



**HCT CO., LTD.**  
**CERTIFICATION DIVISION**  
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**CERTIFICATE OF COMPLIANCE**  
**TEST REPORT**

**JUNI Korea Co. Ltd.**

E-603 Bundang-gu, Seongnam-si, Gyeonggi-do, South Korea

Date of Issue: March 28, 2011

Test Report No.: HCTR1103FR09-2

Test Site: HCT CO., LTD.

**FCC**

**YUL-JL20**

**APPLICANT**

**JUNI Korea Co. Ltd.**

EUT Type: LTE 700M RF Repeater

Model(s): JL-20

UL Frequency:  
777.0 MHz – 787.0 MHz  
698.5 MHz – 703.5 MHz  
704.5 MHz – 709.5 MHz

DL Frequency:  
746.0 MHz – 756.0 MHz  
728.5 MHz – 733.5 MHz  
734.5 MHz – 739.5 MHz

Max. RF Output Power: 20 dBm (0.1 W)

Trade Name/Model(s): JUNI Korea Co. Ltd. / JL-20

FCC Classification: Licensed Non-Broadcast Station Transmitter (TNB)

Application Type: Certification

FCC Rule Part(s): §2, §15 Subpart B, §27 Subpart C

Emission Designator(s):  
Band C : 8M91G9W / 8M91D9W  
Band A : 4M48G9W / 4M48D9W  
Band B : 4M49G9W / 4M49D9W

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in § 2.947.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

HCT Co., Ltd. Certifies that no party to this application has been denied FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998, 21 U.S.C. 853(a)

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

# Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1103FR09	March 11, 2011	- First Approval Report
HCTR1103FR09-1	March 17, 2011	Add of the 27.53(c) (4).
HCTR1103FR09-1	March 28, 2011	Add of the 27.53(f) Radiated.

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# MEASUREMENT REPORT

## 1. SCOPE

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

### General Information

Company Name: JUNI Korea Co. Ltd.  
Address: E-603 Bundang-gu, Seongnam-si,  
Gyeonggi-do, South Korea  
  
Tel. / Fax : + 82-32-870-5782 / + 82-32-870-5784

FCC: YUL-JL20  
EUT Type: LTE 700M RF Repeater  
Trade Name: JUNI Korea Co. Ltd.  
Model(s): JL-20  
Frequency Ranges Uplink : 777.0 MHz – 787.0 MHz  
698.5 MHz - 703.5 MHz  
704.5 MHz - 709.5 MHz  
Downlink: 746.0 MHz – 756.0 MHz  
728.5 MHz - 733.5 MHz  
734.5 MHz - 739.5 MHz  
Application Type: Certification  
FCC Classification: Licensed Non-Broadcast Station Transmitter (TNB)  
FCC Rule Part(s): §2, §15 Subpart B, §27 Subpart C  
Modulation(s): QPSK, 16QAM, 64QAM  
RF Output Power: Uplink: 20 dBm  
Downlink : 20 dBm

## 2. INTRODUCTION

### EUT DESCRIPTION

The JUNI Korea Co. Ltd. JL-20 LTE 700M RF Repeater.

Its basic purpose is used for communications.

It transmits from Uplink : 777 - 787 MHz, 698.5 - 703.5 MHz, 704.5 - 709.5 MHz  
and receives from Downlink: 746 - 756 MHz, 728.5 - 733.5 MHz, 734.5 MHz - 739.5 MHz.

The RF power is rated at 100 mW (20 dBm).

### MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### TEST FACILITY

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 105-1, Jangam-ri , Majang-Myeon, Icheon-si, 467-811, KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated June 10, 2009 (Registration Number: 90661)

### 3. DESCRIPTION OF TESTS

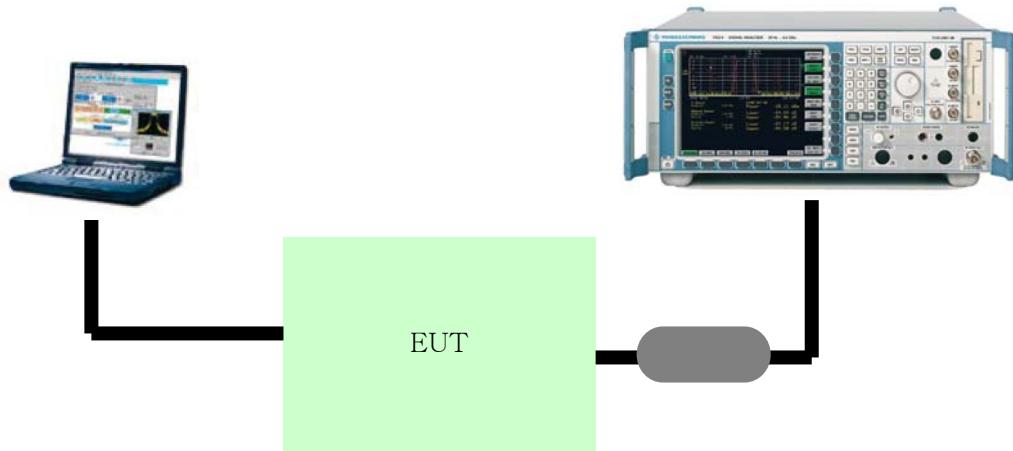
#### Test Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1046 27.50(b) 27.50(c)	RF Power Output	< 30 W ERP	Conducted	PASS	3.1
2.1049(i)	Occupied Bandwidth	N/A		PASS	3.2
2.1051 27.53(g) 27.53(c)(4)	Conducted Spurious Emissions at Antenna Terminals	< 43 + 10log <sub>10</sub> (P[Watt]) < 65 + 10log <sub>10</sub> (P[Watt])		PASS	3.3
2.1053 27.53(g) 27.53(c)(4) 27.53(f)	Spurious Emissions	< 43 + 10log <sub>10</sub> (P[Watt]) < 65 + 10log <sub>10</sub> (P[Watt]) < 70 dBW/MHz	Radiated	PASS	3.4
2.1055 27.54	Frequency Stability	Within the allotted band	Conducted	PASS	3.5
2.1091 2.1093	RF Exposure	0.467 mW/cm <sup>2</sup>	SAR	PASS	3.6

Test Result: The product presented for testing complied with test requirements as shown above.

### 3.1 Conducted RF Power Test

#### Test Set-up



#### Test Procedure

According to FCC §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). The electrical characteristics of the radio frequency load attached to the output terminals when this test is made shall be stated.

- 1) The EUT was coupled to the spectrum analyzer and the base station simulator through a power divider. The radio frequency load attached to the EUT antenna terminal was 50 Ohm. The loss of the cables the test system is calibrated to correct the reading.
- 2) The spectrum analyzer was set to AVG Detector function and Average Trace mode.
- 3) The resolution bandwidth of the spectrum analyzer was comparable to the emission bandwidth.

## Input Signal

INPUT SIGNAL	DL	UL
<b>Source</b>	LTE Forward Noise	LTE Reverse Noise
<b>Power Level</b>	- 30.5 dBm	- 31.2 dBm
<b>Amplitude offset</b>	- 30.7 dB	- 30.7 dB

### Test Result- Down Link

Modulation Type	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit
QPSK	Upper C	751	19.95	0.0989	30
	Lower A	731	19.96	0.0991	30
	Lower B	737	20.03	0.1007	30

Modulation Type	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit
16QAM	Upper C	751	19.95	0.0989	30
	Lower A	731	19.98	0.0995	30
	Lower B	737	20.01	0.1002	30

Modulation Type	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit
64QAM	Upper C	751	19.94	0.0986	30
	Lower A	731	20.04	0.1009	30
	Lower B	737	20.00	0.1000	30

## Test Result- Up Link

Modulation Type	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit
QPSK	Upper C	782	19.90	0.0977	30
	Lower A	701	19.99	0.0998	30
	Lower B	707	20.04	0.1009	30

Modulation Type	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit
16QAM	Upper C	782	19.89	0.0975	30
	Lower A	701	19.99	0.0998	30
	Lower B	707	19.99	0.0998	30

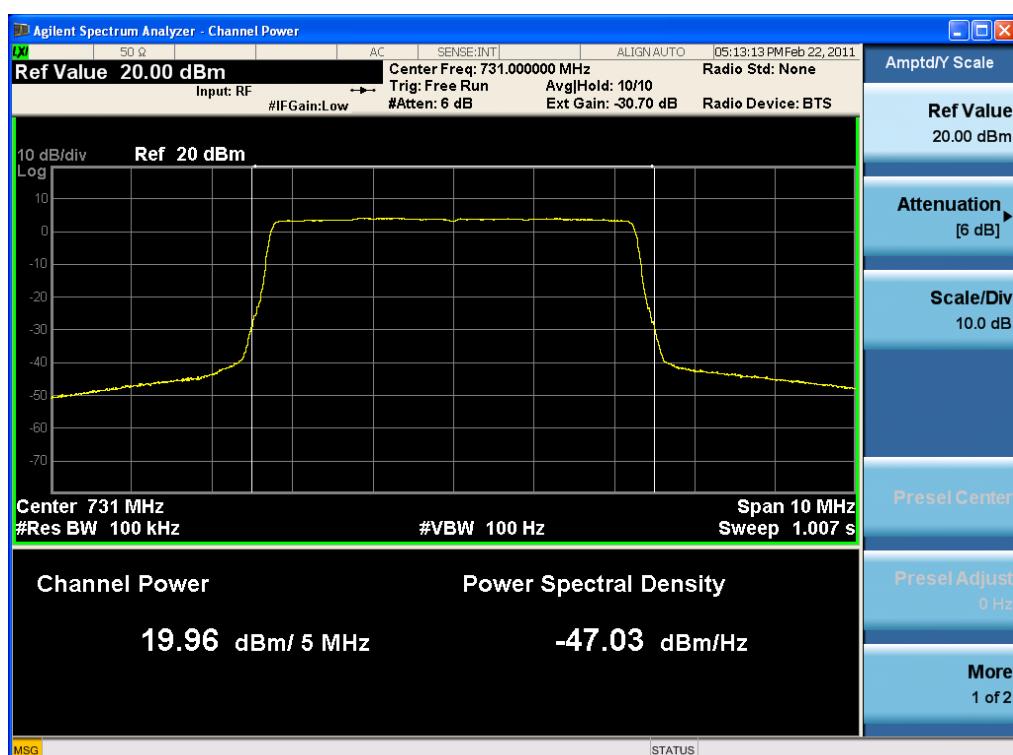
Modulation Type	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit
64QAM	Upper C	782	20.07	0.1016	30
	Lower A	701	19.98	0.0995	30
	Lower B	707	19.99	0.0998	30

