

12.10 Spurious emissions radiated below 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The limits are re-calculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

| Measurement parameter | |
|--------------------------|--|
| Detector: | Peak / Quasi Peak |
| Sweep time: | Auto |
| Video bandwidth: | F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz |
| Resolution bandwidth: | F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz |
| Span: | 9 kHz to 30 MHz |
| Trace mode: | Max Hold |
| Test setup: | See sub clause 7.2 – C |
| Measurement uncertainty: | See chapter 9 |

Limits:

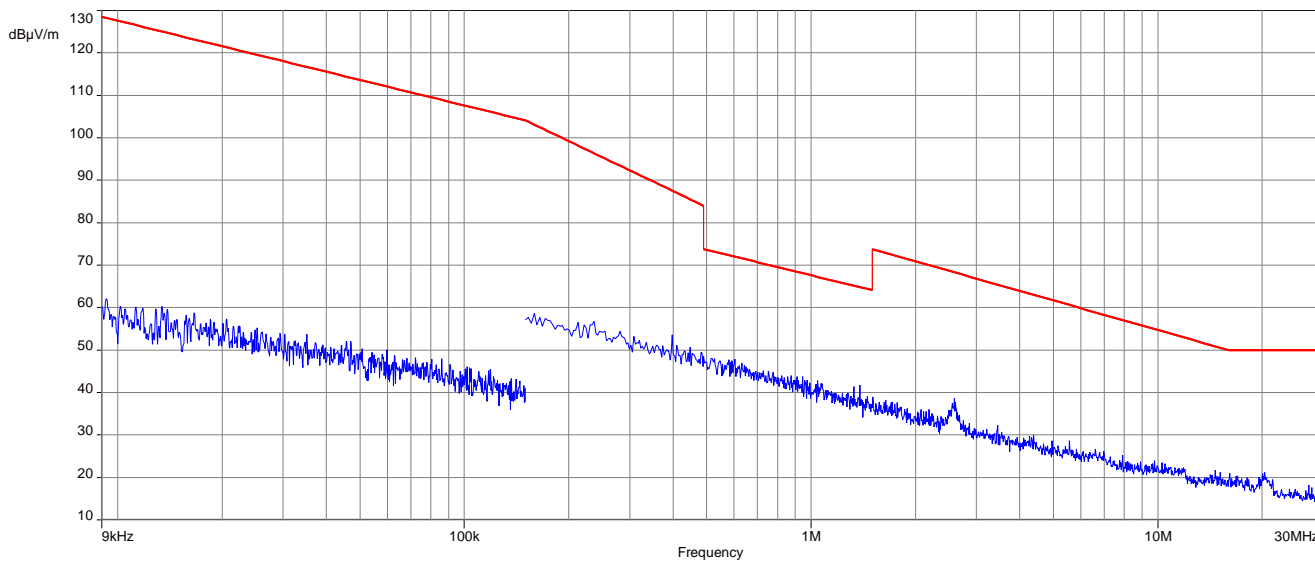
| Spurious Emissions Radiated < 30 MHz | | |
|--------------------------------------|-------------------------|----------------------|
| Frequency (MHz) | Field Strength (dBµV/m) | Measurement distance |
| 0.009 – 0.490 | 2400/F(kHz) | 300 |
| 0.490 – 1.705 | 24000/F(kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |

Results: All antennas

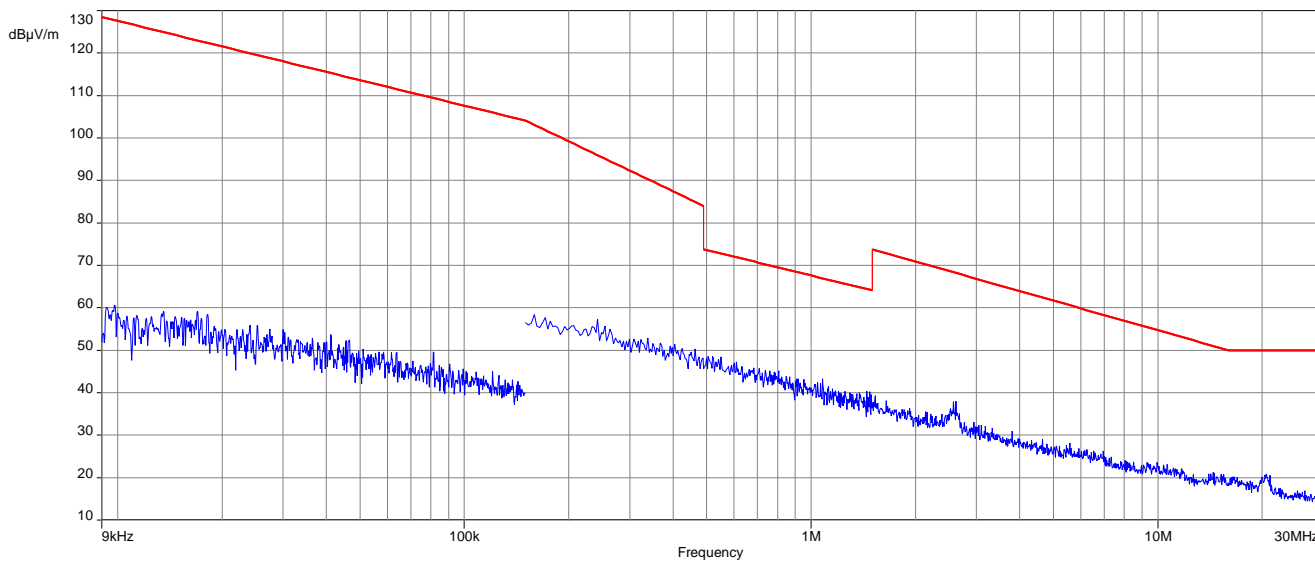
| Spurious Emissions Radiated < 30 MHz [dBµV/m] | | |
|---|----------|----------------|
| F [MHz] | Detector | Level [dBµV/m] |
| All detected emissions are more than 20 dB below the limit. | | |
| | | |
| | | |

Plots: 20 MHz channel bandwidth, COLFLY antennas

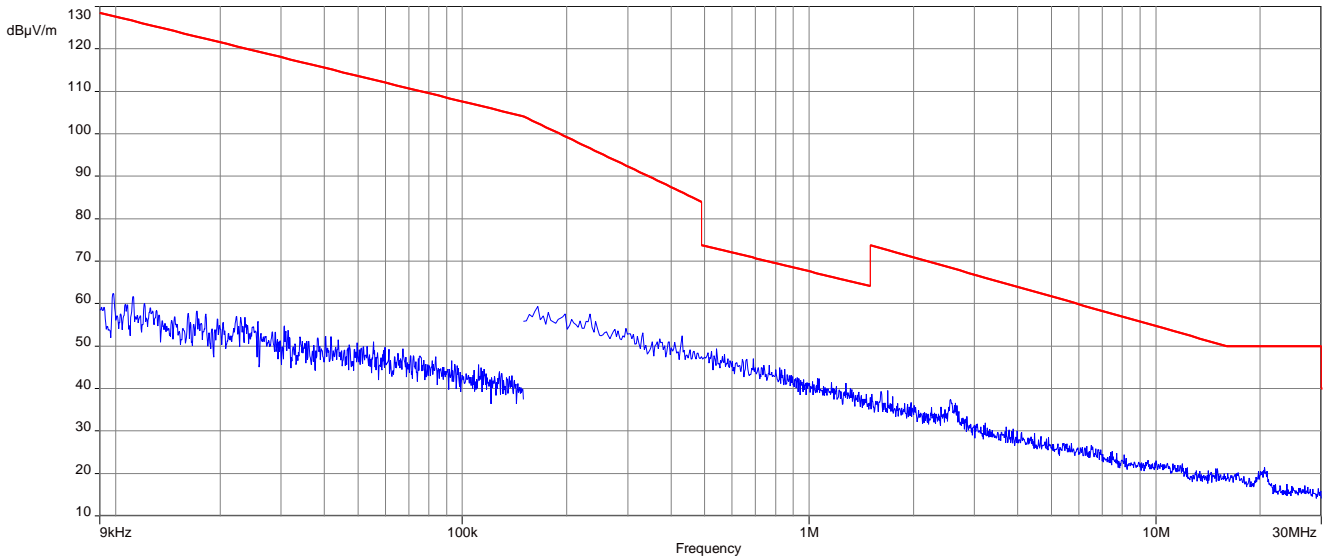
Plot 1: 9 kHz to 30 MHz, U-NII-1; lowest channel



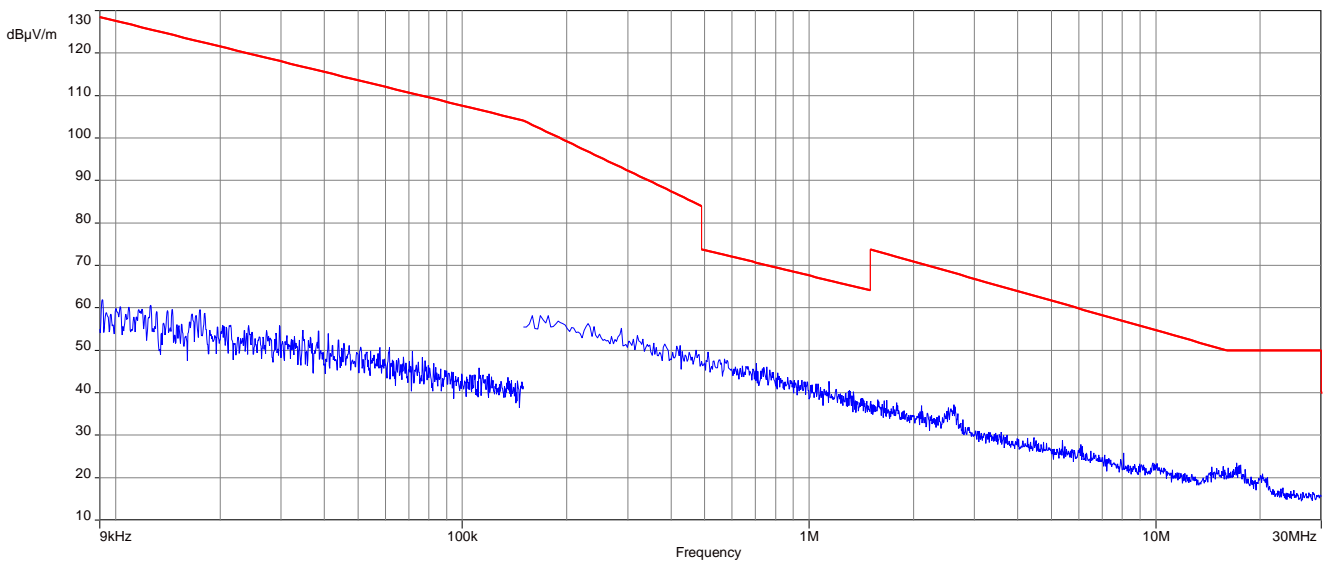
Plot 2: 9 kHz to 30 MHz, U-NII-1; middle channel



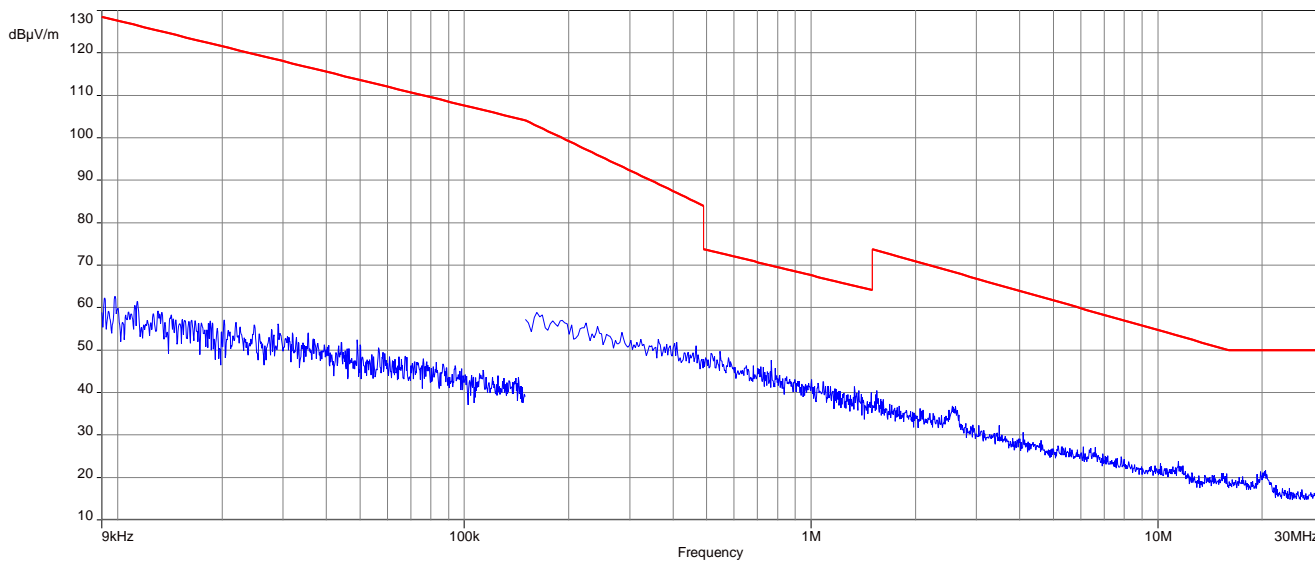
Plot 3: 9 kHz to 30 MHz, U-NII-1; highest channel



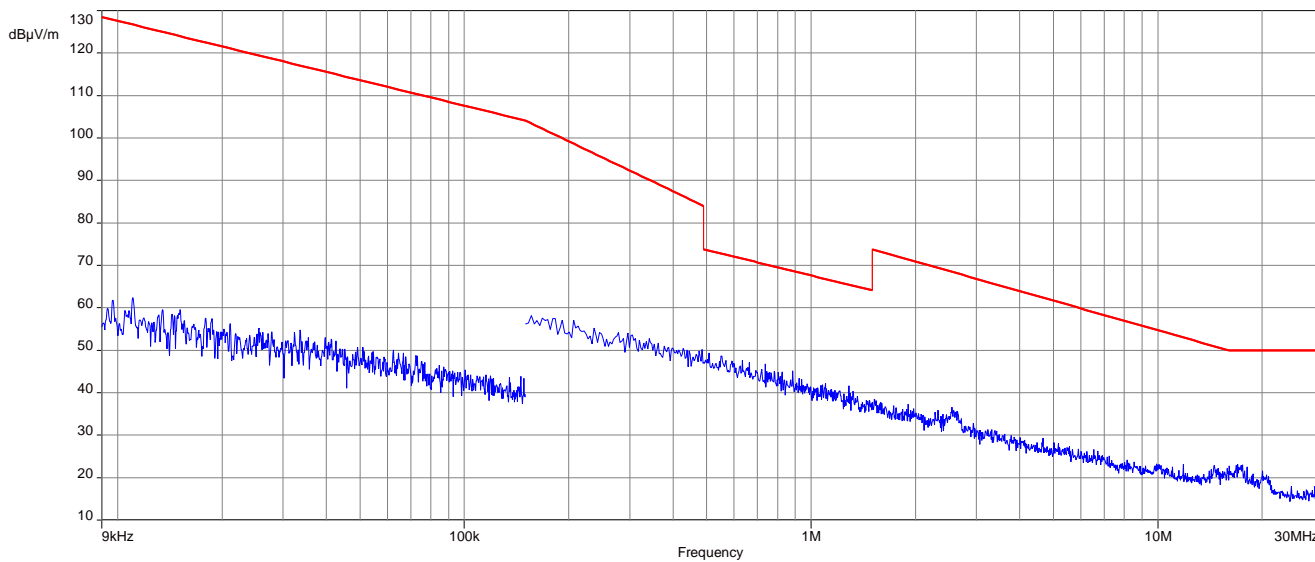
Plot 4: 9 kHz to 30 MHz, U-NII-2A; lowest channel



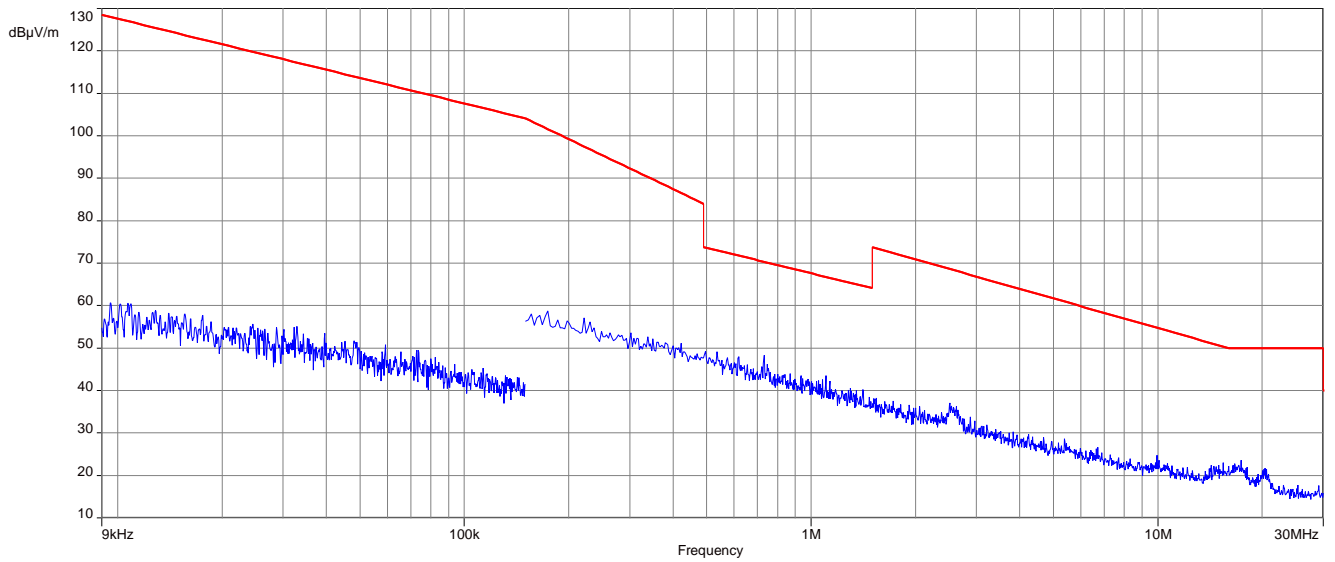
Plot 5: 9 kHz to 30 MHz, U-NII-2A; middle channel



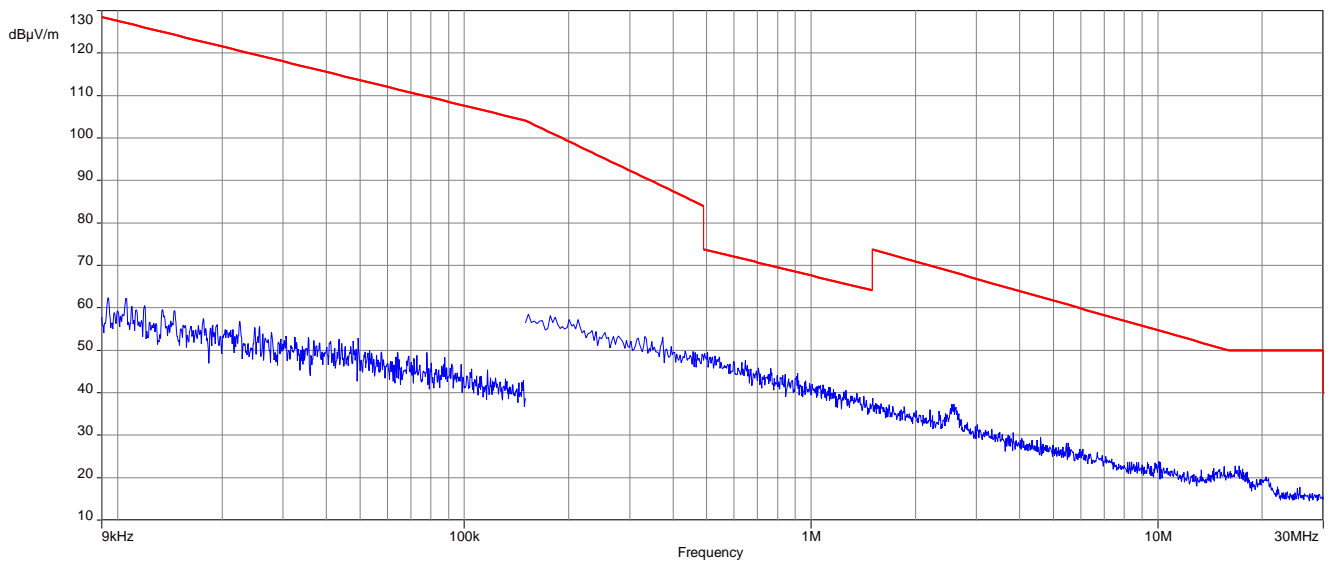
Plot 6: 9 kHz to 30 MHz, U-NII-2A; highest channel



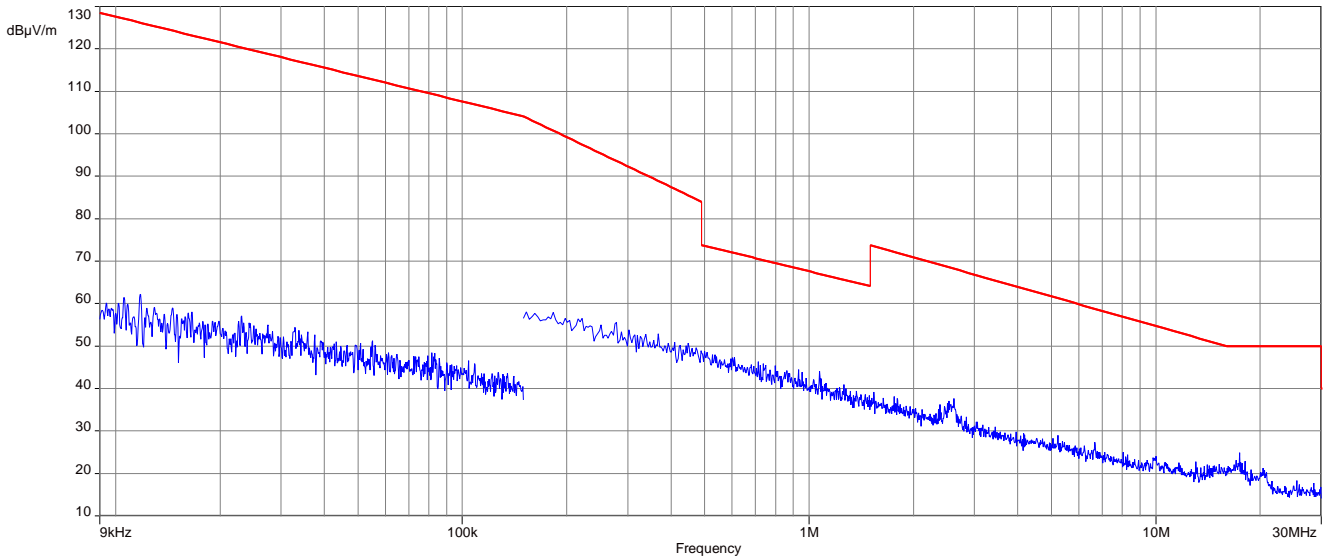
Plot 7: 9 kHz to 30 MHz, U-NII-2C; lowest channel



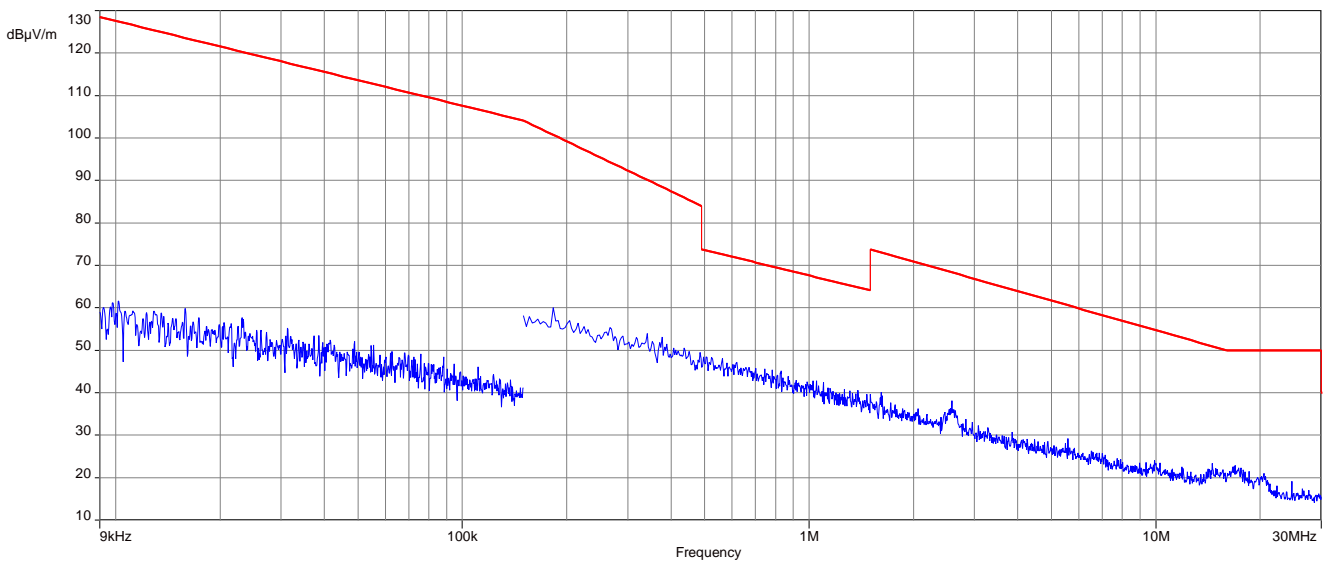
Plot 8: 9 kHz to 30 MHz, U-NII-2C; middle channel



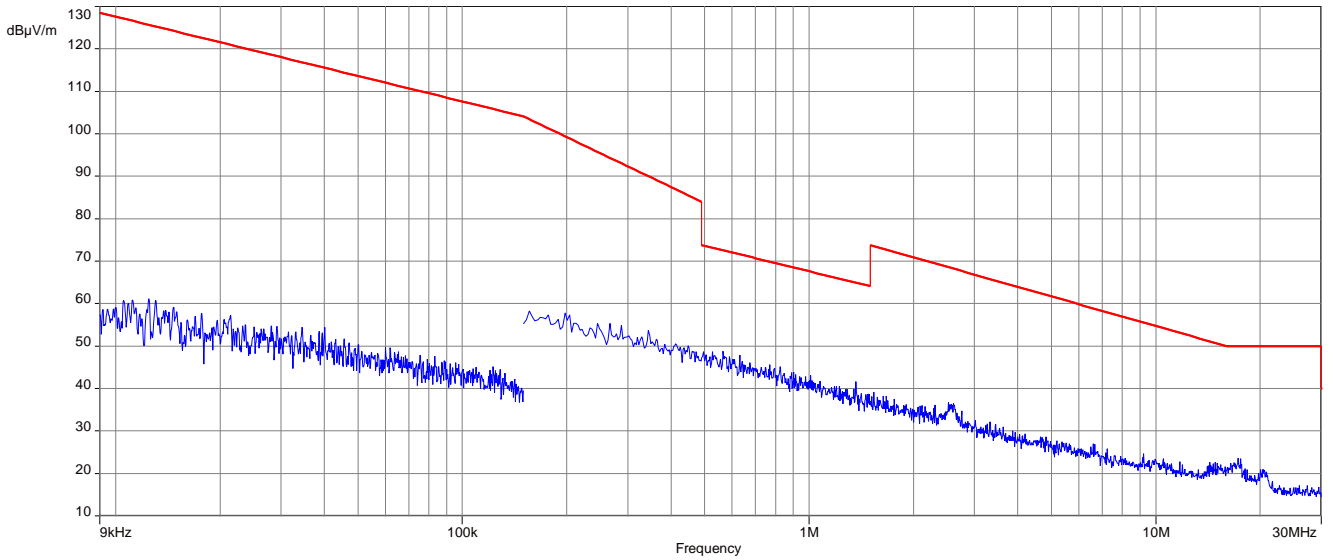
Plot 9: 9 kHz to 30 MHz, U-NII-2C; highest channel



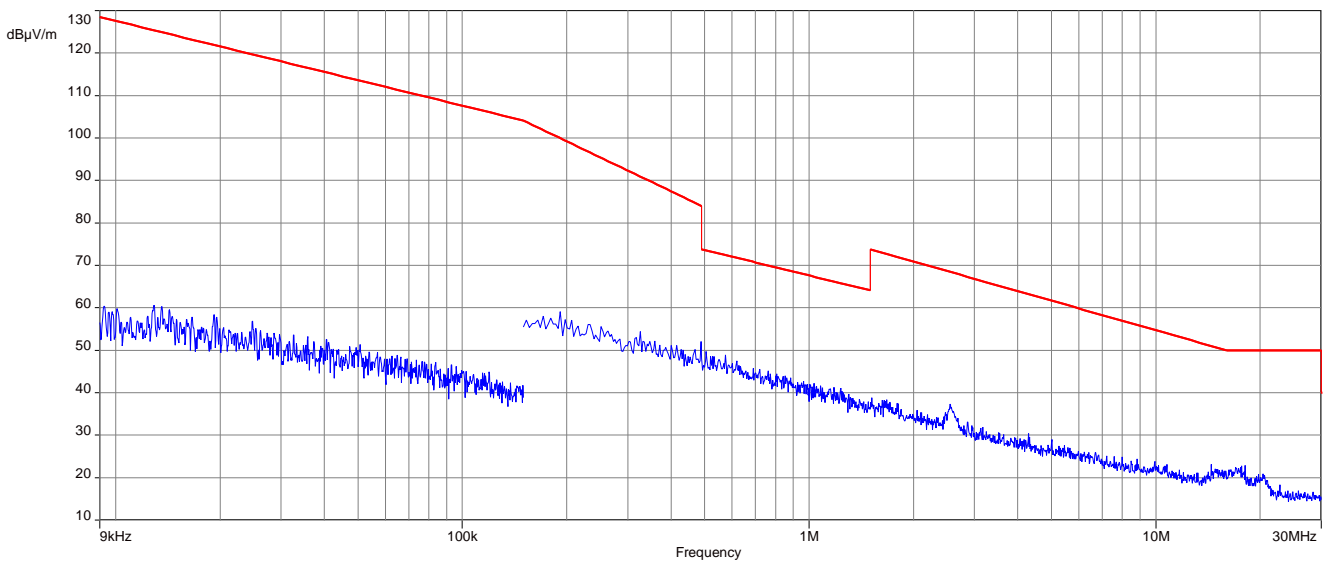
Plot 10: 9 kHz to 30 MHz, U-NII-3; lowest channel



