HCT CO.,LTD.
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
TEL: +82-31-645-6300 FAX: +82-31-645-6401

FCC REPORT

Certification

Applicant Name:
GS Instech Co., Ltd.

Address:
70, Gilpa-ro 71beon-gil, Nam-gu, Inchen, Korea

Date of Issue:
December 29, 2017

Test Site/Location:
HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-R-1712-F008-4

FCC ID:	**U88PSELITE78B**
APPLICANT:	**GS Instech Co., Ltd.**

FCC Model(s): PS-Elite7833B

EUT Type: Public Safety Repeater

Frequency Ranges :

	Downlink	Uplink
FirstNet	758 ~ 768 MHz (768 ~ 769 MHz Guard band)	788 ~ 798 MHz (798 ~ 799 MHz Guard band)
PS 700	769 ~ 775 MHz	799 ~ 805 MHz
PS 800	851 ~ 861 MHz	806 ~ 816 MHz

Conducted Output Power:

	Downlink	Uplink
FirstNet / PS 700	30 dBm	30 dBm
PS 800	33 dBm	33 dBm

Date of Test: November 07, 2017 ~ December 27, 2017

FCC Rule Part(s): CFR 47 Part 2, Part 90

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC under normal use and maintenance.

Report prepared by : Kyung Soo Kang
Engineer of Telecommunication testing center

Approved by : Yong Hyun Lee
Manager of Telecommunication testing center

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1712-F008	December 12, 2017	- First Approval Report
HCT-R-1712-F008-1	December 22, 2017	- Revised the enthesisthe range of ACP offset frequencies within the parenthesis of the titles of the plots. (p.293~294, p.303~304) - Added the note on page 7.
HCT-R-1712-F008-2	December 26, 2017	- Delete emission mask E and D
HCT-R-1712-F008-3	December 28, 2017	- Adding the emission mask C for 700 APCO
HCT-R-1712-F008-4	December 29, 2017	- Adding the standard and test processor about emission mask C

Table of Contents

1. CLIENT INFORMATION

The EUT has been tested by request of

Company	GS Instech Co., Ltd. 70, Gilpa-ro 71beon-gil, Nam-gu, Inchen, Korea

FCC ID: U88PSELITE78B

EUT Type: Public Safety Repeater

FCC/IC Model(s): PS-Elite7833B

Power Supply: 110 ~ 125 VAC

Frequency Ranges :

	Downlink	Uplink
FirstNet	758 ~ 768 MHz (768 ~ 769 MHz Guard band)	788 ~ 798 MHz (798 ~ 799 MHz Guard band)
PS 700	769 ~ 775 MHz	799 ~ 805 MHz
PS 800	851 ~ 861 MHz	806 ~ 816 MHz

Conducted Output Power:

	Downlink	Uplink
FirstNet / PS 700	30 dBm	30 dBm
PS 800	33 dBm	33 dBm

Antenna Gain(s): Manufacturer does not provide an antenna.

Measurement standard(s): ANSI/TIA-603-D-2010, KDB 971168 D01 v03, KDB 935210 D05 v01r02

FCC Rule Part(s): CFR 47 Part 2, Part 90

Place of Tests: HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

2. FACILITIES AND ACCREDITATIONS

2.1. FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 07, 2015 (Registration Number: 90661).

2.2. EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.
Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

3. TEST SPECIFICATIONS

3.1. STANDARDS

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 2, Part 90.

Description	Reference (FCC)	Results
Conducted RF Output Power	§2.1046, §90.541, §90.542, §90.635 §90.219(e)(1)	Compliant
Occupied Bandwidth	§2.1049	Compliant
Out of Band Rejection	KDB 935210 D05 v01r02	Compliant
Noise Figure	§90.219(e)(2)	Compliant
Emission Masks	§90.210	Compliant
Spurious Emissions at Antenna Terminals	§2.1051, §90.219(e)(3), §90.543	Compliant
Radiated Spurious Emissions	§2.1053	Compliant
Frequency Stability	§2.1055, §90.213, §90.539	Compliant

3.2. MODE OF OPERATION DURING THE TEST

The EUT was operated in a manner representative of the typical usage of the equipment.

During all testing, system components were manipulated within the confines of typical usage to maximize each emission.

All modulation modes were tested. Test results are only attached worst cases.

The device does not supply antenna(s) with the system, so the dummy loads were connected to the RF output ports for radiated spurious emission testing.

	Downlink Freq.	Uplink Freq.	Modulation
FirstNet	758 ~ 768 MHz	788 ~ 798 MHz	LTE (5 MHz) LTE (10 MHz)
PS 700	769 ~ 775 MHz	799 ~ 805 MHz	APCO 25
PS 800	851 ~ 861 MHz	806 ~ 816 MHz	

*** Note:**

PSWB: 6.25 kHz x n (n = 1 ~ 40),

12.5 kHz x n (n = 1 ~ 20),

25 kHz x n (n = 1 ~ 10)

100 ~ 250 kHz PSWB bandwidth can consist of a combination of the above signals.

So, we didn't performed test about 100 ~ 250 kHz bandwidth.

* The tests results in plots are already including the actual value of loss for the attenuator and cable combination. Please check correction factors below table.

▣ Correction Factor

Freq(MHz)	Factor(dB)
30	30.504
100	29.246
200	29.578
300	29.551
400	29.859
500	29.924
600	29.983
700	29.946
800	30.056
900	30.200
1000	30.263
2000	30.864
2600*	31.408

2700*	31.767
3000	32.243
4000	32.456
5000	30.504
6000	29.246
7000	33.210
8000	33.429
9000	34.210
10000	34.597
11000	35.485
12000	36.128
13000	37.014
14000	37.524
15000	38.070
16000	41.191
17000	41.070
18000	42.726
19000	41.312
20000	41.964
21000	42.616
22000	43.268
23000	43.920
24000	44.572
25000	45.225

3.3. MAXIMUM MEASUREMENT UNCERTAINTY

The value of the measurement uncertainty for the measurement of each parameter.

Coverage factor *k* = 2, Confidence levels of 95 %

Description	Condition	Uncertainty
Conducted RF Output Power	-	± 0.72 dB
Occupied Bandwidth	OBW ≤ 20 MHz	± 52 kHz
Passband Gain and Bandwidth & Out of Band Rejection	Gain 20 dB bandwidth	± 0.89 dB ± 0.58 MHz
Spurious Emissions at Antenna Terminals	-	± 1.08 dB
Noise Figure, Emission Masks	-	± 0.89 dB
Radiated Spurious Emissions	f ≤ 1 GHz f > 1 GHz	± 4.80 dB ± 6.07 dB

4. STANDARDS ENVIRONMENTAL TEST CONDITIONS

Temperature :	**+ 15 ℃ to + 35 ℃**
Relative humidity:	**30 % to 60 %**
Air pressure	**860 mbar to 1 060 mbar**

5. TEST EQUIPMENT

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Agilent	E4438C / SIGNAL GENERATOR	12/22/2017	Annual	MY42082646
Agilent	E4438C / SIGNAL GENERATOR	01/04/2017	Annual	MY49071736
Agilent	N5182A /Signal Generator	03/29/2017	Annual	MY50141649
Agilent	N5182A /Signal Generator	01/23/2017	Annual	MY47070406
Agilent	N9020A / Spectrum Analyzer	09/15/2017	Annual	MY46471250
Weinschel	67-30-33 / Fixed Attenuator	02/09/2017	Annual	CC7264
Weinschel	2-10 / 10 dB Attenuator	02/22/2017	Annual	BR0554
Agilent	11636A / Power Divider	08/01/2017	Annual	09109
DEAYOUNG ENT	DFSS60 / AC Power Supply	04/05/2017	Annual	1003030-1
NANGYEUL CO., LTD.	NY-THR18750 / Temperature and Humidity Chamber	10/21/2017	Annual	NY-2009012201A
Innco system	MA4000-EP / Antenna Position Tower	N/A	N/A	N/A
Innco system	CT0800 / Turn Table	N/A	N/A	N/A
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
ETS	2090 / Controller(Turn table)	N/A	N/A	1646
Rohde & Schwarz	Loop Antenna	04/19/2017	Biennial	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	04/06/2017	Biennial	760
Schwarzbeck	BBHA 9120D / Horn Antenna	08/28/2017	Biennial	1300
Rohde & Schwarz	FSP / Spectrum Analyzer	09/06/2017	Annual	100688
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/27/2017	Annual	101068-SZ
Wainwright Instruments	WHK1.2/15G-10EF / Highpass Filter	04/10/2017	Annual	4
Wainwright Instruments	WHK3.0/18G-10EF / Highpass Filter	06/12/2017	Annual	8
CERNEX	CBLU1183540 / Power Amplifier	01/25/2017	Annual	24614
CERNEX	CBL06185030 / Power Amplifier	01/25/2017	Annual	24615
CERNEX	CBL18265035 / Power Amplifier	01/23/2017	Annual	22966

6. RF OUTPUT POWER

FCC Rules

Test Requirements:

§ 2.1046 Measurements required: RF power output:

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in § 2.1033(c)(8).The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

(b) For single sideband, independent sideband, and single channel, controlled carrier radio telephone transmitters, the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as specified and as applicable in § 2.1046 (b) (1-5). In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

(c) For measurements conducted pursuant to paragraphs (a) and (b) of this section, all calculations and methods used by the applicant for determining carrier power or peak envelope power, as appropriate, on the basis of measured power in the radio frequency load attached to the transmitter output terminals shall be shown. Under the test conditions specified, no components of the emission spectrum shall exceed the limits specified in the applicable rule parts as necessary for meeting occupied bandwidth or emission limitations.

§ 90.541 Transmitting power and antenna height limits.

The transmitting power and antenna height of base, mobile, portable and control stations operating in the 769-775 MHz and 799-805 MHz frequency bands must not exceed the maximum limits in this section. Power limits are listed in effective radiated power (ERP).

(a) The transmitting power and antenna height of base stations must not exceed the limits given in paragraph (a) of §90.635.

§ 90.542 Broadband transmitting power limits.

(a) The following power limits apply to the 758-768/788-798 MHz band:

(1) Fixed and base stations transmitting a signal in the 758-768 MHz band with an emission bandwidth of 1 MHz or less must not exceed an ERP of 1000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts ERP in accordance with Table 1 of this section.

(2) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 758-768 MHz band with an emission bandwidth of 1 MHz or less must not exceed an ERP of 2000 watts and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are

reduced below 2000 watts ERP in accordance with Table 2 of this section.

(3) Fixed and base stations transmitting a signal in the 758-768 MHz band with an emission bandwidth greater than 1 MHz must not exceed an ERP of 1000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 1000 watts/MHz ERP accordance with Table 3 of this section.

(4) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal in the 758-768 MHz band with an emission bandwidth greater than 1 MHz must not exceed an ERP of 2000 watts/MHz and an antenna height of 305 m HAAT, except that antenna heights greater than 305 m HAAT are permitted if power levels are reduced below 2000 watts/MHz ERP in accordance with Table 4 of this section.

(5) Licensees of fixed or base stations transmitting a signal in the 758-768 MHz band at an ERP greater than 1000 watts must comply with the provisions set forth in paragraph (b) of this section.

(6) Control stations and mobile stations transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 30 watts ERP.

(7) Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

(8) For transmissions in the 758-768 MHz and 788-798 MHz bands, licensees may employ equipment operating in compliance with either of the following measurement techniques:

(i) The maximum composite transmit power shall be measured over any interval of continuous transmission using instrumentation calibrated in terms of RMS-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, etc., so as to obtain a true maximum composite measurement for the emission in question over the full bandwidth of the channel.

(ii) A Commission-approved average power technique.

Table 1 to §90.542(a)—Permissible Power and Antenna Heights for Base and Fixed Stations in the 758-768 MHz Band Transmitting a Signal With an Emission Bandwidth of 1 MHz or Less

Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) (watts)
Above 1372 (4500)	65
Above 1220 (4000) To 1372 (4500)	70
Above 1067 (3500) To 1220 (4000)	75
Above 915 (3000) To 1067 (3500)	100
Above 763 (2500) To 915 (3000)	140
Above 610 (2000) To 763 (2500)	200
Above 458 (1500) To 610 (2000)	350

Above 305 (1000) To 458 (1500)	600
Up to 305 (1000)	1000

Table 2 to §90.542(a)—Permissible Power and Antenna Heights for Base and Fixed Stations in the 758-768 MHz Band Transmitting a Signal With an Emission Bandwidth of 1 MHz or Less

Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) (watts)
Above 1372 (4500)	130
Above 1220 (4000) To 1372 (4500)	140
Above 1067 (3500) To 1220 (4000)	150
Above 915 (3000) To 1067 (3500)	200
Above 763 (2500) To 915 (3000)	280
Above 610 (2000) To 763 (2500)	400
Above 458 (1500) To 610 (2000)	700
Above 305 (1000) To 458 (1500)	1200
Up to 305 (1000)	2000

Table 3 to §90.542(a)—Permissible Power and Antenna Heights for Base and Fixed Stations in the 758-768 MHz Band Transmitting a Signal With an Emission Bandwidth Greater Than 1 MHz

Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) per MHz (watts/MHz)
Above 1372 (4500)	65
Above 1220 (4000) To 1372 (4500)	70
Above 1067 (3500) To 1220 (4000)	75
Above 915 (3000) To 1067 (3500)	100
Above 763 (2500) To 915 (3000)	140
Above 610 (2000) To 763 (2500)	200
Above 458 (1500) To 610 (2000)	350
Above 305 (1000) To 458 (1500)	600
Up to 305 (1000)	1000

Table 4 to §90.542(a)—Permissible Power and Antenna Heights for Base and Fixed Stations in the 758-768 MHz Band Transmitting a Signal With an Emission Bandwidth Greater Than 1 MHz

Antenna height (AAT) in meters (feet)	Effective radiated power (ERP) per MHz (watts/MHz)
Above 1372 (4500)	130
Above 1220 (4000) To 1372 (4500)	140
Above 1067 (3500) To 1220 (4000)	150

Above 915 (3000) To 1067 (3500)	200
Above 763 (2500) To 915 (3000)	280
Above 610 (2000) To 763 (2500)	400
Above 458 (1500) To 610 (2000)	700
Above 305 (1000) To 458 (1500)	1200
Up to 305 (1000)	2000

(b) For base and fixed stations operating in the 758-768 MHz band in accordance with the provisions of paragraph (a)(5) of this section, the power flux density that would be produced by such stations through a combination of antenna height and vertical gain pattern must not exceed 3000 microwatts per square meter on the ground over the area extending to 1 km from the base of the antenna mounting structure.

§ 90.635 Limitations on power and antenna height.

(a) The effective radiated power and antenna height for base stations may not exceed 1 kilowatt (30 dBw) and 304 m. (1,000 ft.) above average terrain (AAT), respectively, or the equivalent thereof as determined from the Table. These are maximum values, and applicants will be required to justify power levels and antenna heights requested.

Table—Equivalent Power and Antenna Heights for Base Stations in the 851-869 MHz and 935-940 MHz Bands Which Have a Requirement for a 32 km (20 mi) Service Area Radius

Antenna height (ATT) meters (feet)	Effective radiated power (watts)
Above 1,372 (4,500)	65
Above 1,220 (4,000) to 1,372 (4,500)	70
Above 1,067 (3,500) to 1,220 (4,000)	75
Above 915 (3,000) to 1,067 (3,500)	100
Above 763 (2,500) to 915 (3,000)	140
Above 610 (2,000) to 763 (2,500)	200
Above 458 (1,500) to 610 (2,000)	350
Above 305 (1,000) to 458 (1,500)	600
Up to 305 (1,000)	1,000

§ 90.219 Use of signal boosters.

(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.

(1) The output power capability of a signal booster must be designed for deployments providing a radiated power not exceeding 5 Watts ERP for each retransmitted channel.

Test Procedures:

Measurements were in accordance with the test methods section 3.5.2 of KDB 935210 D05 v01r02.

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

b) Configure to generate the AWGN (broadband) test signal.

c) The frequency of the signal generator shall be set to the frequency f0 as determined from 3.3.

d) Connect a spectrum analyzer or power meter to the output of the EUT using appropriate attenuation as necessary.

e) Set the signal generator output power to a level that produces an EUT output level that is just below the AGC threshold (see 3.2), but not more than 0.5 dB below.

f) Measure and record the output power of the EUT; use 3.5.3 or 3.5.4 for power measurement.

g) Remove the EUT from the measurement setup. Using the same signal generator settings, repeat the power measurement at the signal generator port, which was used as the input signal to the EUT, and record as the input power. EUT gain may be calculated as described in 3.5.5.

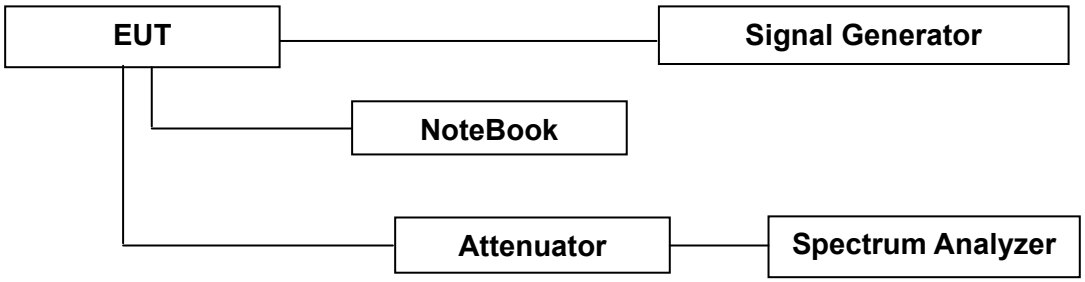
h) Repeat steps f) and g) with input signal amplitude set to 3 dB above the AGC threshold level.

i) Repeat steps e) to h) with the narrowband test signal.

j) Repeat steps e) to i) for all frequency bands authorized for use by the EUT.

Power measurement Method :

Guidance for performing input/output power measurements using a spectrum or signal analyzer is provided in 5.2 of KDB Publication 971168.



Block Diagram 1. RF Power Output Test Setup

Test Results:

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

Single channel Enhancer

* Due to EUT's ALC function (Auto Level Control), even if input signal is increased, The same output power is transmit.

[Downlink]

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
700 LTE (5 MHz)_ QPSK	Low	760.50	30.06	1.014
	Middle	763.00	30.32	1.076
	High	765.50	30.22	1.052
700 LTE (5 MHz)_ 16QAM	Low	760.50	30.17	1.040
	Middle	763.00	30.31	1.074
	High	765.50	30.21	1.050
700 LTE (10 MHz)_ QPSK	Low	-	-	-
	Middle	763.00	30.01	1.002
	High	-	-	-
700 LTE (10 MHz)_ 16QAM	Low	-	-	-
	Middle	763.00	30.27	1.064
	High	-	-	-

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
700 APCO 25 (6.25 kHz)_ AGC threshold	Low	769.003125	30.03	1.007
	Middle	772.000000	29.95	0.989
	High	774.996875	29.95	0.989
700 APCO 25 (6.25 kHz)_ +3dB above AGC threshold	Low	769.003125	30.04	1.009
	Middle	772.000000	30.07	1.016
	High	774.996875	30.15	1.035
700 APCO 25 (12.5 kHz)_ AGC threshold	Low	769.00625	30.03	1.007
	Middle	772.00000	30.03	1.007
	High	774.99375	30.12	1.028
700 APCO 25 (12.5 kHz)_ +3dB above AGC threshold	Low	769.00625	30.06	1.014
	Middle	772.00000	29.99	0.998
	High	774.99375	30.07	1.016
700 APCO 25 (25 kHz)_ AGC threshold	Low	769.01250	29.92	0.982
	Middle	772.00000	30.06	1.014
	High	774.98750	29.93	0.984
700 APCO 25 (25 kHz)_ +3dB above AGC threshold	Low	769.01250	29.93	0.984
	Middle	772.00000	30.07	1.016
	High	774.98750	30.07	1.016

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
800 APCO 25 (6.25 kHz)_ AGC threshold	Low	851.003125	32.96	1.977
	Middle	856.000000	33.03	2.009
	High	860.996875	33.07	2.028
800 APCO 25 (6.25 kHz)_ +3dB above AGC threshold	Low	851.003125	33.27	2.123
	Middle	856.000000	33.44	2.208
	High	860.996875	33.50	2.239
800 APCO 25 (12.5 kHz)_ AGC threshold	Low	851.00625	33.04	2.014
	Middle	856.00000	32.99	1.991
	High	860.99375	33.04	2.014
800 APCO 25 (12.5 kHz)_ +3dB above AGC threshold	Low	851.00625	32.89	1.945
	Middle	856.00000	33.34	2.158
	High	860.99375	33.40	2.188
800 APCO 25 (25 kHz)_ AGC threshold	Low	851.01250	33.04	2.014
	Middle	856.00000	32.97	1.982
	High	860.98750	32.99	1.991
800 APCO 25 (25 kHz)_ +3dB above AGC threshold	Low	851.01250	33.07	2.028
	Middle	856.00000	33.20	2.089
	High	860.98750	33.38	2.178

[Uplink]

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
700 LTE (5 MHz)_ QPSK	Low	790.50	29.97	0.993
	Middle	793.00	30.12	1.028
	High	795.50	30.13	1.030
700 LTE (5 MHz)_ 16QAM	Low	790.50	30.12	1.028
	Middle	793.00	30.38	1.091
	High	795.50	30.23	1.054
700 LTE (10 MHz)_ QPSK	Low	-	-	-
	Middle	793.00	29.98	0.995
	High	-	-	-
700 LTE (10 MHz)_ 16QAM	Low	-	-	-
	Middle	793.00	30.25	1.059
	High	-	-	-

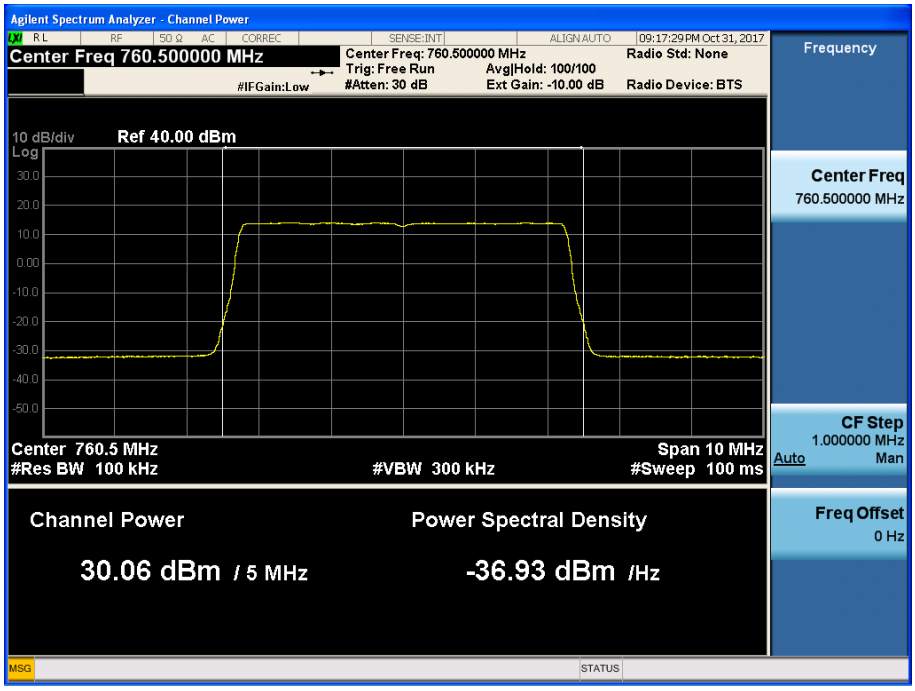
	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
700 APCO 25 (6.25 kHz)_ AGC threshold	Low	799.003125	30.15	1.035
	Middle	802.000000	30.09	1.021
	High	804.996875	30.10	1.023
700 APCO 25 (6.25 kHz)_ +3dB above AGC threshold	Low	799.003125	30.10	1.023
	Middle	802.000000	30.17	1.040
	High	804.996875	30.08	1.019
700 APCO 25 (12.5 kHz)_ AGC threshold	Low	799.00625	30.18	1.042
	Middle	802.00000	30.22	1.052
	High	804.99375	30.32	1.076
700 APCO 25 (12.5 kHz)_ +3dB above AGC threshold	Low	799.00625	30.18	1.042
	Middle	802.00000	30.38	1.091
	High	804.99375	30.41	1.099
700 APCO 25 (25 kHz)_ AGC threshold	Low	799.01250	30.07	1.016
	Middle	802.00000	30.15	1.035
	High	804.98750	30.09	1.021
700 APCO 25 (25 kHz)_ +3dB above AGC threshold	Low	799.01250	30.21	1.050
	Middle	802.00000	30.01	1.002
	High	804.98750	30.04	1.009

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
800 APCO 25 (6.25 kHz)_ AGC threshold	Low	806.003125	33.25	2.113
	Middle	811.000000	32.90	1.950
	High	815.996875	33.11	2.046
800 APCO 25 (6.25 kHz)_ +3dB above AGC threshold	Low	806.003125	33.26	2.118
	Middle	811.000000	32.95	1.972
	High	815.996875	32.40	1.738
800 APCO 25 (12.5 kHz)_ AGC threshold	Low	806.00625	33.17	2.075
	Middle	811.00000	33.02	2.004
	High	815.99375	32.83	1.919
800 APCO 25 (12.5 kHz)_ +3dB above AGC threshold	Low	806.00625	33.24	2.109
	Middle	811.00000	32.95	1.972
	High	815.99375	33.14	2.061
800 APCO 25 (25 kHz)_ AGC threshold	Low	806.01250	33.23	2.104
	Middle	811.00000	33.07	2.028
	High	815.98750	32.92	1.959
800 APCO 25 (25 kHz)_ +3dB above AGC threshold	Low	806.01250	33.09	2.037
	Middle	811.00000	33.25	2.113
	High	815.98750	33.07	2.028

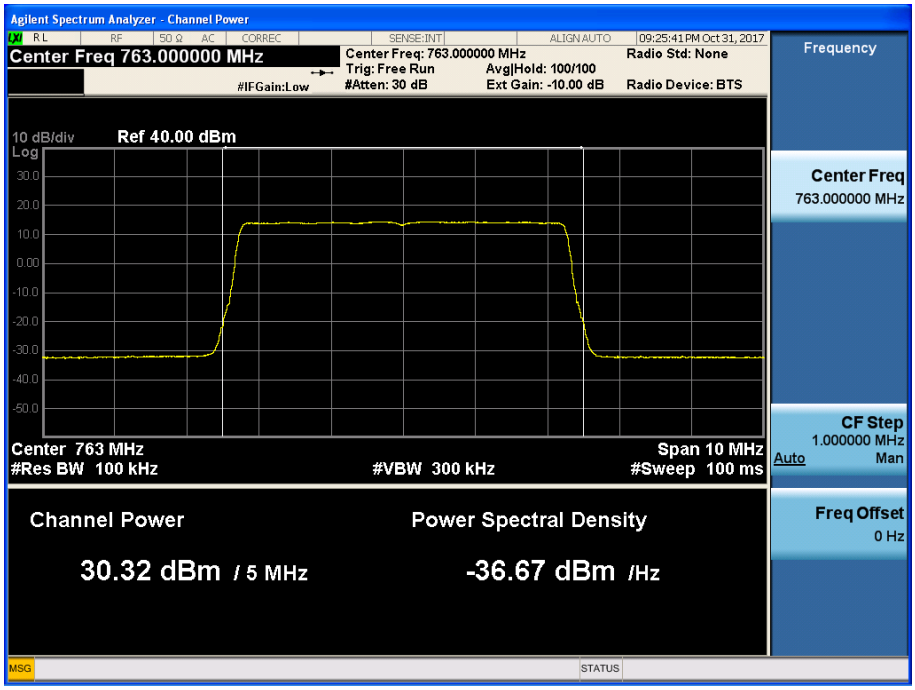
Single channel Enhancer Plots of RF Output Power

700 LTE(5 MHz)_DL

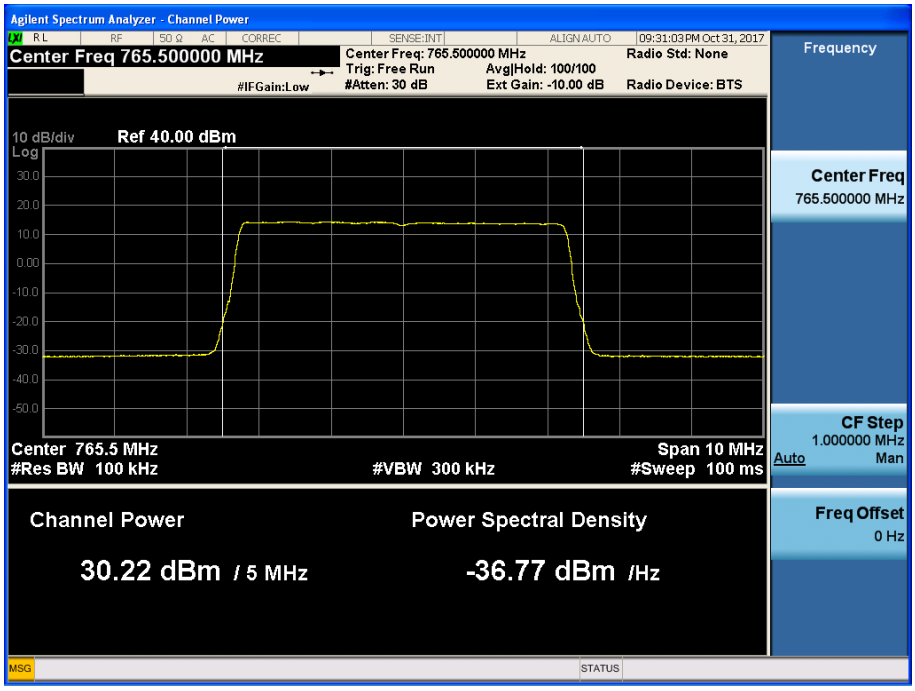
[QPSK Downlink - Low]



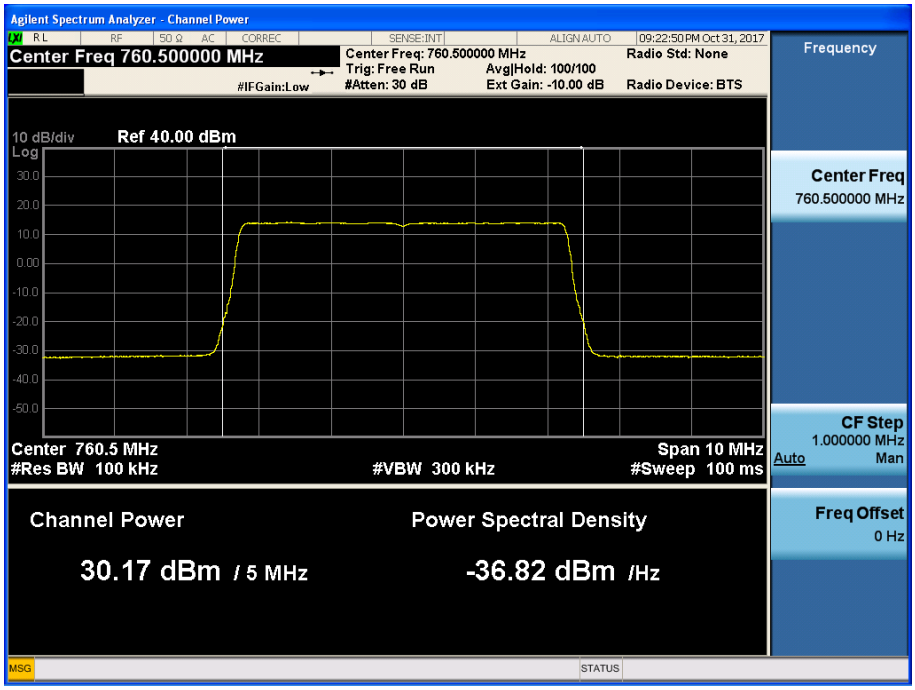
[QPSK Downlink - Middle]



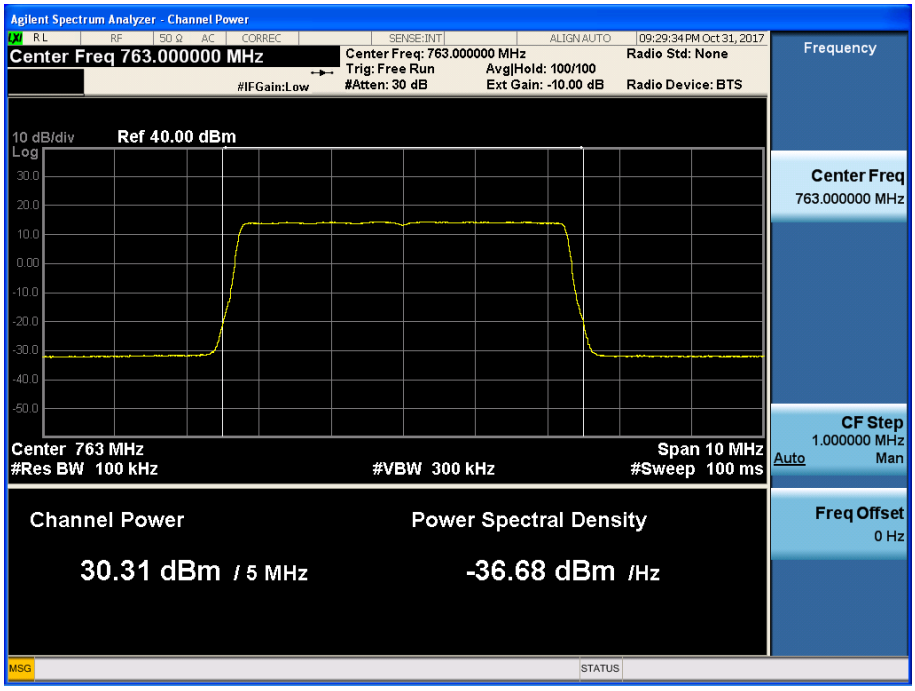
[QPSK Downlink - High]



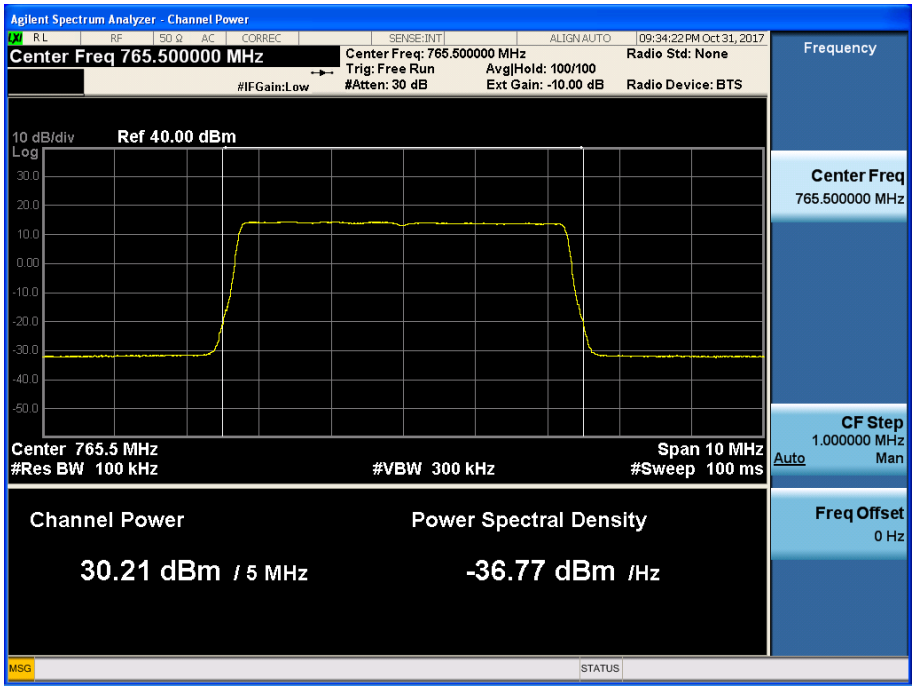
[16QAM Downlink - Low]



[16QAM Downlink - Middle]

