(ii) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(iii) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

(4) *Private agreements.*

(i) For AWS operations in the 2000-2020 MHz and 2180-2200 MHz bands, to the extent a licensee establishes unified operations across the AWS blocks, that licensee may choose not to observe the emission limit specified in paragraph (h)(1), above, strictly between its adjacent block licenses in a geographic area, so long as it complies with other Commission rules and is not adversely affecting the operations of other parties by virtue of exceeding the emission limit.

(ii) For AWS operations in the 2000-2020 MHz band, a licensee may enter into private agreements with all licensees operating between 1995 and 2000 MHz to allow the 70 + 10 $\log_{10}$(P) dB limit to be exceeded within the 1995-2000 MHz band.

(iii) An AWS licensee who is a party to a private agreement described in this section (4) must maintain a copy of the agreement in its station files and disclose it, upon request, to prospective AWS assignees, transferees, or spectrum lessees and to the Commission.

§ 90.219 Use of signal boosters.

(e) *Device Specifications.* In addition to the general rules for equipment certification in §90.203(a)(2) and part 2, subpart J of this chapter, a signal booster must also meet the rules in this paragraph.

(3) Spurious emissions from a signal booster must not exceed −13 dBm within any 100 kHz measurement bandwidth.

§ 90.543 Emission limitations.

(e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the

100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

(f) For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

§90.691 Emission mask requirements for EA-based systems

(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:

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10\text{Log}_{10}(P)$ 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 kHz.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

Test Procedures:

Measurements were in accordance with the test methods section 3.6 of KDB 935210 D05 v01r02.

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle, and high channels or frequencies within each authorized frequency band of operation.

Out-of-band/out-of-block emissions (including intermodulation products) shall be measured under each of the following two stimulus conditions:

a) two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges;

b) a single test signal, sequentially tuned to the lowest and highest frequencies or channels within the frequency band/block under examination.

NOTE—Single-channel boosters that cannot accommodate two simultaneous signals within the passband may be excluded from the test stipulated in step a).

3.6.2 Out-of-band/out-of-block emissions conducted measurements

a) Connect a signal generator to the input of the EUT.

If the signal generator is not capable of generating two modulated carriers simultaneously, then two discrete signal generators can be connected with an appropriate combining network to support this two-signal test.

b) Set the signal generator to produce two AWGN signals as previously described.

c) Set the center frequencies such that the AWGN signals occupy adjacent channels, as defined by

industry standards such as 3GPP or 3GPP2, at the upper edge of the frequency band or block under test.

d) Set the composite power levels such that the input signal is just below the AGC threshold, but not more than 0.5 dB below. The composite power can be measured using the procedures provided in KDB Publication 971168, but it will be necessary to expand the power integration bandwidth so as to include both of the transmit channels.

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band.

g) Set the VBW = 3 × RBW.

h) Set the detector to power averaging (rms) detector.

i) Set the Sweep time = auto-couple.

j) Set the spectrum analyzer start frequency to the upper block edge frequency, and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively.

k) Trace average at least 100 traces in power averaging (rms) mode.

l) Use the marker function to find the maximum power level.

m) Capture the spectrum analyzer trace of the power level for inclusion in the test report.

n) Repeat steps k) to m) with the composite input power level set to 3 dB above the AGC threshold.

o) Reset the frequencies of the input signals to the lower edge of the frequency block or band under test.

p) Reset the spectrum analyzer start frequency to the lower block edge frequency minus 300 kHz or 3 MHz, for frequencies below and above 1 GHz, respectively, and the stop frequency to the lower band or block edge frequency.

q) Repeat steps k) to n).

r) Repeat steps a) to q) with the signal generator configured for a single test signal tuned as close as possible to the block edges.

s) Repeat steps a) to r) with the narrowband test signal.

t) Repeat steps a) to s) for all authorized frequency bands or blocks used by the EUT.

3.6.3 Spurious emissions conducted measurements

a) Connect a signal generator to the input of the EUT.

b) Set the signal generator to produce the broadband test signal as previously described.

c) Set the center frequency of the test signal to the lowest available channel within the frequency band or block.

d) Set the EUT input power to a level that is just below the AGC threshold, but not more than 0.5 dB below.

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band of operation.

g) Set the VBW ≥ 3 × RBW.

h) Set the Sweep time = auto-couple.

i) Set the spectrum analyzer start frequency to the lowest RF signal generated in the equipment, without

going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part.

The number of measurement points in each sweep must be ≥ (2 × span/RBW), which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.

j) Select the power averaging (rms) detector function.

k) Trace average at least 10 traces in power averaging (rms) mode.

l) Use the peak marker function to identify the highest amplitude level over each measured frequency range. Record the frequency and amplitude and capture a plot for inclusion in the test report.

m) Reset the spectrum analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the spectrum analyzer stop frequency to 10 times the highest frequency of the fundamental emission. The number of measurement points in each sweep must be ≥ (2 × span/RBW), which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.

n) Trace average at least 10 traces in power averaging (rms) mode.

o) Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report; also provide tabular data, if required.

p) Repeat steps i) to o) with the input test signals firstly tuned to a middle band/block frequency/channel, and then tuned to a high band/block frequency/channel.

q) Repeat steps b) to p) with the narrowband test signal.

r) Repeat steps b) to q) for all authorized frequency bands/blocks used by the EUT.

Measurements were in accordance with the test methods section 4.7 of KDB 935210 D05 v01r02.

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle, and high channels or frequencies within each authorized frequency band of operation.
Intermodulation products shall be measured using two CW signals with all available channel spacings (e.g., 12.5 kHz and 6.25 kHz) with the center between these channels being equal to the center frequency f0 as determined from 4.4.
NOTE—Intermodulation-product spurious emission measurements are not required for single-channel boosters that cannot accommodate two simultaneous signals within the passband.

4.7.2 Out-of-band/out-of-block emissions conducted measurements

a) Connect a signal generator to the input of the EUT.

If the signal generator is not capable of producing two independent modulated carriers simultaneously, then two discrete signal generators can be connected, with an appropriate combining network to support the two-signal test.

b) Configure the two signal generators to produce CW on frequencies spaced consistent with f_0, with amplitude levels set to just below the AGC threshold.

c) Connect a spectrum analyzer to the EUT output.

d) Set the span to 100 kHz.

e) Set RBW = 300 Hz with VBW ≥ 3 × RBW.

f) Set the detector to power averaging (rms).

g) Place a marker on highest intermodulation product amplitude.

h) Capture the plot for inclusion in the test report.

i) Repeat steps c) to h) with the composite input power level set to 3 dB above the AGC threshold.

j) Repeat steps b) to i) for all operational bands.

4.7.3 EUT spurious emissions conducted measurements

a) Connect a signal generator to the input of the EUT.

b) Configure the signal generator to produce a CW signal.

c) Set the frequency of the CW signal to the center channel of the EUT passband.

d) Set the output power level so that the resultant signal is just below the AGC threshold.

e) Connect a spectrum analyzer to the output of the EUT, using appropriate attenuation as necessary.

f) Set the RBW = 100 kHz. (i.e., for 30 MHz to 1 GHz PLMRS and/or PSRS booster devices)

g) Set the VBW = 3 × RBW.

h) Set the Sweep time = auto-couple.

i) Set the detector to PEAK.

j) Set the spectrum analyzer start frequency to 30 MHz (or the lowest radio frequency signal generated in the EUT, without going below 9 kHz if the EUT has additional internal clock frequencies), and the stop frequency to 10 times the highest allowable frequency of the EUT passband.

k) Select MAX HOLD, and use the marker peak function to find the highest emission(s) outside the passband. (This could be either at a frequency lesser or greater than the passband frequencies.)

l) Capture a plot for inclusion in the test report.

m) Repeat steps c) to l) for each authorized frequency band/block of operation.

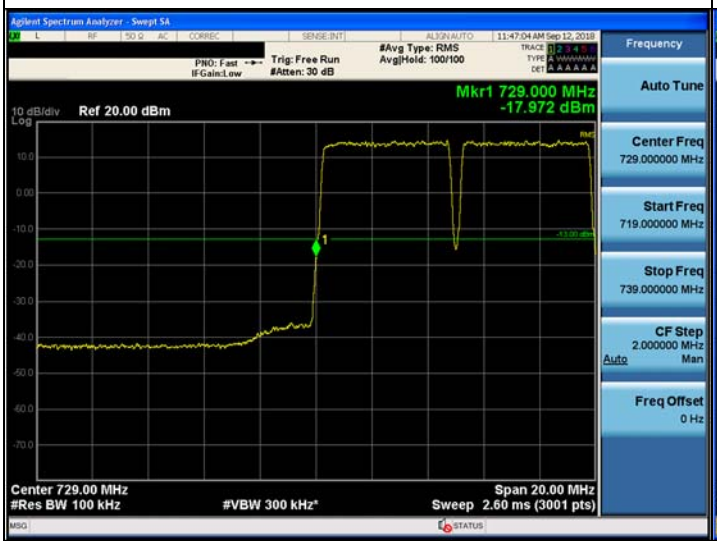
Note1. *In 9 kHz-150 kHz and 150 kHz-30 MHz bands, RBW was reduced to 1 kHz and 10 kHz and correction factor was applied according to section 5.7.2 of ANSI C63.26-2015*

Band	9 ~ 150 kHz Correction	150 kHz ~ 30 MHz Correction
Below 1 GHz (Ref.RBW: 100 kHz)	20 dB	10 dB
Above 1 GHz (Ref.RBW: 1 MHz)	30 dB	20 dB

Note2. *Intermodulation test in ESMR/FirstNet band are performed only for CDMA/LTE 5MHz signal, because the band cannot accommodate two LTE 5 MHz/LTE 10MHz signals. (Refer to Section 3.6.1 of KDB 935210 D05)*

Test Results:

Plot data of Out-of-band/out-of-block emissions_700 MHz Band

Out-of-band (two adjacent test signals) / 700 LTE / Downlink / LTE 5 MHz	
Lower	Upper
	

Out-of-band (two adjacent test signals) / 700 LTE / Downlink / LTE 10 MHz	
Lower	Upper
	

Out-of-band (two adjacent test signals) / FirstNet / Downlink / LTE 5 MHz	
Lower	Upper
	

Note: *Intermodulation test in FirstNet band are performed only for LTE 5MHz signal, because the band cannot accommodate two LTE 10MHz signals. (Refer to Section 3.6.1 of KDB 935210 D05)*