## Test Plots

### [QPSK]-Down Link



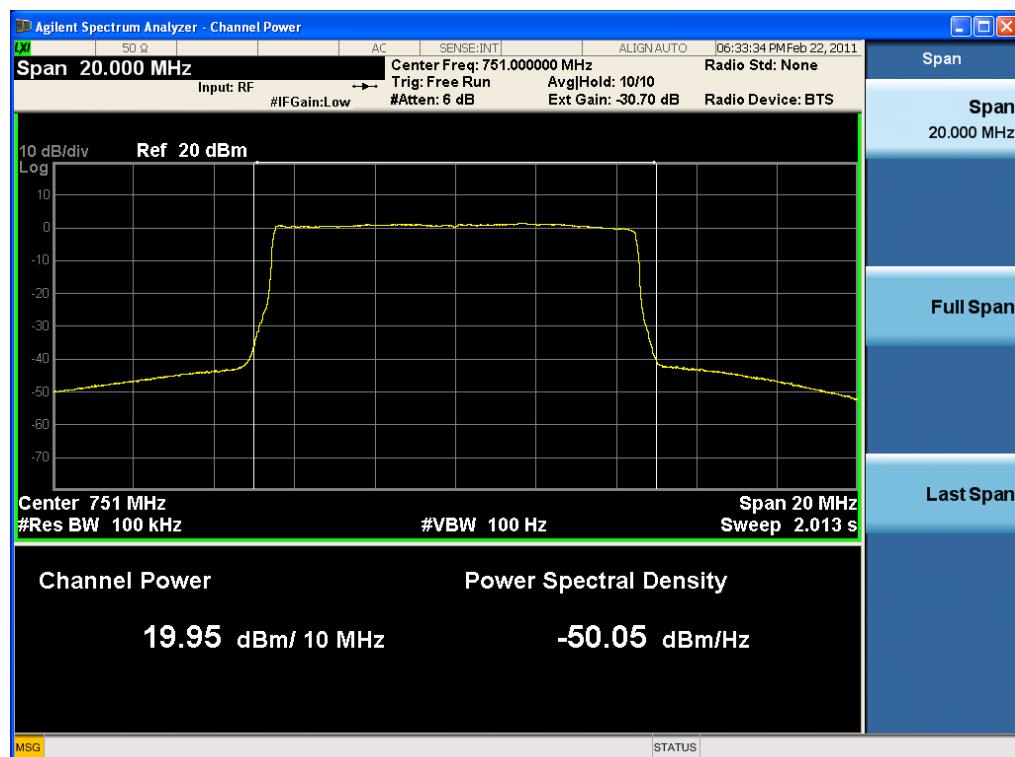
**(751 MHz)**



**(731 MHz)**

**(737 MHz)**

[16QAM] -Down Link



**(751 MHz)**



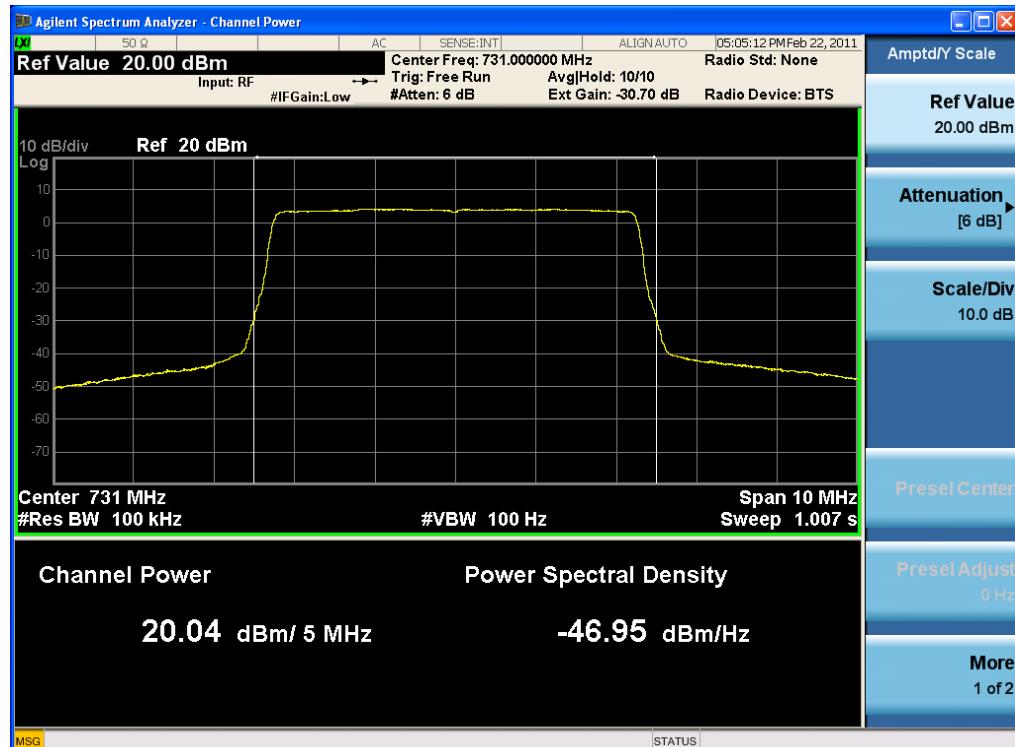
**(731 MHz)**

**(737 MHz)**

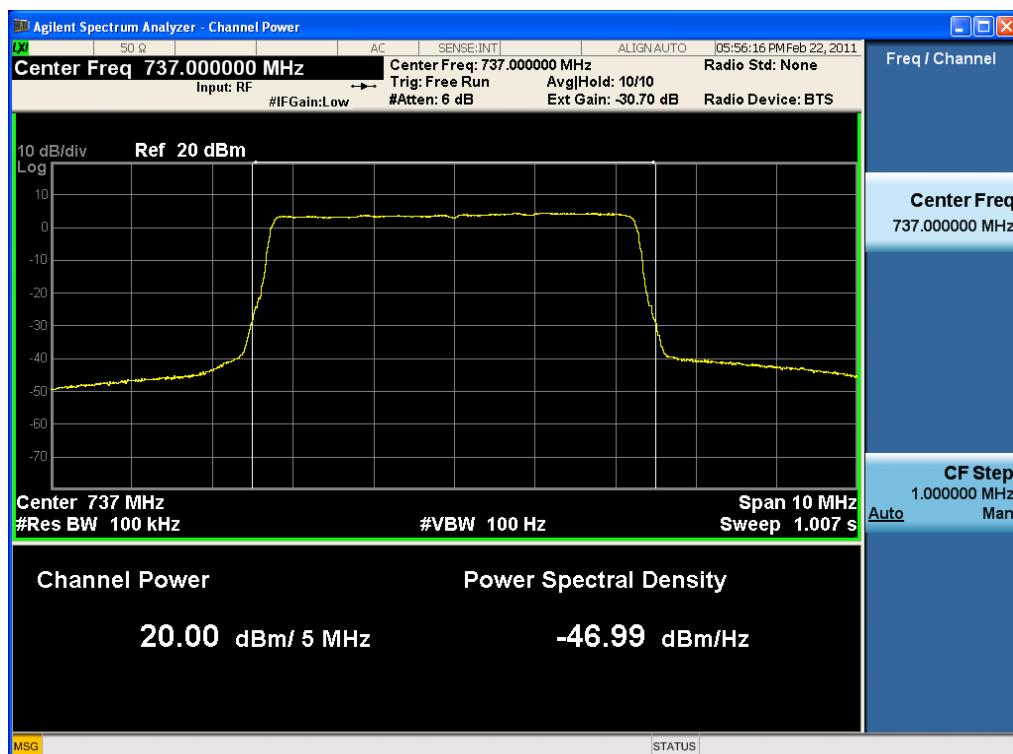
[64QAM] -Down Link



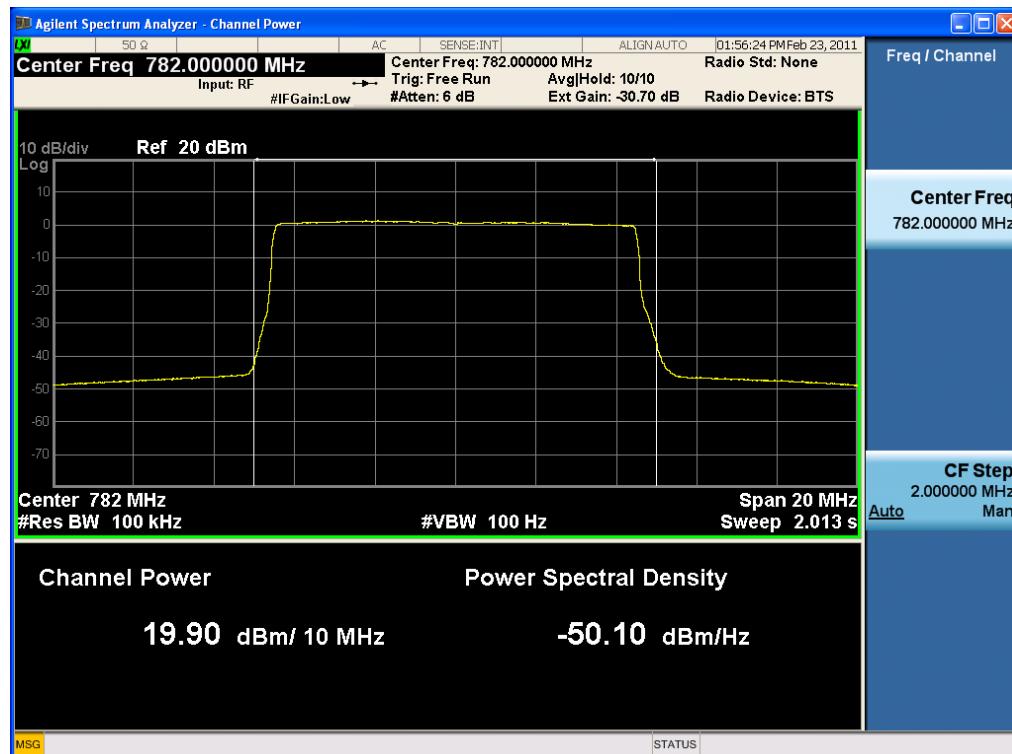
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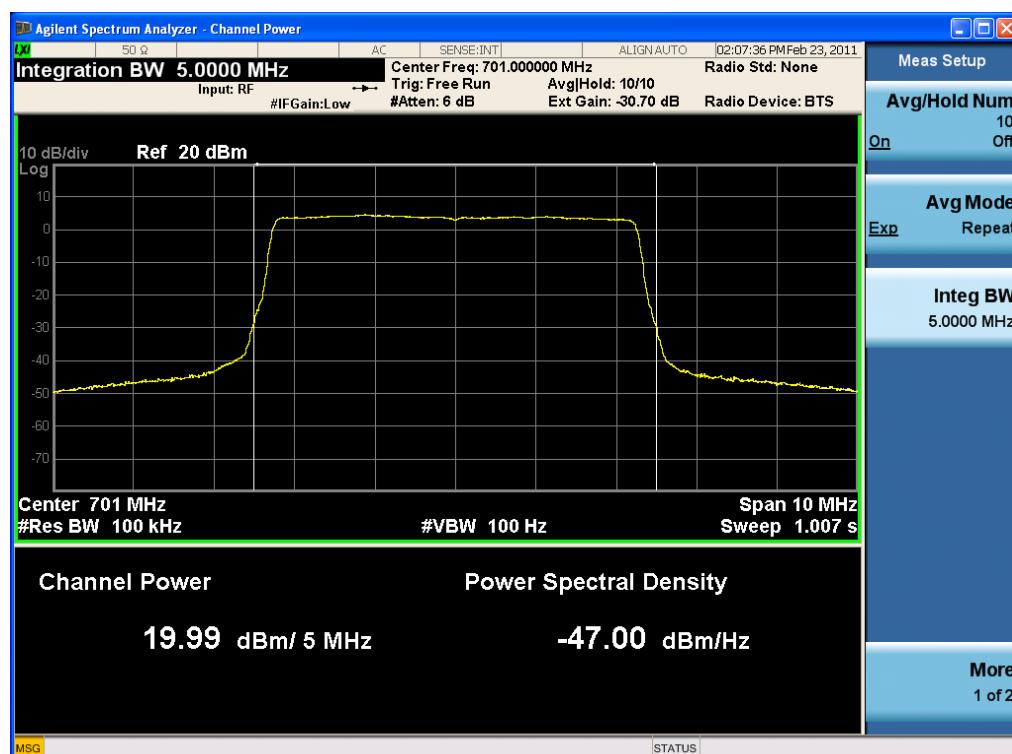
(731 MHz)

**(737 MHz)**

[QPSK]-Up Link



**(782 MHz)**



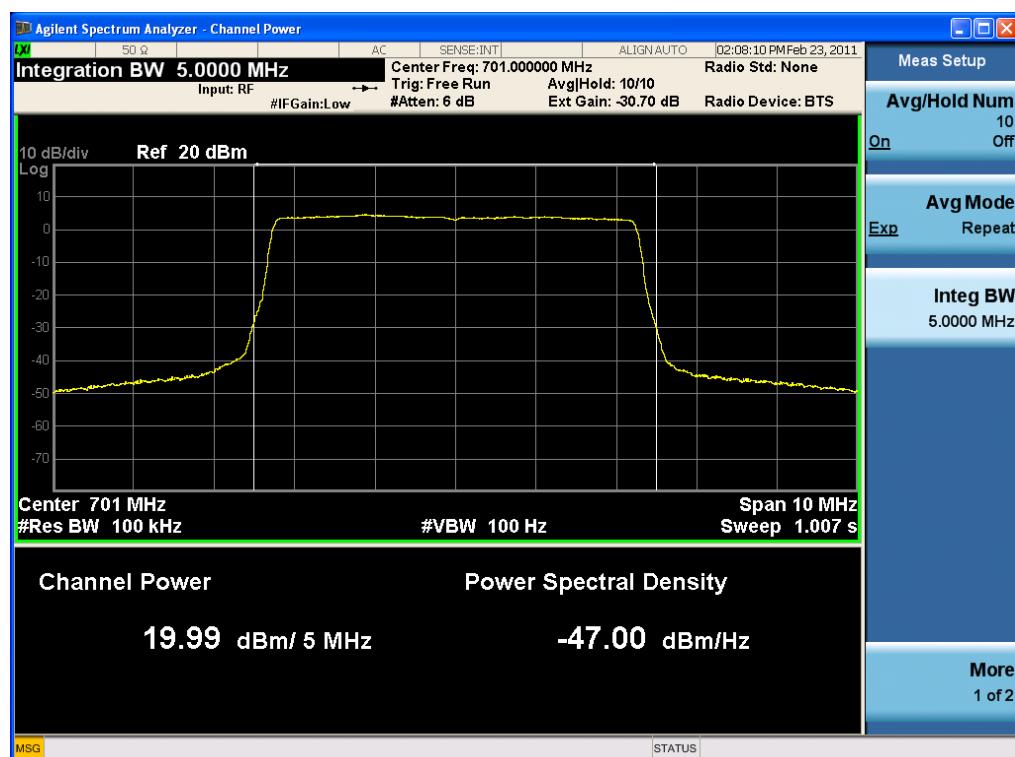
**(701 MHz)**

**(707 MHz)**

[16QAM] -Up Link



**(782 MHz)**



**(701 MHz)**

**(707 MHz)**

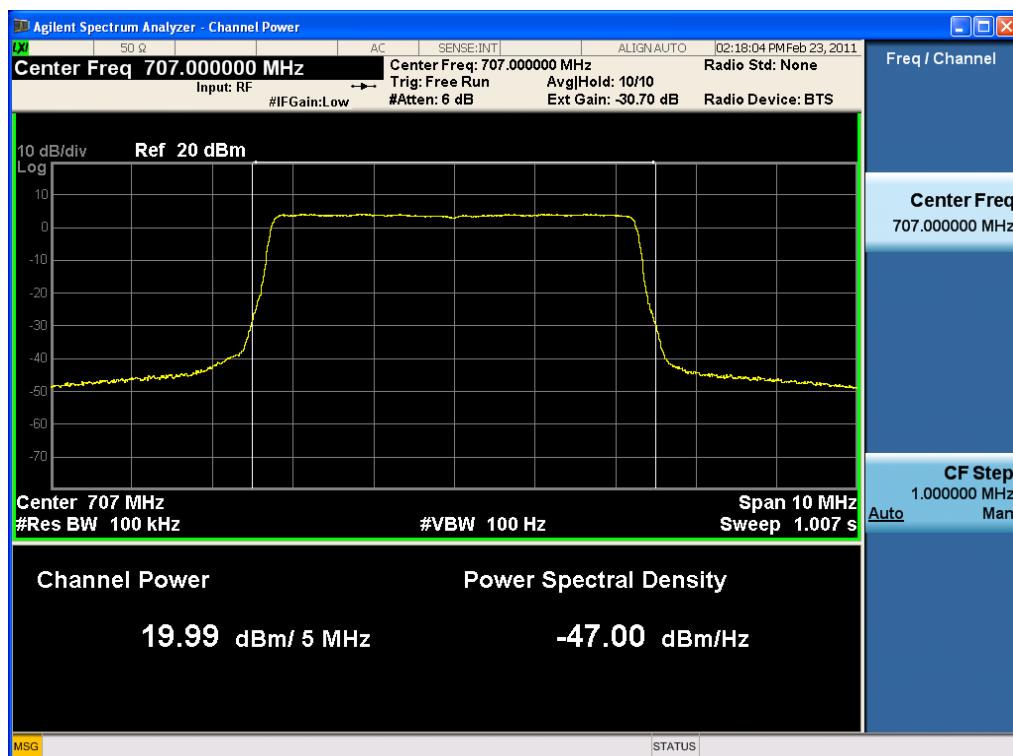
## [64QAM] -Up Link



(782 MHz)

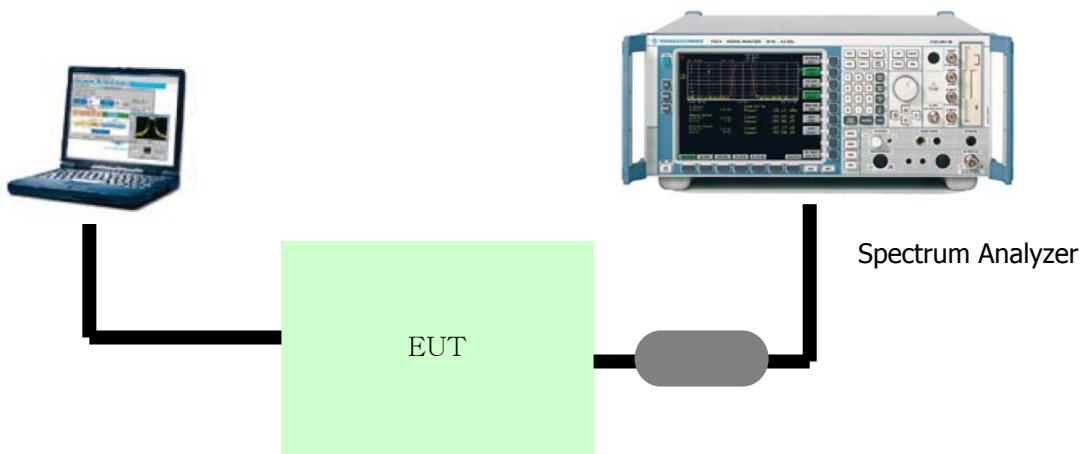


(701 MHz)

**(707 MHz)**

### 3.2 Occupied bandwidth

#### Test Set-up



#### Test Procedure

The EUT was setup to maximum output power at its lowest channel. The occupied bandwidth was measured using a spectrum analyzer. The measurements are repeated for the highest, lowest and a middle channel. The EUT's occupied bandwidth is measured by 26 dB bandwidth. Plots of the EUT's occupied bandwidth are shown herein.

