

Band n71 – radiated spurious emissions

5 MHz, QPSK, LOW channel

Full Spectrum

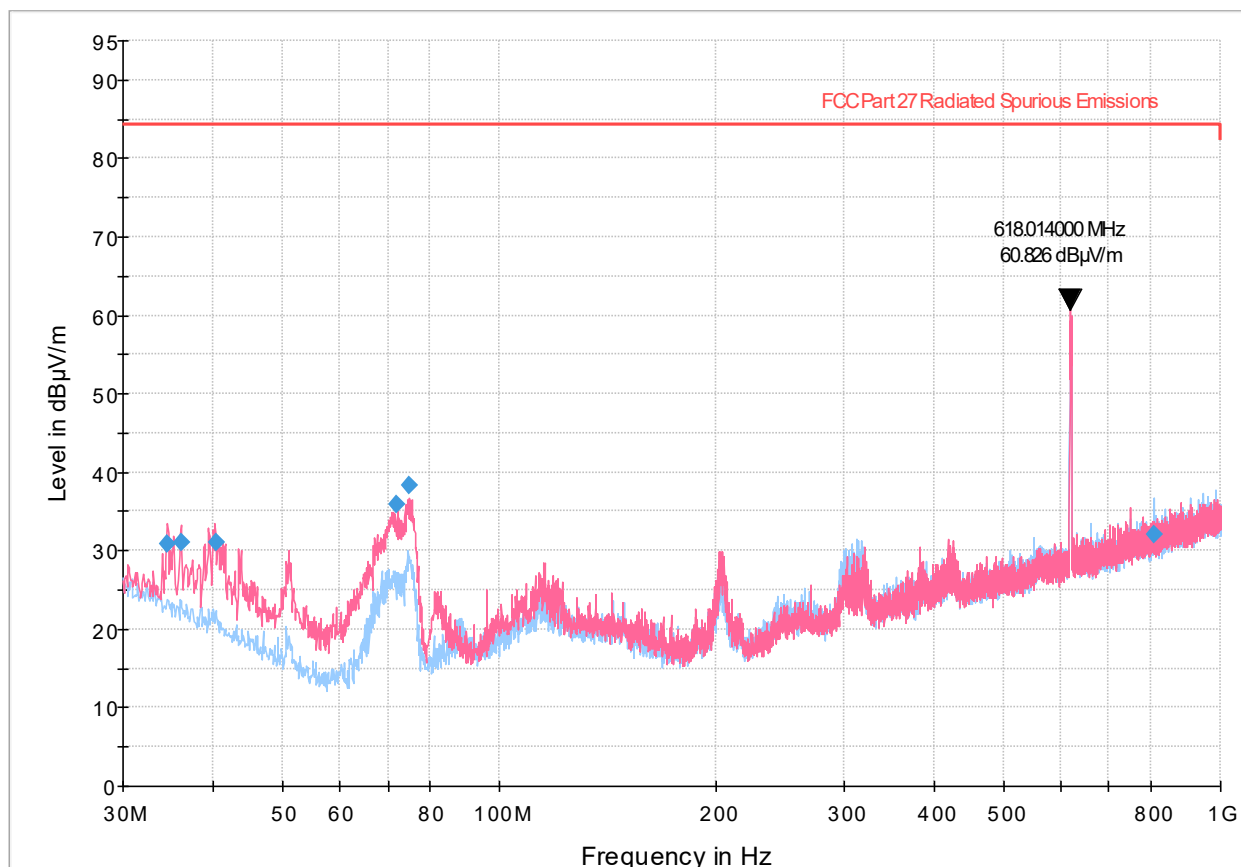


Figure 8.6-10: Radiated emissions spectral plot (30 MHz - 1 GHz)

Table 8.6-10: 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)
34.639000	30.87	84.38	53.51	5000.0	120.000	118.0	V	0.0	24.1
36.111000	31.13	84.38	53.25	5000.0	120.000	100.0	V	34.0	23.3
40.362000	31.04	84.38	53.34	5000.0	120.000	109.0	V	0.0	21.1
71.738000	35.94	84.38	48.44	5000.0	120.000	129.0	V	59.0	14.0
75.048000	38.33	84.38	46.05	5000.0	120.000	109.0	V	33.0	14.5
809.274000	32.08	84.38	52.30	5000.0	120.000	303.0	H	296.0	32.4

Notes: ¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + 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.
The marked emission at 618 MHz is the fundamental emission and is excluded from evaluation against the limits.

