7. OCCUPIED BANDWIDTH

FCC Rules

Test Requirement(s): § 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.

Test Procedures:

Measurements were in accordance with the test methods section 3.4 of KDB 935210 D05 v01r01 and section 4.2 of KDB 971168 D01 v02r02.

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 OBW.

f) The nominal resolution bandwidth (RBW) shall be in the range of 1% to 5 % of the anticipated OBW, and the VBW shall be ≥ 3 × 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.

NOTE—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) Use the 99 % power bandwidth function of the spectrum analyzer (if available) and report the measured bandwidth.

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

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

n) Repeat for all frequency bands authorized for use by the EUT.

IC Rules

Test Requirements: RSS-GEN 6.6

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99 % emission bandwidth, as calculated or measured.

Test Procedures: RSS-GEN 6.6

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3x RBW.

Video averaging is not permitted. A peak, or peak hold, maybe used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth(worst-case measurement).Use of peak hold maybe necessary to determine the occupied bandwidth if the device is not transmitting continuously.

The trace data points are recovered and are 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%ofthe 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 the99% occupied bandwidth.

Test Results: The EUT complies with the requirements of this section.

Input Signal	Input Level (dBm)	Maximum Amp Gain
1900 PCS	-14 dBm	47.0 dB
AWS	-14 dBm	47.0 dB

[Downlink Output_1900 PCS BAND]

	Channel	**Frequency (MHz)**	**OBW (MHz)**
1900 PCS Band_ LTE 5 MHz AGC threshold	Low	1932.50	4.509
	Middle	1962.50	4.516
	High	1992.50	4.510
1900 PCS Band_ LTE 5 MHz +3dBm above the AGC threshold	Low	1932.50	4.510
	Middle	1962.50	4.515
	High	1992.50	4.509
1900 PCS Band_ LTE 10 MHz AGC threshold	Low	1935.00	8.968
	Middle	1962.50	9.005
	High	1990.00	8.988
1900 PCS Band_ LTE 10 MHz +3dBm above the AGC threshold	Low	1935.00	8.968
	Middle	1962.50	9.004
	High	1990.00	8.982

	Channel	Frequency (MHz)	OBW (MHz)
1900 PCS Band_ LTE 20 MHz AGC threshold	Low	1940.00	17.948
	Middle	1962.50	18.056
	High	1985.00	18.010
1900 PCS Band_ LTE 20 MHz +3dBm above the AGC threshold	Low	1940.00	17.798
	Middle	1962.50	17.859
	High	1985.00	17.795
1900 PCS Band_ CDMA AGC threshold	Low	1931.25	1.266
	Middle	1962.50	1.260
	High	1993.75	1.262
1900 PCS Band_ CDMA +3dBm above the AGC threshold	Low	1931.25	1.265
	Middle	1962.50	1.259
	High	1993.75	1.268
1900 PCS Band_ WCDMA AGC threshold	Low	1932.50	4.175
	Middle	1962.50	4.184
	High	1992.50	4.170
1900 PCS Band_ WCDMA +3dBm above the AGC threshold	Low	1932.50	4.168
	Middle	1962.50	4.179
	High	1992.50	4.166

[Downlink Output_AWS BAND]

	Channel	Frequency (MHz)	OBW (MHz)
AWSBand_ LTE 5 MHz AGC threshold	Low	2112.50	4.510
	Middle	2145.00	4.511
	High	2177.50	4.510
AWSBand_ LTE 5 MHz +3dBm above the AGC threshold	Low	2112.50	4.507
	Middle	2145.00	4.514
	High	2177.50	4.505
AWS Band_ LTE 10 MHz AGC threshold	Low	2115.00	8.984
	Middle	2145.00	9.010
	High	2175.00	8.991
AWS Band_ LTE 10 MHz +3dBm above the AGC threshold	Low	2115.00	8.977
	Middle	2145.00	9.001
	High	2175.00	8.992

	Channel	Frequency (MHz)	OBW (MHz)
AWSBand_ LTE 20 MHz AGC threshold	Low	2120.00	17.999
	Middle	2145.00	18.034
	High	2170.00	17.955
AWS Band_ LTE 20 MHz +3dBm above the AGC threshold	Low	2120.00	17.757
	Middle	2145.00	17.812
	High	2170.00	17.727
AWSBand_ CDMA AGC threshold	Low	2111.25	1.264
	Middle	2145.00	1.263
	High	2178.75	1.262
AWS Band_ CDMA +3dBm above the AGC threshold	Low	2111.25	1.261
	Middle	2145.00	1.260
	High	2178.75	1.262
AWSBand_ WCDMA AGC threshold	Low	2112.50	4.114
	Middle	2145.00	4.128
	High	2177.50	4.121
AWSBand_ WCDMA +3dBm above the AGC threshold	Low	2112.50	4.121
	Middle	2145.00	4.124
	High	2177.50	4.113

[Downlink Input_1900 PCS BAND]

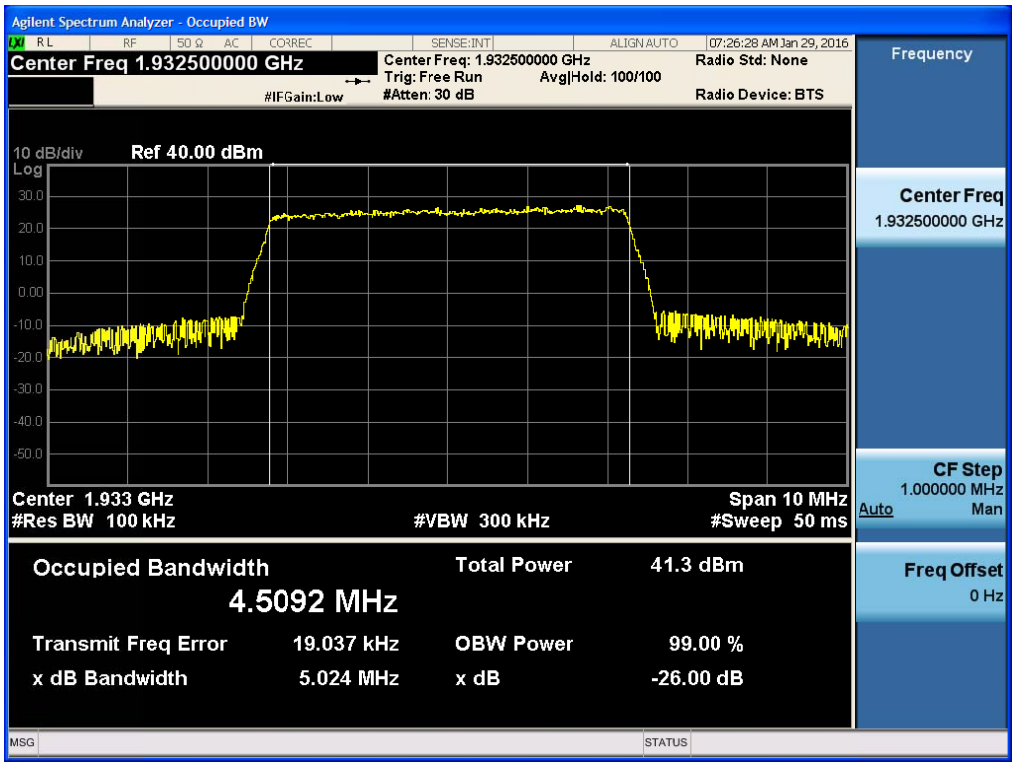
	Channel	Frequency (MHz)	OBW (MHz)
1900 PCS Band_ LTE 5 MHz AGC threshold	Low	1932.50	4.518
	Middle	1962.50	4.519
	High	1992.50	4.521
1900 PCS Band_ LTE 10 MHz AGC threshold	Low	1935.00	9.021
	Middle	1962.50	9.014
	High	1990.00	9.015
1900 PCS Band_ LTE 20 MHz AGC threshold	Low	1940.00	17.916
	Middle	1962.50	17.886
	High	1985.00	17.889
1900 PCS Band_ CDMA AGC threshold	Low	1931.25	1.262
	Middle	1962.50	1.269
	High	1993.75	1.264
1900 PCS Band_ WCDMA AGC threshold	Low	1932.50	4.186
	Middle	1962.50	4.191
	High	1992.50	4.189

[Downlink Output_AWS BAND]

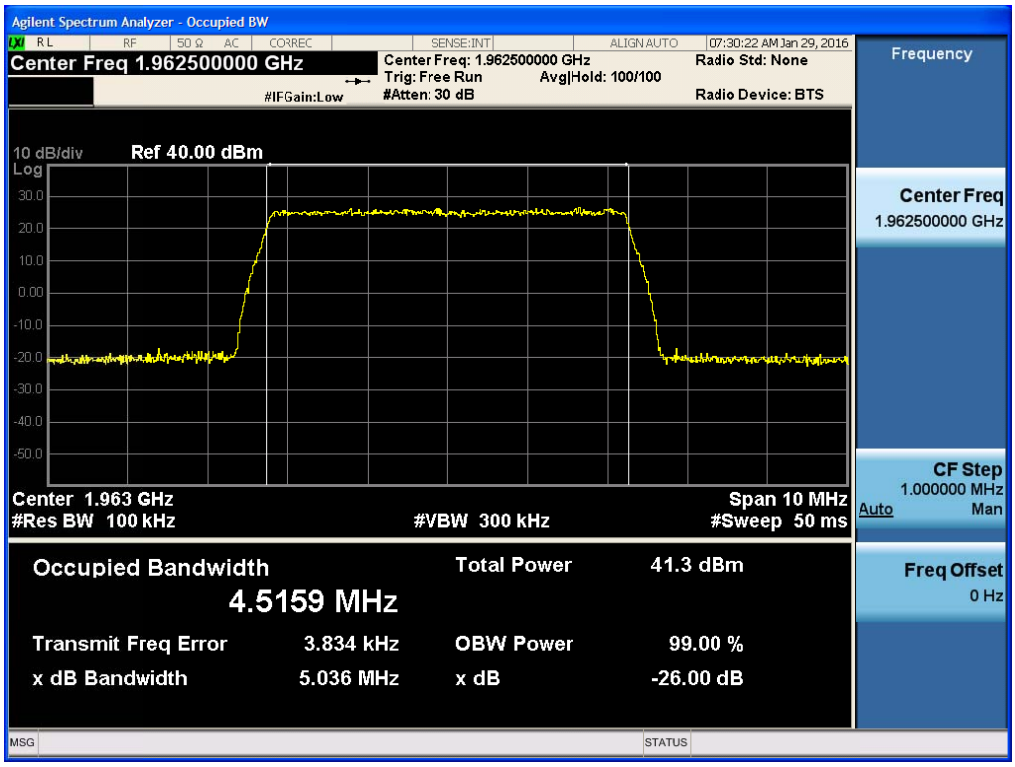
	Channel	Frequency (MHz)	OBW (MHz)
AWS13 Band_ LTE 5 MHz AGC threshold	Low	2112.50	4.517
	Middle	2145.00	4.515
	High	2177.50	4.510
AWS13 Band_ LTE 10 MHz AGC threshold	Low	2115.00	8.983
	Middle	2145.00	9.008
	High	2175.00	8.980
AWS13 Band_ LTE 20 MHz AGC threshold	Low	2120.00	17.819
	Middle	2145.00	17.793
	High	2170.00	17.800
AWS13 Band_ CDMA AGC threshold	Low	2111.25	1.266
	Middle	2145.00	1.263
	High	2178.75	1.264
AWS13 Band_ WCDMA AGC threshold	Low	2111.25	4.122
	Middle	2145.00	4.131
	High	2178.75	4.136

Plots of Occupied Bandwidth_ 1900 PCS BAND LTE 5MHz

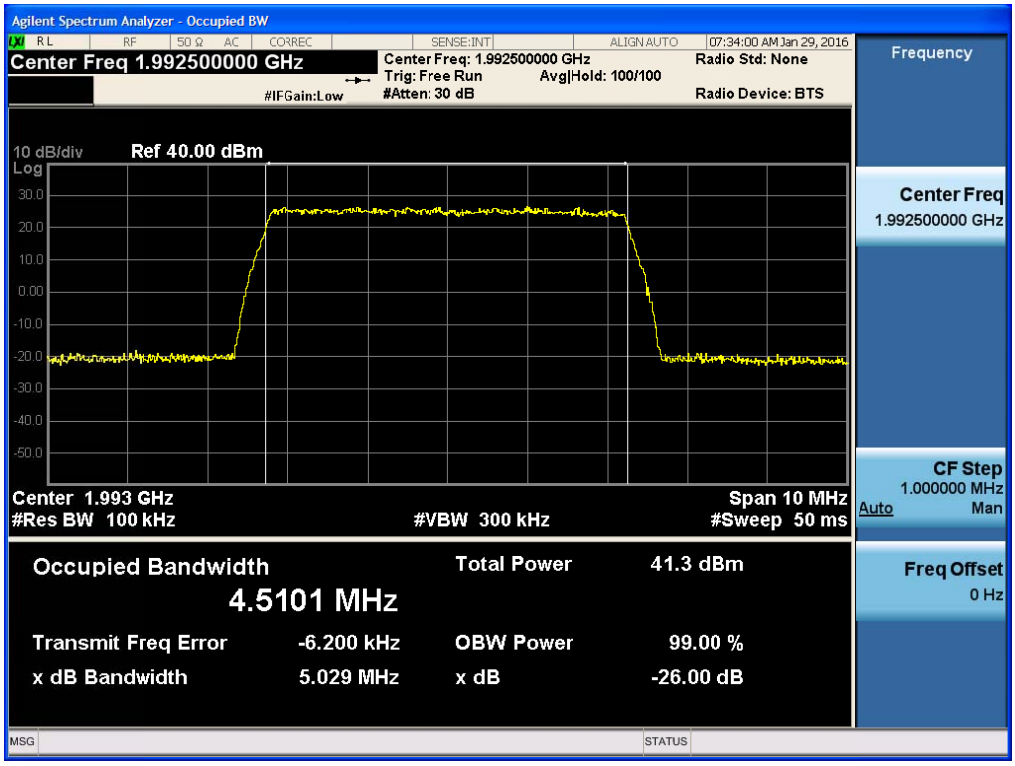
[AGC threshold Output Downlink Low]



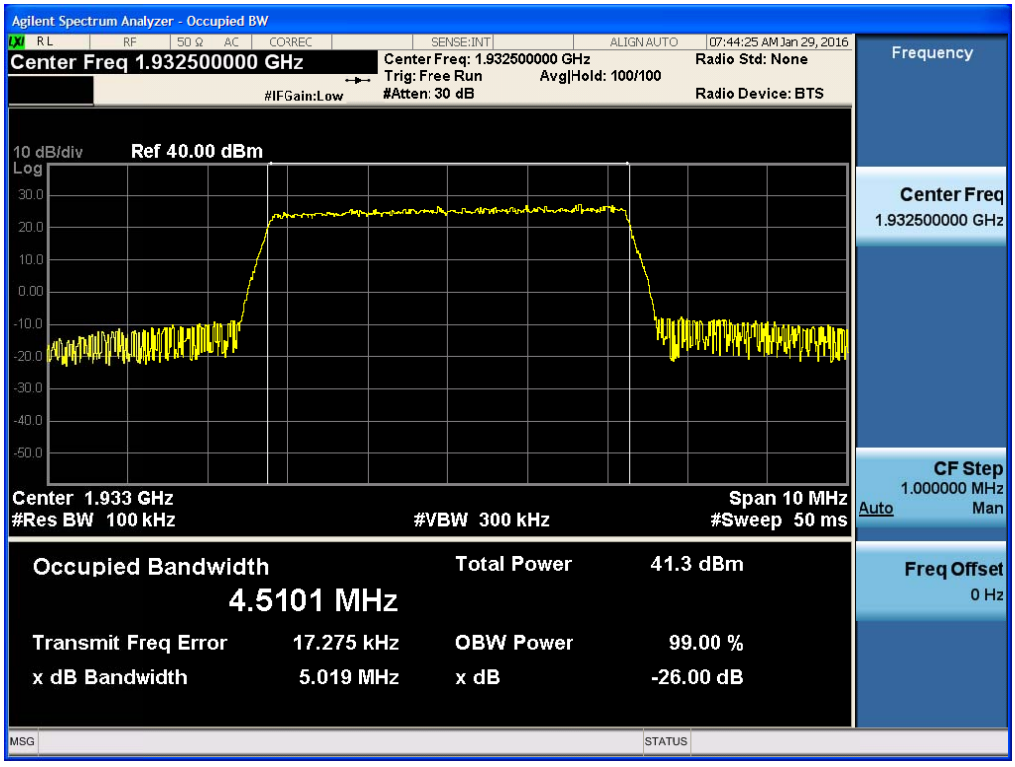
[AGC threshold Output Downlink Middle]



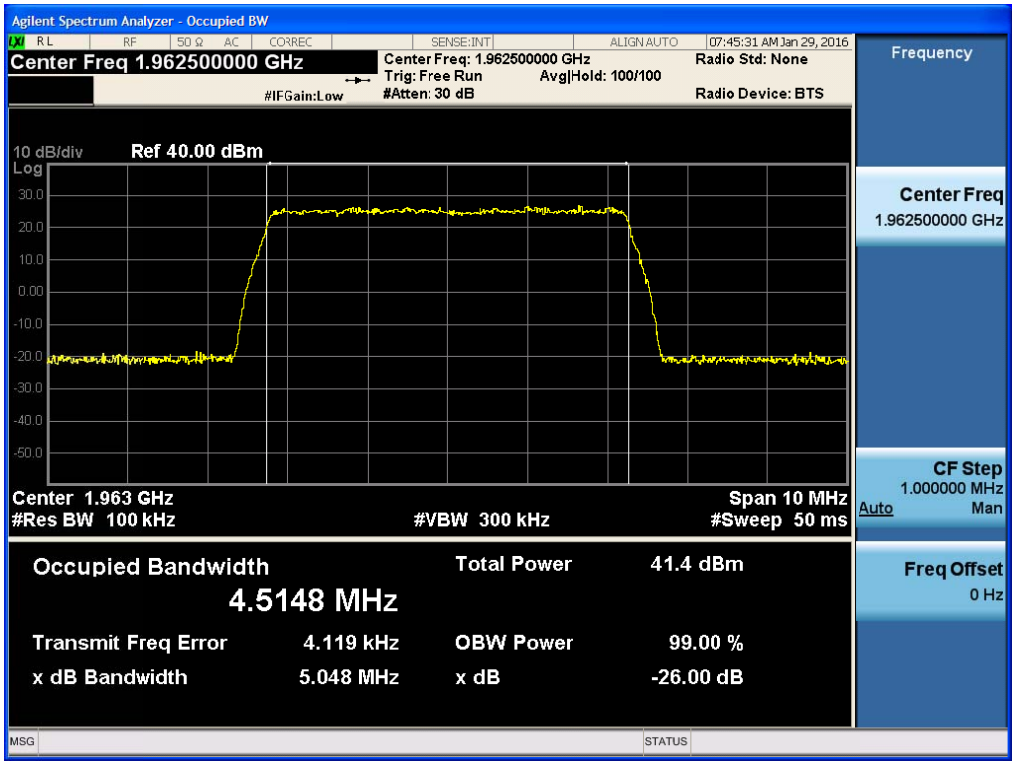
[AGC threshold Output Downlink High]



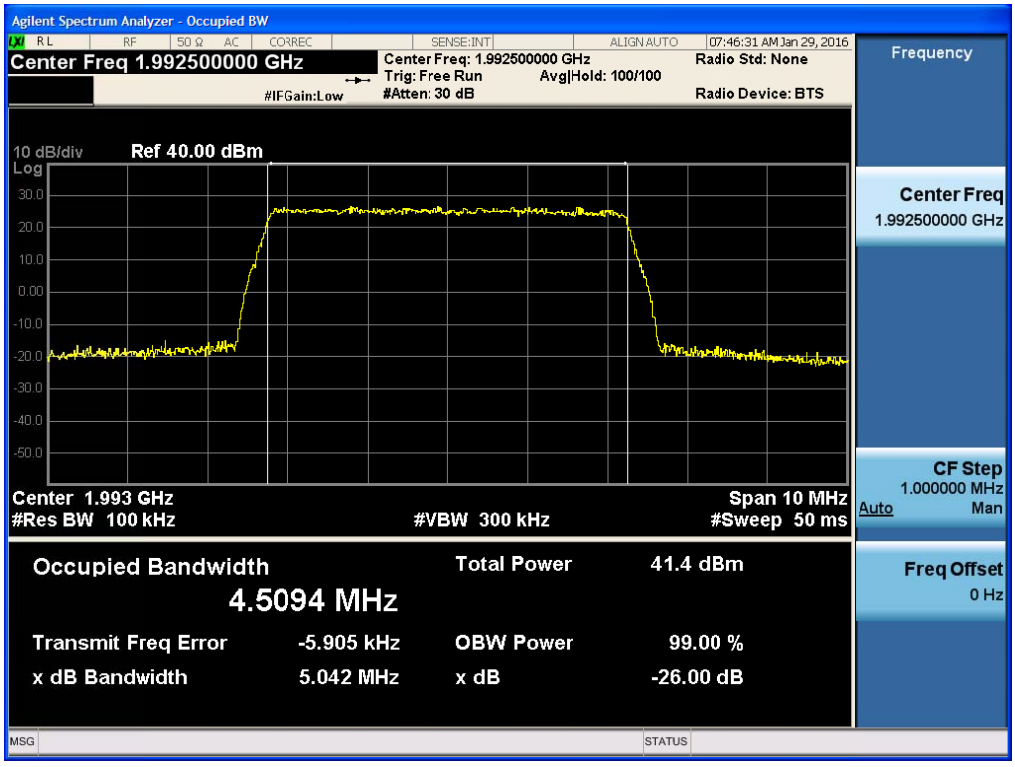
[+3dBmabove AGC threshold Output Downlink Low]



[+3dBm above AGC threshold Output Downlink Middle]

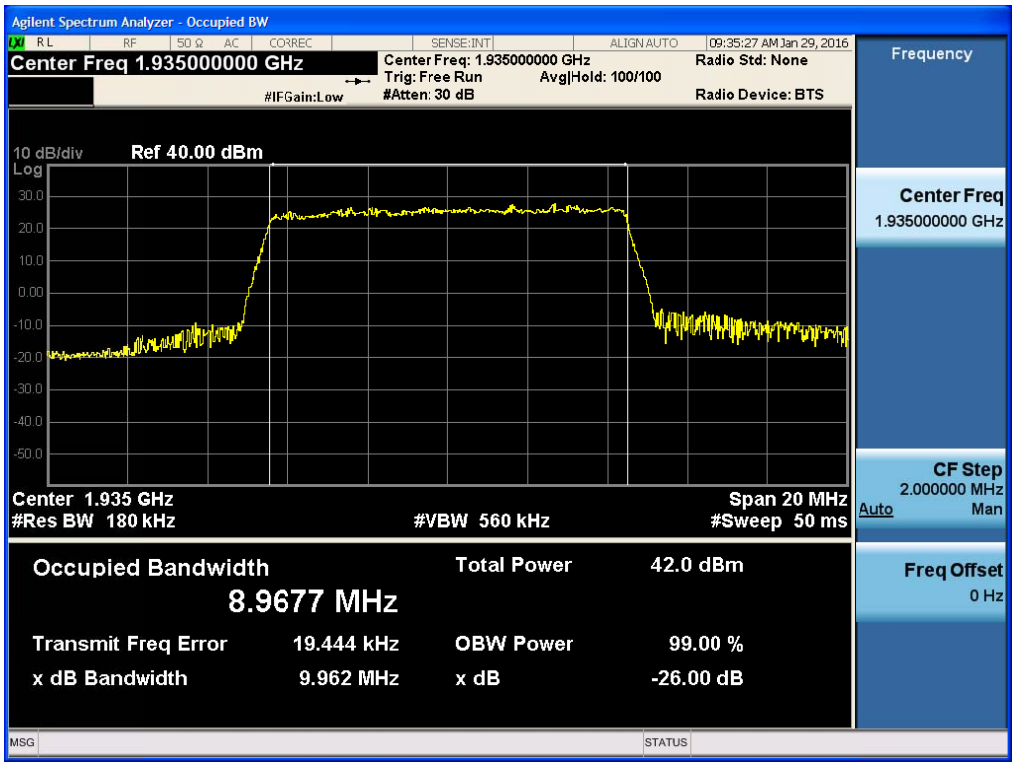


[+3dBm above AGC threshold Output Downlink High]

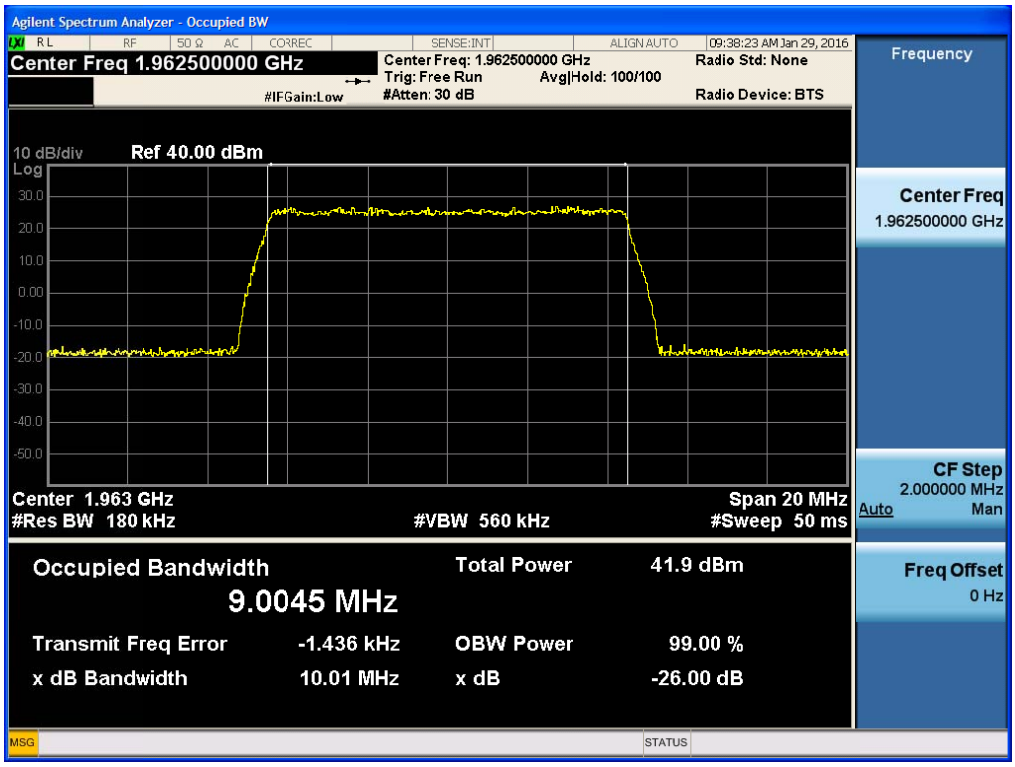


Plots of Occupied Bandwidth_ 1900 PCS BAND LTE 10MHz

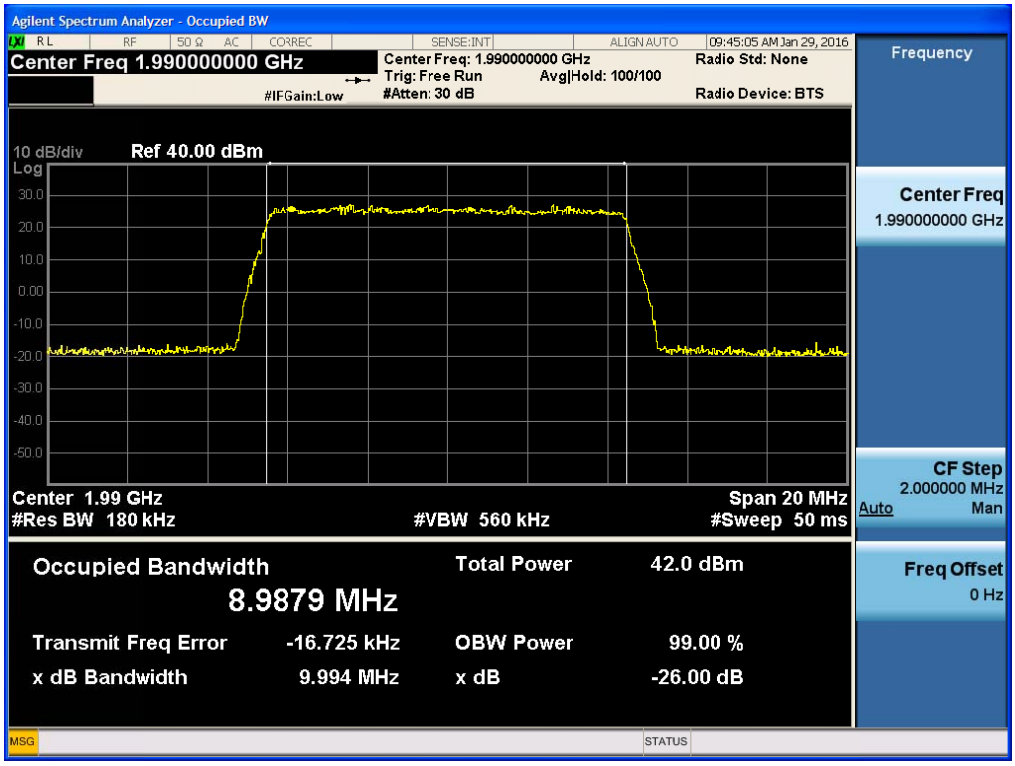
[AGC threshold Output Downlink Low]



