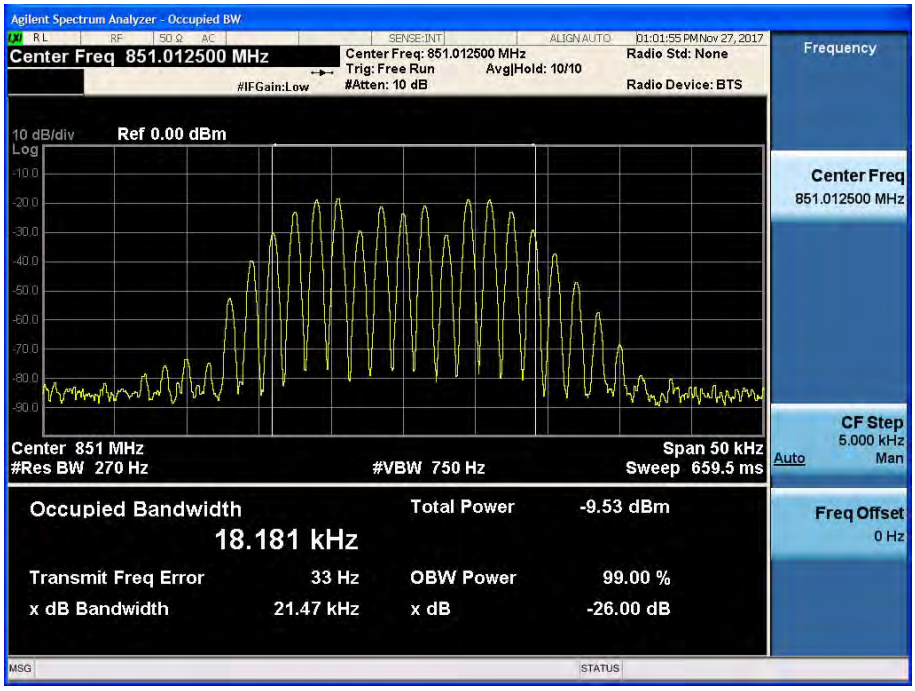
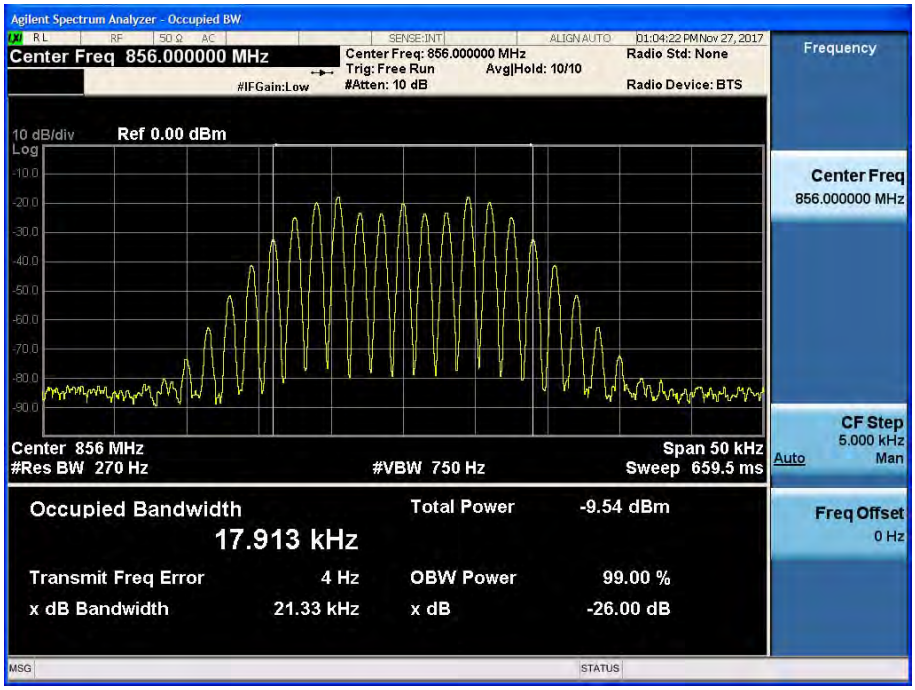
800 APCO 25(25 kHz)_DL Input

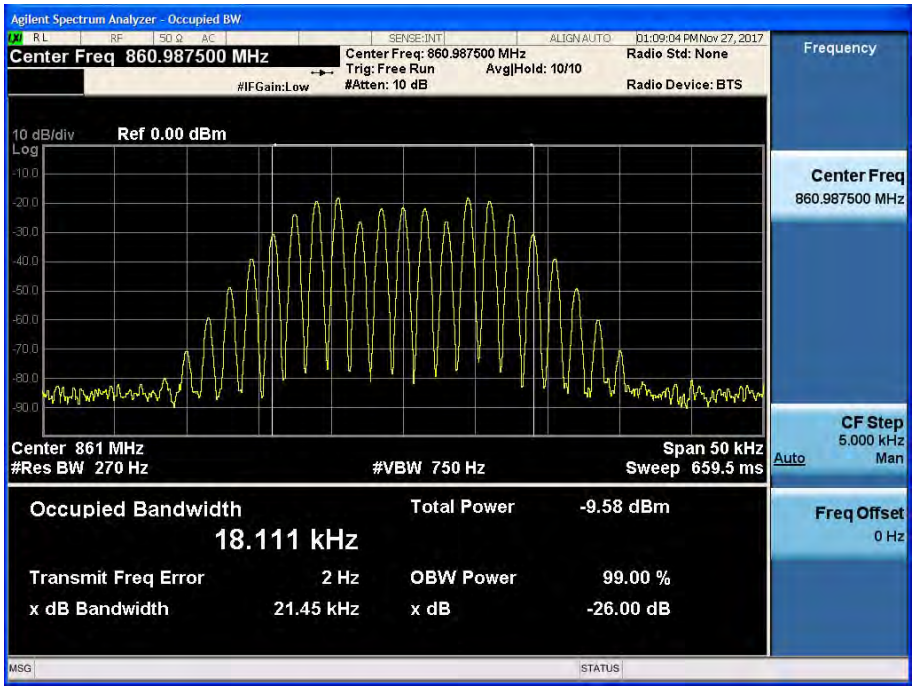
[AGC threshold Downlink - Low]



[AGC threshold Downlink - Middle]

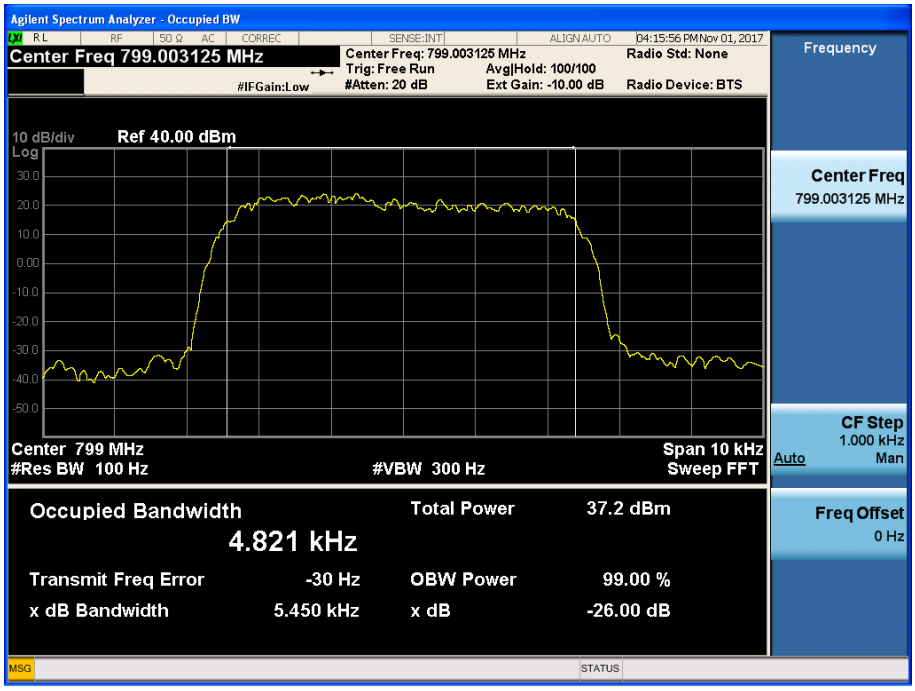


[AGC threshold Downlink - High]

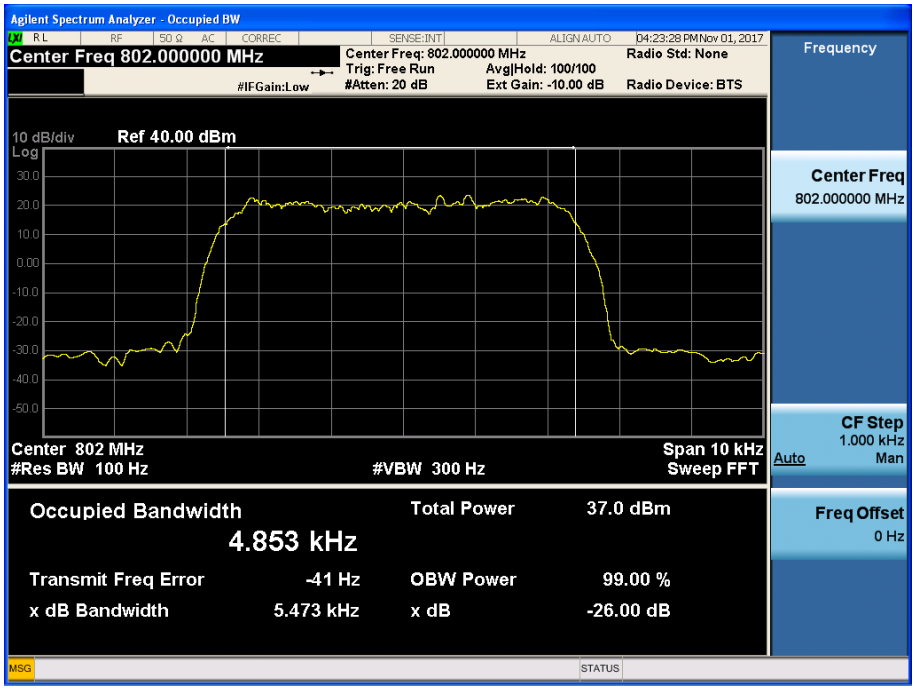


700 APCO 25(6.25 kHz)_UL Output

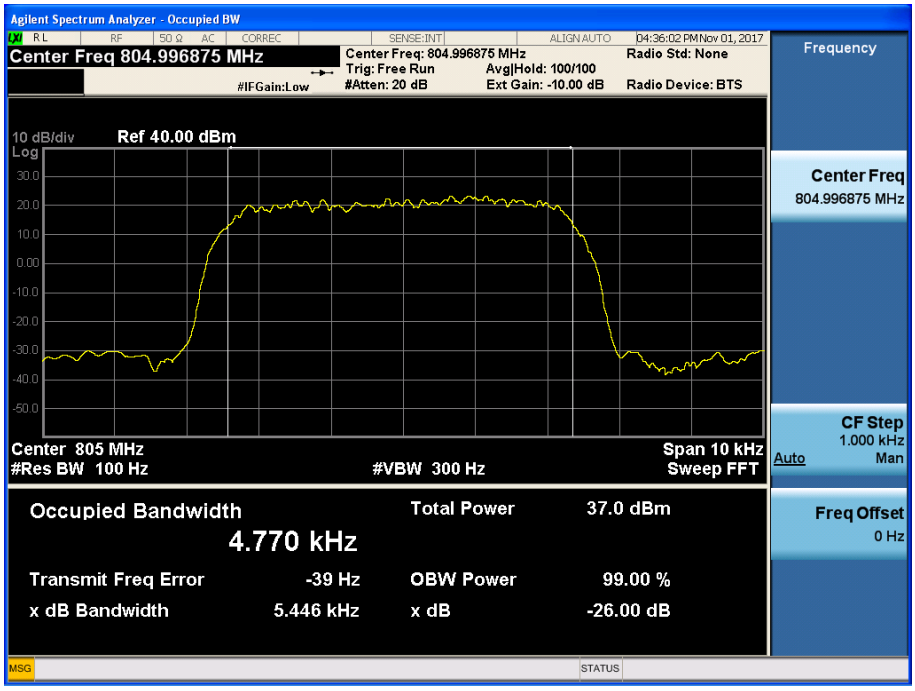
[AGC threshold Uplink - Low]



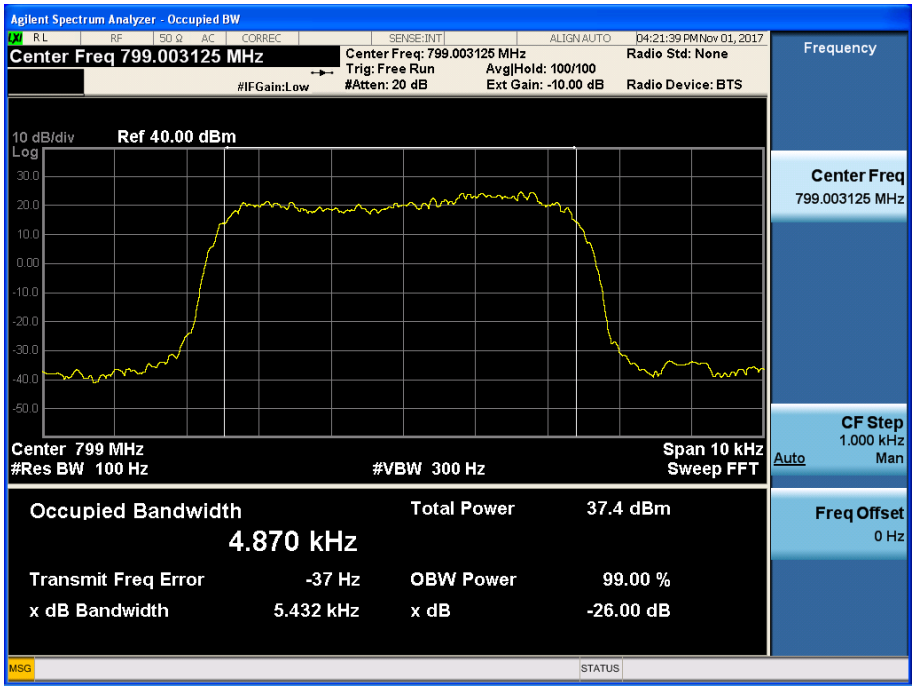
[AGC threshold Uplink - Middle]



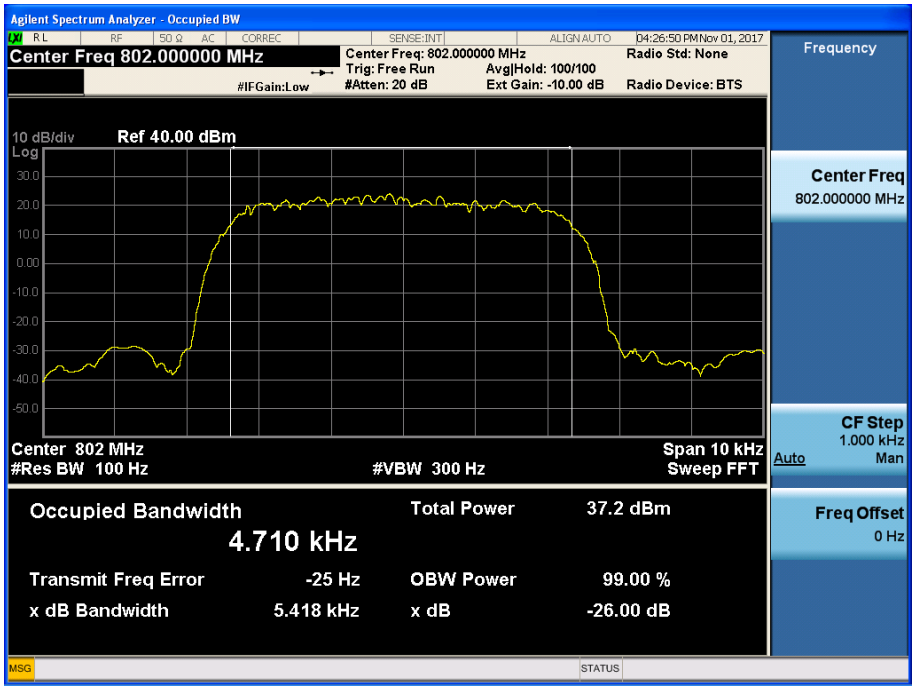
[AGC threshold Uplink - High]



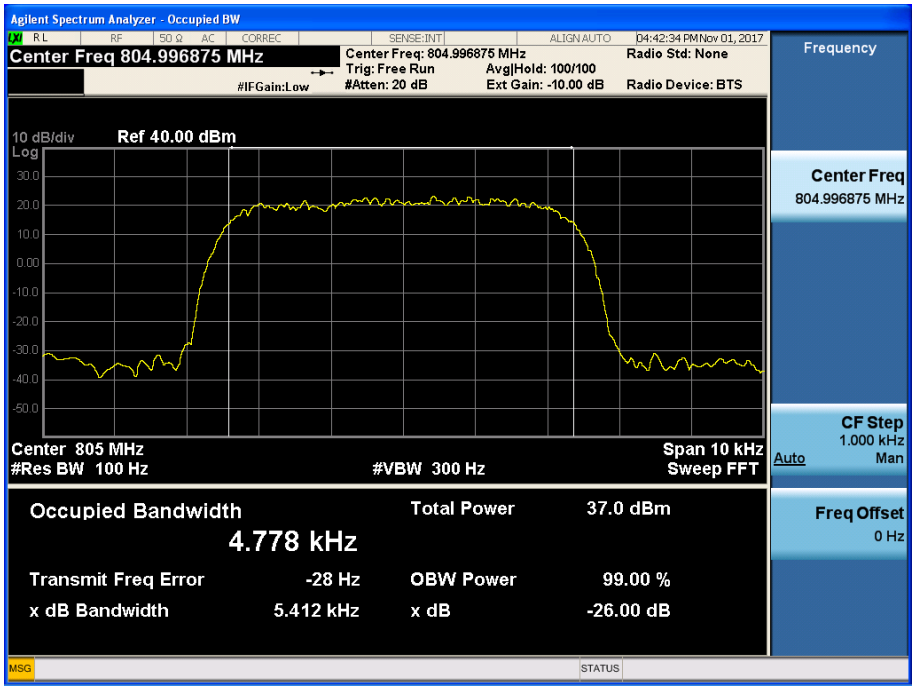
[+3dB above the AGC threshold Uplink - Low]



[+3dB above the AGC threshold Uplink - Middle]

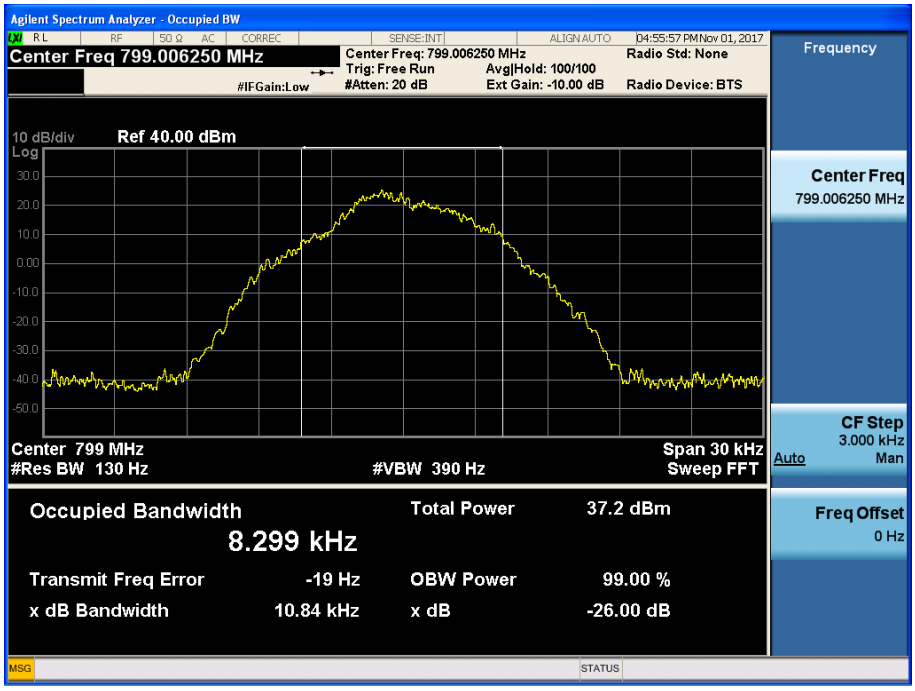


[+3dB above the AGC threshold Uplink - High]

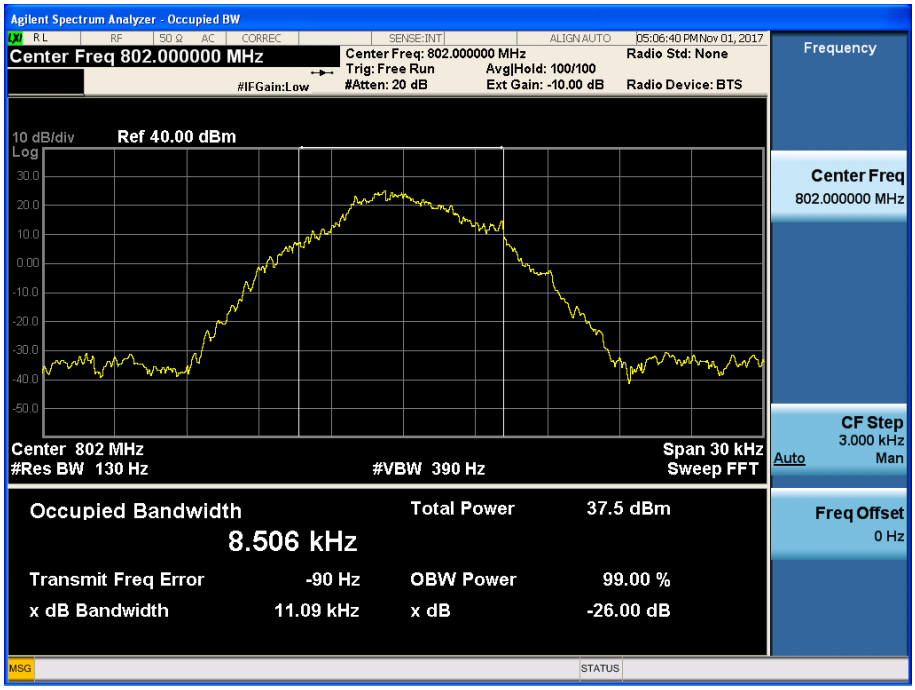


700 APCO 25(12.5 kHz)_UL Output

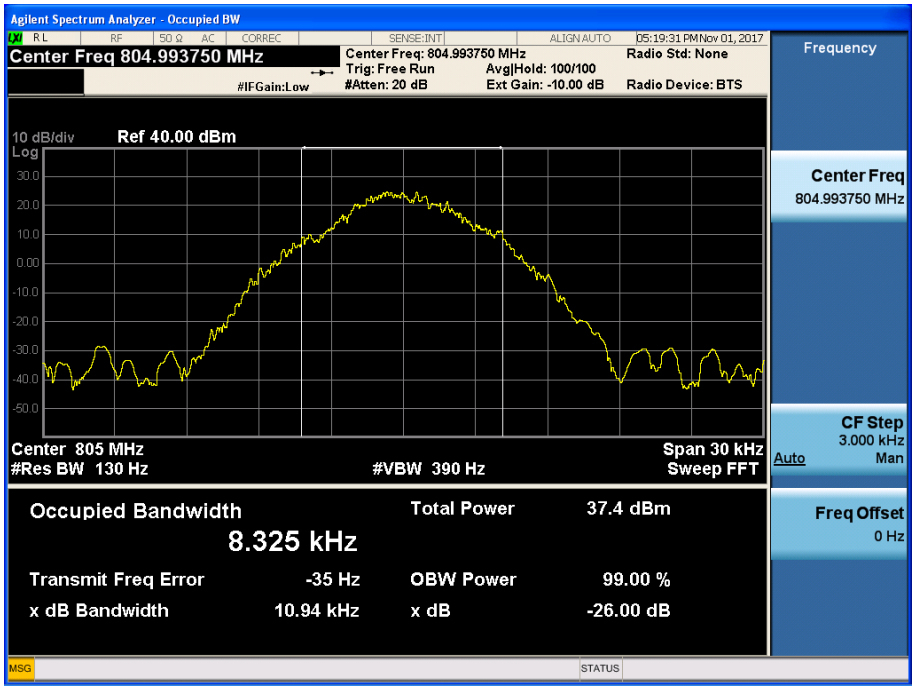
[AGC threshold Uplink - Low]



