

Fig.54. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz

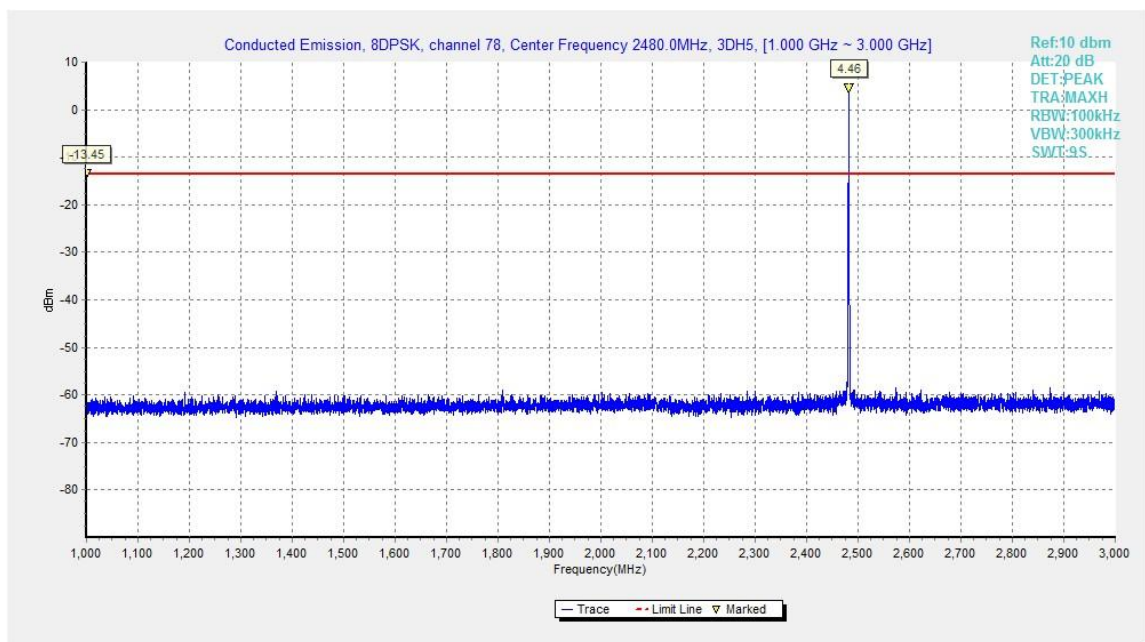


Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

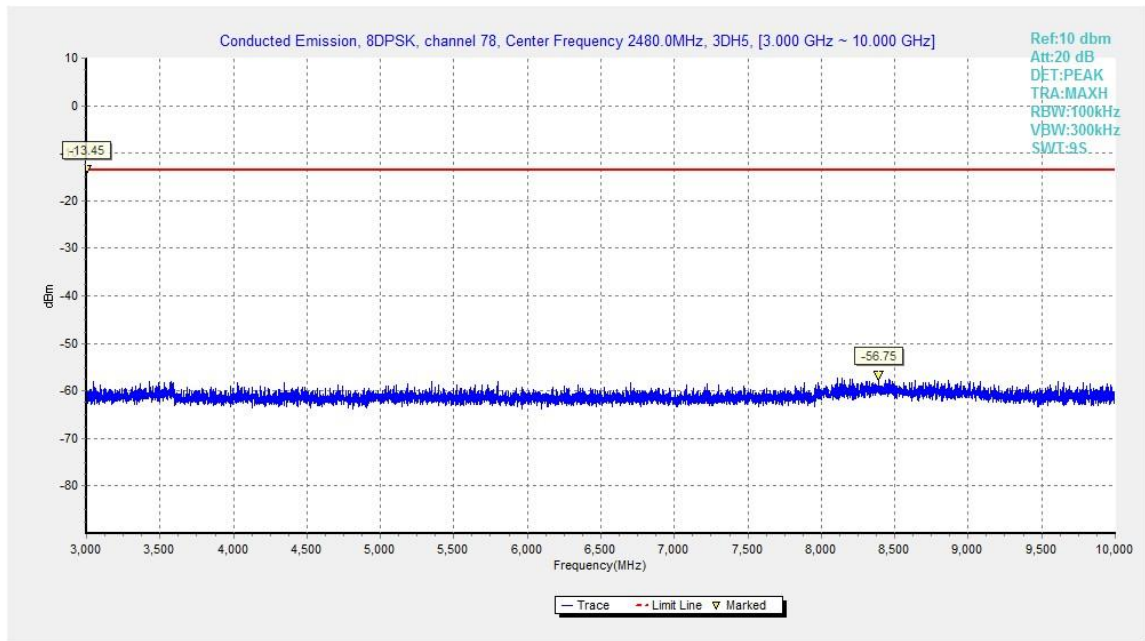


Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

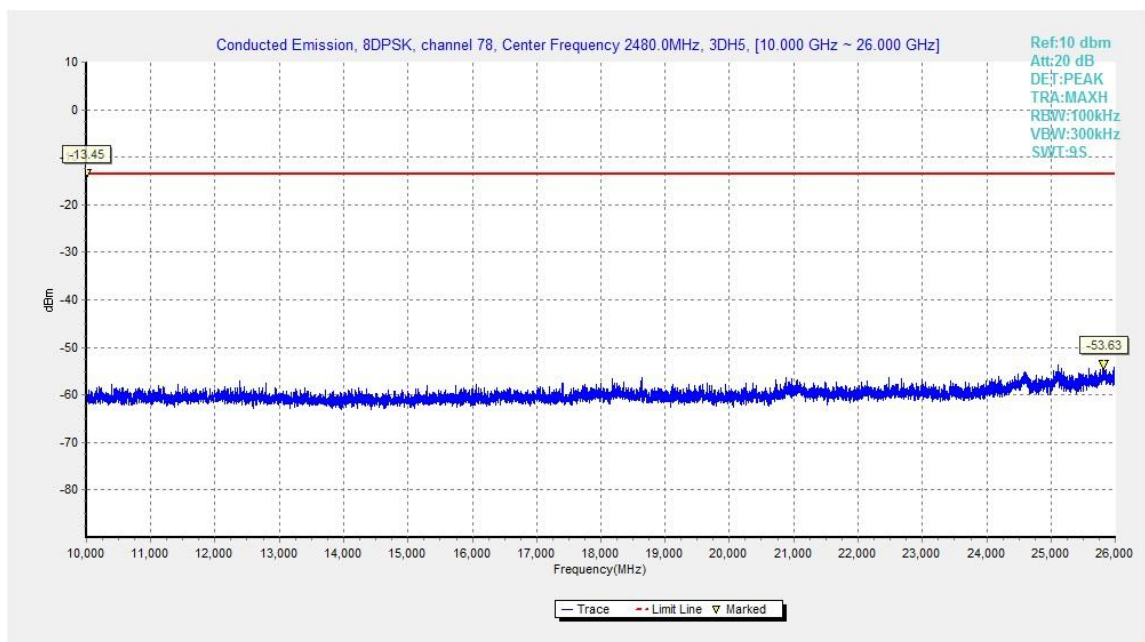


Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

A.5. Transmitter Spurious Emission - Radiated

Measurement Limit:

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

In addition, 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)).

The measurement is made according to ANSI C63.10

Limit in restricted band:

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

Test Condition

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
30-1000	100KHz/300KHz	5
1000-4000	1MHz/1MHz	15
4000-18000	1MHz/1MHz	40
18000-26500	1MHz/1MHz	20

Measurement Results:

$$\text{Result} = P_{\text{Mea}} + \text{ARPL}$$

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	1 GHz ~ 3 GHz	/	P
	3 GHz ~ 18 GHz	/	P
Ch 39 2441 MHz	9 kHz ~ 30 MHz	/	P
	30 MHz ~ 1 GHz	/	P
	1 GHz ~ 3 GHz	/	P
	3 GHz ~ 18 GHz	/	P
Ch 78 2480 MHz	1 GHz ~ 3 GHz	/	P
	3 GHz ~ 18 GHz	/	P
Power	2.38GHz~2.4GHz---L	Fig.58	P
Power	2.45GHz~2.5GHz---H	Fig.59	P

For all channels	18 GHz ~ 26 GHz	/	P
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For $\pi/4$ DQPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	1 GHz ~ 3 GHz	/	P
	3 GHz ~ 18 GHz	/	P
Ch 39 2441 MHz	30 MHz ~ 1 GHz	/	P
	1 GHz ~ 3 GHz	/	P
	3 GHz ~ 18 GHz	/	P
Ch 78 2480 MHz	1 GHz ~ 3 GHz	/	P
	3 GHz ~ 18 GHz	/	P
Power	2.38GHz~2.4GHz---L	Fig.60	P
Power	2.45GHz~2.5GHz---H	Fig.61	P
For all channels	18 GHz ~ 26 GHz	/	P

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	1 GHz ~ 3 GHz	/	P
	3 GHz ~ 18 GHz	/	P
Ch 39 2441 MHz	30 MHz ~ 1 GHz	/	P
	1 GHz ~ 3 GHz	/	P
	3 GHz ~ 18 GHz	/	P
Ch 78 2480 MHz	1 GHz ~ 3 GHz	/	P
	3 GHz ~ 18 GHz	/	P
Power	2.38GHz~2.4GHz---L	Fig.62	P
Power	2.45GHz~2.5GHz---H	Fig.63	P
For all channels	18 GHz ~ 26 GHz	/	P

GFSK Ch 0 - Average

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2389.700	46.40	2.9	32.0	11.55	54.0	7.6	H	155	25
2390.000	46.35	2.9	32.0	11.50	54.0	7.7	H	155	49
4804.500	34.12	-32.8	34.5	32.47	54.0	19.9	H	155	4
7206.000	38.96	-31.6	36.1	34.49	54.0	15.0	H	155	6
9607.500	39.00	-30.0	37.0	32.05	54.0	15.0	H	155	25
12010.500	42.09	-29.8	39.3	32.62	54.0	11.9	H	155	186

GFSK Ch 39 - Average

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2388.900	46.47	2.9	32.0	11.61	54.0	7.5	H	155	5
2390.000	46.41	2.9	32.0	11.56	54.0	7.6	H	155	25
4882.500	36.00	-32.7	34.5	34.22	54.0	18.0	H	155	356
7323.000	39.62	-31.9	36.1	35.46	54.0	14.4	H	155	350
9763.500	38.41	-30.6	37.2	31.79	54.0	15.6	H	155	185
12205.500	42.32	-29.4	39.2	32.53	54.0	11.7	H	155	187

GFSK Ch 78 - Average

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.500	48.21	2.9	32.8	12.52	54.0	5.8	H	155	20
2483.700	47.90	2.9	32.8	12.21	54.0	6.1	H	155	18
4960.500	36.71	-33.4	34.5	35.58	54.0	17.3	H	155	90
7440.000	39.47	-31.8	36.0	35.21	54.0	14.5	H	155	114
9919.500	40.27	-29.9	37.4	32.79	54.0	13.7	H	155	36
12400.500	43.42	-29.5	39.1	33.79	54.0	10.6	H	155	2

$\pi/4$ DQPSK Ch 0 - Average

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2390.000	46.33	2.9	32.0	11.49	54.0	7.7	H	155	4
2388.900	46.37	2.9	32.0	11.52	54.0	7.6	H	155	2
4804.500	33.39	-32.8	34.5	31.74	54.0	20.6	H	155	25
7206.000	39.23	-31.6	36.1	34.76	54.0	14.8	H	155	350
9607.500	39.06	-30.0	37.0	32.11	54.0	14.9	H	155	92
12010.500	42.23	-29.8	39.3	32.76	54.0	11.8	H	155	85

$\pi/4$ DQPSK Ch 39 - Average

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2388.900	46.37	2.9	32.0	11.51	54.0	7.6	H	155	20
2450.800	46.52	2.9	32.4	11.23	54.0	7.5	H	155	45
4882.500	34.26	-32.7	34.5	32.47	54.0	19.7	H	155	240
7323.000	39.63	-31.9	36.1	35.48	54.0	14.4	H	155	180
9763.500	38.36	-30.6	37.2	31.73	54.0	15.6	H	155	85
12205.500	42.33	-29.4	39.2	32.55	54.0	11.7	H	155	25

$\pi/4$ DQPSK Ch 78 - Average

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.600	47.49	2.9	32.8	11.80	54.0	6.5	H	155	268
2483.800	46.89	2.9	32.8	11.20	54.0	7.1	H	155	138
4960.500	35.41	-33.4	34.5	34.29	54.0	18.6	H	155	104
7440.000	39.47	-31.8	36.0	35.21	54.0	14.5	H	155	40
9919.500	40.23	-29.9	37.4	32.75	54.0	13.8	H	155	28
12400.500	43.47	-29.5	39.1	33.84	54.0	10.5	H	155	8

8DPSK Ch 0 - Average

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2388.200	46.45	2.9	32.0	11.6	54.0	7.5	H	155	175
2388.400	46.46	2.9	32.0	11.6	54.0	7.5	H	155	5
4804.500	33.39	-32.8	34.5	31.7	54.0	20.6	H	155	26
7206.000	39.08	-31.6	36.1	34.6	54.0	14.9	H	155	355
9607.500	39.00	-30.0	37.0	32.1	54.0	15.0	H	155	6
12010.500	42.14	-29.8	39.3	32.7	54.0	11.9	H	155	12

8DPSK Ch 39 - Average

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2436.100	46.62	2.9	32.0	11.73	54.0	7.4	H	155	24
2444.500	46.65	2.9	32.2	11.54	54.0	7.3	H	155	336
4882.500	35.09	-32.7	34.5	33.31	54.0	18.9	H	155	248
7323.000	39.67	-31.9	36.1	35.51	54.0	14.3	H	155	268
9763.500	38.41	-30.6	37.2	31.78	54.0	15.6	H	155	290
12205.500	42.34	-29.4	39.2	32.55	54.0	11.7	H	155	300

8DPSK Ch 78 - Average

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.600	47.39	2.9	32.8	11.70	54.0	6.6	H	155	20
2483.700	47.32	2.9	32.8	11.63	54.0	6.7	H	155	248
4960.500	35.28	-33.4	34.5	34.16	54.0	18.7	H	155	49
7440.000	39.46	-31.8	36.0	35.20	54.0	14.5	H	155	335
9919.500	40.29	-29.9	37.4	32.81	54.0	13.7	H	155	180
12400.500	43.47	-29.5	39.1	33.84	54.0	10.5	H	155	8

GFSK Ch 0 - Peak

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2389.772	59.12	2.9	32.0	24.27	74.0	14.9	H	155	22
2389.996	58.44	2.9	32.0	23.60	74.0	15.6	V	155	44
4803.750	41.51	-32.9	34.5	39.86	74.0	32.5	H	155	0
7206.000	44.24	-31.6	36.1	39.77	74.0	29.8	H	155	0
9608.250	43.23	-30.0	37.0	36.27	74.0	30.8	H	155	22
12009.750	46.45	-29.8	39.3	36.98	74.0	27.5	H	155	176

GFSK Ch 39 - Peak

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2366.200	47.80	-27.2	31.9	43.08	74.0	26.2	H	155	0
2511.800	48.74	-26.5	32.5	42.79	74.0	25.3	H	155	22
4881.750	39.04	-32.7	34.5	37.25	74.0	35.0	H	155	352
7323.000	43.41	-31.9	36.1	39.26	74.0	30.6	V	155	352
9764.250	42.38	-30.6	37.2	35.75	74.0	31.6	V	155	176
12204.750	45.27	-29.4	39.2	35.48	74.0	28.7	V	155	176

