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 /ISED REPORT

Certification

Applicant Name:
ADVANCED RF TECHNOLOGIES, INC

Address:
3116 WEST VANOWEN STREET, BURBANK, CA 91505, USA

Date of Issue:
August 31, 2017
Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
Report No.: HCT-R-1707-F020-2
HCT FRN: 0005866421
ISED Registration No.: 5944A-5

FCC ID:	**N52-ADXV-HPR**
IC:	**6416A-ADXVHPR**
APPLICANT:	**ADVANCED RF TECHNOLOGIES, INC**

FCC/ IC Model(s):	ADXV-HPR
EUT Type:	DAS (DISTRIBUTED ANTENNA SYSTEM)
Frequency Ranges:	LTE 700 : 728 ~ 757 MHz (Downlink) / 698 ~ 787 MHz (Uplink) 800 MHz : 862 ~ 894 MHz (Downlink) / 817 ~ 849 MHz (Uplink) PCS 1900 : 1 930 ~ 1 995 MHz (Downlink) / 1 850 ~ 1 915 MHz (Uplink) AWS 2100 : 2 110 ~ 2 180 MHz (Downlink) WCS 2300 : 2 350 ~ 2 360 MHz (Downlink) / 2 305 ~ 2 315 MHz (Uplink) BRS 2600 : 2 496 ~ 2 690 MHz (Uplink / Downlink)
Conducted Output Power:	LTE 700, 800 MHz : 20 W (43 dBm, Downlink) / 0.1 mW (-10 dBm, Uplink) PCS 1900, AWS2100 : Downlink: 40 W (46 dBm) / Uplink: 0.1 mW (-10 dBm) WCS 2300 : 30.2 W (44.8 dBm, Downlink) / 0.1 mW (-10 dBm, Uplink) BRS 2600 : 40 W (46 dBm, Downlink) / 0.1 mW (-10 dBm, Uplink)
Date of Test:	March 13, 2017 ~ July 17, 2017
FCC Rule Part(s):	CFR 47 Part 2, Part 22, Part 24, Part 27, Part 90
IC Rules :	RSS-Gen (Issue 4, November 2014), RSS-131 (Issue 3, January 2017)

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from thisequipment 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 / IC Rules under normal use and maintenance.

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

Approved by : Jong Seok Lee
Manager of Telecommunication testing center

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1707-F020	July 28, 2017	- First Approval Report
HCT-R-1707-F020-1	August 21, 2017	- Added the SRSP 510, 516 on page 6. - Revised the title (OBW -> 26 dB BW) on page 192.
HCT-R-1707-F020-2	August 31, 2017	- Added note for maximum amp. Gain in Section 6 and 9.

Table of Contents

1. CLIENT INFORMATION

The EUT has been tested by request of

Applicant	ADVANCED RF TECHNOLOGIES, INC 3116 WEST VANOWEN STREET, BURBANK, CA 91505, USA
Manufacturer	ADRF Korea, inc 5-5, Mojeon-Ri, Backsa-Myun, Icheon-City, Kyunggi-Do, Korea

FCC ID:	N52-ADXV-HPR
IC:	6416A-ADXVHPR
EUT Type:	DAS (DISTRIBUTED ANTENNA SYSTEM)
FCC/ IC Model:	ADXV-HPR
Power Supply:	AC 110 / 220 V DC -48 V
Frequency Ranges:	LTE 700 : 728 ~ 757 MHz (Downlink) / 698 ~ 787 MHz (Uplink) 800 MHz : 862 ~ 894 MHz (Downlink) / 817 ~ 849 MHz (Uplink) PCS 1900 : 1 930 ~ 1 995 MHz (Downlink) / 1 850 ~ 1 915 MHz (Uplink) AWS 2100 : 2 110 ~ 2 180 MHz (Downlink) WCS 2300 : 2 350 ~ 2 360 MHz (Downlink) / 2 305 ~ 2 315 MHz (Uplink) BRS 2600 : 2 496 ~ 2 690 MHz (Uplink / Downlink)
Conducted Output Power:	LTE 700, 800 MHz : 20 W (43 dBm, Downlink) / 0.1 mW (-10 dBm, Uplink) PCS 1900, AWS2100 : Downlink: 40 W (46 dBm) / Uplink: 0.1 mW (-10 dBm) WCS 2300 : 30.2 W (44.8 dBm, Downlink) / 0.1 mW (-10 dBm, Uplink) BRS 2600 : 40 W (46 dBm, Downlink) / 0.1 mW (-10 dBm, Uplink)
Antenna Gain(s):	Manufacturer does not provide an antenna.
Measurement standard(s):	ANSI/TIA-603-D-2010, KDB 971168 D01 v02r02, KDB 935210 D05 v01r01, RSS-Gen, RSS-131
FCC Rule Part(s):	CFR 47 Part 2, Part 22, Part 24, Part 27, Part 90
IC Rules Part(s):	RSS-Gen (Issue 4, November 2014), RSS-131 (Issue 3, January 2017)
Place of Tests:	HCT CO., LTD. 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA(ISED Registration Number : 5944A-5)

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 22, Part 24, Part 27, Part 90, RSS-Gen, RSS-131.

Description	Reference (FCC)	Reference (IC)	Results
Conducted RF Output Power	§2.1046, §27.50 §22.913,§90.635 §24.232	RSS-130, Section 4.4 RSS-131, Section 4.1 RSS-199, Section 4.4 RSS-119, Section 5.4 RSS-132, Section 5.4 RSS-133, Section 6.4 RSS-139, Section 6.5 RSS-195, Section 5.5 SRSP-510, SRSP-516 SRSP-517, SRSP-518	Compliant
Occupied Bandwidth	§2.1049	RSS-Gen, Section 6.6	Compliant
Input-versus-output Spectrum	-	RSS-131 Section 5.2.2	Compliant
Out of Band Rejection & Mean Output Power and Zone Enhancer Gain	KDB 935210 D05 v01r01	RSS-131, Section 5.2.1 RSS-131, Section 5.2.3 RSS-131, Section 6.1	Compliant
Spurious Emissions at Antenna Terminals	§2.1051, §27.53 §22.917, §90.691 §24.232	RSS-130, Section 4.6 RSS-199, Section 4.5 RSS-131, Section 6.5 RSS-132, Section 5.5 RSS-133, Section 6.5 RSS-139, Section 6.6 RSS-195, Section 5.6	Compliant
Radiated Spurious Emissions	§2.1053, §27.53 §22.917, §90.691 §24.232	RSS-Gen, Section 7.1.2 RSS-133, Section 6.6	Compliant

Frequency Stability	§2.1055, §27.54 §22.917, §90.691 §27.235	RSS-131, Section 5.2.4 RSS-130, Section 4.3 RSS-199 Section 4.3 RSS-119, Section 5.3 RSS-132, Section 5.3 RSS-133, Section 6.3 RSS-139, Section 6.4 RSS-195, Section 5.4	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.
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.

* Note: This EUT is supported power supply both of AC and DC. Test results are only attached worst cases.

3.3. MAXIMUM MEASUREMENTUNCERTAINTY

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
Input-versus-output Spectrum		
Out of Band Rejection & Mean Output Power and Zone Enhancer Gain	Gain 20 dB bandwidth	± 0.89 dB ± 0.58 MHz
Transmitter unwanted emissions	-	± 1.08 dB
Radiated Spurious Emissions	f ≤ 1 GHz f > 1 GHz	± 4.80 dB ± 6.07 dB
Frequency Stability	-	± 1.22 x 10^{-6}

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	N5182A /Signal Generator	03/29/2017	Annual	MY50141649
Agilent	N5182A /Signal Generator	01/23/2017	Annual	MY47070406
Agilent	N9030A / Spectrum Analyzer	11/30/2016	Annual	MY49431210
Weinschel	67-30-33 / Fixed Attenuator	09/22/2016	Annual	N/A
Rohde&Schwarz	10 dB Attenuator	06/01/2017	Annual	N/A
Agilent	11636A / Power Divider	08/12/2016	Annual	09109
DEAYOUNG ENT	DFSS60 / AC Power Supply	04/05/2017	Annual	1003030-1
NANGYEUL CO., LTD.	NY-THR18750 / Temperature and Humidity Chamber	10/21/2016	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	12/11/2015	Biennial	9120D-1191
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	09/03/2015	Biennial	BBHA9170541
Rohde & Schwarz	FSP / Spectrum Analyzer	09/29/2016	Annual	836650/016
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	09/23/2016	Annual	101068-SZ
Wainwright Instruments	WHK1.2/15G-10EF / Highpass Filter	04/10/2017	Annual	4
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.

§ 27.50 Power limits and duty cycle.

(b) The following power and antenna height limits apply to transmitters operating in the 746-758 MHz, 775-788 MHz and 805-806 MHz bands:

(4) Fixed and base stations transmitting a signal in the 746-757 MHz and 776-787 MHz bands 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 in accordance with Table 3 of this section.

(5) 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 746-757 MHz and 776-787 MHz bands 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.

(c) The following power and antenna height requirements apply to stations transmitting in the 600 MHz band and the 698-746 MHz band:

(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 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, except for licensees operating in the 600 MHz downlink band, seeking to operate a fixed or base station 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 at an ERP greater than 1000 watts must:

(i) Coordinate in advance with all licensees authorized to operate in the 698-758 MHz, 775-788, and 805-806 MHz bands within 120 kilometers (75 miles) of the base or fixed station;

(ii) coordinate in advance with all regional planning committees, as identified in §90.527 of this chapter, with jurisdiction within 120 kilometers (75 miles) of the base or fixed station.

§ 22.913 Effective radiated power limits.

Licensees in the Cellular Radiotelephone Service are subject to the effective radiated power (ERP) limits and other requirements in this Section. *See also* §22.169.

(a) *Maximum ERP.* The ERP of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(1) Except as described in paragraphs (a)(2), (3), and (4) of this section, the ERP of base stations and DAS (Distributed Antenna System)s must not exceed—

(i) 500 watts per emission; or

(ii) 400 watts/MHz (PSD) per sector.

(2) Except as described in paragraphs (a)(3) and (4) of this section, for systems operating in areas more than 72 kilometers (45 miles) from international borders that:

(i) Are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census; or

(ii) Extend coverage into Unserved Area on a secondary basis (*see* §22.949), the ERP of base transmitters and DAS (Distributed Antenna System)s must not exceed—

(A) 1000 watts per emission; or

(B) 800 watts/MHz (PSD) per sector.

(3) Provided that they also comply with paragraphs (b) and (c) of this section, licensees are permitted to operate their base transmitters and DAS (Distributed Antenna System)s with an

ERP greater than 400 watts/MHz (PSD) per sector, up to a maximum ERP of 1000 watts/MHz (PSD) per sector unless they meet the conditions in paragraph (a)(4) of this section.

(4) Provided that they also comply with paragraphs (b) and (c) of this section, licensees of systems operating in areas more than 72 kilometers (45 miles) from international borders that:

(i) Are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census; or

(ii) Extend coverage into Unserved Area on a secondary basis (*see* §22.949), are permitted to operate base transmitters and DAS (Distributed Antenna System)s with an ERP greater than 800 watts/MHz (PSD) per sector, up to a maximum of 2000 watts/MHz (PSD) per sector.

(5) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

§ 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.

(b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).

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

§ 24.232 Power and antenna height limits.

(a)(1) Base stations with an emission bandwidth of 1 MHz or less are limited to 1640 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

(3) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; *see* Tables 1 and 2 of this section.

(4) The service area boundary limit and microwave protection criteria specified in §§24.236 and 24.237 apply.

Table 1—Reduced Power for Base Station Antenna Heights Over 300 Meters, With Emission Bandwidth of 1 MHz or Less

HAAT in meters	Maximum EIRP watts
≤300	1640
≤500	1070
≤1000	490
≤1500	270
≤2000	160

Table 2—Reduced Power for Base Station Antenna Heights Over 300 Meters, With Emission Bandwidth Greater Than 1 MHz

HAAT in meters	Maximum EIRP watts/MHz
≤300	1640
≤500	1070
≤1000	490
≤1500	270
≤2000	160

(b)(1) Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth of 1 MHz or less are limited to 3280 watts equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

(2) Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth greater than 1 MHz are limited to 3280 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

(3) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; *see* Tables 3 and 4 of this section.

(4) The service area boundary limit and microwave protection criteria specified in §§24.236 and 24.237 apply.

(5) Operation under this paragraph (b) at power limits greater than permitted under paragraph (a) of this section must be coordinated in advance with all broadband PCS licensees authorized to operate on adjacent frequency blocks within 120 kilometers (75 miles) of the base station and is limited to base stations located more than 120 kilometers (75 miles) from the Canadian border and more than 75 kilometers (45 miles) from the Mexican border.

Table 3—Reduced Power for Base Station Antenna Heights Over 300 Meters, With Emission Bandwidth of 1 MHz or Less

HAAT in meters	Maximum EIRP watts
≤300	3280
≤500	2140
≤1000	980
≤1500	540
≤2000	320

Table 4—Reduced Power for Base Station Antenna Heights Over 300 Meters, With Emission Bandwidth Greater Than 1 MHz

HAAT in meters	Maximum EIRP watts/MHz
≤300	3280
≤500	2140
≤1000	980
≤1500	540
≤2000	320

(c) Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

(d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

(e) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an 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, sensitivity, *etc.*, so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

Note to §24.232: Height above average terrain (HAAT) is to be calculated using the method set forth in §24.53 of this part.

IC Rules

Test Requirements:

RSS-130

4. Transmitter and Receiver Standard Specifications

4.4 Transmitter Output Power and Equivalent Isotropic Radiated Power (e.i.r.p.)

The transmitter output power shall be measured in terms of average power.

For base and fixed equipment, refer to SRSP-518 for power limits.

The e.i.r.p. shall not exceed 50 watts for mobile equipment or for outdoor fixed subscriber equipment, nor shall it exceed 5 watts for portable equipment or for indoor fixed subscriber equipment.

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission.

RSS-131

4. Measurement Methods

4.1 Output power

Unless indicated otherwise in the applicable standards of the equipment with which the zone enhancer is to be used, the output power and noise limit of the zone enhancer shall be measured in terms of root-mean-square (RMS) average value.

RSS-119

5. Transmitter and Receiver Specifications

5.4 Transmitter Output Power

The output power shall be within ±1 dB of the manufacturer's rated power listed in the equipment specifications.

The transmitter output power limits set forth in Table 2 will come into force upon the publication of Issue 12 of this standard and will apply to newly certified equipment.

Table 2 —Transmitter Output Power

Frequency Bands (MHz)	Transmitter Output Power (W)	
	Base/Fixed Equipment	Mobile Equipment
27.41-28 and 29.7-50	300	30

72-76	No limit	1
138-174	110	60
217-218 and 219-220	110	30
220-222	See SRSP-512 for ERP limit	50
406.1-430 and 450-470	110	60
768-776 and 798-806	See SRSP-511 for ERP limit	30 3 W ERP for portable equipment
806-821/851-866 and 821-824/866-869	110	30
896-901/935-940	110	60
929-930/931-932	110	30
928-929/952-953 and 932-932.5/941-941.5	110	30
932.5-935/941.5-944	110	30

RSS-132

5. Transmitter Standard Specifications

5.4 Transmitter Output Power and Equivalent Isotropically Radiated Power

The transmitter output power shall be measured in terms of average power. The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment shall not exceed 11.5 watts. Refer to SRSP-503 for base station e.i.r.p. limits.

In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

RSS-133

6. Transmitter and Receiver Standard Specifications

6.4 Transmitter Output Power and Equivalent Isotropically Radiated Power

The equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510. Moreover, base station transmitters operating in the band 1930-1995 MHz shall not have output power exceeding 100 watts.

In addition, the transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

RSS-139

6. Transmitter Standard Specifications

6.5 Transmitter Output Power

The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters shall not exceed one watt. The e.i.r.p. for fixed and base stations in the band 1710-1780 MHz shall not exceed one watt.

Consult SRSP-513 for e.i.r.p. limits on fixed and base stations operating in the band 2110-2180 MHz.

In addition, the peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.

RSS-195

5. Transmitter and Receiver Standard Specifications

5.5 Transmitter Output Power and Equivalent Isotropically Radiated Power

The equivalent isotropically radiated power (e.i.r.p.) of base and fixed station equipment shall comply with the e.i.r.p. limit in SRSP-516.

The e.i.r.p. of fixed subscriber equipment shall not exceed 20 W/5 MHz.

The e.i.r.p. of mobile or portable equipment transmitting in the band 2305-2315 MHz or the band 2350-2360 MHz, employing 3GPP LTE (Third Generation Partnership Project Long Term Evolution) standards, shall not exceed 250 mW within any 5 MHz bandwidth. For other technologies, the e.i.r.p. shall not exceed 50 mW within any 1 MHz bandwidth.

5.5.1 Peak to Average Power Ratio (PAPR) for Base and Fixed Station Equipment in the Frequency Ranges 2305-2315 MHz and 2350-2360 MHz

The PAPR of the transmitter output power of base and fixed station equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.

RSS-199

4. Transmitter and receiver standard specifications

4.4 Transmitter output power and equivalent isotropically radiated power (e.i.r.p.)

The transmitter output power shall be measured in terms of average value.

For base station equipment, refer to SRSP-517 for the maximum permissible e.i.r.p.

SRSP-517

5. Technical Criteria

5.1 Radiated Power Limits and Antenna Height Limits

5.1.1 Fixed and Base Stations

Fixed and base stations (except fixed subscriber stations) are limited to a maximum ermissible equivalent isotropically radiated power (e.i.r.p.) of 1640 W/MHz (i.e. no more than 1640 W e.i.r.p. in any 1 MHz band segment) with an antenna height above average terrain (HAAT) up to 300 metres. For all installations with antenna HAAT in excess of 300 metres, a corresponding reduction in e.i.r.p. according to Table 2 shall be applied.

Table 2 — Reduction to Maximum Allowable E.I.R.P. for HAAT > 300 m	
HAAT (m)	**Reduction in maximum e.i.r.p. (dB)**
300 < HAAT ≤500	2
500 < HAAT ≤1,000	5
1,000 < HAAT ≤1,500	8
1,500 < HAAT ≤2,000	10

5.1.2 Subscriber Stations

Maximum e.i.r.p. limits are specified in RSS-199, Issue 2, *Broadband Radio Service (BRS) Equipment Operating in the Band 2500-2690 MHz*. Subscriber stations should employ automatic transmit power control such that stations operate on the minimum required power.

Test Procedures:

Measurements were in accordance with the test methods section 3.5.2 of KDB 935210 D05 v01r01.

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.

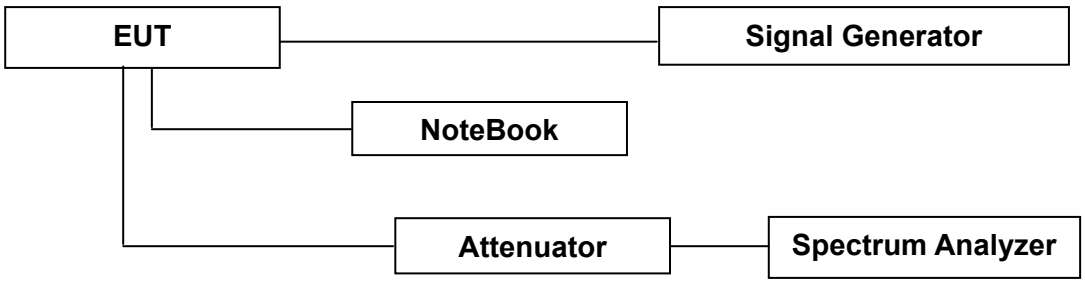
h) Repeat steps f) and g) with input signal amplitude set to 3 dB above the AGC threshold level.

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 D01 v02r02.



Block Diagram 1. RF Power Output Test Setup

Test Results:

[700 LTE, 800 MHz]

Input Signal	Input Level	Maximum Amp Gain
700 LTE, 800 MHz	DL: -8 dBm	DL : 51 dB
	UL: -45 dBm	UL : 35 dB

[PCS 1900]

Input Signal	Input Level (dBm)		Maximum Amp Gain (dB)	
	DL	UL	DL	UL
LTE 20 MHz	-8	-45	54	35
CDMA				

[AWS 2100]

Input Signal	Input Level	Maximum Amp Gain
AWS 2100	DL: -8 dBm	DL : 54 dB

[WCS 2300]

Input Signal	Input Level (dBm)		Maximum Amp Gain (dB)	
	DL	UL	DL	UL
2300_WCS	-8 dBm	-45 dBm	52.8 dB	35 dB

[BRS 2600]

Input Signal	Input Level (dBm)	Maximum Amp Gain
BRS 2600	DL: -8 dBm	DL : 54 dB
	UL: -45 dBm	UL : 35 dB

*** Note:**

1. The Maximum Amp Gain values in the above table are the RU gain value except HeadEnd for DL and HeadEnd + RU gain value for UL.
2. These tests were measured according to the each gain values.(DL: RU gain, UL: HeadEnd + RU gain)
3. Due to EUT's ALC function (Auto Level Control), even if input signal is increased, The same output power is transmit.

[Downlink] – 700 LTE

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
700 LTE Band_ LTE 10 MHz AGC threshold	Low	733.00	42.96	19.770
	Middle	742.00	42.97	19.815
	High	751.00	42.92	19.588
700 LTE Band_ LTE 10 MHz +3dBm above the AGC threshold	Low	733.00	42.94	19.679
	Middle	742.00	42.81	19.099
	High	751.00	42.96	19.770

[Uplink_Lower] - 700 LTE

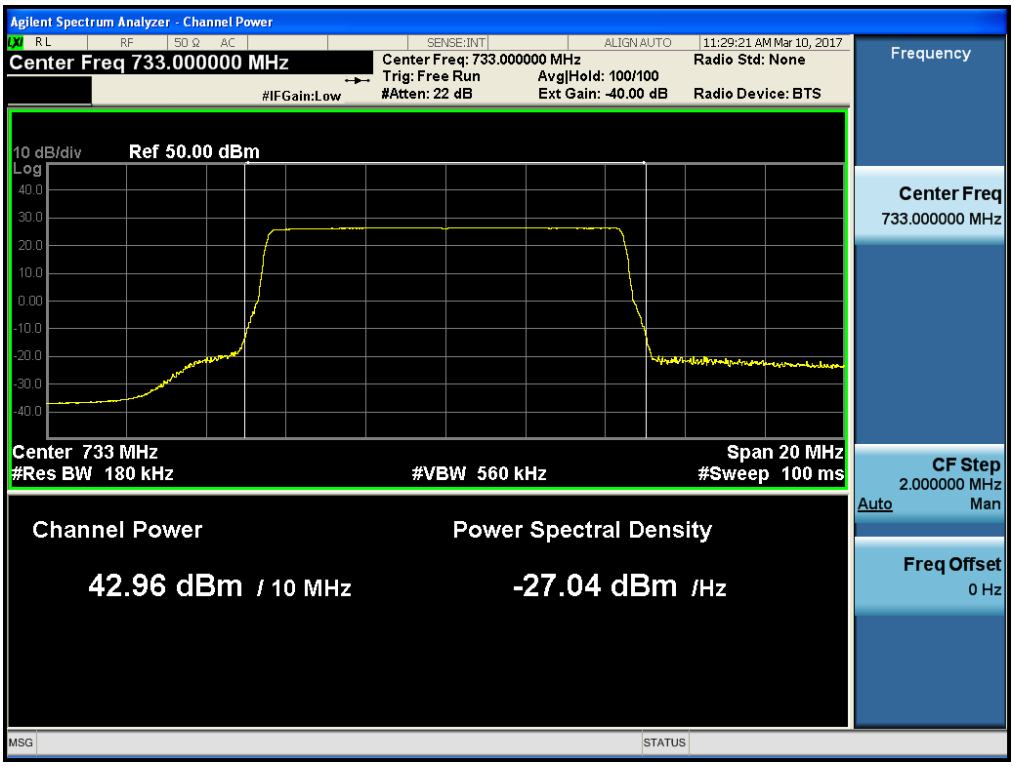
	Channel	Frequency (MHz)	Output Power	
			(dBm)	(mW)
700 LTE Band_ LTE 10 MHz AGC threshold	Low	703.00	-10.06	0.0986
	Middle	-	-	-
	High	711.00	-10.00	0.1000
700 LTE Band_ LTE 10 MHz +3dBm above the AGC threshold	Low	703.00	-10.04	0.0991
	Middle	-	-	-
	High	711.00	-10.01	0.0998

[Uplink_Upper] - 700 LTE

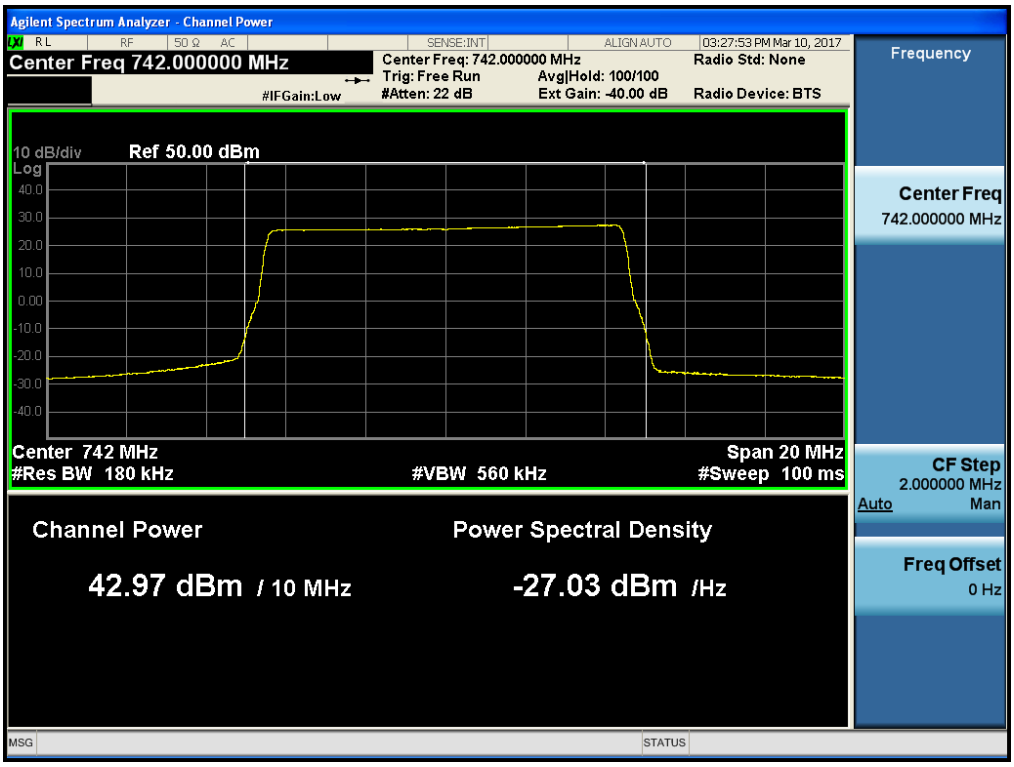
	Channel	Frequency (MHz)	Output Power	
			(dBm)	(mW)
700 LTE Band_ LTE 10 MHz AGC threshold	Low	-	-	-
	Middle	782.00	-10.02	0.0995
	High	-	-	-
700 LTE Band_ LTE 10 MHz +3dBm above the AGC threshold	Low	-	-	-
	Middle	782.00	-10.04	0.0991
	High	-	-	-

Plots of RF Output Power for 700 LTE Band LTE 10 MHz

[AGC threshold Downlink Low]

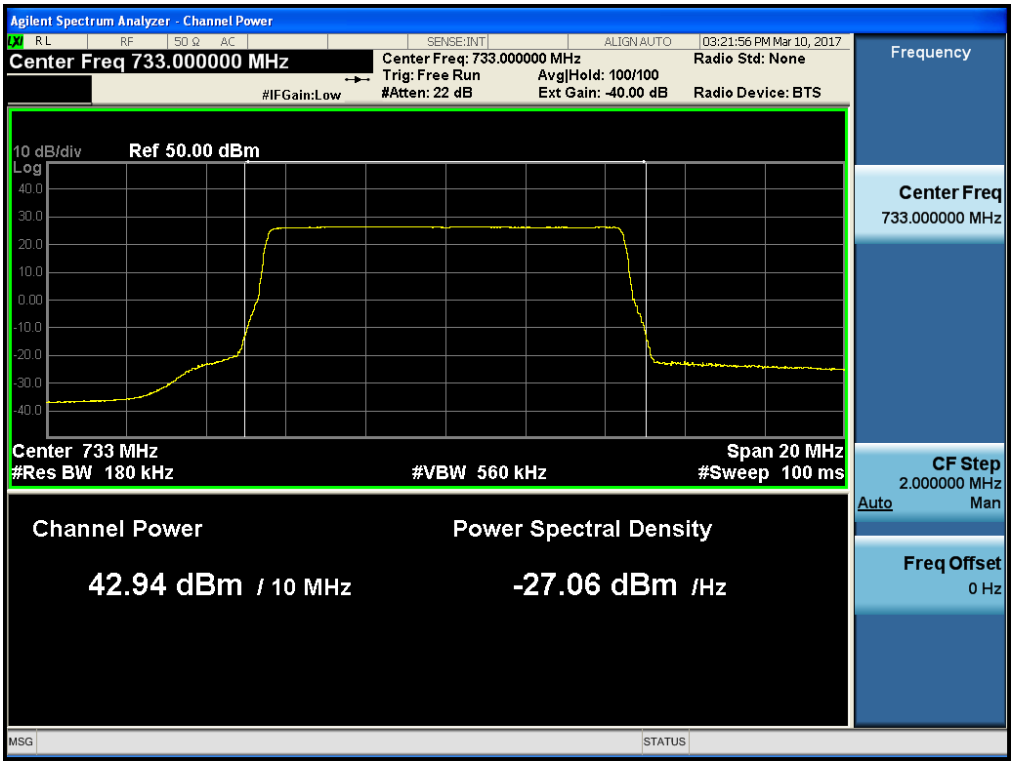


[AGC threshold Downlink Middle]

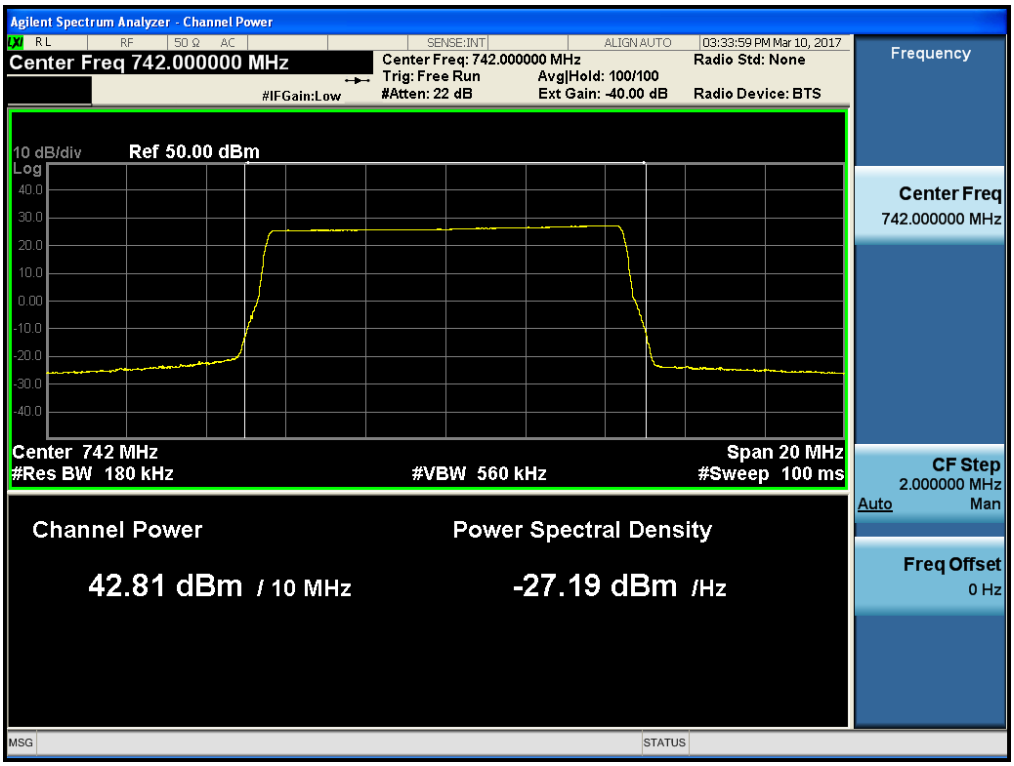


[AGC threshold Downlink High]

[+3dBm above AGC threshold Downlink Low]



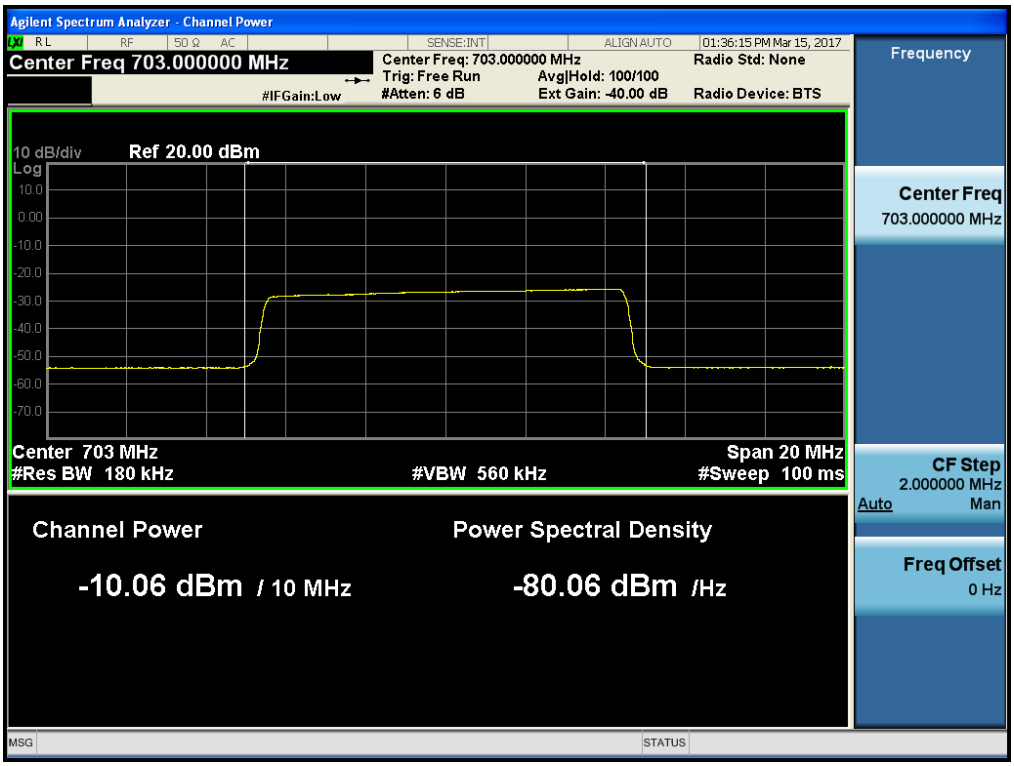
[+3dBm above AGC threshold Downlink Middle]



