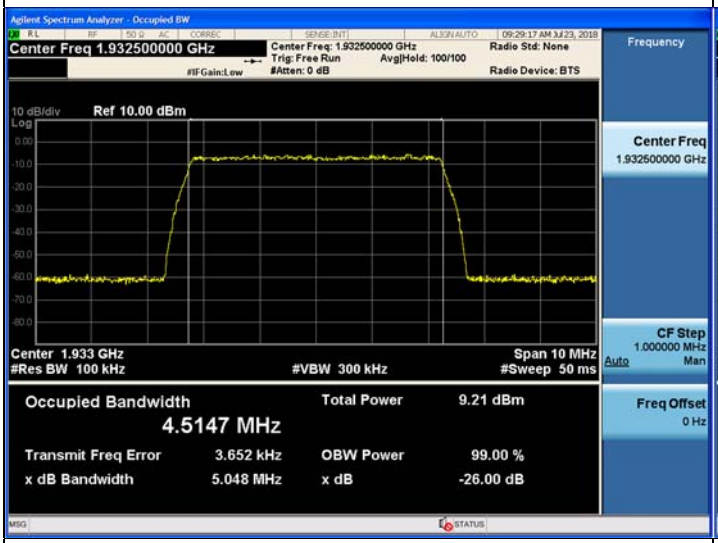
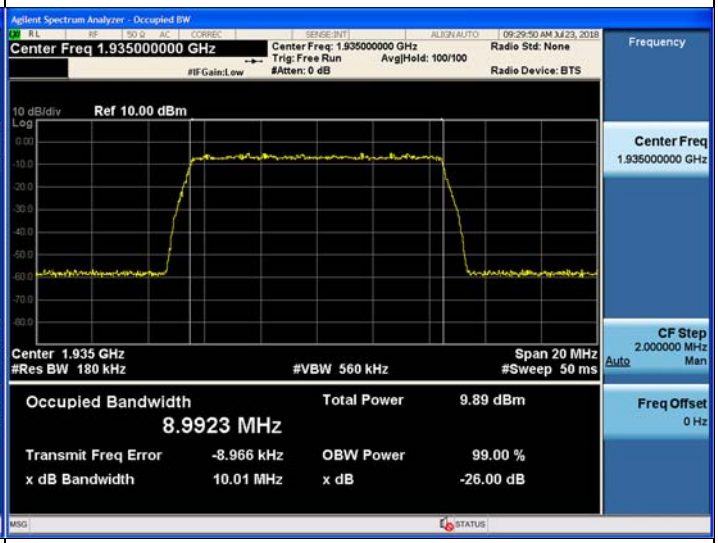
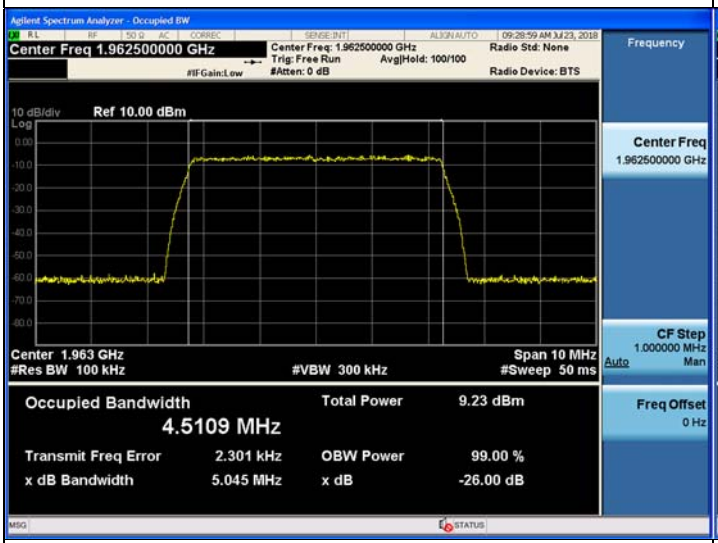
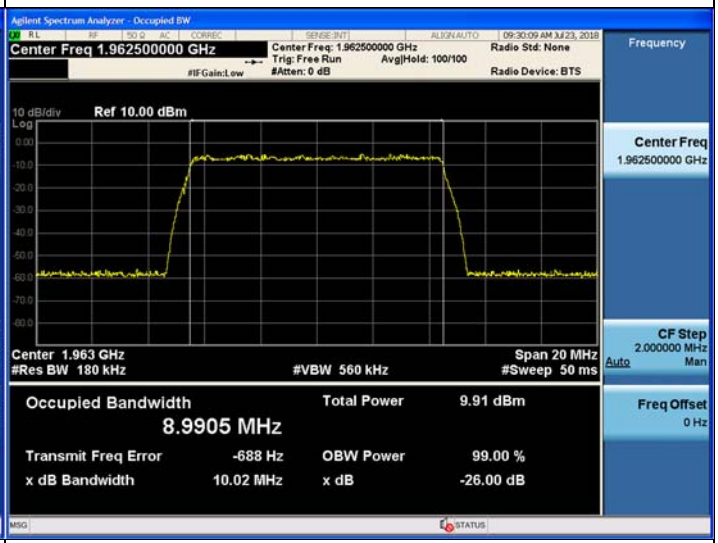
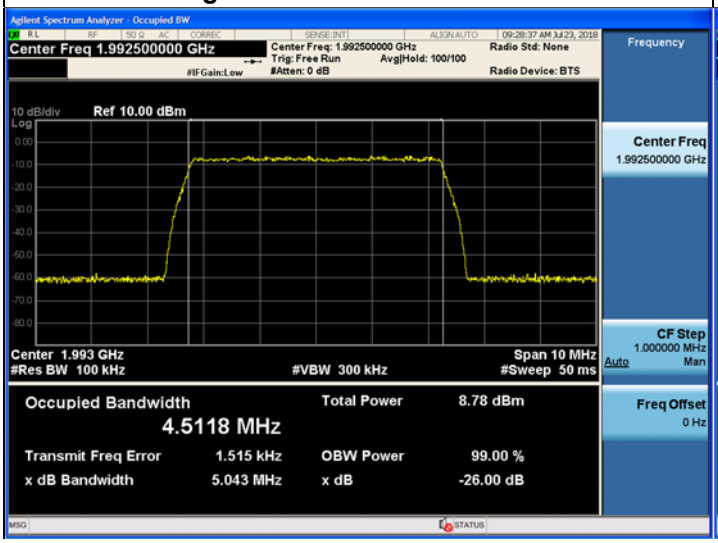
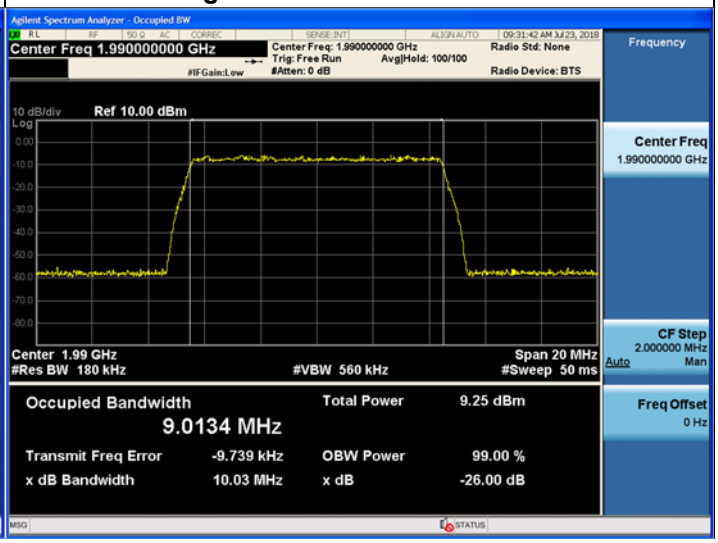
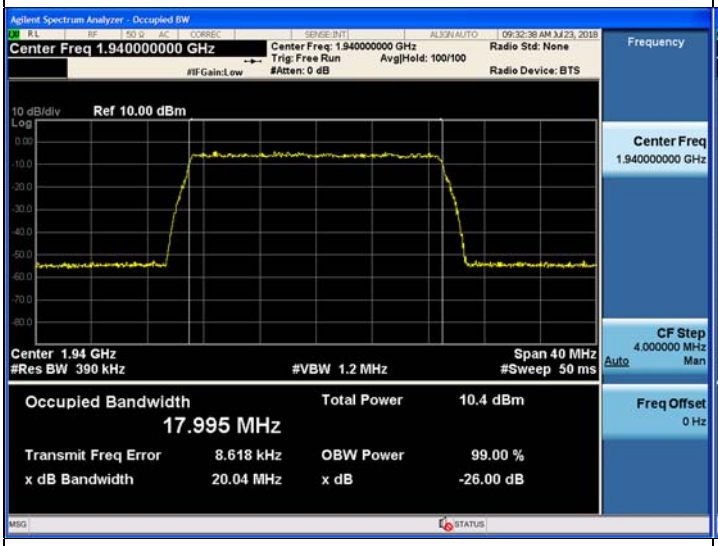
Plots of Input Occupied Bandwidth for 1900 PCS LTE Band

LTE 5 MHz	LTE 10 MHz
Low Channel AGC threshold	Low Channel AGC threshold
	
Middle Channel AGC threshold	Middle Channel AGC threshold
	
High Channel AGC threshold	High Channel AGC threshold
	

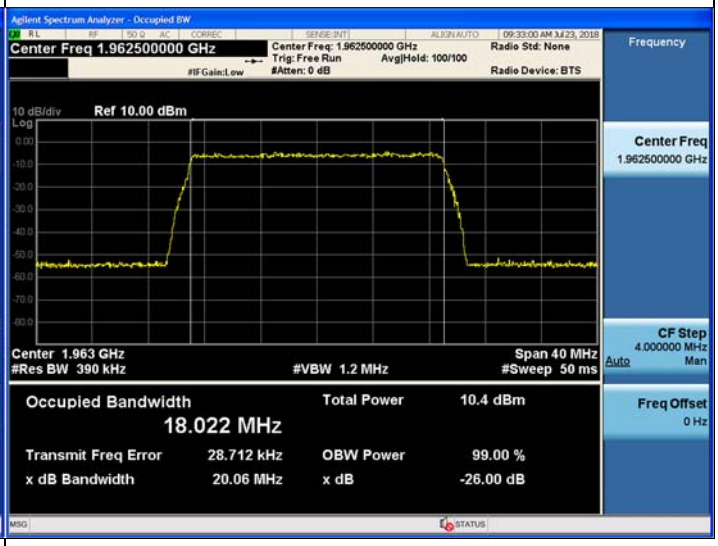
Plots of Input Occupied Bandwidth for 1900 PCS LTE Band