Plot 11: 9 kHz to 30 MHz, U-NII-3; middle channel

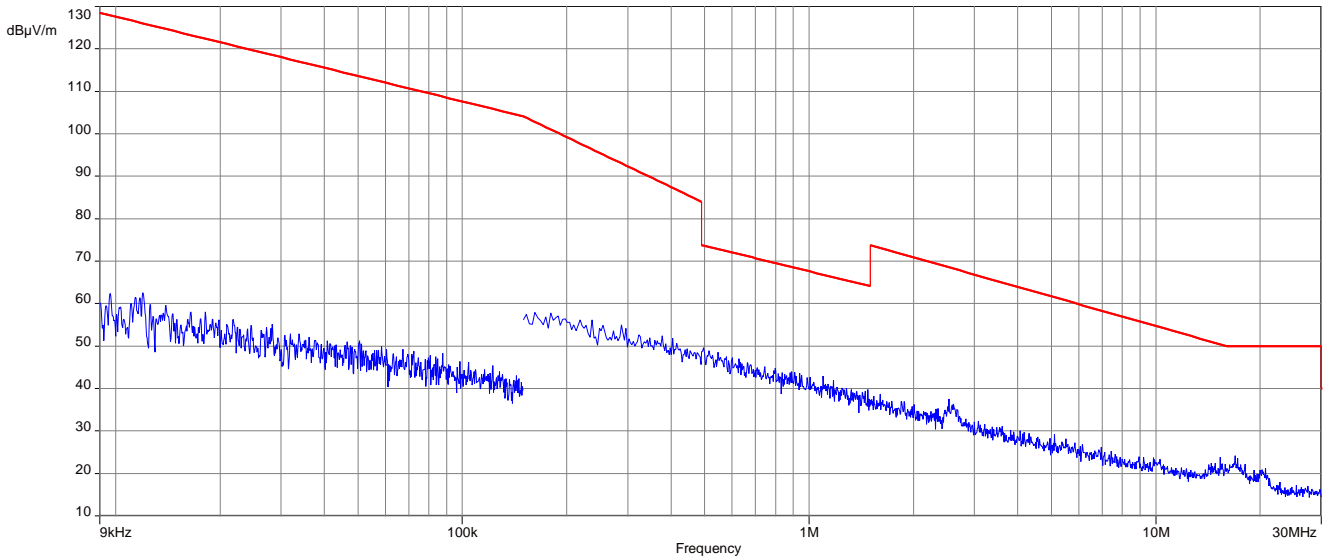


Plot 12: 9 kHz to 30 MHz, U-NII-3; highest channel

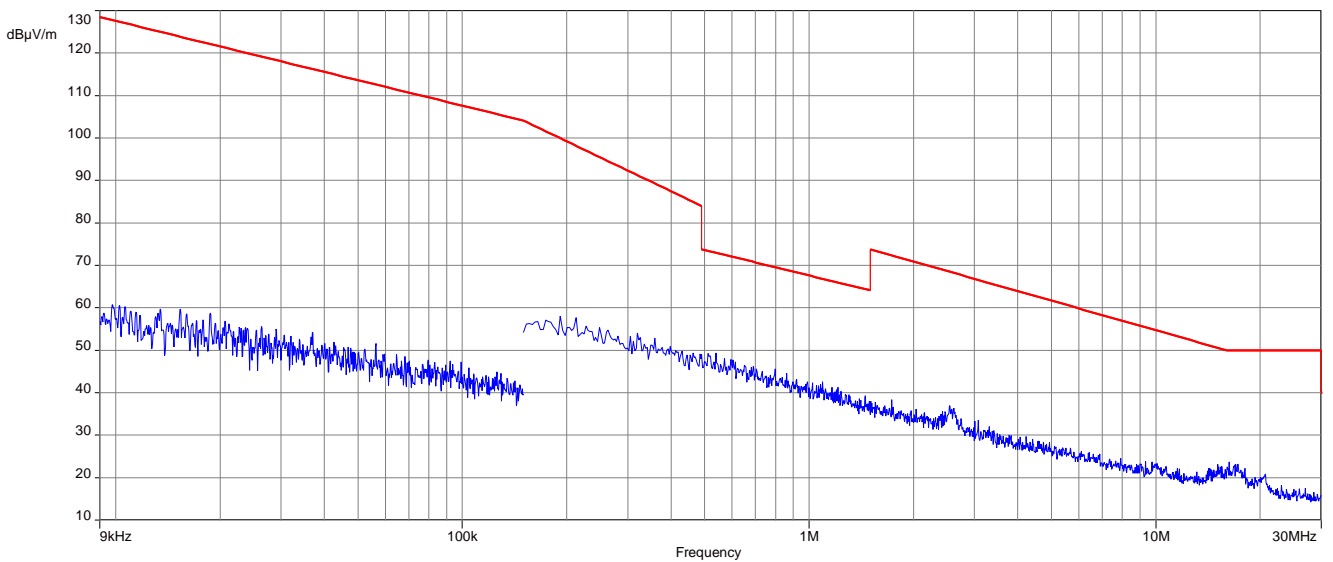


Plots: 40 MHz channel bandwidth

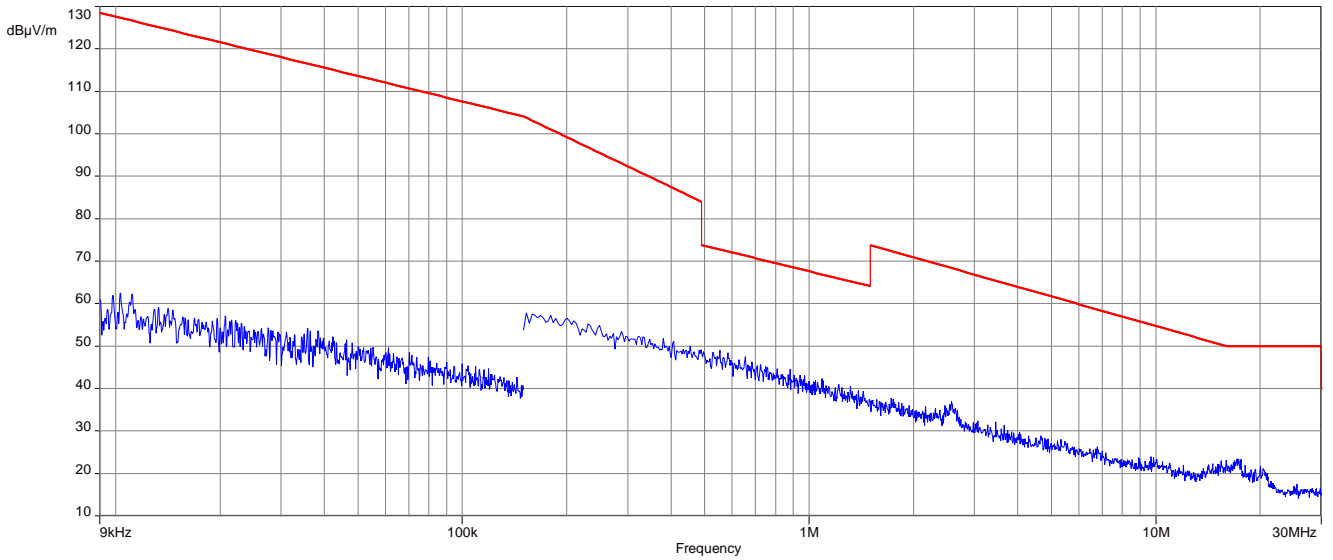
Plot 1: 9 kHz to 30 MHz, U-NII-1; lowest channel



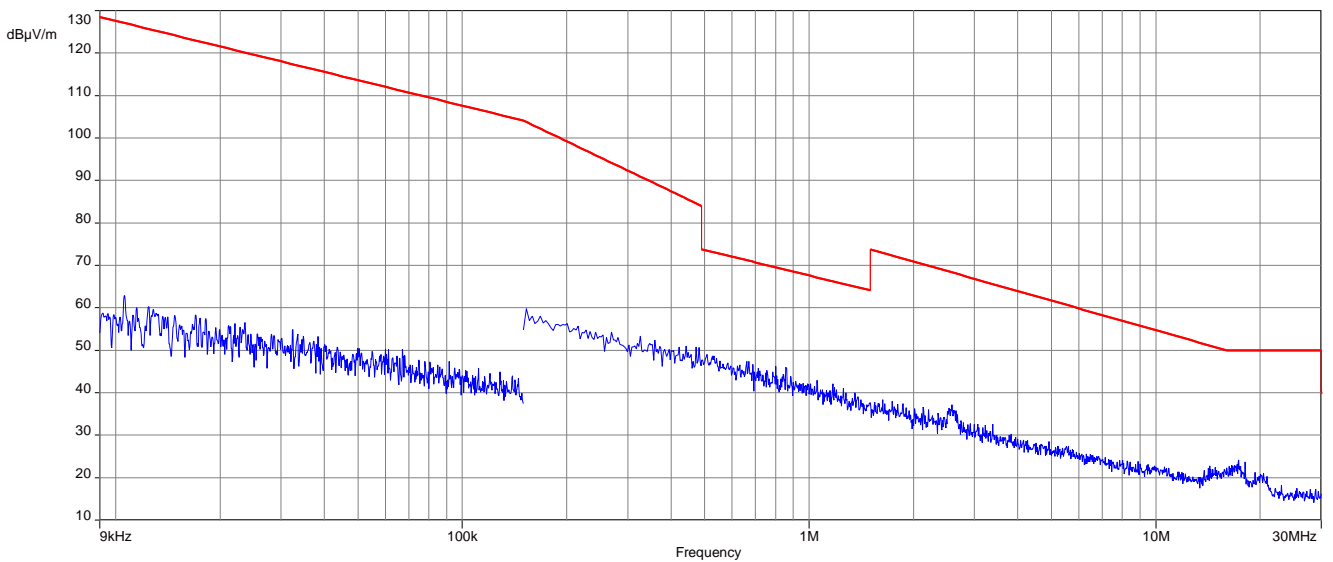
Plot 2: 9 kHz to 30 MHz, U-NII-1; highest channel



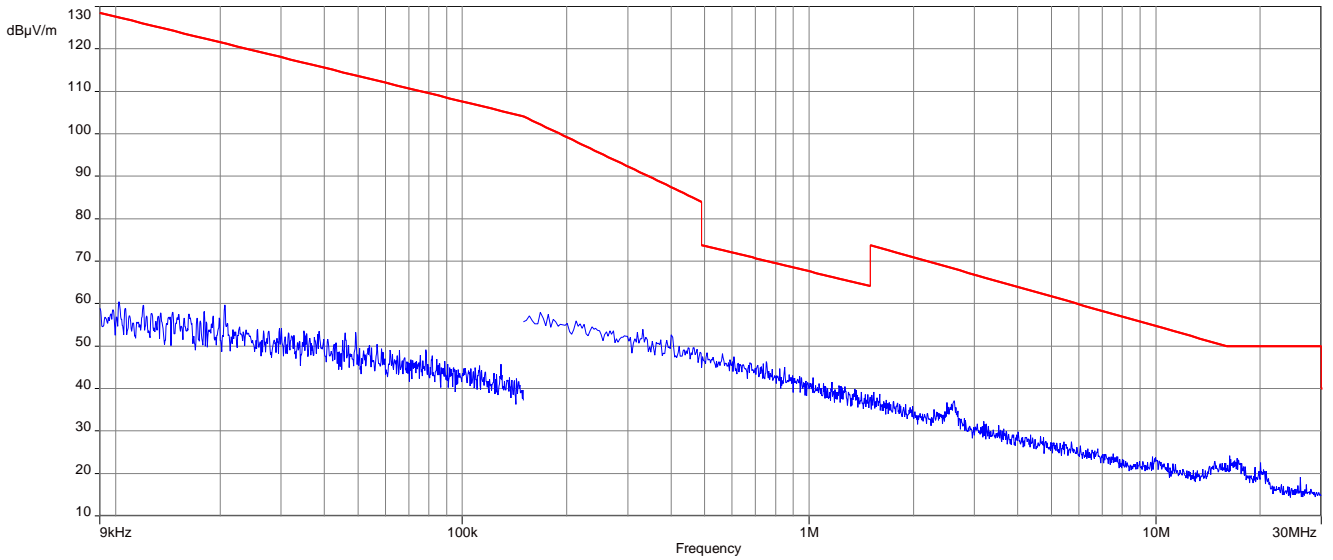
Plot 3: 9 kHz to 30 MHz, U-NII-2A; lowest channel



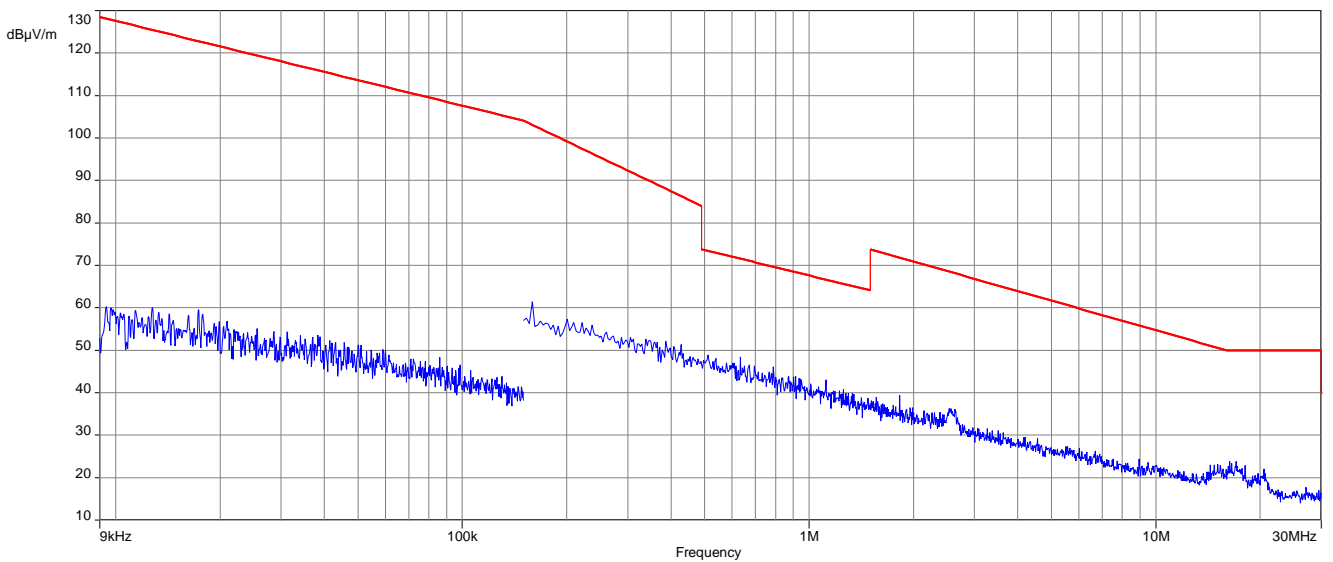
Plot 4: 9 kHz to 30 MHz, U-NII-2A; highest channel



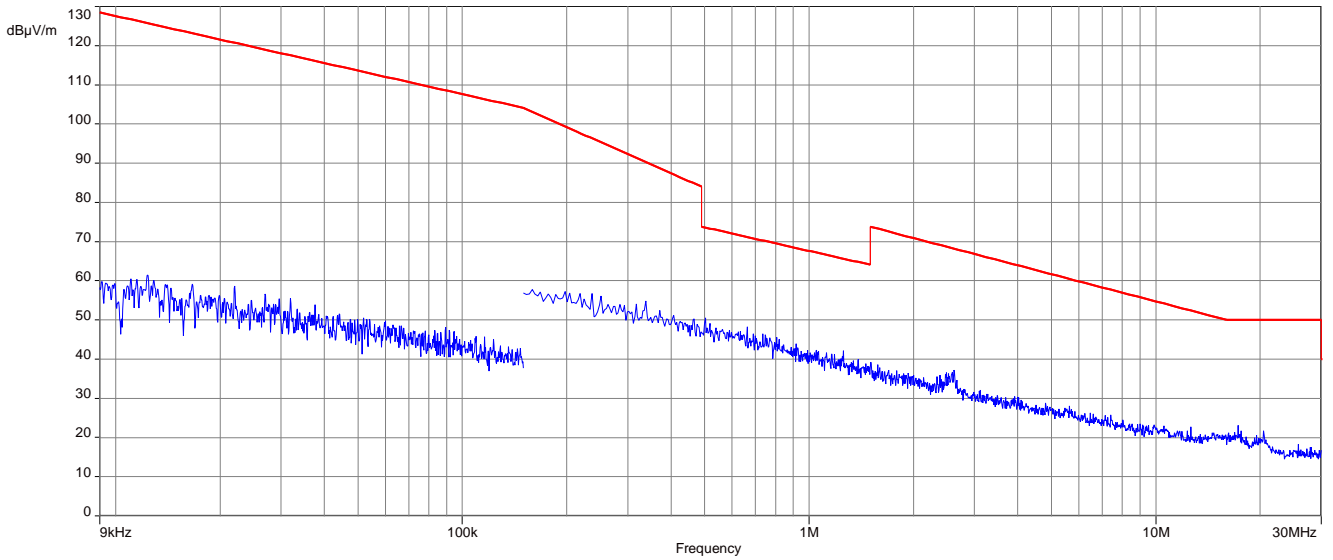
Plot 5: 9 kHz to 30 MHz, U-NII-2C; lowest channel



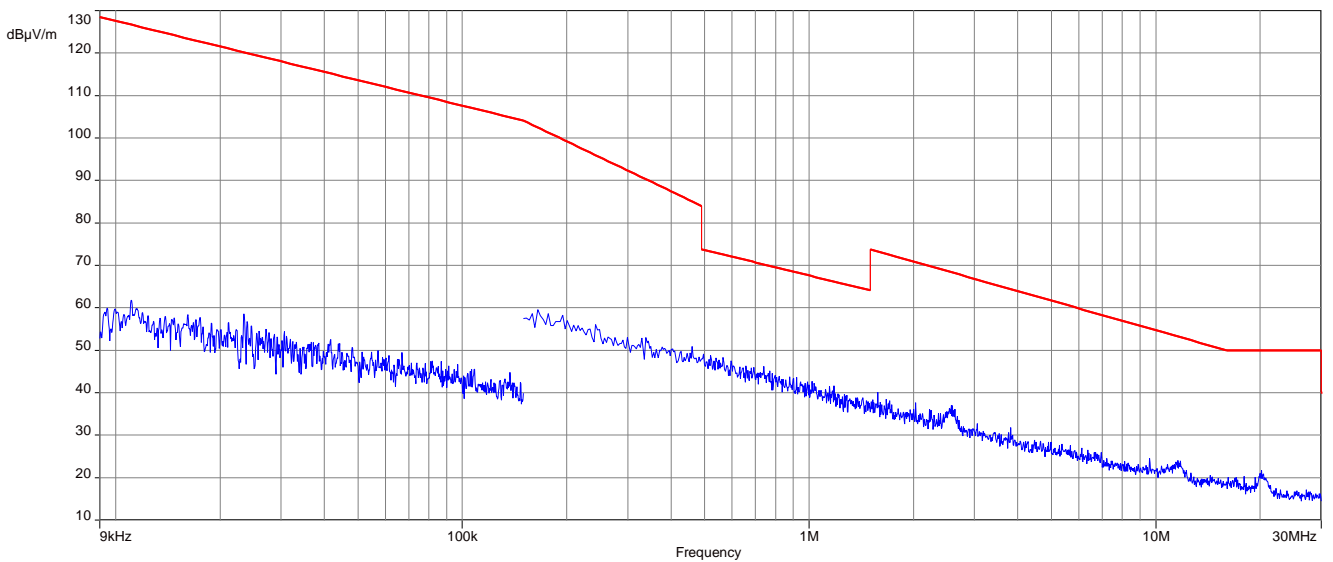
Plot 6: 9 kHz to 30 MHz, U-NII-2C; middle channel



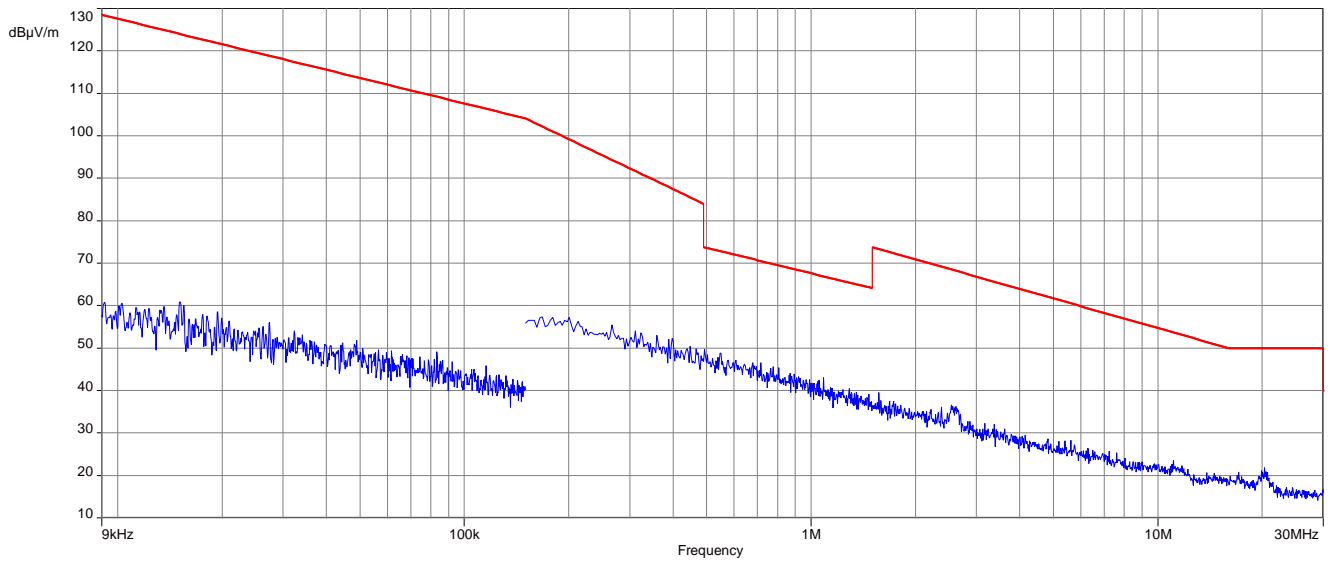
Plot 7: 9 kHz to 30 MHz, U-NII-2C; highest channel



Plot 8: 9 kHz to 30 MHz, U-NII-3; lowest channel

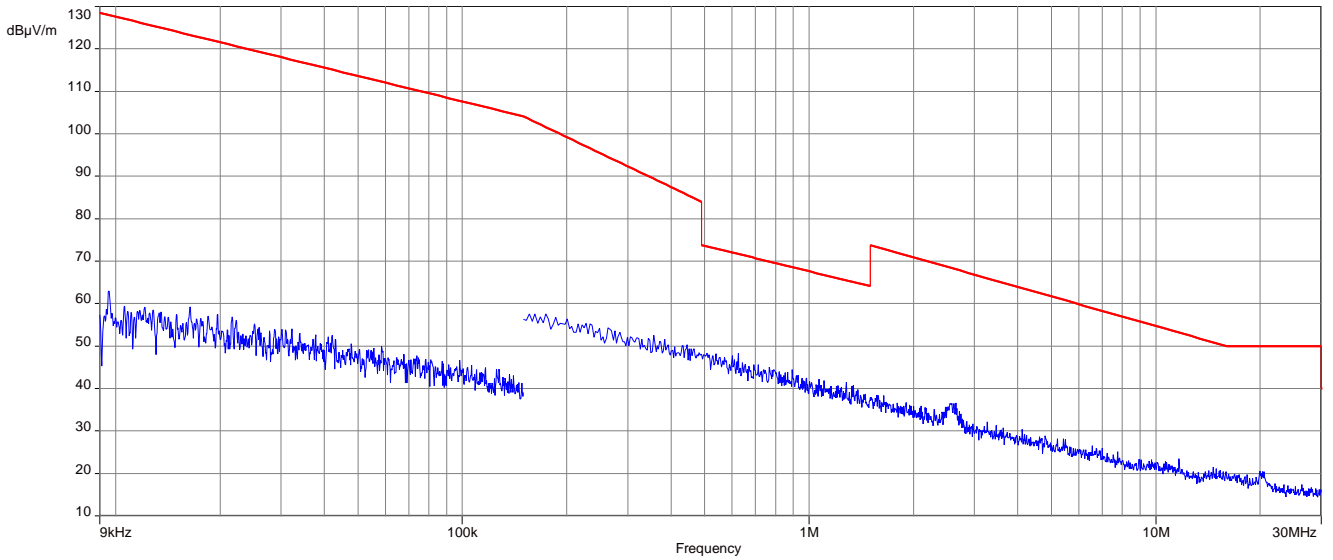


Plot 9: 9 kHz to 30 MHz, U-NII-3; highest channel

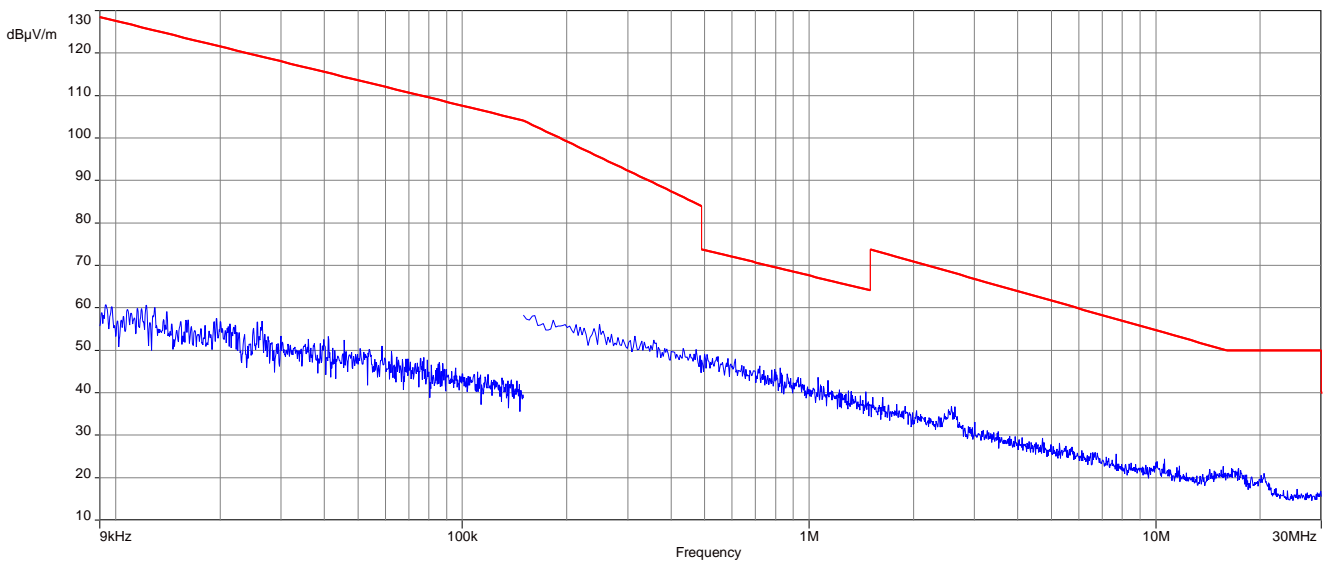


Plots: 80 MHz channel bandwidth

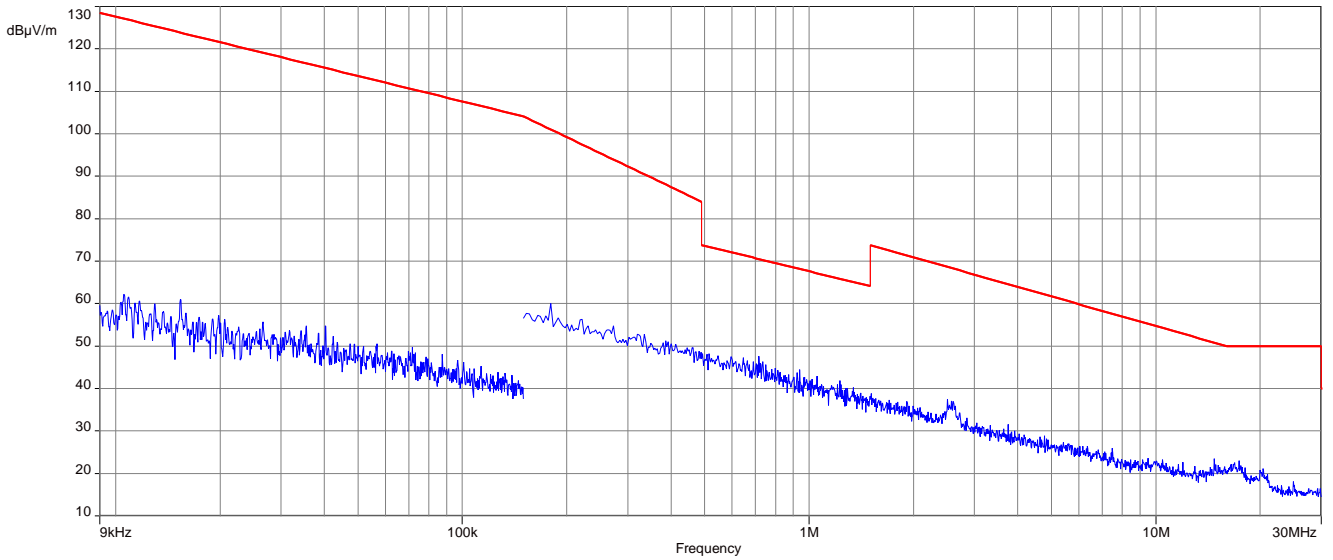
Plot 1: 9 kHz to 30 MHz, U-NII-1; middle channel



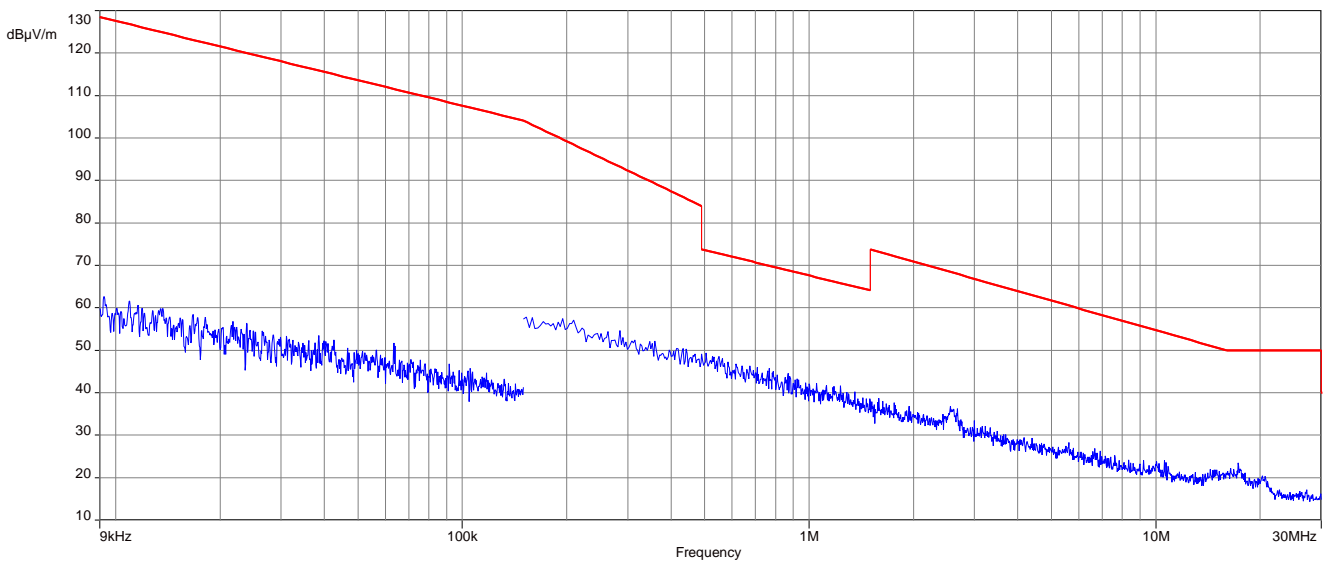
Plot 2: 9 kHz to 30 MHz, U-NII-2A; middle channel



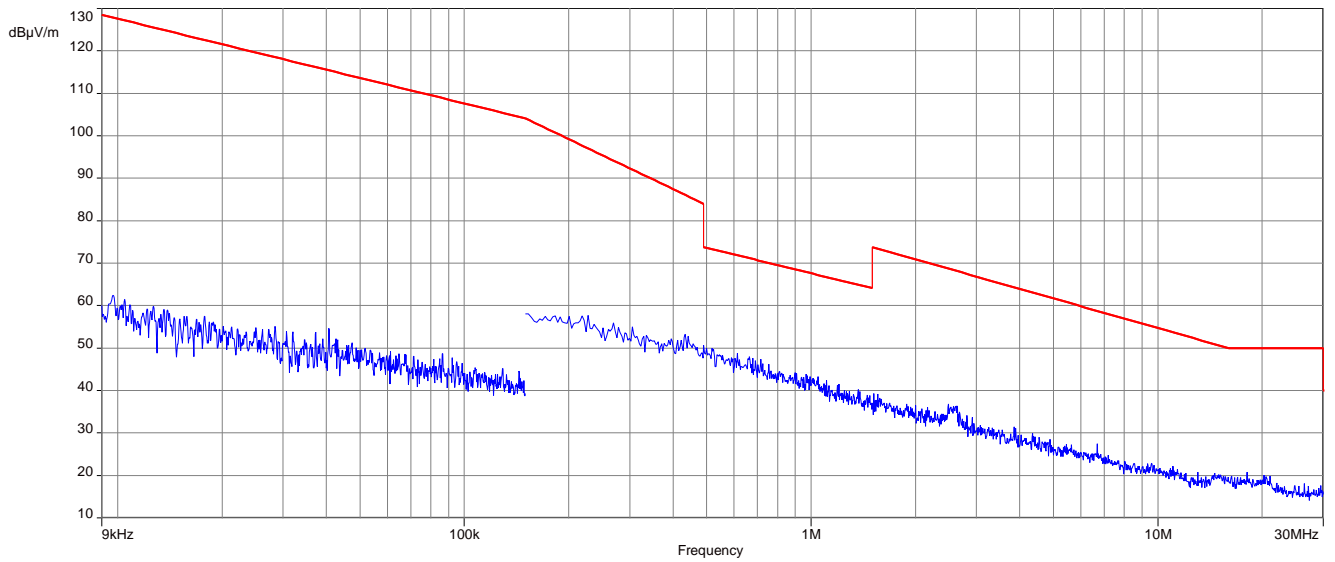
Plot 3: 9 kHz to 30 MHz, U-NII-2C; lowest channel



