

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

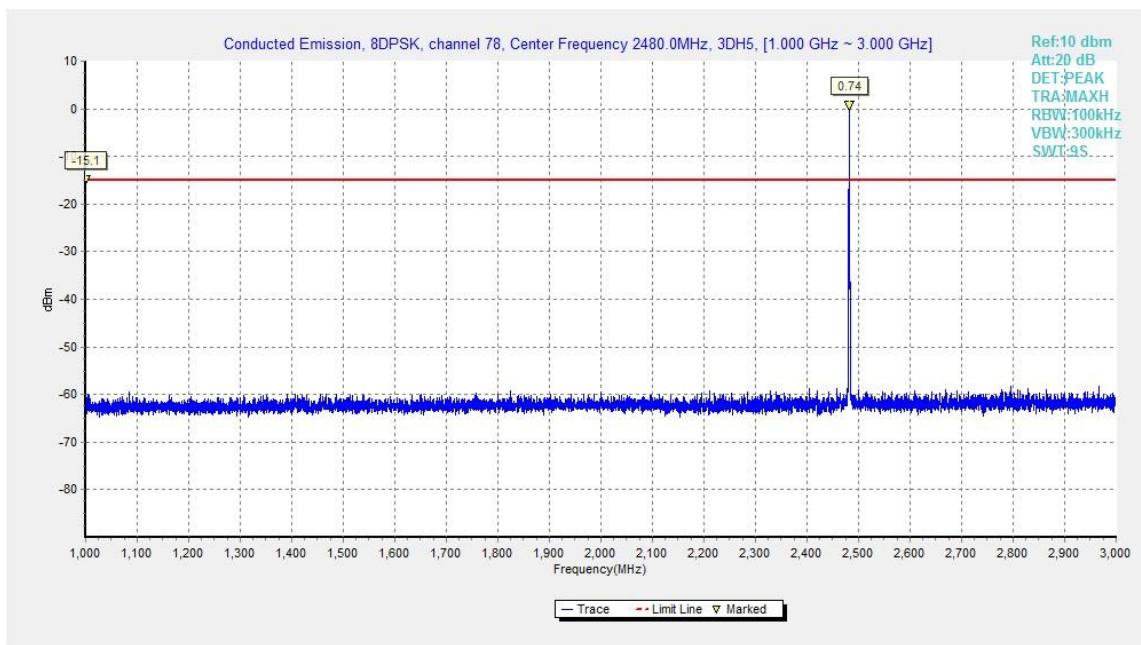


Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

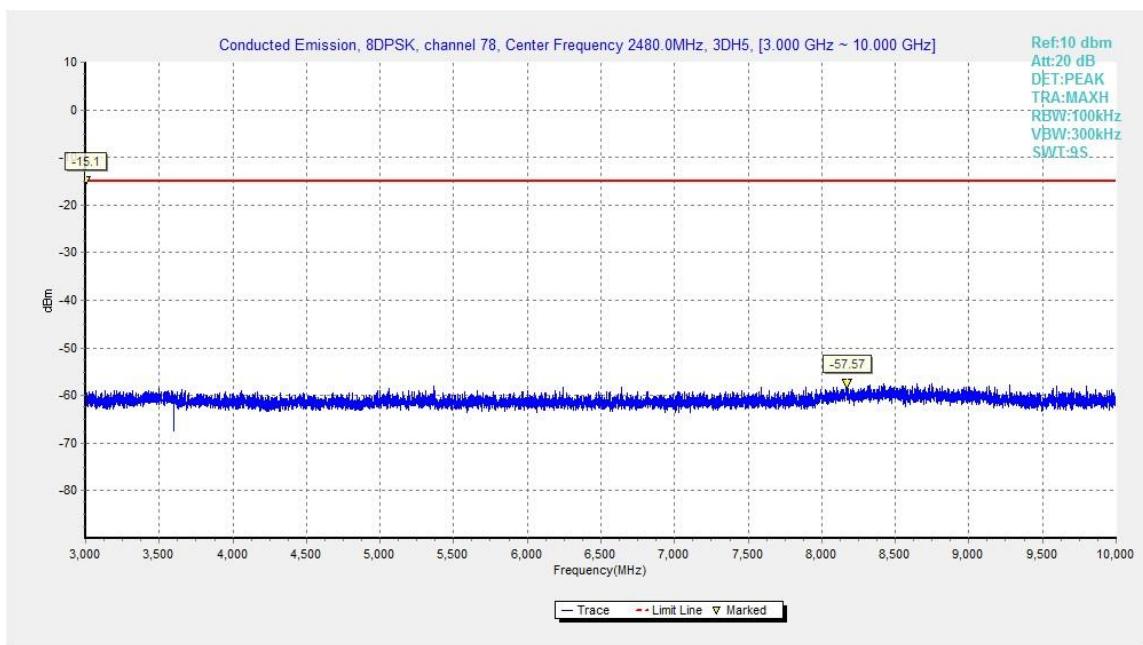


Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

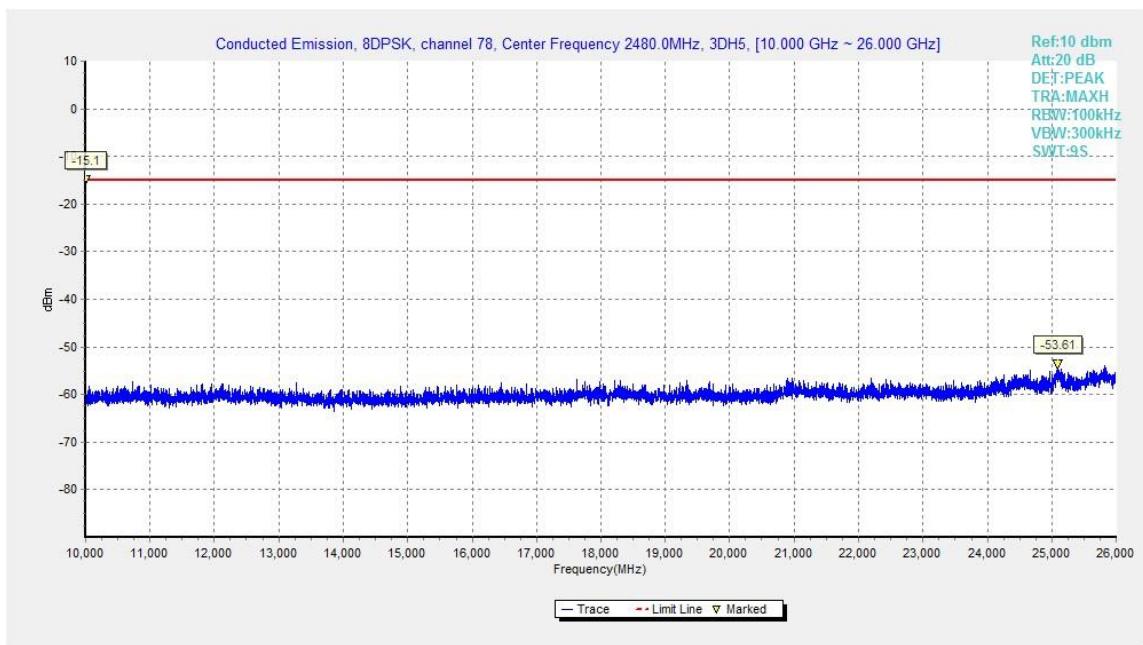


Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

### 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

**Form/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 $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2389.700	46.09	2.9	32.0	11.27	54.0	7.9	H	155	18
2390.000	46.08	2.9	32.0	11.25	54.0	7.9	H	155	56
4804.500	34.13	-35.0	34.1	35.08	54.0	19.9	H	155	139
7206.000	37.67	-32.4	35.8	34.26	54.0	16.3	H	155	108
9607.500	42.10	-29.7	36.7	35.05	54.0	11.9	H	155	78
12010.500	42.58	-30.5	38.9	34.18	54.0	11.4	H	155	36

**GFSK Ch 39 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2424.100	46.29	2.9	32.0	11.42	54.0	7.7	H	155	268
2453.500	46.18	2.9	32.0	11.28	54.0	7.8	H	155	138
4882.500	33.48	-35.5	34.1	34.92	54.0	20.5	H	155	104
7323.000	38.78	-31.3	35.8	34.29	54.0	15.2	H	155	40
9763.500	40.23	-31.4	36.9	34.71	54.0	13.8	H	155	28
12205.500	44.31	-28.9	39.0	34.18	54.0	9.7	H	155	8

**GFSK Ch 78 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.500	47.65	2.9	32.0	12.72	54.0	6.4	H	155	16
2483.700	47.26	2.9	32.0	12.34	54.0	6.7	H	155	48
4960.500	33.65	-34.9	34.1	34.43	54.0	20.4	H	155	80
7440.000	37.94	-32.2	35.8	34.31	54.0	16.1	H	155	8
9919.500	42.19	-29.6	37.1	34.73	54.0	11.8	H	155	102
12400.500	43.60	-30.0	39.1	34.56	54.0	10.4	H	155	118

**π/4 DQPSK Ch 0 - Average**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2388.200	46.09	2.9	32.0	11.26	54.0	7.9	H	155	28
2389.800	46.08	2.9	32.0	11.25	54.0	7.9	H	155	46
4804.500	34.17	-35.0	34.1	35.12	54.0	19.8	H	155	8
7206.000	37.65	-32.4	35.8	34.24	54.0	16.3	H	155	6
9607.500	42.00	-29.7	36.7	34.94	54.0	12.0	H	155	24
12010.500	42.57	-30.5	38.9	34.16	54.0	11.4	H	155	185

**π/4 DQPSK Ch 39 - Average**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2426.600	46.28	2.9	32.0	11.42	54.0	7.7	H	155	28
2458.900	46.27	2.9	32.0	11.37	54.0	7.7	H	155	248
4882.500	33.19	-35.5	34.1	34.64	54.0	20.8	H	155	38
7323.000	38.68	-31.3	35.8	34.19	54.0	15.3	H	155	98
9763.500	40.21	-31.4	36.9	34.69	54.0	13.8	H	155	183
12205.500	44.30	-28.9	39.0	34.18	54.0	9.7	H	155	356

**π/4 DQPSK Ch 78 - Average**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.500	47.88	2.9	32.0	12.96	54.0	6.1	H	155	20
2248.370	47.53	2.8	31.9	12.86	54.0	6.5	H	155	18
4960.500	33.73	-34.9	34.1	34.52	54.0	20.3	H	155	90
7440.000	37.95	-32.2	35.8	34.32	54.0	16.1	H	155	114
9919.500	42.22	-29.6	37.1	34.76	54.0	11.8	H	155	36
12400.500	43.60	-30.0	39.1	34.56	54.0	10.4	H	155	2

**8DPSK Ch 0 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2387.200	46.10	2.9	32.0	11.28	54.0	7.9	H	155	48
2388.900	46.14	2.9	32.0	11.32	54.0	7.9	H	155	6
4804.500	34.13	-35.0	34.1	35.07	54.0	19.9	H	155	312
7206.000	37.59	-32.4	35.8	34.18	54.0	16.4	H	155	48
9607.500	41.96	-29.7	36.7	34.91	54.0	12.0	H	155	68
12010.500	42.50	-30.5	38.9	34.09	54.0	11.5	H	155	80

**8DPSK Ch 39 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2429.500	46.30	2.9	32.0	11.43	54.0	7.7	H	155	28
2449.600	46.32	2.9	32.0	11.43	54.0	7.7	H	155	49
4882.500	33.62	-35.5	34.1	35.07	54.0	20.4	H	155	226
7323.000	38.73	-31.3	35.8	34.25	54.0	15.3	H	155	248
9763.500	40.20	-31.4	36.9	34.68	54.0	13.8	H	155	268
12205.500	44.33	-28.9	39.0	34.20	54.0	9.7	H	155	298

**8DPSK Ch 78 - Average**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.500	48.13	2.9	32.0	13.20	54.0	5.9	H	155	28
2483.600	47.87	2.9	32.0	12.95	54.0	6.1	H	155	48
4960.500	33.92	-34.9	34.1	34.70	54.0	20.1	H	155	8
7440.000	37.96	-32.2	35.8	34.33	54.0	16.0	H	155	16
9919.500	42.10	-29.6	37.1	34.64	54.0	11.9	H	155	228
12400.500	43.63	-30.0	39.1	34.59	54.0	10.4	H	155	92

**GFSK Ch 0 – Peak**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2385.208	59.99	2.9	32.0	25.17	74.0	14.0	H	155	22
2388.246	60.10	2.9	32.0	25.28	74.0	13.9	H	155	44
4804.000	42.79	-35.0	34.1	43.73	74.0	31.2	H	155	132
7206.000	43.41	-32.4	35.8	40.00	74.0	30.6	V	155	110
9608.000	46.36	-29.7	36.7	39.29	74.0	27.6	H	155	88
12010.000	47.05	-30.5	38.9	38.64	74.0	26.9	H	155	44

**GFSK Ch 39 - Peak**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2335.600	48.34	-27.7	31.9	44.10	74.0	25.7	H	155	264
2643.200	48.92	-26.7	32.2	43.48	74.0	25.1	H	155	132
4882.000	40.48	-35.5	34.1	41.92	74.0	33.5	H	155	110
7323.000	43.90	-31.3	35.8	39.41	74.0	30.1	H	155	44
9764.000	44.65	-31.4	36.9	39.14	74.0	29.3	H	155	22
12205.000	48.06	-28.8	39.0	37.92	74.0	25.9	V	155	0

**GFSK Ch 78 - Peak**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.500	60.44	2.9	32.0	25.51	74.0	13.6	H	155	22
2485.595	60.54	2.9	32.0	25.61	74.0	13.5	H	155	44
4960.000	39.62	-34.9	34.1	40.41	74.0	34.4	V	155	88
7440.000	42.00	-32.2	35.8	38.37	74.0	32.0	V	155	0
9920.000	46.54	-29.7	37.1	39.09	74.0	27.5	H	155	110
12400.000	46.03	-30.0	39.1	37.01	74.0	28.0	H	155	132

**π/4 DQPSK Ch 0 - Peak**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2334.318	59.89	2.8	31.9	25.12	74.0	14.1	H	155	22
2356.382	59.84	2.8	31.9	25.05	74.0	14.2	H	155	44
4804.000	41.02	-35.0	34.1	41.96	74.0	33.0	V	155	0
7206.000	42.05	-32.4	35.8	38.65	74.0	31.9	H	155	0
9608.000	46.88	-29.7	36.7	39.81	74.0	27.1	V	155	22
12010.000	45.91	-30.5	38.9	37.50	74.0	28.1	H	155	176

**π/4 DQPSK Ch 39 - Peak**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2338.400	47.24	-27.7	31.9	42.98	74.0	26.8	H	155	22
2625.200	49.14	-26.8	32.2	43.77	74.0	24.9	H	155	242
4882.000	39.44	-35.5	34.1	40.88	74.0	34.6	V	155	44
7323.000	44.35	-31.3	35.8	39.86	74.0	29.7	H	155	88
9764.000	43.60	-31.4	36.9	38.08	74.0	30.4	V	155	176
12205.000	47.55	-28.8	39.0	37.41	74.0	26.5	H	155	0

