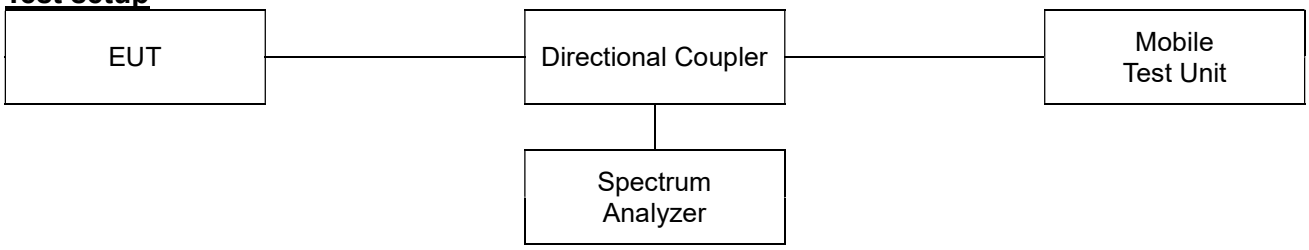
## 7.3. Band Edge Emissions at Antenna Terminal

**Test setup**




**Limit**

According to §90.691(a), Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee’s frequency block by up to and including 37.5 ㎑, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 $Log_{10}$(f/6.1) decibels or 50 + 10$Log_{10}$(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz where f is greater than 12.5 ㎑.

(2) For any frequency removed from the EA licensee’s frequency block greater than 37.5 ㎑, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10$Log_{10}$(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 ㎑.

**Test procedure**

971168 D01 v03r01 - Section 6
ANSI C63.26-2015 – Section 5.7

**Test settings**

1) Start frequency was set to 30 ㎒ and stop frequency was set to at least 10$^{th}$ the fundamental frequency.
2) Span was set large enough so as to capture all out of band emissions near the band edge.
3) Set the RBW > 1% of the emission bandwidth.
4) Set the VBW ≥ 3 x RBW.
5) Set the number of sweep points ≥ 2 x Span/RBW
6) Detector = RMS
7) Trace mode = trace average
8) Sweep time should be auto for peak detection. For RMS detection the sweep time should be set as follows:
    a) If the device can be configured to transmit continuously (duty cycle ≥ 98%), set the (sweep time) > (number of points in sweep) x (symbol period) (e.g., by a factor of 10 x symbol period x number of points) Increasing the sweep time (i.e., slowing the sweep speed) will allow for averaging over multiple symbols.
    b) If the device cannot transmit continuously (duty cycle < 98%), a gated sweep shall be used when possible (i.e., gate triggered such that the analyzer only

sweeps when the device is transmitting at full power), set the sweep time > (number of points in sweep) x (symbol period) but the sweep time shall always be maintained at a value that is less than or equal to the minimum transmission time

c) If the device cannot be configured to transmit continuously (duty cycle > 98%), and a free-running sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) × (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by [10 log (1/duty cycle)]. This assumes that the transmission period and duty cycle is relatively constant (duty cycle variation ≤ ±2%).

d) If the device cannot be configured to transmit continuously and a free-running sweep must be used, and if the transmissions exhibit a non-constant duty cycle (duty cycle variations > ±2%), set the sweep time so that the averaging is performed over the on-period by setting the sweep time > (symbol period) × (number of points), while also maintaining the sweep time < (transmitter on-time). The trace mode shall be set to max hold, since not every display point will be averaged only over just the on-time. Thus, multiple sweeps (e.g., 100) in maximum hold art necessary to ensure that the maximum power is measured.

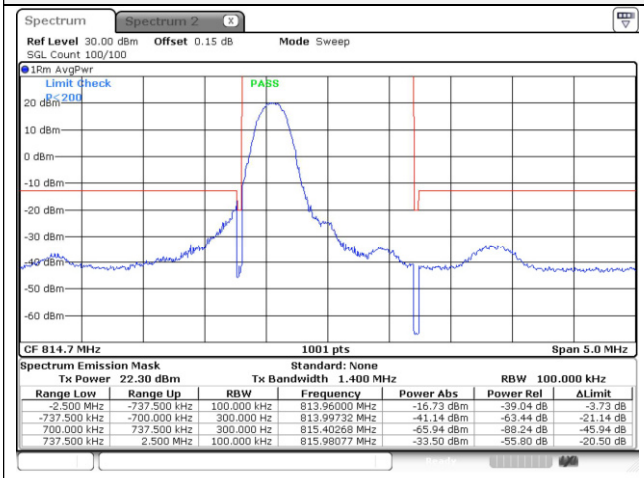
9) Allow trace to fully stabilize.

**Notes:**

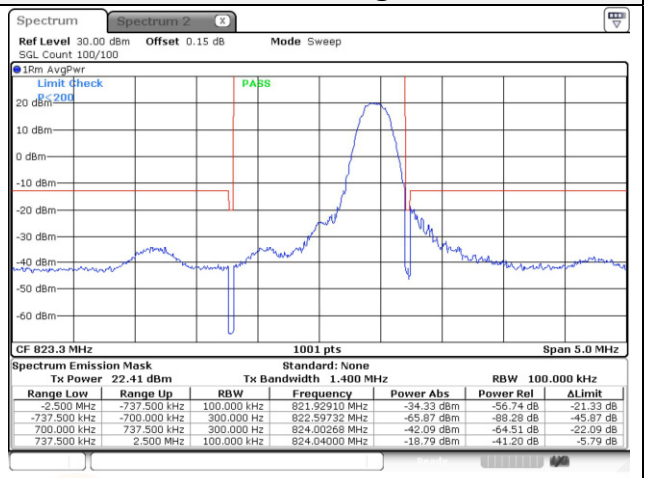
1. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 ㎒ or greater. however in the 1 ㎒ bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 ㏈ below the transmitter power.
2. The EUT was setup to maximum output power as its lowest and highest channel with all bandwidth, modulation and RB configurations.