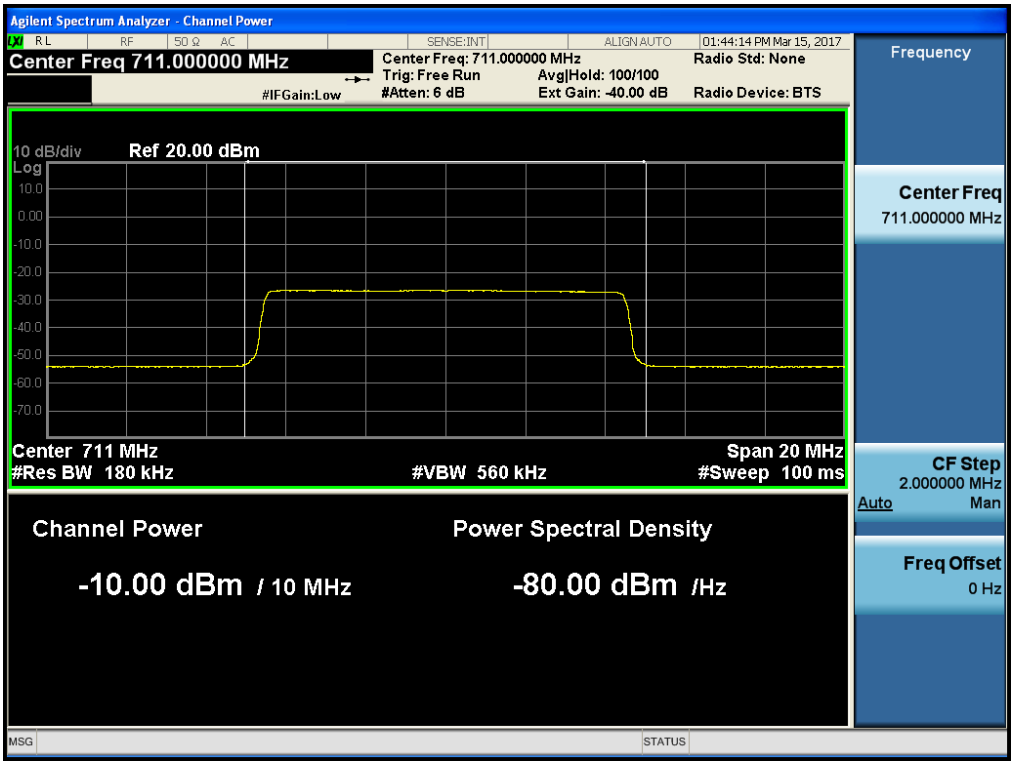
[+3dBm above AGC threshold Downlink High]

Uplink Lower

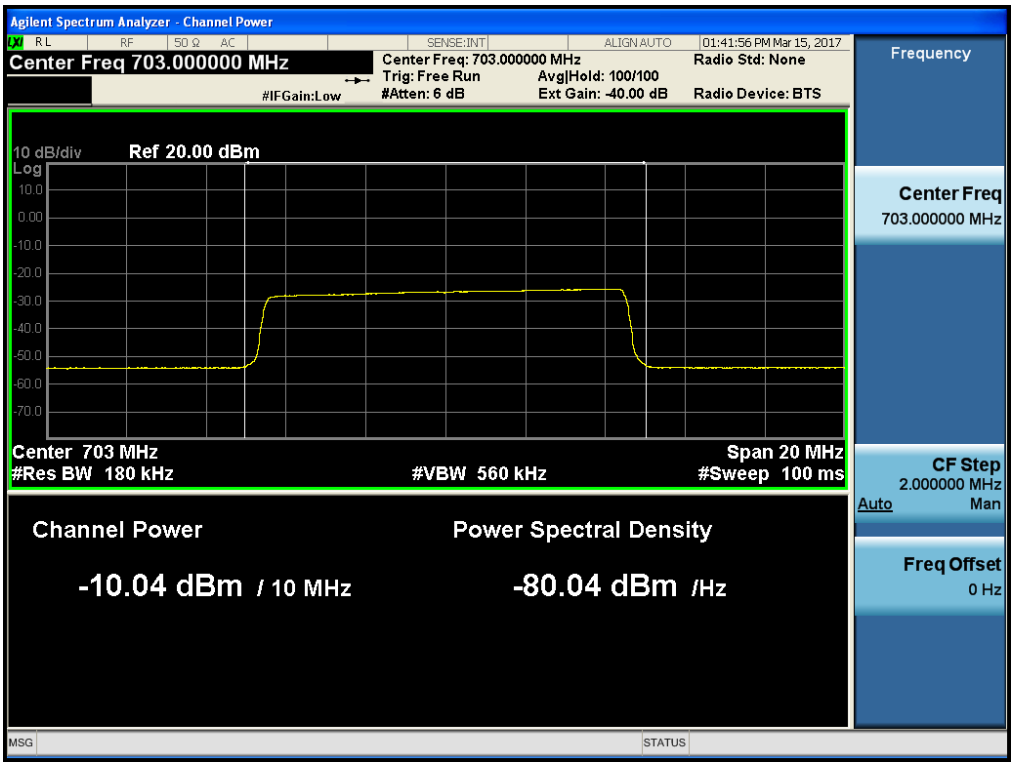
[AGC threshold Uplink - Low]



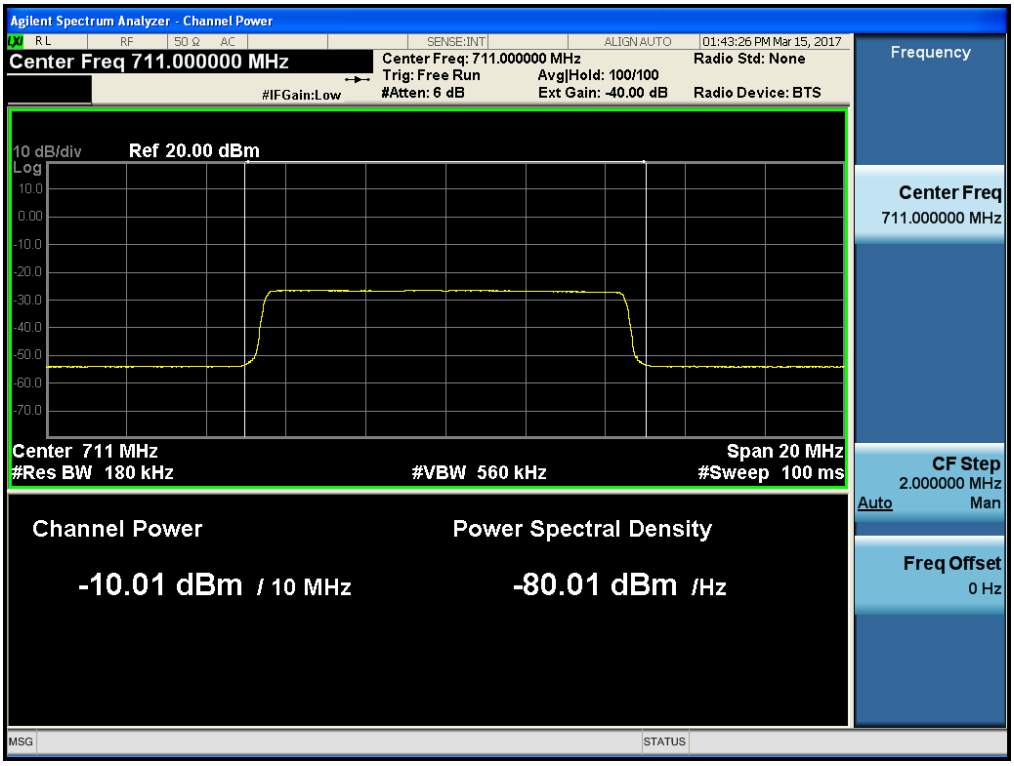
[AGC threshold Uplink - High]



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

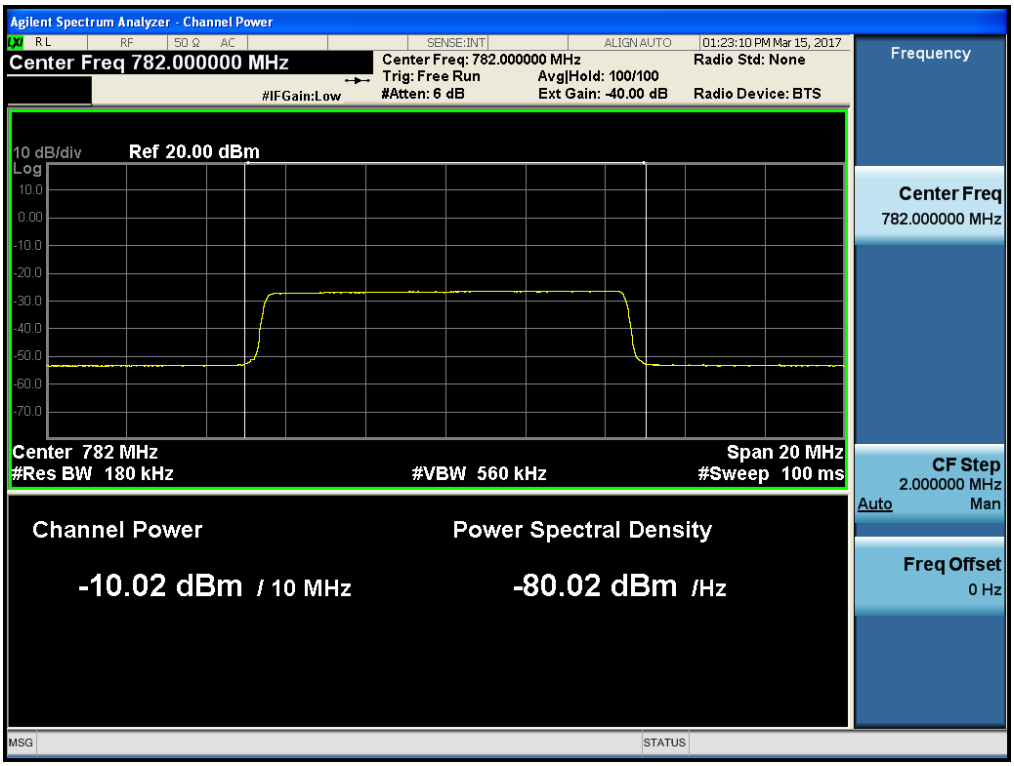


[+3dB above the AGC threshold Uplink - High]

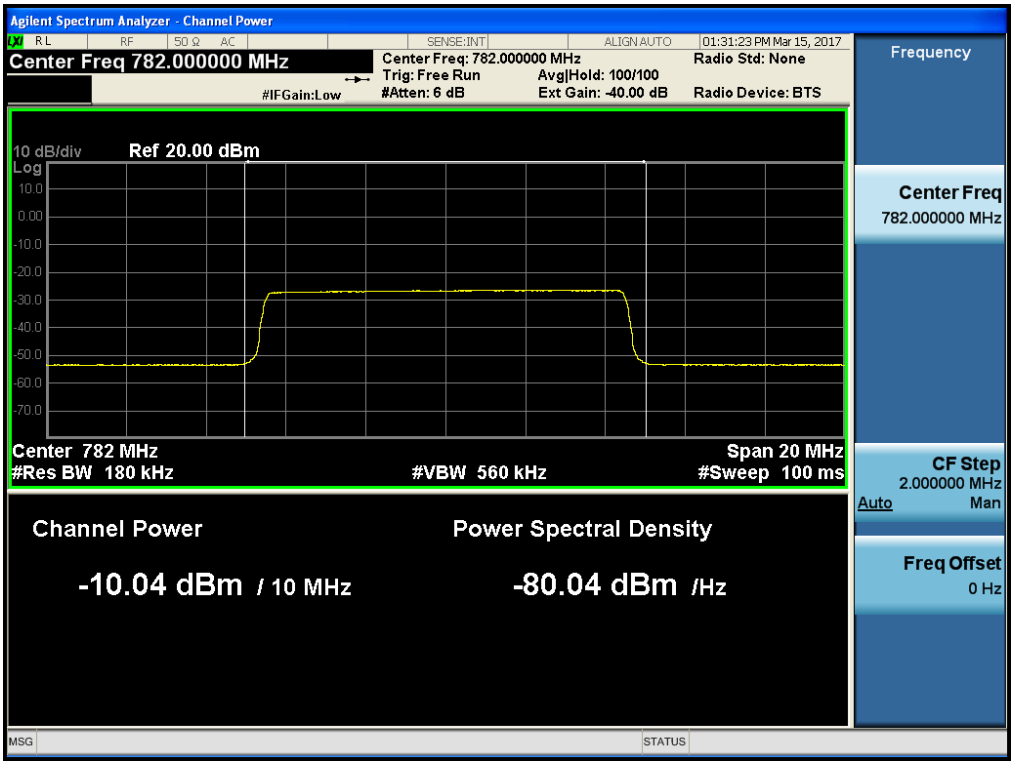


Uplink Upper

[AGC threshold Uplink - Middle]



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



[Downlink] – 800 MHz(Part 22)

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
800 MHz Band _ LTE 20 MHz AGC threshold	Low	879.00	42.92	19.588
	Middle	-	-	-
	High	884.00	42.94	19.679
800 MHz Band _ LTE 20 MHz +3dBm above the AGC threshold	Low	879.00	42.96	19.770
	Middle	-	-	-
	High	884.00	42.92	19.588
800 MHz Band _ CDMA AGC threshold	Low	870.25	42.86	19.320
	Middle	881.50	42.92	19.588
	High	892.75	42.86	19.320
800 MHz Band_ CDMA +3dBm above the AGC threshold	Low	870.25	42.95	19.724
	Middle	881.50	42.88	19.409
	High	892.75	42.86	19.320

[Uplink] – 800 MHz (Part 22)

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(mW)
800 MHz Band _ LTE 20 MHz AGC threshold	Low	834.00	-10.06	0.0986
	Middle	-	-	-
	High	839.00	-10.08	0.0982
800 MHz Band _ LTE 20 MHz +3dBm above the AGC threshold	Low	834.00	-10.01	0.0998
	Middle	-	-	-
	High	839.00	-10.07	0.0984
800 MHz Band _ CDMA AGC threshold	Low	825.25	-10.11	0.0975
	Middle	836.50	-10.02	0.0995
	High	847.75	-10.03	0.0993
800 MHz Band_ CDMA +3dBm above the AGC threshold	Low	825.25	-10.05	0.0989
	Middle	836.50	-10.02	0.0995
	High	847.75	-10.02	0.0995

[Downlink] – 800 MHz (Part 90)

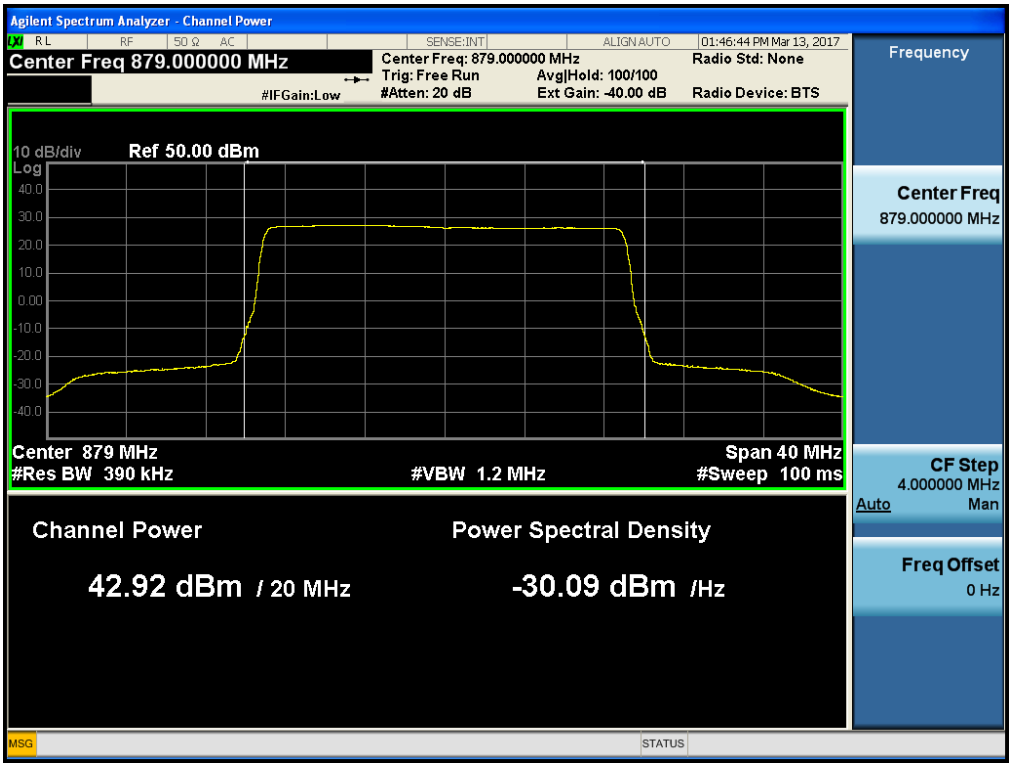
	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
800 MHz Band _ LTE 5 MHz AGC threshold	Low	864.50	42.92	19.588
	Middle	-	-	-
	High	866.50	42.97	19.815
800 MHz Band _ LTE 5 MHz +3dBm above the AGC threshold	Low	864.50	42.91	19.543
	Middle	-	-	-
	High	866.50	42.92	19.588

[Uplink] – 800 MHz (Part 90)

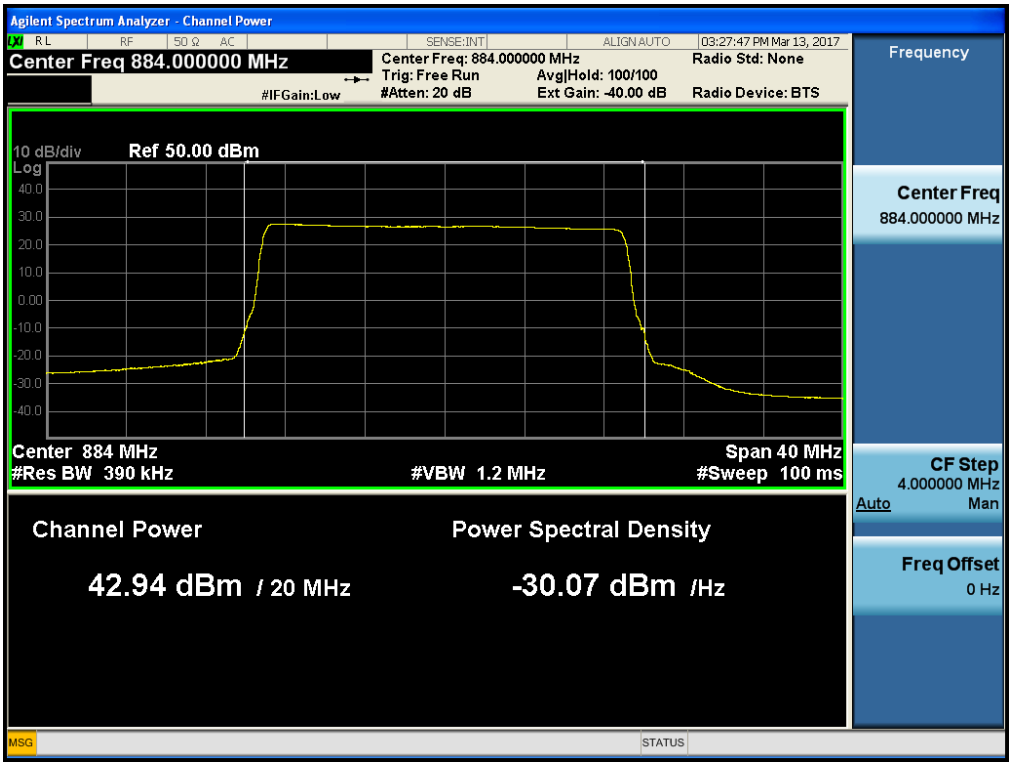
	Channel	Frequency (MHz)	Output Power	
			(dBm)	(mW)
800 MHz Band _ LTE 5 MHz AGC threshold	Low	819.50	-10.07	0.0984
	Middle	-	-	-
	High	821.50	-10.00	0.1000
800 MHz Band _ LTE 5 MHz +3dBm above the AGC threshold	Low	819.50	-10.00	0.1000
	Middle	-	-	-
	High	821.50	-10.07	0.0984

RF Output Power for 800 MHz_LTE 20 MHz_Part 22

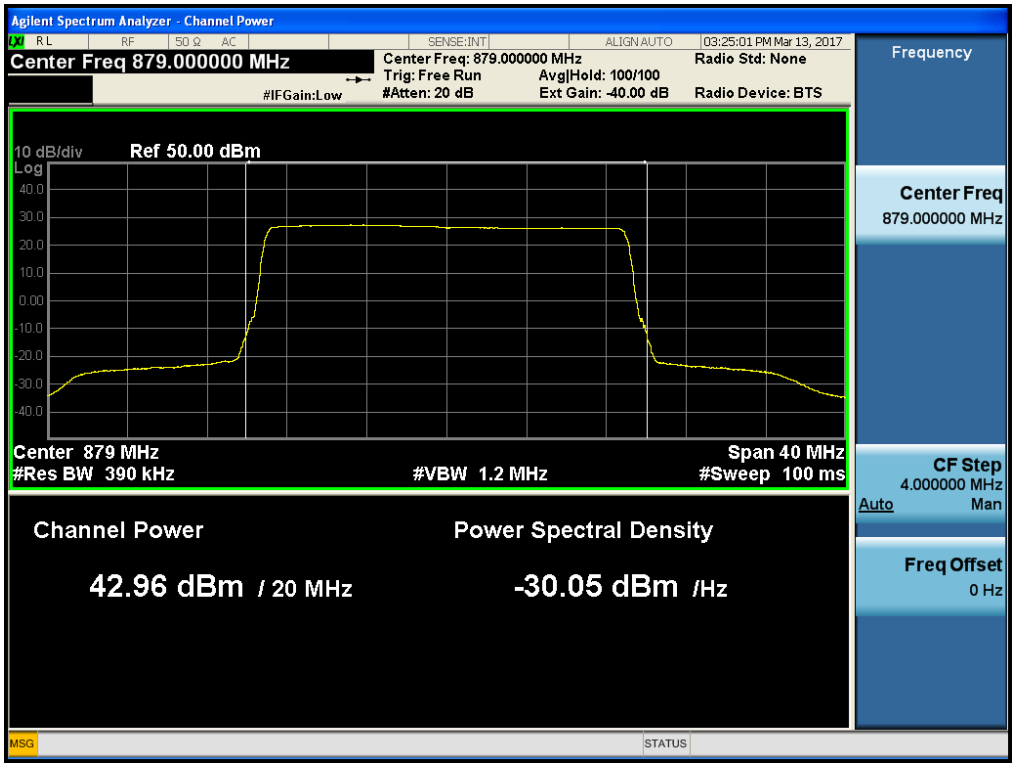
[AGC threshold Downlink Low]



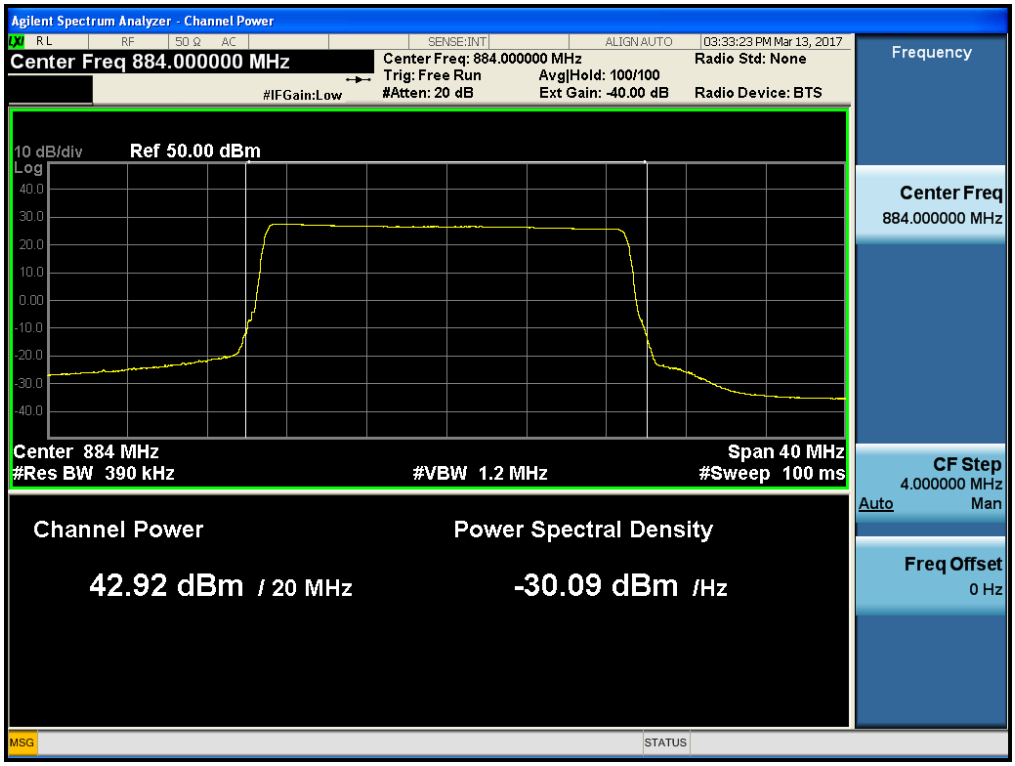
[AGC threshold Downlink High]



[+3dBm above AGC threshold Downlink Low]

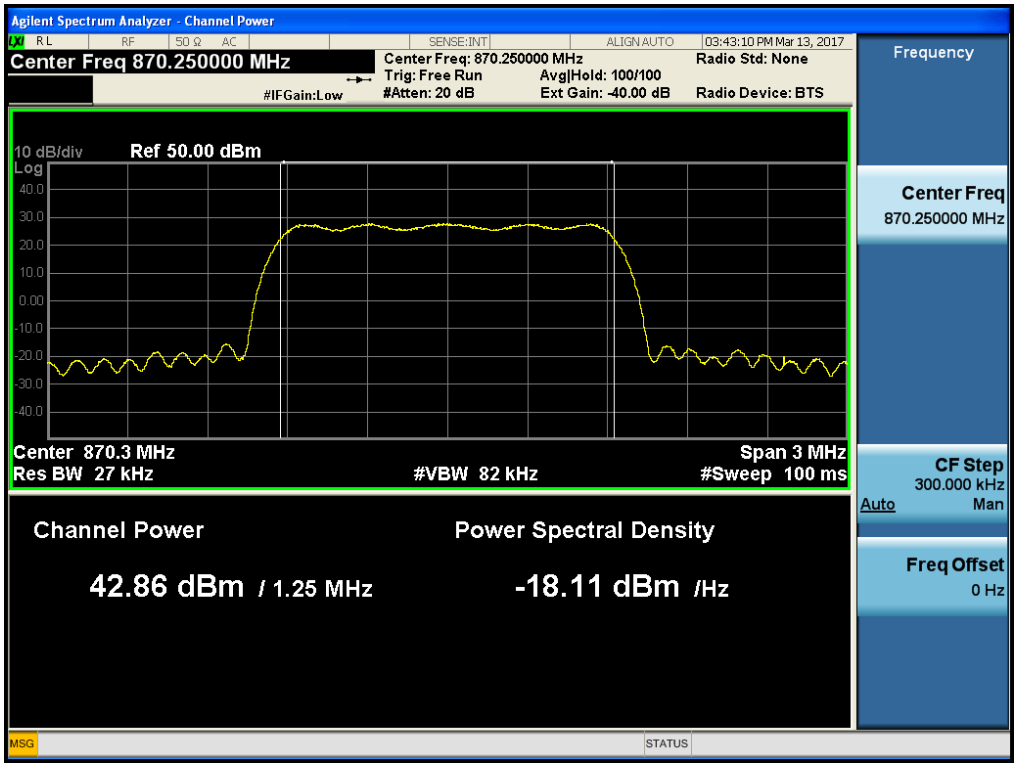


[+3dBm above AGC threshold Downlink High]

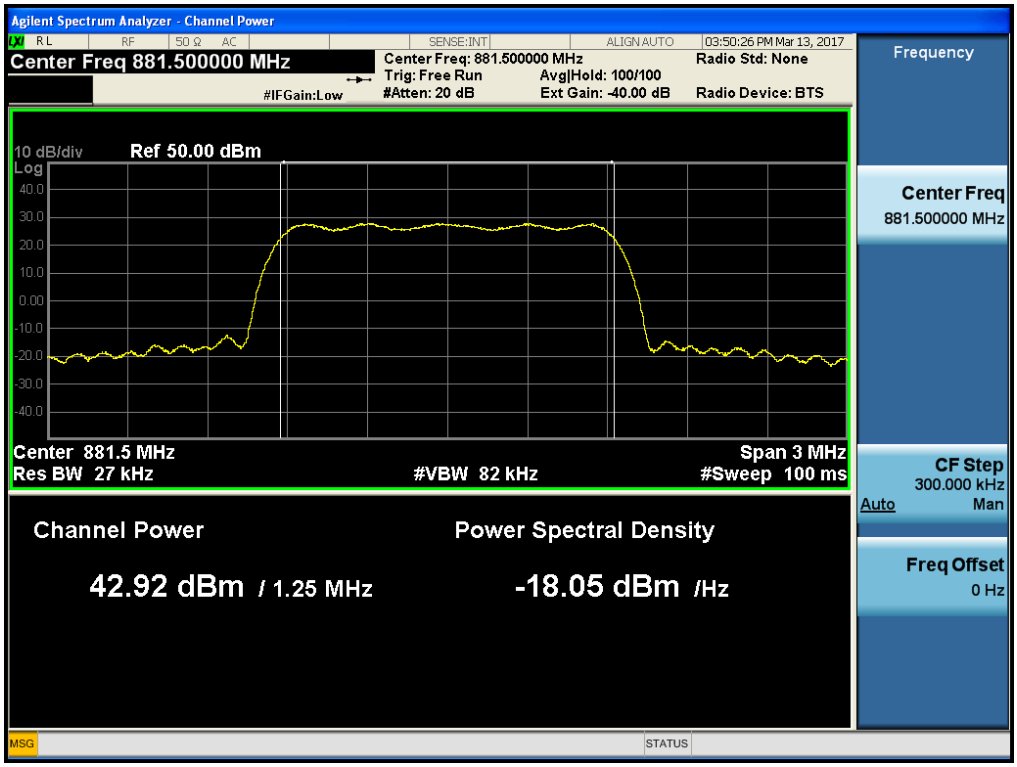


RF Output Power for 800 MHz_CDMA_Part 22

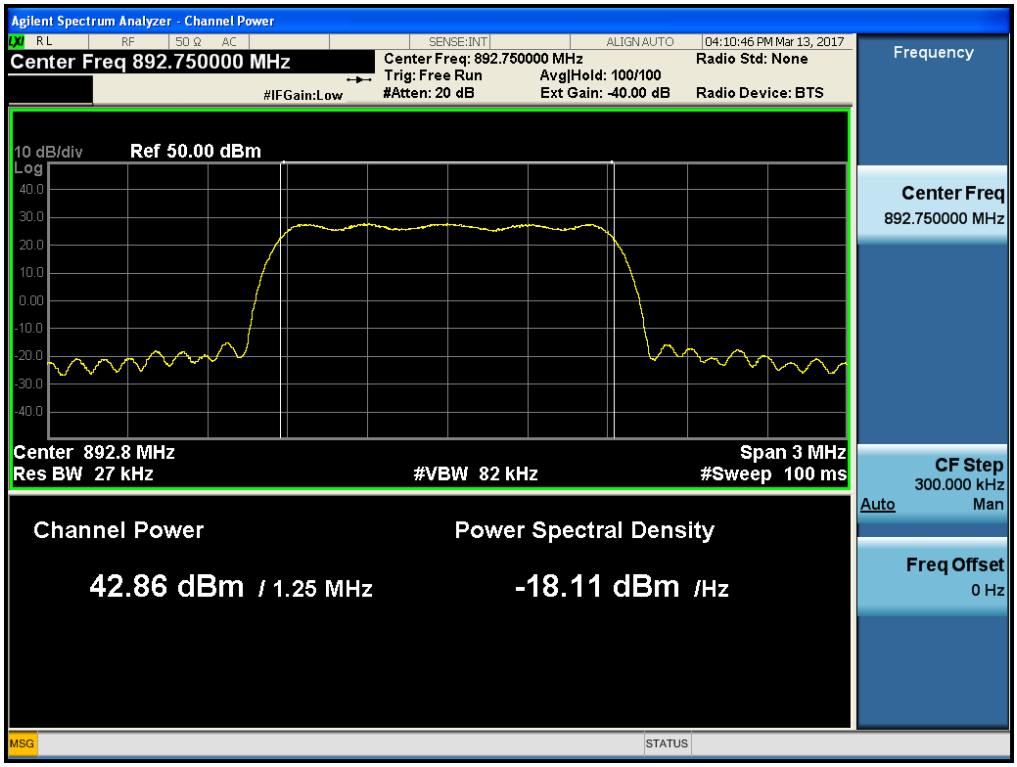
[AGC threshold Downlink Low]