GFSK Ch 78 - Peak

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2491.770	60.11	2.9	32.5	24.6	74.0	13.9	H	155	22
2493.260	60.17	2.9	32.5	24.7	74.0	13.8	H	155	22
4959.750	42.31	-33.4	34.5	41.2	74.0	31.7	H	155	88
7440.000	42.24	-31.8	36.0	38.0	74.0	31.8	V	155	110
9920.250	42.88	-29.9	37.4	35.4	74.0	31.1	V	155	44
12399.750	46.25	-29.5	39.1	36.6	74.0	27.8	H	155	0

$\pi/4$ DQPSK Ch 0 - Peak

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2389.968	58.23	2.9	32.0	23.38	74.0	15.8	H	155	0
2389.646	59.35	2.9	32.0	24.51	74.0	14.6	H	155	0
4803.750	35.15	-32.9	34.5	33.50	74.0	38.8	V	155	22
7206.000	42.34	-31.6	36.1	37.87	74.0	31.7	V	155	352
9608.250	43.40	-30.0	37.0	36.44	74.0	30.6	V	155	88
12009.750	45.16	-29.8	39.3	35.69	74.0	28.8	V	155	88

$\pi/4$ DQPSK Ch 39 - Peak

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2366.800	48.19	-27.2	32.0	43.4	74.0	25.8	H	155	22
2508.600	48.41	-26.5	32.4	42.4	74.0	25.6	H	155	44
4881.750	37.65	-32.7	34.5	35.9	74.0	36.4	H	155	242
7323.000	41.98	-31.9	36.1	37.8	74.0	32.0	H	155	176
9764.250	41.35	-30.6	37.2	34.7	74.0	32.7	H	155	88
12204.750	44.31	-29.4	39.2	34.5	74.0	29.7	V	155	22

$\pi/4$ DQPSK Ch 78 - Peak

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2495.340	60.21	2.9	32.4	24.84	74.0	13.8	H	155	264
2496.820	59.98	2.9	32.4	24.65	74.0	14.0	H	155	132
4959.750	38.33	-33.4	34.5	37.20	74.0	35.7	H	155	110
7440.000	42.81	-31.8	36.0	38.55	74.0	31.2	H	155	44
9920.250	42.70	-29.9	37.4	35.23	74.0	31.3	H	155	22
12399.750	45.04	-29.5	39.1	35.41	74.0	29.0	V	155	0

8DPSK Ch 0 - Peak

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2383.710	59.45	2.9	32.0	24.55	74.0	14.6	H	155	176
2387.518	59.45	2.9	32.0	24.59	74.0	14.5	H	155	0
4803.750	36.31	-32.9	34.5	34.66	74.0	37.7	V	155	22
7206.000	42.99	-31.6	36.1	38.52	74.0	31.0	V	155	352
9608.250	41.46	-30.0	37.0	34.51	74.0	32.5	V	155	0
12009.750	46.66	-29.8	39.3	37.19	74.0	27.3	V	155	0



8DPSK Ch 39 - Peak

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2360.000	47.51	-27.6	31.8	43.26	74.0	26.5	H	155	22
2513.200	48.10	-26.6	32.5	42.15	74.0	25.9	H	155	330
4881.750	37.75	-32.7	34.5	35.96	74.0	36.3	H	155	242
7323.000	41.95	-31.9	36.1	37.80	74.0	32.0	V	155	264
9764.250	40.96	-30.6	37.2	34.33	74.0	33.0	V	155	286
12204.750	44.99	-29.4	39.2	35.20	74.0	29.0	V	155	308

8DPSK Ch 78 - Peak

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Limit (dB μ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.620	60.20	2.9	32.8	24.5	74.0	13.8	H	155	22
2484.420	60.00	2.9	32.7	24.3	74.0	14.0	H	155	242
4959.750	38.47	-33.4	34.5	37.3	74.0	35.5	V	155	44
7440.000	41.73	-31.8	36.0	37.5	74.0	32.3	H	155	330
9920.250	45.45	-29.9	37.4	38.0	74.0	28.6	H	155	176
12399.750	45.36	-29.5	39.1	35.7	74.0	28.6	H	155	0

Conclusion: PASS

Test graphs as below:

RE - Power-2.38GHz-2.45GHz

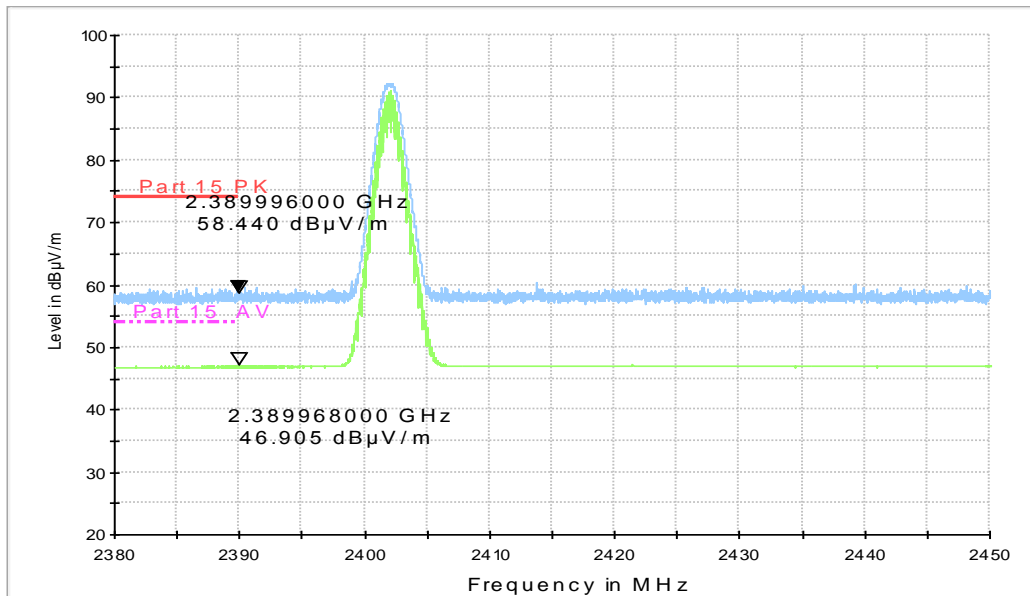


Fig.58. Radiated emission (Power): GFSK, low channel

RE - Power-2.45GHz-2.5GHz

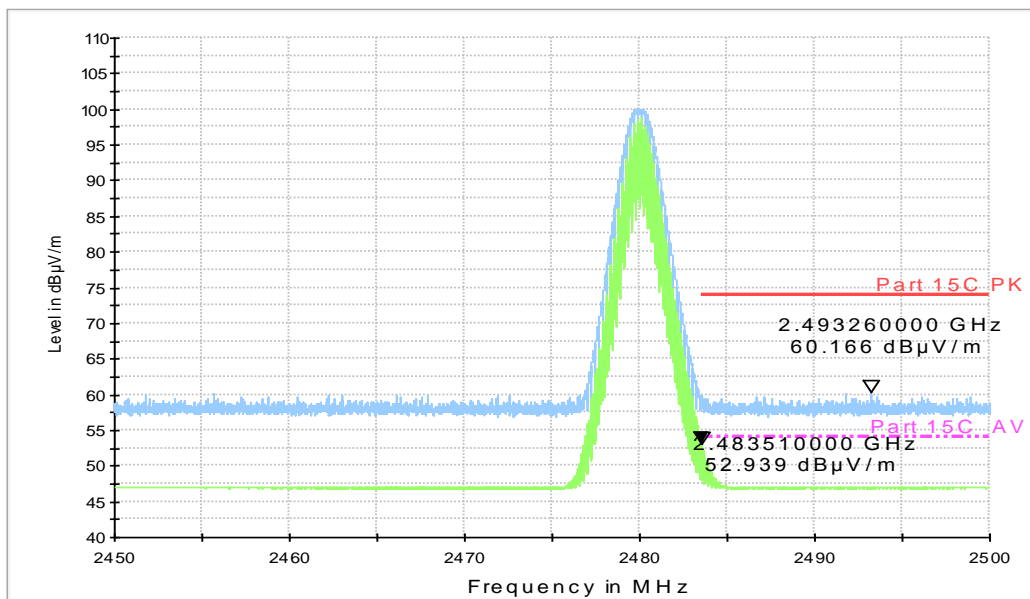


Fig.59. Radiated emission (Power) GFSK, high channel

RE - Power-2.38GHz-2.45GHz

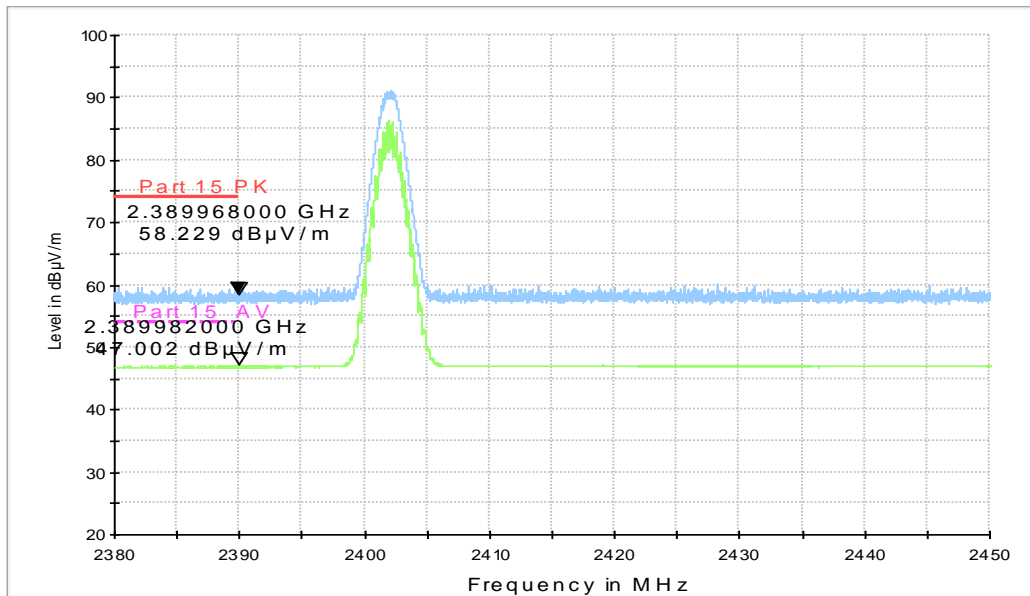


Fig.60. Radiated emission (Power): $\pi/4$ DQPSK, low channel

RE - Power-2.45GHz-2.5GHz

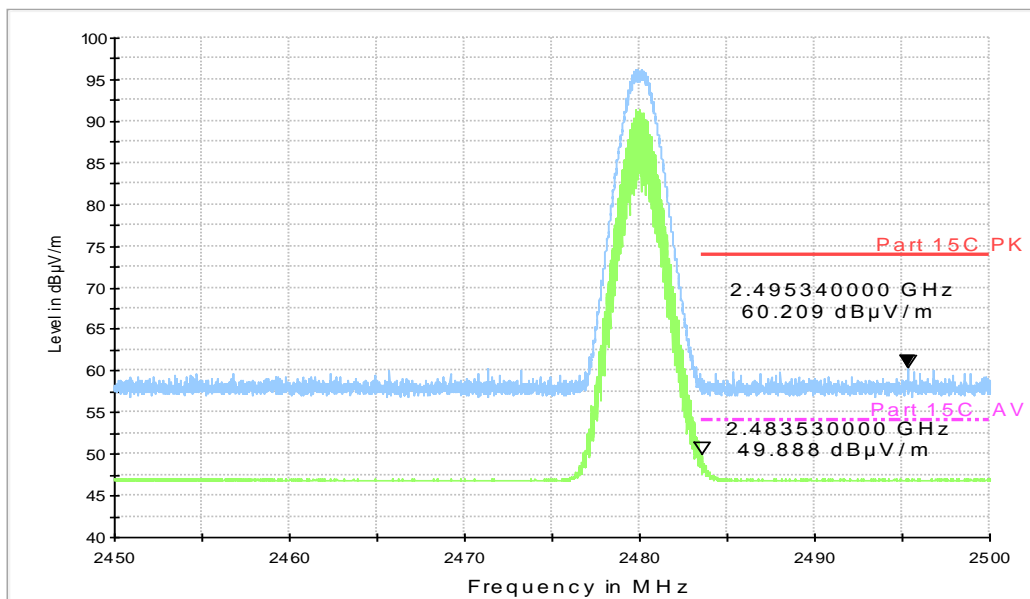


Fig.61. Radiated emission (Power): $\pi/4$ DQPSK, high channel

RE - Power-2.38GHz-2.45GHz

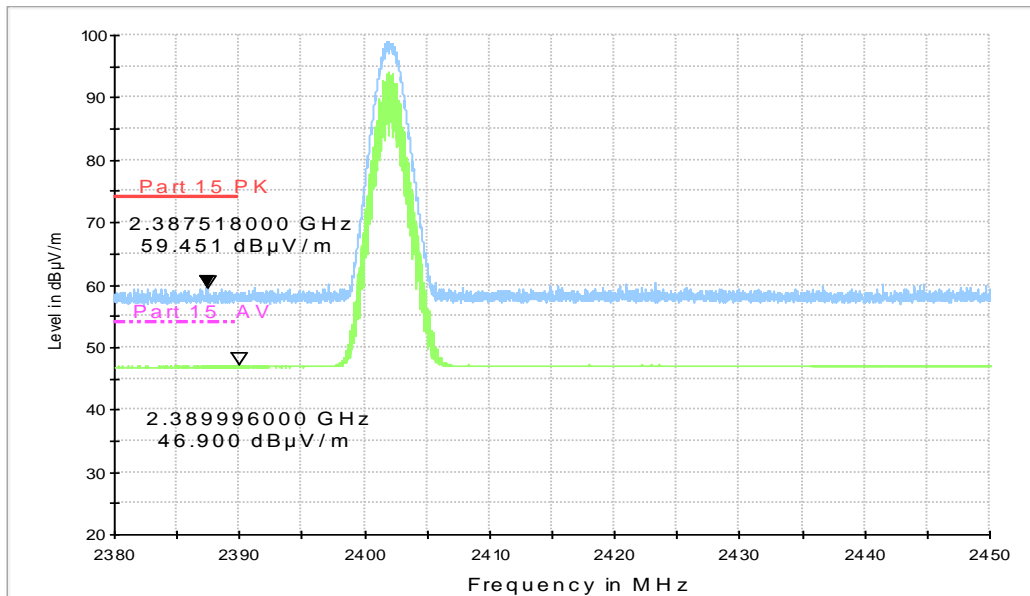


Fig.62. Radiated emission (Power): 8DPSK, low channel

RE - Power-2.45GHz-2.5GHz

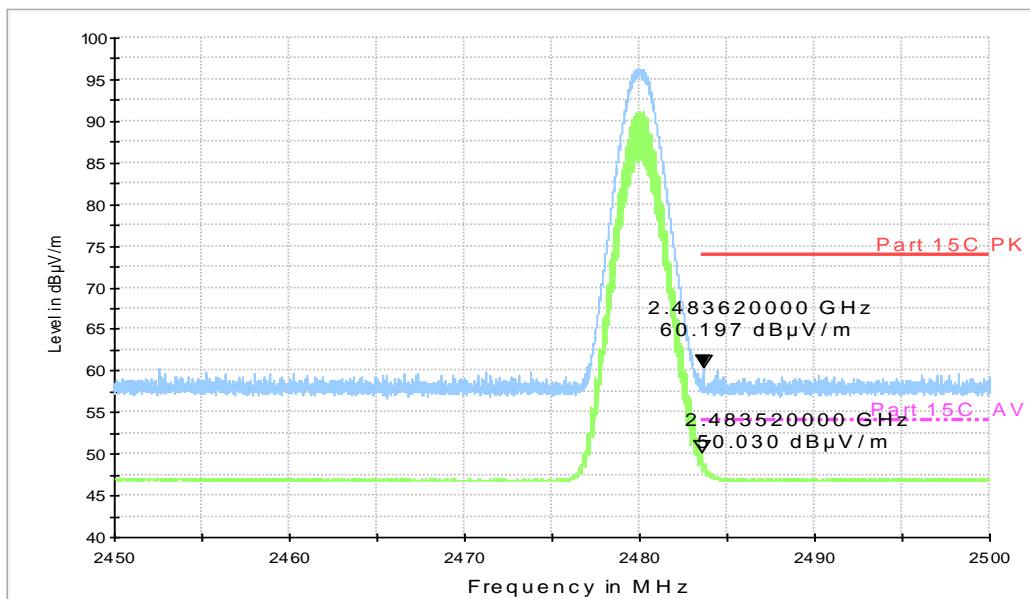


Fig.63. Radiated emission (Power): 8DPSK, high channel

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.64	120.65	P
		Fig.65		
	DH3	Fig.66	179.65	P
		Fig.67		
	DH5	Fig.68	187.28	P
		Fig.69		

