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## **CERTIFICATE OF COMPLIANCE (ERM EVALUATION)**

**Manufacture: GS Instruments Co., Ltd.**

1385-14, Juan-Dong, Nam-Ku, Incheon,,402-200 Korea

**Date of Issue : June 24, 2010**

**Test Report No.: HCTR1006FR16**

**Test Site: HCT CO., LTD.**

**FCC ID**

:

**U88-COVERCELL25KN**

**APPLICANT**

:

**GS Instruments Co., Ltd.**

**EUT Type:**

**In-Building RF Repeater**

**MODEL :**

**CoverCell 25KN**

**Frequency Ranges:**

**Uplink : 1850 - 1910 MHz (PCS)**

**824 - 849 MHz (Cellular)**

**Downlink : 1930 - 1990 MHz (PCS)**

**869 - 894 MHz (Cellular)**

**RF Output Power:**

**24 dBm**

**FCC Rules Part(s):**

**Title 47 of CFR, Part 22 Subpart H (PCS)**

**Part 24 Subpart E (Cellular)**

**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 24 Subpart E of the FCC Rules under normal use and maintenance.

*Chang Seok Choi*

**Report prepared by**

**:Chang Seok Choi**

**Test engineer of RF Team**

*Sang Jun Lee*  
**Approved by**  
**: Sang Jun Lee**  
**Manager of RF Team**

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## 1. CLIENT INFORMATION

The EUT has been tested by request of

Company	GS Instruments Co., Ltd
Contact Point	1385-14, Juan-Dong, Nam-Ku, Incheon,,402-200 Korea

- EUT Type: In-Building RF Repeater
- FCC ID: U88-COVERCELL25KN
- Frequency Ranges: Uplink : 1850 - 1910 MHz (PCS)  
824 – 849 MHz (Cellular)  
Downlink : 1930 - 1990 MHz (PCS)  
869 – 894 MHz (Cellular)
- RF Output Power: 24 dBm
- FCC Rules Part(s): Title 47 of CFR, Part 22 Subpart H (PCS)  
Part 24 Subpart E (Cellular)
- Emission Designators: F9W
- Modulation : QPSK

## 2. TEST SPECIFICATIONS

### 2.1 Standards

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance With  
**Part 22 Subpart H, Part 24 Subpart E.**

Reference	Description	Results
§2.1046; §22.913, §24.232	RF Power Output	Compliant
§2.1047	Modulation Characteristics	N/A
§2.1049	Occupied Bandwidth	Compliant
§2.1051, §22.917, §24.238	Spurious Emissions at Antenna Terminals	Compliant
§2.1053, §22.917, §24.238	Radiated Spurious Emissions	Compliant
§2.1055; §22.355, §24.235	Frequency Stability	Compliant

### 3. STANDARDS ENVIRONMENTAL TEST CONDITIONS

Temperature :	+ 15 °C to + 35 °C
Relative humidity:	30 % to 60 %
Air pressure	860 mbar to 1060 mbar

### 4. TEST EQUIPMENT

Manufacturer	Model / Equipment	Cal Interval	Calibration Due	Serial No.
Agilent	E4438C /Signal Generator	Annual	12/15/2010	MY42082646
Agilent	E4416A /Power Meter	Annual	01/14/2011	GB41291412
WEINSCHEL	67-30-33/ATTENUATOR	Annual	01/14/2011	BR0530
Korea Eng	KR-1005L/ Temperature and Humidity Chamber	Annual	12/28/2010	KRAC05063-3CH
Agilent	N9020A /Signal Analyzer	Annual	03/03/2011	US46220219
Schwarzbeck	VULB 9168/BI-LOG Antenna	Biennial	01/06/2011	9168-200
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	AFS44-00102650-42-10P44-PS	Annual	04/05/2011	1532439
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	04/13/2011	147
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	09/23/2010	296
EMCO	6502/Loop Antenna	Biennial	01/13/2012	9009-2536
Agilent	E4438C /Signal Generator	Annual	12/15/2010	MY42082646

## 5. RF OUTPUT POWER

### 5.1 Test Procedure

#### 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.

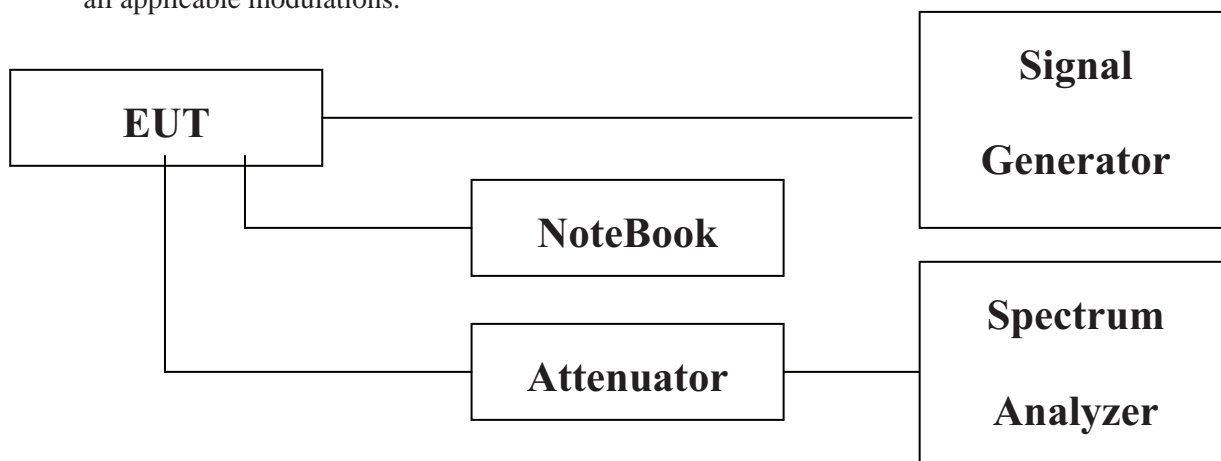
(a) Maximum ERP. In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.

##### **§ 24.232 Power and antenna height limits.**

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

**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**

## 5.2 Test Results

(Cellular)

CARRIER CHANNEL	DOWNLINK		UPLINK	
	Frequency (MHz)	Measured Power (dBm)	Frequency (MHz)	Measured Power (dBm)
Low	869.7	23.98	824.7	24.10
Mid	881.5	23.77	836.5	23.82
High	893.3	23.55	848.3	23.97

INPUT SIGNAL	DOWNLINK	UPLINK
Source	Real-time CDMA Forward	Real-time CDMA Reverse
Power Level	-55.4 dBm	-54.2 dBm
Amplitude offset	-31.1 dB	-31.1 dB

(PCS)

CARRIER CHANNEL	DOWNLINK		UPLINK	
	Frequency (MHz)	Measured Power (dBm)	Frequency (MHz)	Measured Power (dBm)
Low	1931.25	23.95	1851.25	23.95
Mid	1960.00	23.87	1880.00	23.91
High	1988.75	23.81	1908.75	23.85

INPUT SIGNAL	DOWNLINK	UPLINK
Source	Real-time CDMA Forward	Real-time CDMA Reverse
Power Level	-53.1 dBm	- 50.2 dBm
Amplitude offset	-31.1 dB	-31.1 dB

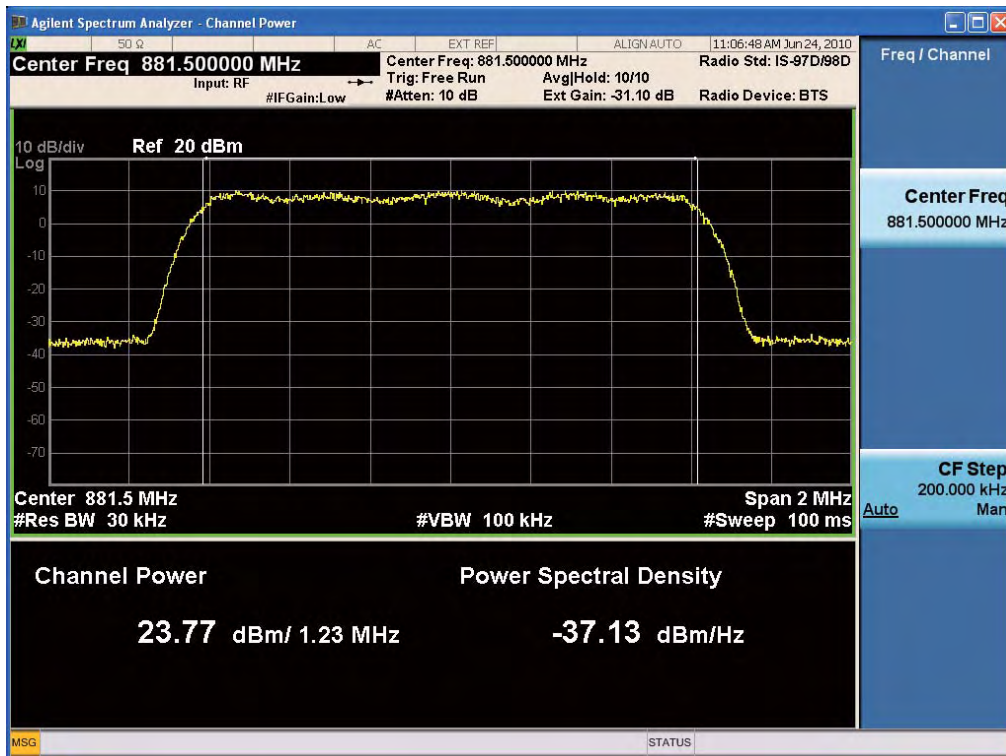


## Plots of RF Output Power

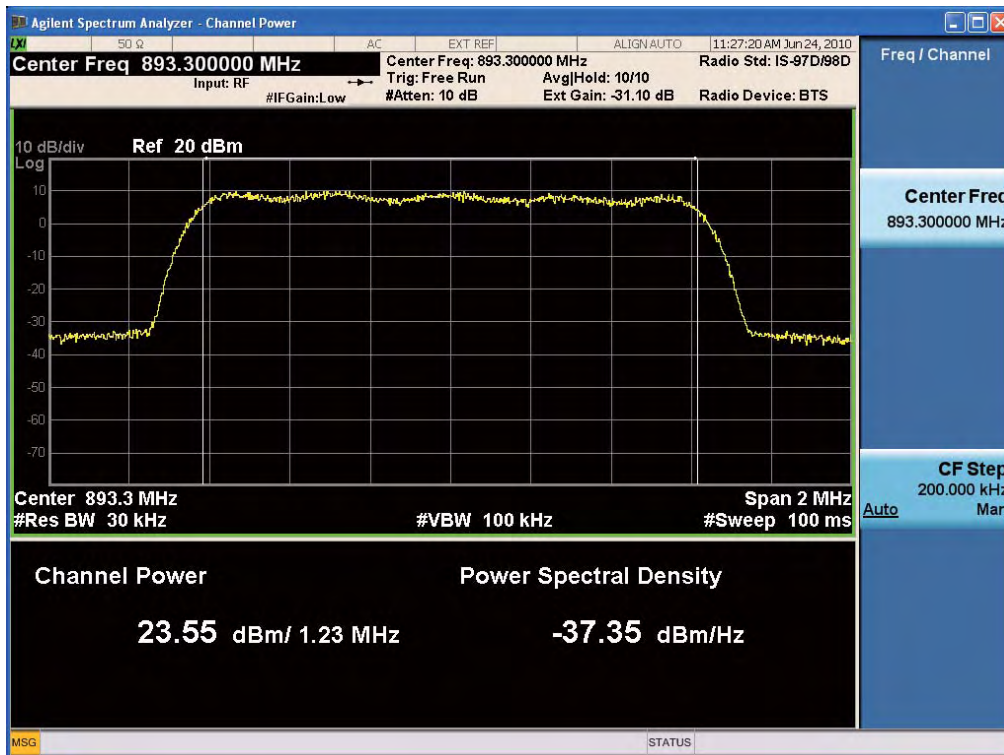
### Downlink Low CH (Cellular)



