

## 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 v01 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  $\geq 3 \times$  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.

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 rolloff 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.

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

### LTE 700 MHz Band

Input Signal	Input Level (dBm)	Maximum Amp Gain
LTE 5 MHz		
LTE 10 MHz		
CDMA 1.25 MHz	DL: -40 dBm UL : -42 dBm	DL : 67 dB UL : 37 dB
P25 12.5 kHz		
FM		

### IC Rules

#### Test Requirements: RSS-GEN 4.6.1

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

#### Test Procedures: RSS-GEN 4.6.1

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 shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

The trace data points are recovered and directly summed in linear 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. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

**[Downlink Output]**

	Channel	Frequency (MHz)	OBW (MHz)
700 Band_ LTE 5 MHz AGC threshold	Low	760.5000	4.492
	Middle	-	-
	High	765.5000	4.511
700 Band_ LTE 10 MHz AGC threshold	Low	-	-
	Middle	763.0000	8.972
	High	-	--

	Channel	Frequency (MHz)	OBW (kHz)
700 Band_P25 AGC threshold	Low	763.0125	8.038
	Middle	769.0125	8.263
	High	774.9875	8.051
700 Band_FM AGC threshold	Low	763.0125	10.139
	Middle	769.0125	10.138
	High	774.9875	10.138

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (MHz)</b>
700 Band_ LTE 5 MHz +3dB above AGC threshold	Low	760.5000	4.498
	Middle	-	-
	High	765.5000	4.515
700 Band_ LTE 10 MHz +3dB above AGC threshold	Low	-	-
	Middle	763.0000	8.982
	High	-	-

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (kHz)</b>
700 Band_P25 +3dB above AGC threshold	Low	763.0125	7.987
	Middle	769.0125	8.162
	High	774.9875	8.184
700 Band_FM +3dB above AGC threshold	Low	763.0125	10.139
	Middle	769.0125	10.138
	High	774.9875	10.138

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (MHz)</b>
800 Band_ LTE 5 MHz AGC threshold	Low	864.5000	4.515
	Middle	-	-
	High	866.5000	4.502
800 Band_ CDMA 1.25 MHz AGC threshold	Low	863.2500	1.262
	Middle	865.5000	1.268
	High	867.7500	1.261

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (kHz)</b>
800 Band_P25 AGC threshold	Low	851.0125	8.081
	Middle	856.0000	8.241
	High	860.9875	8.151
800 Band_FM AGC threshold	Low	851.0125	10.139
	Middle	856.0000	10.138
	High	860.9875	10.138

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (MHz)</b>
800 Band_ LTE 5 MHz +3dB above AGC threshold	Low	864.5000	4.511
	Middle	-	-
	High	866.5000	4.514
800 Band_ CDMA 1.25 MHz +3dB above AGC threshold	Low	863.2500	1.264
	Middle	865.5000	1.262
	High	867.7500	1.260

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (kHz)</b>
800 Band_P25 +3dB above AGC threshold	Low	851.0125	8.272
	Middle	856.0000	8.017
	High	860.9875	8.332
800 Band_FM +3dB above AGC threshold	Low	851.0125	10.139
	Middle	856.0000	10.138
	High	860.9875	10.138

**[Downlink Input]**

	Channel	Frequency (MHz)	OBW (MHz)
700 Band_ LTE 5 MHz AGC threshold	Low	760.5000	4.500
	Middle	-	-
	High	765.5000	4.500
700 Band_ LTE 10 MHz AGC threshold	Low	-	-
	Middle	763.0000	8.969
	High	-	--

	Channel	Frequency (MHz)	OBW (kHz)
700 Band_P25 AGC threshold	Low	763.0125	8.016
	Middle	769.0125	8.207
	High	774.9875	8.118
700 Band_FM AGC threshold	Low	763.0125	10.139
	Middle	769.0125	10.138
	High	774.9875	10.138

	Channel	Frequency (MHz)	OBW (MHz)
800 Band_ LTE 5 MHz AGC threshold	Low	864.5000	4.499
	Middle	-	-
	High	866.5000	4.500
800 Band_ CDMA 1.25 MHz AGC threshold	Low	863.2500	1.263
	Middle	865.5000	1.272
	High	867.7500	1.262

	Channel	Frequency (MHz)	OBW (kHz)
800 Band_P25 AGC threshold	Low	851.0125	7.982
	Middle	856.0000	7.941
	High	860.9875	7.943
800 Band_FM AGC threshold	Low	851.0125	10.140
	Middle	856.0000	10.138
	High	860.9875	10.138

**[Uplink Output]**

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (MHz)</b>
700 Band_ LTE 5 MHz AGC threshold	Low	790.5000	4.495
	Middle	-	-
	High	765.5000	4.517
700 Band_ LTE 10 MHz AGC threshold	Low	-	-
	Middle	793.0000	8.971
	High	-	-

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (kHz)</b>
700 Band_P25 AGC threshold	Low	793.0125	8.036
	Middle	799.0125	8.267
	High	804.9875	8.079
700 Band_FM AGC threshold	Low	793.0125	10.140
	Middle	799.0125	10.139
	High	804.9875	10.140

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (MHz)</b>
700 Band_ LTE 5 MHz +3dB above AGC threshold	Low	790.5000	4.495
	Middle	-	-
	High	765.5000	4.233
700 Band_ LTE 10 MHz +3dB above AGC threshold	Low	-	-
	Middle	793.0000	8.595
	High	-	-

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (kHz)</b>
700 Band_P25 +3dB above AGC threshold	Low	793.0125	8.194
	Middle	799.0125	8.196
	High	804.9875	8.189
700 Band_FM +3dB above AGC threshold	Low	793.0125	10.140
	Middle	799.0125	10.140
	High	804.9875	10.140

	Channel	Frequency (MHz)	OBW (MHz)
800 Band_ LTE 5 MHz AGC threshold	Low	819.5000	4.512
	Middle	-	-
	High	821.5000	4.506
800 Band_ CDMA 1.25 MHz AGC threshold	Low	818.2500	1.262
	Middle	820.5000	1.263
	High	822.7500	1.259

	Channel	Frequency (MHz)	OBW (kHz)
800 Band_P25 AGC threshold	Low	806.0125	8.069
	Middle	811.0000	8.154
	High	815.9875	8.142
800 Band_FM AGC threshold	Low	806.0125	10.139
	Middle	811.0000	10.139
	High	815.9875	10.141

	Channel	Frequency (MHz)	OBW (MHz)
800 Band_ LTE 5 MHz +3dB above AGC threshold	Low	819.5000	4.516
	Middle	-	-
	High	821.5000	4.507
800 Band_ CDMA 1.25 MHz +3dB above AGC threshold	Low	818.2500	1.260
	Middle	820.5000	1.261
	High	822.7500	1.264

	Channel	Frequency (MHz)	OBW (kHz)
800 Band_P25 +3dB above AGC threshold	Low	806.0125	8.112
	Middle	811.0000	7.997
	High	815.9875	8.134
800 Band_FM +3dB above AGC threshold	Low	806.0125	10.139
	Middle	811.0000	10.139
	High	815.9875	10.141

**[Uplink Input]**

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (MHz)</b>
700 Band_ LTE 5 MHz AGC threshold	Low	790.5000	4.519
	Middle	-	-
	High	765.5000	4.519
700 Band_ LTE 10 MHz AGC threshold	Low	-	
	Middle	793.0000	9.009
	High	-	-

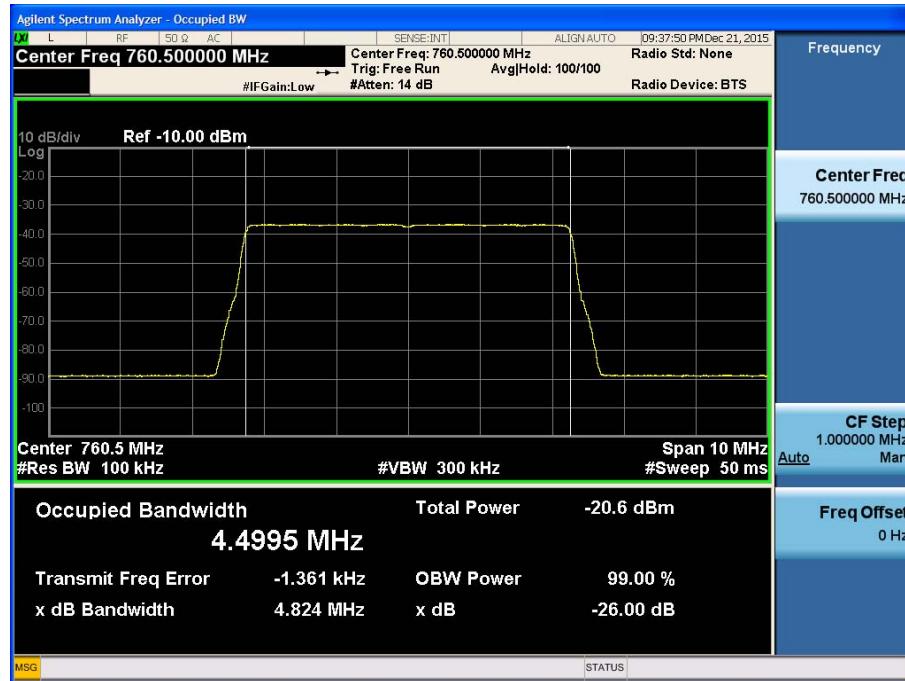
	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (kHz)</b>
700 Band_P25 AGC threshold	Low	793.0125	8.101
	Middle	799.0125	8.055
	High	804.9875	7.686
700 Band_FM AGC threshold	Low	793.0125	10.140
	Middle	799.0125	10.140
	High	804.9875	10.140

	Channel	Frequency (MHz)	OBW (MHz)
800 Band_ LTE 5 MHz AGC threshold	Low	819.5000	4.516
	Middle	-	-
	High	821.5000	4.5189
800 Band_ CDMA 1.25 MHz AGC threshold	Low	818.2500	1.262
	Middle	820.5000	1.265
	High	822.7500	1.265

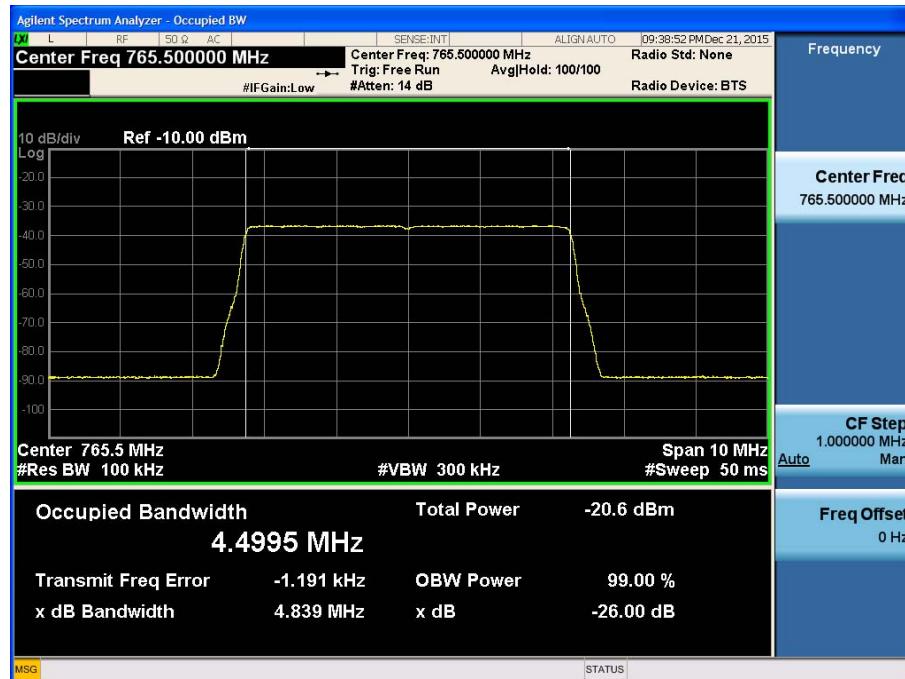
	Channel	Frequency (MHz)	OBW (kHz)
800 Band_P25 AGC threshold	Low	806.0125	8.416
	Middle	811.0000	8.317
	High	815.9875	7.920
800 Band_FM AGC threshold	Low	806.0125	10.139
	Middle	811.0000	10.140
	High	815.9875	10.141