**π/4 DQPSK Ch 78 - Peak**

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2483.720	59.95	2.9	32.0	25.02	74.0	14.1	H	155	22
2493.515	60.87	2.9	32.0	25.93	74.0	13.1	H	155	22
4960.000	39.89	-34.9	34.1	40.67	74.0	34.1	H	155	88
7440.000	41.83	-32.2	35.8	38.21	74.0	32.2	V	155	110
9920.000	46.59	-29.7	37.1	39.14	74.0	27.4	V	155	44
12400.000	47.57	-30.0	39.1	38.54	74.0	26.4	H	155	0

**8DPSK Ch 0 - Peak**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2339.260	59.98	2.8	31.9	25.21	74.0	14.0	H	155	44
2362.318	59.54	2.8	31.9	24.75	74.0	14.5	H	155	0
4804.000	41.58	-35.0	34.1	42.52	74.0	32.4	V	155	308
7206.000	43.17	-32.4	35.8	39.76	74.0	30.8	H	155	44
9608.000	46.13	-29.7	36.7	39.06	74.0	27.9	V	155	66
12010.000	45.58	-30.5	38.9	37.17	74.0	28.4	H	155	88

**8DPSK Ch 39 - Peak**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2297.800	47.48	-27.9	31.9	43.42	74.0	26.5	H	155	22
2511.600	48.03	-26.5	32.0	42.54	74.0	26.0	H	155	44
4882.000	38.73	-35.5	34.1	40.18	74.0	35.3	V	155	220
7323.000	43.84	-31.3	35.8	39.35	74.0	30.2	V	155	242
9764.000	45.10	-31.4	36.9	39.58	74.0	28.9	H	155	264
12205.000	48.02	-28.8	39.0	37.89	74.0	26.0	H	155	286

**8DPSK Ch 78 - Peak**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)	Antenna Height (cm)	Turntable angle (deg)
2485.075	61.08	2.9	32.0	26.15	74.0	12.9	H	155	22
2488.855	60.40	2.9	32.0	25.47	74.0	13.6	H	155	44
4960.000	38.62	-34.9	34.1	39.41	74.0	35.4	V	155	0
7440.000	41.01	-32.2	35.8	37.38	74.0	33.0	H	155	22
9920.000	47.36	-29.7	37.1	39.92	74.0	26.6	H	155	242
12400.000	45.71	-30.0	39.1	36.68	74.0	28.3	H	155	88

**Conclusion: PASS**
**Test graphs as below:**

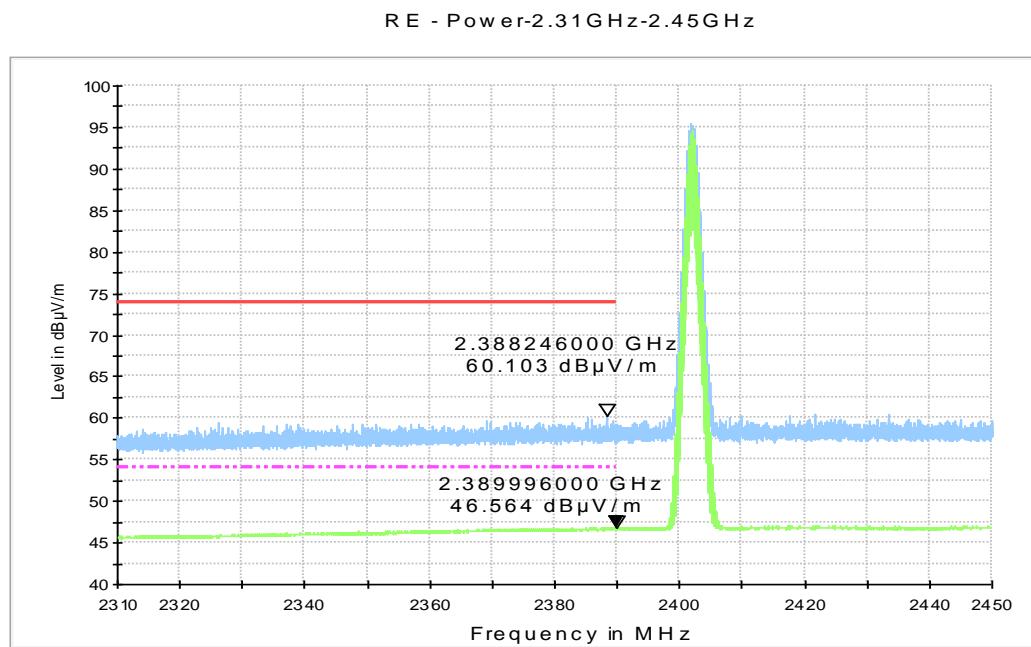


Fig.58. Radiated emission (Power): GFSK, low channel

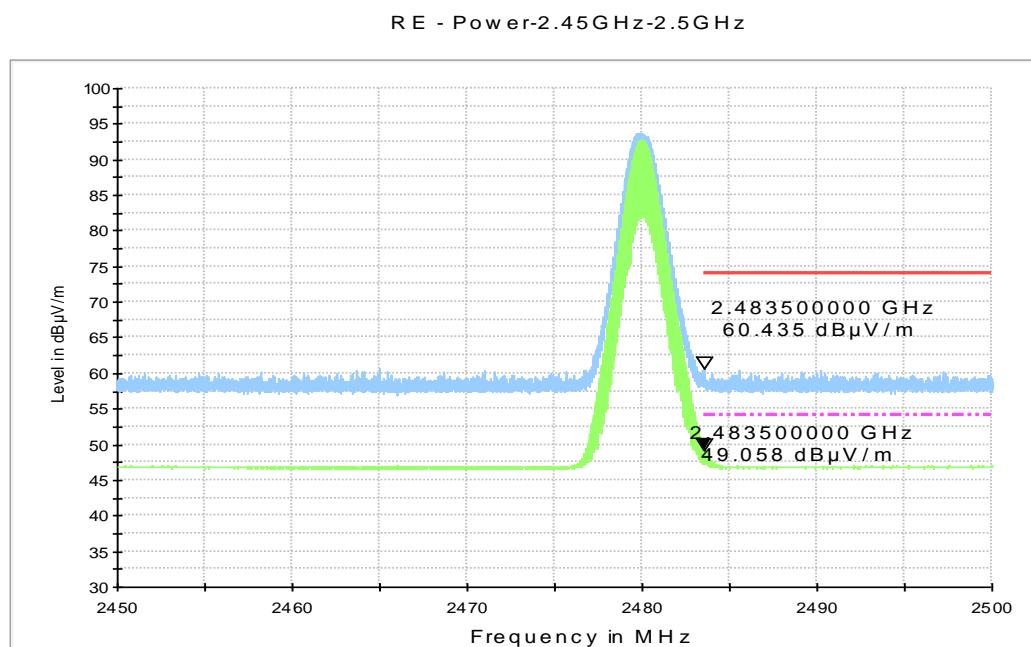
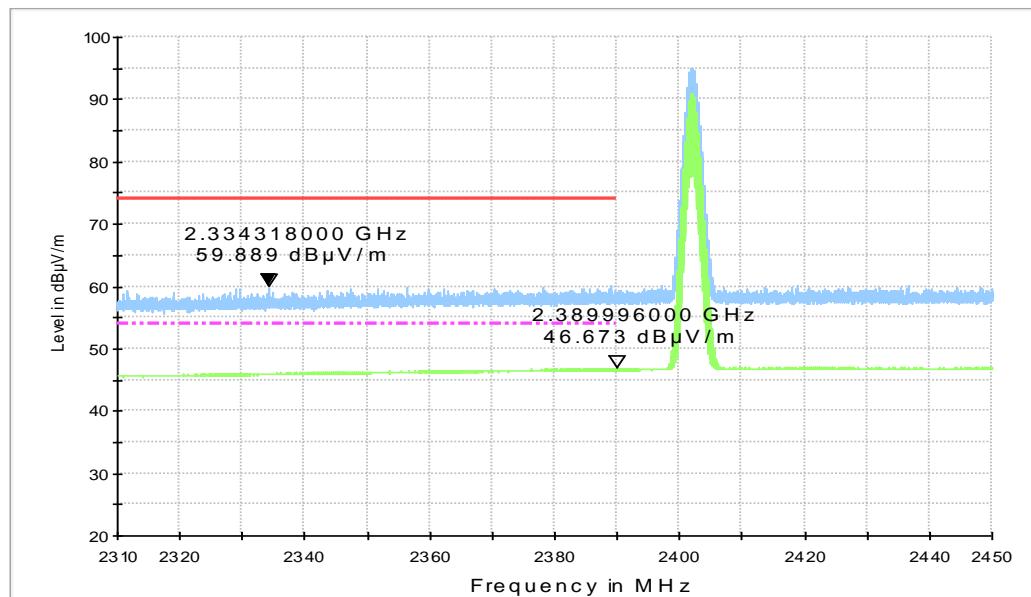
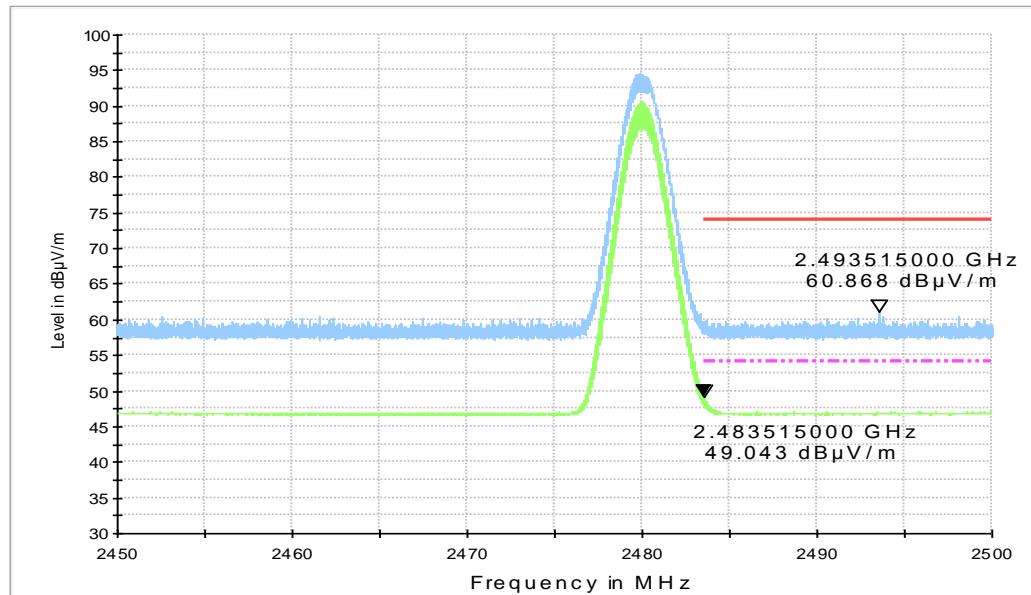


Fig.59. Radiated emission (Power) GFSK, high channel

R E - Power-2.31GHz-2.45GHz

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

R E - Power-2.45GHz-2.5GHz

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

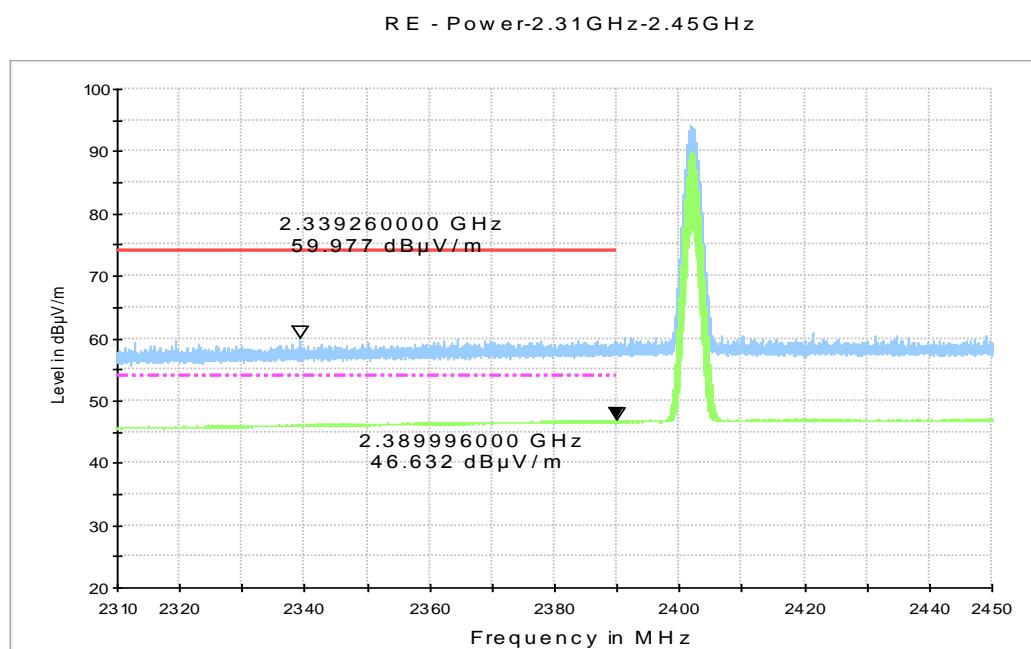


Fig.62. Radiated emission (Power): 8DPSK, low channel

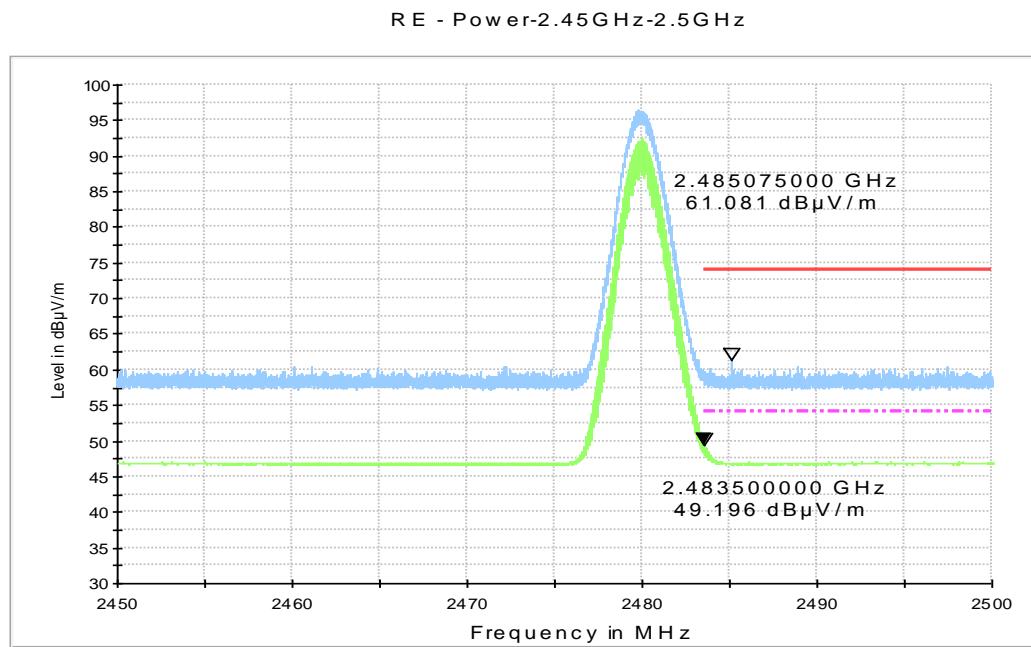


Fig.63. Radiated emission (Power): 8DPSK, high channel

## 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	120.22	P
		Fig.65		
	DH3	Fig.66	156.78	P
		Fig.67		
	DH5	Fig.68	155.59	P
		Fig.69		