For $\pi/4$ DQPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.70	122.53	P
		Fig.71		
	DH3	Fig.72	166.90	P
		Fig.73		
	DH5	Fig.74	204.78	P
		Fig.75		

For 8DPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.76	122.46	P
		Fig.77		
	DH3	Fig.78	184.81	P

		Fig.79		
	DH5	Fig.80	176.07	P
		Fig.81		

Conclusion: PASS

Test graphs as below:

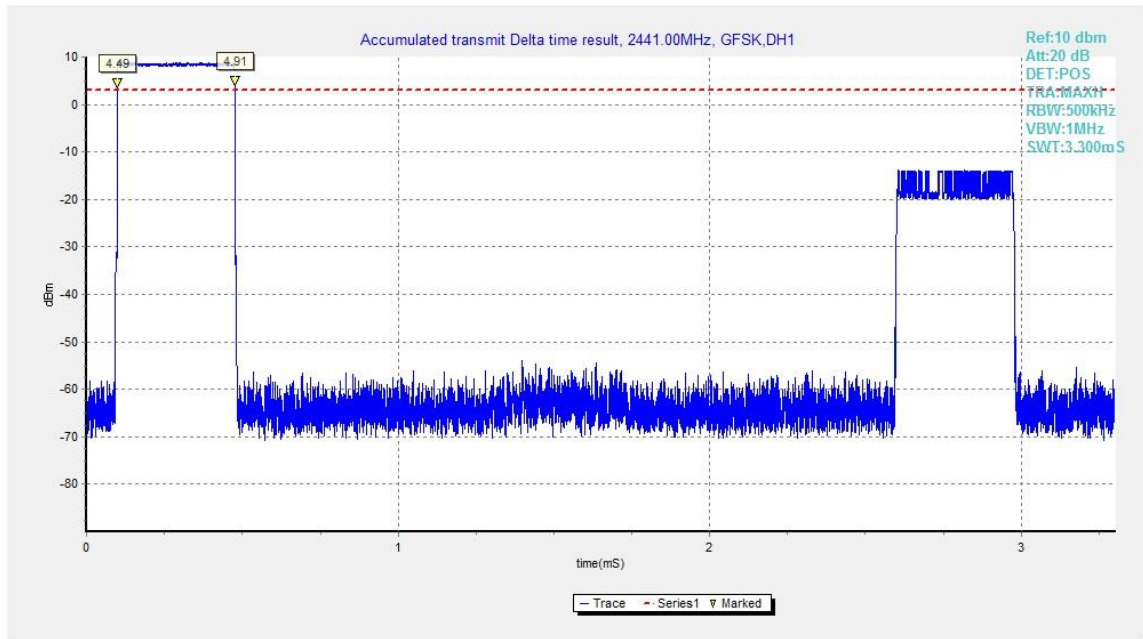


Fig.64. Time of occupancy (Dwell Time): Channel 39, Packet DH1

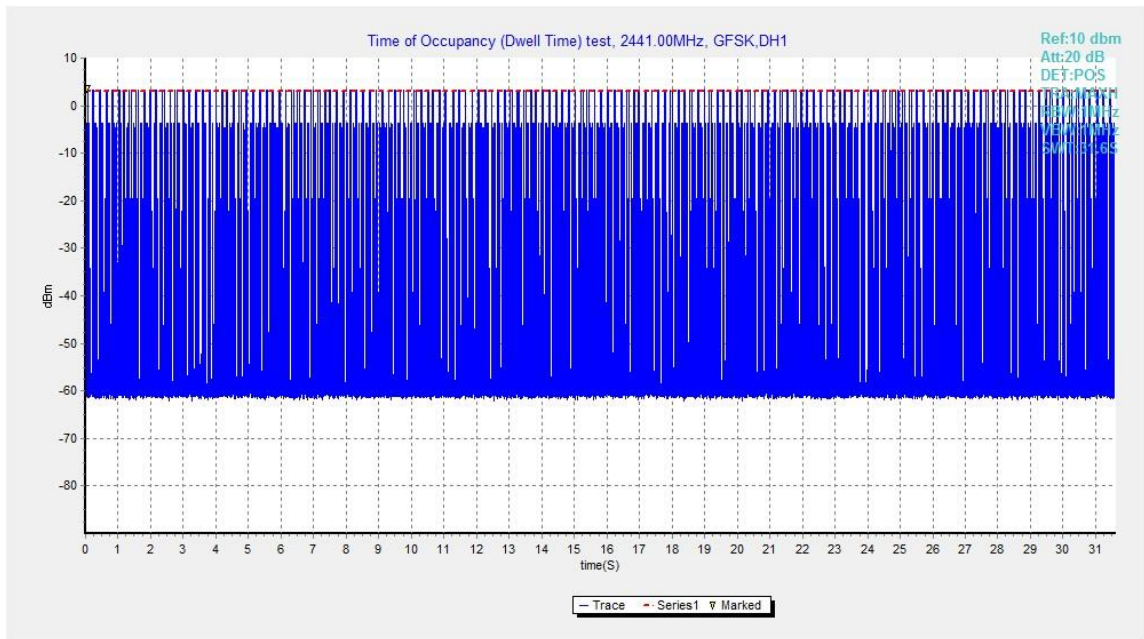


Fig.65. Number of Transmissions Measurement: Channel 39,Packet DH1

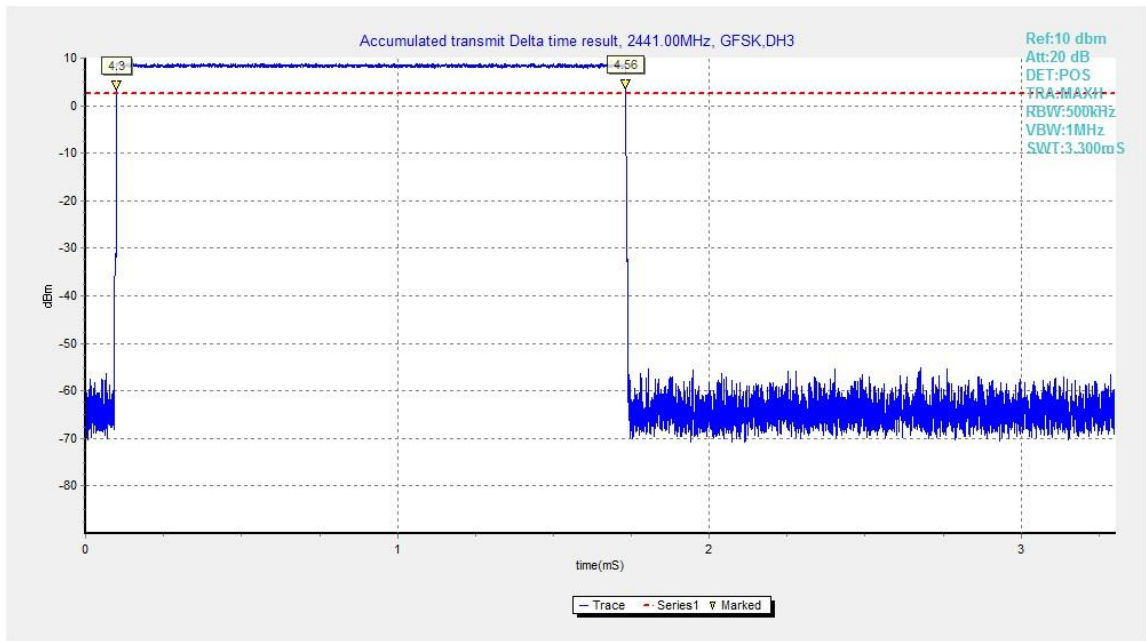


Fig.66. Time of occupancy (Dwell Time): Channel 39, Packet DH3

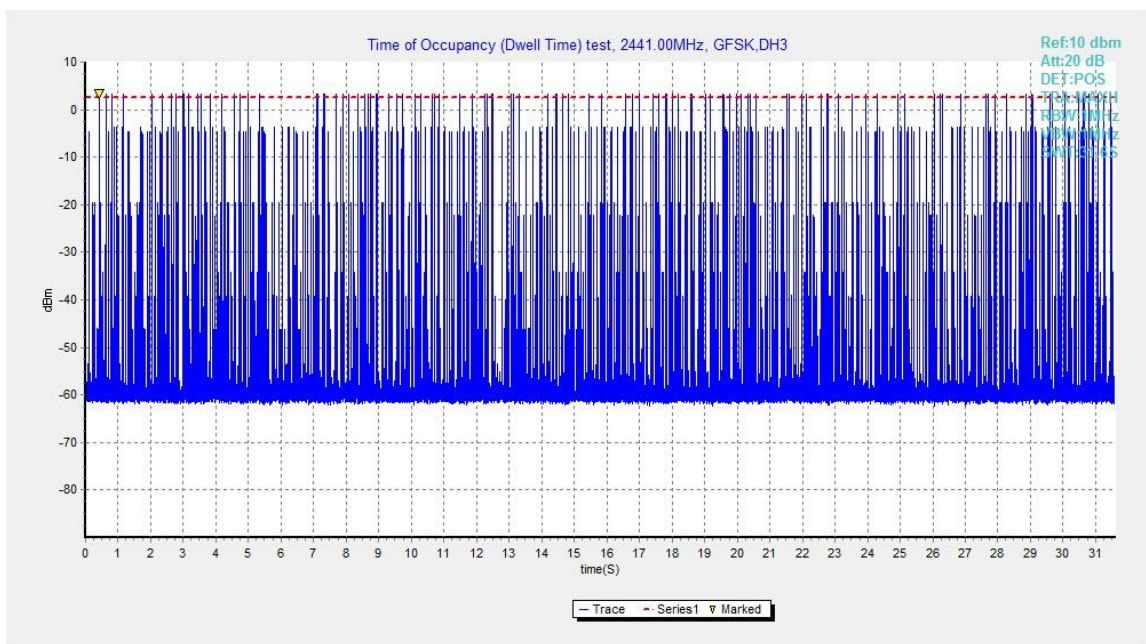


Fig.67. Number of Transmissions Measurement: Channel 39,Packet DH3

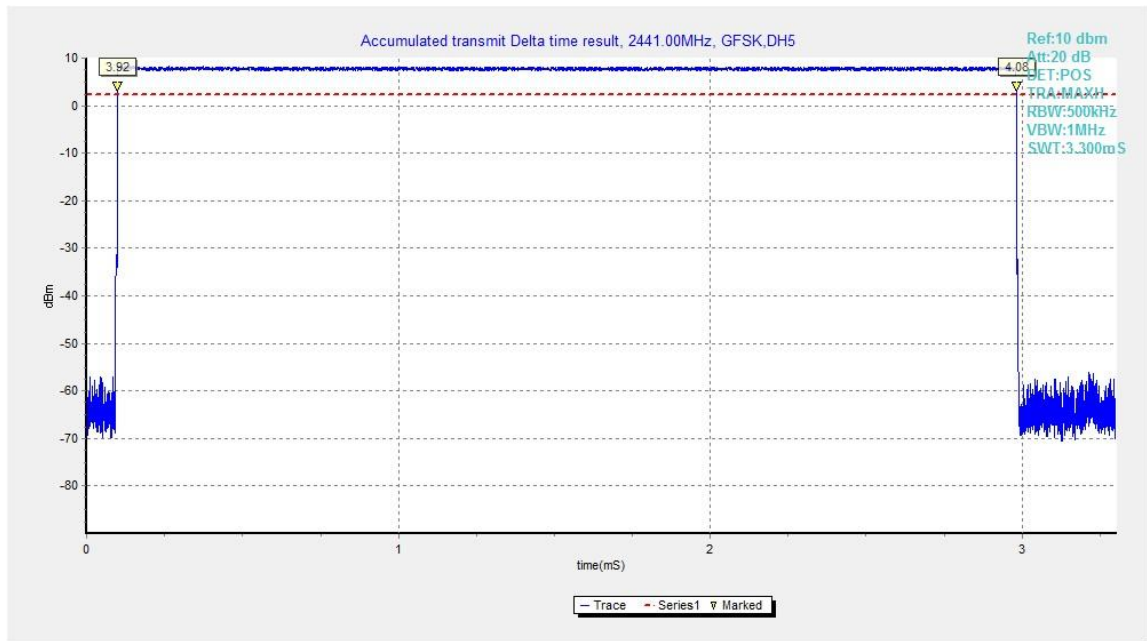


Fig.68. Time of occupancy (Dwell Time): Channel 39, Packet DH5

