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

REPORT

FCC/IC Certification

FCC Applicant Name:
ADRF Korea, inc.
Address:
5-5, Mojeon-Ri, Backsa-Myun, Icheon-City, Kyunggi-Do, Korea

IC Applicant Name:
Advanced RF Technologies, Inc
Address:
3116 West VANOWEN STREET, BURBANK, CA 91505

Date of Issue:
June 9, 2016
Test Site/Location:
HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
Report No.: HCT-R-1605-F019-2
HCT FRN: 0005866421
IC Recognition No.: 5944A-5

FCC ID:	**N52-ADXV**
IC:	**6416A-ADXV**
FCC APPLICANT:	**ADRF Korea, inc**
IC APPLICANT:	**Advanced RF Technologies, Inc**

Model(s):	ADXV
EUT Type:	DAS(Distributed Antenna System)
Frequency Ranges:	DL : 729 MHz ~ 746 MHz (700 MHz Lower) / 746 MHz ~ 756 MHz (700 MHz Upper) 862 MHz ~ 894 MHz (SMR 800&Cellular) /1930 MHz ~1995 MHz (PCS 1900) / 2110 MHz ~2180 MHz (AWS 2100) UL : 699 MHz ~ 716 MHz (700 MHz Lower) / 777 MHz ~ 787 MHz (700 MHz Upper) 817 MHz ~ 849 MHz (SMR 800&Cellular) /1850 MHz ~1915 MHz (PCS 1900) / 1710 MHz ~1780 MHz (AWS 2100)
Conducted Output Power:	DL : 2 W (33 dBm) , 5 W(37dBm) UL : 0.0316 mW (-15 dBm)
Date of Test:	March 30, 2016 ~ June 1, 2016
FCC Rule Part(s):	CFR 47, Part 22/24, Part 27, part 90
IC Rules:	RSS-Gen (Issue 4,November 2014), RSS-131 (Issue 2, July 2003)

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 / IC Rules under normal use and maintenance.

Report prepared by
:Se Wook Park
Test engineer of RF Team

Approved by
: Jong Seok Lee
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1605-F019	May 26, 2016	- First Approval Report
HCT-R-1605-F019-1	June 2, 2016	- Revise the test plot on page 96. - Delete the rule part 27.53(m) for FCC, SRSP-516 and 517 for IC. - Add the rule part 90.669 and note on page 128. - Retest the Multi-channel Enhancer for IC.
HCT-R-1605-F019-2	June 9, 2016	- Delete the CDMA, GSM modulation.

Table of Contents

1. CLIENT INFORMATION

The EUT has been tested by request of

FCC Company	ADRF Korea, inc 5-5, Mojeon-Ri, Backsa-Myun, Icheon-City, Kyunggi-Do, Korea
IC Company	Advanced RF Technologies, Inc 3116 West VANOWEN STREET, BURBANK, CA 91505

FCC ID:	N52-ADXV
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Conducted Output Power:	DL : 2 W (33 dBm) , 5 W(37dBm) UL : 0.0316 mW (-15 dBm)
Antenna Gain(s):	Manufacturer does not provide an antenna.
Measurement standard(s):	ANSI/TIA-603-C-2004, KDB 971168 D01 v02r02, KDB 935210 D02 v03r02, KDB 935210 D05 v01r01, KDB 662911 D01 v02r01, RSS-GEN, RSS-131
FCC Rule Part(s):	CFR 47, Part 22/24, Part 27, Part 90
IC Rules:	RSS-Gen (Issue 4,November 2014), RSS-131 (Issue 2, July 2003)
Place of Tests:	HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA (IC Recognition No. : 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 :2003) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 07, 2015 (Registration Number: 90661) / June 22, 2015 (IC Registration Number: 5944A-5)

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 22/24, Part 27, Part 90 RSS-GEN, RSS-131, RSS-132&RSS-139

Description	Reference (FCC)	Reference (IC)	Results
Conducted RF Output Power	§2.1046; §27.50 §22.913, §24.232 §90.635	RSS-131, Section 4.3 RSS-131, Section 6.2 SRSP-502, SRSP-510, SRSP-513, SRSP-518	Compliant
Occupied Bandwidth	§2.1049	RSS-GEN, Section 4.6.1	Compliant
Passband Gain and Bandwidth & Out of Band Rejection	KDB 935210 D02 v03	RSS-131, Section 4.2 RSS-131, Section 6.1	Compliant
Spurious Emissions at Antenna Terminals	§2.1051, §27.53 §22.917, §24.238	RSS-131, Section 4.4 RSS-131, Section 6.3 RSS-131, Section 6.4 SRSP-510	Compliant
Radiated Spurious Emissions	§2.1053, §27.53 §22.917 §24.238	-	Compliant
Frequency Stability	§2.1055, §27.54 §22.355	RSS-131, Section 4.5 RSS-131, Section 6.5	N/A The EUT does not perform frequency translation

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.

Band Info	Modulation
700 MHz	LTE(10 MHz_Lower) LTE(10 MHz_Upper)
SMR800&Cellular	LTE (5 MHz), LTE (10 MHz)
PCS 1900	LTE (20 MHz)
AWS 2100	LTE (20 MHz)

3.3. MAXIMUM MEASUREMENT UNCERTAINTY

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

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

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

4. STANDARDS ENVIRONMENTAL TEST CONDITIONS

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

5. TEST EQUIPMENT

Manufacturer	Model / Equipment	Cal Interval	Calibration Date	Serial No.
Agilent	E4438C /Signal Generator	Annual	09/02/2015	MY42082646
Agilent	N5182A /Signal Generator	Annual	03/29/2016	MY50141649
Agilent	N5182A /Signal Generator	Annual	05/13/2016	MY47070230
Agilent	N9020A / Signal Analyzer	Annual	06/30/2015	MY51110085
WEINSCHEL	67-30-33 / Fixed Attenuator	Annual	10/29/2015	BR5347
Weinschel	1506A / Power Divider	Annual	02/15/2016	MD793
DEAYOUNG ENT	DFSS60 / AC Power Supply	Annual	04/06/2016	1003030-1
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	Biennial	02/23/2016	1513-175
Schwarzbeck	VULB 9168 / Hybrid Antenna	Biennial	04/15/2015	255
Schwarzbeck	BBHA 9120D / Horn Antenna	Biennial	08/26/2014	9120D-1300
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	Biennial	09/03/2015	BBHA9170541
Rohde & Schwarz	FSP / Spectrum Analyzer	Annual	10/05/2015	836650/016
Rohde & Schwarz	FSV40-N / Spectrum Analyzer	Annual	09/23/2015	101068-SZ
Wainwright Instruments	WHK1.2/15G-10EF / Highpass Filter	Annual	04/11/2016	4
Wainwright Instruments	WHK3.0/18G-10EF / Highpass Filter	Annual	06/29/2015	8
CERNEX	CBLU1183540 / Power Amplifier	Annual	02/01/2016	24614
CERNEX	CBL06185030 / Power Amplifier	Annual	02/01/2016	24615
CERNEX	CBL18265035 / Power Amplifier	Annual	07/27/2015	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.

§ 22.913 Effective radiated power limits. The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(a) Maximum ERP. In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. However, for those systems operating in areas more than 72 km (45 miles) from international borders that:

(1) 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,

(2) Extend coverage on a secondary basis into cellular unserved areas, as those areas are defined in § 22.949, the ERP of base transmitters and cellular repeaters of such systems must not exceed 1000 Watts. The ERP of mobile transmitter sand auxiliary test transmitters must not exceed 7 Watts.

§ 24.232 Power and antenna height limits. (a) Base stations are limited to 1640 watts peak equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below. See §24.53 for HAAT calculation method. Base station antenna heights may exceed 300 meters with a corresponding reduction in power; see Table 1 of this section.

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

§ 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: permitted if power levels are reduced below 1000 watts/MHz ERP in accordance with Table 3 of this section;

(4) Fixed and base stations located in a county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, and transmitting a signal 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:

(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.

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

§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).

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

Test Procedures:

Measurements were in accordance with the test methods section 3.5.2 of KDB 935210 D05 v01.

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 of (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 the output power of the EUT and record (Power measurement with a spectrum analyzer).

g) Remove the EUT from the measurement setup and using the same signal generator settings, repeat the power measurement on the input signal to the EUT and record as input power.