LTE 20 MHz

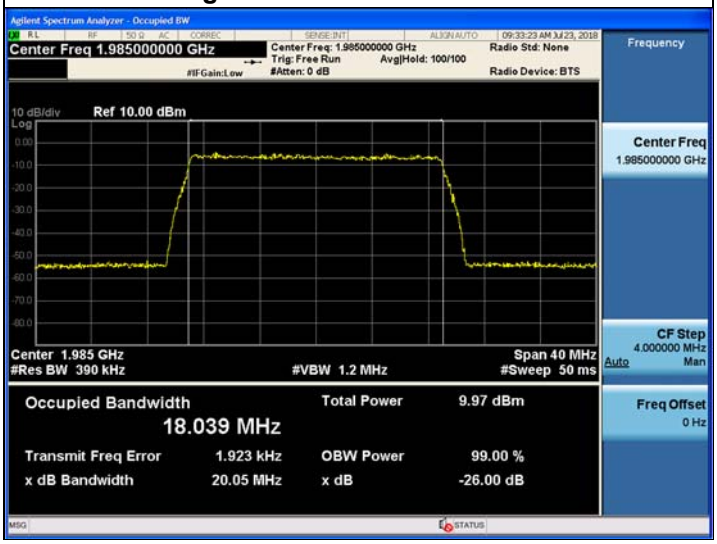
Low Channel AGC threshold



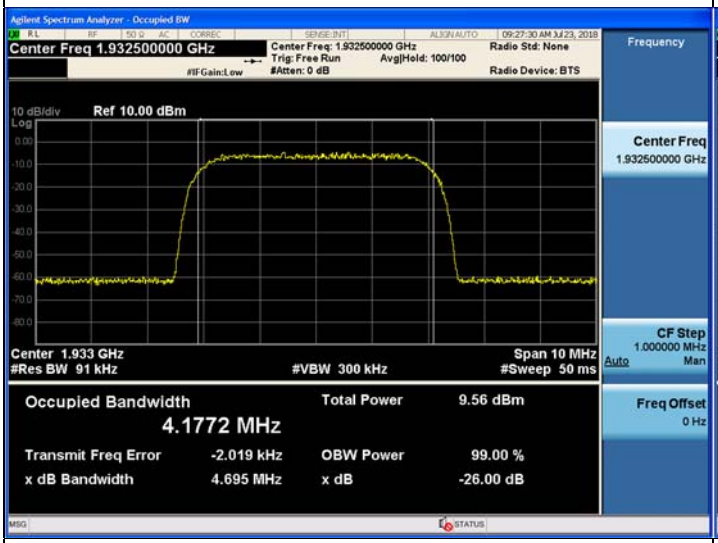
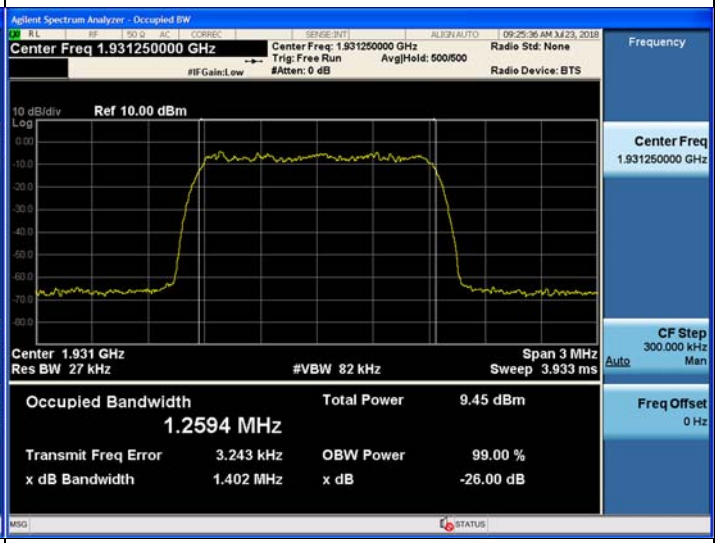
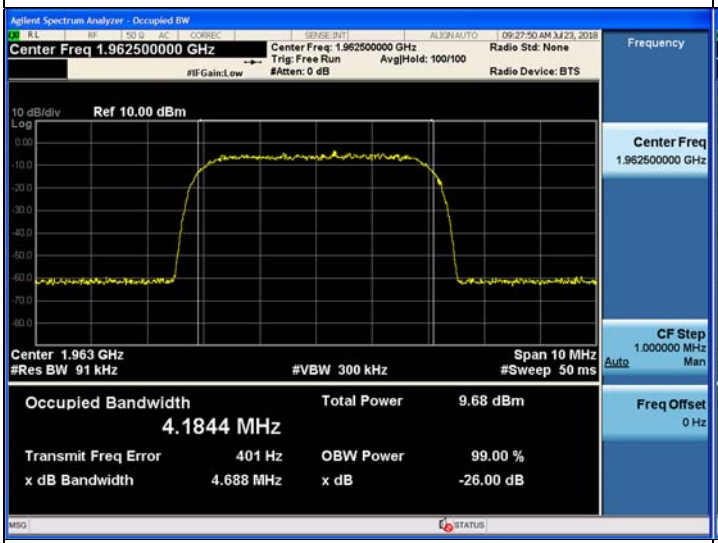
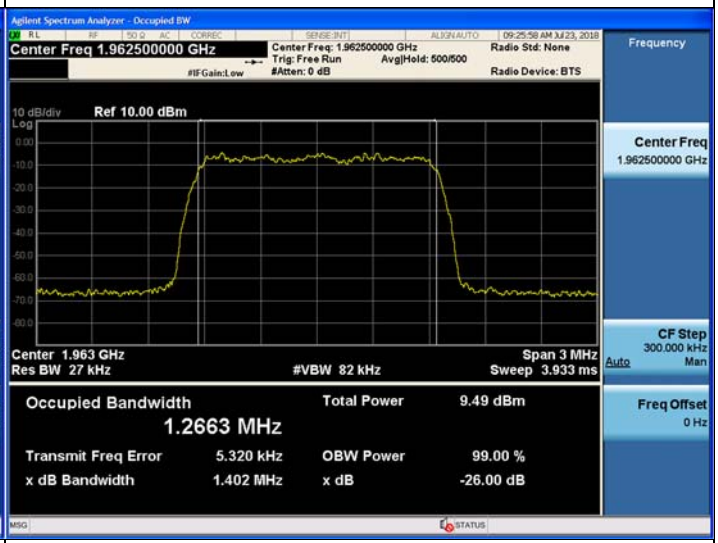
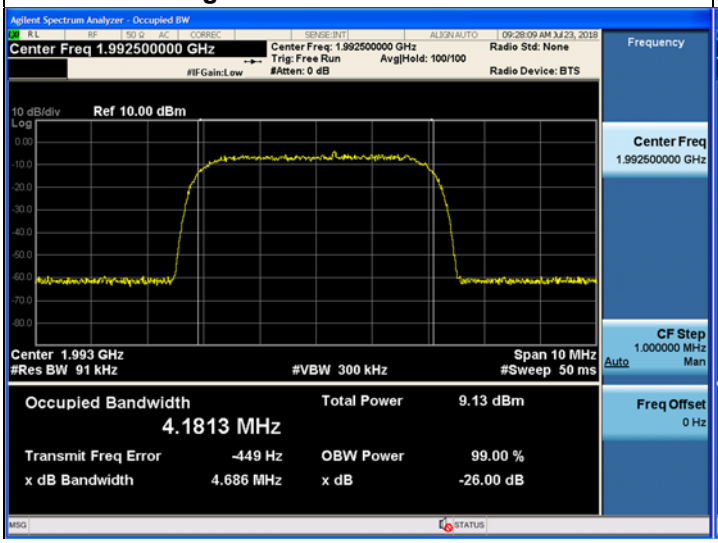
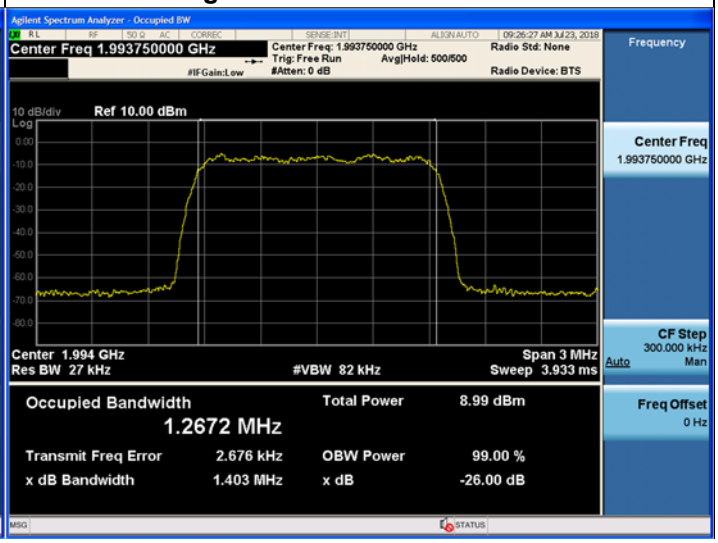
Middle Channel AGC threshold



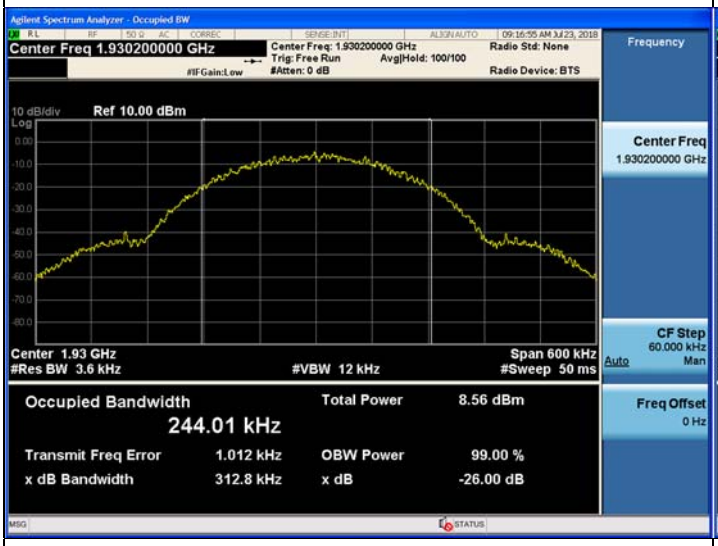
High Channel AGC threshold



Plots of Input Occupied Bandwidth for 1900 PCS Band

WCDMA	CDMA
Low Channel AGC threshold	Low Channel AGC threshold
	
Middle Channel AGC threshold	Middle Channel AGC threshold
	
High Channel AGC threshold	High Channel AGC threshold
	

Plots of Input Occupied Bandwidth for 1900 PCS Band

GSM	
Low Channel AGC threshold	Middle Channel AGC threshold
	
High Channel AGC threshold	
	

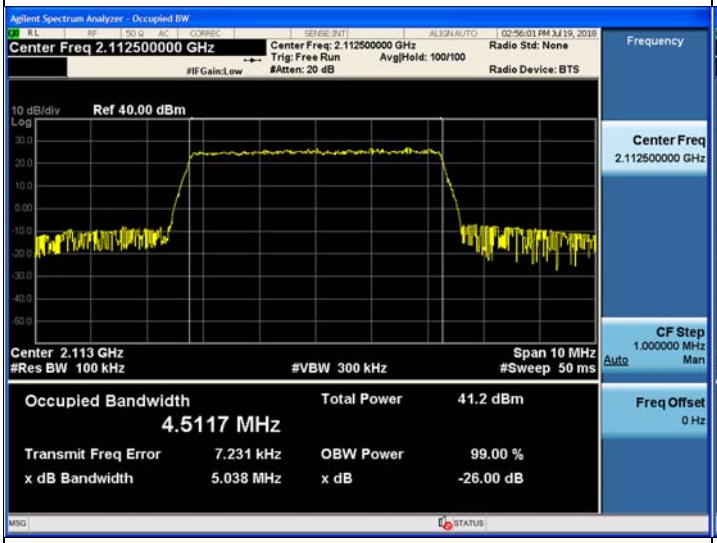
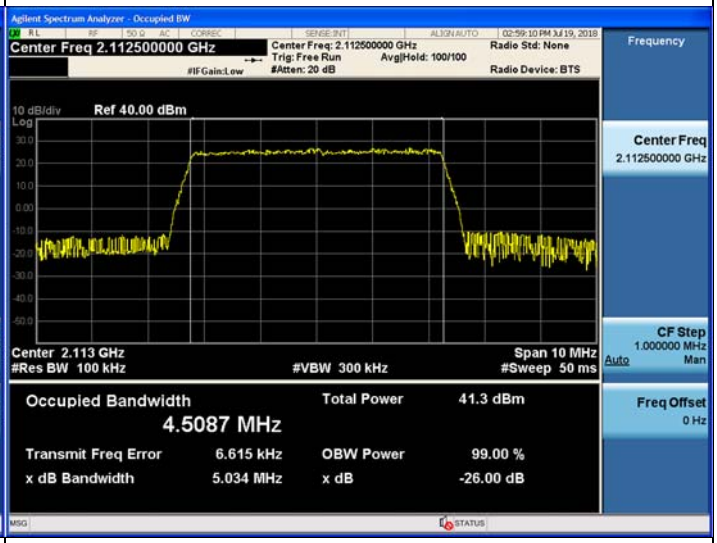
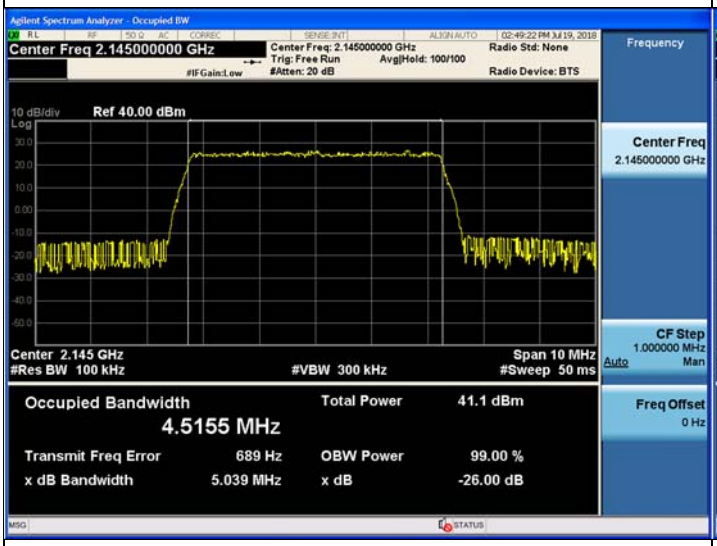
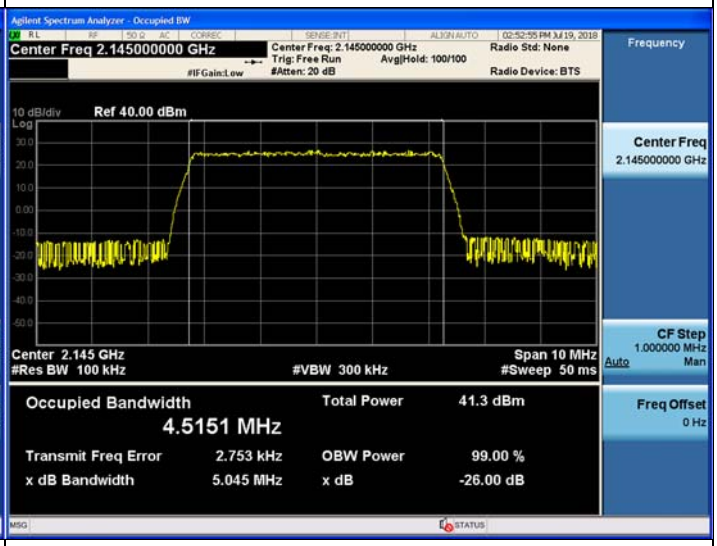
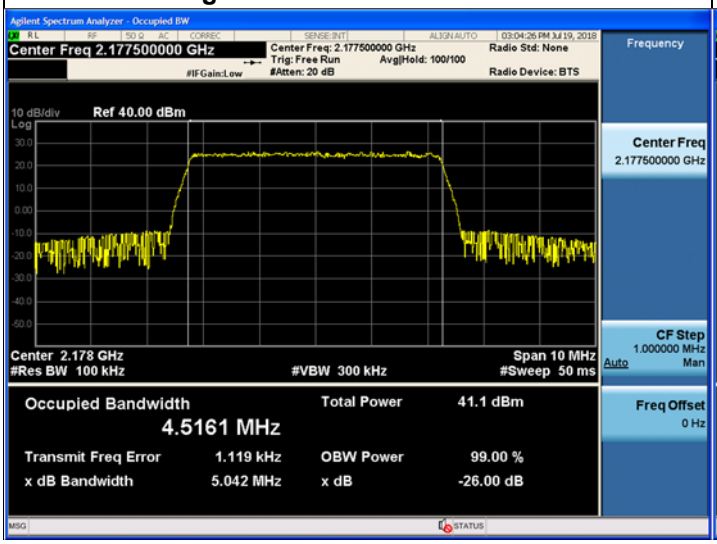
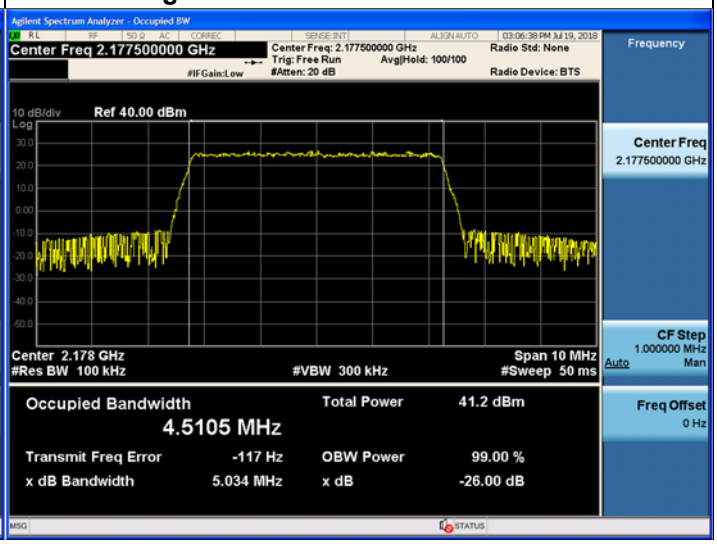
[Downlink Output_AWS 2100 Band]