## Test results
## Test mode: LTE Band 26

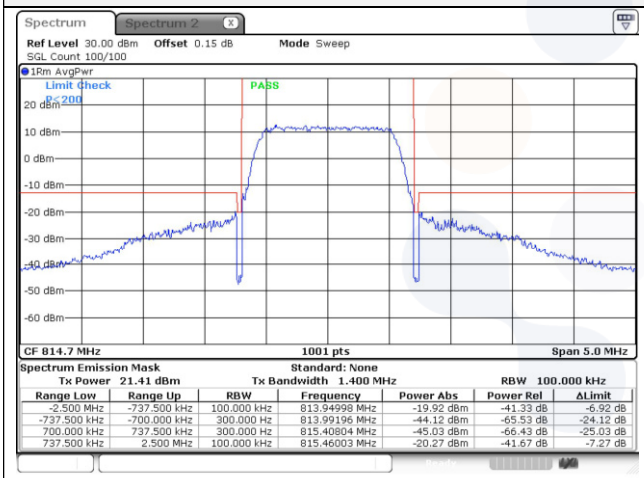
### 1.4M BW QPSK Low ch. 1RB



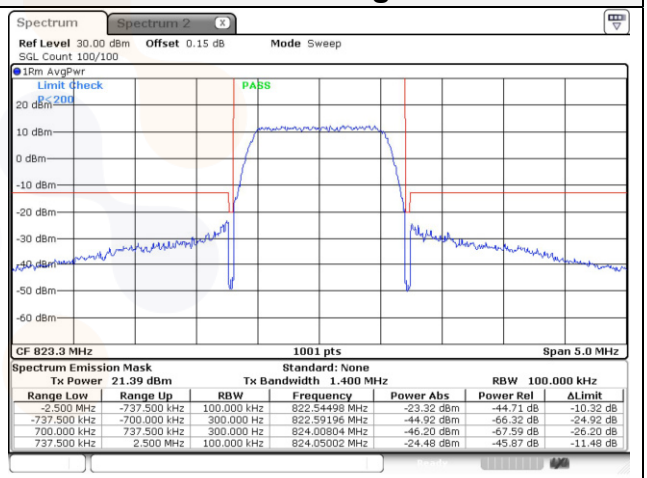

### 1.4M BW QPSK High ch. 1RB



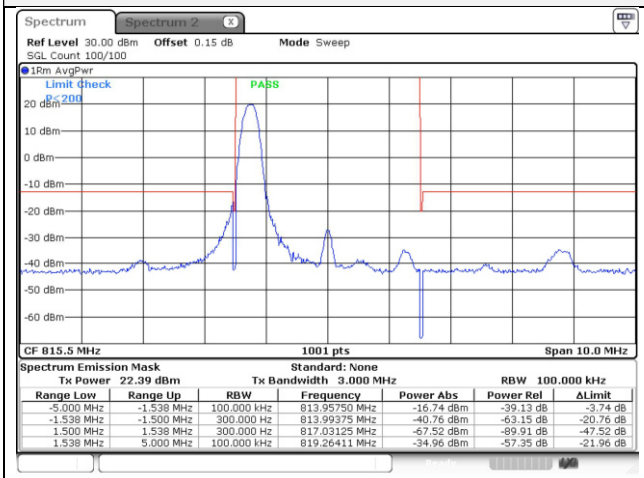

### 1.4M BW QPSK Low ch. FRB



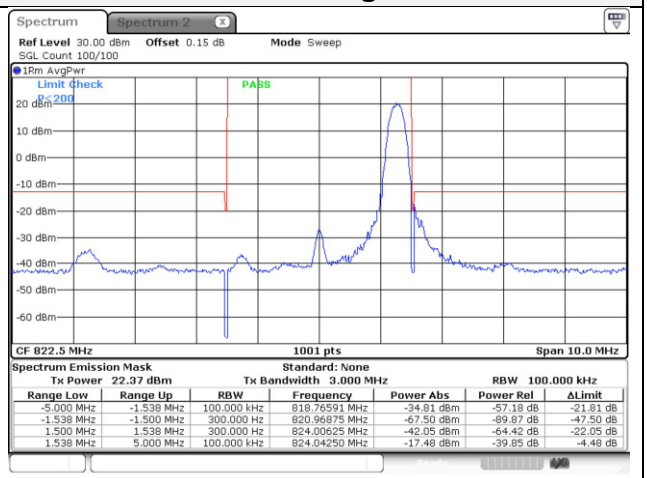

### 1.4M BW QPSK High ch. FRB



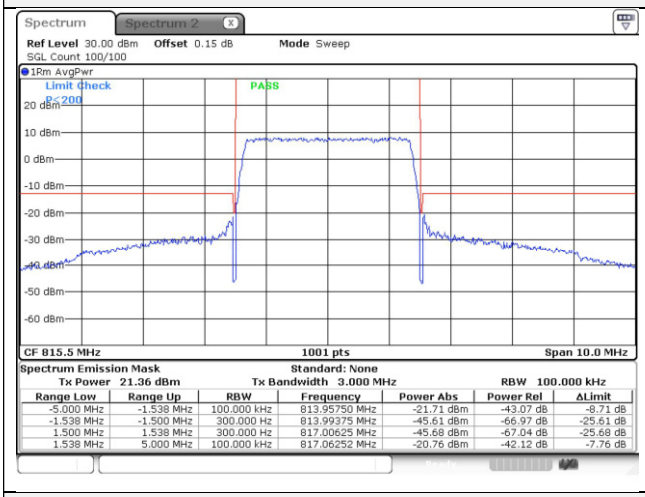

### 3M BW QPSK Low ch. 1RB




### 3M BW QPSK High ch. 1RB

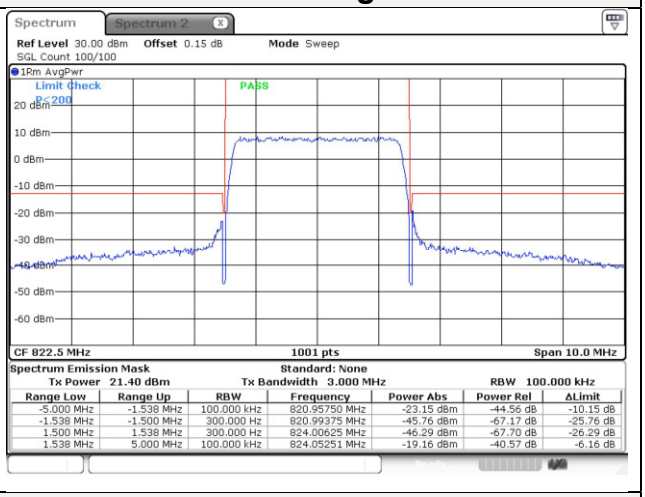


## 3M BW QPSK Low ch. FRB



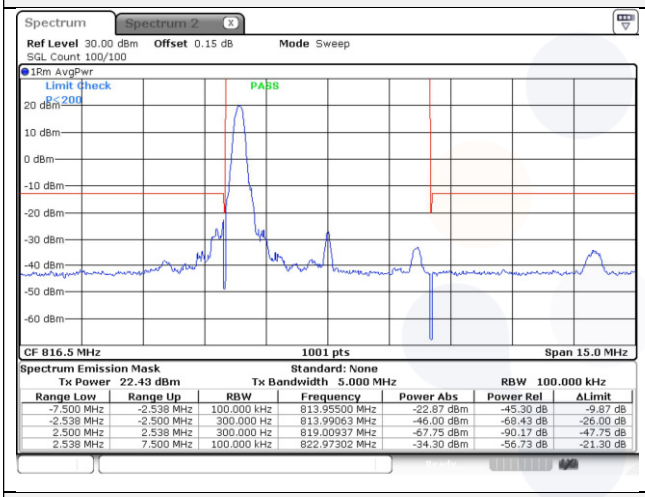

| Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit |
|---|---|---|---|---|---|---|
| -5.000 MHz | -1.538 MHz | 100.000 kHz | 813.95750 MHz | -21.71 dBm | -43.07 dB | -8.71 dB |
| -1.538 MHz | -1.500 MHz | 300.000 Hz | 813.99375 MHz | -45.61 dBm | -66.97 dB | -25.61 dB |
| 1.500 MHz | 1.538 MHz | 300.000 Hz | 817.00625 MHz | -45.68 dBm | -67.04 dB | -25.68 dB |
| 1.538 MHz | 5.000 MHz | 100.000 kHz | 817.06252 MHz | -20.76 dBm | -42.12 dB | -7.76 dB |

## 3M BW QPSK High ch. FRB



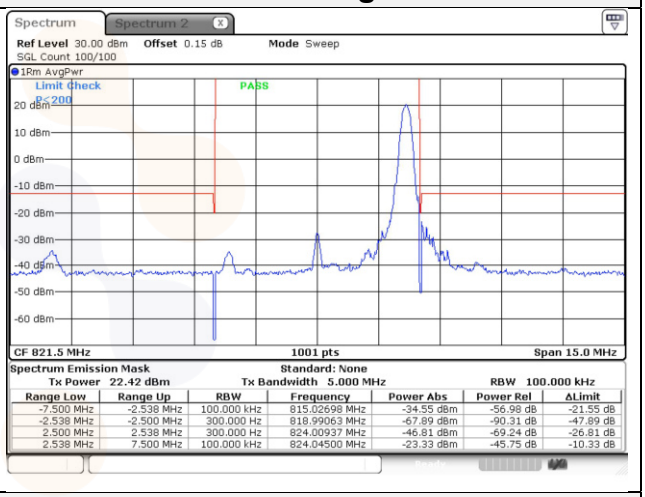

| Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit |
|---|---|---|---|---|---|---|
| -5.000 MHz | -1.538 MHz | 100.000 kHz | 820.95750 MHz | -23.15 dBm | -44.56 dB | -10.15 dB |
| -1.538 MHz | -1.500 MHz | 300.000 Hz | 820.99375 MHz | -45.76 dBm | -67.17 dB | -25.76 dB |
| 1.500 MHz | 1.538 MHz | 300.000 Hz | 824.00625 MHz | -46.29 dBm | -67.70 dB | -26.29 dB |
| 1.538 MHz | 5.000 MHz | 100.000 kHz | 824.05251 MHz | -19.16 dBm | -40.57 dB | -6.16 dB |

## 5M BW QPSK Low ch. 1RB



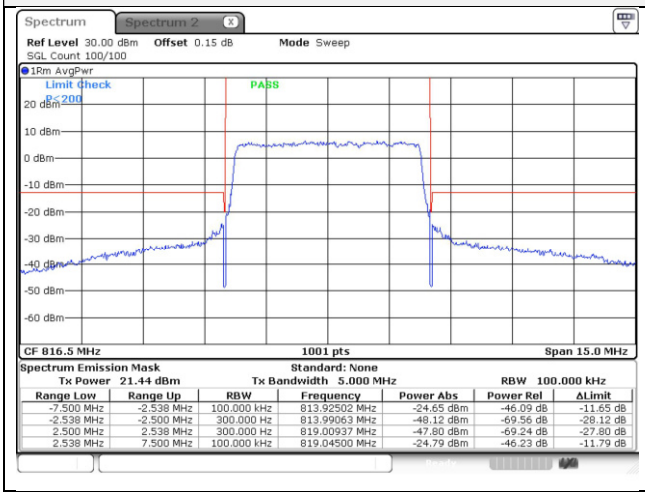

| Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit |
|---|---|---|---|---|---|---|
| -7.500 MHz | -2.538 MHz | 100.000 kHz | 813.95500 MHz | -22.87 dBm | -45.30 dB | -9.87 dB |
| -2.538 MHz | -2.500 MHz | 300.000 Hz | 813.99063 MHz | -46.00 dBm | -68.43 dB | -26.00 dB |
| 2.500 MHz | 2.538 MHz | 300.000 Hz | 819.00937 MHz | -67.75 dBm | -90.17 dB | -47.75 dB |
| 2.538 MHz | 7.500 MHz | 100.000 kHz | 822.97302 MHz | -34.30 dBm | -56.73 dB | -21.30 dB |

## 5M BW QPSK High ch. 1RB



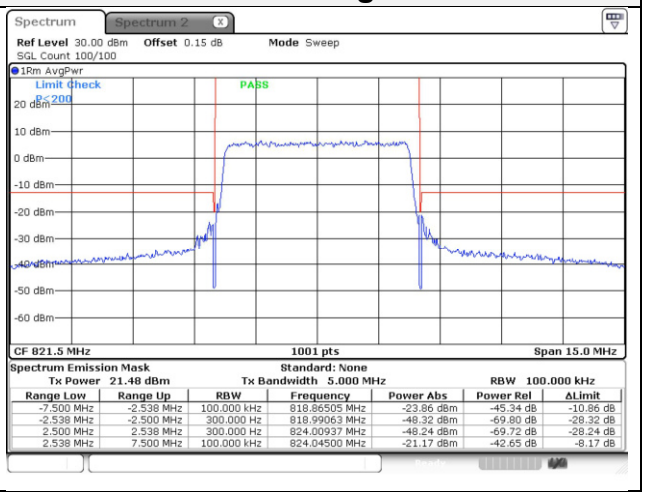

| Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit |
|---|---|---|---|---|---|---|
| -7.500 MHz | -2.538 MHz | 100.000 kHz | 815.02698 MHz | -34.55 dBm | -56.98 dB | -21.55 dB |
| -2.538 MHz | -2.500 MHz | 300.000 Hz | 818.99063 MHz | -67.89 dBm | -90.31 dB | -47.89 dB |
| 2.500 MHz | 2.538 MHz | 300.000 Hz | 824.00937 MHz | -46.81 dBm | -69.24 dB | -26.81 dB |
| 2.538 MHz | 7.500 MHz | 100.000 kHz | 824.04500 MHz | -23.33 dBm | -45.75 dB | -10.33 dB |

## 5M BW QPSK Low ch. FRB



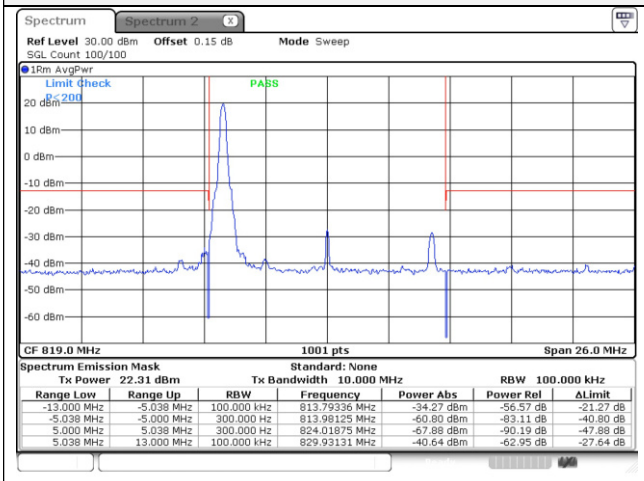

| Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit |
|---|---|---|---|---|---|---|
| -7.500 MHz | -2.538 MHz | 100.000 kHz | 813.92502 MHz | -24.65 dBm | -46.09 dB | -11.65 dB |
| -2.538 MHz | -2.500 MHz | 300.000 Hz | 813.99063 MHz | -48.12 dBm | -69.56 dB | -28.12 dB |
| 2.500 MHz | 2.538 MHz | 300.000 Hz | 819.00937 MHz | -47.80 dBm | -69.24 dB | -27.80 dB |
| 2.538 MHz | 7.500 MHz | 100.000 kHz | 819.04500 MHz | -24.79 dBm | -46.23 dB | -11.79 dB |

