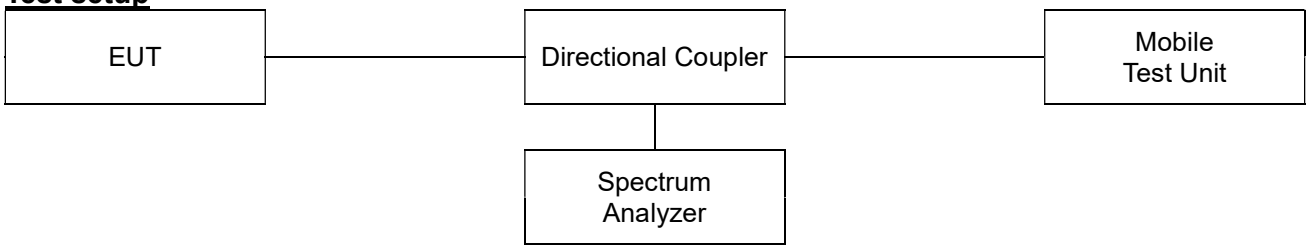
7.3. Band Edge Emissions at Antenna Terminal

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 + $10Log_{10}(P)$ 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
ANSI C63.26-2015 – 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) 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.

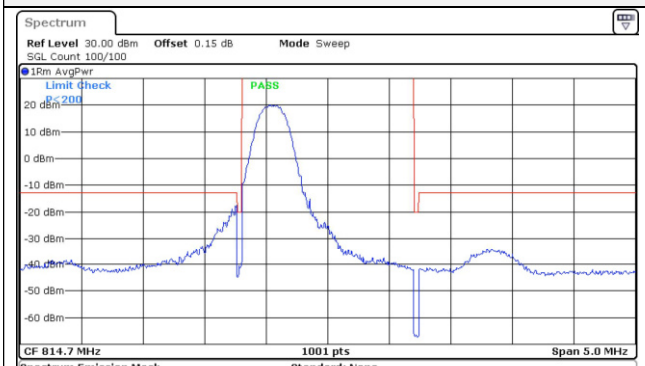
9) Allow trace to fully stabilize.

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

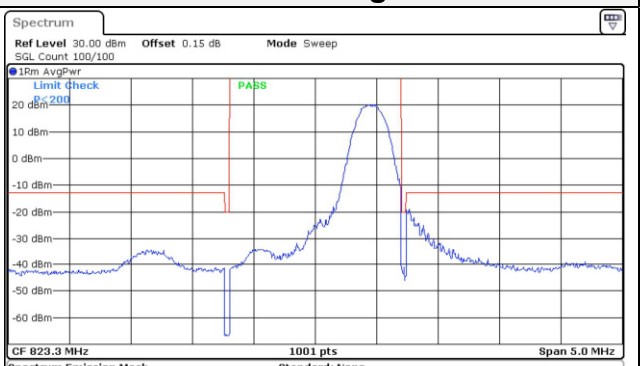
1.4M BW QPSK Low ch. 1RB



Spectrum Emission Mask — Standard: None
Tx Power 22.36 dBm — Tx Bandwidth 1.400 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-2.500 MHz	-737.500 kHz	100.000 kHz	813.96000 MHz	-17.50 dBm	-39.86 dB	-4.50 dB
-737.500 kHz	-700.000 kHz	300.000 Hz	813.99732 MHz	-39.32 dBm	-61.69 dB	-19.32 dB
700.000 kHz	737.500 kHz	300.000 Hz	815.40268 MHz	-66.30 dBm	-88.67 dB	-46.30 dB
737.500 kHz	2.500 MHz	100.000 kHz	815.99579 MHz	-34.14 dBm	-56.50 dB	-21.14 dB

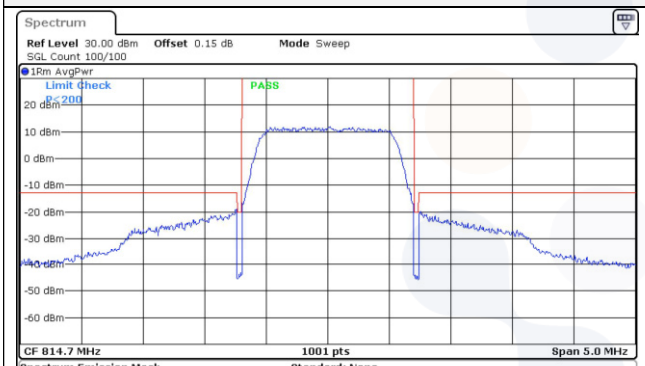
1.4M BW QPSK High ch. 1RB



Spectrum Emission Mask — Standard: None
Tx Power 22.40 dBm — Tx Bandwidth 1.400 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-2.500 MHz	-737.500 kHz	100.000 kHz	822.06429 MHz	-34.78 dBm	-57.18 dB	-21.78 dB
-737.500 kHz	-700.000 kHz	300.000 Hz	822.59732 MHz	-66.09 dBm	-88.49 dB	-46.09 dB
700.000 kHz	737.500 kHz	300.000 Hz	824.00268 MHz	-40.86 dBm	-63.25 dB	-20.86 dB
737.500 kHz	2.500 MHz	100.000 kHz	824.06504 MHz	-18.87 dBm	-41.27 dB	-5.87 dB

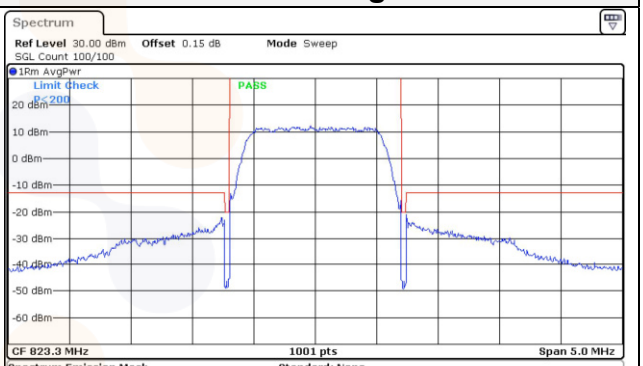
1.4M BW QPSK Low ch. FRB



Spectrum Emission Mask — Standard: None
Tx Power 20.90 dBm — Tx Bandwidth 1.400 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-2.500 MHz	-737.500 kHz	100.000 kHz	813.96000 MHz	-18.85 dBm	-39.75 dB	-5.85 dB
-737.500 kHz	-700.000 kHz	300.000 Hz	813.99196 MHz	-43.31 dBm	-64.21 dB	-23.31 dB
700.000 kHz	737.500 kHz	300.000 Hz	815.40804 MHz	-44.19 dBm	-65.08 dB	-24.19 dB
737.500 kHz	2.500 MHz	100.000 kHz	815.45002 MHz	-19.95 dBm	-40.84 dB	-6.95 dB

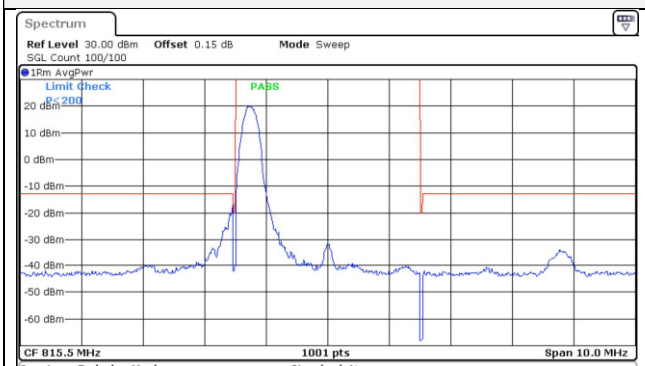
1.4M BW QPSK High ch. FRB



Spectrum Emission Mask — Standard: None
Tx Power 21.03 dBm — Tx Bandwidth 1.400 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-2.500 MHz	-737.500 kHz	100.000 kHz	822.53997 MHz	-22.14 dBm	-43.16 dB	-9.14 dB
-737.500 kHz	-700.000 kHz	300.000 Hz	822.59732 MHz	-45.53 dBm	-66.56 dB	-25.53 dB
700.000 kHz	737.500 kHz	300.000 Hz	824.00268 MHz	-46.22 dBm	-67.25 dB	-26.22 dB
737.500 kHz	2.500 MHz	100.000 kHz	824.04000 MHz	-21.14 dBm	-42.17 dB	-8.14 dB

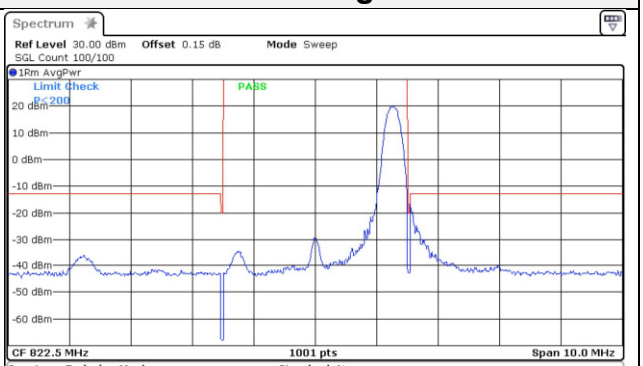
3M BW QPSK Low ch. 1RB



Spectrum Emission Mask — Standard: None
Tx Power 22.25 dBm — Tx Bandwidth 3.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-5.000 MHz	-1.538 MHz	100.000 kHz	813.95750 MHz	-16.90 dBm	-39.15 dB	-3.90 dB
-1.538 MHz	-1.500 MHz	300.000 Hz	813.99375 MHz	-39.98 dBm	-62.23 dB	-19.98 dB
1.500 MHz	1.538 MHz	300.000 Hz	817.03125 MHz	-67.72 dBm	-89.98 dB	-47.72 dB
1.538 MHz	5.000 MHz	100.000 kHz	819.26411 MHz	-33.98 dBm	-56.24 dB	-20.98 dB