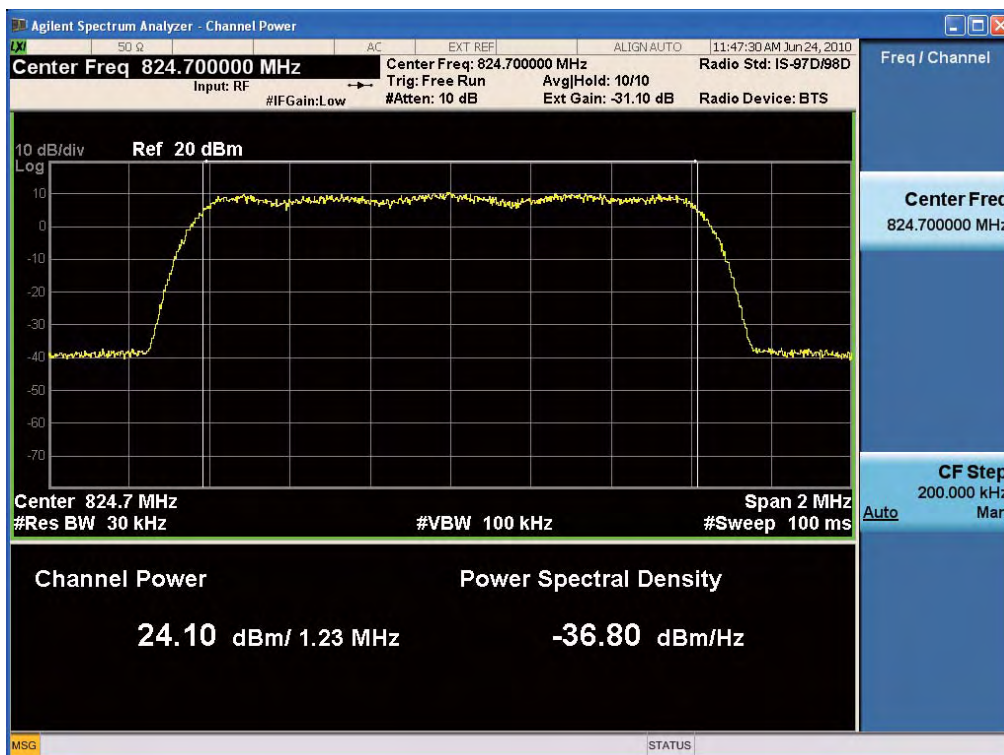
### Downlink Middle CH (Cellular)



