

Fig.38. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 2480MHz

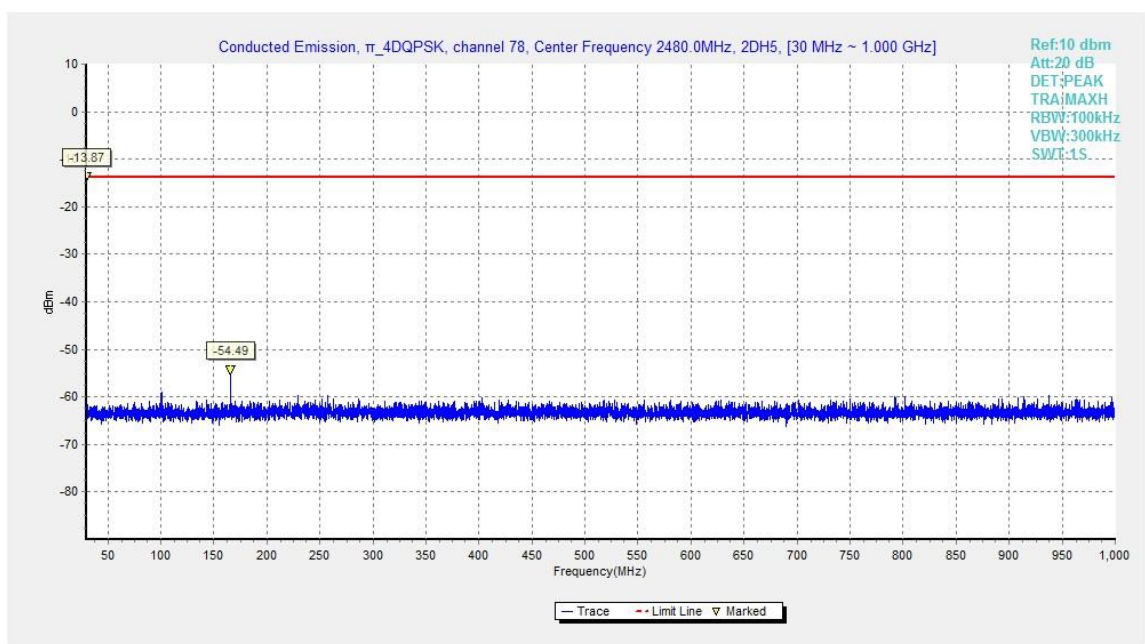


Fig.39. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 30MHz - 1GHz

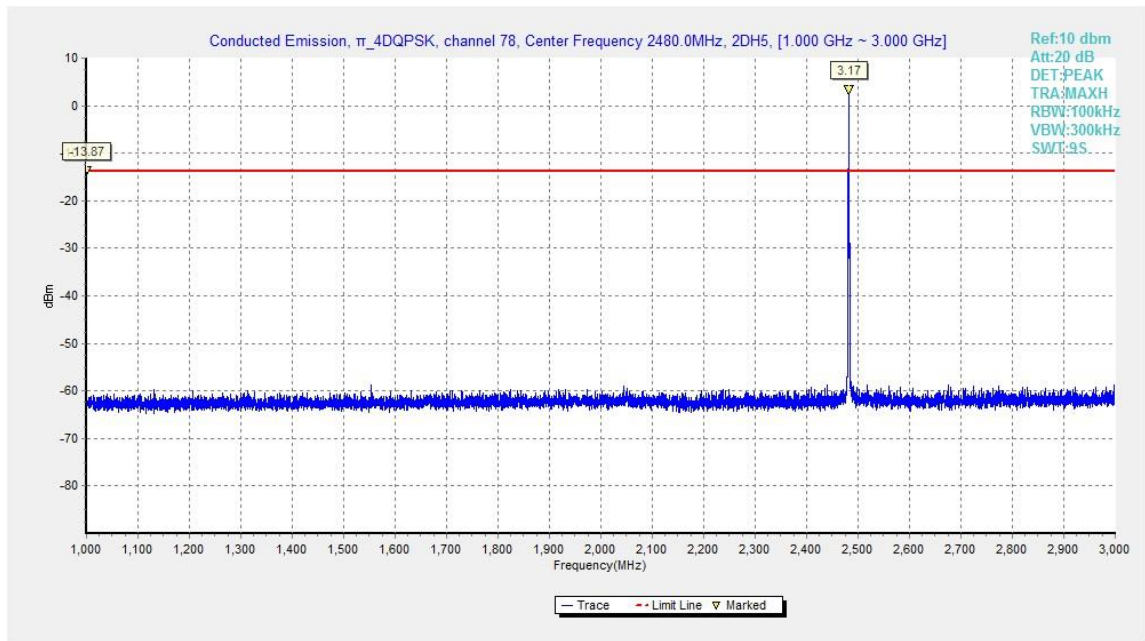


Fig.40. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 1GHz - 3GHz

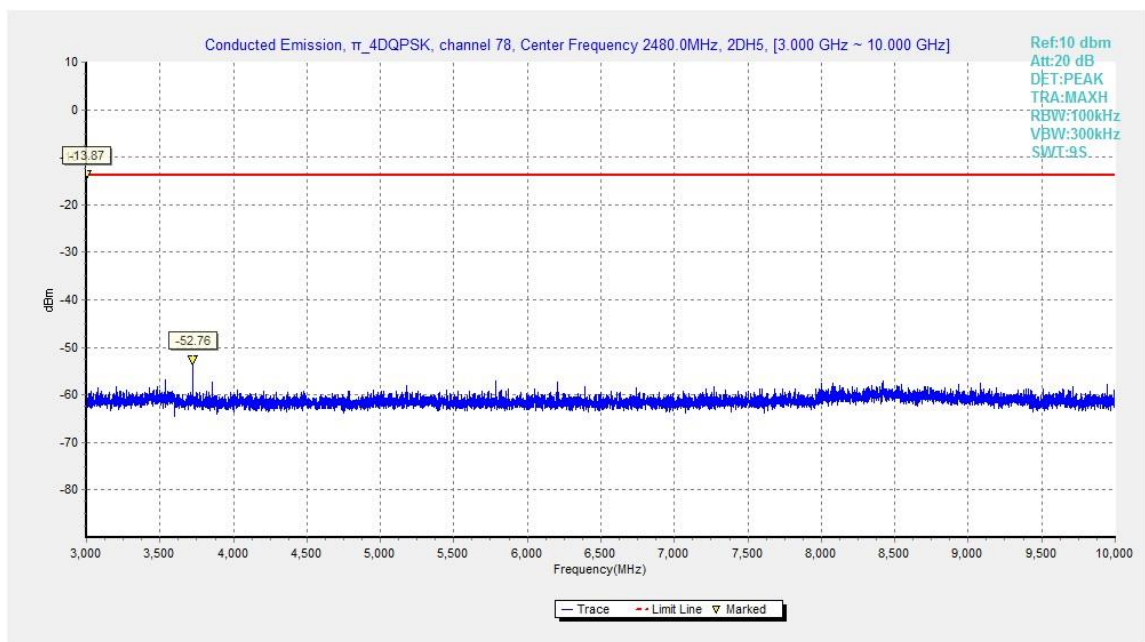


Fig.41. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 3GHz - 10GHz

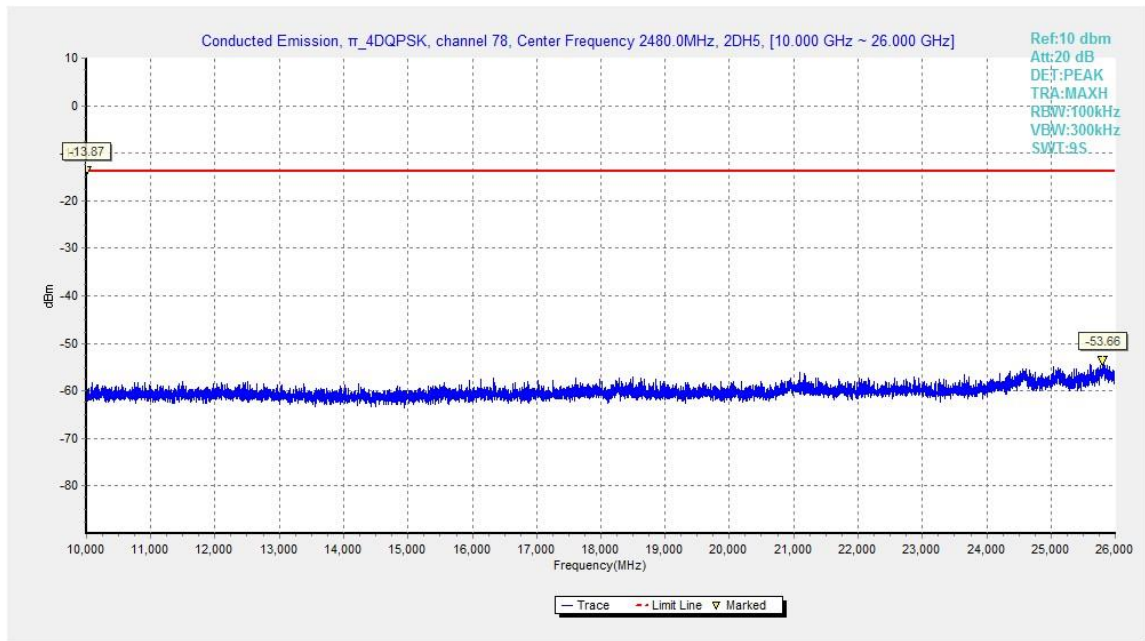


Fig.42. Conducted spurious emission:  $\pi/4$  DQPSK, Channel 78, 10GHz - 26GHz

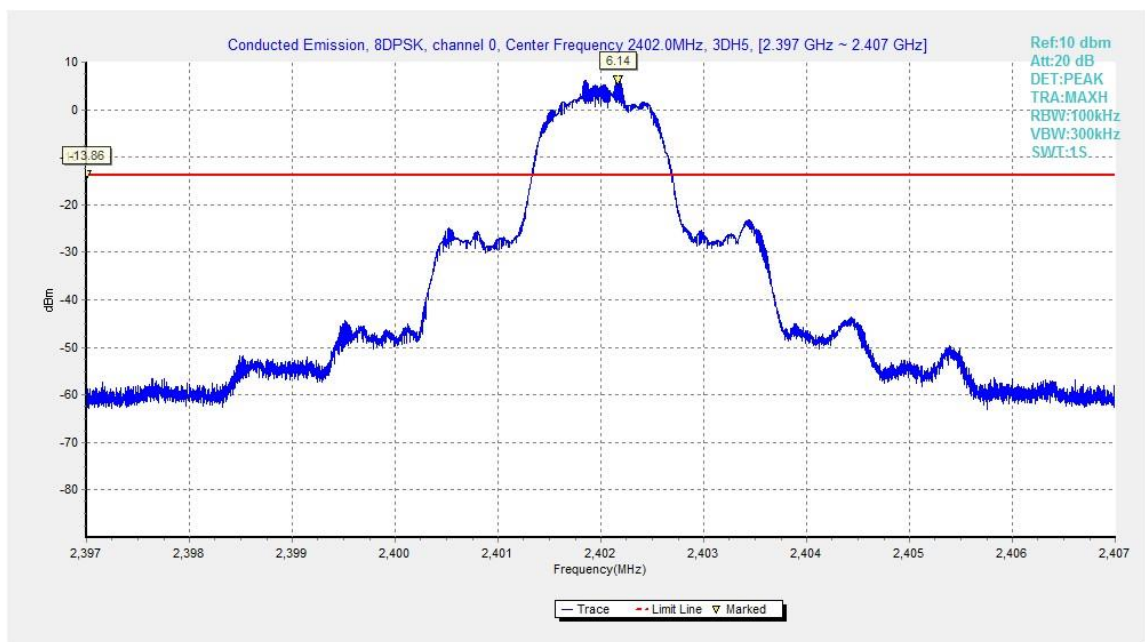


Fig.43. Conducted spurious emission: 8DPSK, Channel 0,2402MHz

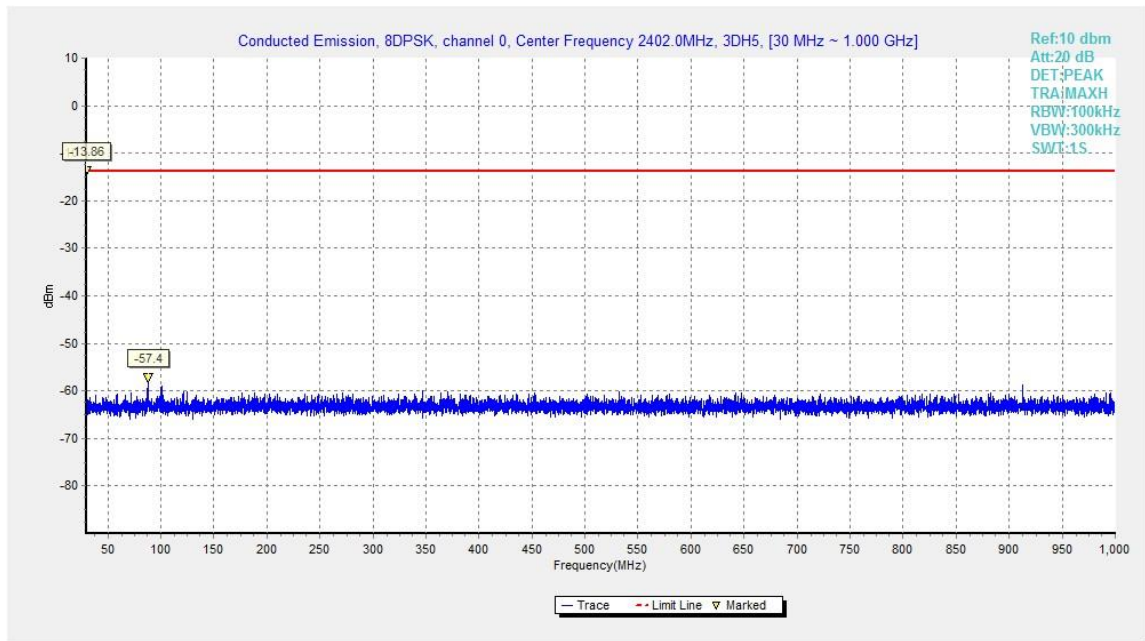


Fig.44. Conducted spurious emission: 8DPSK, Channel 0, 30MHz - 1GHz

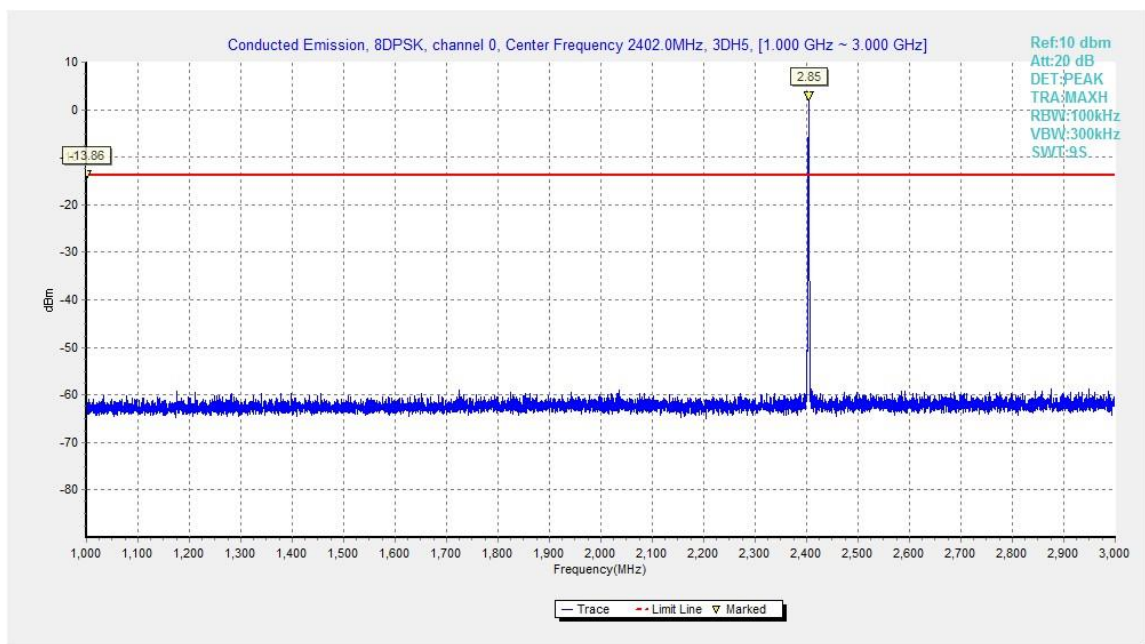


Fig.45. Conducted spurious emission: 8DPSK, Channel 0, 1GHz - 3GHz

