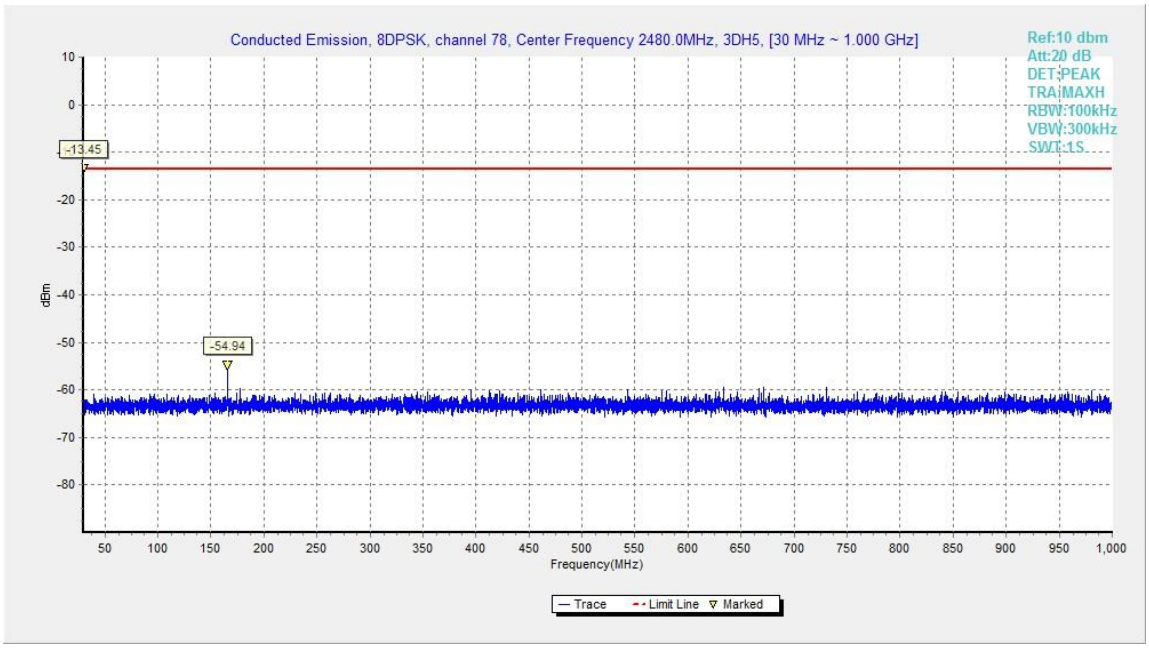



Fig.54. Conducted spurious emission: 8DPSK, Channel 78, 30MHz - 1GHz

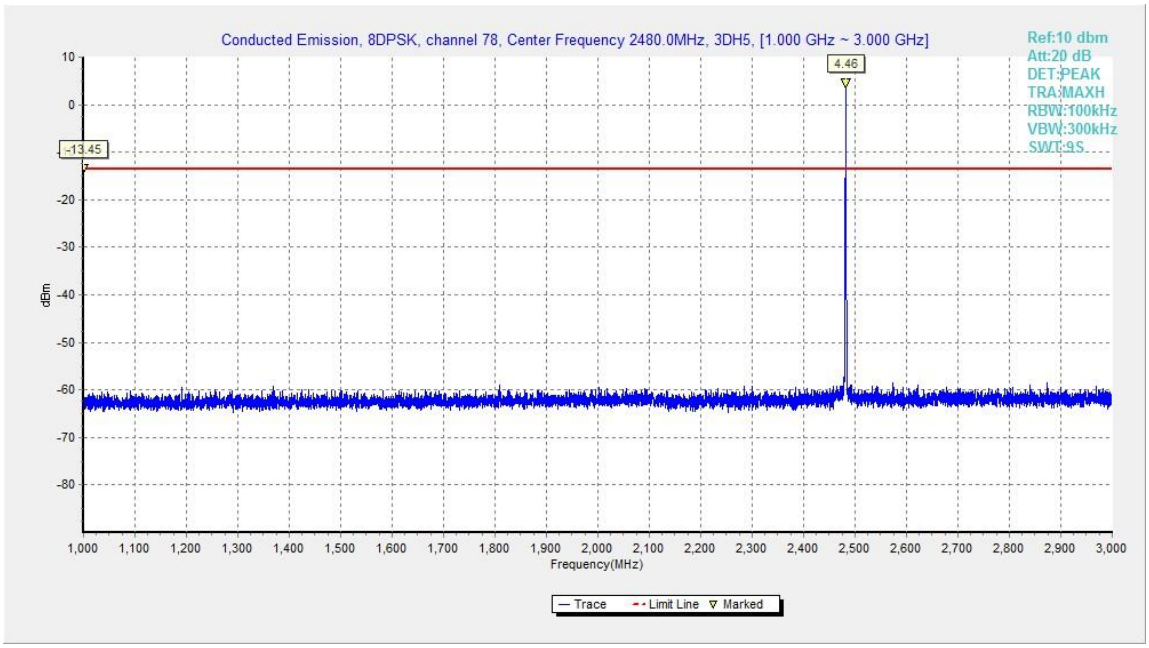



Fig.55. Conducted spurious emission: 8DPSK, Channel 78, 1GHz - 3GHz

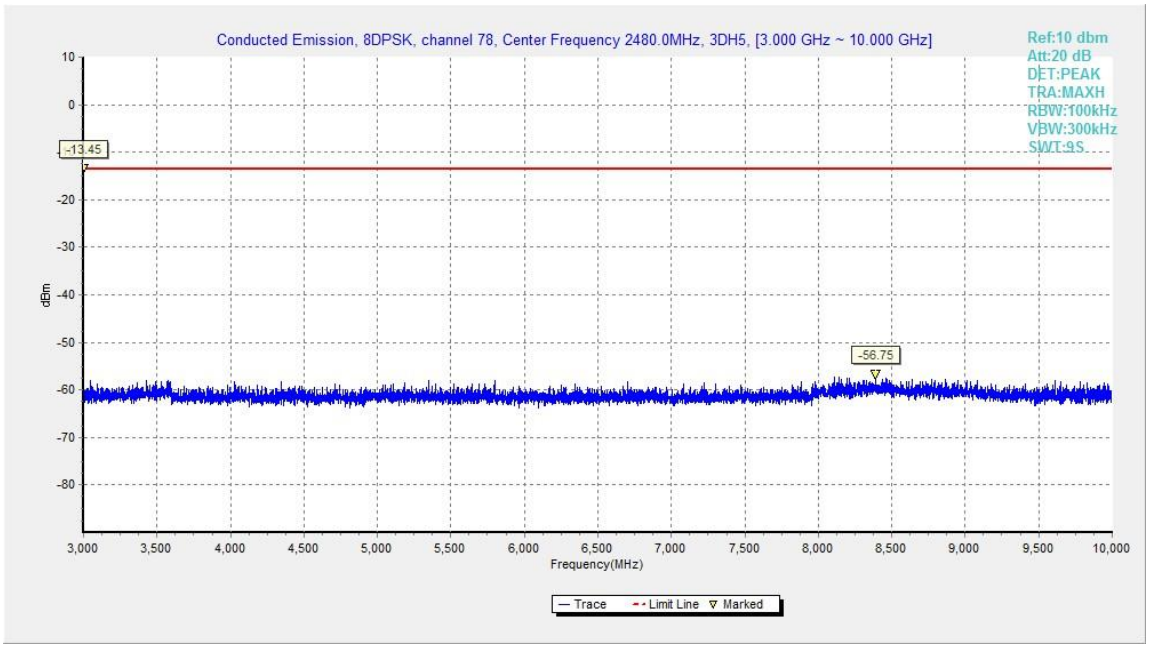



Fig.56. Conducted spurious emission: 8DPSK, Channel 78, 3GHz - 10GHz

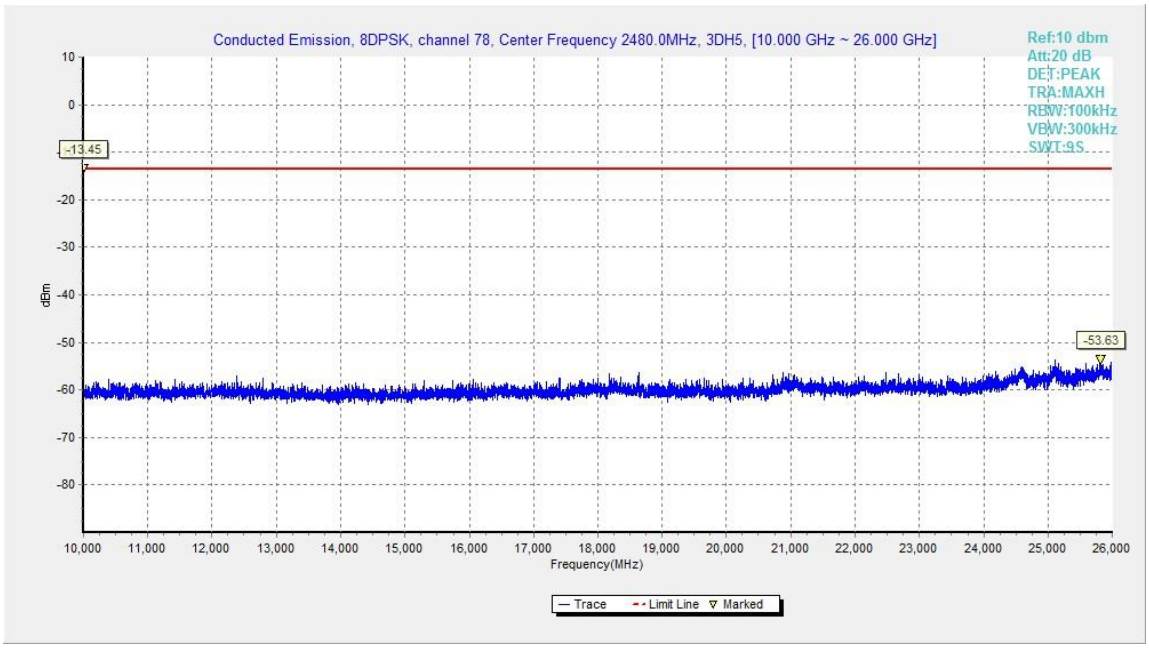



Fig.57. Conducted spurious emission: 8DPSK, Channel 78, 10GHz - 26GHz

## 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:**

Result=$P_{Mea}$+ARPL

**For GFSK**

| Channel | Frequency Range | Test Results | Conclusion |
|---|---|---|---|
| Ch 0<br>2402 MHz | 1 GHz ~ 3 GHz | / | P |
| | 3 GHz ~ 18 GHz | / | P |
| Ch 39<br>2441 MHz | 9 kHz ~ 30 MHz | / | P |
| | 30 MHz ~ 1 GHz | / | P |
| | 1 GHz ~ 3 GHz | / | P |
| | 3 GHz ~ 18 GHz | / | P |
| Ch 78<br>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 |

**Forπ/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 (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) |
|---|---|---|---|---|---|---|---|---|---|
| 2389.700 | 46.40 | 2.9 | 32.0 | 11.55 | 54.0 | 7.6 | H | 155 | 25 |
| 2390.000 | 46.35 | 2.9 | 32.0 | 11.50 | 54.0 | 7.7 | H | 155 | 49 |
| 4804.500 | 34.12 | -32.8 | 34.5 | 32.47 | 54.0 | 19.9 | H | 155 | 4 |
| 7206.000 | 38.96 | -31.6 | 36.1 | 34.49 | 54.0 | 15.0 | H | 155 | 6 |
| 9607.500 | 39.00 | -30.0 | 37.0 | 32.05 | 54.0 | 15.0 | H | 155 | 25 |
| 12010.500 | 42.09 | -29.8 | 39.3 | 32.62 | 54.0 | 11.9 | H | 155 | 186 |

**GFSK Ch 39 - Average**

| Frequency (MHz) | Measurement Result (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) |
|---|---|---|---|---|---|---|---|---|---|
| 2388.900 | 46.47 | 2.9 | 32.0 | 11.61 | 54.0 | 7.5 | H | 155 | 5 |
| 2390.000 | 46.41 | 2.9 | 32.0 | 11.56 | 54.0 | 7.6 | H | 155 | 25 |
| 4882.500 | 36.00 | -32.7 | 34.5 | 34.22 | 54.0 | 18.0 | H | 155 | 356 |
| 7323.000 | 39.62 | -31.9 | 36.1 | 35.46 | 54.0 | 14.4 | H | 155 | 350 |
| 9763.500 | 38.41 | -30.6 | 37.2 | 31.79 | 54.0 | 15.6 | H | 155 | 185 |
| 12205.500 | 42.32 | -29.4 | 39.2 | 32.53 | 54.0 | 11.7 | H | 155 | 187 |

**GFSK Ch 78 - Average**

| Frequency (MHz) | Measurement Result (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 | 48.21 | 2.9 | 32.8 | 12.52 | 54.0 | 5.8 | H | 155 | 20 |
| 2483.700 | 47.90 | 2.9 | 32.8 | 12.21 | 54.0 | 6.1 | H | 155 | 18 |
| 4960.500 | 36.71 | -33.4 | 34.5 | 35.58 | 54.0 | 17.3 | H | 155 | 90 |
| 7440.000 | 39.47 | -31.8 | 36.0 | 35.21 | 54.0 | 14.5 | H | 155 | 114 |
| 9919.500 | 40.27 | -29.9 | 37.4 | 32.79 | 54.0 | 13.7 | H | 155 | 36 |
| 12400.500 | 43.42 | -29.5 | 39.1 | 33.79 | 54.0 | 10.6 | H | 155 | 2 |

**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) |
|---|---|---|---|---|---|---|---|---|---|
| 2390.000 | 46.33 | 2.9 | 32.0 | 11.49 | 54.0 | 7.7 | H | 155 | 4 |
| 2388.900 | 46.37 | 2.9 | 32.0 | 11.52 | 54.0 | 7.6 | H | 155 | 2 |
| 4804.500 | 33.39 | -32.8 | 34.5 | 31.74 | 54.0 | 20.6 | H | 155 | 25 |
| 7206.000 | 39.23 | -31.6 | 36.1 | 34.76 | 54.0 | 14.8 | H | 155 | 350 |
| 9607.500 | 39.06 | -30.0 | 37.0 | 32.11 | 54.0 | 14.9 | H | 155 | 92 |
| 12010.500 | 42.23 | -29.8 | 39.3 | 32.76 | 54.0 | 11.8 | H | 155 | 85 |

**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) |
|---|---|---|---|---|---|---|---|---|---|
| 2388.900 | 46.37 | 2.9 | 32.0 | 11.51 | 54.0 | 7.6 | H | 155 | 20 |
| 2450.800 | 46.52 | 2.9 | 32.4 | 11.23 | 54.0 | 7.5 | H | 155 | 45 |
| 4882.500 | 34.26 | -32.7 | 34.5 | 32.47 | 54.0 | 19.7 | H | 155 | 240 |
| 7323.000 | 39.63 | -31.9 | 36.1 | 35.48 | 54.0 | 14.4 | H | 155 | 180 |
| 9763.500 | 38.36 | -30.6 | 37.2 | 31.73 | 54.0 | 15.6 | H | 155 | 85 |
| 12205.500 | 42.33 | -29.4 | 39.2 | 32.55 | 54.0 | 11.7 | H | 155 | 25 |

**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) |
|---|---|---|---|---|---|---|---|---|---|
| 2483.600 | 47.49 | 2.9 | 32.8 | 11.80 | 54.0 | 6.5 | H | 155 | 268 |
| 2483.800 | 46.89 | 2.9 | 32.8 | 11.20 | 54.0 | 7.1 | H | 155 | 138 |
| 4960.500 | 35.41 | -33.4 | 34.5 | 34.29 | 54.0 | 18.6 | H | 155 | 104 |
| 7440.000 | 39.47 | -31.8 | 36.0 | 35.21 | 54.0 | 14.5 | H | 155 | 40 |
| 9919.500 | 40.23 | -29.9 | 37.4 | 32.75 | 54.0 | 13.8 | H | 155 | 28 |
| 12400.500 | 43.47 | -29.5 | 39.1 | 33.84 | 54.0 | 10.5 | H | 155 | 8 |

**8DPSK Ch 0 - Average**

| Frequency (MHz) | Measurement Result (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 | 46.45 | 2.9 | 32.0 | 11.6 | 54.0 | 7.5 | H | 155 | 175 |
| 2388.400 | 46.46 | 2.9 | 32.0 | 11.6 | 54.0 | 7.5 | H | 155 | 5 |
| 4804.500 | 33.39 | -32.8 | 34.5 | 31.7 | 54.0 | 20.6 | H | 155 | 26 |
| 7206.000 | 39.08 | -31.6 | 36.1 | 34.6 | 54.0 | 14.9 | H | 155 | 355 |
| 9607.500 | 39.00 | -30.0 | 37.0 | 32.1 | 54.0 | 15.0 | H | 155 | 6 |
| 12010.500 | 42.14 | -29.8 | 39.3 | 32.7 | 54.0 | 11.9 | H | 155 | 12 |

