



HCT. CO., LTD.

CERTIFICATION DIVISION

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CERTIFICATE OF COMPLIANCE (ERM EVALUATION)

Manufacture: ADRF Korea, inc

5-5, Mojeon-Ri, Backsa-Myun, Icheon-City, Kyunggi-Do, Korea

Date of Issue:

April 18, 2014

Location:

HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea

Test Report No.: HCT-R-1402-F024-3

FCC ID:

N52-AXM850-9543I

APPLICANT:

ADRF Korea, inc

EUT Type:

REPEATER

Model:

AXM850-9543-ICS

Frequency Ranges:

DL : 869 MHz ~ 894 MHz

UL : 824 MHz ~ 849 MHz

Conducted Output Power:

DL : 20 W(43 dBm)

UL : 1 W(30 dBm)

FCC Rules Part(s):

CFR 47, Part 22

Engineering Statement:

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 Part 22 of the FCC Rules under normal use and maintenance.

Report prepared by
:Yong Hyun Lee
Test engineer of RF Team

Approved by
: Chang Seok Choi
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1402-F024	March 03, 2014	- First Approval Report
HCT-R-1402-F024-1	March 07, 2014	- Revised the RF output power limit and description. (RF Power Output => Conducted RF Output Power) - Revised the clause 2.2. (Add the worst case configuration) - Revised the clause 7. (Add the test for Out of Band Rejection)
HCT-R-1402-F024-2	March 31, 2014	- Add The technologies CDMA, WCDMA, LTE 5 MHz
HCT-R-1402-F024-3	April 18, 2014	- Test summary update - Add the test 9 kHz ~ 30 MHz - Add the Out of Band Rejection test procedure - Revised the RF exposure

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company	ADRF Korea, inc 5-5, Mojeon-Ri, Backsa-Myun, Icheon-City, Kyunggi-Do, Korea
Contact Point	Attention/ E-Mail: HK Song/ hk4464@adrfttech.com Tel./ H.P. : +82-31-637-4435/ +82-10-3191-4773

- **FCC ID:** N52-AXM850-9543I
- **APPLICANT:** ADRF Korea, inc
- **EUT Type:** REPEATER
- **Model:** AXM850-9543-ICS
- **Frequency Ranges:** DL : 869 MHz ~ 894 MHz
UL : 824 MHz ~ 849 MHz
- **Conducted Output Power:** DL : 20 W(43 dBm)
UL : 1 W(30 dBm)
- **Antenna Gain(s):** 16 dBi
- **Date(s) of Tests:** 2014. 02. 08. ~ 2014. 02. 14. , 2014. 03. 17. ~ 2014.03.21
- **FCC Rules Part(s):** CFR Title 47 Part 22
- **Measurement standard(s):** ANSI/TIA-603-C-2004, KDB 971168 D01 v02r01,
KDB 935210 D02 v01r01
- **Place of Tests:** 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do,
Korea. (IC Recognition No. : 5944A-3)

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, 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 June 21, 2011 (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 SUMMARY

3.1. STANDARDS

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 22.

Description	Reference	Results
Conducted RF Output Power	§2.1046; §22.913	Compliant
Occupied Bandwidth	§2.1049	Compliant
Spurious Emissions at Antenna Terminals	§2.1051, §22.917	Compliant
Out of Band Rejection	KDB 935210 D02 v01r01	Compliant
Radiated Spurious Emissions	§2.1053, §22.917	Compliant
Frequency Stability	§2.1055, §22.355	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.

QPSK was only selected and tested since it's the worst case configuration among all here modulations (QPSK, 16QAM, 64QAM).

4. STANDARDS ENVIRONMENTAL TEST CONDITIONS

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

5. TEST EQUIPMENT

Manufacturer	Model / Equipment	Cal Interval	Calibration Due	Serial No.
Agilent	E4438C /Signal Generator	Annual	09/05/2014	MY42082646
Agilent	N5182A /Signal Generator	Annual	09/30/2014	MY50141649
Agilent	E4416A /Power Meter	Annual	10/16/2014	GB41291412
Agilent	E9327A/ Power Sensor	Annual	03/31/2015	MY4442009
NANGYEUL CO., LTD.	NY-THR18750/ Temperature and Humidity Chamber	Annual	10/30/2014	NY-2009012201A
Agilent	N9020A /Signal Analyzer	Annual	04/16/2015	US46220219
WEINSCHTEL	67-30-33 / Fixed Attenuator	Annual	11/05/2014	BU5347
MCE / Weinschel	2-10 / Fixed Attenuator	Annual	10/28/2014	BR0554
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	12
MITEQ	AMF-6D-001180-35-20P/AMP	Annual	09/12/2014	1081666
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	07/05/2015	1151
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	07/05/2015	1151
Schwarzbeck	VULB 9168/TRILOG Antenna	Biennial	07/02/2014	9168-255

6. RF OUTPUT POWER

Test Requirements:

§ 2.1046 Measurements required: RF power output:

§ 2.1046 (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.

§ 2.1046 (b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone 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.

§ 2.1046 (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.

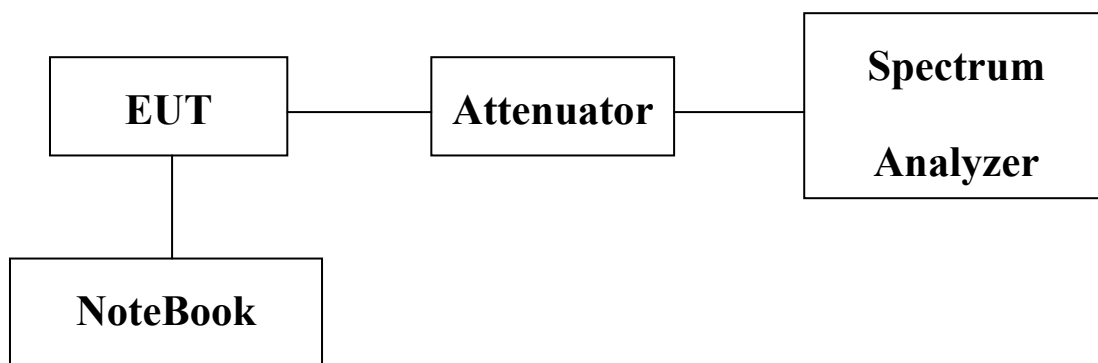
§ 22.913 **Effective radiated power limits.** The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(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 transmitters and auxiliary test transmitters must not exceed 7 Watts.

Test Procedures:

As required by 47 CFR 2.1046, RF power output measurements were made at the RF output terminals using an attenuator and spectrum analyzer or power meter. This test was performed in all applicable modulations.



Block Diagram 1. RF Power Output Test Setup

Test Results:

Input Signal	Input Level (dBm)	Maximum Amp Gain
CDMA	DL : -52 dBm UL : -65 dBm	DL : 95 dB UL : 95 dB
WCDMA		
LTE		

[Downlink]

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
CDMA	Low	869.75	43.06	20.237
	Middle	881.52	43.04	20.139
	High	893.25	43.04	20.121
WCDMA	Low	871.50	42.96	19.751
	Middle	881.50	43.06	20.213
	High	891.50	43.05	20.169

[Downlink]

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
LTE 5 MHz	Low	871.50	43.00	19.949
	Middle	881.50	42.98	19.844
	High	891.50	43.00	19.932
LTE 10 MHz	Low	874.00	43.01	20.008
	Middle	884.00	43.19	20.835
	High	889.00	43.12	20.526

[Uplink]

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
CDMA	Low	824.75	29.84	0.964
	Middle	836.52	30.01	1.001
	High	848.25	29.98	0.996
WCDMA	Low	826.50	30.02	1.004
	Middle	836.50	30.17	1.040
	High	846.50	30.02	1.005

[Uplink]

	Channel	Frequency (MHz)	Output Power	
			(dBm)	(W)
LTE 5 MHz	Low	826.50	30.05	1.012
	Middle	836.50	30.06	1.014
	High	846.50	30.00	1.000
LTE 10 MHz	Low	829.00	30.00	1.001
	Middle	839.00	29.98	0.996
	High	844.00	30.04	1.010

Plots of RF Output Power

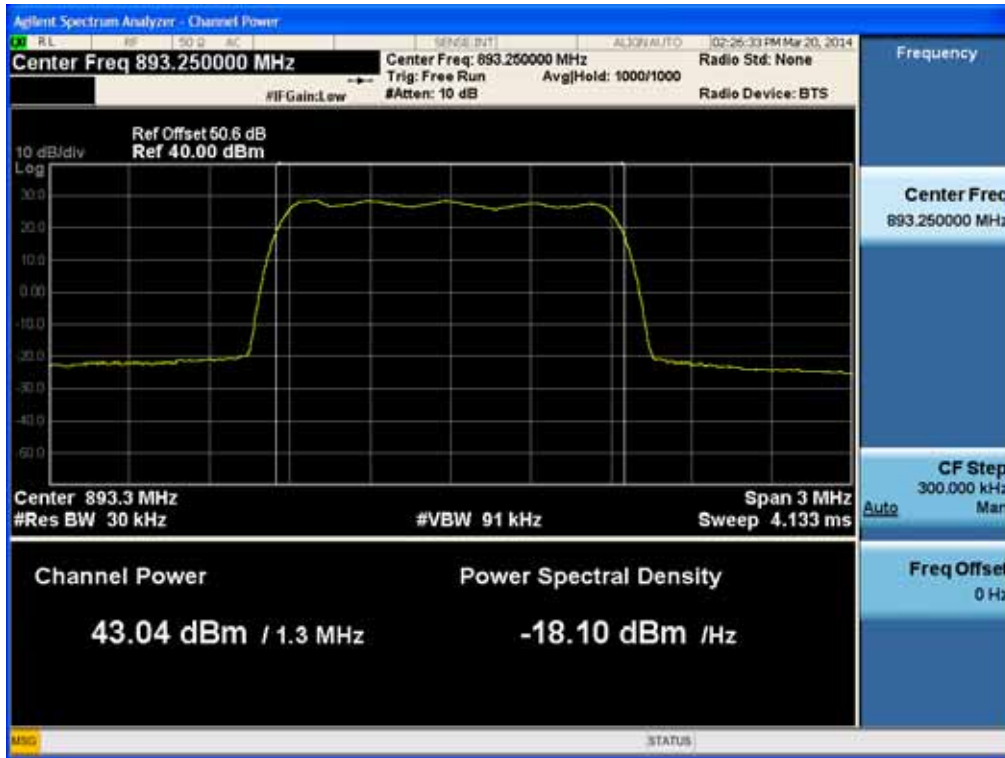
[CDMA Downlink Low]



[CDMA Downlink Middle]



[CDMA Downlink High]



[WCDMA Downlink Low]



[WCDMA Downlink Middle]



[WCDMA Downlink High]



[LTE Downlink 5 MHz Low]



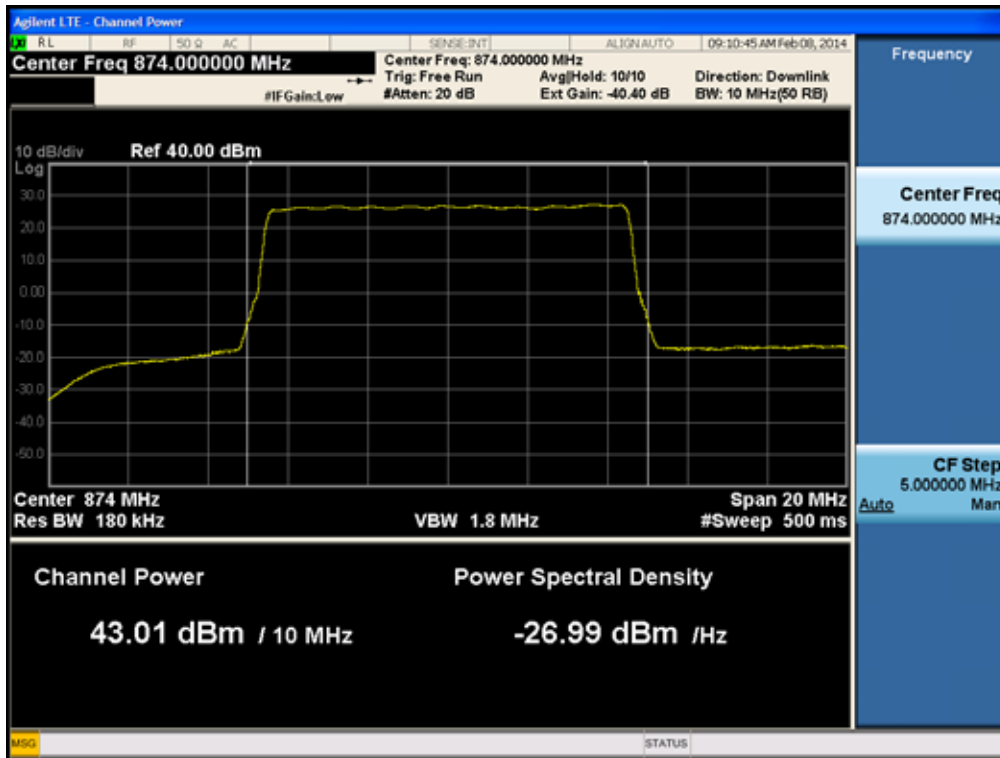
[LTE Downlink 5 MHz Middle]



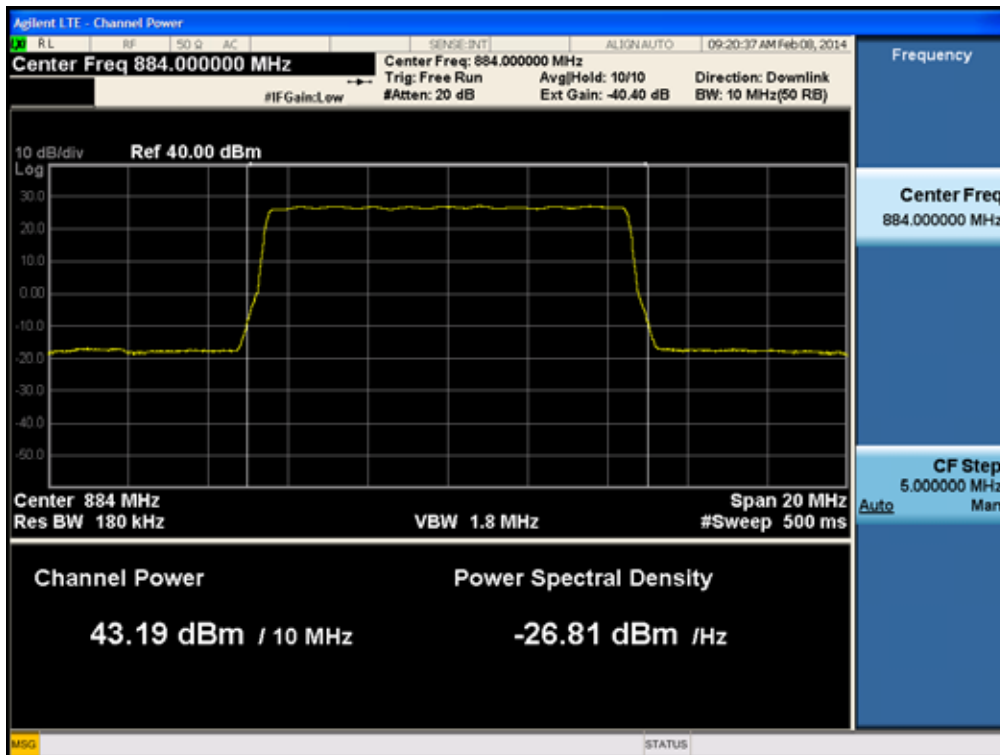
[LTE Downlink 5 MHz High]



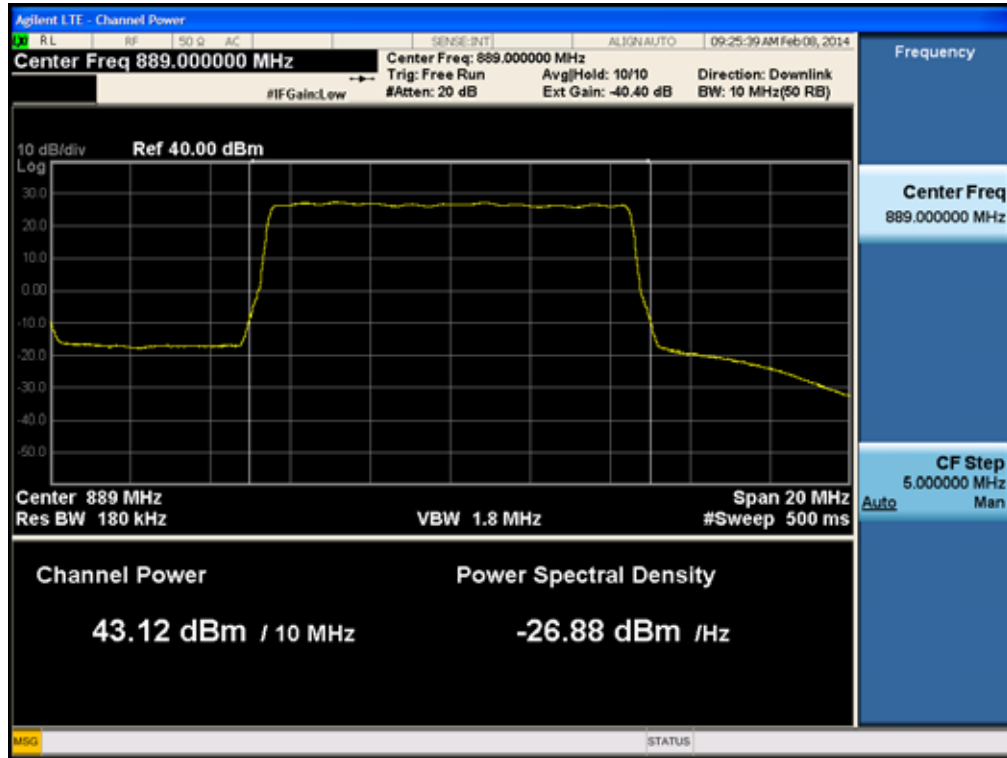
[LTE Downlink 10 MHz Low]



[LTE Downlink 10 MHz Middle]



[LTE Downlink 10 MHz High]



[CDMA Uplink Low]



[CDMA Uplink Middle]



[CDMA Uplink High]



