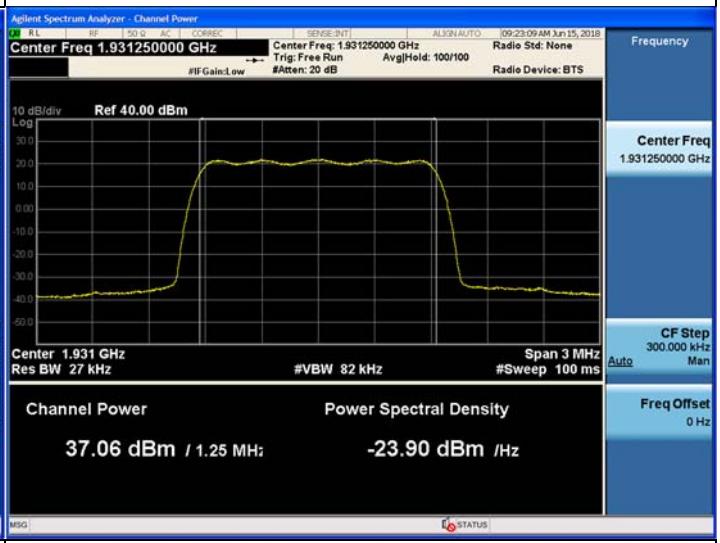
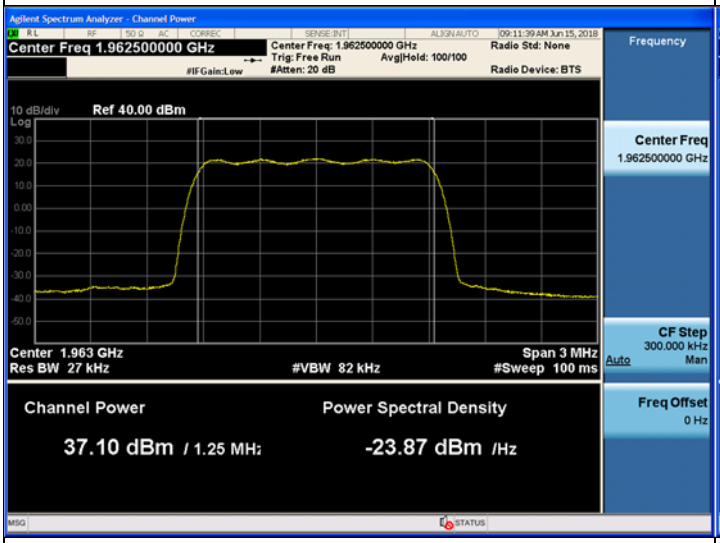
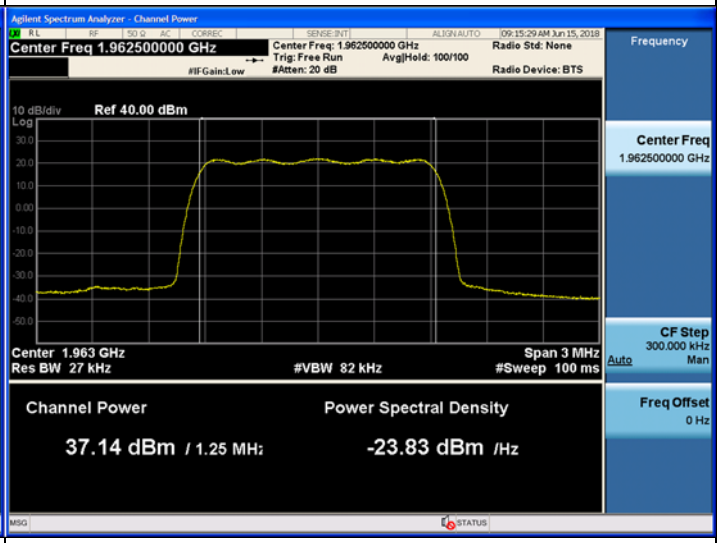
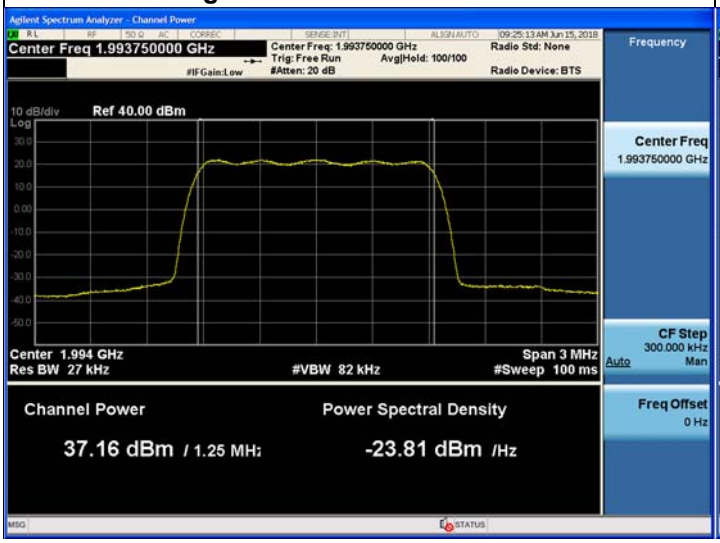
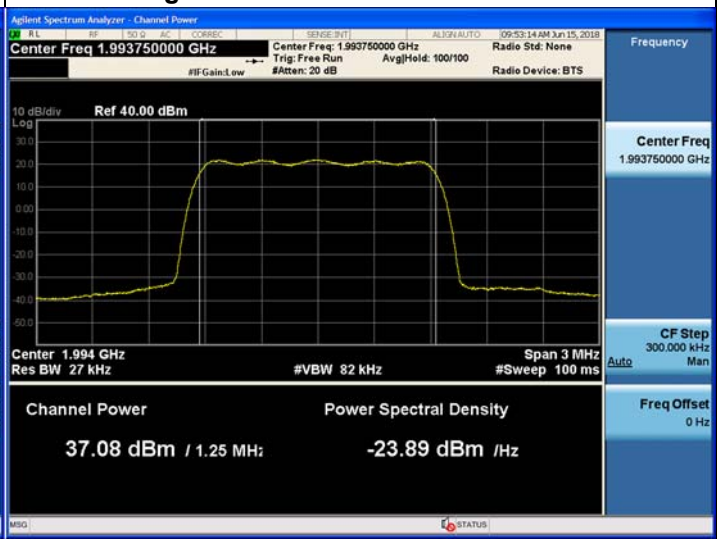
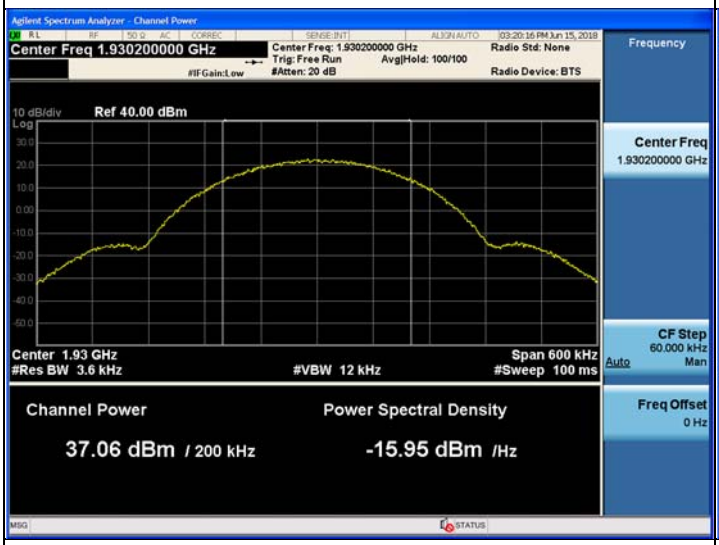
Plots of RF Output Power for 1900 PCS Band CDMA

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 RF Output Power for 1900 PCS Band GSM

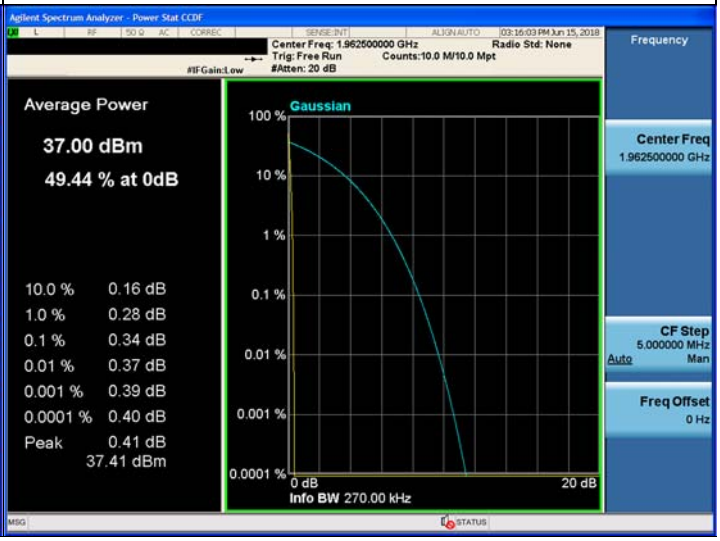
Low Channel AGC threshold	Low Channel +3 dB AGC threshold
	
Middle Channel AGC threshold	**Middle Channel +3 dB AGC threshold**
High Channel AGC threshold	**High Channel +3 dB AGC threshold**

Peak-to-Average Ratio (PAR)

1900 PCS Band	Channel	Frequency (MHz)	PAR (dB)
LTE 5 MHz AGC threshold	Middle	1962.50	8.41
LTE 10 MHz AGC threshold	Middle	1962.50	8.38
LTE 20 MHz AGC threshold	Middle	1962.50	8.51
WCDMA AGC threshold	Middle	1962.50	4.65
CDMA AGC threshold	Middle	1962.50	7.76
GSM AGC threshold	Middle	1962.50	0.34

*Note: We have done CDMA and 1xEVDO / GSM and EDGE modulation test in technology. Test results are only attached worst cases.

Plots of Peak-to-Average Ratio for 1900 PCS Band

LTE 5 MHz	LTE 10 MHz
Middle Channel AGC threshold	Middle Channel AGC threshold
LTE 20 MHz	**WCDMA**
Middle Channel AGC threshold	Middle Channel AGC threshold
CDMA	**GSM**
Middle Channel AGC threshold	Middle Channel AGC threshold
	

6. OCCUPIED BANDWIDTH

FCC Rules

Test Requirements:

§ 2.1049 Measurements required: Occupied bandwidth:

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

ISED Rules

Test Requirements:

RSS-Gen

6 General administrative and technical requirements

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

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

Test Procedures:

Measurements were in accordance with the test methods section 3.4 of KDB 935210 D05 v01r02 and section 4.2 of KDB 971168 D01 v03r01.