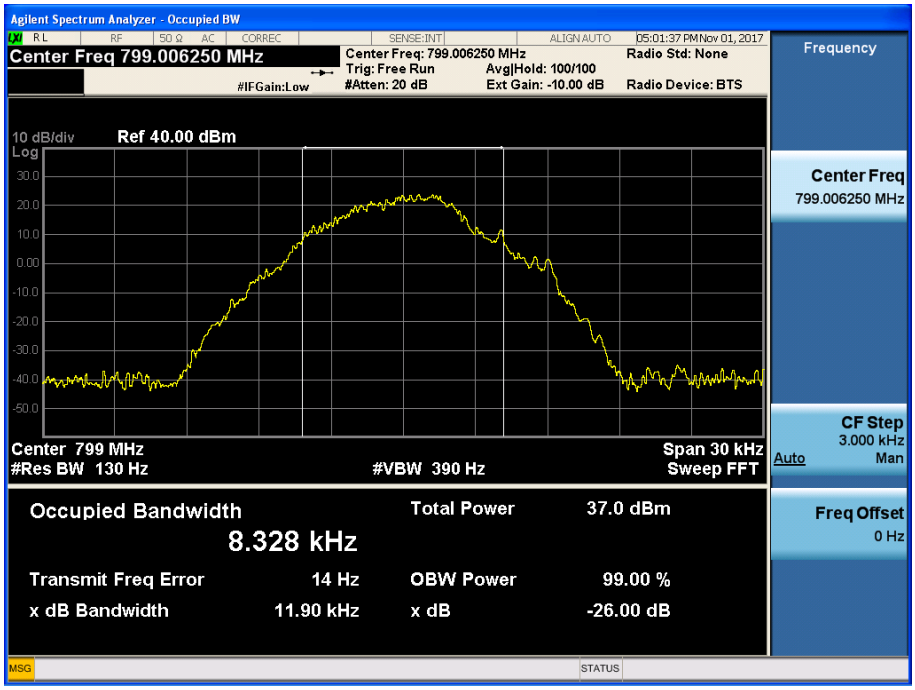
[AGC threshold Uplink - Middle]



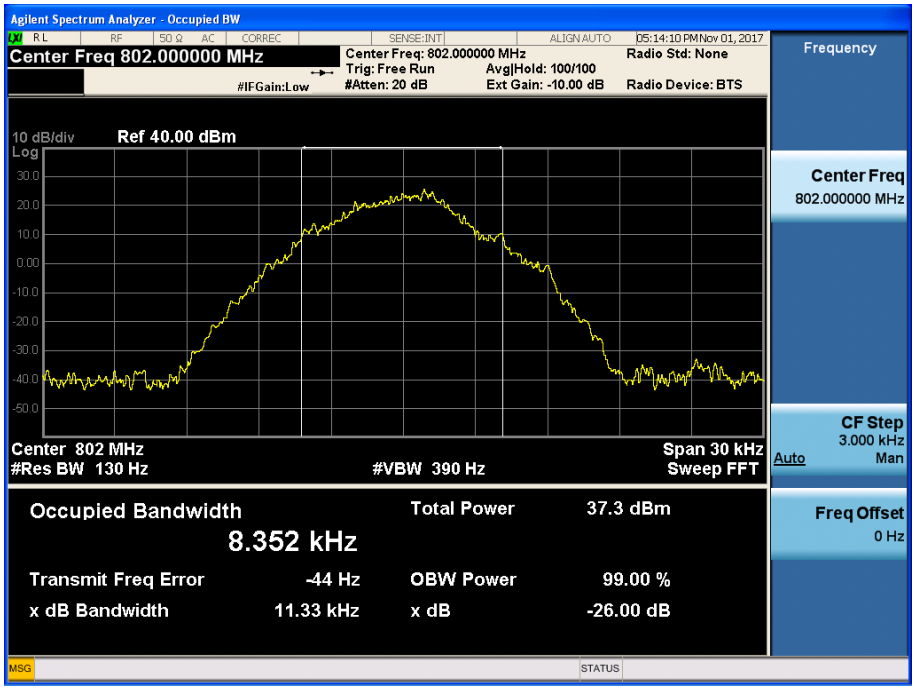
[AGC threshold Uplink - High]



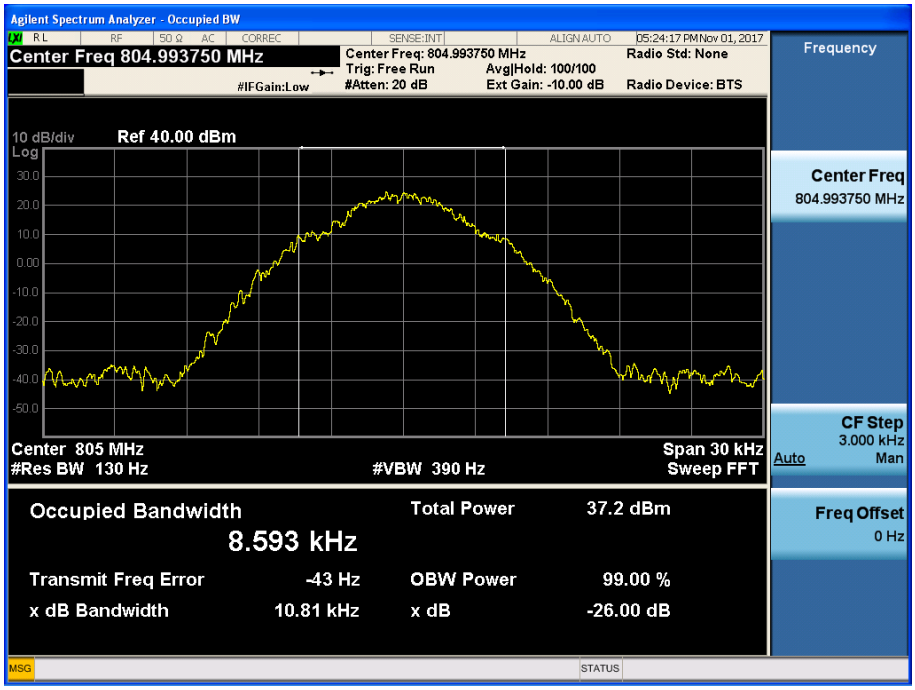
[+3dB above the AGC threshold Uplink - Low]



[+3dB above the AGC threshold Uplink - Middle]

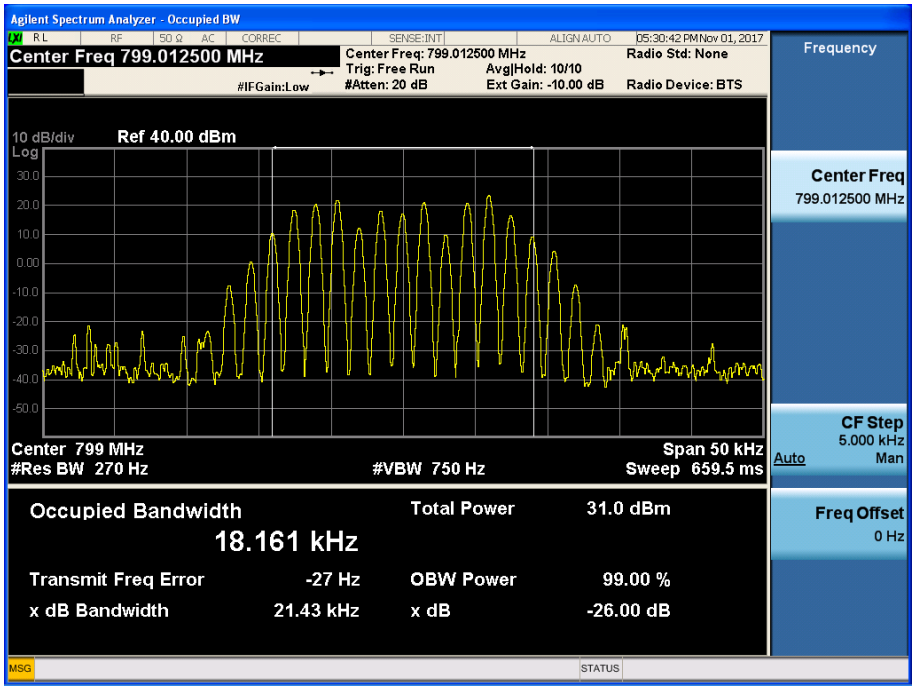


[+3dB above the AGC threshold Uplink - High]

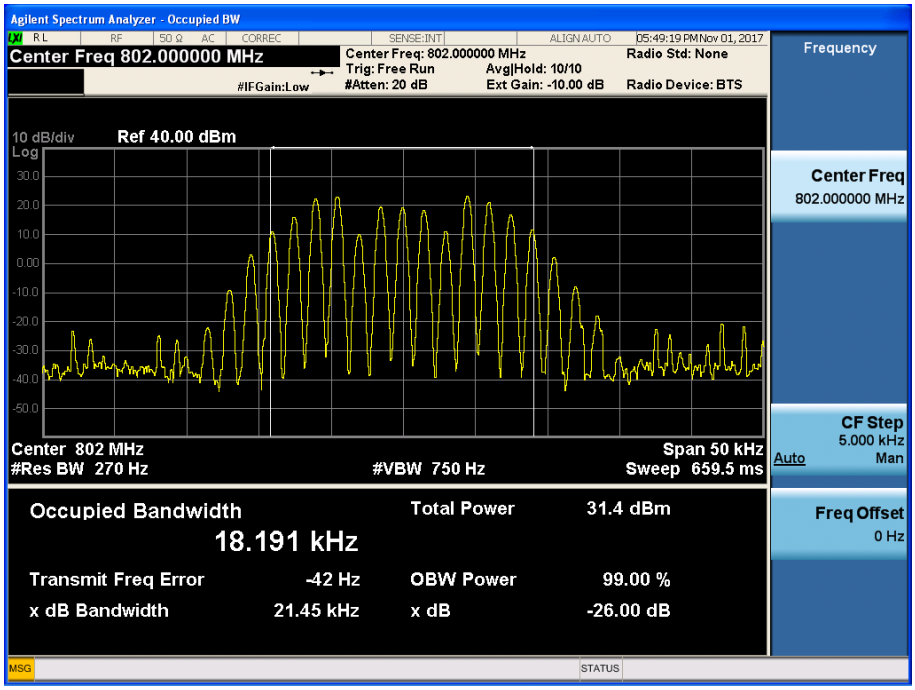


700 APCO 25(25 kHz)_UL Output

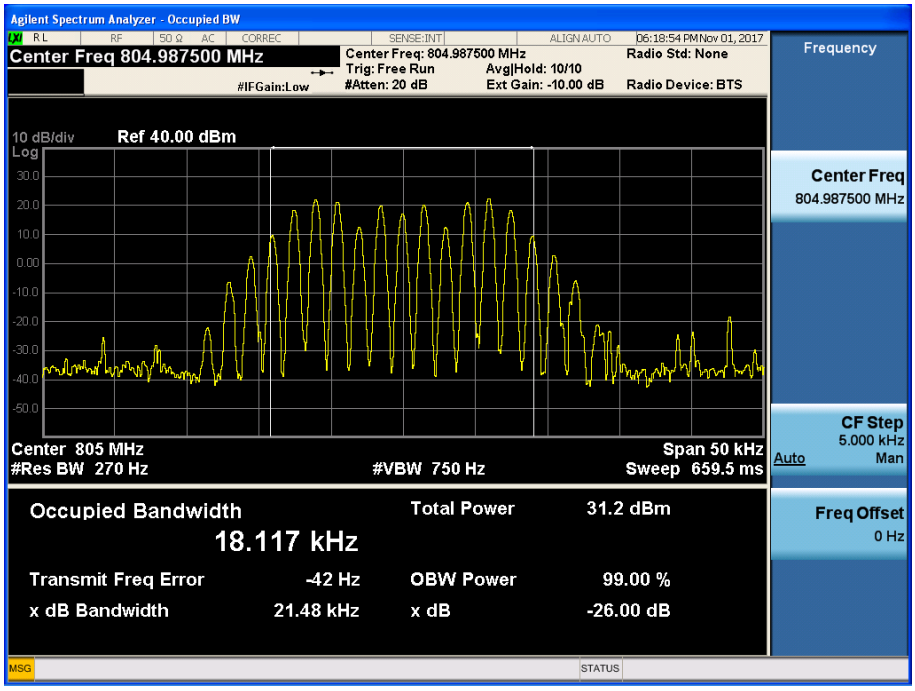
[AGC threshold Uplink - Low]



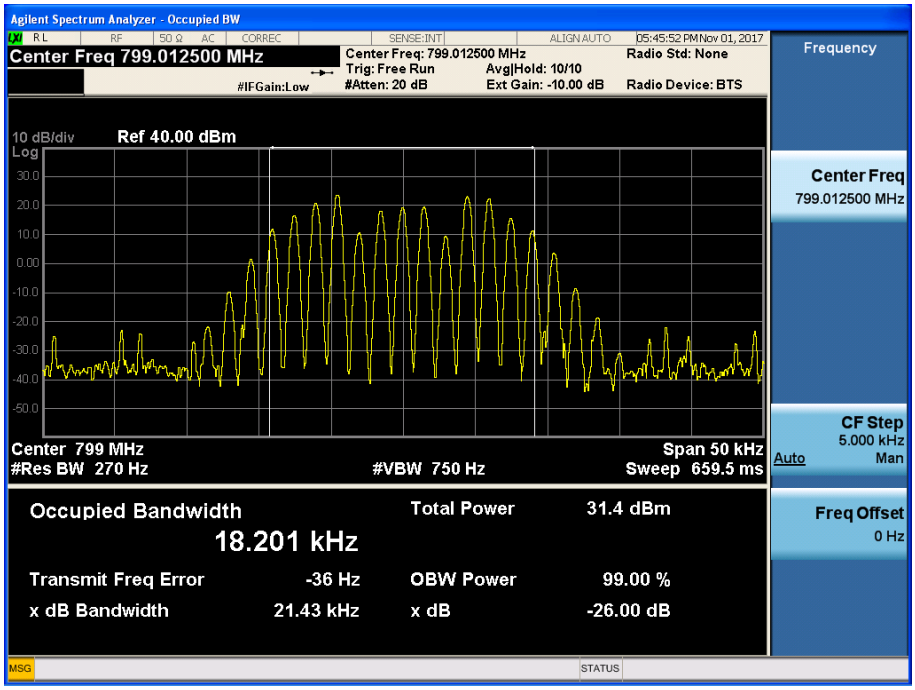
[AGC threshold Uplink - Middle]



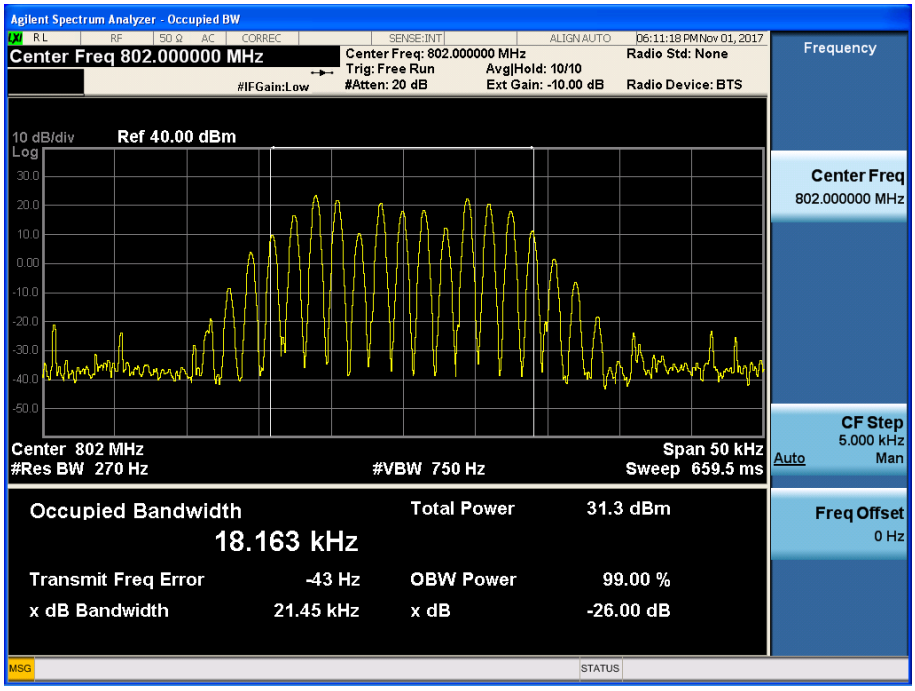
[AGC threshold Uplink - High]



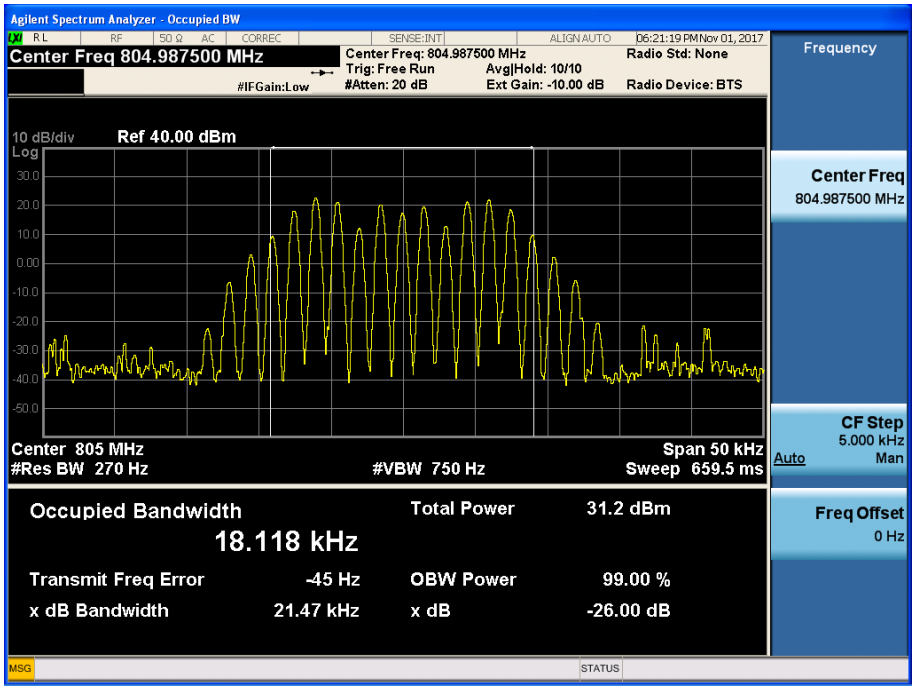
[+3dB above the AGC threshold Uplink - Low]



[+3dB above the AGC threshold Uplink - Middle]



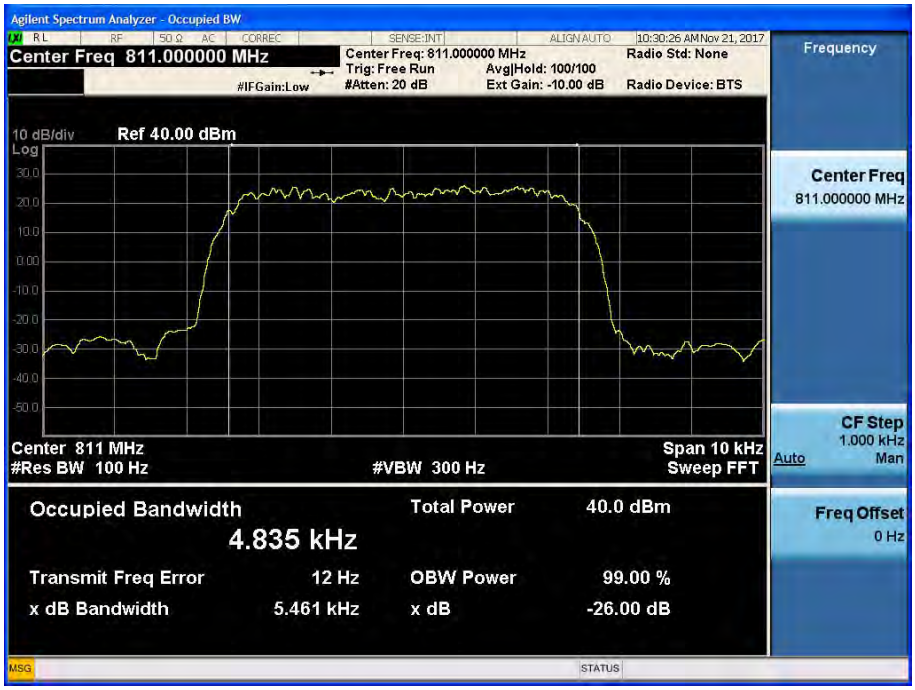
[+3dB above the AGC threshold Uplink - High]



800 APCO 25(6.25 kHz)_UL Output

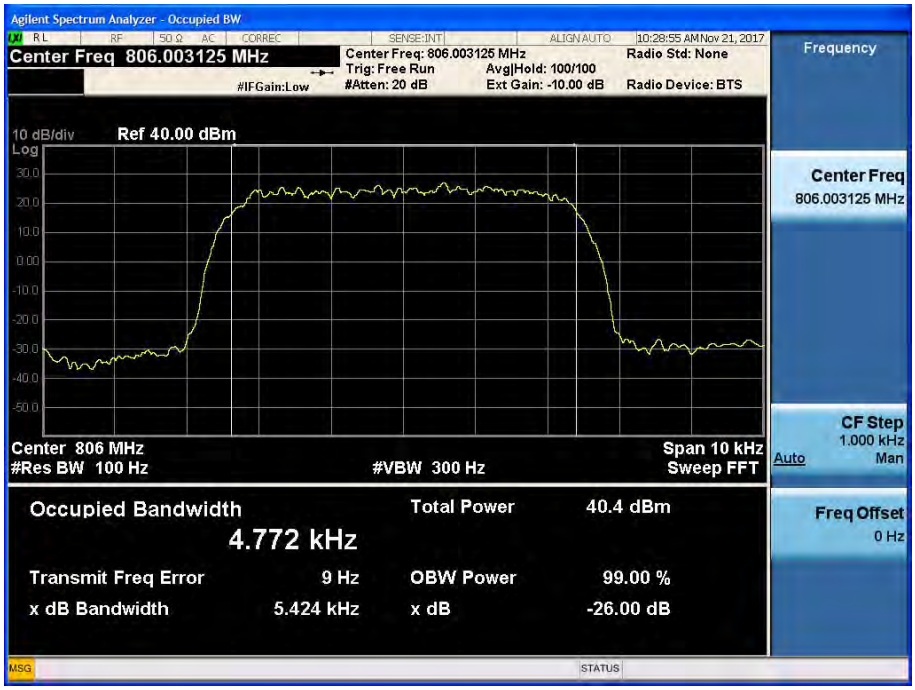
[AGC threshold Uplink - Low]

[AGC threshold Uplink - Middle]



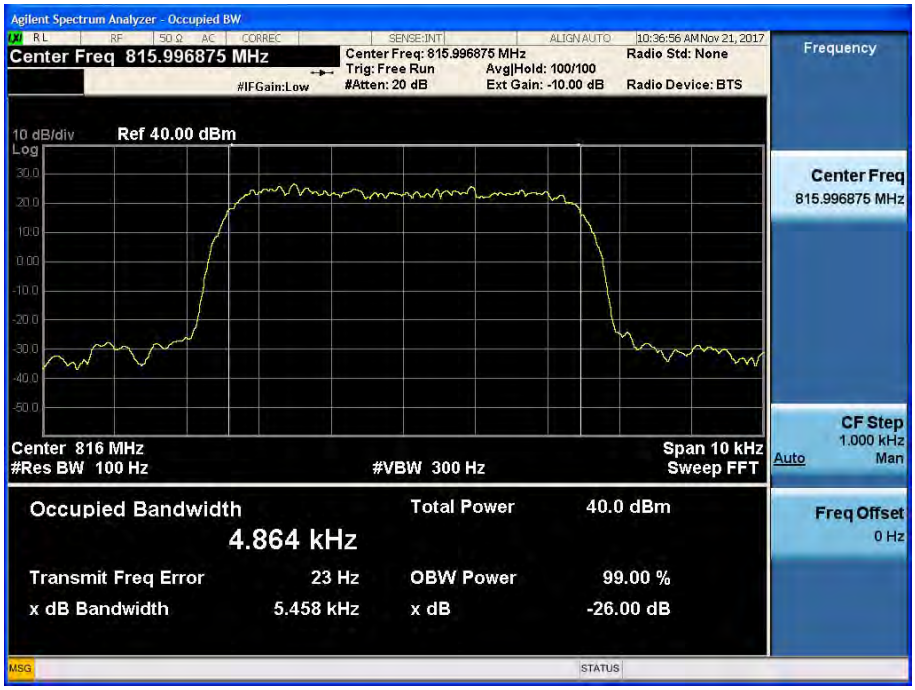
[AGC threshold Uplink - High]