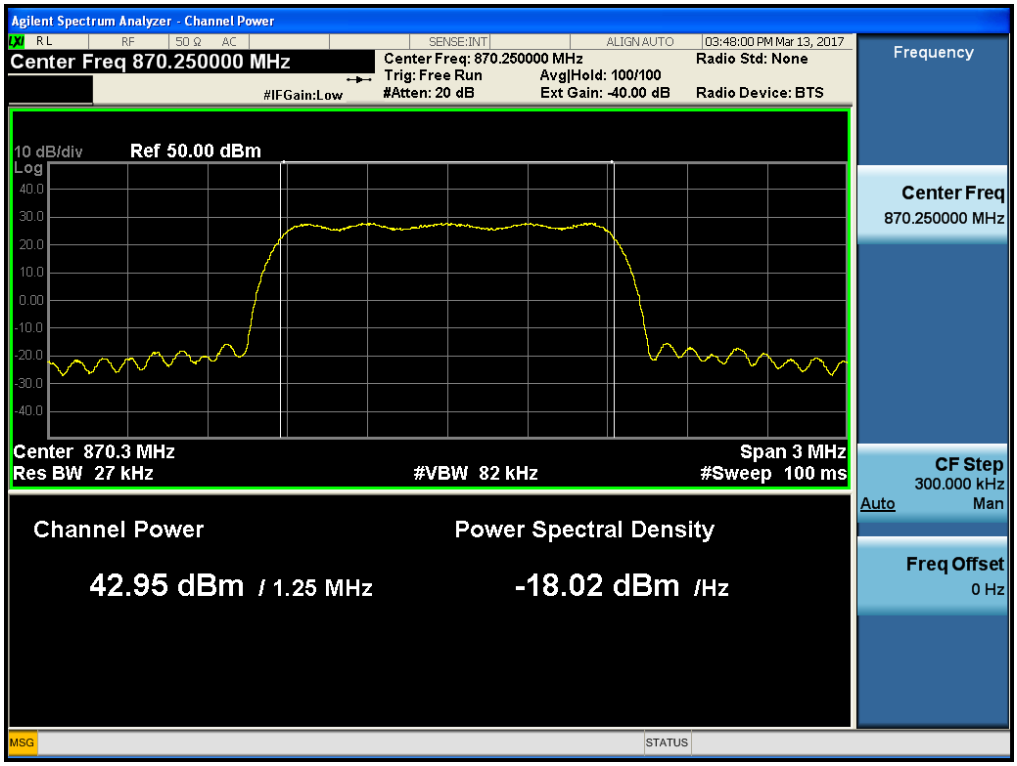
[AGC threshold Downlink Middle]



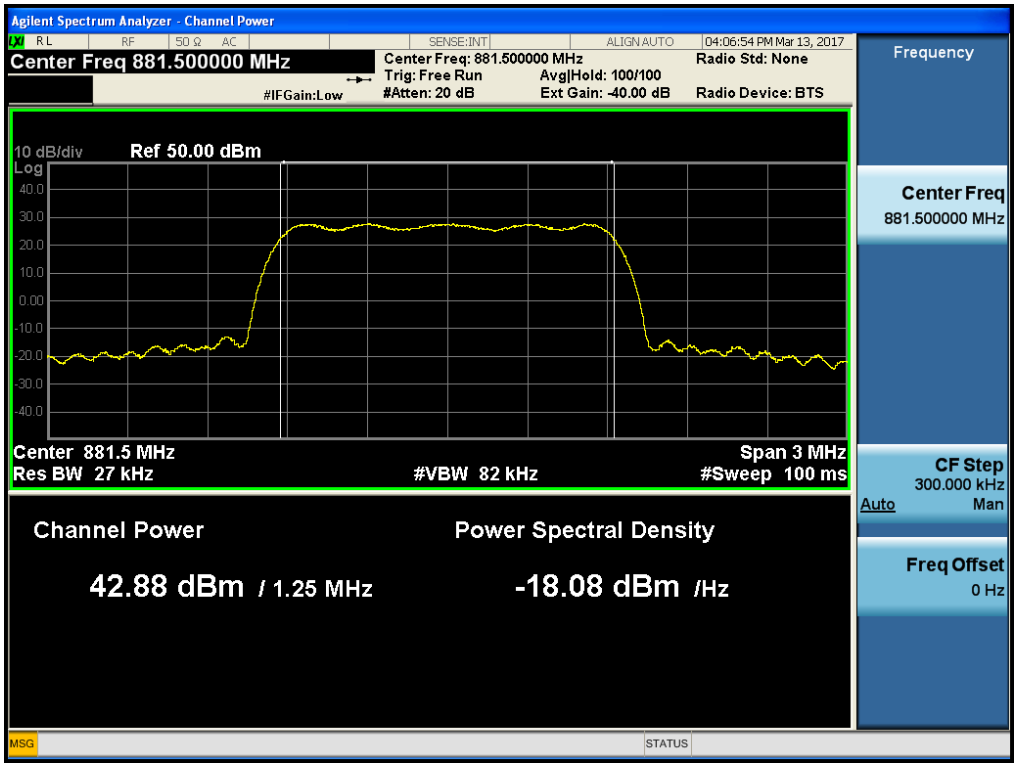
[AGC threshold Downlink High]



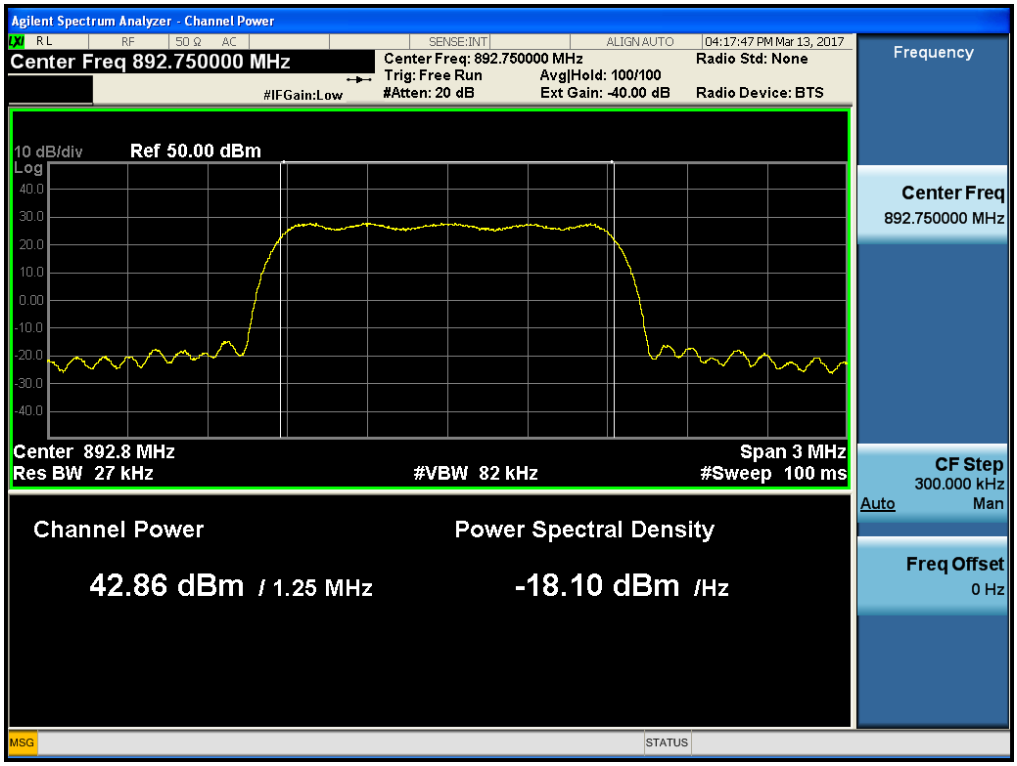
[+3dBm above AGC threshold Downlink Low]



[+3dBm above AGC threshold Downlink Middle]

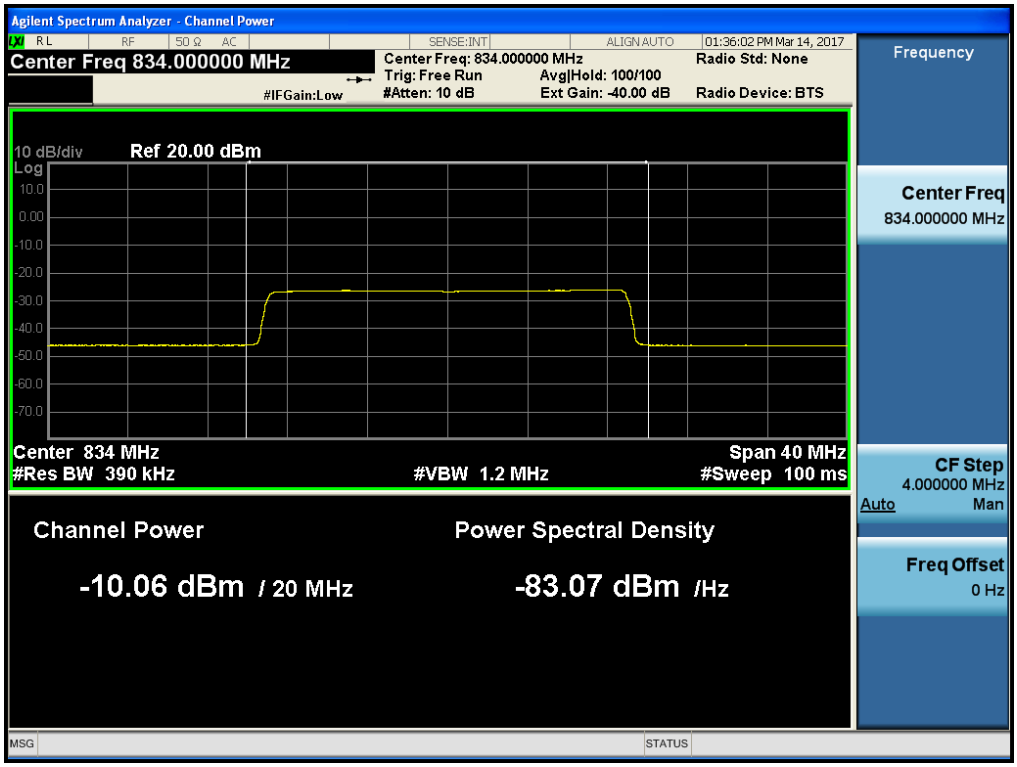


[+3dBm above AGC threshold Downlink High]

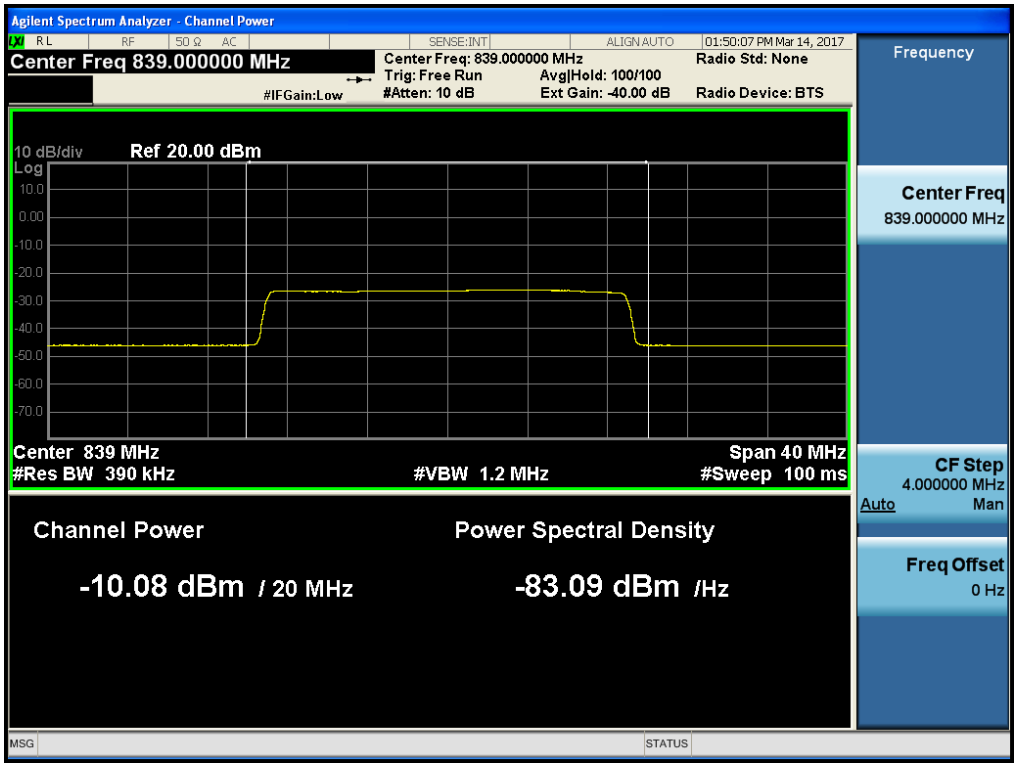


RF Output Power for 800 MHz_LTE 20 MHz_Part 22

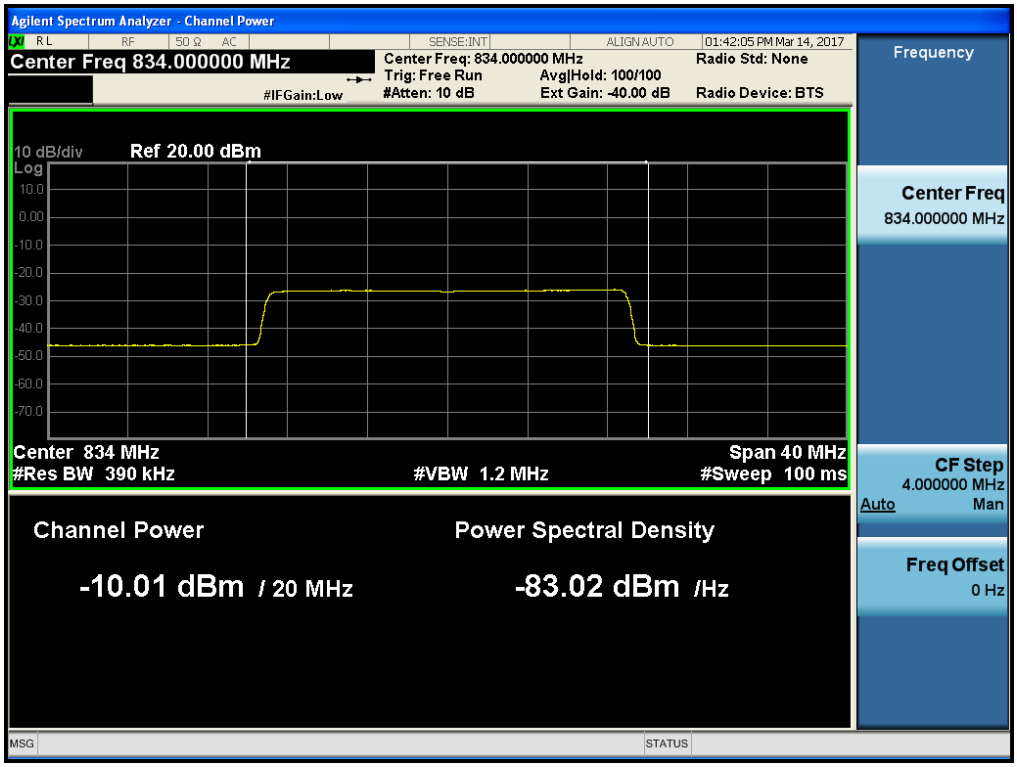
[AGC threshold Uplink Low]



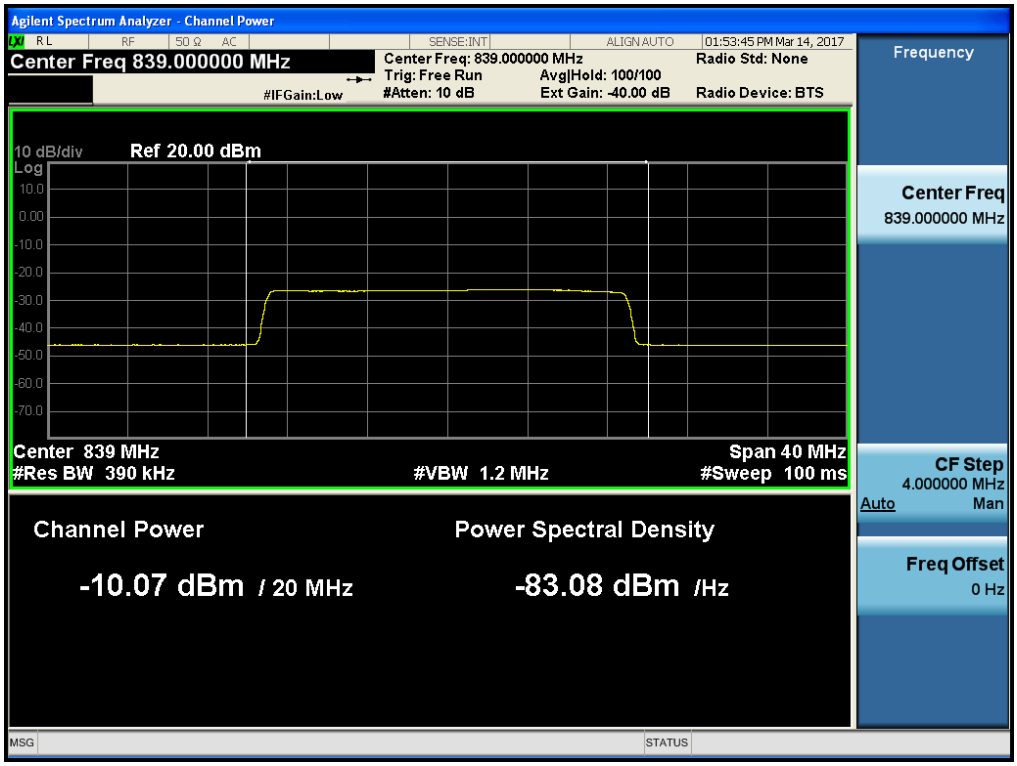
[AGC threshold Uplink High]



[+3dBm above AGC threshold Uplink Low]

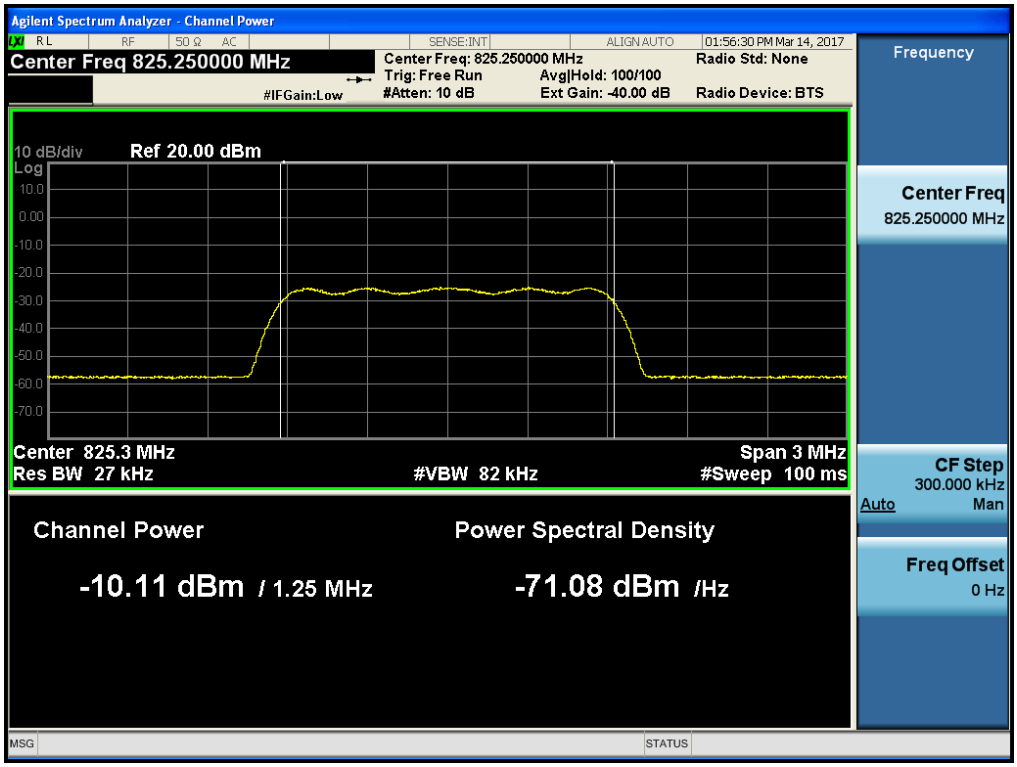


[+3dBm above AGC threshold Uplink High]

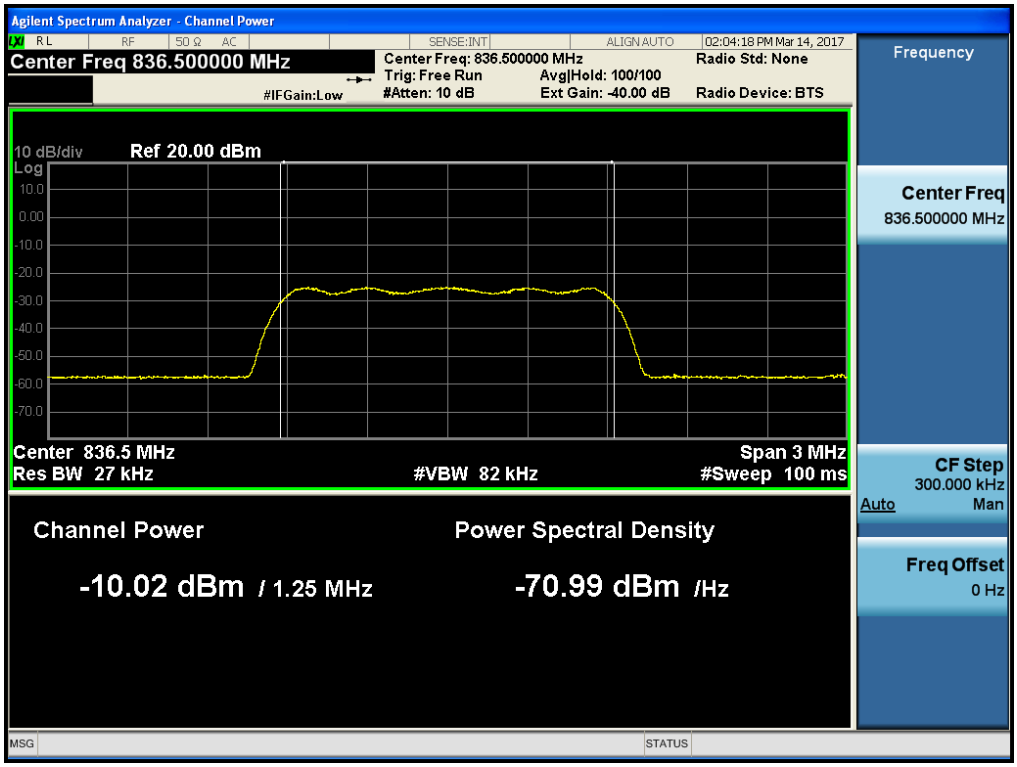


RF Output Power for 800 MHz_CDMA_Part 22

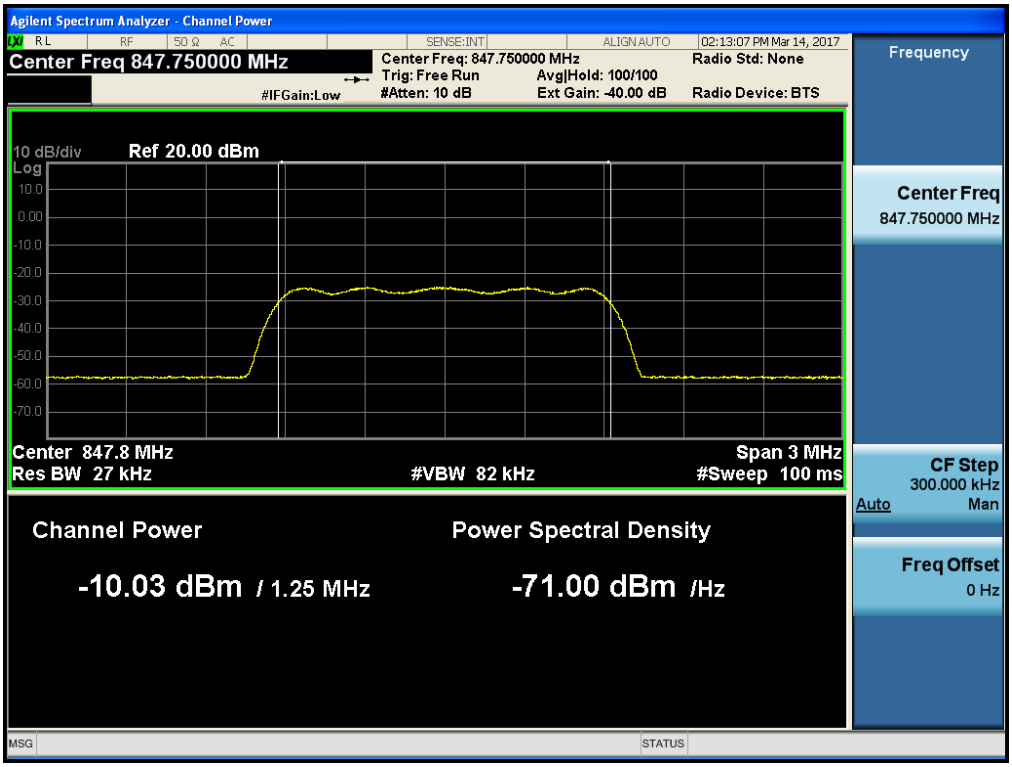
[AGC threshold Uplink Low]



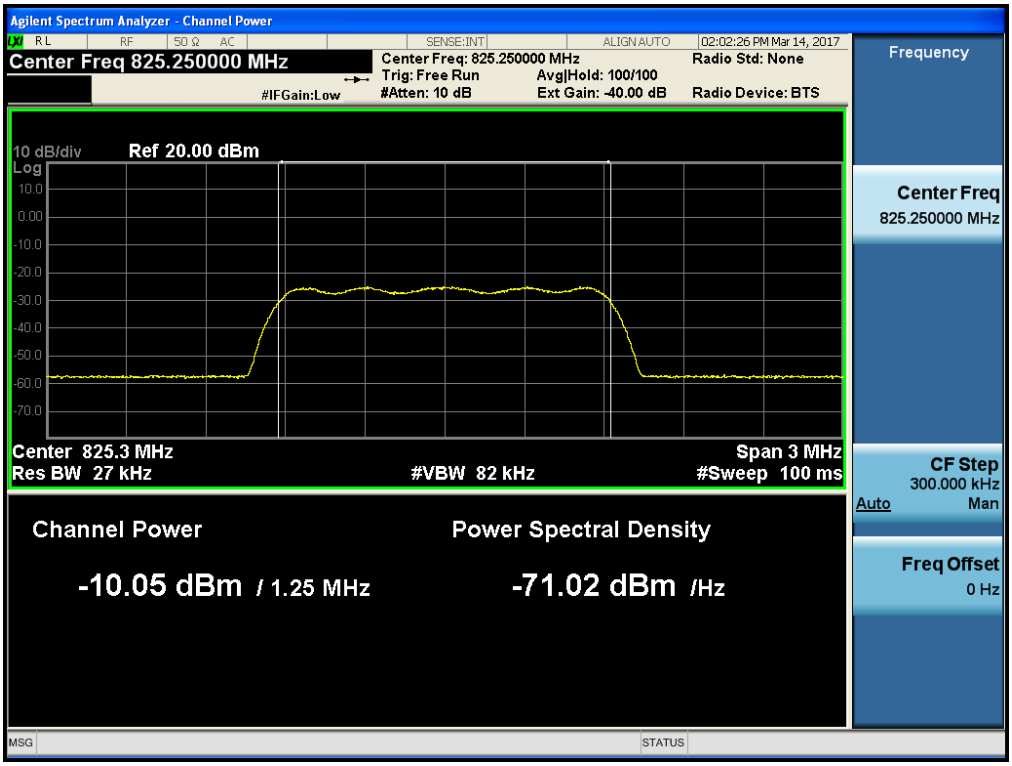
[AGC threshold Uplink Middle]



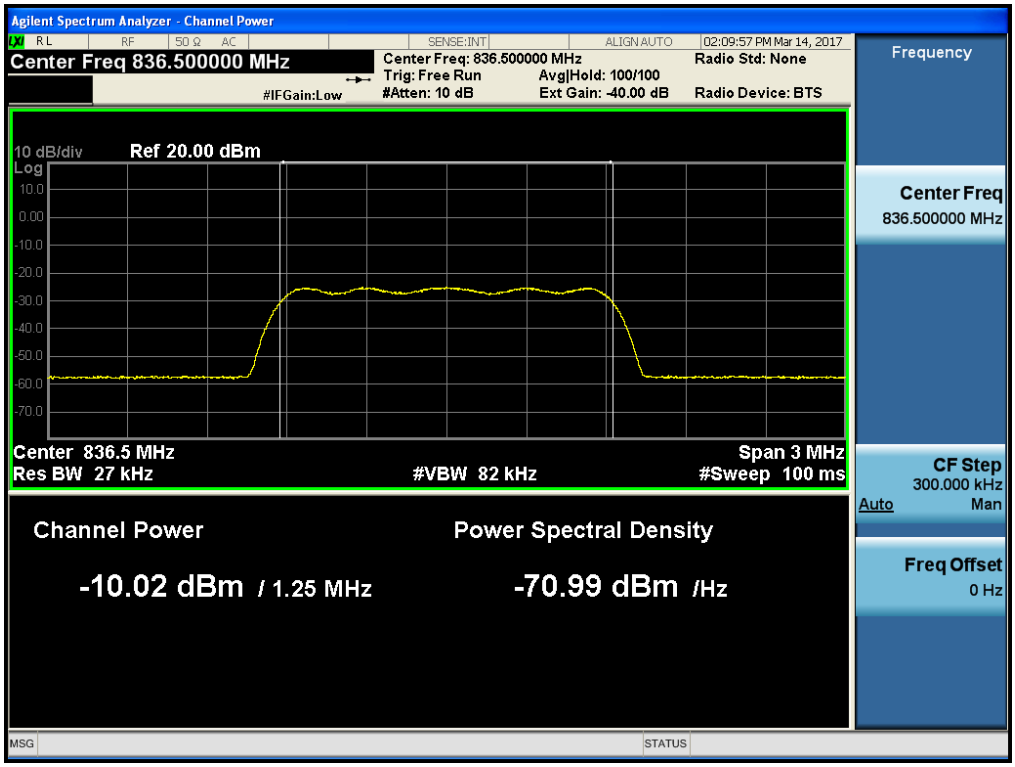
[AGC threshold Uplink High]



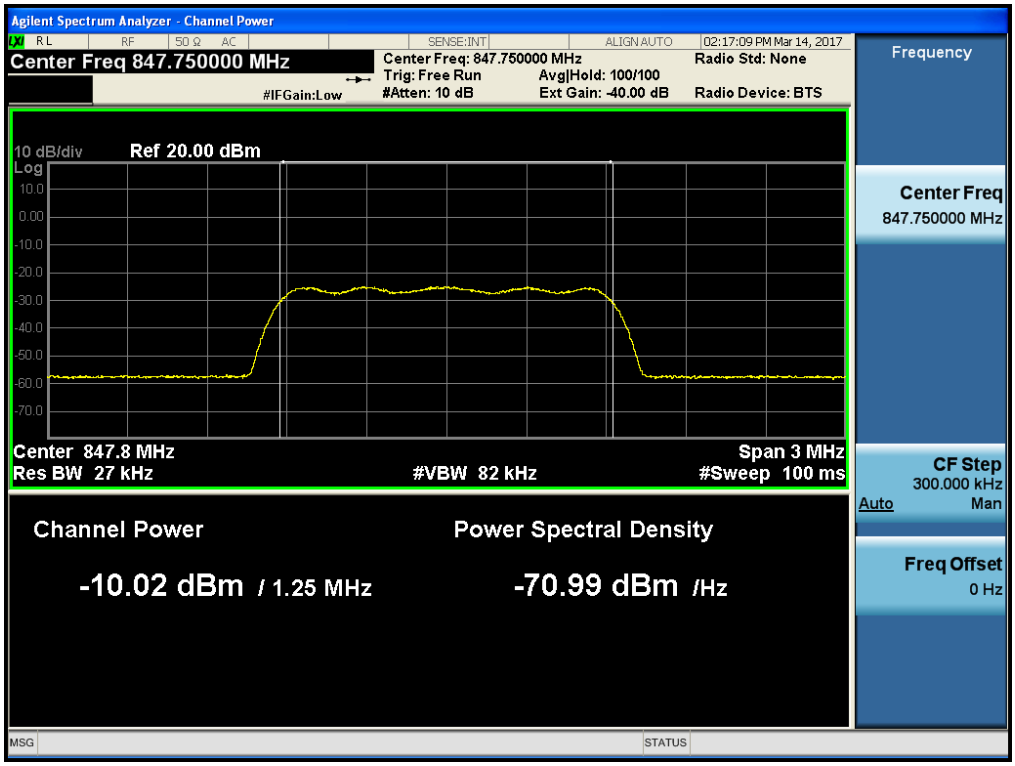
[+3dBm above AGC threshold Uplink Low]



[+3dBm above AGC threshold Uplink Middle]

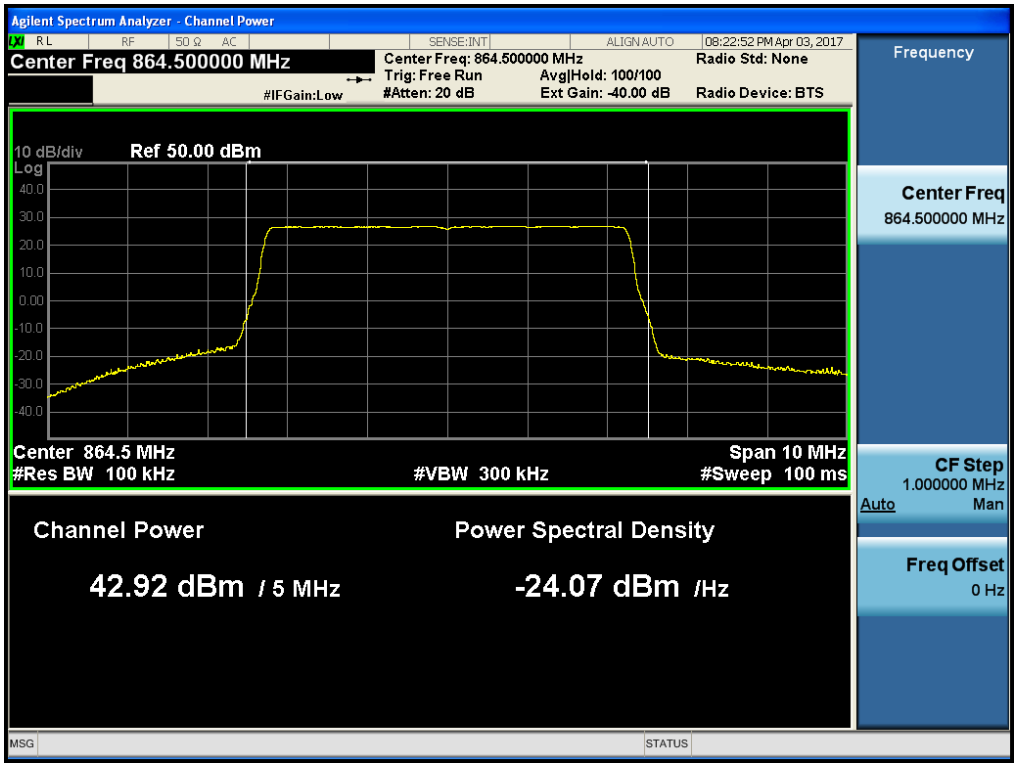


[+3dBm above AGC threshold Uplink High]