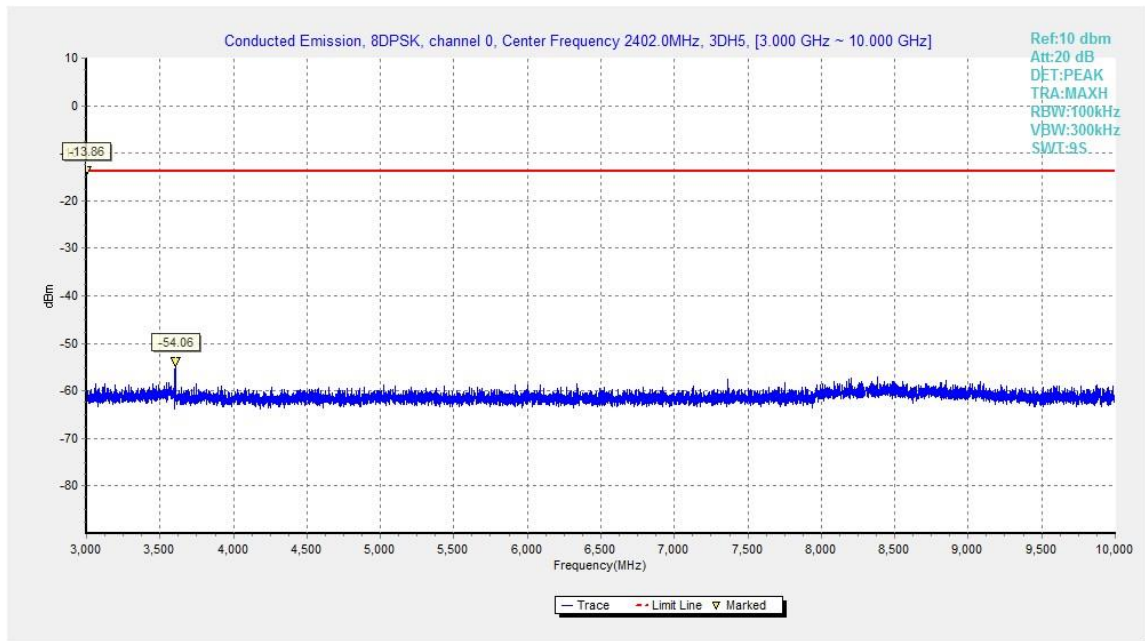


Fig.46. Conducted spurious emission: 8DPSK, Channel 0, 3GHz - 10GHz

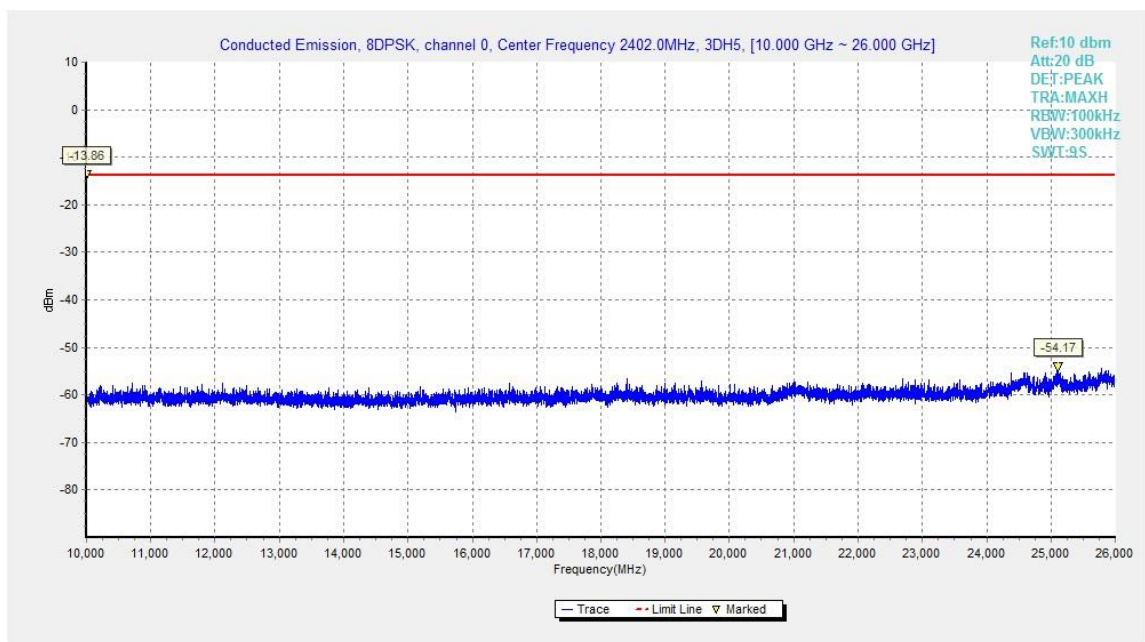


Fig.47. Conducted spurious emission: 8DPSK, Channel 0,10GHz - 26GHz

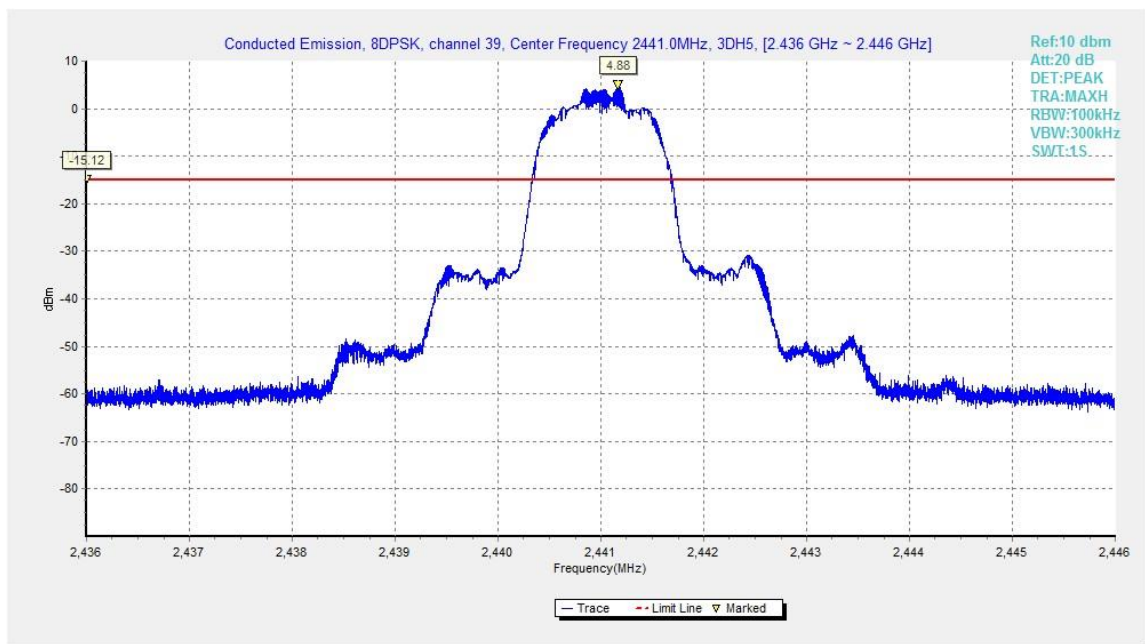


Fig.48. Conducted spurious emission: 8DPSK, Channel 39, 2441MHz

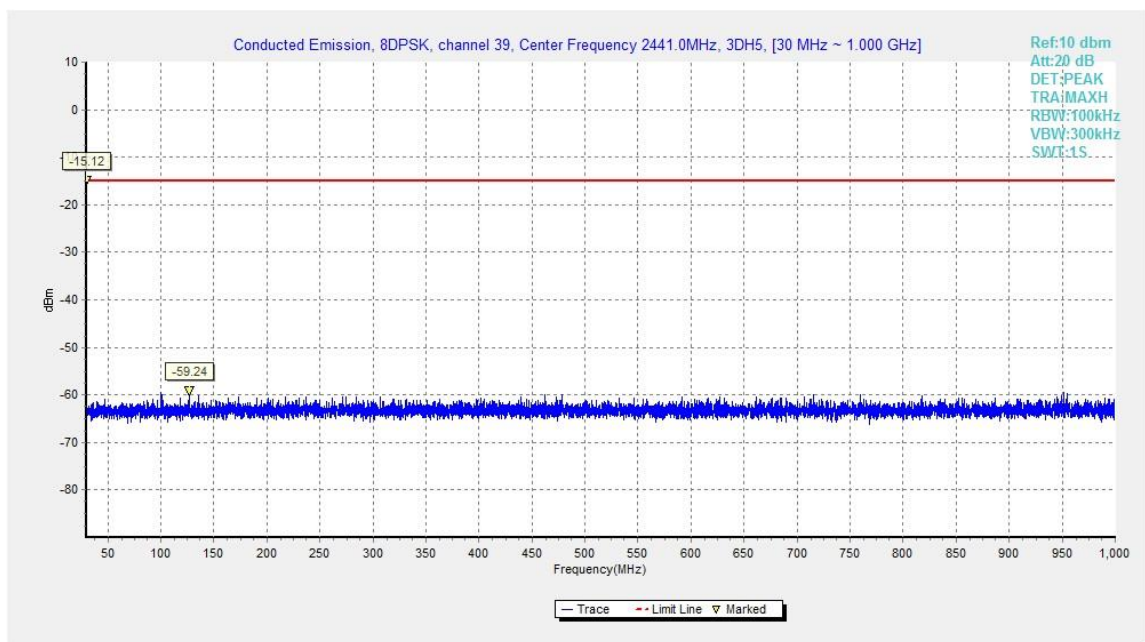


Fig.49. Conducted spurious emission: 8DPSK, Channel 39, 30MHz - 1GHz

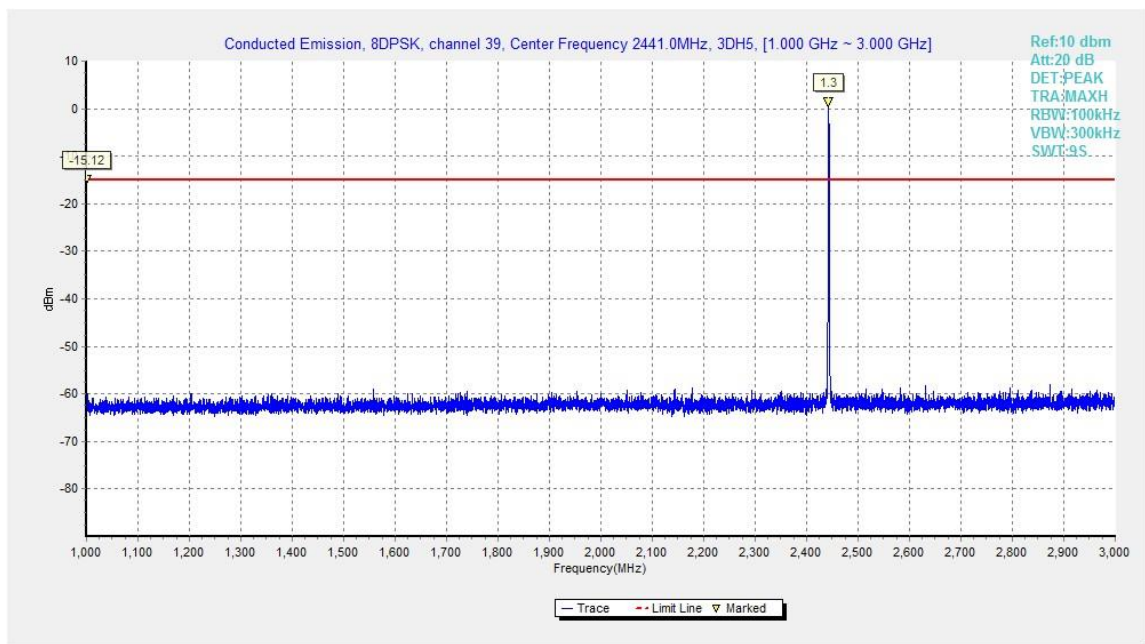


Fig.50. Conducted spurious emission: 8DPSK, Channel 39, 1GHz - 3GHz

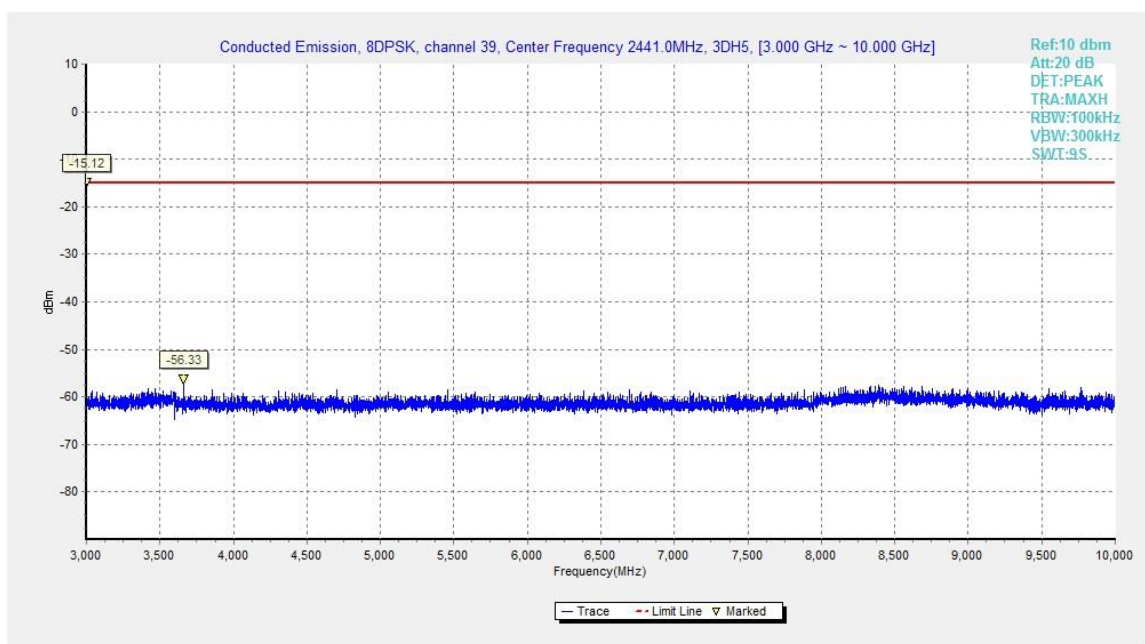


Fig.51. Conducted spurious emission: 8DPSK, Channel 39, 3GHz - 10GHz

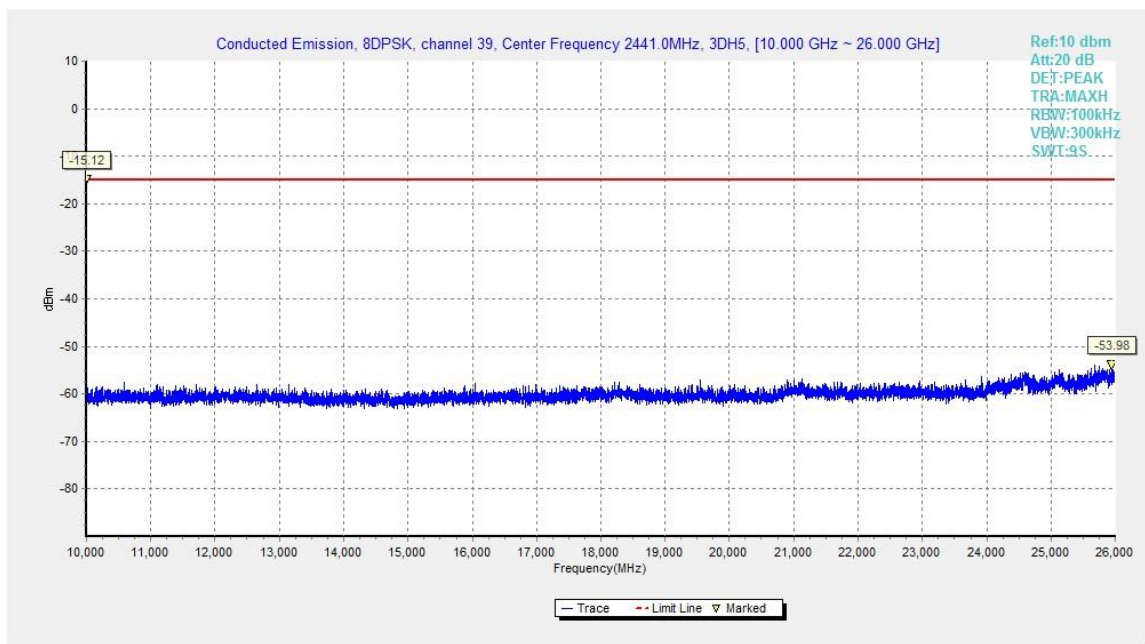


Fig.52. Conducted spurious emission: 8DPSK, Channel 39, 10GHz – 26GHz

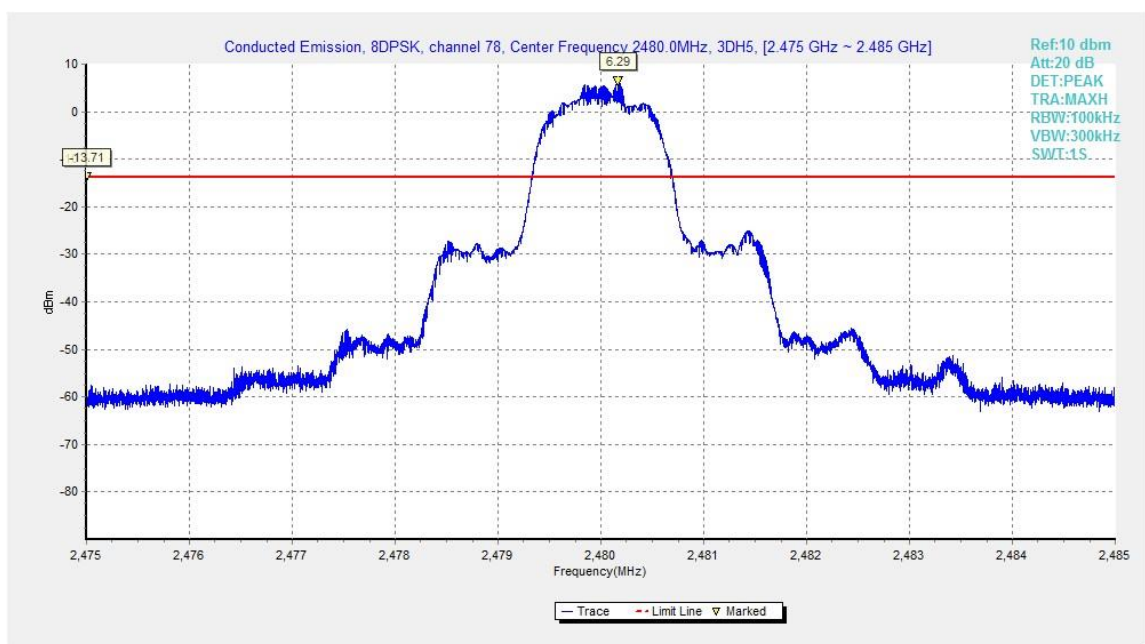


Fig.53. Conducted spurious emission: 8DPSK, Channel 78, 2480MHz