#### Input Signal

INPUT SIGNAL	DL	UL
Source	LTE Forward Noise	LTE Reverse Noise
Power Level	-30.5 dBm	-31.2 dBm
Amplitude offset	-30.7 dB	-30.7 dB

## Test Result- Down Link/ Output

Modulation Type	Channel	Frequency (MHz)	Occupied BandWidth (MHz)	Limit
QPSK	Upper C	751	8.9097	-
	Lower A	731	4.4881	-
	Lower B	737	4.4918	-

Modulation Type	Channel	Frequency (MHz)	Occupied BandWidth (MHz)	Limit
16QAM	Upper C	751	8.9091	-
	Lower A	731	4.4883	-
	Lower B	737	4.4927	-

Modulation Type	Channel	Frequency (MHz)	Occupied BandWidth (MHz)	Limit
64QAM	Upper C	751	8.9093	-
	Lower A	731	4.4889	-
	Lower B	737	4.4913	-

## Test Result- Down Link/ Input

Modulation Type	Channel	Frequency (MHz)	Occupied BandWidth (MHz)	Limit
QPSK	Upper C	751	8.9530	-
	Lower A	731	4.5053	-
	Lower B	737	4.5050	-

Modulation Type	Channel	Frequency (MHz)	Occupied BandWidth (MHz)	Limit
16QAM	Upper C	751	8.9534	-
	Lower A	731	4.5049	-
	Lower B	737	4.5047	-

Modulation Type	Channel	Frequency (MHz)	Occupied BandWidth (MHz)	Limit
64QAM	Upper C	751	8.9537	-
	Lower A	731	4.5048	-
	Lower B	737	4.5052	-

## Test Result- Up Link/ Output

Modulation Type	Cannel	Frequency (MHz)	Occupied BandWidth (MHz)	Limit
QPSK	Upper C	782	8.9135	-
	Lower A	701	4.4883	-
	Lower B	707	4.4926	-

Modulation Type	Cannel	Frequency (MHz)	Occupied BandWidth (MHz)	Limit
16QAM	Upper C	782	8.9134	-
	Lower A	701	4.4870	-
	Lower B	707	4.4932	-

Modulation Type	Cannel	Frequency (MHz)	Occupied BandWidth (MHz)	Limit
64QAM	Upper C	782	8.9135	-
	Lower A	701	4.4868	-
	Lower B	707	4.4935	-

## Test Result- Up Link/ Input

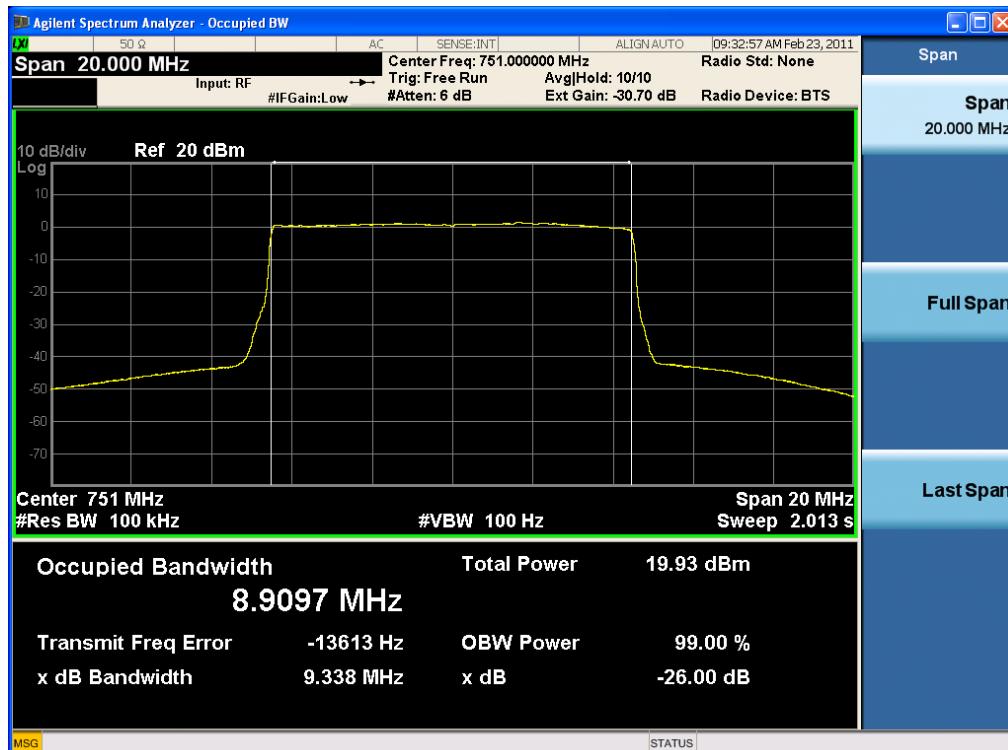
Modulation Type	Cannel	Frequency (MHz)	Occupied BandWidth (MHz)	Limit
QPSK	Upper C	782	8.9550	-
	Lower A	701	4.5050	-
	Lower B	707	4.5045	-

Modulation Type	Cannel	Frequency (MHz)	Occupied BandWidth (MHz)	Limit
16QAM	Upper C	782	8.9541	-
	Lower A	701	4.5048	-
	Lower B	707	4.5050	-

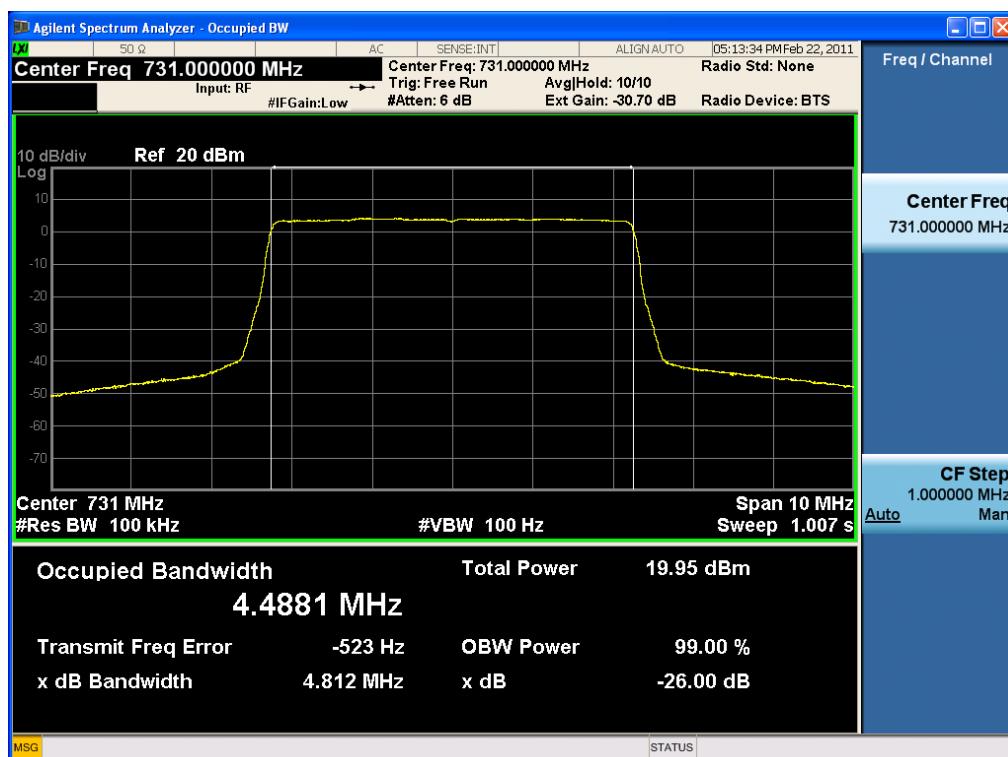
Modulation Type	Cannel	Frequency (MHz)	Occupied BandWidth (MHz)	Limit
64QAM	Upper C	782	8.9538	-
	Lower A	701	4.5046	-
	Lower B	707	4.5056	-

## Test Plots

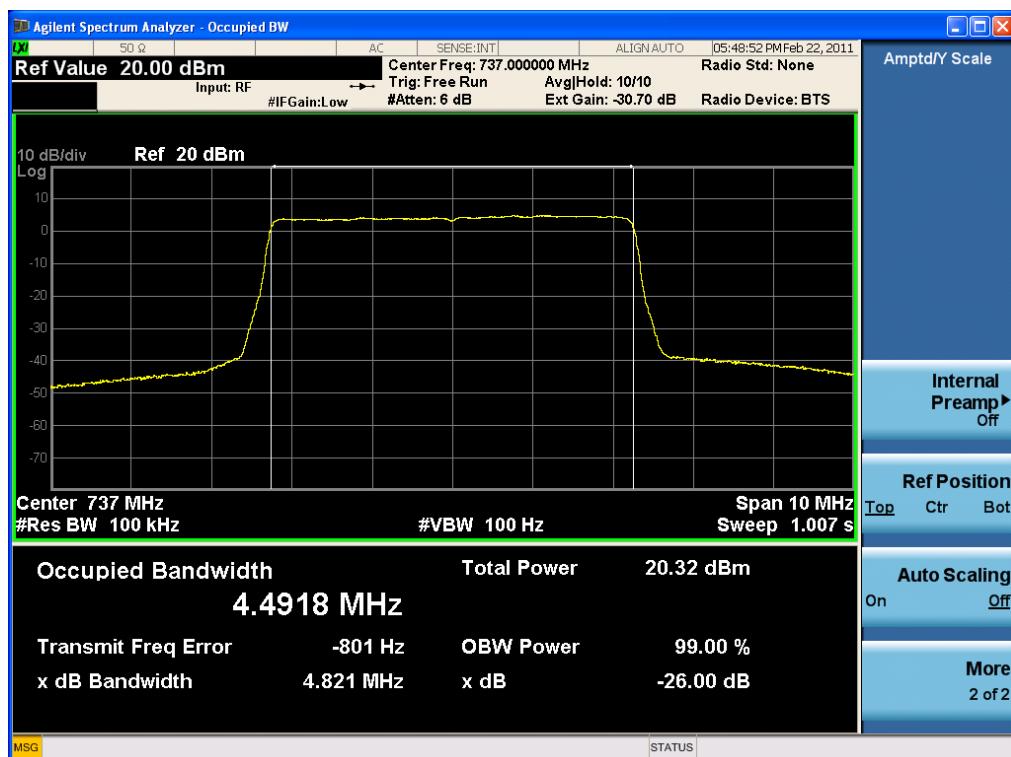
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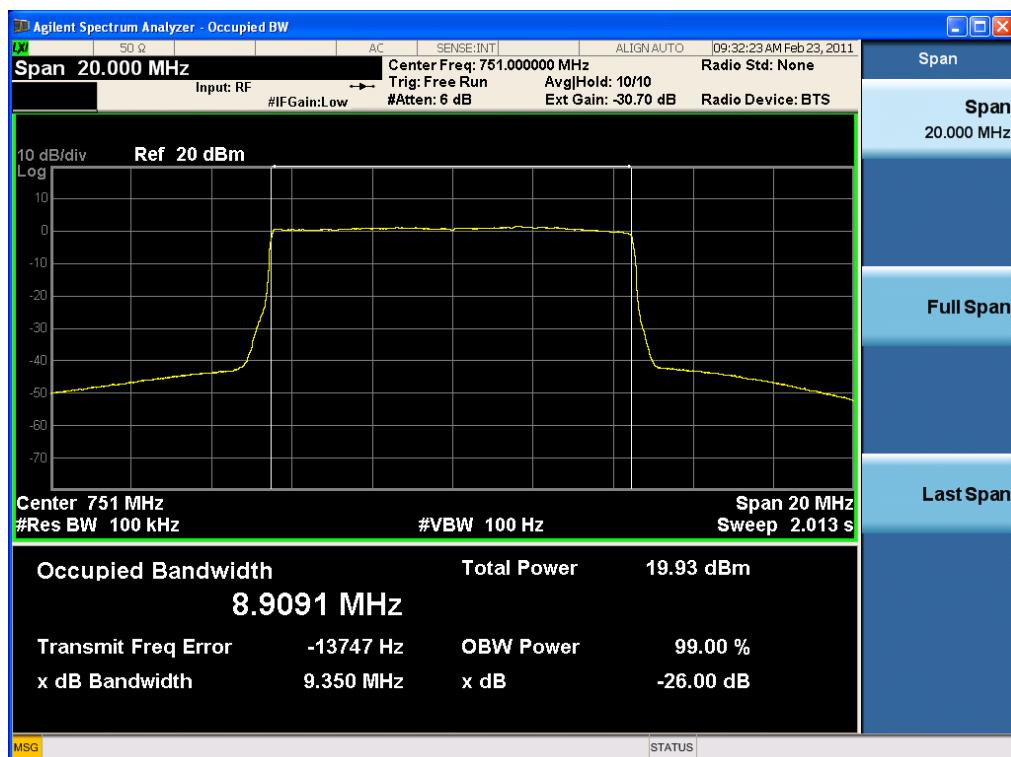
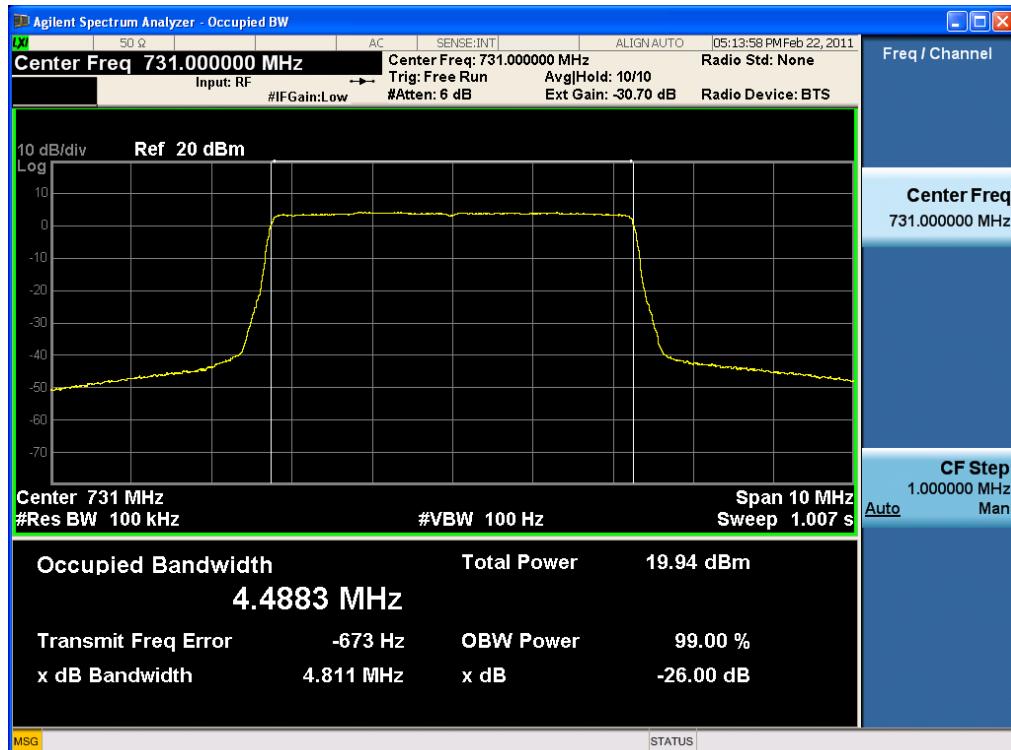


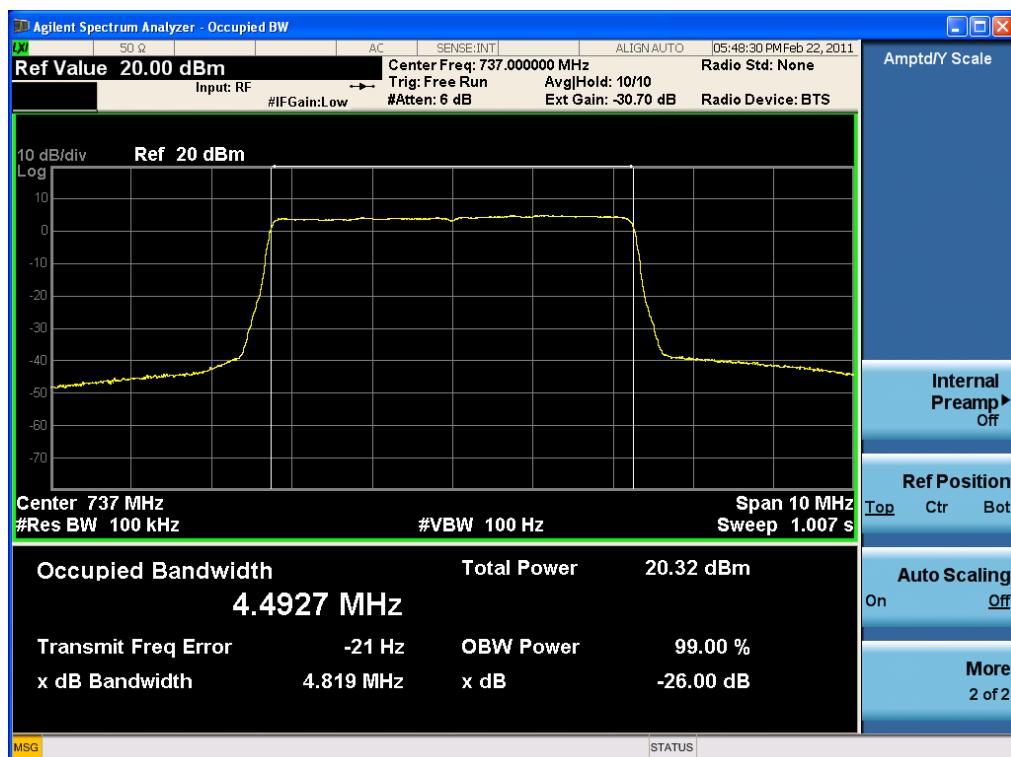
(751 MHz)