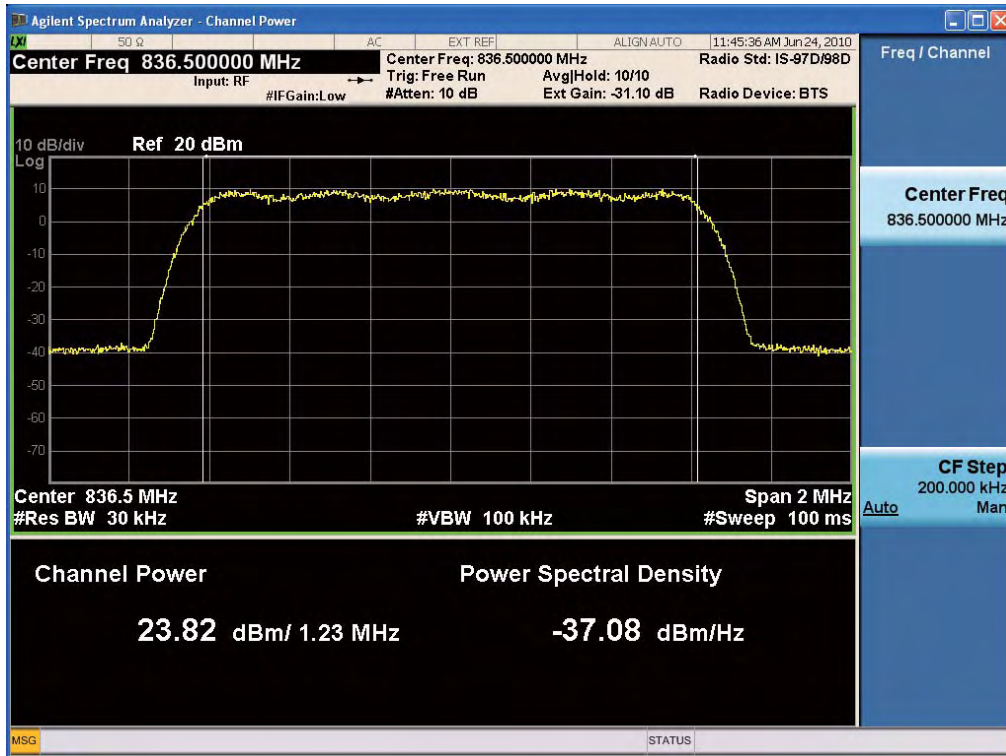
**Downlink High CH (Cellular)**



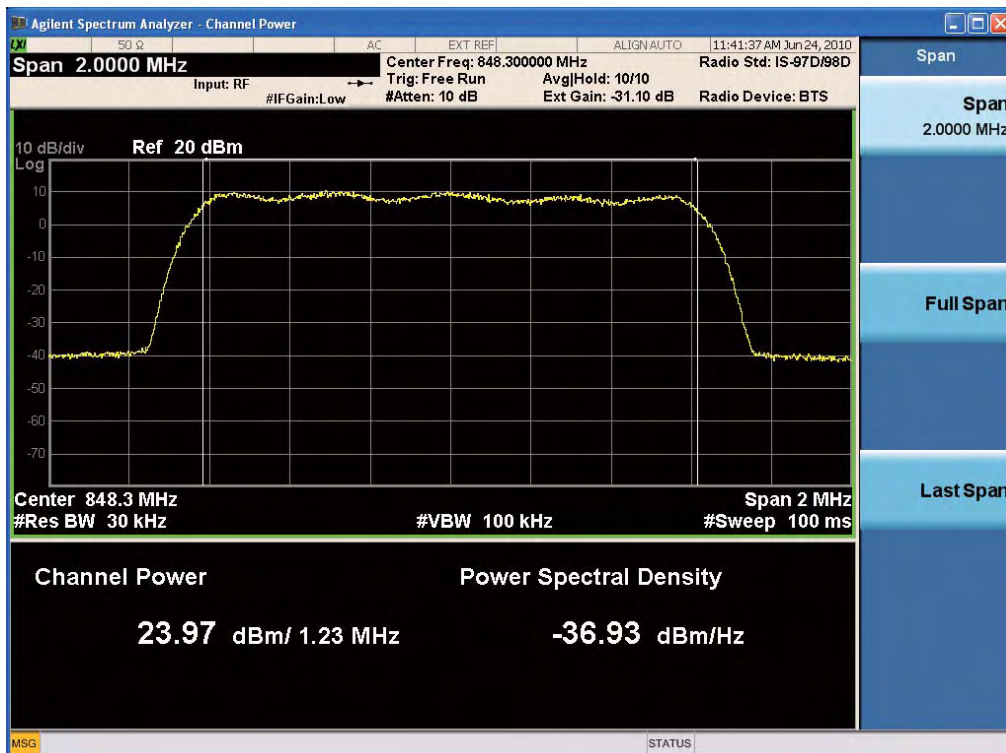
**Uplink Low CH (Cellular)**



**Uplink Middle CH (Cellular)**

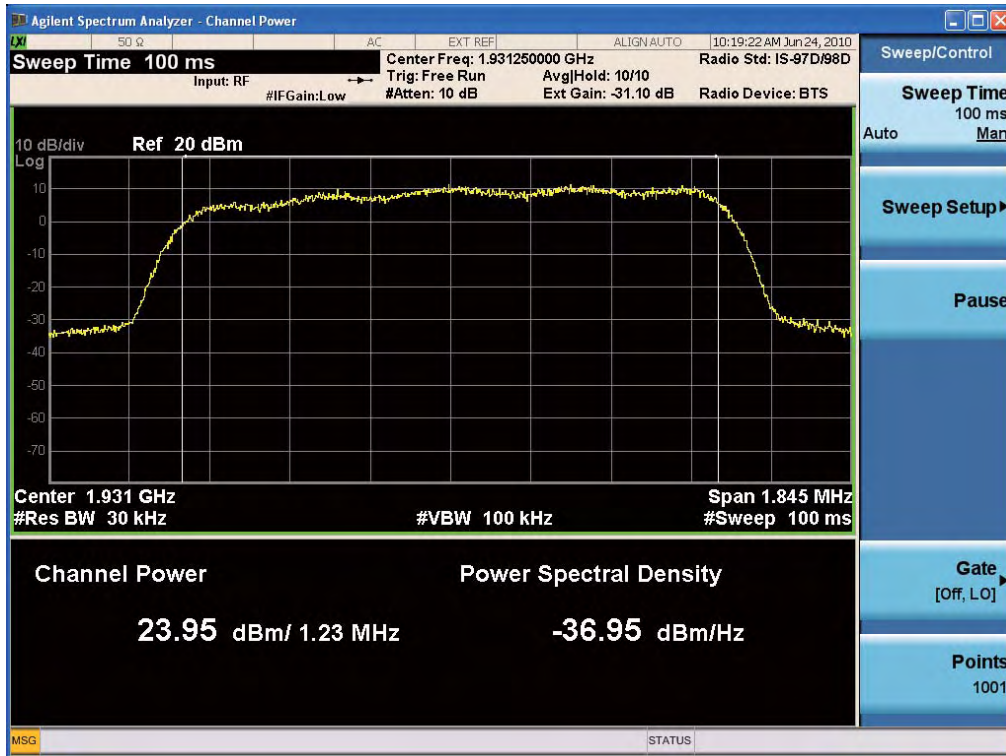


**Uplink High CH (Cellular)**

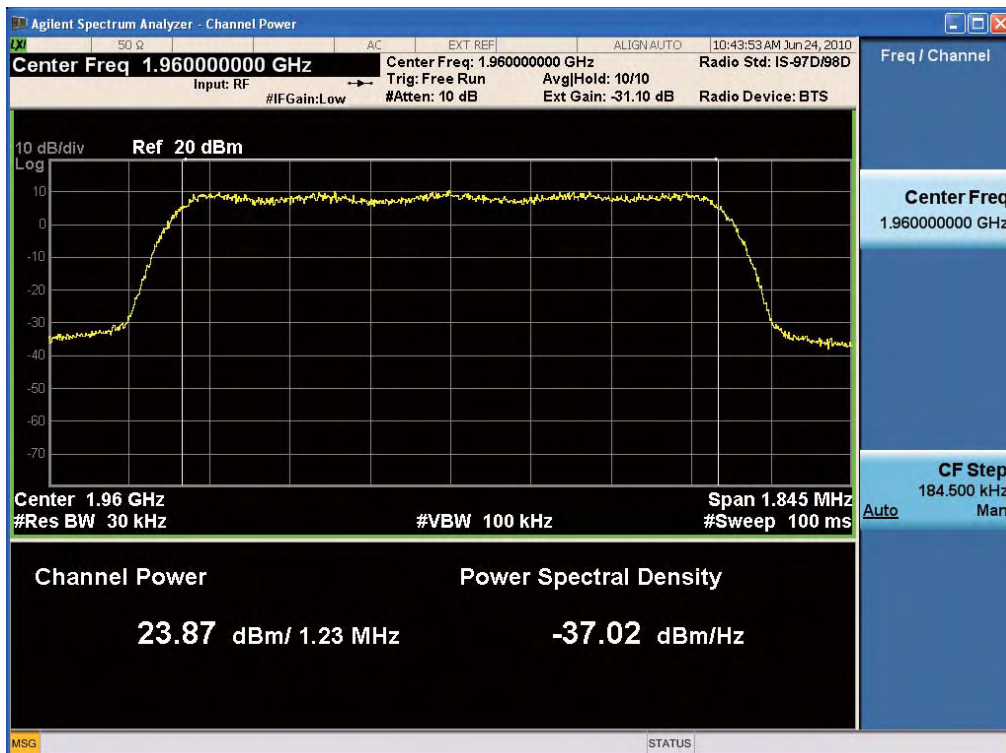




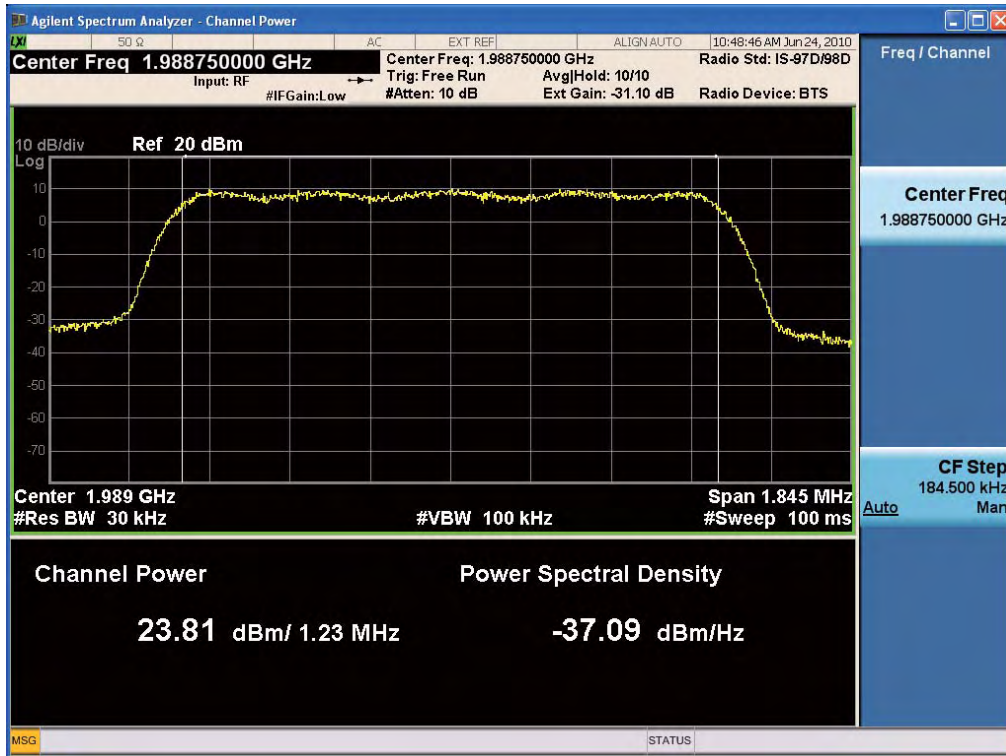
**Downlink Low CH (PCS)**



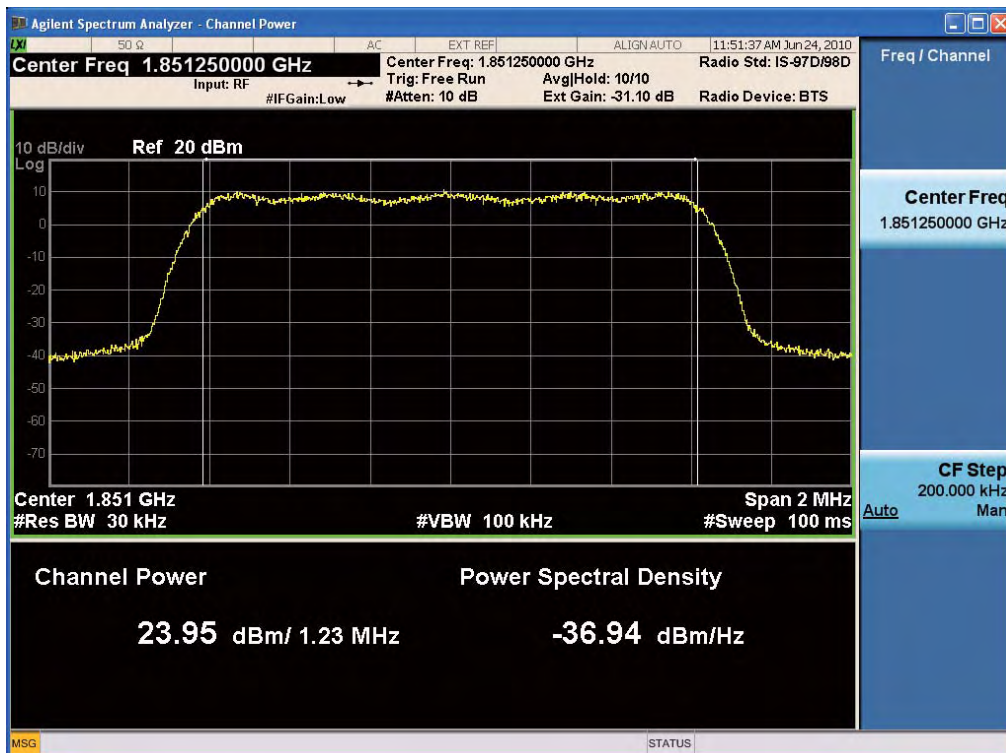
**Downlink Middle CH (PCS)**



**Downlink High CH (PCS)**



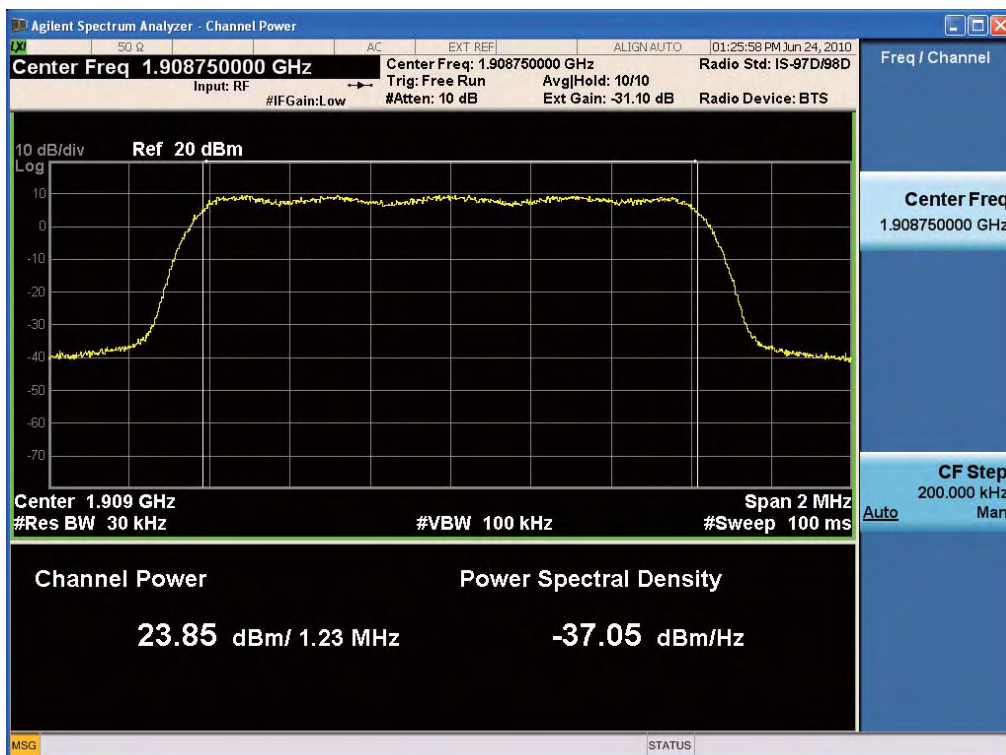
**Uplink Low CH (PCS)**



**Uplink Middle CH (PCS)**



**Uplink High CH (PCS)**



## 6. OCCUPIED BANDWIDTH

### 6.1 Test Procedure

**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.

**(Cellular)**

CARRIER CHANNEL	DOWNLINK		UPLINK	