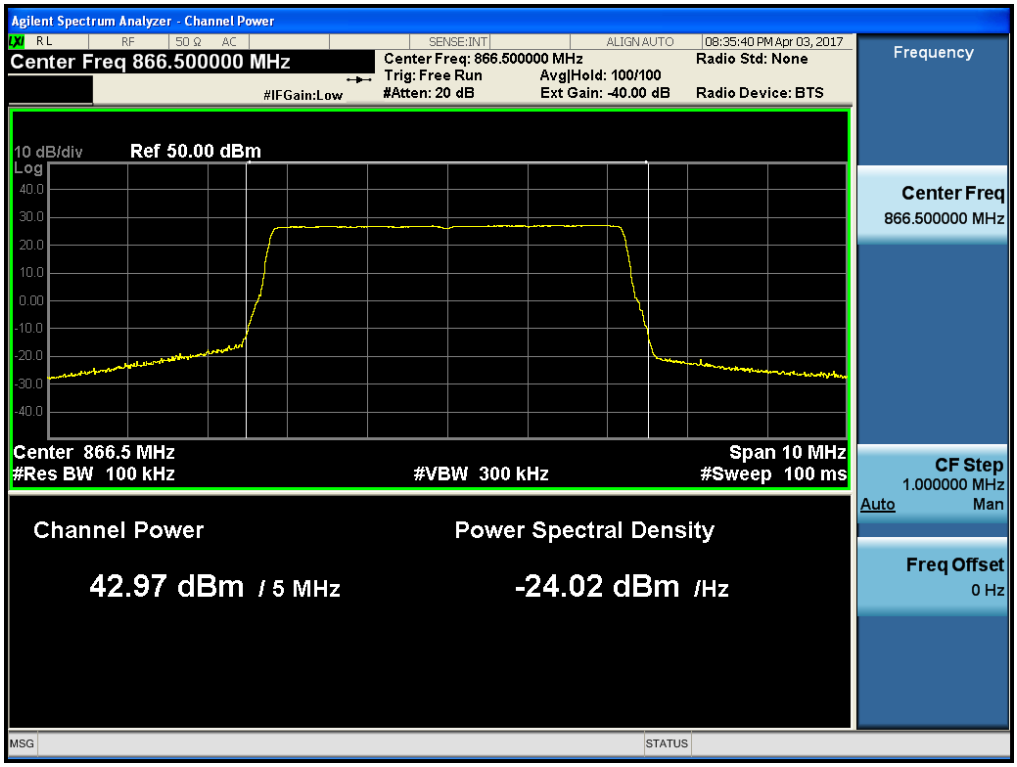


Plots of RF Output Power for 800 MHz Band LTE 5 MHz_Part 90

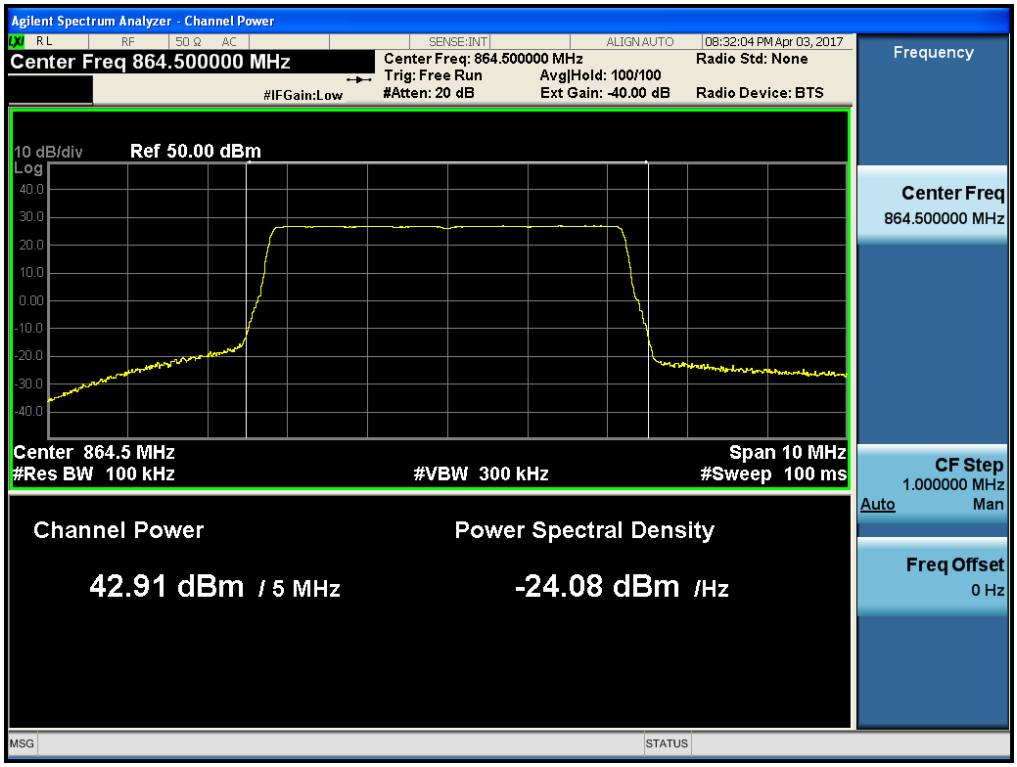
[AGC threshold Downlink Low]



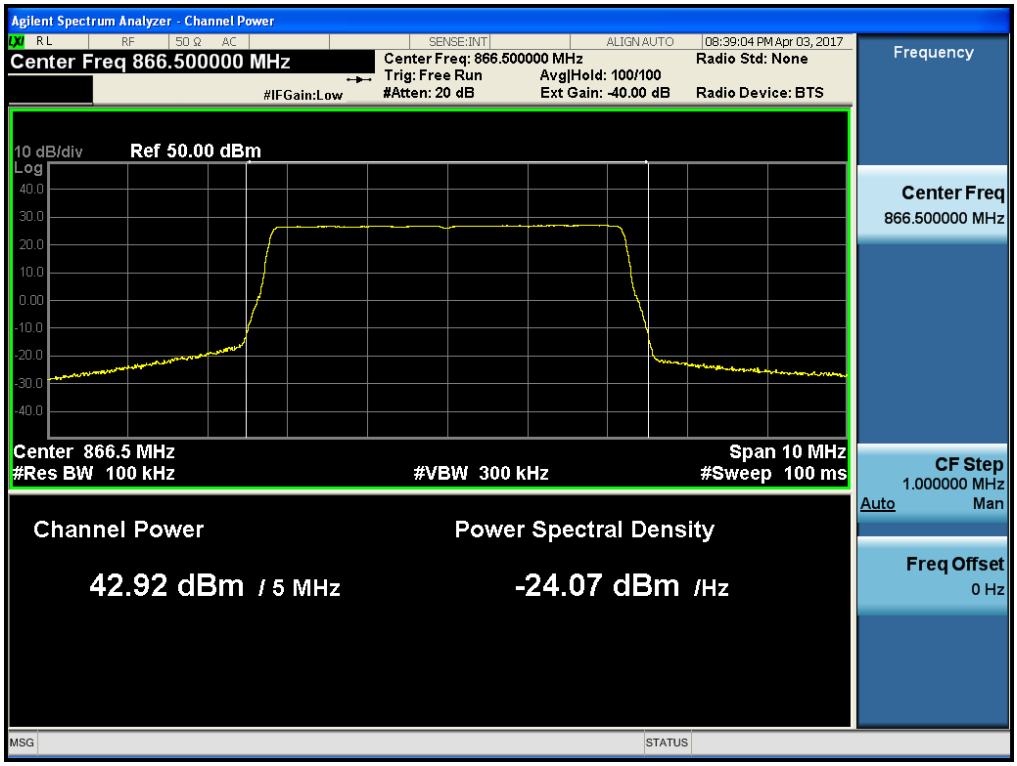
[AGC threshold Downlink High]



[+3dBm above AGC threshold Downlink Low]

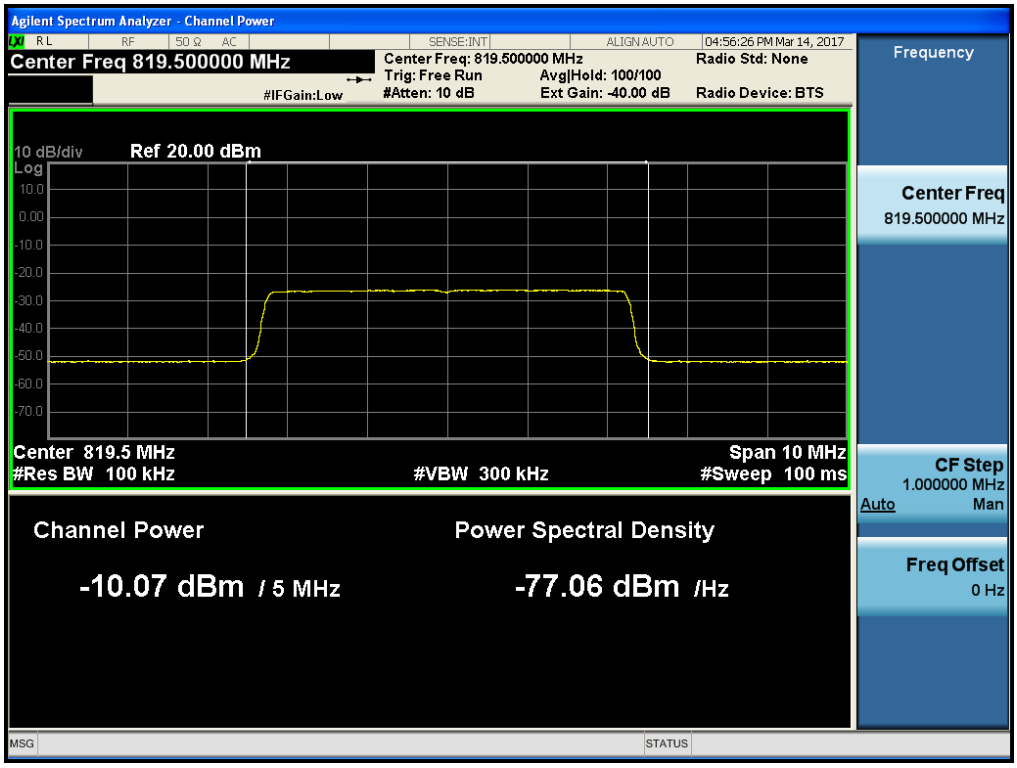


[+3dBm above AGC threshold Downlink High]

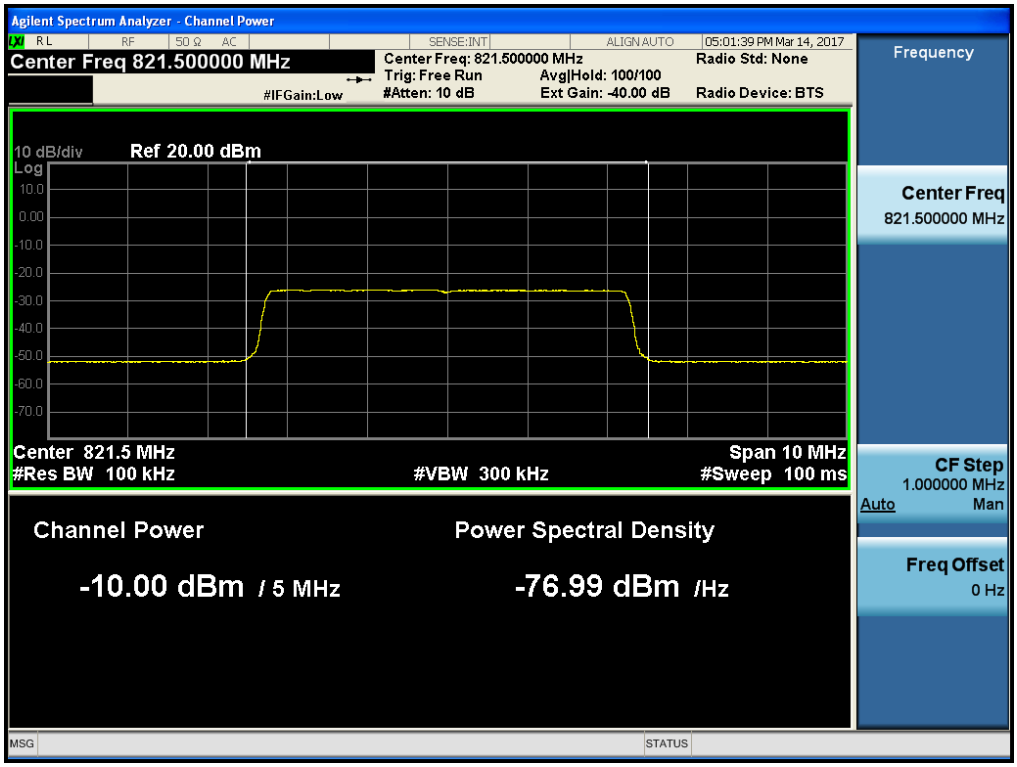


Plots of RF Output Power for 800 MHz Band LTE 5 MHz_Part 90

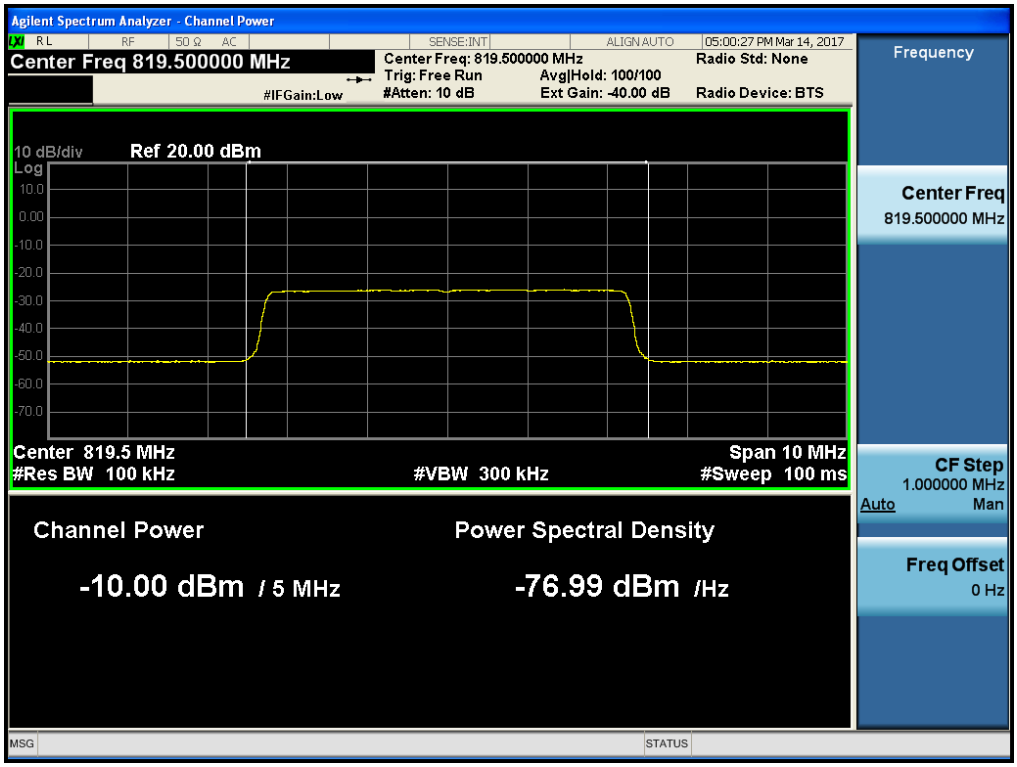
[AGC threshold Uplink Low]



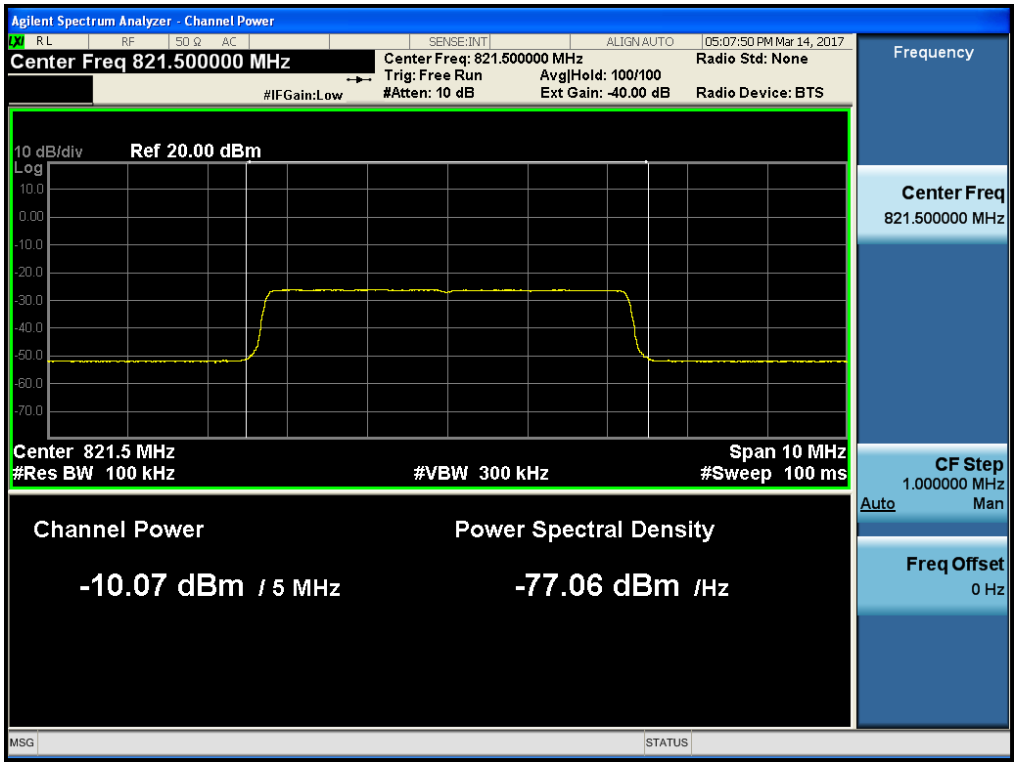
[AGC threshold Uplink High]



[+3dBm above AGC threshold Uplink Low]



[+3dBm above AGC threshold Uplink High]



[Downlink] – PCS 1900

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
LTE 20 MHz_ AGC threshold	Low	1940.00	45.97	39.537
	Middle	1962.50	45.92	39.084
	High	1985.00	45.89	38.815
LTE 20 MHz_ +3dB above AGC threshold	Low	1940.00	45.86	38.548
	Middle	1962.50	45.89	38.815
	High	1985.00	45.95	39.355
CDMA_ AGC threshold	Low	1931.25	45.98	39.628
	Middle	1962.50	45.92	39.084
	High	1993.75	45.96	39.446
CDMA_ +3dB above AGC threshold	Low	1931.25	45.73	37.411
	Middle	1962.50	45.85	38.459
	High	1993.75	45.93	39.174

[Uplink] – PCS 1900

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(mW)
LTE 20 MHz_ AGC threshold	Low	1860.00	-10.04	0.0991
	Middle	1882.50	-10.01	0.0998
	High	1905.00	-10.05	0.0989
LTE 20 MHz_ +3dB above AGC threshold	Low	1860.00	-10.05	0.0989
	Middle	1882.50	-10.01	0.0998
	High	1905.00	-10.03	0.0993
CDMA_ AGC threshold	Low	1851.25	-10.18	0.0959
	Middle	1882.50	-10.06	0.0986
	High	1913.75	-10.00	0.1000
CDMA_ +3dB above AGC threshold	Low	1851.25	-10.00	0.1000
	Middle	1882.50	-10.07	0.0984
	High	1913.75	-10.05	0.0989

Peak-to-Average Ratio

[Downlink] – PCS 1900

	Channel	Frequency (MHz)	Measured Level (dB)
LTE 20 MHz_ AGC threshold	Low	1940.00	8.41
	Middle	1962.50	8.41
	High	1985.00	8.35
LTE 20 MHz_ +3dB above AGC threshold	Low	1940.00	8.38
	Middle	1962.50	8.41
	High	1985.00	8.34
CDMA_ AGC threshold	Low	1931.25	5.76
	Middle	1962.50	5.78
	High	1993.75	5.74
CDMA_ +3dB above AGC threshold	Low	1931.25	5.78
	Middle	1962.50	5.77
	High	1993.75	5.84

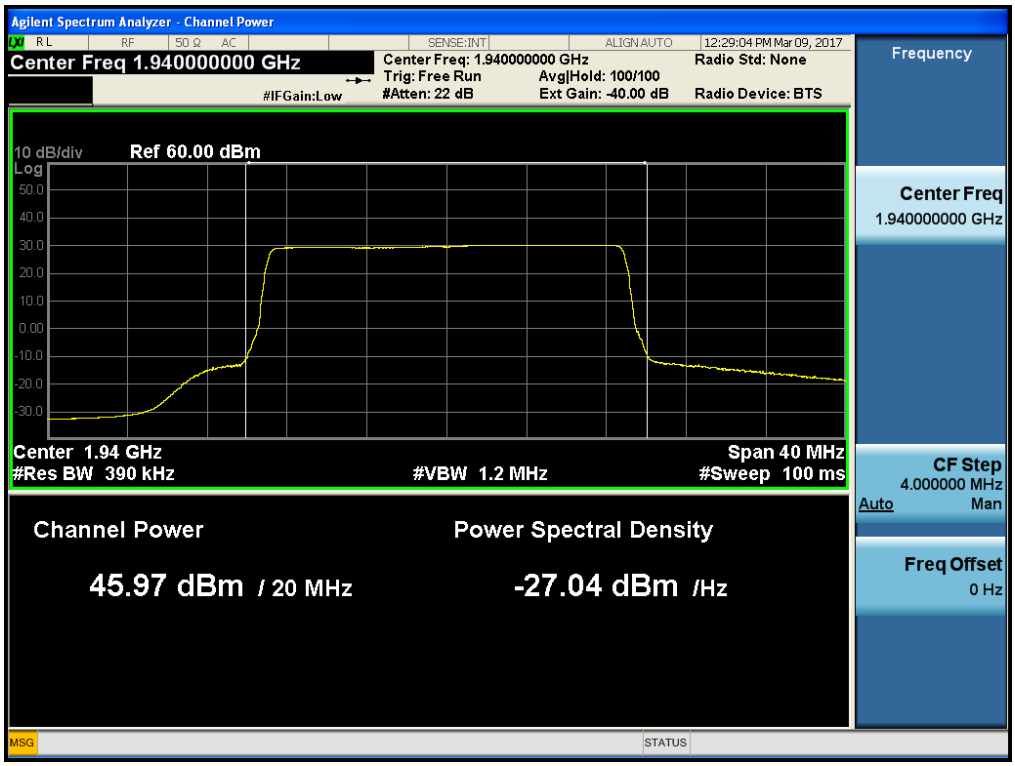
[Uplink] – PCS 1900

	Channel	Frequency (MHz)	Measured Level (dB)
LTE 20 MHz_ AGC threshold	Low	1860.00	8.37
	Middle	1882.50	8.36
	High	1905.00	8.35
LTE 20 MHz_ +3dB above AGC threshold	Low	1860.00	8.36
	Middle	1882.50	8.37
	High	1905.00	8.34
CDMA_ AGC threshold	Low	1851.25	5.80
	Middle	1882.50	5.81
	High	1913.75	5.81
CDMA_ +3dB above AGC threshold	Low	1851.25	5.80
	Middle	1882.50	5.80
	High	1913.75	5.83

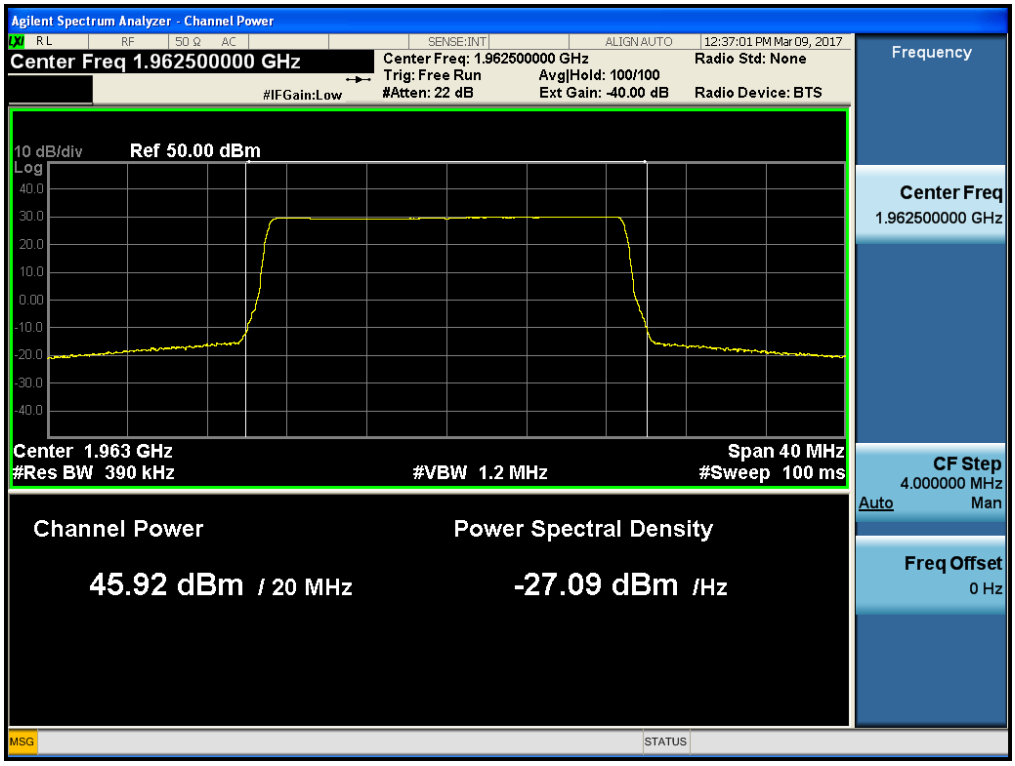
Single channel Enhancer Plots of RF Output Power (PCS 1900)

LTE 20 MHz DL

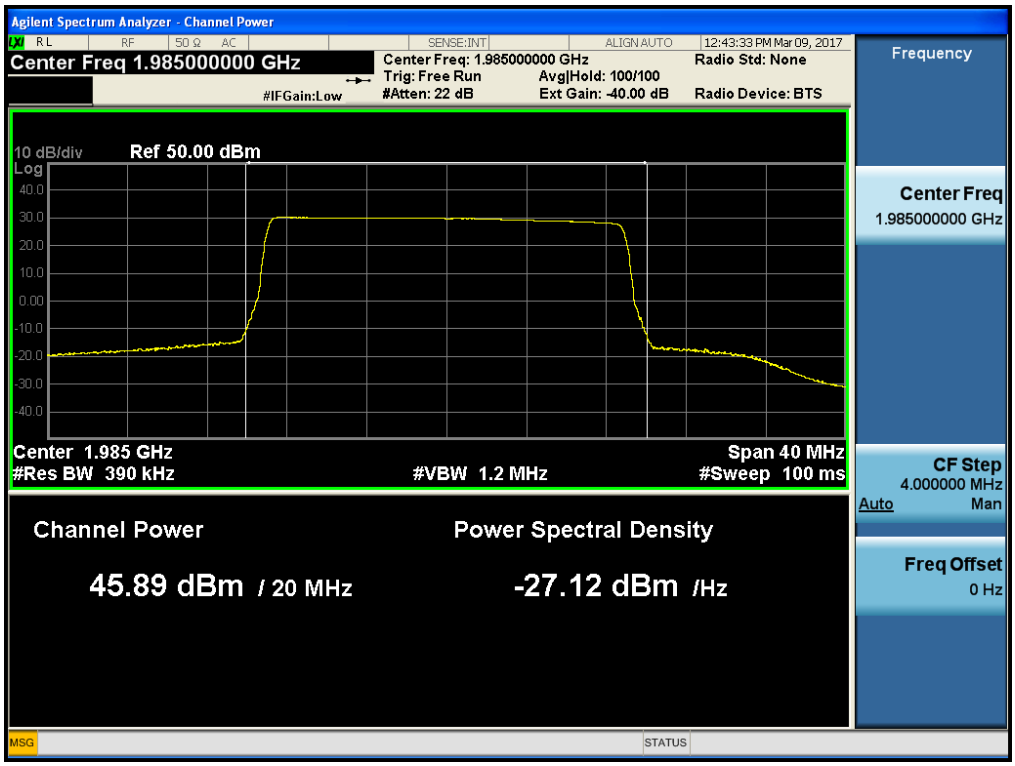
[LTE 20 MHz AGC threshold Downlink Low]



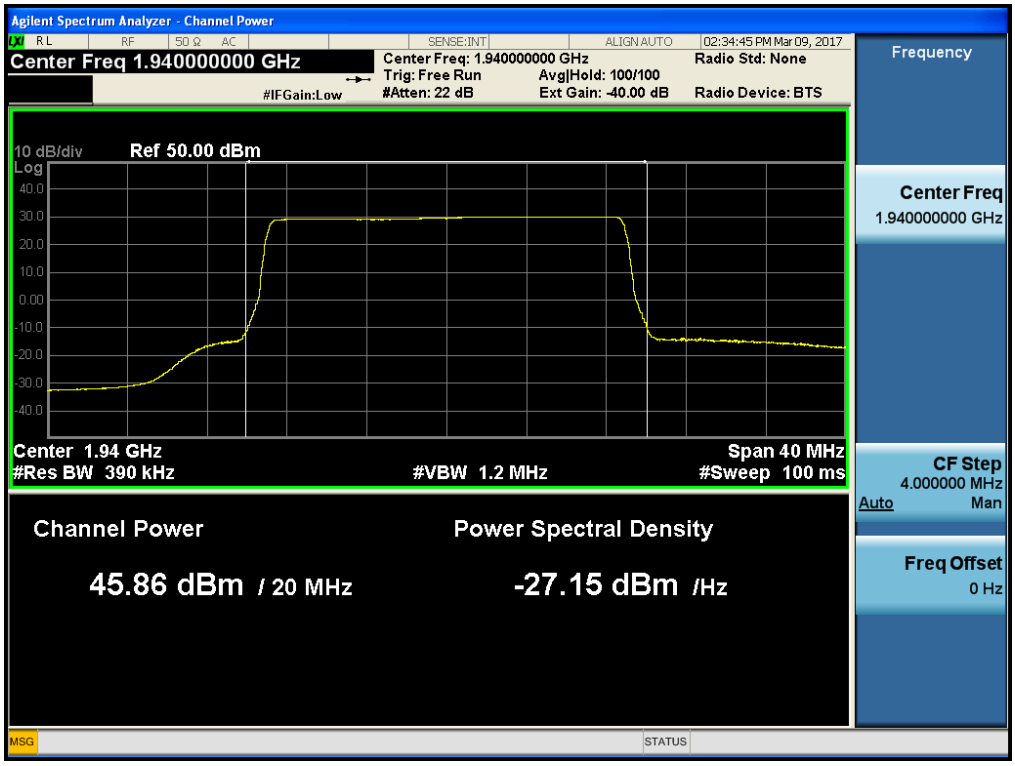
[LTE 20 MHz AGC threshold Downlink Middle]



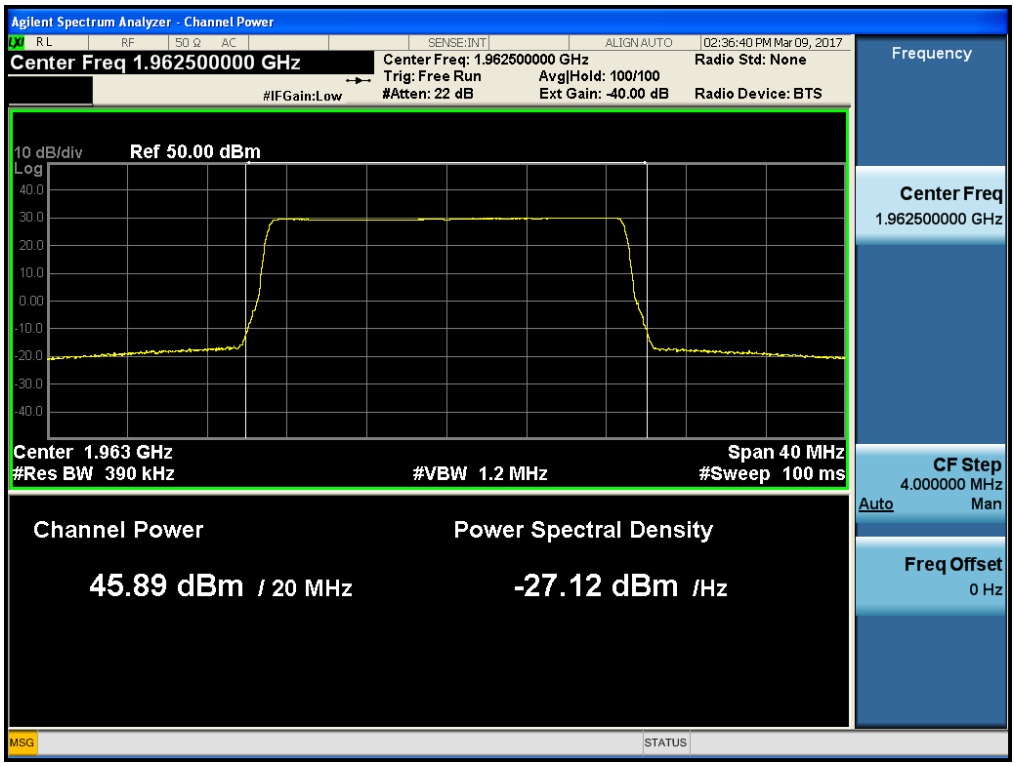
[LTE 20 MHz AGC threshold Downlink High]