[+3dB above the AGC threshold Uplink - Low]



[+3dB above the AGC threshold Uplink - Middle]

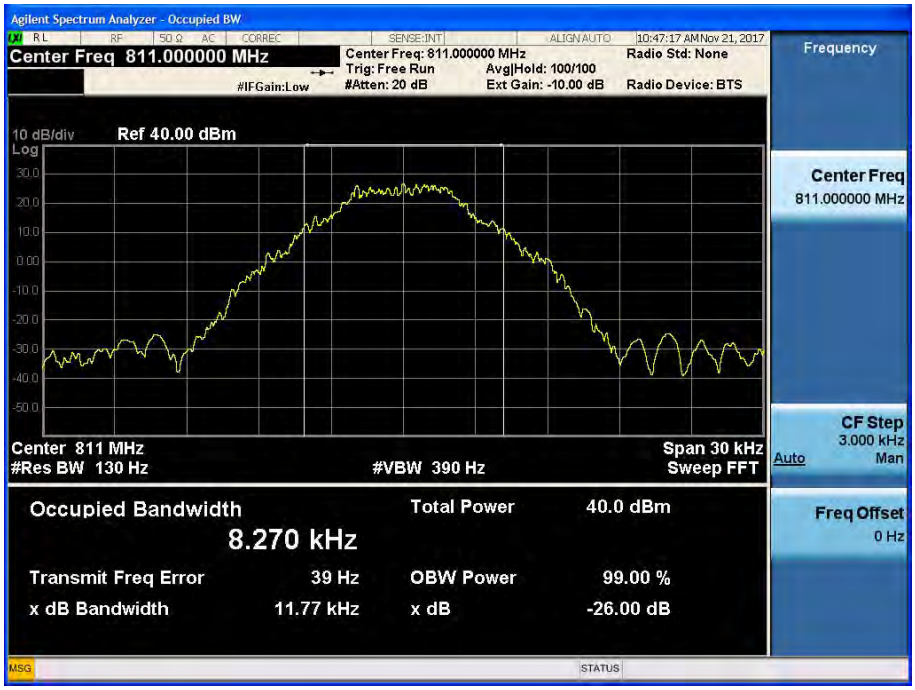
[+3dB above the AGC threshold Uplink - High]



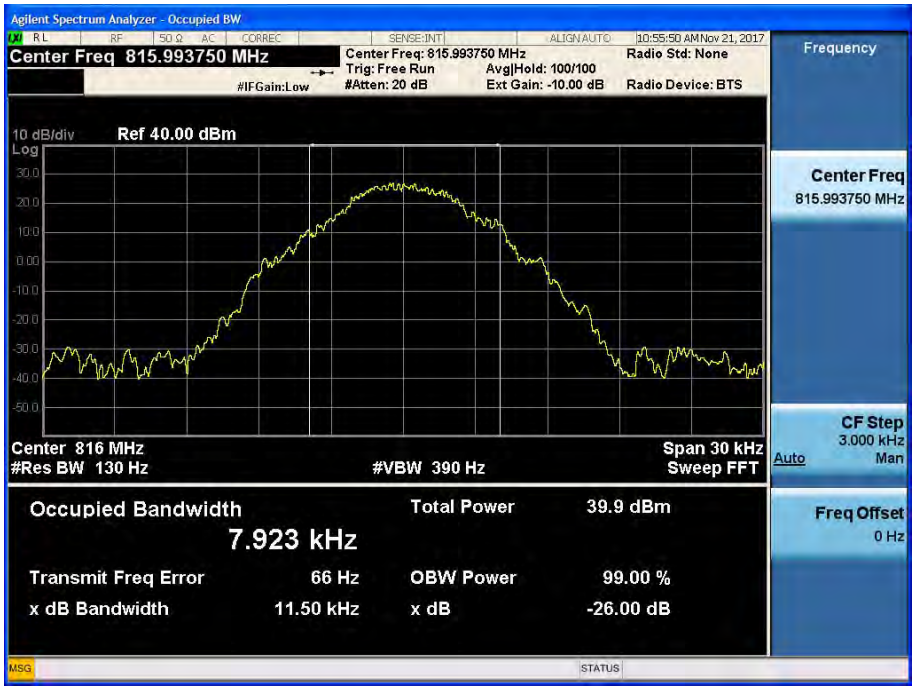
800 APCO 25(12.5 kHz)_UL Output

[AGC threshold Uplink - Low]

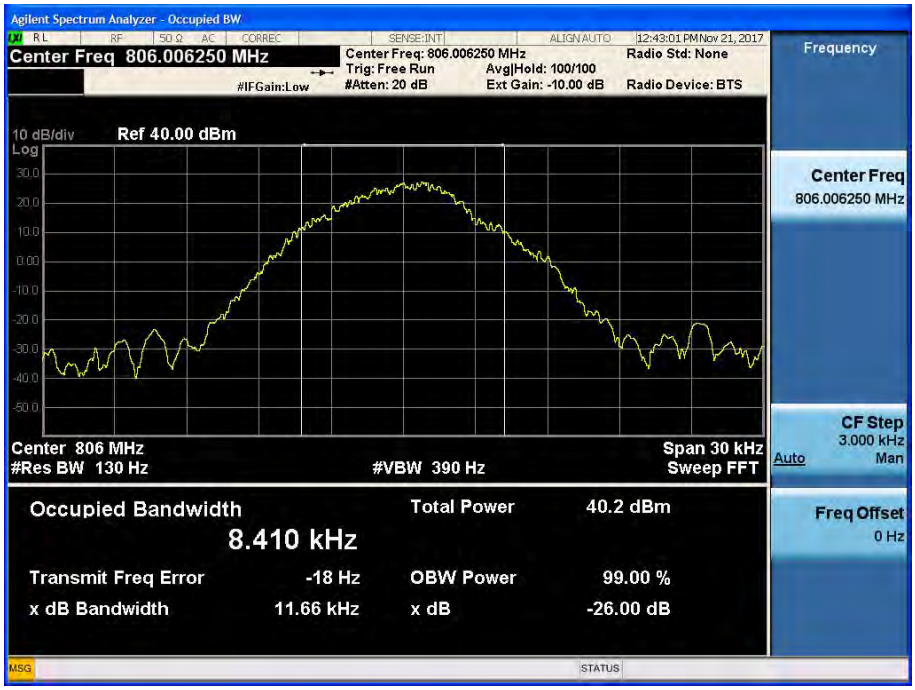
[AGC threshold Uplink - Middle]



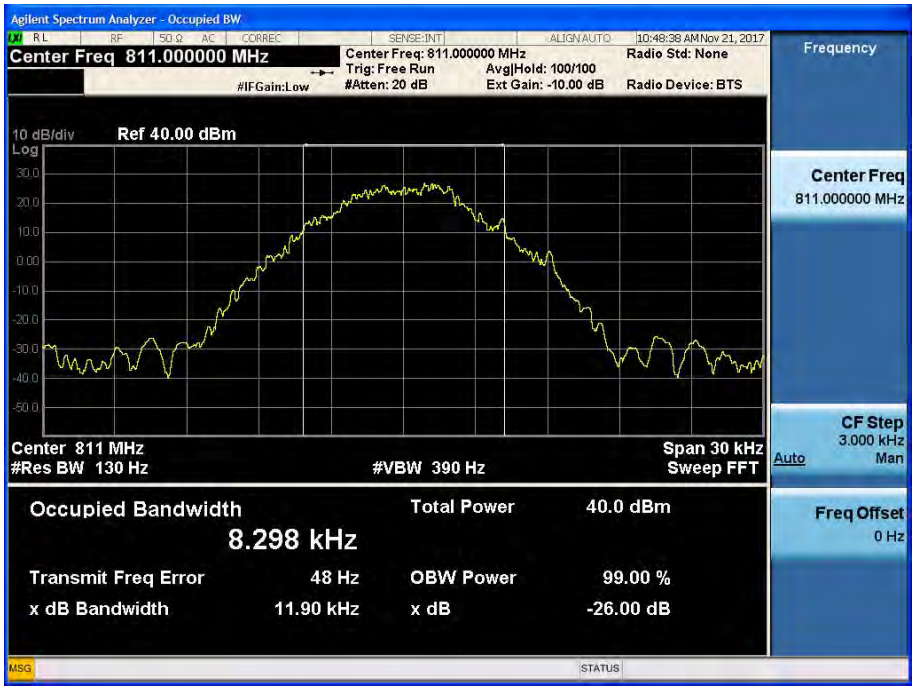
[AGC threshold Uplink - High]



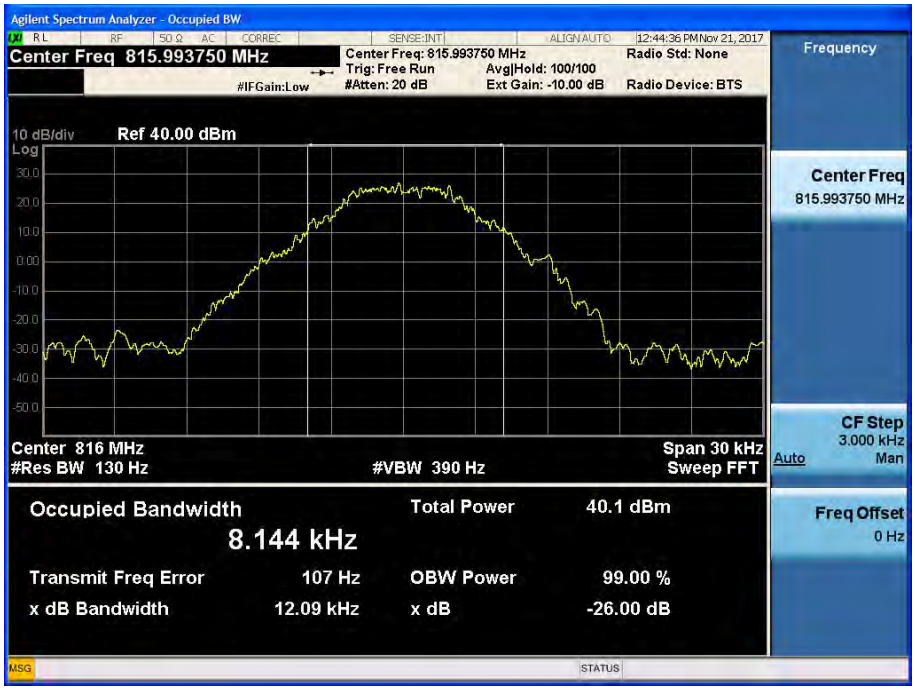
[+3dB above the AGC threshold Uplink - Low]



[+3dB above the AGC threshold Uplink - Middle]

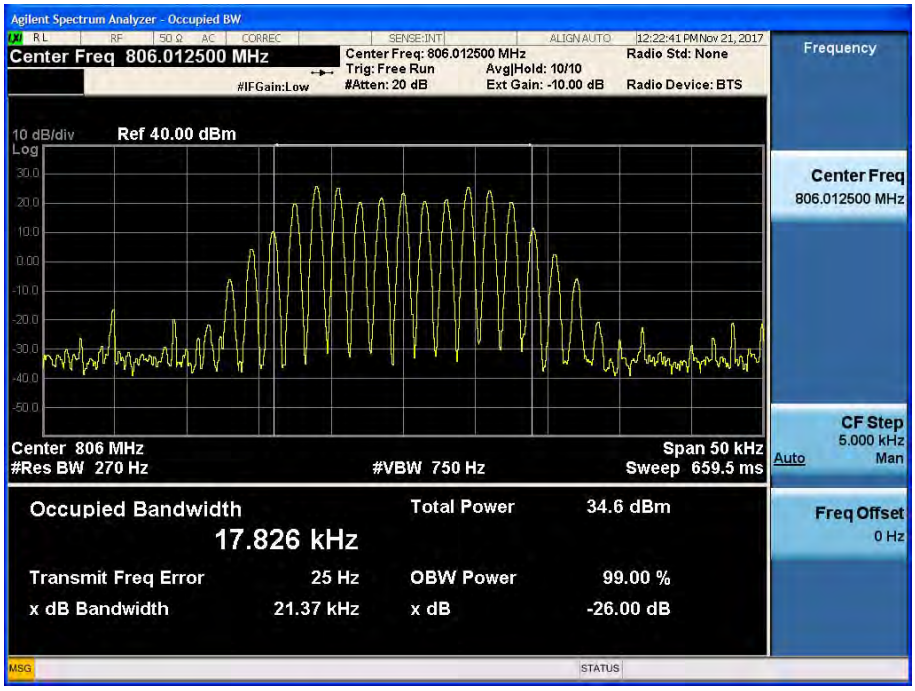


[+3dB above the AGC threshold Uplink - High]

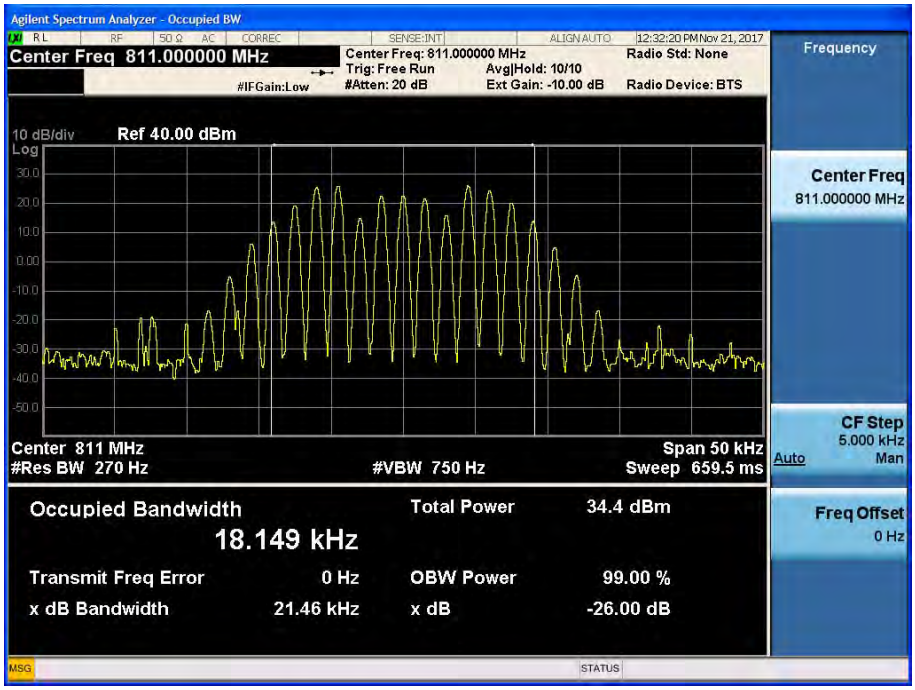


800 APCO 25(25 kHz)_UL Output

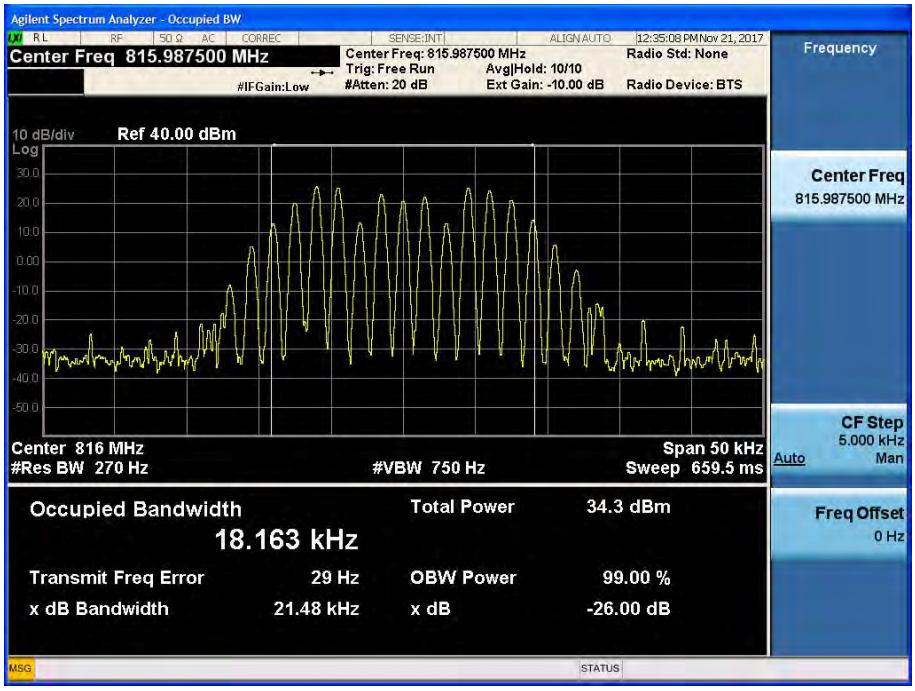
[AGC threshold Uplink - Low]



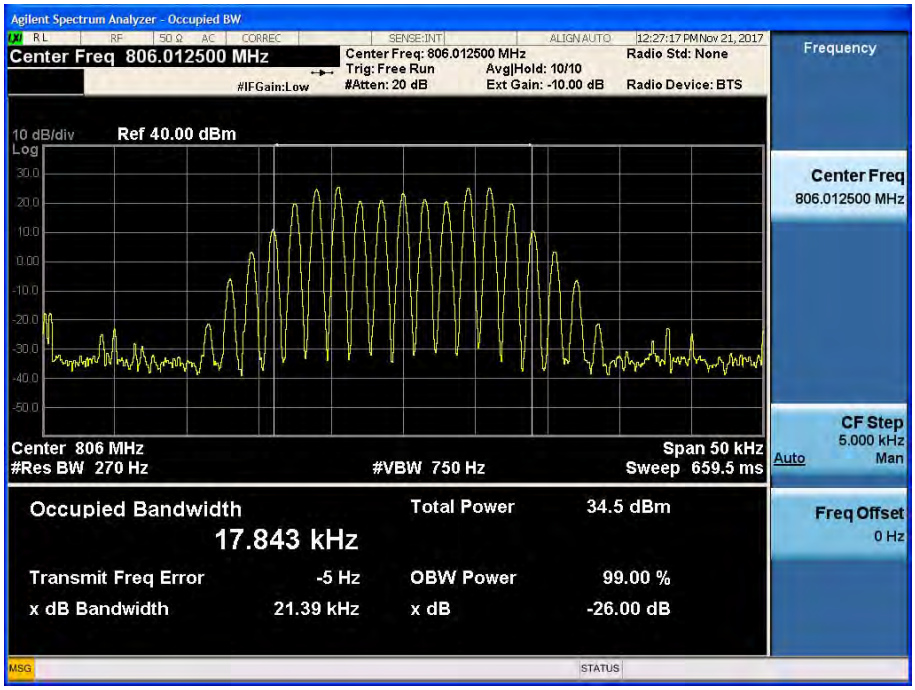
[AGC threshold Uplink - Middle]



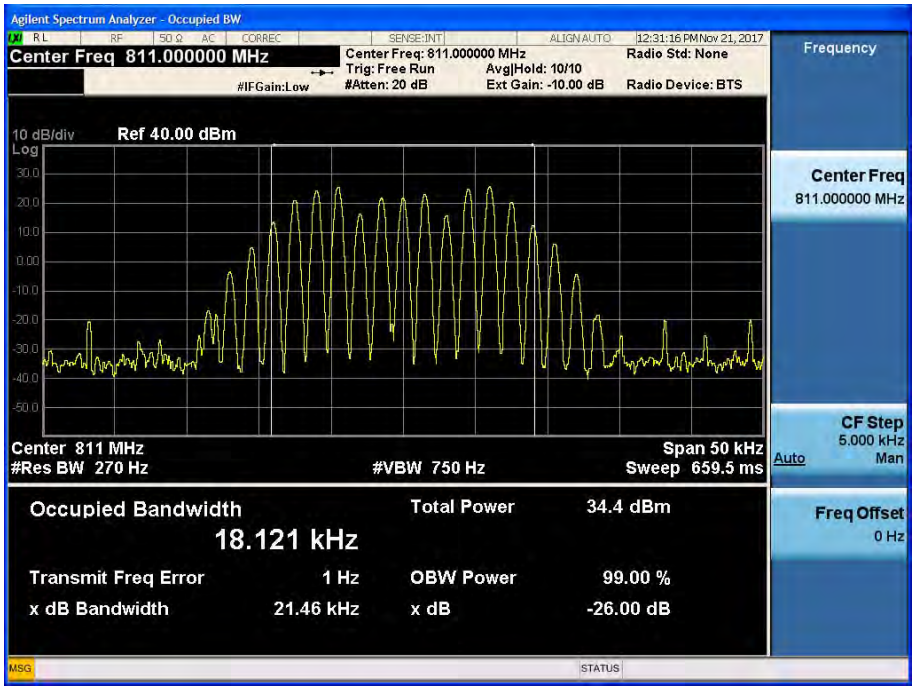
[AGC threshold Uplink - High]



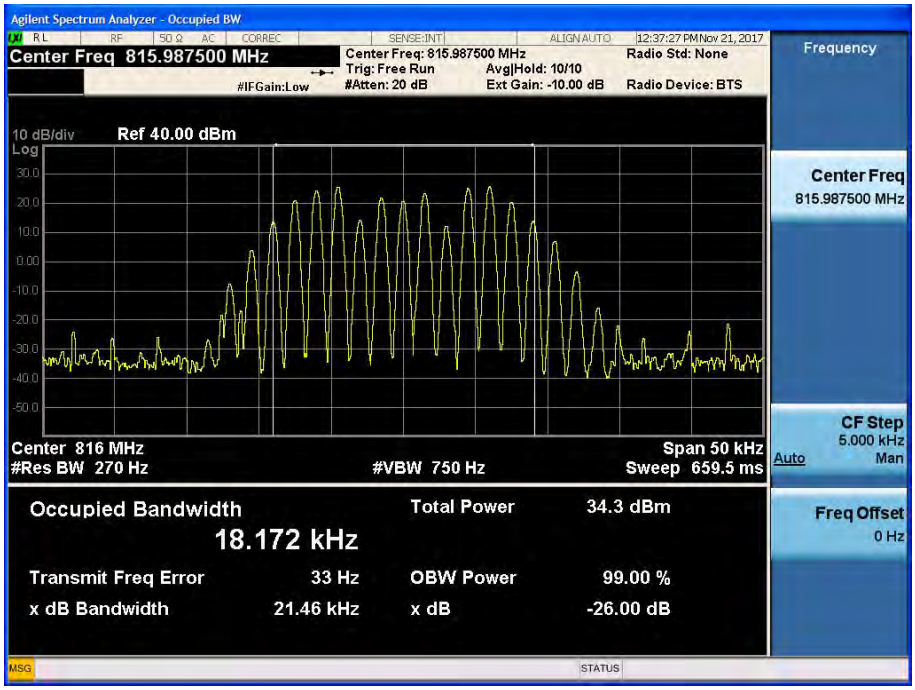
[+3dB above the AGC threshold Uplink - Low]



[+3dB above the AGC threshold Uplink - Middle]



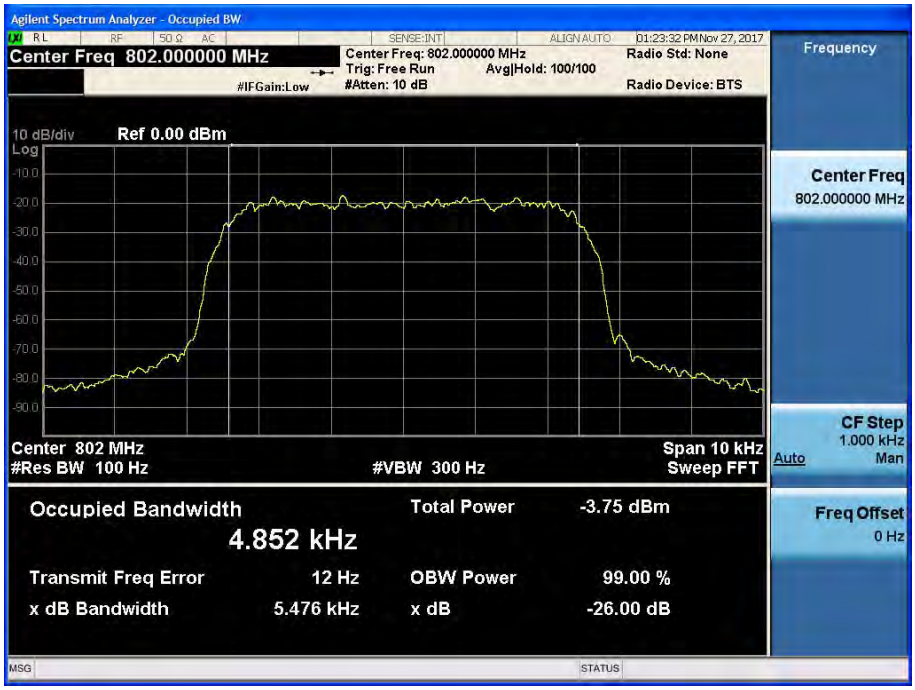
[+3dB above the AGC threshold Uplink - High]