**8DPSK Ch 39 - Average**

| Frequency (MHz) | Measurement Result (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) |
|---|---|---|---|---|---|---|---|---|---|
| 2436.100 | 46.62 | 2.9 | 32.0 | 11.73 | 54.0 | 7.4 | H | 155 | 24 |
| 2444.500 | 46.65 | 2.9 | 32.2 | 11.54 | 54.0 | 7.3 | H | 155 | 336 |
| 4882.500 | 35.09 | -32.7 | 34.5 | 33.31 | 54.0 | 18.9 | H | 155 | 248 |
| 7323.000 | 39.67 | -31.9 | 36.1 | 35.51 | 54.0 | 14.3 | H | 155 | 268 |
| 9763.500 | 38.41 | -30.6 | 37.2 | 31.78 | 54.0 | 15.6 | H | 155 | 290 |
| 12205.500 | 42.34 | -29.4 | 39.2 | 32.55 | 54.0 | 11.7 | H | 155 | 300 |

**8DPSK Ch 78 - Average**

| Frequency (MHz) | Measurement Result (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) |
|---|---|---|---|---|---|---|---|---|---|
| 2483.600 | 47.39 | 2.9 | 32.8 | 11.70 | 54.0 | 6.6 | H | 155 | 20 |
| 2483.700 | 47.32 | 2.9 | 32.8 | 11.63 | 54.0 | 6.7 | H | 155 | 248 |
| 4960.500 | 35.28 | -33.4 | 34.5 | 34.16 | 54.0 | 18.7 | H | 155 | 49 |
| 7440.000 | 39.46 | -31.8 | 36.0 | 35.20 | 54.0 | 14.5 | H | 155 | 335 |
| 9919.500 | 40.29 | -29.9 | 37.4 | 32.81 | 54.0 | 13.7 | H | 155 | 180 |
| 12400.500 | 43.47 | -29.5 | 39.1 | 33.84 | 54.0 | 10.5 | H | 155 | 8 |

**GFSK Ch 0 – Peak**

| Frequency (MHz) | Measurement Result (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) |
|---|---|---|---|---|---|---|---|---|---|
| 2389.772 | 59.12 | 2.9 | 32.0 | 24.27 | 74.0 | 14.9 | H | 155 | 22 |
| 2389.996 | 58.44 | 2.9 | 32.0 | 23.60 | 74.0 | 15.6 | V | 155 | 44 |
| 4803.750 | 41.51 | -32.9 | 34.5 | 39.86 | 74.0 | 32.5 | H | 155 | 0 |
| 7206.000 | 44.24 | -31.6 | 36.1 | 39.77 | 74.0 | 29.8 | H | 155 | 0 |
| 9608.250 | 43.23 | -30.0 | 37.0 | 36.27 | 74.0 | 30.8 | H | 155 | 22 |
| 12009.750 | 46.45 | -29.8 | 39.3 | 36.98 | 74.0 | 27.5 | H | 155 | 176 |

**GFSK Ch 39 - Peak**

| Frequency (MHz) | Measurement Result (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) |
|---|---|---|---|---|---|---|---|---|---|
| 2366.200 | 47.80 | -27.2 | 31.9 | 43.08 | 74.0 | 26.2 | H | 155 | 0 |
| 2511.800 | 48.74 | -26.5 | 32.5 | 42.79 | 74.0 | 25.3 | H | 155 | 22 |
| 4881.750 | 39.04 | -32.7 | 34.5 | 37.25 | 74.0 | 35.0 | H | 155 | 352 |
| 7323.000 | 43.41 | -31.9 | 36.1 | 39.26 | 74.0 | 30.6 | V | 155 | 352 |
| 9764.250 | 42.38 | -30.6 | 37.2 | 35.75 | 74.0 | 31.6 | V | 155 | 176 |
| 12204.750 | 45.27 | -29.4 | 39.2 | 35.48 | 74.0 | 28.7 | V | 155 | 176 |

**GFSK Ch 78 - Peak**

| Frequency (MHz) | Measurement Result (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) |
|---|---|---|---|---|---|---|---|---|---|
| 2491.770 | 60.11 | 2.9 | 32.5 | 24.6 | 74.0 | 13.9 | H | 155 | 22 |
| 2493.260 | 60.17 | 2.9 | 32.5 | 24.7 | 74.0 | 13.8 | H | 155 | 22 |
| 4959.750 | 42.31 | -33.4 | 34.5 | 41.2 | 74.0 | 31.7 | H | 155 | 88 |
| 7440.000 | 42.24 | -31.8 | 36.0 | 38.0 | 74.0 | 31.8 | V | 155 | 110 |
| 9920.250 | 42.88 | -29.9 | 37.4 | 35.4 | 74.0 | 31.1 | V | 155 | 44 |
| 12399.750 | 46.25 | -29.5 | 39.1 | 36.6 | 74.0 | 27.8 | H | 155 | 0 |

**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) |
|---|---|---|---|---|---|---|---|---|---|
| 2389.968 | 58.23 | 2.9 | 32.0 | 23.38 | 74.0 | 15.8 | H | 155 | 0 |
| 2389.646 | 59.35 | 2.9 | 32.0 | 24.51 | 74.0 | 14.6 | H | 155 | 0 |
| 4803.750 | 35.15 | -32.9 | 34.5 | 33.50 | 74.0 | 38.8 | V | 155 | 22 |
| 7206.000 | 42.34 | -31.6 | 36.1 | 37.87 | 74.0 | 31.7 | V | 155 | 352 |
| 9608.250 | 43.40 | -30.0 | 37.0 | 36.44 | 74.0 | 30.6 | V | 155 | 88 |
| 12009.750 | 45.16 | -29.8 | 39.3 | 35.69 | 74.0 | 28.8 | V | 155 | 88 |

**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) |
|---|---|---|---|---|---|---|---|---|---|
| 2366.800 | 48.19 | -27.2 | 32.0 | 43.4 | 74.0 | 25.8 | H | 155 | 22 |
| 2508.600 | 48.41 | -26.5 | 32.4 | 42.4 | 74.0 | 25.6 | H | 155 | 44 |
| 4881.750 | 37.65 | -32.7 | 34.5 | 35.9 | 74.0 | 36.4 | H | 155 | 242 |
| 7323.000 | 41.98 | -31.9 | 36.1 | 37.8 | 74.0 | 32.0 | H | 155 | 176 |
| 9764.250 | 41.35 | -30.6 | 37.2 | 34.7 | 74.0 | 32.7 | H | 155 | 88 |
| 12204.750 | 44.31 | -29.4 | 39.2 | 34.5 | 74.0 | 29.7 | V | 155 | 22 |

**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) |
|---|---|---|---|---|---|---|---|---|---|
| 2495.340 | 60.21 | 2.9 | 32.4 | 24.84 | 74.0 | 13.8 | H | 155 | 264 |
| 2496.820 | 59.98 | 2.9 | 32.4 | 24.65 | 74.0 | 14.0 | H | 155 | 132 |
| 4959.750 | 38.33 | -33.4 | 34.5 | 37.20 | 74.0 | 35.7 | H | 155 | 110 |
| 7440.000 | 42.81 | -31.8 | 36.0 | 38.55 | 74.0 | 31.2 | H | 155 | 44 |
| 9920.250 | 42.70 | -29.9 | 37.4 | 35.23 | 74.0 | 31.3 | H | 155 | 22 |
| 12399.750 | 45.04 | -29.5 | 39.1 | 35.41 | 74.0 | 29.0 | V | 155 | 0 |

**8DPSK Ch 0 - Peak**

| Frequency (MHz) | Measurement Result (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) |
|---|---|---|---|---|---|---|---|---|---|
| 2383.710 | 59.45 | 2.9 | 32.0 | 24.55 | 74.0 | 14.6 | H | 155 | 176 |
| 2387.518 | 59.45 | 2.9 | 32.0 | 24.59 | 74.0 | 14.5 | H | 155 | 0 |
| 4803.750 | 36.31 | -32.9 | 34.5 | 34.66 | 74.0 | 37.7 | V | 155 | 22 |
| 7206.000 | 42.99 | -31.6 | 36.1 | 38.52 | 74.0 | 31.0 | V | 155 | 352 |
| 9608.250 | 41.46 | -30.0 | 37.0 | 34.51 | 74.0 | 32.5 | V | 155 | 0 |
| 12009.750 | 46.66 | -29.8 | 39.3 | 37.19 | 74.0 | 27.3 | V | 155 | 0 |

**8DPSK Ch 39 - Peak**

| Frequency (MHz) | Measurement Result (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) |
|---|---|---|---|---|---|---|---|---|---|
| 2360.000 | 47.51 | -27.6 | 31.8 | 43.26 | 74.0 | 26.5 | H | 155 | 22 |
| 2513.200 | 48.10 | -26.6 | 32.5 | 42.15 | 74.0 | 25.9 | H | 155 | 330 |
| 4881.750 | 37.75 | -32.7 | 34.5 | 35.96 | 74.0 | 36.3 | H | 155 | 242 |
| 7323.000 | 41.95 | -31.9 | 36.1 | 37.80 | 74.0 | 32.0 | V | 155 | 264 |
| 9764.250 | 40.96 | -30.6 | 37.2 | 34.33 | 74.0 | 33.0 | V | 155 | 286 |
| 12204.750 | 44.99 | -29.4 | 39.2 | 35.20 | 74.0 | 29.0 | V | 155 | 308 |

**8DPSK Ch 78 - Peak**

| Frequency (MHz) | Measurement Result (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) |
|---|---|---|---|---|---|---|---|---|---|
| 2483.620 | 60.20 | 2.9 | 32.8 | 24.5 | 74.0 | 13.8 | H | 155 | 22 |
| 2484.420 | 60.00 | 2.9 | 32.7 | 24.3 | 74.0 | 14.0 | H | 155 | 242 |
| 4959.750 | 38.47 | -33.4 | 34.5 | 37.3 | 74.0 | 35.5 | V | 155 | 44 |
| 7440.000 | 41.73 | -31.8 | 36.0 | 37.5 | 74.0 | 32.3 | H | 155 | 330 |
| 9920.250 | 45.45 | -29.9 | 37.4 | 38.0 | 74.0 | 28.6 | H | 155 | 176 |
| 12399.750 | 45.36 | -29.5 | 39.1 | 35.7 | 74.0 | 28.6 | H | 155 | 0 |