(731 MHz)

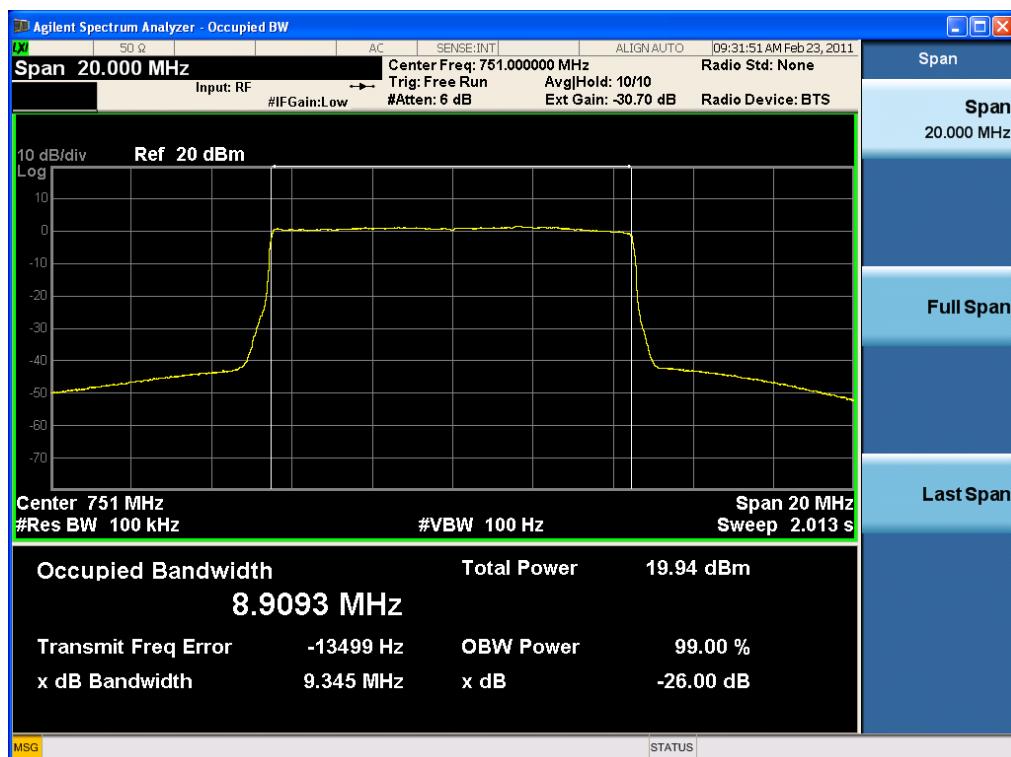
**(737 MHz)**

**[16QAM] -Down Link (Output)**

**(751 MHz)**

**(731 MHz)**

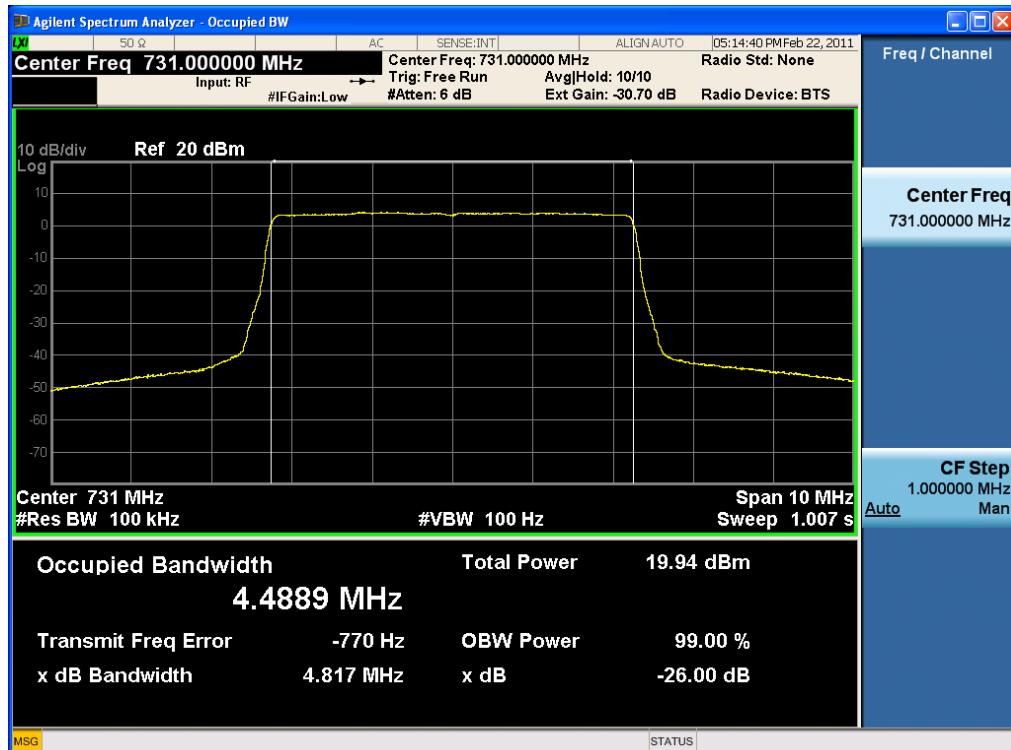


(737 MHz)

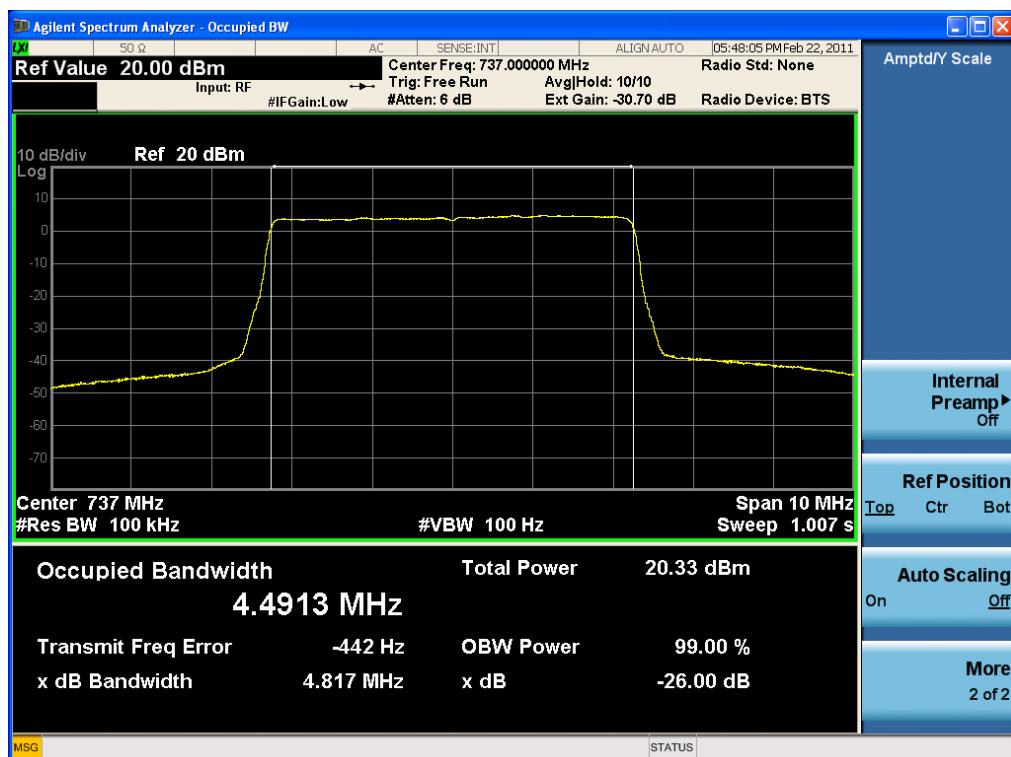
## [64QAM] -Down Link (Output)



(751 MHz)

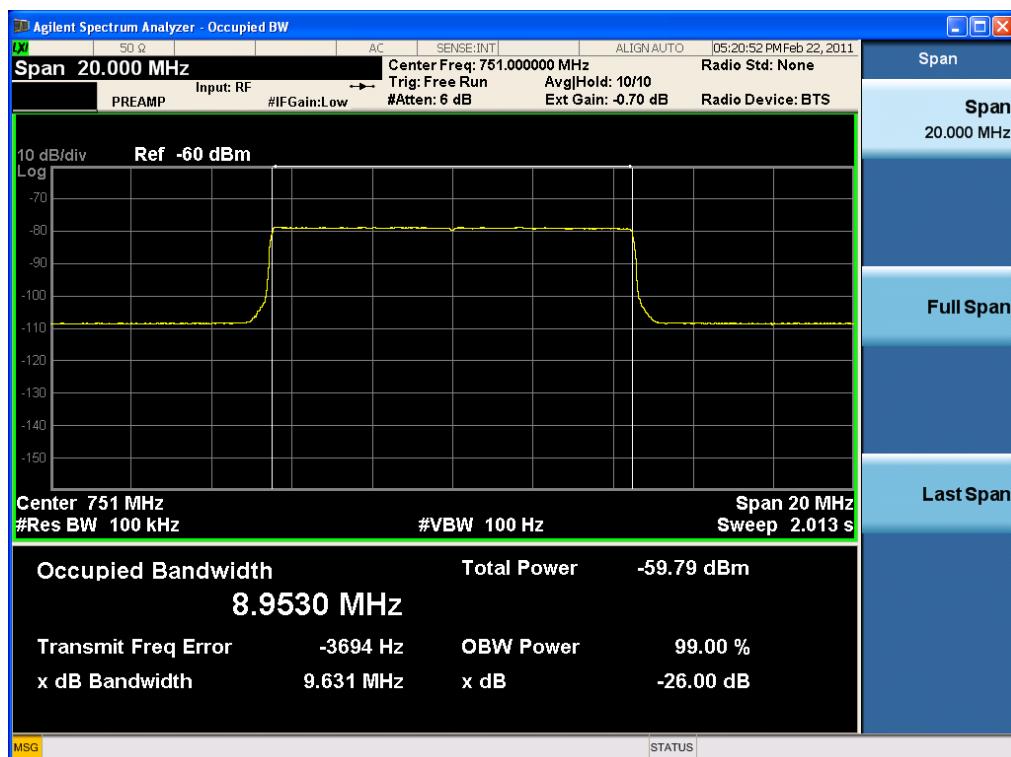


(731 MHz)



(737 MHz)

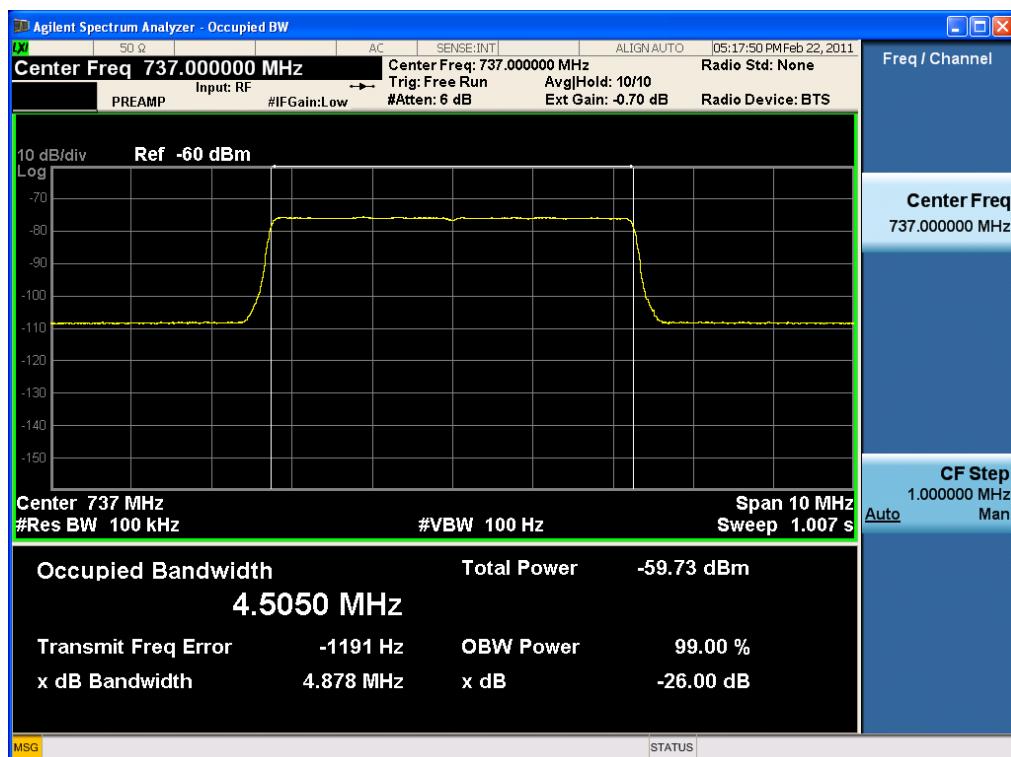
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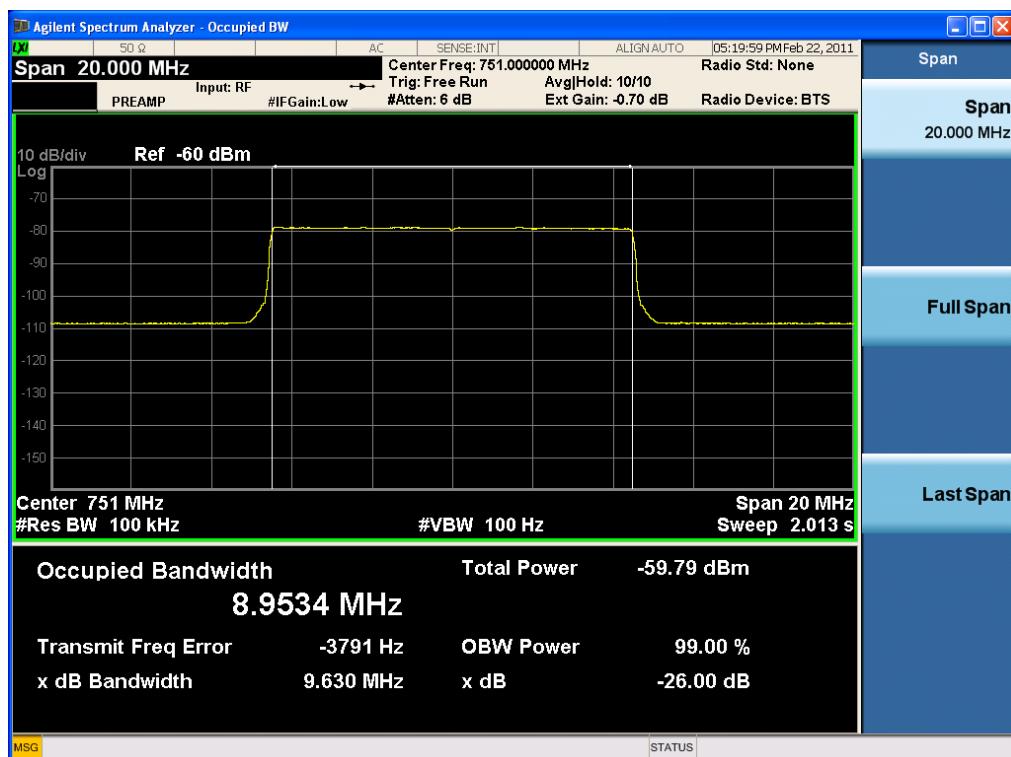
(751 MHz)