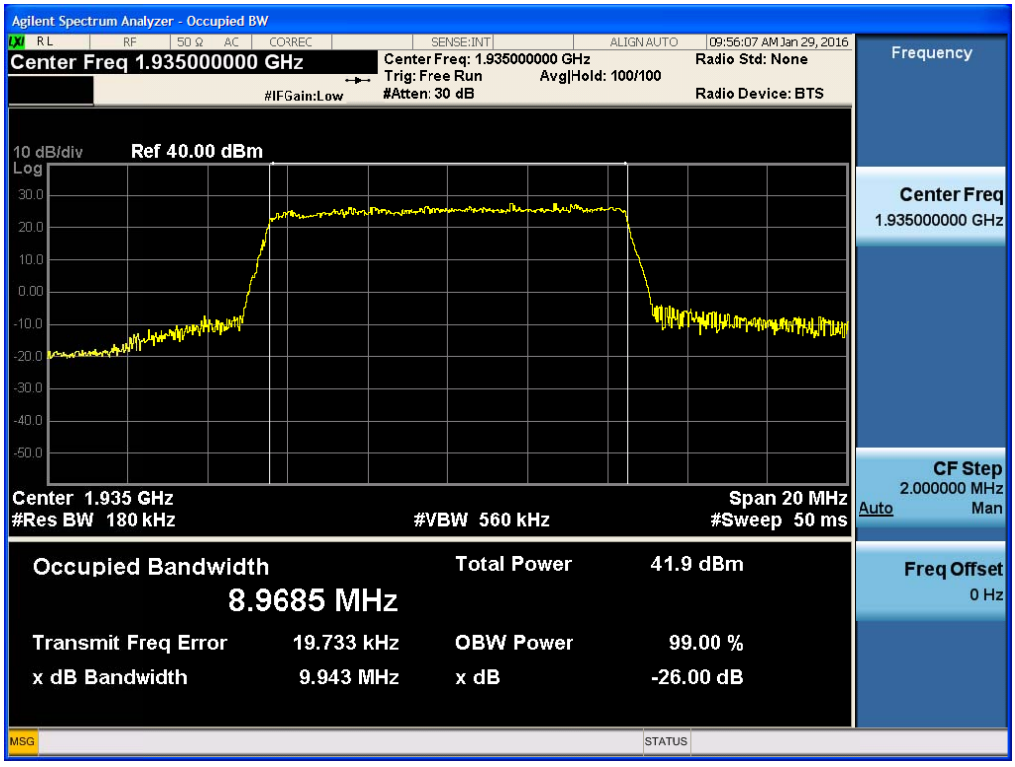
[AGC threshold Output Downlink Middle]



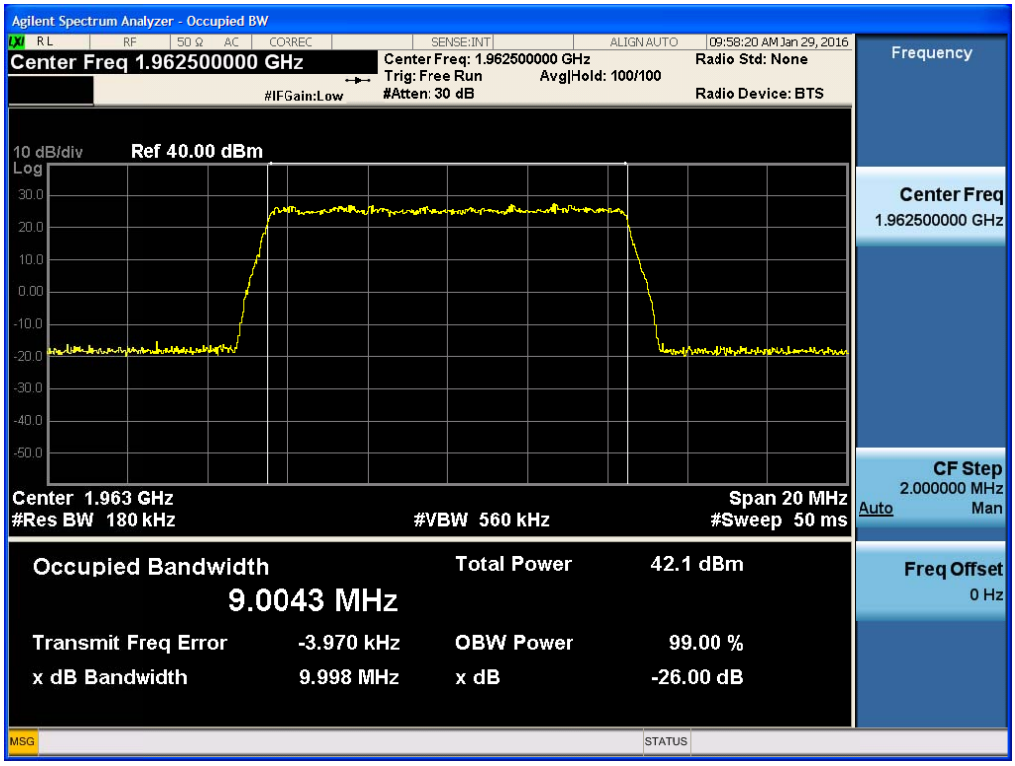
[AGC threshold Output Downlink High]



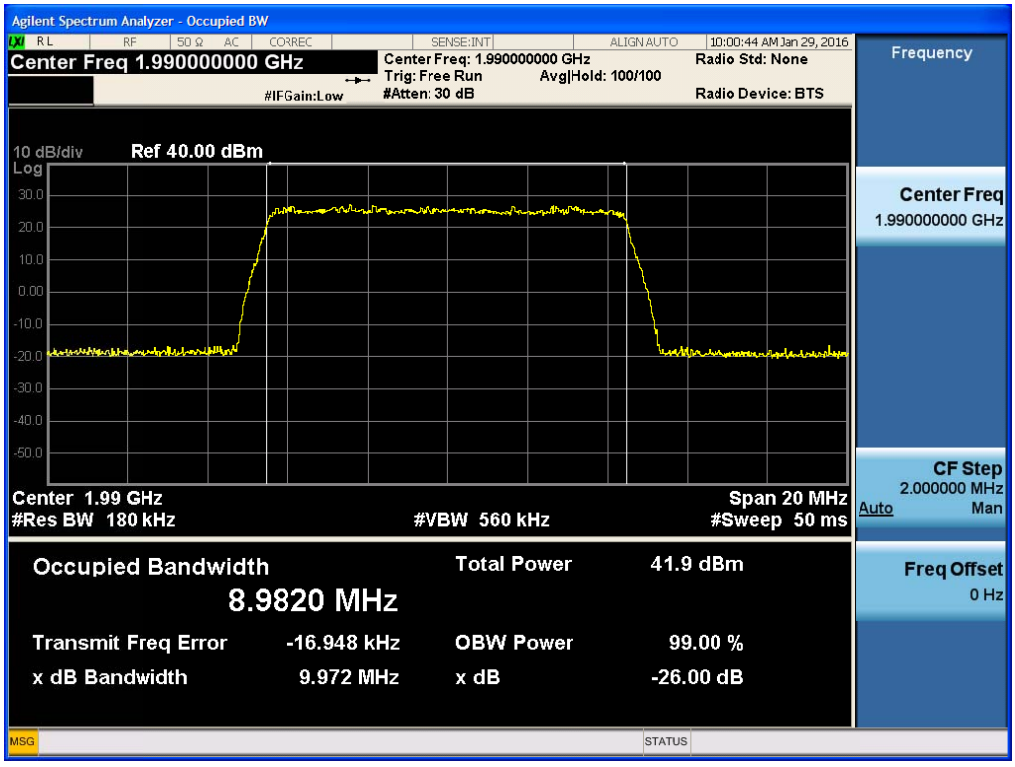
[+3dBmabove AGC threshold Output Downlink Low]



[+3dBm above AGC threshold Output Downlink Middle]

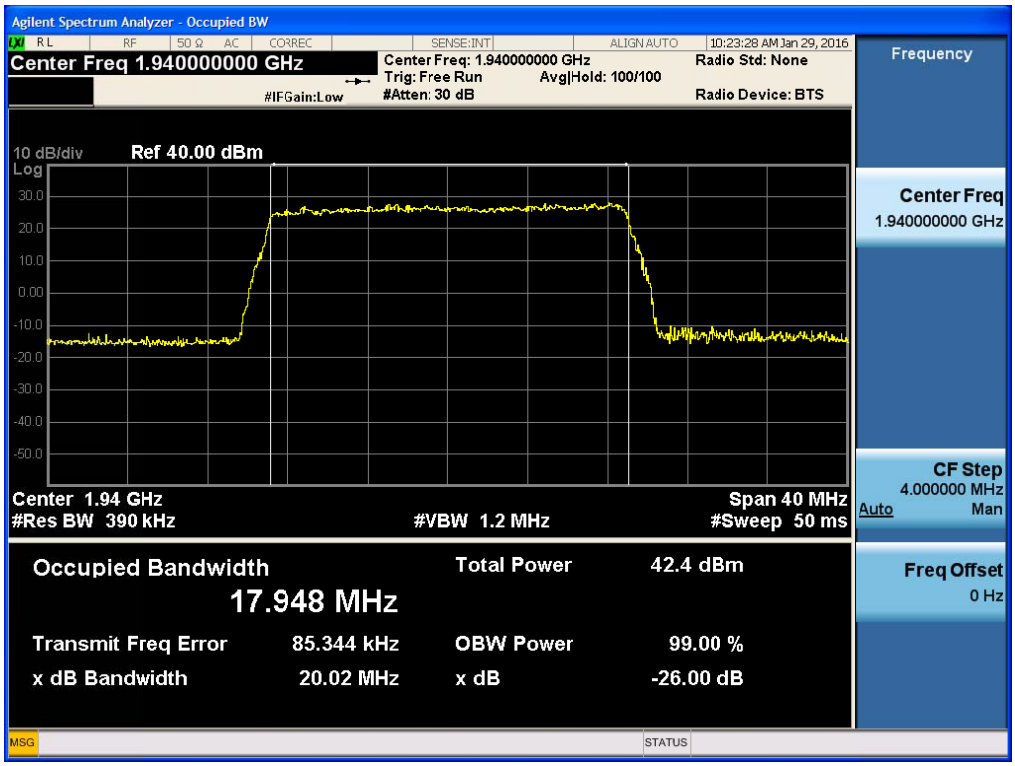


[+3dBm above AGC threshold Output Downlink High]

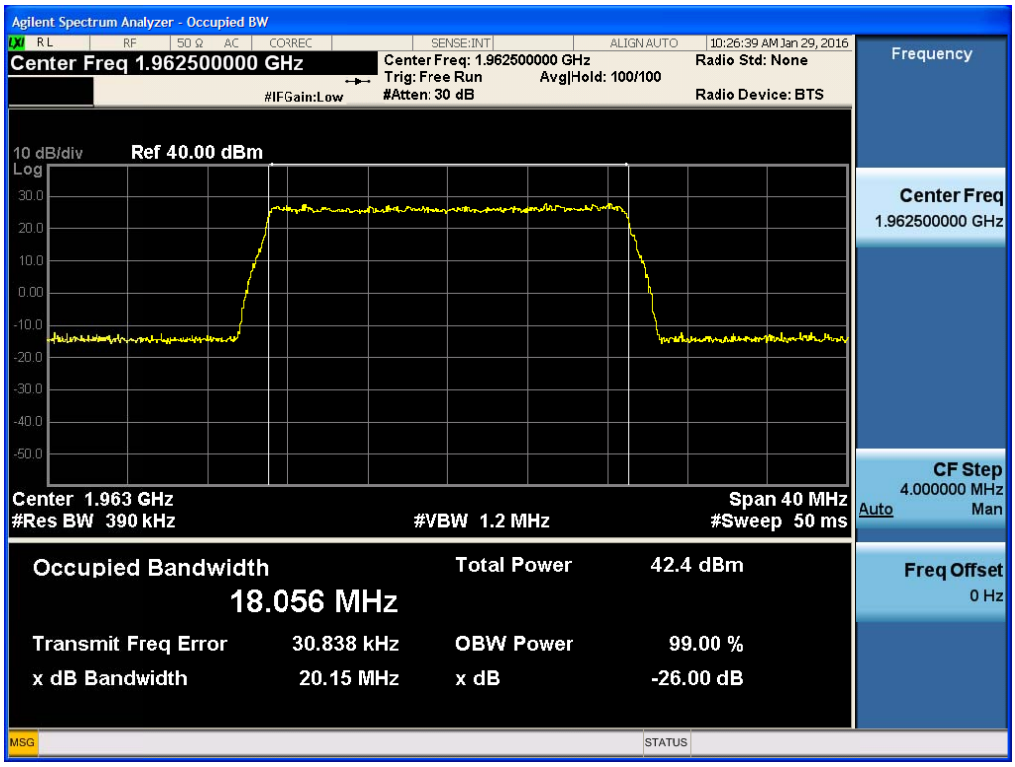


Plots of Occupied Bandwidth_ 1900 PCS BAND LTE 20MHz

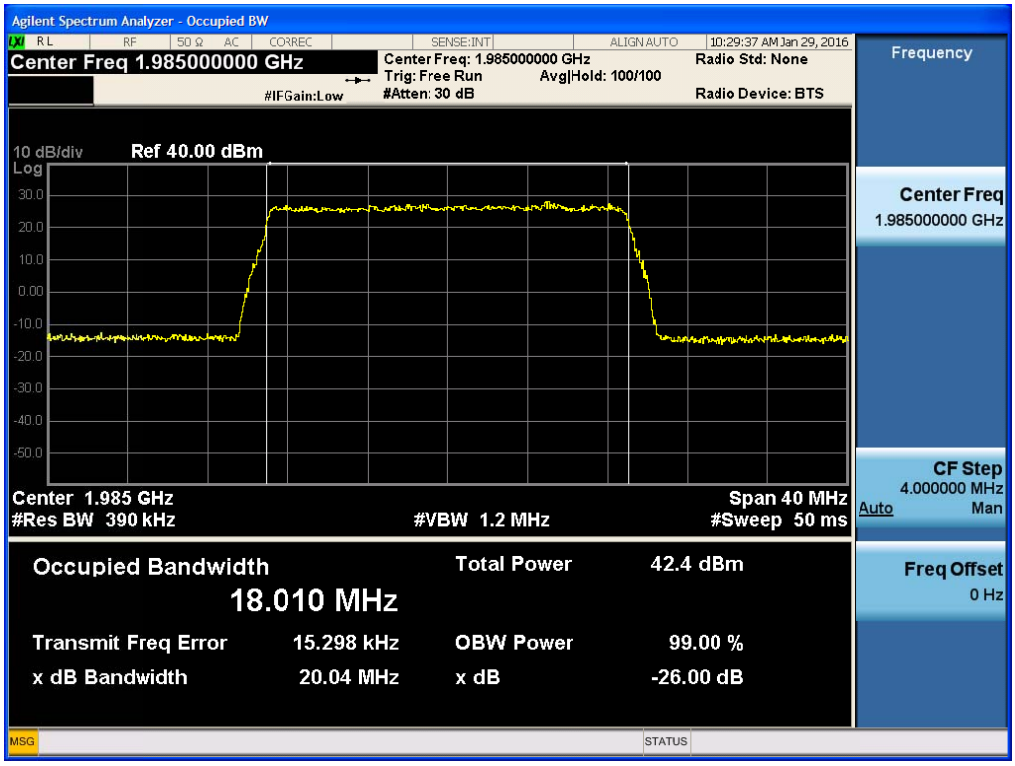
[AGC threshold Output Downlink Low]



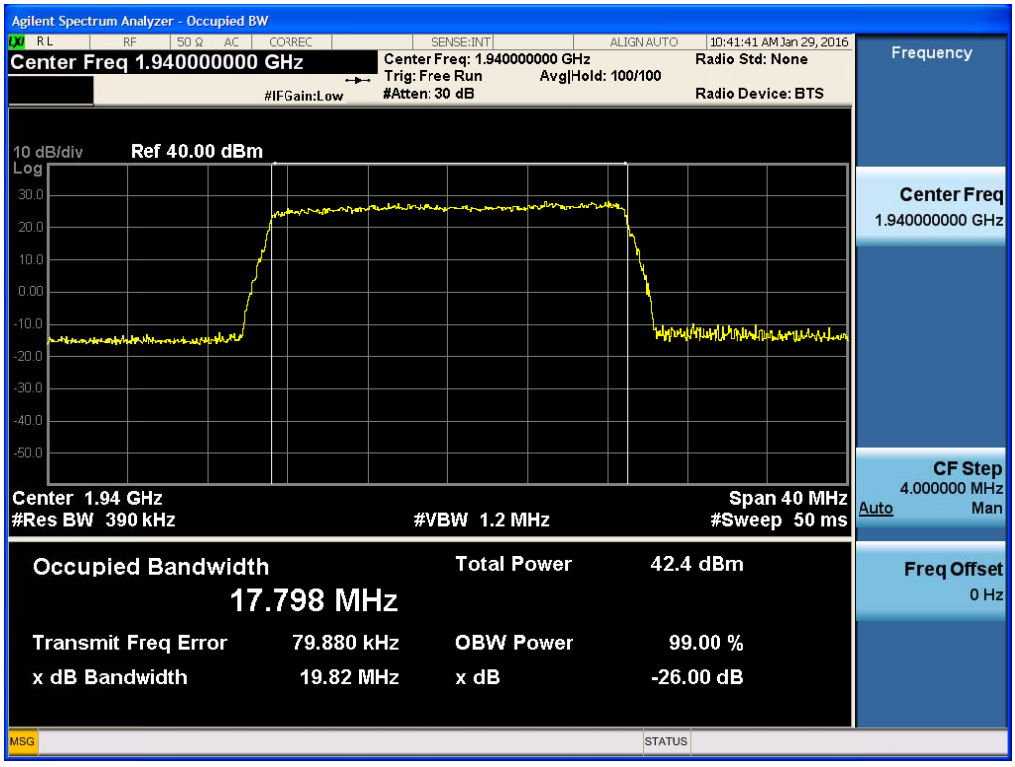
[AGC threshold Output Downlink Middle]



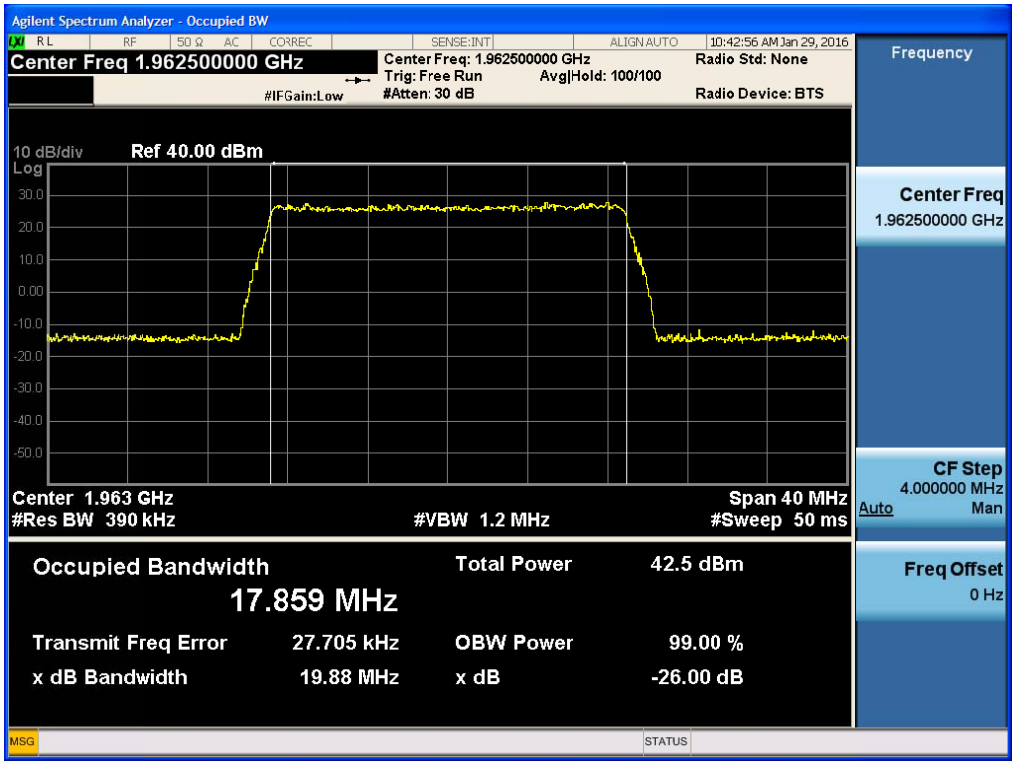
[AGC threshold Output Downlink High]



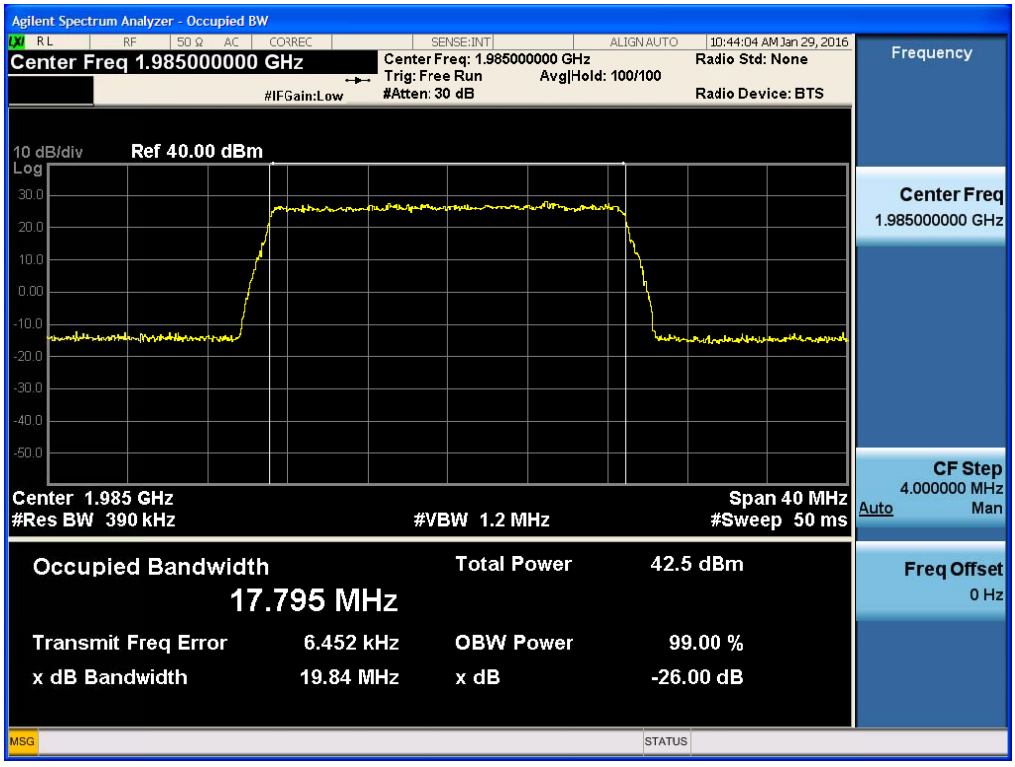
[+3dBmabove AGC threshold Output Downlink Low]



[+3dBm above AGC threshold Output Downlink Middle]

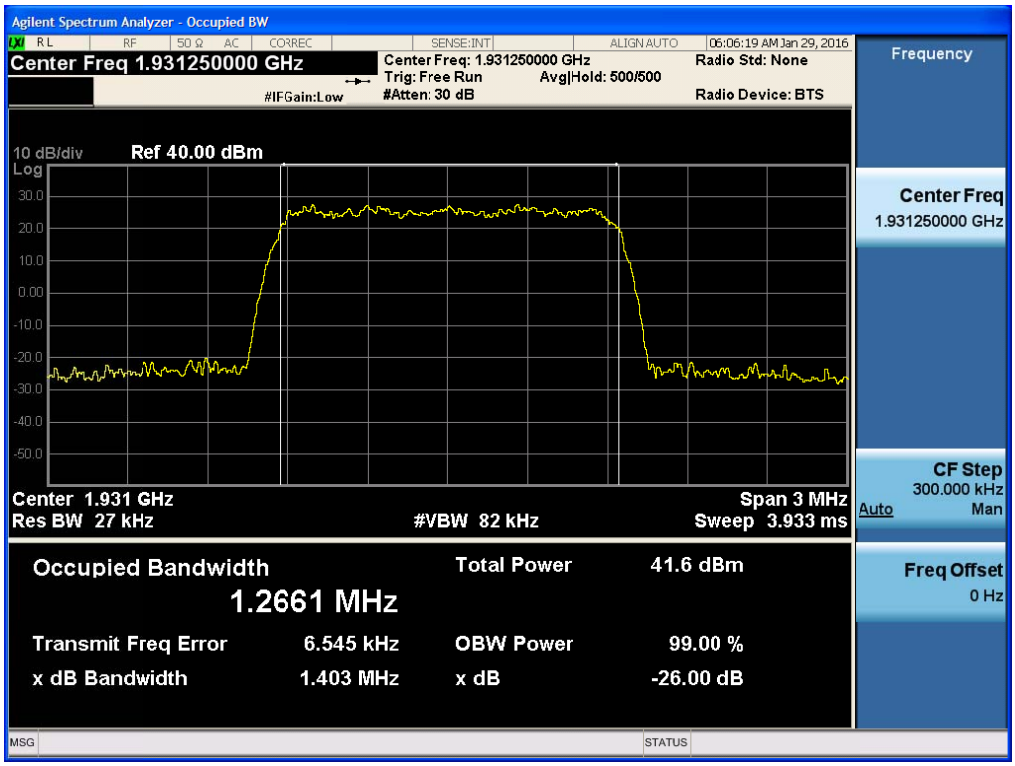


[+3dBm above AGC threshold Output Downlink High]