AWS 2100 Band	Channel	Frequency (MHz)	OBW (MHz)
LTE 5 MHz AGC threshold	Low	2112.50	4.5117
	Middle	2145.00	4.5155
	High	2177.50	4.5161
LTE 5 MHz +3 dB above the AGC threshold	Low	2112.50	4.5087
	Middle	2145.00	4.5151
	High	2177.50	4.5105
LTE 10 MHz AGC threshold	Low	2115.00	8.9953
	Middle	2145.00	9.0016
	High	2175.00	8.9944
LTE 10 MHz +3 dB above the AGC threshold	Low	2115.00	8.9915
	Middle	2145.00	9.0062
	High	2175.00	8.9951
LTE 20 MHz AGC threshold	Low	2120.00	17.990
	Middle	2145.00	18.039
	High	2170.00	18.017
LTE 20 MHz +3 dB above the AGC threshold	Low	2120.00	18.007
	Middle	2145.00	18.030
	High	2170.00	18.010
WCDMA AGC threshold	Low	2112.50	4.1601
	Middle	2145.00	4.1599
	High	2177.50	4.1873
WCDMA +3 dB above the AGC threshold	Low	2112.50	4.1752
	Middle	2145.00	4.1717
	High	2177.50	4.1778
CDMA AGC threshold	Low	2111.25	1.2421
	Middle	2145.00	1.2423
	High	2178.75	1.2449
CDMA +3 dB above the AGC threshold	Low	2111.25	1.2392
	Middle	2145.00	1.2464
	High	2178.75	1.2398

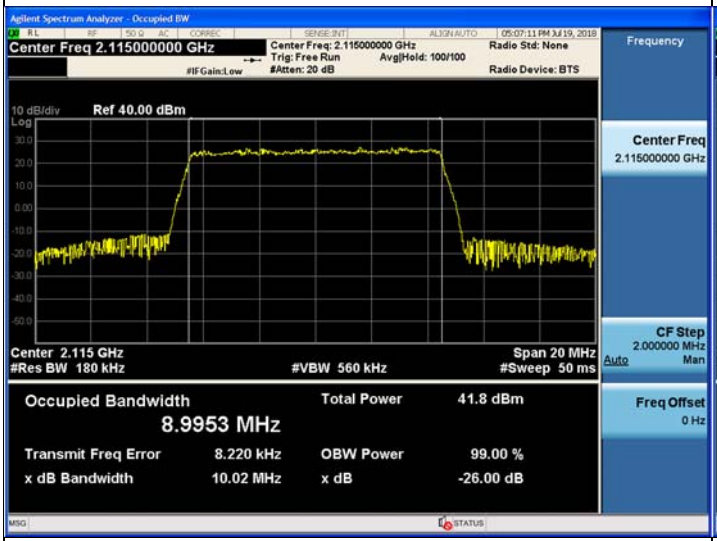
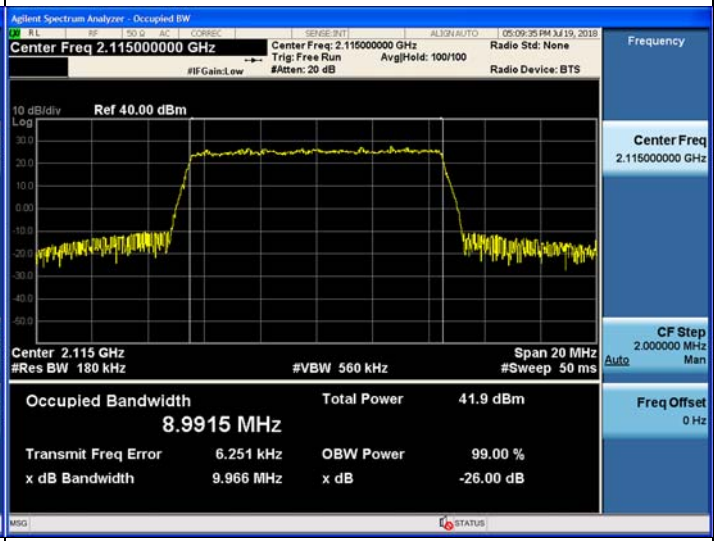
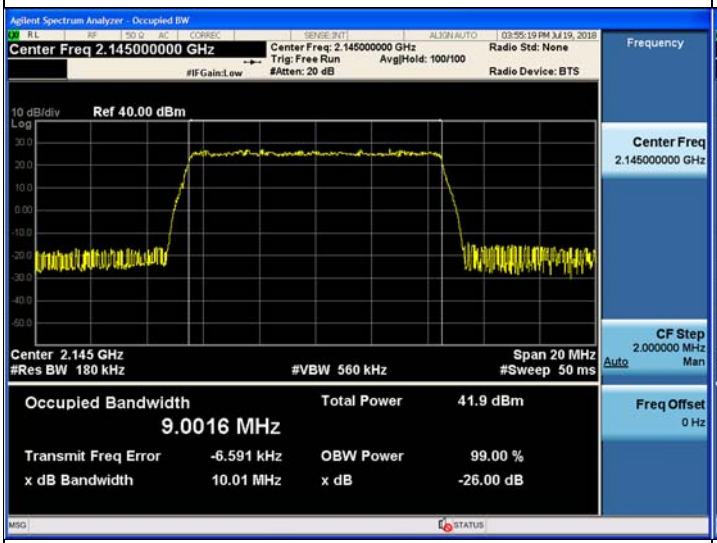
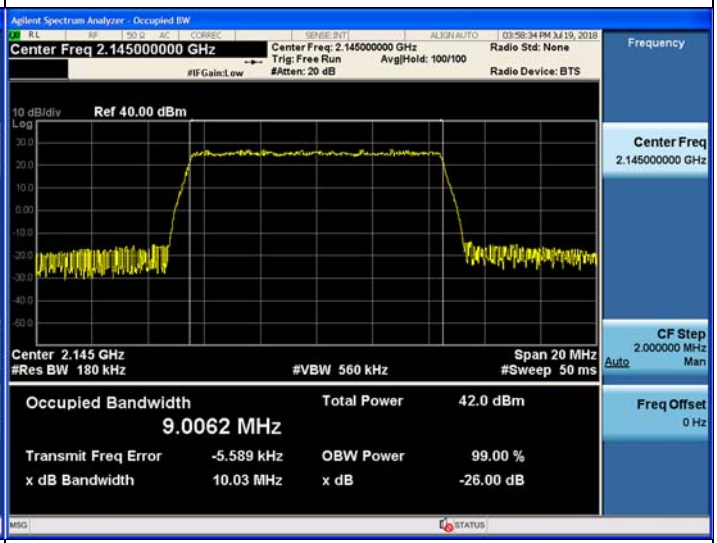
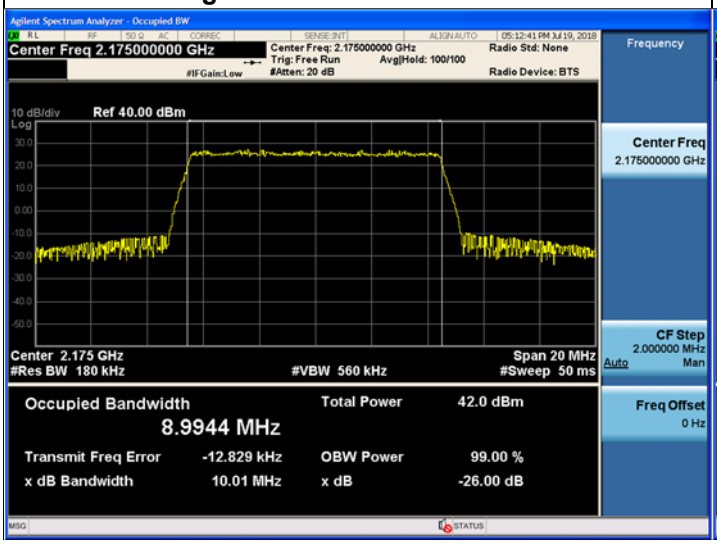
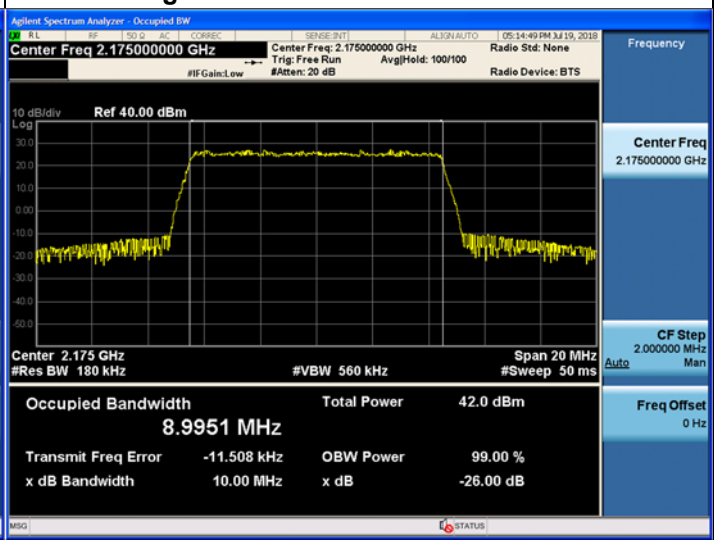
[Downlink Input_AWS 2100 Band]

AWS 2100 Band	Channel	Frequency (MHz)	OBW (MHz)
LTE 5 MHz AGC threshold	Low	2112.50	4.5093
	Middle	2145.00	4.5086
	High	2177.50	4.5108
LTE 10 MHz AGC threshold	Low	2115.00	9.0053
	Middle	2145.00	8.9911
	High	2175.00	9.0012
LTE 20 MHz AGC threshold	Low	2120.00	18.019
	Middle	2145.00	18.025
	High	2170.00	18.016
WCDMA AGC threshold	Low	2112.50	4.1697
	Middle	2145.00	4.1663
	High	2177.50	4.1673
CDMA AGC threshold	Low	2111.25	1.2440
	Middle	2145.00	1.2435
	High	2178.75	1.2398

