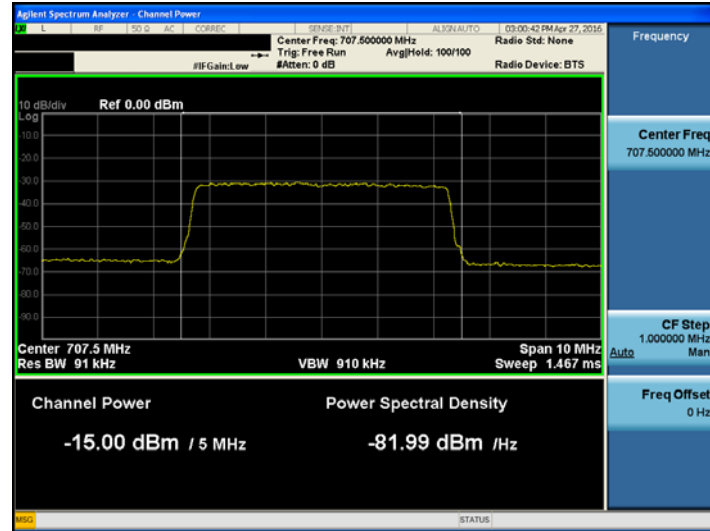
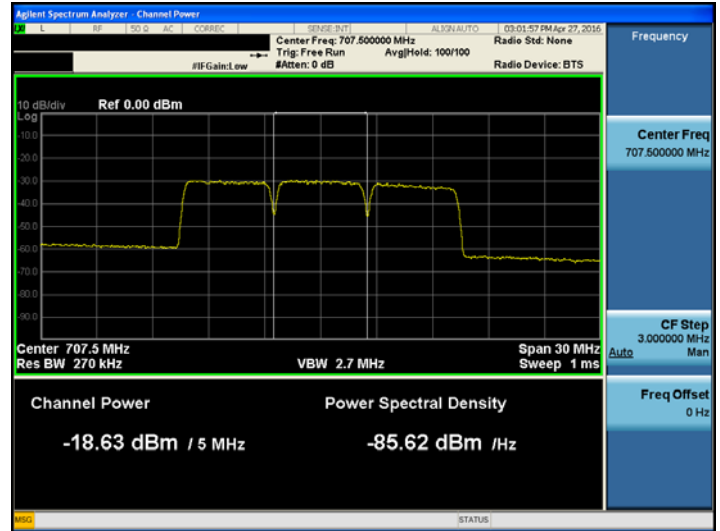


**Uplink**

**[700MHz\_Lower Band 1 Carrier Mid]**



**[700MHz\_Lower Band 3 Carrier Mid]**

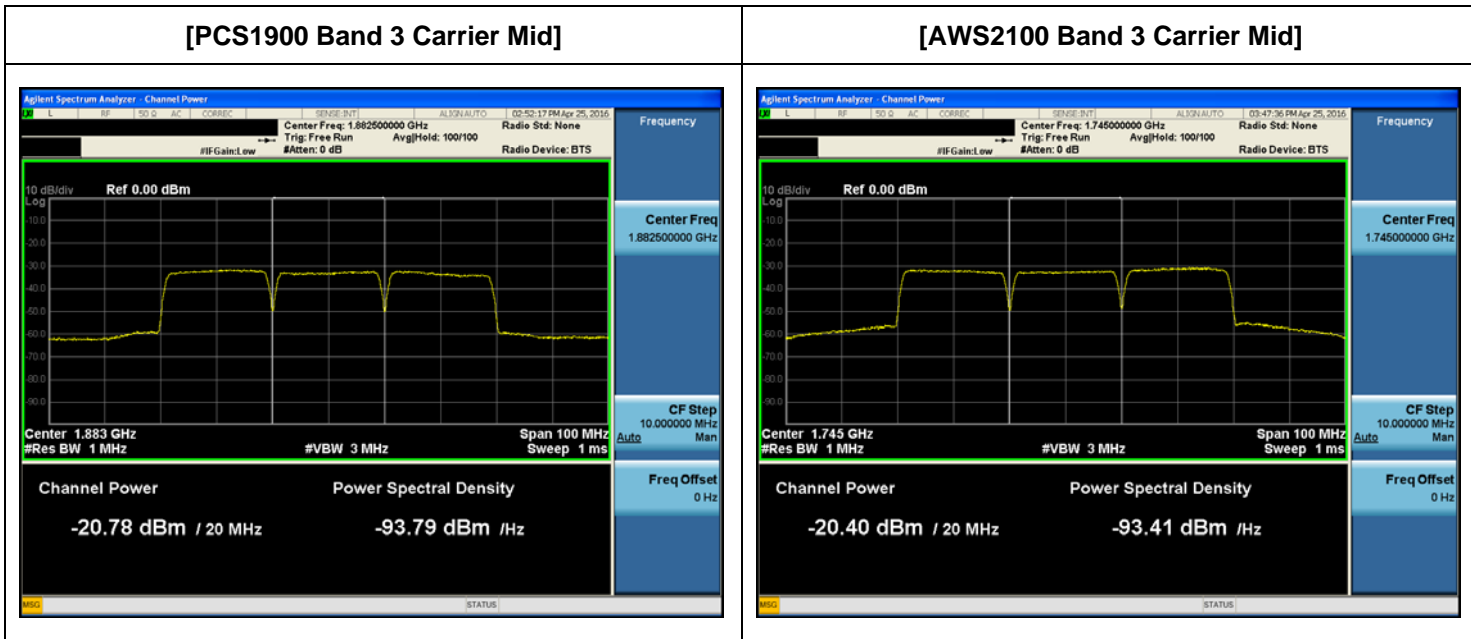


**[SMR800/850 Cellular Band 1 Carrier Mid]**



**[SMR800/850 Cellular Band 3 Carrier Mid]**





## 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  $\geq 3 \times \text{RBW}$ .
- 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  $[10 \log (\text{OBW} / \text{RBW})]$  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.

**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.

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

Input Signal	Input Level (dBm)	Maximum Amp Gain
700 MHz	DL : 0 dBm	DL : 33 dB
SMR800&Celluar	UL : -45 dBm	UL : 30 dB
PCS 1900	DL : 0 dBm	DL : 37 dB
AWS 2100	UL : -45 dBm	UL : 30 dB

**[Downlink Output]**

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (MHz)</b>
700 Band_ LTE 10 MHz (Lower) AGC threshold	Low	734.00	8.9678
	Middle	-	-
	High	741.00	8.9747
700 Band_ LTE 10 MHz (Lower) +3dBm above the AGC threshold	Low	734.00	8.9730
	Middle	-	-
	High	741.00	8.9775
700 Band_ LTE 10 MHz (Upper) AGC threshold	Low	-	-
	Middle	751.00	8.9737
	High	-	-
700 Band_ LTE 10 MHz (Upper) +3dBm above the AGC threshold	Low	-	-
	Middle	751.00	8.9802
	High	-	-

	Channel	Frequency (MHz)	OBW (MHz)
SMR800& Cellular Band_5MHz (862MHz~869MHz) AGC threshold	Low	864.50	4.4874
	Middle	-	-
	High	866.50	4.4888
SMR800& Cellular Band_5MHz (862MHz~869MHz) +3dBm above the AGC threshold	Low	864.50	4.4902
	Middle	-	-
	High	866.50	4.4916
SMR800& Cellular Band_10MHz (869MHz~894MHz) AGC threshold	Low	874.00	8.9612
	Middle	881.50	8.9790
	High	889.00	8.9666
SMR800& Cellular Band_10MHz (869MHz~894MHz) +3dBm above the AGC threshold	Low	874.00	8.9640
	Middle	881.50	8.9858
	High	889.00	8.9783

	Channel	Frequency (MHz)	OBW (MHz)
PCS 1900 Band_ AGC threshold	Low	1940.00	17.845
	Middle	1962.50	17.916
	High	1985.00	17.902
PCS 1900 Band_ +3dBm above the AGC threshold	Low	1940.00	17.847
	Middle	1962.50	17.914
	High	1985.00	17.894
AWS 2100 Band_ LTE 20 MHz AGC threshold	Low	2120.00	17.936
	Middle	2145.00	17.917
	High	2170.00	17.908
AWS 2100 Band_ LTE 20 MHz +3dBm above the AGC threshold	Low	2120.00	17.909
	Middle	2145.00	17.912
	High	2170.00	17.921

[Downlink Input]

	Channel	Frequency (MHz)	OBW (MHz)
700 Band_ LTE 10 MHz (Lower) AGC threshold	Low	734.00	8.9692
	Middle	-	-
	High	741.00	8.9711
700 Band_ LTE 10 MHz (Lower) +3dBm above the AGC threshold	Low	734.00	8.9797
	Middle	-	-
	High	741.00	8.9660
700 Band_ LTE 10 MHz (Upper) AGC threshold	Low	-	-
	Middle	751.00	8.9864
	High	-	-
700 Band_ LTE 10 MHz (Upper) +3dBm above the AGC threshold	Low	-	-
	Middle	751.00	8.9814
	High	-	-



	Channel	Frequency (MHz)	OBW (MHz)
SMR800& Cellular Band (862 MHz~869 MHz) 5MHz AGC threshold	Low	864.50	4.4950
	-	-	-
	High	866.50	4.4943
SMR800& Cellular Band (862 MHz~869 MHz) 5MHz 3dB above the threshold	Low	864.50	4.4878
	-	-	-
	High	866.50	4.4907
SMR800& Cellular Band (869 MHz~894 MHz) 10MHz AGC threshold	Low	874.00	8.9709
	Middle	881.50	8.9687
	High	889.00	8.9937
SMR800& Cellular Band (869 MHz~894 MHz) 10MHz 3dB above the threshold	Low	874.00	8.9819
	Middle	881.50	8.9817
	High	889.00	8.9576

	Channel	Frequency (MHz)	OBW (MHz)
PCS 1900 AGC threshold	Low	1940.00	17.937
	Middle	1962.50	17.915
	High	1985.00	17.893
PCS 1900 3dB above the threshold	Low	1940.00	17.913
	Middle	1962.50	17.928
	High	1985.00	17.906
AWS 2100 LTE 20MHz AGC threshold	Low	2120.00	17.906
	Middle	2145.00	17.888
	High	2170.00	17.907
AWS 2100 LTE 20MHz 3dB above the threshold	Low	2120.00	17.917
	Middle	2145.00	17.904
	High	2170.00	17.900

**[Uplink Output]**

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (MHz)</b>
700 Band_ LTE 10 MHz (Lower) AGC threshold	Low	704.00	8.988
	Middle	-	-
	High	711.00	8.965
700 Band_ LTE 10 MHz (Lower) +3dBm above the AGC threshold	Low	704.00	8.966
	Middle	-	-
	High	711.00	8.967
700 Band_ LTE 10 MHz (Upper) AGC threshold	Low	-	-
	Middle	782.00	8.998
	High	-	-
700 Band_ LTE 10 MHz (Upper) +3dBm above the AGC threshold	Low	-	-
	Middle	782.00	8.993
	High	-	-

	Channel	Frequency (MHz)	OBW (MHz)
SMR800& Cellular Band_ LTE 5MHz AGC threshold	Low	819.50	4.4897
	Middle	-	-
	High	821.50	4.4948
SMR800& Cellular Band_ LTE 5MHz +3dBm above the AGC threshold	Low	819.50	4.4883
	Middle	-	-
	High	821.50	4.4945
SMR800& Cellular Band_ LTE 10 MHz AGC threshold	Low	829.00	8.9887
	Middle	836.50	8.9740
	High	844.00	8.9771
SMR800& Cellular Band_ LTE 10 MHz +3dBm above the AGC threshold	Low	829.00	8.9630
	Middle	836.50	8.9811
	High	844.00	8.9627