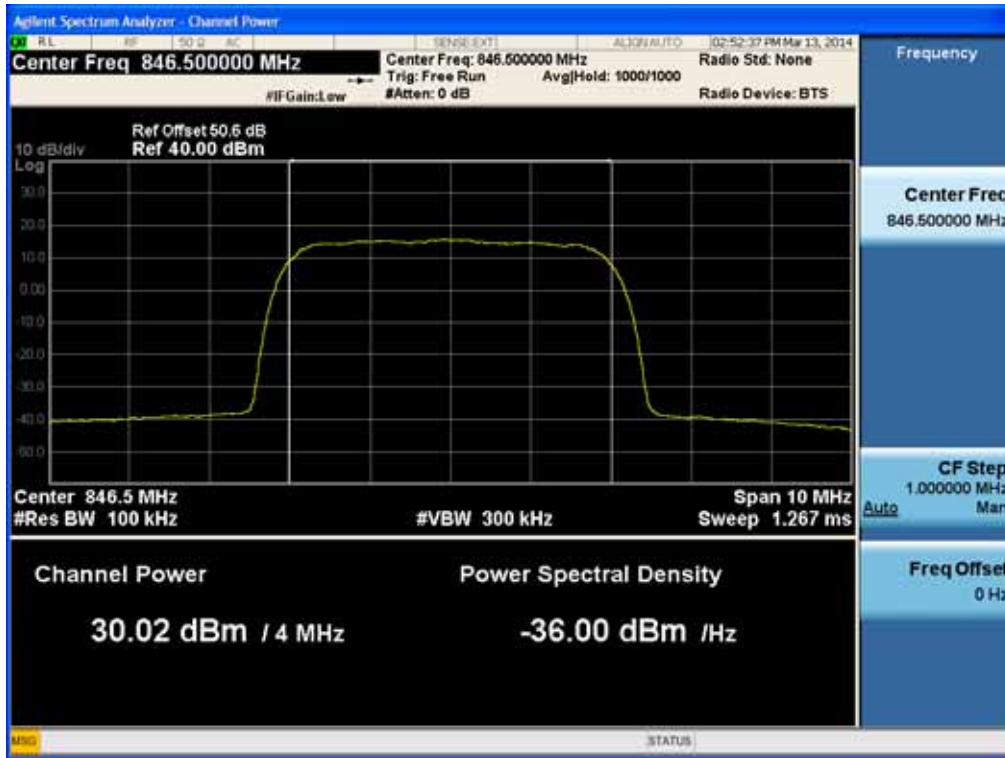
[WCDMA Uplink Low]



[WCDMA Uplink Middle]



[WCDMA Uplink High]



[LTE Uplink 5 MHz Low]



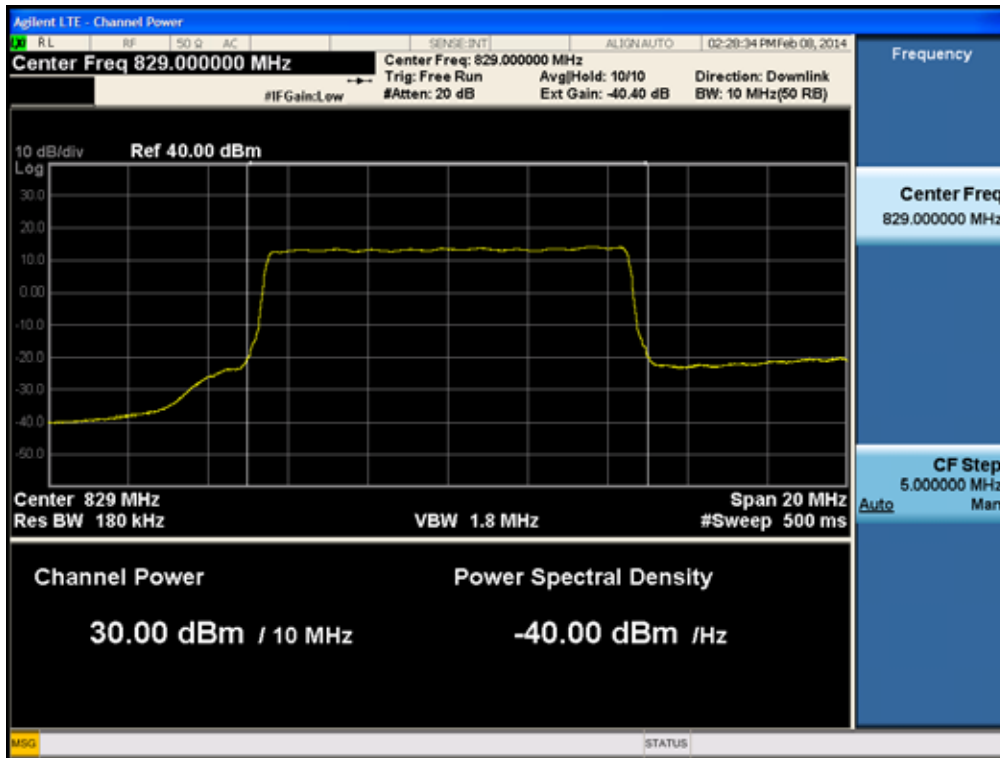
[LTE Uplink 5 MHz Middle]



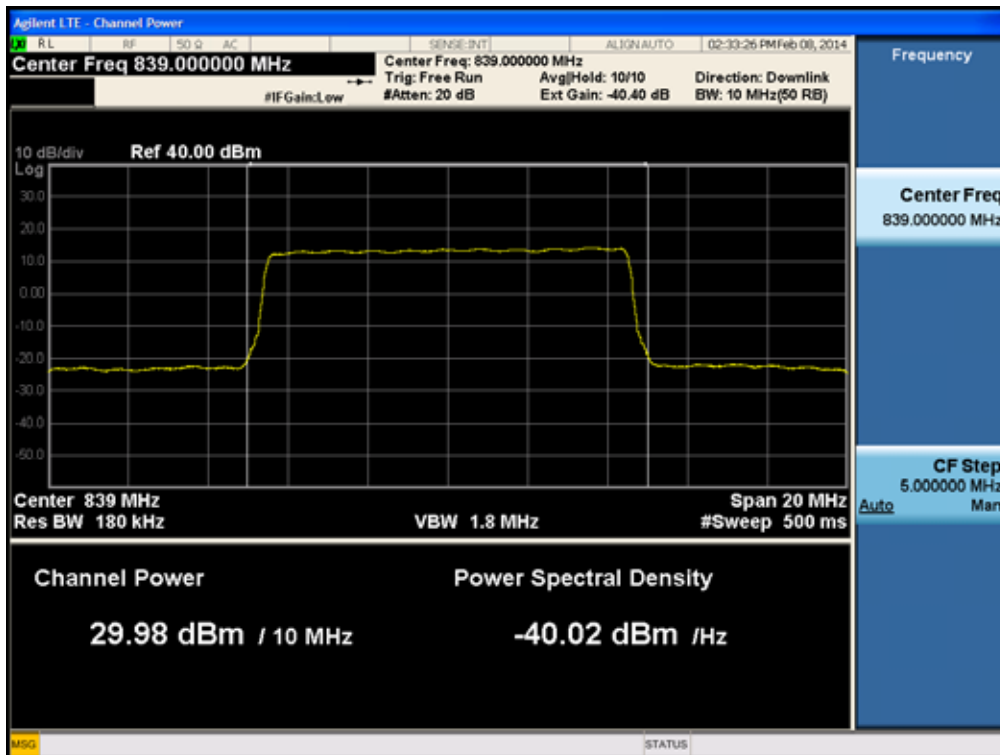
[LTE Uplink 5 MHz High]



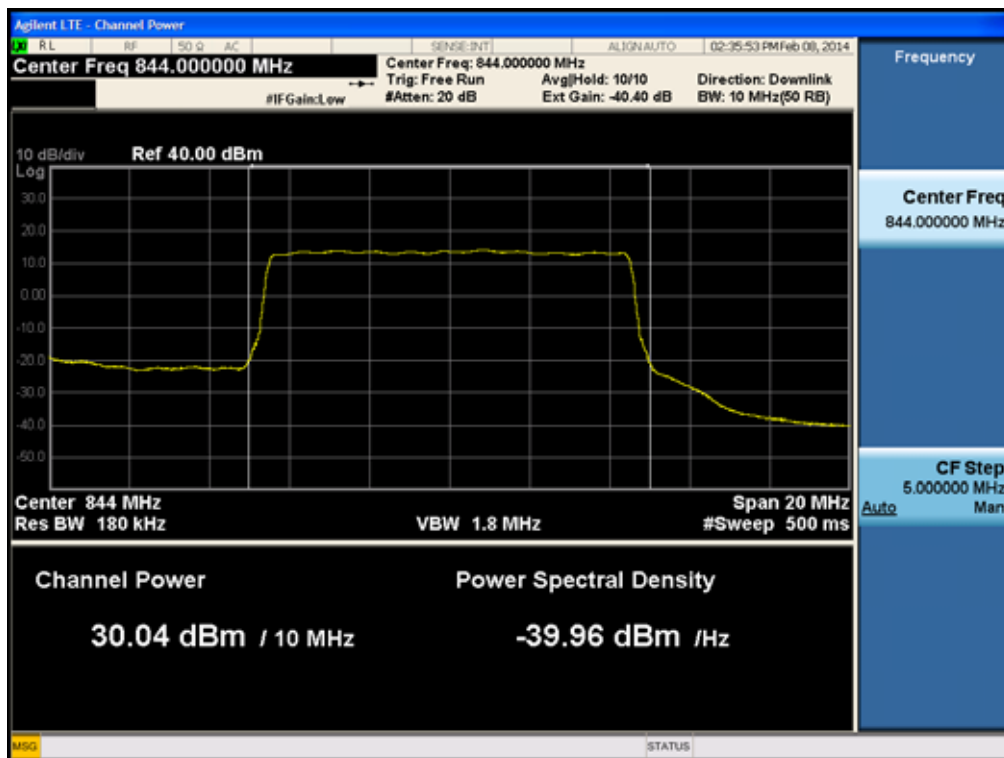
[LTE Uplink 10 MHz Low]



[LTE Uplink 10 MHz Middle]



[LTE Uplink 10 MHz High]



7. OCCUPIED BANDWIDTH

Test Requirement(s): § 2.1049 Measurements required: Occupied bandwidth:

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

Test Procedures: As required by 47 CFR 2.1049, *occupied bandwidth measurements* were made with a Spectrum Analyzer connected to the RF ports for both Uplink and Downlink. The modulation characteristics of signal generator's carrier was measured first at a maximum RF level prescribed by the OEM. The signal generator was then connected to either the Uplink or Downlink input at the appropriate RF level. The resulting modulated signal through the EUT was measured and compared against the original signal.

Test Results: The EUT complies with the requirements of this section.

Input Signal	Modulation	Input Level (dBm)	Maximum Amp Gain
CDMA	QPSK	DL : -52 dBm UL : -65 dBm	DL : 95 dB UL : 95 dB
WCDMA			
LTE			

[Downlink Output]

	Channel	Frequency (MHz)	OBW (MHz)
CDMA	Low	869.75	1.2621
	Middle	881.52	1.2611
	High	893.25	1.2588
WCDMA	Low	871.50	4.0881
	Middle	881.50	4.0894
	High	891.50	4.0692

[Downlink Input]

	Channel	Frequency (MHz)	OBW (MHz)
CDMA	Low	869.75	1.2665
	Middle	881.52	1.2663
	High	893.25	1.2611
WCDMA	Low	871.50	4.1700
	Middle	881.50	4.1638
	High	891.50	4.1672

[Downlink Output]

	Channel	Frequency (MHz)	OBW (MHz)
LTE 5 MHz	Low	871.50	4.5036
	Middle	881.50	4.5002
	High	891.50	4.4960
LTE 10 MHz	Low	874.00	9.0151
	Middle	884.00	8.9984
	High	889.00	9.0285

[Downlink Input]

	Channel	Frequency (MHz)	OBW (MHz)
LTE 5 MHz	Low	871.50	4.5217
	Middle	881.50	4.5267
	High	891.50	4.5179
LTE 10 MHz	Low	874.00	9.0138
	Middle	884.00	9.0225
	High	889.00	8.9770

[Uplink Output]

	Channel	Frequency (MHz)	OBW (MHz)
CDMA	Low	824.75	1.2636
	Middle	836.52	1.2665
	High	848.25	1.2562
WCDMA	Low	826.50	4.0474
	Middle	836.50	4.0498
	High	846.50	4.0455

[Uplink Input]

	Channel	Frequency (MHz)	OBW (MHz)
CDMA	Low	824.75	1.2675
	Middle	836.52	1.2681
	High	848.25	1.2651
WCDMA	Low	826.50	4.1752
	Middle	836.50	4.1685
	High	846.50	4.1571

[Uplink Output]

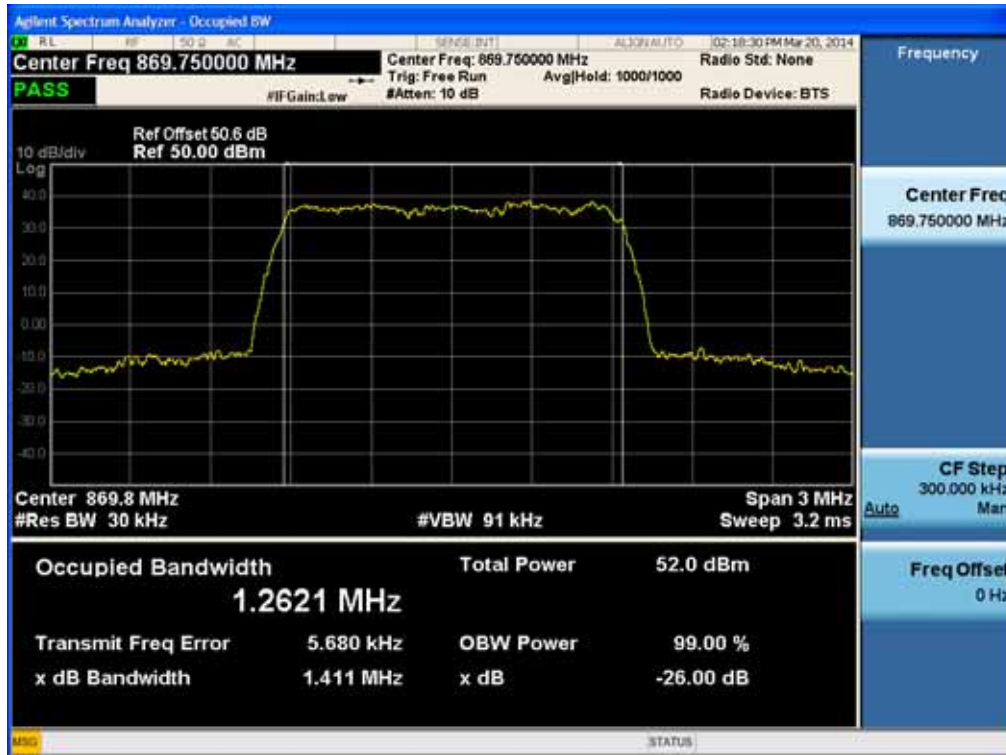
	Channel	Frequency (MHz)	OBW (MHz)
LTE 5 MHz	Low	826.50	4.5017
	Middle	836.50	4.5098
	High	846.50	4.4998
LTE 10 MHz	Low	829.00	9.0018
	Middle	839.00	9.0244
	High	844.00	8.9804

[Uplink Input]

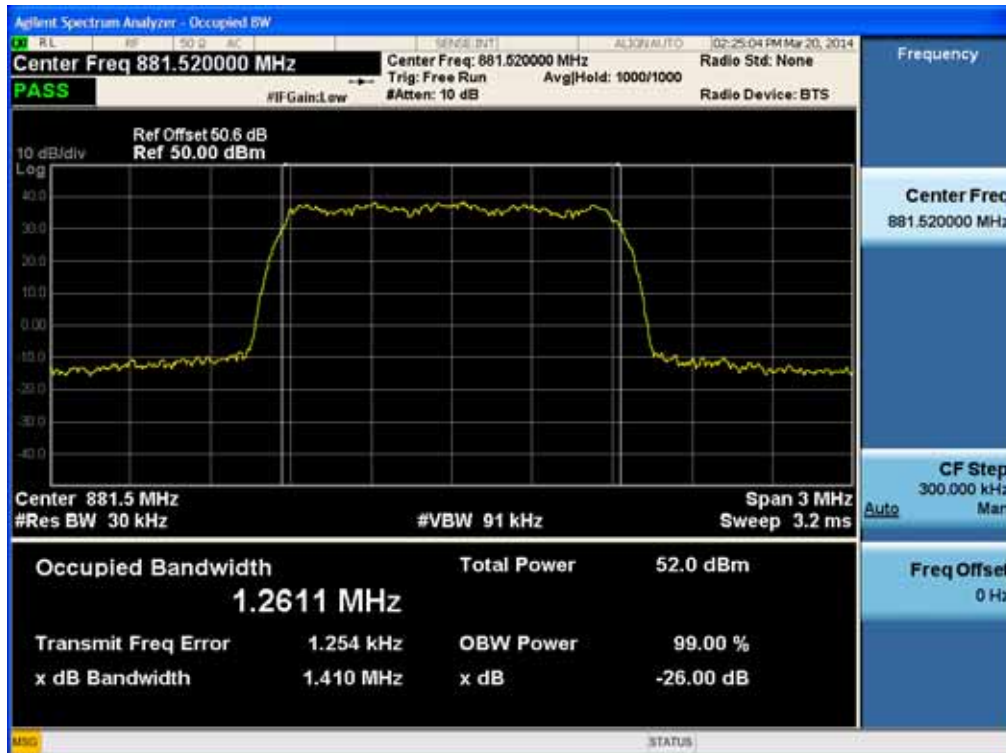
	Channel	Frequency (MHz)	OBW (MHz)
LTE 5 MHz	Low	826.50	4.5252
	Middle	836.50	4.5248
	High	846.50	4.5295
LTE 10 MHz	Low	829.00	8.9939
	Middle	839.00	8.9860
	High	844.00	8.9938

Plots of Occupied Bandwidth

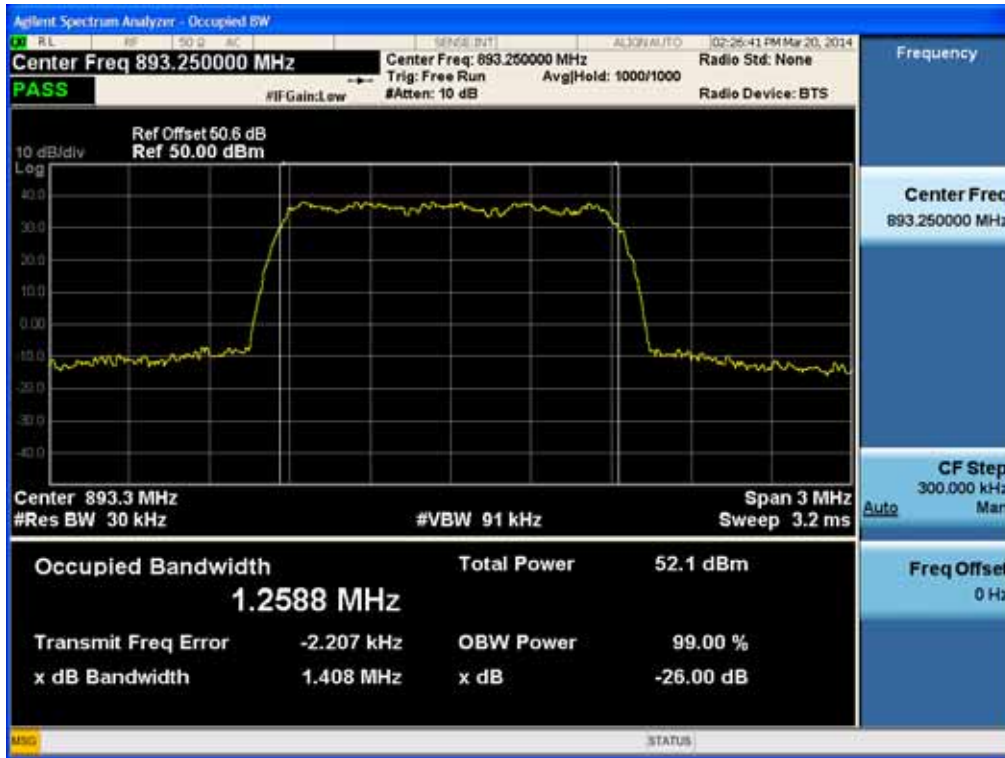
[Output CDMA Downlink Low]