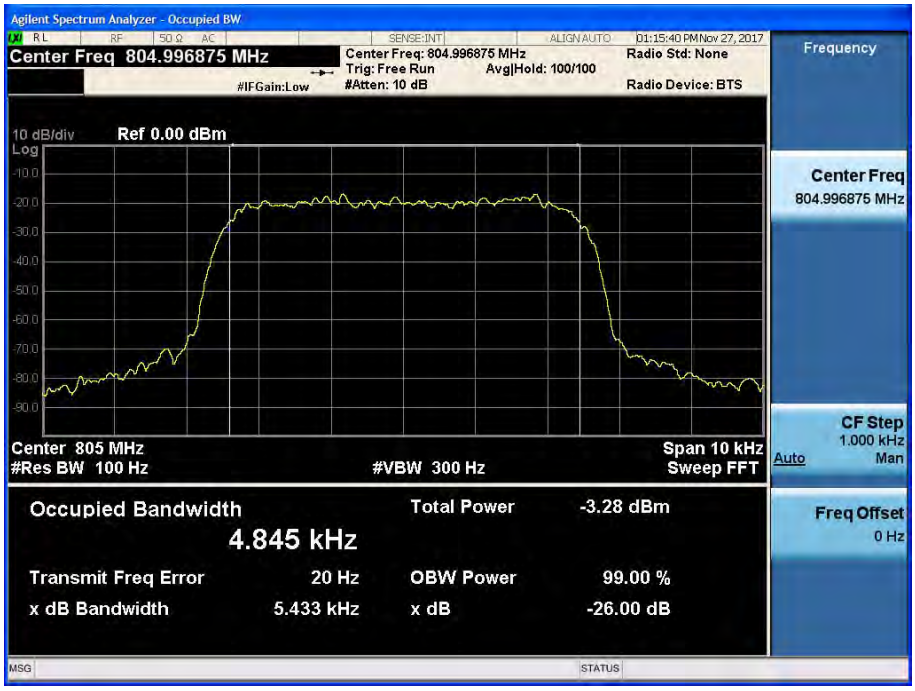
700 APCO 25(6.25 kHz)_UL Input

[AGC threshold Uplink - Low]

[AGC threshold Uplink - Middle]

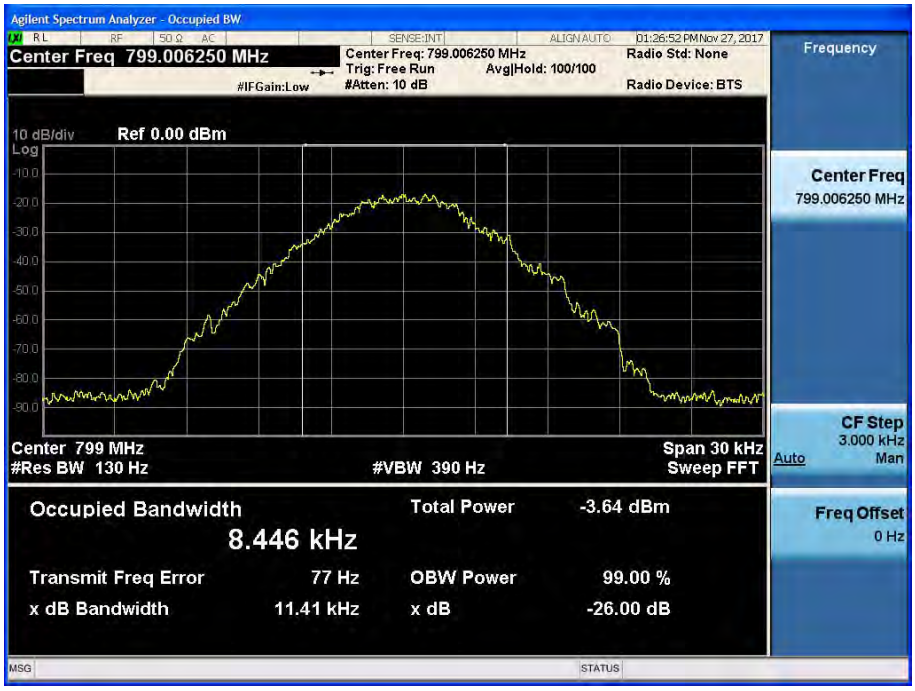


[AGC threshold Uplink - High]

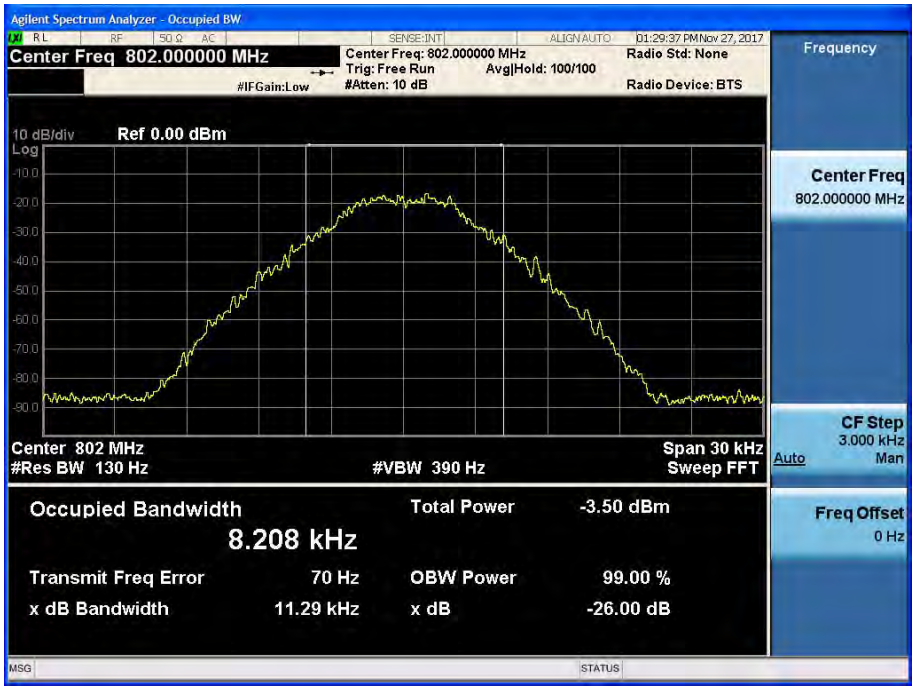


700 APCO 25(12.5 kHz)_UL Input

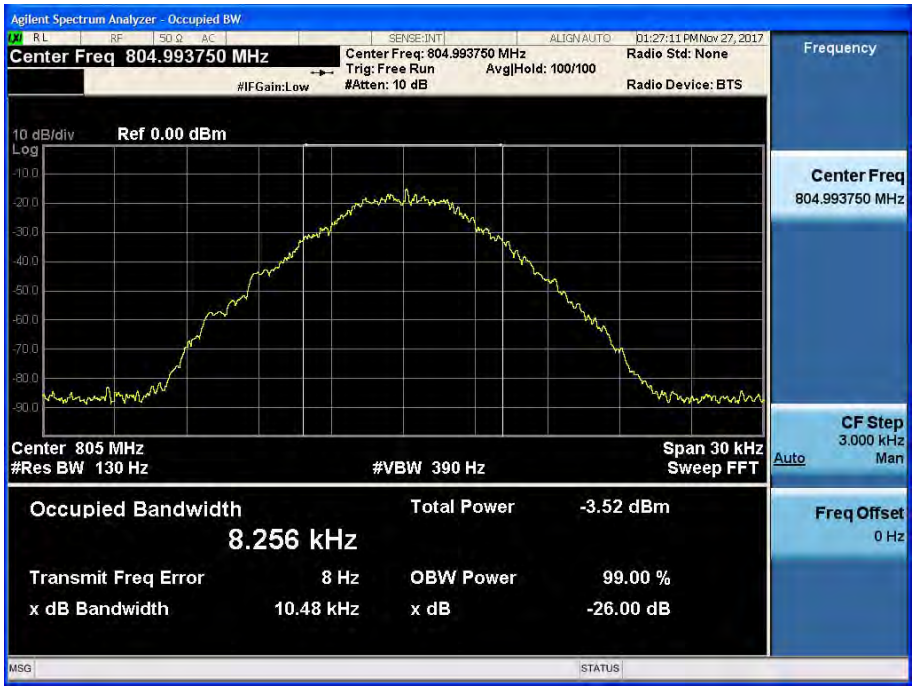
[AGC threshold Uplink - Low]



[AGC threshold Uplink - Middle]

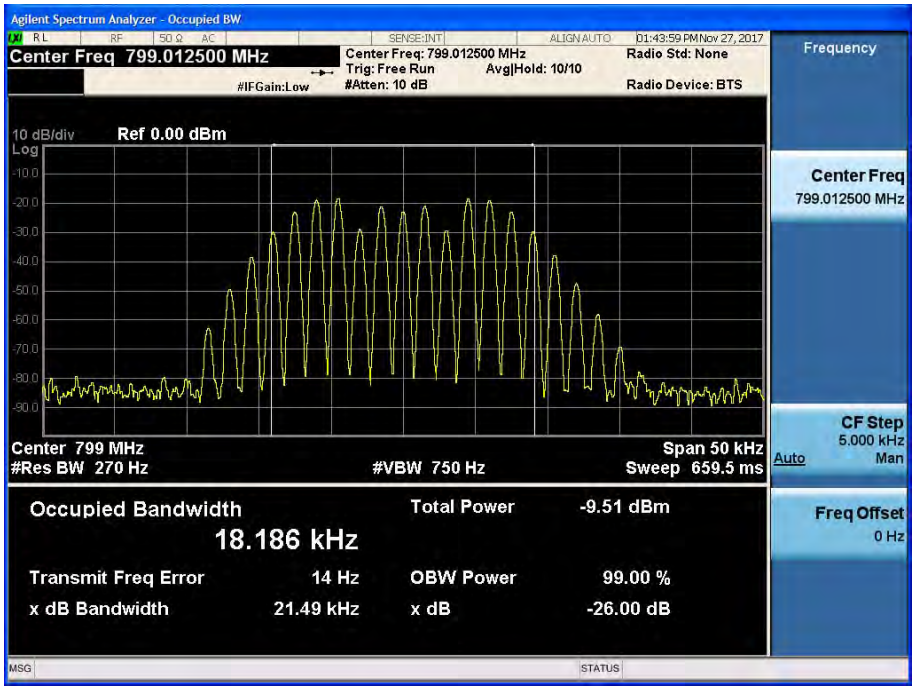


[AGC threshold Uplink - High]

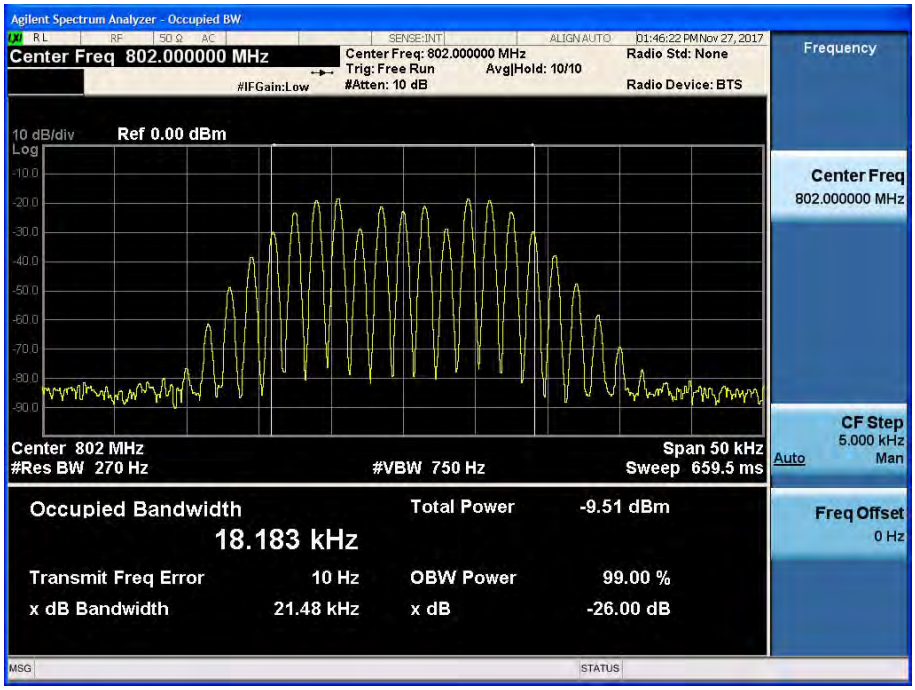


700 APCO 25(25 kHz)_UL Input

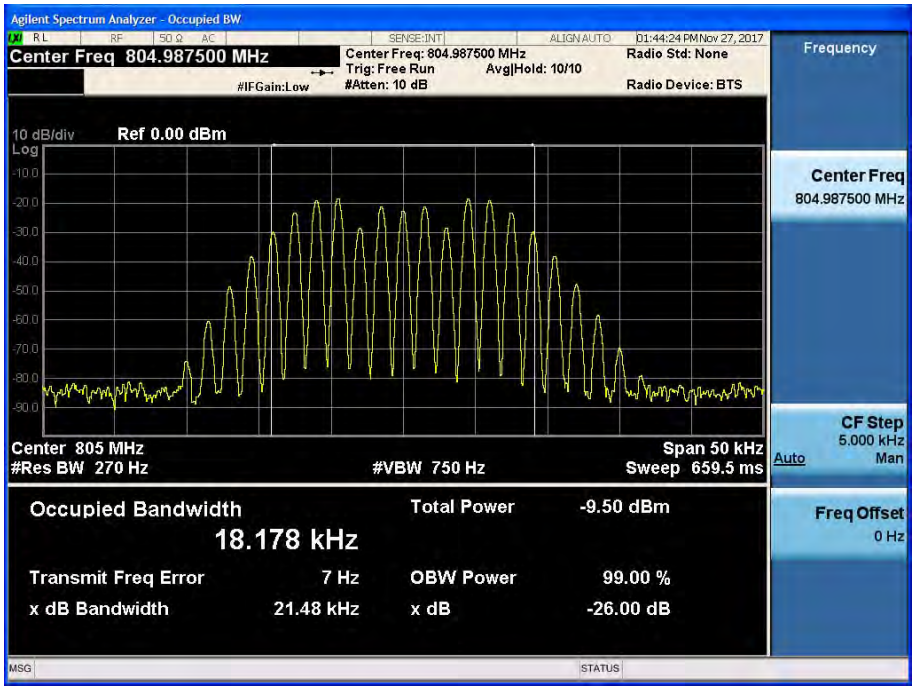
[AGC threshold Uplink - Low]



[AGC threshold Uplink - Middle]



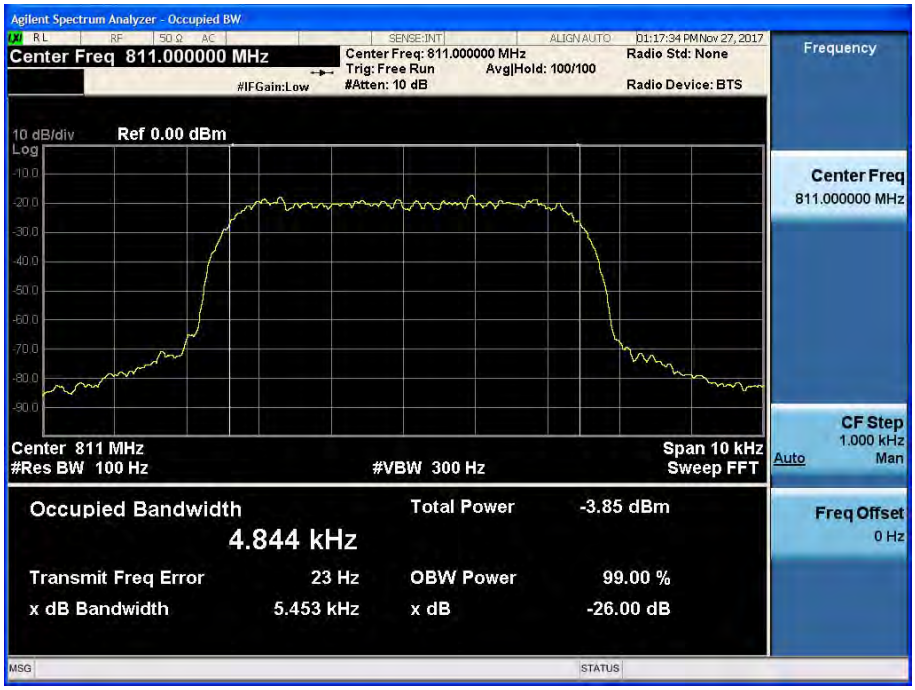
[AGC threshold Uplink - High]



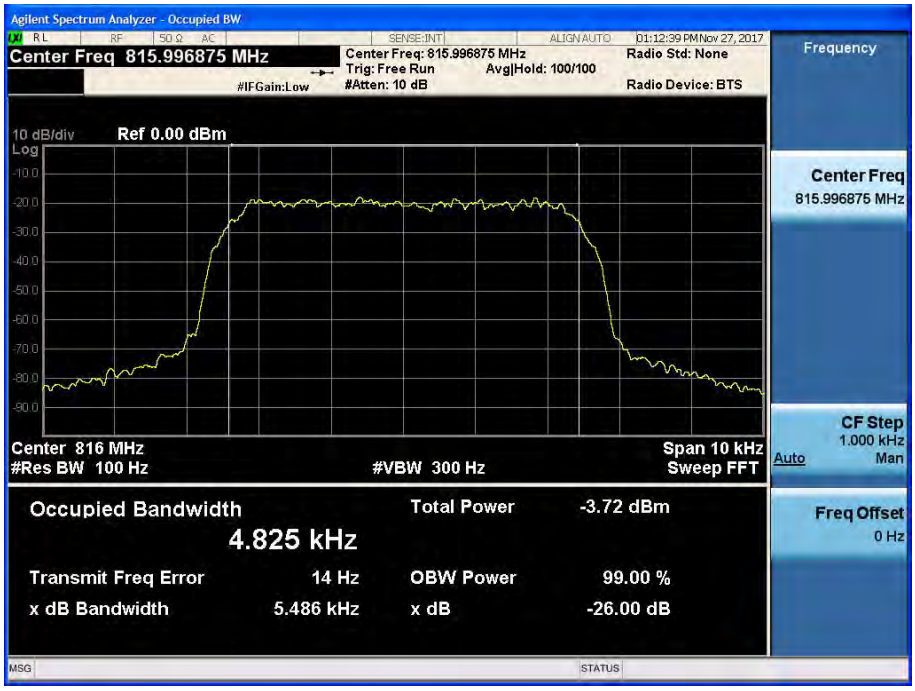
800 APCO 25(6.25 kHz)_UL Input

[AGC threshold Uplink - Low]

[AGC threshold Uplink - Middle]

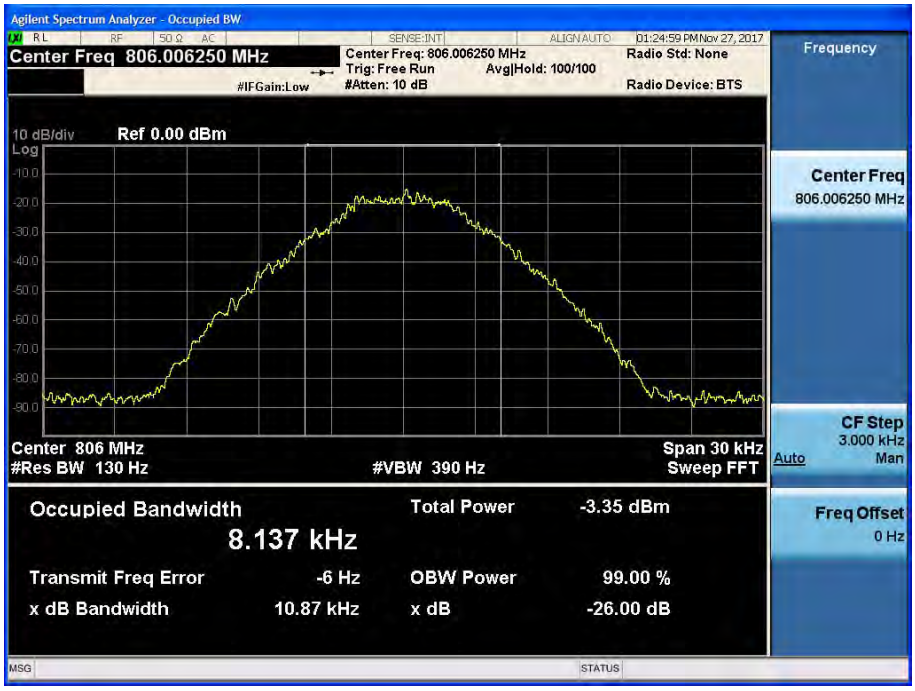


[AGC threshold Uplink - High]

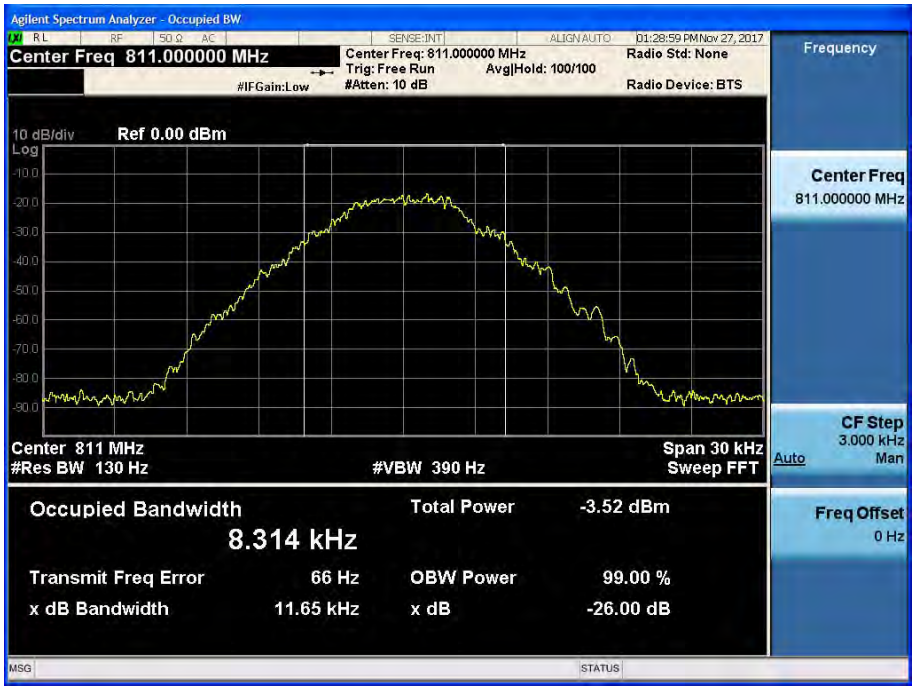


800 APCO 25(12.5 kHz)_UL Input

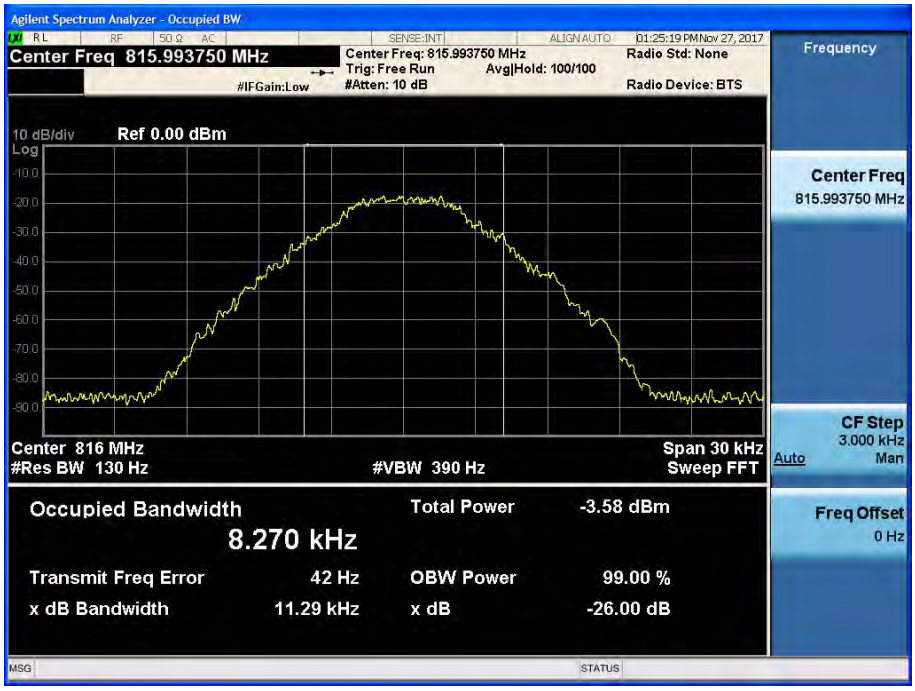
[AGC threshold Uplink - Low]