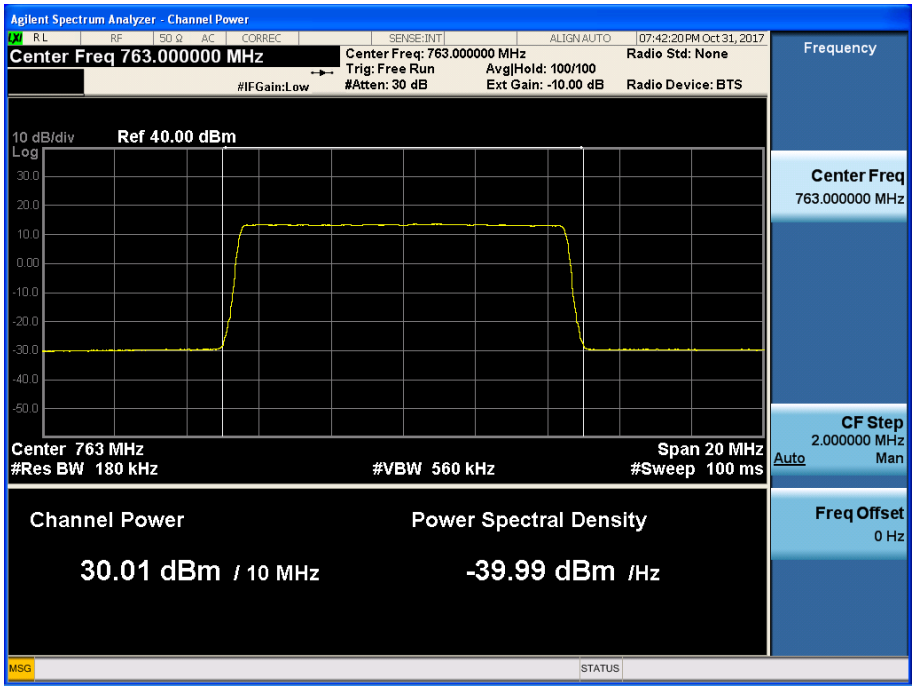


[16QAM Downlink - High]

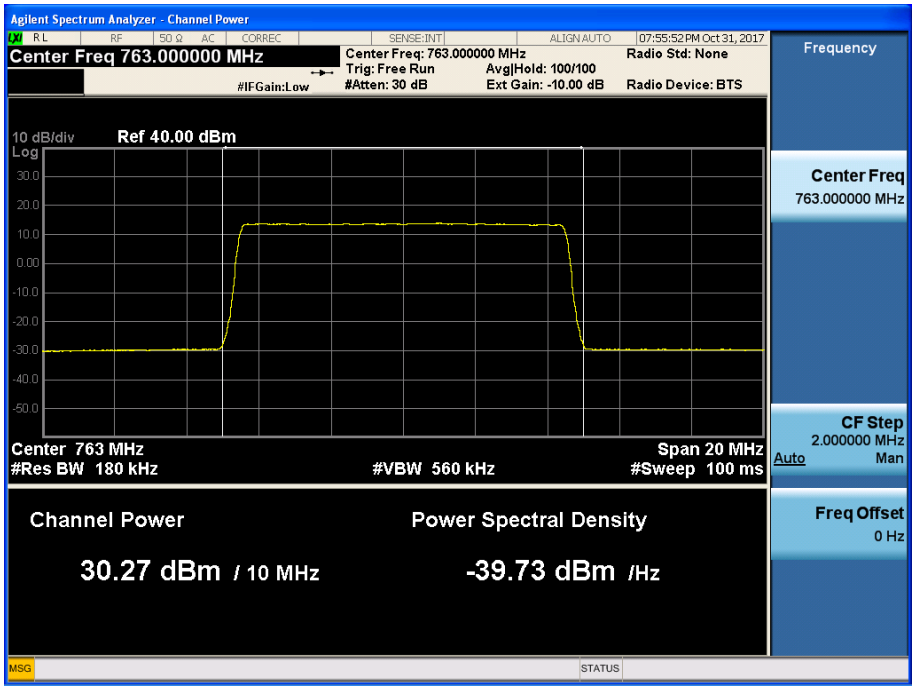


700 LTE(10 MHz)_DL

[QPSK Downlink - Middle]

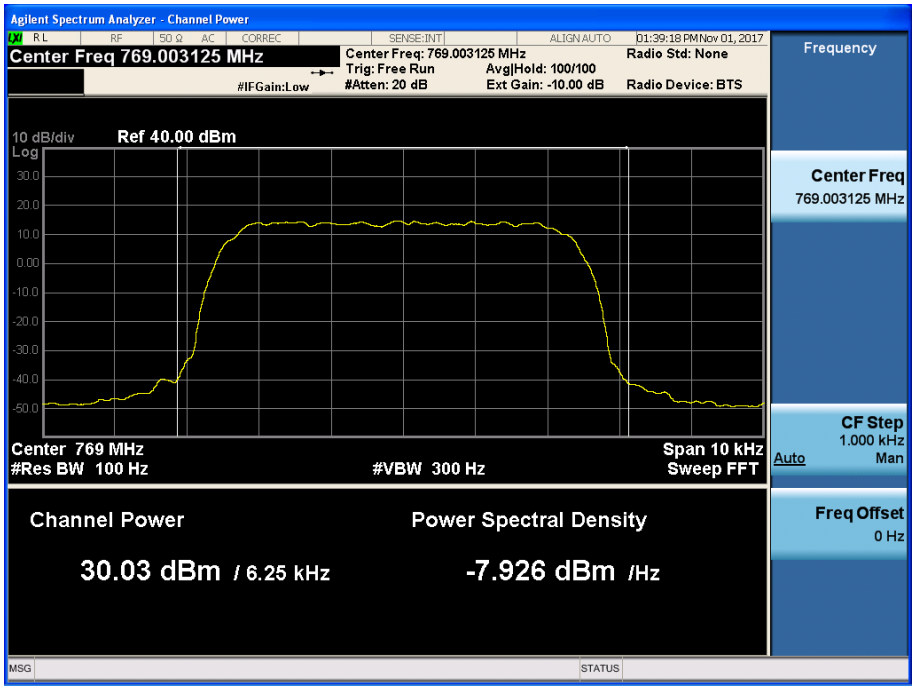


[16QAM Downlink - Middle]

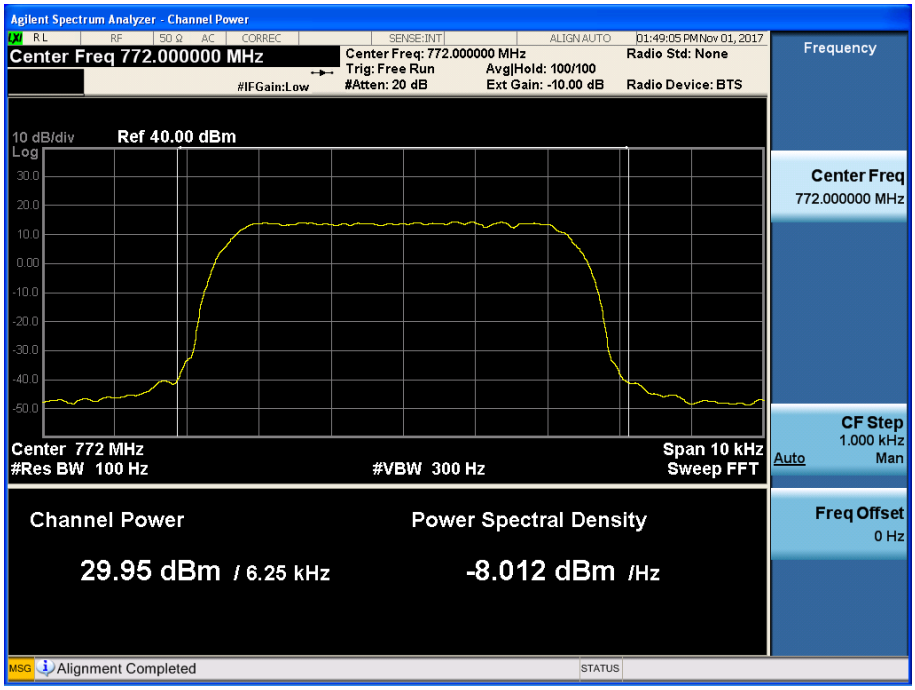


700 APCO 25(6.25 kHz)_DL

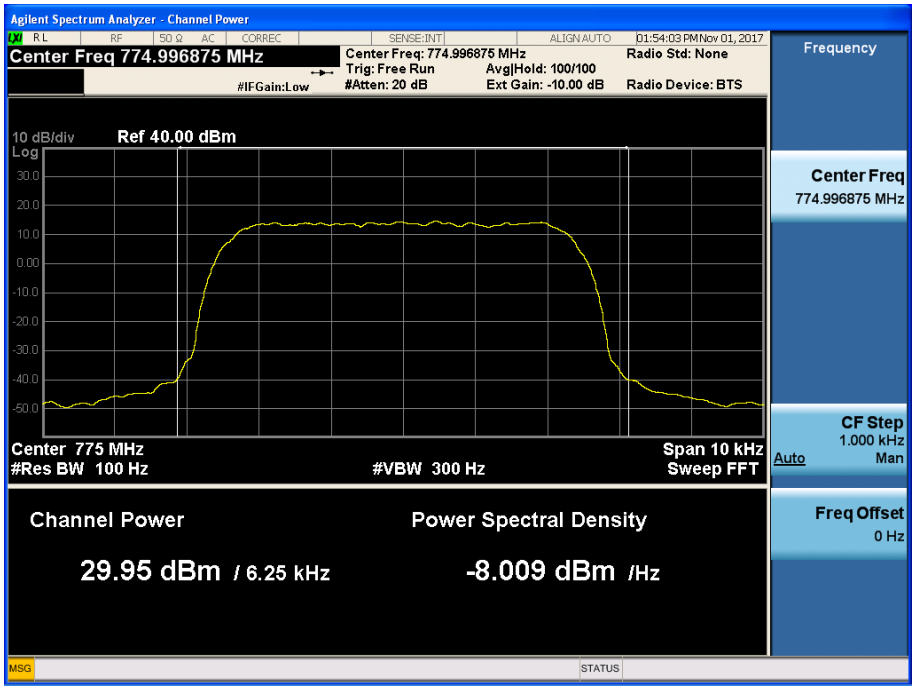
[AGC threshold Downlink - Low]



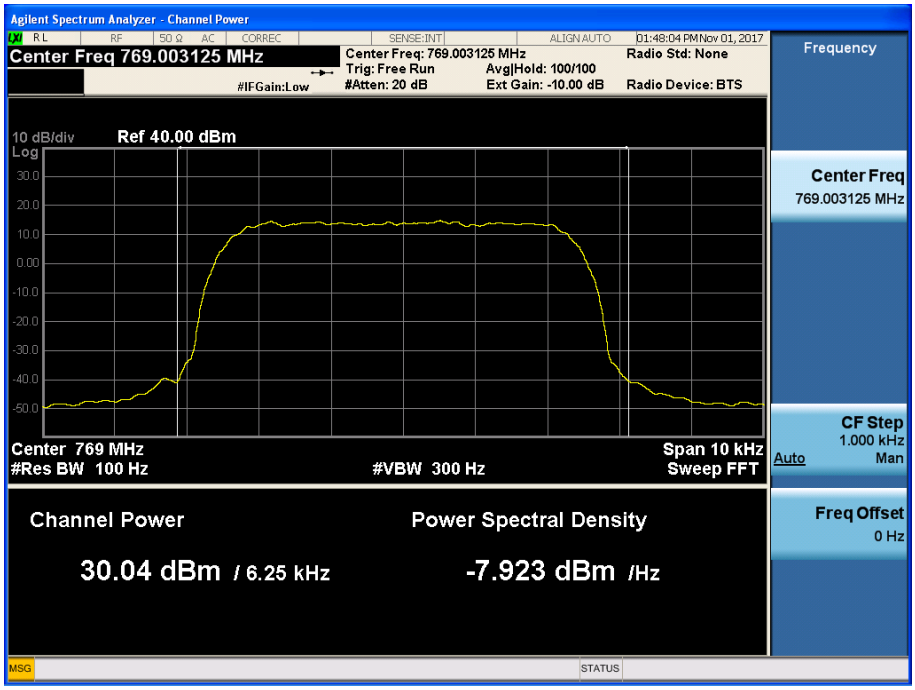
[AGC threshold Downlink - Middle]



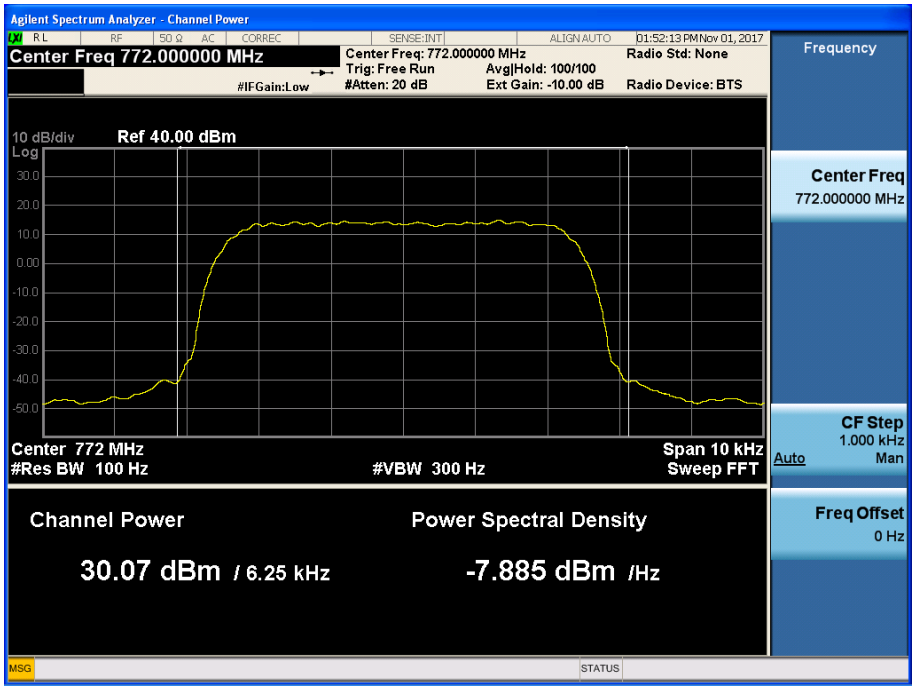
[AGC threshold Downlink - High]



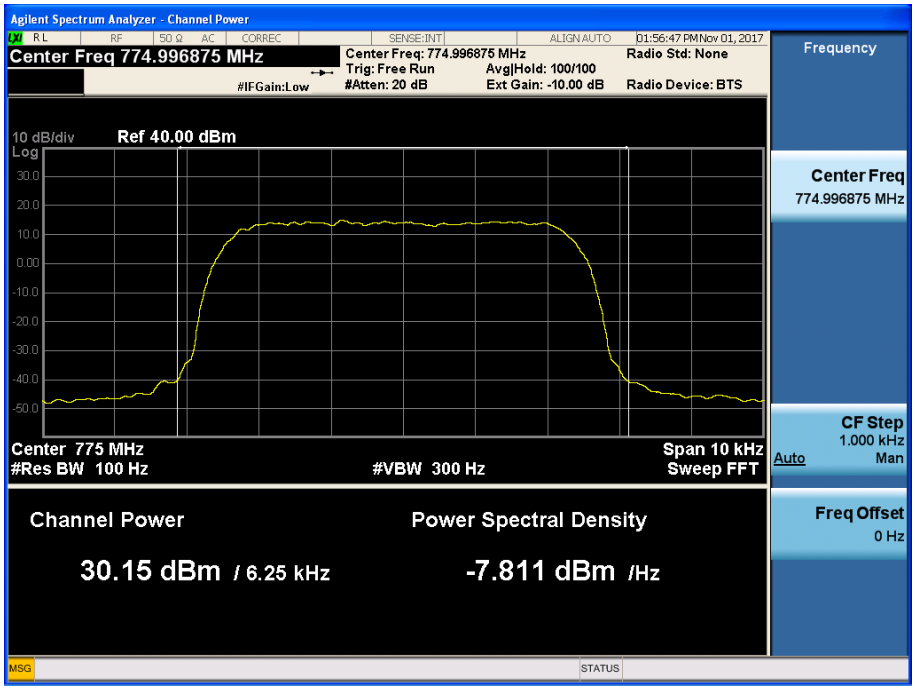
[+3dB above the AGC threshold Downlink - Low]



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

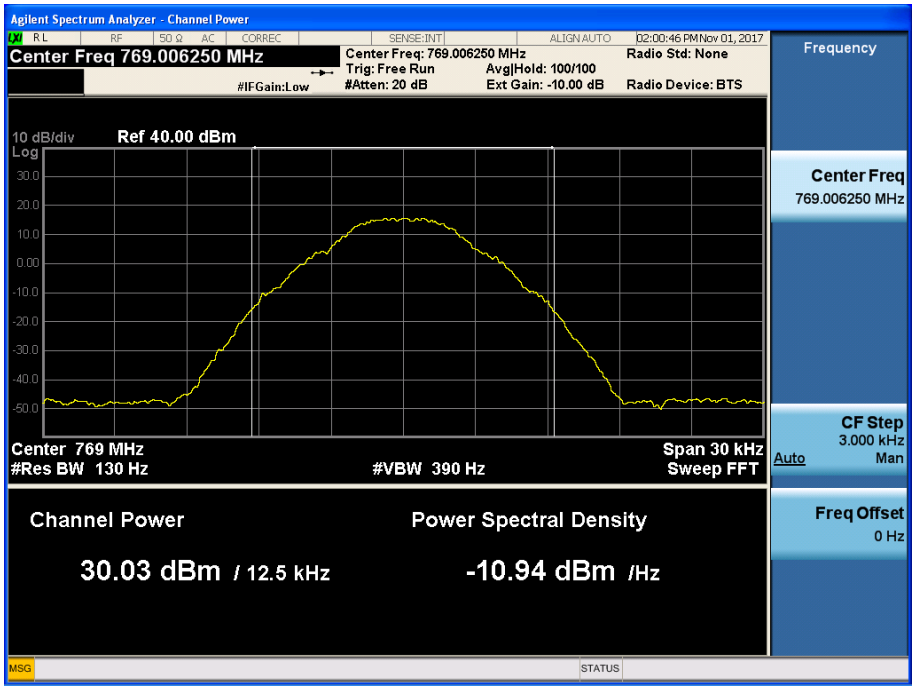


[+3dB above the AGC threshold Downlink - High]

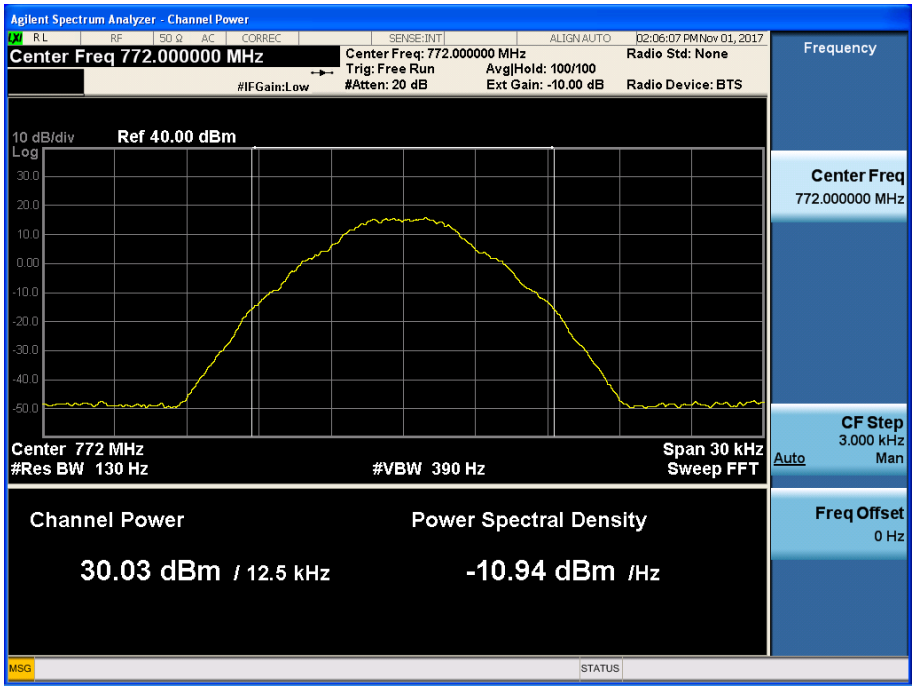


700 APCO 25(12.5 kHz)_DL

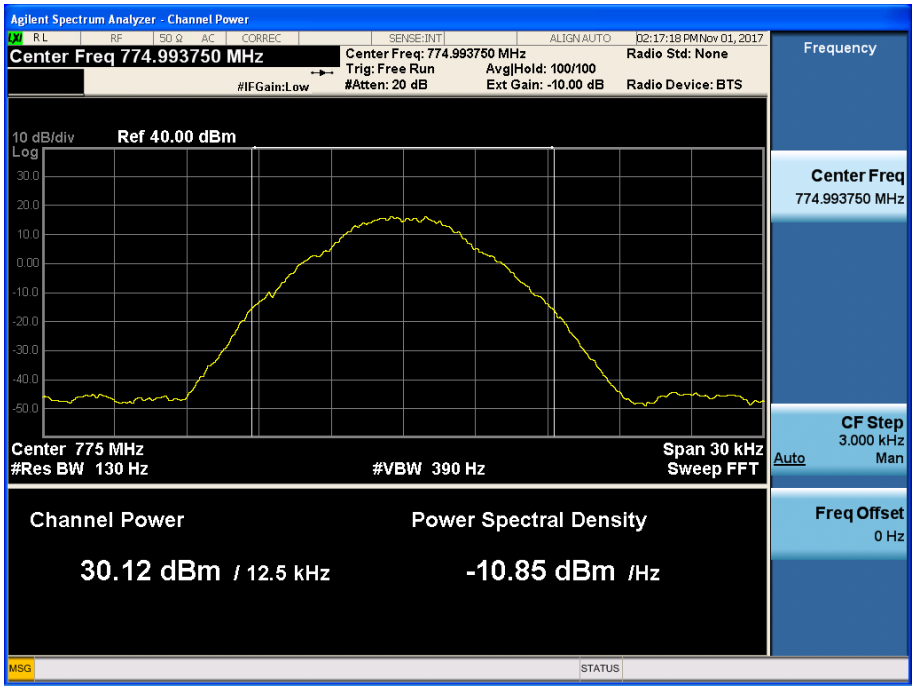
[AGC threshold Downlink - Low]



[AGC threshold Downlink - Middle]

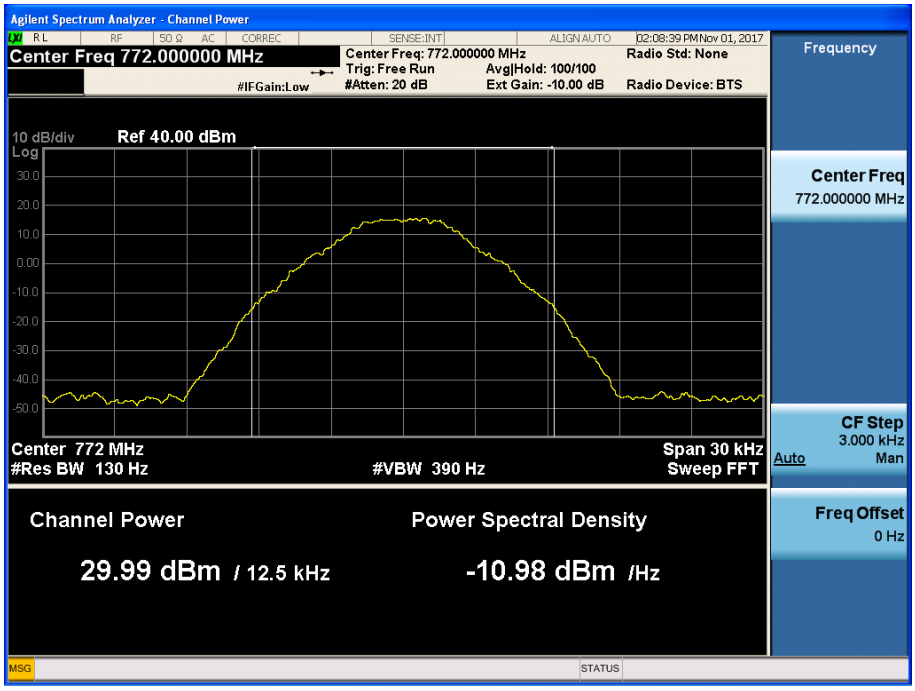


[AGC threshold Downlink - High]

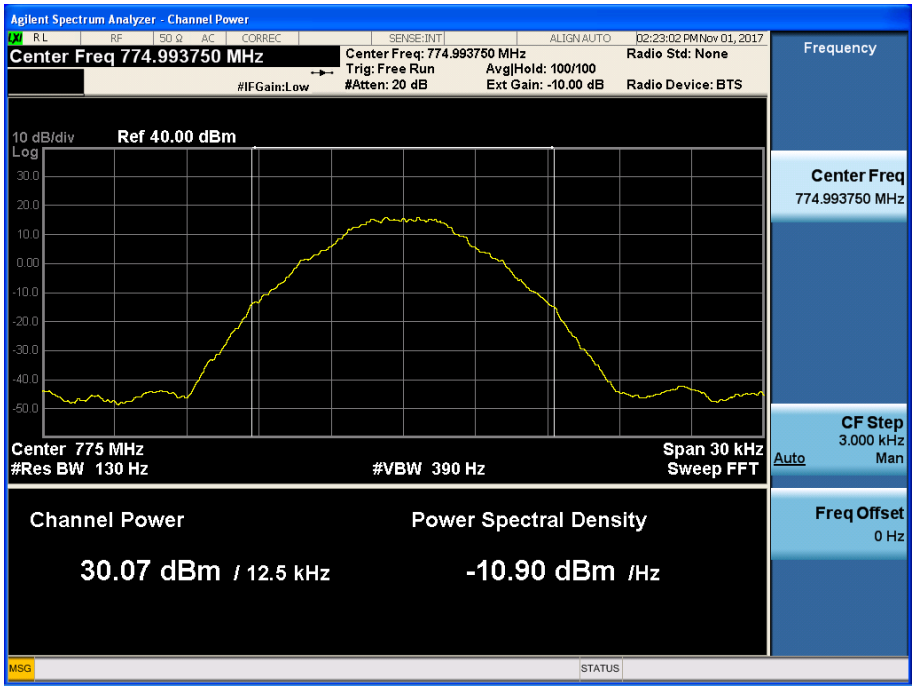


[+3dB above the AGC threshold Downlink - Low]

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

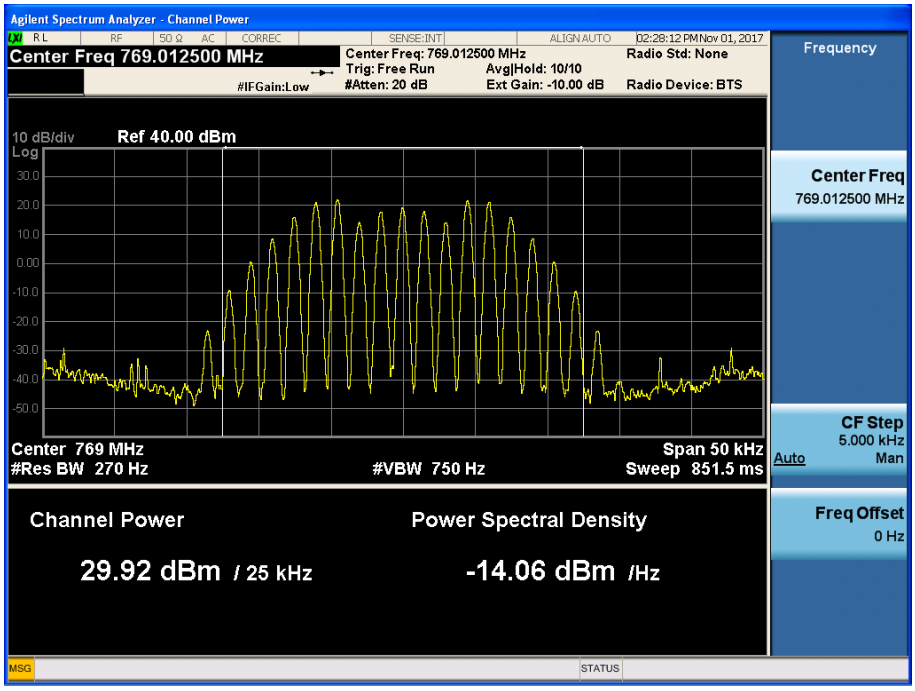


[+3dB above the AGC threshold Downlink - High]

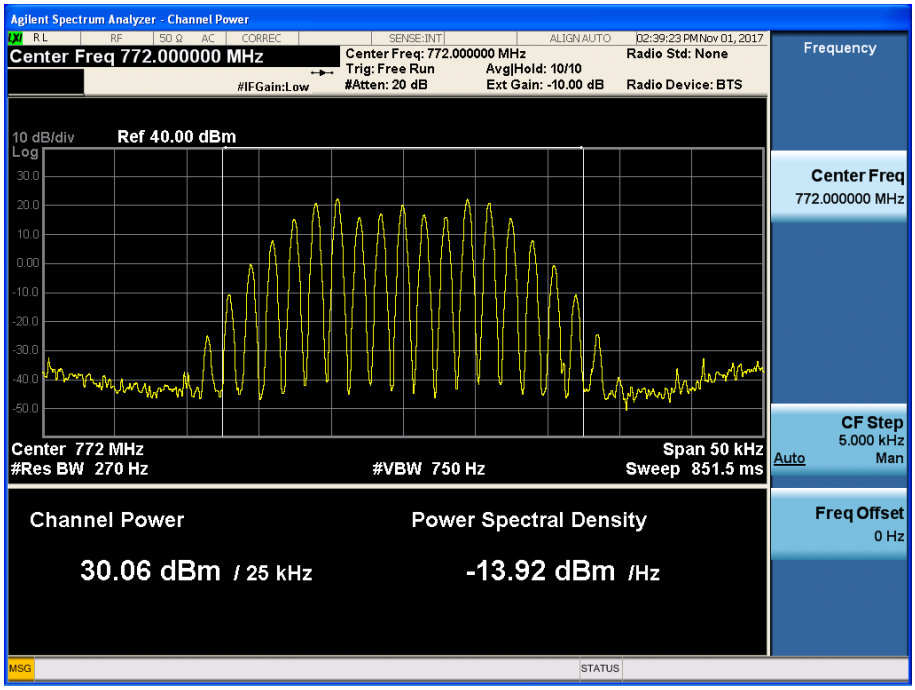


700 APCO 25(25 kHz)_DL

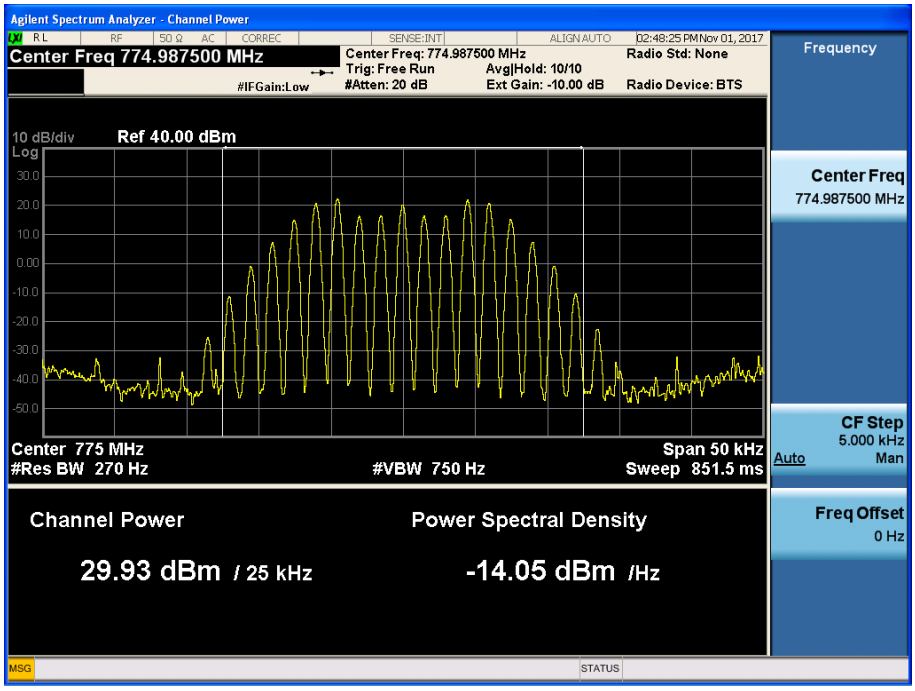
[AGC threshold Downlink - Low]



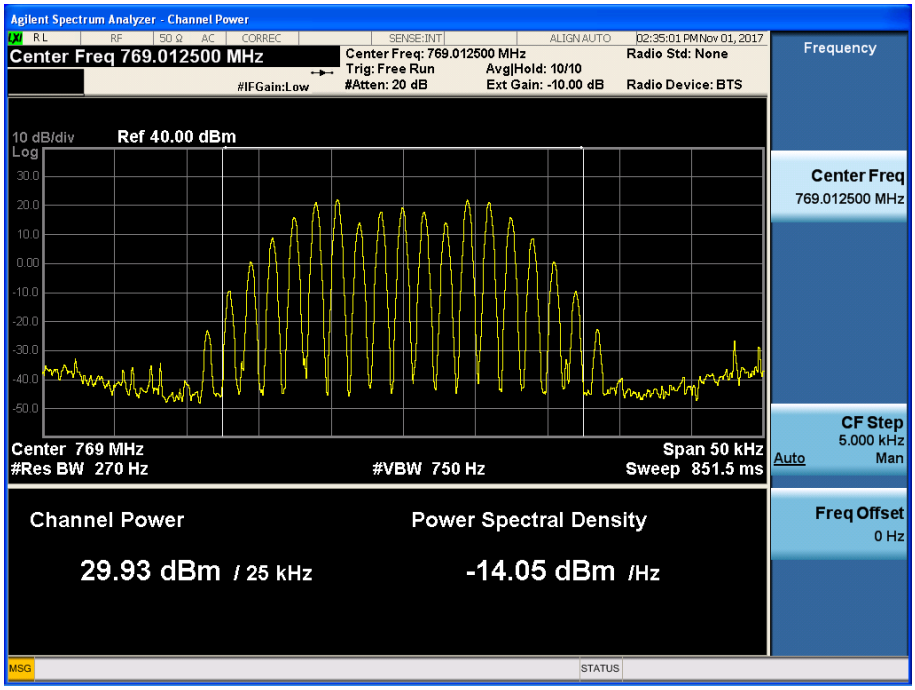
[AGC threshold Downlink - Middle]



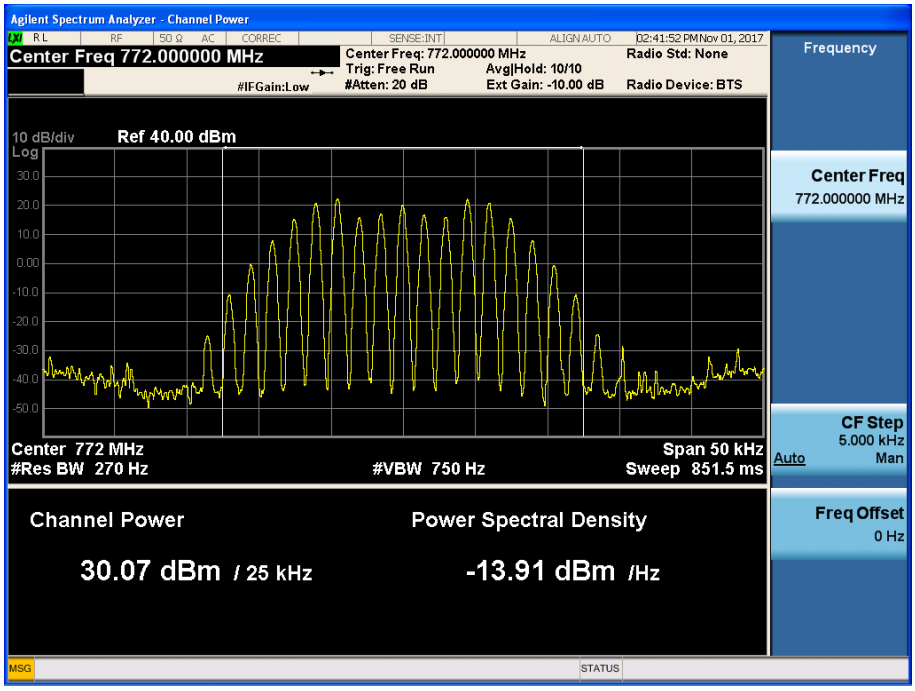
[AGC threshold Downlink - High]