Test is 99% OBW measured and used.

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

b) Configure the signal generator to transmit the AWGN signal.

c) Configure the signal amplitude to be just below the AGC threshold level (see 3.2), but not more than 0.5 dB below.

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

e) Set the spectrum analyzer center frequency to the center frequency of the operational band under test. The span range of the spectrum analyzer shall be between 2 times to 5 times the emission bandwidth (EBW) or alternatively, the OBW.

f) The nominal RBW shall be in the range of 1 % to 5 % of the anticipated OBW, and the VBW shall be $\geq$ 3 $\times$ RBW.

g) Set the reference level of the instrument as required to preclude the signal from exceeding the maximum spectrum analyzer input mixer level for linear operation. In general, the peak of the spectral envelope must be more than [10 log (OBW / RBW)] below the reference level.

Steps f) and g) may require iteration to enable adjustments within the specified tolerances.

h) The noise floor of the spectrum analyzer at the selected RBW shall be at least 36 dB below the reference level.

i) Set spectrum analyzer detection function to positive peak.

j) Set the trace mode to max hold.

k) Determine the reference value: Allow the trace to stabilize. Set the spectrum analyzer marker to the highest amplitude level of the displayed trace (this is the reference value) and record the associated frequency as f_0.

l) 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 −26 dB down amplitude. The 26 dB EBW (alternatively OBW) is the positive frequency difference between the two markers. If the spectral envelope crosses the −26 dB down amplitude at multiple points, the lowest or highest frequency shall be selected as the frequencies that are the furthest removed from the center frequency at which the spectral envelope crosses the −26 dB down amplitude point.

m) Repeat steps e) to l) with the input signal connected directly to the spectrum analyzer (i.e., input signal measurement).

n) Compare the spectral plot of the input signal (determined from step m) to the output signal (determined from step l) to affirm that they are similar (in passband and rolloff characteristic features and relative spectral locations), and include plot(s) and descriptions in test report.

o) Repeat the procedure [steps e) to n)] with the input signal amplitude set to 3 dB above the AGC threshold.

p) Repeat steps e) to o) with the signal generator set to the narrowband signal.

q) Repeat steps e) to p) for all frequency bands authorized for use by the EUT.

RSS-Gen

6 General administrative and technical requirements

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

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

Test Results:

[Downlink Output_1900 PCS Band]

1900 PCS Band	Channel	Frequency (MHz)	OBW (MHz)
LTE 5 MHz AGC threshold	Low	1932.50	4.5138
	Middle	1962.50	4.5168
	High	1992.50	4.5093
LTE 5 MHz +3 dB above the AGC threshold	Low	1932.50	4.5147
	Middle	1962.50	4.5107
	High	1992.50	4.5083
LTE 10 MHz AGC threshold	Low	1935.00	8.9787
	Middle	1962.50	8.9975
	High	1990.00	8.9889
LTE 10 MHz +3 dB above the AGC threshold	Low	1935.00	8.9929
	Middle	1962.50	8.9994
	High	1990.00	8.9846
LTE 20 MHz AGC threshold	Low	1940.00	18.000
	Middle	1962.50	18.045
	High	1985.00	17.947
LTE 20 MHz +3 dB above the AGC threshold	Low	1940.00	17.996
	Middle	1962.50	18.053
	High	1985.00	17.943

1900 PCS Band	Channel	Frequency (MHz)	OBW (MHz)
WCDMA AGC threshold	Low	1932.50	4.1778
	Middle	1962.50	4.1782
	High	1992.50	4.1747
WCDMA +3 dB above the AGC threshold	Low	1932.50	4.1808
	Middle	1962.50	4.1826
	High	1992.50	4.1709
CDMA AGC threshold	Low	1931.25	1.2673
	Middle	1962.50	1.2674
	High	1993.75	1.2666
CDMA +3 dB above the AGC threshold	Low	1931.25	1.2633
	Middle	1962.50	1.2623
	High	1993.75	1.2642
1900 PCS Band	**Channel**	**Frequency (MHz)**	**OBW (kHz)**
GSM AGC threshold	Low	1930.20	245.49
	Middle	1962.50	244.23
	High	1994.80	244.70
GSM +3 dB bove the AGC threshold	Low	1930.20	244.66
	Middle	1962.50	244.97
	High	1994.80	245.94

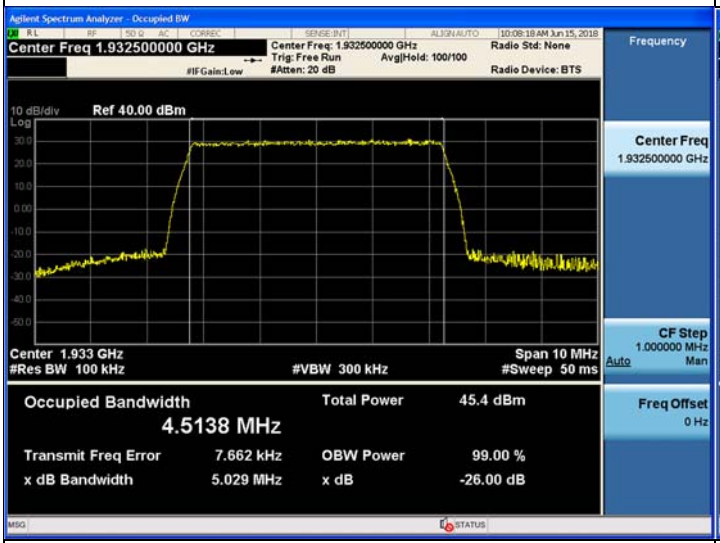
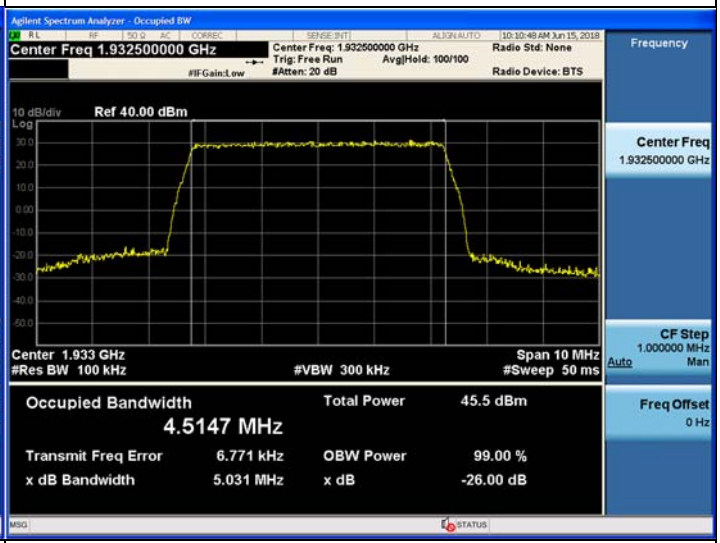
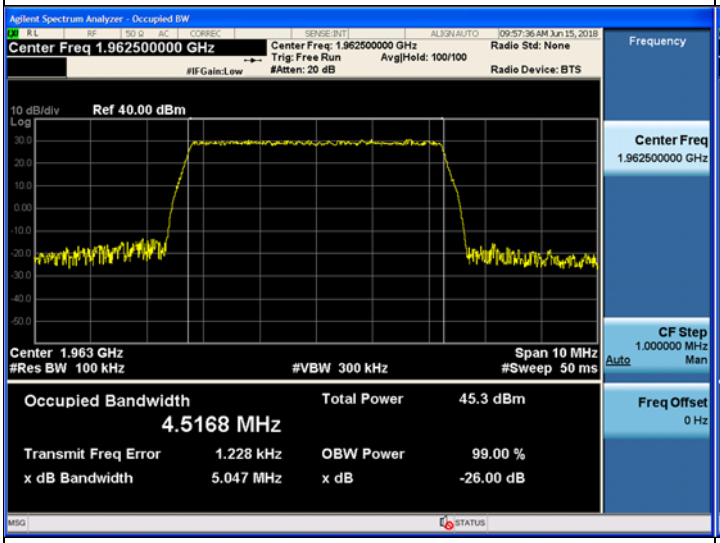
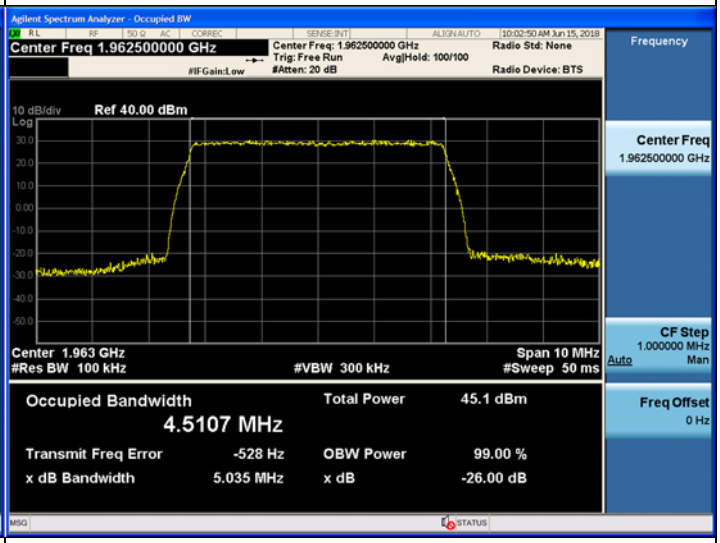
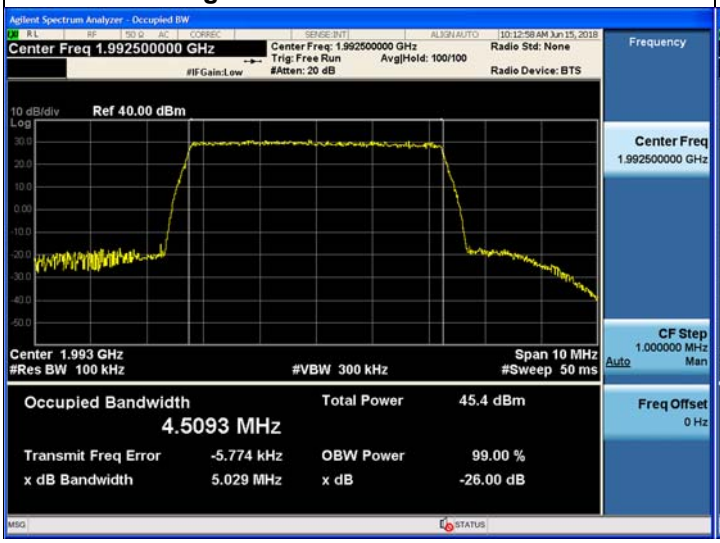
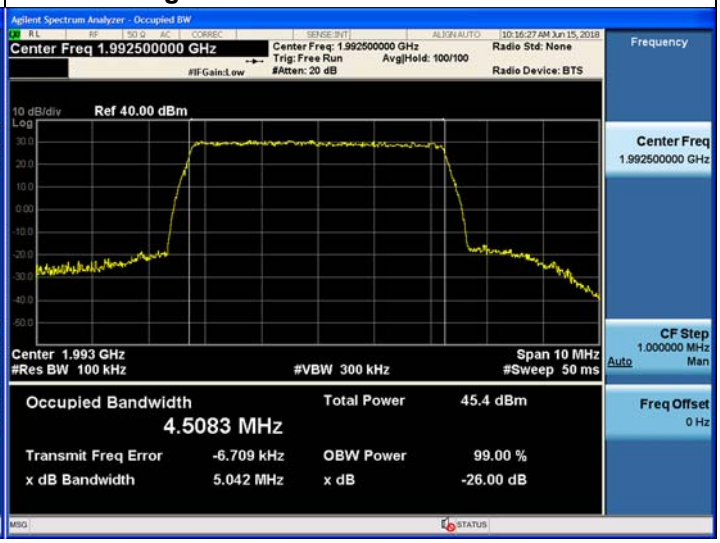
*Note: We have done CDMA and 1xEVDO / GSM and EDGE modulation test in technology. Test results are only attached worst cases.