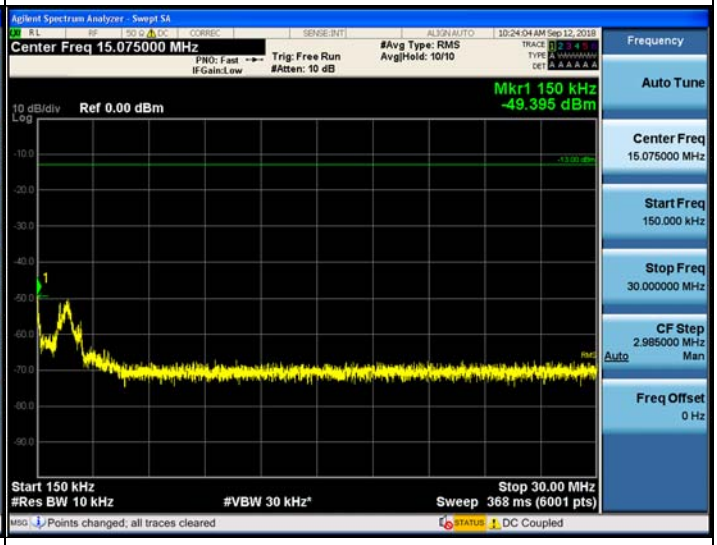
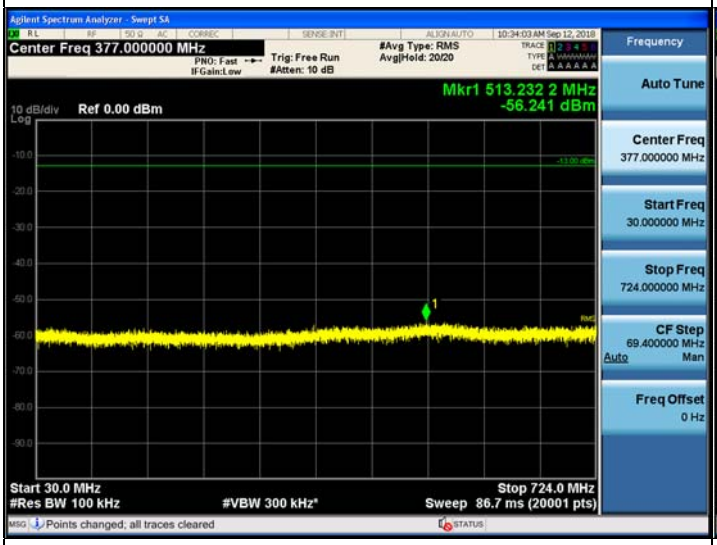
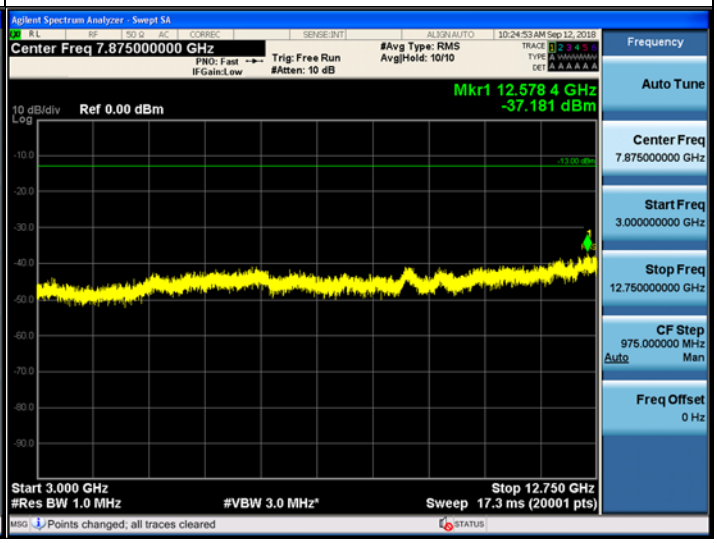
Out-of-band (single test signal) / 700 LTE / Downlink / LTE 5 MHz	
Lower	Upper
	

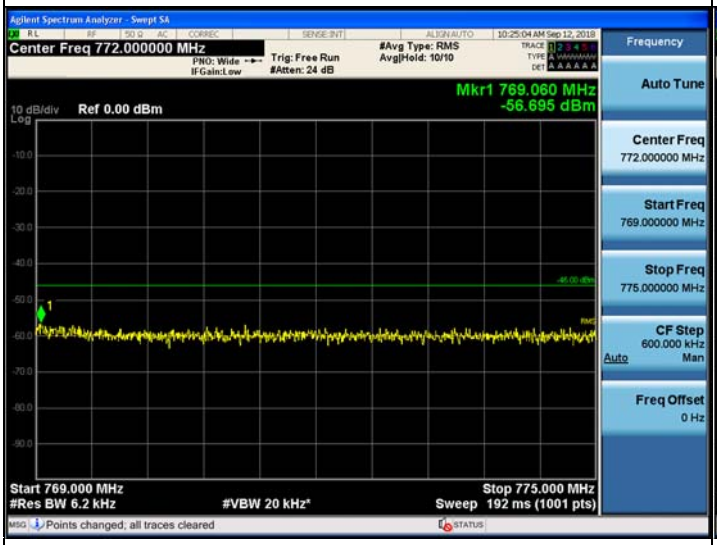
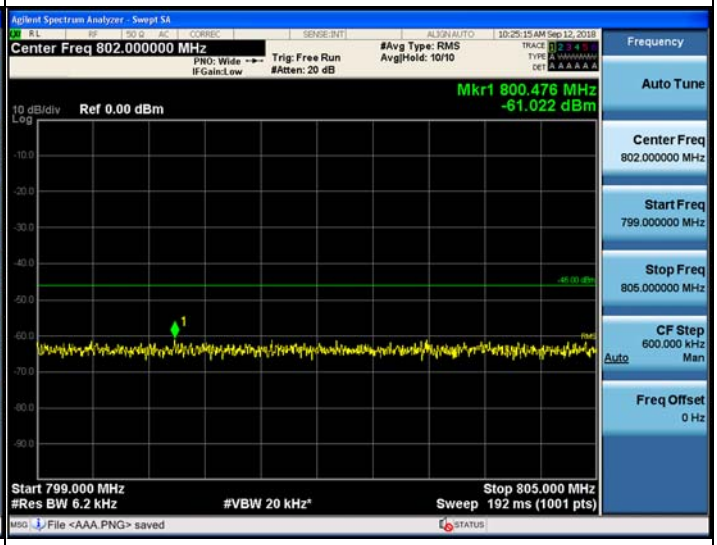
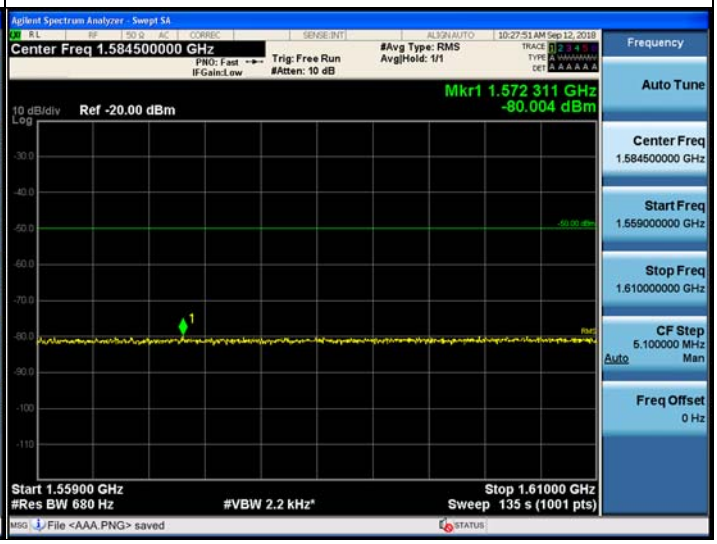
Out-of-band (single test signal) / 700 LTE / Downlink / LTE 10 MHz	
Lower	Upper
	