#### For $\pi/4$ DQPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.70	122.92	P
		Fig.71		
	DH3	Fig.72	181.63	P
		Fig.73		
	DH5	Fig.74	170.18	P
		Fig.75		

#### For 8DPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.76	123.24	P
		Fig.77		

	DH3	Fig.78	179.87	P
		Fig.79		
	DH5	Fig.80	248.23	P
		Fig.81		

**Conclusion: PASS**

**Test graphs as below:**

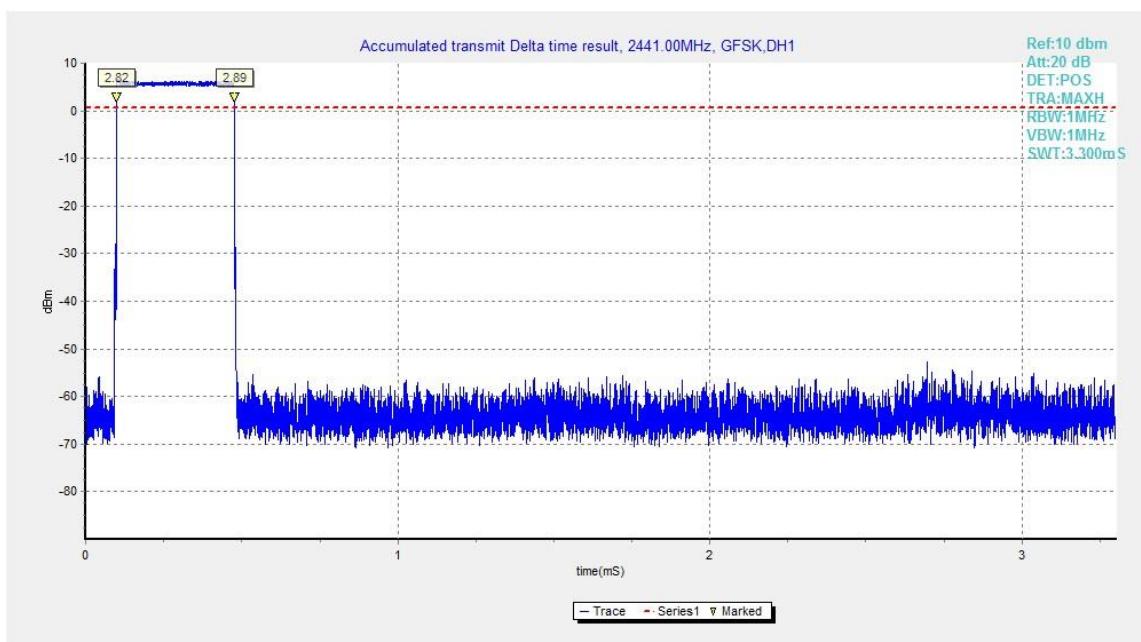


Fig.64. Time of occupancy (Dwell Time): Channel 39, Packet DH1

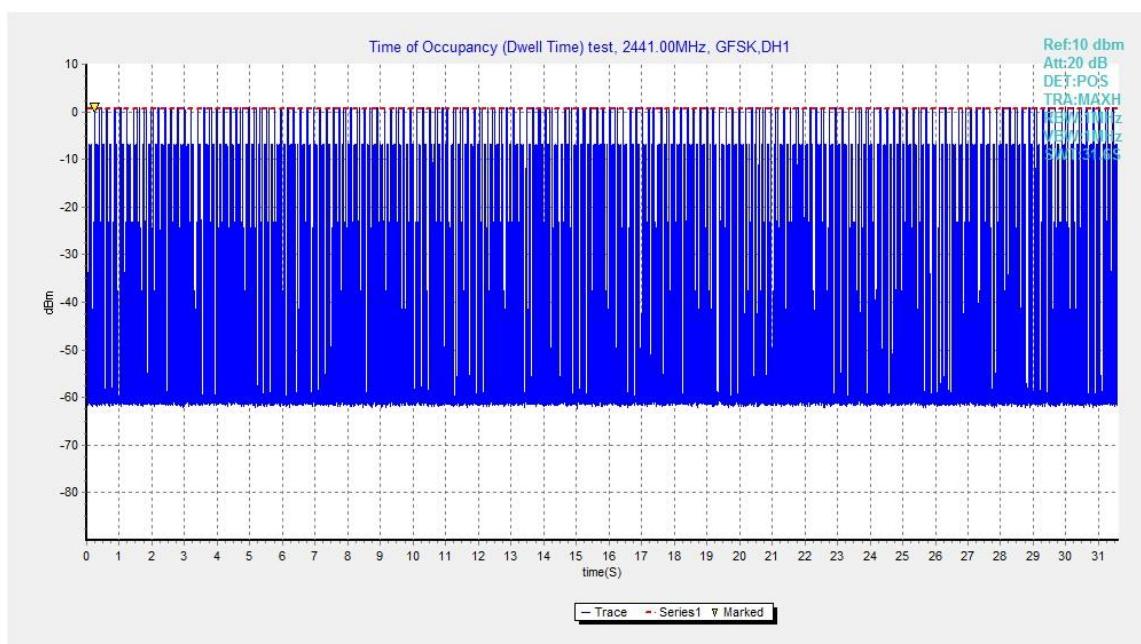


Fig.65. Number of Transmissions Measurement: Channel 39,Packet DH1

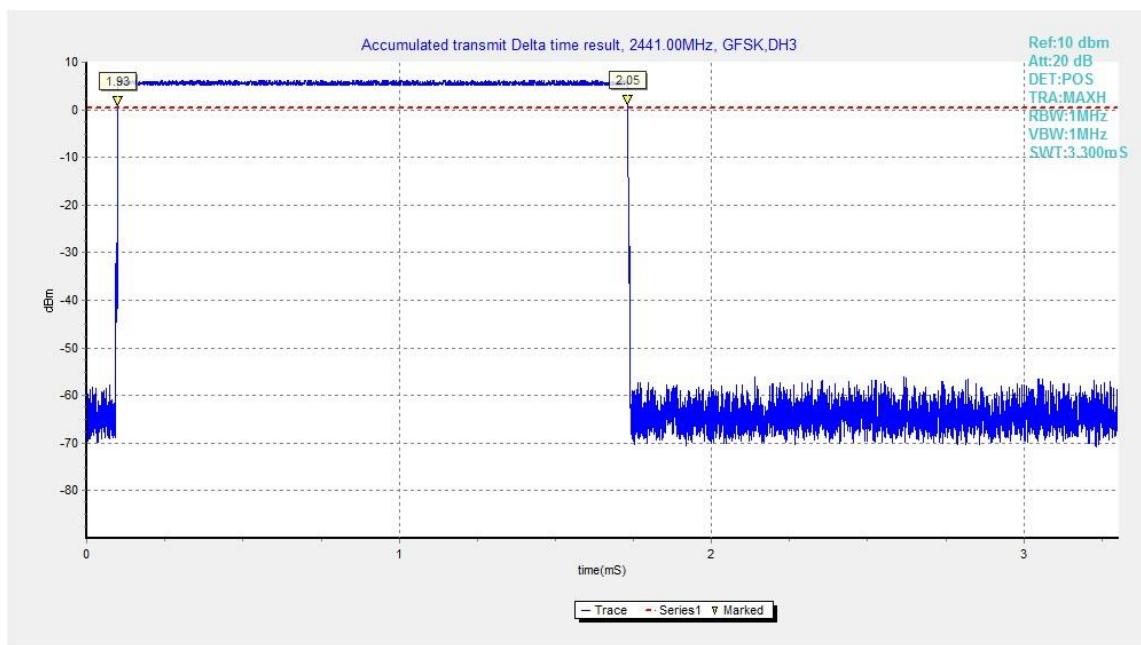


Fig.66. Time of occupancy (Dwell Time): Channel 39, Packet DH3

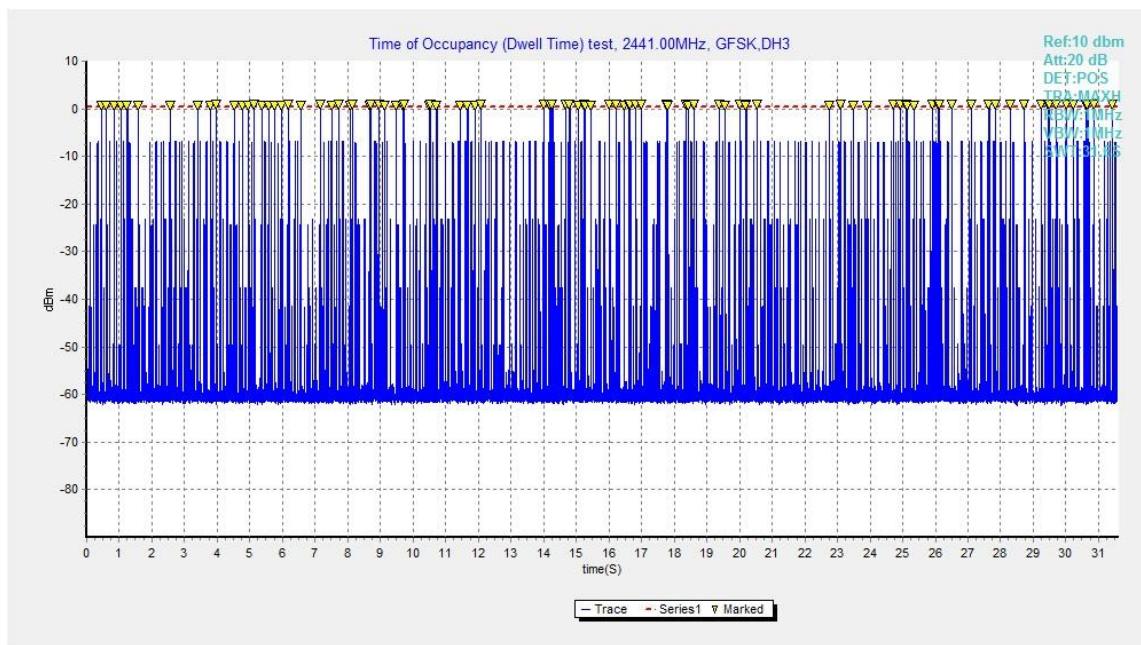


Fig.67. Number of Transmissions Measurement: Channel 39,Packet DH3



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

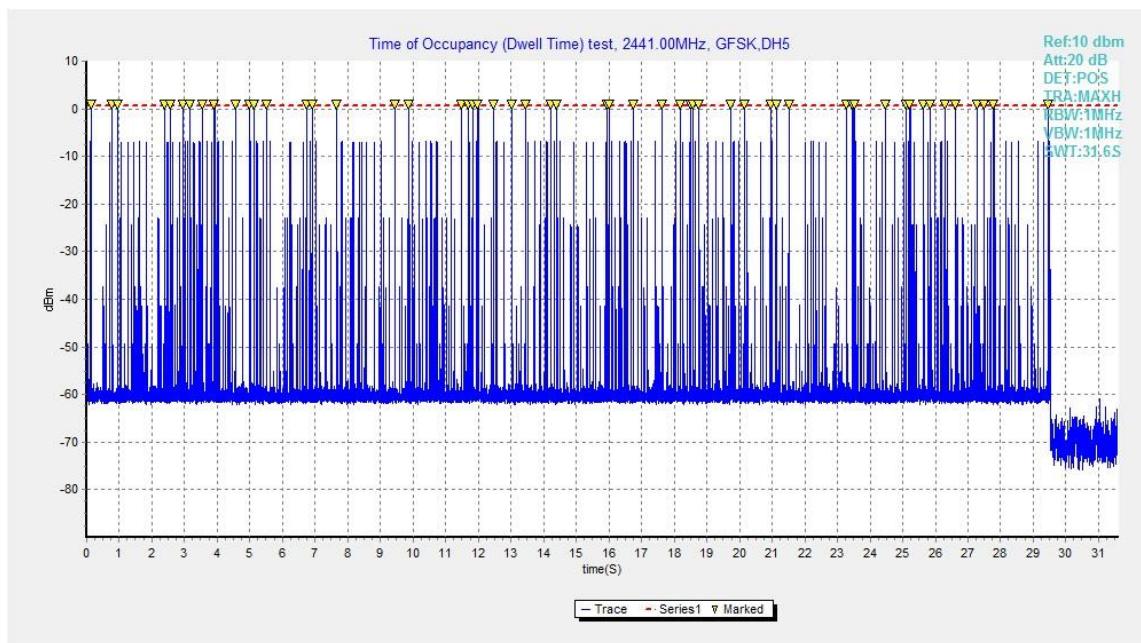


