HCT CO.,LTD.
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FCC / ISED REPORT

Certification

Applicant Name:
SOLiD, Inc.

Address:
10, 9th Floor, SOLiD Space, Pangyoyeok-ro 220, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-400, South Korea

Date of Issue:
July 6, 2018
Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
Report No.: HCT-RF-1806-FI008-R1

ISED Registration No.: 5944A-5

FCC ID:	**W6UHMAWS13R**
ISED:	**9354A-HMAWS13R**
APPLICANT:	**SOLiD, Inc**

FCC/ ISED Model:	MRDU_AWS13
EUT Type:	ALLIANCE_5W
Frequency Ranges	2 110 ~ 2 180 MHz (Downlink)
Conducted Output Power:	5 W (37 dBm, Downlink)
Date of Test:	June 07, 2018 ~ June 25, 2018
FCC Rule Part(s):	CFR 47 Part 2, Part 27
ISED Rules(s):	RSS-Gen (Issue 5, April 2018), RSS-131 (Issue 3, May 2017) RSS-139 (Issue 3, July 2015)

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 / ISED 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-RF-1806-FI008	June 27, 2018	- First Approval Report
HCT-RF-1806-FI008-R1	July 6, 2018	- Fixed the test plots with higher resolution. - Revised the frequency information at the page 36. - Revised the spurious emissions test plots.

Table of Contents

1. GENERAL INFORMATION

1.1. APPLICANT INFORMATION

Company Name	SOLiD, Inc.
Company Address	10, 9th Floor, SOLiD Space, Pangyoyeok-ro 220, Bundang-gu, Seongnam-si, Gyeonggi-do, 463-400, South Korea

1.2. PRODUCT INFORMATION

EUT Type	ALLIANCE_5W
FCC/ISED Model	MRDU_AWS13
Power Supply	120VAC, 50Hz / DC -48V
Frequency Range	2 110 ~ 2 180 MHz (Downlink)
Tx Output Power	5 W (37 dBm, Downlink)
Supporting Technologies	CDMA, WCDMA, LTE 5 MHz , LTE 10 MHz, LTE 20 MHz
Antenna Specification	Manufacturer does not provide an antenna.

1.3. TEST INFORMATION

FCC Rule Parts	CFR 47 Part 2, Part 27
ISED Rule Parts	RSS-Gen (Issue 5, April 2018), RSS-131 (Issue 3, May 2017), RSS-139 (Issue 3, July 2015)
Measurement standards	ANSI C63.26-2015, KDB 971168 D01 v03r01, KDB 935210 D05 v01r02, RSS-GEN, RSS-131, RSS-139
Place of Test	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 27, RSS-Gen, RSS-131, RSS-139

Description	Reference (FCC)	Reference (ISED)	Results
Conducted RF Output Power	§2.1046, §27.50	RSS-139, Section 6.5	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 v01r02	RSS-131, Section 5.2.1 RSS-131, Section 5.2.3	Compliant
Spurious Emissions at Antenna Terminals	§2.1051, §27.53	RSS-139, Section 6.6	Compliant
Radiated Spurious Emissions	§2.1053, §27.53	RSS-Gen, Section 7.1.2	Compliant
Frequency Stability	§2.1055, §27.54	RSS-131, Section 5.2.4 RSS-139, Section 6.4	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.
* 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	30.014
100	28.826
200	29.218
300	29.281
400	29.649
500	29.774
600	29.873
700	29.996
800	30.106
900	30.160
1000	30.273
2000	31.154
3000	31.848
4000	32.447
5000	33.233
6000	33.586
7000	34.840
8000	33.689
9000	34.850
10000	36.207
20000	44.684
26000	49.207

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
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}

3.4. STANDARDS ENVIRONMENTAL TEST CONDITIONS

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

4. TEST EQUIPMENT

Manufacturer	Model / Equipment	Calibration Date	Calibration Interval	Serial No.
Agilent	N9020A / Spectrum Analyzer	09/15/2017	Annual	MY46471250
Agilent	N5128A / Signal Generator	03/05/2018	Annual	MY50141649
Agilent	N5128A / Signal Generator	02/17/2018	Annual	MY46240523
Weinschel	WA67-30-33/ Fixed Attenuator	09/14/2017	Annual	WA67-30-33-2
Agilent	11636A / Power Divider	08/01/2017	Annual	09109
KIKUSUI	CBL06185030 / DC Power Supply	02/27/2018	Annual	RE001149
DEAYOUNG ENT	DFSS60 / AC Power Supply	04/05/2018	Annual	1003030-1
NANGYEUL CO., LTD.	NY-THR18750 / Temperature and Humidity Chamber	10/21/2017	Annual	NY-2009012201A
Innco system	CO3000 / Controller(Antenna mast)	N/A	N/A	CO3000-4p
Innco system	MA4640/800-XP-EP / Antenna Position Tower	N/A	N/A	N/A
Emco	2090 / Controller	N/A	N/A	060520
Ets	Turn Table	N/A	N/A	N/A
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	06/30/2017	Biennial	9120D-1300
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	04/25/2017	Biennial	BBHA9170124
Rohde & Schwarz	FSP / Spectrum Analyzer	09/21/2017	Annual	836650/016
Wainwright Instruments	WHKX10-900-1000-15000-40SS	07/21/2017	Annual	5
Wainwright Instruments	WHKX10-2700-3000-18000-40SS / High Pass Filter	08/01/2017	Annual	4
CERNEX	CBLU1183540 / Power Amplifier	01/03/2018	Annual	24613
CERNEX	CBL06185030 / Power Amplifier	01/03/2018	Annual	24615
CERNEX	CBL18265035 / Power Amplifier	01/10/2018	Annual	22966

5. 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.

(d) The following power and antenna height requirements apply to stations transmitting in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz and 2180-2200 MHz bands:

(1) The power of each fixed or base station transmitting in the 1995-2000 MHz, 2110-2155 MHz, 2155-2180 MHz or 2180-2200 MHz band and located in any 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, is limited to:

(i) An equivalent isotropically radiated power (EIRP) of 3280 watts when transmitting with an emission bandwidth of 1 MHz or less;

(ii) An EIRP of 3280 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

(2) The power of each fixed or base station transmitting in the 1995-2000 MHz, the 2110-2155 MHz 2155-2180 MHz band, or 2180-2200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to:

(i) An equivalent isotropically radiated power (EIRP) of 1640 watts when transmitting with an emission bandwidth of 1 MHz or less;

(ii) An EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

(3) A licensee operating a base or fixed station in the 2110-2155 MHz band utilizing a power greater than 1640 watts EIRP and greater than 1640 watts/MHz EIRP must coordinate such operations in advance with all Government and non-Government satellite entities in the 2025-2110 MHz band. A licensee operating a base or fixed station in the 2110-2180 MHz band utilizing power greater than 1640 watts EIRP and greater than 1640 watts/MHz EIRP must be coordinated in advance with the following licensees authorized to operate within 120 kilometers (75 miles) of the base or fixed station operating in this band: All Broadband Radio Service (BRS) licensees authorized under this part in the 2155-2160 MHz band and all advanced wireless services (AWS) licensees authorized to operate on adjacent frequency blocks in the 2110-2180 MHz band.