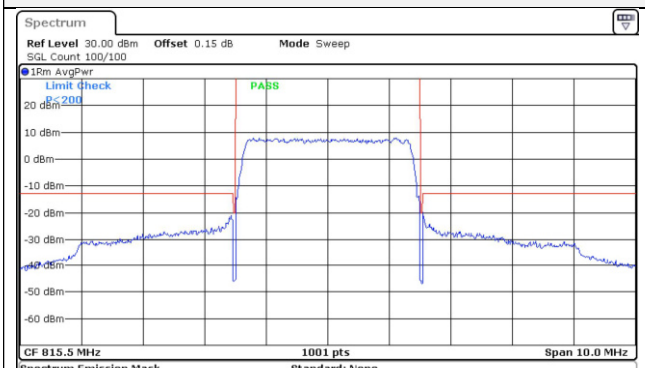
3M BW QPSK High ch. 1RB



Spectrum Emission Mask — Standard: None
Tx Power 22.16 dBm — Tx Bandwidth 3.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-5.000 MHz	-1.538 MHz	100.000 kHz	818.73589 MHz	-36.10 dBm	-58.25 dB	-23.10 dB
-1.538 MHz	-1.500 MHz	300.000 Hz	820.96875 MHz	-67.61 dBm	-89.76 dB	-47.61 dB
1.500 MHz	1.538 MHz	300.000 Hz	824.00625 MHz	-41.85 dBm	-64.00 dB	-21.85 dB
1.538 MHz	5.000 MHz	100.000 kHz	824.04250 MHz	-16.21 dBm	-38.37 dB	-3.21 dB

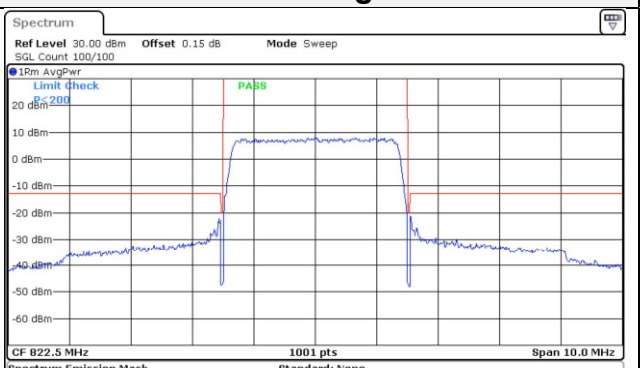
3M BW QPSK Low ch. FRB



Spectrum Emission Mask — Standard: None
Tx Power 20.96 dBm — Tx Bandwidth 3.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-5.000 MHz	-1.538 MHz	100.000 kHz	813.93748 MHz	-21.05 dBm	-42.01 dB	-8.05 dB
-1.538 MHz	-1.500 MHz	300.000 Hz	813.99375 MHz	-45.46 dBm	-66.42 dB	-25.46 dB
1.500 MHz	1.538 MHz	300.000 Hz	817.01875 MHz	-45.80 dBm	-66.76 dB	-25.80 dB
1.538 MHz	5.000 MHz	100.000 kHz	817.04250 MHz	-19.88 dBm	-40.84 dB	-6.88 dB

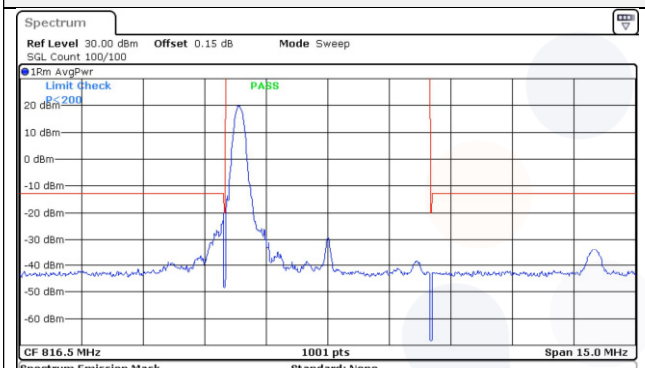
3M BW QPSK High ch. FRB



Spectrum Emission Mask — Standard: None
Tx Power 21.01 dBm — Tx Bandwidth 3.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-5.000 MHz	-1.538 MHz	100.000 kHz	820.92747 MHz	-22.04 dBm	-43.05 dB	-9.04 dB
-1.538 MHz	-1.500 MHz	300.000 Hz	820.99375 MHz	-46.26 dBm	-67.27 dB	-26.26 dB
1.500 MHz	1.538 MHz	300.000 Hz	824.00625 MHz	-46.55 dBm	-67.56 dB	-26.55 dB
1.538 MHz	5.000 MHz	100.000 kHz	824.04250 MHz	-21.30 dBm	-42.31 dB	-8.30 dB

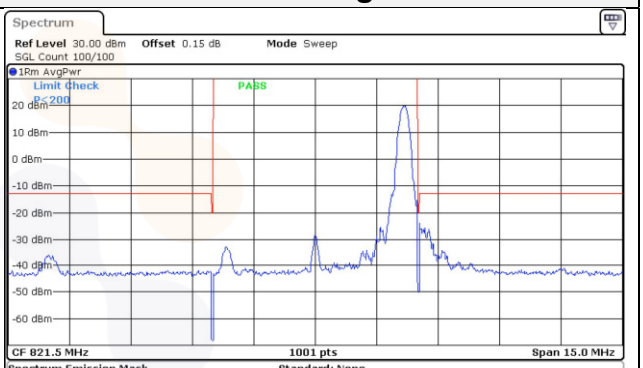
5M BW QPSK Low ch. 1RB



Spectrum Emission Mask — Standard: None
Tx Power 22.18 dBm — Tx Bandwidth 5.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-7.500 MHz	-2.538 MHz	100.000 kHz	813.95500 MHz	-20.44 dBm	-42.62 dB	-7.44 dB
-2.538 MHz	-2.500 MHz	300.000 Hz	813.99063 MHz	-45.39 dBm	-67.57 dB	-25.39 dB
2.500 MHz	2.538 MHz	300.000 Hz	819.00937 MHz	-68.14 dBm	-90.32 dB	-48.14 dB
2.538 MHz	7.500 MHz	100.000 kHz	822.94303 MHz	-33.94 dBm	-56.12 dB	-20.94 dB

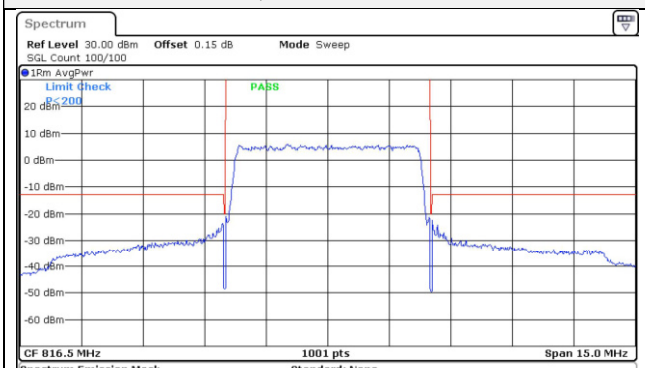
5M BW QPSK High ch. 1RB



Spectrum Emission Mask — Standard: None
Tx Power 22.27 dBm — Tx Bandwidth 5.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-7.500 MHz	-2.538 MHz	100.000 kHz	814.99700 MHz	-36.16 dBm	-58.43 dB	-23.16 dB
-2.538 MHz	-2.500 MHz	300.000 Hz	818.97188 MHz	-68.07 dBm	-90.34 dB	-48.07 dB
2.500 MHz	2.538 MHz	300.000 Hz	824.00937 MHz	-46.71 dBm	-68.99 dB	-26.71 dB
2.538 MHz	7.500 MHz	100.000 kHz	824.04500 MHz	-23.97 dBm	-46.25 dB	-10.97 dB

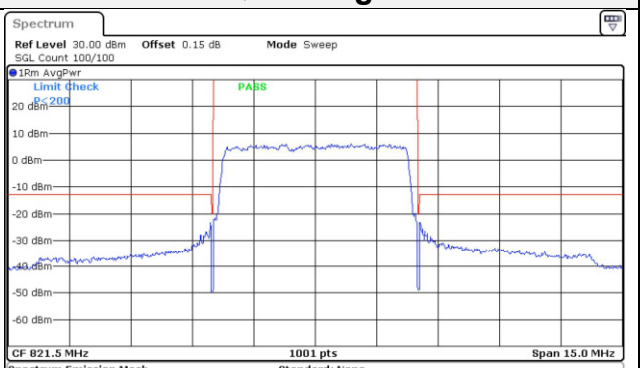
5M BW QPSK Low ch. FRB



Spectrum Emission Mask — Standard: None
Tx Power 20.89 dBm — Tx Bandwidth 5.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-7.500 MHz	-2.538 MHz	100.000 kHz	813.94001 MHz	-23.63 dBm	-44.52 dB	-10.63 dB
-2.538 MHz	-2.500 MHz	300.000 Hz	813.99063 MHz	-48.32 dBm	-69.21 dB	-28.32 dB
2.500 MHz	2.538 MHz	300.000 Hz	819.00937 MHz	-48.69 dBm	-69.58 dB	-28.69 dB
2.538 MHz	7.500 MHz	100.000 kHz	819.04500 MHz	-22.34 dBm	-43.23 dB	-9.34 dB

