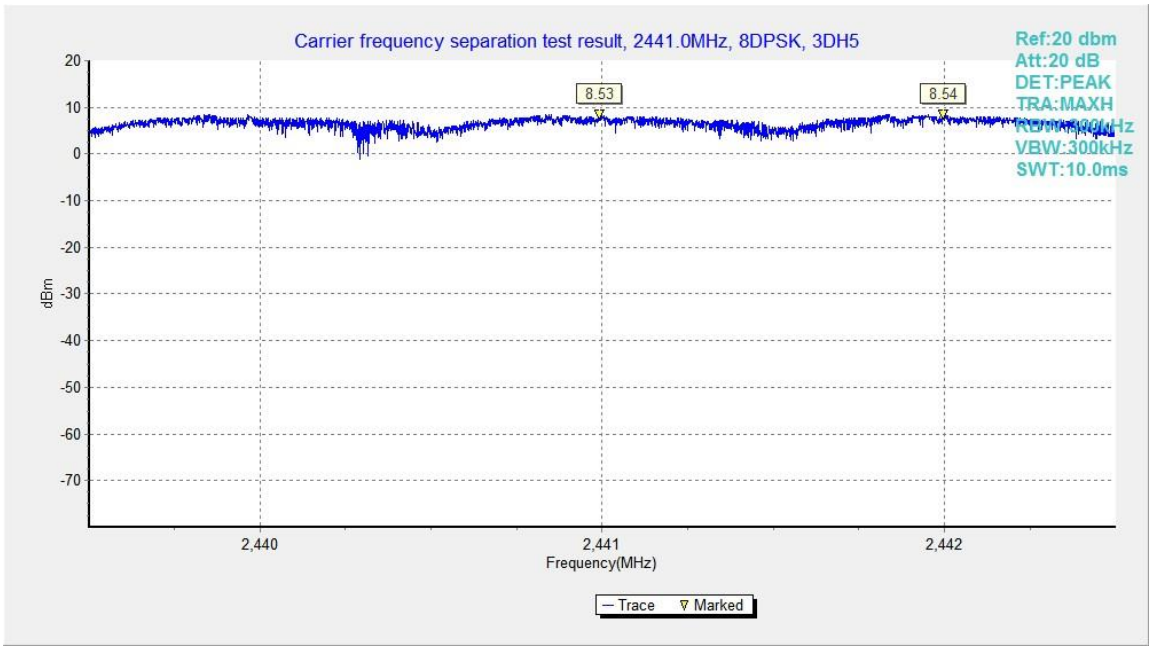


Fig.102. Carrier frequency separation measurement: 8DPSK, Channel 39

B.10. 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.103	79	P
40~78	Fig.104		

Forπ/4 DQPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.105	79	P
40~78	Fig.106		

For 8DPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.107	79	P
40~78	Fig.108		

Conclusion: PASS

Test graphs as below:

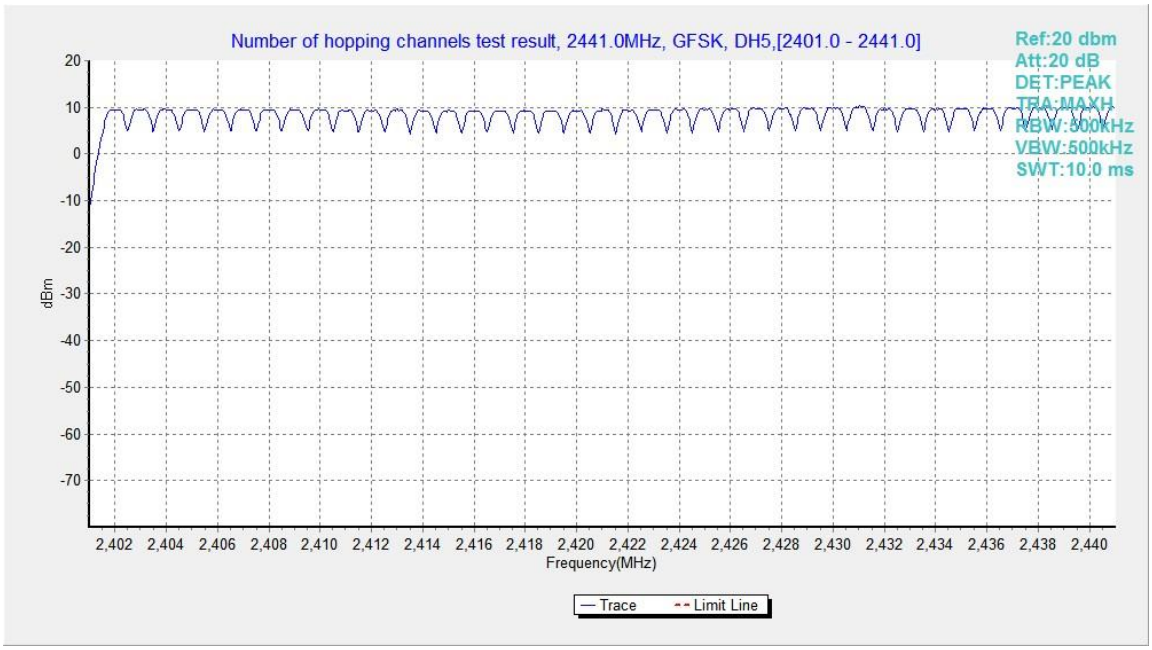


Fig.103. Number of hopping frequencies: GFSK, Channel 0 - 39

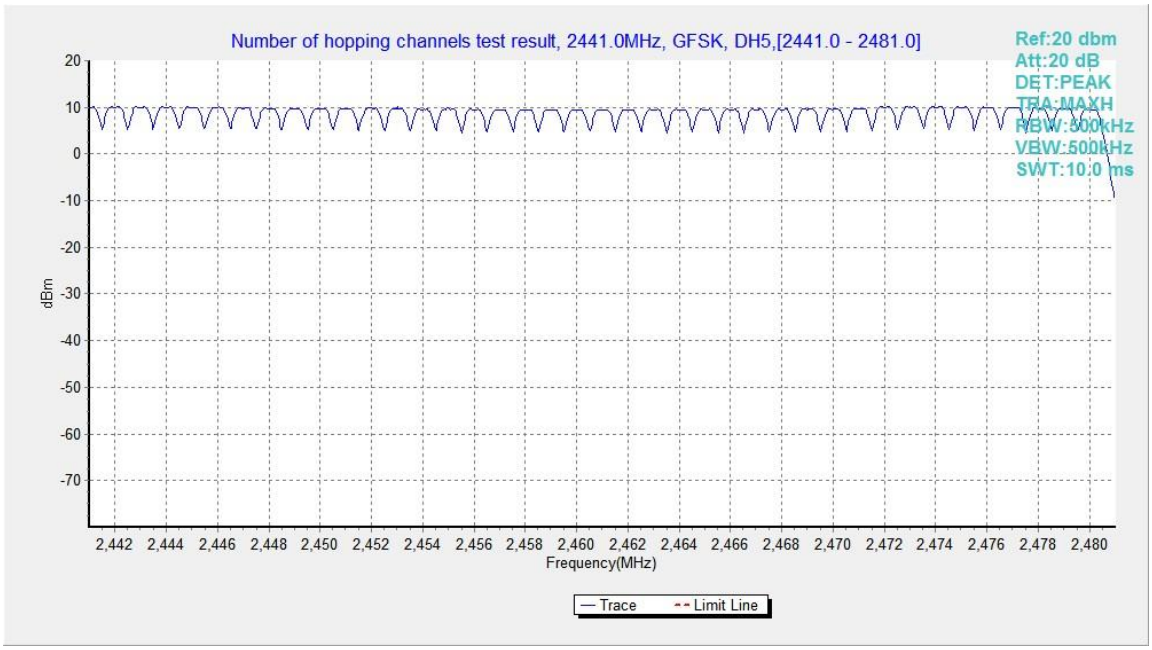


Fig.104. Number of hopping frequencies: GFSK, Channel 40 - 78