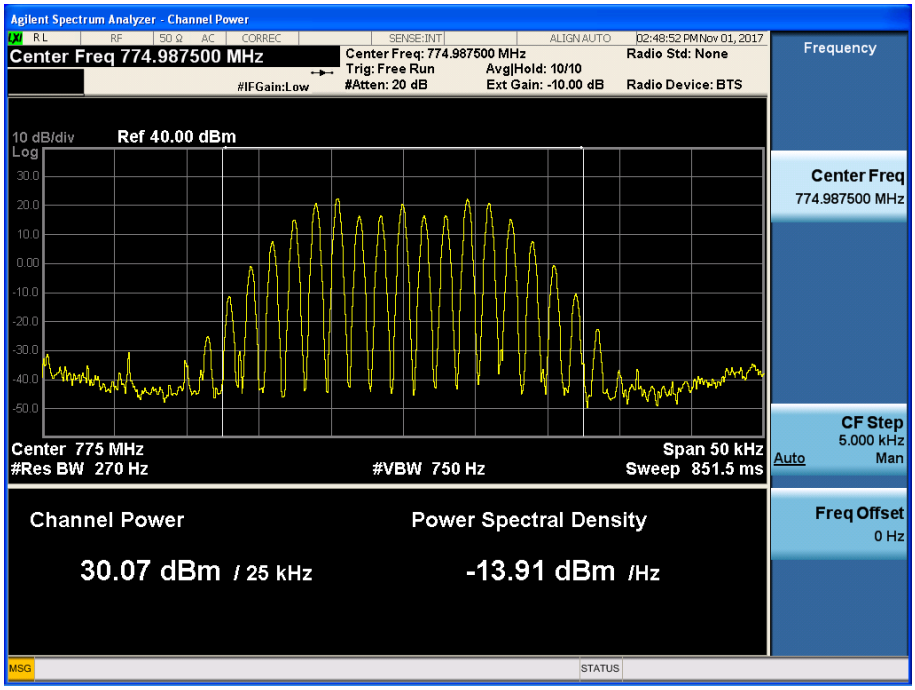
[+3dB above the AGC threshold Downlink - Low]



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

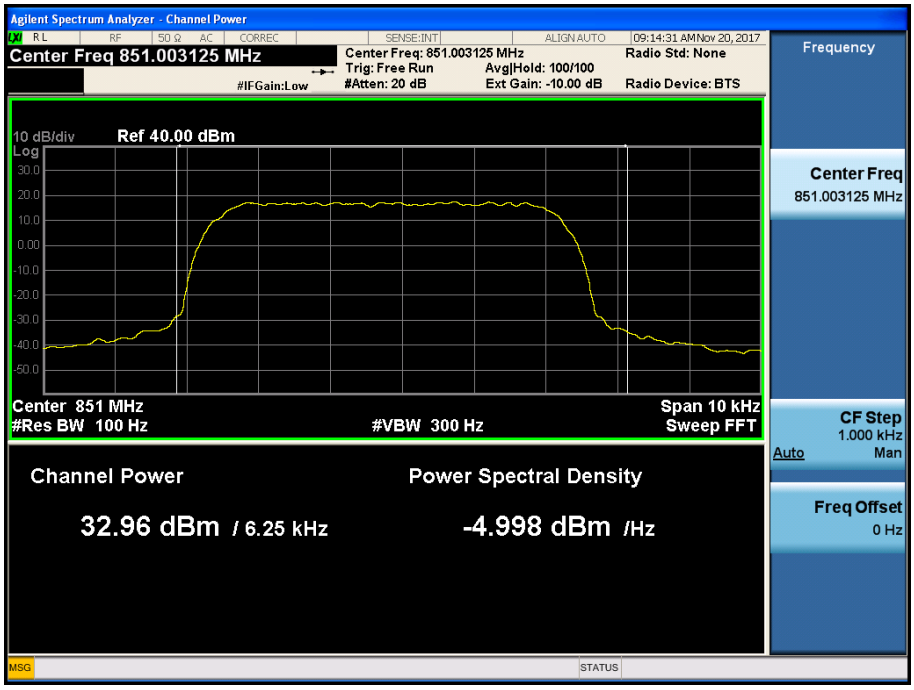


[+3dB above the AGC threshold Downlink - High]

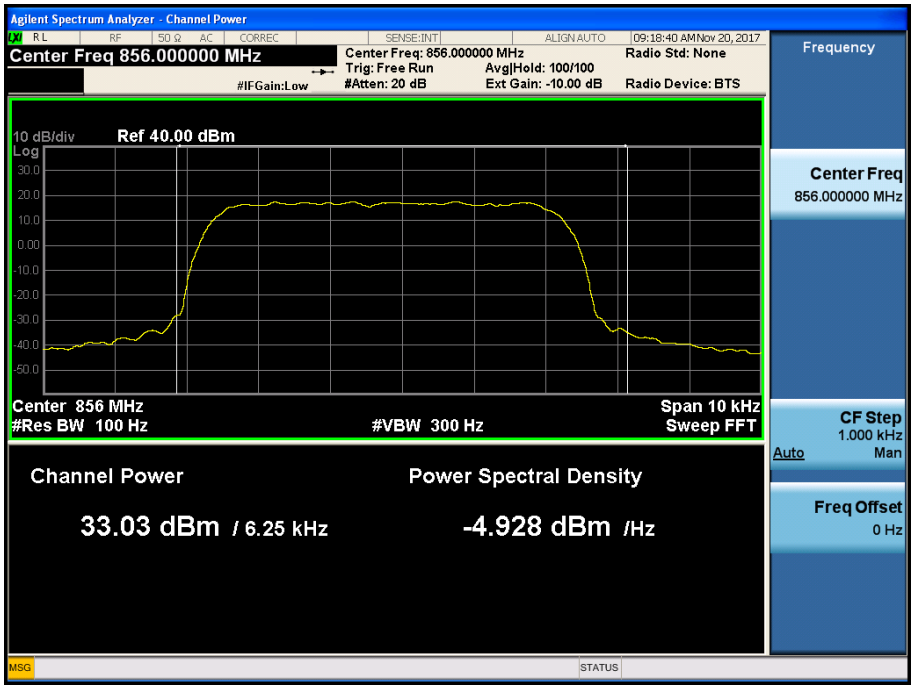


800 APCO 25(6.25 kHz)_DL

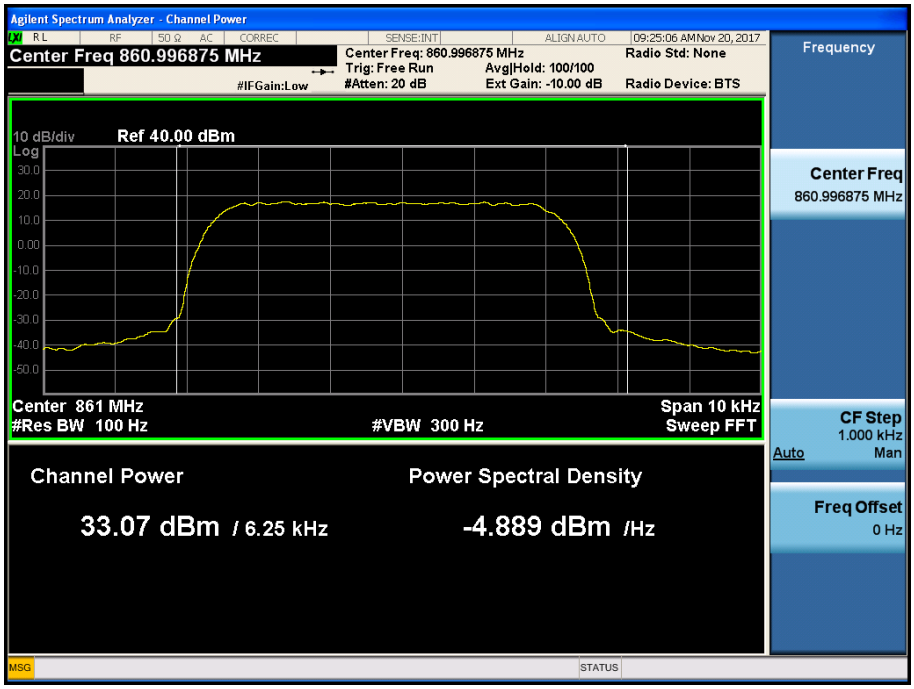
[AGC threshold Downlink - Low]



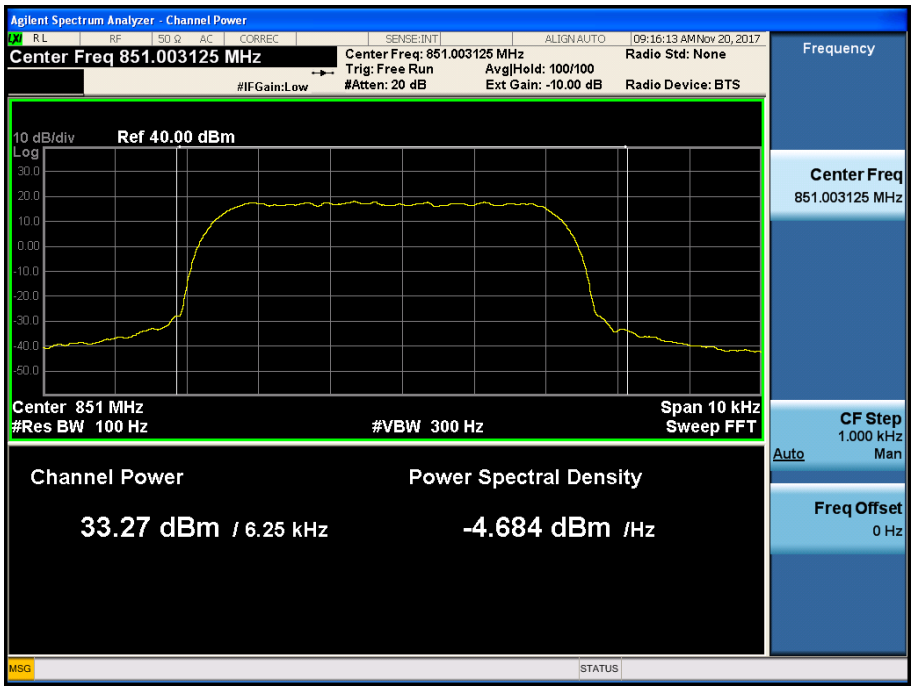
[AGC threshold Downlink - Middle]



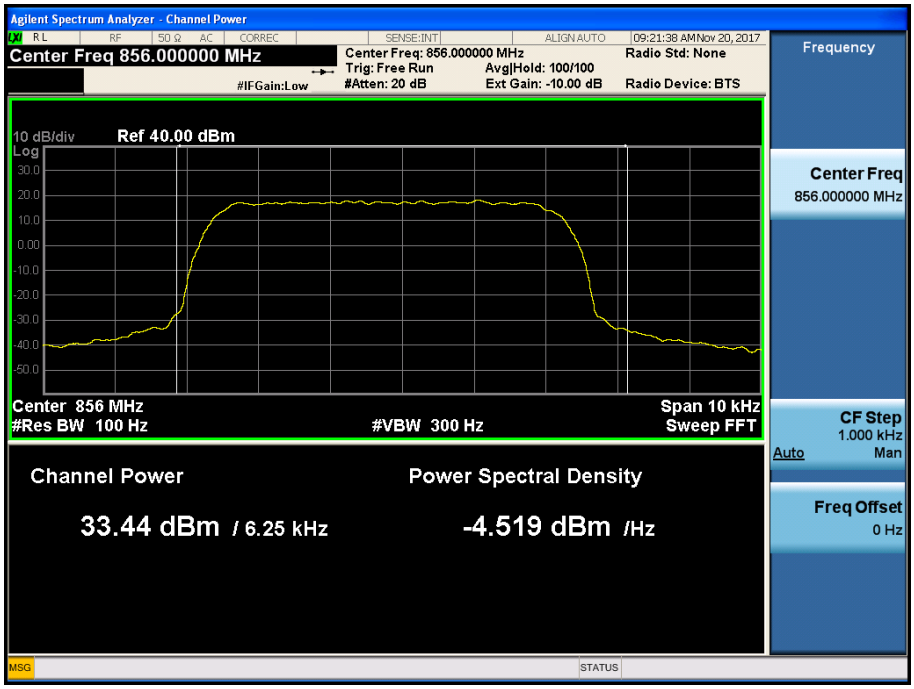
[AGC threshold Downlink - High]



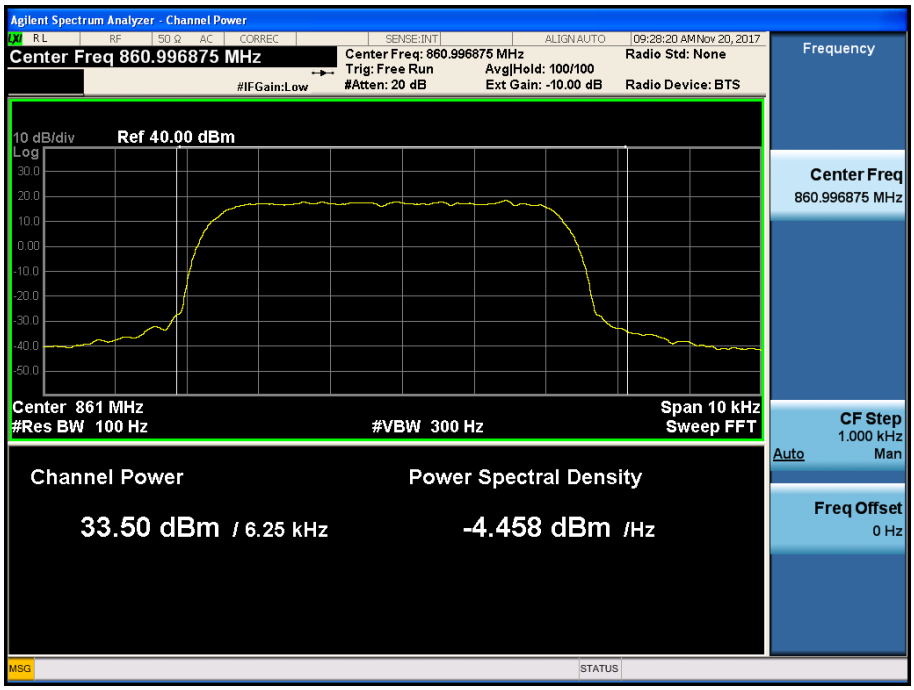
[+3dB above the AGC threshold Downlink - Low]



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

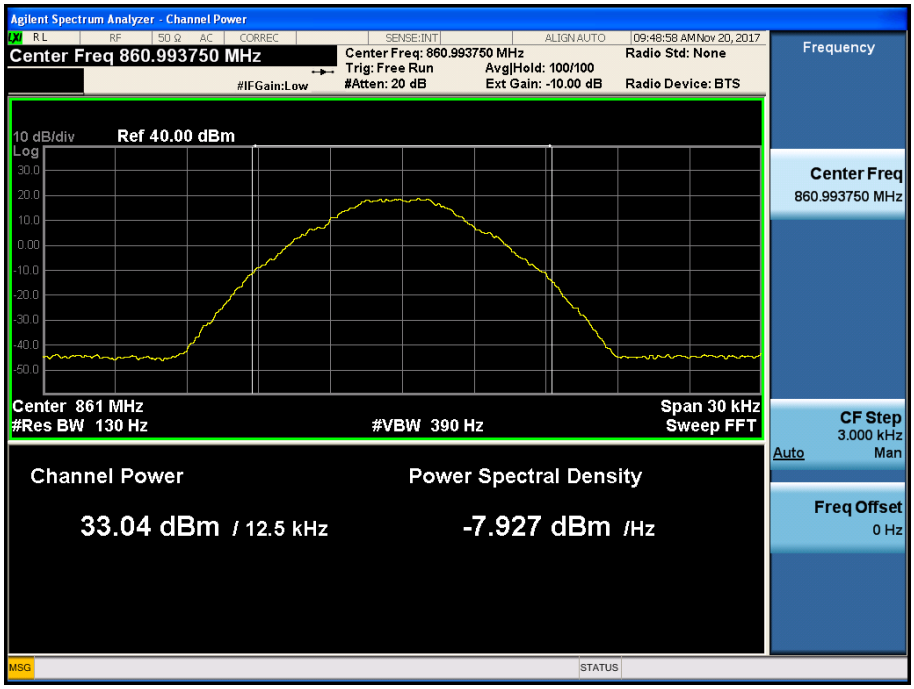


[+3dB above the AGC threshold Downlink - High]

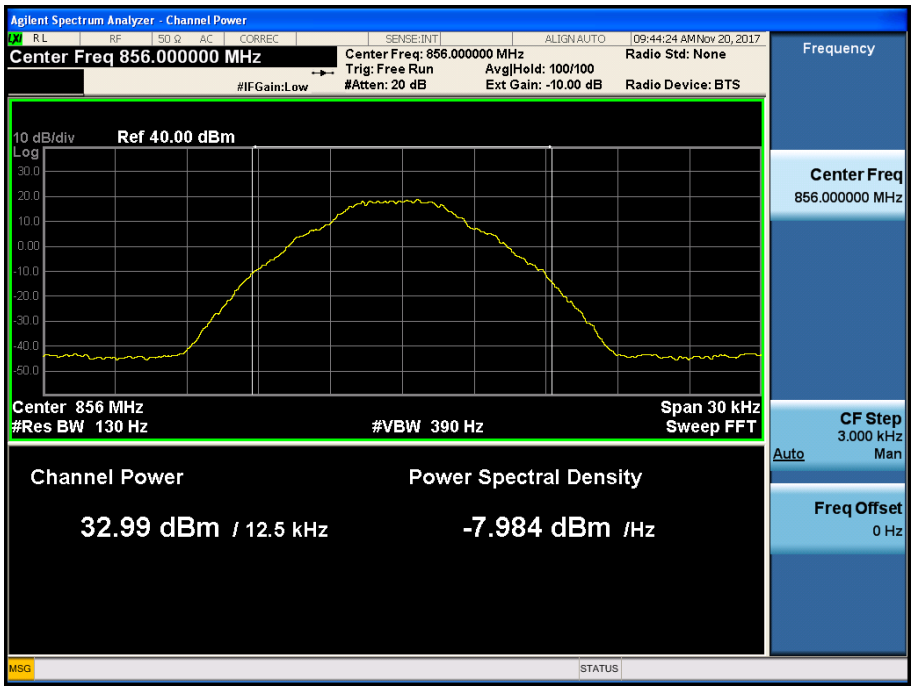


800 APCO 25(12.5 kHz)_DL

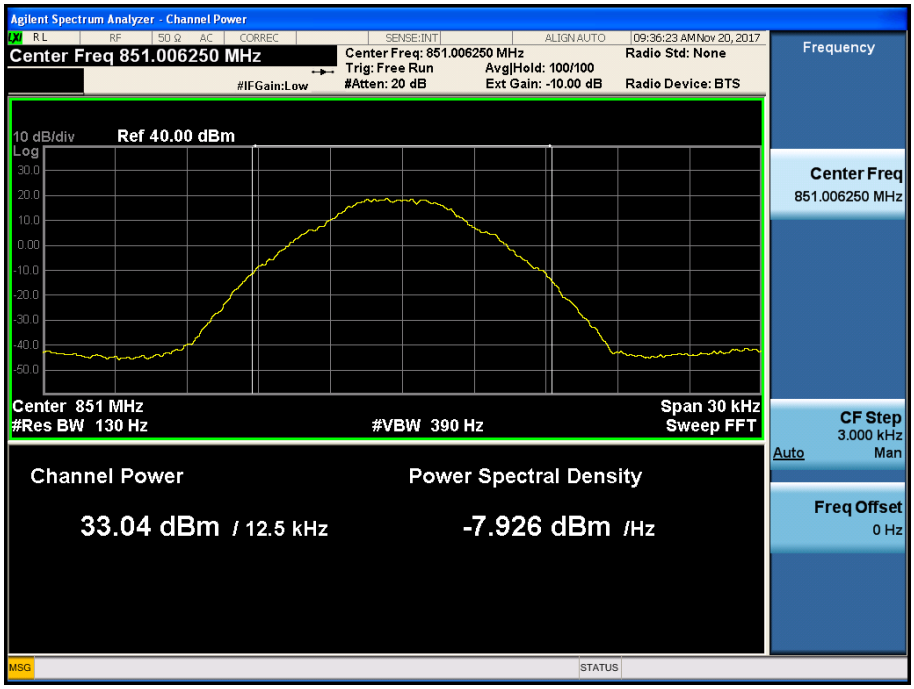
[AGC threshold Downlink - Low]



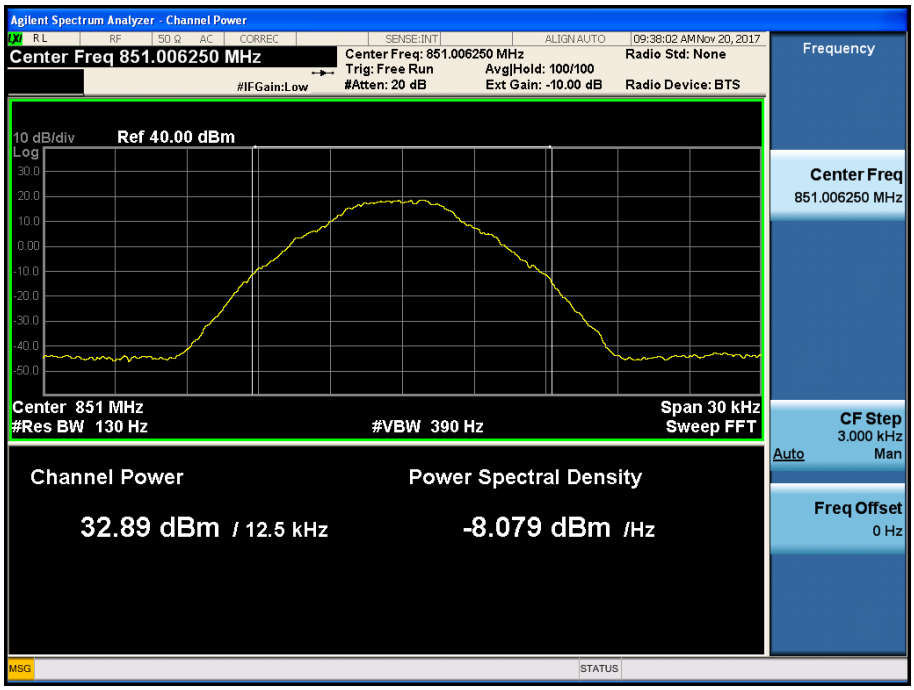
[AGC threshold Downlink - Middle]



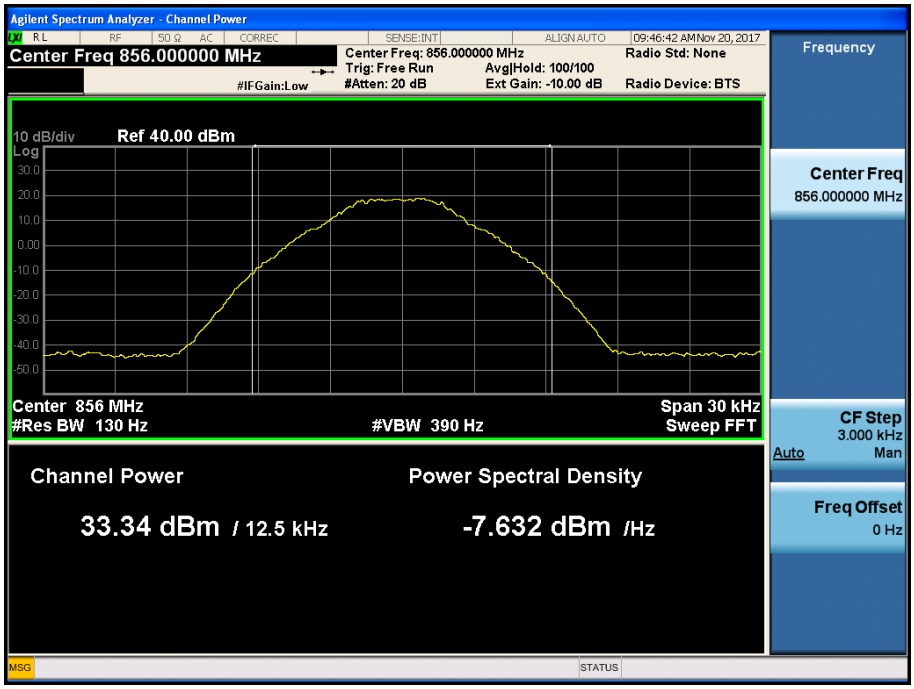
[AGC threshold Downlink - High]



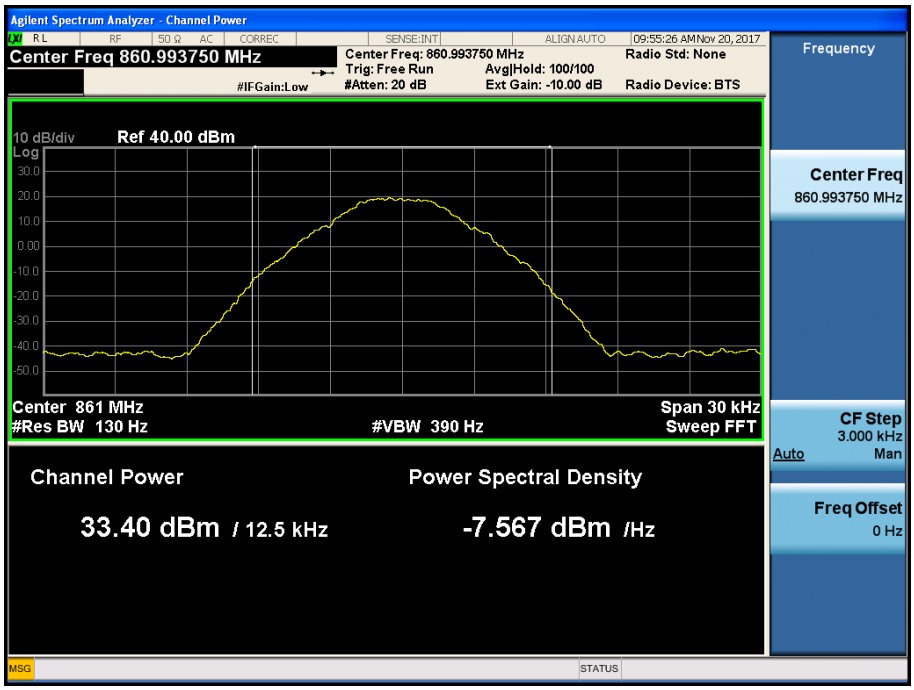
[+3dB above the AGC threshold Downlink - Low]



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

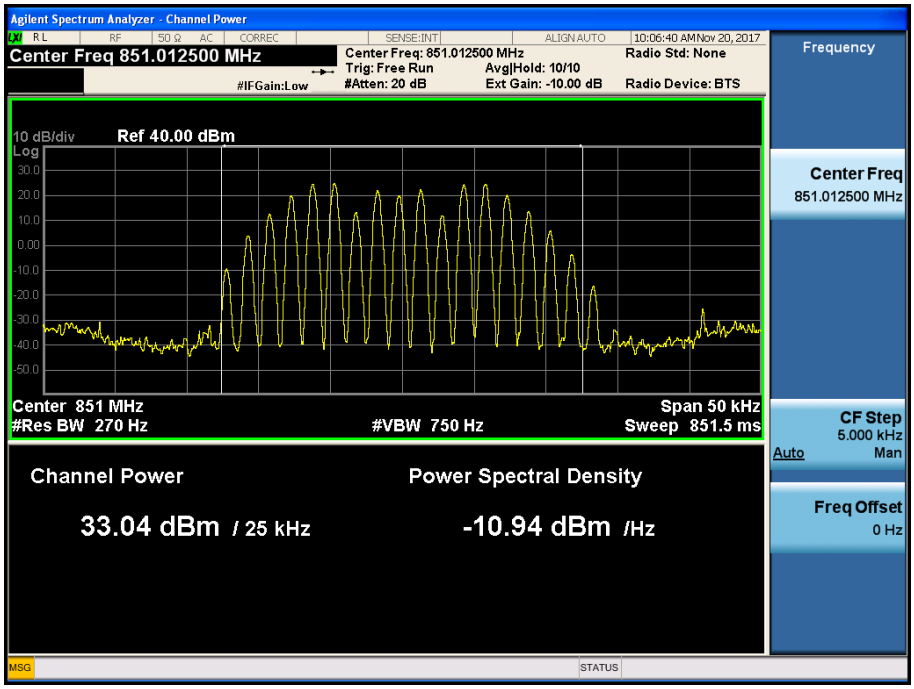


[+3dB above the AGC threshold Downlink - High]

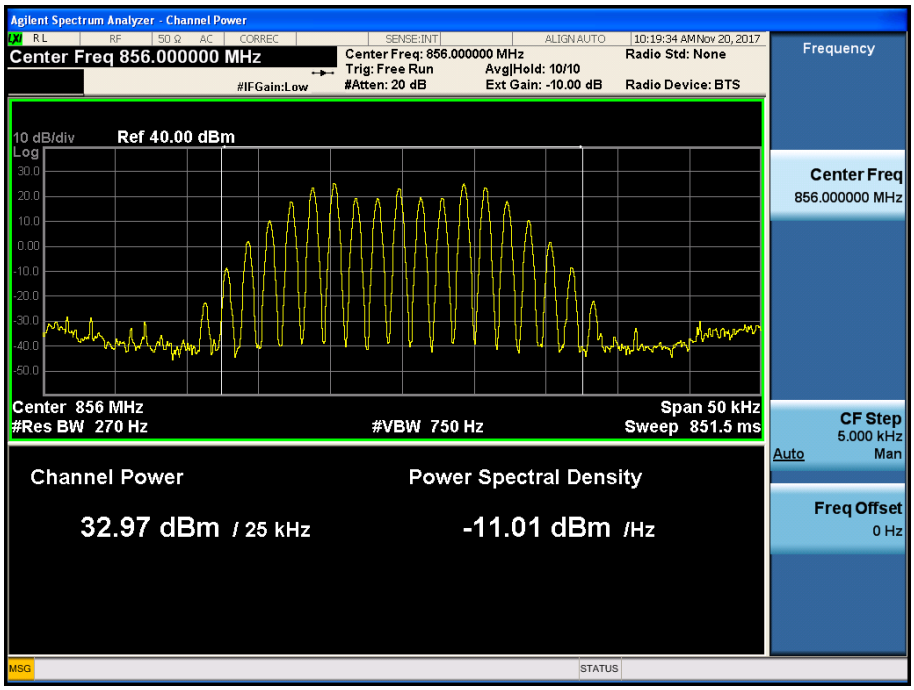


800 APCO 25(25 kHz)_DL

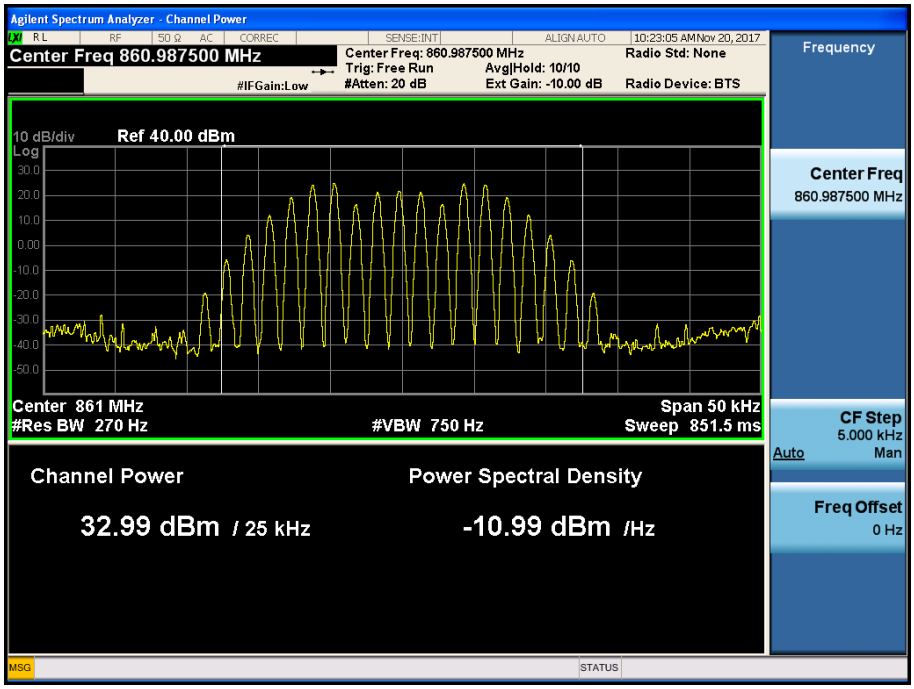
[AGC threshold Downlink - Low]



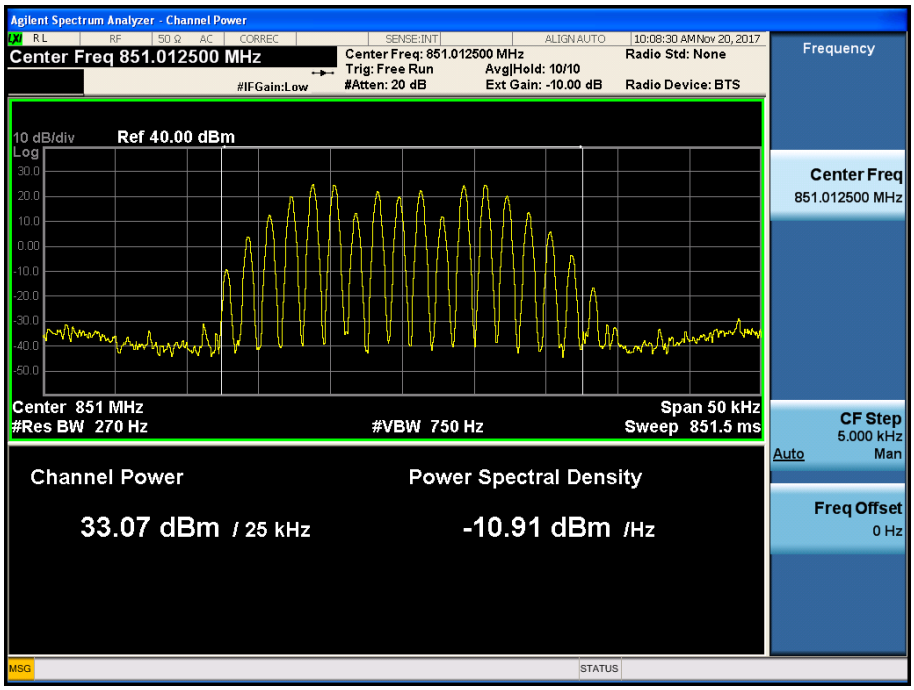
[AGC threshold Downlink - Middle]



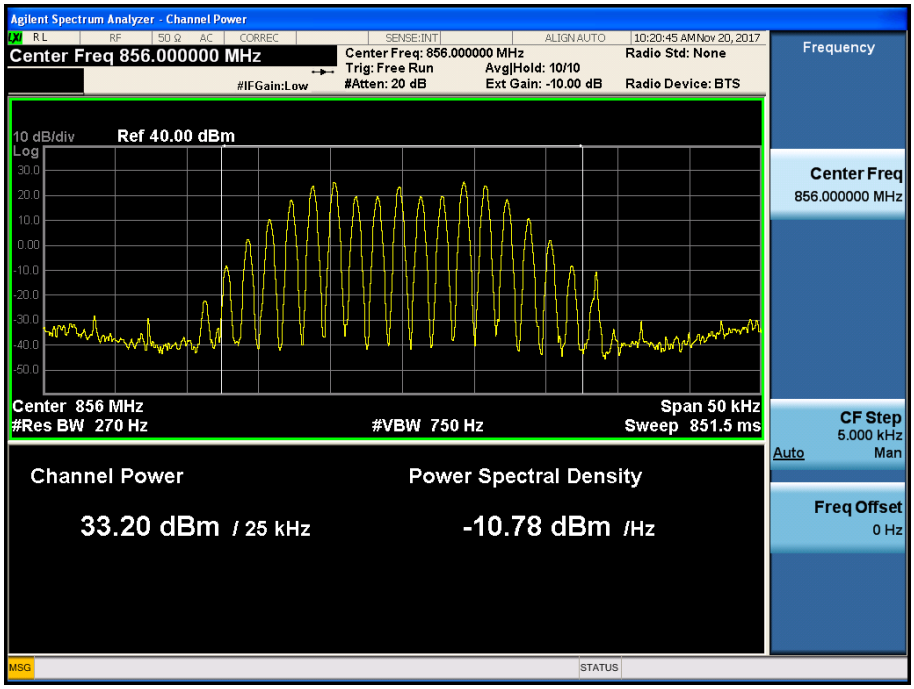
[AGC threshold Downlink - High]