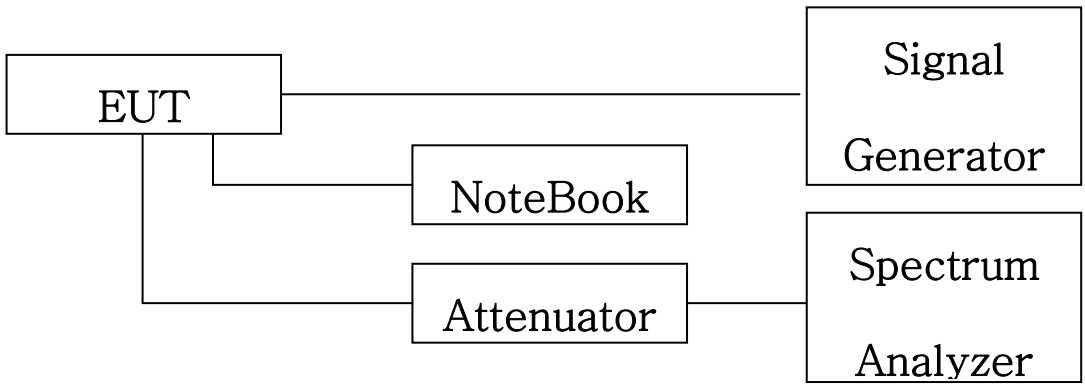
h) Repeat the procedure with the narrowband test signal.

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

j) Repeat for all frequency bands authorized for use by the EUT.

Power measurement Method :

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



Block Diagram 1. RF Power Output Test Setup

IC Rules

Test Requirements:

SRSP-502

6.3 Technical Requirements

6.3.1 Radiated Power and Antenna Height Limits

Within the sharing and protection zones, the ERP will be subject to the limitations in tables C3 and C4 of Annex C. Outside the sharing and protection zones, the ERP shall be limited to that necessary to provide the required service as determined by the system requirements. Systems requiring an ERP greater than 125 watts may require additional justification and will be considered on a case−by−case basis by the local spectrum management office.

C3 Limits of Effective Radiated Power and Antenna Height for General Sharing Arrangements

Effective Radiated Power (ERP) is defined as the product of the power supplied to the antenna and its gain relative to a half−wave dipole in a given direction.

C3.1 For base stations in Sharing Zones I (include Sectors 1 and 2) and III, and the Protection Zones, Table C3 lists the limits of Effective Radiated Power (ERP) corresponding to the Effective Antenna Height (EAH) ranges shown. In this case, Effective Antenna Height is calculated by subtracting the Assumed Average Terrain Elevation given in Table C5 from the antenna height above mean sea level.

Table C3 — Limits of Effective Radiated Power (ERP) Corresponding to Effective Antenna Heights of Base Stations in Sharing Zones I (including Sectors 1 and 2) and III, and the Protection Zones

Effective Antenna Height (EAH) in Metres	ERP Watts (Maximum)
Up to 153	500
Above 153 to 306	125
Above 306 to 458	40
Above 458 to 610	20
Above 610 to 915	10
Above 915 to 1067	6
Above 1067	5

C3.2 For base stations in Sharing Zone II, Table C4 lists the limits of Effective Radiated Power (ERP) corresponding to the antenna height above mean sea level (AMSL) ranges shown.

Table C4 — Limits of Effective Radiated Power (ERP) Corresponding to Antenna Heights Above Mean Sea Level of Base Stations in Sharing Zone II	
Antenna Height Above Mean Sea Level (AMSL) in Metres	**ERP Watts (Maximum)**
Up to 504	500
Above 504 to 610	350
Above 610 to 763	200
Above 763 to 915	140
Above 915 to 1067	100
Above 1067 to 1220	75
Above 1220 to 1372	70
Above 1372 to 1523	65
Above 1523	5

corresponding to the antenna height above mean sea level ranges shown.

SRSP-503

5. Technical Criteria

5.1 Power and Antenna Height Limitations

5.1.1 The maximum effective radiated power (ERP) for base stations shall be 100 watts for analogue systems and 500 watts per channel for digital systems.

5.1.2 Notwithstanding of section 5.1.1, outside of metropolitan areas along transportation corridors, when a directional antenna is used, the maximum allowable ERP of analogue systems shall not exceed 500 watts.

5.1.3 The maximum ERP shall be 6.3 watts for mobile stations.

5.1.4 The ERP and antenna height shall be limited to that necessary to provide the required service as governed by the system requirements.

5.1.5 A reduction in ERP from that specified in paragraphs 5.1.1 and 5.1.2 is required for base station antenna heights in excess of 150 meters above average terrain (AAT) as follows:

Antenna Height up to: (AAT) (meter)	150	180	210	240	270	300	450
Power Reduction (dB)	0.0	1.8	3.5	4.5	6.0	7.0	11.0

SRSP-510

5. Technical Criteria

5.1 Radiated Power and Antenna Height Limits

5.1.1 Base Stations

For base stations with channel bandwidth equal to or less than 1 MHz, the maximum equivalent isotropically radiated power (e.i.r.p.) is limited to 3280 watts with an antenna height above average terrain (HAAT) up to 300 metres. Base stations operating in urban areas are limited to a maximum allowable e.i.r.p. of 1640 watts. Base station antenna heights above average terrain may exceed 300 metres with a corresponding reduction in e.i.r.p. according to the following table:

HAAT[5] (in metres)	Maximum e.i.r.p. (watts)
≤ 300	3280 or 1640[8]
≤ 500	1070
≤1000	490
≤1500	270
≤2000	160

For base stations with a channel bandwidth greater than 1 MHz, the maximum e.i.r.p. is limited to 3280 watts/MHz e.i.r.p. (i.e., no more than 3280 watts e.i.r.p. in any 1 MHz band segment) with an antenna height above average terrain (HAAT) up to 300 metres. Fixed or base stations operating in urban areas are limited to a maximum allowable e.i.r.p. of 1640 watts/MHz e.i.r.p. Base station antenna heights above average terrain may exceed 300 metres with a corresponding reduction in e.i.r.p. according to the following table:

HAAT[5] (in metres)	Maximum e.i.r.p. (watts per MHz)
≤ 300	3280 or 1640[8]
≤ 500	1070
≤1000	490
≤1500	270
≤2000	160

Base stations transmitting in the lower sub-band shall comply with the power limits set forth in section 5.1.2, i.e. the same as mobile stations.

5.1.2 Mobile Stations

Mobile stations and hand-held portables are limited to 2 watts maximum e.i.r.p. The equipment shall employ means to limit the power to the minimum necessary for successful communication.

SRSP-513

5. Technical Criteria

5.1 Radiated Power and Antenna Height Limits

5.1.1 Fixed and Base Stations

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 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 coverage 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 MHz[a])
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.

SRSP-518

5. Technical Criteria

5.1 Radiated Power and Antenna Height Limits

5.1.1.2 For fixed and base stations transmitting in accordance with sections 4.1.1 to 4.1.3 within the frequency range 716-756 MHz with a channel bandwidth greater than 1 MHz, the maximum permissible e.i.r.p. is 1640 watts/MHz (i.e. no more than 1640 watts e.i.r.p. in any 1 MHz band segment) with a HAAT up to 305 metres. The same e.i.r.p. limit also applies to fixed and base stations operating at any frequency in the 700 MHz band in accordance with Section 4.1.4.

5.1.1.4 For all installations with an antenna HAAT in excess of 305 metres, a corresponding reduction in e.i.r.p. according to the following formula shall be applied:

EIRPreduction =20 log10(HAAT/305) dB

RSS-131 6.2

The manufacturer's output power rating Prated MUST NOT be greater than Pmean for all types of enhancers.

Additional Power Back-off Condition for Multiple Carrier Operations:

An example of a single carrier operation is a band translator that incorporates an (IF) filter of a passband equal to one channel bandwidth. Another example of a single carrier operation is the use of an enhancer, before the connection to the antenna, to boost a low power transmitter (single carrier) to a higher power.