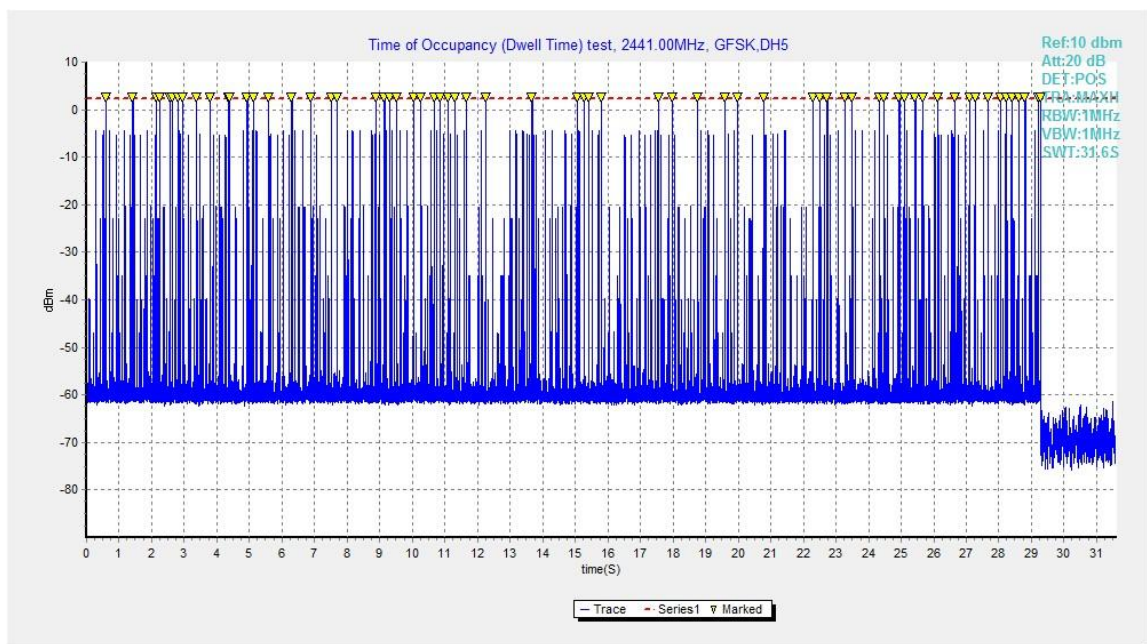


Fig.69. Number of Transmissions Measurement: Channel 39,Packet DH5

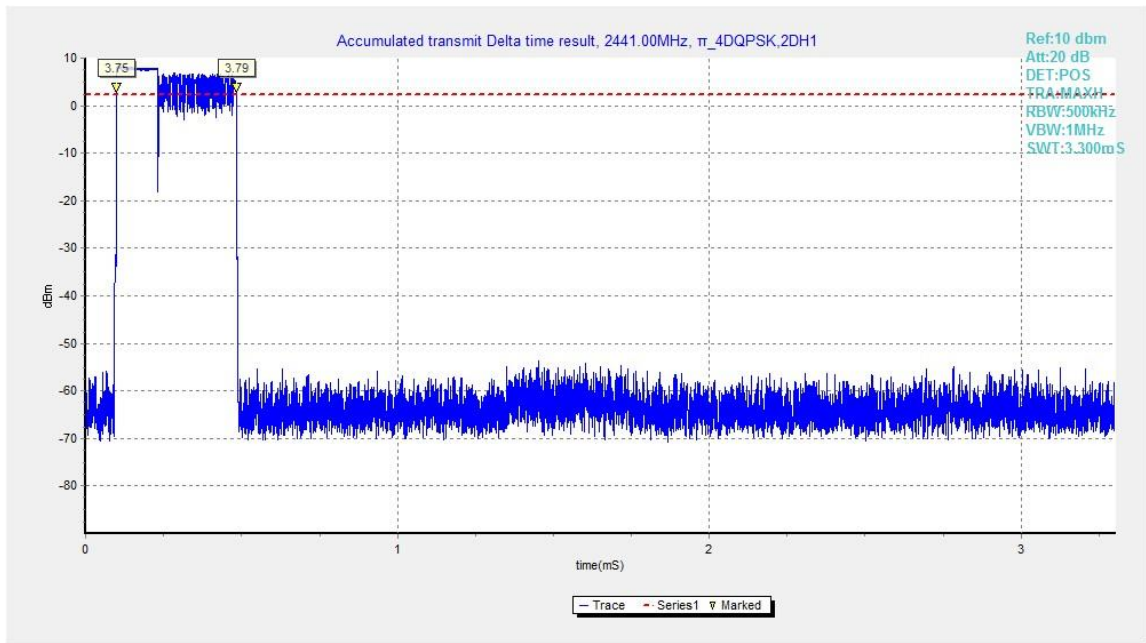


Fig.70. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

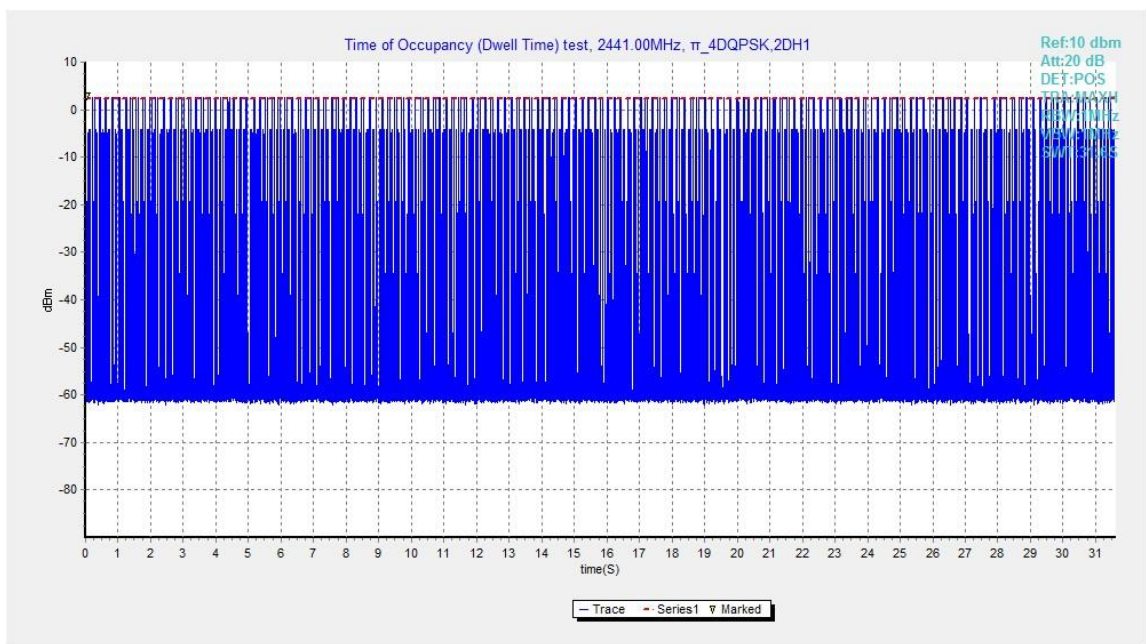


Fig.71. Number of Transmissions Measurement: Channel 39,Packet 2-DH1

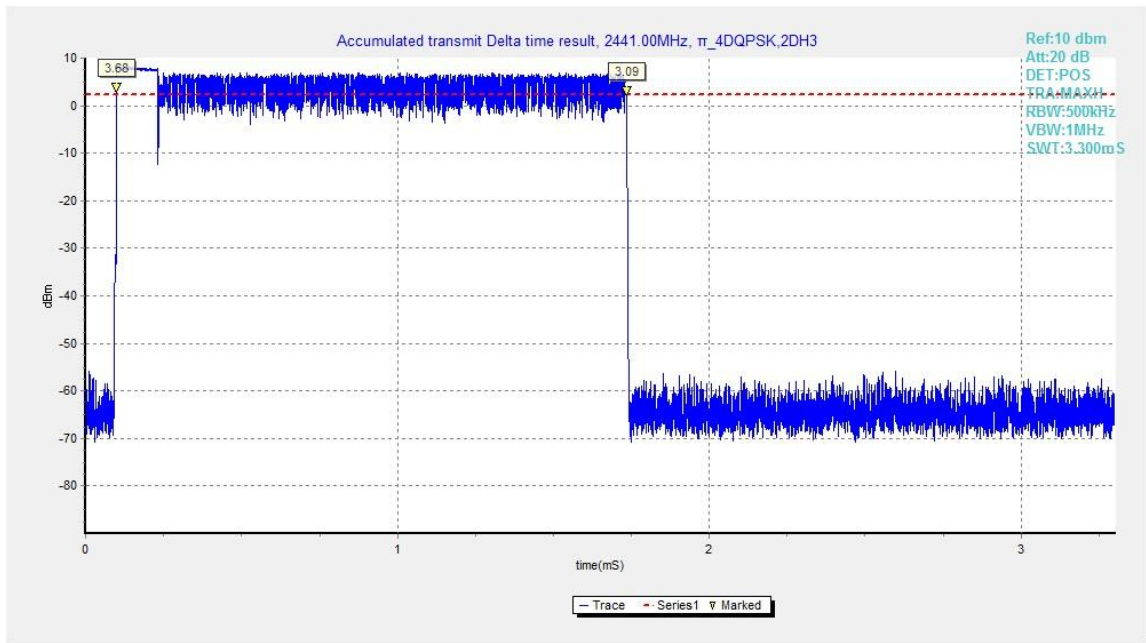


Fig.72. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3

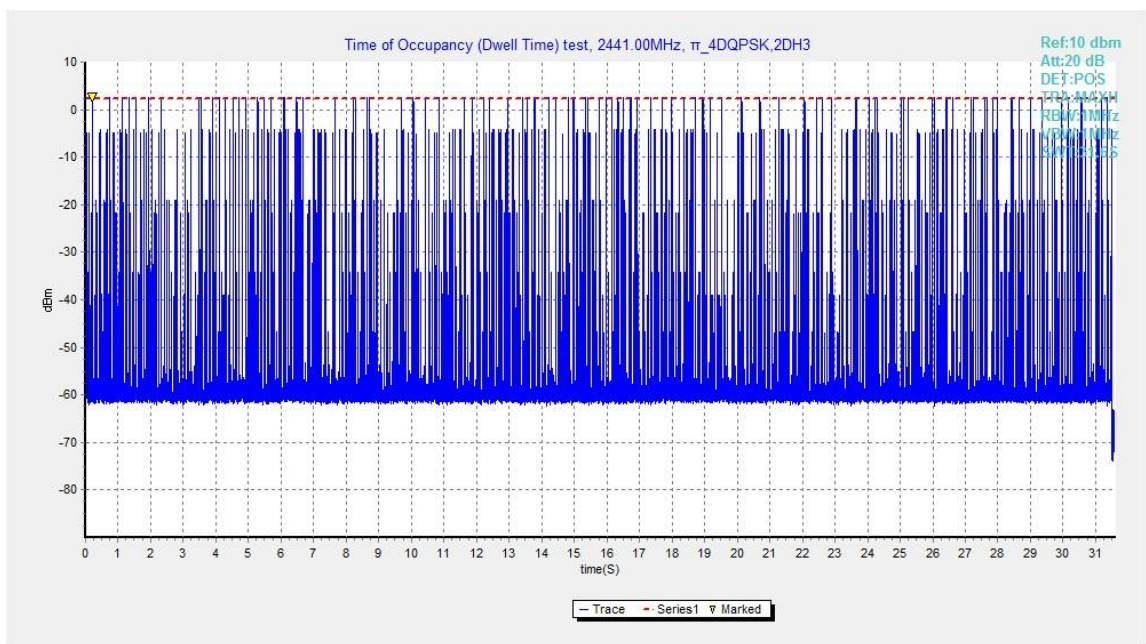


Fig.73. Number of Transmissions Measurement: Channel 39,Packet 2-DH3

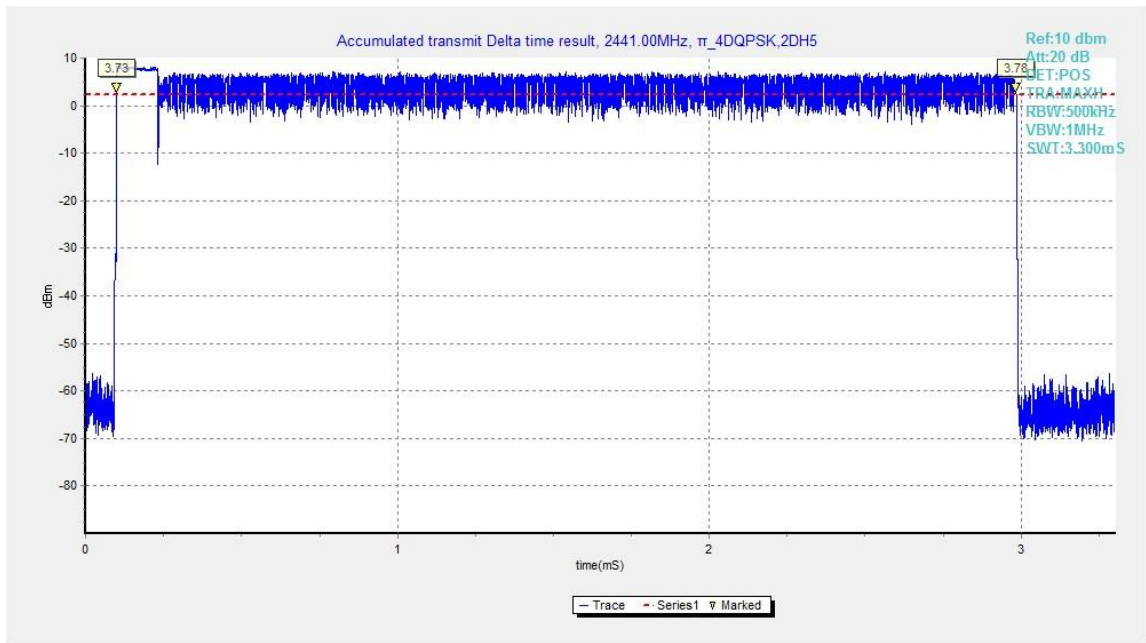


Fig.74. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

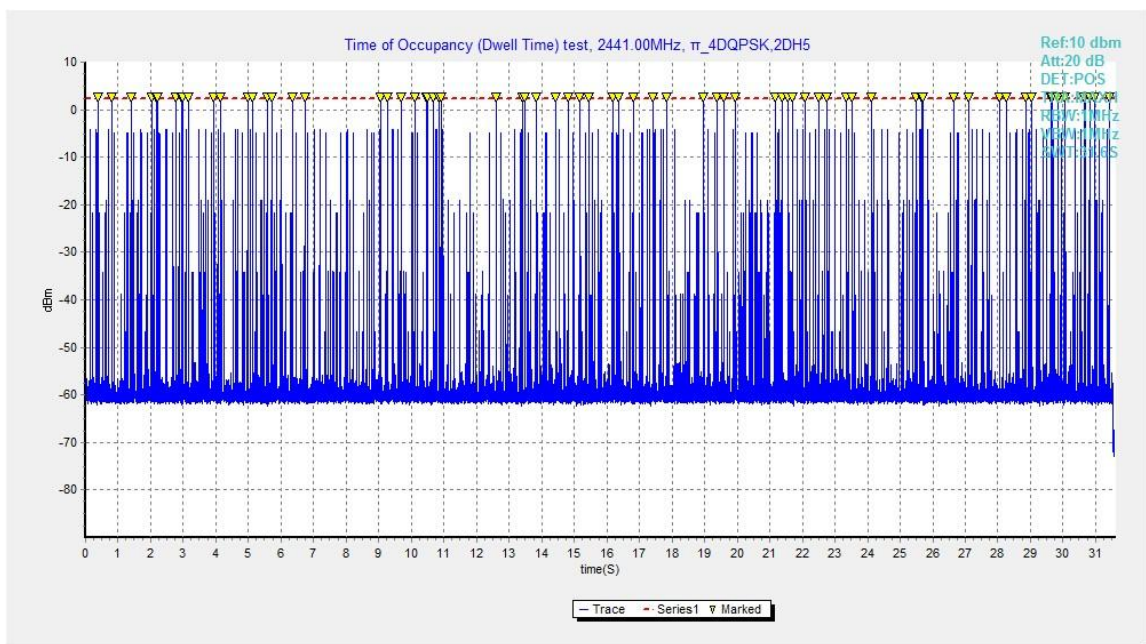


Fig.75. Number of Transmissions Measurement: Channel 39,Packet 2-DH5

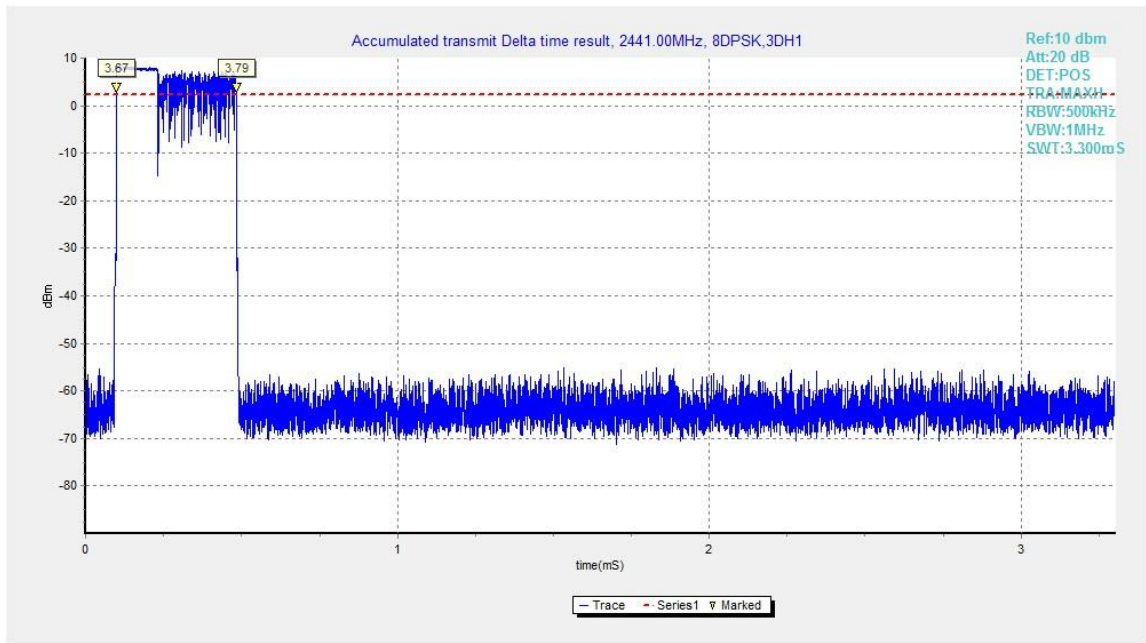


Fig.76. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1

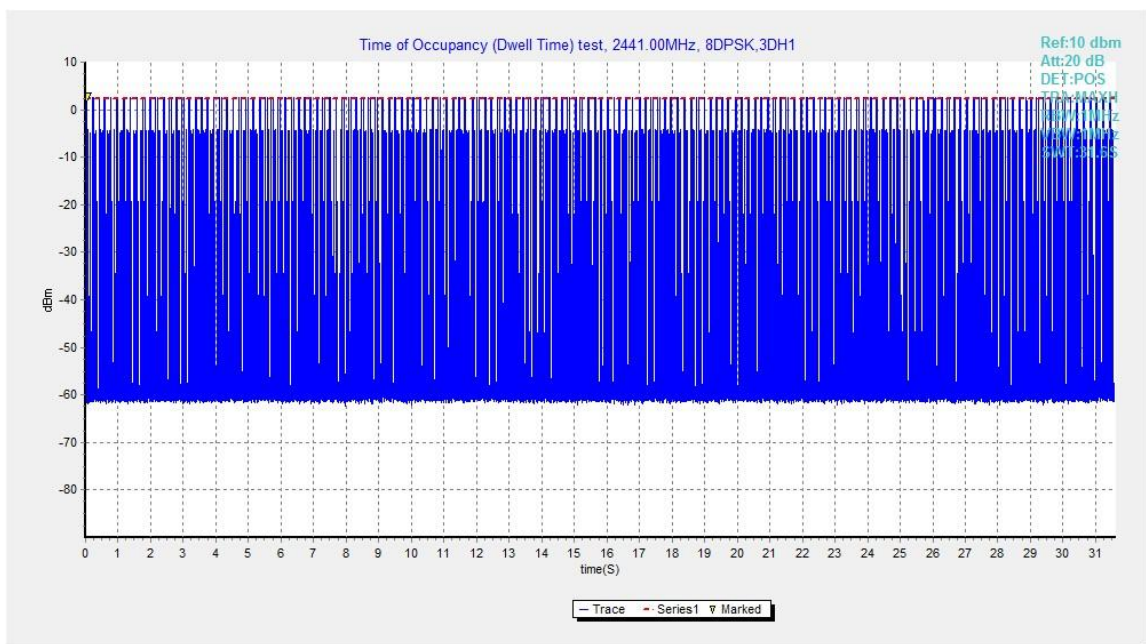