## 5M BW QPSK High ch. FRB

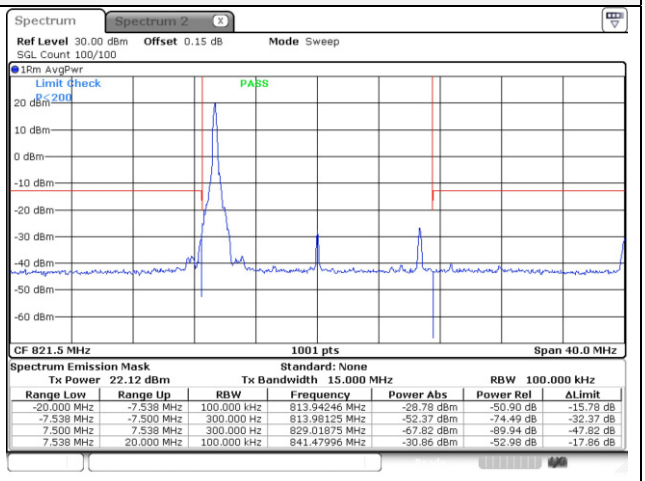



| Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit |
|---|---|---|---|---|---|---|
| -7.500 MHz | -2.538 MHz | 100.000 kHz | 818.86505 MHz | -23.86 dBm | -45.34 dB | -10.86 dB |
| -2.538 MHz | -2.500 MHz | 300.000 Hz | 818.99063 MHz | -48.32 dBm | -69.80 dB | -28.32 dB |
| 2.500 MHz | 2.538 MHz | 300.000 Hz | 824.00937 MHz | -48.24 dBm | -69.72 dB | -28.24 dB |
| 2.538 MHz | 7.500 MHz | 100.000 kHz | 824.04500 MHz | -21.17 dBm | -42.65 dB | -8.17 dB |