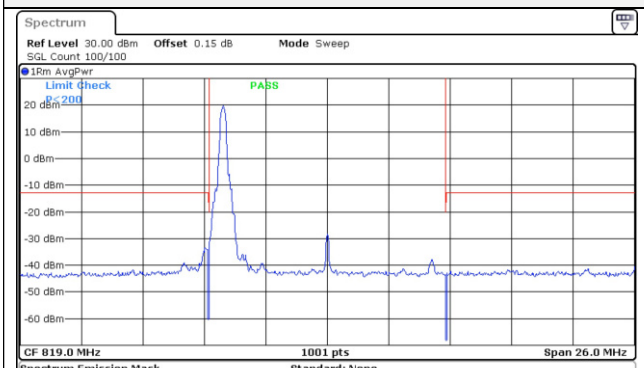
5M BW QPSK High ch. FRB



Spectrum Emission Mask — Standard: None
Tx Power 21.05 dBm — Tx Bandwidth 5.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-7.500 MHz	-2.538 MHz	100.000 kHz	818.94001 MHz	-23.50 dBm	-44.54 dB	-10.50 dB
-2.538 MHz	-2.500 MHz	300.000 Hz	818.99063 MHz	-49.06 dBm	-70.11 dB	-29.06 dB
2.500 MHz	2.538 MHz	300.000 Hz	824.00937 MHz	-48.16 dBm	-69.21 dB	-28.16 dB
2.538 MHz	7.500 MHz	100.000 kHz	824.04500 MHz	-23.21 dBm	-44.26 dB	-10.21 dB

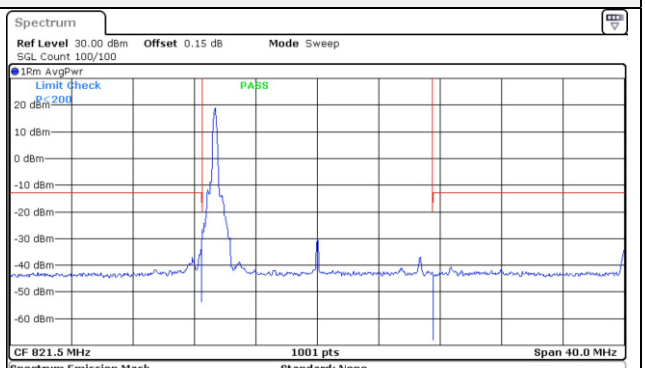
10M BW QPSK Mid ch. Lower 1RB



Spectrum Emission Mask Standard: None
Tx Power 22.21 dBm Tx Bandwidth 10.000 MHz RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-13.000 MHz	-5.038 MHz	100.000 kHz	813.81938 MHz	-33.42 dBm	-55.63 dB	-20.42 dB
-5.038 MHz	-5.000 MHz	300.000 Hz	813.98125 MHz	-60.28 dBm	-82.48 dB	-40.28 dB
5.000 MHz	5.038 MHz	300.000 Hz	824.01875 MHz	-68.18 dBm	-90.39 dB	-48.18 dB
5.038 MHz	13.000 MHz	100.000 kHz	831.98699 MHz	-40.56 dBm	-62.77 dB	-27.56 dB

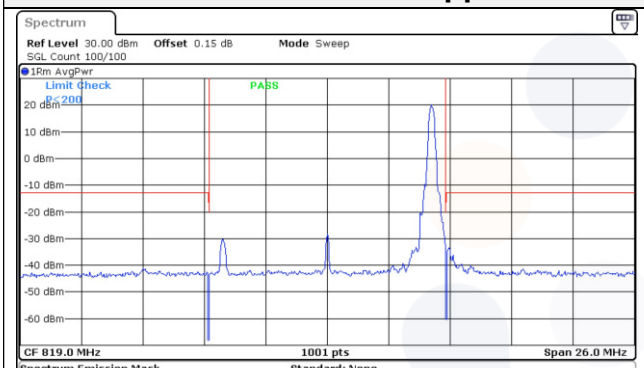
15M BW QPSK Mid ch. Lower 1RB



Spectrum Emission Mask Standard: None
Tx Power 21.55 dBm Tx Bandwidth 15.000 MHz RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-20.000 MHz	-7.538 MHz	100.000 kHz	813.94246 MHz	-30.52 dBm	-52.07 dB	-17.52 dB
-7.538 MHz	-7.500 MHz	300.000 Hz	813.98125 MHz	-53.66 dBm	-75.21 dB	-33.66 dB
7.500 MHz	7.538 MHz	300.000 Hz	829.01875 MHz	-68.09 dBm	-89.64 dB	-48.09 dB
7.538 MHz	20.000 MHz	100.000 kHz	841.43989 MHz	-34.47 dBm	-56.02 dB	-21.47 dB

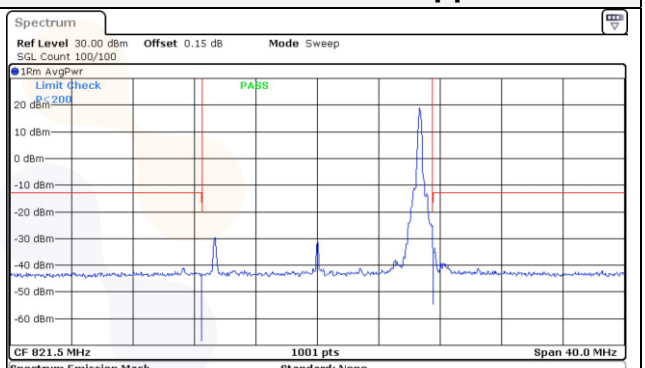
10M BW QPSK Mid ch. Upper 1RB



Spectrum Emission Mask Standard: None
Tx Power 22.45 dBm Tx Bandwidth 10.000 MHz RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-13.000 MHz	-5.038 MHz	100.000 kHz	811.21726 MHz	-41.27 dBm	-63.73 dB	-28.27 dB
-5.038 MHz	-5.000 MHz	300.000 Hz	813.98125 MHz	-68.25 dBm	-90.70 dB	-48.25 dB
5.000 MHz	5.038 MHz	300.000 Hz	824.01875 MHz	-60.39 dBm	-82.84 dB	-40.39 dB
5.038 MHz	13.000 MHz	100.000 kHz	824.12857 MHz	-33.42 dBm	-55.87 dB	-20.42 dB

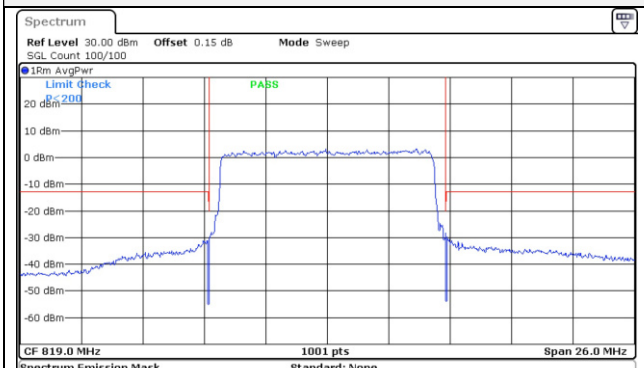
15M BW QPSK Mid ch. Upper 1RB



Spectrum Emission Mask Standard: None
Tx Power 21.35 dBm Tx Bandwidth 15.000 MHz RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-20.000 MHz	-7.538 MHz	100.000 kHz	812.74029 MHz	-41.18 dBm	-62.53 dB	-28.18 dB
-7.538 MHz	-7.500 MHz	300.000 Hz	813.98125 MHz	-68.26 dBm	-89.61 dB	-48.26 dB
7.500 MHz	7.538 MHz	300.000 Hz	829.01875 MHz	-54.53 dBm	-75.88 dB	-34.53 dB
7.538 MHz	20.000 MHz	100.000 kHz	829.05754 MHz	-33.48 dBm	-54.83 dB	-20.48 dB

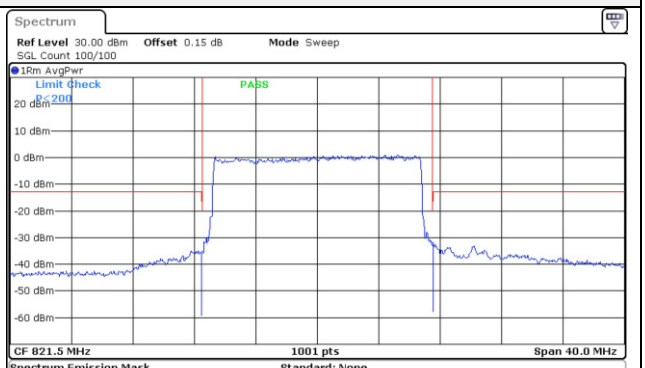
10M BW QPSK Mid ch. FRB



Spectrum Emission Mask Standard: None
Tx Power 20.92 dBm Tx Bandwidth 10.000 MHz RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-13.000 MHz	-5.038 MHz	100.000 kHz	813.89745 MHz	-31.31 dBm	-52.23 dB	-18.31 dB
-5.038 MHz	-5.000 MHz	300.000 Hz	813.98125 MHz	-54.99 dBm	-75.91 dB	-34.99 dB
5.000 MHz	5.038 MHz	300.000 Hz	824.01875 MHz	-54.11 dBm	-75.03 dB	-34.11 dB
5.038 MHz	13.000 MHz	100.000 kHz	824.07653 MHz	-29.65 dBm	-50.57 dB	-16.65 dB