Full Spectrum

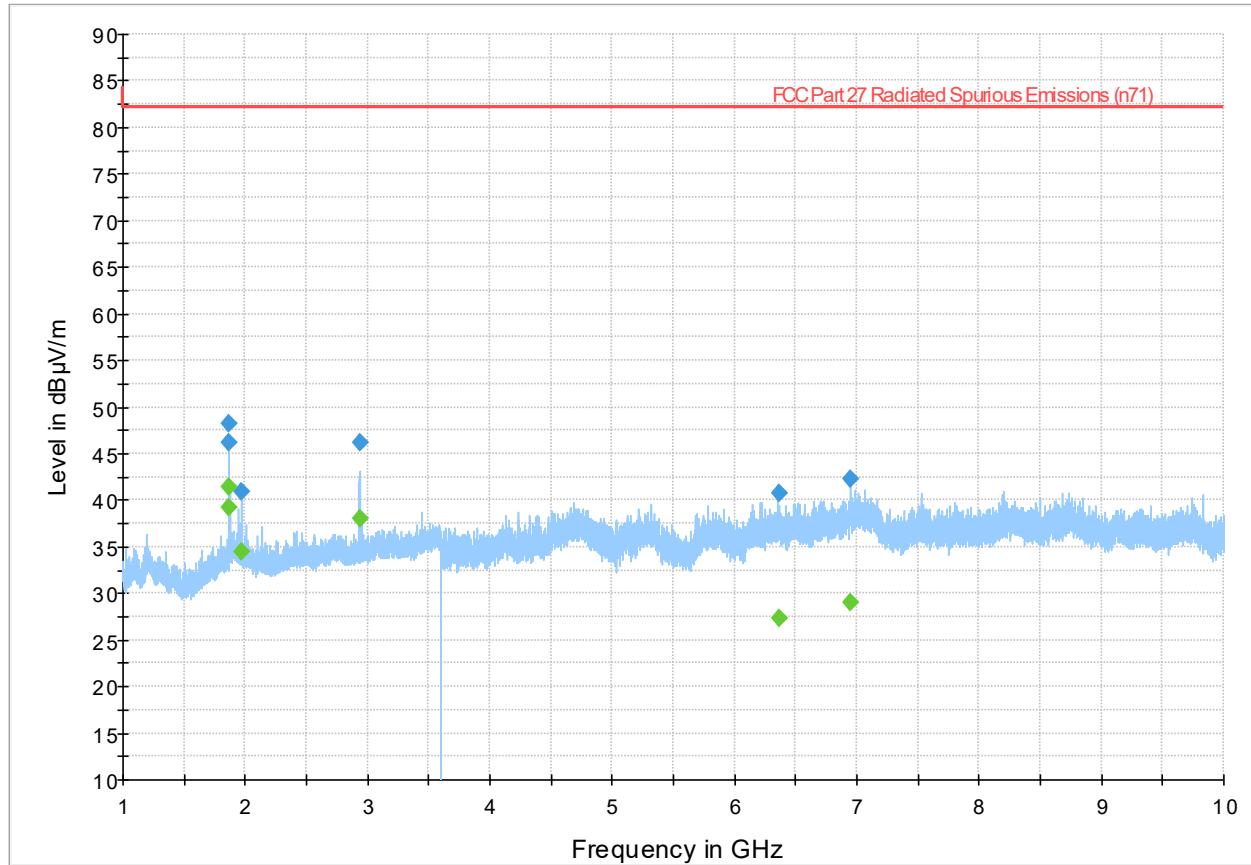


Figure 8.6-11: Radiated emissions spectral plot (1 GHz - 10 GHz)

Table 8.6-11: Radiated emissions results

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1866.400000	48.22	---	82.23	34.01	5000.0	1000.000	200.0	V	215.0	-11.0
1866.400000	---	41.50	---	---	5000.0	1000.000	200.0	V	215.0	-11.0
1866.600000	46.24	---	82.23	35.99	5000.0	1000.000	311.0	H	132.0	-10.9
1866.600000	---	39.29	---	---	5000.0	1000.000	311.0	H	132.0	-10.9
1966.100000	40.97	---	82.23	41.26	5000.0	1000.000	306.0	H	145.0	-10.7
1966.100000	---	34.38	---	---	5000.0	1000.000	306.0	H	145.0	-10.7
2933.200000	46.11	---	82.23	36.12	5000.0	1000.000	211.0	V	147.0	-8.3
2933.200000	---	38.05	---	---	5000.0	1000.000	211.0	V	147.0	-8.3
6360.600000	40.80	---	82.23	41.43	5000.0	1000.000	336.0	H	0.0	0.2
6360.600000	---	27.24	---	---	5000.0	1000.000	336.0	H	0.0	0.2
6949.000000	42.24	---	82.23	39.99	5000.0	1000.000	248.0	V	0.0	0.8
6949.000000	---	28.94	---	---	5000.0	1000.000	248.0	V	0.0	0.8

Notes: ¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + 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.