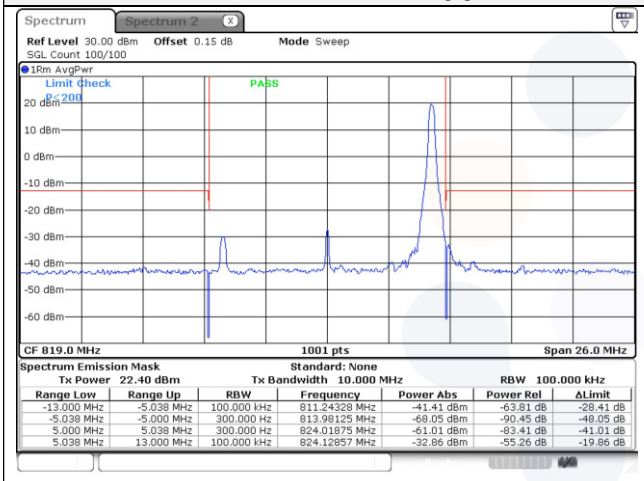
## 10M BW QPSK Mid ch. Lower 1RB



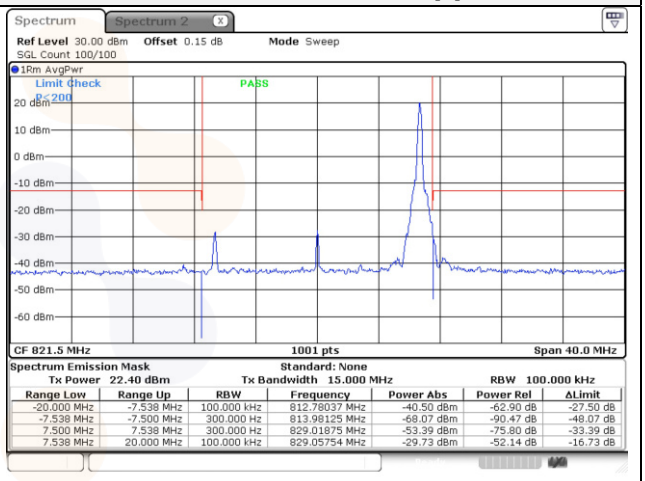

## 15M BW QPSK Mid ch. Lower 1RB



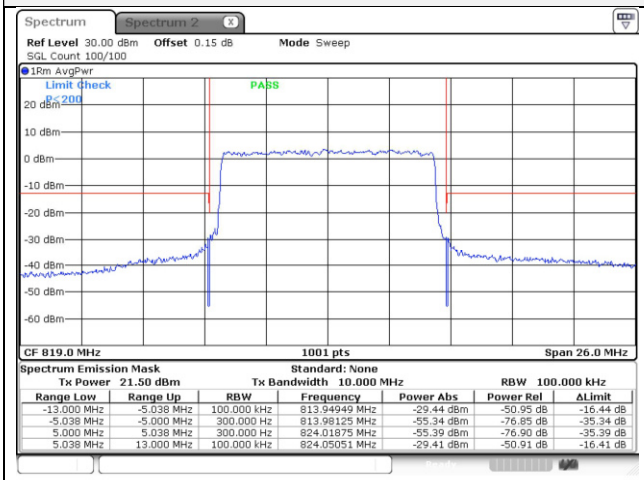

## 10M BW QPSK Mid ch. Upper 1RB



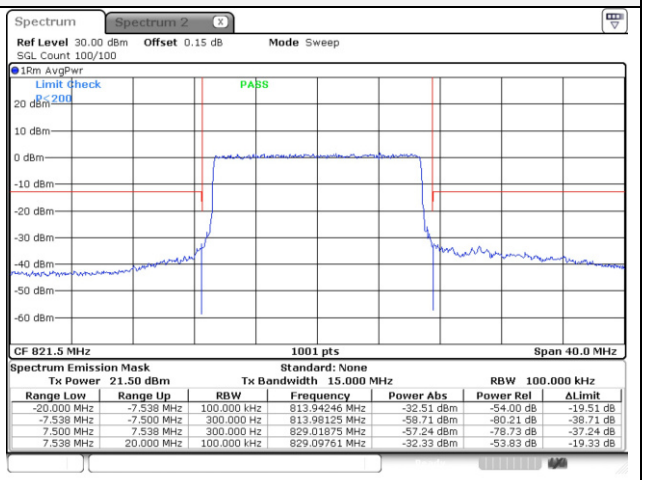

## 15M BW QPSK Mid ch. Upper 1RB




## 10M BW QPSK Mid ch. FRB

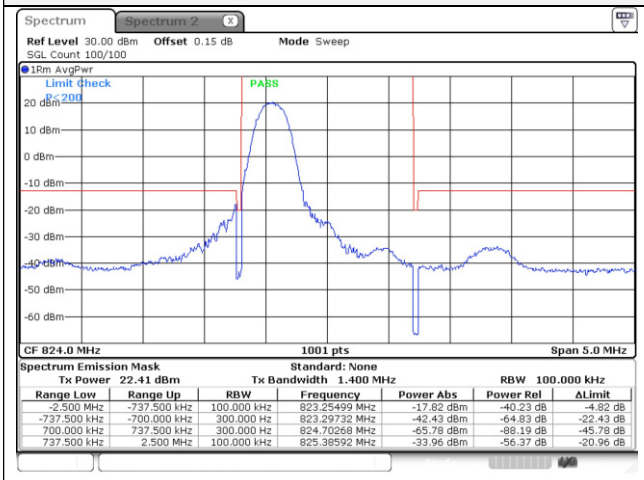



## 15M BW QPSK Mid ch. FRB

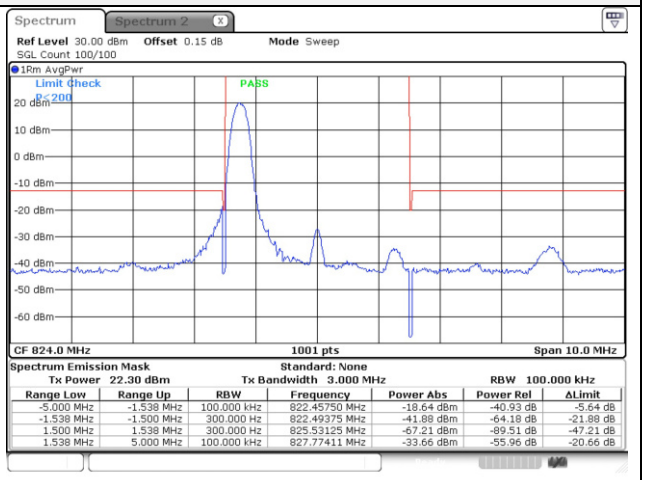


## Straddle channel

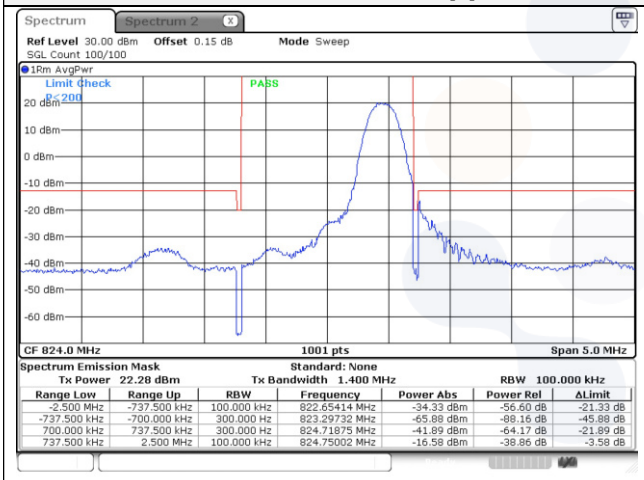
### 1.4M BW QPSK Mid ch. Lower 1RB



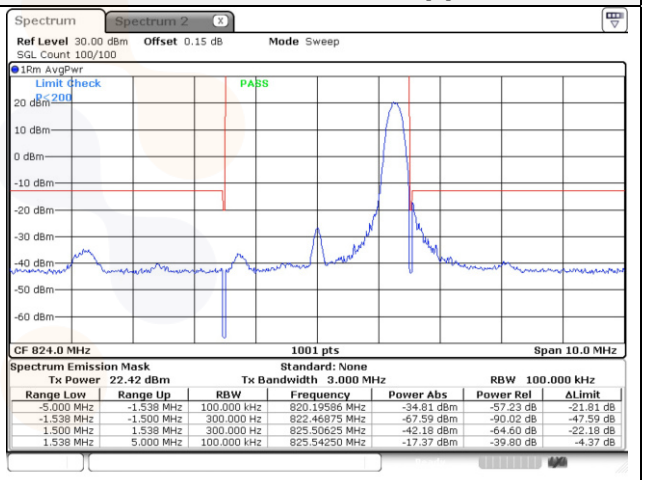

### 3M BW QPSK Mid ch. Lower 1RB



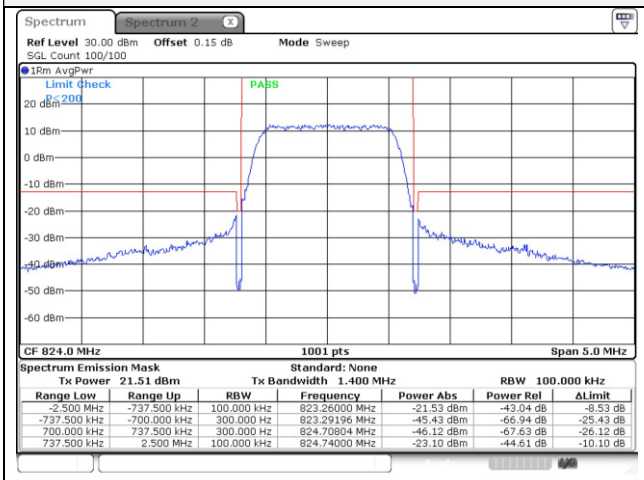

### 1.4M BW QPSK Mid ch. Upper 1RB



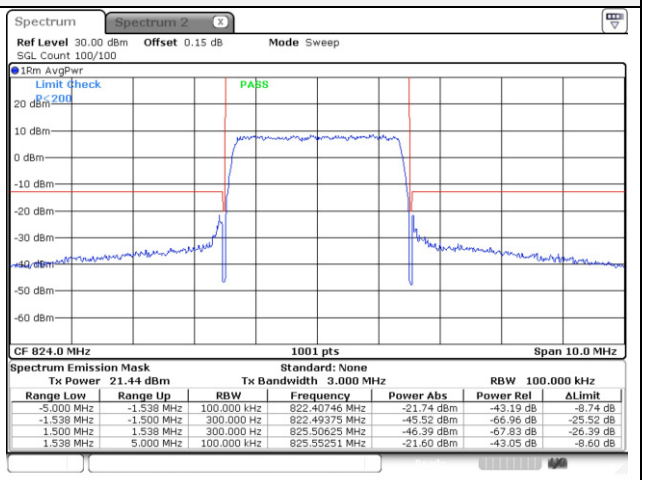

### 3M BW QPSK Mid ch. Upper 1RB



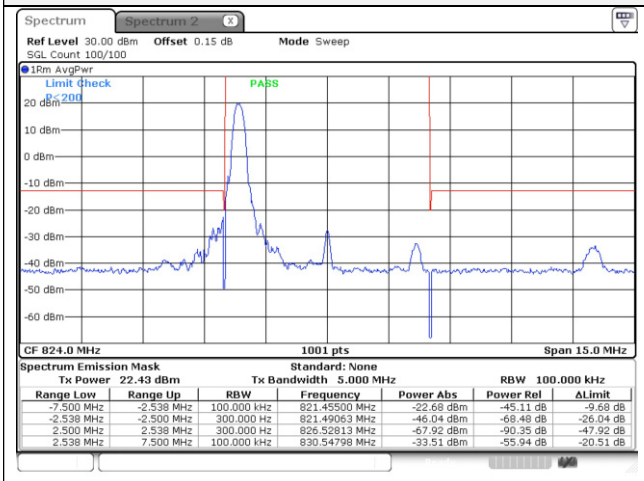

### 1.4M BW QPSK Mid ch. FRB




### 3M BW QPSK Mid ch. FRB

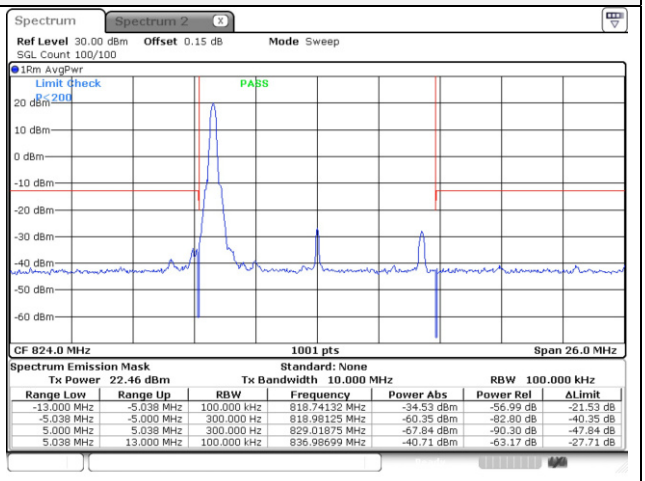


## 5M BW QPSK Mid ch. Lower 1RB



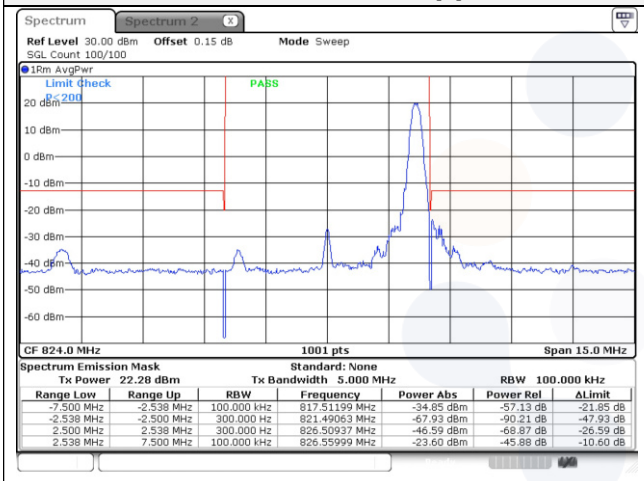

| Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit |
|---|---|---|---|---|---|---|
| -7.500 MHz | -2.538 MHz | 100.000 kHz | 821.45500 MHz | -22.68 dBm | -45.11 dB | -9.68 dB |
| -2.538 MHz | -2.500 MHz | 300.000 Hz | 821.49063 MHz | -46.04 dBm | -68.48 dB | -26.04 dB |
| 2.500 MHz | 2.538 MHz | 300.000 Hz | 826.52813 MHz | -67.92 dBm | -90.35 dB | -47.92 dB |
| 2.538 MHz | 7.500 MHz | 100.000 kHz | 830.54798 MHz | -33.51 dBm | -55.94 dB | -20.51 dB |

## 10M BW QPSK Mid ch. Lower 1RB



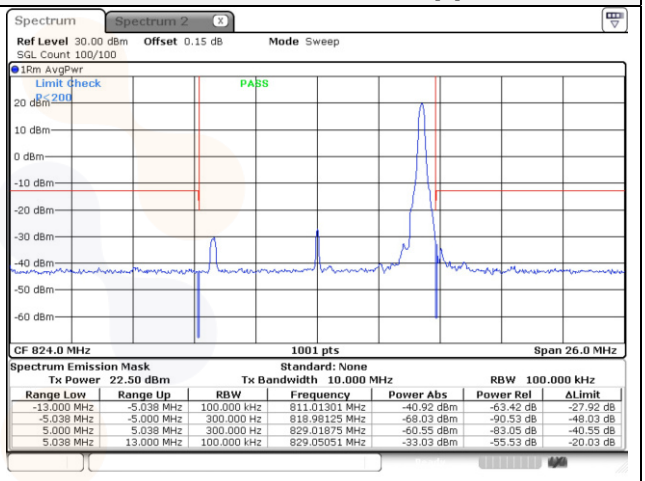

| Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit |
|---|---|---|---|---|---|---|
| -13.000 MHz | -5.038 MHz | 100.000 kHz | 818.74132 MHz | -34.53 dBm | -56.99 dB | -21.53 dB |
| -5.038 MHz | -5.000 MHz | 300.000 Hz | 818.98125 MHz | -60.35 dBm | -82.80 dB | -40.35 dB |
| 5.000 MHz | 5.038 MHz | 300.000 Hz | 829.01875 MHz | -67.84 dBm | -90.30 dB | -47.84 dB |
| 5.038 MHz | 13.000 MHz | 100.000 kHz | 836.98699 MHz | -40.71 dBm | -63.17 dB | -27.71 dB |

## 5M BW QPSK Mid ch. Upper 1RB



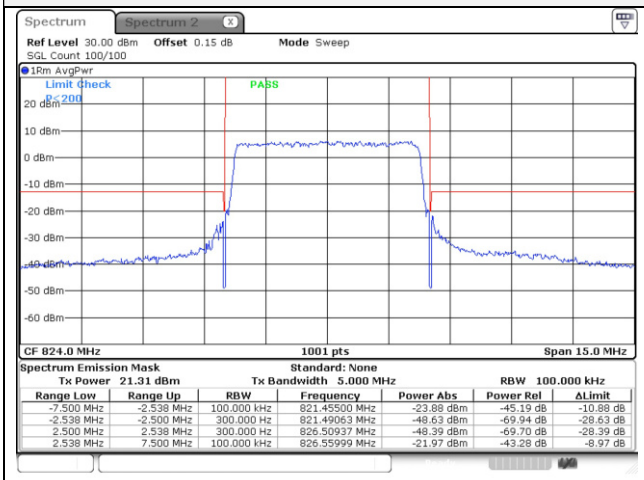

| Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit |
|---|---|---|---|---|---|---|
| -7.500 MHz | -2.538 MHz | 100.000 kHz | 817.51199 MHz | -34.85 dBm | -57.13 dB | -21.85 dB |
| -2.538 MHz | -2.500 MHz | 300.000 Hz | 821.49063 MHz | -67.93 dBm | -90.21 dB | -47.93 dB |
| 2.500 MHz | 2.538 MHz | 300.000 Hz | 826.50937 MHz | -46.59 dBm | -68.87 dB | -26.59 dB |
| 2.538 MHz | 7.500 MHz | 100.000 kHz | 826.55999 MHz | -23.60 dBm | -45.88 dB | -10.60 dB |

## 10M BW QPSK Mid ch. Upper 1RB



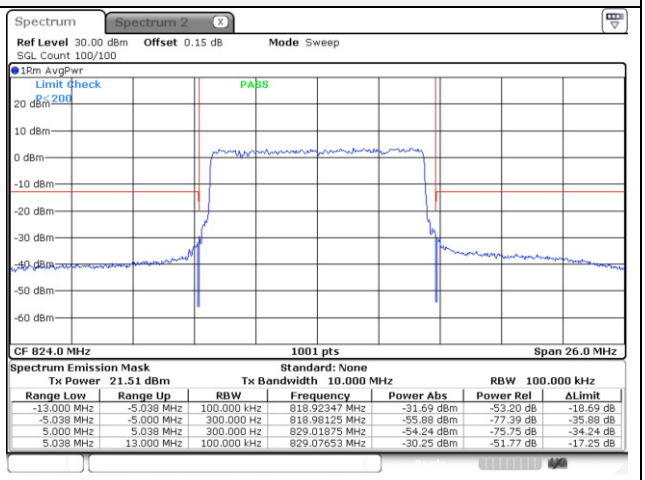

| Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit |
|---|---|---|---|---|---|---|
| -13.000 MHz | -5.038 MHz | 100.000 kHz | 811.01301 MHz | -40.92 dBm | -63.42 dB | -27.92 dB |
| -5.038 MHz | -5.000 MHz | 300.000 Hz | 818.98125 MHz | -68.03 dBm | -90.53 dB | -48.03 dB |
| 5.000 MHz | 5.038 MHz | 300.000 Hz | 829.01875 MHz | -60.55 dBm | -83.05 dB | -40.55 dB |
| 5.038 MHz | 13.000 MHz | 100.000 kHz | 829.05051 MHz | -33.03 dBm | -55.53 dB | -20.03 dB |