15M BW QPSK Mid ch. FRB

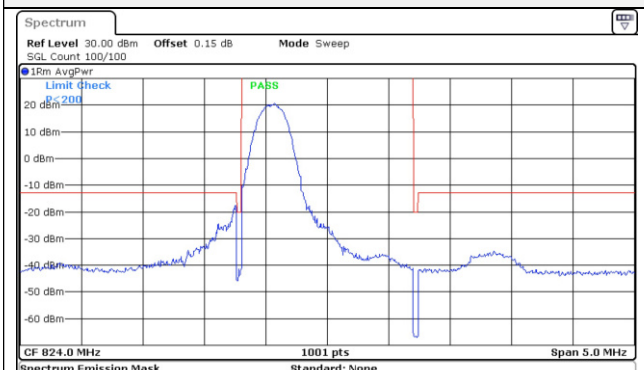


Spectrum Emission Mask Standard: None
Tx Power 20.46 dBm Tx Bandwidth 15.000 MHz RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-20.000 MHz	-7.538 MHz	100.000 kHz	813.74210 MHz	-34.95 dBm	-55.41 dB	-21.95 dB
-7.538 MHz	-7.500 MHz	300.000 Hz	813.98125 MHz	-59.13 dBm	-79.60 dB	-39.13 dB
7.500 MHz	7.538 MHz	300.000 Hz	829.01875 MHz	-57.86 dBm	-78.33 dB	-37.86 dB
7.538 MHz	20.000 MHz	100.000 kHz	829.05754 MHz	-31.92 dBm	-52.38 dB	-18.92 dB

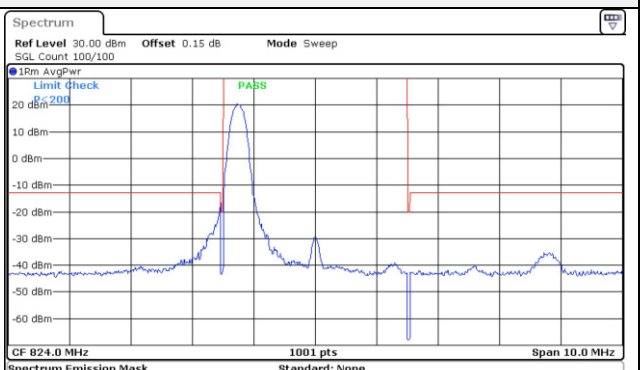
Straddle channel

1.4M BW QPSK Mid ch. Lower 1RB



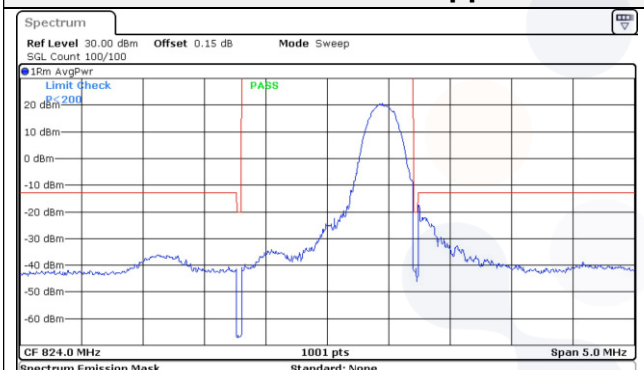
Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-2.500 MHz	-737.500 kHz	100.000 kHz	823.25499 MHz	-17.61 dBm	-40.13 dB	-4.61 dB
-737.500 kHz	-700.000 kHz	300.000 Hz	823.29732 MHz	-41.35 dBm	-63.87 dB	-21.35 dB
700.000 kHz	737.500 kHz	300.000 Hz	824.70268 MHz	-65.59 dBm	-88.11 dB	-45.59 dB
737.500 kHz	2.500 MHz	100.000 kHz	825.35087 MHz	-34.87 dBm	-57.39 dB	-21.87 dB

3M BW QPSK Mid ch. Lower 1RB



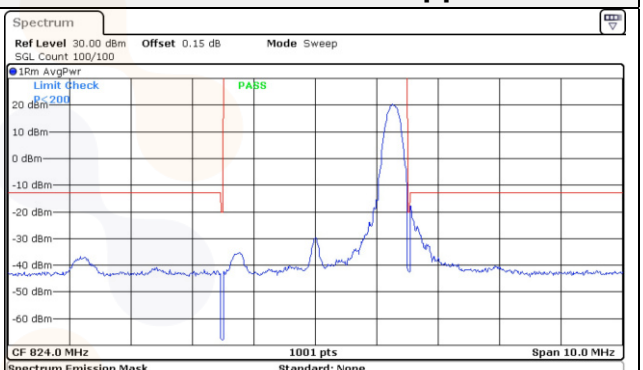
Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-5.000 MHz	-1.538 MHz	100.000 kHz	822.45750 MHz	-16.34 dBm	-38.81 dB	-3.34 dB
-1.538 MHz	-1.500 MHz	300.000 Hz	822.49375 MHz	-41.16 dBm	-63.63 dB	-21.16 dB
1.500 MHz	1.538 MHz	300.000 Hz	825.53125 MHz	-67.39 dBm	-89.86 dB	-47.39 dB
1.538 MHz	5.000 MHz	100.000 kHz	827.72408 MHz	-35.27 dBm	-57.74 dB	-22.27 dB

1.4M BW QPSK Mid ch. Upper 1RB



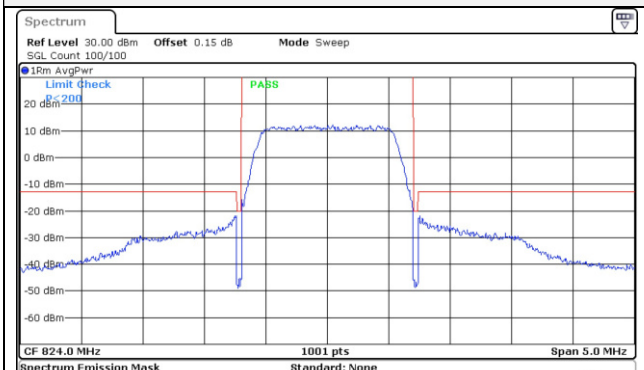
Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-2.500 MHz	-737.500 kHz	100.000 kHz	822.62409 MHz	-36.10 dBm	-58.58 dB	-23.10 dB
-737.500 kHz	-700.000 kHz	300.000 Hz	823.29732 MHz	-66.25 dBm	-88.73 dB	-46.25 dB
700.000 kHz	737.500 kHz	300.000 Hz	824.71875 MHz	-41.24 dBm	-63.72 dB	-21.24 dB
737.500 kHz	2.500 MHz	100.000 kHz	824.74501 MHz	-17.43 dBm	-39.91 dB	-4.43 dB

3M BW QPSK Mid ch. Upper 1RB



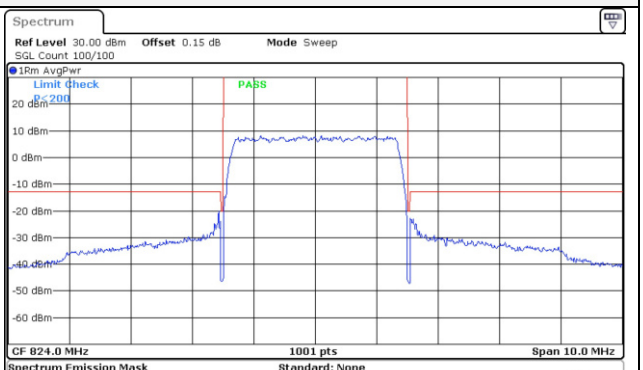
Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-5.000 MHz	-1.538 MHz	100.000 kHz	820.17585 MHz	-36.84 dBm	-59.23 dB	-23.84 dB
-1.538 MHz	-1.500 MHz	300.000 Hz	822.46875 MHz	-67.61 dBm	-90.00 dB	-47.61 dB
1.500 MHz	1.538 MHz	300.000 Hz	825.50625 MHz	-41.49 dBm	-63.89 dB	-21.49 dB
1.538 MHz	5.000 MHz	100.000 kHz	825.54250 MHz	-17.73 dBm	-40.12 dB	-4.73 dB

1.4M BW QPSK Mid ch. FRB



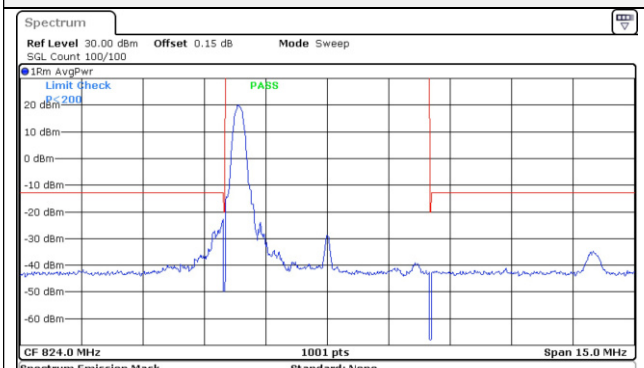
Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-2.500 MHz	-737.500 kHz	100.000 kHz	823.24498 MHz	-21.94 dBm	-43.04 dB	-8.94 dB
-737.500 kHz	-700.000 kHz	300.000 Hz	823.29196 MHz	-45.28 dBm	-66.39 dB	-25.28 dB
700.000 kHz	737.500 kHz	300.000 Hz	824.70804 MHz	-45.93 dBm	-67.03 dB	-25.93 dB
737.500 kHz	2.500 MHz	100.000 kHz	824.75002 MHz	-22.00 dBm	-43.10 dB	-9.00 dB

