

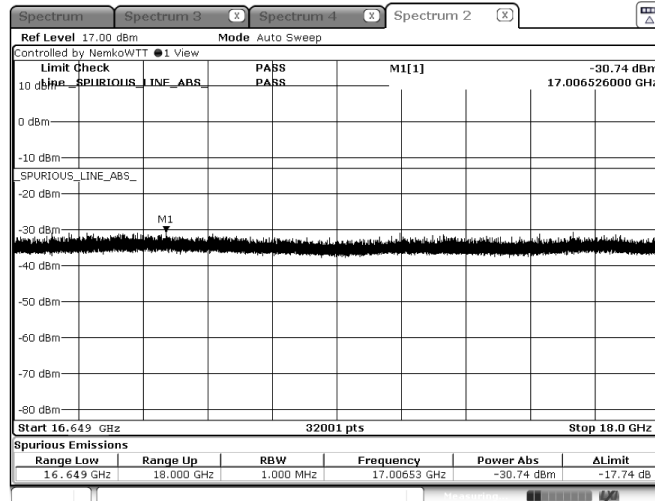


Figure 8.4-33: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), Middle channel: 16.15 GHz, longest pulse. (200 MHz BW)

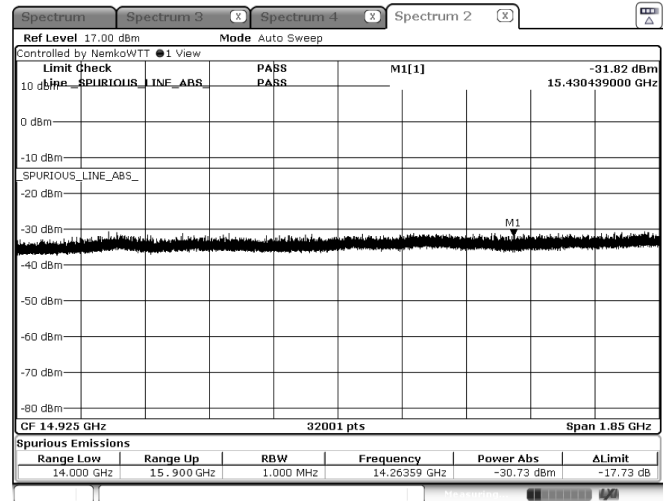


Figure 8.4-34: Emission mask, beyond $\pm 250\%$ of BW (low frequency range), High channel: 16.40 GHz, longest pulse. (200 MHz BW)

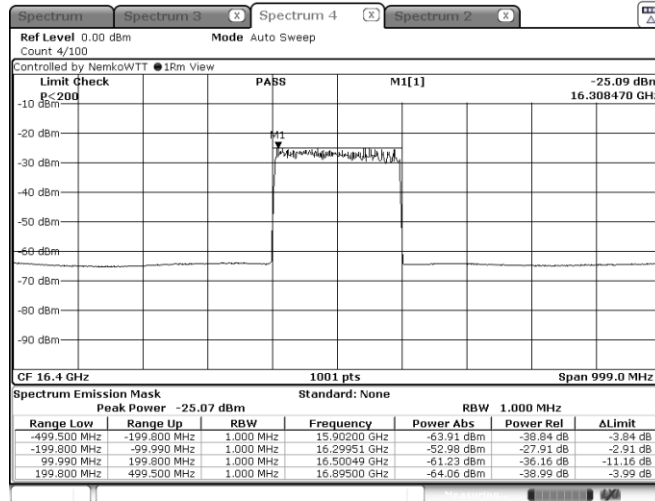


Figure 8.4-35: Emission mask, High channel: 16.40 GHz, longest pulse. (200 MHz BW)

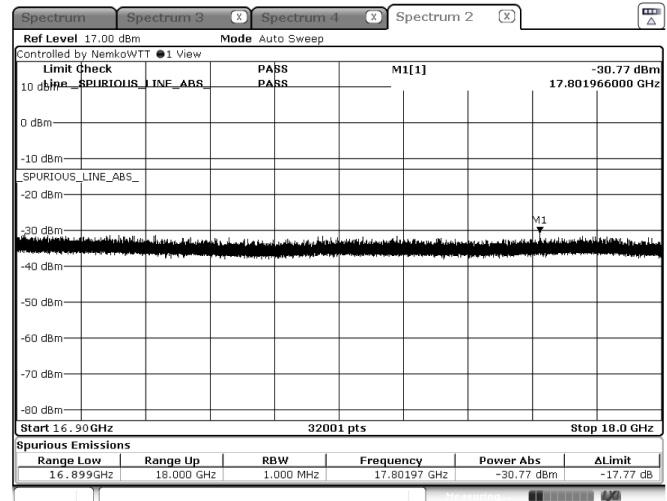


Figure 8.4-36: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), High channel: 16.40 GHz, longest pulse. (200 MHz BW)

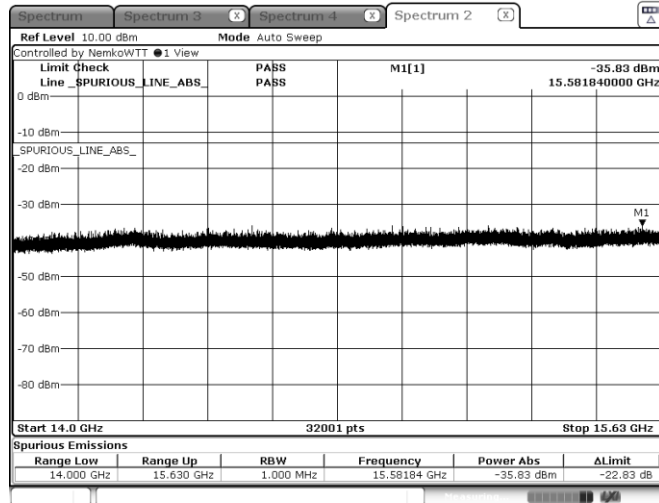


Figure 8.4-37: Emission mask, beyond $\pm 250\%$ of BW (low frequency range), Low channel: 15.75 GHz, shortest pulse. (25 MHz BW)

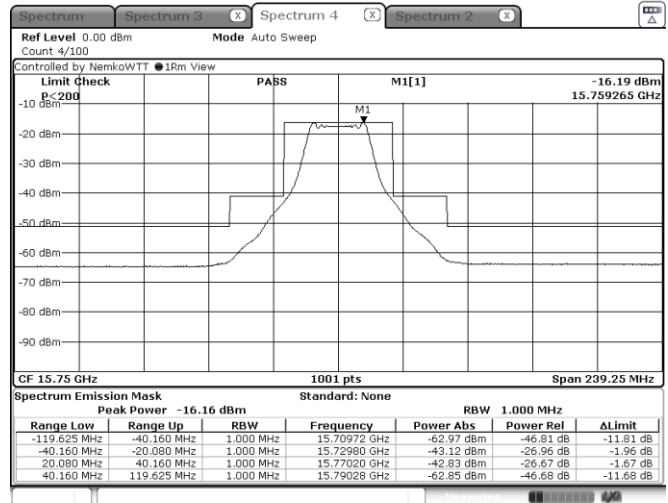


Figure 8.4-38: Emission mask, Low channel: 15.75 GHz, shortest pulse. (25 MHz BW)

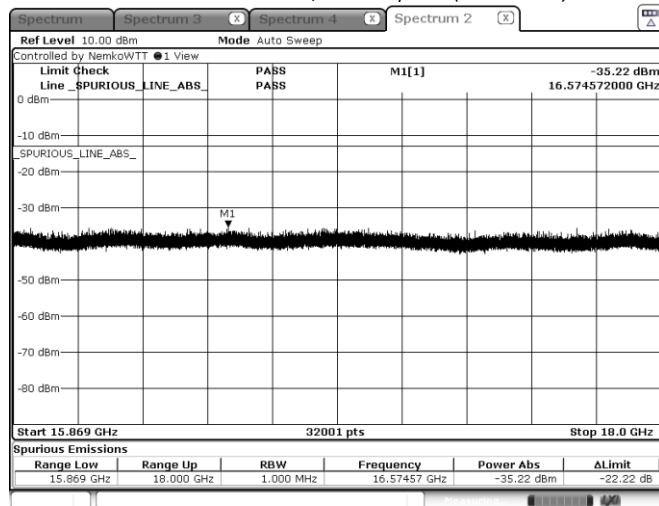


Figure 8.4-39: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), Low channel: 15.75 GHz, shortest pulse. (25 MHz BW)

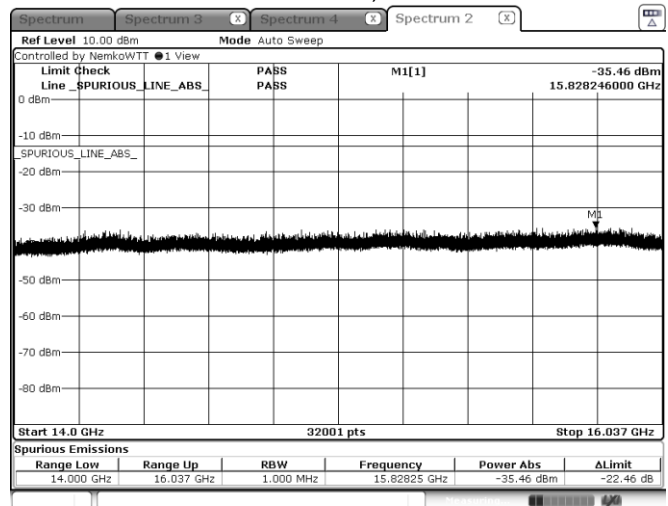


Figure 8.4-40: Emission mask, beyond $\pm 250\%$ of BW (low frequency range), Middle channel: 16.15 GHz, shortest pulse. (25 MHz BW)

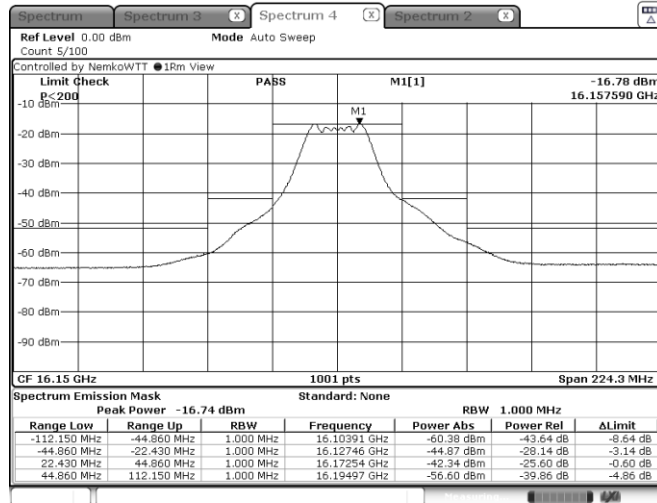


Figure 8.4-41: Emission mask, Middle channel: 16.15 GHz, shortest pulse. (25 MHz BW)

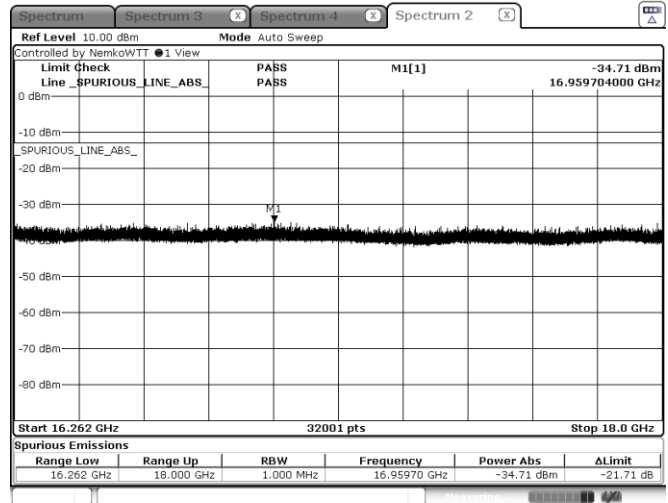


Figure 8.4-42: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), Middle channel: 16.15 GHz, shortest pulse. (25 MHz BW)

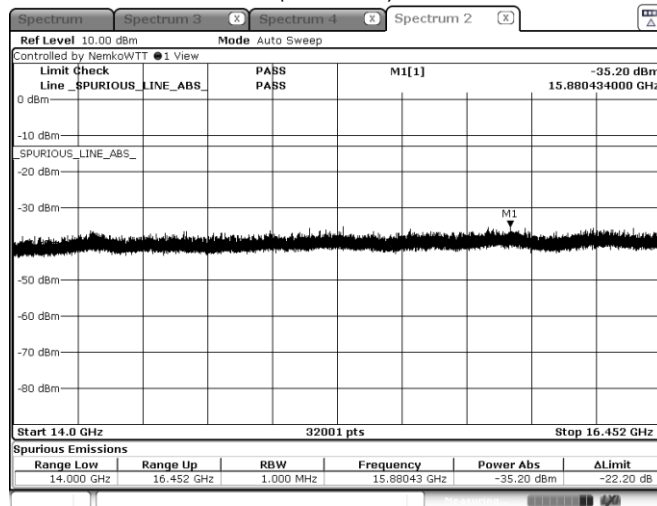


Figure 8.4-43: Emission mask, beyond $\pm 250\%$ of BW (low frequency range), High channel: 16.55 GHz, shortest pulse. (25 MHz BW)

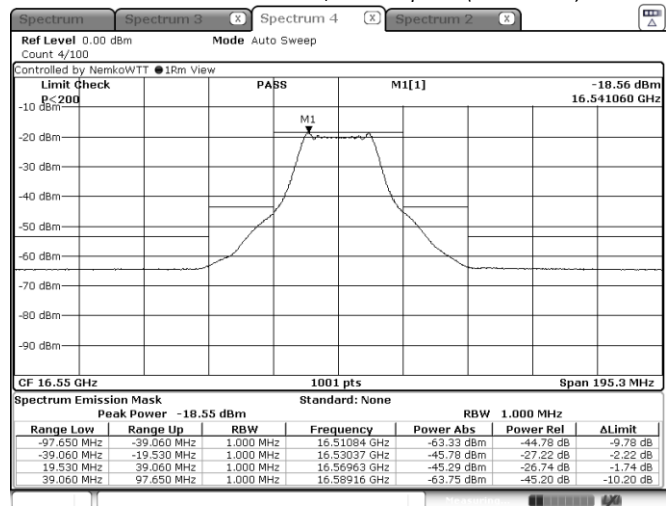


Figure 8.4-44: Emission mask, High channel: 16.55 GHz, shortest pulse. (25 MHz BW)

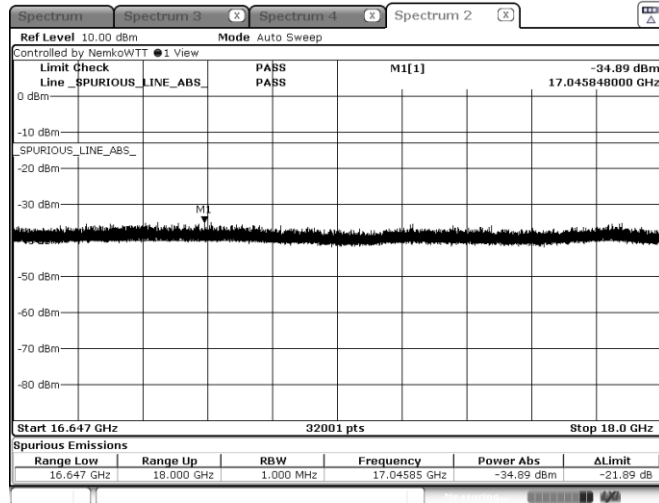


Figure 8.4-45: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), High channel: 16.55 GHz, shortest pulse. (25 MHz BW)

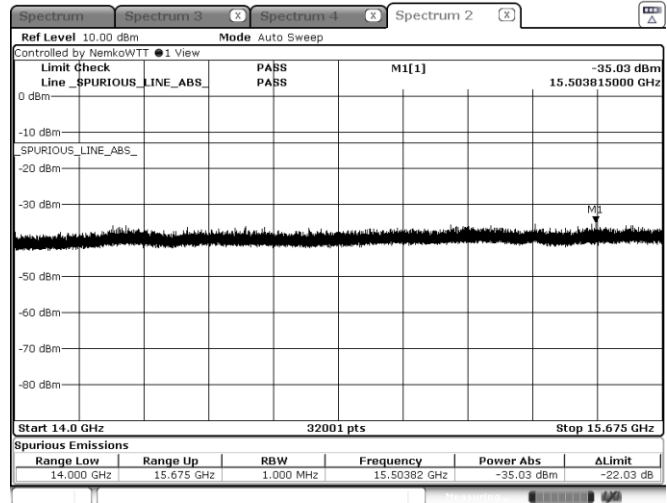


Figure 8.4-46: Emission mask, beyond $\pm 250\%$ of BW (low frequency range), Low channel: 15.80 GHz, shortest pulse. (50 MHz BW)

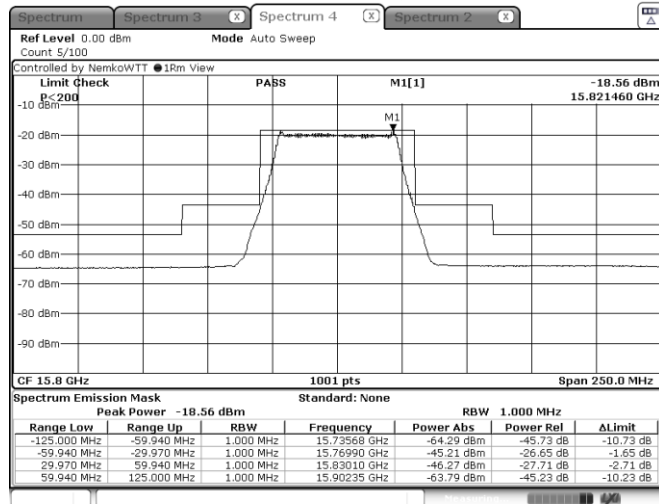


Figure 8.4-47: Emission mask, Low channel: 15.80 GHz, shortest pulse. (50 MHz BW)

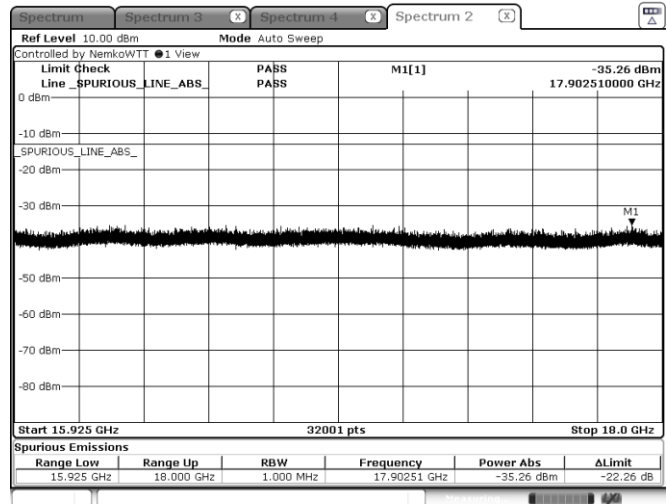


Figure 8.4-48: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), Low channel: 15.80 GHz, shortest pulse. (50 MHz BW)