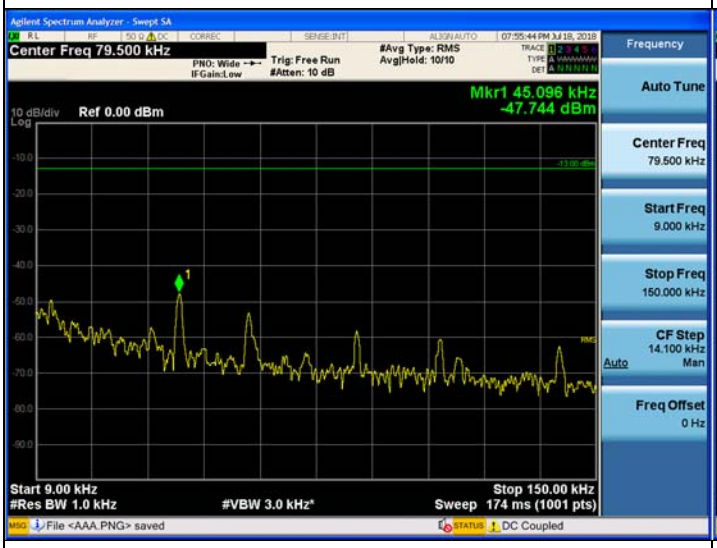
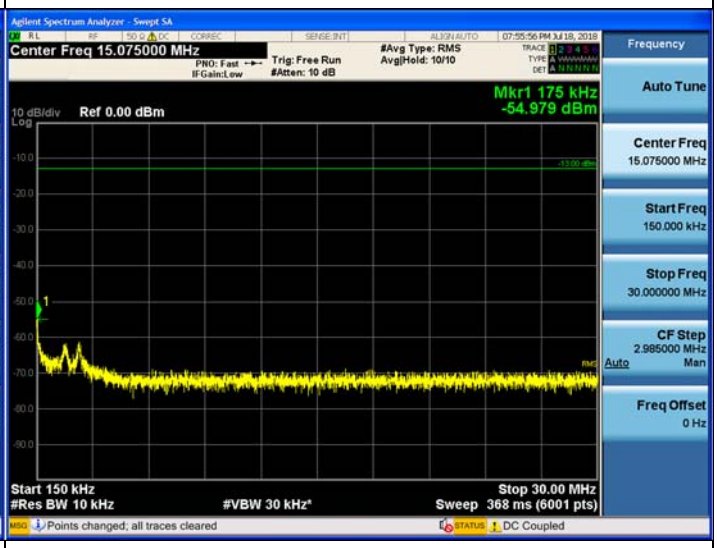
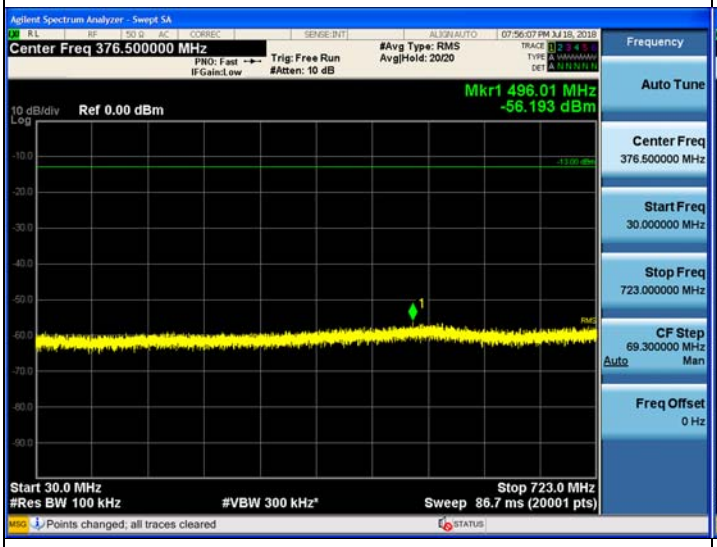
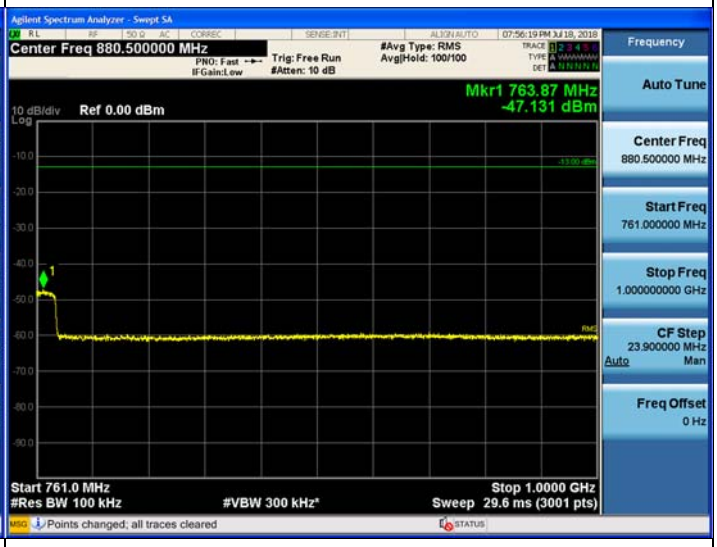
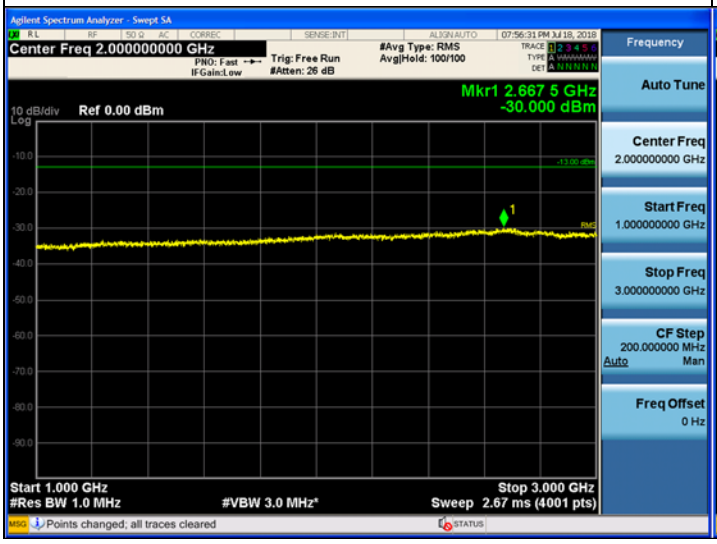
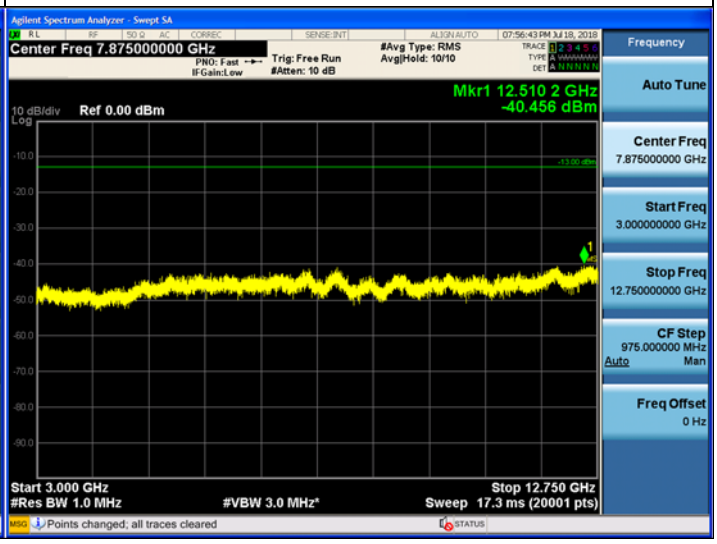
Out-of-band (single test signal) / FirstNet / Downlink / LTE 5 MHz	
Lower	Upper
	

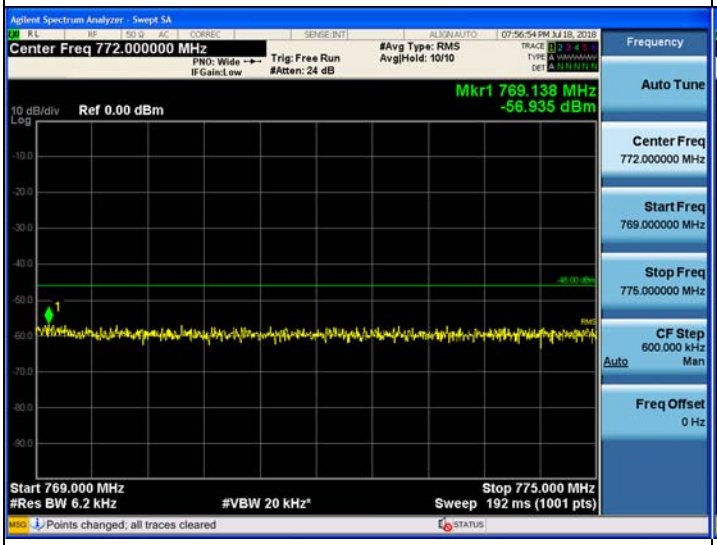
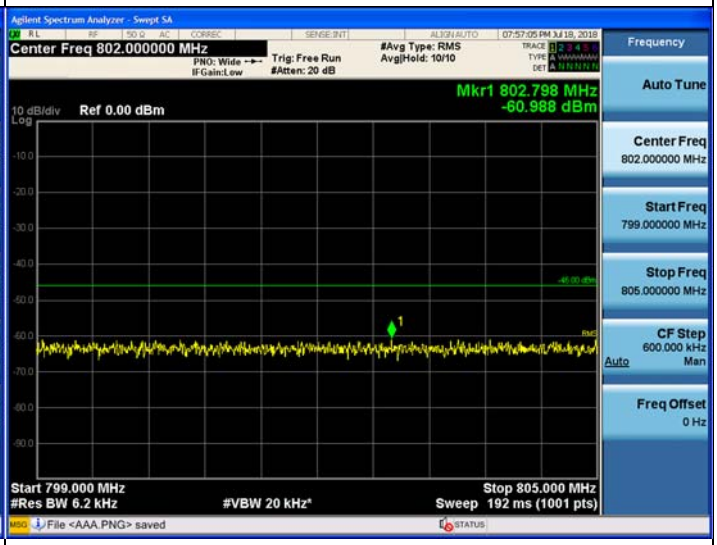
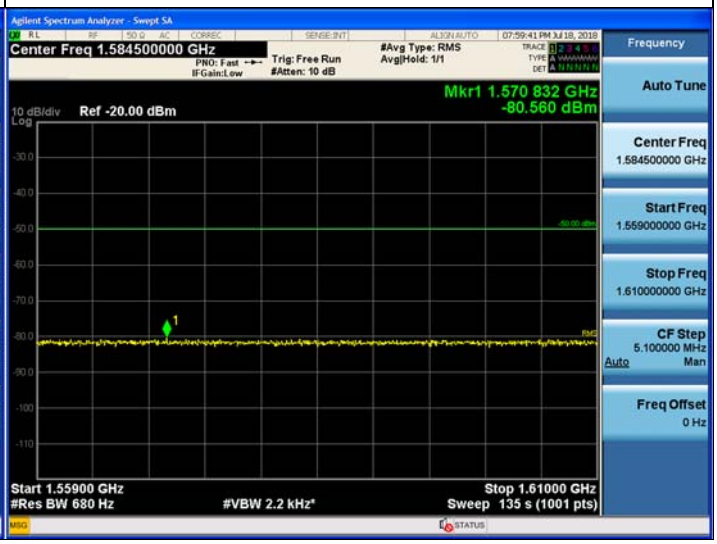
Out-of-band (single test signal) / FirstNet / Downlink / LTE 10 MHz	
Lower	Upper
	