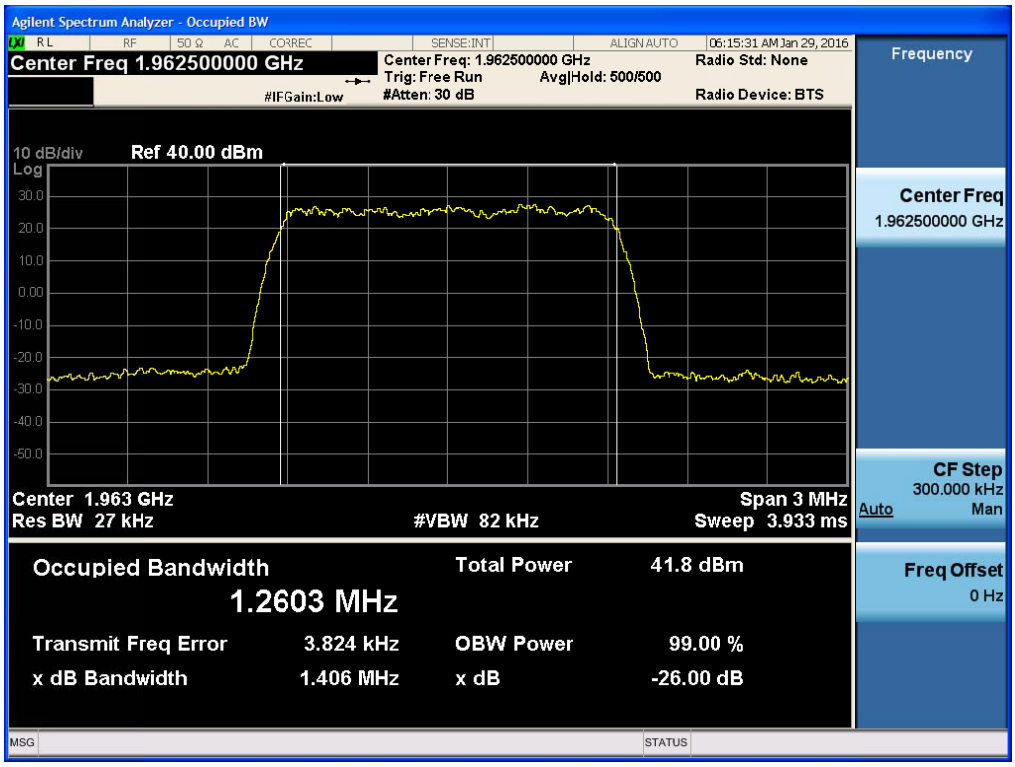


Plots of Occupied Bandwidth_ 1900 PCS BAND CDMA

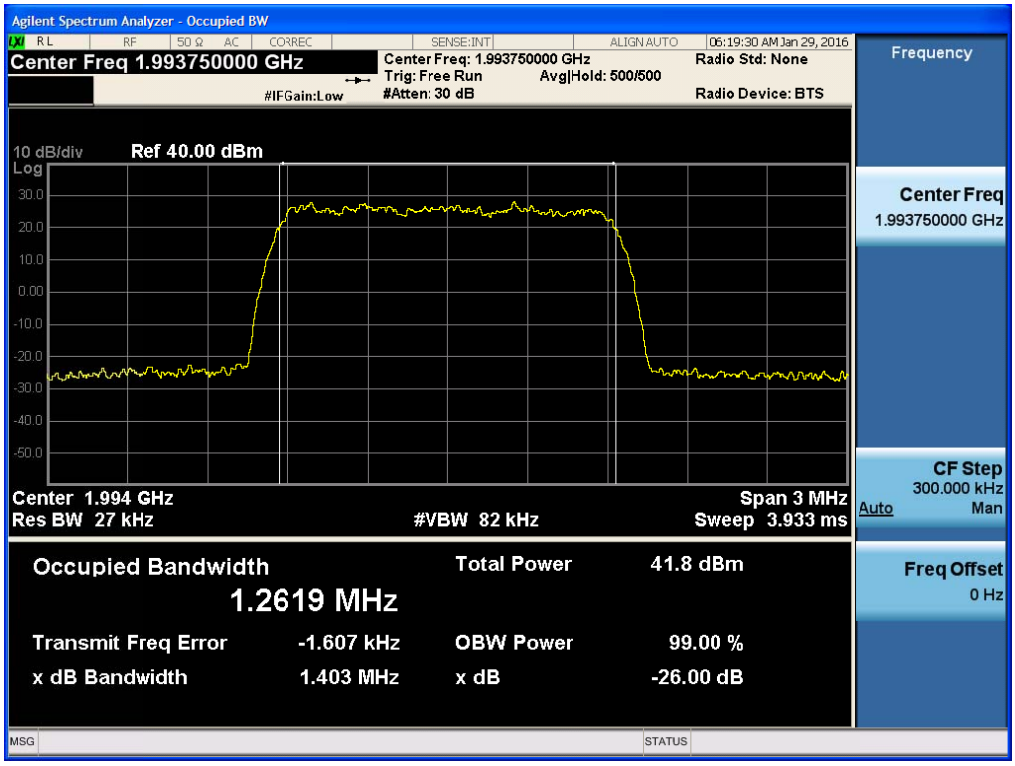
[AGC threshold Output Downlink Low]



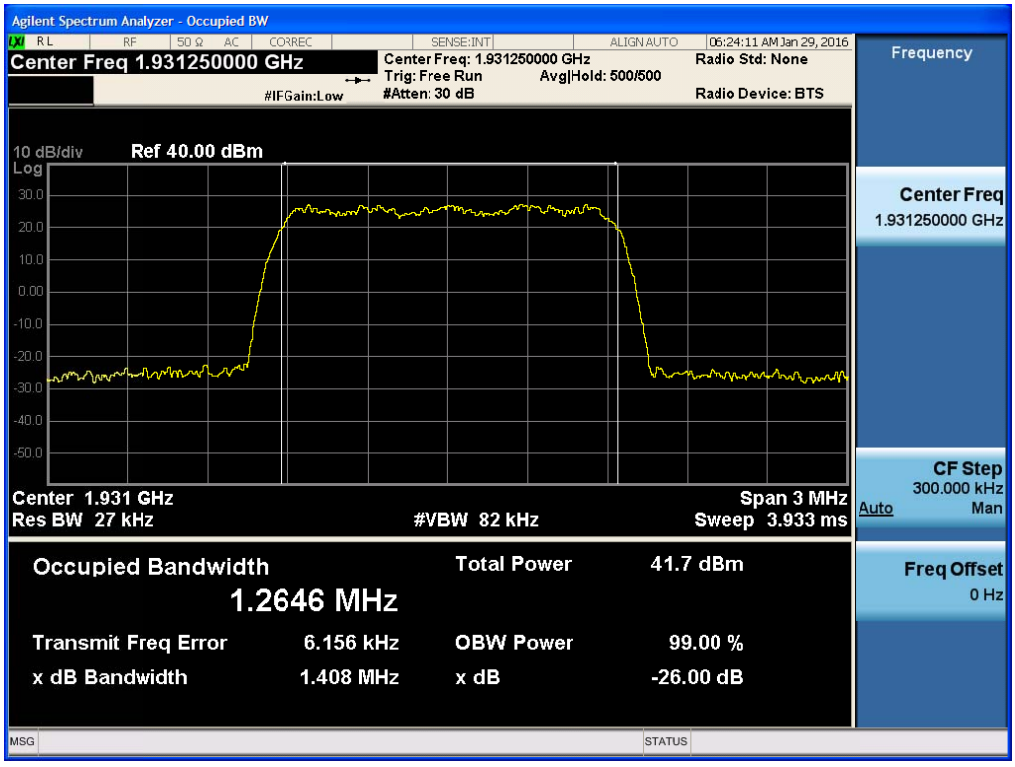
[AGC threshold Output Downlink Middle]



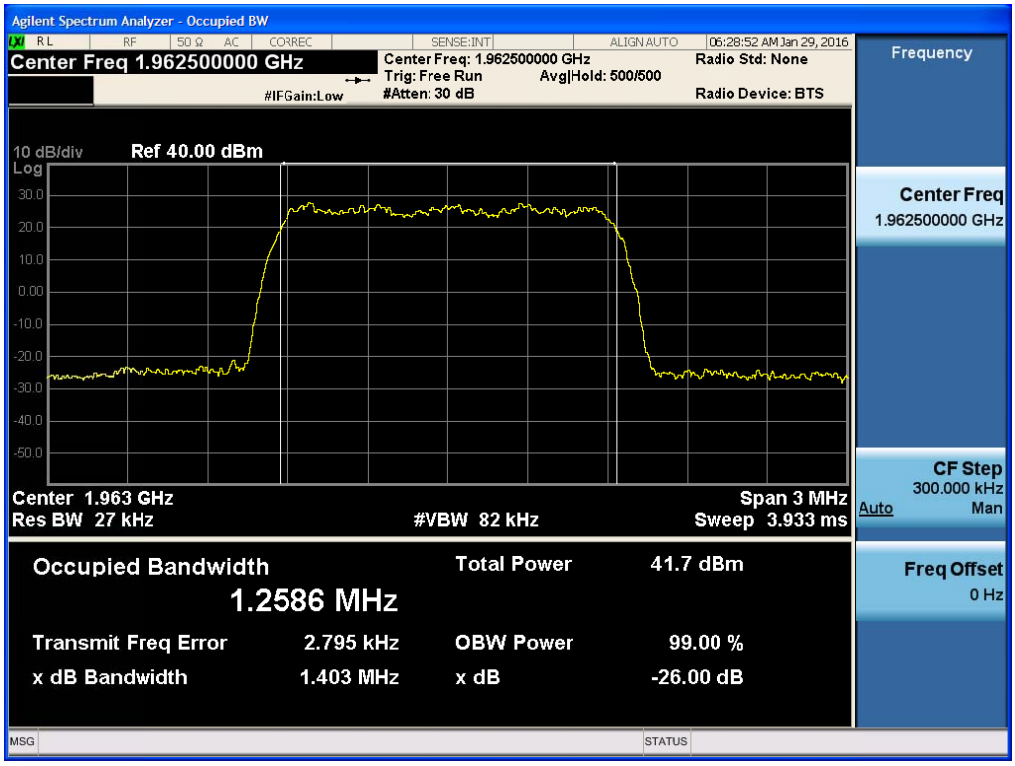
[AGC threshold Output Downlink High]



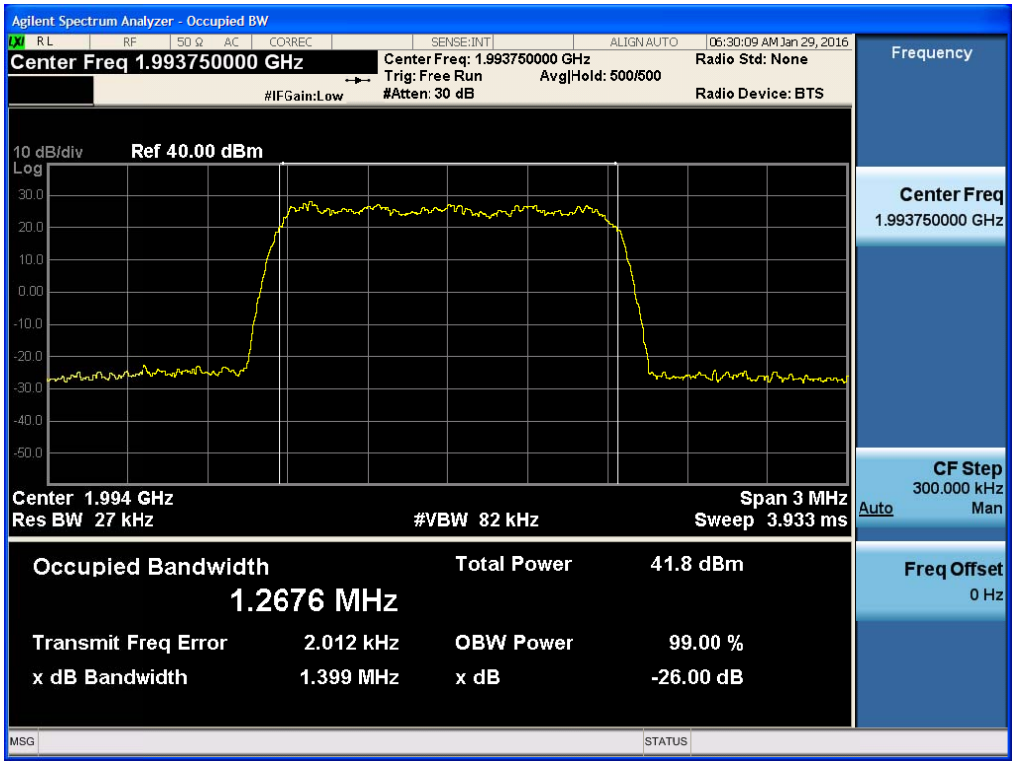
[+3dBmabove AGC threshold Output Downlink Low]



[+3dBm above AGC threshold Output Downlink Middle]

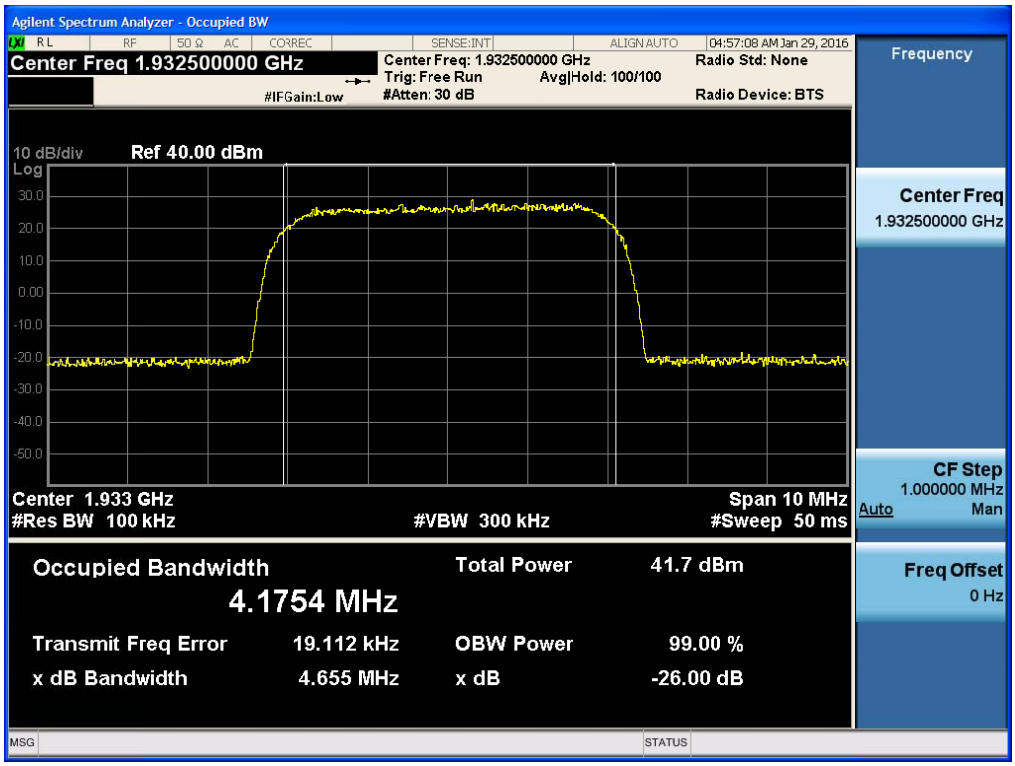


[+3dBm above AGC threshold Output Downlink High]

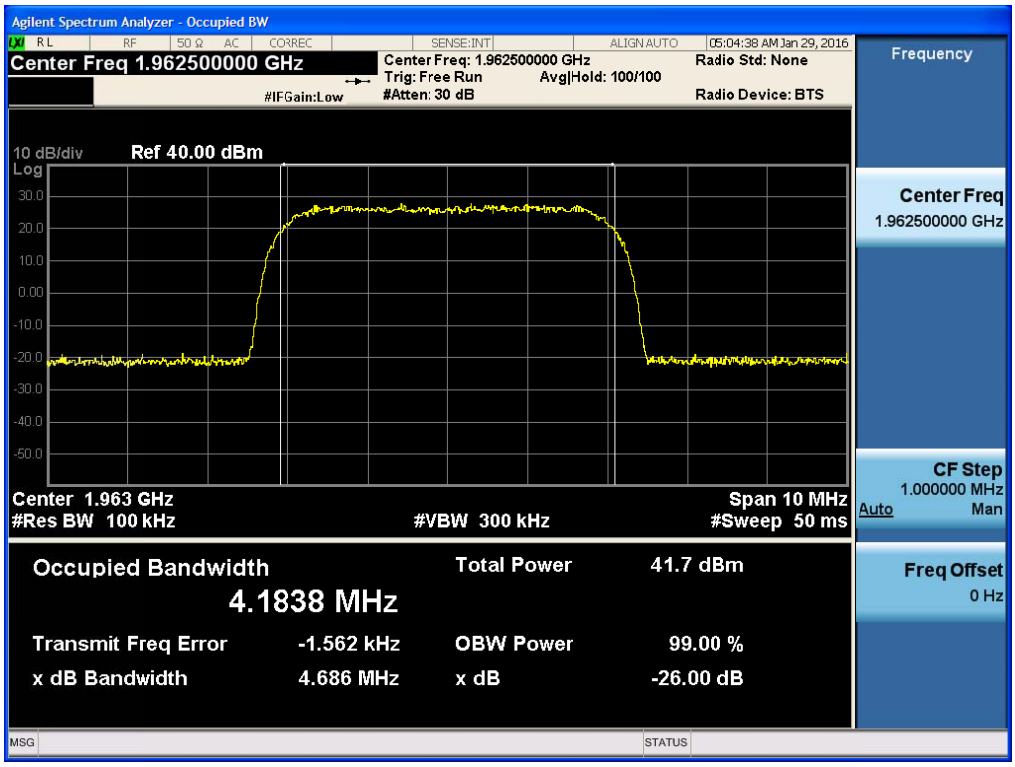


Plots of Occupied Bandwidth_ 1900 PCS BAND WCDMA

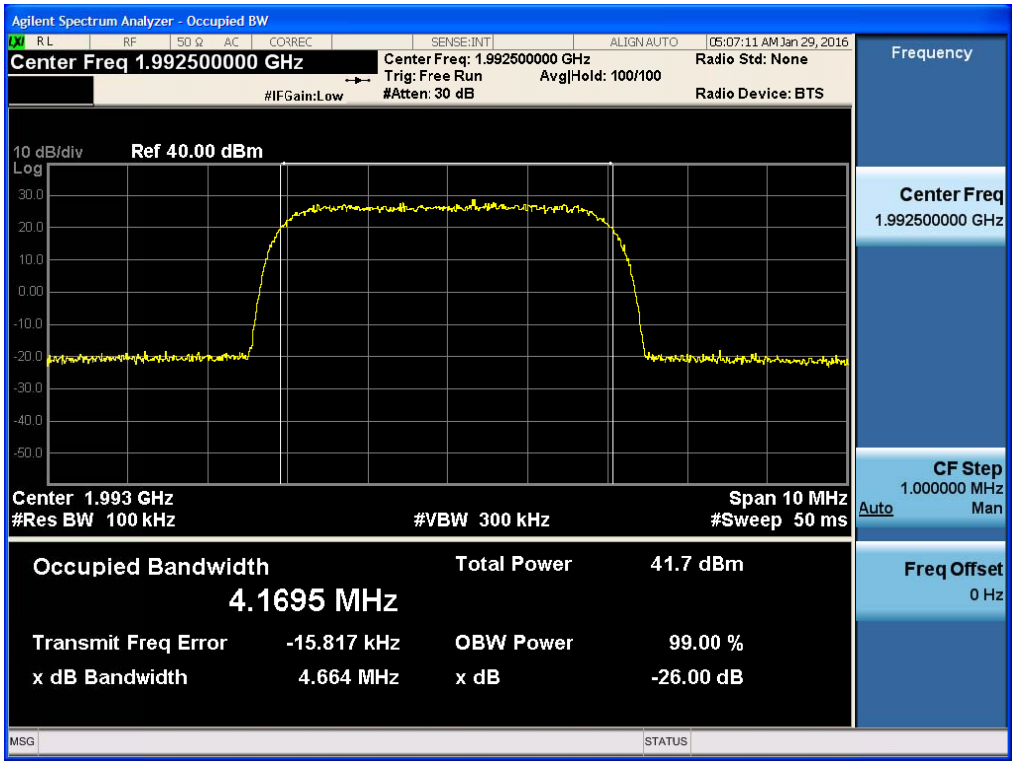
[AGC threshold Output Downlink Low]



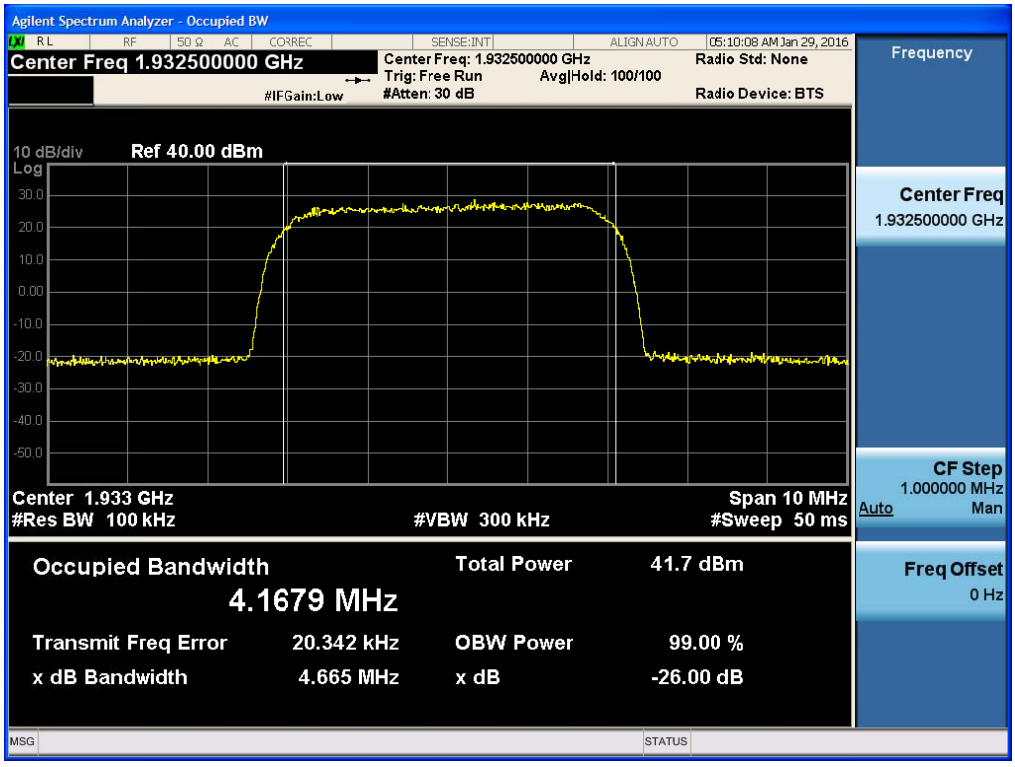
[AGC threshold Output Downlink Middle]



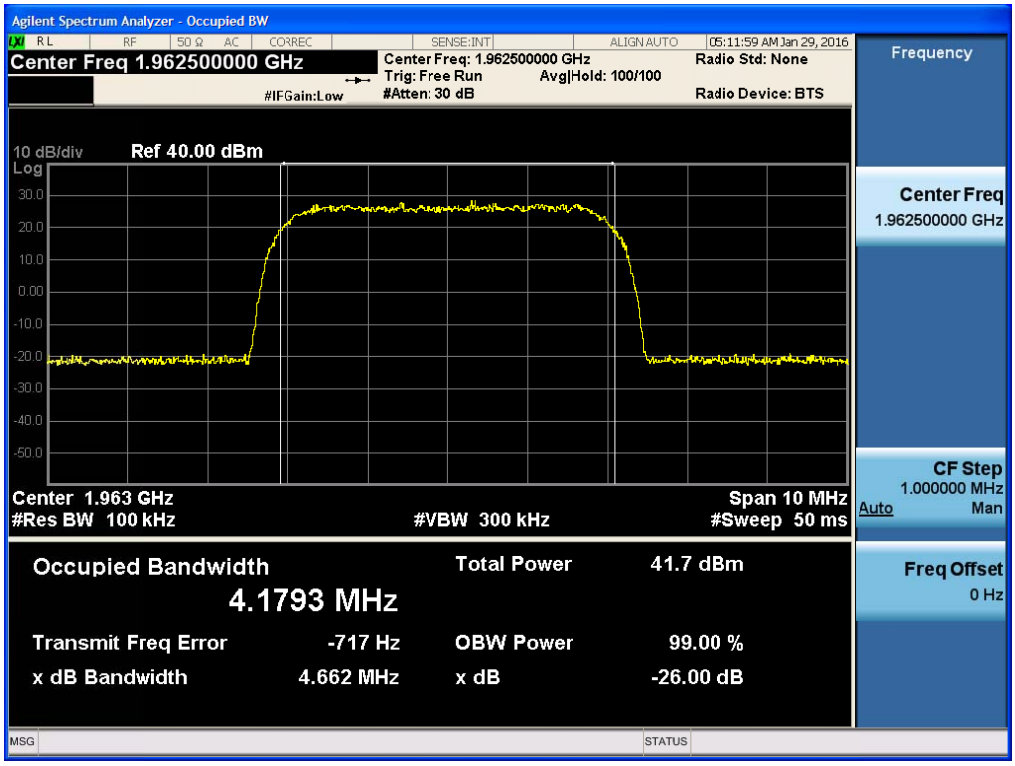
[AGC threshold Output Downlink High]



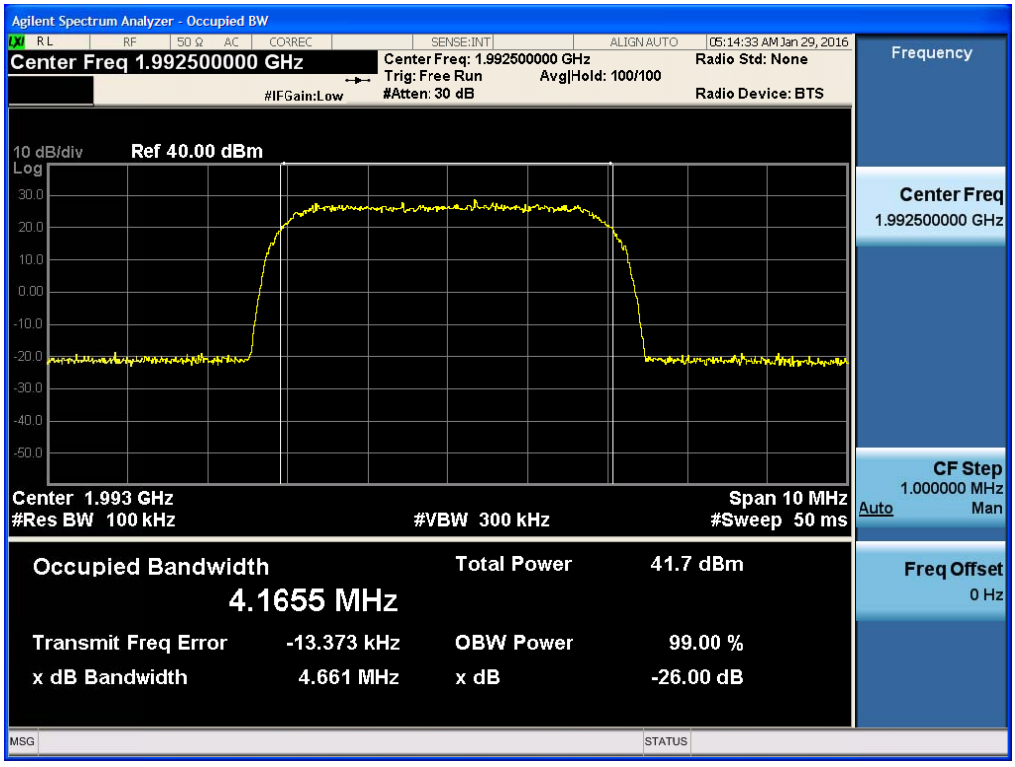
[+3dBmabove AGC threshold Output Downlink Low]



[+3dBm above AGC threshold Output Downlink Middle]