**Conclusion: PASS**

**Test graphs as below:**

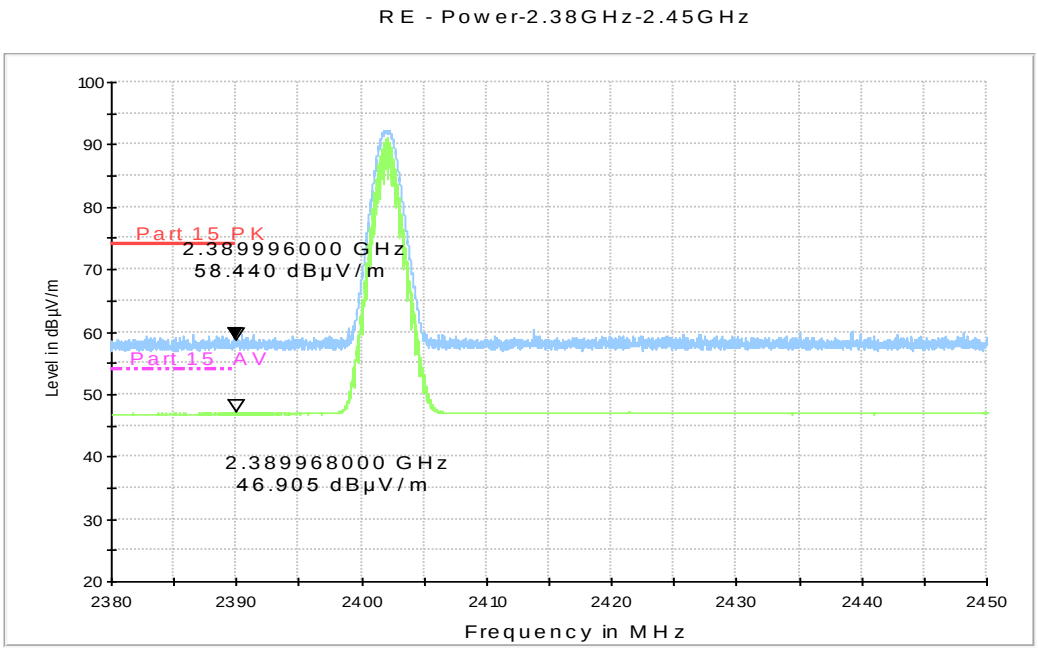



Fig.58. Radiated emission (Power): GFSK, low channel

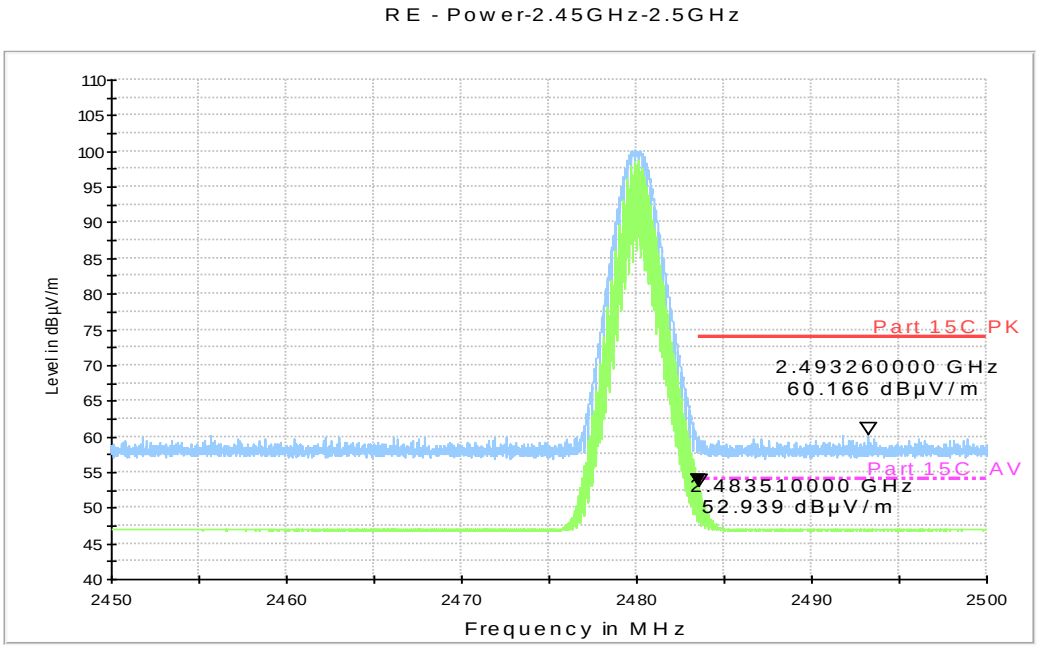



Fig.59. Radiated emission (Power) GFSK, high channel

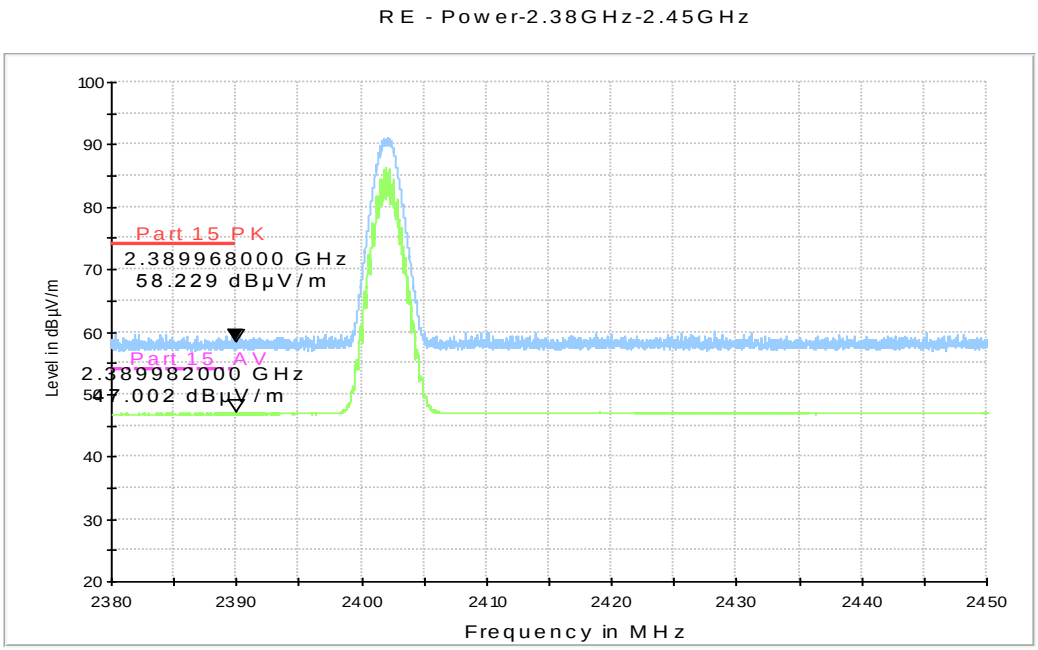



Fig.60. Radiated emission (Power): π/4 DQPSK, low channel

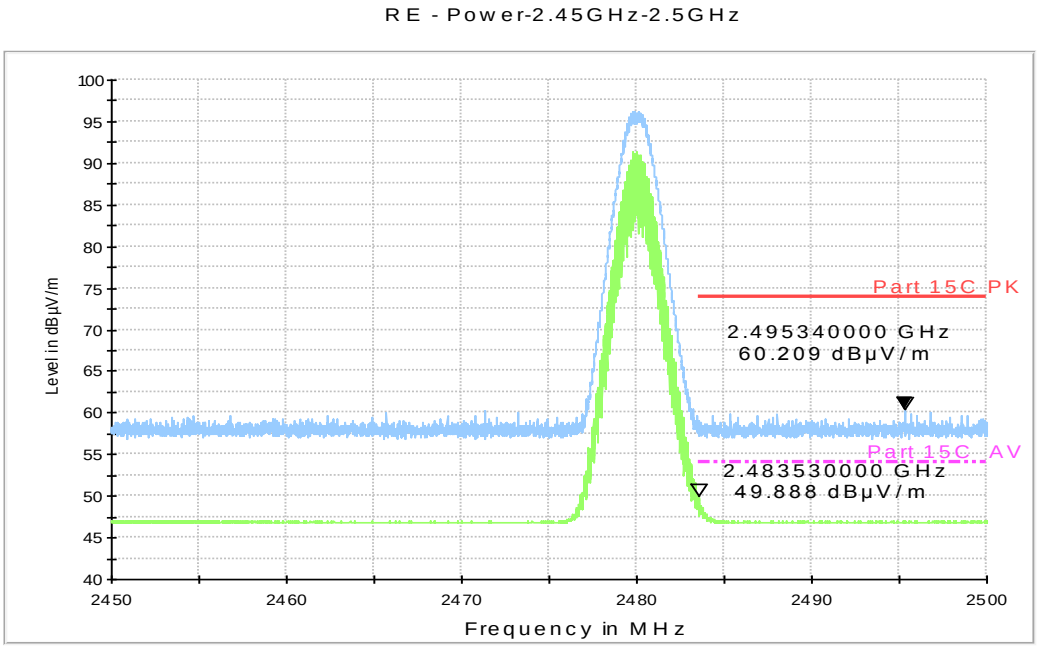



Fig.61. Radiated emission (Power): π/4 DQPSK, high channel

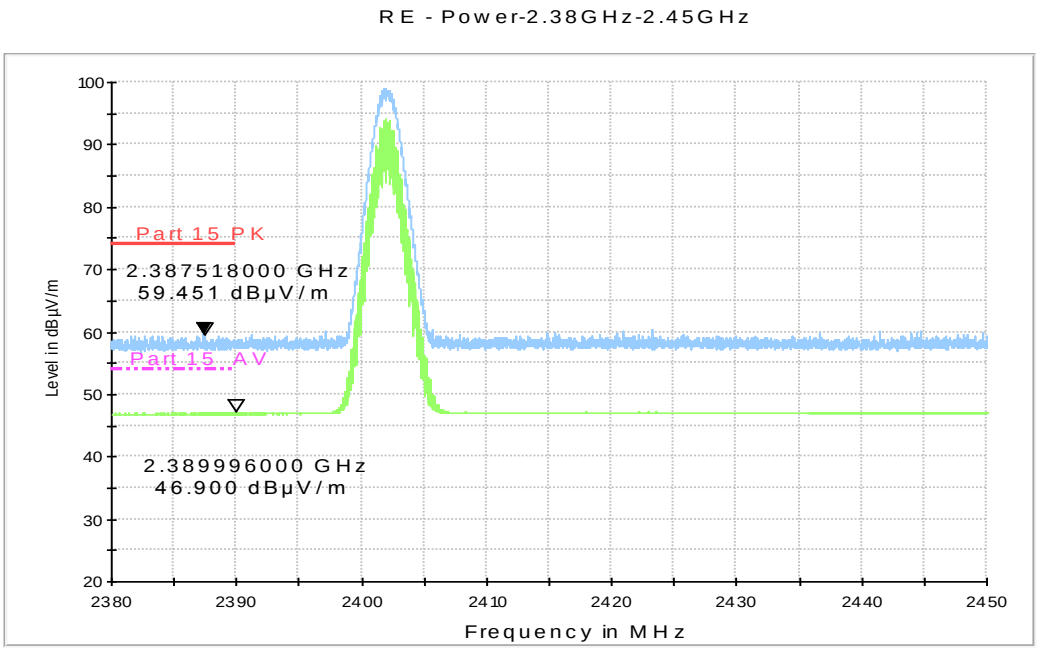



Fig.62. Radiated emission (Power): 8DPSK, low channel

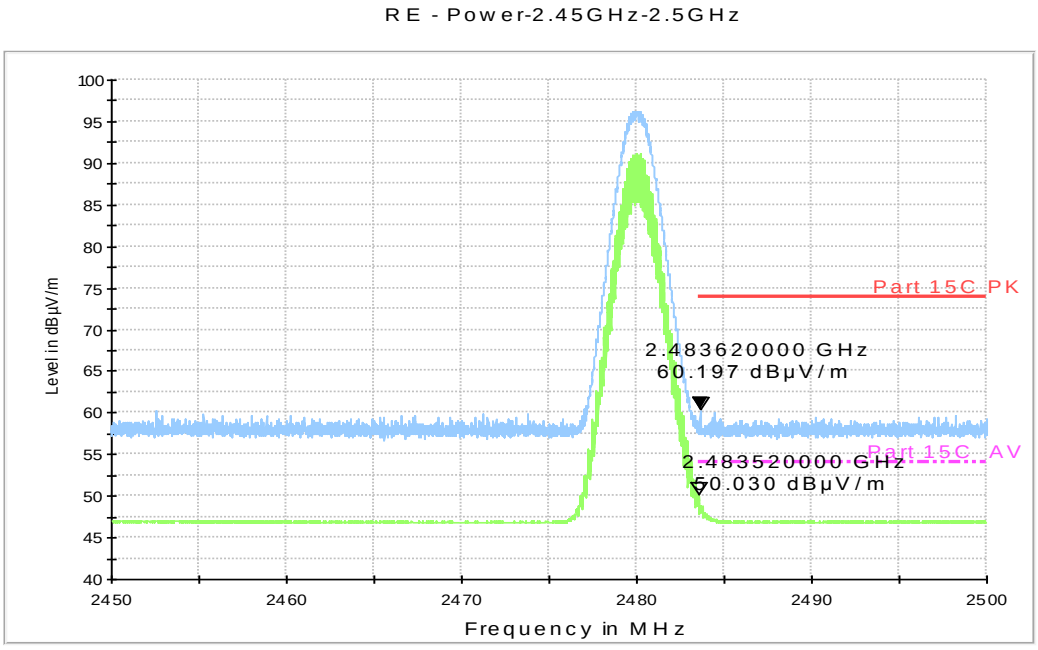



Fig.63. Radiated emission (Power): 8DPSK, high channel

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

**For π/4 DQPSK**

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

**For 8DPSK**

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

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

**Conclusion: PASS**

**Test graphs as below:**

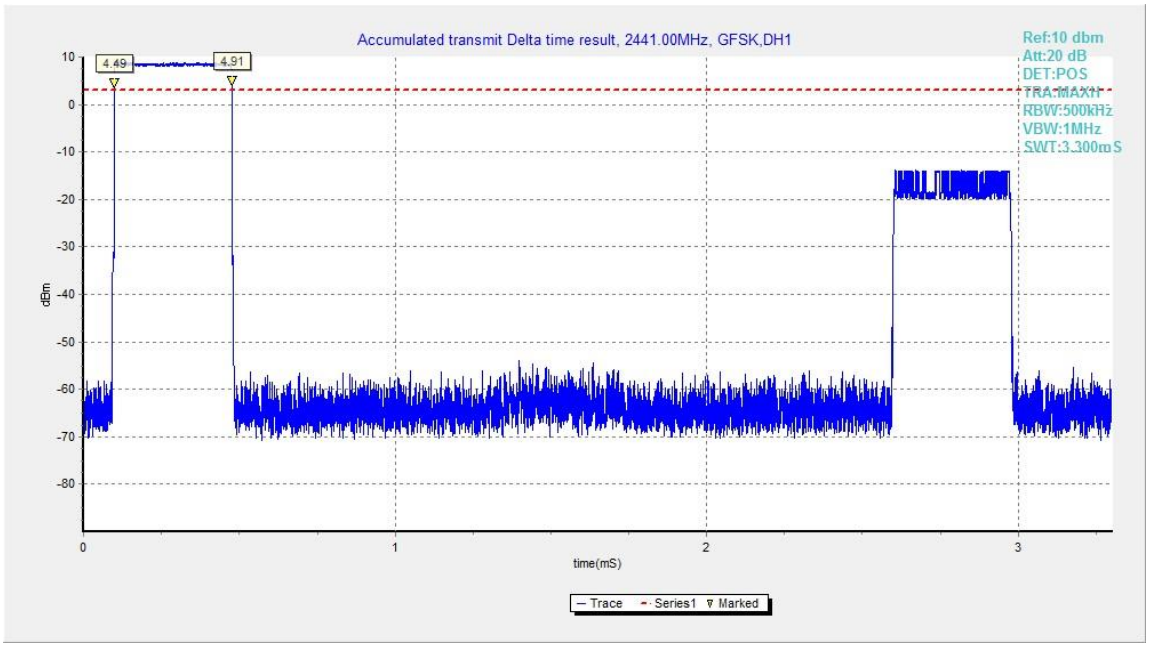



Fig.64. Time of occupancy (Dwell Time): Channel 39, Packet DH1

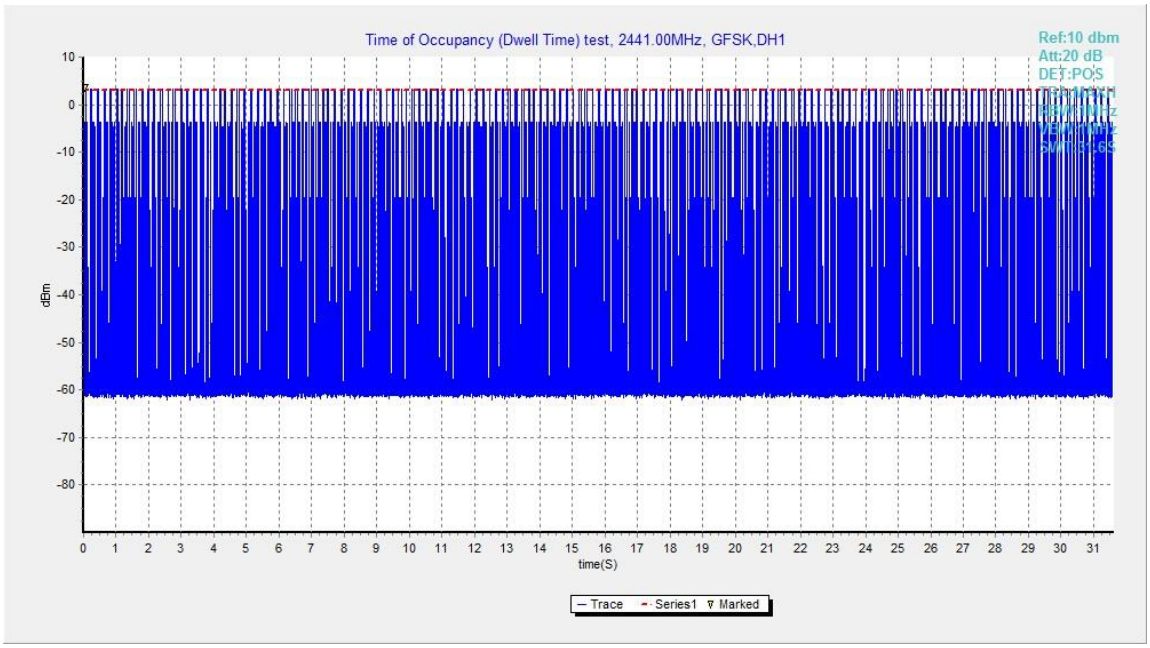



Fig.65. Number of Transmissions Measurement: Channel 39,Packet DH1