	Frequency (MHz)	Occupied Bandwidth (MHz)	Frequency (MHz)	Occupied Bandwidth (dBm)
Low	869.7	1.2708	824.7	1.2602
Mid	881.5	1.2623	836.5	1.2654
High	893.3	1.2641	848.3	1.2626

INPUT SIGNAL	DOWNLINK	UPLINK
Source	Real-time CDMA Forward	Real-time CDMA Reverse
Power Level	-55.4 dBm	-54.2 dBm
Amplitude offset	-31.1 dB	-31.1 dB

**(PCS)**

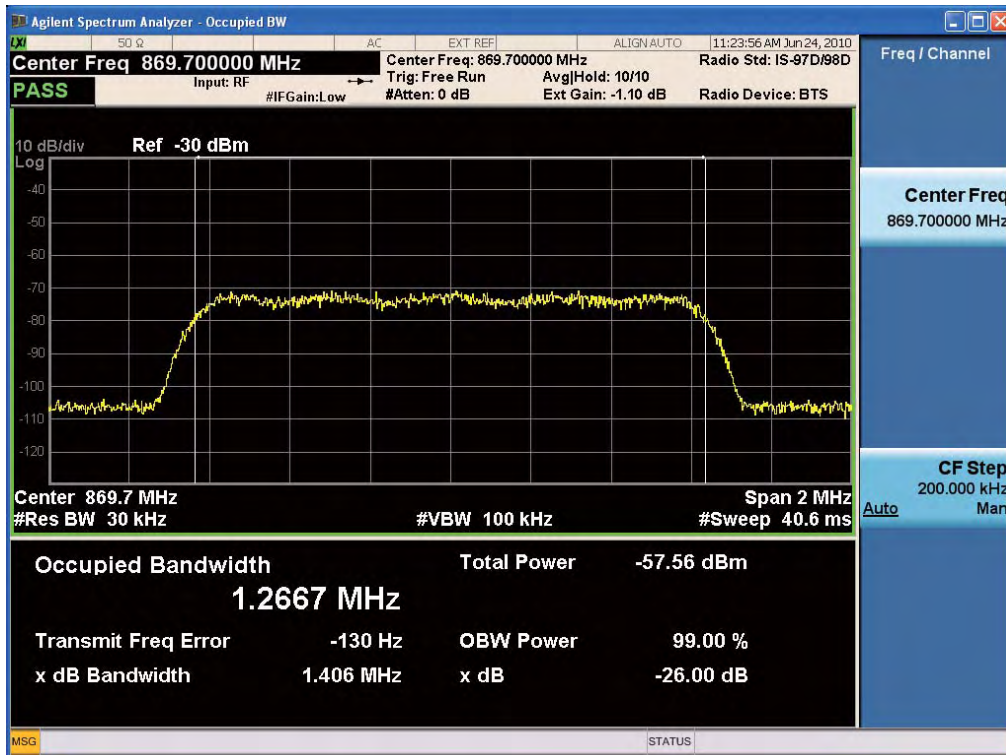
CARRIER CHANNEL	DOWNLINK		UPLINK	
	Frequency (MHz)	Occupied Bandwidth (dBm)	Frequency (MHz)	Occupied Bandwidth (dBm)
Low	1931.25	1.2349	1851.25	1.2651
Mid	1960.00	1.2653	1880.00	1.2631
High	1988.75	1.2605	1908.75	1.2651

INPUT SIGNAL	DOWNLINK	UPLINK
Source	Real-time CDMA Forward	Real-time CDMA Reverse
Power Level	-53.1 dBm	- 50.2 dBm
Amplitude offset	-31.1 dB	-31.1 dB