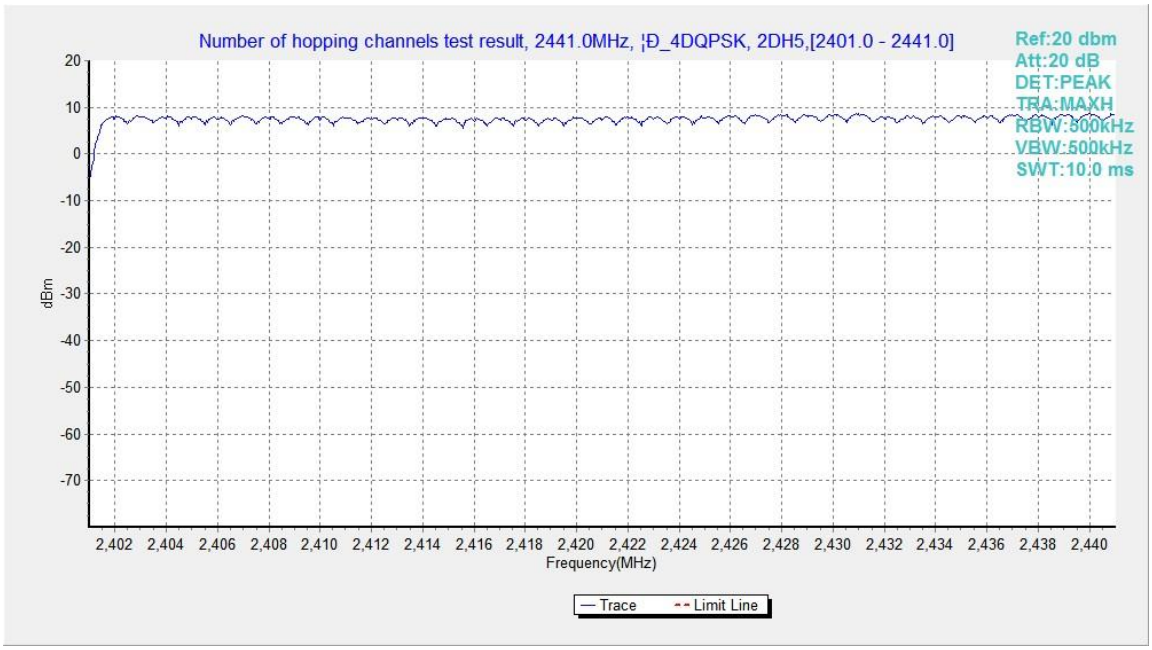


Fig.105. Number of hopping frequencies: π/4 DQPSK, Channel 0 - 39

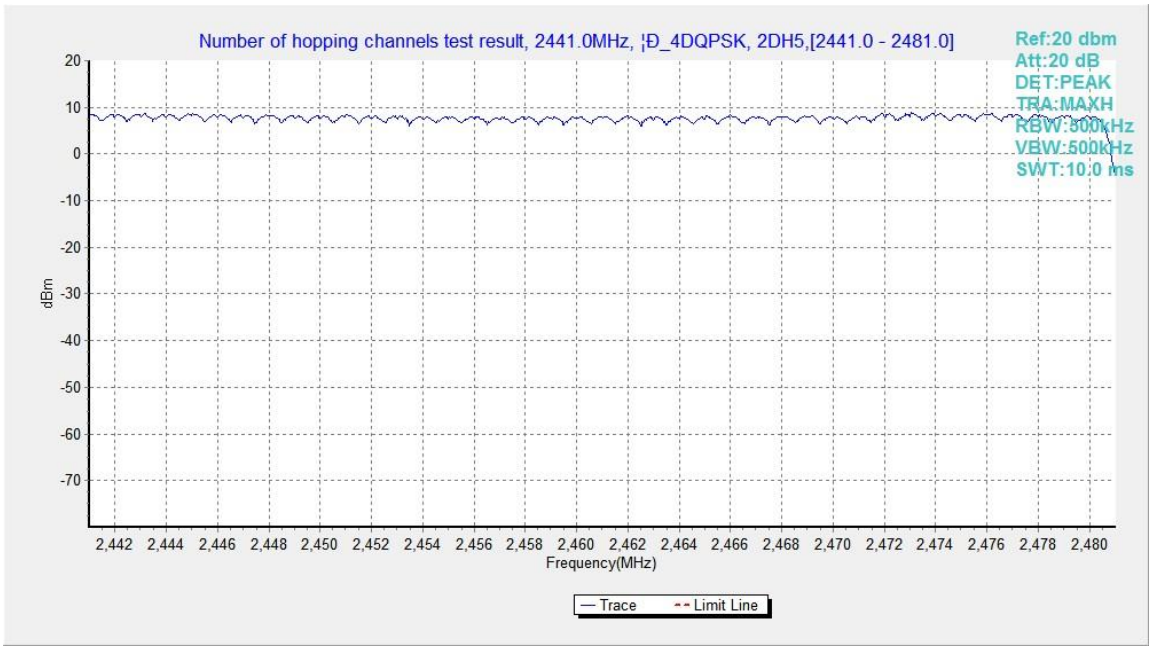