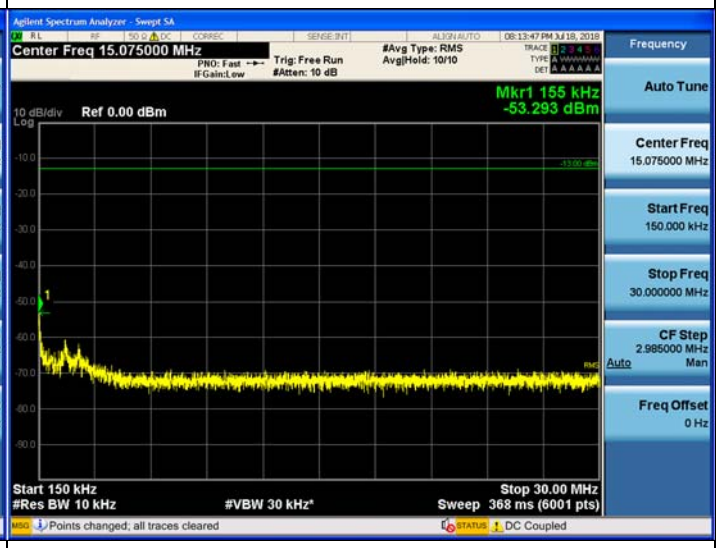
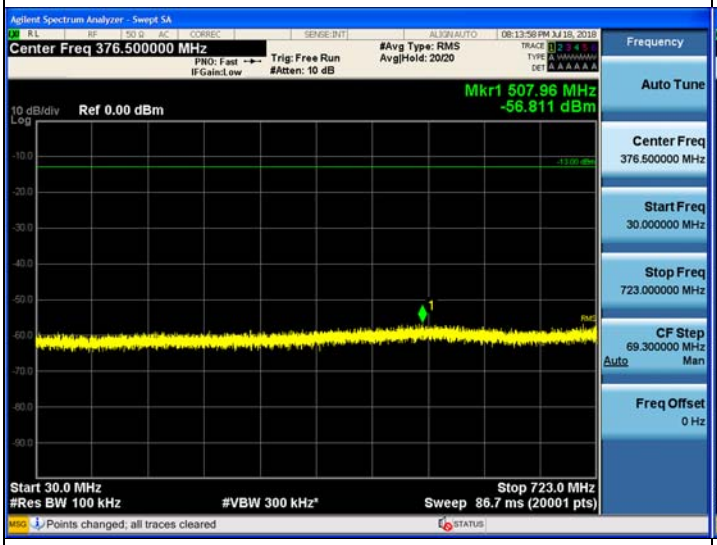
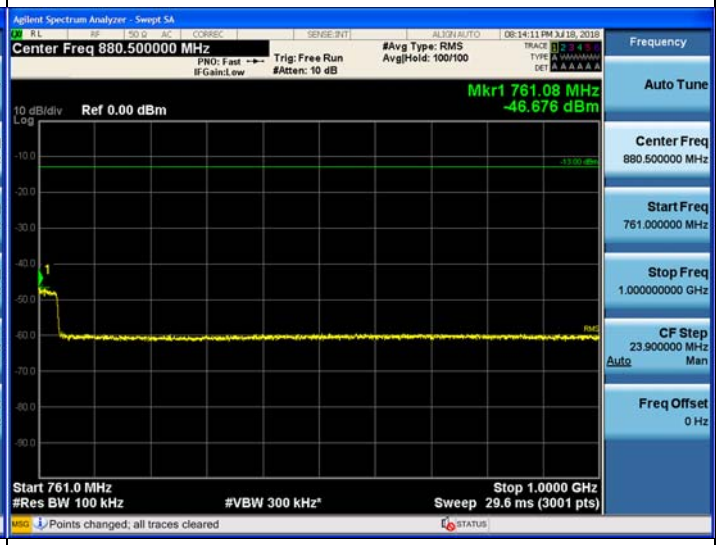
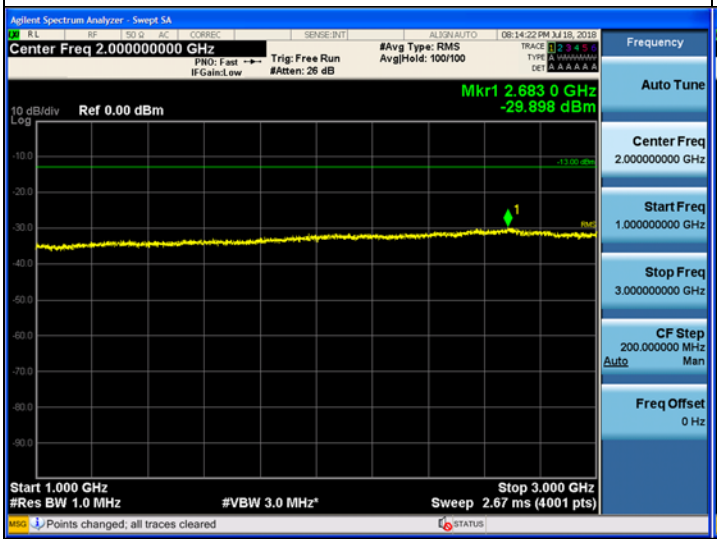
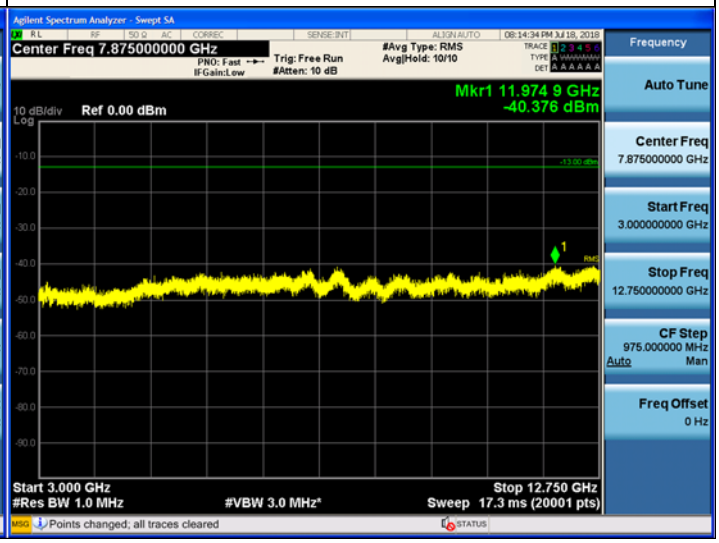
Plot data of Spurious Emissions_700 MHz Band

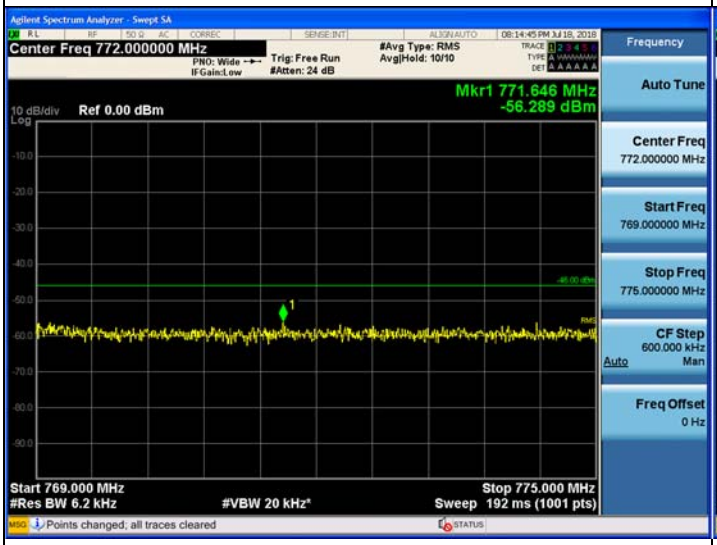
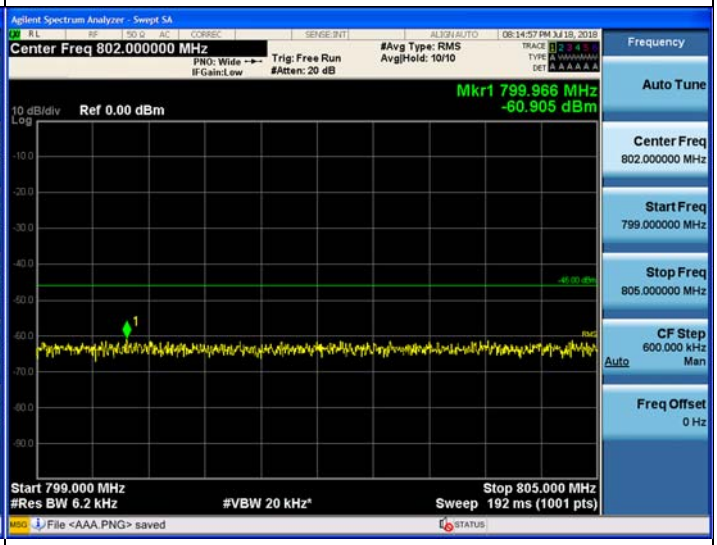
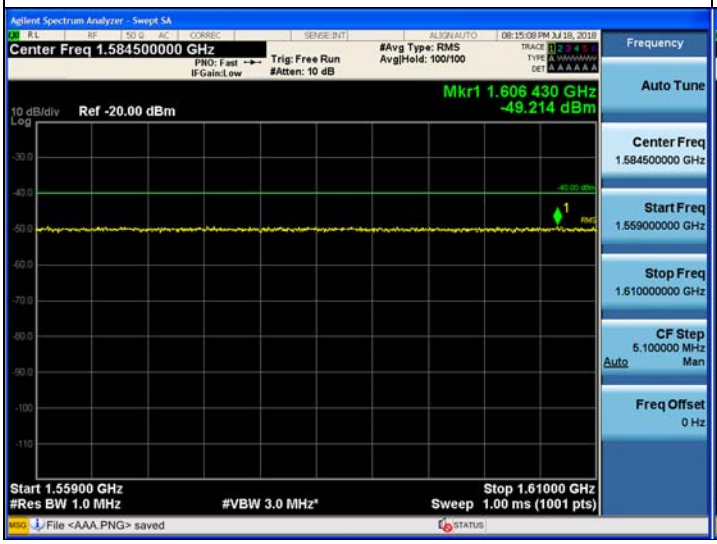
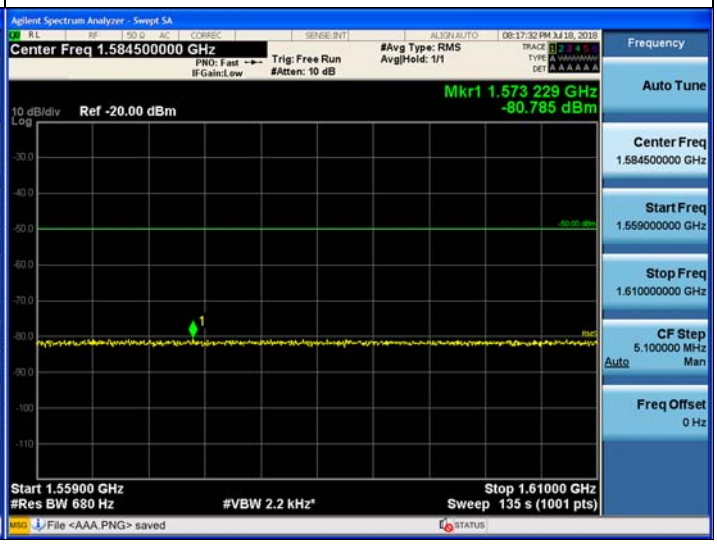
Spurious / 700 LTE / Downlink / LTE 5 MHz / Low Channel	
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 724 MHz	761 MHz ~ 1 GHz
	
