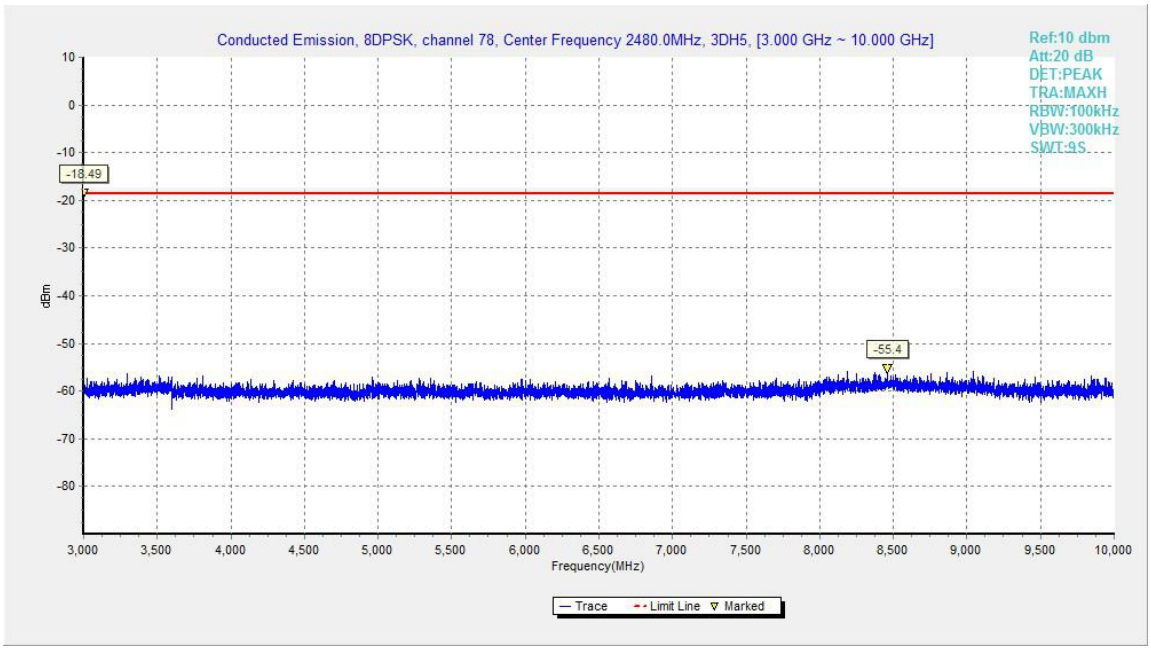


Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

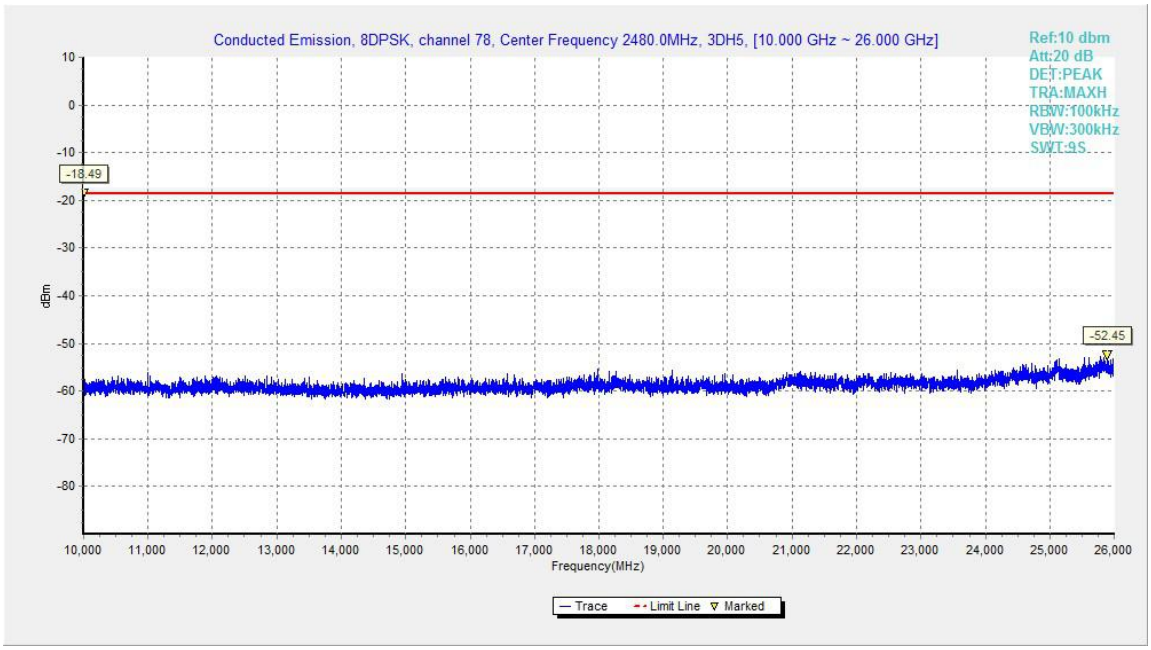


Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

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/3MHz	15
4000-18000	1MHz/3MHz	40
18000-26500	1MHz/3MHz	20

Measurement Results:

Result=P_{Mea}+ARPL

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Power	2.31GHz~2.4GHz---L	Fig.58	P
Power	2.45GHz~2.5GHz---H	Fig.59	P

Forπ/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Power	2.31GHz~2.4GHz---L	Fig.60	P
Power	2.45GHz~2.5GHz---H	Fig.61	P

For 8DPSK

Channel	Frequency Range	Test Results	Conclusion
Power	2.31GHz~2.4GHz---L	Fig.62	P
Power	2.45GHz~2.5GHz---H	Fig.63	P

GFSK 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)
2385.900	46.29	2.9	32.0	11.46	54.0	7.7	H	155	8
2387.900	46.30	2.9	32.0	11.47	54.0	7.7	H	155	6
4804.500	33.21	-35.0	34.1	34.16	54.0	20.8	H	155	25
7206.000	37.29	-32.4	35.8	33.88	54.0	16.7	H	155	70
9607.500	40.86	-29.7	36.7	33.81	54.0	13.1	H	155	135
12010.500	42.36	-30.5	38.9	33.96	54.0	11.6	H	155	270

GFSK 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)
2437.600	46.34	2.9	32.0	11.46	54.0	7.7	H	155	28
2444.500	46.41	2.9	32.0	11.53	54.0	7.6	H	155	49
4882.500	32.51	-35.5	34.1	33.96	54.0	21.5	H	155	226
7323.000	38.27	-31.3	35.8	33.78	54.0	15.7	H	155	248
9763.500	39.27	-31.4	36.9	33.75	54.0	14.7	H	155	268
12205.500	44.09	-28.9	39.0	33.97	54.0	9.9	H	155	298

GFSK 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	46.49	2.9	32.0	11.57	54.0	7.5	H	155	226
2483.700	46.48	2.9	32.0	11.55	54.0	7.5	H	155	92
4960.500	33.42	-34.9	34.1	34.21	54.0	20.6	H	155	70
7440.000	37.42	-32.2	35.8	33.80	54.0	16.6	H	155	8
9919.500	41.28	-29.6	37.1	33.82	54.0	12.7	H	155	48
12400.500	43.30	-30.0	39.1	34.26	54.0	10.7	H	155	246

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)
2385.200	46.28	2.9	32.0	11.46	54.0	7.7	H	155	25
2388.200	46.30	2.9	32.0	11.48	54.0	7.7	H	155	49
4804.500	33.28	-35.0	34.1	34.22	54.0	20.7	H	155	4
7206.000	37.26	-32.4	35.8	33.85	54.0	16.7	H	155	6
9607.500	40.85	-29.7	36.7	33.79	54.0	13.2	H	155	25
12010.500	42.35	-30.5	38.9	33.95	54.0	11.6	H	155	186

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)
2435.900	46.27	2.9	32.0	11.40	54.0	7.7	H	155	46
2445.100	46.40	2.9	32.0	11.52	54.0	7.6	H	155	60
4882.500	32.60	-35.5	34.1	34.04	54.0	21.4	H	155	116
7323.000	38.31	-31.3	35.8	33.82	54.0	15.7	H	155	8
9763.500	39.23	-31.4	36.9	33.72	54.0	14.8	H	155	128
12205.500	44.12	-28.9	39.0	34.00	54.0	9.9	H	155	94

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	46.51	2.9	32.0	11.58	54.0	7.5	H	155	135
2483.700	46.42	2.9	32.0	11.50	54.0	7.6	H	155	160
4960.500	33.35	-34.9	34.1	34.14	54.0	20.6	H	155	92
7440.000	37.50	-32.2	35.8	33.87	54.0	16.5	H	155	115
9919.500	41.25	-29.6	37.1	33.80	54.0	12.7	H	155	112
12400.500	43.39	-30.0	39.1	34.35	54.0	10.6	H	155	85

8DPSK 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)
2385.400	46.44	2.9	32.0	11.62	54.0	7.6	H	155	20
2389.900	46.48	2.9	32.0	11.66	54.0	7.5	H	155	248
4804.500	33.31	-35.0	34.1	34.25	54.0	20.7	H	155	49
7206.000	37.26	-32.4	35.8	33.85	54.0	16.7	H	155	82
9607.500	40.84	-29.7	36.7	33.79	54.0	13.2	H	155	168
12010.500	42.30	-30.5	38.9	33.90	54.0	11.7	H	155	8

8DPSK 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)
2437.600	46.53	2.9	32.0	11.65	54.0	7.5	H	155	48
2444.500	46.56	2.9	32.0	11.68	54.0	7.4	H	155	6
4882.500	32.52	-35.5	34.1	33.96	54.0	21.5	H	155	312
7323.000	38.26	-31.3	35.8	33.78	54.0	15.7	H	155	48
9763.500	39.29	-31.4	36.9	33.77	54.0	14.7	H	155	68
12205.500	44.08	-28.9	39.0	33.95	54.0	9.9	H	155	80

8DPSK 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	46.60	2.9	32.0	11.67	54.0	7.4	H	155	92
2499.800	46.51	2.9	32.0	11.57	54.0	7.5	H	155	26
4960.500	33.29	-34.9	34.1	34.07	54.0	20.7	H	155	222
7440.000	37.38	-32.2	35.8	33.75	54.0	16.6	H	155	248
9919.500	41.23	-29.6	37.1	33.77	54.0	12.8	H	155	46
12400.500	43.38	-30.0	39.1	34.34	54.0	10.6	H	155	68

GFSK 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)
2383.220	60.04	2.9	32.0	25.22	74.0	14.0	H	155	0
2389.968	59.86	2.9	32.0	25.03	74.0	14.1	V	155	0
4804.000	42.08	-35.0	34.1	43.02	74.0	31.9	V	155	22
7206.000	44.14	-32.4	35.8	40.74	74.0	29.9	V	155	66
9608.000	46.48	-29.7	36.7	39.41	74.0	27.5	V	155	132
12010.000	46.67	-30.5	38.9	38.26	74.0	27.3	V	155	274

GFSK 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)
2331.200	47.31	-27.7	31.9	43.08	74.0	26.7	H	155	22
2521.600	47.94	-26.8	32.0	42.67	74.0	26.1	H	155	44
4882.000	39.17	-35.5	34.1	40.61	74.0	34.8	V	155	220
7323.000	43.97	-31.3	35.8	39.48	74.0	30.0	V	155	242
9764.000	43.98	-31.4	36.9	38.47	74.0	30.0	H	155	264
12205.000	48.01	-28.8	39.0	37.87	74.0	26.0	H	155	286

GFSK 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)
2490.990	60.21	2.9	32.0	25.27	74.0	13.8	H	155	220
2495.370	60.21	2.9	32.0	25.27	74.0	13.8	V	155	88
4960.000	39.61	-34.9	34.1	40.40	74.0	34.4	H	155	66
7440.000	42.09	-32.2	35.8	38.46	74.0	31.9	H	155	0
9920.000	46.27	-29.7	37.1	38.82	74.0	27.7	H	155	44
12400.000	46.71	-30.0	39.1	37.69	74.0	27.3	V	155	242

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)
2371.894	60.42	2.9	32.0	25.61	74.0	13.6	H	155	22
2373.168	60.11	2.9	32.0	25.30	74.0	13.9	V	155	44
4804.000	40.65	-35.0	34.1	41.59	74.0	33.4	H	155	0
7206.000	43.69	-32.4	35.8	40.28	74.0	30.3	H	155	0
9608.000	46.46	-29.7	36.7	39.39	74.0	27.5	H	155	22
12010.000	47.44	-30.5	38.9	39.03	74.0	26.6	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)
2358.400	47.52	-27.6	31.9	43.21	74.0	26.5	H	155	44
2524.200	47.05	-26.8	32.0	41.83	74.0	27.0	H	155	66
4882.000	39.68	-35.5	34.1	41.12	74.0	34.3	V	155	110
7323.000	44.04	-31.3	35.8	39.55	74.0	30.0	V	155	0
9764.000	45.05	-31.4	36.9	39.54	74.0	28.9	H	155	132
12205.000	48.09	-28.8	39.0	37.95	74.0	25.9	H	155	88

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)
2486.325	61.08	2.9	32.0	26.15	74.0	12.9	H	155	132
2492.815	60.57	2.9	32.0	25.64	74.0	13.4	H	155	154
4960.000	39.14	-34.9	34.1	39.93	74.0	34.9	V	155	88
7440.000	43.44	-32.2	35.8	39.81	74.0	30.6	H	155	110
9920.000	46.61	-29.7	37.1	39.16	74.0	27.4	V	155	110
12400.000	46.46	-30.0	39.1	37.44	74.0	27.5	V	155	88

8DPSK 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)
2384.746	60.45	2.9	32.0	25.63	74.0	13.5	H	155	22
2387.112	60.56	2.9	32.0	25.74	74.0	13.4	V	155	242
4804.000	39.90	-35.0	34.1	40.84	74.0	34.1	H	155	44
7206.000	43.78	-32.4	35.8	40.37	74.0	30.2	V	155	88
9608.000	45.34	-29.7	36.7	38.27	74.0	28.7	V	155	176
12010.000	46.43	-30.5	38.9	38.02	74.0	27.6	V	155	0

8DPSK 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)
2321.000	47.62	-27.8	31.9	43.43	74.0	26.4	H	155	44
2528.600	48.26	-26.8	32.0	43.05	74.0	25.7	H	155	0
4882.000	37.88	-35.5	34.1	39.33	74.0	36.1	V	155	308
7323.000	45.26	-31.3	35.8	40.78	74.0	28.7	H	155	44
9764.000	44.90	-31.4	36.9	39.39	74.0	29.1	V	155	66
12205.000	47.39	-28.8	39.0	37.25	74.0	26.6	H	155	88

8DPSK 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)
2488.165	60.47	2.9	32.0	25.54	74.0	13.5	H	155	88
2499.205	60.42	2.9	32.0	25.48	74.0	13.6	H	155	22
4960.000	38.70	-34.9	34.1	39.49	74.0	35.3	V	155	220
7440.000	42.56	-32.2	35.8	38.93	74.0	31.4	V	155	242
9920.000	46.41	-29.7	37.1	38.97	74.0	27.6	V	155	44
12400.000	46.03	-30.0	39.1	37.01	74.0	28.0	V	155	66

Conclusion: PASS

Test graphs as below:

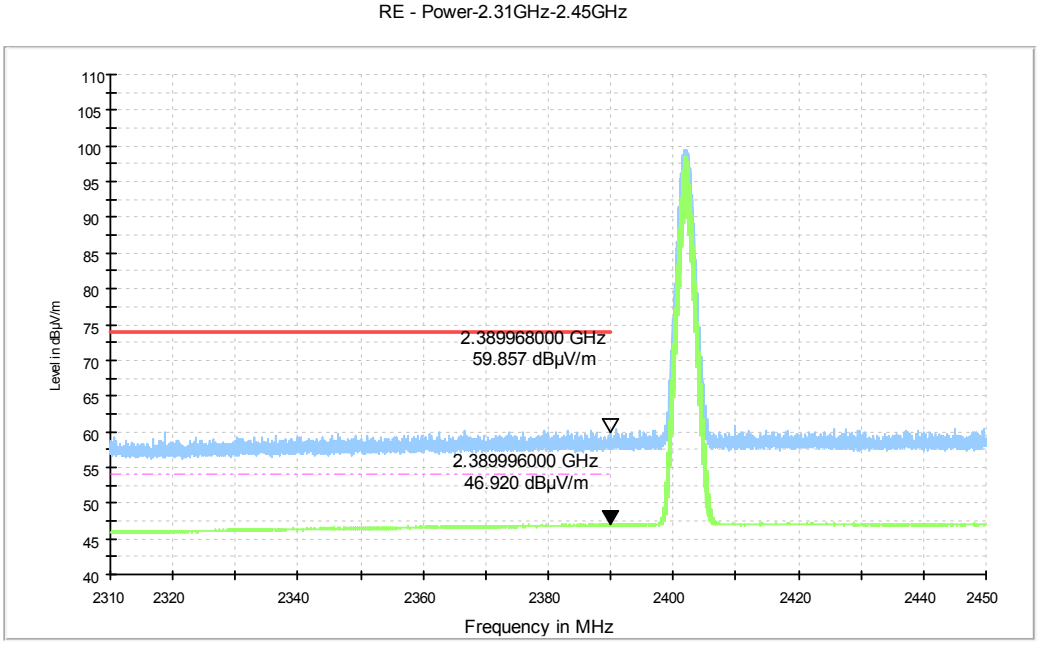


Fig.58. Radiated emission (Power): GFSK, low channel

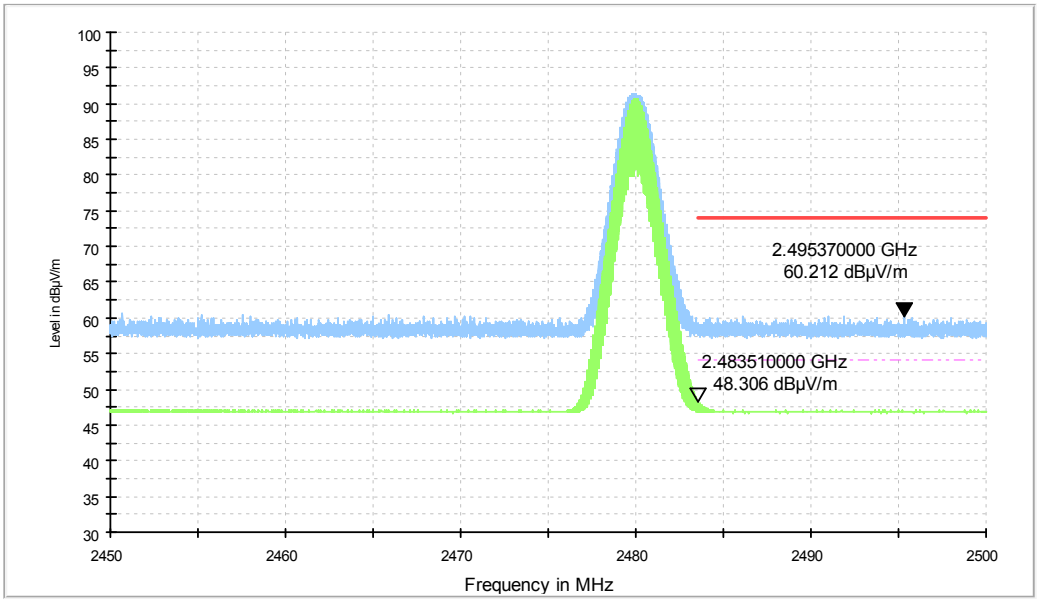


Fig.59. Radiated emission (Power) GFSK, high channel

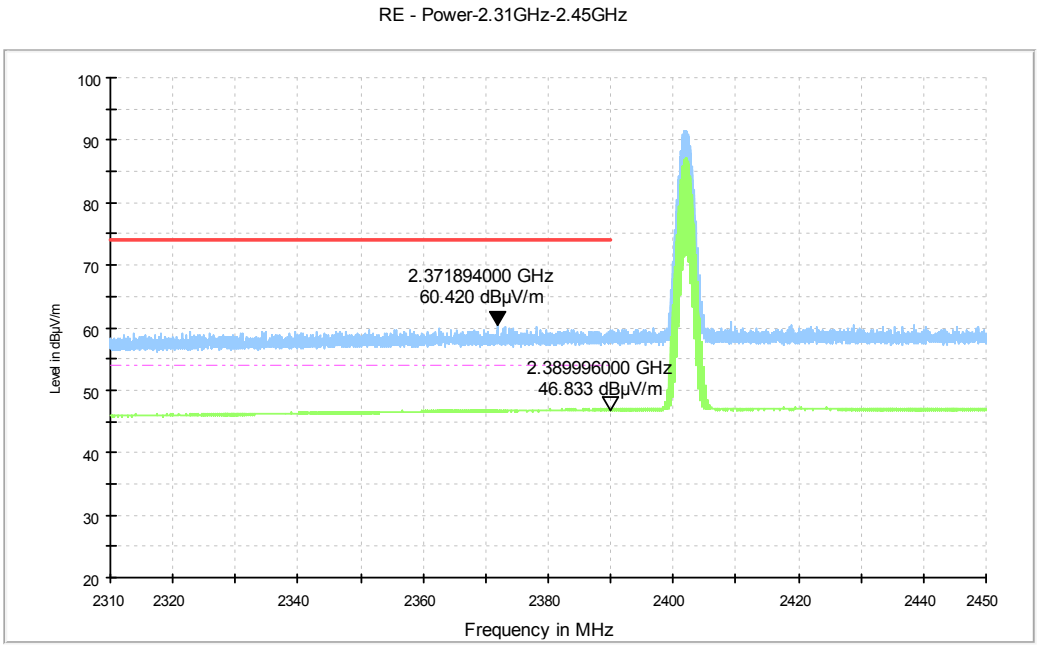


Fig.60. Radiated emission (Power): π/4 DQPSK, low channel

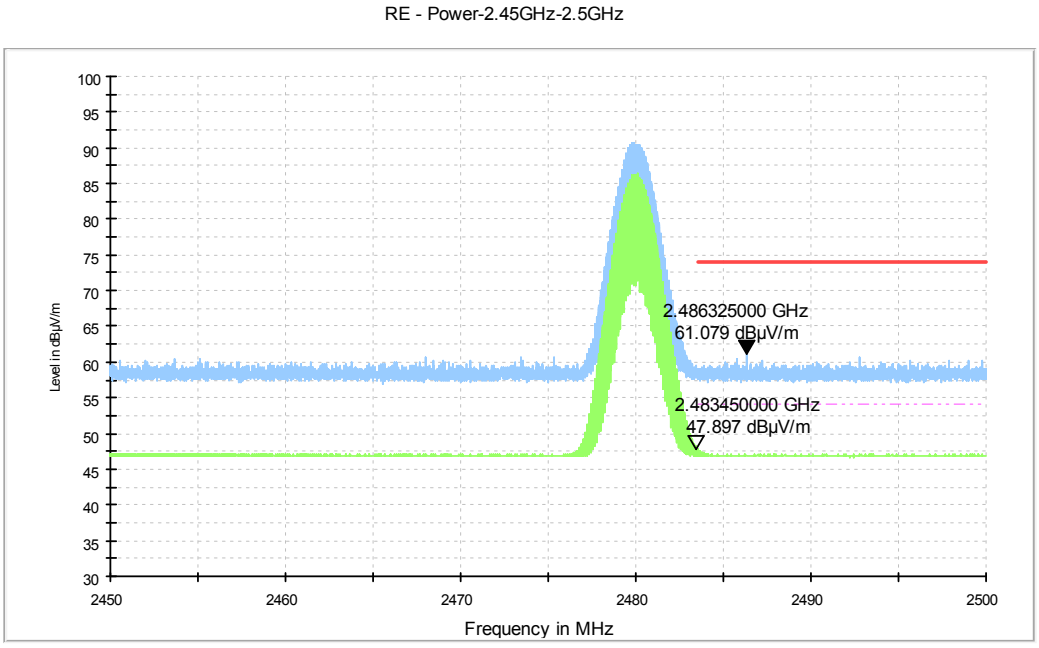


Fig.61. Radiated emission (Power): π/4 DQPSK, high channel

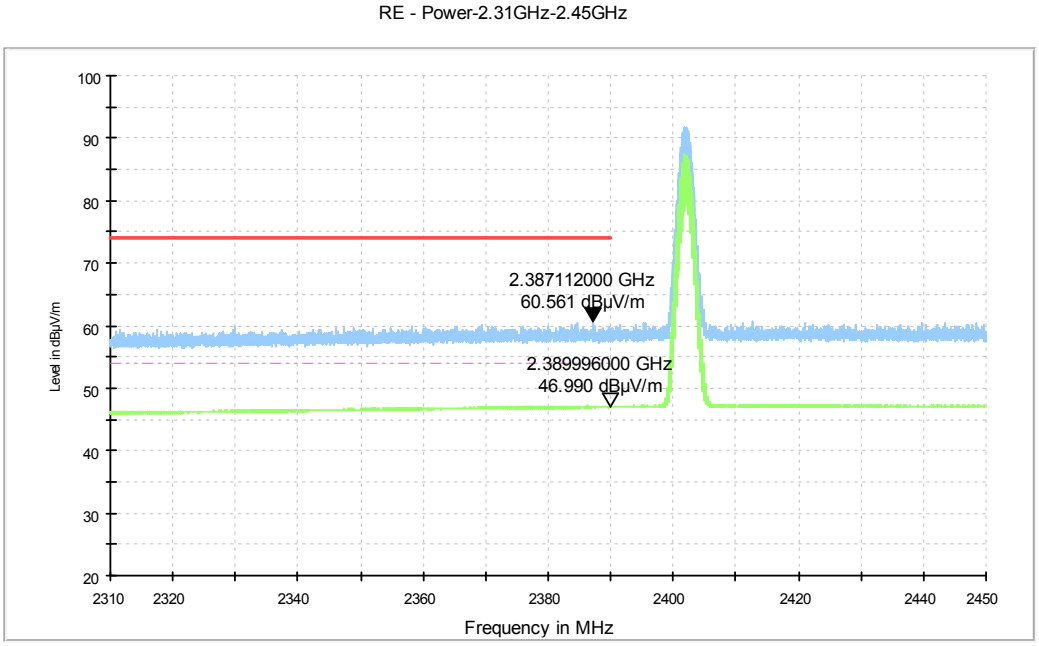


Fig.62. Radiated emission (Power): 8DPSK, low channel

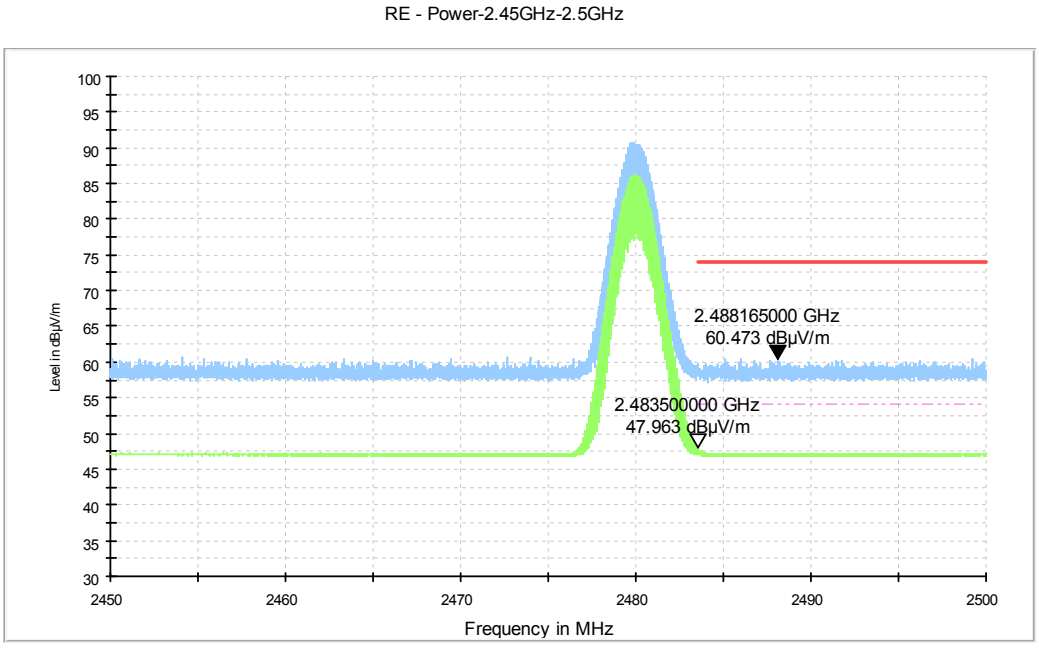


Fig.63. Radiated emission (Power): 8DPSK, high channel

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 ≥ 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	84.87	P
		Fig.65		
	DH3	Fig.66	176.38	P
		Fig.67		
	DH5	Fig.68	207.46	P
		Fig.69		

For π/4 DQPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.70	105.72	P
		Fig.71		
	DH3	Fig.72	180.01	P
		Fig.73		
	DH5	Fig.74	216.34	P
		Fig.75		

For 8DPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.76	123.34	P
		Fig.77		
	DH3	Fig.78	183.30	P

		Fig.79		
	DH5	Fig.80	155.88	P
		Fig.81		

Conclusion: PASS

Test graphs as below:

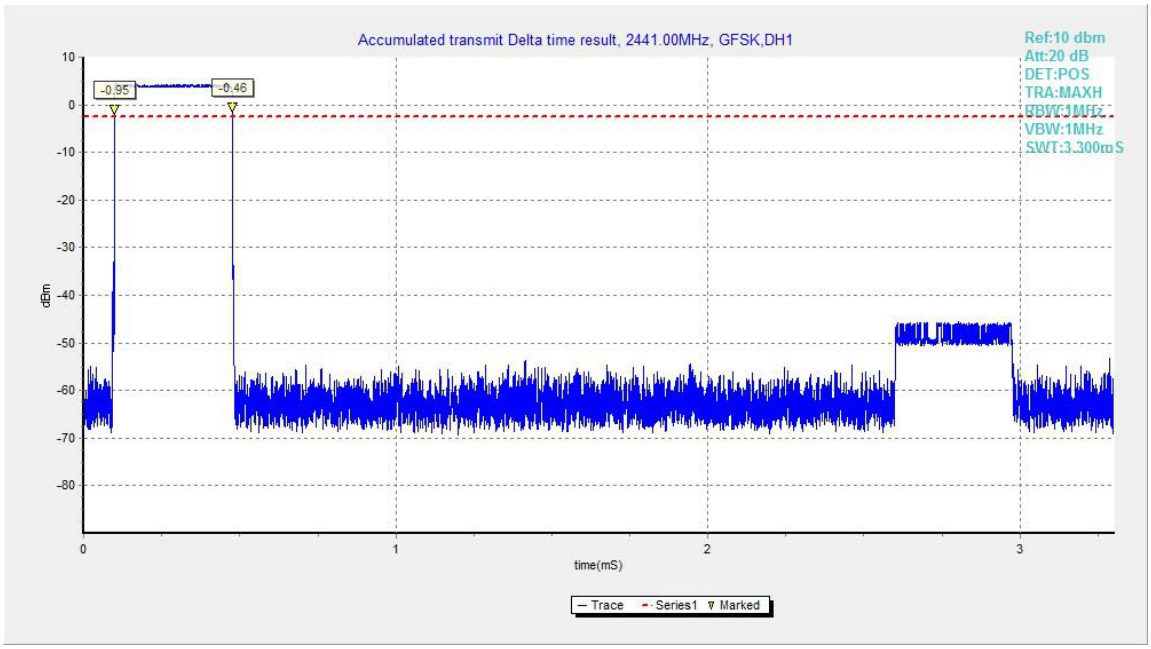


Fig.64. Time of occupancy (Dwell Time): Channel 39, Packet DH1

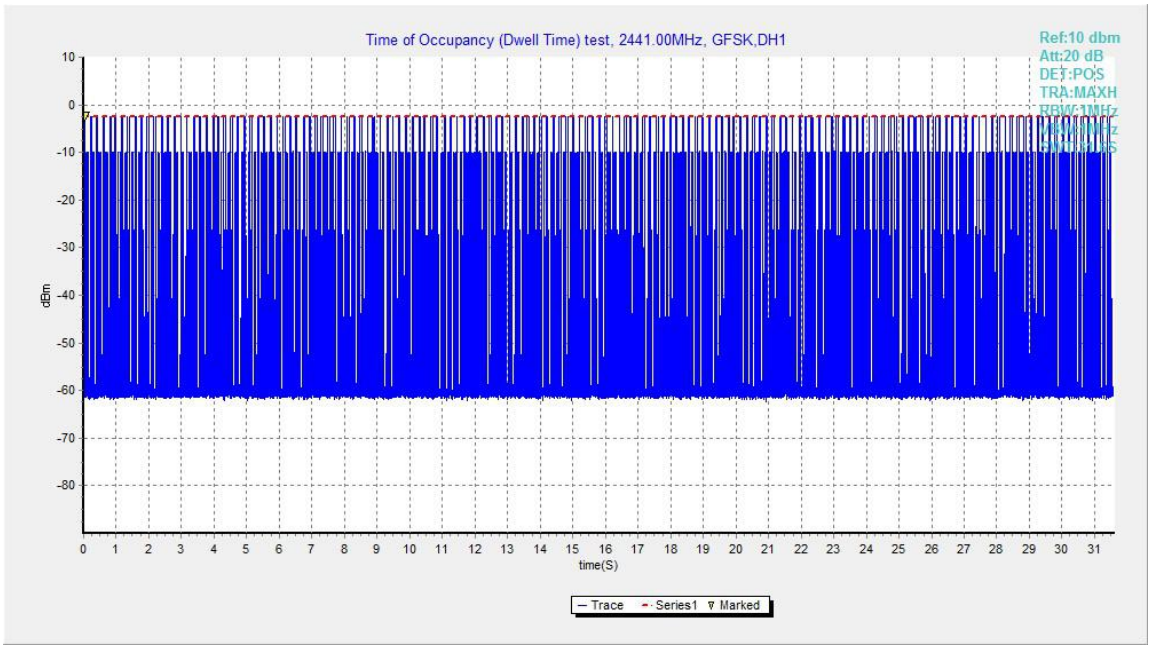


Fig.65. Number of Transmissions Measurement: Channel 39,Packet DH1

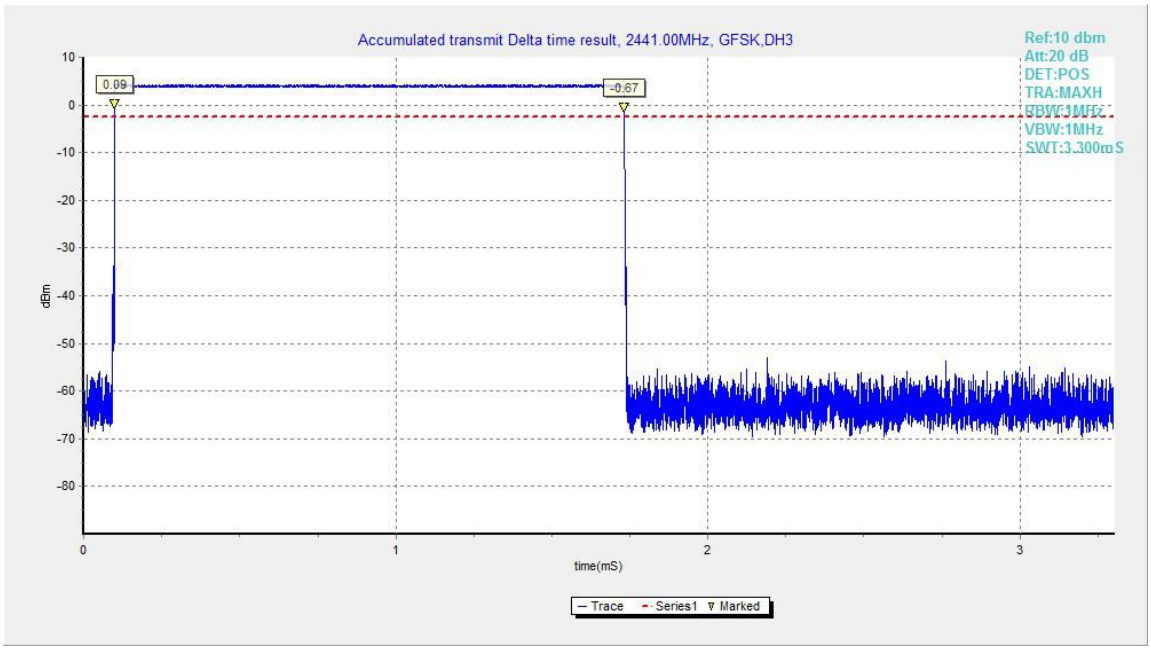


Fig.66. Time of occupancy (Dwell Time): Channel 39, Packet DH3

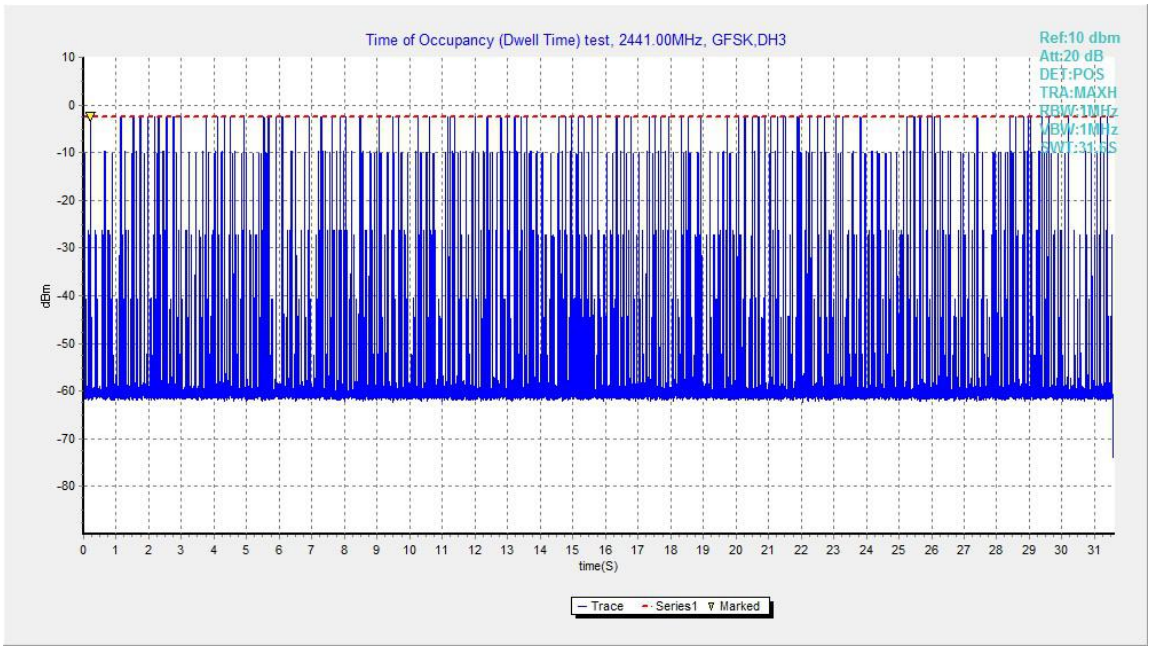


Fig.67. Number of Transmissions Measurement: Channel 39,Packet DH3

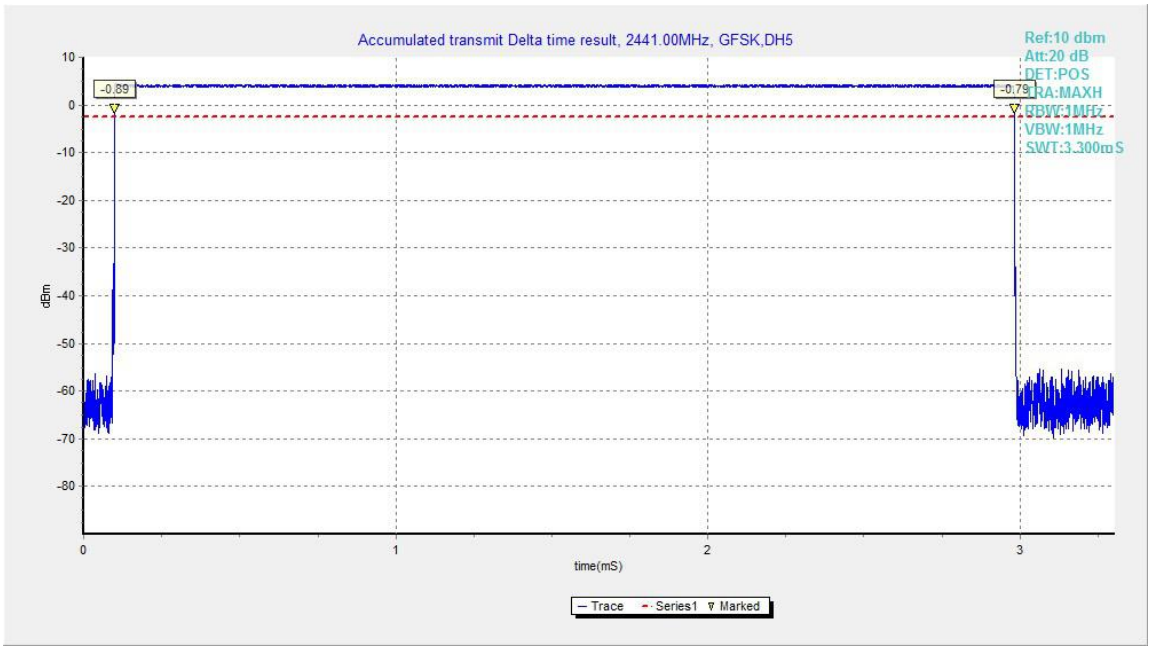


Fig.68. Time of occupancy (Dwell Time): Channel 39, Packet DH5

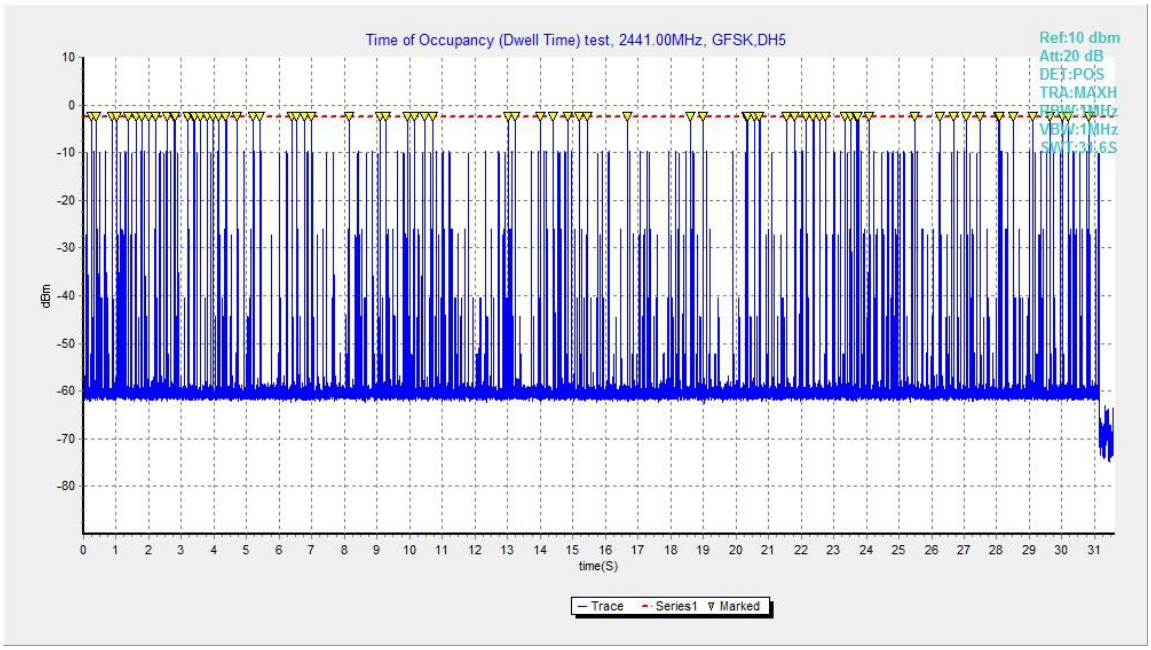


Fig.69. Number of Transmissions Measurement: Channel 39,Packet DH5

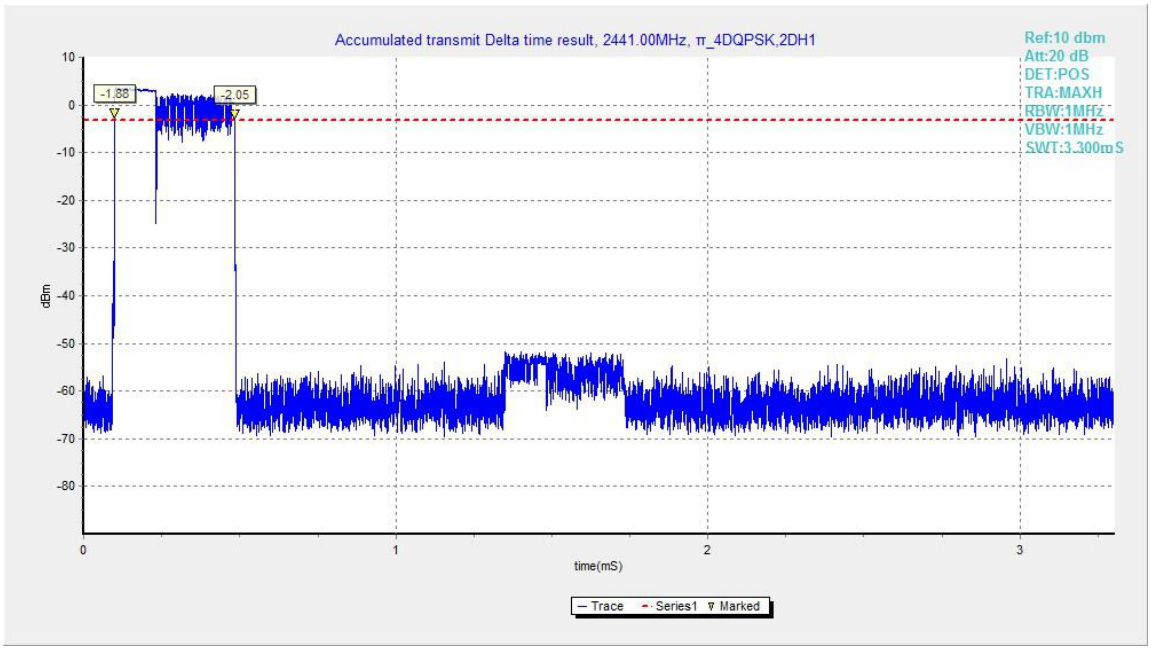


Fig.70. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

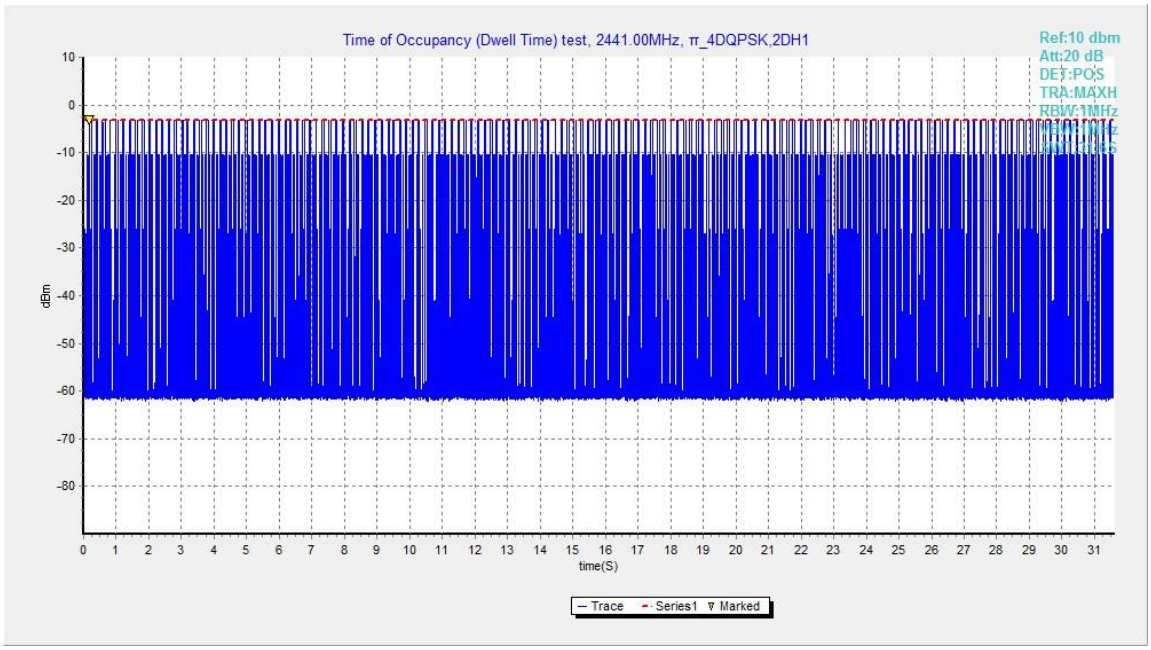