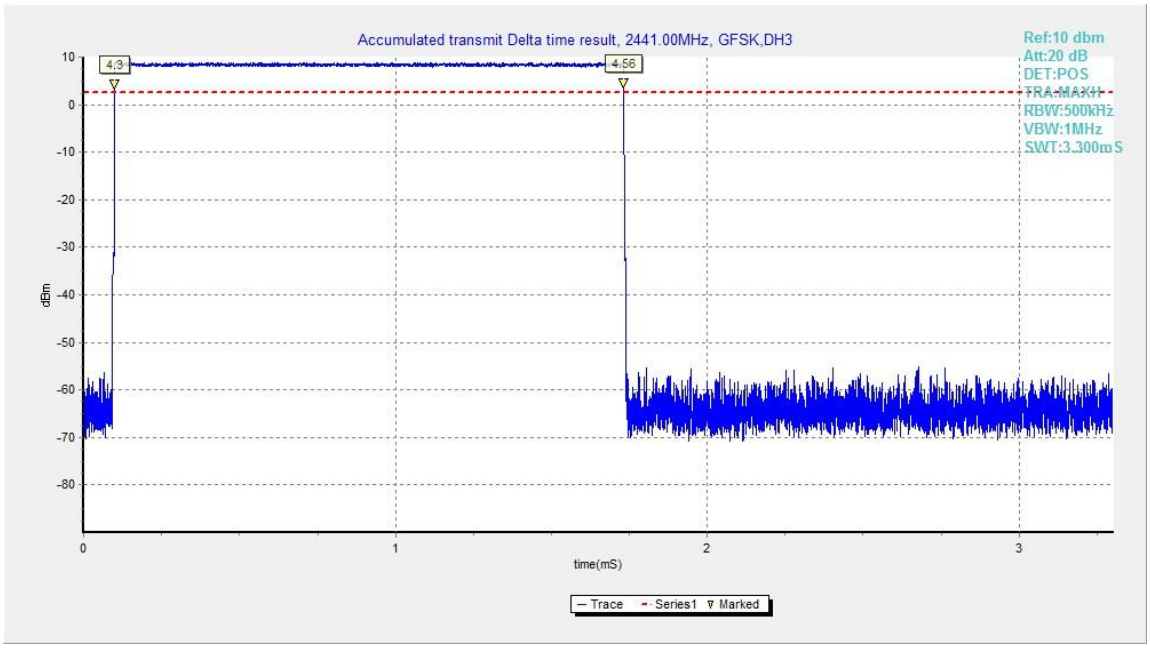



Fig.66. Time of occupancy (Dwell Time): Channel 39, Packet DH3

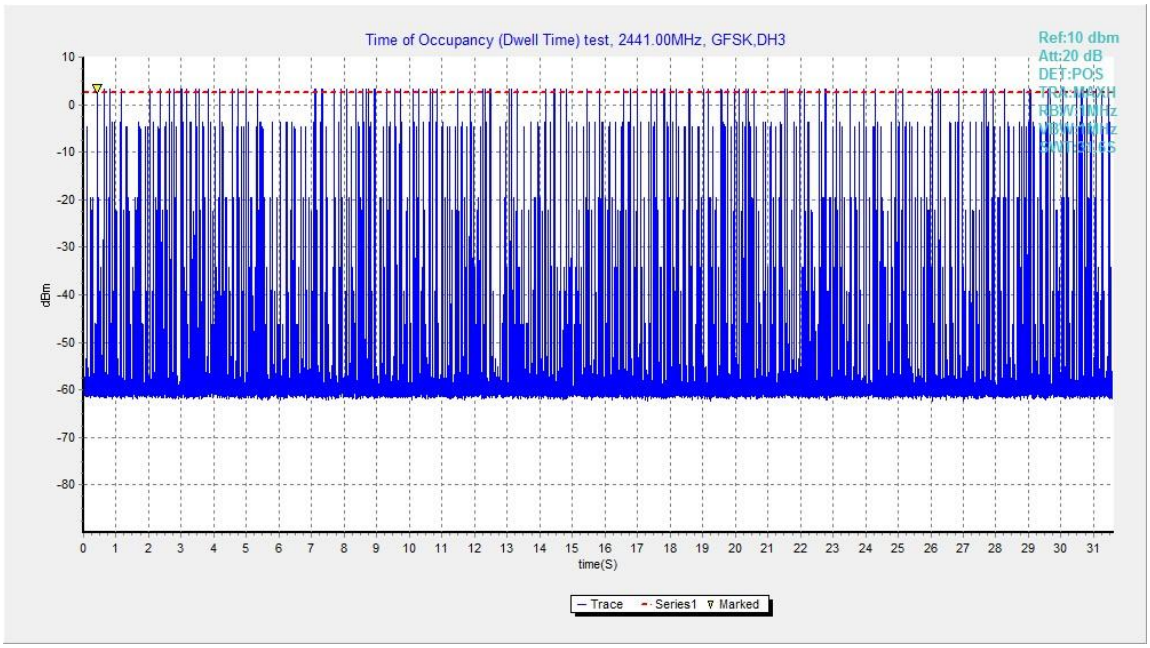



Fig.67. Number of Transmissions Measurement: Channel 39,Packet DH3


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

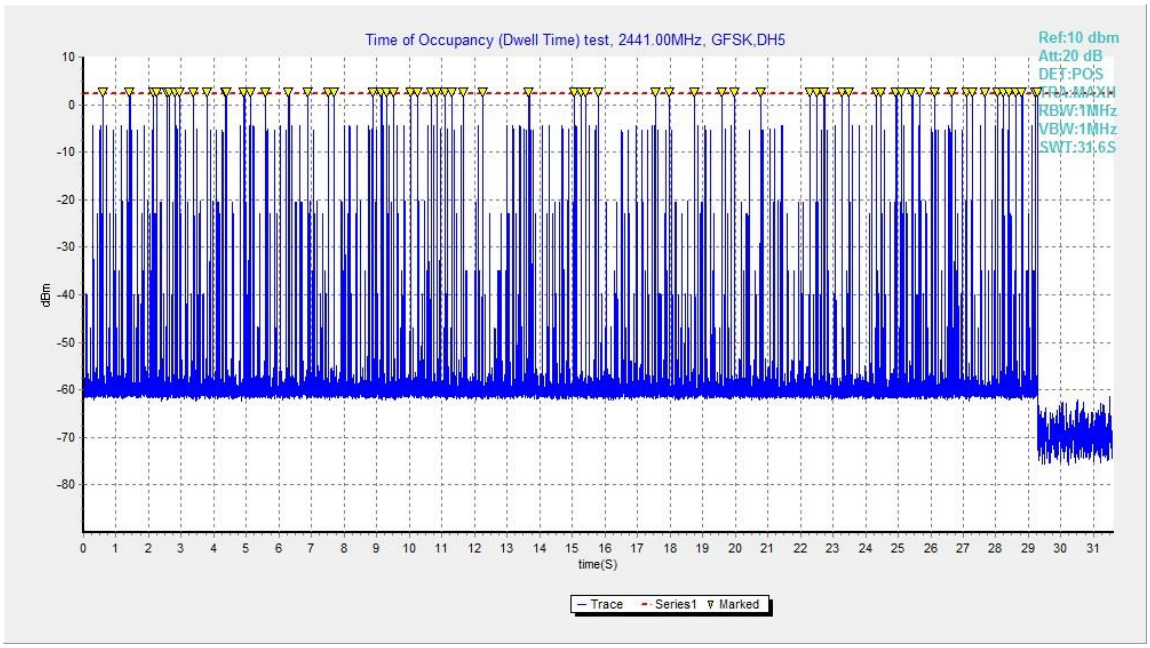



Fig.69. Number of Transmissions Measurement: Channel 39,Packet DH5

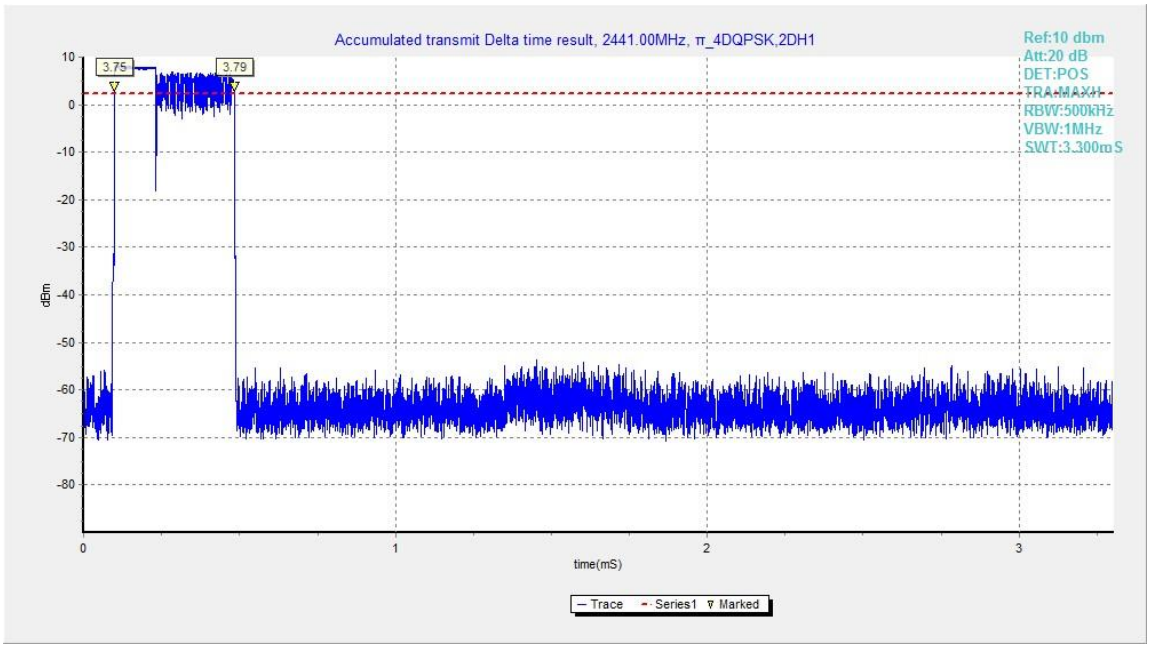



Fig.70. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH1

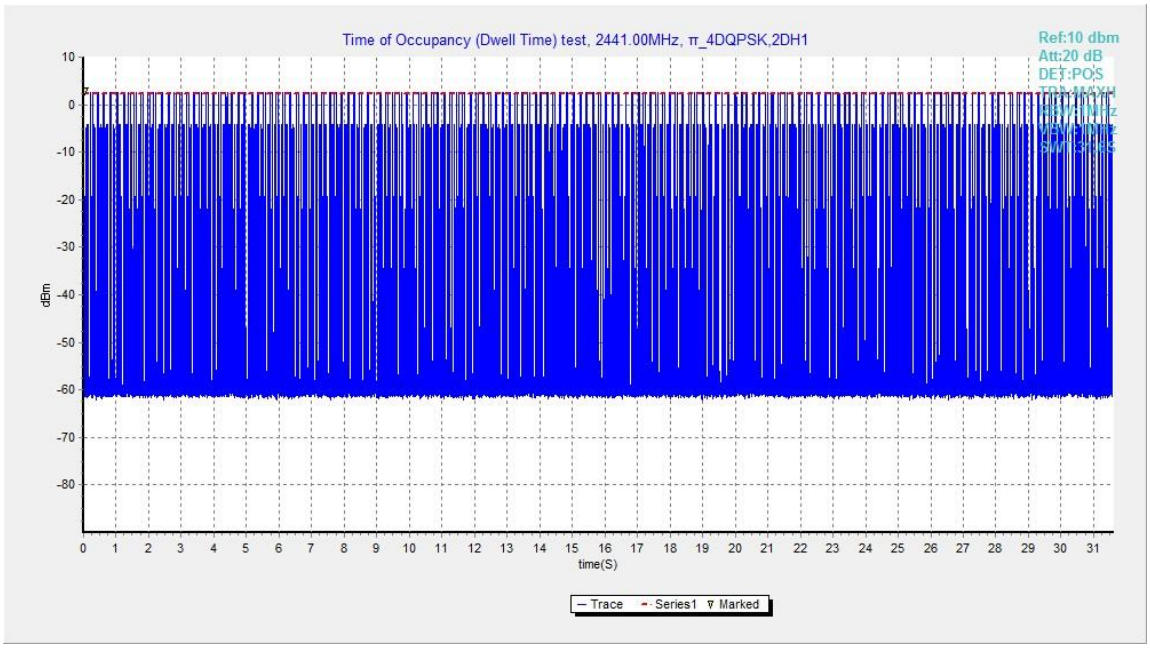



Fig.71. Number of Transmissions Measurement: Channel 39,Packet 2-DH1

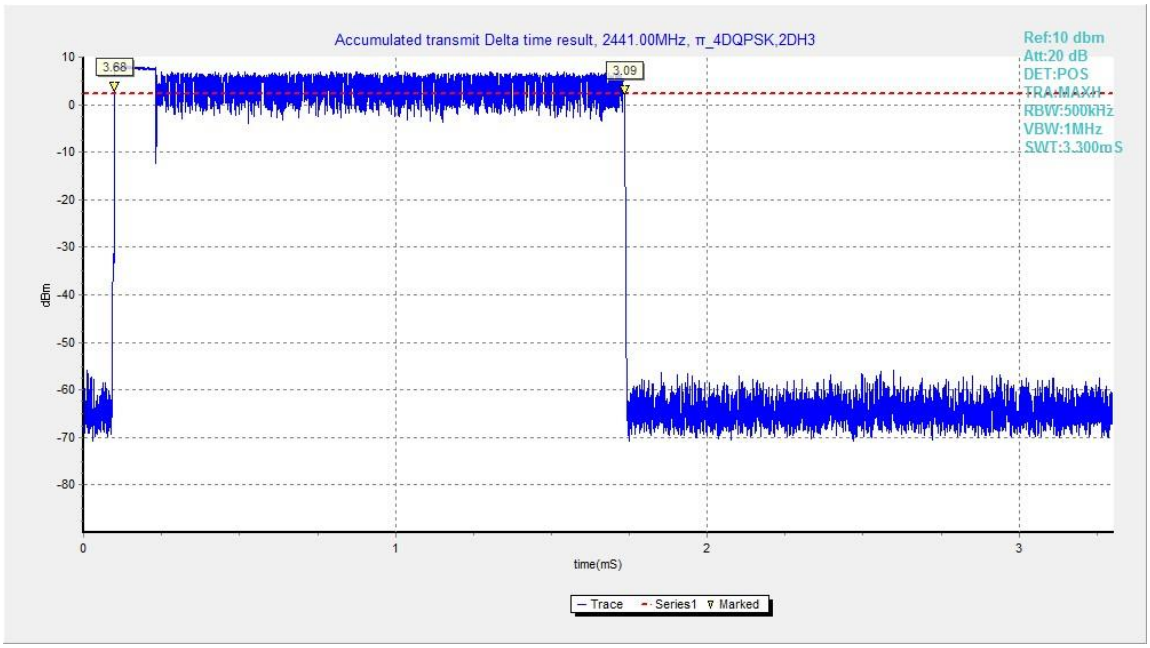



Fig.72. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH3

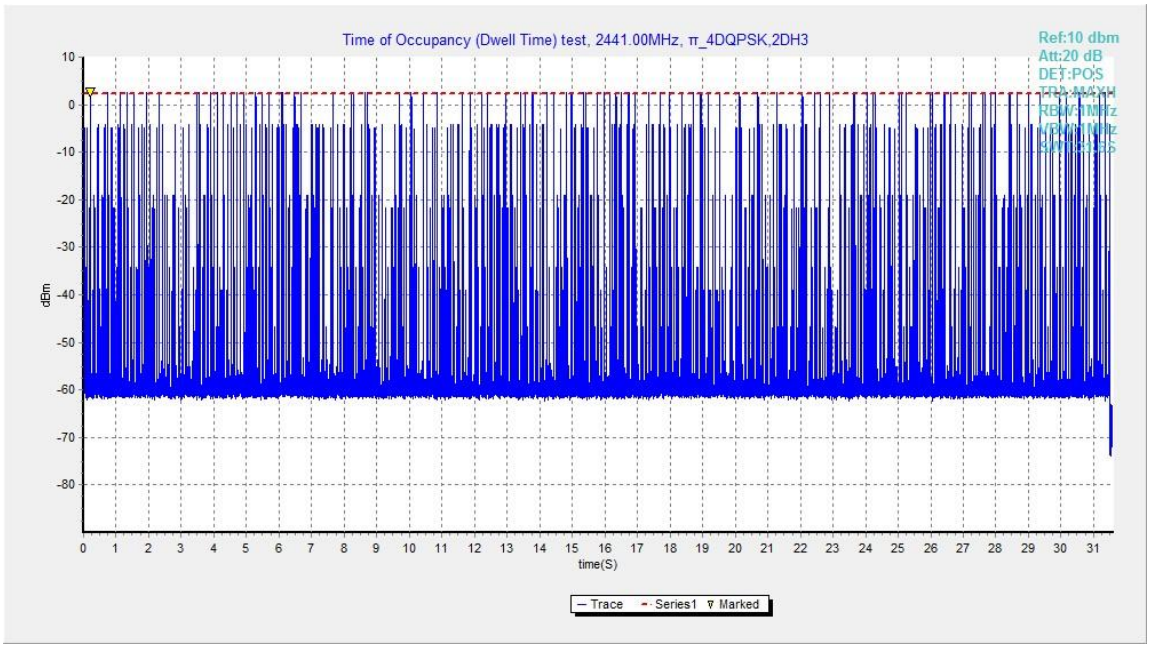



Fig.73. Number of Transmissions Measurement: Channel 39,Packet 2-DH3

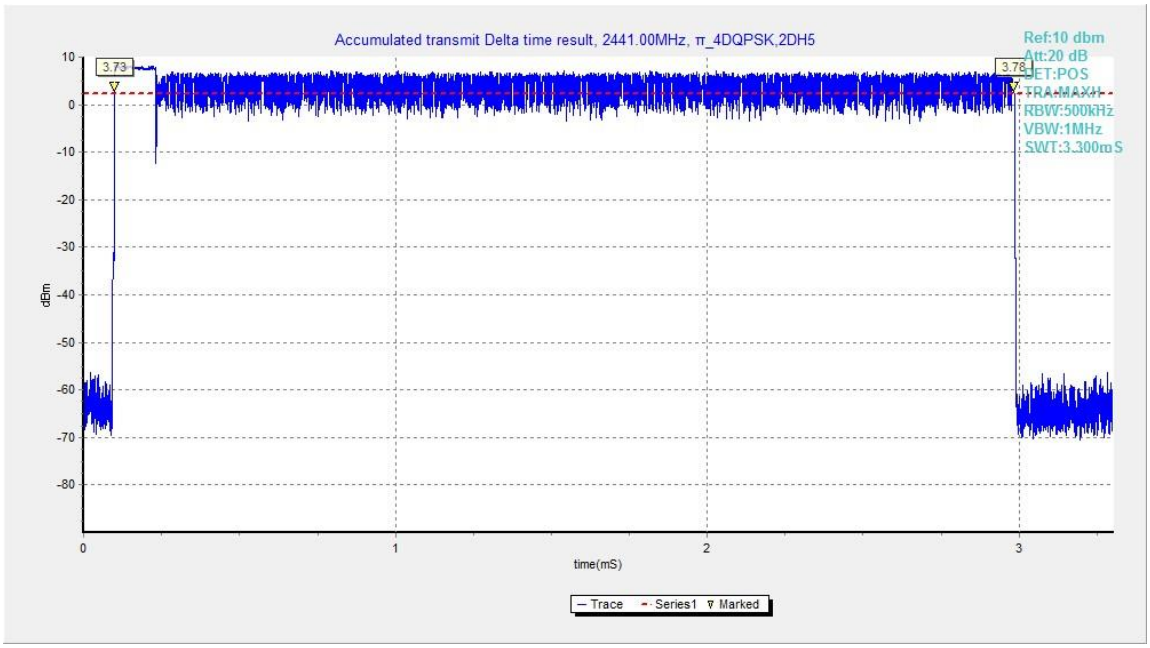



Fig.74. Time of occupancy (Dwell Time): Channel 39, Packet 2-DH5

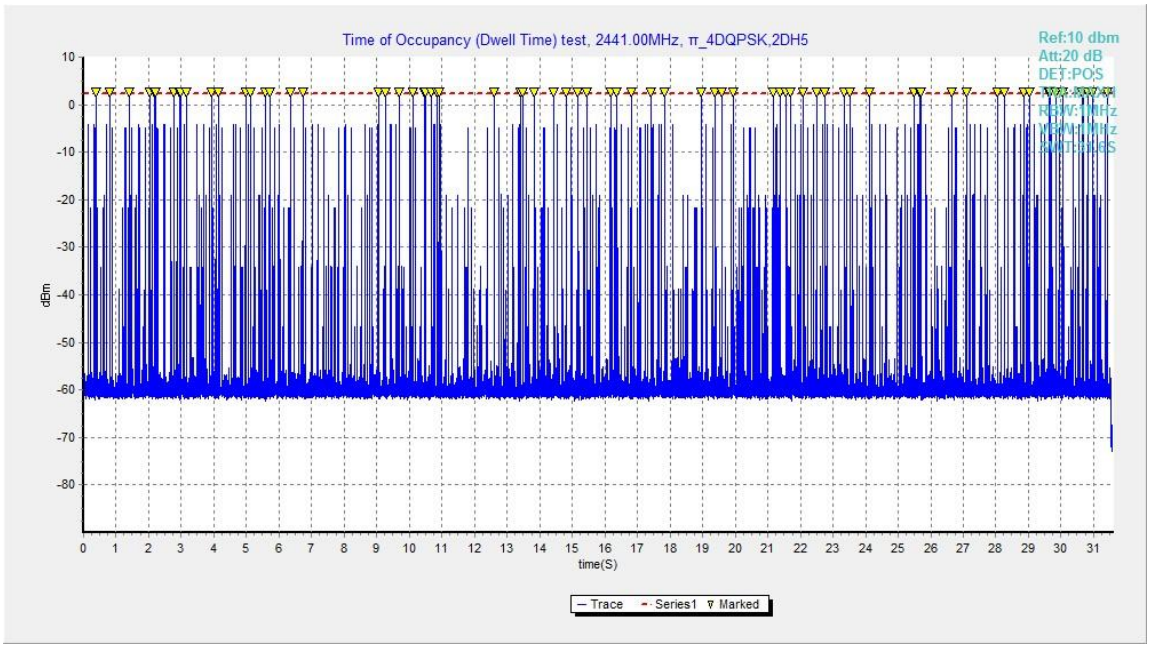



Fig.75. Number of Transmissions Measurement: Channel 39,Packet 2-DH5

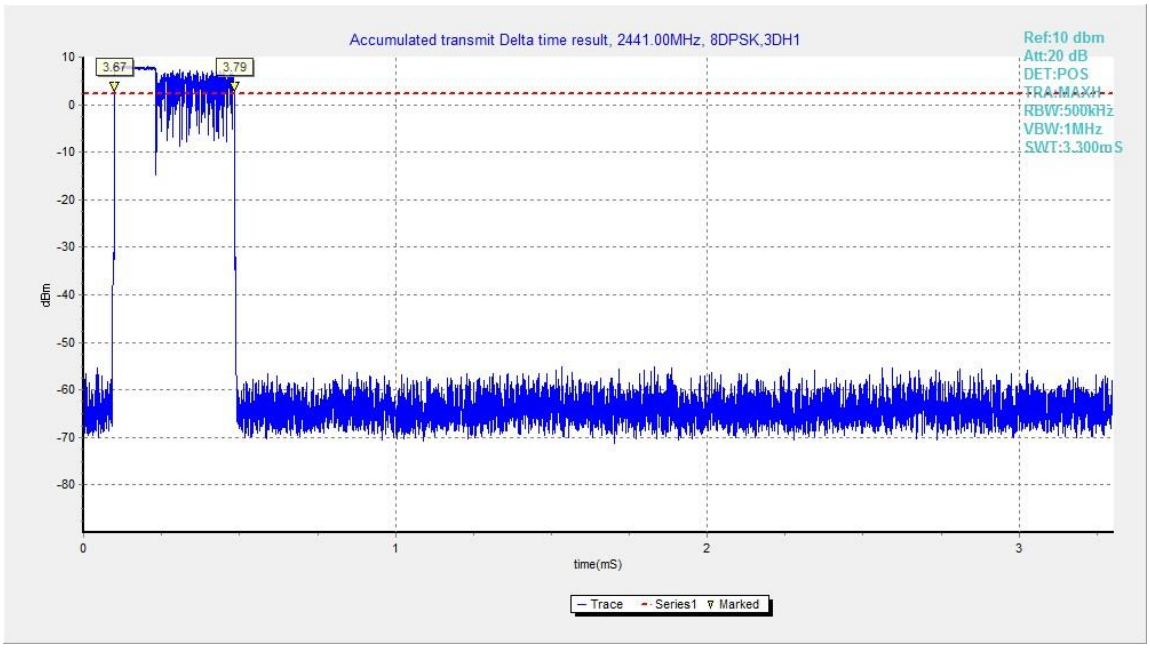



Fig.76. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH1

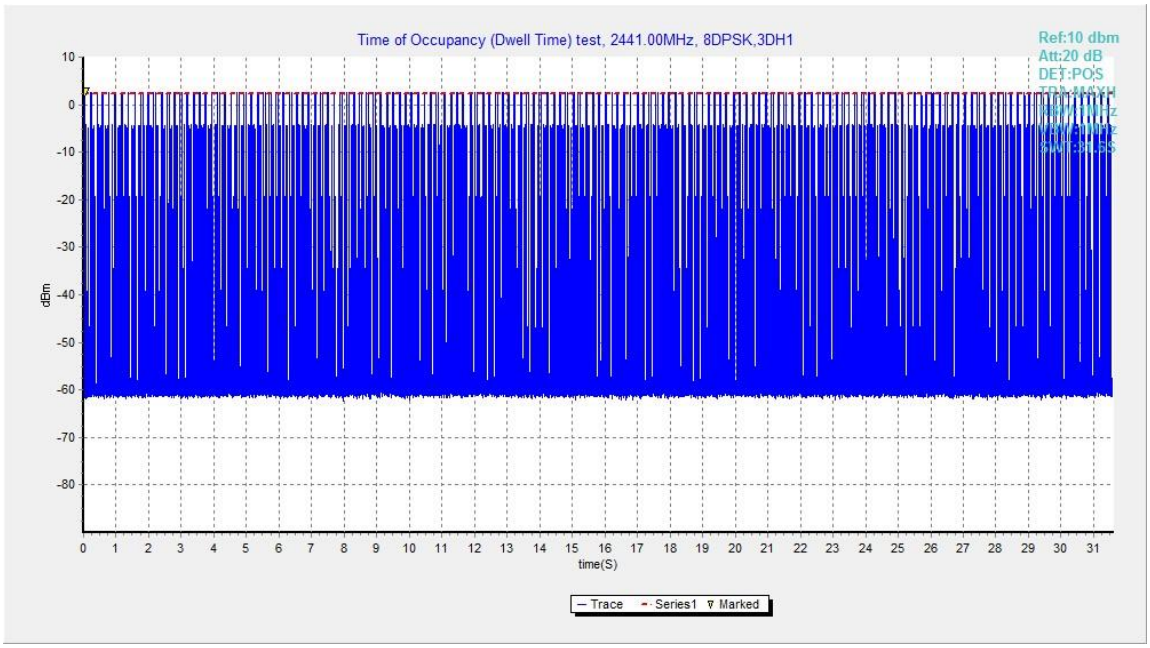