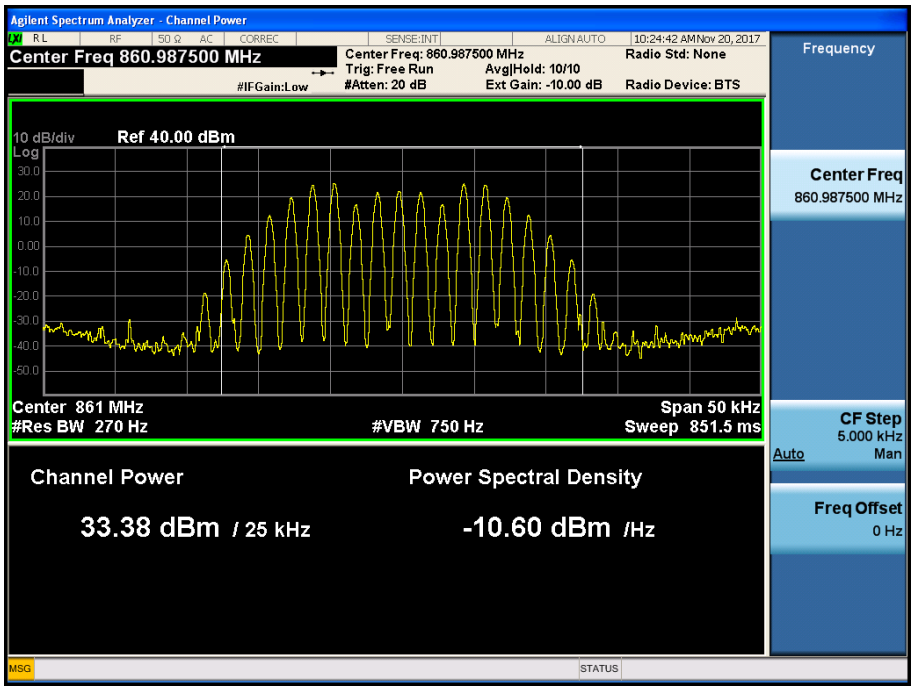
[+3dB above the AGC threshold Downlink - Low]



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

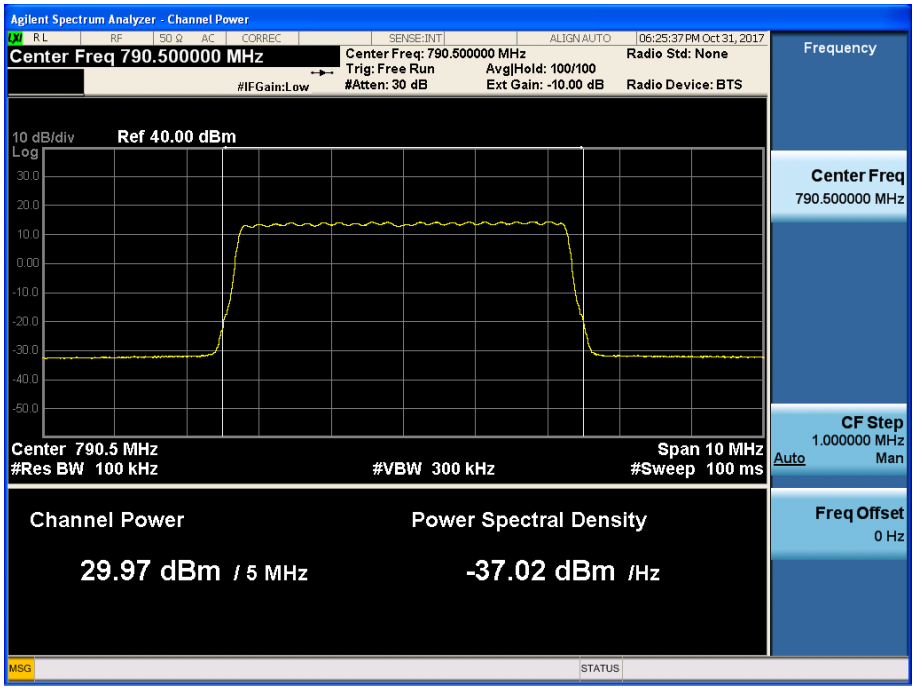


[+3dB above the AGC threshold Downlink - High]

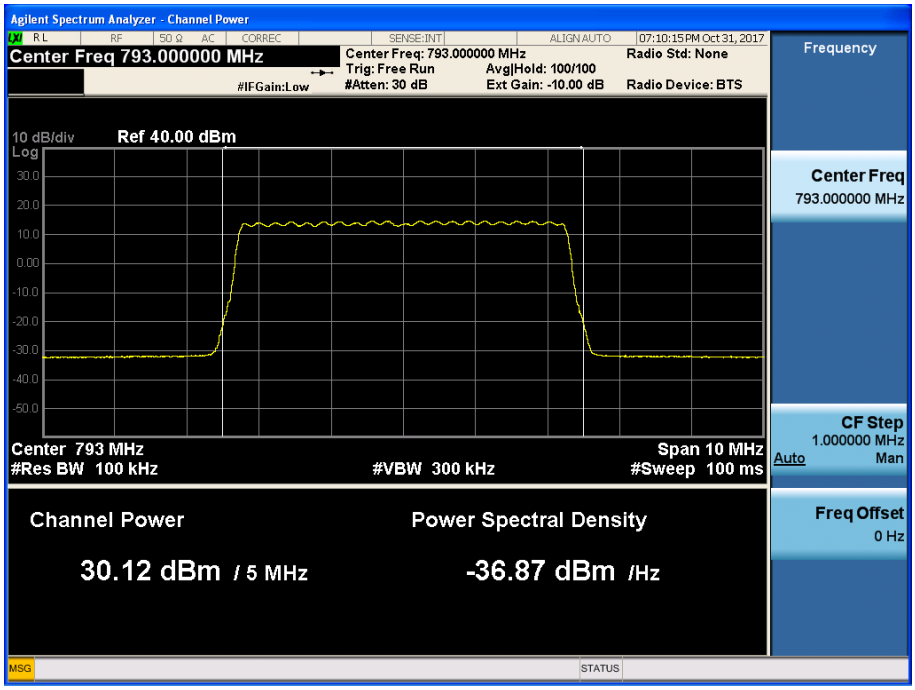


700 LTE(5 MHz)_UL

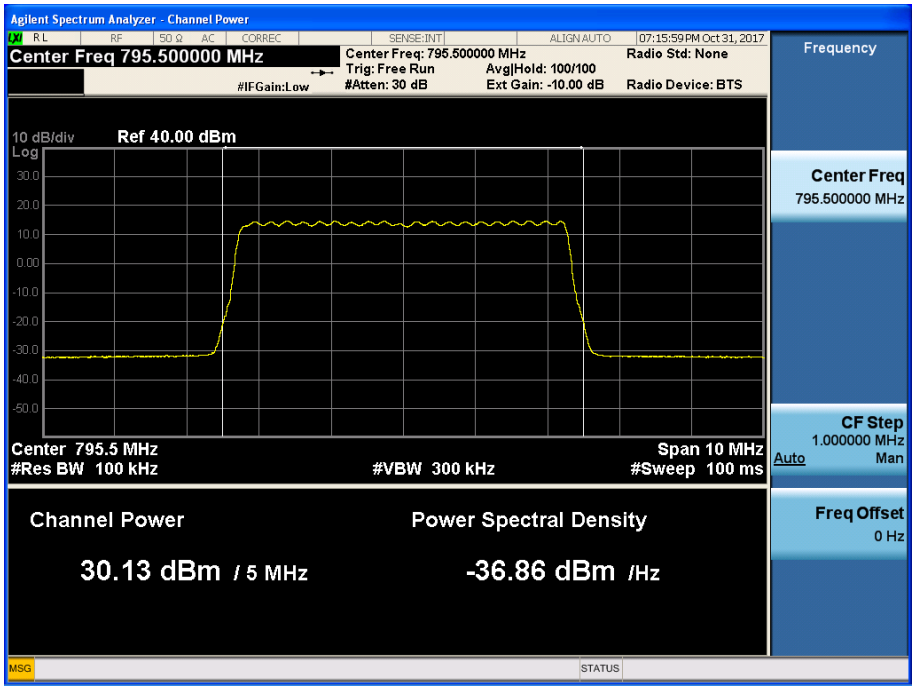
[QPSK Uplink - Low]



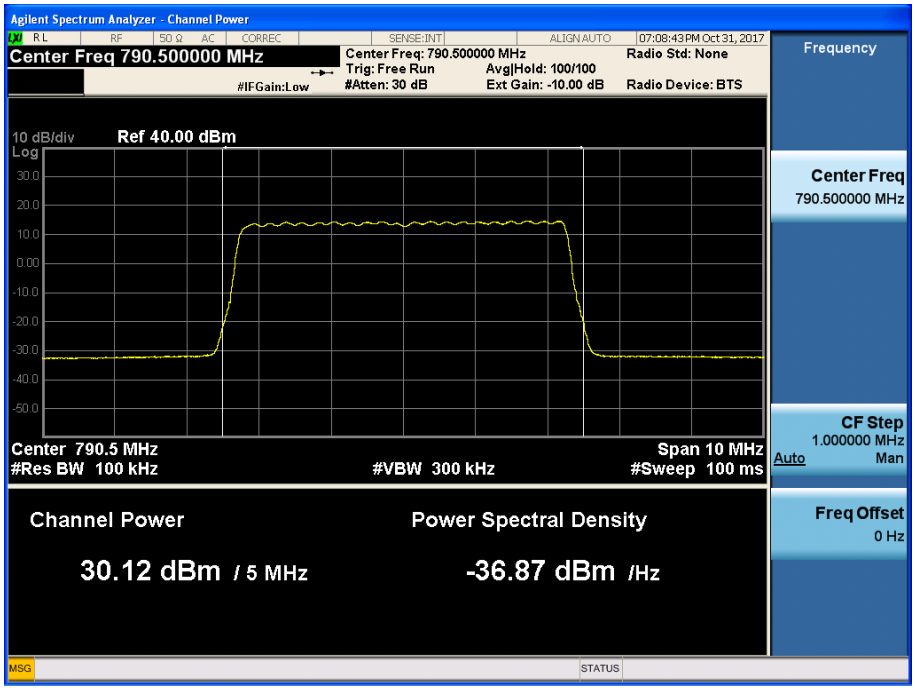
[QPSK Uplink - Middle]



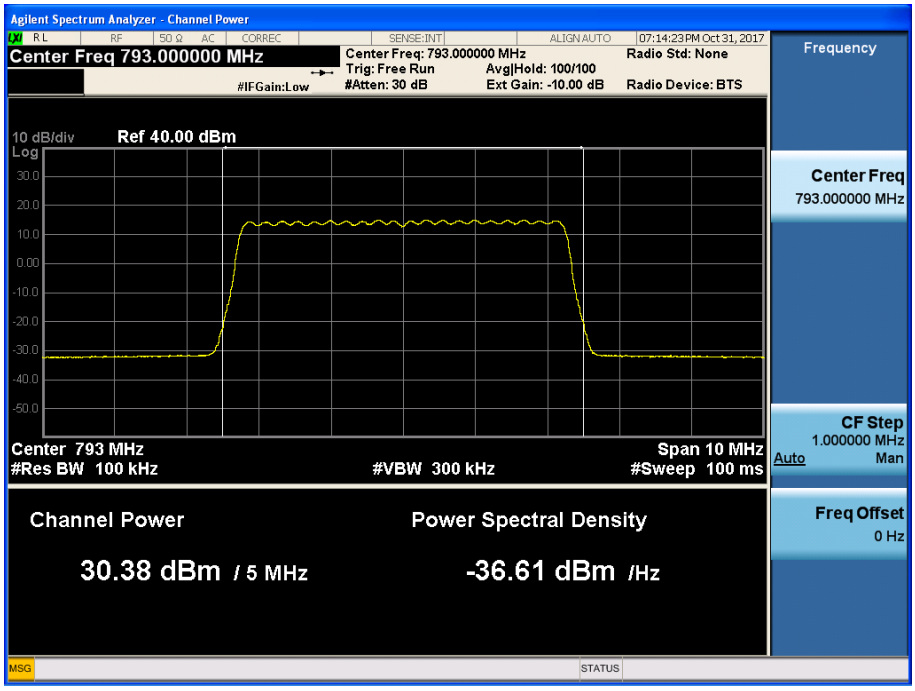
[QPSK Uplink - High]



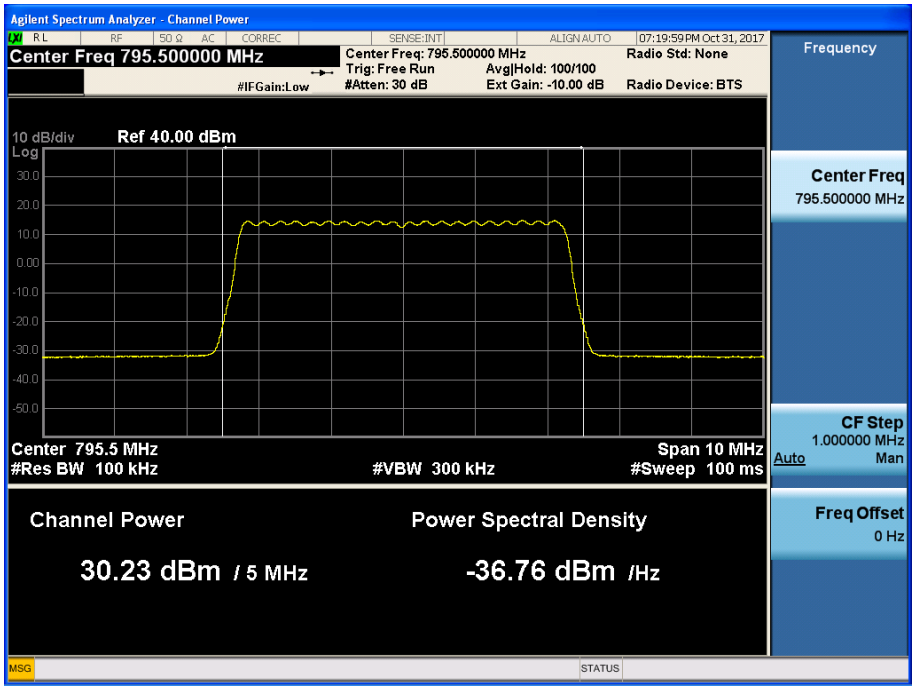
[16QAM Uplink - Low]



[16QAM Uplink - Middle]

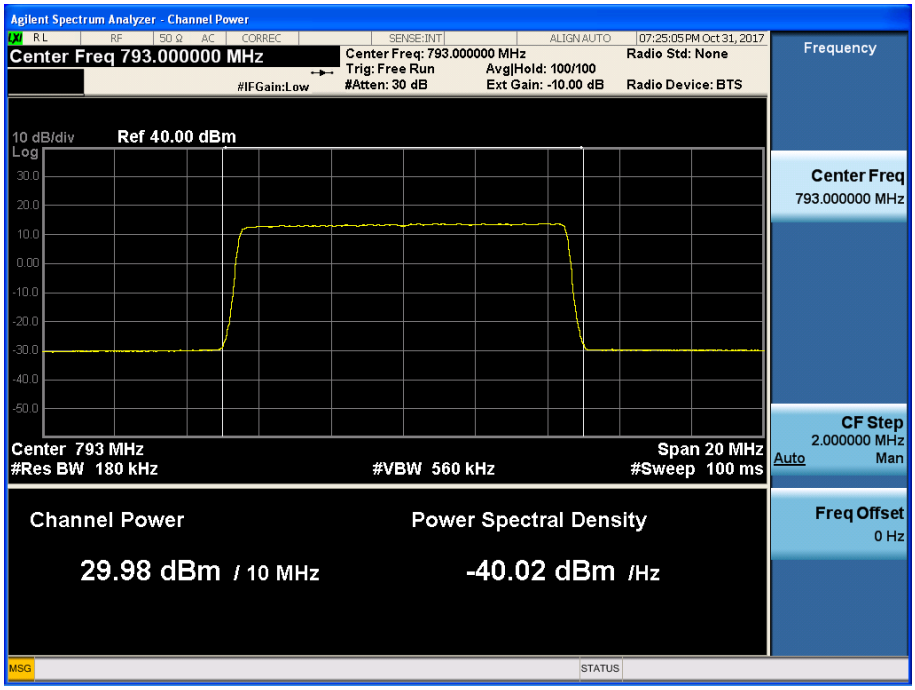


[16QAM Uplink - High]

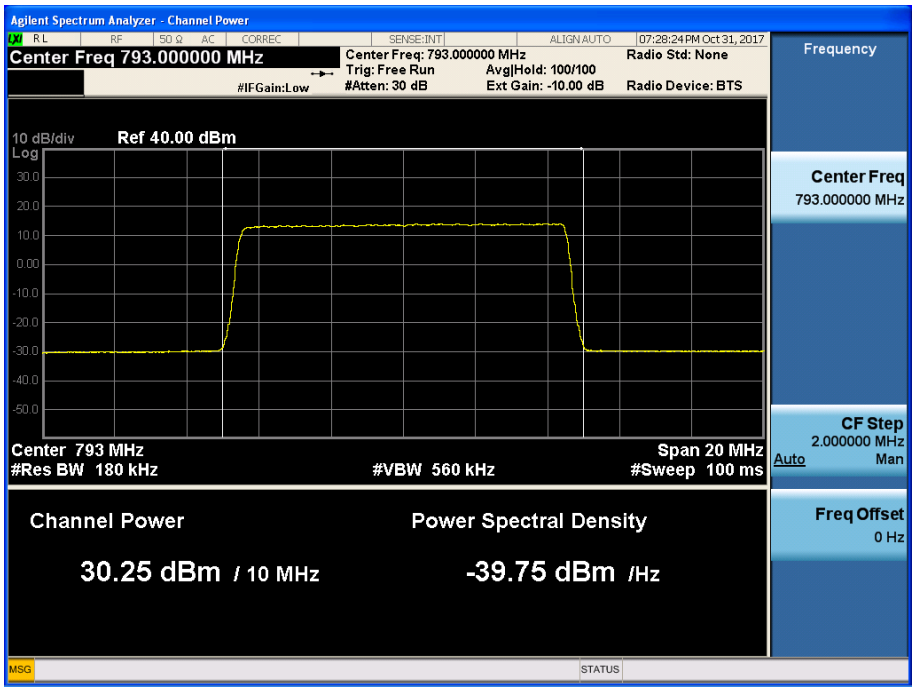


700 LTE(10 MHz)_UL

[QPSK Uplink - Middle]

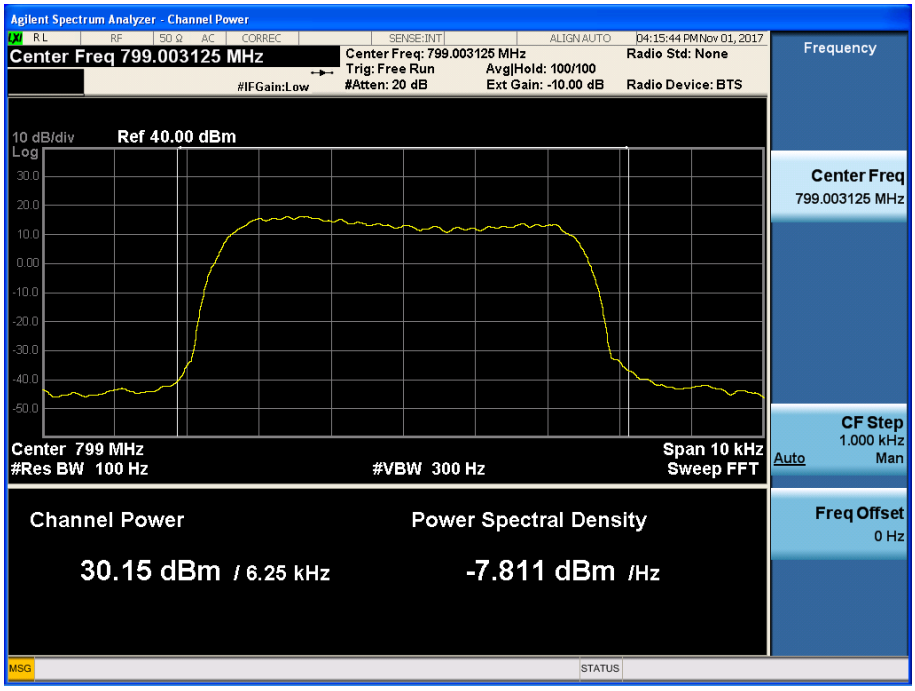


[16QAM Uplink - Middle]

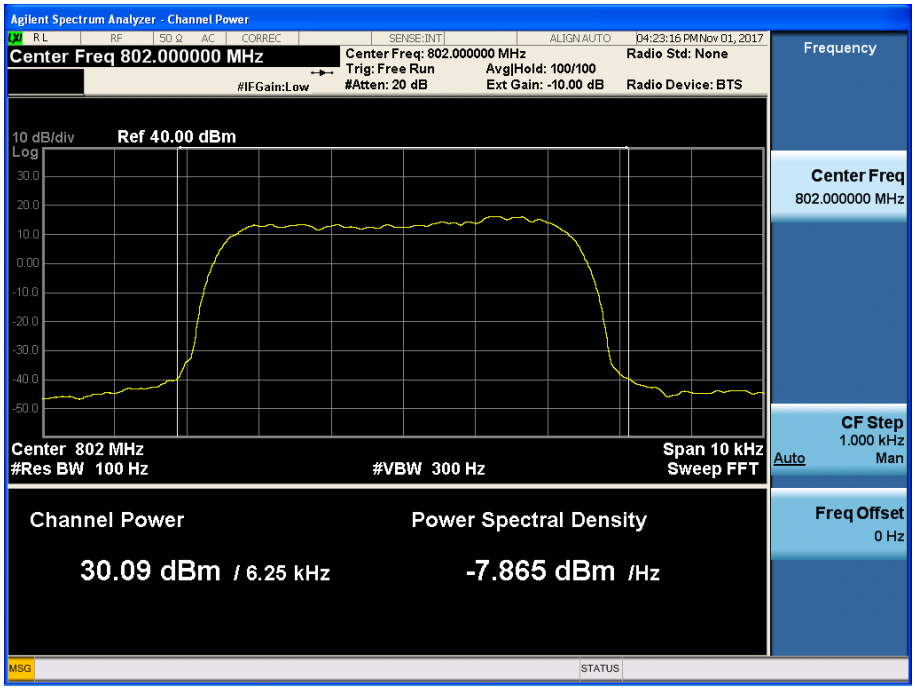


700 APCO 25(6.25 kHz)_UL

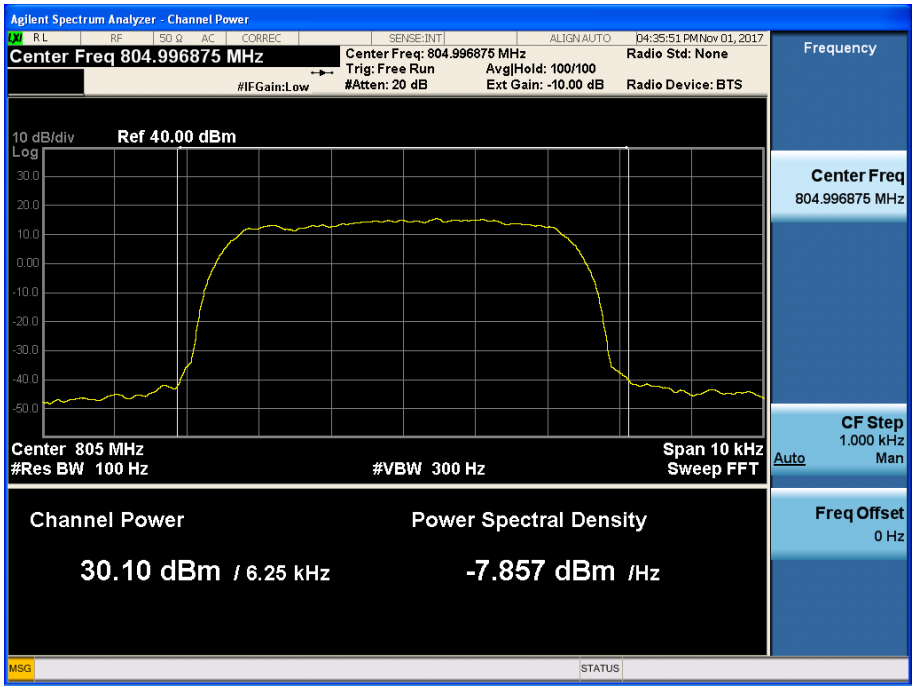
[AGC threshold Uplink - Low]



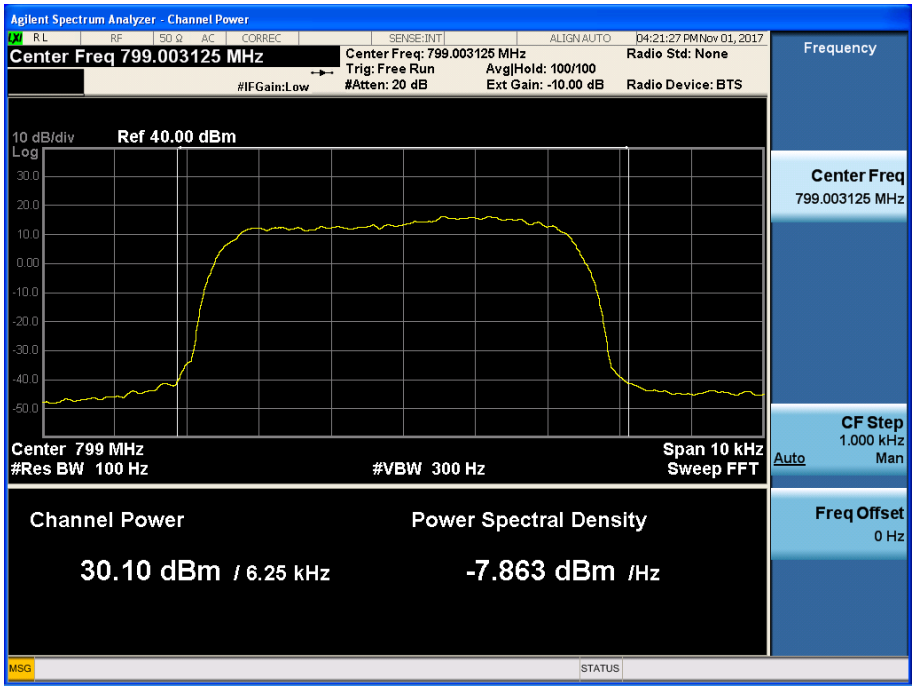
[AGC threshold Uplink - Middle]



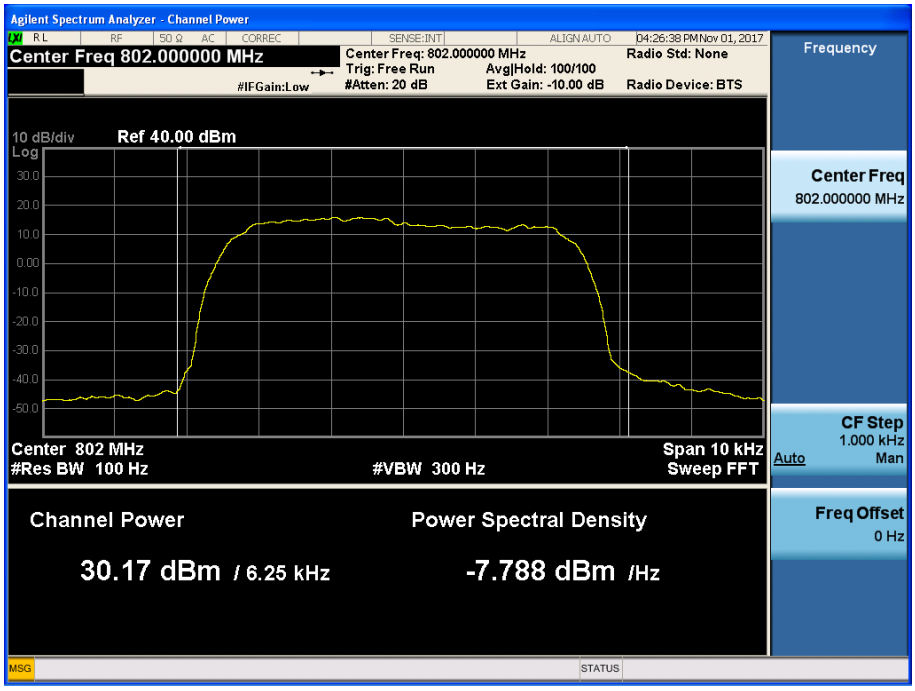
[AGC threshold Uplink - High]



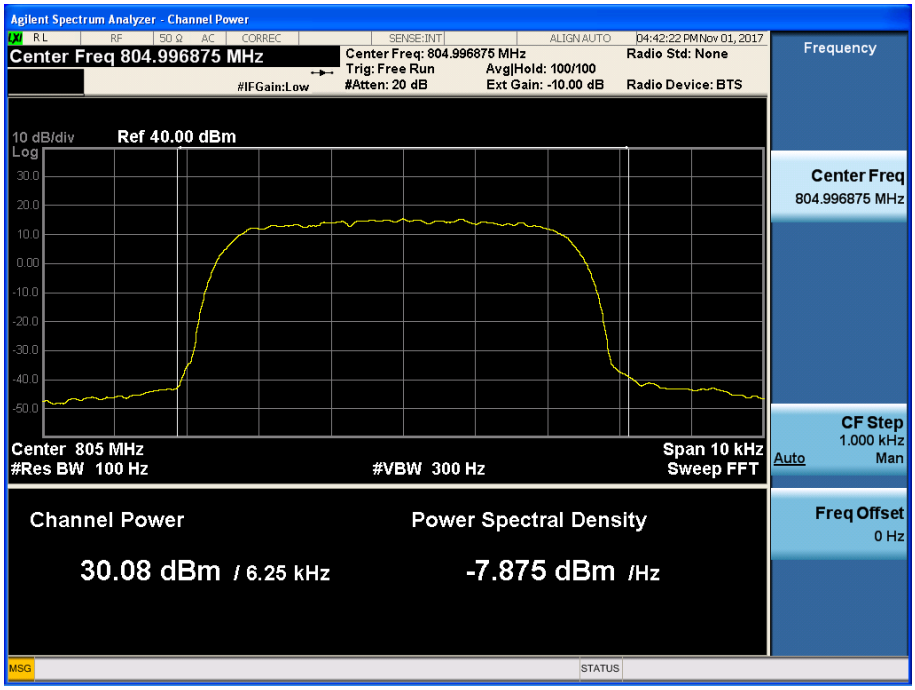
[+3dB above the AGC threshold Uplink - Low]



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

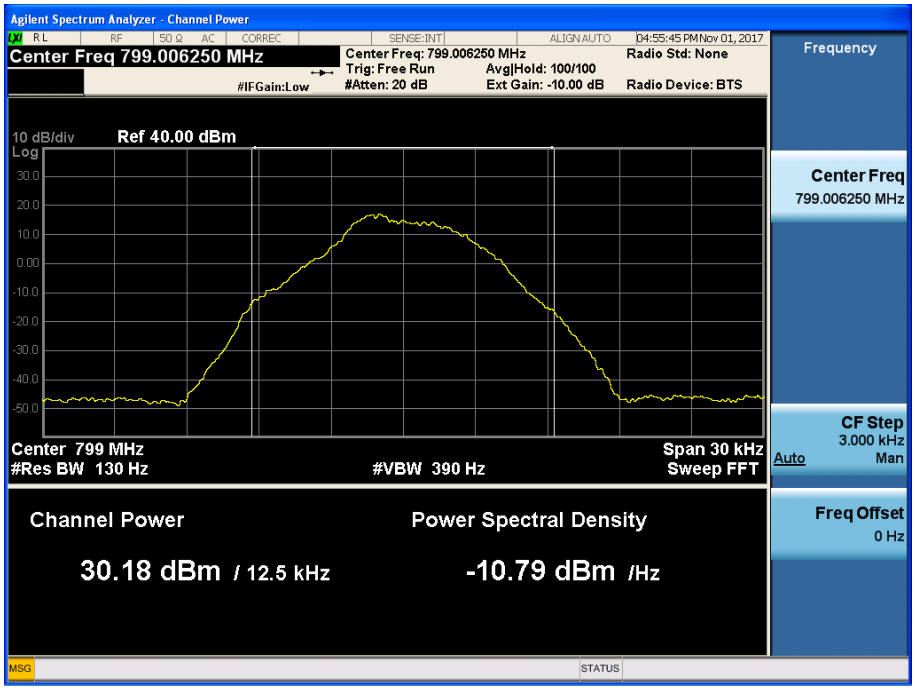


[+3dB above the AGC threshold Uplink - High]

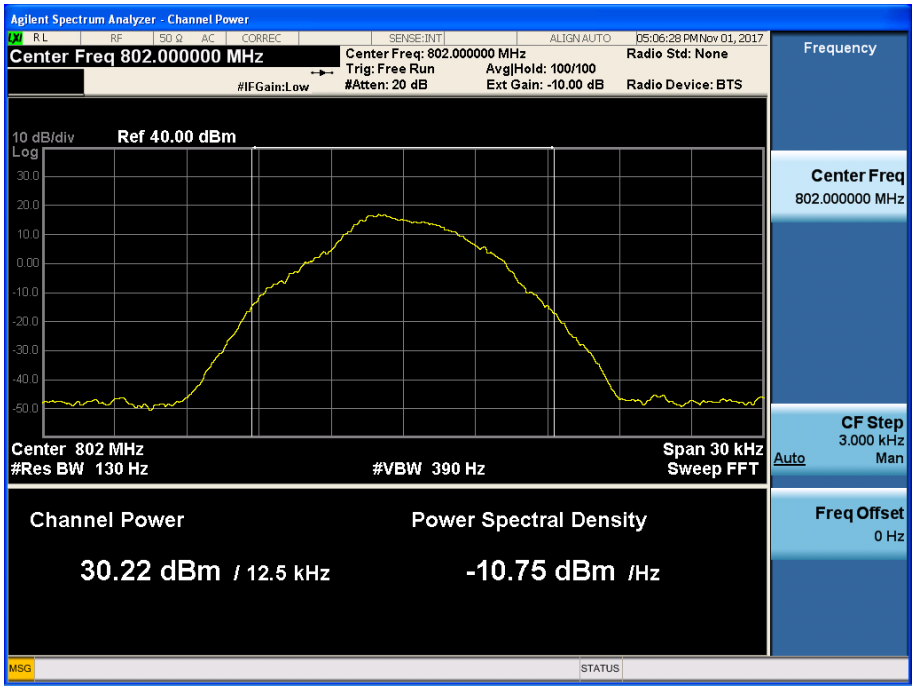


700 APCO 25(12.5 kHz)_UL

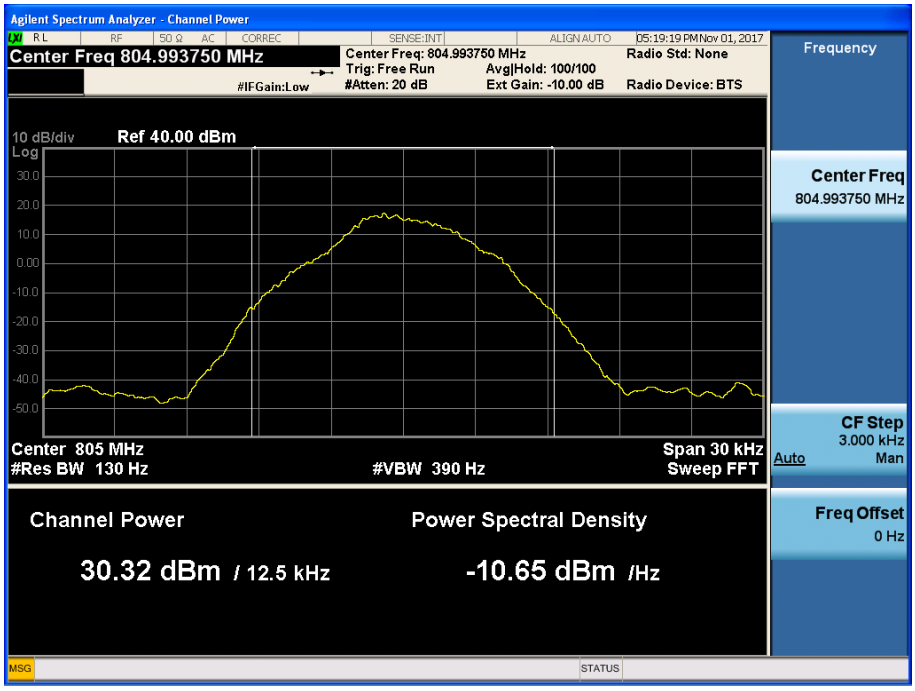
[AGC threshold Uplink - Low]