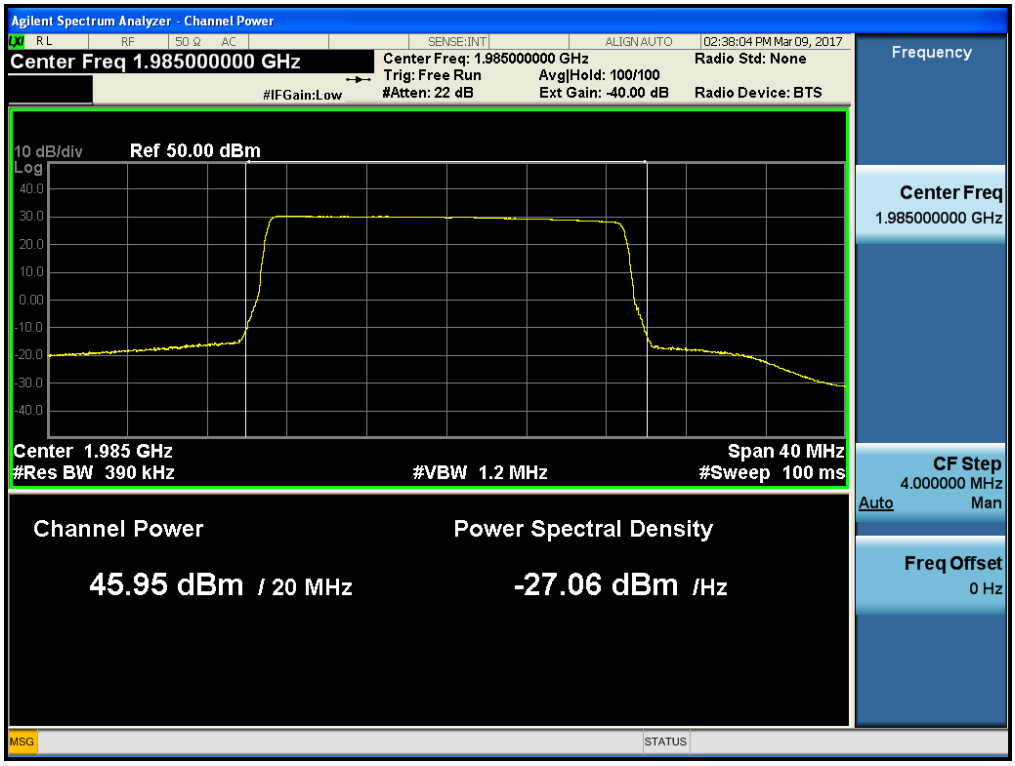
[LTE 20 MHz +3dB above the AGC threshold Downlink Low]



[LTE 20 MHz +3dB above the AGC threshold Downlink Middle]

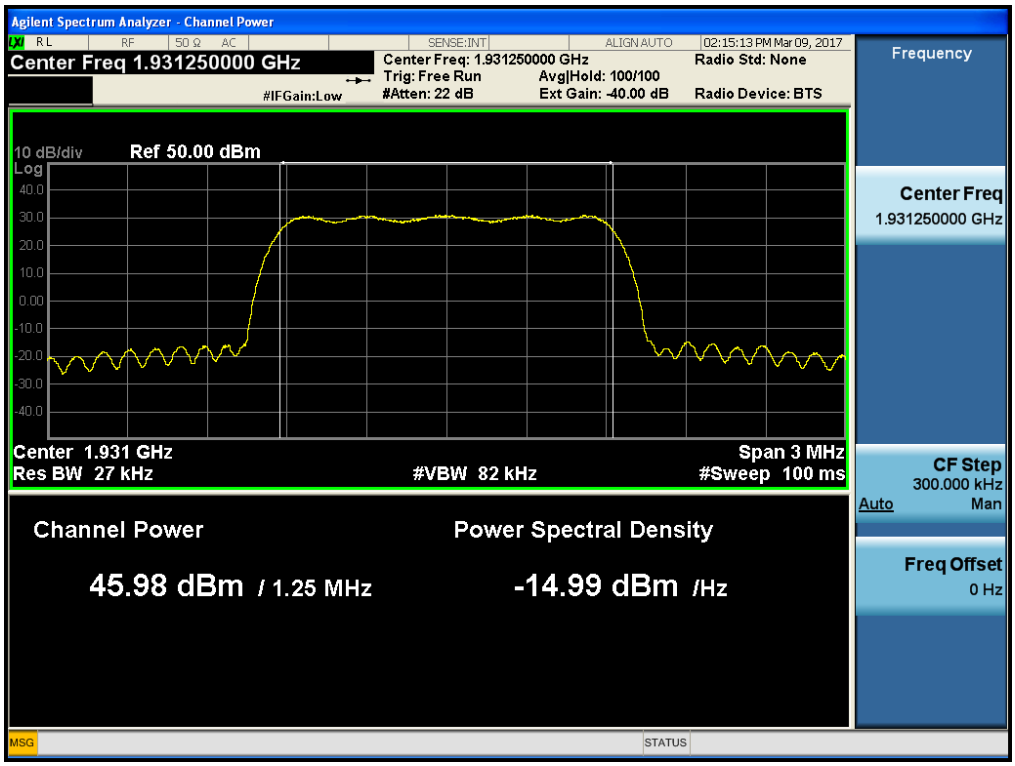


[LTE 20 MHz +3dB above the AGC threshold Downlink High]

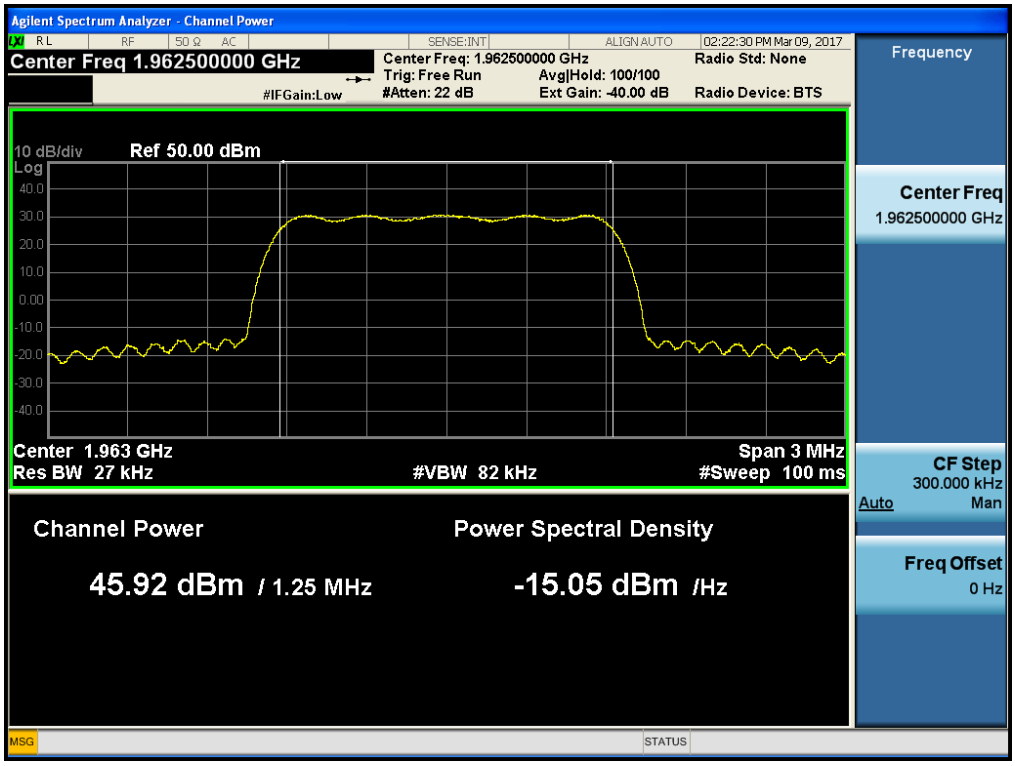


CDMA DL

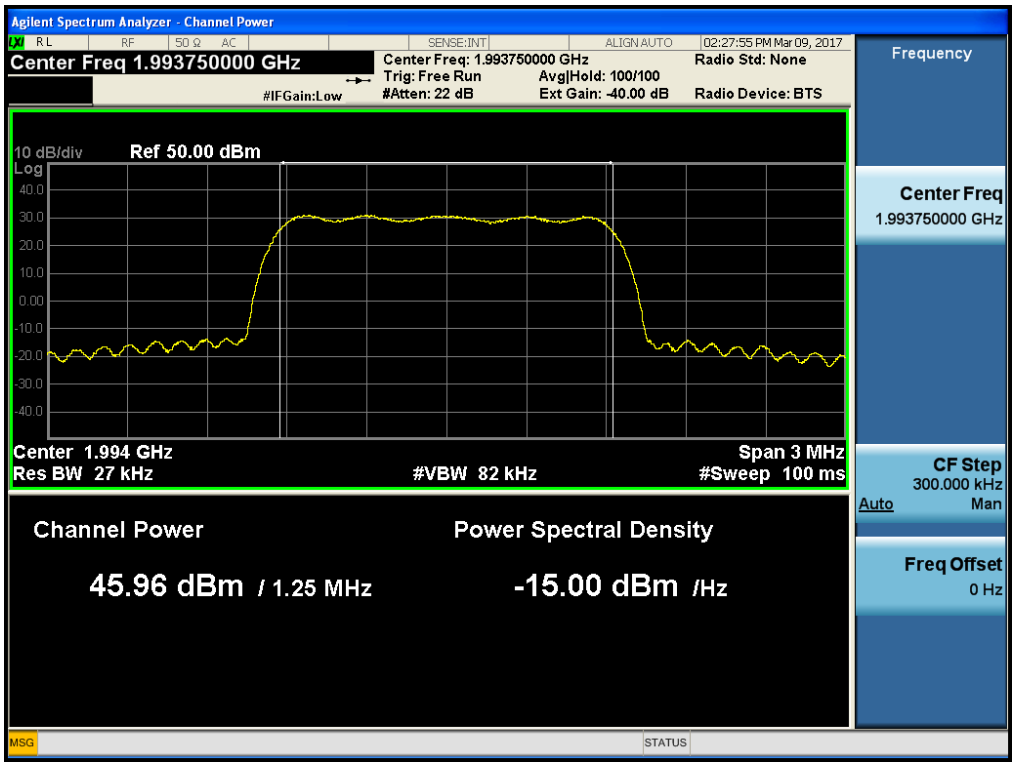
[CDMA AGC threshold Downlink Low]



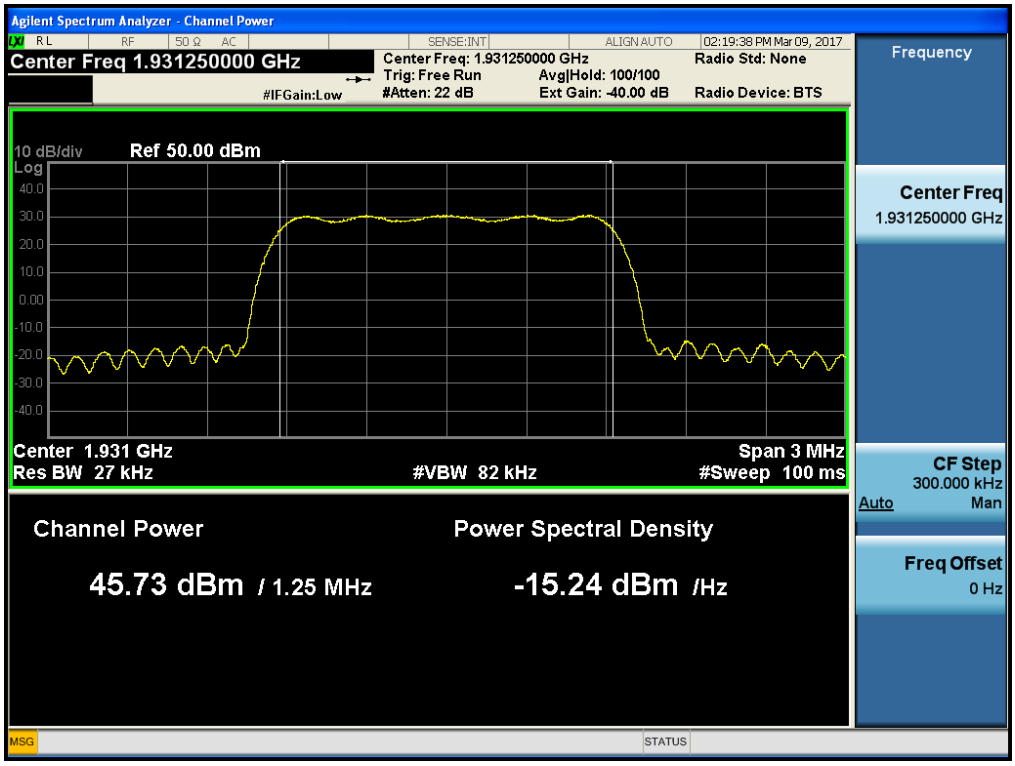
[CDMA AGC threshold Downlink Middle]



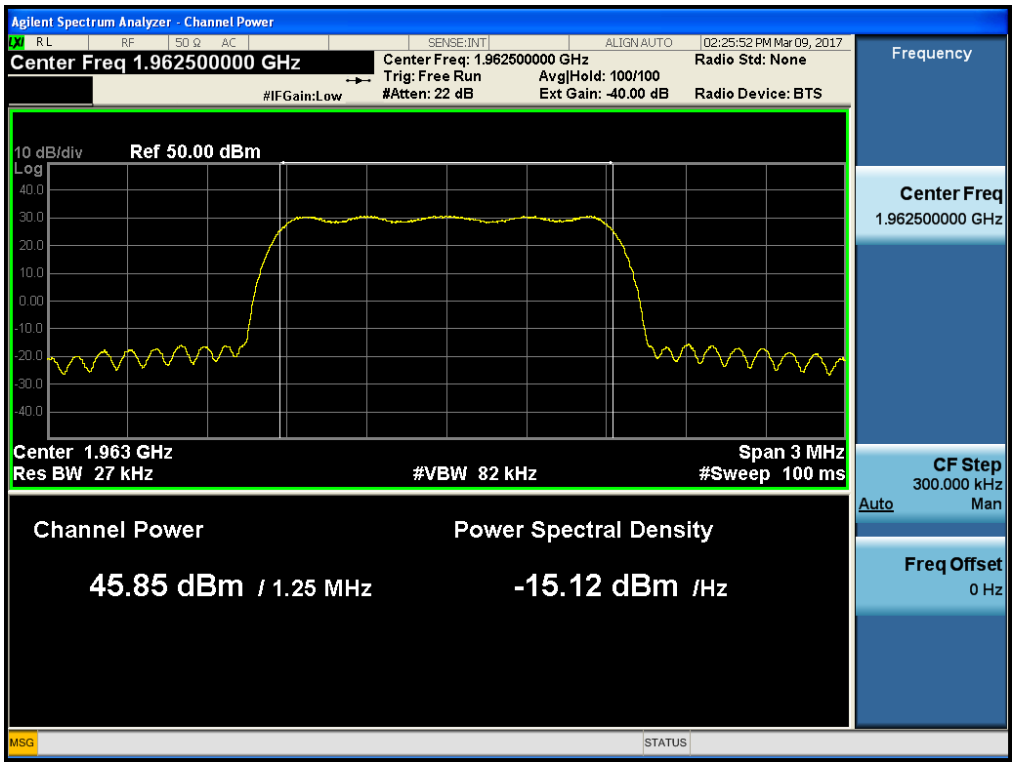
[CDMA AGC threshold Downlink High]



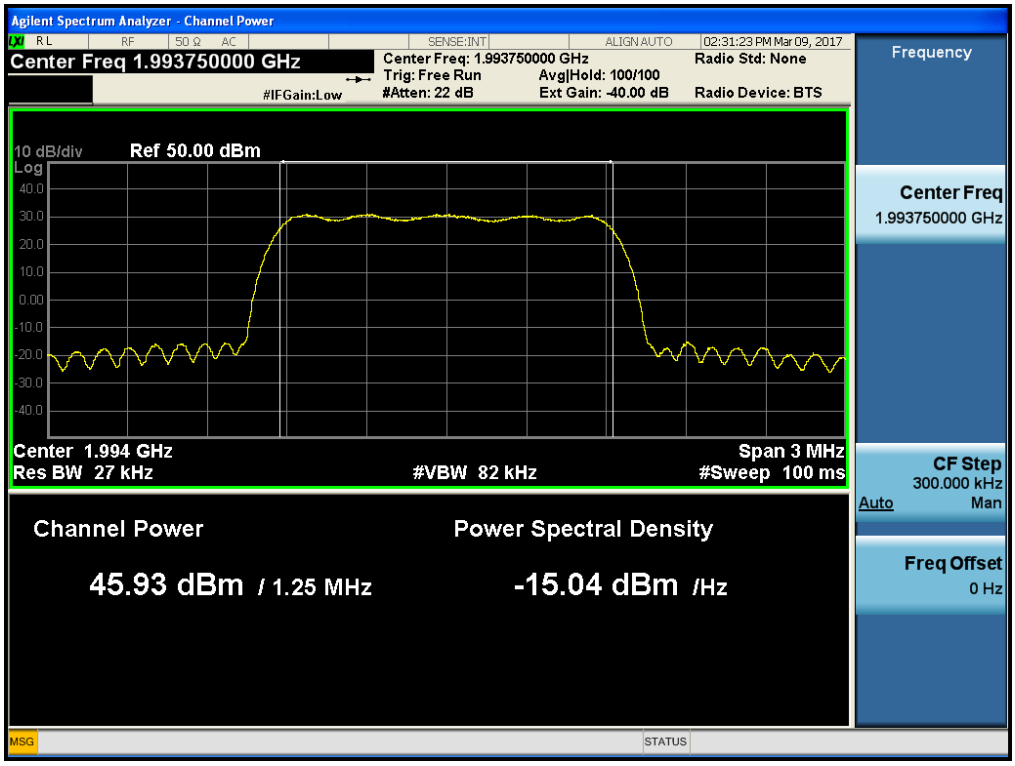
[CDMA +3dB above the AGC threshold Downlink Low]



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

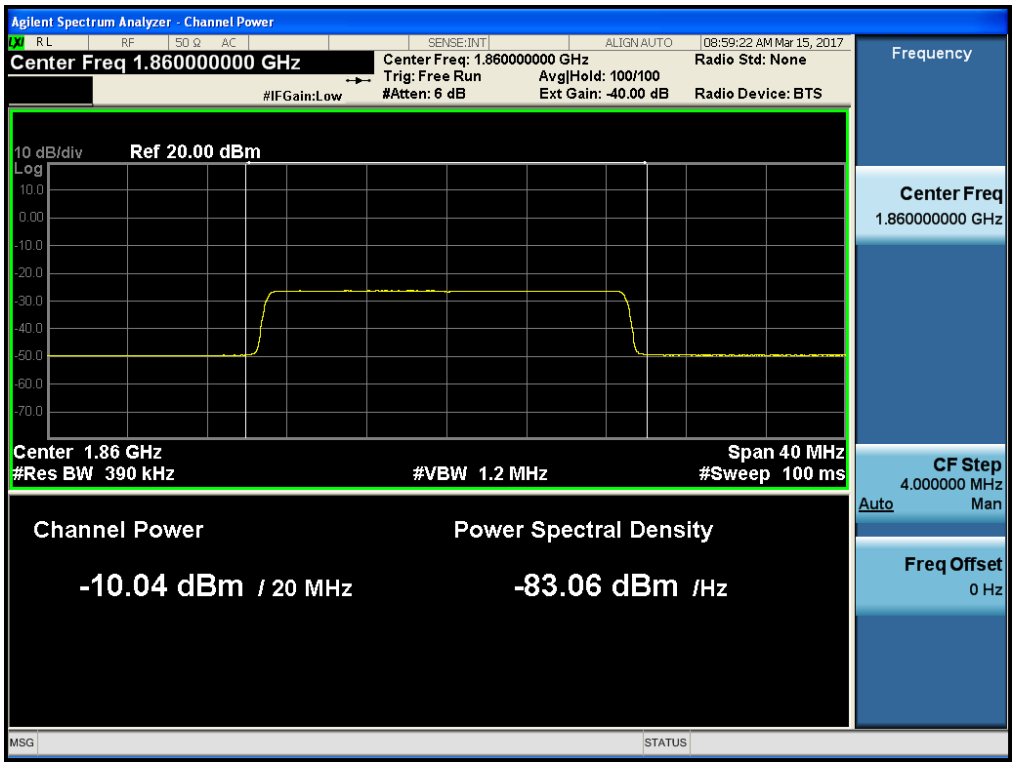


[CDMA +3dB above the AGC threshold Downlink High]

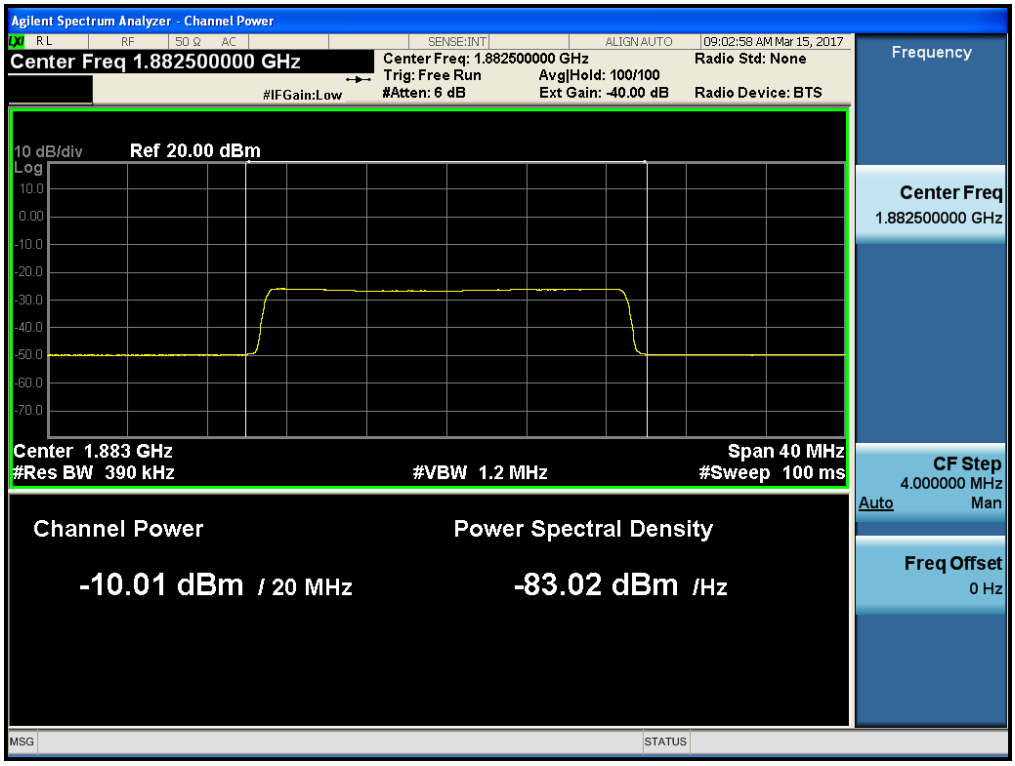


LTE 20 MHz UL

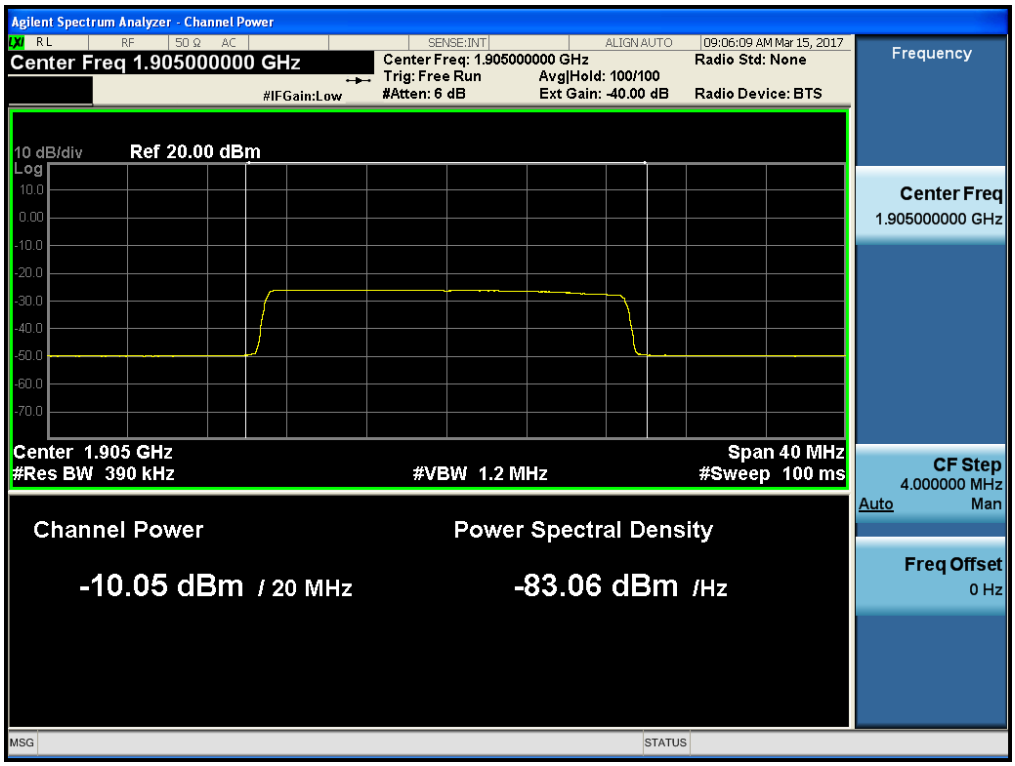
[LTE 20 MHz AGC threshold Uplink Low]



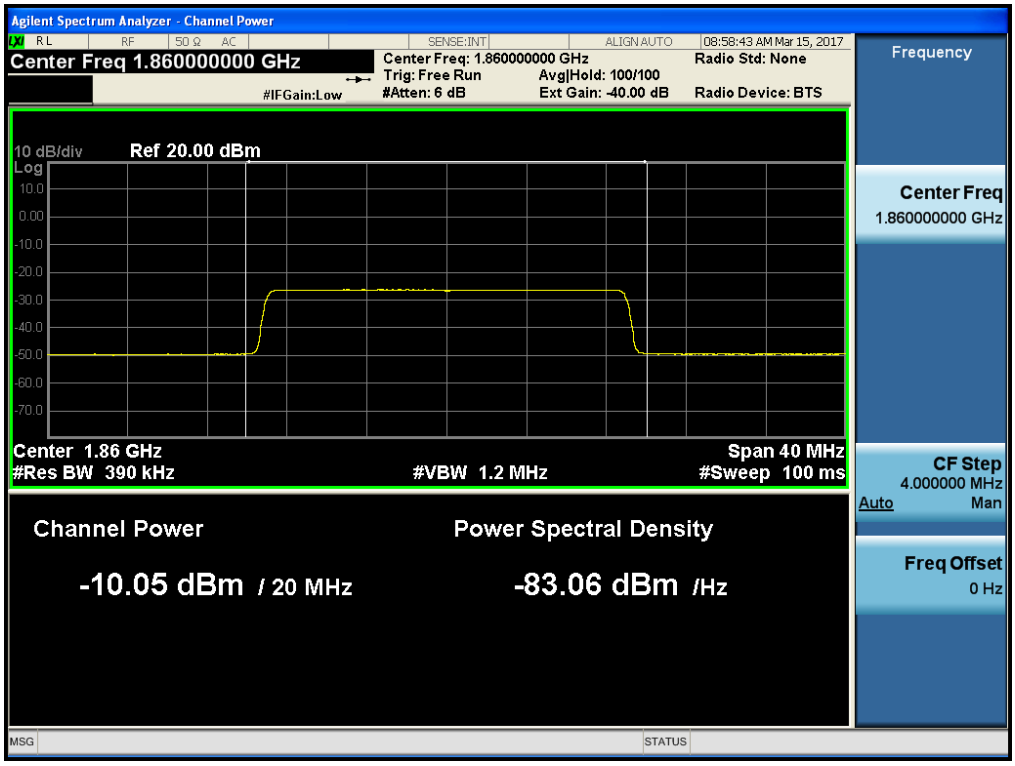
[LTE 20 MHz AGC threshold Uplink Middle]



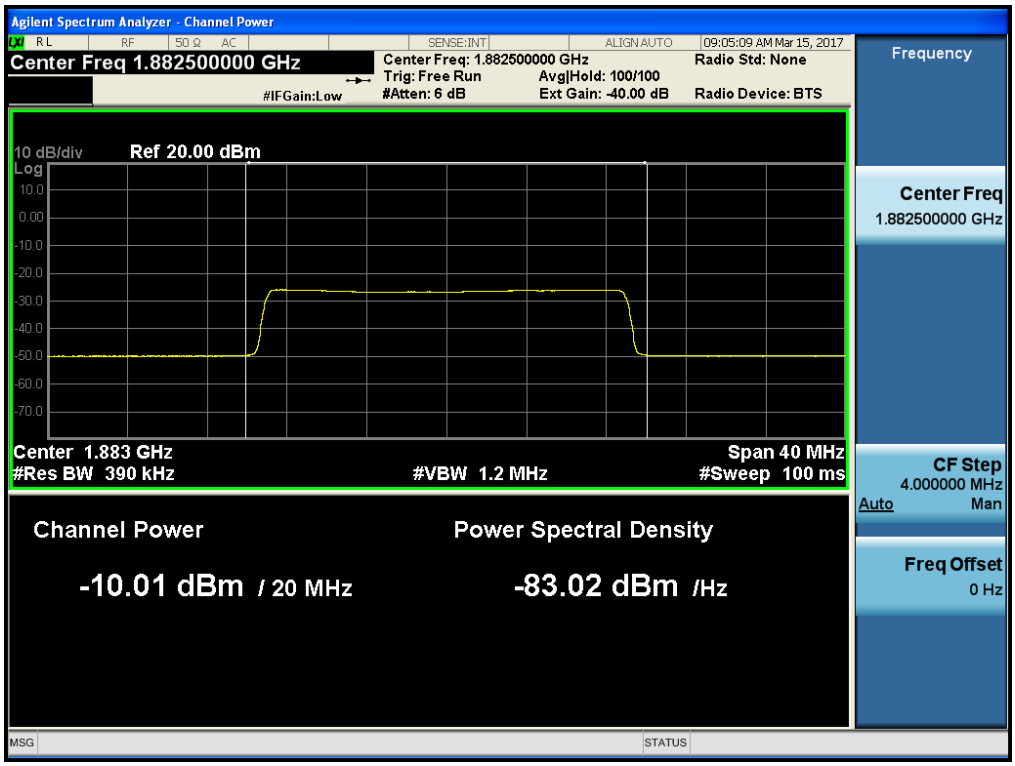
[LTE 20 MHz AGC threshold Uplink High]



[LTE 20 MHz +3dB above the AGC threshold Uplink Low]



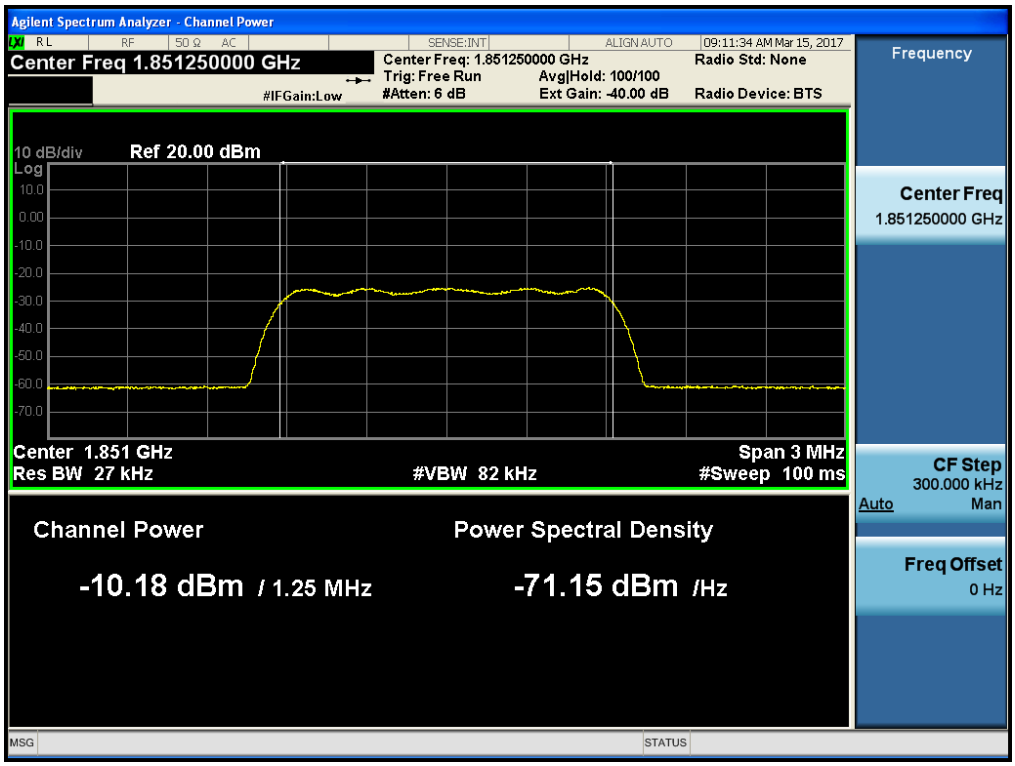
[LTE 20 MHz +3dB above the AGC threshold Uplink Middle]