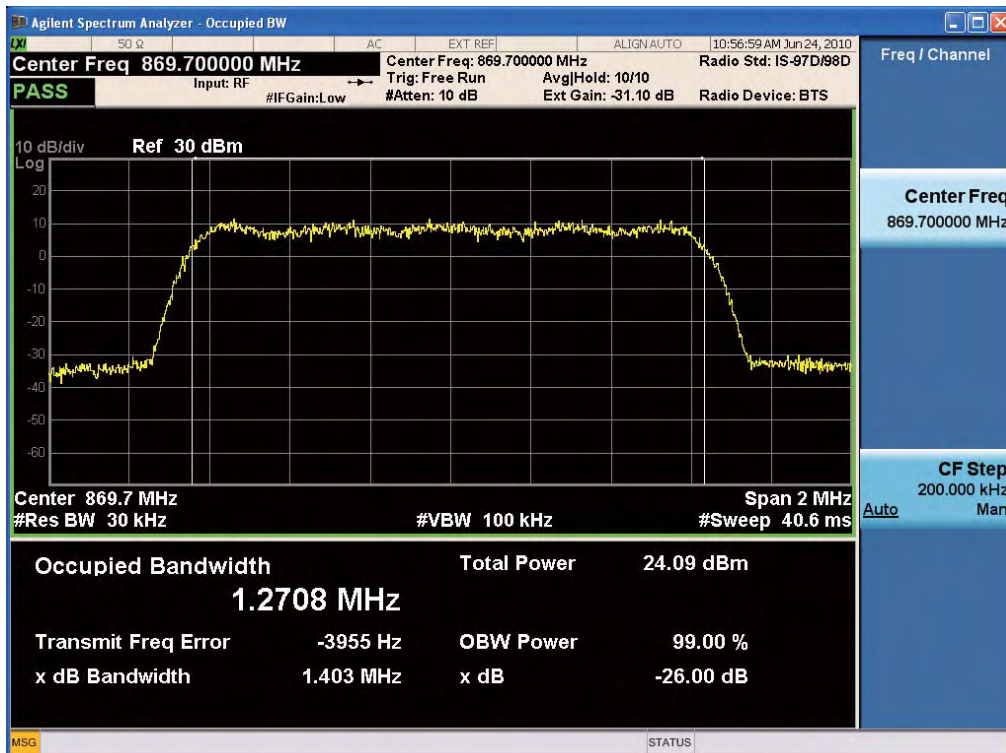


## Plots of RF Output Power

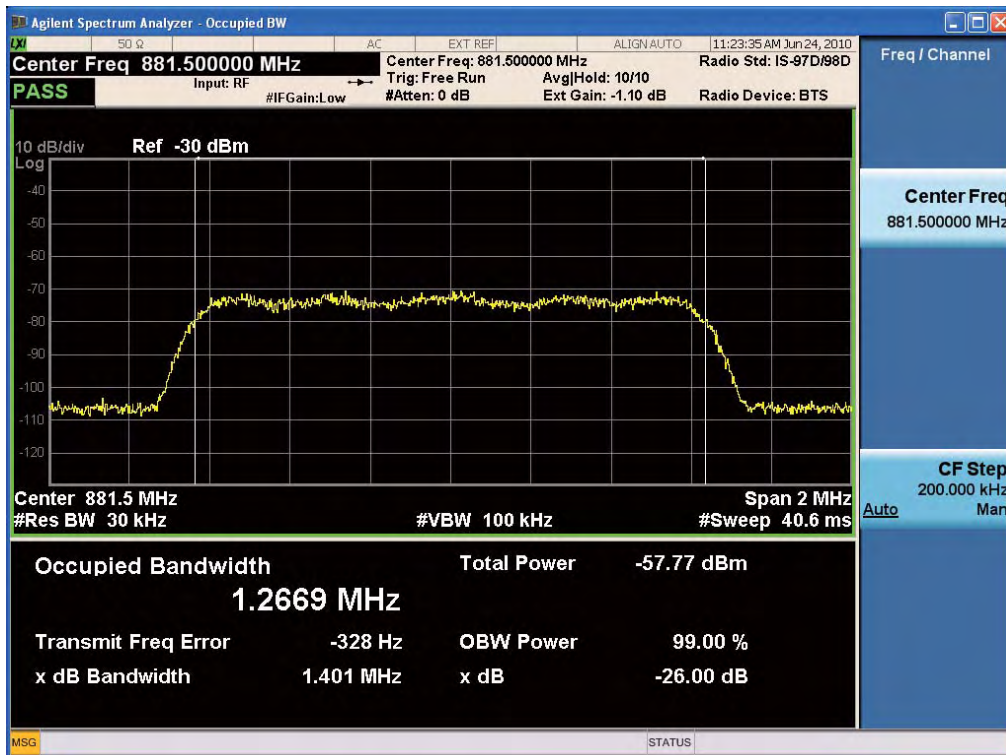
### Downlink Low CH (Cellular) Input Signal



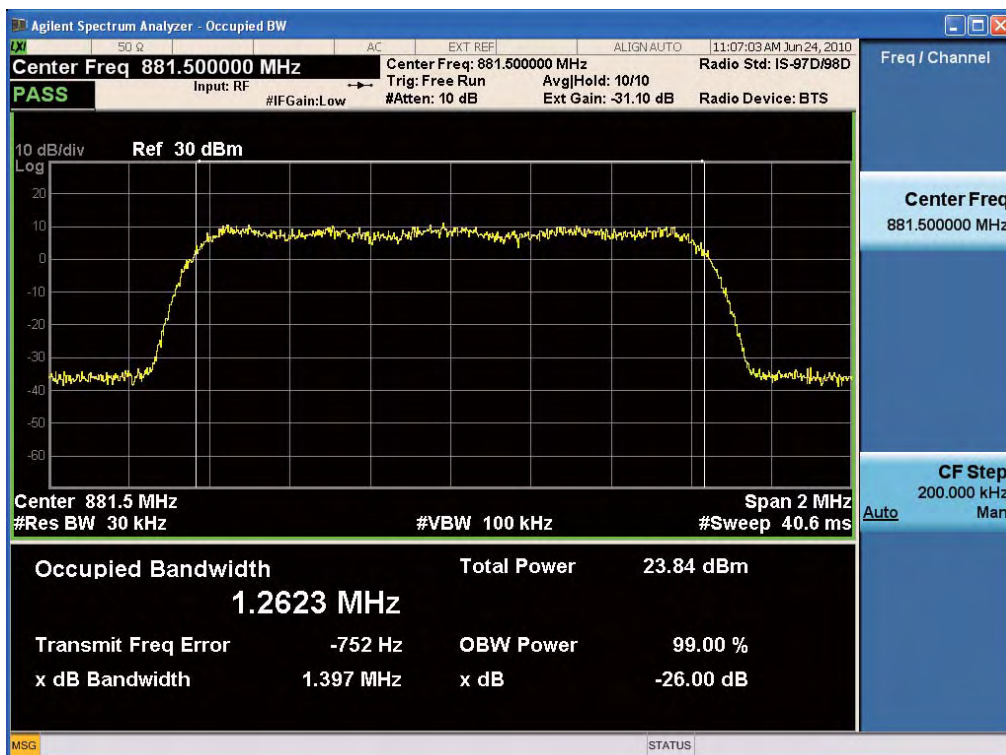
### Downlink Low CH (Cellular) Output Signal



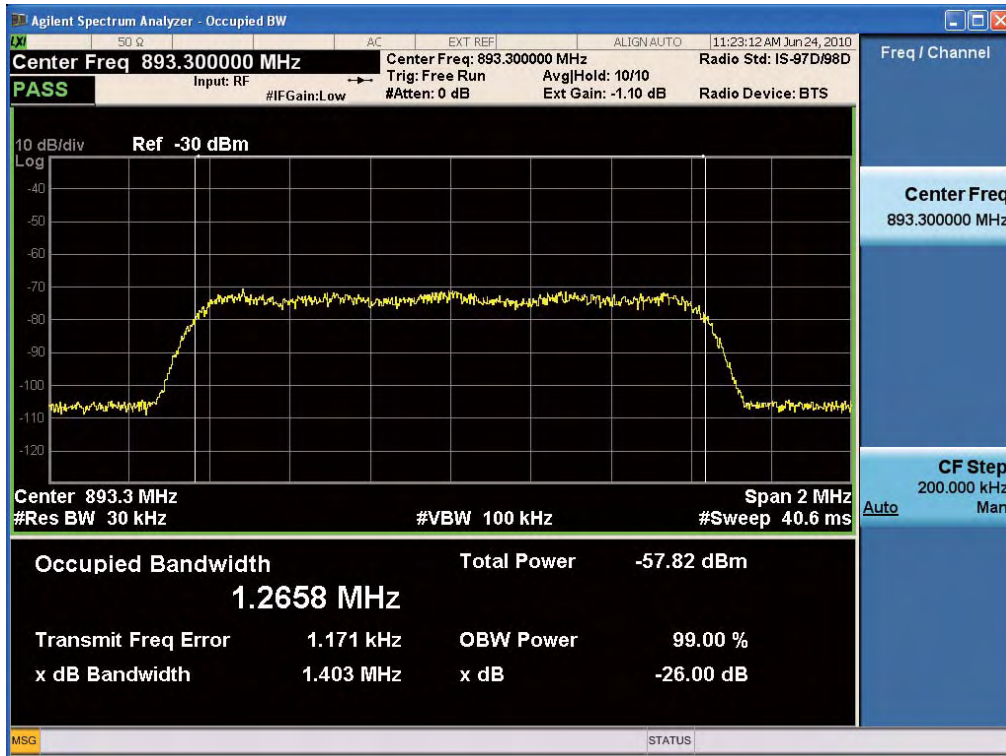
**Downlink Mid CH (Cellular) Input Signal**



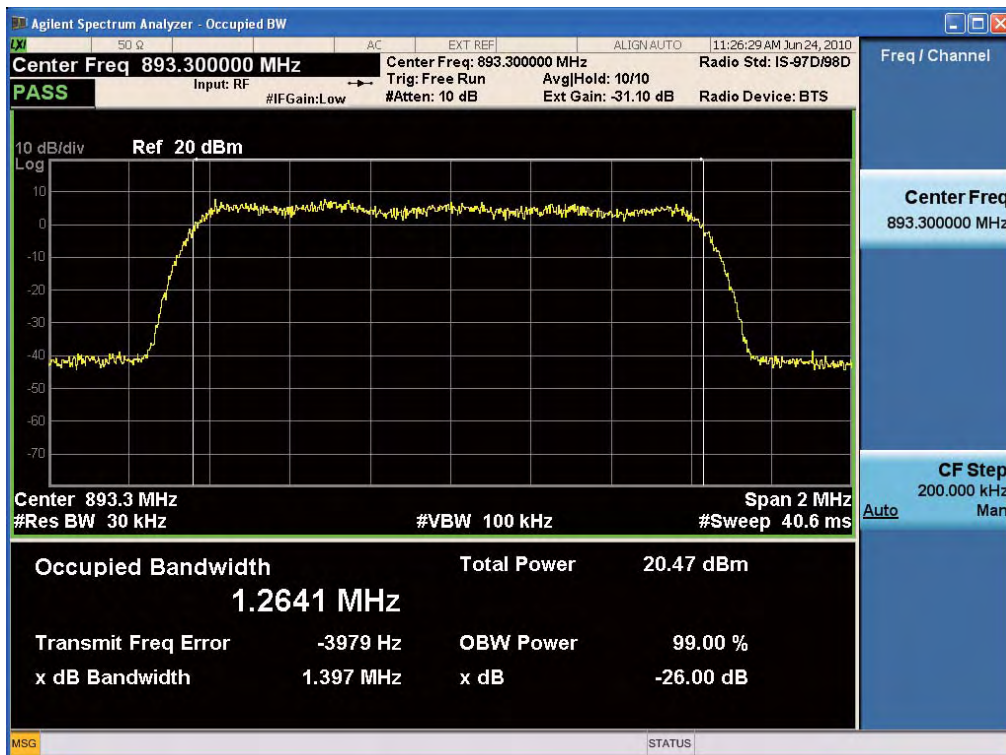
**Downlink Mid CH (Cellular) Output Signal**