Plot 4: 9 kHz to 30 MHz, U-NII-2C; highest channel

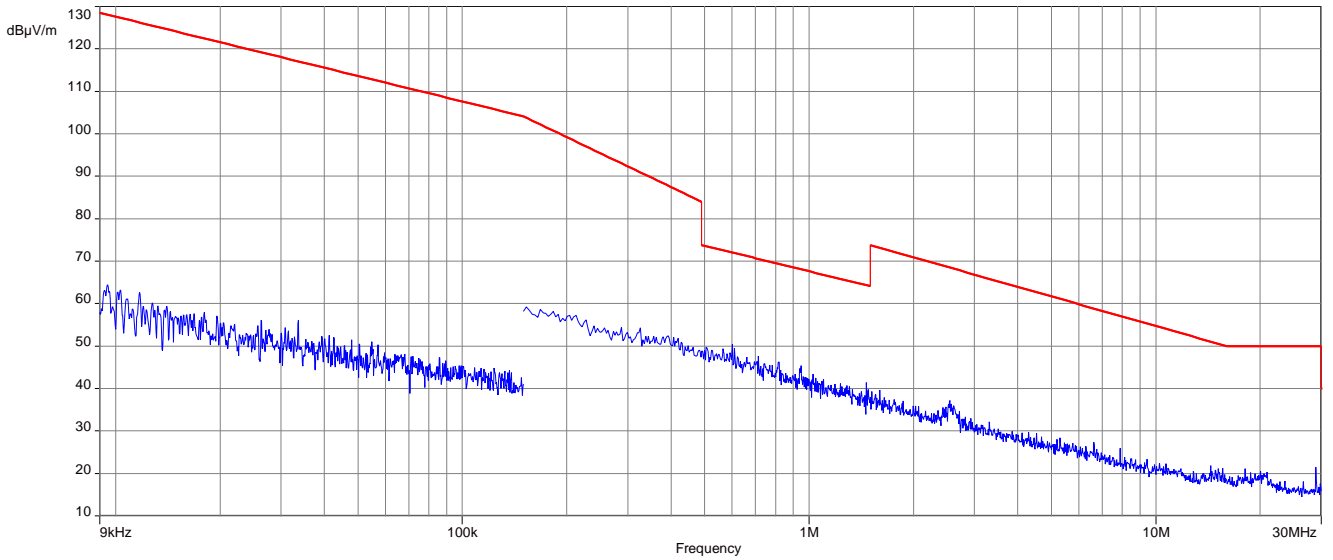


Plot 5: 9 kHz to 30 MHz, U-NII-3; middle channel

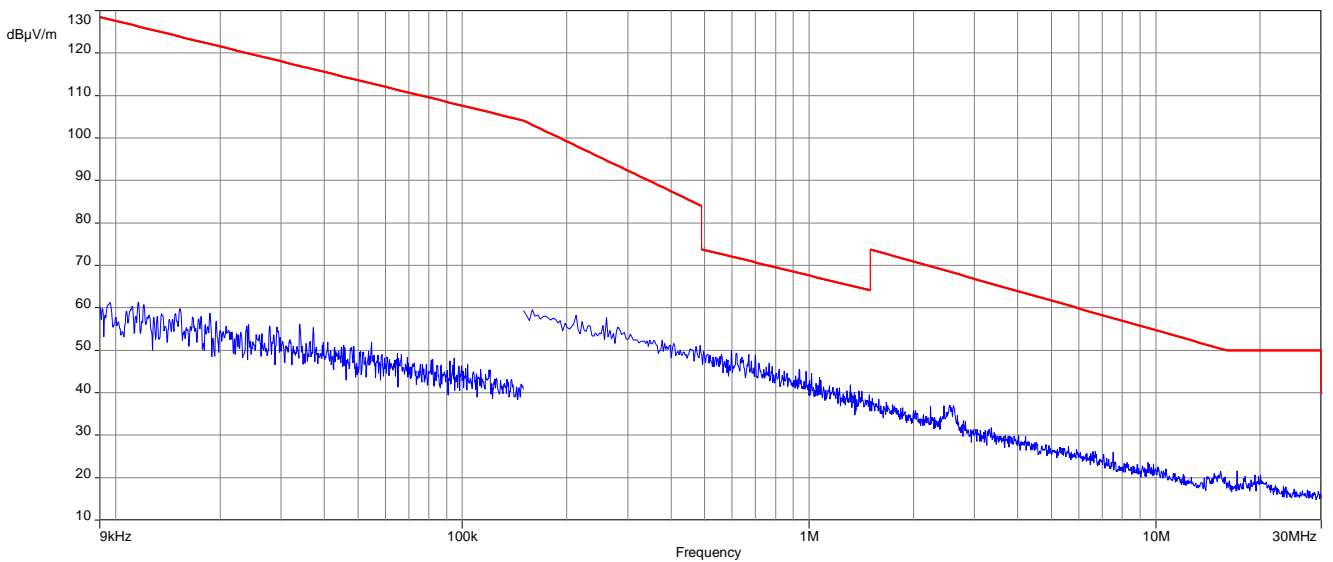


Plots: 80+80 MHz channel bandwidth

Plot 1: 9 kHz to 30 MHz, U-NII-1 & U-NII-2A; middle channel

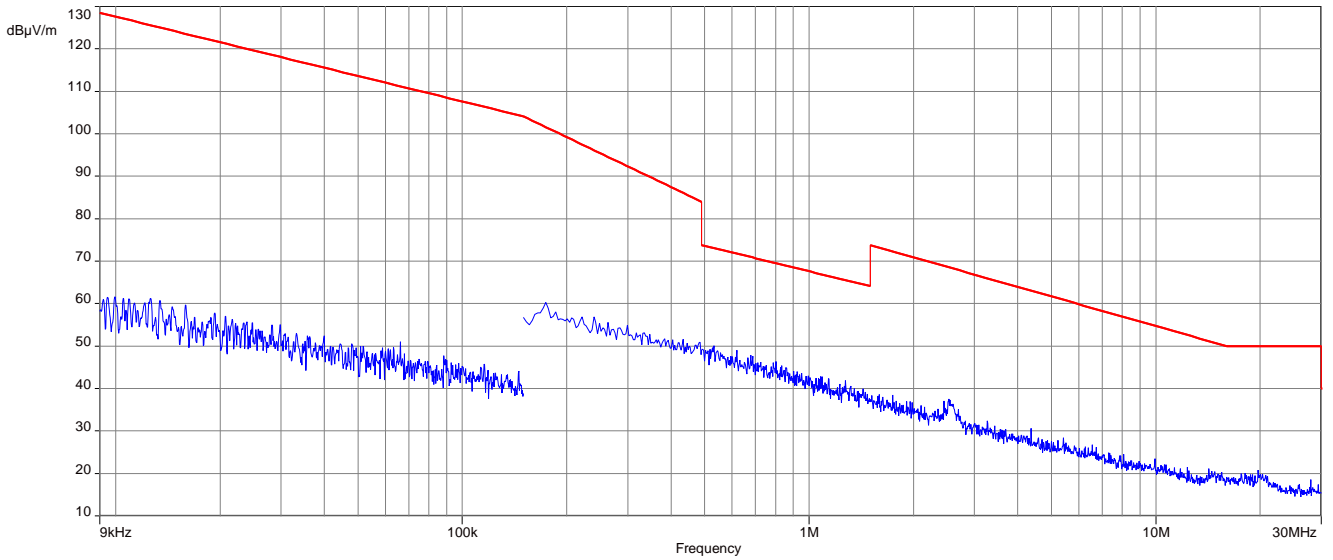


Plot 2: 9 kHz to 30 MHz, U-NII-2C; middle channel

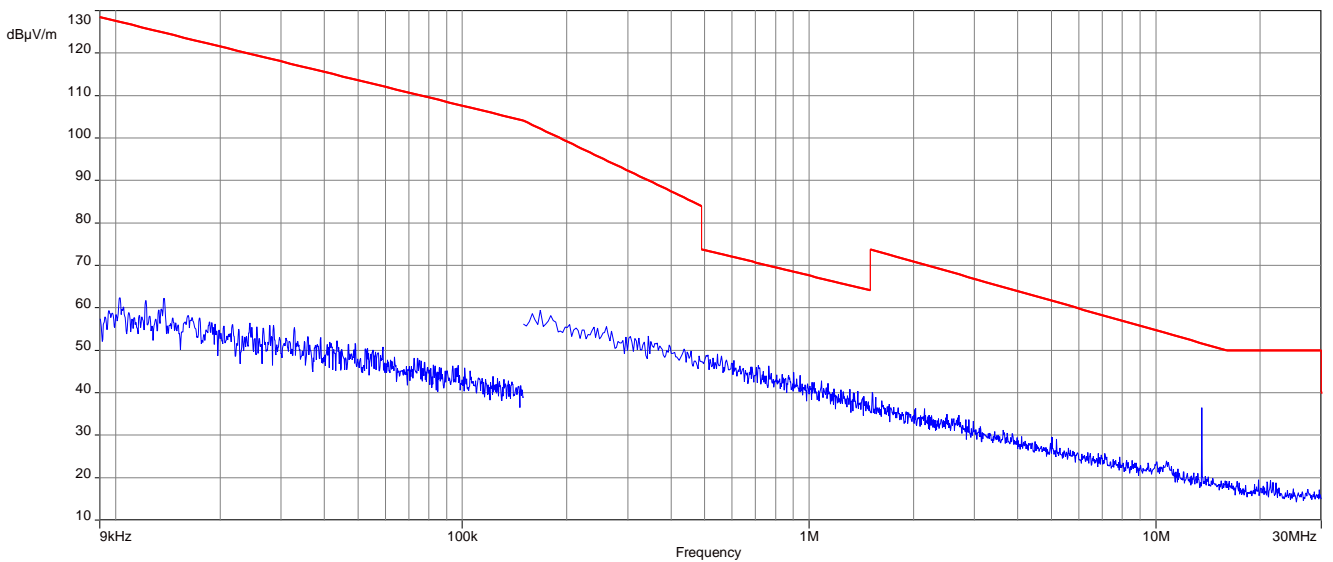


Plots: WALSIN antennas

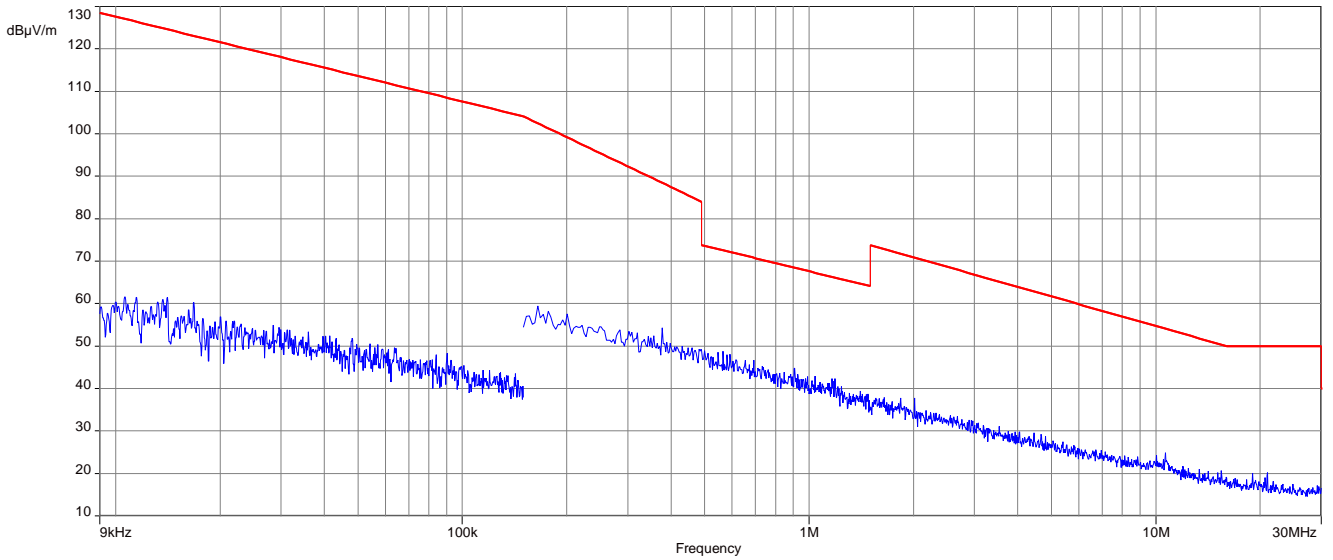
Plot 1: 9 kHz to 30 MHz, U-NII-3; lowest channel, 20 MHz OFDM-mode



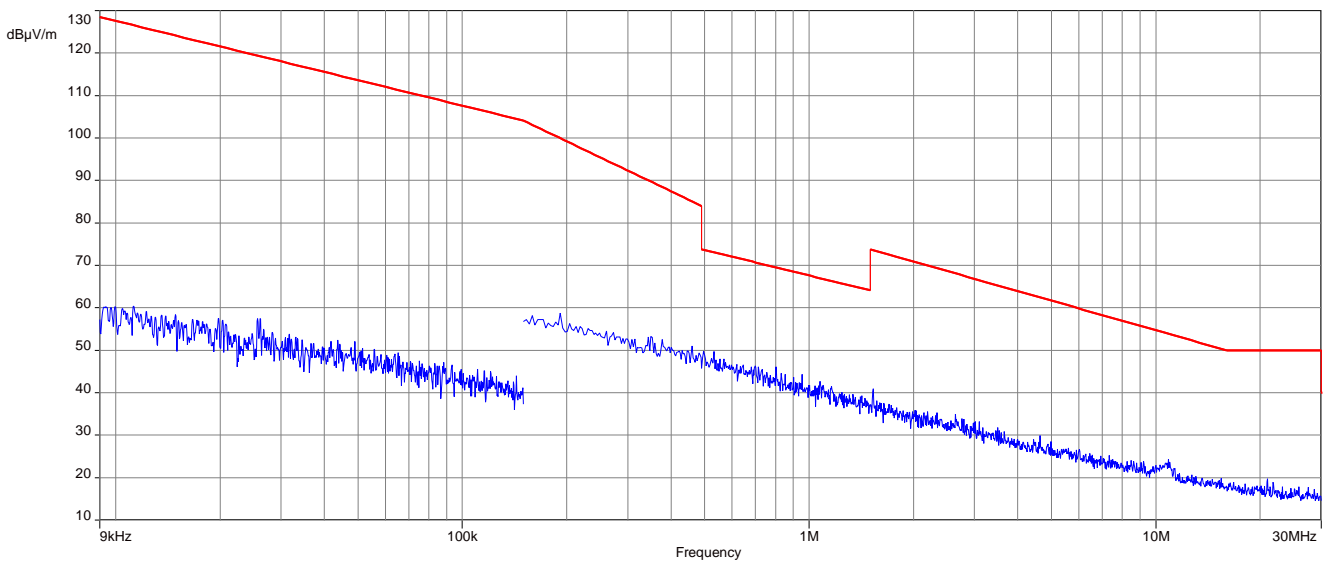
Plot 2: 9 kHz to 30 MHz, U-NII-2C; highest channel, 40 MHz OFDM mode



Plot 3: 9 kHz to 30 MHz, U-NII-2C; middle channel 80 MHz OFDM-mode

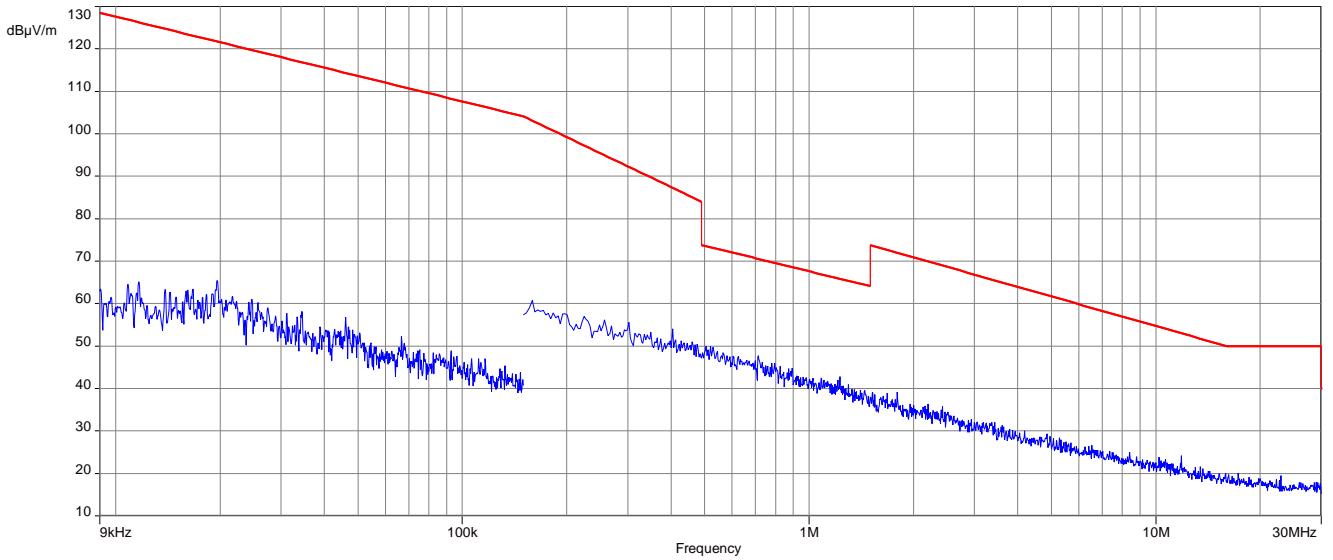


Plot 4: 9 kHz to 30 MHz, U-NII-2C; middle channel, 80+80 MHz OFDM-mode

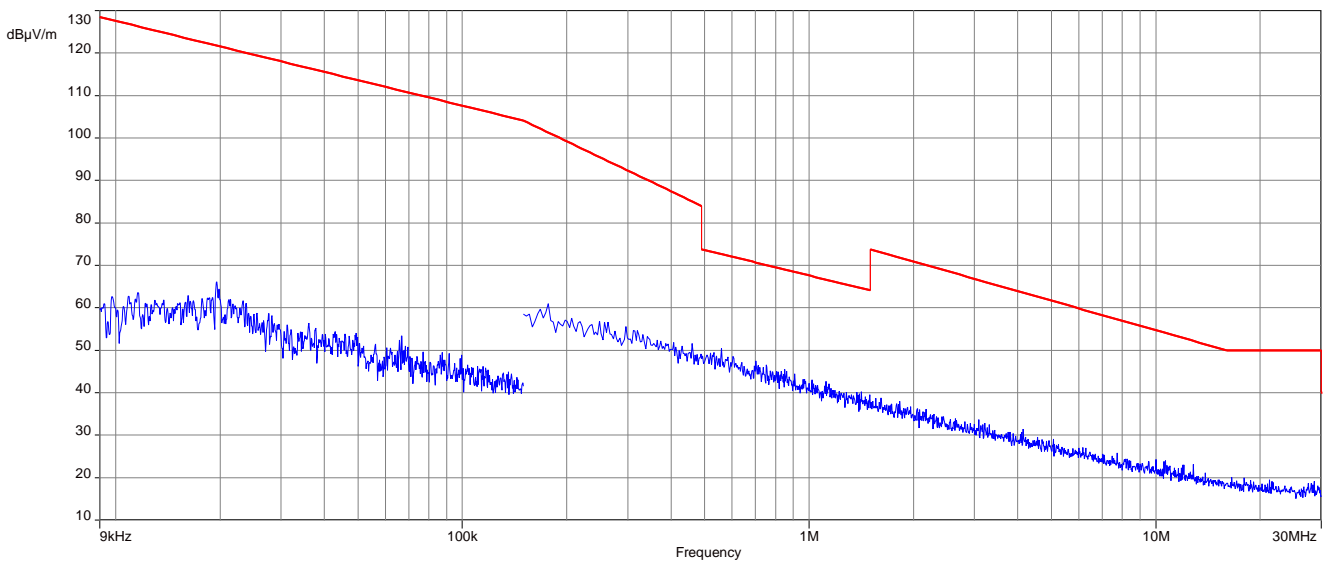


Plots: HL antennas

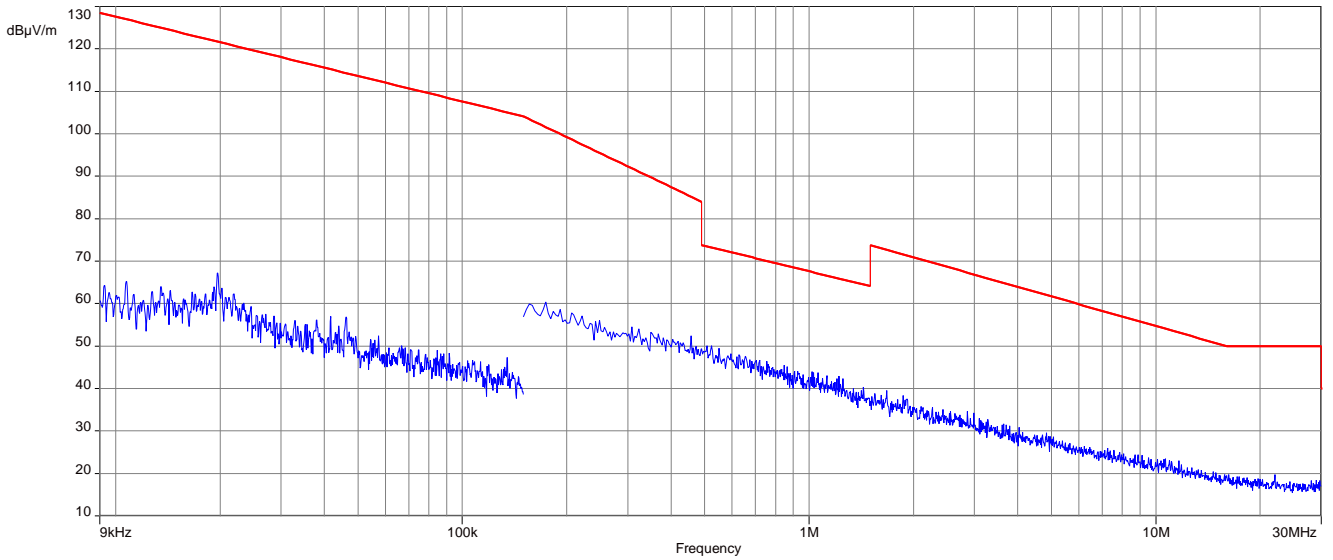
Plot 1: 9 kHz to 30 MHz, U-NII-3; lowest channel, 20 MHz OFDM-mode



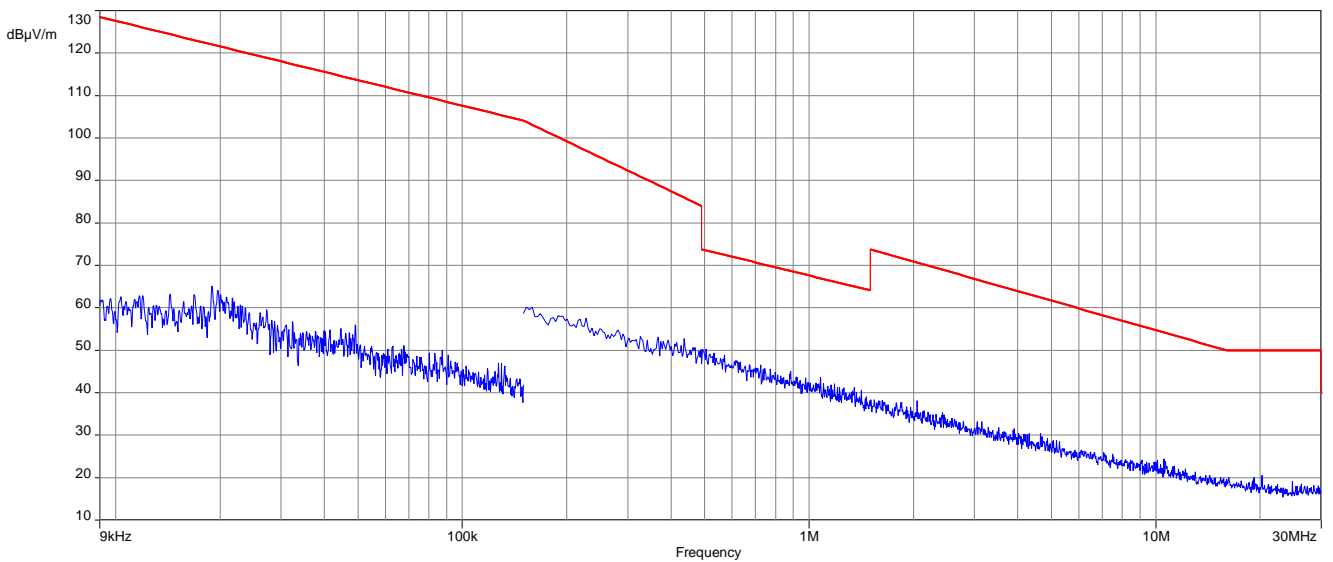
Plot 2: 9 kHz to 30 MHz, U-NII-2C; highest channel, 40 MHz OFDM mode



Plot 3: 9 kHz to 30 MHz, U-NII-2C; middle channel 80 MHz OFDM-mode



Plot 4: 9 kHz to 30 MHz, U-NII-2C; middle channel, 80+80 MHz OFDM-mode



12.11 Spurious emissions radiated 30 MHz to 1 GHz

Description:

Measurement of the radiated spurious emissions and cabinet radiations below 1 GHz.

Measurement:

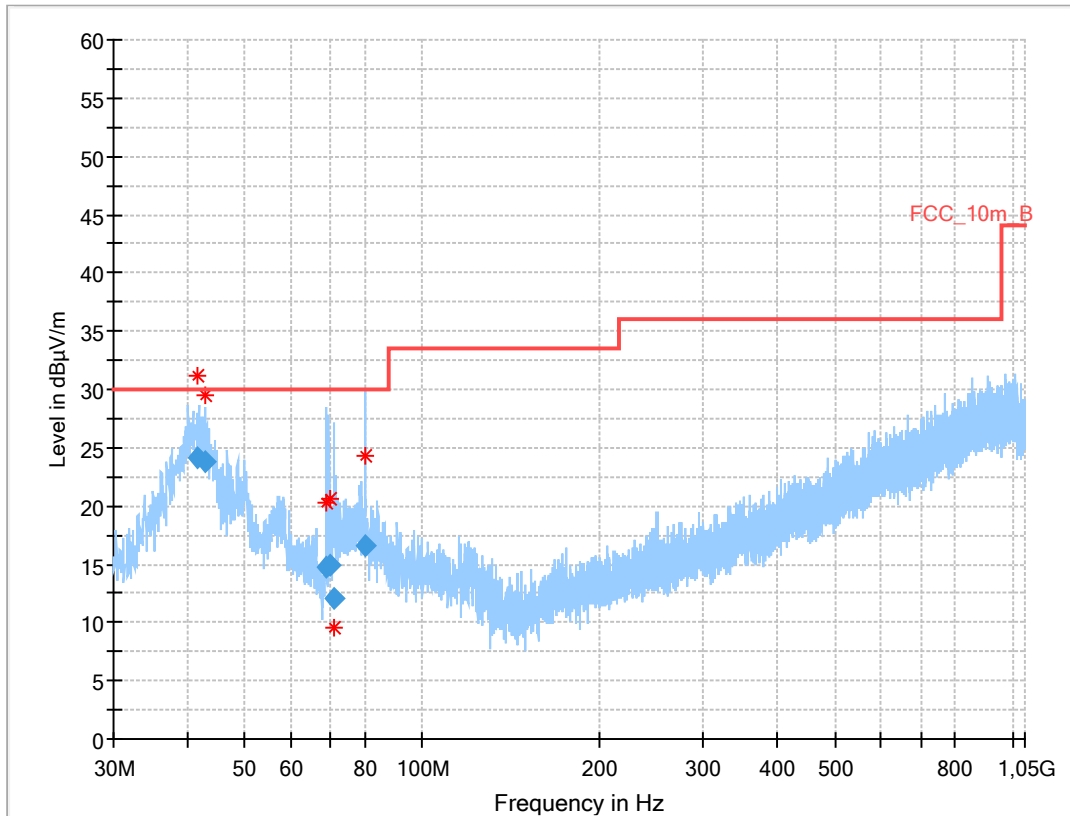
| Measurement parameter | |
|--------------------------|------------------------|
| Detector: | Quasi Peak |
| Sweep time: | Auto |
| Resolution bandwidth: | 120 kHz |
| Video bandwidth: | 500 kHz |
| Span: | 30 MHz to 1 GHz |
| Test setup: | See sub clause 7.1 – A |
| Measurement uncertainty: | See chapter 9 |

Limits:

| TX Spurious Emissions Radiated | | |
|--------------------------------|-------------------------|----------------------|
| §15.209 / RSS-247 | | |
| Frequency (MHz) | Field Strength (dBµV/m) | Measurement distance |
| 30 - 88 | 30.0 | 10 |
| 88 – 216 | 33.5 | 10 |
| 216 – 960 | 36.0 | 10 |
| Above 960 | 54.0 | 3 |
| §15.407 | | |
| Outside the restricted bands! | -27 dBm / MHz | |

Plots:

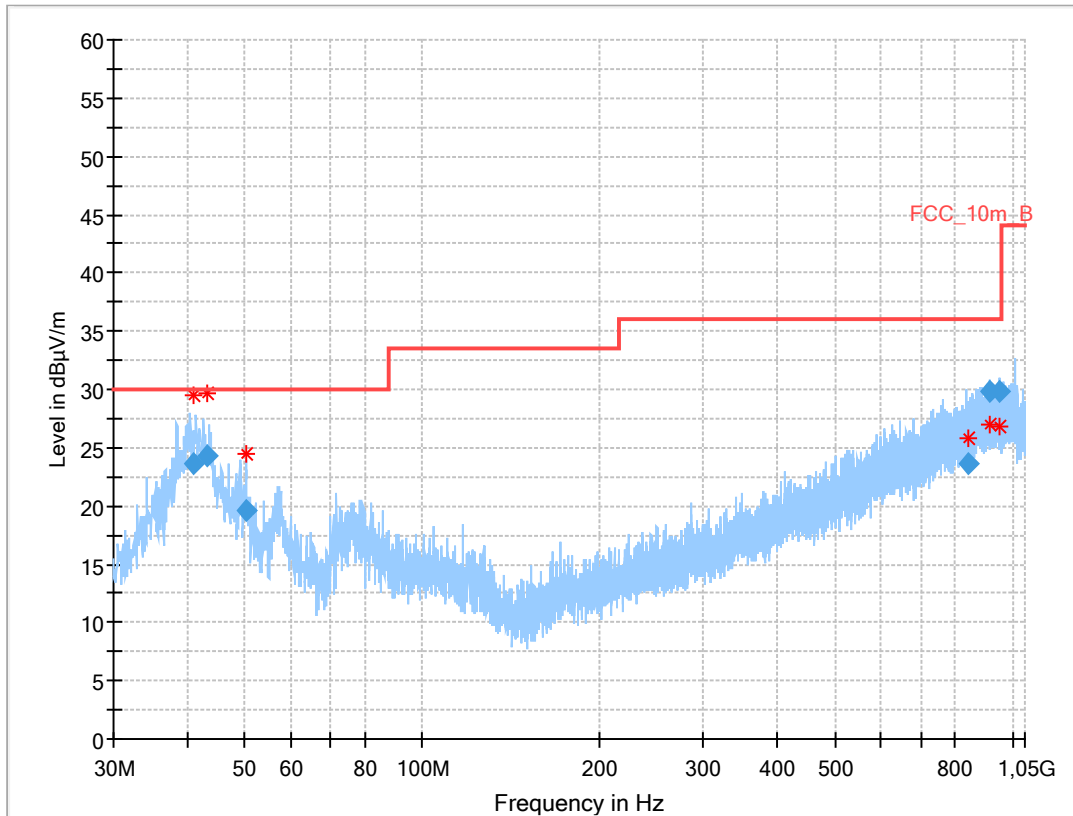
Plot 1: 30 MHz to 1 GHz; vertical & horizontal polarization; valid for all channels of all 20 MHz modes and all antenna configurations



Results:

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 41.713 | 24.13 | 30.0 | 5.9 | 1000 | 120.0 | 152.0 | V | 192 | 16 |
| 42.922 | 23.79 | 30.0 | 6.2 | 1000 | 120.0 | 106.0 | V | 76 | 16 |
| 68.531 | 14.68 | 30.0 | 15.3 | 1000 | 120.0 | 195.0 | V | 29 | 10 |
| 70.006 | 14.97 | 30.0 | 15.0 | 1000 | 120.0 | 101.0 | V | 19 | 10 |
| 70.889 | 12.02 | 30.0 | 18.0 | 1000 | 120.0 | 195.0 | H | -37 | 9 |
| 80.147 | 16.55 | 30.0 | 13.5 | 1000 | 120.0 | 195.0 | V | 57 | 8 |