Band n71 – radiated spurious emissions

10 MHz, 16QAM, MID channel

Full Spectrum

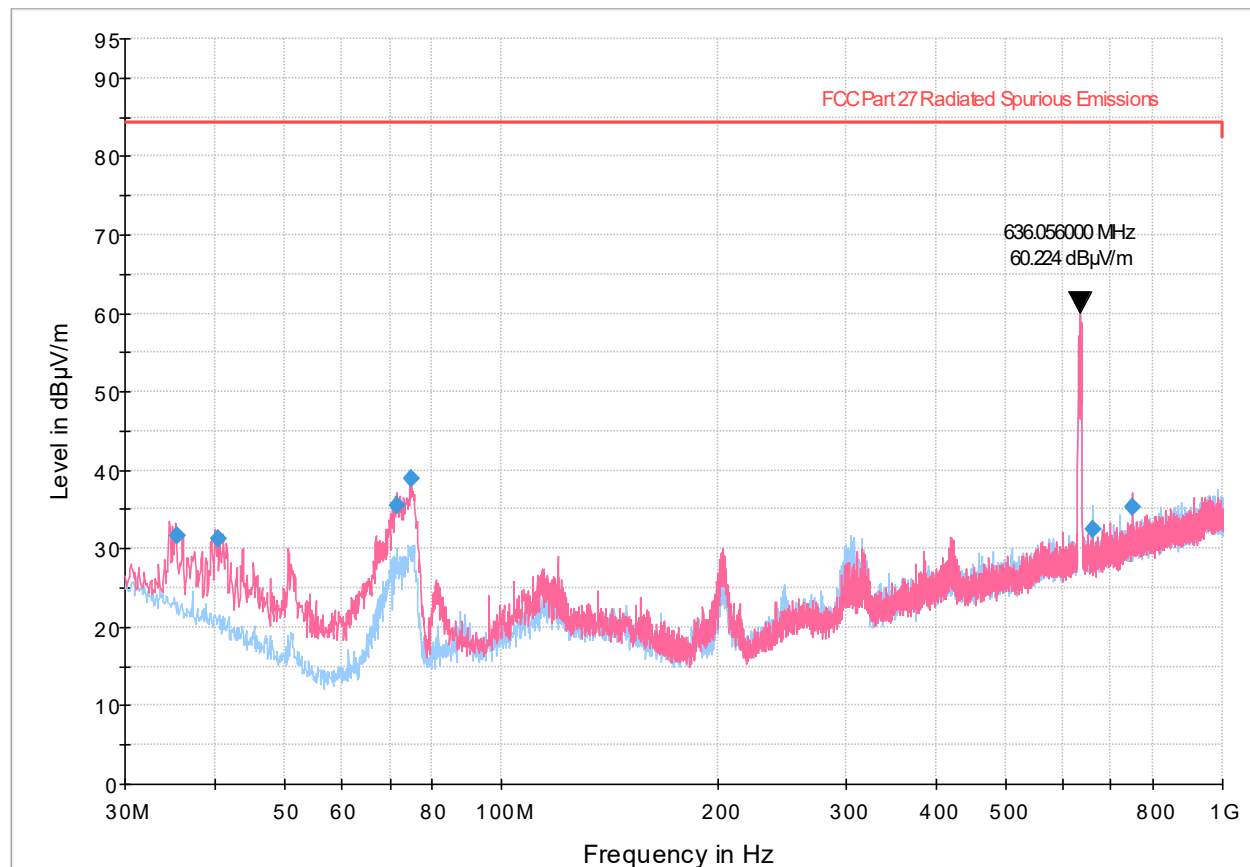


Figure 8.6-12: Radiated emissions spectral plot (30 MHz - 1 GHz)

Table 8.6-12: 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)
35.359000	31.68	84.38	52.70	5000.0	120.000	140.0	V	11.0	23.7
40.351000	31.28	84.38	53.10	5000.0	120.000	100.0	V	33.0	21.1
71.693000	35.51	84.38	48.87	5000.0	120.000	118.0	V	21.0	14.0
74.928000	38.84	84.38	45.55	5000.0	120.000	110.0	V	48.0	14.5
659.975000	32.53	84.38	51.85	5000.0	120.000	233.0	H	70.0	29.9
749.991000	35.32	84.38	49.06	5000.0	120.000	193.0	V	358.0	31.7

Notes: ¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + 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.
The marked emission at 636 MHz is the fundamental emission and is excluded from evaluation against the limits.

Full Spectrum

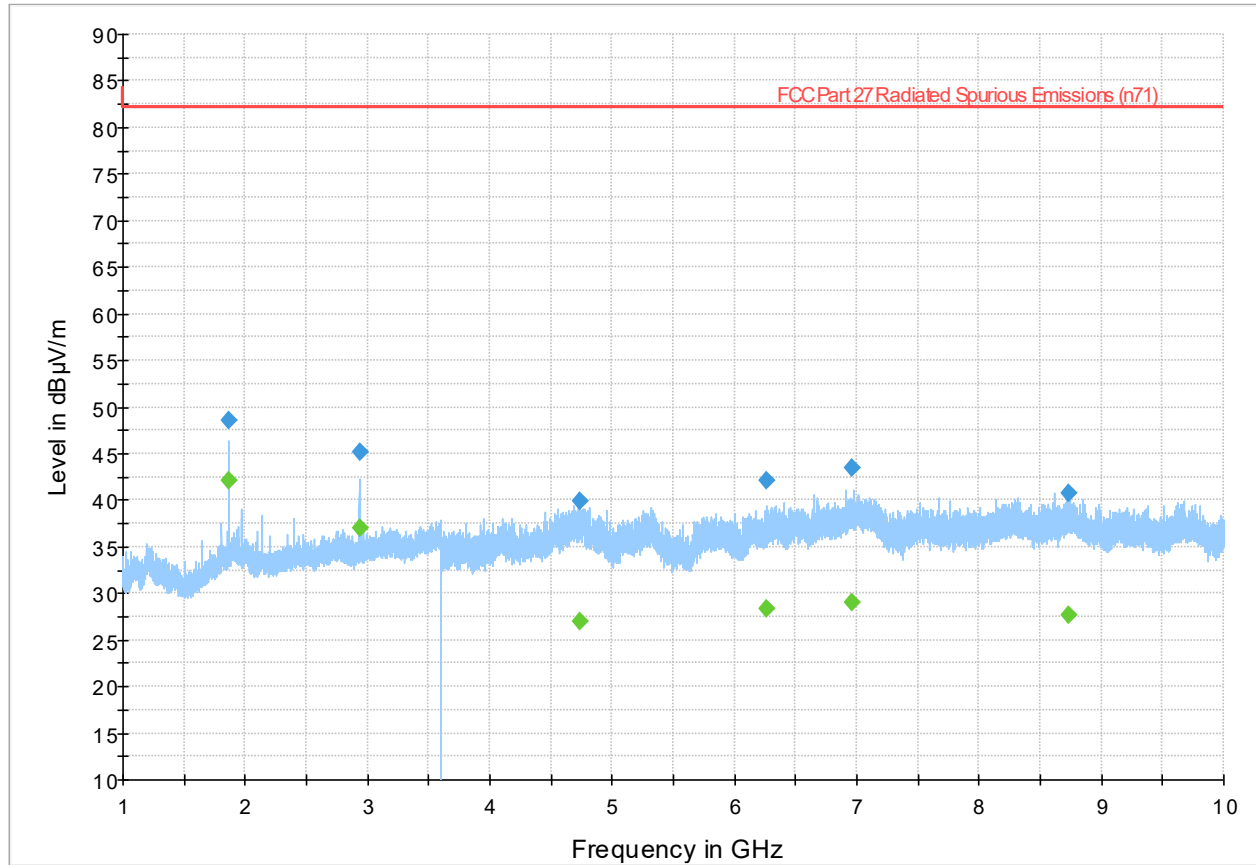


Figure 8.6-13: Radiated emissions spectral plot (1 GHz - 10 GHz)