[Downlink Input_1900 PCS Band]

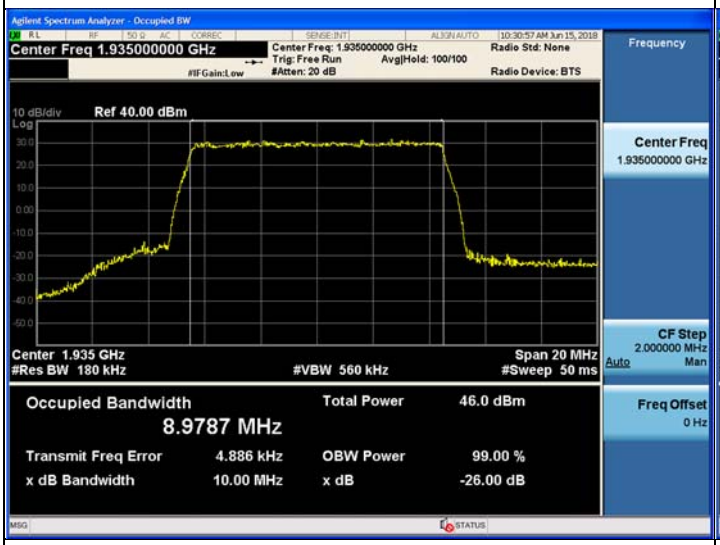
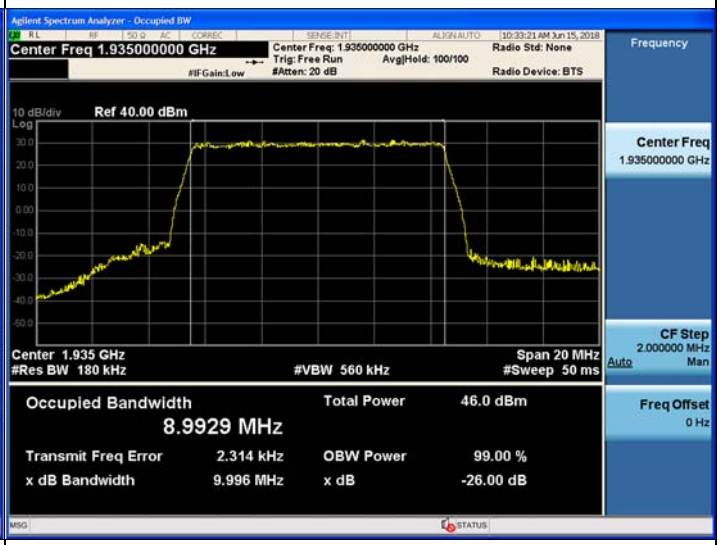
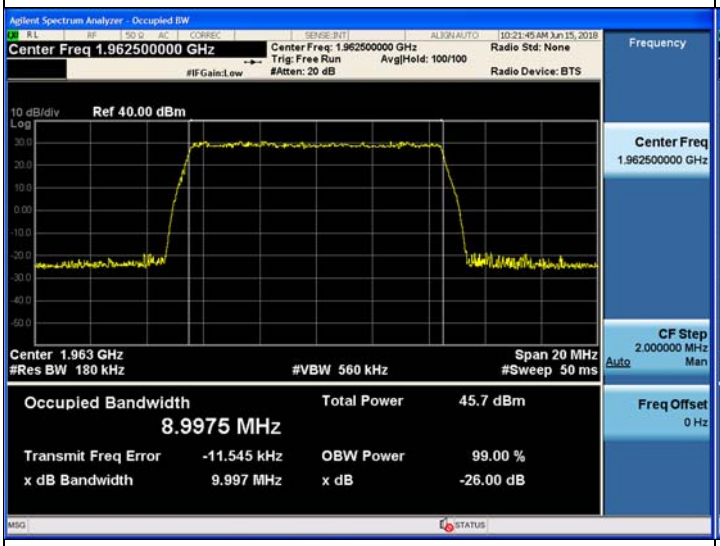
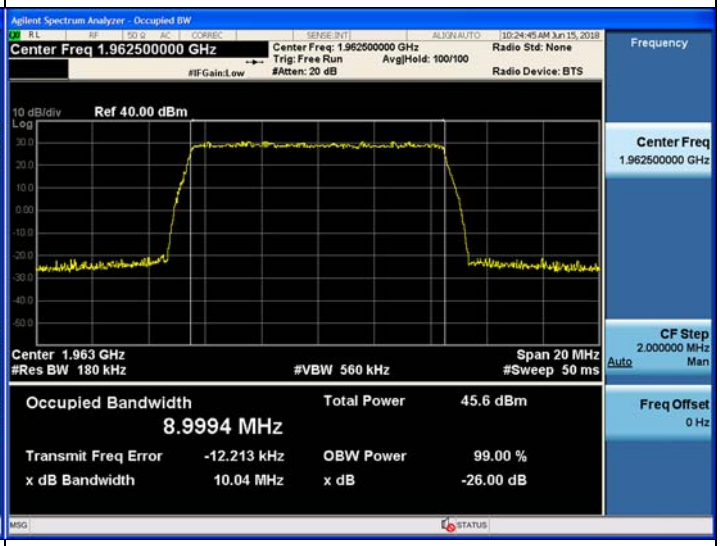
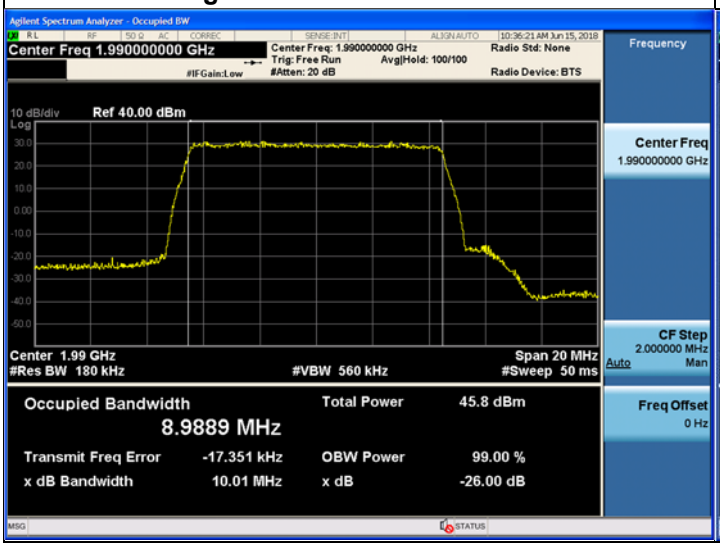
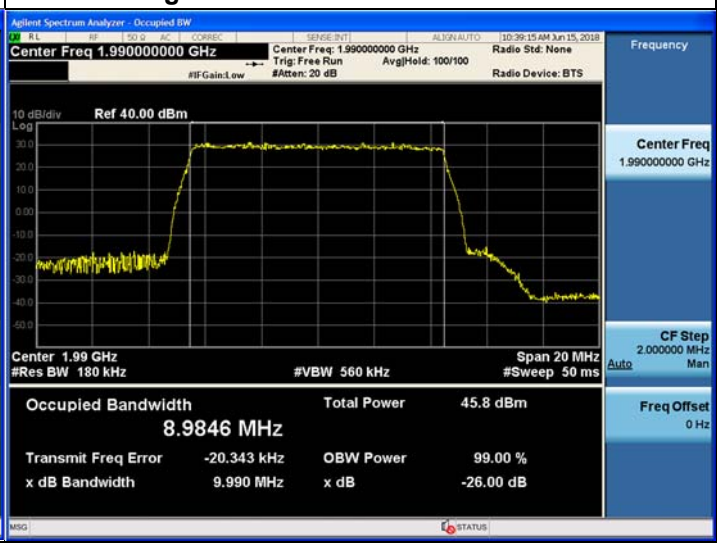
1900 PCS Band	Channel	Frequency (MHz)	OBW (MHz)
LTE 5 MHz AGC threshold	Low	1932.50	4.5121
	Middle	1962.50	4.5124
	High	1992.50	4.5110
LTE 10 MHz AGC threshold	Low	1935.00	8.9959
	Middle	1962.50	8.9997
	High	1990.00	9.0055
LTE 20 MHz AGC threshold	Low	1940.00	18.024
	Middle	1962.50	18.029
	High	1985.00	18.008
WCDMA AGC threshold	Low	1932.50	4.1787
	Middle	1962.50	4.1851
	High	1992.50	4.1856
CDMA AGC threshold	Low	1931.25	1.2620
	Middle	1962.50	1.2610
	High	1993.75	1.2596
1900 PCS Band	**Channel**	**Frequency (MHz)**	**OBW (kHz)**
GSM AGC threshold	Low	1930.20	243.79
	Middle	1962.50	244.18
	High	1994.80	244.27

*Note: We have done CDMA and 1xEVDO / GSM and EDGE modulation test in technology. Test results are only attached worst cases.