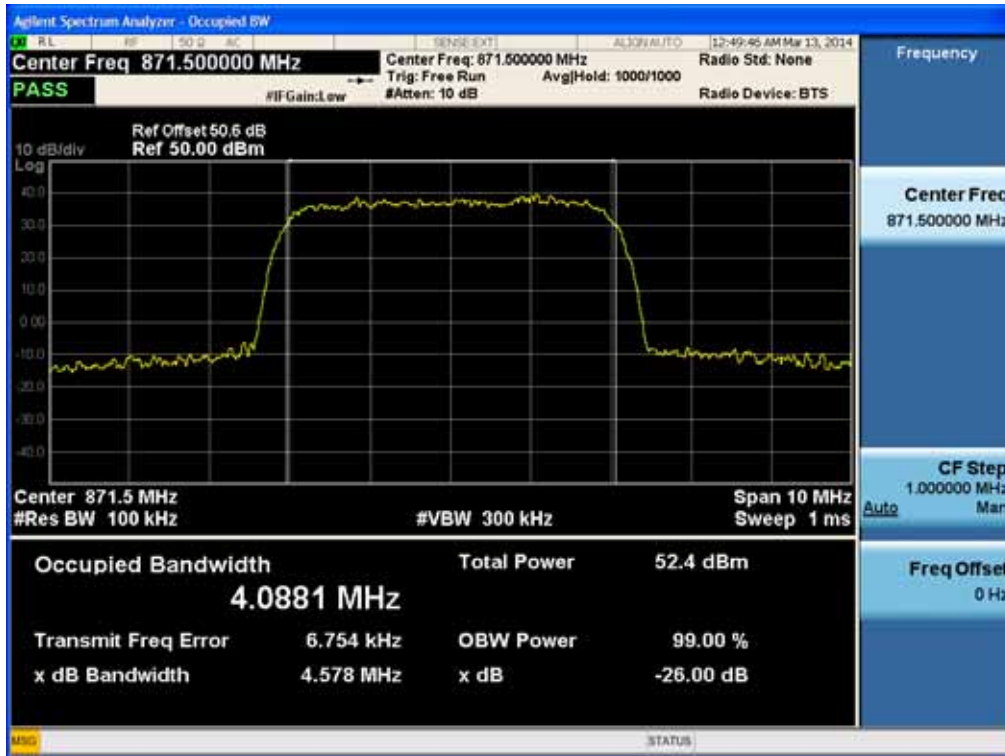
[Output CDMA Downlink Middle]



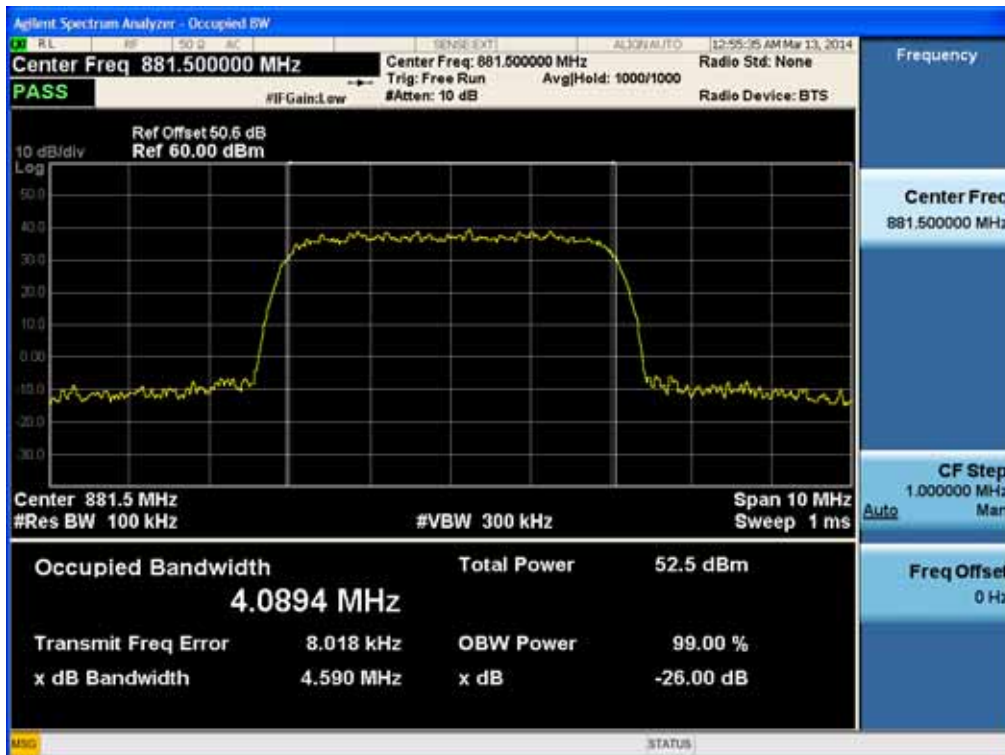
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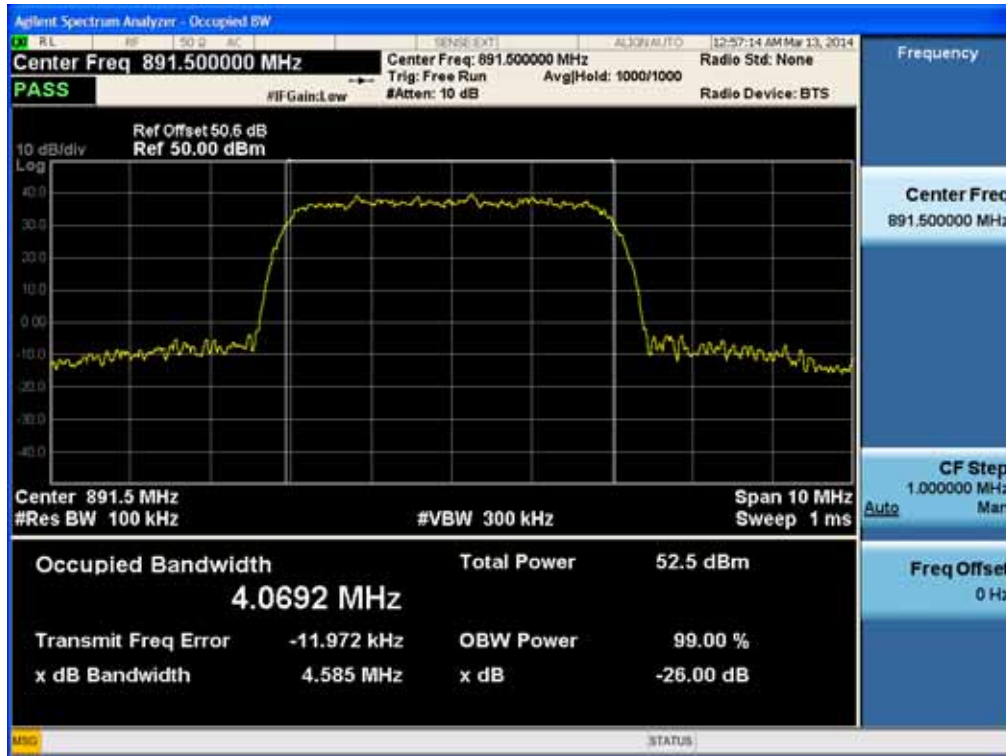
[Output WCDMA Downlink Low]



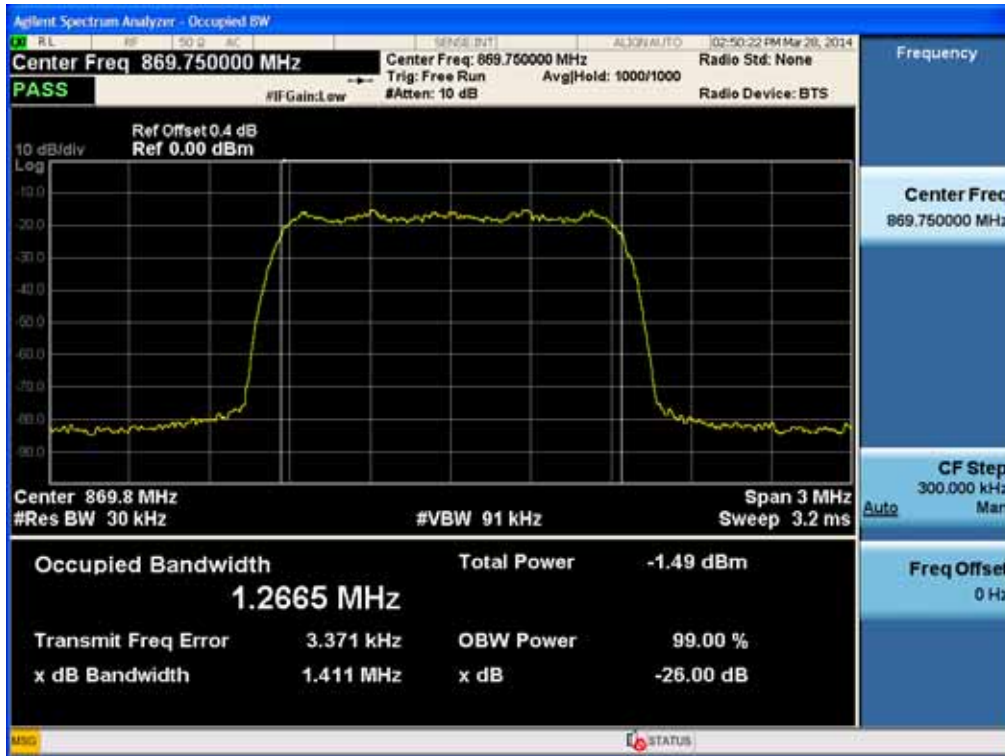
[Output WCDMA Downlink Middle]



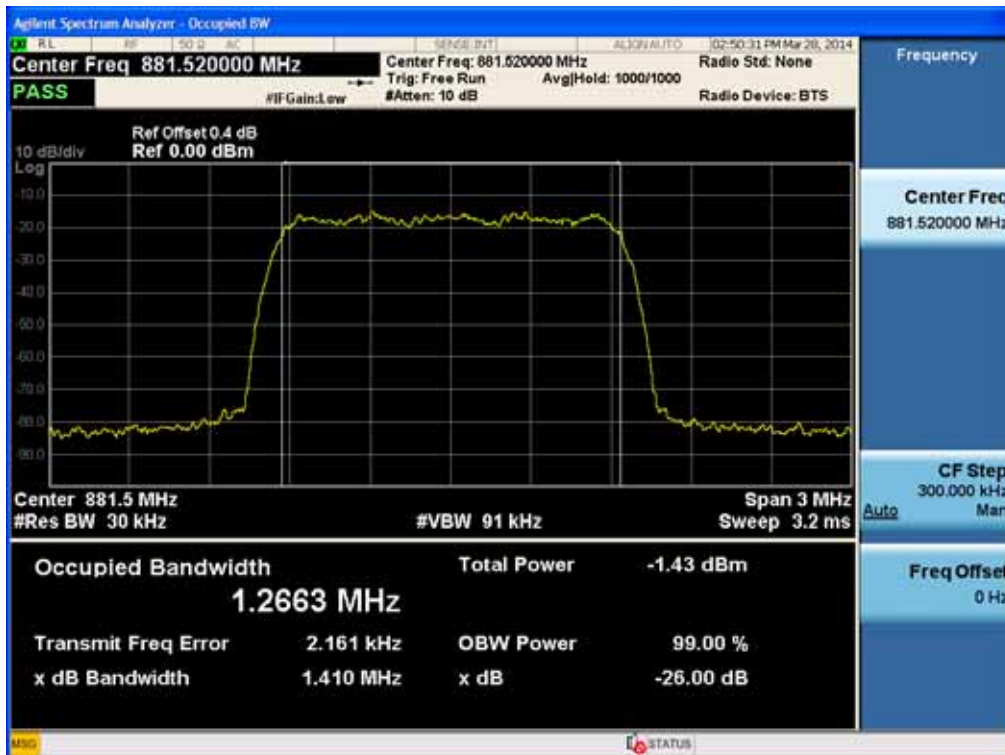
[Output WCDMA Downlink High]



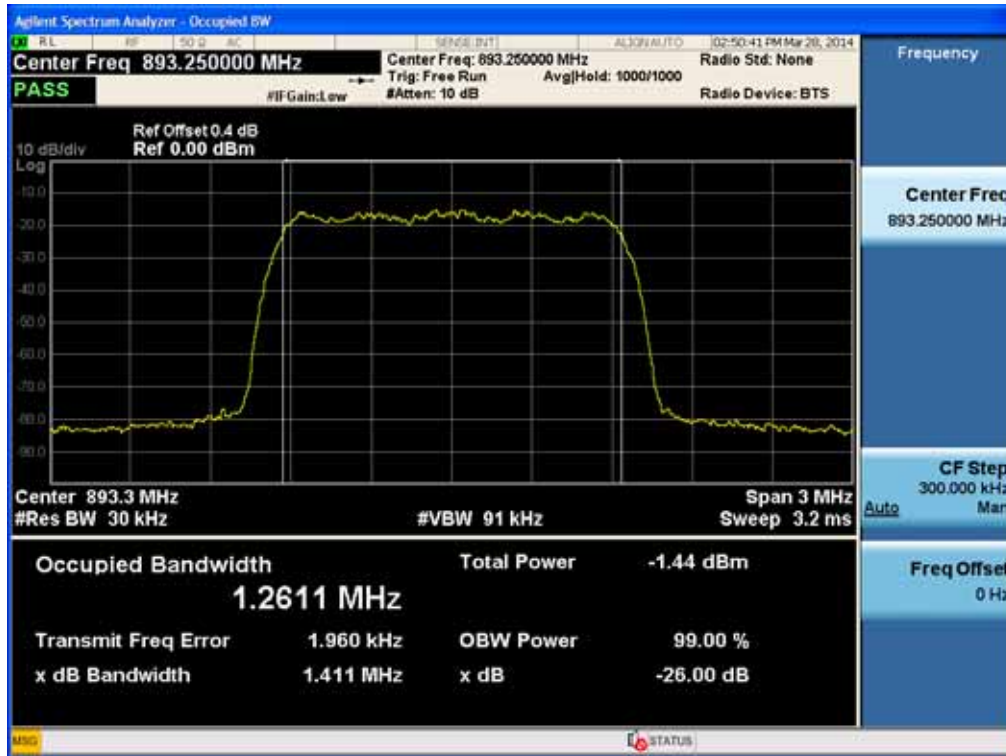
[Input CDMA Downlink Low]



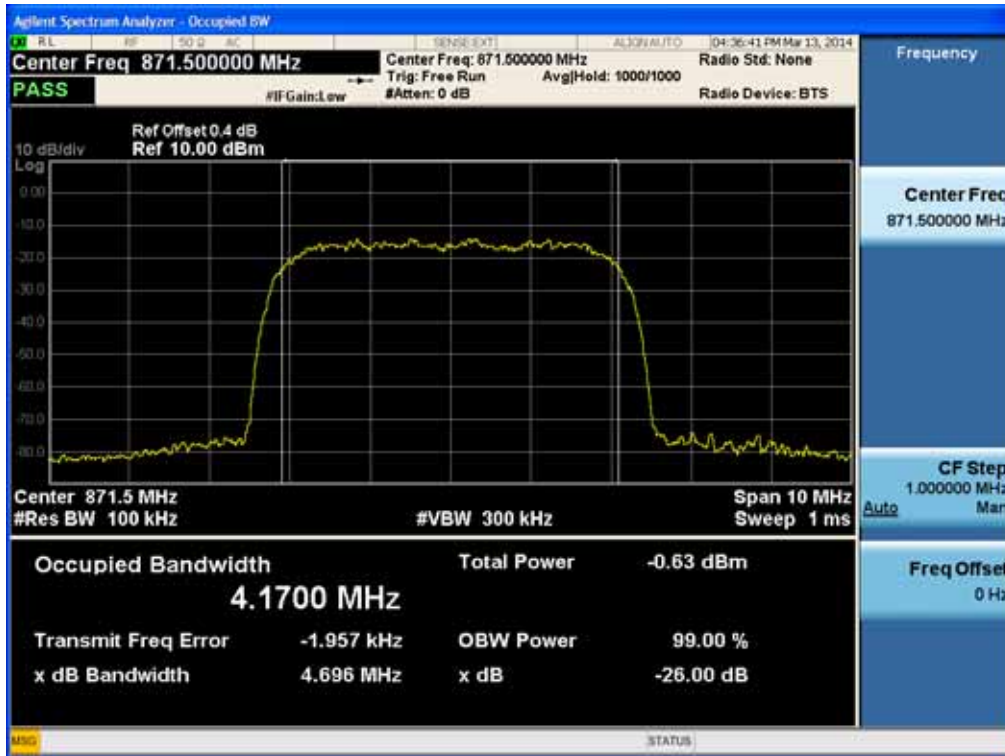
[Input CDMA Downlink Middle]



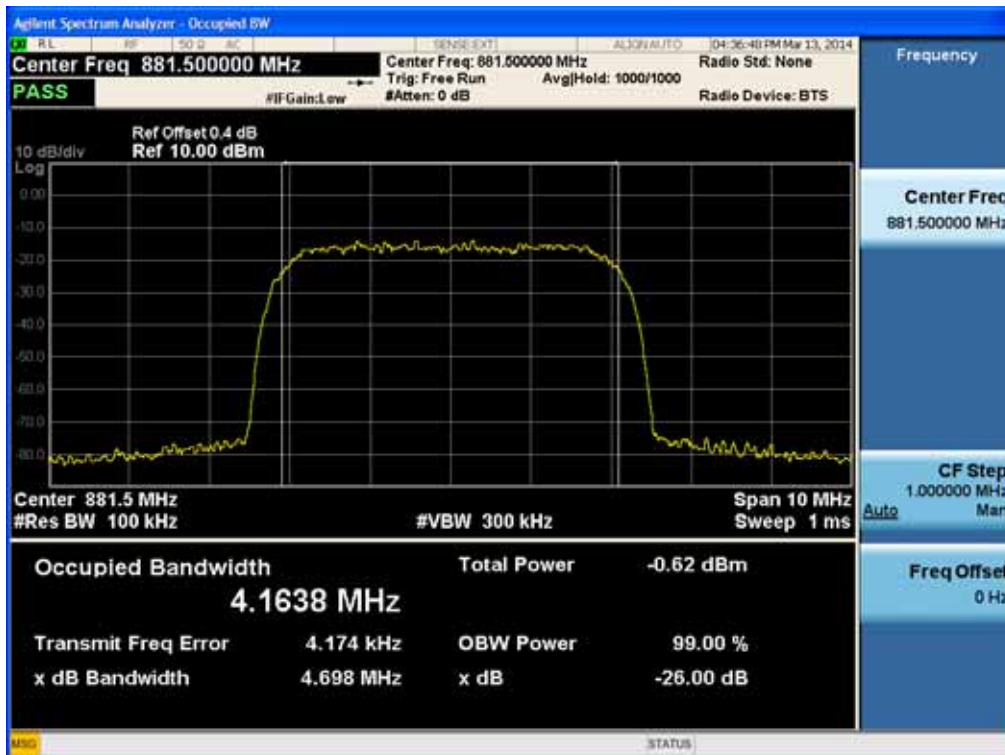
[Input CDMA Downlink High]



