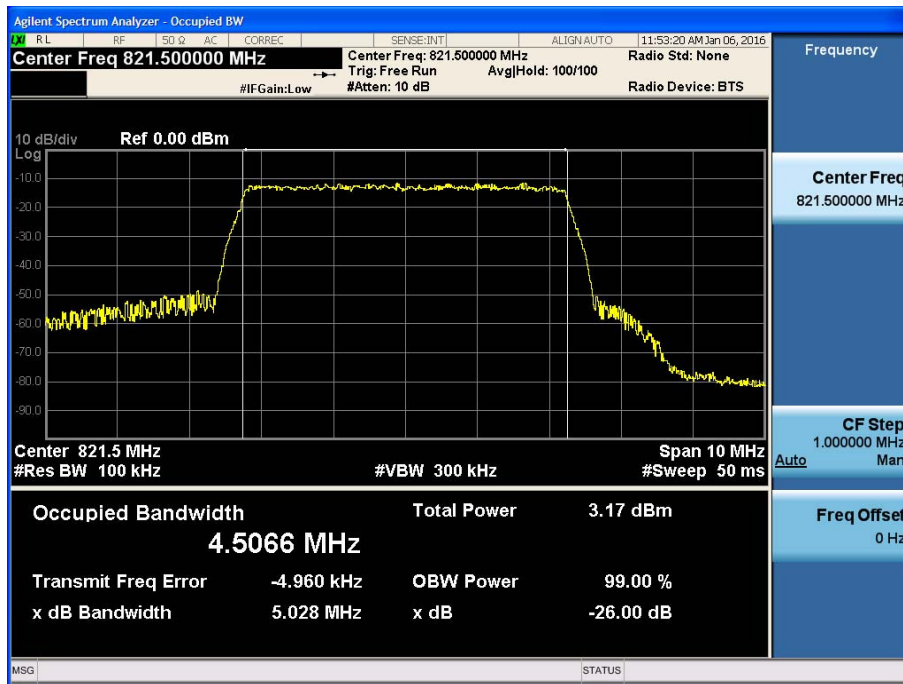
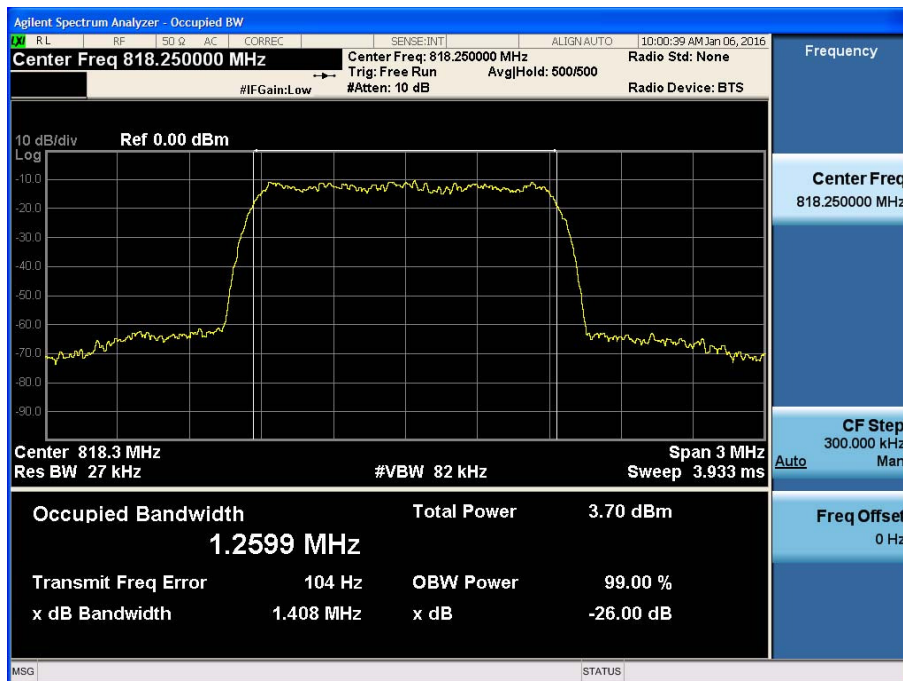


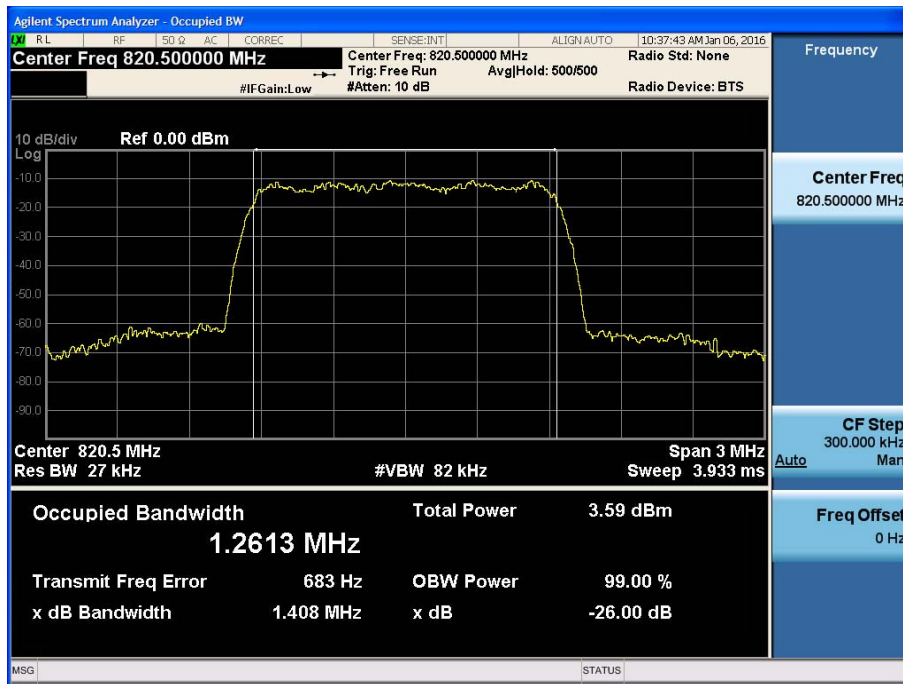
**[800 Band +3 dB above the AGC threshold Uplink Output LTE 5 MHz High]**



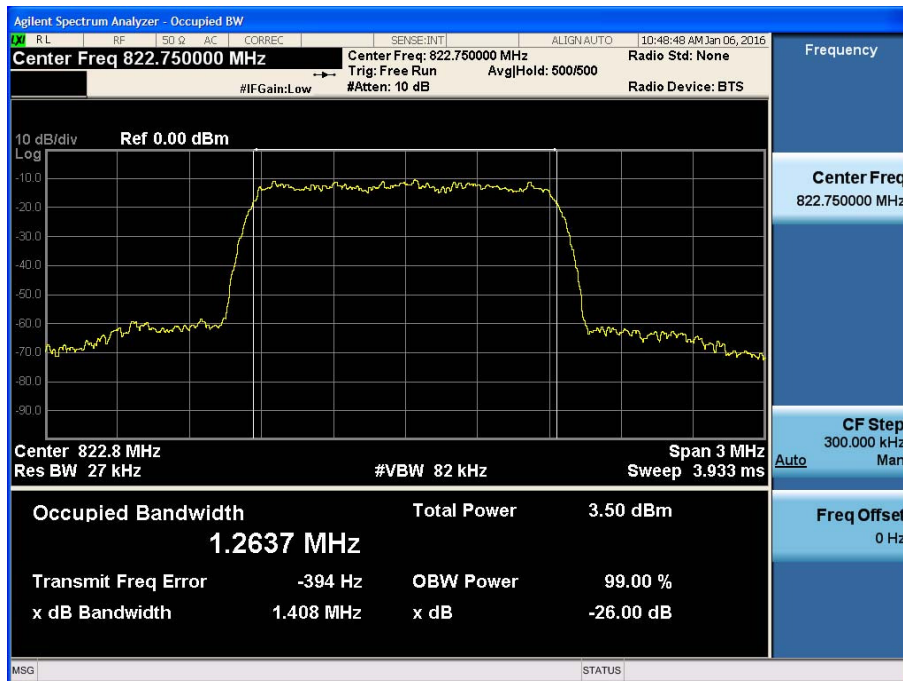
**[800 Band +3 dB above the AGC threshold Uplink Output CDMA 1.25 MHz Low]**



[800 Band +3 dB above the AGC threshold Uplink Output CDMA 1.25 MHz Middle]

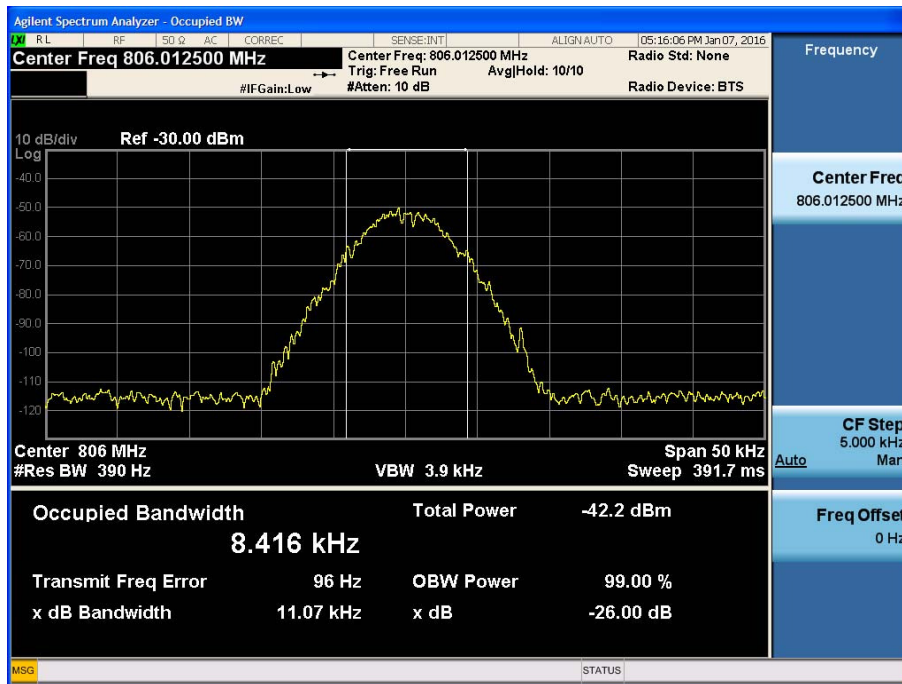


[800 Band +3 dB above the AGC threshold Uplink Output CDMA 1.25 MHz High]

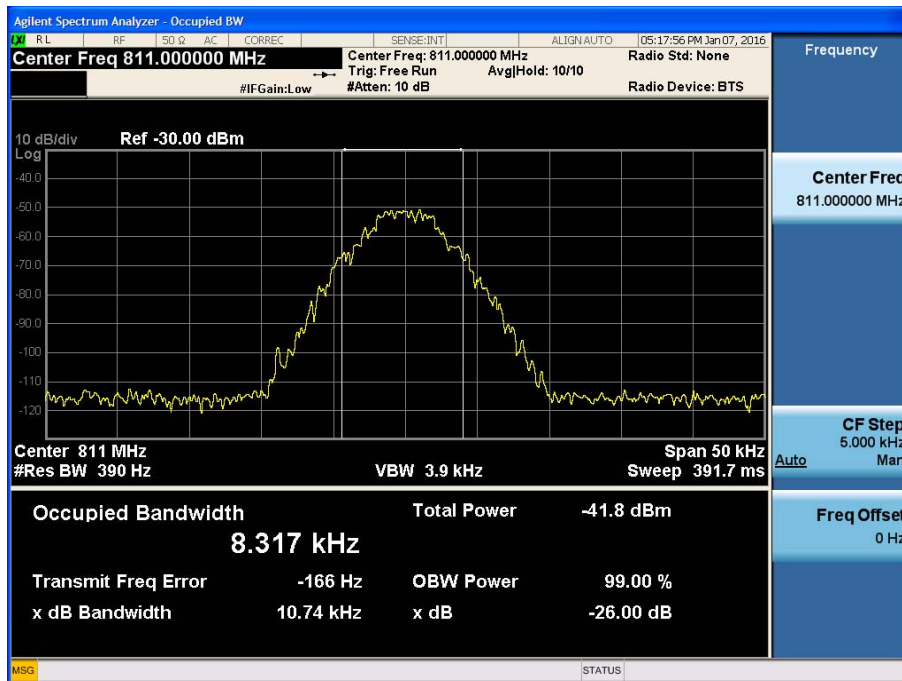


**800 MHz Band\_P25, FM UL**

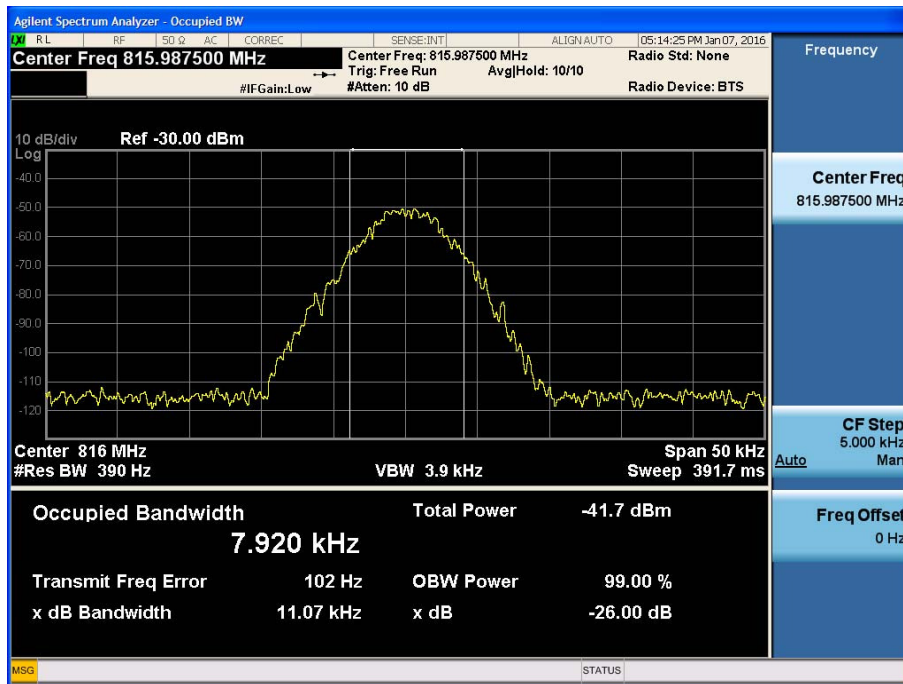
**[800 Band AGC threshold Uplink Input P25 Low]**