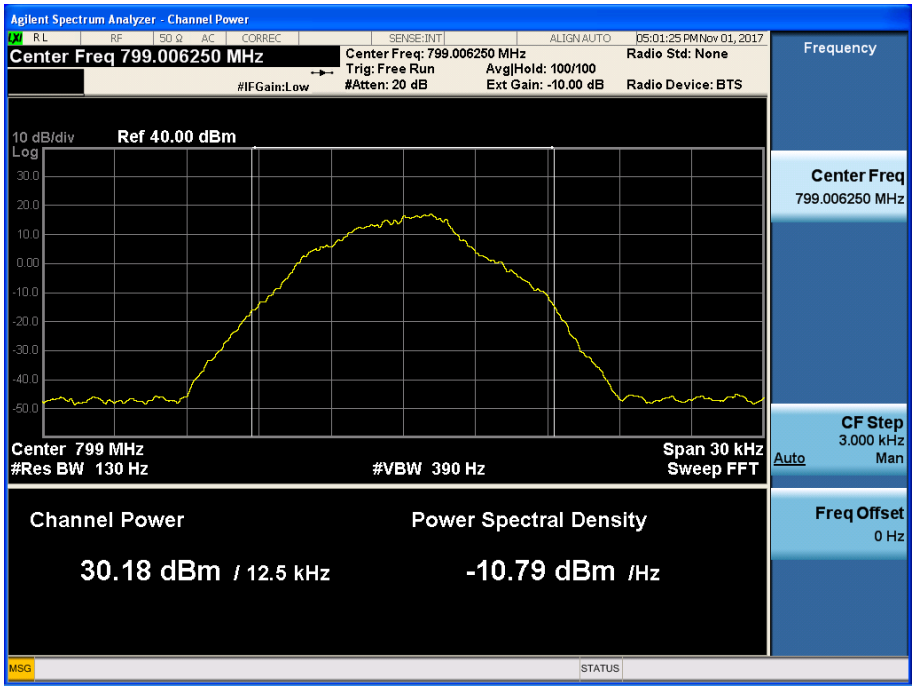
[AGC threshold Uplink - Middle]



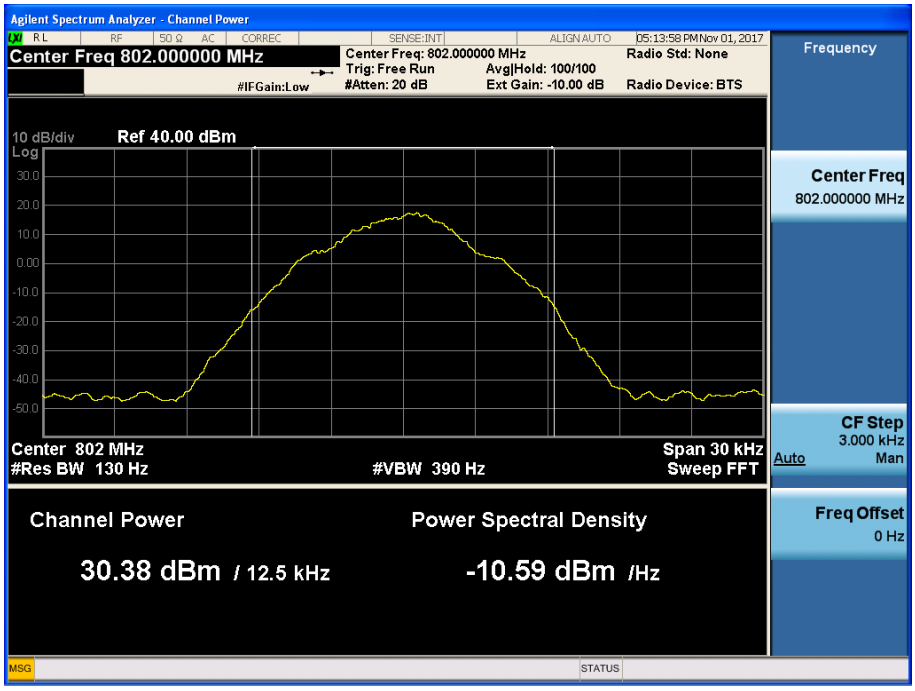
[AGC threshold Uplink - High]



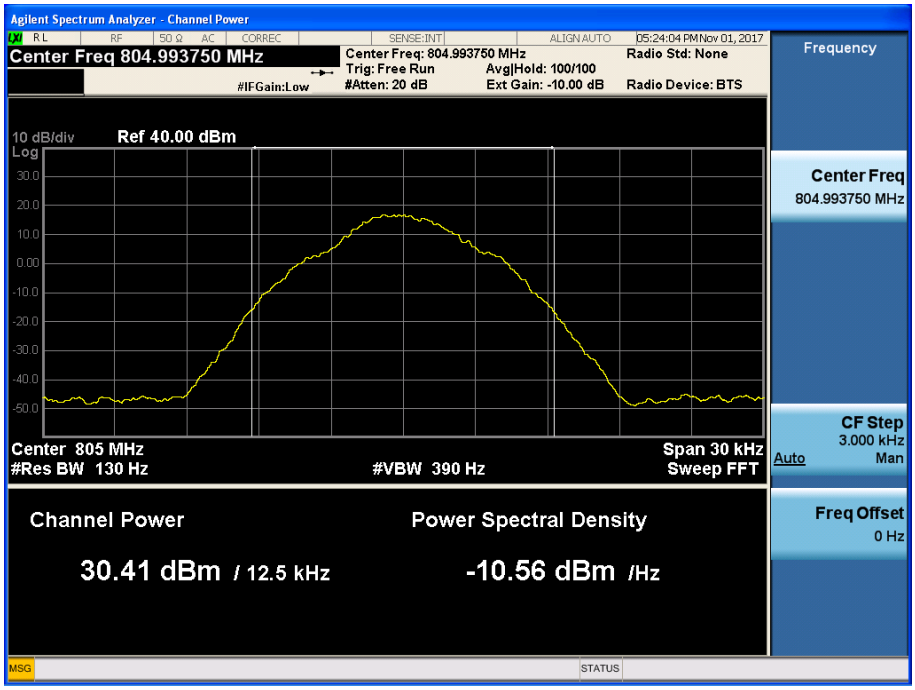
[+3dB above the AGC threshold Uplink - Low]



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

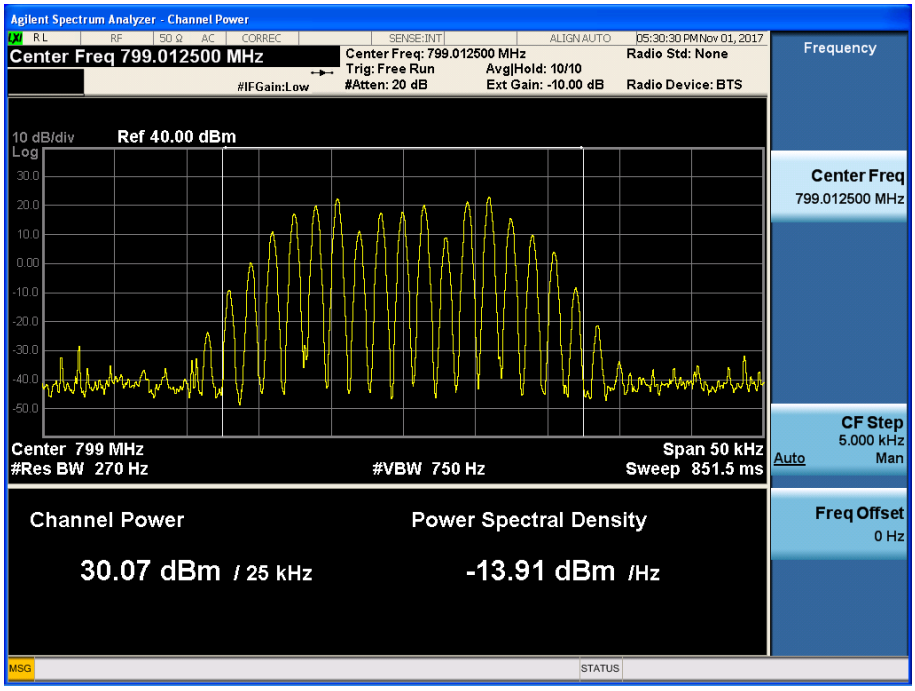


[+3dB above the AGC threshold Uplink - High]

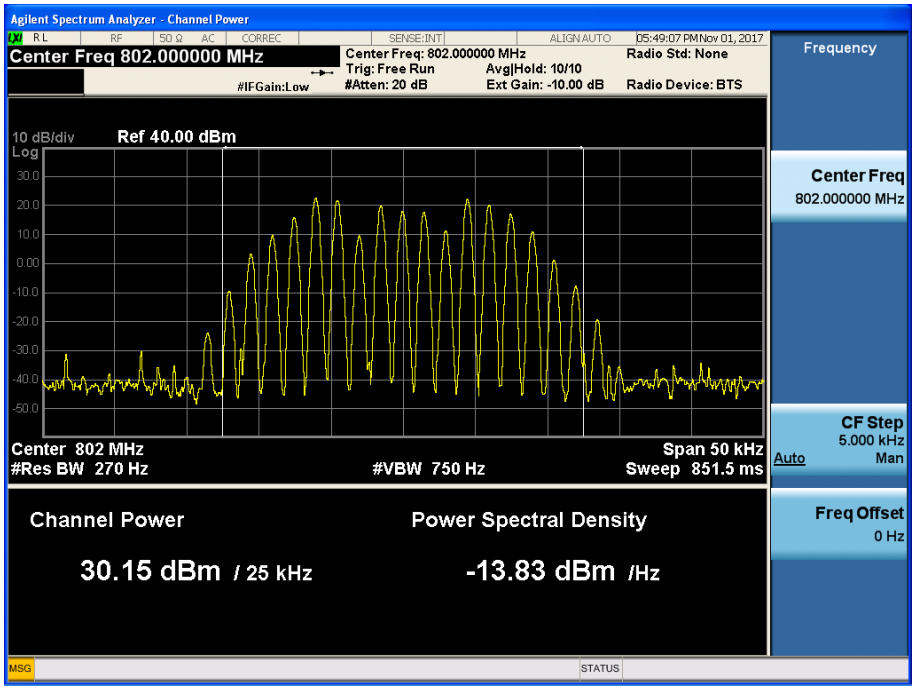


700 APCO 25(25 kHz)_UL

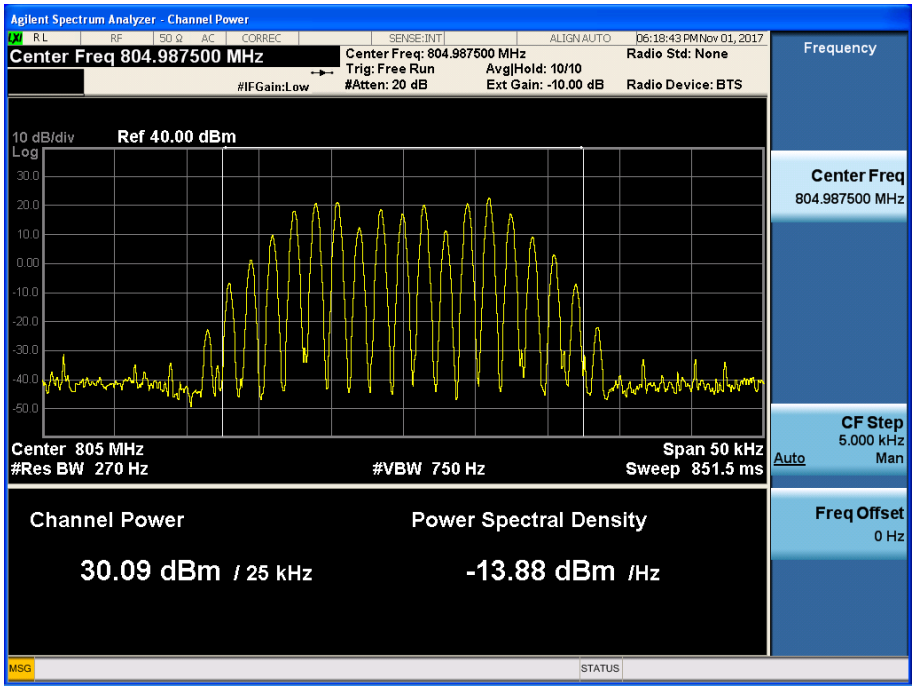
[AGC threshold Uplink - Low]



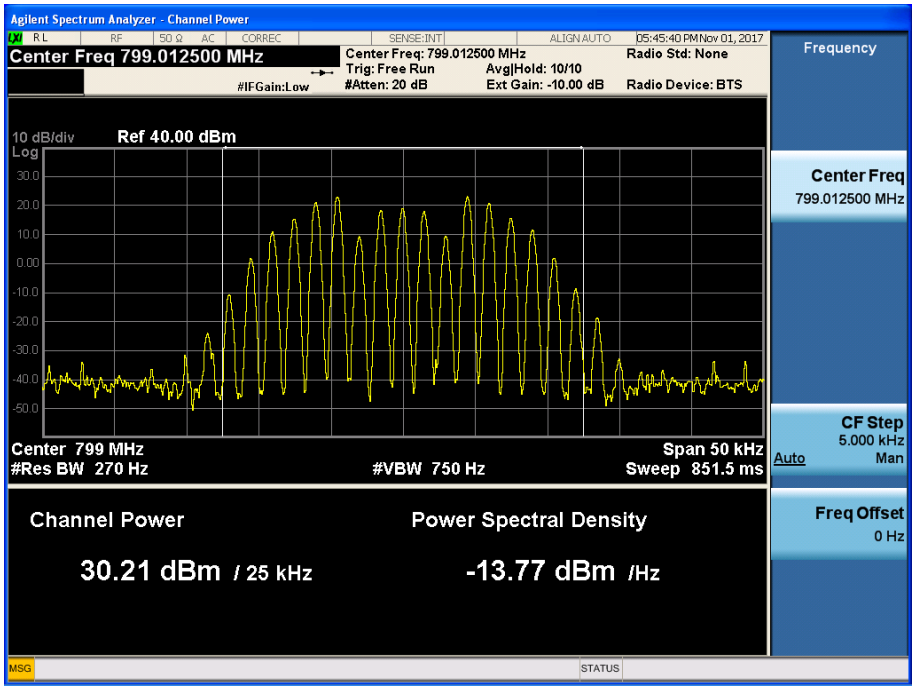
[AGC threshold Uplink - Middle]



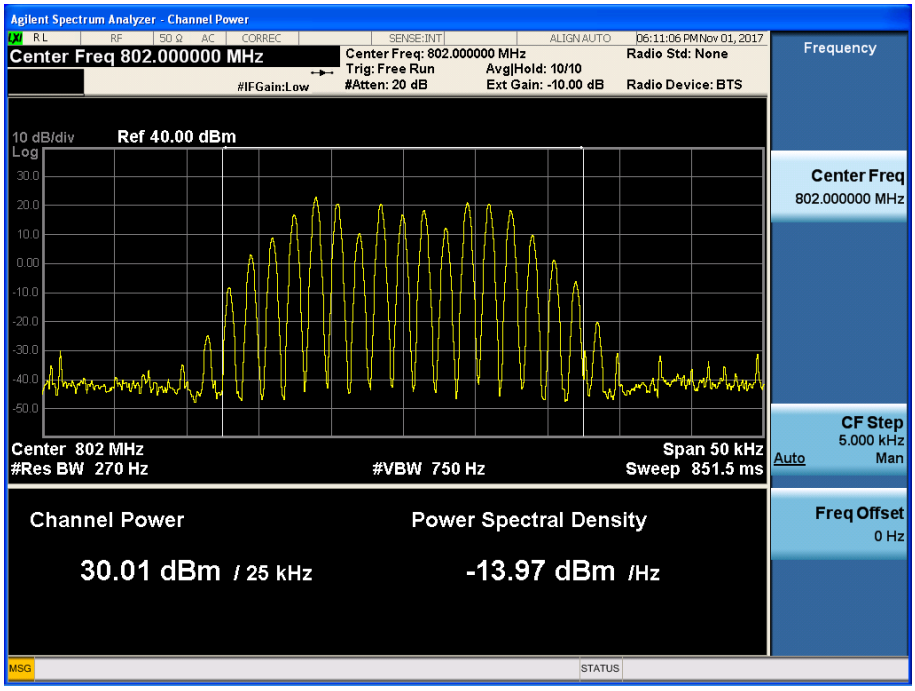
[AGC threshold Uplink - High]



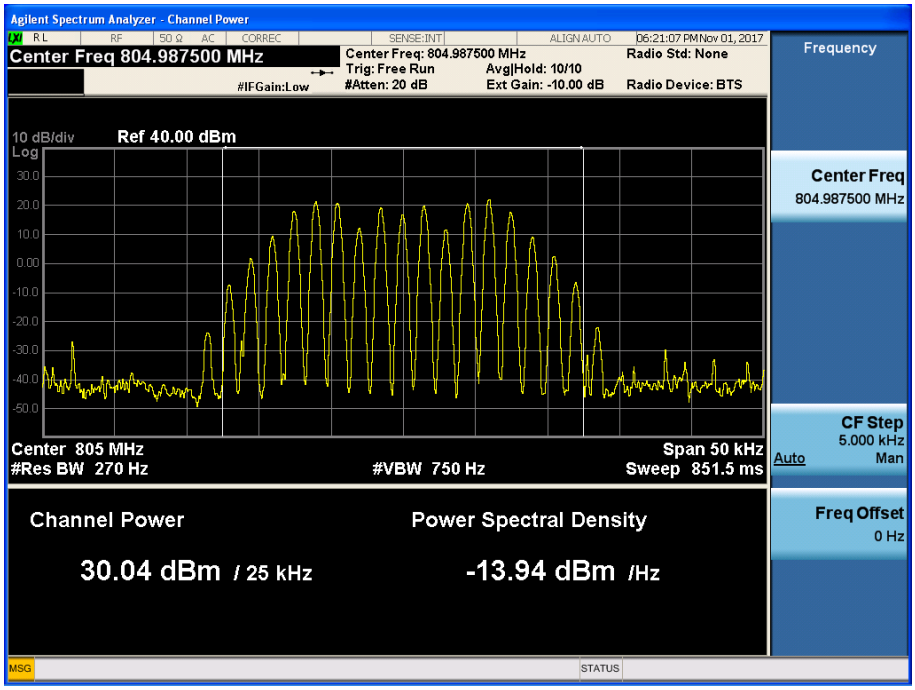
[+3dB above the AGC threshold Uplink - Low]



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

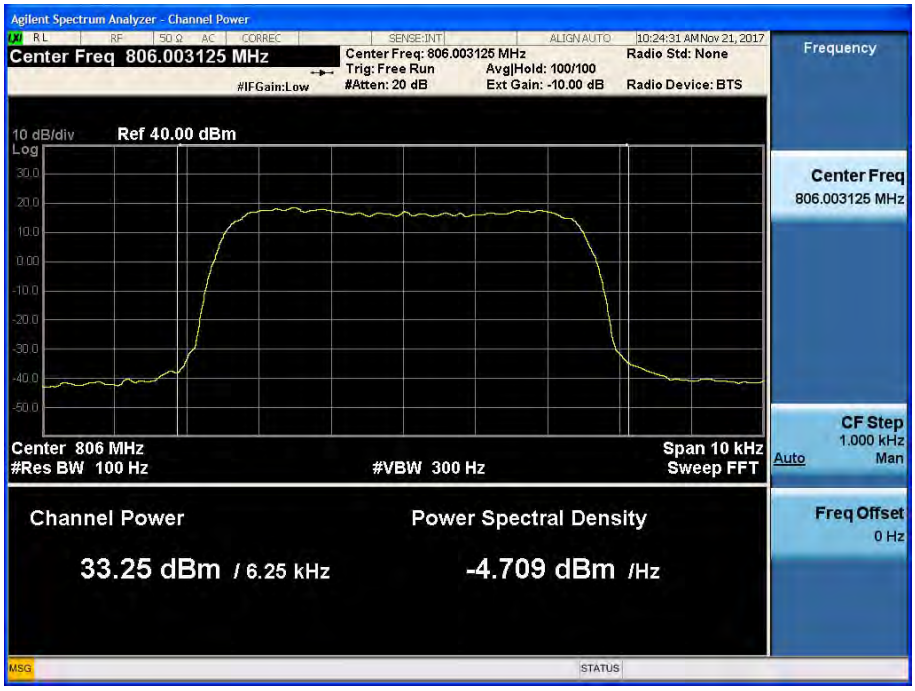


[+3dB above the AGC threshold Uplink - High]

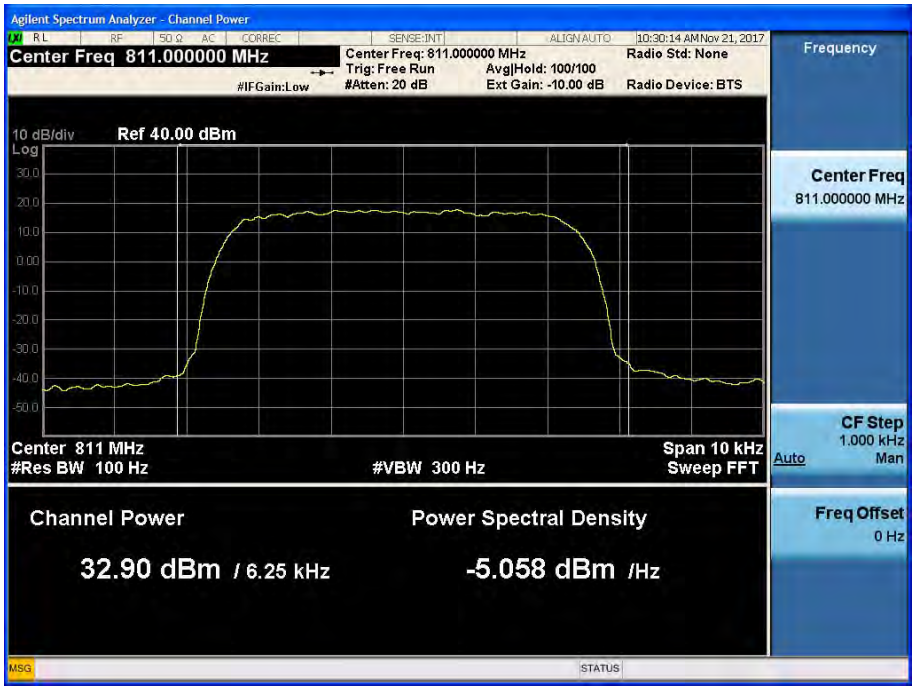


800 APCO 25(6.25 kHz)_UL

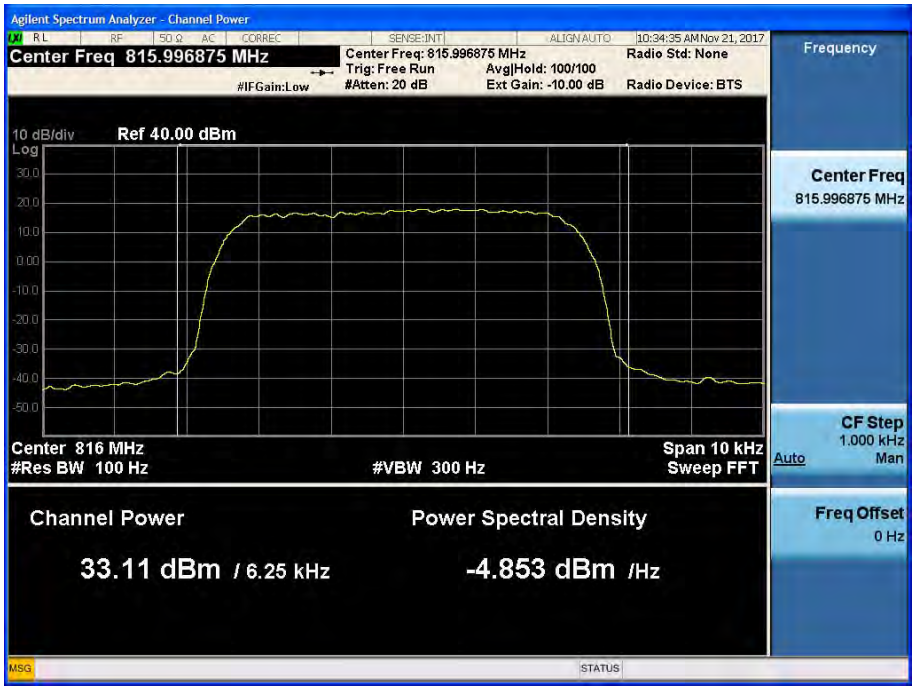
[AGC threshold Uplink - Low]



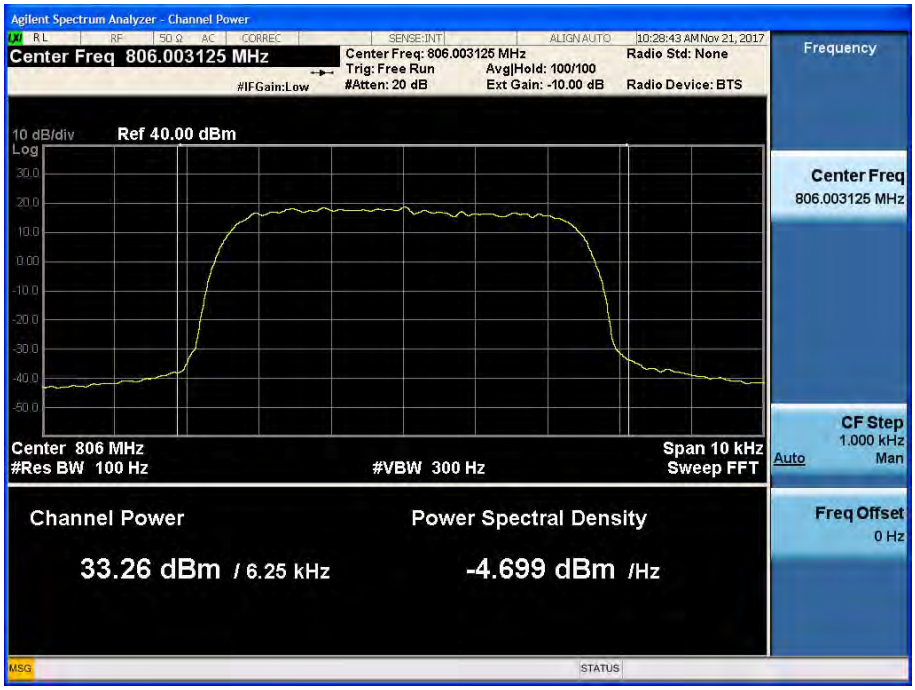
[AGC threshold Uplink - Middle]



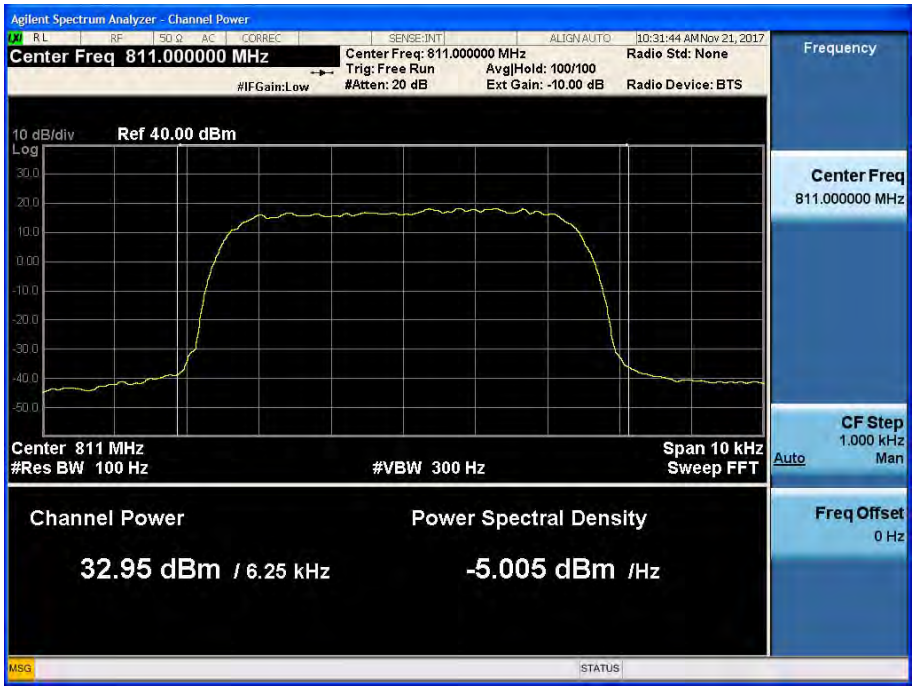
[AGC threshold Uplink - High]



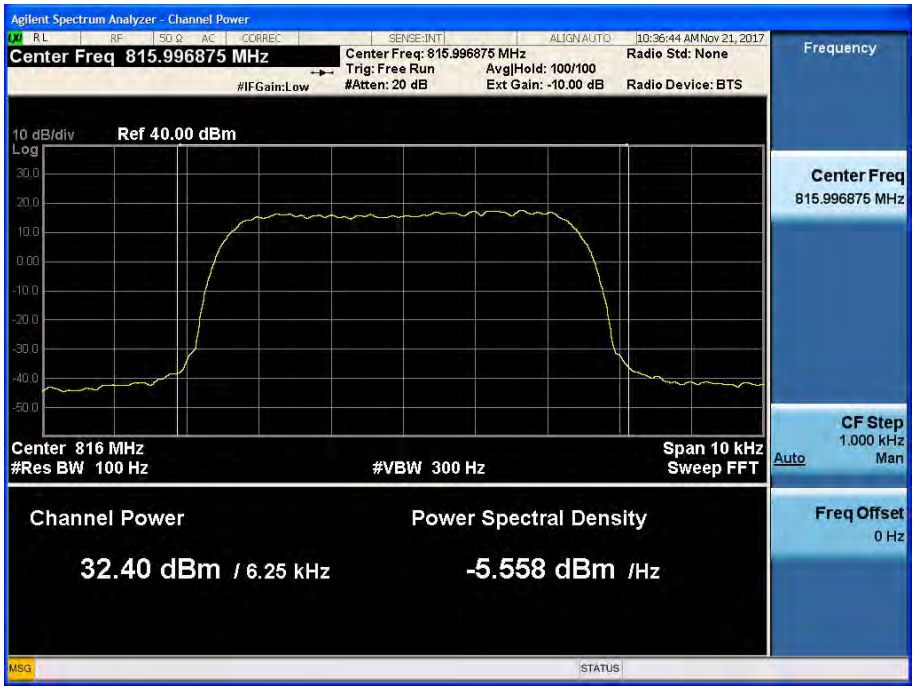
[+3dB above the AGC threshold Uplink - Low]



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

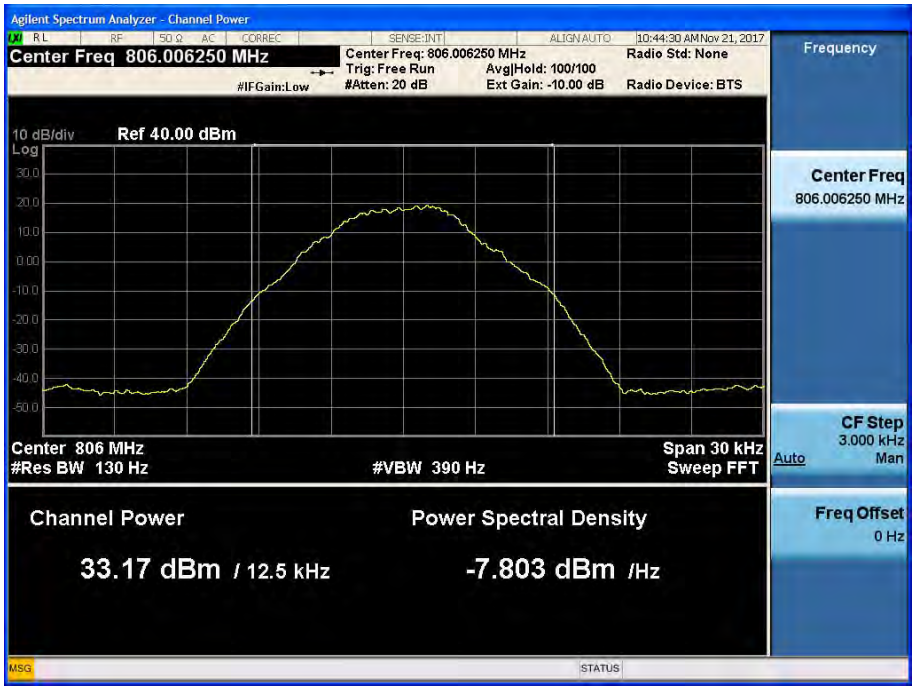


[+3dB above the AGC threshold Uplink - High]



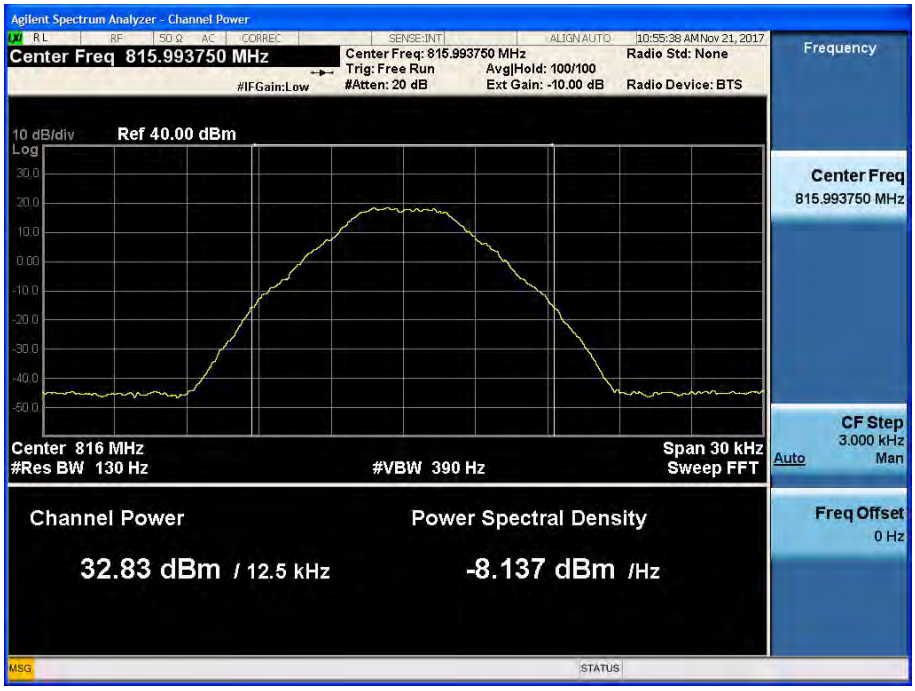
800 APCO 25(12.5 kHz)_UL

[AGC threshold Uplink - Low]

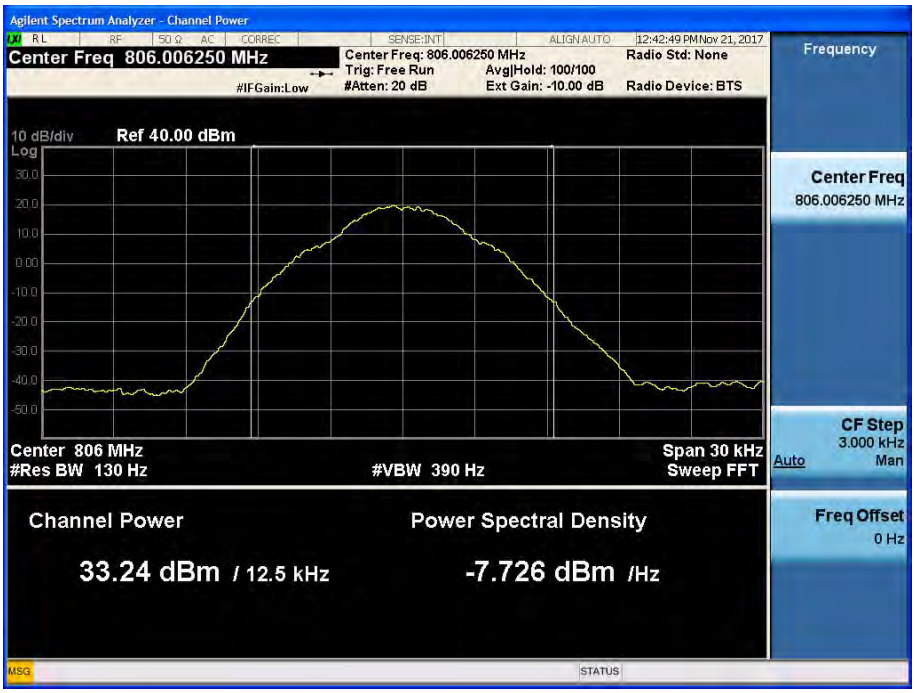


[AGC threshold Uplink - Middle]