Fig.71. Number of Transmissions Measurement: Channel 39,Packet 2-DH1

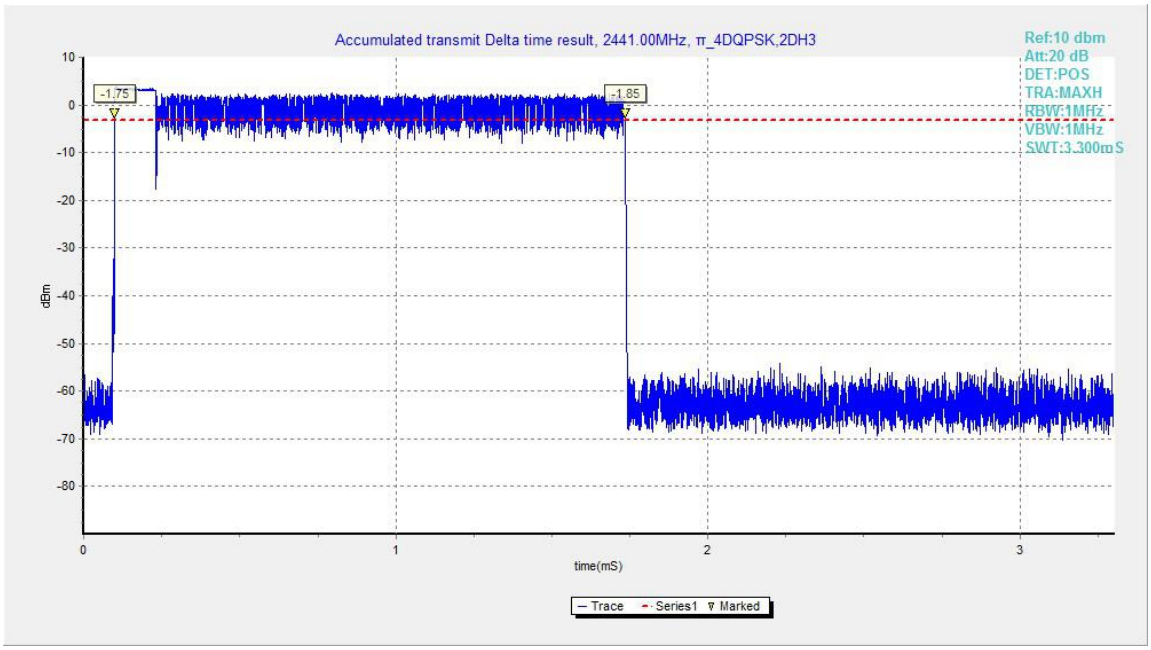


Fig.72. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3

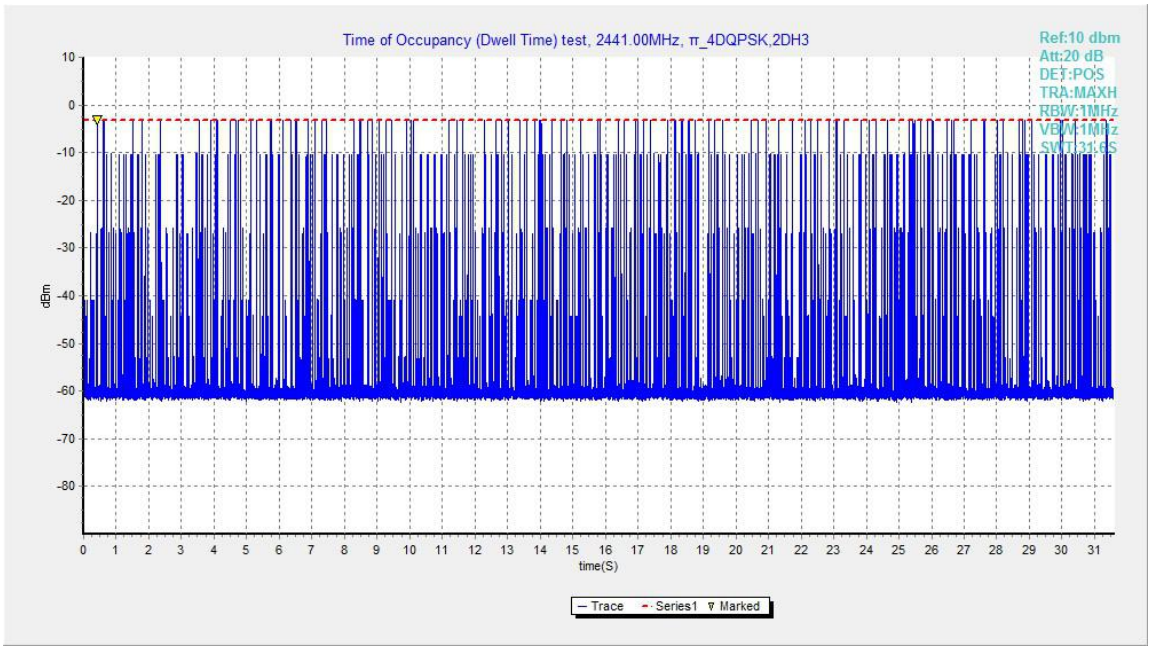


Fig.73. Number of Transmissions Measurement: Channel 39,Packet 2-DH3

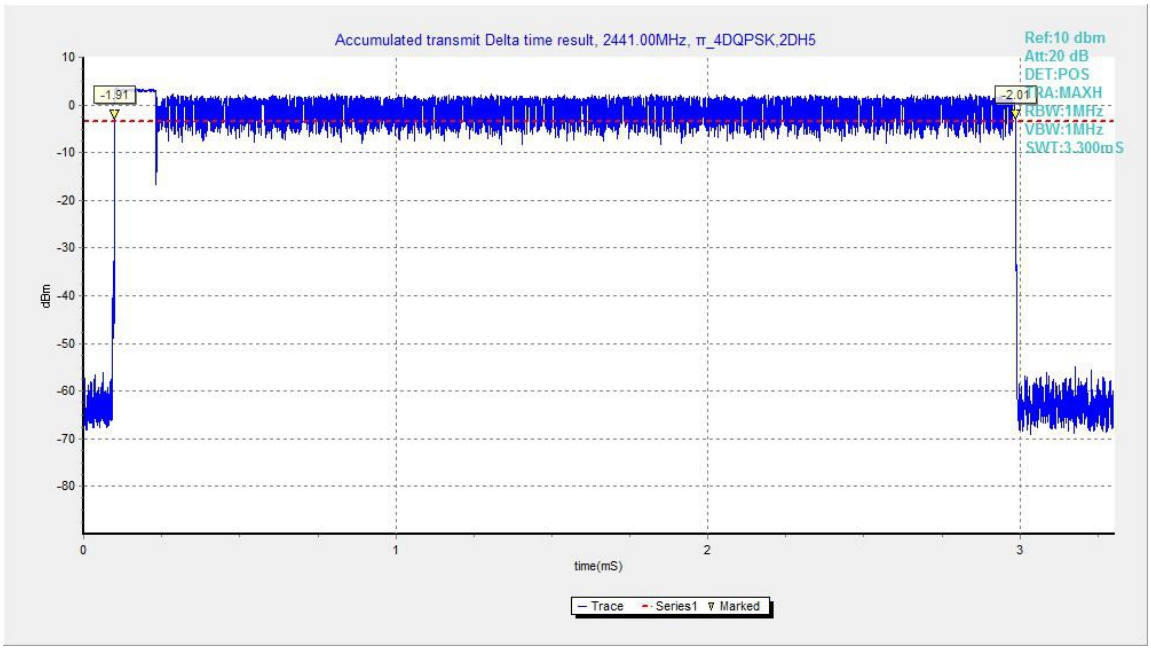


Fig.74. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

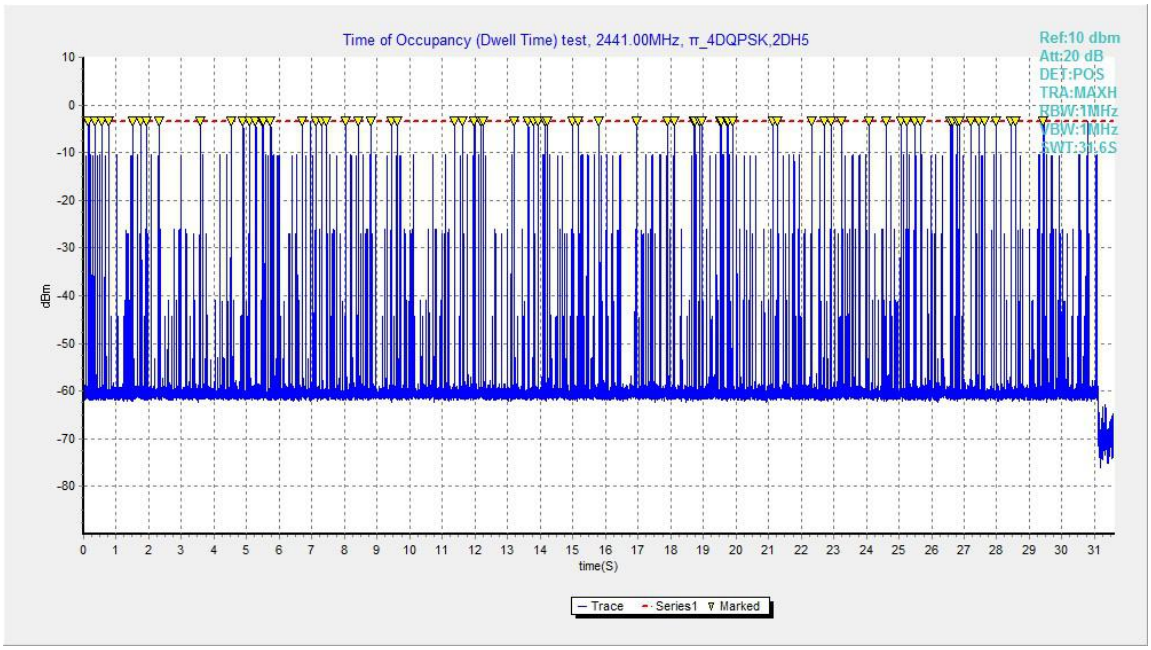


Fig.75. Number of Transmissions Measurement: Channel 39,Packet 2-DH5

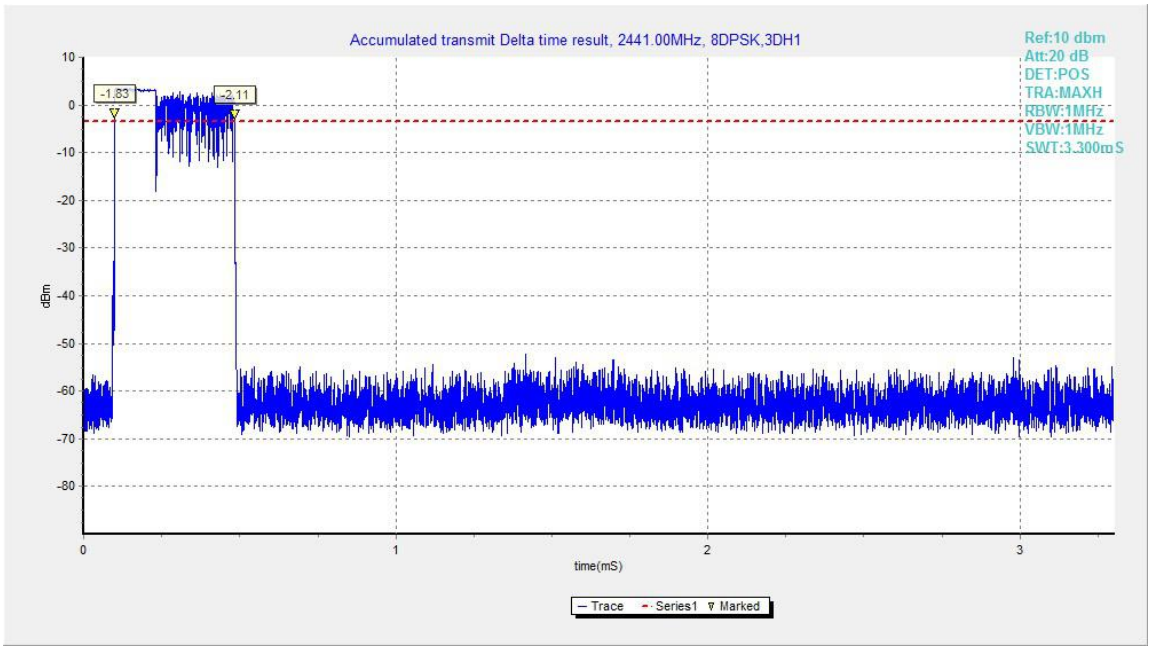


Fig.76. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1

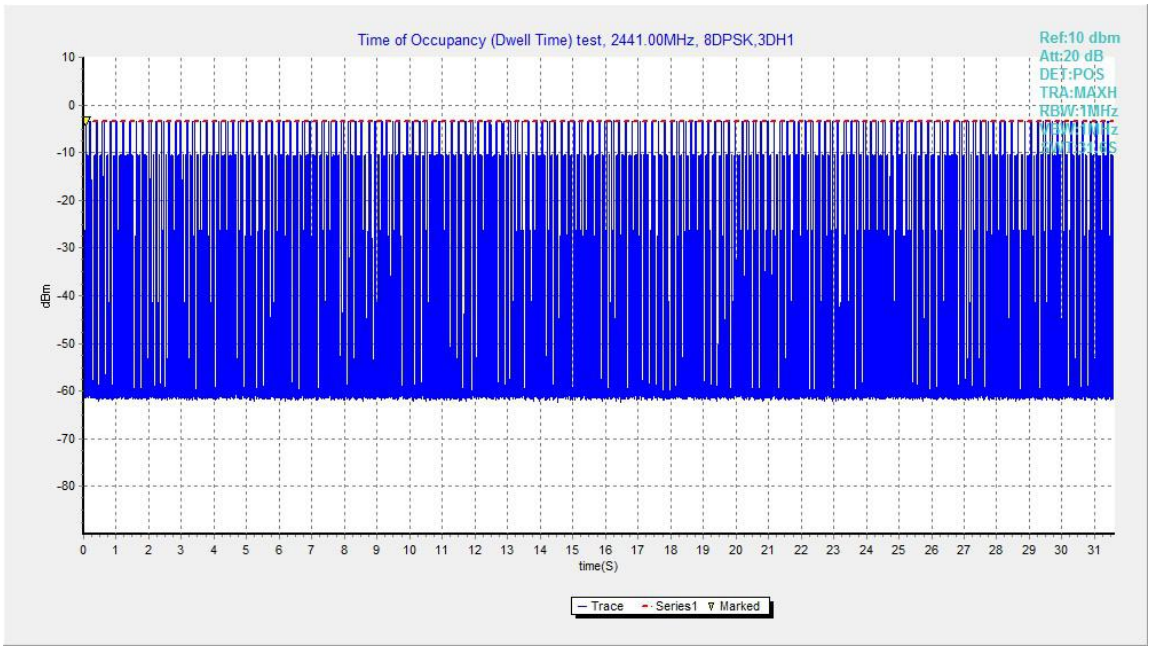


Fig.77. Number of Transmissions Measurement: Channel 39,Packet 3-DH1

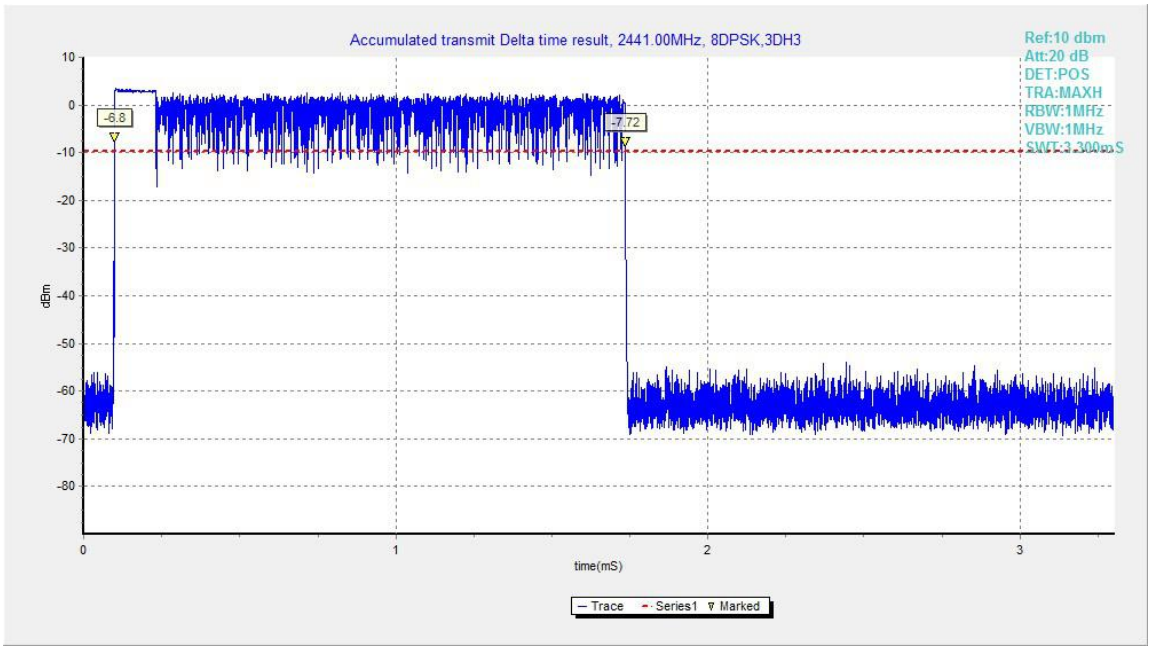