3M BW QPSK Mid ch. FRB



Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-5.000 MHz	-1.538 MHz	100.000 kHz	822.42747 MHz	-20.05 dBm	-41.04 dB	-7.05 dB
-1.538 MHz	-1.500 MHz	300.000 Hz	822.49375 MHz	-45.53 dBm	-66.52 dB	-25.53 dB
1.500 MHz	1.538 MHz	300.000 Hz	825.50625 MHz	-46.12 dBm	-67.11 dB	-26.12 dB
1.538 MHz	5.000 MHz	100.000 kHz	825.54250 MHz	-22.73 dBm	-43.72 dB	-9.73 dB

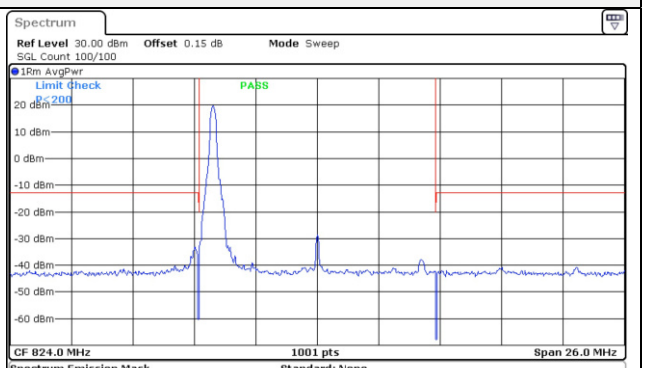
5M BW QPSK Mid ch. Lower 1RB



Spectrum Emission Mask — Standard: None
Tx Power 22.32 dBm — Tx Bandwidth 5.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-7.500 MHz	-2.538 MHz	100.000 kHz	821.45500 MHz	-22.72 dBm	-45.05 dB	-9.72 dB
-2.538 MHz	-2.500 MHz	300.000 Hz	821.49063 MHz	-46.28 dBm	-68.60 dB	-26.28 dB
2.500 MHz	2.538 MHz	300.000 Hz	826.52813 MHz	-67.93 dBm	-90.25 dB	-47.93 dB
2.538 MHz	7.500 MHz	100.000 kHz	830.48801 MHz	-34.63 dBm	-56.95 dB	-21.63 dB

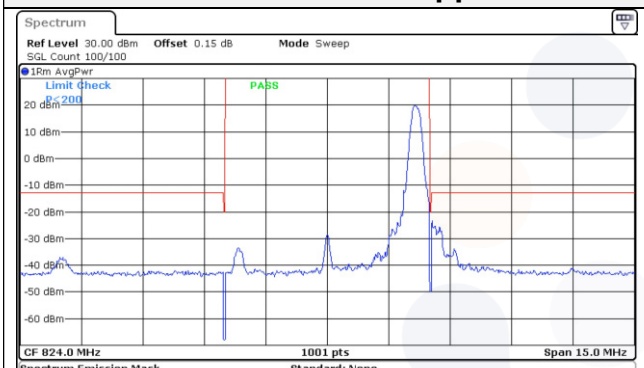
10M BW QPSK Mid ch. Lower 1RB



Spectrum Emission Mask — Standard: None
Tx Power 22.43 dBm — Tx Bandwidth 10.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-13.000 MHz	-5.038 MHz	100.000 kHz	818.81938 MHz	-33.20 dBm	-55.63 dB	-20.20 dB
-5.038 MHz	-5.000 MHz	300.000 Hz	818.98125 MHz	-60.25 dBm	-82.69 dB	-40.25 dB
5.000 MHz	5.038 MHz	300.000 Hz	829.01875 MHz	-67.92 dBm	-90.35 dB	-47.92 dB
5.038 MHz	13.000 MHz	100.000 kHz	834.98335 MHz	-40.84 dBm	-63.27 dB	-27.84 dB

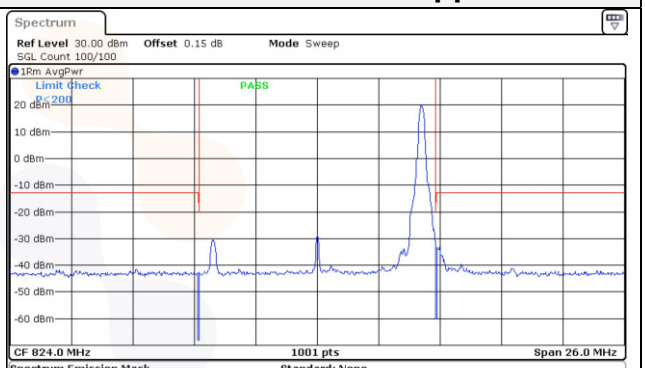
5M BW QPSK Mid ch. Upper 1RB



Spectrum Emission Mask — Standard: None
Tx Power 22.33 dBm — Tx Bandwidth 5.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-7.500 MHz	-2.538 MHz	100.000 kHz	817.54198 MHz	-37.07 dBm	-59.40 dB	-24.07 dB
-2.538 MHz	-2.500 MHz	300.000 Hz	821.47188 MHz	-67.95 dBm	-90.28 dB	-47.95 dB
2.500 MHz	2.538 MHz	300.000 Hz	826.50937 MHz	-46.26 dBm	-68.58 dB	-26.26 dB
2.538 MHz	7.500 MHz	100.000 kHz	826.55999 MHz	-23.26 dBm	-45.58 dB	-10.26 dB

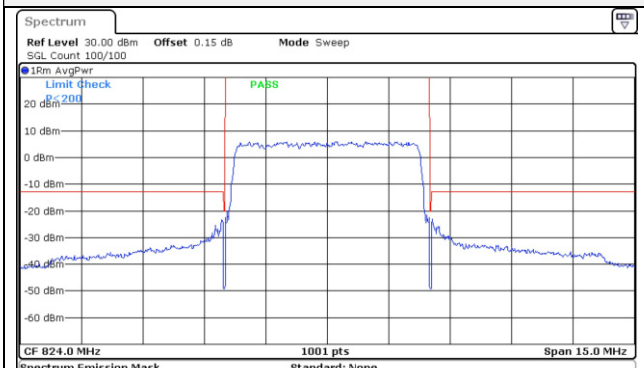
10M BW QPSK Mid ch. Upper 1RB



Spectrum Emission Mask — Standard: None
Tx Power 22.44 dBm — Tx Bandwidth 10.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-13.000 MHz	-5.038 MHz	100.000 kHz	811.01301 MHz	-41.40 dBm	-63.85 dB	-28.40 dB
-5.038 MHz	-5.000 MHz	300.000 Hz	818.98125 MHz	-68.14 dBm	-90.59 dB	-48.14 dB
5.000 MHz	5.038 MHz	300.000 Hz	829.01875 MHz	-60.10 dBm	-82.54 dB	-40.10 dB
5.038 MHz	13.000 MHz	100.000 kHz	829.07653 MHz	-33.12 dBm	-55.57 dB	-20.12 dB

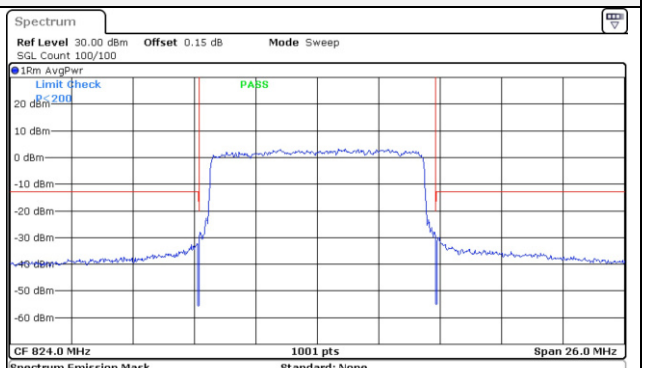
5M BW QPSK Mid ch. FRB



Spectrum Emission Mask — Standard: None
Tx Power 21.14 dBm — Tx Bandwidth 5.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-7.500 MHz	-2.538 MHz	100.000 kHz	821.42502 MHz	-23.37 dBm	-44.51 dB	-10.37 dB
-2.538 MHz	-2.500 MHz	300.000 Hz	821.49063 MHz	-48.39 dBm	-69.53 dB	-28.39 dB
2.500 MHz	2.538 MHz	300.000 Hz	826.50937 MHz	-48.79 dBm	-69.93 dB	-28.79 dB
2.538 MHz	7.500 MHz	100.000 kHz	826.55999 MHz	-22.97 dBm	-44.11 dB	-9.97 dB

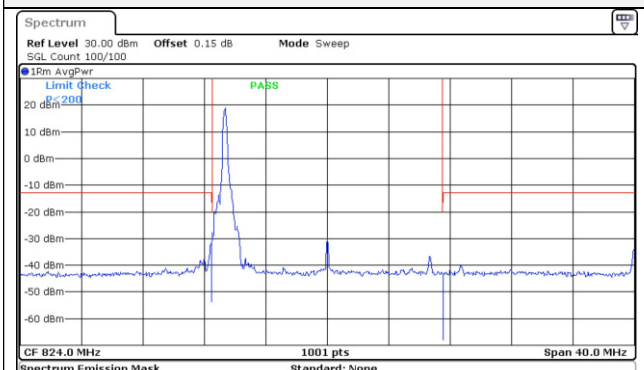
10M BW QPSK Mid ch. FRB



Spectrum Emission Mask — Standard: None
Tx Power 21.00 dBm — Tx Bandwidth 10.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-13.000 MHz	-5.038 MHz	100.000 kHz	818.92347 MHz	-32.26 dBm	-53.26 dB	-19.26 dB
-5.038 MHz	-5.000 MHz	300.000 Hz	818.98125 MHz	-55.60 dBm	-76.60 dB	-35.60 dB
5.000 MHz	5.038 MHz	300.000 Hz	829.01875 MHz	-55.03 dBm	-76.03 dB	-35.03 dB
5.038 MHz	13.000 MHz	100.000 kHz	829.12857 MHz	-29.94 dBm	-50.94 dB	-16.94 dB