	Channel	Frequency (MHz)	OBW (MHz)
PCS 1900 Band_ LTE 20MHz AGC threshold	Low	1860.00	17.890
	Middle	1882.50	17.932
	High	1905.00	17.943
PCS 1900 Band_ LTE 20MHz +3dBm above the AGC threshold	Low	1860.00	17.884
	Middle	1882.50	17.949
	High	1905.00	17.945
AWS 2100 Band_ LTE 20 MHz AGC threshold	Low	1720.00	17.907
	Middle	1745.00	17.956
	High	1770.00	17.941
AWS 2100 Band_ LTE 20 MHz +3dBm above the AGC threshold	Low	1720.00	17.914
	Middle	1745.00	17.959
	High	1770.00	17.916

**[Uplink Input]**

	<b>Channel</b>	<b>Frequency (MHz)</b>	<b>OBW (MHz)</b>
700 Band_ LTE 10 MHz (Lower) AGC threshold	Low	704.00	8.9752
	Middle	-	-
	High	711.00	8.9846
700 Band_ LTE 10 MHz (Lower) +3dBm above the AGC threshold	Low	704.00	8.9866
	Middle	-	-
	High	711.00	8.9852
700 Band_ LTE 10 MHz (Upper) AGC threshold	Low	-	-
	Middle	782.00	8.9993
	High	-	-
700 Band_ LTE 10 MHz (Upper) +3dBm above the AGC threshold	Low	-	-
	Middle	782.00	8.9927
	High	-	-

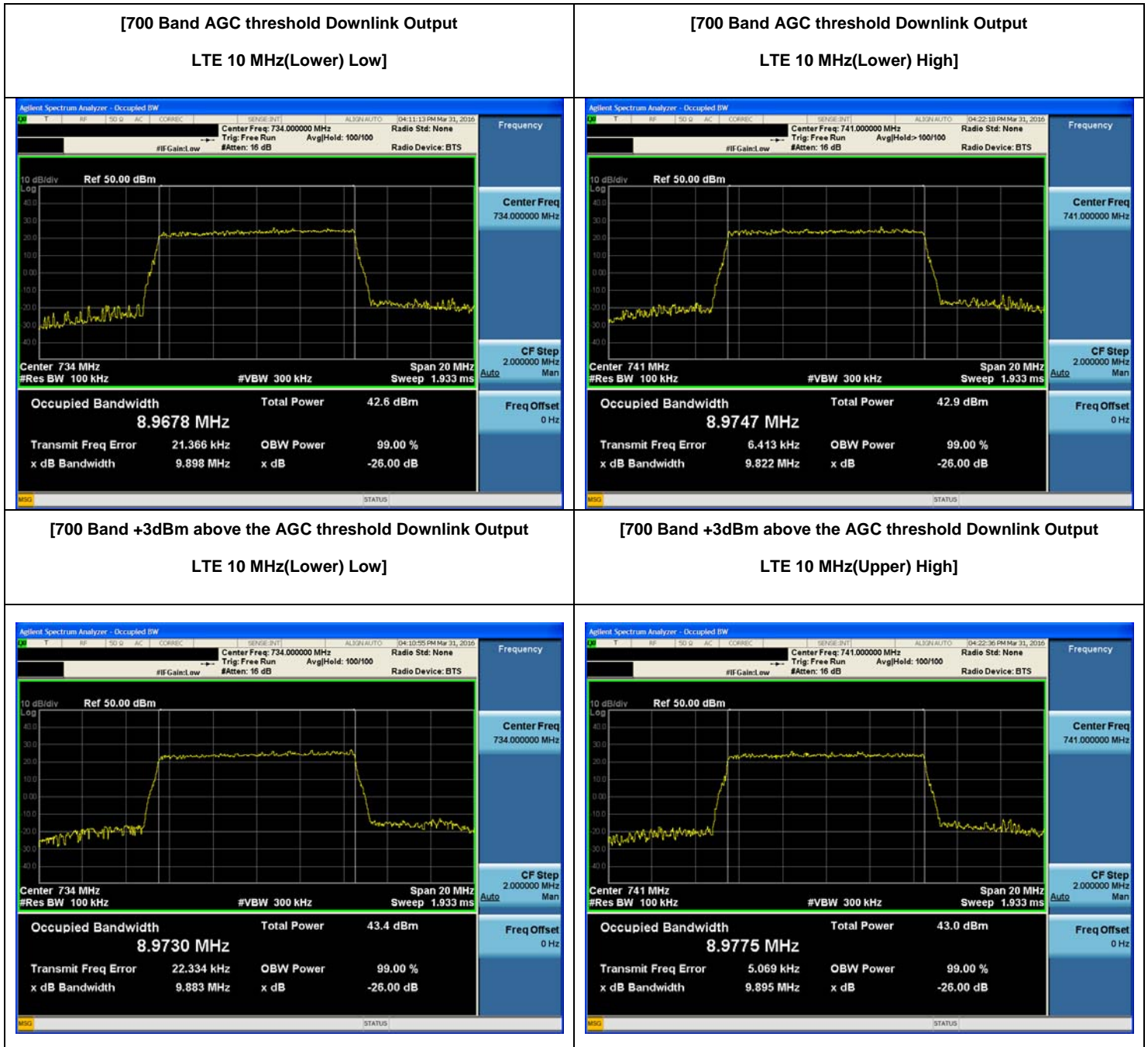
	Channel	Frequency (MHz)	OBW (MHz)
SMR800& Cellular Band_ LTE 5MHz AGC threshold	Low	819.50	4.4978
	Middle	-	-
	High	821.50	4.5003
SMR800& Cellular Band_ LTE 5MHz +3dBm above the AGC threshold	Low	819.50	4.5012
	Middle	-	-
	High	821.50	4.4996
SMR800& Cellular Band_ LTE 10 MHz AGC threshold	Low	829.00	8.9983
	Middle	836.50	8.9795
	High	844.00	8.9743
SMR800& Cellular Band_ LTE 10 MHz +3dBm above the AGC threshold	Low	829.00	8.9845
	Middle	836.50	8.9907
	High	844.00	8.9905

	Channel	Frequency (MHz)	OBW (MHz)
PCS 1900 Band_ LTE 20MHz AGC threshold	Low	1860.00	17.938
	Middle	1882.50	17.896
	High	1905.00	17.924
PCS 1900 Band_ LTE 20MHz +3dBm above the AGC threshold	Low	1860.00	17.923
	Middle	1882.50	17.909
	High	1905.00	17.920
AWS 2100 Band_ LTE 20 MHz AGC threshold	Low	1720.00	17.926
	Middle	1745.00	17.935
	High	1770.00	17.931
AWS 2100 Band_ LTE 20 MHz +3dBm above the AGC threshold	Low	1720.00	17.932
	Middle	1745.00	17.913
	High	1770.00	17.913