Fig.69. Number of Transmissions Measurement: Channel 39,Packet DH5

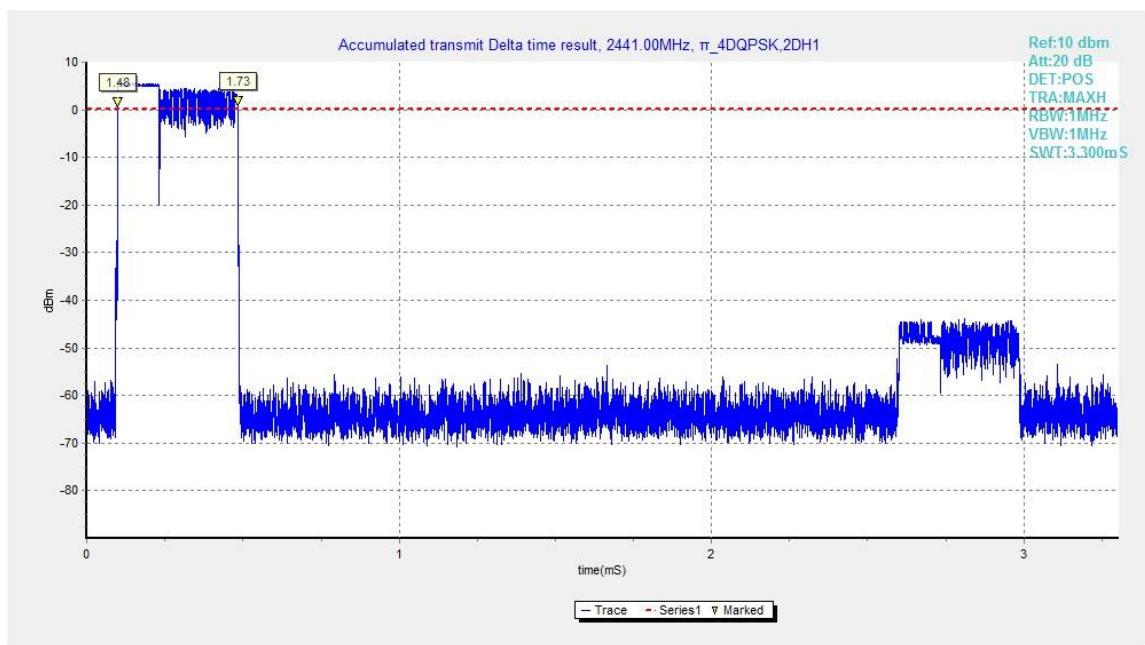


Fig.70. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

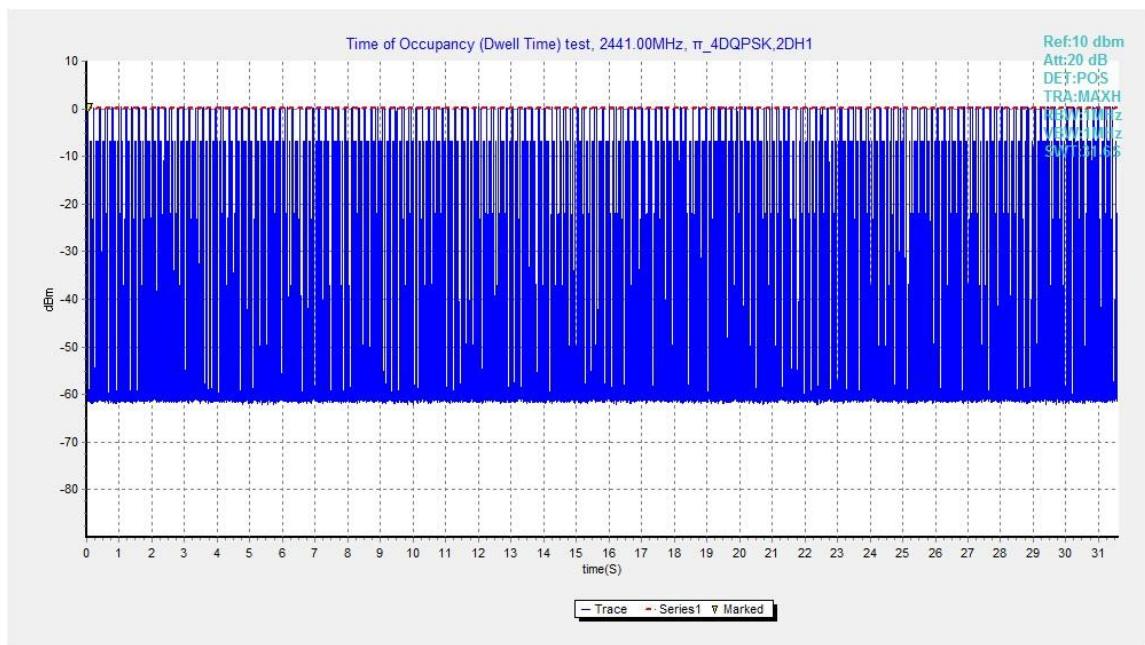


Fig.71. Number of Transmissions Measurement: Channel 39,Packet 2-DH1

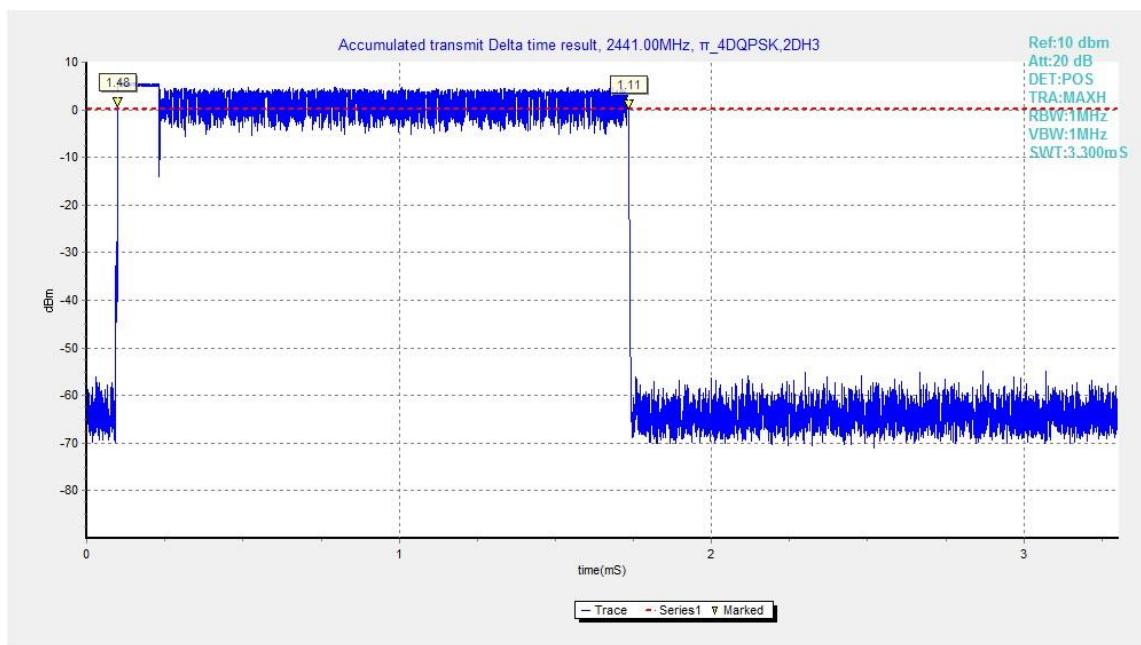


Fig.72. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3

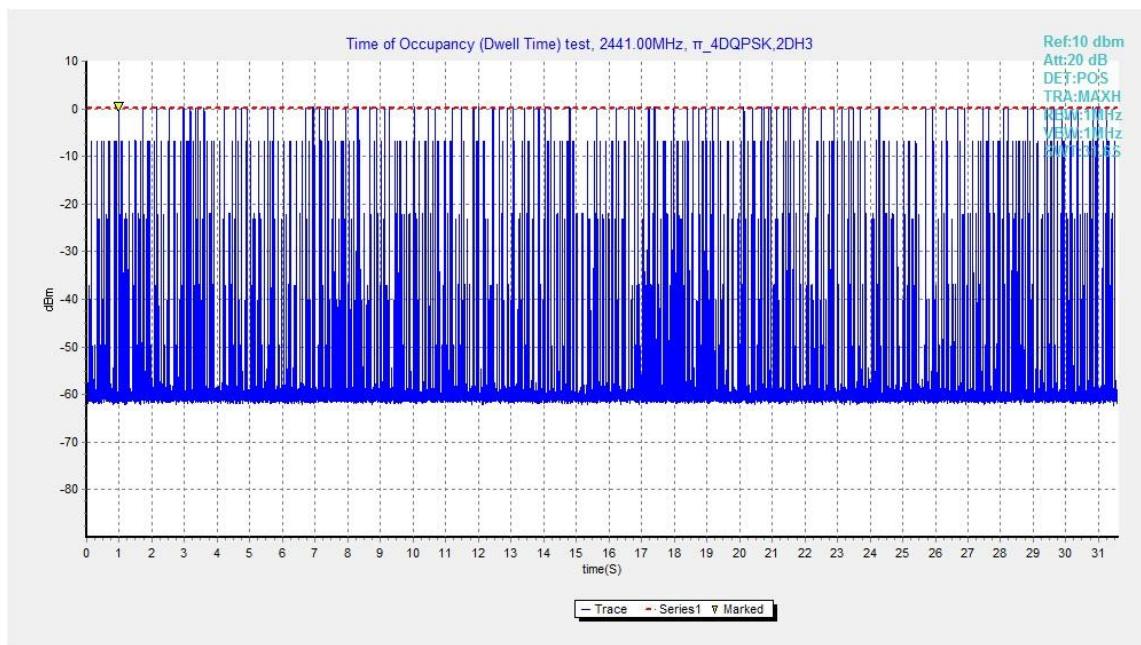


Fig.73. Number of Transmissions Measurement: Channel 39,Packet 2-DH3

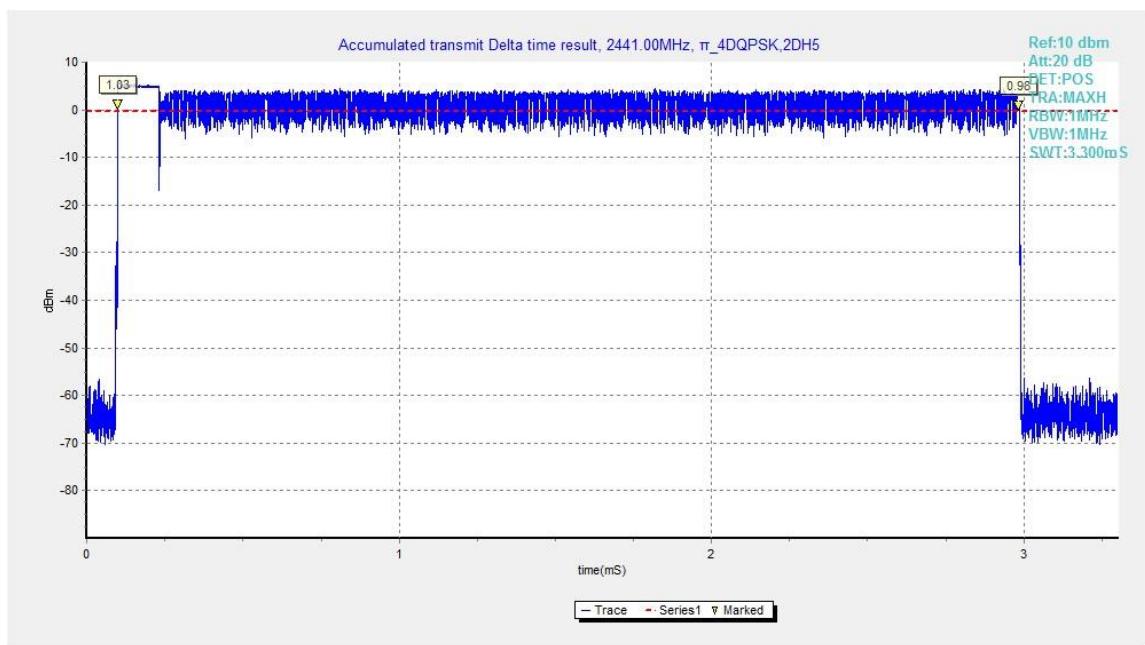


Fig.74. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

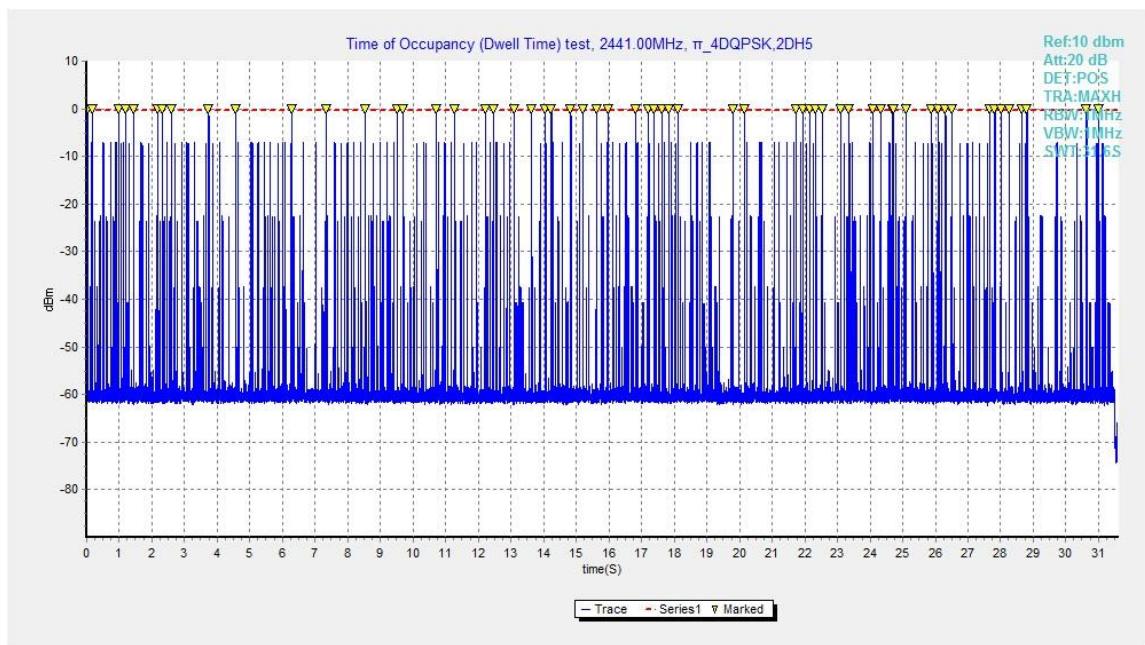


Fig.75. Number of Transmissions Measurement: Channel 39,Packet 2-DH5

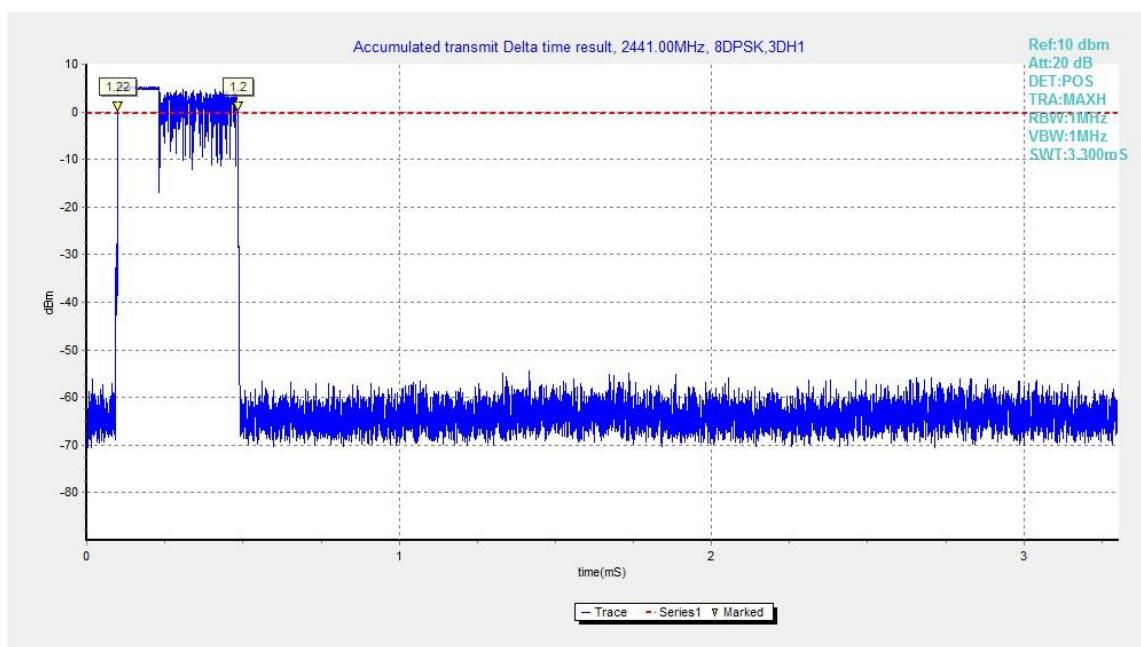


Fig.76. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1

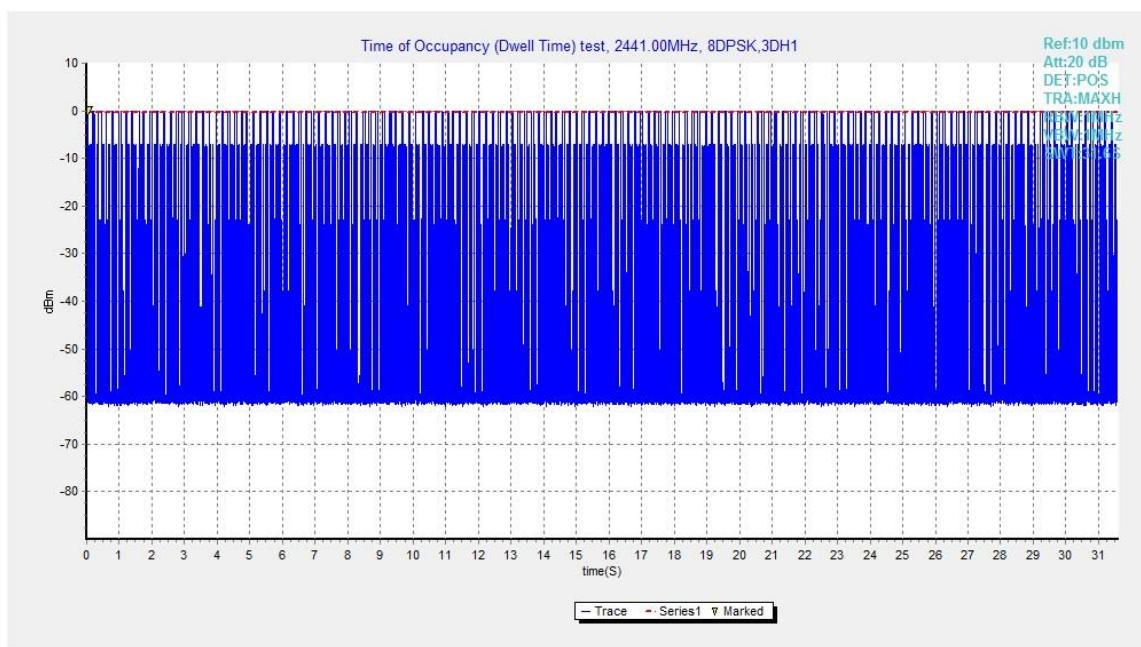