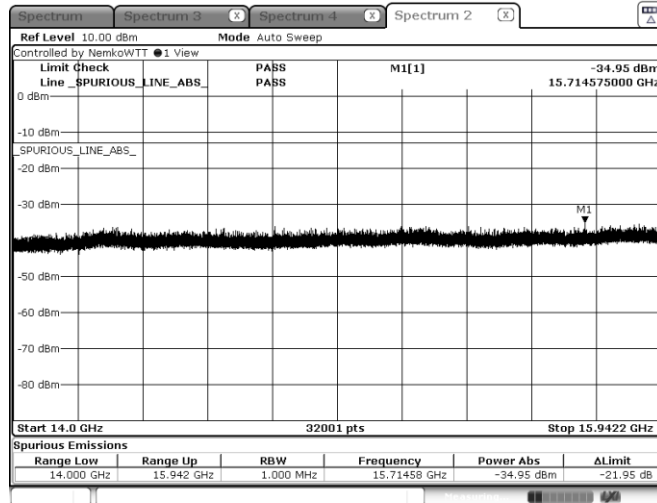


Figure 8.4-49: Emission mask, beyond $\pm 250\%$ of BW (low frequency range), Middle channel: 16.15 GHz, shortest pulse. (50 MHz BW)

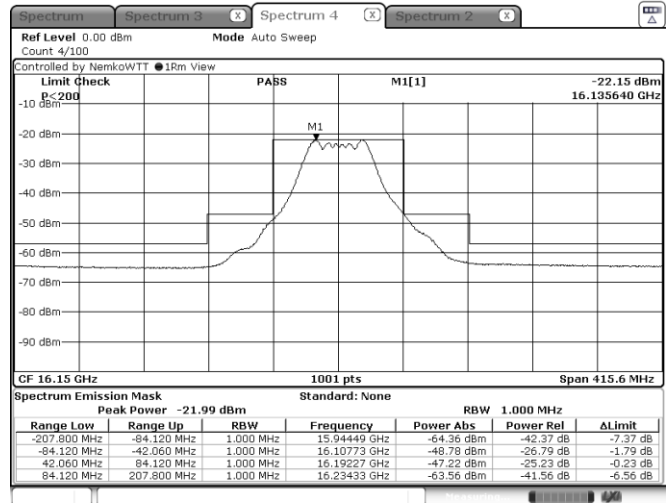


Figure 8.4-50: Emission mask, Middle channel: 16.15 GHz, I shortest pulse. (50 MHz BW)

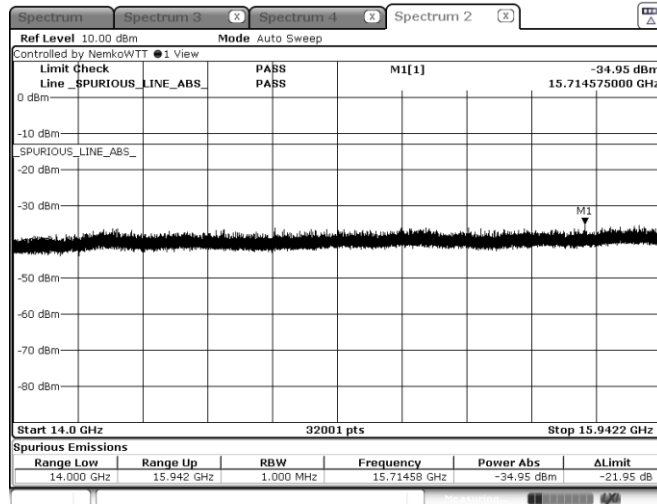


Figure 8.4-51: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), Middle channel: 16.15 GHz, shortest pulse. (50 MHz BW)

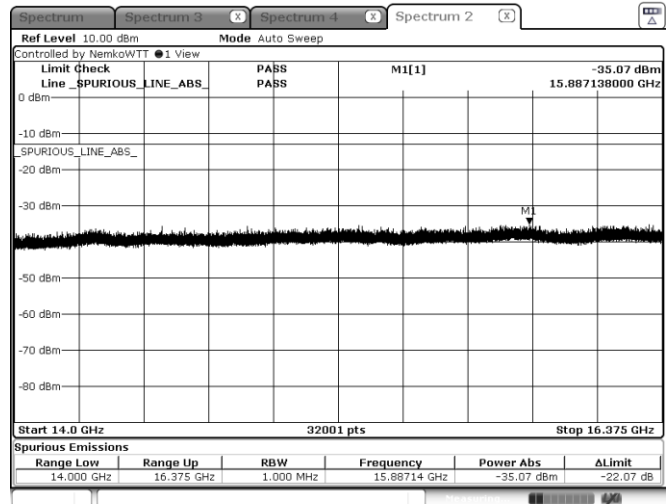


Figure 8.4-52: Emission mask, beyond $\pm 250\%$ of BW (low frequency range), High channel: 16.50 GHz, shortest pulse. (50 MHz BW)

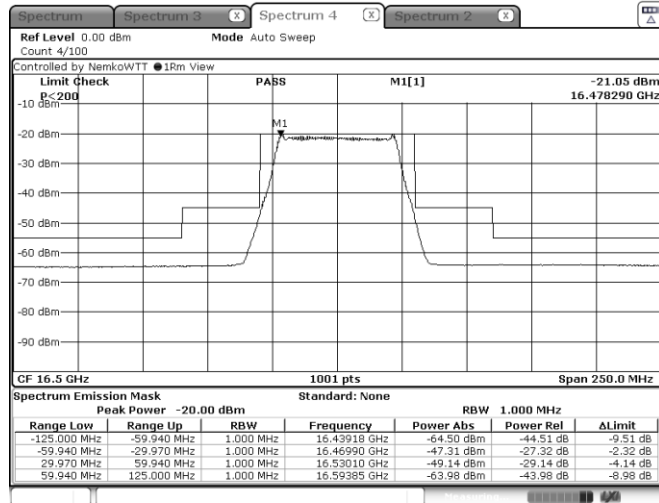


Figure 8.4-53: Emission mask, High channel: 16.50 GHz, shortest pulse. (50 MHz BW)

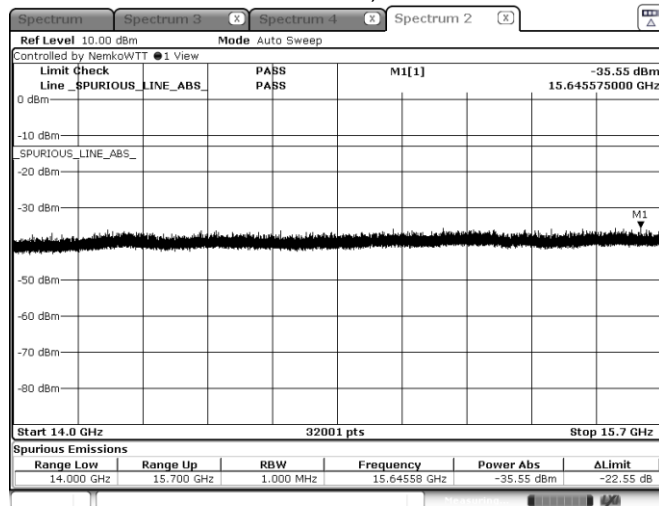


Figure 8.4-55: Emission mask, beyond ±250% of BW (low frequency range), Low channel: 15.85 GHz, shortest pulse. (100 MHz BW)

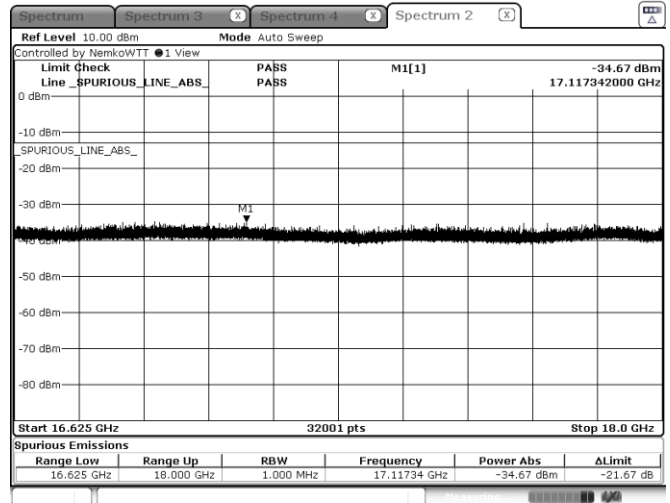


Figure 8.4-54: Emission mask, beyond ±250% of BW (high frequency range), High channel: 16.50 GHz, shortest pulse. (50 MHz BW)

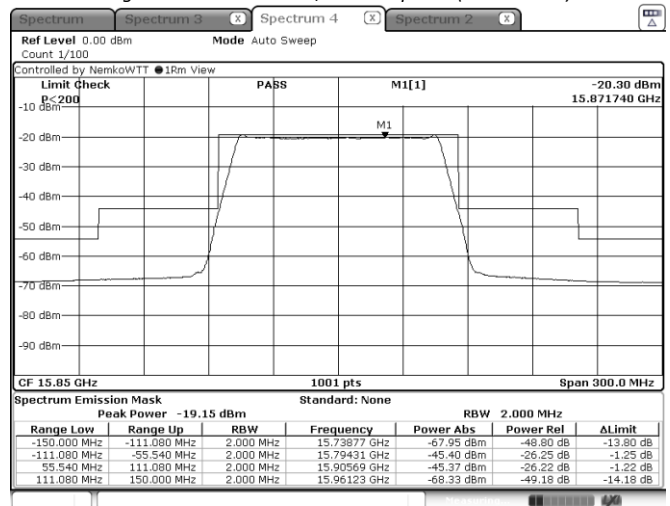


Figure 8.4-56: Emission mask, Low channel: 15.85 GHz, shortest pulse. (100 MHz BW)

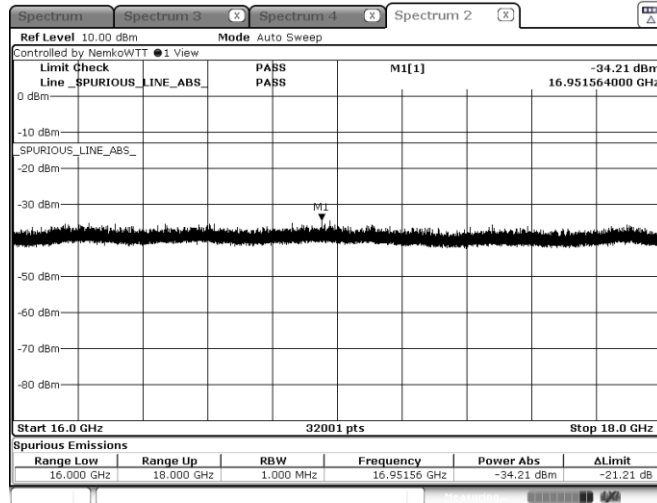


Figure 8.4-57: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), Low channel: 15.85 GHz, shortest pulse. (100 MHz BW)

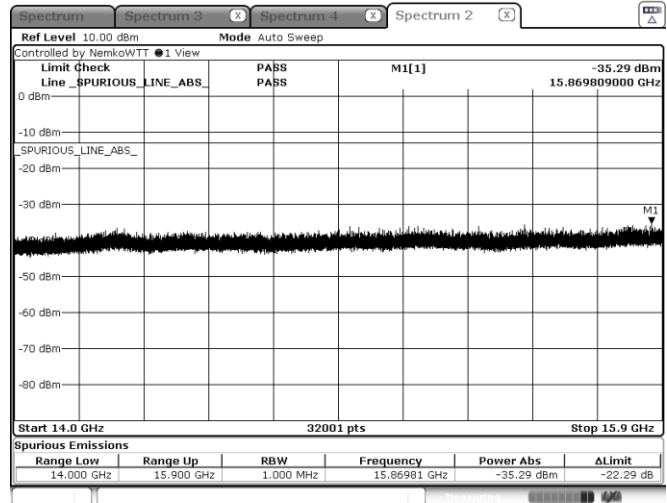


Figure 8.4-58: Emission mask, beyond $\pm 250\%$ of BW (low frequency range), Middle channel: 16.15 GHz, shortest pulse. (100 MHz BW)

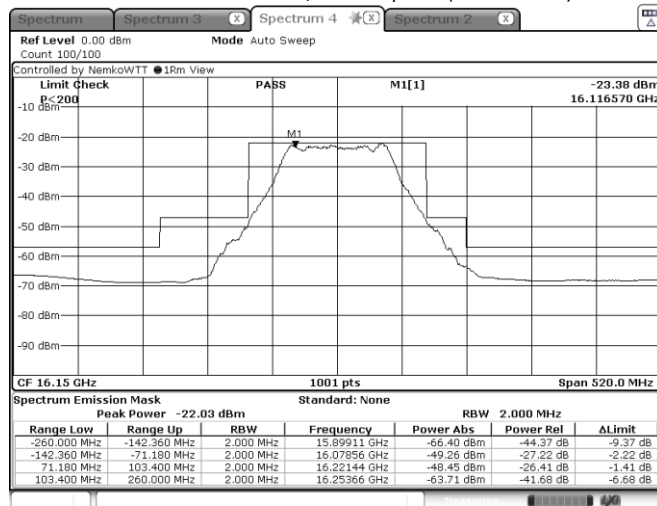


Figure 8.4-59: Emission mask, Middle channel: 16.15 GHz, shortest pulse. (100 MHz BW)

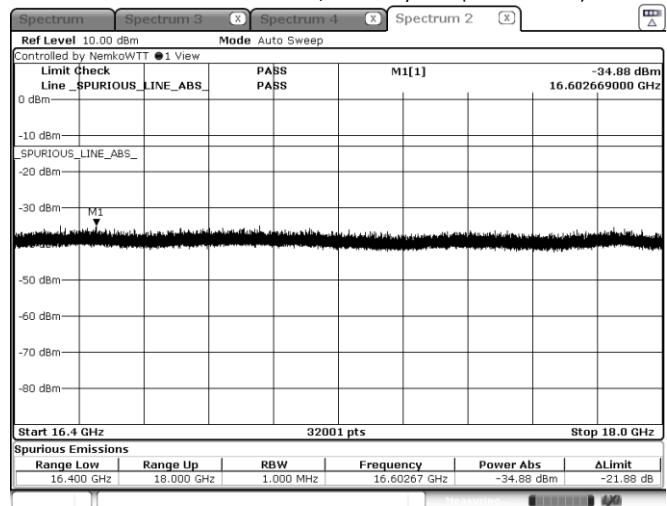


Figure 8.4-60: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), Middle channel: 16.15 GHz, shortest pulse. (100 MHz BW)

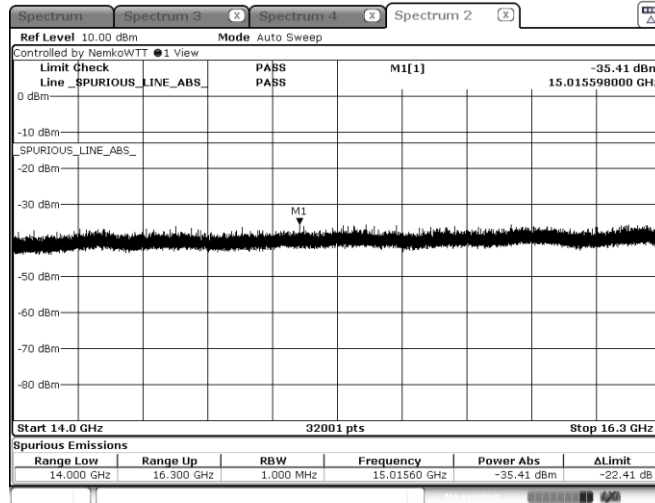


Figure 8.4-61: Emission mask, beyond $\pm 250\%$ of BW (low frequency range), High channel: 16.45 GHz, shortest pulse. (100 MHz BW)

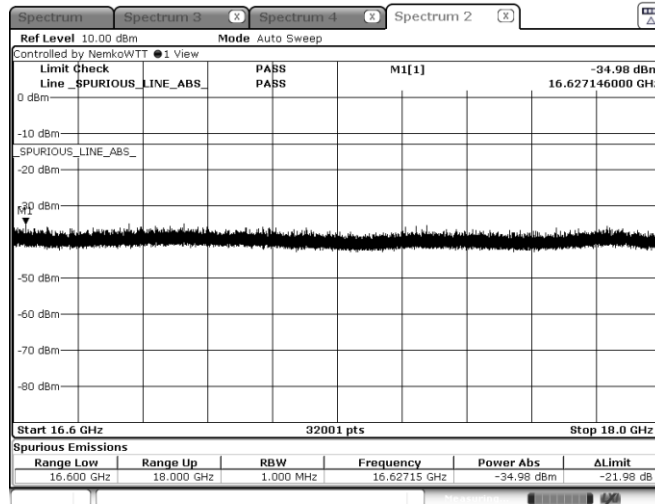


Figure 8.4-63: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), High channel: 16.45 GHz, shortest pulse. (100 MHz BW)

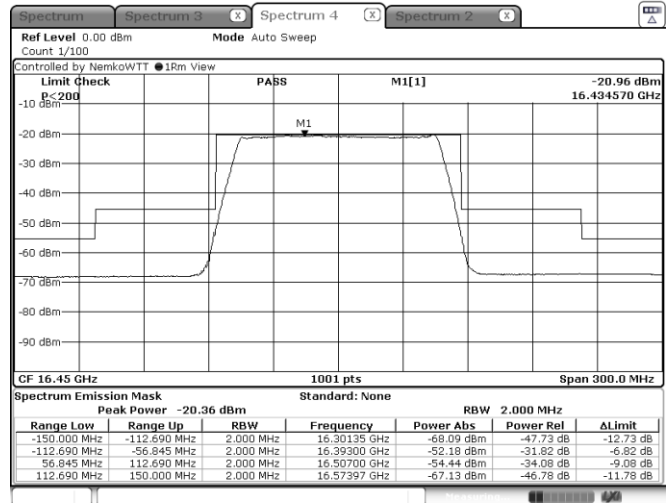


Figure 8.4-62: Emission mask, High channel: 16.45 GHz, shortest pulse. (100 MHz BW)