An example of a multiple carrier operation is the use of an enhancer to amplify off-air signals that contain the wanted carrier and two (or more) adjacent band carriers. If the enhancer passband is wide enough to pass more than the wanted channel bandwidth, the enhancer output stage will be loaded by the multiple carriers.

Examination: with 3 carrier signals (of assumed equal level), the peak voltage will be 3 times the single carrier voltage. The corresponding Peak Envelope Power (PEP) will be 3^2 times greater than a single carrier or 9/4 = 2.25 times greater than 2 tones PEP. Therefore the permissible wanted signal operating point has to be backed off by 3.5 dB (i.e. **Ppermissible = Prated - 3.5 dB**).

Note 1: All enhancers will be classified in the Radio Equipment List (REL) for a single carrier operation.

Note 2: For a multiple carrier operation, the rating must be reduced by 3.5 dB or more.

Note 3: If there are more than 3 carriers present at the amplifier input point, greater power back-off may be required. This can be examined on a case-by-case basis.

Test Procedures: RSS-131 4.3

4.3.1 Multi-channel Enhancer

The following subscript "o" denotes a parameter at the enhancer output point.

Connect two signal generators to the input of the Device Under Test (DUT), via a proper impedance matching network (and preferably via a variable attenuator) so that the two input signals are equal sinusoids (and can be raised equally).

Connect a dummy load of suitable load rating to the enhancer output point. Connect also a spectrum analyser to this output point via a coupling network and attenuator, so that only a portion of the output signal is coupled to the spectrum analyser. The coupling attenuation shall be stated in the test report.

Set the two generator frequencies f1 and f2 such that they and their third-order intermodulation product frequencies, f3= 2f1-f2 and f4 = 2f2 - f1, are all within the passband of the DUT.

Raise the input level to the DUT while observing the output tone levels, Po1 and Po2, and the intermodulation product levels, Po3 and Po4.

For enhancers rated 500 watts or less: Raise the input level to the DUT until the greater level of the intermodulation products at the enhancer output terminals, Po3 or Po4, equals -43 dBW.

For enhancers rated over 500 watts: Raise the input level to the DUT until the greater level of the intermodulation products at the enhancer output terminals, Po3 or Po4, is 67 dB below the level of either output tone level, Po1 or Po2.

Record all signal levels and their frequencies. Calculate the mean output power (Pmean) under this testing condition using Pmean = Po1 + 3 dB.

4.3.2 Single Channel Enhancer

A suitably modulated signal, representative of the technology for which certification is sought, is applied to the input of the amplifier. The input power level is increased until the manufacturer’s rated input power level is achieved or until a 2 dB increase in input level results in a 1 dB increase

in output level (i.e. compression begins). Record the output power in the 99% emission bandwidth using any suitable means.

Test Results:

Input Signal	Input Level (dBm)	Maximum Amp Gain
700 MHz	DL : 0 dBm UL : -45 dBm	DL : 33 dB UL : 30 dB
SMR800&Celluar		
PCS 1900	DL : 0 dBm UL : -45 dBm	DL : 37 dB UL : 30 dB
AWS 2100		

Single channel Enhancer

* Due to EUT's ALC function (Auto Level Control), even if input signal is increased,

The same output power is transmit.

[Downlink]

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
700 Band_ LTE 10 MHz Lower AGC threshold	Low	734.00	34.06	2.547
	Middle	-	-	-
	High	741.00	34.21	2.636
700 Band_ LTE 10 MHz Lower +3dBm above the AGC threshold	Low	734.00	34.16	2.606
	Middle	-	-	-
	High	741.00	34.33	2.710
700 Band_ LTE 10 MHz Upper AGC threshold	Low	-	-	-
	Middle	751.00	33.72	2.355
	High	-	-	
700 Band_ LTE 10 MHz Upper +3dBm above the AGC threshold	Low	-	-	
	Middle	751.00	33.78	2.388
	High	-	-	

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
SMR 800 &Cellular Band_ (862 MHz~869MHz) AGC threshold	Low	864.50	32.83	1.919
	Middle	-	-	-
	High	866.50	33.09	2.037
SMR 800 &Cellular Band_ (862 MHz~869MHz) +3dBm above the AGC threshold	Low	864.50	32.93	1.963
	Middle	-	-	-
	High	866.50	33.17	2.075
SMR 800 &Cellular Band_ (869 MHz~894MHz) AGC threshold	Low	874.00	33.28	2.128
	Middle	881.50	33.55	2.265
	High	889.00	33.24	2.109
SMR 800 &Cellular Band_ (869 MHz~894MHz) +3dBm above the AGC threshold	Low	874.00	33.02	2.004
	Middle	881.50	33.47	2.223
	High	889.00	33.06	2.023

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
PCS 1900 Band_ AGC threshold	Low	1940.00	37.42	5.521
	Middle	1962.50	37.81	6.039
	High	1985.00	37.66	5.834
PCS 1900 Band_ +3dBm above the AGC threshold	Low	1940.00	37.32	5.395
	Middle	1962.50	37.80	6.026
	High	1985.00	37.60	5.754

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
AWS 2100 Band_ LTE 20 MHz AGC threshold	Low	2120.00	37.00	5.012
	Middle	2145.00	37.01	5.023
	High	2170.00	37.66	5.834
AWS 2100 Band_ LTE 20 MHz +3dBm above the AGC threshold	Low	2120.00	37.05	5.070
	Middle	2145.00	37.02	5.035
	High	2170.00	37.64	5.808

[Uplink]

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
700 Band_ LTE 10 MHz Lower AGC threshold	Low	704.00	-15.73	0.027
	Middle	-	-	-
	High	711.00	-15.45	0.029
700 Band_ LTE 10 MHz Lower +3dBm above the AGC threshold	Low	704.00	-15.52	0.028
	Middle	-	-	-
	High	711.00	-15.25	0.030
700 Band_ LTE 10 MHz Upper AGC threshold	Low	-	-	-
	Middle	782.00	-15.17	0.030
	High	-	-	
700 Band_ LTE 10 MHz Upper +3dBm above the AGC threshold	Low	-	-	
	Middle	782.00	-14.88	0.033
	High	-	-	

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
SMR 800 &Cellular Band_ LTE 5MHz AGC threshold	Low	819.50	-16.38	0.023
	Middle	-	-	-
	High	821.50	-16.00	0.025
SMR 800 &Cellular Band_ LTE 5MHz +3dBm above the AGC threshold	Low	819.50	-16.06	0.025
	Middle	-	-	-
	High	821.50	-15.88	0.026
SMR 800 &Cellular Band_ LTE 10MHz AGC threshold	Low	829.00	-15.13	0.031
	Middle	836.50	-14.43	0.036
	High	844.00	-14.80	0.033
SMR 800 &Cellular Band_ LTE 10MHz +3dBm above the AGC threshold	Low	829.00	-14.97	0.032
	Middle	836.50	-14.80	0.033
	High	844.00	-14.64	0.034

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
PCS 1900 Band_ LTE 20MHz AGC threshold	Low	1860.00	-15.12	0.031
	Middle	1882.50	-15.01	0.032
	High	1905.00	-15.67	0.027
PCS 1900 Band_ LTE 20MHz +3dBm above the AGC threshold	Low	1860.00	-15.44	0.029
	Middle	1882.50	-15.38	0.029
	High	1905.00	-15.74	0.027

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
AWS 2100 Band_ LTE 20 MHz AGC threshold	Low	1720.00	-15.33	0.029
	Middle	1745.00	-15.20	0.030
	High	1770.00	-15.44	0.029
AWS 2100 Band_ LTE 20 MHz +3dBm above the AGC threshold	Low	1720.00	-15.62	0.027
	Middle	1745.00	-15.49	0.028
	High	1770.00	-15.36	0.029

Multi-channel Enhancer for IC

* Due to EUT's ALC function (Auto Level Control), even if input signal is increased,

The same output power is transmit.