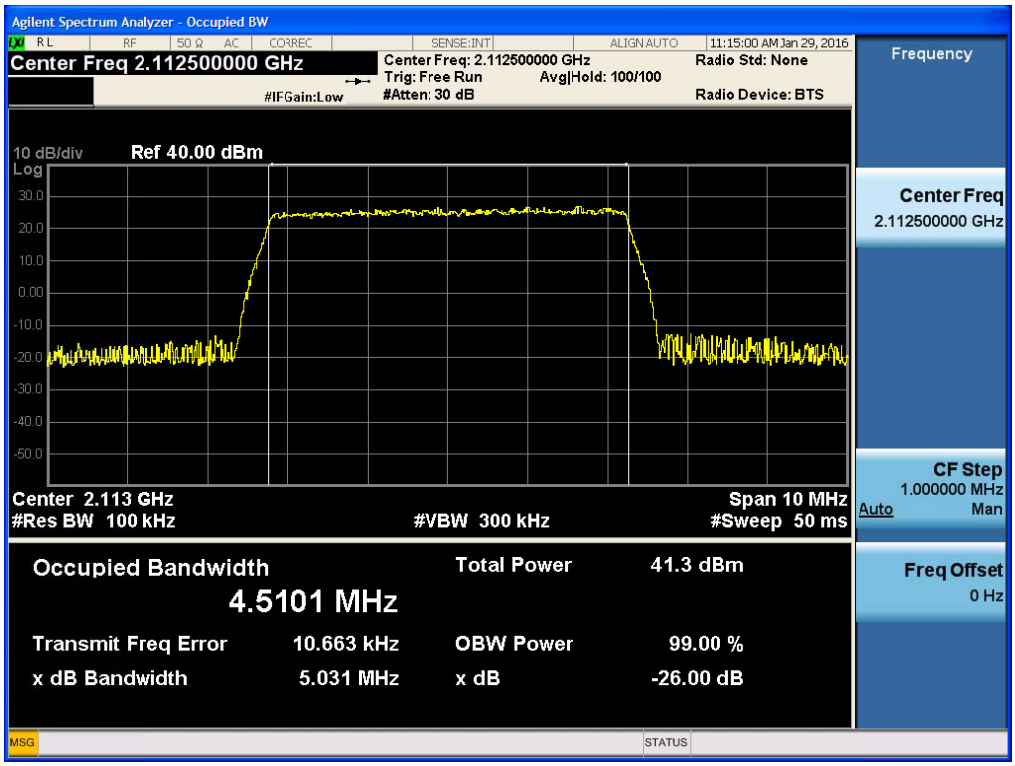


[+3dBm above AGC threshold Output Downlink High]

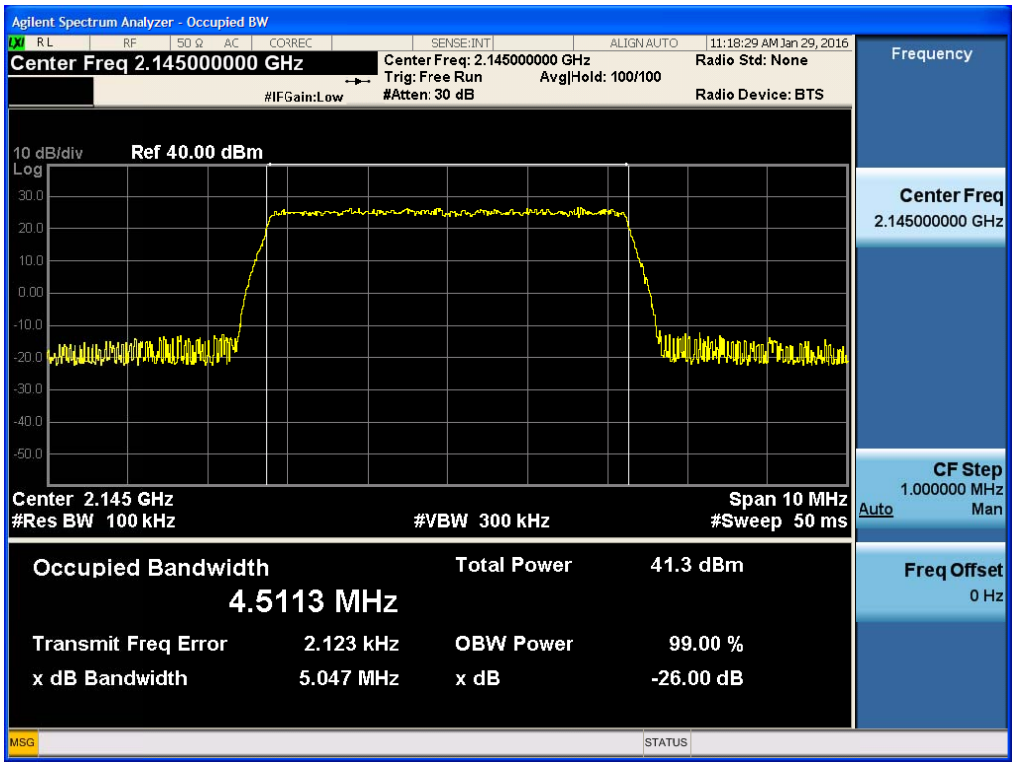


Plots of Occupied Bandwidth_AWS BAND LTE 5MHz

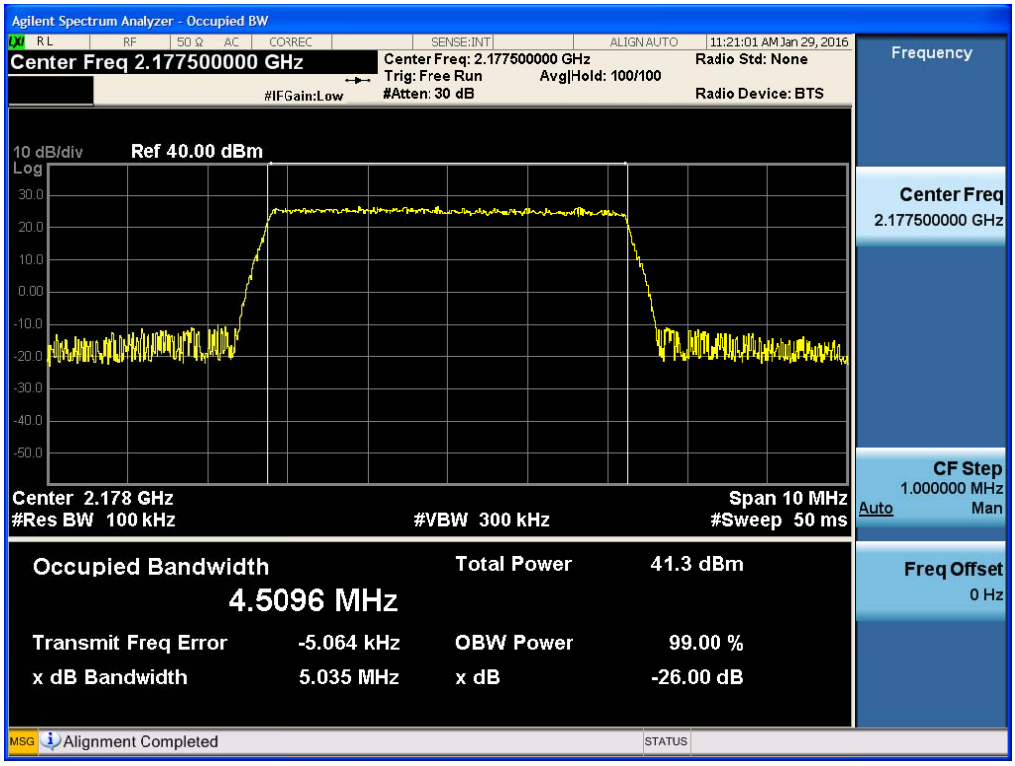
[AGC threshold Output Downlink Low]



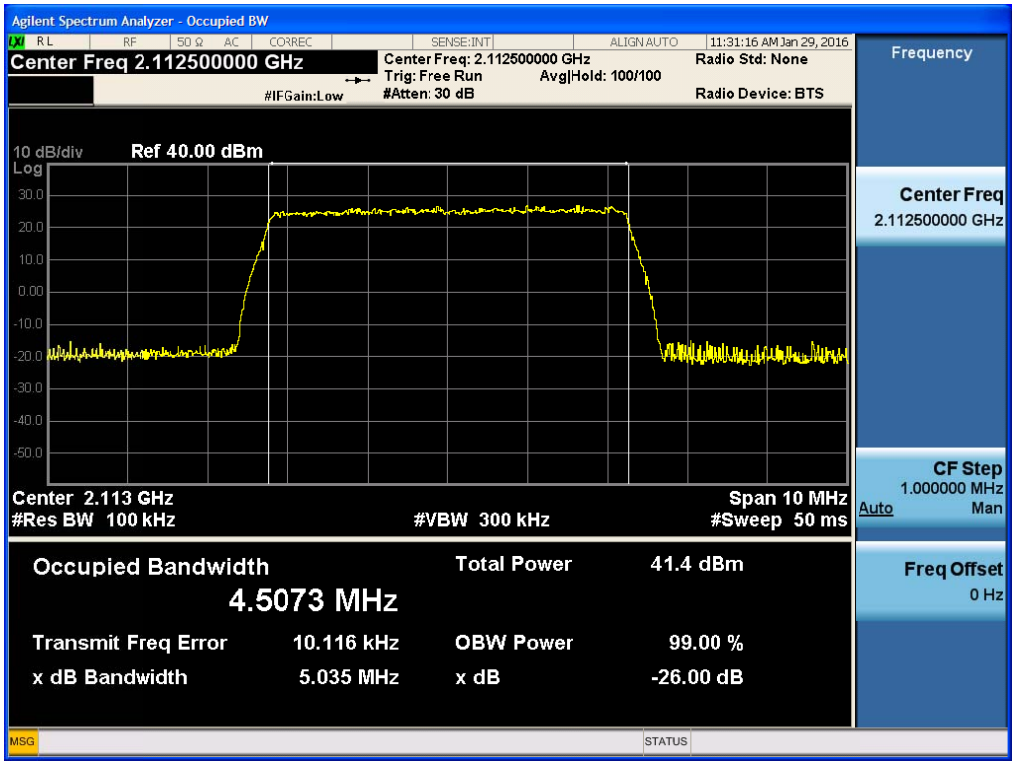
[AGC threshold Output Downlink Middle]



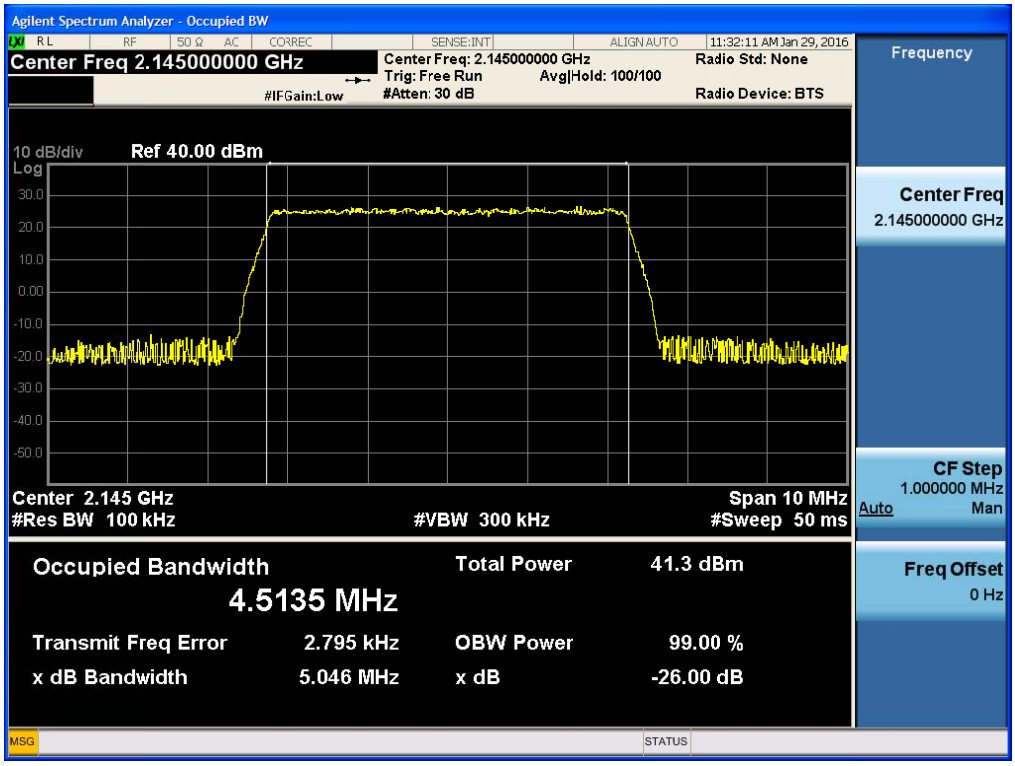
[AGC threshold Output Downlink High]



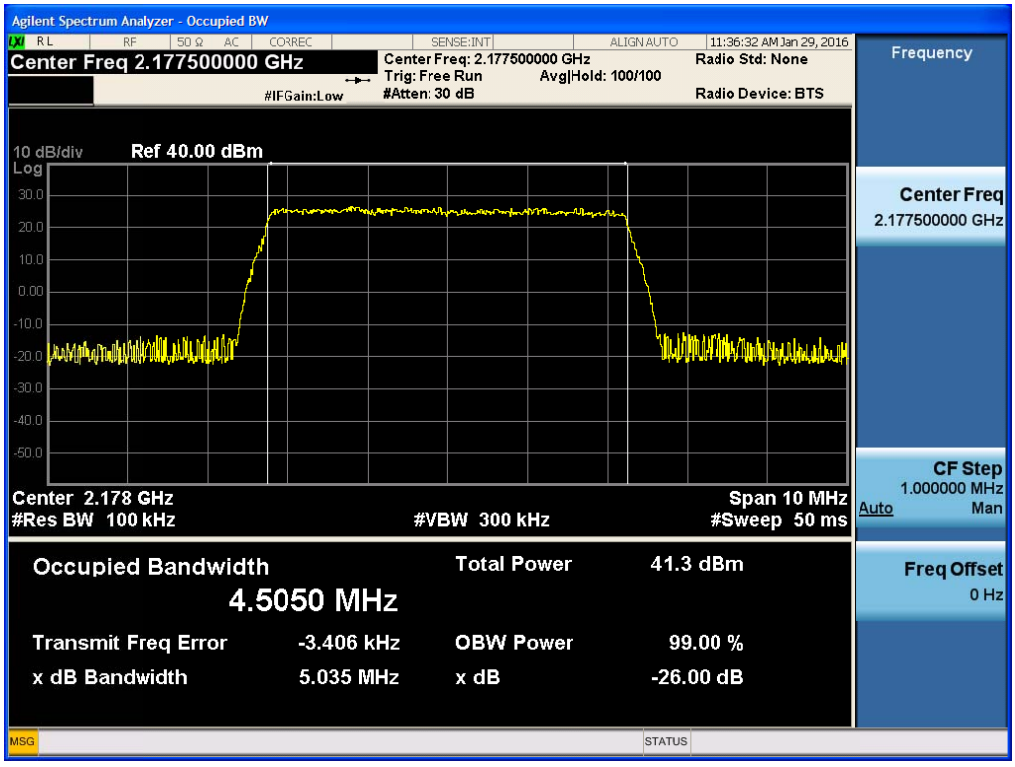
[+3dBmabove AGC threshold Output Downlink Low]



[+3dBm above AGC threshold Output Downlink Middle]

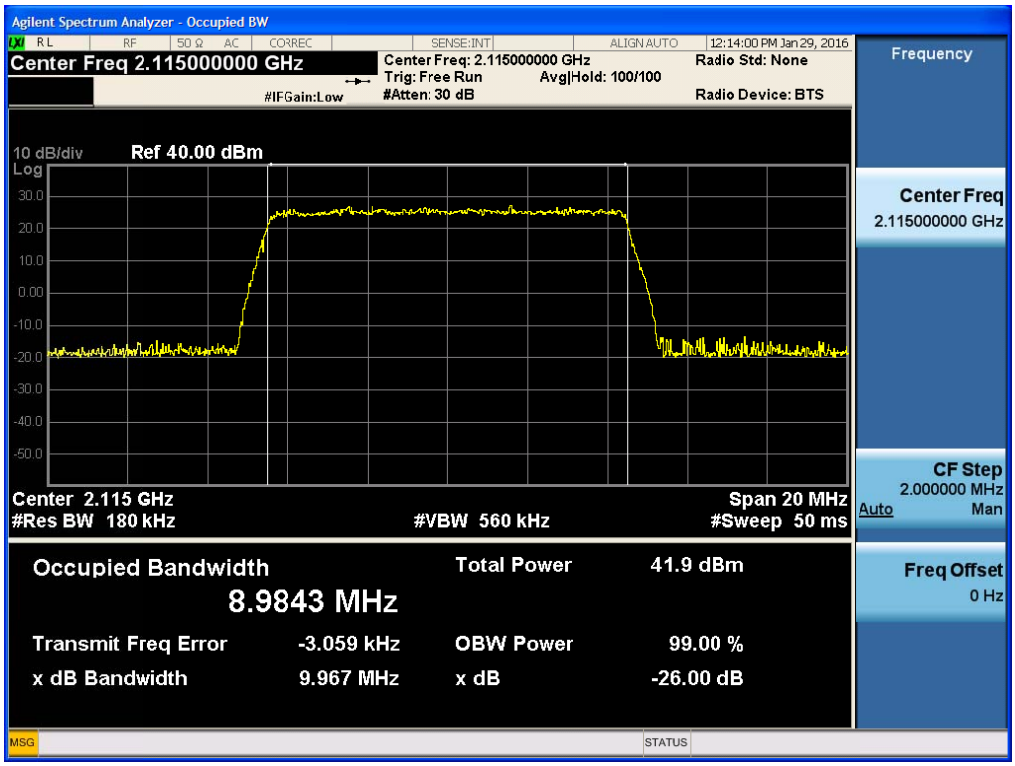


[+3dBm above AGC threshold Output Downlink High]

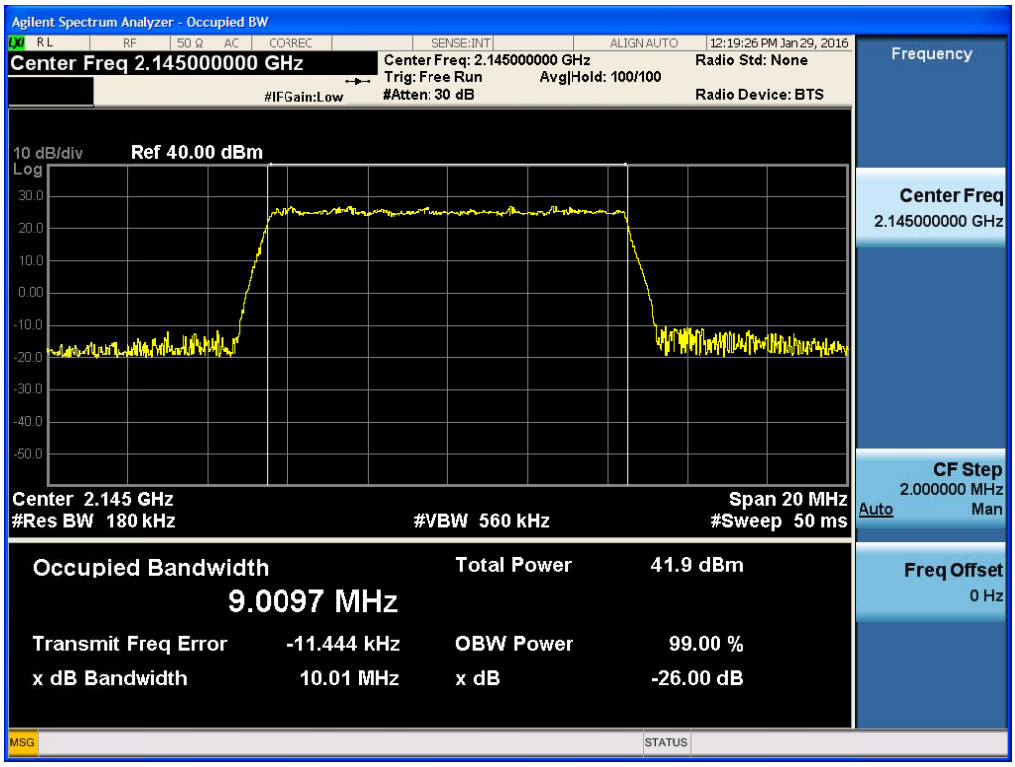


Plots of Occupied Bandwidth_ AWS BAND LTE 10MHz

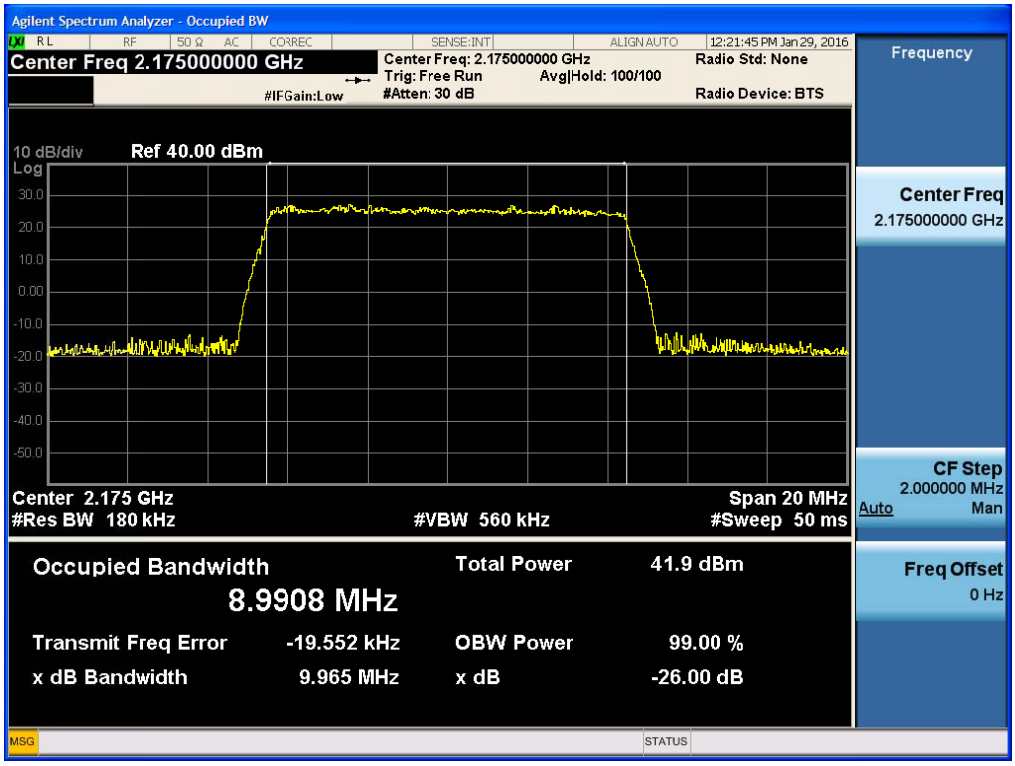
[AGC threshold Output Downlink Low]



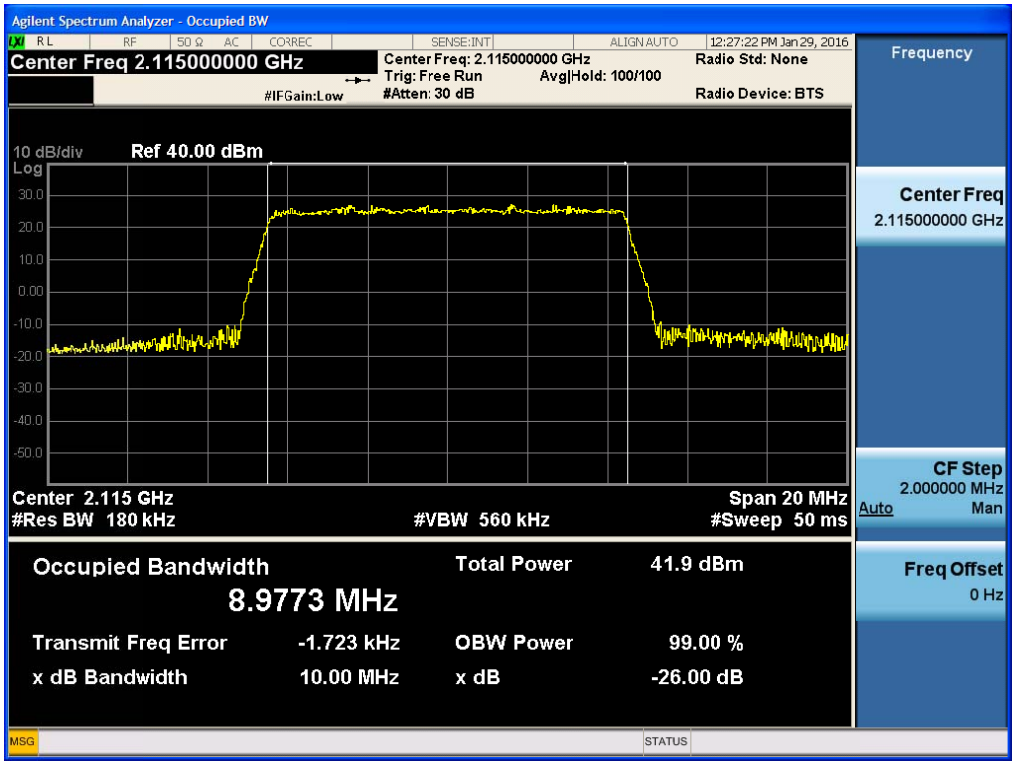
[AGC threshold Output Downlink Middle]



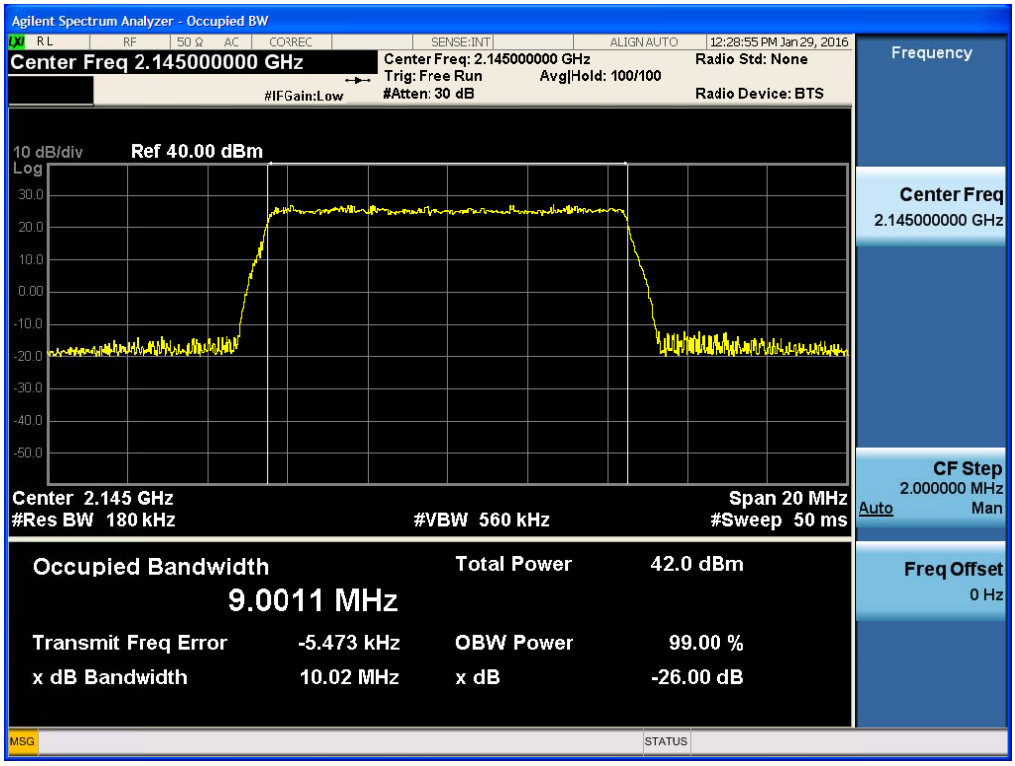
[AGC threshold Output Downlink High]