**Plots of Occupied Bandwidth**

**700 MHz Band\_LTE 10MHz (Lower) DL\_Output**



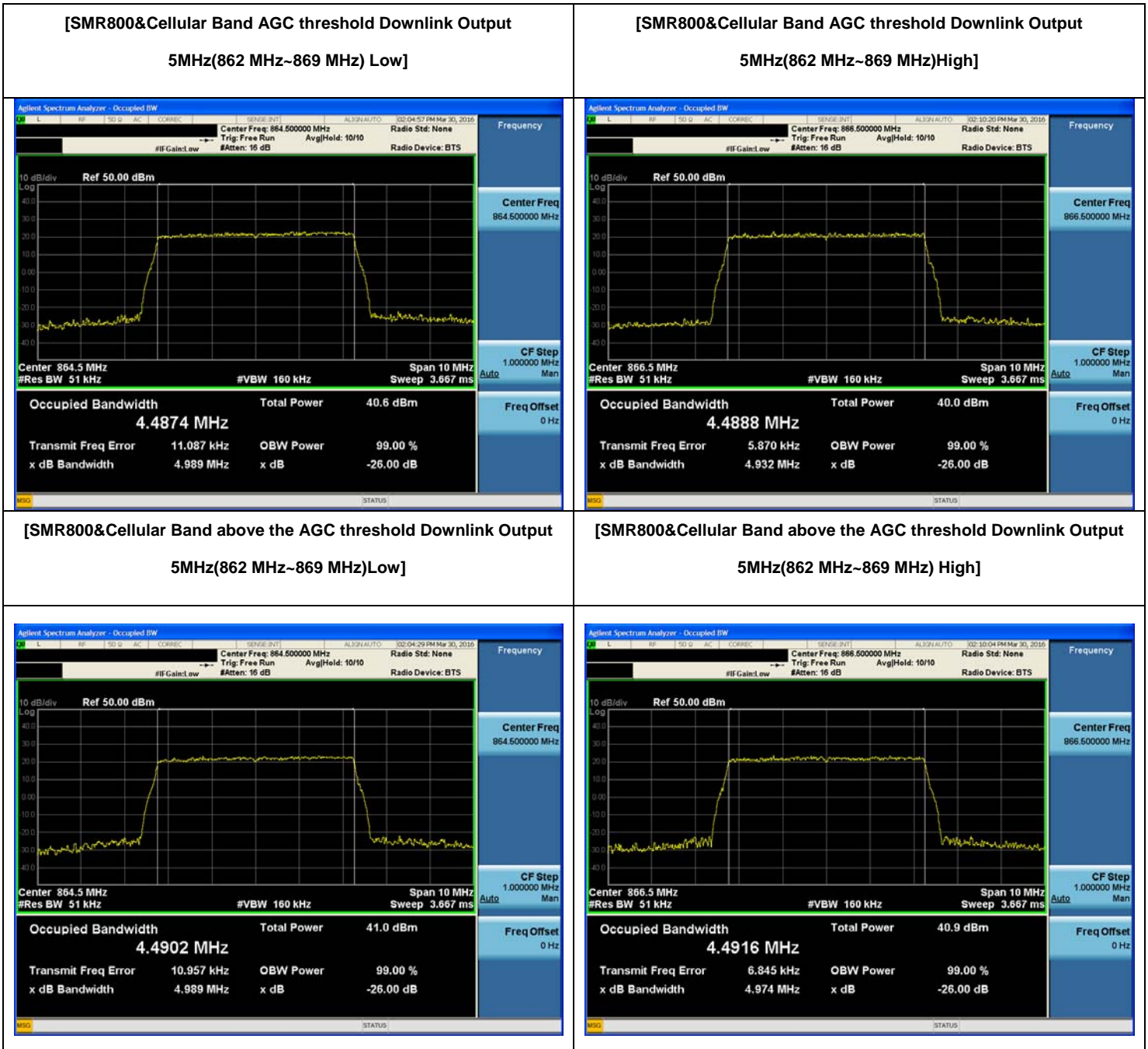
**Plots of Occupied Bandwidth**

**700 MHz Band\_LTE 10MHz (Upper) DL\_Output**



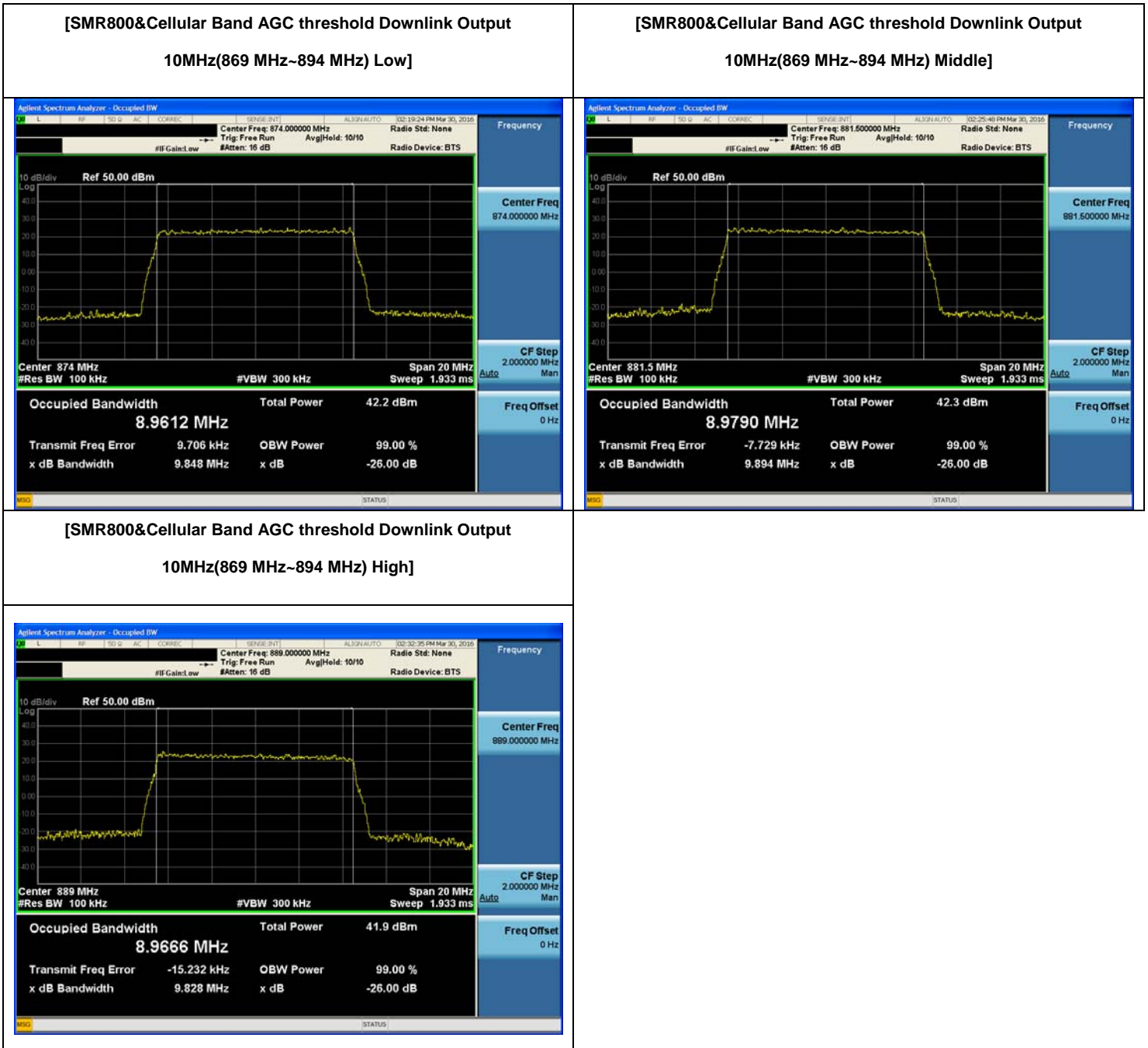
**Plots of Occupied Bandwidth**

**SMR800&Cellular\_5MHz(862 MHz ~ 869 MHz) DL\_Output**



**Plots of Occupied Bandwidth**

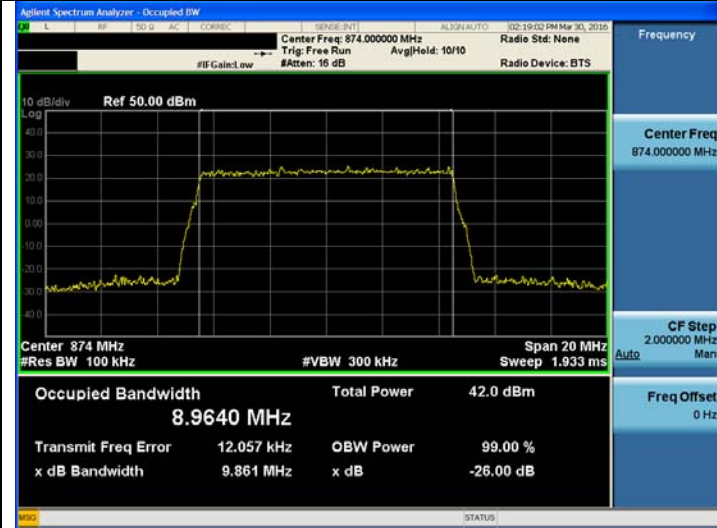
**SMR800&Cellular\_10MHz(869 MHz ~ 894MHz) DL\_Output**



[SMR800&Cellular Band +3dBm above the AGC threshold

Downlink Output

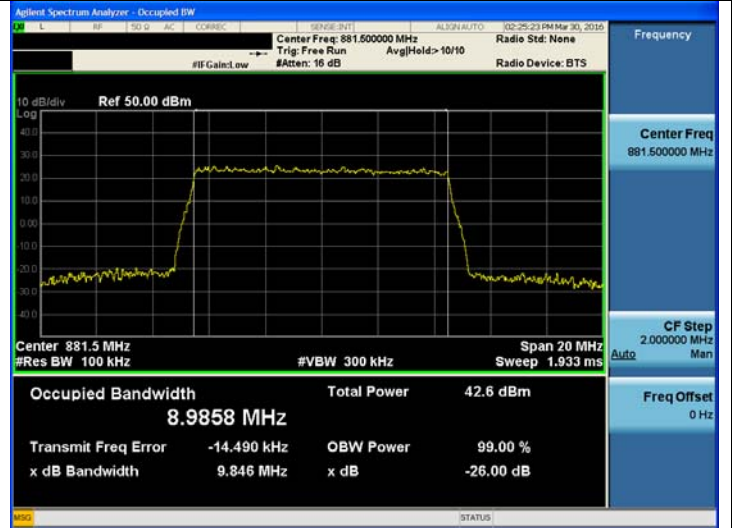
10MHz(869 MHz~894 MHz) Low]



[SMR800&Cellular Band +3dBm above the AGC threshold

Downlink Output

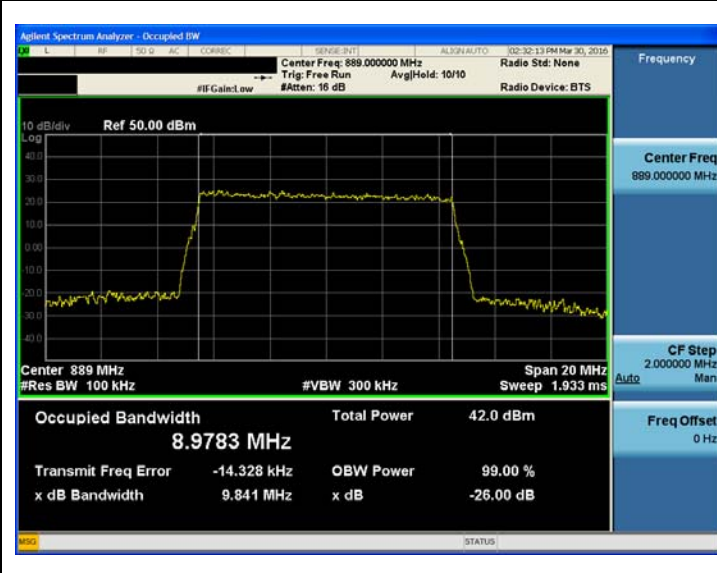
10MHz(869 MHz~894 MHz) Middle]



[SMR800&Cellular Band +3dBm above the AGC threshold

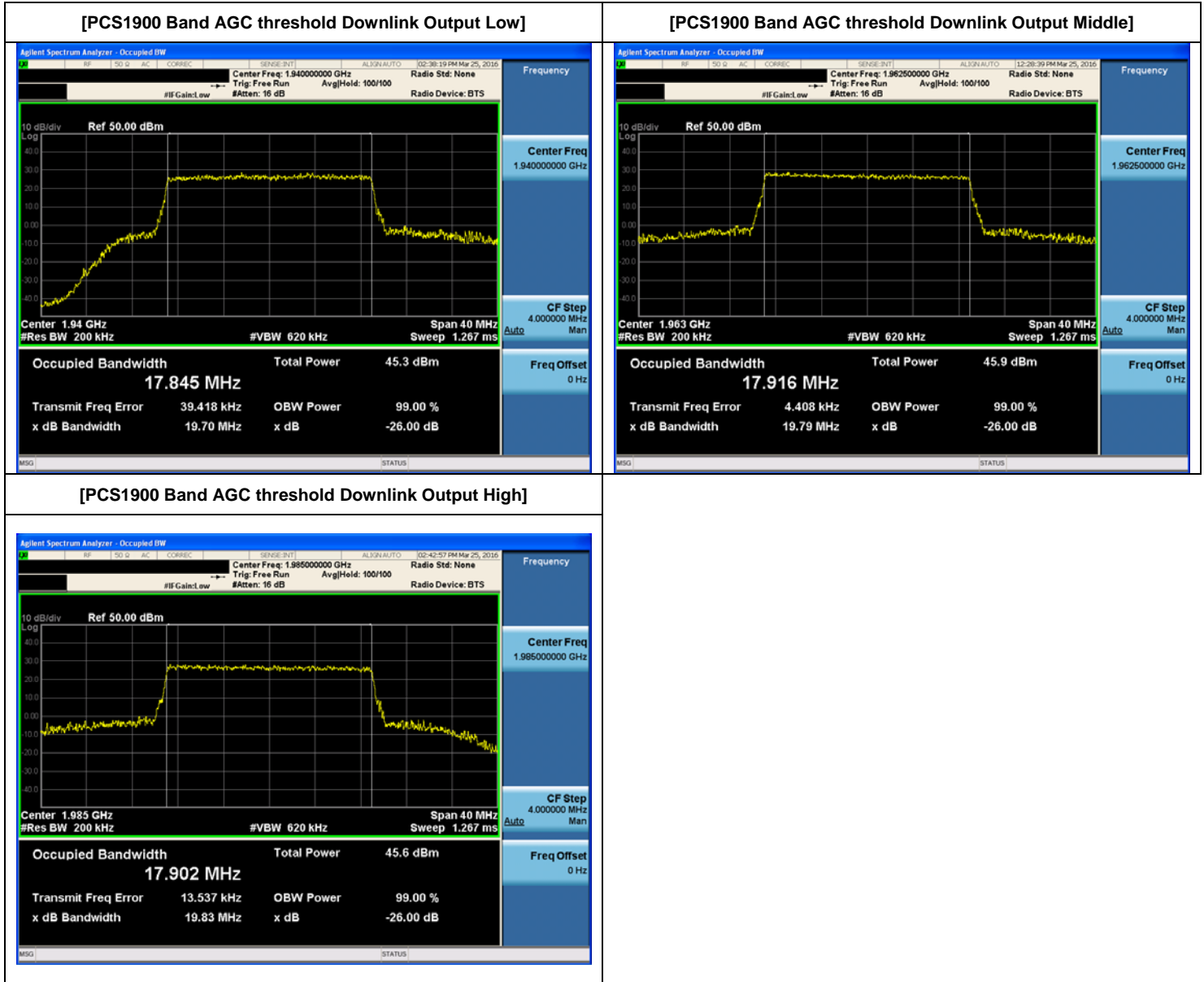
Downlink Output

10MHz(869 MHz~894 MHz) High]