## 5M BW QPSK Mid ch. FRB

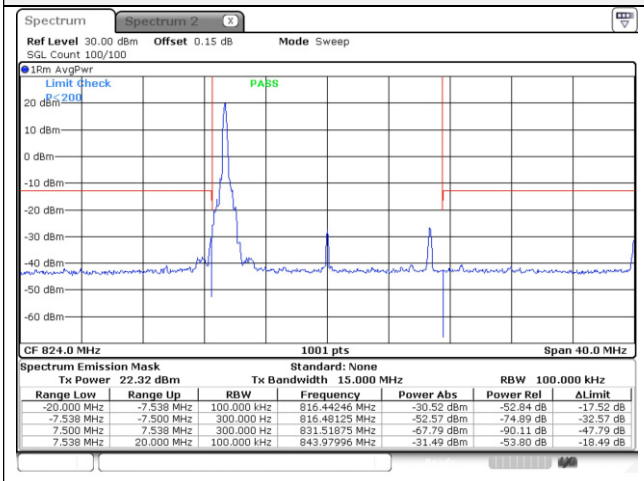
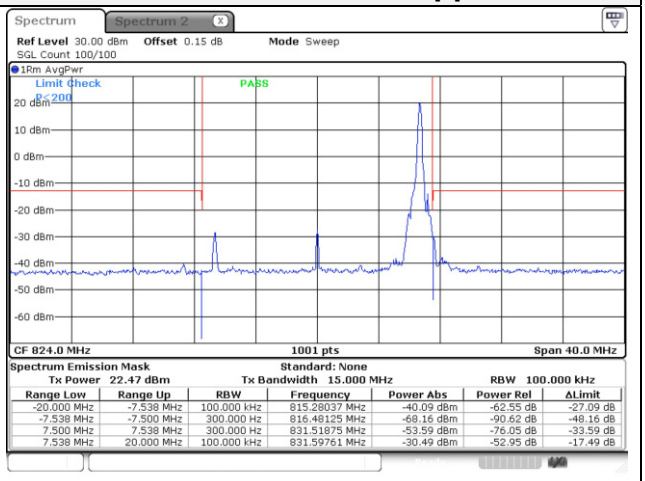
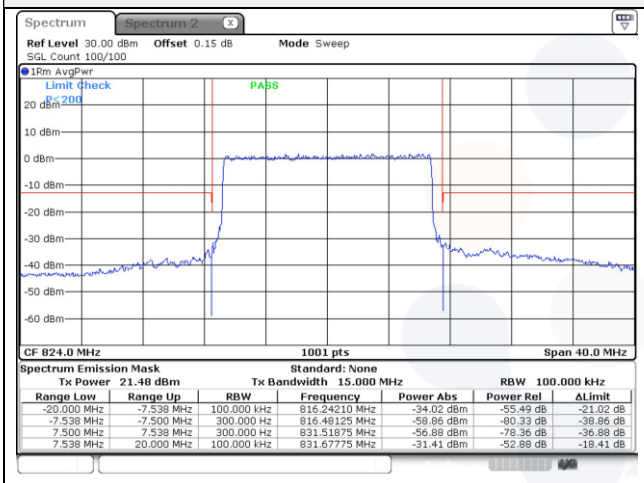



| Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit |
|---|---|---|---|---|---|---|
| -7.500 MHz | -2.538 MHz | 100.000 kHz | 821.45500 MHz | -23.88 dBm | -45.19 dB | -10.88 dB |
| -2.538 MHz | -2.500 MHz | 300.000 Hz | 821.49063 MHz | -48.63 dBm | -69.94 dB | -28.63 dB |
| 2.500 MHz | 2.538 MHz | 300.000 Hz | 826.50937 MHz | -48.39 dBm | -69.70 dB | -28.39 dB |
| 2.538 MHz | 7.500 MHz | 100.000 kHz | 826.55999 MHz | -21.97 dBm | -43.28 dB | -8.97 dB |

## 10M BW QPSK Mid ch. FRB

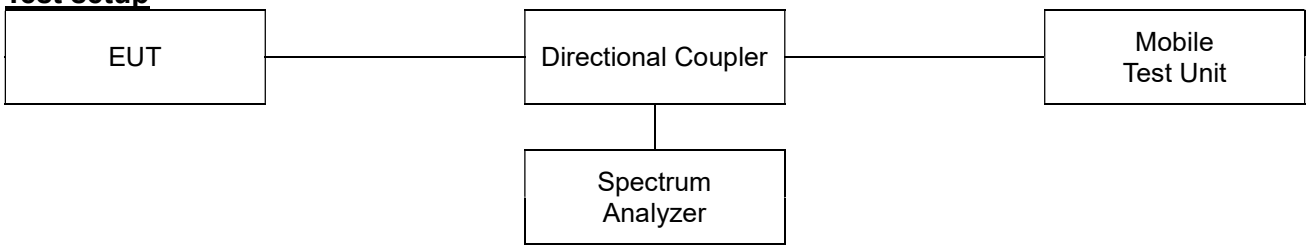



| Range Low | Range Up | RBW | Frequency | Power Abs | Power Rel | ΔLimit |
|---|---|---|---|---|---|---|
| -13.000 MHz | -5.038 MHz | 100.000 kHz | 818.92347 MHz | -31.69 dBm | -53.20 dB | -18.69 dB |
| -5.038 MHz | -5.000 MHz | 300.000 Hz | 818.98125 MHz | -55.88 dBm | -77.39 dB | -35.88 dB |
| 5.000 MHz | 5.038 MHz | 300.000 Hz | 829.01875 MHz | -54.24 dBm | -75.75 dB | -34.24 dB |
| 5.038 MHz | 13.000 MHz | 100.000 kHz | 829.07653 MHz | -30.25 dBm | -51.77 dB | -17.25 dB |

| 15M BW QPSK Mid ch. Lower 1RB | 15M BW QPSK Mid ch. Upper 1RB |
|---|---|
|  |  |
| **15M BW QPSK Mid ch. FRB** | **-** |
|  | Blank |

## 7.4. Spurious Emissions at Antenna Terminal

**Test setup**




**Limit**

According to §90.691(a), Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee’s frequency block by up to and including 37.5 ㎑, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 $Log_{10}$(f/6.1) decibels or 50 + 10$Log_{10}$(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz where f is greater than 12.5 ㎑.

(2) For any frequency removed from the EA licensee’s frequency block greater than 37.5 ㎑, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10$Log_{10}$(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 ㎑.

**Test procedure**

971168 D01 v03r01 - Section 6
ANSI 63.26-2015 – Section 5.7

**Test settings**

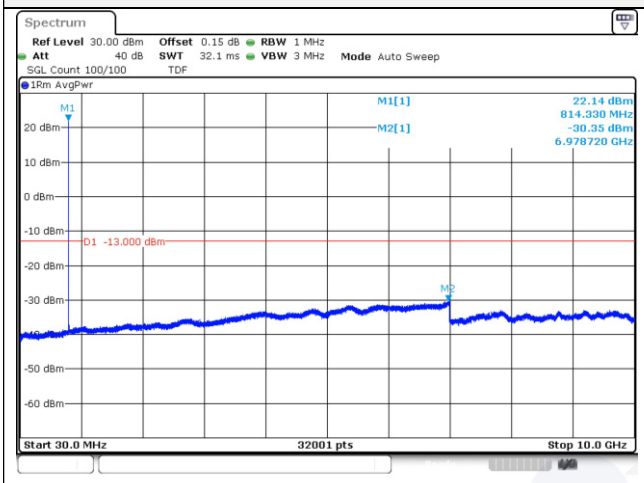
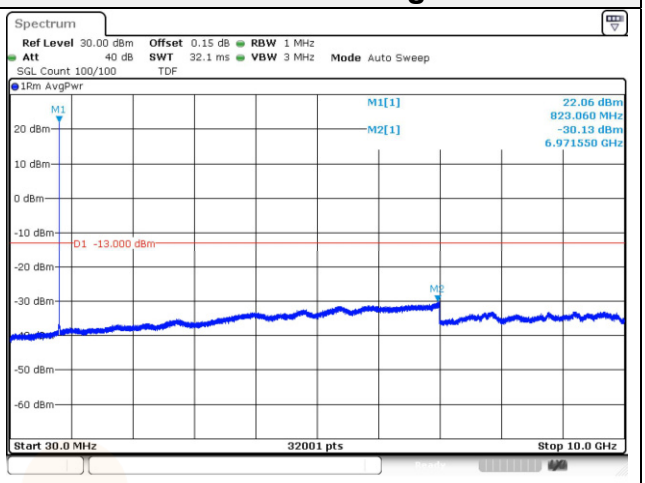
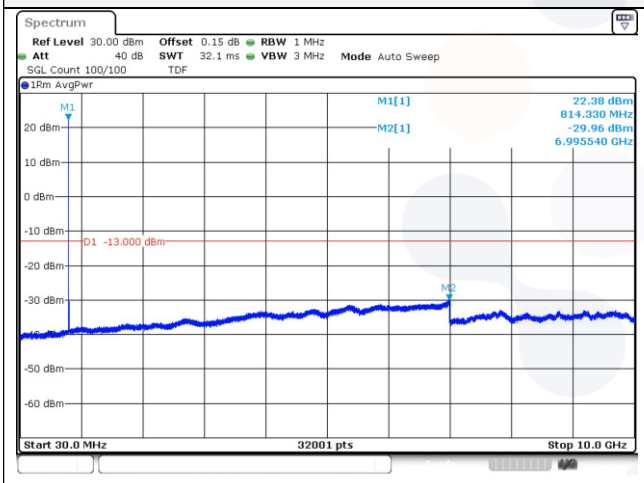
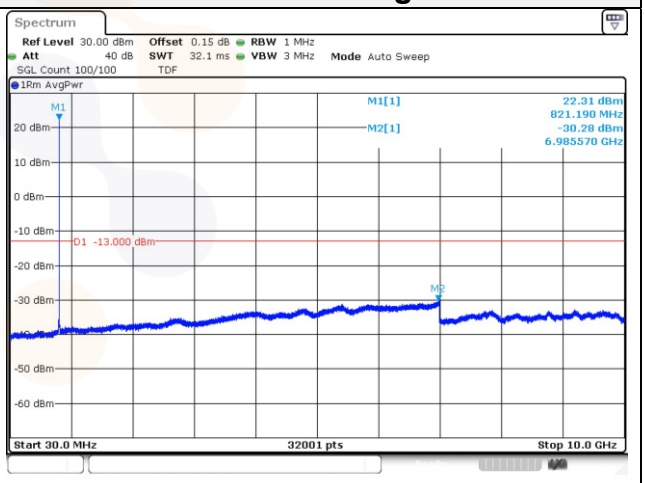
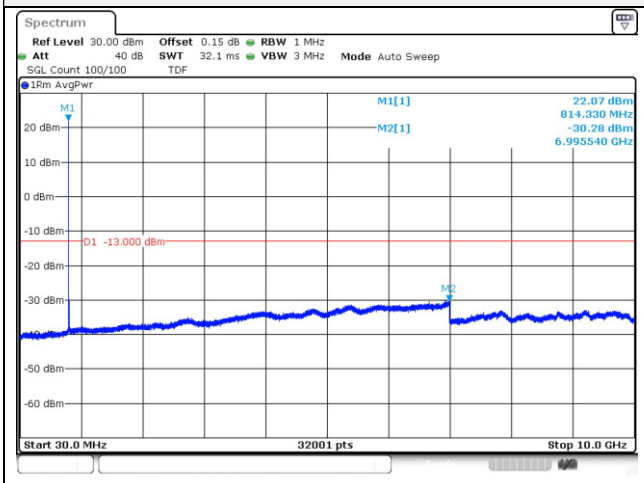
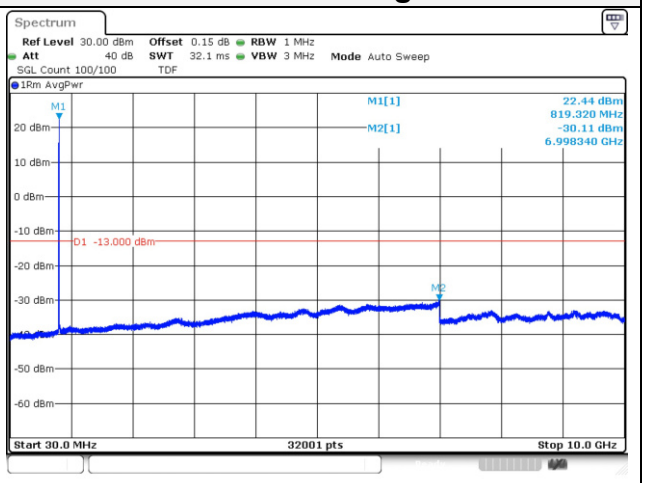
1) Start frequency was set to 30 ㎒ and stop frequency was set to at least 10th the fundamental frequency.
2) Detector = RMS
3) Sweep time = auto couple.
4) Trace mode = trace average
5) Allow trace to fully stabilize.
6) Please see test notes below RBW and VBW settings.