1 GHz ~ 3 GHz	3 GHz ~ 12.75 GHz
	

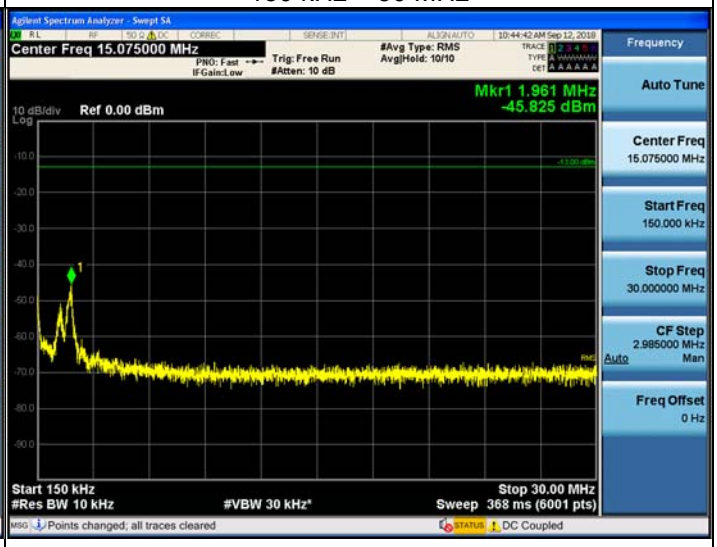
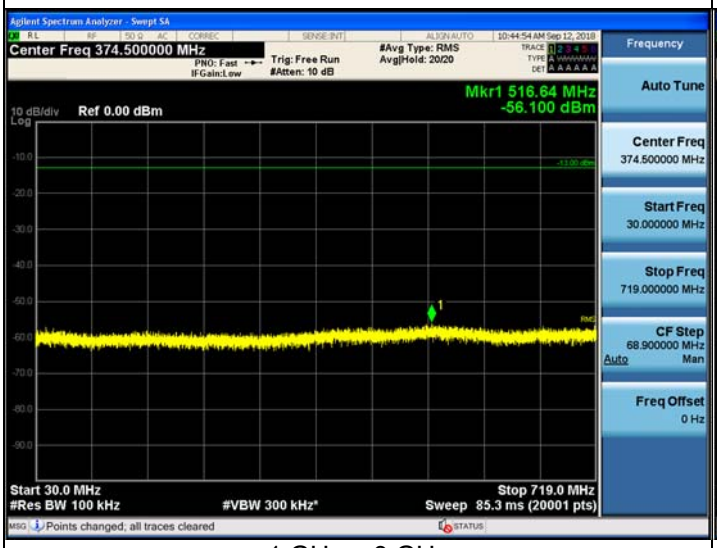
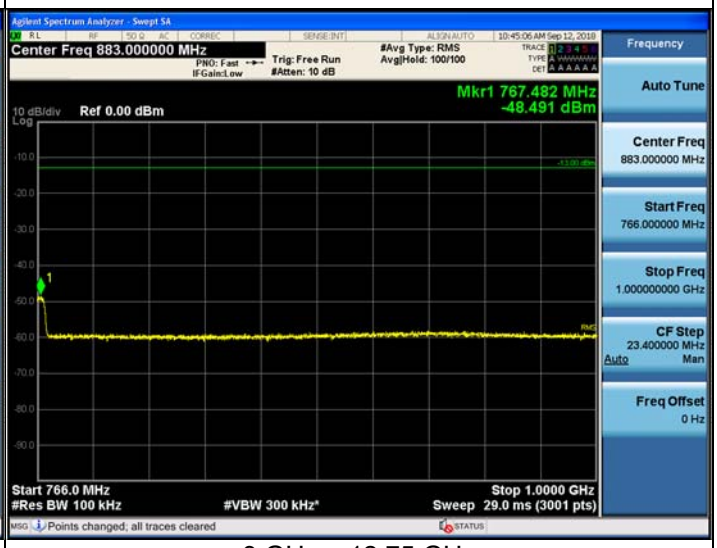
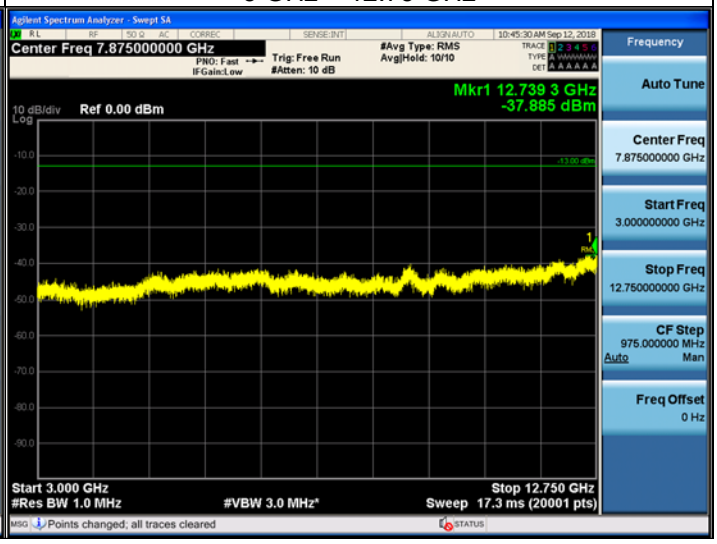
Spurious / 700 LTE / Downlink / LTE 5 MHz / Low Channel	
769 MHz ~ 775 MHz	799 MHz ~ 805 MHz
	
1 559 MHz ~ 1 610 MHz (1)	1 559 MHz ~ 1 610 MHz (2)
	

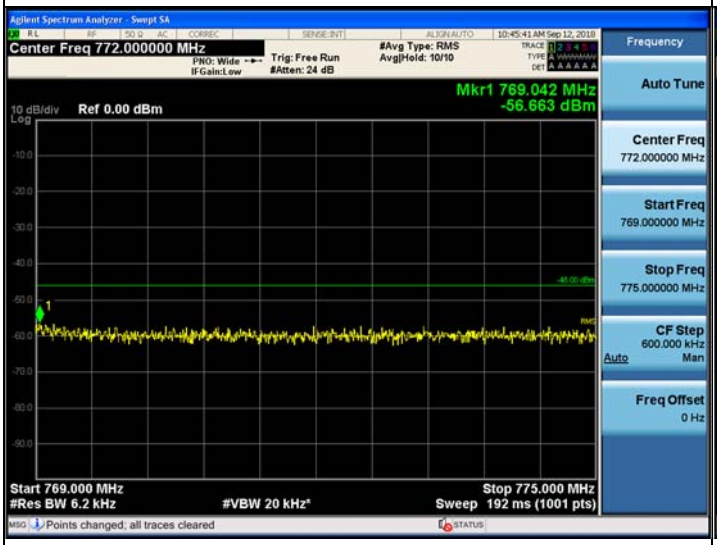
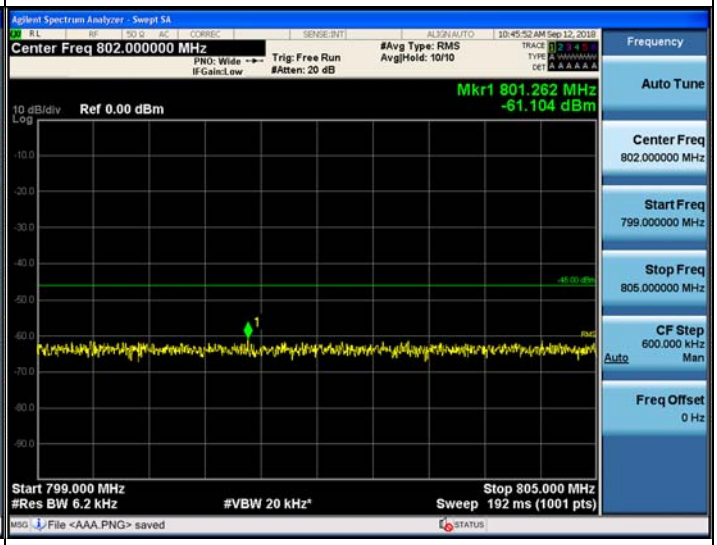
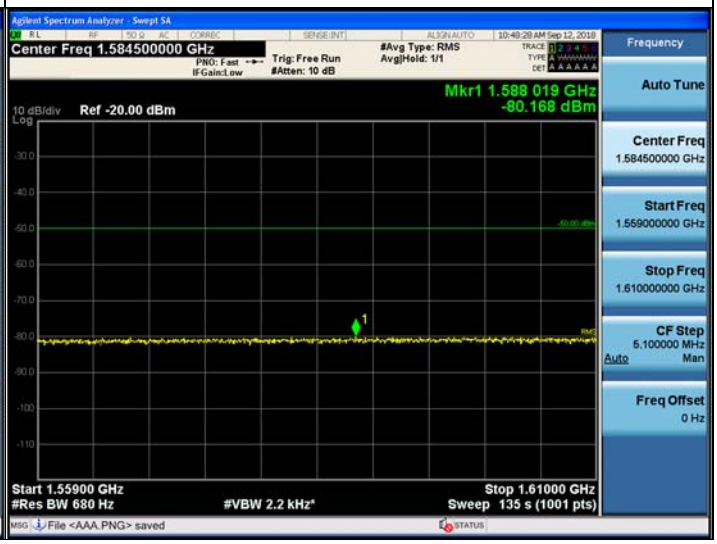
Spurious / 700 LTE / Downlink / LTE 5 MHz / Middle Channel	
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 723 MHz	761 MHz ~ 1 GHz
	