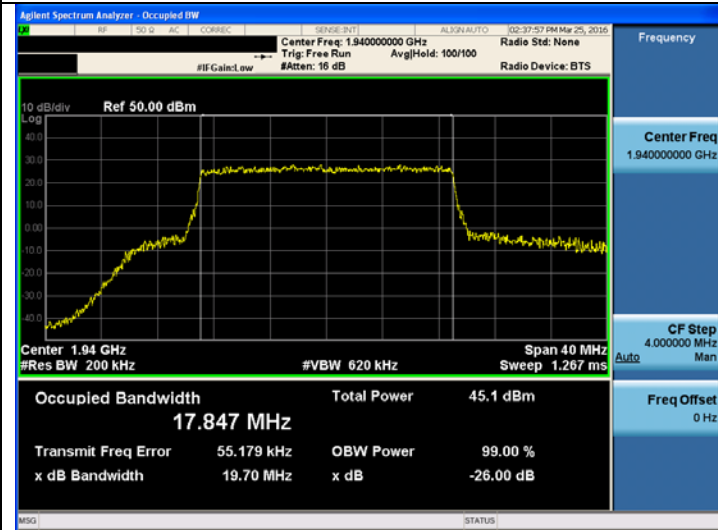


**Plots of Occupied Bandwidth**

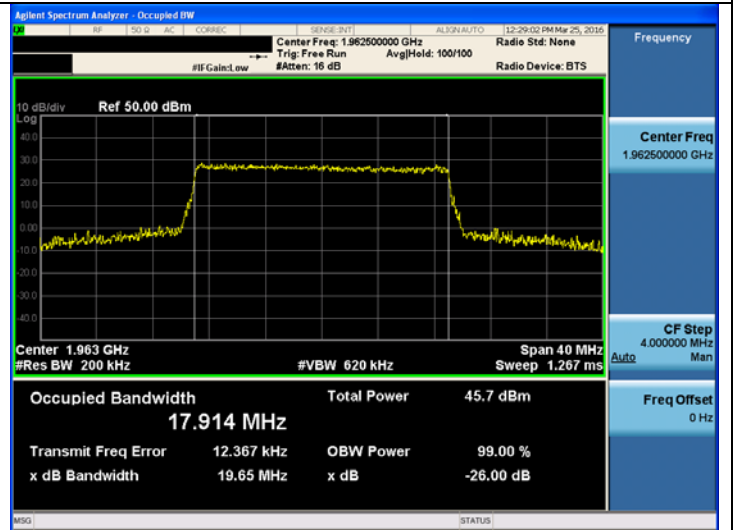
**PCS 1900\_DL\_Output**



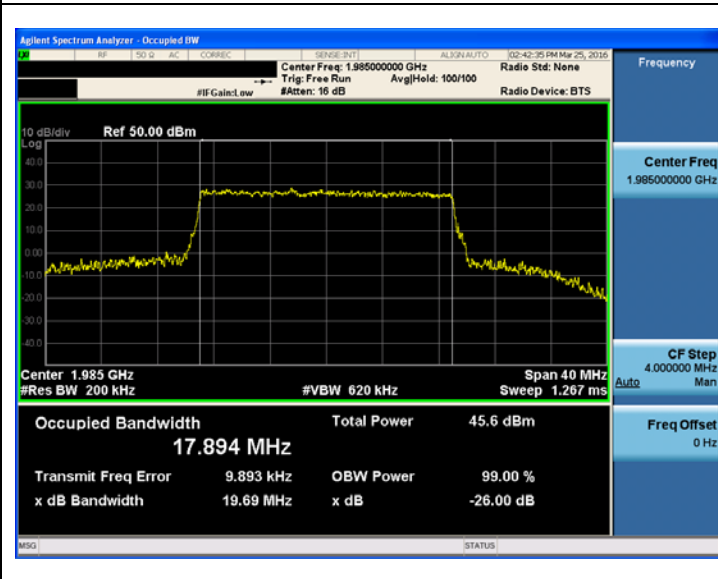
[PCS1900 Band +3dBm above the AGC threshold  
Downlink Output Low]



[PCS1900 Band +3dBm above the AGC threshold  
Downlink Output Middle]

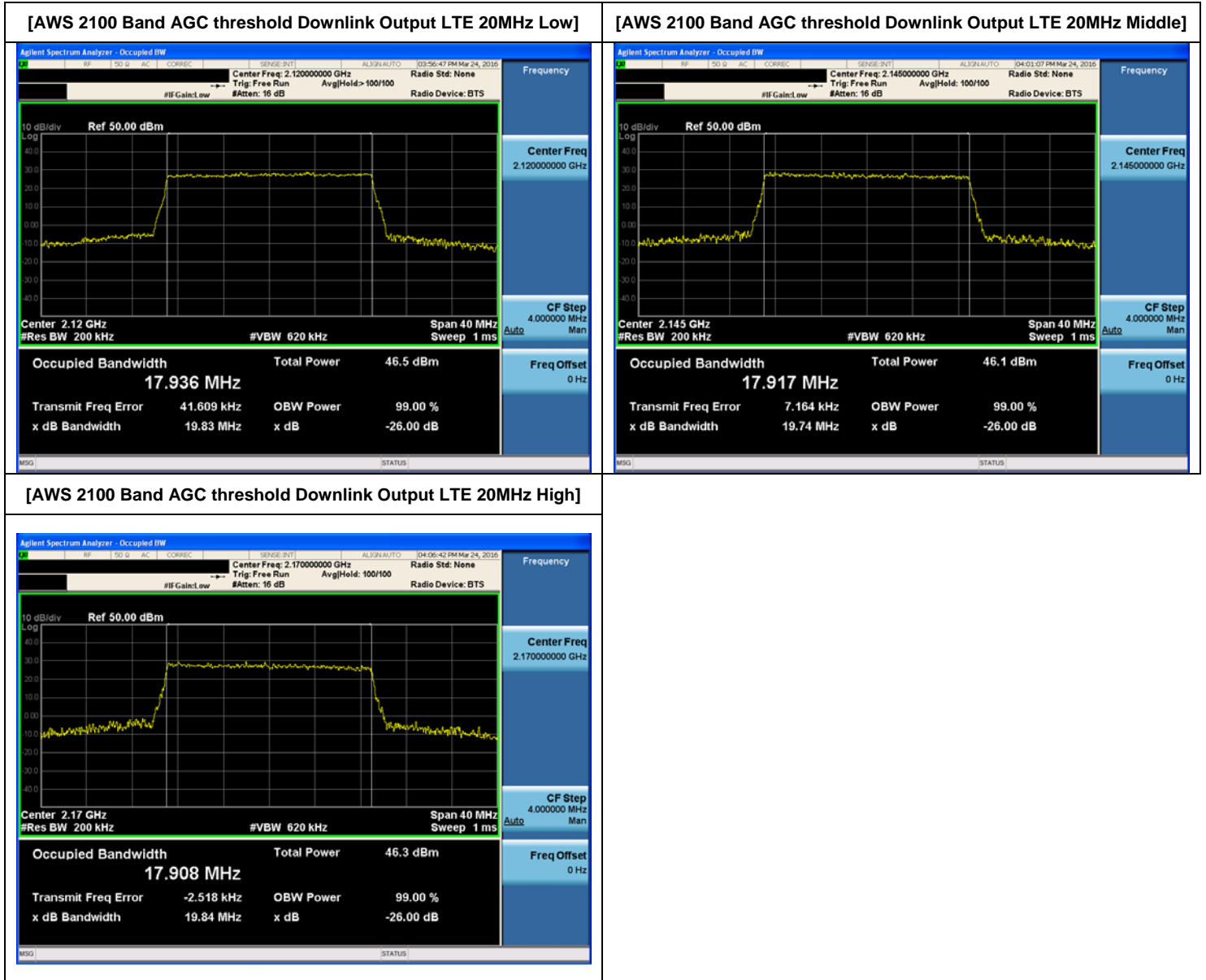


[PCS1900 Band +3dBm above the AGC threshold  
Downlink Output High]



**Plots of Occupied Bandwidth**

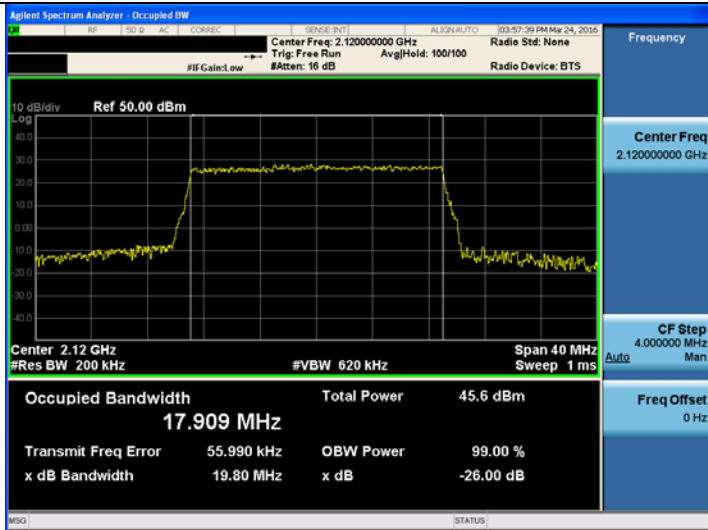
**AWS2100\_LTE 20MHz DL\_Output**





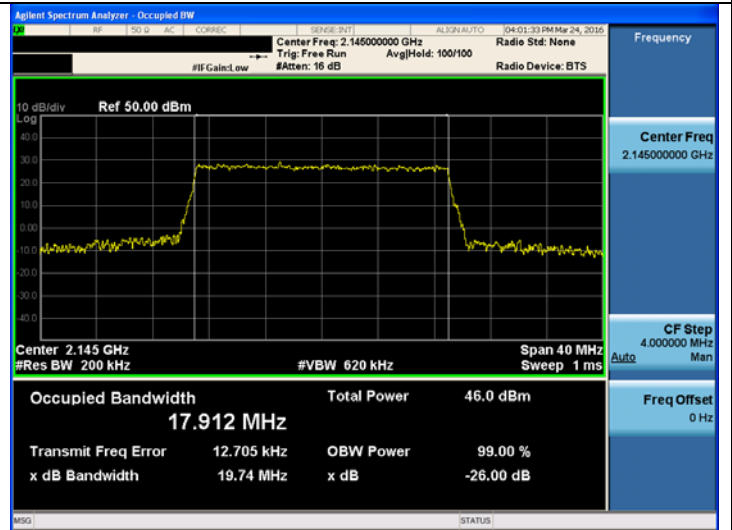
[AWS 2100 Band +3dBm above the AGC threshold]

Downlink Output LTE 20MHz Low]



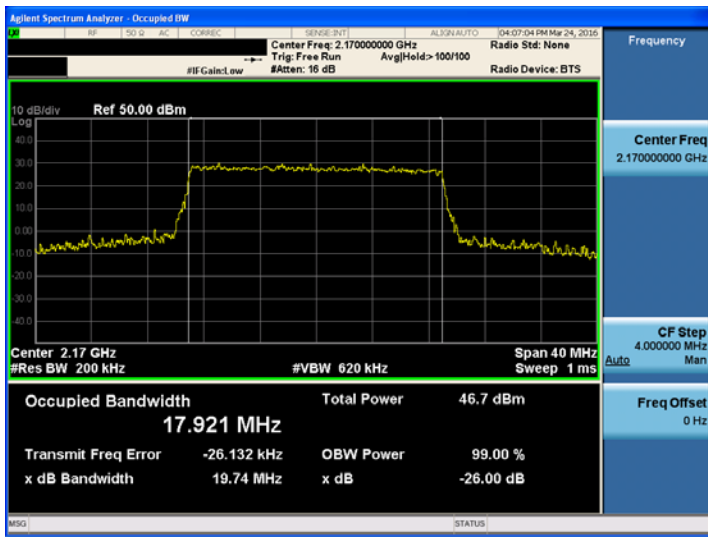
[AWS 2100 Band +3dBm above the AGC threshold]

Downlink Output LTE 20MHz Middle]