Fig.77. Number of Transmissions Measurement: Channel 39,Packet 3-DH1

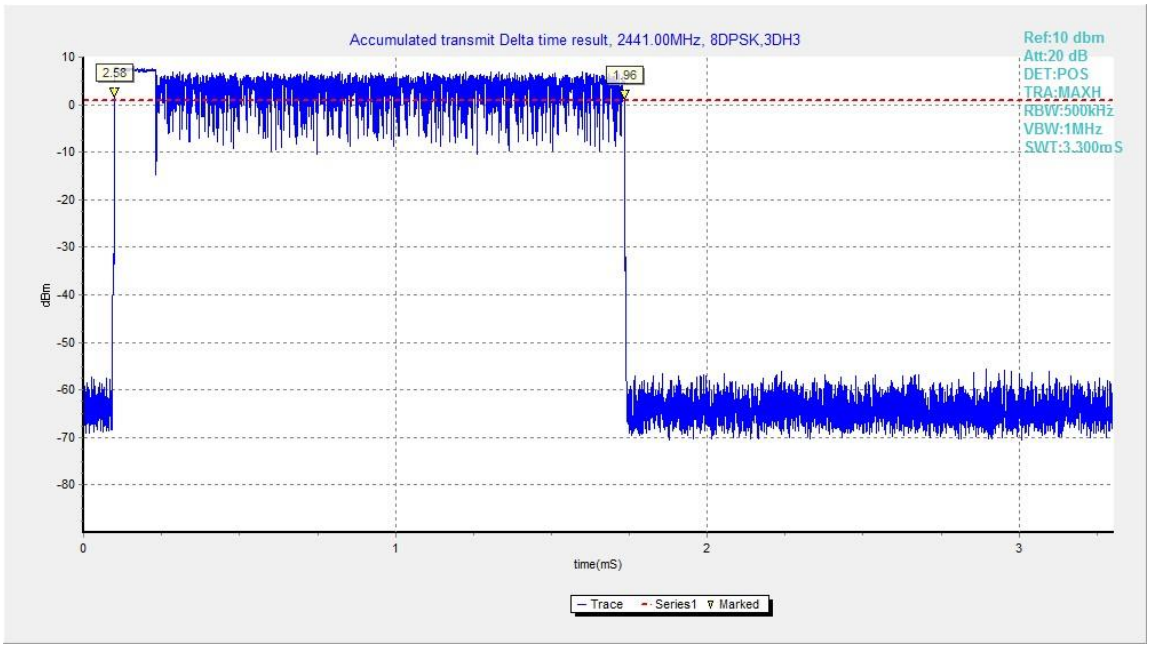



Fig.78. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH3

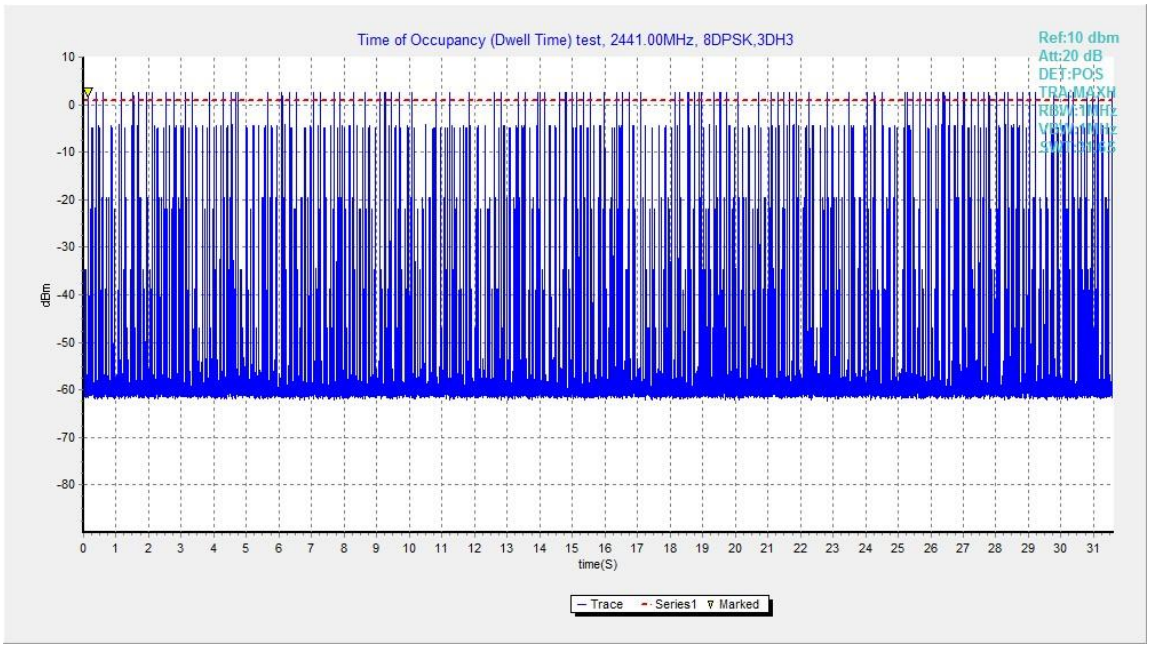



Fig.79. Number of Transmissions Measurement: Channel 39,Packet 3-DH3

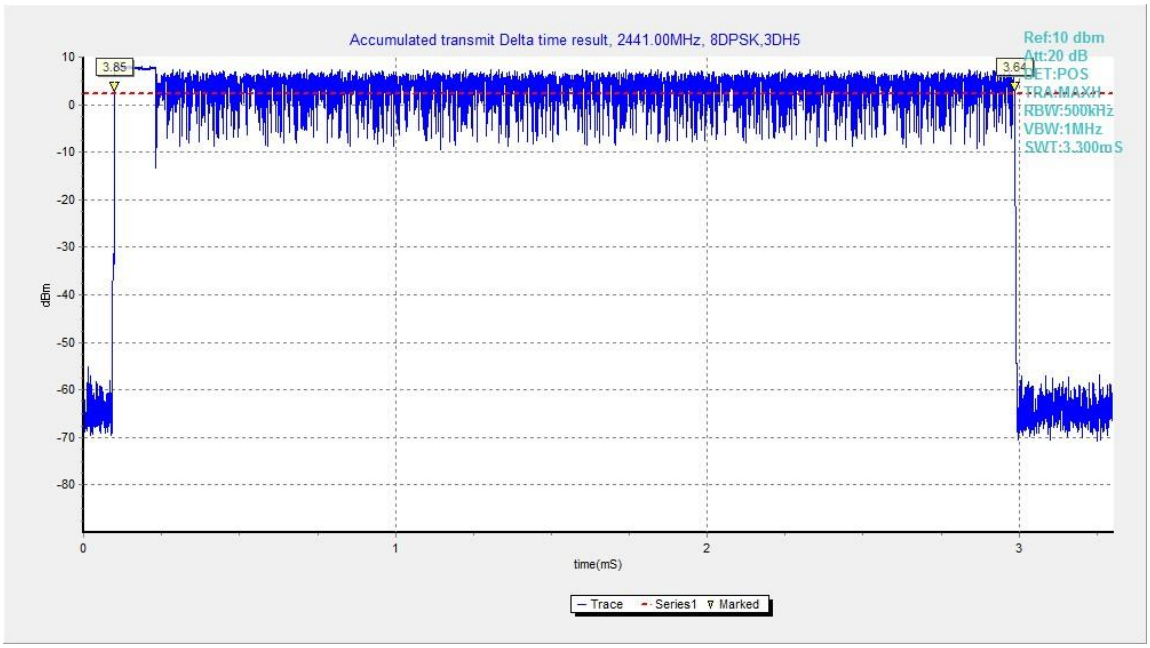



Fig.80. Time of occupancy (Dwell Time): Channel 39, Packet 3-DH5

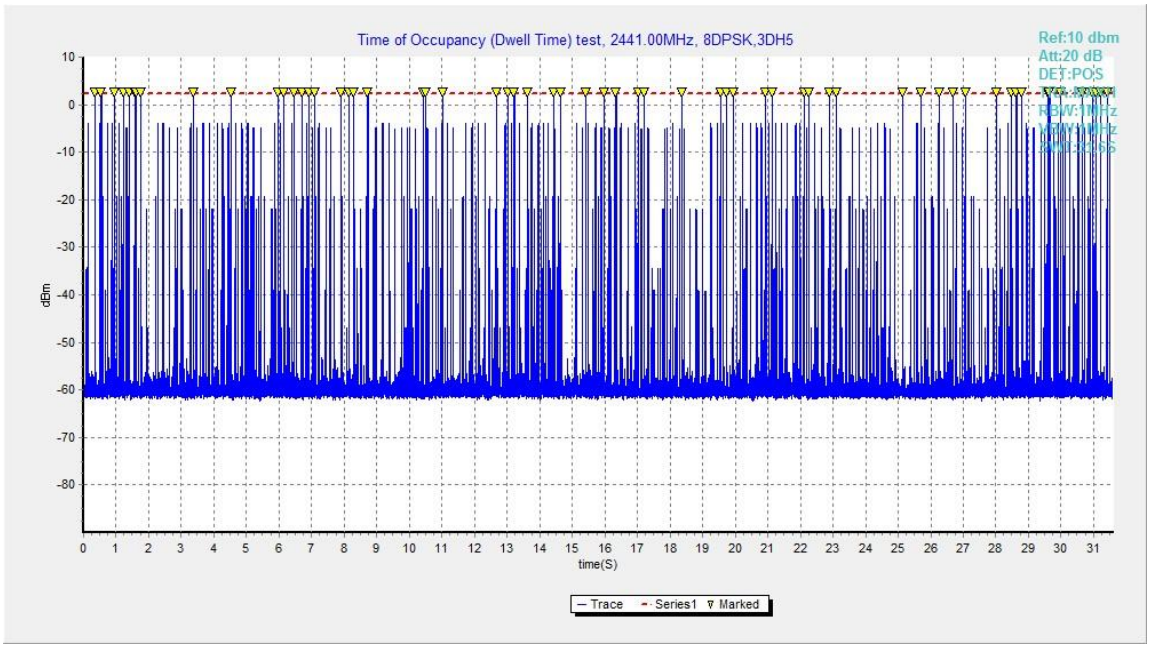



Fig.81. Number of Transmissions Measurement: Channel 39,Packet 3-DH5

## A.7. 20dB Bandwidth

**Method of Measurement: See ANSI C63.10-clause 6.9.2**

Measurement Procedure - Unwanted Emissions

1. Set RBW = 30kHz.

2. Set VBW = 100 kHz.

3. Set span to 3MHz

4. Detector = peak.

5. Trace Mode = max hold.

6. Sweep = auto couple.

7. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

**Measurement Limit:**

| Standard | Limit |
|---|---|
| FCC 47 CFR Part 15.247(a)(1) | NA * |

Use NdB Down function of the SA to measure the 20dB Bandwidth

* Comment: This test case is not required according to the latest FCC 47 CFR Part 15.247. But the test results are necessary for “carrier frequency separation” test case, in Annex A.8.