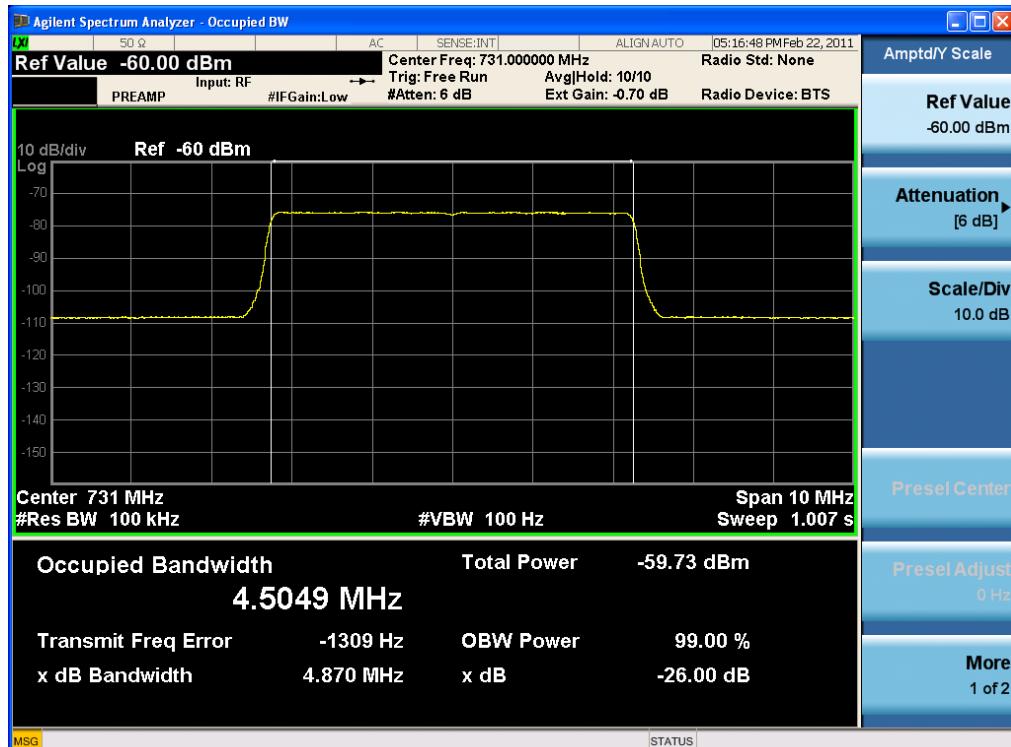
(731 MHz)

**(737 MHz)**

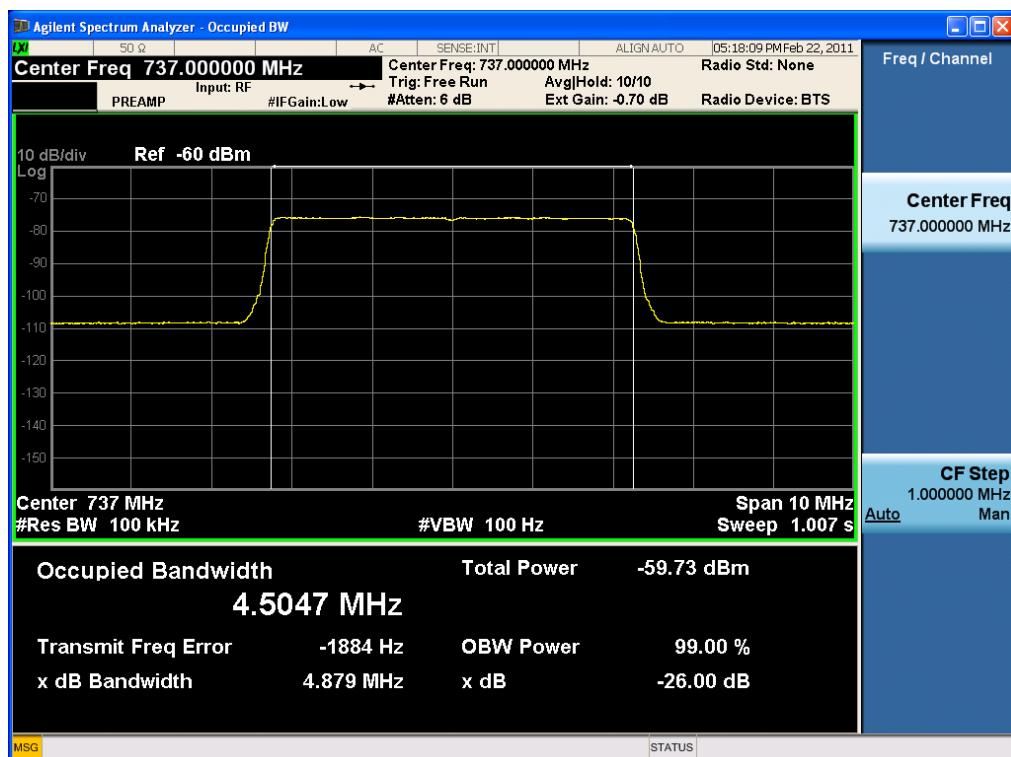
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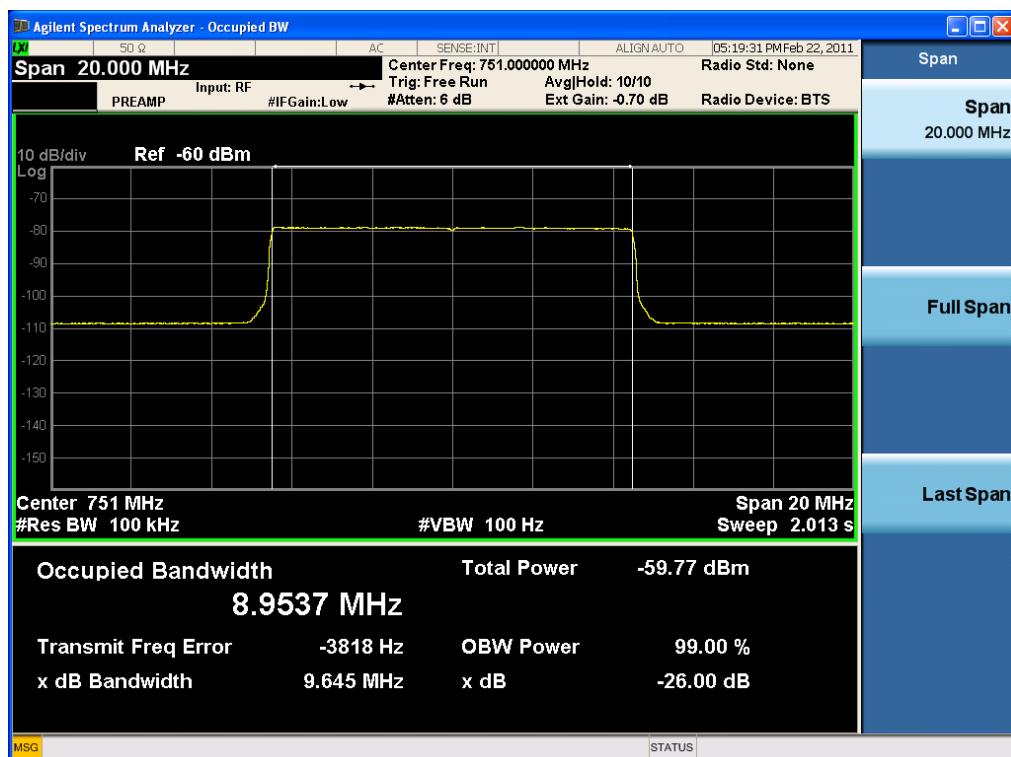
(751 MHz)



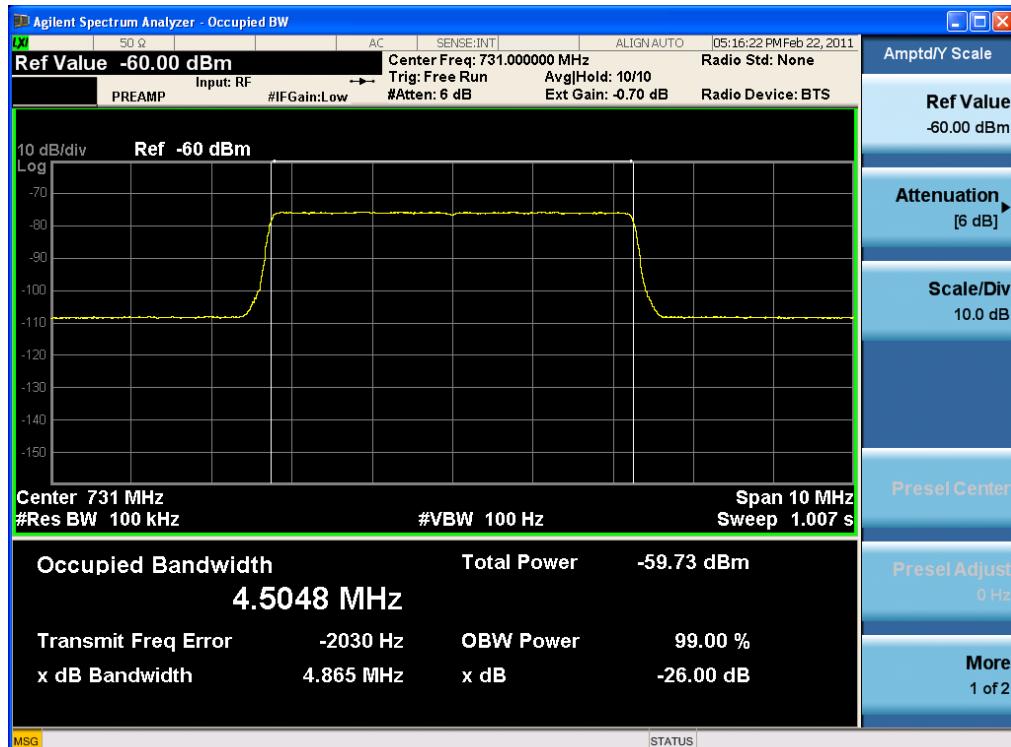
(731 MHz)

**(737 MHz)**

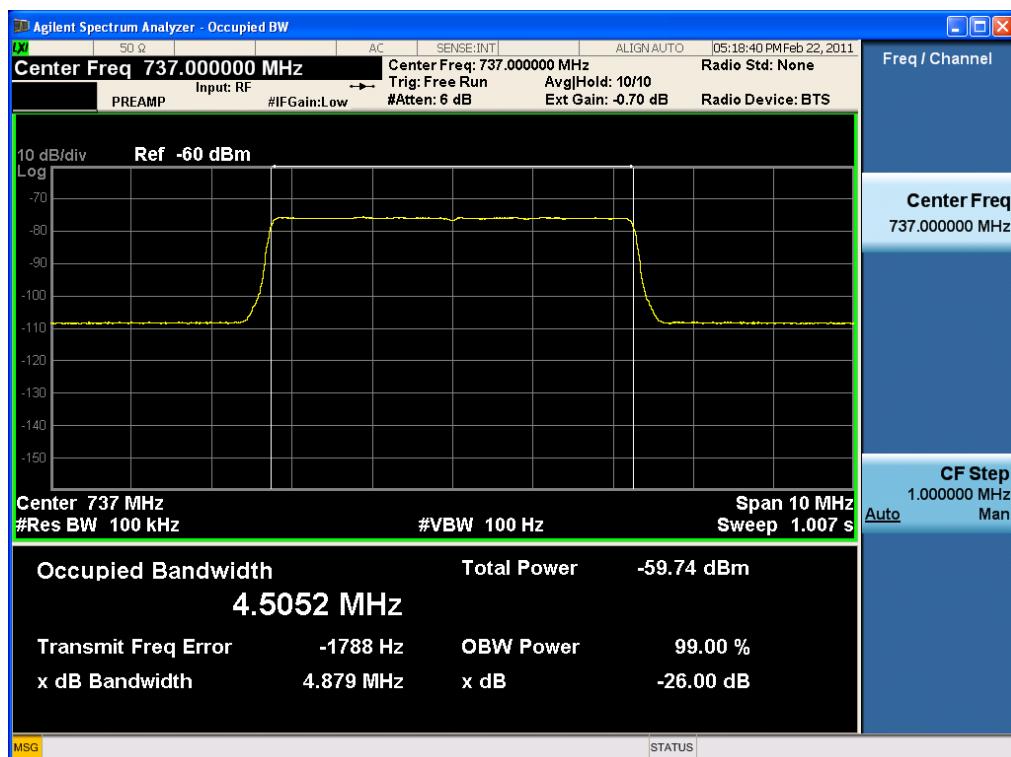
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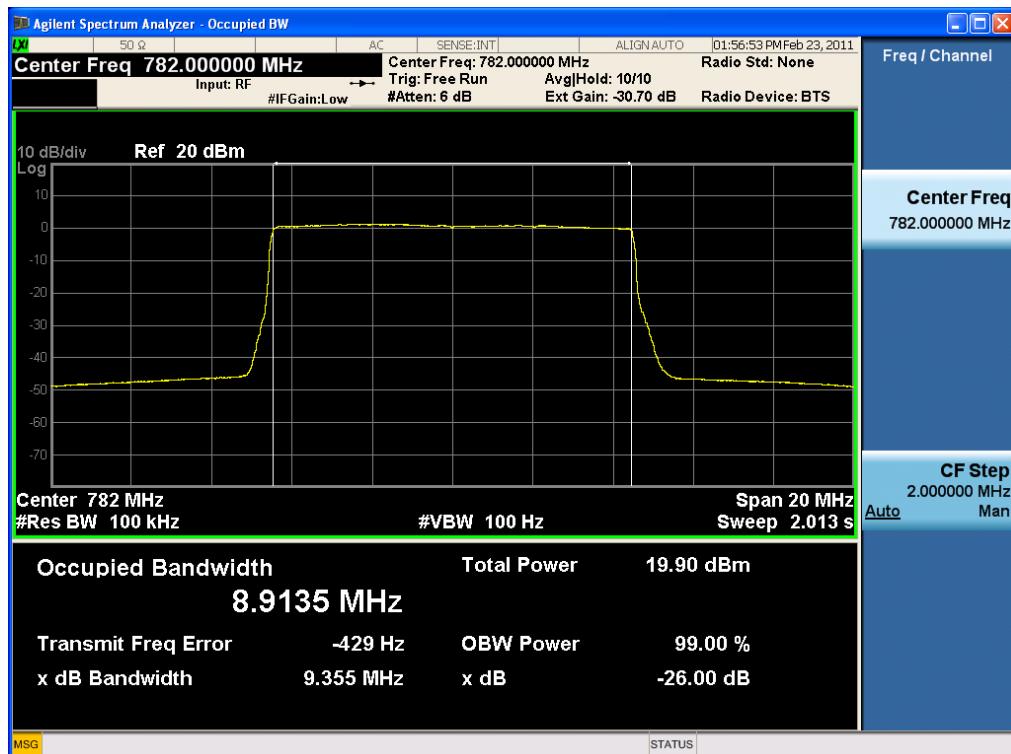
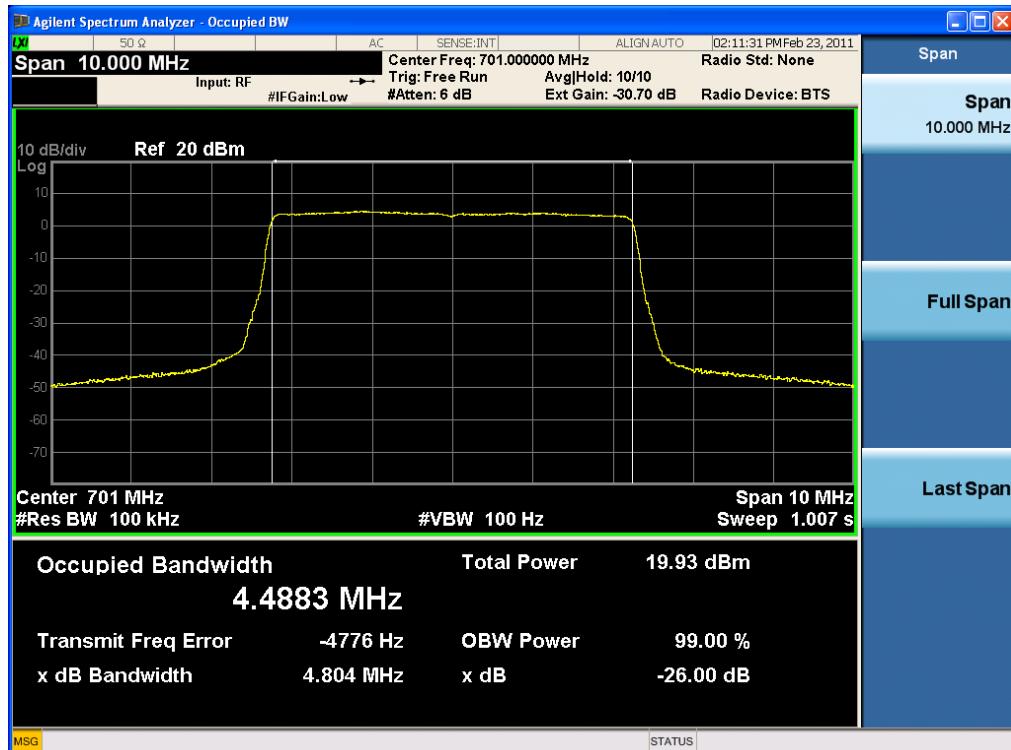