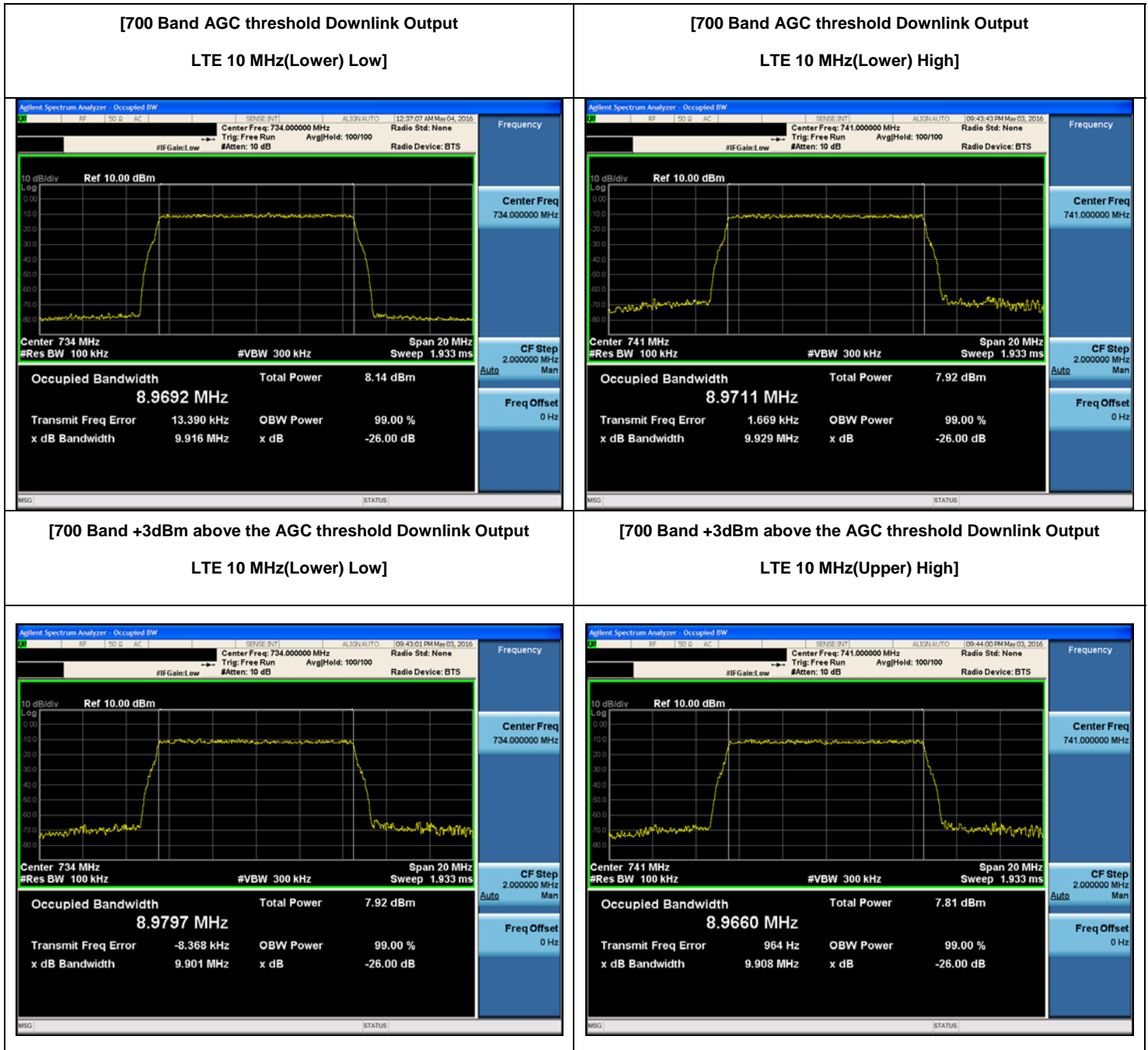
[AWS 2100 Band +3dBm above the AGC threshold]

Downlink Output LTE 20MHz High]