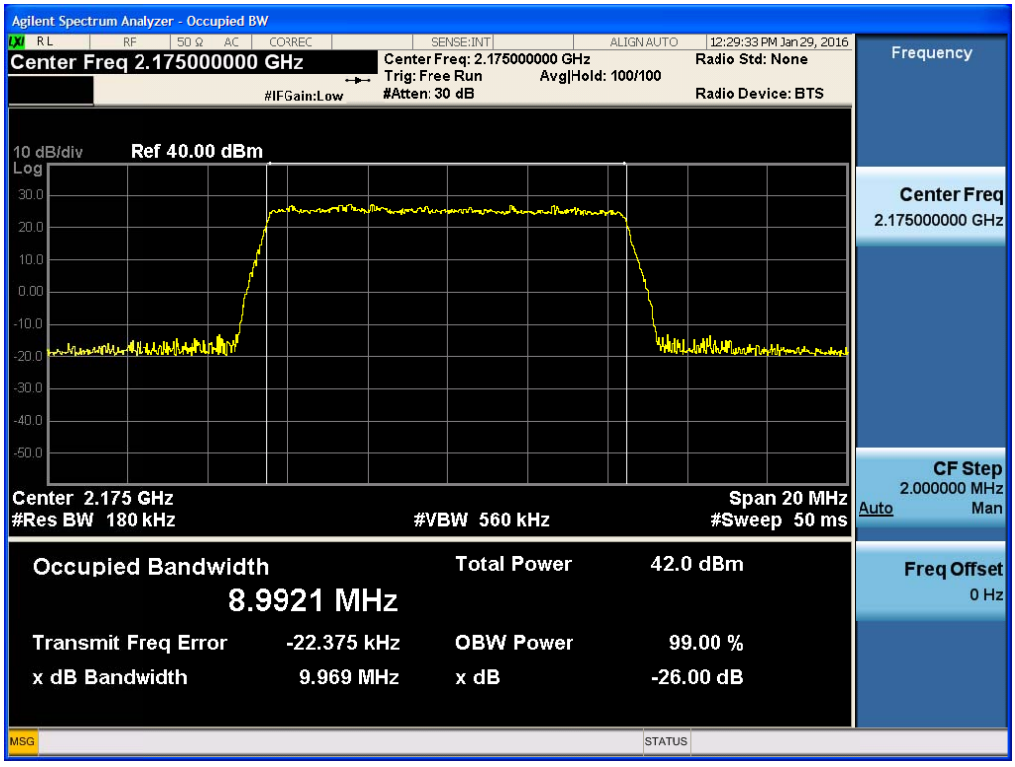
[+3dBmabove AGC threshold Output Downlink Low]



[+3dBm above AGC threshold Output Downlink Middle]

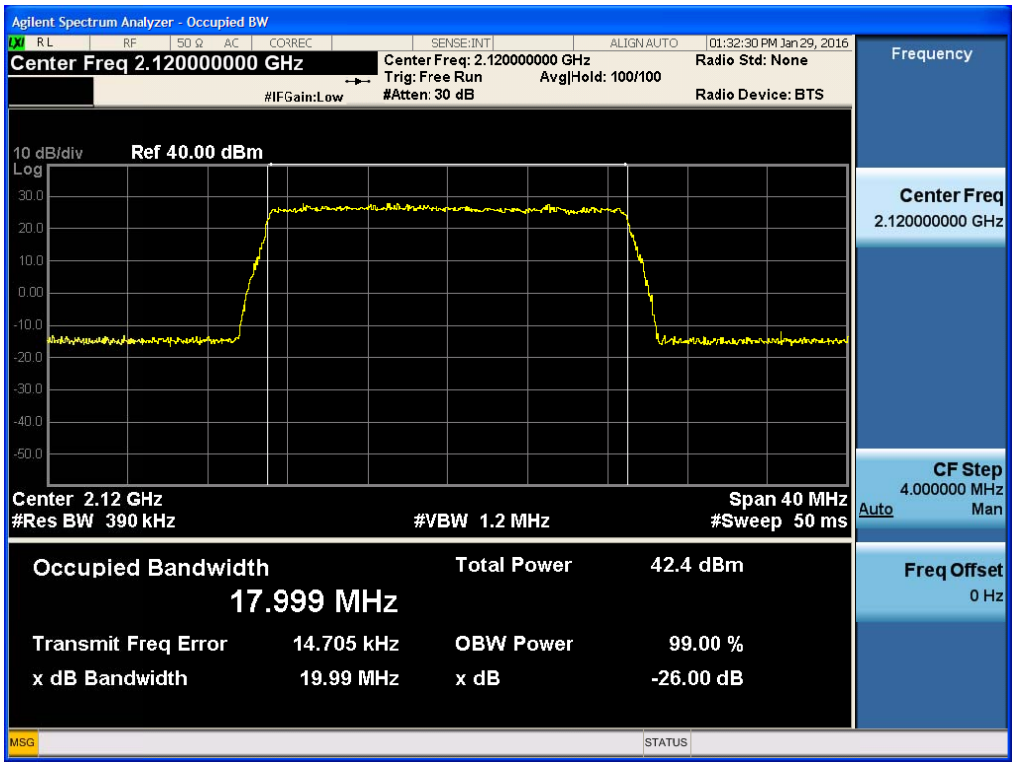


[+3dBm above AGC threshold Output Downlink High]

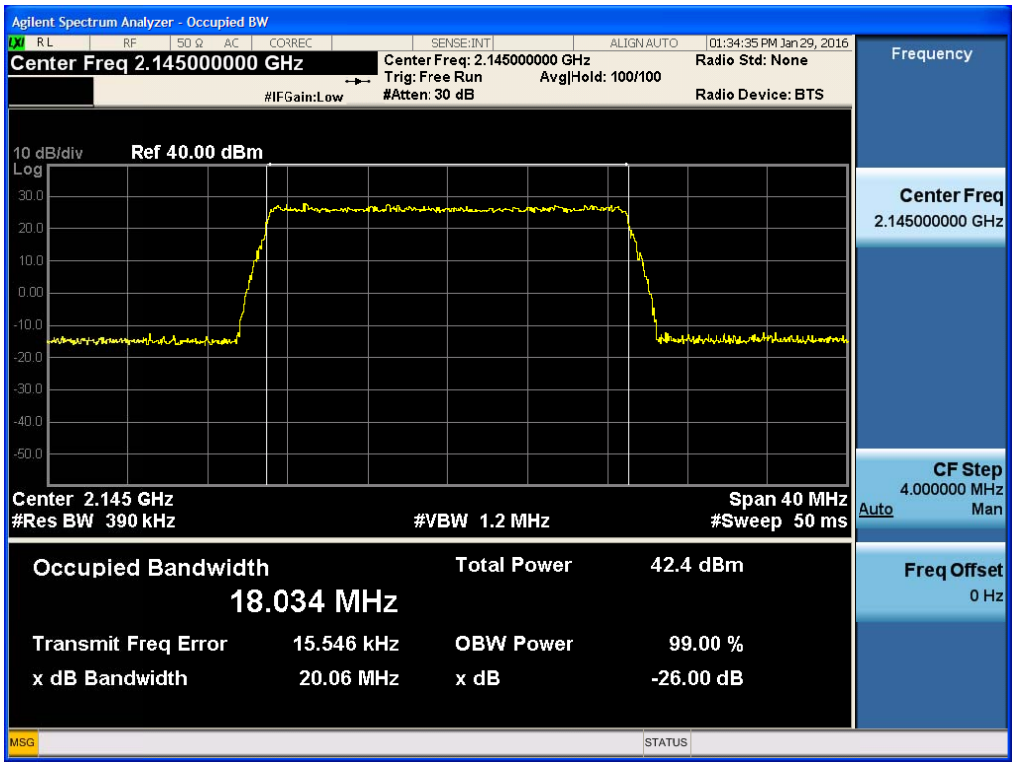


Plots of Occupied Bandwidth_ AWS BAND LTE 20MHz

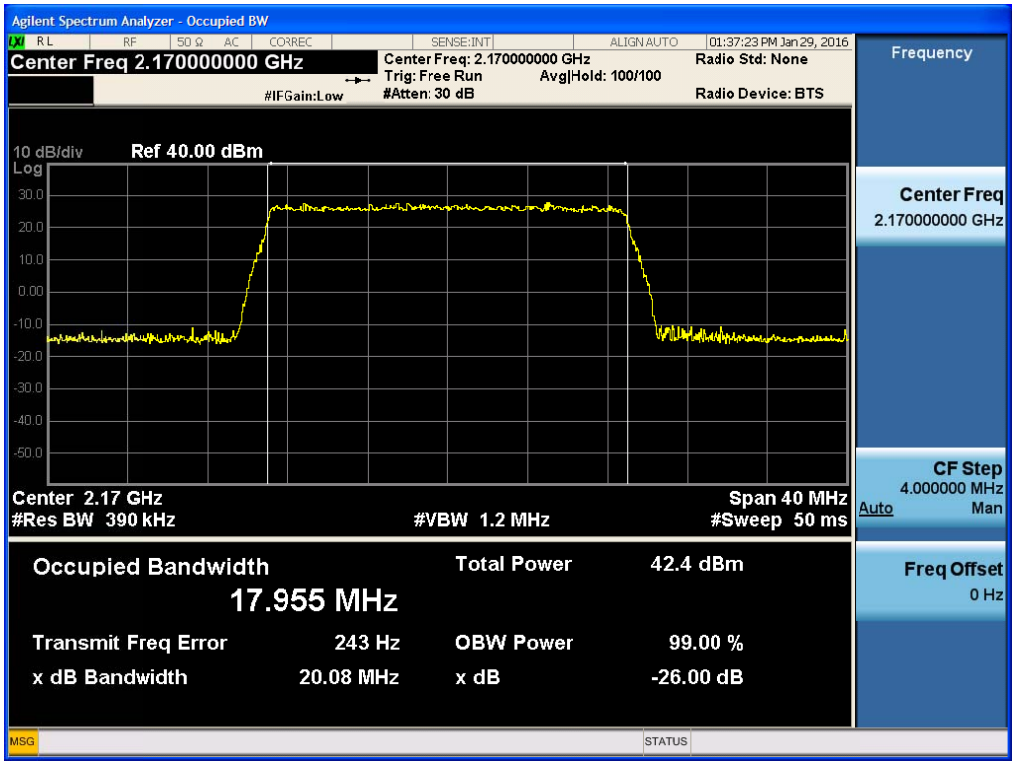
[AGC threshold Output Downlink Low]



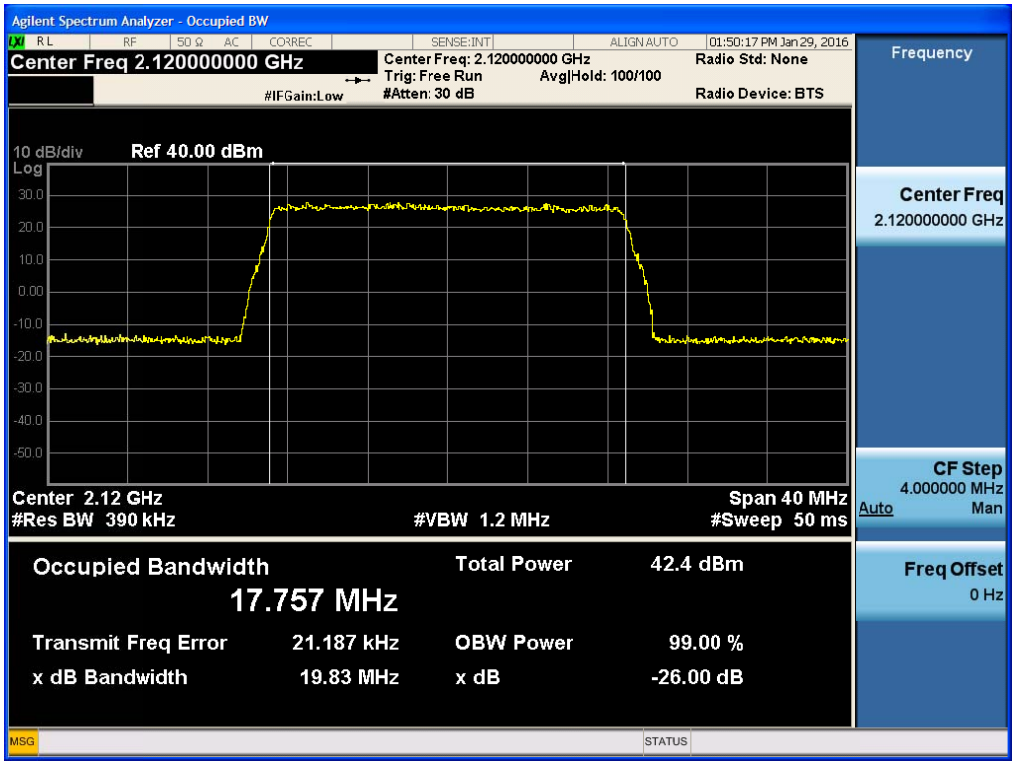
[AGC threshold Output Downlink Middle]



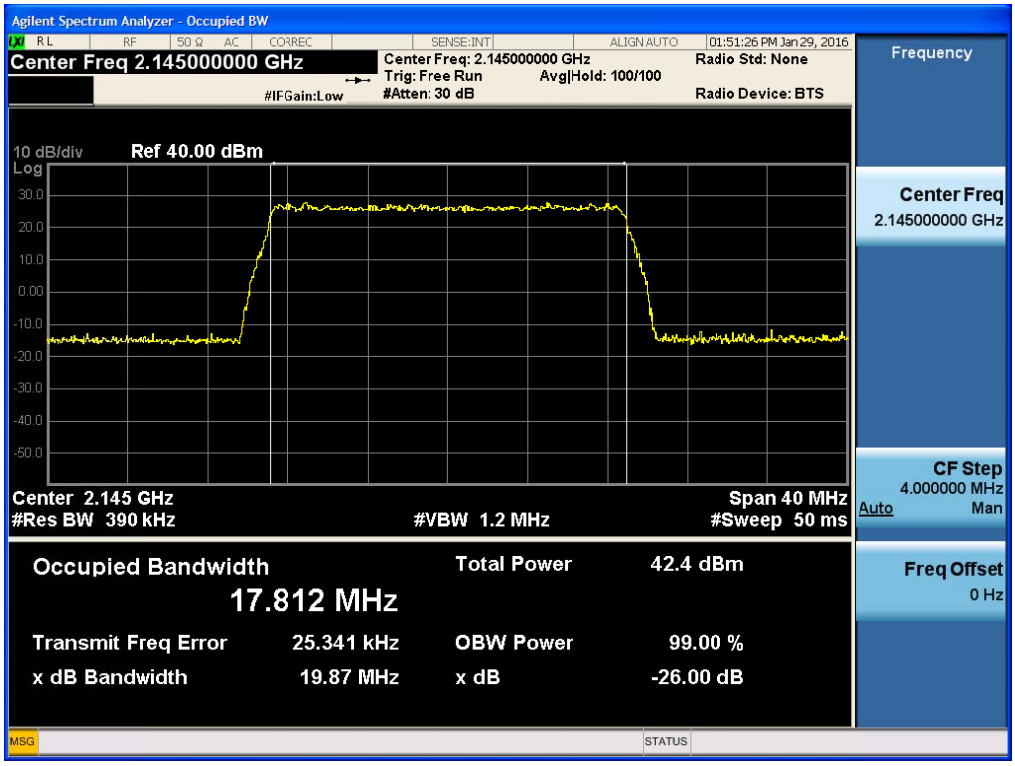
[AGC threshold Output Downlink High]



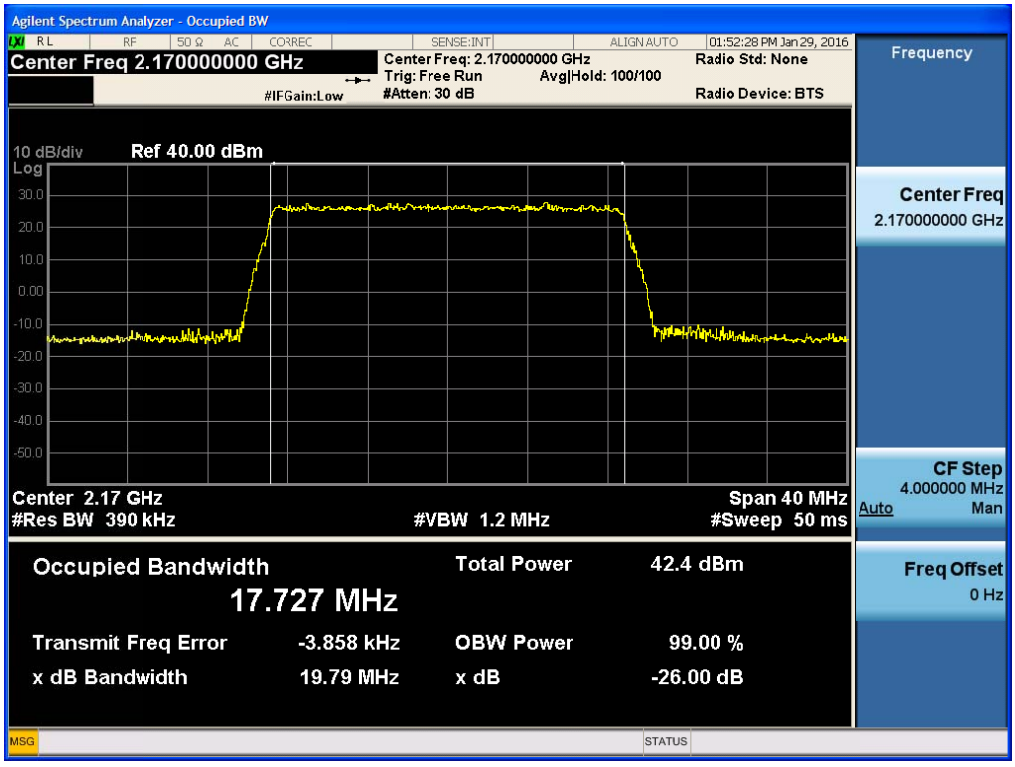
[+3dBmabove AGC threshold Output Downlink Low]



[+3dBm above AGC threshold Output Downlink Middle]

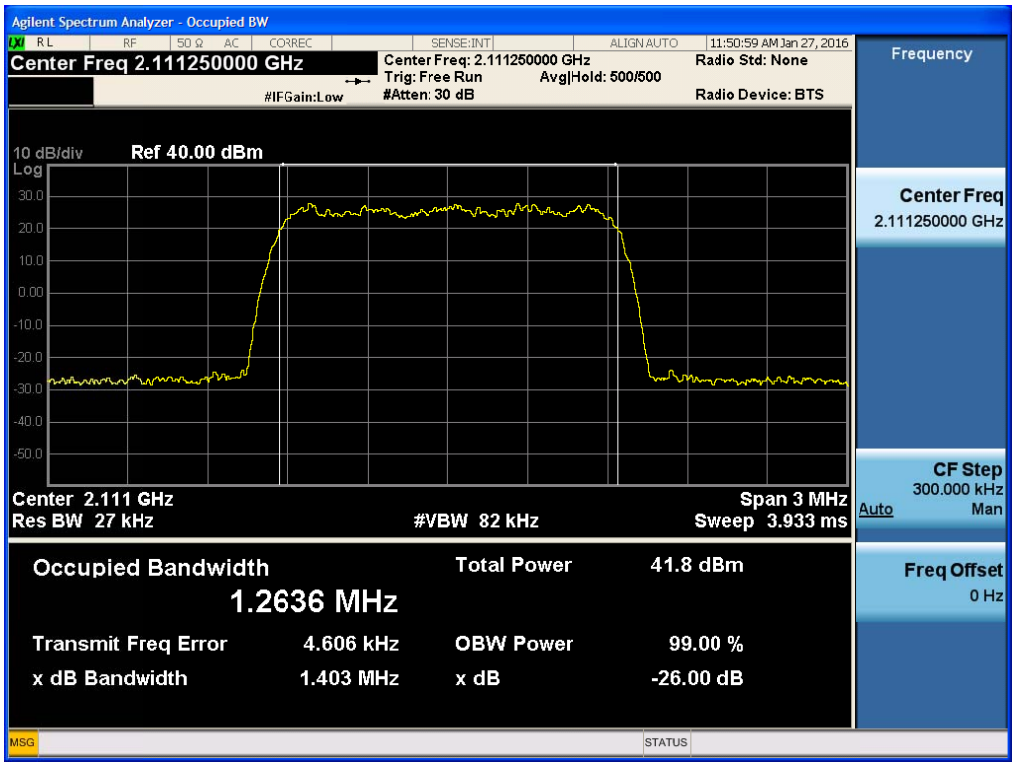


[+3dBm above AGC threshold Output Downlink High]

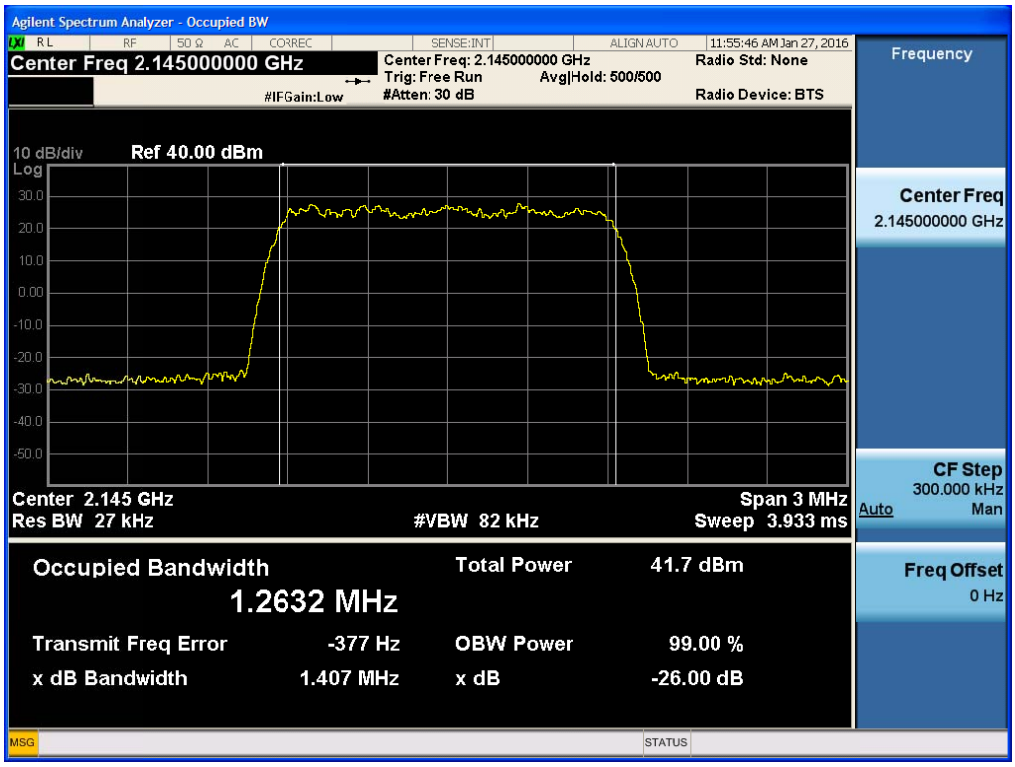


Plots of Occupied Bandwidth_ AWS BAND CDMA

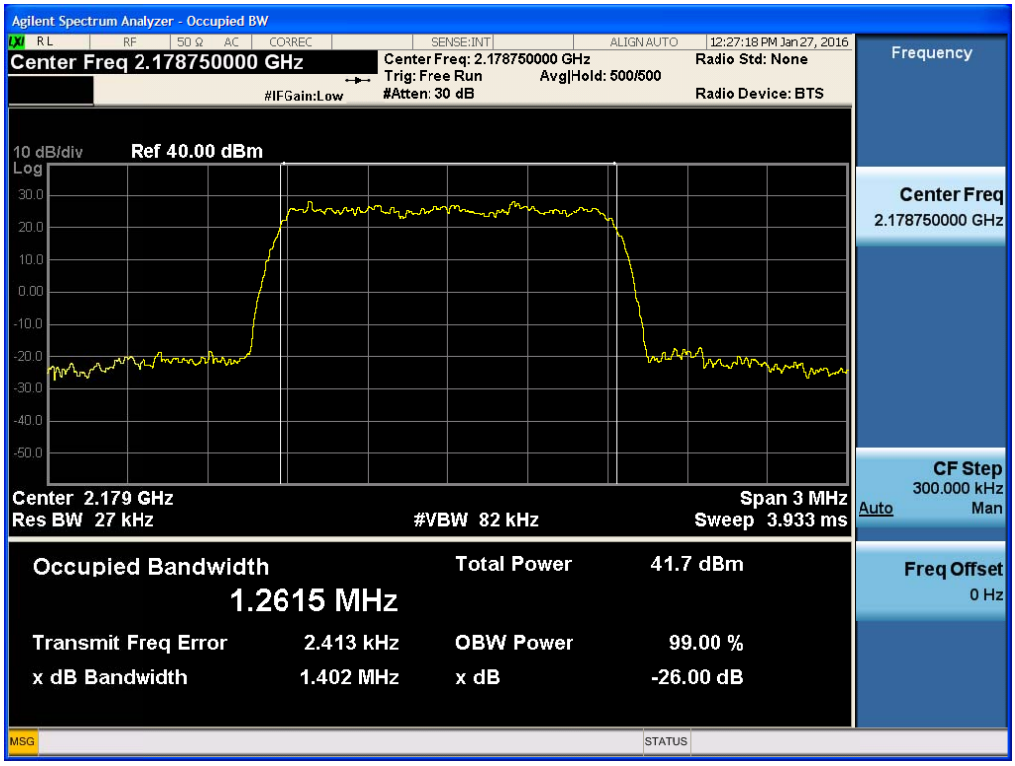
[AGC threshold Output Downlink Low]



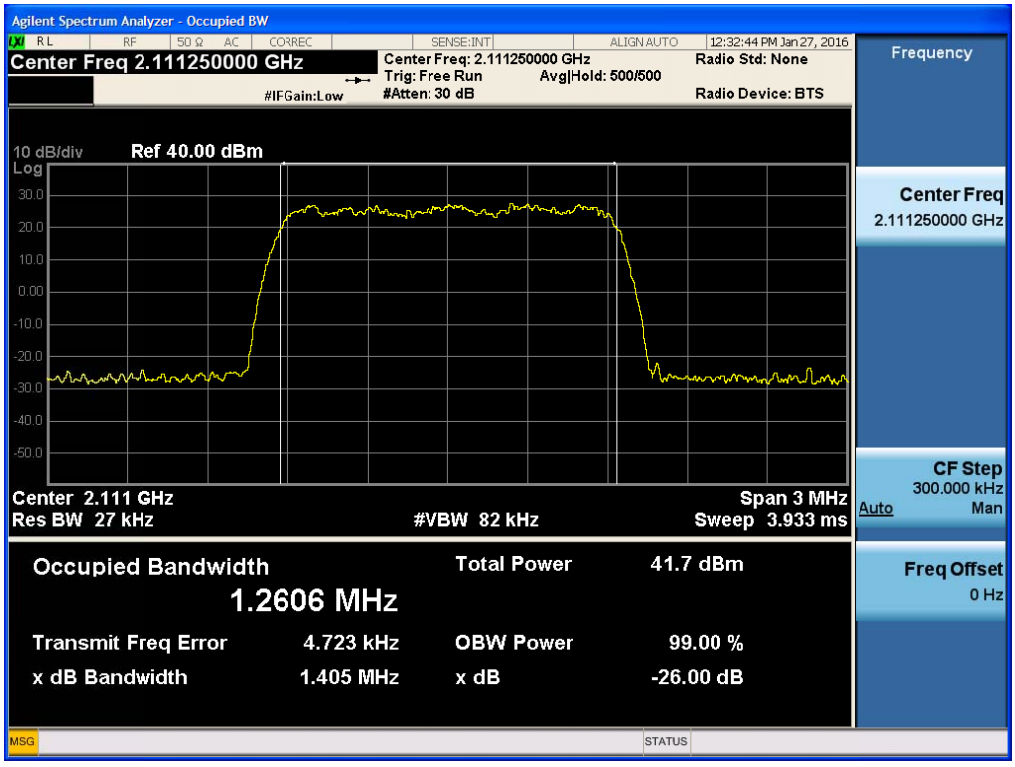
[AGC threshold Output Downlink Middle]