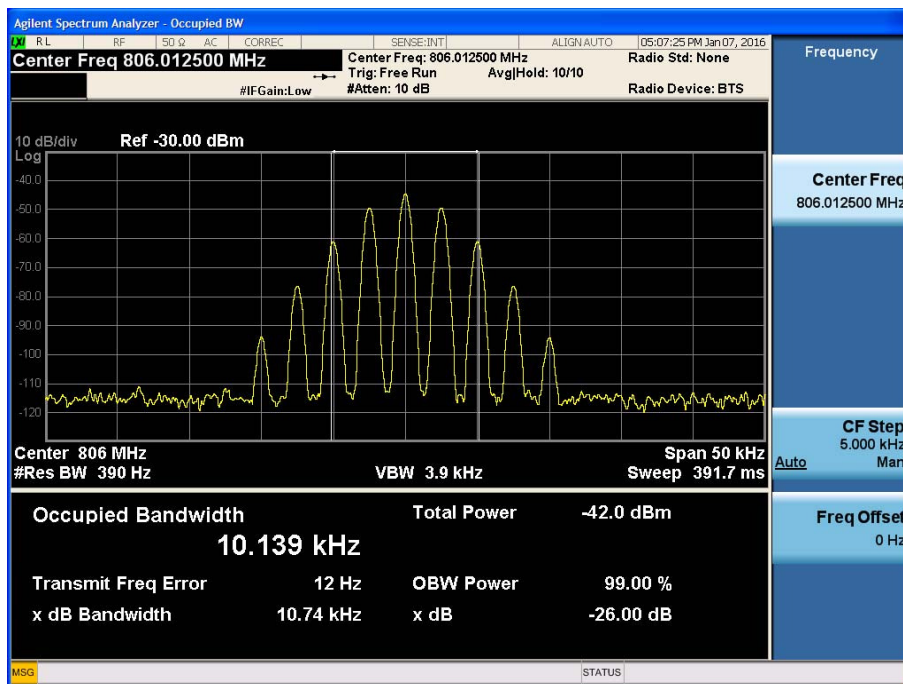
**[800 Band AGC threshold Uplink Input P25 Middle]**



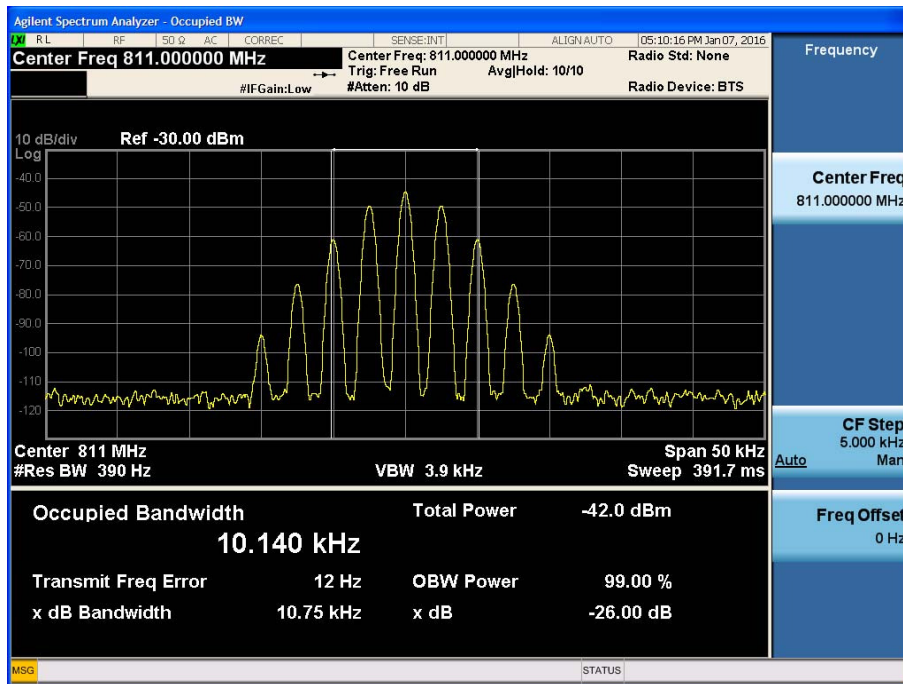
**[800 Band AGC threshold Uplink Input P25 High]**



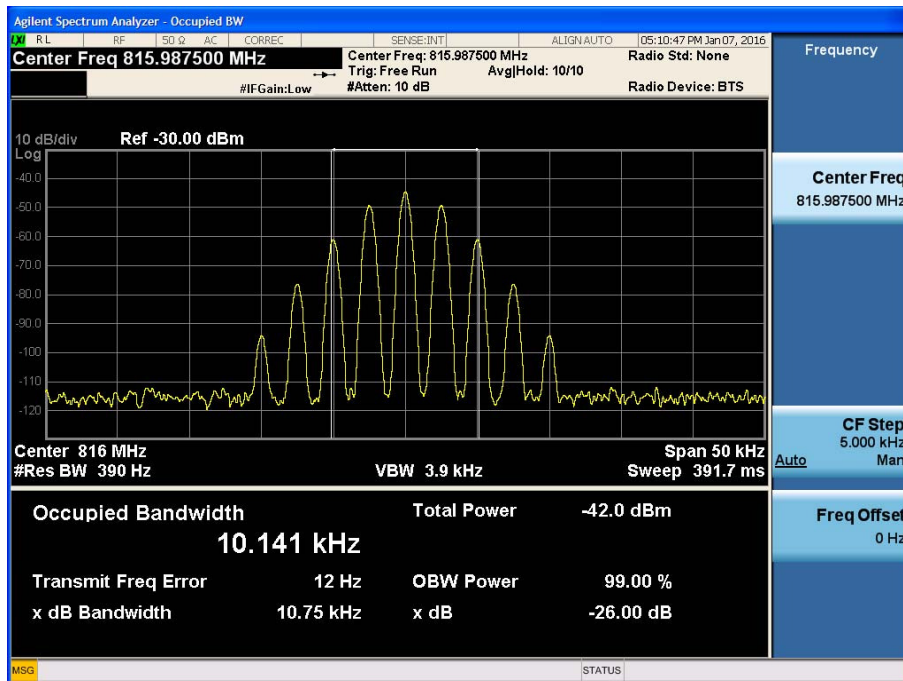
**[800 Band AGC threshold Uplink Input FM Low]**



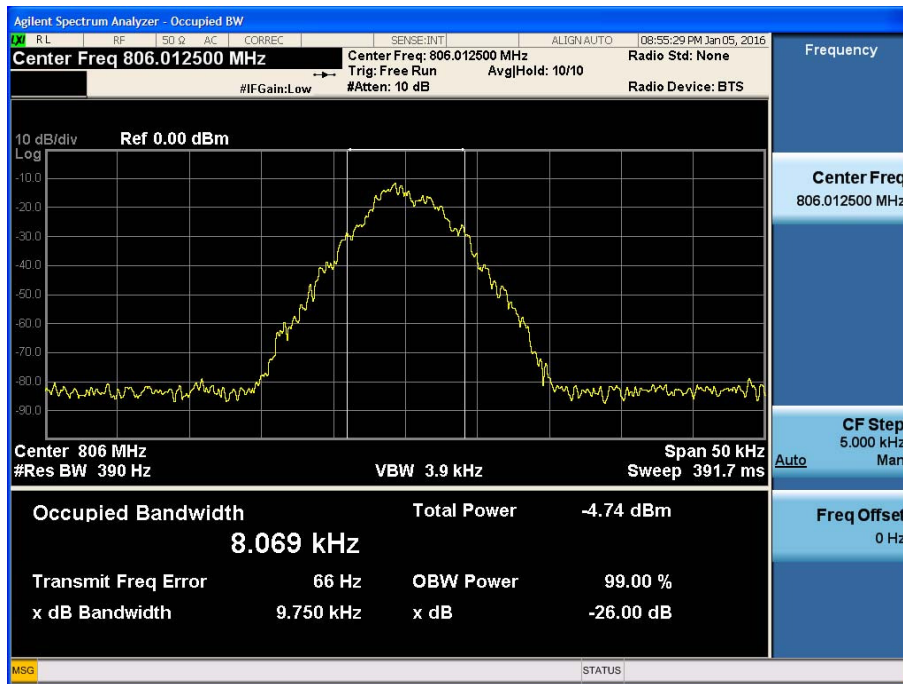
**[800 Band AGC threshold Uplink Input FM Middle]**



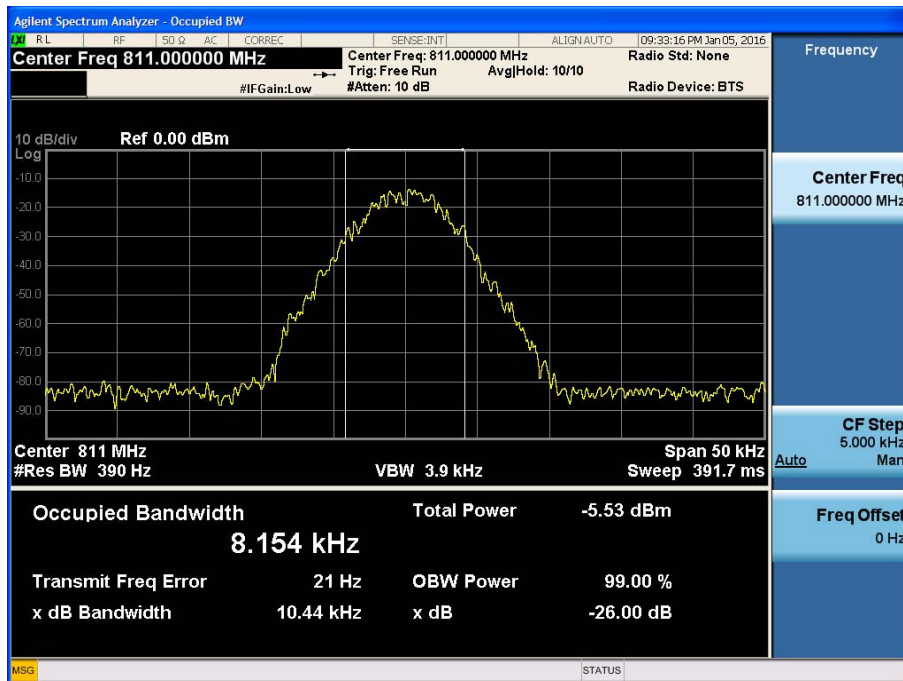
**[800 Band AGC threshold Uplink Input FM High]**



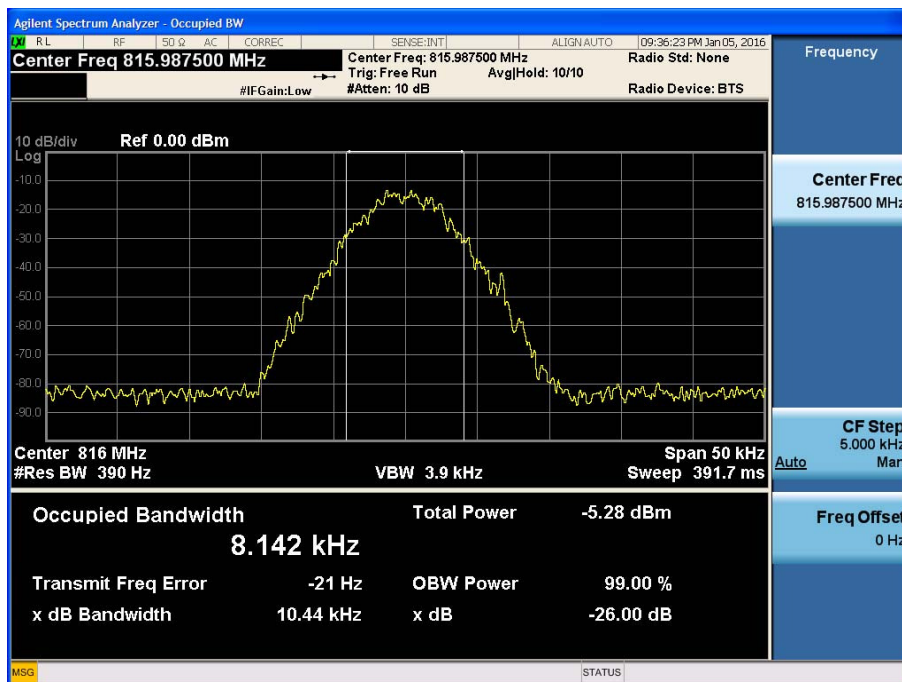
[800 Band AGC threshold Uplink Output P25 Low]