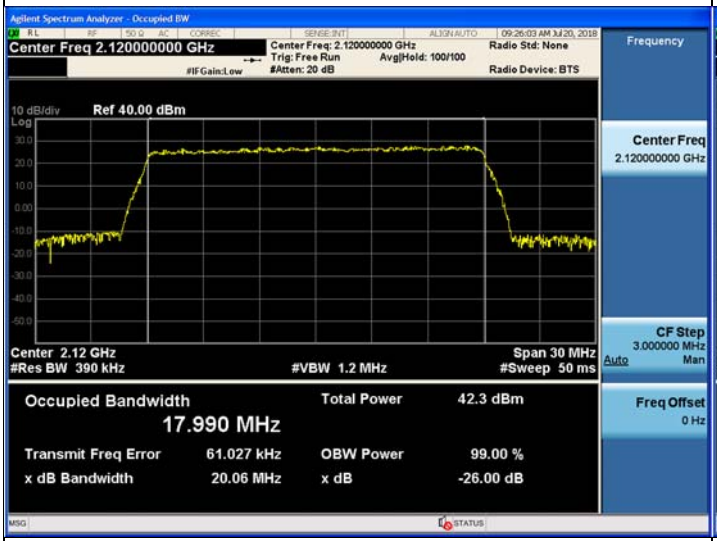
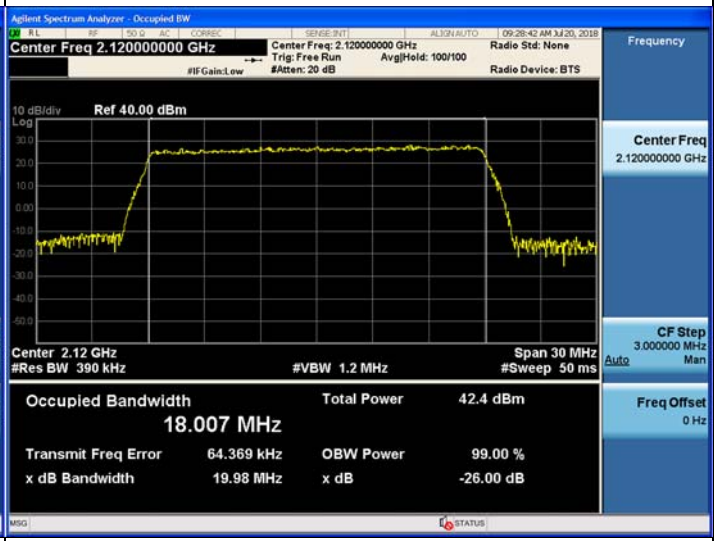
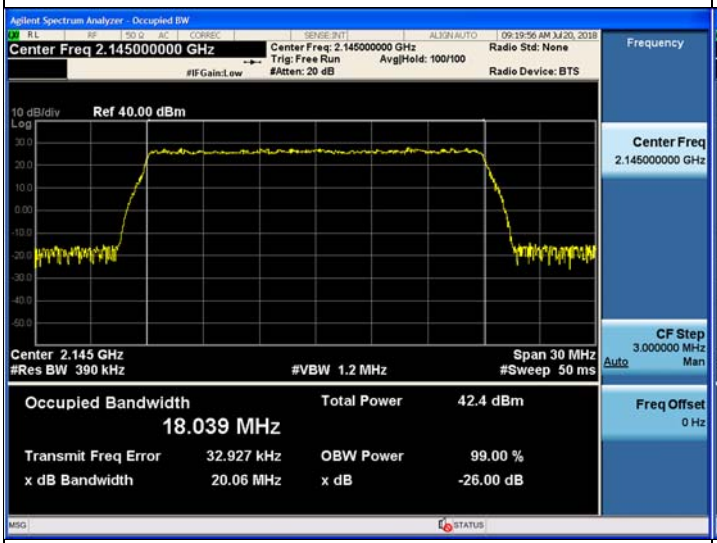
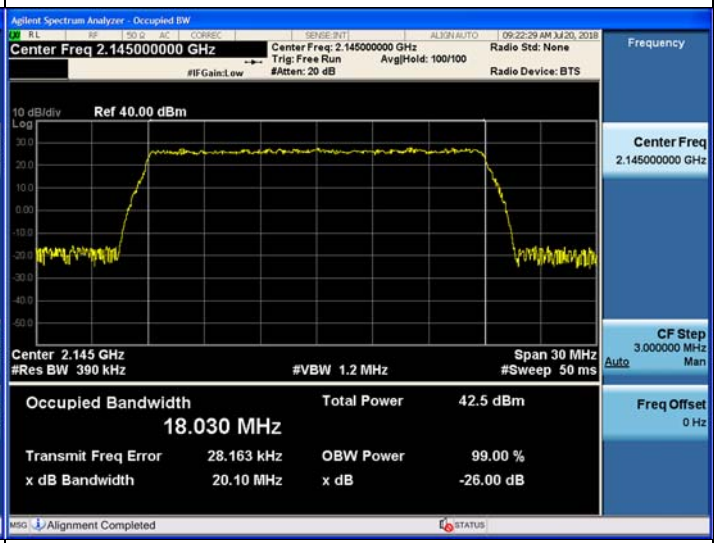
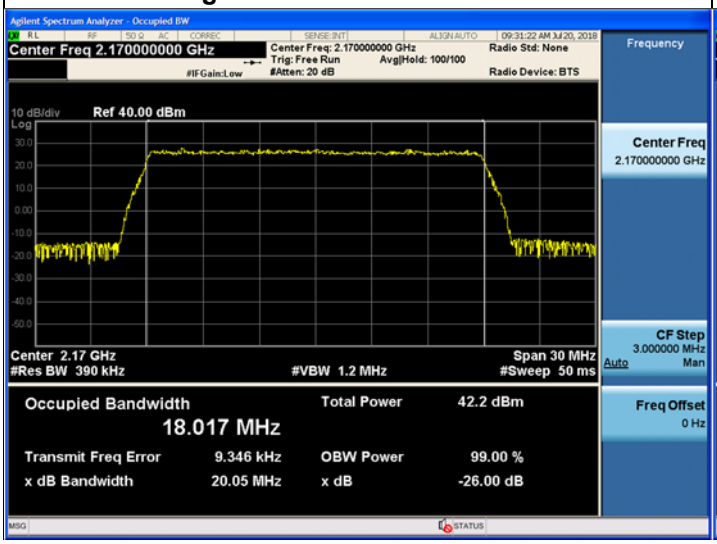
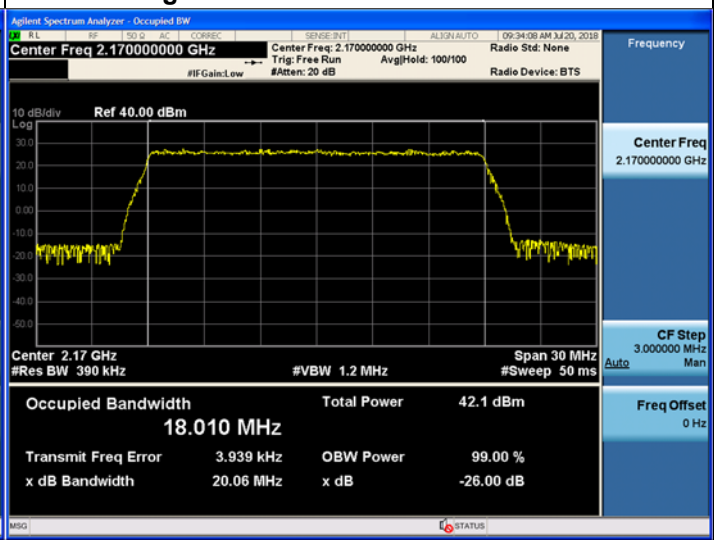
Plots of Output Occupied Bandwidth for AWS 2100 Band LTE 5 MHz

Low Channel AGC threshold	Low Channel +3 dB AGC threshold
	
Middle Channel AGC threshold	**Middle Channel +3 dB AGC threshold**
	
High Channel AGC threshold	**High Channel +3 dB AGC threshold**
	

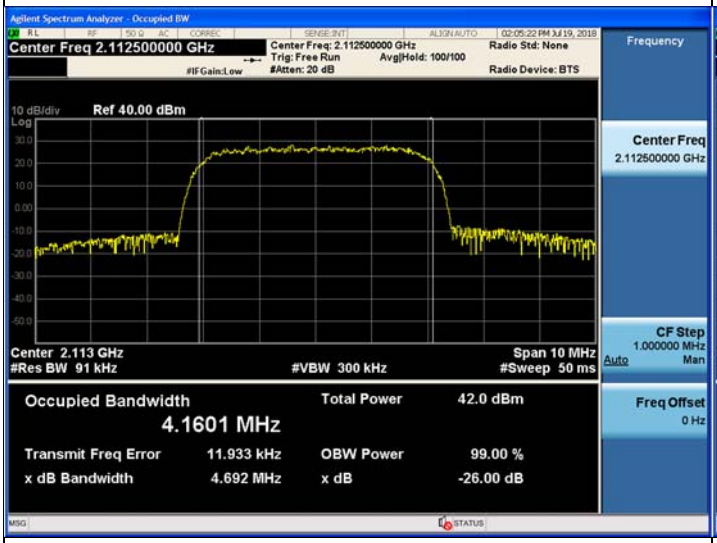
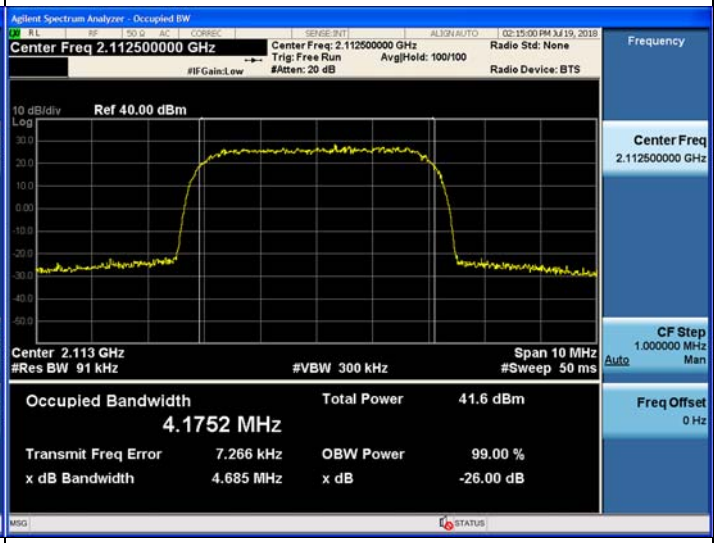
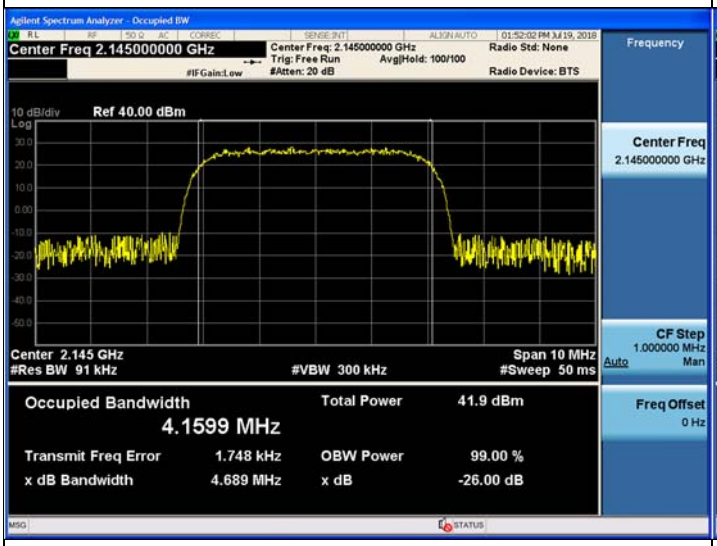
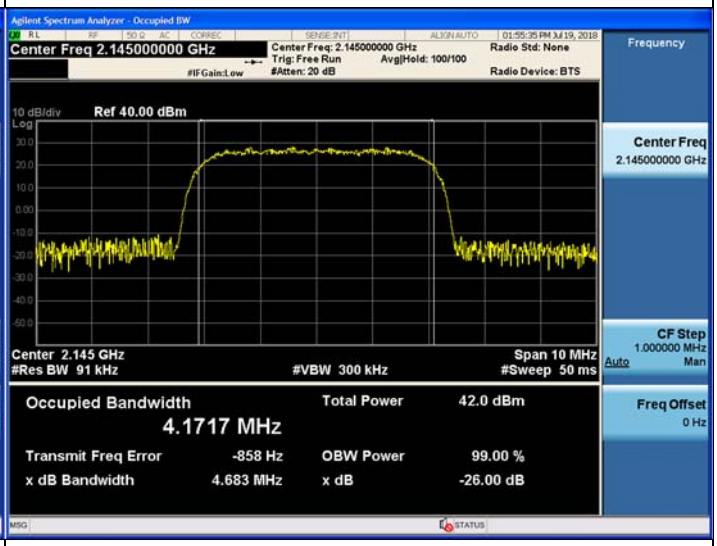
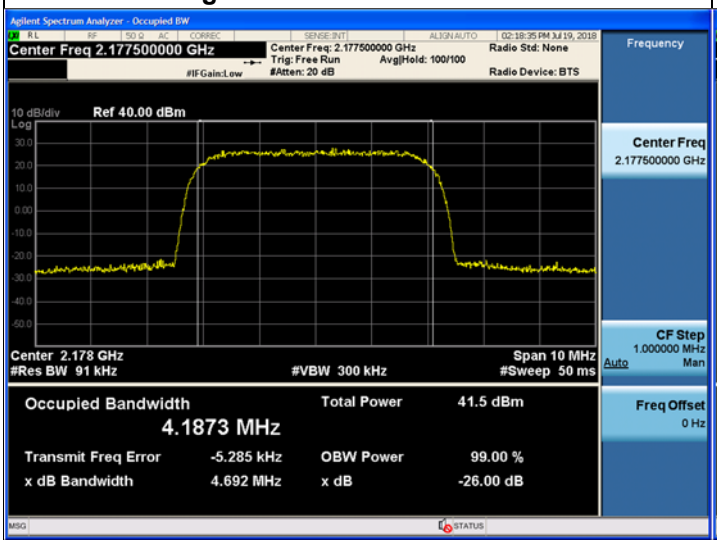
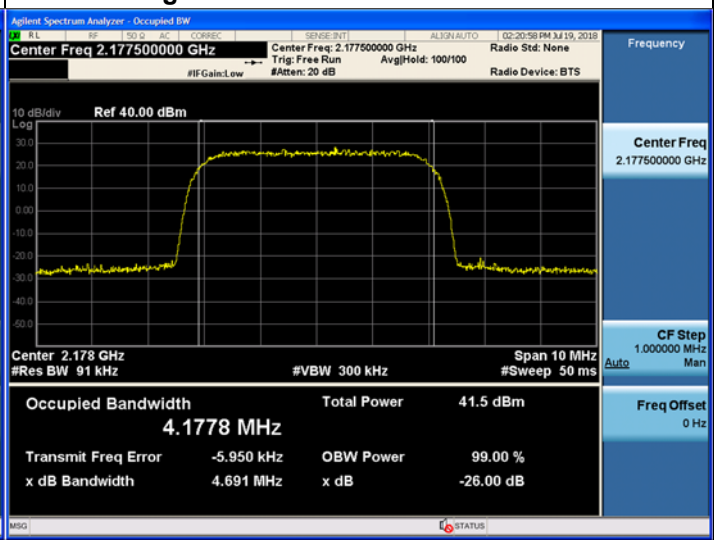
Plots of Output Occupied Bandwidth for AWS 2100 Band LTE 10 MHz

