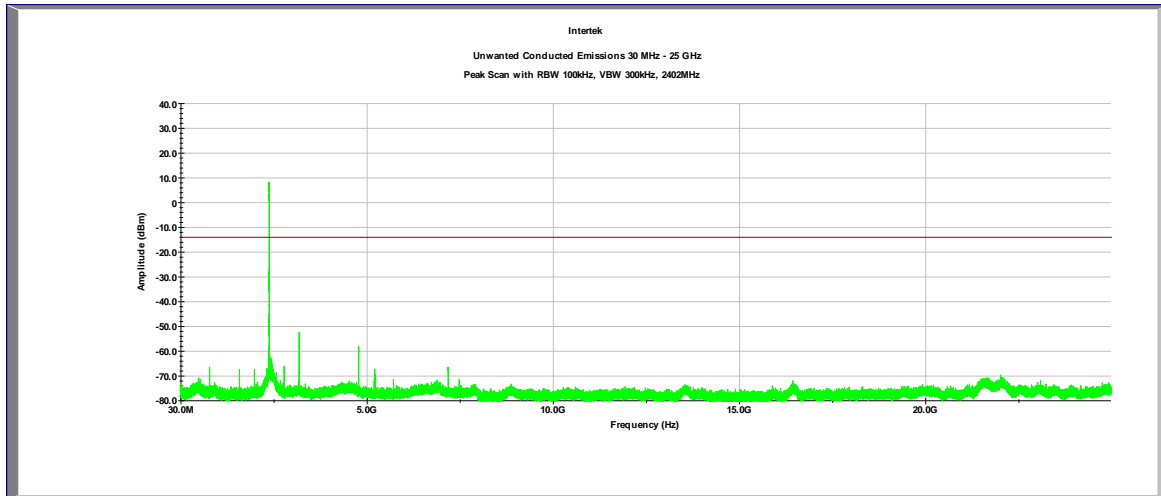
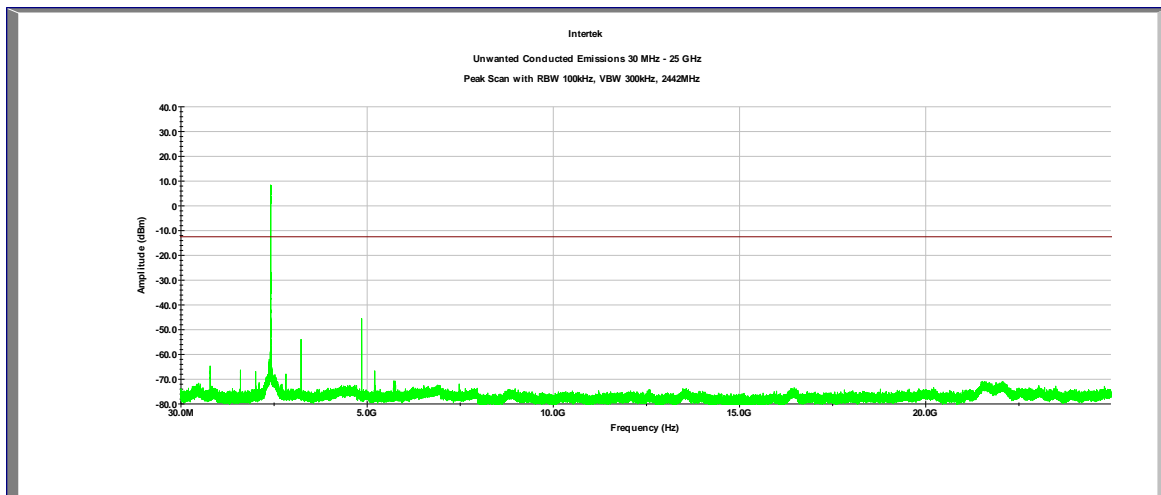


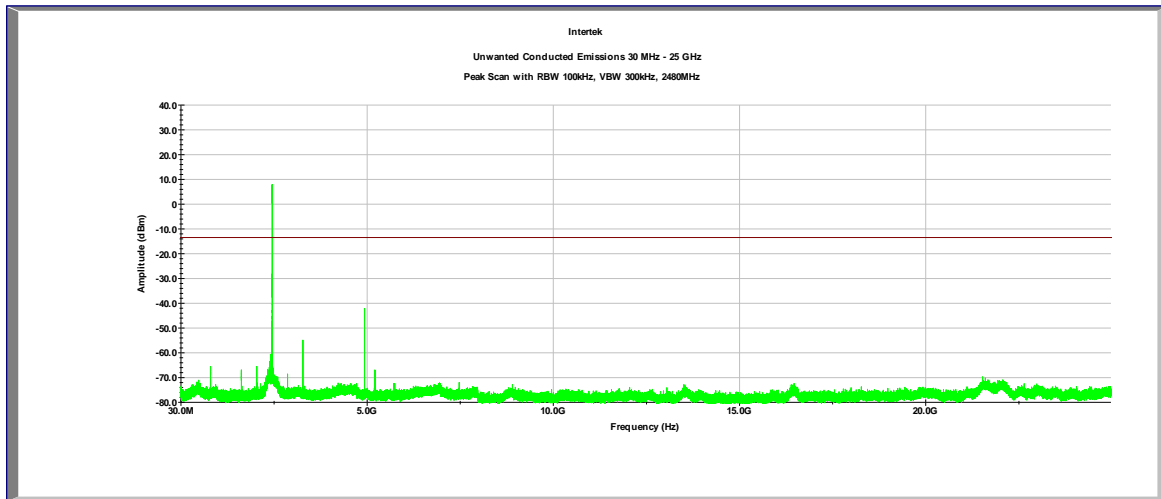
Out-of-Band Conducted Spurious Emissions, 8-DPSK, 2402 MHz



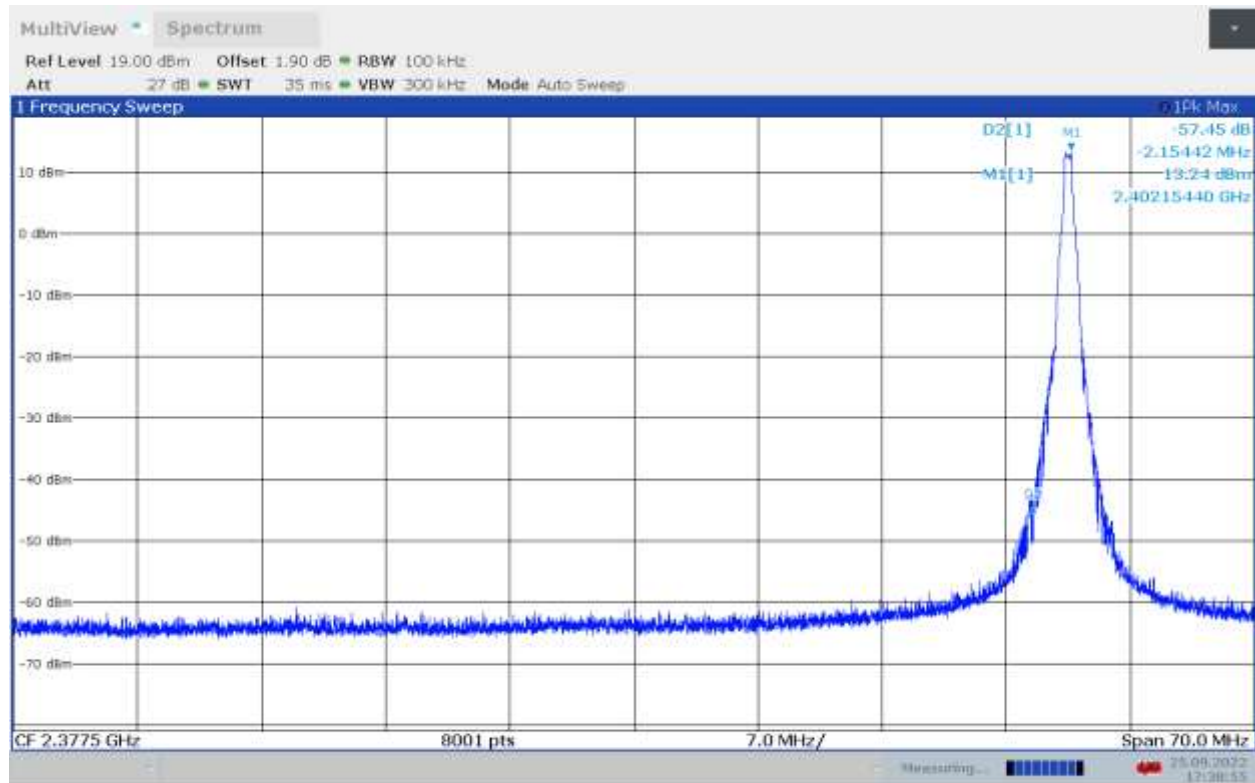
Out-of-Band Conducted Spurious Emissions, 8-DPSK, 2442 MHz



Out-of-Band Conducted Spurious Emissions, 8-DPSK, 2480 MHz

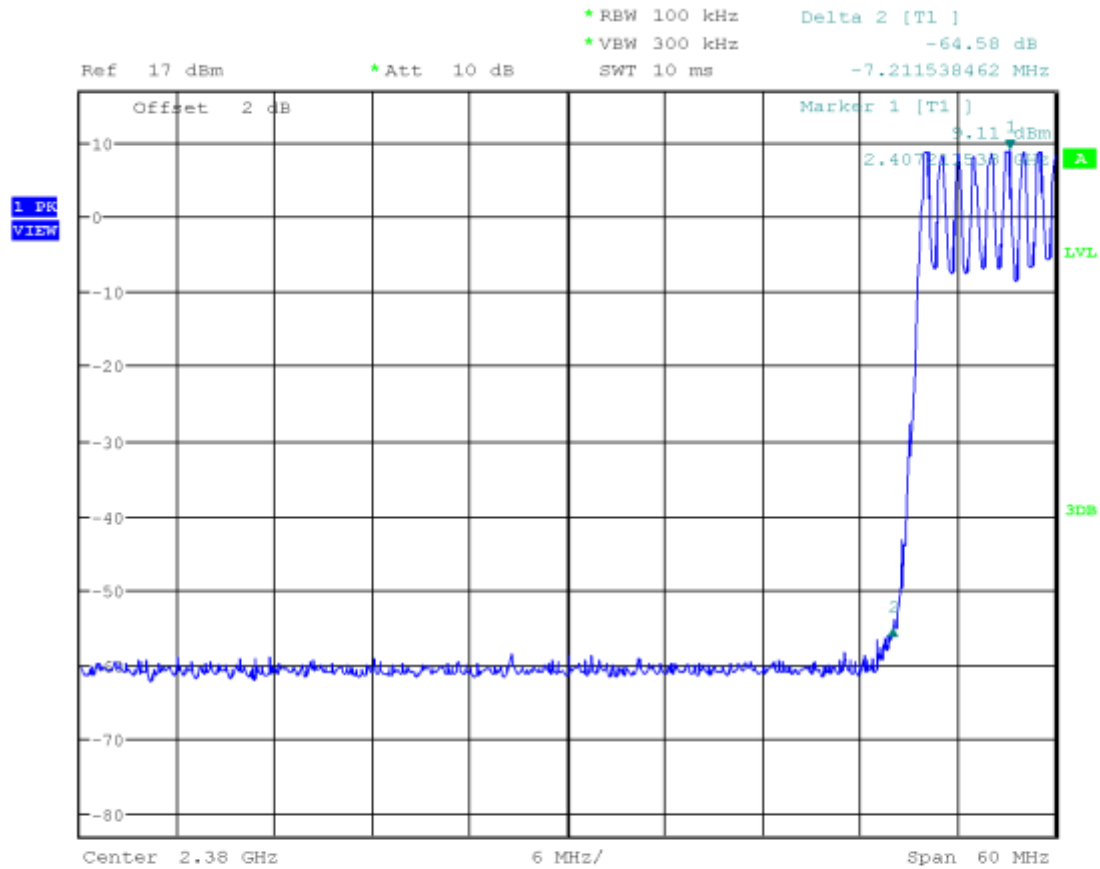


GFSK
Conducted Band Edge, Low Channel



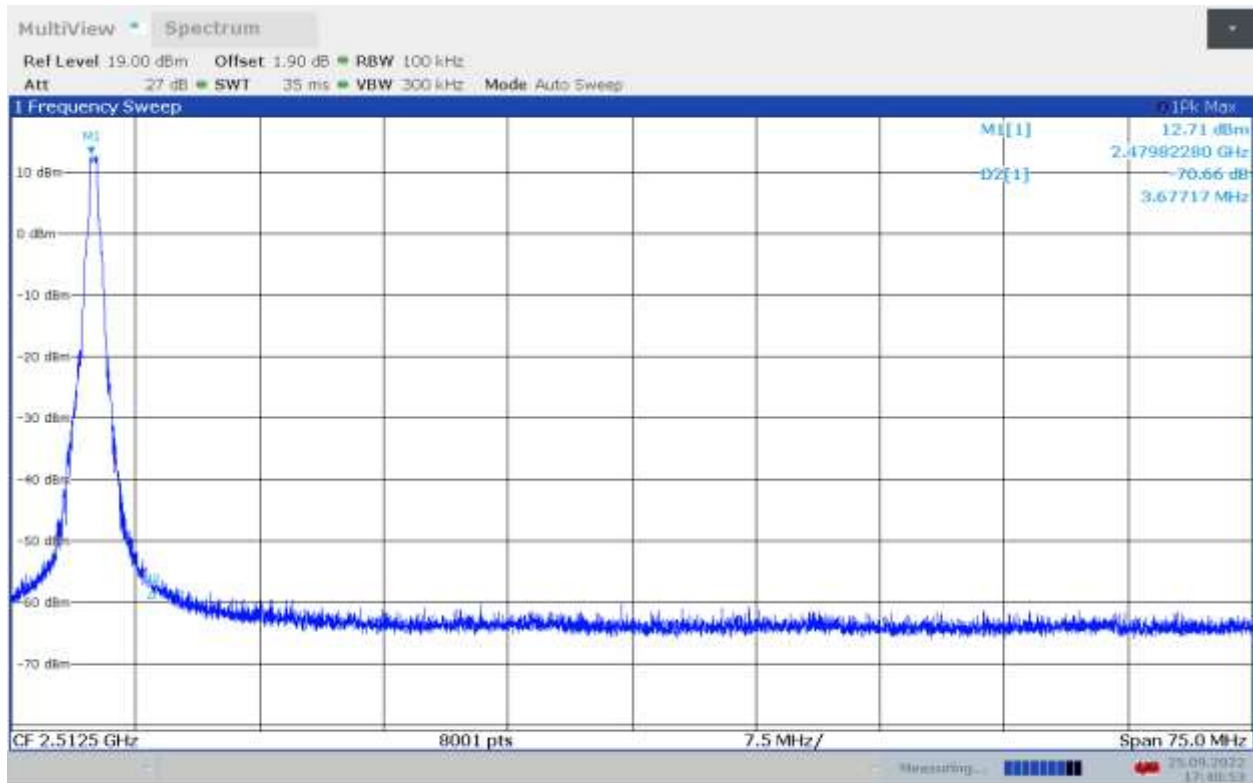
17:38:56 25.09.2022

*GFSK
Conducted Band Edge (Hopping)*



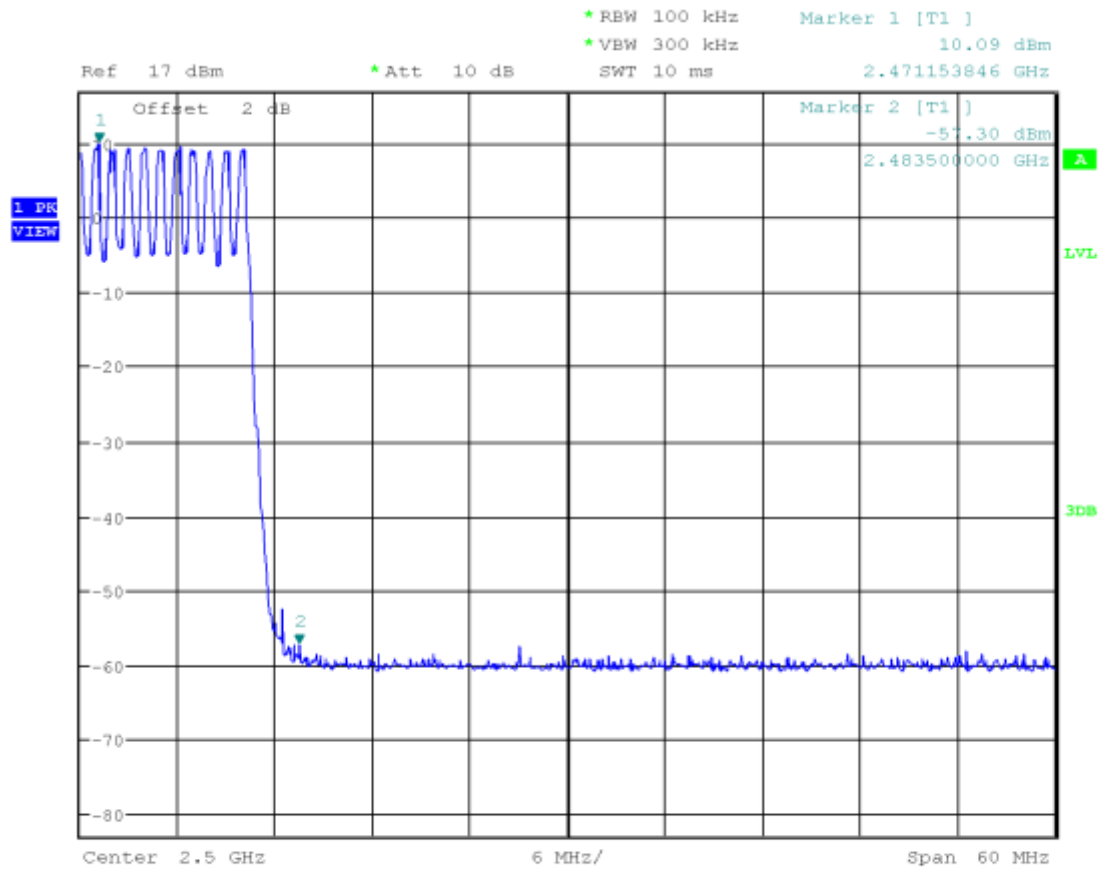
Date: 13.OCT.2022 22:54:49

*GFSK
Conducted Band Edge, High Channel*



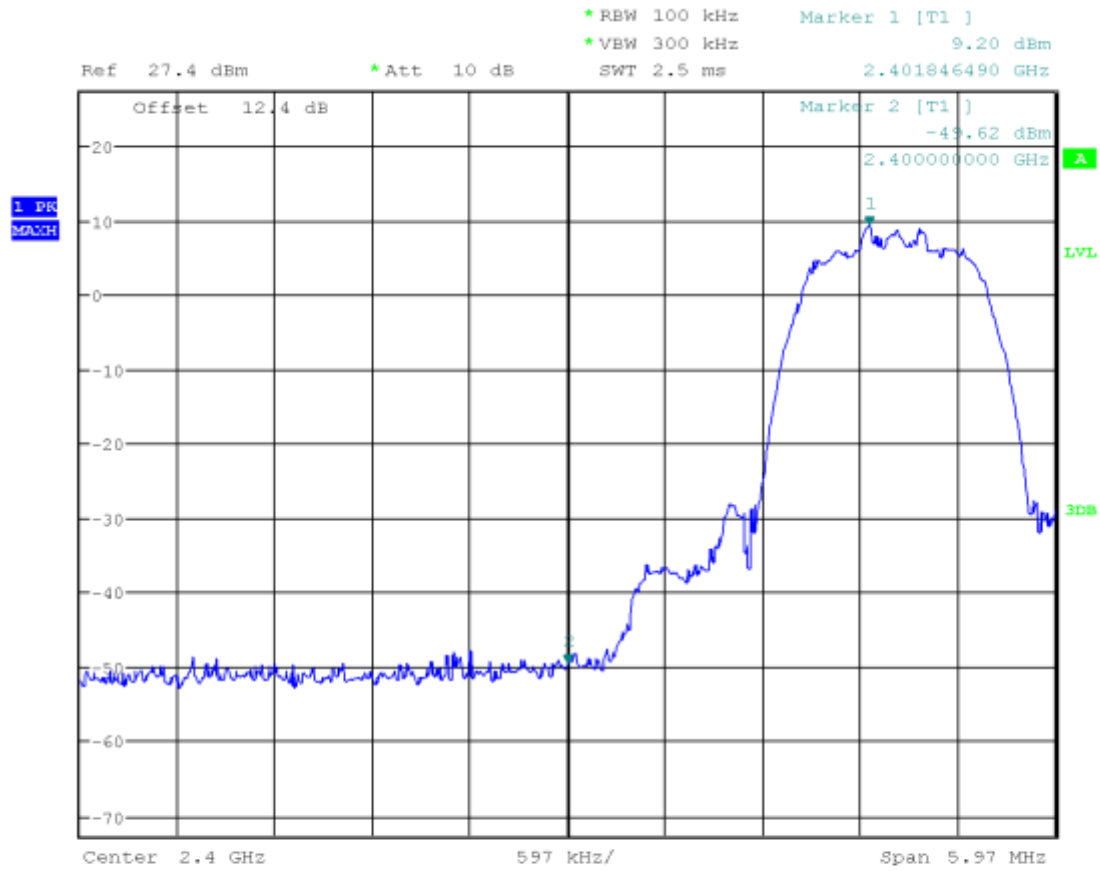
17:40:53 25.09.2022

GFSK
Conducted Band Edge (Hopping)