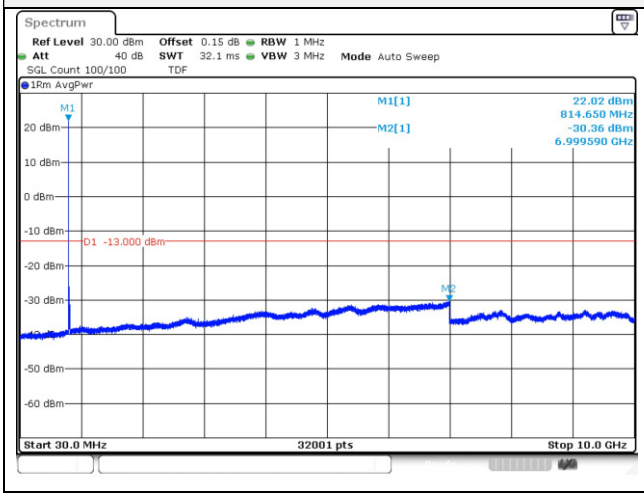
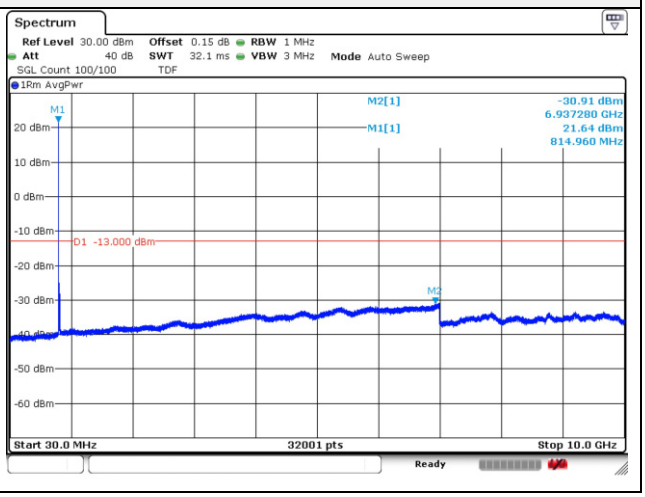
**Notes:**

1. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 100 ㎑ or greater for frequencies less than 1 ㎓ and 1 ㎒ or greater for frequencies greater than 1 ㎓.
   The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 ㏈ below the transmitter power.

## Test results

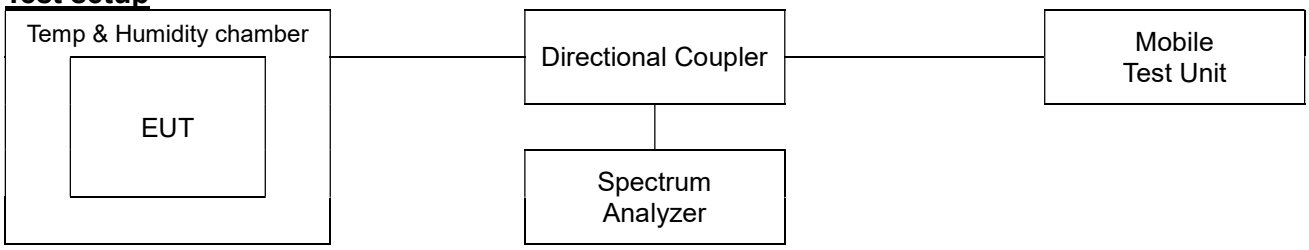
### Test mode: LTE Band 26

| 1.4M BW QPSK Low ch. | 1.4M BW QPSK High ch. |
|---|---|
|  |  |
| **3M BW QPSK Low ch.** | **3M BW QPSK High ch.** |
|  |  |
| **5M BW QPSK Low ch.** | **5M BW QPSK High ch.** |
|  |  |

| 10M BW QPSK Mid ch. | 15M BW QPSK Mid ch. |
|---|---|
|  |  |

## 7.5. Frequency stability

**Test setup**




**Limit**

**According to §2.1055(a),**

The frequency stability shall be measured with variation of ambient temperature as follows:

1) From -30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.
2) From -20° to + 50° centigrade for equipment to be licensed for use in the maritime services under part 80 of this chapter, except for class A, B, and S emergency position indicating Radiobeacons (EPIRBS), and equipment to be licensed for use above 952 ㎒ at operational fixed stations in all services, stations in the local television transmission service and point-to-point microwave radio service under part 21 of this chapter, equipment licensed for use aboard aircraft in the aviation services under part 87 of this chapter, and equipment authorized for use in the family radio service under part 95 of this chapter.
3) From 0° to + 50° centigrade for equipment to be licensed for use in the radio broadcast Services under part 73 of this chapter.

**According to §2.1055(d),**

The frequency stability shall be measured with variation of primary supply Voltage as follows:

1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating and point which shall be specified by the manufacturer.
3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

**According to §90.213**

For mobile devices operating in the 809 to 824 ㎒ band at a power level 2 Watts or less, the limit specified in Table is ±2.5 ppm.

**Test procedure**

ANSI 63.26-2015 – Section 5.6

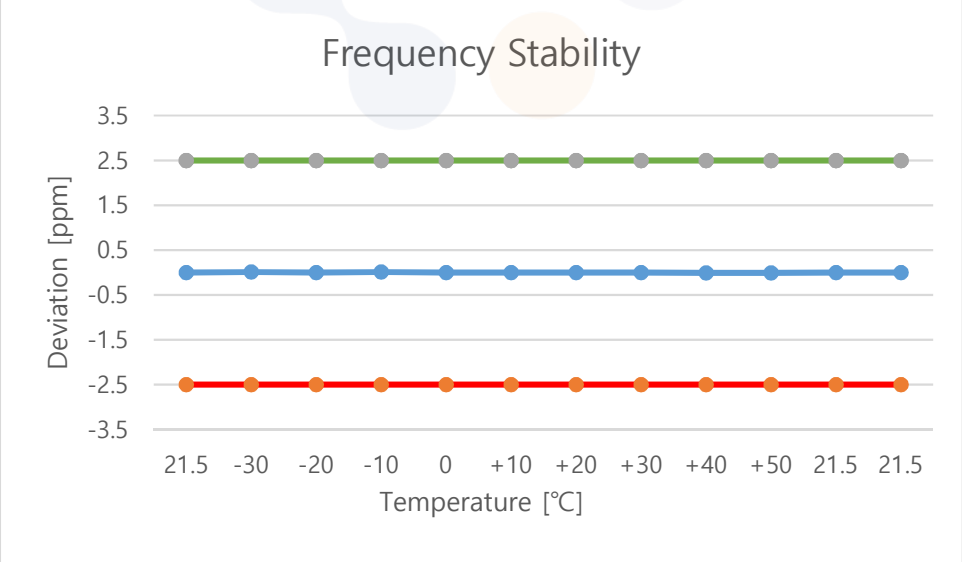
**Test settings**

1) The carrier frequency of the transmitter is measured at room temperature. (20°C to provide a reference)
2) The equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3) Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each Temperature level.