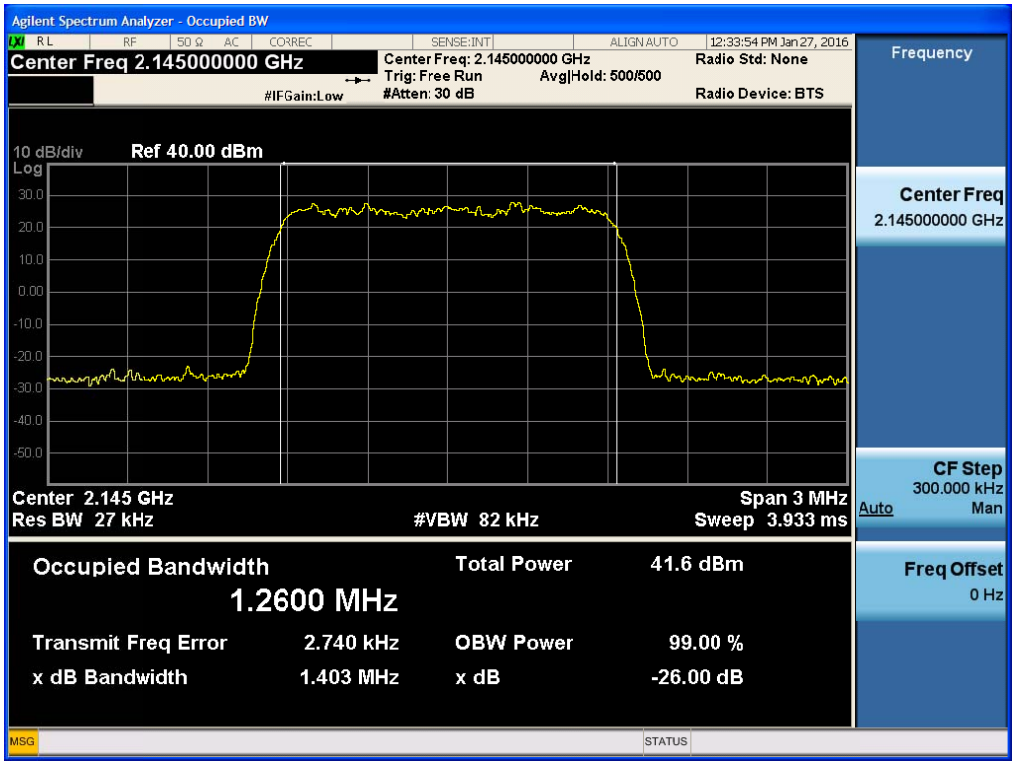
[AGC threshold Output Downlink High]



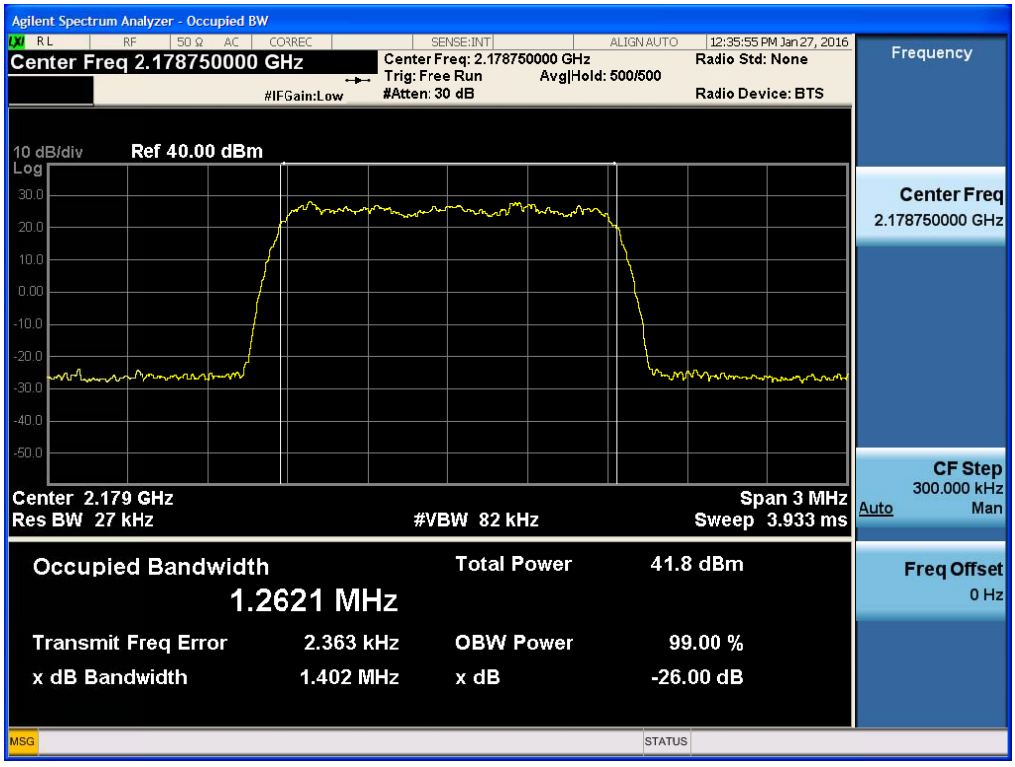
[+3dBmabove AGC threshold Output Downlink Low]



[+3dBm above AGC threshold Output Downlink Middle]

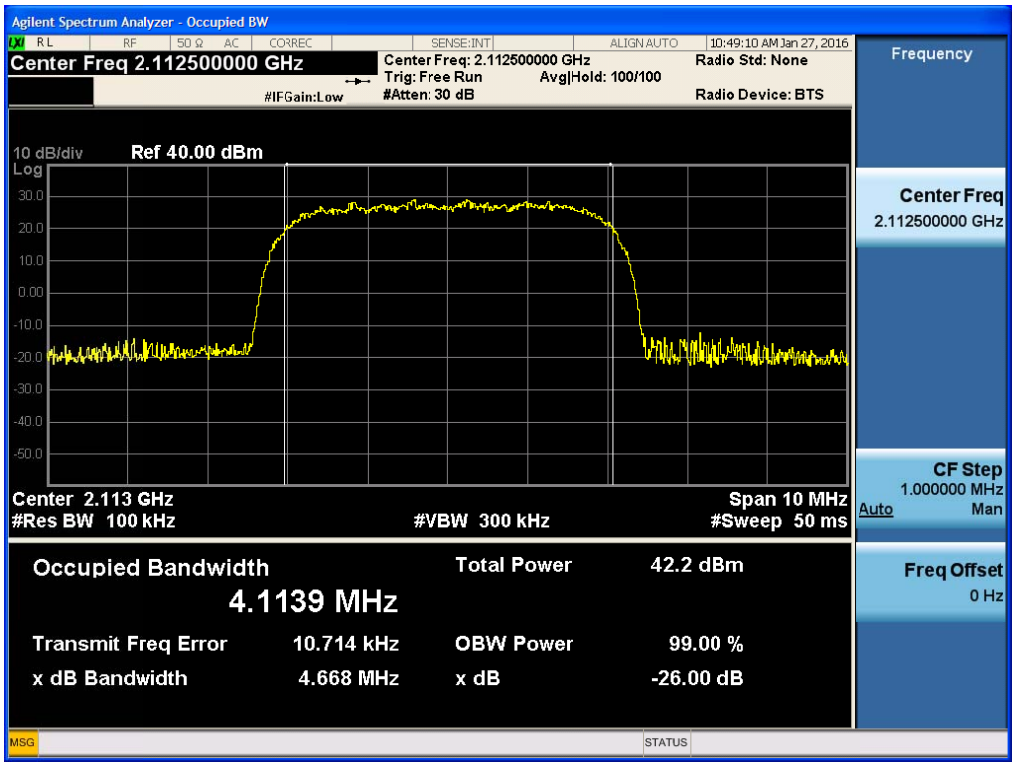


[+3dBm above AGC threshold Output Downlink High]

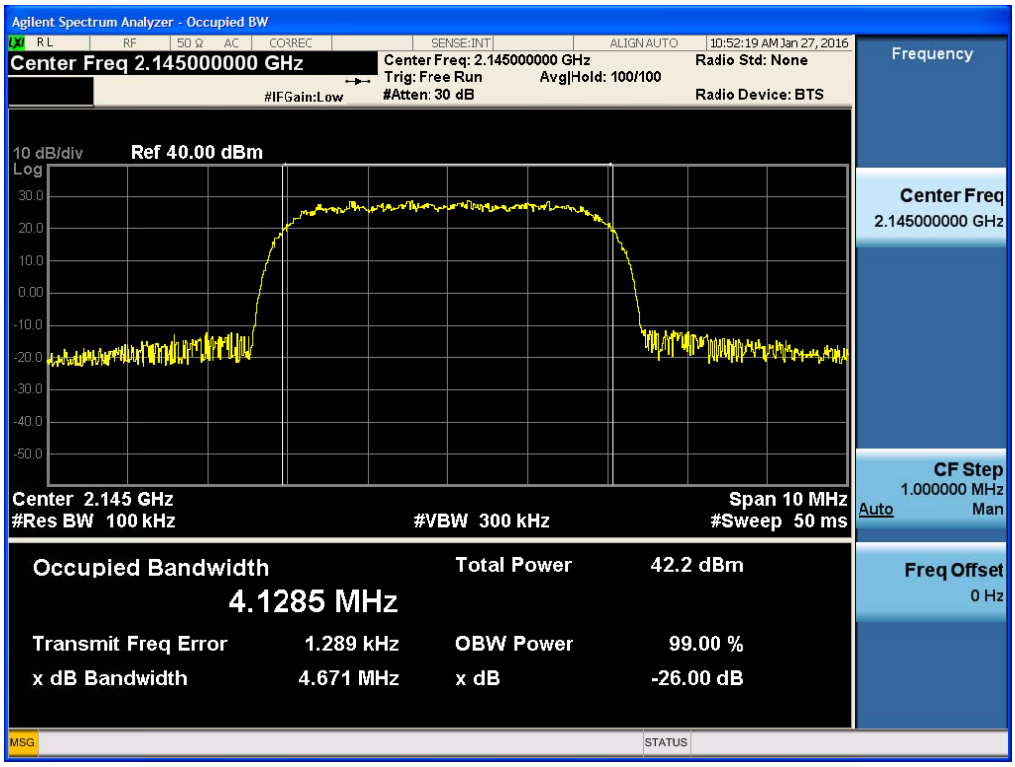


Plots of Occupied Bandwidth_AWS BAND WCDMA

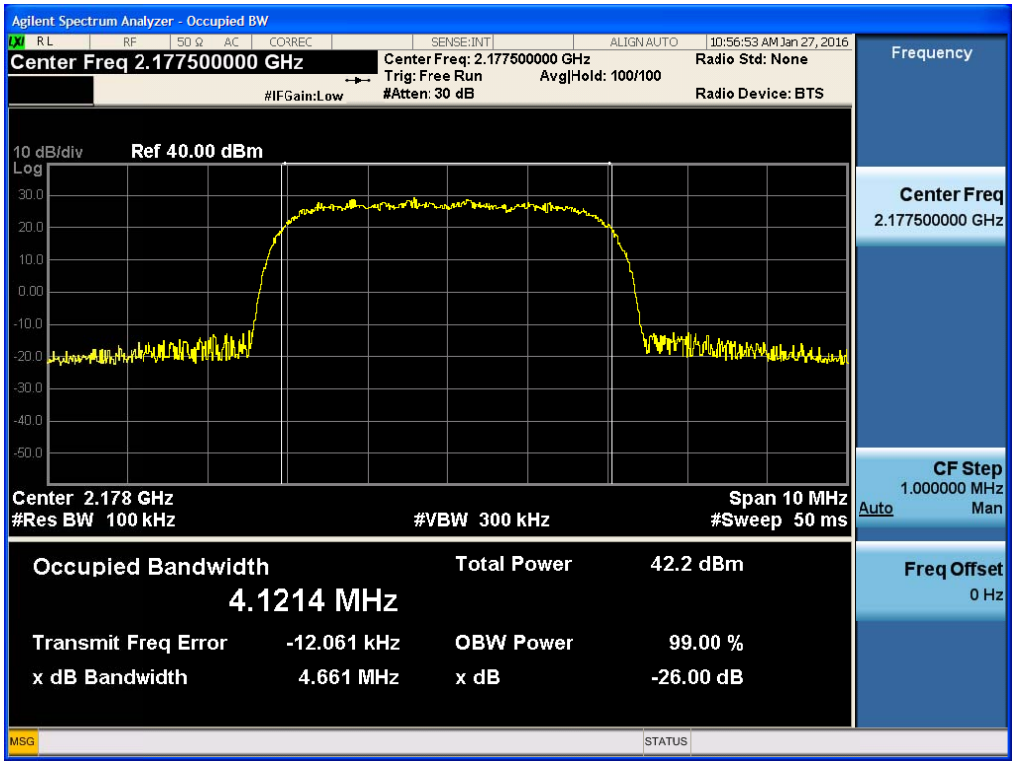
[AGC threshold Output Downlink Low]



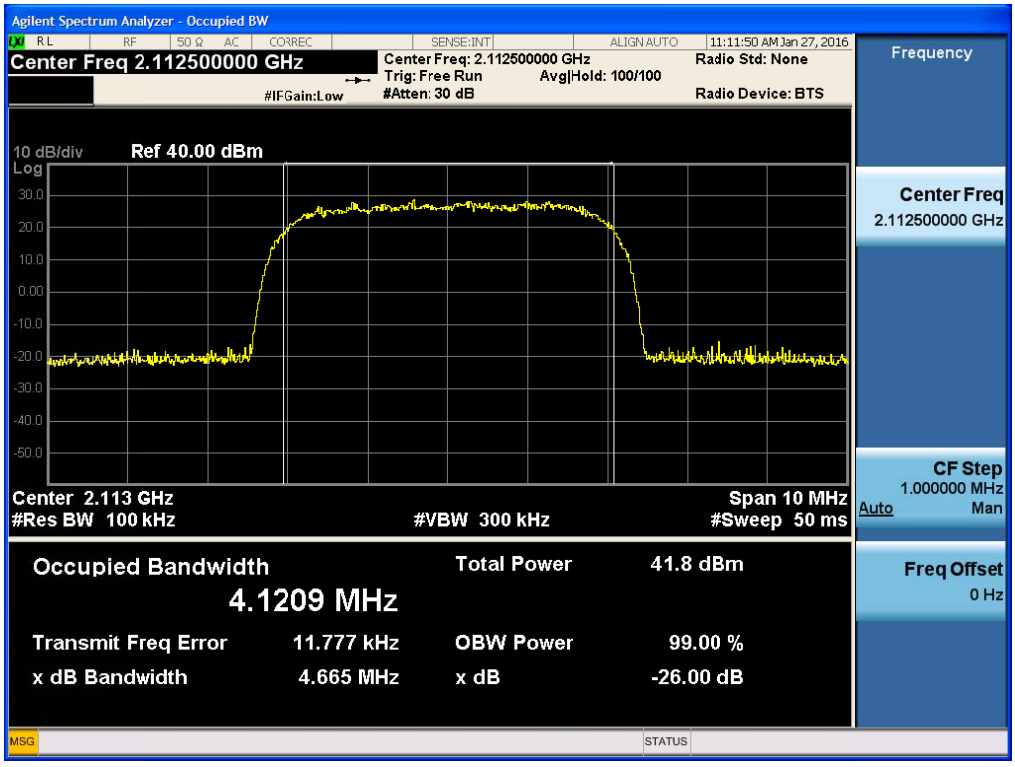
[AGC threshold Output Downlink Middle]



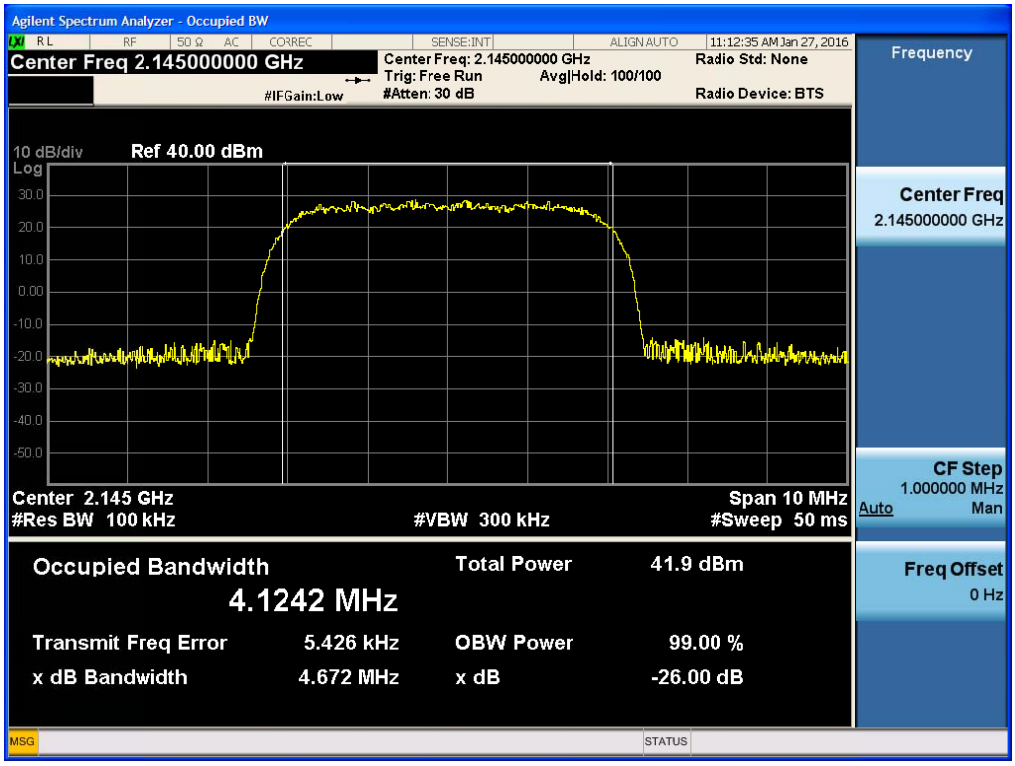
[AGC threshold Output Downlink High]



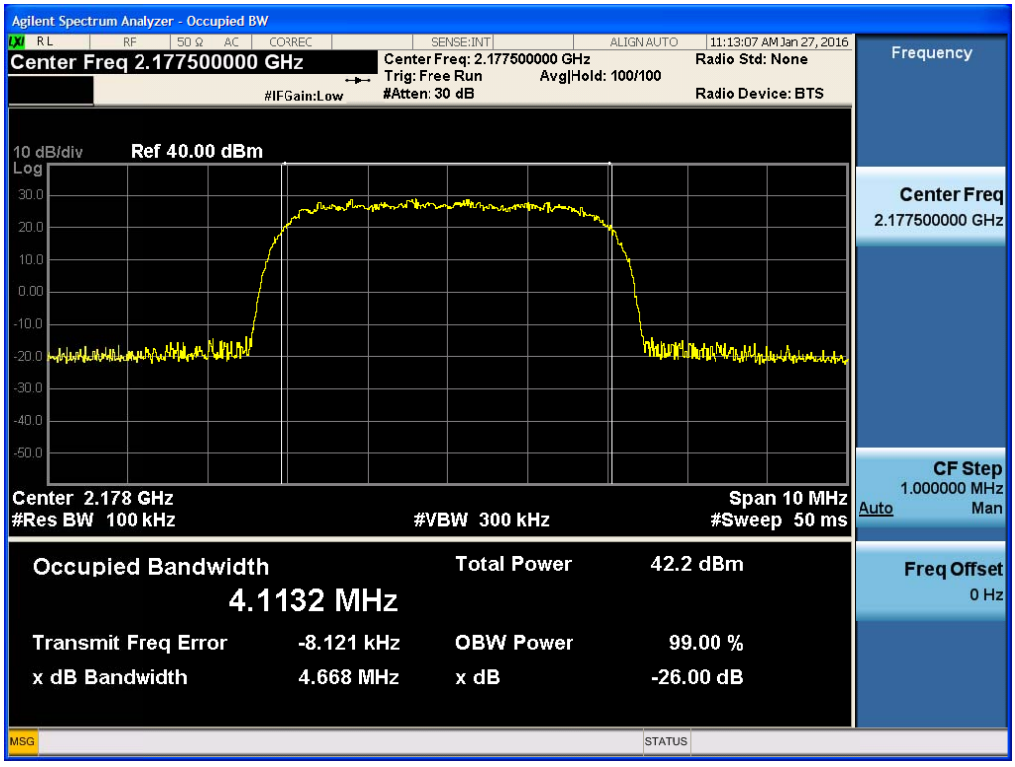
[+3dBmabove AGC threshold Output Downlink Low]



[+3dBm above AGC threshold Output Downlink Middle]

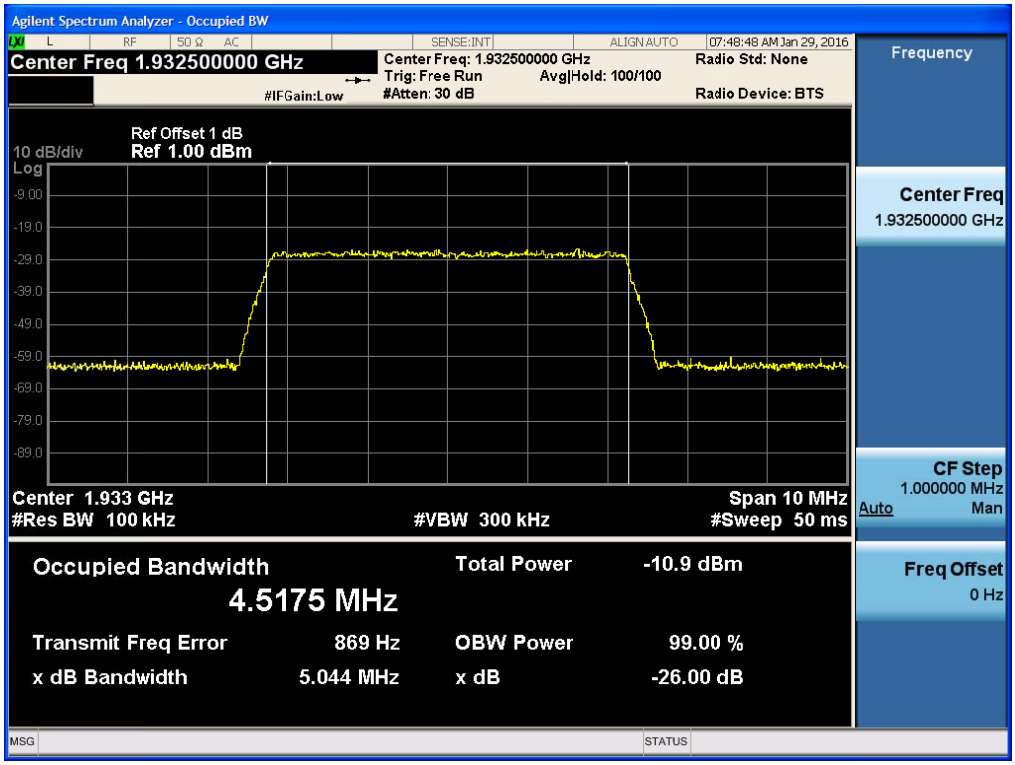


[+3dBm above AGC threshold Output Downlink High]

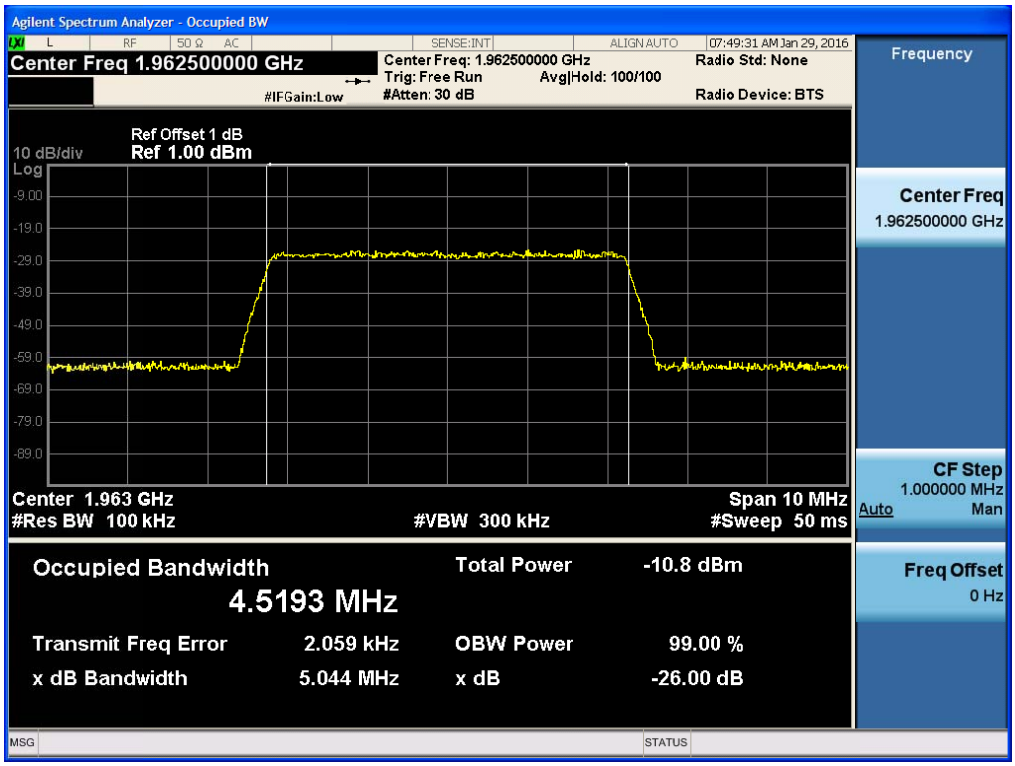


Plots of Occupied Bandwidth_1900 PCS BAND LTE 5MHz

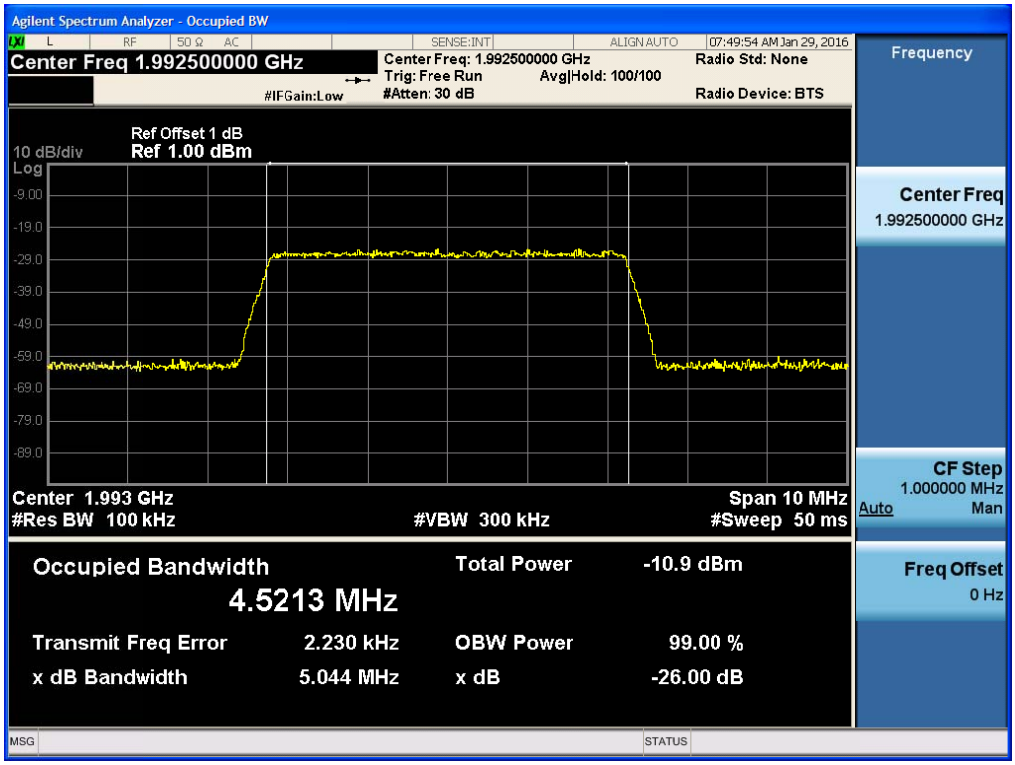
[AGC threshold Input Downlink Low]



[AGC threshold Input Downlink Middle]