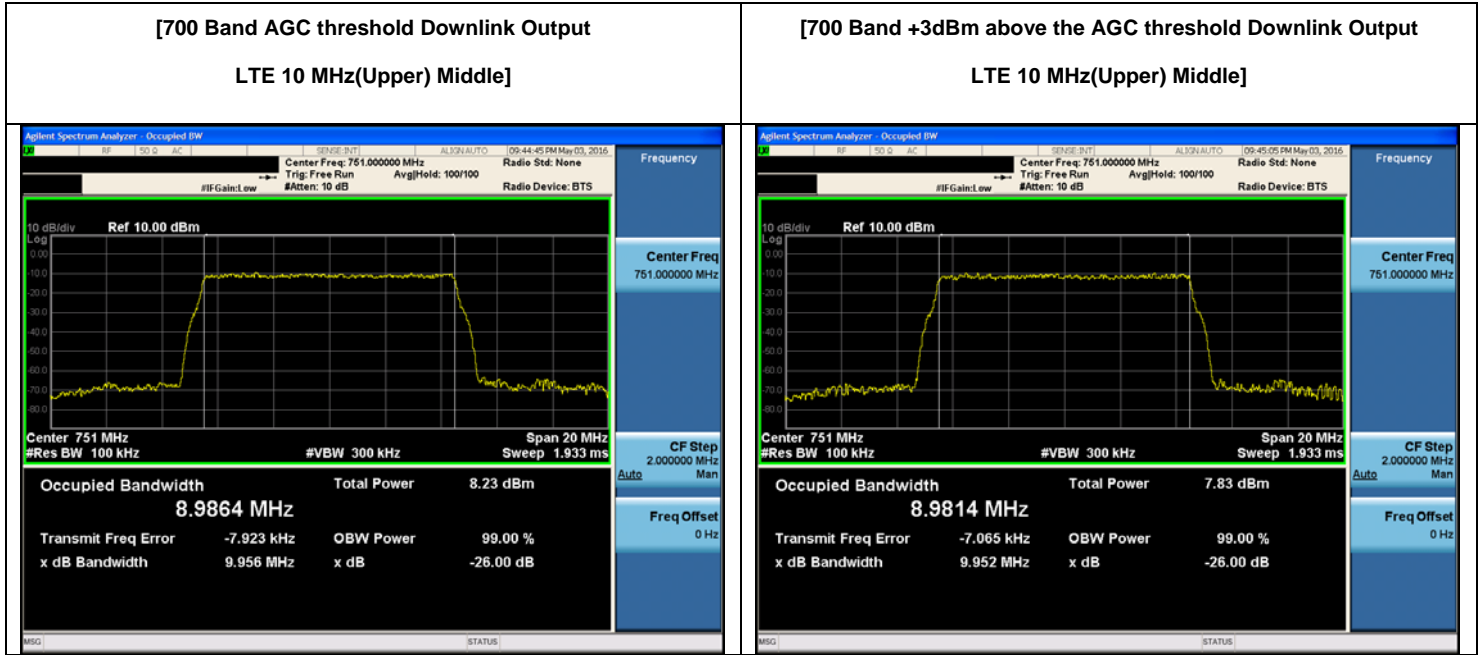
**Plots of Occupied Bandwidth**

**700 MHz Band\_LTE 10MHz (Lower) DL\_Input**



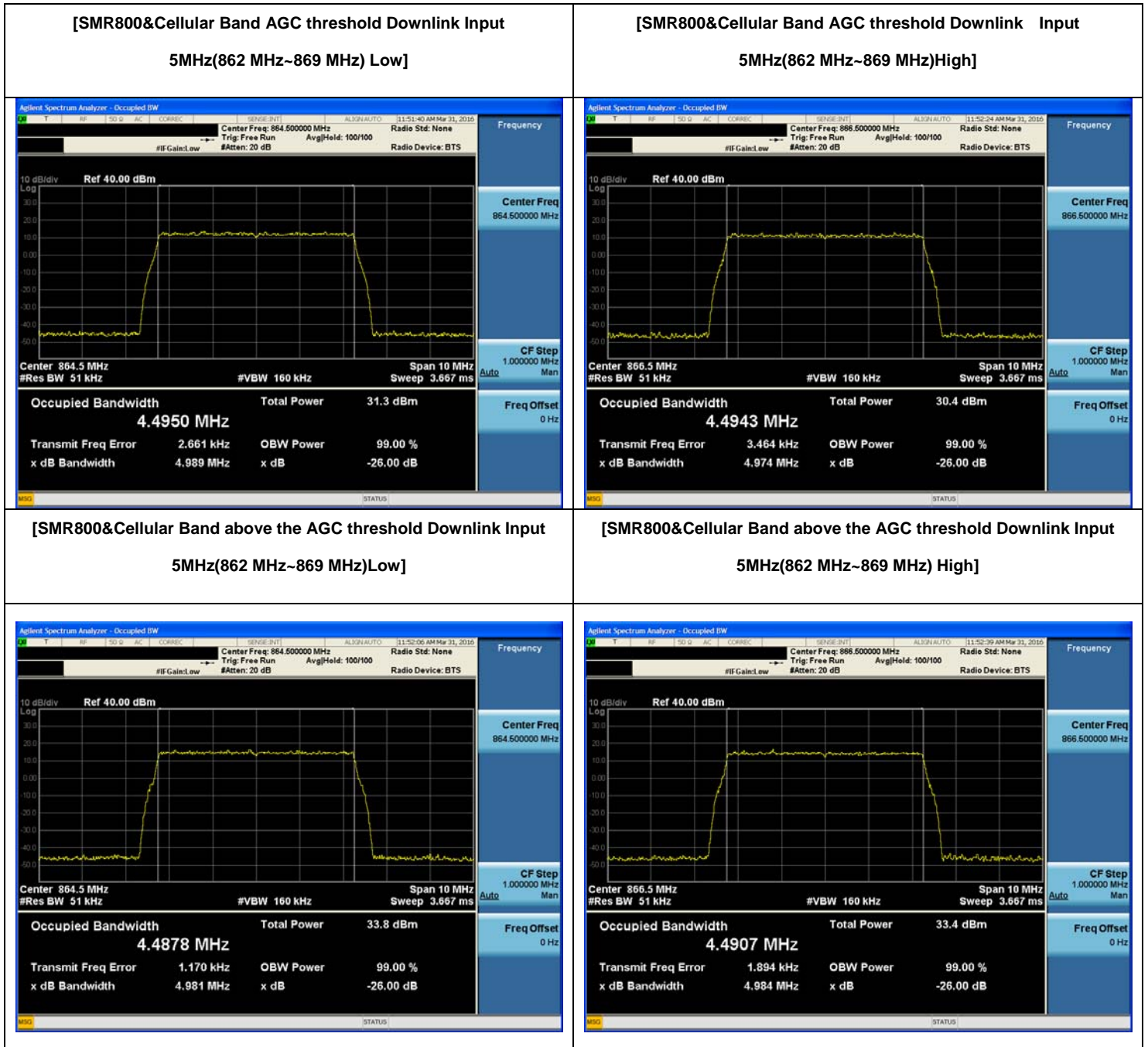
**Plots of Occupied Bandwidth**

**700 MHz Band\_LTE 10MHz (Upper) DL\_Input**



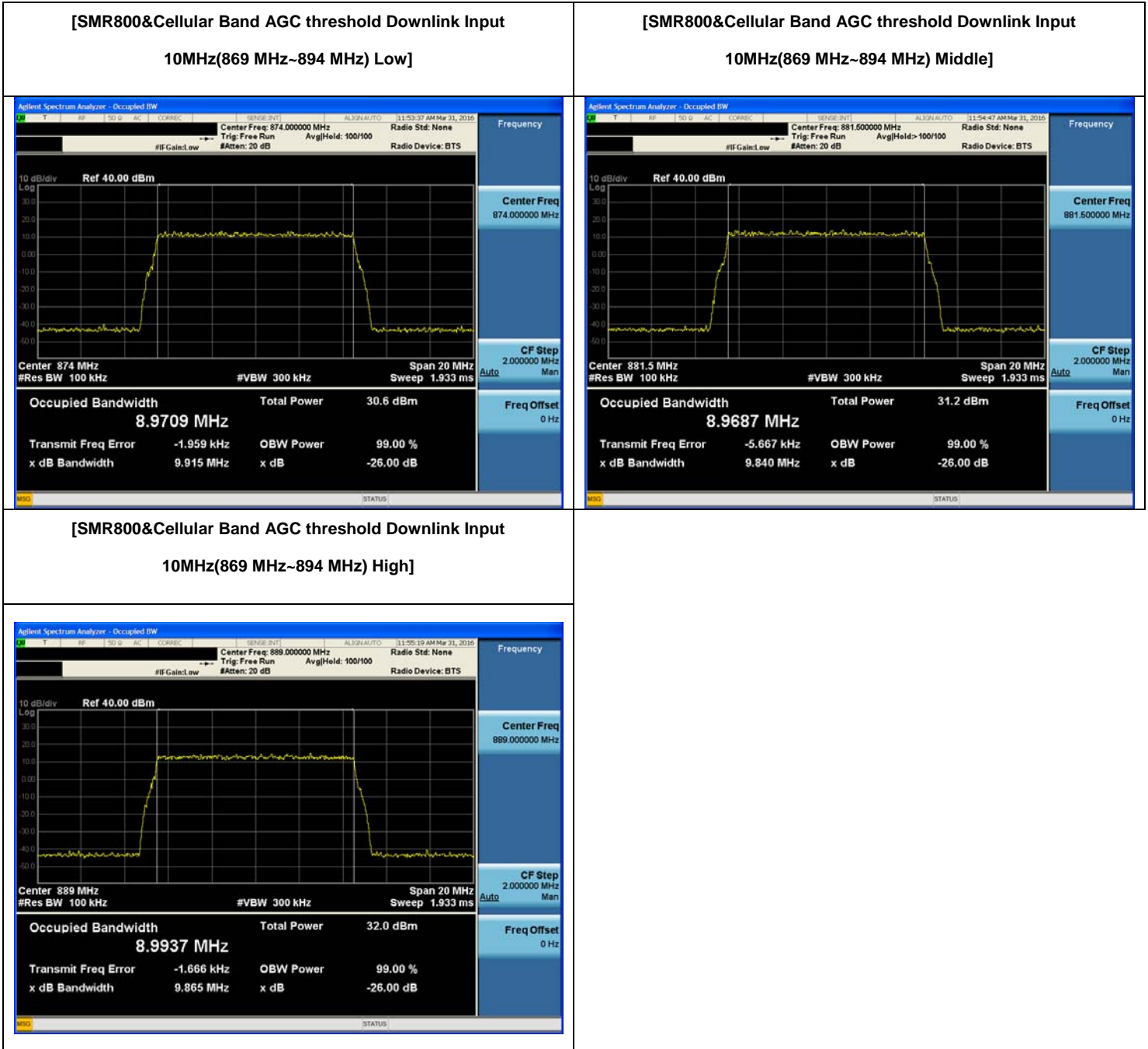
**Plots of Occupied Bandwidth**

**SMR800&Cellular\_5MHz(862 MHz ~ 869 MHz) DL\_Input**

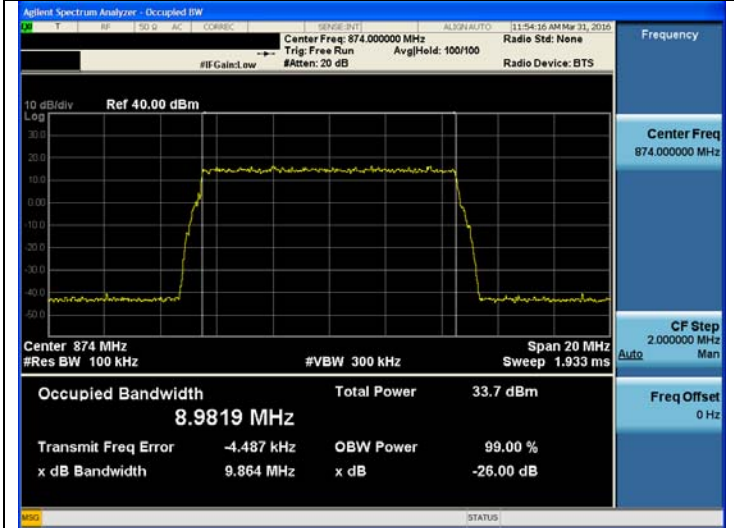


**Plots of Occupied Bandwidth**

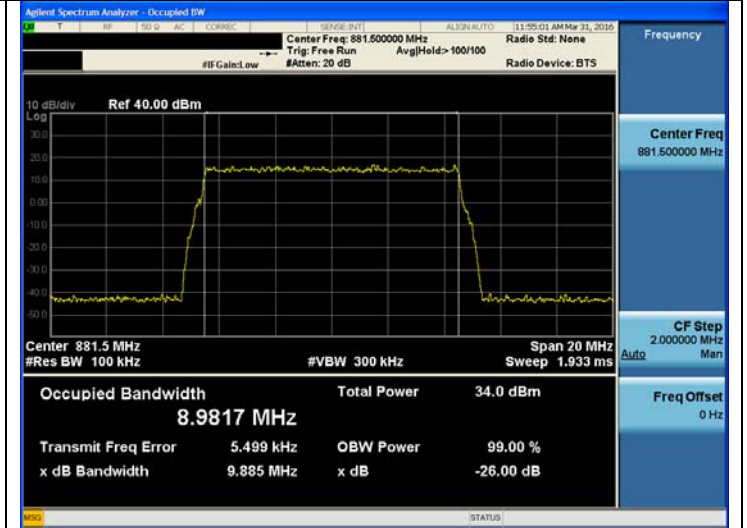
**SMR800&Cellular\_10MHz(869 MHz ~ 894 MHz) DL\_Input**



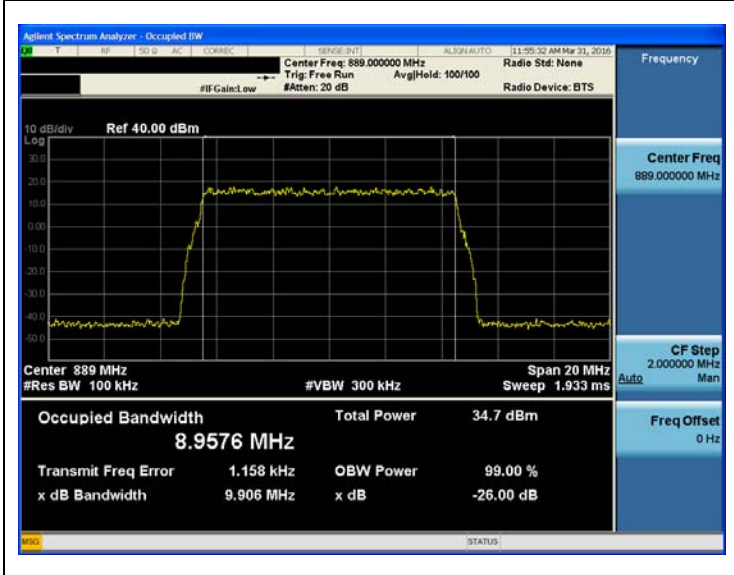
**[SMR800&Cellular Band +3dBm above the AGC threshold  
Downlink Input  
10MHz(869 MHz~894 MHz) Low]**



**[SMR800&Cellular Band +3dBm above the AGC threshold  
Downlink Input  
10MHz(869 MHz~894 MHz) Middle]**

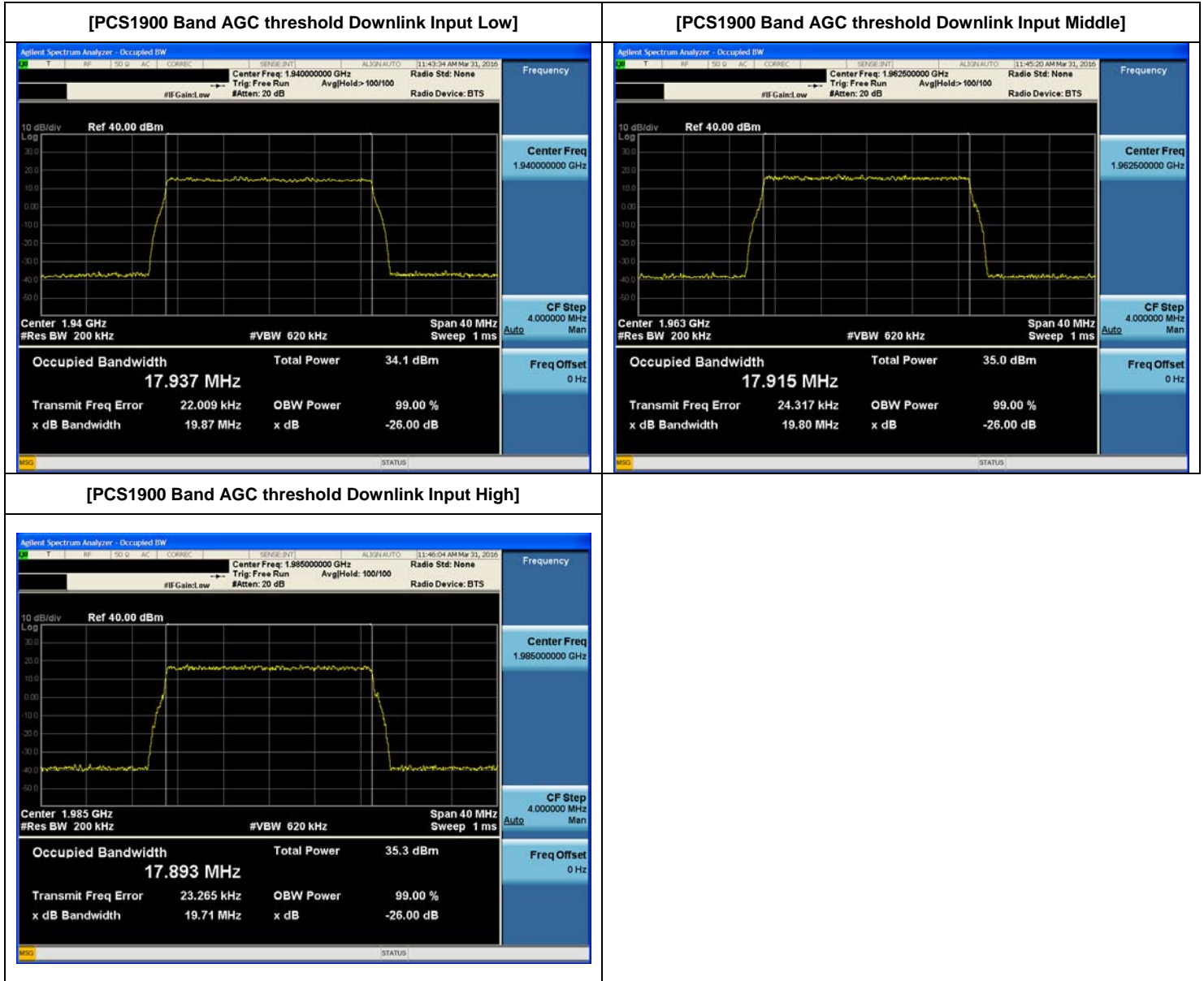


**[SMR800&Cellular Band +3dBm above the AGC threshold  
Downlink Input  
10MHz(869 MHz~894 MHz) High]**

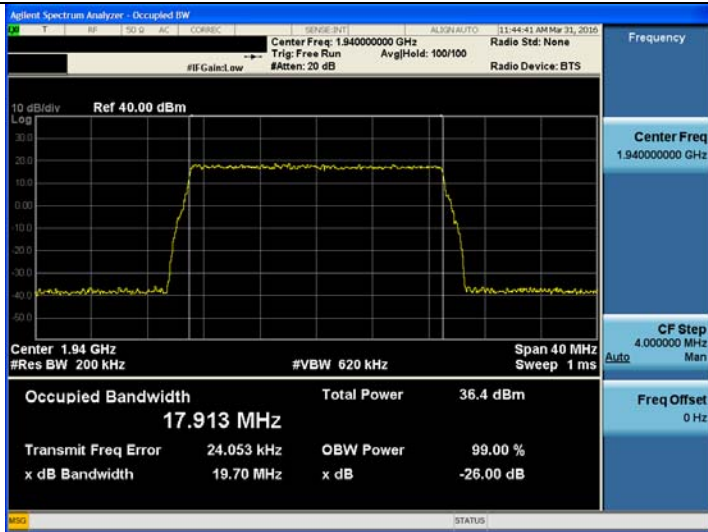


**Plots of Occupied Bandwidth**

**PCS 1900\_DL\_Input**



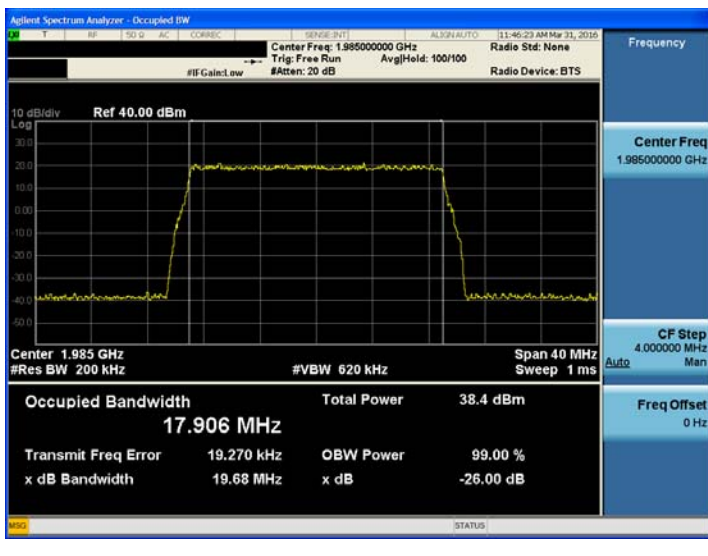
**[PCS1900 Band +3dBm above the AGC threshold  
Downlink Input Low]**