## Plots of Occupied Bandwidth 700 MHz Band\_LTE DL

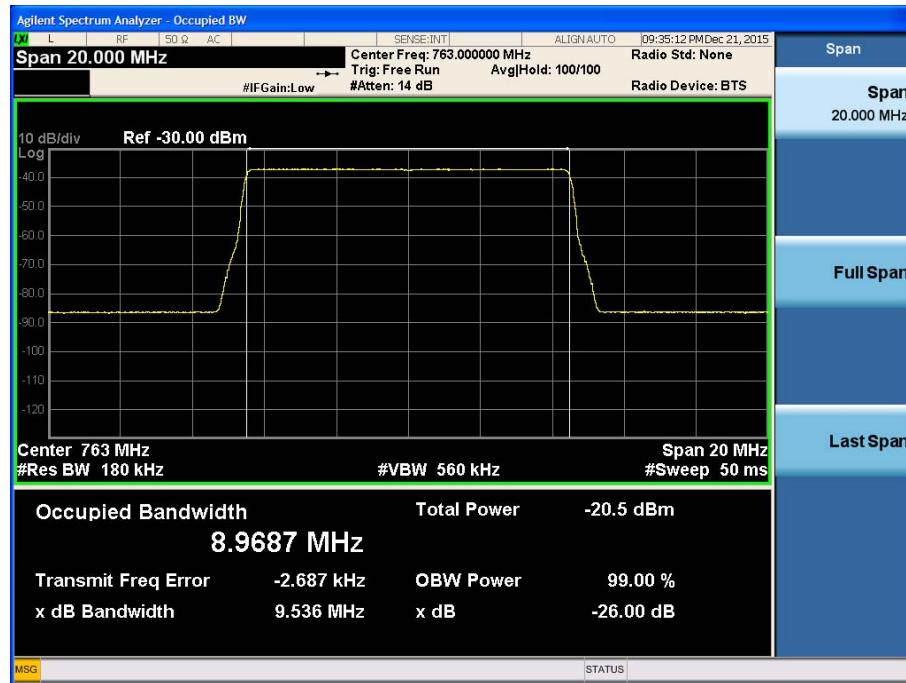
[700 Band AGC threshold Downlink Input LTE 5 MHz Low]



[700 Band AGC threshold Downlink Input LTE 5 MHz High]



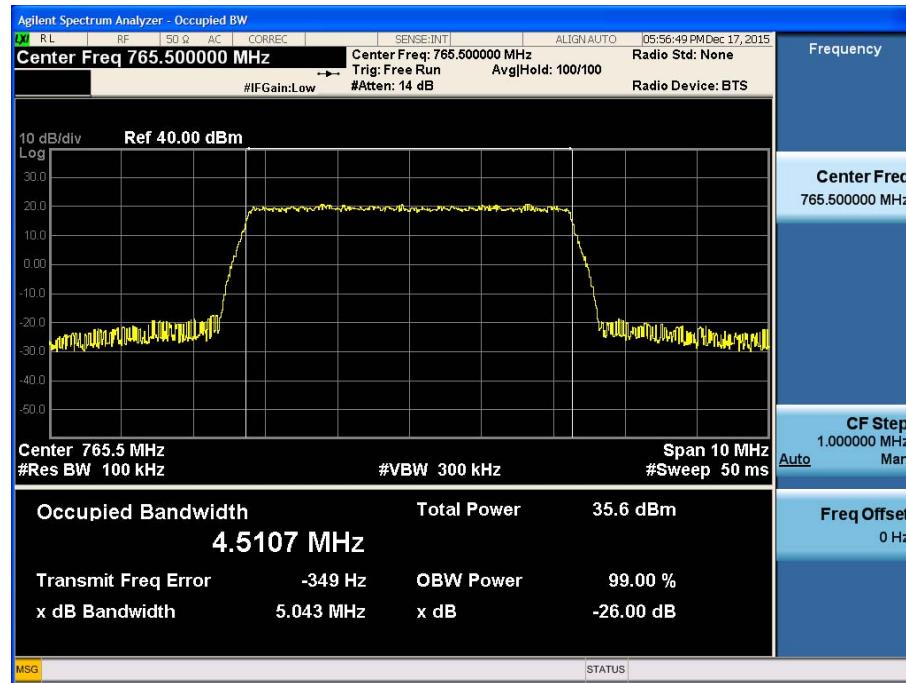
[700 Band AGC threshold Downlink Input LTE 10 MHz Middle]



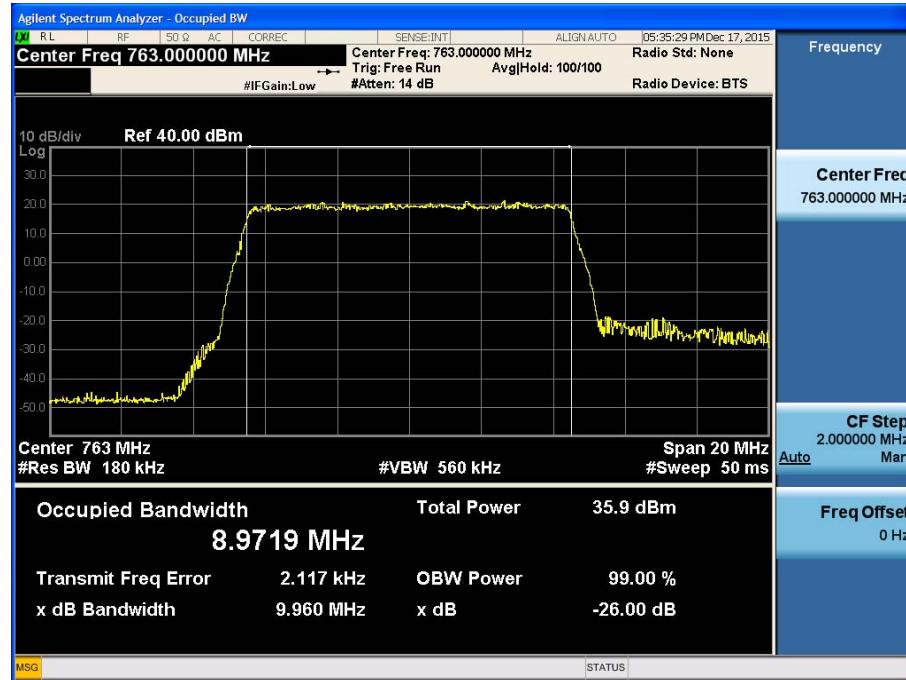
[700 Band AGC threshold Downlink Output LTE 5 MHz Low]



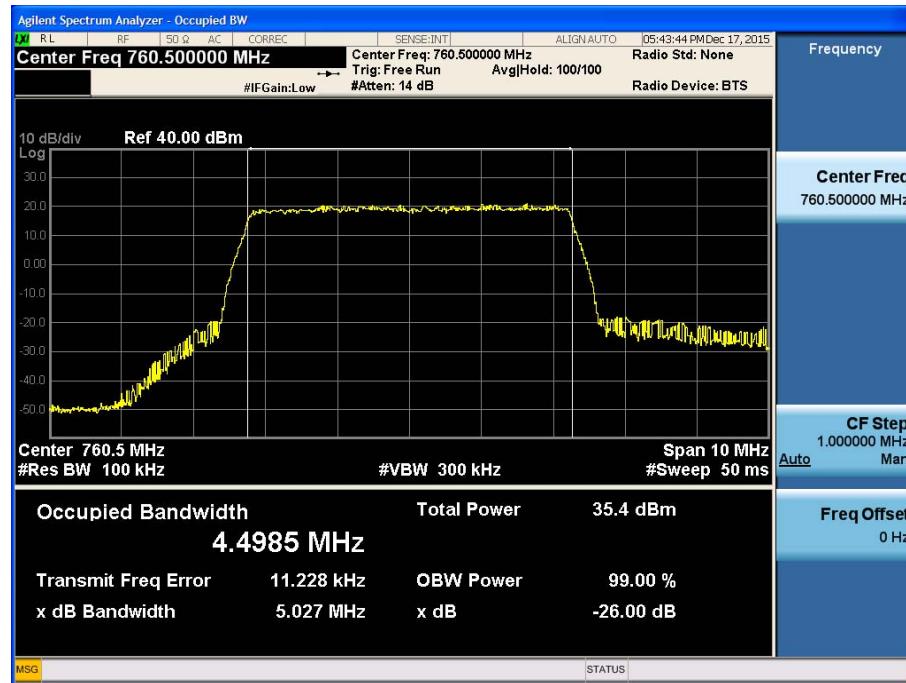
### [700 Band AGC threshold Downlink Output LTE 5 MHz High]



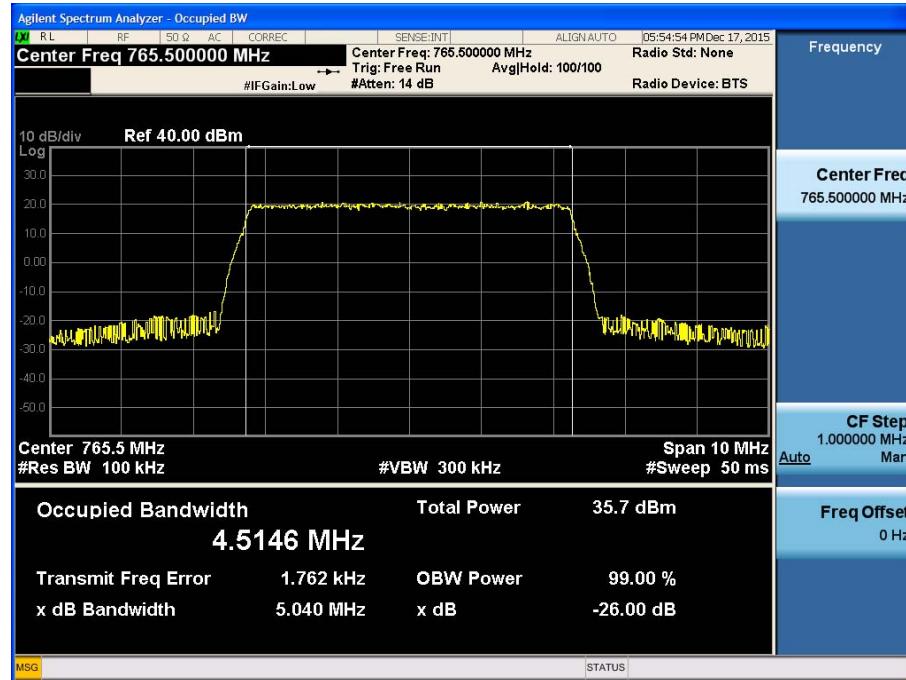
### [700 Band AGC threshold Downlink Output LTE 10 MHz Middle]