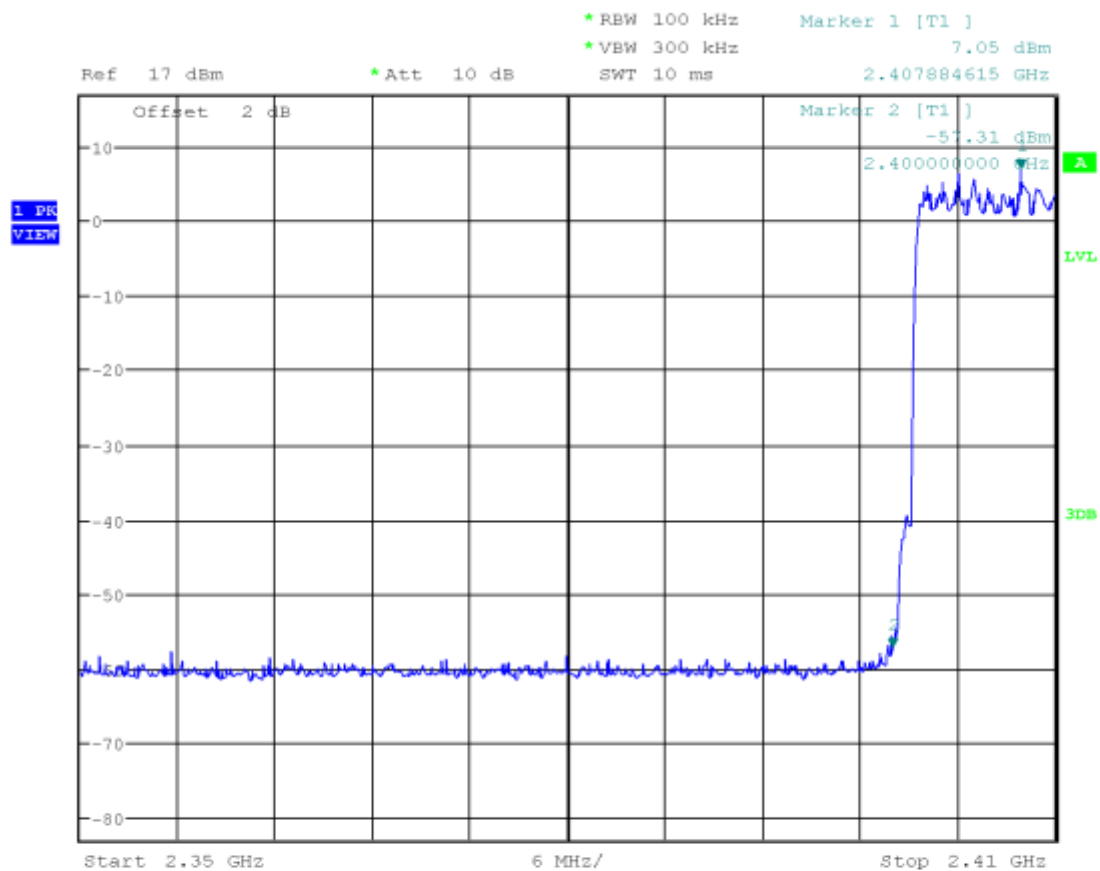
Date: 13.OCT.2022 22:57:21

$\pi/4$ -DQPSK
Conducted Band Edge, Low Channel



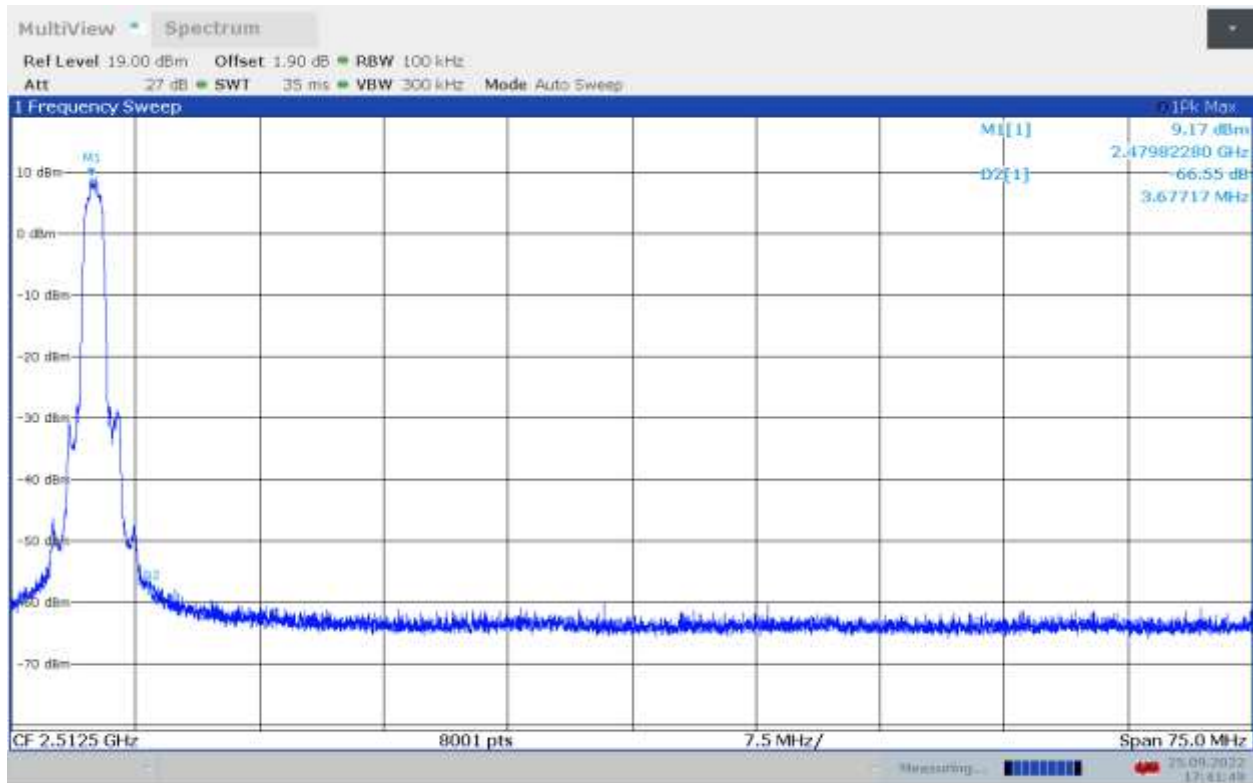
Date: 23.OCT.2022 23:36:59

$\pi/4$ -DQPSK
Conducted Band Edge (Hopping)



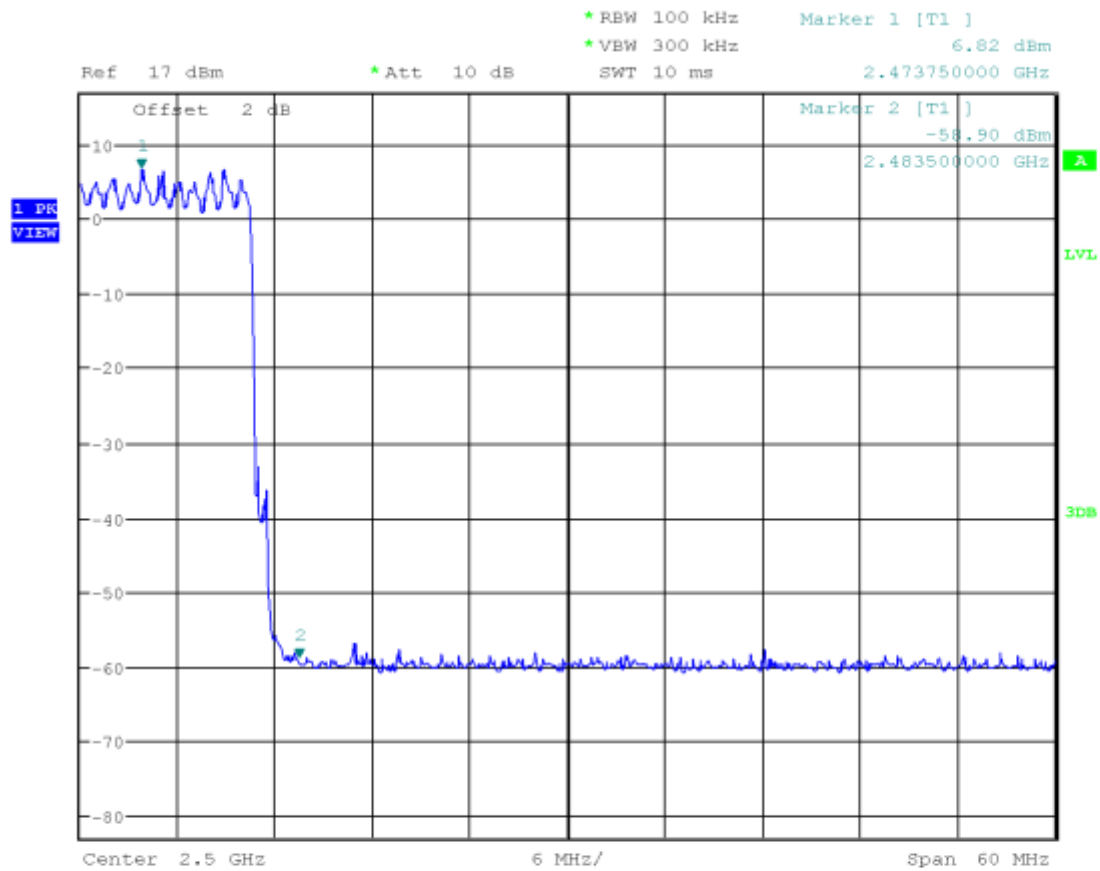
Date: 13.OCT.2022 23:01:55

$\pi/4$ -DQPSK
Conducted Band Edge, High Channel



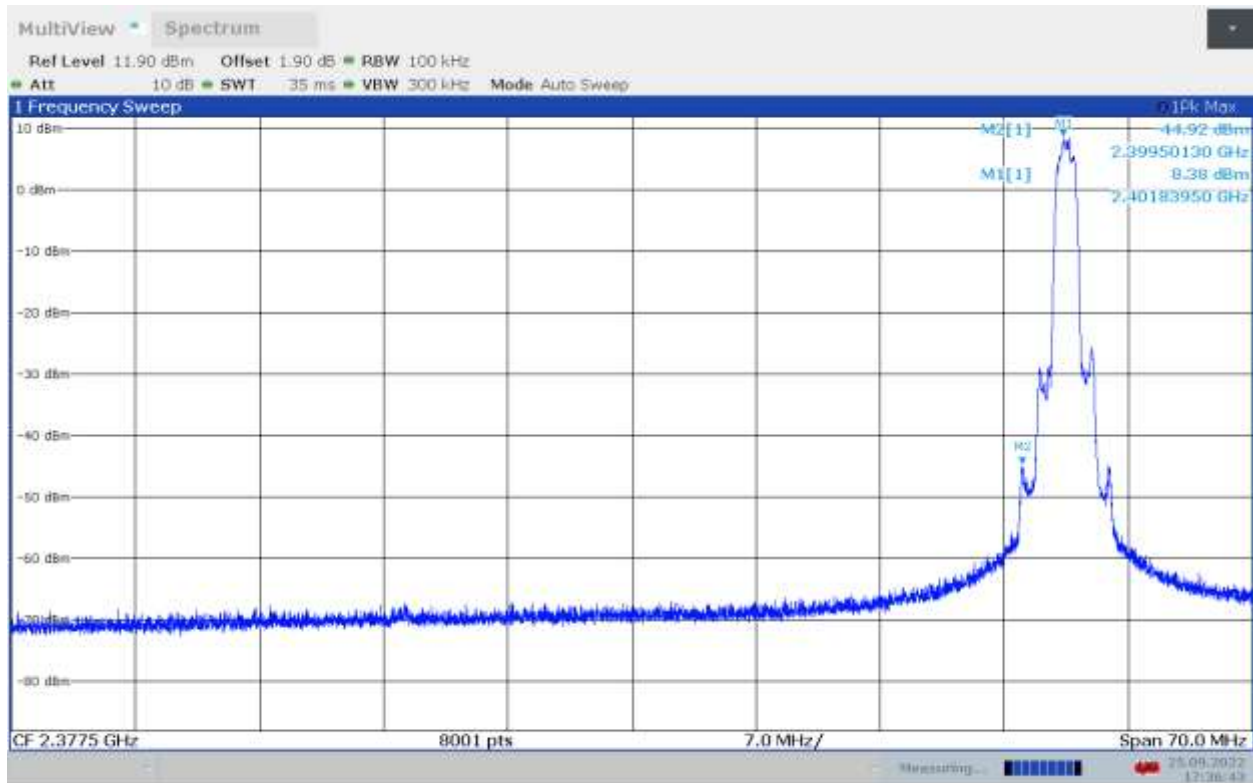
17:41:49 25.09.2022

$\pi/4$ -DQPSK
Conducted Band Edge (Hopping)



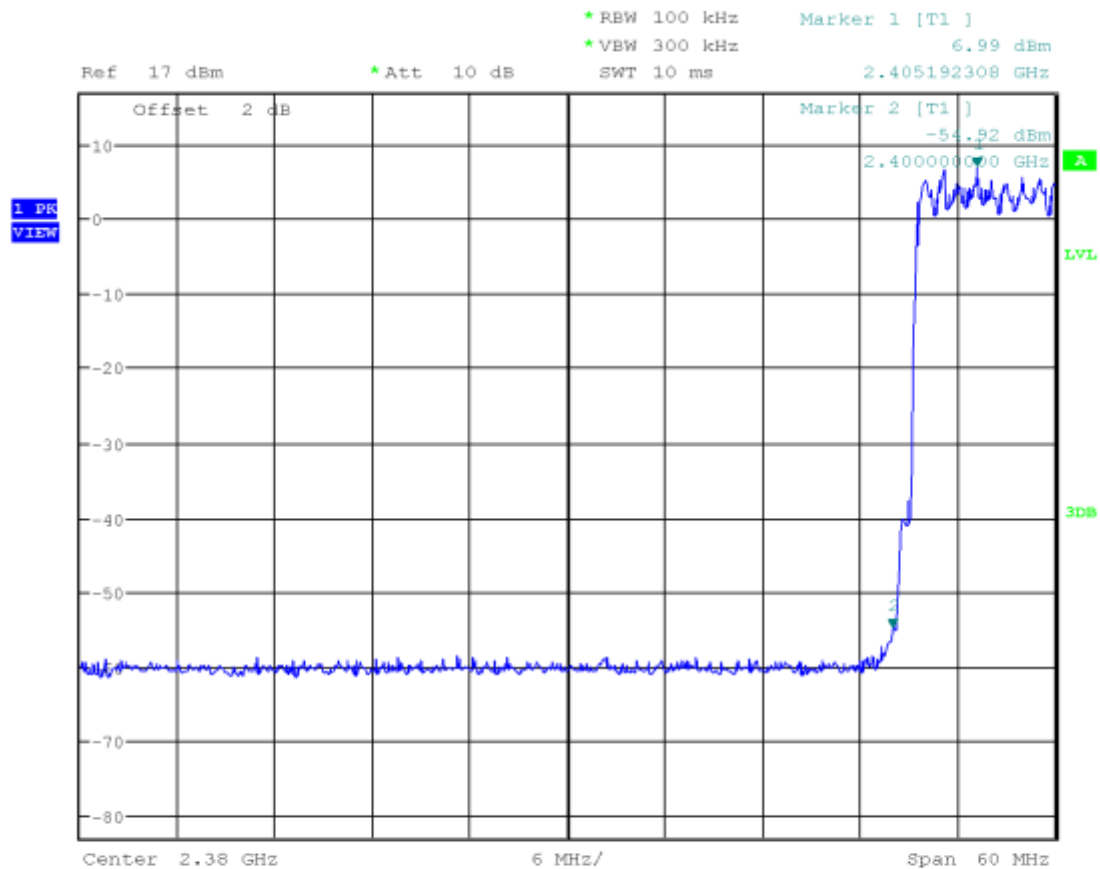
Date: 13.OCT.2022 23:00:12

8-DPSK
Conducted Band Edge, Low Channel



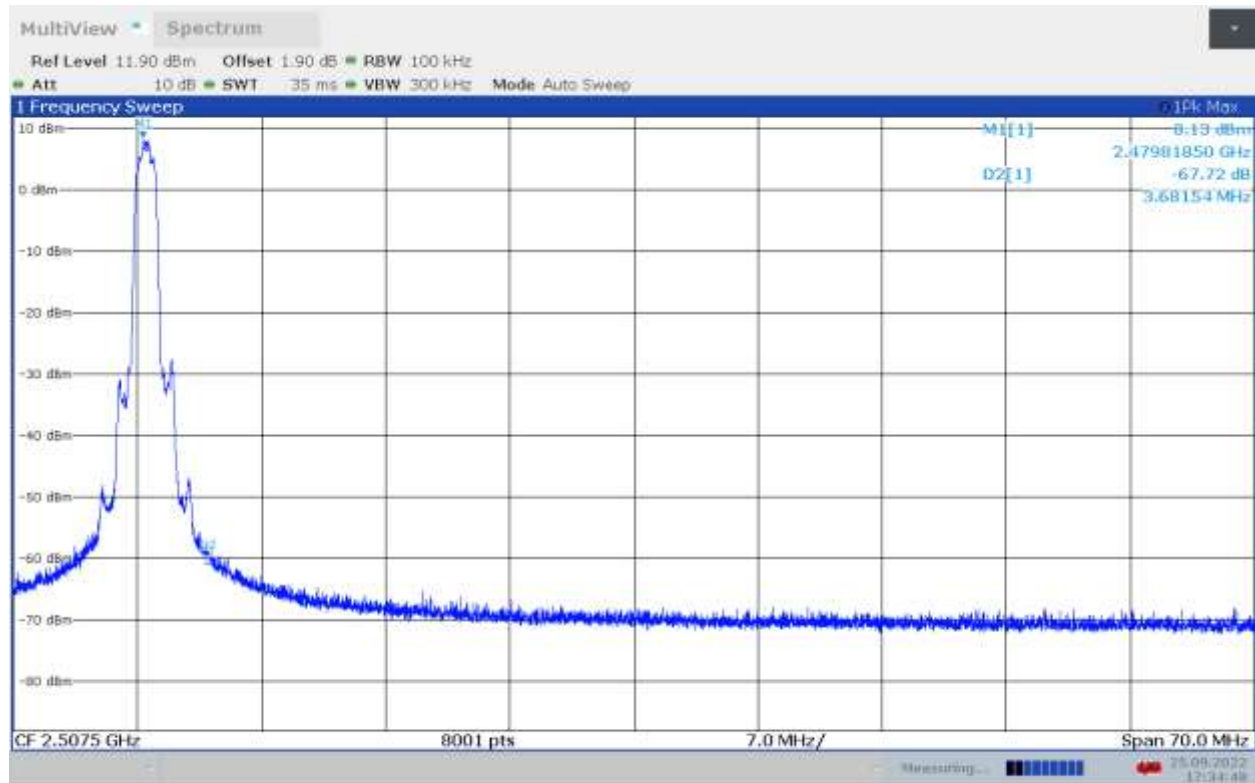
17:36:44 25.09.2022

8-DPSK
Conducted Band Edge (Hopping)



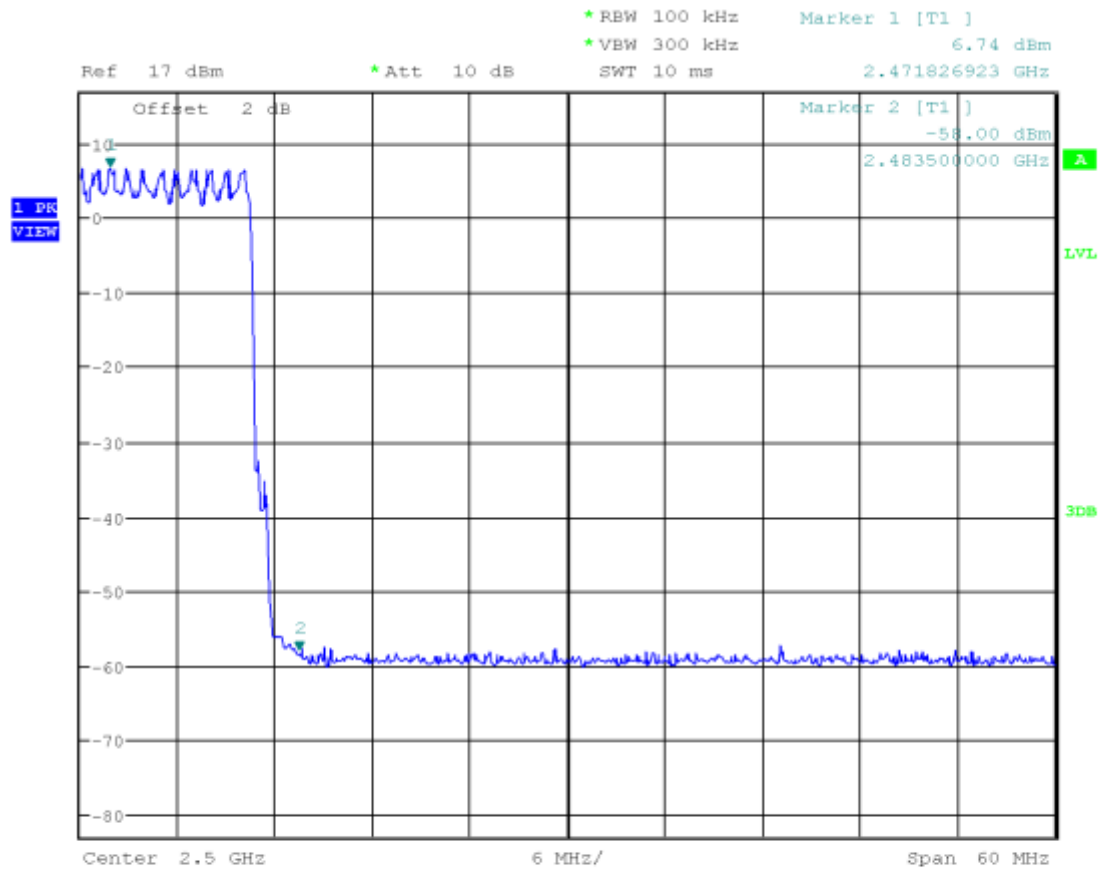
Date: 13.OCT.2022 23:03:28

8-DPSK
Conducted Band Edge, High Channel



17:34:48 25.09.2022

8-DPSK
Conducted Band Edge (Hopping)



Date: 13.OCT.2022 23:12:25

4.7 Transmitter Radiated Emissions FCC Rule 15.247(d), 15.209, 15.205

4.7.1 Requirement

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

For out of band radiated emissions (except for frequencies in restricted bands), in any 100 kHz bandwidths outside the EUT pass-band, the RF power shall be at least 20dB (peak) or 30 dB (average) below that of the maximum in-band 100 kHz emissions.

4.7.2 Procedure

Radiated emission measurements were performed from 9kHz to 25GHz. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz for frequencies above 1000 MHz.

If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst-case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at 3 meters for frequencies above 1 GHz and at 10 meters for frequencies below 1 GHz.

Spurious measurements are made with a preamp from 9kHz MHz to 25 GHz.