Table 8.6-13: Radiated emissions results

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1866.800000	48.59	---	82.23	33.64	5000.0	1000.000	180.0	V	208.0	-10.9
1866.800000	---	42.13	---	---	5000.0	1000.000	180.0	V	208.0	-10.9
2933.200000	45.18	---	82.23	37.05	5000.0	1000.000	221.0	V	142.0	-8.3
2933.200000	---	36.95	---	---	5000.0	1000.000	221.0	V	142.0	-8.3
4740.900000	---	26.97	---	---	5000.0	1000.000	180.0	V	223.0	-2.1
4740.900000	39.86	---	82.23	42.37	5000.0	1000.000	180.0	V	223.0	-2.1
6266.500000	---	28.39	---	---	5000.0	1000.000	271.0	H	46.0	0.4
6266.500000	42.15	---	82.23	40.08	5000.0	1000.000	271.0	H	46.0	0.4
6965.900000	43.48	---	82.23	38.75	5000.0	1000.000	209.0	V	0.0	0.9
6965.900000	---	29.00	---	---	5000.0	1000.000	209.0	V	0.0	0.9
8731.700000	40.71	---	82.23	41.52	5000.0	1000.000	397.0	V	173.0	2.8
8731.700000	---	27.64	---	---	5000.0	1000.000	397.0	V	173.0	2.8

Notes:

¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + 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.

Band n71 – radiated spurious emissions

15 MHz, 16QAM, LOW channel

Full Spectrum

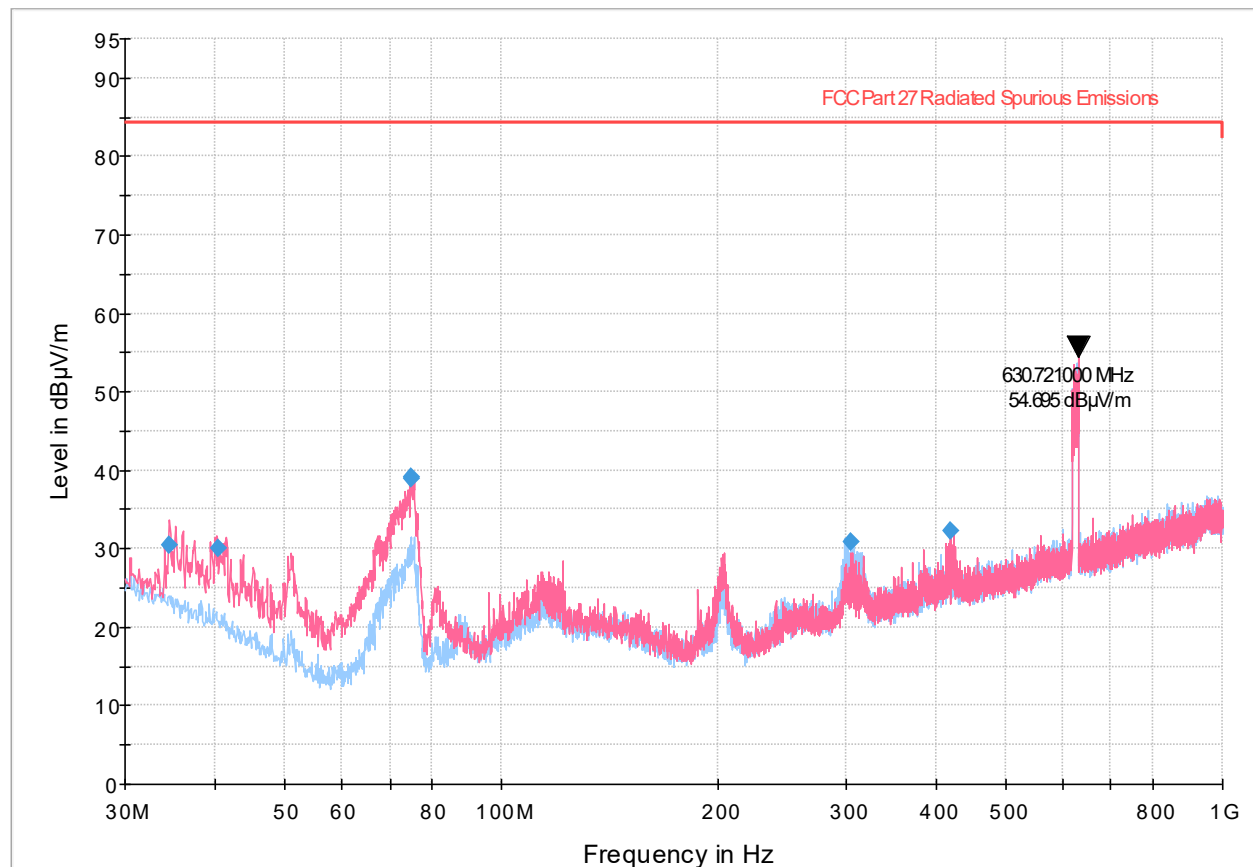


Figure 8.6-14: Radiated emissions spectral plot (30 MHz - 1 GHz)