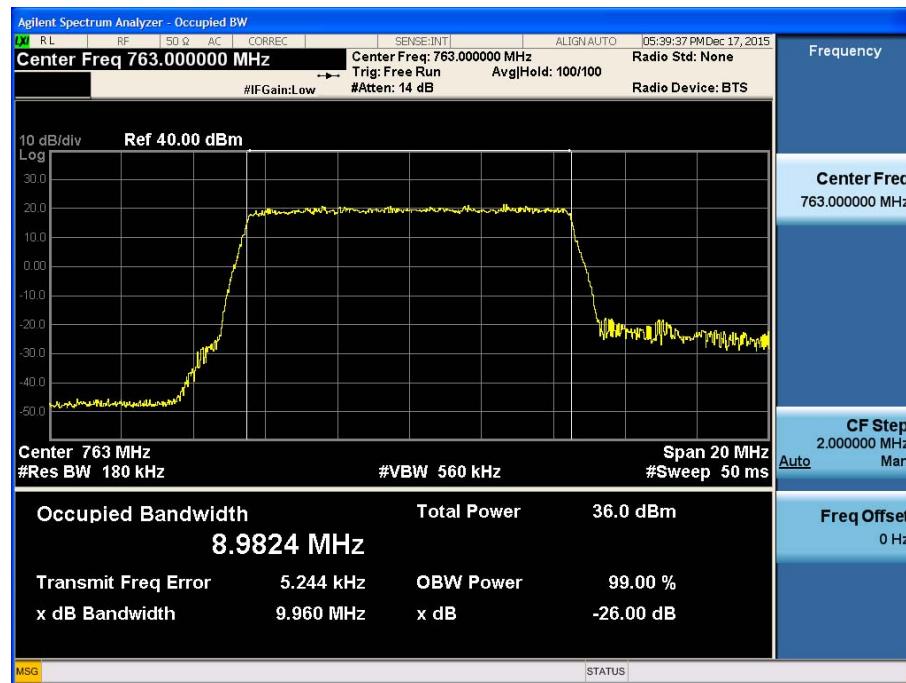
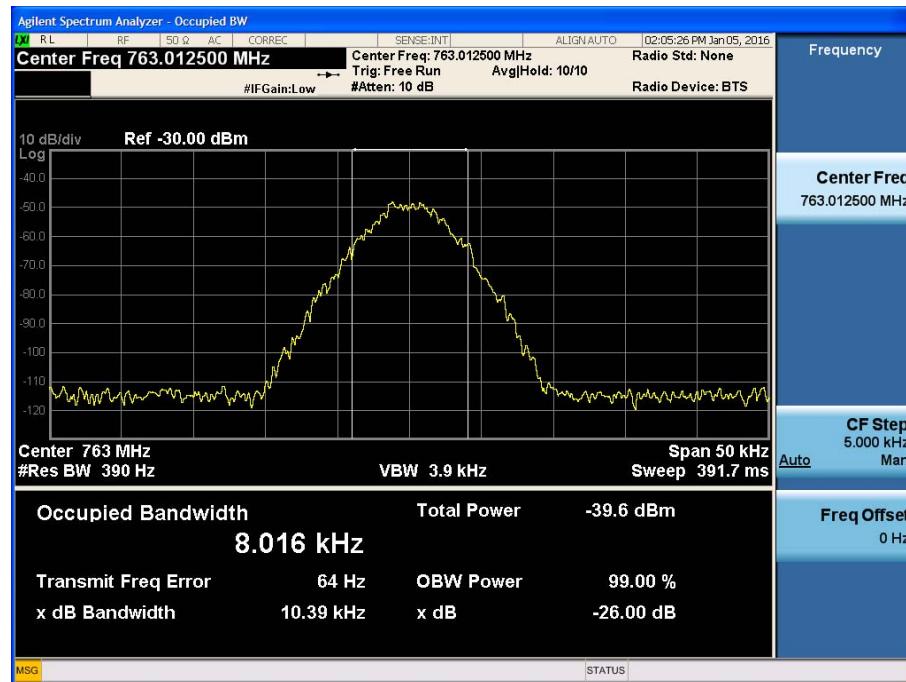


**[700 Band +3 dB above the AGC threshold Downlink Output LTE 5 MHz Low]**

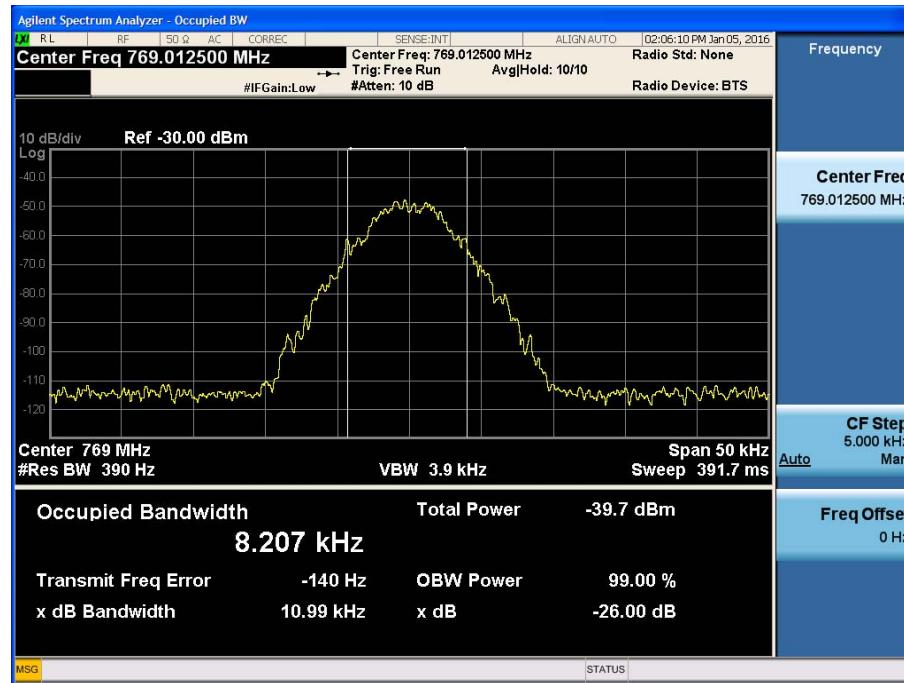


**[700 Band +3 dB above the AGC threshold Downlink Output LTE 5 MHz High]**

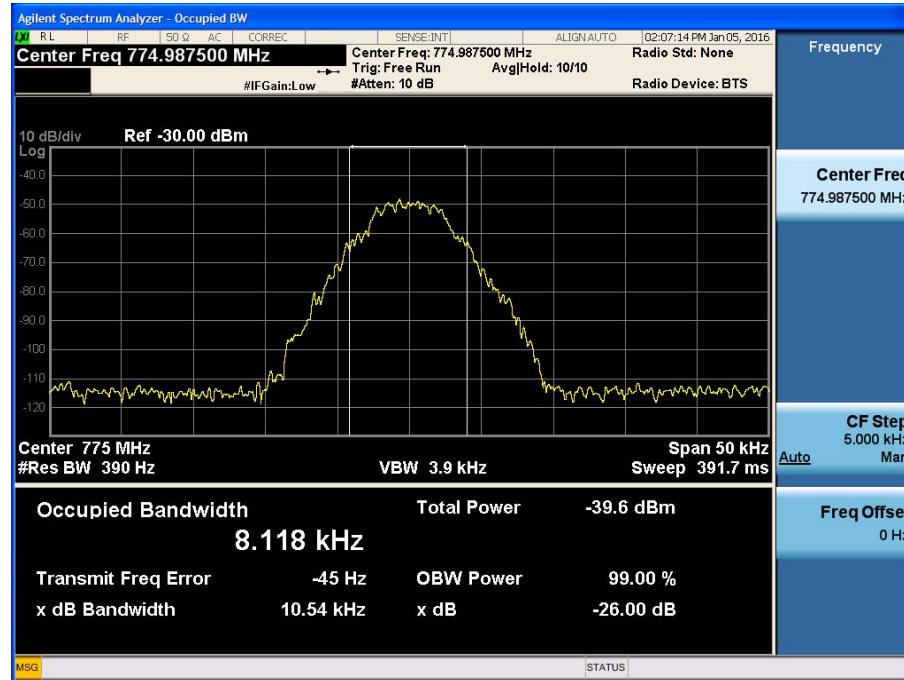


**[700 Band +3 dB above the AGC threshold Downlink Output LTE 10 MHz Middle]**

**700 MHz Band\_P25, FM DL**
**[700 Band AGC threshold Downlink Input P25 Low]**


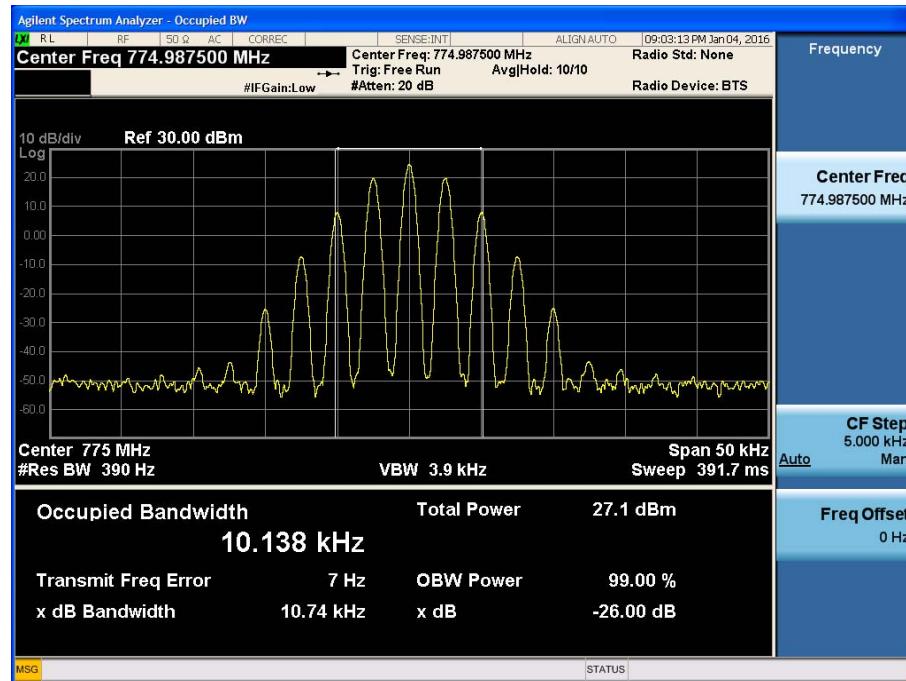
### [700 Band AGC threshold Downlink Input P25 Middle]



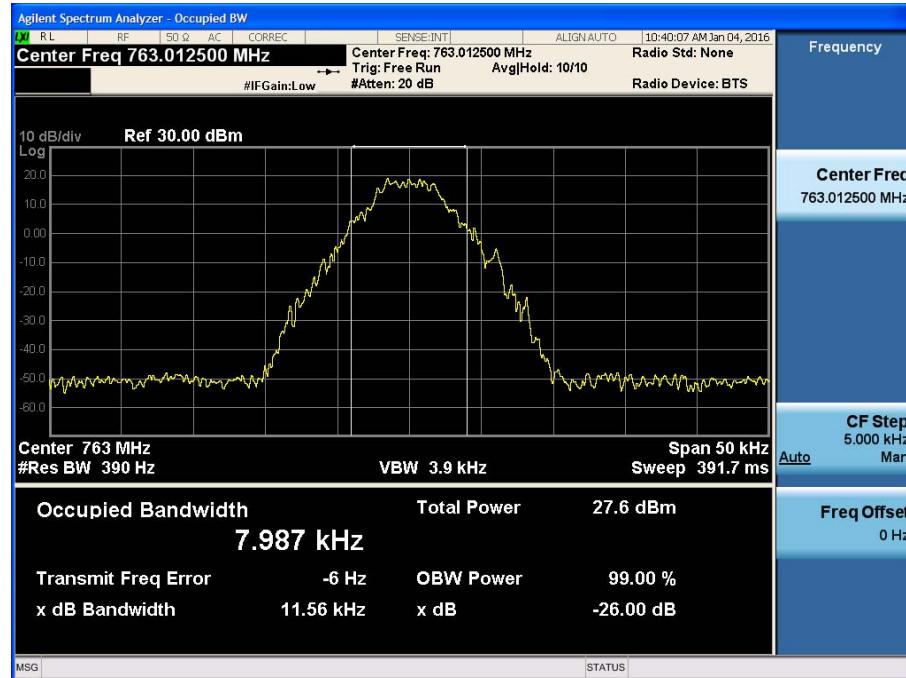
### [700 Band AGC threshold Downlink Input P25 High]