**Downlink High CH (Cellular) Input Signal**

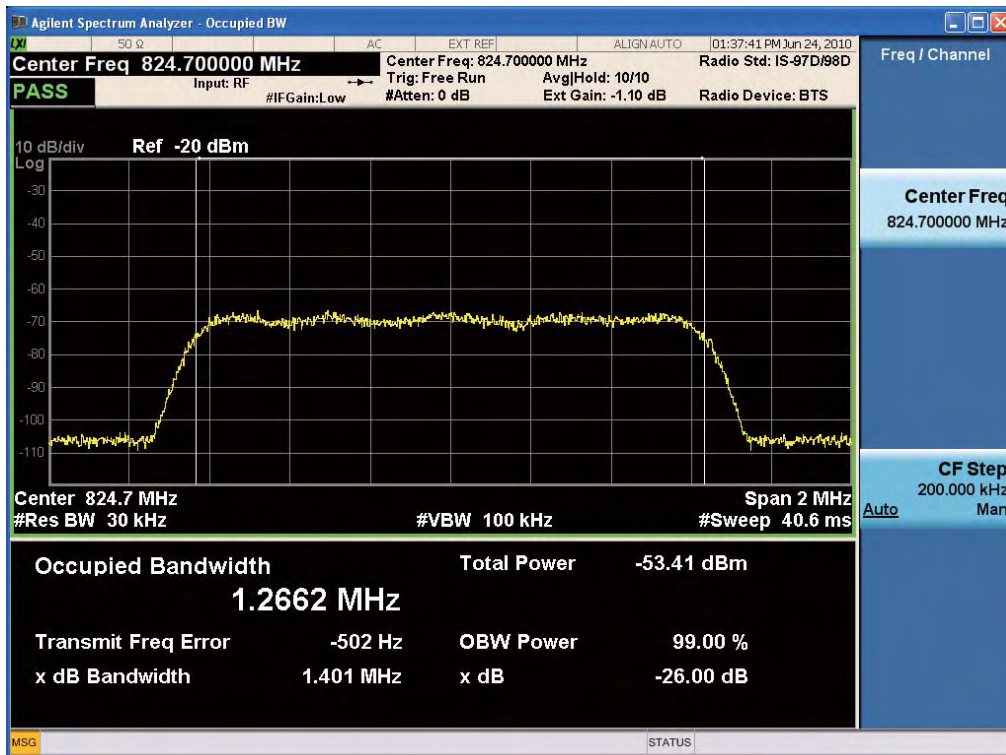


**Downlink High CH (Cellular) Output Signal**

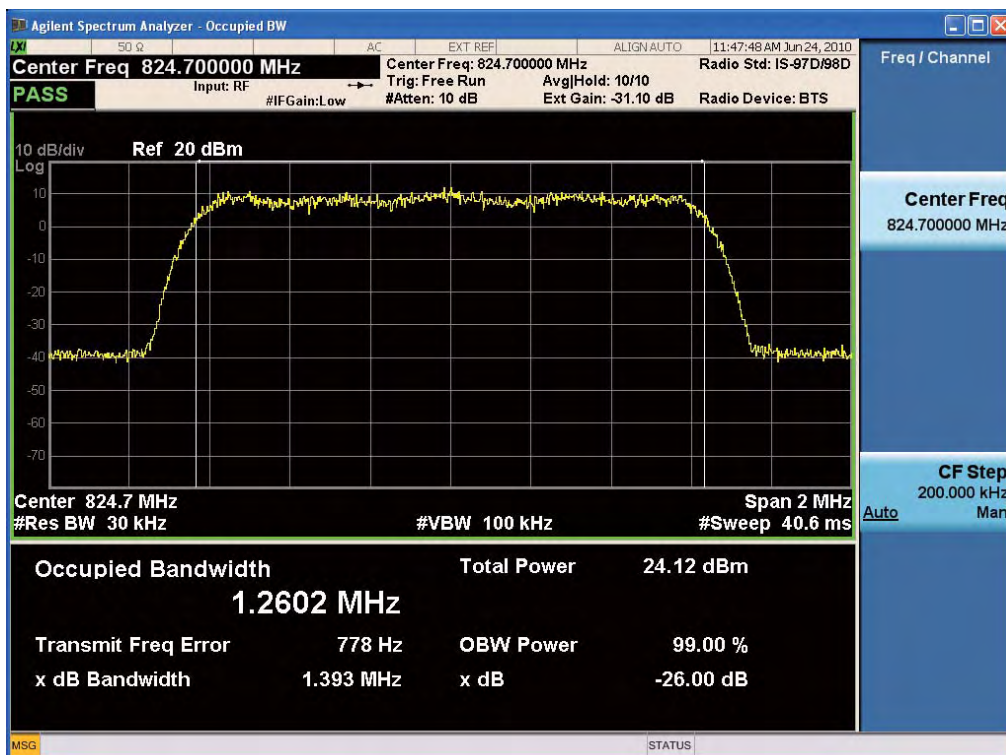




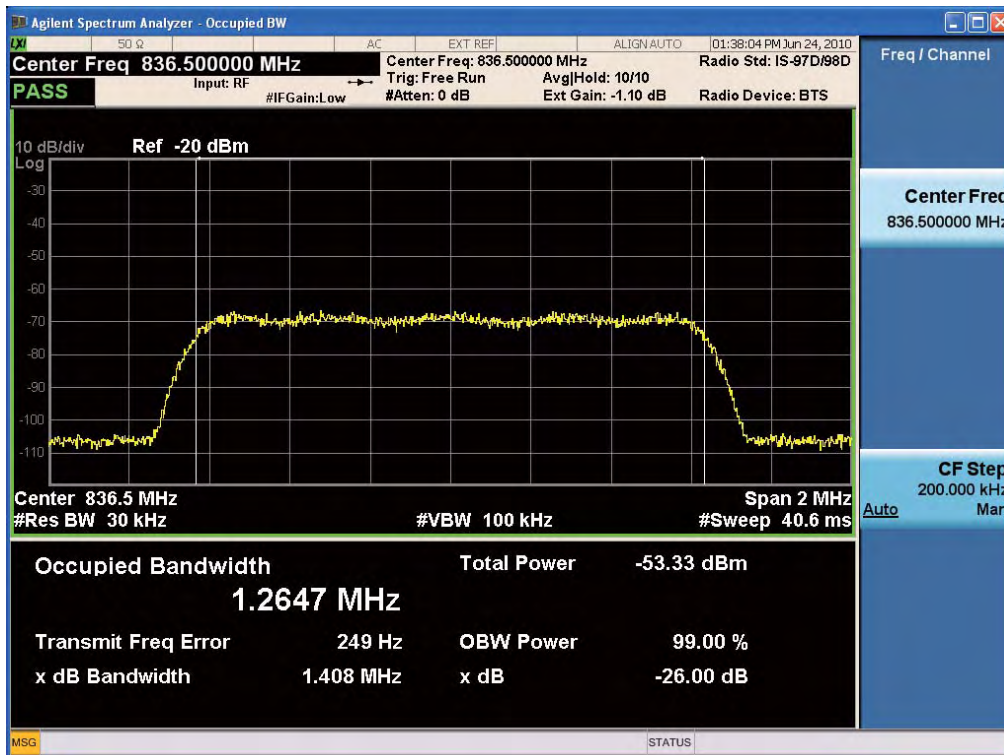
### Uplink Low CH (Cellular) Input Signal



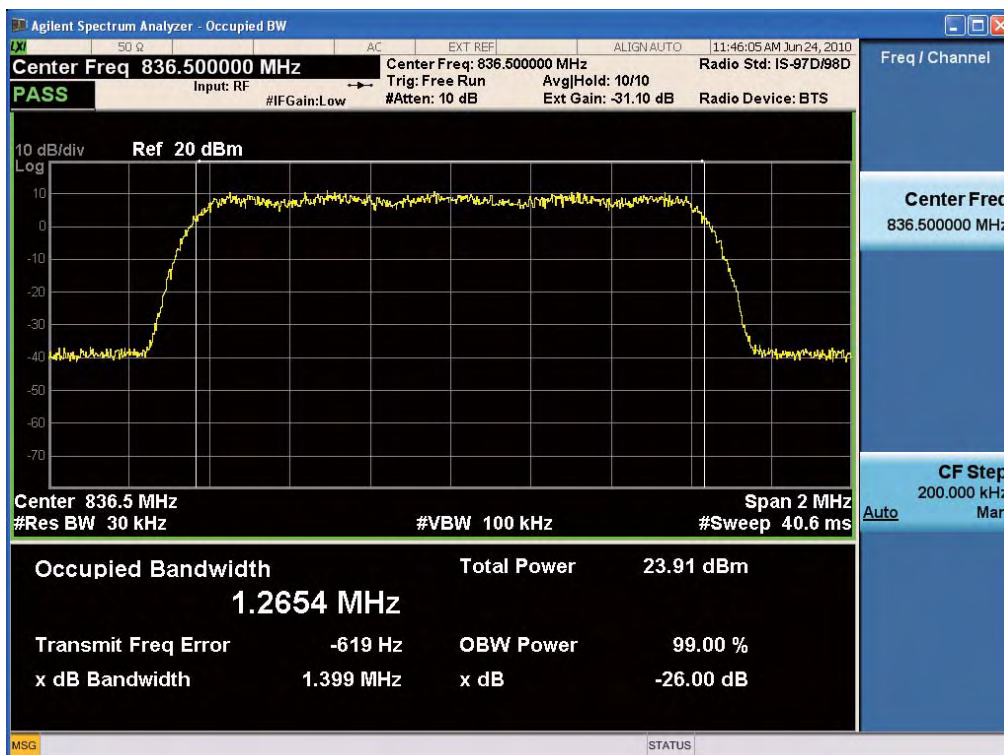
### Uplink Low CH (Cellular) Output Signal



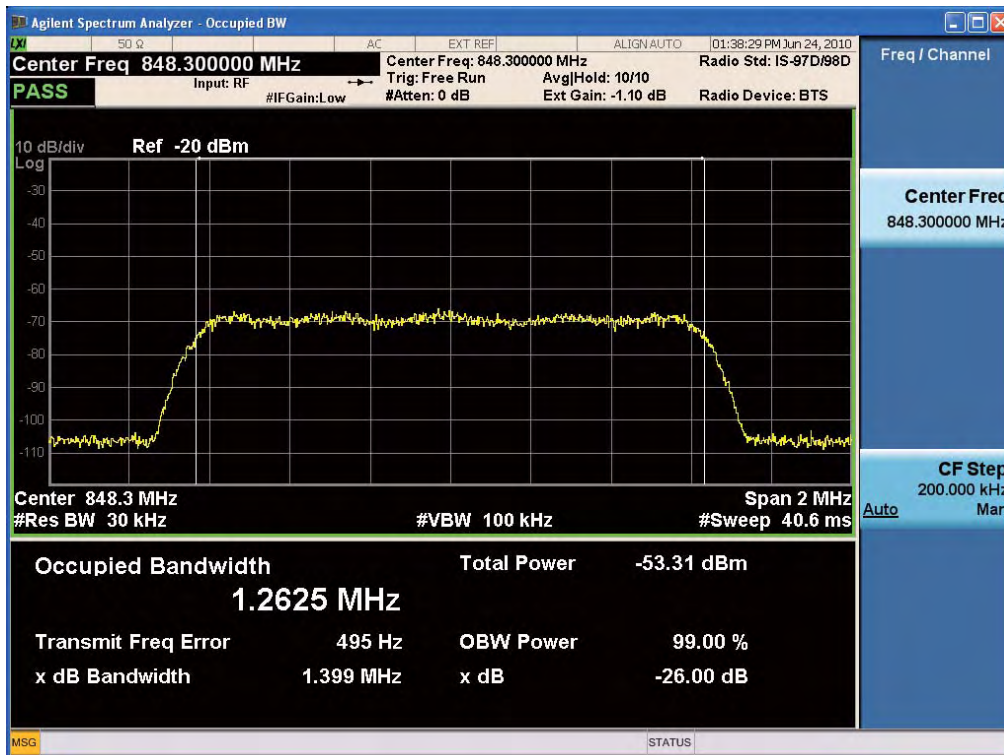
### Uplink Mid CH (Cellular) Input Signal



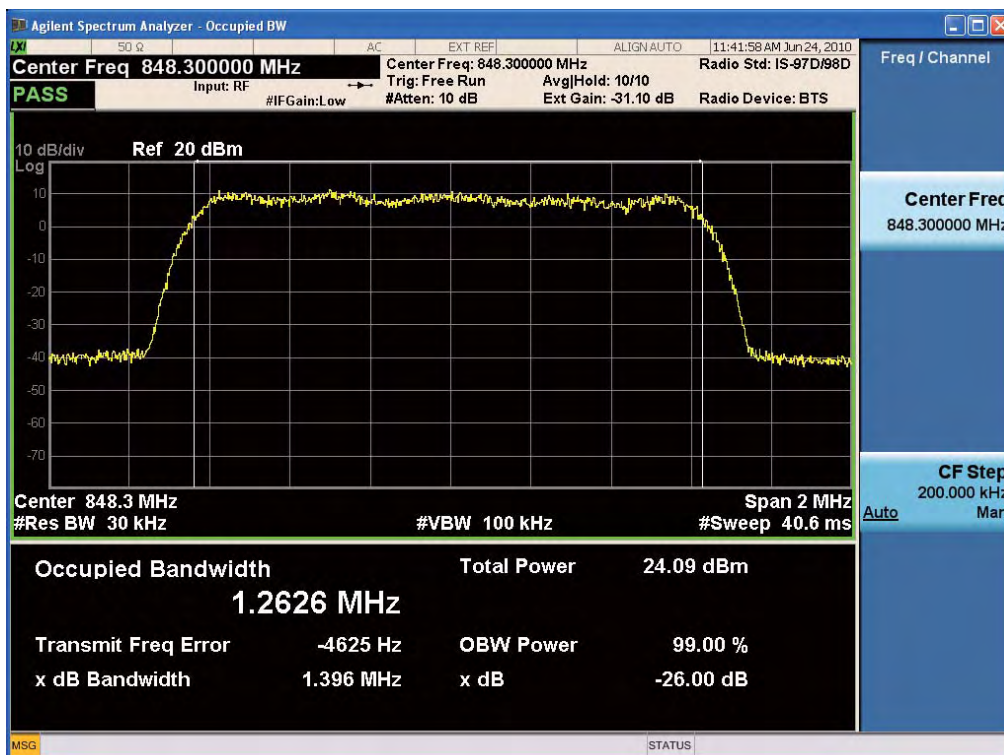
### Uplink Mid CH (Cellular) Output Signal