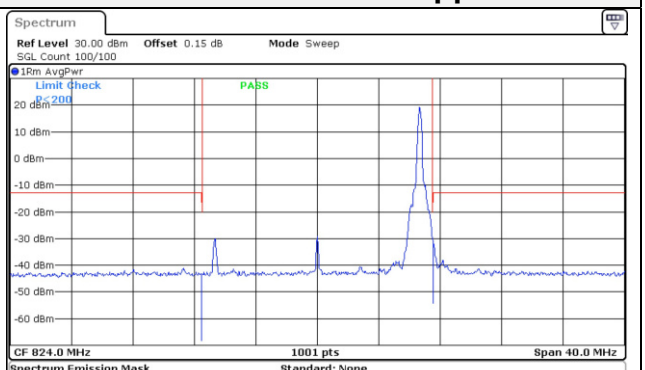
15M BW QPSK Mid ch. Lower 1RB



Spectrum Emission Mask — Standard: None
Tx Power 21.50 dBm — Tx Bandwidth 15.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-20.000 MHz	-7.538 MHz	100.000 kHz	816.44246 MHz	-31.09 dBm	-52.60 dB	-18.09 dB
-7.538 MHz	-7.500 MHz	300.000 Hz	816.48125 MHz	-53.78 dBm	-75.28 dB	-33.78 dB
7.500 MHz	7.538 MHz	300.000 Hz	831.51875 MHz	-68.00 dBm	-89.50 dB	-48.00 dB
7.538 MHz	20.000 MHz	100.000 kHz	843.93989 MHz	-34.17 dBm	-55.67 dB	-21.17 dB

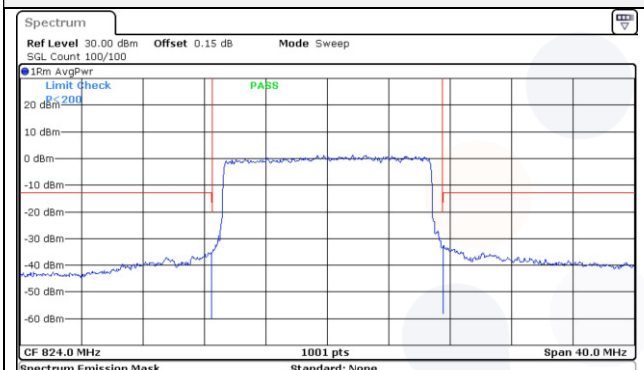
15M BW QPSK Mid ch. Upper 1RB



Spectrum Emission Mask — Standard: None
Tx Power 21.72 dBm — Tx Bandwidth 15.000 MHz — RBW 100.000 kHz

Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-20.000 MHz	-7.538 MHz	100.000 kHz	815.28037 MHz	-41.23 dBm	-62.95 dB	-28.23 dB
-7.538 MHz	-7.500 MHz	300.000 Hz	816.48125 MHz	-68.20 dBm	-89.92 dB	-48.20 dB
7.500 MHz	7.538 MHz	300.000 Hz	831.51875 MHz	-54.27 dBm	-75.99 dB	-34.27 dB
7.538 MHz	20.000 MHz	100.000 kHz	831.55754 MHz	-30.64 dBm	-52.36 dB	-17.64 dB

15M BW QPSK Mid ch. FRB



Spectrum Emission Mask — Standard: None
Tx Power 20.66 dBm — Tx Bandwidth 15.000 MHz — RBW 100.000 kHz

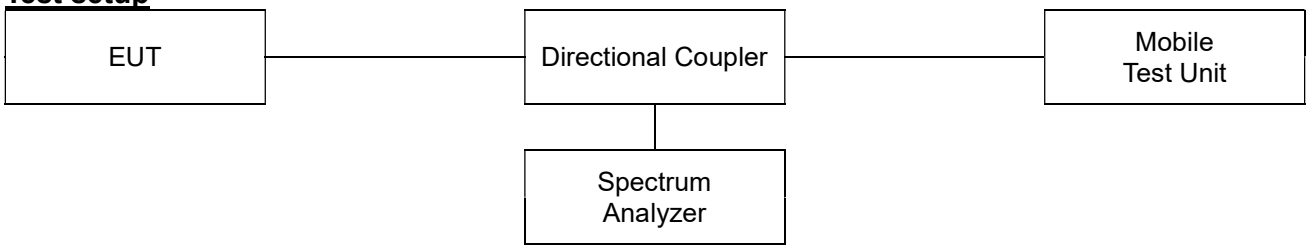
Range Low	Range Up	RBW	Frequency	Power Abs	Power Rel	ΔLimit
-20.000 MHz	-7.538 MHz	100.000 kHz	816.24210 MHz	-35.17 dBm	-55.83 dB	-22.17 dB
-7.538 MHz	-7.500 MHz	300.000 Hz	816.48125 MHz	-59.76 dBm	-80.42 dB	-39.76 dB
7.500 MHz	7.538 MHz	300.000 Hz	831.51875 MHz	-58.11 dBm	-78.77 dB	-38.11 dB
7.538 MHz	20.000 MHz	100.000 kHz	831.55754 MHz	-32.57 dBm	-53.23 dB	-19.57 dB

-

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 + $10Log_{10}(P)$ 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
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.

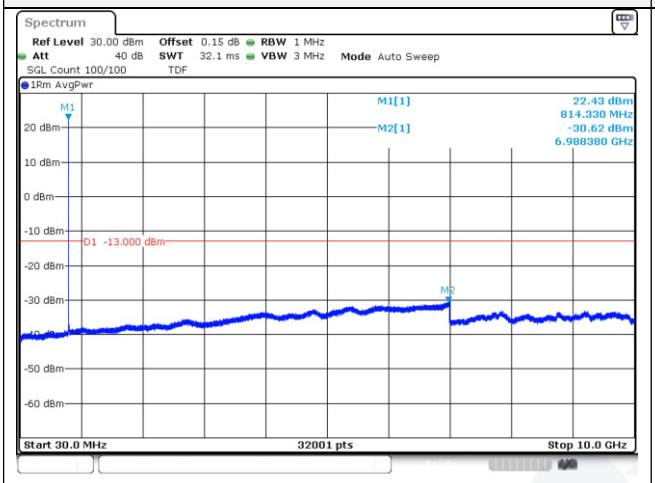
Notes:

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.

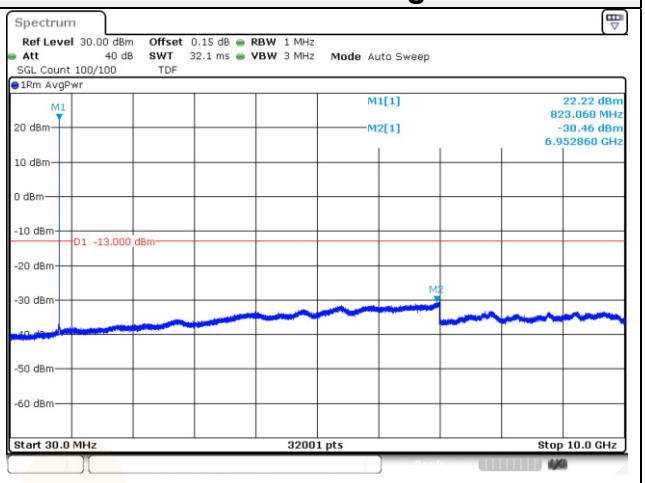
Test results

Test mode: LTE Band 26

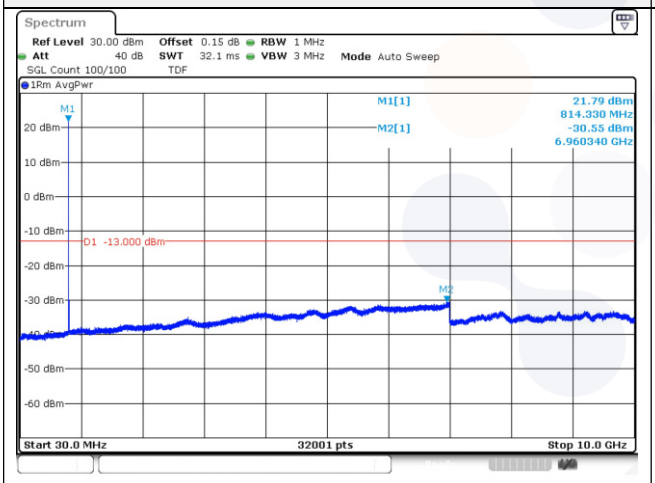
1.4M BW QPSK Low ch.



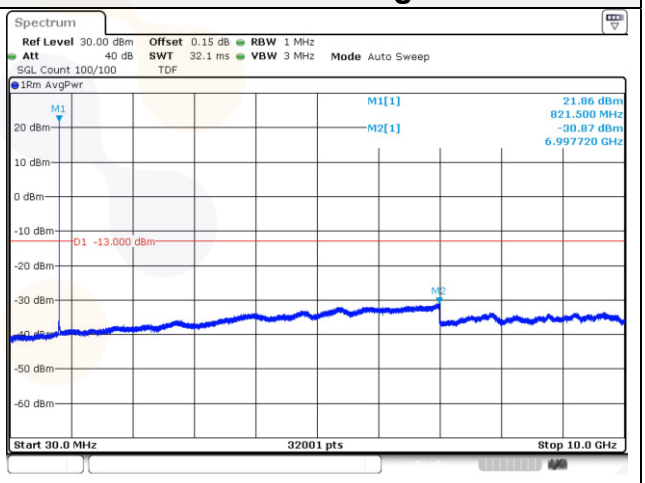
1.4M BW QPSK High ch.