[Input WCDMA Downlink Low]



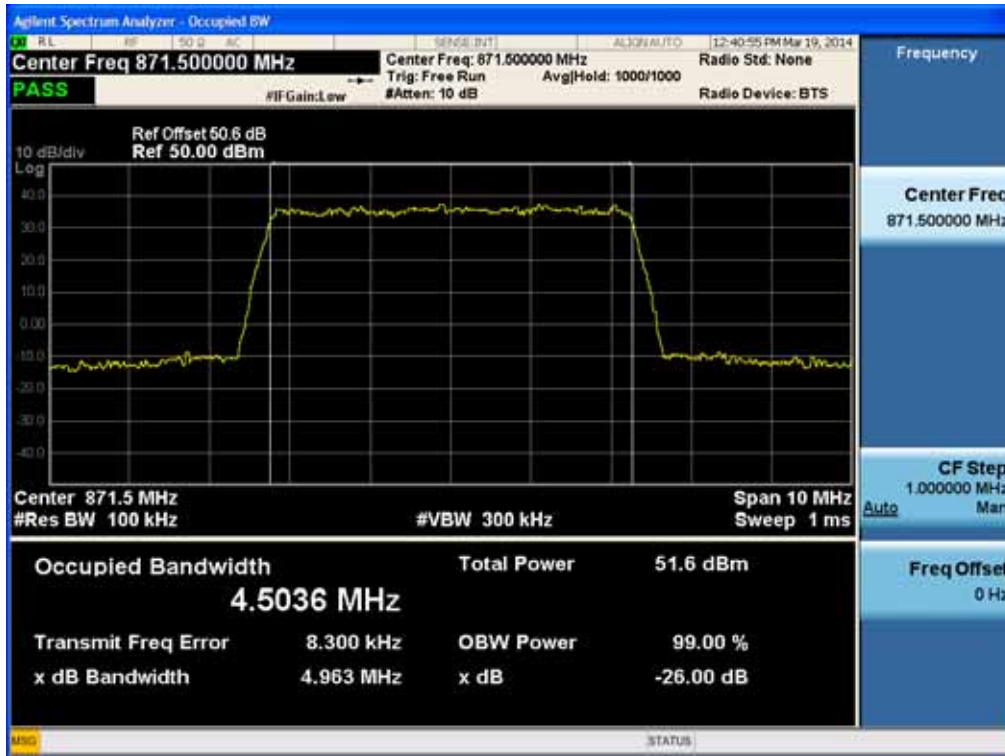
[Input WCDMA Downlink Middle]



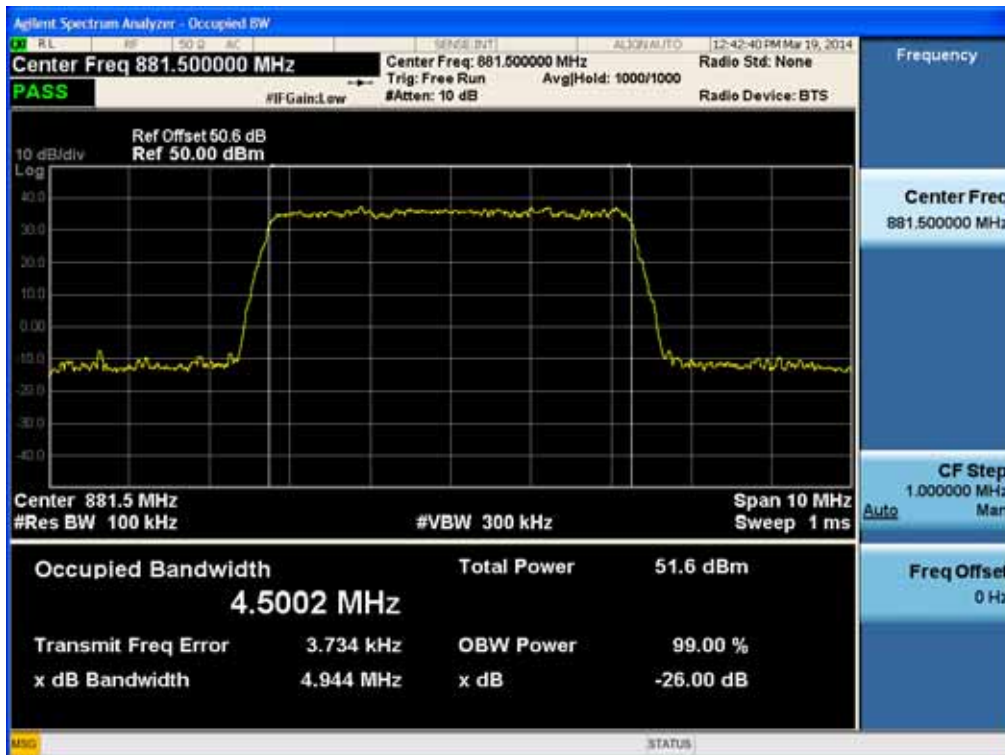
[Input WCDMA Downlink High]



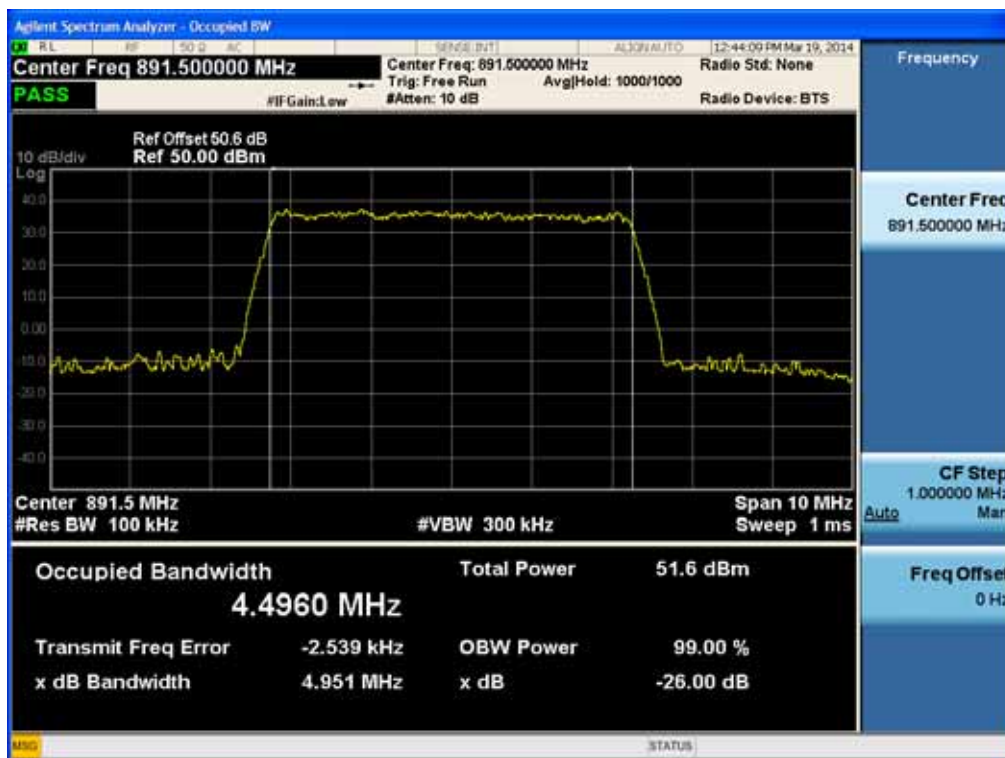
[Output LTE Downlink 5 MHz Low]



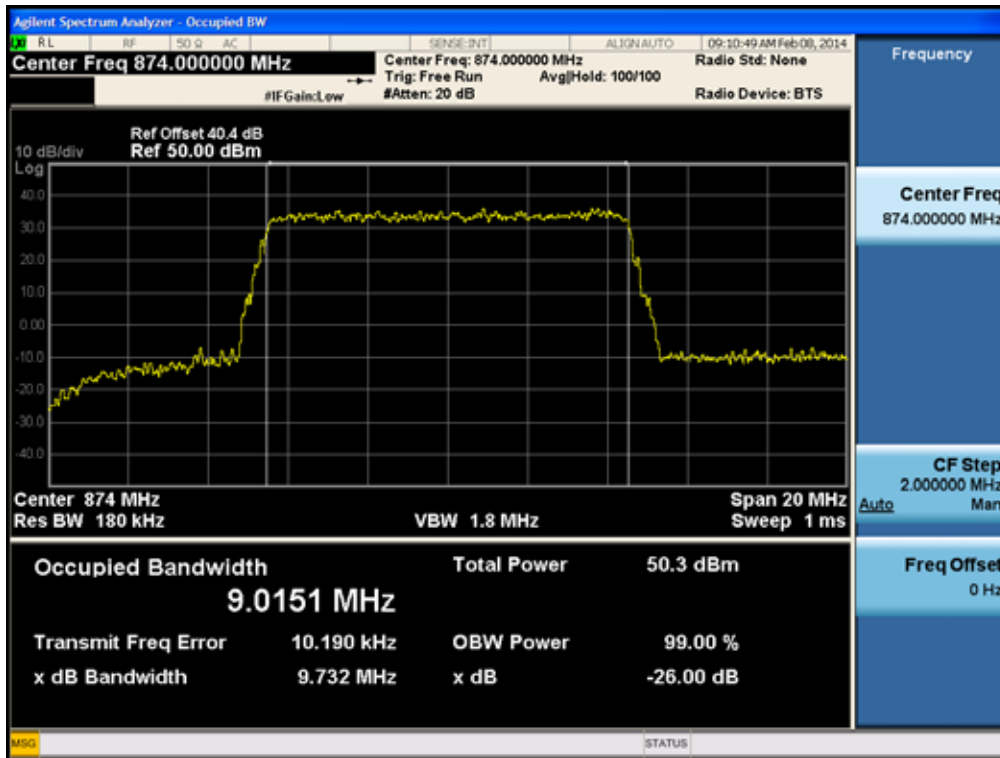
[Output LTE Downlink 5 MHz Middle]



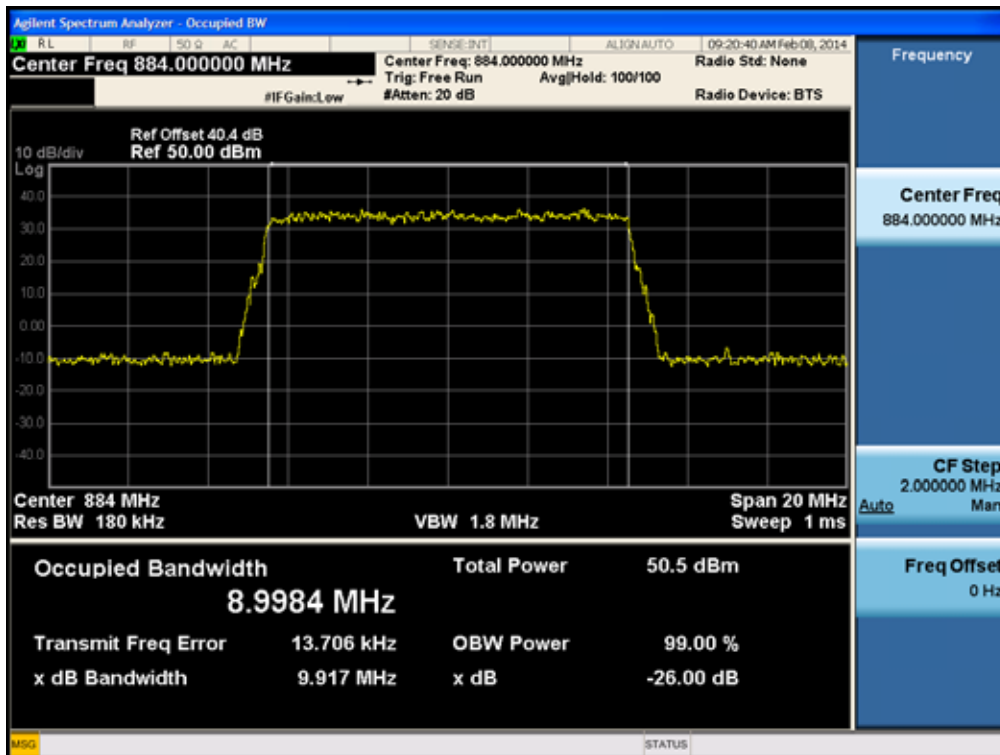
[Output LTE Downlink 5 MHz High]



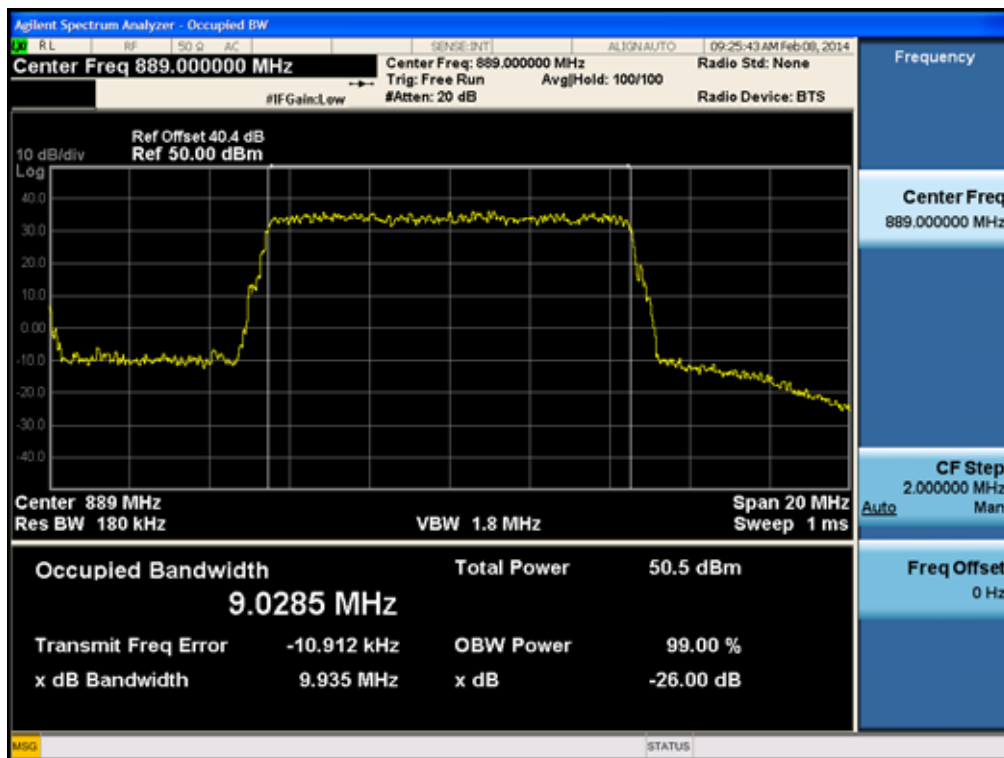
[Output LTE Downlink 10 MHz Low]



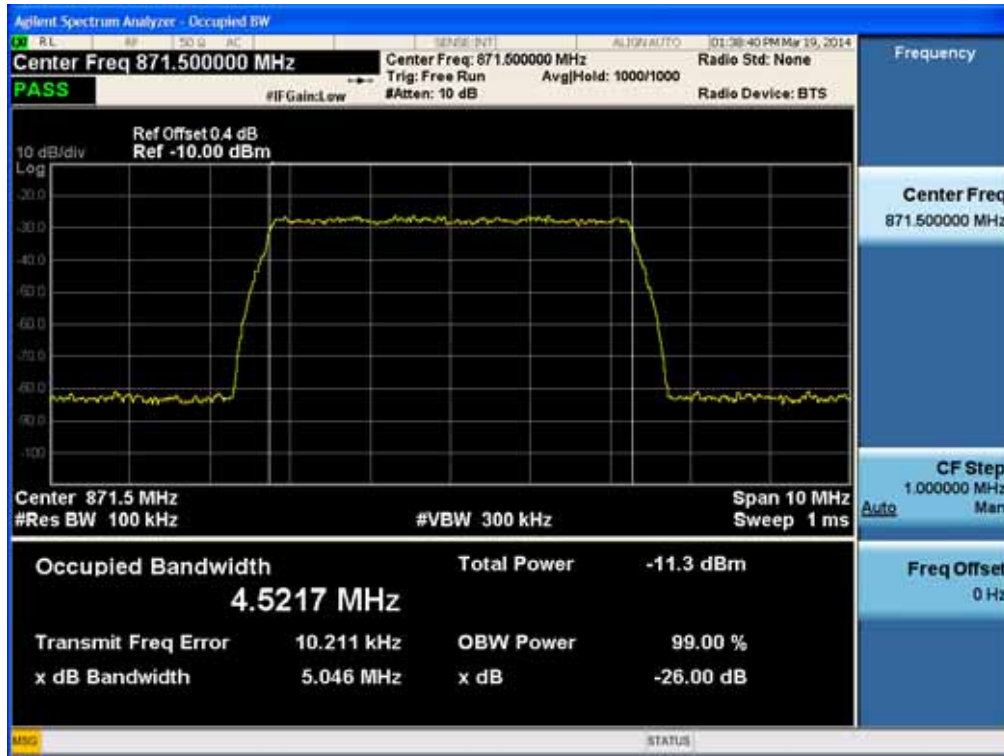
[Output LTE Downlink 10 MHz Middle]



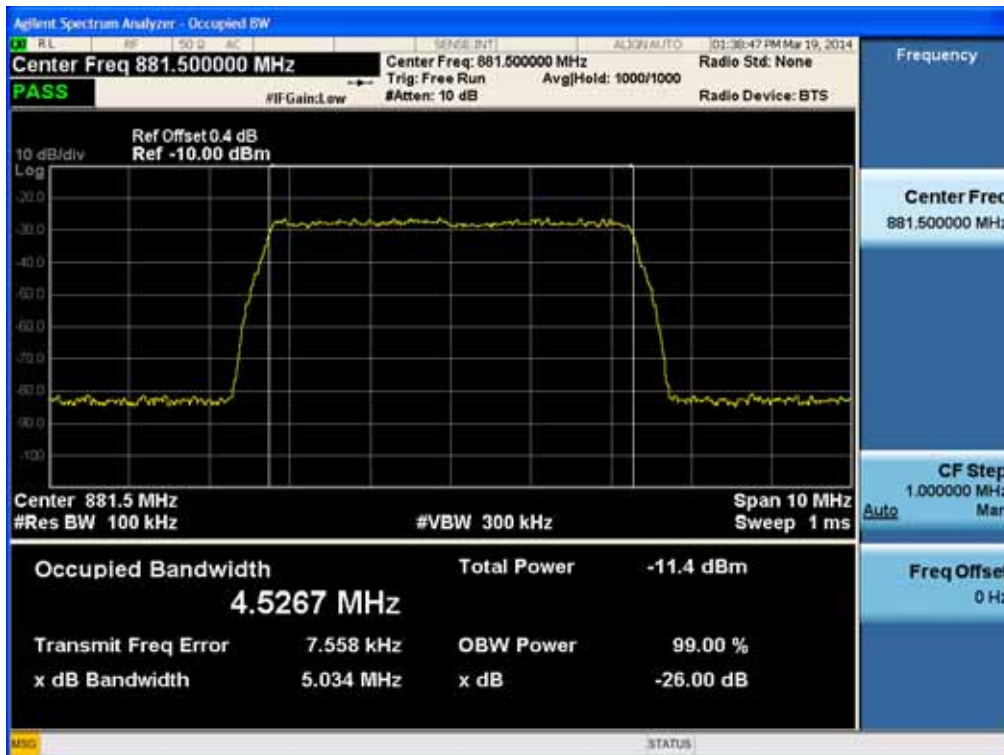
[Output LTE Downlink 10 MHz High]