### Uplink High CH (Cellular) Input Signal

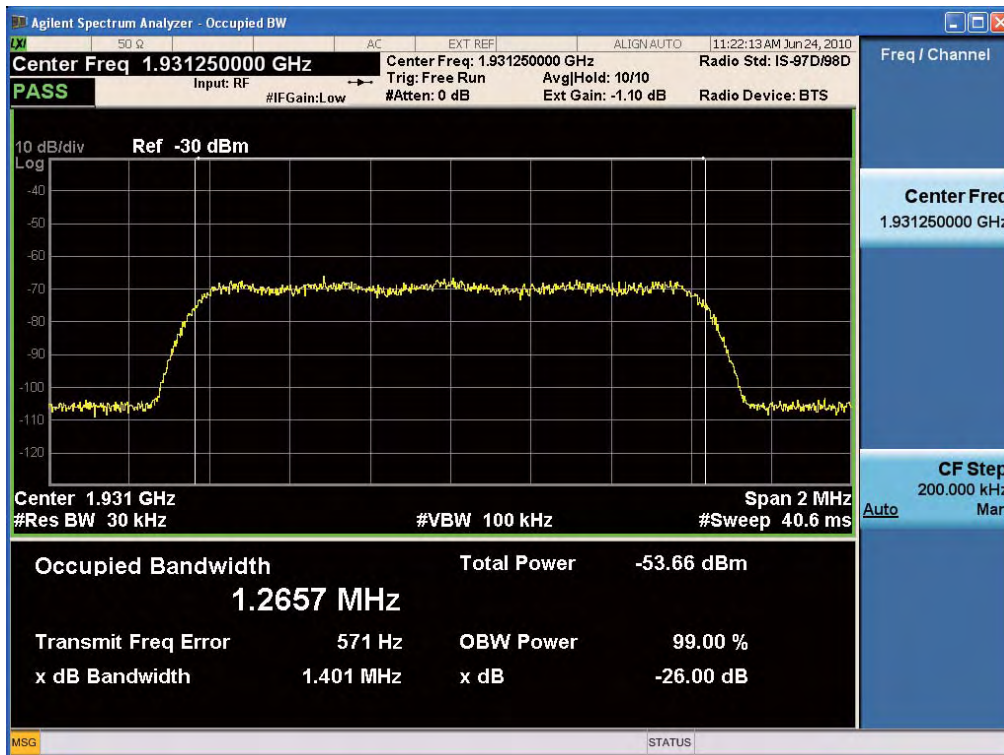


### Uplink High CH (Cellular) Output Signal

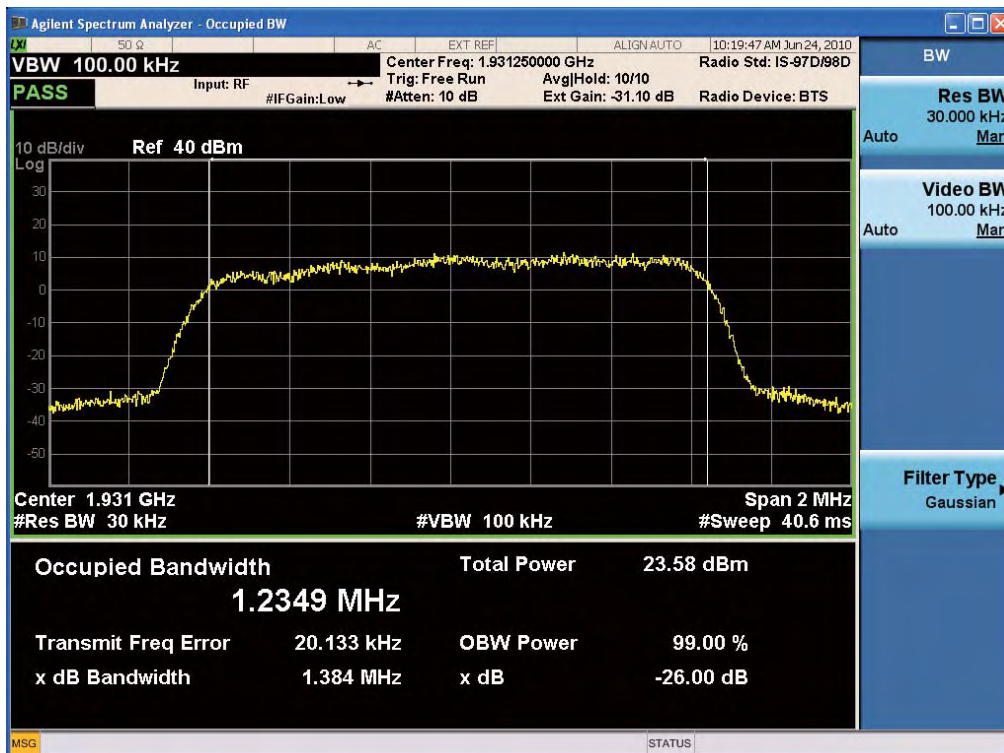




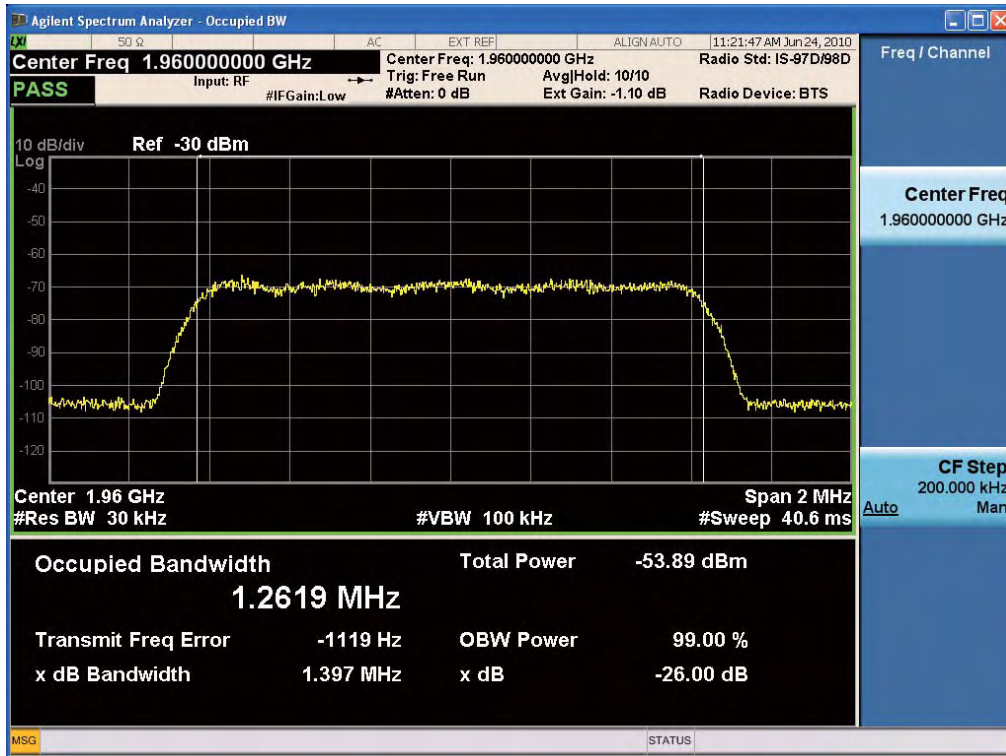
Downlink Low CH (PCS) Input Signal



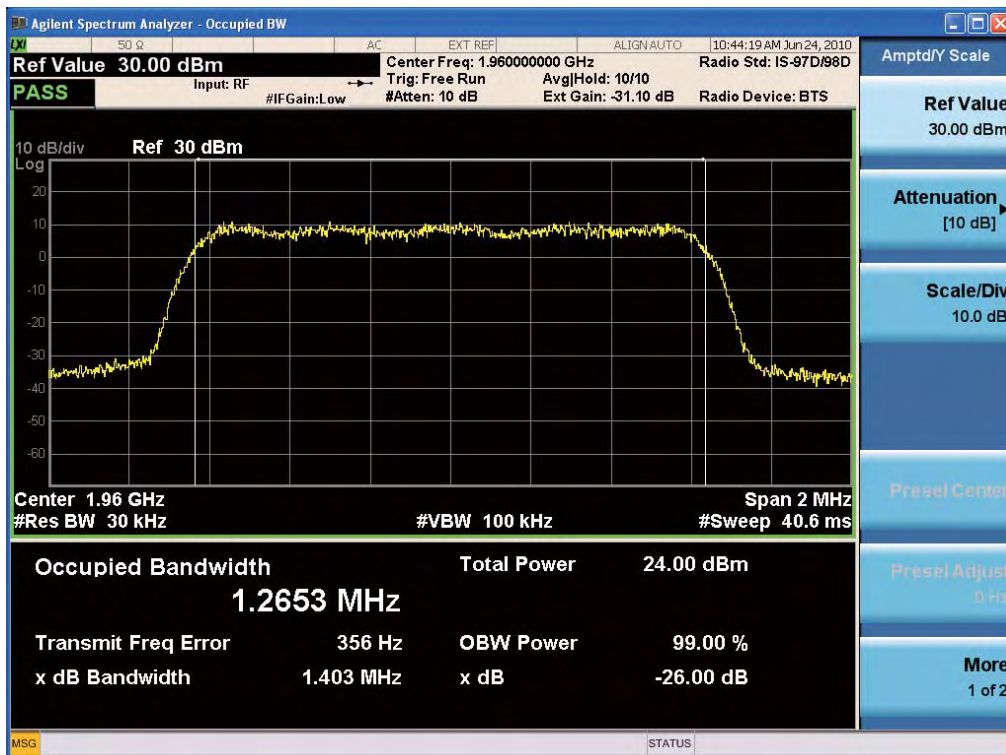
Downlink Low CH (PCS) Output Signal



**Downlink Mid CH (PCS) Input Signal**

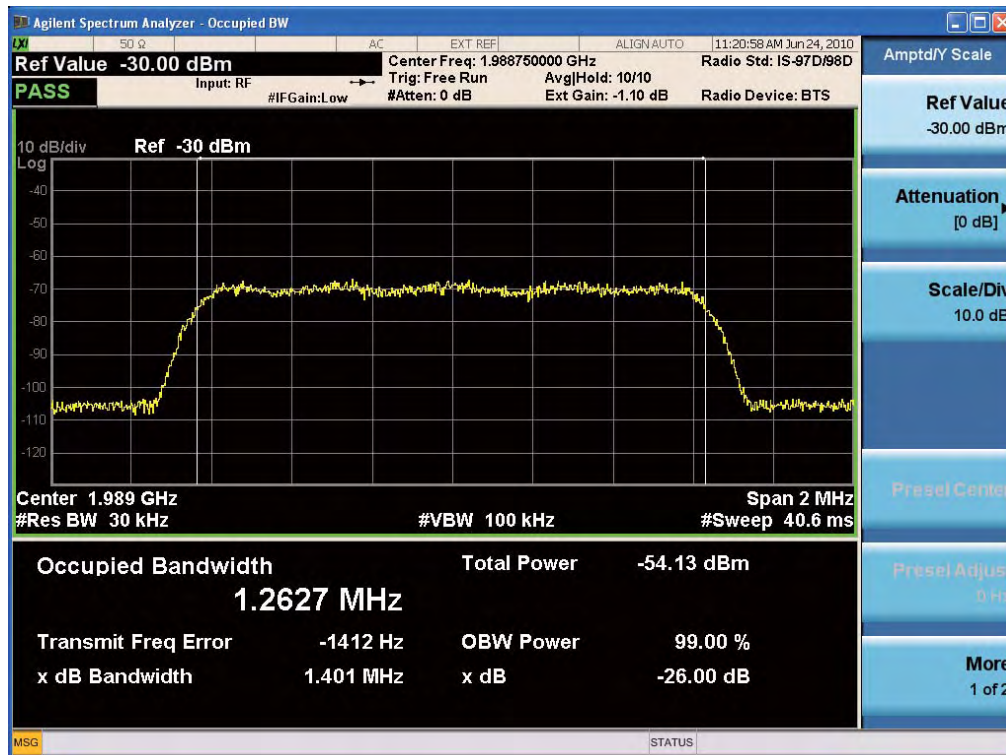


**Downlink Mid CH (PCS) Output Signal**

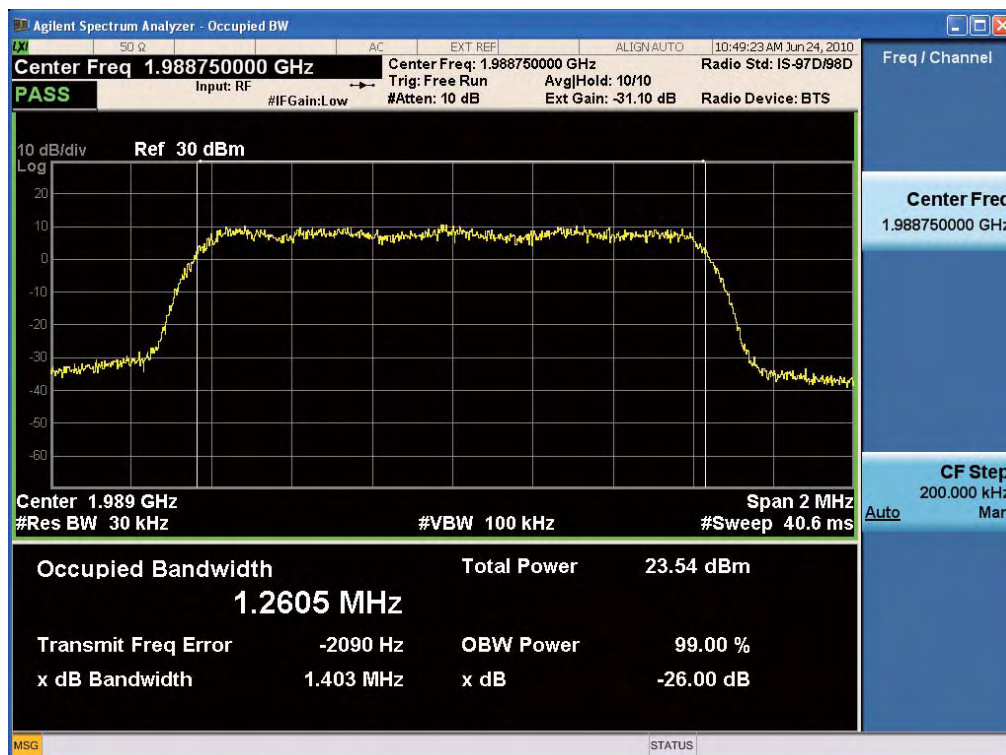




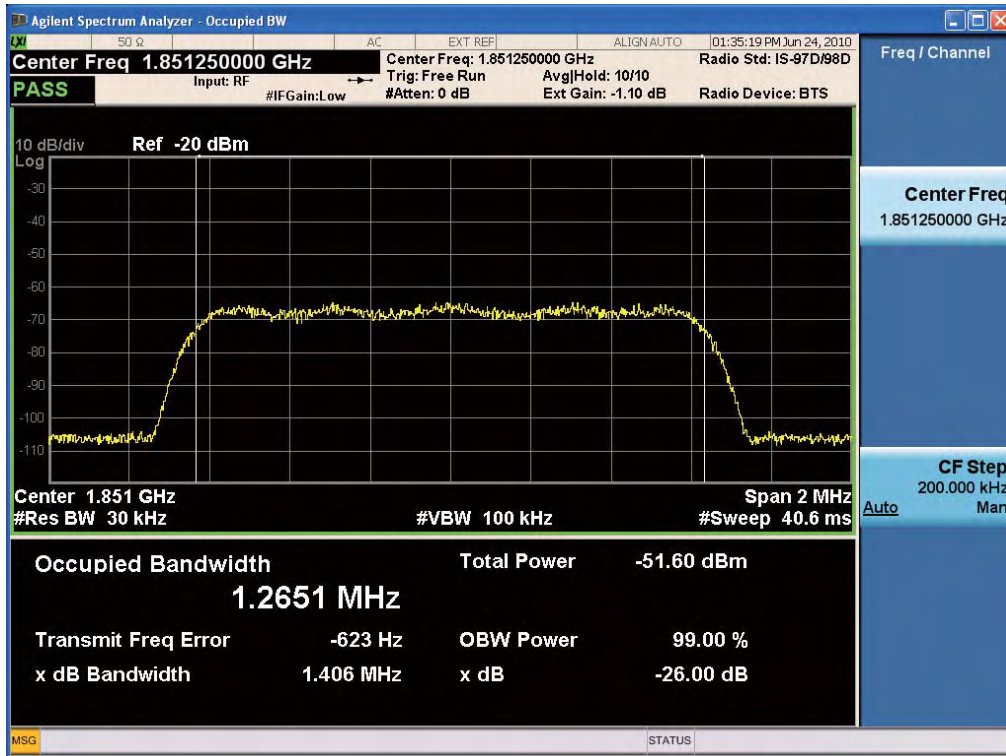
### Downlink High CH (PCS) Input Signal



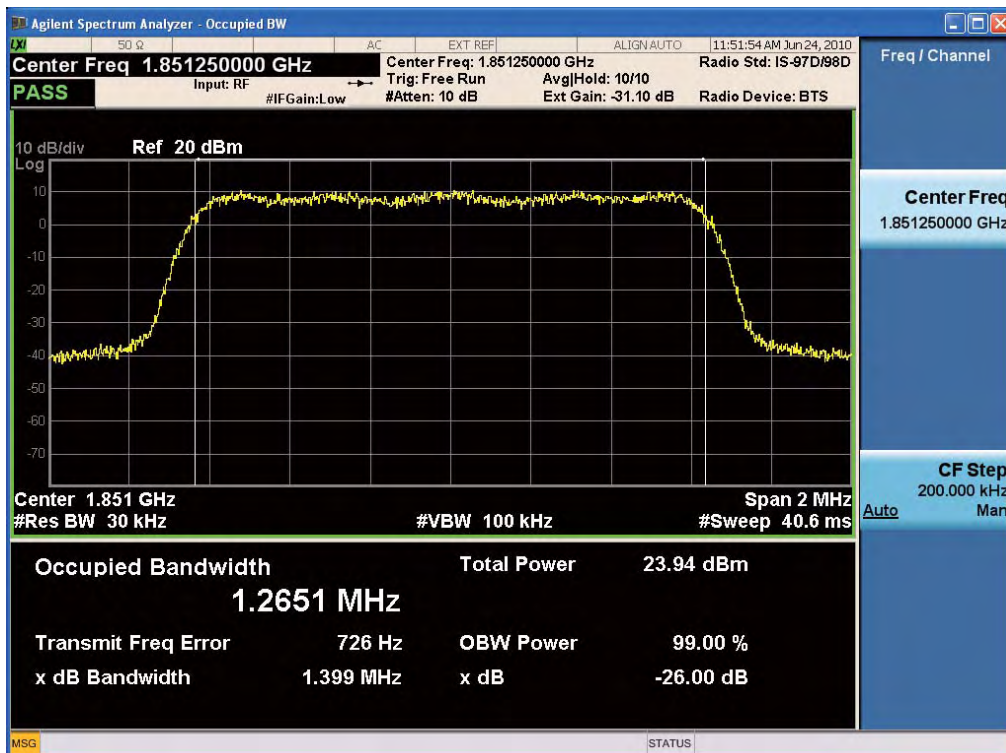
### Downlink High CH (PCS) Output Signal