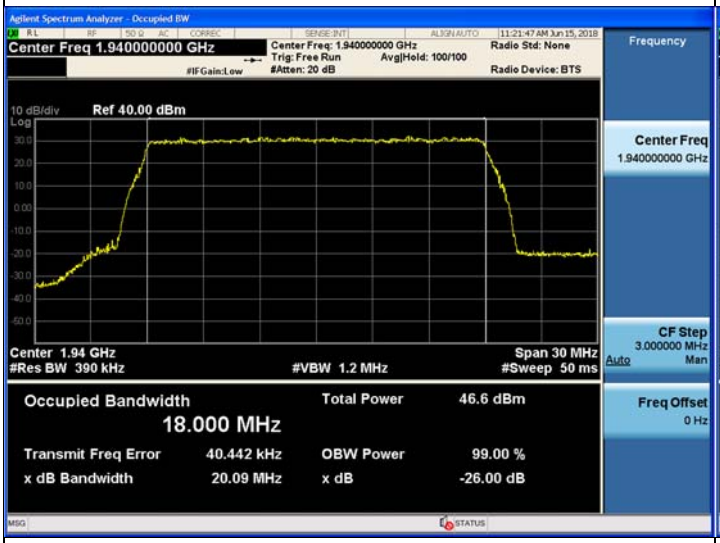
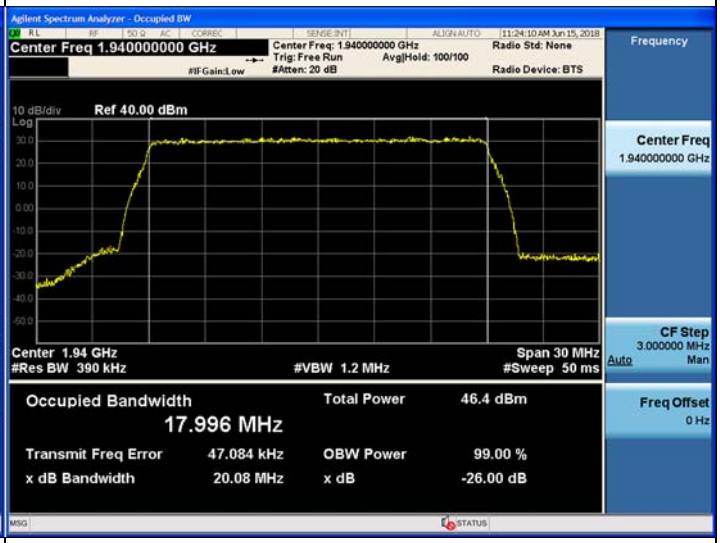
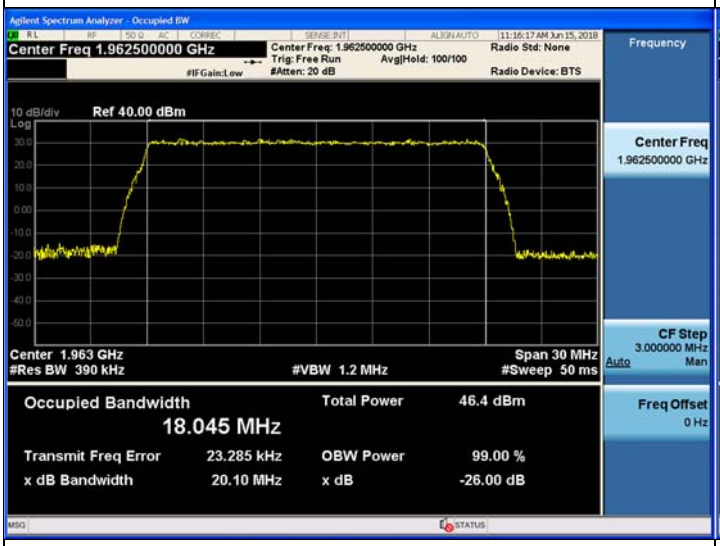
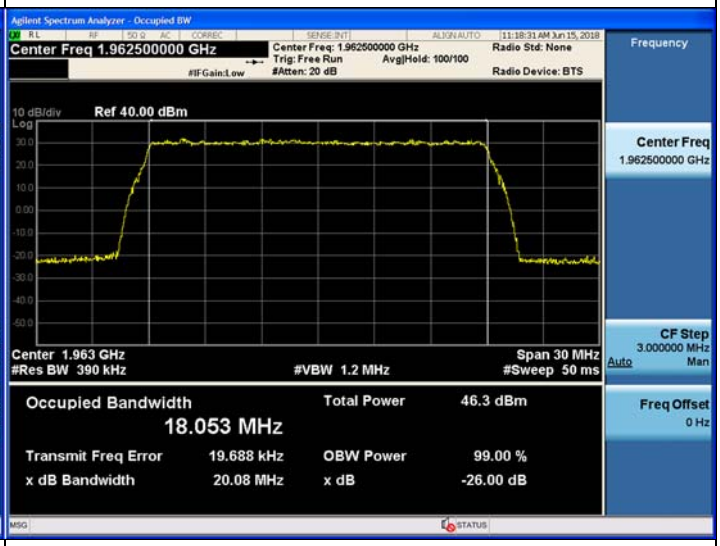
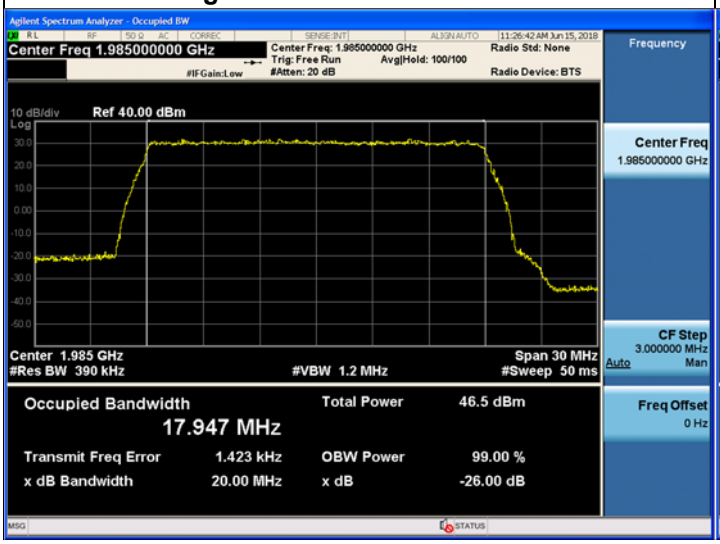
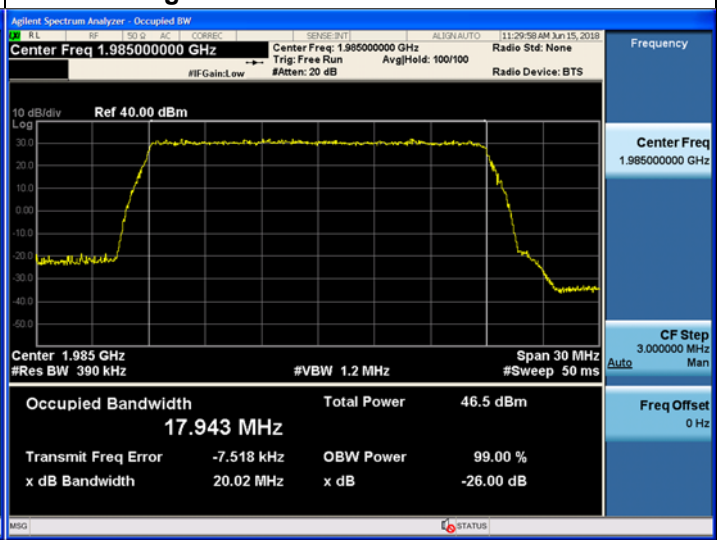
Plots of Output Occupied Bandwidth for 1900 PCS Band LTE 5 MHz

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 1900 PCS Band LTE 10 MHz

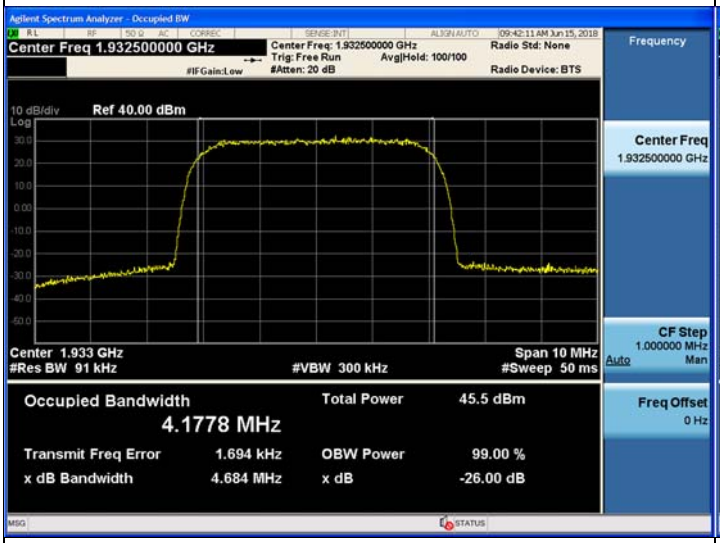
Low Channel AGC threshold	Low Channel +3 dB AGC threshold
	
Middle Channel AGC threshold	**Middle Channel +3 dB AGC threshold**
	
High Channel AGC threshold	**High Channel +3 dB AGC threshold**
	

Plots of Output Occupied Bandwidth for 1900 PCS Band LTE 20 MHz

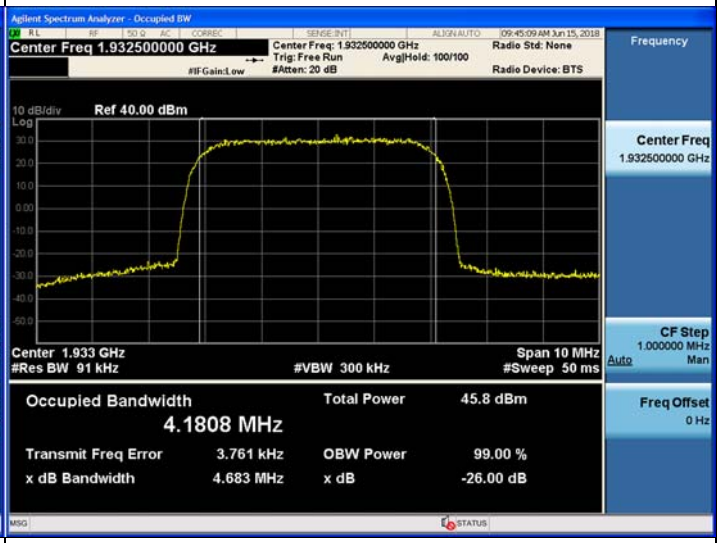
Low Channel AGC threshold	Low Channel +3 dB AGC threshold
	