**Measurement Results:**

**For GFSK**

| Channel | 20dB Bandwidth (kHz) | | Conclusion |
|---|---|---|---|
| 0 | Fig.82 | 942.00 | NA |
| 39 | Fig.83 | 948.00 | NA |
| 78 | Fig.84 | 972.00 | NA |

**For π/4 DQPSK**

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

**For 8DPSK**

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

**Conclusion: NA**

**Test graphs as below:**

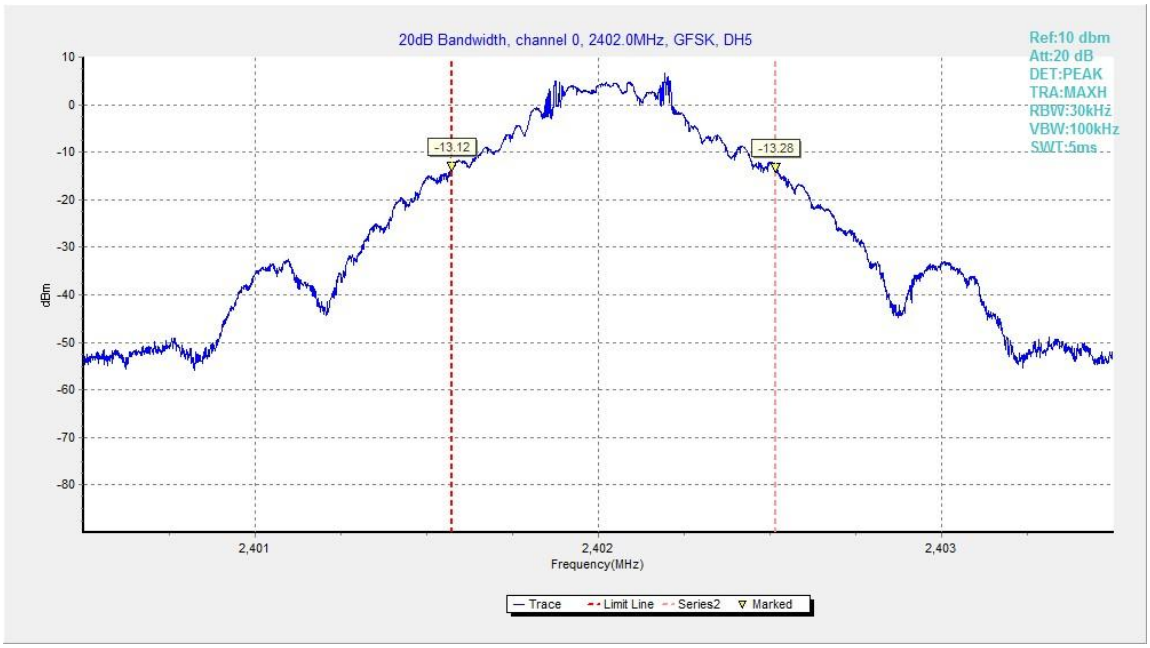



Fig.82. 20dB Bandwidth: GFSK, Channel 0

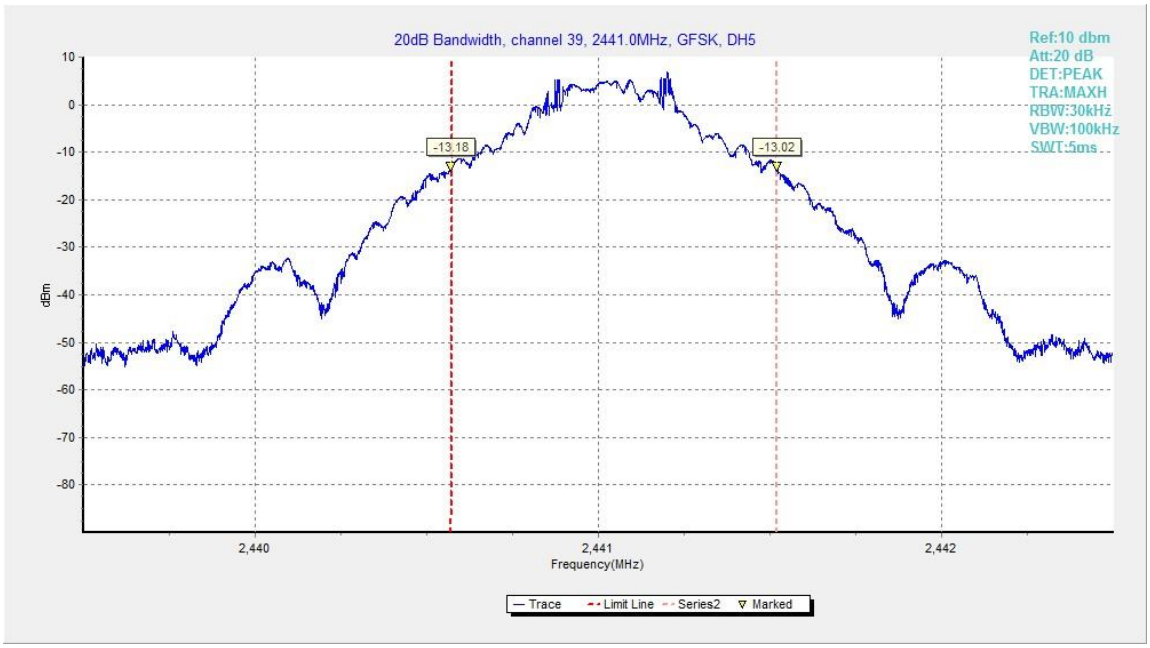



Fig.83. 20dB Bandwidth: GFSK, Channel 39

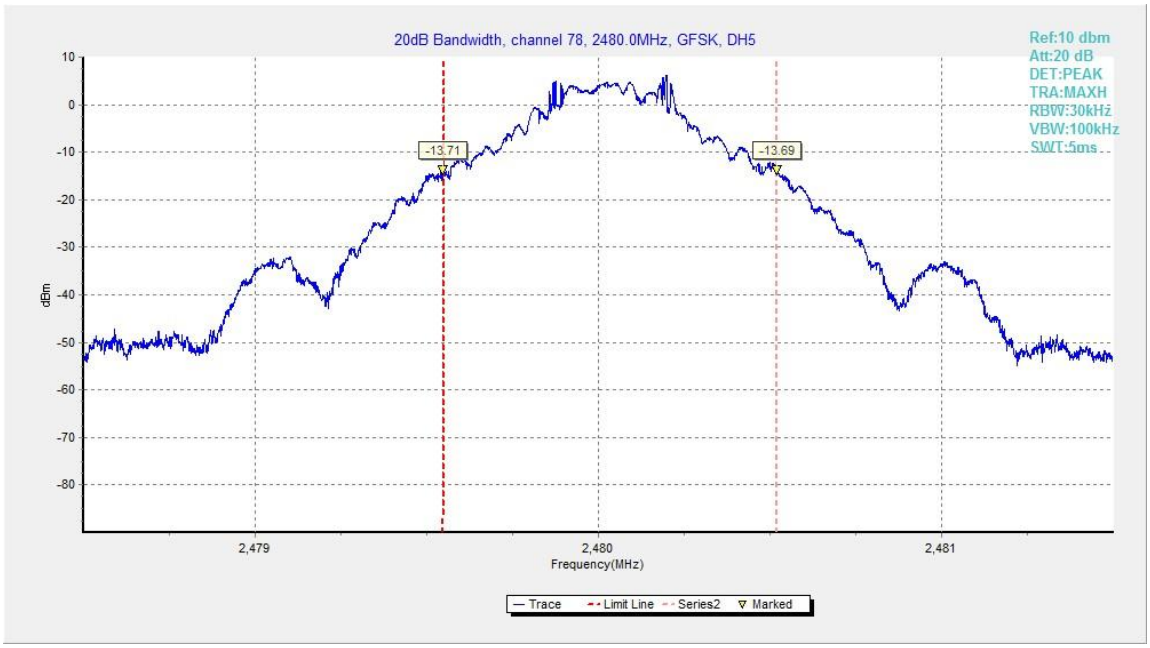



Fig.84. 20dB Bandwidth: GFSK, Channel 78

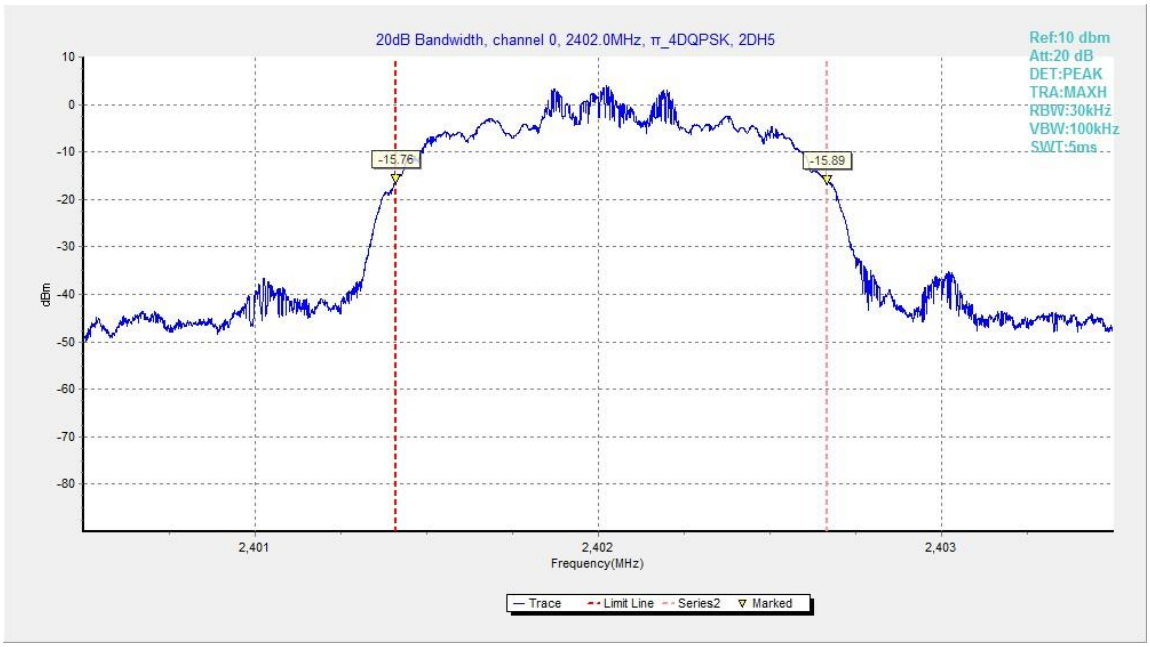



Fig.85. 20dB Bandwidth: π/4 DQPSK, Channel 0

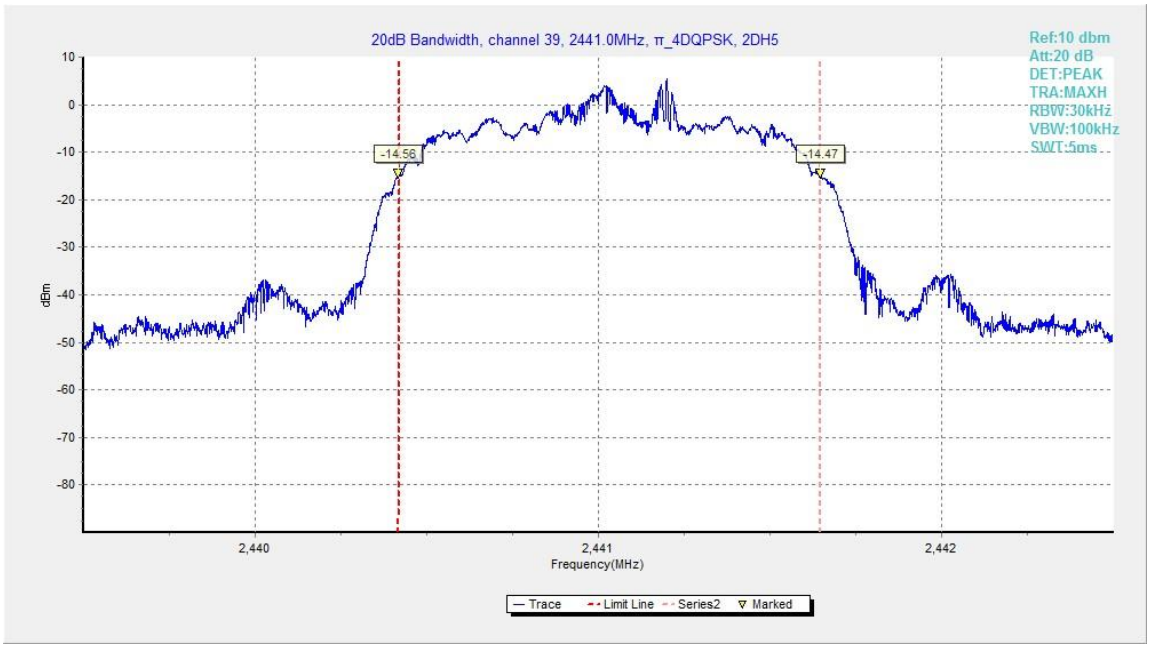



Fig.86. 20dB Bandwidth: π/4 DQPSK, Channel 39

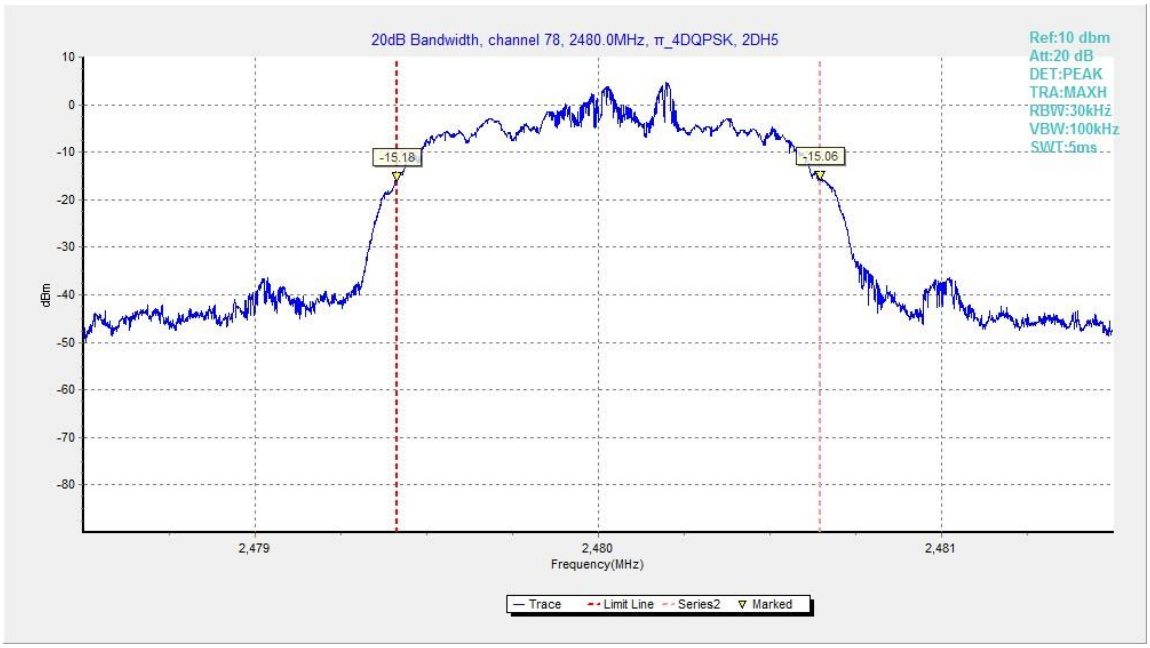



Fig.87. 20dB Bandwidth: π/4 DQPSK, Channel 78

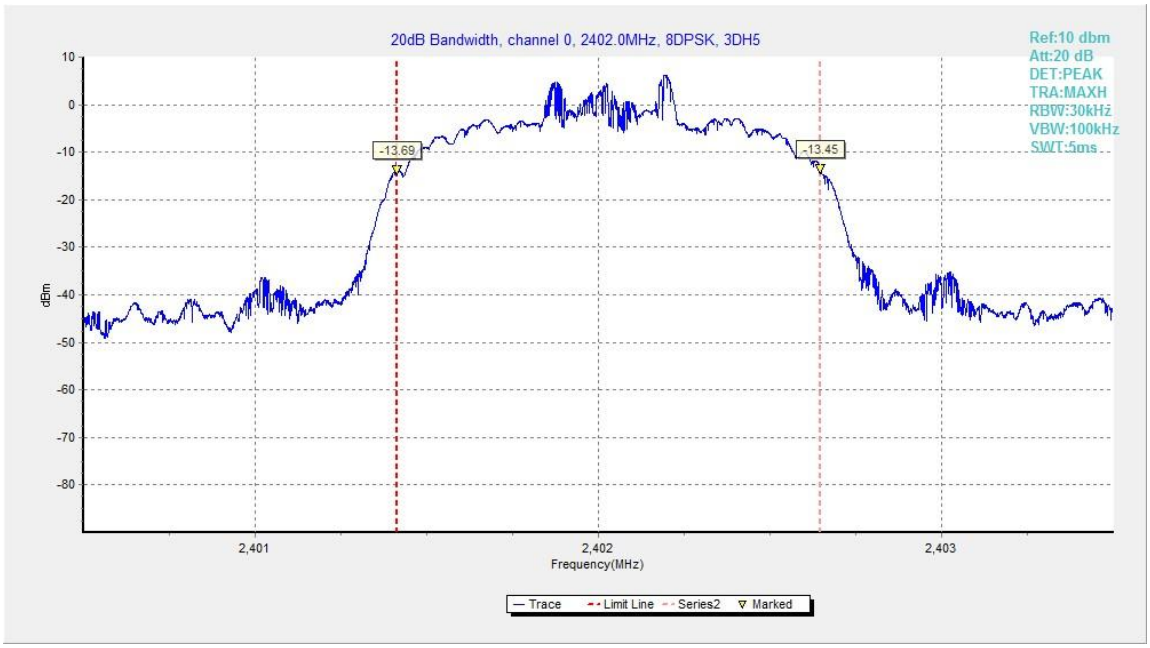



Fig.88. 20dB Bandwidth: 8DPSK, Channel 0

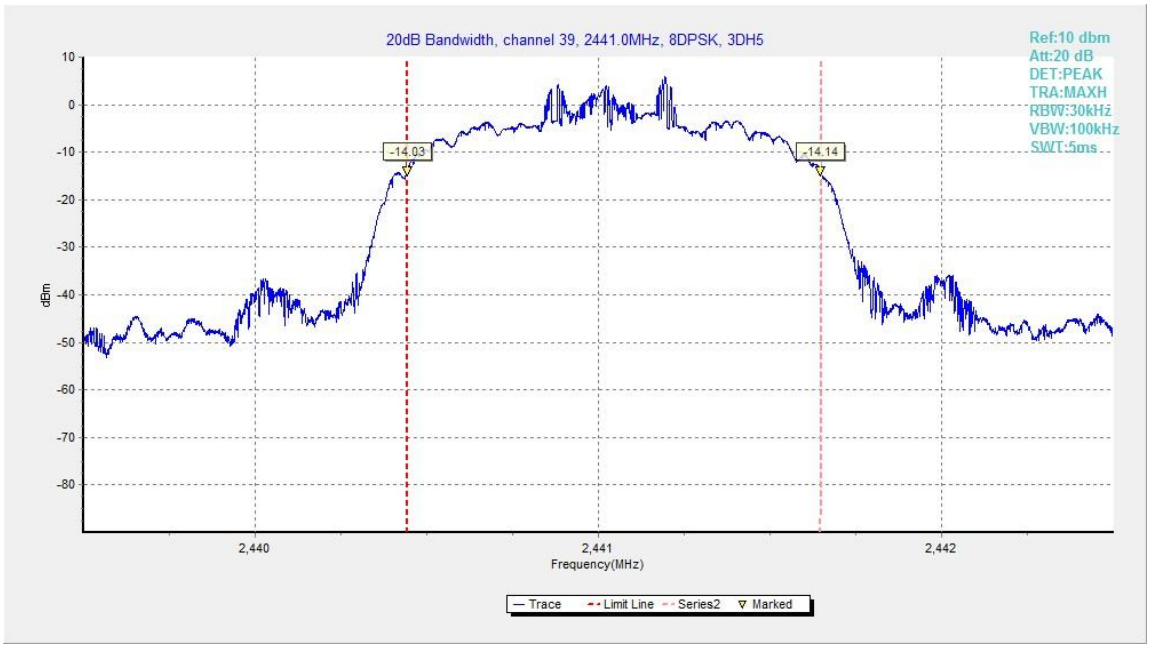



Fig.89. 20dB Bandwidth: 8DPSK, Channel 39

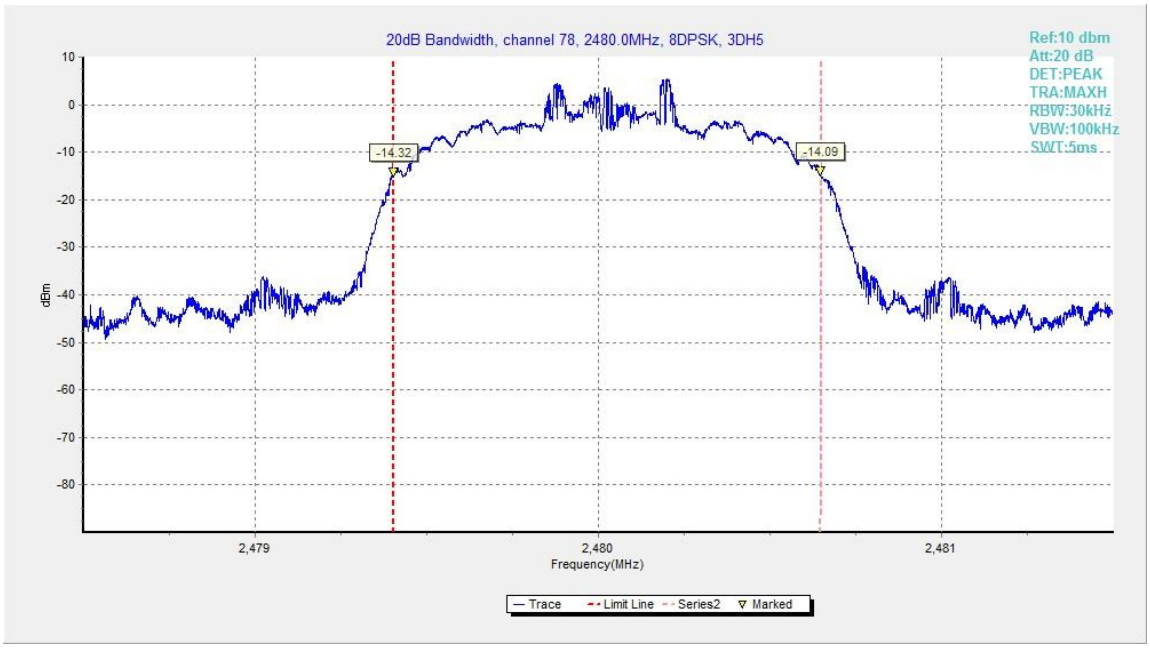



Fig.90. 20dB Bandwidth: 8DPSK, Channel 78