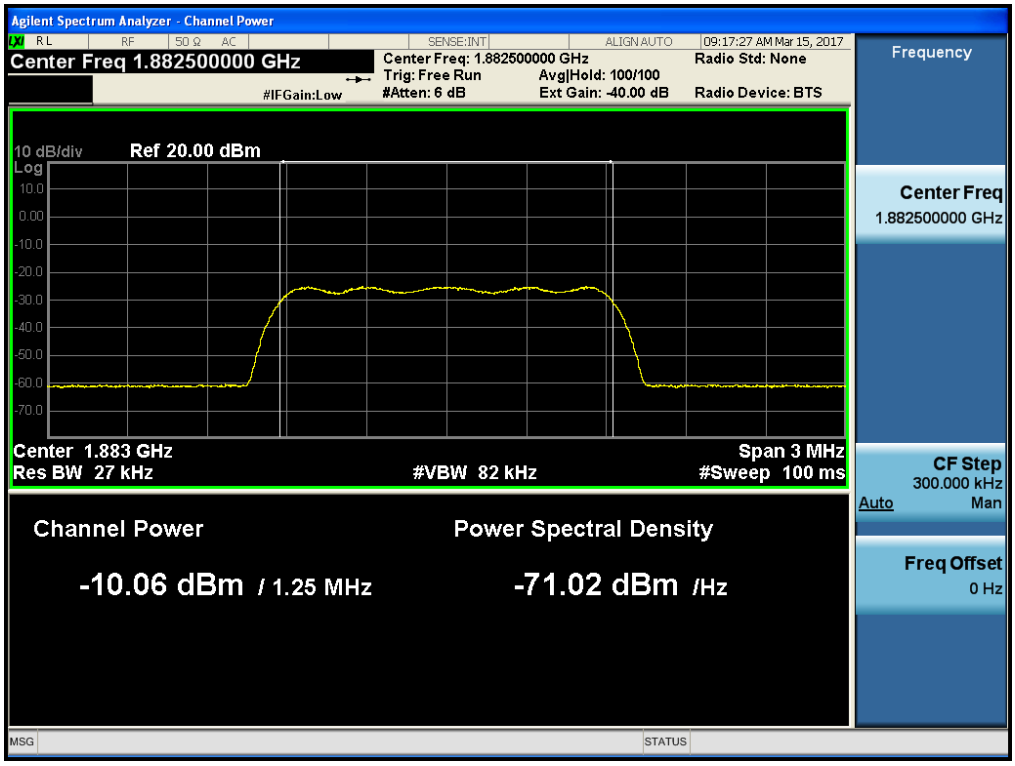
[LTE 20 MHz +3dB above the AGC threshold Uplink High]

CDMA UL

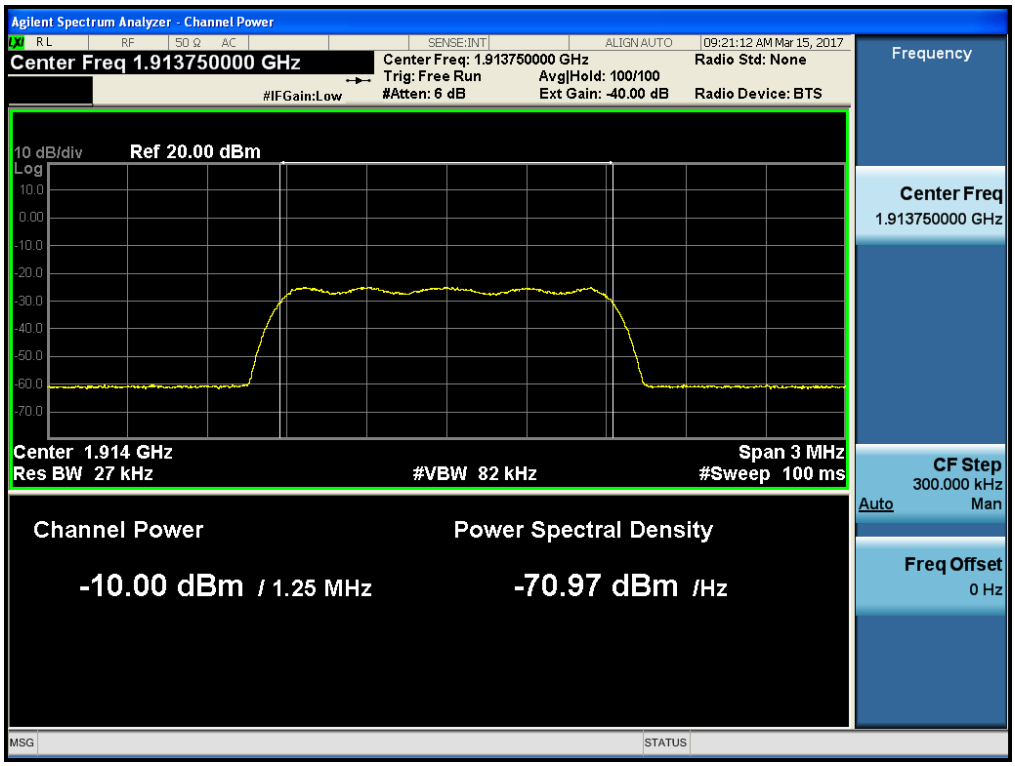
[CDMA AGC threshold Uplink Low]



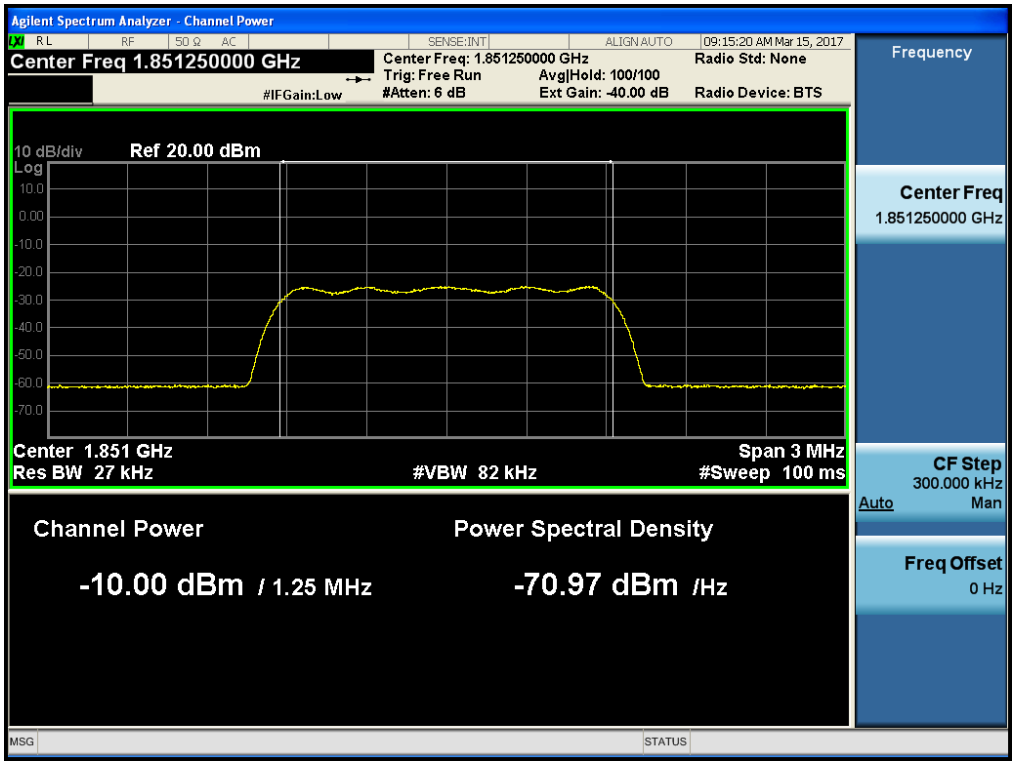
[CDMA AGC threshold Uplink Middle]



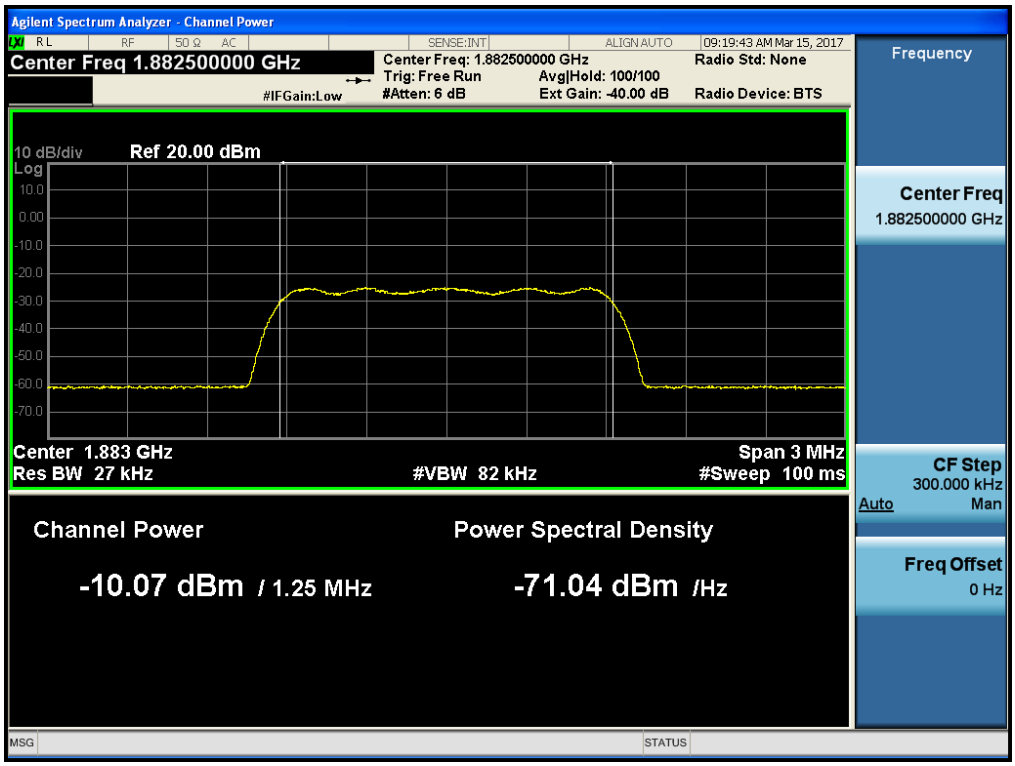
[CDMA AGC threshold Uplink High]



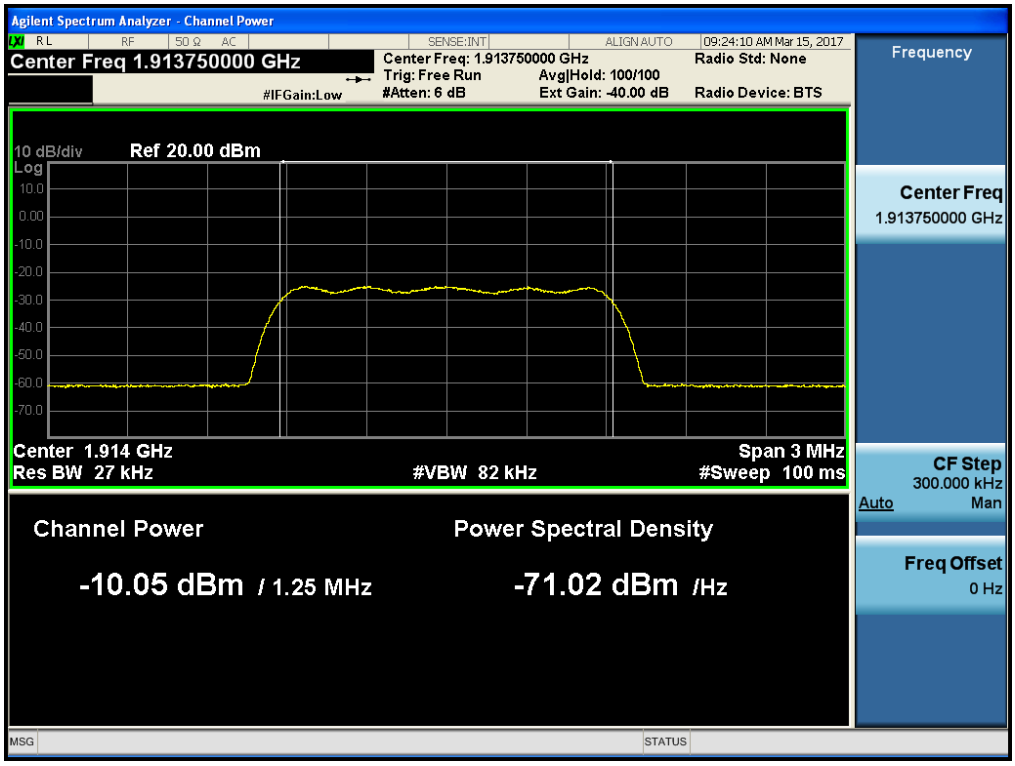
[CDMA +3dB above the AGC threshold Uplink Low]



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

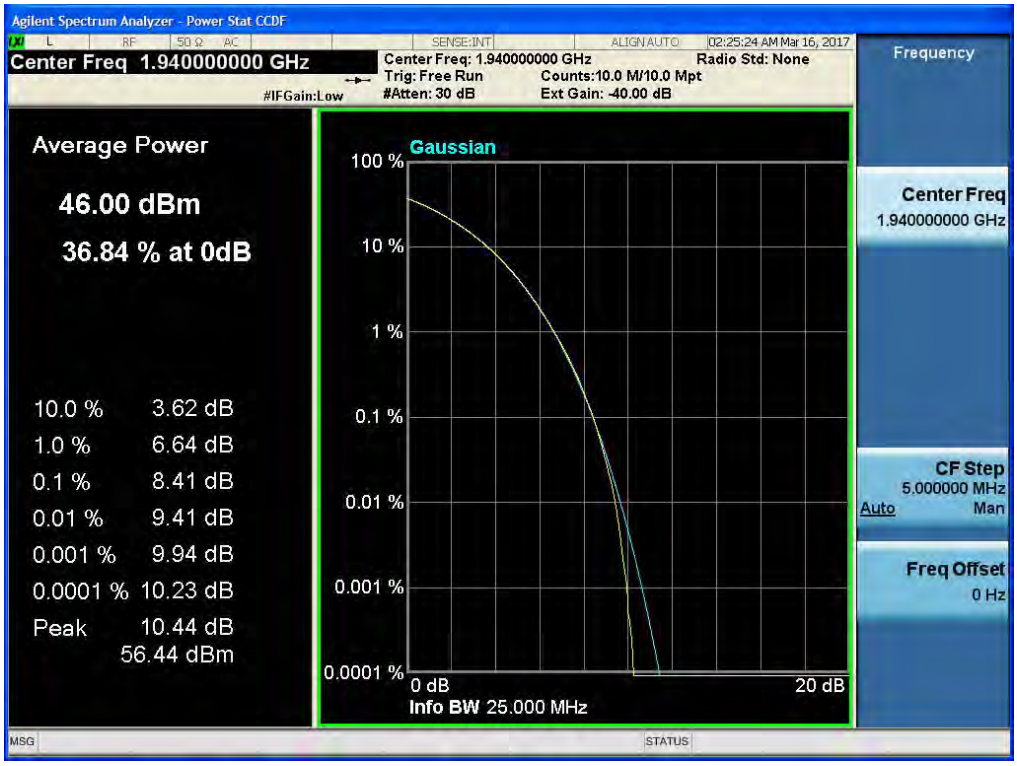


[CDMA +3dB above the AGC threshold Uplink High]

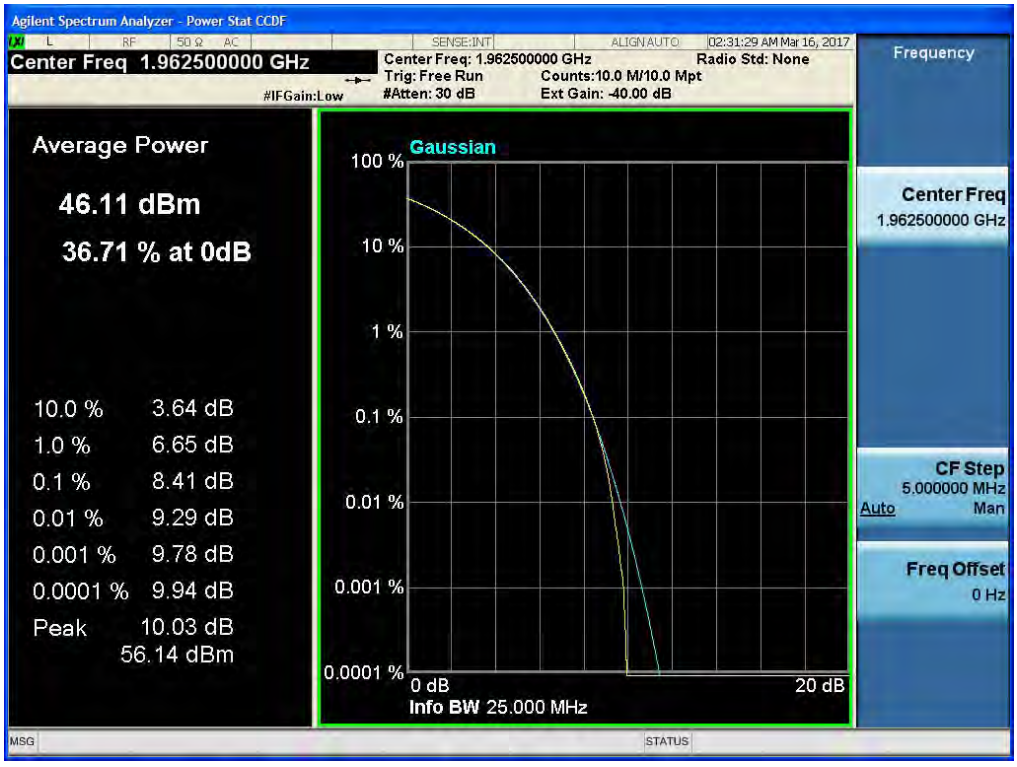


Peak-to-Average Ratio for PCS 1900

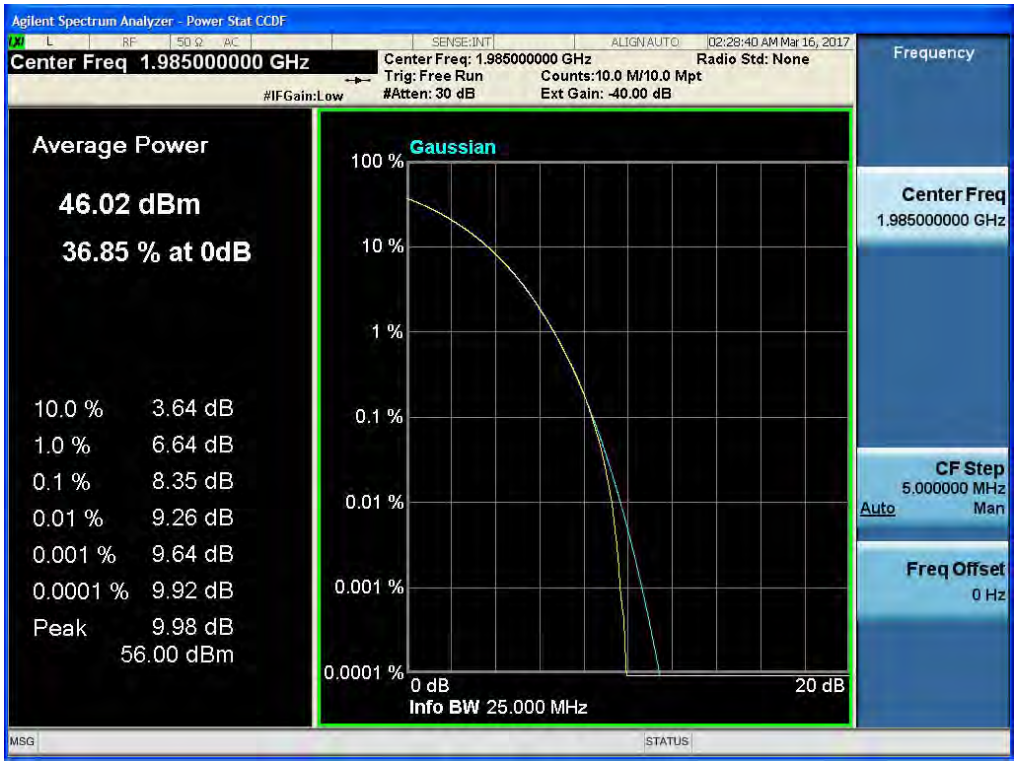
[LTE 20 MHz Downlink Low]



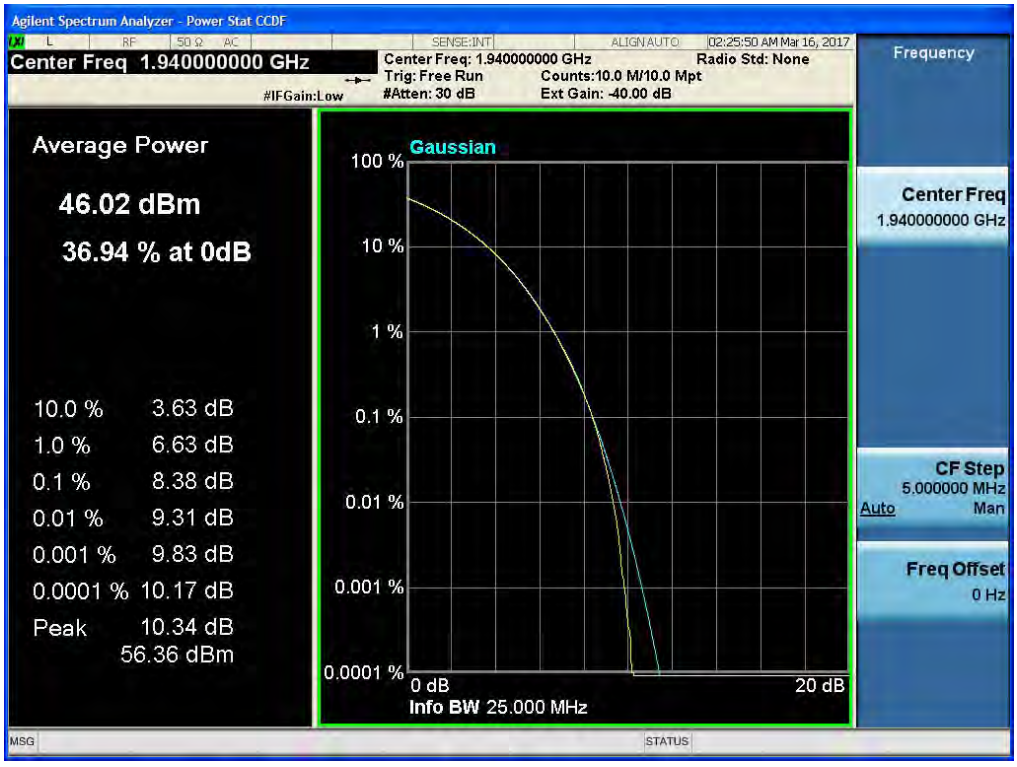
[LTE 20 MHz Downlink Middle]



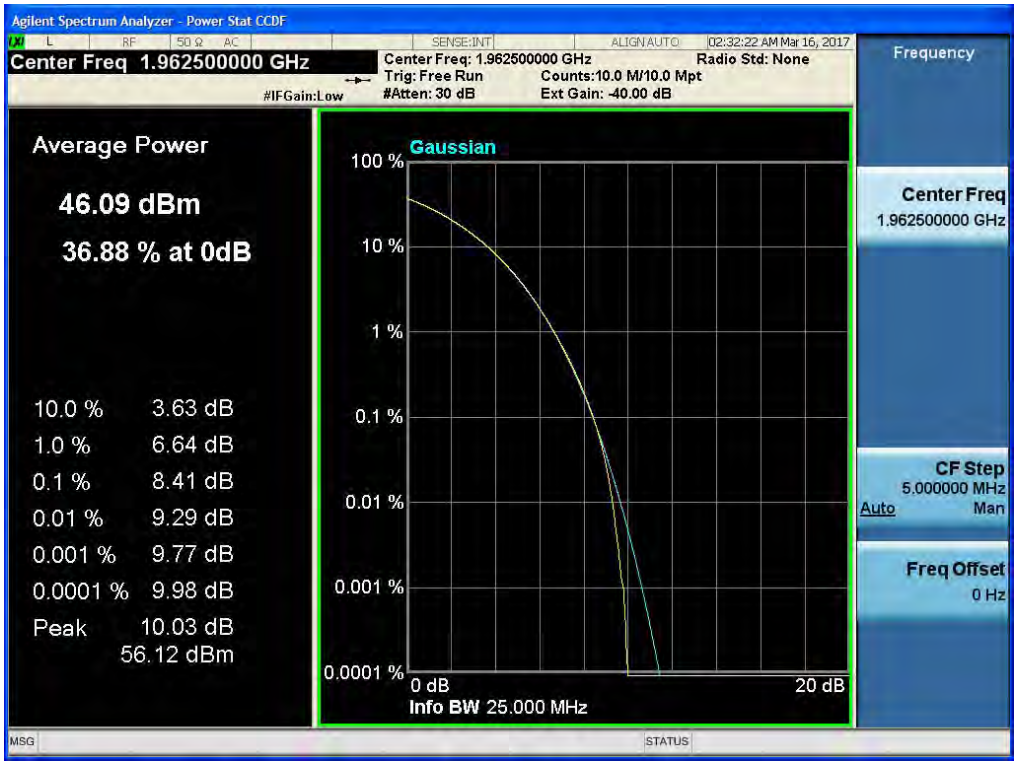
[LTE 20 MHz Downlink High]



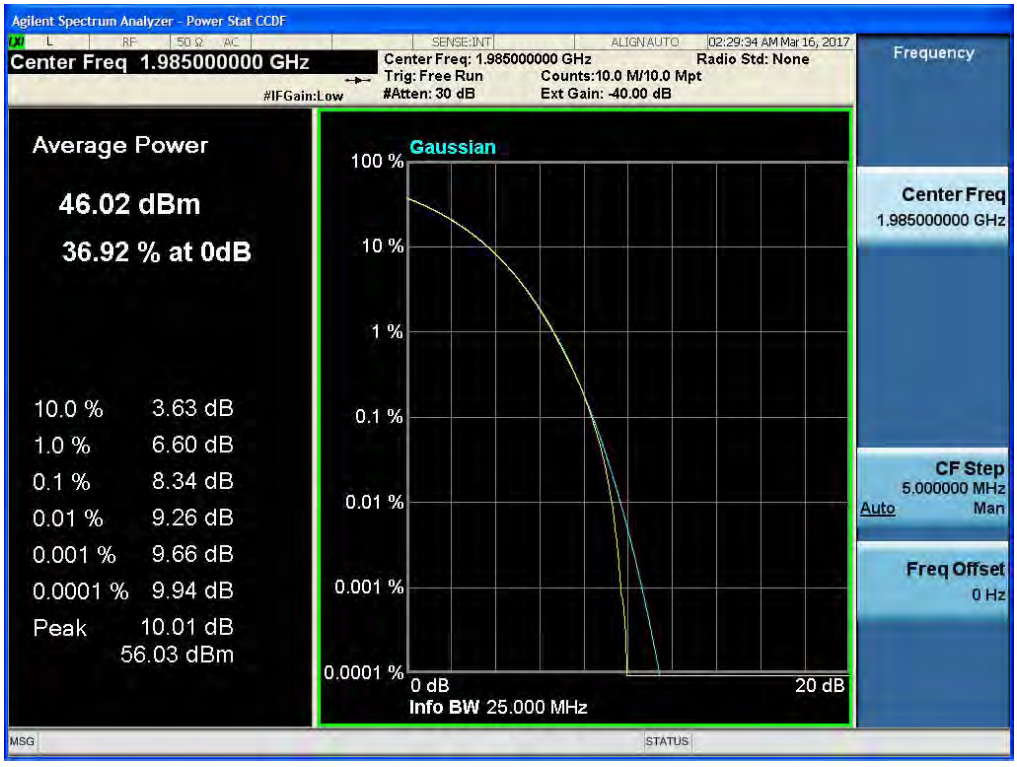
[LTE 20 MHz +3dB above the Downlink Low]



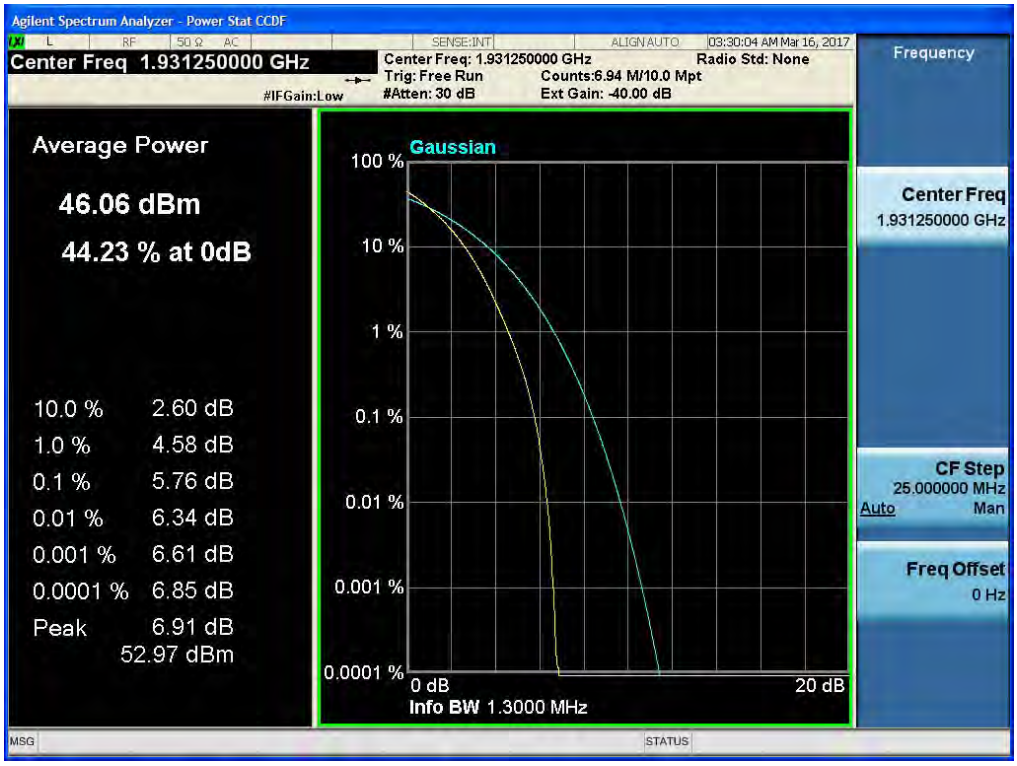
[LTE 20 MHz +3dB above the Downlink Middle]



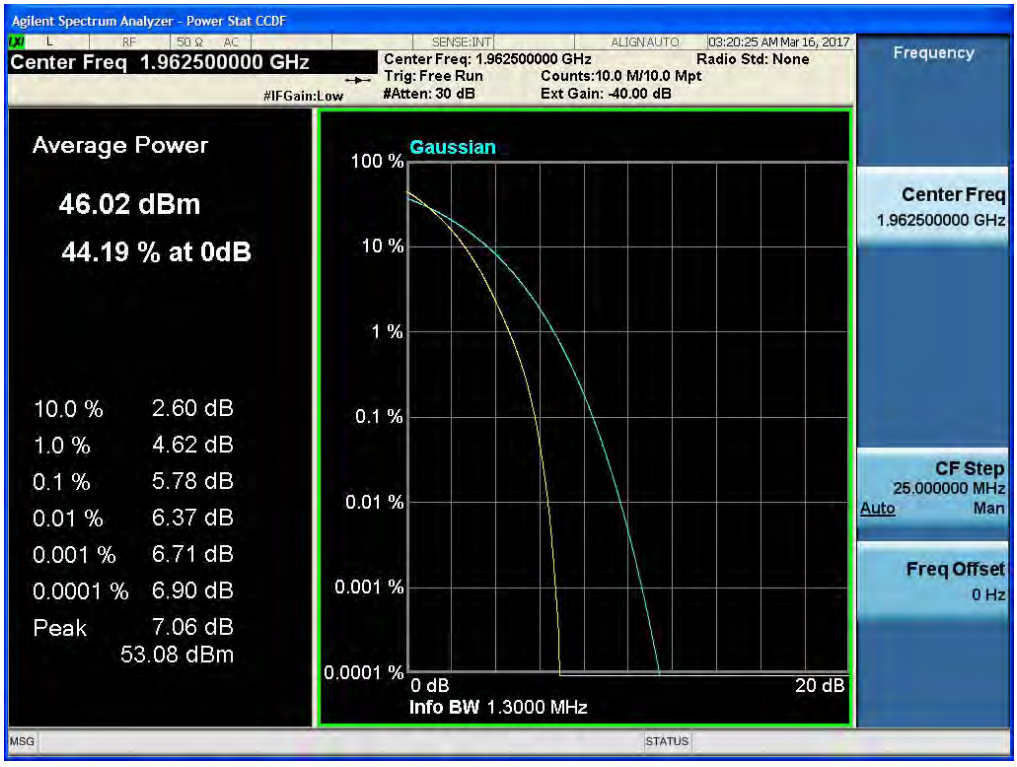
[LTE 20 MHz +3dB above the Downlink High]



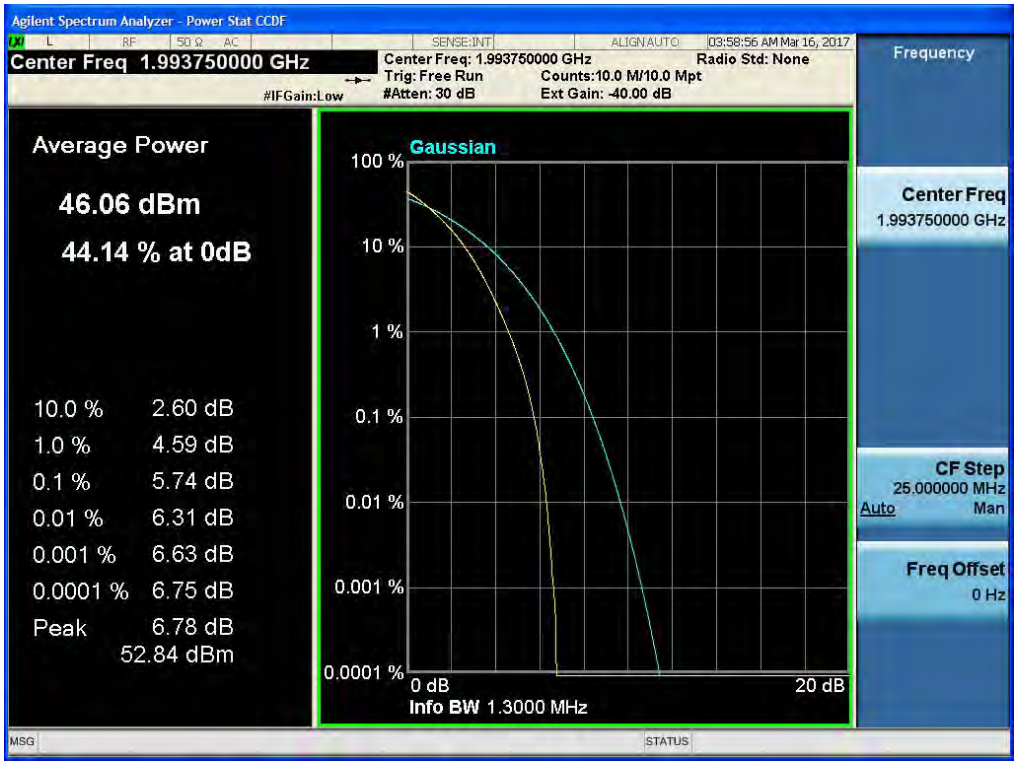
[CDMA Downlink Low]