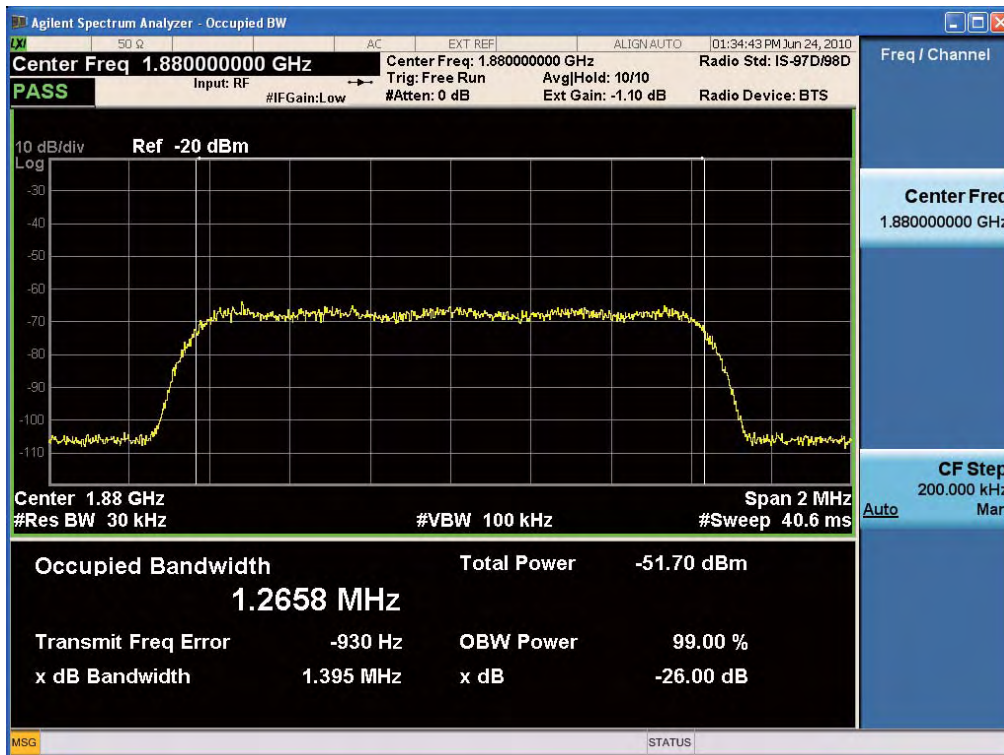
**Uplink Low CH (PCS) Input Signal**



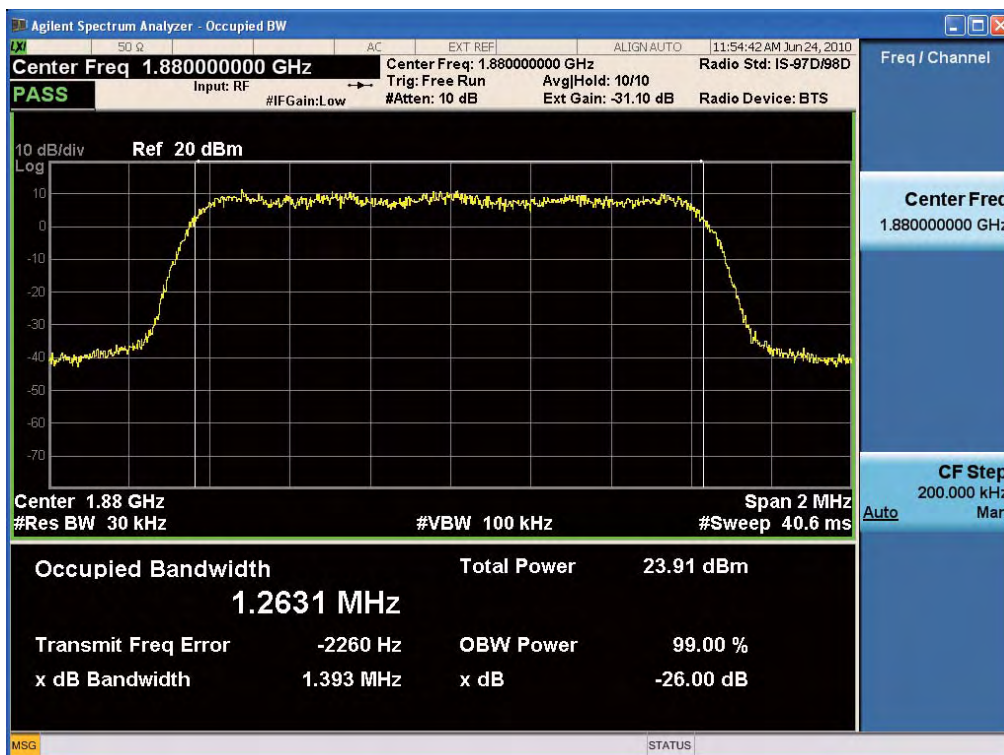
**Uplink Low CH (PCS) Output Signal**



### Uplink Mid CH (PCS) Input Signal

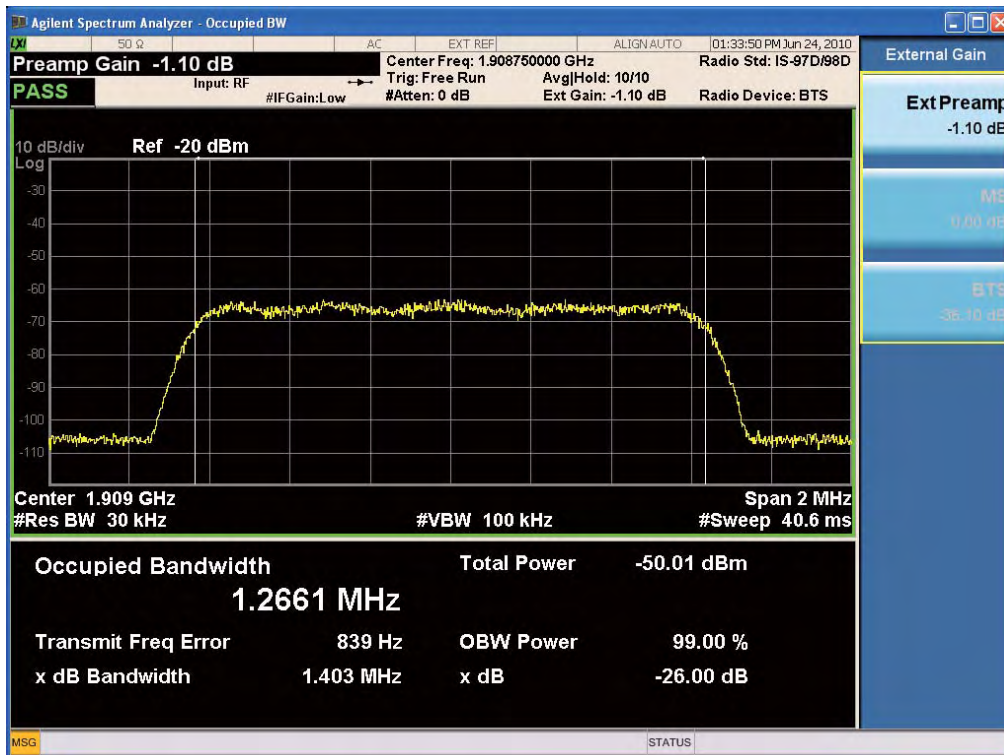


### Uplink Mid CH (PCS) Output Signal

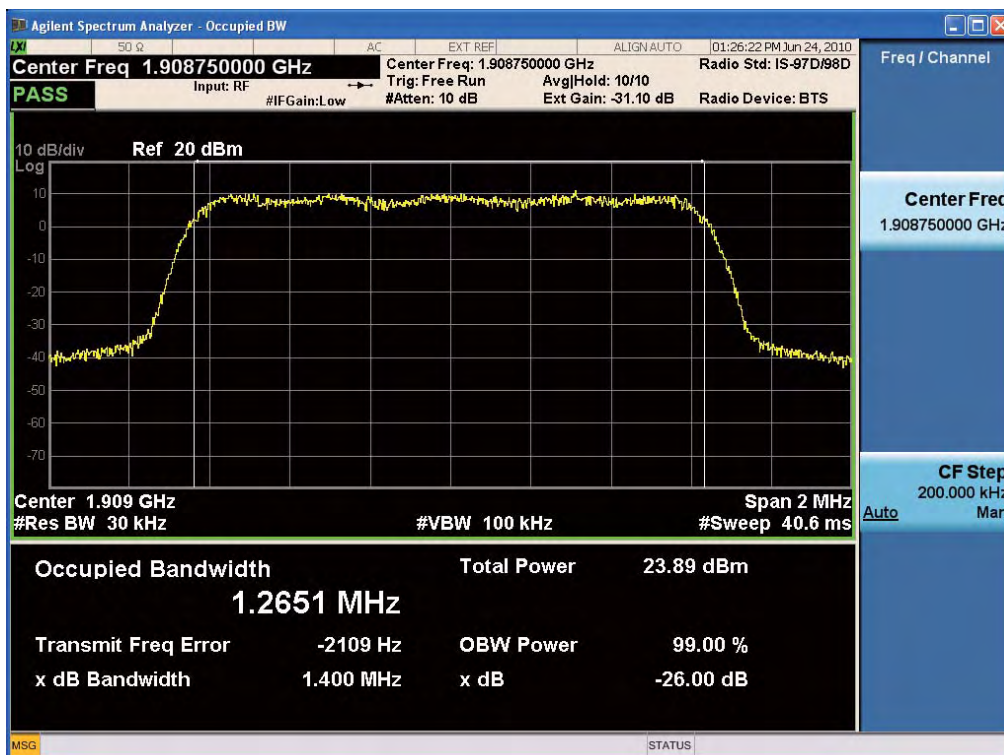




### Uplink High CH (PCS) Input Signal



### Uplink High CH (PCS) Output Signal



## 7. 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.

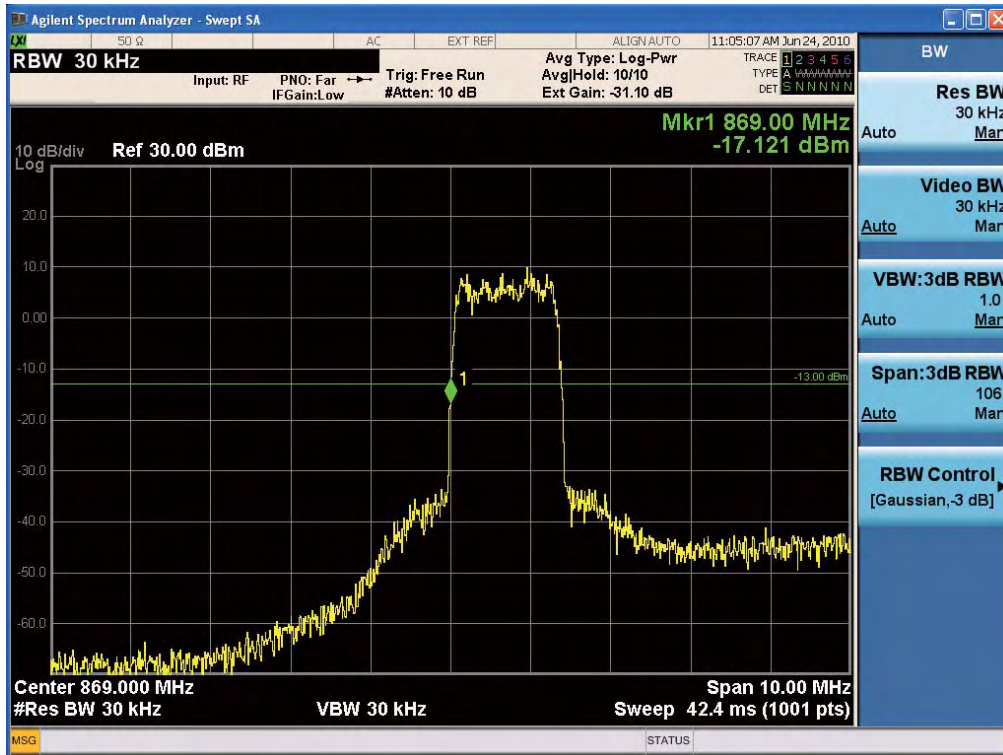
**§ 22.917, §24.238 Emission limitations for Broadband PCS equipment:** The rules in this section govern the spectral characteristics of emissions in the Broadband Personal Communications Service. § 22.917 (a), § 24.238 (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

**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 OEM A spectrum analyzer was connected to either the Uplink or Downlink port depending on the circuitry being measured. The spectrum was investigated from 30 MHz to the 26.5 GHz of the carrier.

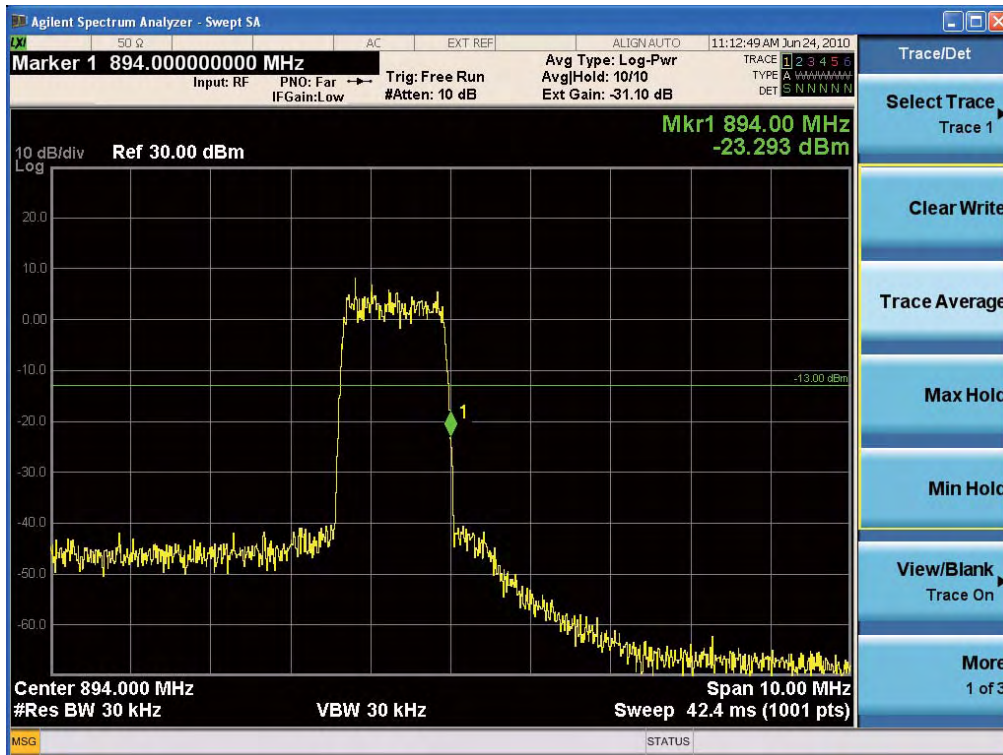
**Test Results:** The EUT complies with the requirements of this section. There were no detectable spurious emissions for this EUT.

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## Plots of BAND EDGE

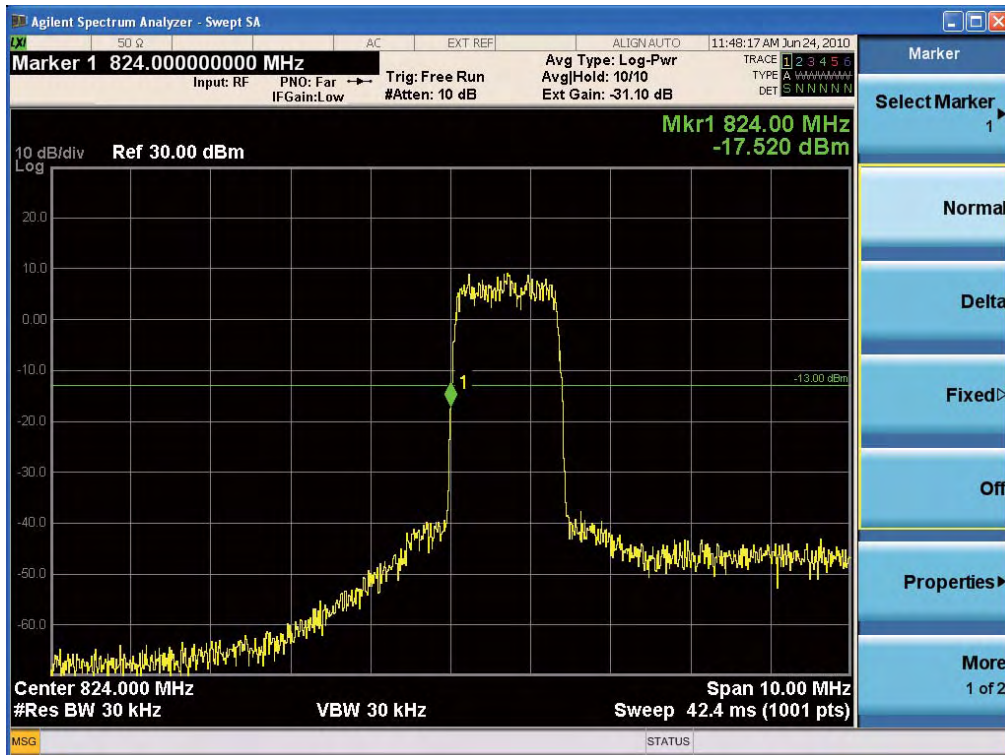


(Downlink Low CH-Cellular)

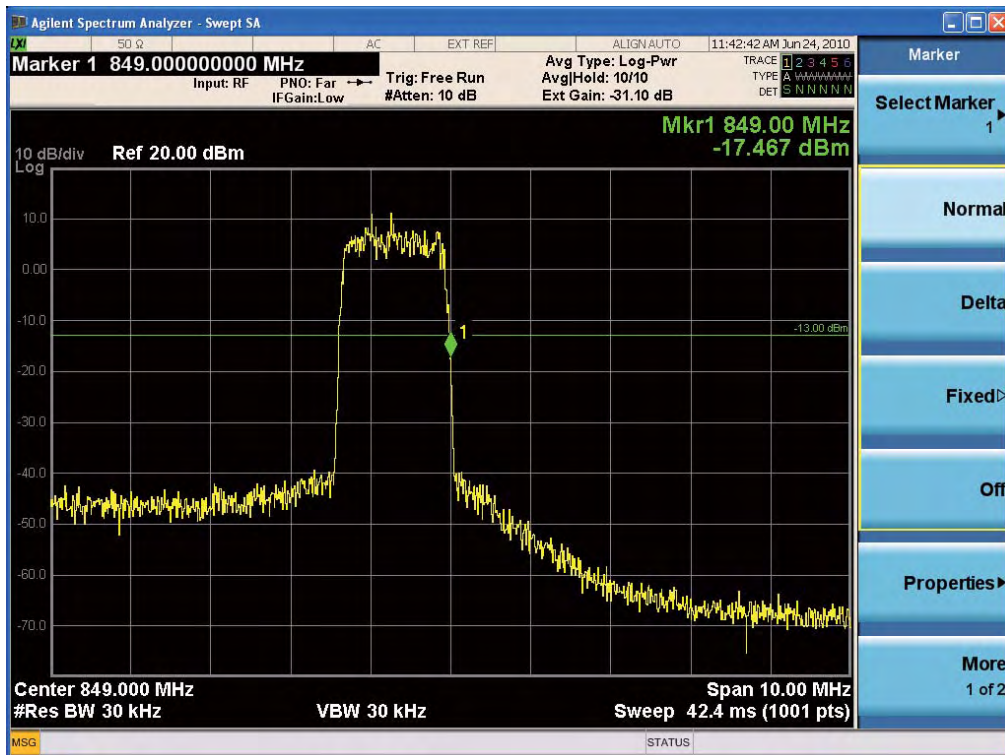


(Downlink High CH-Cellular)





(Uplink Low CH-Cellular)



(Uplink High CH-Cellular)