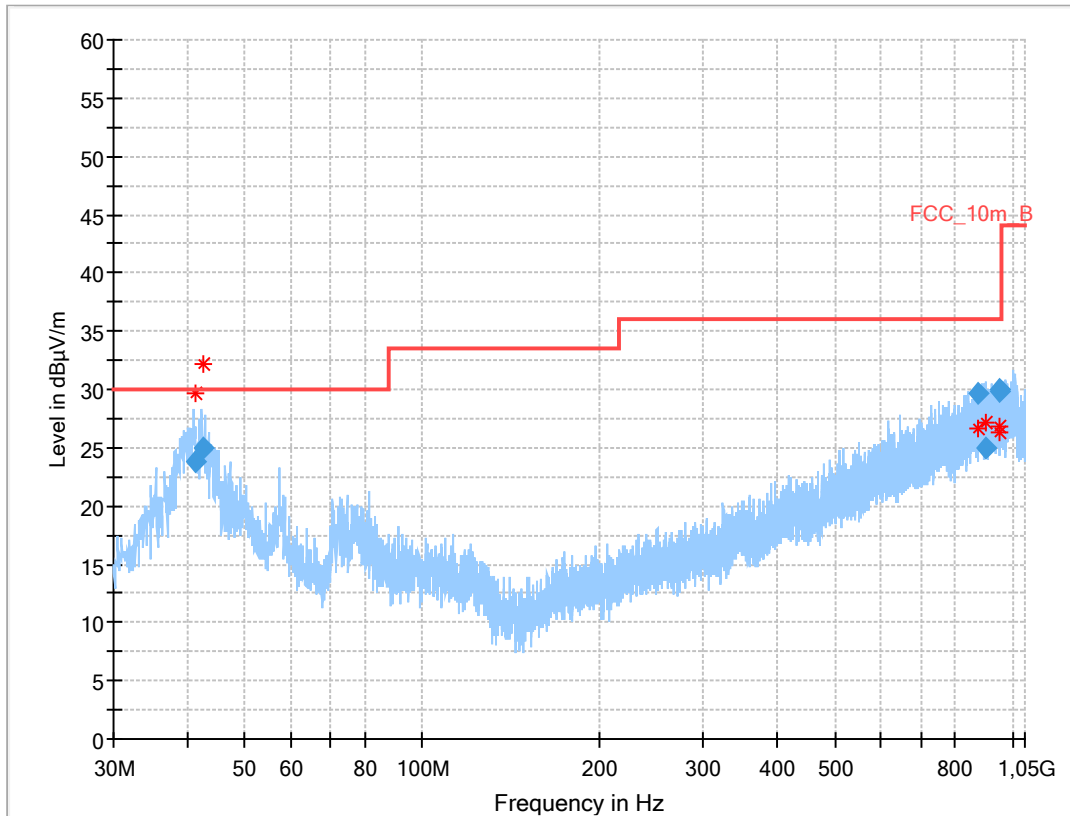
Plot 2: 30 MHz to 1 GHz; vertical & horizontal polarization; valid for all channels of all 40 MHz modes and all antenna configurations



Results:

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 40.954 | 23.61 | 30.0 | 6.4 | 1000 | 120.0 | 98.0 | V | -16 | 15 |
| 43.220 | 24.35 | 30.0 | 5.7 | 1000 | 120.0 | 101.0 | V | 201 | 16 |
| 50.491 | 19.55 | 30.0 | 10.5 | 1000 | 120.0 | 102.0 | V | 4 | 16 |
| 838.805 | 23.59 | 36.0 | 12.4 | 1000 | 120.0 | 102.0 | H | 52 | 24 |
| 918.339 | 29.86 | 36.0 | 6.1 | 1000 | 120.0 | 165.0 | V | 127 | 26 |
| 951.469 | 29.90 | 36.0 | 6.1 | 1000 | 120.0 | 195.0 | V | -20 | 25 |

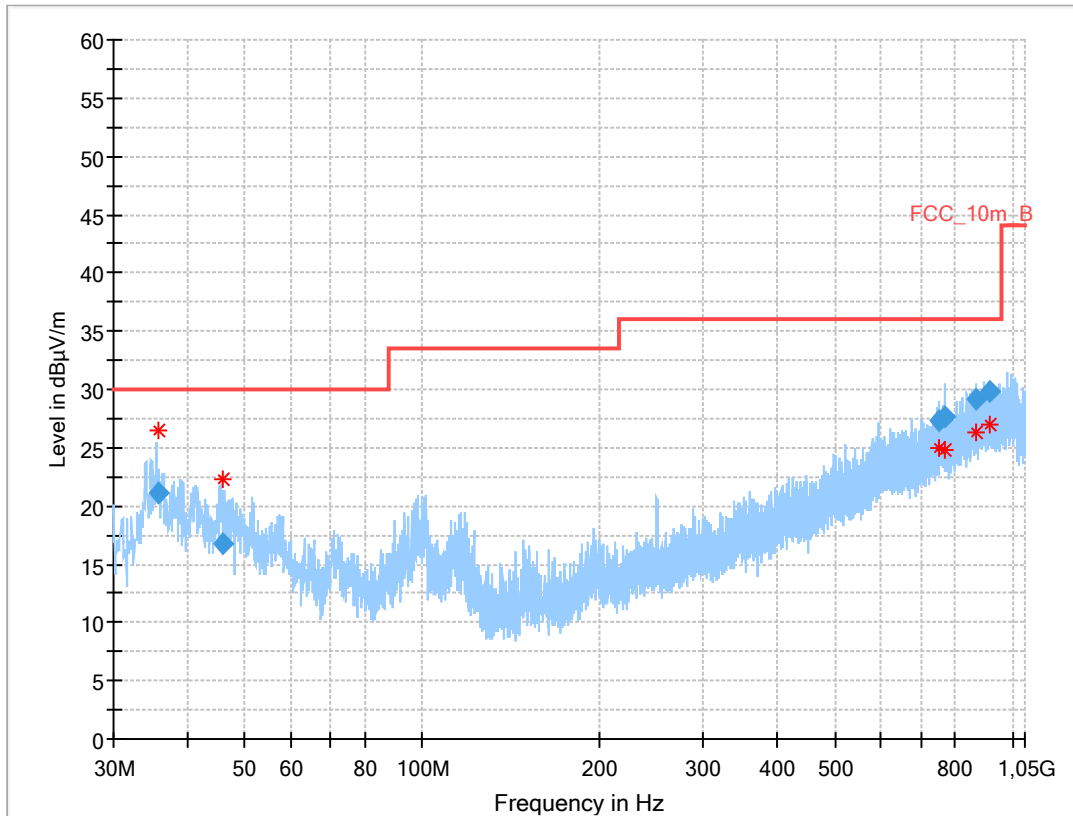
Plot 3: 30 MHz to 1 GHz; vertical & horizontal polarization; valid for all channels of all 80 MHz modes and all antenna configurations



Results:

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 41.377 | 23.85 | 30.0 | 6.2 | 1000 | 120.0 | 109.0 | V | 254 | 16 |
| 42.425 | 24.97 | 30.0 | 5.0 | 1000 | 120.0 | 107.0 | V | -35 | 16 |
| 871.902 | 29.64 | 36.0 | 6.4 | 1000 | 120.0 | 182.0 | V | -37 | 25 |
| 898.619 | 24.97 | 36.0 | 11.0 | 1000 | 120.0 | 195.0 | H | 232 | 25 |
| 948.109 | 29.97 | 36.0 | 6.0 | 1000 | 120.0 | 177.0 | V | 52 | 25 |
| 951.798 | 29.84 | 36.0 | 6.2 | 1000 | 120.0 | 195.0 | H | 232 | 25 |

Plot 4: 30 MHz to 1 GHz; vertical & horizontal polarization; U-NII-1 & U-NII-2A; 802.11ax HE80+80 and all antenna configurations



Results:

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|------------|
| 35.661 | 21.18 | 30.0 | 8.8 | 1000 | 120.0 | 104.0 | V | 239 | 14 |
| 45.913 | 16.80 | 30.0 | 13.2 | 1000 | 120.0 | 102.0 | V | 185 | 16 |
| 750.578 | 27.25 | 36.0 | 8.8 | 1000 | 120.0 | 101.0 | V | 142 | 24 |
| 769.905 | 27.60 | 36.0 | 8.4 | 1000 | 120.0 | 183.0 | H | 232 | 24 |
| 866.435 | 29.20 | 36.0 | 6.8 | 1000 | 120.0 | 195.0 | V | -16 | 25 |
| 915.288 | 29.89 | 36.0 | 6.1 | 1000 | 120.0 | 137.0 | H | 186 | 26 |

12.12 Spurious emissions radiated 1 GHz to 40 GHz

Description:

Measurement of the radiated spurious emissions and cabinet radiations from 1 GHz to 40 GHz.

Measurement:

| Measurement parameter | |
|--------------------------|--|
| Detector: | Peak/AVG |
| Sweep time: | Auto |
| Resolution bandwidth: | 1 MHz |
| Video bandwidth: | 3 MHz |
| Span: | 1 GHz to 40 GHz |
| Trace mode: | Max Hold / Average with 100 counts + 20 log (1 / X) for duty cycle lower than 100 % |
| Test setup: | See sub clause 7.2 – A See sub clause 7.3 – A |
| Measurement uncertainty: | See chapter 9 |

Limits:

| TX Spurious Emissions Radiated | | |
|--------------------------------|-------------------------|----------------------|
| §15.209 | | |
| Frequency (MHz) | Field Strength (dBµV/m) | Measurement distance |
| Above 960 | 54.0 (AVG) 74 (Peak) | 3 |
| §15.407 | | |
| Outside the restricted bands! | -27 dBm / MHz | |

NOTE: For emissions between 5 and 6 GHz please see the results in Chapter 12.9. In this chapter the signal was notched with a band rejection filter.

Results: 20 MHz channel bandwidth, COLFLY antennas

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | | | | | | | |
|---|----------|----------------|----------------|----------|----------------|-----------------|----------|----------------|
| U-NII-1 (5150 MHz to 5250 MHz) | | | | | | | | |
| Lowest channel | | | Middle channel | | | Highest channel | | |
| F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] |
| 15606 | Peak | 51.9 | | Peak | | | Peak | |
| | AVG | 36.7 | | AVG | | | AVG | |

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | | | | | | | |
|---|----------|----------------|----------------|----------|----------------|-----------------|----------|----------------|
| U-NII-2A (5250 MHz to 5350 MHz) | | | | | | | | |
| Lowest channel | | | Middle channel | | | Highest channel | | |
| F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] |
| -/- | Peak | -/- | -/- | Peak | -/- | -/- | Peak | -/- |
| | AVG | -/- | | AVG | -/- | | AVG | -/- |
| -/- | Peak | -/- | -/- | Peak | -/- | -/- | Peak | -/- |
| | AVG | -/- | | AVG | -/- | | AVG | -/- |

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | | | | | | | |
|---|----------|----------------|----------------|----------|----------------|-----------------|----------|----------------|
| U-NII-2C (5470 MHz to 5725 MHz) | | | | | | | | |
| Lowest channel | | | Middle channel | | | Highest channel | | |
| F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] |
| -/- | Peak | -/- | 11200 | Peak | 50.2 | 11440 | Peak | 54.0 |
| | AVG | -/- | | AVG | 44.3 | | AVG | 51.1 |

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | | | | | | | |
|---|----------|----------------|----------------|----------|----------------|-----------------|----------|----------------|
| U-NII-3 (5725 MHz to 5850 MHz) | | | | | | | | |
| Lowest channel | | | Middle channel | | | Highest channel | | |
| F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] |
| 11490 | Peak | 54.1 | 11570 | Peak | 54.1 | 11650 | Peak | 51.8 |
| | AVG | 50.1 | | AVG | 48.8 | | AVG | 43.9 |

Results: 40 MHz channel bandwidth, COLFLY antennas

| TX Spurious Emissions Radiated [dB μ V/m] / dBm | | | | | | | | |
|---|----------|----------------------|----------------|----------|----------------------|-----------------|----------|----------------------|
| U-NII-1 (5150 MHz to 5250 MHz) | | | | | | | | |
| Lowest channel | | | Middle channel | | | Highest channel | | |
| F [MHz] | Detector | Level [dB μ V/m] | F [MHz] | Detector | Level [dB μ V/m] | F [MHz] | Detector | Level [dB μ V/m] |
| -/- | Peak | -/- | | Peak | | -/- | Peak | -/- |
| | AVG | -/- | | AVG | | | AVG | -/- |

| TX Spurious Emissions Radiated [dB μ V/m] / dBm | | | | | | | | |
|---|----------|----------------------|----------------|----------|----------------------|-----------------|----------|----------------------|
| U-NII-2A (5250 MHz to 5350 MHz) | | | | | | | | |
| Lowest channel | | | Middle channel | | | Highest channel | | |
| F [MHz] | Detector | Level [dB μ V/m] | F [MHz] | Detector | Level [dB μ V/m] | F [MHz] | Detector | Level [dB μ V/m] |
| -/- | Peak | -/- | | Peak | | -/- | Peak | -/- |
| | AVG | -/- | | AVG | | | AVG | -/- |
| -/- | Peak | -/- | | Peak | | -/- | Peak | -/- |
| | AVG | -/- | | AVG | | | AVG | -/- |

| TX Spurious Emissions Radiated [dB μ V/m] / dBm | | | | | | | | |
|---|----------|----------------------|----------------|----------|----------------------|-----------------|----------|----------------------|
| U-NII-2C (5470 MHz to 5725 MHz) | | | | | | | | |
| Lowest channel | | | Middle channel | | | Highest channel | | |
| F [MHz] | Detector | Level [dB μ V/m] | F [MHz] | Detector | Level [dB μ V/m] | F [MHz] | Detector | Level [dB μ V/m] |
| -/- | Peak | -/- | 11180 | Peak | 50.2 | 11420 | Peak | 51.1 |
| | AVG | -/- | | AVG | 44.6 | | AVG | 46.2 |

| TX Spurious Emissions Radiated [dB μ V/m] / dBm | | | | | | | | |
|---|----------|----------------------|----------------|----------|----------------------|-----------------|----------|----------------------|
| U-NII-3 (5725 MHz to 5850 MHz) | | | | | | | | |
| Lowest channel | | | Middle channel | | | Highest channel | | |
| F [MHz] | Detector | Level [dB μ V/m] | F [MHz] | Detector | Level [dB μ V/m] | F [MHz] | Detector | Level [dB μ V/m] |
| 11510 | Peak | 53.7 | | Peak | | 11590 | Peak | 51.4 |
| | AVG | 49.8 | | AVG | | | AVG | 45.6 |

Results: 80 MHz channel bandwidth, COLFLY antennas

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | |
|---|----------|----------------|
| U-NII-1 (5150 MHz to 5250 MHz) | | |
| Middle channel | | |
| F [MHz] | Detector | Level [dBµV/m] |
| -/- | Peak | -/- |
| | AVG | -/- |
| -/- | Peak | -/- |
| | AVG | -/- |

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | |
|---|----------|----------------|
| U-NII-2A (5250 MHz to 5350 MHz) | | |
| Middle channel | | |
| F [MHz] | Detector | Level [dBµV/m] |
| -/- | Peak | -/- |
| | AVG | -/- |
| -/- | Peak | -/- |
| | AVG | -/- |

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | | | | |
|---|------|------|-----------------|------|------|
| U-NII-2C (5470 MHz to 5725 MHz) | | | | | |
| Lowest channel | | | Highest channel | | |
| 11060 | Peak | 48.3 | 11220 | Peak | 50.2 |
| | AVG | 41.7 | | AVG | 45.7 |

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | |
|---|----------|----------------|
| U-NII-3 (5725 MHz to 5850 MHz) | | |
| Middle channel | | |
| F [MHz] | Detector | Level [dBµV/m] |
| 11550 | Peak | 53.2 |
| | AVG | 48.9 |

Results: 80+80 MHz channel bandwidth, COLFLY antennas

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | |
|--|----------|----------------|
| U-NII-1 & U-NII-2A (5150 MHz to 5250 MHz & 5250 MHz to 5350 MHz) | | |
| Middle channel | | |
| F [MHz] | Detector | Level [dBµV/m] |
| -/- | Peak | -/- |
| | AVG | -/- |
| -/- | Peak | -/- |
| | AVG | -/- |

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | |
|---|----------|----------------|
| U-NII-2C (5470 MHz to 5725 MHz) | | |
| Middle channel | | |
| F [MHz] | Detector | Level [dBµV/m] |
| 11220 | Peak | 53.6 |
| | AVG | 50.6 |
| -/- | Peak | -/- |
| | AVG | -/- |

Results: 20 MHz channel bandwidth, WALSIN antennas

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | | | | | | | |
|---|----------|----------------|----------------|----------|----------------|-----------------|----------|----------------|
| U-NII-3 (5725 MHz to 5850 MHz) | | | | | | | | |
| Lowest channel | | | Middle channel | | | Highest channel | | |
| F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] |
| 11490 | Peak | 51.1 | | Peak | | | Peak | |
| | AVG | 44.4 | | AVG | | | AVG | |

Results: 40 MHz channel bandwidth, WALSIN antennas

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | | | | | | | |
|---|----------|----------------|----------------|----------|----------------|-----------------|----------|----------------|
| U-NII-2C (5470 MHz to 5725 MHz) | | | | | | | | |
| Lowest channel | | | Middle channel | | | Highest channel | | |
| F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] |
| | Peak | | | Peak | | 11340 | Peak | 51.9 |
| | AVG | | | AVG | | | AVG | 46.8 |

Results: 80 MHz channel bandwidth, WALSIN antennas

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | | | | |
|---|------|--|-----------------|------|------|
| U-NII-2C (5470 MHz to 5725 MHz) | | | | | |
| Lowest channel | | | Highest channel | | |
| | Peak | | 11220 | Peak | 50.0 |
| | AVG | | | AVG | 45.4 |

Results: 80+80 MHz channel bandwidth, WALSIN antennas

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | |
|---|----------|----------------|
| U-NII-2C (5470 MHz to 5725 MHz) | | |
| Middle channel | | |
| F [MHz] | Detector | Level [dBµV/m] |
| 11220 | Peak | 53.6 |
| | AVG | 50.6 |

Results: 20 MHz channel bandwidth, HL antennas

| TX Spurious Emissions Radiated [dBµV/m] / dBm | | | | | | | | |
|---|----------|----------------|----------------|----------|----------------|-----------------|----------|----------------|
| U-NII-1 (5150 MHz to 5250 MHz) | | | | | | | | |
| Lowest channel | | | Middle channel | | | Highest channel | | |
| F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] |
| -/- | Peak | -/- | | Peak | | | Peak | |
| | AVG | -/- | | AVG | | | AVG | |

Results: 40 MHz channel bandwidth, HL antennas

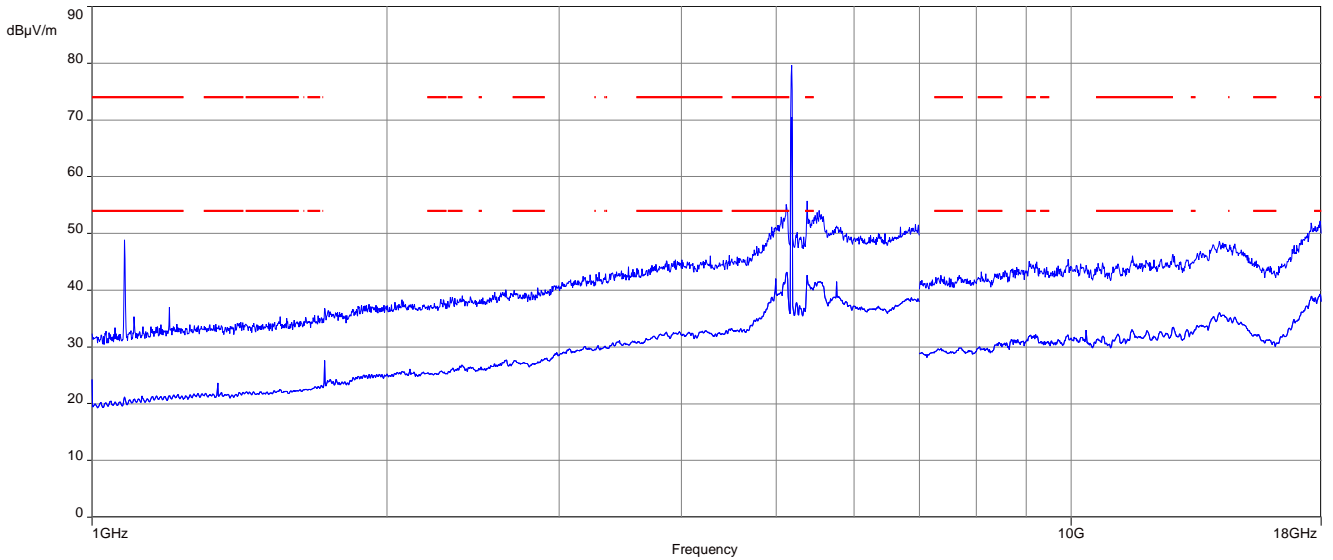
| TX Spurious Emissions Radiated [dBµV/m] / dBm | | | | | | | | |
|---|----------|----------------|----------------|----------|----------------|-----------------|----------|----------------|
| U-NII-1 (5150 MHz to 5250 MHz) | | | | | | | | |
| Lowest channel | | | Middle channel | | | Highest channel | | |
| F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] | F [MHz] | Detector | Level [dBµV/m] |
| -/- | Peak | -/- | | Peak | | | Peak | |
| | AVG | -/- | | AVG | | | AVG | |

Results: 80 MHz channel bandwidth, HL antennas

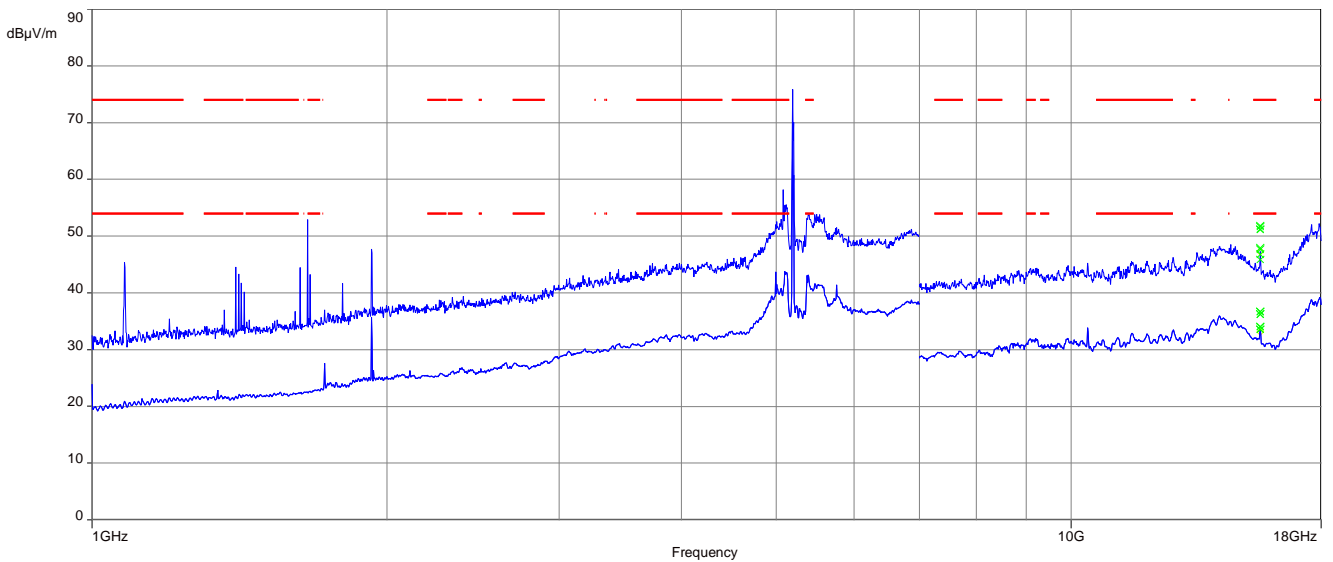
| TX Spurious Emissions Radiated [dBµV/m] / dBm | | |
|---|----------|----------------|
| U-NII-1 (5150 MHz to 5250 MHz) | | |
| Middle channel | | |
| F [MHz] | Detector | Level [dBµV/m] |
| -/- | Peak | -/- |
| | AVG | -/- |

Plots: 20 MHz channel bandwidth, COLFLY antennas

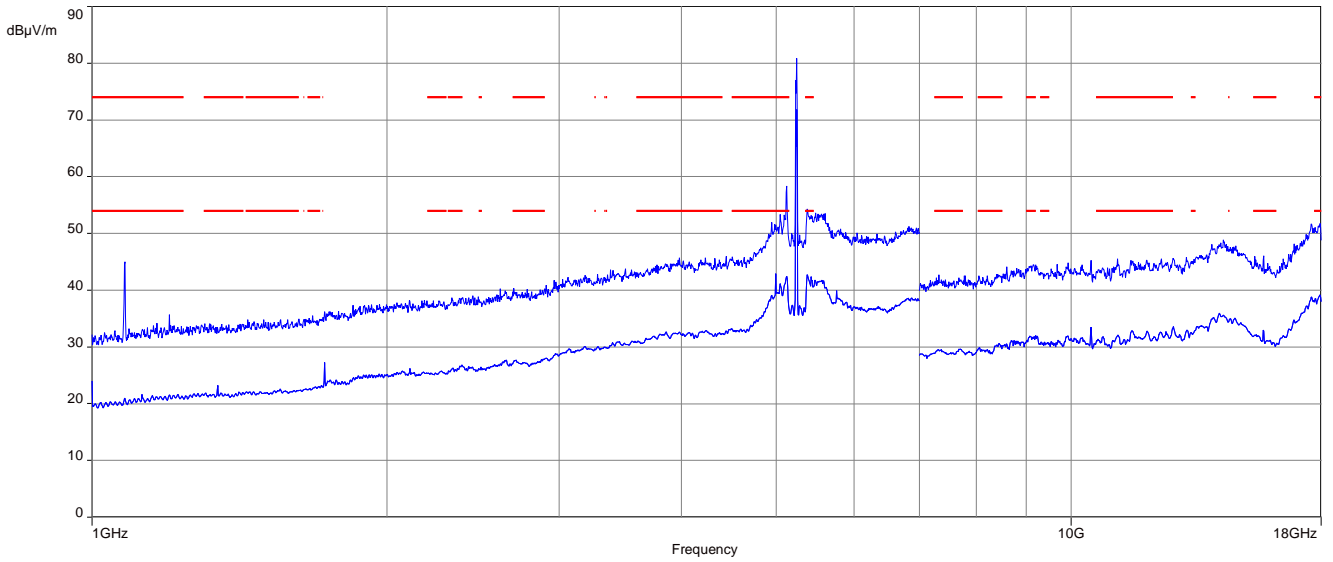
Plot 1: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-1; lowest channel



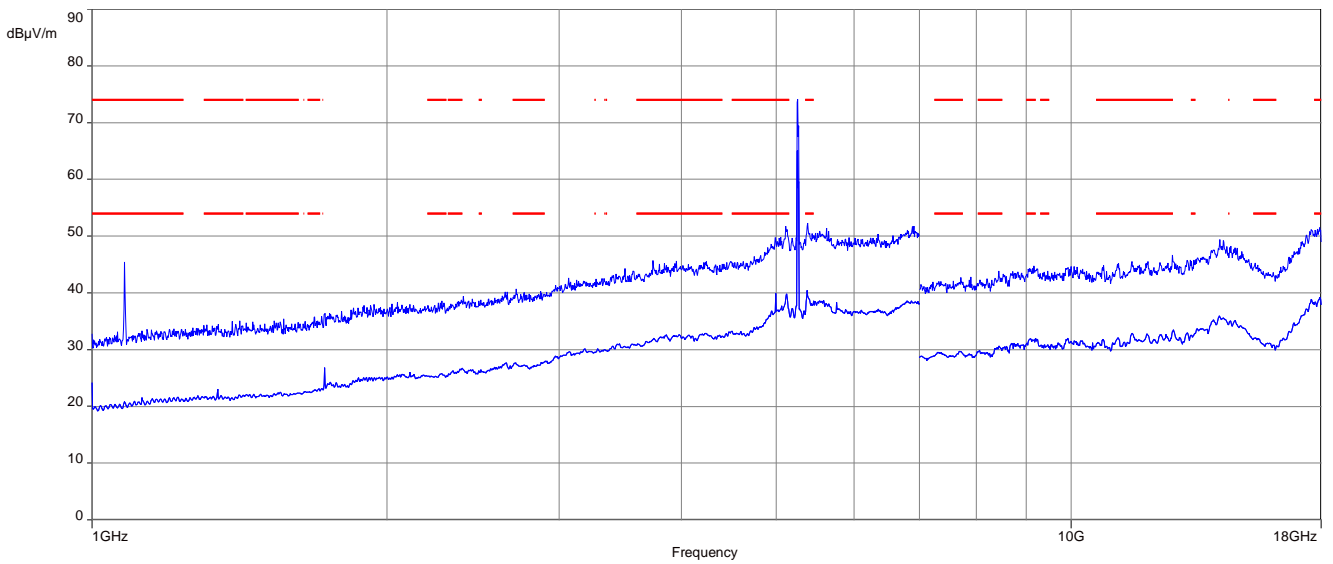
Plot 2: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-1; middle channel



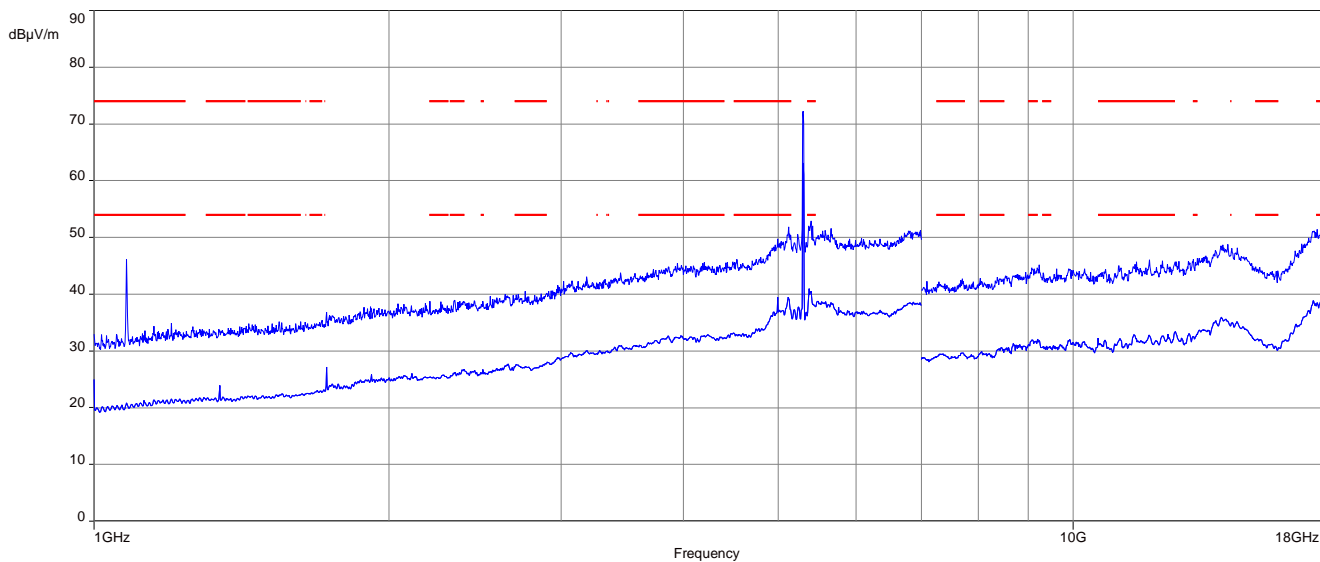
Plot 3: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-1; highest channel



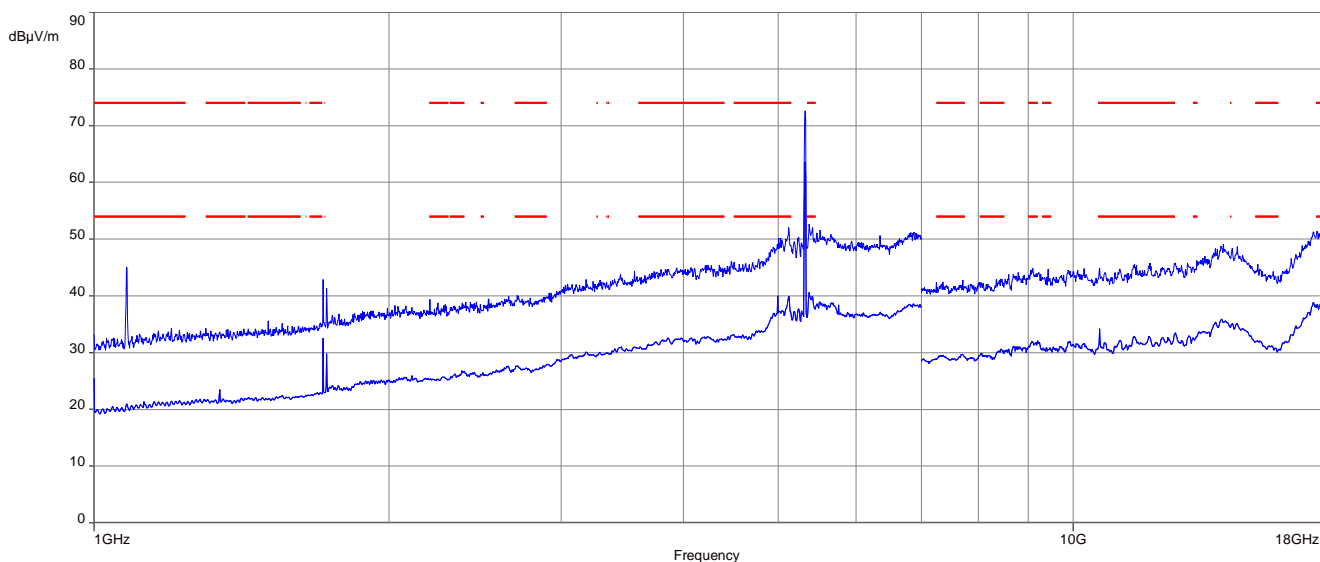
Plot 4: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2A; lowest channel