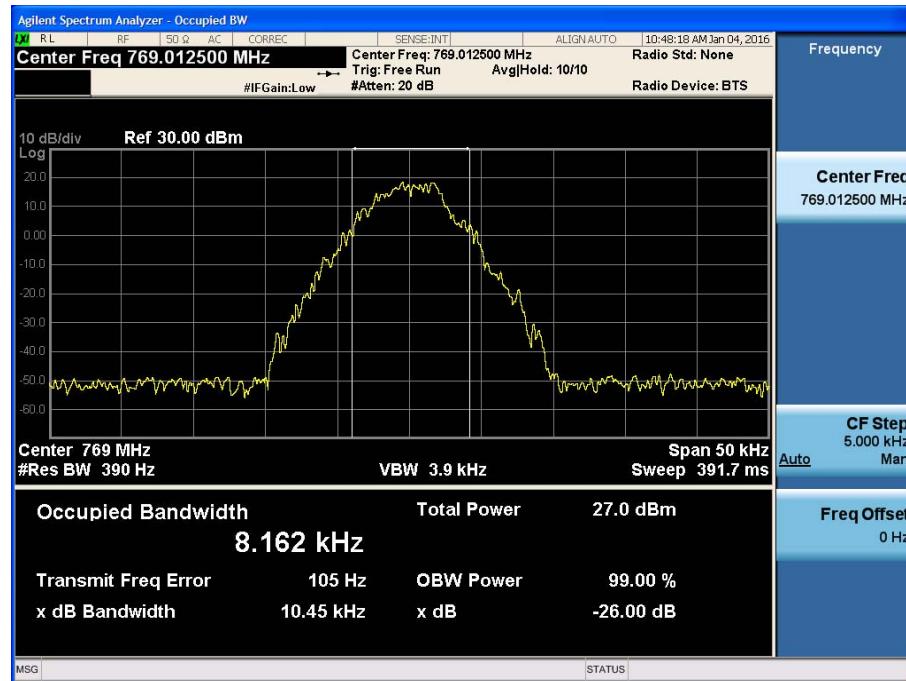
### [700 Band AGC threshold Downlink Output FM High]



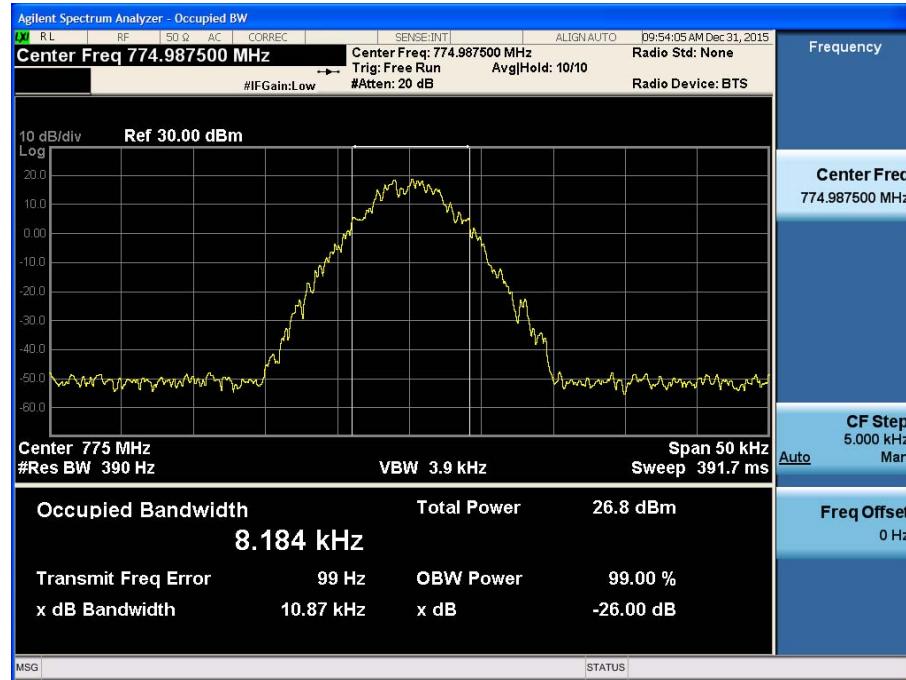
### [700 Band +3 dB above the AGC threshold Downlink Output P25 Low]



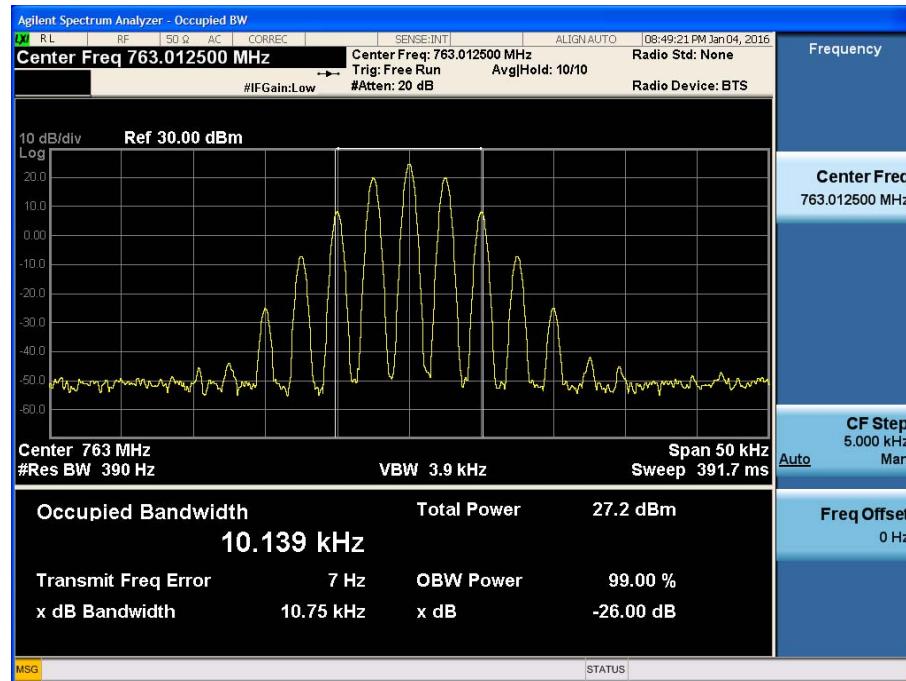
[700 Band +3 dB above the AGC threshold Downlink Output P25 Middle]



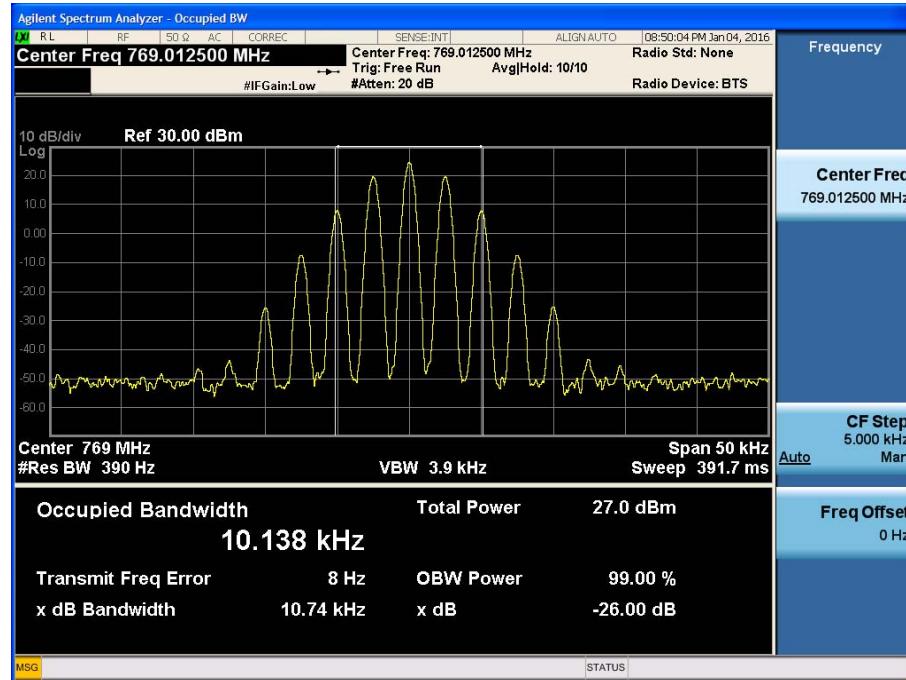
[700 Band +3 dB above the AGC threshold Downlink Output P25 High]



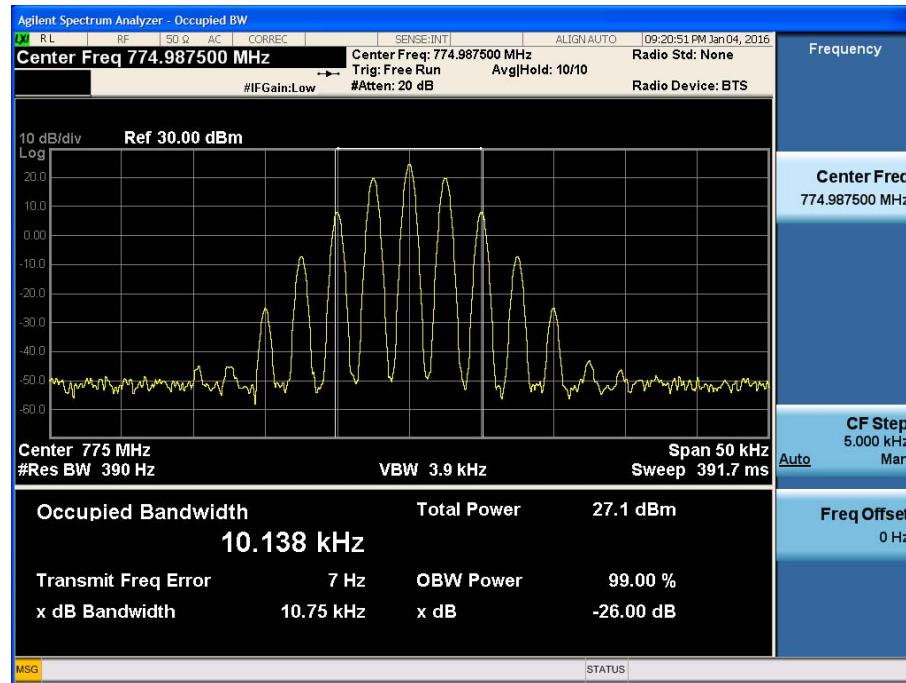
**[700 Band +3 dB above the AGC threshold Downlink Output FM Low]**



**[700 Band +3 dB above the AGC threshold Downlink Output FM Middle]**

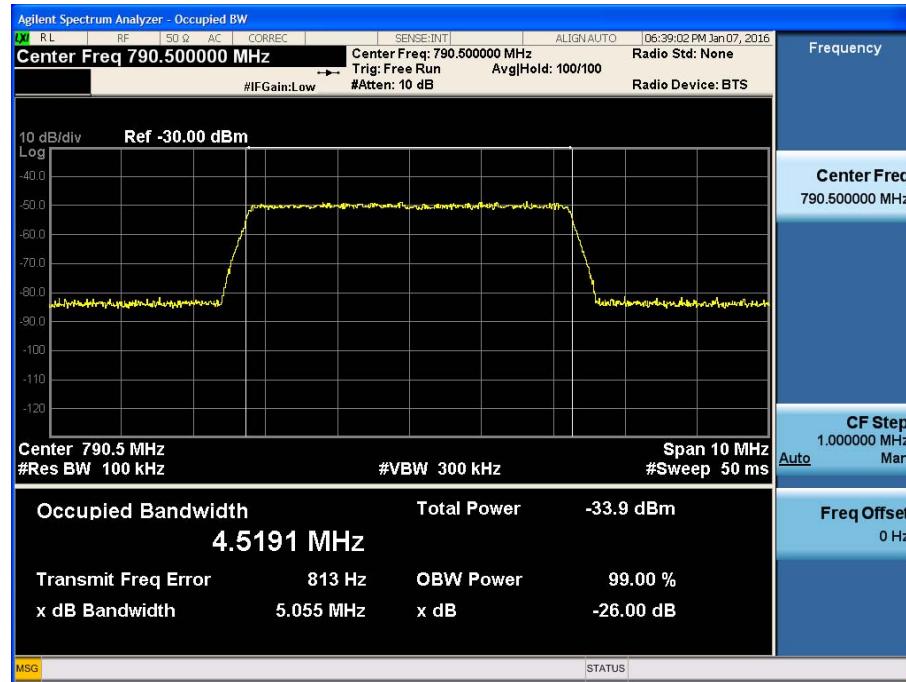


[700 Band +3 dB above the AGC threshold Downlink Output FM High]