Measurements may be made with a Peak Detector and compared to QP limits for 9kHz – 1 GHz and Average limits for 1 GHz – 25 GHz.

Correlation measurements were performed below 30MHz between 10m ALSE and Open Field site according to FCC KDB 414788 D01 Radiated Test Site v01r01 section 2. All readings were within the acceptable tolerance.

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels).

4.7.3 Field Strength Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$FS = RA + AF + CF - AG$; if measurement is performed at a distance other than specified in the rule, a Distance Correction Factor (DCF) shall be added.

Where FS = Field Strength in dB(μ V/m)

RA = Receiver Amplitude (including preamplifier) in dB(μ V); AF = Antenna Factor in dB(1/m)

CF = Cable Attenuation Factor in dB; AG = Amplifier Gain in dB

Assume a receiver reading of 52.0 dB(μ V) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB(μ V/m). This value in dB(μ V/m) was converted to its corresponding level in μ V/m.

RA = 52.0 dB(μ V)

AF = 7.4 dB(1/m)

CF = 1.6 dB

AG = 29.0 dB

$FS = 52.0 + 7.4 + 1.6 - 29.0 = 32 \text{ dB}(\mu\text{V/m})$.

Level in μ V/m = Common Antilogarithm $[(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$.

4.7.4 Antenna-port conducted measurements

Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

4.7.5 General Procedure for conducted measurements in restricted bands

- a) Measure the conducted output power (in dBm) using the detector specified for determining quasi-peak, peak, and average conducted output power, respectively.
- b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
- c) Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
- d) For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (*e.g.*, Watts, mW).
- e) Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:
$$E = \text{EIRP} - 20\log D + 104.8 + \text{DCF (DCF for Average measurements)}$$
where:
E = electric field strength in dB μ V/m,
EIRP = equivalent isotropic radiated power in dBm
D = specified measurement distance in meters.
DCF = Duty Cycle Correction Factor
- f) Compare the resultant electric field strength level to the applicable limit.
- g) Perform radiated spurious emission test

4.7.6 Test Results

| Tested By | Test Date |
|--------------------|--------------------|
| Juan Alapizco Vega | September 18, 2022 |

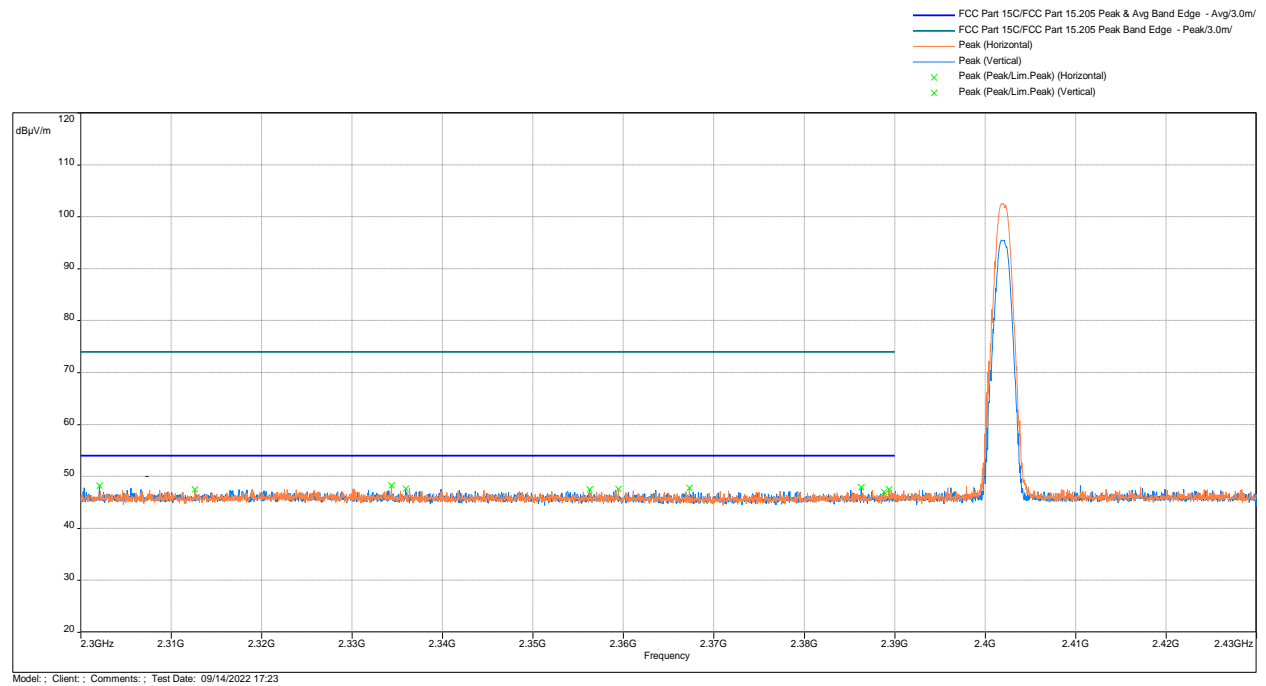
These measurements were performed with Antenna in place.

4.7.6 Test Results (Continued)

Test Results: 15.209/15.205 Radiated Restricted Band Emissions

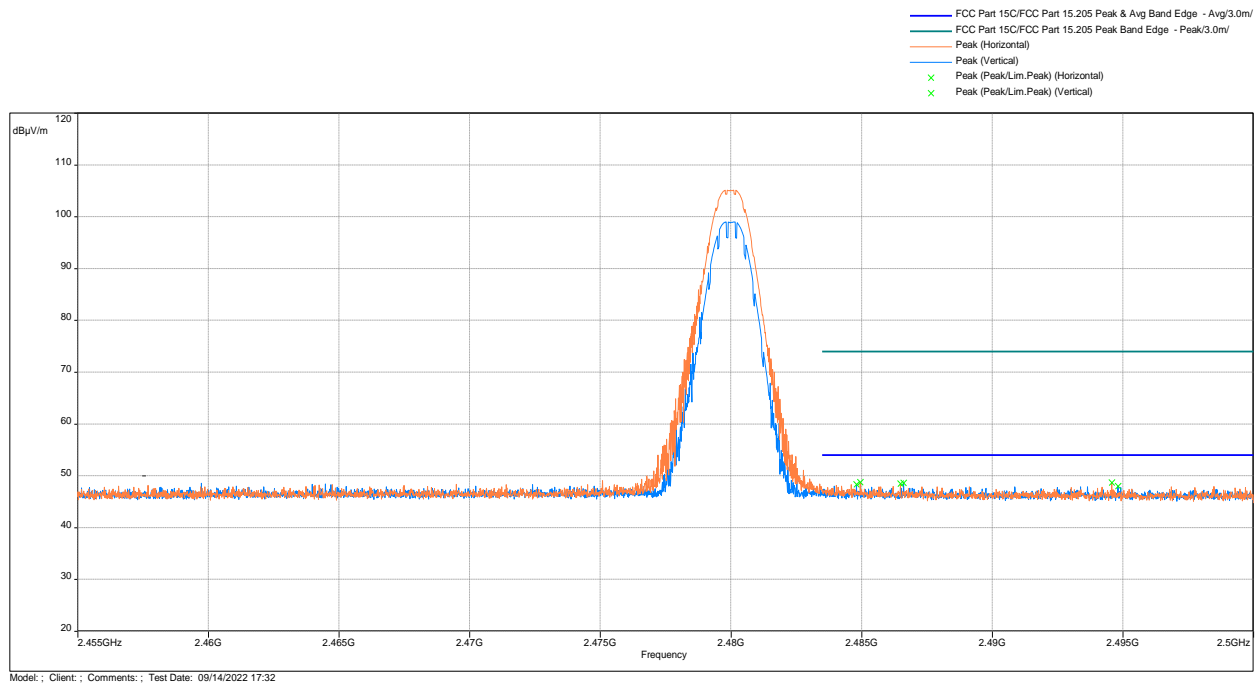
GFSK

Radiated Band Edge at the Restricted Band – Tx @ Low Channel, Peak



| Frequency (MHz) | Peak (dBμV/m) | Lim. Average (dBμV/m) | Peak-Lim (dB) | Height (m) | Angle (°) | Comment | Correction (dB) |
|-----------------|---------------|-----------------------|---------------|------------|-----------|----------|-----------------|
| 2390 | 45.35 | 54 | -8.65 | 1.10 | 182 | Vertical | 21.46 |

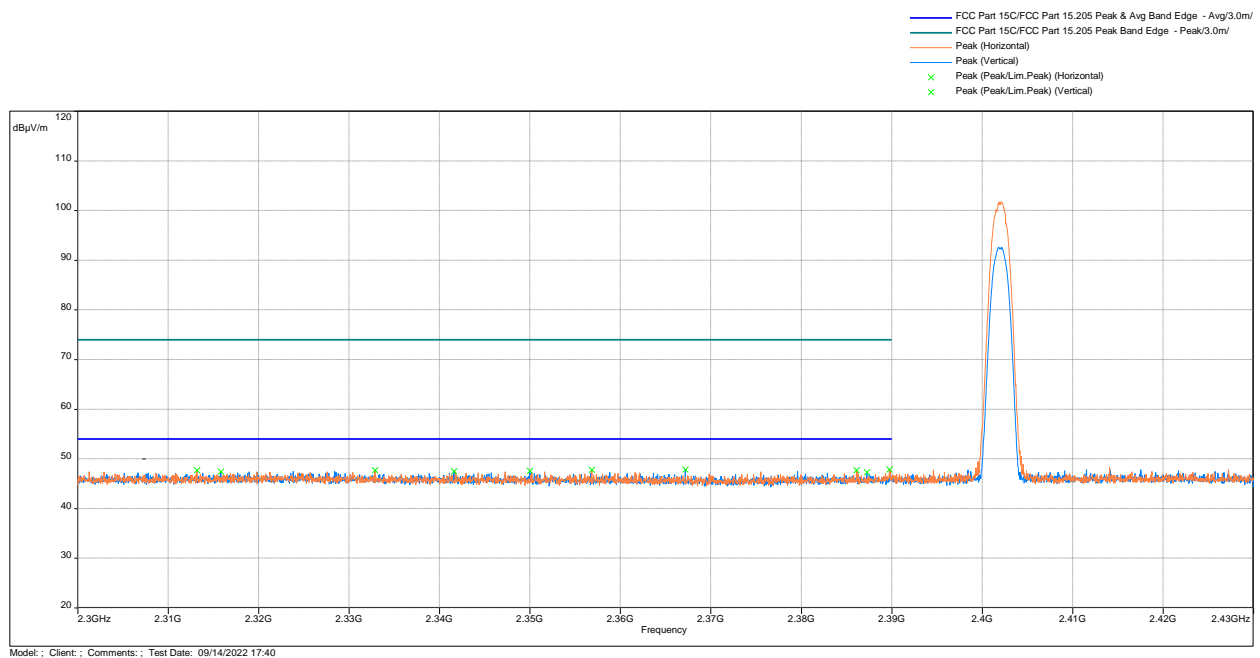
Radiated Band Edge at the Restricted Band – Tx @ High Channel, Peak



| Frequency (MHz) | Peak (dBμV/m) | Lim. Average (dBμV/m) | Peak-Lim (dB) | Height (m) | Angle (°) | Comment | Correction (dB) |
|-----------------|---------------|-----------------------|---------------|------------|-----------|----------|-----------------|
| 2483.5 | 45.27 | 54 | -8.23 | 3.41 | 187.5 | Vertical | 21.78 |

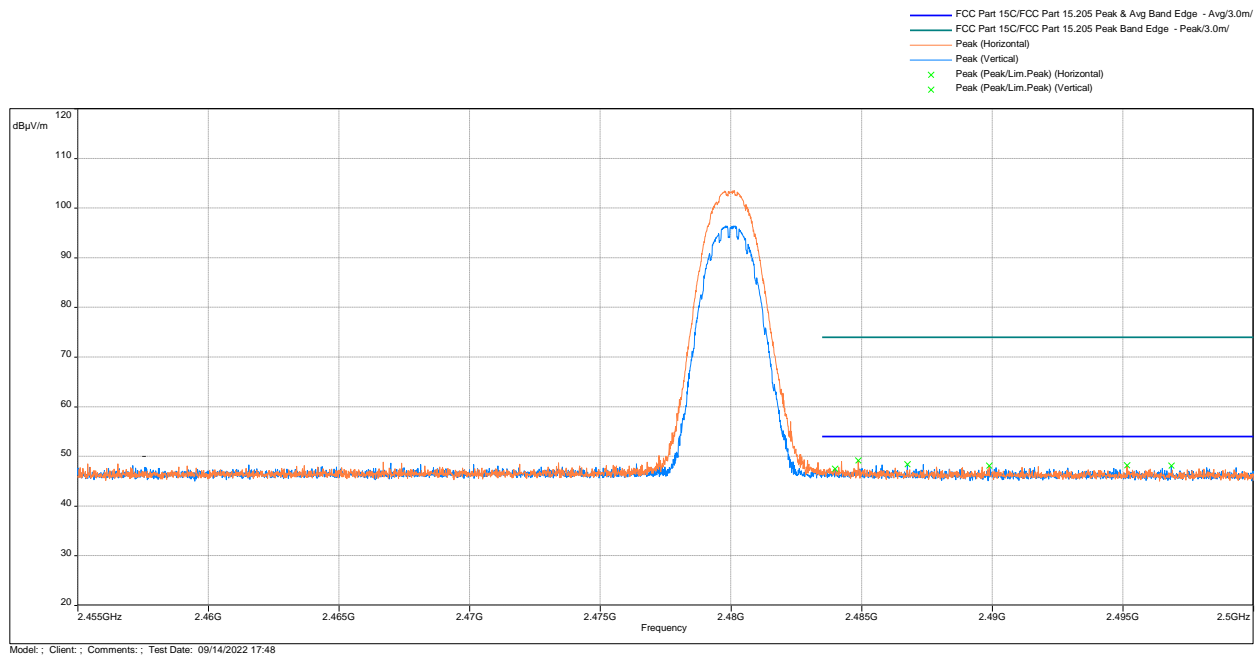
$\pi/4$ -DQPSK

Radiated Band Edge at the Restricted Band – Tx @ Low Channel, Peak



| Frequency (MHz) | Peak (dBμV/m) | Lim. Average (dBμV/m) | Peak-Lim (dB) | Height (m) | Angle (°) | Comment | Correction (dB) |
|-----------------|---------------|-----------------------|---------------|------------|-----------|------------|-----------------|
| 2390 | 44.94 | 54 | -9.06 | 3.09 | 15 | Horizontal | 21.46 |

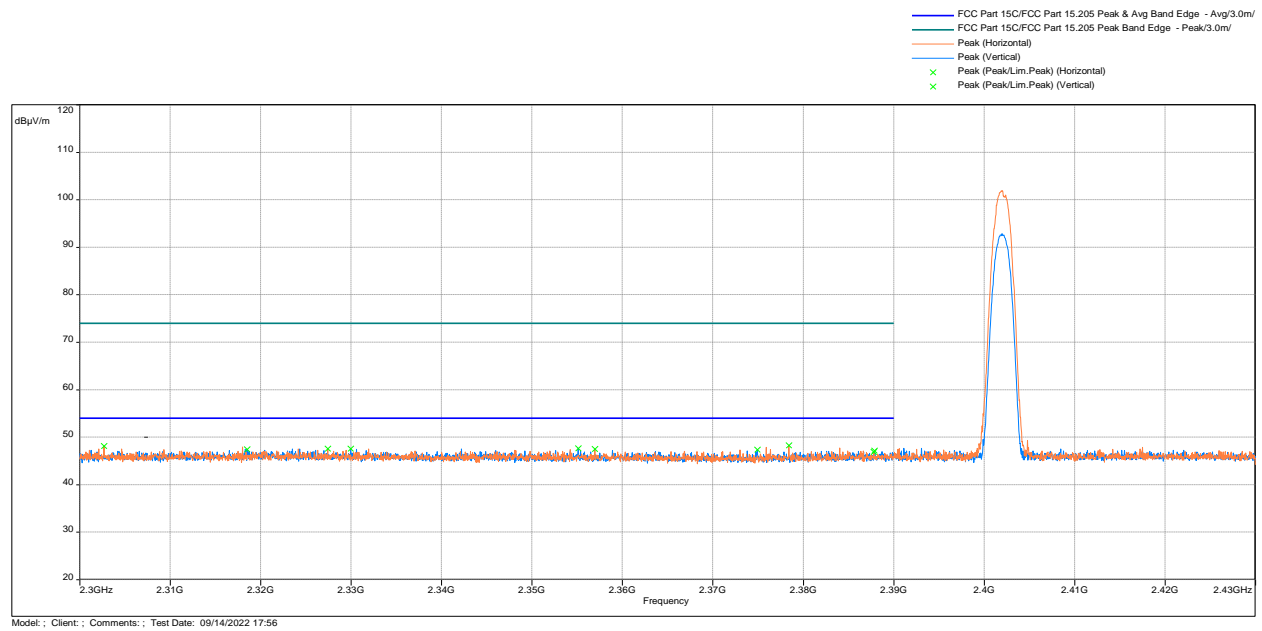
Radiated Band Edge at the Restricted Band – Tx @ High Channel, Peak



| Frequency (MHz) | Peak (dBμV/m) | Lim. Average (dBμV/m) | Peak-Lim (dB) | Height (m) | Angle (°) | Comment | Correction (dB) |
|-----------------|---------------|-----------------------|---------------|------------|-----------|------------|-----------------|
| 2483.5 | 45.79 | 54 | -8.21 | 1.40 | 114.75 | Horizontal | 21.78 |

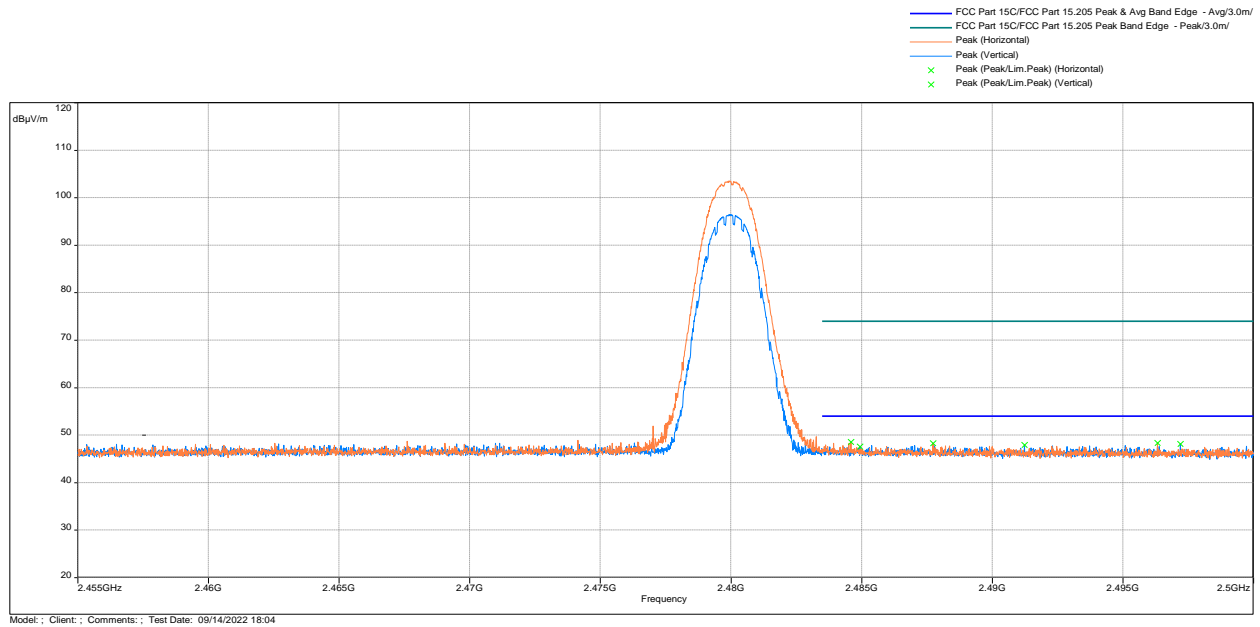
8-DPSK

Radiated Band Edge at the Restricted Band – Tx @ Low Channel, Peak



| Frequency (MHz) | Peak (dBμV/m) | Lim. Average (dBμV/m) | Peak-Lim (dB) | Height (m) | Angle (°) | Comment | Correction (dB) |
|-----------------|---------------|-----------------------|---------------|------------|-----------|------------|-----------------|
| 2390 | 44.19 | 54 | -9.81 | 2.09 | 42.25 | Horizontal | 21.46 |

Radiated Band Edge at the Restricted Band – Tx @ High Channel, Peak



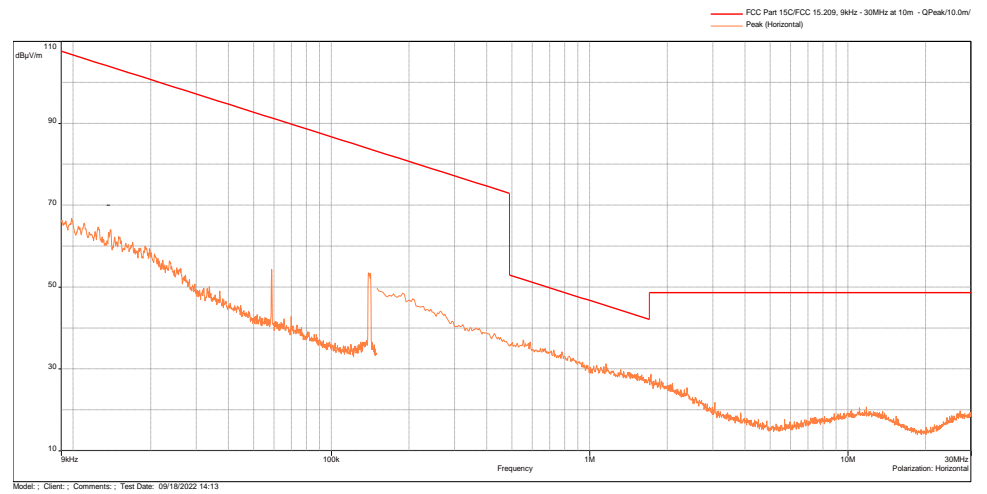
| Frequency (MHz) | Peak (dBμV/m) | Lim. Average (dBμV/m) | Peak-Lim (dB) | Height (m) | Angle (°) | Comment | Correction (dB) |
|-----------------|---------------|-----------------------|---------------|------------|-----------|----------|-----------------|
| 2483.5 | 45.29 | 54 | -8.21 | 1.41 | 85.75 | Vertical | 21.78 |