**[PCS1900 Band +3dBm above the AGC threshold  
Downlink Input Middle]**



**[PCS1900 Band +3dBm above the AGC threshold  
Downlink Input High]**



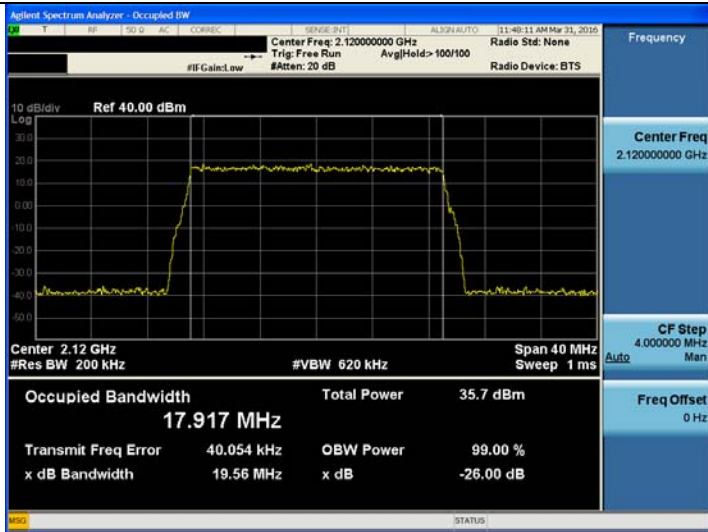


**Plots of Occupied Bandwidth**

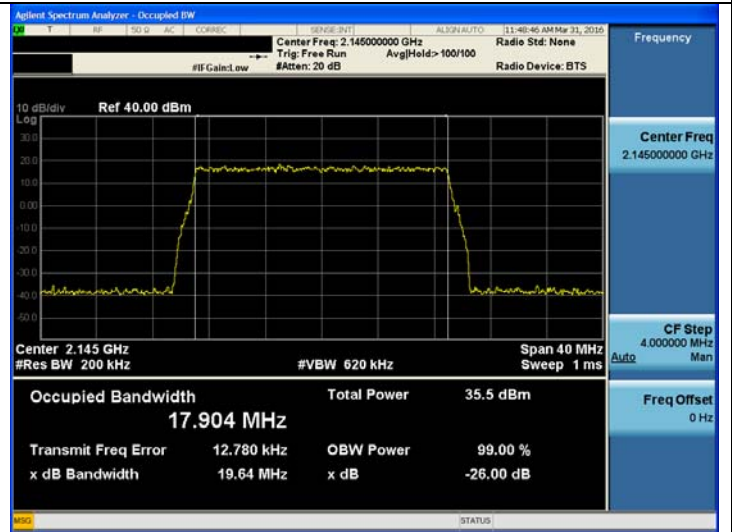
**AWS2100\_LTE 20MHz DL\_Input**



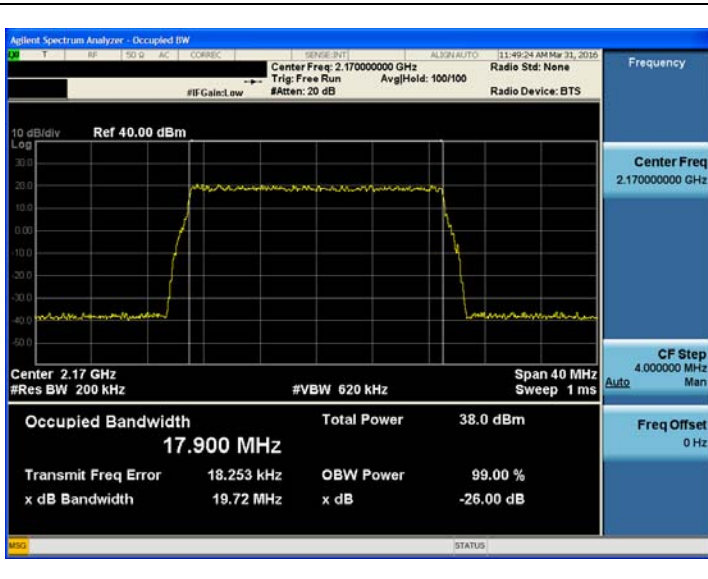
**[AWS 2100 Band +3dBm above the AGC threshold  
Downlink Input LTE 20MHz Low]**