[Downlink]

	Channel	Frequency (MHz)	Output Power	
			Po1(dBm)	Pmean(mW)
700 MHz_Lower Band	Low	730.50	30.02	33.02
	Middle	737.50	30.03	33.03
	High	744.60	30.01	33.01
700 MHz_Upper Band	Low	747.40	30.02	33.02
	Middle	751.00	30.02	33.02
	High	754.60	30.02	33.02
SMR800 / 850 Cellular	Low	863.40	30.03	33.03
	Middle	878.00	30.00	33.00
	High	892.60	30.04	33.04
PCS1900	Low	1931.40	34.02	37.02
	Middle	1962.50	34.03	37.03
	High	1993.60	34.03	37.03
AWS2100	Low	2111.40	34.02	37.02
	Middle	2145.00	34.01	37.01
	High	2178.60	34.00	37.00

[Uplink]

	Channel	Frequency (MHz)	Output Power	
			Po1(dBm)	Pmean(mW)
700 MHz_Lower Band	Low	700.40	-17.86	-14.86
	Middle	707.50	-17.97	-14.97
	High	714.60	-17.96	-14.96
700 MHz_Upper Band	Low	778.40	-17.99	-14.99
	Middle	781.30	-17.96	-14.96
	High	785.60	-17.95	-14.95
SMR800 / 850 Cellular	Low	818.40	-17.96	-14.96
	Middle	833.00	-17.99	-14.99
	High	847.60	-17.97	-14.97
PCS1900	Low	1851.40	-17.96	-14.96
	Middle	1882.50	-17.99	-14.99
	High	1913.60	-17.98	-14.98
AWS2100	Low	1711.40	-18.00	-15.00
	Middle	1745.00	-17.99	-14.99
	High	1778.60	-17.97	-14.97

Additional Power Back-off Condition for Multiple Carrier Operations for IC

[Downlink]

	1 Carrier (dBm)	3 Carrier (dBm)	Power Back-off (dB)
700 MHz _Lower Band	33.01	28.26	4.75
700 MHz _Upper Band	-	-	-
SMR800 / 850 cellular	33.05	28.90	4.15
PCS1900	37.81	32.11	5.70
AWS2100	37.01	32.20	4.81

[Uplink]

	1 Carrier (dBm)	3 Carrier (dBm)	Power Back-off (dB)
700 MHz _Lower Band	-15.00	-18.63	-3.63
700 MHz _Upper Band	-	-	-
SMR800 / 850 cellular	-15.02	-18.91	3.89
PCS1900	-15.01	-20.78	5.77
AWS2100	-15.20	-20.40	5.20

Note (for IC):

1. 700MHz_Upper Band frequency range is 746 MHz ~ 756 MHz. It's narrow for measurement, so except that band.
2. The EUT is normally operate only LTE signal, not capable to operate using the two CW input signals, then we tested using two independent modulated carriers.

Single channel Enhancer Plots of RF Output Power

700MHz LTE10MHz Lower DL

[700 Band AGC threshold Downlink LTE 10MHz Lower Low]	[700 Band AGC threshold Downlink LTE 10MHz Lower High]
	
[700 Band +3dB above the threshold Downlink LTE 10MHz Lower Low]	**[700 Band +3dB above the threshold Downlink LTE 10MHz Lower High]**
	

700MHz LTE10MHz Upper DL

[700 Band AGC threshold Downlink LTE 10MHz Upper Middle]	[700 Band +3dB above the threshold Downlink LTE 10MHz Upper Middle]
	

SMR800&Cellular (862 MHz ~ 869 MHz) DL

SMR 800&Cellular Band_ AGC threshold Downlink (862 MHz~869 MHz) Low]	SMR 800&Cellular Band_ AGC threshold Downlink (862 MHz~869 MHz) High]
	
SMR 800&Cellular Band_ +3dB above the threshold Downlink (862 MHz~869 MHz) Low]	SMR 800&Cellular Band_ +3dB above the threshold Downlink (862 MHz~869 MHz) High]
	

SMR800&Cellular (869 MHz ~ 894 MHz) DL

SMR 800&Cellular Band_ AGC threshold Downlink (869 MHz~894 MHz) Low]	SMR 800&Cellular Band_ AGC threshold Downlink (869 MHz~894 MHz) Middle]
	
SMR 800&Cellular Band_ AGC threshold Downlink (869 MHz~894 MHz) High]	
	

SMR 800&Cellular Band_+3dB above the threshold

Downlink (869 MHz~894 MHz) Low]

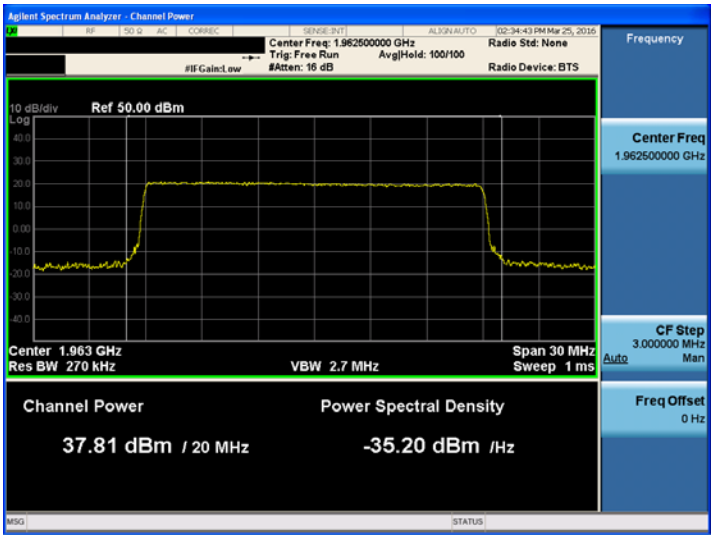
SMR 800&Cellular Band_ +3dB above the threshold

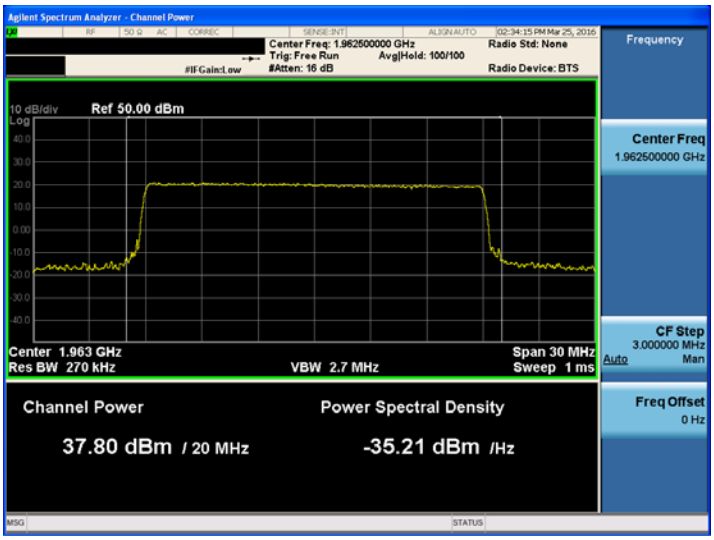
Downlink (869 MHz~894 MHz) Middle]

SMR 800&Cellular Band_ +3dB above the threshold

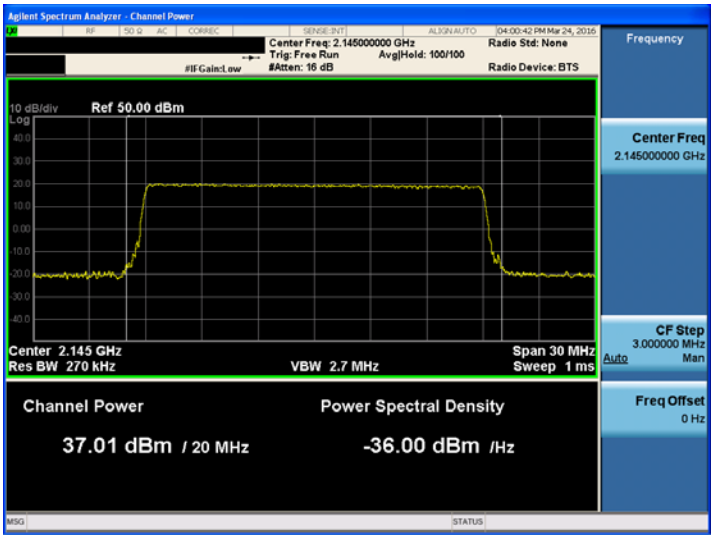
Downlink (869 MHz~894 MHz) High]