(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

(5) Equipment employed must be authorized in accordance with the provisions of §24.51. 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 (d)(6) of this section. 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.

(6) 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.

(7) Fixed, mobile, and portable (hand-held) stations operating in the 2000-2020 MHz band are limited to 2 watts EIRP, except that the total power of any portion of an emission that falls within the 2000-2005 MHz band may not exceed 5 milliwatts. A licensee of AWS-4 authority may enter into private operator-to-operator agreements with all 1995-2000 MHz licensees to operate in 2000-2005 MHz at power levels above 5 milliwatts EIRP; except the total power of the AWS-4 mobile emissions may not exceed 2 watts EIRP.

(8) A licensee operating a base or fixed station in the 2180-2200 MHz band utilizing a power greater than 1640 watts EIRP and greater than 1640 watts/MHz EIRP must be coordinated in advance with all AWS licensees authorized to operate on adjacent frequency blocks in the 2180-2200 MHz band.

(9) Fixed, mobile and portable (hand-held) stations operating in the 1915-1920 MHz band are limited to 300 milliwatts EIRP.

(10) A licensee operating a base or fixed station in the 1995-2000 MHz band utilizing a power greater than 1640 watts EIRP and greater than 1640 watts/MHz EIRP must be coordinated in advance with all PCS G Block licensees authorized to operate on adjacent frequency blocks in the 1990-1995 MHz band within 120 kilometers of the base or fixed station operating in this band.

ISED Rules

Test Requirements:

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.

SRSP-513

5. Technical Criteria

5.1 Radiated Power and Antenna Height Limits

5.1.1 Fixed and Base Stations

5.1.1.1 For fixed and base stations operating within the frequency range 2110-2180 MHz with a channel bandwidth equal to or less than 1 MHz, the maximum permissible equivalent isotropically radiated power (e.i.r.p.) is 1640 watts with an antenna height above average terrain (HAAT)Footnote 4 up to 300 metres.

5.1.1.2 For fixed and base stations operating within the frequency range 2110-2180 MHz with a channel bandwidth greater than 1 MHz, the maximum permissible e.i.r.p. is 1640 watts/MHz e.i.r.p. (i.e. no more than 1640 watts e.i.r.p. in any 1 MHz band segment) with an antenna height above average terrain (HAAT) up to 300 metres.

5.1.1.3 Fixed and base stations located in geographic areas at a distance greater than 26 km from large or medium population centres,Footnote 5 and transmitting within the frequency range 2110-2180 MHz, may increase their e.i.r.p. up to a maximum of 3280 watts/MHz (i.e. no more than 3280 watts e.i.r.p. in any 1 MHz band segment), with an antenna HAAT up to 300 metres.

Within 26 km of any large or medium population centre, fixed and base stations may operate at increased e.i.r.p. if more than 50% of the population within a particular sector's coverageFootnote 6 is located outside these large and medium population centres.

Fixed and base stations with increased e.i.r.p. must not be used to provide coverage to large and medium population centres. However, some incidental coverage of these large and medium population centres by stations with increased e.i.r.p. is permitted.

This provision also applies for fixed and base stations with a channel bandwidth equal to or less than 1 MHz (i.e. the e.i.r.p. may be increased up to a maximum of 3280 watts).

5.1.1.4 Fixed and base station antenna heights above average terrain may exceed 300 metres with a reduction in e.i.r.p. The maximum permissible e.i.r.p. for installations with antenna HAAT in excess of 300 metres is given in the following table:

Table 2 — Reduction to Maximum Allowable E.I.R.P. for HAAT > 300 m

HAAT (in metres)	Maximum e.i.r.p. (watts or watts per MHza)
HAAT ≤ 300	1640 (or 3280[b])
300 < HAAT ≤ 500	1070
500 < HAAT ≤ 1000	490
1000 < HAAT ≤ 1500	270
1500 < HAAT ≤ 2000	160

Notes:

a Depending on the channel bandwidth: watts if less than 1 MHz bandwidth or else watts per MHz.

b If Section 5.1.1.3 applies.

5.1.1.5 Fixed or base stations transmitting in the lower sub-band (1710-1780 MHz) shall comply with the power limits set forth in Section 5.1.2.

5.1.2 Mobile and Portable Stations

Maximum e.i.r.p. limits for mobile and portable (hand-held) stations are specified in RSS-139, Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710–1780 MHz and 2110–2180 MHz. These 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 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.

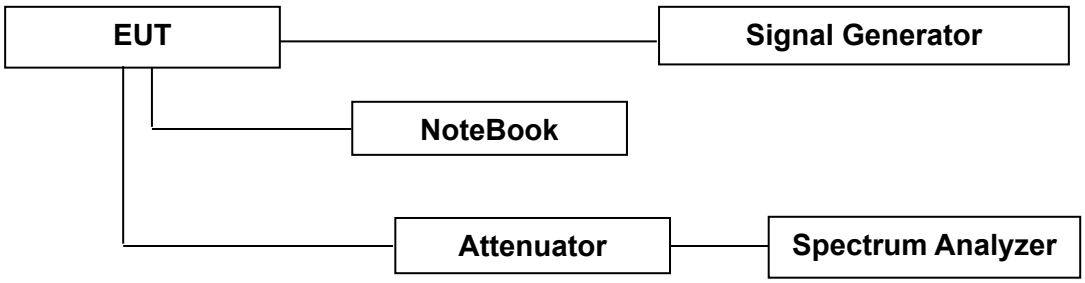
h) Repeat steps f) and g) with input signal amplitude set to 3 dB above the AGC threshold level.

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 D01 v03r01.



Block Diagram 1. RF Power Output Test Setup

Test Results:

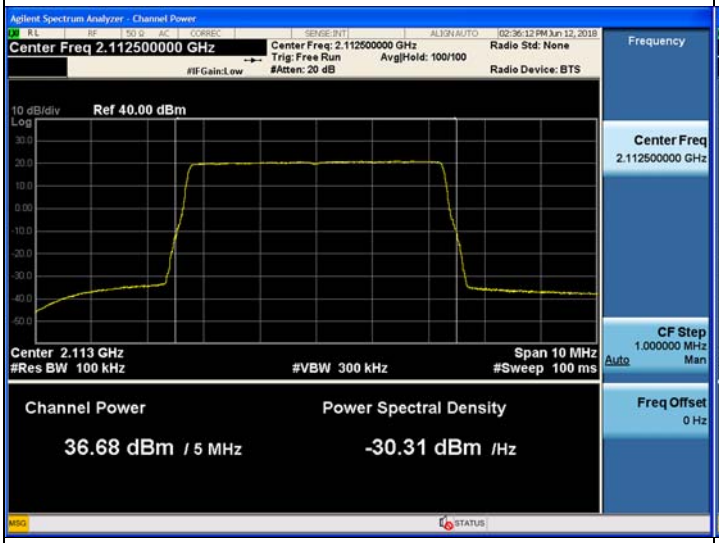
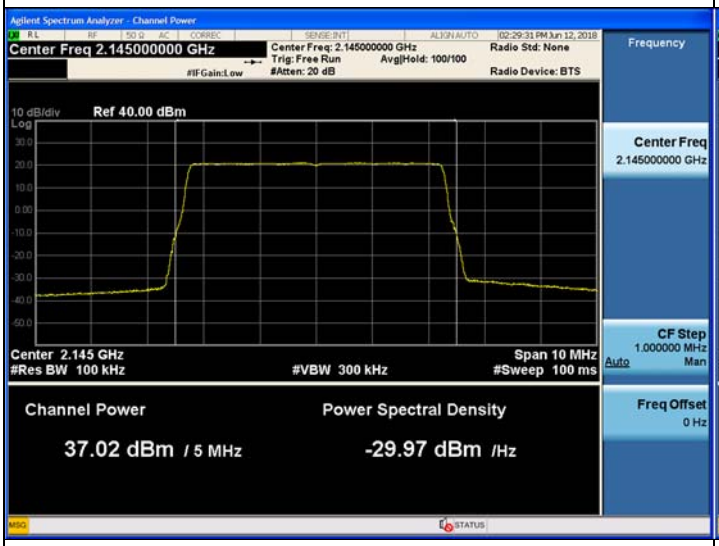
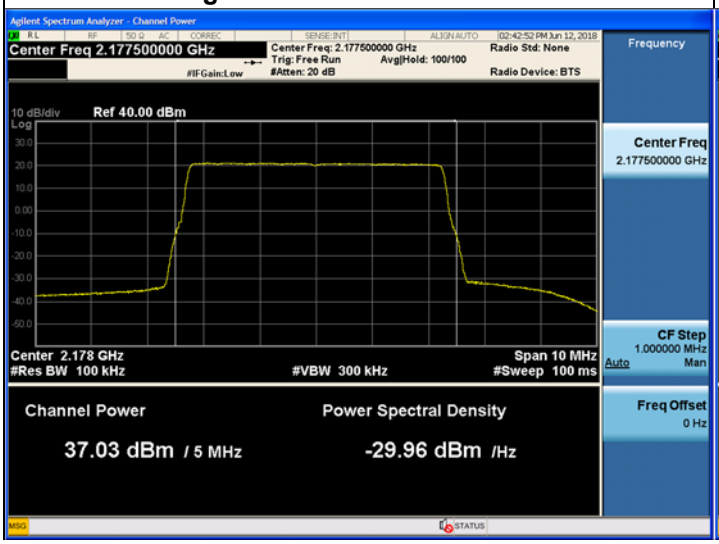
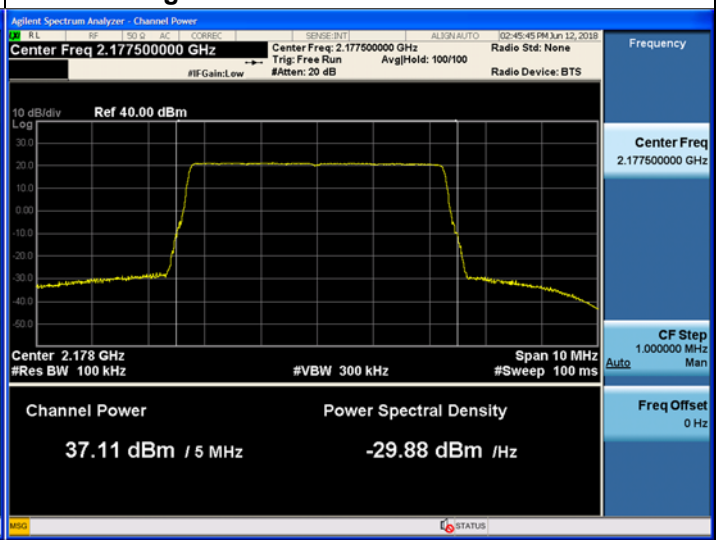
Input Signal	Input Level	Maximum Amp Gain
AWS 2100	-20 dBm	57 dB