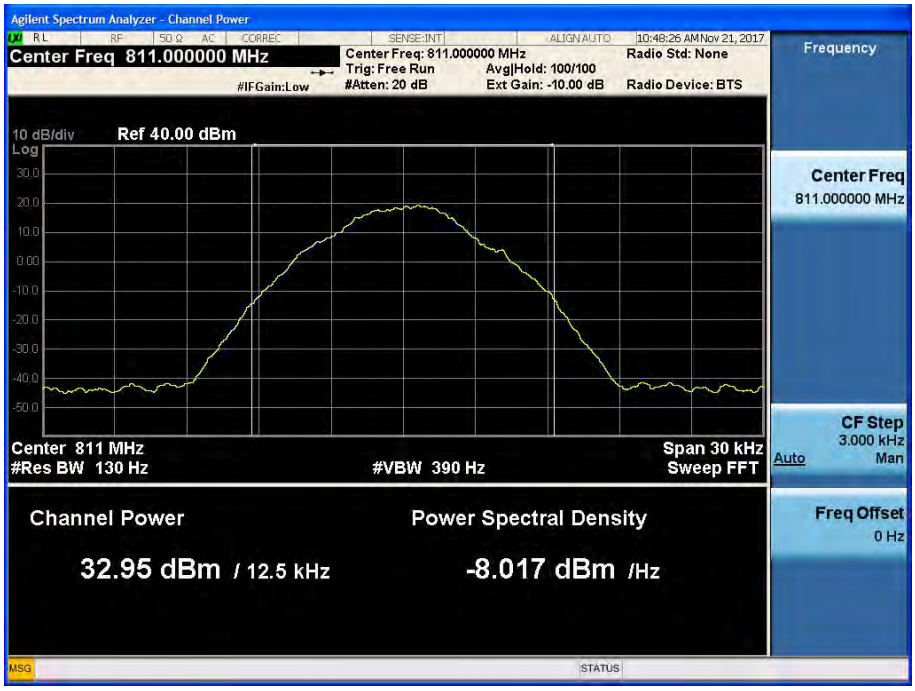
[AGC threshold Uplink - High]



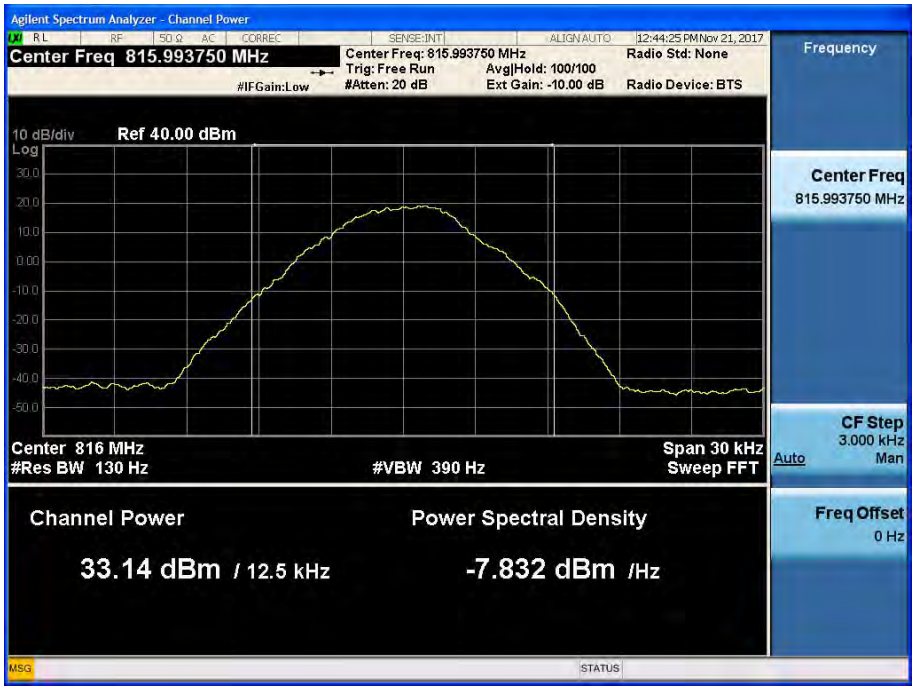
[+3dB above the AGC threshold Uplink - Low]



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

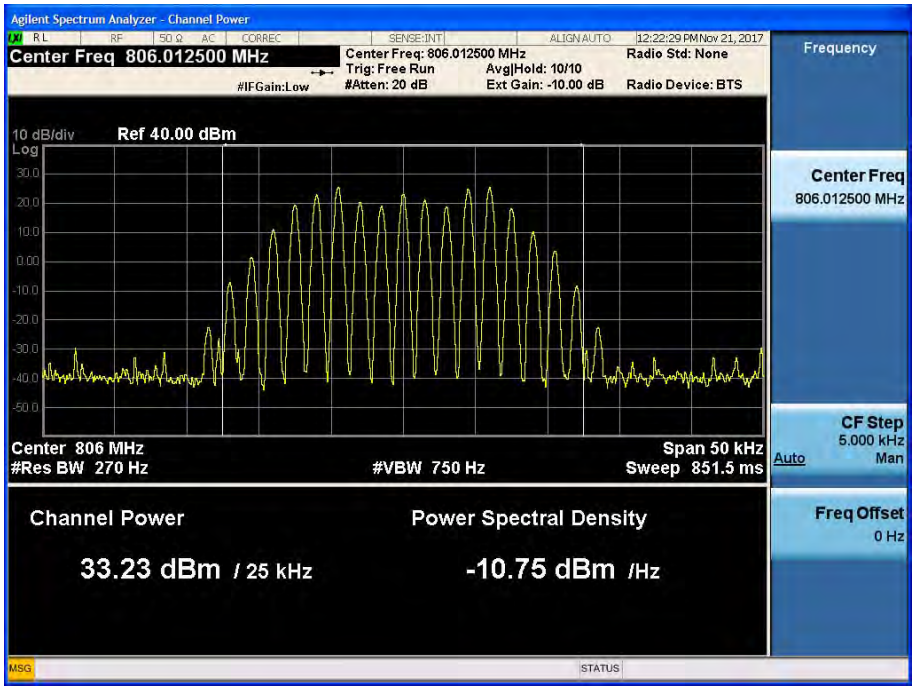


[+3dB above the AGC threshold Uplink - High]

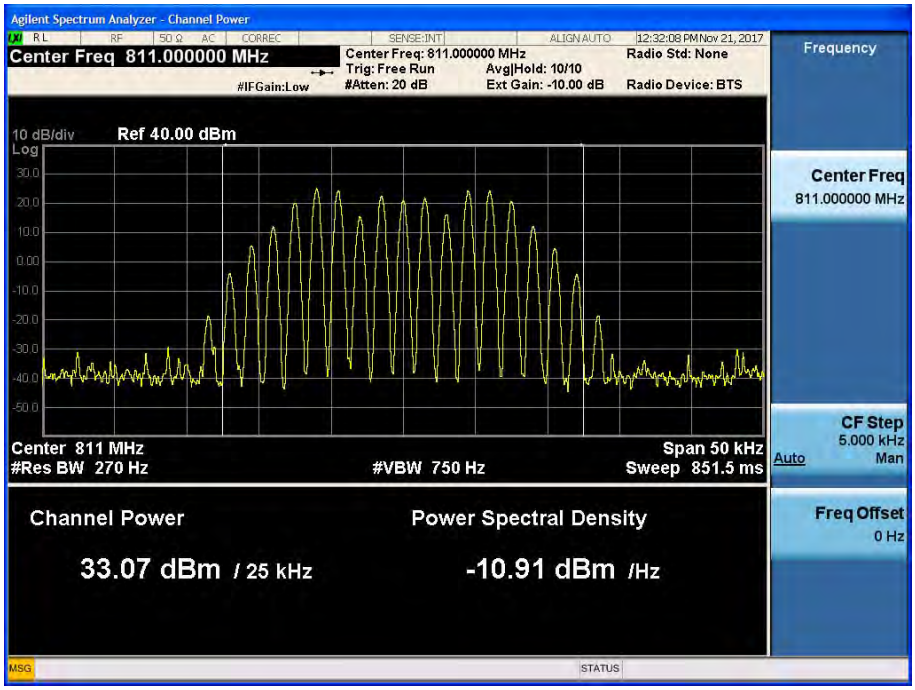


800 APCO 25(25 kHz)_UL

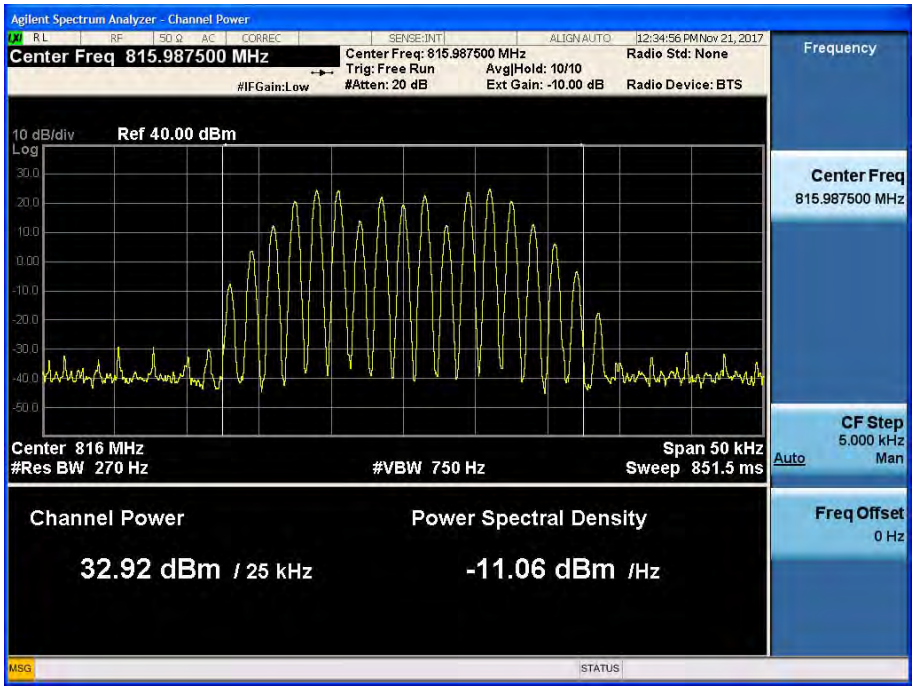
[AGC threshold Uplink - Low]



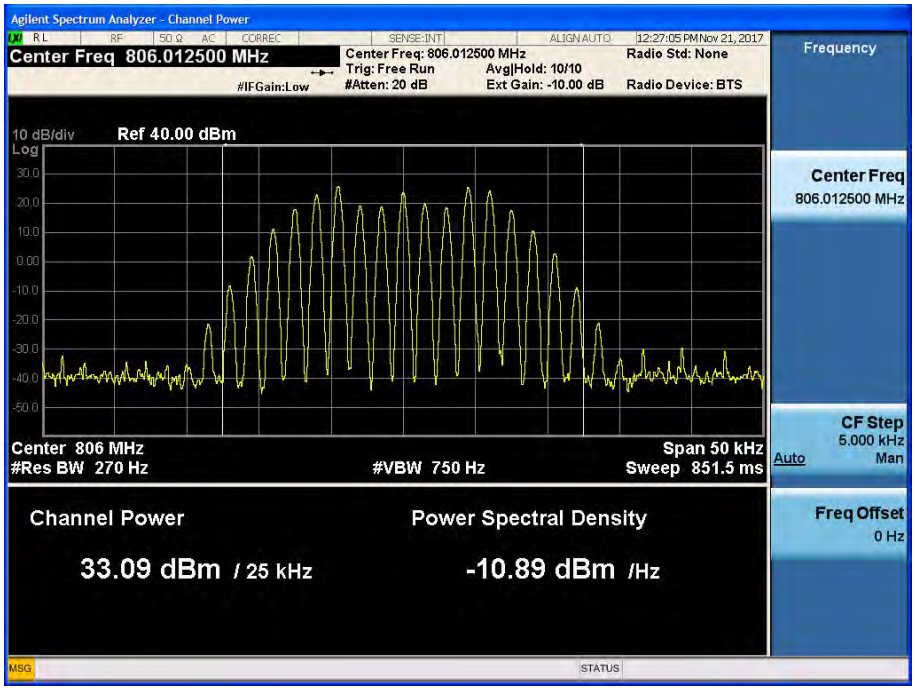
[AGC threshold Uplink - Middle]



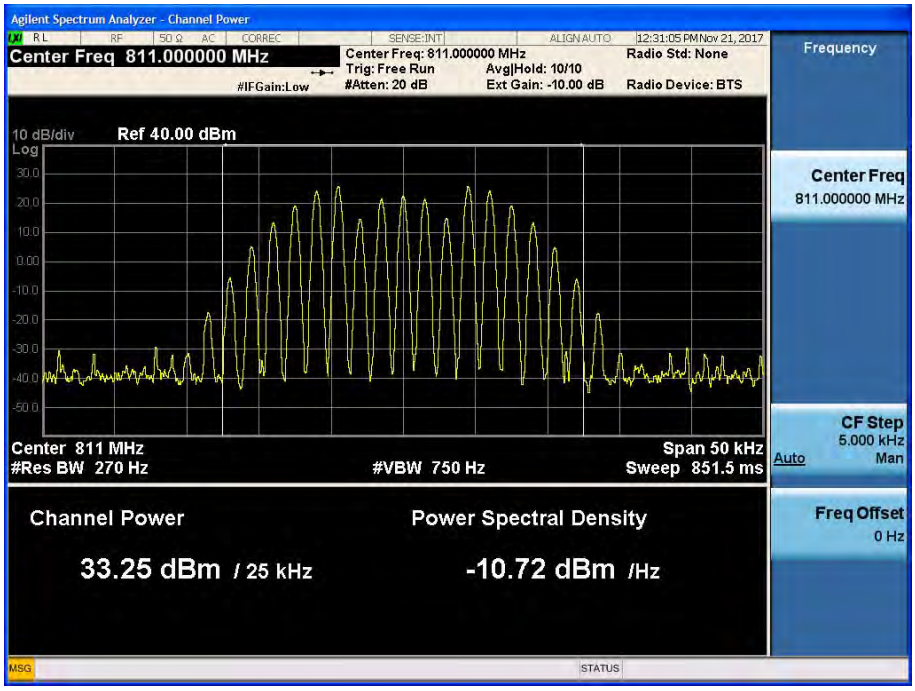
[AGC threshold Uplink - High]



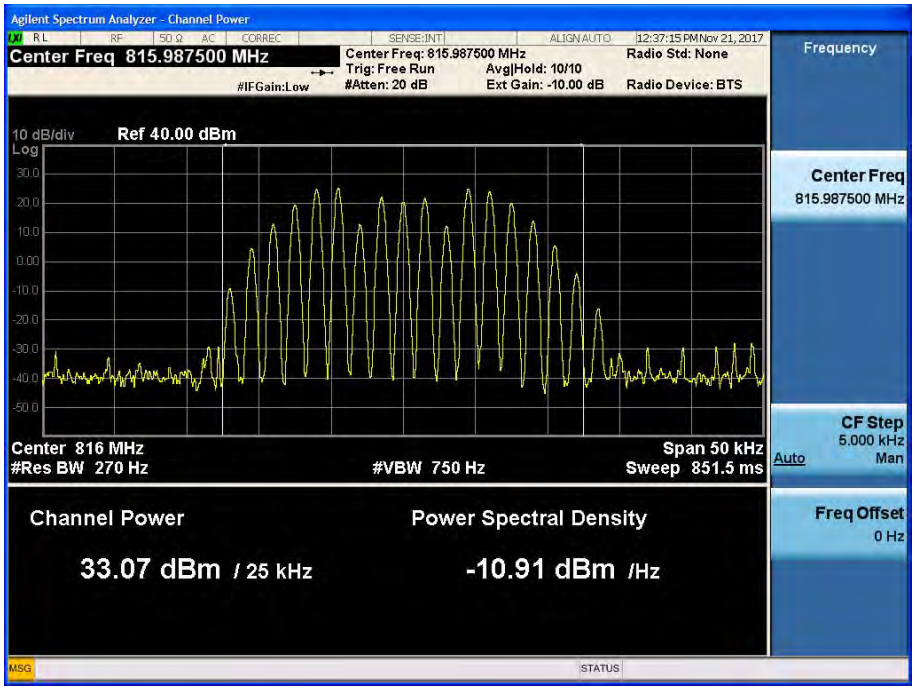
[+3dB above the AGC threshold Uplink - Low]



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



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



7. OCCUPIED BANDWIDTH

FCC Rules

Test Requirements:

§ 2.1049 Measurements required: Occupied bandwidth:

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the specified conditions of § 2.1049 (a) through (i) as applicable.

Test Procedures:

Measurements were in accordance with the test methods section 3.4 of KDB 935210 D05 v01r02 and section 4.2 of KDB 971168 D01 v03.

Test is 99% OBW measured and used.

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

b) Configure the signal generator to transmit the AWGN signal.

c) Configure the signal amplitude to be just below the AGC threshold level (see 3.2), but not more than 0.5 dB below.

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

e) Set the spectrum analyzer center frequency to the center frequency of the operational band under test. The span range of the spectrum analyzer shall be between 2 times to 5 times the emission bandwidth (EBW) or alternatively, the OBW.

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

g) Set the reference level of the instrument as required to preclude the signal from exceeding the maximum spectrum analyzer input mixer level for linear operation. In general, the peak of the spectral envelope must be more than [10 log (OBW / RBW)] below the reference level.
Steps f) and g) may require iteration to enable adjustments within the specified tolerances.

h) The noise floor of the spectrum analyzer at the selected RBW shall be at least 36 dB below the reference level.

i) Set spectrum analyzer detection function to positive peak.

j) Set the trace mode to max hold.

k) Determine the reference value: Allow the trace to stabilize. Set the spectrum analyzer marker to the highest amplitude level of the displayed trace (this is the reference value) and record the associated frequency as f0.

l) 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 −26 dB down amplitude. The 26 dB EBW (alternatively OBW) is the positive frequency difference between the two markers. If the spectral envelope crosses the −26 dB down amplitude at multiple points, the

lowest or highest frequency shall be selected as the frequencies that are the furthest removed from the center frequency at which the spectral envelope crosses the −26 dB down amplitude point.

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

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

o) Repeat the procedure [steps e) to n)] with the input signal amplitude set to 3 dB above the AGC threshold.

p) Repeat steps e) to o) with the signal generator set to the narrowband signal.

q) Repeat steps e) to p) for all frequency bands authorized for use by the EUT.

Test Results:

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

[Downlink Output]

	Channel	Frequency (MHz)	OBW (MHz)
700 LTE (5 MHz)_ QPSK	Low	760.50	4.5039
	Middle	763.00	4.4979
	High	765.50	4.5030
700 LTE (5 MHz)_ 16QAM	Low	760.50	4.5004
	Middle	763.00	4.4989
	High	765.50	4.5015
700 LTE (10 MHz)_ QPSK	Low	-	-
	Middle	763.00	8.9663
	High	-	-
700 LTE (10 MHz)_ 16QAM	Low	-	-
	Middle	763.00	8.9622
	High	-	-

	Channel	Frequency (MHz)	OBW (kHz)
700 APCO 25 (6.25 kHz)_ AGC threshold	Low	769.003125	4.842
	Middle	772.000000	4.794
	High	774.996875	4.815
700 APCO 25 (6.25 kHz)_ +3dB above AGC threshold	Low	769.003125	4.801
	Middle	772.000000	4.829
	High	774.996875	4.842
700 APCO 25 (12.5 kHz)_ AGC threshold	Low	769.00625	8.246
	Middle	772.00000	8.267
	High	774.99375	8.324
700 APCO 25 (12.5 kHz)_ +3dB above AGC threshold	Low	769.00625	8.255
	Middle	772.00000	8.370
	High	774.99375	8.285
700 APCO 25 (25 kHz)_ AGC threshold	Low	769.01250	18.041
	Middle	772.00000	17.928
	High	774.98750	17.878
700 APCO 25 (25 kHz)_ +3dB above AGC threshold	Low	769.01250	18.044
	Middle	772.00000	17.929
	High	774.98750	17.882

	Channel	Frequency (MHz)	OBW (kHz)
800 APCO 25 (6.25 kHz)_ AGC threshold	Low	851.003125	4.792
	Middle	856.000000	4.820
	High	860.996875	4.846
800 APCO 25 (6.25 kHz)_ +3dB above AGC threshold	Low	851.003125	4.846
	Middle	856.000000	4.818
	High	860.996875	4.818
800 APCO 25 (12.5 kHz)_ AGC threshold	Low	851.00625	8.235
	Middle	856.00000	8.197
	High	860.99375	8.253
800 APCO 25 (12.5 kHz)_ +3dB above AGC threshold	Low	851.00625	8.176
	Middle	856.00000	8.188
	High	860.99375	7.699
800 APCO 25 (25 kHz)_ AGC threshold	Low	851.01250	18.168
	Middle	856.00000	17.867
	High	860.98750	18.084
800 APCO 25 (25 kHz)_ +3dB above AGC threshold	Low	851.01250	18.164
	Middle	856.00000	17.866
	High	860.98750	18.084

[Downlink Input]

	Channel	Frequency (MHz)	OBW (MHz)
700 LTE (5 MHz)_ QPSK	Low	760.50	4.5123
	Middle	763.00	4.5109
	High	765.50	4.5131
700 LTE (10 MHz)_ QPSK	Low	-	-
	Middle	763.00	8.9941
	High	-	-

	Channel	Frequency (MHz)	OBW (kHz)
700 APCO 25 (6.25 kHz)_ AGC threshold	Low	769.003125	4.813
	Middle	772.000000	4.826
	High	774.996875	4.864
700 APCO 25 (12.5 kHz)_ AGC threshold	Low	769.00625	8.590
	Middle	772.00000	8.306
	High	774.99375	8.206
700 APCO 25 (25 kHz)_ AGC threshold	Low	769.01250	18.072
	Middle	772.00000	17.964
	High	774.98750	17.924

	Channel	Frequency (MHz)	OBW (kHz)
800 APCO 25 (6.25 kHz)_ AGC threshold	Low	851.003125	4.823
	Middle	856.000000	4.849
	High	860.996875	4.808
800 APCO 25 (12.5 kHz)_ AGC threshold	Low	851.00625	8.218
	Middle	856.00000	8.391
	High	860.99375	8.338
800 APCO 25 (25 kHz)_ AGC threshold	Low	851.01250	18.181
	Middle	856.00000	17.913
	High	860.98750	18.111

[Uplink Output]

	Channel	Frequency (MHz)	OBW (kHz)
700 APCO 25 (6.25 kHz)_ AGC threshold	Low	798.003125	4.753
	Middle	802.000000	4.824
	High	805.996875	4.764
700 APCO 25 (6.25 kHz)_ +3dB above AGC threshold	Low	798.003125	4.905
	Middle	802.000000	4.768
	High	805.996875	4.809
700 APCO 25 (12.5 kHz)_ AGC threshold	Low	798.00625	8.382
	Middle	802.00000	8.315
	High	805.99375	8.311
700 APCO 25 (12.5 kHz)_ +3dB above AGC threshold	Low	798.00625	8.103
	Middle	802.00000	8.361
	High	805.99375	8.325
700 APCO 25 (25 kHz)_ AGC threshold	Low	798.01250	18.172
	Middle	802.00000	18.136
	High	805.98750	17.830
700 APCO 25 (25 kHz)_ +3dB above AGC threshold	Low	798.01250	18.157
	Middle	802.00000	18.155
	High	805.98750	17.958

	Channel	Frequency (MHz)	OBW (MHz)
700 LTE (5 MHz)_ QPSK	Low	790.50	4.5058
	Middle	793.00	4.4861
	High	795.50	4.5055
700 LTE (5 MHz)_ 16QAM	Low	790.50	4.4795
	Middle	793.00	4.5117
	High	795.50	4.5150
700 LTE (10 MHz)_ QPSK	Low	-	-
	Middle	793.00	8.9399
	High	-	-
700 LTE (10 MHz)_ 16QAM	Low	-	-
	Middle	793.00	8.9617
	High	-	-

	Channel	Frequency (MHz)	OBW (kHz)
700 APCO 25 (6.25 kHz)_ AGC threshold	Low	799.003125	4.821
	Middle	802.000000	4.853
	High	804.996875	4.770
700 APCO 25 (6.25 kHz)_ +3dB above AGC threshold	Low	799.003125	4.870
	Middle	802.000000	4.710
	High	804.996875	4.778
700 APCO 25 (12.5 kHz)_ AGC threshold	Low	799.00625	8.299
	Middle	802.00000	8.506
	High	804.99375	8.325
700 APCO 25 (12.5 kHz)_ +3dB above AGC threshold	Low	799.00625	8.328
	Middle	802.00000	8.352
	High	804.99375	8.593
700 APCO 25 (25 kHz)_ AGC threshold	Low	799.01250	18.161
	Middle	802.00000	18.191
	High	804.98750	18.117
700 APCO 25 (25 kHz)_ +3dB above AGC threshold	Low	799.01250	18.201
	Middle	802.00000	18.163
	High	804.98750	18.118

	Channel	Frequency (MHz)	OBW (kHz)
800 APCO 25 (6.25 kHz)_ AGC threshold	Low	806.003125	4.796
	Middle	811.000000	4.835
	High	815.996875	4.858
800 APCO 25 (6.25 kHz)_ +3dB above AGC threshold	Low	806.003125	4.772
	Middle	811.000000	4.869
	High	815.996875	4.864
800 APCO 25 (12.5 kHz)_ AGC threshold	Low	806.00625	8.091
	Middle	811.00000	8.270
	High	815.99375	7.923
800 APCO 25 (12.5 kHz)_ +3dB above AGC threshold	Low	806.00625	8.410
	Middle	811.00000	8.298
	High	815.99375	8.144
800 APCO 25 (25 kHz)_ AGC threshold	Low	806.01250	17.826
	Middle	811.00000	18.149
	High	815.98750	18.163
800 APCO 25 (25 kHz)_ +3dB above AGC threshold	Low	806.01250	17.843
	Middle	811.00000	18.121
	High	815.98750	18.172

[Uplink Input]

	Channel	Frequency (MHz)	OBW (MHz)
700 LTE (5 MHz)_ QPSK	Low	790.50	4.5130
	Middle	793.00	4.5094
	High	795.50	4.5100
700 LTE (10 MHz)_ QPSK	Low	-	-
	Middle	793.00	8.9931
	High	-	-

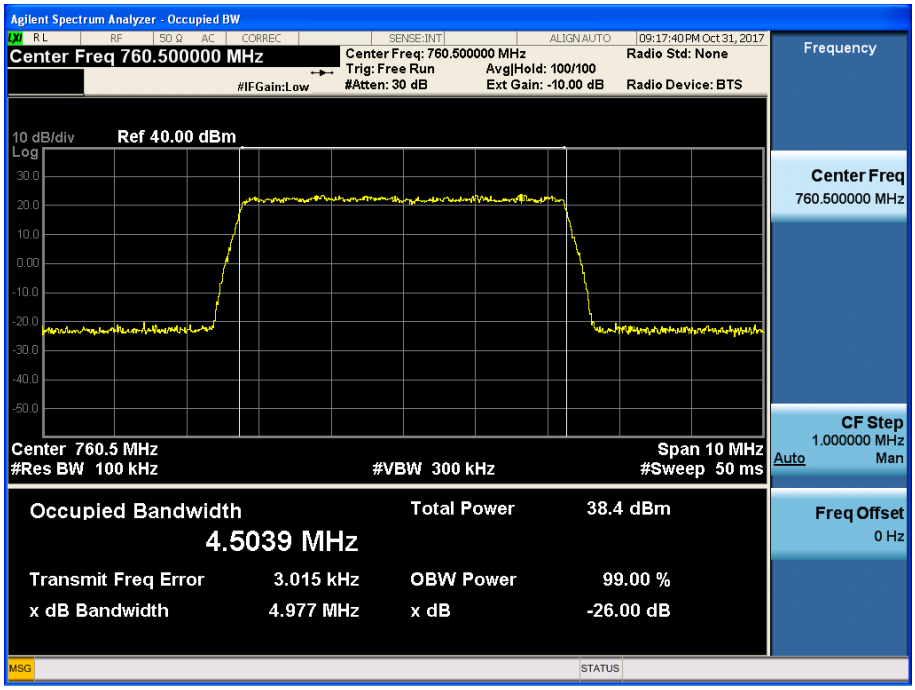
	Channel	Frequency (MHz)	OBW (kHz)
700 APCO 25 (6.25 kHz)_ AGC threshold	Low	799.003125	4.842
	Middle	802.000000	4.852
	High	804.996875	4.845
700 APCO 25 (12.5 kHz)_ AGC threshold	Low	799.00625	8.446
	Middle	802.00000	8.208
	High	804.99375	8.256
700 APCO 25 (25 kHz)_ AGC threshold	Low	799.01250	18.186
	Middle	802.00000	18.183
	High	804.98750	18.178

	Channel	Frequency (MHz)	OBW (kHz)
800 APCO 25 (6.25 kHz)_ AGC threshold	Low	806.003125	4.840
	Middle	811.000000	4.844
	High	815.996875	4.825
800 APCO 25 (12.5 kHz)_ AGC threshold	Low	806.00625	8.137
	Middle	811.00000	8.314
	High	815.99375	8.270
800 APCO 25 (25 kHz)_ AGC threshold	Low	806.01250	17.947
	Middle	811.00000	18.155
	High	815.98750	18.181

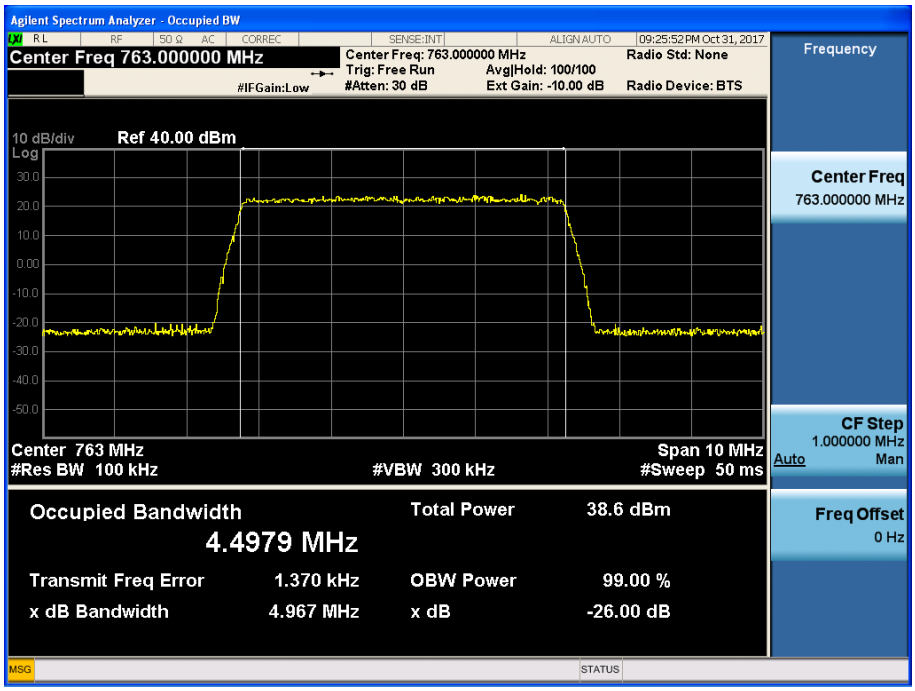
Plots of Occupied Bandwidth

700 LTE(5 MHz)_DL Output

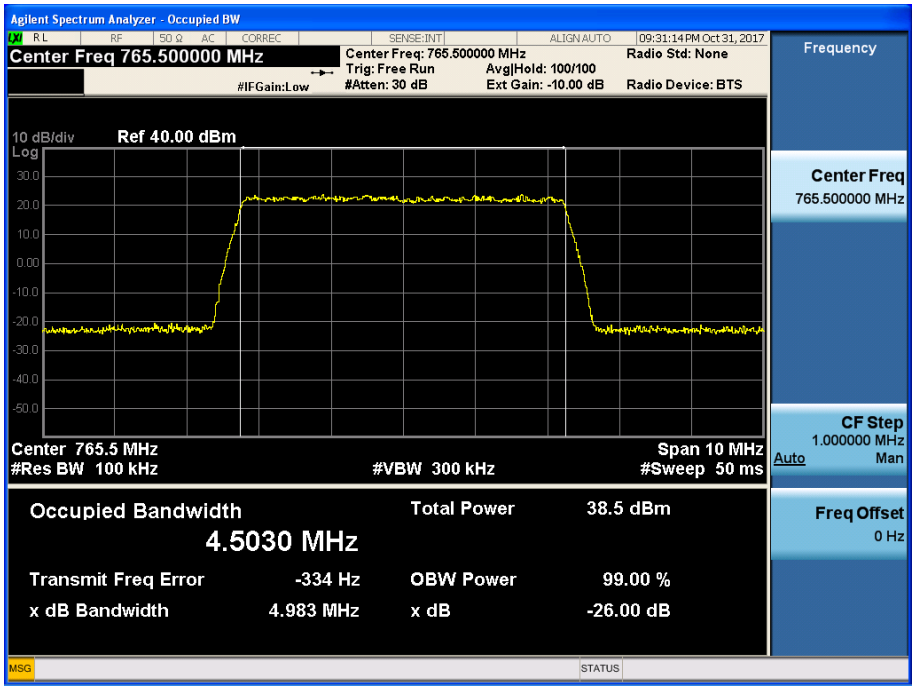
[QPSK Downlink - Low]



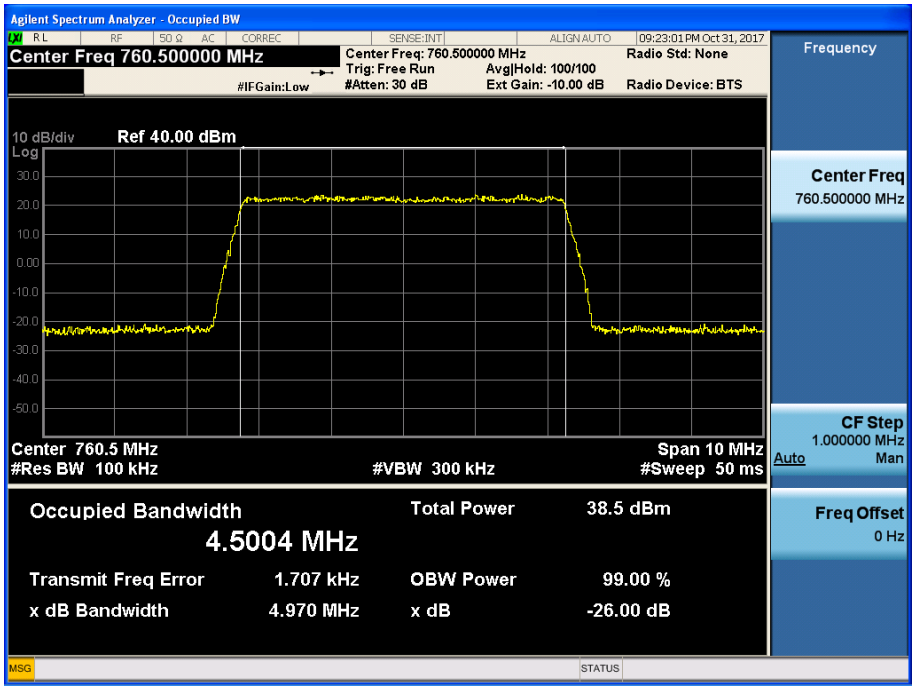
[QPSK Downlink - Middle]



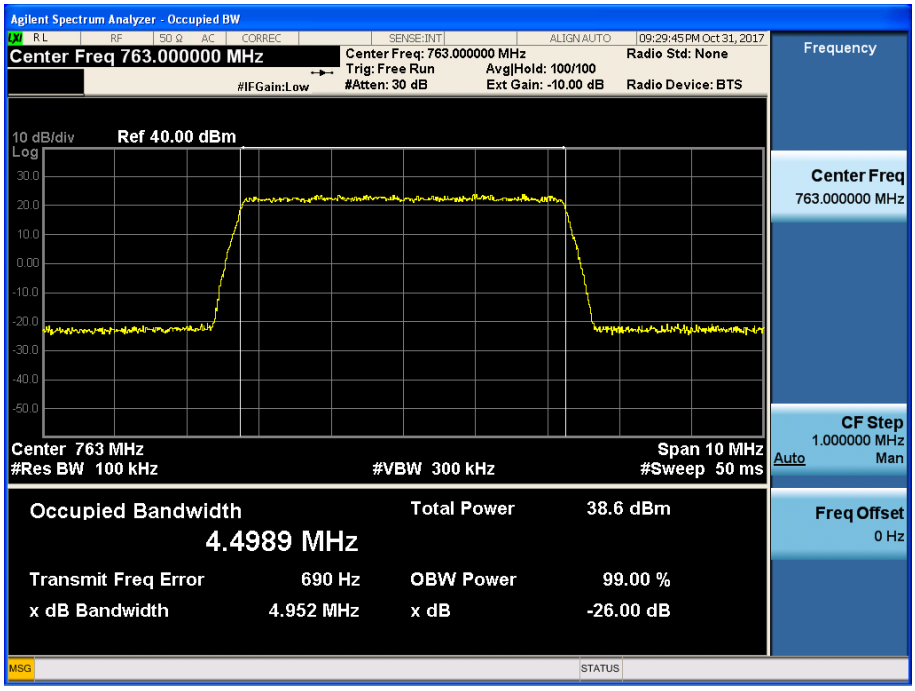
[QPSK Downlink - High]



