











9.7 RADIATED SPURIOUS EMISSION

9.7.1 Applicable Standard

According to FCC Part 15.247(d), 15.205, 15.209 and KDB 558074 D01 15.247 MEAS GUIDANCE v05r02
 According to IC RSS-Gen and RSS-247

9.7.2 Conformance Limit

According to FCC Part 15.247(d): 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)).

According to FCC Part15.205, Restricted bands

| MHz | MHz | MHz | GHz |
|-------------------|---------------------|---------------|-------------|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| 10.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | (2) |
| 13.36-13.41 | | | |

According to FCC Part15.205, the level of any transmitter spurious emission in Restricted bands shall not exceed the level of the emission specified in the following table

| Restricted Frequency(MHz) | Field Strength (μ V/m) | Field Strength ($\text{dB}\mu$ V/m) | Measurement Distance |
|---------------------------|-----------------------------|--------------------------------------|----------------------|
| 0.009-0.490 | 2400/F(KHz) | 20 log (μ V/m) | 300 |
| 0.490-1.705 | 24000/F(KHz) | 20 log (μ V/m) | 30 |
| 1.705-30 | 30 | 29.5 | 30 |
| 30-88 | 100 | 40 | 3 |
| 88-216 | 150 | 43.5 | 3 |
| 216-960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

9.7.3 Test Configuration

Test according to clause 7.2 radio frequency test setup 2

9.7.4 Test Procedure

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

For Above 1GHz:

The EUT was placed on a turn table which is 1.5m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

For Below 1GHz:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 100 kHz for

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

For Below 30MHz:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 9kHz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

For Below 150KHz:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 200Hz

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Repeat above procedures until all frequency measured was complete.

9.7.5 Test Results

■ Spurious Emission below 30MHz (9KHz to 30MHz)

| | |
|--------------------|-----------|
| Temperature: | 26° C |
| Relative Humidity: | 54% |
| ATM Pressure: | 1011 mbar |

| Freq. (MHz) | Ant.Pol. H/V | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|----------------|-----------------|---------------------------|----|------------------|----|----------|----|
| | | PK | AV | PK | AV | PK | AV |
| -- | -- | -- | -- | -- | -- | -- | -- |

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40\log(\text{Specific distance}/\text{test distance})(\text{dB})$;

Limit line=Specific limits(dBuV) + distance extrapolation factor

■ Spurious Emission Above 1GHz (1GHz to 25GHz)

Bluetooth (GFSK, π/4-DQPSK) mode have been tested, and the worst result(GFSK) was report as below:

Test mode: GFSK Frequency: Channel 0: 2402MHz

| Freq. (MHz) | Ant.Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|----------------|----------|---------------------------|-------|------------------|----|----------|--------|
| | | H/V | PK | AV | PK | AV | PK |
| 4959.307 | V | 49.91 | 31.27 | 74 | 54 | -24.09 | -22.73 |
| 7439.362 | V | 68.60 | 52.14 | 74 | 54 | -5.40 | -1.86 |
| 17906.59 | V | 65.67 | 48.65 | 74 | 54 | -8.33 | -5.35 |
| 4960.023 | H | 53.44 | 35.12 | 74 | 54 | -20.56 | -18.88 |
| 7439.362 | H | 66.15 | 38.24 | 74 | 54 | -7.85 | -15.76 |
| 17961.02 | H | 64.86 | 47.41 | 74 | 54 | -9.14 | -6.59 |

Test mode: GFSK Frequency: Channel 39: 2441MHz

| Freq. (MHz) | Ant.Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|----------------|----------|------------------------|-------|------------------|----|----------|--------|
| | | H/V | PK | AV | PK | AV | PK |
| 5740.342 | V | 61.62 | 44.38 | 74 | 54 | -12.38 | -9.62 |
| 7439.362 | V | 68.61 | 52.75 | 74 | 54 | -5.39 | -1.25 |
| 17909.18 | V | 64.64 | 46.66 | 74 | 54 | -9.36 | -7.34 |
| 4960.023 | H | 53.34 | 35.72 | 74 | 54 | -20.66 | -18.28 |
| 7439.362 | H | 66.56 | 51.32 | 74 | 54 | -7.44 | -2.68 |
| 17872.98 | H | 64.68 | 48.15 | 74 | 54 | -9.32 | -5.85 |