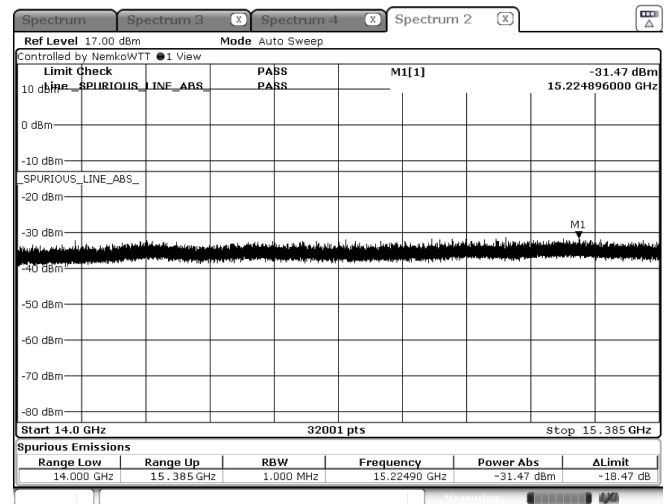


Figure 8.4-64: Emission mask, beyond $\pm 250\%$ of BW (low frequency range), Low channel: 15.90 GHz, shortest pulse. (200 MHz BW)

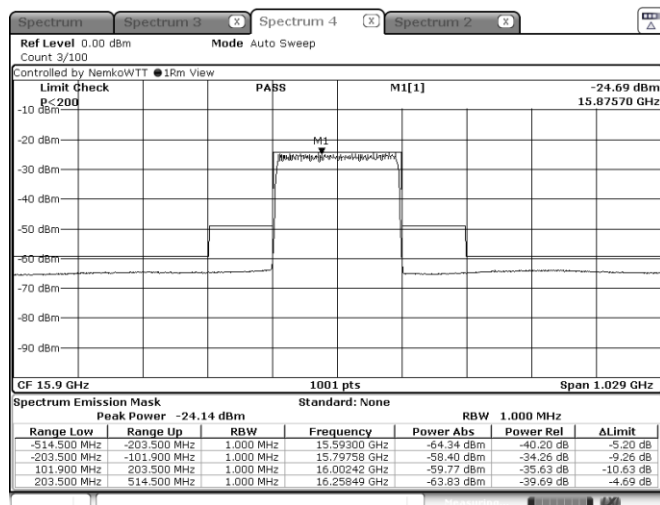


Figure 8.4-65: Emission mask, Low channel: 15.90 GHz, shortest pulse. (200 MHz BW)

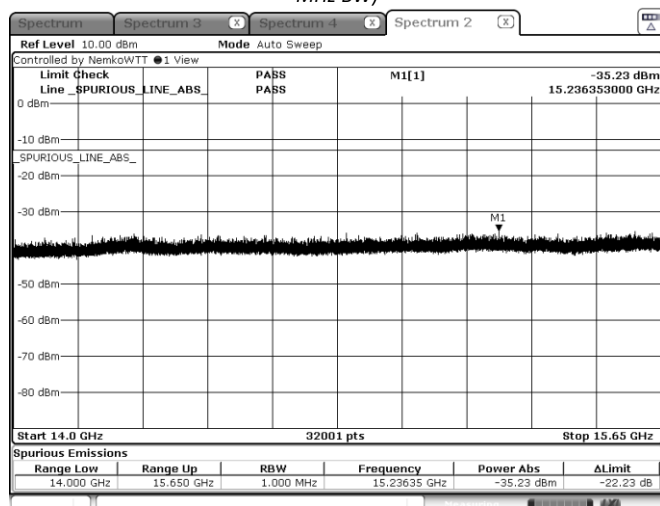


Figure 8.4-67: Emission mask, beyond $\pm 250\%$ of BW (low frequency range), Middle channel: 16.15 GHz, shortest pulse. (200 MHz BW)

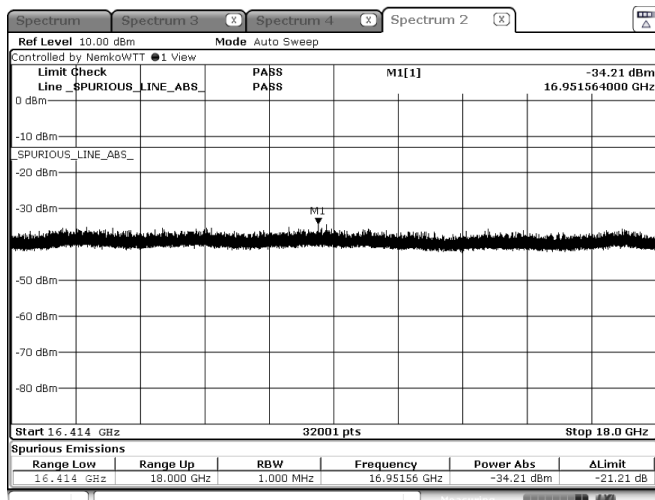


Figure 8.4-66: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), Low channel: 15.90 GHz, shortest pulse. (200 MHz BW)

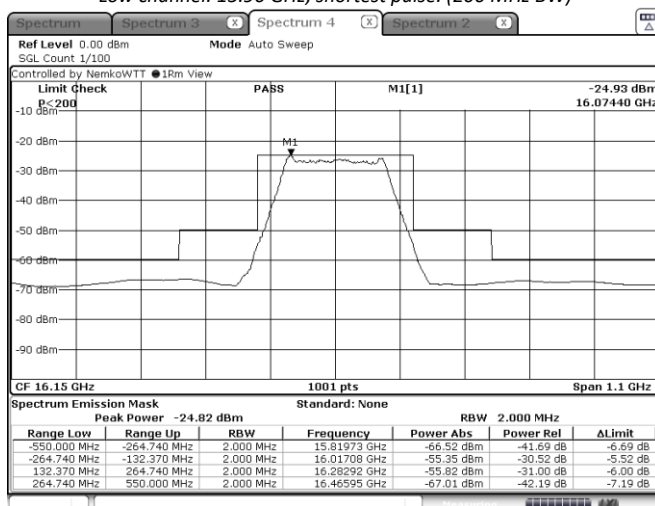


Figure 8.4-68: Emission mask, Middle channel: 16.15 GHz, shortest pulse. (200 MHz BW)

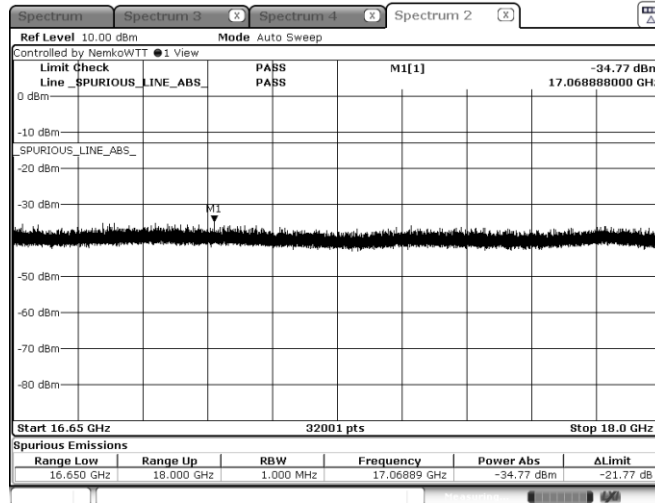


Figure 8.4-69: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), Middle channel: 16.15 GHz, shortest pulse. (200 MHz BW)

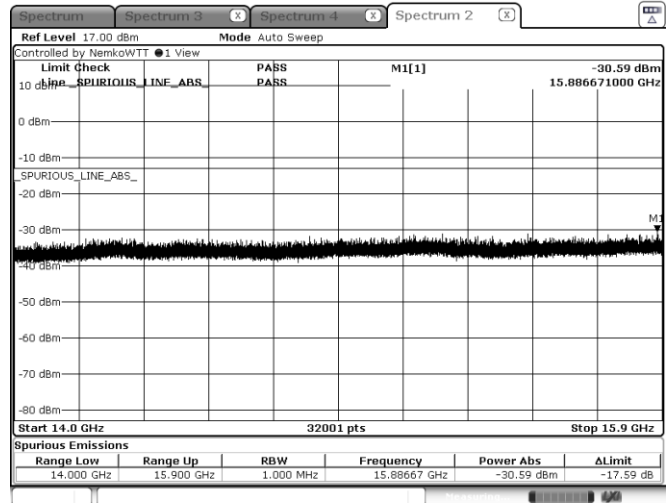


Figure 8.4-70: Emission mask, beyond $\pm 250\%$ of BW (low frequency range), High channel: 16.40 GHz, shortest pulse. (200 MHz BW)

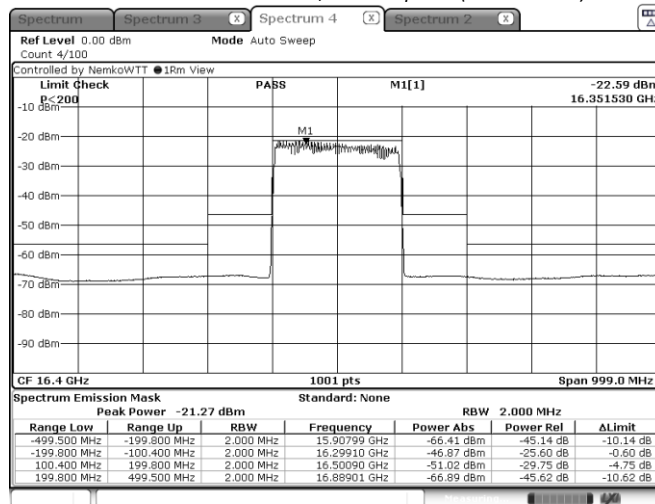


Figure 8.4-71: Emission mask, High channel: 16.40 GHz, shortest pulse. (200 MHz BW)

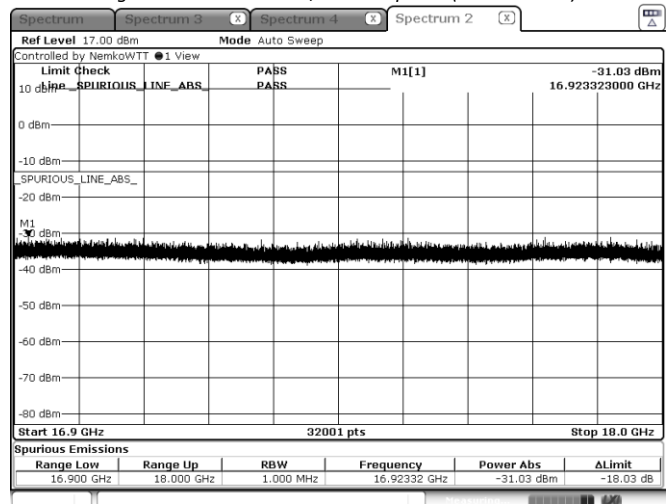


Figure 8.4-72: Emission mask, beyond $\pm 250\%$ of BW (high frequency range), High channel: 16.40 GHz, shortest pulse. (200 MHz BW)

8.5 Transmitter spurious emissions

8.5.1 References and limits

- FCC 47 CFR Part 90: §90.210
- Test method: ANSI C63.26-2015 (5.5)
 - (a) Except for ELTs and when using single sideband (R3E, H3E, J3E), or frequency modulation (F9) or digital modulation (F9Y) for telemetry or telecommand in the 1435–1525 MHz, 2345–2395 MHz, or 5091–5150 MHz band or digital modulation (G7D) for differential GPS, the mean power of any emissions must be attenuated below the mean power of the transmitter (pY) as follows:

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

- FCC 47 CFR Part 2: §2.1057

(a) In all of the measurements set forth in §§ 2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:

(2) If the equipment operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

8.5.2 Test summary

Verdict	Pass		
Test date	September 9, 2024; September 10, 2024; September 11, 2024	Temperature	20°C; 18°C 20°C
Test engineer	Chenhao Ma, Wireless Test Technician	Air pressure	1002mbar; 1001mbar; 1001mbar
Test location	☐ Wireless bench ☒ Other: 3M Chamber	Relative humidity	59%; 56%; 58%

8.5.3 Notes

Testing was performed with the transmitter operating on a fixed channel at full power. Max power found in table 8.3-2 was selected as the representative case for this testing (wors case). Low, middle, and high channels were tested using the longest pulse and the 200 MHz declared bandwidth.

Due to the high power emitted by the EUT, several considerations were made to execute accuracy testing but avoiding the damage of the receiver system:

- 1) In the range from 1-18 GHz two low-pass filters in cascade were inserted between the receiving antenna a power amplifier with the purpose of attenuating the signal and maintaining the linearity of the power amplifier. The 1 dB cut frequency of these filters is at 14 GHz gaining attenuation at the interest frequencies around 100 dB and preserving an insertion loss of 2 dB average in the frequency range under investigation. The suppressed frequencies in this section were investigated previously in section 8.4.5 where the filter was not aggregated (frequency range from 14-18 GHz).
- 2) In the range from 18-40 GHz two high-pass filters in cascade were inserted between the receiving antenna a power amplifier with the purpose of attenuating the signal and maintaining the linearity of the power amplifier. The cut frequency of these filters is at 18 GHz, attenuating the interest frequencies signals with around 87 dB (minimum) and preserving an insertion loss of 2.5 dB average in the frequency range under investigation.
- 3) In the range above 40 GHz ranges no filters or amplifiers were used. Waveguide antennas provide enough carrier attenuation.

After calculation -13dBm=84.38dBμV/m below 1GHz
-13dBm=82.23dBμV/m above 1GHz

8.5.4 Setup details

EUT power input during test	28 V DC
EUT setup configuration	☒ Table-top (Above 1 GHz: 1.5 m) ☐ Floor standing ☒ Other: Tripod mounted (Below 1 GHz: 80 cm)
Antenna height variation	1–4 m
Turn table position	0–360°
Measurement details	A preview measurement was generated with receiver in continuous scan or sweep mode while the EUT was rotated, and antenna adjusted to maximize radiated emission. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

Receiver settings (below 1 GHz):

Resolution bandwidth	120 kHz
Video bandwidth	300 kHz
Detector mode	Peak (preview measurements) Quasi-peak (final measurements)
Trace mode	Max Hold
Measurement time	5000 ms (final measurements)

Receiver settings (from 1 -40 GHz):

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Average (final measurements)
Trace mode	Max Hold
Measurement time	5000 ms (final measurements)

Spectrum analyzer settings (above 40 GHz):

Resolution bandwidth	1 MHz
Video bandwidth	3 MHz
Detector mode	Average
Trace mode	Max Hold

8.5.5 Test data

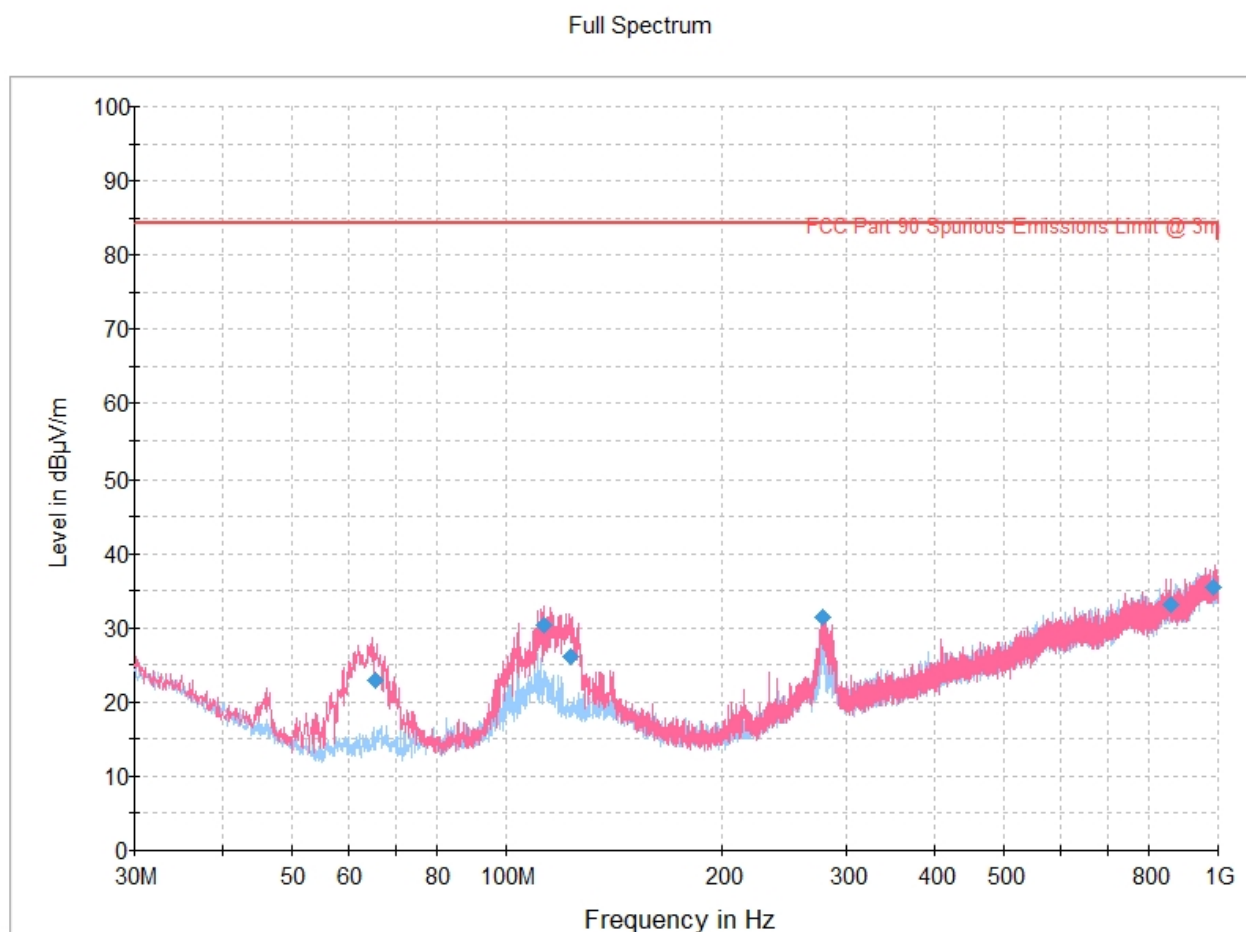


Figure 8.5-1: Radiated emissions spectral plot (30 MHz - 1 GHz) low channel

Table 8.5-1: Radiated emissions results

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
65.669000	22.85	84.38	61.53	5000.0	120.000	110.0	V	325.0	12.4
113.119000	30.29	84.38	54.09	5000.0	120.000	100.0	V	353.0	18.3
123.406000	26.17	84.38	58.21	5000.0	120.000	170.0	V	42.0	18.4
278.121000	31.34	84.38	53.04	5000.0	120.000	100.0	V	136.0	20.7
857.804000	33.12	84.38	51.26	5000.0	120.000	283.0	V	251.0	33.4
987.126000	35.46	84.38	48.93	5000.0	120.000	186.0	V	213.0	35.6