**Test results**

Test mode : LTE Band 26
Frequency (㎐) : 823 300 000
Channel : 26783
Deviation limit(FCC) : ±0.00025% or 2.5ppm

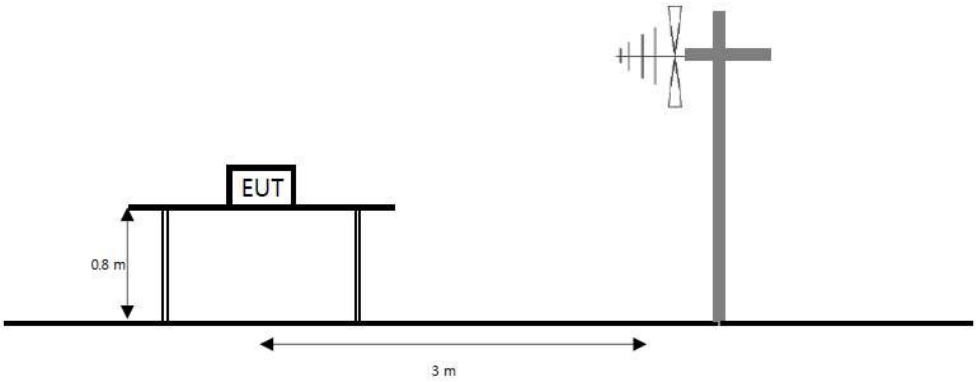
| Voltage (%) | Power (V) | Temp. (°C) | Frequency (㎐) | Frequency error (㎐) | Deviation | |
|---|---|---|---|---|---|---|
| | | | | | (ppm) | (%) |
| 100% | 3.88 | +21.5(Ref) | 823,299,998 | -1.57 | 0.0 | 0.000000 |
| | | -30 | 823,300,005 | 5.01 | 0.0 | 0.000001 |
| | | -20 | 823,300,004 | 3.74 | 0.0 | 0.000000 |
| | | -10 | 823,300,004 | 4.36 | 0.0 | 0.000001 |
| | | 0 | 823,300,003 | 3.02 | 0.0 | 0.000000 |
| | | +10 | 823,300,002 | 2.28 | 0.0 | 0.000000 |
| | | +20 | 823,300,001 | 1.11 | 0.0 | 0.000000 |
| | | +30 | 823,299,996 | -3.96 | 0.0 | 0.000000 |
| | | +40 | 823,299,994 | -6.45 | 0.0 | -0.000001 |
| | | +50 | 823,299,993 | -6.83 | 0.0 | -0.000001 |
| 115% | 4.46 | +21.5(Ref) | 823,300,000 | -0.39 | 0.0 | 0.000000 |
| End point | 3.40 | +21.5(Ref) | 823,300,000 | 0.23 | 0.0 | 0.000000 |



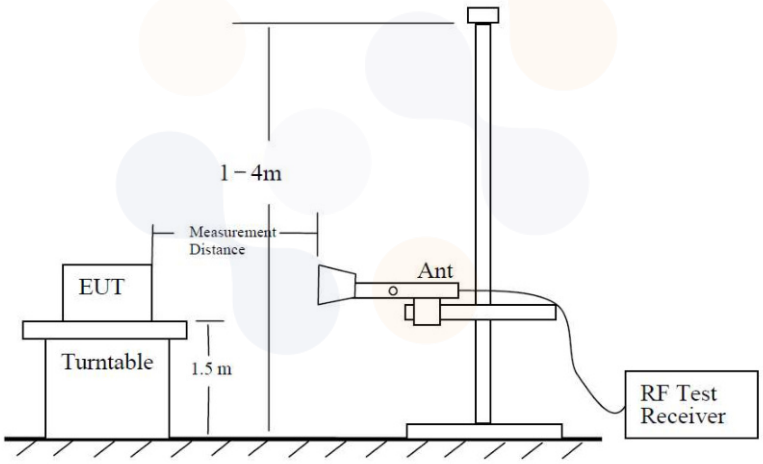
## 7.6. Radiated Power (ERP/EIRP)

**Test setup**

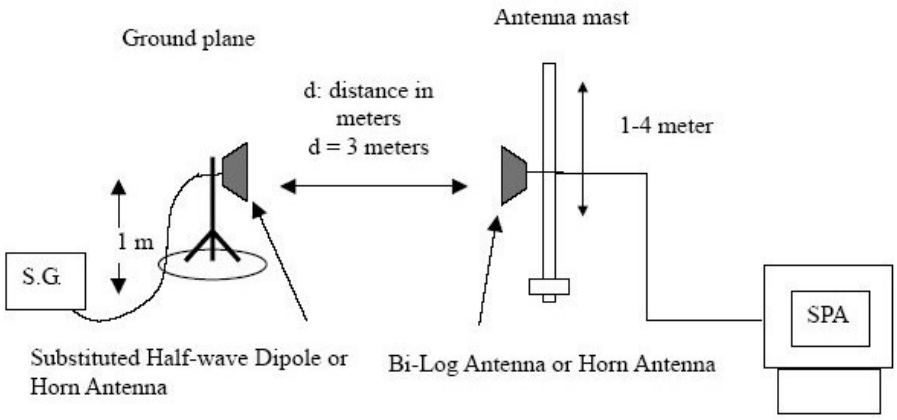
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.




The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to the tenth harmonic of the highest fundamental frequency or to 40 ㎓ emissions, whichever is lower.




The diagram below shows the test setup for substituted method.



**Limit**

According to §90.635(b), the maximum output power of the transmitter for mobile stations is 100 watts(20 dBw).

**Test procedure**

971168 D01 v03r01 - Section 5.2 and 5.8
ANSI 63.26-2015 – Section 5.2
ANSI/TIA-603-E-2016 - Section 2.2.17

**Test settings**

1) RBW = 1 % to 5 % of the OBW.
2) VBW ≥ 3 × RBW.
3) SPAN = 2 × to 3 × the OBW.
4) Number of measurement points in sweep ≥ 2 × span / RBW.
5) Sweep time :
   1) Auto couple, or
   2) ≥ [10 × (number of points in sweep) × (transmission period)] for single sweep (automation-compatible) measurement. Transmission period is the on and off time of the transmitter.
6) Detector = RMS
7) If the EUT can be configured to transmit continuously, then set the trigger to free run.
8) If the EUT cannot be configured to transmit continuously, then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Verify that the sweep time is less than or equal to the transmission burst duration. Time gating can also be used under similar constraints (i.e., configured such that measurement data is collected only during active full -power transmissions).
9) Trace mode = trace averaging (RMS) over 100 sweeps.
10) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
11) Allow trace to fully stabilize.

**Notes:**

1. On a test site, the EUT shall be placed at 80 cm or 1.5 m height on a turn table, and in the position close to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to Correspond to the fundamental frequency of the transmitter.
3. The turntable is rotated through 360°, and the receiving antenna scans in order to determine the Level of the maximized emission.
4. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
5. The maximum signal level detected by the measuring receiver shall be noted.
6. The EUT was replaced by half-wave dipole (1 ㎓ below) or horn antenna (1 ㎓ above) connected to a signal generator.
   The power is calculated by the following formula;
   Pd(㏈m) = Pg(㏈m) – Cable loss (㏈) + Antenna gain (㏈)
   Note. Pd is the dipole equivalent power and Pg is the generator output power into the substitution antenna.
7. The test antenna shall be raised and lowered through the specified range of height to ensure that The maximum signal is received.
8. The input signal to the substitution antenna shall be adjusted to the level that produces a level Detected by the measuring corrected for the change of input attenuator setting of the measuring Receiver.
9. The input level to the substitution antenna shall be recorded as power level in ㏈m, corrected for Any change of input attenuator setting of the measuring receiver.
10. The measurement shall be repeated with the test antenna and the substitution antenna Orientated for horizontal polarization.

## Test results

### Test mode: LTE Band 26

| Bandwidth | Modulation | Frequency | Pol. | Antenna Gain | C.L | Substitute Level | ERP | |
|---|---|---|---|---|---|---|---|---|
| | | [㎒] | [V/H] | [dBd] | [dB] | [dBm] | [dBm] | [W] |
| 1.4 M | QPSK | 814.7 | H | 4.99 | 2.74 | 13.36 | 15.61 | 0.036 |
| | | 823.3 | H | 5.20 | 2.67 | 12.96 | 15.49 | 0.035 |
| | 16QAM | 814.7 | H | 4.99 | 2.74 | 12.15 | 14.40 | 0.028 |
| | | 823.3 | H | 5.20 | 2.67 | 11.98 | 14.51 | 0.028 |
| 3 M | QPSK | 815.5 | H | 5.01 | 2.79 | 13.21 | 15.43 | 0.035 |
| | | 822.5 | H | 5.18 | 2.73 | 13.07 | 15.51 | 0.036 |
| | 16QAM | 815.5 | H | 5.01 | 2.79 | 12.20 | 14.42 | 0.028 |
| | | 822.5 | H | 5.18 | 2.73 | 12.07 | 14.51 | 0.028 |
| 5 M | QPSK | 816.5 | H | 5.03 | 2.58 | 13.26 | 15.71 | 0.037 |
| | | 821.5 | H | 5.15 | 2.81 | 13.10 | 15.43 | 0.035 |
| | 16QAM | 816.5 | H | 5.03 | 2.58 | 12.19 | 14.64 | 0.029 |
| | | 821.5 | H | 5.15 | 2.81 | 12.07 | 14.40 | 0.028 |
| 10 M | QPSK | 819.0 | H | 5.08 | 2.81 | 13.30 | 15.57 | 0.036 |
| | 16QAM | 819.0 | H | 5.08 | 2.81 | 12.12 | 14.39 | 0.027 |
| 15 M | QPSK | 821.5 | H | 5.15 | 2.81 | 13.18 | 15.51 | 0.036 |
| | 16QAM | 821.5 | H | 5.15 | 2.81 | 12.06 | 14.39 | 0.027 |

### Straddle channel

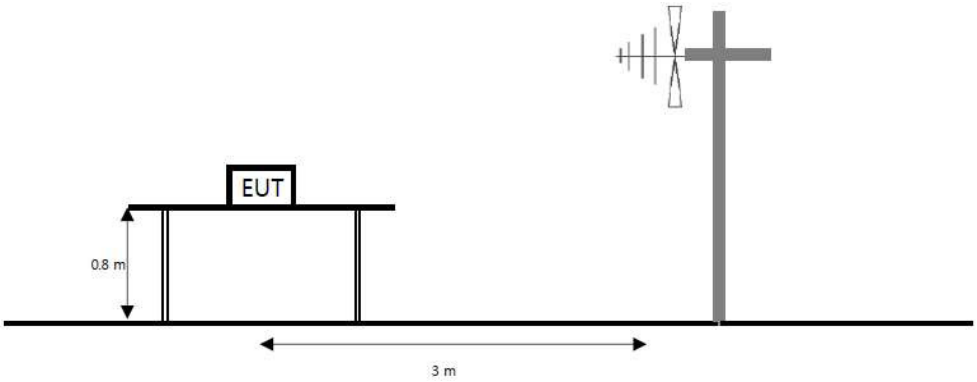
| Bandwidth | Modulation | Frequency | Pol. | Antenna Gain | C.L | Substitute Level | ERP | |
|---|---|---|---|---|---|---|---|---|
| | | [㎒] | [V/H] | [dBd] | [dB] | [dBm] | [dBm] | [W] |
| 1.4 M | QPSK | 824.0 | H | 5.22 | 2.68 | 13.20 | 15.74 | 0.037 |
| | 16QAM | | H | 5.22 | 2.68 | 12.05 | 14.59 | 0.029 |
| 3 M | QPSK | | H | 5.22 | 2.68 | 13.14 | 15.68 | 0.037 |
| | 16QAM | | H | 5.22 | 2.68 | 12.05 | 14.59 | 0.029 |
| 5 M | QPSK | | H | 5.22 | 2.68 | 13.23 | 15.77 | 0.038 |
| | 16QAM | | H | 5.22 | 2.68 | 12.23 | 14.77 | 0.030 |
| 10 M | QPSK | | H | 5.22 | 2.68 | 13.18 | 15.72 | 0.037 |
| | 16QAM | | H | 5.22 | 2.68 | 11.90 | 14.44 | 0.028 |
| 15 M | QPSK | | H | 5.22 | 2.68 | 13.17 | 15.71 | 0.037 |
| | 16QAM | | H | 5.22 | 2.68 | 11.87 | 14.41 | 0.028 |