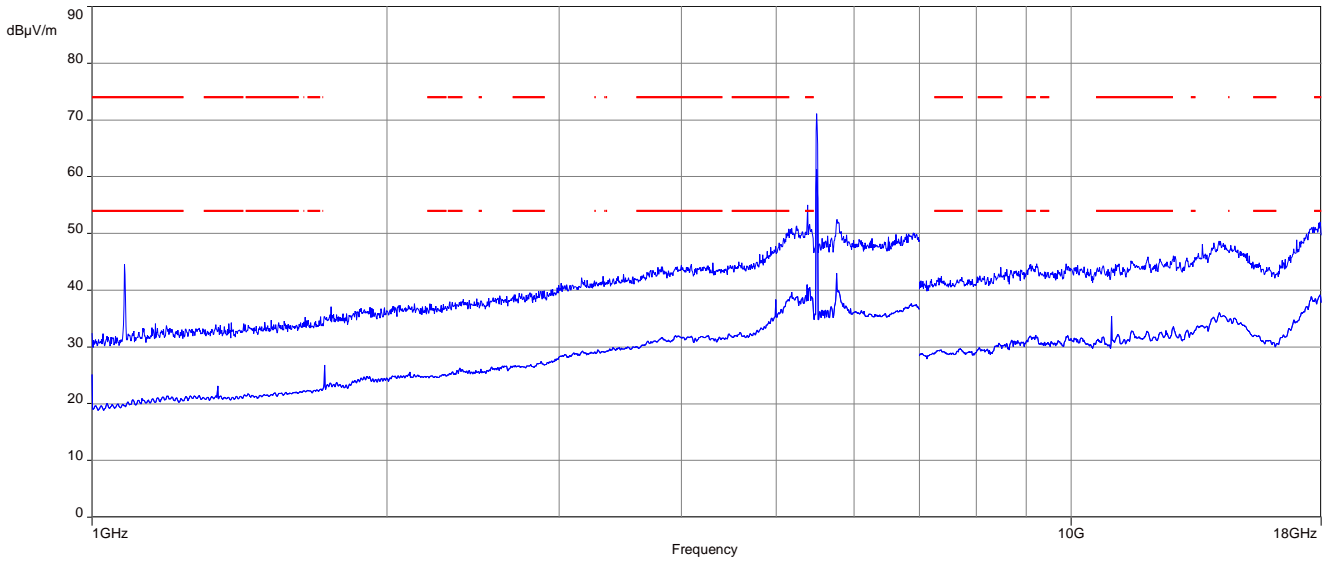
Plot 5: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2A; middle channel



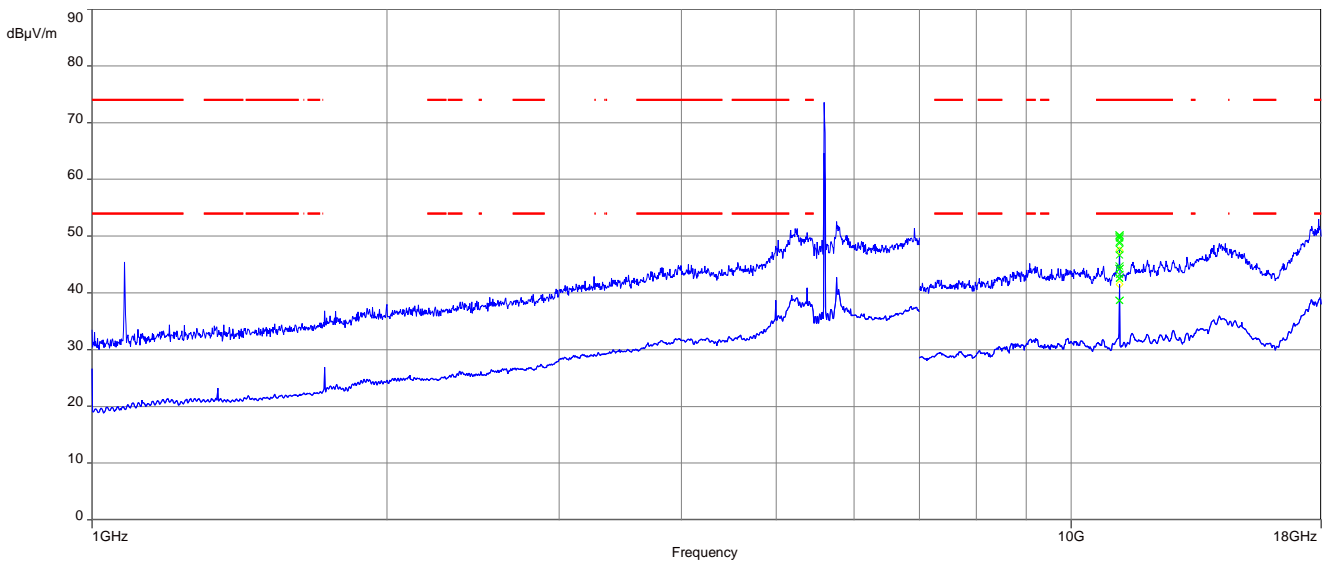
Plot 6: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2A; highest channel



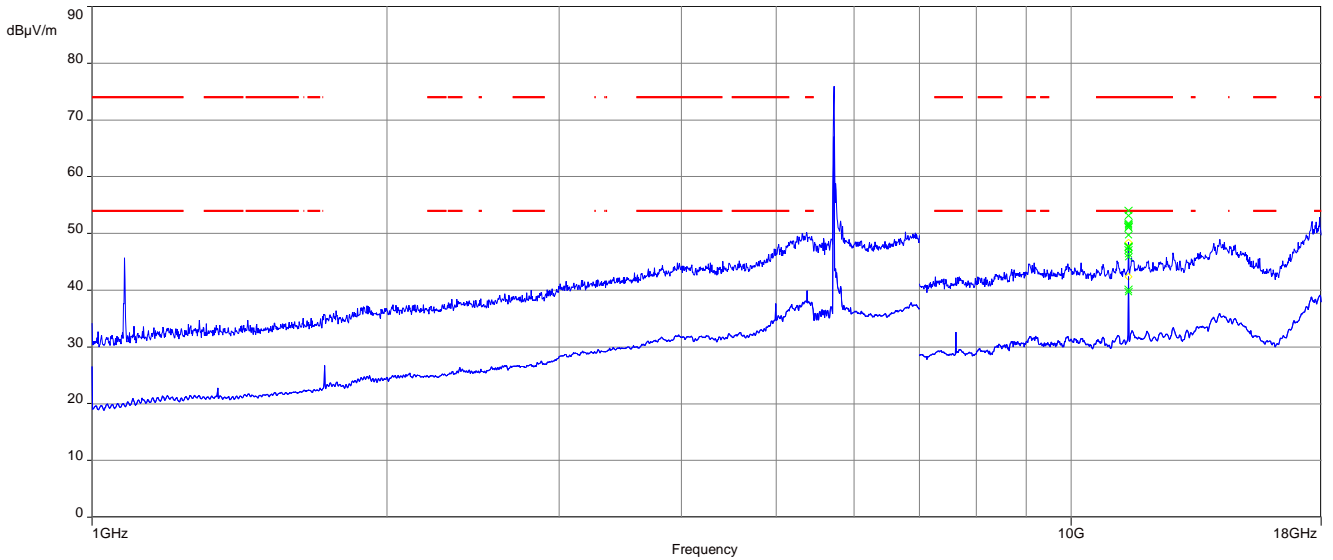
Plot 7: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2C; lowest channel



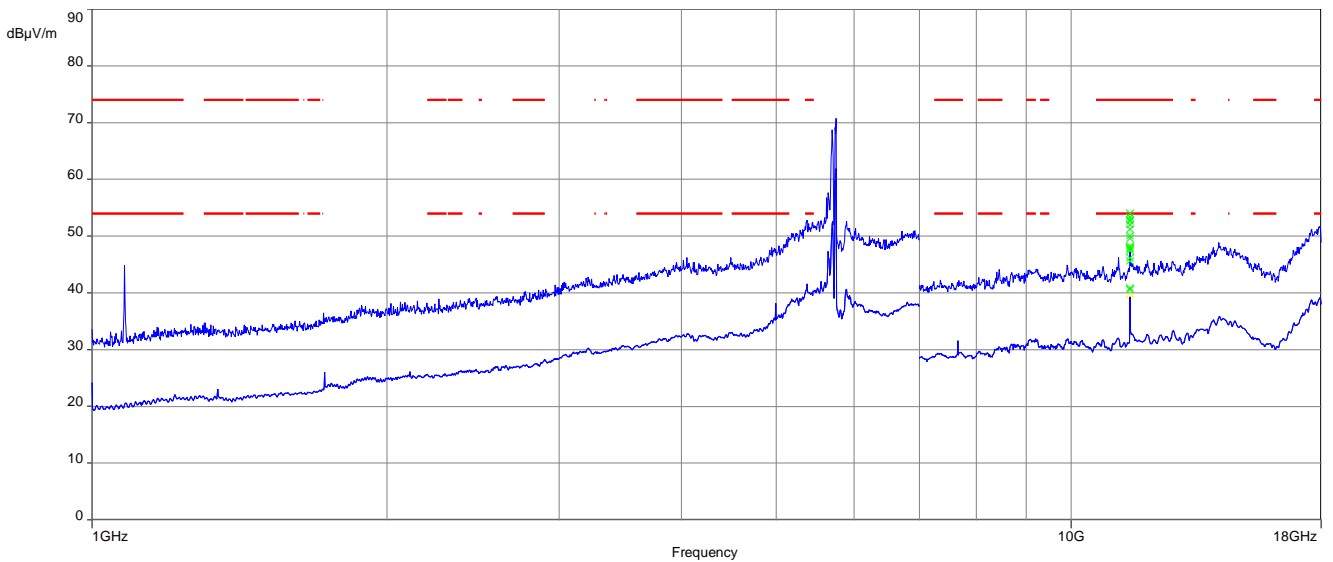
Plot 8: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2C; middle channel



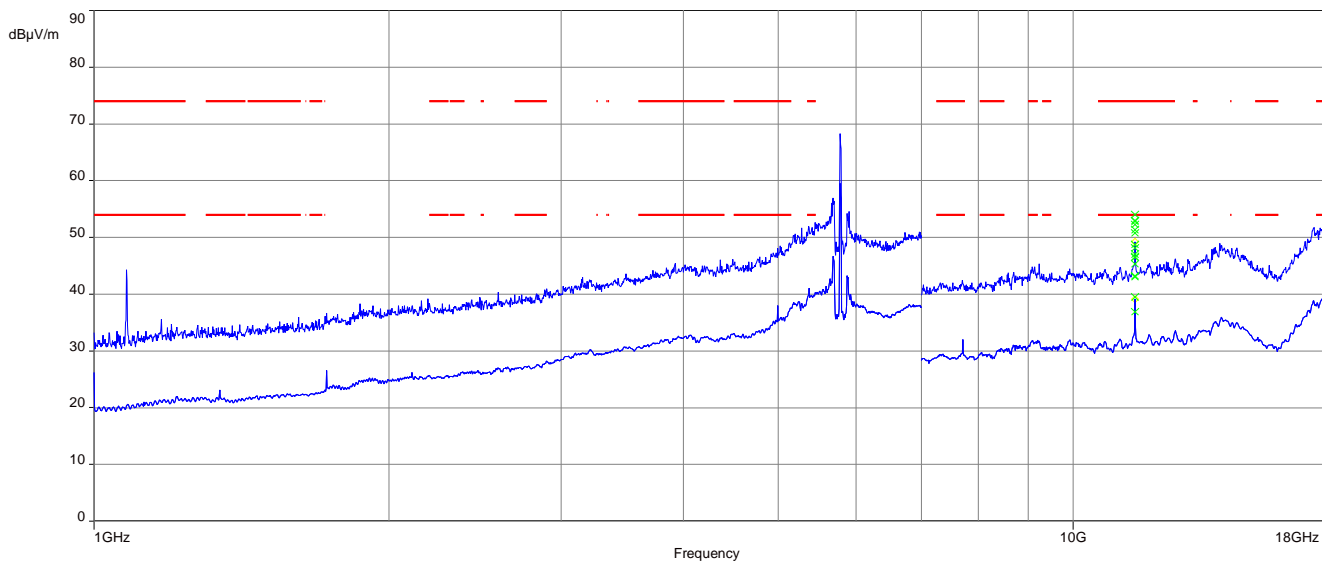
Plot 9: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2C; highest channel



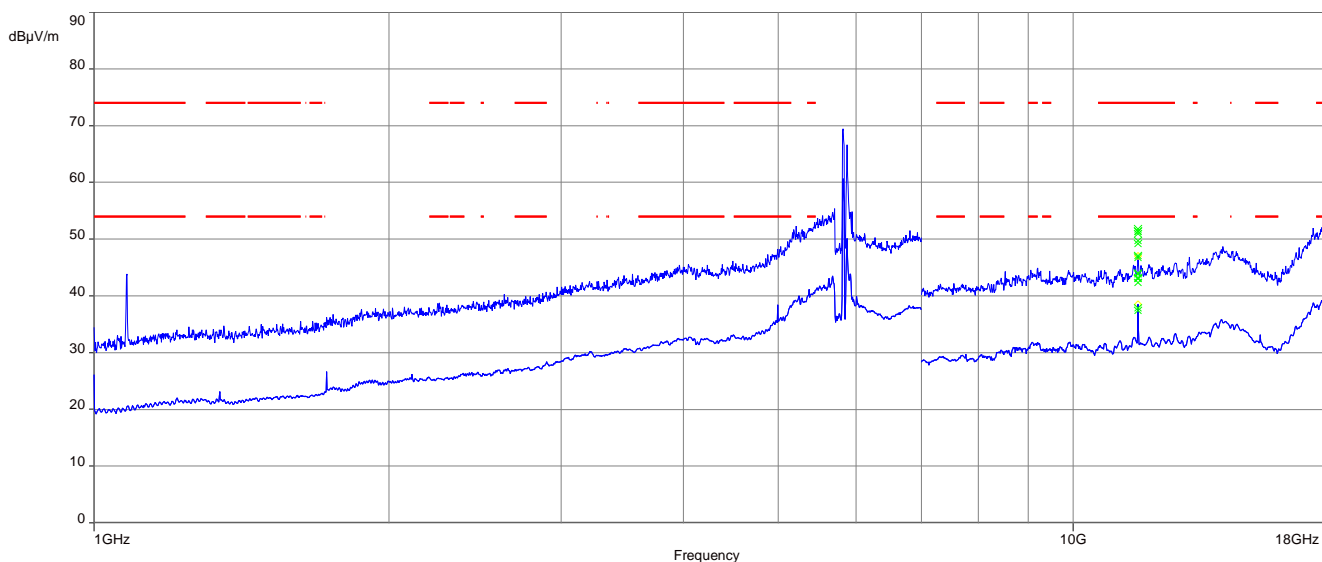
Plot 10: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-3; lowest channel



Plot 11: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-3; middle channel

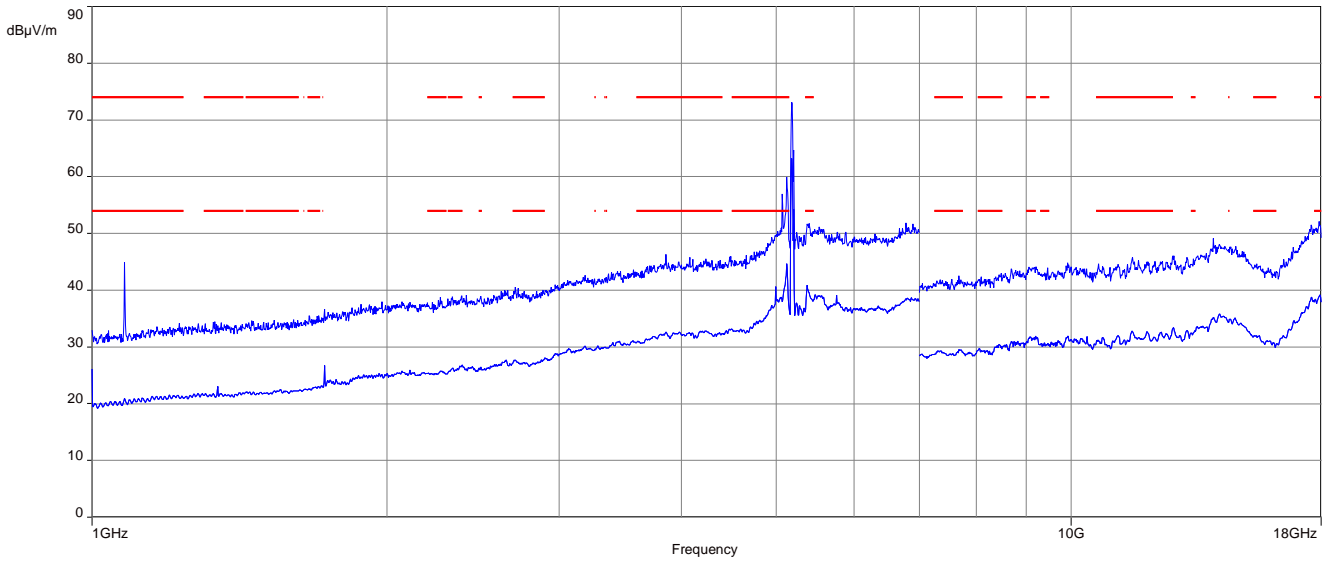


Plot 12: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-3; highest channel

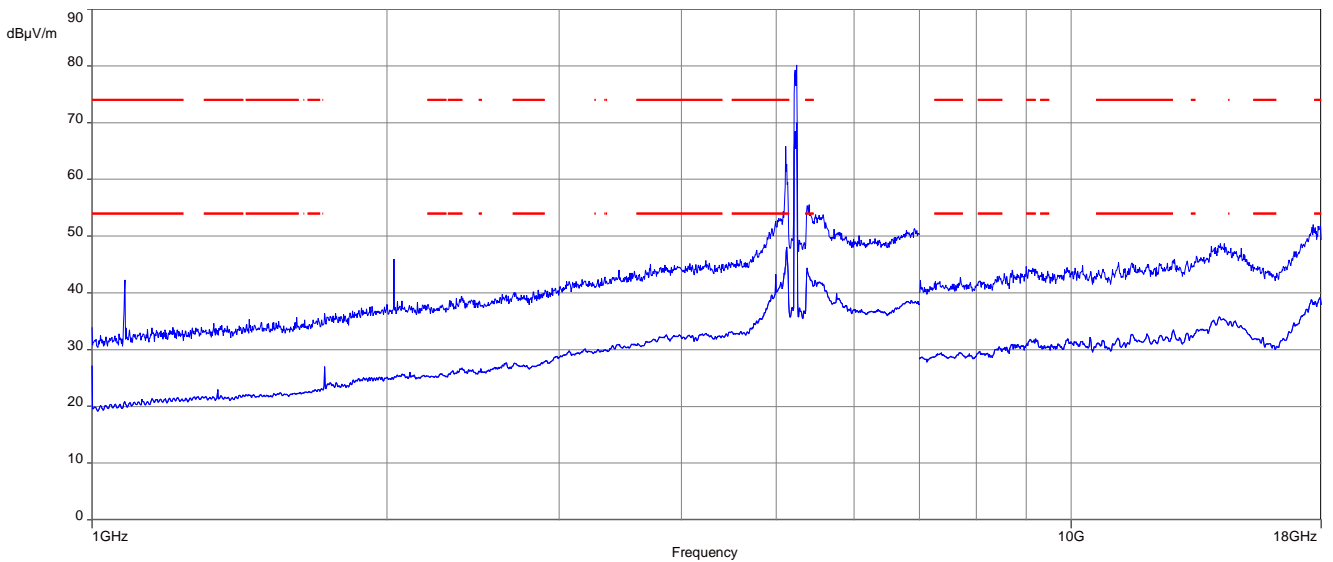


Plots: 40 MHz channel bandwidth, COLFLY antennas

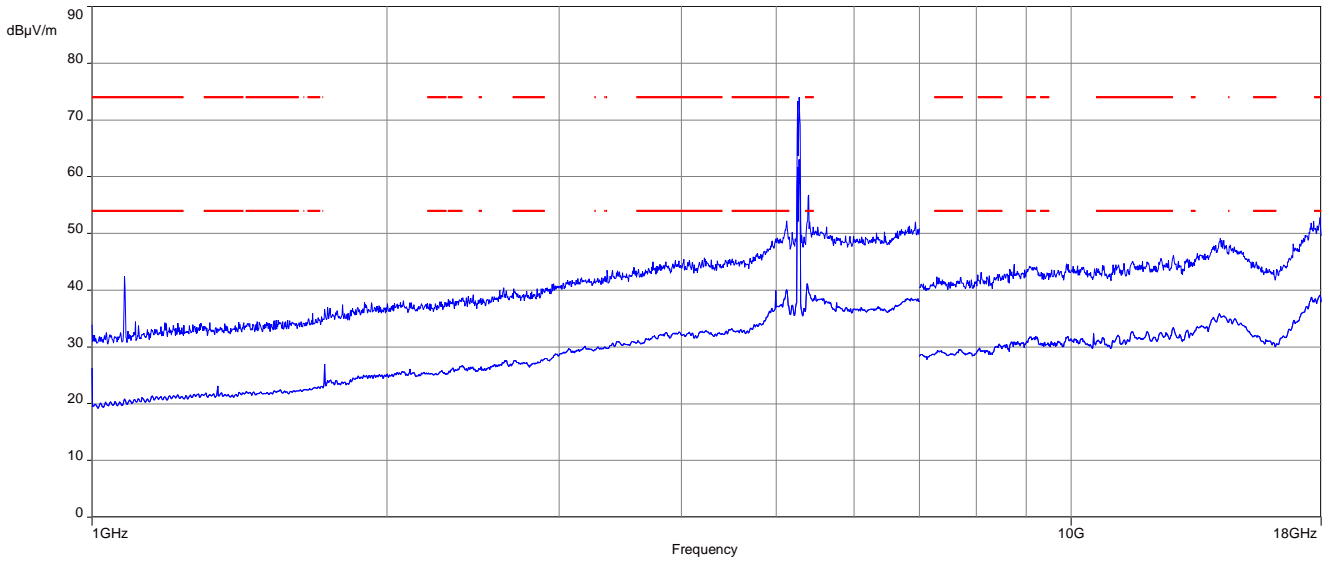
Plot 1: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-1; lowest channel



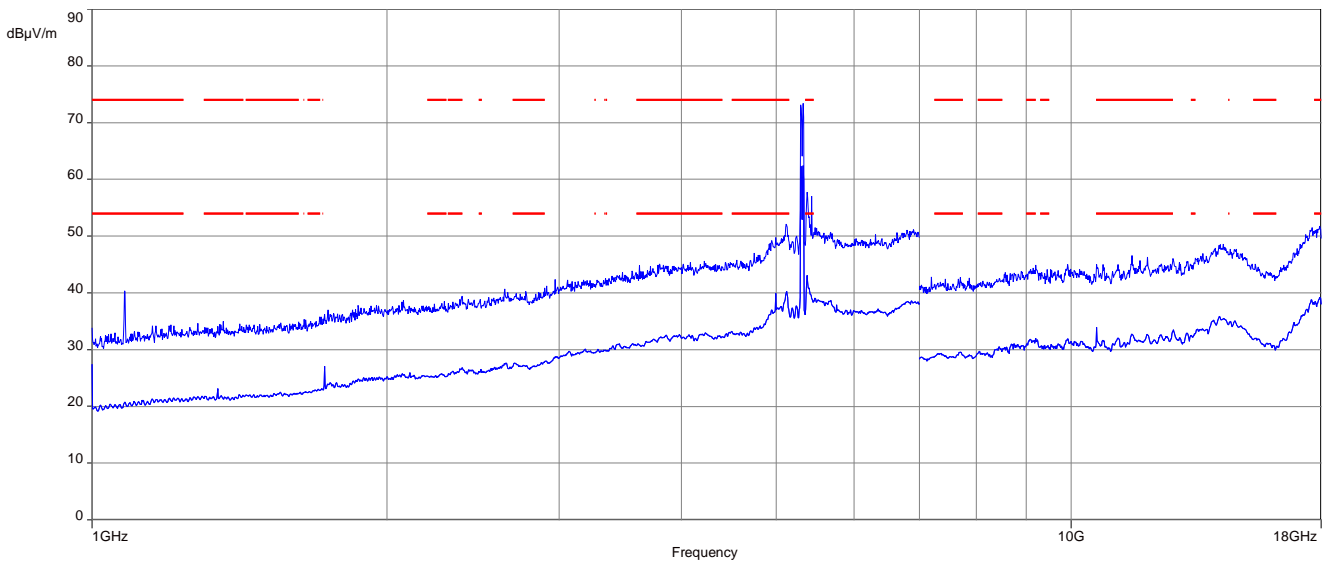
Plot 2: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-1; highest channel



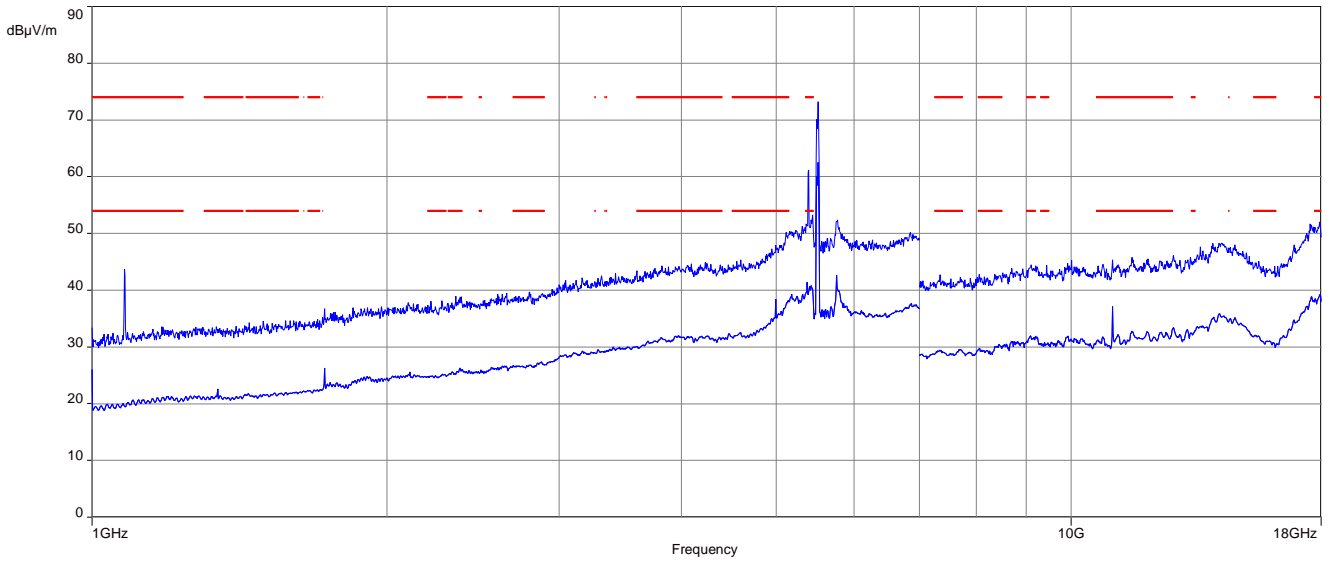
Plot 3: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2A; lowest channel



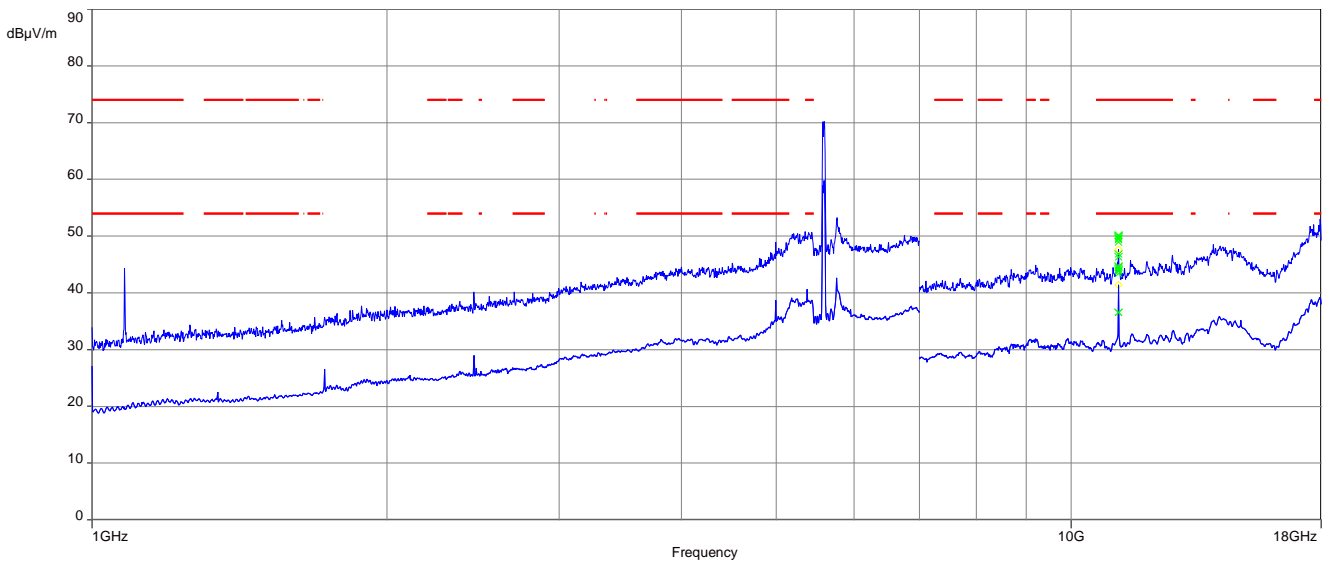
Plot 4: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2A; highest channel



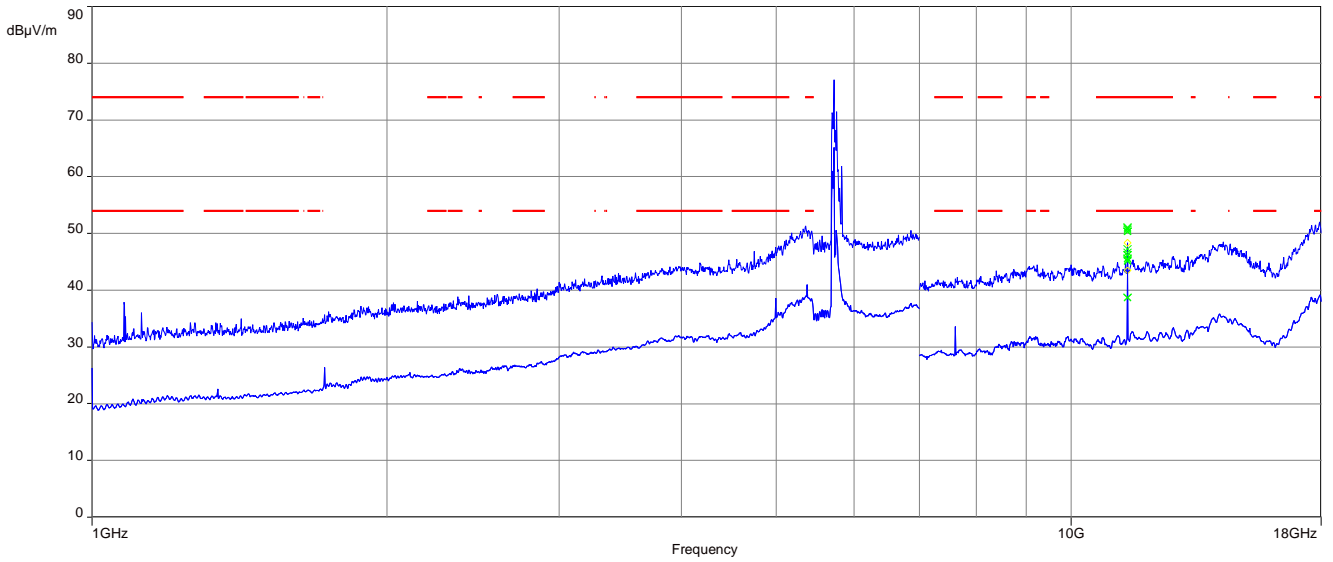
Plot 5: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2C; lowest channel