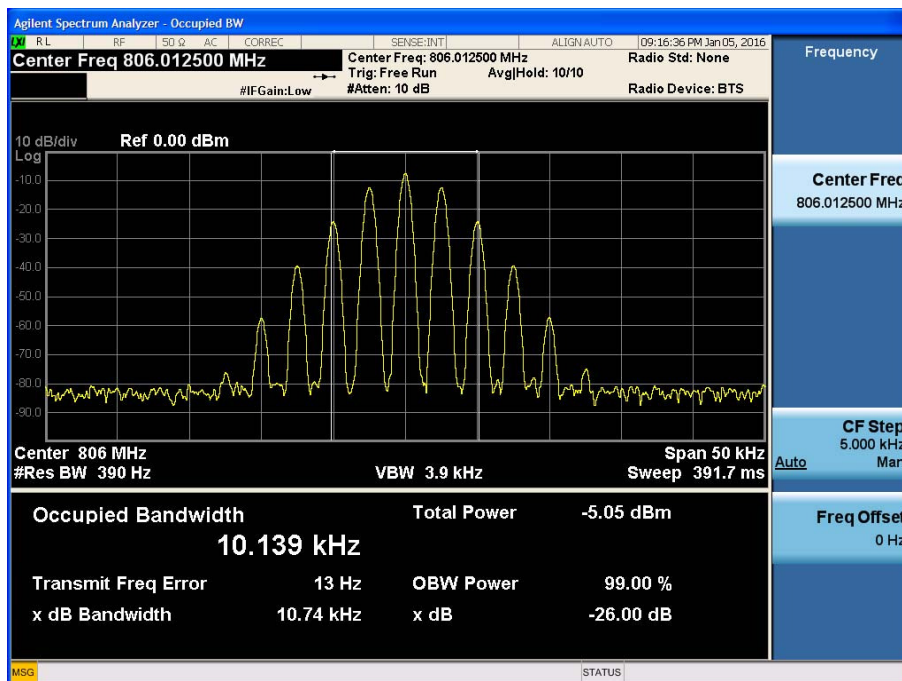
[800 Band AGC threshold Uplink Output P25 Middle]



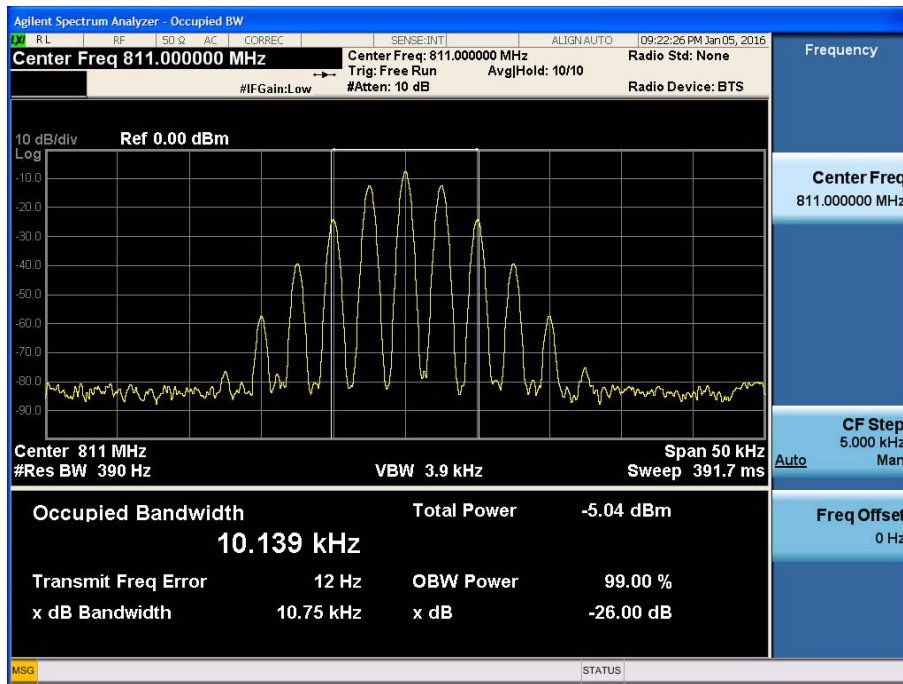
**[800 Band AGC threshold Uplink Output P25 High]**



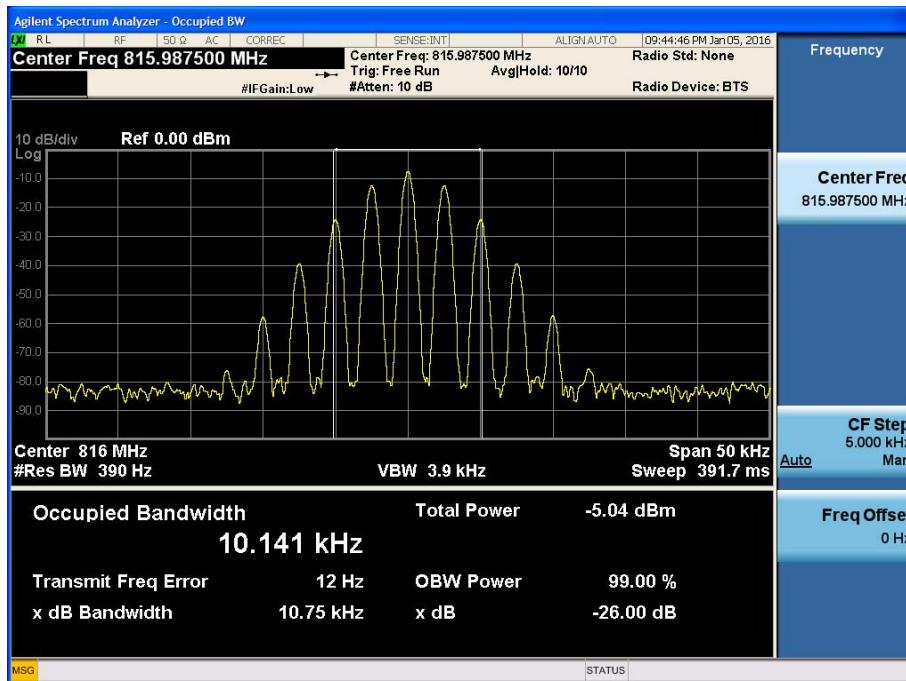
**[800 Band AGC threshold Uplink Output FM Low]**



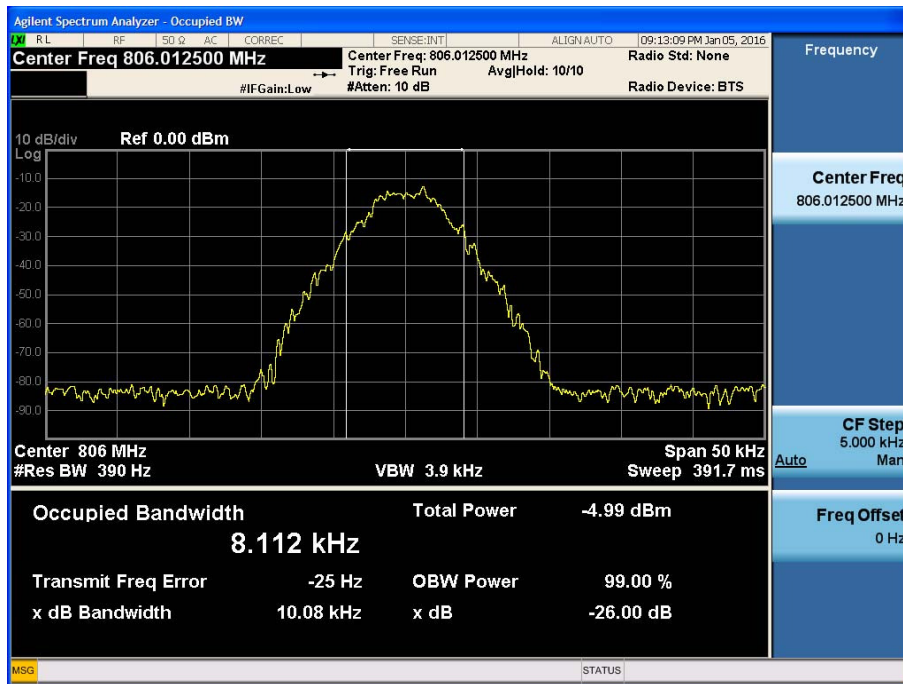
**[800 Band AGC threshold Uplink Output FM Middle]**



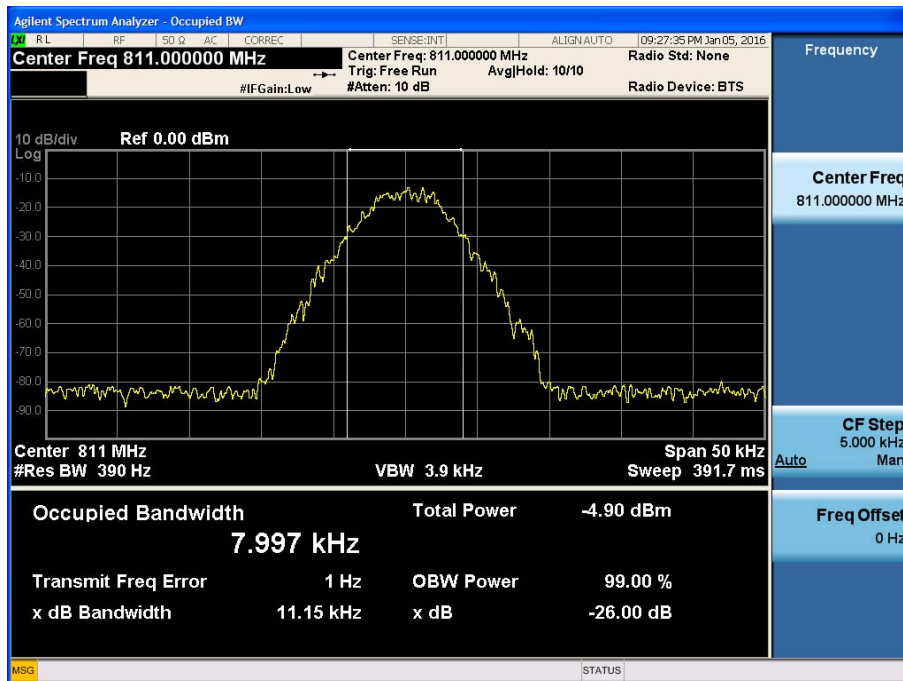
**[800 Band AGC threshold Uplink Output FM High]**



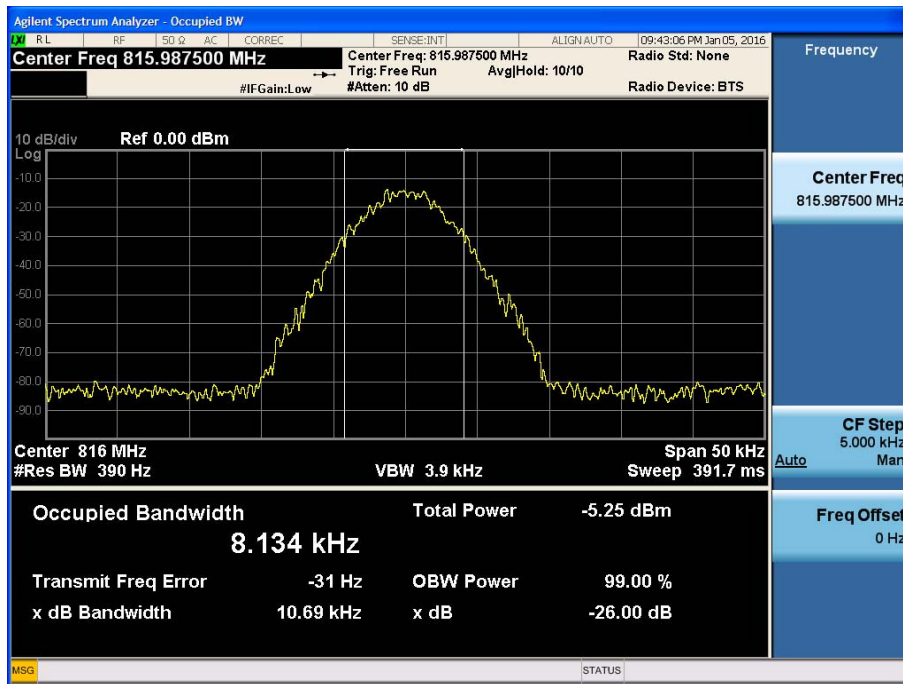
**[800 Band +3 dB above the AGC threshold Uplink Output P25 Low]**