Middle Channel AGC threshold	**Middle Channel +3 dB AGC threshold**
	
High Channel AGC threshold	**High Channel +3 dB AGC threshold**
	

Plots of Output Occupied Bandwidth for 1900 PCS Band WCDMA

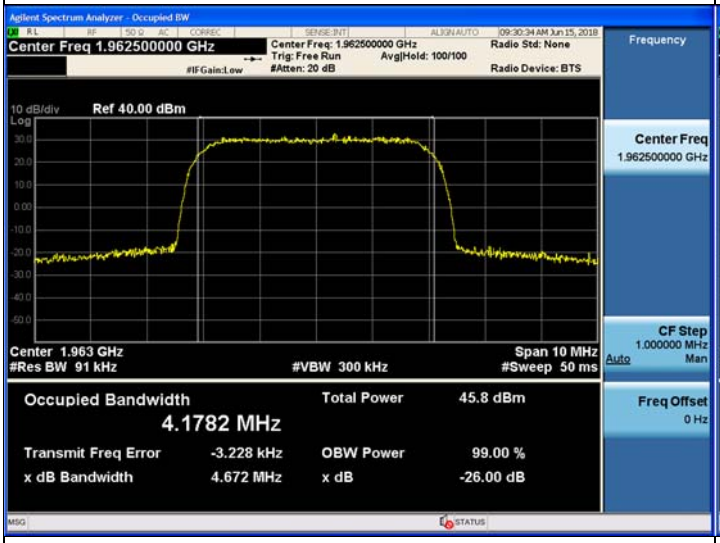
Low Channel AGC threshold



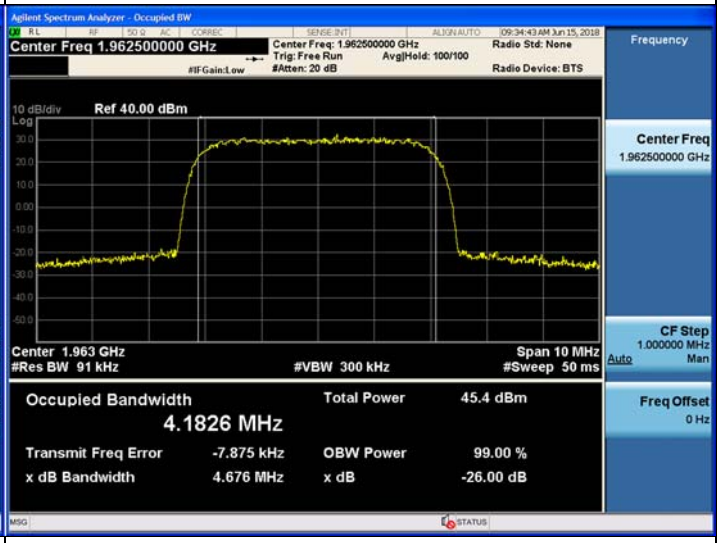
Low Channel +3 dB AGC threshold



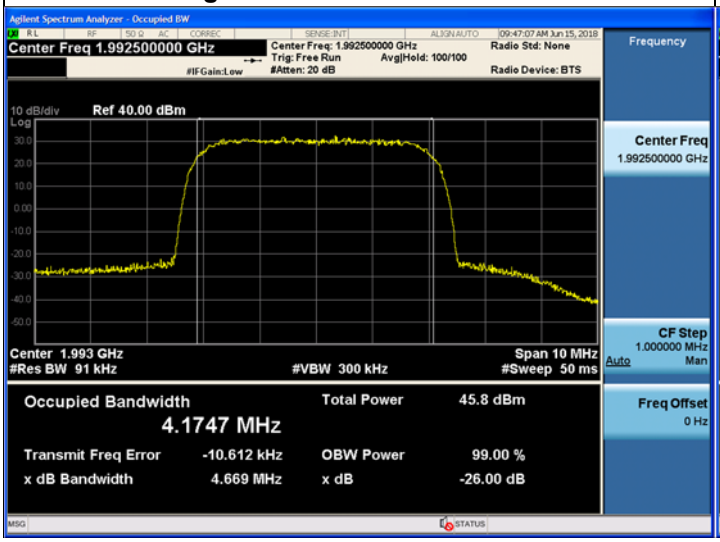
Middle Channel AGC threshold



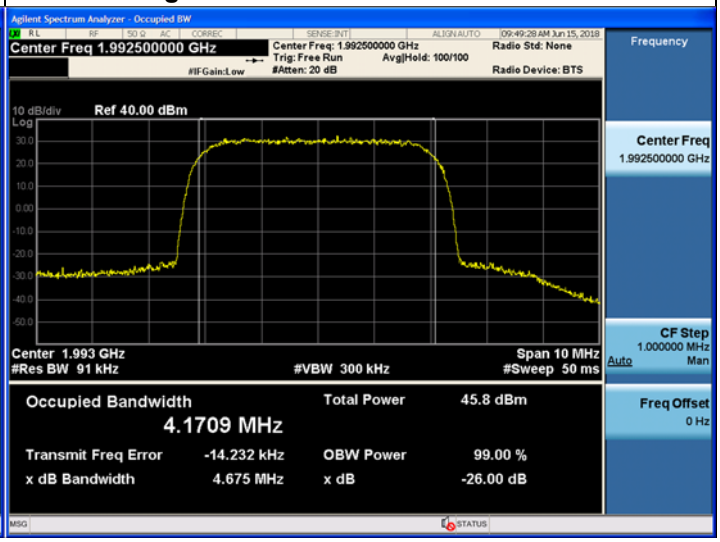
Middle Channel +3 dB AGC threshold



High Channel AGC threshold

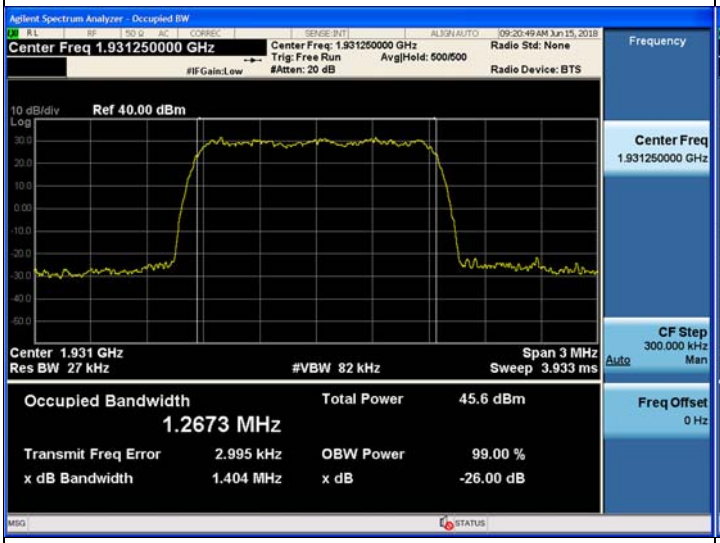


High Channel +3 dB AGC threshold

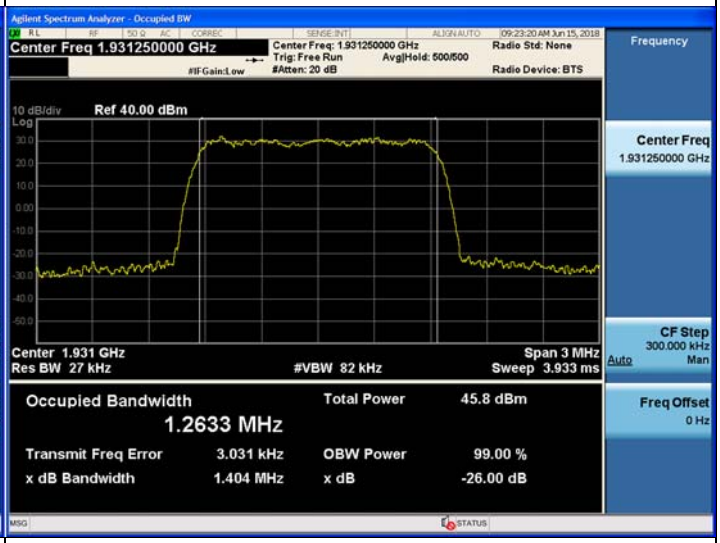


Plots of Output Occupied Bandwidth for 1900 PCS Band CDMA

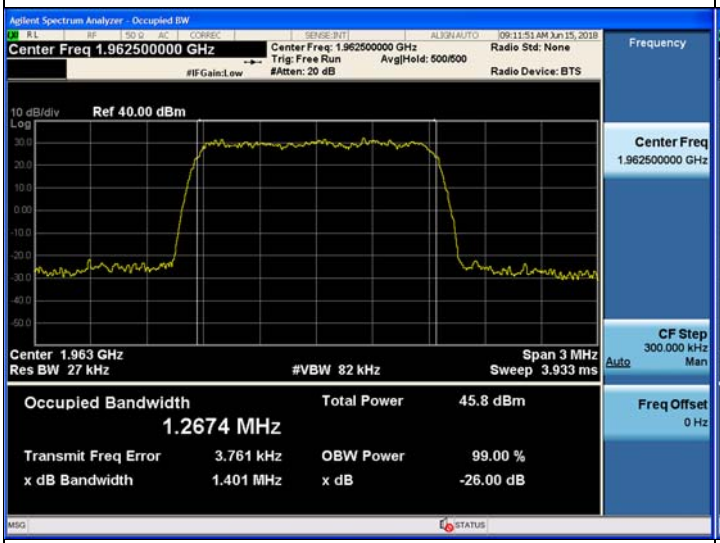
Low Channel AGC threshold



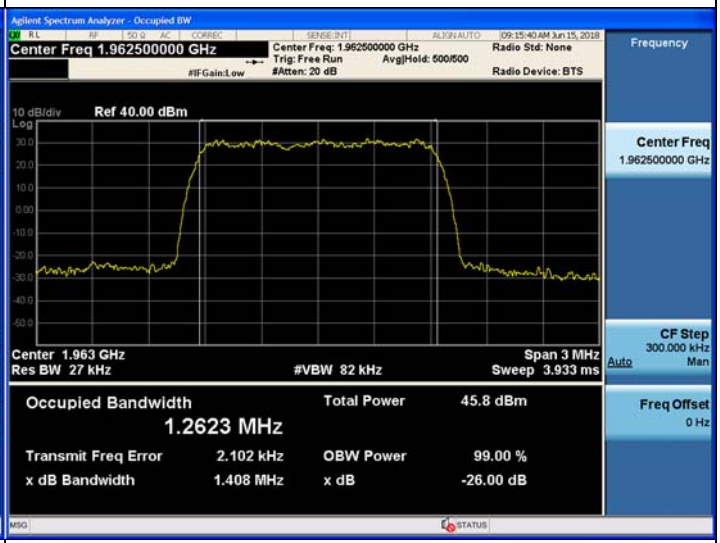