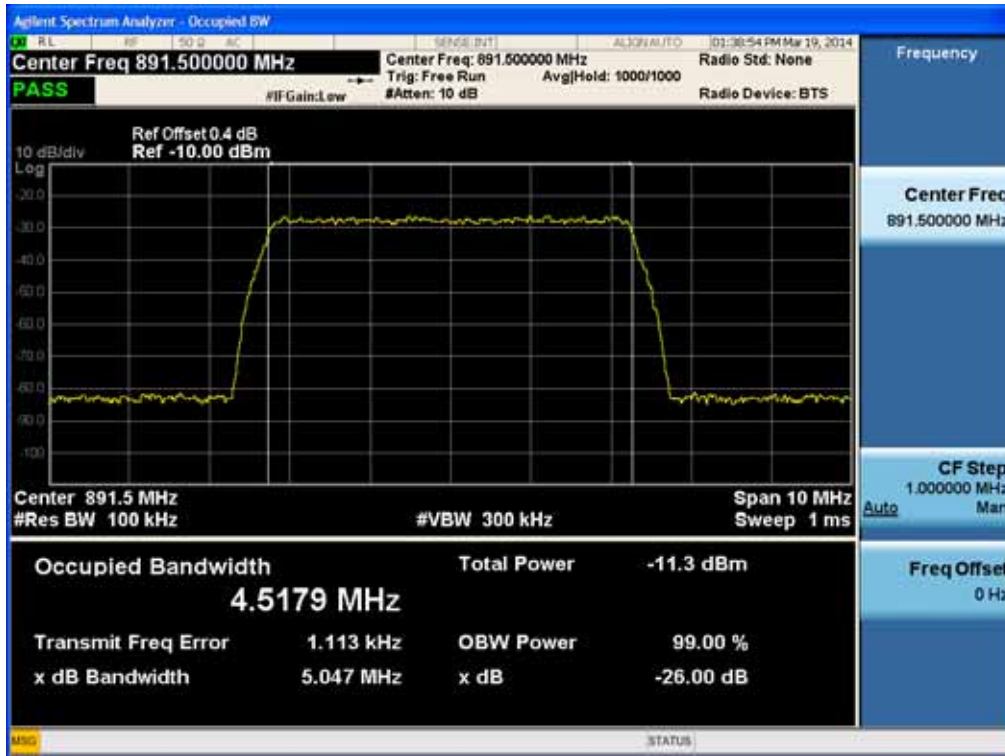
[Input LTE Downlink 5 MHz Low]



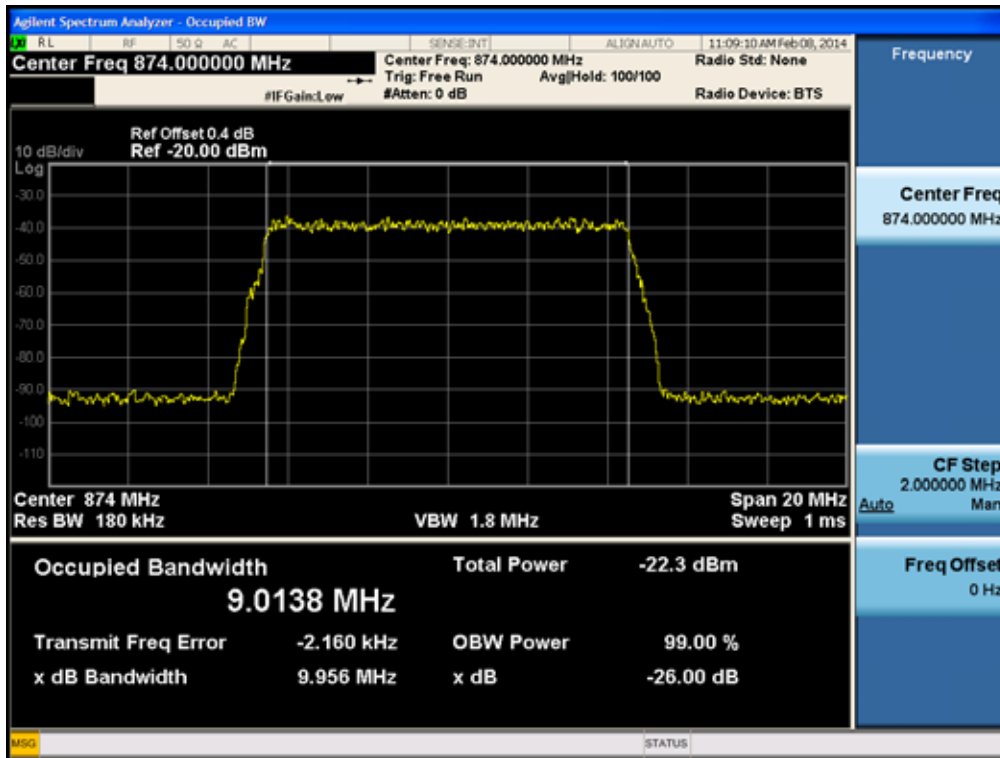
[Input LTE Downlink 5 MHz Middle]



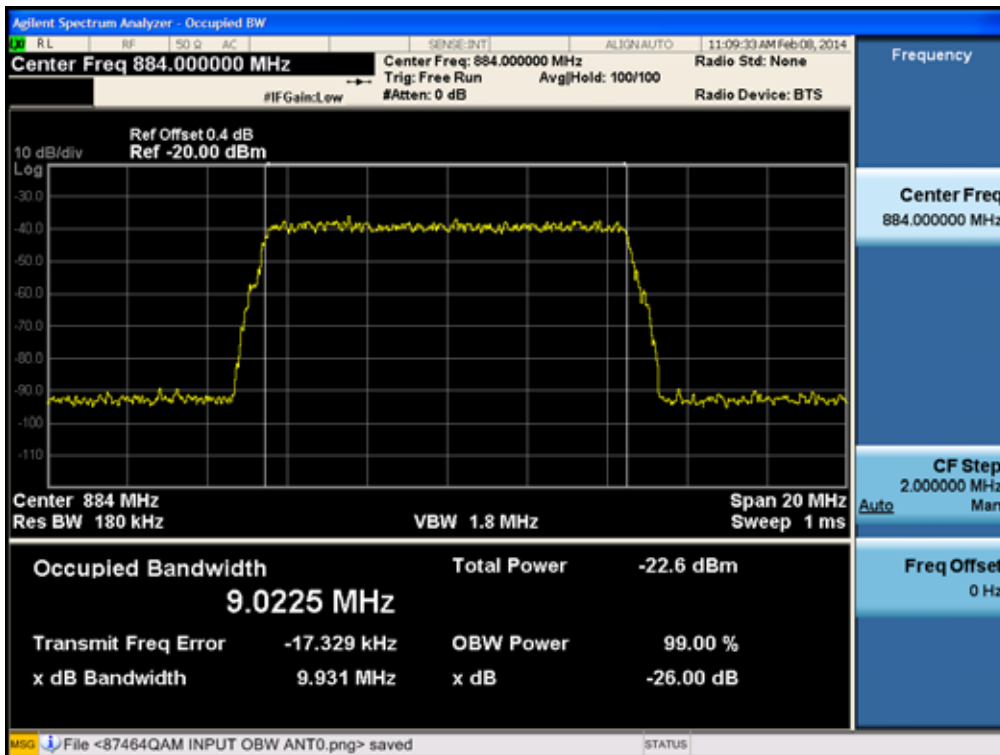
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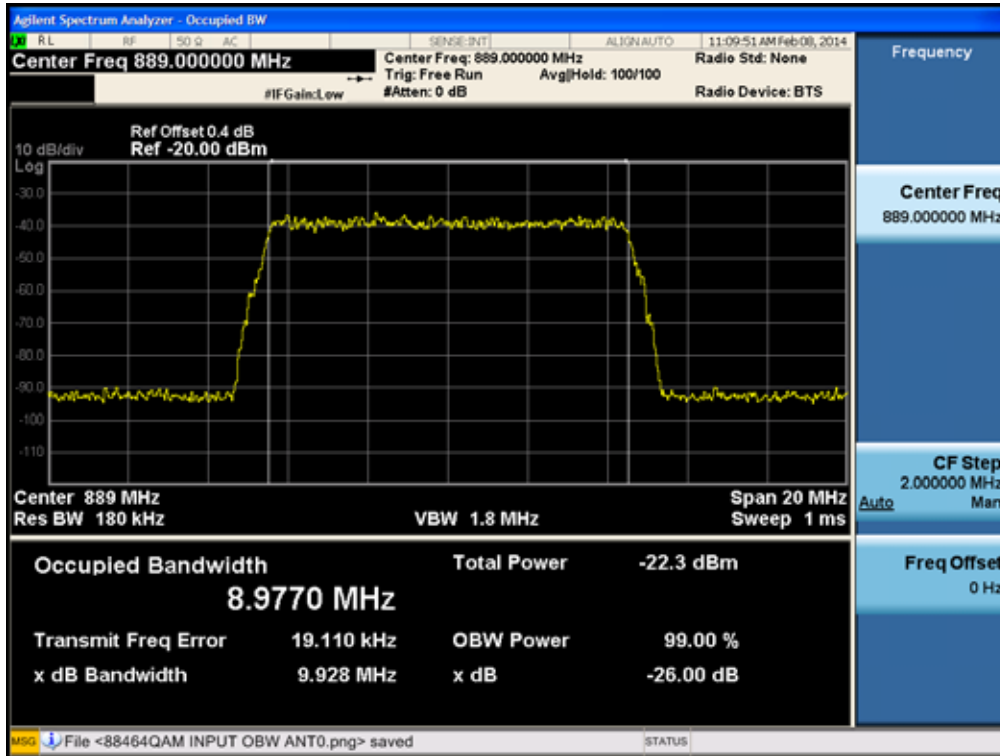
[Input LTE Downlink 10 MHz Low]



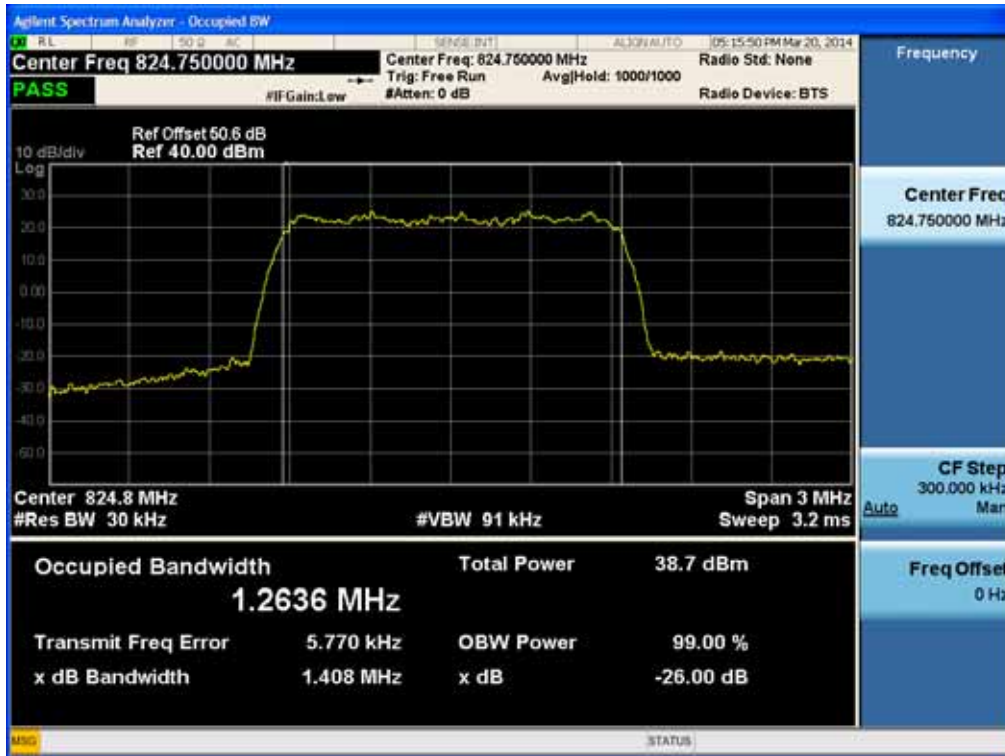
[Input LTE Downlink 10 MHz Middle]



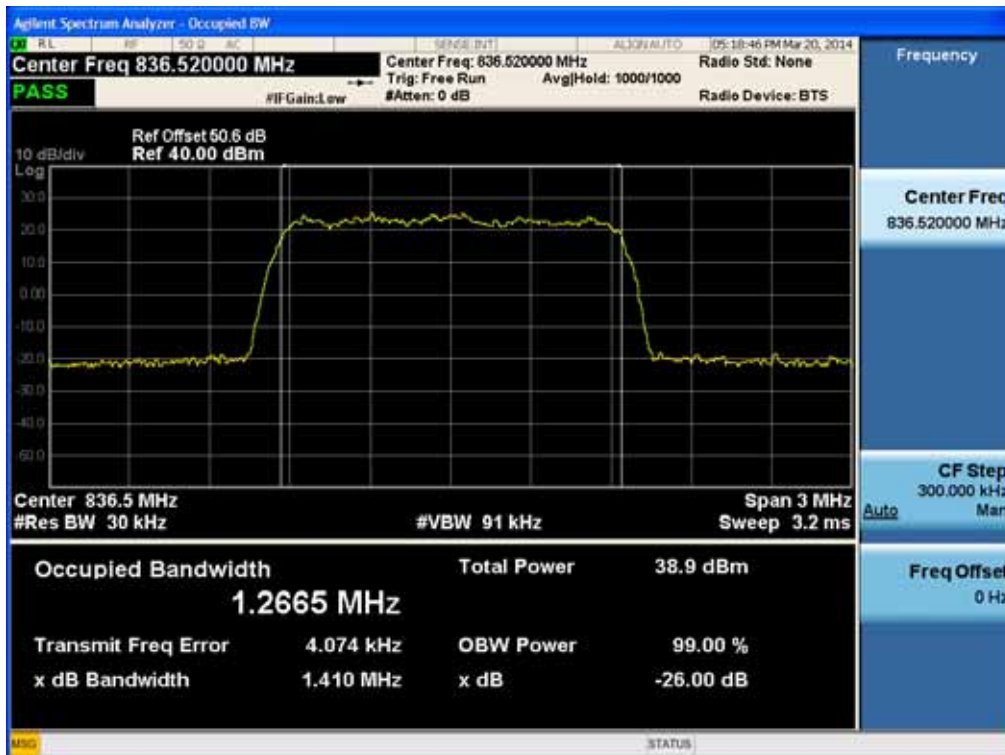
[Input LTE Downlink 10 MHz High]



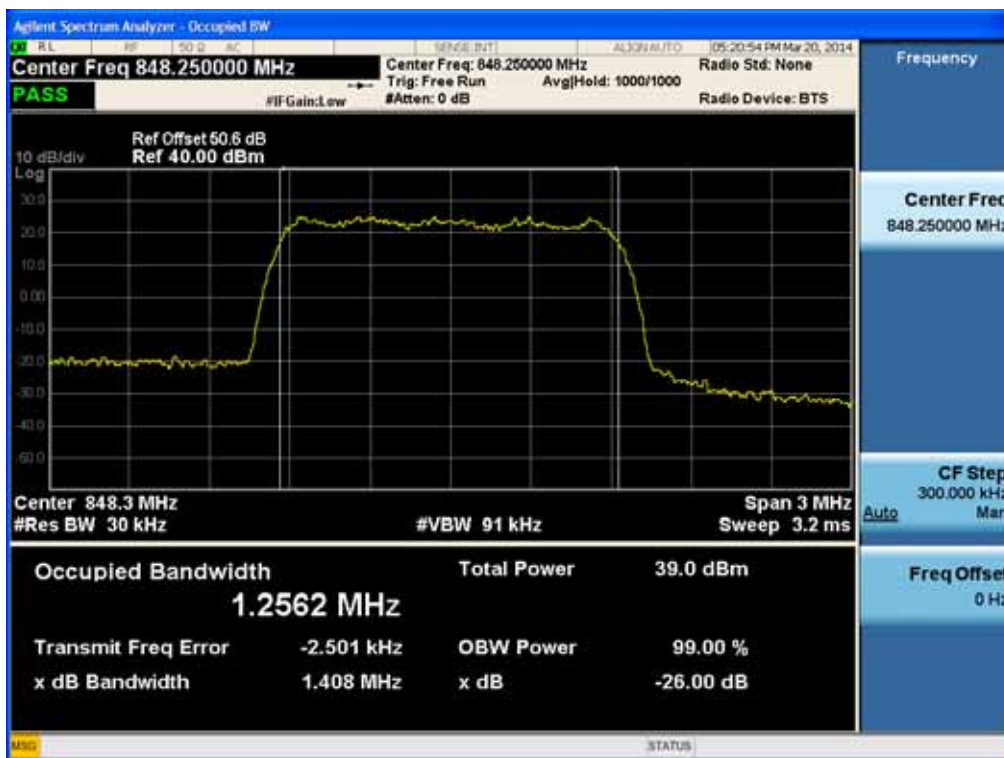
[Output CDMA Uplink Low]



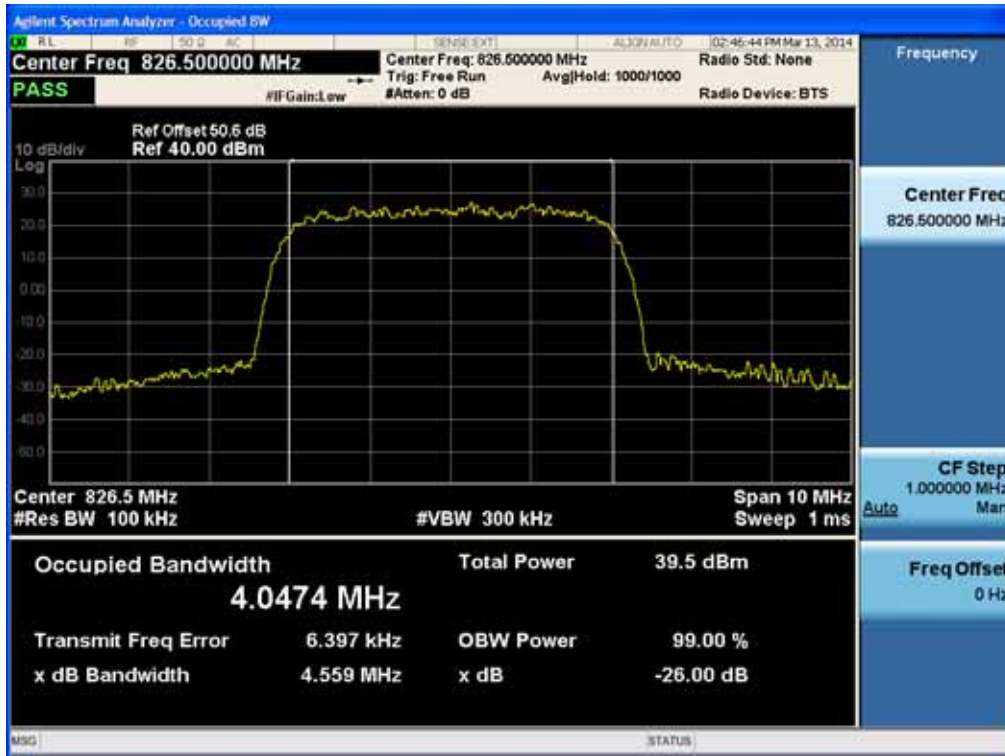
[Output CDMA Uplink Middle]