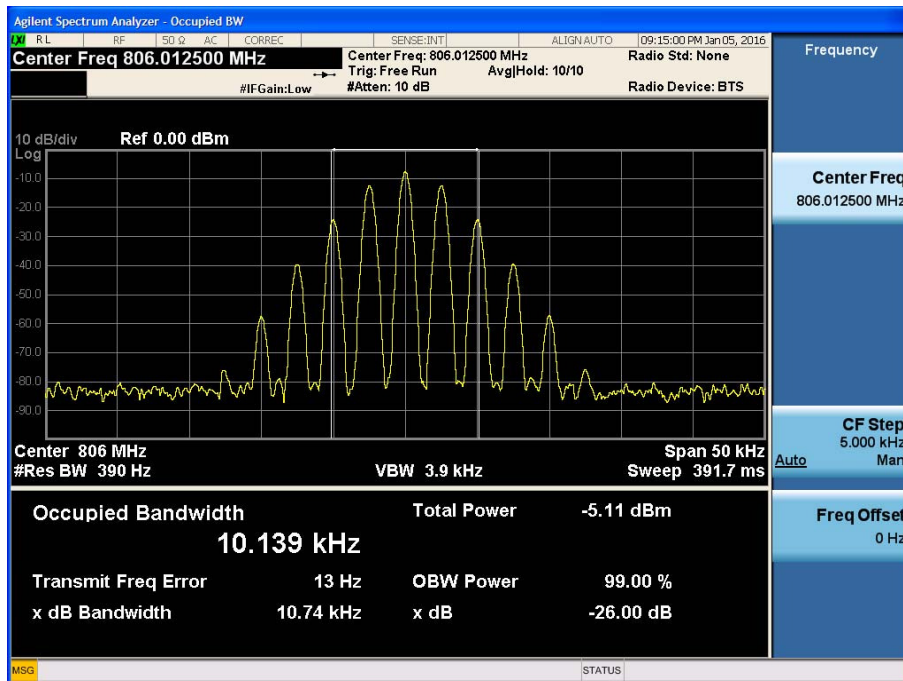
**[800 Band +3 dB above the AGC threshold Uplink Output P25 Middle]**



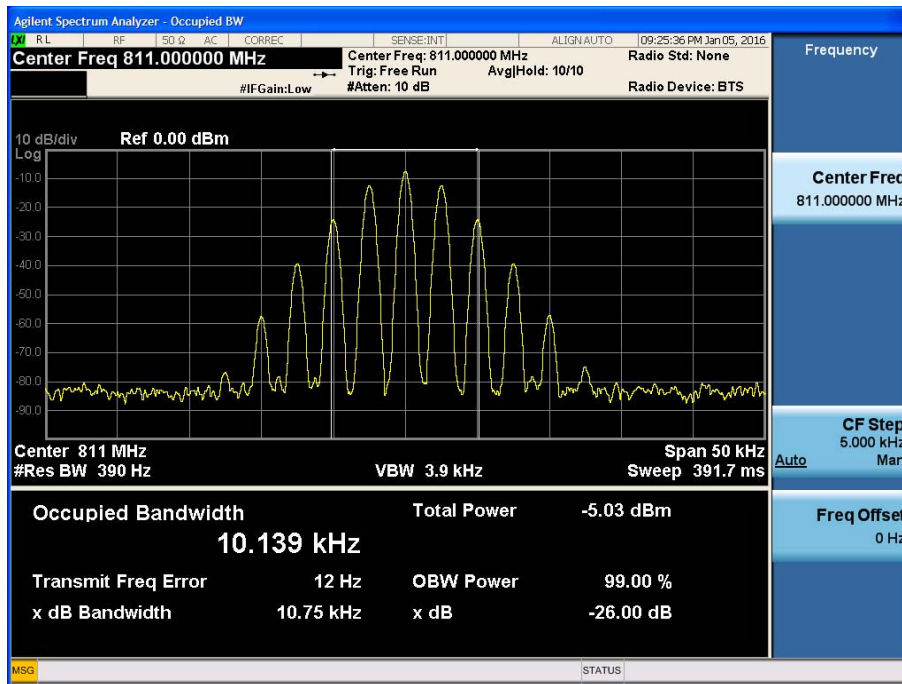
[800 Band +3 dB above the AGC threshold Uplink Output P25 High]



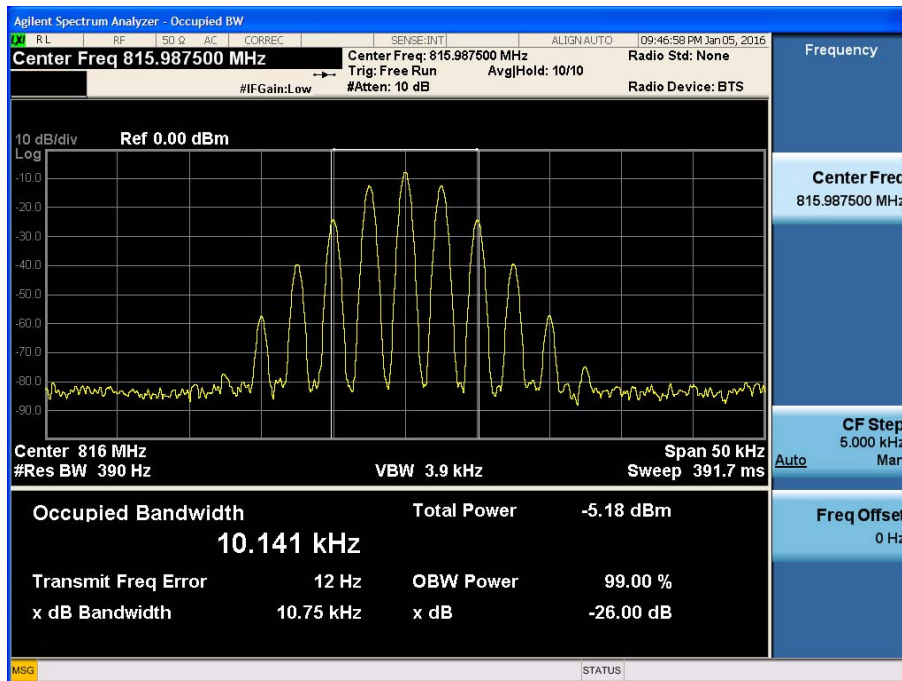
[800 Band +3 dB above the AGC threshold Uplink Output FM Low]



**[800 Band +3 dB above the AGC threshold Uplink Output FM Middle]**



**[800 Band +3 dB above the AGC threshold Uplink Output FM High]**



## 8. PASSBAND GAIN AND BANDWIDTH & OUT OF BAND REJECTION

### FCC Rules

#### Test Requirement(s): KDB 935210 D05 v01

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

**Test Procedures:** Measurements were in accordance with the test methods section 3.3, 4.3 of KDB 935210 D05 v01.

#### 3.3 EUT out-of-band rejection

- a) Connect a signal generator to the input of the EUT.
- b) Configure a swept CW signal with the following parameters:
  - 1) Frequency range =  $\pm 250\%$  of the passband from the center of the passband.
  - 2) Level = a sufficient level to affirm that the out-of-band rejection is  $> 20$  dB above the noise floor and will not engage the AGC during the entire sweep.
  - 3) Dwell time = approx. 10 ms.
  - 4) Number of points =  $\text{SPAN}/(\text{RBW}/2)$ .
- c) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
- d) Set the span of the spectrum analyzer to the same as the frequency range of the signal generator.
- e) Set the resolution bandwidth of the spectrum analyzer to be  $1\%$  to  $5\%$  of the passband and the video bandwidth shall be set to  $\geq 3 \times \text{RBW}$ .
- f) Set the detector to Peak Max-Hold and wait for the spectrum analyzer's spectral display to fill.
- g) Place a marker to the peak of the frequency response and record this frequency as  $f_0$ .
- h) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the  $-20$  dB down amplitude to determine the 20 dB bandwidth. Capture the frequency response of the EUT.

#### 4.3 PLMRS device out-of-band rejection

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

- a) Connect a signal generator to the input of the EUT.
- b) Configure a swept CW signal with the following parameters:
- c) Frequency range =  $\pm 250\%$  of the manufacturer's pass band.
- d) The CW amplitude will be 3 dB below the AGC threshold (see 4.2) and but not activate the AGC threshold throughout the test.

- e) Dwell time = approx. 10 ms.
- f) Frequency step = 50 kHz.
- g) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
- h) Set the resolution bandwidth of the spectrum analyzer between 1 % and 5 % of the manufacturer's pass band with the video bandwidth set to  $3 \times \text{RBW}$ .
- i) Set the detector to Peak and the trace to Max-Hold.
- j) After the trace is completely filled, place a marker at the peak amplitude, which is designated as  $f_0$ , and with two additional markers (use the marker-delta method) at the 20 dB bandwidth (i.e., at the points where the gain has fallen by 20 dB).
- k) Capture the frequency response plot and for inclusion in the test report.

## IC Rules

### Test Requirements: RSS-131 6.1

The passband gain shall not exceed the nominal gain by more than 1.0 dB. The 20 dB bandwidth shall not exceed the nominal bandwidth that is stated by the manufacturer. Outside of the 20 dB bandwidth, the gain shall not exceed the gain at the 20 dB point.

### Test Procedures: RSS-131 4.2

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

With the aid of a signal generator and spectrum analyzer, measure the 20 dB bandwidth of the amplifier (i.e. at the point where the gain has fallen by 20 dB). Measure the gain-versus-frequency response of the amplifier from the midband frequency  $f_0$  of the passband up to at least  $f_0 + 250\%$  of the 20 dB bandwidth.

Signal generator sweep from the frequency more lower than the low frequency -250% to the frequency more higher than high frequency +250%.

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

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

## 700 MHz Band

### [Downlink]

| 20 dB point<br>frequency<br>(MHz) | Output power<br>(dBm) | Gain (dB) |
|-----------------------------------|-----------------------|-----------|
| 756.95 ~ 776.06                   | 24.048                | 67.048    |

### [Upnlink]

| 20 dB point<br>frequency<br>(MHz) | Output power<br>(dBm) | Gain (dB) |
|-----------------------------------|-----------------------|-----------|
| 787 ~ 805.54                      | -8.034                | 37.034    |

## 800 MHz Band

### [Downlink]

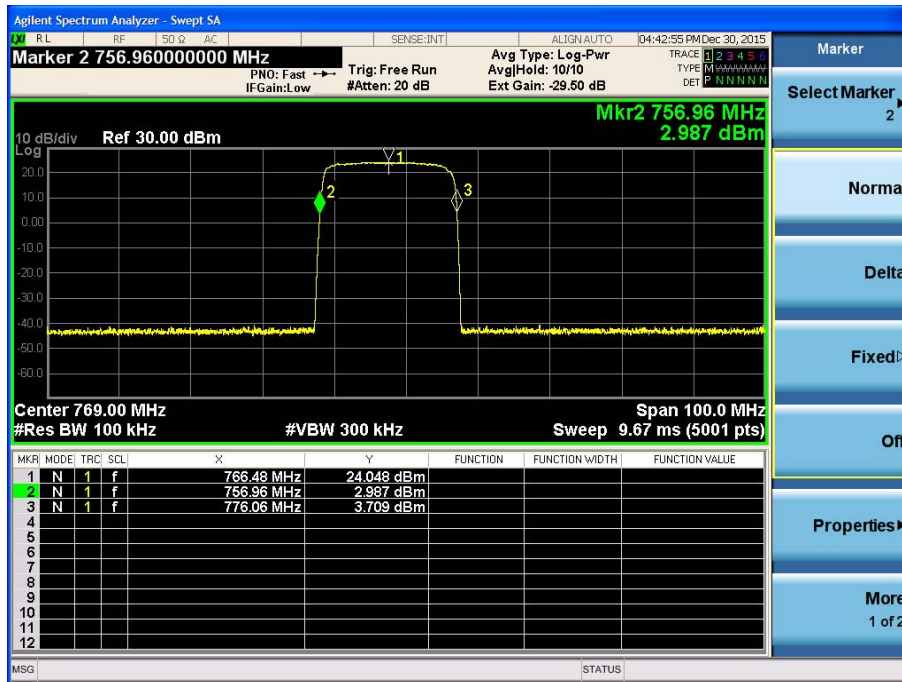
| 20 dB point<br>frequency<br>(MHz) | Output power<br>(dBm) | Gain (dB) |
|-----------------------------------|-----------------------|-----------|
| 850.02 ~ 870.32                   | 24.166                | 67.166    |