Fig.77. Number of Transmissions Measurement: Channel 39,Packet 3-DH1

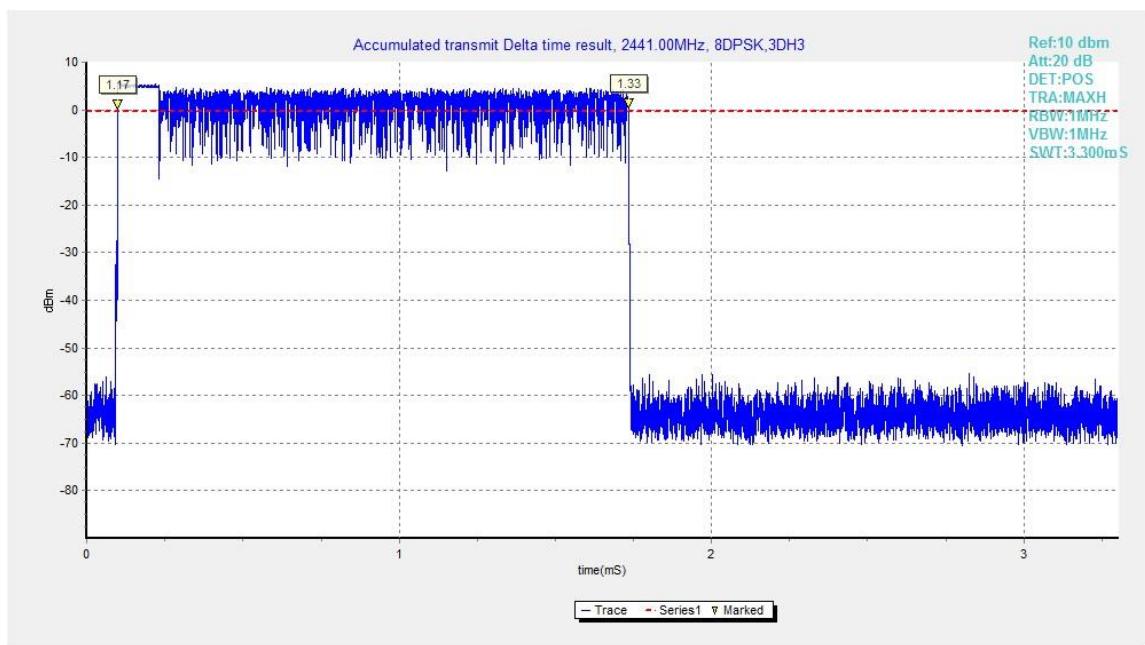


Fig.78. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

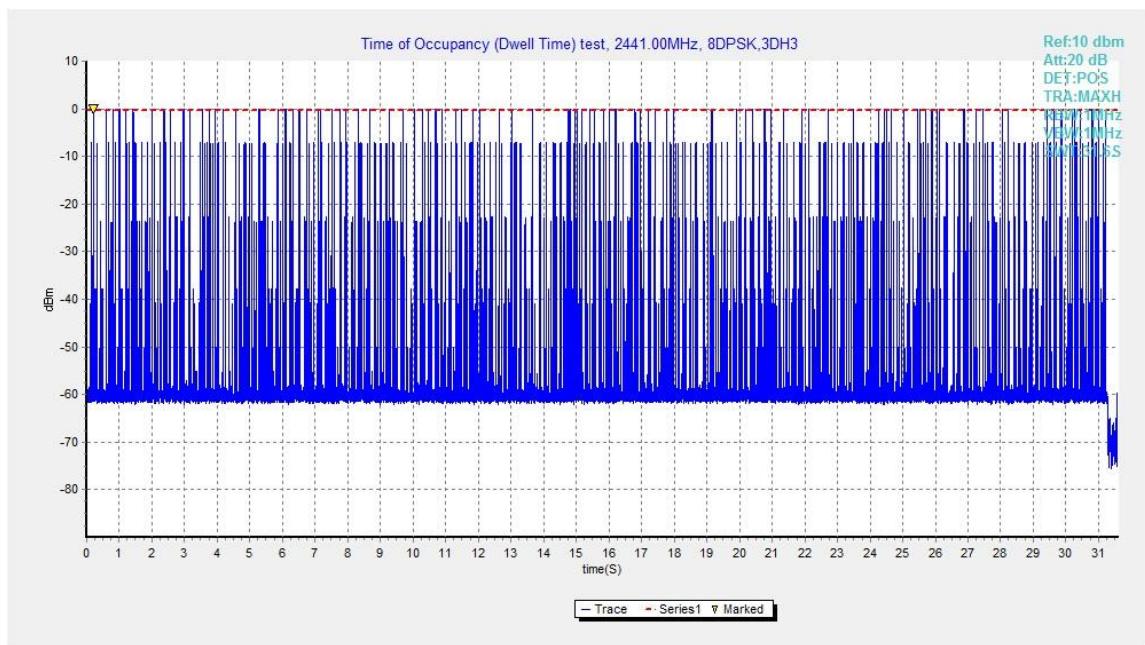


Fig.79. Number of Transmissions Measurement: Channel 39,Packet 3-DH3

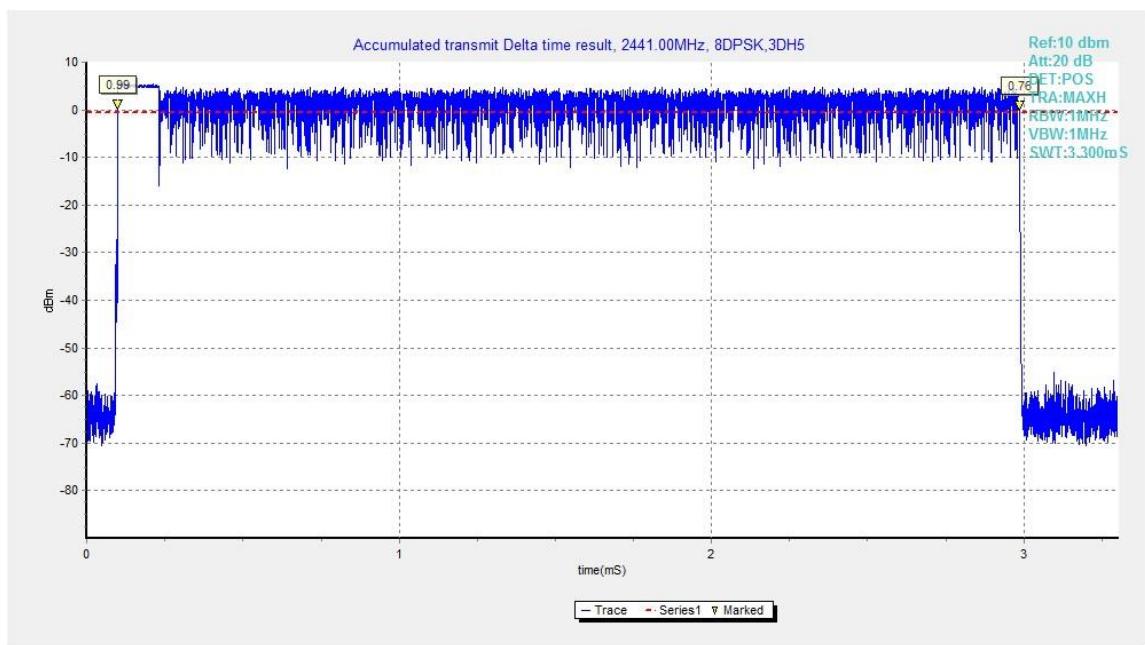


Fig.80. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

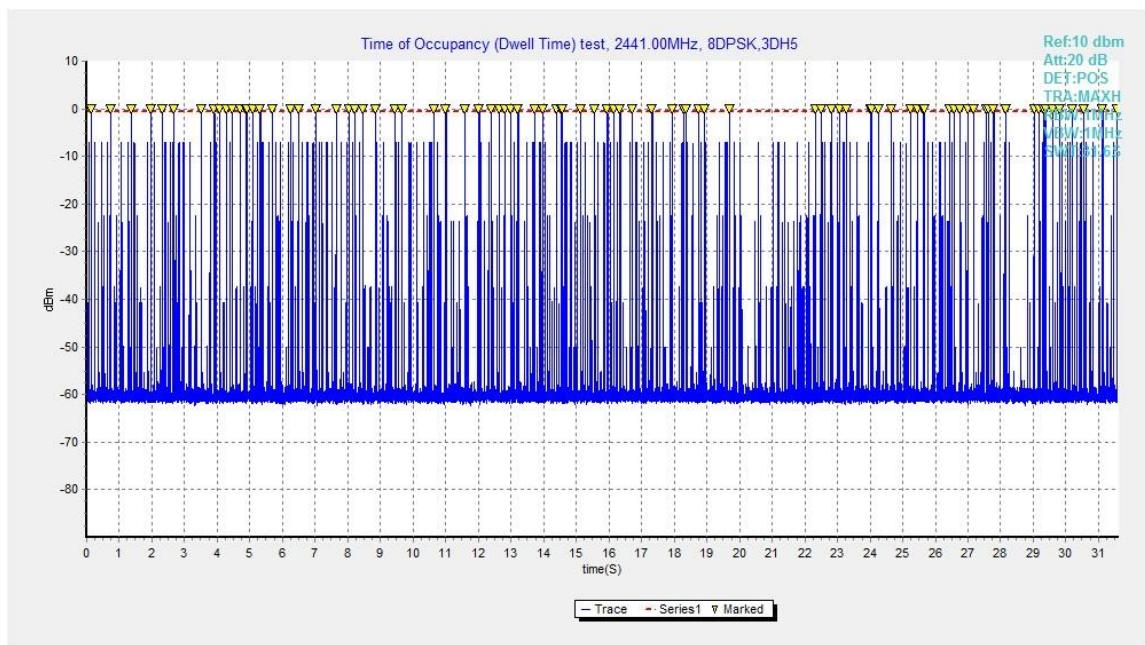


Fig.81. Number of Transmissions Measurement: Channel 39,Packet 3-DH5

### 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	1047.00	NA
39	Fig.83	949.50	NA
78	Fig.84	992.25	NA

**For π/4 DQPSK**

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.85	1272.75	NA
39	Fig.86	1242.00	NA
78	Fig.87	1267.50	NA

**For 8DPSK**

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.88	1253.25	NA
39	Fig.89	1241.25	NA
78	Fig.90	1249.50	NA