Low Channel AGC threshold	Low Channel +3 dB AGC threshold
	
Middle Channel AGC threshold	**Middle Channel +3 dB AGC threshold**
	
High Channel AGC threshold	**High Channel +3 dB AGC threshold**
	

Plots of Output Occupied Bandwidth for AWS 2100 Band LTE 20 MHz

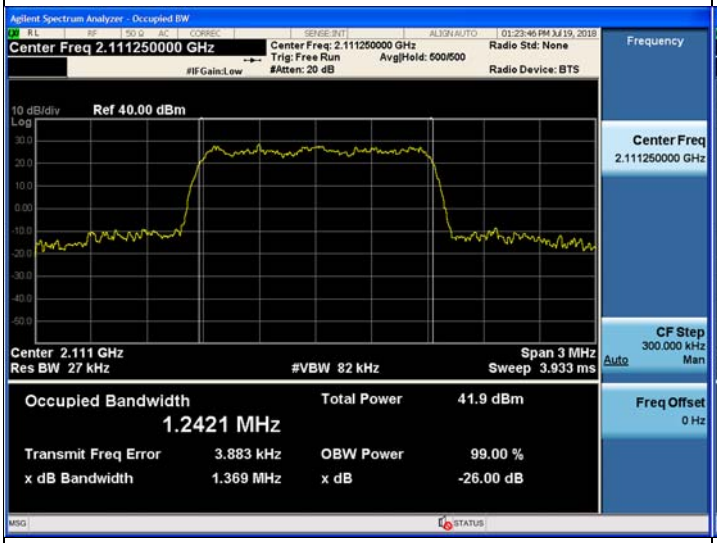
Low Channel AGC threshold	Low Channel +3 dB AGC threshold
	
Middle Channel AGC threshold	**Middle Channel +3 dB AGC threshold**
	
High Channel AGC threshold	**High Channel +3 dB AGC threshold**
	

Plots of Output Occupied Bandwidth for AWS 2100 Band WCDMA

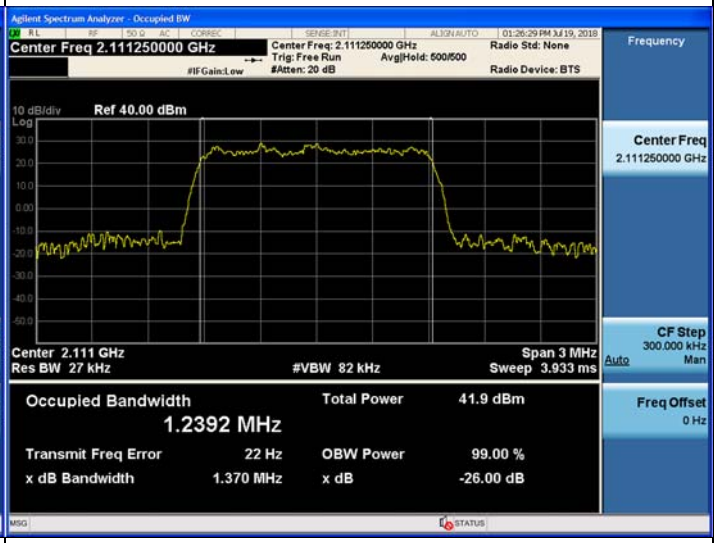
Low Channel AGC threshold	Low Channel +3 dB AGC threshold
	
Middle Channel AGC threshold	**Middle Channel +3 dB AGC threshold**
	
High Channel AGC threshold	**High Channel +3 dB AGC threshold**
	

Plots of Output Occupied Bandwidth for AWS 2100 Band CDMA

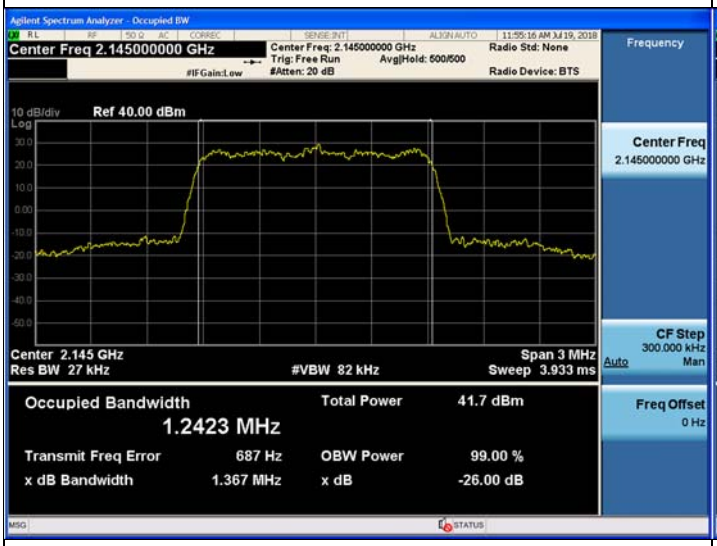
Low Channel AGC threshold



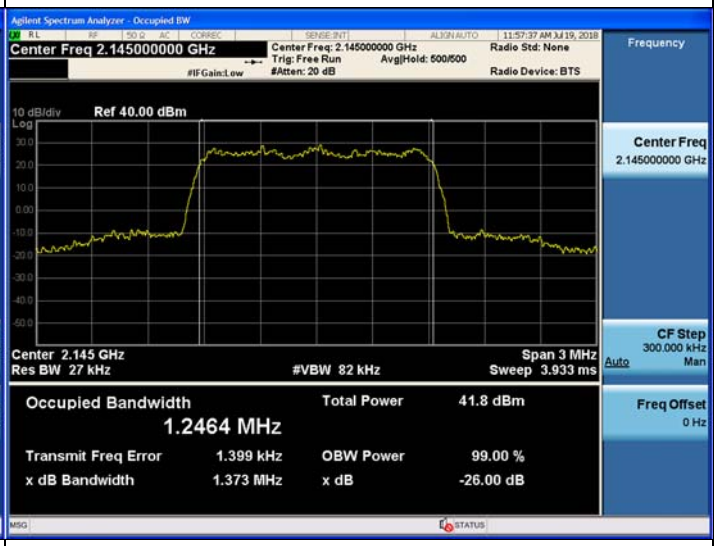
Low Channel +3 dB AGC threshold



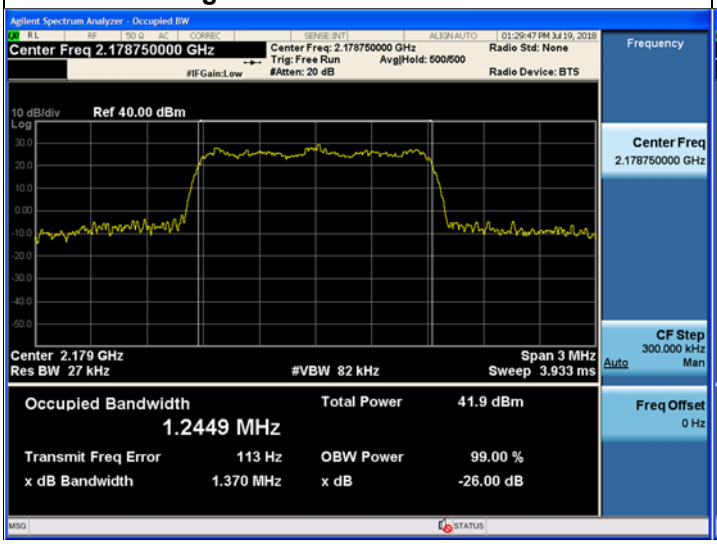
Middle Channel AGC threshold



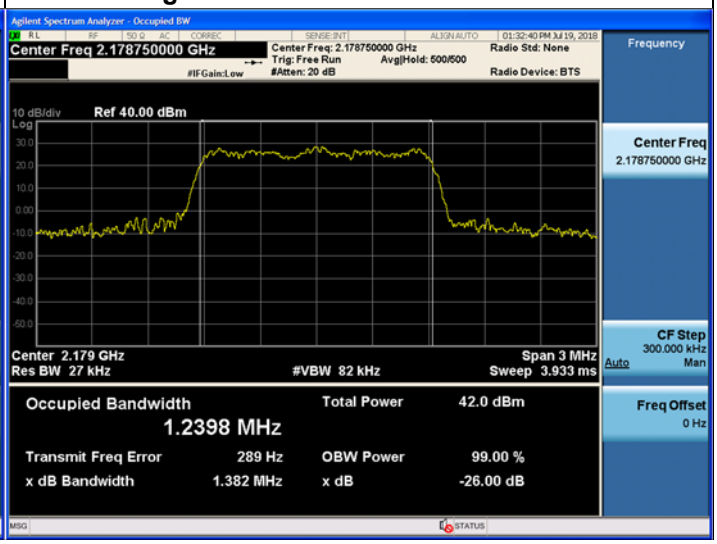
Middle Channel +3 dB AGC threshold



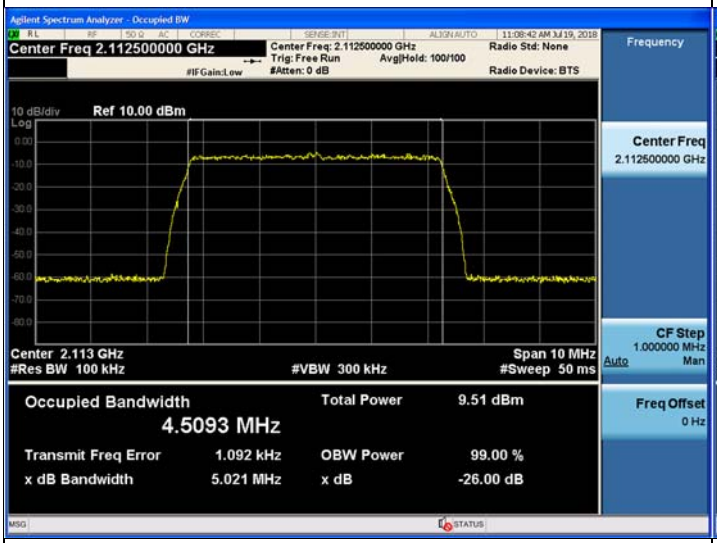
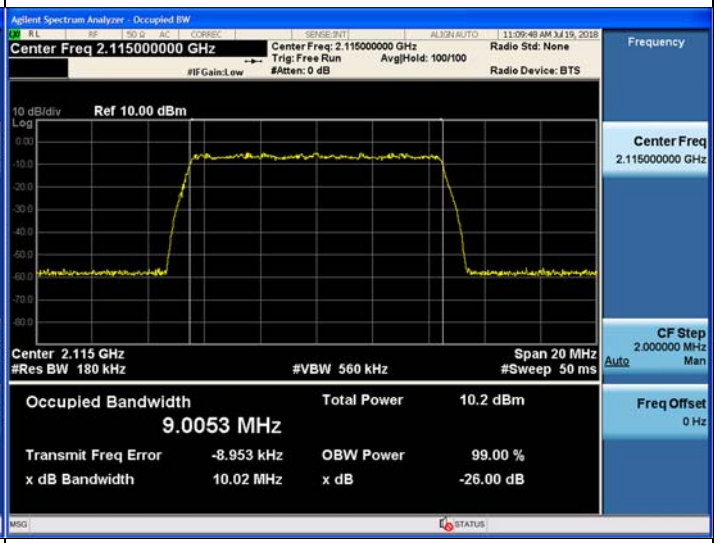
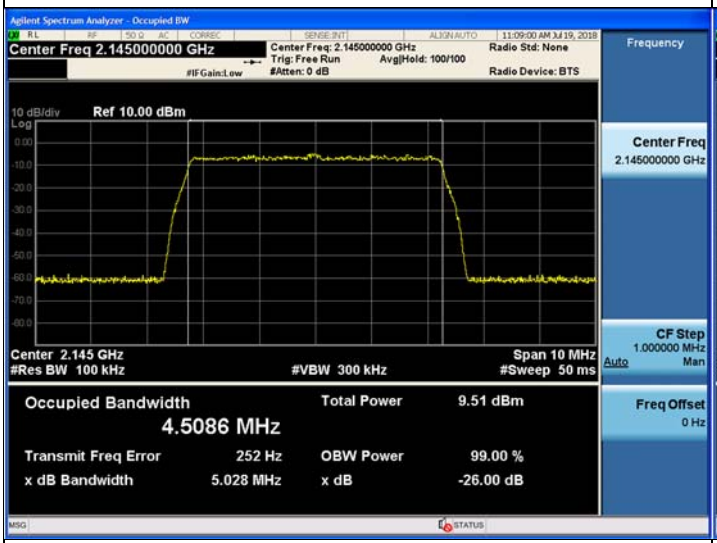
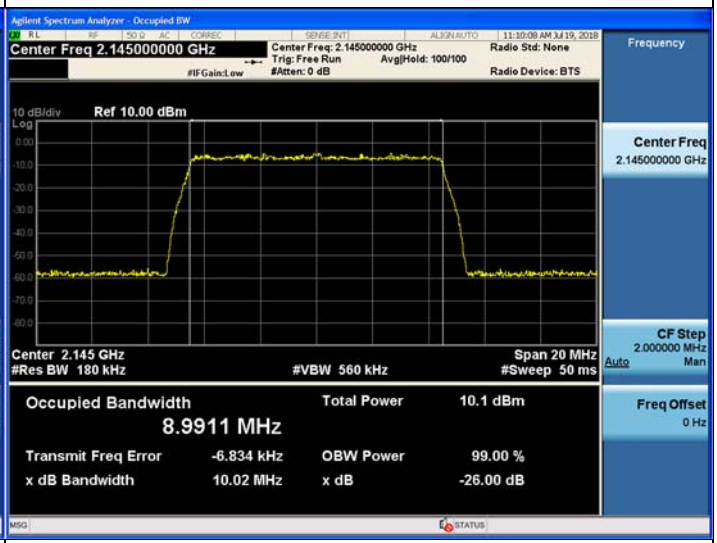
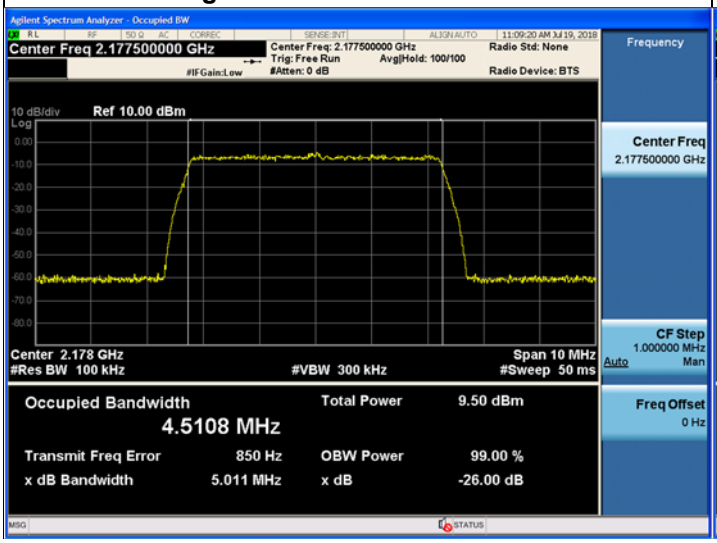
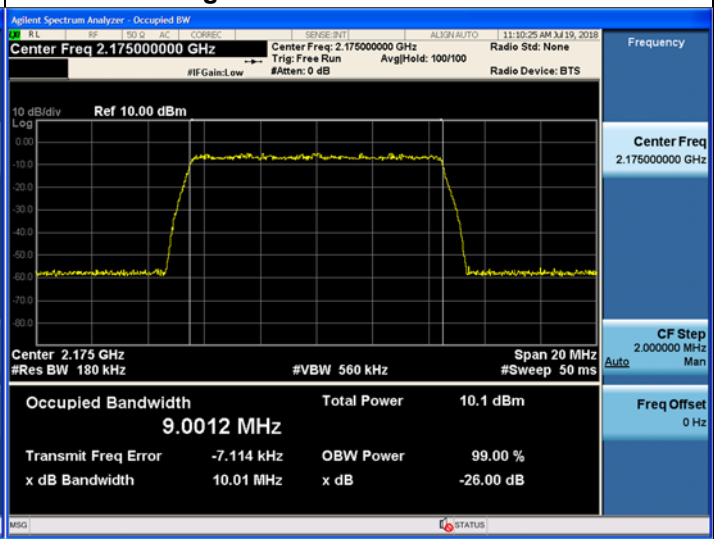
High Channel AGC threshold