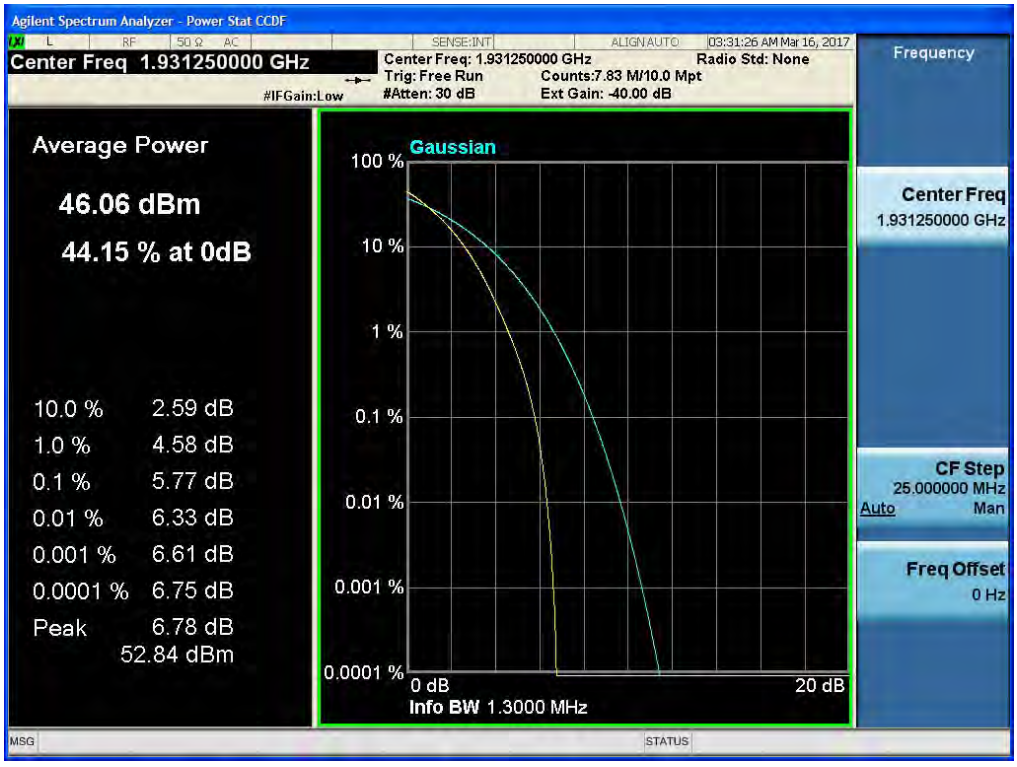
[CDMA Downlink Middle]



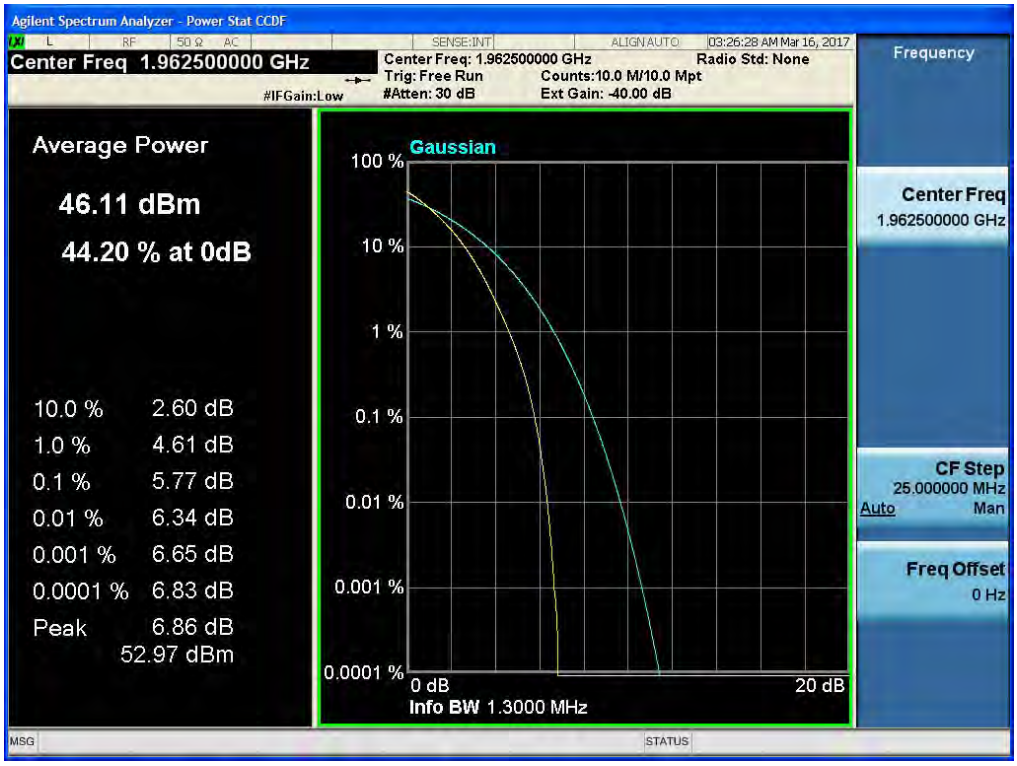
[CDMA Downlink High]



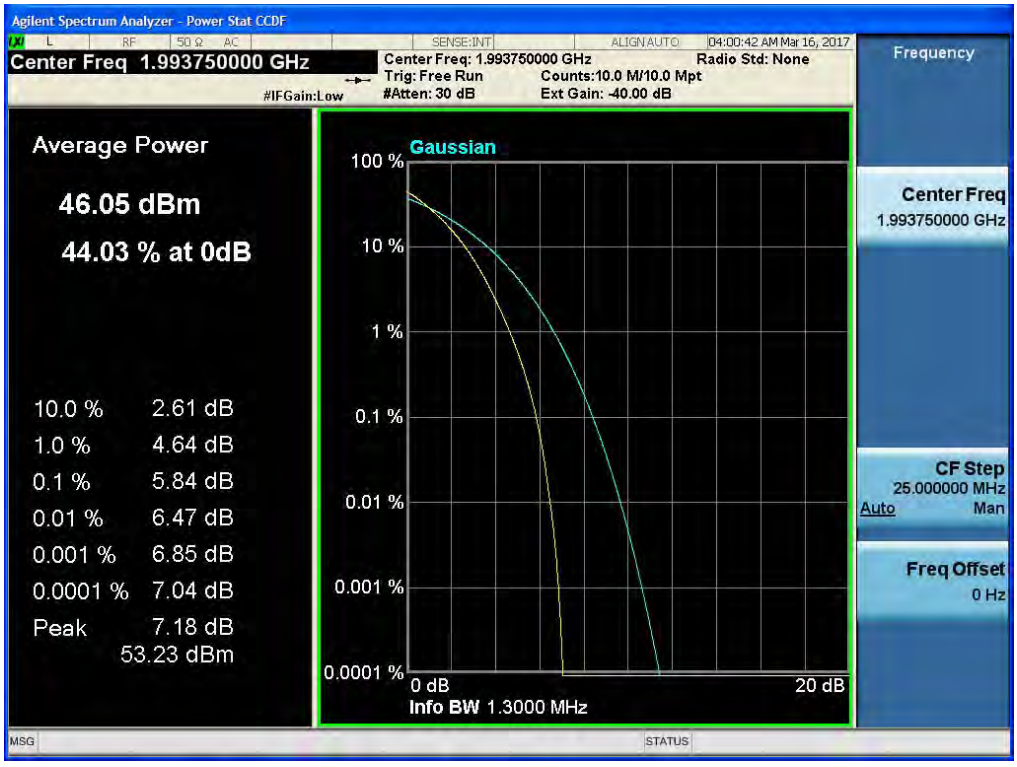
[CDMA +3dB above the Downlink Low]



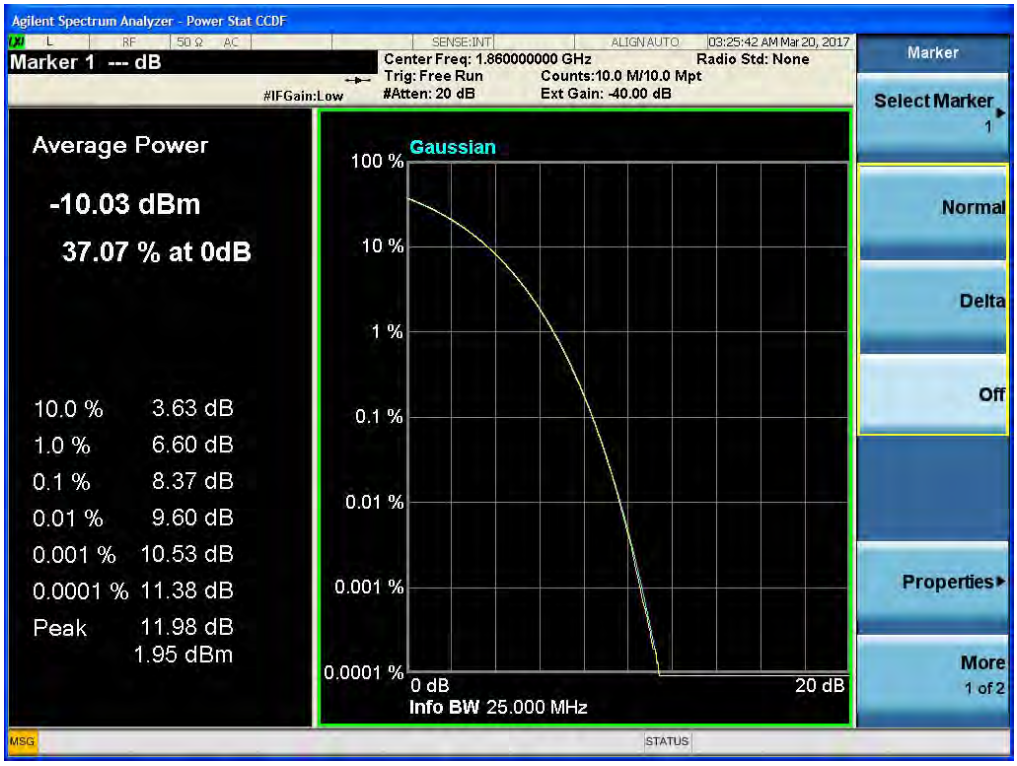
[CDMA +3dB above the Downlink Middle]



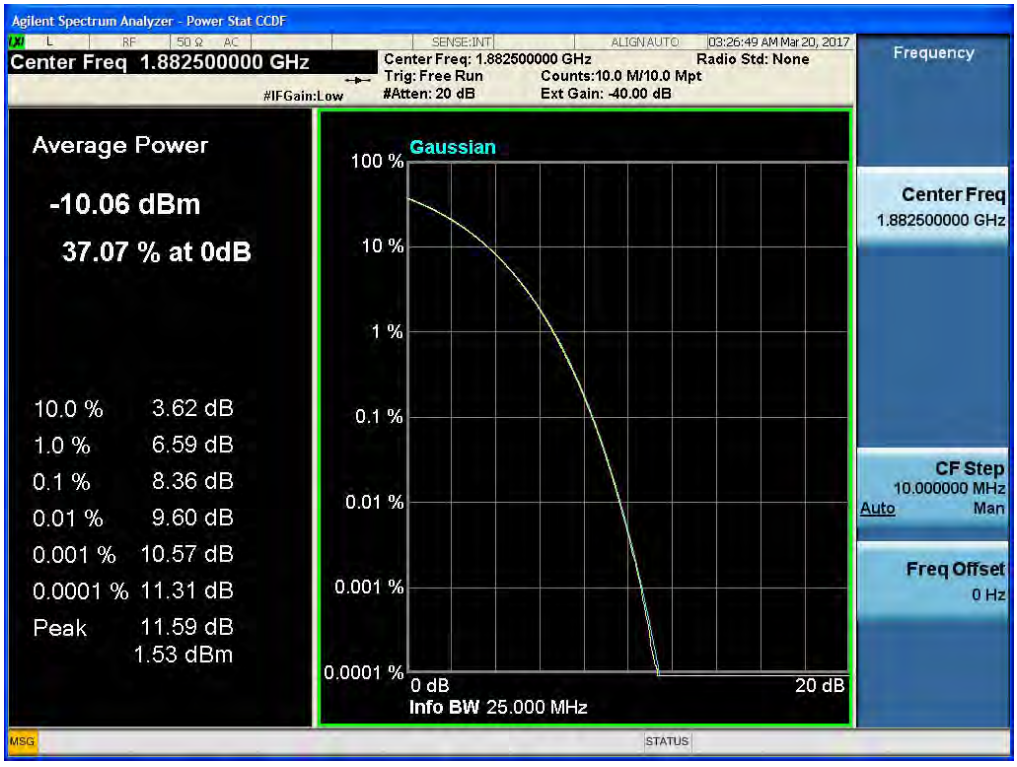
[CDMA +3dB above the Downlink High]



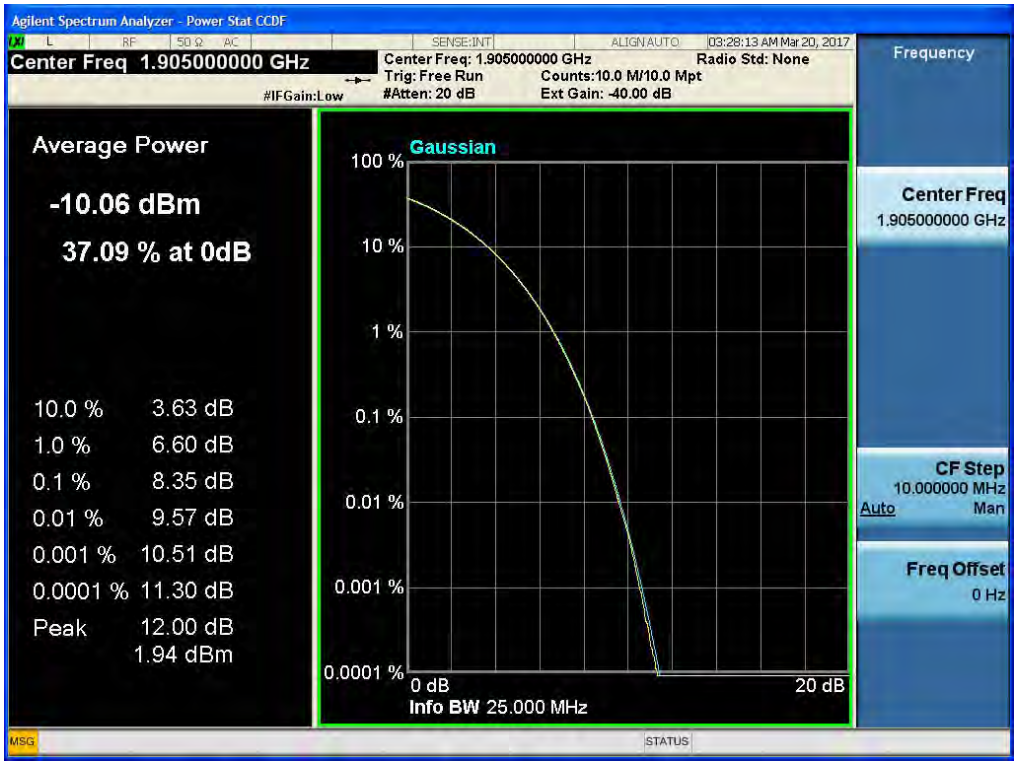
[LTE 20 MHz Uplink Low]



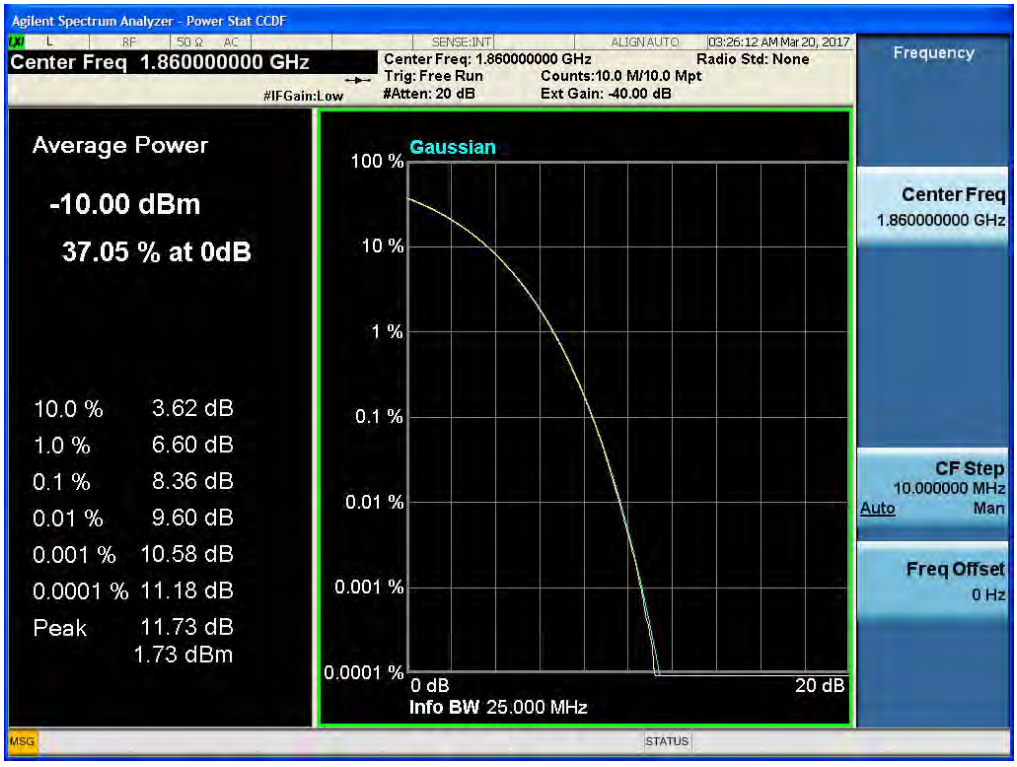
[LTE 20 MHz Uplink Middle]



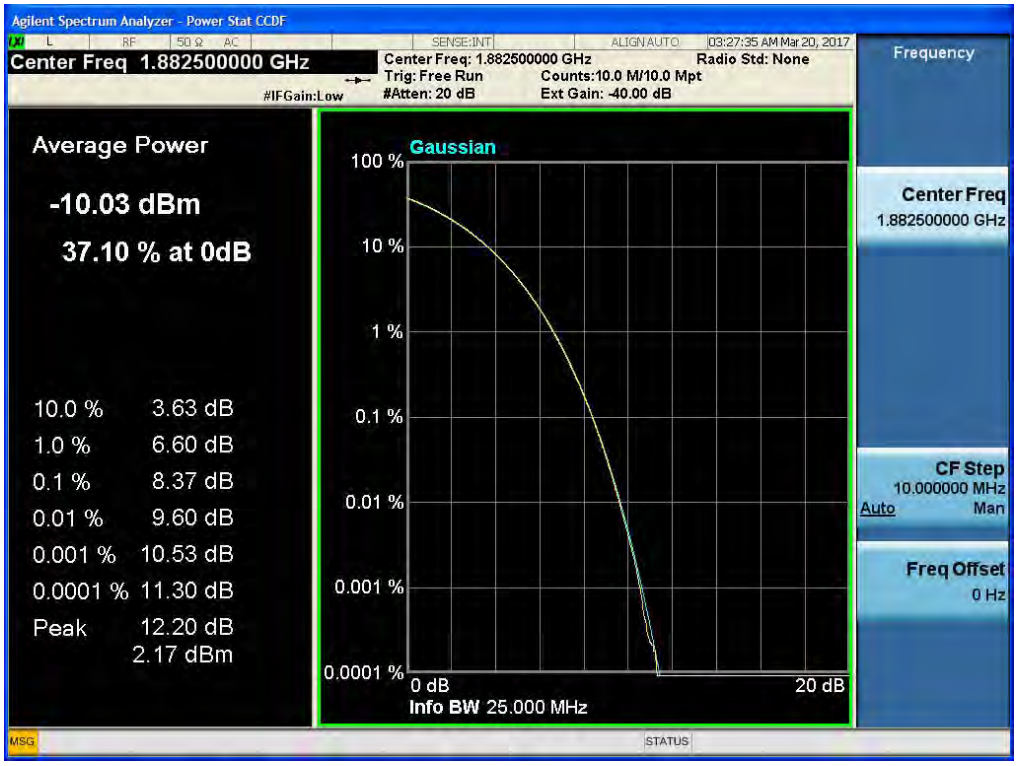
[LTE 20 MHz Uplink High]



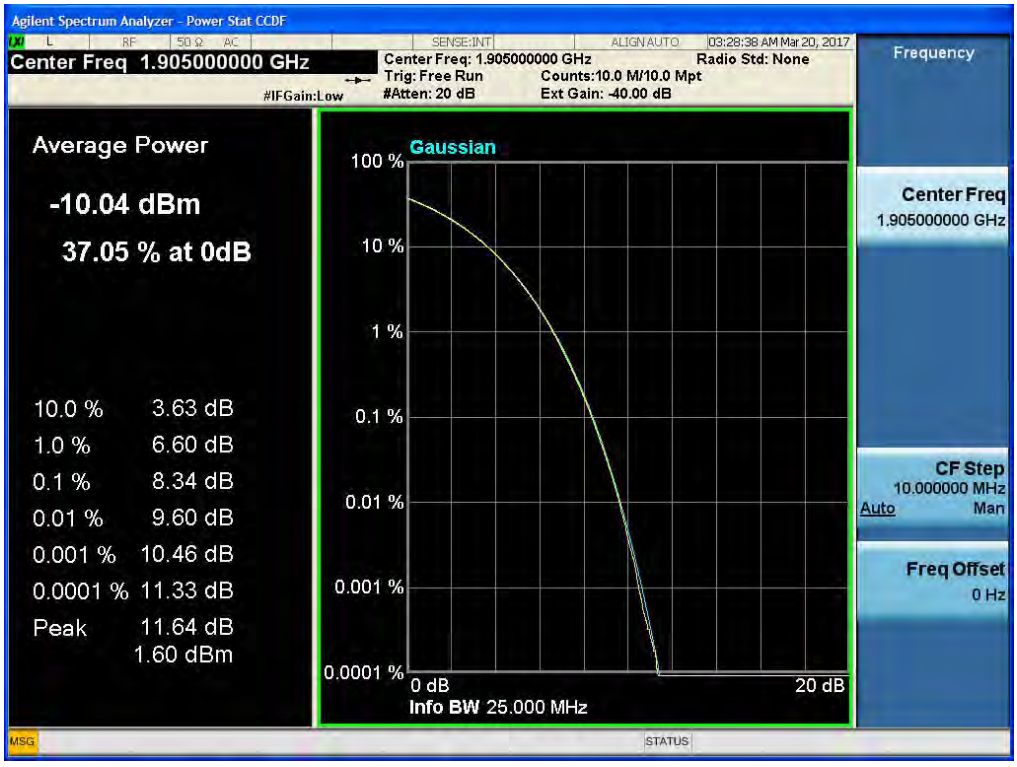
[LTE 20 MHz +3dB above the Uplink Low]



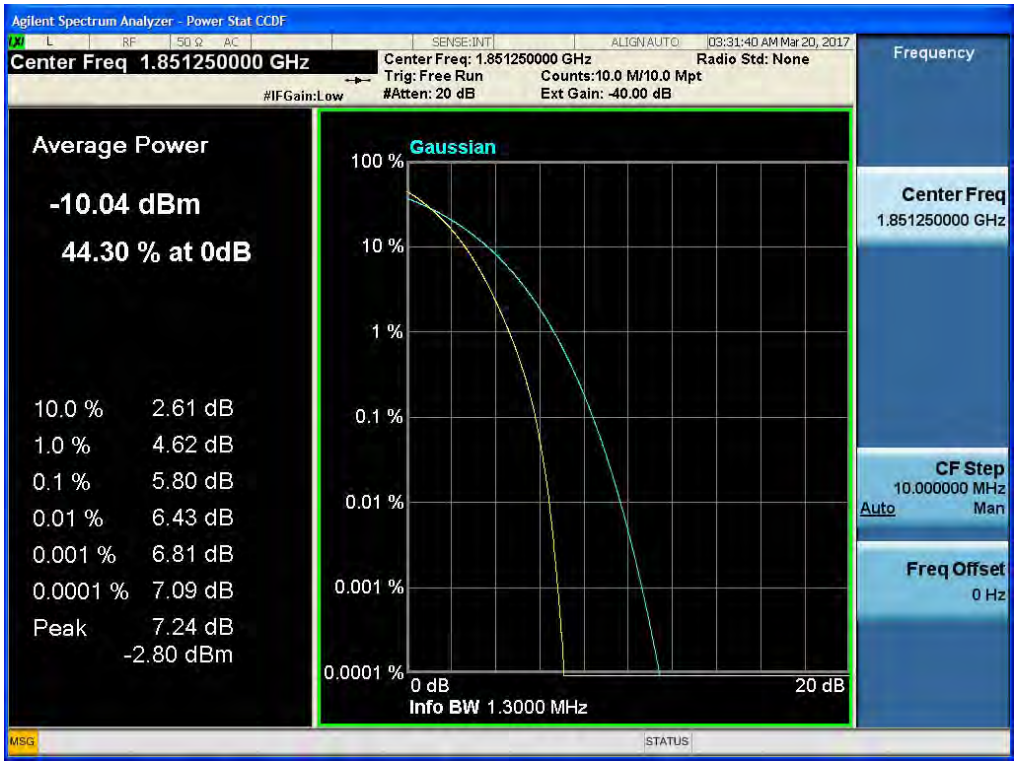
[LTE 20 MHz +3dB above the Uplink Middle]



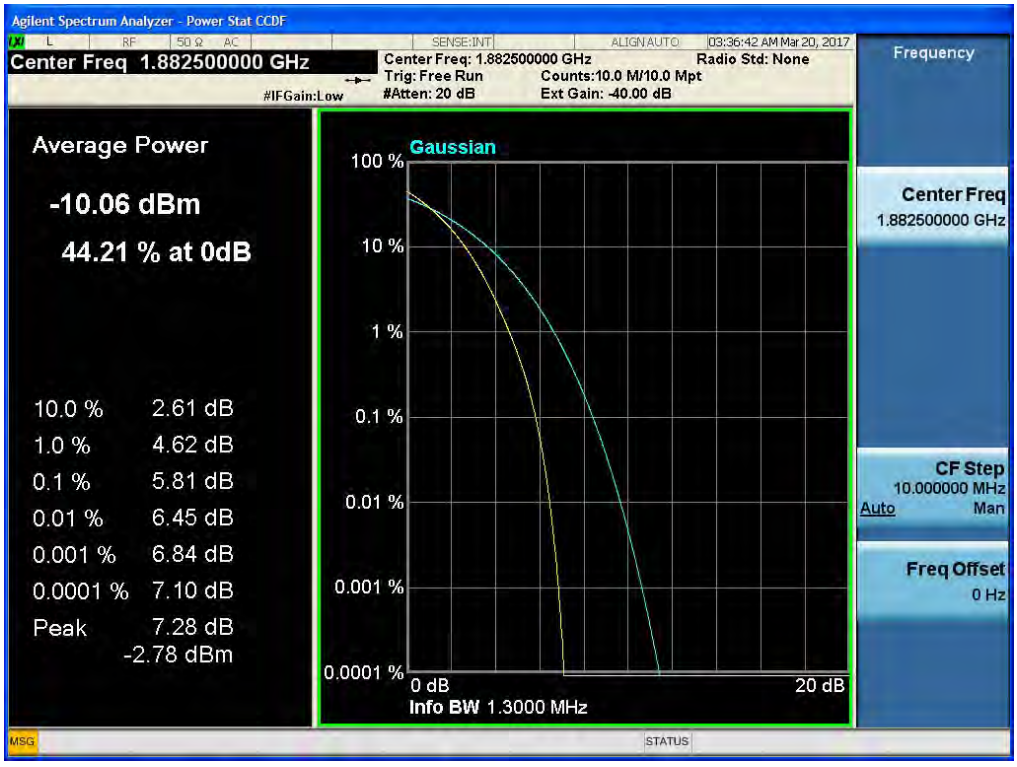
[LTE 20 MHz +3dB above the Uplink High]



[CDMA Uplink Low]

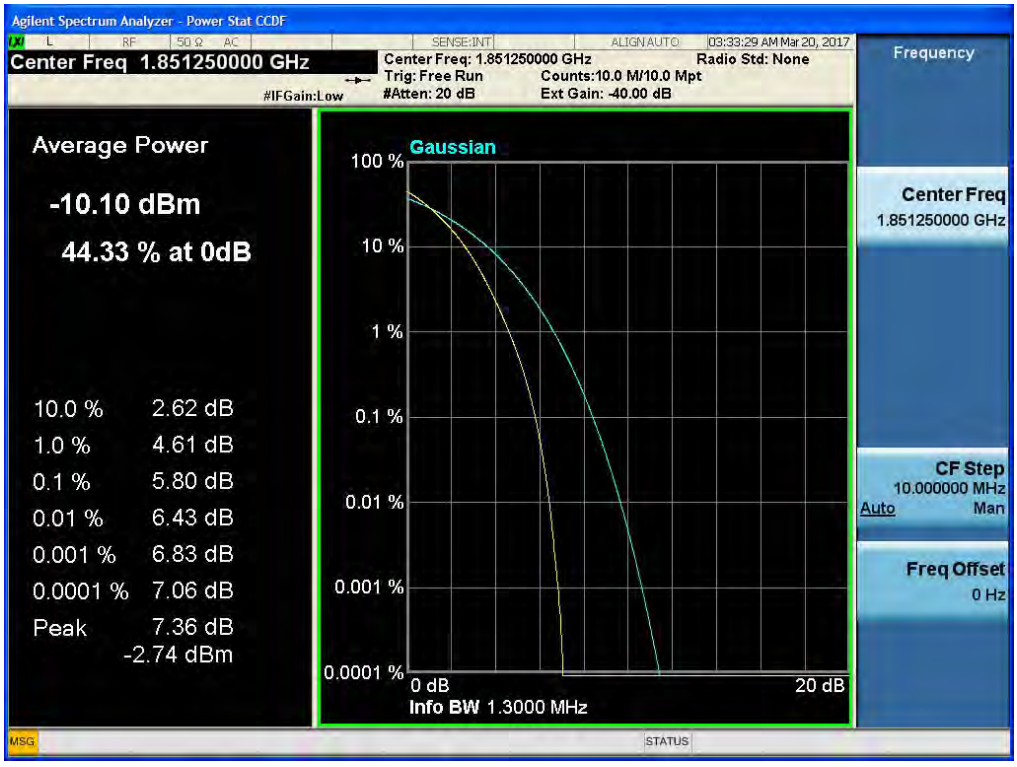


[CDMA Uplink Middle]

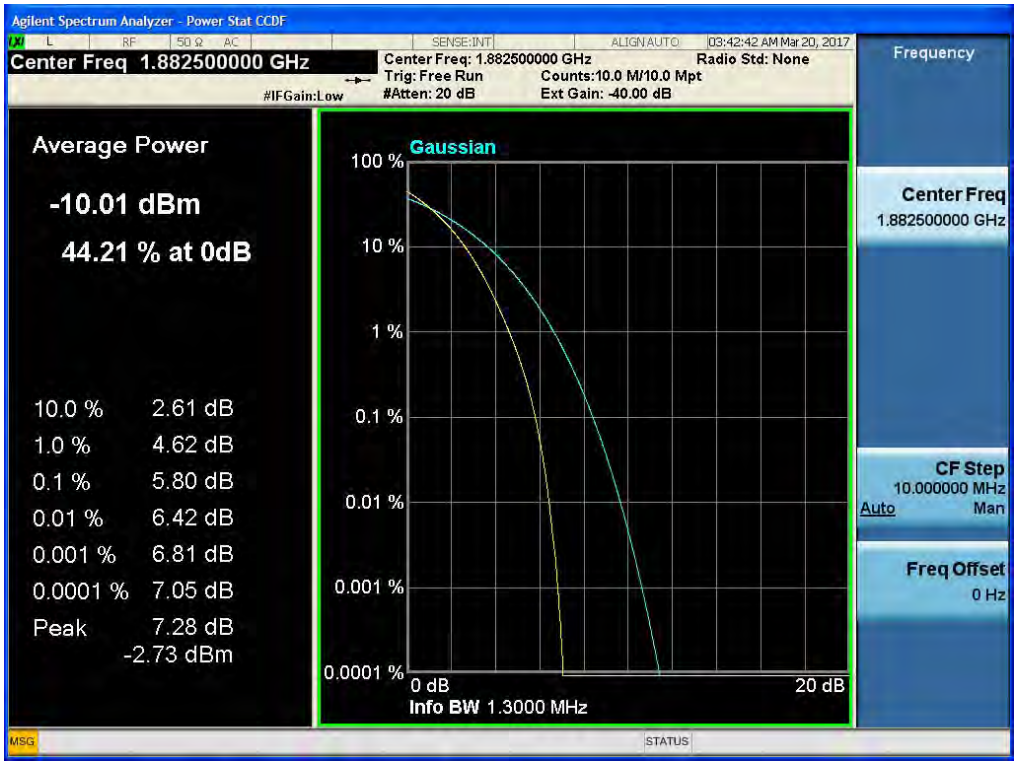


[CDMA Uplink High]

[CDMA +3dB above the Uplink Low]



[CDMA +3dB above the Uplink Middle]