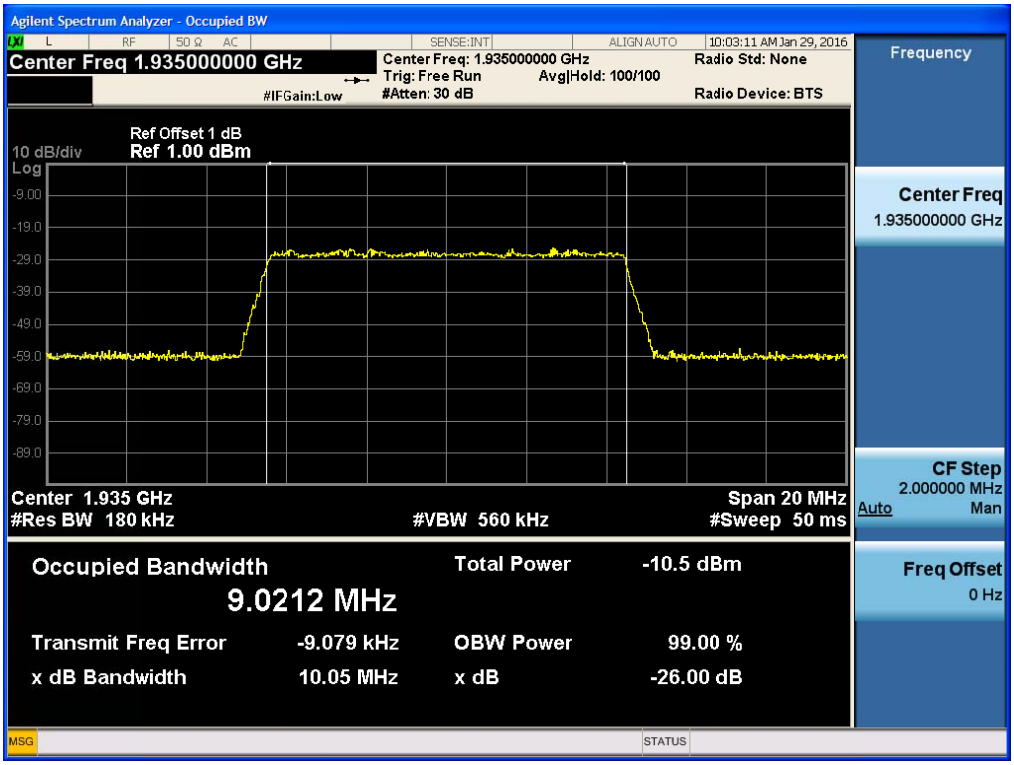


[AGC threshold Input Downlink High]

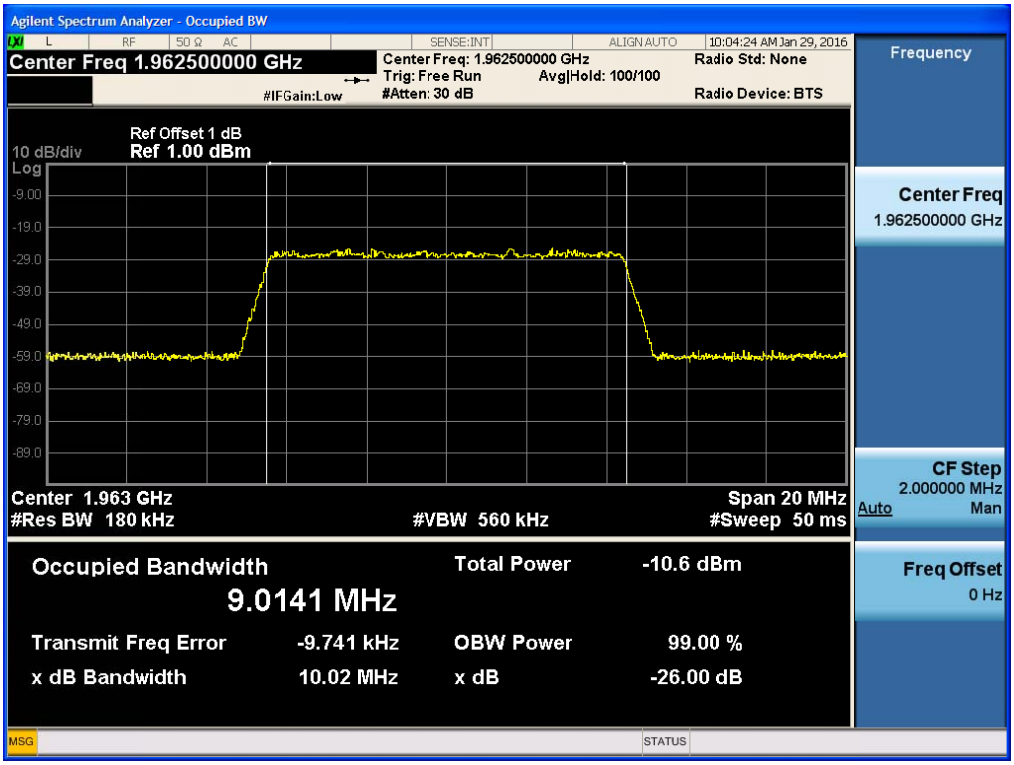


Plots of Occupied Bandwidth_1900 PCS BAND LTE 10MHz

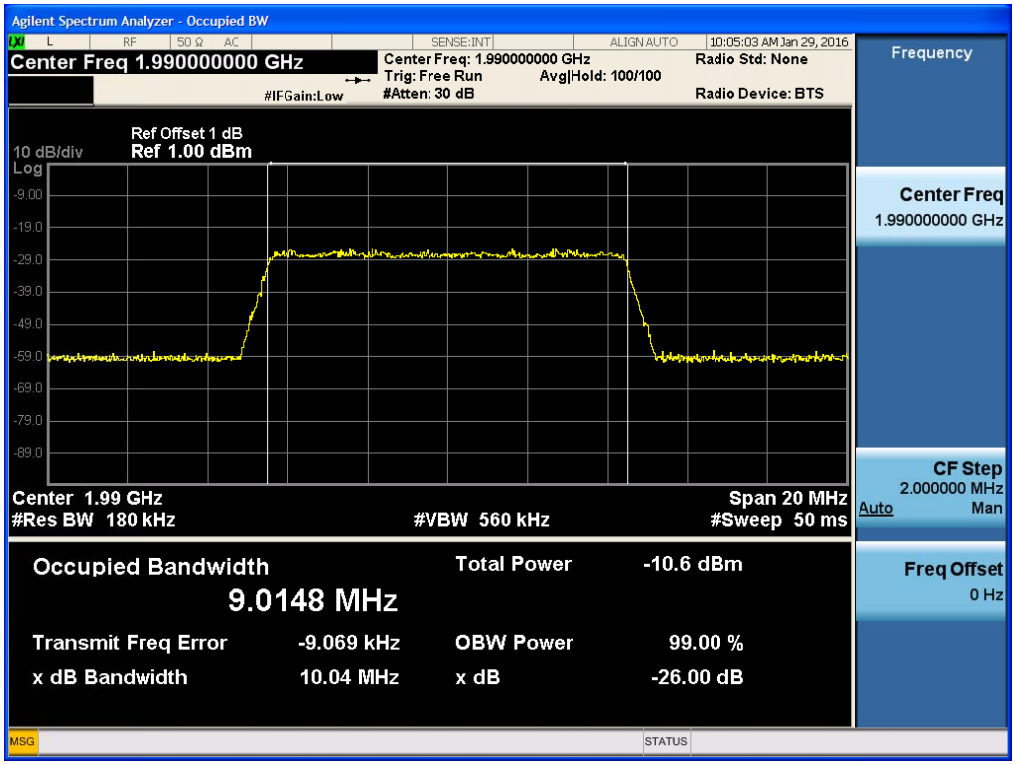
[AGC threshold Input Downlink Low]



[AGC threshold Input Downlink Middle]

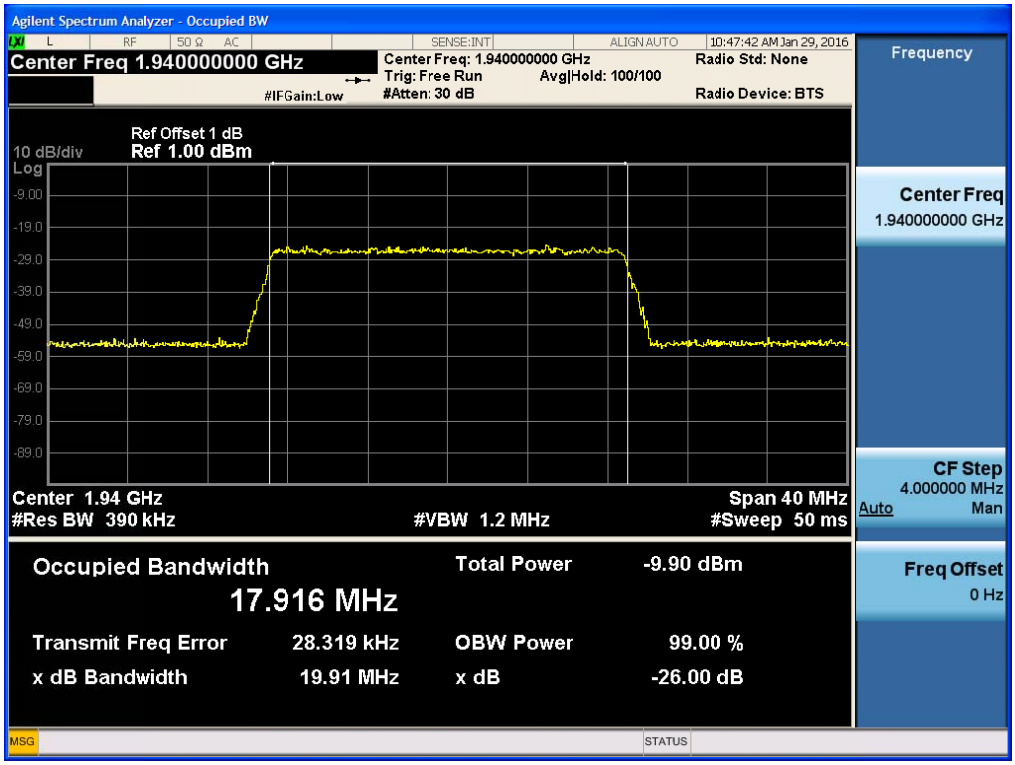


[AGC threshold Input Downlink High]

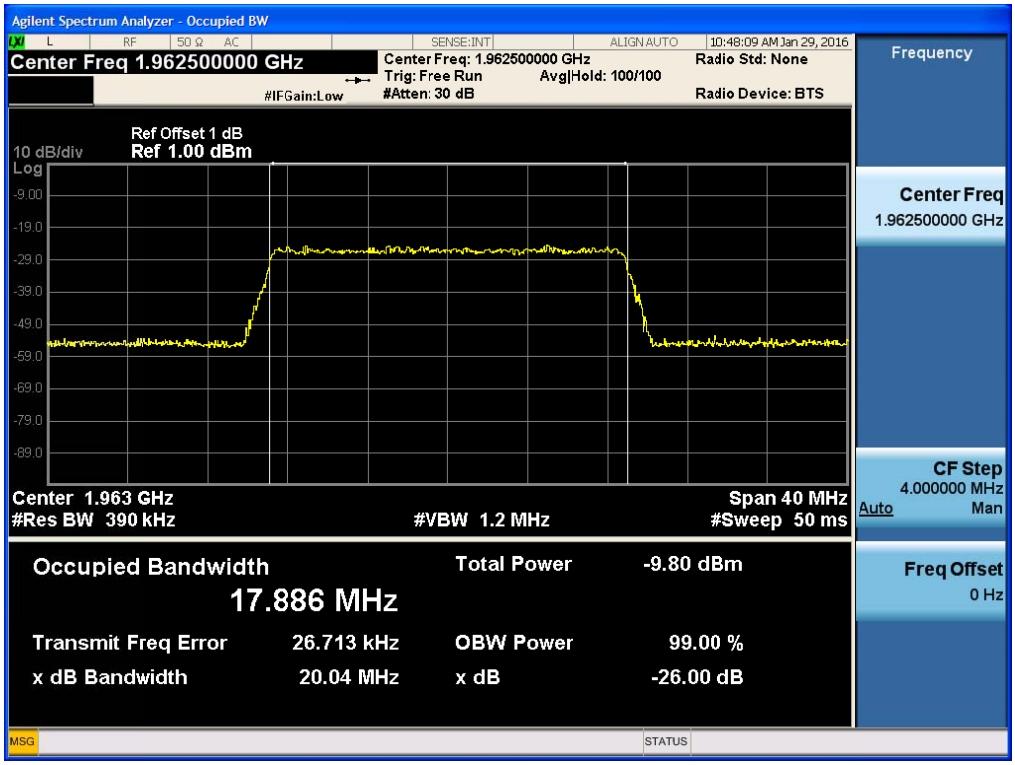


Plots of Occupied Bandwidth_1900 PCS BAND LTE 20MHz

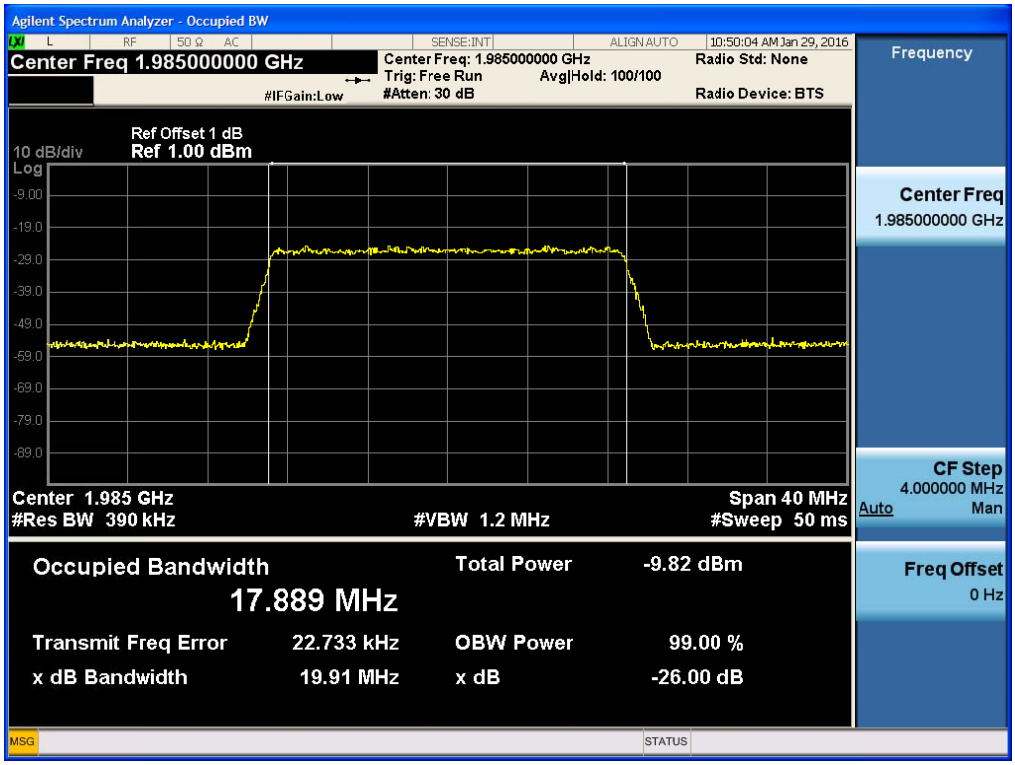
[AGC threshold Input Downlink Low]



[AGC threshold Input Downlink Middle]

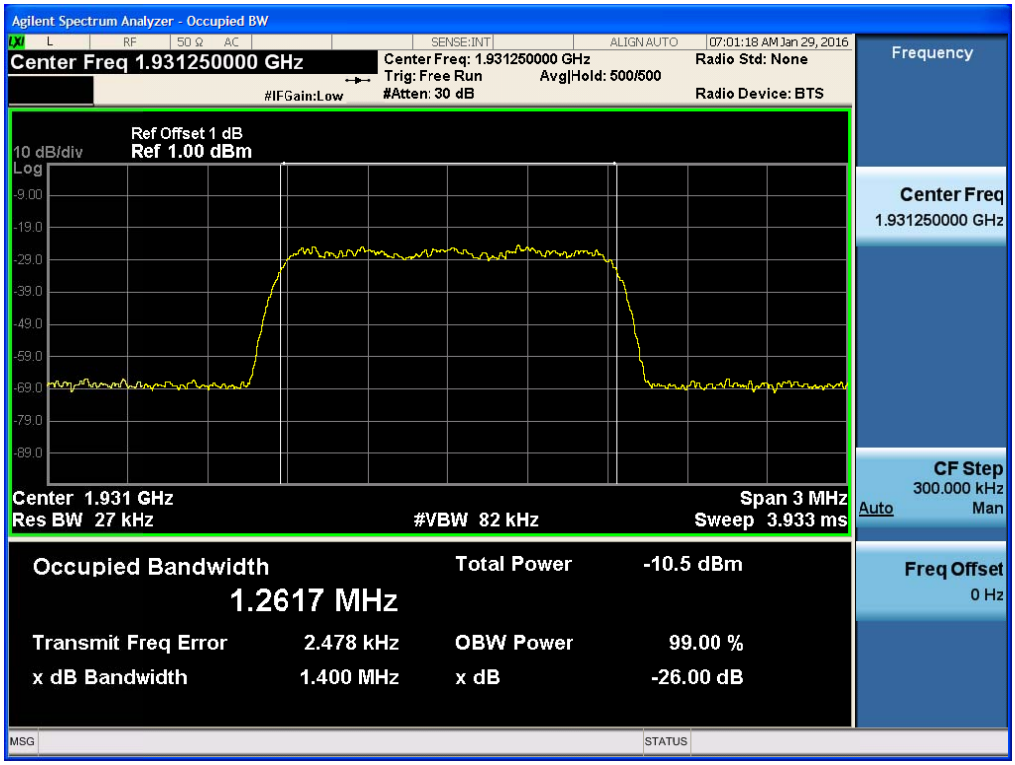


[AGC threshold Input Downlink High]

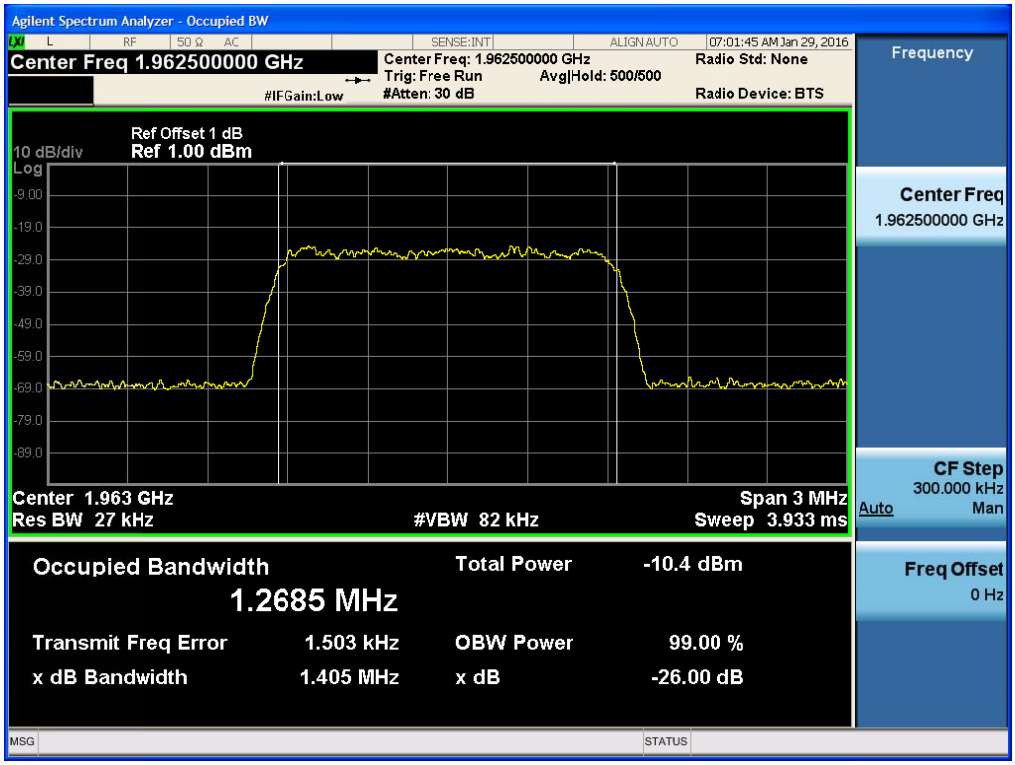


Plots of Occupied Bandwidth_1900 PCS BAND CDMA

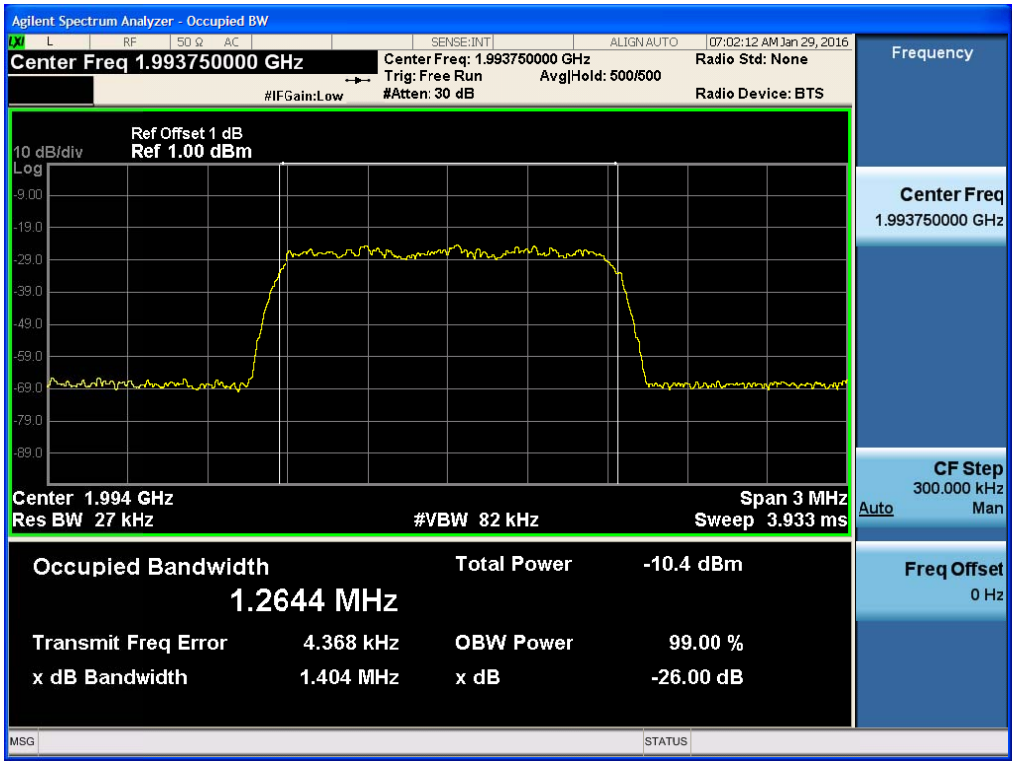
[AGC threshold Input Downlink Low]



[AGC threshold Input Downlink Middle]

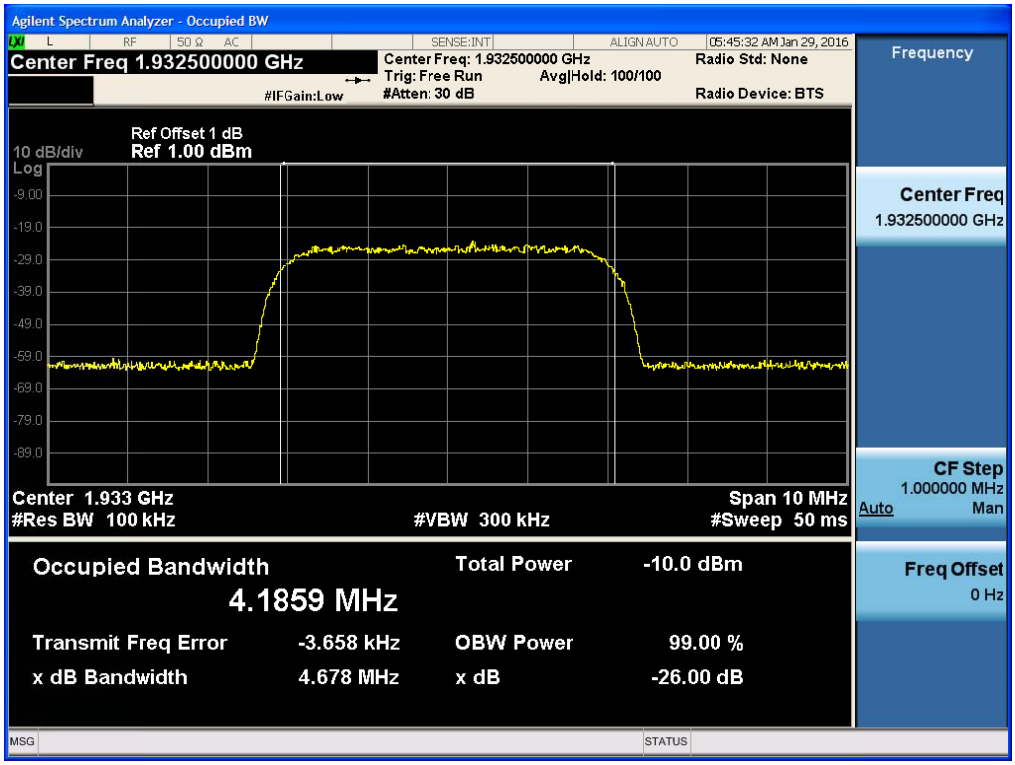


[AGC threshold Input Downlink High]

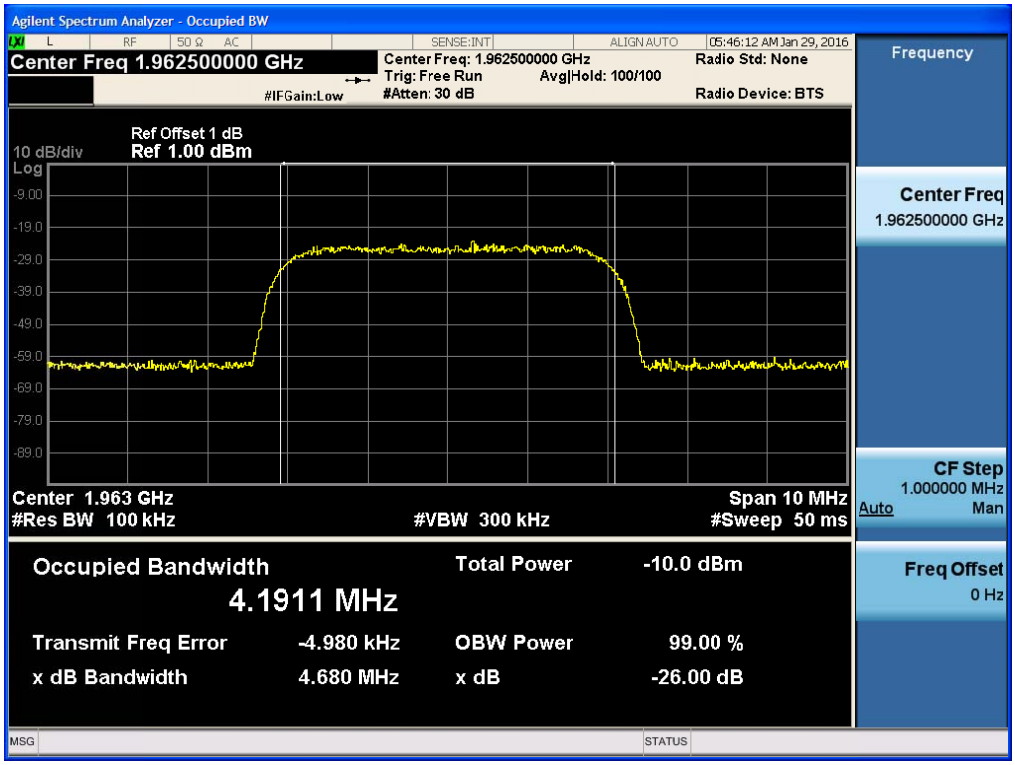


Plots of Occupied Bandwidth_1900 PCS BAND WCDMA

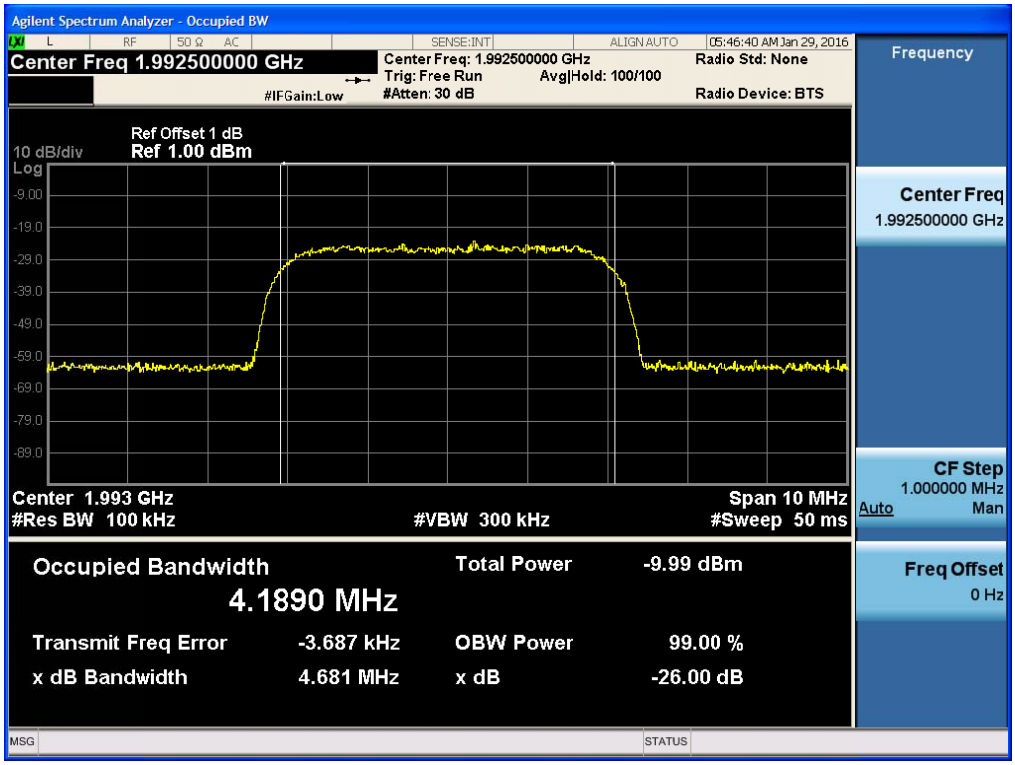
[AGC threshold Input Downlink Low]