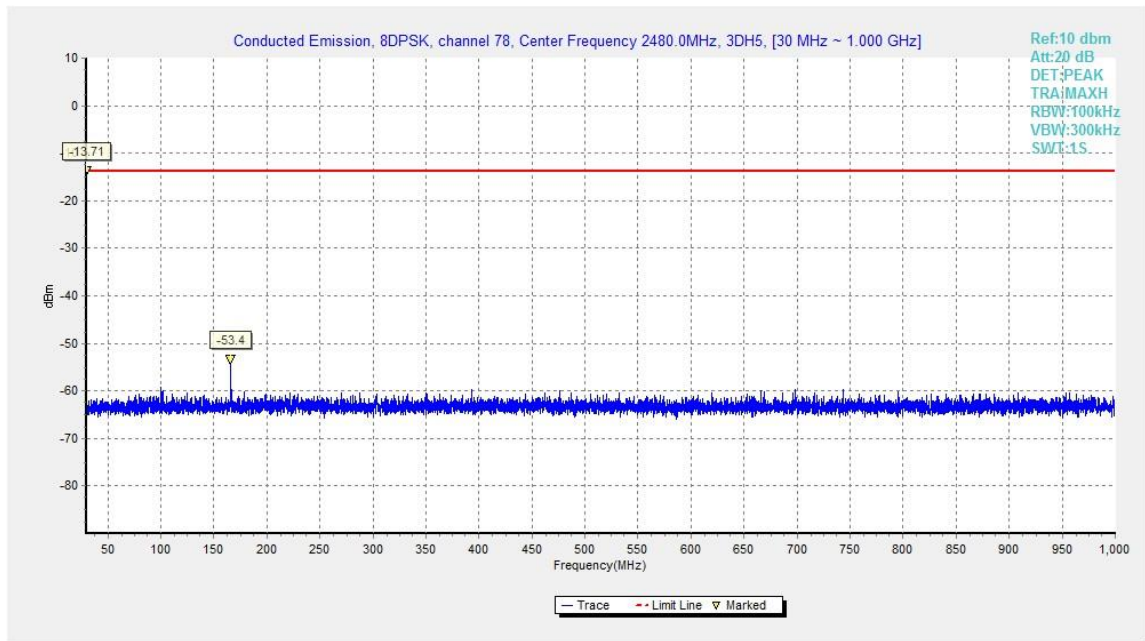


Fig.54. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz

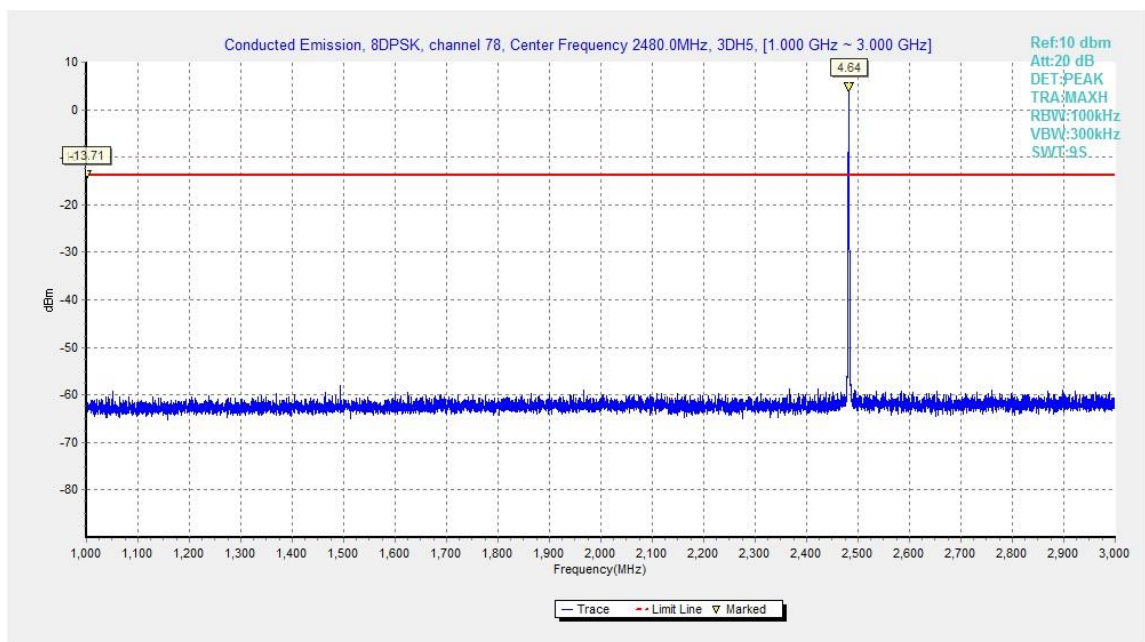


Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

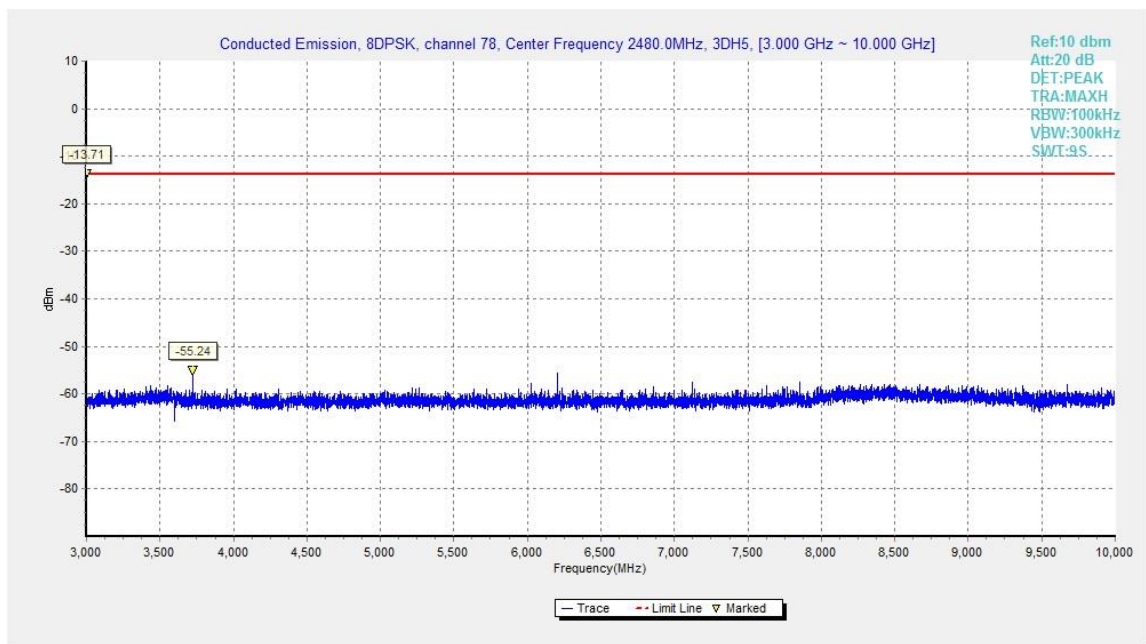


Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

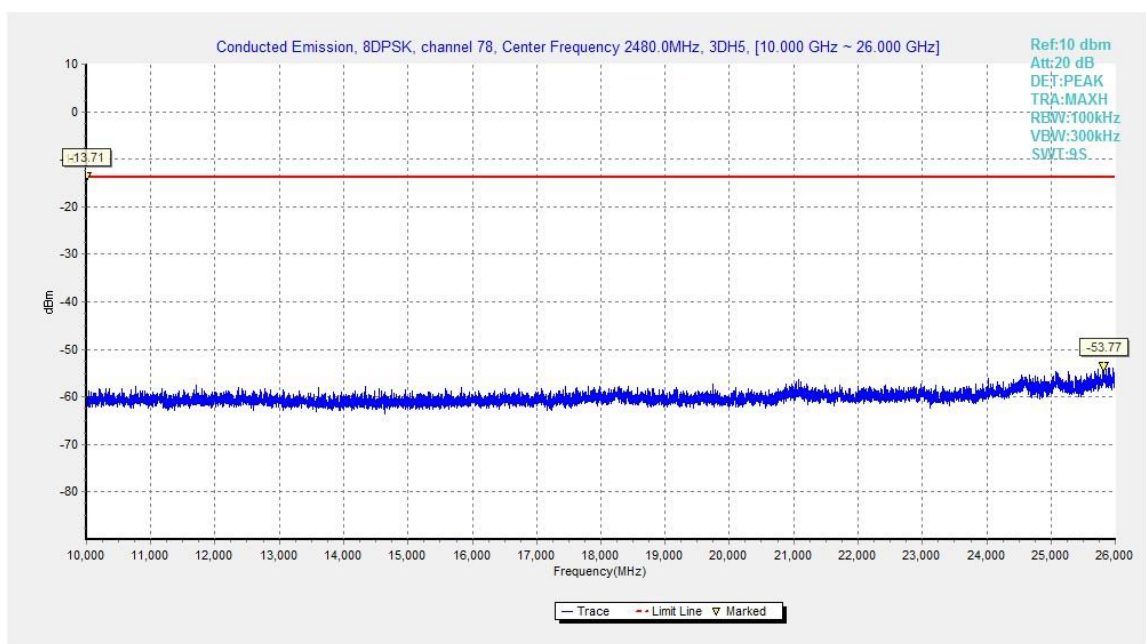


Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

### 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 2440 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 2440 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 2440 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 (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
2387.590	41.3	-14.3	27.2	28.442	H
4803.000	47.7	-17.2	32.3	32.607	H
4804.500	43.4	-17.2	32.3	28.307	V
17995.500	40.7	-5.4	43.4	2.716	H
17998.500	40.7	-5.4	43.4	2.716	H
17997.000	40.5	-5.4	43.4	2.516	H

**GFSK Ch 39 - Average**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
4881.000	41.3	-17.4	32.3	26.409	H
18000.000	40.7	-6.5	46.4	0.841	H
17986.500	40.4	-5.4	43.4	2.416	V
17979.000	40.4	-5.4	43.4	2.416	H
17965.500	40.4	-5.4	43.4	2.416	H
17998.500	40.3	-5.4	43.4	2.316	H

**GFSK Ch 78 - Average**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
2487.560	41.8	-14.4	27.2	28.963	H
4959.000	41.7	-17.2	32.3	26.602	H
17983.500	40.6	-5.4	43.4	2.616	V
17985.000	40.6	-5.4	43.4	2.616	H
18000.000	40.5	-6.5	46.4	0.641	H
17998.500	40.5	-5.4	43.4	2.516	H

**GFSK Ch 0 – Peak**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
2385.995	54.7	-14.3	27.2	41.842	H
4803.000	56.8	-17.2	32.3	41.707	H
4804.500	56.7	-17.2	32.3	41.607	V
17932.500	52.7	-5.4	43.4	14.716	H
17985.000	52.7	-5.4	43.4	14.716	H
17964.000	52.2	-5.4	43.4	14.216	H