### [Upnlink]

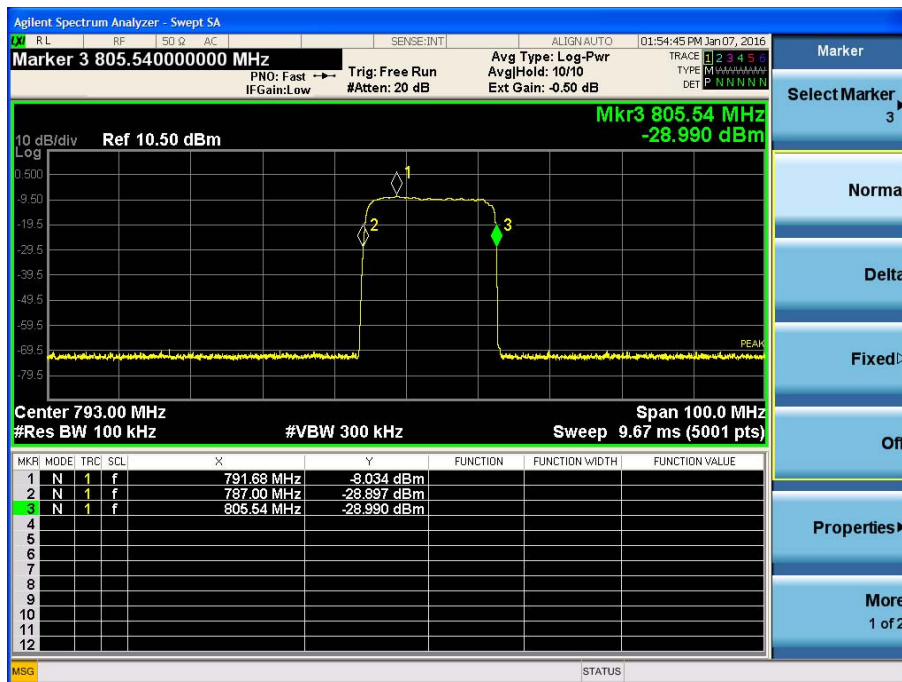
| 20 dB point<br>frequency<br>(MHz) | Output power<br>(dBm) | Gain (dB) |
|-----------------------------------|-----------------------|-----------|
| 804.64 ~ 825.10                   | 8.006                 | 37.034    |

## Plots of Passband Gain and Bandwidth & Out of Band Rejection

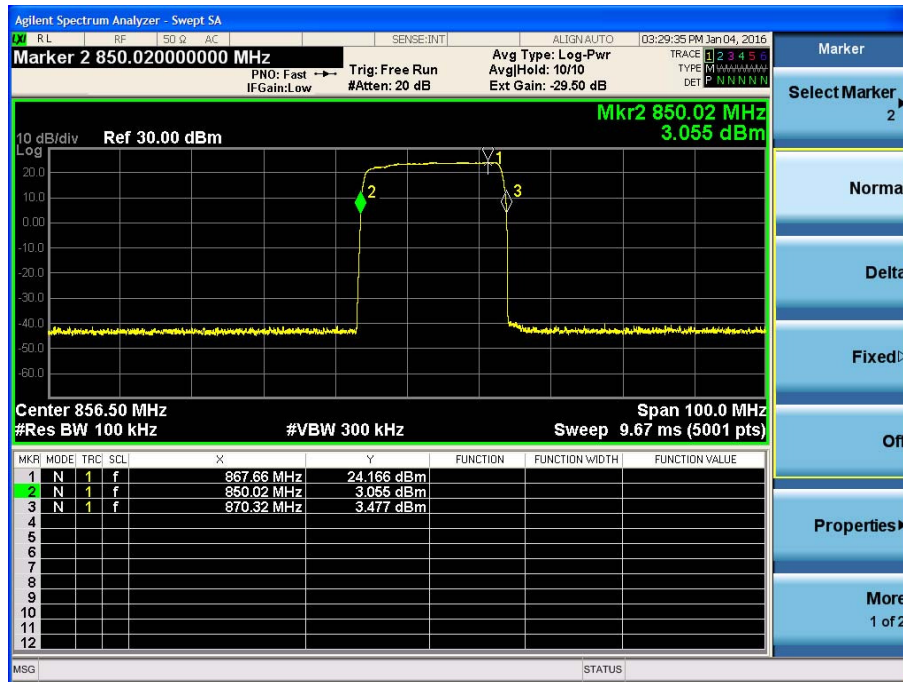
### [700M Band Downlink]



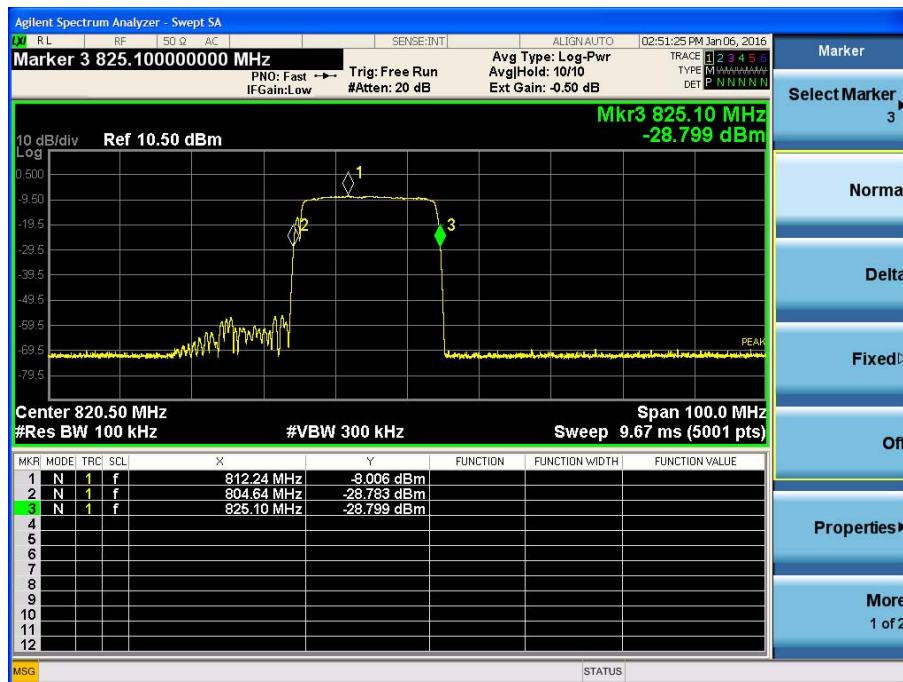
### [700M Band Uplink]



### [800M Band Downlink]



### [800M Band Uplink]



## 9. NOISE FIGURE

### FCC Rules

#### Test Requirement(s):

##### § 90.219 Use of signal boosters:

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

##### Test Procedures:

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

##### 1. GAIN measurement

EUT in the maximum gain of the repeater state.

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

EUT GAIN = Output signal level – Input signal level

##### 2. Output Noise level measurement

EUT in the maximum gain of the repeater state.

Without input signal.

Spectrum analyzer was connected to RF output port  
Measured to Noise power.

$$NF = NP - G - BCF + PNAD$$

$$NF = NP - G - 60 + 174$$

$$NF = NP - G + 114$$

NF=Noise Figure(dB)

NP=Noise power(dBm/MHz)

G=Maximum gain

BCF=Bandwidth Correction Factor= $10\log(1 \text{ MHz}/1 \text{ Hz})=60$

PNAD=Noise Power Density=174 dBm/Hz

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

| Input Signal         | Maximum Amp Gain         |
|----------------------|--------------------------|
| Without input signal | DL : 67 dB<br>UL : 37 dB |

### 700 MHz Band

DL : Noise Figure =  $-38.732 - 67 + 114 = 8.268$  dB

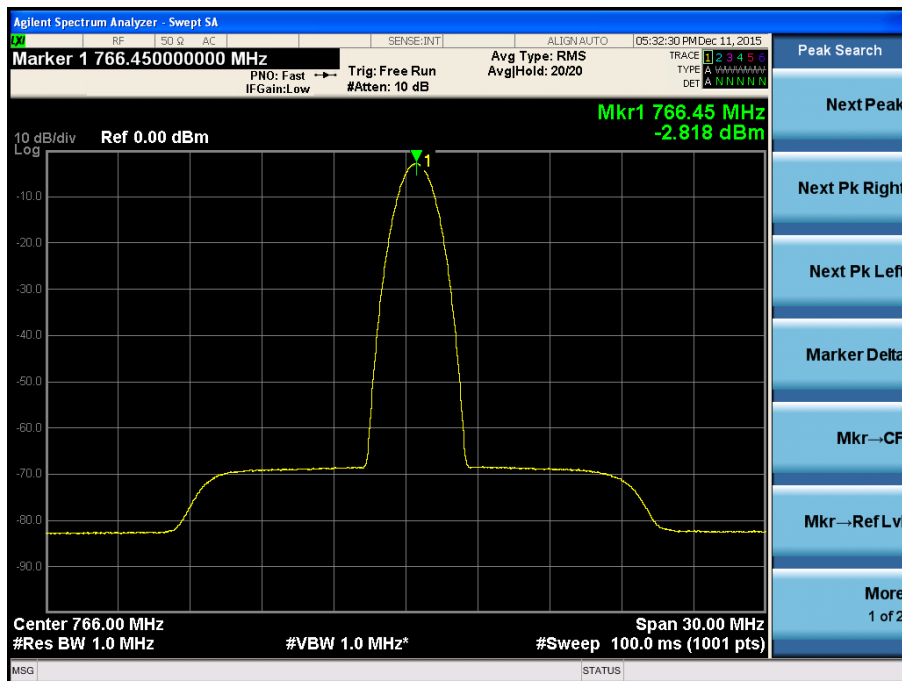
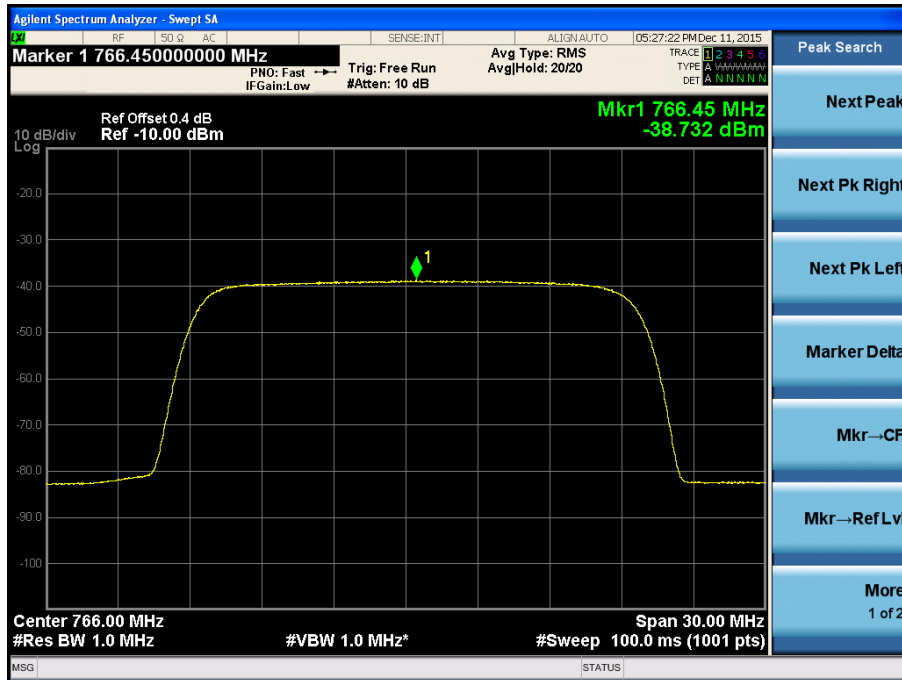
### 800 MHz Band

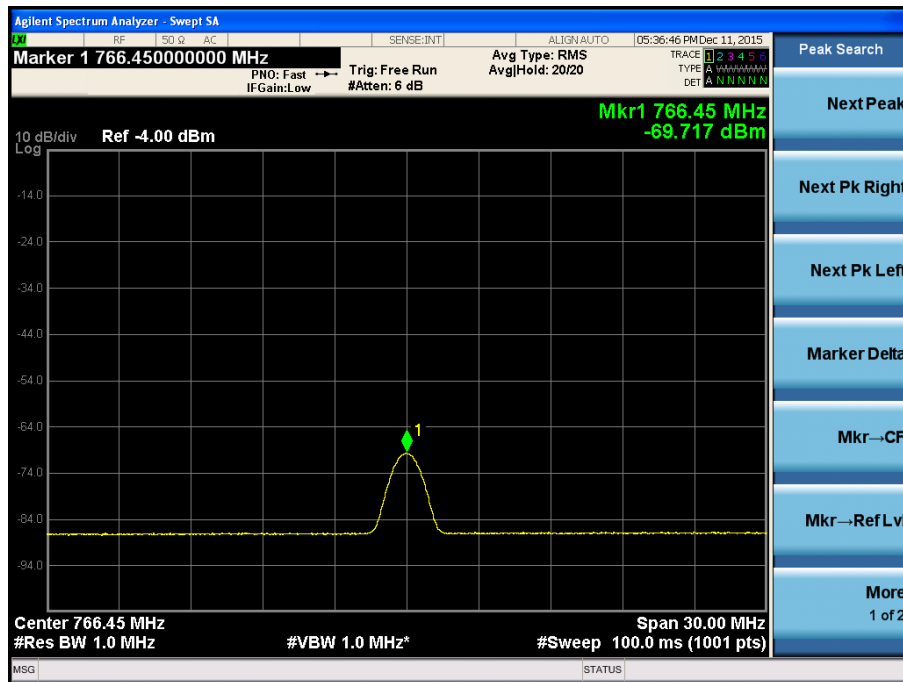
DL : Noise Figure =  $-39.289 - 67 + 114 = 7.711$  dB