[AGC threshold Input Downlink Middle]

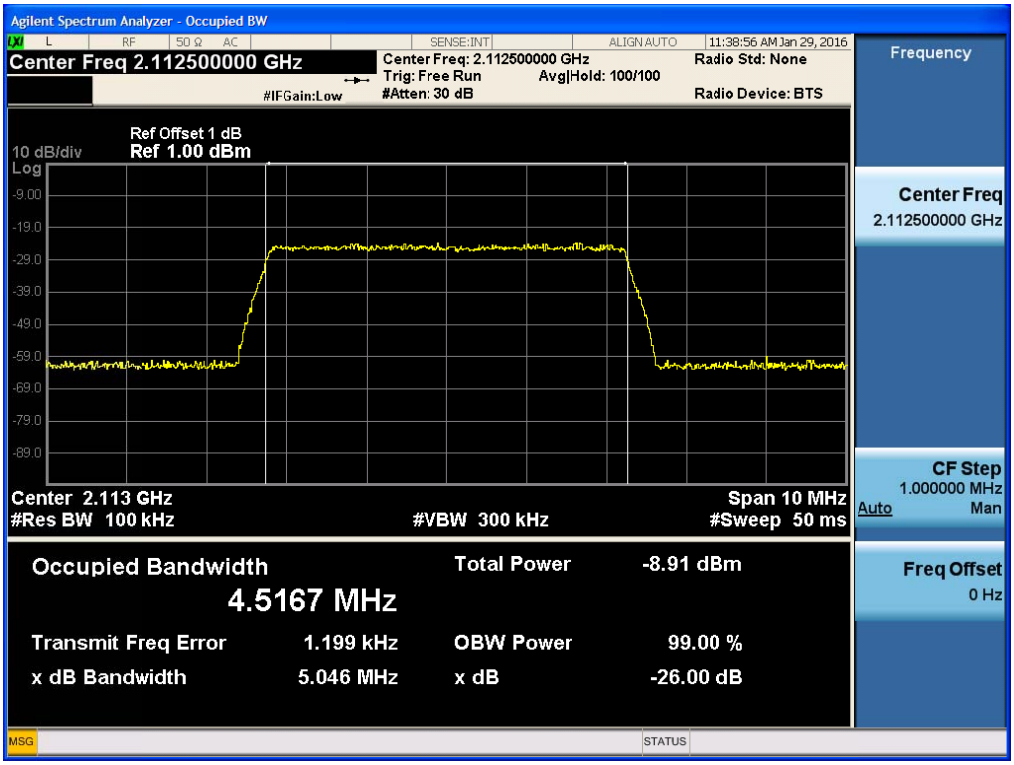


[AGC threshold Input Downlink High]

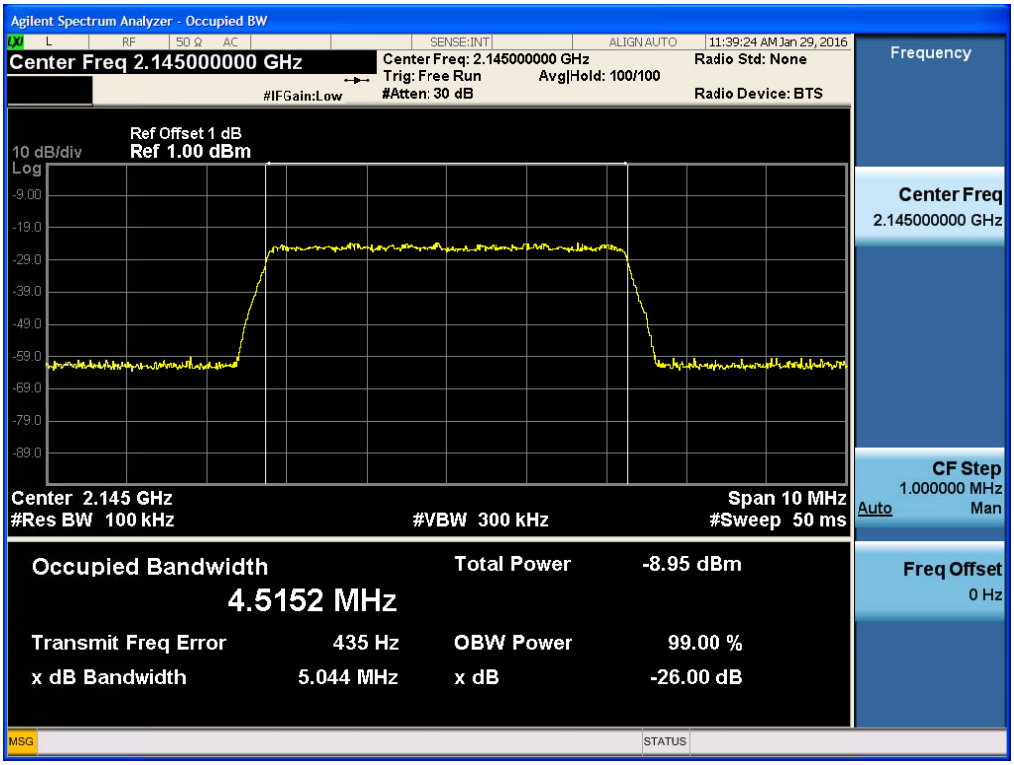


Plots of Occupied Bandwidth_AWS BAND LTE 5MHz

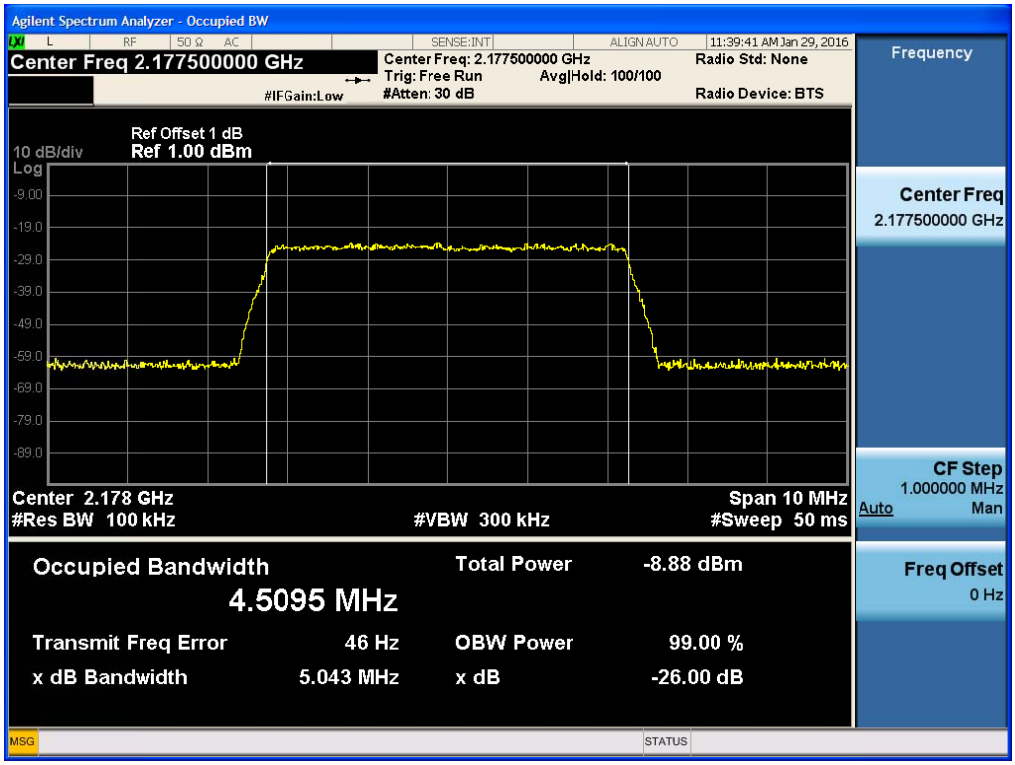
[AGC threshold Input Downlink Low]



[AGC threshold Input Downlink Middle]

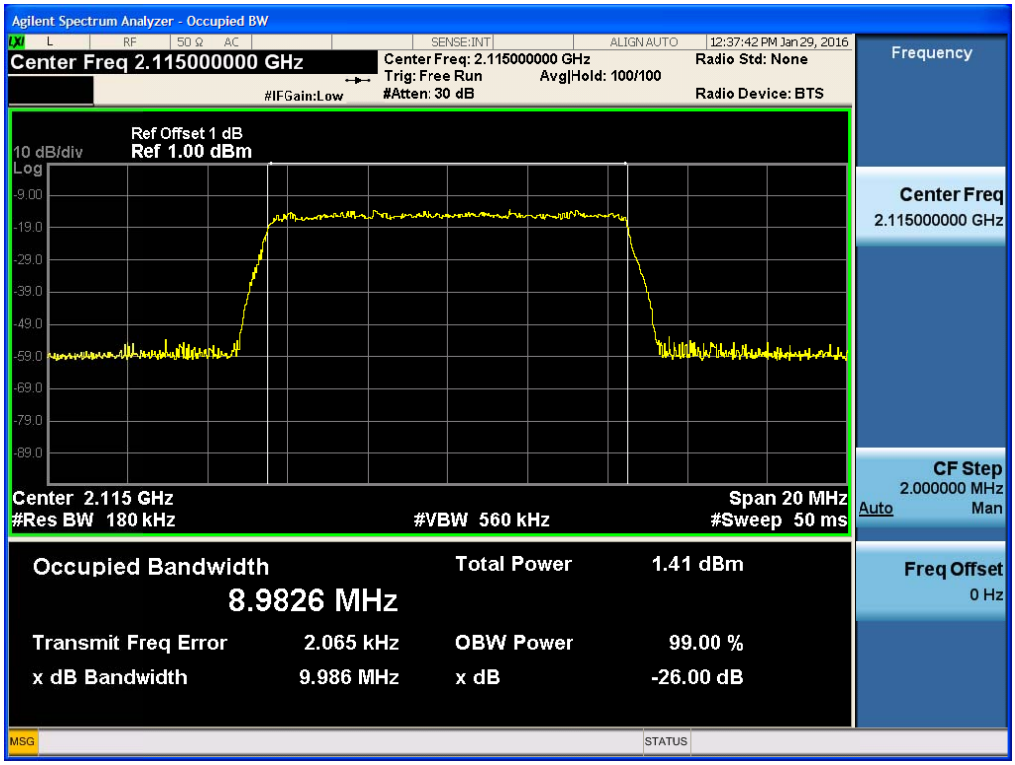


[AGC threshold Input Downlink High]

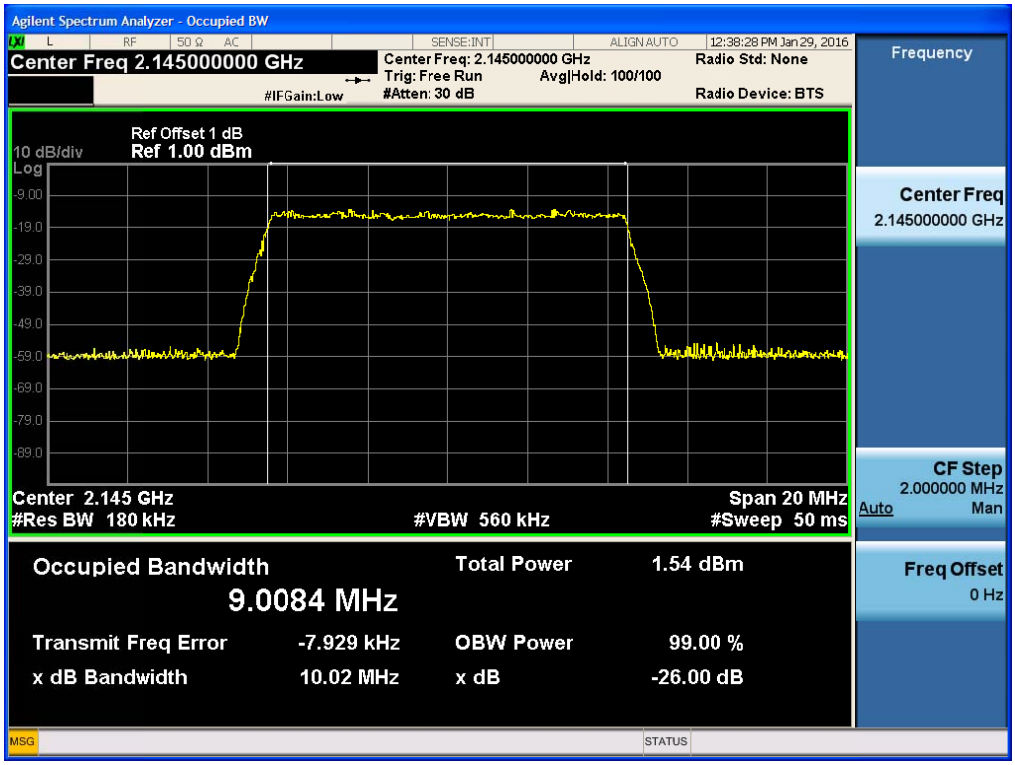


Plots of Occupied Bandwidth_AWS BAND LTE 10MHz

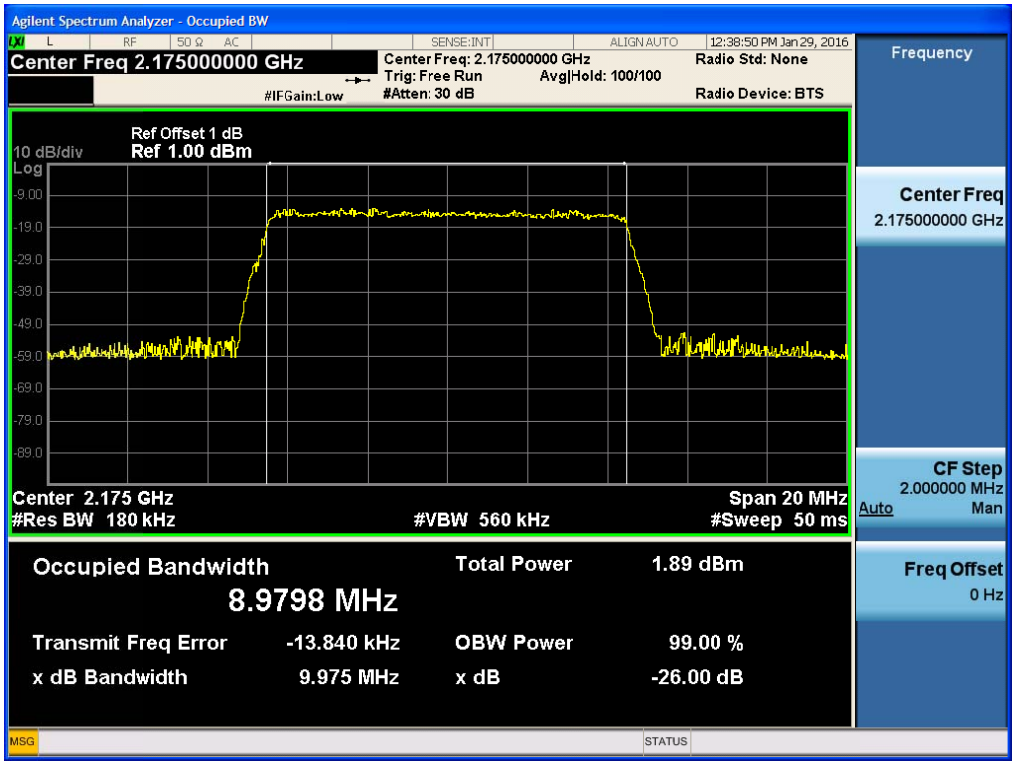
[AGC threshold Input Downlink Low]



[AGC threshold Input Downlink Middle]

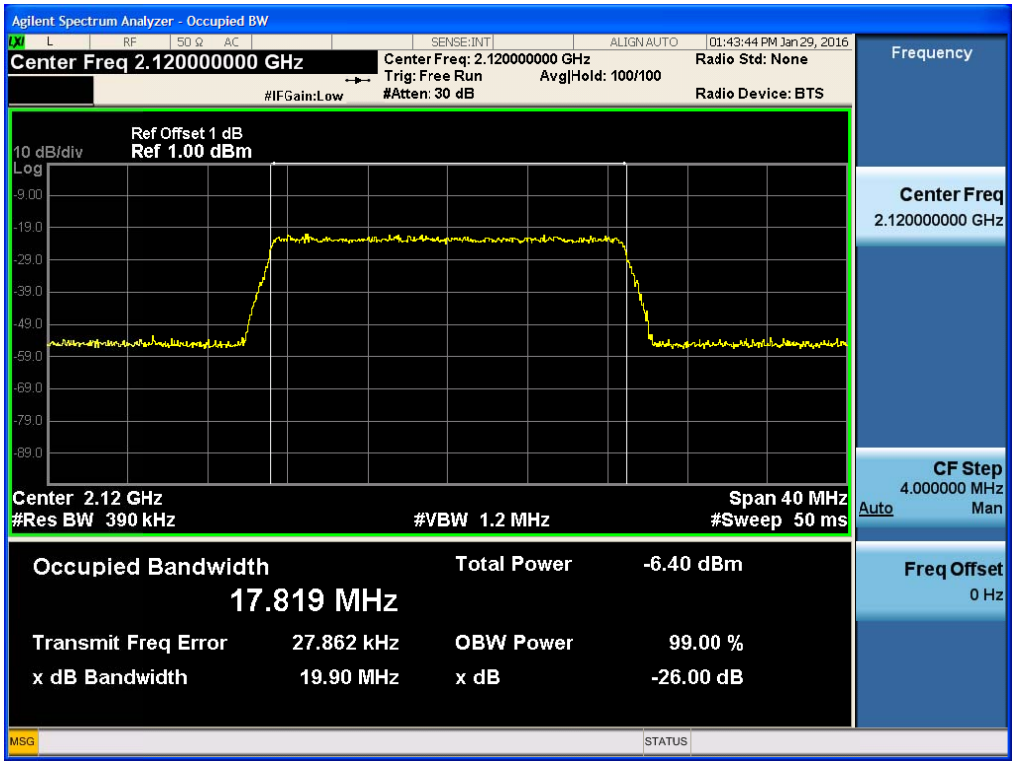


[AGC threshold Input Downlink High]

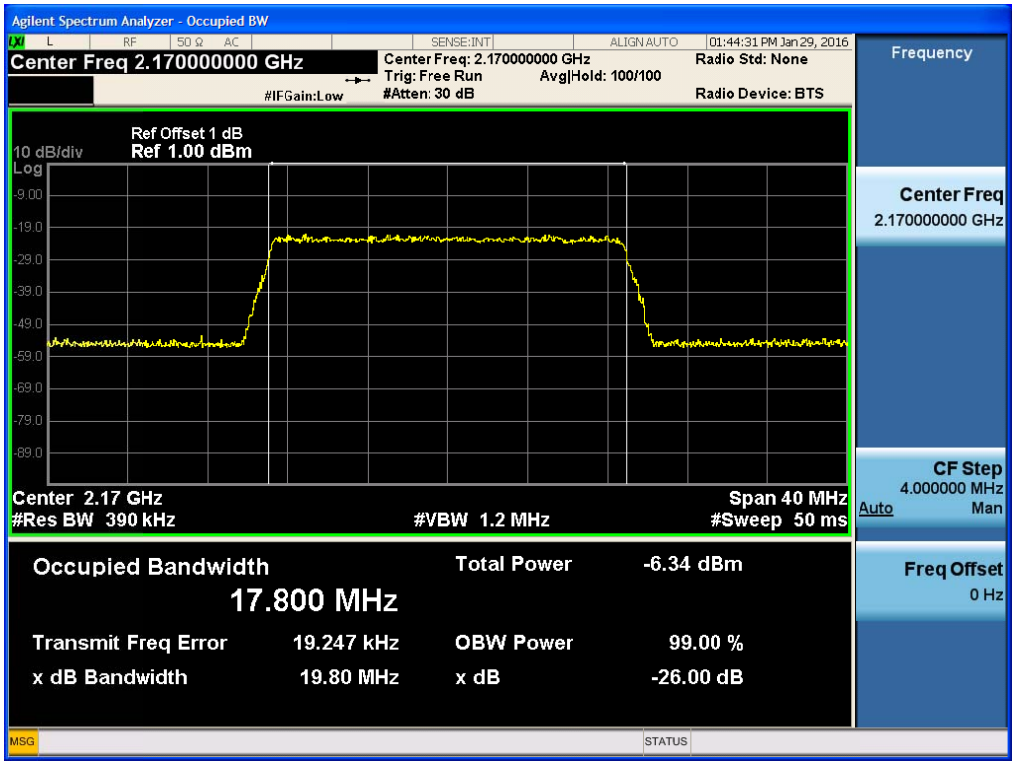


Plots of Occupied Bandwidth_AWS BAND LTE 20MHz

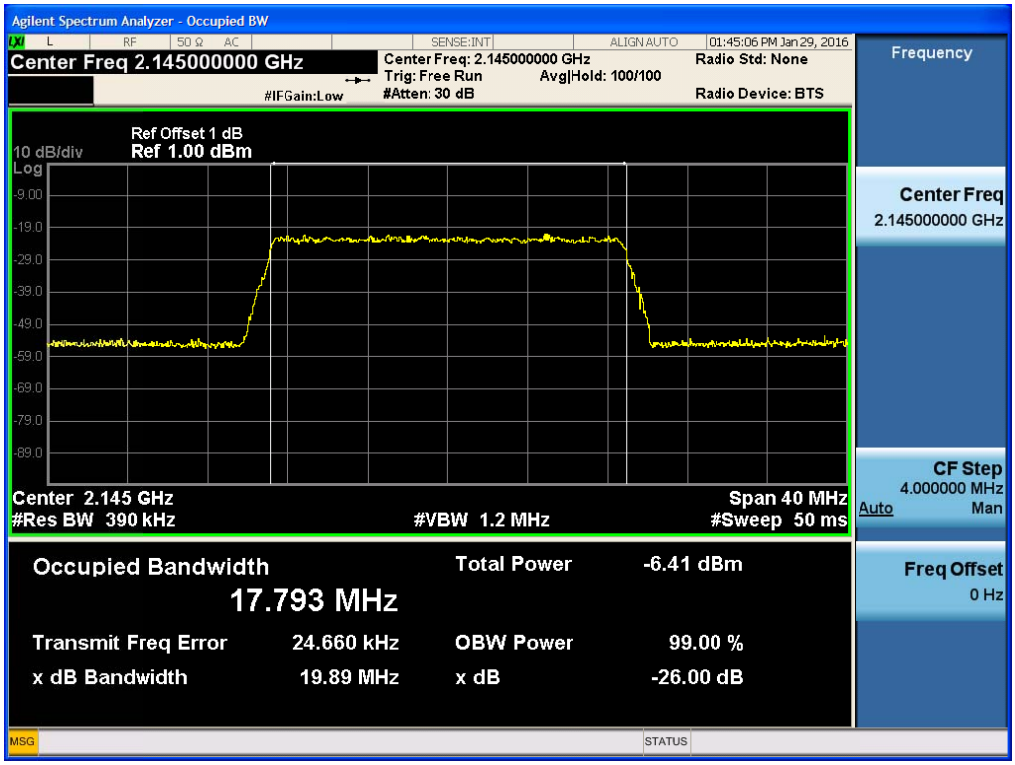
[AGC threshold Input Downlink Low]



[AGC threshold Input Downlink Middle]

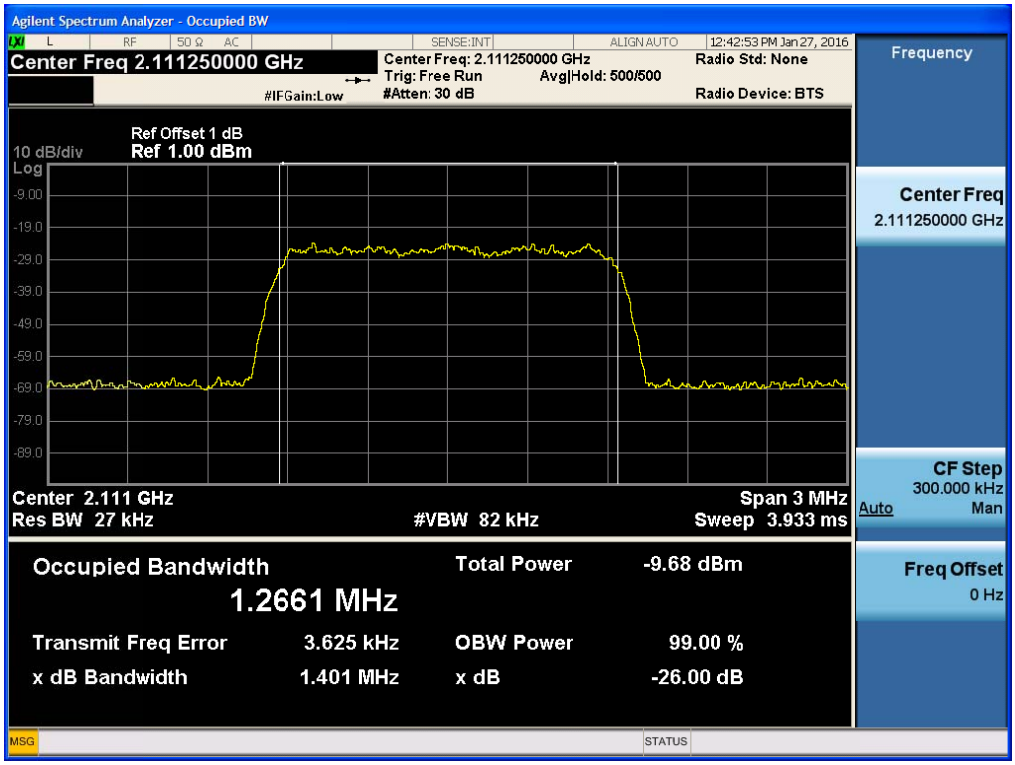


[AGC threshold Input Downlink High]



Plots of Occupied Bandwidth_AWS BAND CDMA

[AGC threshold Input Downlink Low]



[AGC threshold Input Downlink Middle]