**GFSK Ch 39 - Peak**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17980.500	52.4	-5.4	43.4	14.416	H
17896.500	52.3	-5.7	43.4	14.638	H
17997.000	52.2	-5.4	43.4	14.216	V
17983.500	52.1	-5.4	43.4	14.116	H
17995.500	52.1	-5.4	43.4	14.116	H
17982.000	52.1	-5.4	43.4	14.116	H

**GFSK Ch 78 - Peak**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
2488.780	54.7	-14.4	27.2	41.863	H
17829.000	53.4	-5.7	43.4	15.738	H
17955.000	52.8	-5.4	43.4	14.816	V
17905.500	52.7	-5.7	43.4	15.038	H
17914.500	52.2	-5.4	43.4	14.216	H
17992.500	52.2	-5.4	43.4	14.216	H

**$\pi/4$  DQPSK Ch 0 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
2388.675	41.6	-14.3	27.2	28.742	H
17998.500	40.8	-5.4	43.4	2.816	H
17997.000	40.6	-5.4	43.4	2.616	V
17994.000	40.5	-5.4	43.4	2.516	H
18000.000	40.5	-6.5	46.4	0.641	H
17967.000	40.5	-5.4	43.4	2.516	H

**$\pi/4$  DQPSK Ch 39 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
18000.000	40.6	-6.5	46.4	0.741	H
17998.500	40.5	-5.4	43.4	2.516	H
17983.500	40.5	-5.4	43.4	2.516	V
17980.500	40.5	-5.4	43.4	2.516	H
17997.000	40.5	-5.4	43.4	2.516	H
17947.500	40.4	-5.4	43.4	2.416	H

**$\pi/4$  DQPSK Ch 78 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
2484.720	41.7	-14.4	27.2	28.863	H
17994.000	40.8	-5.4	43.4	2.816	H
17980.500	40.5	-5.4	43.4	2.516	V
17997.000	40.5	-5.4	43.4	2.516	H
18000.000	40.5	-6.5	46.4	0.641	H
17992.500	40.4	-5.4	43.4	2.416	H

**$\pi/4$  DQPSK Ch 0 – Peak**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
2388.460	54.1	-14.3	27.2	41.242	H
17941.500	53.0	-5.4	43.4	15.016	H
17817.000	52.8	-5.7	43.4	15.138	V
17908.500	52.7	-5.7	43.4	15.038	H
17973.000	52.7	-5.4	43.4	14.716	H
17989.500	52.5	-5.4	43.4	14.516	H

**$\pi/4$  DQPSK Ch 39 - Peak**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
17976.000	52.6	-5.4	43.4	14.616	H
17988.000	52.6	-5.4	43.4	14.616	H
17895.000	52.5	-5.7	43.4	14.838	V
17854.500	52.4	-5.7	43.4	14.738	H
17992.500	52.4	-5.4	43.4	14.416	H
17941.500	52.3	-5.4	43.4	14.316	H

**$\pi/4$  DQPSK Ch 78 - Peak**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
2485.170	54.2	-14.4	27.2	41.363	H
17994.000	52.5	-5.4	43.4	14.516	H
17992.500	52.5	-5.4	43.4	14.516	V
17917.500	52.2	-5.4	43.4	14.216	H
17938.500	52.2	-5.4	43.4	14.216	H
17901.000	52.2	-5.7	43.4	14.538	H



**8DPSK Ch 0 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
2384.930	41.5	-14.3	27.2	28.642	H
4806.000	43.4	-17.2	32.3	28.307	H
18000.000	40.8	-6.5	46.4	0.941	V
17998.500	40.7	-5.4	43.4	2.716	H
17988.000	40.7	-5.4	43.4	2.716	H
17995.500	40.6	-5.4	43.4	2.616	H

**8DPSK Ch 39 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
17995.500	40.8	-5.4	43.4	2.816	H
17998.500	40.8	-5.4	43.4	2.816	H
17937.000	40.7	-5.4	43.4	2.716	V
18000.000	40.7	-6.5	46.4	0.841	H
17997.000	40.6	-5.4	43.4	2.616	H
17988.000	40.6	-5.4	43.4	2.616	H

**8DPSK Ch 78 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
2487.825	41.9	-14.4	27.2	29.063	H
17983.500	40.8	-5.4	43.4	2.816	H
17998.500	40.8	-5.4	43.4	2.816	V
17971.500	40.7	-5.4	43.4	2.716	H
17994.000	40.7	-5.4	43.4	2.716	H
17961.000	40.6	-5.4	43.4	2.616	H

**8DPSK Ch 0 – Peak**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
2384.585	54.6	-14.3	27.2	41.742	H
4806.000	54.0	-17.2	32.3	38.907	H
4804.500	53.2	-17.2	32.3	38.107	V
17985.000	53.0	-5.4	43.4	15.016	H
17938.500	52.8	-5.4	43.4	14.816	H
17991.000	52.8	-5.4	43.4	14.816	H

**8DPSK Ch 39 - Peak**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
17943.000	53.4	-5.4	43.4	15.416	H
17916.000	53.2	-5.4	43.4	15.216	H
17899.500	53.0	-5.7	43.4	15.338	V
17998.500	52.8	-5.4	43.4	14.816	H
18000.000	52.5	-6.5	46.4	12.641	H
17956.500	52.5	-5.4	43.4	14.516	H

**8DPSK Ch 78 - Peak**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Antenna Pol. (H/V)
2487.305	55.0	-14.4	27.2	42.163	H
18000.000	53.8	-6.5	46.4	13.941	H
17916.000	53.1	-5.4	43.4	15.116	V
17934.000	52.8	-5.4	43.4	14.816	H
17967.000	52.7	-5.4	43.4	14.716	H
17953.500	52.3	-5.4	43.4	14.316	H