[AGC threshold Uplink - Middle]

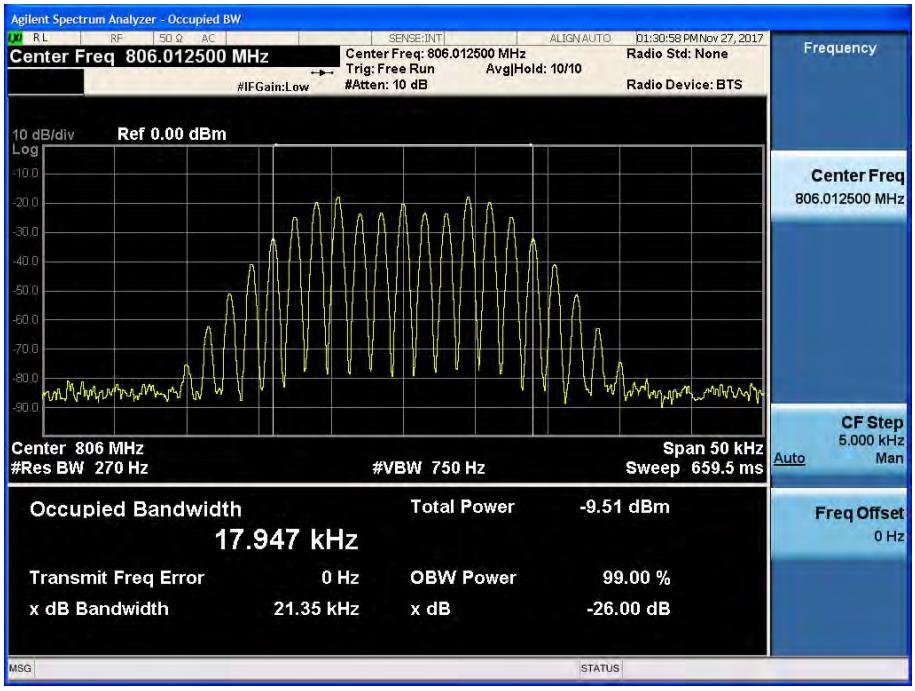


[AGC threshold Uplink - High]

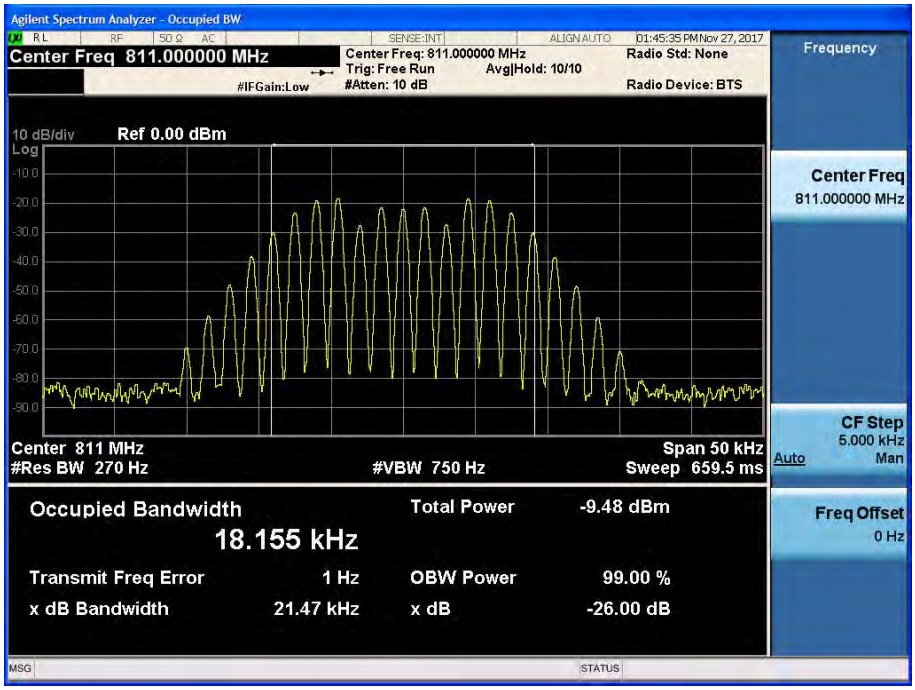


800 APCO 25(25 kHz)_UL Input

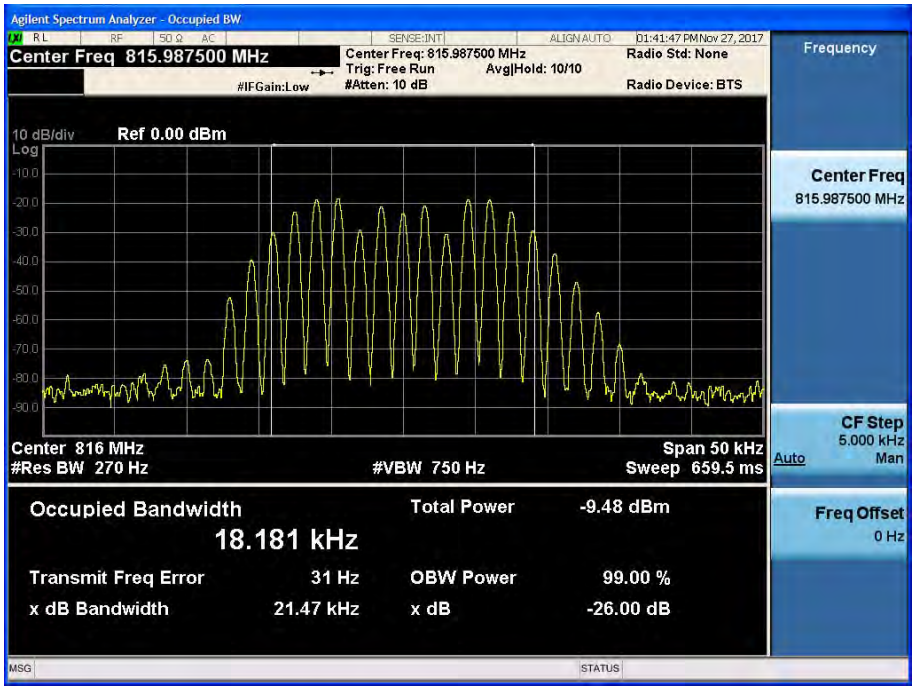
[AGC threshold Uplink - Low]



[AGC threshold Uplink - Middle]



[AGC threshold Uplink - High]



8. OUT OF BAND REJECTION

FCC rules

Test Requirements:

KDB 935210 D05 v01r02

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 v01r02.

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 = ± 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 = SPAN/(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 ≥ 3 × 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:

1) Frequency range = ± 250 % of the manufacturer's specified pass band.

2) The CW amplitude shall be 3 dB below the AGC threshold (see 4.2), and shall not activate the AGC threshold throughout the test.

3) Dwell time = approximately 10 ms.

4) Frequency step = 50 kHz.

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

d) Set the RBW of the spectrum analyzer to between 1 % and 5 % of the manufacturer's rated passband, and VBW = 3 × RBW.

e) Set the detector to Peak and the trace to Max-Hold.

f) After the trace is completely filled, place a marker at the peak amplitude, which is designated as f0, and with two additional markers (use the marker-delta method) at the 20 dB bandwidth (i.e., at the points where the level has fallen by 20 dB).

g) Capture the frequency response plot for inclusion in the test report.

Test Results:

Input Signal	Input Level (dBm)		Maximum Amp Gain	
	DL	UL	DL	UL
PS 700	-62	-62	92	92
PS 800	-62	-62	95	95

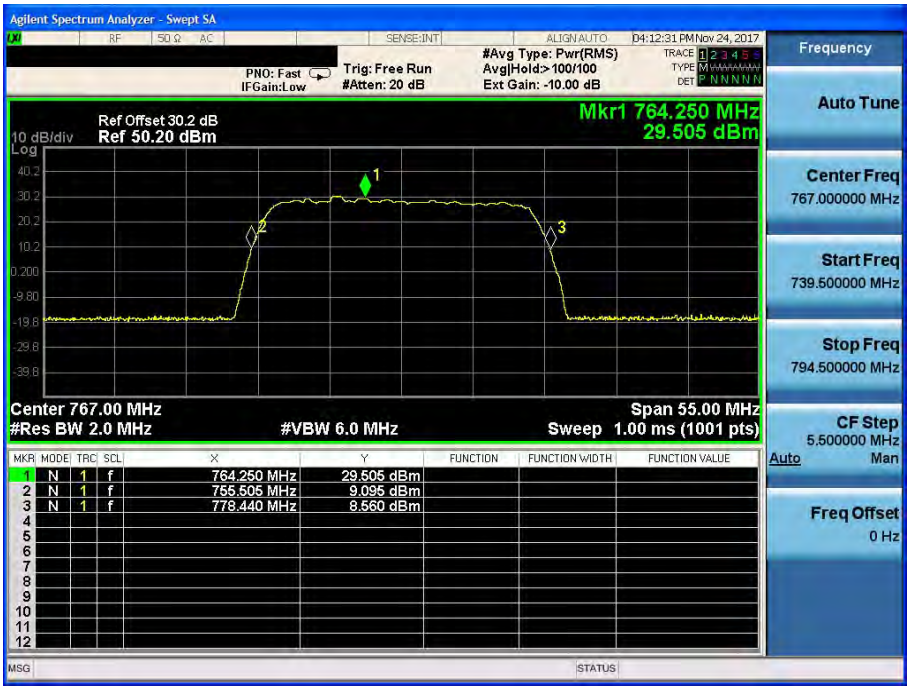
PS 700

[Downlink]

20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
755.505 ~ 778.440	29.505	91.505

Plots of Out of Band Rejection

[PS 700 Downlink]



***This device Downlink amplifies FirstNet and PS 700 together.**

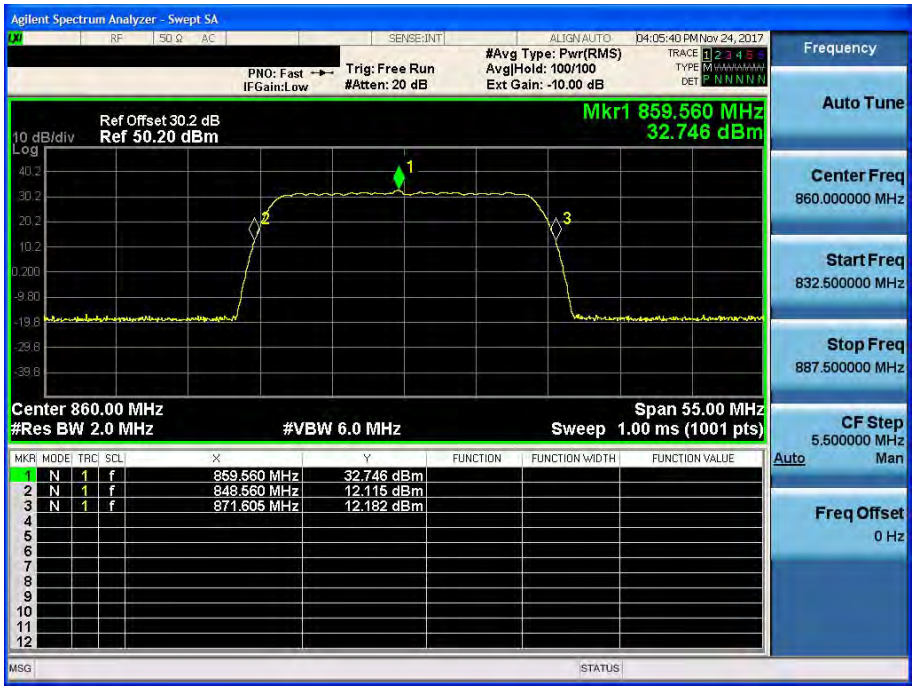
PS 800

[Downlink]

20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
848.560 ~ 871.605	32.746	94.746

Plots of Out of Band Rejection

[PS 800 Downlink]



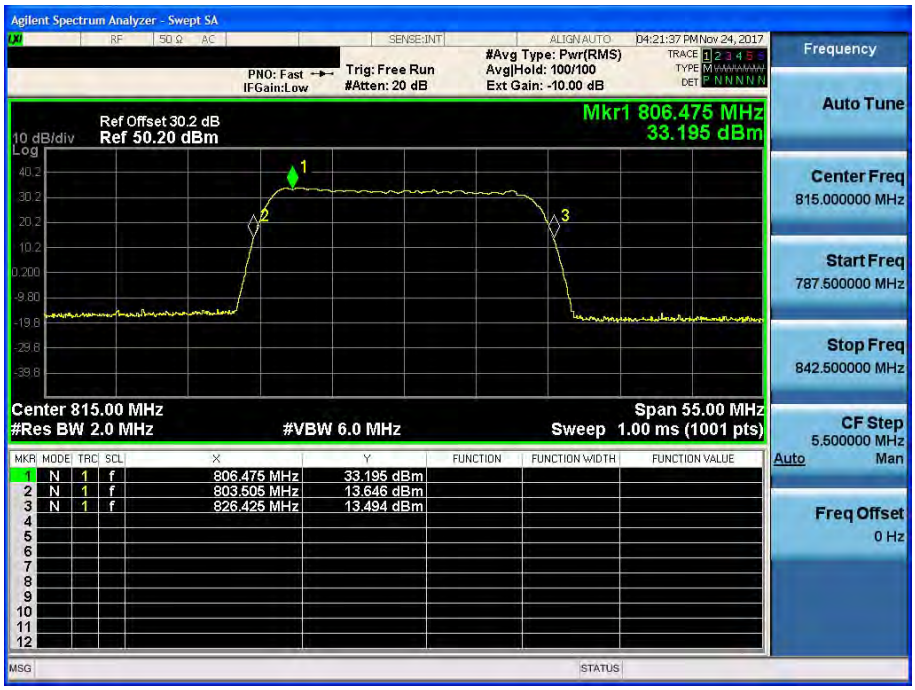
PS 800

[Uplink]

20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
803.505 ~ 826.425	33.195	95.195

Plots of Out of Band Rejection

[PS 800 Uplink]



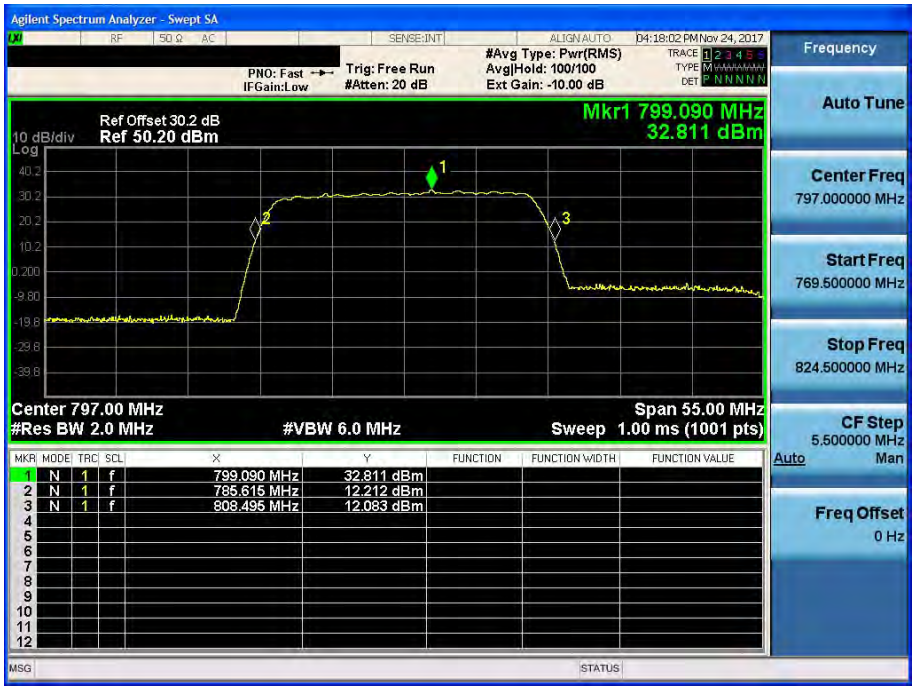
PS 700 + PS 800

[Uplink]

20 dB point frequency (MHz)	Output power (dBm)	Gain (dB)
785.615 ~ 808.495	32.811	94.811

Plots of Out of Band Rejection

[PS 700 + PS 800 Uplink]



***This device Uplink amplifies PS 700, PS800 together.**

9. NOISE FIGURE

FCC Rules

Test Requirements:

§ 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 and 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=10log(1 MHz/1 Hz)=60

PNAD=Noise Power Density=174 dBm/Hz

Test Results:

Input Signal	Input Level (dBm)		Maximum Amp Gain	
	DL	UL	DL	UL
PS 700	Without input signal		92	92
PS 800			95	95

Downlink

PS 700: Noise Figure = - 45.134 – 92 + 114 = -23.134 dB

PS 800: Noise Figure = - 43.093 – 95 + 114 = -24.093 dB

Uplink

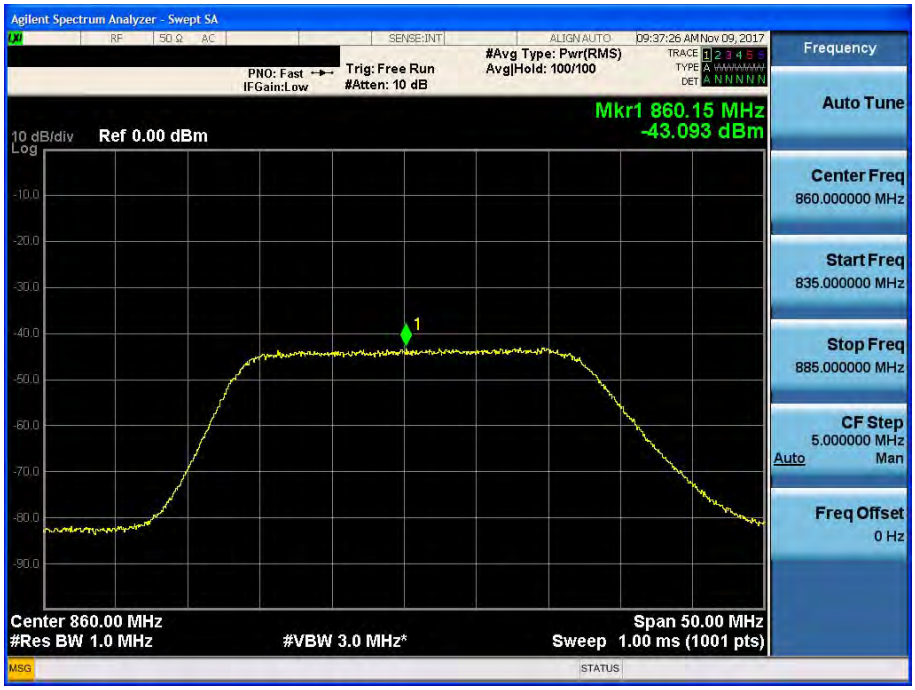
Noise Figure = - 40.556 – 95 + 114 = - 21.556 dB

Plots of Noise power

Downlink

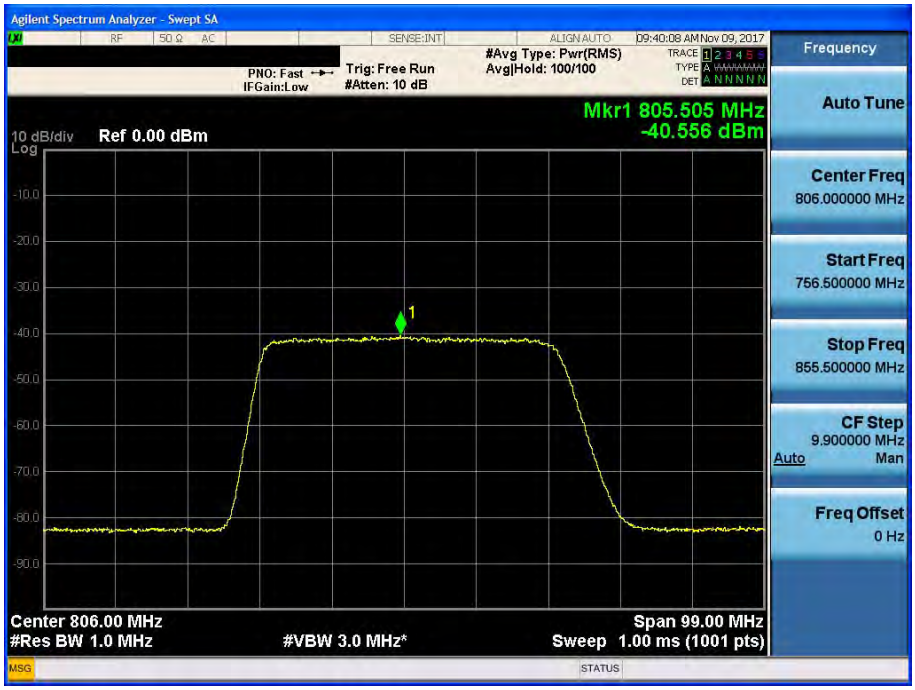
[PS 700]

[PS 800]



Uplink

[PS 700+ PS 800]



10. EMISSION MASKS

FCC Rules

Test Requirements:

§ 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	A or B	A or C
25-50	B	C
72-76	B	C
150-174	B, D, or E	C, D or E
150 paging only	B	C
220-222	F	F
421-512[2 5]	B, D, or E	C, D, or E
450 paging only	B	G
806-809/851-854	B	H
809-824/854-869	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		
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 (fd in kHz) of more than 5 kHz, but not more than 10 kHz: At least 83 log (fd/5) dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least 29 log (fd2/11) 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 + 10 log (P) dB.

Test Procedures:

Measurements were in accordance with the test methods section 4.4 of KDB 935210 D05 v01r02.

4.4 Input-versus-output signal comparison

Compliance with the emission mask of the EUT output shall be measured for the public safety service signal types as specified in 4.1.

Refer to the applicable regulatory requirements (e.g., § 90.210) for emission mask specifications.

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.