1 GHz ~ 3 GHz	3 GHz ~ 12.75 GHz
	

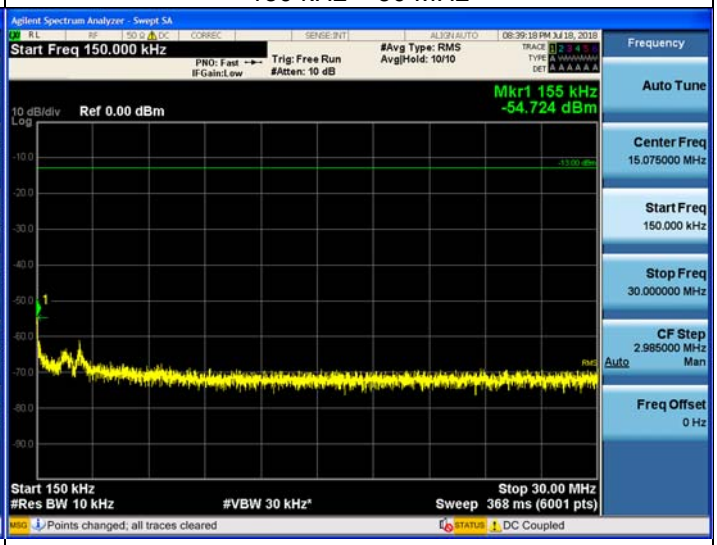
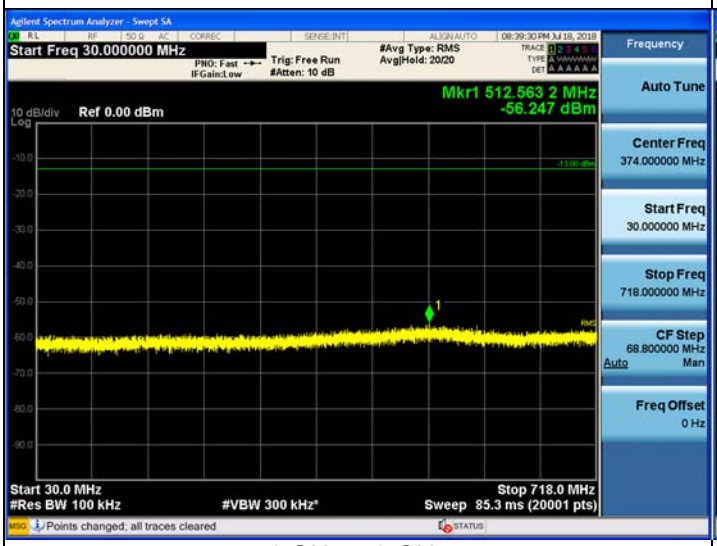
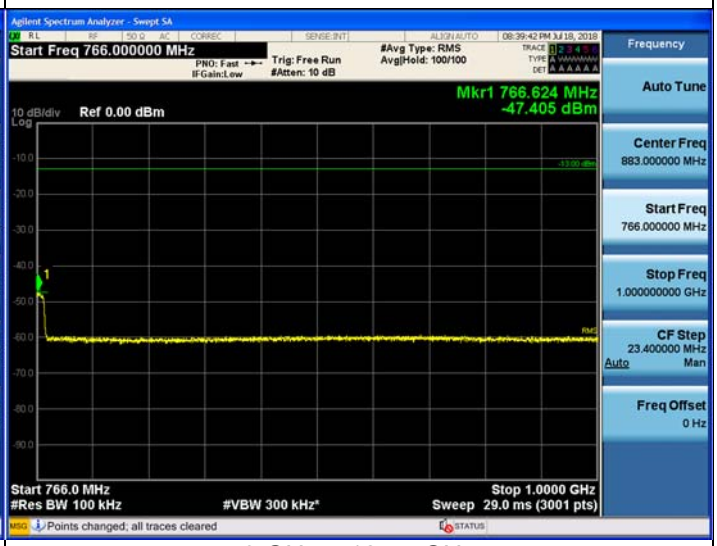
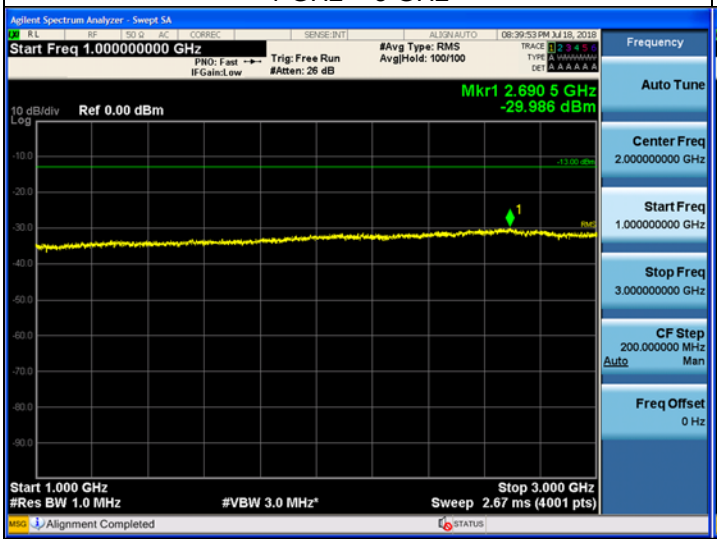
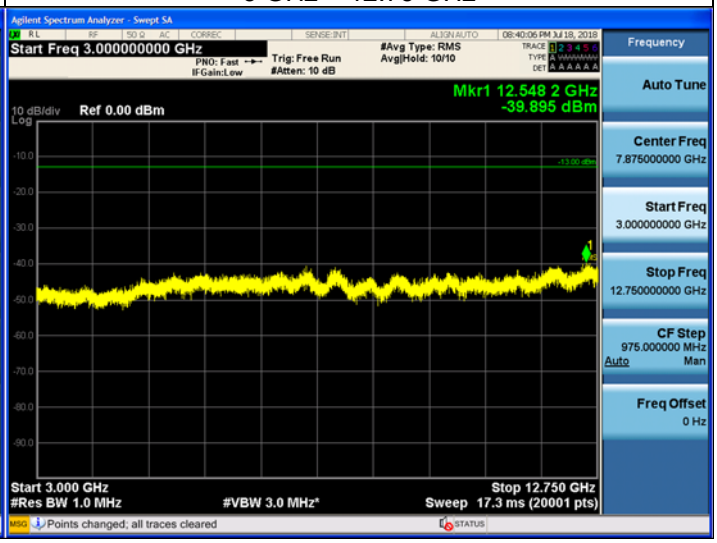
Spurious / 700 LTE / Downlink / LTE 5 MHz / Middle Channel	
769 MHz ~ 775 MHz	799 MHz ~ 805 MHz
	
1 559 MHz ~ 1 610 MHz (1)	1 559 MHz ~ 1 610 MHz (2)
	

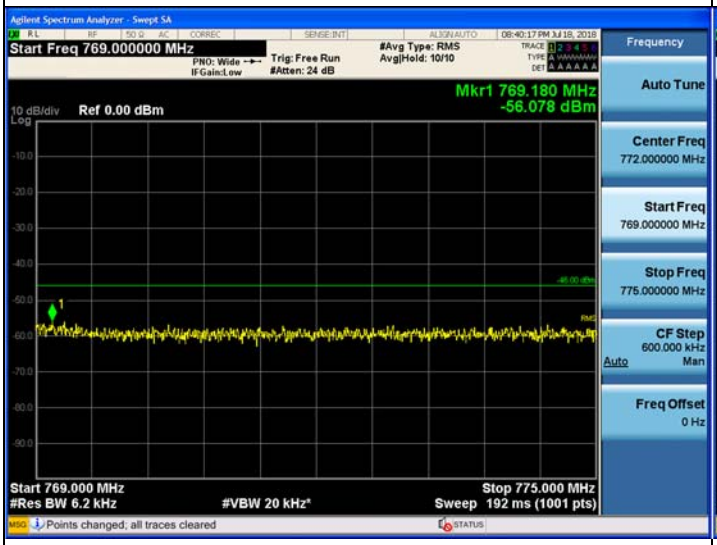
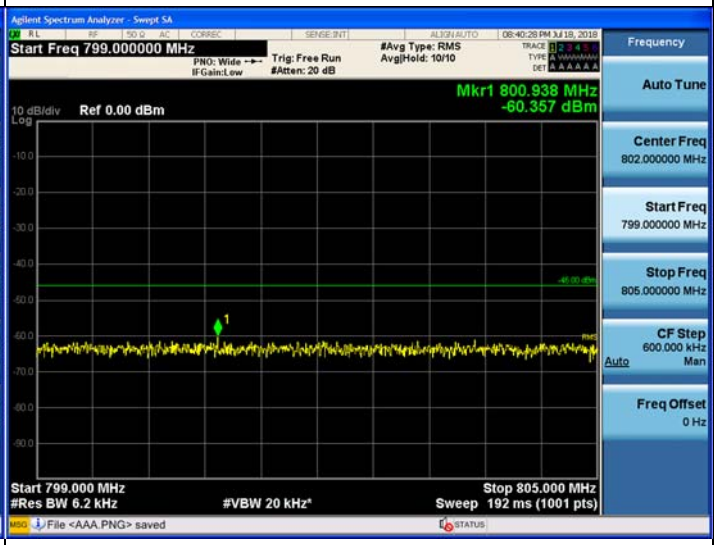
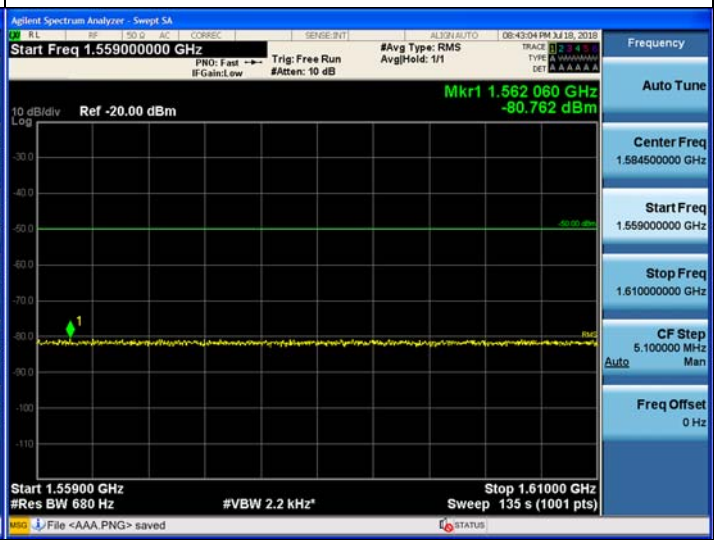
Spurious / 700 LTE / Downlink / LTE 5 MHz / High Channel	
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 723 MHz	761 MHz ~ 1 GHz
	