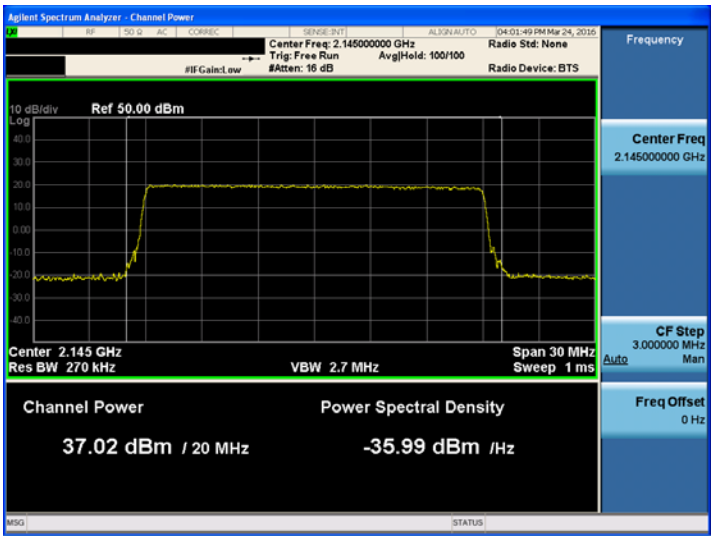
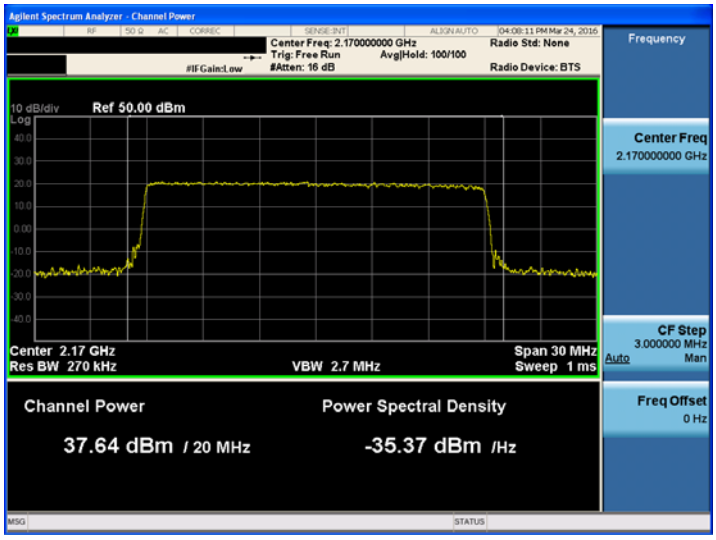
PCS 1900 Band DL

[PCS AGC threshold Downlink Low]	[PCS AGC threshold Downlink Mid]
	
[PCS AGC threshold Downlink High]	
	

[PCS +3dB above the threshold Downlink Low]	[PCS +3dB above the threshold Downlink Mid]
	
[PCS +3dB above the threshold Downlink High]	
	

AWS 2100 LTE 20MHz Band DL

[AWS 2100 AGC threshold Downlink LTE 20MHz Low]	[AWS 2100 AGC threshold Downlink LTE 20MH Mid]
	
[AWS 2100 AGC threshold Downlink LTE 20MH High]	
	

[AWS 2100 +3dB above the threshold Downlink LTE 20MHz Low]	[AWS 2100 +3dB above the threshold Downlink LTE 20MHz Mid]
	
[AWS 2100 +3dB above the threshold Downlink LTE 20MHz High]	
	

700MHz LTE10MHz(Lower) Band UL

[700 Band AGC threshold Uplink LTE 10 MHz(Lower) Low]	[700 Band AGC threshold Uplink LTE 10 MHz(Lower) High]
	
[700 Band +3dB above the threshold Uplink LTE 10 MHz(Lower) Low]	**[700 Band +3dB above the threshold Uplink LTE 10 MHz(Lower) High]**
	

700MHz LTE10MHz(Upper) Band UL

[700 Band AGC threshold Uplink LTE 10 MHz(Upper) Mid]	[700 Band +3dB above the threshold Uplink LTE 10 MHz(Upper) Mid]
	

SMR 800, Cellular LTE 5MHz Band UL

[SMR 800, Cellular AGC threshold Uplink LTE 5MHz Low]	[SMR 800, Cellular AGC threshold Uplink LTE 5MHz High]
	
[SMR 800, Cellular +3dB above the threshold Uplink LTE 5MHz Low]	**[SMR 800, Cellular +3dB above the threshold Uplink LTE 5MHz High]**
	

SMR 800, Cellular LTE 10MHz Band UL

[SMR 800, Cellular AGC threshold Uplink LTE 10 MHz Low]	[SMR 800, Cellular AGC threshold Uplink LTE 10 MHz Mid]
	
[SMR 800, Cellular AGC threshold Uplink LTE 10 MHz High]	
	

[SMR 800, Cellular +3dB above the threshold Uplink LTE 10 MHz Low]	[SMR 800, Cellular +3dB above the threshold Uplink LTE 10 MHz Mid]
	
[SMR 800, Cellular +3dB above the threshold Uplink LTE 10 MHz High]	
	

PCS 1900 Band LTE 20MHz UL

[PCS 1900 AGC threshold Uplink LTE 20MHz Low]	[PCS 1900 AGC threshold Uplink LTE 20MHz Mid]
	
[PCS 1900 AGC threshold Uplink LTE 20MHz High]	
	

[PCS 1900 +3dB above the AGC threshold Uplink LTE20MHz Low]	[PCS 1900 +3dB above the AGC threshold Uplink LTE 20MHz Mid]
	
[PCS 1900 +3dB above the AGC threshold Uplink LTE 20MHz High]	
	

AWS 2100 LTE 20MHz Band UL

[AWS 2100 AGC threshold Uplink LTE 20MHz Low]	[AWS 2100 AGC threshold Uplink LTE 20MHz Mid]
	
[AWS 2100 AGC threshold Uplink LTE 20MHz High]	
	

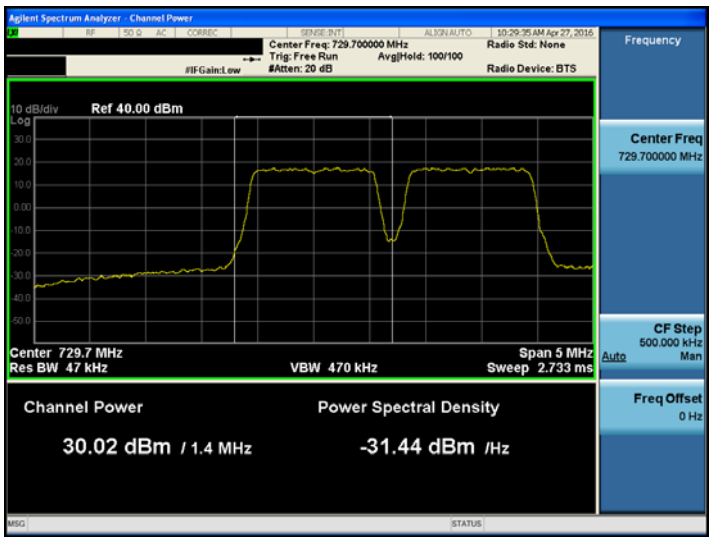
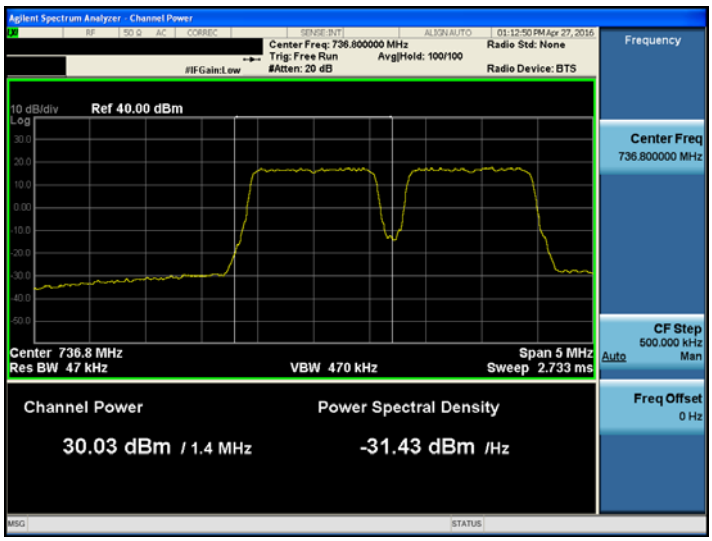
[AWS2100 +3dB above the AGC threshold Uplink LTE 20MHz Low]