**Conclusion: NA**

**Test graphs as below:**

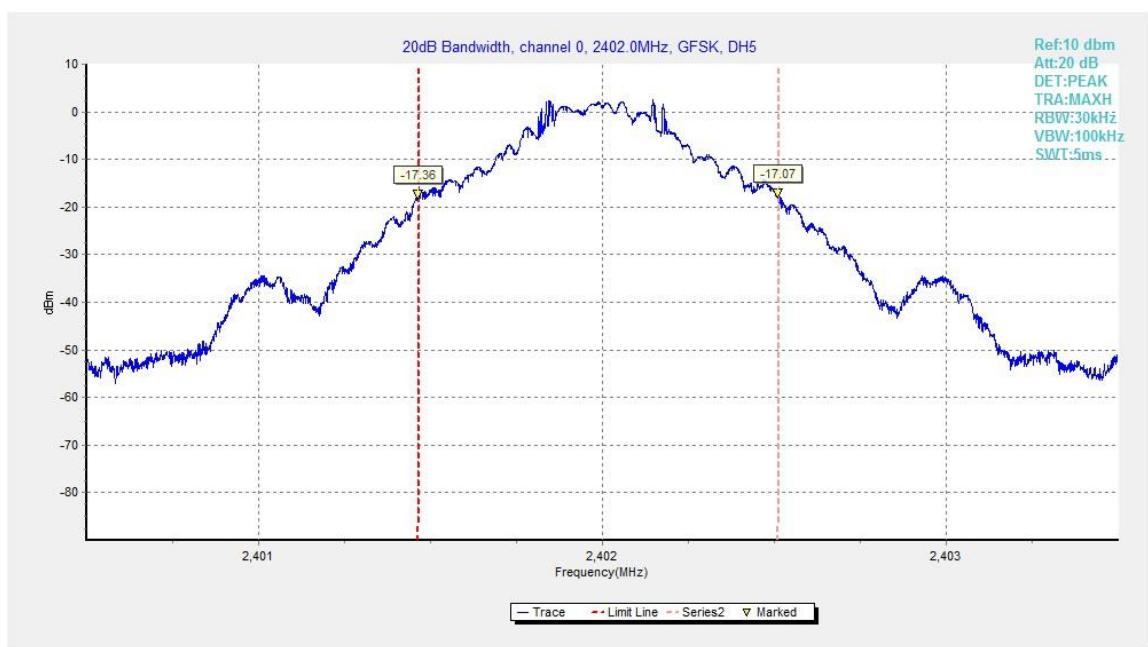


Fig.82. 20dB Bandwidth: GFSK, Channel 0



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

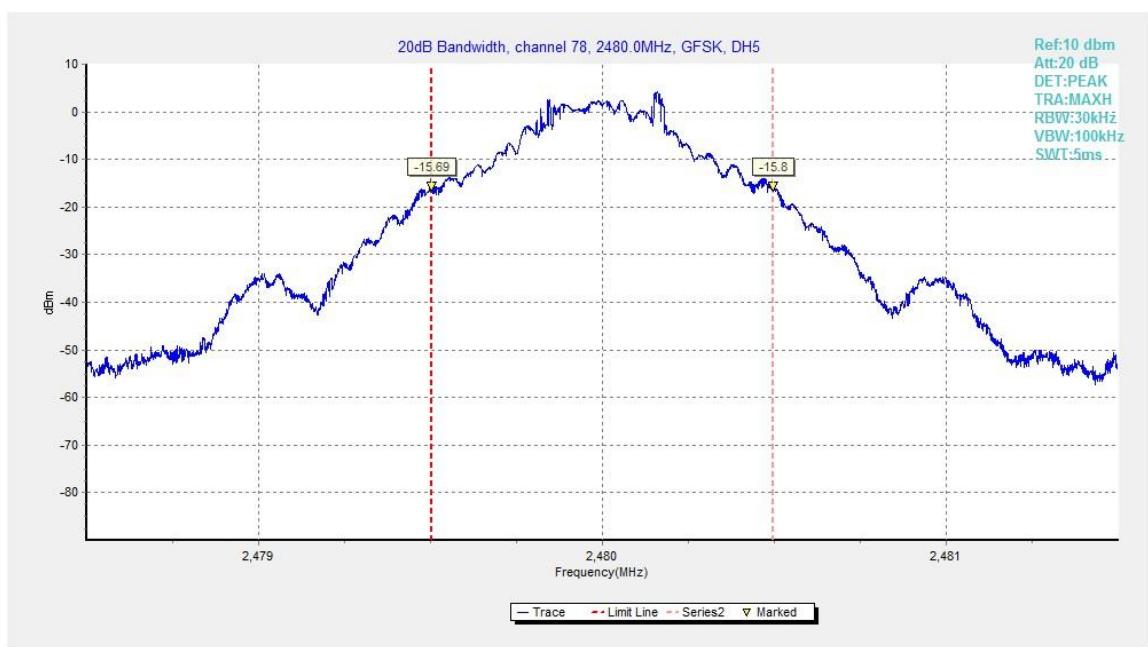


Fig.84. 20dB Bandwidth: GFSK, Channel 78

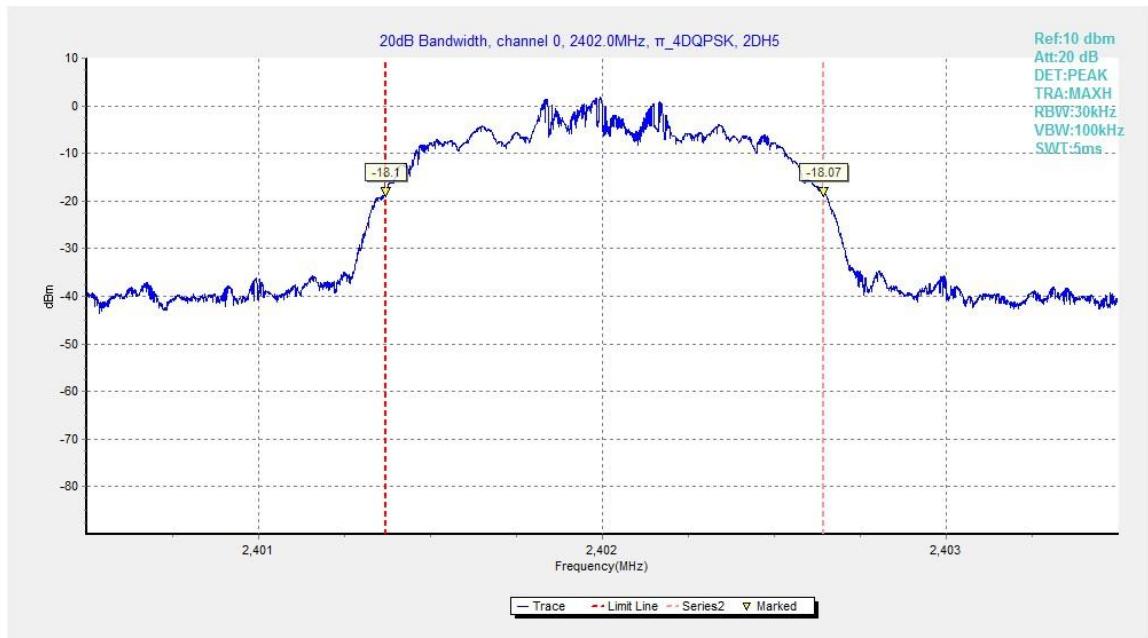


Fig.85. 20dB Bandwidth:  $\pi/4$  DQPSK, Channel 0

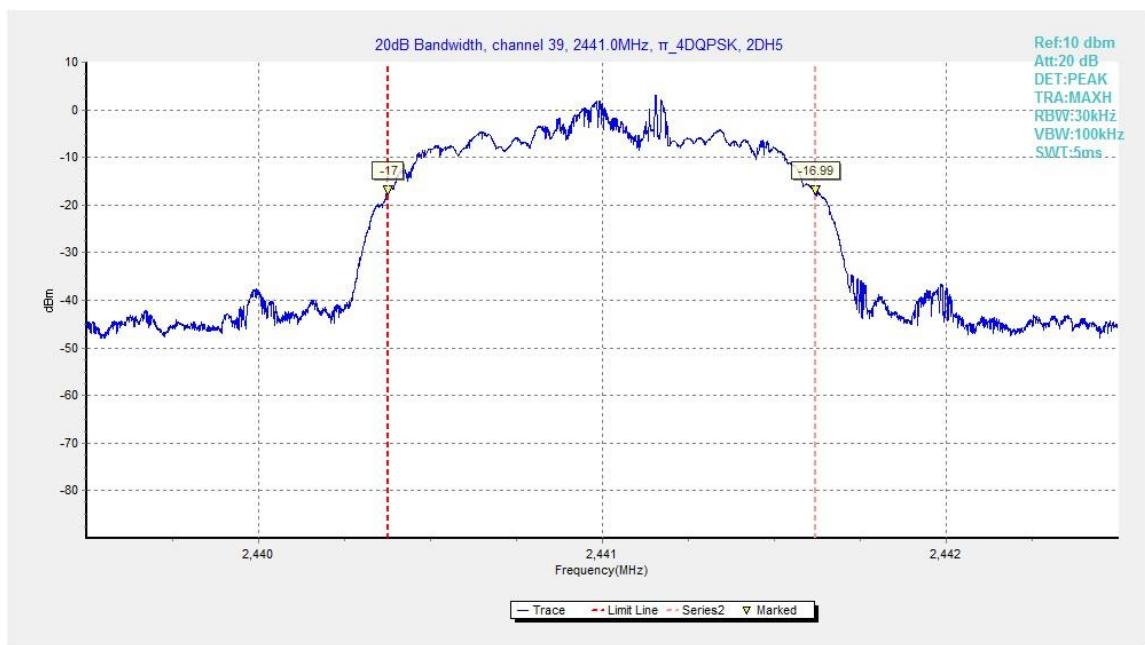


Fig.86. 20dB Bandwidth:  $\pi/4$  DQPSK, Channel 39

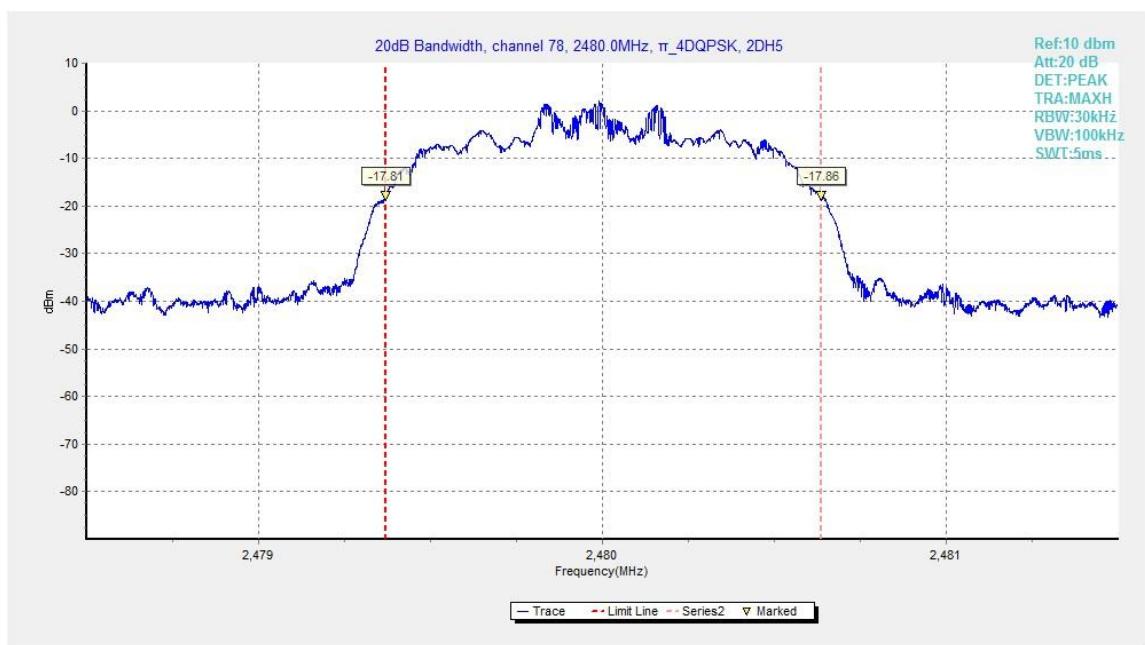


Fig.87. 20dB Bandwidth:  $\pi/4$  DQPSK, Channel 78

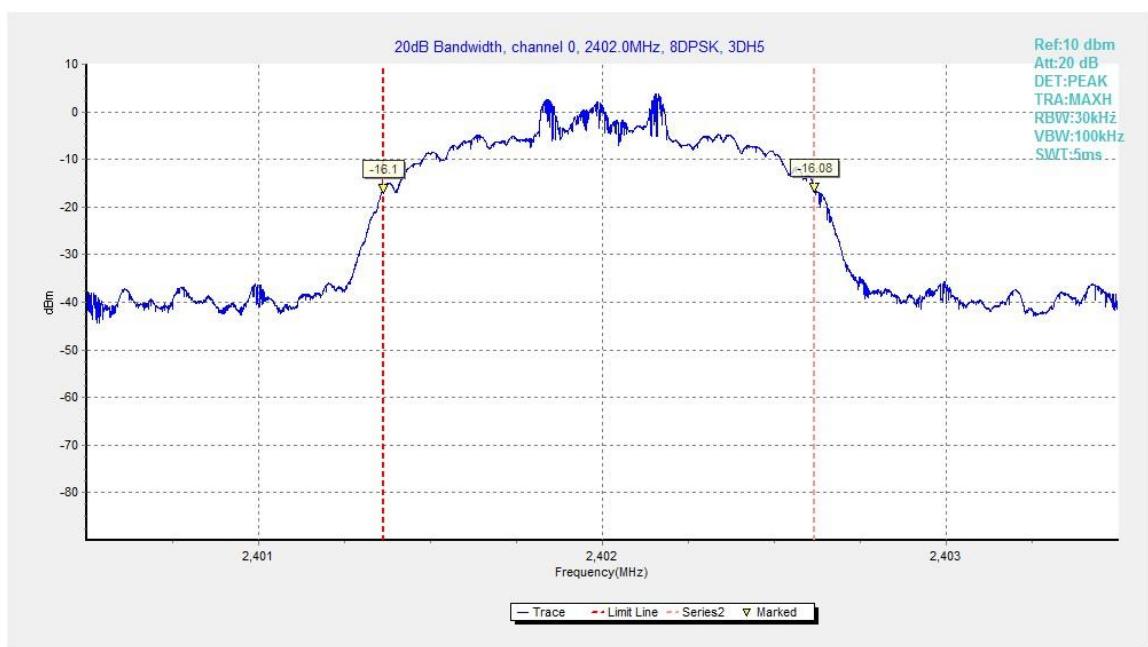


Fig.88. 20dB Bandwidth: 8DPSK, Channel 0

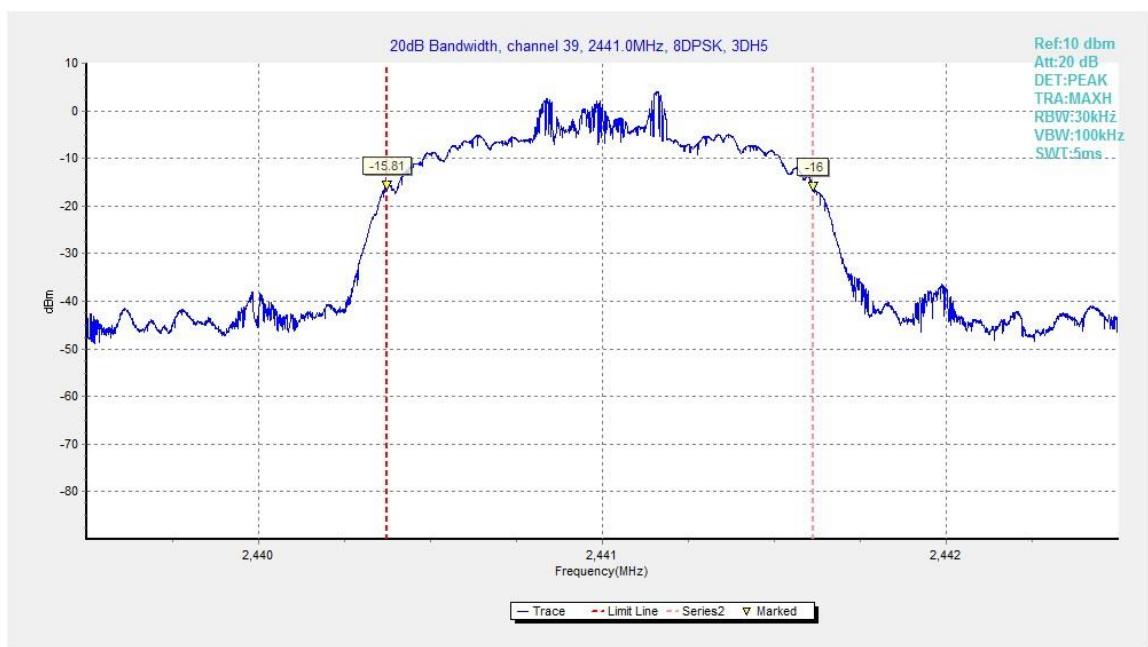


Fig.89. 20dB Bandwidth: 8DPSK, Channel 39

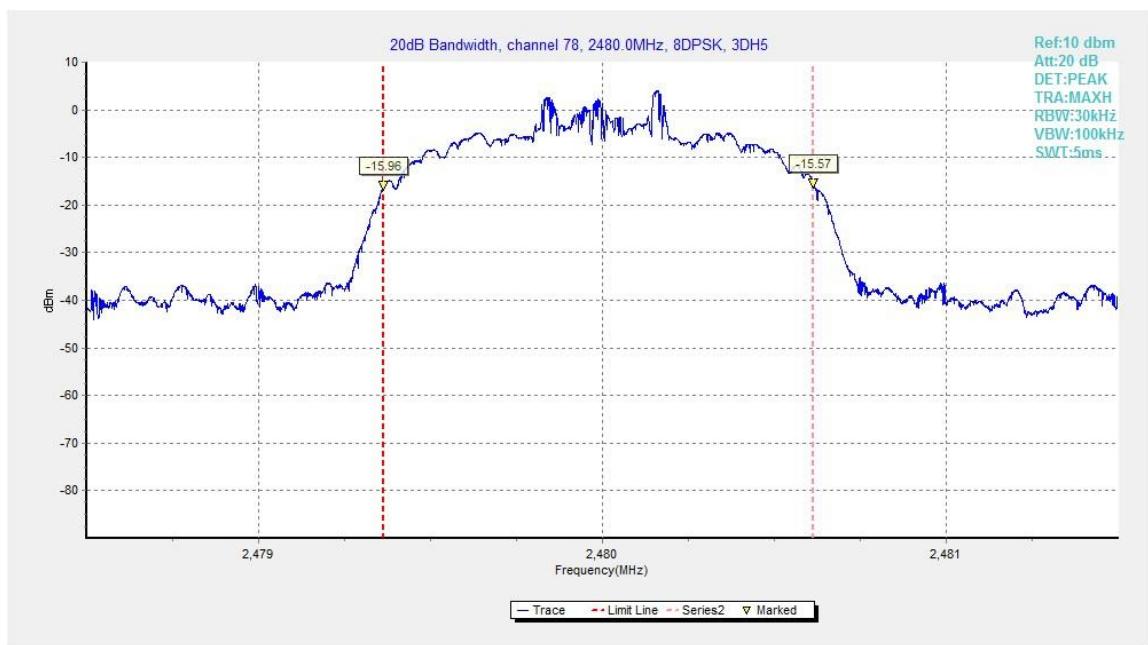


Fig.90. 20dB Bandwidth: 8DPSK, Channel 78

## 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	984.00	P

#### For $\pi/4$ DQPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.92	999.00	P

#### For 8DPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.93	993.75	P

**Conclusion: PASS**

**Test graphs as below:**

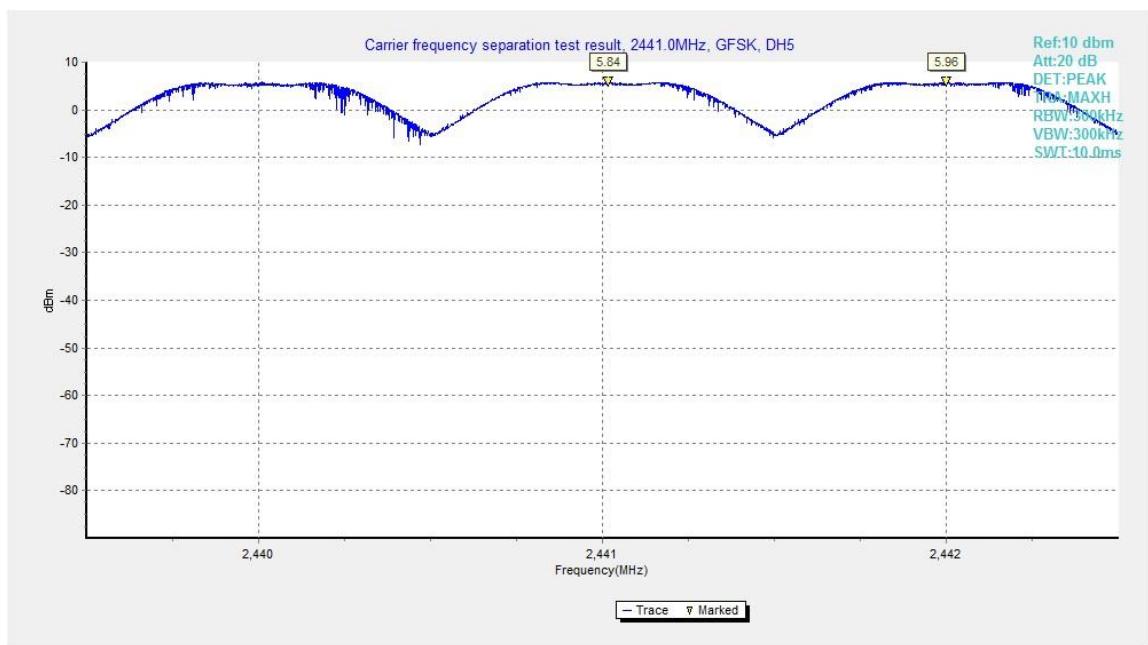


Fig.91. Carrier frequency separation measurement: GFSK, Channel 39

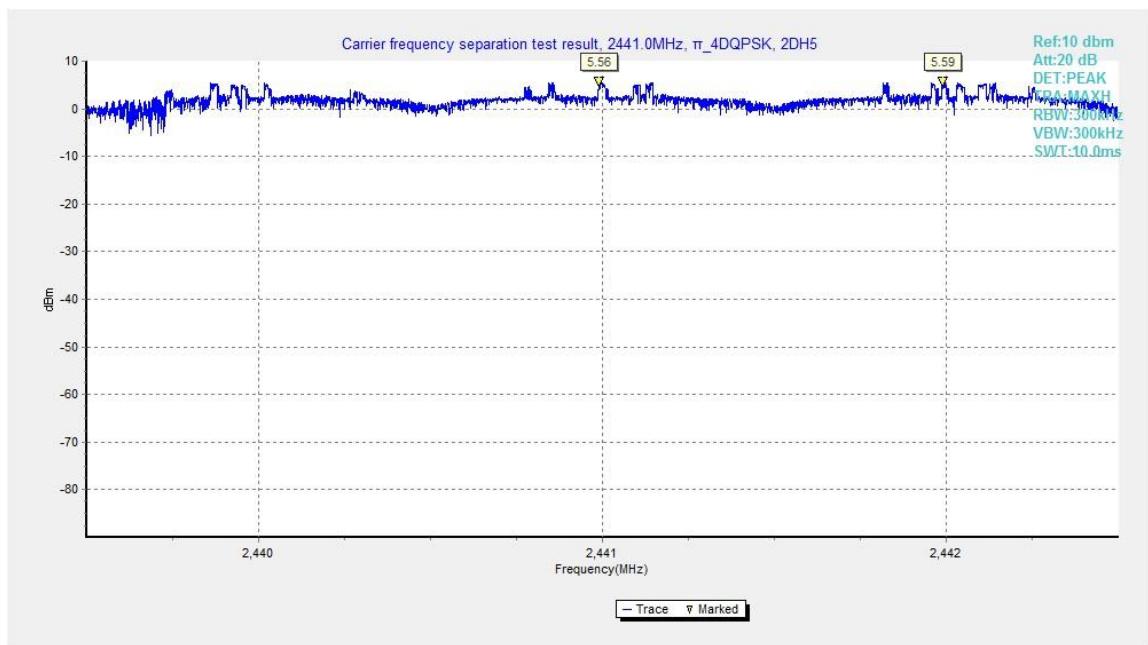


Fig.92. Carrier frequency separation measurement:  $\pi/4$  DQPSK, Channel 39

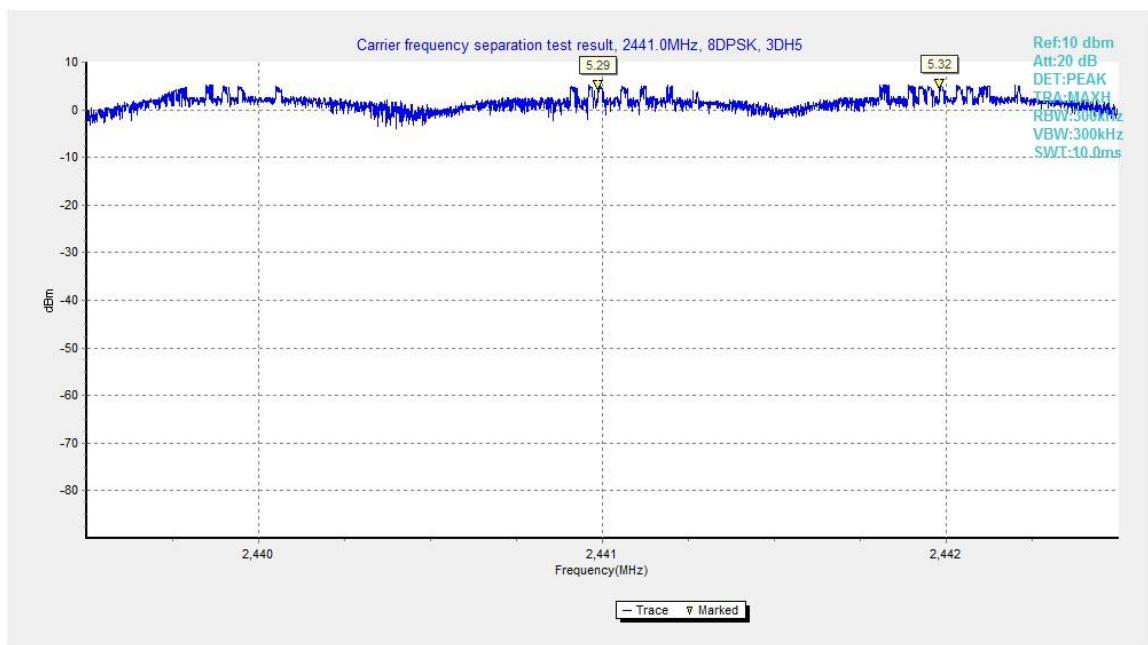


Fig.93. Carrier frequency separation measurement: 8DPSK, Channel 39

## 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
40~78	Fig.95	