Out-of-Band Radiated Spurious Emissions

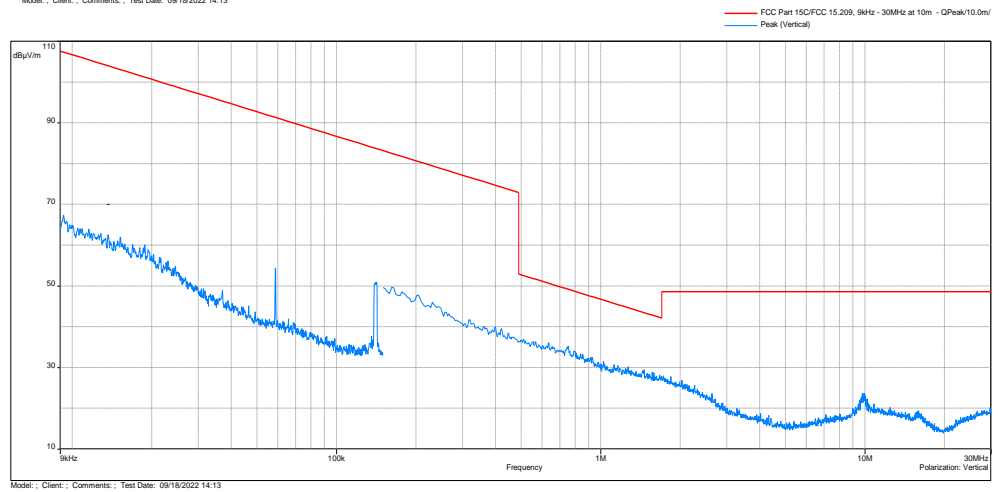
Test Results: 15.209 Radiated Spurious Emissions, GFSK

Radiated Spurious Emissions 9 kHz to 30 MHz, Peak Scan vs QP Limit

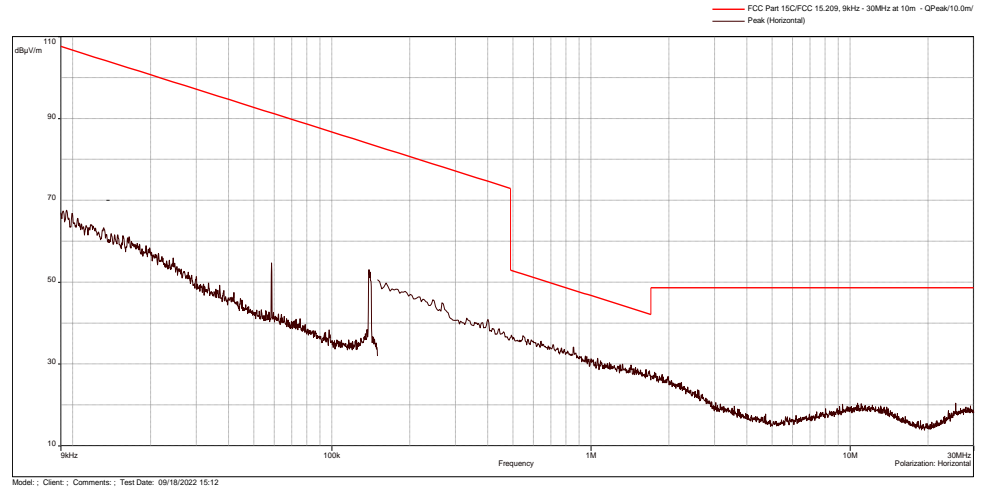
Antenna
Position -
Coaxial



Antenna
Position -
Coplanar

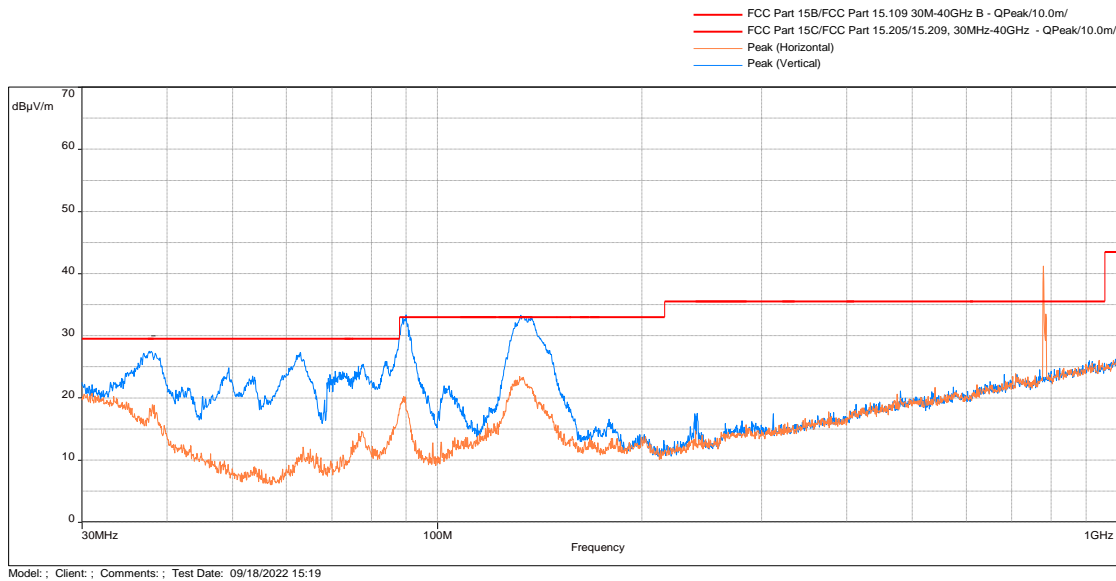


Antenna
Position -
Horizontal

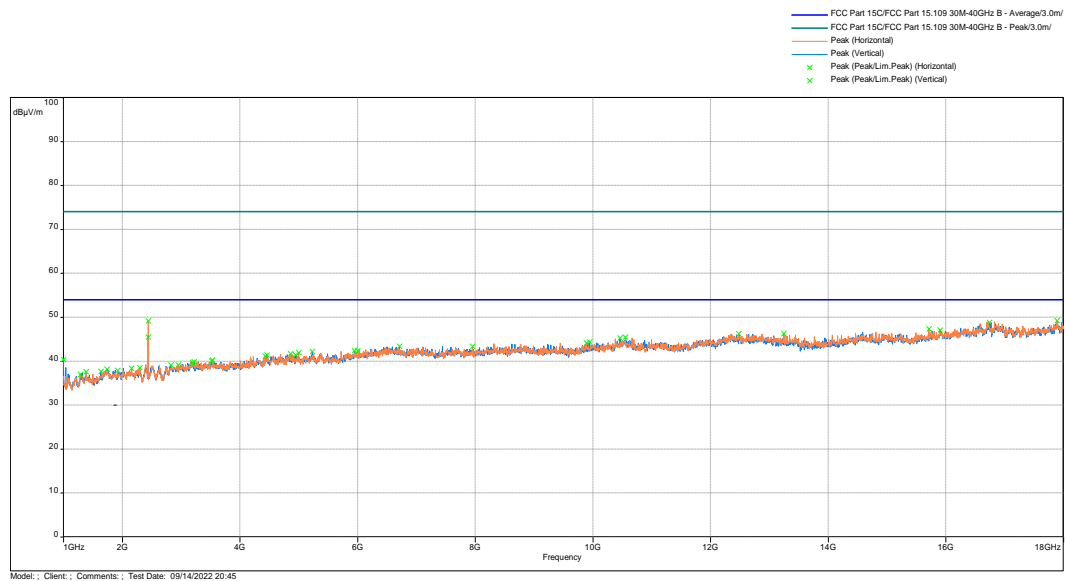


Test Results: Test Results: 15.209 Radiated Spurious Emissions, GFSK Tx at 2402MHz

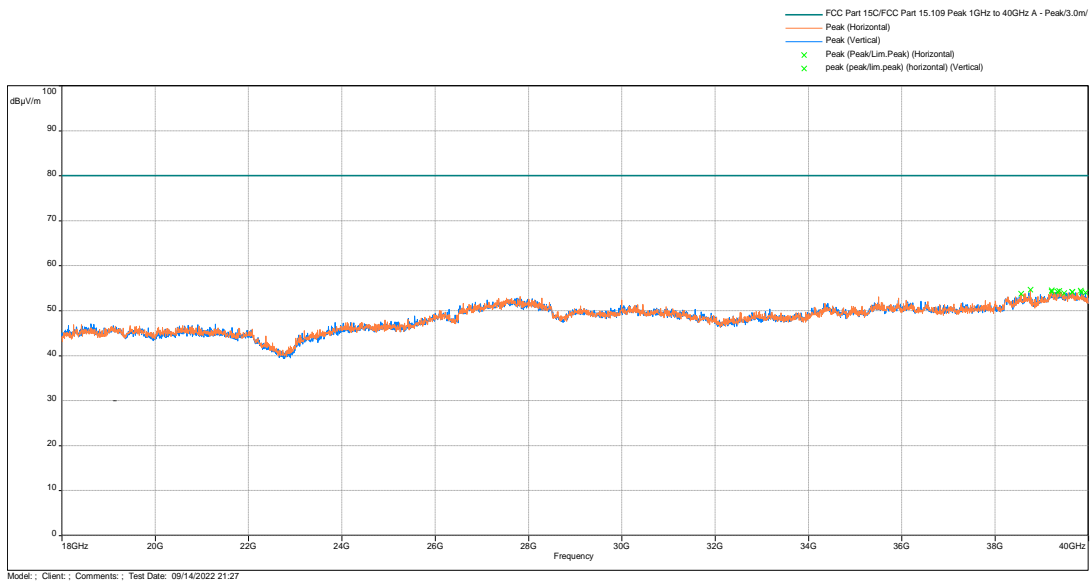
Out-of-Band Radiated Spurious Emissions - 30 MHz to 1000 MHz



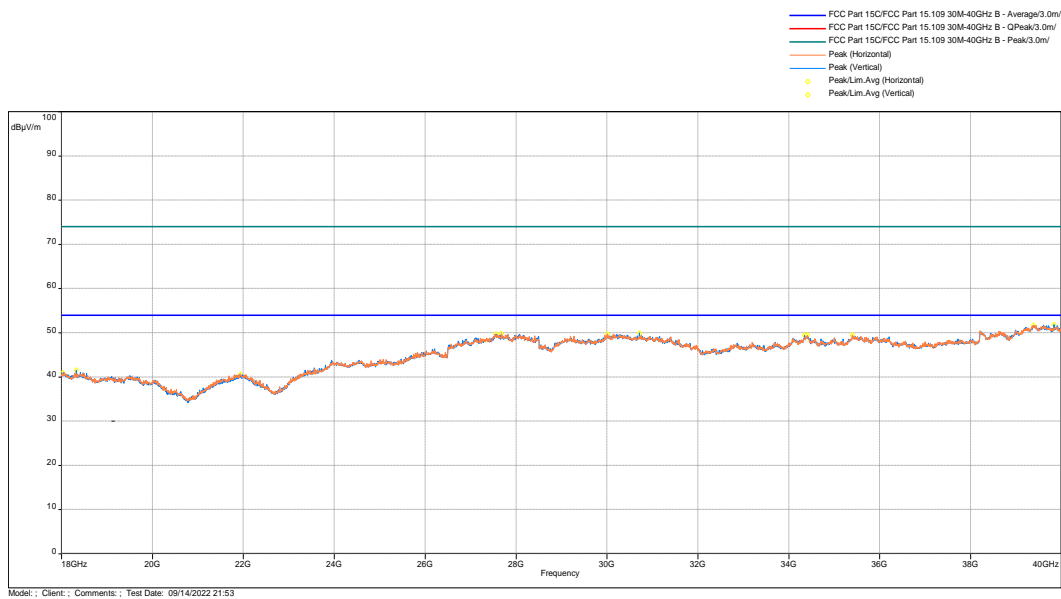
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak & Avg Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Peak Scan vs Peak Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Avg Scan vs Avg Limit



| Frequency (MHz) | QP@10m (dBµV/m) | Limit@10m (dB(uV/m)) | Margin (dB) | Height (m) | Azimuth (deg) | Polarity | Correction (dB) |
|-----------------|-----------------|----------------------|-------------|------------|---------------|------------|-----------------|
| 77.498 | 25.14 | 29.5 | -4.36 | 2 | 281 | Vertical | -18.95 |
| 89.202 | 32.52 | 33 | -0.48 | 1 | 128.5 | Vertical | -19.19 |
| 134.081 | 32.42 | 33 | -0.48 | 2 | 184.5 | Vertical | -12.78 |
| 441.603 | 30.06 | 35.5 | -5.44 | 2.11 | 143 | Horizontal | -7.91 |
| 532.298 | 33.6 | 35.5 | -1.9 | 2.28 | 199 | Horizontal | -6.39 |
| 542.063 | 34.6 | 35.5 | -0.9 | 2.52 | 17 | Horizontal | -6.26 |
| 543.421 | 31.26 | 35.5 | -4.24 | 1 | 93 | Vertical | -6.16 |

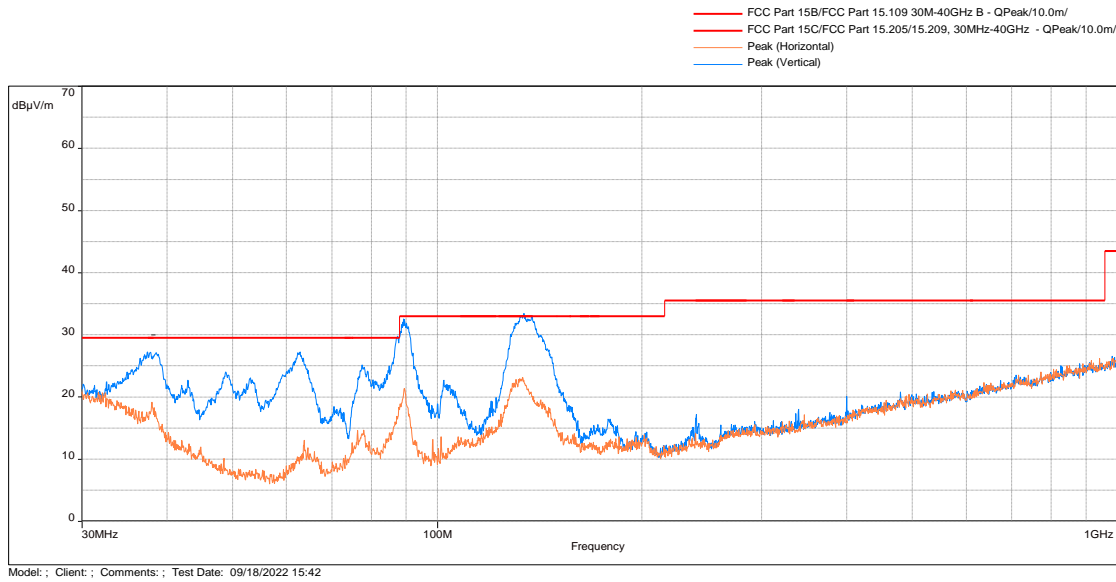
Note: 783MHz is a transient signal and not in the restricted band.

Note: Correction = AF + CF – Preamp

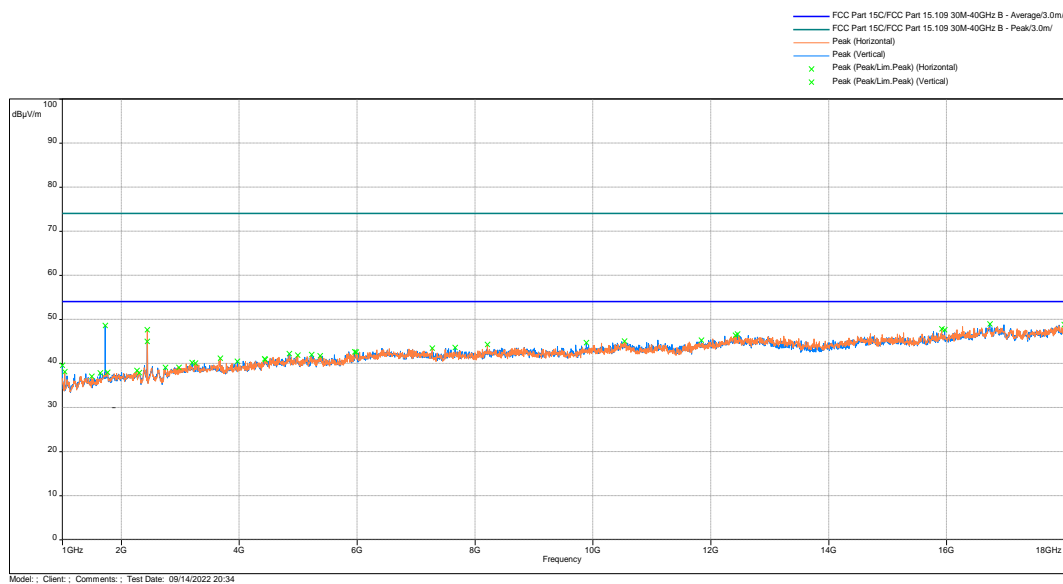
| | |
|----------------|-----------------|
| Results | Complies |
|----------------|-----------------|

Test Results: Test Results: 15.209 Radiated Spurious Emissions, GFSK Tx at 2442MHz

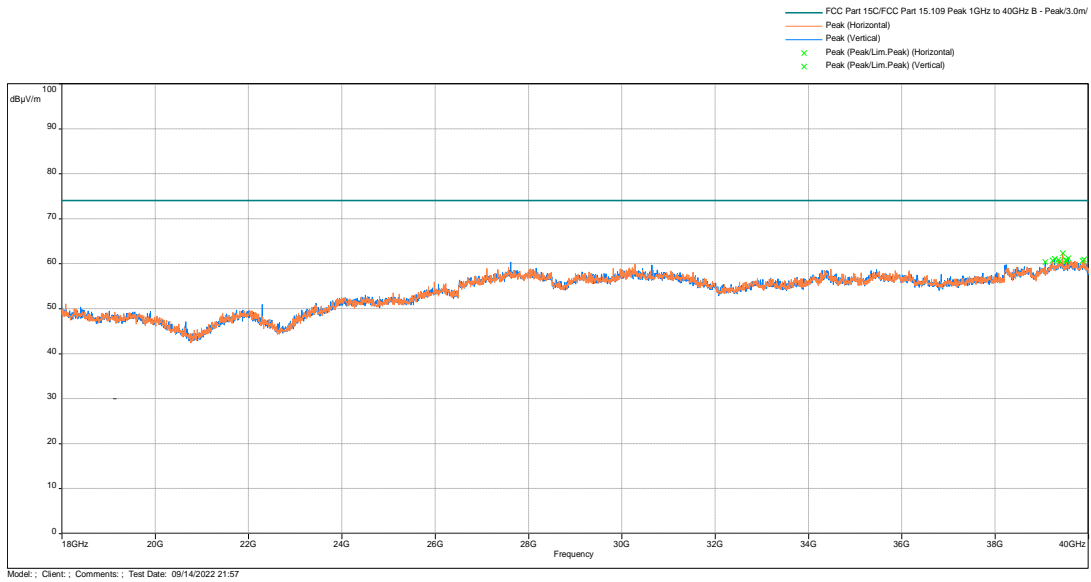
Out-of-Band Radiated Spurious Emissions - 30 MHz to 1000 MHz



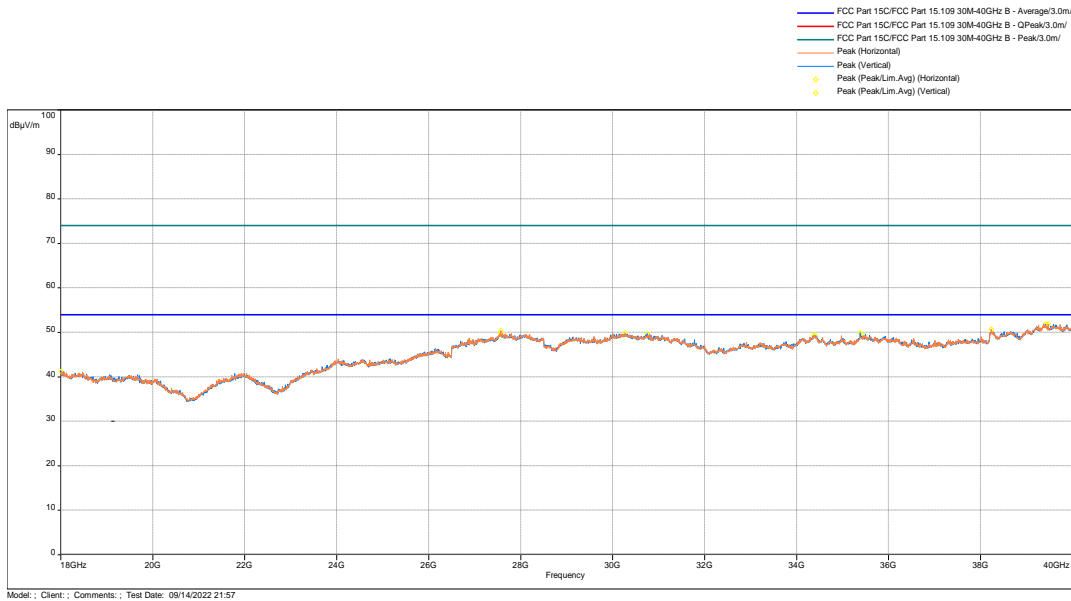
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak & Avg Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Peak Scan vs Peak Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Avg Scan vs Avg Limit



| Frequency (MHz) | QP@10m (dBμV/m) | Limit@10m (dB(μV/m)) | Margin (dB) | Height (m) | Azimuth (deg) | Polarity | Correction (dB) |
|-----------------|-----------------|----------------------|-------------|------------|---------------|----------|-----------------|
| 37.469 | 27.22 | 29.5 | -1.78 | 3 | 113.5 | Vertical | -11.46 |
| 48.818 | 24.03 | 29.5 | -4.97 | 2 | 127.5 | Vertical | -18.89 |
| 62.85067 | 27.25 | 29.5 | -1.75 | 2 | 135.25 | Vertical | -19.34 |
| 77.49767 | 25.14 | 29.5 | -4.36 | 2 | 281 | Vertical | -18.95 |
| 89.20233 | 32.52 | 33 | -0.48 | 1 | 128.5 | Vertical | -19.19 |
| 134.081 | 32.42 | 33 | -0.58 | 2 | 184.5 | Vertical | -12.78 |