Note.
1. E.R.P & E.I.R.P(㏈m) = Substitute Level(㏈) + Antenna gain(㏈i&㏈d) - C.L(Cable loss) (㏈)

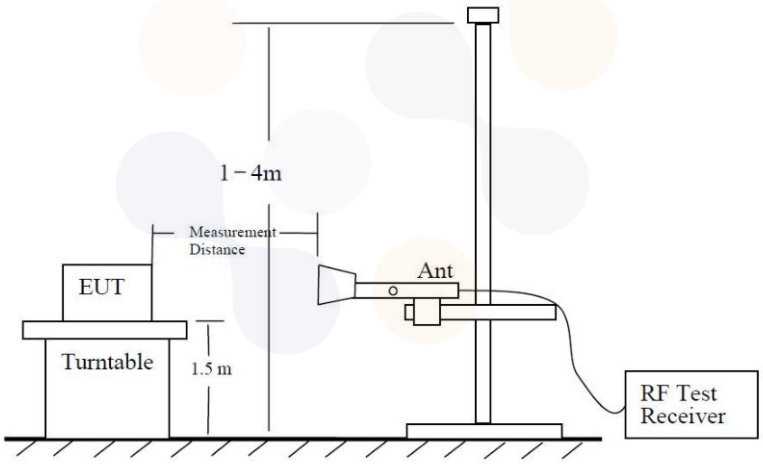
## 7.7. Radiated Spurious Emissions

**Test setup**

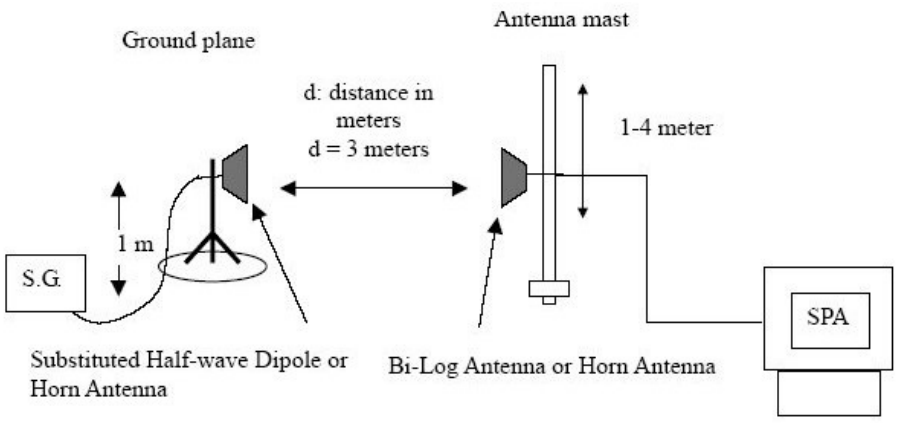
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.




The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to the tenth harmonic of the highest fundamental frequency or to 40 ㎓ emissions, whichever is lower.




The diagram below shows the test setup for substituted method.



**Limit**

According to §90.691(a), Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee’s frequency block by up to and including 37.5 ㎑, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 $Log_{10}(f/6.1)$ decibels or 50 + $10Log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz where f is greater than 12.5 ㎑.

(2) For any frequency removed from the EA licensee’s frequency block greater than 37.5 ㎑, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + $10Log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 ㎑.

**Test procedure**

971168 D01 v03r01 - Section 6.2
ANSI 63.26-2015 – Section 5.5
ANSI/TIA-603-E-2016 - Section 2.2.12

**Test settings**

1) RBW = 1 ㎑ for below 1 ㎓ and 1 ㎒ for above 1 ㎓.
2) VBW ≥ 3 × RBW.
3) Detector = RMS
4) Trace mode = Max hold
5) Sweep time = Auto couple
6) Number of sweep points ≥ 2 × span / RBW
7) Allow trace to fully stabilize.

**Notes:**

1. On a test site, the EUT shall be placed at 80 cm or 1.5 m height on a turn table, and in the position close to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m from EUT to correspond to the fundamental frequency of the transmitter.
3. The turntable is rotated through 360°, and the receiving antenna scans in order to determine the level of the maximized emission.
4. The test antenna shall be raised and lowered again through the specified range of height until the maximum signal level is detected by the measuring receiver.
5. The maximum signal level detected by the measuring receiver shall be noted.
6. The EUT was replaced by half-wave dipole (1 ㎓ below) or horn antenna (1 ㎓ above) connected to a signal generator.
7. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
8. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring corrected for the change of input attenuator setting of the measuring receiver.
9. The input level to the substitution antenna shall be recorded as power level in ㏈m, corrected for any change of input attenuator setting of the measuring receiver.
10. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

**Test results (Above 1 000 ㎒)**

Test mode : LTE Band 26
Frequency(㎒) : 816.5
Channel : 26715
Bandwidth(㎒) : 5

| Mode | Frequency | Pol. | Antenna Gain | Cable loss | Substitute Level | Level | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| | [㎒] | [V/H] | [dBi] | [dB] | [dBm] | [dBm] | [dBm] | [dB] |
| QPSK | 1 633.60 | V | 6.03 | 4.98 | -61.05 | -60.00 | -13.00 | 47.00 |
| | 2 447.20 | V | 6.10 | 5.95 | -58.15 | -58.00 | -13.00 | 45.00 |
| | 3 266.40 | V | 7.55 | 6.73 | -57.02 | -56.20 | -13.00 | 43.20 |
| | 4 083.20 | V | 8.97 | 7.34 | -56.43 | -54.80 | -13.00 | 41.80 |

Test mode : LTE Band 26
Frequency(㎒) : 821.5
Channel : 26765
Bandwidth(㎒) : 5

| Mode | Frequency | Pol. | Antenna Gain | Cable loss | Substitute Level | Level | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| | [㎒] | [V/H] | [dBi] | [dB] | [dBm] | [dBm] | [dBm] | [dB] |
| QPSK | 1 643.60 | V | 6.01 | 5.01 | -58.40 | -57.40 | -13.00 | 44.40 |
| | 2 462.40 | H | 6.13 | 5.98 | -55.65 | -55.50 | -13.00 | 42.50 |
| | 3 284.80 | H | 7.61 | 6.74 | -56.57 | -55.70 | -13.00 | 42.70 |
| | 4 107.20 | V | 8.99 | 7.37 | -56.32 | -54.70 | -13.00 | 41.70 |

Test mode : LTE Band 26
Frequency(㎒) : 824
Channel : 26790
Bandwidth(㎒) : 5

| Mode | Frequency | Pol. | Antenna Gain | Cable loss | Substitute Level | Level | Limit | Margin |
|---|---|---|---|---|---|---|---|---|
| | [㎒] | [V/H] | [dBi] | [dB] | [dBm] | [dBm] | [dBm] | [dB] |
| QPSK | 1 648.40 | H | 6.00 | 5.02 | -57.78 | -56.80 | -13.00 | 43.80 |
| | 2 471.20 | V | 6.15 | 6.00 | -57.45 | -57.30 | -13.00 | 44.30 |
| | 3 298.00 | V | 7.65 | 6.75 | -54.90 | -54.00 | -13.00 | 41.00 |
| | 4 122.00 | V | 9.00 | 7.38 | -54.92 | -53.30 | -13.00 | 40.30 |

Note.
1. E.R.P & E.I.R.P(㏈m) = Substitute Level(㏈) + Antenna gain(㏈i&㏈d) - C.L(Cable loss) (㏈)

## 8. Measurement equipment

| Equipment Name | Manufacturer | Model No. | Serial No. | Next Cal. Date |
|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSV30 | 100810 | 23.07.12 |
| Spectrum Analyzer | AGILENT | N9040B | MY57010132 | 23.10.14 |
| Signal Generator | R&S | SMB100A | 176206 | 24.01.19 |
| DC Power Supply | AGILENT | E3632A | KR73001026 | 24.01.19 |
| Directional Coupler | AAMCS | AAMCS-UDC-0.5G-18G-10dB-SF | 399 | 24.01.19 |
| Directional Coupler | Marki Microwave, Inc. | CBR17-0026 | 0001 | 23.08.10 |
| Wideband Radio Communication Tester | R&S | CMW500 | 106840 | 24.01.19 |
| Wideband Radio Communication Tester | R&S | CMW500 | 168683 | 24.02.09 |
| Wideband Radio Communication Tester | R&S | CMW500 | 141780 | 24.01.19 |
| Temp & Humid Chamber | Daejin Engineering | DJ-THR11000 | 10041 | 24.01.19 |
| Bi-log Antenna | Teseq GmbH | CBL 6112D | 62027 | 24.11.17 |
| Bi-log Antenna | ETS.LINDGREN | 3143B | 228420 | 23.09.28 |
| Horn Antenna | ETS-LINDGREN | 3117 | 251528 | 24.02.02 |
| Horn Antenna | ETS.LINDGREN | 3117 | 227509 | 23.09.20 |
| Horn Antenna | ETS-Lindgren | 3116 | 00086632 | 24.01.25 |
| Horn Antenna | ETS-LINDGREN | 3116C | 251516 | 24.02.02 |
| Amplifier | SONOMA INSTRUMENT | 310N | 421822 | 23.12.14 |
| Amplifier | C&K Technologies, Inc. | BZRT-00504000-481055-382525 | 26299-27735 | 23.09.19 |
| Amplifier | C&K Technologies, Inc. | BZR-00504000-551028-252525 | 27736 | 23.09.19 |
| High Pass Filter | Wainwright Instruments GmbH | WHKX10-900-1000-15000-40SS | 11 | 23.08.10 |
| High Pass Filter | Wainwright Instruments GmbH | WHKX12-2805-3000-18000-40SS | 32 | 23.08.10 |
| Antenna Mast | Innco systems GmbH | MA4640-XP-ET | N/A | - |
| Controller | Innco Systems | CO3000 | 1175/4585031 9/P | - |

**End of test report**