Fig.78. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

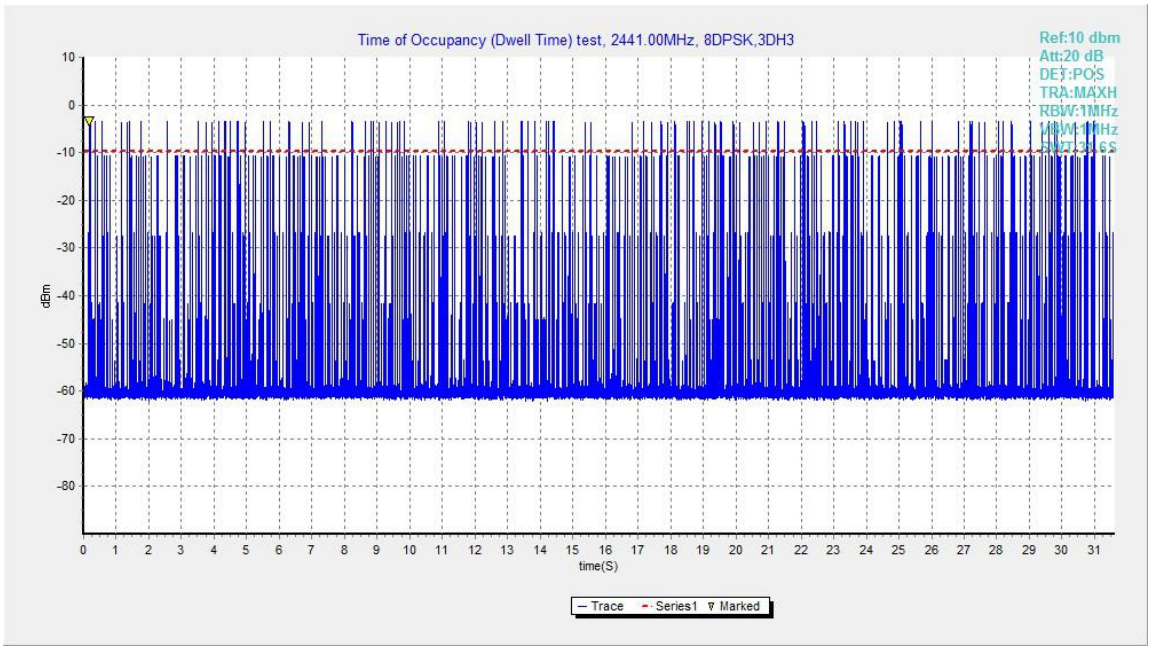


Fig.79. Number of Transmissions Measurement: Channel 39,Packet 3-DH3

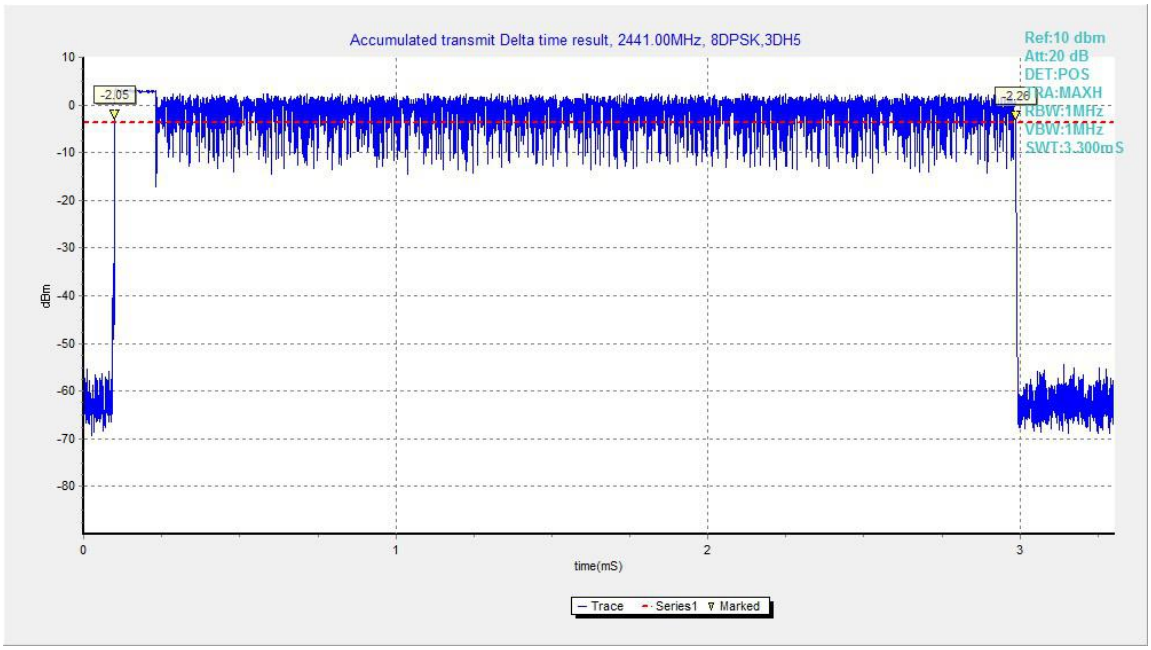


Fig.80. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

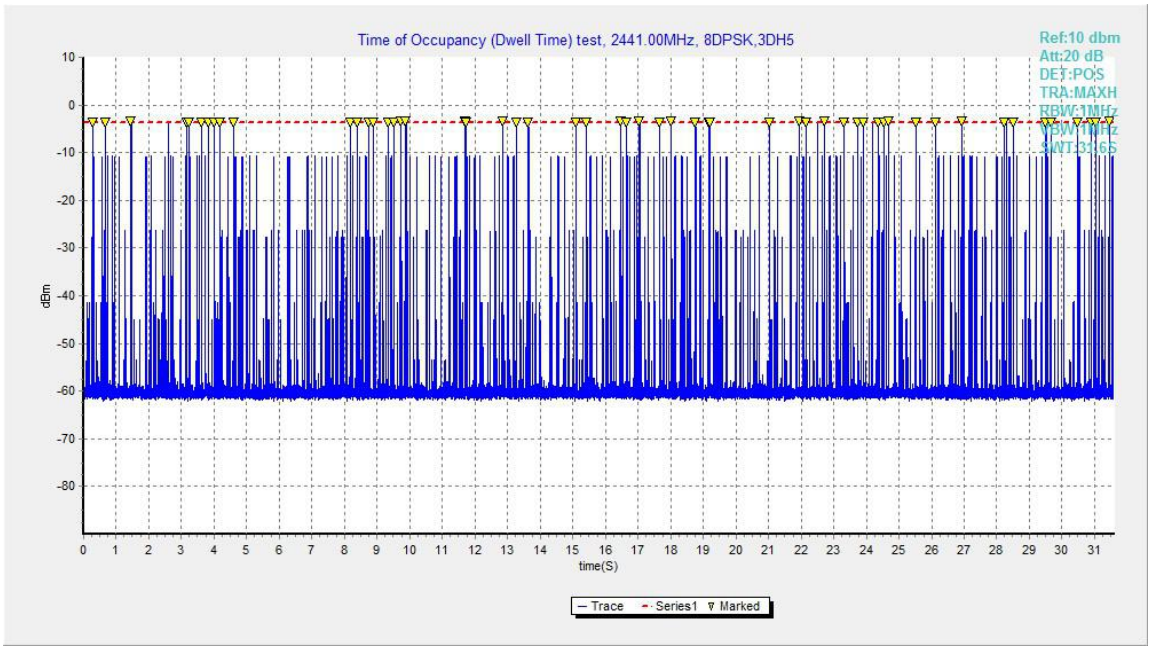


Fig.81. Number of Transmissions Measurement: Channel 39,Packet 3-DH5

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	945.00	NA
39	Fig.83	946.50	NA
78	Fig.84	942.75	NA

For π/4 DQPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.85	1213.50	NA
39	Fig.86	1222.50	NA
78	Fig.87	1225.50	NA

For 8DPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.88	1259.25	NA
39	Fig.89	1257.00	NA
78	Fig.90	1257.00	NA

Conclusion: NA

Test graphs as below:

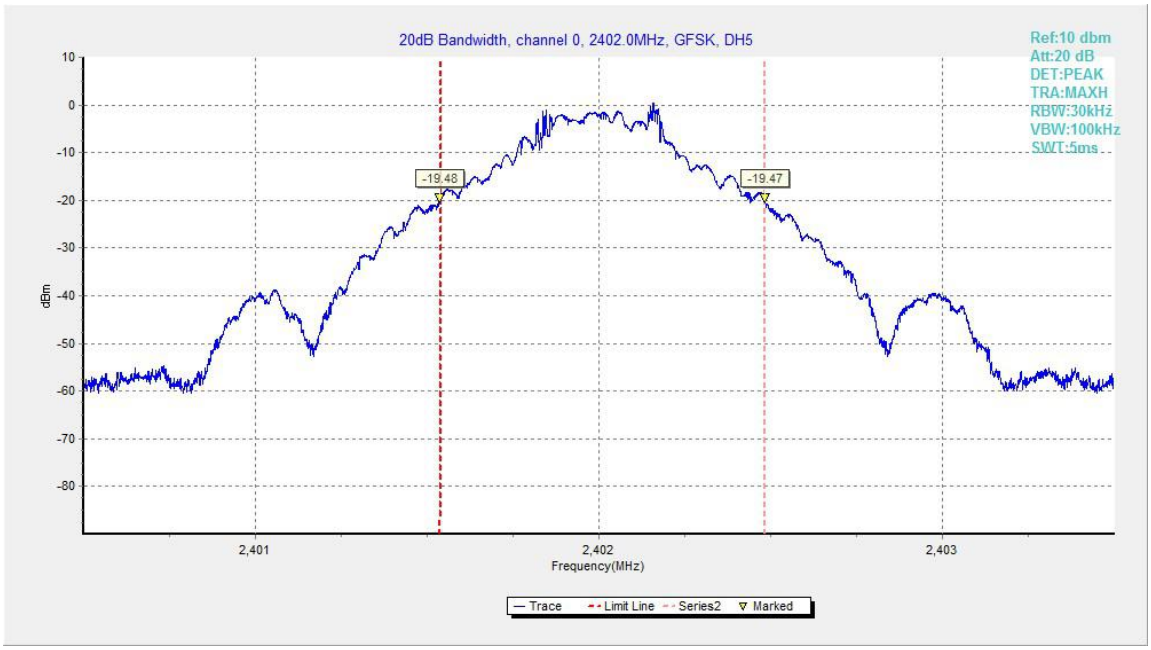


Fig.82. 20dB Bandwidth: GFSK, Channel 0

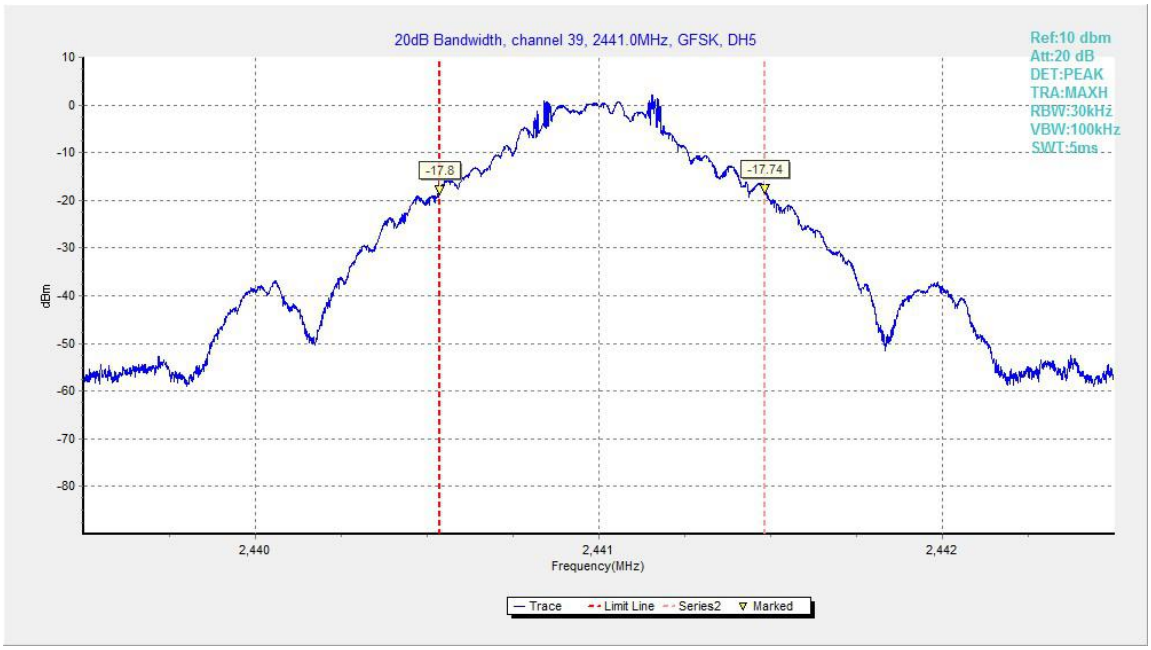


Fig.83. 20dB Bandwidth: GFSK, Channel 39

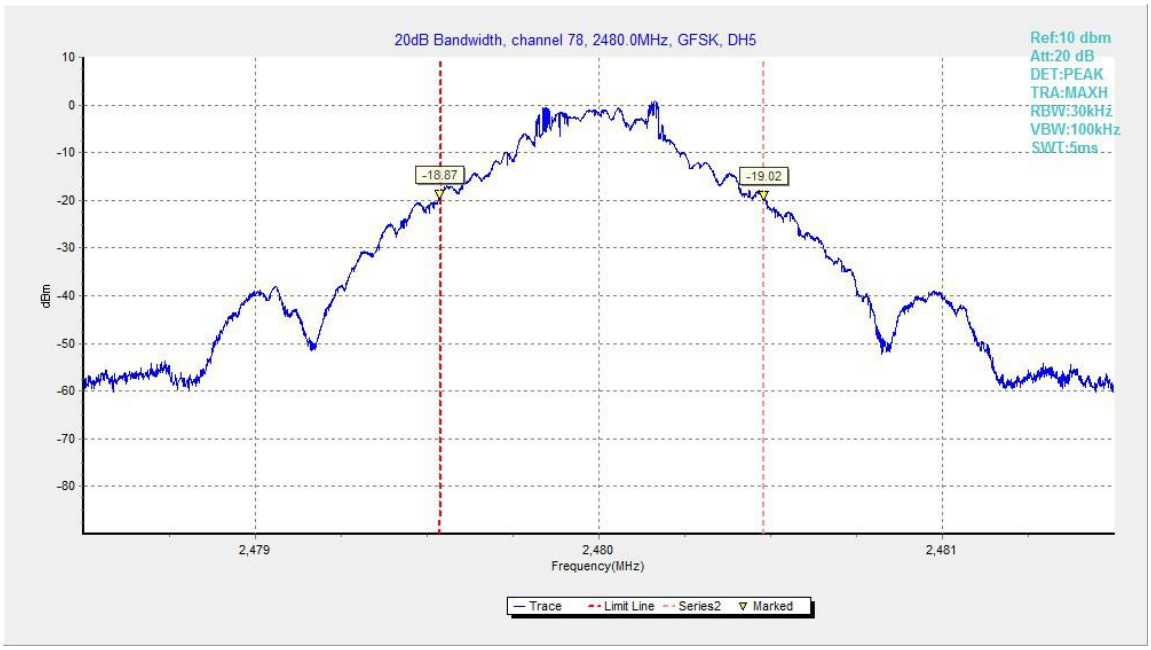


Fig.84. 20dB Bandwidth: GFSK, Channel 78

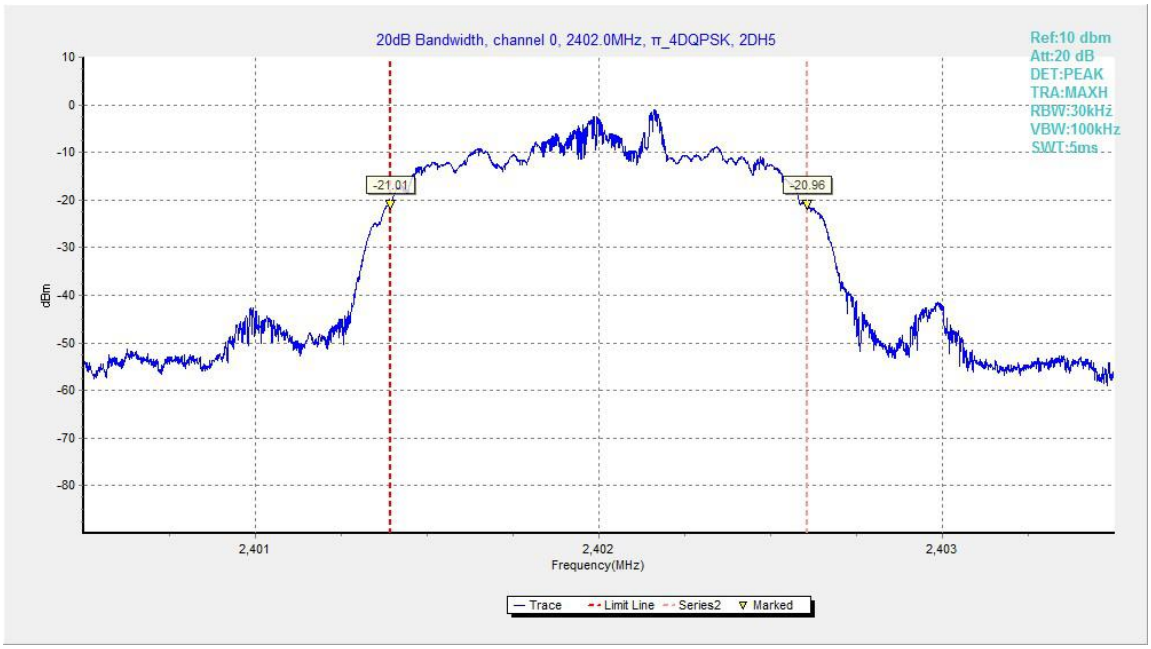


Fig.85. 20dB Bandwidth: π/4 DQPSK, Channel 0

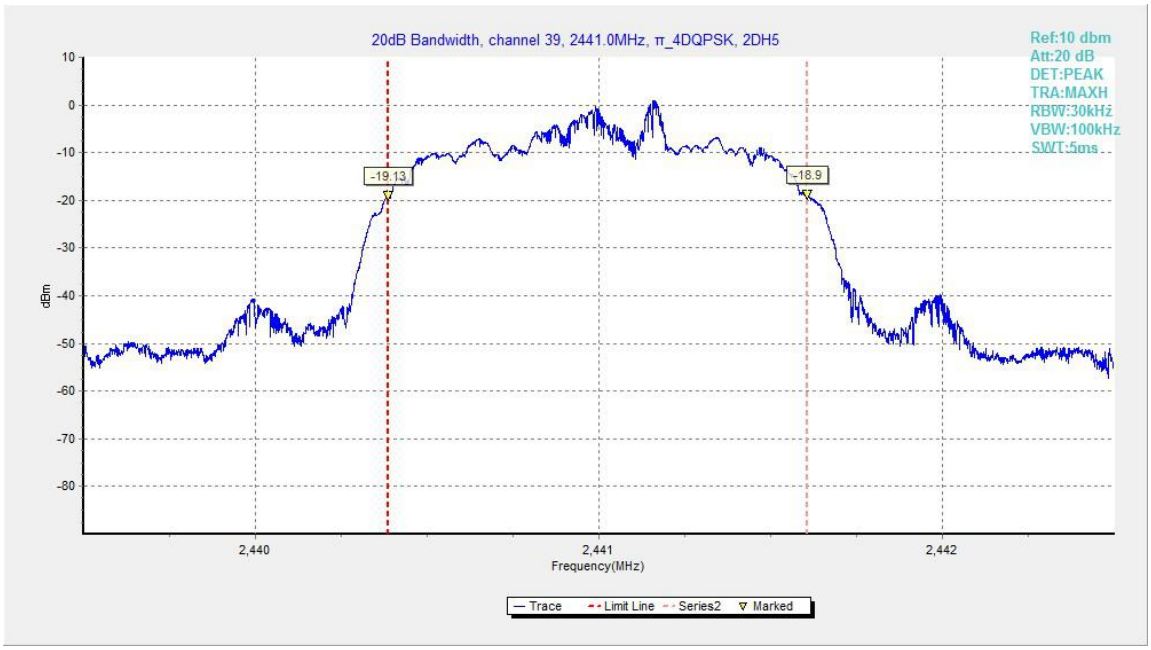


Fig.86. 20dB Bandwidth: π/4 DQPSK, Channel 39

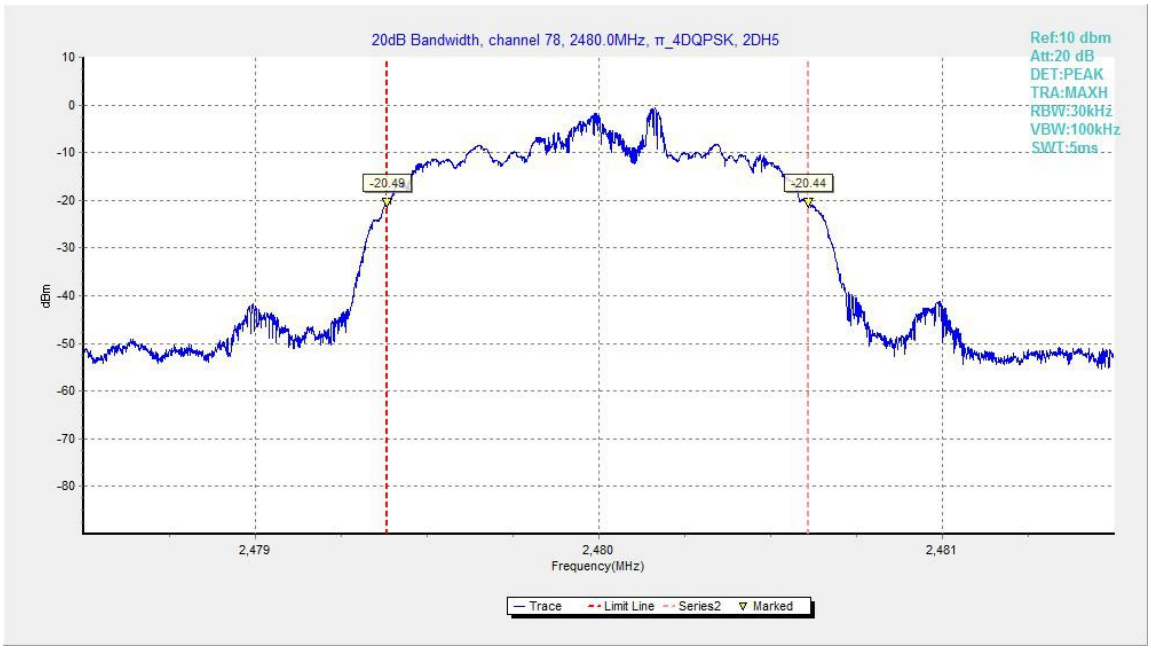


Fig.87. 20dB Bandwidth: π/4 DQPSK, Channel 78

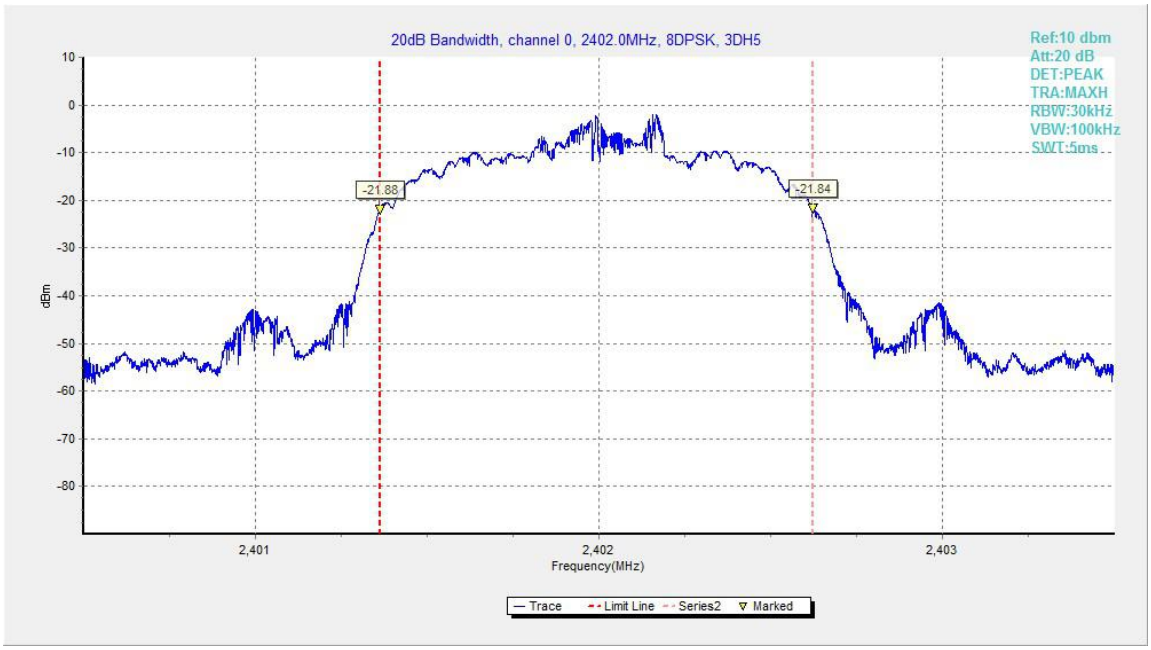


Fig.88. 20dB Bandwidth: 8DPSK, Channel 0

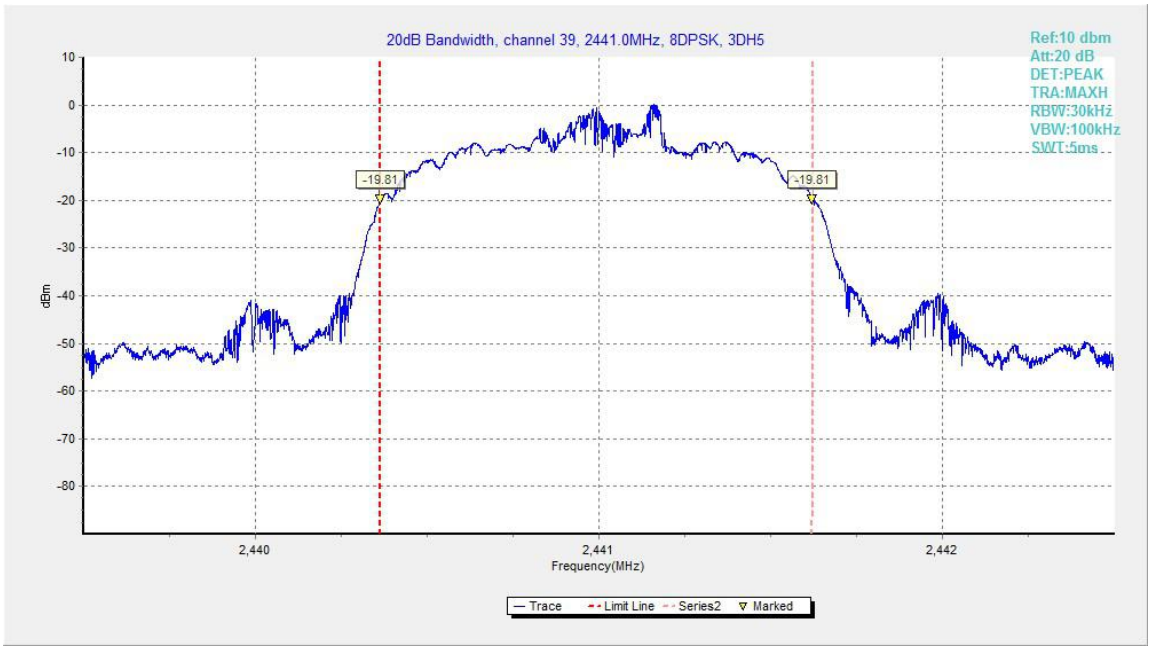


Fig.89. 20dB Bandwidth: 8DPSK, Channel 39

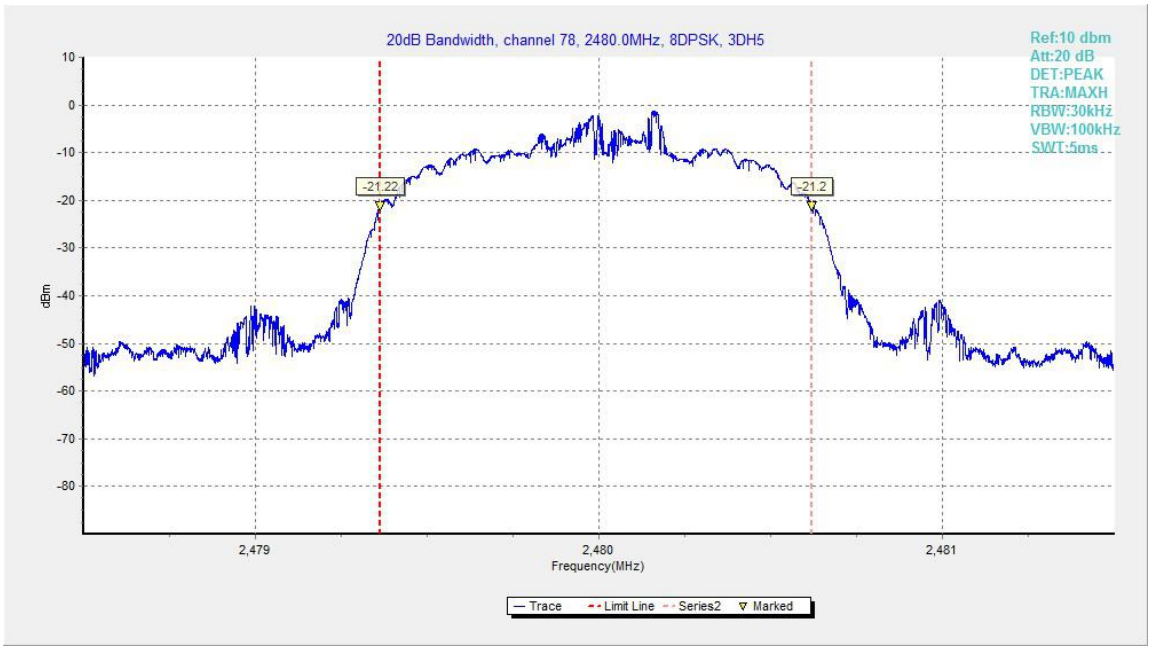


Fig.90. 20dB Bandwidth: 8DPSK, Channel 78

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) * 20dB bandwidth, whichever is greater.

Measurement Limit:

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

Measurement Result:

For GFSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.91	994.50	P

For π/4 DQPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.92	1137.75	P

For 8DPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.93	984.00	P

Conclusion: PASS

Test graphs as below:

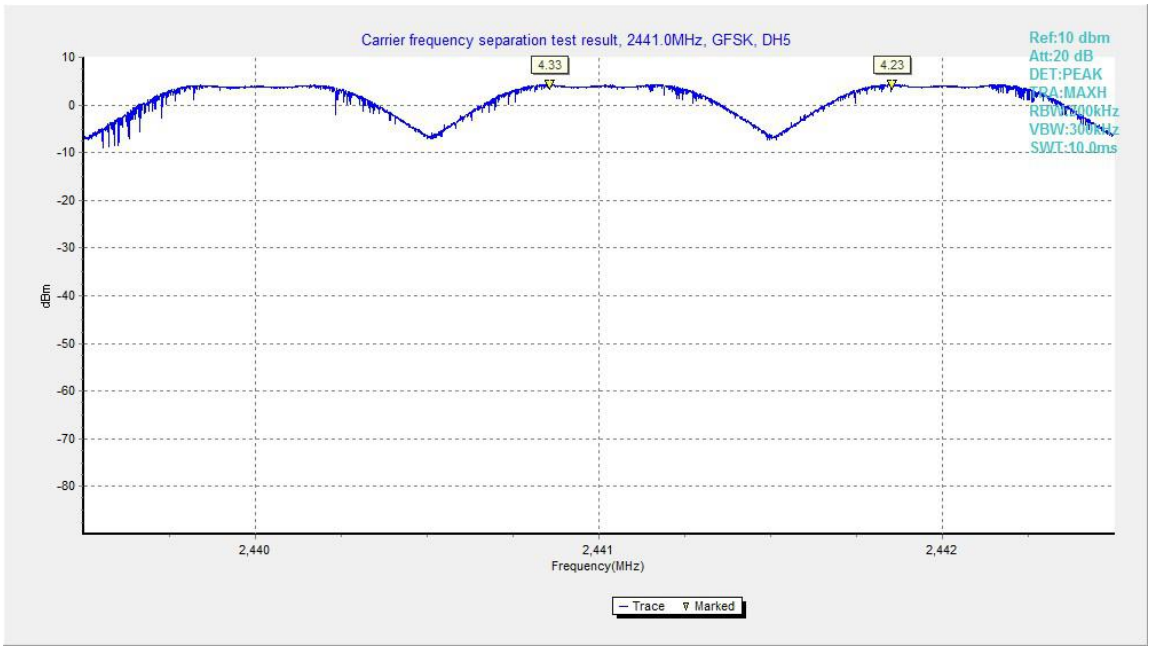


Fig.91. Carrier frequency separation measurement: GFSK, Channel 39

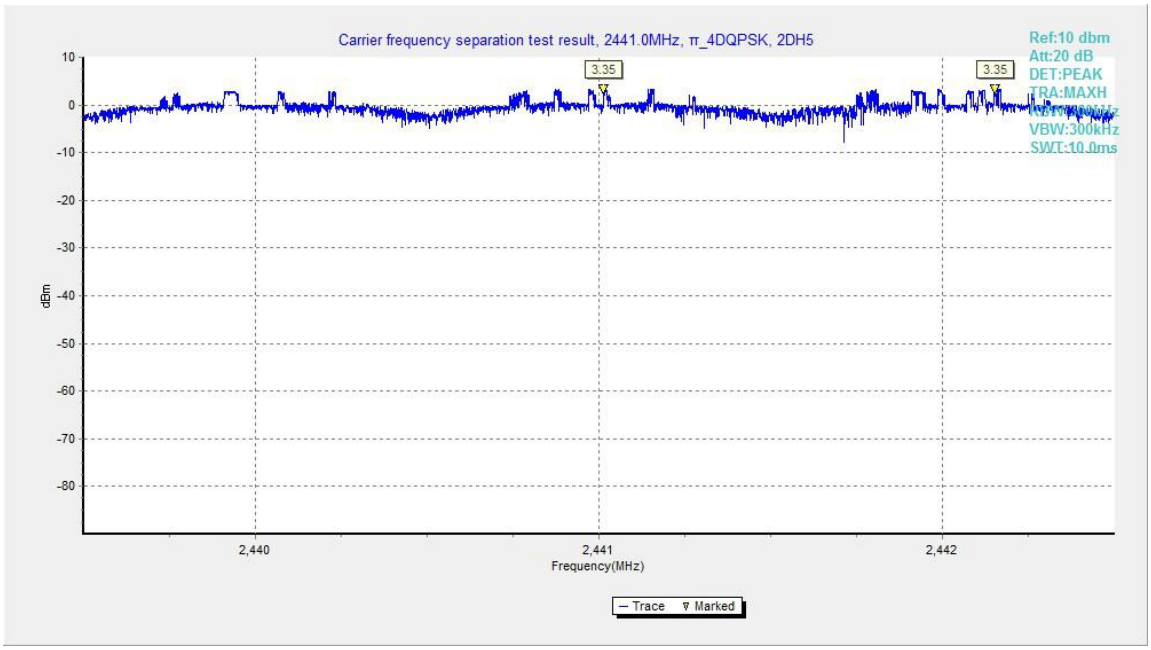


Fig.92. Carrier frequency separation measurement: π/4 DQPSK, Channel 39

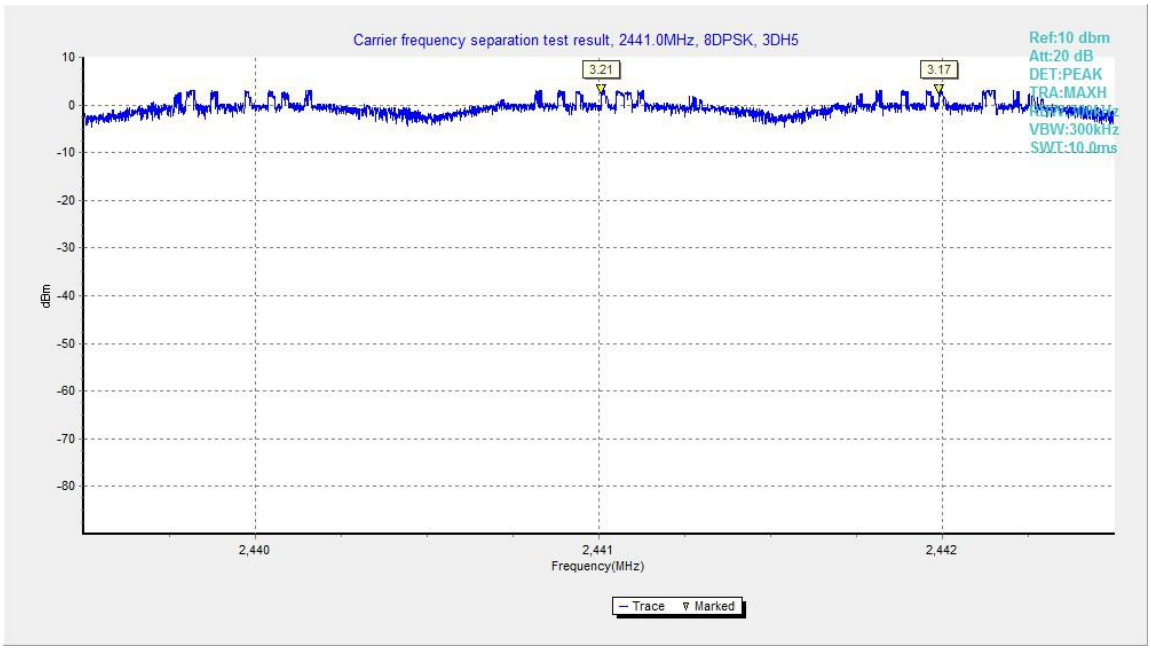


Fig.93. Carrier frequency separation measurement: 8DPSK, Channel 39

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	P
40~78	Fig.95		

Forπ/4 DQPSK

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

For 8DPSK

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

Conclusion: PASS

Test graphs as below:

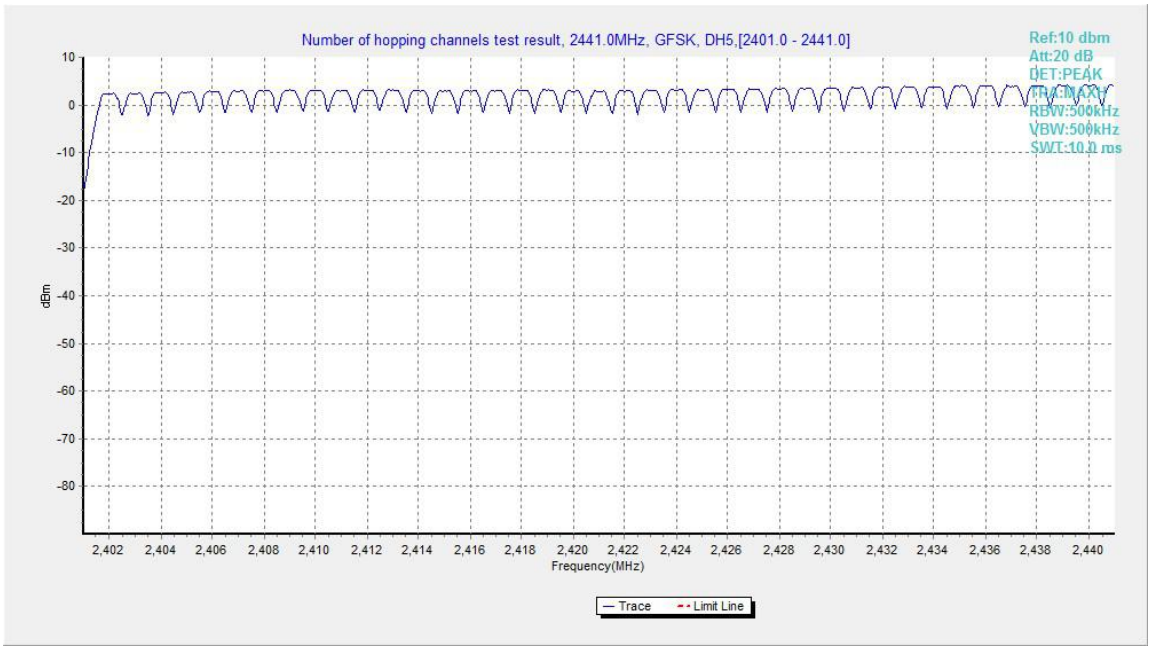


Fig.94. Number of hopping frequencies: GFSK, Channel 0 - 39

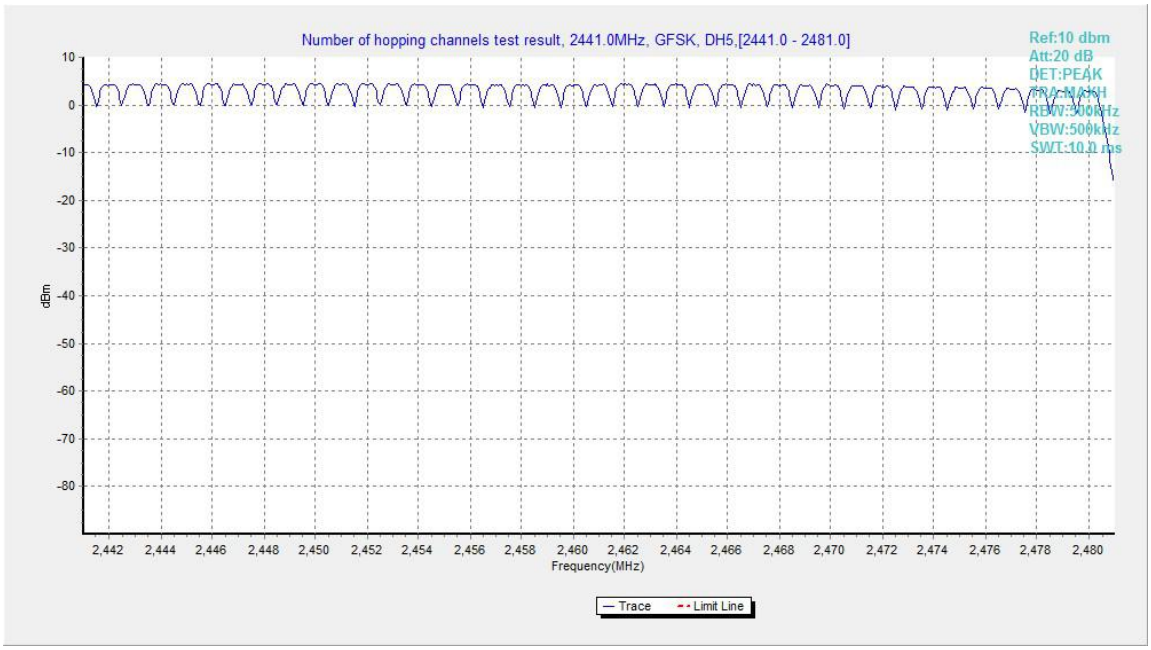


Fig.95. Number of hopping frequencies: GFSK, Channel 40 - 78

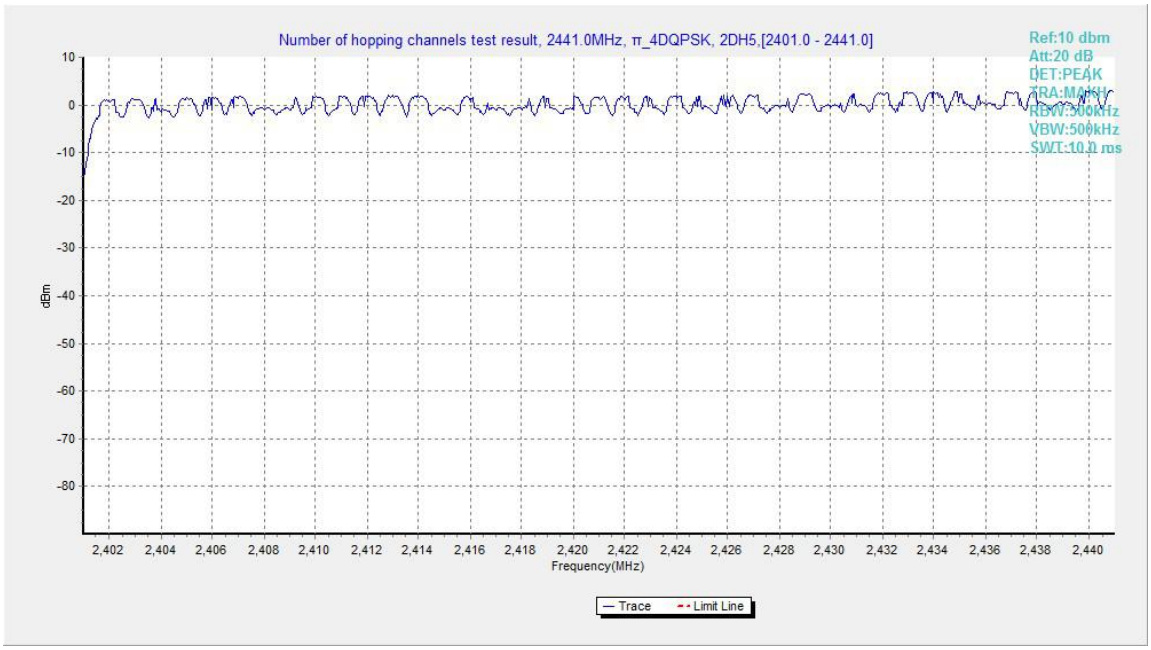


Fig.96. Number of hopping frequencies: π/4 DQPSK, Channel 0 - 39

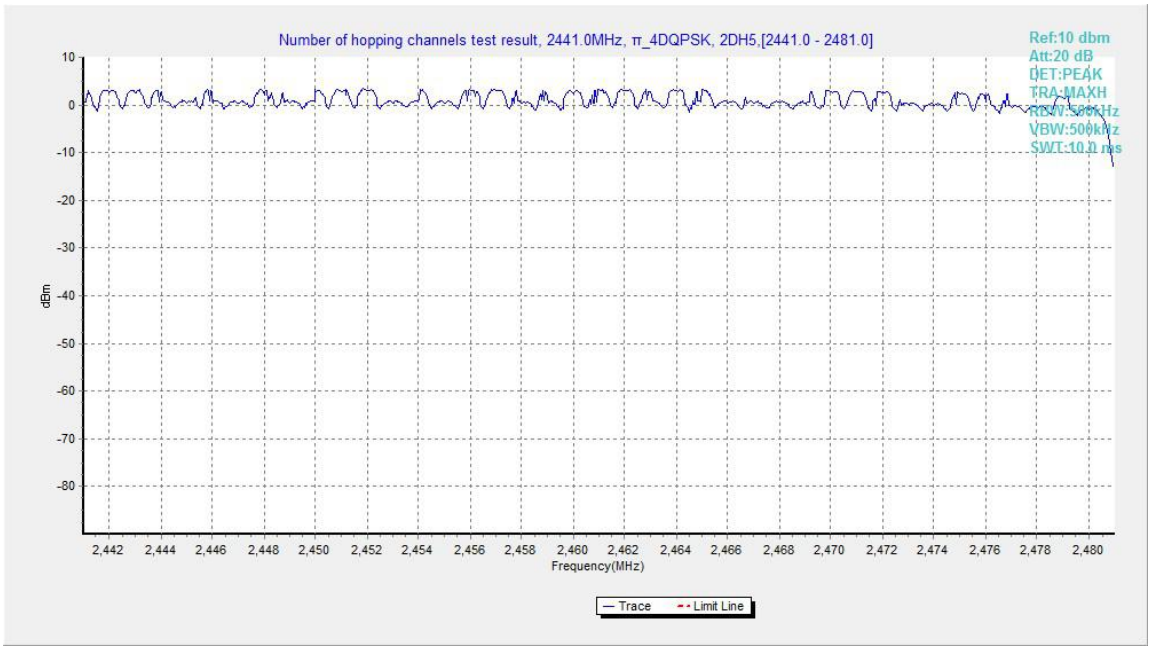


Fig.97. Number of hopping frequencies: π/4 DQPSK, Channel 40 - 78

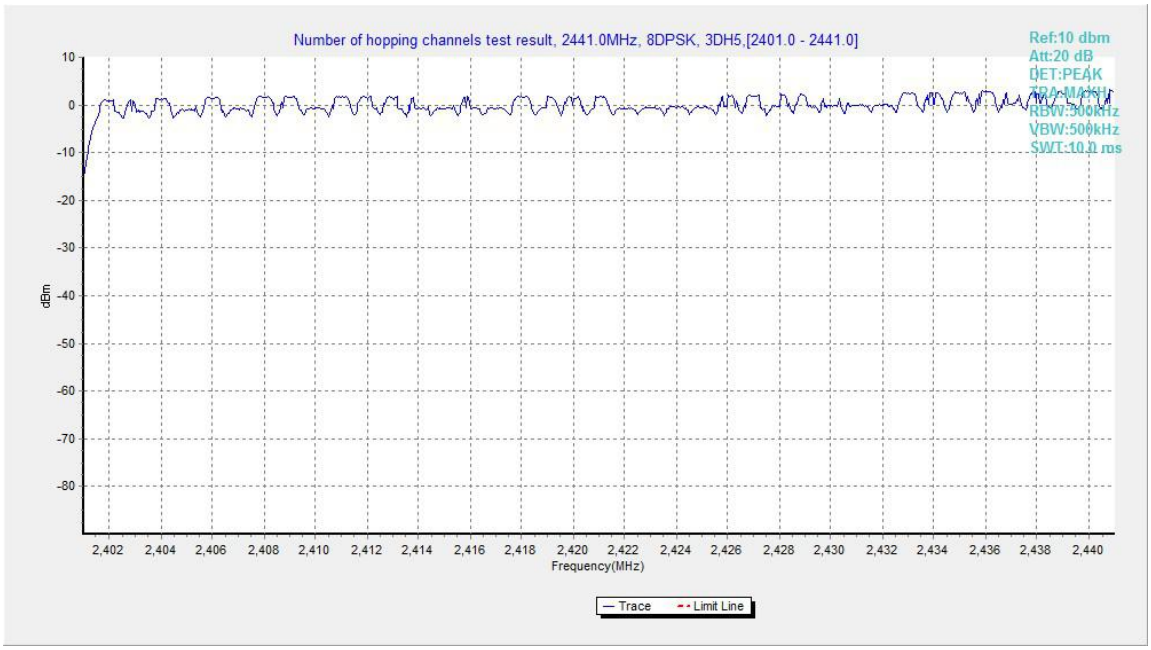


Fig.98. Number of hopping frequencies: 8DPSK, Channel 0 - 39

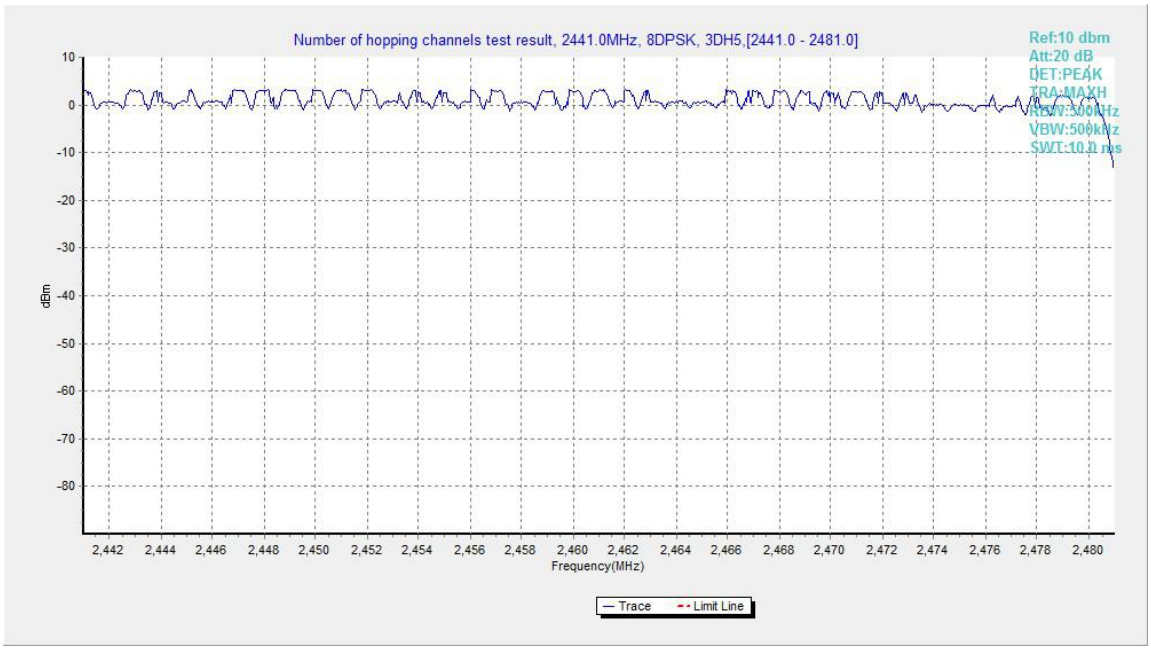


Fig.99. Number of hopping frequencies: 8DPSK, Channel 40 - 78

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 (dBμV)	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)