**Conclusion: PASS**

**Test graphs as below:**

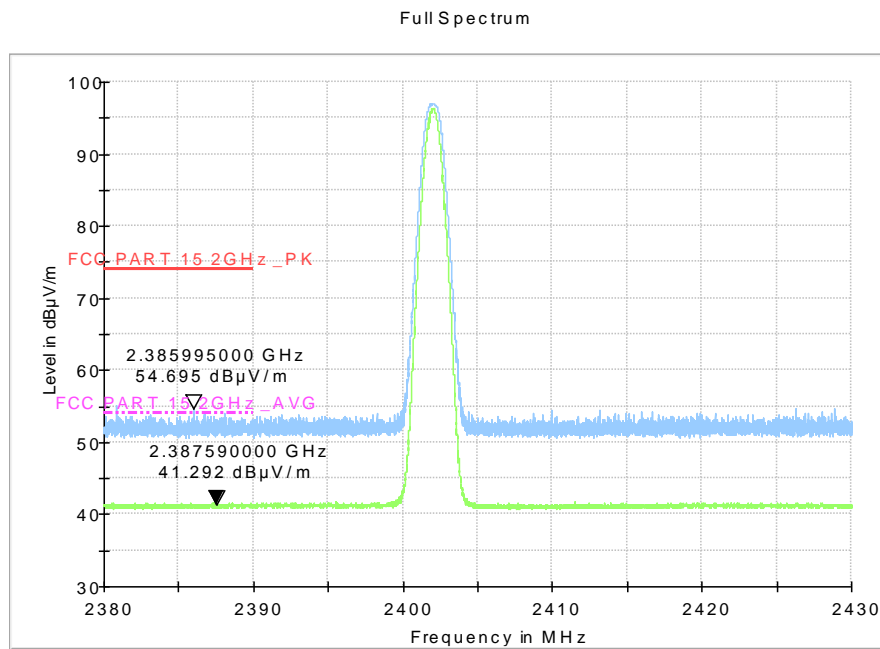


Fig.58. Radiated emission (Power): GFSK, low channel

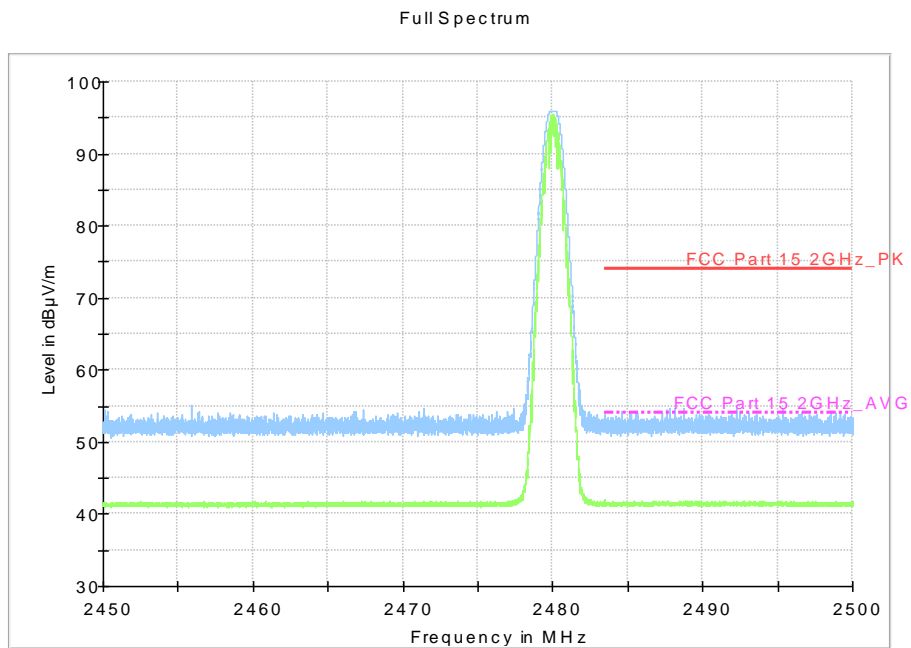


Fig.59. Radiated emission (Power) GFSK, high channel

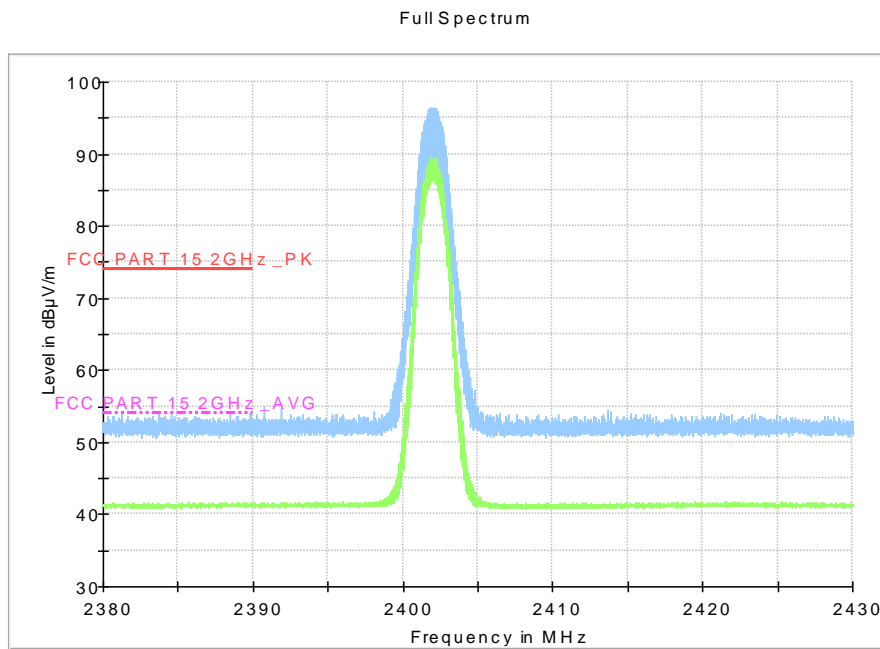


Fig.60. Radiated emission (Power):  $\pi/4$  DQPSK, low channel

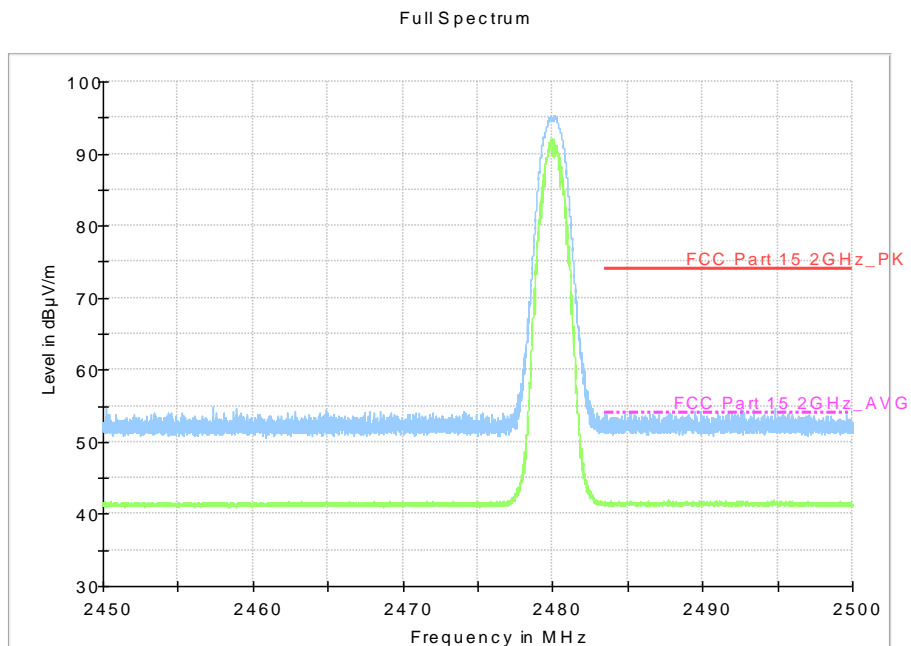


Fig.61. Radiated emission (Power):  $\pi/4$  DQPSK, high channel

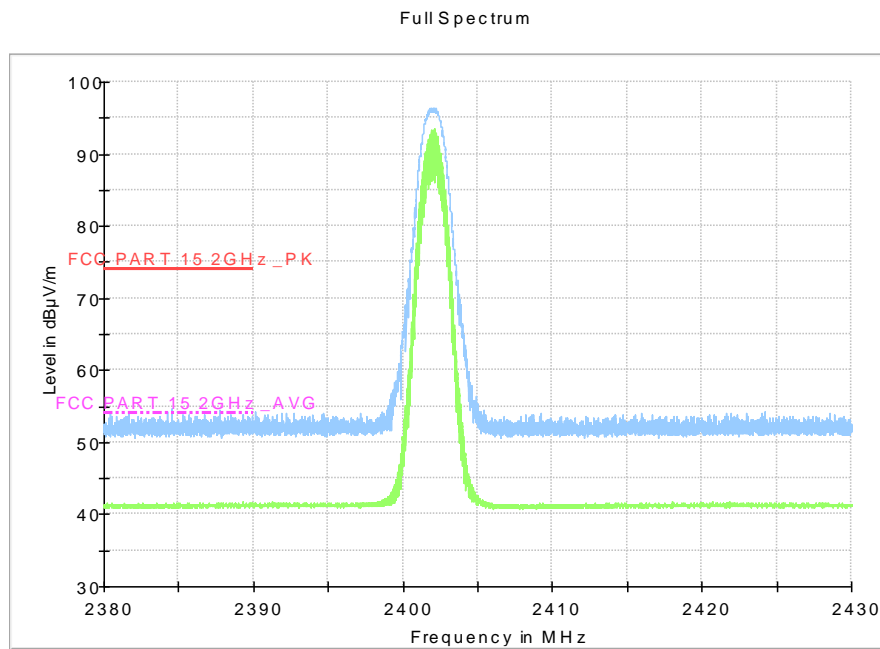


Fig.62. Radiated emission (Power): 8DPSK, low channel

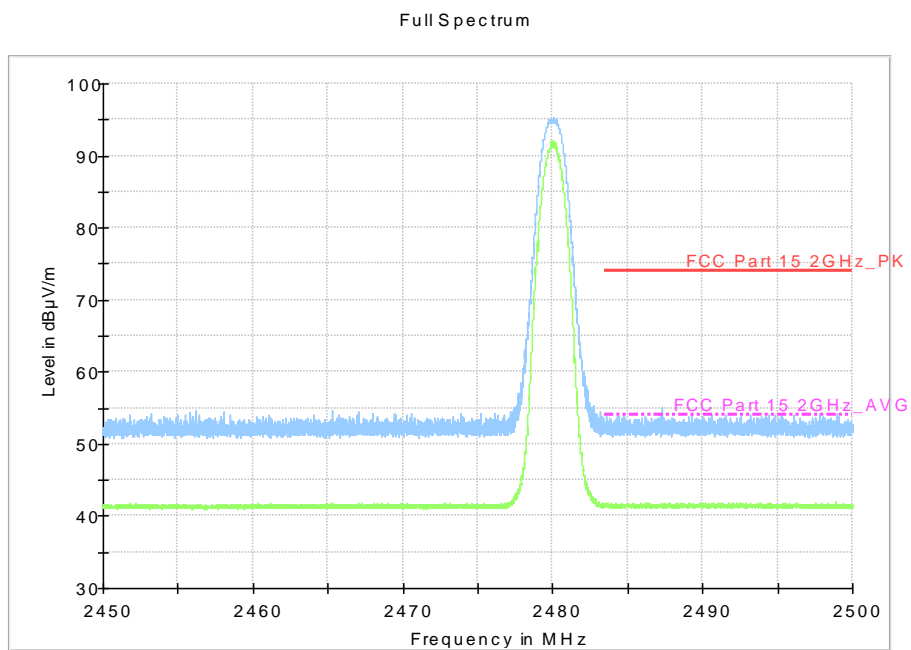


Fig.63. Radiated emission (Power): 8DPSK, high channel

### 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	119.52	P
		Fig.65		
	DH3	Fig.66	181.28	P
		Fig.67		
	DH5	Fig.68	221.85	P
		Fig.69		

**For  $\pi/4$  DQPSK**

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.70	123.51	P
		Fig.71		
	DH3	Fig.72	188.23	P
		Fig.73		
	DH5	Fig.74	180.63	P
		Fig.75		

**For 8DPSK**

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.76	122.90	P
		Fig.77		
	DH3	Fig.78	163.53	P