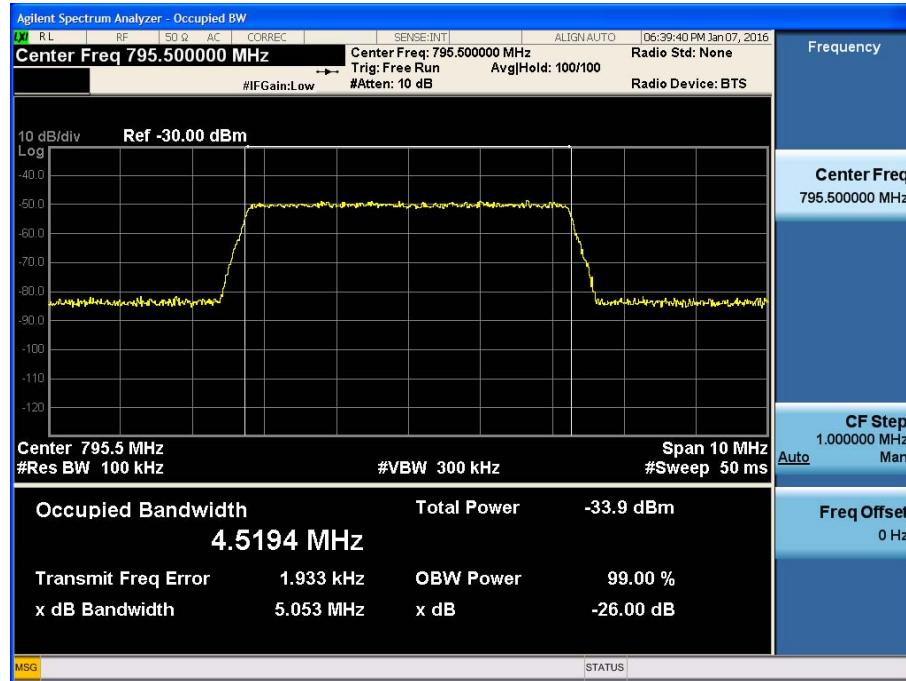


## 700 MHz Band\_LTE UL

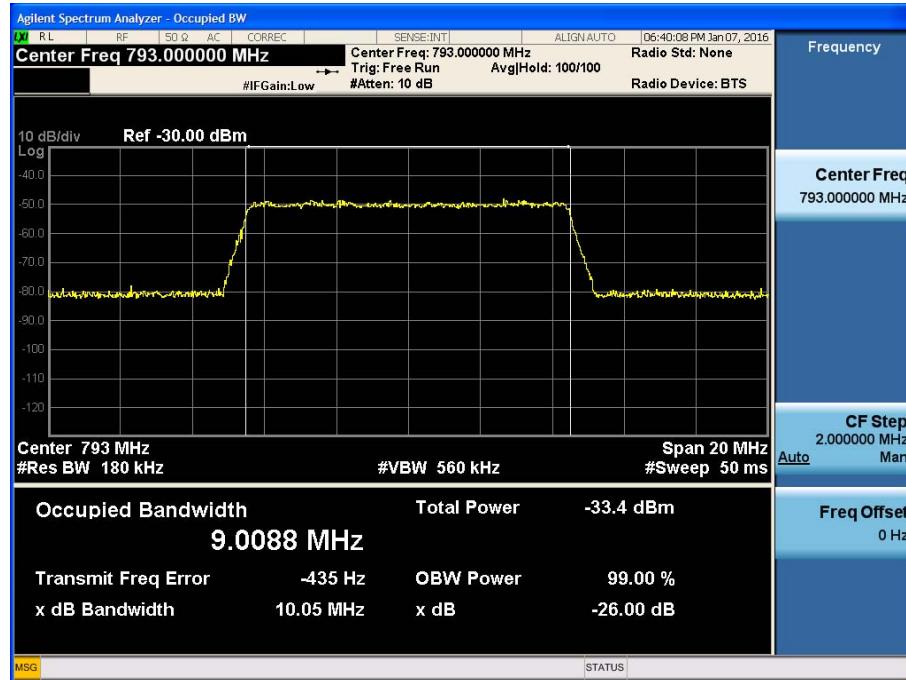
[700 Band AGC threshold Uplink Input LTE 5 MHz Low]



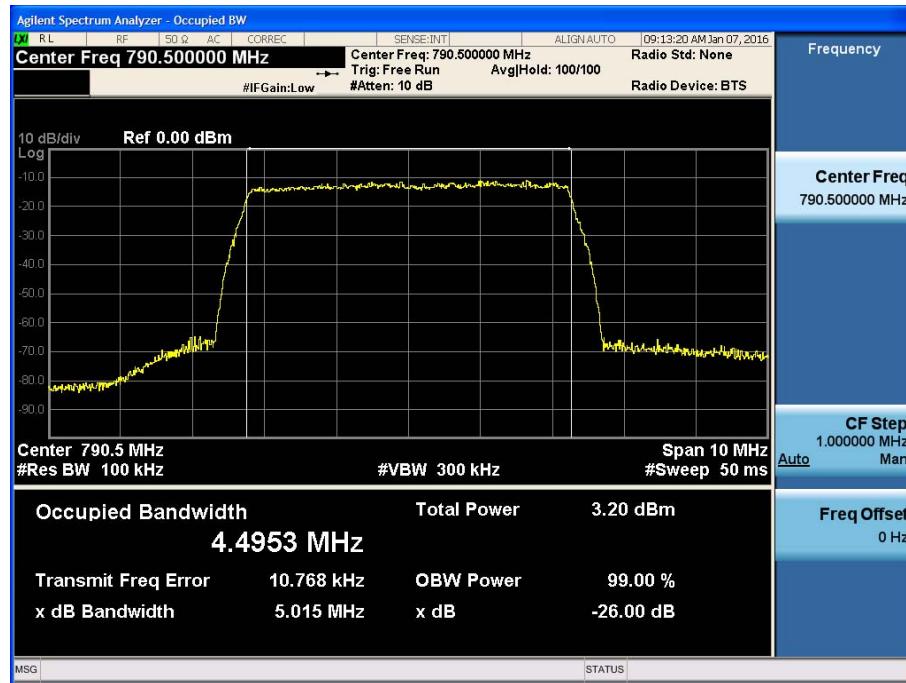
## [700 Band AGC threshold Uplink Input LTE 5 MHz High]



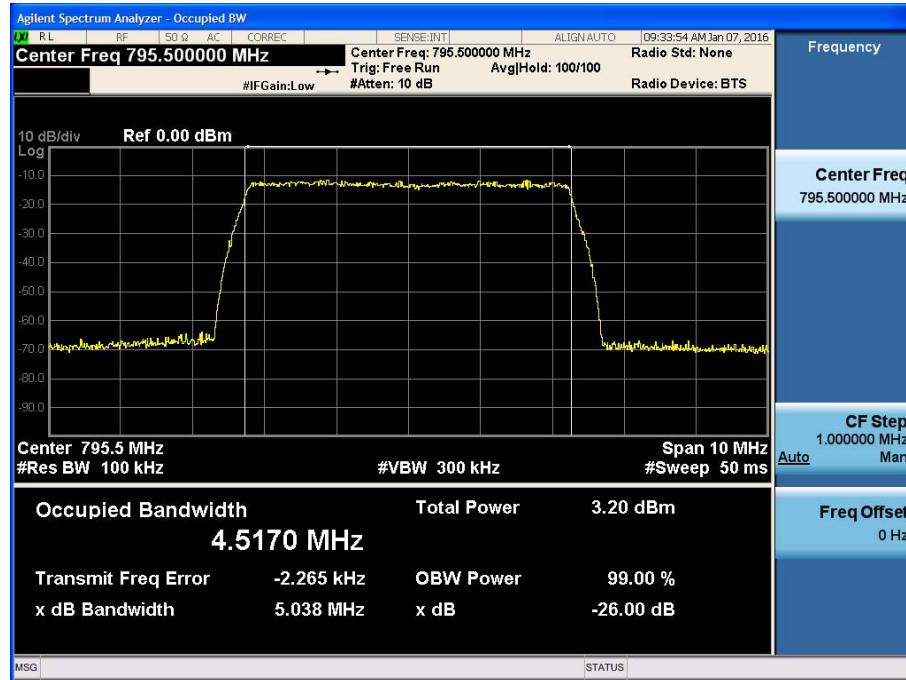
## [700 Band AGC threshold Uplink Input LTE 10 MHz Middle]



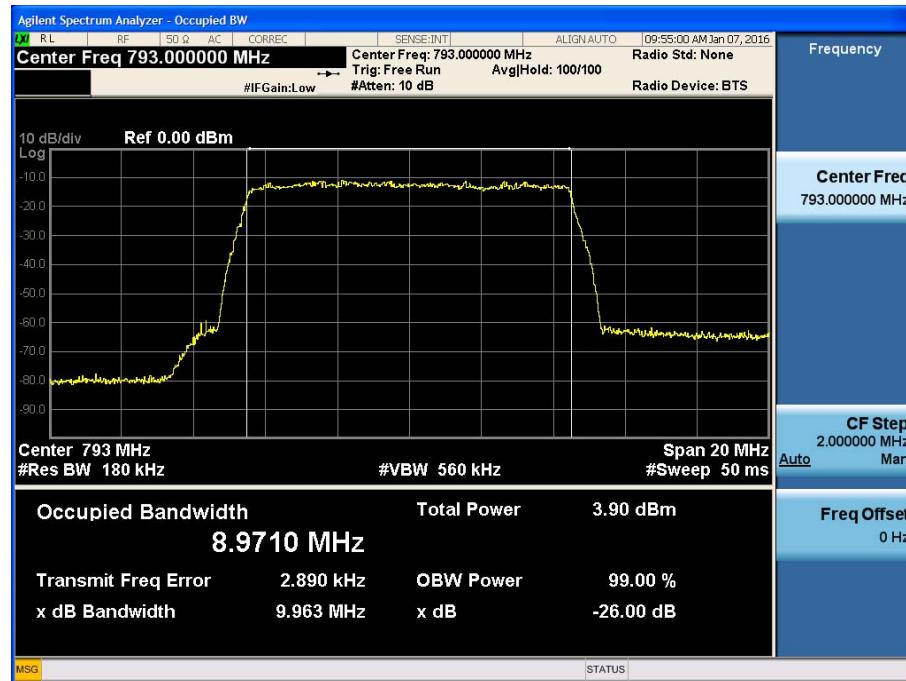
## [700 Band AGC threshold Uplink Output LTE 5 MHz Low]



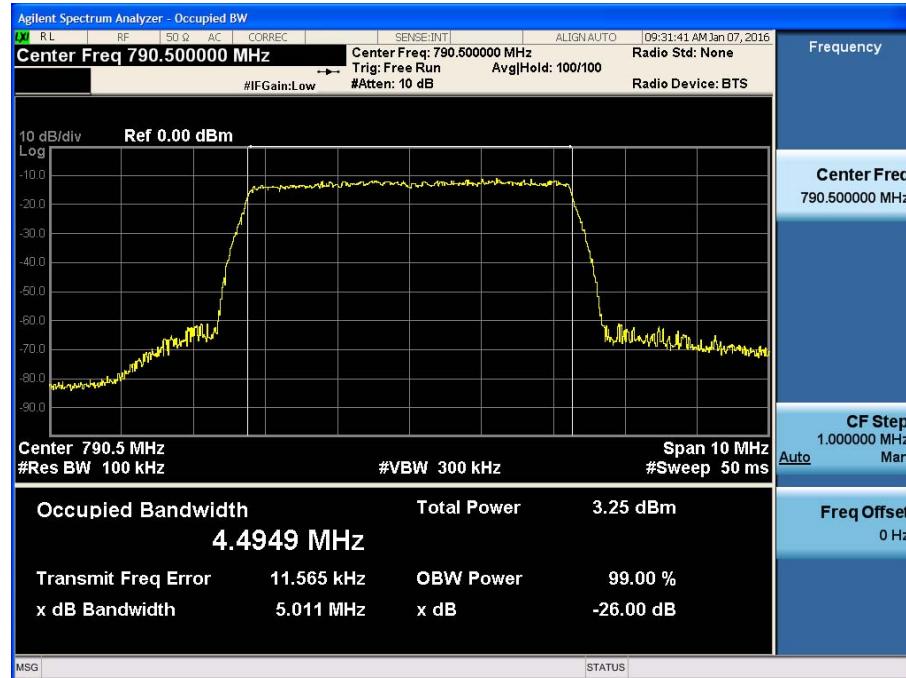
[700 Band AGC threshold Uplink Output LTE 5 MHz High]