Table 8.6-14: 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)
34.639000	30.49	84.38	53.89	5000.0	120.000	139.0	V	354.0	24.1
40.328000	30.02	84.38	54.36	5000.0	120.000	100.0	V	302.0	21.1
74.894000	38.86	84.38	45.52	5000.0	120.000	110.0	V	46.0	14.5
74.910000	39.05	84.38	45.33	5000.0	120.000	139.0	V	58.0	14.5
304.470000	30.91	84.38	53.47	5000.0	120.000	140.0	H	48.0	22.2
419.980000	32.17	84.38	52.21	5000.0	120.000	100.0	V	123.0	26.2

Notes: ¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + 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.
The marked emission at 630 MHz is the fundamental emission and is excluded from evaluation against the limits.

Full Spectrum

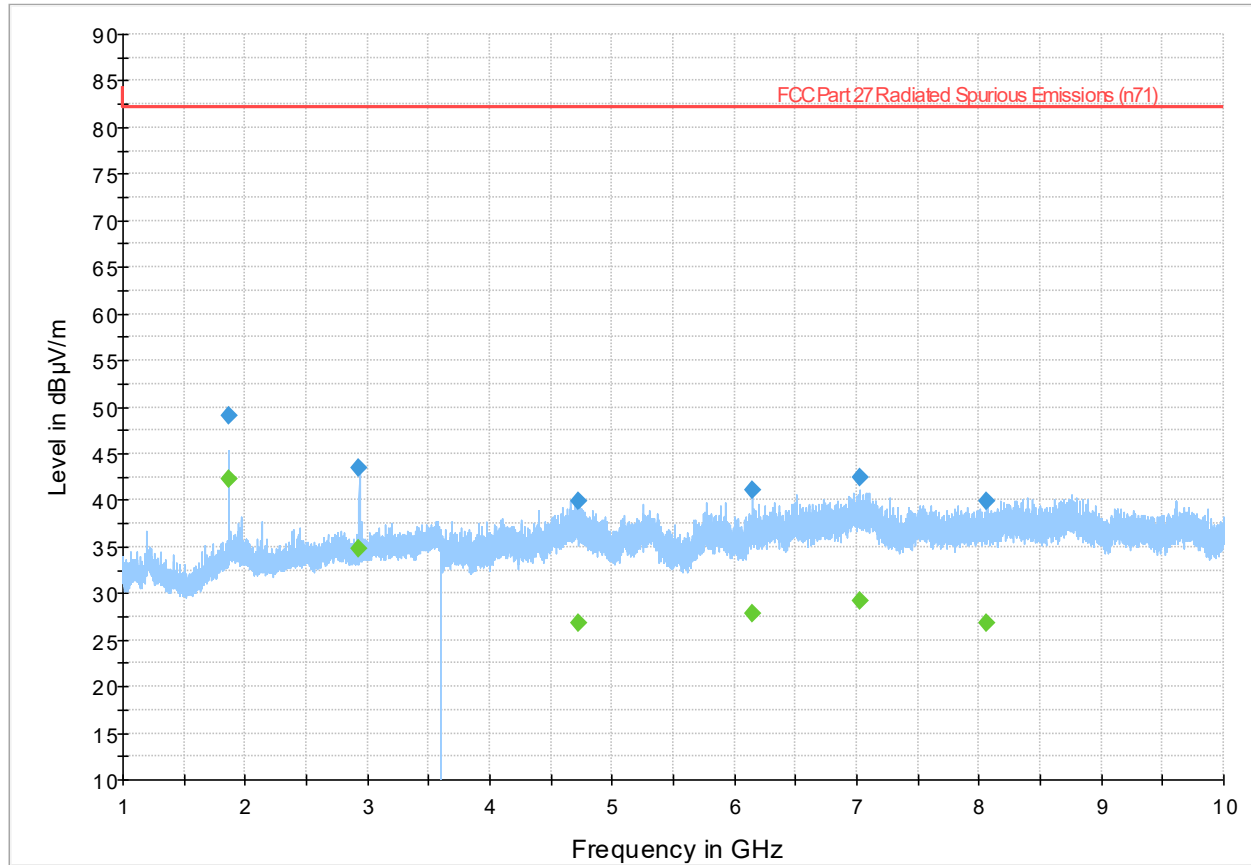


Figure 8.6-15: Radiated emissions spectral plot (1 GHz - 10 GHz)

Table 8.6-15: Radiated emissions results

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1866.700000	49.03	---	82.23	33.20	5000.0	1000.000	174.0	V	211.0	-10.9
1866.700000	---	42.26	---	---	5000.0	1000.000	174.0	V	211.0	-10.9
2933.100000	---	34.83	---	---	5000.0	1000.000	133.0	V	139.0	-8.3
2933.100000	43.45	---	82.23	38.78	5000.0	1000.000	133.0	V	139.0	-8.3
4730.100000	---	26.89	---	---	5000.0	1000.000	137.0	V	147.0	-2.1
4730.100000	39.92	---	82.23	42.31	5000.0	1000.000	137.0	V	147.0	-2.1
6151.900000	---	27.82	---	---	5000.0	1000.000	298.0	V	312.0	0.1
6151.900000	41.07	---	82.23	41.16	5000.0	1000.000	298.0	V	312.0	0.1
7023.800000	42.38	---	82.23	39.85	5000.0	1000.000	335.0	V	34.0	1.0
7023.800000	---	29.25	---	---	5000.0	1000.000	335.0	V	34.0	1.0
8062.600000	---	26.88	---	---	5000.0	1000.000	269.0	V	21.0	1.7
8062.600000	39.88	---	82.23	42.35	5000.0	1000.000	269.0	V	21.0	1.7

Notes: ¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + 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.