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

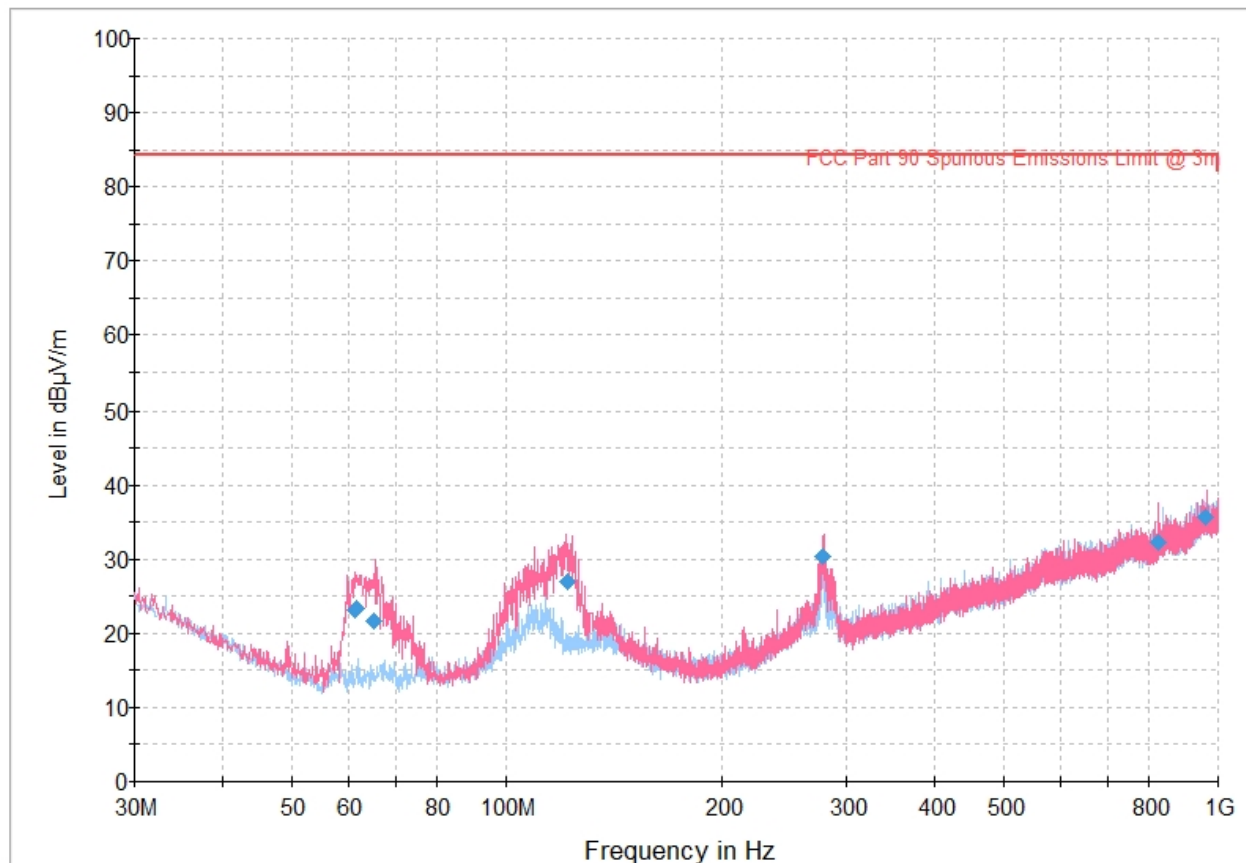


Figure 8.5-2: Radiated emissions spectral plot (30 MHz - 1 GHz) mid channel

Table 8.5-2: Radiated emissions results

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
61.159000	23.05	84.38	61.33	5000.0	120.000	137.0	V	296.0	12.2
61.596000	23.45	84.38	60.93	5000.0	120.000	131.0	V	0.0	12.2
65.199000	21.72	84.38	62.66	5000.0	120.000	124.0	V	54.0	12.4
122.111000	26.86	84.38	57.52	5000.0	120.000	158.0	V	56.0	18.4
278.005000	30.41	84.38	53.97	5000.0	120.000	127.0	V	113.0	20.7
823.624000	32.19	84.38	52.19	5000.0	120.000	279.0	V	0.0	32.4
962.438000	35.59	84.38	48.79	5000.0	120.000	208.0	V	78.0	35.7

Notes: ¹ Field strength (dBμV/m) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

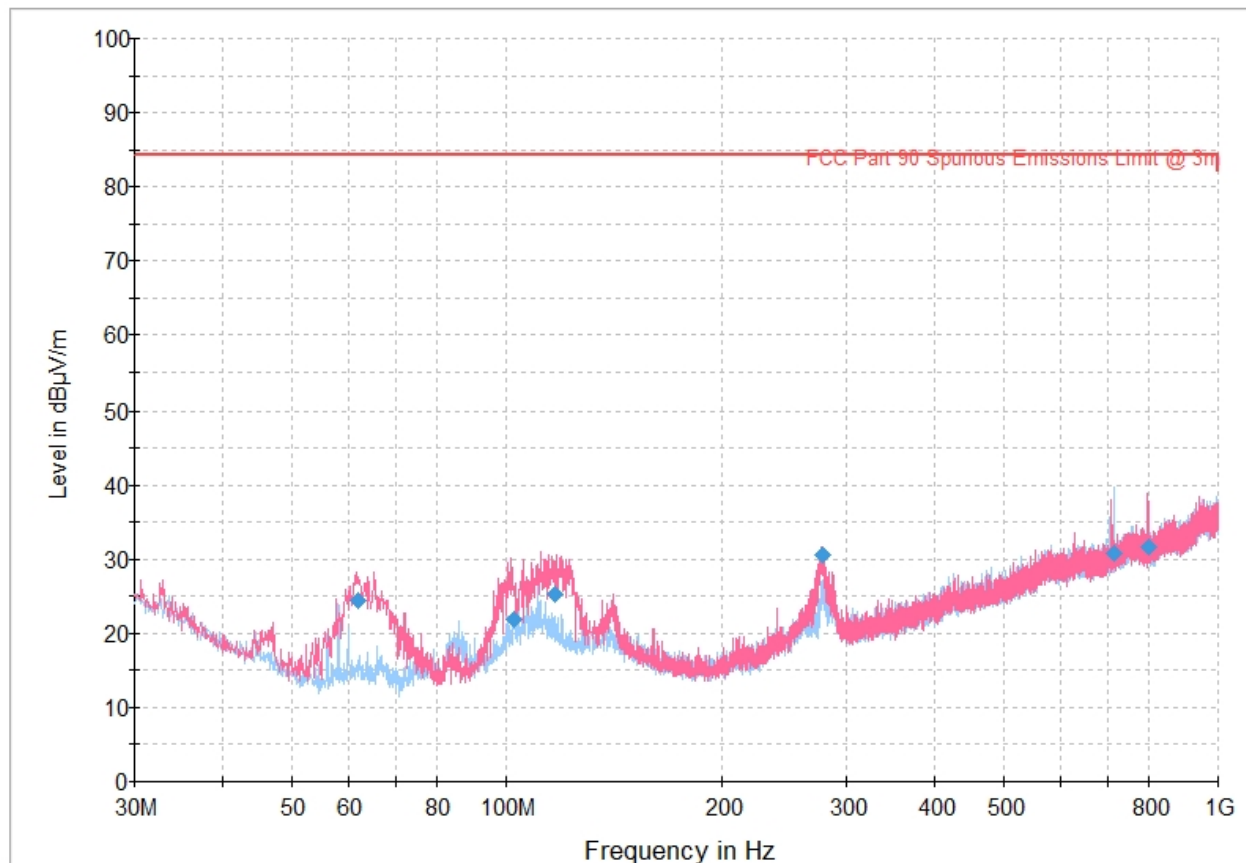


Figure 8.5-3: Radiated emissions spectral plot (30 MHz - 1 GHz) high channel

Table 8.5-3: Radiated emissions results

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
61.896000	24.35	84.38	60.03	5000.0	120.000	154.0	V	11.0	12.2
102.889000	21.94	84.38	62.44	5000.0	120.000	110.0	V	202.0	17.5
117.419000	25.32	84.38	59.06	5000.0	120.000	100.0	V	194.0	18.4
277.617000	30.55	84.38	53.83	5000.0	120.000	104.0	V	125.0	20.6
713.018000	30.71	84.38	53.67	5000.0	120.000	318.0	H	66.0	30.8
797.214000	31.66	84.38	52.72	5000.0	120.000	141.0	V	78.0	31.8

Notes: ¹ Field strength (dBμV/m) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

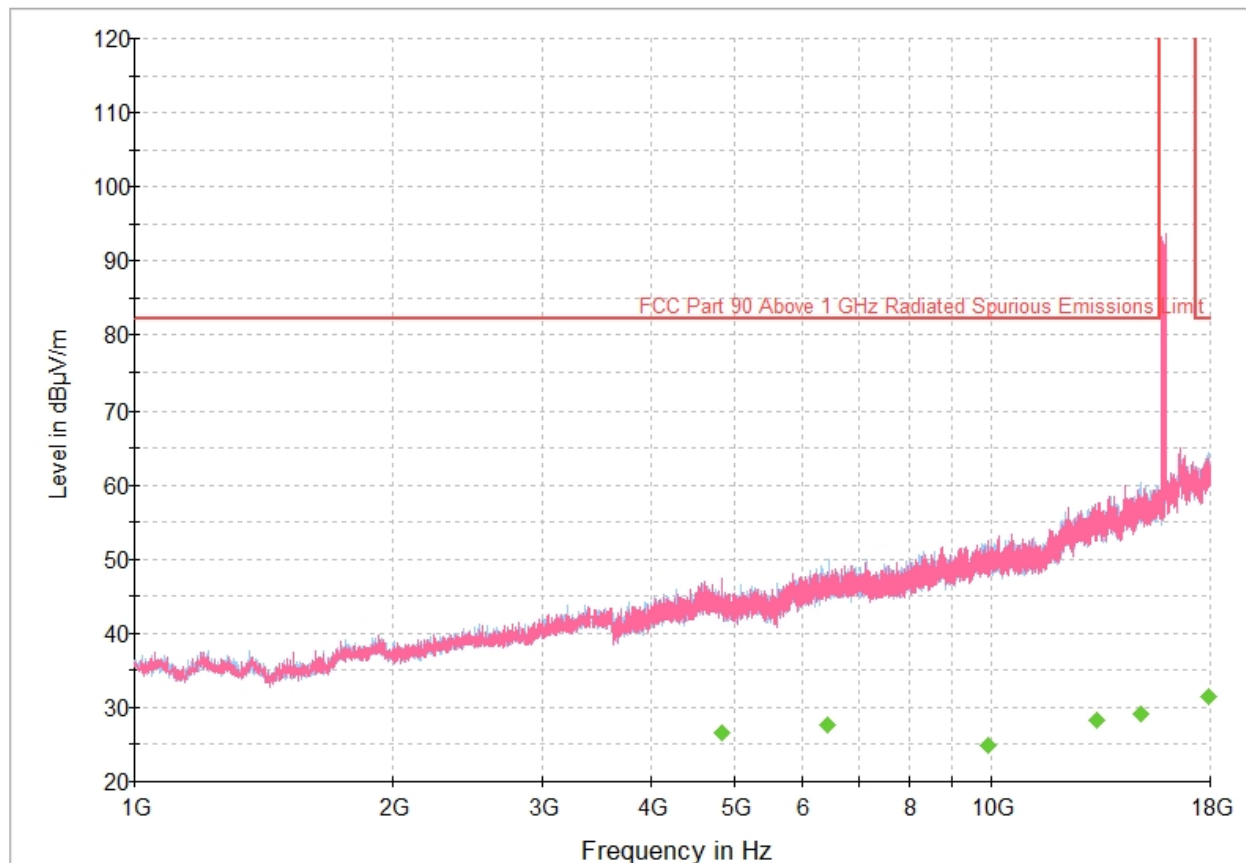


Figure 8.5-4: Radiated emissions spectral plot (1 GHz - 18 GHz) low channel

Table 8.5-4: Radiated emissions results

Frequency (MHz)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
4837.866667	26.65	82.23	55.58	5000.0	1000.000	165.0	V	331.0	-1.3
6436.144444	27.69	82.23	54.54	5000.0	1000.000	306.0	H	86.0	1.5
9890.300000	24.91	82.23	57.32	5000.0	1000.000	120.0	V	56.0	4.4
13290.411111	28.28	82.23	53.95	5000.0	1000.000	331.0	V	265.0	10.4
14928.411111	29.08	82.23	53.15	5000.0	1000.000	260.0	H	152.0	11.9
17918.044444	31.40	82.23	50.83	5000.0	1000.000	179.0	H	248.0	17.0

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
² Correction factors = antenna factor ACF (dB) + cable loss (dB)
³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

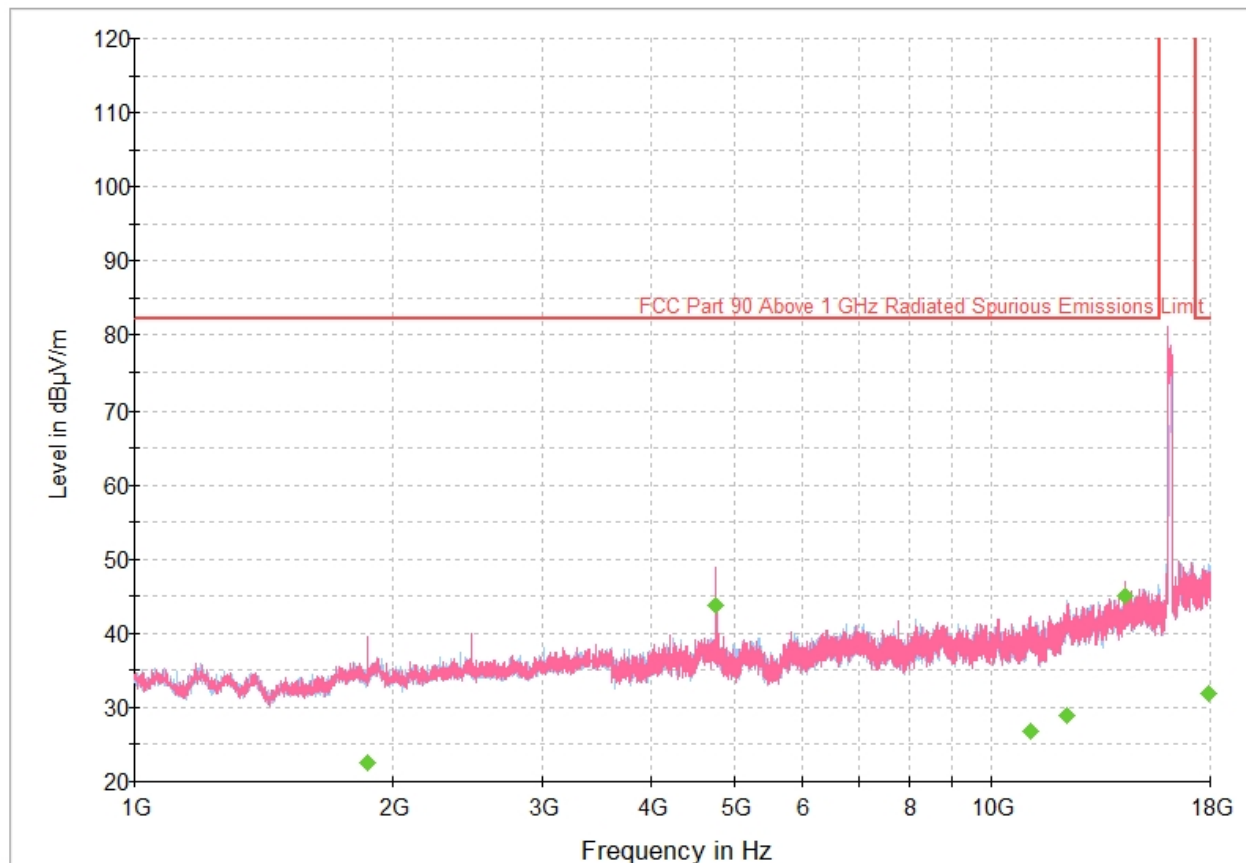


Figure 8.5-5: Radiated emissions spectral plot (1 GHz - 18 GHz) mid channel

Table 8.5-5: Radiated emissions results

Frequency (MHz)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1873.977778	22.53	82.23	59.70	5000.0	1000.000	142.0	V	0.0	-10.6
4766.444444	43.74	82.23	38.49	5000.0	1000.000	252.0	V	201.0	-1.1
11083.255556	26.77	82.23	55.46	5000.0	1000.000	231.0	V	0.0	5.4
12238.200000	28.91	82.23	53.32	5000.0	1000.000	168.0	H	287.0	8.9
14300.066667	45.02	82.23	37.21	5000.0	1000.000	194.0	V	0.0	11.5
17900.622222	31.86	82.23	50.37	5000.0	1000.000	144.0	H	230.0	17.0

Notes:

¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

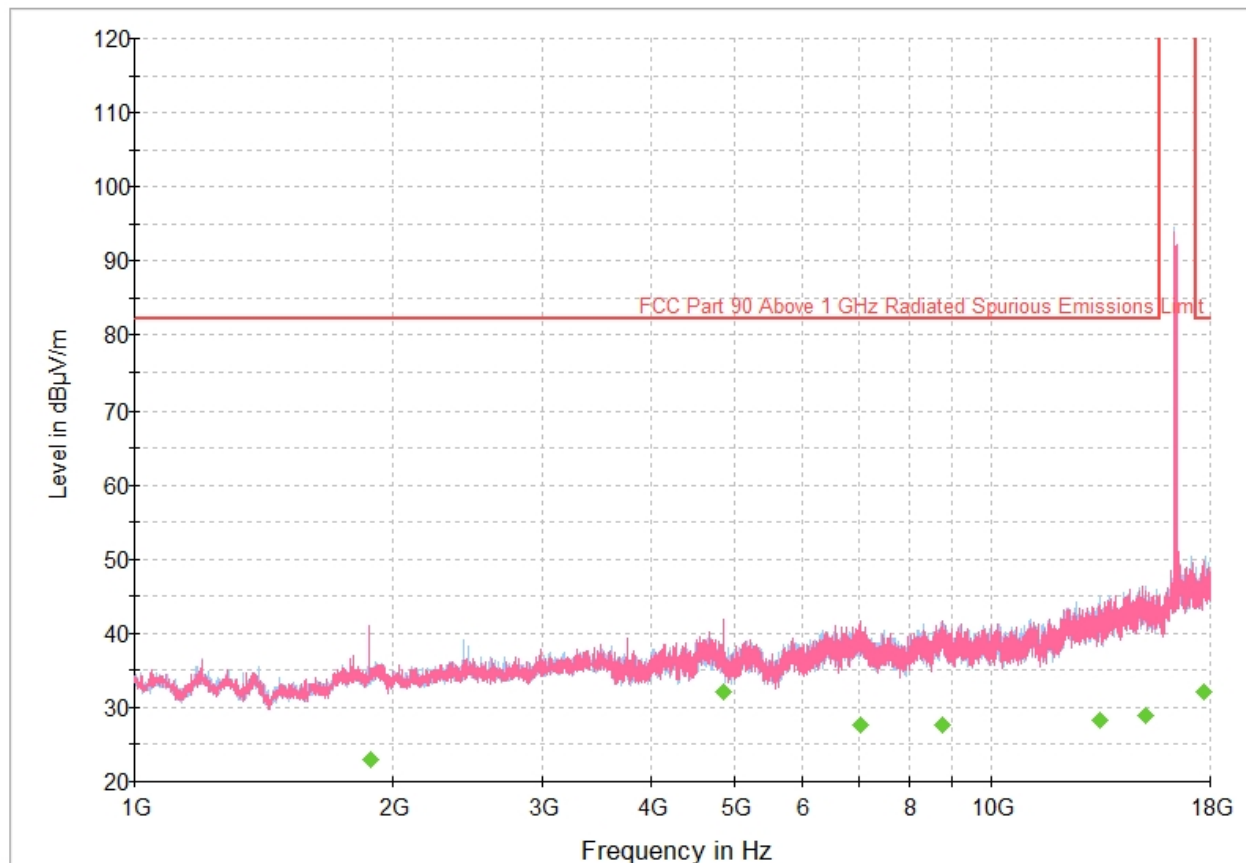


Figure 8.5-6: Radiated emissions spectral plot (1 GHz - 18 GHz) high channel

Table 8.5-6: Radiated emissions results

Frequency (MHz)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1888.655556	23.01	82.23	59.22	5000.0	1000.000	400.0	V	0.0	-10.4
4850.355556	32.18	82.23	50.05	5000.0	1000.000	193.0	V	194.0	-1.4
7015.055556	27.72	82.23	54.51	5000.0	1000.000	147.0	V	182.0	1.5
8760.500000	27.55	82.23	54.68	5000.0	1000.000	139.0	V	107.0	4.0
13368.288889	28.38	82.23	53.85	5000.0	1000.000	319.0	H	345.0	10.4
15115.122222	28.97	82.23	53.26	5000.0	1000.000	237.0	H	299.0	12.1
17732.388889	32.08	82.23	50.15	5000.0	1000.000	329.0	H	52.0	16.2

Notes: ¹ Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

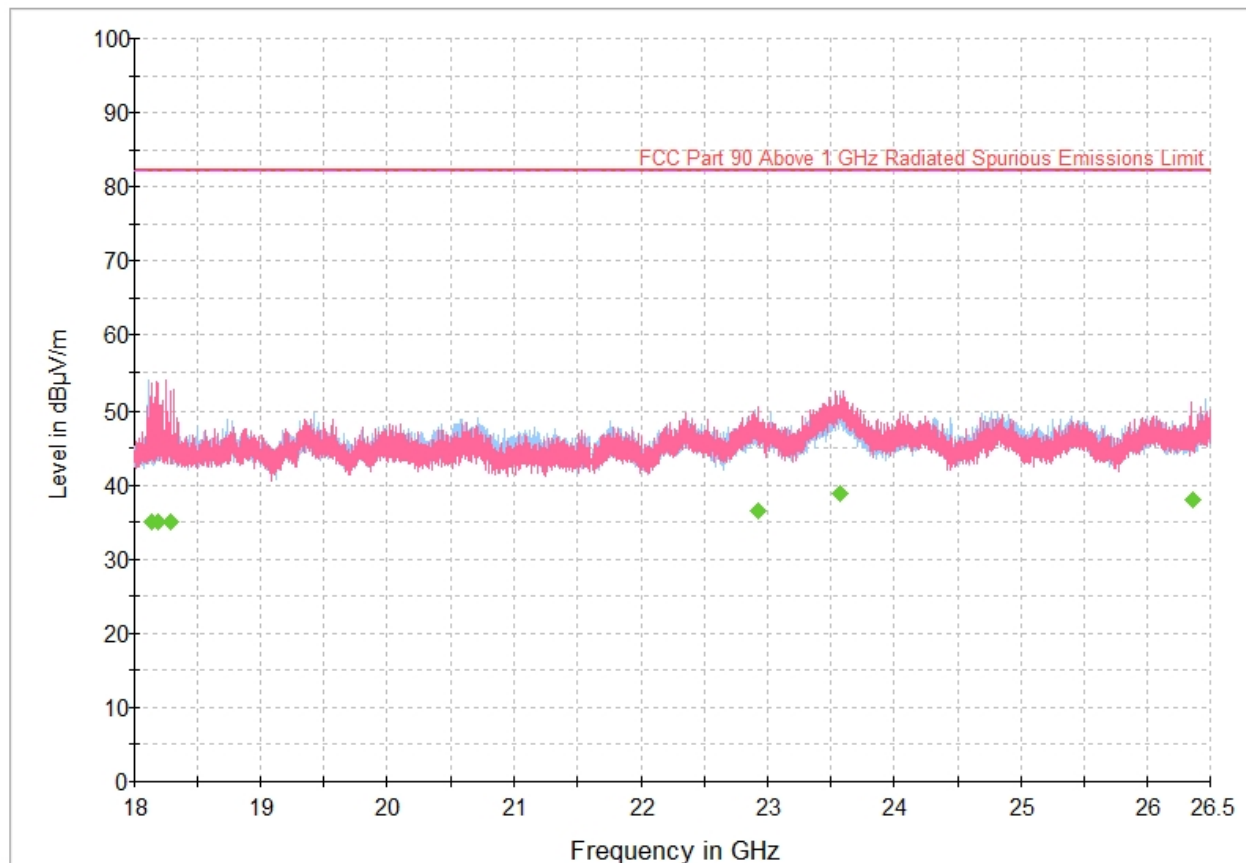


Figure 8.5-7: Radiated emissions spectral plot (18 GHz - 26.5 GHz) low channel

Table 8.5-7: Radiated emissions results

Frequency (MHz)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18140.987500	35.01	82.23	47.22	5000.0	1000.000	104.0	V	344.0	23.6
18184.381250	34.93	82.23	47.30	5000.0	1000.000	175.0	V	0.0	23.6
18283.606250	34.96	82.23	47.27	5000.0	1000.000	179.0	V	0.0	23.1
22919.837500	36.49	82.23	45.74	5000.0	1000.000	231.0	V	353.0	29.5
23567.956250	38.87	82.23	43.36	5000.0	1000.000	238.0	H	0.0	33.1
26357.206250	37.91	82.23	44.32	5000.0	1000.000	400.0	V	201.0	30.8

Notes:

¹ Field strength (dBμV/m) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

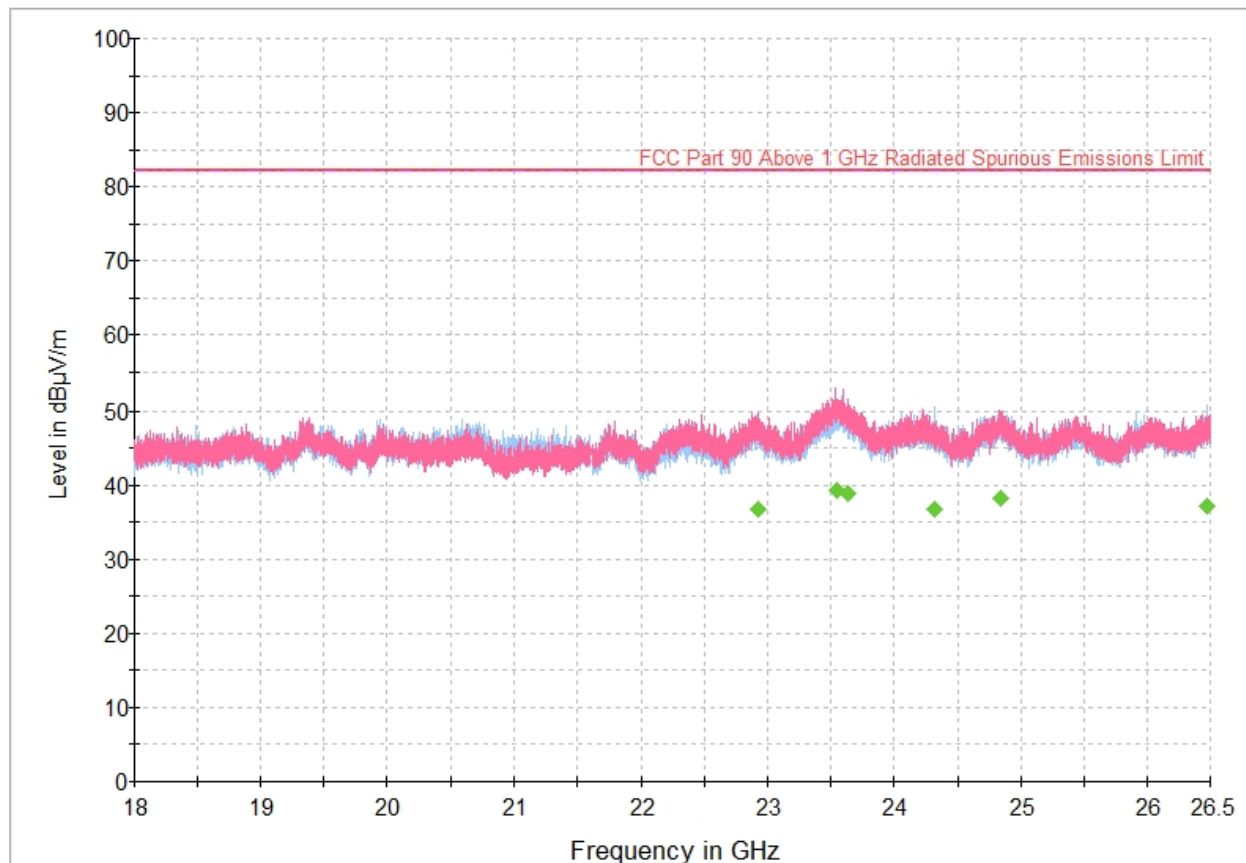


Figure 8.5-8: Radiated emissions spectral plot (18 GHz - 26.5 GHz) mid channel

Table 8.5-8: Radiated emissions results

Frequency (MHz)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
22924.493750	36.71	82.23	45.52	5000.0	1000.000	265.0	V	355.0	29.5
23546.087500	39.19	82.23	43.04	5000.0	1000.000	301.0	V	315.0	32.9
23632.237500	38.82	82.23	43.41	5000.0	1000.000	400.0	V	43.0	32.7
24318.468750	36.72	82.23	45.51	5000.0	1000.000	305.0	H	274.0	30.0
24840.493750	38.30	82.23	43.93	5000.0	1000.000	114.0	V	0.0	30.3
26470.162500	37.13	82.23	45.10	5000.0	1000.000	110.0	H	252.0	31.1

Notes:

¹ Field strength (dBμV/m) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

Full Spectrum

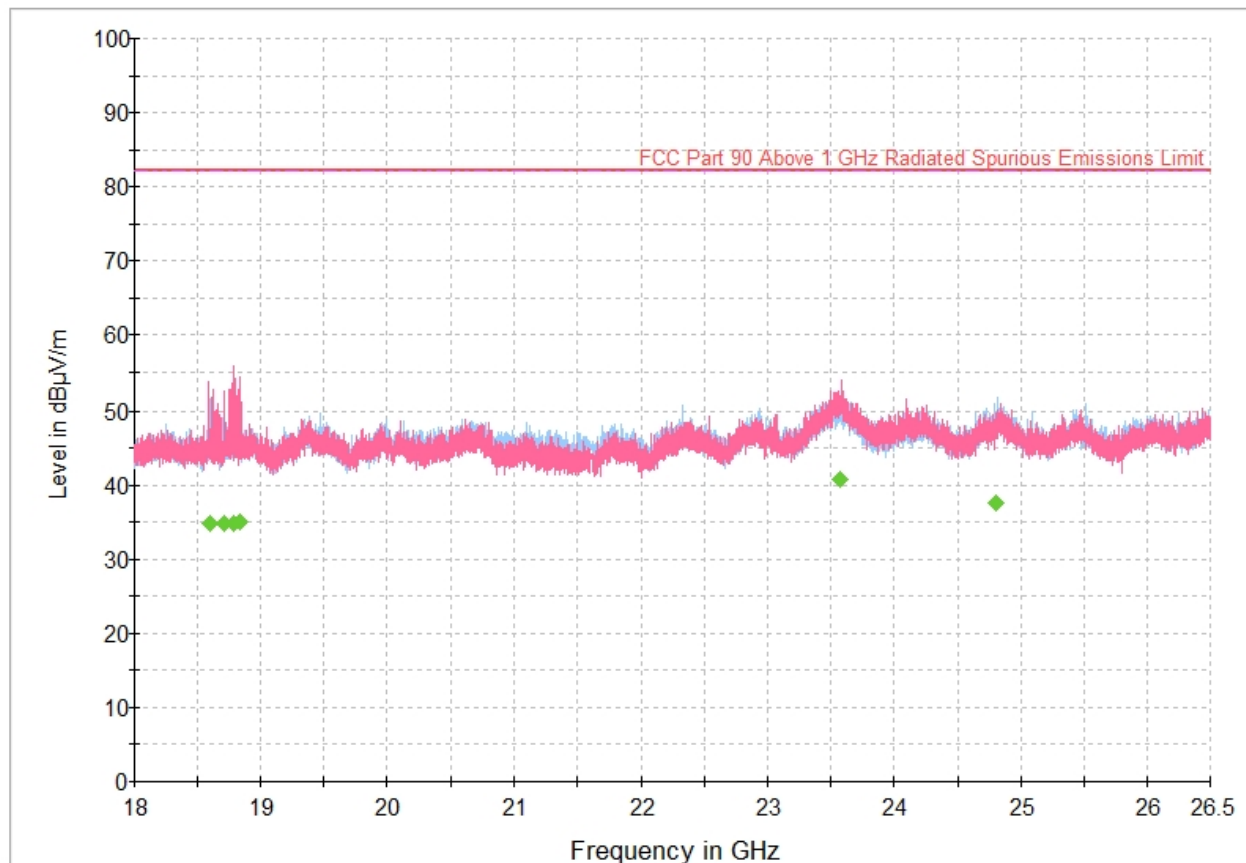


Figure 8.5-9: Radiated emissions spectral plot (18 GHz - 26.5 GHz) high channel

Table 8.5-9: Radiated emissions results

Frequency (MHz)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
18601.756250	34.92	82.23	47.31	5000.0	1000.000	207.0	V	0.0	22.9
18712.593750	34.91	82.23	47.32	5000.0	1000.000	188.0	V	0.0	22.6
18783.237500	34.78	82.23	47.45	5000.0	1000.000	161.0	V	0.0	22.4
18835.212500	35.00	82.23	47.23	5000.0	1000.000	188.0	V	0.0	22.3
23574.306250	40.85	82.23	41.38	5000.0	1000.000	347.0	V	20.0	33.2
24810.781250	37.63	82.23	44.60	5000.0	1000.000	234.0	H	225.0	30.2

Notes:

¹ Field strength (dBμV/m) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

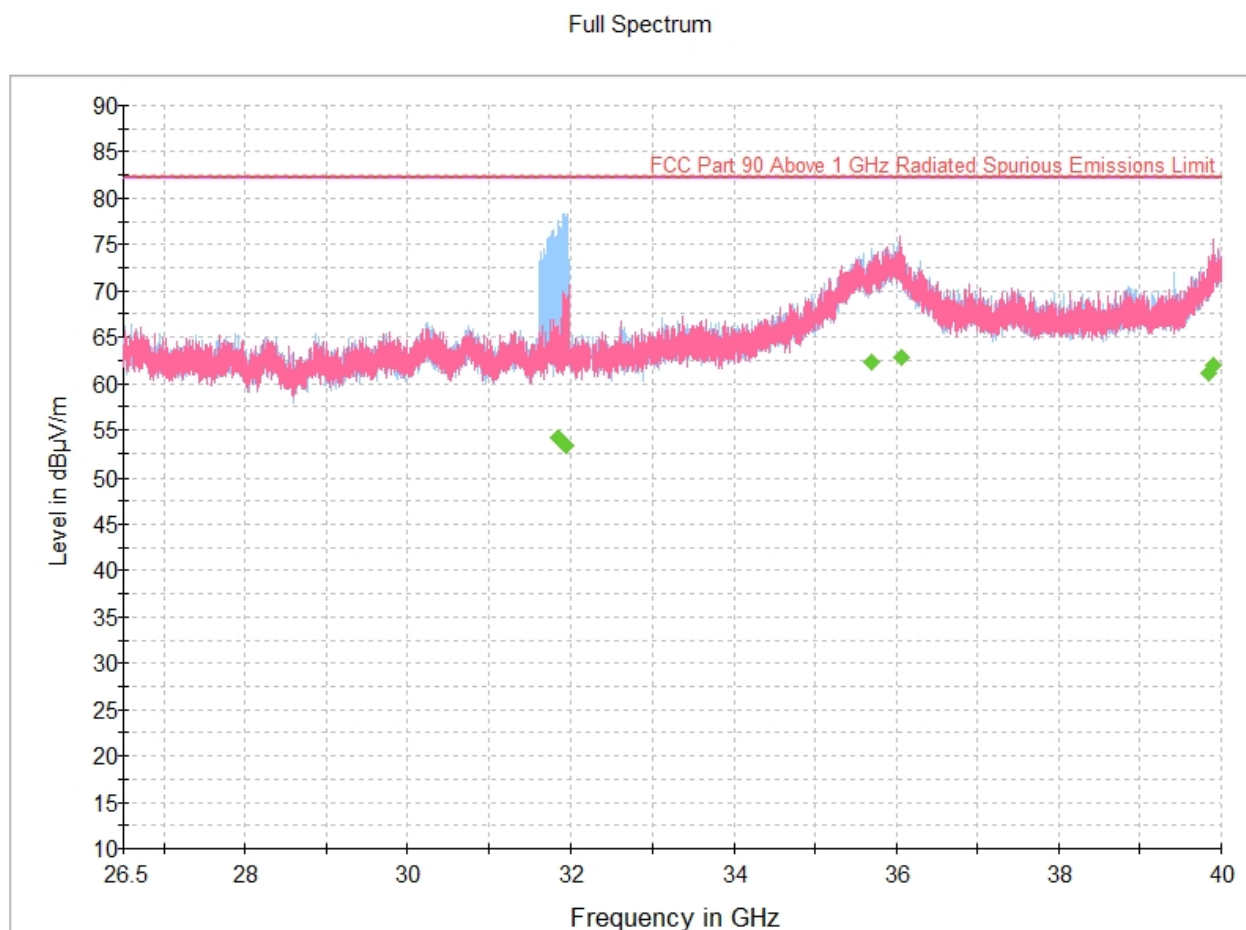


Figure 8.5-10: Radiated emissions spectral plot (26.5 GHz - 40 GHz) low channel

Table 8.5-10: Radiated emissions results

Frequency (MHz)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
31846.581250	54.08	82.23	28.15	5000.0	1000.000	190.0	H	292.0	48.4
31949.500000	53.30	82.23	28.93	5000.0	1000.000	191.0	H	292.0	48.5
35696.275000	62.26	82.23	19.97	5000.0	1000.000	114.0	H	203.0	55.6
36055.718750	62.78	82.23	19.45	5000.0	1000.000	163.0	V	322.0	55.9
39841.581250	61.21	82.23	21.02	5000.0	1000.000	143.0	V	171.0	52.6
39906.868750	62.02	82.23	20.21	5000.0	1000.000	215.0	V	149.0	53.1