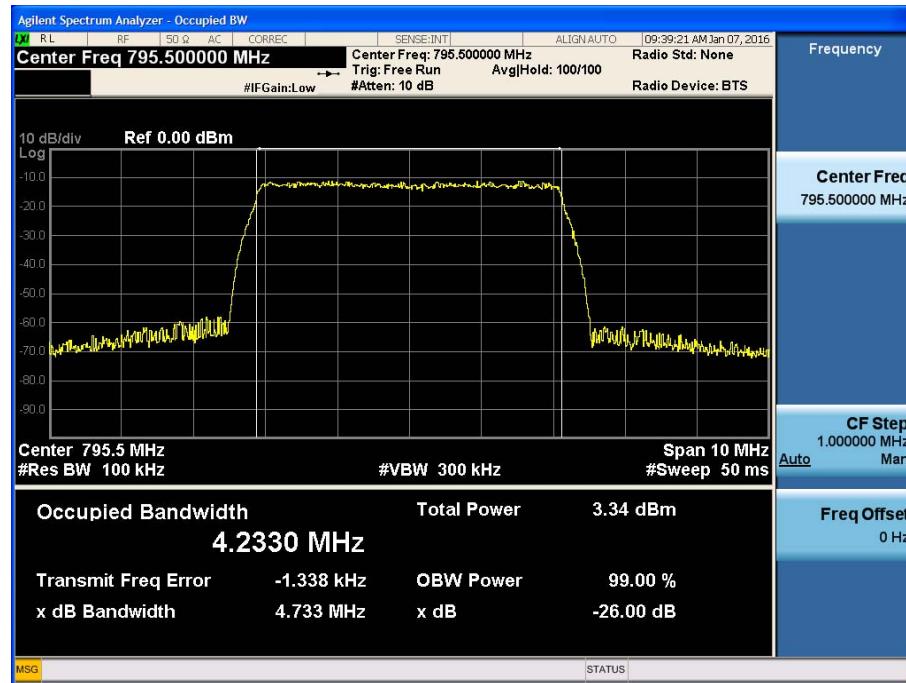
### [700 Band AGC threshold Uplink Output LTE 10 MHz Middle]



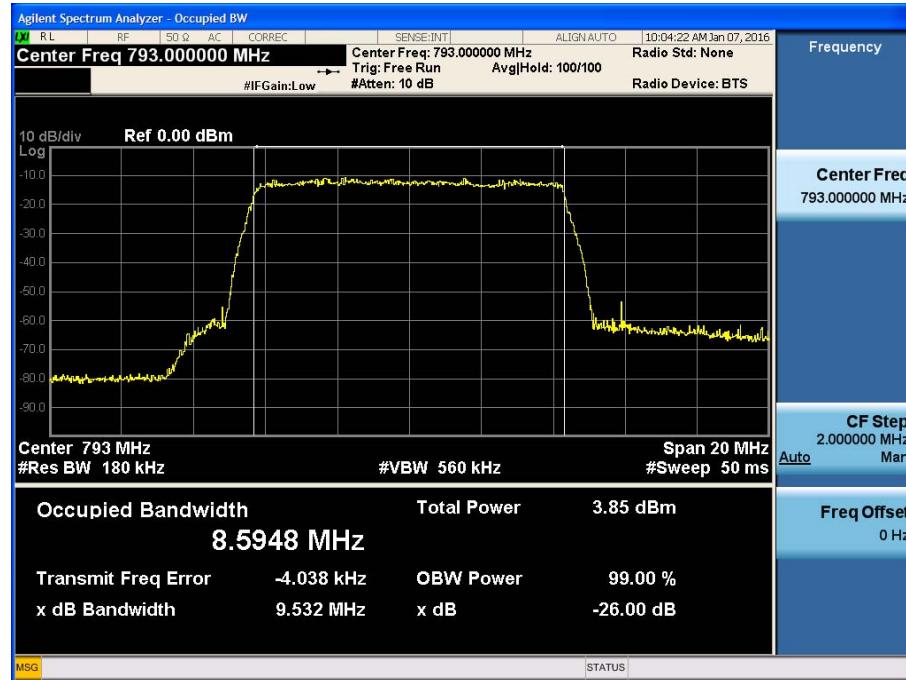
### [700 Band +3 dB above the AGC threshold Uplink Output LTE 5 MHz Low]



[700 Band +3 dB above the AGC threshold Uplink Output LTE 5 MHz High]

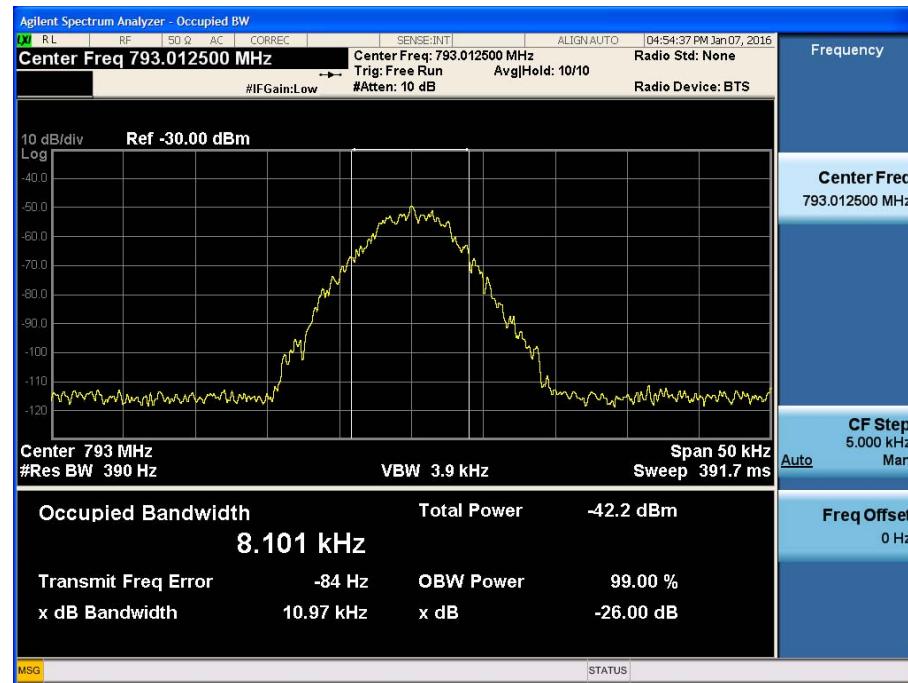


[700 Band +3 dB above the AGC threshold Uplink Output LTE 10 MHz Middle]

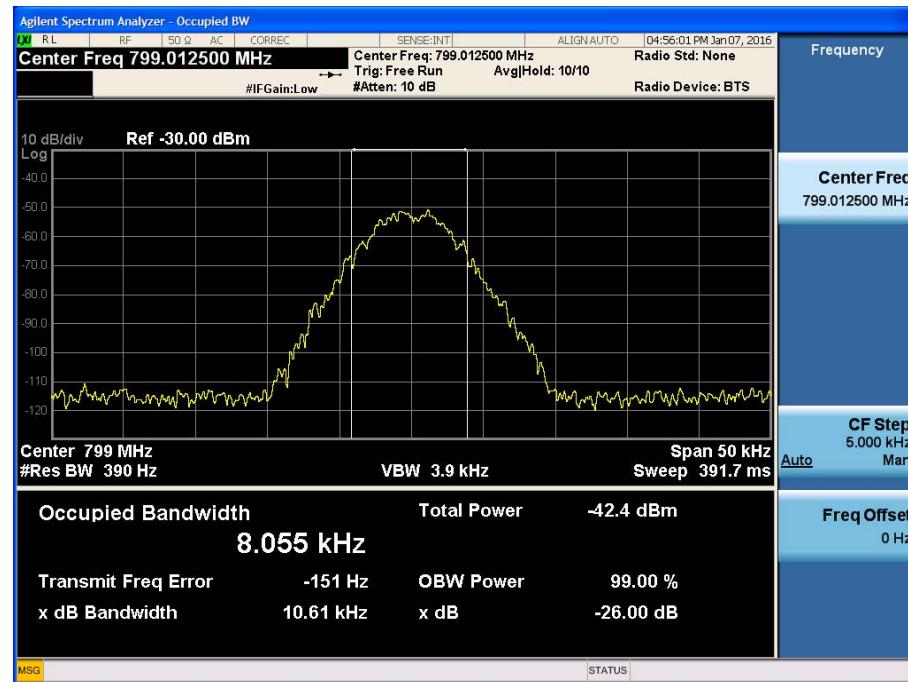


## 700 MHz Band\_P25, FM UL

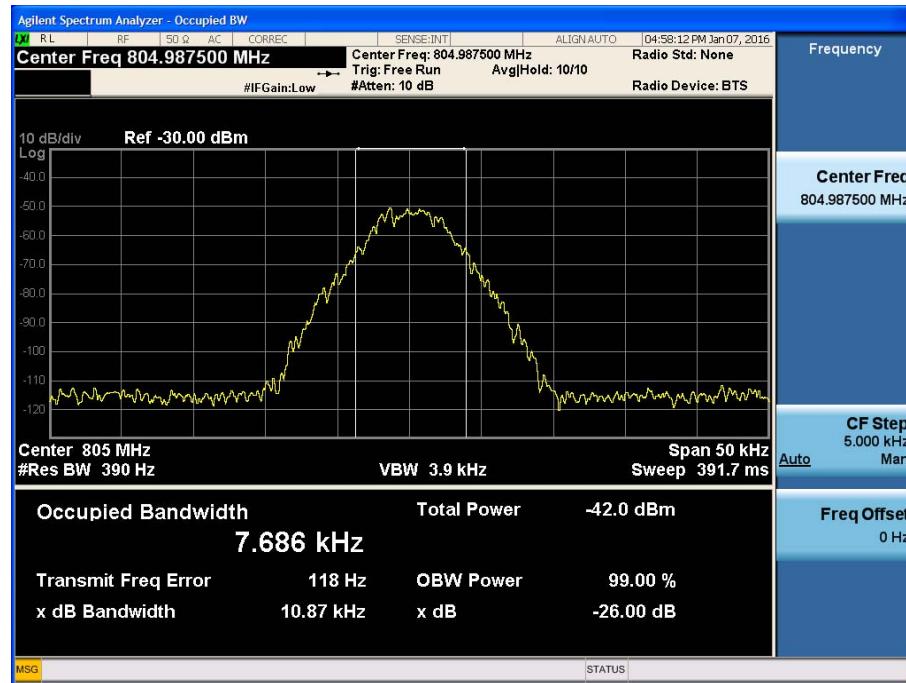
### [700 Band AGC threshold Uplink Input P25 Low]



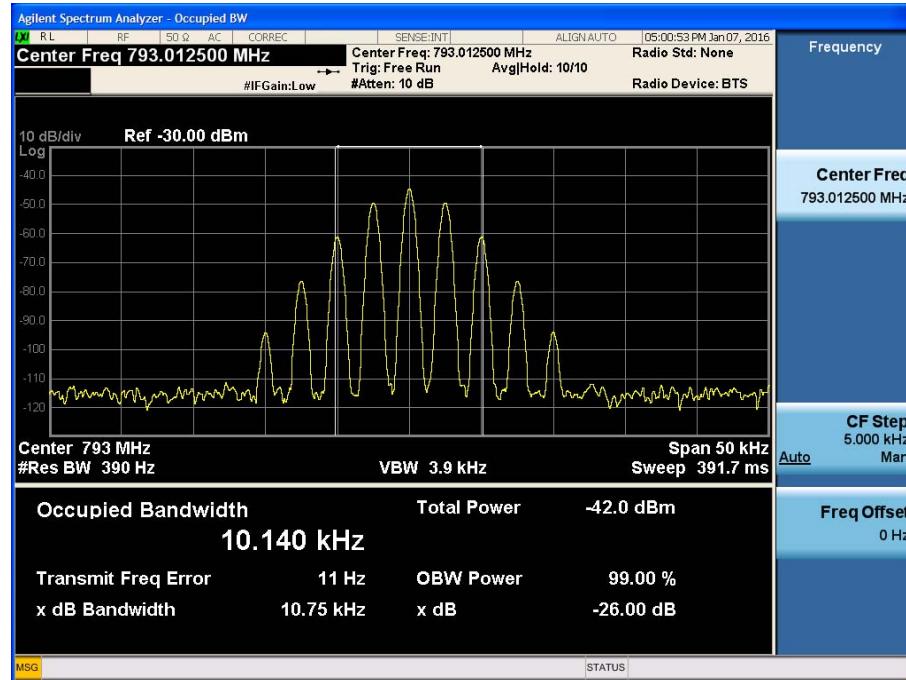
### [700 Band AGC threshold Uplink Input P25 Middle]