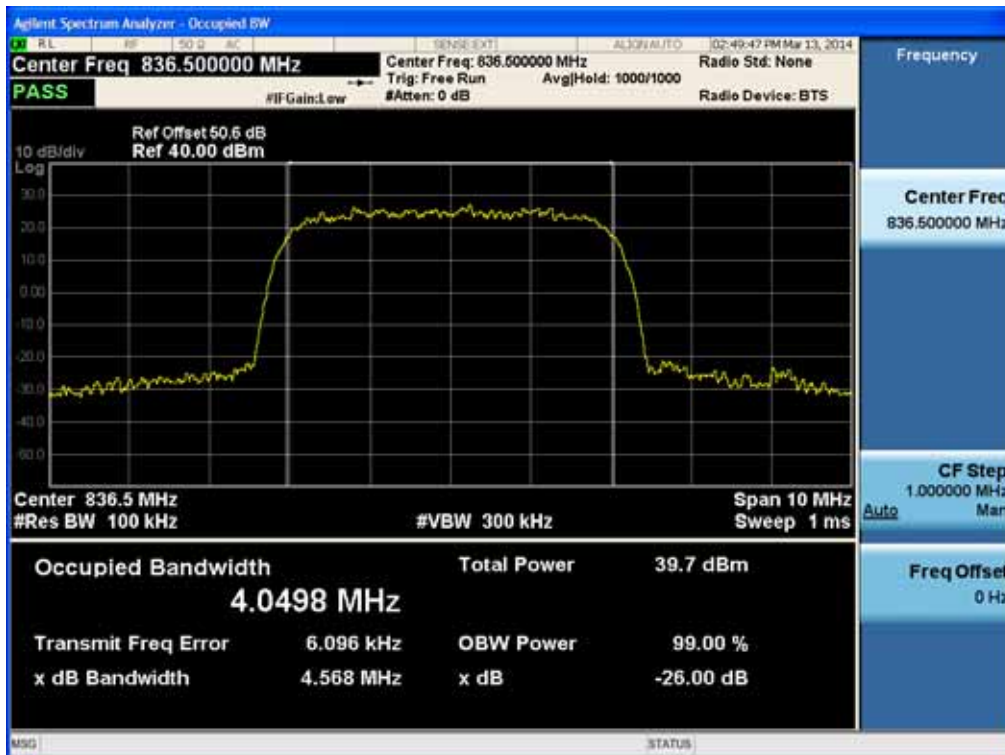
[Output CDMA Uplink High]



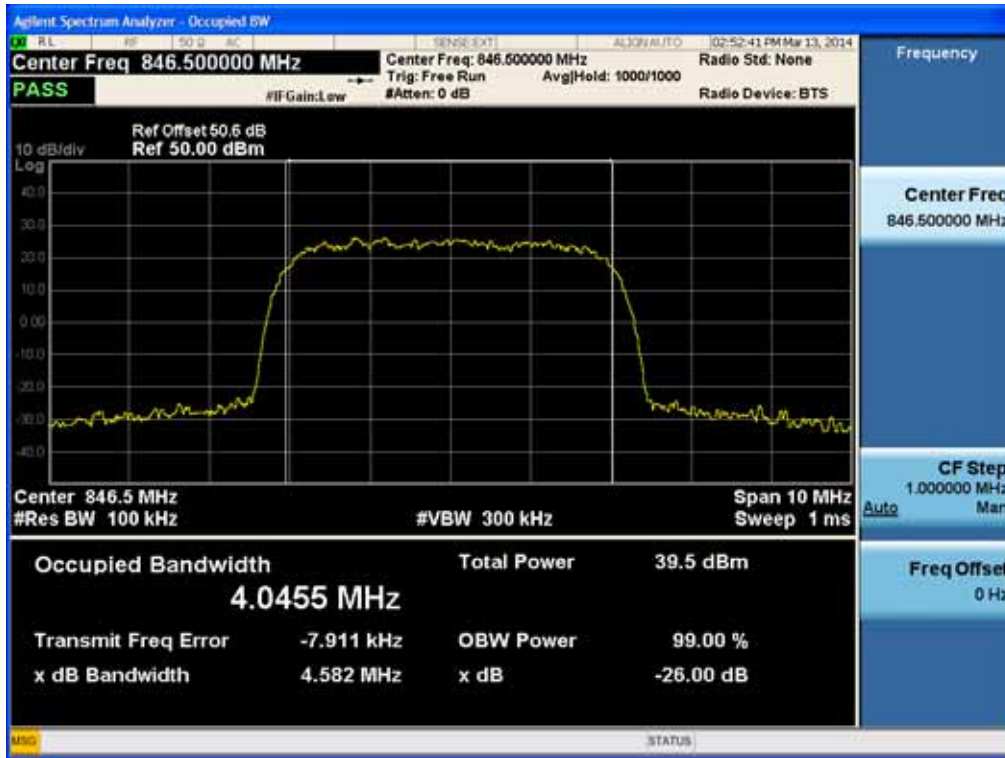
[Output WCDMA Uplink Low]



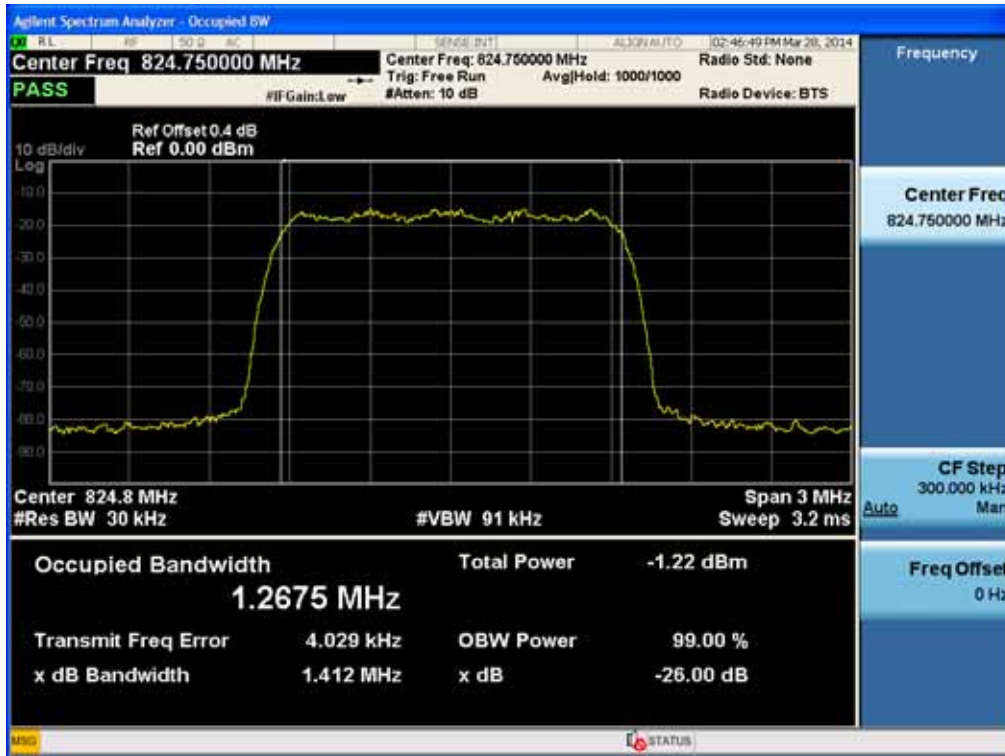
[Output WCDMA Uplink Middle]



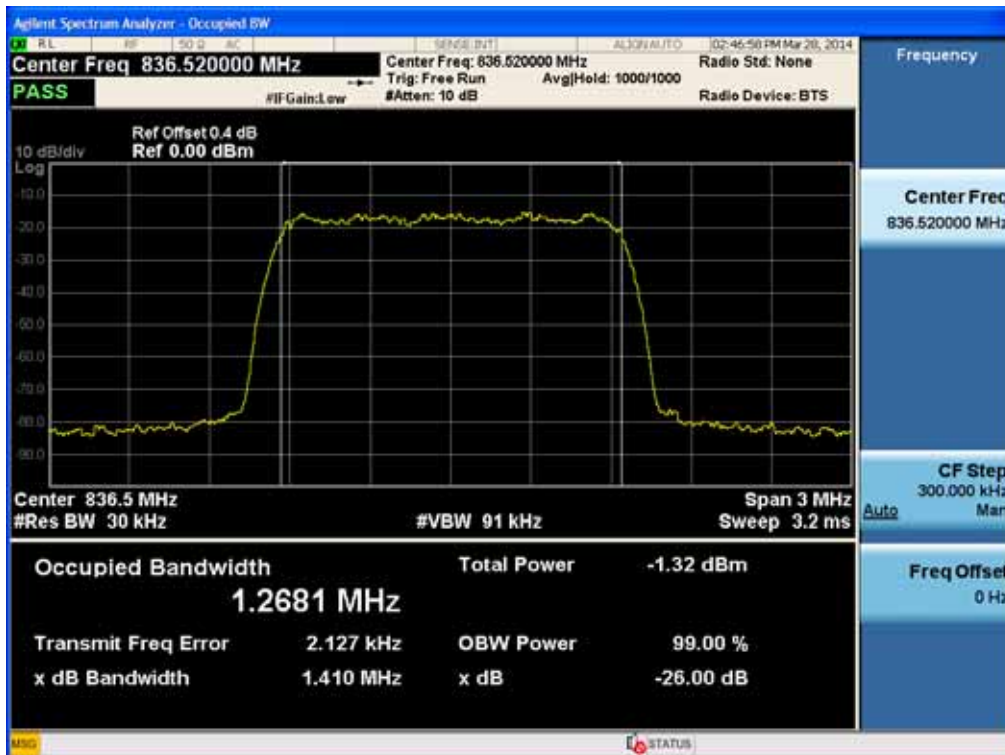
[Output WCDMA Uplink High]



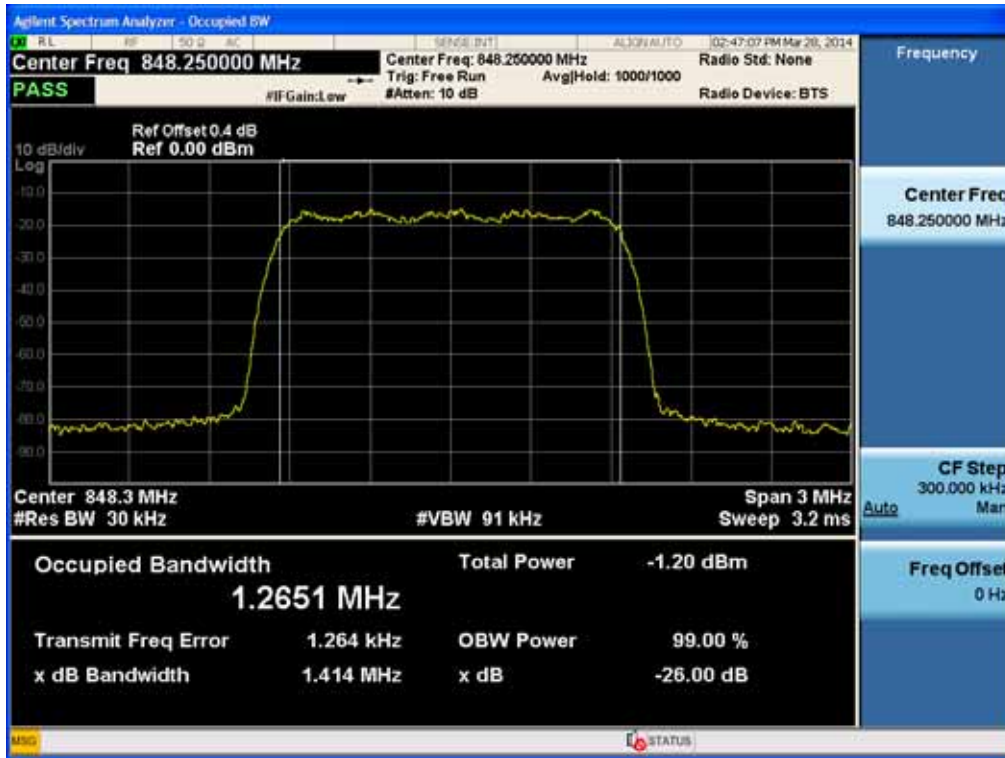
[Input CDMA Uplink Low]



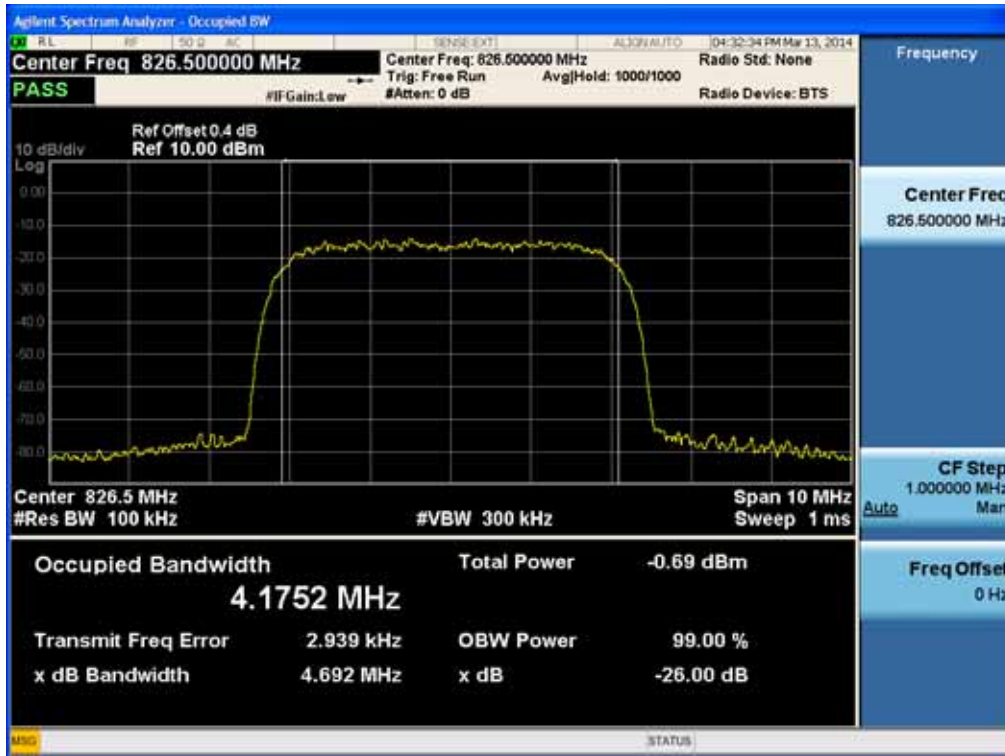
[Input CDMA Uplink Middle]



[Input CDMA Uplink High]



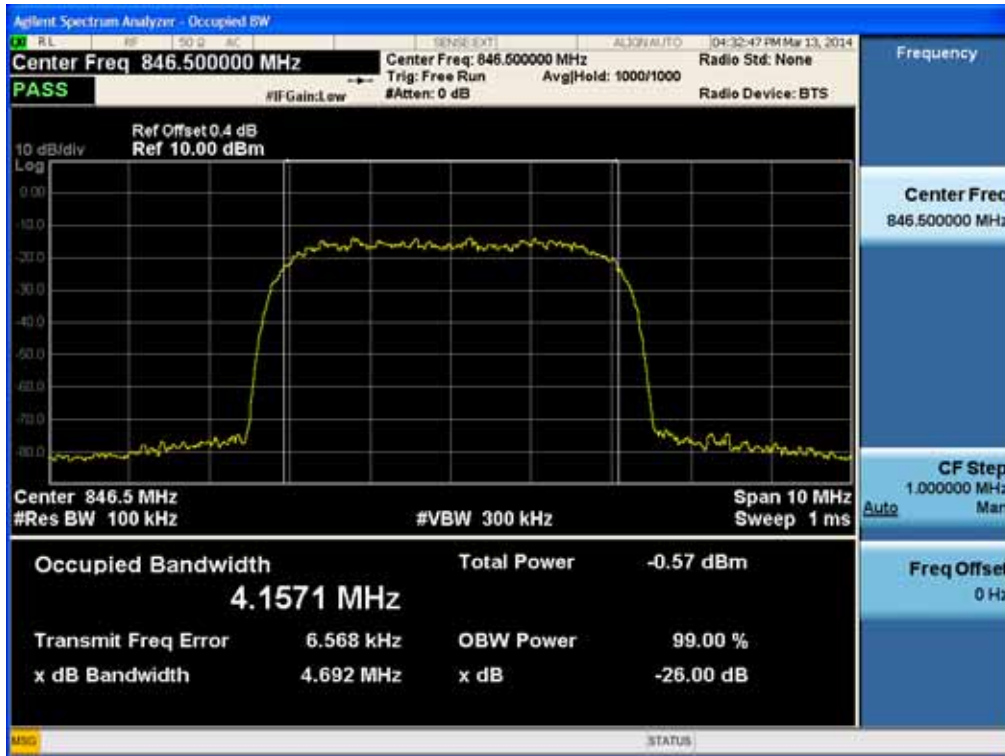
[Input WCDMA Uplink Low]



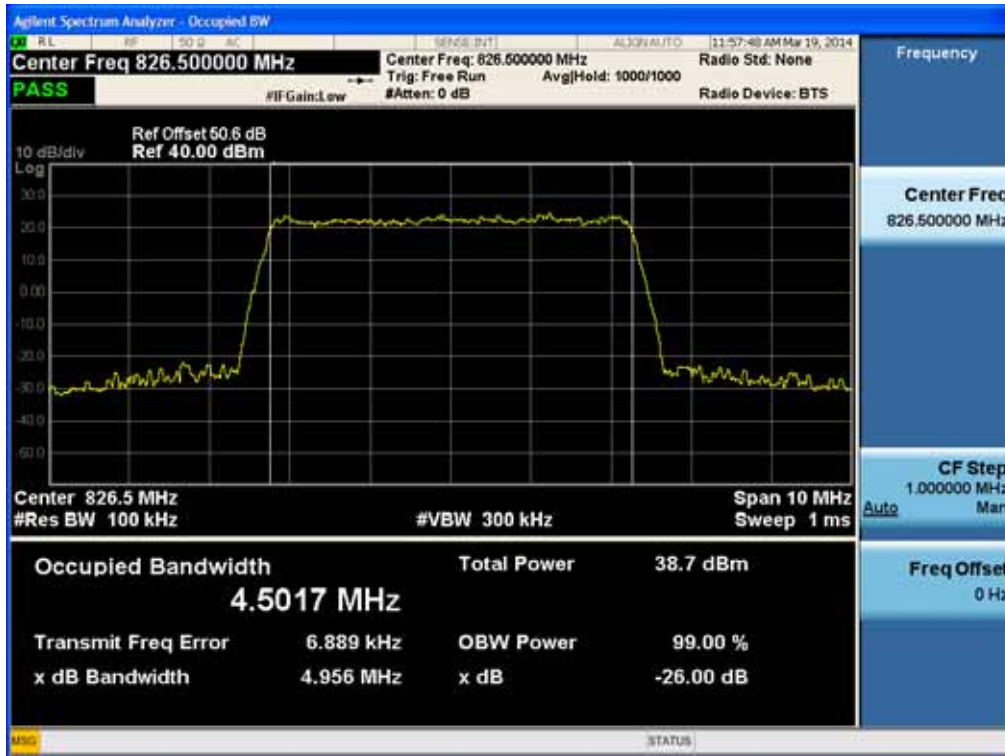
[Input WCDMA Uplink Middle]