## 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 | 993.75 | P |

**For π/4 DQPSK**

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

**For 8DPSK**

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

**Conclusion: PASS**

**Test graphs as below:**

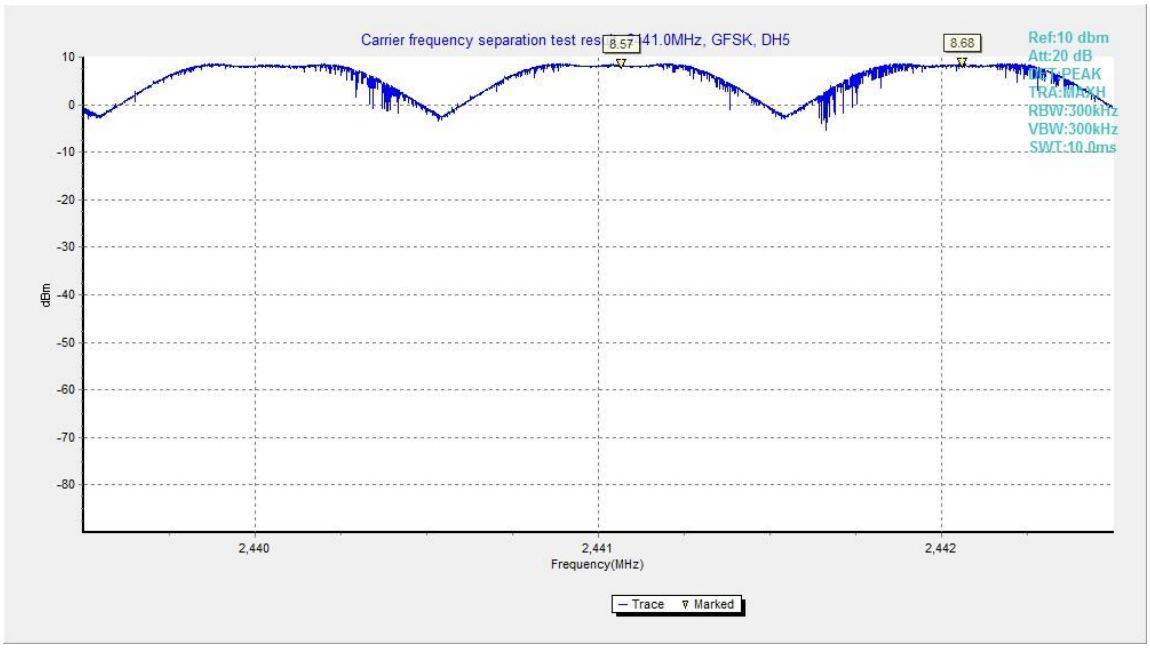



Fig.91. Carrier frequency separation measurement: GFSK, Channel 39

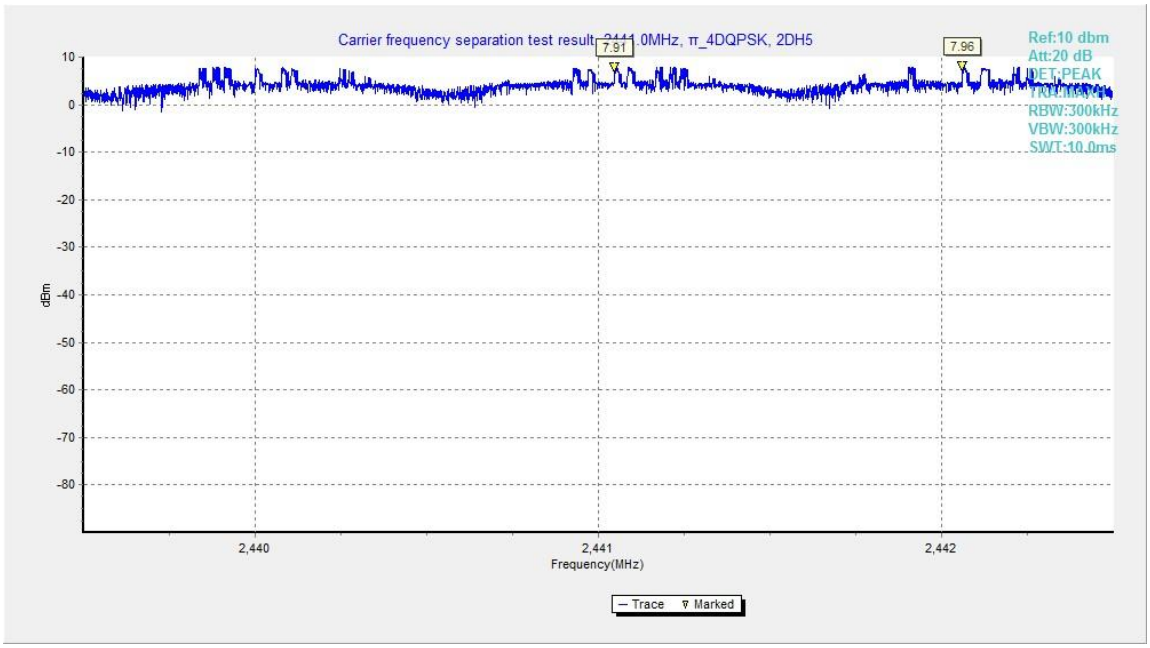



Fig.92. Carrier frequency separation measurement: π/4 DQPSK, Channel 39

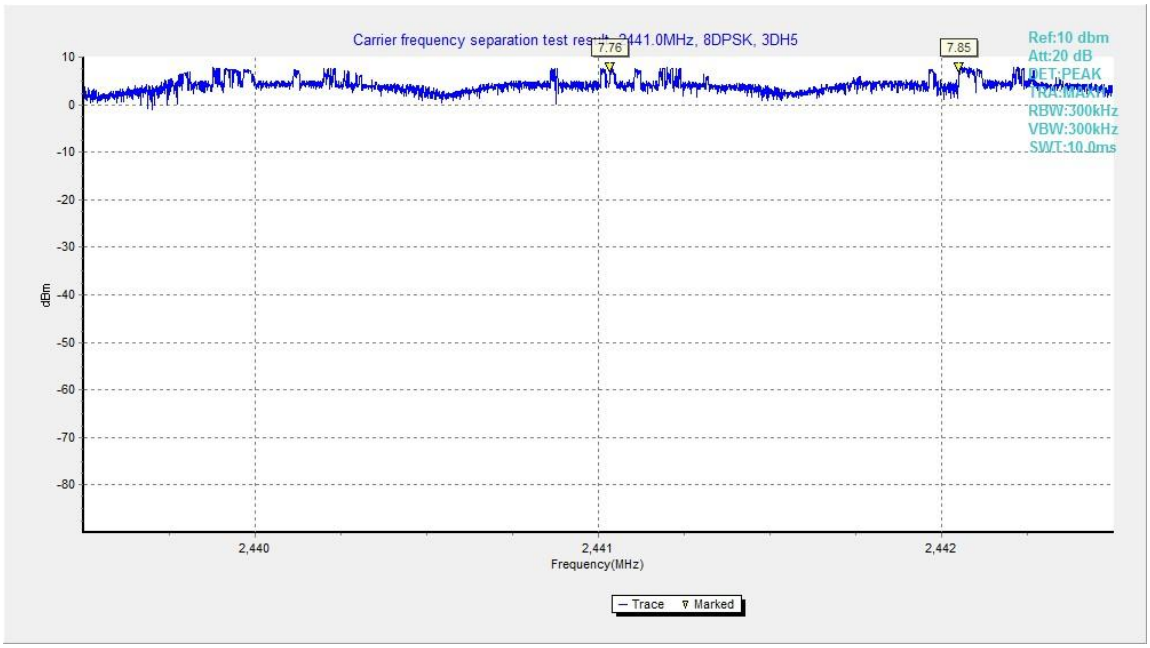



Fig.93. Carrier frequency separation measurement: 8DPSK, Channel 39

## 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:**

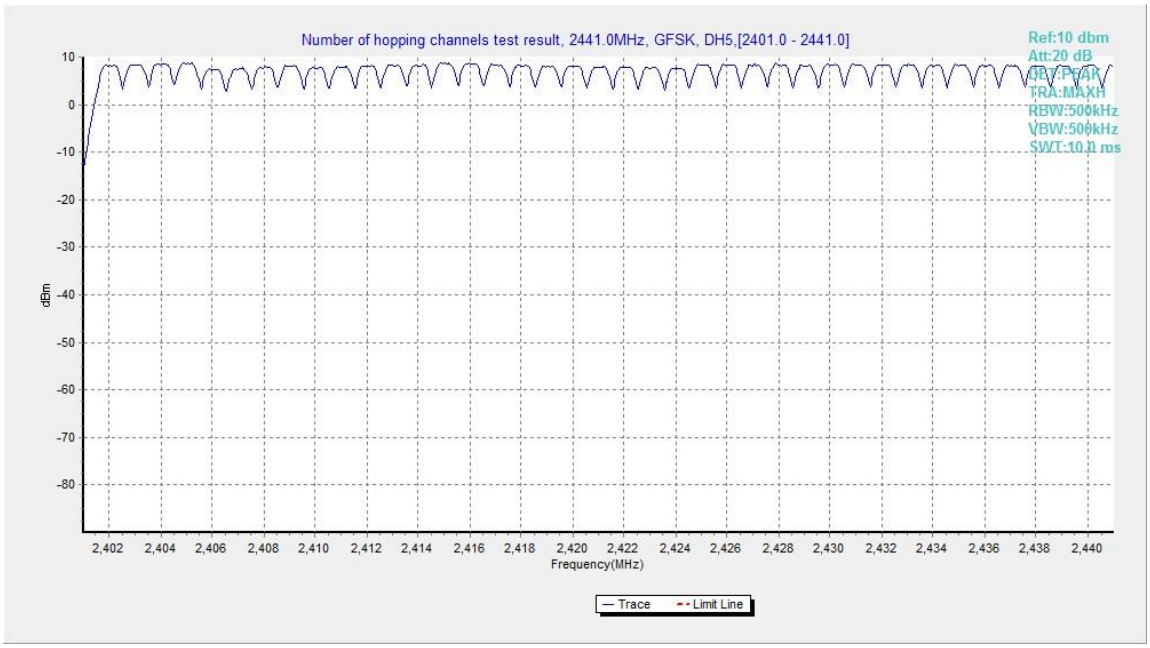



Fig.94. Number of hopping frequencies: GFSK, Channel 0 - 39

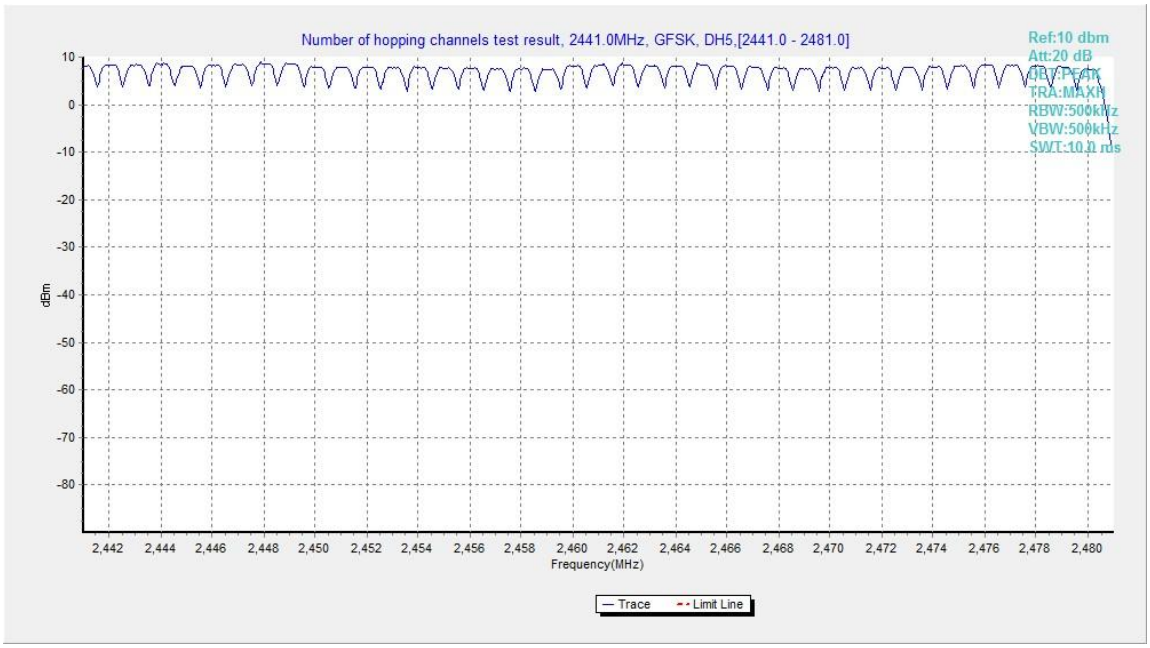



Fig.95. Number of hopping frequencies: GFSK, Channel 40 - 78

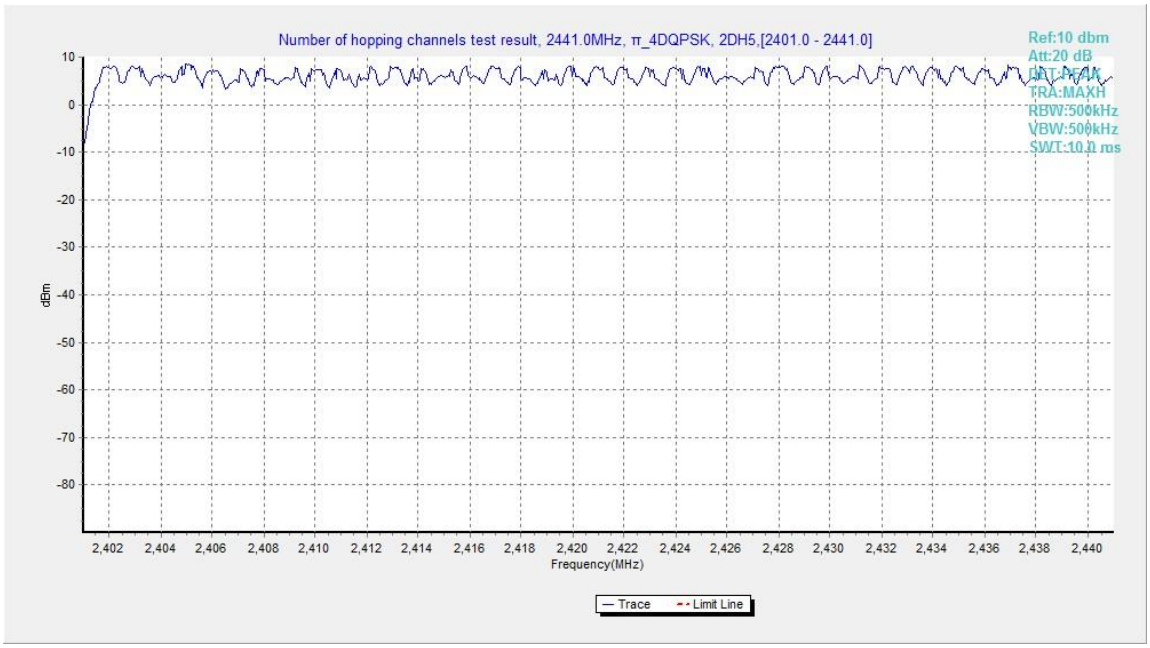



Fig.96. Number of hopping frequencies: π/4 DQPSK, Channel 0 - 39

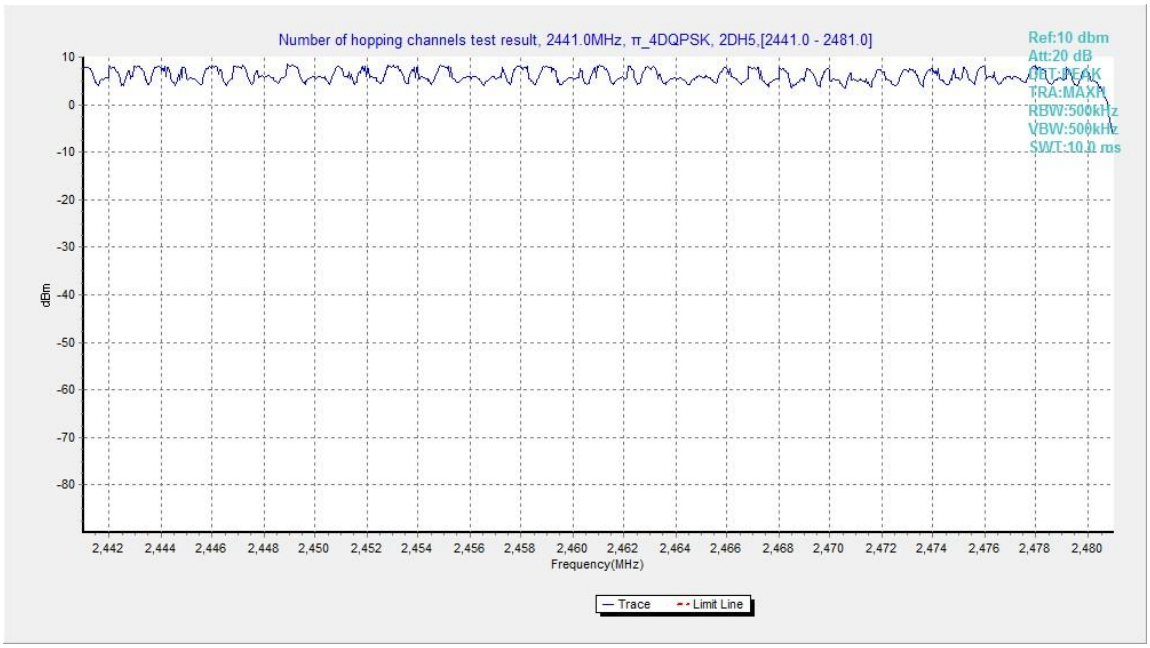



Fig.97. Number of hopping frequencies: π/4 DQPSK, Channel 40 - 78

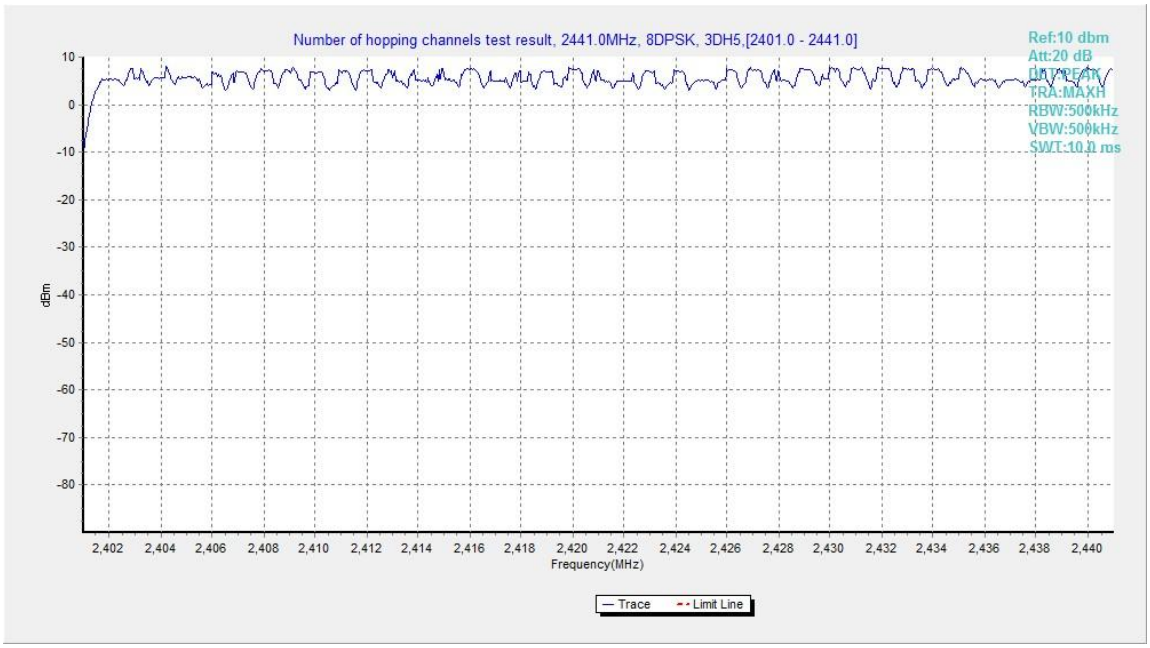



Fig.98. Number of hopping frequencies: 8DPSK, Channel 0 - 39