		Fig.79		
	DH5	Fig.80	173.19	P
		Fig.81		

**Conclusion: PASS**

**Test graphs as below:**

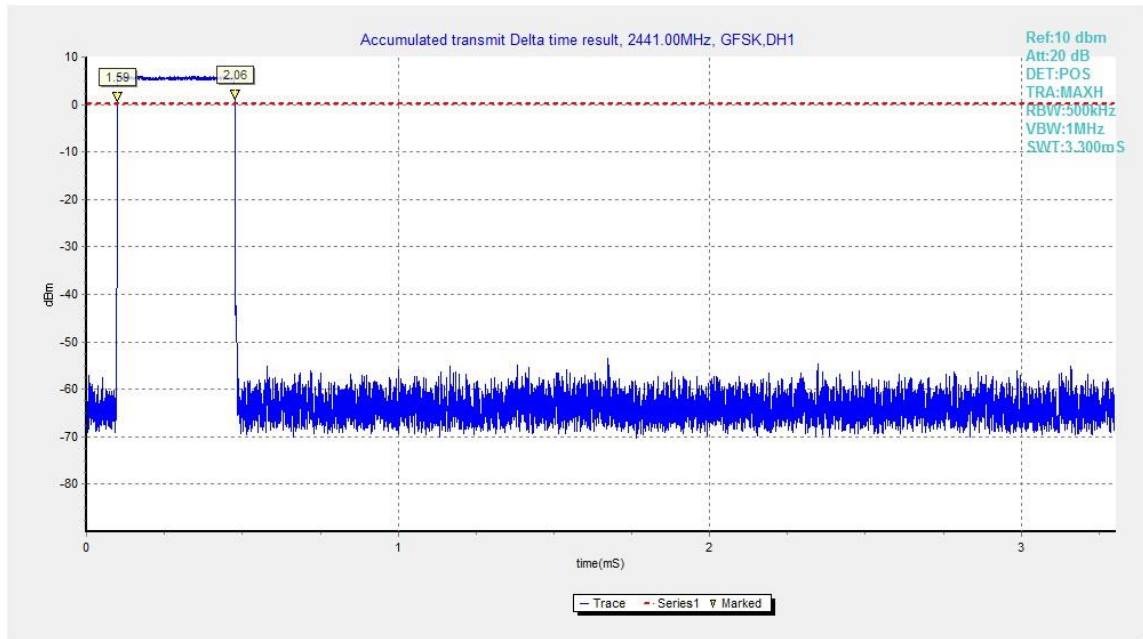


Fig.64. Time of occupancy (Dwell Time): Channel 39, Packet DH1

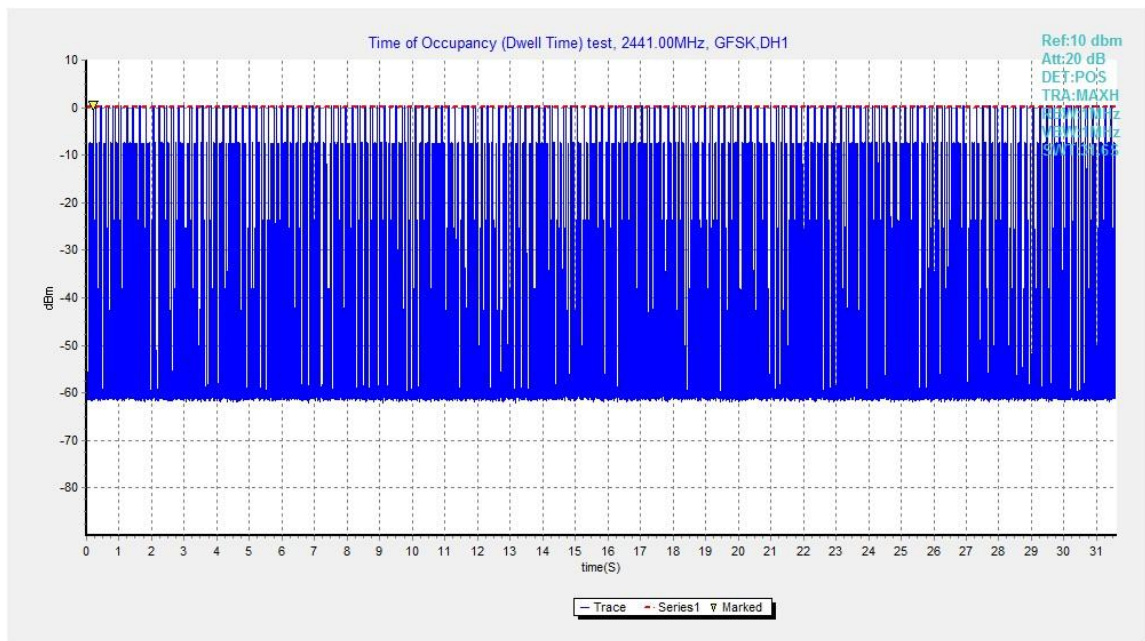


Fig.65. Number of Transmissions Measurement: Channel 39,Packet DH1

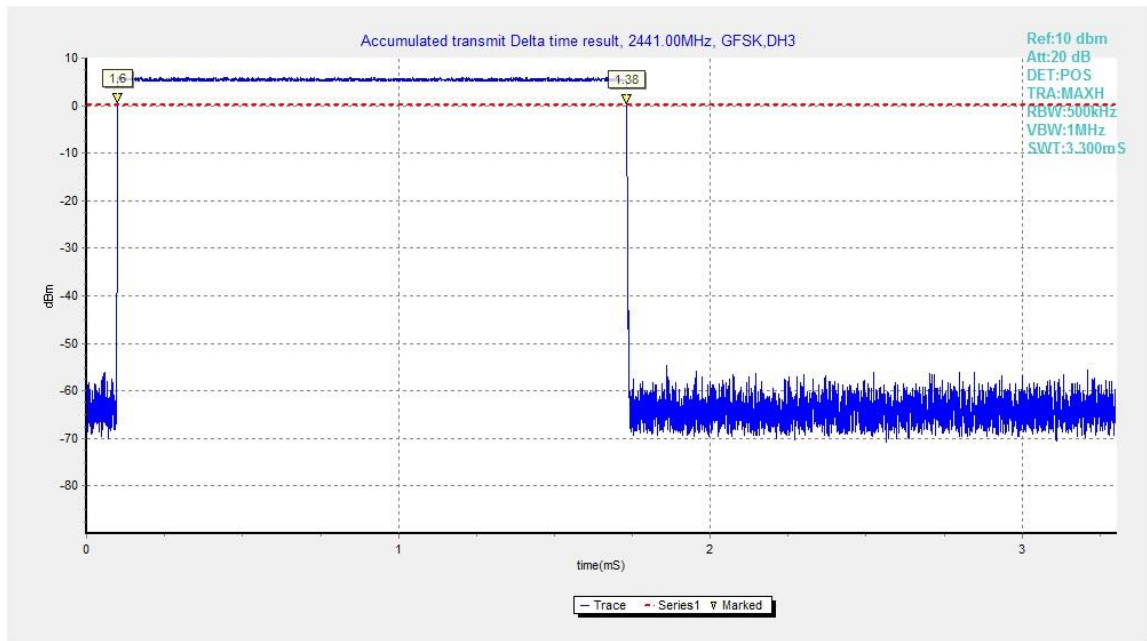


Fig.66. Time of occupancy (Dwell Time): Channel 39, Packet DH3

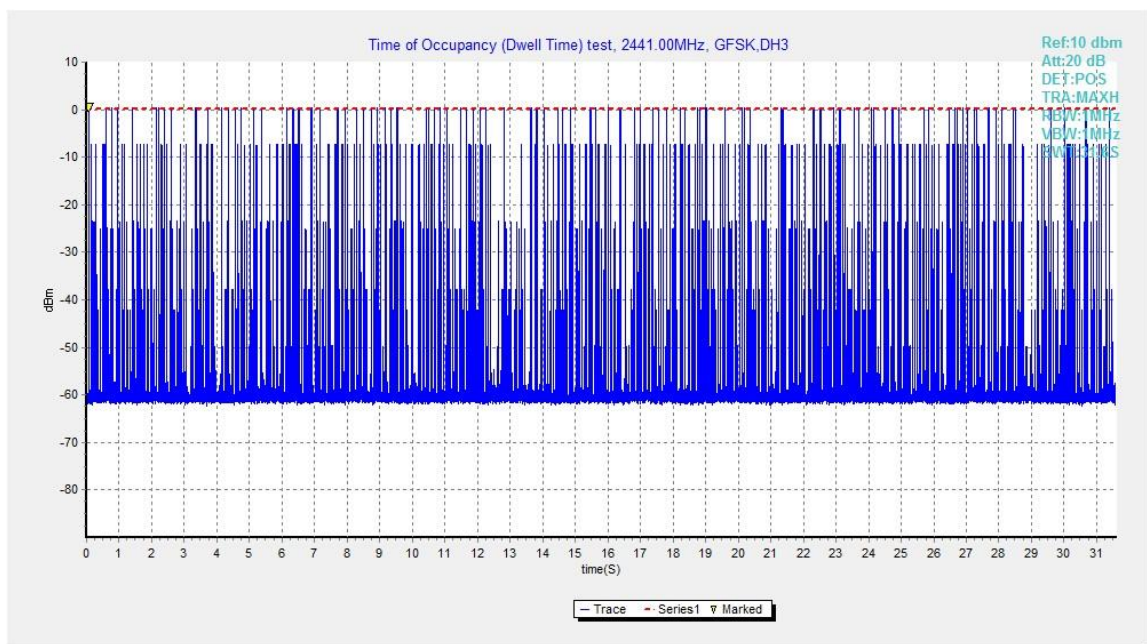


Fig.67. Number of Transmissions Measurement: Channel 39,Packet DH3



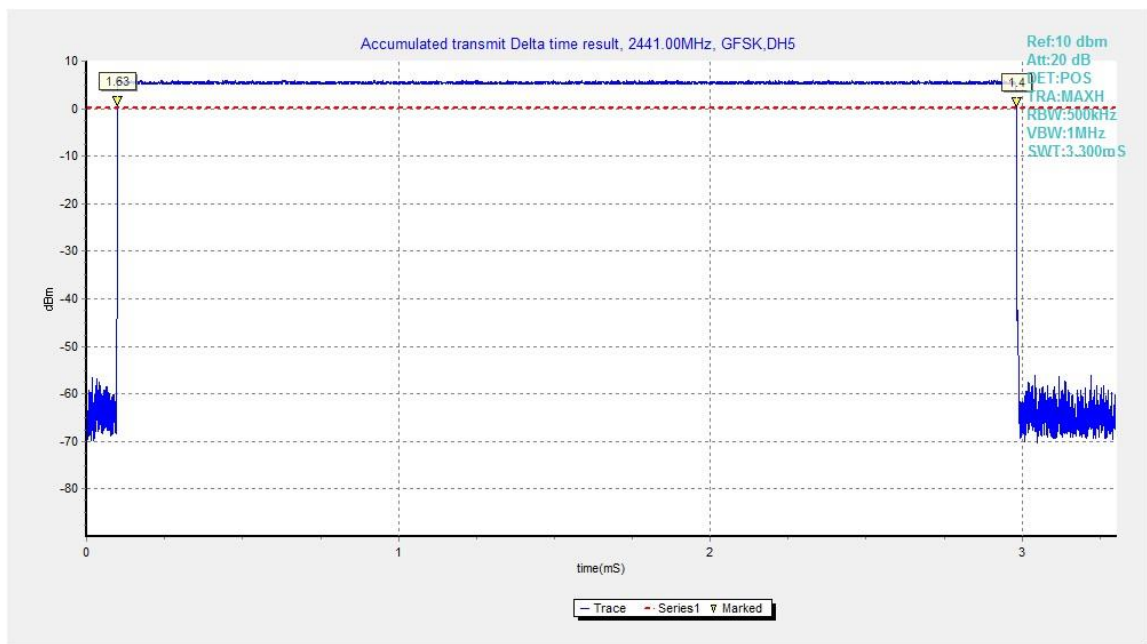


Fig.68. Time of occupancy (Dwell Time): Channel 39, Packet DH5

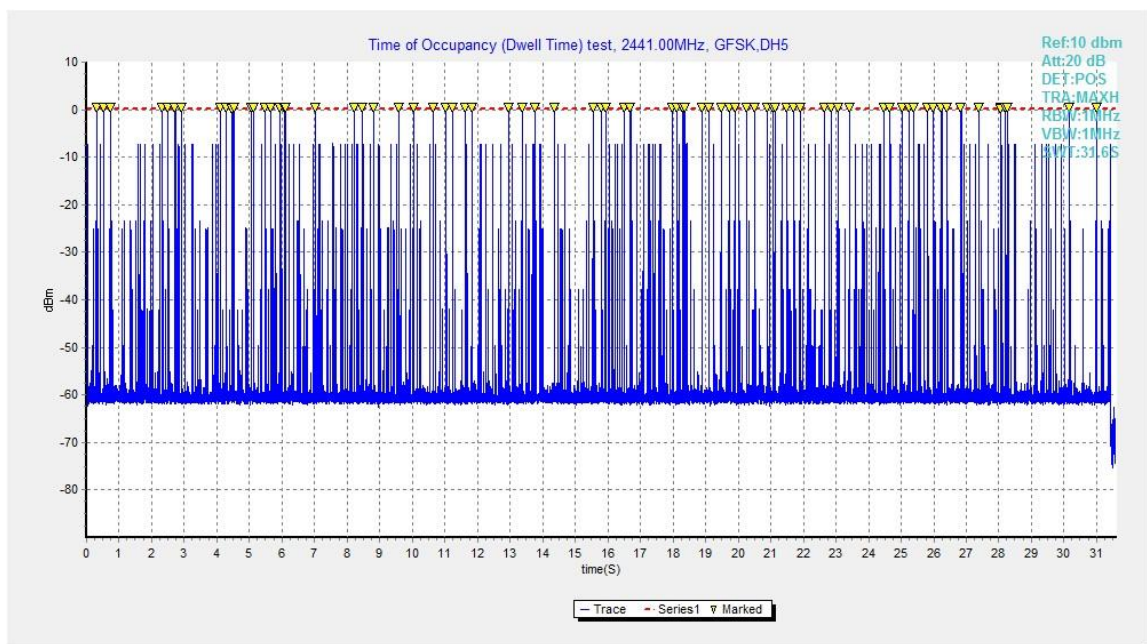