## Plots of Noise power

### 700 MHz Band

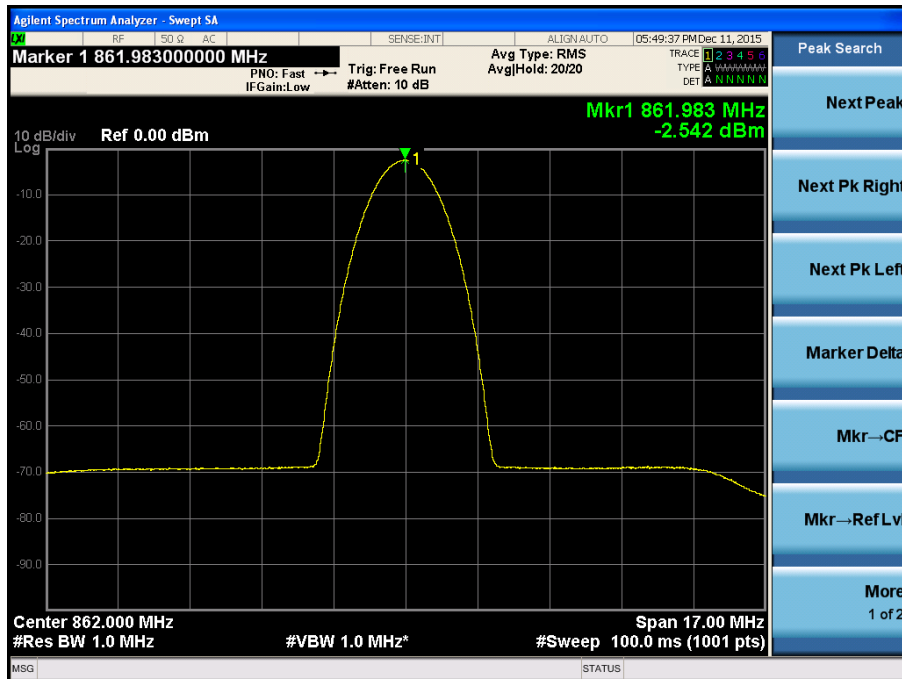
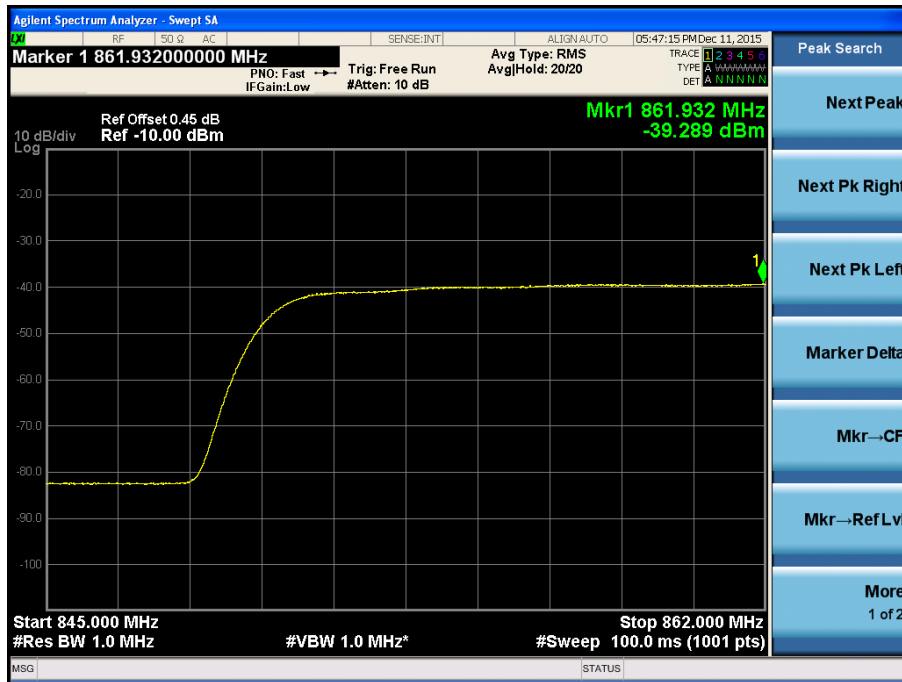
#### [700 MHz Band Downlink]

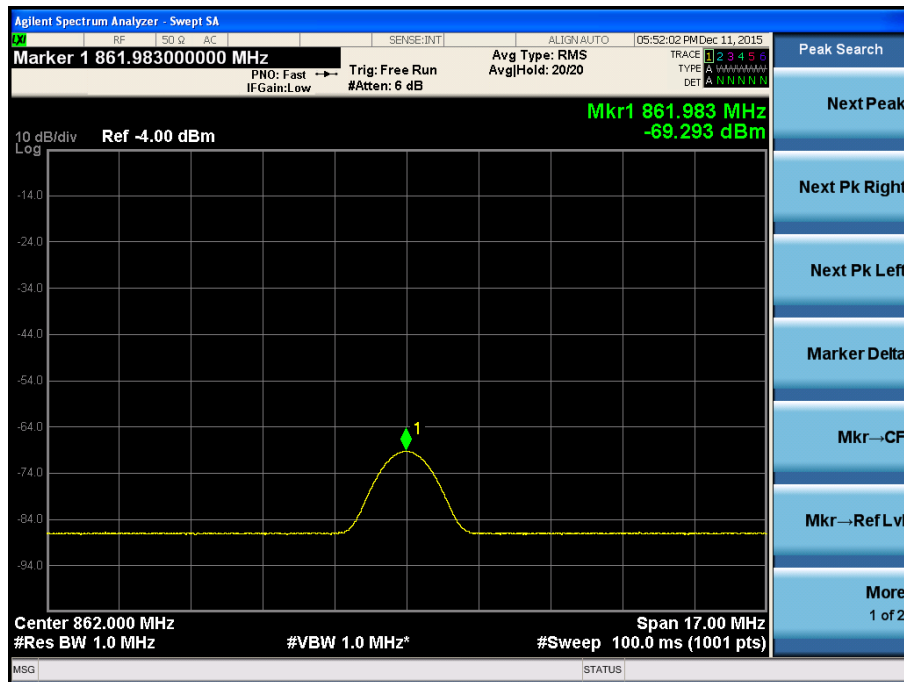




## 800 MHz Band

### [800 MHz Band Downlink]





## 10. EMISSION MASKS

### FCC Rules

#### Test Requirement(s):

##### § 90.210 Emission masks:

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (o) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating under this part.

#### APPLICABLE EMISSION MASKS

| Frequency band (MHz)           | Mask for equipment with audio low pass filter | Mask for equipment without audio low pass filter |
|--------------------------------|-----------------------------------------------|--------------------------------------------------|
| Below 25 <sup>1</sup>          | A or B                                        | A or C                                           |
| 25-50                          | B                                             | C                                                |
| 72-76                          | B                                             | C                                                |
| 150-174 <sup>2</sup>           | B, D, or E                                    | C, D or E                                        |
| 150 paging only                | B                                             | C                                                |
| 220-222                        | F                                             | F                                                |
| 421-512 <sup>2 5</sup>         | B, D, or E                                    | C, D, or E                                       |
| 450 paging only                | B                                             | G                                                |
| 806-809/851-854                | B                                             | H                                                |
| 809-824/854-869 <sup>3 5</sup> | B                                             | G                                                |
| 896-901/935-940                | I                                             | J                                                |
| 902-928                        | K                                             | K                                                |
| 929-930                        | B                                             | G                                                |

|                        |        |        |
|------------------------|--------|--------|
| 4940-4990 MHz          | L or M | L or M |
| 5850-5925 <sup>4</sup> |        |        |
| All other bands        | B      | C      |

c) *Emission Mask C.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5 kHz, but not more than 10 kHz:

At least  $83 \log (f_d/5)$  dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least  $29 \log (f_d^2/11)$  dB or 50 dB, whichever is the lesser attenuation;

(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \log (P)$  dB.

(4) In the 1427-1432 MHz band, licensees are encouraged to take all reasonable steps to ensure that unwanted emissions power does not exceed the following levels in the 1400-1427 MHz band:

(i) For stations of point-to-point systems in the fixed service: -45 dBW/27 MHz.

(ii) For stations in the mobile service: -60 dBW/27 MHz.

(g) *Emission Mask G.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 10 kHz, but no more than 250 percent of the authorized bandwidth: At least  $116 \log (f_d/6.1)$  dB, or  $50 + 10 \log (P)$  dB, or 70 dB, whichever is the lesser attenuation;

(2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \log (P)$  dB.

(h) *Emission Mask H.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the center of the authorized bandwidth by a

displacement frequency ( $f_d$  in kHz) of 4 kHz or less: Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 4 kHz, but no more than 8.5 kHz: At least  $107 \log (f_d/4)$  dB;

(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 8.5 kHz, but no more than 15 kHz: At least  $40.5 \log (f_d/1.16)$  dB;

(4) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 15 kHz, but no more than 25 kHz: At least  $116 \log (f_d/6.1)$  dB;

(5) On any frequency removed from the center of the authorized bandwidth by more than 25 kHz: At least  $43 + \log (P)$  dB.

**Test Procedures:**

- a) Connect a signal generator to the input of the EUT.
- b) Configure the signal generator to transmit the appropriate test signal associated with the public safety emission designation (see Table 1).
- c) Configure the signal level to be just below the AGC threshold (see results from 4.2).
- d) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.
- e) Set the spectrum analyzer center frequency to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be between 2 times to 5 times the EBW (or OBW).
- f) The nominal resolution bandwidth (RBW) shall 300 Hz for 16K0F3E and 100 Hz for all other emissions types.
- g) Set the reference level of the spectrum analyzer to accommodate the maximum input amplitude level.
- h) Set spectrum analyzer detection mode to peak, and trace mode to max hold.
- i) Allow the trace to fully stabilize.
- j) Confirm that the signal is contained within the appropriate emissions mask.
- k) Use the marker function to determine the maximum emission level and record the associated frequency as  $f_0$ .
- l) Capture the emissions mask plot for inclusion in the test report (output signal spectra).
- m) Measure the EUT input signal power (signal generator output signal) directly from the signal generator using power measurement guidance provided in KDB Publication 971168 (input signal spectra).
- n) Compare the spectral plot of the output signal (determined in step k), to the input

signal (determined in step l) to affirm they are similar (in passband and rolloff characteristic features and relative spectral locations).

o) Repeat the procedure for both test signals with the input signal amplitude set 3 dB above the AGC threshold.

p) Repeat steps b) to n) for all authorized operational bands and emissions types (see applicable regulatory specifications, e.g., §90.210).

q) Include all accumulated spectral plots depicting EUT input signal and EUT output signal in the test report and note any observed dissimilarities.