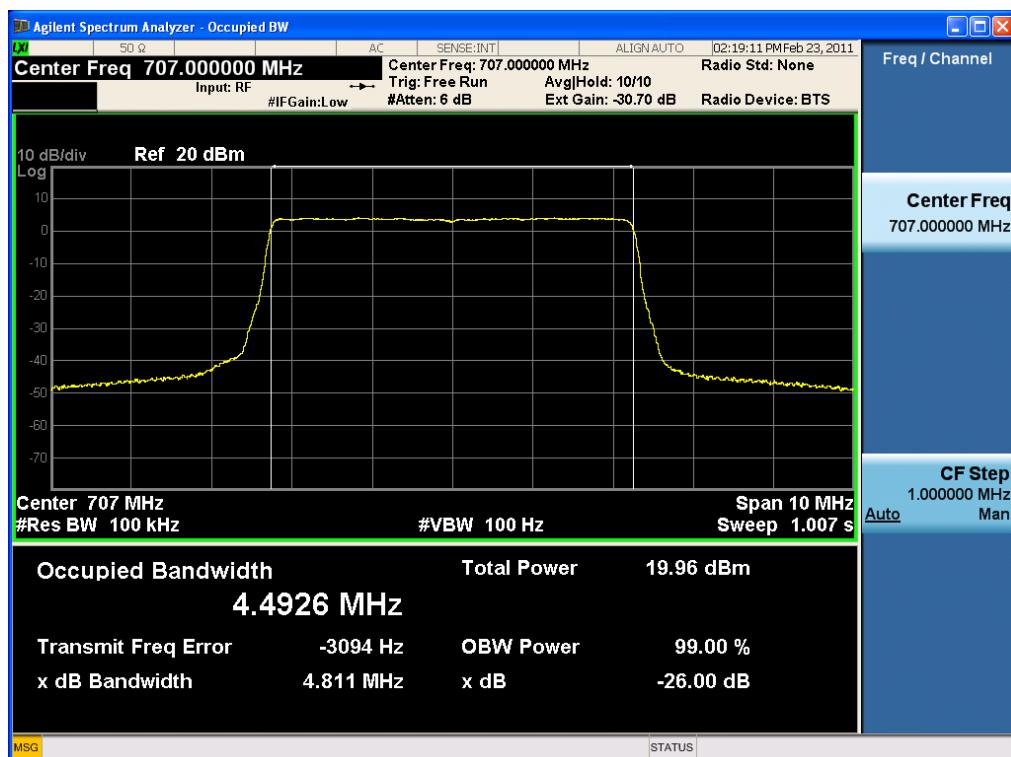
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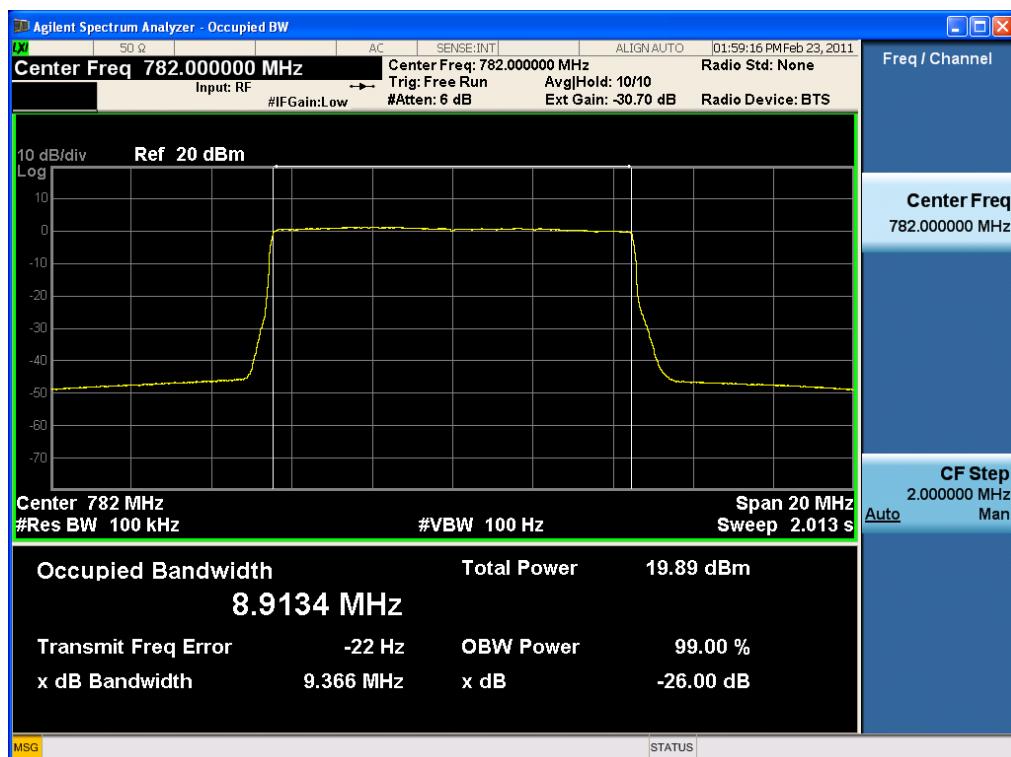
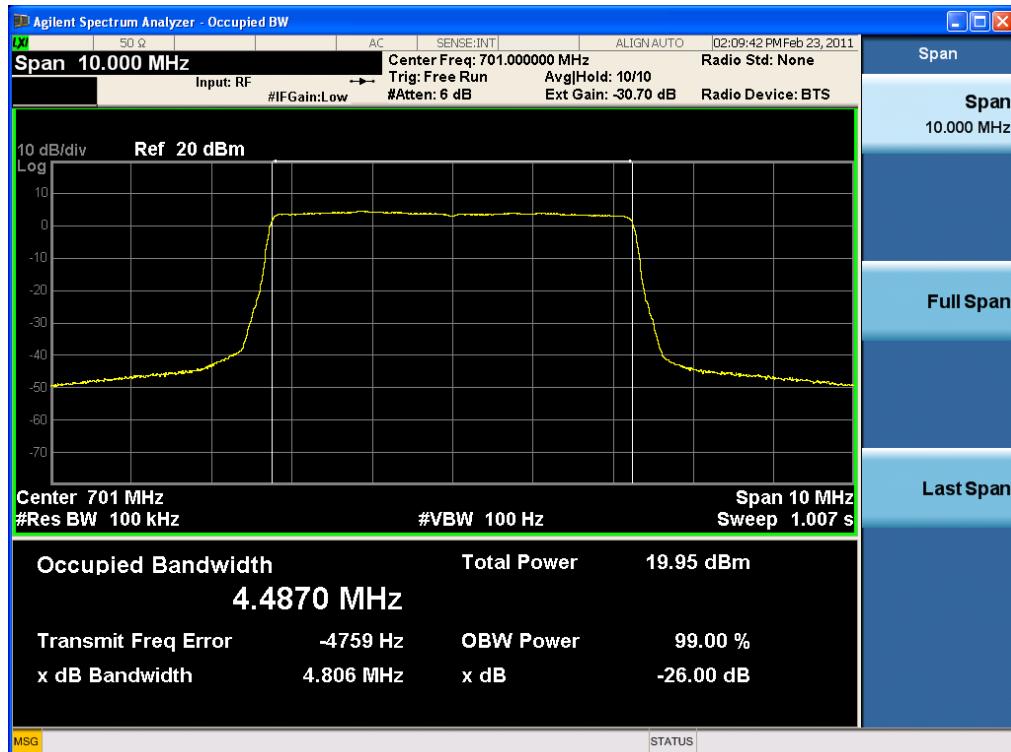


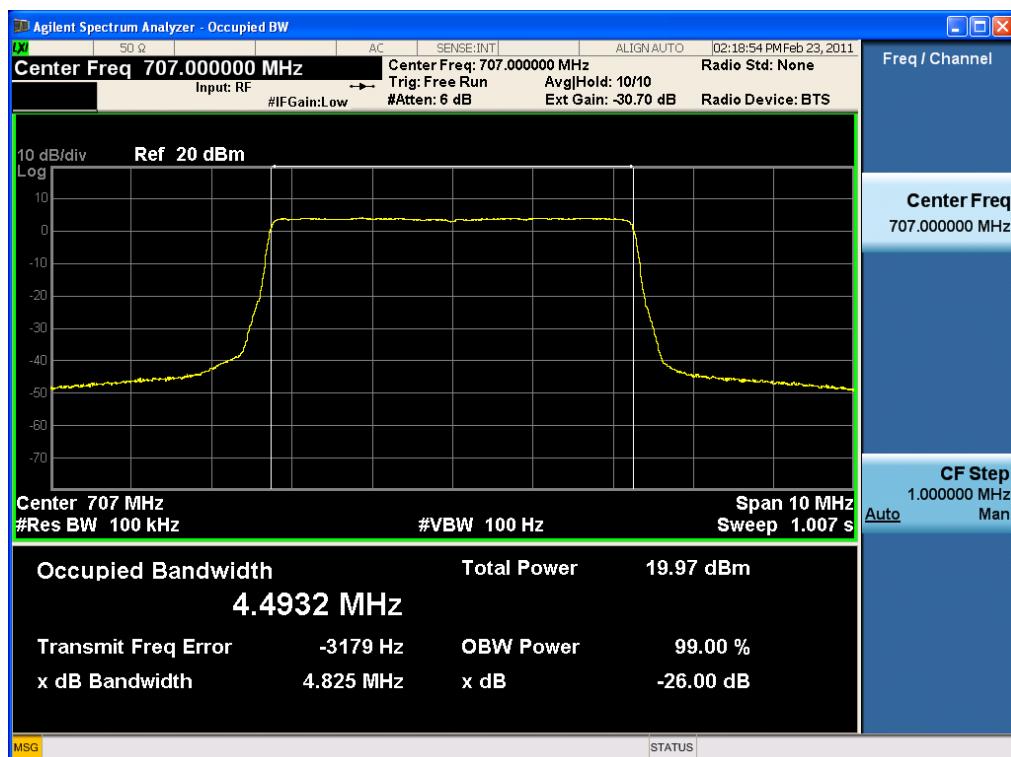
(731 MHz)