Notes: ¹ Field strength (dBμV/m) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)
² Correction factors = antenna factor ACF (dB) + cable loss (dB)
³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

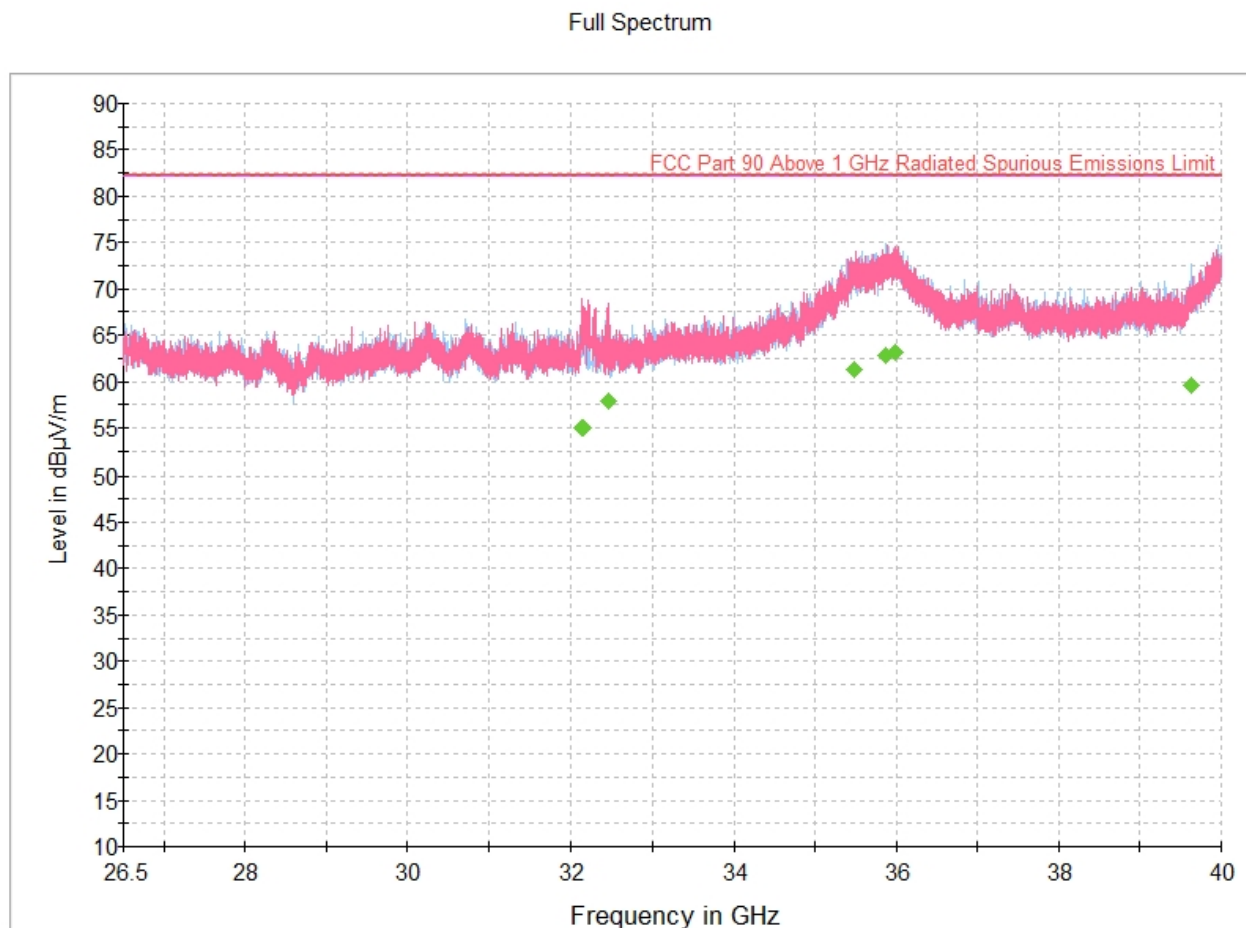


Figure 8.5-11: Radiated emissions spectral plot (26.5 GHz - 40 GHz) mid channel

Table 8.5-11: Radiated emissions results

Frequency (MHz)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32149.750000	55.02	82.23	27.21	5000.0	1000.000	166.0	V	-1.0	48.4
32455.431250	57.82	82.23	24.41	5000.0	1000.000	158.0	V	-1.0	48.3
35480.275000	61.32	82.23	20.91	5000.0	1000.000	125.0	V	343.0	55.0
35862.681250	62.75	82.23	19.48	5000.0	1000.000	148.0	H	-1.0	56.1
35977.431250	63.19	82.23	19.04	5000.0	1000.000	151.0	H	52.0	56.3
39638.143750	59.61	82.23	22.62	5000.0	1000.000	109.0	H	113.0	50.8

Notes:

¹ Field strength (dBμV/m) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

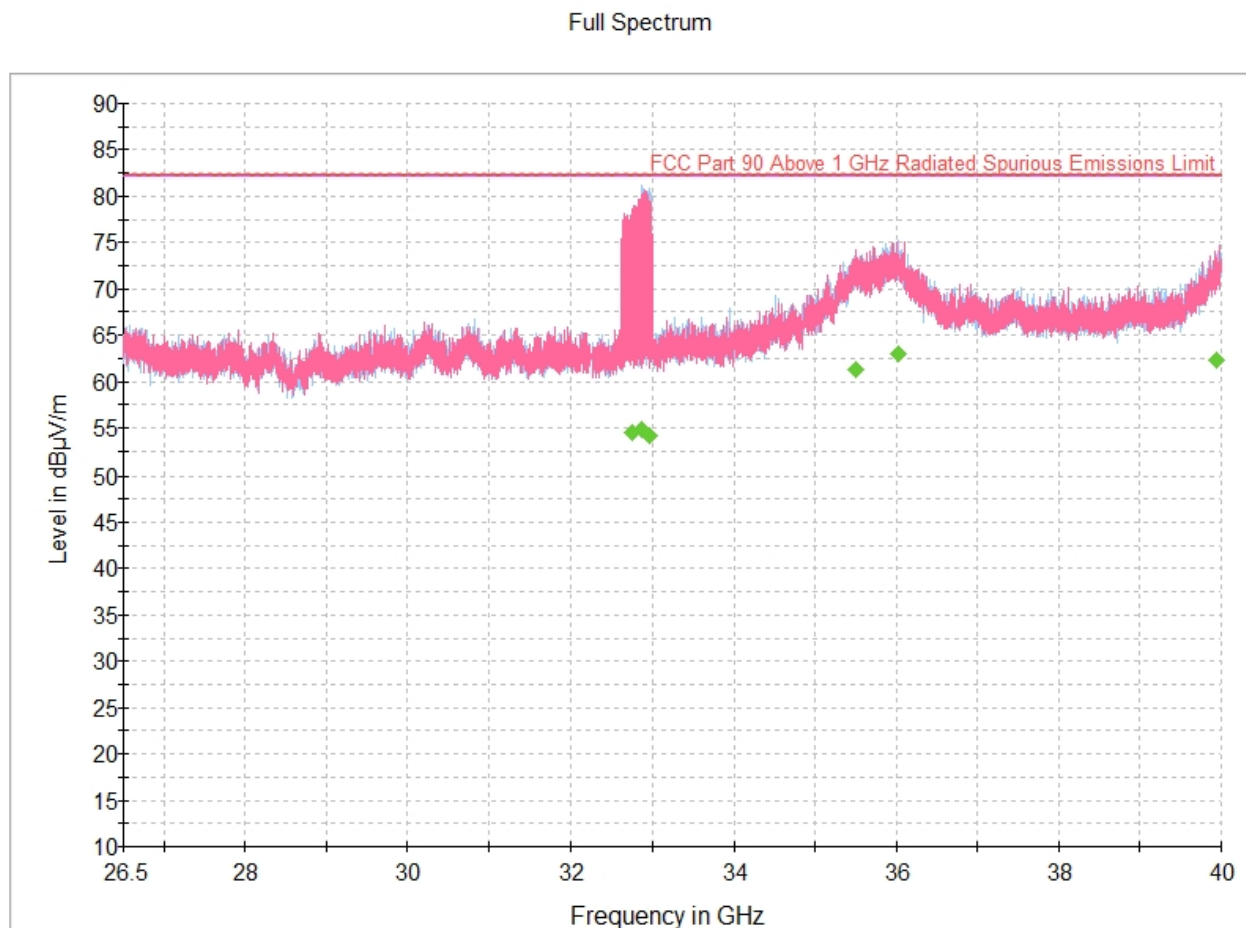


Figure 8.5-12: Radiated emissions spectral plot (26.5 GHz - 40 GHz) high channel

Table 8.5-12: Radiated emissions results

Frequency (MHz)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
32749.900000	54.58	82.23	27.65	5000.0	1000.000	163.0	V	-1.0	48.2
32858.068750	54.86	82.23	27.37	5000.0	1000.000	197.0	H	77.0	48.2
32954.406250	54.22	82.23	28.01	5000.0	1000.000	195.0	H	84.0	48.1
35500.581250	61.32	82.23	20.91	5000.0	1000.000	203.0	V	231.0	55.1
36020.012500	62.98	82.23	19.25	5000.0	1000.000	193.0	H	10.0	56.2
39933.925000	62.35	82.23	19.88	5000.0	1000.000	116.0	V	17.0	53.4

Notes:

¹ Field strength (dBμV/m) = receiver/spectrum analyzer value (dBμV) + correction factor (dB)

² Correction factors = antenna factor ACF (dB) + cable loss (dB)

³ Emissions that were continuously present for a minimum of 1 second and occurred more than once for every 15 seconds observation period were considered valid emissions. The maximum value of valid emissions has been recorded.

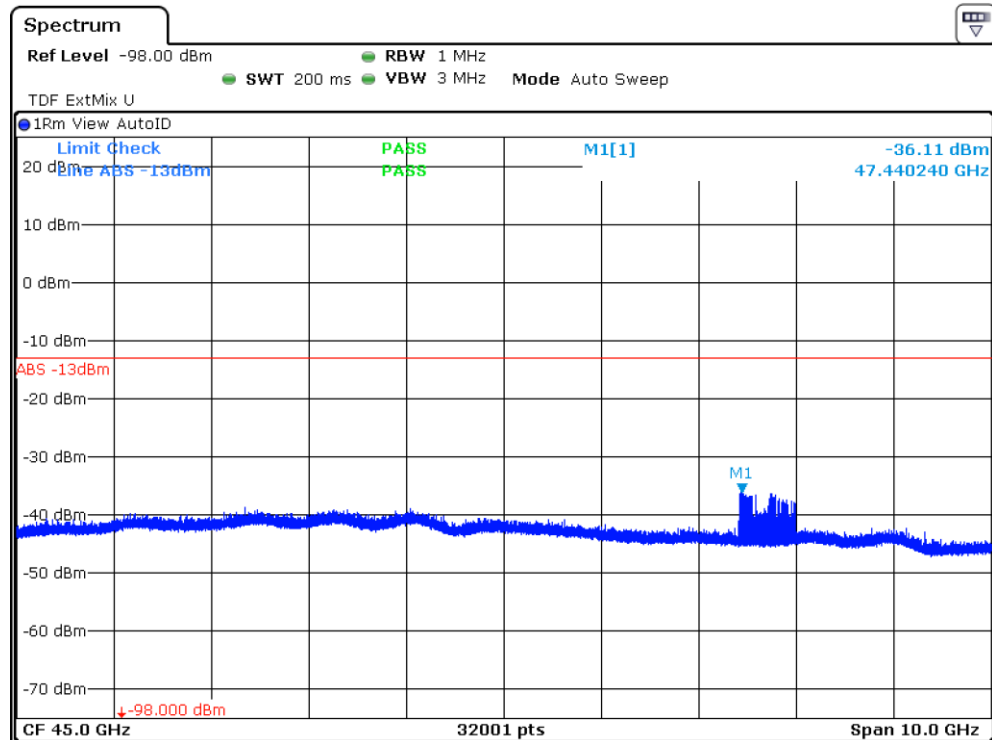


Figure 8.5-13: Radiated emissions spectral plot (40 GHz - 50 GHz) low channel horizontal

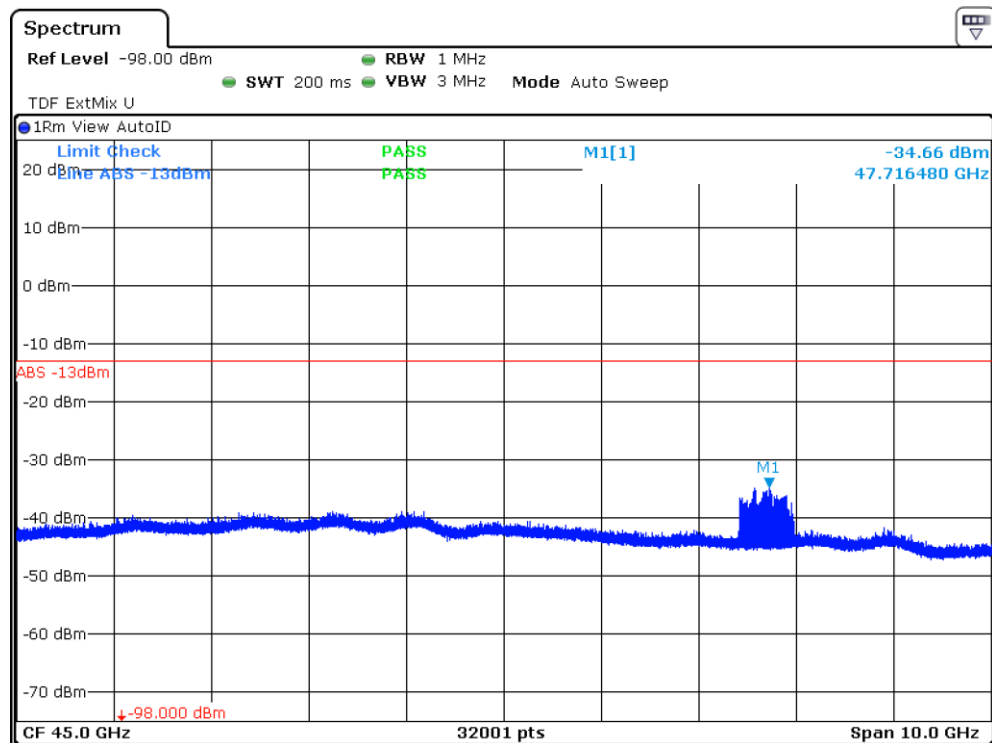


Figure 8.5-14: Radiated emissions spectral plot (40 GHz - 50 GHz) low channel vertical

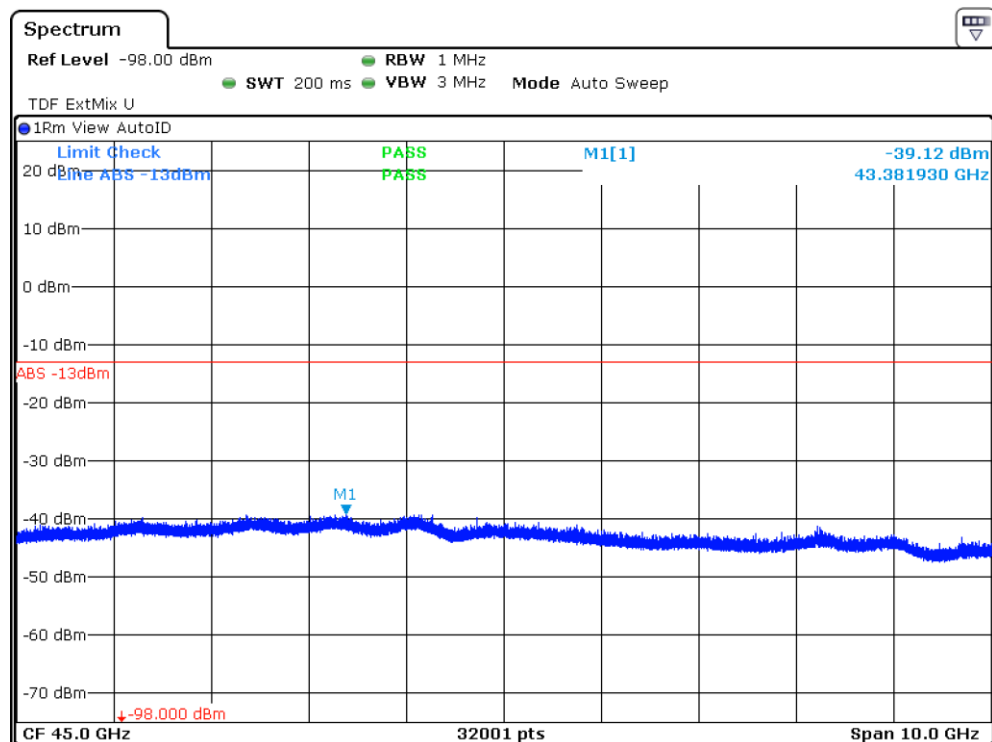


Figure 8.5-15: Radiated emissions spectral plot (40 GHz - 50 GHz) mid channel horizontal