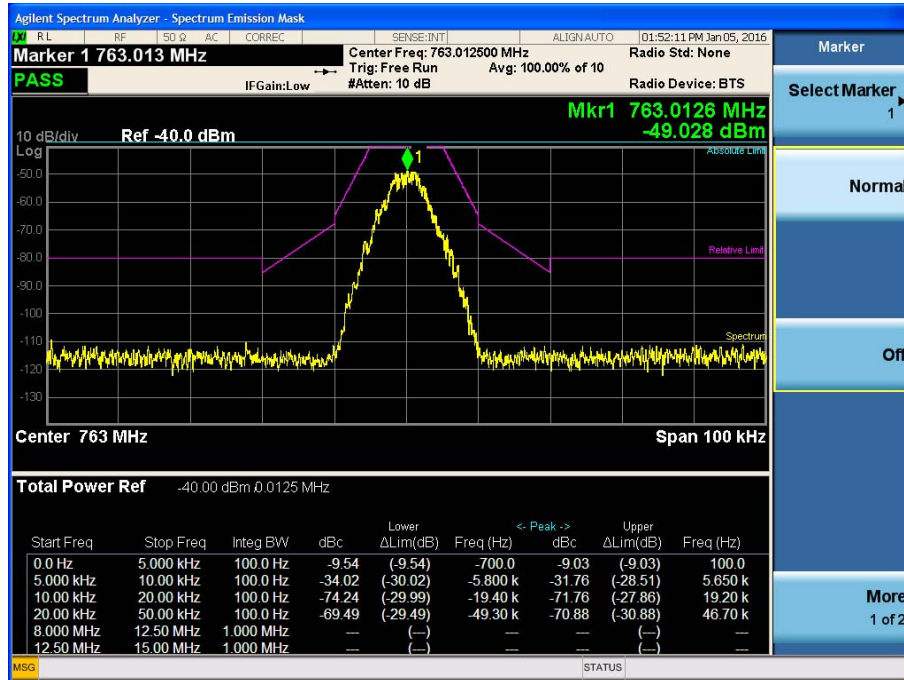
**Test Results:** The EUT complies with the requirements of this section.

| Input Signal  | Input Level (dBm)            | Maximum Amp Gain         |
|---------------|------------------------------|--------------------------|
| FM modulation | DL : -40 dBm<br>UL : -42 dBm | DL : 67 dB<br>UL : 37 dB |
| P25 12.5 kHz  | DL : -40 dBm<br>UL : -42 dBm | DL : 67 dB<br>UL : 37 dB |

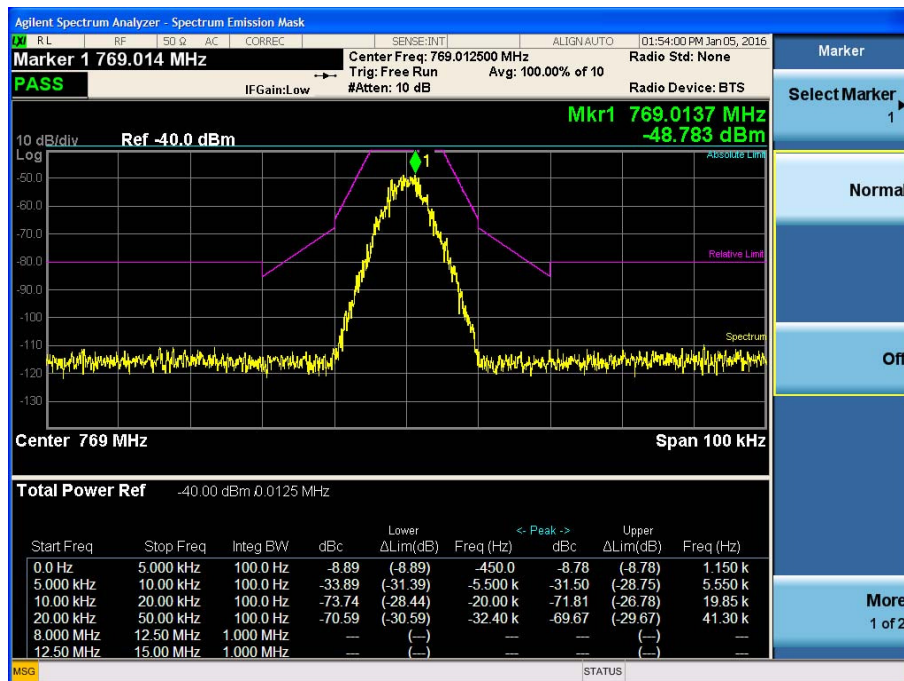
## Plots of Emission Mask

### 700 MHz Band DL

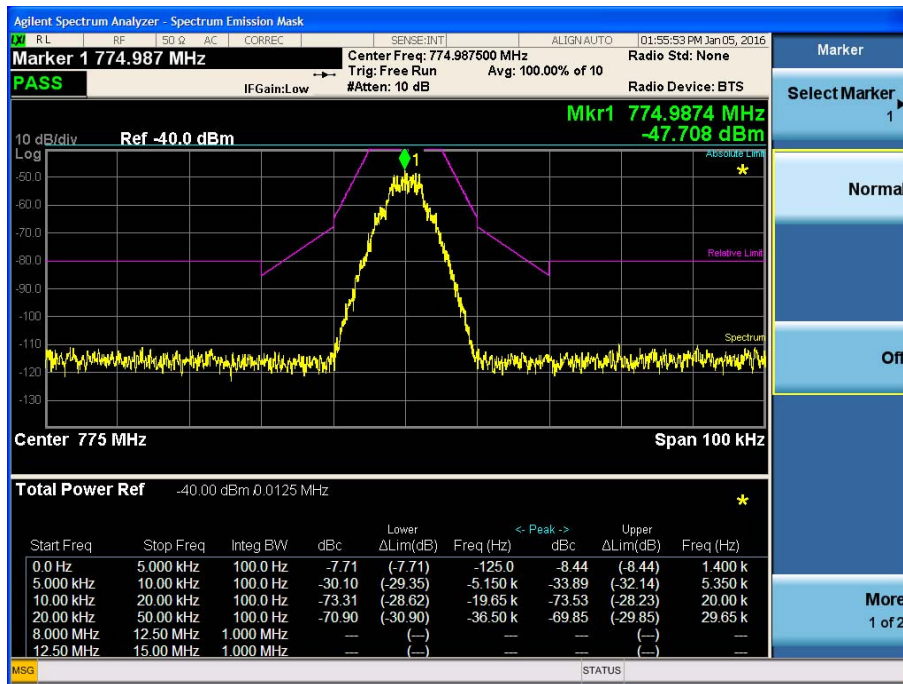
#### [763 MHz ~ 775 MHz Downlink Input P25 Low Emission Mask C]



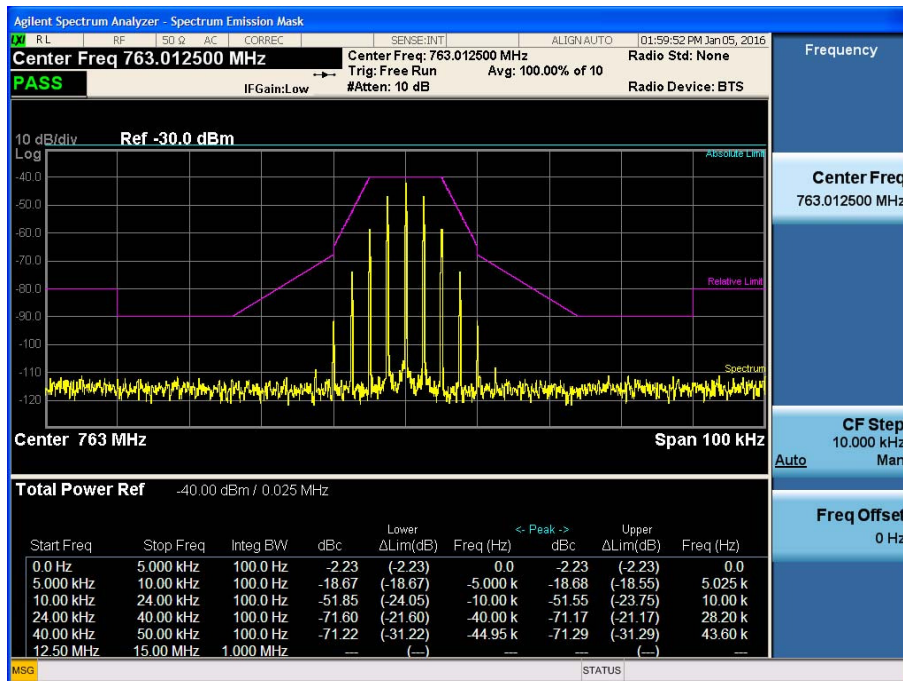
#### [763 MHz ~ 775 MHz Downlink Input P25 Middle Emission Mask C]



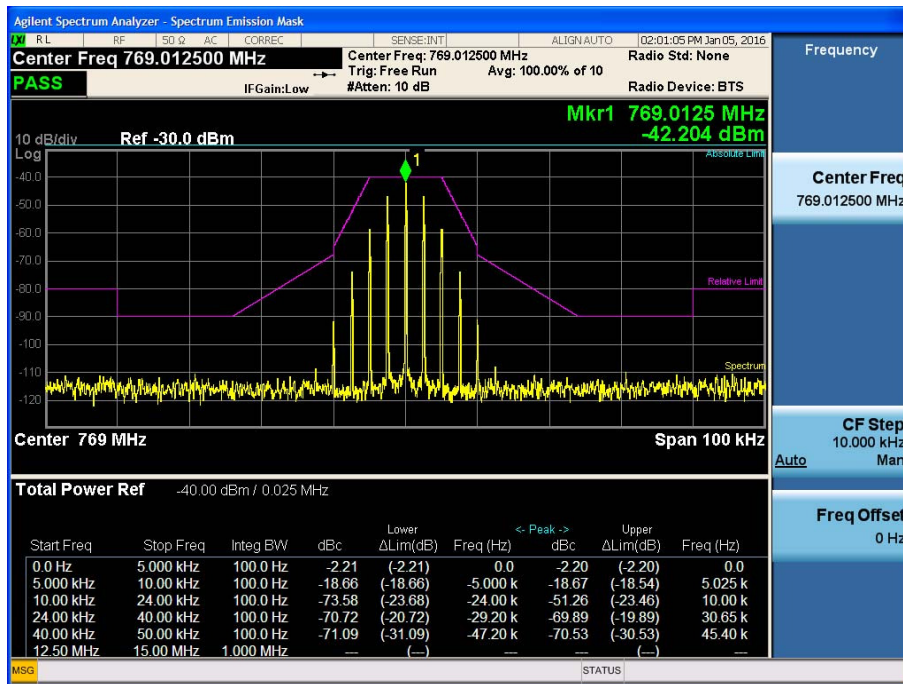
[763 MHz ~ 775 MHz Downlink Input P25 High Emission Mask C]



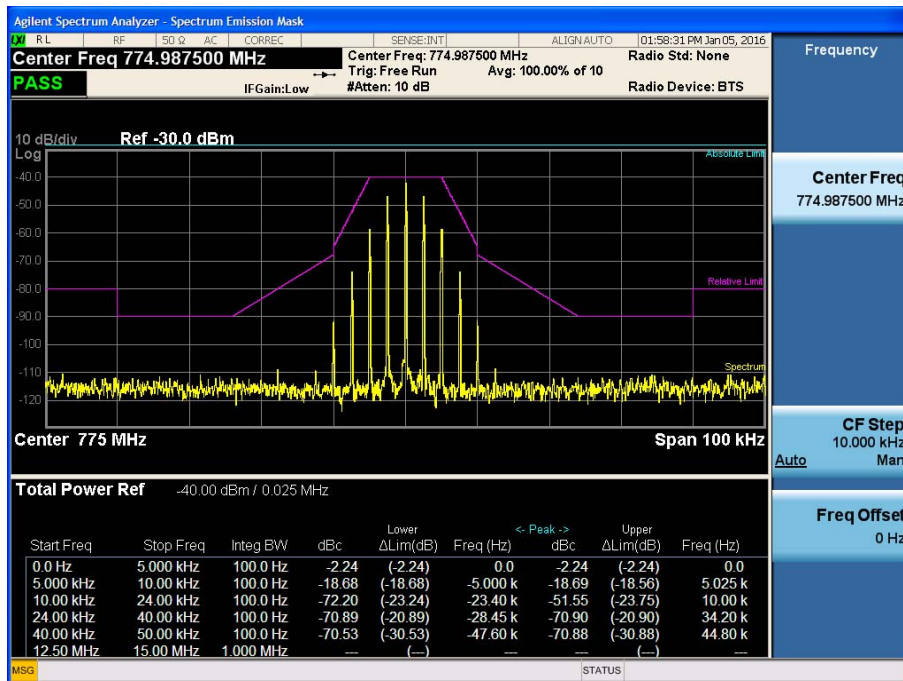
[763 MHz ~ 775 MHz Downlink Input FM Low Emission Mask C]



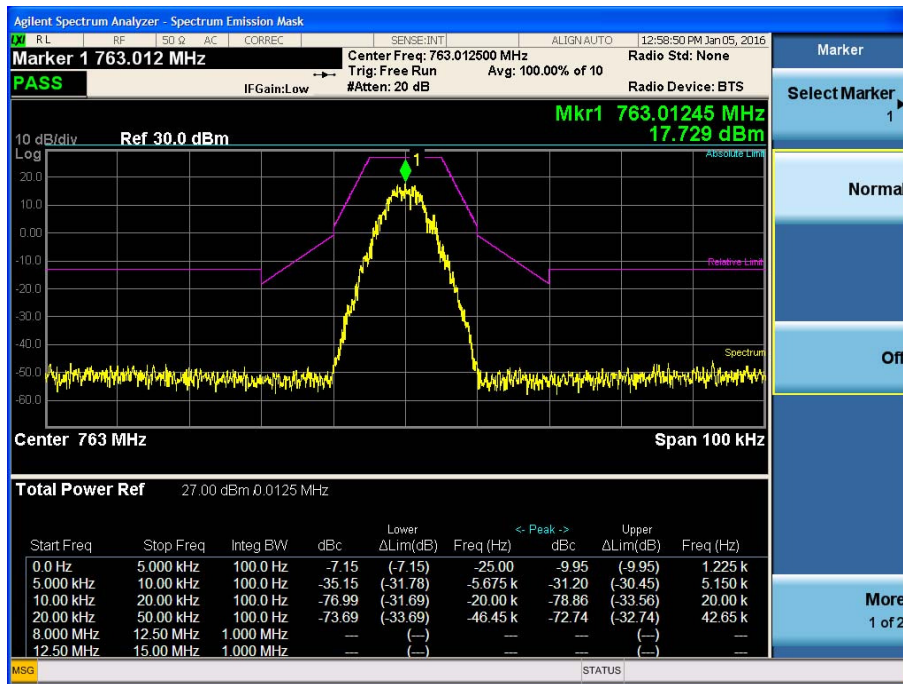
[763 MHz ~ 775 MHz Downlink Input FM Middle Emission Mask C]