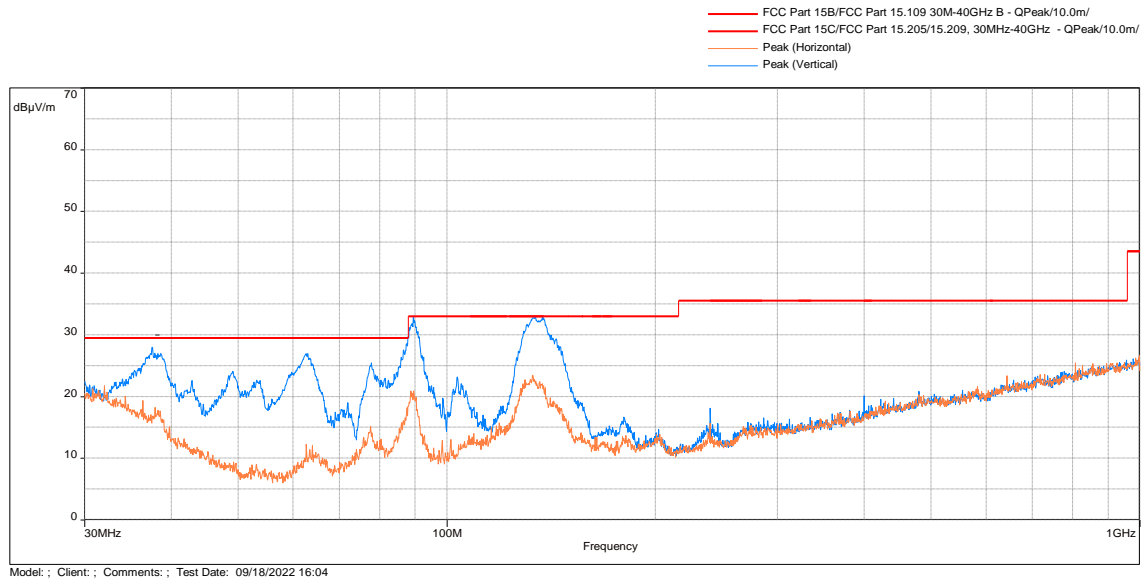
Note: Correction = AF + CF – Preamp

| | |
|----------------|-----------------|
| Results | Complies |
|----------------|-----------------|

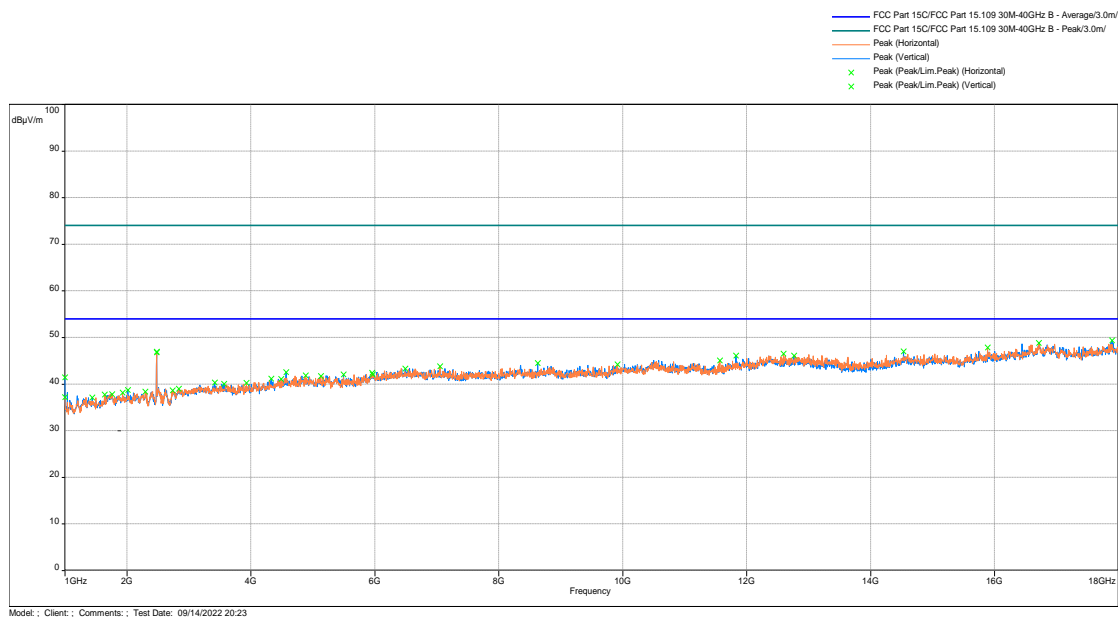
Note: Radiated emission measurements were performed up to from 9kHz to 26GHz. No Emissions were identified when scanned from 9k to 30MHz.

Test Results: Test Results: 15.209 Radiated Spurious Emissions, GFSK Tx at 2480MHz

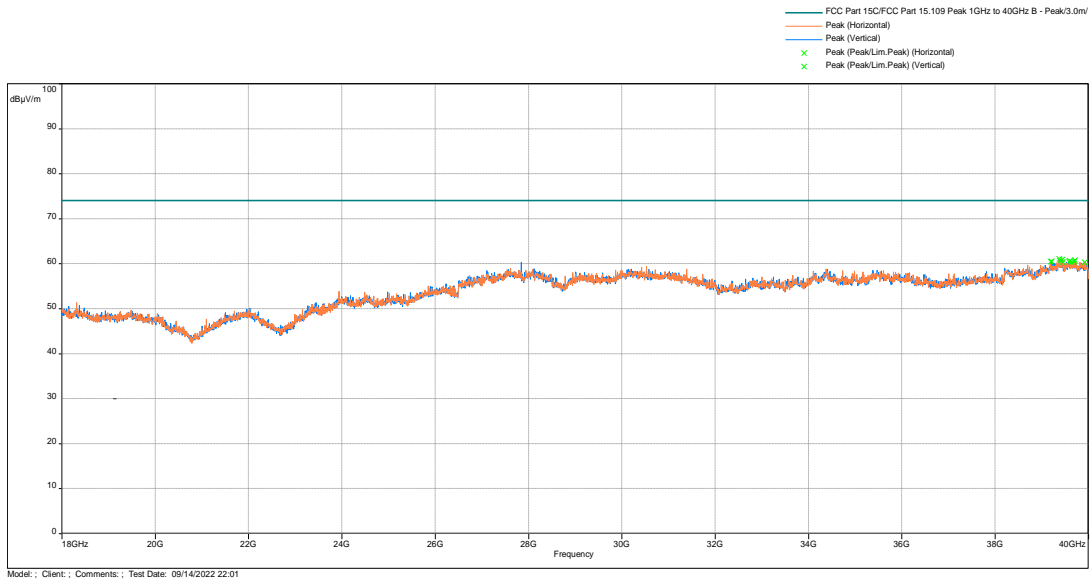
Out-of-Band Radiated Spurious Emissions - 30 MHz to 1000 MHz



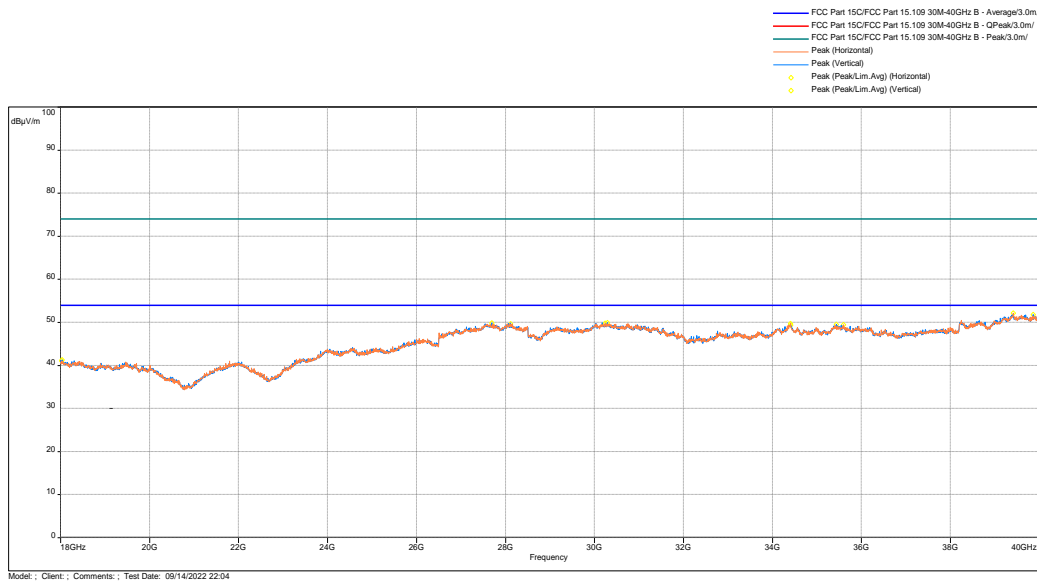
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak & Avg Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Peak Scan vs Peak Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Avg Scan vs Avg Limit



| Frequency (MHz) | QP@10m (dBμV/m) | Limit@10m (dB(uV/m)) | Margin (dB) | Height (m) | Azimuth (deg) | Polarity | Correction (dB) |
|-----------------|-----------------|----------------------|-------------|------------|---------------|----------|-----------------|
| 37.566 | 27.96 | 29.5 | -1.54 | 2 | 97 | Vertical | -11.54 |
| 49.109 | 24.08 | 29.5 | -5.42 | 3 | 115.5 | Vertical | -18.99 |
| 62.98 | 26.92 | 29.5 | -2.58 | 2 | 111.25 | Vertical | -19.33 |
| 77.821 | 25.42 | 29.5 | -4.08 | 2 | 271.5 | Vertical | -18.98 |
| 89.493 | 32.8 | 33 | -0.2 | 1 | 85.75 | Vertical | -19.16 |
| 137.379* | 32.9 | 33 | -0.1 | 3 | 203.5 | Vertical | -12.99 |

Note: 137.3MHZ is found to be unintentional emission. The EUT meets FCC 15.109 Class A limit.

Note: Correction = AF + CF – Preamp

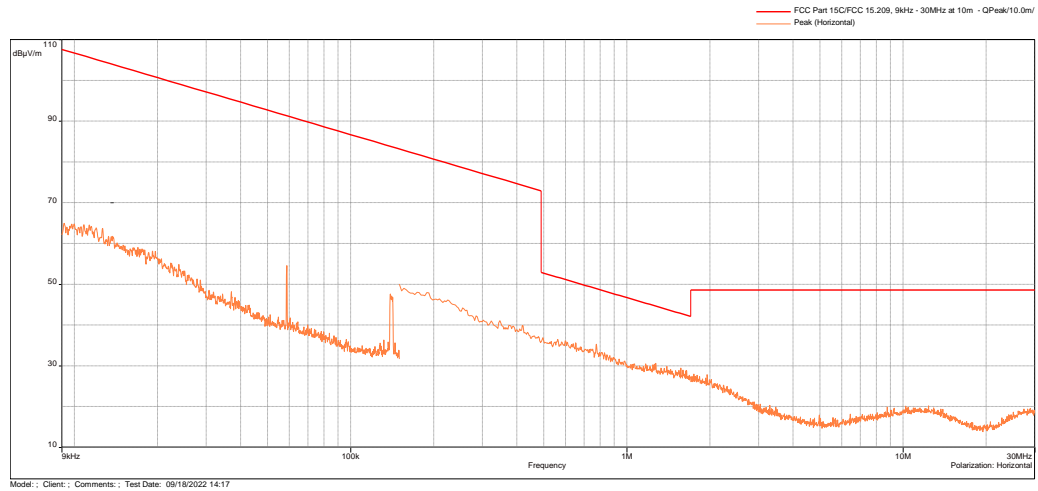
| | |
|----------------|-----------------|
| Results | Complies |
|----------------|-----------------|

Note: Radiated emission measurements were performed up to from 9kHz to 26GHz. No Emissions were identified when scanned from 9k to 30MHz.

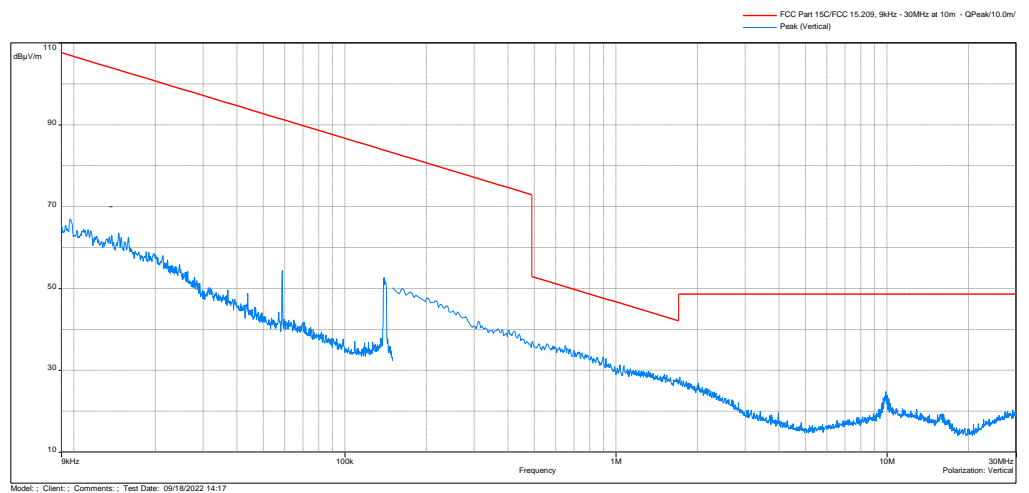
Test Results: 15.209 Radiated Spurious Emissions, $\pi/4$ -DQPSK

Radiated Spurious Emissions 9 kHz to 30 MHz, Peak Scan vs QP Limit

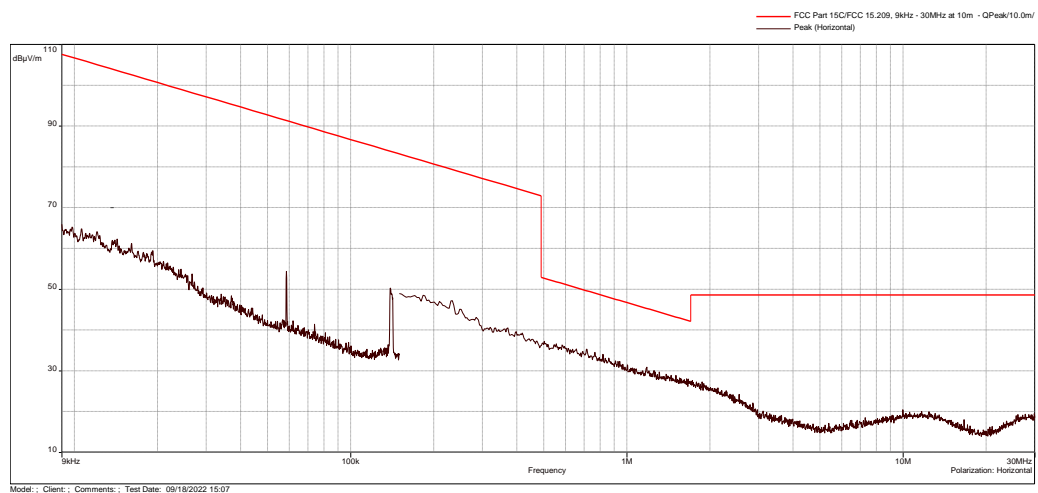
Antenna
Position -
Coaxial



Antenna
Position -
Coplanar

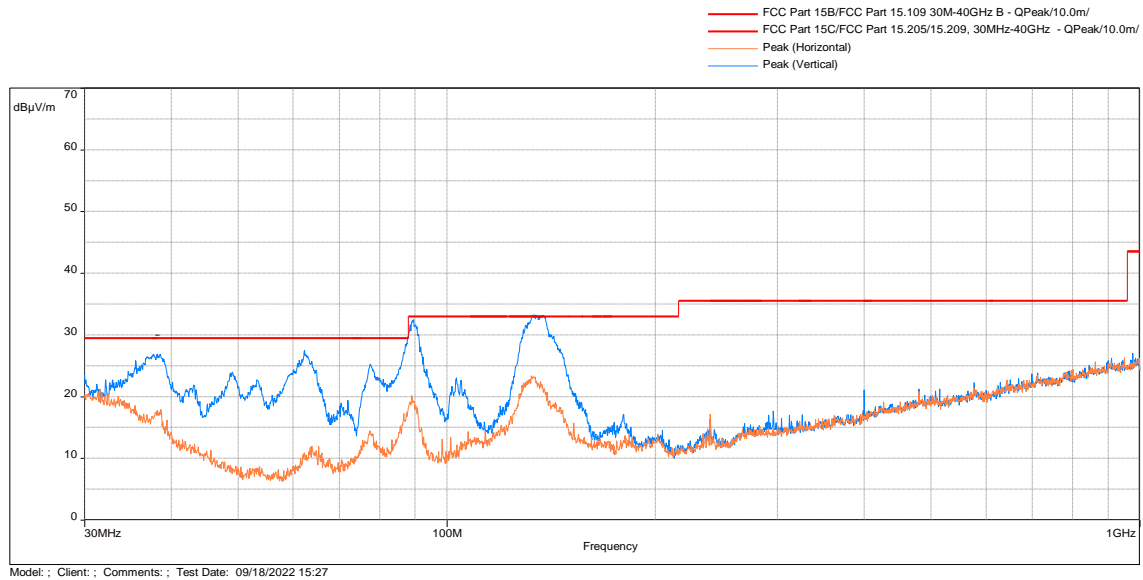


Antenna
Position -
Horizontal

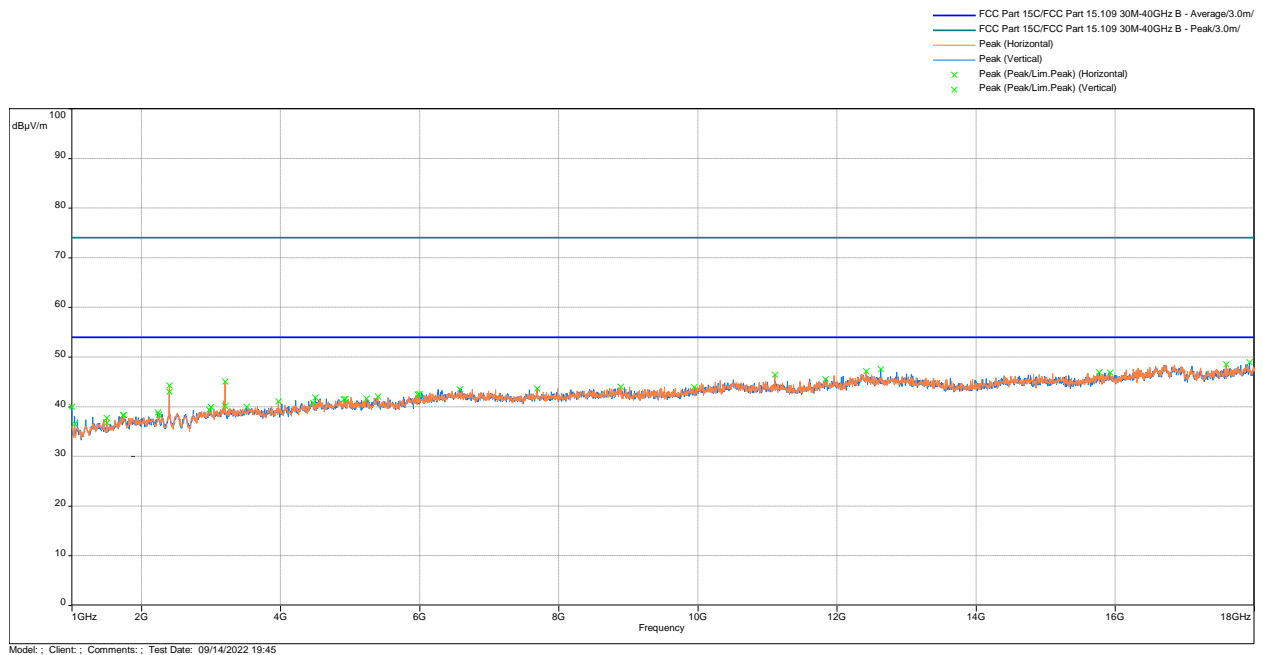


Test Results: Test Results: 15.209 Radiated Spurious Emissions, $\pi/4$ -DQPSK Tx at 2402MHz

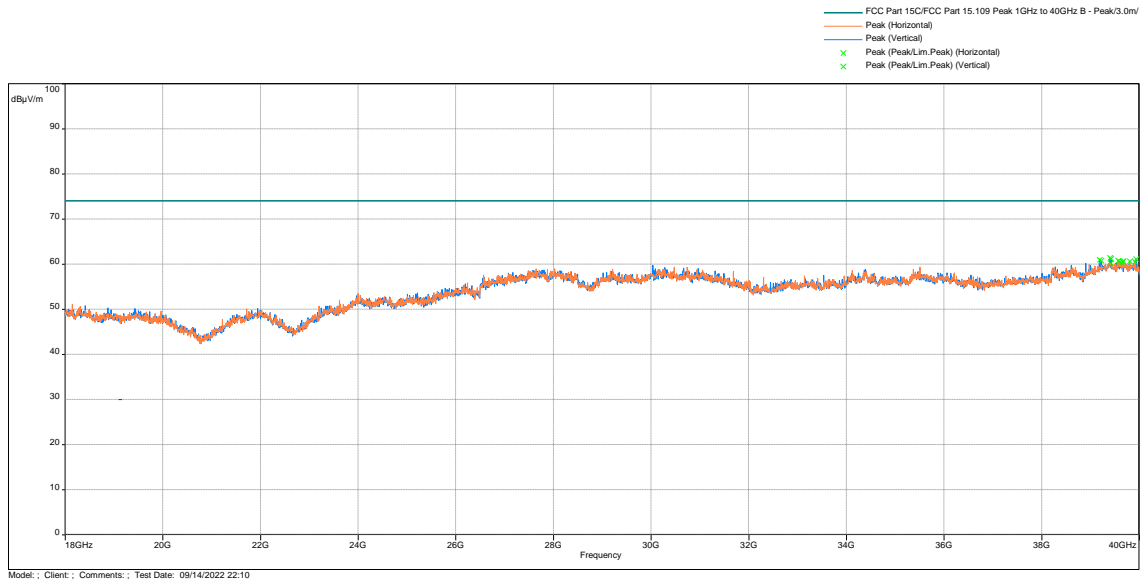
Out-of-Band Radiated Spurious Emissions - 30 MHz to 1000 MHz