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

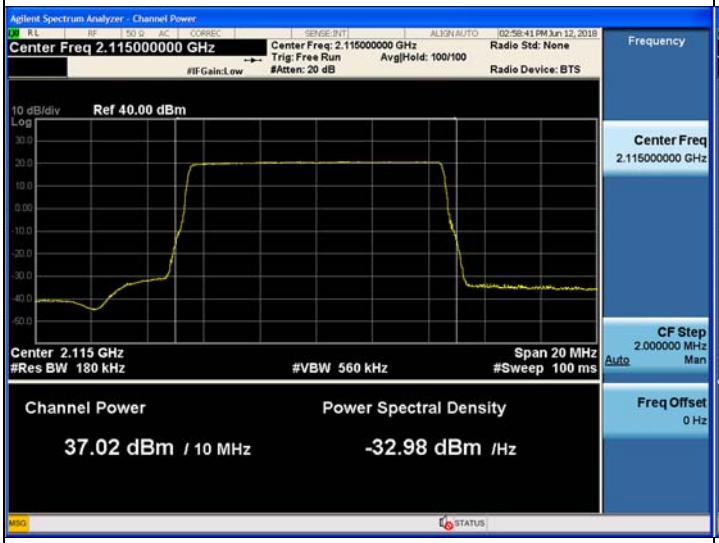
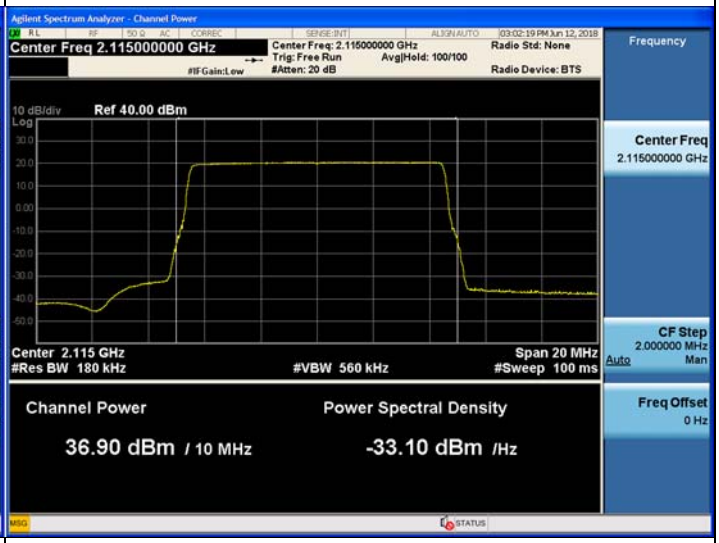
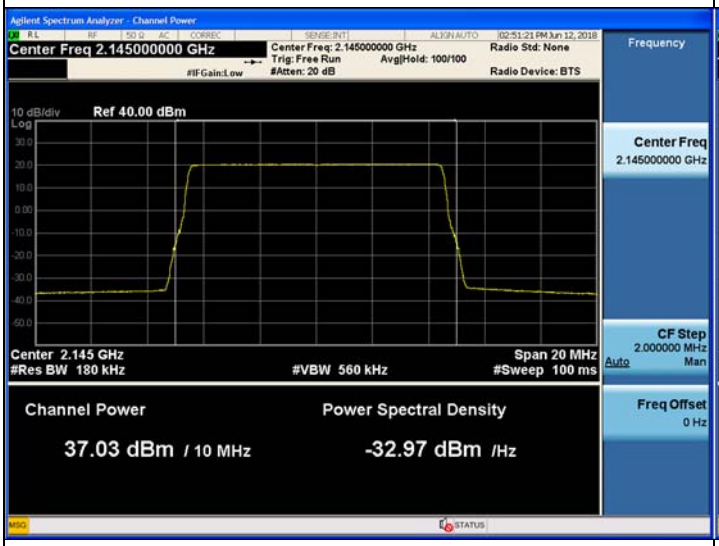
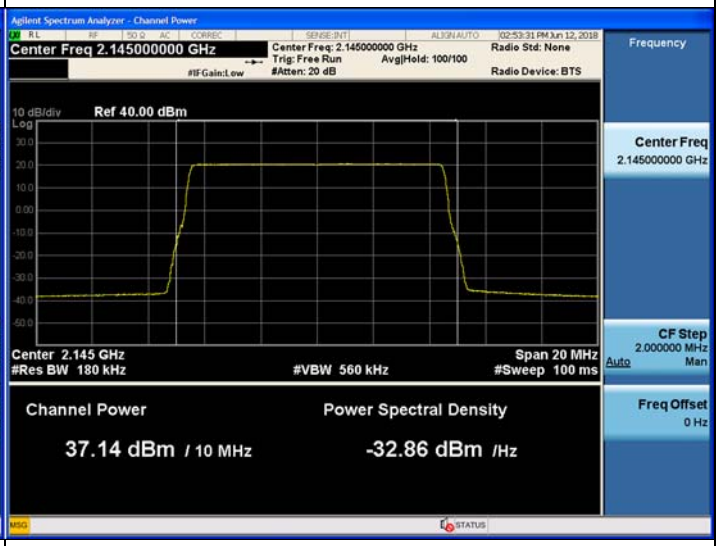
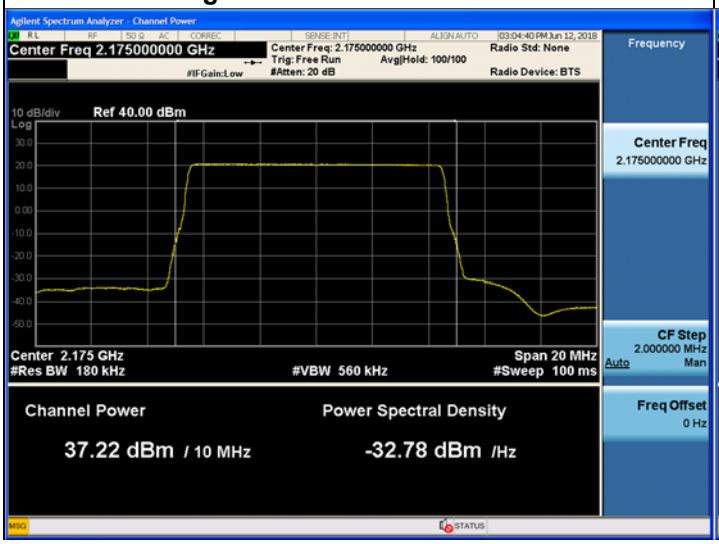
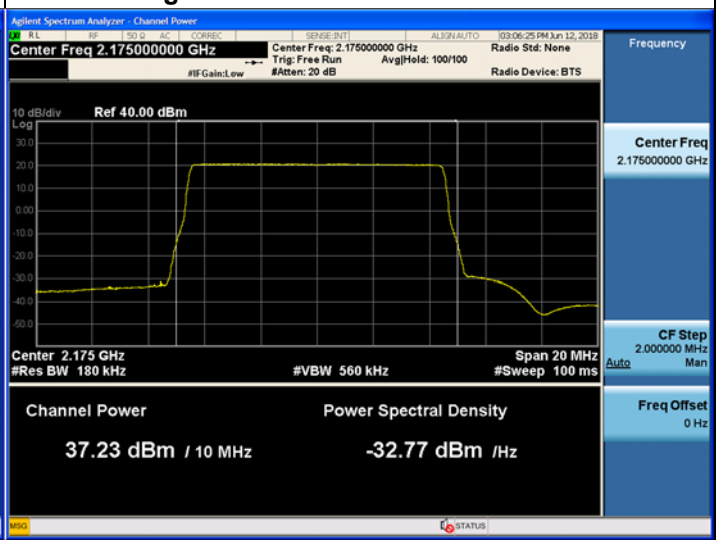
[Downlink_AWS 2100 Band]

AWS 2100 Band	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
LTE 5 MHz AGC threshold	Low	2112.50	36.68	4.656
	Middle	2145.00	37.02	5.035
	High	2177.50	37.03	5.047
LTE 5 MHz +3 dB above the AGC threshold	Low	2112.50	36.94	4.943
	Middle	2145.00	37.14	5.176
	High	2177.50	37.11	5.140
LTE 10 MHz AGC threshold	Low	2115.00	37.02	5.035
	Middle	2145.00	37.03	5.047
	High	2175.00	37.22	5.272
LTE 10 MHz +3 dB above the AGC threshold	Low	2115.00	36.90	4.898
	Middle	2145.00	37.14	5.176
	High	2175.00	37.23	5.284
LTE 20 MHz AGC threshold	Low	2120.00	37.19	5.236
	Middle	2145.00	36.90	4.898
	High	2170.00	36.98	4.989
LTE 20 MHz +3 dB above the AGC threshold	Low	2120.00	37.16	5.200
	Middle	2145.00	37.02	5.035
	High	2170.00	36.89	4.887
WCDMA AGC threshold	Low	2112.50	37.28	5.346
	Middle	2145.00	36.93	4.932
	High	2177.50	36.79	4.775
WCDMA +3 dB above the AGC threshold	Low	2112.50	36.98	4.989
	Middle	2145.00	37.02	5.035
	High	2177.50	37.00	5.012
CDMA AGC threshold	Low	2111.25	36.92	4.920
	Middle	2145.00	36.84	4.831
	High	2178.75	36.99	5.000
CDMA +3 dB above the AGC threshold	Low	2111.25	36.97	4.977
	Middle	2145.00	36.88	4.875
	High	2178.75	37.05	5.070