Band n71 – radiated spurious emissions

20 MHz, 16QAM, LOW channel

Full Spectrum

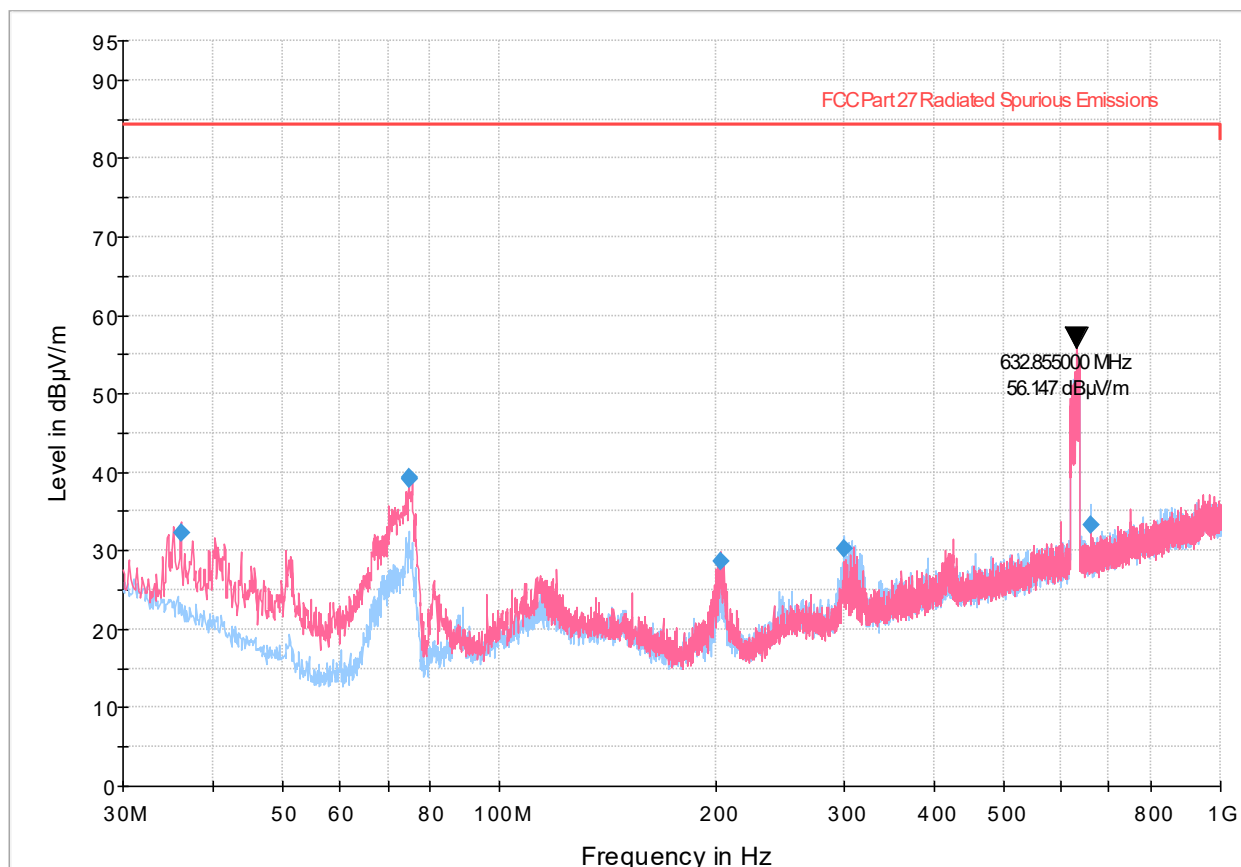


Figure 8.6-16: Radiated emissions spectral plot (30 MHz - 1 GHz)

Table 8.6-16: 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)
36.151000	32.22	84.38	52.16	5000.0	120.000	100.0	V	315.0	23.3
74.910000	39.42	84.38	44.96	5000.0	120.000	109.0	V	48.0	14.5
74.911000	39.19	84.38	45.19	5000.0	120.000	100.0	V	59.0	14.5
202.163000	28.67	84.38	55.71	5000.0	120.000	100.0	V	71.0	17.9
300.448000	30.16	84.38	54.22	5000.0	120.000	119.0	H	47.0	22.2
660.015000	33.30	84.38	51.08	5000.0	120.000	194.0	H	336.0	29.9

Notes:

¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + 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.

The marked emission at 633 MHz is the fundamental emission and is excluded from evaluation against the limits.