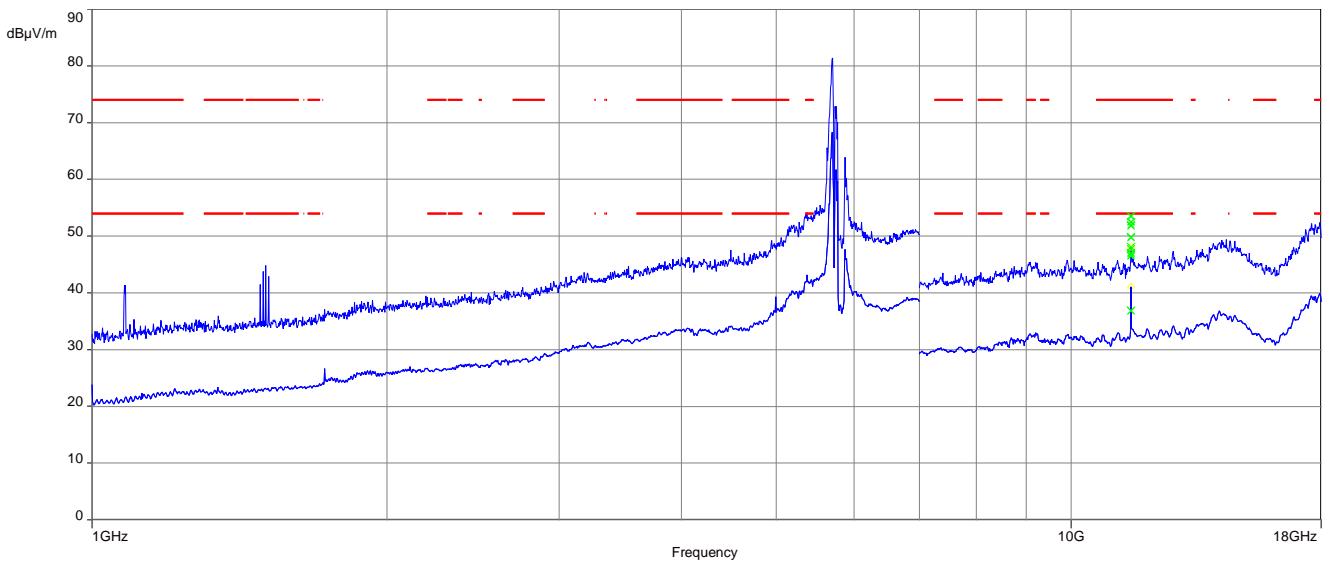
Plot 6: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2C; middle channel



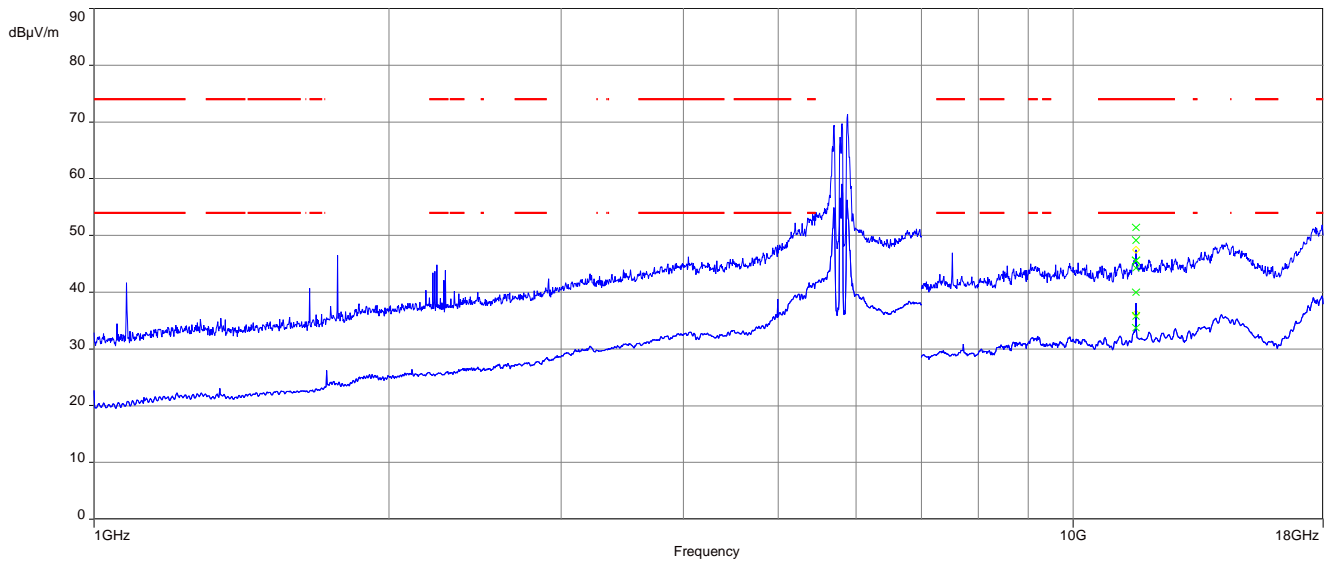
Plot 7: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2C; highest channel



Plot 8: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-3; lowest channel

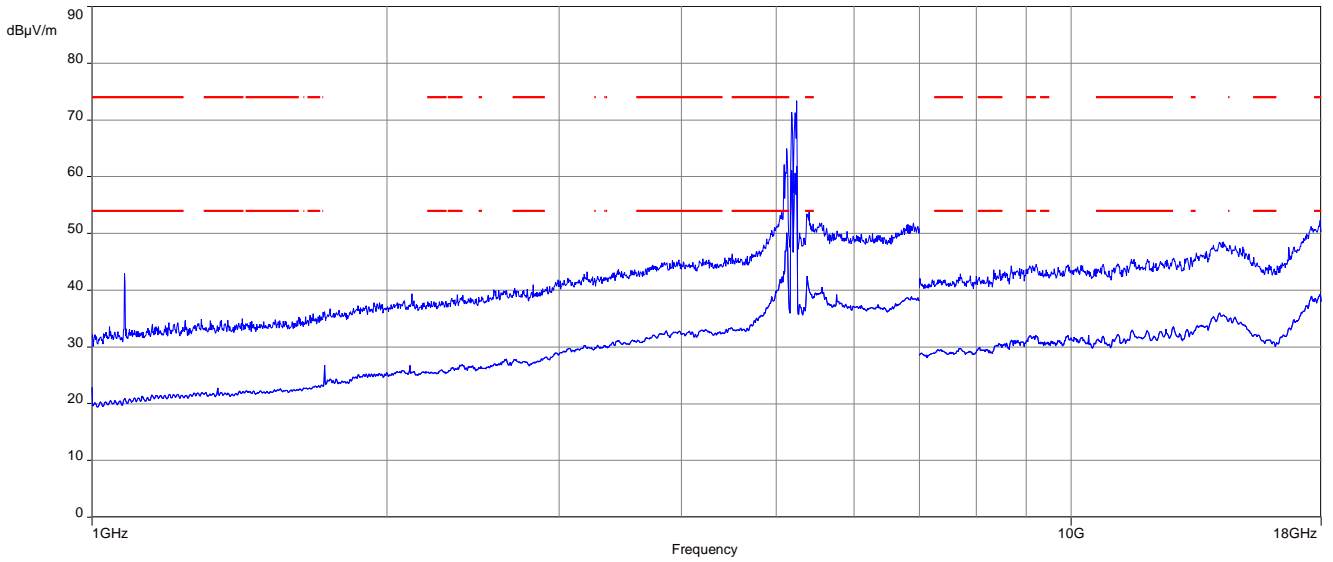


Plot 9: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-3; highest channel

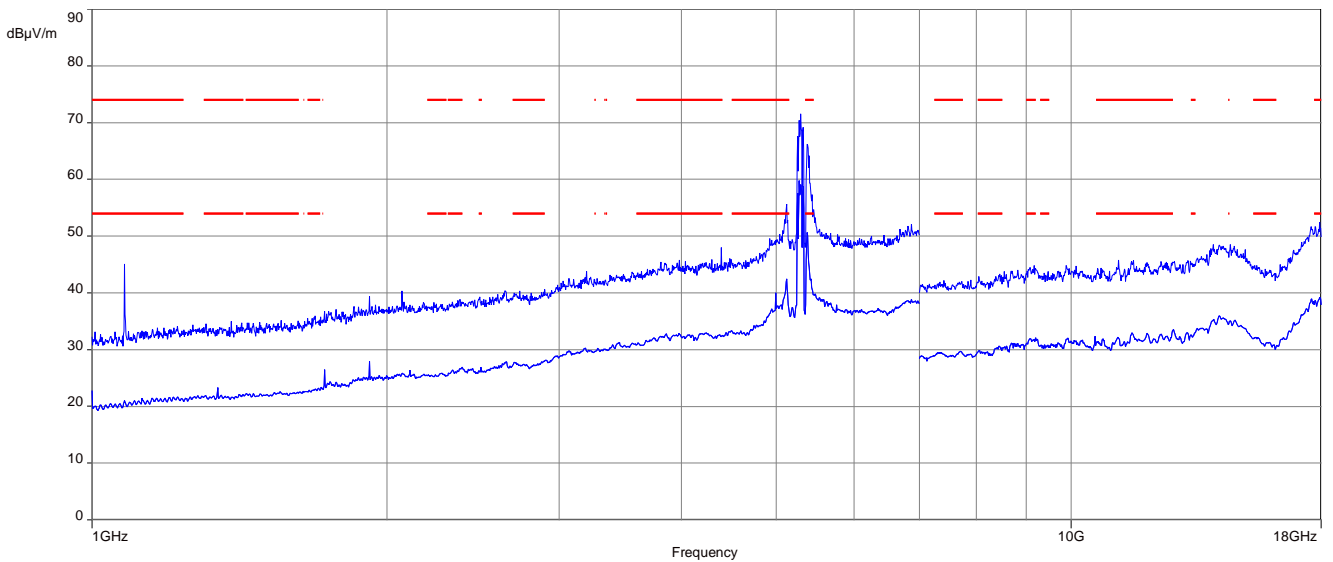


Plots: 80 MHz channel bandwidth, COLFLY antennas

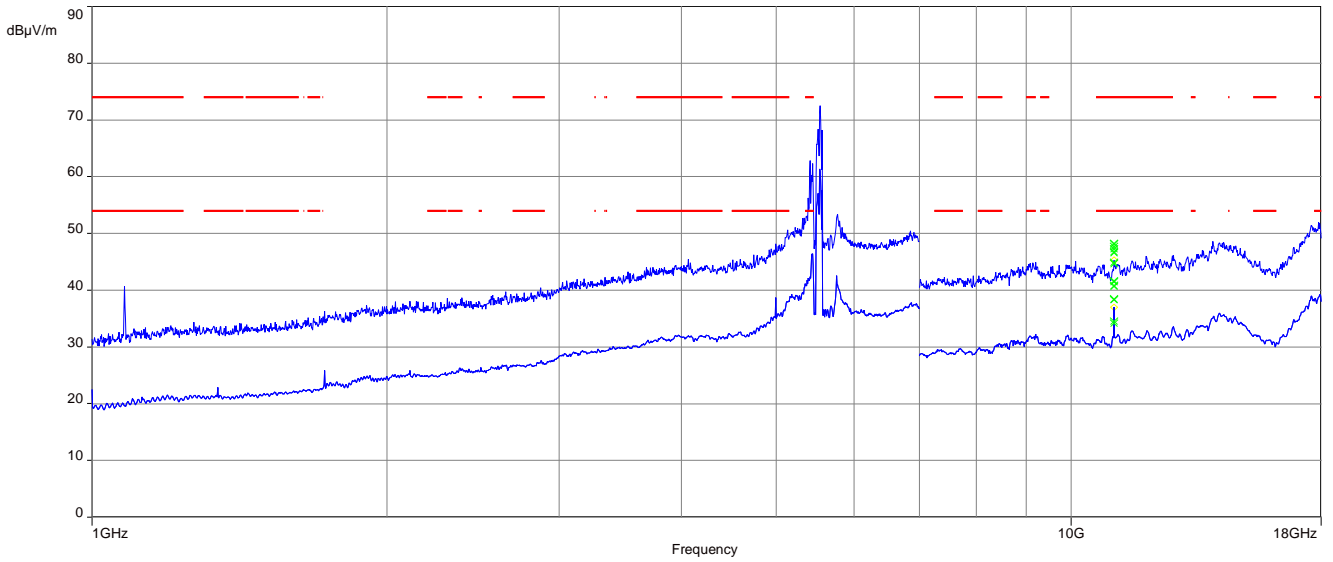
Plot 1: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-1; middle channel



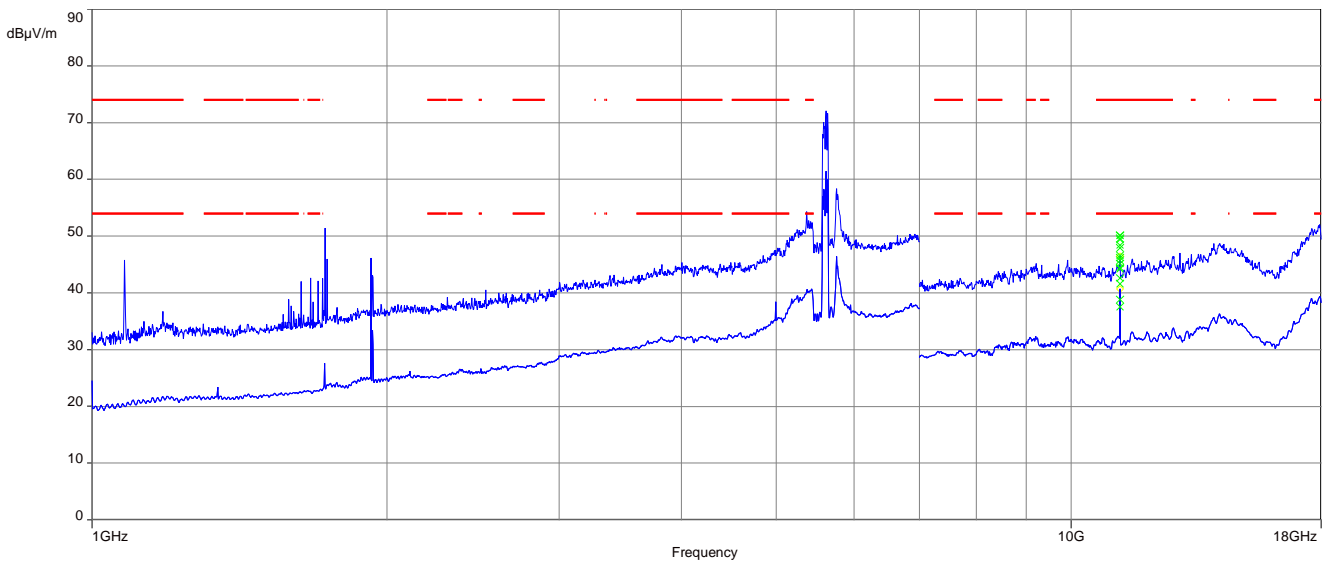
Plot 2: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2A; middle channel



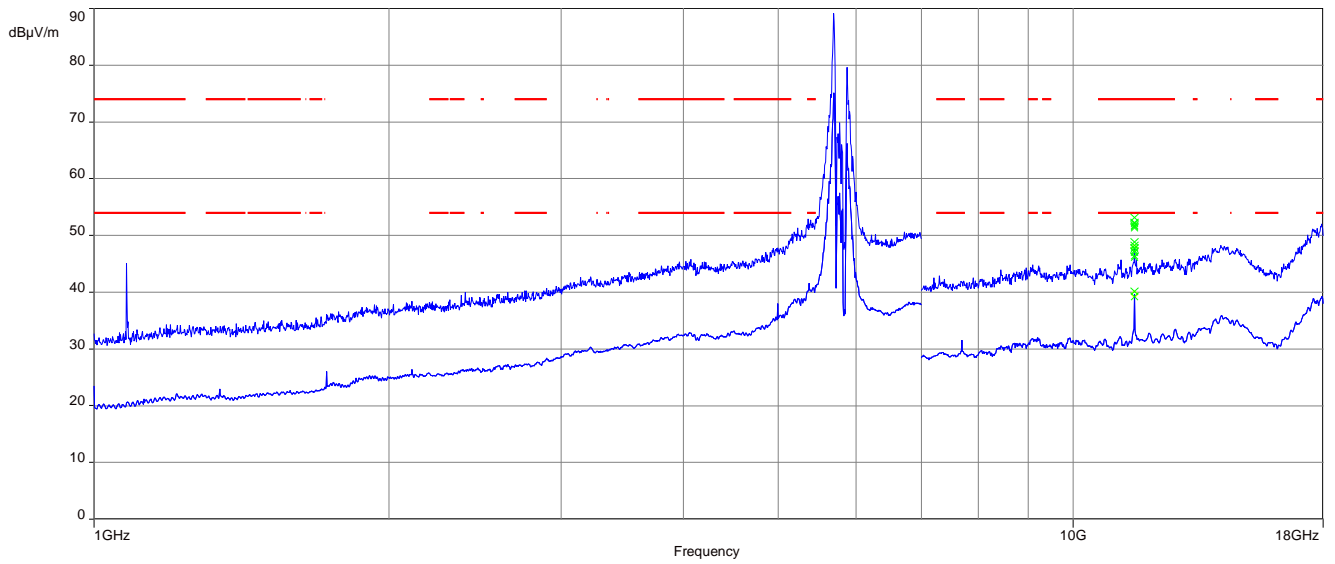
Plot 3: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2C; lowest channel



Plot 4: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2C; highest channel

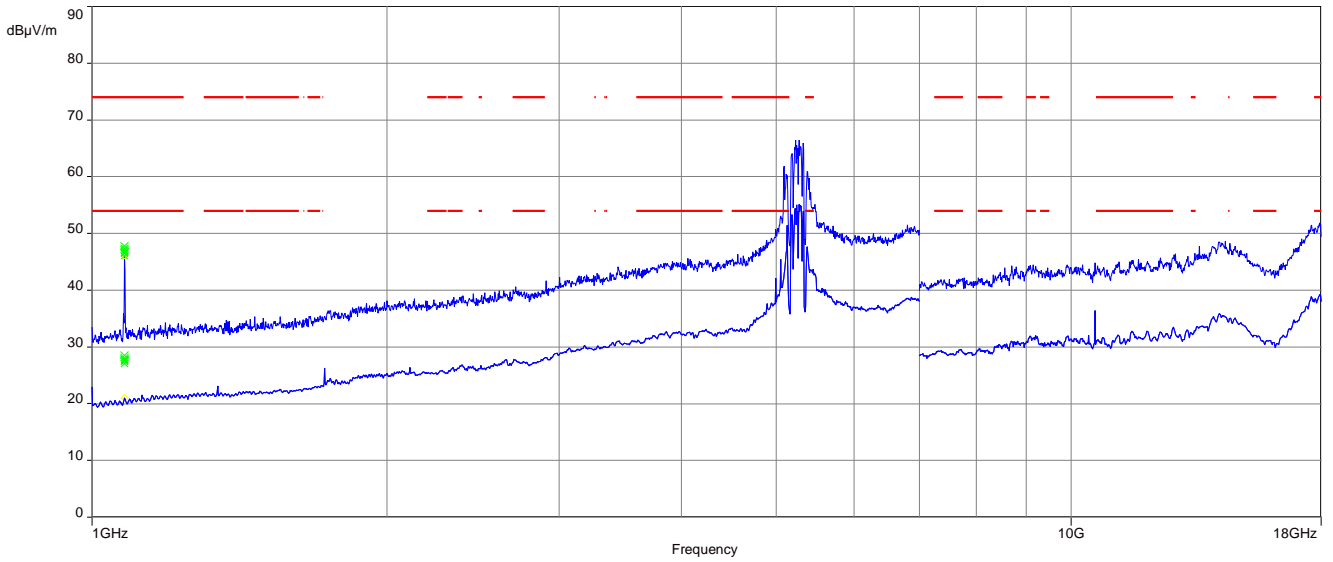


Plot 5: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-3; middle channel

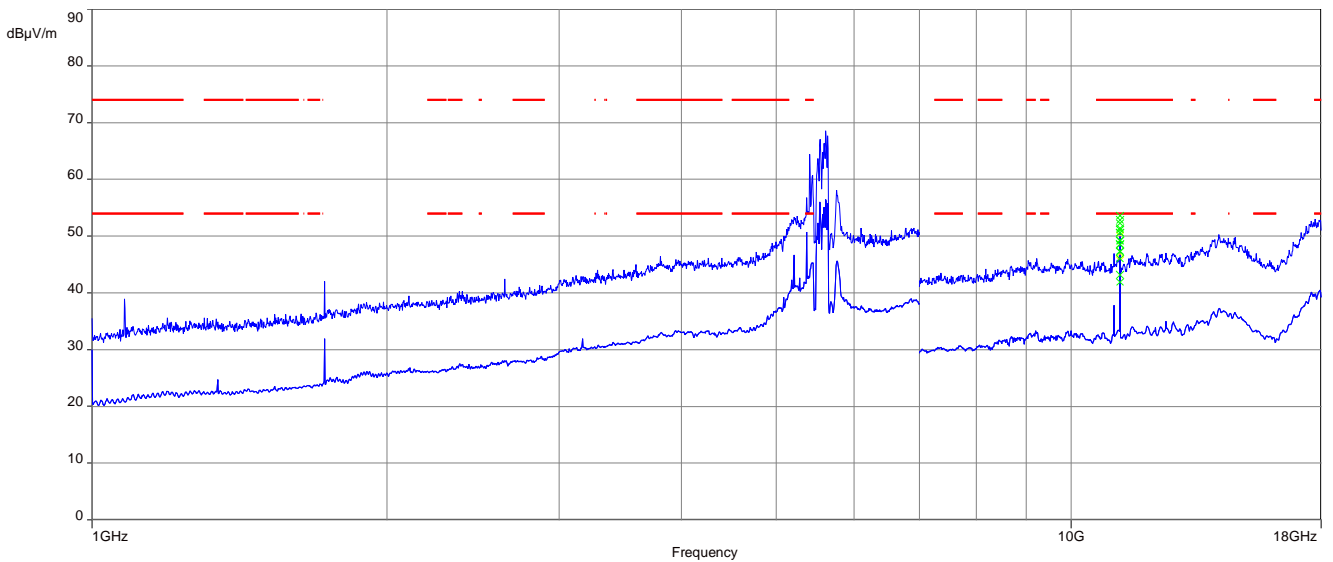


Plots: 80+80 MHz channel bandwidth, COLFLY antennas

Plot 1: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-1 & U-NII-2A; middle channel

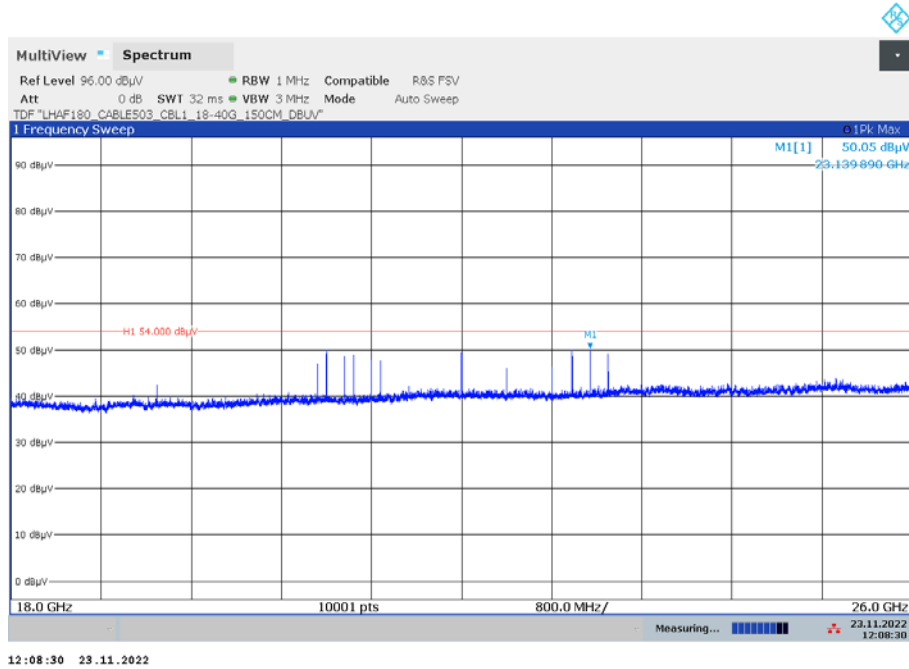


Plot 2: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2C; middle channel

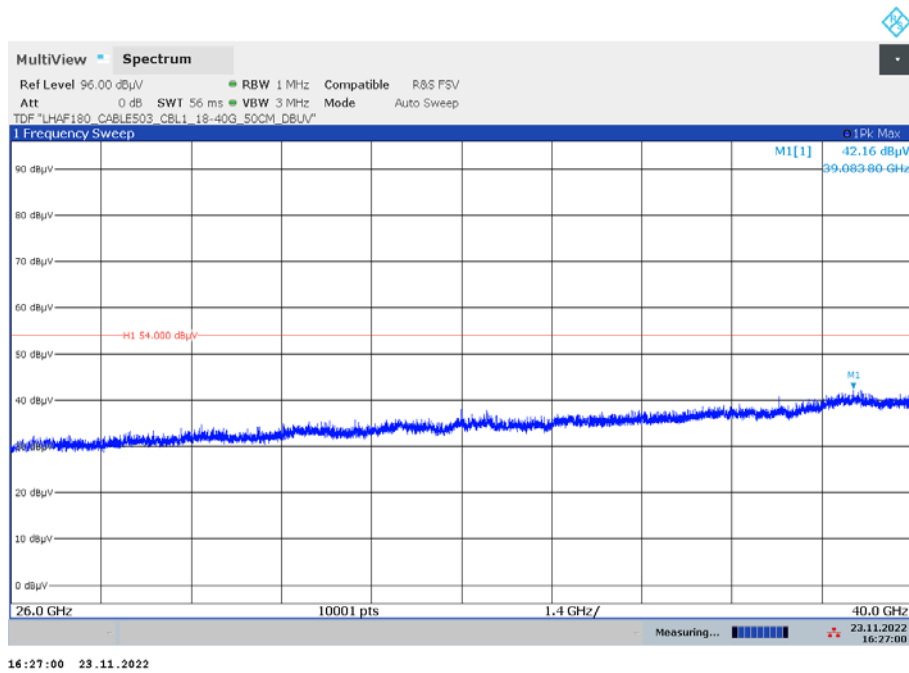


Plots: 18 GHz to 40 GHz, COLFLY antennas

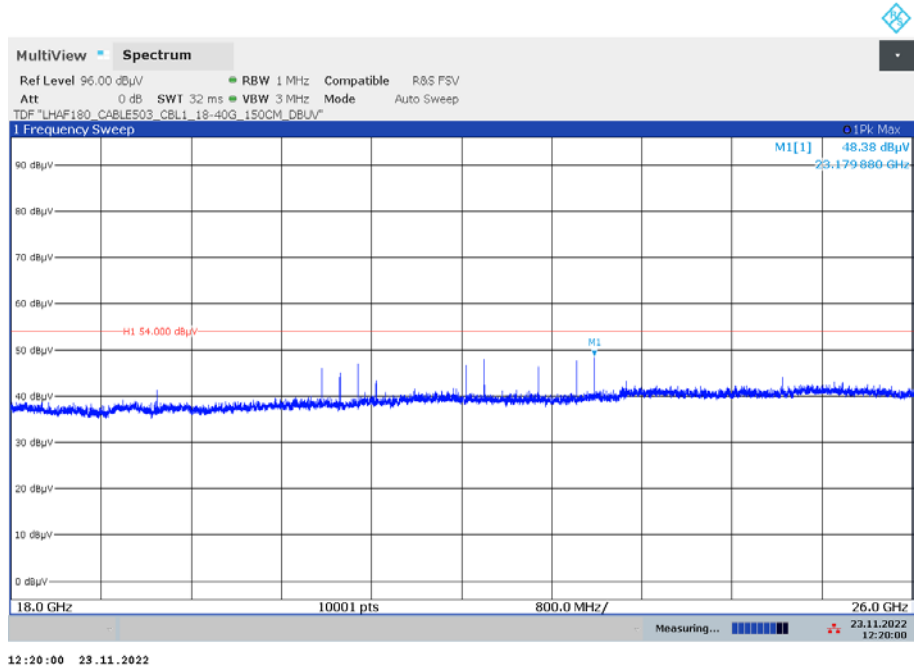
Plot 1: 18 GHz to 26 GHz, valid for all bands, channels and 20 MHz modes



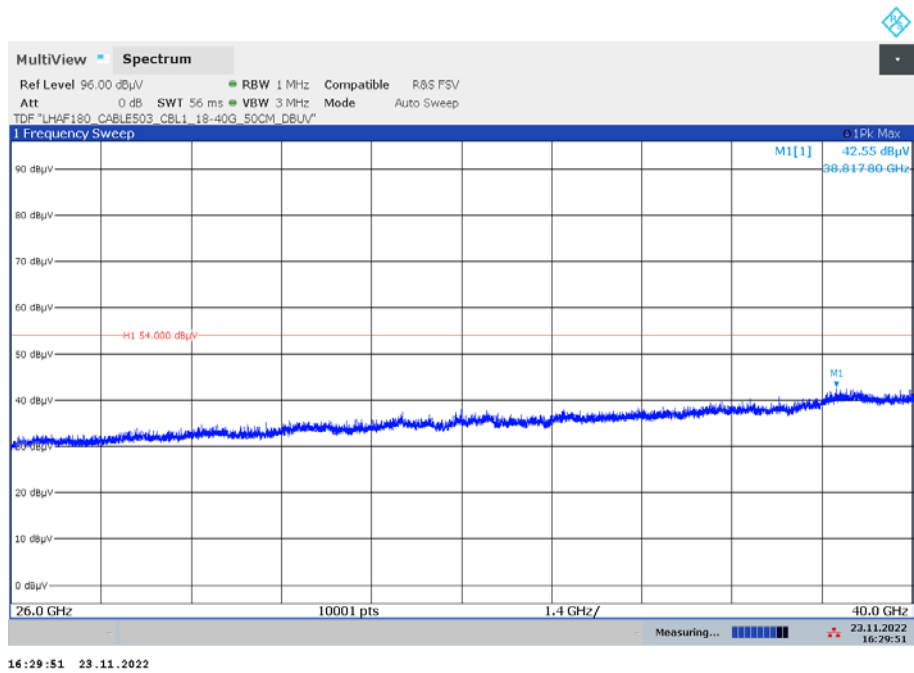
Plot 2: 26 GHz to 40 GHz, valid for all bands, channels and 20 MHz modes



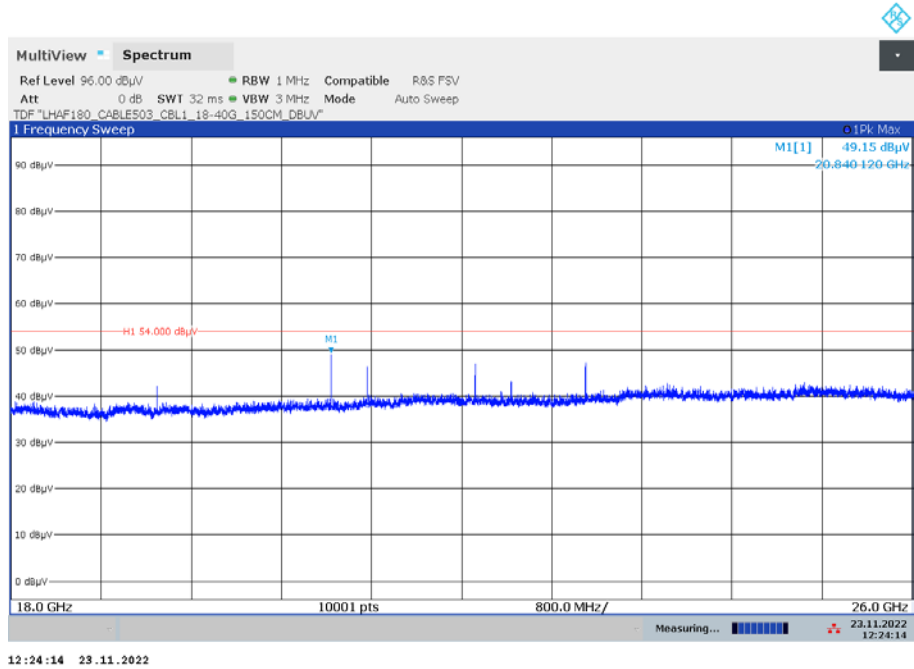
Plot 3: 18 GHz to 26 GHz, valid for all bands, channels and 40 MHz modes



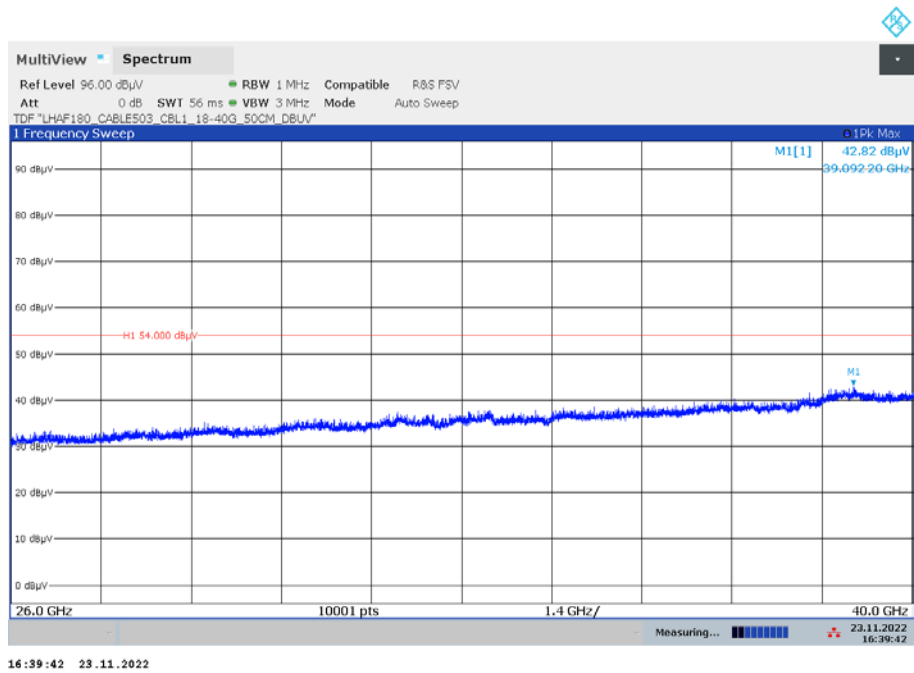
Plot 4: 26 GHz to 40 GHz, valid for all bands, channels and 40 MHz modes