1 GHz ~ 3 GHz	3 GHz ~ 12.75 GHz
	

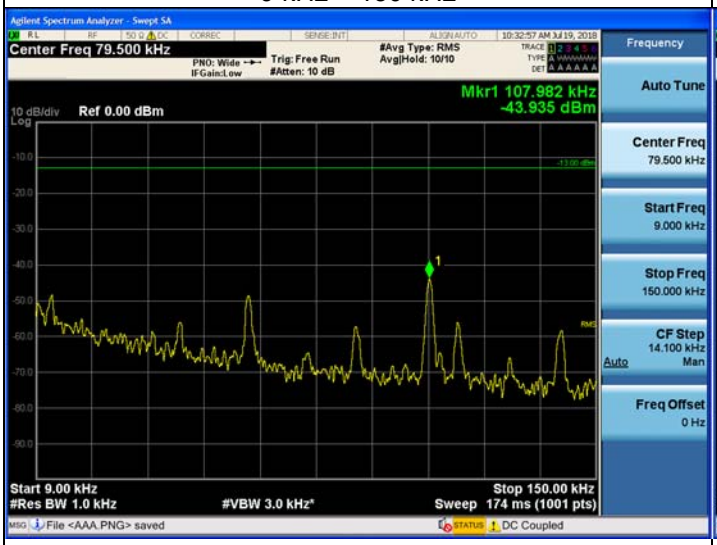
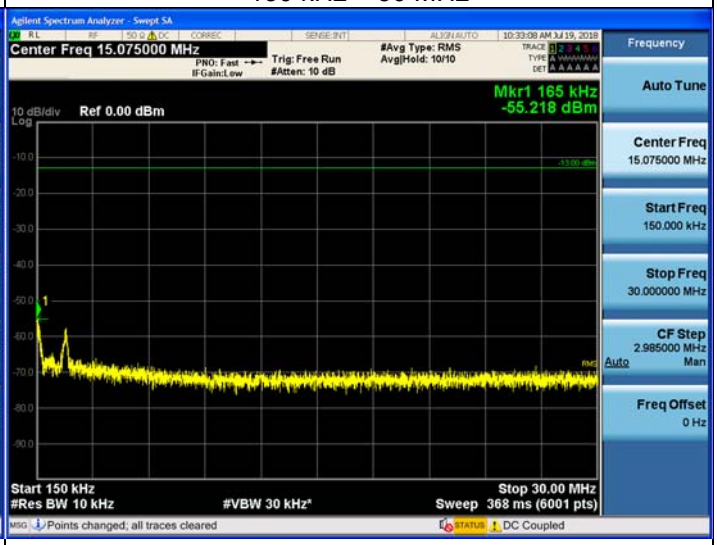
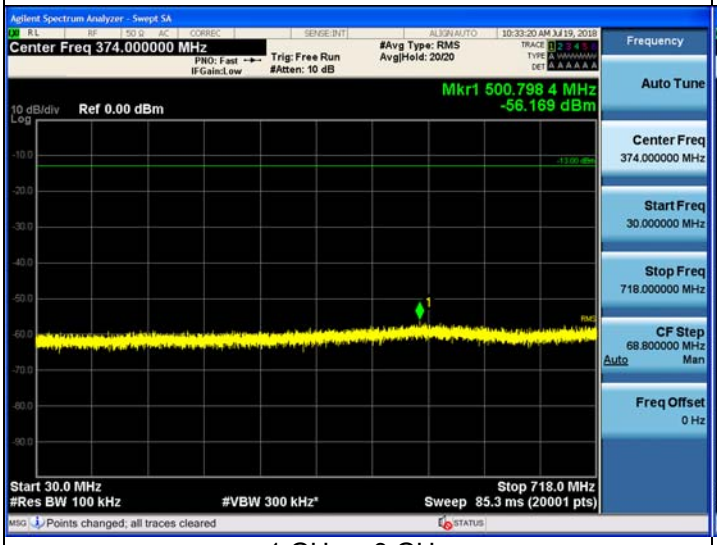
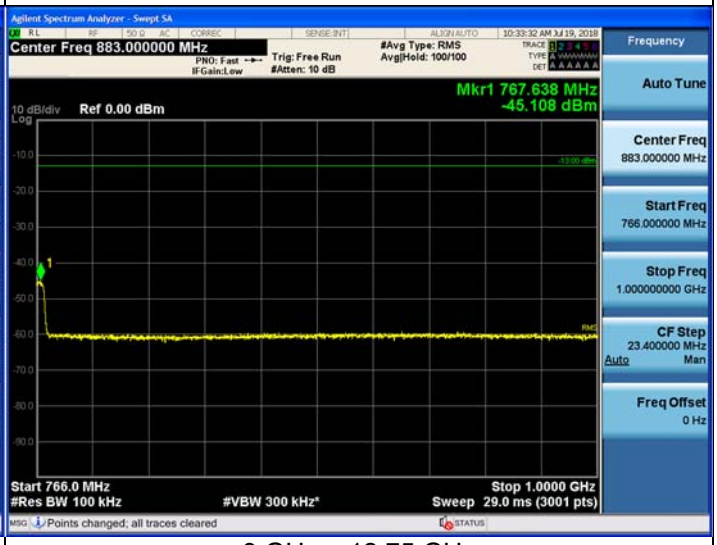
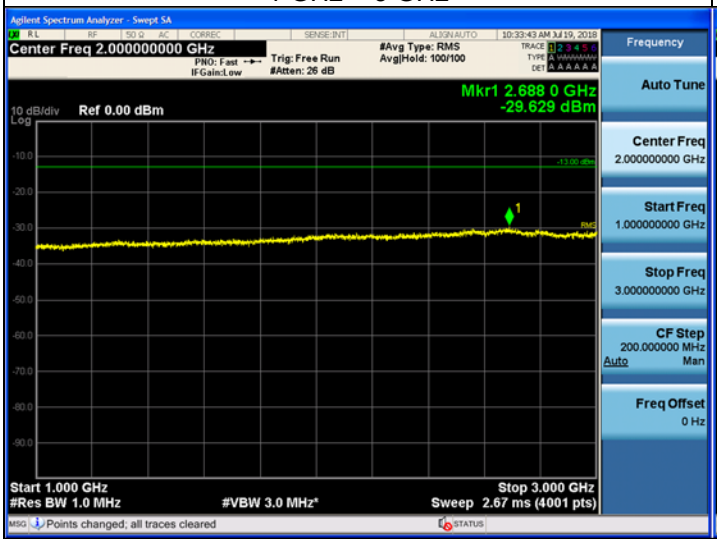
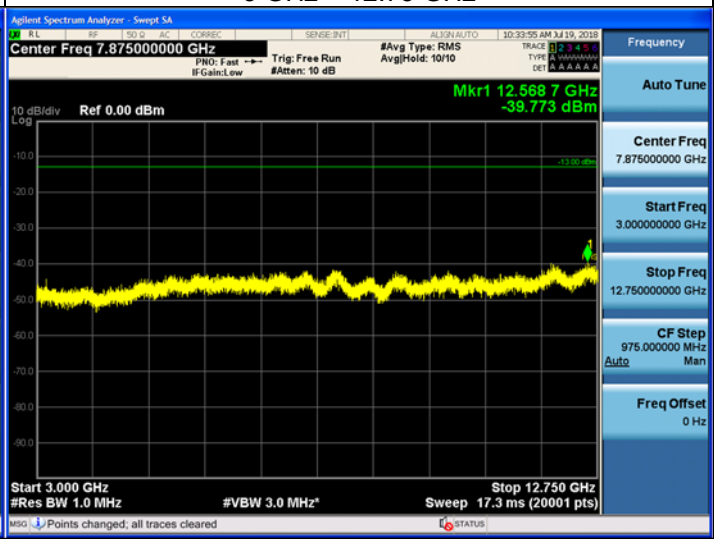
Spurious / 700 LTE / Downlink / LTE 5 MHz / High Channel	
769 MHz ~ 775 MHz	799 MHz ~ 805 MHz
	
1 559 MHz ~ 1 610 MHz (1)	1 559 MHz ~ 1 610 MHz (2)
	

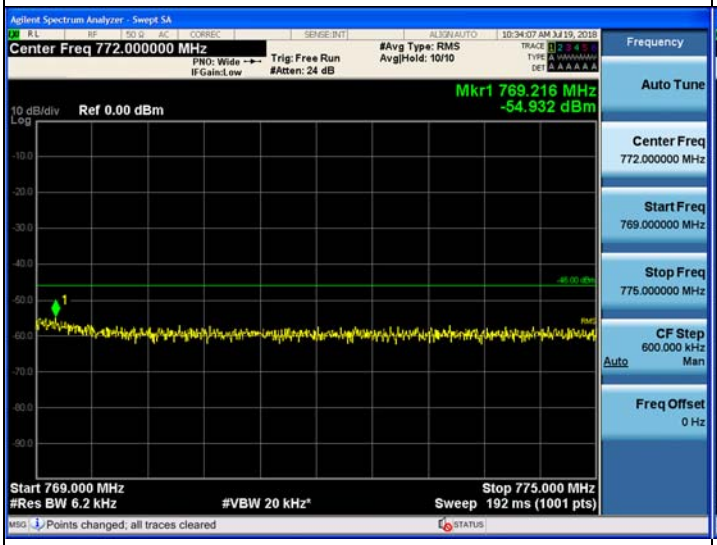
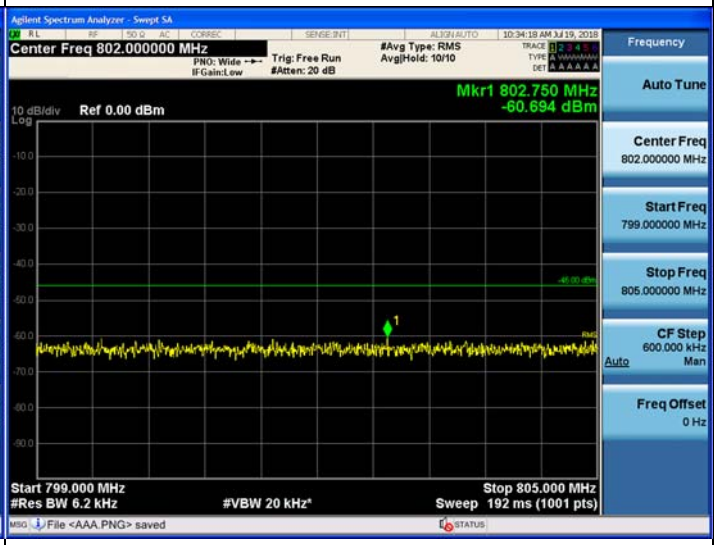
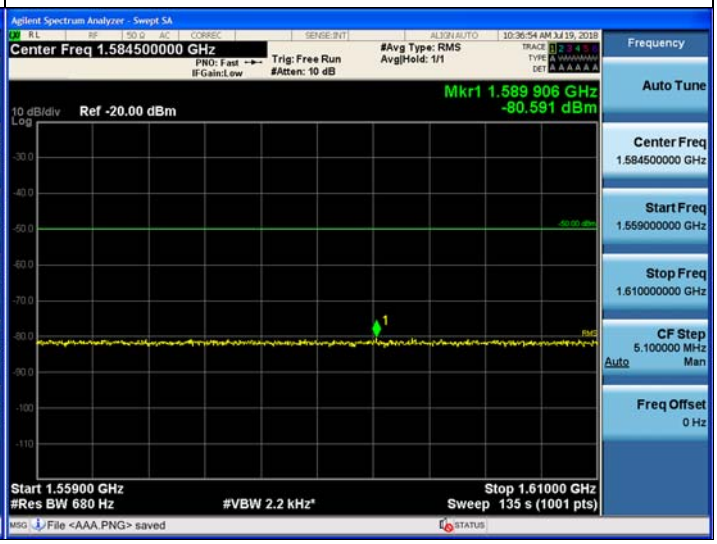
Spurious / 700 LTE / Downlink / LTE 10 MHz / Low Channel	
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 719 MHz	766 MHz ~ 1 GHz
	