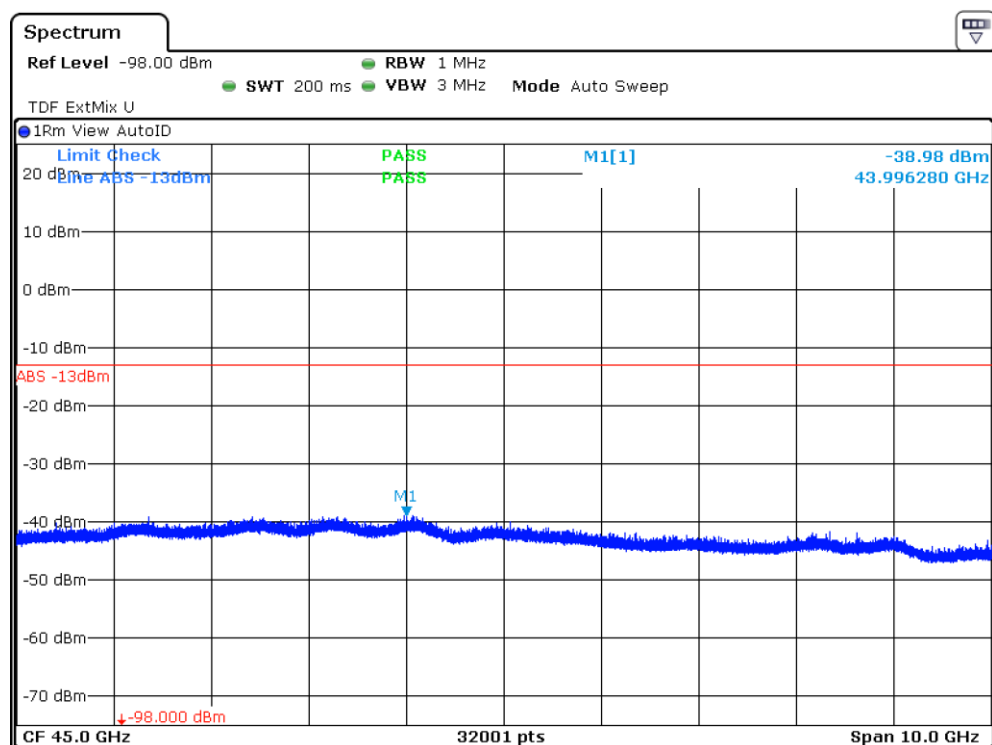


Figure 8.5-16: Radiated emissions spectral plot (40 GHz - 50 GHz) mid channel vertical

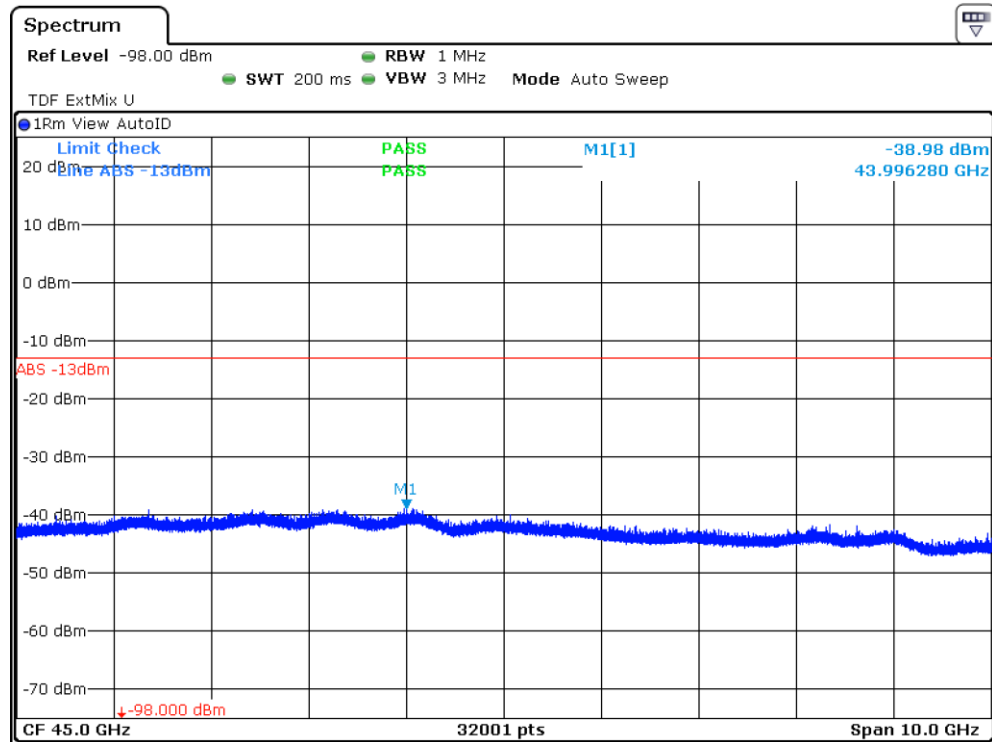


Figure 8.5-17: Radiated emissions spectral plot (40 GHz - 50 GHz) high channel horizontal

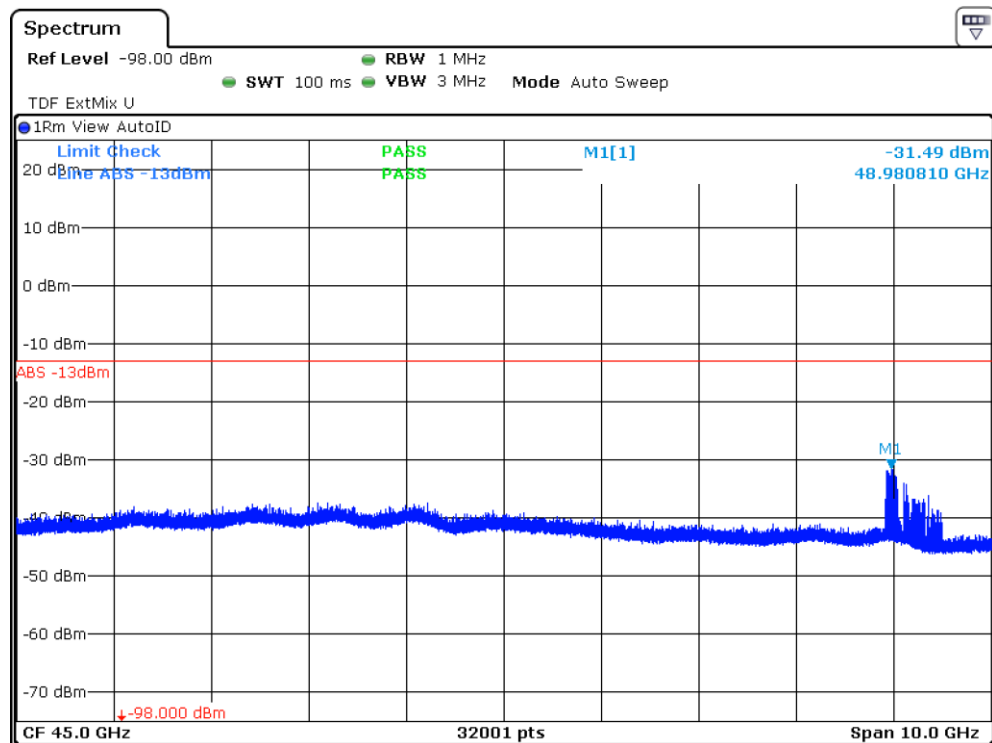


Figure 8.5-18: Radiated emissions spectral plot (40 GHz - 50 GHz) high channel vertical

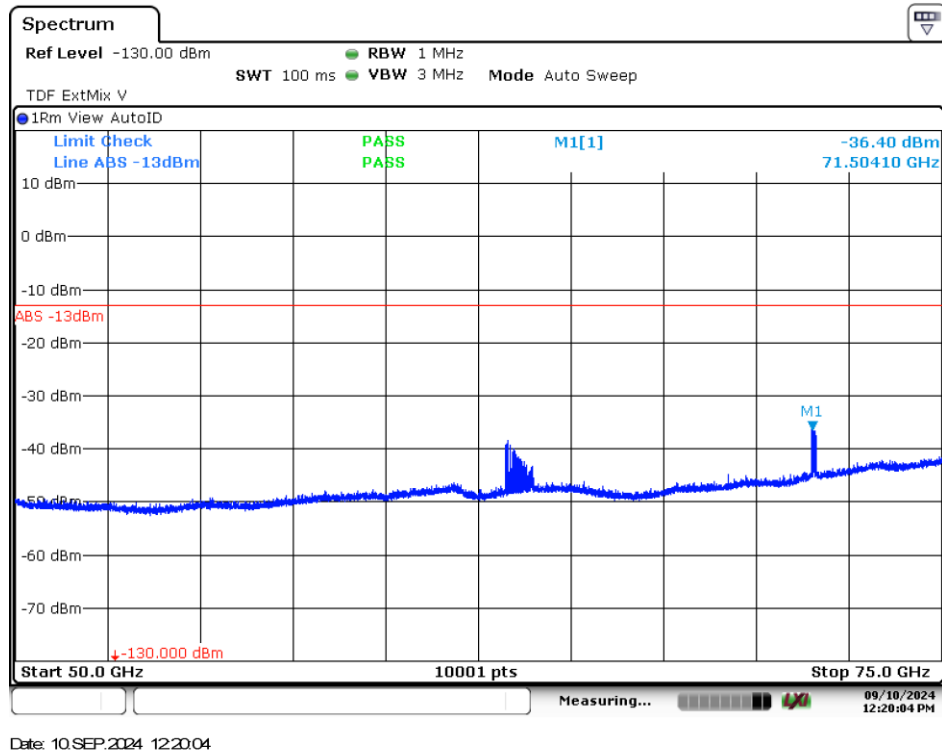


Figure 8.5-19: Radiated emissions spectral plot (50 GHz - 75 GHz) low channel horizontal

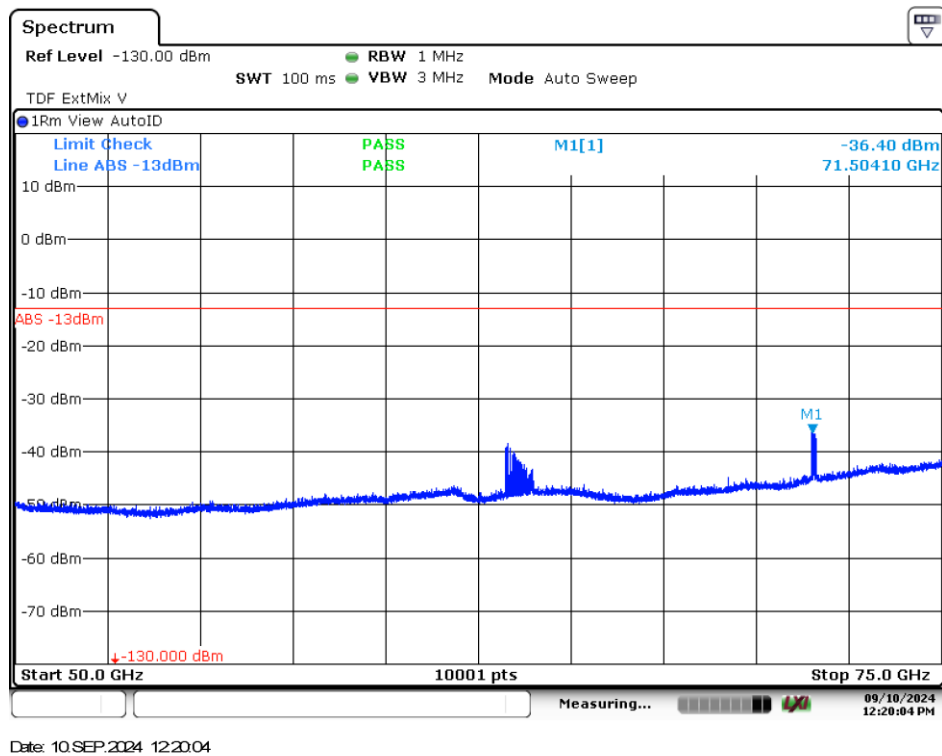


Figure 8.5-20: Radiated emissions spectral plot (50 GHz - 75 GHz) low channel vertical

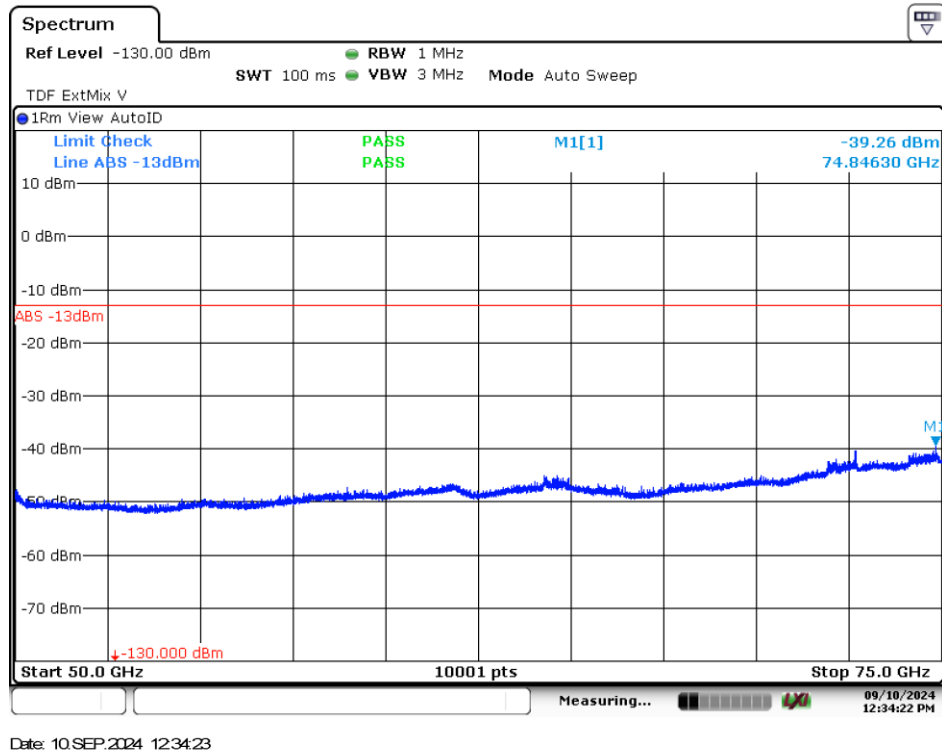


Figure 8.5-21: Radiated emissions spectral plot (50 GHz - 75 GHz) mid channel horizontal

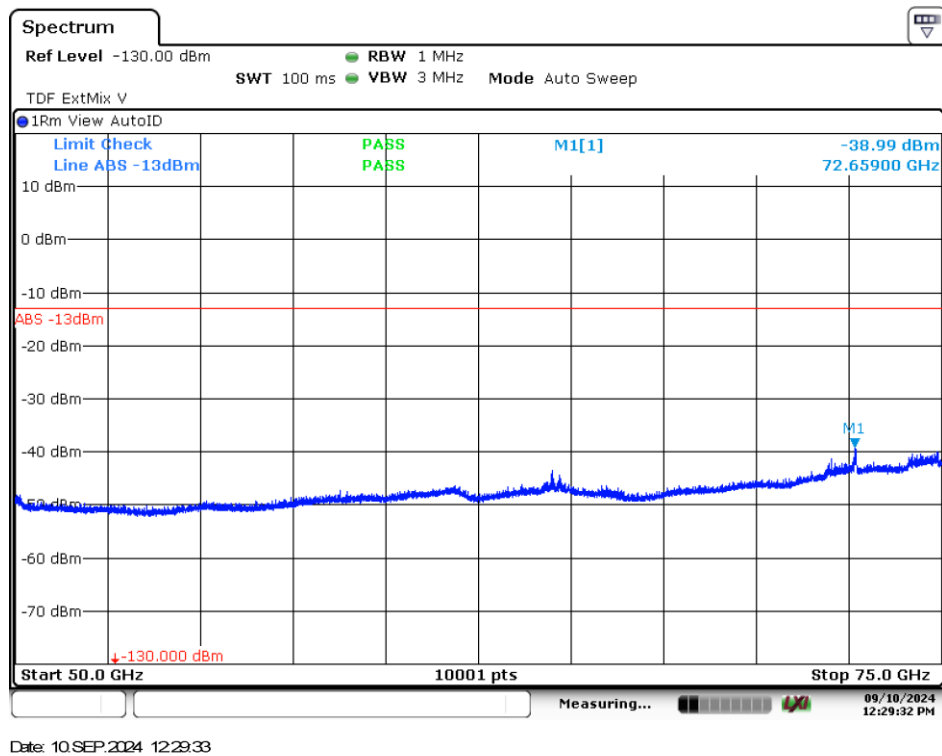


Figure 8.5-22: Radiated emissions spectral plot (50 GHz - 75 GHz) mid channel vertical

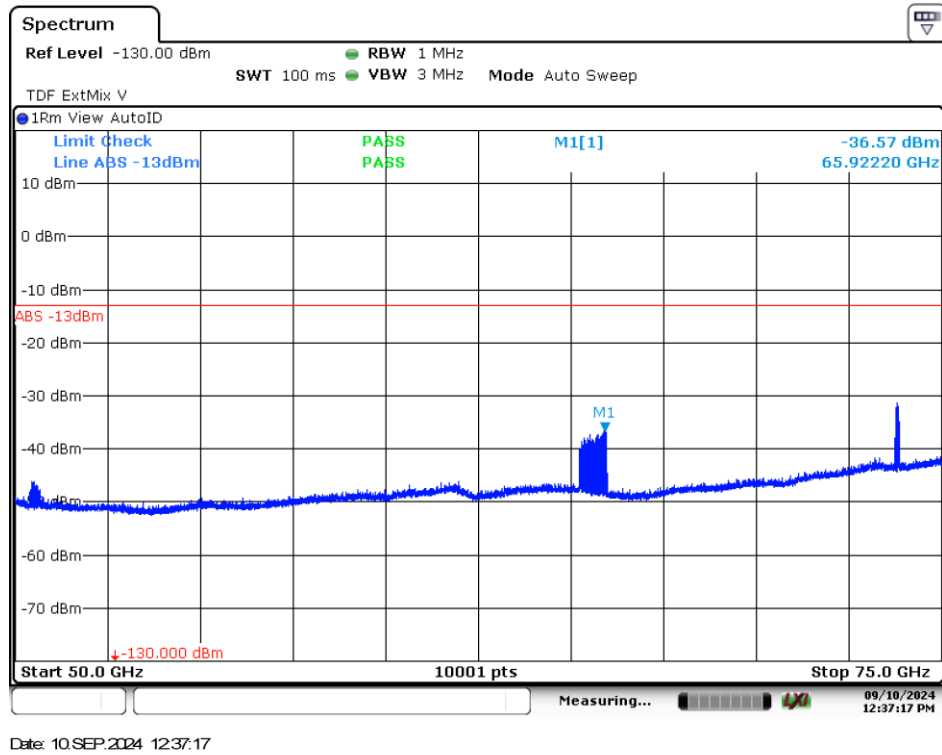


Figure 8.5-23: Radiated emissions spectral plot (50 GHz - 75 GHz) high channel horizontal