Low Channel +3 dB AGC threshold



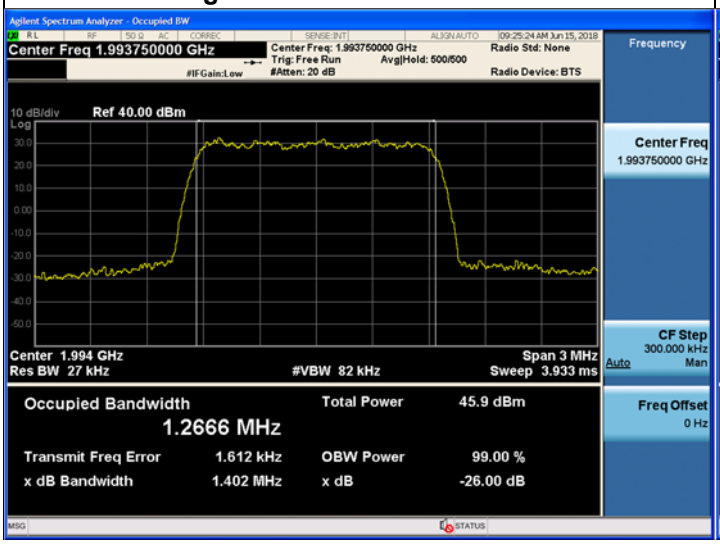
Middle Channel AGC threshold



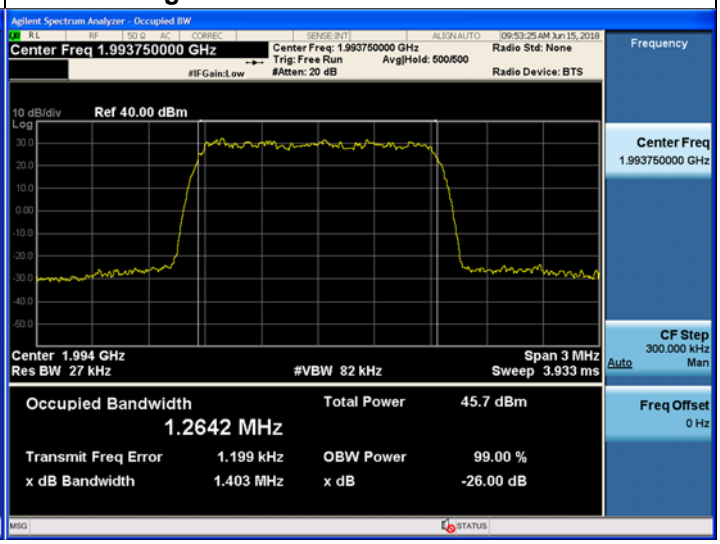
Middle Channel +3 dB AGC threshold



High Channel AGC threshold



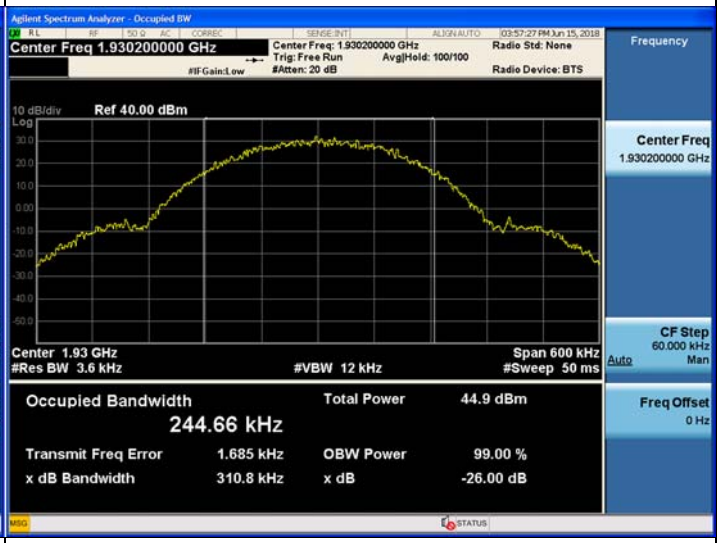
High Channel +3 dB AGC threshold



Plots of Output Occupied Bandwidth for 1900 PCS Band GSM

Low Channel AGC threshold

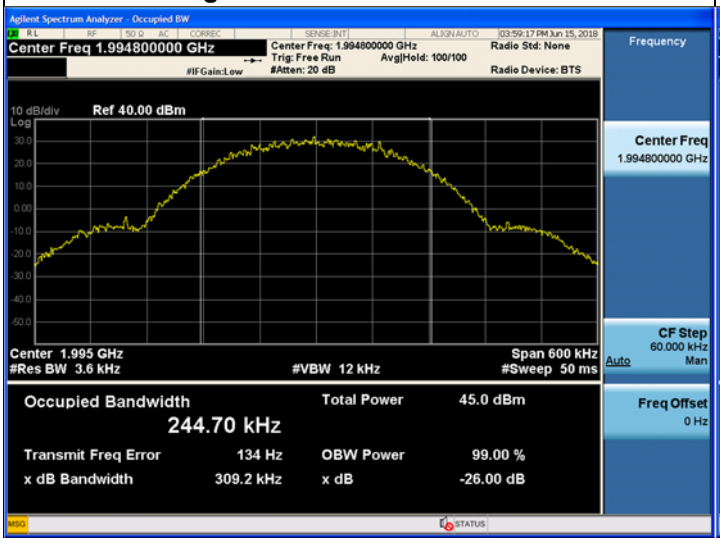
Low Channel +3 dB AGC threshold



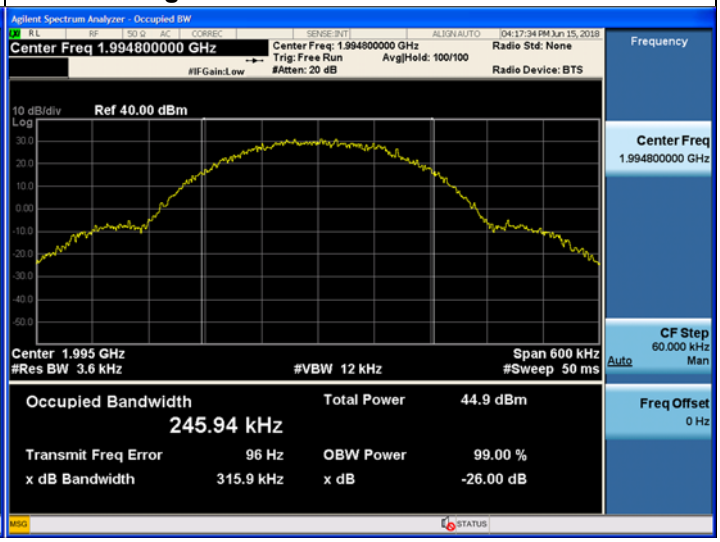
Middle Channel AGC threshold

Middle Channel +3 dB AGC threshold

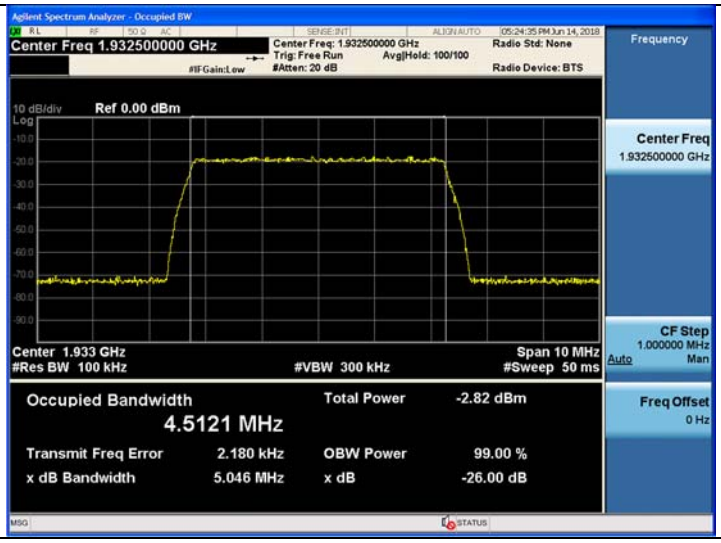
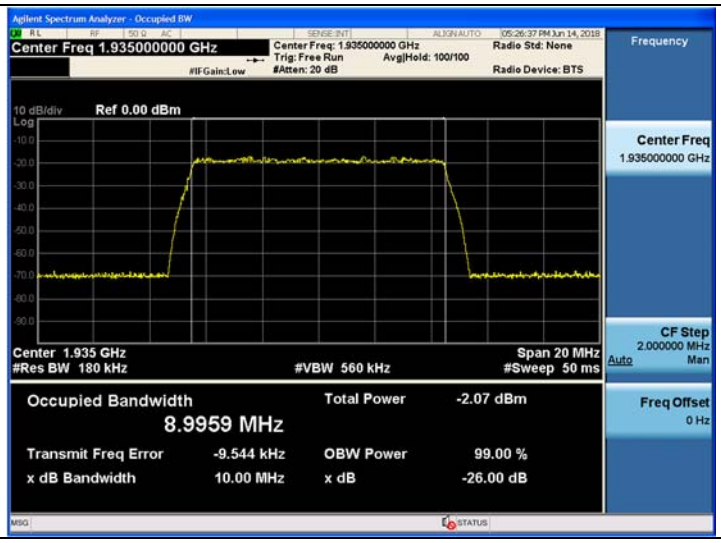
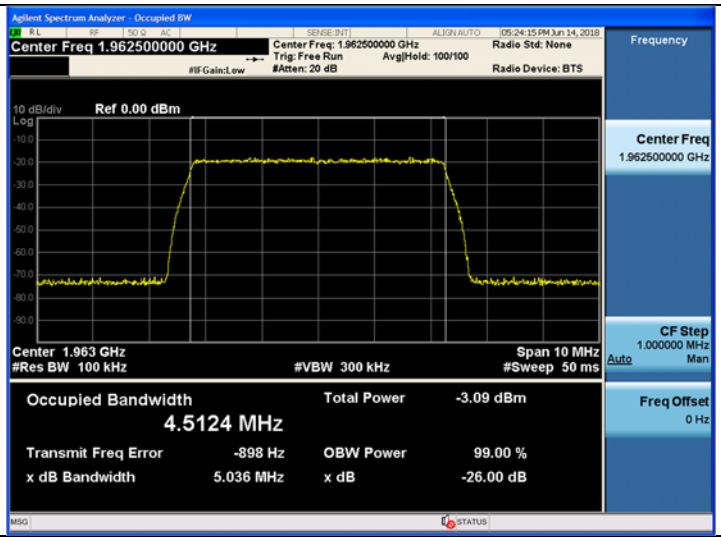
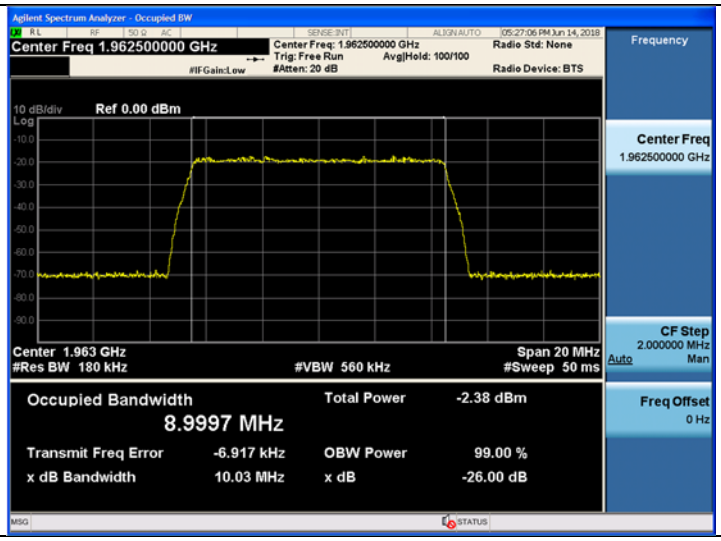
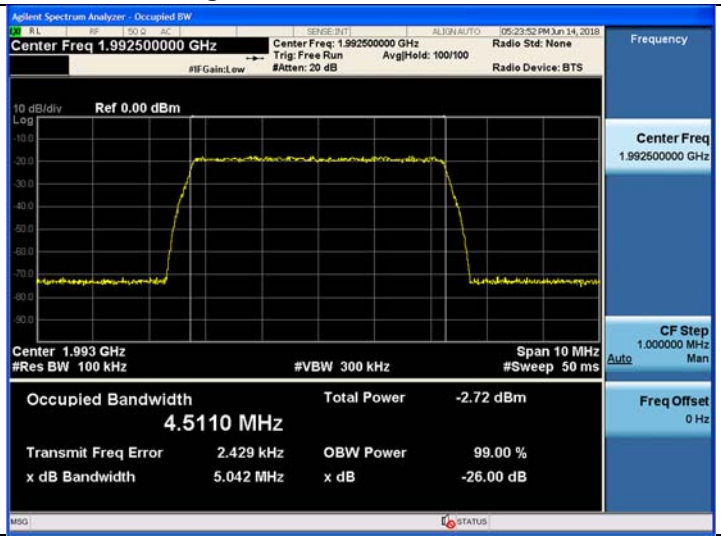
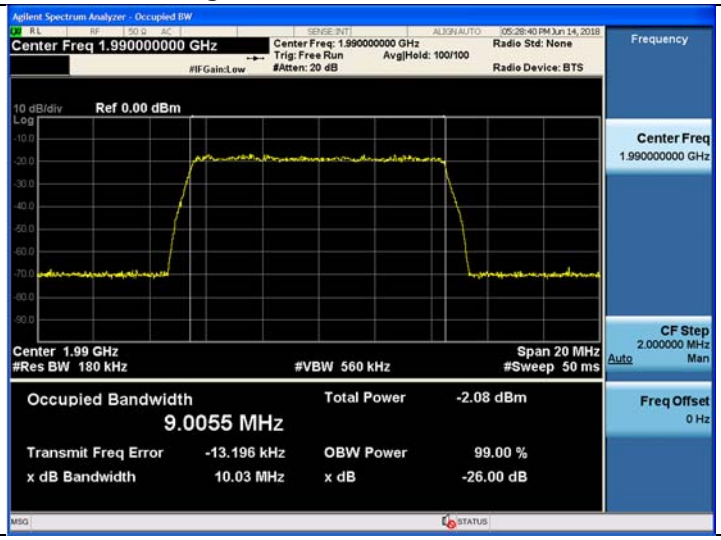
High Channel AGC threshold