#### For 4 DQPSK

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

#### For 8DPSK

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

**Conclusion: PASS**

**Test graphs as below:**

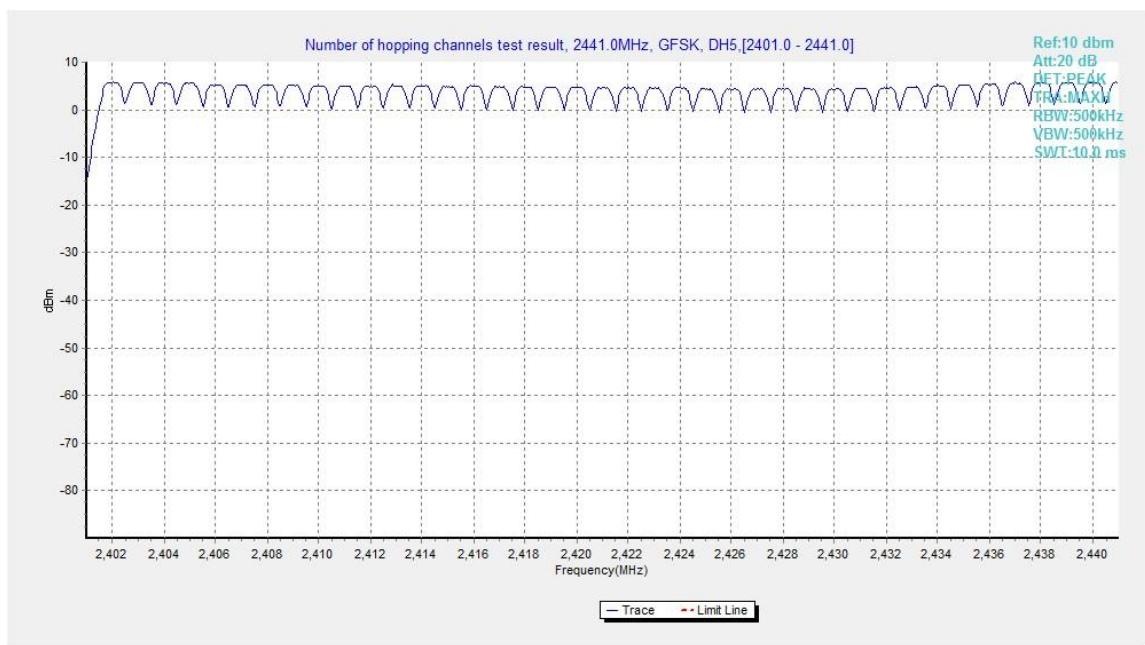


Fig.94. Number of hopping frequencies: GFSK, Channel 0 - 39

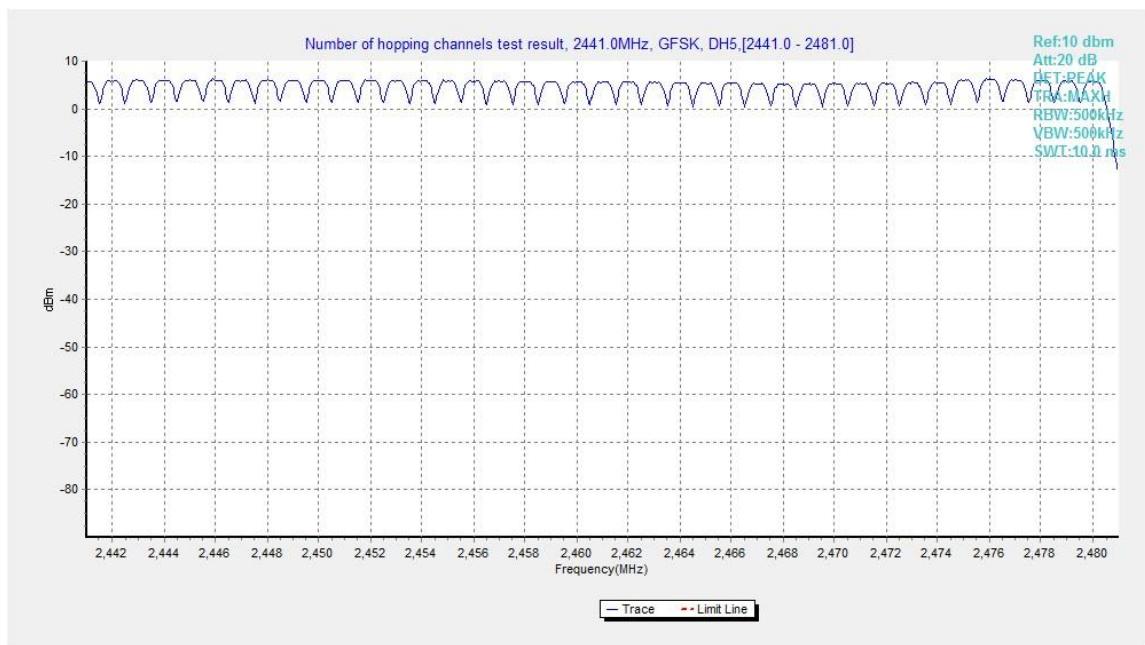


Fig.95. Number of hopping frequencies: GFSK, Channel 40 - 78

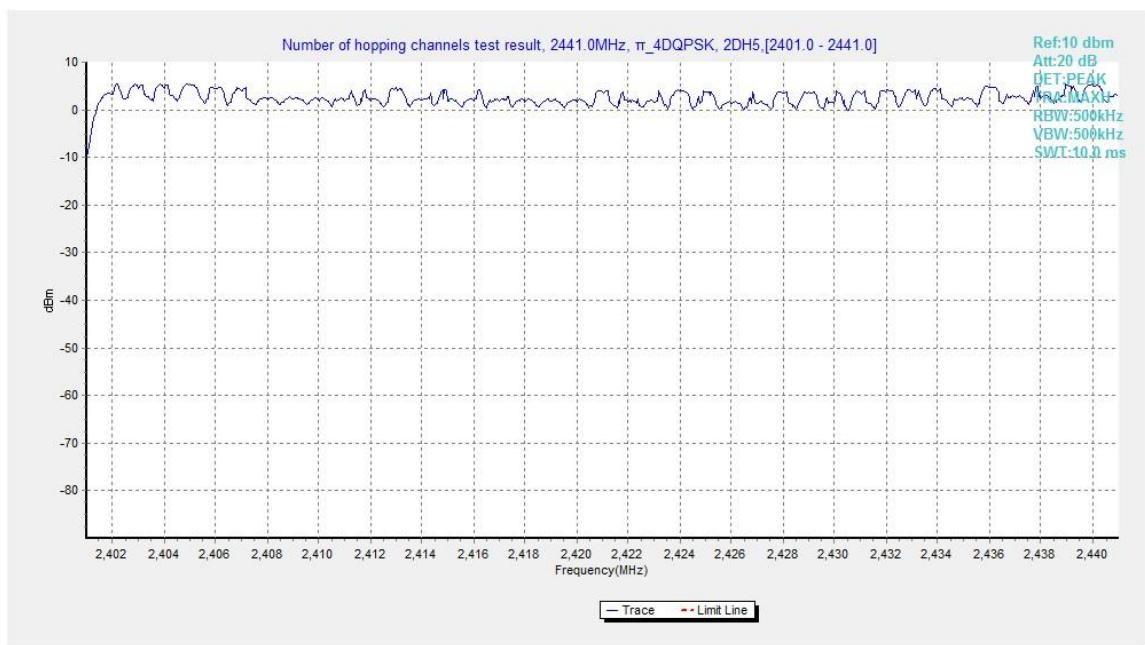


Fig.96. Number of hopping frequencies:  $\pi/4$  DQPSK, Channel 0 - 39

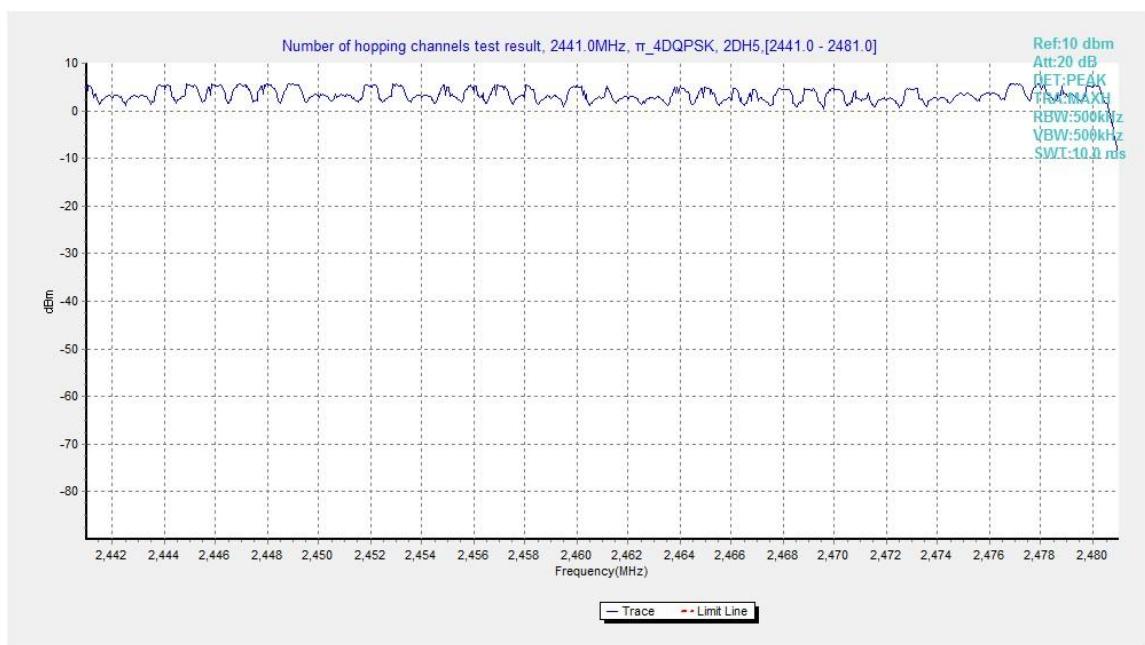


Fig.97. Number of hopping frequencies:  $\pi/4$  DQPSK, Channel 40 - 78

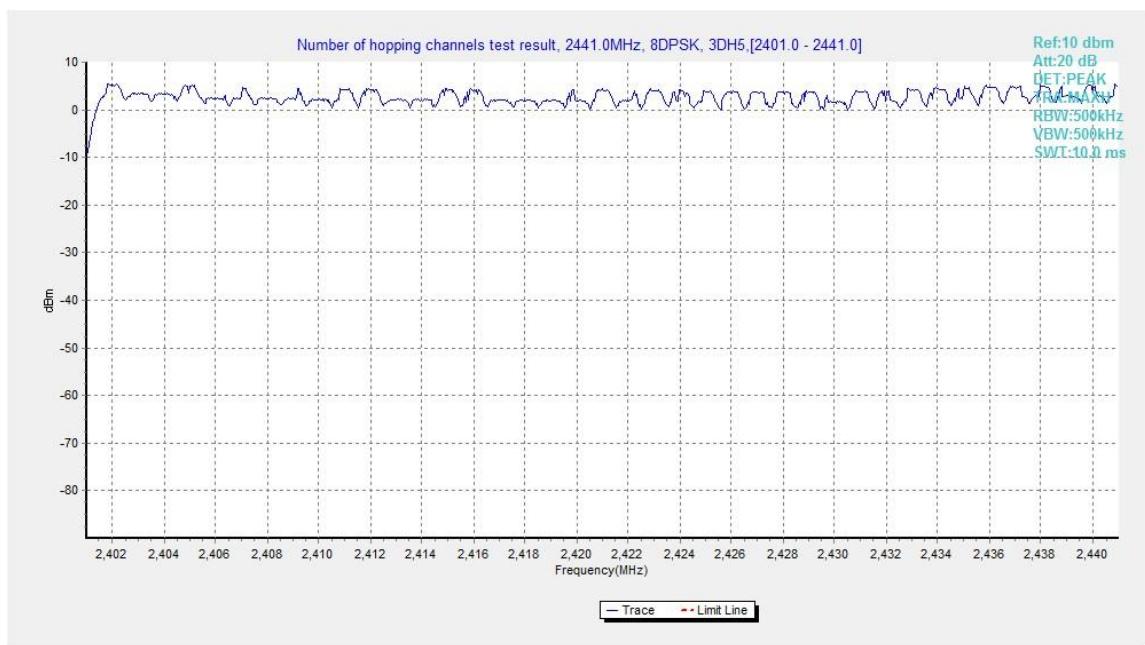


Fig.98. Number of hopping frequencies: 8DPSK, Channel 0 - 39

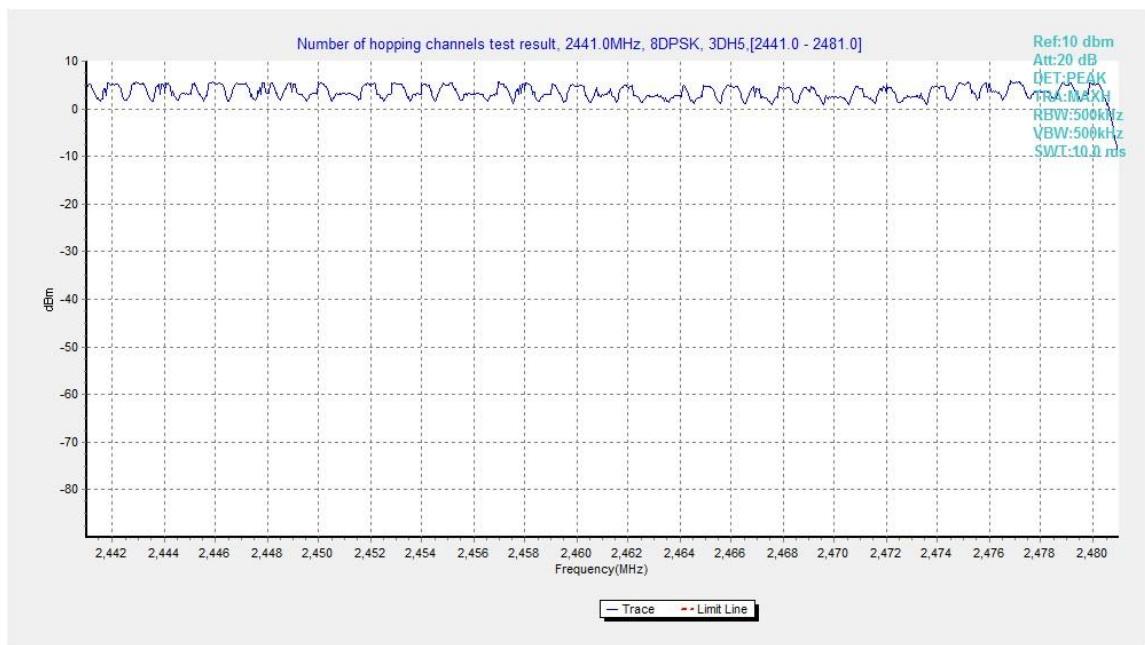


Fig.99. Number of hopping frequencies: 8DPSK, Channel 40 - 78

## 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.<sup>36</sup> 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 $\mu$ 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)**

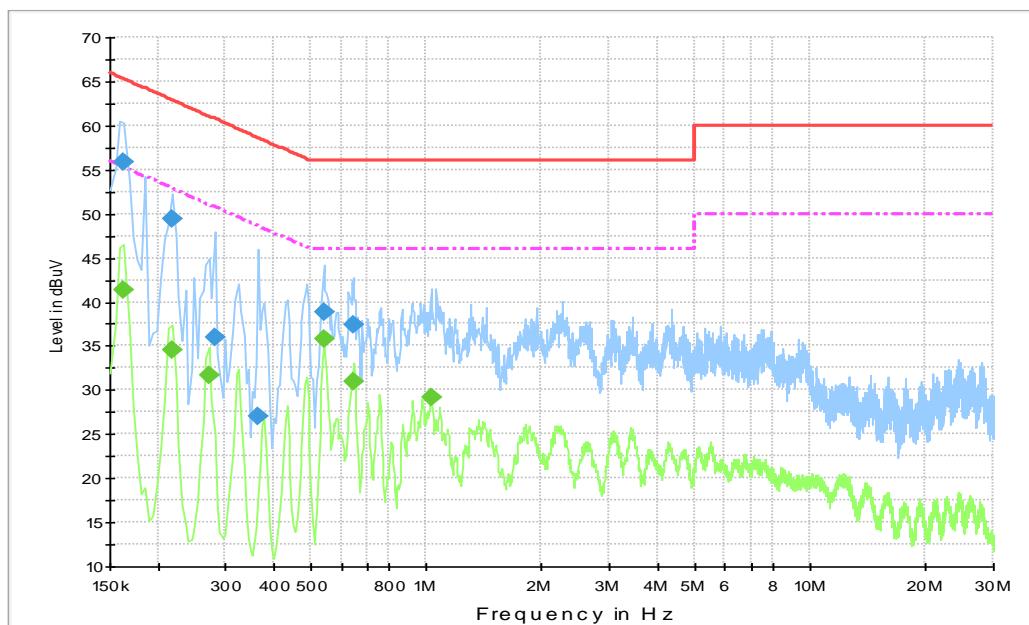
Frequency range (MHz)	Average Limit (dB $\mu$ V)	Conclusion
0.15 to 0.5	56 to 46	P
0.5 to 5	46	
5 to 30	50	

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**

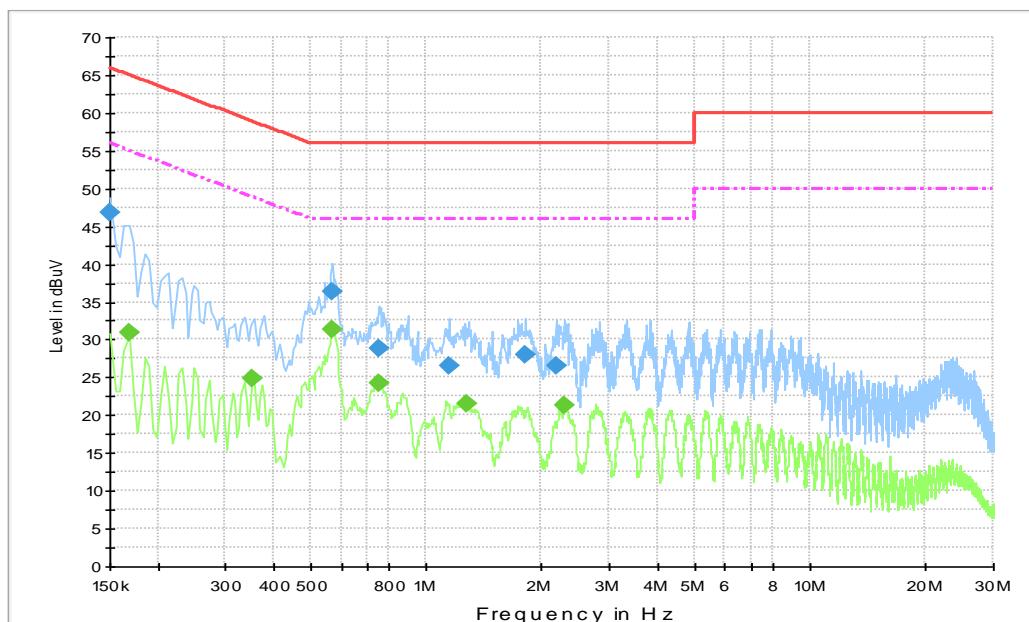
**Test graphs as below:**

**Traffic:**

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	55.9	10000.0	9.000	On	N	26.3	9.4	65.3
0.217500	49.5	10000.0	9.000	On	L1	20.0	13.4	62.9