1 GHz ~ 3 GHz	3 GHz ~ 12.75 GHz
	

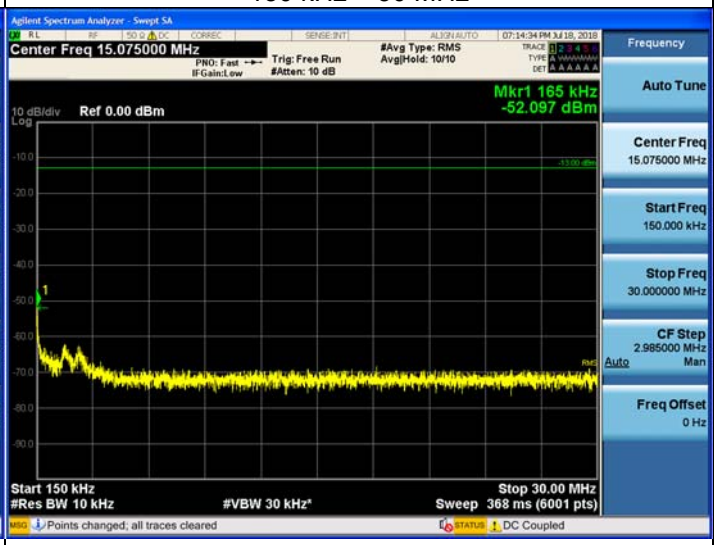
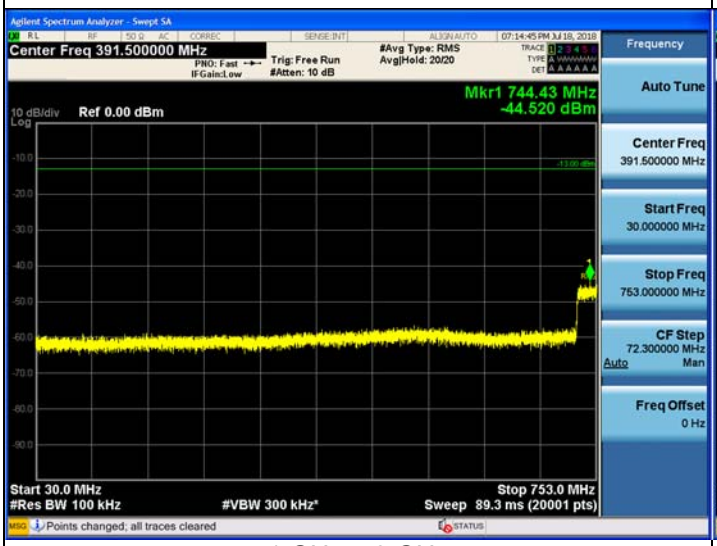
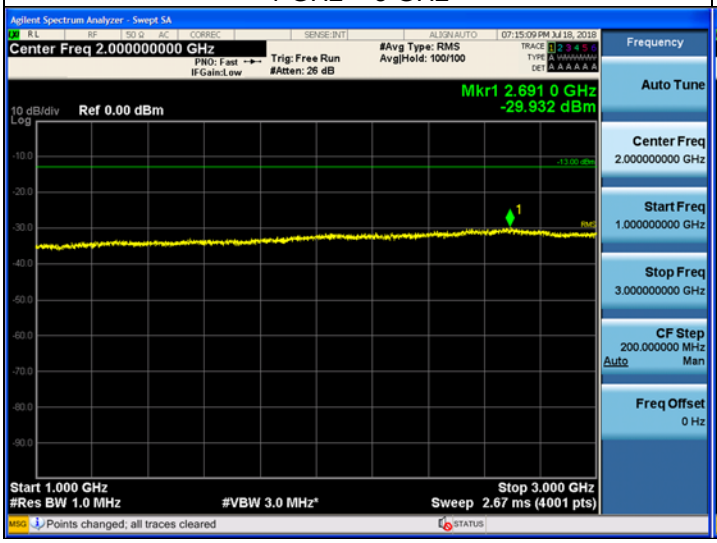
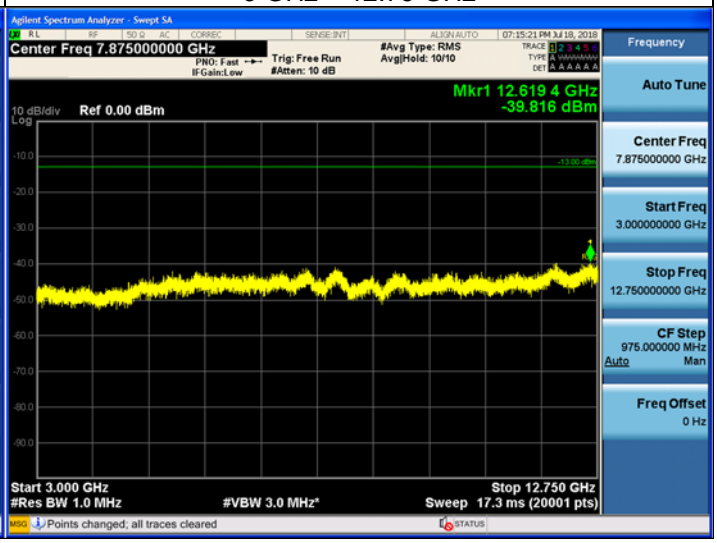
Spurious / 700 LTE / Downlink / LTE 10 MHz / Low Channel	
769 MHz ~ 775 MHz	799 MHz ~ 805 MHz
	
1 559 MHz ~ 1 610 MHz (1)	1 559 MHz ~ 1 610 MHz (2)
	

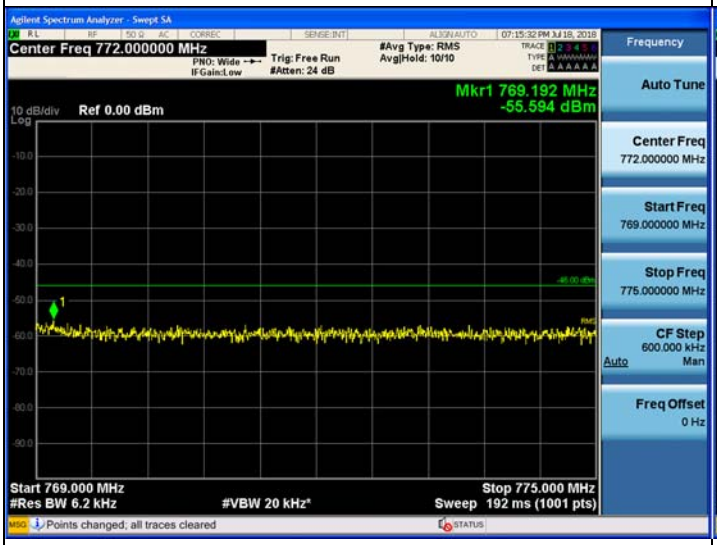
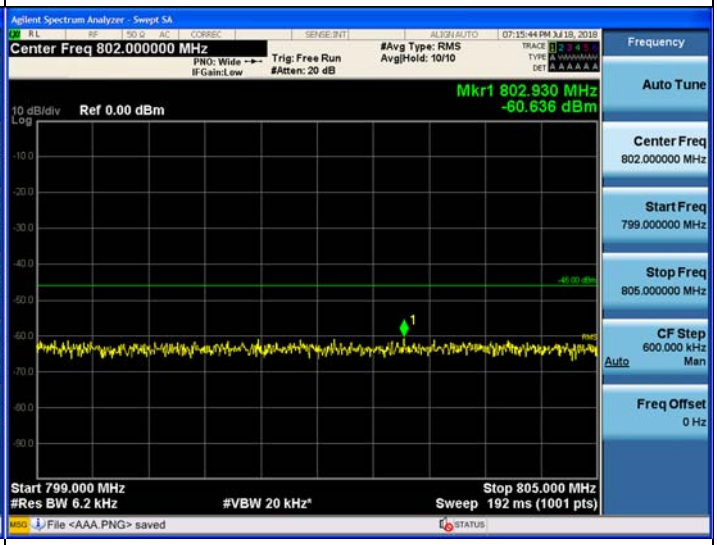
Spurious / 700 LTE / Downlink / LTE 10 MHz / Middle Channel	
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 718 MHz	766 MHz ~ 1 GHz
	
1 GHz ~ 3 GHz	3 GHz ~ 12.75 GHz
	

Spurious / 700 LTE / Downlink / LTE 10 MHz / Middle Channel	
769 MHz ~ 775 MHz	799 MHz ~ 805 MHz
	
1 559 MHz ~ 1 610 MHz (1)	1 559 MHz ~ 1 610 MHz (2)
	

Spurious / 700 LTE / Downlink / LTE 10 MHz / High Channel	
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 718 MHz	766 MHz ~ 1 GHz
	
1 GHz ~ 3 GHz	3 GHz ~ 12.75 GHz
	

Spurious / 700 LTE / Downlink / LTE 10 MHz / High Channel	
769 MHz ~ 775 MHz	799 MHz ~ 805 MHz
	
1 559 MHz ~ 1 610 MHz (1)	1 559 MHz ~ 1 610 MHz (2)
	

Spurious / FirstNet / Downlink / LTE 5 MHz / Low Channel	
9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 753 MHz	773 MHz ~ 1 GHz
	
1 GHz ~ 3 GHz	3 GHz ~ 12.75 GHz
	

Spurious / FirstNet / Downlink / LTE 5 MHz / Low Channel	
769 MHz ~ 775 MHz	799 MHz ~ 805 MHz
	
1 559 MHz ~ 1 610 MHz (1)	1 559 MHz ~ 1 610 MHz (2)