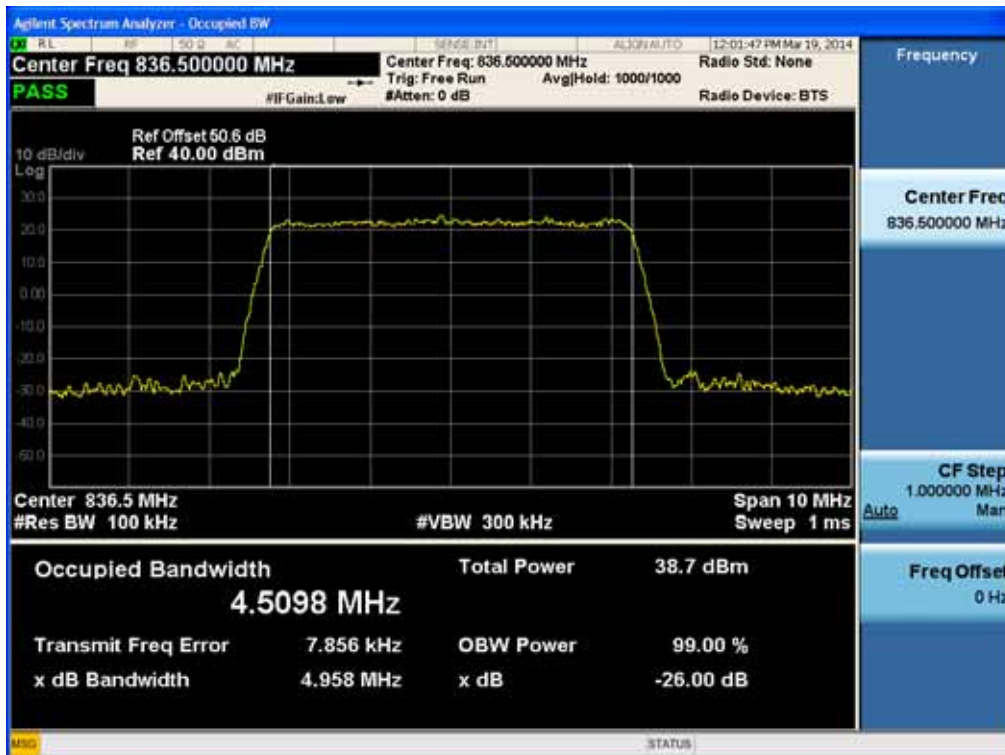
[Input WCDMA Uplink High]



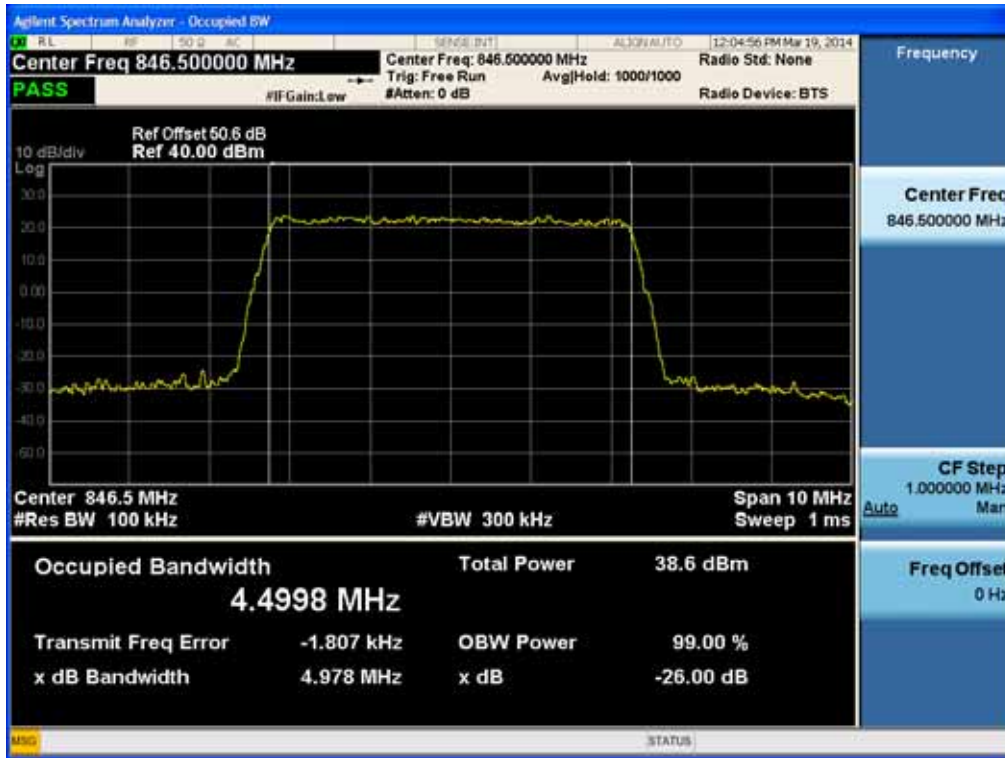
[Output LTE Uplink 5 MHz Low]



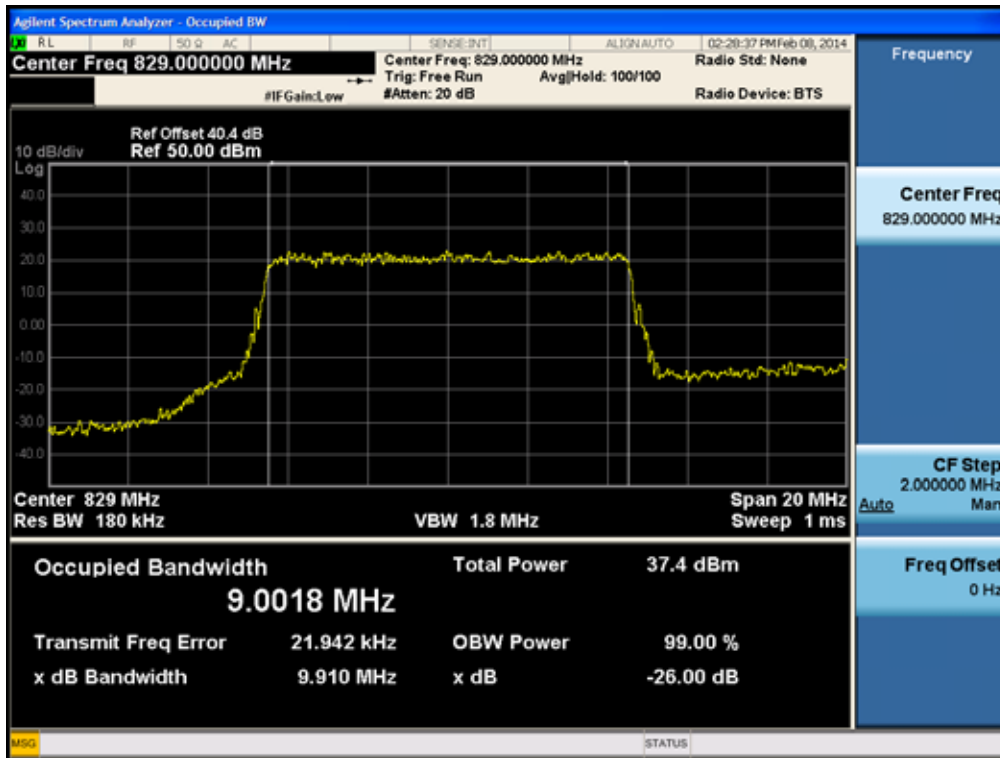
[Output LTE Uplink 5 MHz Middle]



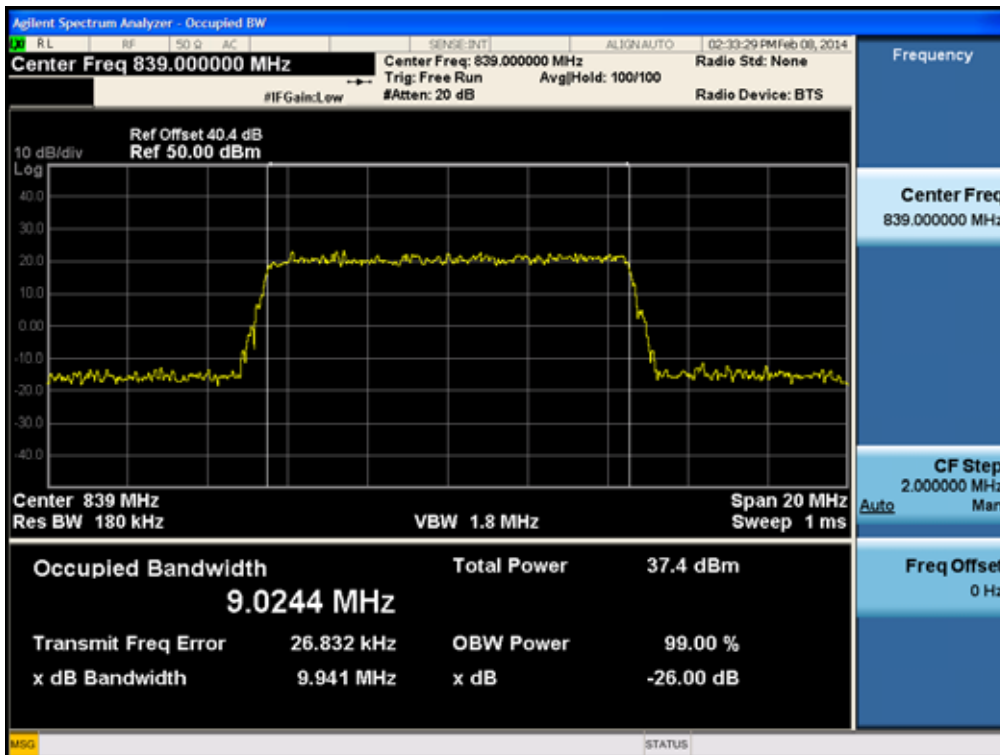
[Output LTE Uplink 5 MHz High]



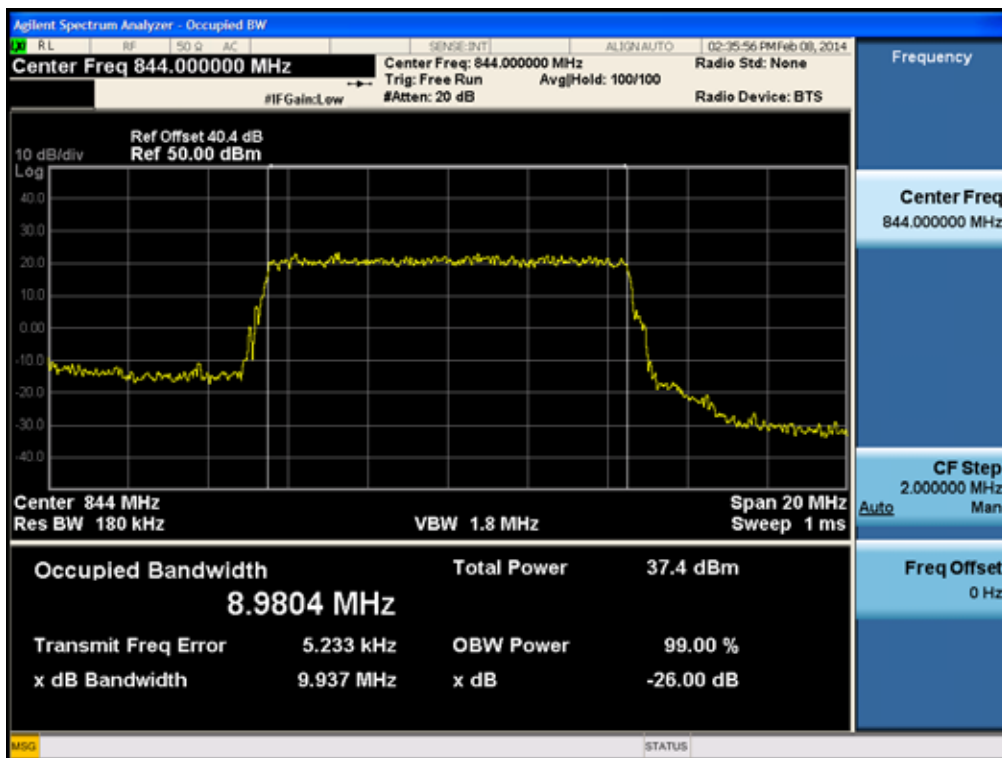
[Output LTE Uplink 10 MHz Low]



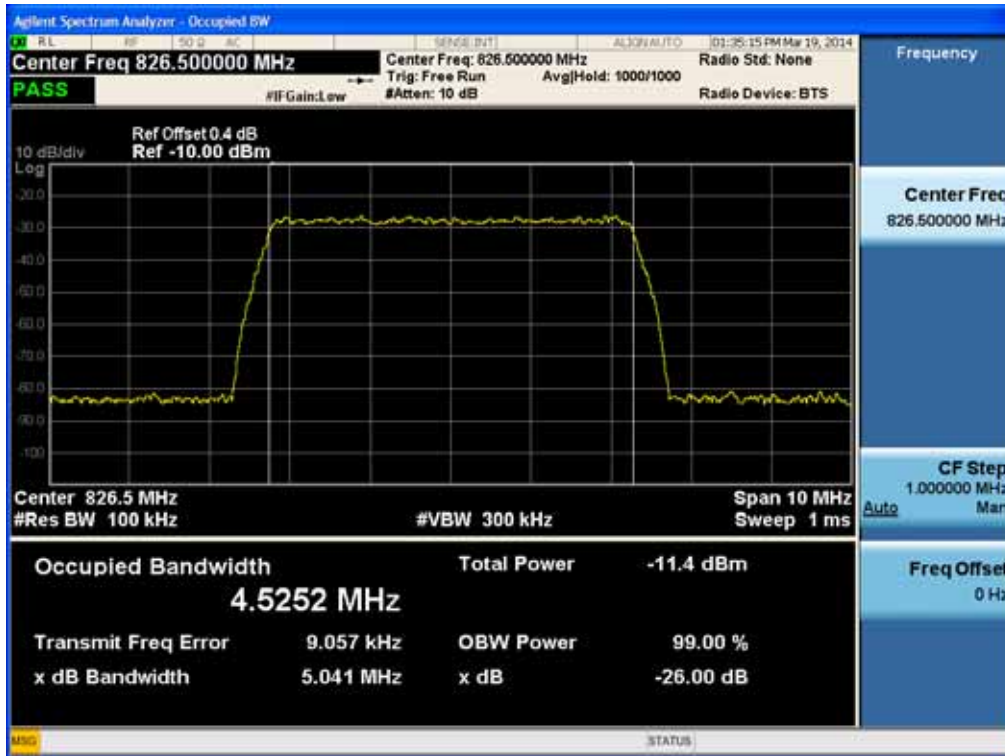
[Output LTE Uplink 10 MHz Middle]



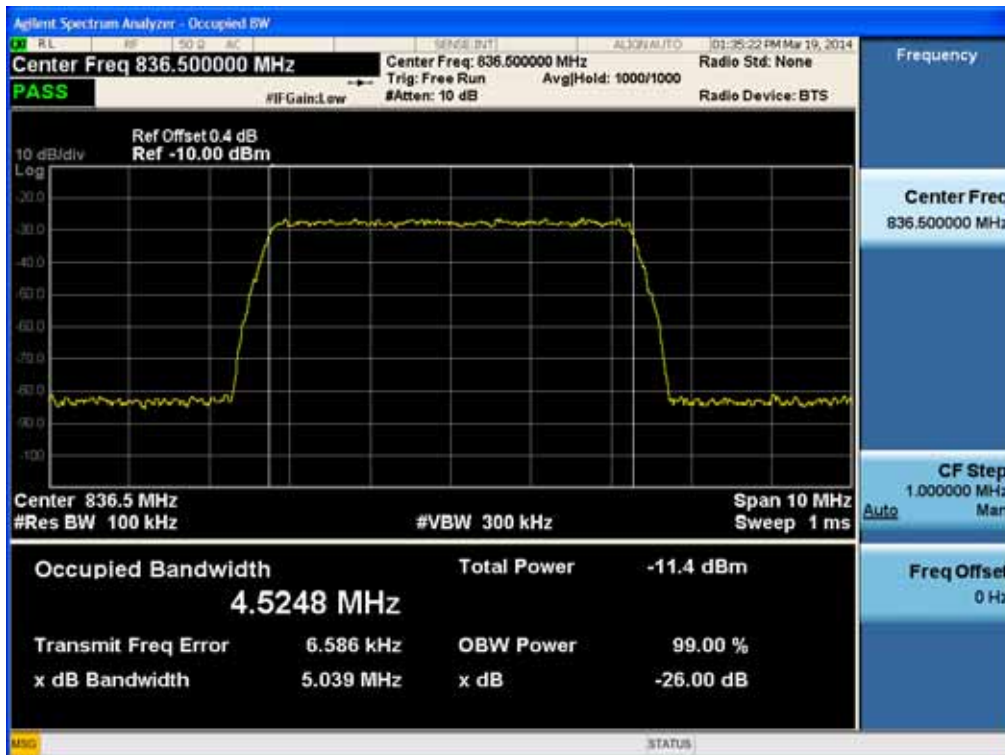
[Output LTE Uplink 10 MHz High]



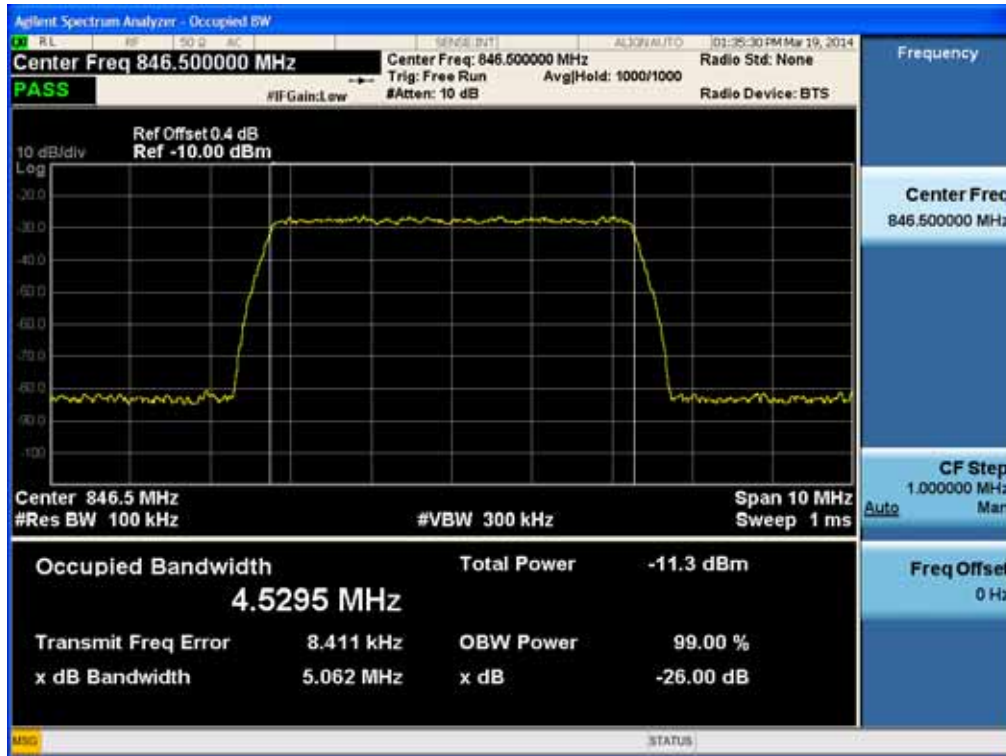
[Input LTE Uplink 5 MHz Low]