[AWS2100 +3dB above the AGC threshold Uplink LTE 20MHz Mid]

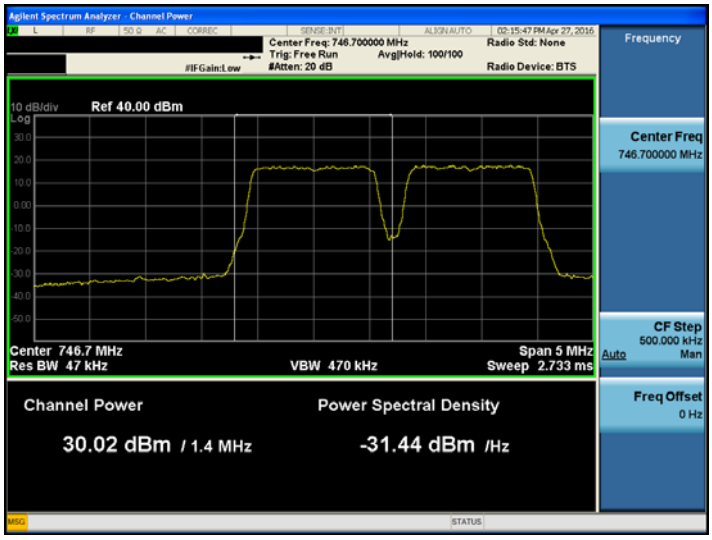
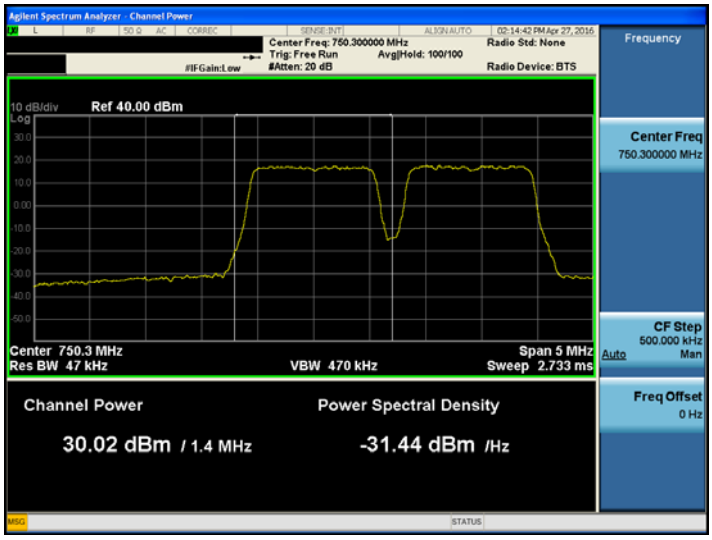
[AWS2100 +3dB above the AGC threshold Uplink LTE 20MHz High]

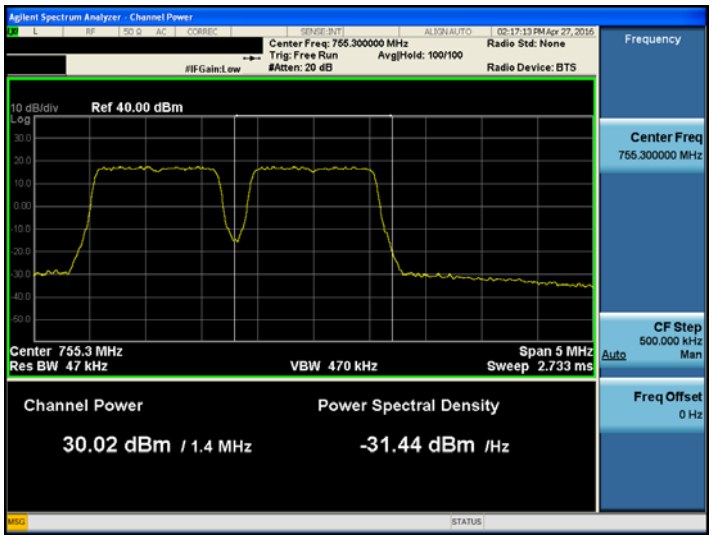
Multi-channel Enhancer for IC

700 MHz_Lower Band DL

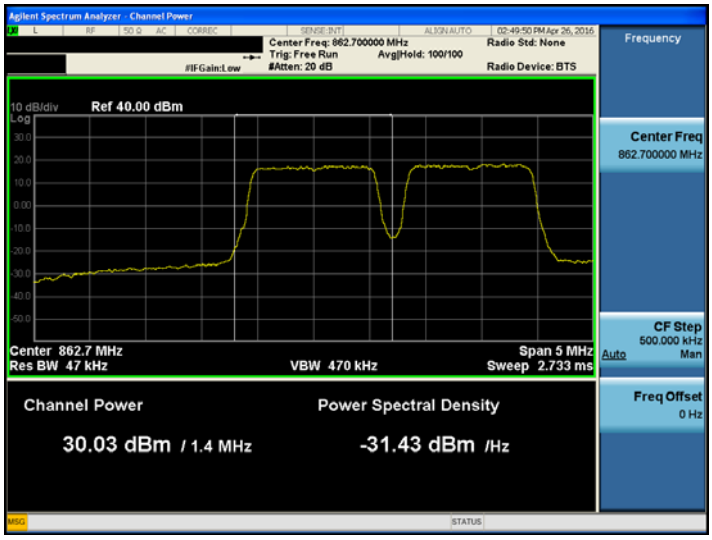
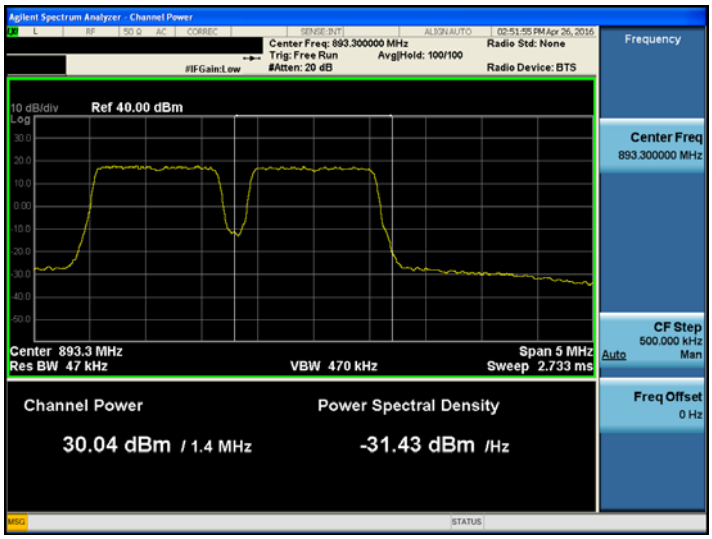
[700 MHz_Lower Downlink Low]	[700MHz_Lower Downlink Mid]
	
[700 MHz_Lower Downlink High]	
	