Fig.69. Number of Transmissions Measurement: Channel 39,Packet DH5

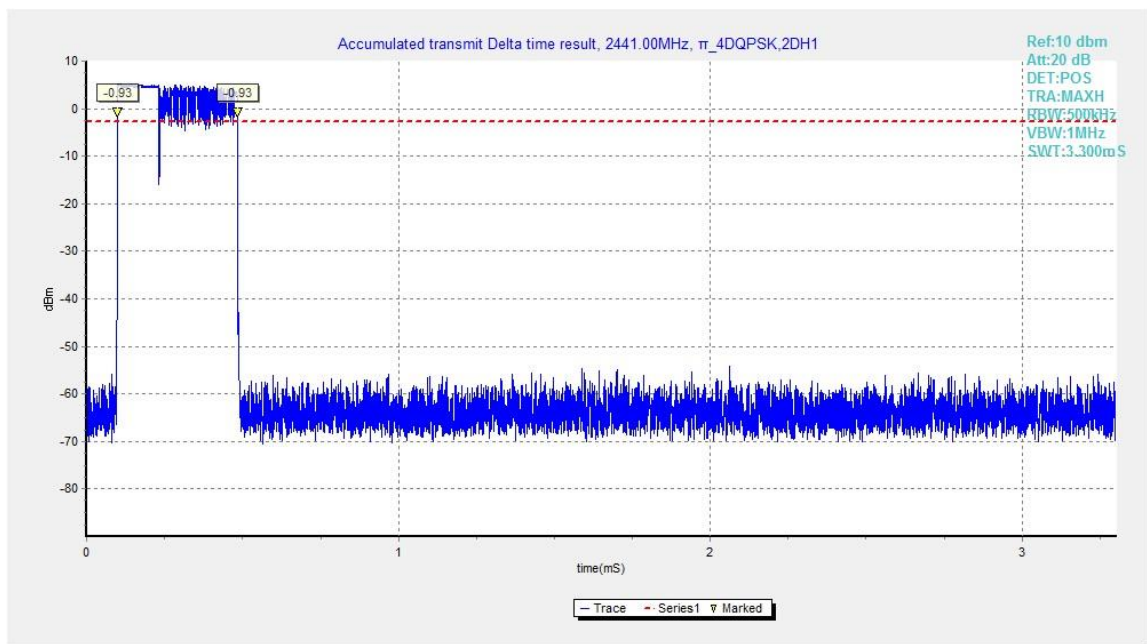


Fig.70. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

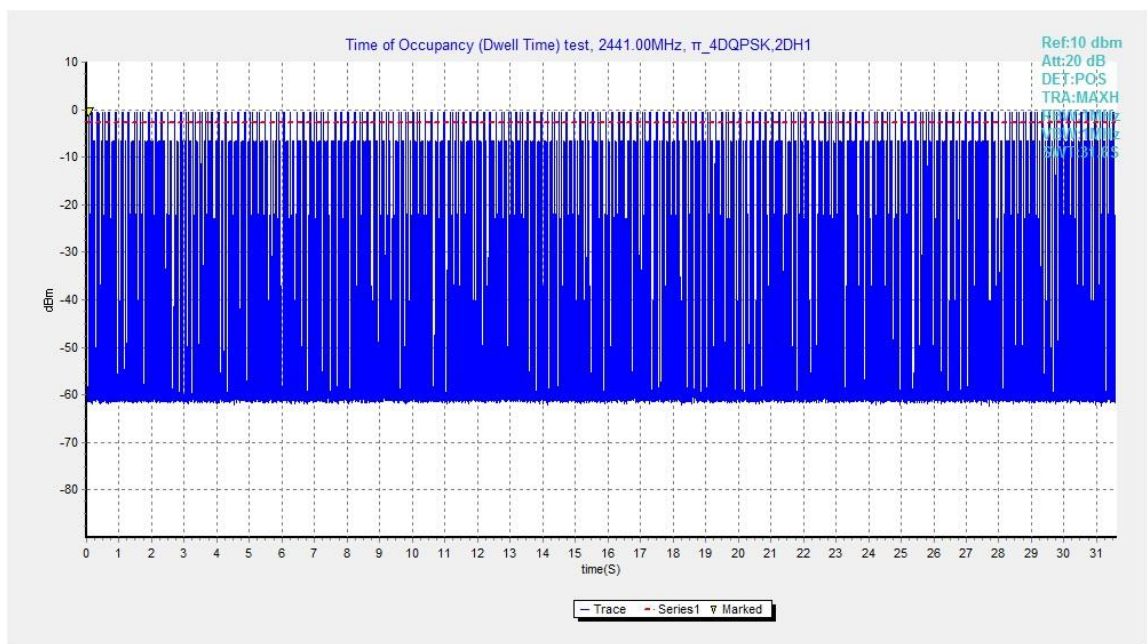


Fig.71. Number of Transmissions Measurement: Channel 39,Packet 2-DH1

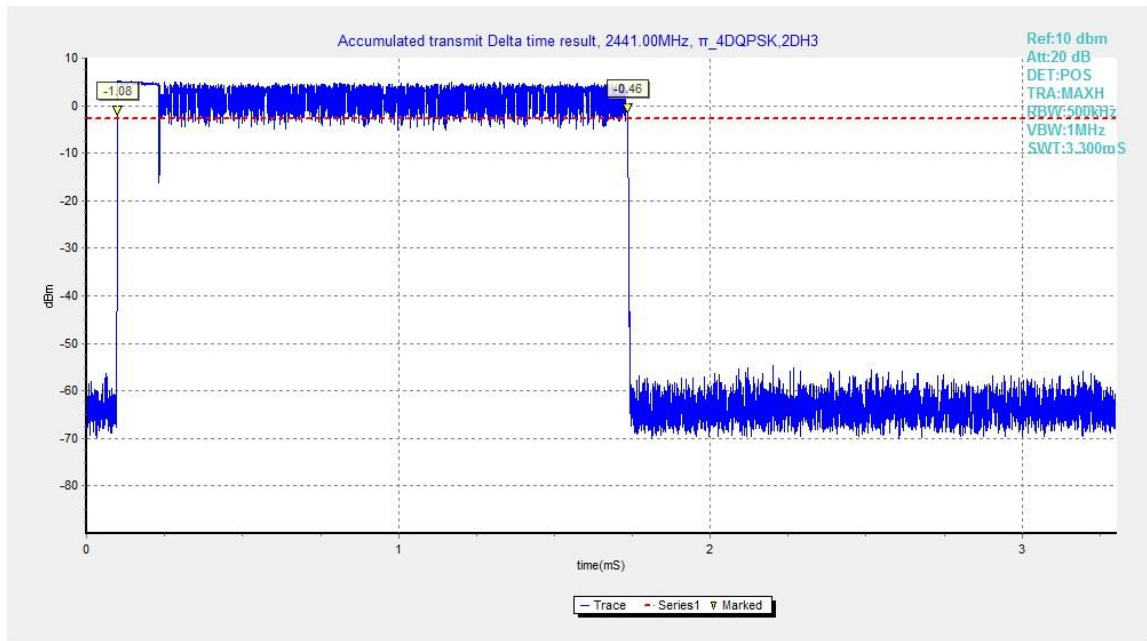


Fig.72. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3

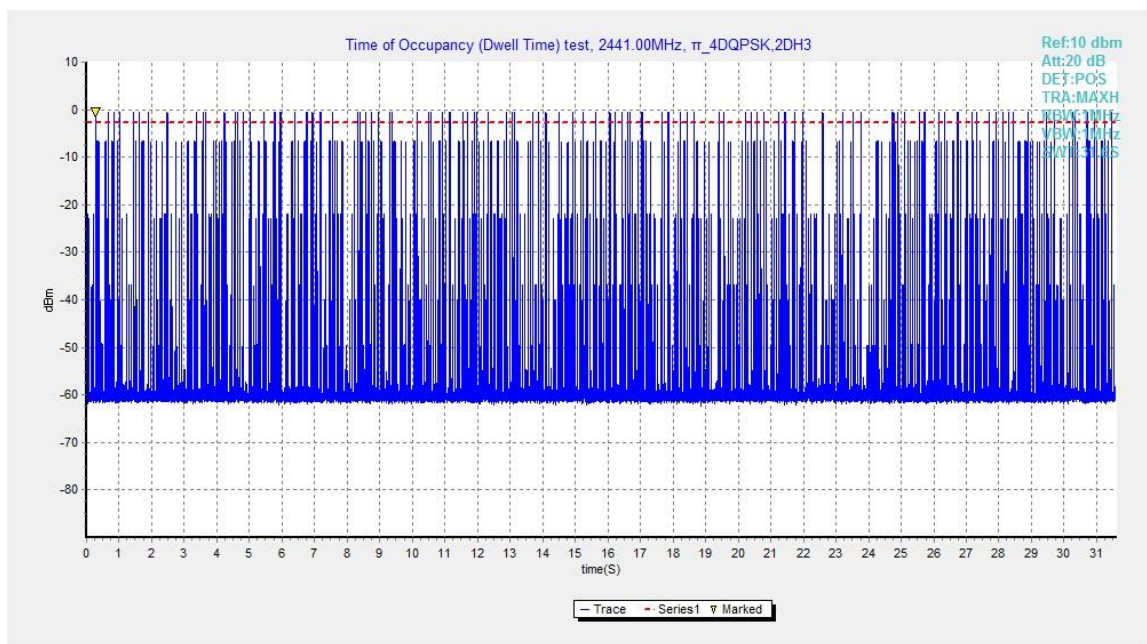


Fig.73. Number of Transmissions Measurement: Channel 39,Packet 2-DH3

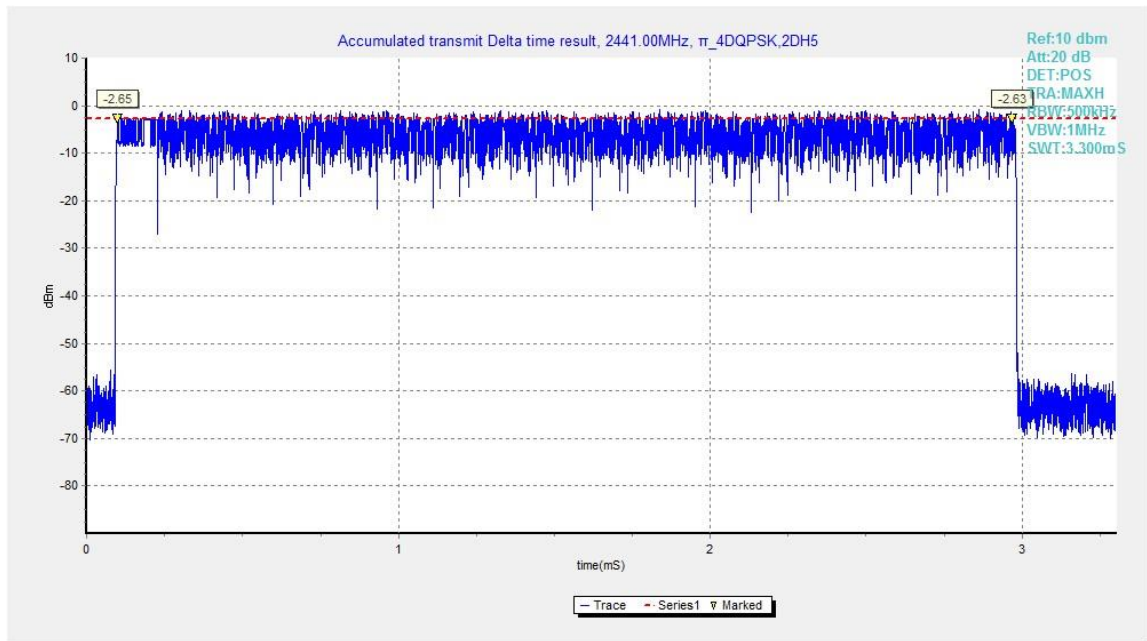


Fig.74. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

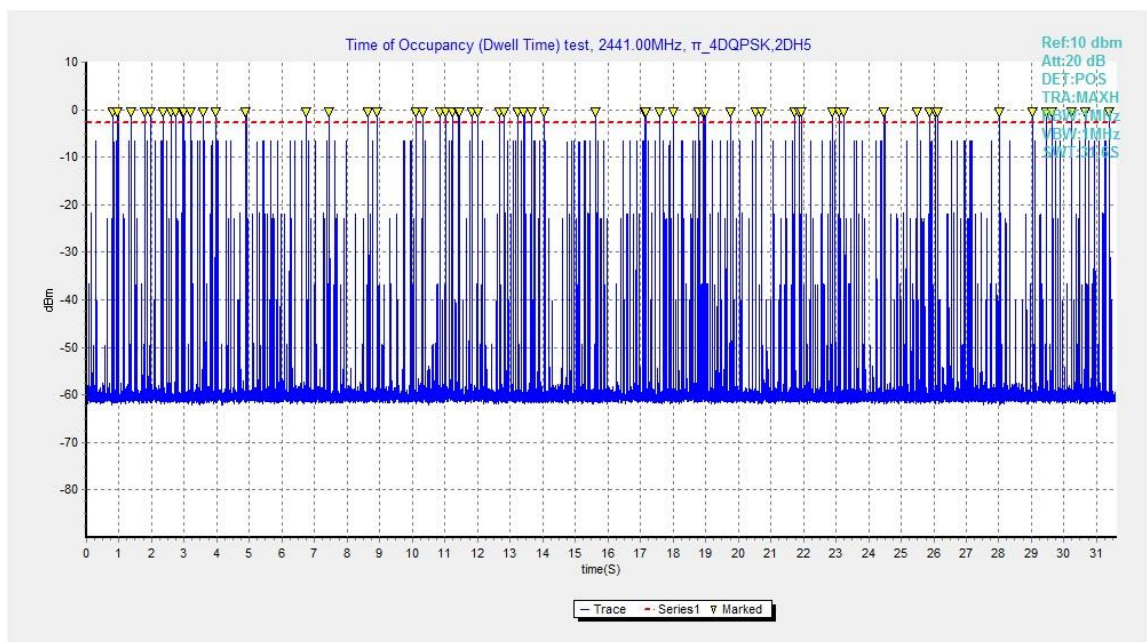


Fig.75. Number of Transmissions Measurement: Channel 39,Packet 2-DH5