**(737 MHz)**

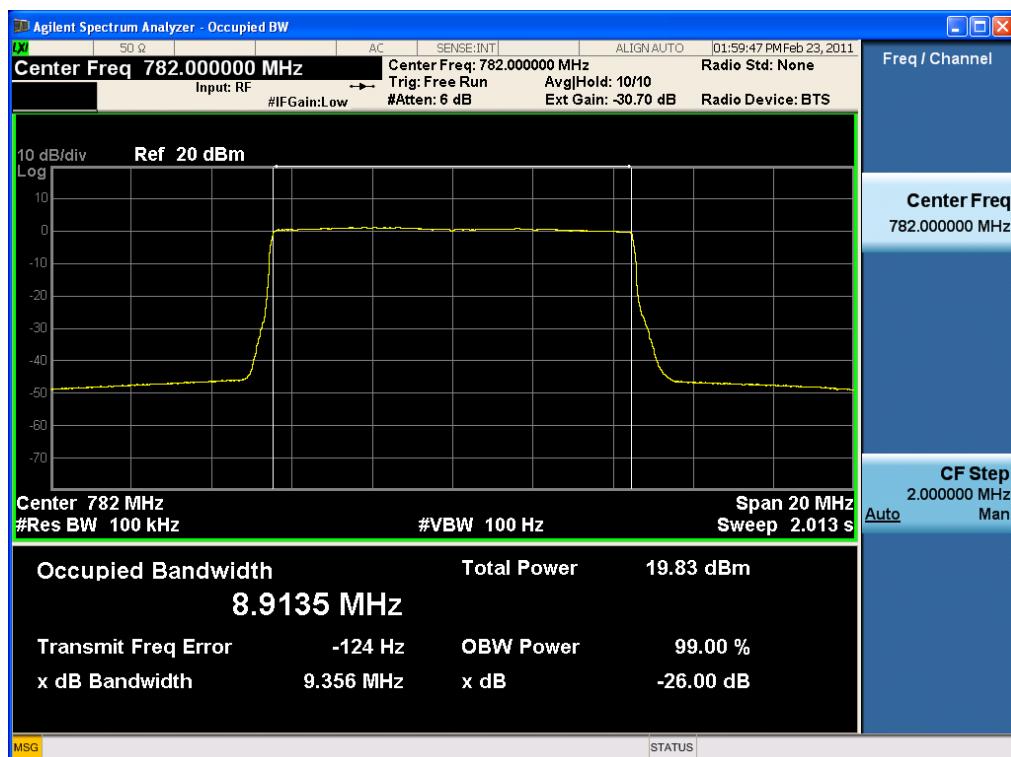
**[QPSK]-Up Link (Output)**

**(782 MHz)**

**(701 MHz)**

**(707 MHz)**

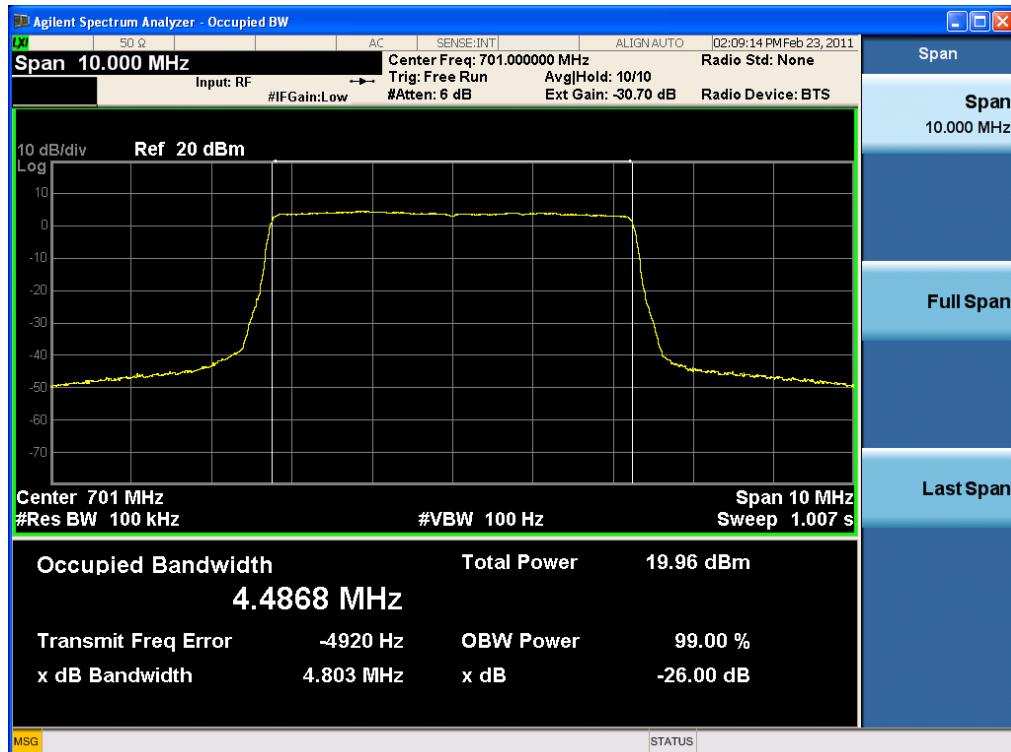
**[16QAM] -Up Link (Output)**

**(782 MHz)**

**(701 MHz)**

**(707 MHz)**

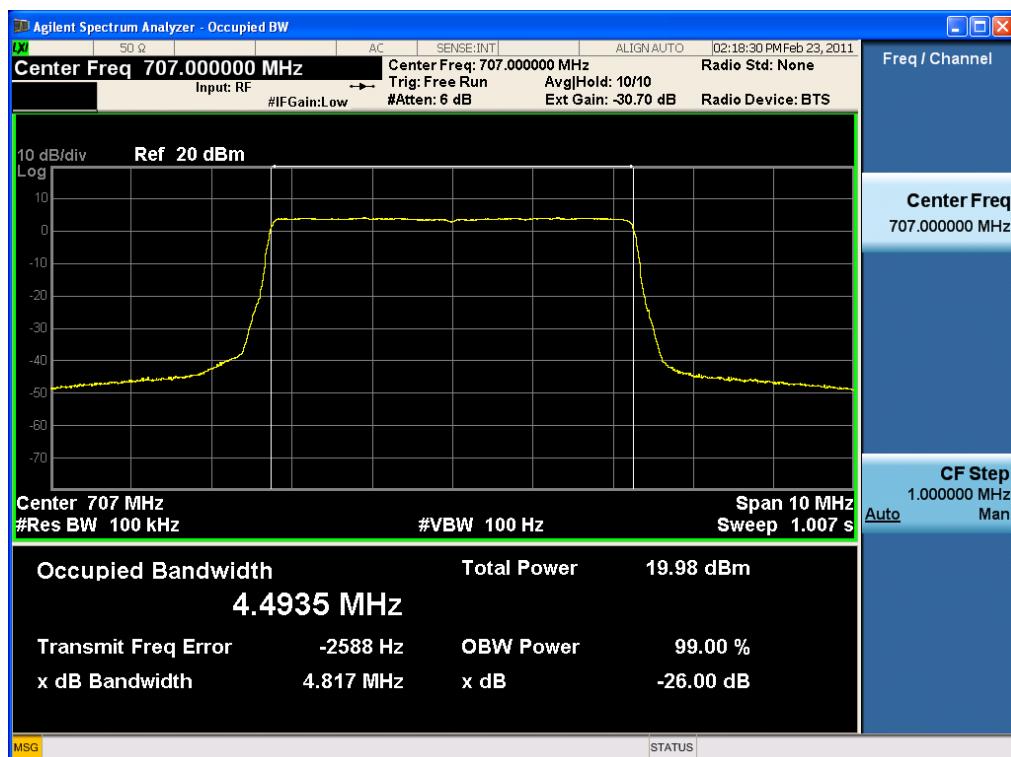
[64QAM] -Up Link (Output)

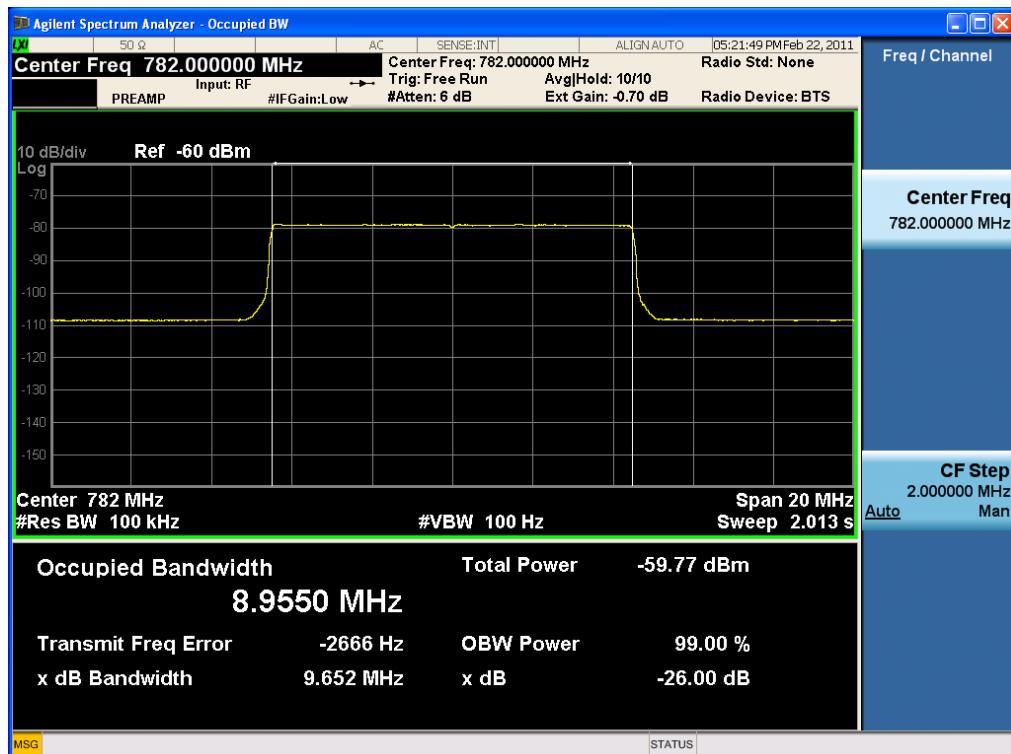
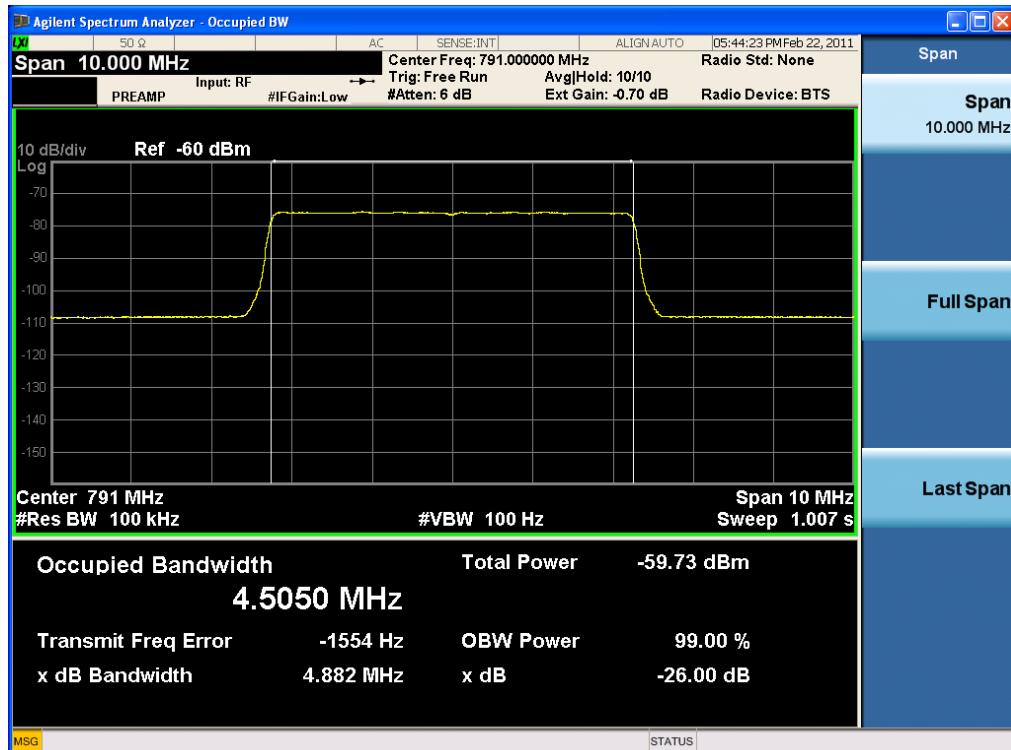


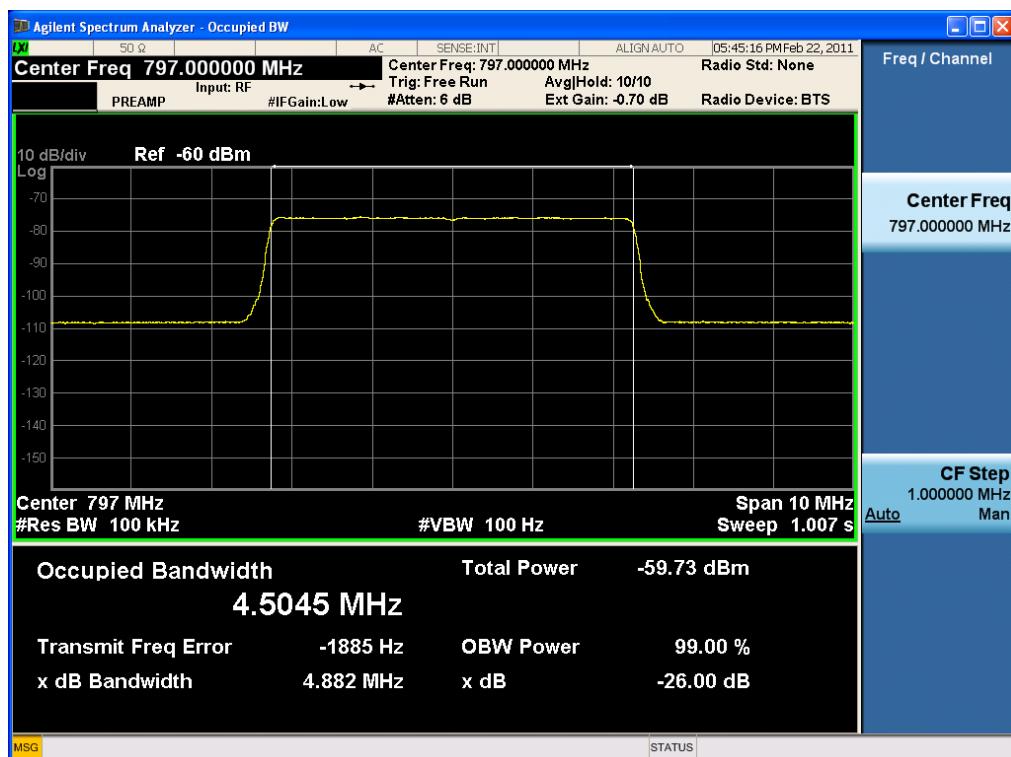
(782 MHz)



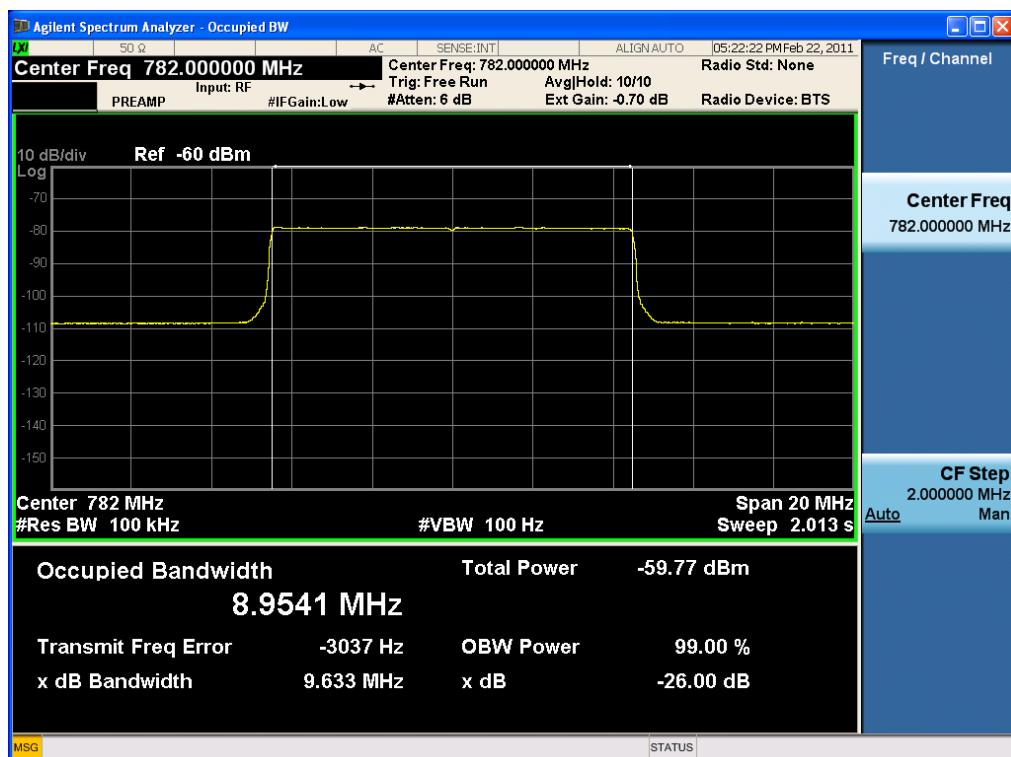
(701 MHz)

**(707 MHz)**

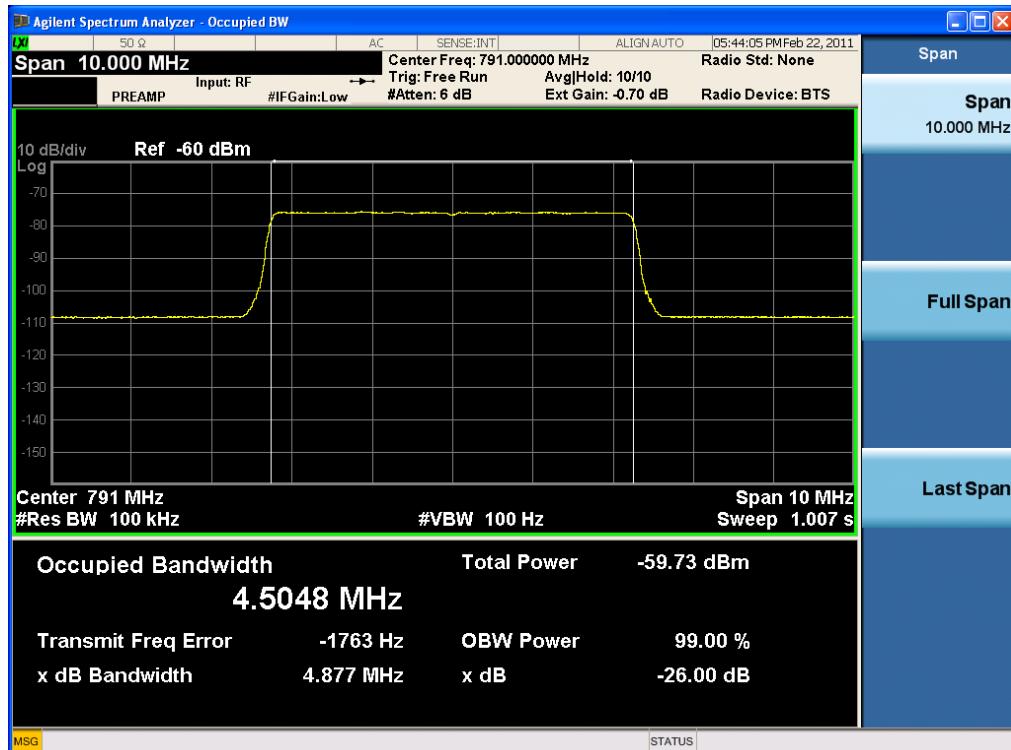
**[QPSK]-Up Link (Input)**

**(782 MHz)**

**(701 MHz)**

**(707 MHz)**

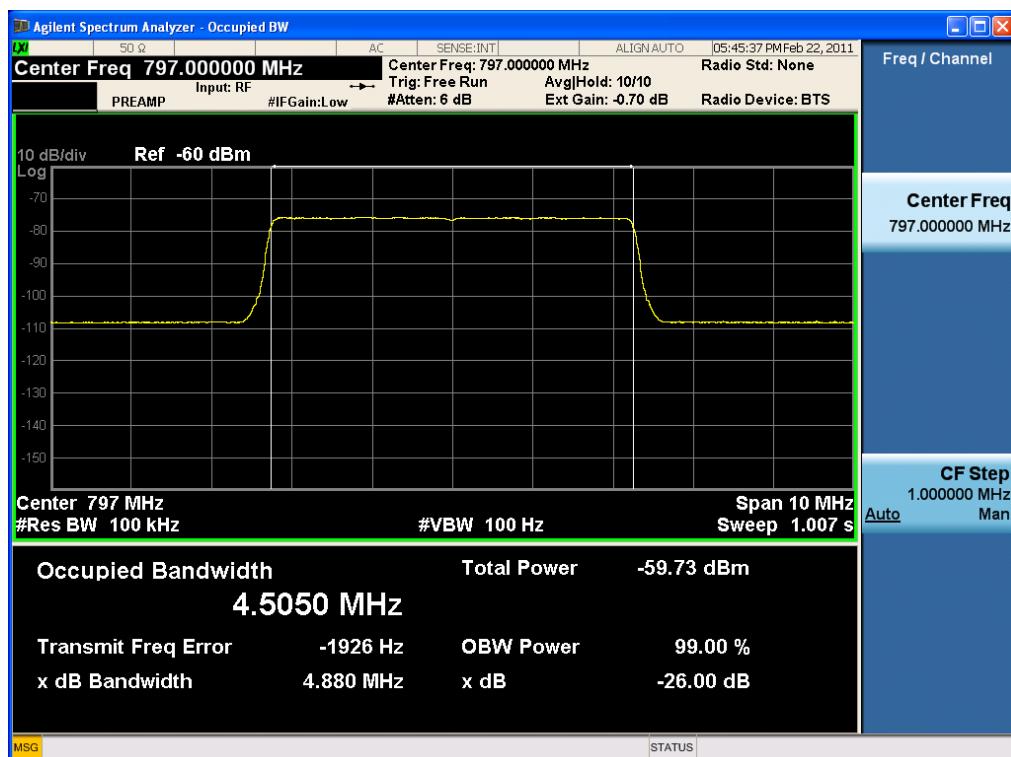
[16QAM] -Up Link (Input)