High Channel +3 dB AGC threshold



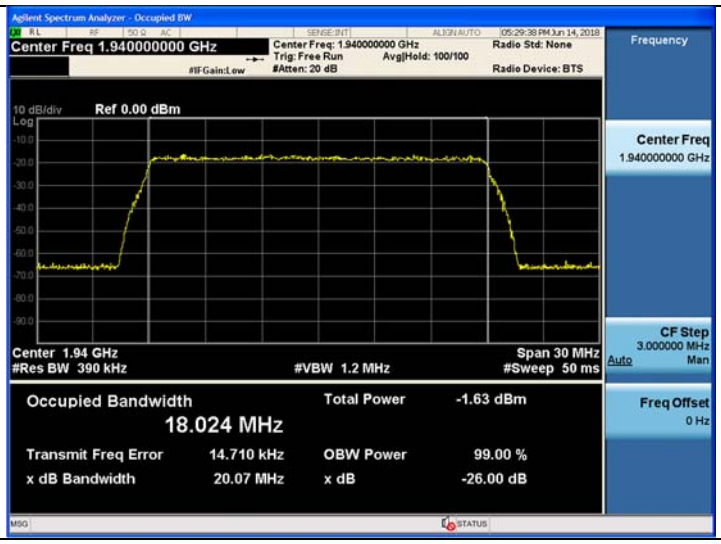
Plots of Input Occupied Bandwidth for 1900 PCS LTE Band

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
	

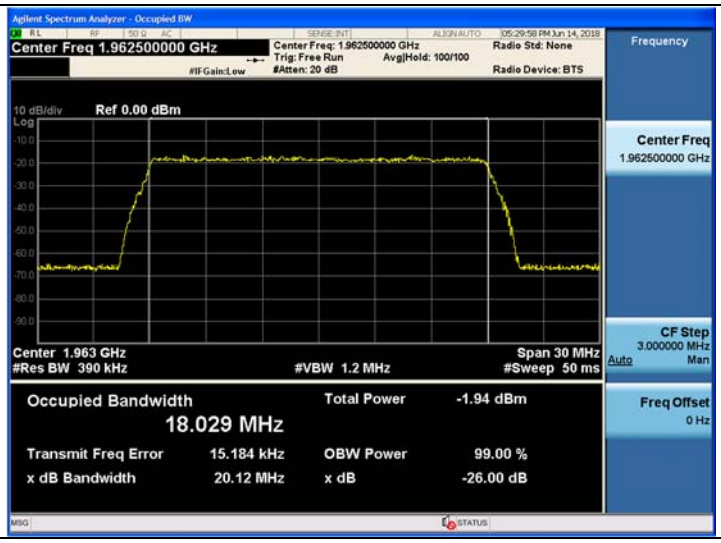
Plots of Input Occupied Bandwidth for 1900 PCS LTE Band