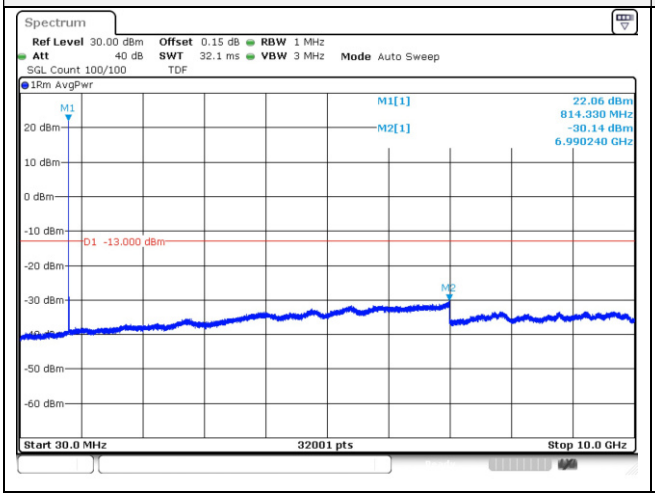
3M BW QPSK Low ch.



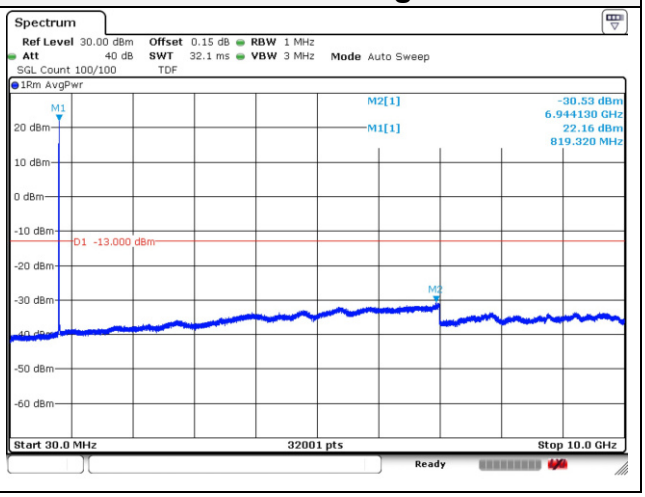
3M BW QPSK High ch.

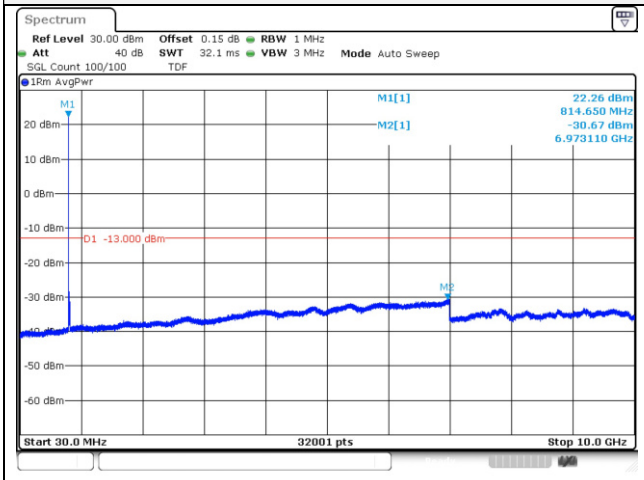
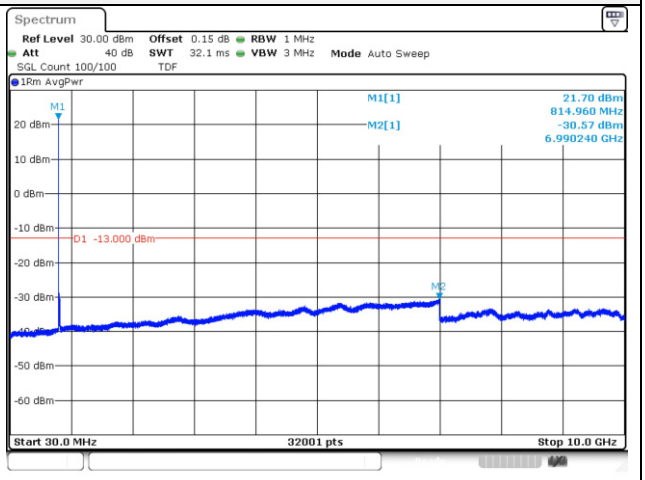


5M BW QPSK Low ch.



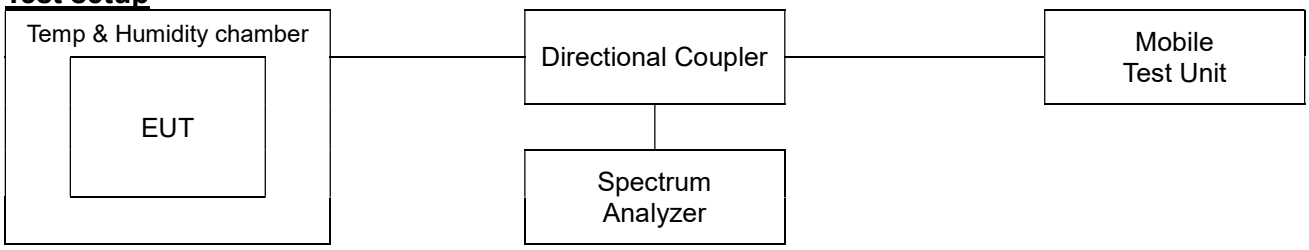
5M BW QPSK High ch.



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

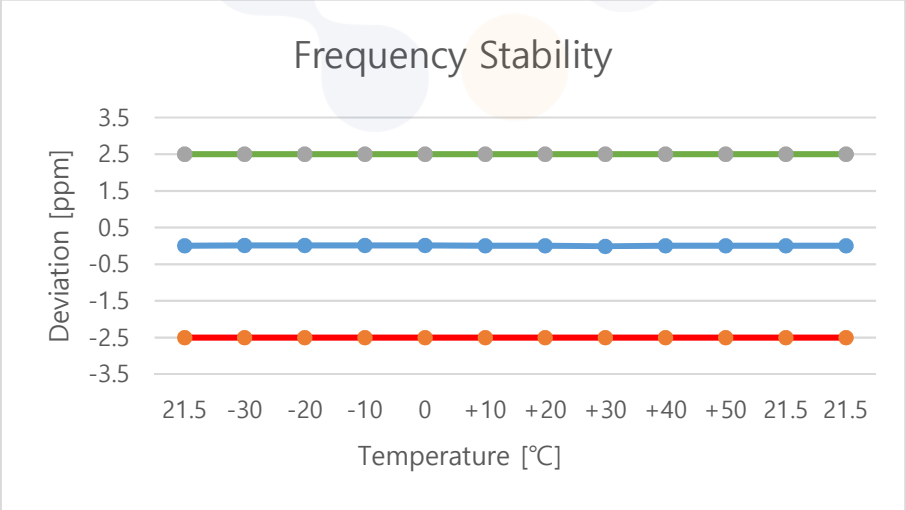
Test settings

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 (Hz) : 823 300 000
Channel : 26783
Deviation limit(FCC) : ±0.00025% or 2.5ppm

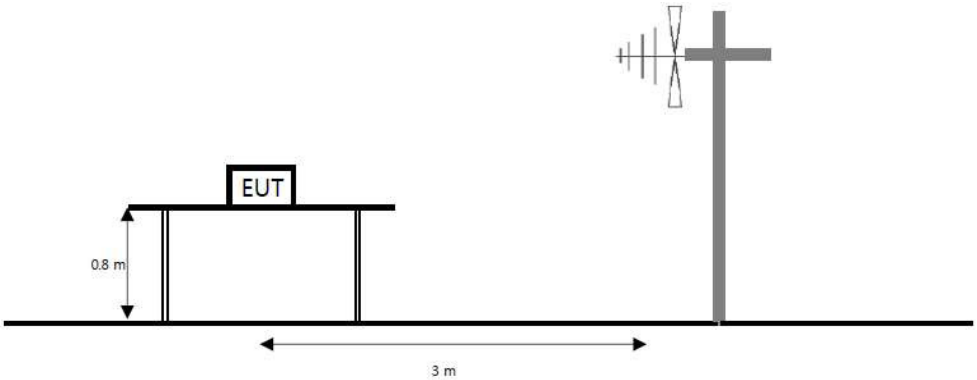
Voltage (%)	Power (V)	Temp. (°C)	Frequency (Hz)	Frequency error (Hz)	Deviation	
					(ppm)	(%)
100%	3.88	+21.5(Ref)	823,300,001	0.92	0.0	0.000000
		-30	823,300,004	4.37	0.0	0.000001
		-20	823,300,008	8.02	0.0	0.000001
		-10	823,300,005	5.28	0.0	0.000001
		0	823,300,004	4.13	0.0	0.000001
		+10	823,300,003	3.04	0.0	0.000000
		+20	823,300,001	1.03	0.0	0.000000
		+30	823,299,995	-4.52	0.0	-0.000001
		+40	823,299,997	-3.39	0.0	0.000000
		+50	823,299,997	-2.78	0.0	0.000000
115%	4.46	+21.5(Ref)	823,300,000	0.34	0.0	0.000000
End point	3.40	+21.5(Ref)	823,300,001	0.51	0.0	0.000000