Fig.106. Number of hopping frequencies: π/4 DQPSK, Channel 40 - 78

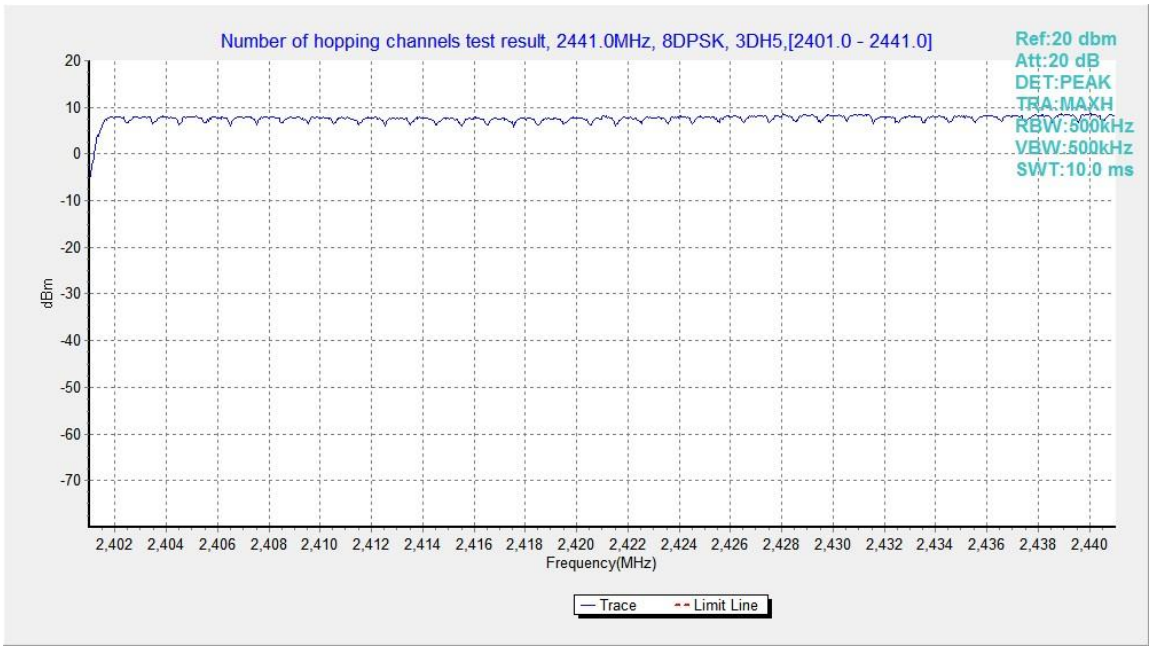


Fig.107. Number of hopping frequencies: 8DPSK, Channel 0 - 39

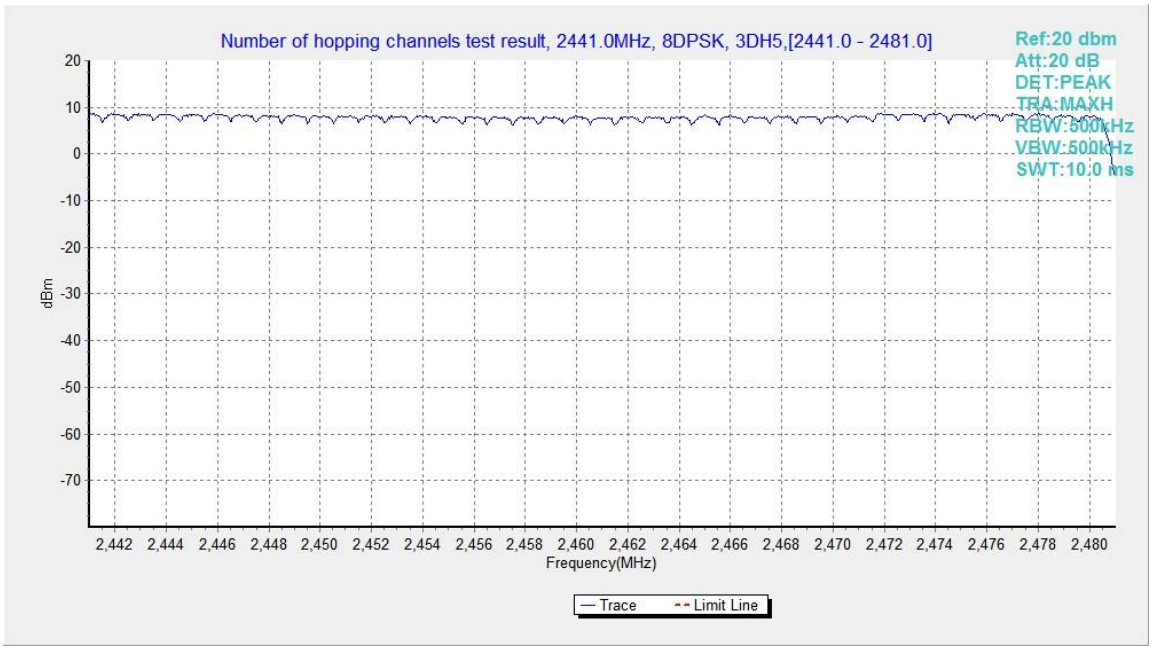