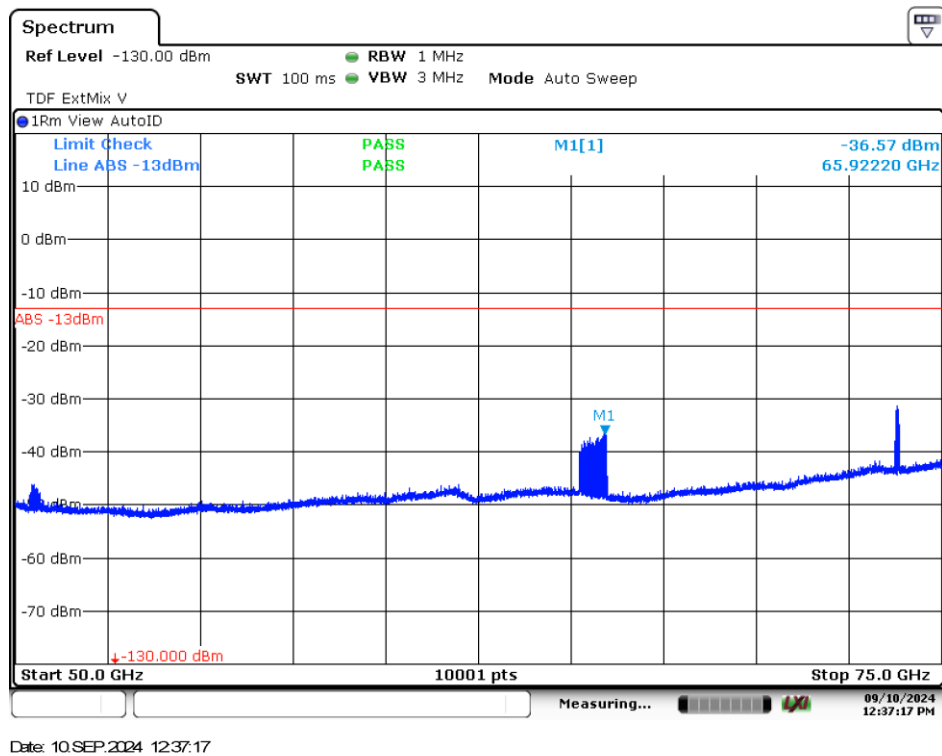


Figure 8.5-24: Radiated emissions spectral plot (50 GHz - 75 GHz) high channel vertical

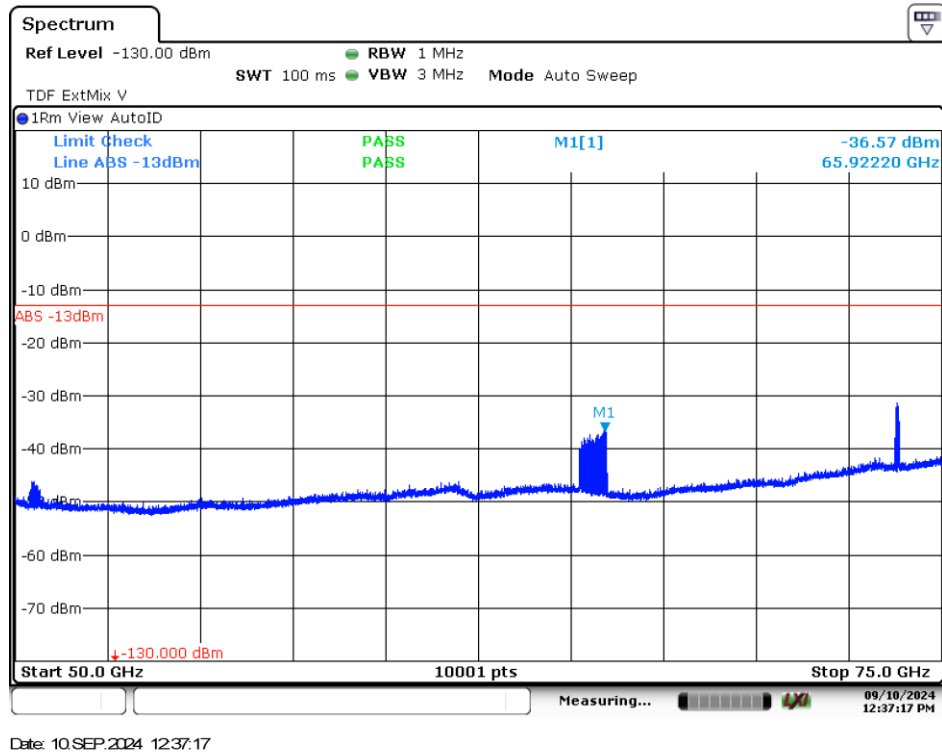


Figure 8.5-25: Radiated emissions spectral plot (75 GHz - 100 GHz) low channel horizontal

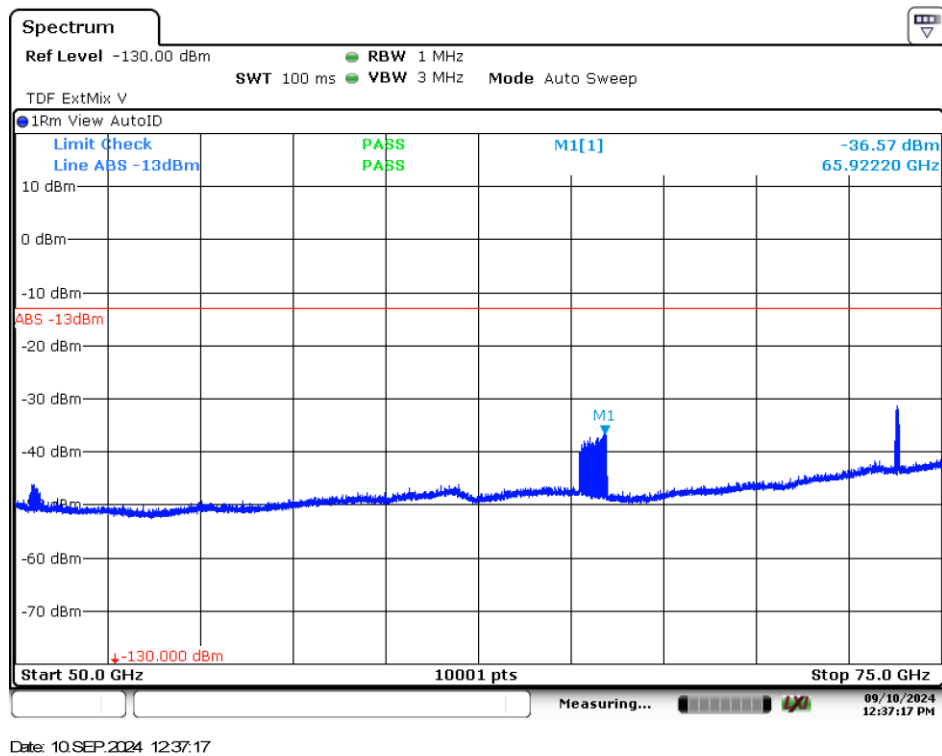


Figure 8.5-26: Radiated emissions spectral plot (75 GHz - 100 GHz) low channel vertical

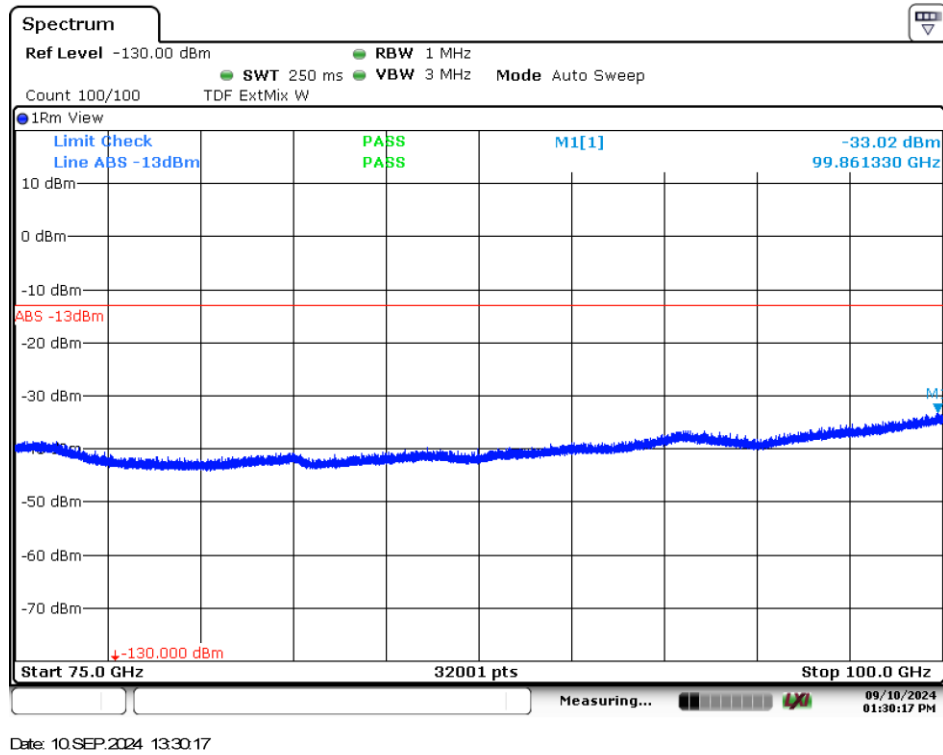


Figure 8.5-27: Radiated emissions spectral plot (75 GHz - 100 GHz) mid channel horizontal

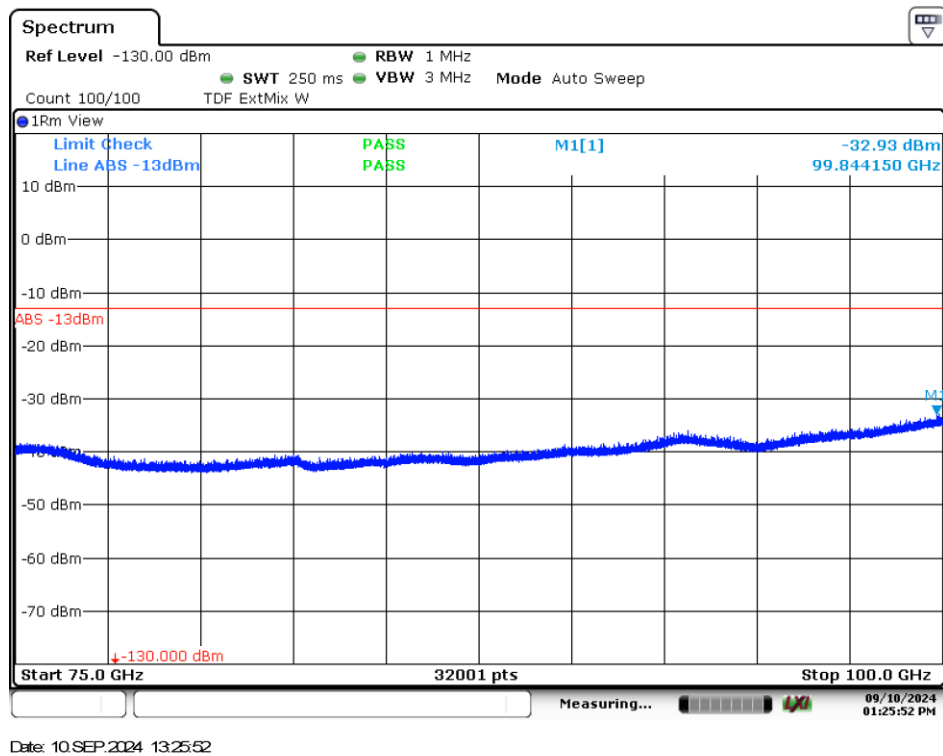


Figure 8.5-28: Radiated emissions spectral plot (75 GHz - 100 GHz) mid channel vertical

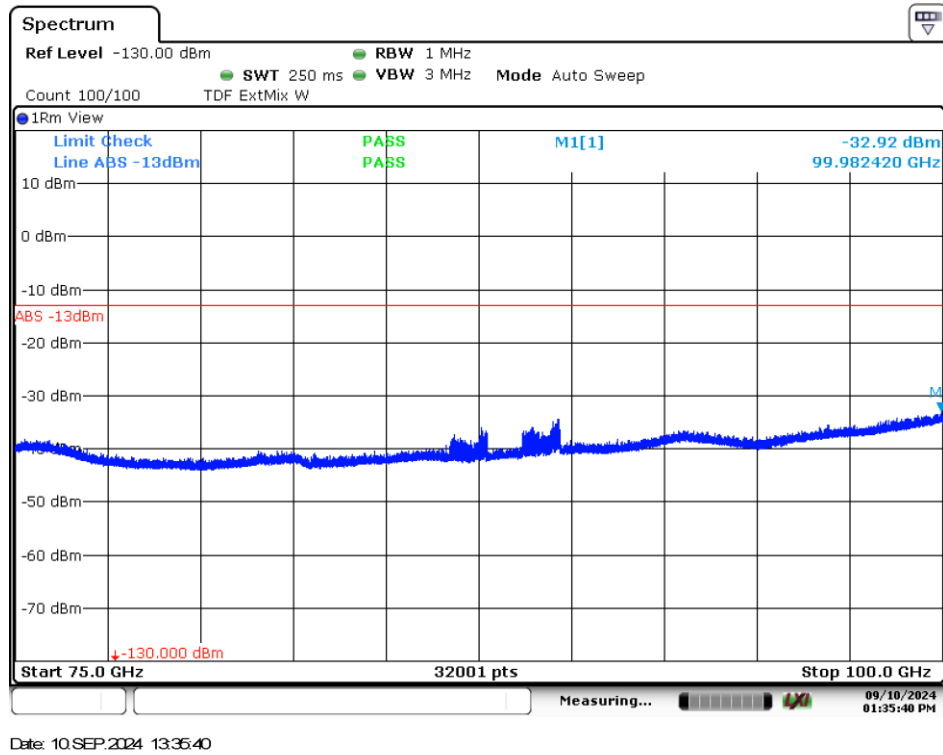


Figure 8.5-29: Radiated emissions spectral plot (75 GHz - 100 GHz) high channel horizontal

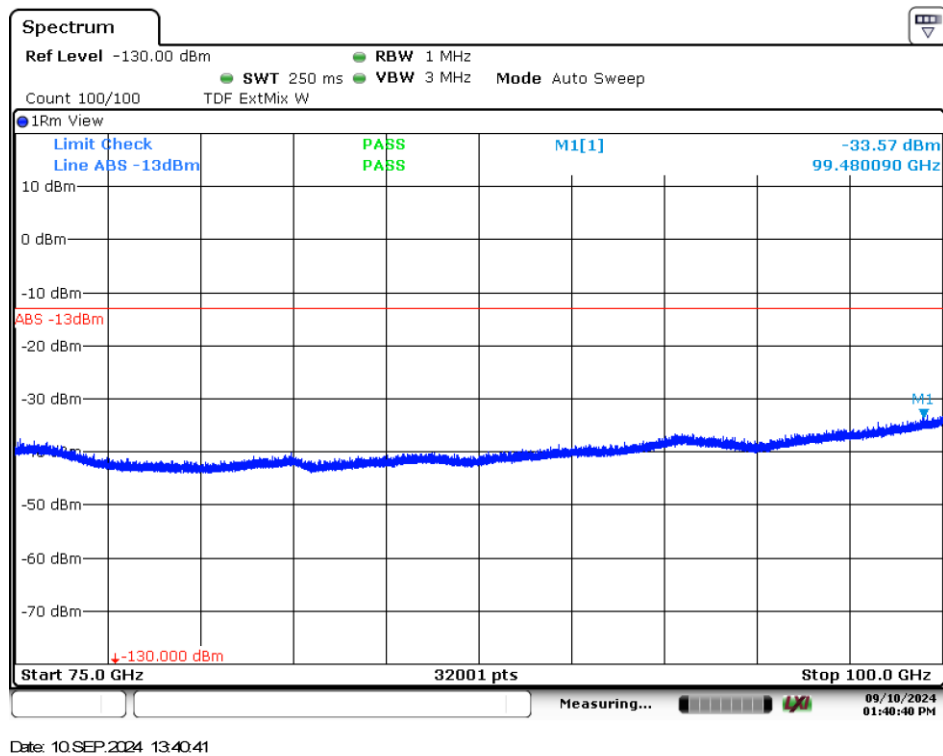


Figure 8.5-30: Radiated emissions spectral plot (75 GHz - 100 GHz) low channel vertical

8.6 Frequency stability

8.6.1 References and limits

- FCC 47 CFR Part 90: §90.213
- Test method: ANSI C63.26-2015 (5.6.3)
 - (a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Above 2450 ¹⁰			

¹⁰Frequency stability for DSRCS equipment in the 5895–5925 MHz band is specified in subpart M of this part. For all other equipment, frequency stability is to be specified in the station authorization.

8.6.2 Test summary

Verdict	Pass		
Test date	September 13, 2024	Temperature	18°C
Test engineer	Chenhao Ma, Wireless Test Technician	Air pressure	1006mbar
Test location	☐ Wireless bench ☐ 10 m semi-anechoic chamber ☐ 3 m semi-anechoic chamber ☒ Other: Environmental chamber	Relative humidity	51 %

8.6.3 Notes

Testing was performed with the transmitter operating on a fixed channel at full power. An unmodulated signal with a frequency center in the middle channel was selected for this test (16.15 GHz).

8.6.4 Setup details

EUT power input during test	28 V DC
EUT setup configuration	☐ Table-top ☐ Floor standing ☒ Other: Mounted on a fixture provided by client

Spectrum analyzer settings:

Resolution bandwidth	30 kHz
Video bandwidth	3 MHz
Detector mode	Peak
Trace mode	Max Hold

8.6.5 Test data

Table 8.6-1: Frequency stability results.

Voltage	Temperature	Channel frequency (Hz)	Measured frequency (Hz)
28 V	-40°C	16150000000	16150000000
28 V	-30°C	16150000000	16150000000
28 V	-20°C	16150000000	16150000000
28 V	-10°C	16150000000	16150000000
28 V	0°C	16150000000	16150000000
28 V	+10°C	16150000000	16150000000
28 V	+20°C	16150000000	16150000000
23.8 V (-15%)	+20°C	16150000000	16150000000
32.2 V (+15%)	+20°C	16150000000	16150000000
28 V	+30°C	16150000000	16150000000
28 V	+40°C	16150000000	16149992800
28 V	+50°C	16150000000	16150000000
28 V	+60°C	16150000000	16150000000
28 V	+65°C	16150000000	16149992800

End of test report