High Channel +3 dB AGC threshold

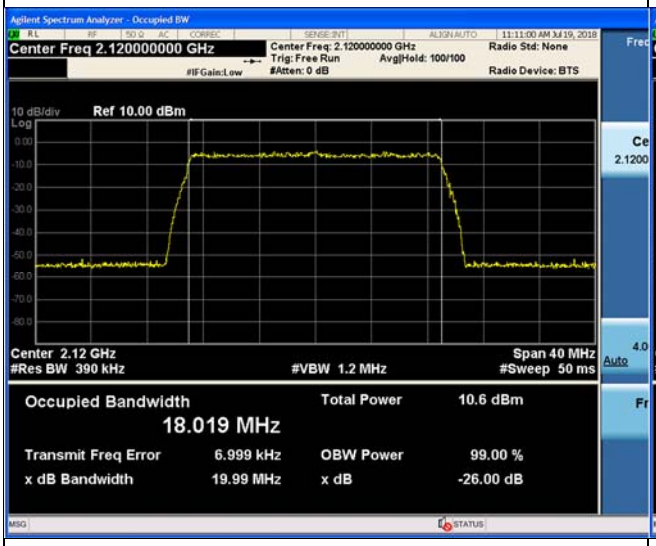


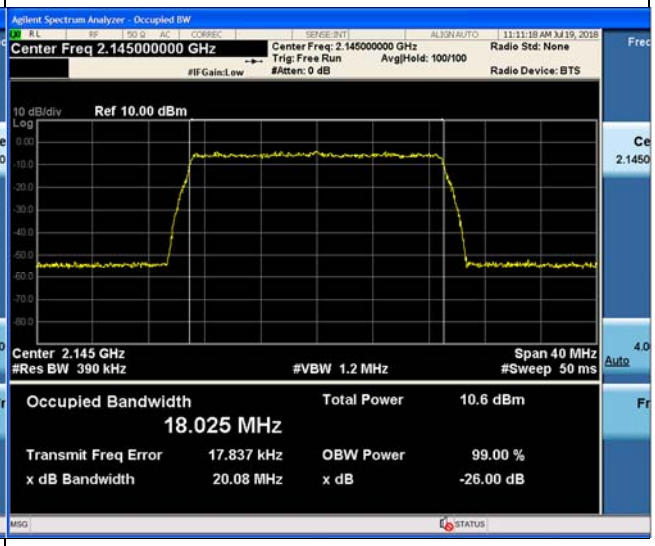
Plots of Input Occupied Bandwidth for AWS 2100 LTE Band

LTE 5 MHz	LTE 10 MHz
Low Channel AGC threshold	Low Channel AGC threshold
	
Middle Channel AGC threshold	Middle Channel AGC threshold
	
High Channel AGC threshold	High Channel AGC threshold
	

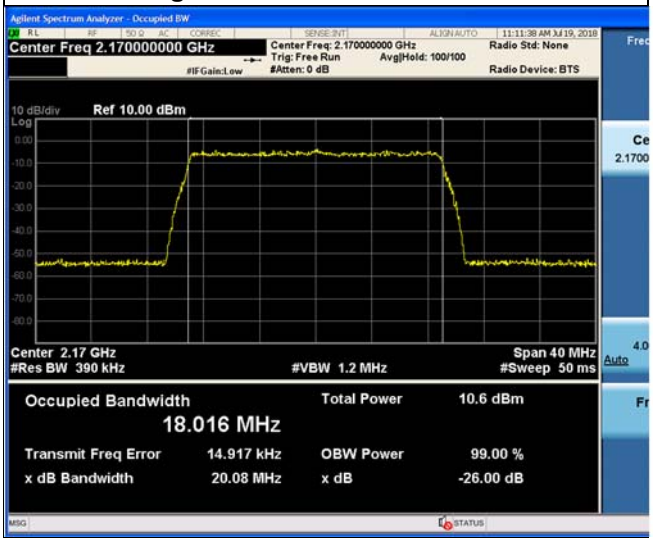
Plots of Input Occupied Bandwidth for AWS 2100 LTE Band

LTE 20 MHz	
Low Channel AGC threshold	Middle Channel AGC threshold

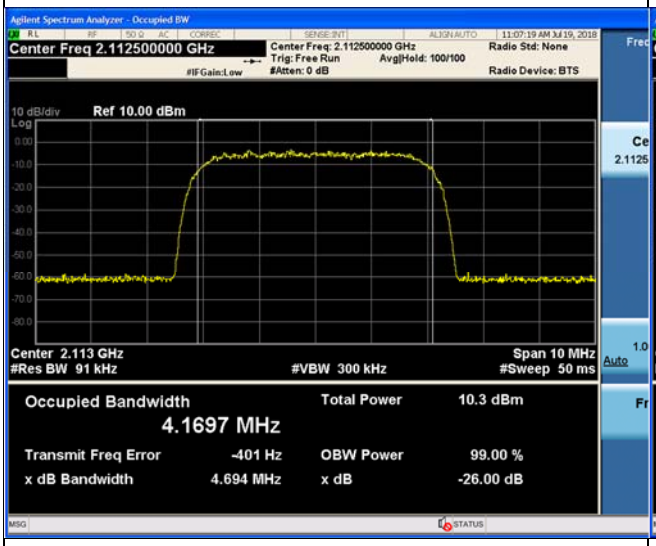
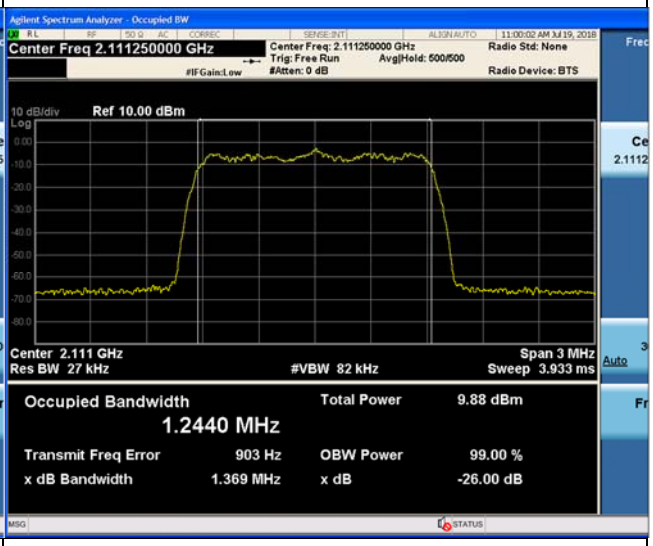
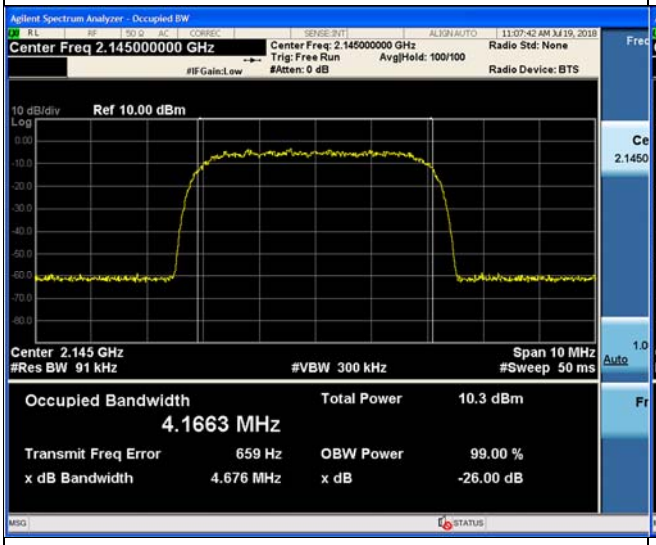
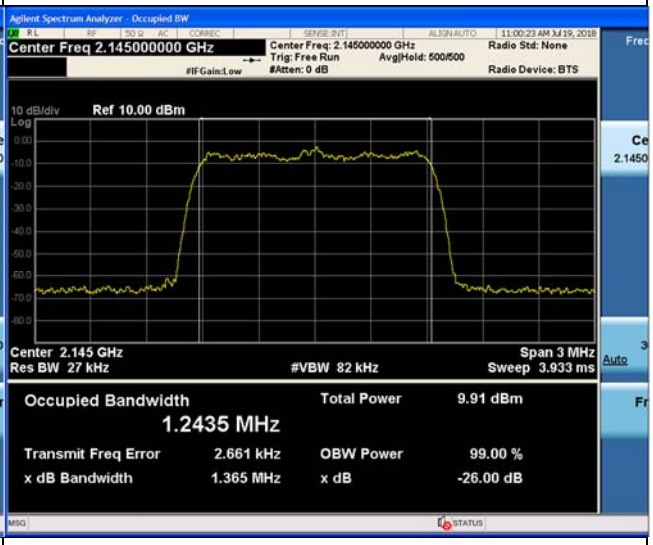
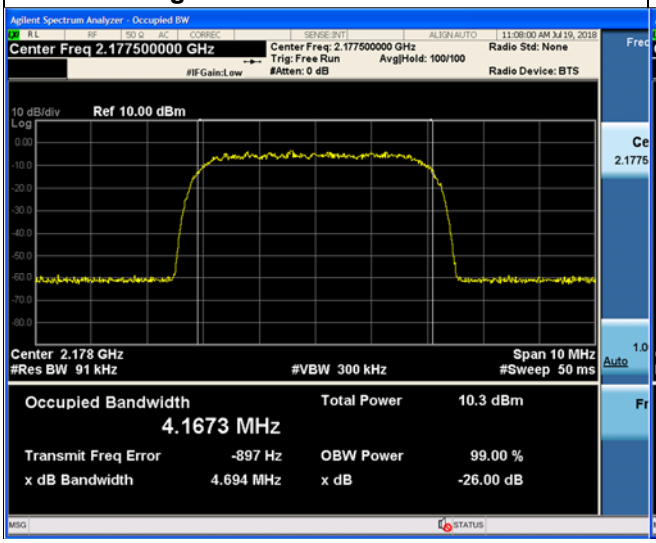
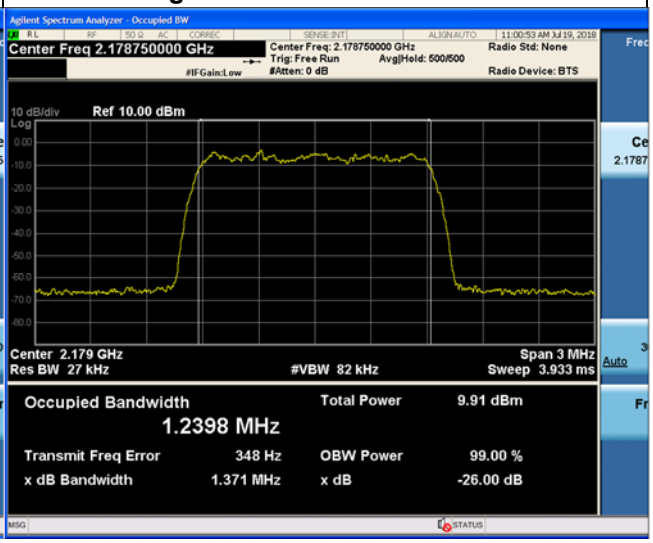




High Channel AGC threshold



Plots of Input Occupied Bandwidth for AWS 2100 Band

WCDMA	CDMA
Low Channel AGC threshold	Low Channel AGC threshold
	
Middle Channel AGC threshold	Middle Channel AGC threshold
	
High Channel AGC threshold	High Channel AGC threshold
	

7. INPUT VERSUS OUTPUT SPECTRUM

ISED Rules

Test Requirements:

RSS-131

5. Equipment standard specifications for zone enhancers working with equipment certified in RSSs listed in section 1 except RSS-119

5.2 Industrial Zone Enhancers

5.2.2 Input-versus-output spectrum

The spectral growth of the 26 dB bandwidth of the output signal shall be less than 5% of the input signal spectrum.