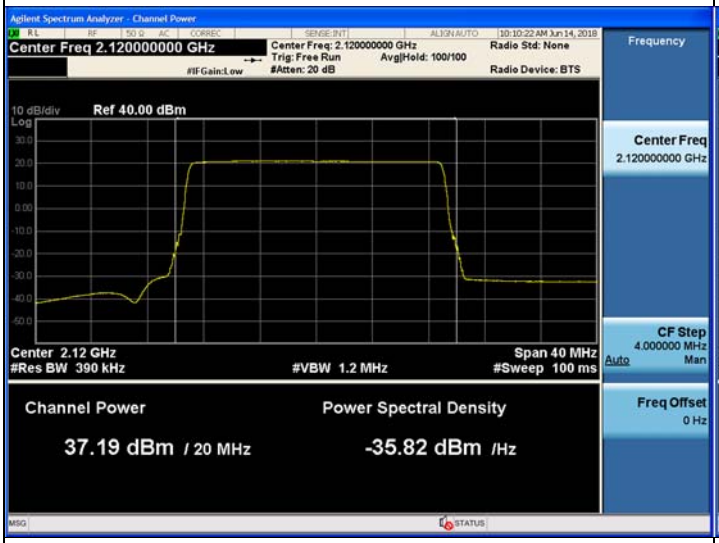
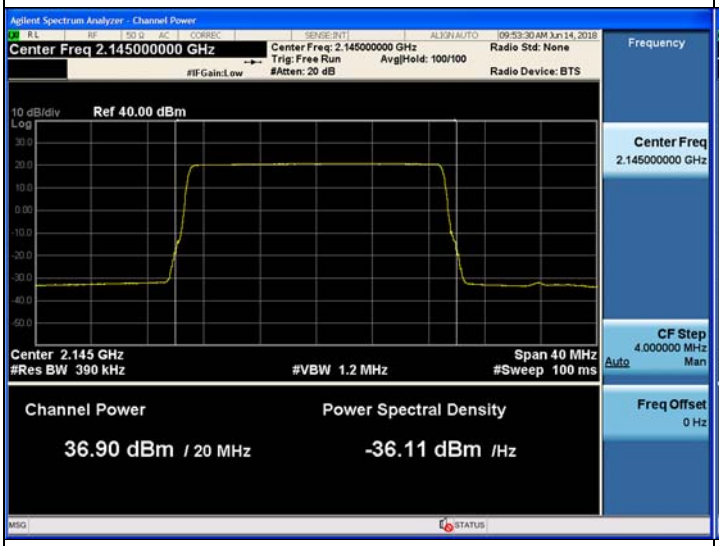
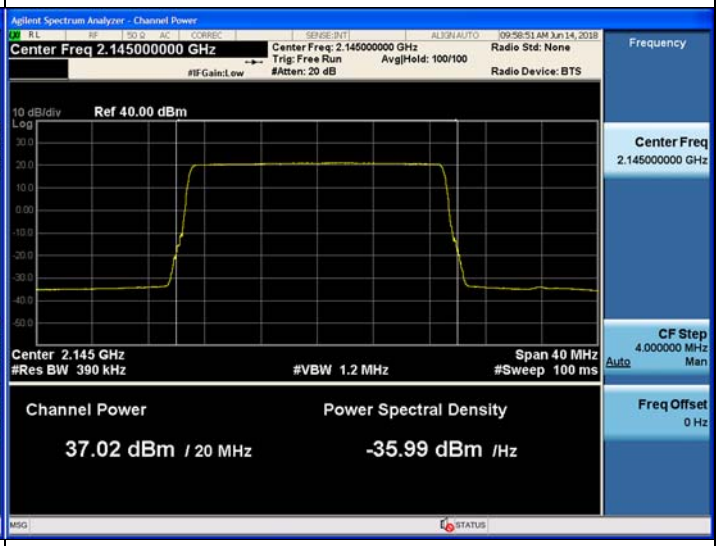
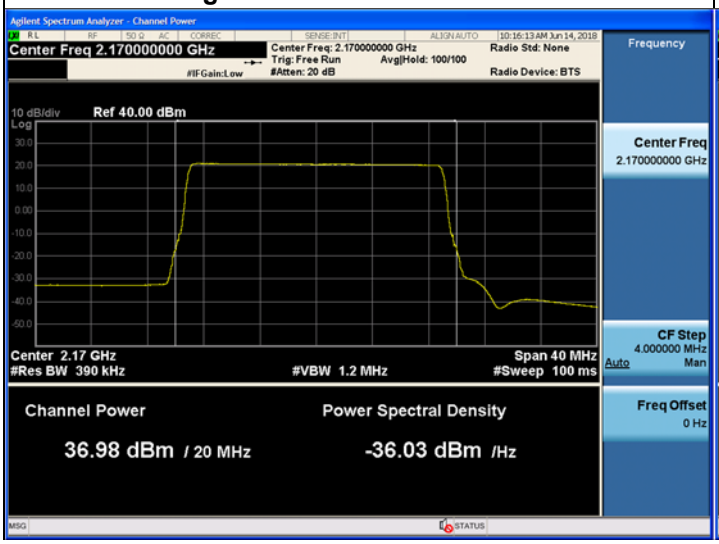
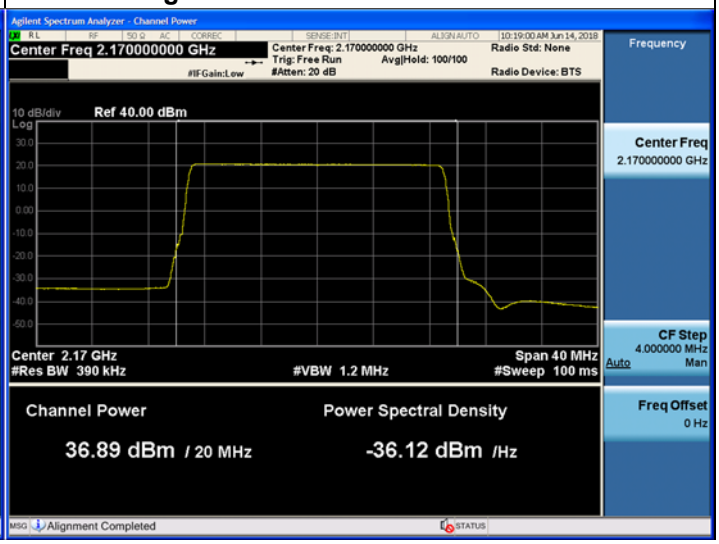
Plots of RF Output Power for AWS 2100 Band LTE 5 MHz