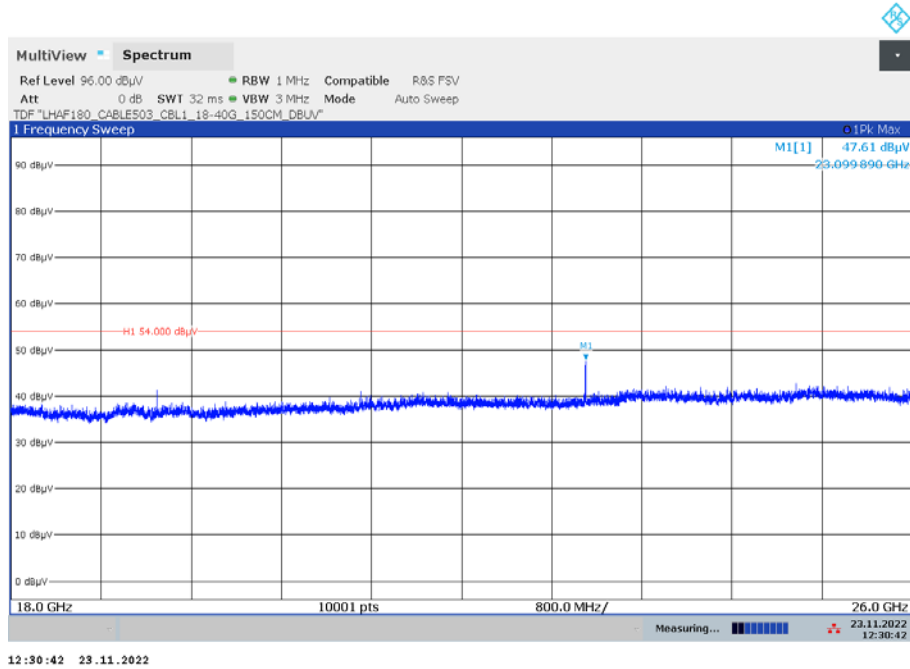
Plot 5: 18 GHz to 26 GHz, valid for all bands, channels and 80 MHz modes



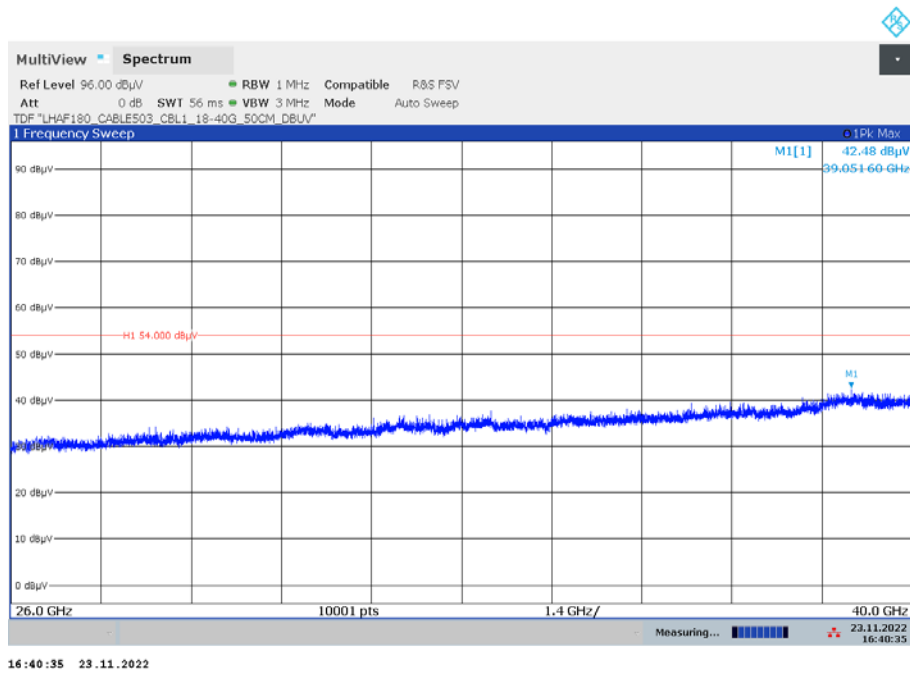
Plot 6: 26 GHz to 40 GHz, valid for all bands, channels and 80 MHz modes



Plot 7: 18 GHz to 26 GHz, valid for all bands, channels and 80+80 MHz modes

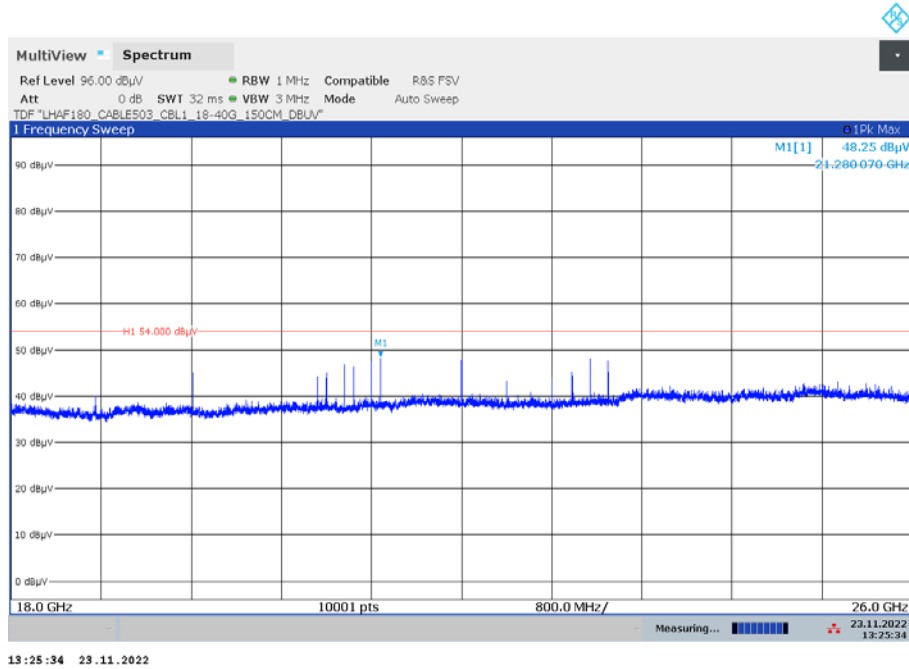


Plot 8: 26 GHz to 40 GHz, valid for all bands, channels and 80+80 MHz modes

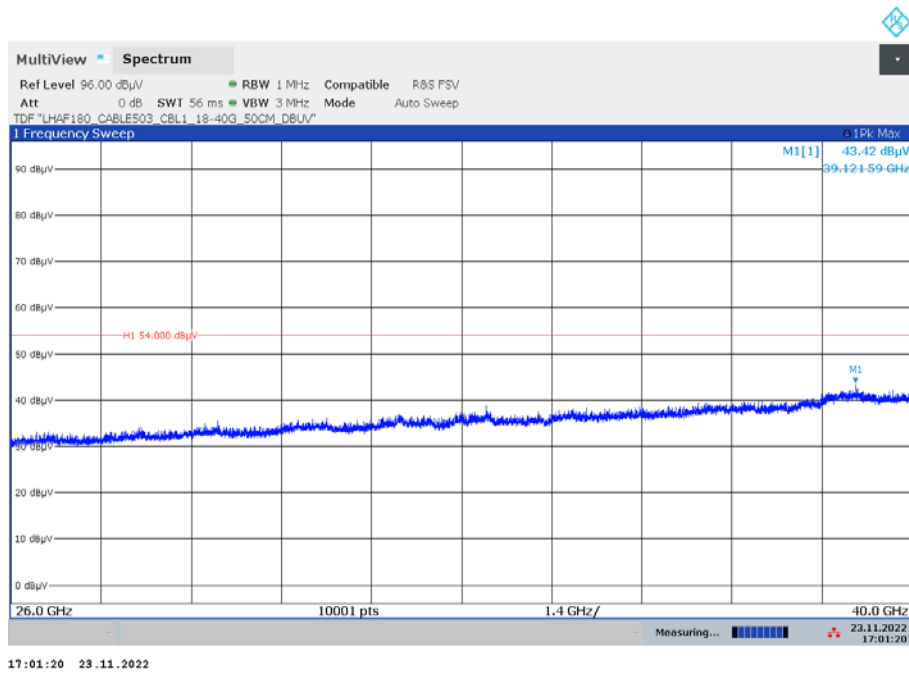


Plots: 18 GHz to 40 GHz, WALSIN antennas

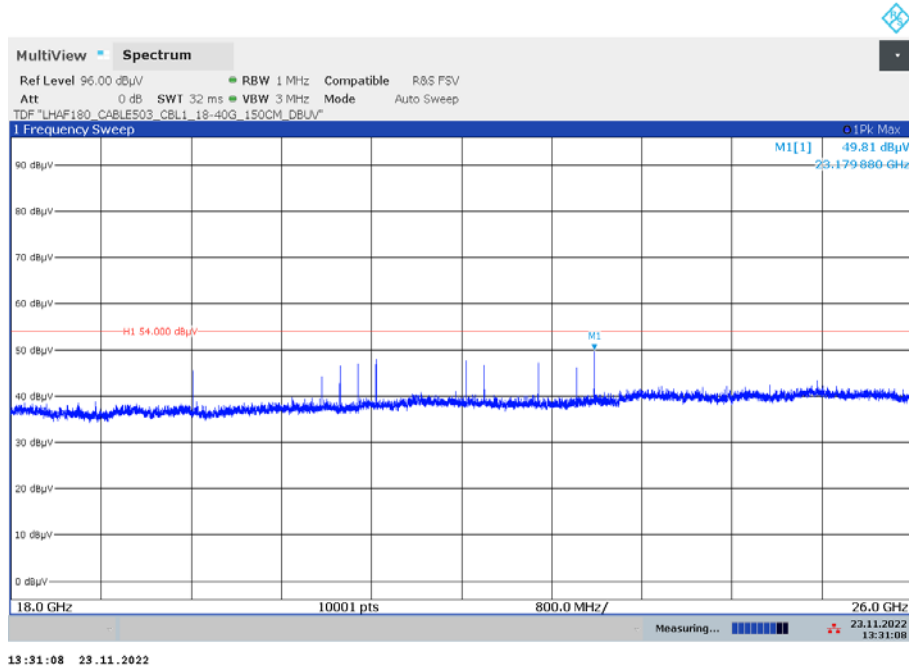
Plot 1: 18 GHz to 26 GHz, valid for all bands, channels and 20 MHz modes



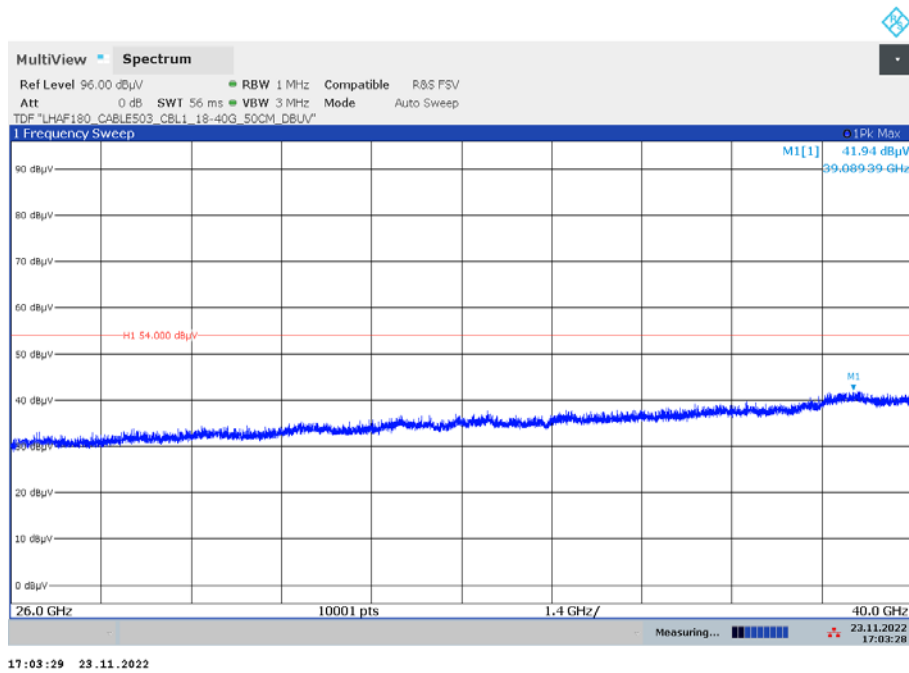
Plot 2: 26 GHz to 40 GHz, valid for all bands, channels and 20 MHz modes



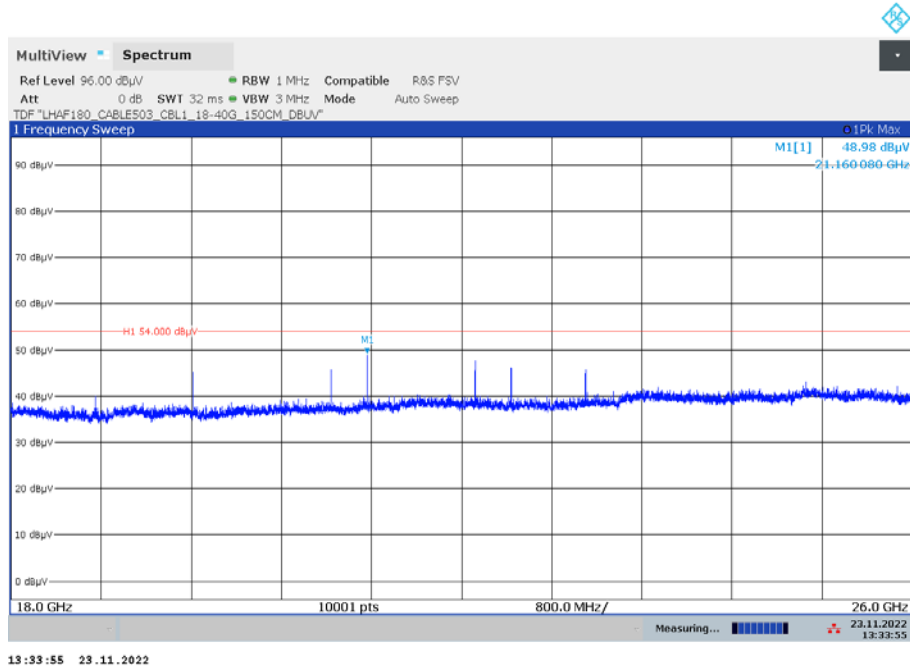
Plot 3: 18 GHz to 26 GHz, valid for all bands, channels and 40 MHz modes



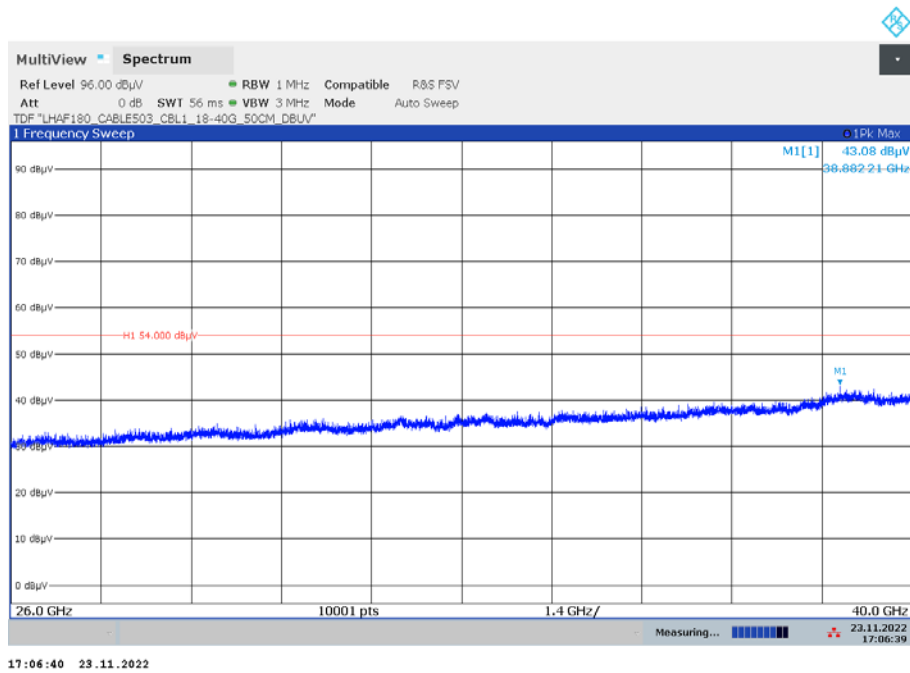
Plot 4: 26 GHz to 40 GHz, valid for all bands, channels and 40 MHz modes



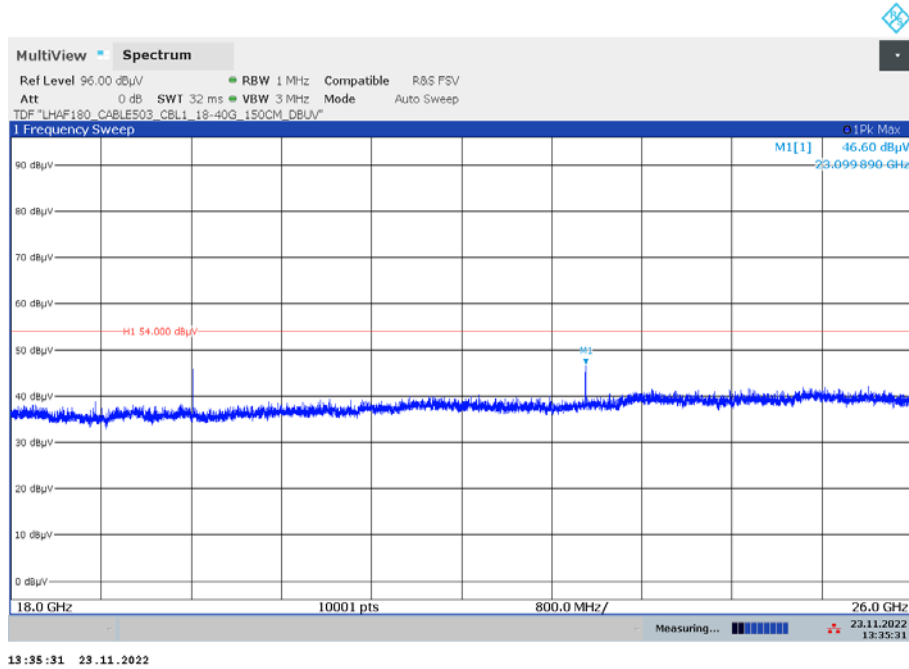
Plot 5: 18 GHz to 26 GHz, valid for all bands, channels and 80 MHz modes



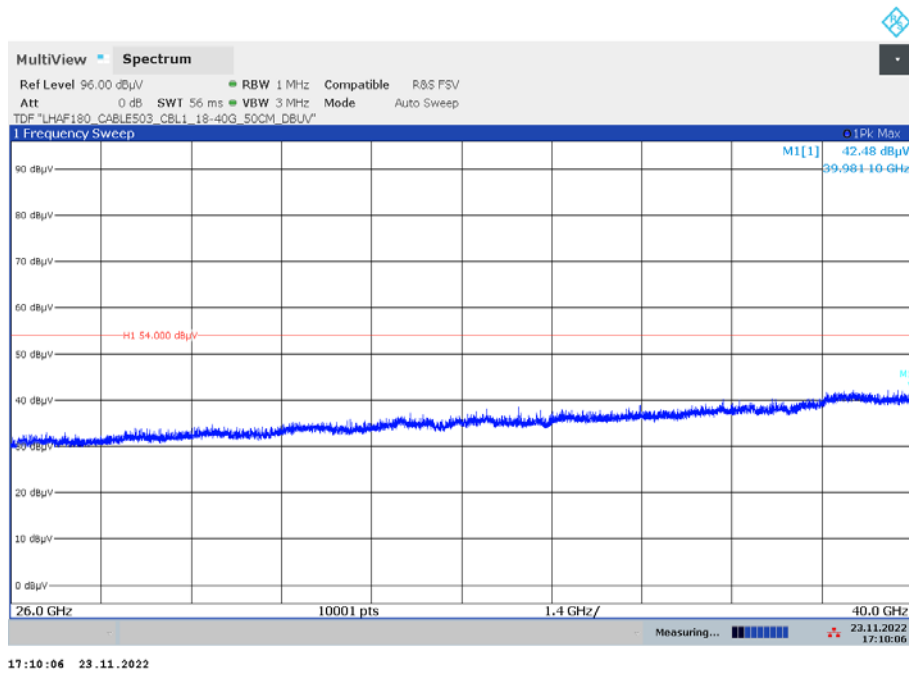
Plot 6: 26 GHz to 40 GHz, valid for all bands, channels and 80 MHz modes



Plot 7: 18 GHz to 26 GHz, valid for all bands, channels and 80+80 MHz modes

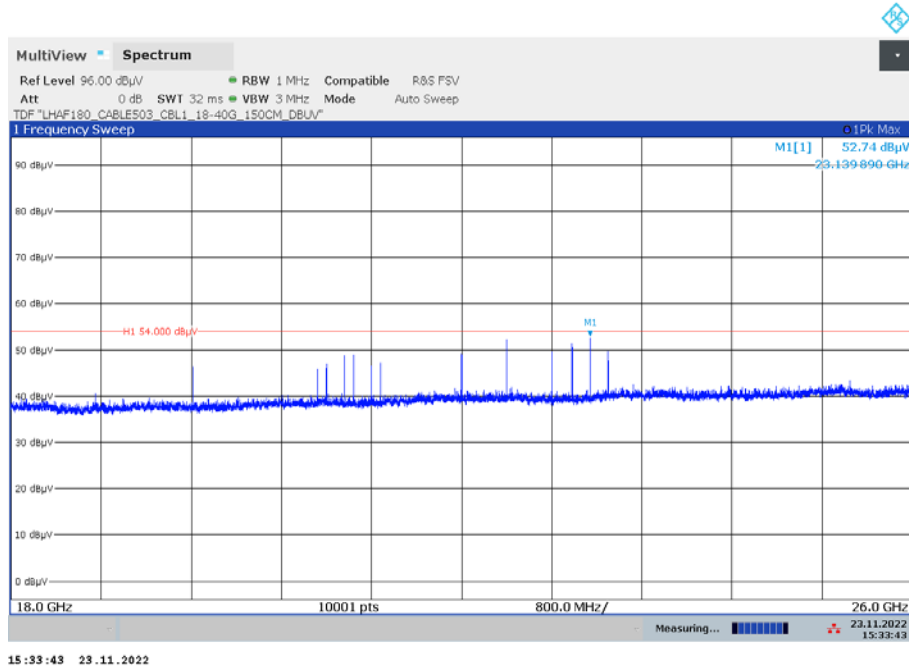


Plot 8: 26 GHz to 40 GHz, valid for all bands, channels and 80+80 MHz modes

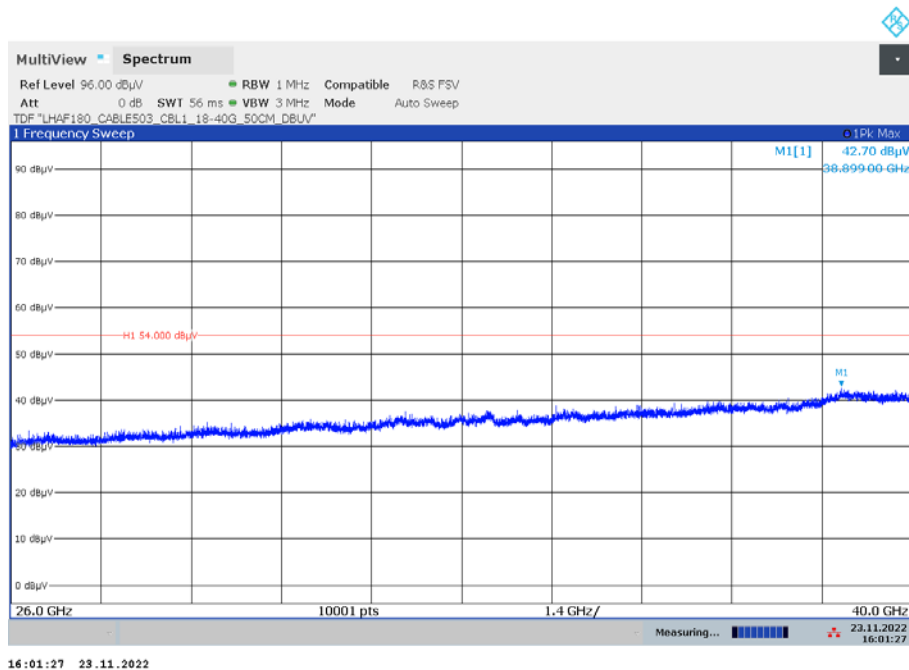


Plots: 18 GHz to 40 GHz, HL antennas

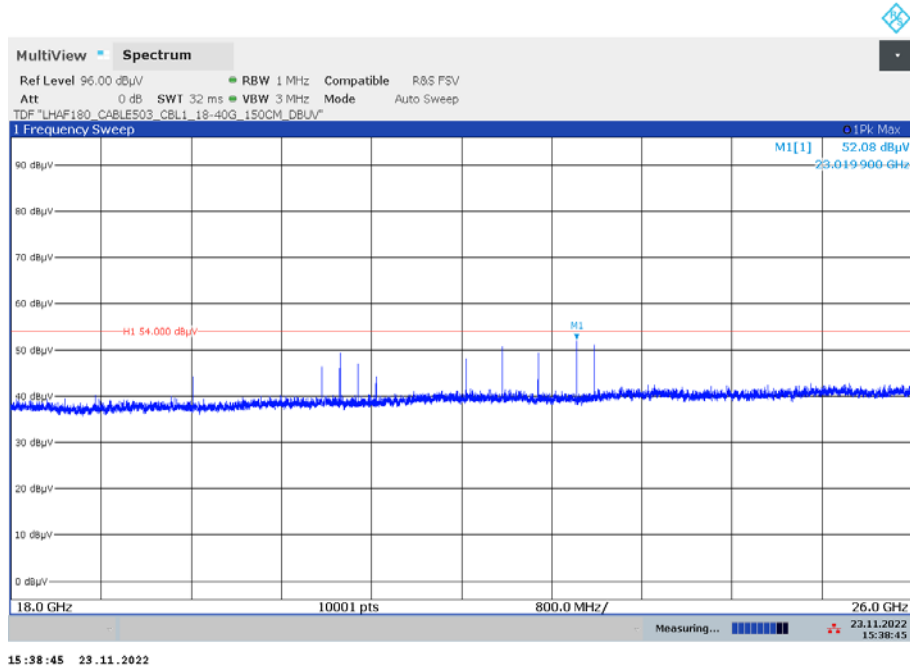
Plot 1: 18 GHz to 26 GHz, valid for all bands, channels and 20 MHz modes



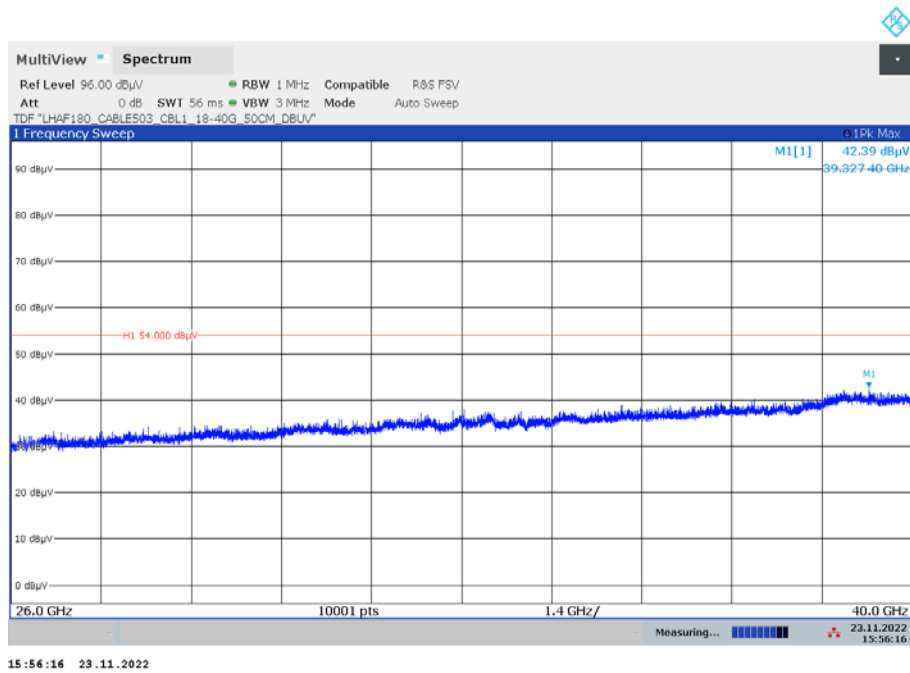
Plot 2: 26 GHz to 40 GHz, valid for all bands, channels and 20 MHz modes



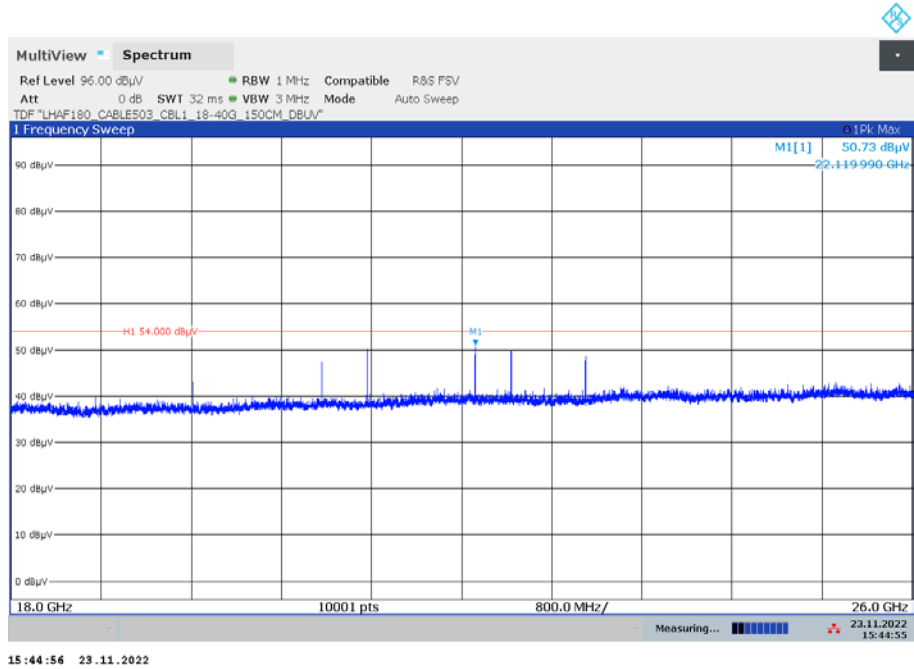
Plot 3: 18 GHz to 26 GHz, valid for all bands, channels and 40 MHz modes



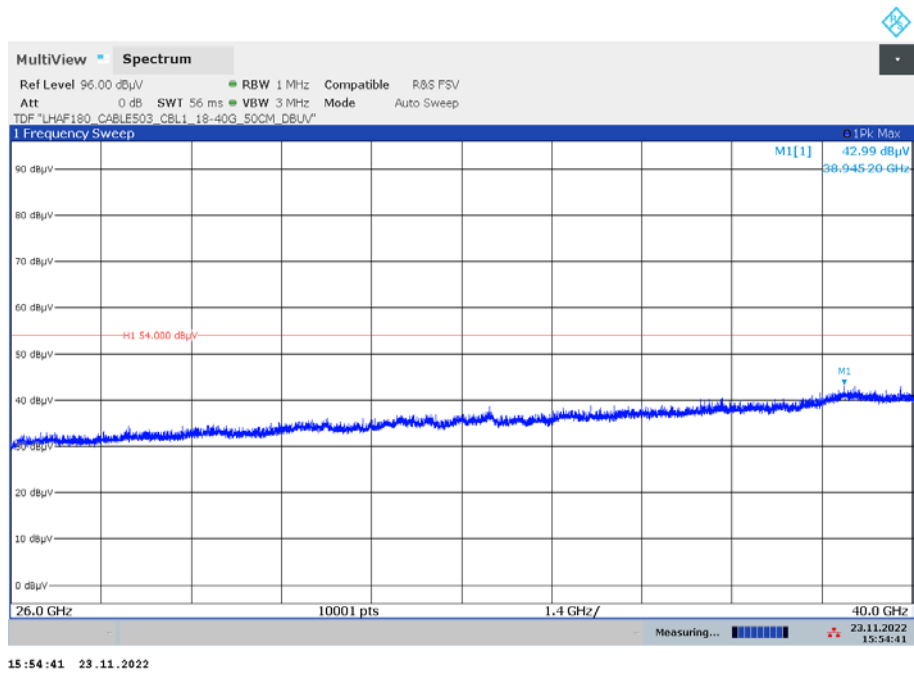
Plot 4: 26 GHz to 40 GHz, valid for all bands, channels and 40 MHz modes