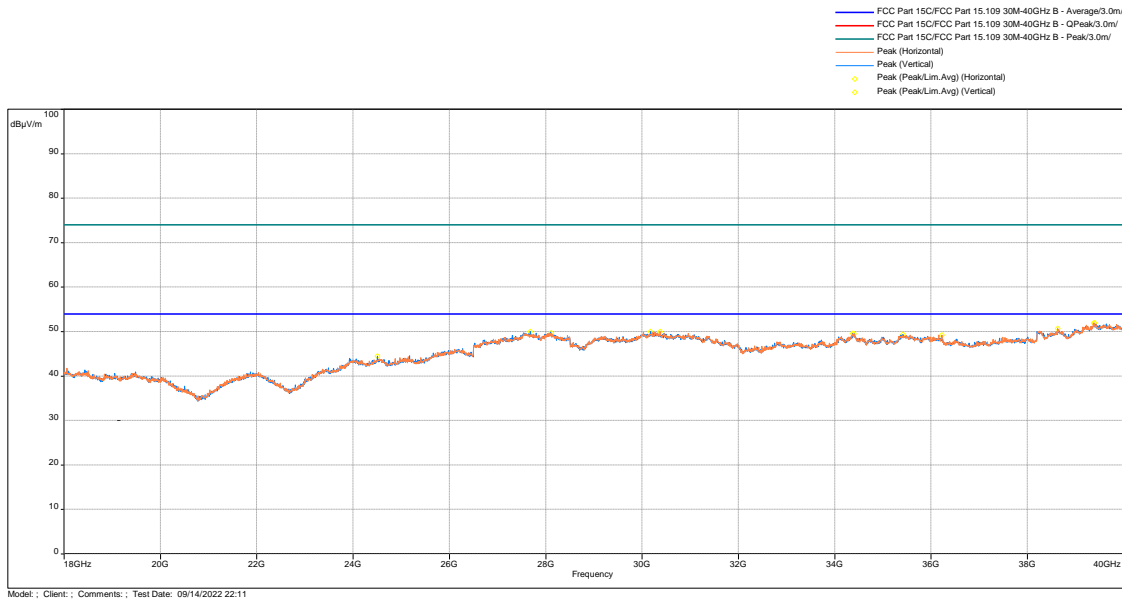
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak & Avg Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Peak Scan vs Peak Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Avg Scan vs Avg Limit



| Frequency (MHz) | QP@10m (dBμV/m) | Limit@10m (dB(μV/m)) | Margin (dB) | Height (m) | Azimuth (deg) | Polarity | Correction (dB) |
|-----------------|-----------------|----------------------|-------------|------------|---------------|----------|-----------------|
| 38.536 | 26.9 | 29.5 | -2.6 | 0.99 | 104.25 | Vertical | -12.3 |
| 49.04433 | 23.93 | 29.5 | -5.57 | 3 | 172.75 | Vertical | -18.97 |
| 62.301 | 27.47 | 29.5 | -2.03 | 2 | 132 | Vertical | -19.4 |
| 77.59467 | 25.25 | 29.5 | -3.5 | 2 | 293.25 | Vertical | -18.96 |
| 89.558 | 32.48 | 33 | -1.02 | 0.99 | 92.75 | Vertical | -19.15 |
| 133.596 | 33.75 | 33 | -0.25 | 0.99 | 186.5 | Vertical | -12.74 |

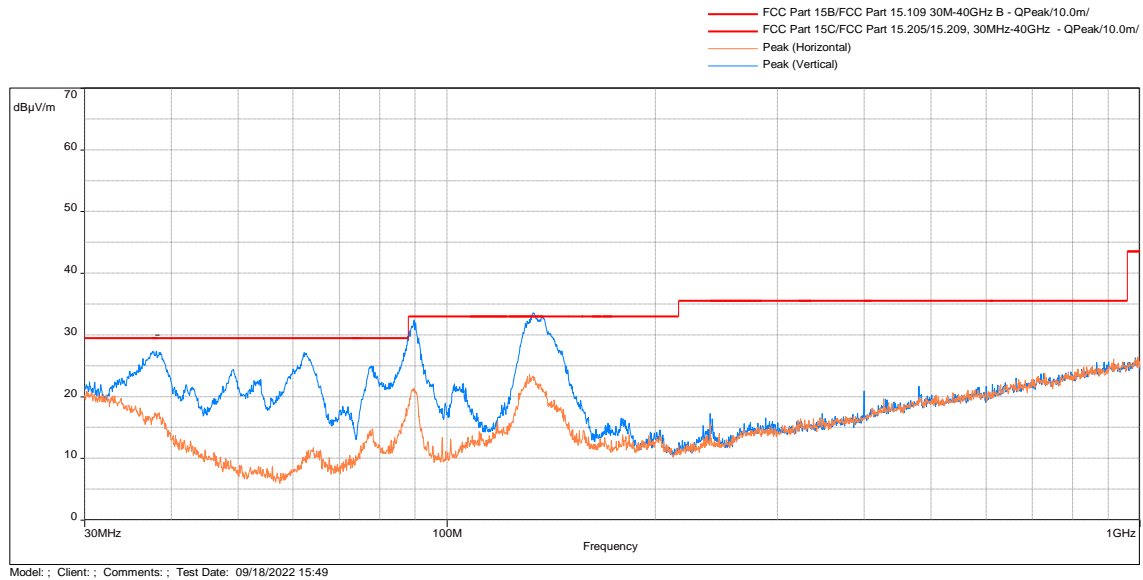
Note: Correction = AF + CF – Preamp

| | |
|----------------|-----------------|
| Results | Complies |
|----------------|-----------------|

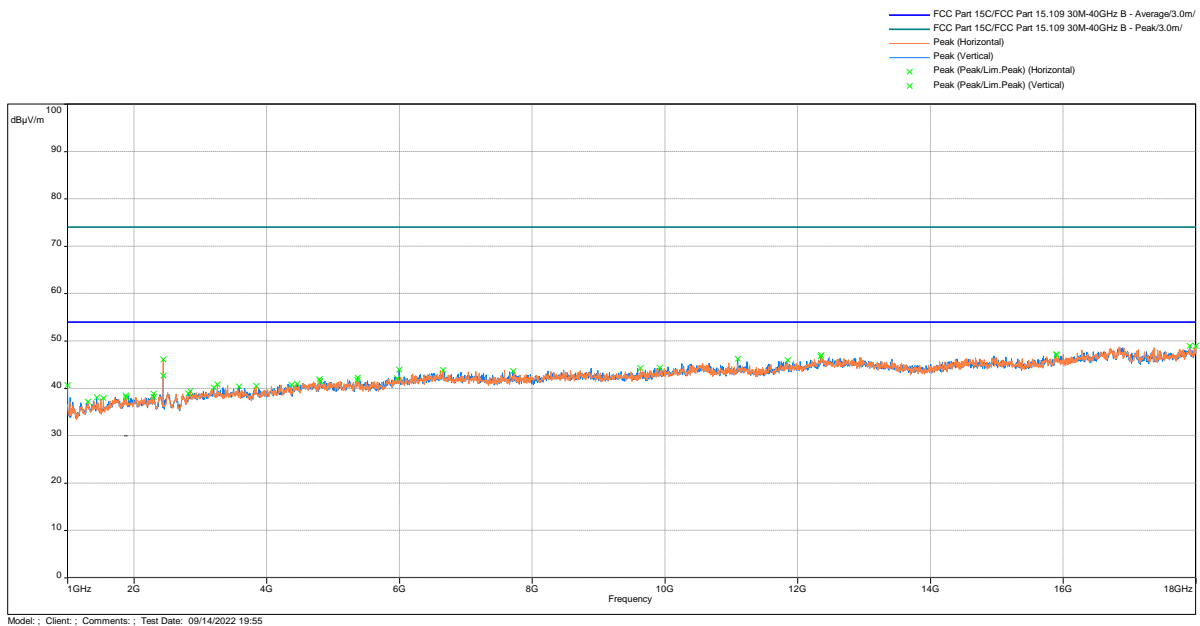
Note: Radiated emission measurements were performed up to from 9kHz to 26GHz. No Emissions were identified when scanned from 9k to 30MHz.

Test Results: Test Results: 15.209 Radiated Spurious Emissions, $\pi/4$ -DQPSK Tx at 2442MHz

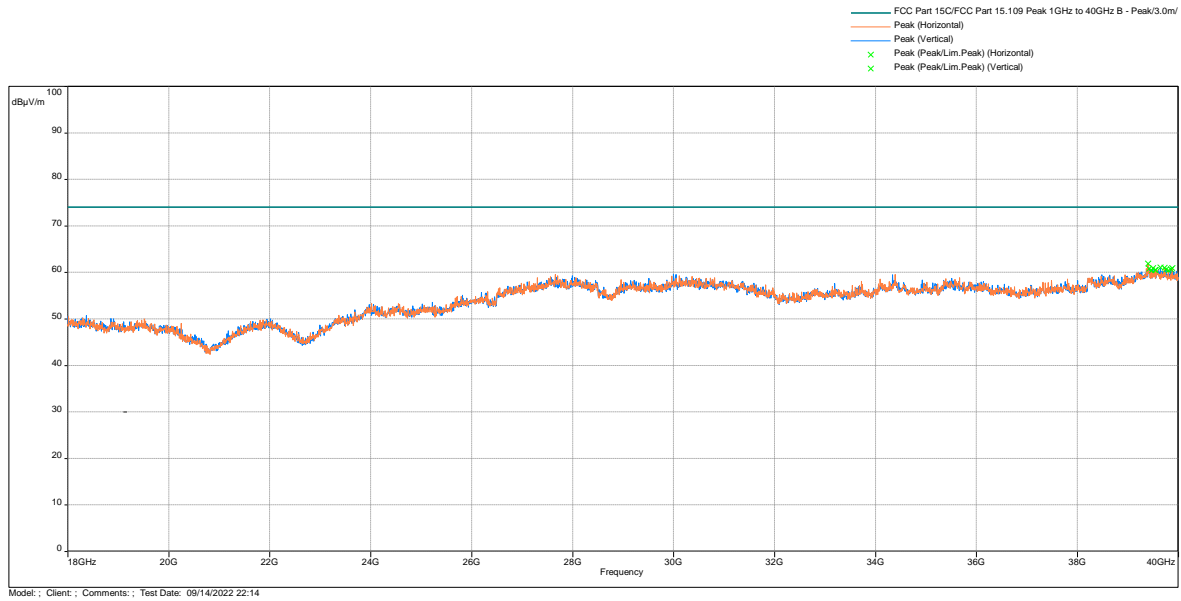
Out-of-Band Radiated Spurious Emissions - 30 MHz to 1000 MHz



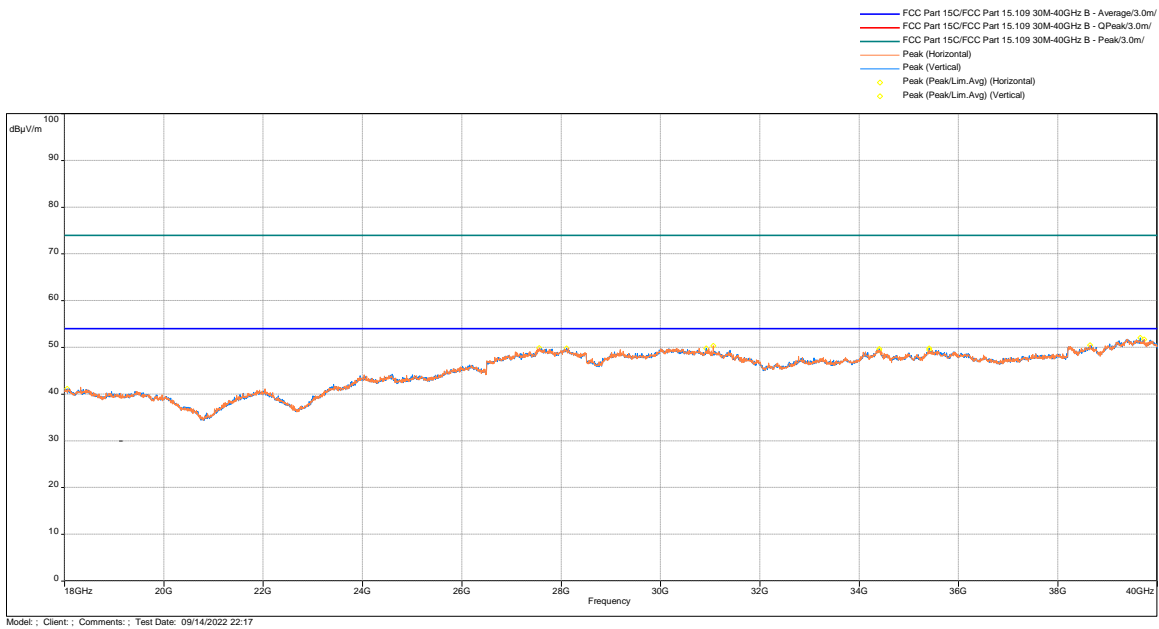
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak & Avg Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Peak Scan vs Peak Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Avg Scan vs Avg Limit



| Frequency (MHz) | QP@10m (dBμV/m) | Limit@10m (dB(uV/m)) | Margin (dB) | Height (m) | Azimuth (deg) | Polarity | Correction (dB) |
|-----------------|-----------------|----------------------|-------------|------------|---------------|----------|-----------------|
| 38.083 | 27.33 | 29.6 | -1.17 | 2 | 95.5 | Vertical | -11.95 |
| 49.206 | 24.43 | 29.5 | -4.07 | 2 | 136.75 | Vertical | -19.02 |
| 62.268 | 27.12 | 29.5 | -1.38 | 1 | 124 | Vertical | -19.4 |
| 77.885 | 24.94 | 29.5 | -3.56 | 2 | 286 | Vertical | -18.99 |
| 89.687 | 32.4 | 33 | -0.6 | 1 | 80.75 | Vertical | -19.14 |
| 133.208* | 33.6 | 33 | 0.6 | 2 | 208.25 | Vertical | -12.7 |

Note: 133.208 MHZ is found to be unintentional emission. The EUT meets FCC 15.109 Class A limit.

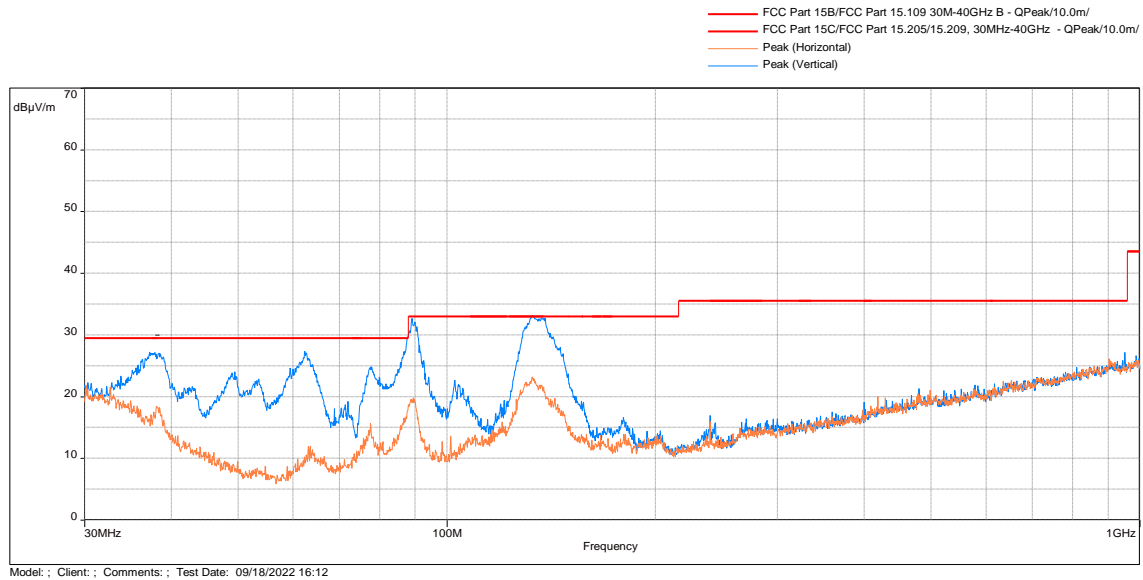
Note: Correction = AF + CF – Preamp

| | |
|----------------|-----------------|
| Results | Complies |
|----------------|-----------------|

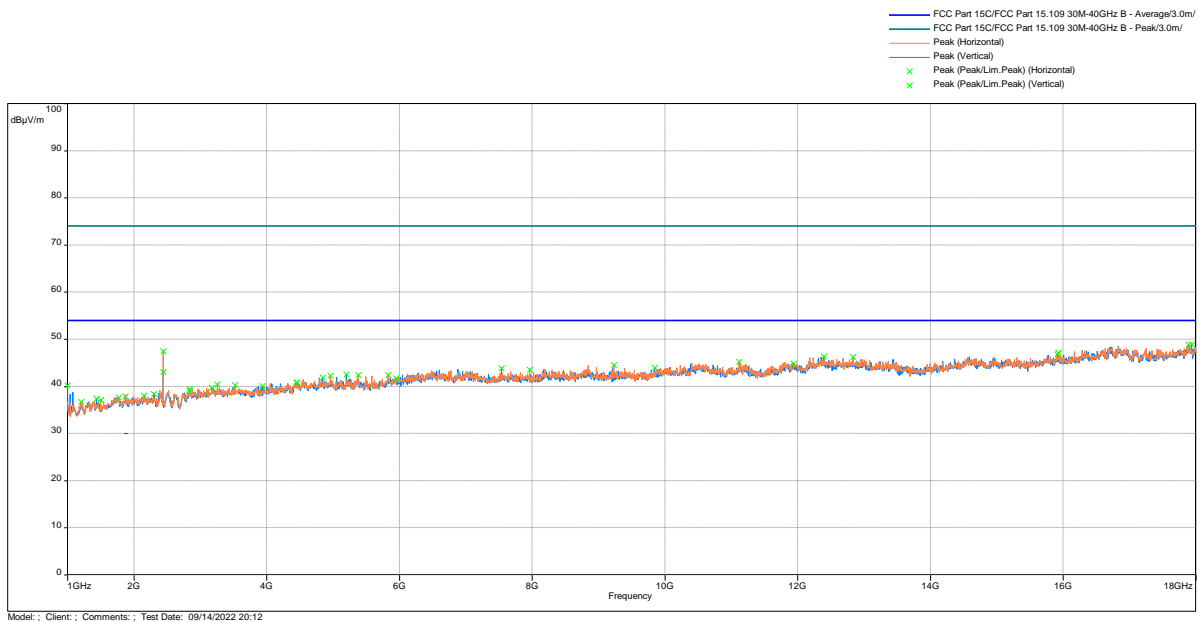
Note: Radiated emission measurements were performed up to from 9kHz to 26GHz. No Emissions were identified when scanned from 9k to 30MHz.

Test Results: Test Results: 15.209 Radiated Spurious Emissions, $\pi/4$ -DQPSK Tx at 2480MHz

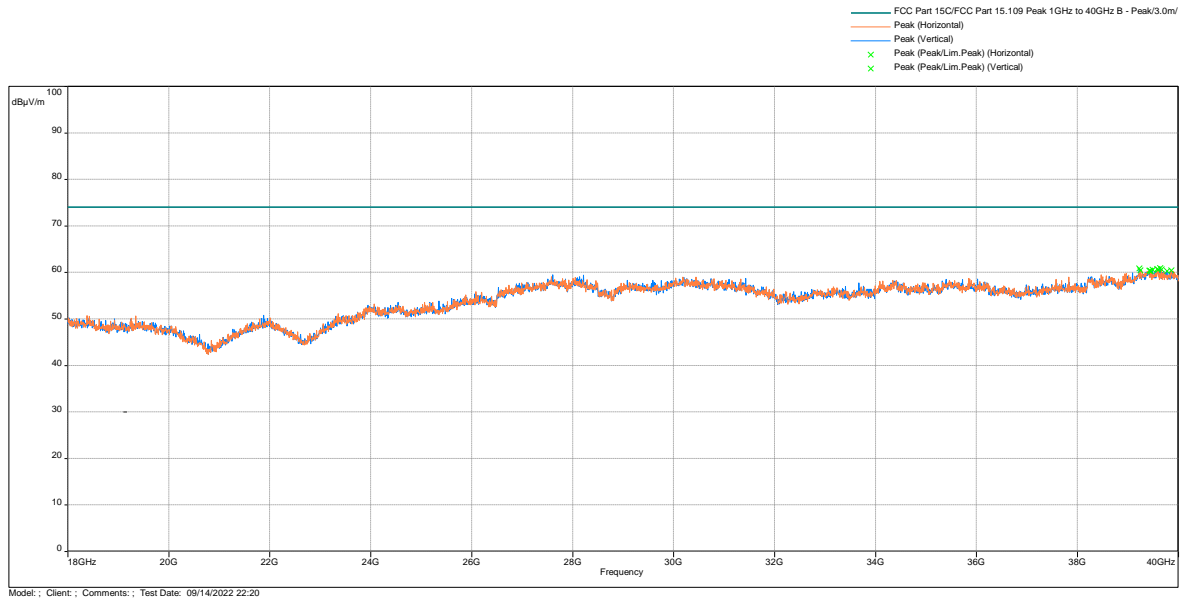
Out-of-Band Radiated Spurious Emissions - 30 MHz to 1000 MHz