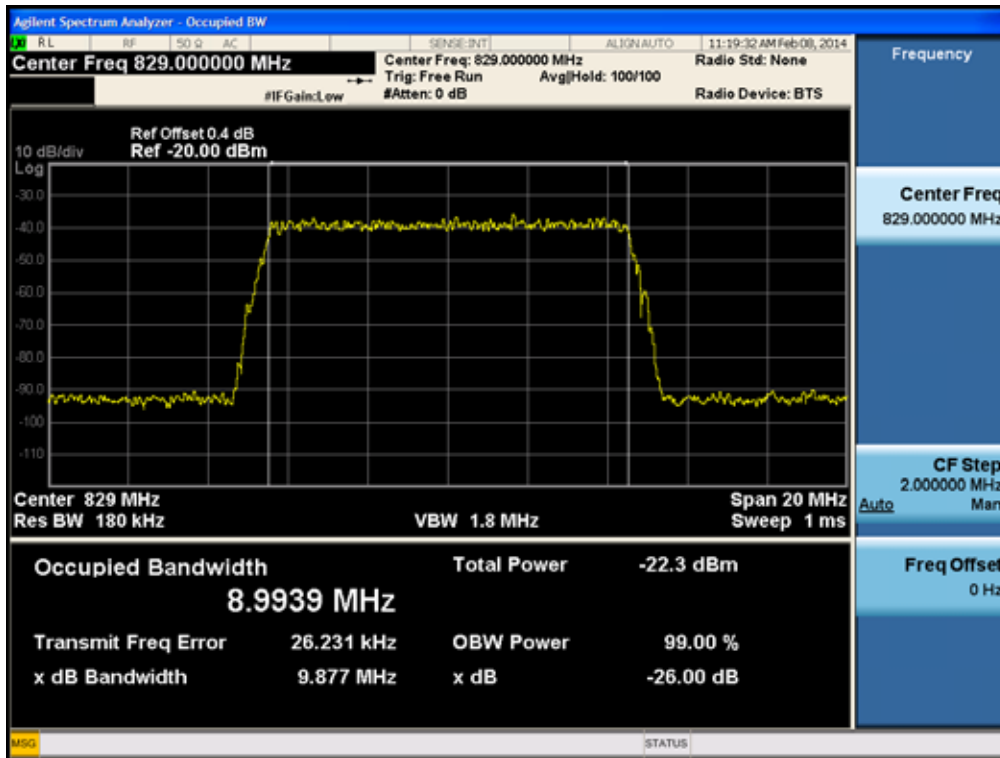
[Input LTE Uplink 5 MHz Middle]



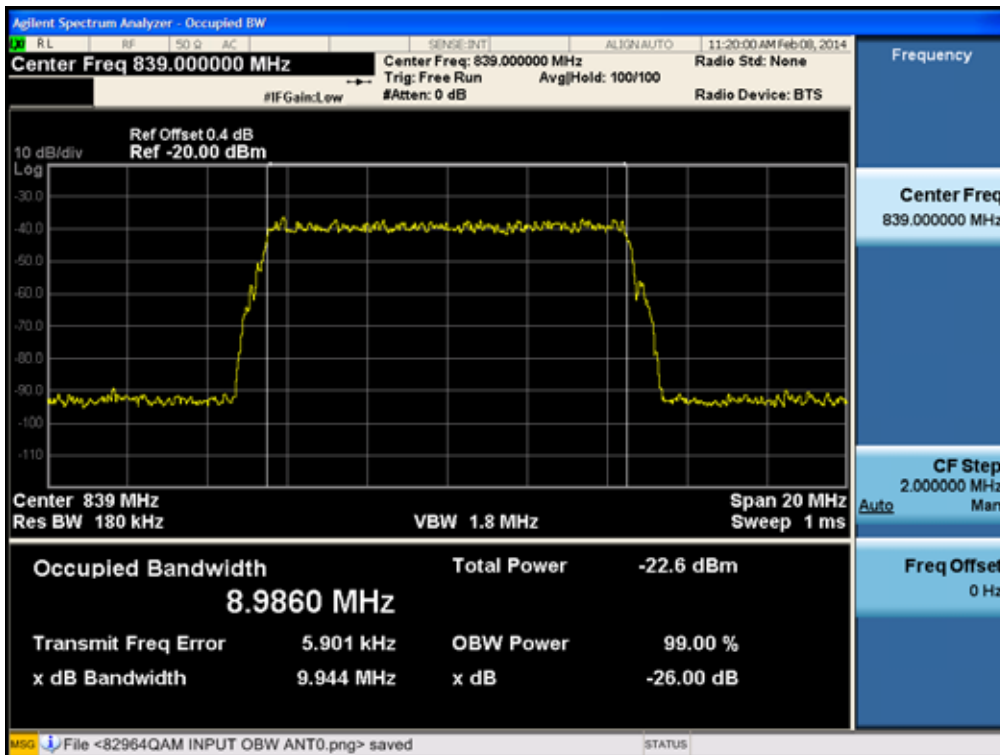
[Input LTE Uplink 5 MHz High]



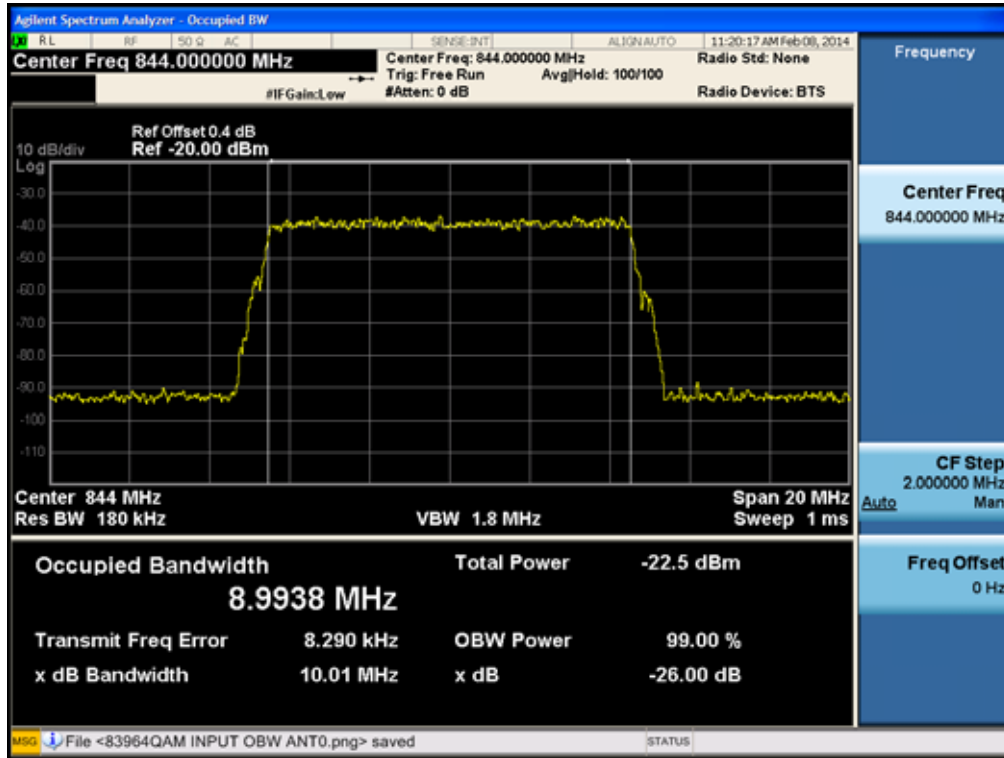
[Input LTE Uplink 10 MHz Low]



[Input LTE Uplink 10 MHz Middle]



[Input LTE Uplink 10 MHz High]



8. SPURIOUS AND HARMONIC EMISSION AT ANTENNA TERMINAL

Test Requirement(s): § 2.1051 Measurements required: Spurious emissions at antenna terminals:

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

§ 22.917 Emission limitations for cellular equipment.

The rules in this section govern the spectral characteristics of emissions in the Cellular Radiotelephone Service.

- (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.
- (b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
- (c) Alternative out of band emission limit. Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas, in lieu of that set forth in this section, pursuant to a private contractual arrangement of all affected licensees and applicants. In this event, each party to such contract shall maintain a copy of the contract in their station files and disclose it to prospective assignees or transferees and, upon request, to the FCC.
- (d) Interference caused by out of band emissions. If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC

may require a greater attenuation of that emission than specified in this section.

Test Procedures: A modulated carrier generated by the signal generator carrier was connected to either the Uplink or Downlink RF port at a maximum level as determined by the spectrum analyzer was connected to either the Uplink or Downlink port depending on the circuitry being measured.

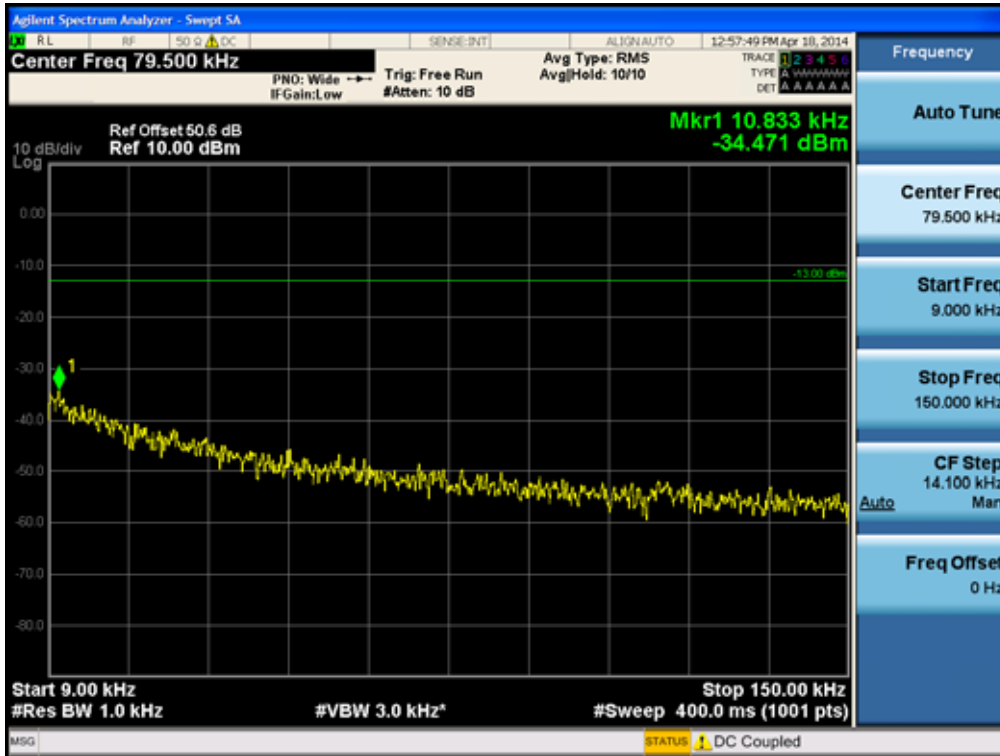
The spectrum was investigated from 9 kHz to the 12.75 GHz of the carrier.

Test Results: The EUT complies with the requirements of this section. There were no detectable Spurious emissions for this EUT.

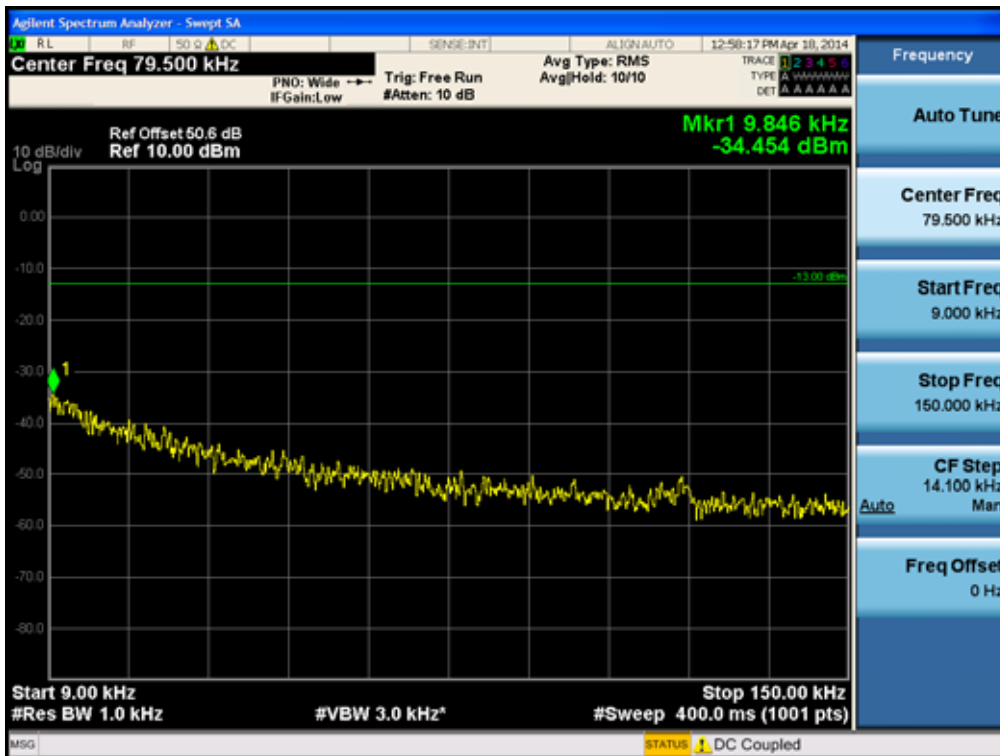
Plots of Spurious Emission

Conducted Spurious Emissions (9 kHz – 150 kHz)

[CDMA Downlink Low]



[CDMA Downlink Middle]



HCT Co., Ltd.

74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea

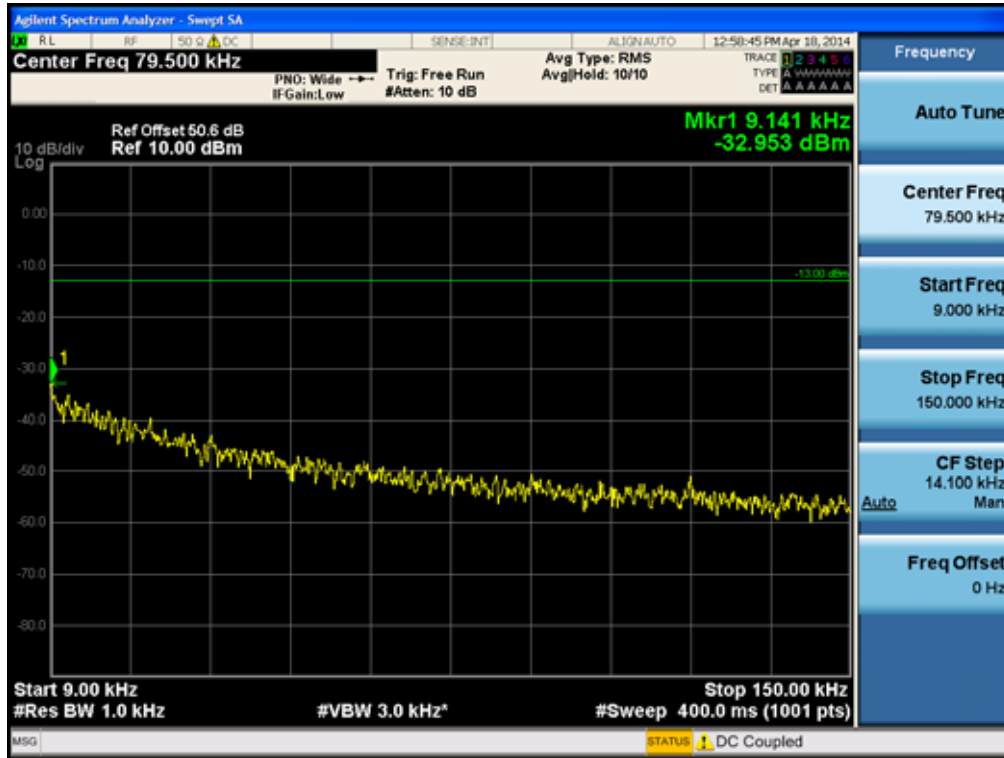
TEL : +82 31 645 6300

FAX : +82 31 645 6401

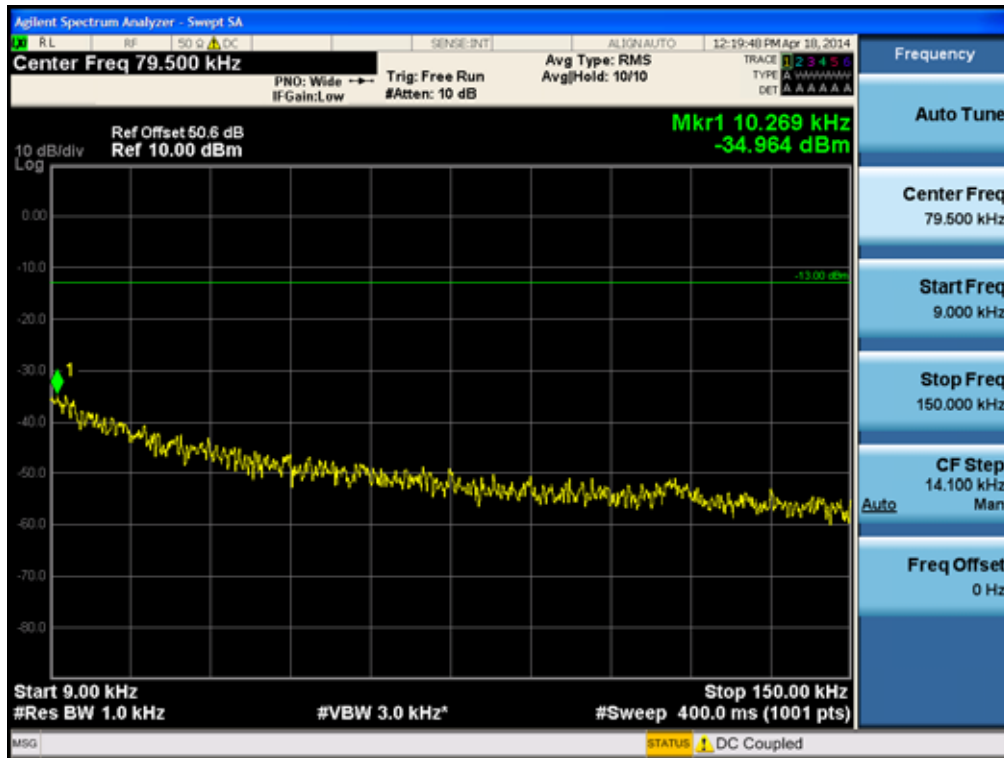
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- 68 /157-

[CDMA Downlink High]



[WCDMA Downlink Low]



[WCDMA Downlink Middle]