Fig.77. Number of Transmissions Measurement: Channel 39,Packet 3-DH1

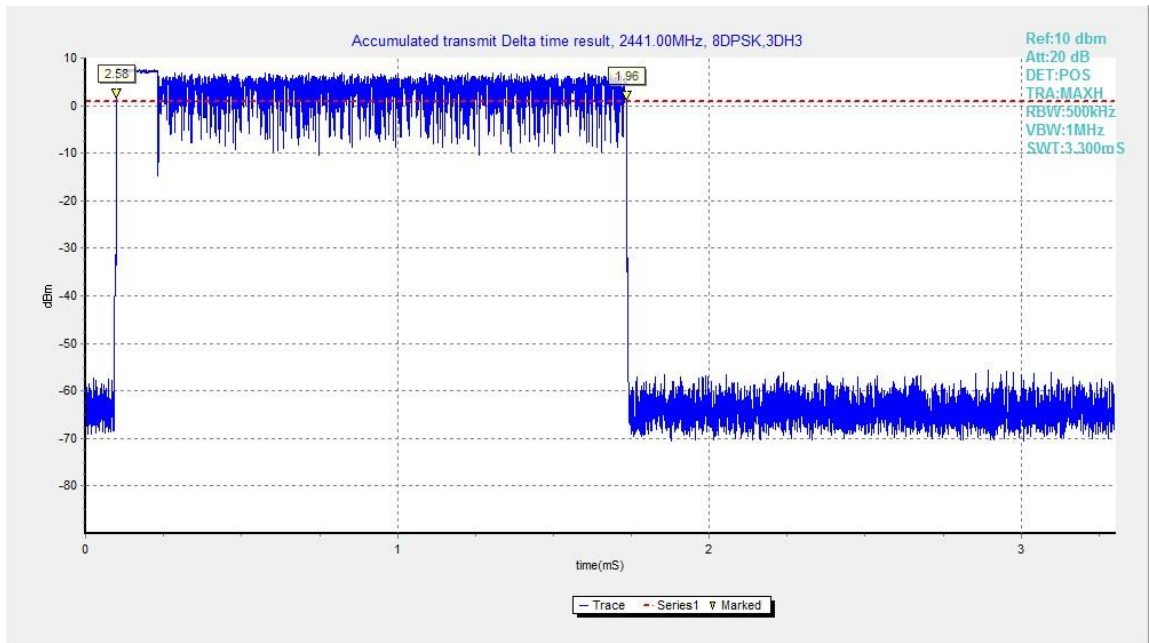


Fig.78. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

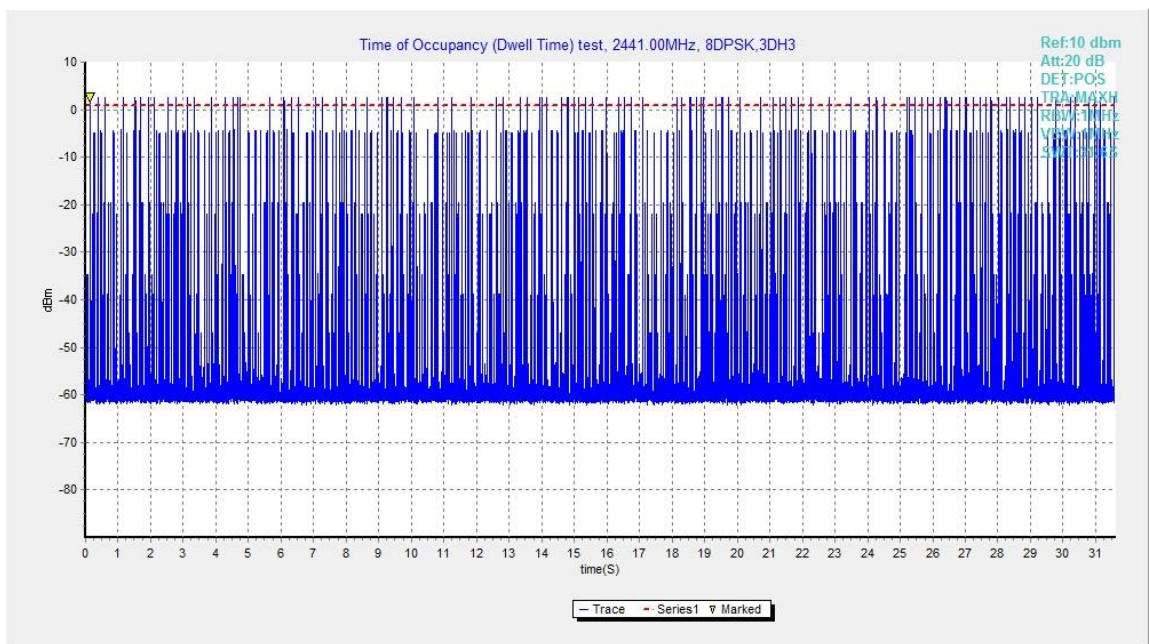


Fig.79. Number of Transmissions Measurement: Channel 39,Packet 3-DH3

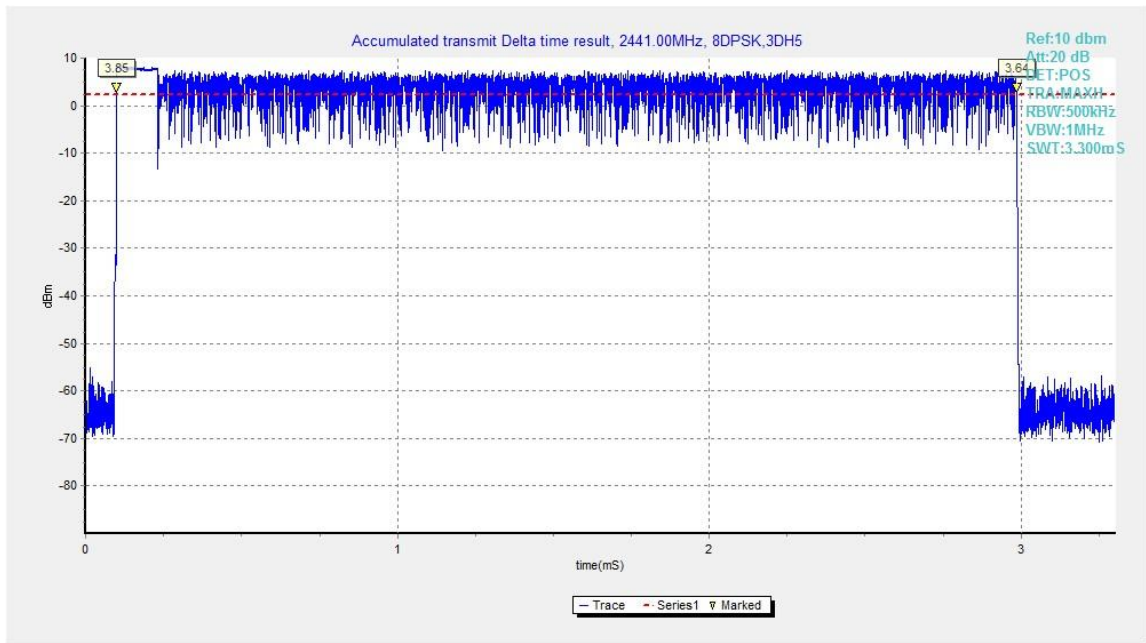


Fig.80. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

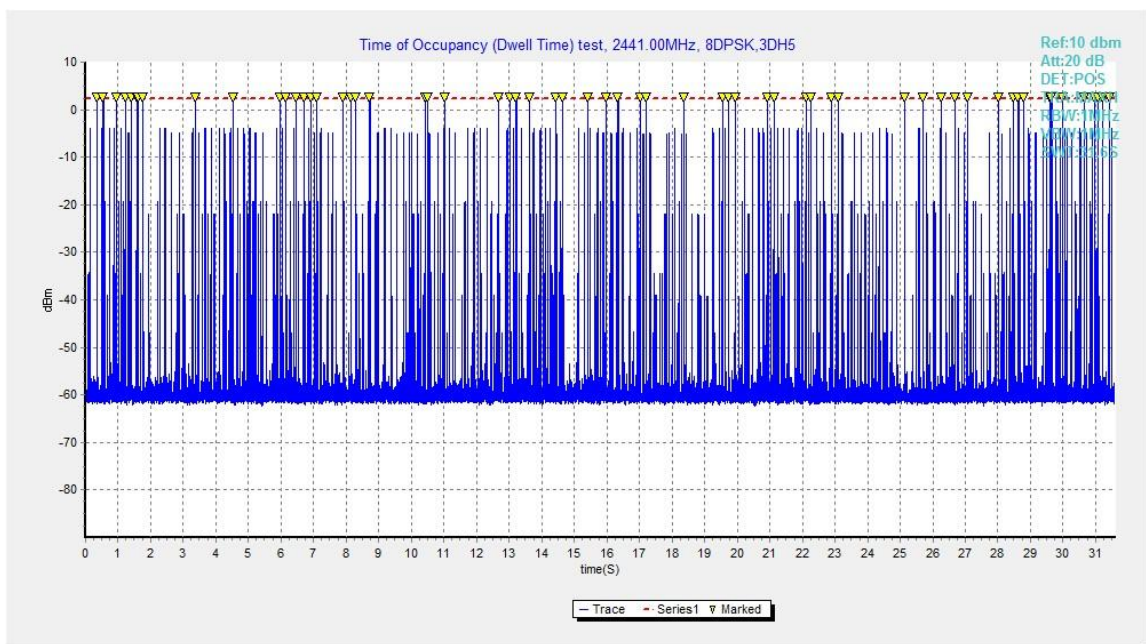


Fig.81. Number of Transmissions Measurement: Channel 39,Packet 3-DH5



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.82	942.00	NA
39	Fig.83	948.00	NA
78	Fig.84	972.00	NA

For $\pi/4$ DQPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.85	1257.00	NA
39	Fig.86	1227.00	NA
78	Fig.87	1233.00	NA

For 8DPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.88	1234.50	NA
39	Fig.89	1206.00	NA
78	Fig.90	1245.75	NA

Conclusion: NA

Test graphs as below:

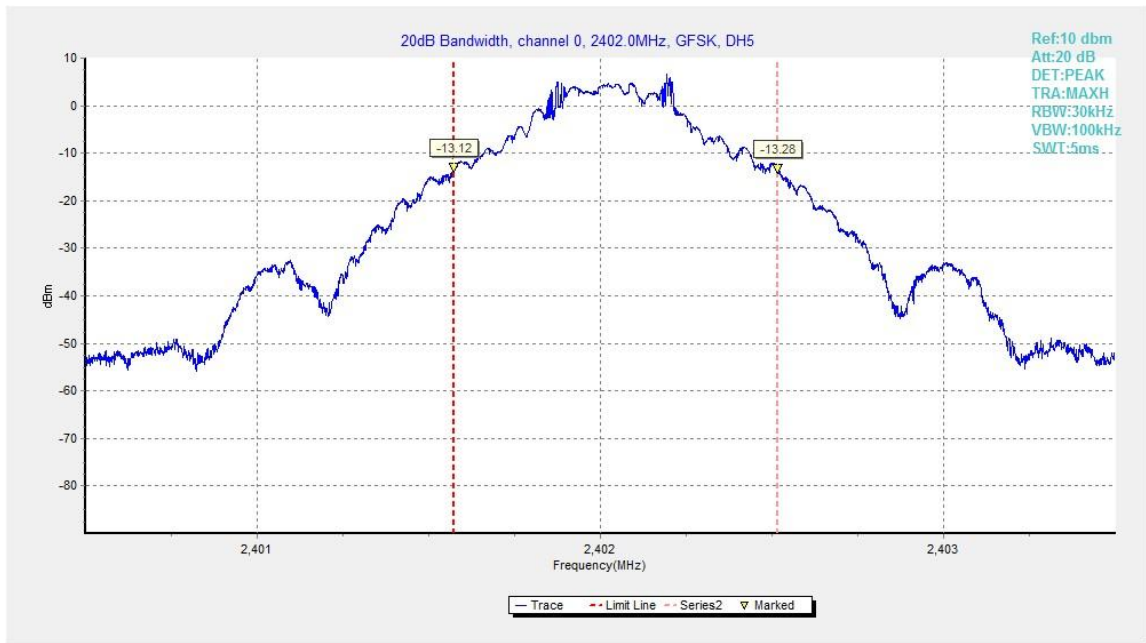


Fig.82. 20dB Bandwidth: GFSK, Channel 0

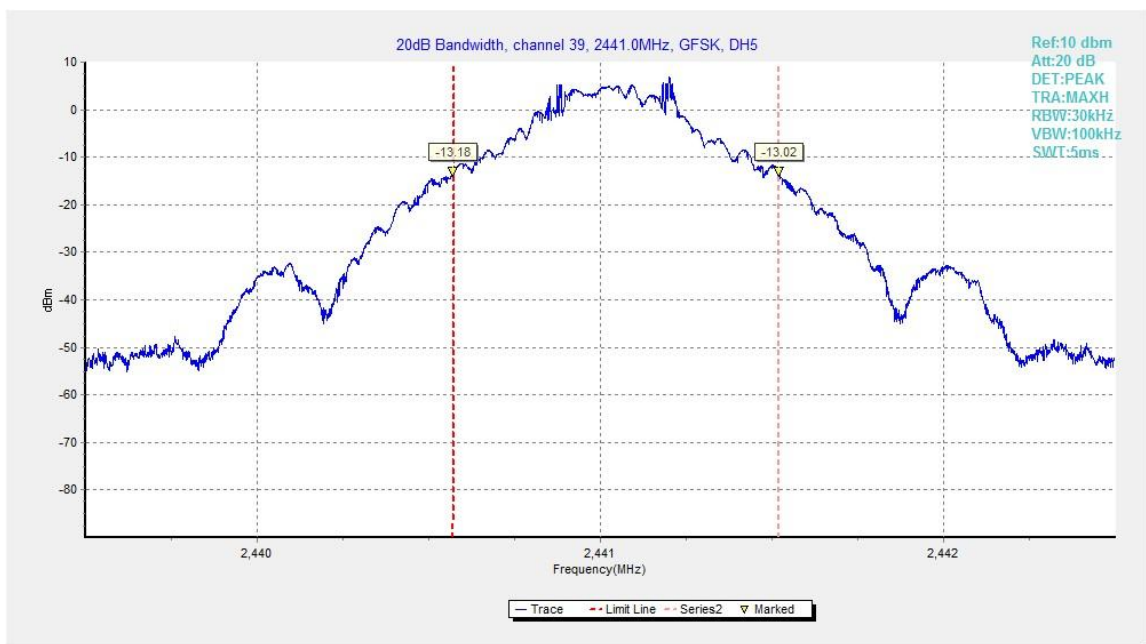


Fig.83. 20dB Bandwidth: GFSK, Channel 39

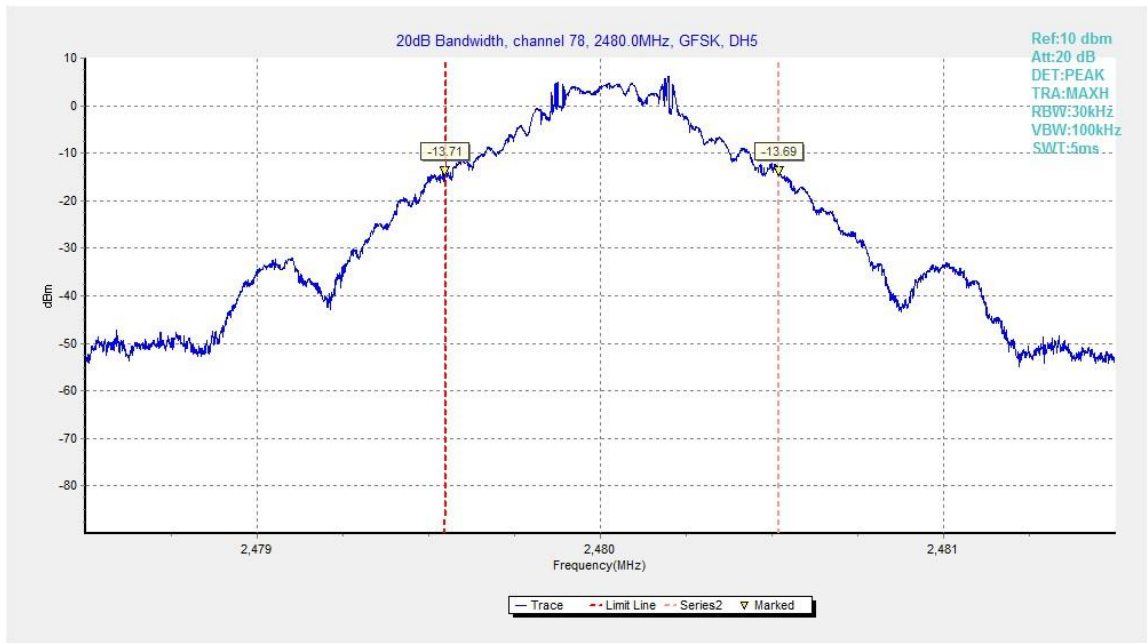


Fig.84. 20dB Bandwidth: GFSK, Channel 78

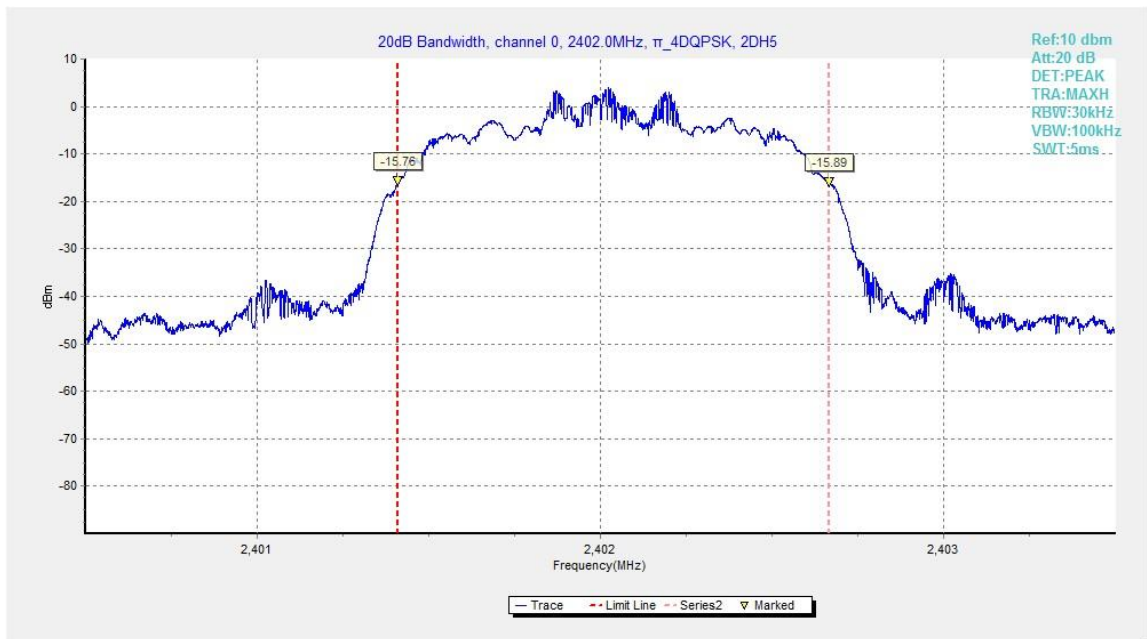


Fig.85. 20dB Bandwidth: $\pi/4$ DQPSK, Channel 0

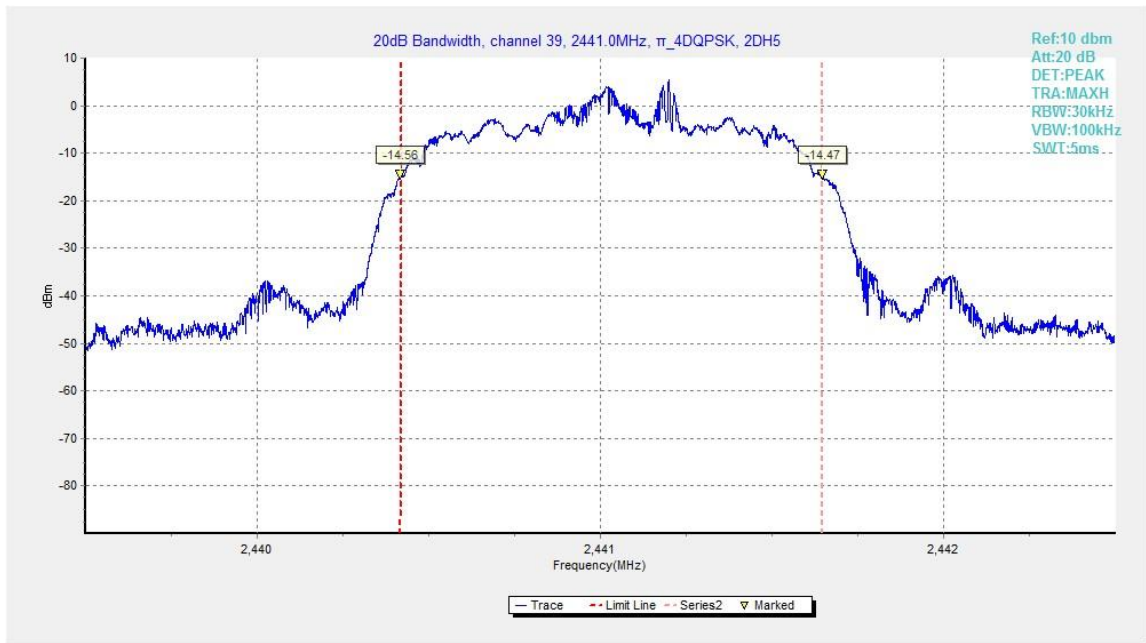


Fig.86. 20dB Bandwidth: $\pi/4$ DQPSK, Channel 39

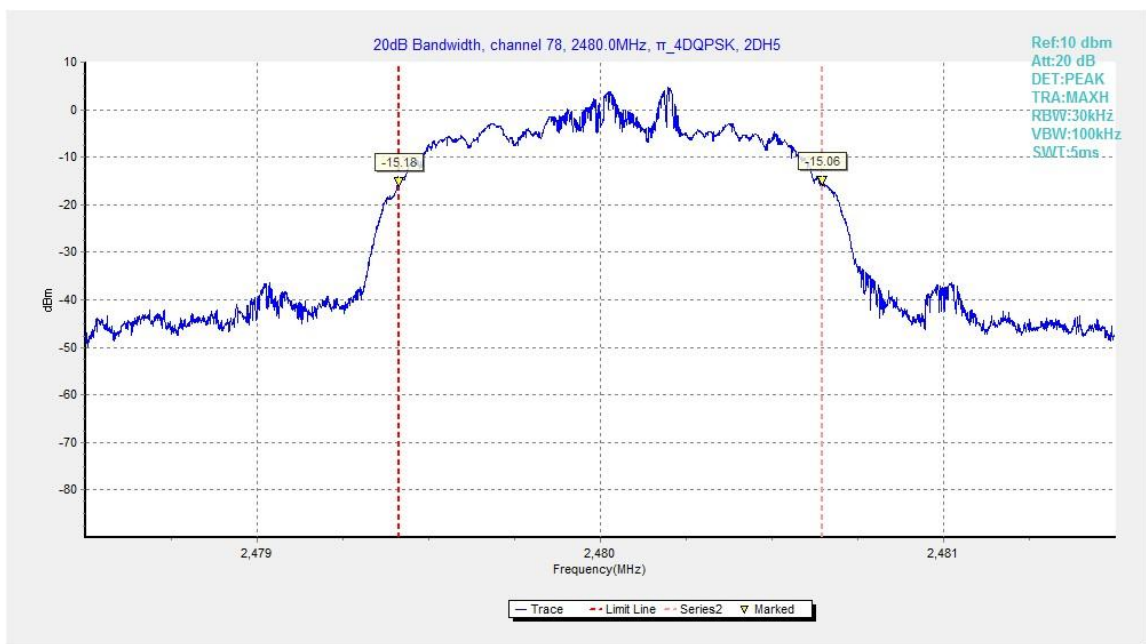


Fig.87. 20dB Bandwidth: $\pi/4$ DQPSK, Channel 78

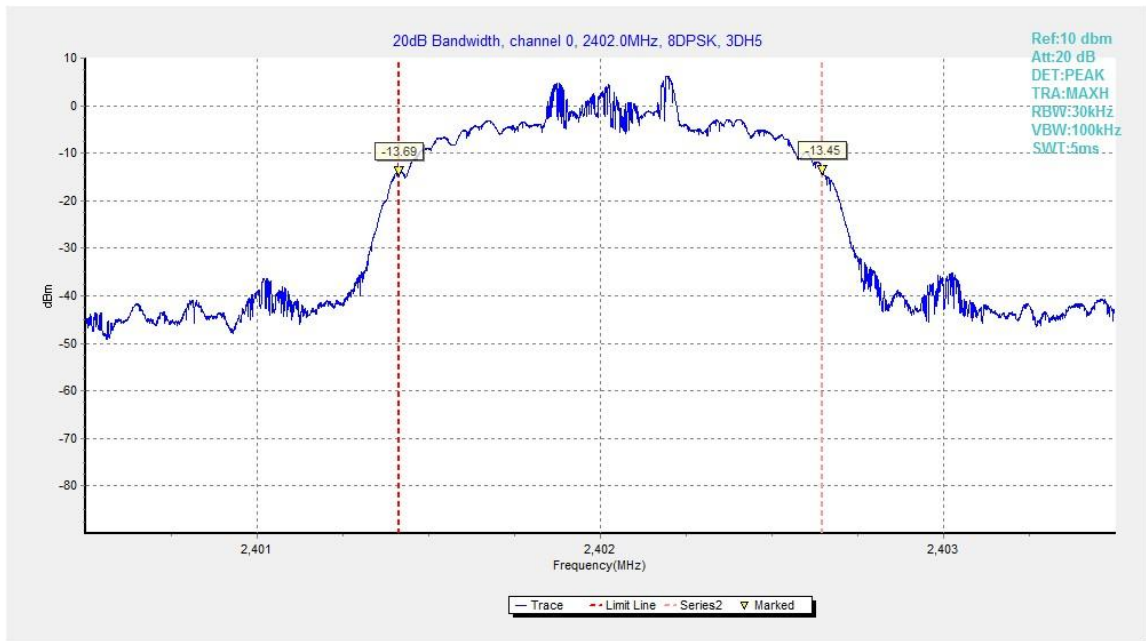


Fig.88. 20dB Bandwidth: 8DPSK, Channel 0

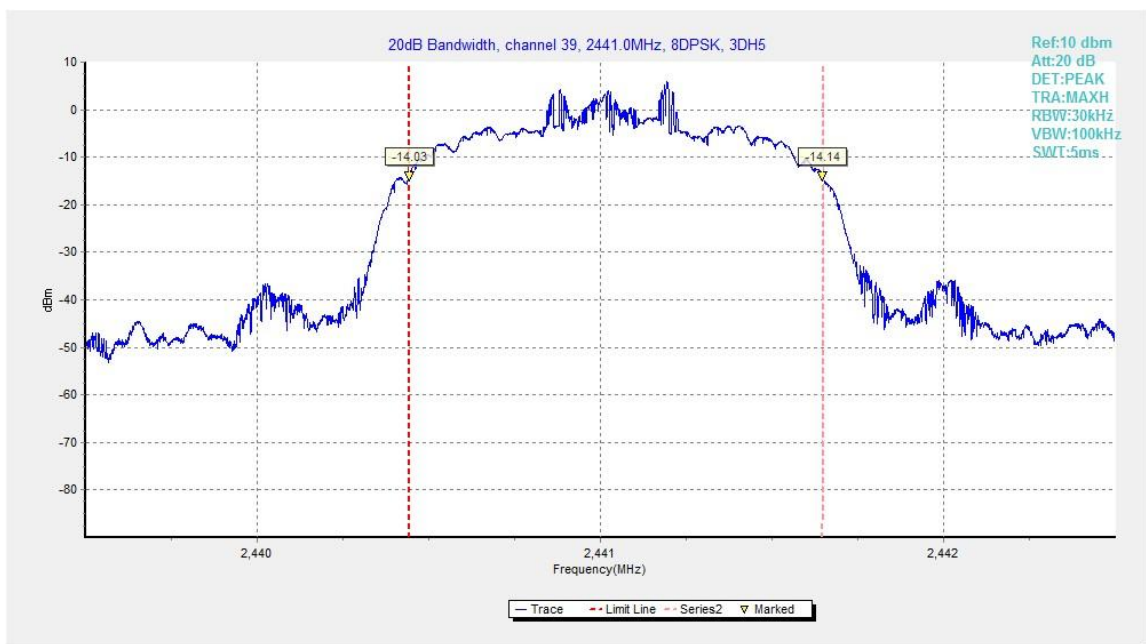