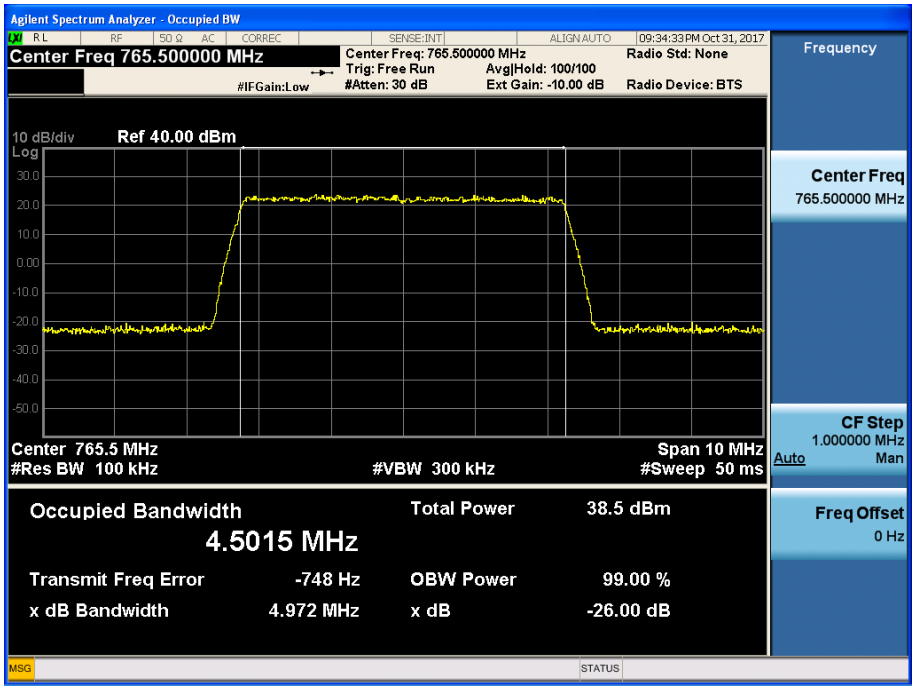
[16QAM Downlink - Low]



[16QAM Downlink - Middle]

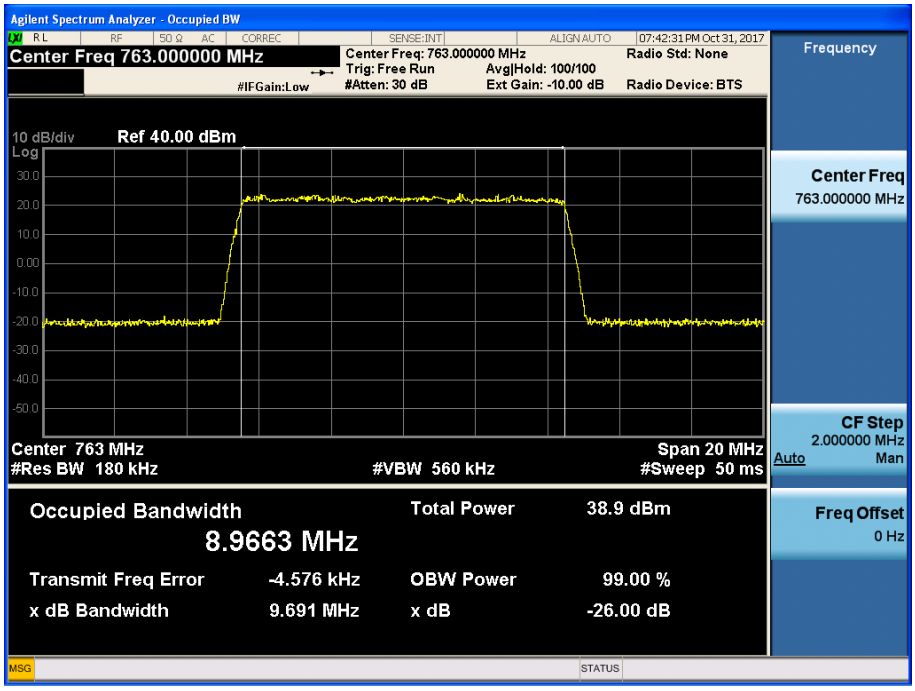


[16QAM Downlink - High]

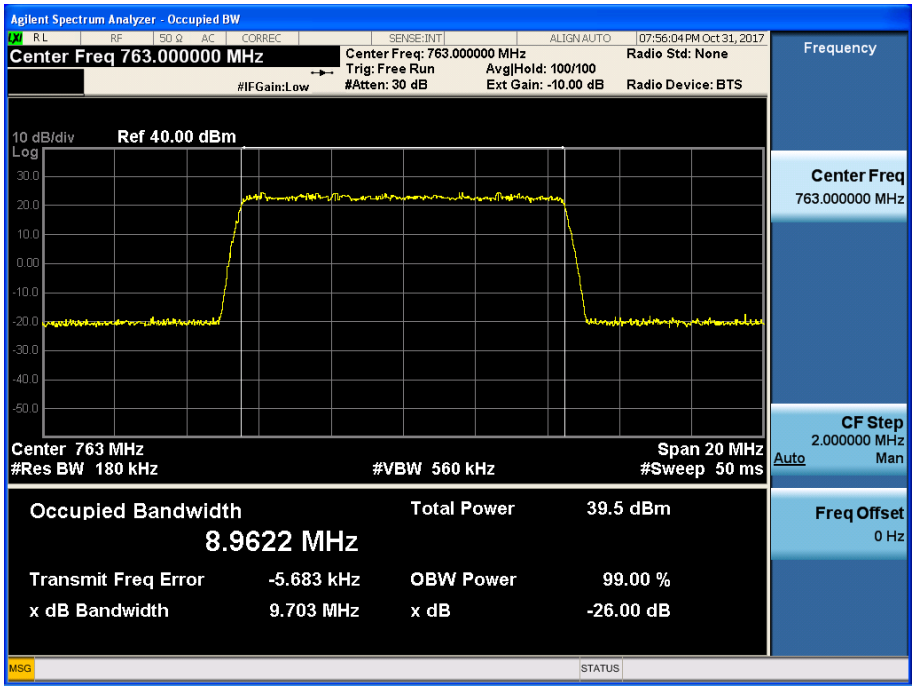


700 LTE(10 MHz)_DL Output

[QPSK Downlink - Middle]

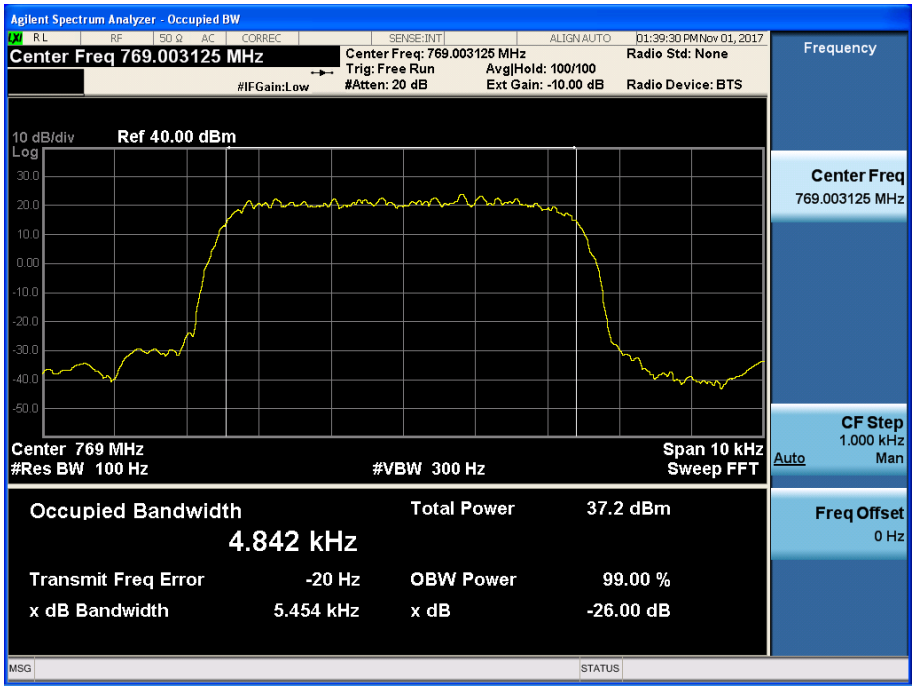


[16QAM Downlink - Middle]

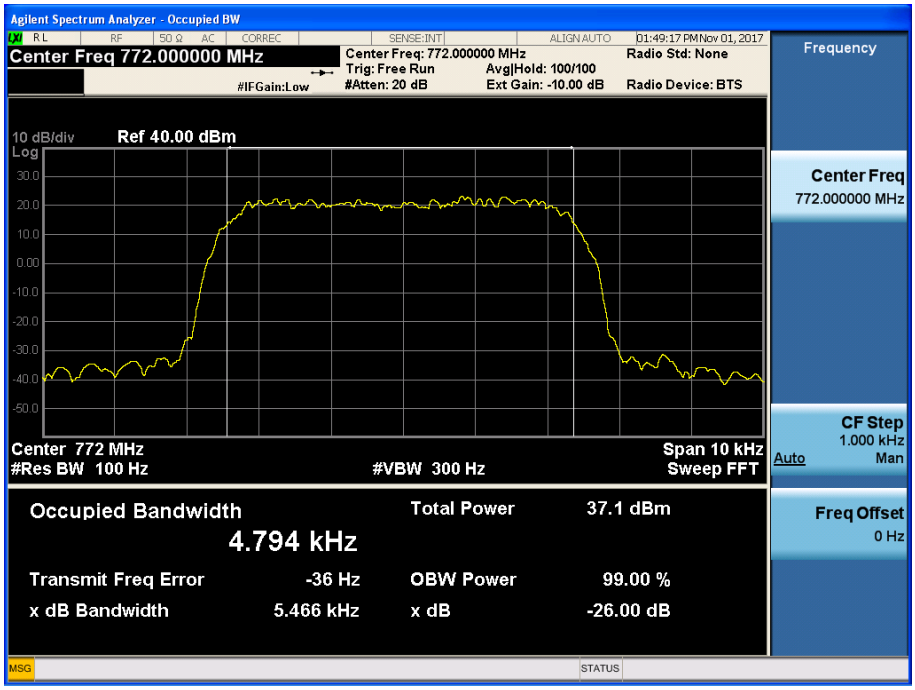


700 APCO 25(6.25 kHz)_DL Output

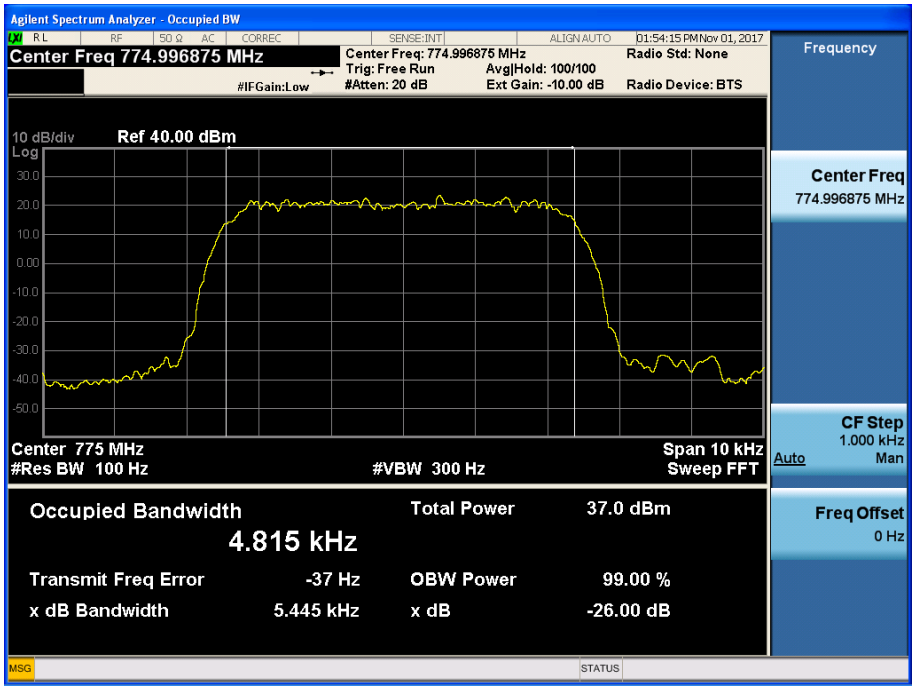
[AGC threshold Downlink - Low]



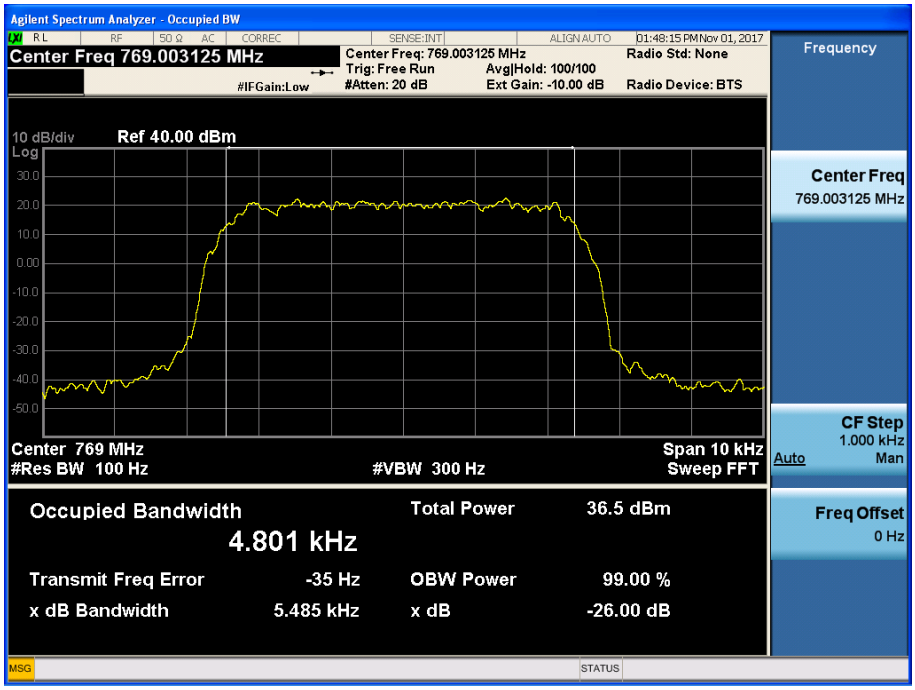
[AGC threshold Downlink - Middle]



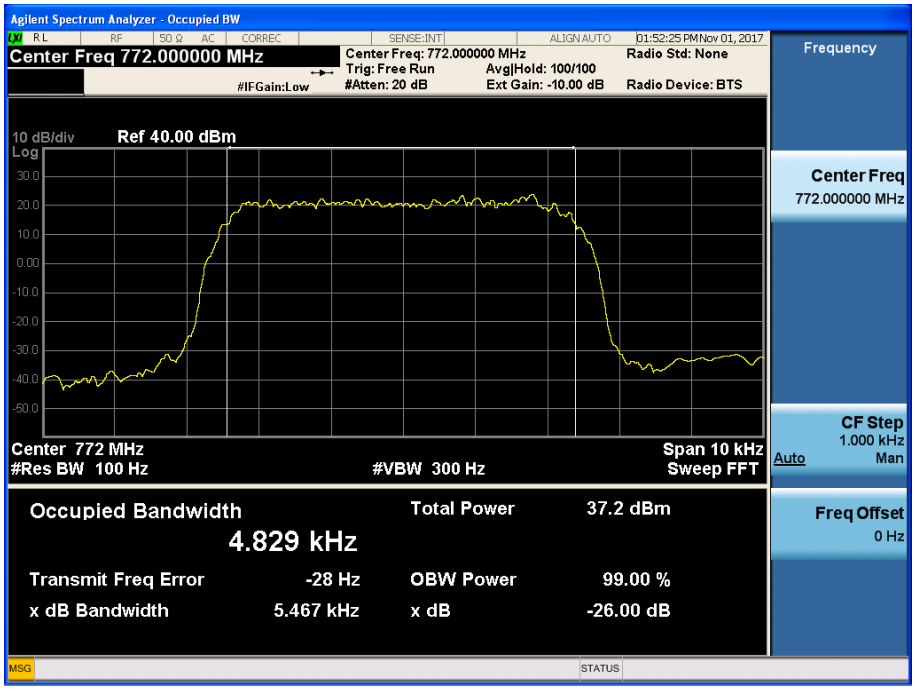
[AGC threshold Downlink - High]



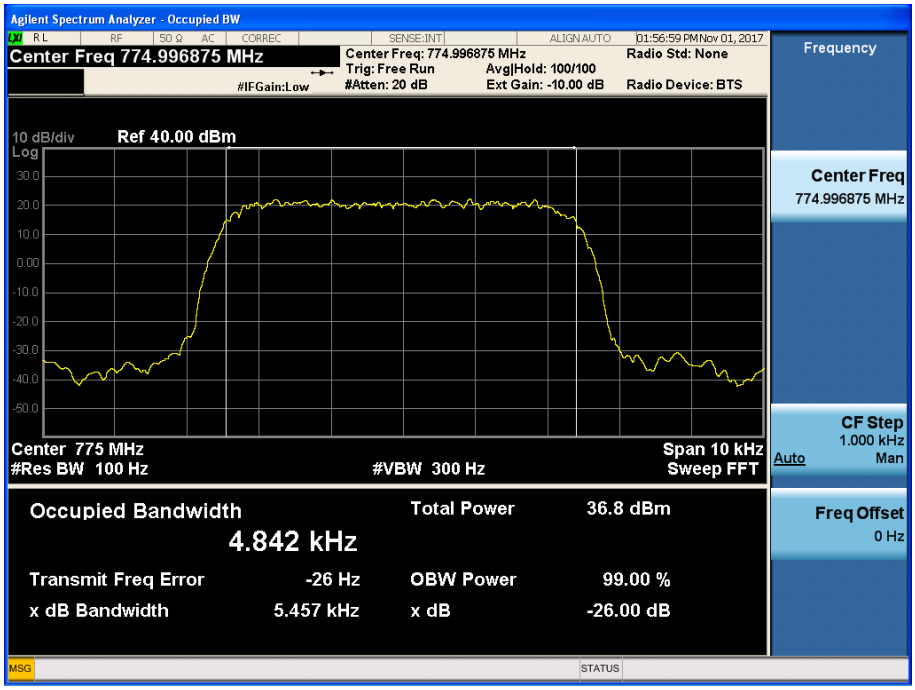
[+3dB above the AGC threshold Downlink - Low]



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

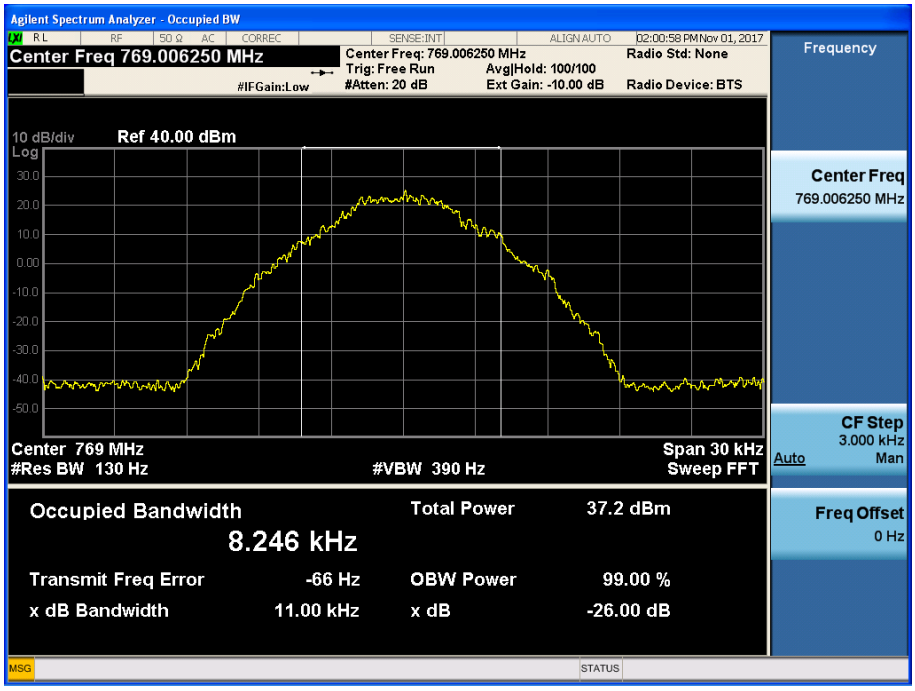


[+3dB above the AGC threshold Downlink - High]

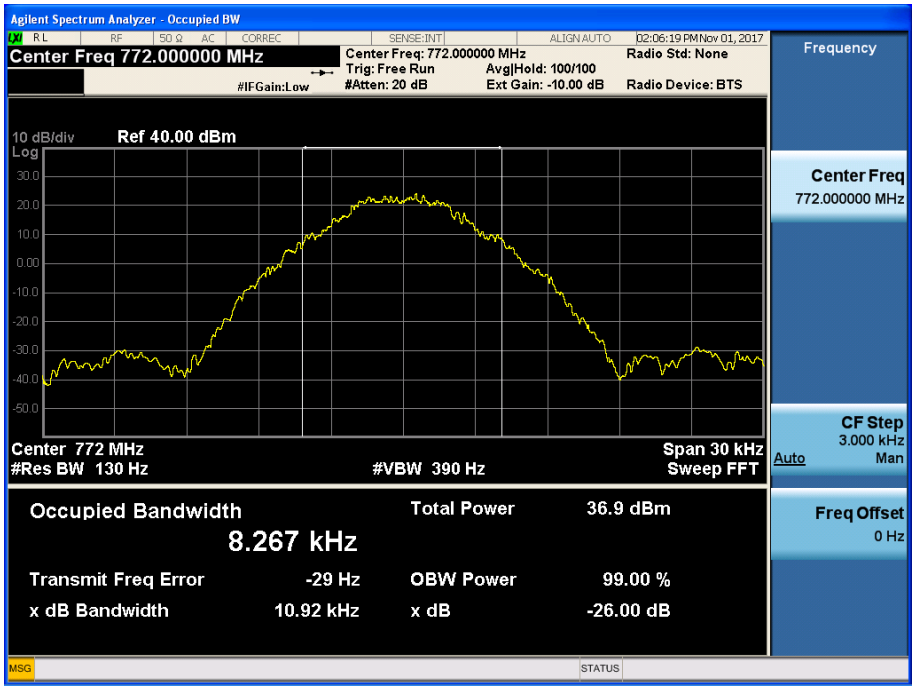


700 APCO 25(12.5 kHz)_DL Output

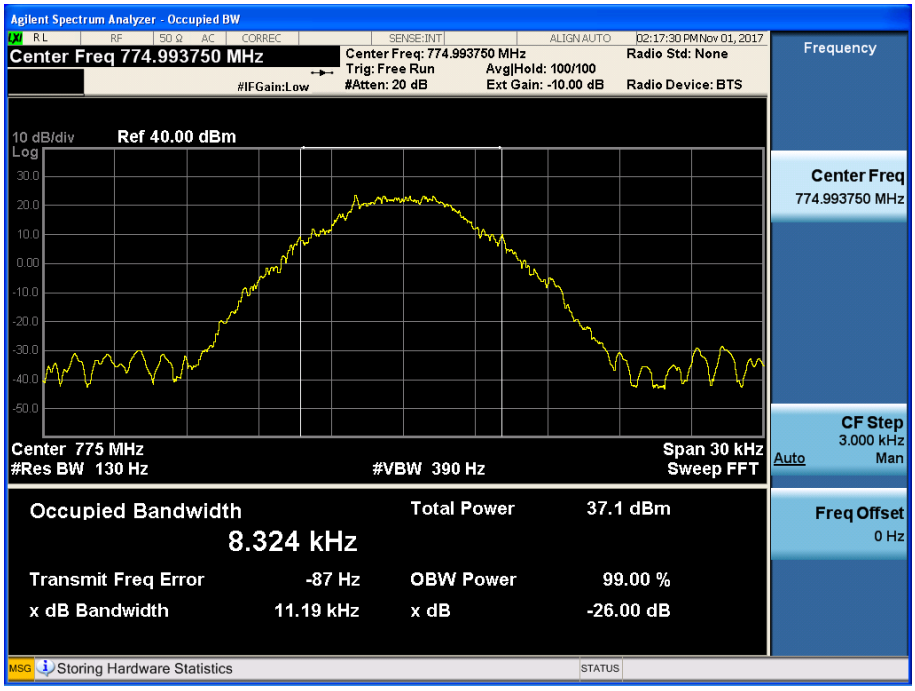
[AGC threshold Downlink - Low]



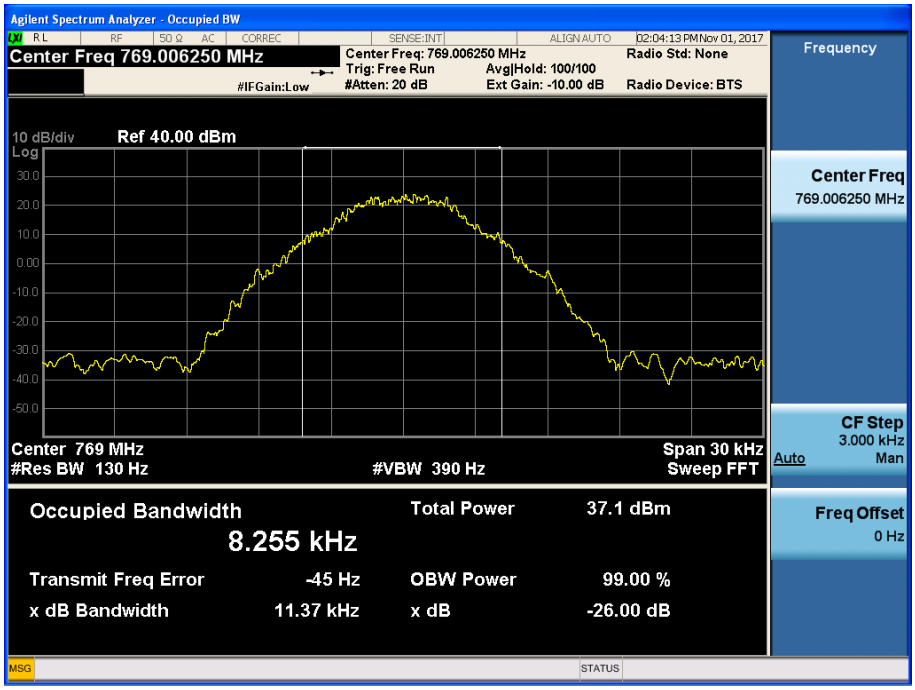
[AGC threshold Downlink - Middle]



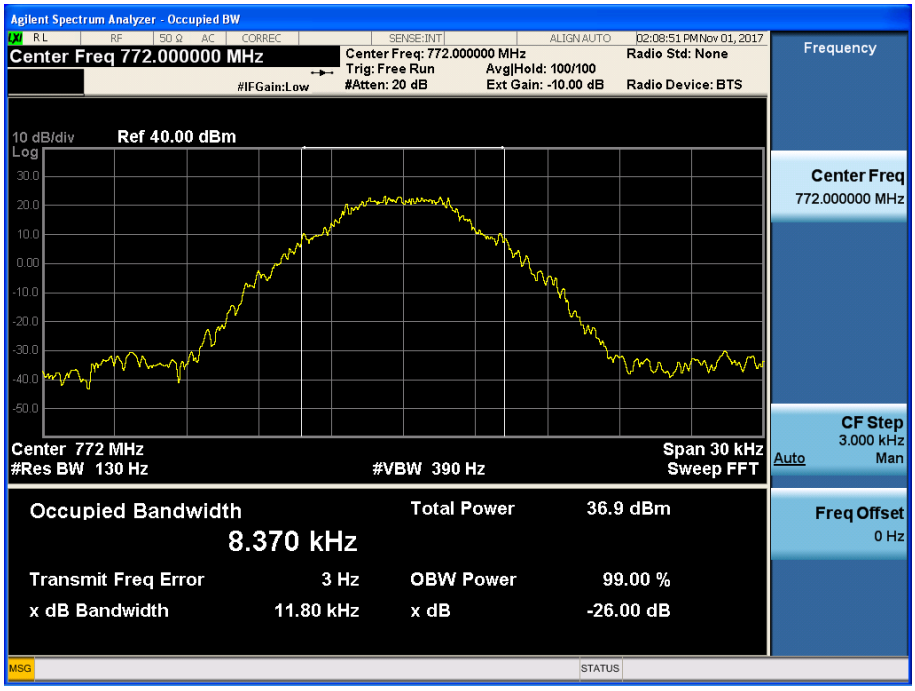
[AGC threshold Downlink - High]



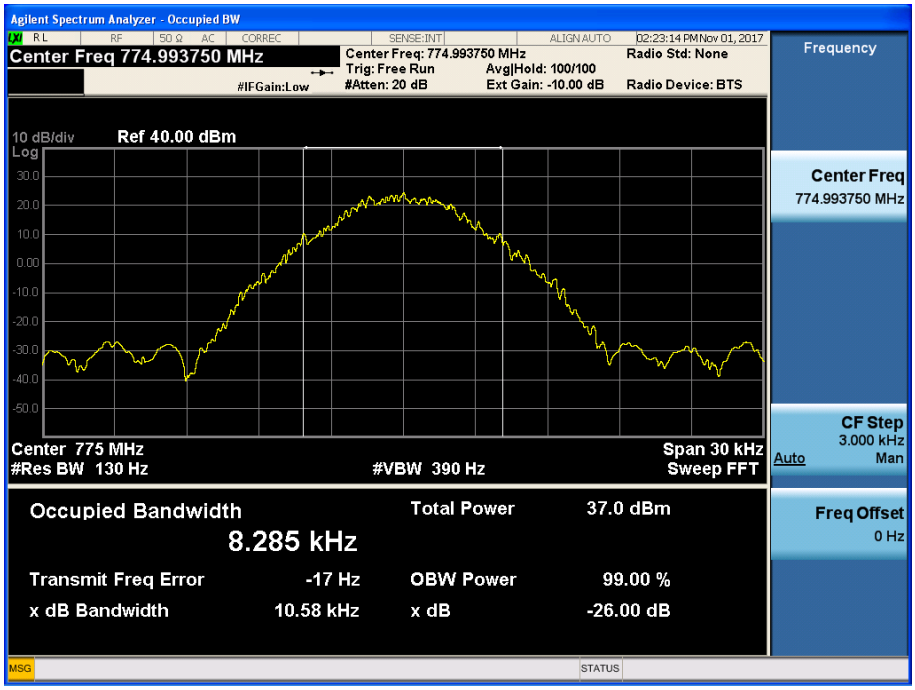
[+3dB above the AGC threshold Downlink - Low]



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

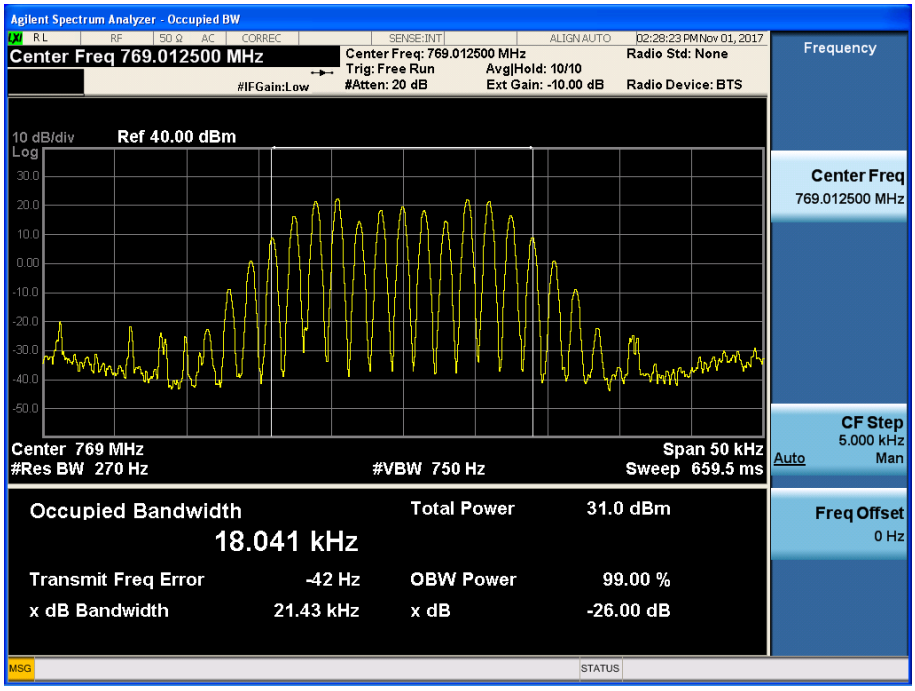


[+3dB above the AGC threshold Downlink - High]

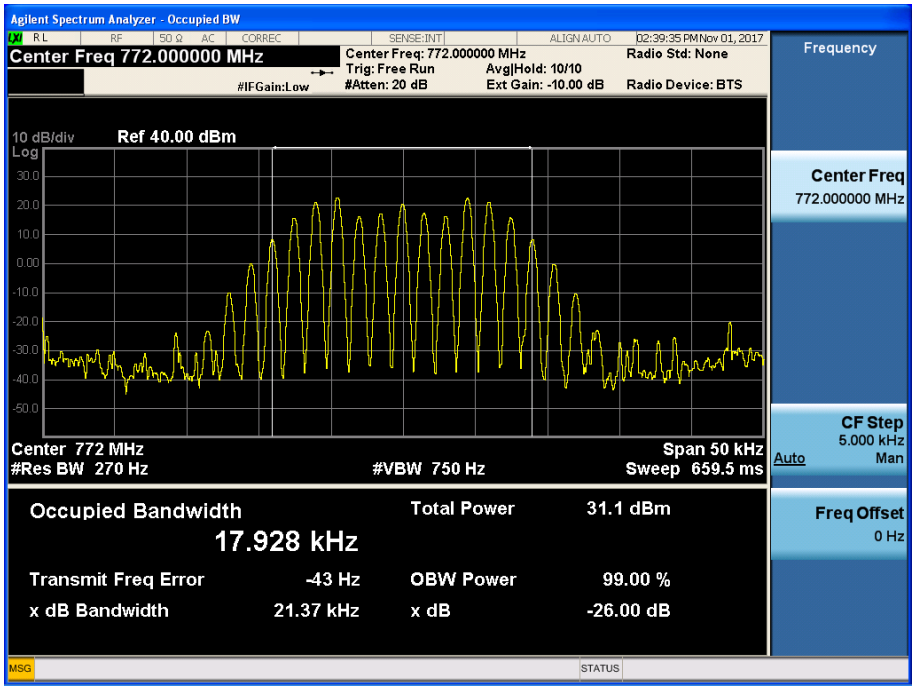


700 APCO 25(25 kHz)_DL Output

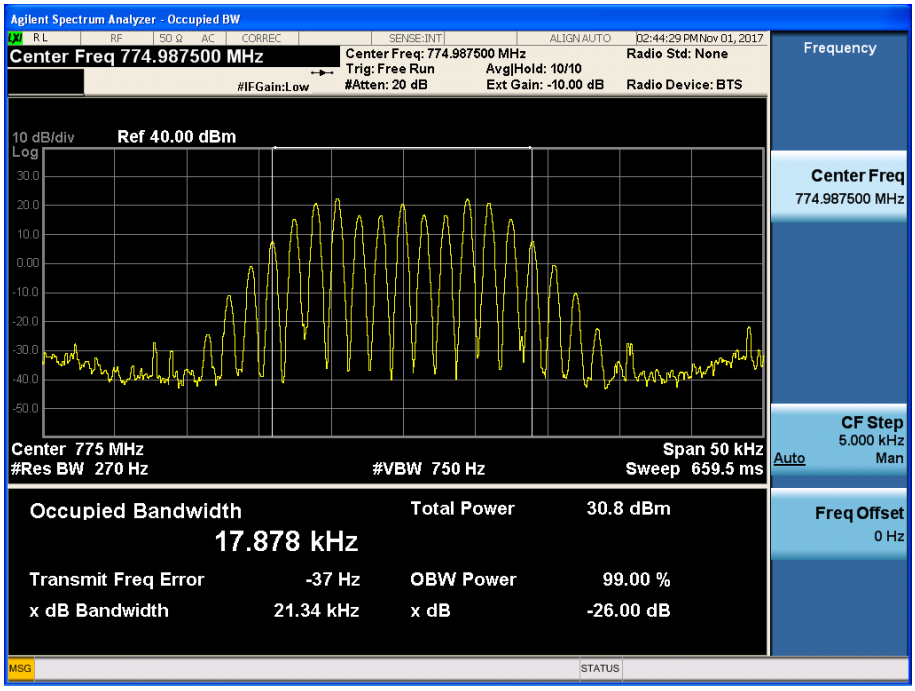
[AGC threshold Downlink - Low]