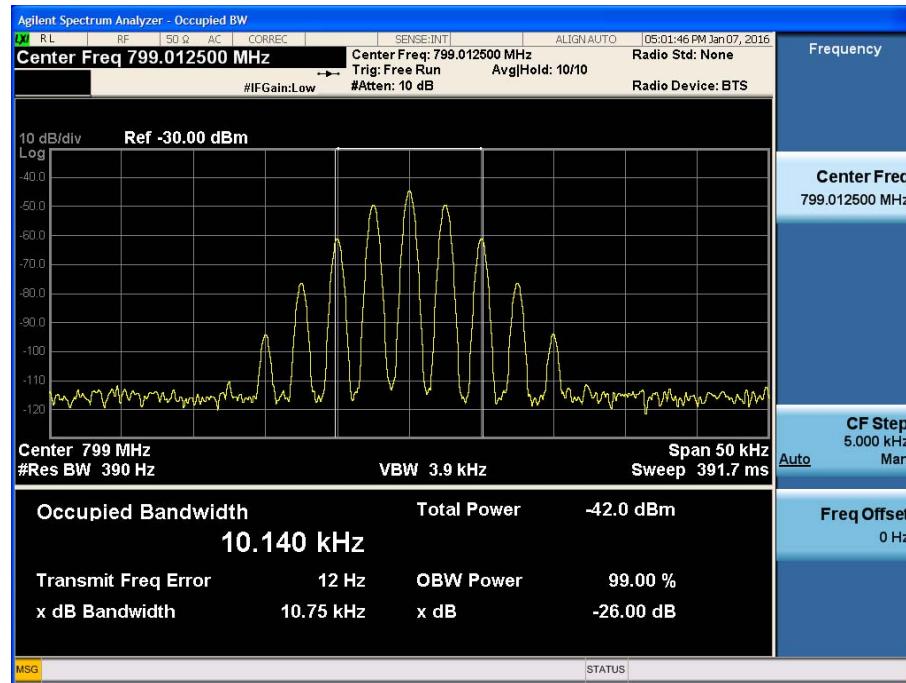
### [700 Band AGC threshold Uplink Input P25 High]



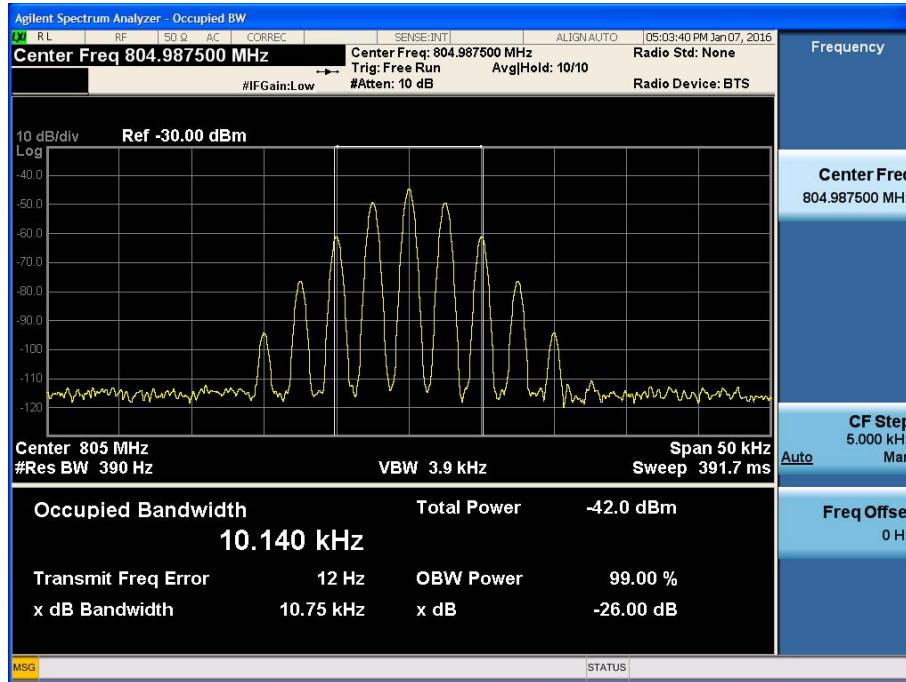
### [700 Band AGC threshold Uplink Input FM Low]



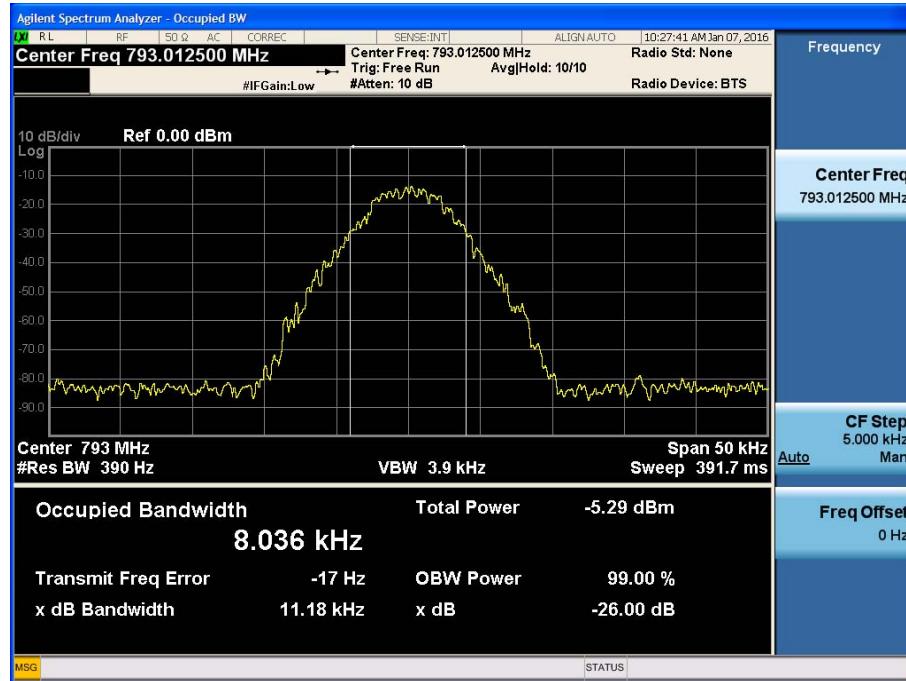
### [700 Band AGC threshold Uplink Input FM Middle]



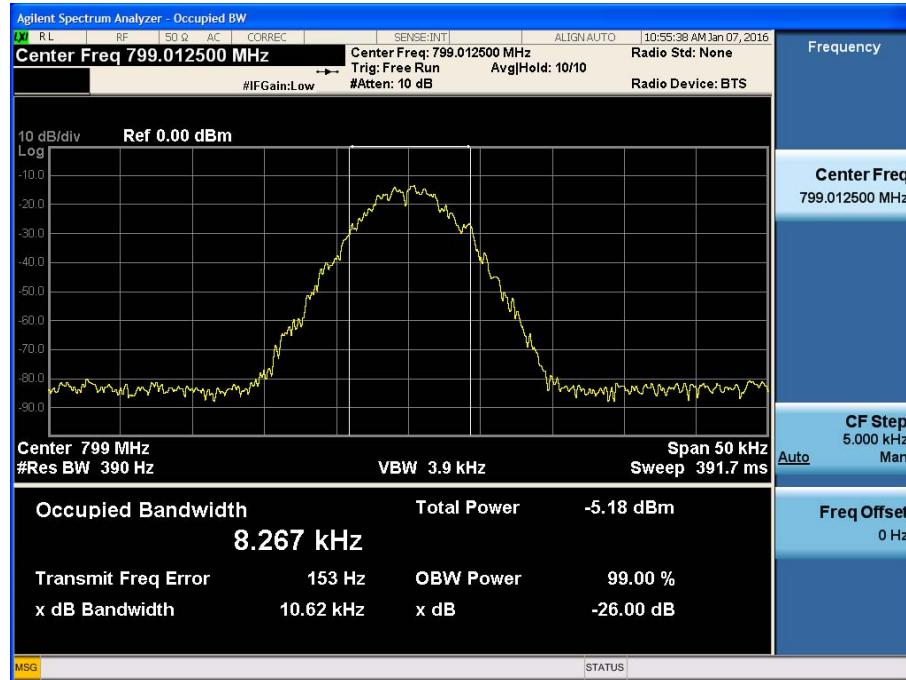
### [700 Band AGC threshold Uplink Input FM High]



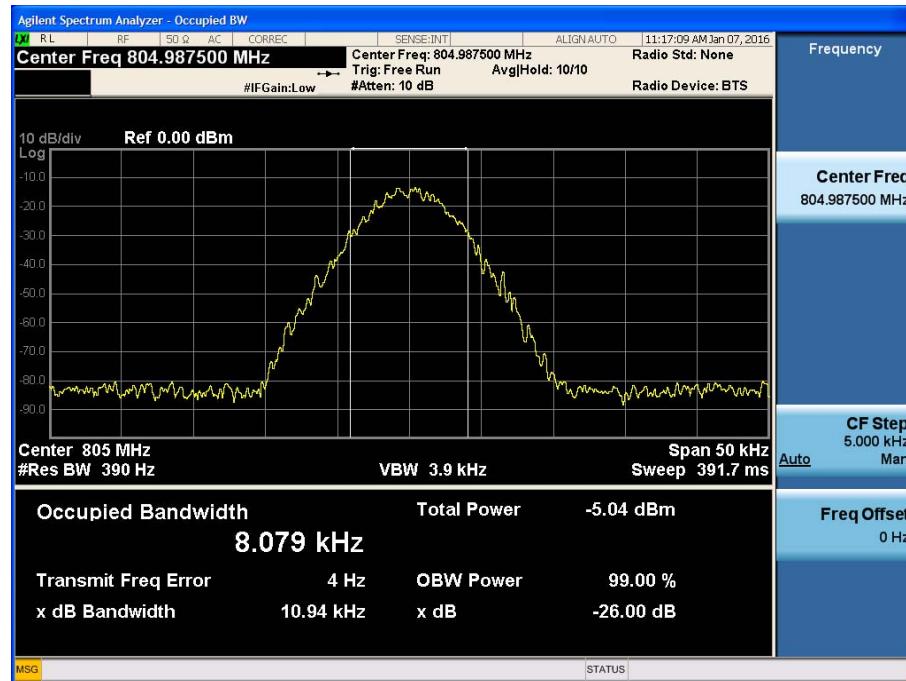
[700 Band AGC threshold Uplink Output P25 Low]