Fig.89. 20dB Bandwidth: 8DPSK, Channel 39

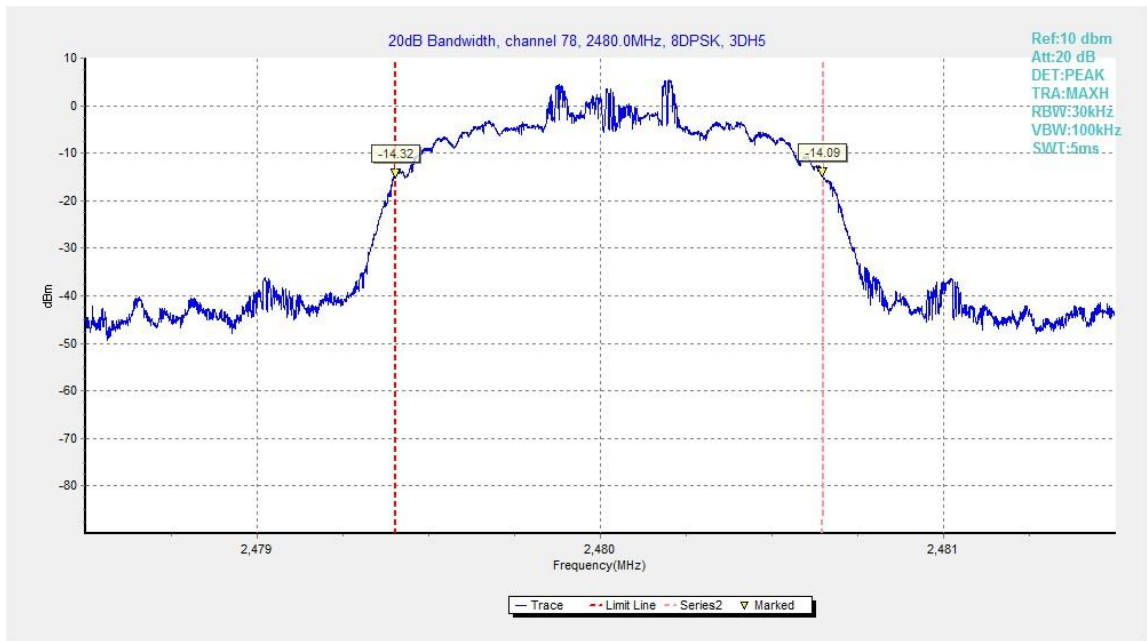


Fig.90. 20dB Bandwidth: 8DPSK, Channel 78

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.91	993.75	P

For $\pi/4$ DQPSK

Channel	Carrier frequency separation (kHz)	Conclusion	
39	Fig.92	1013.25	P

For 8DPSK

Channel	Carrier frequency separation (kHz)	Conclusion	
39	Fig.93	1017.00	P

Conclusion: PASS

Test graphs as below:

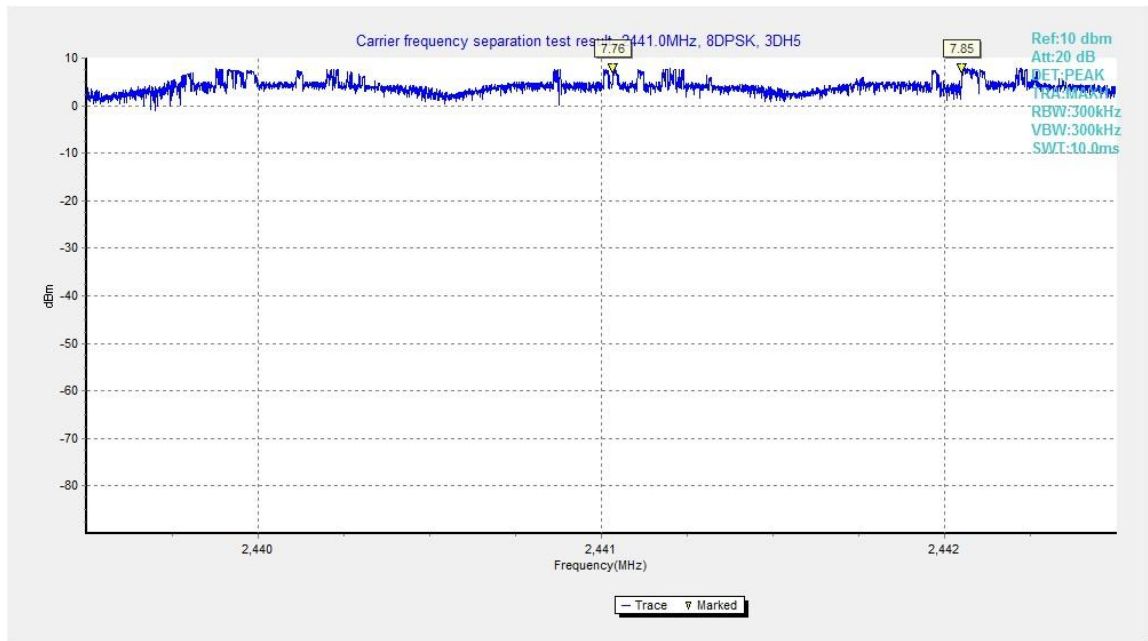


Fig.93. Carrier frequency separation measurement: 8DPSK, Channel 39

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.94	79	P
40~78	Fig.95		

For $\pi/4$ 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:

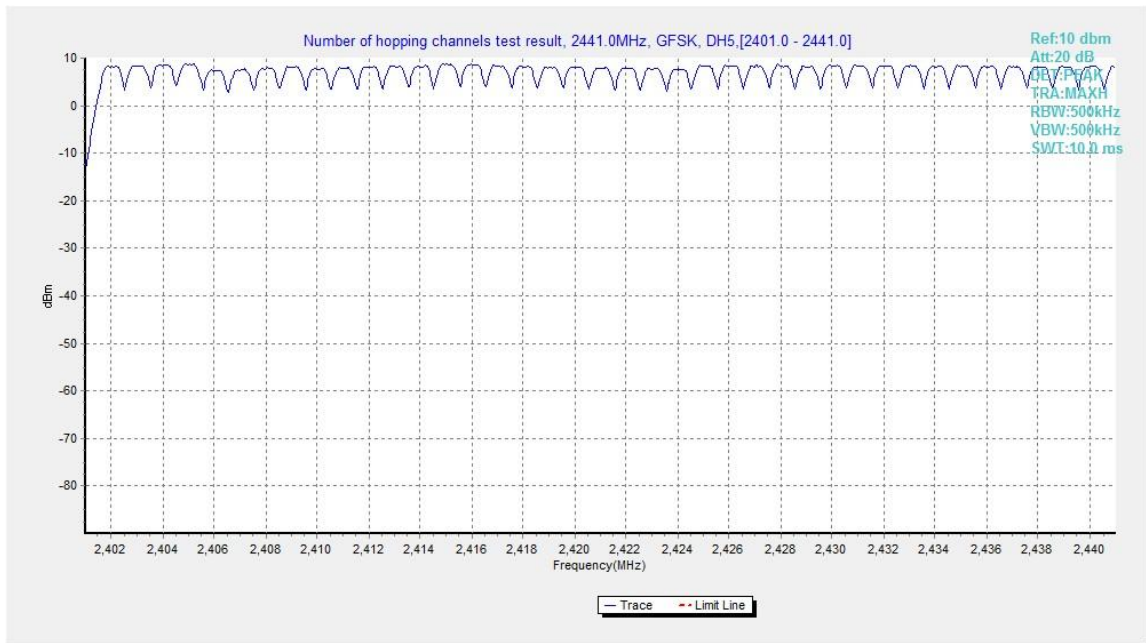


Fig.94. Number of hopping frequencies: GFSK, Channel 0 - 39

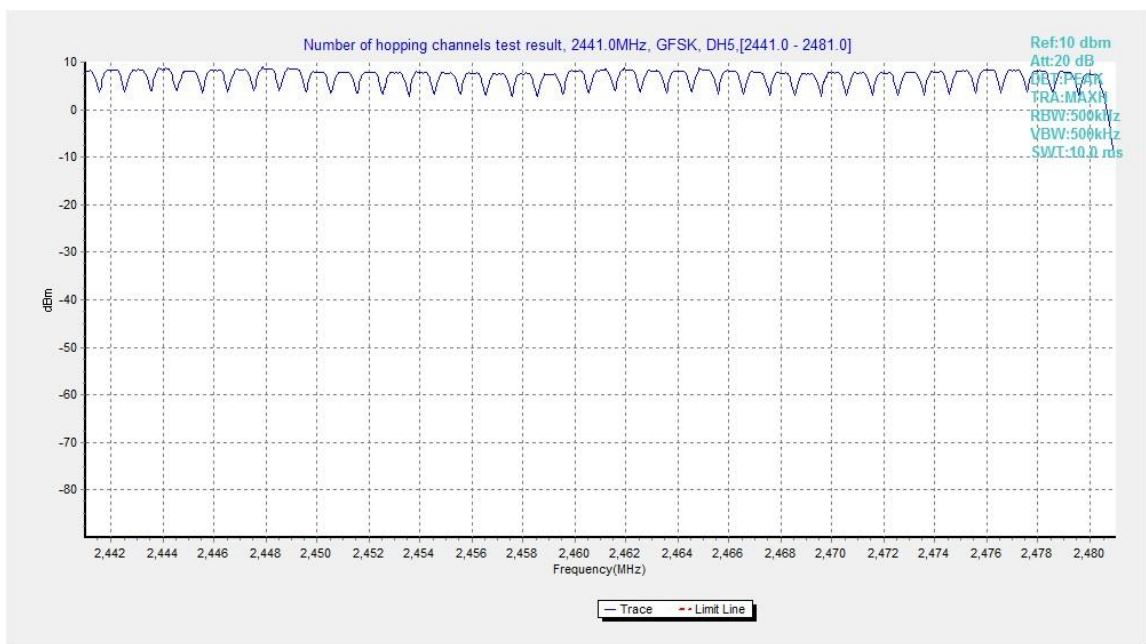


Fig.95. Number of hopping frequencies: GFSK, Channel 40 - 78

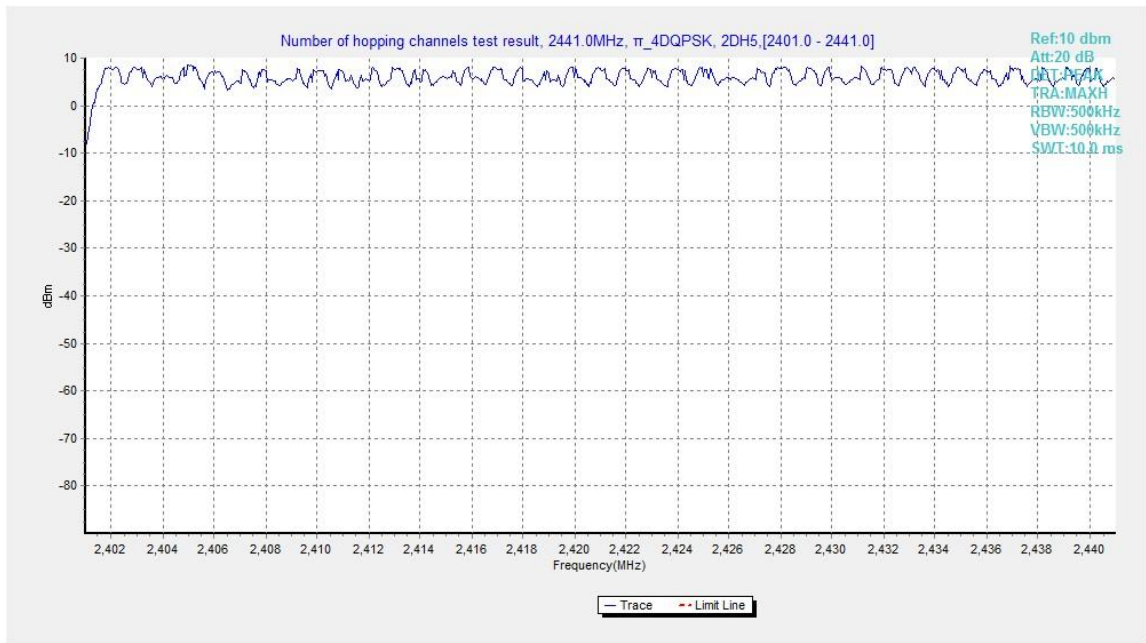


Fig.96. Number of hopping frequencies: $\pi/4$ DQPSK, Channel 0 - 39

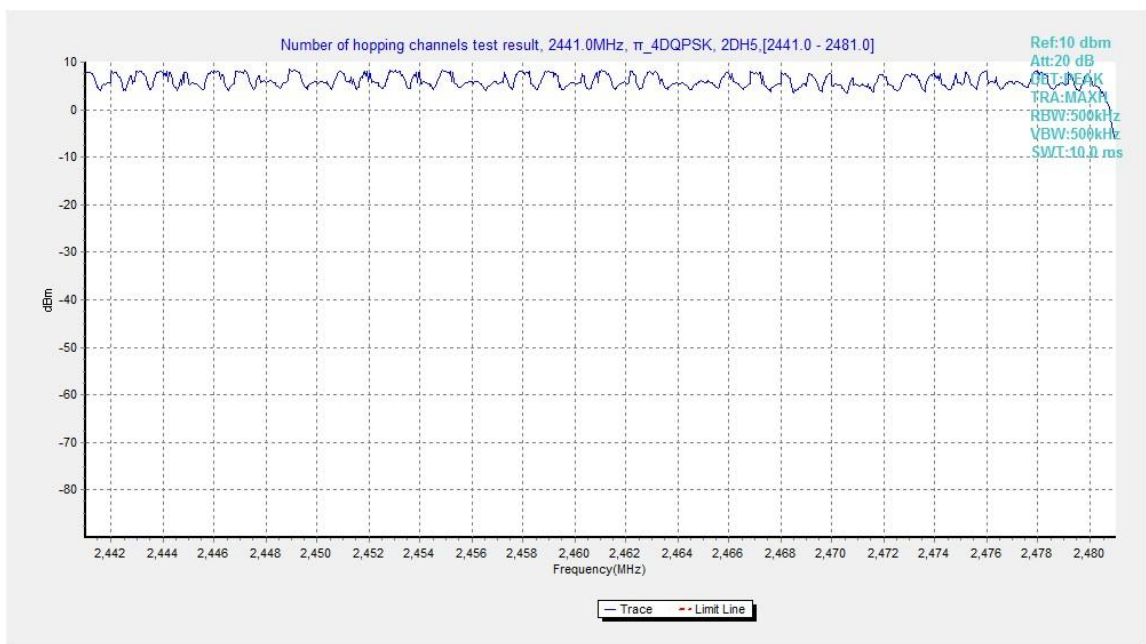


Fig.97. Number of hopping frequencies: $\pi/4$ DQPSK, Channel 40 - 78

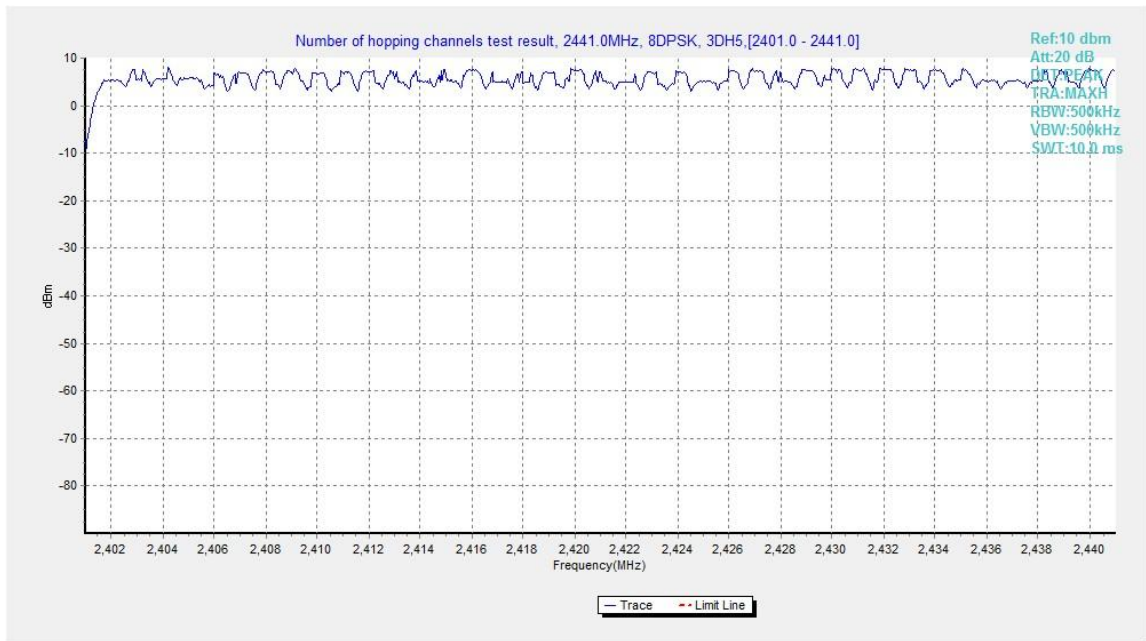


Fig.98. Number of hopping frequencies: 8DPSK, Channel 0 - 39

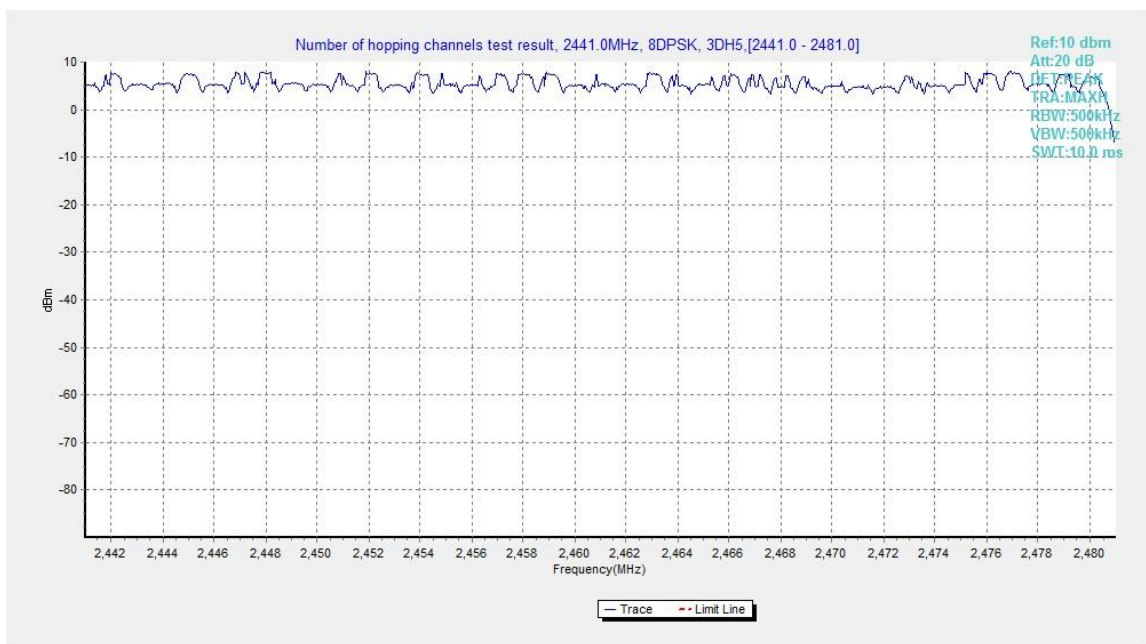


Fig.99. Number of hopping frequencies: 8DPSK, Channel 40 - 78

A.10. AC Powerline Conducted Emission

Method of Measurement: See ANSI C63.10-clause 6.2

1. the one EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is selected for the final measurement, while applying the appropriate modulating signal to the EUT.
2. If the EUT is relocated from an exploratory test site to a final test site, the highest emissions shall be remaximized at the final test location before final ac power-line conducted emission measurements are performed.
3. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) is then performed for the full frequency range for which the EUT is being tested for compliance without further variation of the EUT arrangement, cable positions, or EUT mode of operation.
4. If the EUT is comprised of equipment units that have their own separate ac power connections, e.g., floor-standing equipment with independent power cords for each shelf that are able to connect directly to the ac power network, each current-carrying conductor of one unit is measured while the other units are connected to a second (or more) LISN(s). All units shall be separately measured. If a power strip is provided by the manufacturer, to supply all of the units making up the EUT, only the conductors in the power cord of the power strip shall be measured.
5. If the EUT uses a detachable antenna, these measurements shall be made with a suitable dummy load connected to the antenna output terminals; otherwise, the tests shall be made with the antenna connected and, if adjustable, fully extended. When measuring the ac conducted emissions from a device that operates between 150 kHz and 30 MHz a non-detachable antenna may be replaced with a dummy load for the measurements within the fundamental emission band of the transmitter, but only for those measurements.³⁶ Record the six highest EUT emissions relative to the limit of each of the current-carrying conductors of the power cords of the equipment that comprises the EUT over the frequency range specified by the procuring or regulatory agency. Diagram or photograph the test setup that was used. See Clause 8 for full reporting requirements.

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	

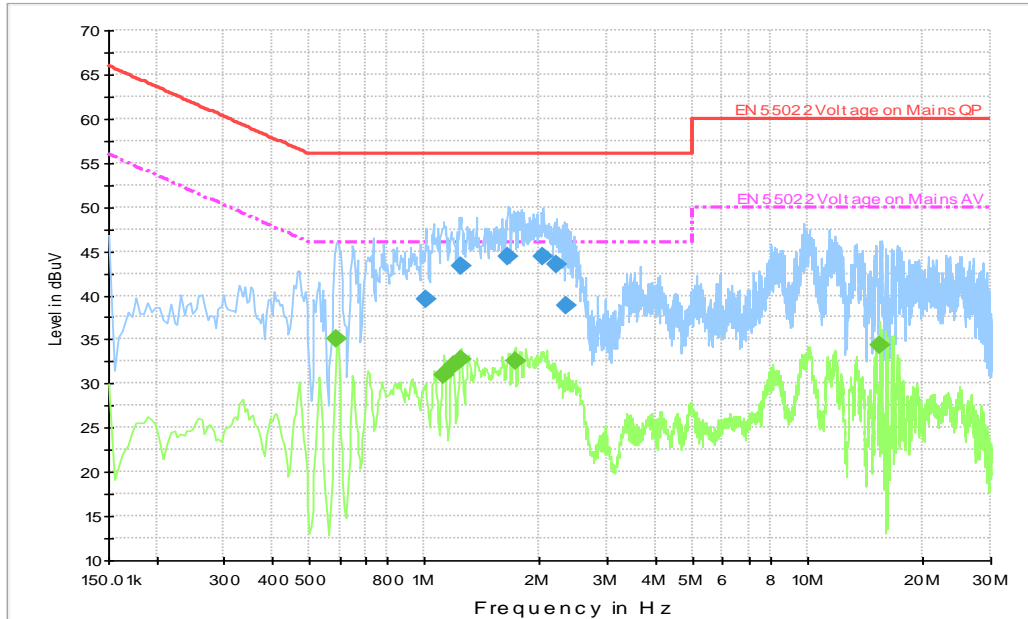
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

The measurement is made according to ANSI C63.10

Conclusion: PASS

Test graphs as below:

Traffic:



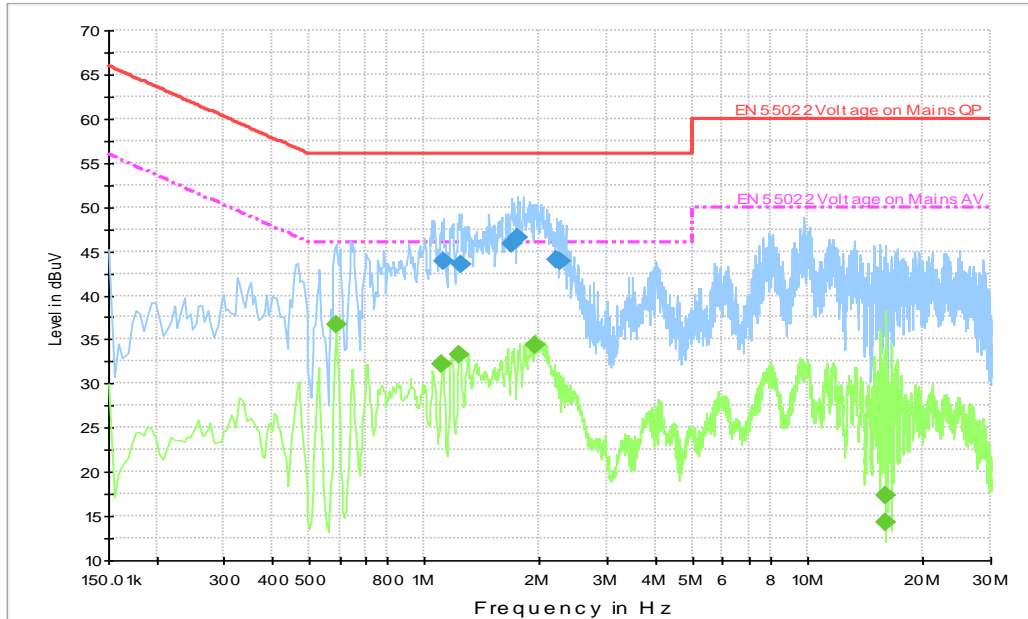
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
1.009500	39.6	2000.0	9.000	GND	L1	10.1	16.4	56.0
1.243500	43.4	2000.0	9.000	GND	L1	10.1	12.6	56.0
1.657500	44.3	2000.0	9.000	GND	L1	10.2	11.7	56.0
2.044500	44.3	2000.0	9.000	GND	L1	10.0	11.7	56.0
2.215500	43.4	2000.0	9.000	GND	L1	8.7	12.6	56.0
2.346000	38.8	2000.0	9.000	GND	L1	9.2	17.2	56.0

Final Result 2

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.591000	35.1	2000.0	9.000	GND	L1	10.1	10.9	46.0
1.126500	30.9	2000.0	9.000	GND	L1	10.2	15.1	46.0
1.185000	32.0	2000.0	9.000	GND	L1	10.2	14.0	46.0
1.243500	32.8	2000.0	9.000	GND	N	10.1	13.2	46.0
1.720500	32.6	2000.0	9.000	GND	L1	10.2	13.4	46.0
15.486000	34.3	2000.0	9.000	GND	L1	10.7	15.7	50.0

Idle:



Final Result 1

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
1.122000	43.9	2000.0	9.000	GND	L1	10.2	12.1	56.0
1.243500	43.4	2000.0	9.000	GND	L1	10.1	12.6	56.0
1.684500	45.9	2000.0	9.000	GND	L1	10.2	10.1	56.0
1.752000	46.6	2000.0	9.000	GND	L1	10.2	9.4	56.0
2.211000	44.0	2000.0	9.000	GND	L1	8.7	12.0	56.0
2.274000	43.8	2000.0	9.000	GND	L1	9.0	12.2	56.0

Final Result 2

Frequency (MHz)	QuasiPeak (dB μ V)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.586500	36.7	2000.0	9.000	GND	L1	10.1	9.3	46.0
1.108500	32.3	2000.0	9.000	GND	L1	10.2	13.7	46.0
1.230000	33.2	2000.0	9.000	GND	L1	10.1	12.8	46.0
1.941000	34.4	2000.0	9.000	GND	L1	10.2	11.6	46.0
15.922500	17.3	2000.0	9.000	GND	L1	10.8	32.7	50.0
15.985500	14.3	2000.0	9.000	GND	L1	10.8	35.7	50.0

ANNEX E: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology



Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT
Beijing
China

*is accredited by the National Voluntary Laboratory Accreditation Program for specific services,
listed on the Scope of Accreditation, for:*

Electromagnetic Compatibility & Telecommunications

*This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005.
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 January 2009).*

2018-09-28 through 2019-09-30
Effective Dates




For the National Voluntary Laboratory Accreditation Program

END OF REPORT