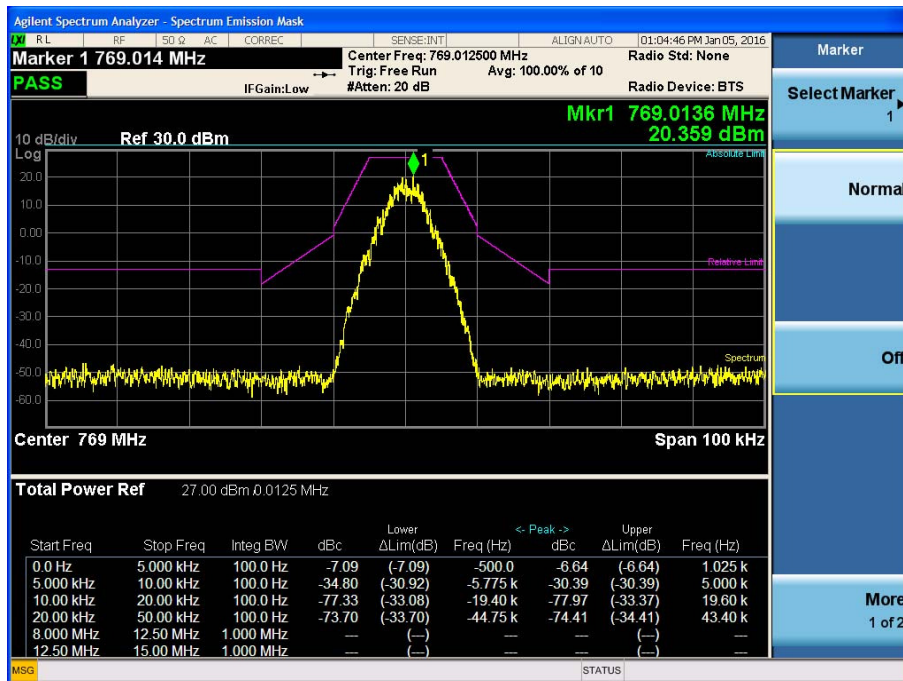
[763 MHz ~ 775 MHz Downlink Input FM High Emission Mask C]



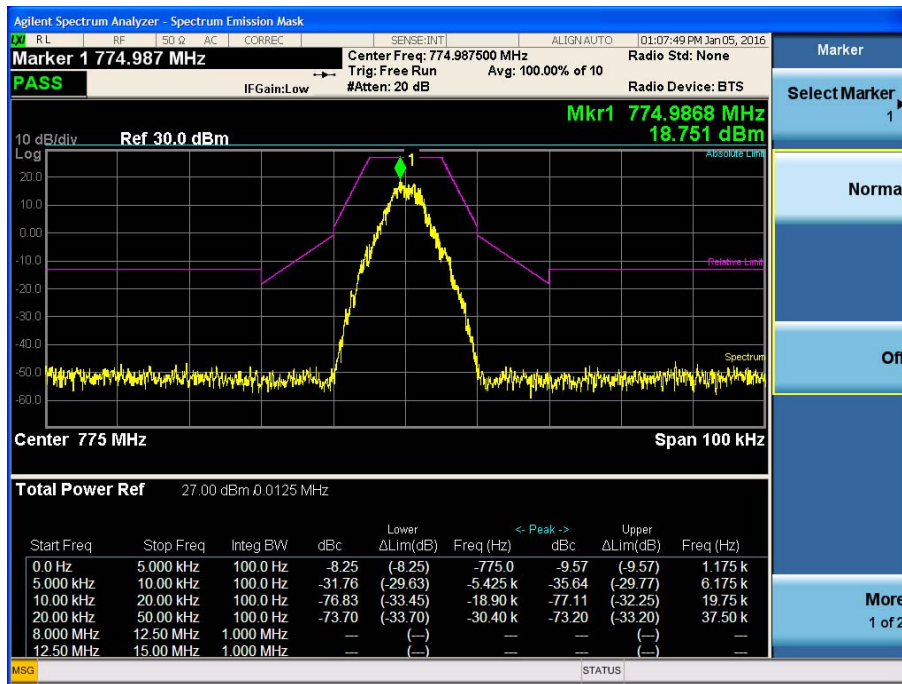
[763 MHz ~ 775 MHz Downlink Output P25 Low Emission Mask C]



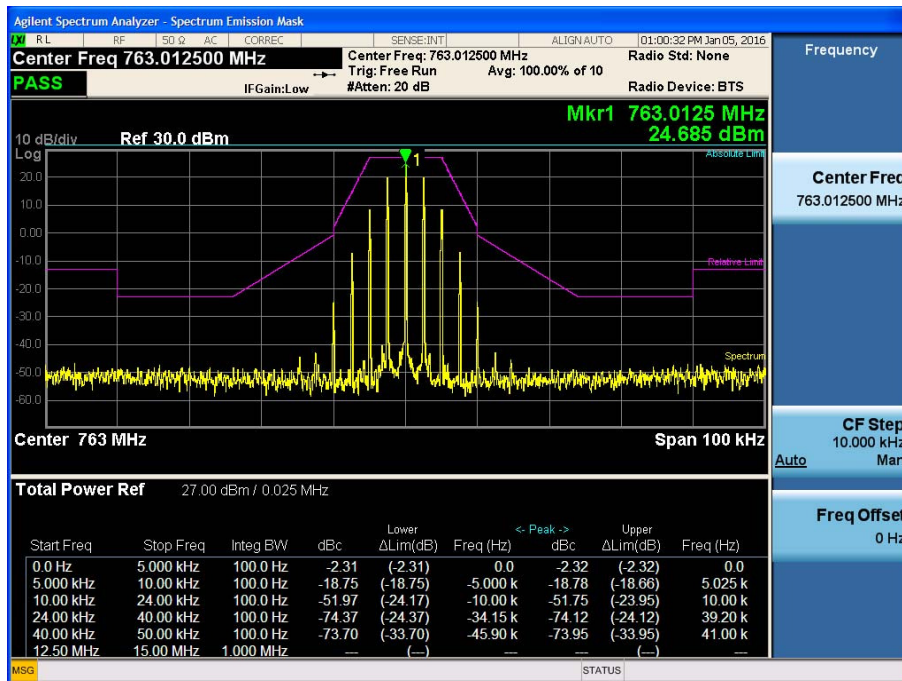
[763 MHz ~ 775 MHz Downlink Output P25 Middle Emission Mask C]



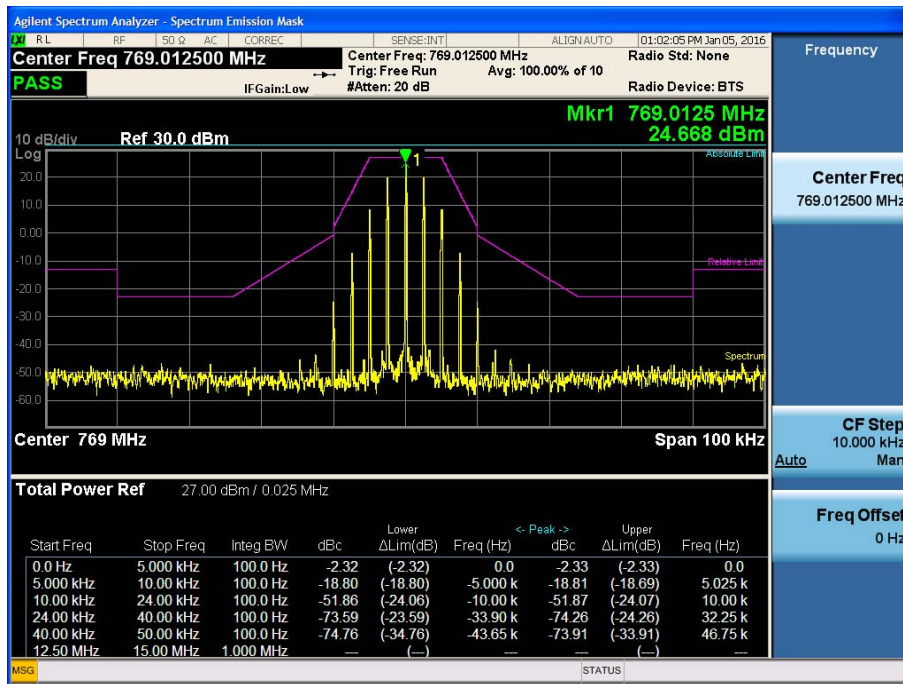
[763 MHz ~ 775 MHz Downlink Output P25 High Emission Mask C]



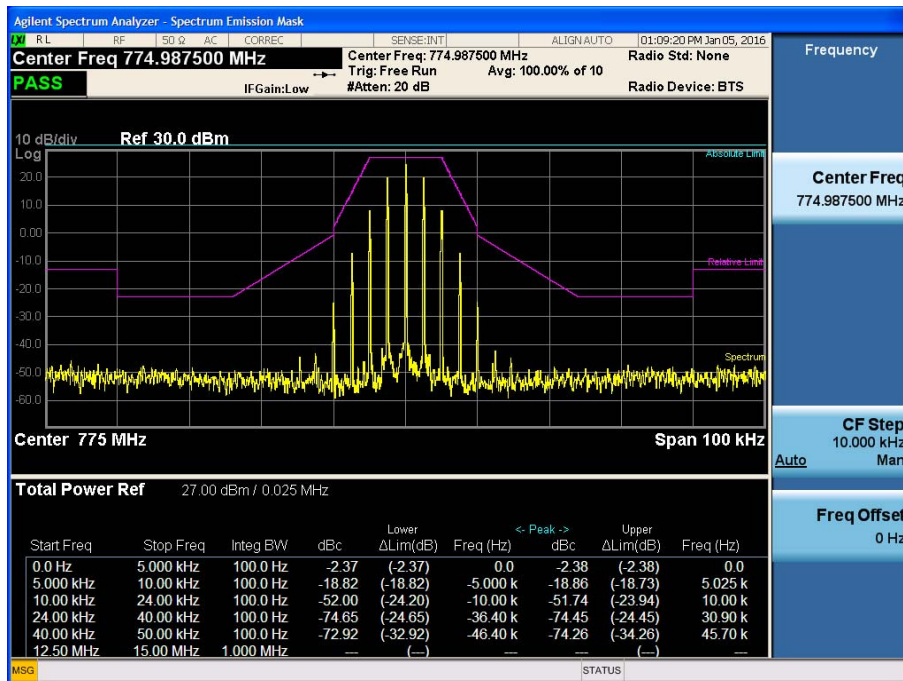
[763 MHz ~ 775 MHz Downlink Output FM Low Emission Mask C]



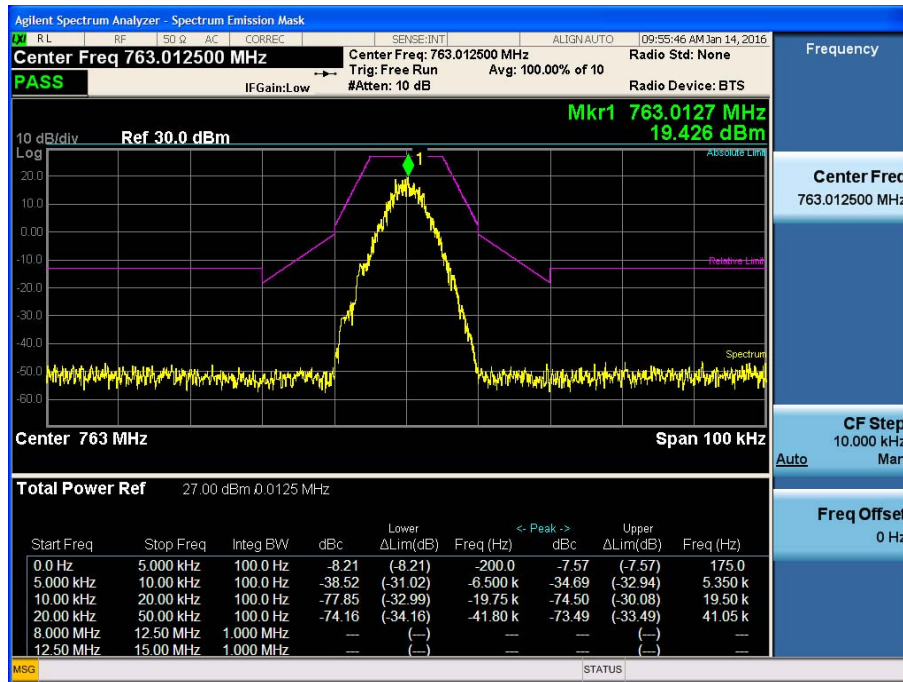
[763 MHz ~ 775 MHz Downlink Output FM Middle Emission Mask C]



[763 MHz ~ 775 MHz Downlink Output FM High Emission Mask C]



**[+3 dB Above the AGC Threshold Downlink Output P25 Low Emission Mask C]**



**[+3 dB Above the AGC Threshold Downlink Output P25 Middle Emission Mask C]**