LTE 20 MHz

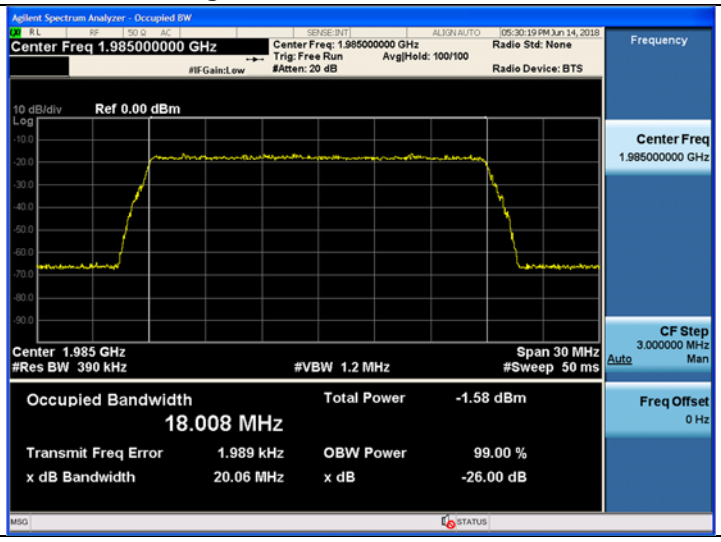
Low Channel AGC threshold



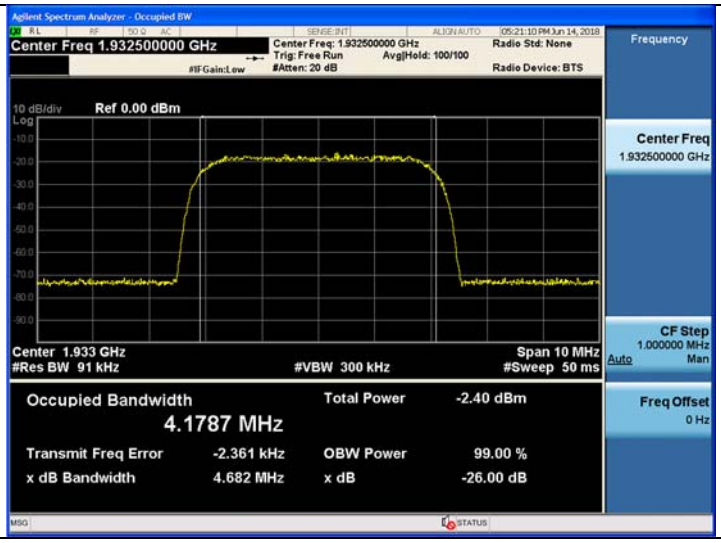
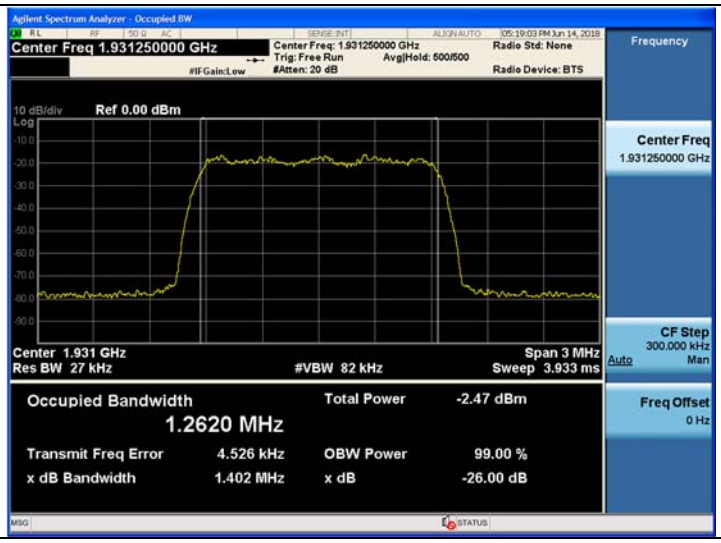
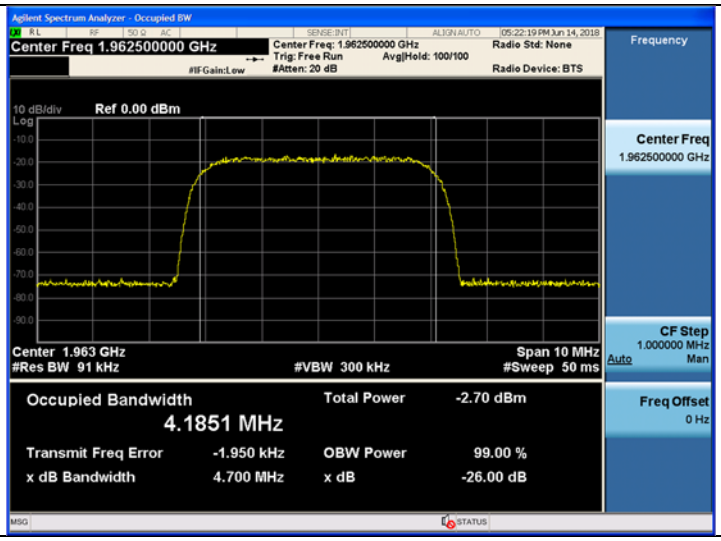
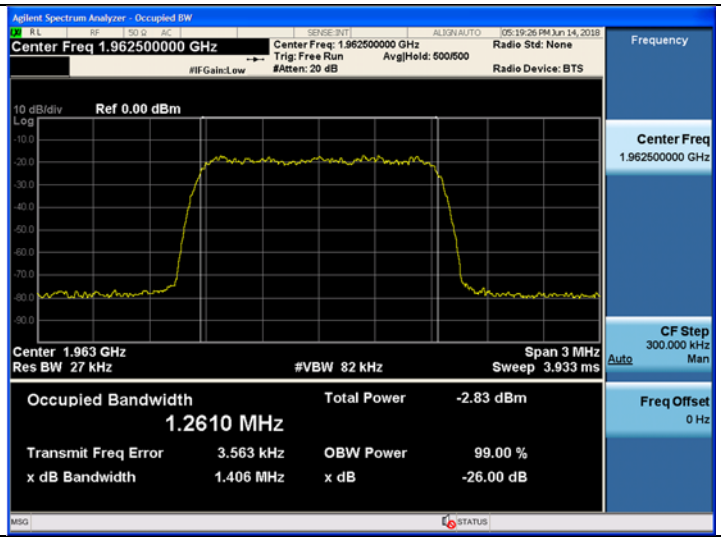
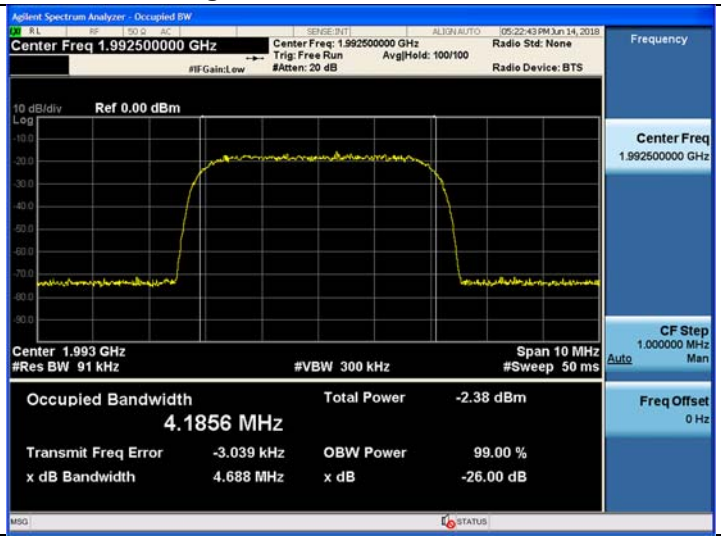
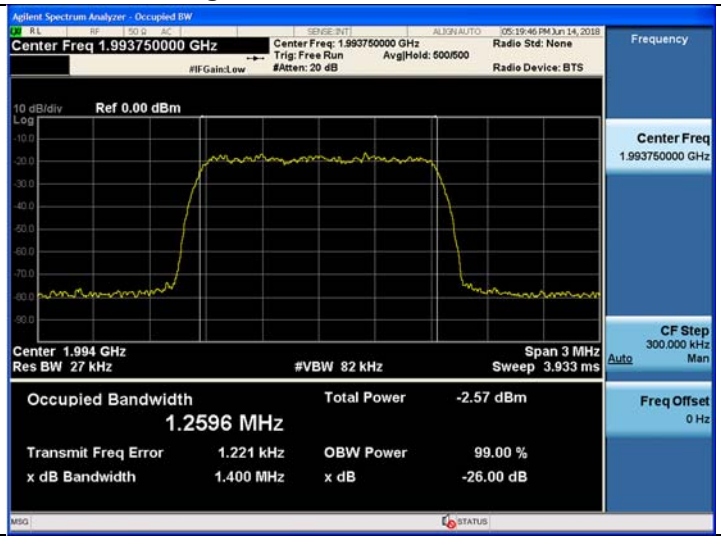
Middle Channel AGC threshold



High Channel AGC threshold



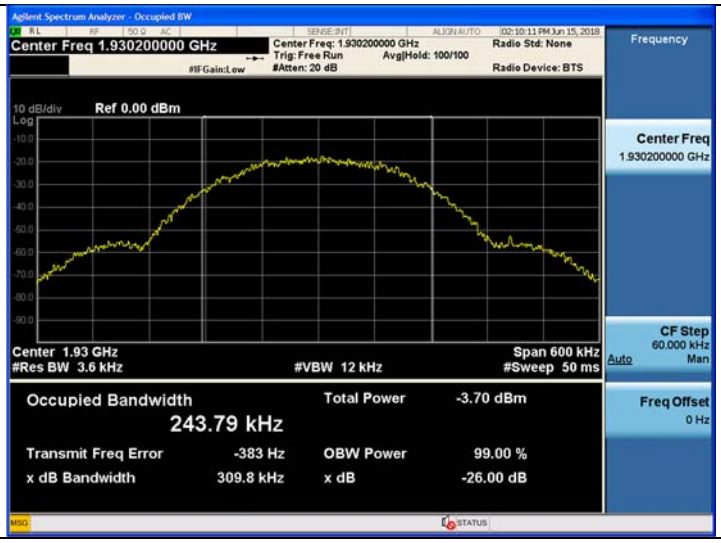
Plots of Input Occupied Bandwidth for 1900 PCS Band

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**
	

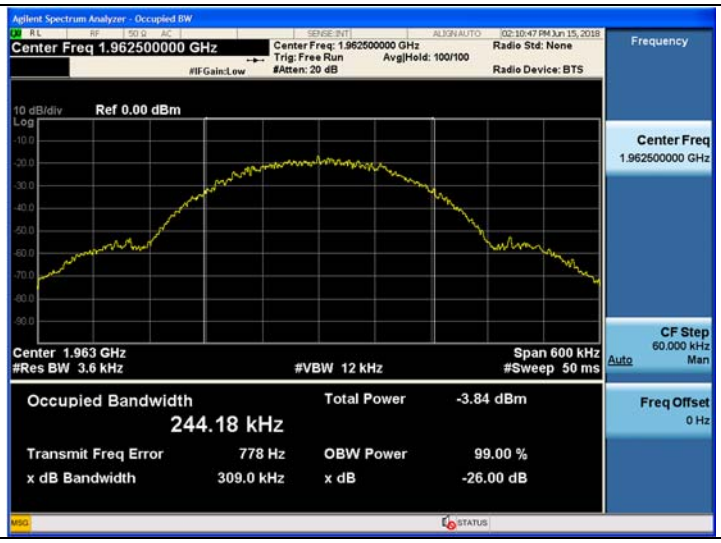
Plots of Input Occupied Bandwidth for 1900 PCS Band

GSM

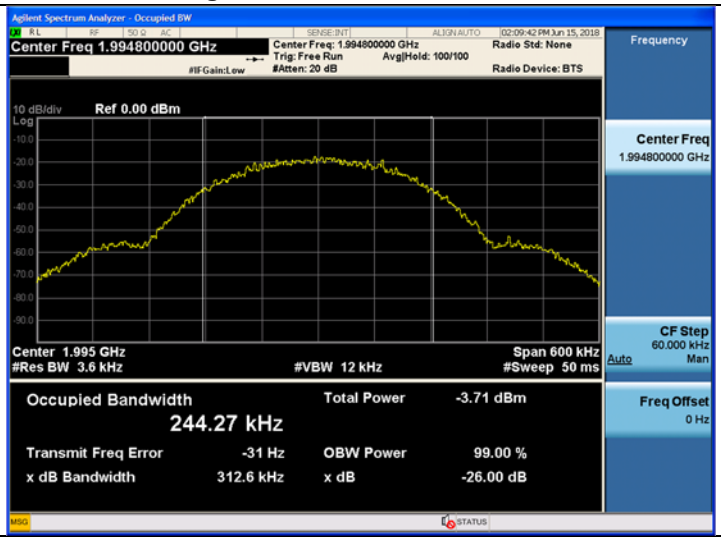
Low Channel AGC threshold



Middle Channel AGC threshold



High Channel AGC threshold



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 : We tested using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 26 dB.

Test Results:

[Downlink Output_1900 PCS Band]

1900 PCS Band	Channel	Frequency (MHz)	26 dB BW (MHz)	Growth (%)
LTE 5 MHz AGC threshold	Low	1932.50	5.029	-0.34
	Middle	1962.50	5.047	0.22
	High	1992.50	5.029	-0.26
LTE 5 MHz +3dBm above the AGC threshold	Low	1932.50	5.031	-0.30
	Middle	1962.50	5.035	-0.02
	High	1992.50	5.042	0.00
LTE 10 MHz AGC threshold	Low	1935.00	10.00	0.00
	Middle	1962.50	9.997	-0.33
	High	1990.00	10.01	-0.20
LTE 10 MHz +3dBm above the AGC threshold	Low	1935.00	9.996	-0.04
	Middle	1962.50	10.04	0.10
	High	1990.00	9.990	-0.40
LTE 20 MHz AGC threshold	Low	1940.00	20.09	0.10
	Middle	1962.50	20.10	-0.10
	High	1985.00	20.00	-0.30
LTE 20 MHz +3dBm above the AGC threshold	Low	1940.00	20.08	0.05
	Middle	1962.50	20.08	-0.20
	High	1985.00	20.02	-0.20
WCDMA AGC threshold	Low	1932.50	4.684	0.04
	Middle	1962.50	4.672	-0.60
	High	1992.50	4.669	-0.41
WCDMA +3dBm above the AGC threshold	Low	1932.50	4.683	0.02
	Middle	1962.50	4.676	-0.51
	High	1992.50	4.675	-0.28