Fig.108. Number of hopping frequencies: 8DPSK, Channel 40 - 78

B.11. 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.

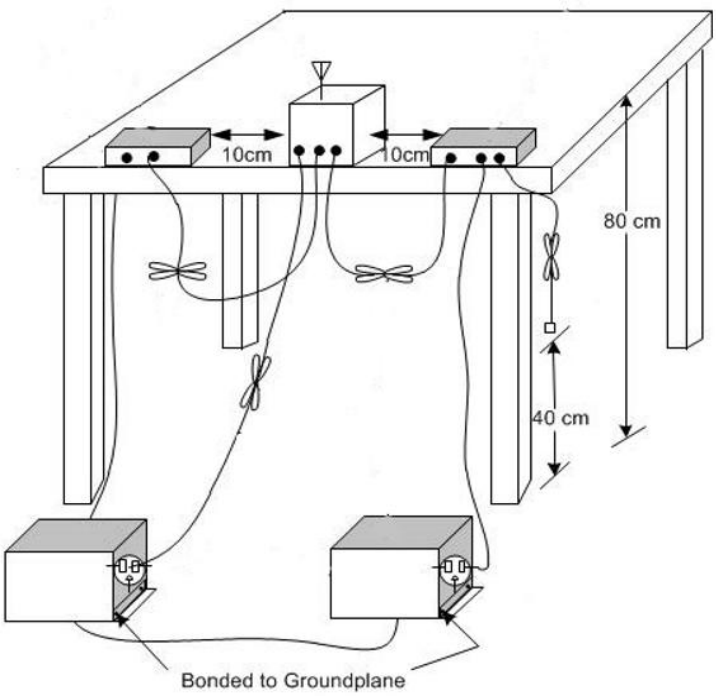
The measurement bandwidth is:

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

Test Condition:

Voltage（V）	Frequency（Hz）
120	60

Measurement Setup



Measurement Result and limit:

EUT ID: UT25a

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.11.1	Fig.B.11.2	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.11.1	Fig.B.11.2	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:

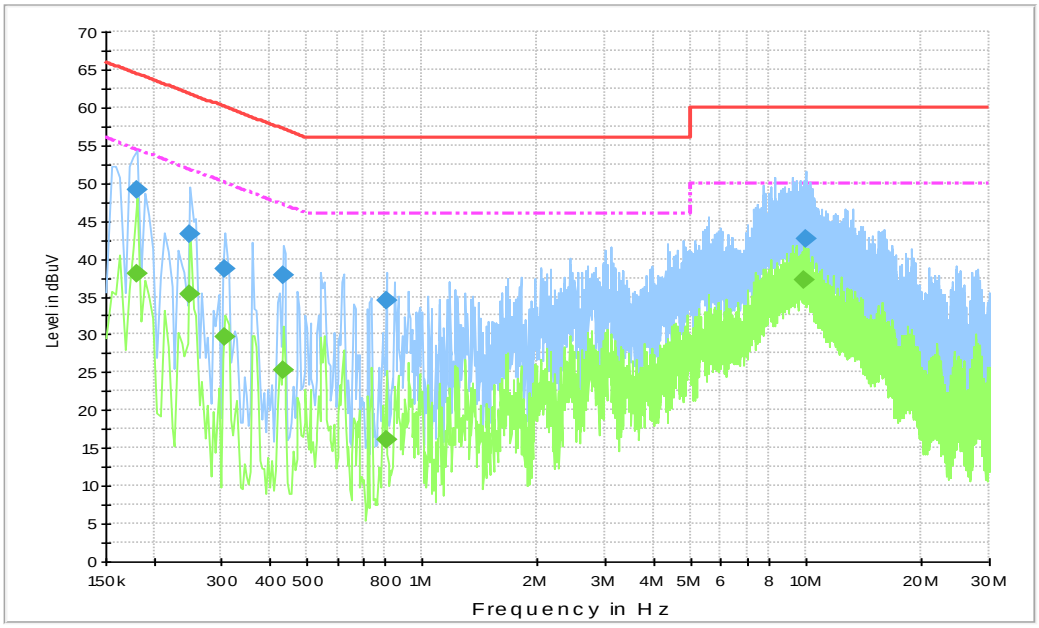


Fig.B.11.1 AC Powerline Conducted Emission- bluetooth

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 (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.181500	49.0	2000.0	9.000	On	L1	22.7	15.4	64.4
0.249000	43.2	2000.0	9.000	On	L1	19.7	18.5	61.8
0.307500	38.7	2000.0	9.000	On	L1	19.7	21.3	60.0
0.433500	37.8	2000.0	9.000	On	L1	19.8	19.4	57.2
0.807000	34.4	2000.0	9.000	On	L1	19.7	21.6	56.0
9.937500	42.5	2000.0	9.000	On	L1	19.7	17.5	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.181500	38.0	2000.0	9.000	On	L1	22.7	16.5	54.4
0.249000	35.2	2000.0	9.000	On	N	19.7	16.6	51.8
0.307500	29.6	2000.0	9.000	On	L1	19.7	20.4	50.0
0.433500	25.2	2000.0	9.000	On	N	19.8	22.0	47.2
0.811500	16.0	2000.0	9.000	On	L1	19.7	30.0	46.0
9.901500	37.3	2000.0	9.000	On	N	19.7	12.7	50.0