Low Channel AGC threshold	Low Channel +3 dB AGC threshold
	
Middle Channel AGC threshold	**Middle Channel +3 dB AGC threshold**
	
High Channel AGC threshold	**High Channel +3 dB AGC threshold**
	

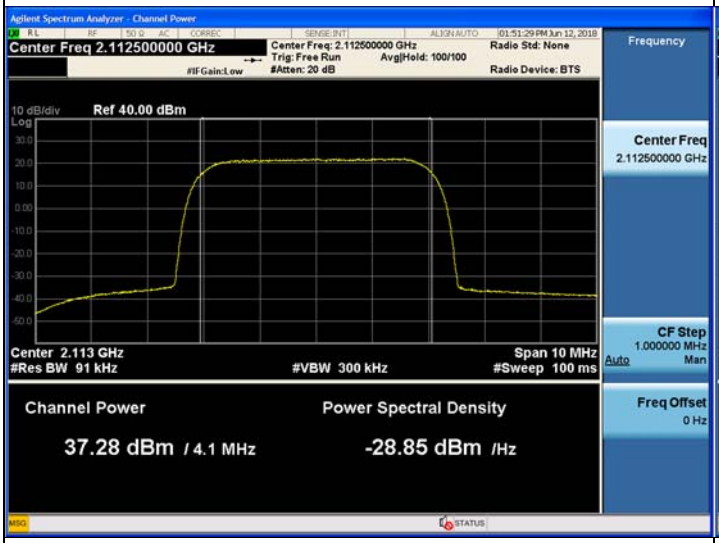
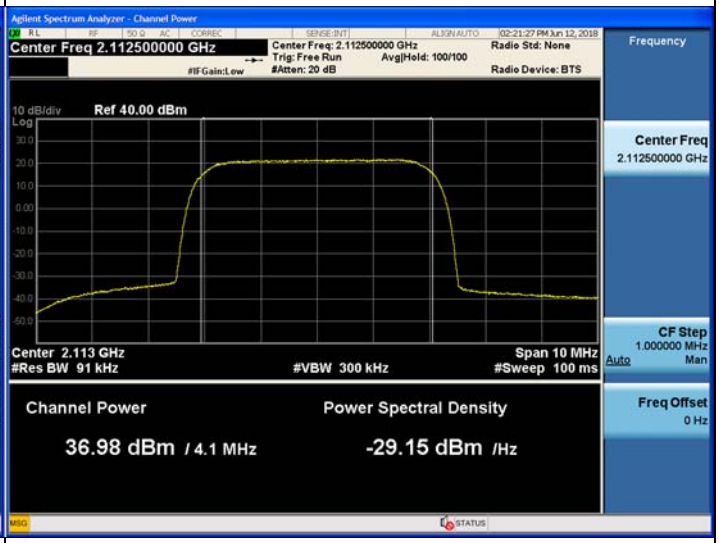
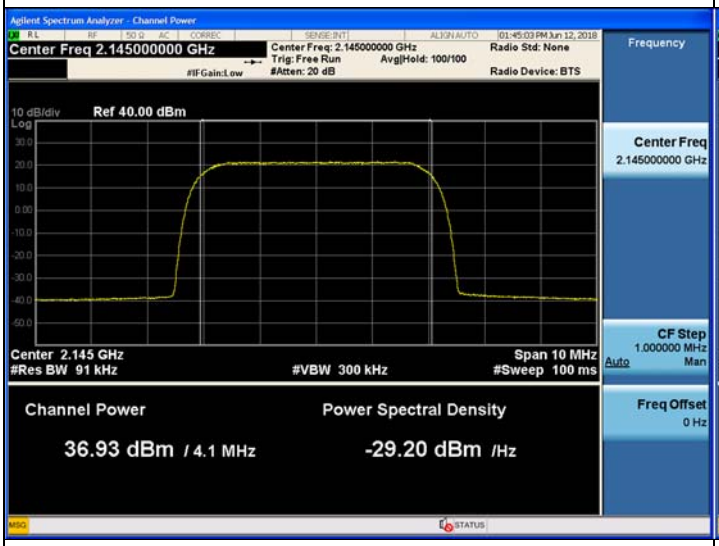
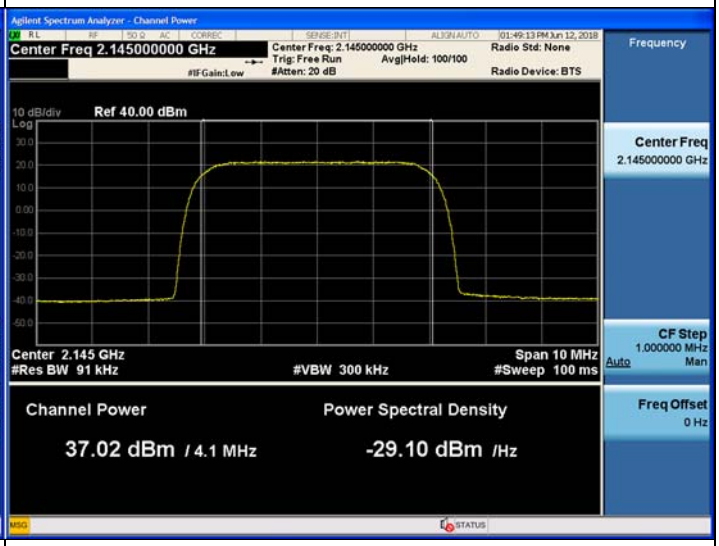
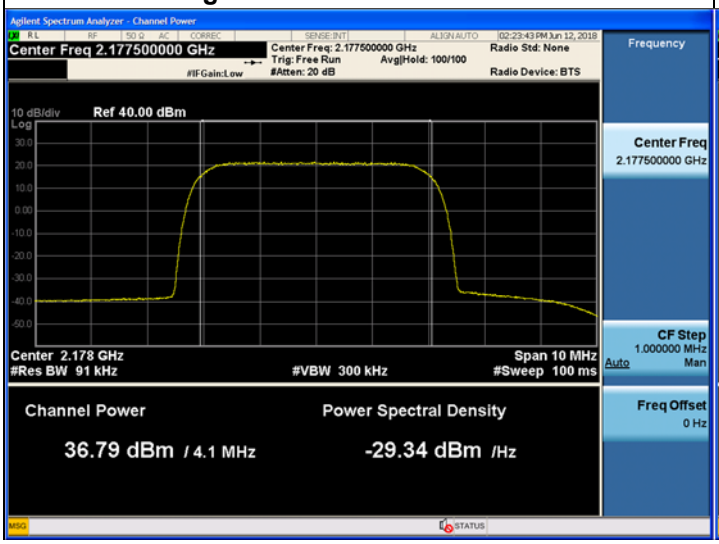
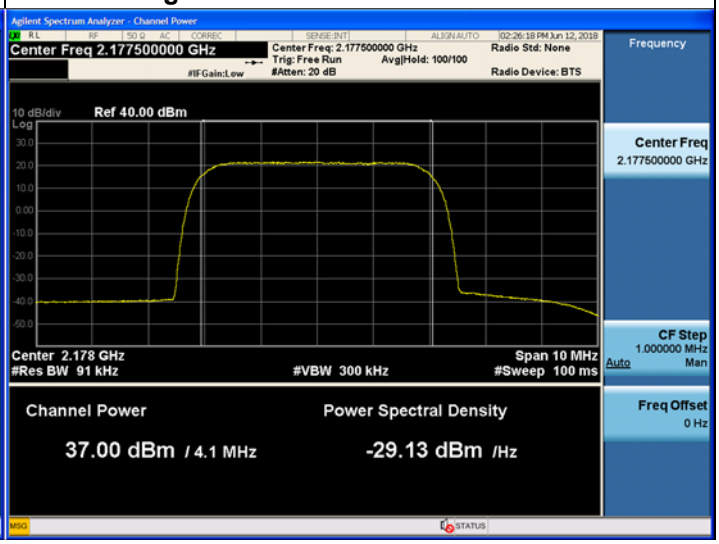
Plots of RF Output Power for AWS 2100 Band LTE 10 MHz