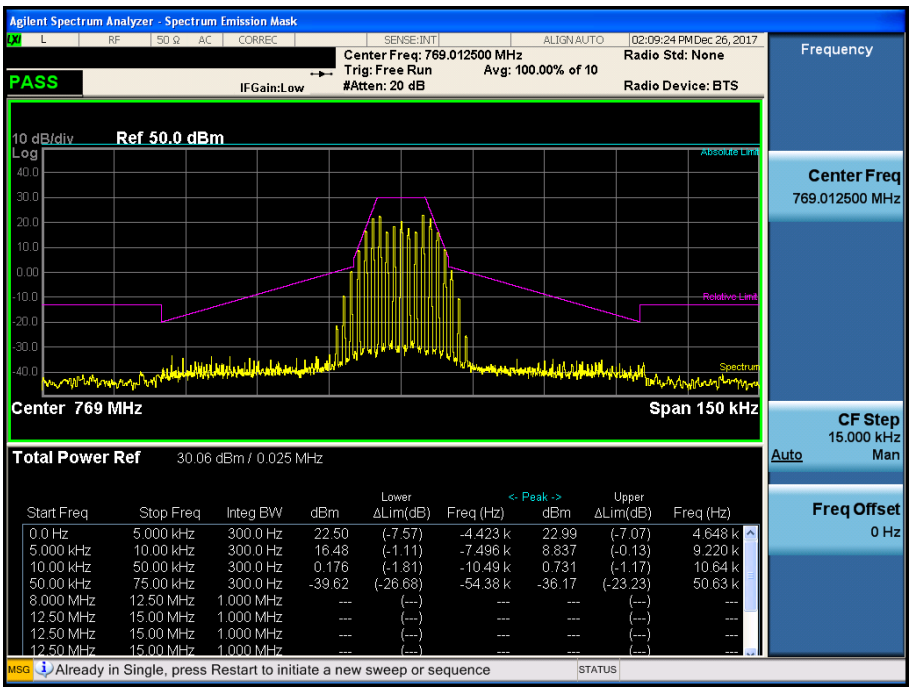
Test Results:

Input Signal	Input Level (dBm)		Maximum Amp Gain	
	DL	UL	DL	UL
PS 700	-62	-62	92	92
PS 800	-62	-62	95	95

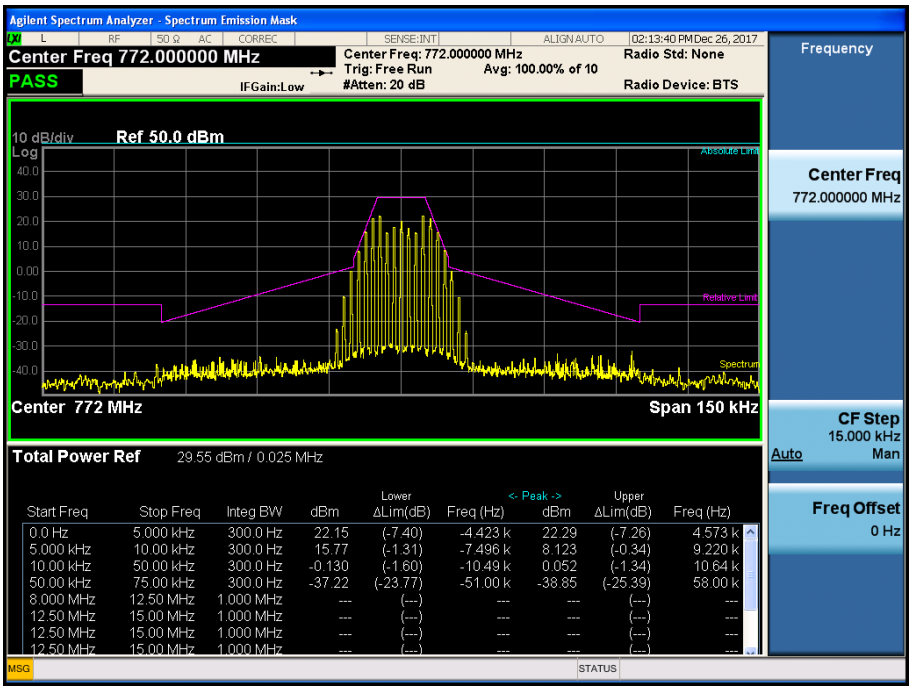
Plots of Emission Mask

700 APCO25_Downlink

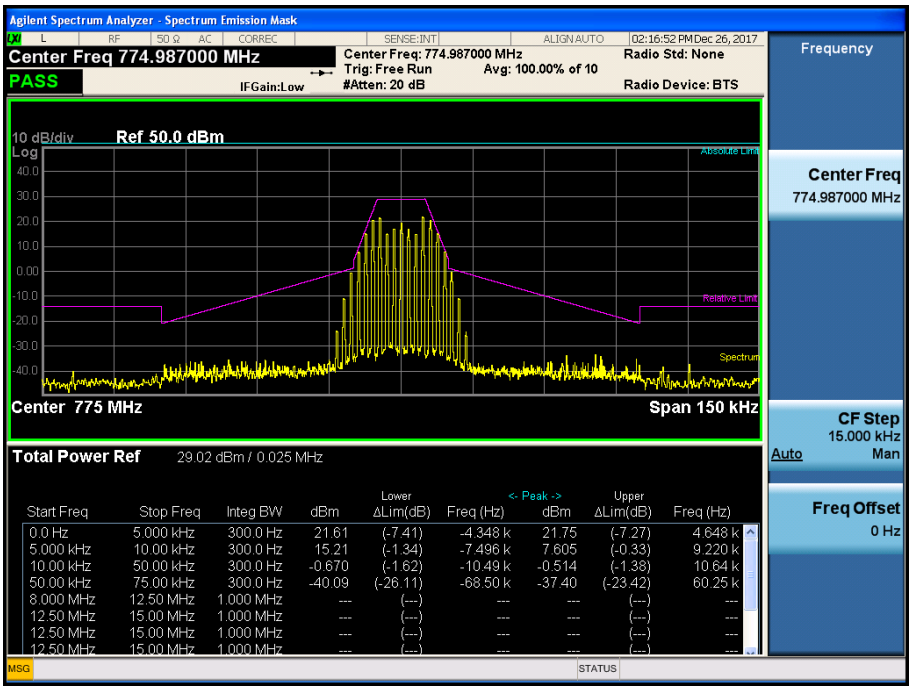
[Downlink Emission Mask C – Low, 25 kHz]



[Downlink Emission Mask C – Middle, 25 kHz]

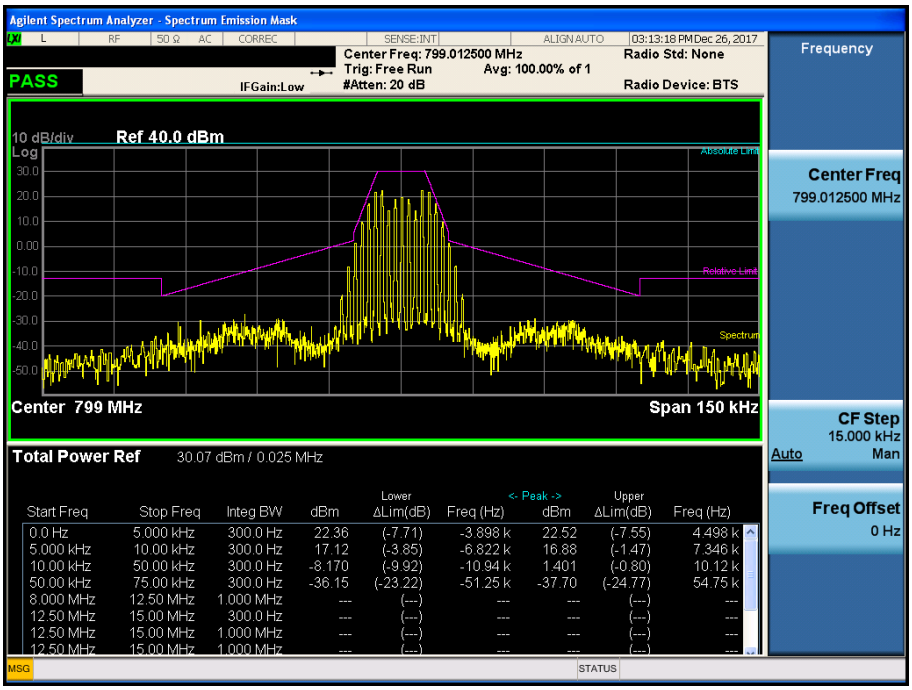


[Downlink Emission Mask C – High, 25 kHz]



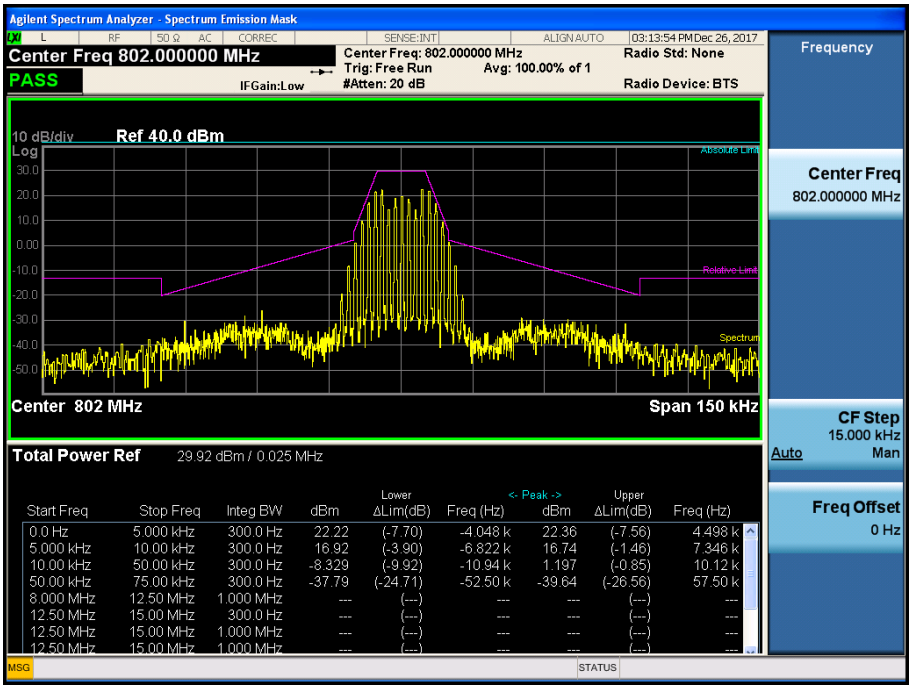
700 APCO 25_Uplink

[Uplink Emission Mask C – Low, 25 kHz]



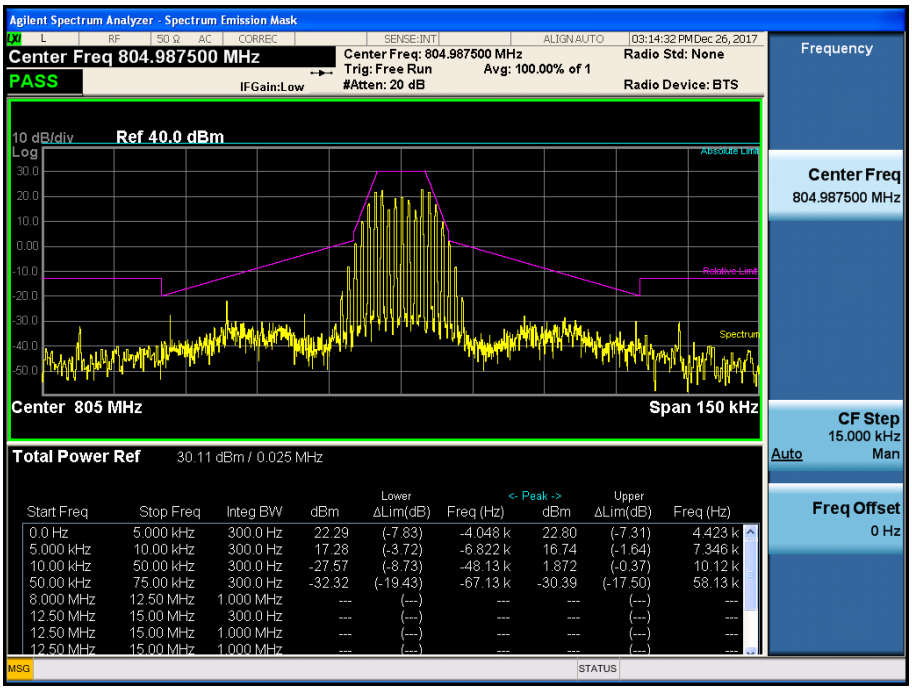
Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	Peak dBm	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	5.000 kHz	300.0 Hz	22.36	(-7.71)	-3.898 k	22.52	(-7.55)	4.498 k
5.000 kHz	10.00 kHz	300.0 Hz	17.12	(-3.85)	-6.822 k	16.88	(-1.47)	7.346 k
10.00 kHz	50.00 kHz	300.0 Hz	-8.170	(-9.92)	-10.94 k	1.401	(-0.80)	10.12 k
50.00 kHz	75.00 kHz	300.0 Hz	-36.15	(-23.22)	-51.25 k	-37.70	(-24.77)	54.75 k
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	300.0 Hz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

[Uplink Emission Mask C – Middle, 25 kHz]



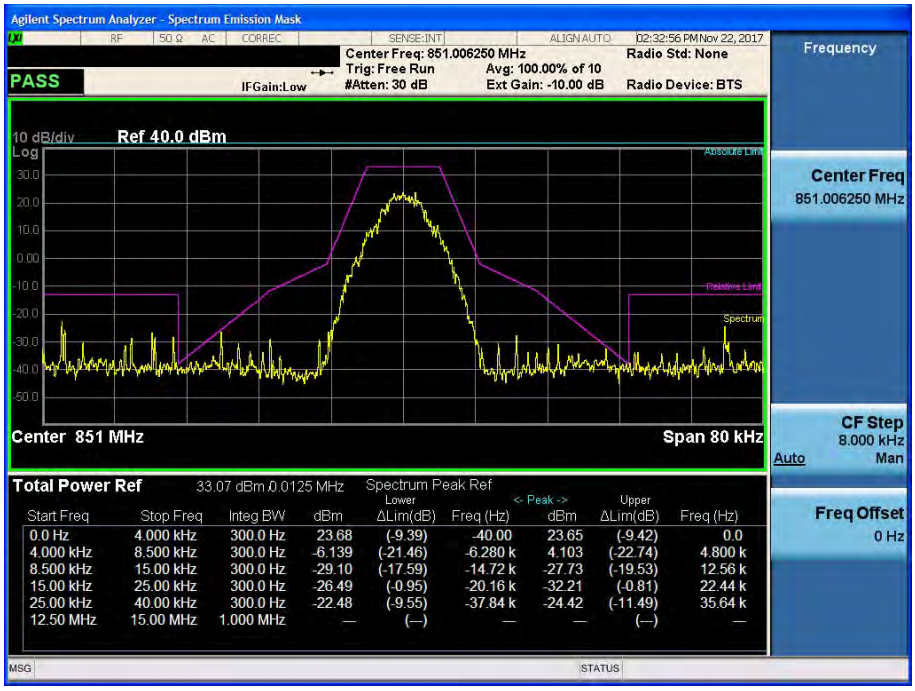
Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	Peak dBm	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	5.000 kHz	300.0 Hz	22.22	(-7.70)	-4.048 k	22.36	(-7.56)	4.498 k
5.000 kHz	10.00 kHz	300.0 Hz	16.92	(-3.90)	-6.822 k	16.74	(-1.46)	7.346 k
10.00 kHz	50.00 kHz	300.0 Hz	-8.329	(-9.92)	-10.94 k	1.197	(-0.85)	10.12 k
50.00 kHz	75.00 kHz	300.0 Hz	-37.79	(-24.71)	-52.50 k	-39.64	(-26.56)	57.50 k
8.000 MHz	12.50 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	300.0 Hz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

[Uplink Emission Mask C – High, 25 kHz]



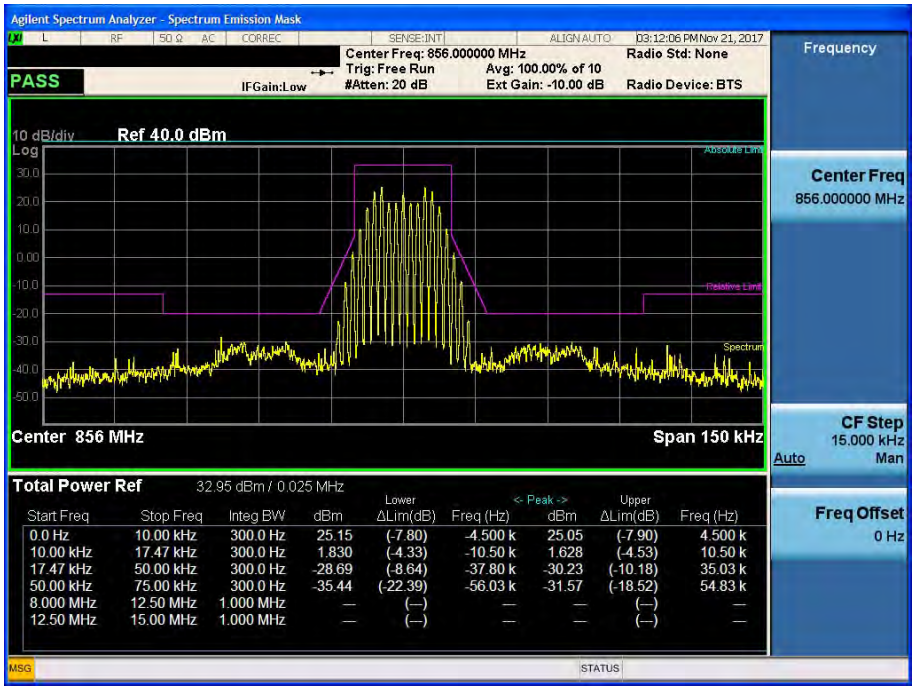
800 APCO 25_Downlink

[Downlink Emission Mask H – Low, 12.5 kHz]



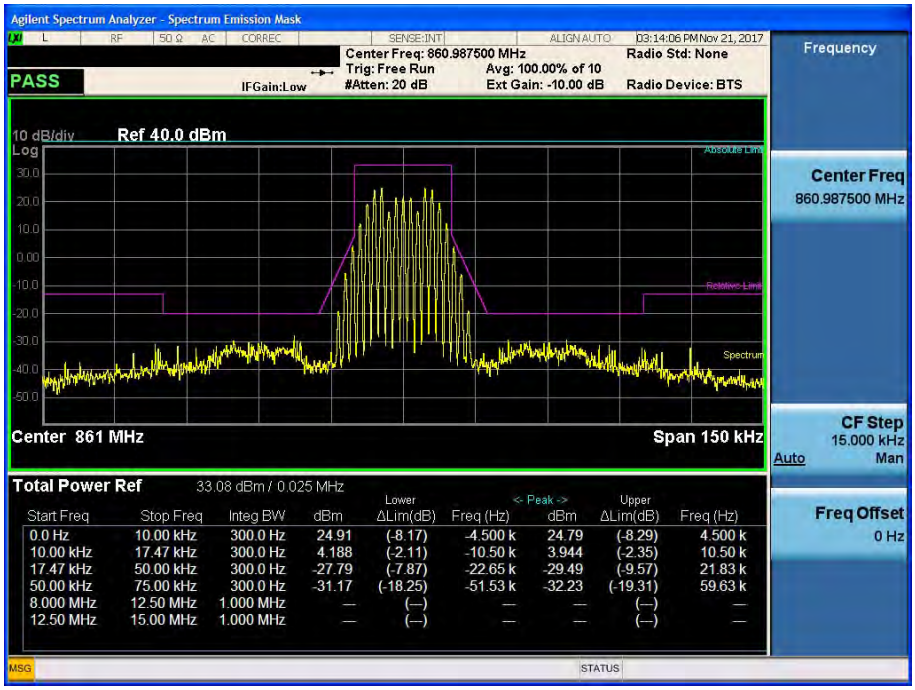
Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	Peak dBm	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	4.000 kHz	300.0 Hz	23.68	(-9.39)	-40.00	23.65	(-9.42)	0.0
4.000 kHz	8.500 kHz	300.0 Hz	-6.139	(-21.46)	-6.280 k	4.103	(-22.74)	4.800 k
8.500 kHz	15.00 kHz	300.0 Hz	-29.10	(-17.59)	-14.72 k	-27.73	(-19.53)	12.56 k
15.00 kHz	25.00 kHz	300.0 Hz	-26.49	(-0.95)	-20.16 k	-32.21	(-0.81)	22.44 k
25.00 kHz	40.00 kHz	300.0 Hz	-22.48	(-9.55)	-37.84 k	-24.42	(-11.49)	35.64 k
12.50 MHz	15.00 MHz	1.000 MHz	—	(—)	—	—	(—)	—

[Downlink Emission Mask G – Middle, 25 kHz]



Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	Peak dBm	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	10.00 kHz	300.0 Hz	25.15	(-7.80)	-4.500 k	25.05	(-7.90)	4.500 k
10.00 kHz	17.47 kHz	300.0 Hz	1.830	(-4.33)	-10.50 k	1.628	(-4.53)	10.50 k
17.47 kHz	50.00 kHz	300.0 Hz	-28.69	(-8.64)	-37.80 k	-30.23	(-10.18)	35.03 k
50.00 kHz	75.00 kHz	300.0 Hz	-35.44	(-22.39)	-56.03 k	-31.57	(-18.52)	54.83 k
8.000 MHz	12.50 MHz	1.000 MHz	—	(—)	—	—	(—)	—
12.50 MHz	15.00 MHz	1.000 MHz	—	(—)	—	—	(—)	—

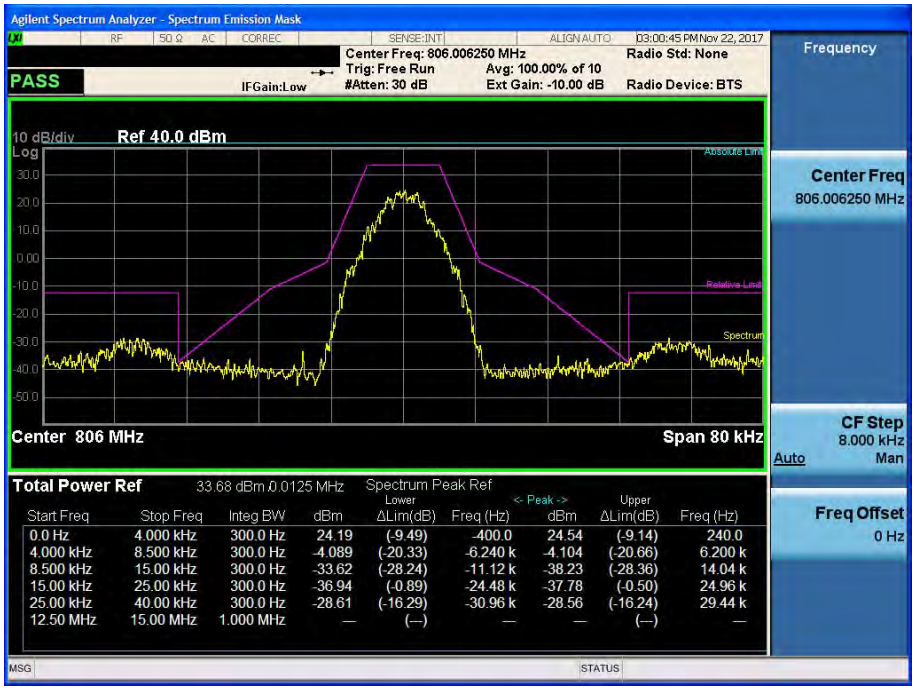
[Downlink Emission Mask G – High, 25 kHz]



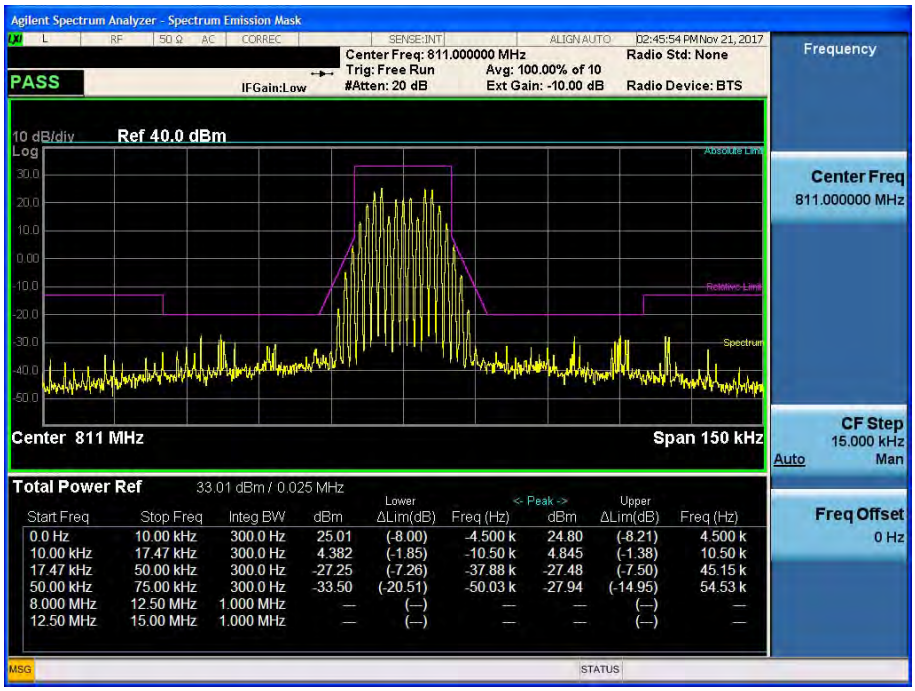
Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Lower Freq (Hz)	Peak dBm	Upper ΔLim(dB)	Upper Freq (Hz)
0.0 Hz	10.00 kHz	300.0 Hz	24.91	(-8.17)	-4.500 k	24.79	(-8.29)	4.500 k
10.00 kHz	17.47 kHz	300.0 Hz	4.188	(-2.11)	-10.50 k	3.944	(-2.35)	10.50 k
17.47 kHz	50.00 kHz	300.0 Hz	-27.79	(-7.87)	-22.65 k	-29.49	(-9.57)	21.83 k
50.00 kHz	75.00 kHz	300.0 Hz	-31.17	(-18.25)	-51.53 k	-32.23	(-19.31)	59.63 k
8.000 MHz	12.50 MHz	1.000 MHz	—	(—)	—	—	(—)	—
12.50 MHz	15.00 MHz	1.000 MHz	—	(—)	—	—	(—)	—

800 APCO 25_Uplink

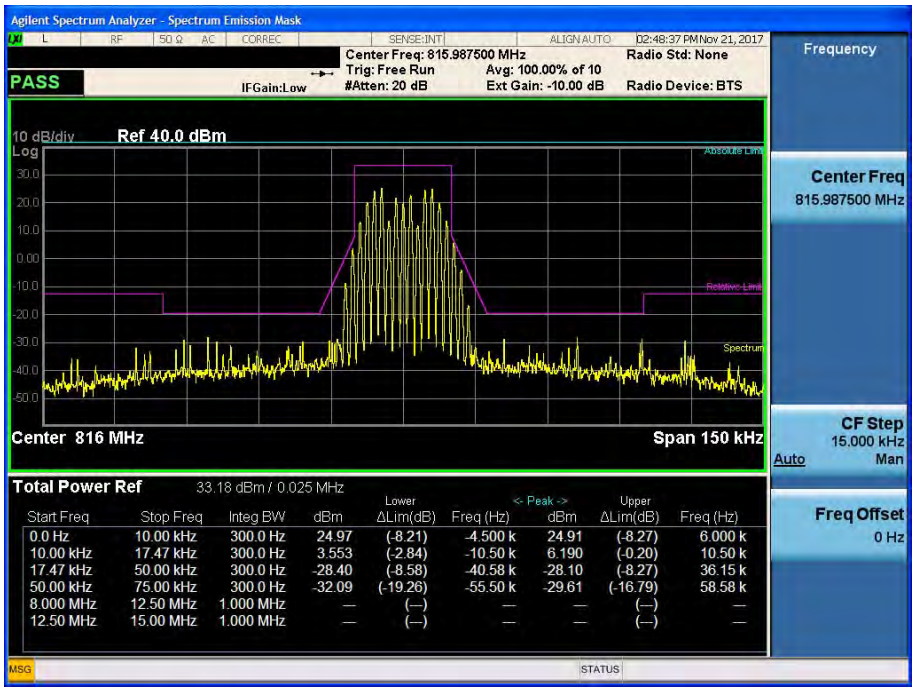
[Uplink Emission Mask H– Low, 12.5 kHz]



[Uplink Emission Mask G – Middle, 25 kHz]



[Uplink Emission Mask G – High, 25 kHz]



Start Freq	Stop Freq	Integ BW	dBm	Lower ΔLim(dB)	Freq (Hz)	< Peak > dBm	Upper ΔLim(dB)	Freq (Hz)
0.0 Hz	10.00 kHz	300.0 Hz	24.97	(-8.21)	-4.500 k	24.91	(-8.27)	6.000 k
10.00 kHz	17.47 kHz	300.0 Hz	3.553	(-2.84)	-10.50 k	6.190	(-0.20)	10.50 k
17.47 kHz	50.00 kHz	300.0 Hz	-28.40	(-8.58)	-40.58 k	-28.10	(-8.27)	36.15 k
50.00 kHz	75.00 kHz	300.0 Hz	-32.09	(-19.26)	-55.50 k	-29.61	(-16.79)	58.58 k
8.000 MHz	12.50 MHz	1.000 MHz	—	(---)	—	—	(---)	—
12.50 MHz	15.00 MHz	1.000 MHz	—	(---)	—	—	(---)	—

11. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL

FCC Rules

Test Requirements:

§ 2.1051 Measurements required: Spurious emissions at antenna terminals:

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§ 90.219 Use of signal booters.