Full Spectrum

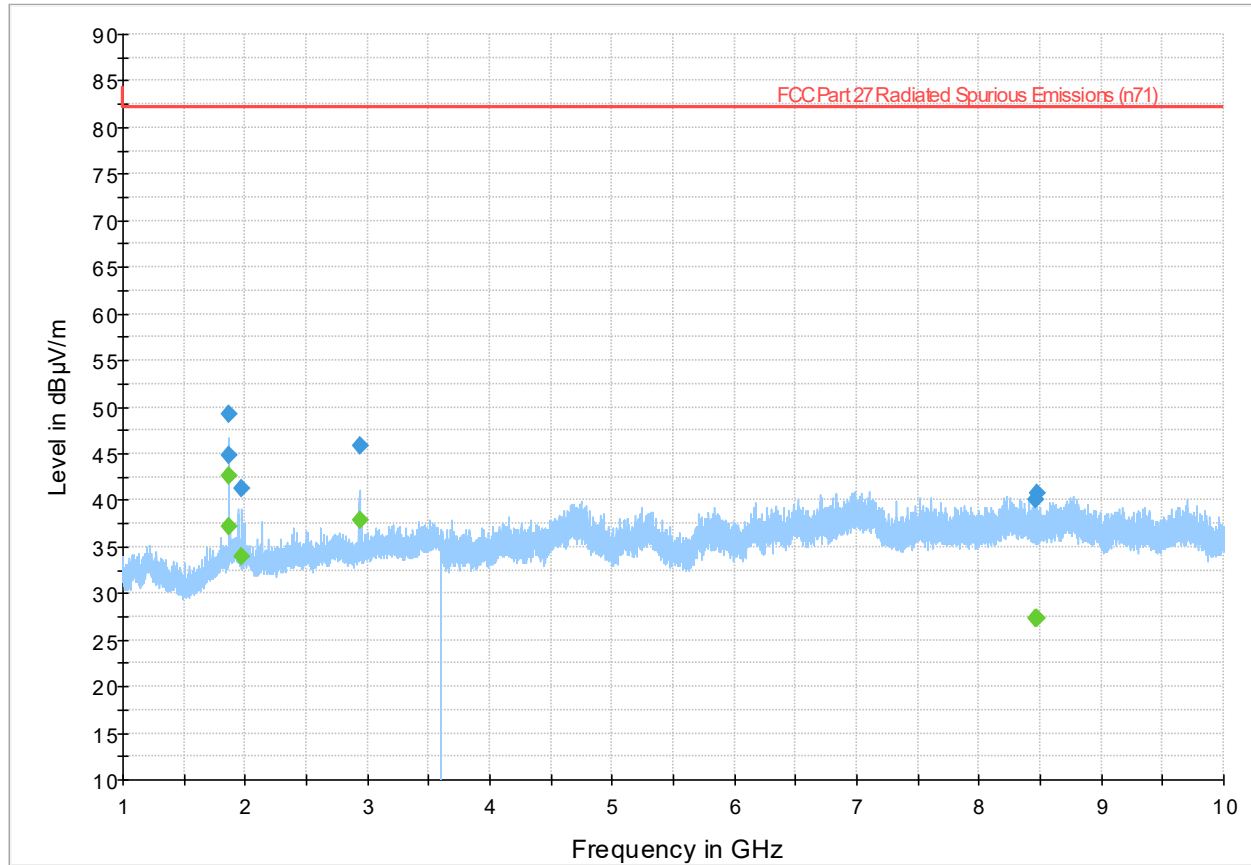


Figure 8.6-17: Radiated emissions spectral plot (1 GHz - 10 GHz)

Table 8.6-17: Radiated emissions results

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1866.700000	---	42.66	---	---	5000.0	1000.000	200.0	V	214.0	-10.9
1866.700000	49.29	---	82.23	32.94	5000.0	1000.000	200.0	V	214.0	-10.9
1866.800000	44.88	---	82.23	37.35	5000.0	1000.000	107.0	V	169.0	-10.9
1866.800000	---	37.14	---	---	5000.0	1000.000	107.0	V	169.0	-10.9
1966.100000	41.24	---	82.23	40.99	5000.0	1000.000	310.0	H	144.0	-10.7
1966.100000	---	33.95	---	---	5000.0	1000.000	310.0	H	144.0	-10.7
2933.200000	45.87	---	82.23	36.36	5000.0	1000.000	224.0	V	143.0	-8.3
2933.200000	---	37.90	---	---	5000.0	1000.000	224.0	V	143.0	-8.3
8467.200000	---	27.34	---	---	5000.0	1000.000	129.0	H	21.0	2.3
8467.200000	40.04	---	82.23	42.19	5000.0	1000.000	129.0	H	21.0	2.3
8470.000000	40.66	---	82.23	41.57	5000.0	1000.000	296.0	H	240.0	2.3
8470.000000	---	27.37	---	---	5000.0	1000.000	296.0	H	240.0	2.3

Notes: ¹ Field strength (dB V/m) = receiver/spectrum analyzer value (dB V) + 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.

8.7 FCC 27.54 Frequency Stability

8.7.1 Definitions and limits

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

8.7.2 Test summary

Test date	July 28, 2022	Temperature	21 °C
Test engineer	Lan Sayasane, EMC Test Engineer	Air pressure	1005 mbar
Verdict	Pass	Relative humidity	64%

8.7.3 Observations, settings and special notes

The EUT was configured to continuously transmit an un-modulated continuous wave signal. The frequency measurement was performed using the marker-signal count functionality of the spectrum analyzer. The only requirement is that the carrier stays within the allocated band.