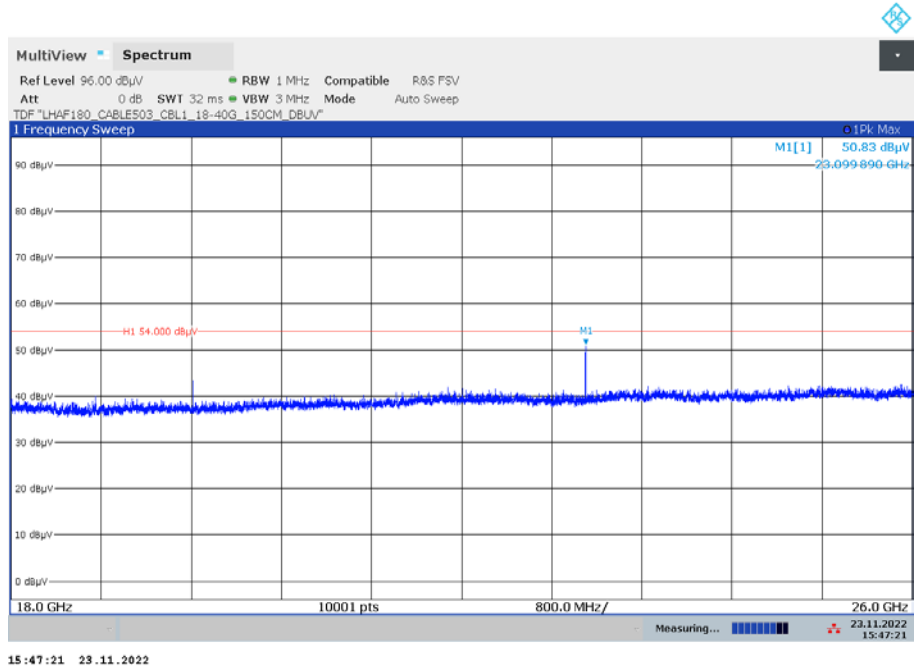
Plot 5: 18 GHz to 26 GHz, valid for all bands, channels and 80 MHz modes



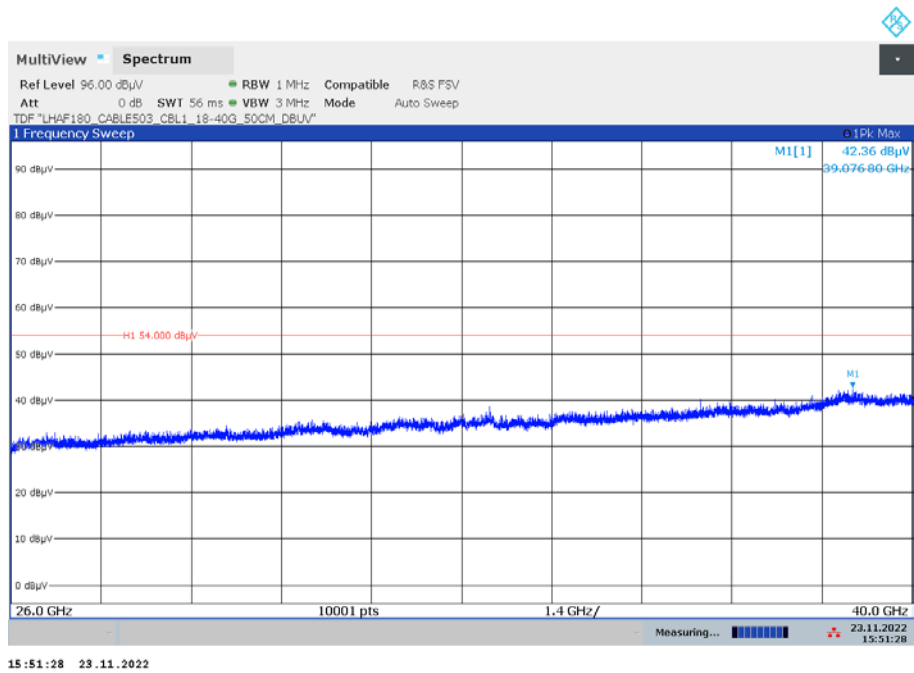
Plot 6: 26 GHz to 40 GHz, valid for all bands, channels and 80 MHz modes



Plot 7: 18 GHz to 26 GHz, valid for all bands, channels and 80+80 MHz modes

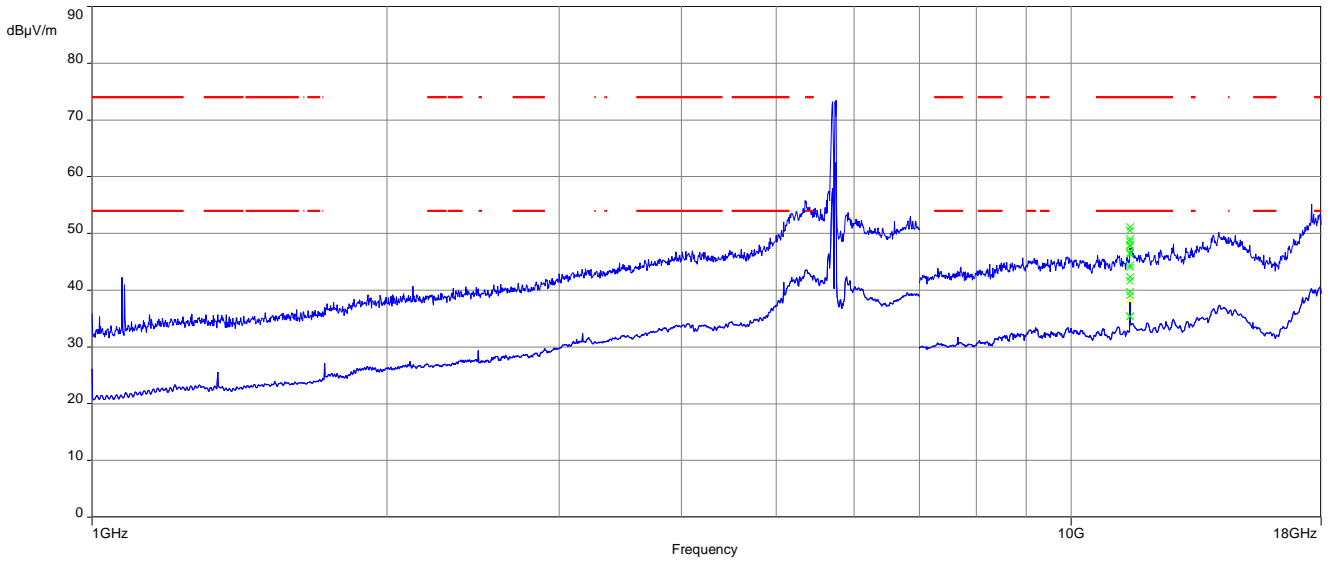


Plot 8: 26 GHz to 40 GHz, valid for all bands, channels and 80+80 MHz modes

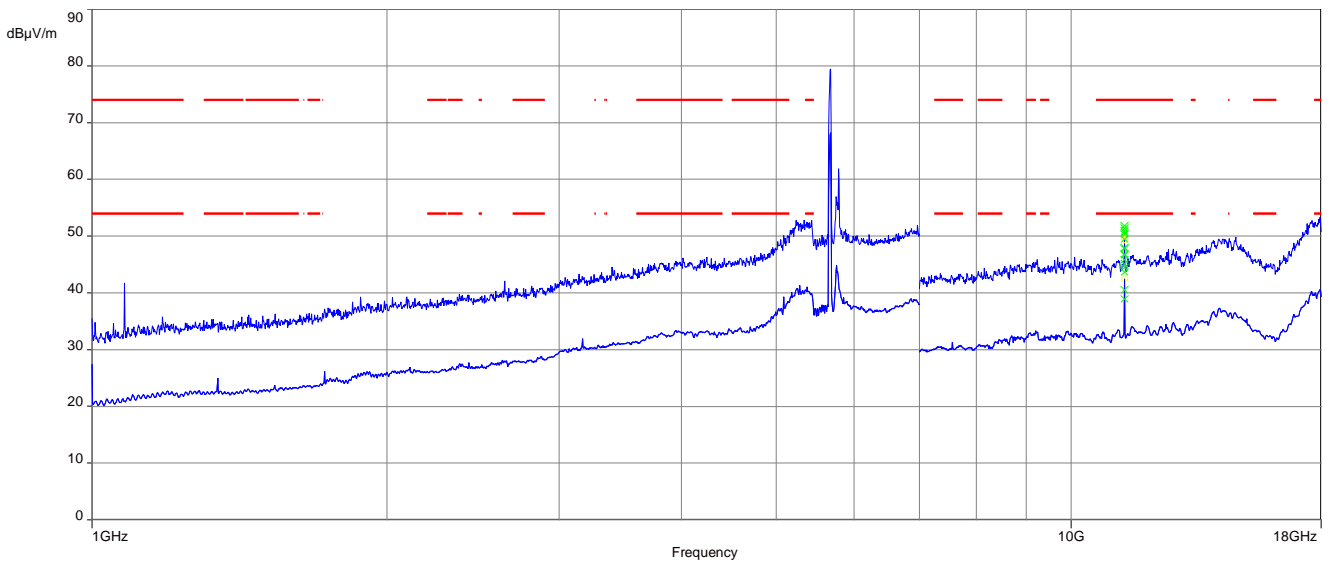


Plots: WALSIN antennas

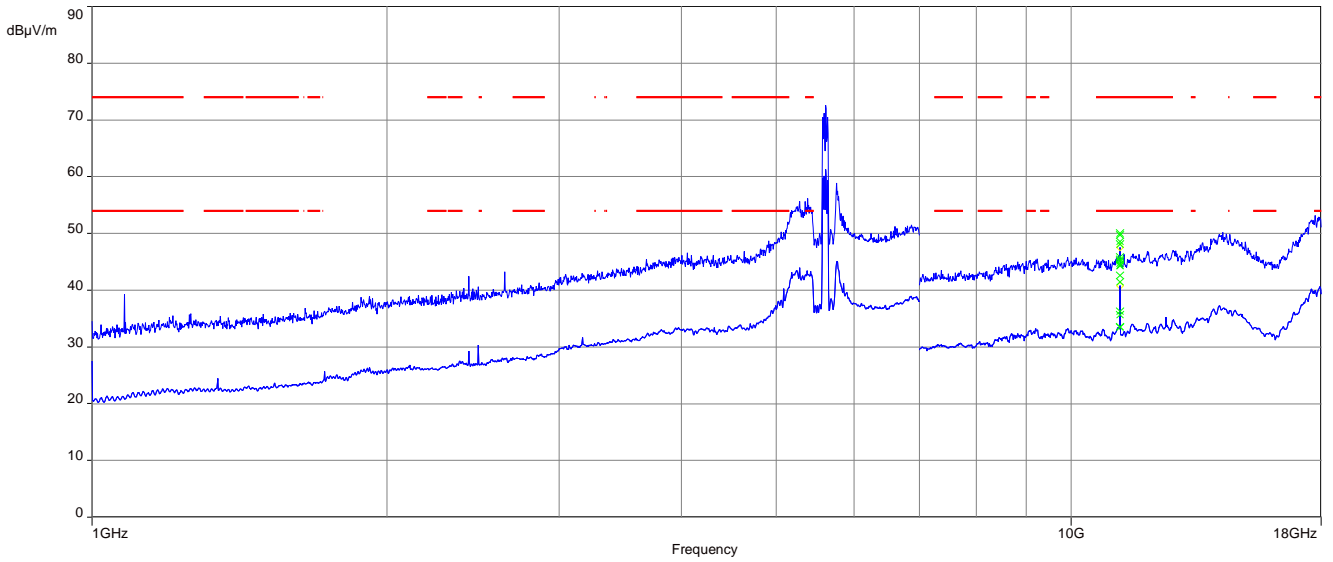
Plot 1: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-3; lowest channel, 20 MHz bandwidth



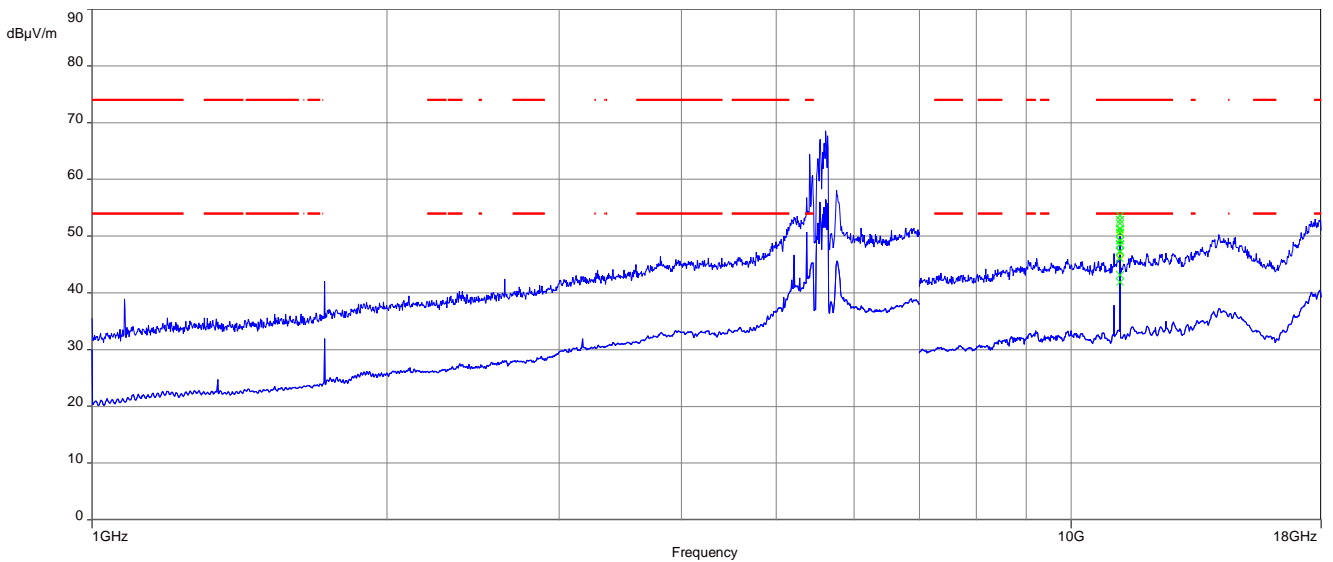
Plot 2: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2C; highest channel, 40 MHz bandwidth



Plot 3: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2C; highest channel, 80 MHz bandwidth

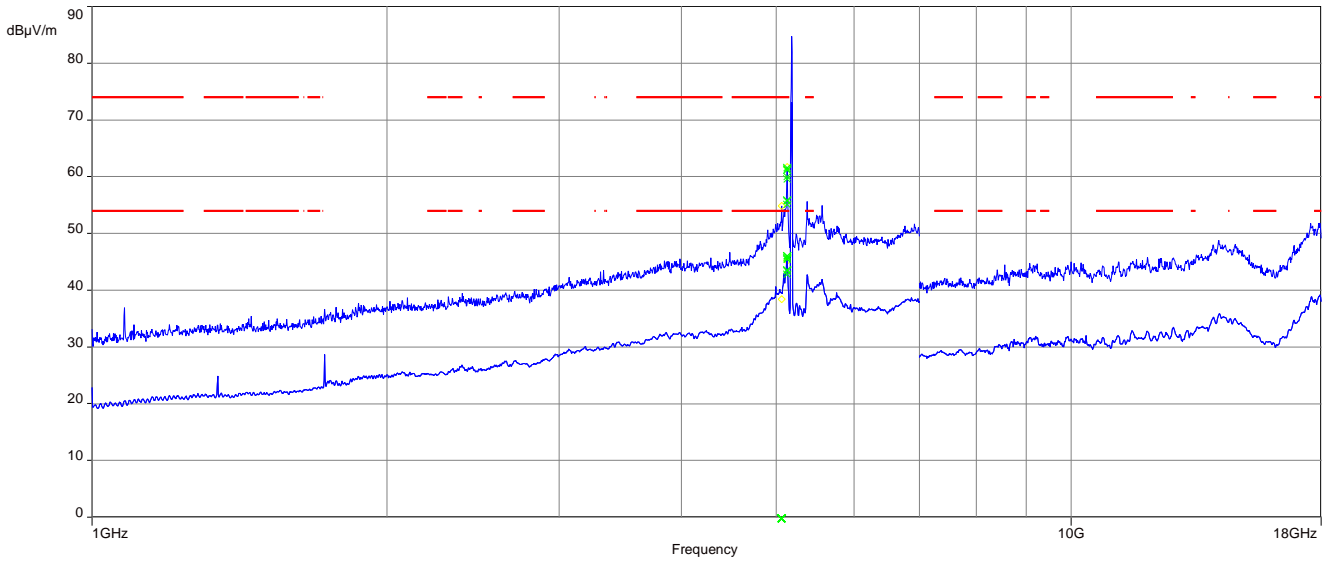


Plot 4: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-2C; middle channel, 80+80 MHz bandwidth

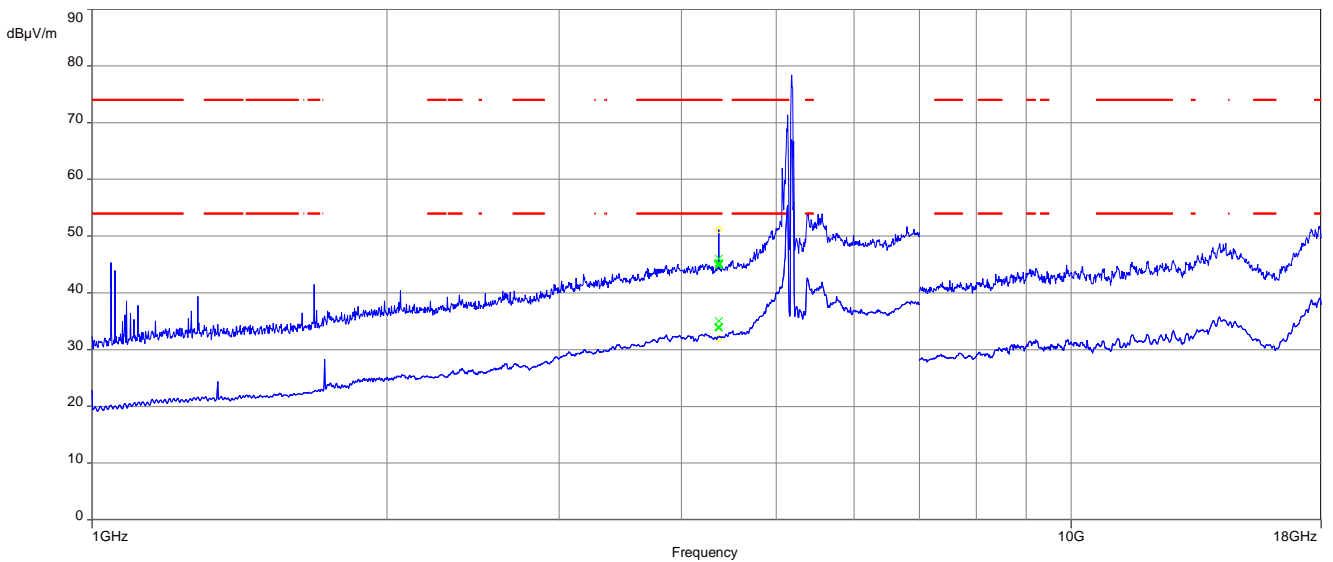


Plots: HL antennas

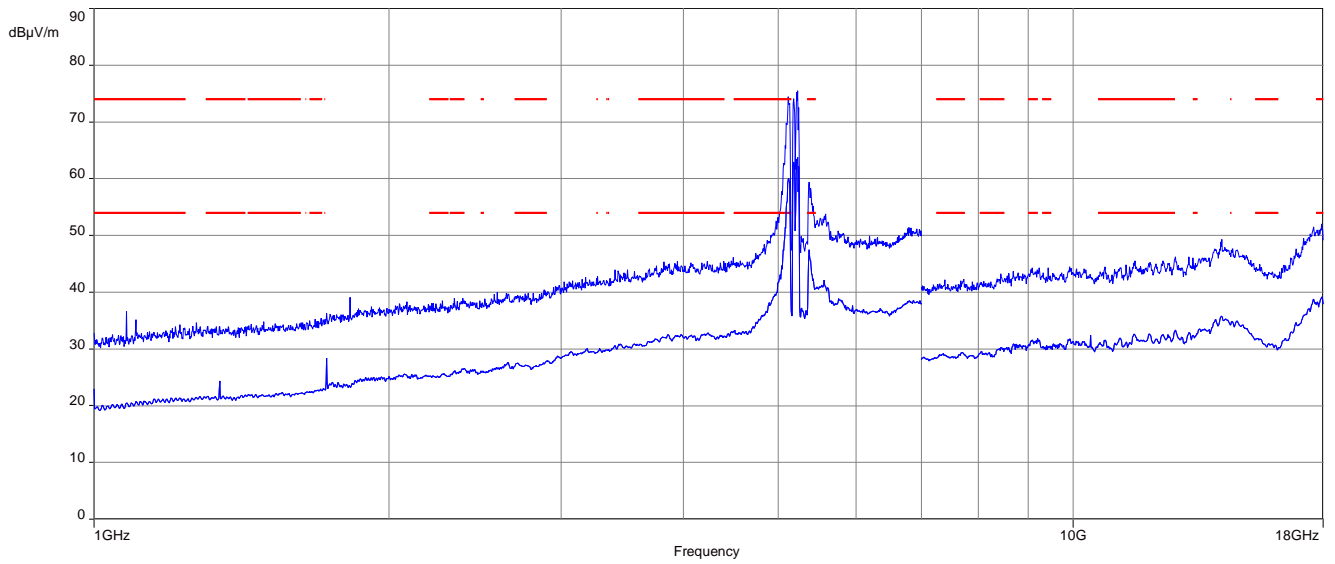
Plot 1: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-1; lowest channel, 20 MHz bandwidth



Plot 2: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-1; lowest channel, 40 MHz bandwidth



Plot 3: 1 GHz to 18 GHz; vertical & horizontal polarization; U-NII-1; middle channel, 80 MHz bandwidth



12.13 Spurious emissions conducted < 30 MHz

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to middle channel. If critical peaks are found the lowest channel and the highest channel will be measured too. Both power lines, phase and neutral line, are measured. Found peaks are re-measured with average and quasi peak detection to show compliance to the limits.

Measurement:

| Measurement parameter | |
|--------------------------|-----------------------------|
| Detector: | Peak - Quasi Peak / Average |
| Sweep time: | Auto |
| Video bandwidth: | 9 kHz |
| Resolution bandwidth: | 100 kHz |
| Span: | 150 kHz to 30 MHz |
| Trace mode: | Max Hold |
| Test setup: | See sub clause 7.5 – A |
| Measurement uncertainty: | See chapter 9 |

Limits:

| Spurious Emissions Conducted < 30 MHz | | |
|---------------------------------------|---------------------|------------------|
| Frequency (MHz) | Quasi-Peak (dBµV/m) | Average (dBµV/m) |
| 0.15 – 0.5 | 66 to 56* | 56 to 46* |
| 0.5 – 5 | 56 | 46 |
| 5 – 30.0 | 60 | 50 |

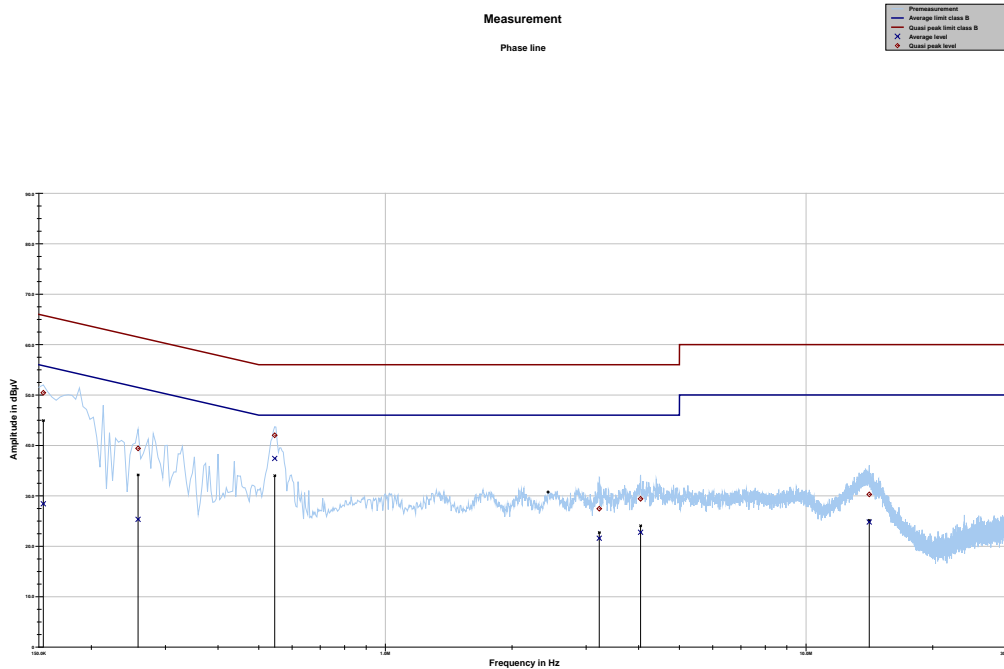
*Decreases with the logarithm of the frequency

Results:

| Spurious Emissions Conducted < 30 MHz [dBµV/m] | | |
|---|----------|----------------|
| F [MHz] | Detector | Level [dBµV/m] |
| All detected emissions are more than 20 dB below the limit. | | |
| | | |

Plots:

Plot 1: 150 kHz to 30 MHz, phase line

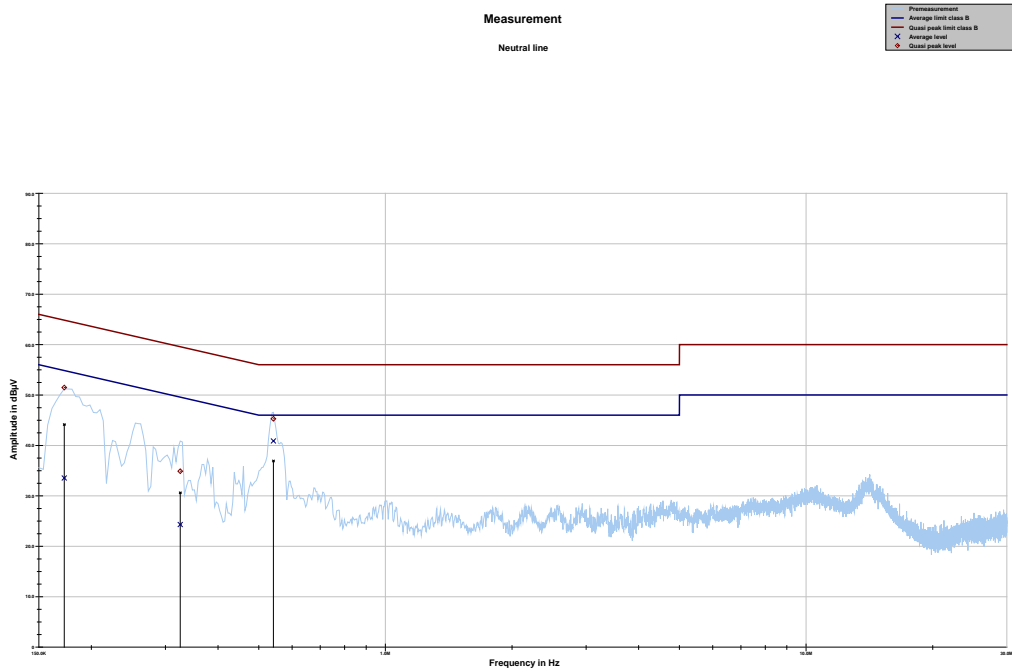


Project ID: 3977

Final results:

| Frequency | Quasi peak level | Margin quasi peak | Limit QP | Average level | Margin Average | Limit AV |
|-----------|------------------|-------------------|----------|---------------|----------------|----------|
| MHz | dBµV | dB | dBµV | dBµV | dB | dBµV |
| 0.153731 | 50.45 | 15.35 | 65.796 | 28.43 | 27.47 | 55.893 |
| 0.258206 | 39.41 | 22.08 | 61.489 | 25.33 | 27.58 | 52.908 |
| 0.545512 | 42.00 | 14.00 | 56.000 | 37.41 | 8.59 | 46.000 |
| 3.224550 | 27.44 | 28.56 | 56.000 | 21.59 | 24.41 | 46.000 |
| 4.041694 | 29.40 | 26.60 | 56.000 | 22.77 | 23.23 | 46.000 |
| 14.130994 | 30.29 | 29.71 | 60.000 | 24.80 | 25.20 | 50.000 |

Plot 2: 150 kHz to 30 MHz, neutral line



Project ID: 3977

Final results:

| Frequency | Quasi peak level | Margin quasi peak | Limit QP | Average level | Margin Average | Limit AV |
|-----------|------------------|-------------------|----------|---------------|----------------|----------|
| MHz | dBµV | dB | dBµV | dBµV | dB | dBµV |
| 0.172387 | 51.49 | 13.36 | 64.845 | 33.53 | 21.83 | 55.360 |
| 0.325369 | 34.88 | 24.69 | 59.569 | 24.31 | 26.68 | 50.989 |
| 0.541781 | 45.28 | 10.72 | 56.000 | 40.88 | 5.12 | 46.000 |

13 Glossary

| | |
|------------------------|--|
| EUT | Equipment under test |
| DUT | Device under test |
| UUT | Unit under test |
| GUE | GNSS User Equipment |
| ETSI | European Telecommunications Standards Institute |
| EN | European Standard |
| FCC | Federal Communications Commission |
| FCC ID | Company Identifier at FCC |
| IC | Industry Canada |
| PMN | Product marketing name |
| HMN | Host marketing name |
| HVIN | Hardware version identification number |
| FVIN | Firmware version identification number |
| EMC | Electromagnetic Compatibility |
| HW | Hardware |
| SW | Software |
| Inv. No. | Inventory number |
| S/N or SN | Serial number |
| C | Compliant |
| NC | Not compliant |
| NA | Not applicable |
| NP | Not performed |
| PP | Positive peak |
| QP | Quasi peak |
| AVG | Average |
| OC | Operating channel |
| OCW | Operating channel bandwidth |
| OBW | Occupied bandwidth |
| OOB | Out of band |
| DFS | Dynamic frequency selection |
| CAC | Channel availability check |
| OP | Occupancy period |
| NOP | Non occupancy period |
| DC | Duty cycle |
| PER | Packet error rate |
| CW | Clean wave |
| MC | Modulated carrier |
| WLAN | Wireless local area network |
| RLAN | Radio local area network |
| DSSS | Dynamic sequence spread spectrum |
| OFDM | Orthogonal frequency division multiplexing |
| FHSS | Frequency hopping spread spectrum |
| GNSS | Global Navigation Satellite System |
| C/N₀ | Carrier to noise-density ratio, expressed in dB-Hz |

14 Document history

| Version | Applied changes | Date of release |
|---------|-----------------|-----------------|
| -/- | Initial release | 2023-01-16 |

15 Accreditation Certificate – D-PL-12076-01-05

| first page | last page | | | |
|---|---|--|--|--|
|  <p>Deutsche Akkreditierungsstelle GmbH</p> <p>Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition</p> <p>Accreditation </p> <p>The Deutsche Akkreditierungsstelle GmbH attests that the testing laboratory CTC advanced GmbH Untertürkheimer Straße 6-10, 66117 Saarbrücken is competent under the terms of DIN EN ISO/IEC 17025:2018 to carry out tests in the following fields: Telecommunication (FCC Requirements)</p> <p>The accreditation certificate shall only apply in connection with the notice of accreditation of 09.06.2020 with the accreditation number D-PL-12076-01. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 05 pages. Registration number of the certificate: D-PL-12076-01-05</p> <p>Frankfurt am Main, 09.06.2020  by Dipl.-Ing. (FH) Alf Egner Head of Division</p> <p><small>The certificate together with its annex reflects the status at the time of the date of issue. The current status of the scope of accreditation can be found in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH. https://www.dakks.de/en/content/accredited-bodies-dakks Site valid: 09/2020</small></p> | <p>Deutsche Akkreditierungsstelle GmbH</p> <table border="0"> <tr> <td>Office Berlin Spittelmarkt 10 10117 Berlin</td> <td>Office Frankfurt am Main Europa-Allee 52 60327 Frankfurt am Main</td> <td>Office Braunschweig Bundesallee 100 38116 Braunschweig</td> </tr> </table> <p>The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkKS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.</p> <p>No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkKS.</p> <p>The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkKS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.</p> <p>The up-to-date state of membership can be retrieved from the following websites: EA: www.european-accreditation.org ILAC: www.ilac.org IAF: www.iaf.nu</p> | Office Berlin Spittelmarkt 10 10117 Berlin | Office Frankfurt am Main Europa-Allee 52 60327 Frankfurt am Main | Office Braunschweig Bundesallee 100 38116 Braunschweig |
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Note: The current certificate annex is published on the websites (link see below).

<https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-05e.pdf>

or

https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-05_TCB_USA.pdf

END OF TEST REPORT