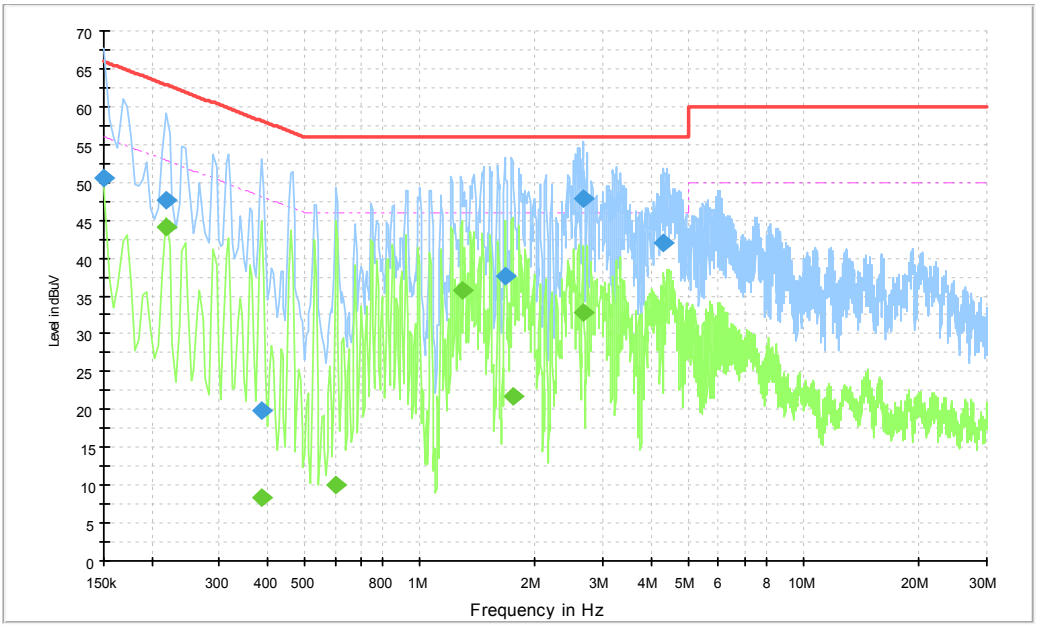
Frequency range (MHz)	Average Limit (dBμV)	Conclusion
0.15 to 0.5	56 to 46	P
0.5 to 5	46	
5 to 30	50	
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.		

The measurement is made according to ANSI C63.10

Conclusion: PASS

Test graphs as below:

Traffic (With AE3):



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

Final Result 1

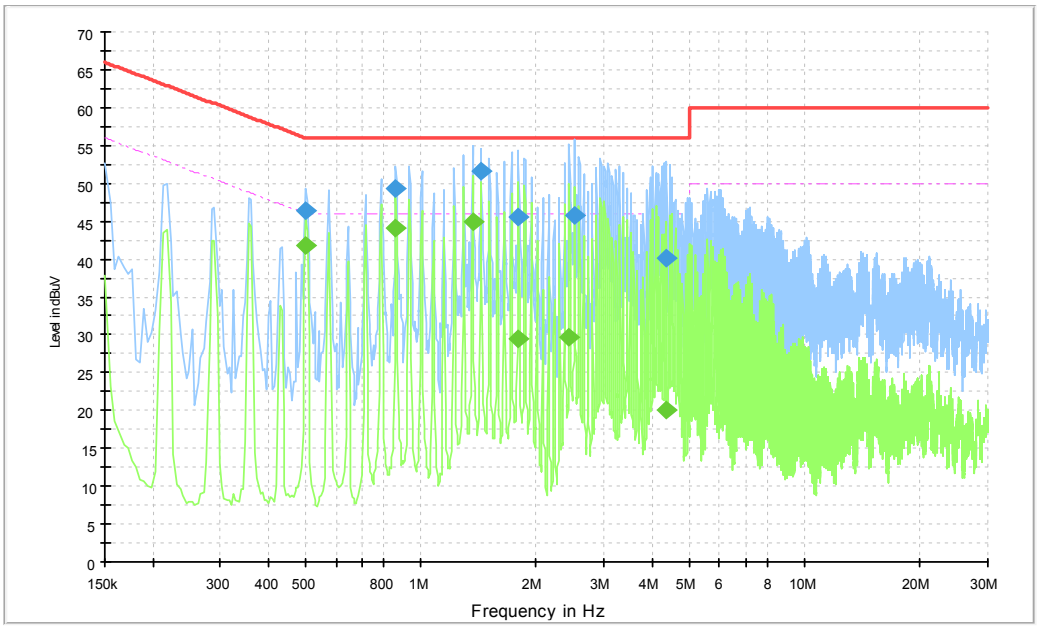
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	50.6	10000.0	9.000	On	L1	28.9	15.4	66.0
0.217500	47.7	10000.0	9.000	On	L1	20.0	15.3	62.9
0.388500	19.9	10000.0	9.000	On	N	20.0	38.2	58.1
1.662000	37.6	10000.0	9.000	On	N	19.8	18.4	56.0
2.656500	47.8	10000.0	9.000	On	L1	19.8	8.2	56.0
4.312500	41.9	10000.0	9.000	On	L1	19.8	14.1	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.217500	44.1	10000.0	9.000	On	N	19.9	8.8	52.9
0.388500	8.4	10000.0	9.000	On	L1	20.0	39.7	48.1
0.604500	10.1	10000.0	9.000	On	N	20.0	35.9	46.0
1.284000	35.7	10000.0	9.000	On	N	19.8	10.3	46.0
1.743000	21.7	10000.0	9.000	On	N	19.8	24.3	46.0
2.661000	32.8	10000.0	9.000	On	N	19.8	13.2	46.0

Note: The measurement results showed here are worst cases of the combinations of different USB cables.

Idle (With AE3):



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

Final Result 1

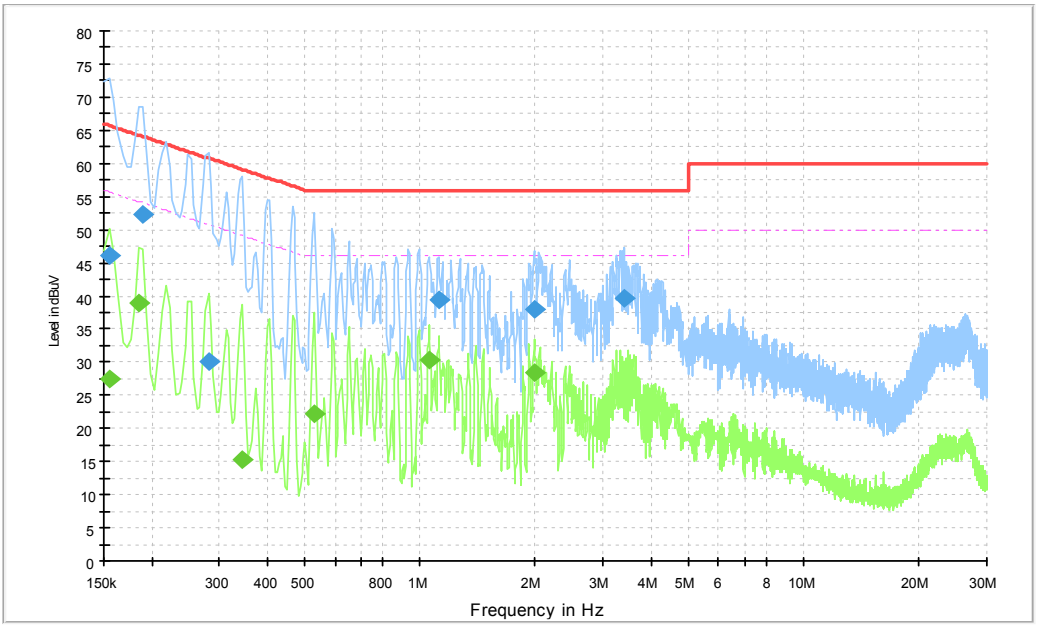
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.501000	46.5	10000.0	9.000	On	L1	20.0	9.5	56.0
0.861000	49.3	10000.0	9.000	On	L1	19.9	6.7	56.0
1.437000	51.6	10000.0	9.000	On	L1	19.8	4.4	56.0
1.792500	45.6	10000.0	9.000	On	L1	19.8	10.4	56.0
2.512500	45.7	10000.0	9.000	On	L1	19.8	10.3	56.0
4.375500	40.1	10000.0	9.000	On	L1	19.8	15.9	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.501000	41.9	10000.0	9.000	On	N	20.0	4.1	46.0
0.861000	44.0	10000.0	9.000	On	N	19.9	2.0	46.0
1.365000	44.9	10000.0	9.000	On	N	19.8	1.1	46.0
1.792500	29.5	10000.0	9.000	On	L1	19.8	16.5	46.0
2.440500	29.6	10000.0	9.000	On	L1	19.8	16.4	46.0
4.375500	20.1	10000.0	9.000	On	L1	19.8	25.9	46.0

Note: The measurement results showed here are worst cases of the combinations of different USB cables.

Traffic (With AE4):



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

Final Result 1

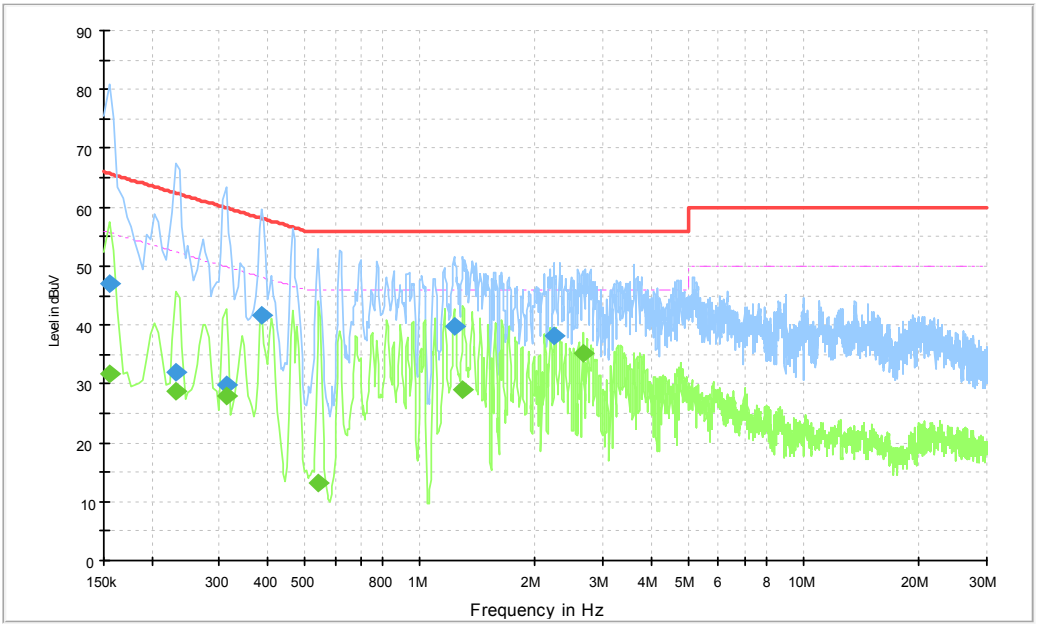
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154500	46.1	10000.0	9.000	On	L1	28.0	19.6	65.8
0.190500	52.4	10000.0	9.000	On	L1	21.5	11.6	64.0
0.280500	30.2	10000.0	9.000	On	L1	20.0	30.6	60.8
1.117500	39.4	10000.0	9.000	On	N	19.9	16.6	56.0
1.981500	38.1	10000.0	9.000	On	N	19.8	17.9	56.0
3.408000	39.6	10000.0	9.000	On	L1	19.8	16.4	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154500	27.5	10000.0	9.000	On	L1	28.0	28.3	55.8
0.186000	38.9	10000.0	9.000	On	L1	22.2	15.3	54.2
0.343500	15.4	10000.0	9.000	On	L1	20.0	33.7	49.1
0.528000	22.2	10000.0	9.000	On	L1	20.0	23.8	46.0
1.059000	30.3	10000.0	9.000	On	L1	19.9	15.7	46.0
1.986000	28.3	10000.0	9.000	On	N	19.8	17.7	46.0

Note: The measurement results showed here are worst cases of the combinations of different USB cables.

Traffic (With AE5):



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

Final Result 1

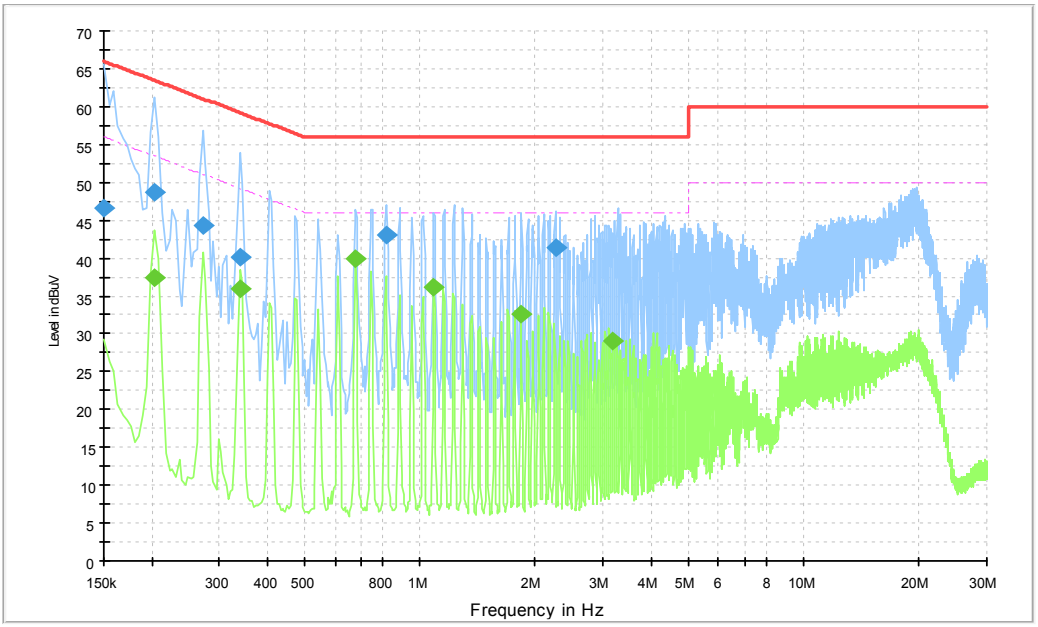
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154500	47.1	10000.0	9.000	On	N	28.0	18.7	65.8
0.231000	31.9	10000.0	9.000	On	L1	20.0	30.5	62.4
0.312000	29.9	10000.0	9.000	On	L1	20.0	30.1	59.9
0.388500	41.7	10000.0	9.000	On	N	20.0	16.4	58.1
1.225500	39.9	10000.0	9.000	On	N	19.9	16.1	56.0
2.238000	38.2	10000.0	9.000	On	N	19.8	17.8	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154500	31.7	10000.0	9.000	On	N	28.0	24.0	55.8
0.231000	28.7	10000.0	9.000	On	N	20.0	23.7	52.4
0.312000	28.0	10000.0	9.000	On	N	20.0	21.9	49.9
0.546000	13.1	10000.0	9.000	On	N	20.0	32.9	46.0
1.297500	29.1	10000.0	9.000	On	N	19.8	16.9	46.0
2.656500	35.2	10000.0	9.000	On	N	19.8	10.8	46.0

Note: The measurement results showed here are worst cases of the combinations of different USB cables.

Traffic (With AE6):



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

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	46.6	10000.0	9.000	On	N	28.9	19.4	66.0
0.204000	48.6	10000.0	9.000	On	L1	20.0	14.9	63.4
0.271500	44.3	10000.0	9.000	On	L1	20.0	16.8	61.1
0.339000	40.2	10000.0	9.000	On	L1	20.0	19.0	59.2
0.820500	43.0	10000.0	9.000	On	N	19.9	13.0	56.0
2.251500	41.5	10000.0	9.000	On	N	19.8	14.5	56.0

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.204000	37.4	10000.0	9.000	On	L1	20.0	16.1	53.4
0.339000	36.0	10000.0	9.000	On	L1	20.0	13.2	49.2
0.681000	40.0	10000.0	9.000	On	L1	19.9	6.0	46.0
1.086000	36.2	10000.0	9.000	On	L1	19.9	9.8	46.0
1.837500	32.7	10000.0	9.000	On	L1	19.8	13.3	46.0
3.187500	29.0	10000.0	9.000	On	L1	19.8	17.0	46.0

Note: The measurement results showed here are worst cases of the combinations of different USB cables.

ANNEX B: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

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 Communique dated January 2009).

2019-09-26 through 2020-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program

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