Low Channel AGC threshold	Low Channel +3 dB AGC threshold
	
Middle Channel AGC threshold	**Middle Channel +3 dB AGC threshold**
	
High Channel AGC threshold	**High Channel +3 dB AGC threshold**
	

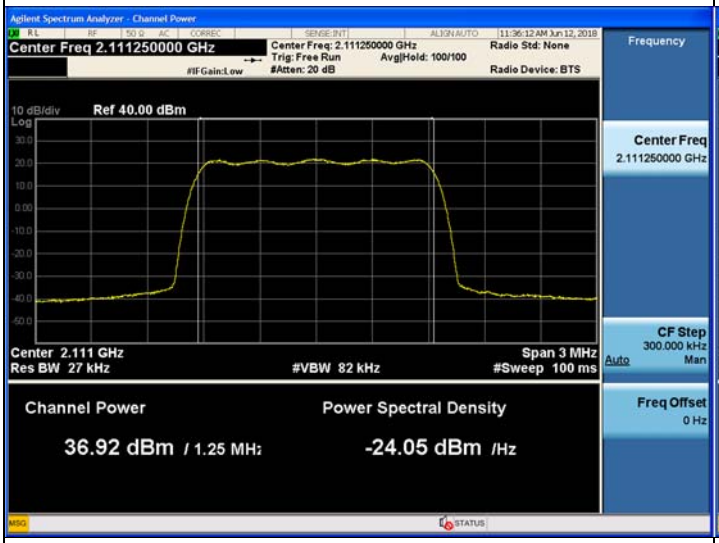
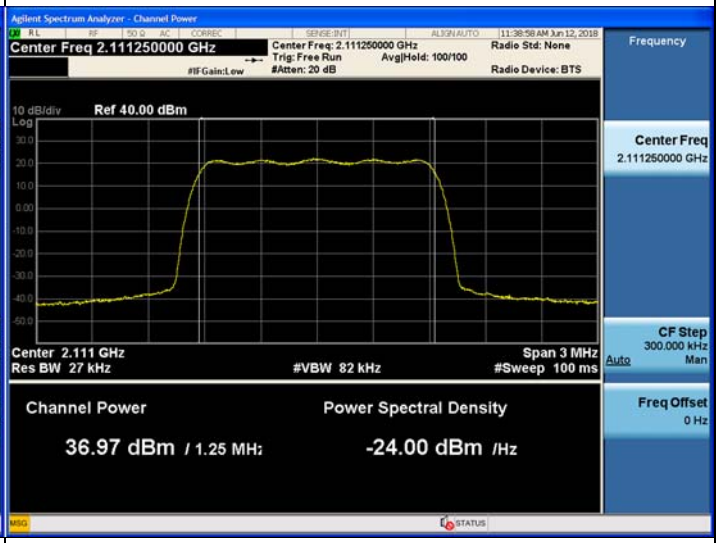
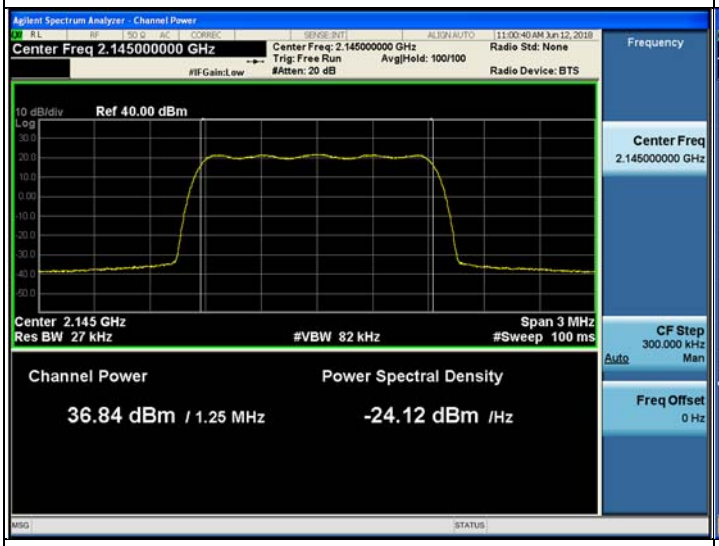
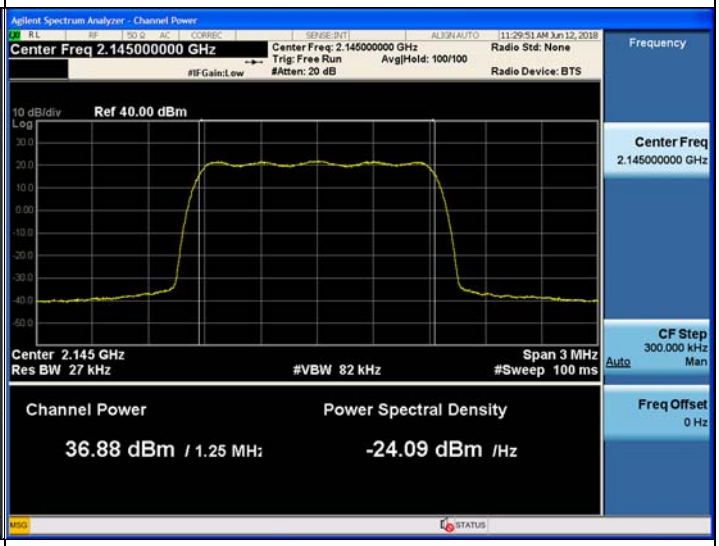
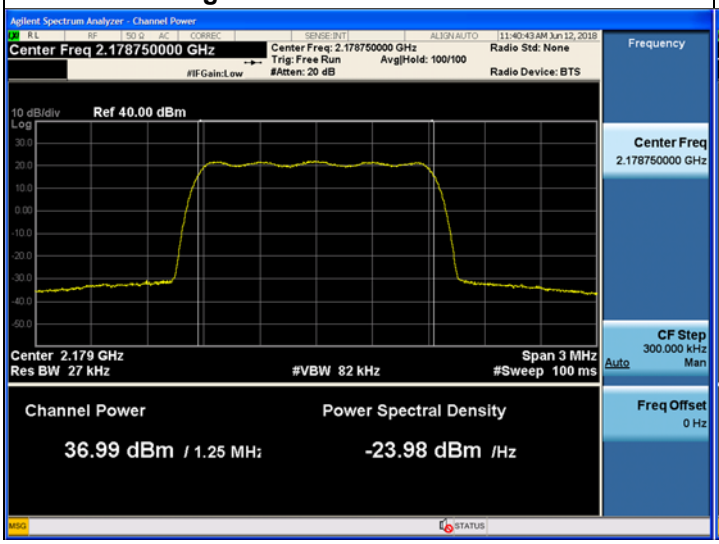
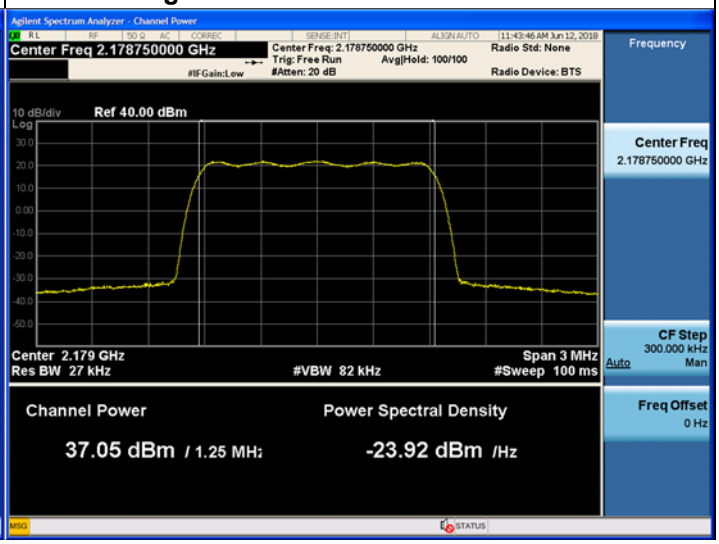
Plots of RF Output Power for AWS 2100 Band LTE 20 MHz