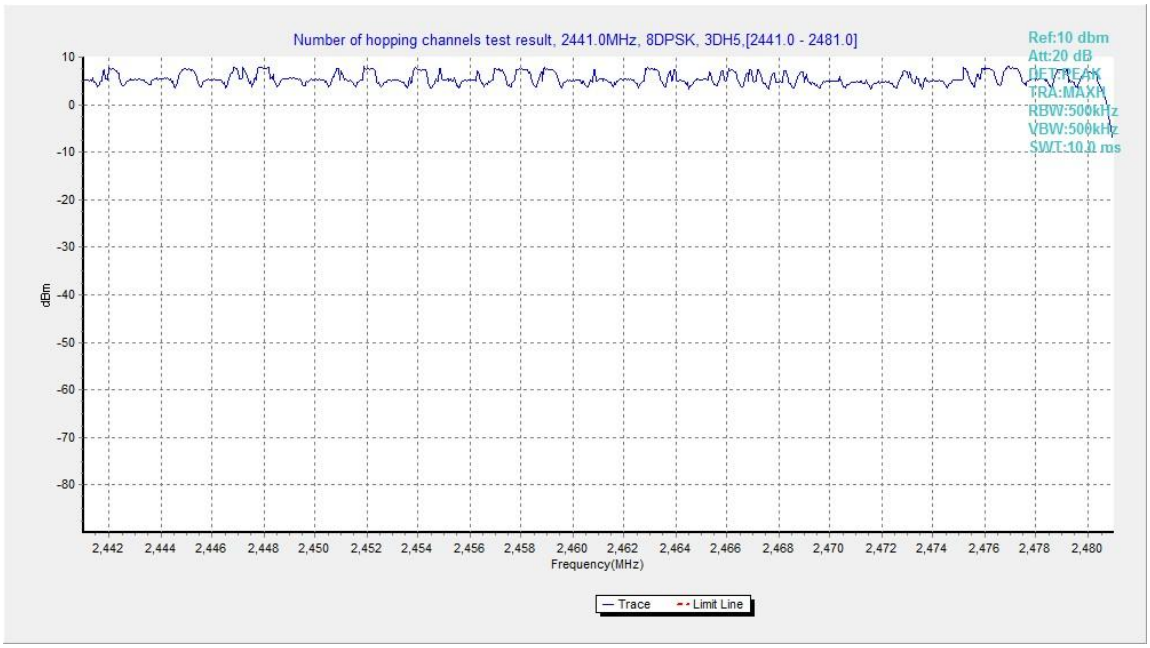



Fig.99. Number of hopping frequencies: 8DPSK, Channel 40 - 78

## 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)**

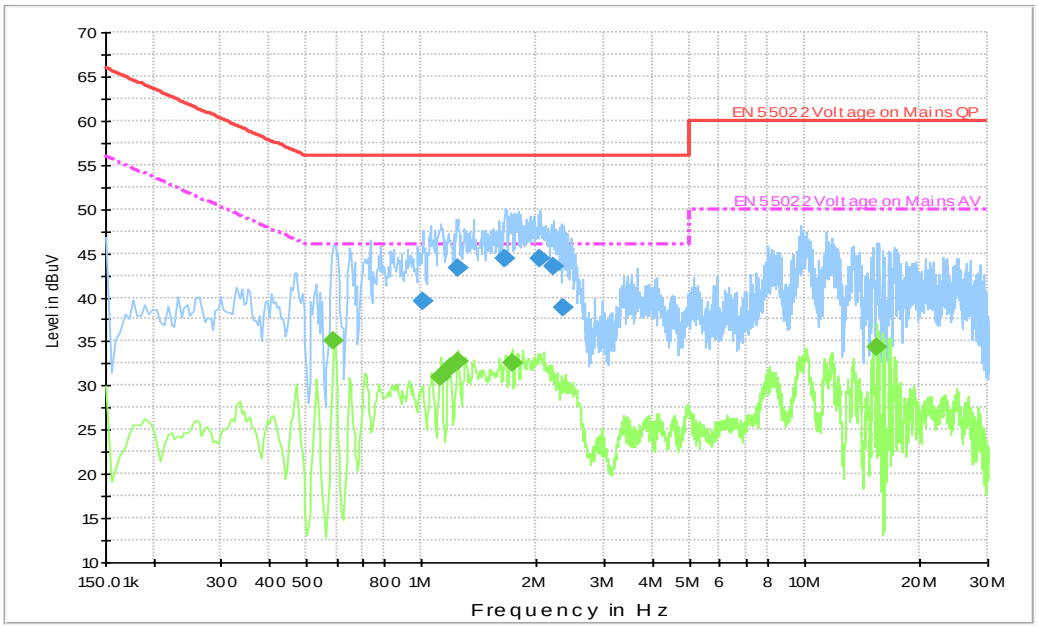
| Frequency range (MHz) | Average Limit (dBμV) | Conclusion |
|---|---|---|
| 0.15 to 0.5 | 56 to 46 | P |
| 0.5 to 5 | 46 | |
| 5 to 30 | 50 | |
| NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz. | | |

The measurement is made according to ANSI C63.10

**Conclusion: PASS**

**Test graphs as below:**

**Traffic:**



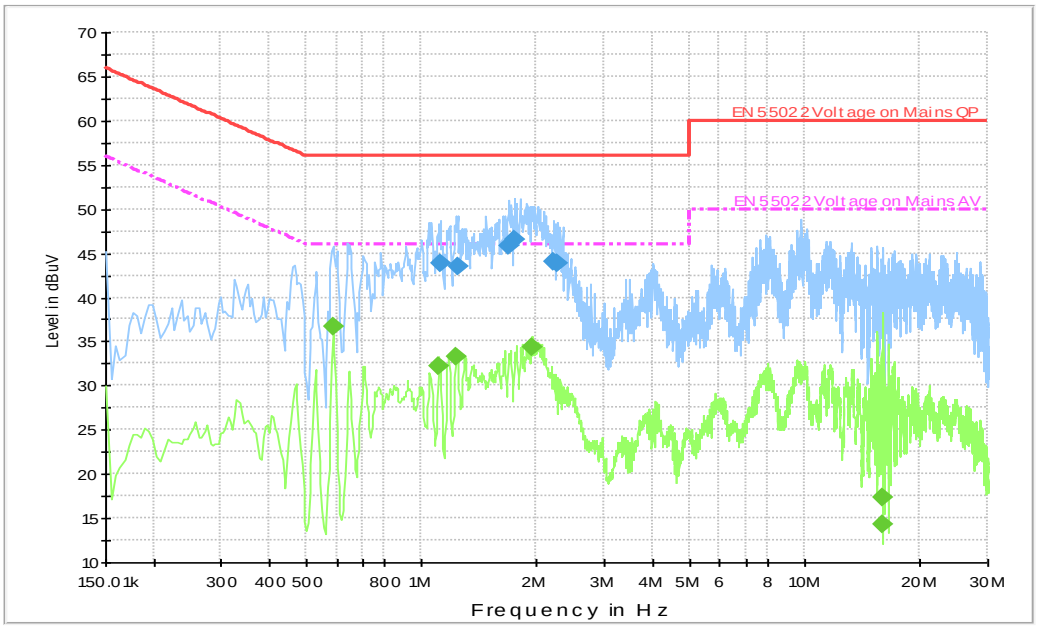

## Final Result 1

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

## Final Result 2

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

**Idle:**




## Final Result 1

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

## Final Result 2

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

## ANNEX E: Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

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).*

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

*For the National Voluntary Laboratory Accreditation Program*

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