(e) *Device Specifications.* In addition to the general rules for equipment certification in §90.203(a)(2) and part 2, subpart J of this chapter, a signal booster must also meet the rules in this paragraph.

(3) Spurious emissions from a signal booster must not exceed −13 dBm within any 100 kHz measurement bandwidth.

§ 90.543 Emission limitations.

Transmitters designed to operate in 769-775 MHz and 799-805 MHz frequency bands must meet the emission limitations in paragraphs (a) through (d) of this section. Class A and Class B signal boosters retransmitting signals in the 769-775 MHz and 799-805 MHz frequency bands are exempt from the limits listed in paragraph (a) of this section when simultaneously retransmitting multiple signals and instead shall be subject to the limit listed in paragraph (c) of this section when operating in this manner. Transmitters operating in 758-768 MHz and 788-798 MHz bands must meet the emission limitations in (e) of this section.

(a) The adjacent channel power (ACP) requirements for transmitters designed for various channel sizes are shown in the following tables. Mobile station requirements apply to handheld, car mounted and control station units. The tables specify a value for the ACP as a function of the displacement from the channel center frequency and measurement bandwidth. In the following tables, “(s)” indicates a swept measurement may be used.

6.25 kHz Mobile Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP relative (dBc)
6.25	6.25	−40
12.5	6.25	−60
18.75	6.25	−60

25.00	6.25	−65
37.50	25.00	−65
62.50	25.00	−65
87.50	25.00	−65
150.00	100.00	−65
250.00	100.00	−65
350.00	100.00	−65
>400 kHz to 12 MHz	30 (s)	−75
12 MHz to paired receive band	30 (s)	−75
In the paired receive band	30 (s)	−100

12.5 kHz Mobile Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP relative (dBc)
9.375	6.25	−40
15.625	6.25	−60
21.875	6.25	−60
37.50	25.00	−60
62.50	25.00	−65
87.50	25.00	−65
150.00	100	−65
250.00	100	−65
350.00	100	−65
>400 to 12 MHz	30 (s)	−75
12 MHz to paired receive band	30 (s)	−75
In the paired receive band	30 (s)	−100

25 kHz Mobile Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP relative (dBc)
15.625	6.25	−40
21.875	6.25	−60
37.50	25	−60
62.50	25	−65
87.50	25	−65

150.00	100	−65
250.00	100	−65
350.00	100	−65
>400 kHz to 12 MHz	30 (s)	−75
12 MHz to paired receive band	30 (s)	−75
In the paired receive band	30 (s)	−100

6.25 kHz Base Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP (dBc)
6.25	6.25	−40
12.50	6.25	−60
18.75	6.25	−60
25.00	6.25	−65
37.50	25	−65
62.50	25	−65
87.50	25	−65
150.00	100	−65
250.00	100	−65
350.00	100	−65
>400 to 12 MHz	30 (s)	−80
12 MHz to paired receive band	30 (s)	−80
In the paired receive band	30 (s)	[1]-85

[1]Although we permit individual base transmitters to radiate a maximum ACP of −85 dBc in the paired receive band, licensees deploying these transmitters may not exceed an ACP of −100 dBc in the paired receive band when measured at either the transmitting antenna input port or the output of the transmitter combining network. Consequently, licensees deploying these transmitters may need to use external filters to comply with the more restrictive ACP limit.

12.5 kHz Base Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP (dBc)
9.375	6.25	−40
15.625	6.25	−60
21.875	6.25	−60

37.5	25	−60
62.5	25	−65
87.5	25	−65
150	100	−65
250	100	−65
350.00	100	−65
>400 kHz to 12 MHz	30 (s)	−80
12 MHz to paired receive band	30 (s)	−80
In the paired receive band	30 (s)	[1]-85

[1]Although we permit individual base transmitters to radiate a maximum ACP of −85 dBc in the paired receive band, licensees deploying these transmitters may not exceed an ACP of −100 dBc in the paired receive band when measured at either the transmitting antenna input port or the output of the transmitter combining network. Consequently, licensees deploying these transmitters may need to use external filters to comply with the more restrictive ACP limit.

25 kHz Base Transmitter ACP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACP (dBc)
15.625	6.25	−40
21.875	6.25	−60
37.5	25	−60
62.5	25	−65
87.5	25	−65
150	100	−65
250	100	−65
350	100.00	−65
>400 kHz to 12 MHz	30 (s)	−80
12 MHz to paired receive band	30 (s)	−80
In the paired receive band	30 (s)	[1]-85

[1]Although we permit individual base transmitters to radiate a maximum ACP of −85 dBc in the paired receive band, licensees deploying these transmitters may not exceed an ACP of −100 dBc in the paired receive band when measured at either the transmitting antenna input port or the output of the transmitter combining network. Consequently, licensees deploying these transmitters may need to use external filters to comply with the more restrictive ACP limit.

(b) *ACP measurement procedure.* The following are the procedures for making the transmitter ACP measurements. For all measurements modulate the transmitter as it would be modulated in

normal operating conditions. For time division multiple access (TDMA) systems, the measurements are to be made under TDMA operation only during time slots when the transmitter is active. All measurements are made at the transmitter's output port. If a transmitter has an integral antenna, a suitable power coupling device shall be used to couple the RF signal to the measurement instrument. The coupling device shall substantially maintain the proper transmitter load impedance. The ACP measurements may be made with a spectrum analyzer capable of making direct ACP measurements. “Measurement bandwidth”, as used for non-swept measurements, implies an instrument that measures the power in many narrow bandwidths equal to the nominal resolution bandwidth and integrates these powers to determine the total power in the specified measurement bandwidth.

(1) *Setting reference level.* Set transmitter to maximum output power. Using a spectrum analyzer capable of ACP measurements, set the measurement bandwidth to the channel size. For example, for a 6.25 kHz transmitter set the measurement bandwidth to 6.25 kHz. Set the frequency offset of the measurement bandwidth to zero and adjust the center frequency of the instrument to the assigned center frequency to measure the average power level of the transmitter. Record this power level in dBm as the “reference power level.”

(2) *Non-swept power measurement.* Using a spectrum analyzer capable of ACP measurements, set the mesurement bandwidth and frequency offset from the assigned center frequency as shown in the tables in §90.543 (a) above. Any value of resolution bandwidth may be used as long as it does not exceed 2 percent of the specified measurement bandwidth. Measure the power level in dBm. These measurements should be made at maximum power. Calculate ACP by substracting the reference power level measured in (b)(1) from the measurements made in this step. The absolute value of the calculated ACP must be greater than or equal to the absolute value of the ACP given in the table for each condition above.

(3) *Swept power measurement.* Set a spectrum analyzer to 30 kHz resolution bandwidth, 1 MHz video bandwidth and average, sample, or RMS detection. Set the reference level of the spectrum analyzer to the RMS value of the transmitter power. Sweep above and below the carrier frequency to the limits defined in the tables. Calculate ACP by substracting the reference power level measured in (b)(1) from the measurements made in this step. The absolute value of the calculated ACP must be greater than or equal to the absolute value of the ACP given in the table for each condition above.

(c) *Out-of-band emission limit.* On any frequency outside of the frequency ranges covered by the ACP tables in this section, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

(d) *Authorized bandwidth.* Provided that the ACP requirements of this section are met, applicants may request any authorized bandwidth that does not exceed the channel size.

(e) For operations in the 758-768 MHz and the 788-798 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter

power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations.

(2) On all frequencies between 769-775 MHz and 799-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

(3) On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB.

(4) Compliance with the provisions of paragraphs (e)(1) and (2) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(5) Compliance with the provisions of paragraph (e)(3) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of 30 kHz may be employed.

(f) For operations in the 758-775 MHz and 788-805 MHz bands, all emissions including harmonics in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

Test Procedures:

Measurements were in accordance with the test methods section 3.6 and 4.7 of KDB 935210 D05 v01r02.

3.6.1. General

Spurious emissions shall be measured using a single test signal sequentially tuned to the low, middle and high channels or frequencies within each authorized frequency band of operation. Out-of-band/block emissions (including intermodulation products) shall be measured under each of the following two stimulus conditions:

a) two adjacent test signals sequentially tuned to the lower and upper frequency band/block edges;

b) a single test signal, sequentially tuned to the lowest and highest frequencies or channels within the frequency band/block under examination.

NOTE—Single channel boosters that cannot accommodate two simultaneous signals within the passband, can be excluded from the test stipulated in step a).

3.6.2. EUT out-of-band/block emissions conducted measurement

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

NOTE—If the signal generator is not capable of generating two modulated carriers simultaneously, then two discrete signal generators can be connected with an appropriate combining network to support the two-tone test.

b) Set the signal generator to produce two AWGN signals as previously described (e.g., 4.1 MHz OBW).

c) Set the center frequencies such that the AWGN signals occupy adjacent channels, as defined by industry standards such as 3GPP or 3GPP2, at the upper edge of the frequency band or block of interest.

d) Set the composite power levels such that the input signal is just below the AGC threshold (see 3.2), but not more than 0.5 dB below. The composite power can be measured using the procedures provided in KDB Publication 971168, but it will be necessary to expand the power integration bandwidth so as to include both of the transmit channels. Alternatively, the composite power can be measured using an average power meter as described in KDB Publication 971168.

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band (typically 1 % of the emission bandwidth, 100 kHz, or 1 MHz)

g) Set the VBW = 3 × RBW.

h) Set the detector to power averaging (rms) detector.

i) Set the Sweep time = auto-couple.

j) Set the analyzer start frequency to the upper block edge frequency and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz for frequencies below and above 1 GHz, respectively.

k) Trace average at least 100 traces in power averaging (i.e., rms) mode.

l) Use the marker function to find the maximum power level.

m) Capture the spectrum analyzer trace of the power level for inclusion in the test report.

n) Repeat the procedure with the composite input power level set to 3 dB above the AGC threshold.

o) Reset the input signals frequencies to the lower edge of the frequency block or band under examination.

p) Reset the spectrum analyzer start frequency to the lower block edge frequency minus 300 kHz, or 3 MHz (for frequencies below and above 1 GHz, respectively), and the stop frequency to the lower band or block edge frequency.

q) Repeat steps k) to n).

r) Repeat steps a) to q) with the signal generator configured for a single test signal tuned as close as possible to the block edges.

s) Repeat steps a) to r) with the narrowband test signal.

t) Repeat steps a) to s) for all authorized frequency bands or blocks used by the EUT.

3.6.3. EUT spurious emissions conducted measurement

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

b) Set the signal generator to produce the broadband test signal as previously described (e.g., 4.1 MHz OBW AWGN).

c) Set the center frequency of the test signal to the lowest available channel within the frequency band or block.

d) Set the EUT input power to a level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW = reference bandwidth in the applicable rule section for the supported frequency band of operation (e.g., reference bandwidth is typically 100 kHz or 1 MHz).

g) Set the VBW ≥ 3 × RBW.

h) Set the Sweep time = auto-couple.

i) Set the analyzer start frequency to the lowest radio frequency signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part.

NOTE—The number of measurement points in each sweep must be ≥ (2 × span/RBW) which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.

j) Select the power averaging (rms) detector function.

k) Trace average at least 10 traces in power averaging (i.e., rms) mode.

l) Use the peak marker function to identify the highest amplitude level over each measured frequency range. Record the frequency and amplitude and capture a plot for inclusion in the test report.

m) Reset the analyzer start frequency to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part, and the analyzer stop frequency to 10 times the highest frequency of the fundamental emission (see §2.1057). Note that the number of measurement points in each sweep must be ≥ (2 × span/RBW) which may require that the measurement range defined by the start and stop frequencies be subdivided, depending on the available number of measurement points provided by the spectrum analyzer.

n) Trace average at least 10 traces in power averaging (i.e., rms) mode.

o) Use the peak marker function to identify the highest amplitude level over each of the measured frequency ranges. Record the frequency and amplitude and capture a plot for inclusion in the test report and provide tabular data, if required.

p) Repeat the procedure with the input test signals tuned to a middle band/block frequency/channel and then a high band/block frequency/channel.

q) Repeat entire procedure with the narrowband test signal.

r) Repeat for all authorized frequency bands/blocks used by the EUT.

4.7.2 EUT out-of-band/block emissions conducted measurement

Intermodulation products shall be measured while applying two CW tones spaced in frequency ±12.5 kHz relative to the center frequency (f0) as determined from 4.4.

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

NOTE—If the signal generator is not capable of producing two independent modulated carriers simultaneously, then two discrete signal generators can be connected with an appropriate combining network to support the two-tone test.

b) Configure the two signal generators to produce CW tones on frequencies spaced at ± 12.5 kHz relative to f0 with amplitude levels set just below the AGC threshold (see 4.2).

c) Connect a spectrum analyzer to the EUT output.

d) Set the span to 100 kHz.

e) Set the resolution bandwidth to 300 Hz with a video bandwidth ≥ 3 × RBW.

f) Set the detector to power average (rms).

g) Place a marker on highest intermodulation product amplitude.

h) Capture the plot for inclusion in the test report.

i) Repeat the procedure with the composite input power level set to 3 dB above the AGC threshold.

j) Repeat steps b) to h) for all operational bands.

4.7.3 EUT spurious emissions conducted measurement

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

b) Configure the signal generator to produce a CW signal.

c) Set the frequency of the CW signal to the center channel of the pass band.

d) Set the output power level so that the resultant signal is just below the AGC threshold (see 4.2).

e) Connect a spectrum analyzer to the output of the EUT using appropriate attenuation as necessary.

f) Set the RBW to 100 kHz.

g) Set the VBW = 3 × RBW.

h) Set the Sweep time = auto-couple.

i) Set the detector to PEAK.

j) Set the analyzer start frequency to 30 MHz (or the lowest radio frequency signal generated in the equipment, without going below 9 kHz if the EUT has internal clock frequencies) and the stop frequency to 10 × the highest allowable frequency of the pass band.

k) Select MAX HOLD and use the marker peak function to find the highest emission(s) outside the pass band. (This could be either at a frequency lesser or greater than the pass

band.)

l) Capture a plot for inclusion in the test report.

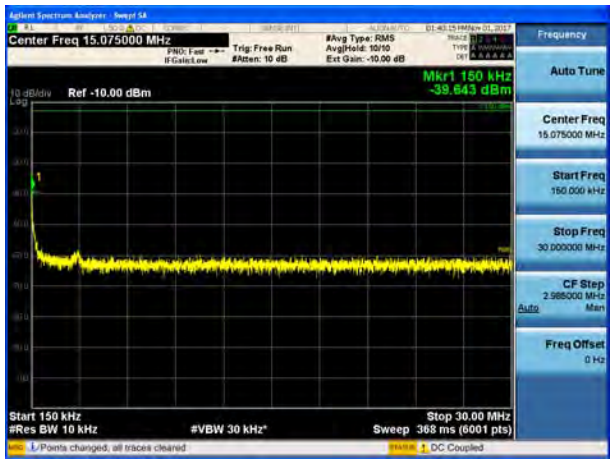
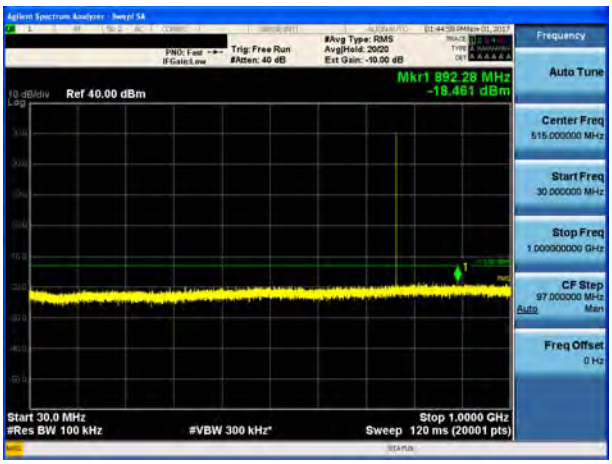
m) Repeat steps c) to l) for each authorized frequency band/block of operation.

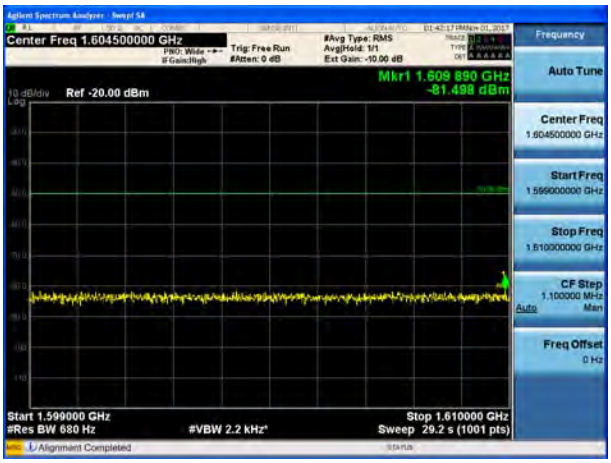
Notes: In 9 KHz-150 KHz and 150 KHz-30 MHz bands, RBW was reduced to 1% and 10% of the reference bandwidth for measuring unwanted emission level(typically, 100KHz if the authorized frequency band is below 1GHz) and power was integrated. (1% = +20 dB, 10% = +10 dB)

Single channel Enhancer Plots of Spurious Emission

700 APCO 25(6.25 kHz)_DL

[Downlink_Low]

9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 1 ㎓	**1 ㎓ ~ 3 ㎓**
	
3 ㎓ ~ 12.75 ㎓	

1599 MHz ~ 1610 MHz (1)	1599 MHz ~ 1610 MHz (2)
	

[Downlink_Middle]

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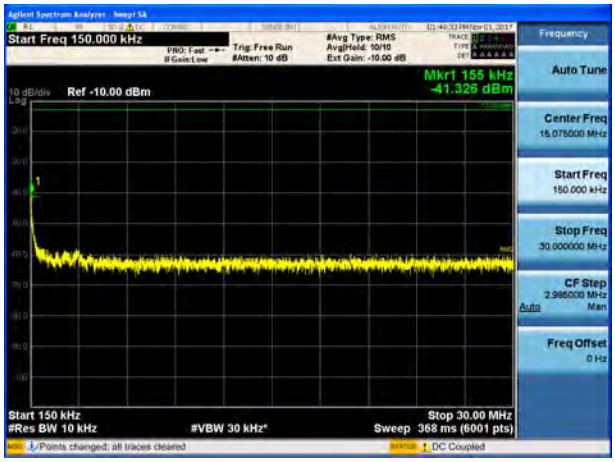
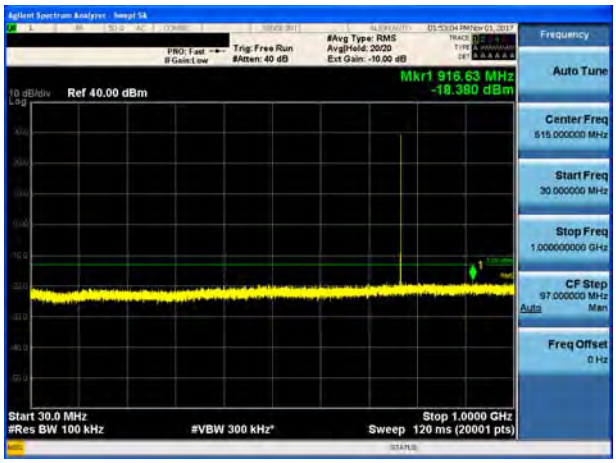
	
30 MHz ~ 1 GHz	**1 GHz ~ 3 GHz**
	
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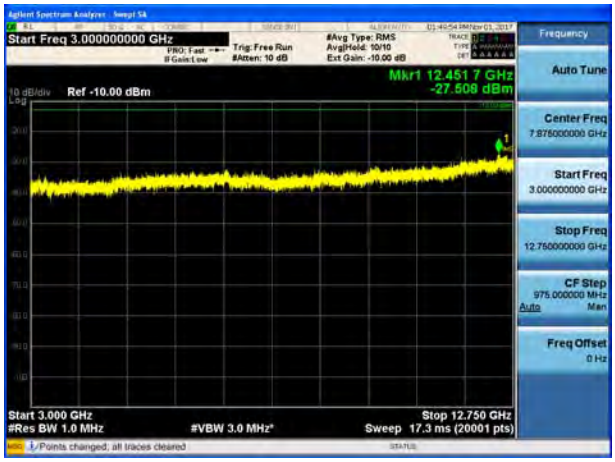
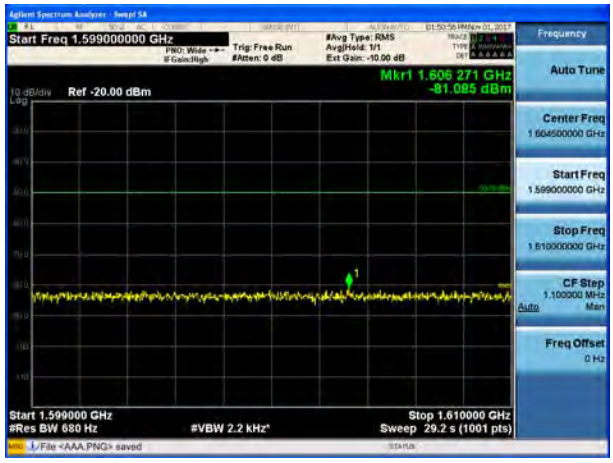
	

1599 MHz ~ 1610 MHz (1)	1599 MHz ~ 1610 MHz (2)
	

[Downlink_High]