700 MHz_Upper Band DL

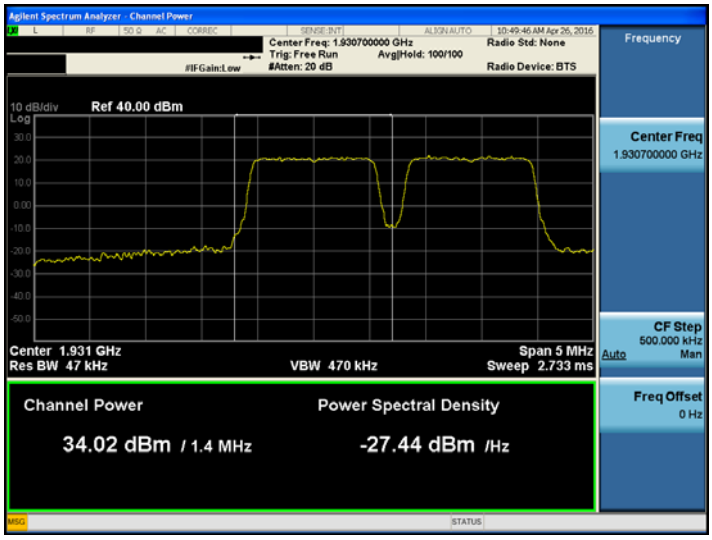
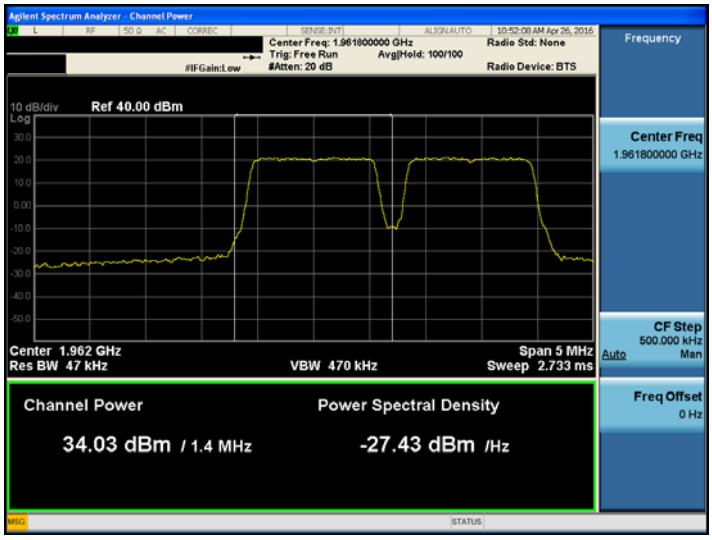
[700 MHz_Upper Downlink Low]	[700 MHz_Upper Downlink Mid]
	

[700 MHz_Upper Downlink High]


SMR800/850 Cellular Band DL

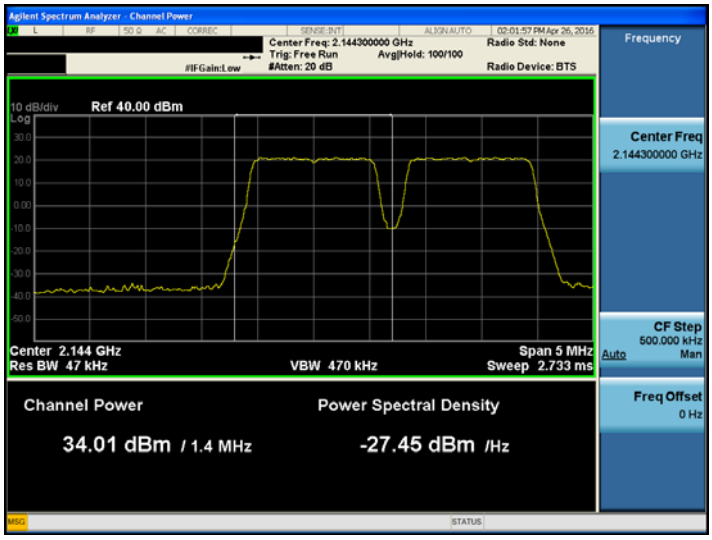
[SMR800/850 Cellular Downlink Low]	[SMR800/850 Cellular Downlink Mid]
	
[SMR800/850 Cellular Downlink High]	
	

PCS1900 Band DL

[PCS1900 Downlink Low]	[PCS1900 Downlink Mid]
	

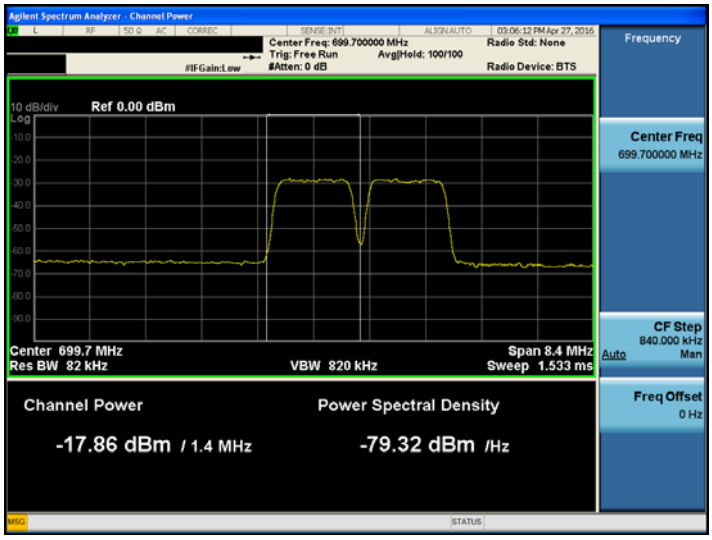
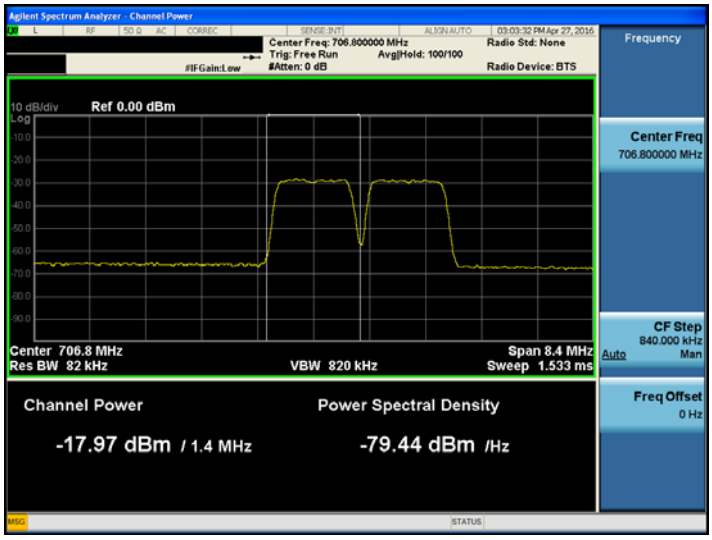
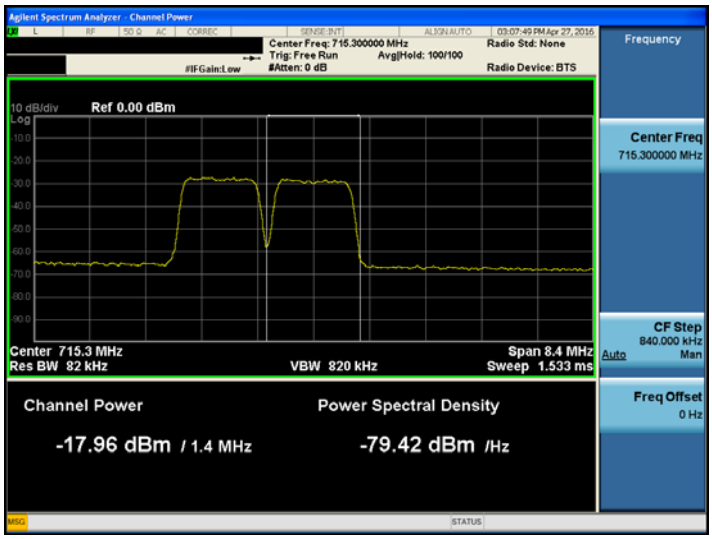
[PCS1900 Downlink High]