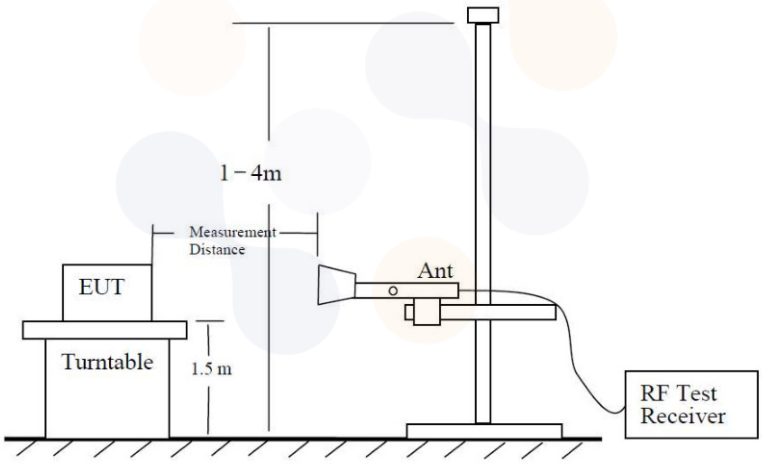
7.6. Radiated Power (ERP/EIRP)

Test setup

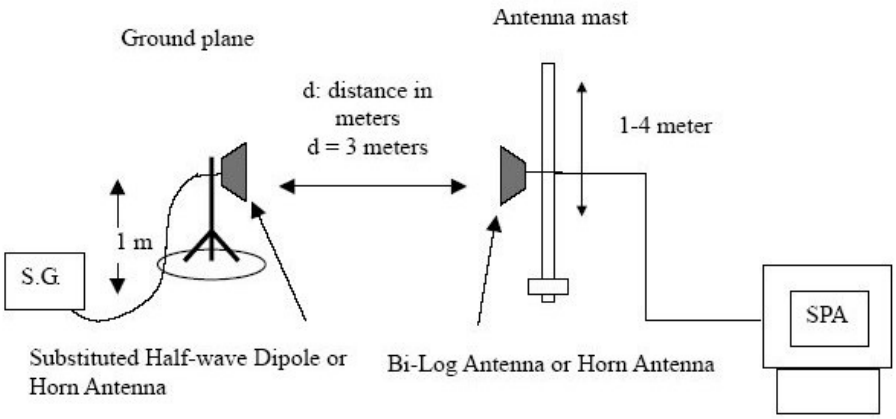
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



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	814.70	H	4.99	2.74	12.87	15.12	0.033
		823.30	H	5.20	2.67	12.42	14.95	0.031
	16QAM	814.70	H	4.99	2.74	11.33	13.58	0.023
		823.30	H	5.20	2.67	10.95	13.48	0.022
3 M	QPSK	815.50	H	5.01	2.79	12.75	14.97	0.031
		822.50	H	5.18	2.73	12.49	14.93	0.031
	16QAM	815.50	H	5.01	2.79	11.05	13.27	0.021
		822.50	H	5.18	2.73	11.06	13.50	0.022
5 M	QPSK	816.50	H	5.03	2.58	12.66	15.11	0.032
		821.50	H	5.15	2.81	12.53	14.86	0.031
	16QAM	816.50	H	5.03	2.58	11.33	13.78	0.024
		821.50	H	5.15	2.81	11.09	13.42	0.022
10 M	QPSK	819.00	H	5.08	2.81	12.67	14.94	0.031
	16QAM	819.00	H	5.08	2.81	11.14	13.41	0.022
15 M	QPSK	821.50	H	5.15	2.81	11.95	14.28	0.027
	16QAM	821.50	H	5.15	2.81	10.48	12.81	0.019

Straddle channel

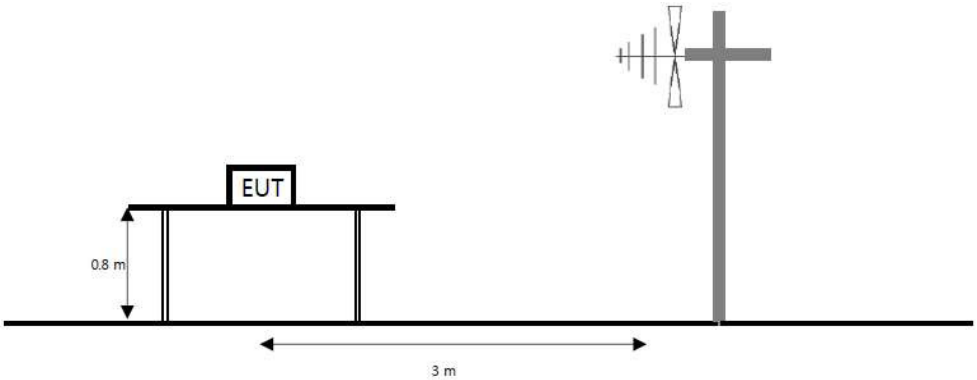
Bandwidth	Modulation	Frequency	Pol.	Antenna Gain	C.L	Substitute Level	ERP	
		[㎒]	[V/H]	[dBd]	[dB]	[dBm]	[dBm]	[W]
1.4 M	QPSK	824.00	H	5.22	2.68	12.50	15.04	0.032
	16QAM		H	5.22	2.68	11.22	13.76	0.024
3 M	QPSK		H	5.22	2.68	12.53	15.07	0.032
	16QAM		H	5.22	2.68	11.09	13.63	0.023
5 M	QPSK		H	5.22	2.68	12.56	15.10	0.032
	16QAM		H	5.22	2.68	11.18	13.72	0.024
10 M	QPSK		H	5.22	2.68	12.68	15.22	0.033
	16QAM		H	5.22	2.68	11.17	13.71	0.023
15 M	QPSK		H	5.22	2.68	12.14	14.68	0.029
	16QAM		H	5.22	2.68	10.96	13.50	0.022

Note.
1. E.R.P & E.I.R.P(dBm) = Substitute Level(dB) + Antenna gain(dBi&dBd) - C.L(Cable loss) (dB)

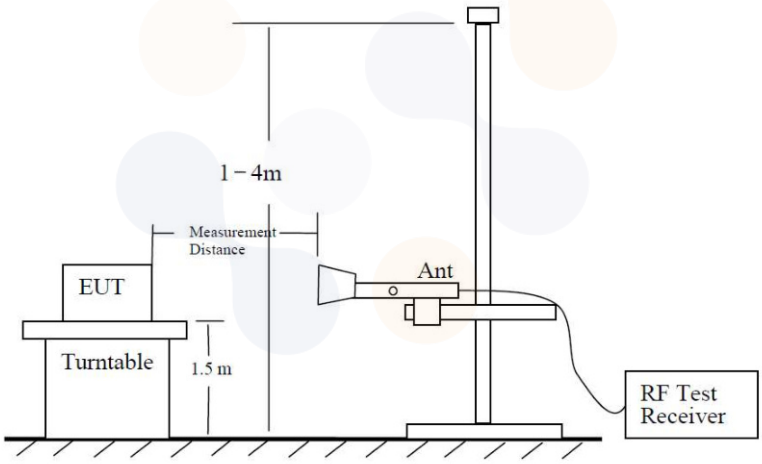
7.7. Radiated Spurious Emissions

Test setup

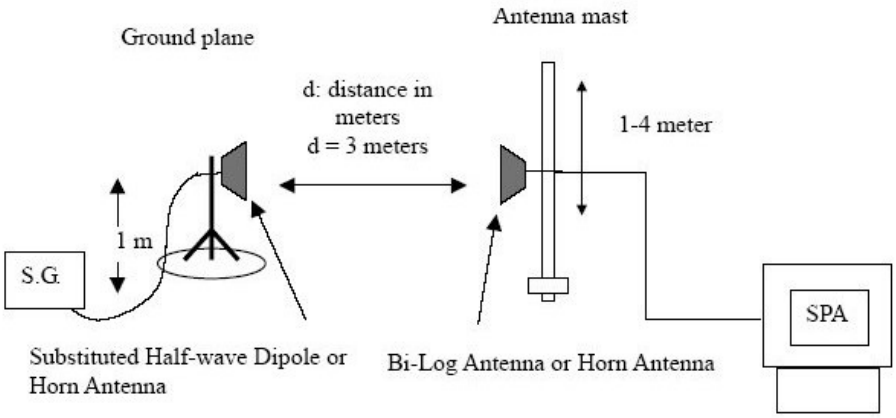
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



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 GHz below) or horn antenna (1 GHz 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 dBm, 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(㎒) : 819
Channel : 26740
Bandwidth(㎒) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 638.00	V	6.02	4.99	-60.53	-59.50	-13.00	46.50
	2 456.80	V	6.12	5.97	-57.95	-57.80	-13.00	44.80
	3 276.00	H	7.58	6.73	-57.15	-56.30	-13.00	43.30
	4 094.80	H	8.98	7.35	-58.03	-56.40	-13.00	43.40

Test mode : LTE Band 26
Frequency(㎒) : 824
Channel : 26790
Bandwidth(㎒) : 10

Mode	Frequency	Pol.	Antenna Gain	Cable loss	Substitute Level	Level	Limit	Margin
	[㎒]	[V/H]	[dBi]	[dB]	[dBm]	[dBm]	[dBm]	[dB]
QPSK	1 639.60	V	6.02	5.00	-61.52	-60.50	-13.00	47.50
	2 458.80	H	6.13	5.98	-54.35	-54.20	-13.00	41.20
	3 277.60	V	7.59	6.74	-56.35	-55.50	-13.00	42.50
	4 098.00	H	8.98	7.35	-55.63	-54.00	-13.00	41.00

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	1175/45850319/P	-

End of test report