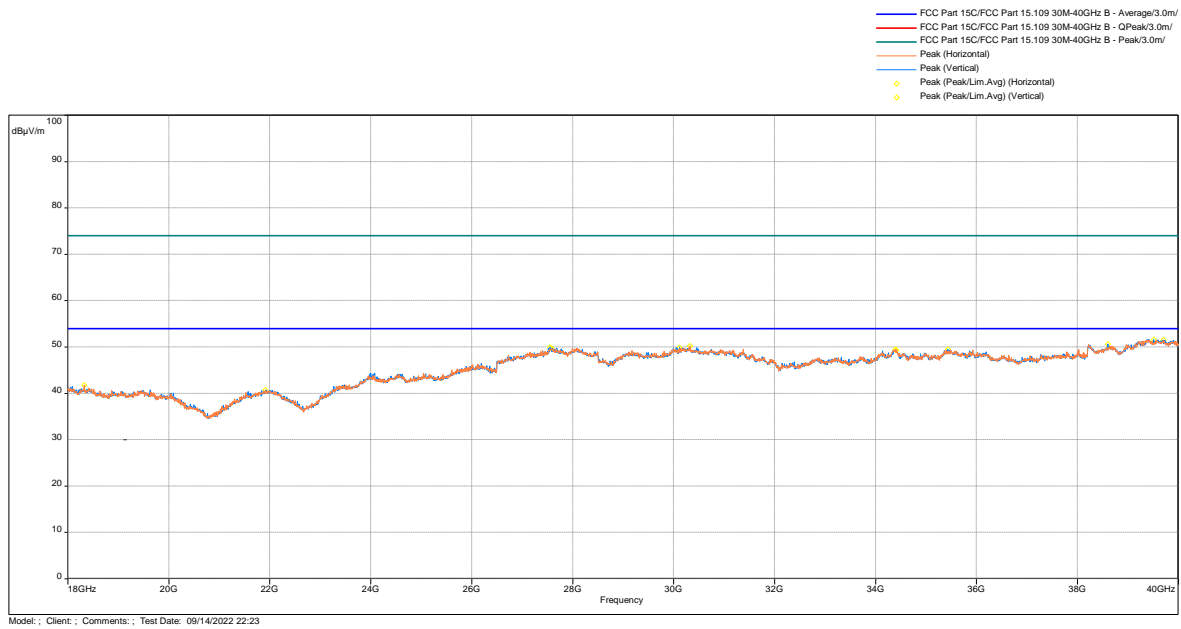
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak & Avg Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Peak Scan vs Peak Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Avg Scan vs Avg Limit



| Frequency (MHz) | QP@10m (dBµV/m) | Limit@10m (dB(µV/m)) | Margin (dB) | Height (m) | Azimuth (deg) | Polarity | Correction (dB) |
|-----------------|-----------------|----------------------|-------------|------------|---------------|----------|-----------------|
| 37.24267 | 27.2 | 29.5 | -1.3 | 0.98 | 122 | Vertical | -11.29 |
| 49.4 | 23.99 | 29.5 | -4.51 | 2 | 137.5 | Vertical | -19.07 |
| 62.36567 | 27.35 | 29.5 | -1.15 | 0.98 | 127 | Vertical | -19.39 |
| 77.56233 | 24.82 | 29.5 | -3.68 | 2 | 1.5 | Vertical | -18.96 |
| 89.073 | 32.65 | 33 | -0.35 | 0.98 | 102.5 | Vertical | -19.2 |
| 132.7553 | 32.64 | 33 | -0.36 | 2 | 188.75 | Vertical | -12.66 |

Note: Correction = AF + CF – Preamp

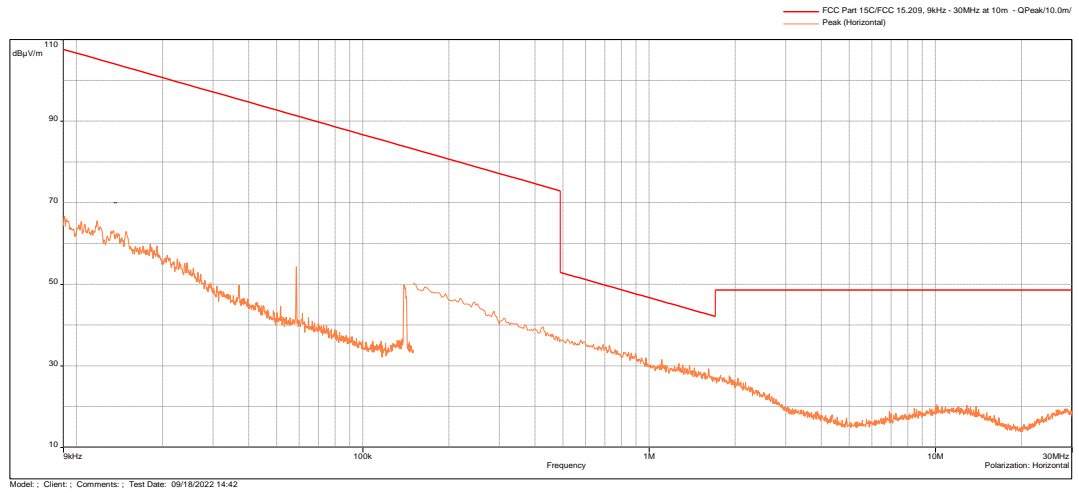
| | |
|----------------|-----------------|
| Results | Complies |
|----------------|-----------------|

Note: Radiated emission measurements were performed up to from 9kHz to 26GHz. No Emissions were identified when scanned from 9k to 30MHz.

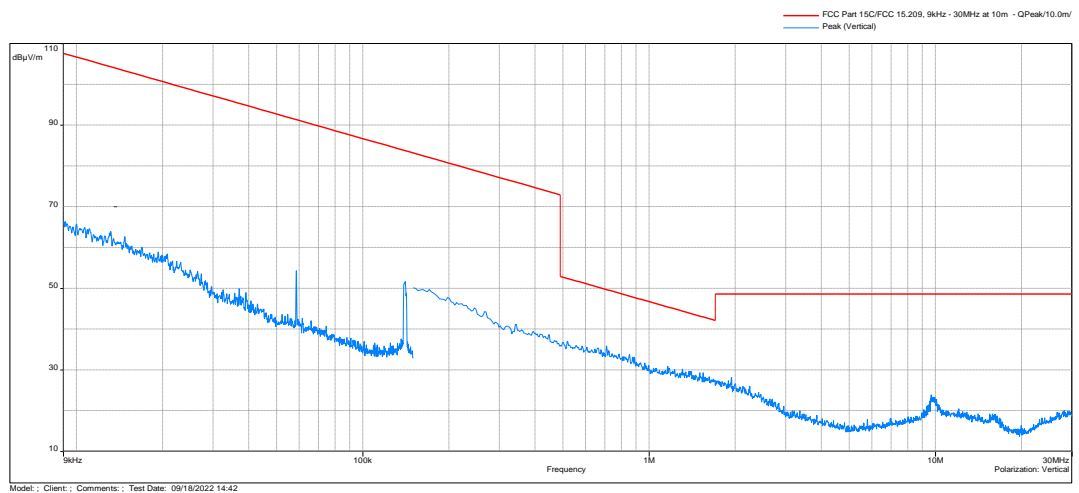
Test Results: 15.209 Radiated Spurious Emissions, 8-DPSK

Radiated Spurious Emissions 9 kHz to 30 MHz, Peak Scan vs QP Limit

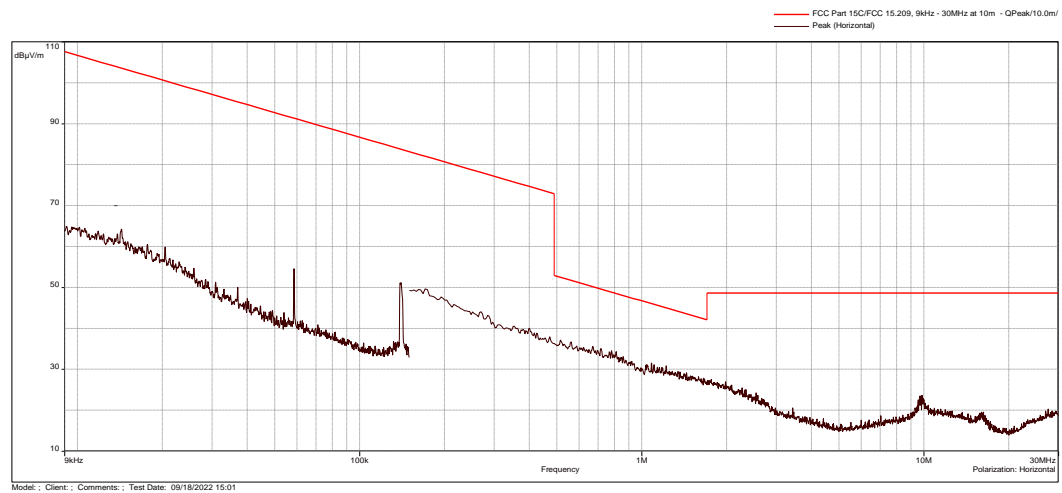
Antenna
Position -
Coaxial



Antenna
Position -
Coplanar

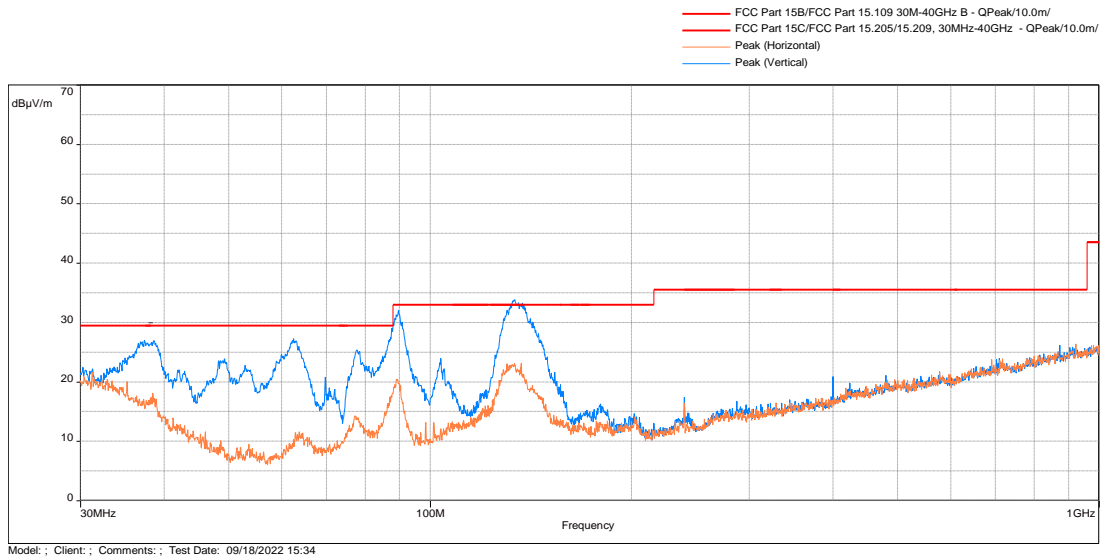


Antenna
Position -
Horizontal

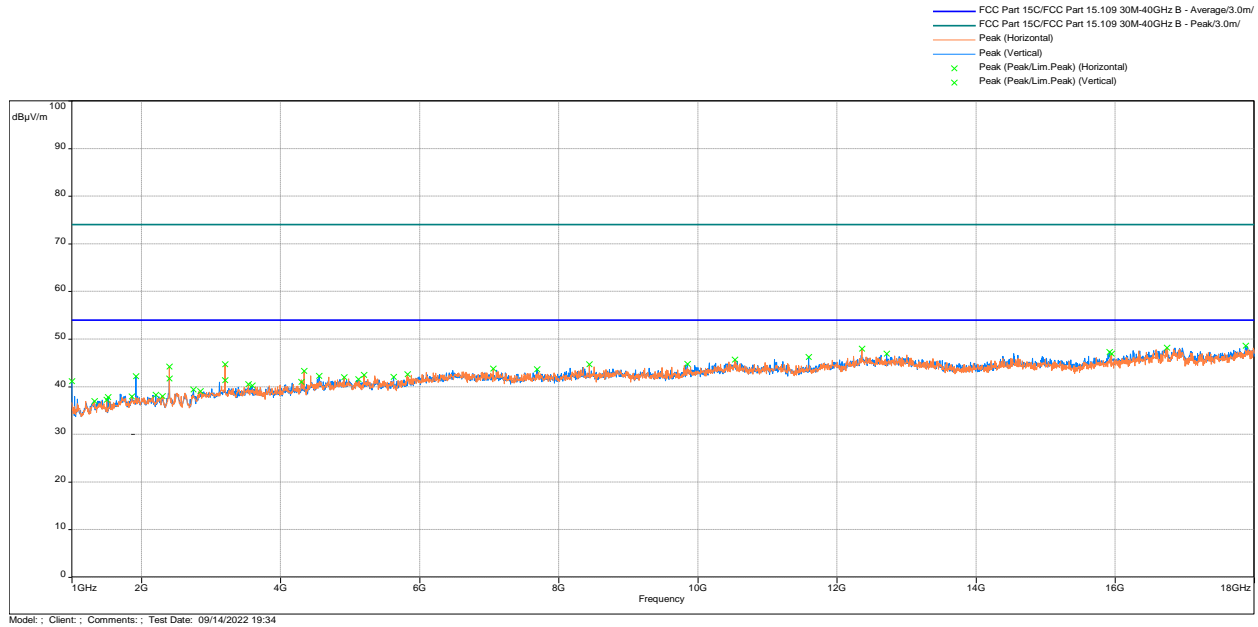


Test Results: Test Results: 15.209 Radiated Spurious Emissions, 8-DPSK Tx at 2402MHz

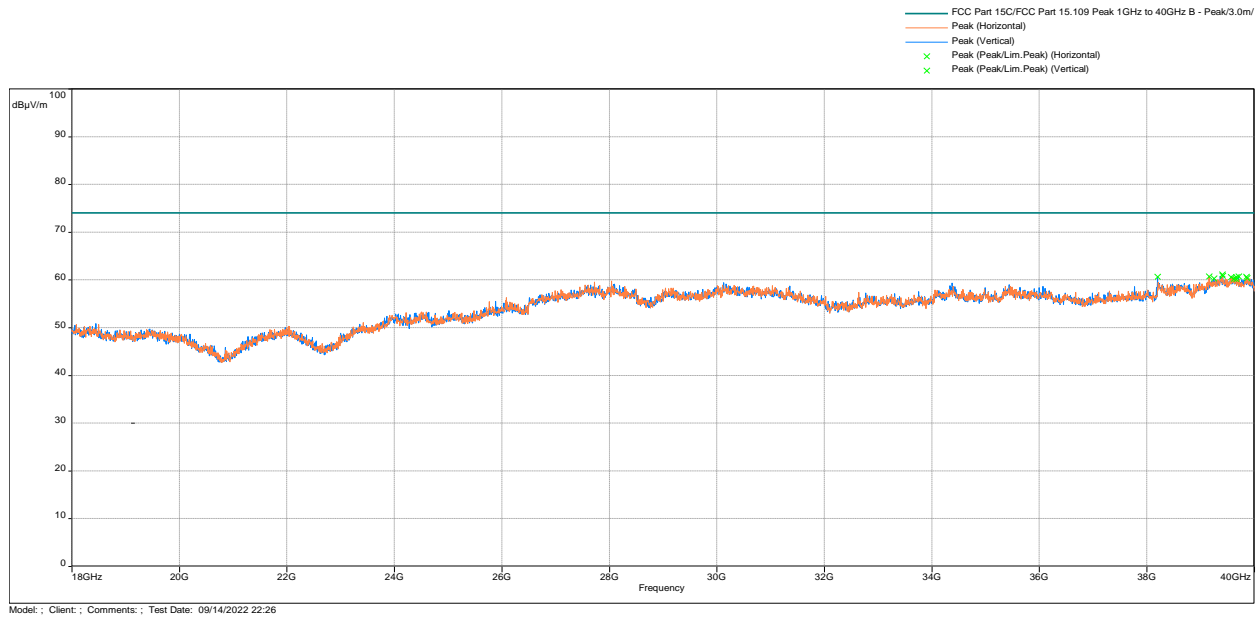
Out-of-Band Radiated Spurious Emissions - 30 MHz to 1000 MHz



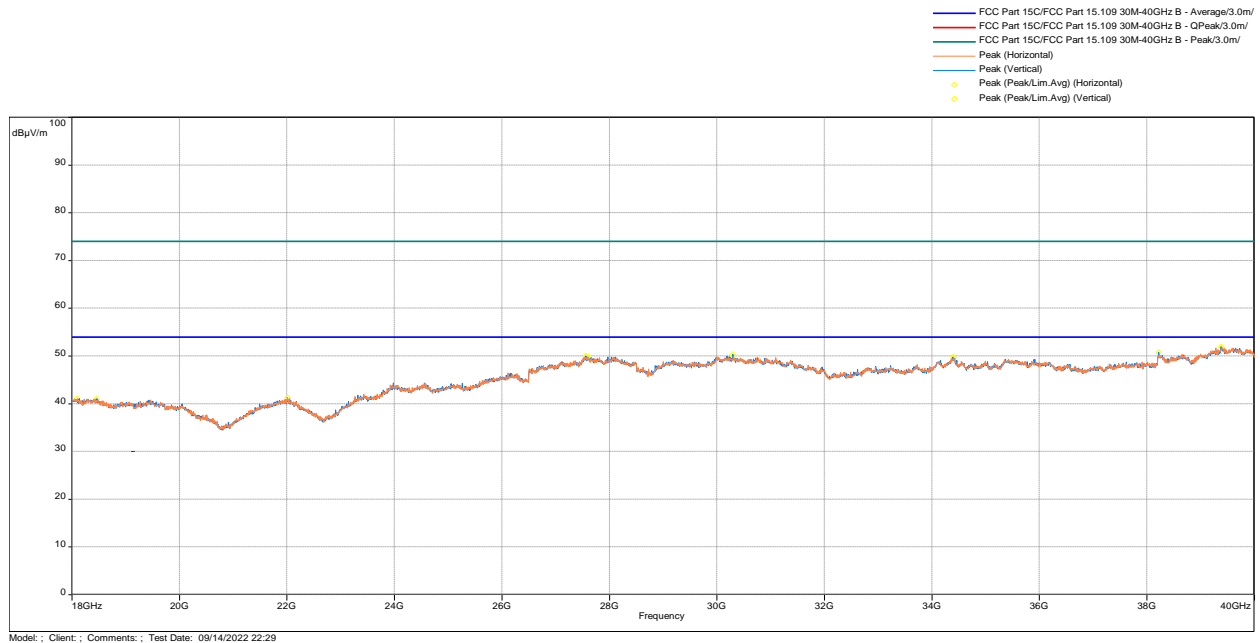
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak & Avg Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Peak Scan vs Peak Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Avg Scan vs Avg Limit



| Frequency (MHz) | QP@10m (dBμV/m) | Limit@10m (dB(uV/m)) | Margin (dB) | Height (m) | Azimuth (deg) | Polarity | Correction (dB) |
|-----------------|-----------------|----------------------|-------------|------------|---------------|------------|-----------------|
| 37.40433 | 27.01 | 29.5 | -1.49 | 3 | 144.75 | Vertical | -11.41 |
| 49.27067 | 23.91 | 29.5 | -4.59 | 3 | 140 | Vertical | -19.04 |
| 62.495 | 27.27 | 29.5 | -1.23 | 0.99 | 178.5 | Vertical | -19.38 |
| 77.69167 | 25.36 | 29.5 | -3.14 | 2 | 271.5 | Vertical | -18.97 |
| 89.71967 | 32.01 | 33 | -0.99 | 0.99 | 107 | Vertical | -19.13 |
| 572.747 | 32.32 | 35.5 | -3.18 | 1.64 | 13.75 | Horizontal | -4.21 |
| 543.453 | 30.77 | 35.5 | -4.73 | 1.37 | 145 | Vertical | -6.16 |

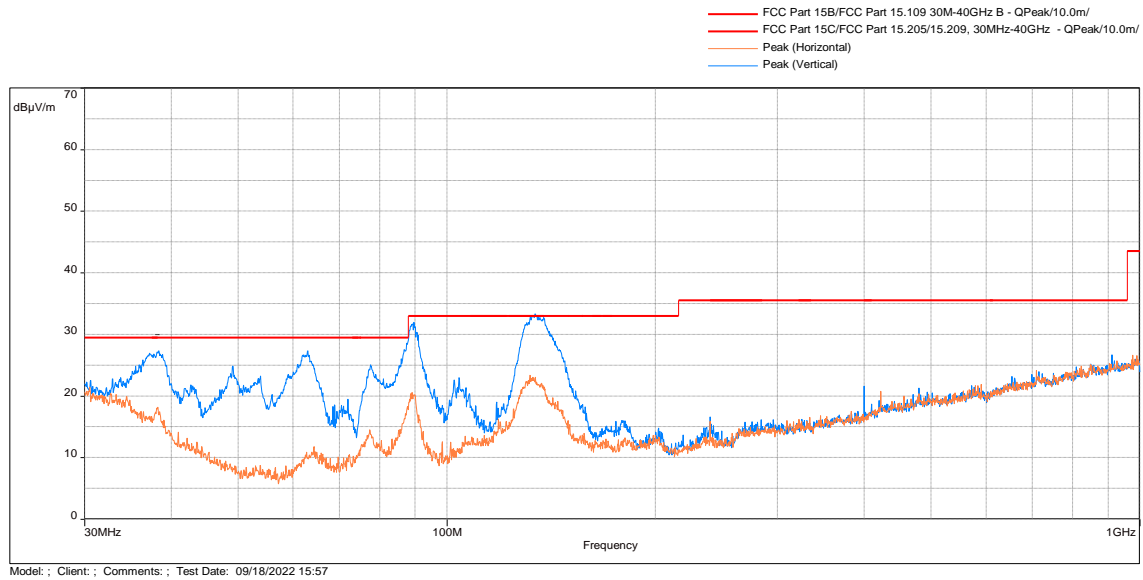
Note: Correction = AF + CF – Preamp

| | |
|----------------|-----------------|
| Results | Complies |
|----------------|-----------------|

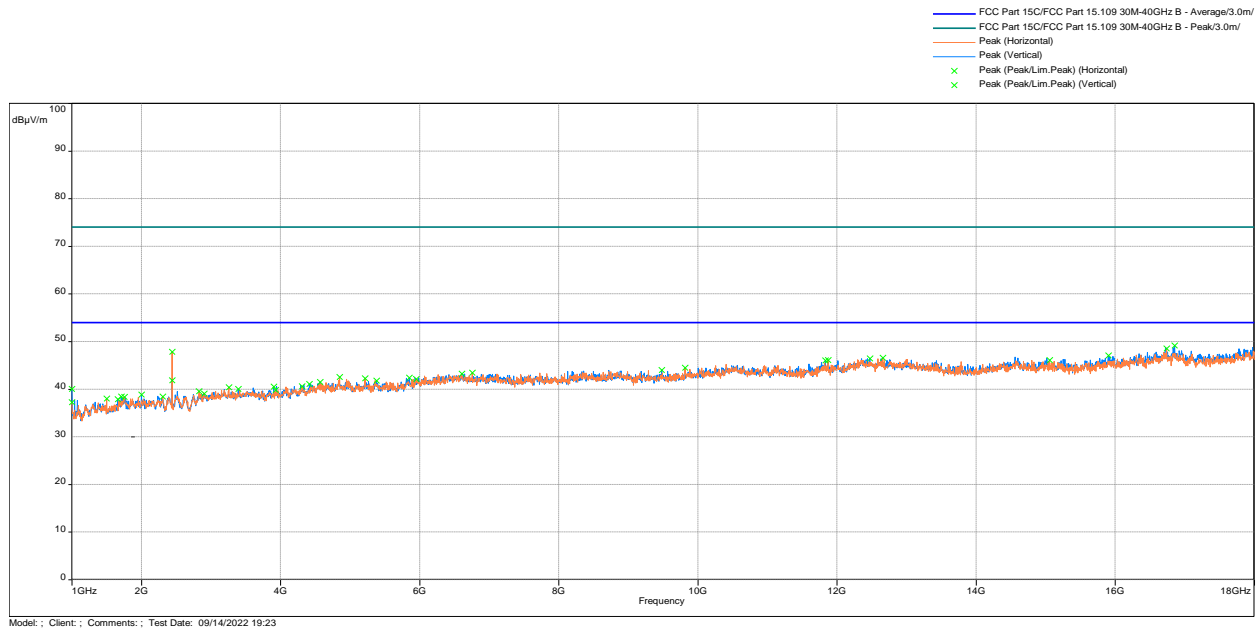
Note: Radiated emission measurements were performed up to from 9kHz to 26GHz. No Emissions were identified when scanned from 9k to 30MHz.