Low Channel AGC threshold	Low Channel +3 dB AGC threshold
	
Middle Channel AGC threshold	**Middle Channel +3 dB AGC threshold**
	
High Channel AGC threshold	**High Channel +3 dB AGC threshold**
	

Plots of RF Output Power for AWS 2100 Band WCDMA

Low Channel AGC threshold	Low Channel +3 dB AGC threshold
	
Middle Channel AGC threshold	**Middle Channel +3 dB AGC threshold**
	
High Channel AGC threshold	**High Channel +3 dB AGC threshold**
	

Plots of RF Output Power for AWS 2100 Band CDMA

Low Channel AGC threshold	Low Channel +3 dB AGC threshold
	
Middle Channel AGC threshold	**Middle Channel +3 dB AGC threshold**
	
High Channel AGC threshold	**High Channel +3 dB AGC threshold**
	

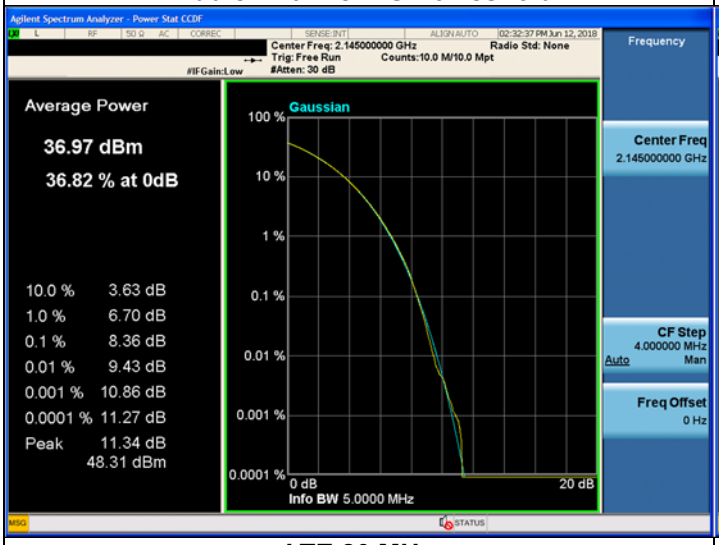
Peak-to-Average Ratio (PAR)

AWS 2100 Band	Channel	Frequency (MHz)	PAR (dB)
LTE 5 MHz AGC threshold	Middle	2145.00	8.36
LTE 10 MHz AGC threshold	Middle	2145.00	8.39
LTE 20 MHz AGC threshold	Middle	2145.00	8.47
WCDMA AGC threshold	Middle	2145.00	4.48
CDMA AGC threshold	Middle	2145.00	7.73

Plots of Peak-to-Average Ratio_AWS 2100

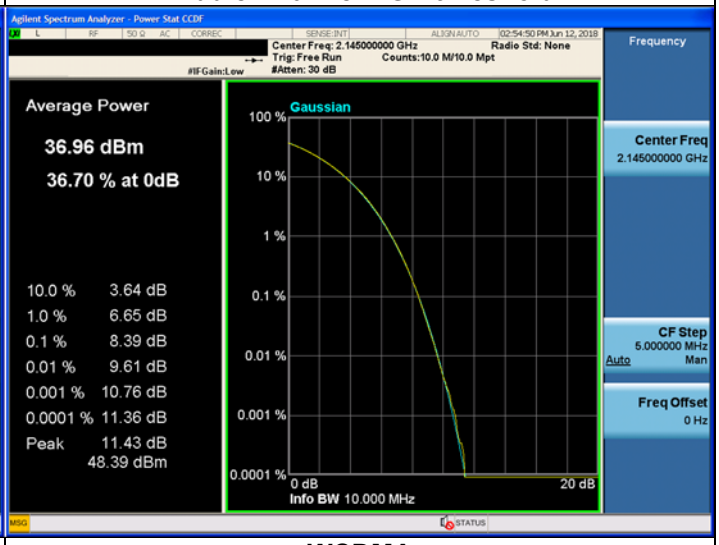
LTE 5 MHz

Middle Channel AGC threshold



LTE 10 MHz

Middle Channel AGC threshold



LTE 20 MHz

Middle Channel AGC threshold

WCDMA

Middle Channel AGC threshold

CDMA

Middle Channel AGC threshold

6. 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.

ISED Rules

Test Requirements:

RSS-Gen

6 General administrative and technical requirements

6.7 Occupied bandwidth (or 99% emission bandwidth) and x dB bandwidth

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

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 v03r01.

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 $\geq$ 3 $\times$ 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 f_0.

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.

RSS-Gen

6 General administrative and technical requirements

6.7 Occupied bandwidth (or 99% emission bandwidth) and x dB bandwidth

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

Test Results:

[Downlink Output_AWS 2100 Band]

AWS 2100 Band	Channel	Frequency (MHz)	OBW (MHz)
LTE 5 MHz AGC threshold	Low	2112.50	4.5078
	Middle	2145.00	4.5132
	High	2177.50	4.5108
LTE 5 MHz +3 dB above the AGC threshold	Low	2112.50	4.5110
	Middle	2145.00	4.5116
	High	2177.50	4.5115
LTE 10 MHz AGC threshold	Low	2115.00	8.9893
	Middle	2145.00	9.0000
	High	2175.00	8.9907
LTE 10 MHz +3 dB above the AGC threshold	Low	2115.00	8.9784
	Middle	2145.00	8.9991
	High	2175.00	8.9926
LTE 20 MHz AGC threshold	Low	2120.00	17.986
	Middle	2145.00	18.005
	High	2170.00	17.983
LTE 20 MHz +3 dB above the AGC threshold	Low	2120.00	18.004
	Middle	2145.00	17.967
	High	2170.00	18.009
WCDMA AGC threshold	Low	2112.50	4.1688
	Middle	2145.00	4.1839
	High	2177.50	4.1771
WCDMA +3 dB above the AGC threshold	Low	2112.50	4.1680
	Middle	2145.00	4.1764
	High	2177.50	4.1753
CDMA AGC threshold	Low	2111.25	1.2630
	Middle	2145.00	1.2635
	High	2178.75	1.2625
CDMA +3 dB above the AGC threshold	Low	2111.25	1.2630
	Middle	2145.00	1.2608
	High	2178.75	1.2660