0.280500	36.0	10000.0	9.000	On	N	20.0	24.8	60.8
0.366000	27.0	10000.0	9.000	On	N	20.0	31.6	58.6
0.541500	38.9	10000.0	9.000	On	L1	20.0	17.1	56.0
0.645000	37.5	10000.0	9.000	On	L1	19.9	18.5	56.0

**Final Result 2**

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	41.3	10000.0	9.000	On	L1	26.3	14.0	55.3
0.217500	34.6	10000.0	9.000	On	L1	20.0	18.3	52.9
0.271500	31.7	10000.0	9.000	On	L1	20.0	19.3	51.1
0.541500	35.7	10000.0	9.000	On	L1	20.0	10.3	46.0
0.649500	30.9	10000.0	9.000	On	L1	19.9	15.1	46.0
1.027500	29.3	10000.0	9.000	On	L1	19.9	16.7	46.0

**Idle:**


## Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	46.7	10000.0	9.000	On	N	28.9	19.3	66.0
0.568500	36.3	10000.0	9.000	On	L1	20.0	19.7	56.0
0.753000	28.8	10000.0	9.000	On	L1	20.0	27.2	56.0
1.149000	26.6	10000.0	9.000	On	L1	19.8	29.4	56.0
1.810500	28.0	10000.0	9.000	On	N	19.8	28.0	56.0
2.175000	26.5	10000.0	9.000	On	N	19.8	29.5	56.0

## Final Result 2

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.168000	31.0	10000.0	9.000	On	L1	25.4	24.1	55.1
0.352500	24.8	10000.0	9.000	On	L1	20.0	24.1	48.9
0.568500	31.4	10000.0	9.000	On	L1	20.0	14.6	46.0
0.757500	24.2	10000.0	9.000	On	L1	20.0	21.8	46.0
1.270500	21.6	10000.0	9.000	On	L1	19.8	24.4	46.0
2.301000	21.2	10000.0	9.000	On	L1	19.8	24.8	46.0

## ANNEX B: 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).*

2019-09-26 through 2020-09-30

Effective Dates



For the National Voluntary Laboratory Accreditation Program



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