**[AWS 2100 Band +3dBm above the AGC threshold  
Downlink Input LTE 20MHz Middle]**

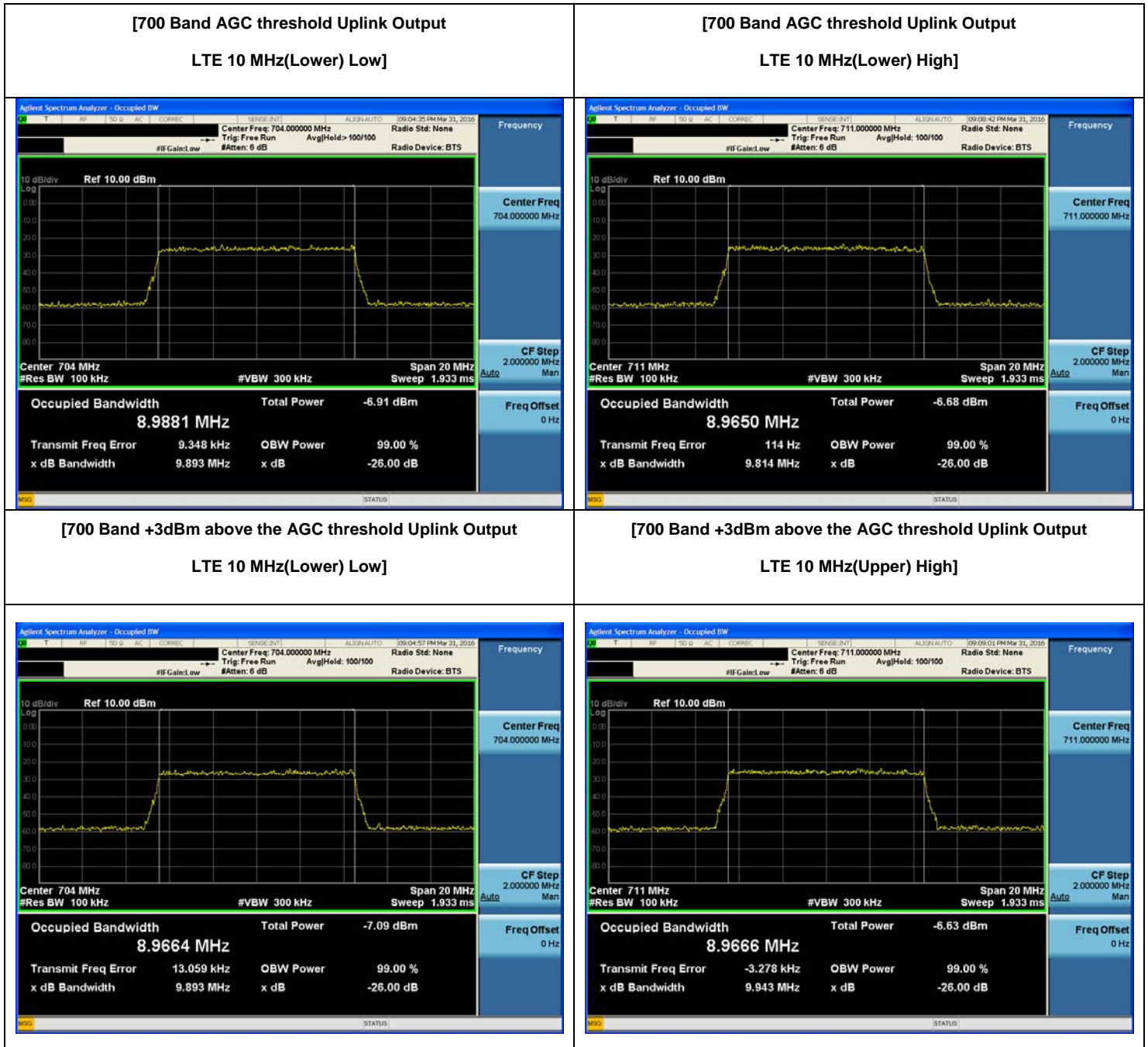


**[AWS 2100 Band +3dBm above the AGC threshold  
Downlink Input LTE 20MHz High]**



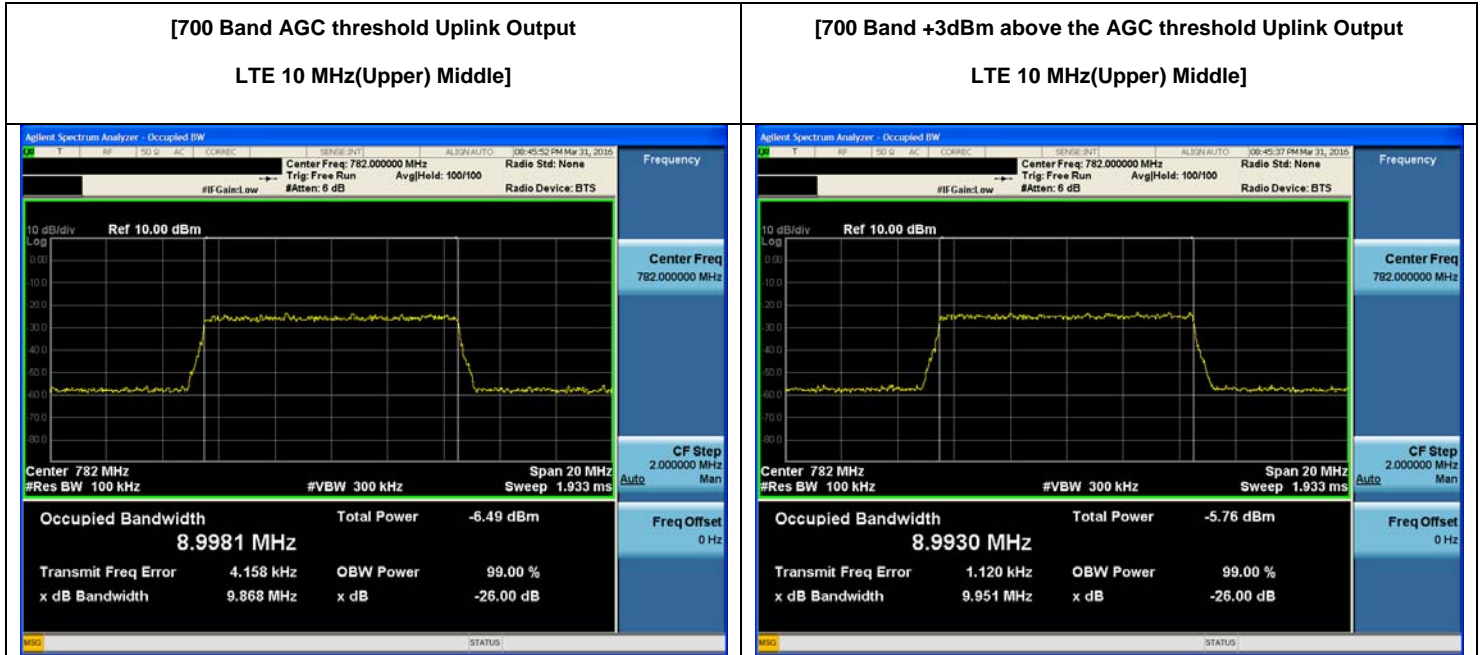
**Plots of Occupied Bandwidth**

**700 MHz Band\_LTE 10MHz (Lower) UL\_Output**

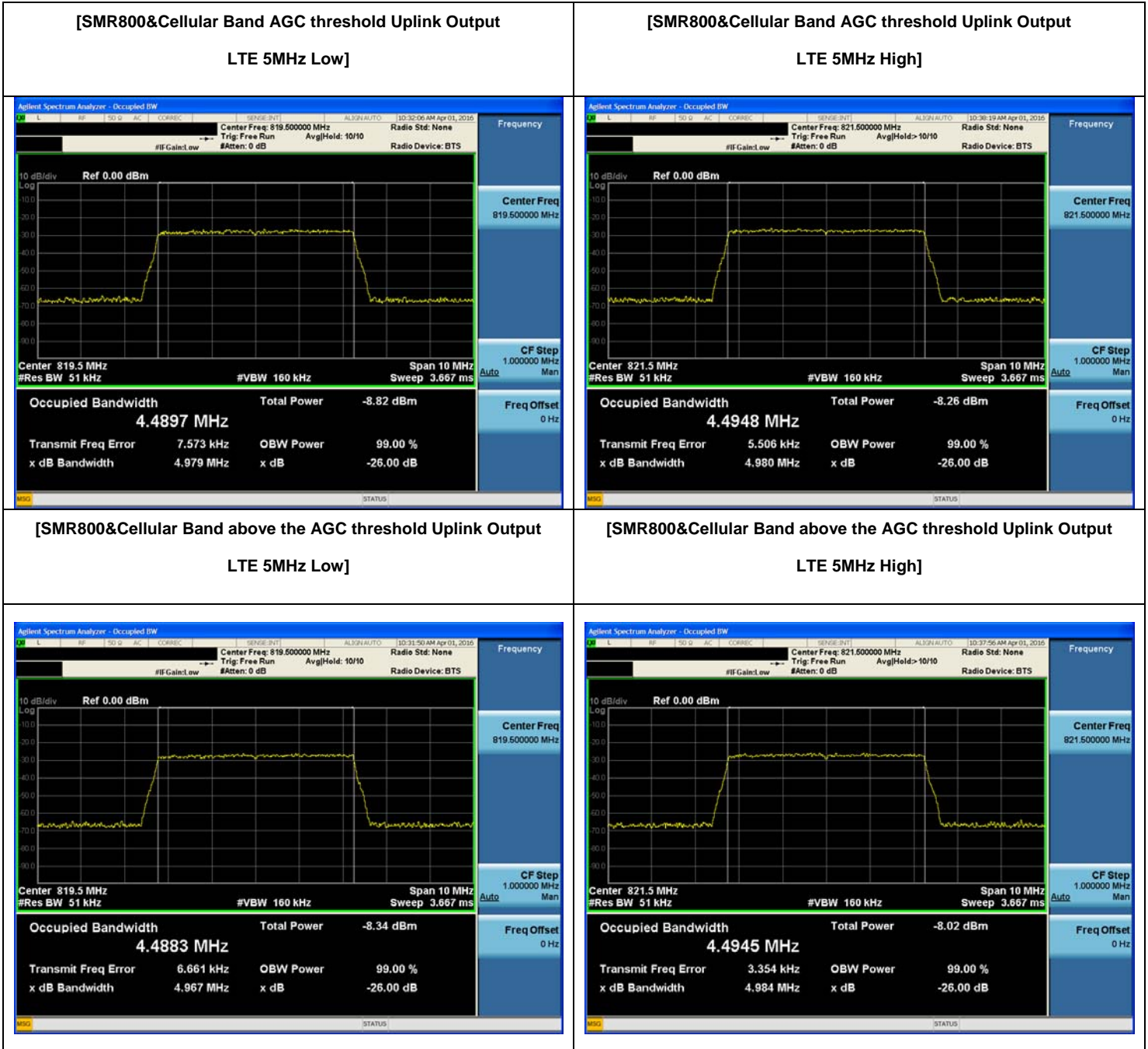


**Plots of Occupied Bandwidth**

**700 MHz Band\_LTE 10MHz (Upper) UL\_Output**

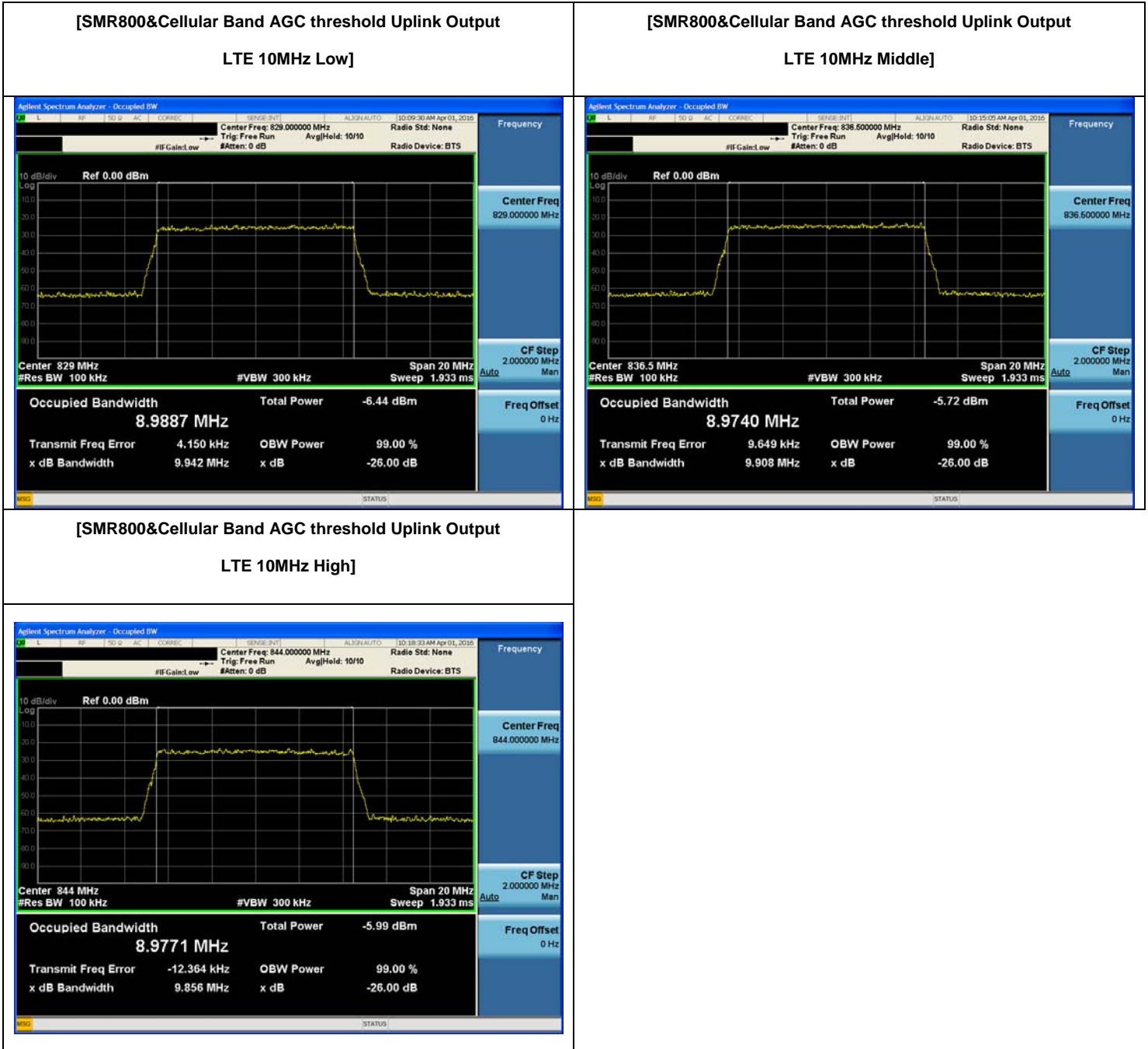


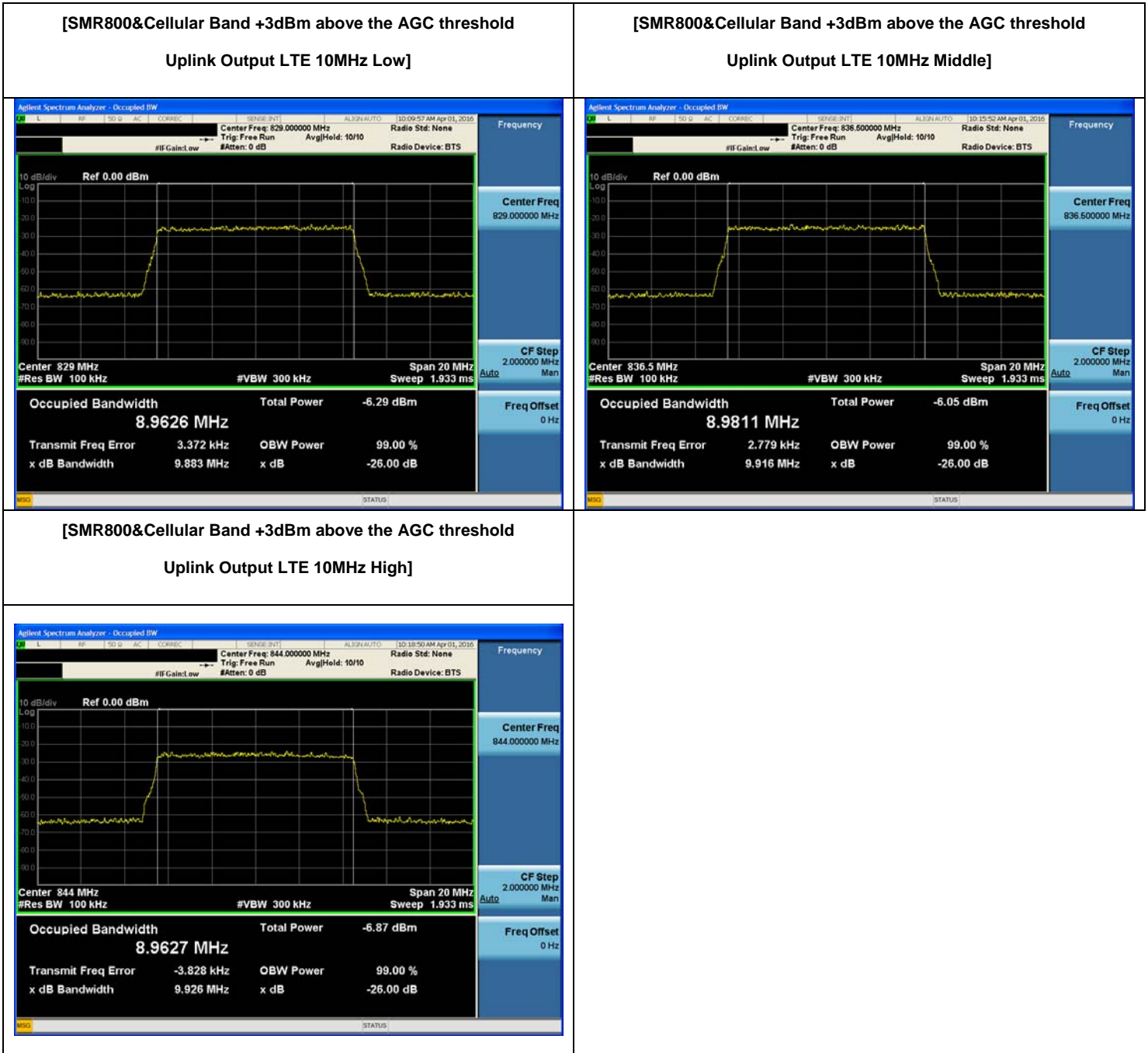
**Plots of Occupied Bandwidth**  
**SMR800&Cellular\_LTE 5MHz UL\_Output**



**Plots of Occupied Bandwidth**

**SMR800&Cellular\_LTE 10 MHz UL\_Output**





**Plots of Occupied Bandwidth**

**PCS 1900\_LTE 20MHz UL\_Output**