8.7.4 Test data

Band n26:

Table 8.7-1: Frequency stability results, band n26

Test conditions	Frequency MHz
+55 °C, Nominal	866.499
+50 °C, Nominal	866.499
+40 °C, Nominal	866.499
+30 °C, Nominal	866.499
+20 °C, 58 VDC	866.499
+20 °C, Nominal	866.499
+20 °C, 36 VDC	866.499
+10 °C, Nominal	866.499
0 °C, Nominal	866.499
-10 °C, Nominal	866.499
-20 °C, Nominal	866.499
-30 °C, Nominal	866.499
-40 °C, Nominal	866.499

Band n29:

Table 8.7-2: Frequency stability results, band n29

Test conditions	Frequency, MHz
+55 °C, Nominal	722.999
+50 °C, Nominal	722.999
+40 °C, Nominal	722.999
+30 °C, Nominal	722.999
+20 °C, 58 VDC	722.999
+20 °C, Nominal	722.999
+20 °C, 36 VDC	722.999
+10 °C, Nominal	722.999
0 °C, Nominal	722.999
-10 °C, Nominal	722.999
-20 °C, Nominal	722.999
-30 °C, Nominal	722.999

Band n71:

Table 8.7-3: Frequency stability results, band n71

Test conditions	Frequency, MHz
+55 °C, Nominal	634.499
+50 °C, Nominal	634.499
+40 °C, Nominal	634.499
+30 °C, Nominal	634.499
+20 °C, 58 VDC	634.499
+20 °C, Nominal	634.499
+20 °C, 36 VDC	634.499
+10 °C, Nominal	634.499
0 °C, Nominal	634.499
-10 °C, Nominal	634.499
-20 °C, Nominal	634.499
-30 °C, Nominal	634.499

Section 9. Block diagrams of test setups

9.1 Radiated emissions set-up

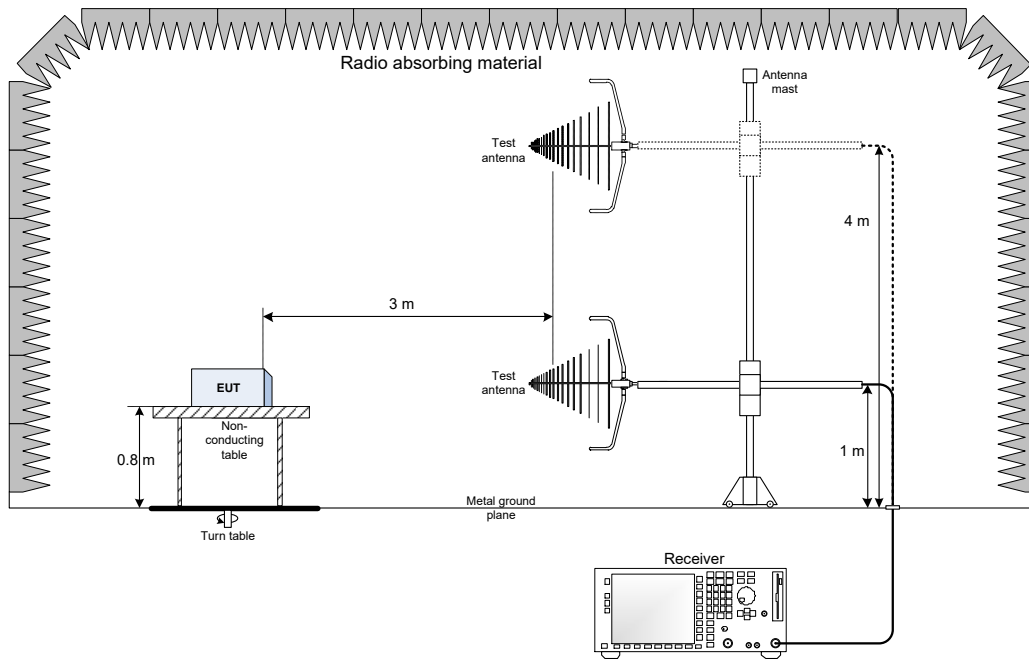


Figure 9.1-1: Below 1 GHz setup

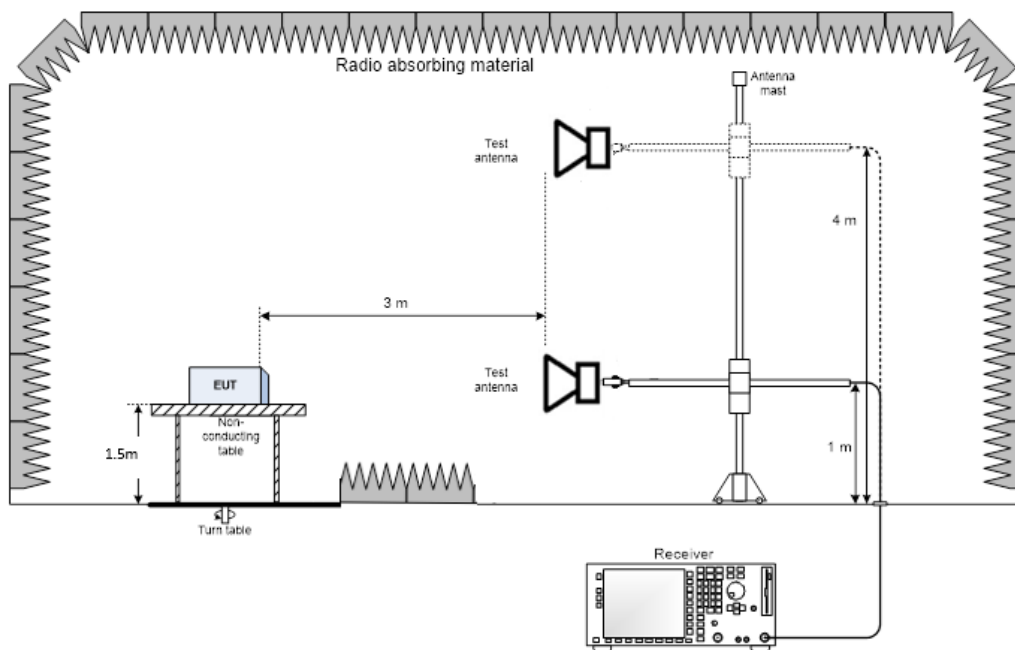


Figure 9.1-2: Above 1 GHz setup