[CDMA +3dB above the Uplink High]

[Downlink] – AWS 2100

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
LTE 20 MHz AGC threshold	Low	2120.00	45.83	38.282
	Middle	2145.00	45.88	38.726
	High	2170.00	45.91	38.994
LTE 20 MHz +3dBm above the AGC threshold	Low	2120.00	45.95	39.355
	Middle	2145.00	45.91	38.994
	High	2170.00	45.97	39.537
CDMA AGC threshold	Low	2111.25	45.90	38.905
	Middle	2145.00	45.96	39.446
	High	2178.75	45.94	39.264
CDMA +3dBm above the AGC threshold	Low	2111.25	45.82	38.194
	Middle	2145.00	45.87	38.637
	High	2178.75	45.98	39.628

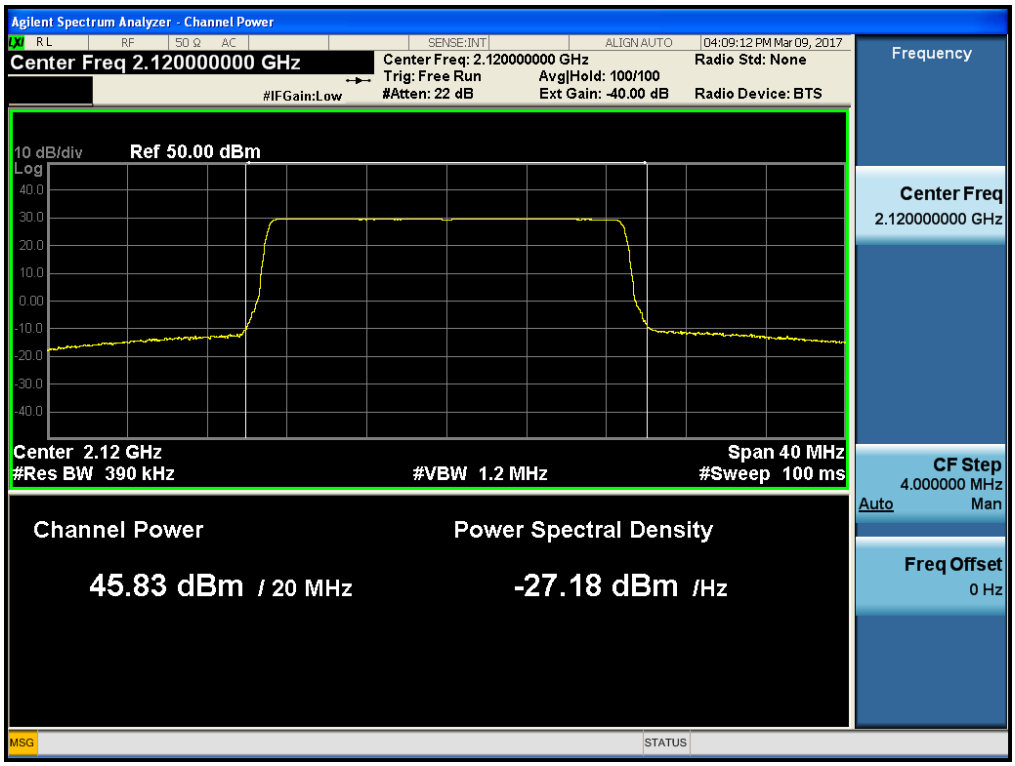
Peak-to-Average Ratio

[Downlink] – AWS 2100

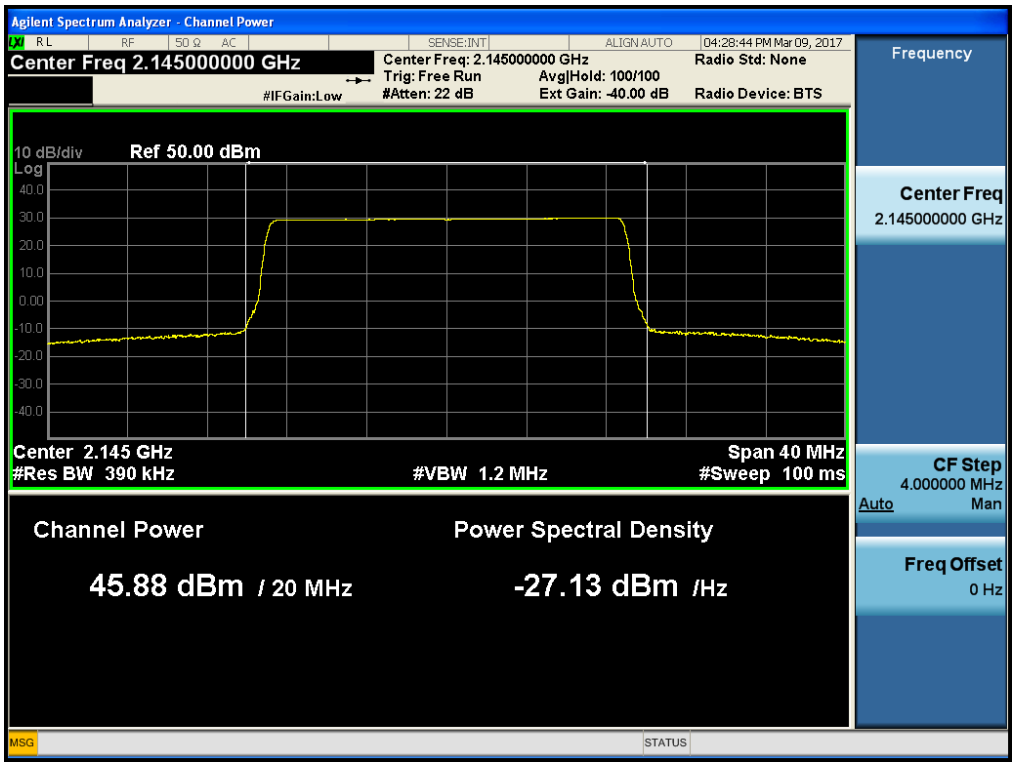
	Channel	Frequency (MHz)	Measured Level (dB)
LTE 20 MHz	Middle	2145.00	8.26
CDMA	Middle	2145.00	5.79

RF Output Power for AWS 2100_LTE 20 MHz

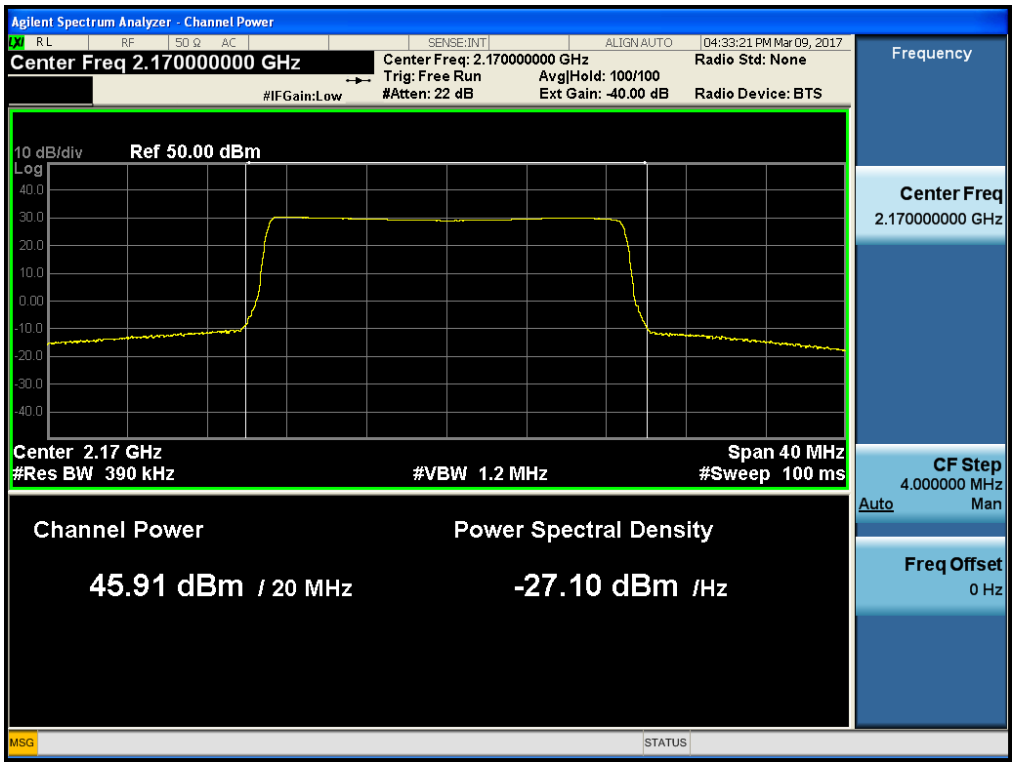
[AGC threshold Downlink Low]



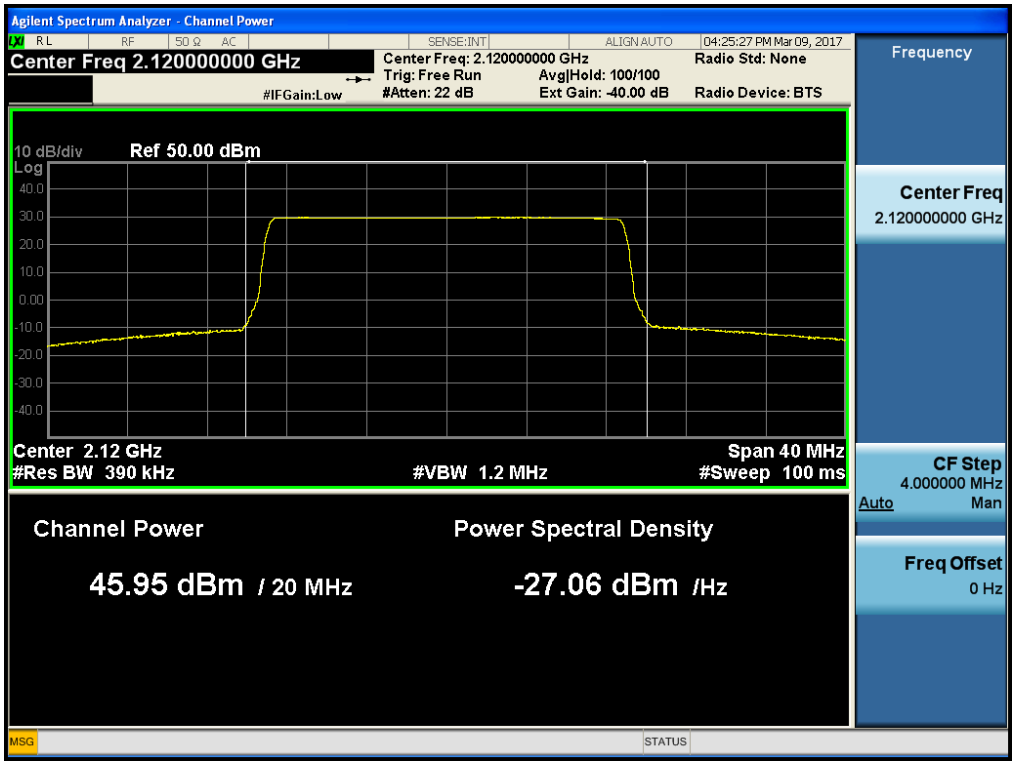
[AGC threshold Downlink Middle]



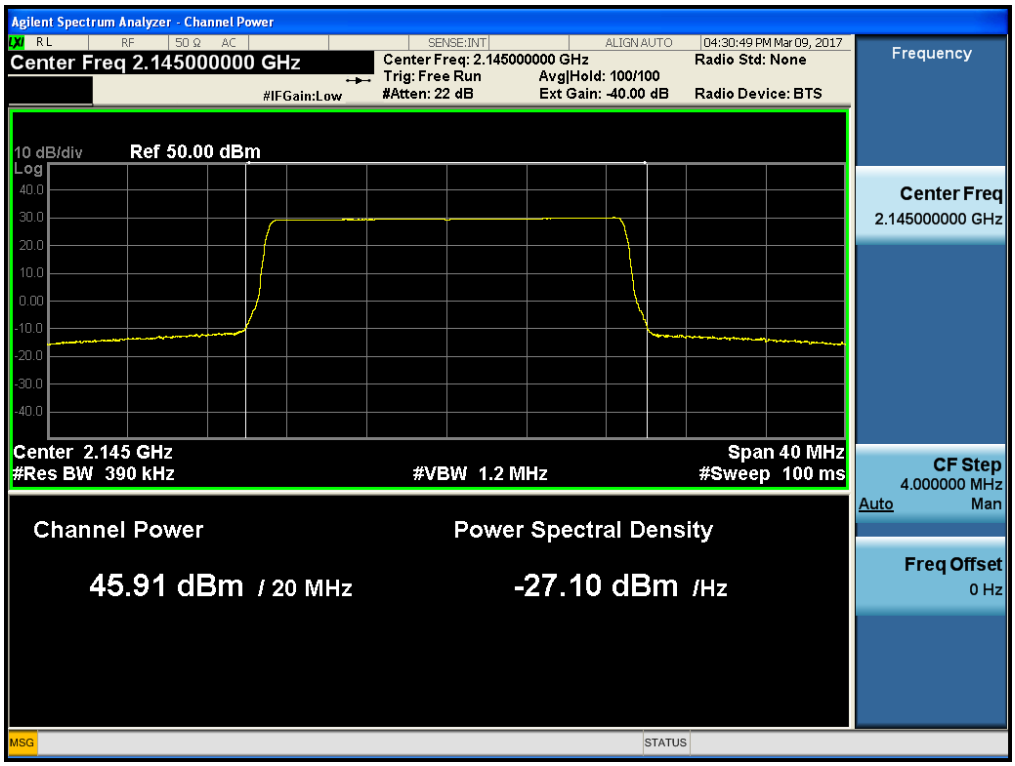
[AGC threshold Downlink High]



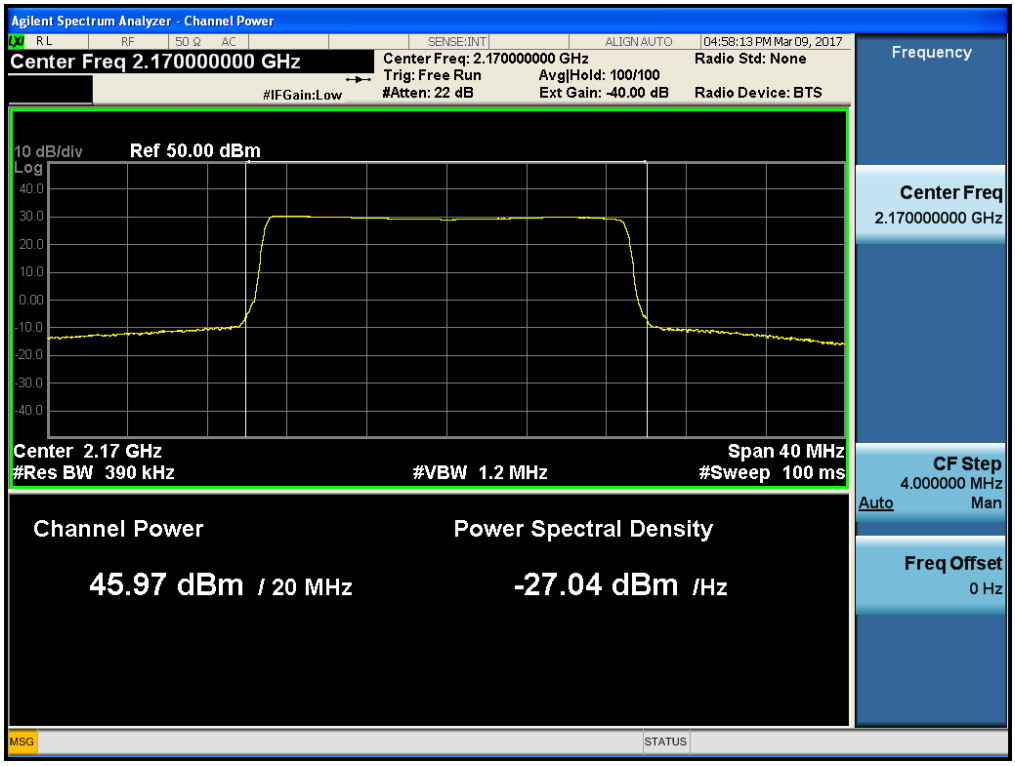
[+3dBm above AGC threshold Downlink Low]



[+3dBm above AGC threshold Downlink Middle]

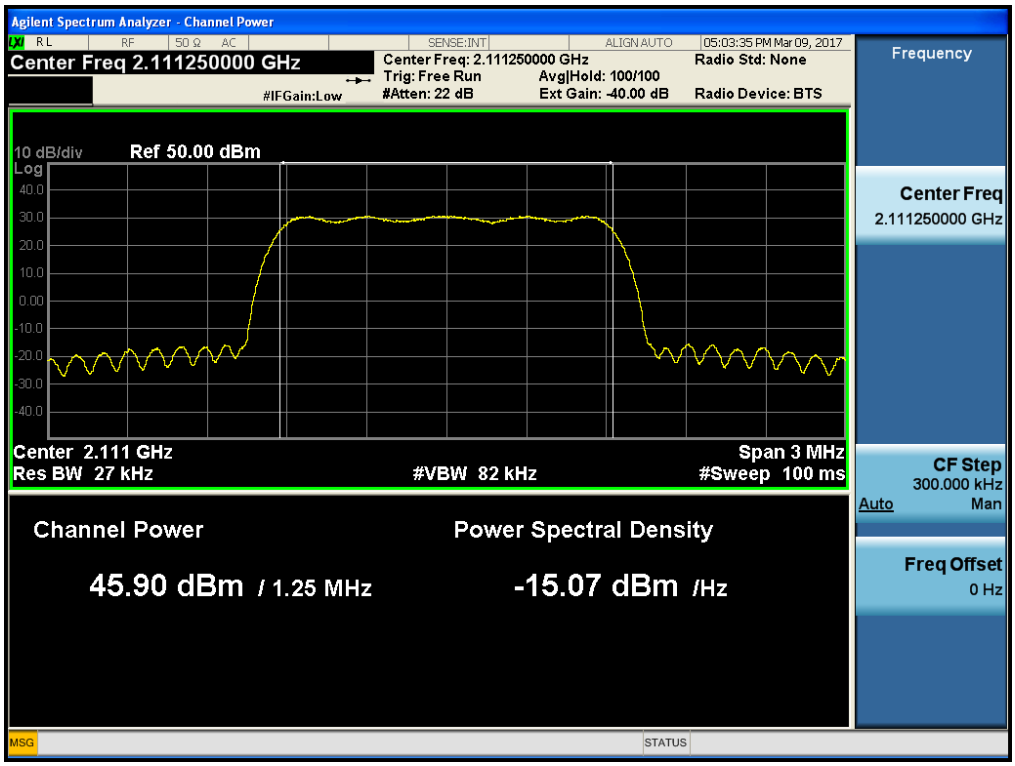


[+3dBm above AGC threshold Downlink High]

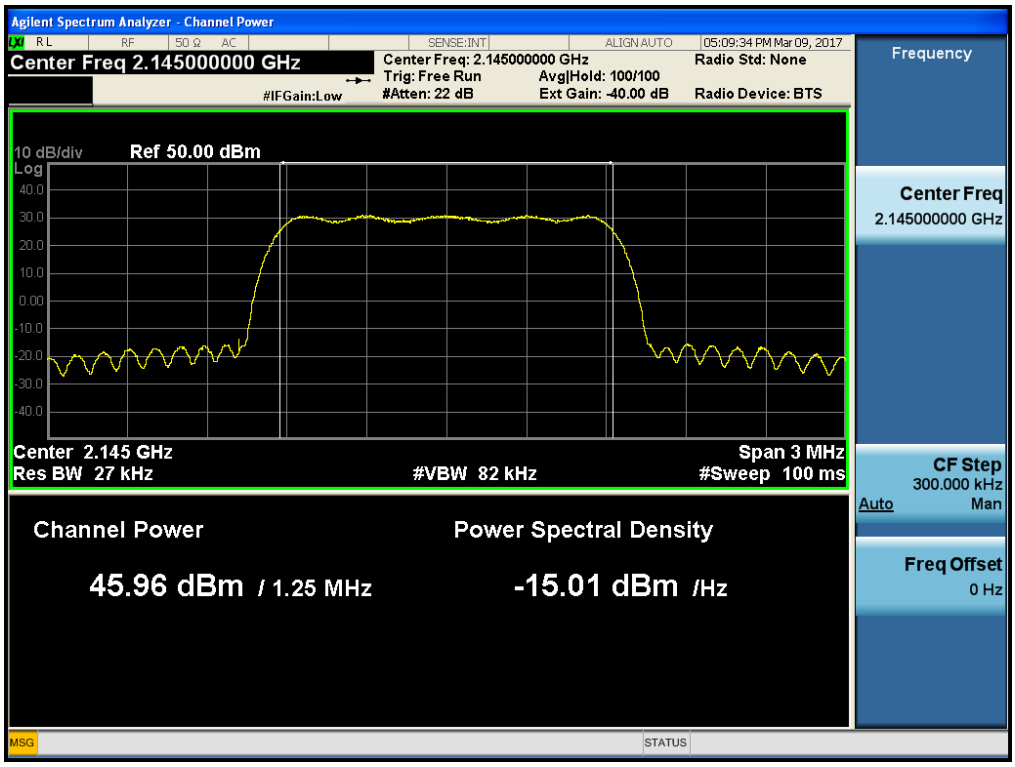


RF Output Power for AWS 2100_CDMA

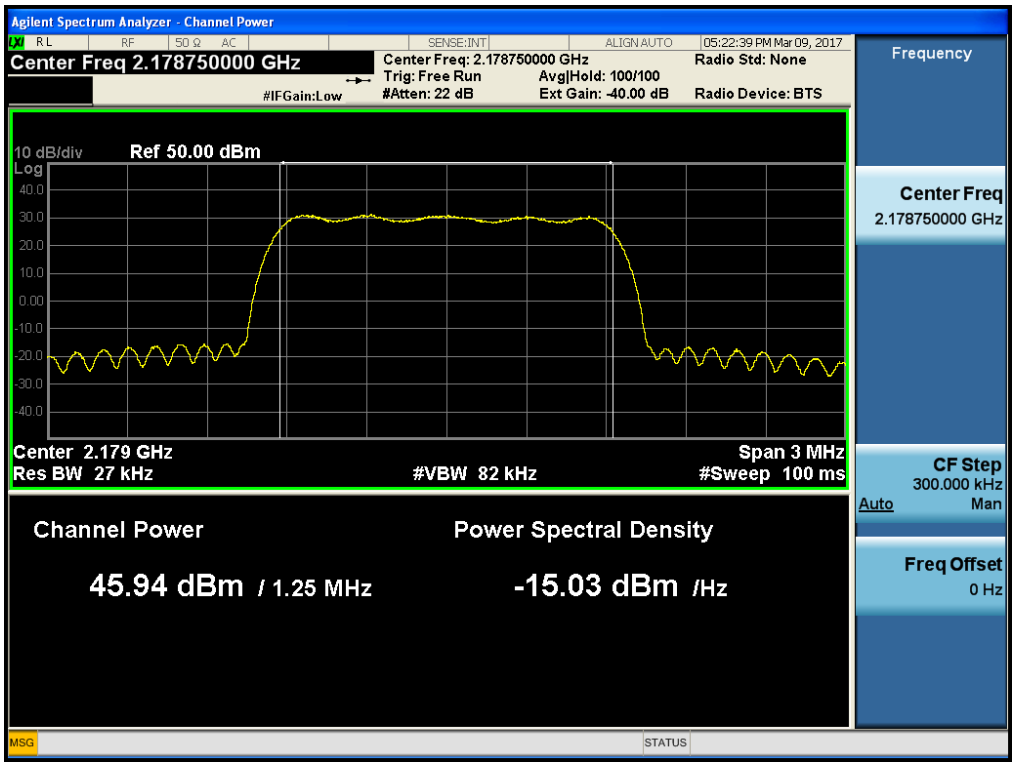
[AGC threshold Downlink Low]



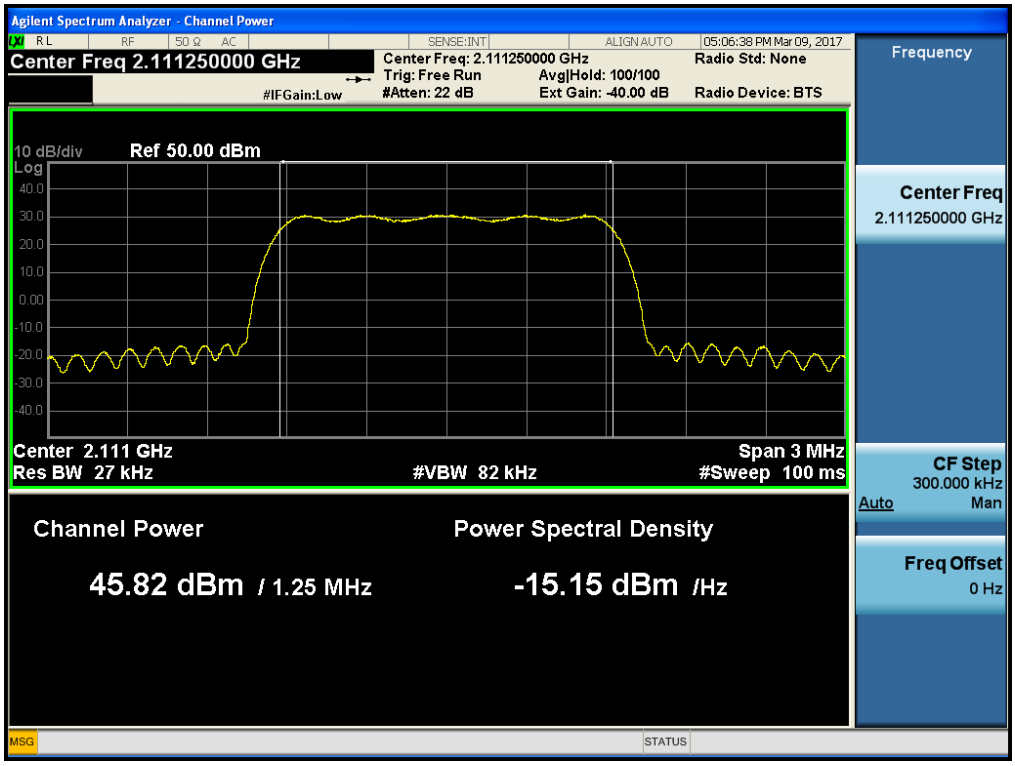
[AGC threshold Downlink Middle]



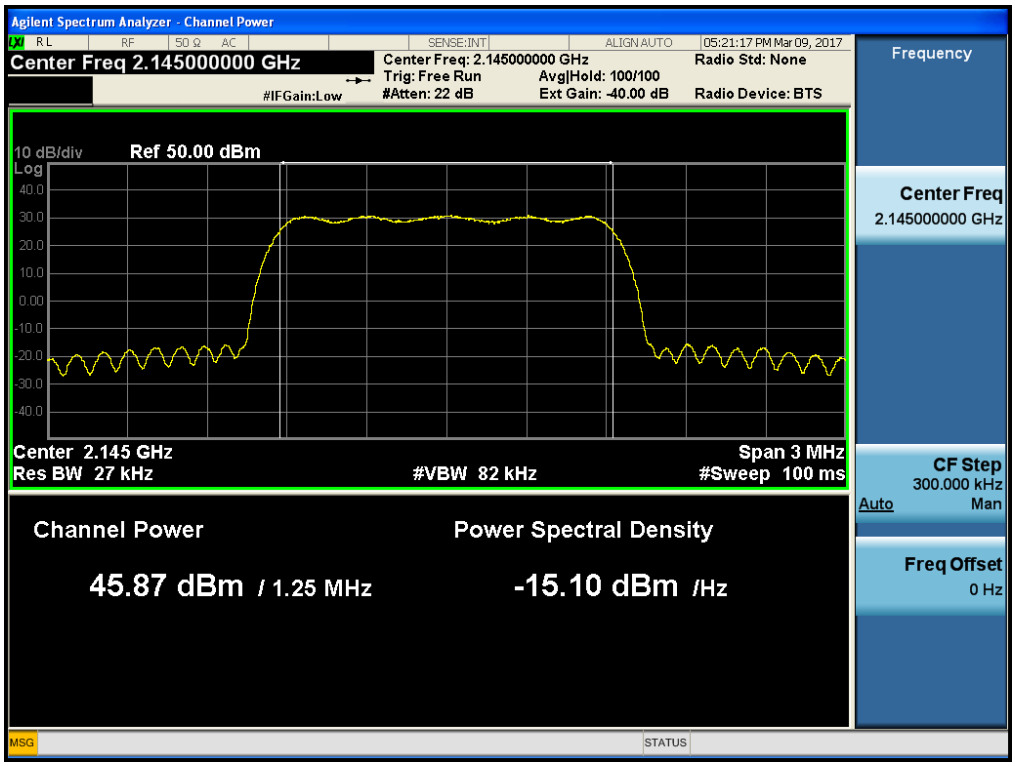
[AGC threshold Downlink High]



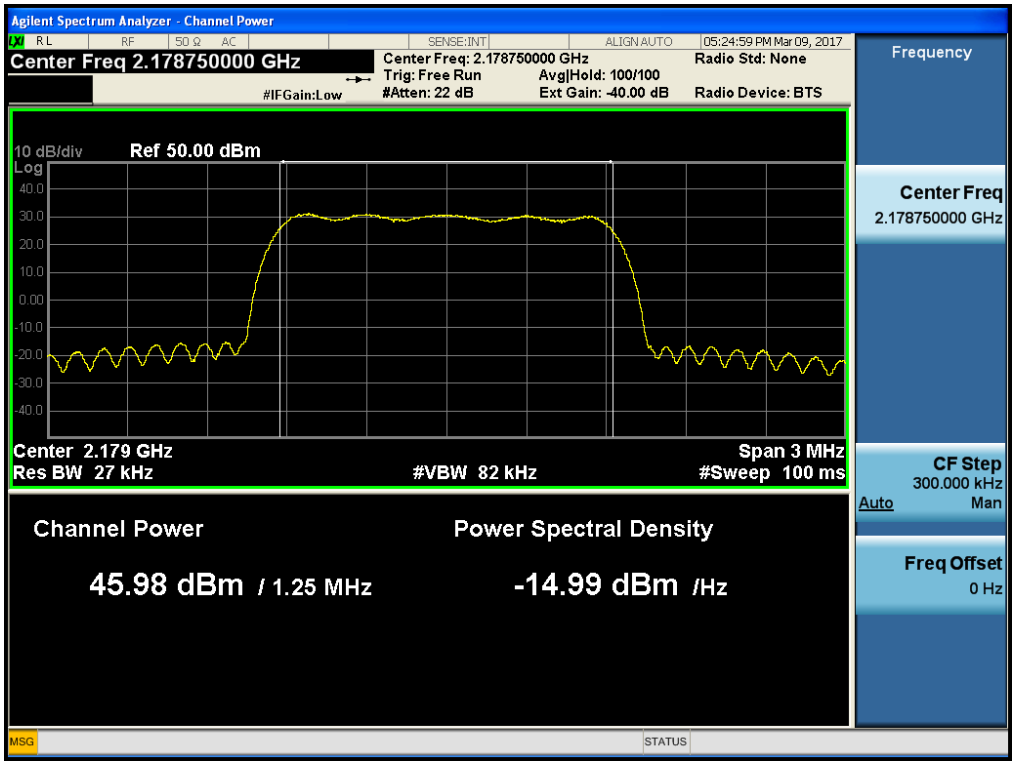
[+3dBm above AGC threshold Downlink Low]



[+3dBm above AGC threshold Downlink Middle]

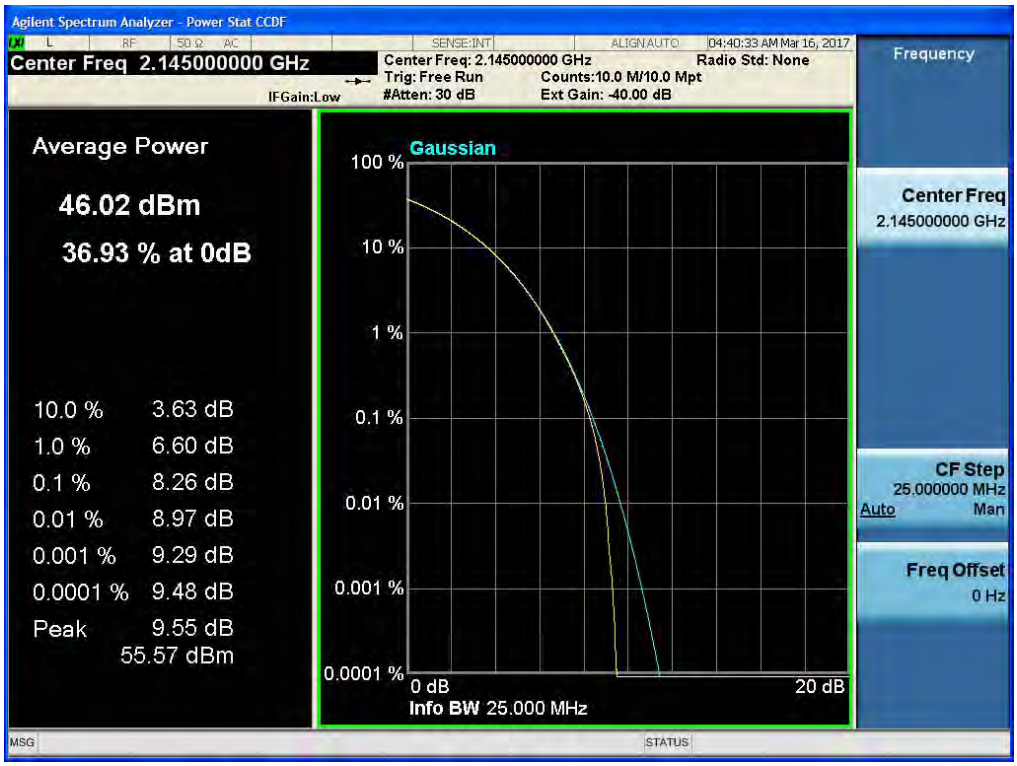


[+3dBm above AGC threshold Downlink High]



Peak-to-Average Ratio for AWS 2100

[LTE 20 MHz Downlink Middle]



[CDMA Downlink Middle]