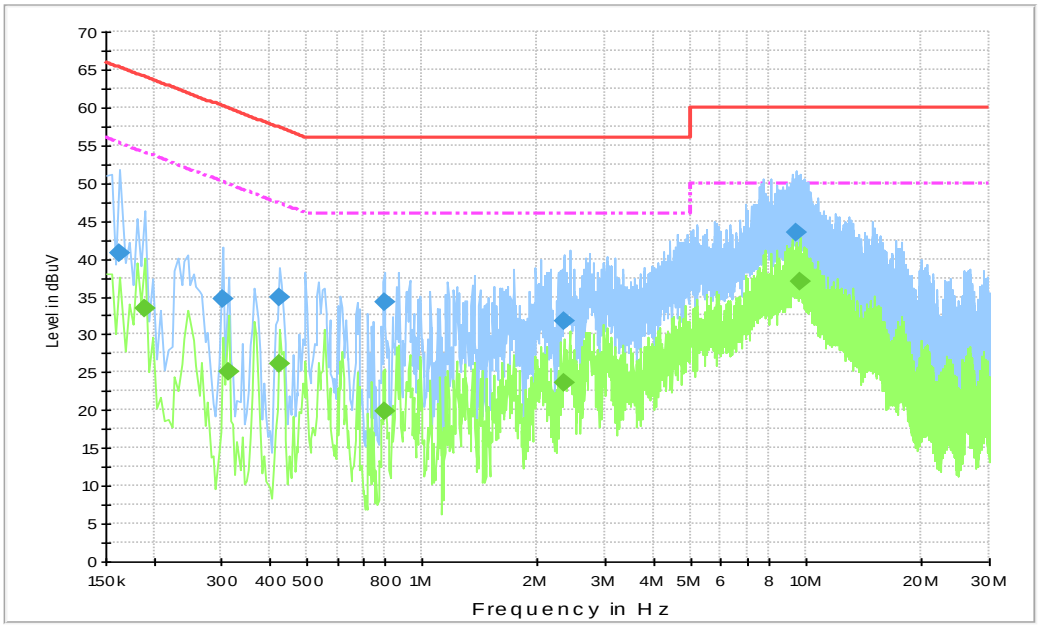


Fig.B.11.2 AC Powerline Conducted Emission-Idle

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 (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	40.8	2000.0	9.000	On	L1	26.0	24.5	65.3
0.303000	34.7	2000.0	9.000	On	N	19.7	25.5	60.2
0.424500	34.8	2000.0	9.000	On	N	19.8	22.5	57.4
0.798000	34.3	2000.0	9.000	On	L1	19.7	21.7	56.0
2.332500	31.7	2000.0	9.000	On	L1	19.6	24.3	56.0
9.415500	43.5	2000.0	9.000	On	L1	19.8	16.5	60.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.190500	33.5	2000.0	9.000	On	N	21.2	20.5	54.0
0.312000	25.1	2000.0	9.000	On	N	19.7	24.8	49.9
0.424500	26.0	2000.0	9.000	On	N	19.8	21.3	47.4
0.798000	19.9	2000.0	9.000	On	N	19.7	26.1	46.0
2.332500	23.5	2000.0	9.000	On	L1	19.6	22.5	46.0
9.645000	36.9	2000.0	9.000	On	L1	19.8	13.1	50.0

B.12. Duty cycle

Method of Measurement:

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

- Span = zero span
- RBW = 100kHz
- VBW ≥ RBW
- Sweep = single sweep
- Detector function = peak

Measurement Results:

Channel	Modulation	Duty cycle	
39	GFSK	Fig.109	0.77
	π/4 DQPSK	Fig.110	0.77
	8DPSK	Fig.111	0.77

See test graphs as following.