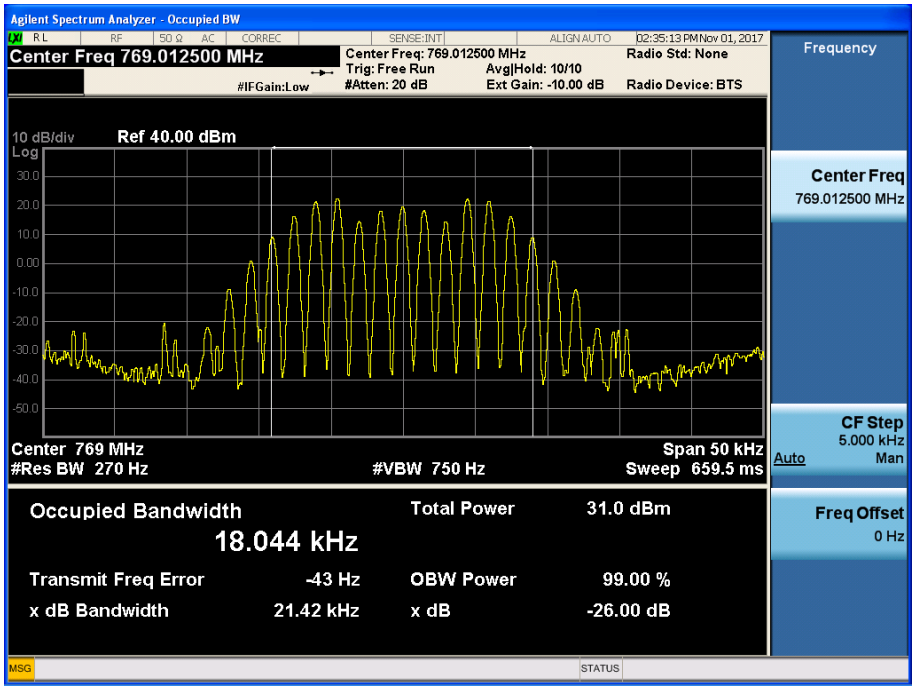
[AGC threshold Downlink - Middle]



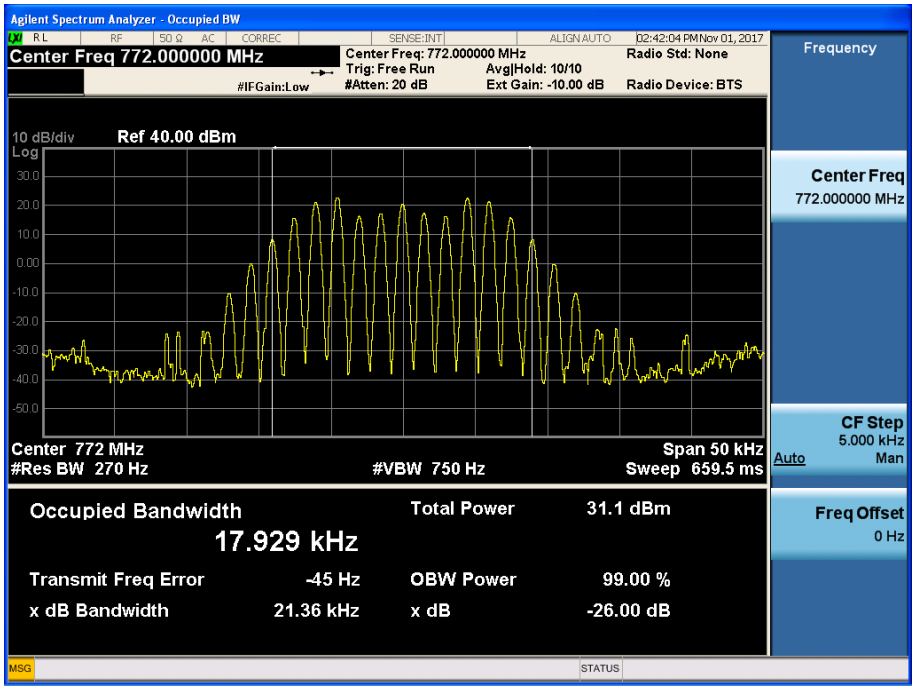
[AGC threshold Downlink - High]



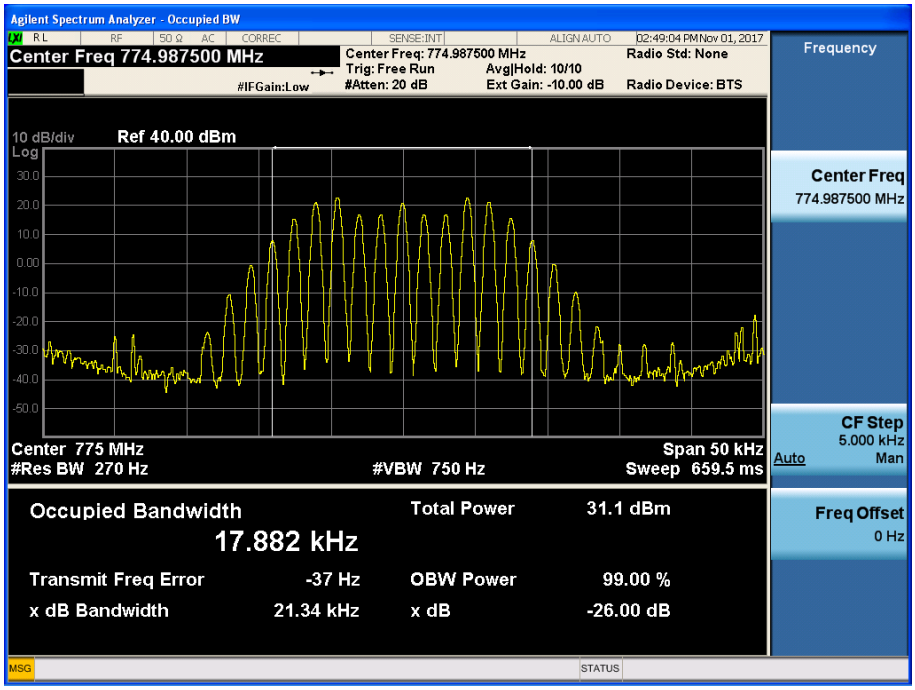
[+3dB above the AGC threshold Downlink - Low]



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

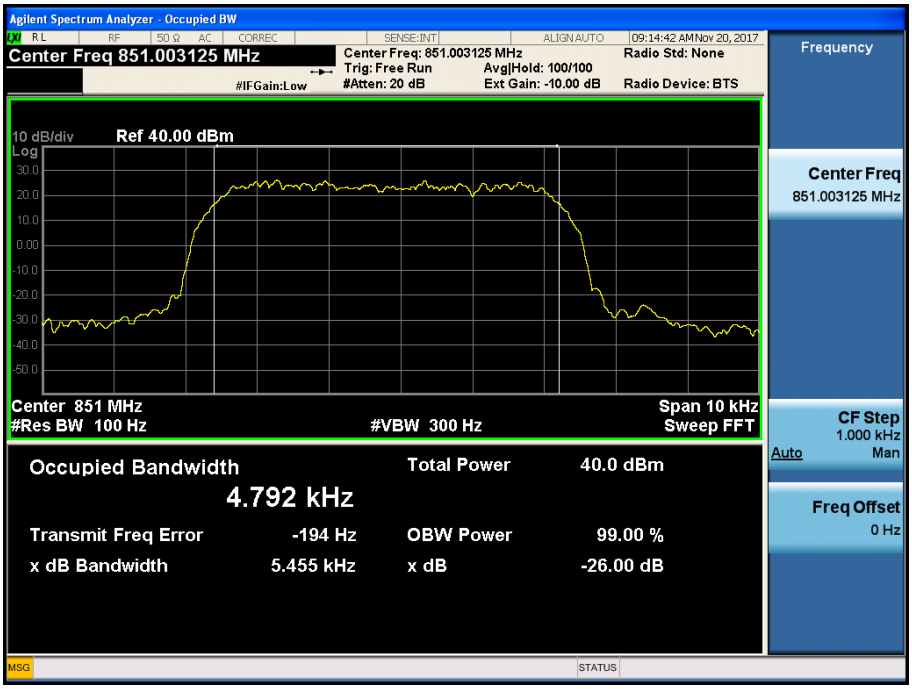


[+3dB above the AGC threshold Downlink - High]

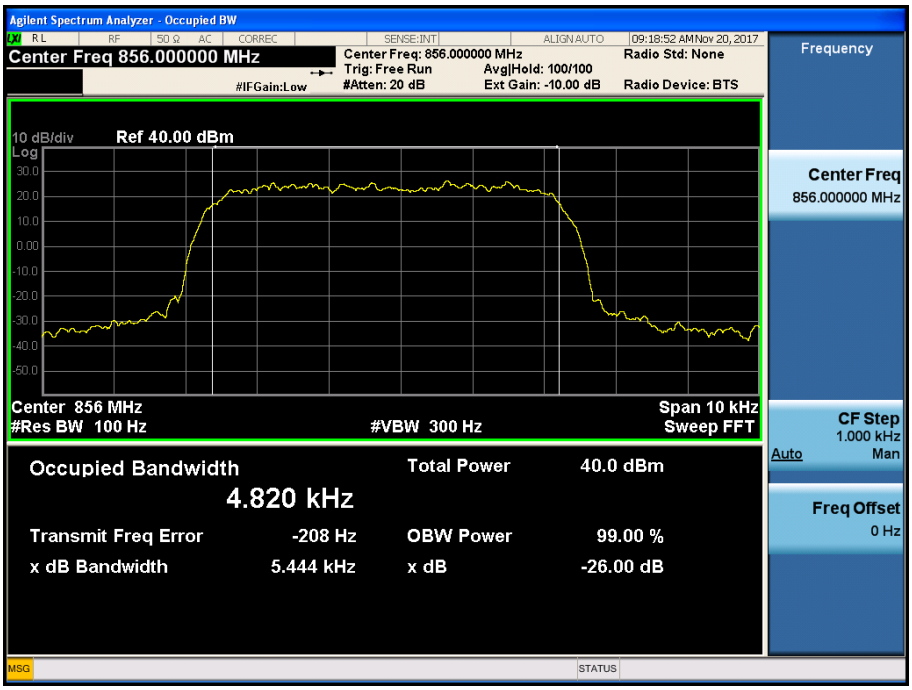


800 APCO 25(6.25 kHz)_DL Output

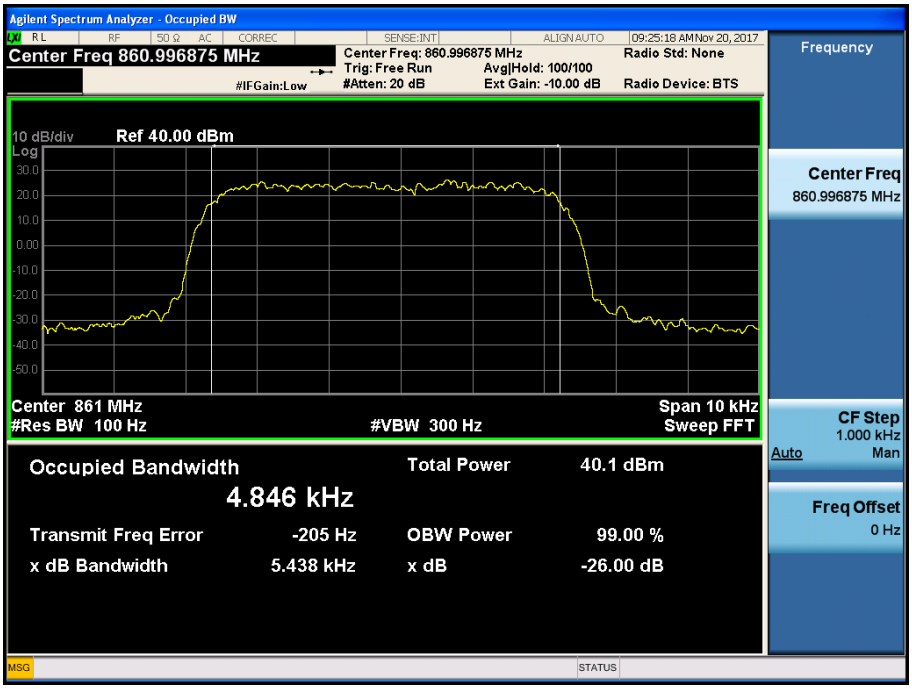
[AGC threshold Downlink - Low]



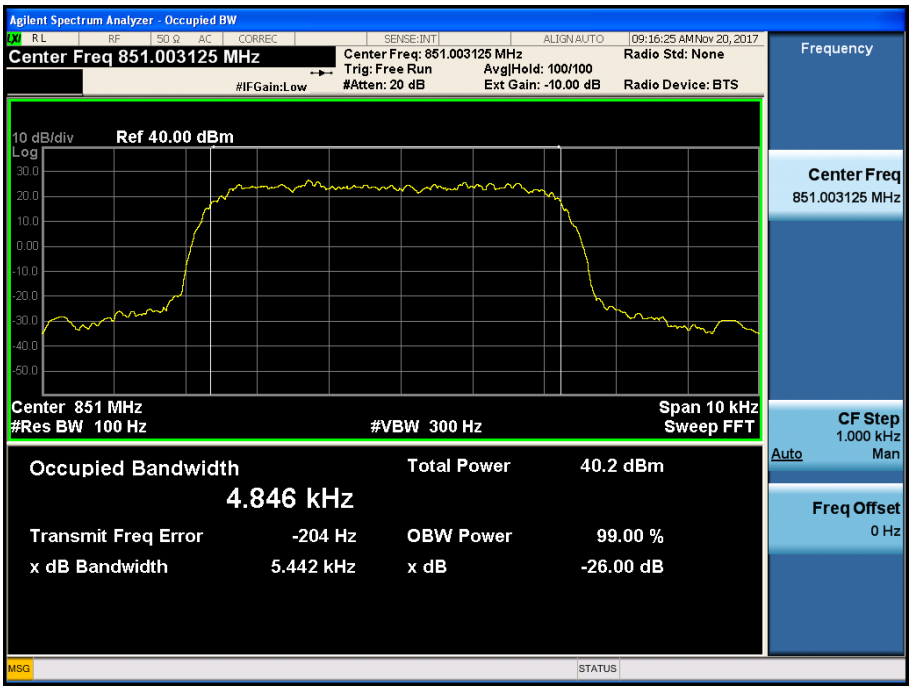
[AGC threshold Downlink - Middle]



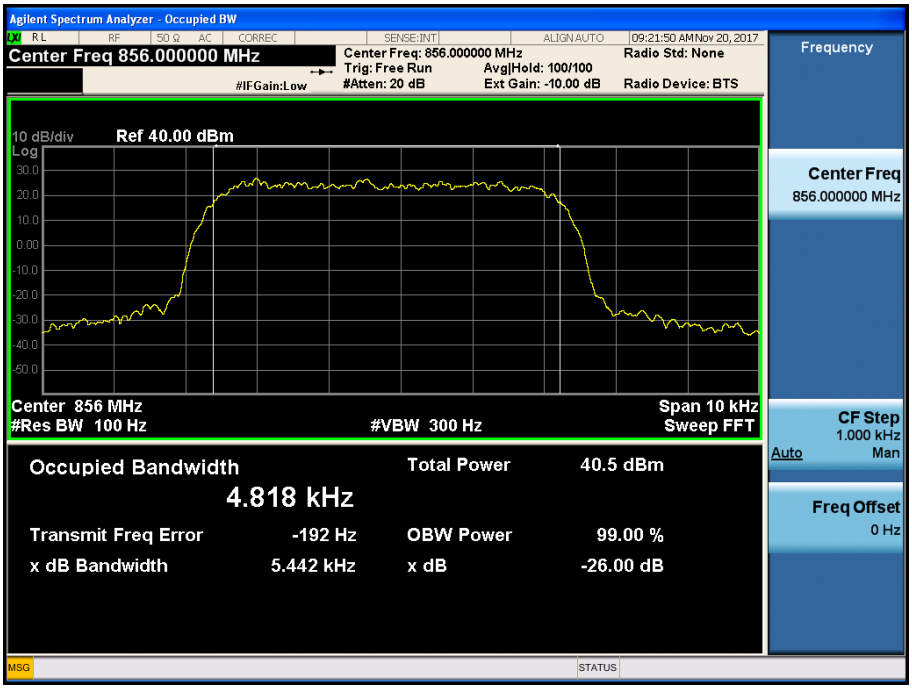
[AGC threshold Downlink - High]



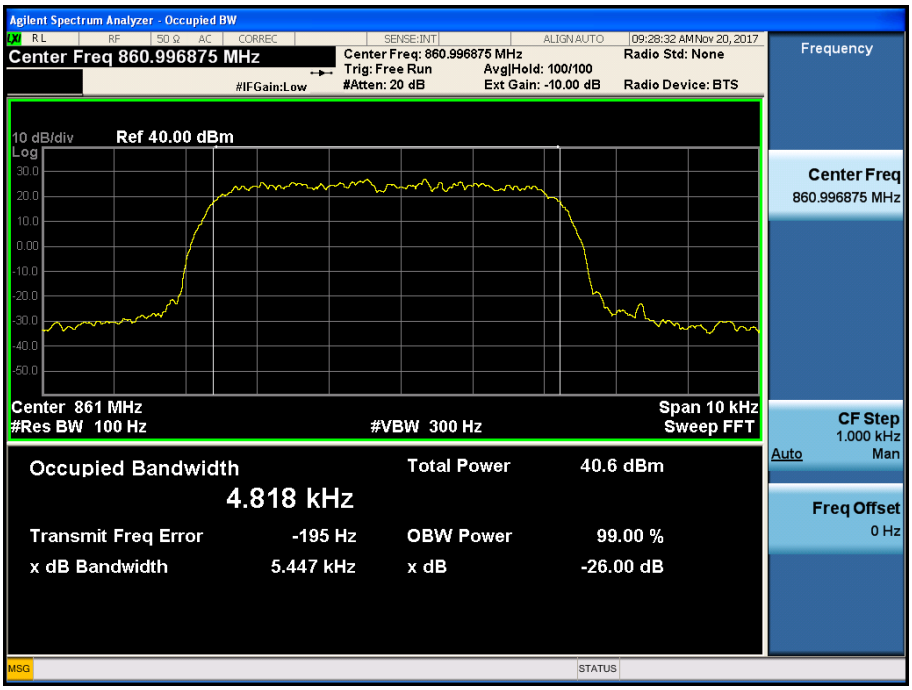
[+3dB above the AGC threshold Downlink - Low]



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

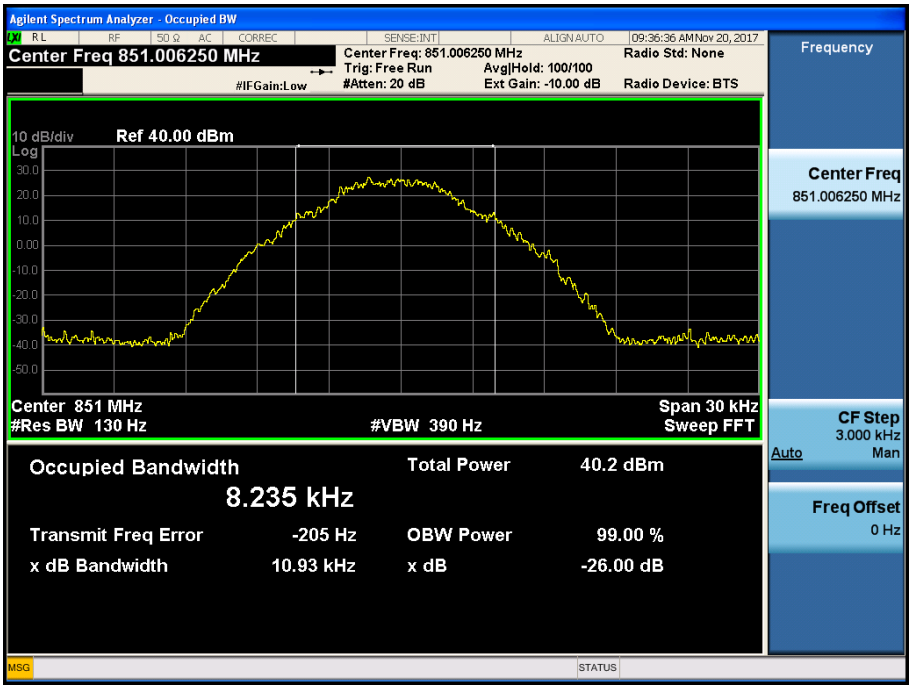


[+3dB above the AGC threshold Downlink - High]

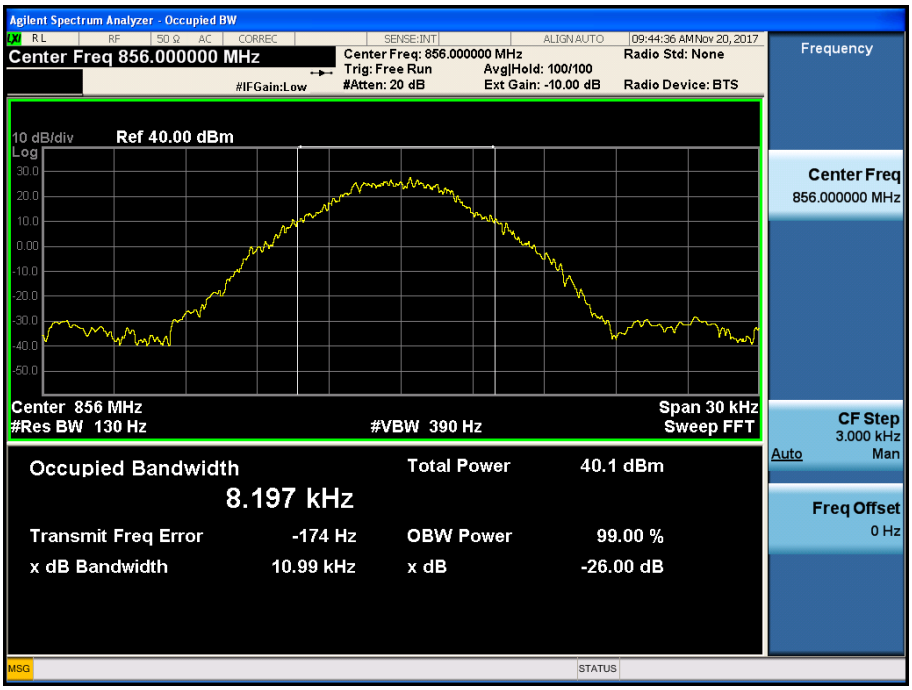


800 APCO 25(12.5 kHz)_DL Output

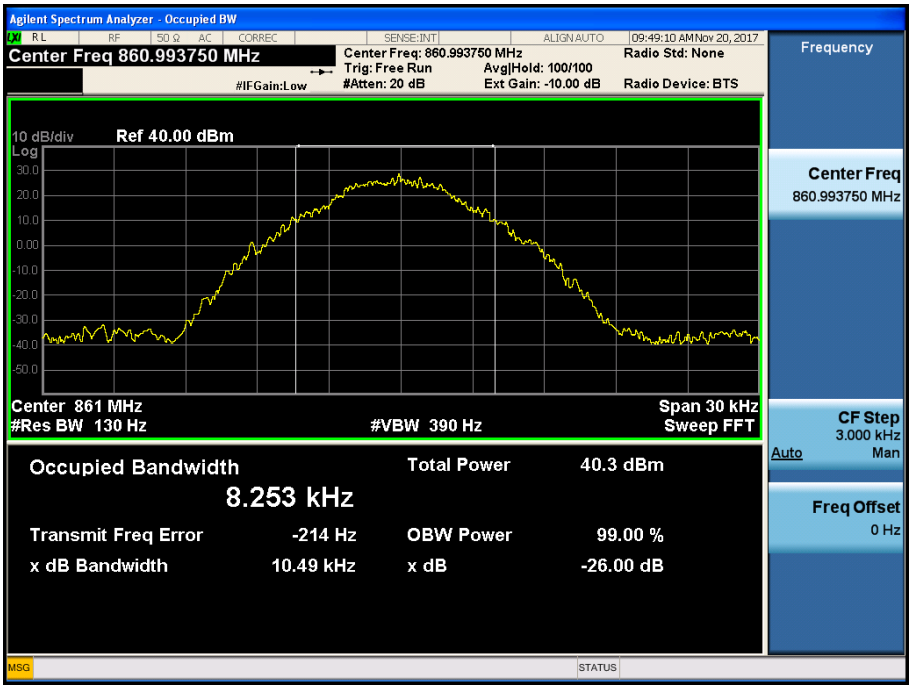
[AGC threshold Downlink - Low]



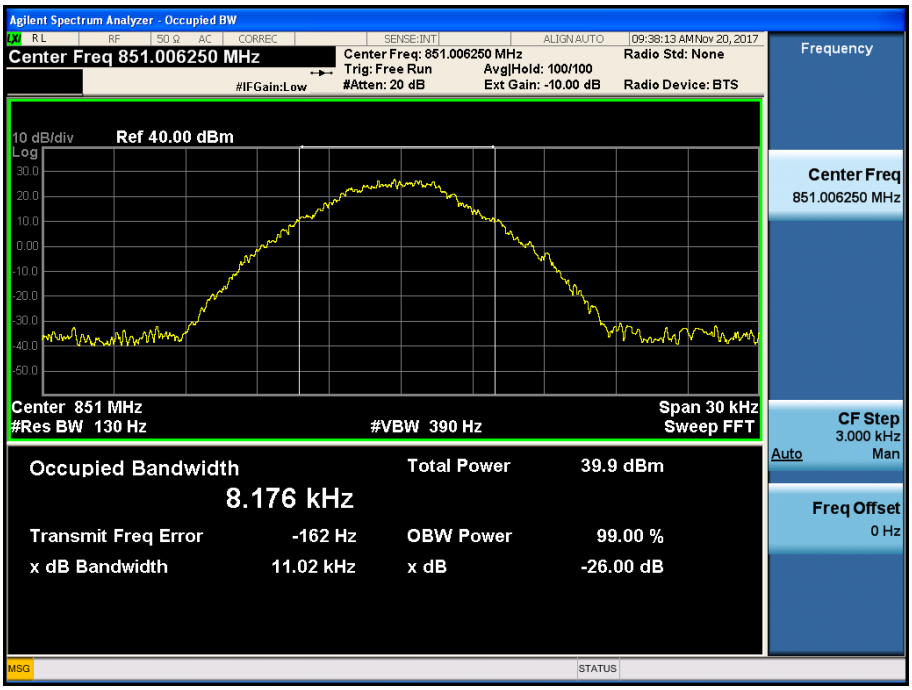
[AGC threshold Downlink - Middle]



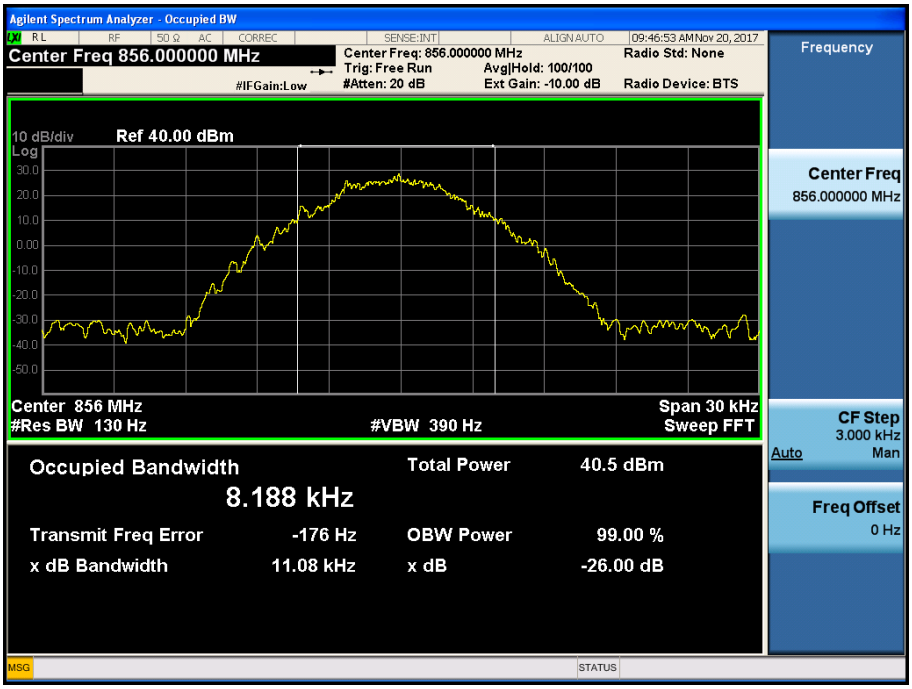
[AGC threshold Downlink - High]



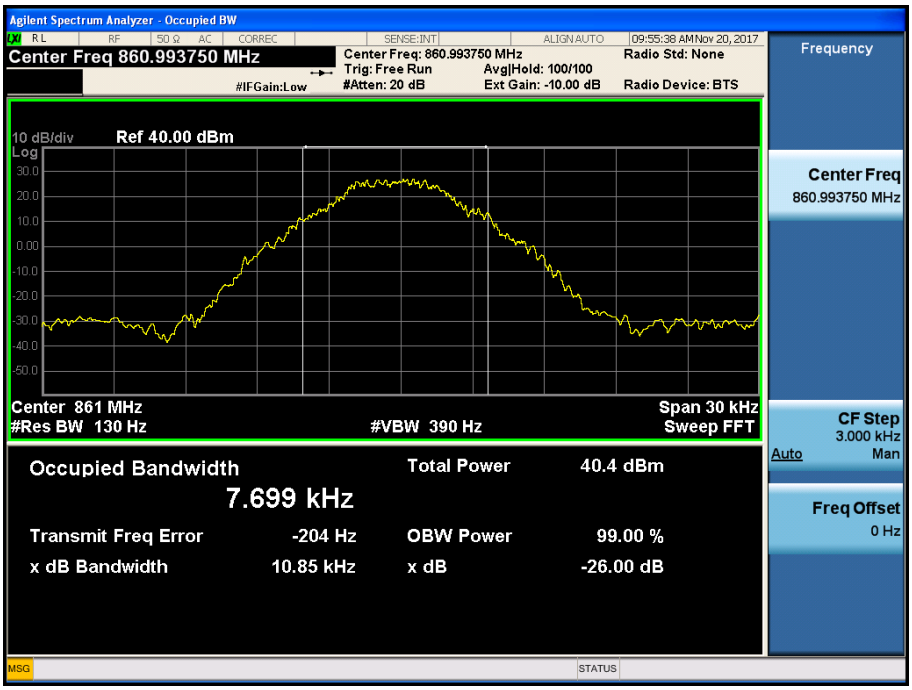
[+3dB above the AGC threshold Downlink - Low]



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

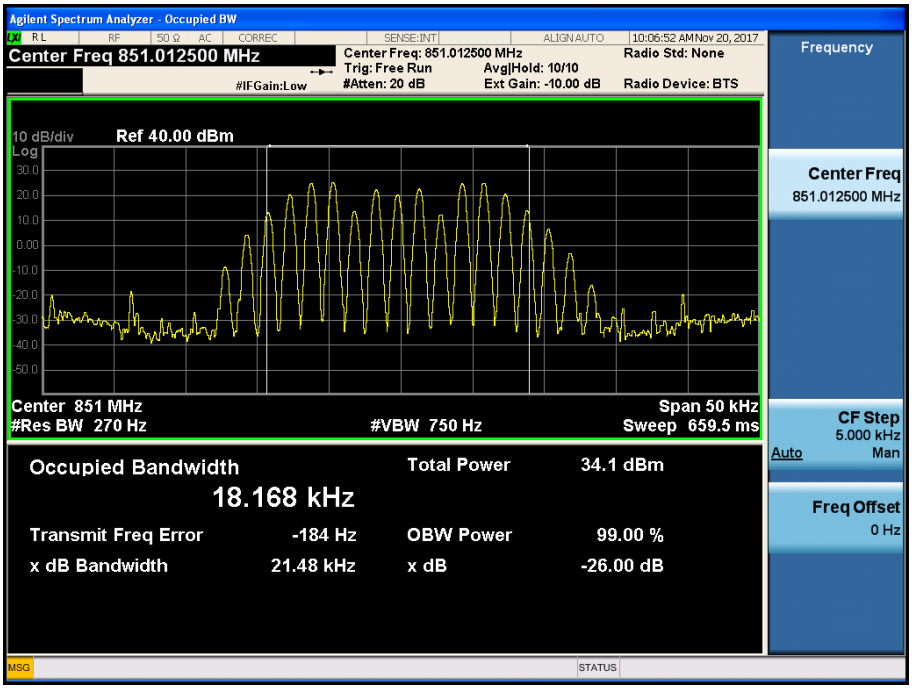


[+3dB above the AGC threshold Downlink - High]

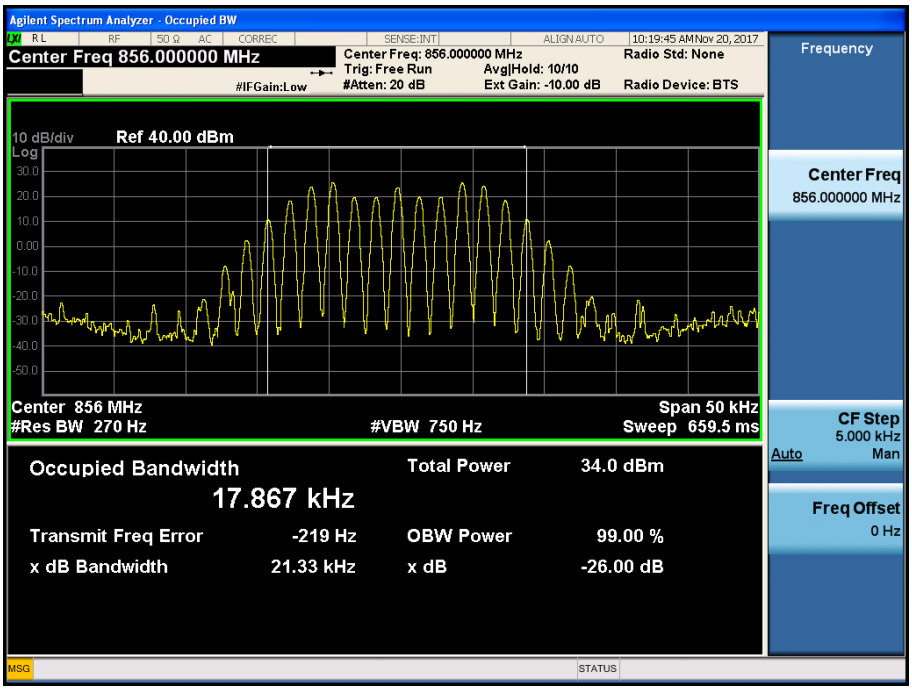


800 APCO 25(25 kHz)_DL Output

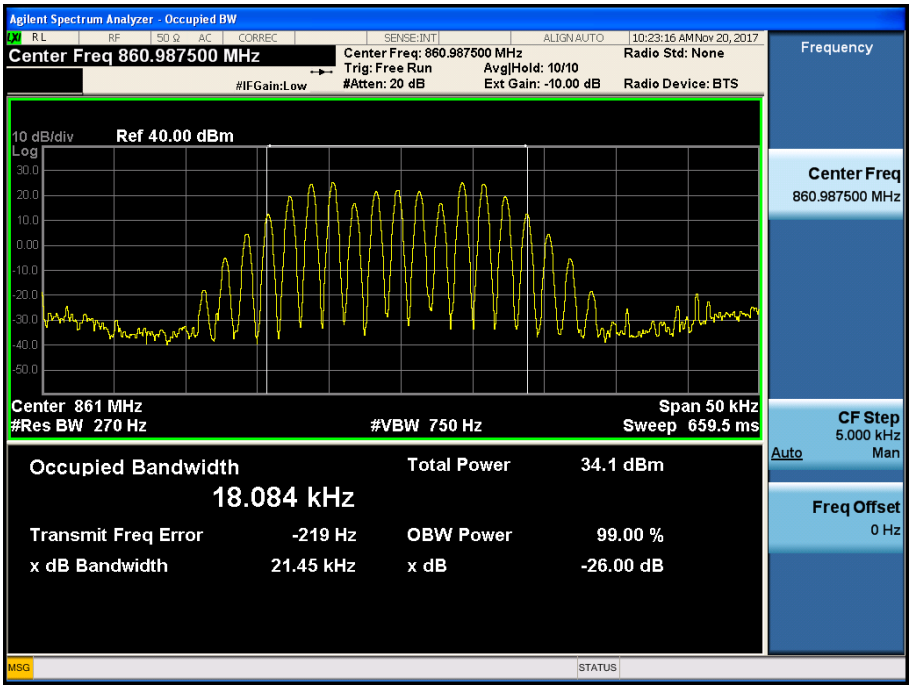
[AGC threshold Downlink - Low]



[AGC threshold Downlink - Middle]



[AGC threshold Downlink - High]



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