Test Results: Test Results: 15.209 Radiated Spurious Emissions, 8-DPSK Tx at 2442MHz

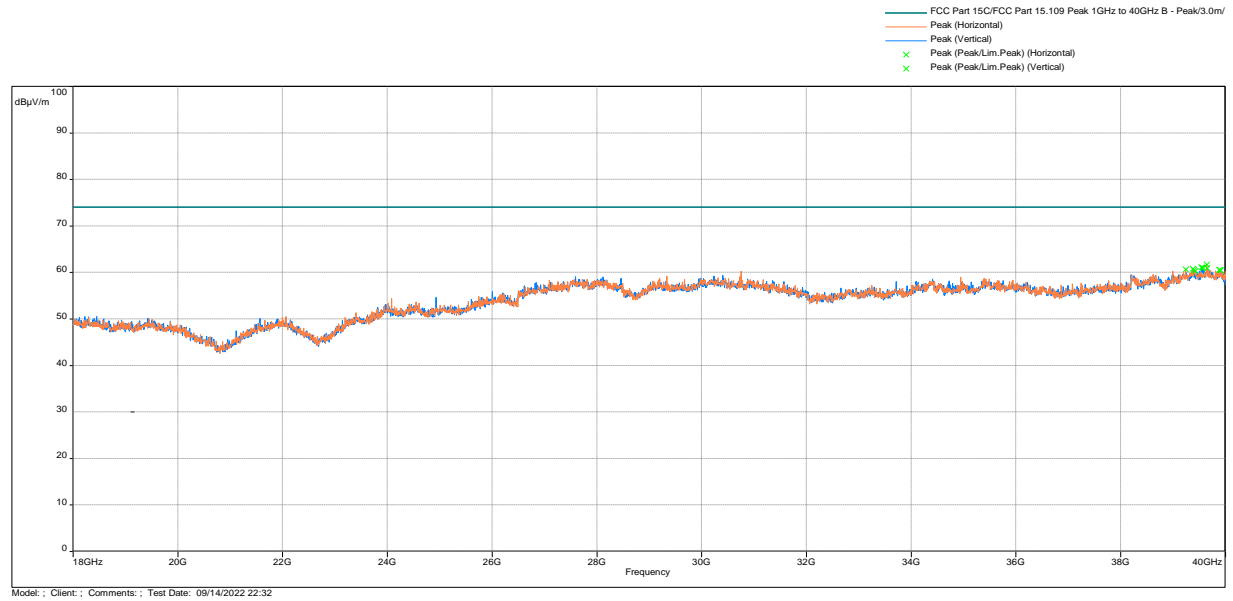
Out-of-Band Radiated Spurious Emissions - 30 MHz to 1000 MHz



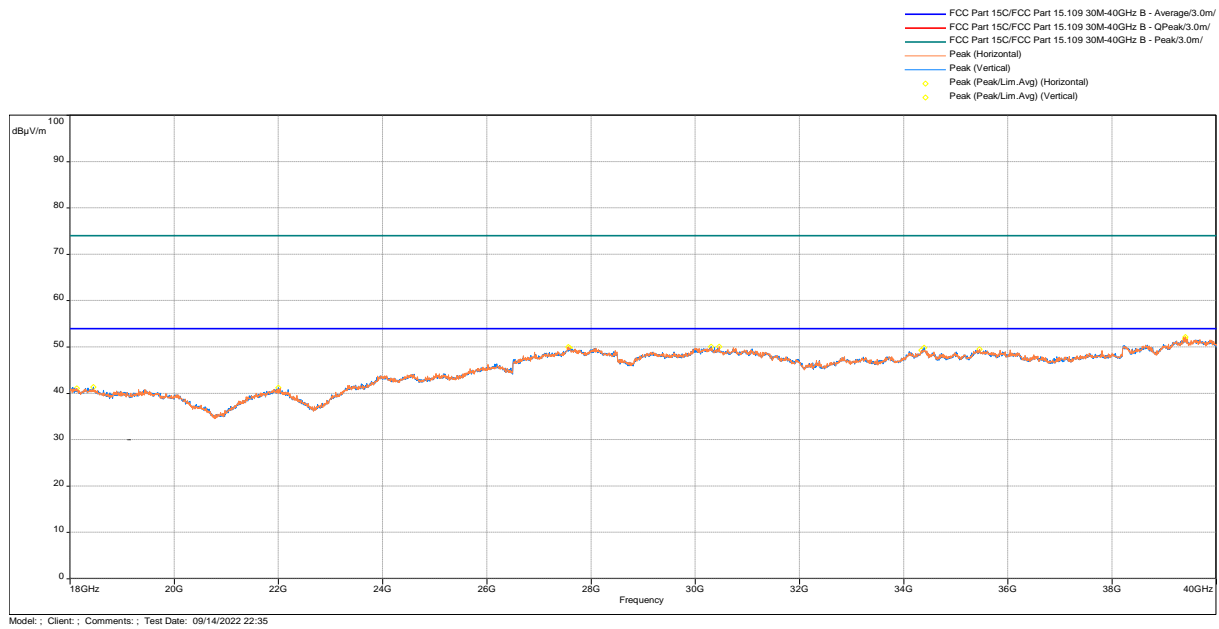
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak & Avg Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Peak Scan vs Peak Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Avg Scan vs Avg Limit



| Frequency (MHz) | QP@10m (dBμV/m) | Limit@10m (dB(μV/m)) | Margin (dB) | Height (m) | Azimuth (deg) | Polarity | Correction (dB) |
|-----------------|-----------------|----------------------|-------------|------------|---------------|----------|-----------------|
| 38.40667 | 27.34 | 29.5 | -1.16 | 3 | 126 | Vertical | -12.19 |
| 49.109 | 24.84 | 29.5 | -3.66 | 3 | 137.5 | Vertical | -18.99 |
| 62.98 | 27.35 | 29.5 | -1.15 | 0.99 | 98 | Vertical | -19.33 |
| 77.56233 | 25.08 | 29.5 | -3.42 | 2 | 256.5 | Vertical | -18.96 |
| 89.62267 | 31.93 | 33 | -1.07 | 0.99 | 104.75 | Vertical | -19.15 |
| 38.40667 | 27.34 | 29.5 | -1.16 | 3 | 126 | Vertical | -12.19 |

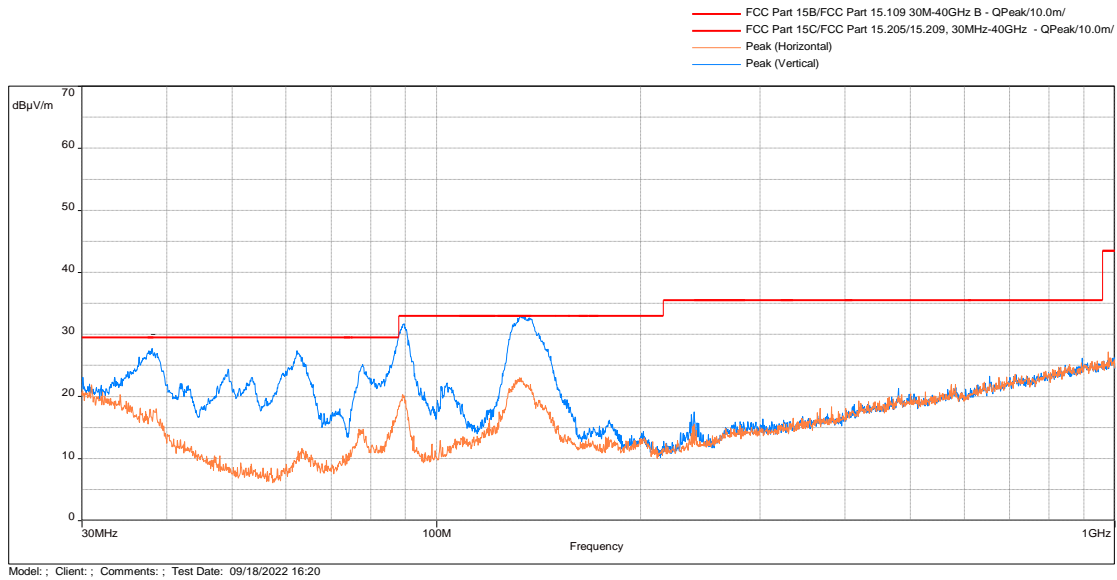
Note: Correction = AF + CF – Preamp

| | |
|----------------|-----------------|
| Results | Complies |
|----------------|-----------------|

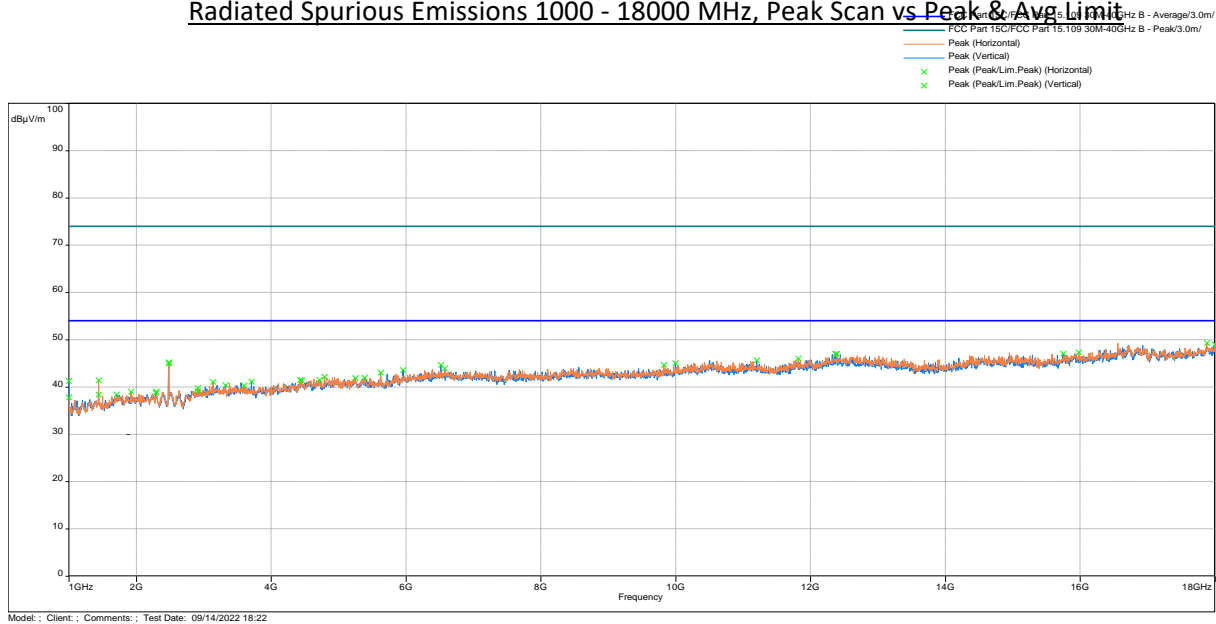
Note: Radiated emission measurements were performed up to from 9kHz to 26GHz. No Emissions were identified when scanned from 9k to 30MHz.

Test Results: Test Results: 15.209 Radiated Spurious Emissions, 8-DPSK Tx at 2480MHz

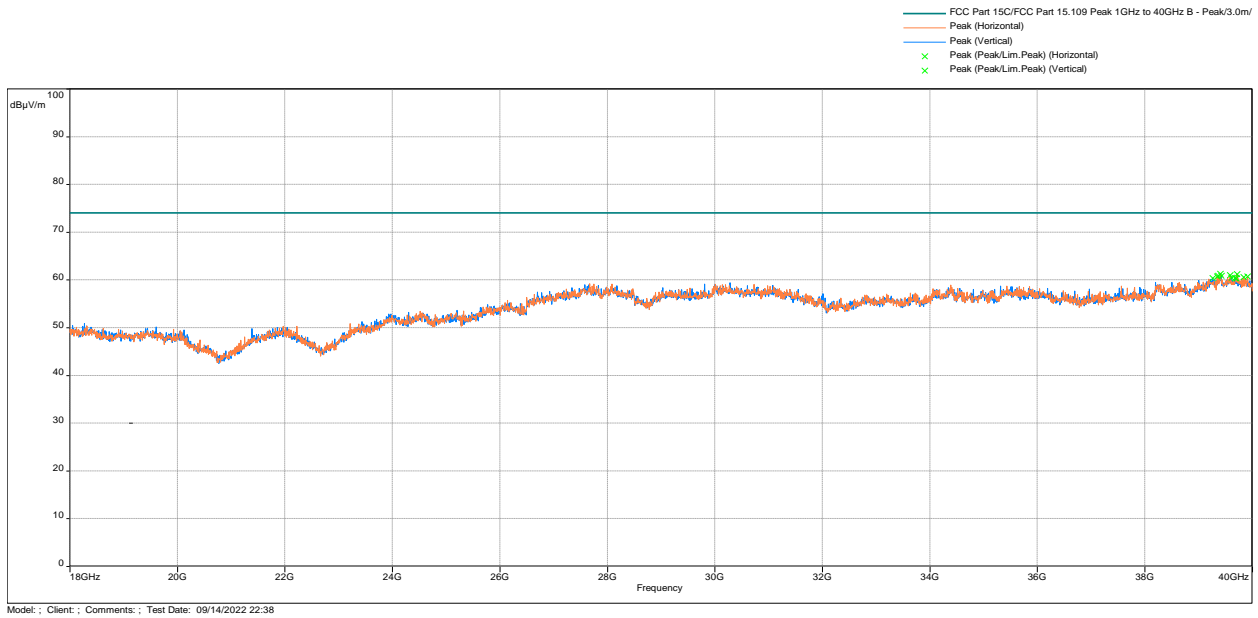
Out-of-Band Radiated Spurious Emissions - 30 MHz to 1000 MHz



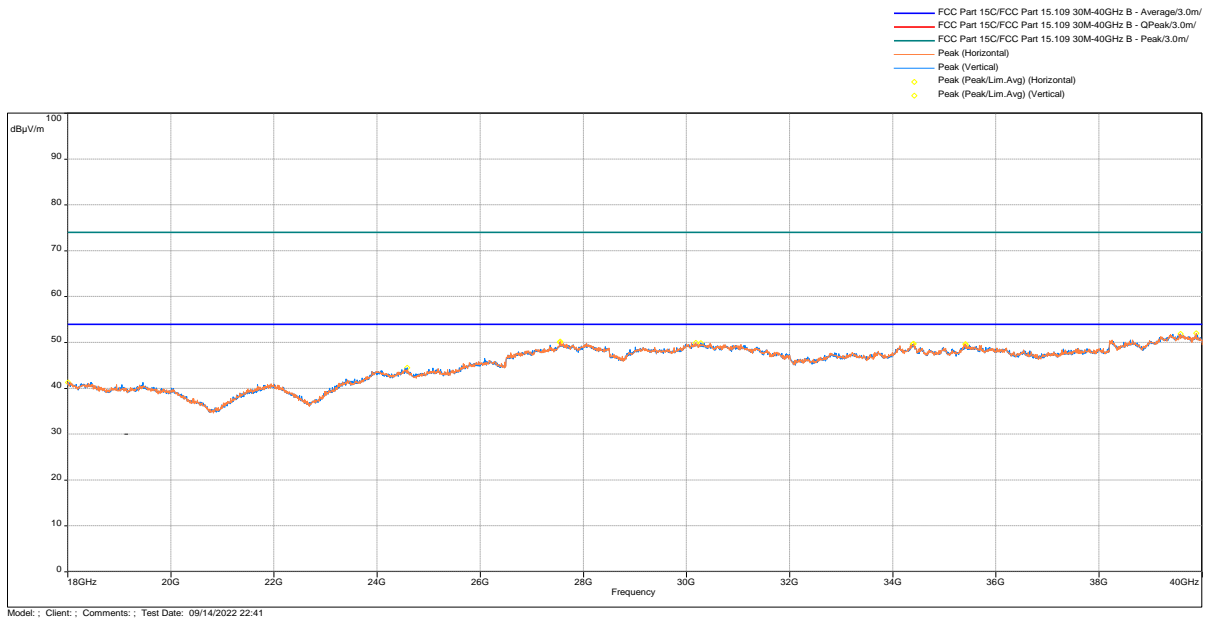
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak & Avg Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Peak Scan vs Peak Limit



Radiated Spurious Emissions 18000 - 26000 MHz, Avg Scan vs Avg Limit



| Frequency (MHz) | QP@10m (dBμV/m) | Limit@10m (dB(μV/m)) | Margin (dB) | Height (m) | Azimuth (deg) | Polarity | Correction (dB) |
|-----------------|-----------------|----------------------|-------------|------------|---------------|----------|-----------------|
| 38.083 | 27.72 | 29.5 | -0.78 | 3 | 116.75 | Vertical | -11.95 |
| 49.303 | 24.38 | 29.5 | -4.12 | 2 | 121 | Vertical | -19.05 |
| 62.268 | 27.38 | 29.5 | -1.12 | 2 | 139.75 | Vertical | -19.4 |
| 77.853 | 25.15 | 29.5 | -3.35 | 2 | 299.75 | Vertical | -18.98 |
| 89.590 | 31.7 | 43.5 | -11.8 | 1 | 117.25 | Vertical | -19.15 |
| 133.79 | 33.05 | 43.5 | -10.45 | 2 | 202.5 | Vertical | -12.76 |

Note: Correction = AF + CF – Preamp

| | |
|----------------|-----------------|
| Results | Complies |
|----------------|-----------------|

Note: Radiated emission measurements were performed up to from 9kHz to 26GHz. No Emissions were identified when scanned from 9k to 30MHz.

4.7.7 Test Setup Photographs

4.8 AC Line Conducted Emission FCC: 15.207; RSS-GEN;

4.8.1 Requirement

| Frequency Band MHz | Class B Limit dB(μ V) | | Class A Limit dB(μ V) | |
|-----------------------|----------------------------|------------|----------------------------|---------|
| | Quasi-Peak | Average | Quasi-Peak | Average |
| 0.15-0.50 | 66 to 56 * | 56 to 46 * | 79 | 66 |
| 0.50-5.00 | 56 | 46 | 73 | 60 |
| 5.00-30.00 | 60 | 50 | 73 | 60 |

Note: *Decreases linearly with the logarithm of the frequency. At the transition frequency the lower limit applies.

4.8.2 Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.10-2013.

| Tested By | Test Date | Results |
|----------------|----------------|---------|
| Not Applicable | Not applicable | N/A |

4.8.3 Test Result

| | |
|----------------|-----------------------|
| Results | Not applicable |
|----------------|-----------------------|

5.0 List of Test Equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

| Equipment | Manufacturer | Model/Type | Asset # | Cal Int | Cal Due |
|--------------------------|-------------------|----------------------|---------|---------|------------|
| 9kHz-30MHz Loop Antenna | ETS Lindgren | 6512 | 01573 | 12 | 11/09/2022 |
| 30MHz-2GHz Bi-Log | SunAR RF Motion | JB1 | 01577 | 12 | 02/10/2023 |
| 1-18GHz 2 meter RF Cable | TRU Corp. | TRU Core 300 | 01330 | 12 | 08/25/2023 |
| 1-40GHz RF Cable (SMA | MEGAPHASE | EMC1-K1K1-20 | 01889 | 12 | 03/11/2023 |
| 1-40GHz DRG Horn (small) | ETS-Lindgren | 3116 | 01894 | 12 | 06/20/2023 |
| 1-18GHz Horn Antenna | ETS Lindgren | 3117-PA | 01325 | 12 | 10/26/2022 |
| 9kHz-1GHz Pre-amplifier | Sonoma Instrument | 310N | 01713 | 12 | 02/17/2023 |
| 1-40GHz RF Cable | Mega PHASE | TM40-K1K1-59 | 01655 | 12 | 01/11/2023 |
| 1GHz to 40GHz RF Cable | MEGAPHASE | EMC1-K1K1-236 | 01484 | 12 | 06/27/2023 |
| 1-18GHz Horn Antenna | EMCO | 3115 | 001595 | 12 | # |
| 18-40GHz Preamp | uComp Nordic | MCNS-50-18004000335p | 01799 | 12 | 03/24/2023 |
| EMI Test Receiver 40GHz | Rohde & Schwarz | ESU40 | 00961 | 12 | 03/10/2023 |
| EMI Test Receiver | Rohde & Schwarz | ESR7 | 01607 | 12 | 11/19/2022 |
| 10m Chamber | Panashield | 10 Meter Chamber | 00984 | 12 | # |

= Calibration not required.

Software used for emission compliance testing utilized the following:

| Name | Manufacturer | Version | Template/Profile |
|--------------|----------------|-----------|-----------------------------------------------------|
| Tile | Quantum Change | 3.4.K.22 | Conducted Spurious_30M-26GHz Conducted Emissions |
| RS Commander | Rohde Schwarz | 1.6.4 | Not Applicable (Screen grabber) |
| BAT-EMC | Nexio | 3.16.0.64 | Lytx wifipt2.bpp |

6.0 Document History

| Revision/ Job Number | Writer Initials | Reviewers Initials | Date | Change |
|-------------------------|--------------------|--------------------|------------------|-------------------|
| 1.0 / G10514626 | JAV | ML | October 29, 2022 | Original Document |

END OF REPORT