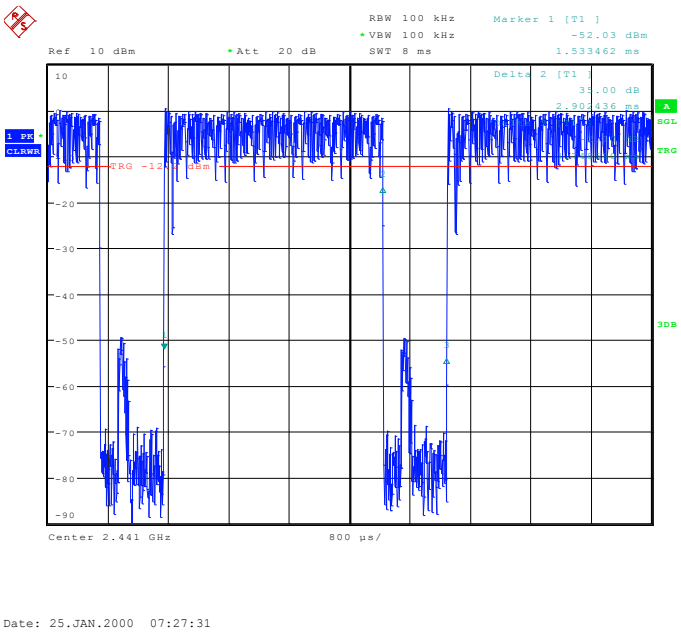


Fig. 109 Duty cycle: GFSK Channel 39

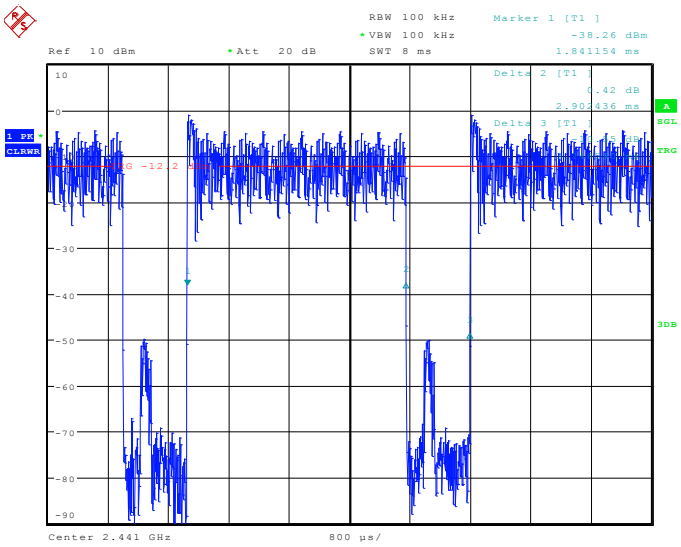


Fig. 110 Duty cycle:π/4 DQPSK Channel 39

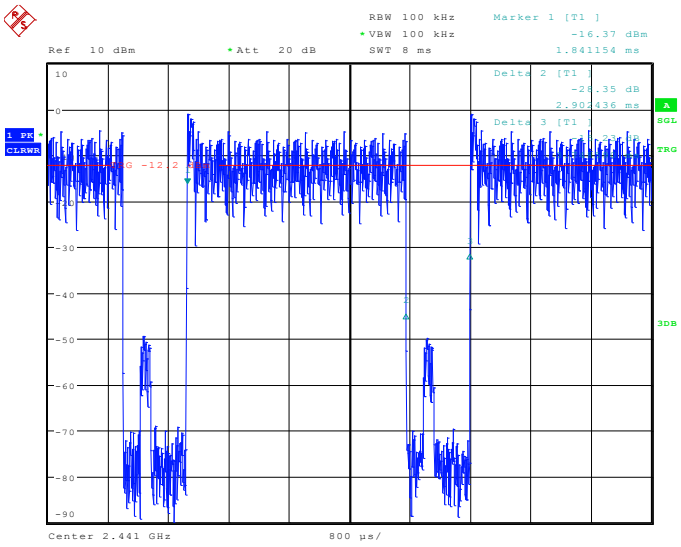


Fig. 111 Duty cycle: 8DPSK Channel 39

B.13. 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.

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*****