Test Procedures:

RSS-Gen

6 General administrative and technical requirements

6.7 Occupied bandwidth (or 99% emission bandwidth) and x dB bandwidth

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

Note :

1. We tested using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 26 dB.
2. Plots of results are the same as Section 6.

Test Results:

[Downlink Output_700 LTE]

700 LTE Band	Channel	Frequency (MHz)	26 dB BW (MHz)	Growth (%)
LTE 5 MHz AGC threshold	Low	731.50	5.039	-0.14
	Middle	742.00	5.032	-0.16
	High	753.50	5.045	0.24
LTE 5 MHz +3dBm above the AGC threshold	Low	731.50	5.044	-0.04
	Middle	742.00	5.040	0.00
	High	753.50	5.045	0.24
LTE 10 MHz AGC threshold	Low	734.00	10.000	0.00
	Middle	741.00	9.982	-0.18
	High	751.00	9.991	-0.29
LTE 10 MHz +3dBm above the AGC threshold	Low	734.00	9.988	-0.12
	Middle	741.00	10.020	0.20
	High	751.00	10.000	-0.20

[Downlink Output_FirstNet]

FirstNet Band	Channel	Frequency (MHz)	26 dB BW (MHz)	Growth (%)
LTE 5 MHz AGC threshold	Low	760.50	5.035	-0.08
	High	765.50	5.031	-0.04
LTE 5 MHz +3dBm above the AGC threshold	Low	760.50	5.058	0.38
	High	765.50	5.032	-0.02
LTE 10 MHz AGC threshold	Middle	763.00	9.995	-0.15
LTE 10 MHz +3dBm above the AGC threshold	Middle	763.00	9.952	-0.58

[Downlink Output_800 IDEN]

800 IDEN Band	Channel	Frequency (MHz)	26 dB BW (MHz)	Growth (%)
LTE 5 MHz AGC threshold	Low	864.50	5.038	-0.02
	High	866.50	5.026	-0.24
LTE 5 MHz +3dBm above the AGC threshold	Low	864.50	5.041	0.04
	High	866.50	5.015	-0.46
CDMA AGC threshold	Low	863.25	1.373	0.07
	Middle	865.50	1.367	-0.15
	High	867.75	1.373	0.07
CDMA +3dBm above the AGC threshold	Low	863.25	1.368	-0.29
	Middle	865.50	1.367	-0.15
	High	867.75	1.369	-0.22

[Downlink Output_850 CEL]

850 CEL Band	Channel	Frequency (MHz)	26 dB BW (MHz)	Growth (%)
LTE 5 MHz AGC threshold	Low	871.50	5.033	0.26
	Middle	881.50	5.046	0.16
	High	891.50	5.027	-0.36
LTE 5 MHz +3dBm above the AGC threshold	Low	871.50	5.049	0.58
	Middle	881.50	5.043	0.10
	High	891.50	5.010	-0.69
LTE 10 MHz AGC threshold	Low	874.00	10.010	-0.10
	Middle	881.50	9.996	-0.24
	High	889.00	9.971	-0.59
LTE 10 MHz +3dBm above the AGC threshold	Low	874.00	10.010	-0.10
	Middle	881.50	10.010	-0.10
	High	889.00	9.967	-0.63
WCDMA AGC threshold	Low	871.50	4.692	-0.13
	Middle	881.50	4.684	0.06
	High	891.50	4.684	-0.04
WCDMA +3dBm above the AGC threshold	Low	871.50	4.675	-0.49
	Middle	881.50	4.697	0.34
	High	891.50	4.686	0.00
CDMA AGC threshold	Low	870.25	1.368	-0.15
	Middle	881.50	1.376	0.29
	High	892.75	1.365	-0.36
CDMA +3dBm above the AGC threshold	Low	870.25	1.372	0.15
	Middle	881.50	1.370	-0.15
	High	892.75	1.363	-0.51

[Downlink Output_1900 PCS Band]

1900 PCS Band	Channel	Frequency (MHz)	26 dB BW (MHz)	Growth (%)
LTE 5 MHz AGC threshold	Low	1932.50	5.026	-0.44
	Middle	1962.50	5.045	0.00
	High	1992.50	5.048	0.10
LTE 5 MHz +3dBm above the AGC threshold	Low	1932.50	5.014	-0.67
	Middle	1962.50	5.037	-0.16
	High	1992.50	5.033	-0.20
LTE 10 MHz AGC threshold	Low	1935.00	9.977	-0.33
	Middle	1962.50	10.010	-0.10
	High	1990.00	9.982	-0.48
LTE 10 MHz +3dBm above the AGC threshold	Low	1935.00	9.978	-0.32
	Middle	1962.50	10.010	-0.10
	High	1990.00	9.976	-0.54
LTE 20 MHz AGC threshold	Low	1940.00	20.010	-0.15
	Middle	1962.50	20.030	-0.15
	High	1985.00	20.080	0.15
LTE 20 MHz +3dBm above the AGC threshold	Low	1940.00	20.080	0.20
	Middle	1962.50	20.080	0.10
	High	1985.00	19.990	-0.30
WCDMA AGC threshold	Low	1932.50	4.676	-0.40
	Middle	1962.50	4.677	-0.23
	High	1992.50	4.680	-0.13
WCDMA +3dBm above the AGC threshold	Low	1932.50	4.666	-0.62
	Middle	1962.50	4.680	-0.17
	High	1992.50	4.694	0.17

1900 PCS Band	Channel	Frequency (MHz)	26 dB BW (MHz)	Growth (%)
CDMA AGC threshold	Low	1931.25	1.407	0.36
	Middle	1962.50	1.409	0.50
	High	1993.75	1.406	0.21
CDMA +3dBm above the AGC threshold	Low	1931.25	1.402	0.00
	Middle	1962.50	1.412	0.71
	High	1993.75	1.408	0.36
1900 PCS Band	**Channel**	**Frequency (MHz)**	**26 dB BW (kHz)**	**Growth (%)**
GSM AGC threshold	Low	1930.20	311.9	-0.29
	Middle	1962.50	313.8	1.29
	High	1994.80	305.1	-1.80
GSM +3dBm above the AGC threshold	Low	1930.20	319.8	2.24
	Middle	1962.50	304.2	-1.81
	High	1994.80	308.6	-0.68

[Downlink Output_AWS 2100 Band]

AWS 2100 Band	Channel	Frequency (MHz)	26 dB BW (MHz)	Growth (%)
LTE 5 MHz AGC threshold	Low	2112.50	5.038	0.34
	Middle	2145.00	5.039	0.22
	High	2177.50	5.042	0.62
LTE 5 MHz +3dBm above the AGC threshold	Low	2112.50	5.034	0.26
	Middle	2145.00	5.045	0.34
	High	2177.50	5.034	0.46
LTE 10 MHz AGC threshold	Low	2115.00	10.020	0.00
	Middle	2145.00	10.010	-0.10
	High	2175.00	10.010	0.00
LTE 10 MHz +3dBm above the AGC threshold	Low	2115.00	9.966	-0.54
	Middle	2145.00	10.030	0.10
	High	2175.00	10.000	-0.10
LTE 20 MHz AGC threshold	Low	2120.00	20.060	0.35
	Middle	2145.00	20.060	-0.10
	High	2170.00	20.050	-0.15
LTE 20 MHz +3dBm above the AGC threshold	Low	2120.00	19.980	-0.05
	Middle	2145.00	20.100	0.10
	High	2170.00	20.060	-0.10
WCDMA AGC threshold	Low	2112.50	4.692	-0.04
	Middle	2145.00	4.689	0.28
	High	2177.50	4.692	-0.04
WCDMA +3dBm above the AGC threshold	Low	2112.50	4.685	-0.19
	Middle	2145.00	4.683	0.15
	High	2177.50	4.691	-0.06
CDMA AGC threshold	Low	2111.25	1.369	0.00
	Middle	2145.00	1.367	0.15
	High	2178.75	1.370	-0.07
CDMA +3dBm above the AGC threshold	Low	2111.25	1.370	0.07
	Middle	2145.00	1.373	0.59
	High	2178.75	1.382	0.80

8. OUT OF BAND REJECTION & MEAN OUTPUT POWER AND ZONE ENHANCER GAIN

FCC Rules

Test Requirements:

KDB 935210 D05 v01r02

Out of Band Rejection – Test for rejection of out of band signals. Filter freq. response plots are acceptable.

ISED Rules

Test Requirements:

RSS-131

5. Equipment standard specifications for zone enhancers working with equipment certified in RSSs listed in section 1 except RSS-119

5.2 Industrial Zone Enhancers

5.2.1 Out-of-band rejection

The gain-versus-frequency response and the 20 dB bandwidth of the zone enhancer shall be reported. The zone enhancer shall reject amplification of other signals outside the passband of the zone enhancer.

5.2.3 Mean output power and zone enhancer gain

The zone enhancer gain shall not exceed the nominal gain by more than 1.0 dB. Outside of the 20 dB bandwidth, the gain shall not exceed the gain at the 20 dB point.

Test Procedures:

Measurements were in accordance with the test methods section 3.3, 4.3 of KDB 935210 D05 v01r02.

3.3 EUT out-of-band rejection

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

b) Configure a swept CW signal with the following parameters:

1) Frequency range = ± 250 % of the passband from the center of the passband.

2) Level = a sufficient level to affirm that the out-of-band rejection is > 20 dB above the noise floor and will not engage the AGC during the entire sweep.

3) Dwell time = approx. 10 ms.

4) Number of points = SPAN/(RBW/2).

c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.

d) Set the span of the spectrum analyzer to the same as the frequency range of the signal generator.

e) Set the resolution bandwidth of the spectrum analyzer to be 1 % to 5 % of the passband and

the video bandwidth shall be set to ≥ 3 × RBW.

f) Set the detector to Peak Max-Hold and wait for the spectrum analyzer's spectral display to fill.

g) Place a marker to the peak of the frequency response and record this frequency as f0.

h) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the −20 dB down amplitude to determine the 20 dB bandwidth. Capture the frequency response of the EUT.

4.3 PLMRS device out-of-band rejection

Adjust the internal gain control of the equipment under test to the maximum gain for which equipment certification is sought.

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

b) Configure a swept CW signal with the following parameters:

c) Frequency range = ± 250 % of the manufacturer's pass band.

d) The CW amplitude will be 3 dB below the AGC threshold (see 4.2) and but not activate the AGC threshold throughout the test.

e) Dwell time = approx. 10 ms.

f) Frequency step = 50 kHz.

g) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.

h) Set the resolution bandwidth of the spectrum analyzer between 1 % and 5 % of the manufacturer's pass band with the video bandwidth set to 3 × RBW.

i) Set the detector to Peak and the trace to Max-Hold.

j) After the trace is completely filled, place a marker at the peak amplitude, which is designated as f0, and with two additional markers (use the marker-delta method) at the 20 dB bandwidth (i.e., at the points where the gain has fallen by 20 dB).

k) Capture the frequency response plot and for inclusion in the test report.