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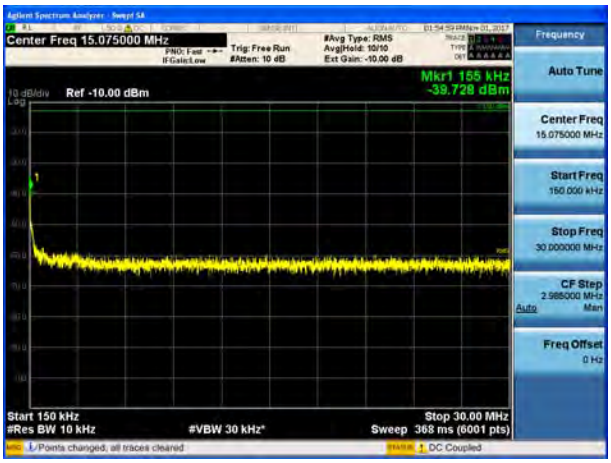
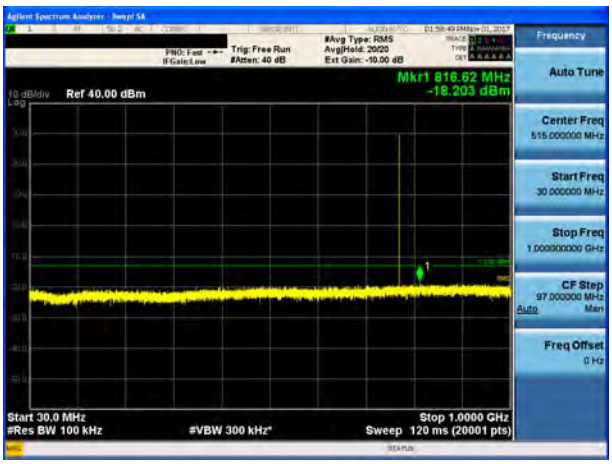
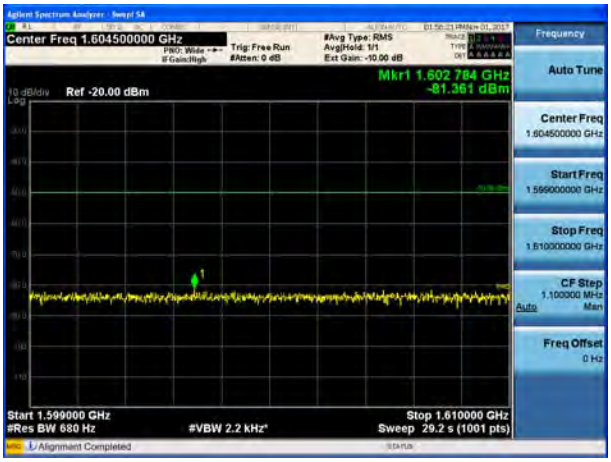
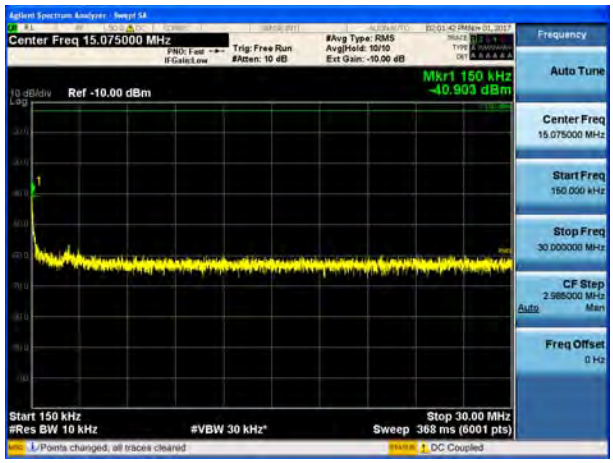
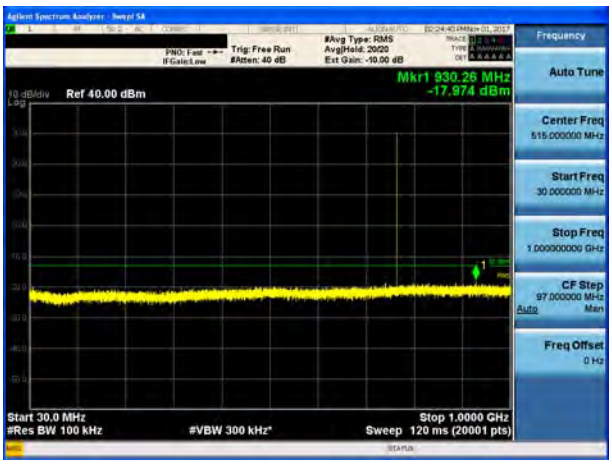
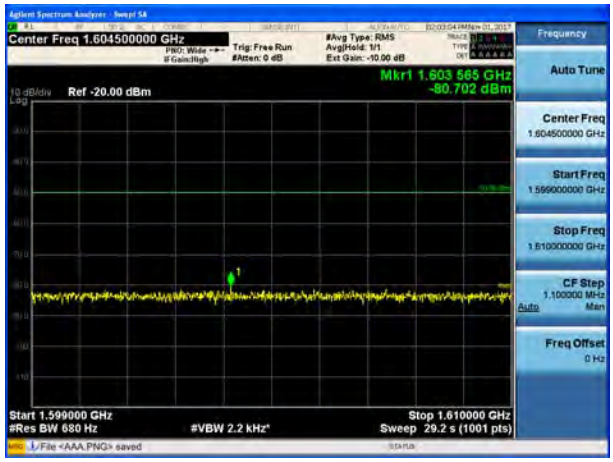
	
30 MHz ~ 1 GHz	**1 GHz ~ 3 GHz**
	
3 GHz ~ 12.75 GHz	

1599 MHz ~ 1610 MHz (1)	1599 MHz ~ 1610 MHz (2)
	

700 APCO 25(12.5 kHz)_DL

[Downlink_Low]

9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 1 ㎓	**1 ㎓ ~ 3 ㎓**
	
3 ㎓ ~ 12.75 ㎓	

1599 MHz ~ 1610 MHz (1)	1599 MHz ~ 1610 MHz (2)
	

[Downlink_Middle]

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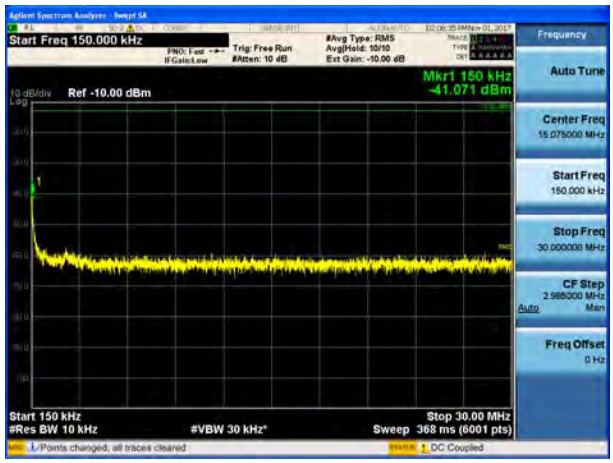
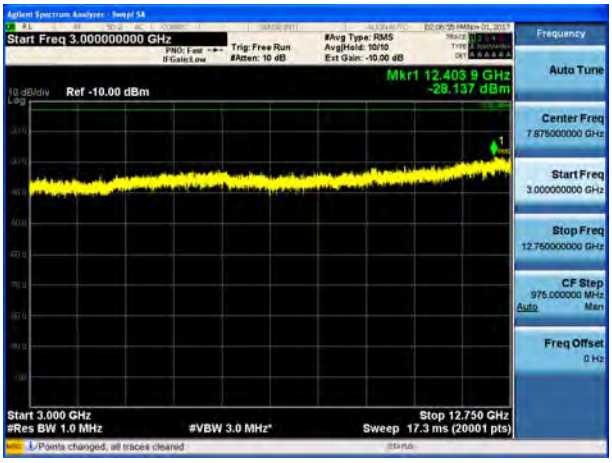
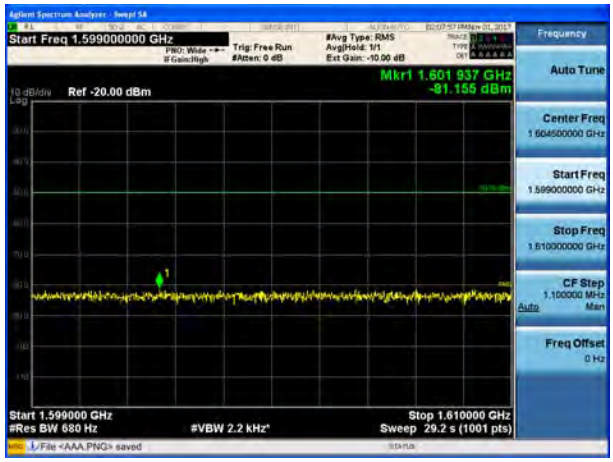
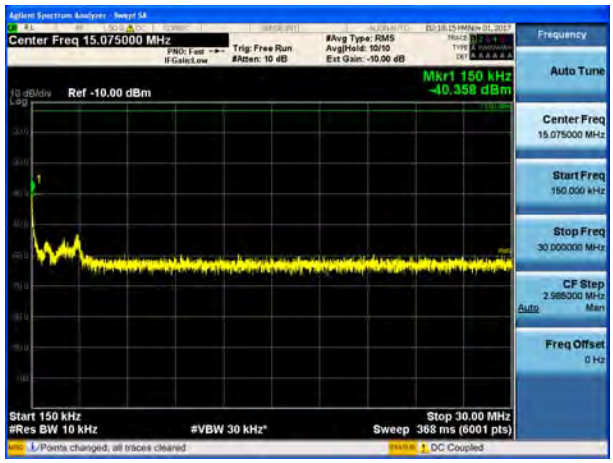
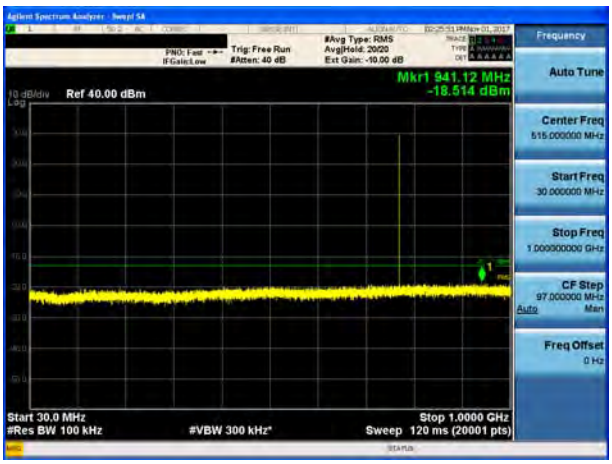
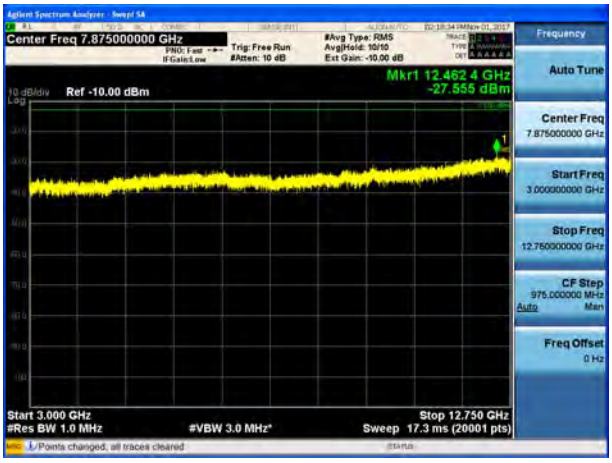
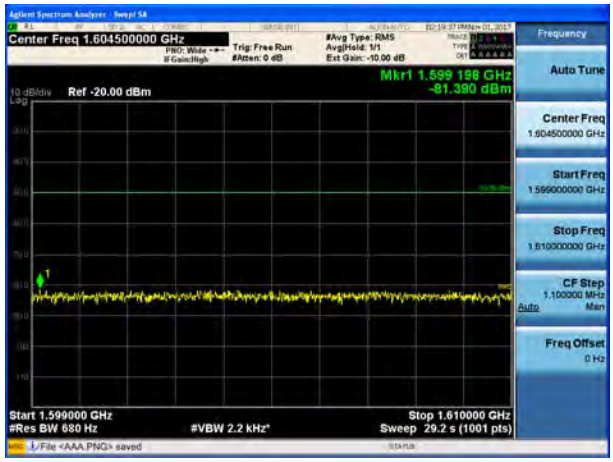
	
30 MHz ~ 1 GHz	**1 GHz ~ 3 GHz**
3 GHz ~ 12.75 GHz	
	

1599 MHz ~ 1610 MHz (1)	1599 MHz ~ 1610 MHz (2)
	

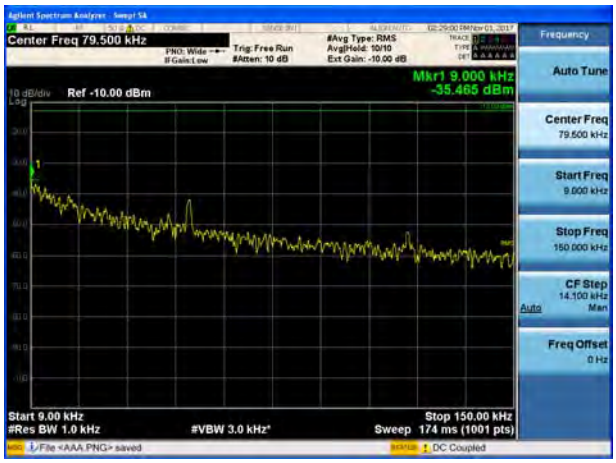
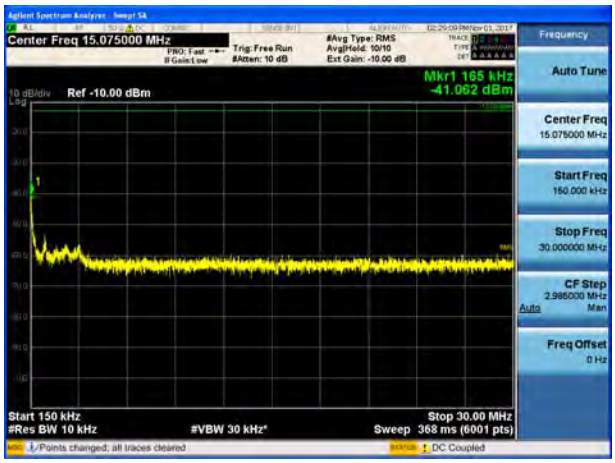
[Downlink_High]

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 3 GHz**
	
3 GHz ~ 12.75 GHz	
	

1599 MHz ~ 1610 MHz (1)	1599 MHz ~ 1610 MHz (2)
	

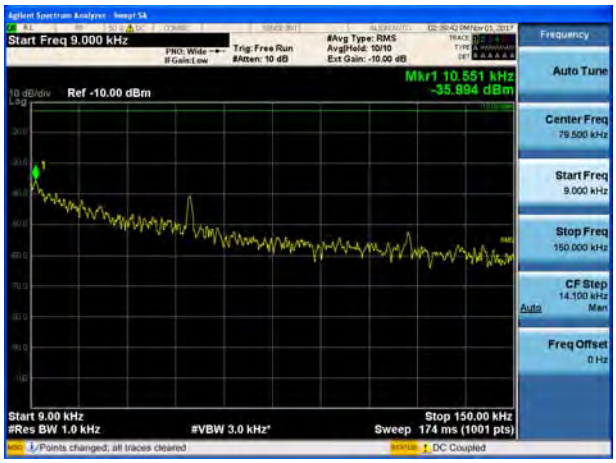
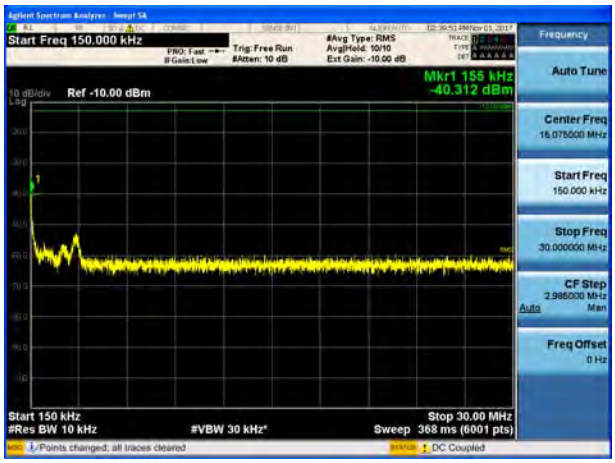
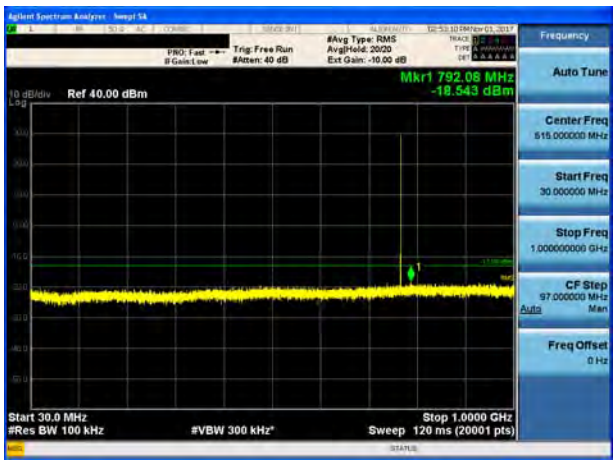
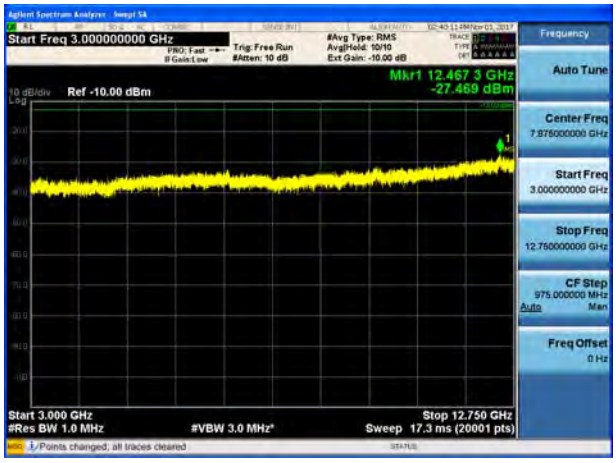
700 APCO 25(25 kHz)_DL

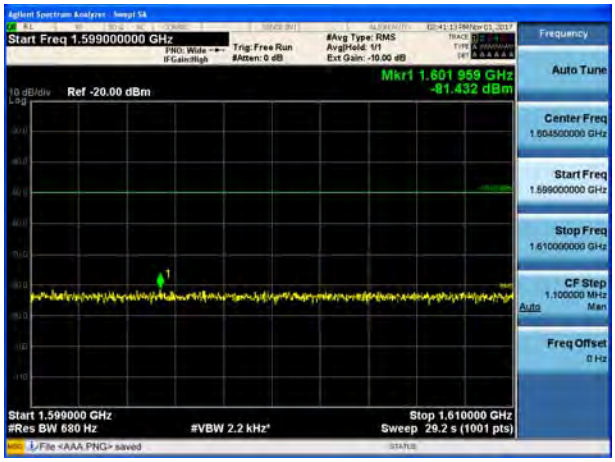
[Downlink_Low]

9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 1 ㎓	**1 ㎓ ~ 3 ㎓**
3 ㎓ ~ 12.75 ㎓	

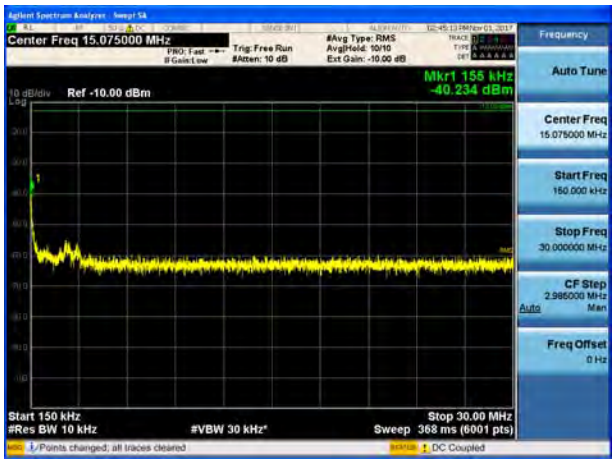
1599 MHz ~ 1610 MHz (1)	1599 MHz ~ 1610 MHz (2)

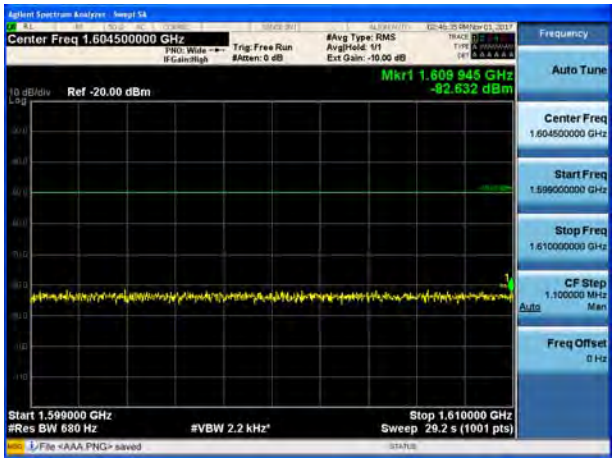
[Downlink_Middle]

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 3 GHz**
	
3 GHz ~ 12.75 GHz	
	

1599 MHz ~ 1610 MHz (1)	1599 MHz ~ 1610 MHz (2)
	

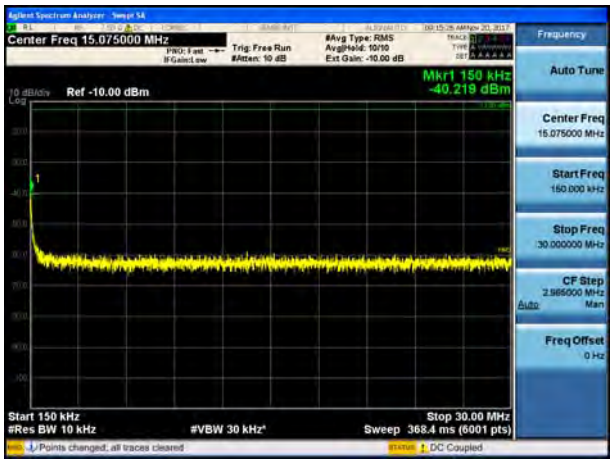
[Downlink_High]

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 3 GHz**
3 GHz ~ 12.75 GHz	

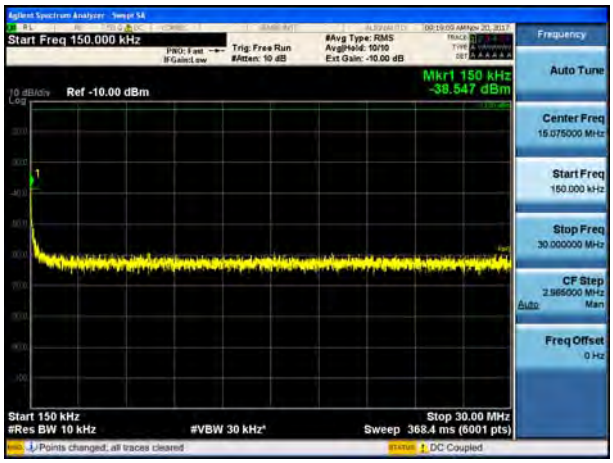
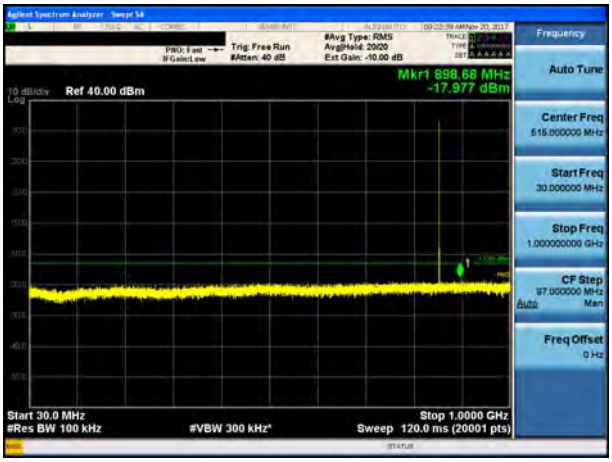
1599 MHz ~ 1610 MHz (1)	1599 MHz ~ 1610 MHz (2)
	

800 APCO 25(6.25 kHz)_DL

[Downlink_Low]

9 ㎑ ~ 150 ㎑	150 ㎑ ~ 30 ㎒
	
30 ㎒ ~ 1 ㎓	**1 ㎓ ~ 3 ㎓**
3 ㎓ ~ 12.75 ㎓	

[Downlink_Middle]

9 kHz ~ 150 kHz	150 kHz ~ 30 MHz
	
30 MHz ~ 1 GHz	**1 GHz ~ 3 GHz**
	
3 GHz ~ 12.75 GHz	