Test mode: GFSK Frequency: Channel 78: 2480MHz

| Freq. (MHz) | Ant.Pol. | Emission Level(dBuV/m) | | Limit 3m(dBuV/m) | | Over(dB) | |
|----------------|----------|------------------------|-------|------------------|----|----------|--------|
| | | H/V | PK | AV | PK | AV | PK |
| 7440.437 | V | 68.32 | 52.14 | 74 | 54 | -5.68 | -1.86 |
| 9919.689 | V | 57.73 | 40.15 | 74 | 54 | -16.27 | -13.85 |
| 17891.07 | V | 65.11 | 48.13 | 74 | 54 | -8.89 | -5.87 |
| 4960.023 | H | 53.34 | 35.14 | 74 | 54 | -20.66 | -18.86 |
| 7439.362 | H | 65.73 | 50.23 | 74 | 54 | -8.27 | -3.77 |
| 17968.81 | H | 65.18 | 48.14 | 74 | 54 | -8.82 | -5.86 |

Note: (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).

(2) Emission Level= Reading Level+Correct Factor.

(3) Correct Factor= Ant_F + Cab_L - Preampl

(4) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

■ Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz
 Bluetooth (GFSK, π/4-DQPSK, Hopping) mode have been tested, and the worst result(GFSK, Hopping) was report as below:

| | | | | | |
|------------|------|------------|--------------------|--|--|
| Test mode: | GFSK | Frequency: | Channel 0: 2402MHz | | |
|------------|------|------------|--------------------|--|--|

| Frequency (MHz) | Polarity H/V | PK(dBuV/m) (VBW=3MHz) | Limit 3m (dBuV/m) | AV(dBuV/m) (VBW=10Hz) | Limit 3m (dBuV/m) |
|-----------------|--------------|-----------------------|-------------------|-----------------------|-------------------|
| 2387.040 | H | 50.38 | 74 | 33.24 | 54 |
| 2387.820 | V | 50.74 | 74 | 33.93 | 54 |

| | | | | | |
|------------|------|------------|---------------------|--|--|
| Test mode: | GFSK | Frequency: | Channel 78: 2480MHz | | |
|------------|------|------------|---------------------|--|--|

| Frequency (MHz) | Polarity H/V | PK(dBuV/m) (VBW=3MHz) | Limit 3m (dBuV/m) | AV(dBuV/m) (VBW=10Hz) | Limit 3m (dBuV/m) |
|-----------------|--------------|-----------------------|-------------------|-----------------------|-------------------|
| 2483.601 | H | 64.76 | 74 | 50.13 | 54 |
| 2483.515 | V | 61.90 | 74 | 43.24 | 54 |

| | | | | | |
|------------|------|------------|---------|--|--|
| Test mode: | GFSK | Frequency: | Hopping | | |
|------------|------|------------|---------|--|--|

| Frequency (MHz) | Polarity H/V | PK(dBuV/m) (VBW=3MHz) | Limit 3m (dBuV/m) | AV(dBuV/m) (VBW=10Hz) | Limit 3m (dBuV/m) |
|-----------------|--------------|-----------------------|-------------------|-----------------------|-------------------|
| 2400.0 | H | 58.66 | 74 | 40.54 | 54 |
| 2483.5 | H | 43.86 | 74 | 25.67 | 54 |
| 2400.0 | V | 46.63 | 74 | 29.07 | 54 |
| 2483.5 | V | 43.26 | 74 | 24.91 | 54 |

Note: (1) All Readings are Peak Value (VBW=3MHz) and Average Value (VBW=10Hz).
 (2) Emission Level= Reading Level+Correct Factor.
 (3) Correct Factor= Ant_F + Cab_L - Preamplifier
 (4) The reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.