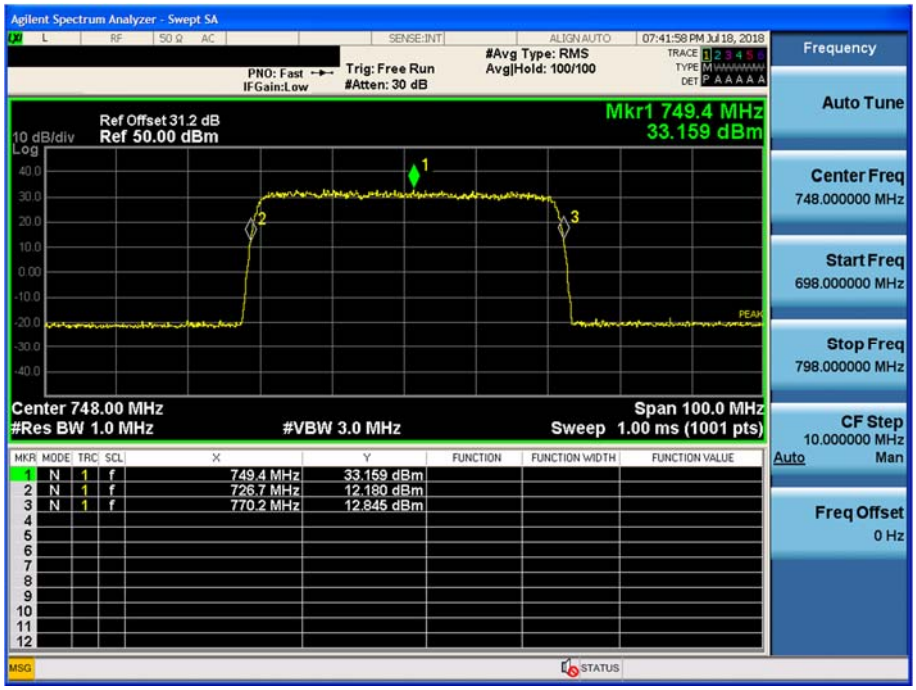
Test Results:

Input Signal	Input Level Input Signal : Sinusoidal	Maximum Amp Gain
700LTE, FirstNet 800IDEN, 850CEL 800 MHz PLMR 1900PCS AWS13	-20 dBm	53 dB

[Downlink]

Band	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
700 LTE FirstNet	726.700 MHz ~ 770.200 MHz	33.159	53.159

Plot of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain

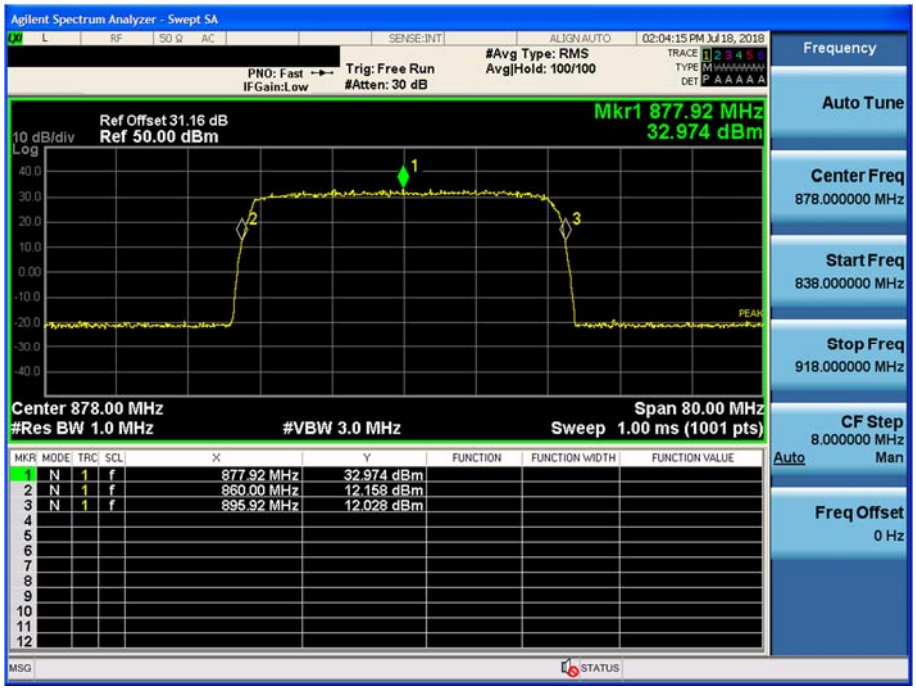


* MRDU_700LTE_FN module amplifies 700 LTE band (729 ~ 758 MHz) and FirstNet band (758 ~ 768 MHz) together.

[Downlink]

Band	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
800 IDEN 850 CEL 800 MHz PLMR	860.000 MHz ~ 895.950 MHz	32.974	52.974

Plot of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain

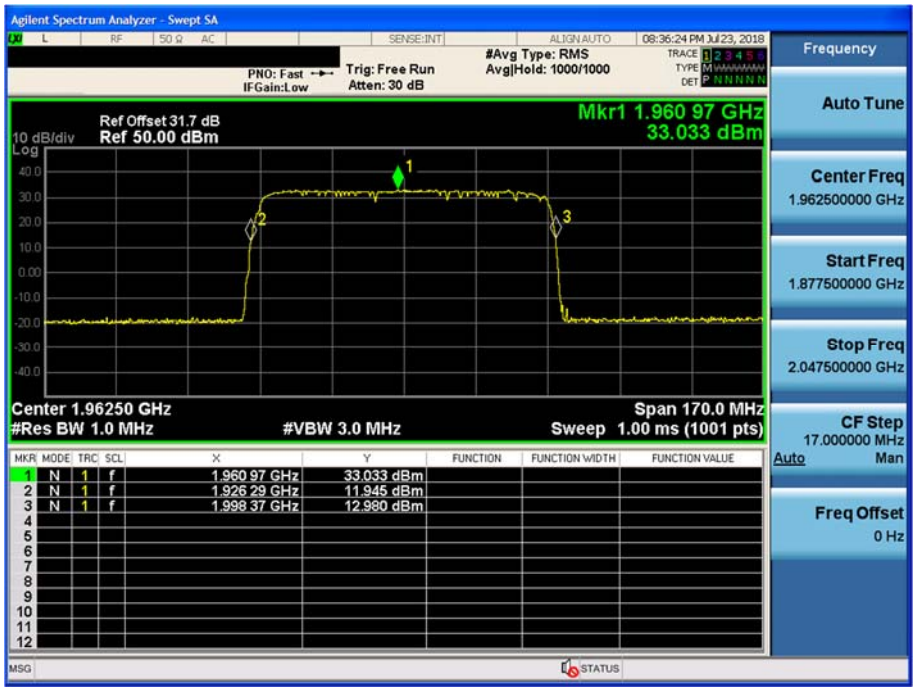


* MRDU_800I_850C module amplifies 800 IDEN band (PLMR Band, 862 ~ 869 MHz) and 850 CEL band (869 ~ 894 MHz) together.

[Downlink]

Band	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
1900 PCS	1 926.290 MHz ~ 1 998.370 MHz	33.033	53.033

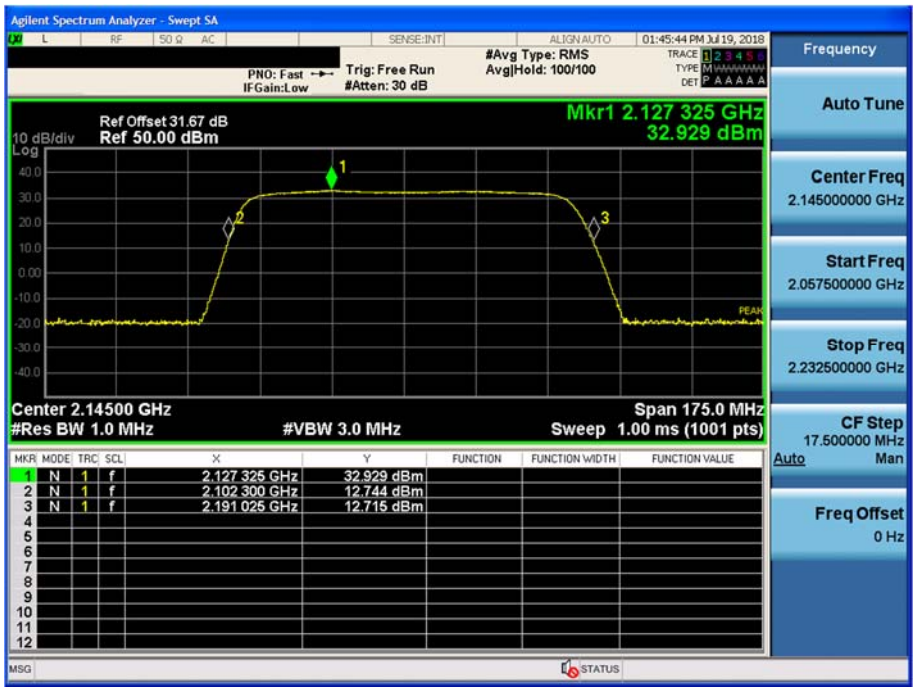
Plot of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain



[Downlink]

Band	20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
AWS 2100	2 102.300 MHz ~ 2 191.025 MHz	32.929	52.929

Plot of Out of Band Rejection & Mean Output Power and Zone Enhancer Gain



9. NOISE FIGURE

FCC Rules

Test Requirements:

§ 90.219 Use of signal boosters:

(e) (2) The noise figure of a signal booster must not exceed 9 dB in either direction.

ISED Rules

Test Requirements:

RSS-131

6. Equipment standard specifications for zone enhancers working with equipment certified under RSS-119

6.4 Noise

The ERP of noise within the passband should not exceed −43 dBm in a 10 kHz measurement bandwidth.

The ERP of noise in spectrum more than 1 MHz outside of the passband should not exceed −70 dBm in a 10 kHz measurement bandwidth.

The noise figure of a zone enhancer shall not exceed 9 dB in either direction.

Test Procedures:

The EUT was tested using Agilent Application Note 57-1, ‘The direct noise measurement method”

1. GAIN measurement

EUT in the maximum gain of the repeater state.

The signal generator was connected to RF input port at a maximum level as determined by the spectrum analyzer was connected to RF output port depending on the circuitry being measured.

EUT GAIN = Output signal level − Input signal level

2. Output Noise level measurement

EUT in the maximum gain of the repeater state.

Without input signal.

Spectrum analyzer was connected to RF output port

Measured to Noise power.

NF=NP-G-BCF-PNAD

NF=NP-G-60+174

NF=NP-G+114

NF=Noise Figure (dB)

NP=Noise power (dBm/MHz)

G=Maximum gain

BCF=Bandwidth Correction Factor=10 log(1 MHz/1 Hz)=60

PNAD=Noise Power Density=-174 dBm/Hz

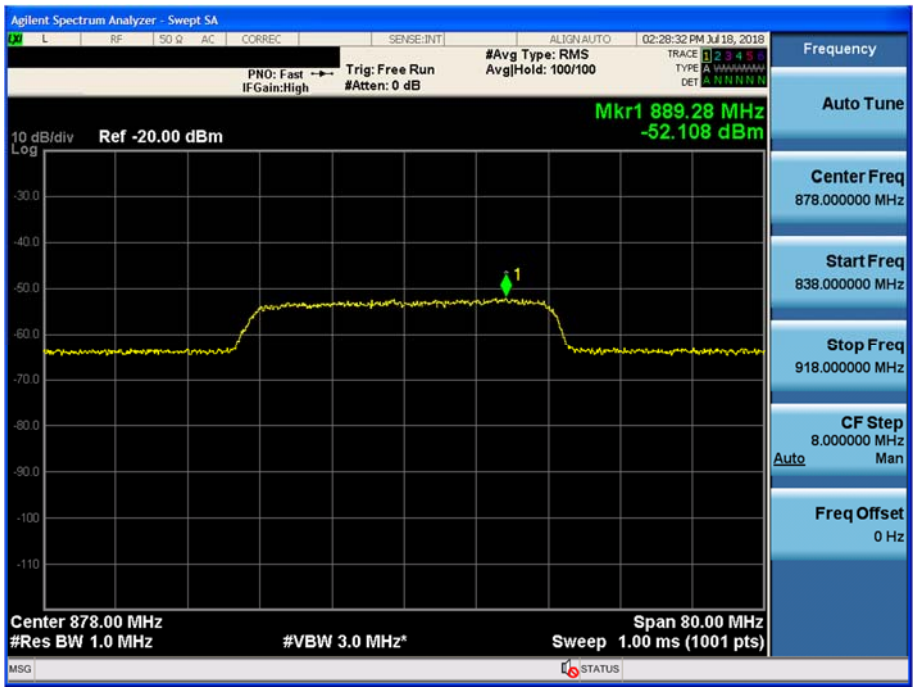
Test Results:

Input Signal	Input Level	Maximum Amp Gain
800IDEN, 850CEL 800 MHz PLMR	-20 dBm	53 dB

* For reason of filter setting, noise figure is measured at all frequencies of par 22 and part 90 band.

Noise Figure = - 52.108 - 53 + 114 = 8.892 dB

Plot of Noise power



10. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL

FCC Rules

Test Requirements:

§ 2.1051 Measurements required: Spurious emissions at antenna terminals:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a reference bandwidth as follows:

(1) In the spectrum below 1 GHz, instrumentation should employ a reference bandwidth of 100 kHz or greater. In the 1 MHz 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 employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy, provided that the measured power is integrated over the full required reference bandwidth (i.e., 100 kHz or 1 percent of emission bandwidth, as specified). 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 dB below the transmitter power.

(2) In the spectrum above 1 GHz, instrumentation should employ a reference bandwidth of 1 MHz.

(c) Alternative out of band emission limit. Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

(d) Interference caused by out of band emissions. If any emission from a transmitter operating in

this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

§ 24.238 Emission limitations for Broadband PCS equipment.

The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service.

(a) *Out of band emissions.* The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

(b) *Measurement procedure.* Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz 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 employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 1 MHz or 1 percent of emission bandwidth, as specified). 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 dB below the transmitter power.

(c) *Alternative out of band emission limit.* Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.

(d) *Interference caused by out of band emissions.* If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

§ 27.53 Emission limits.

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, 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 any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) 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 at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) 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.

(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions 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.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a 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, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(h) *AWS emission limits*

(1) *General protection levels.* Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 $\log_{10}$ (P) dB.

(2) *Additional protection levels.* Notwithstanding the foregoing paragraph (h)(1) of this section:

(i) Operations in the 2180-2200 MHz band are subject to the out-of-band emission requirements set forth in §27.1134 for the protection of federal government operations operating in the 2200-2290 MHz band.

(ii) For operations in the 2000-2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10 $\log_{10}$(P) dB.

(iii) For operations in the 1915-1920 MHz band, the power of any emission between 1930-1995 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10