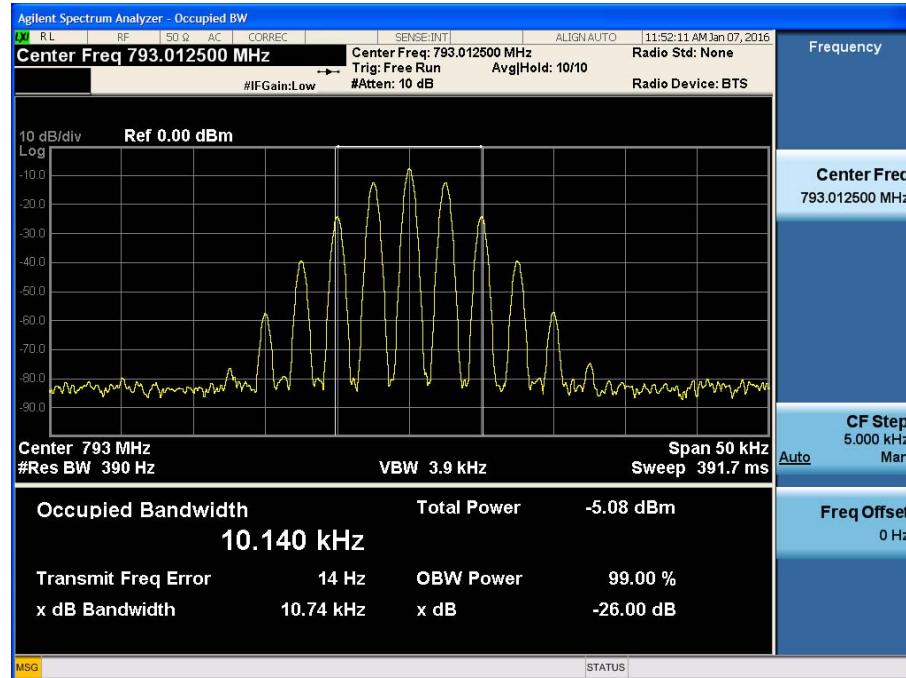
[700 Band AGC threshold Uplink Output P25 Middle]



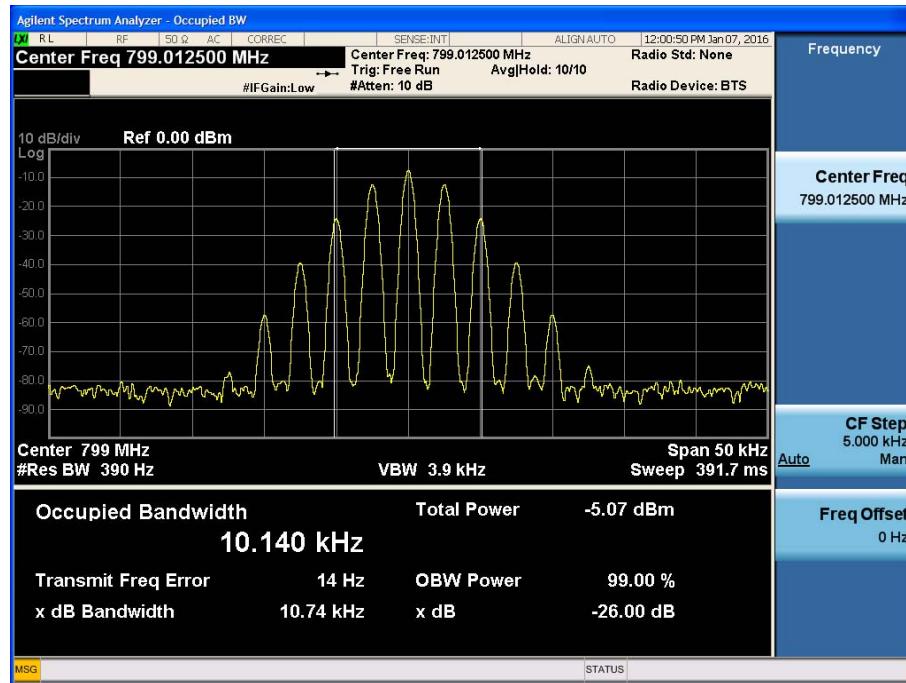
### [700 Band AGC threshold Uplink Output P25 High]



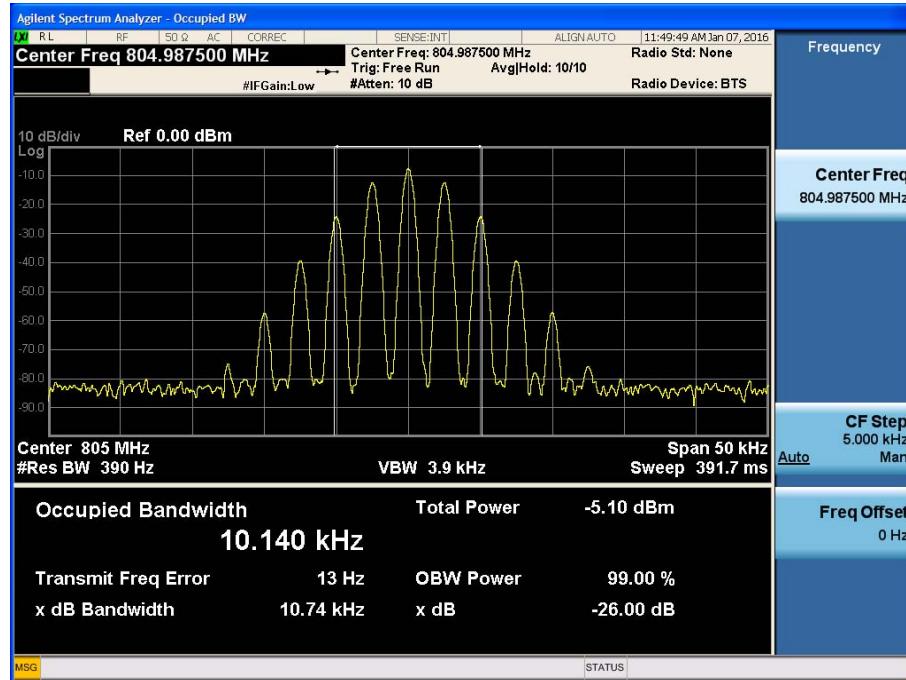
### [700 Band AGC threshold Uplink Output FM Low]



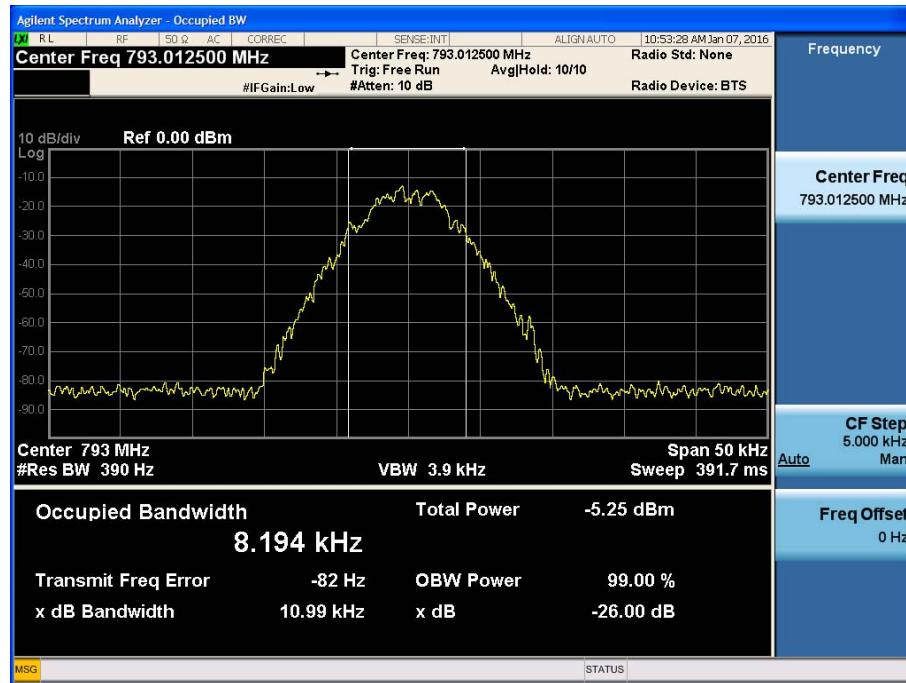
[700 Band AGC threshold Uplink Output FM Middle]



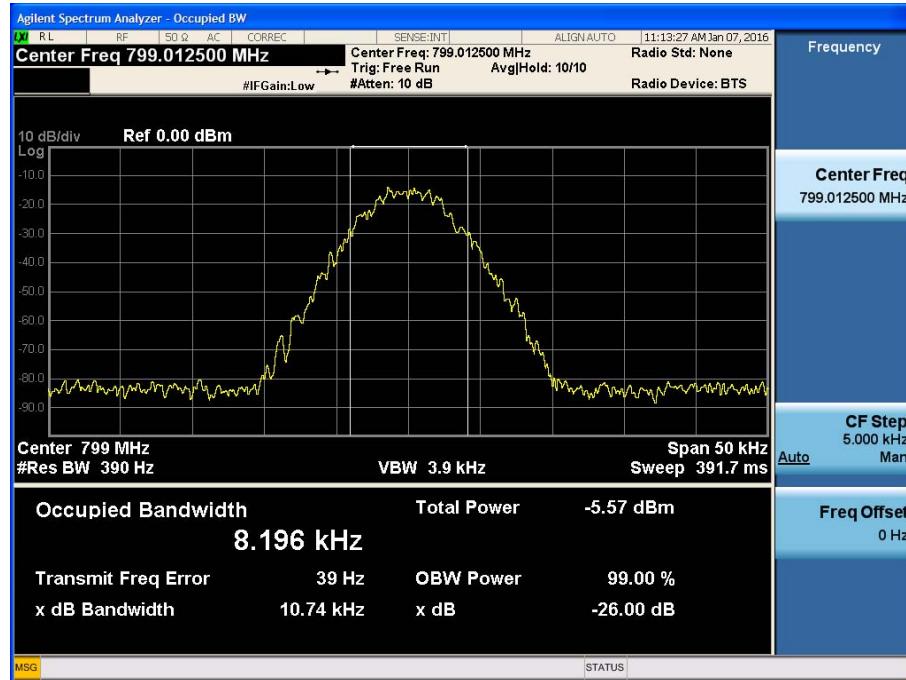
## [700 Band AGC threshold Uplink Output FM High]



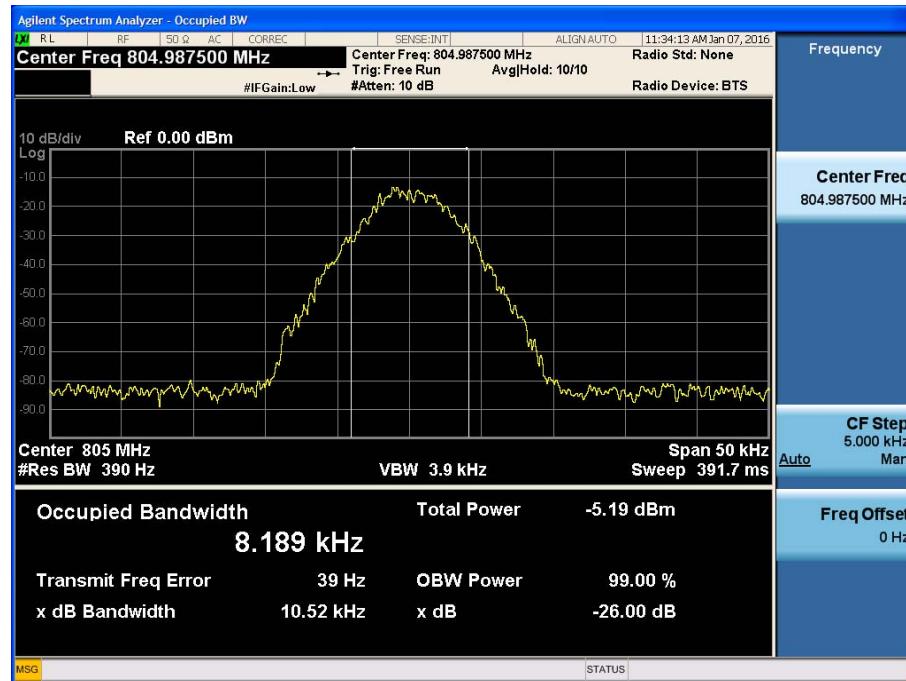
[700 Band +3 dB above the AGC threshold Uplink Output P25 Low]



## [700 Band +3 dB above the AGC threshold Uplink Output P25 Middle]



[700 Band +3 dB above the AGC threshold Uplink Output P25 High]



[700 Band +3 dB above the AGC threshold Uplink Output FM Low]