AWS2100 Band DL

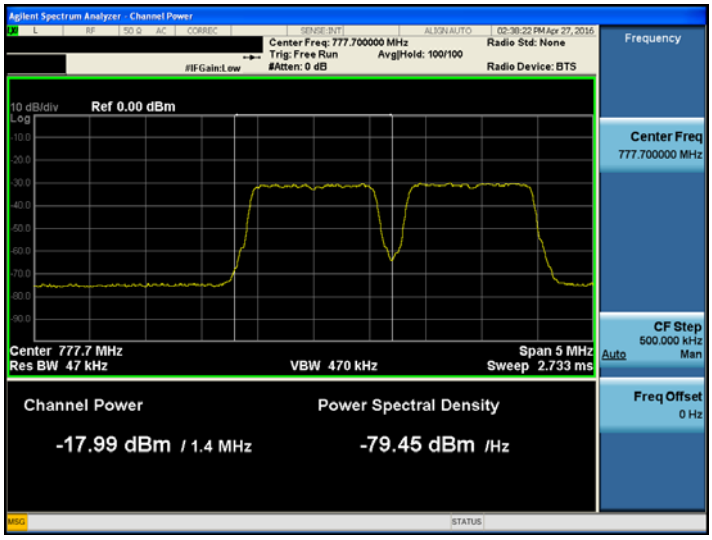
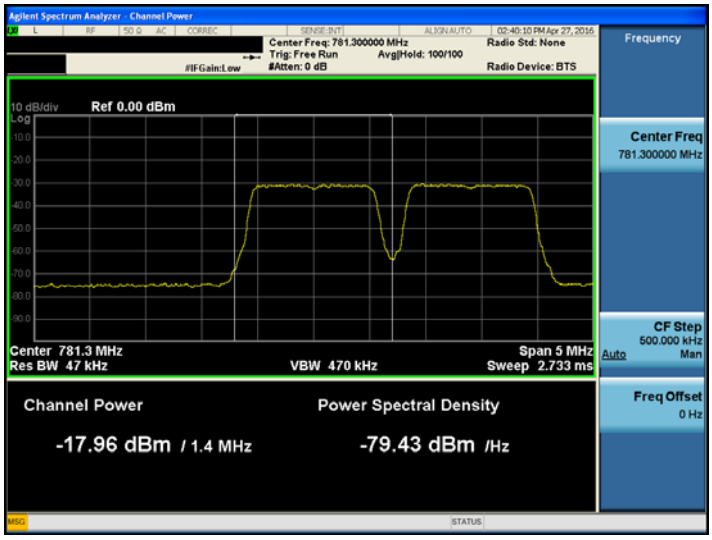
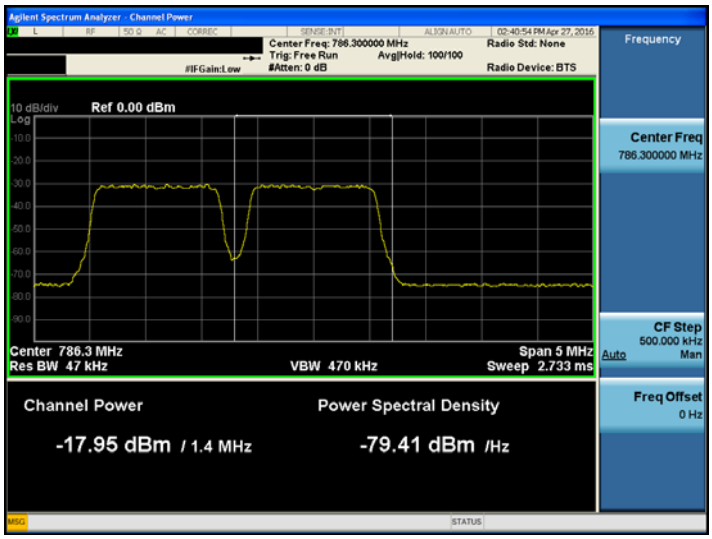
[AWS2100 Downlink Low]	[AWS2100 Downlink Mid]
	

[AWS2100 Downlink High]

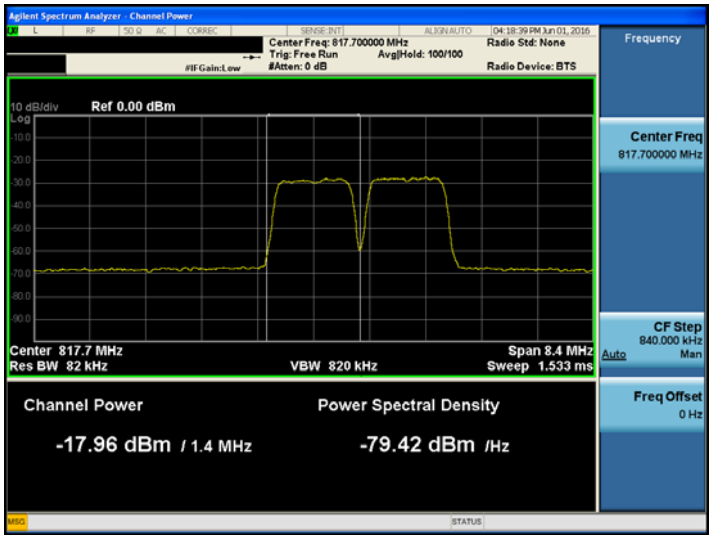
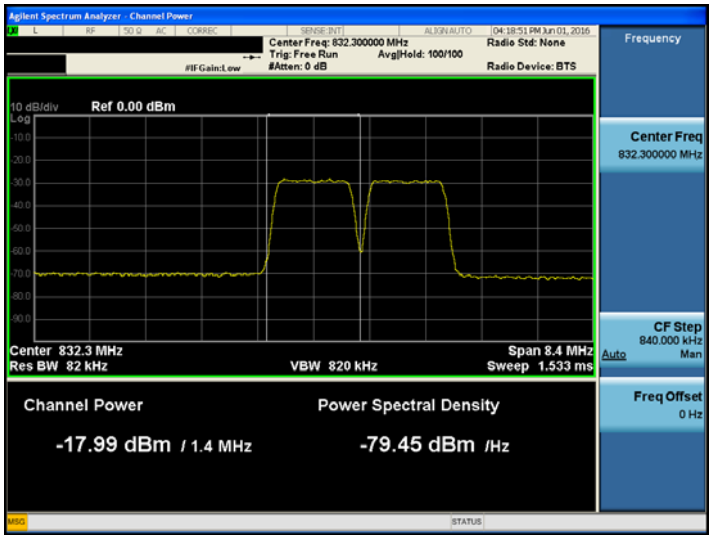

700 MHz_Lower Band UP

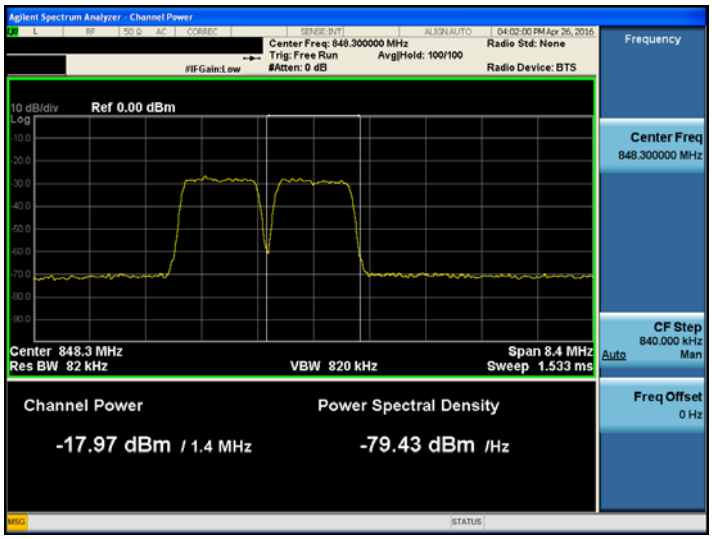
[700 MHz_Lower Uplink Low]	[700MHz_Lower Uplink Mid]
	
[700 MHz_Lower Uplink High]	
	

700 MHz_Upper Band UL

[700 MHz_Upper Uplink Low]	[700 MHz_Upper Uplink Mid]
	
[700 MHz_Upper Uplink High]	
	

SMR800/850 Cellular Band UL

[SMR800/850 Cellular Uplink Low]	[SMR800/850 Cellular Uplink Mid]
	

[SMR800/850 Cellular Uplink High]


PCS1900 Band UL

[PCS1900 Uplink Low]	[PCS1900 Uplink Mid]
	
[PCS1900 Uplink High]	
	

AWS2100 Band UL

[AWS2100 Uplink Low]	[AWS2100 Uplink Mid]
	

[AWS2100 Uplink High]

*** Power Back-off for IC**

Downlink

[700MHz_Lower Band 1 Carrier Mid]	[700MHz_Lower Band 3 Carrier Mid]
	
[SMR800/850 Cellular Band 1 Carrier Mid]	**[SMR800/850 Cellular Band 3 Carrier Mid]**
	

[PCS1900 Band 3 Carrier Mid]	[AWS2100 Band 3 Carrier Mid]