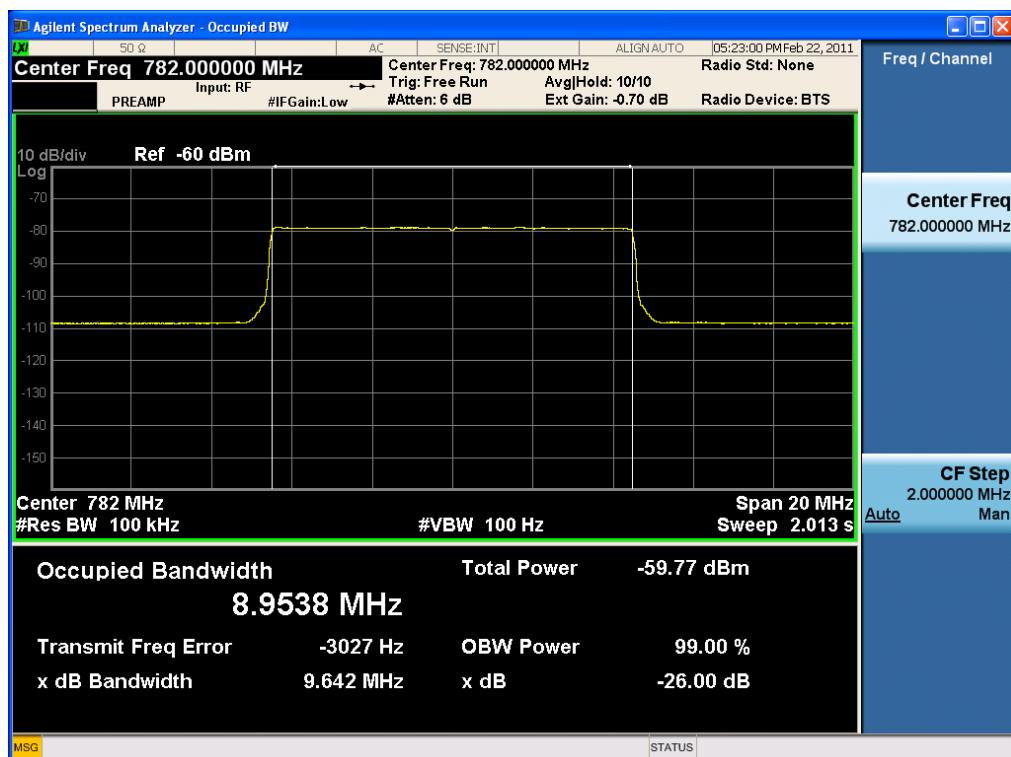
(782 MHz)



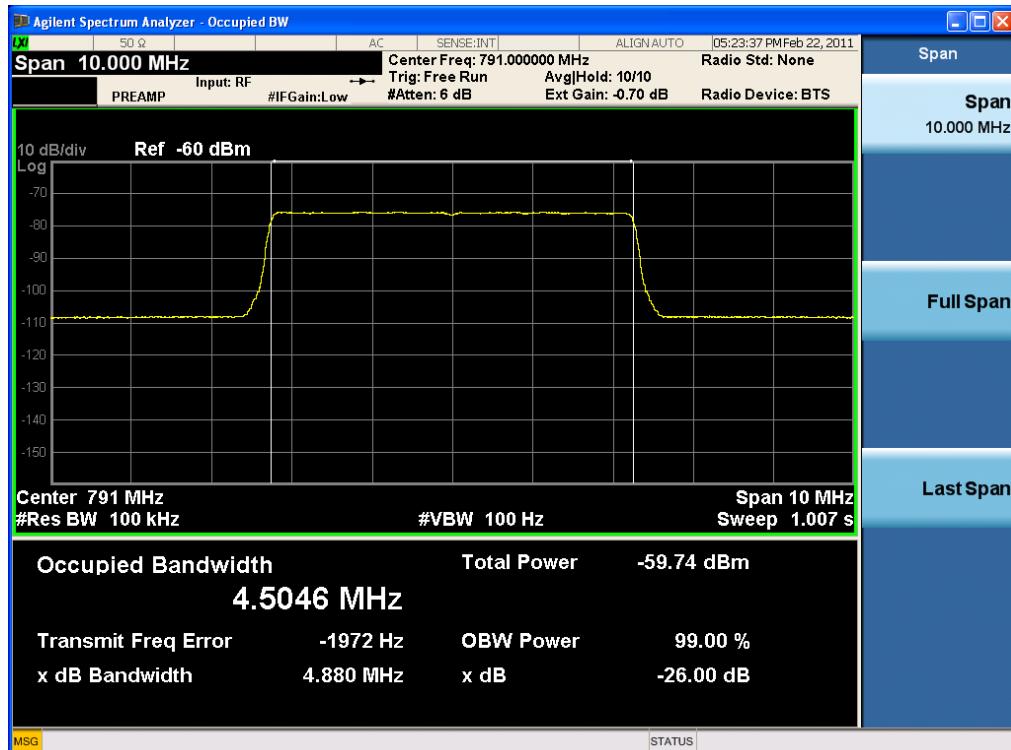
(701 MHz)

**(707 MHz)**

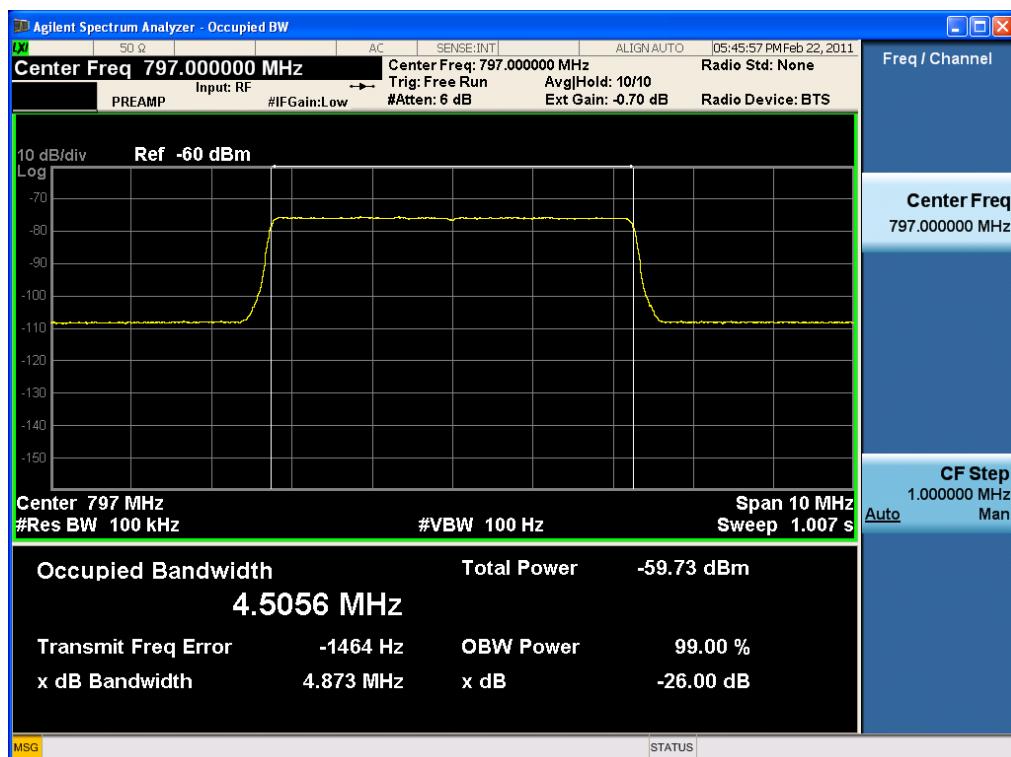
[64QAM] -Up Link (Input)



(782 MHz)

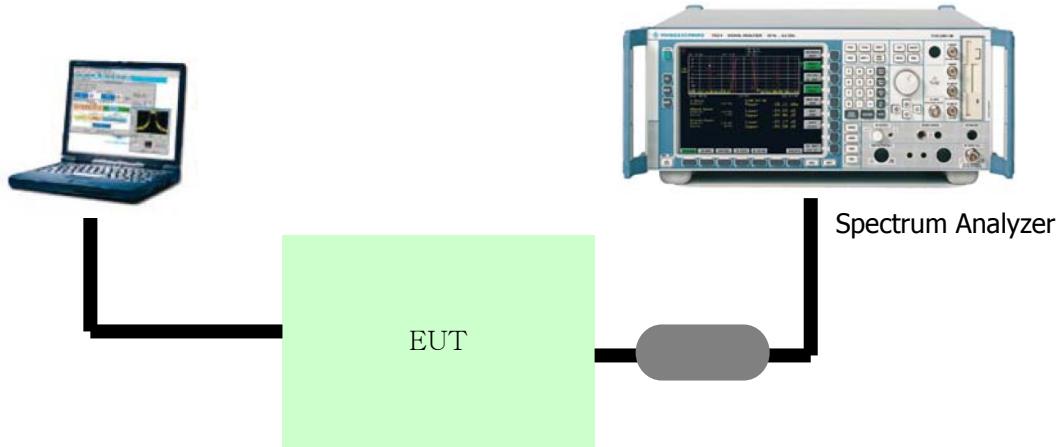


(701 MHz)



### 3.3 Spurious Emissions at Antenna Terminal

#### Test Set-up

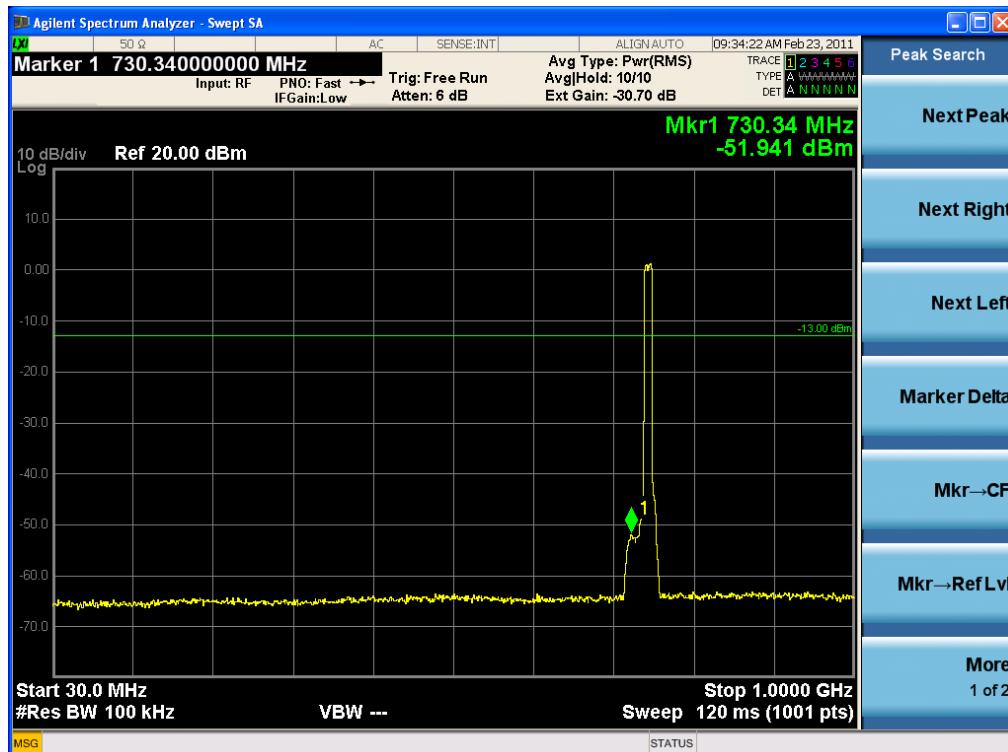


#### Test Procedure

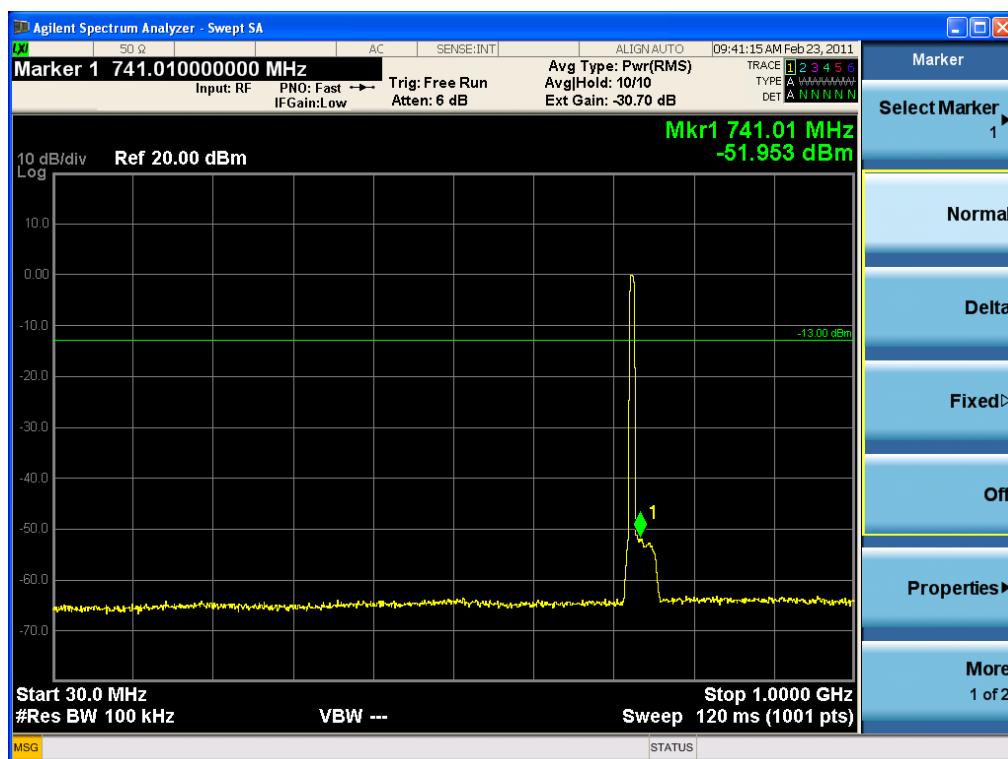
The EUT was setup to maximum output power at its lowest channel. The Resolution BW of the analyzer is set to 1 % of the emission bandwidth to show compliance with the - 13 dBm limit, in the 1 MHz bands immediately outside and adjacent to the edge of the frequency block. The 1 MHz RBW was used to scan from 1 GHz to 26 GHz. A display line was placed at - 13 dBm to show compliance. The high, lowest and a middle channel were tested for out of band measurements.

## Test Plots

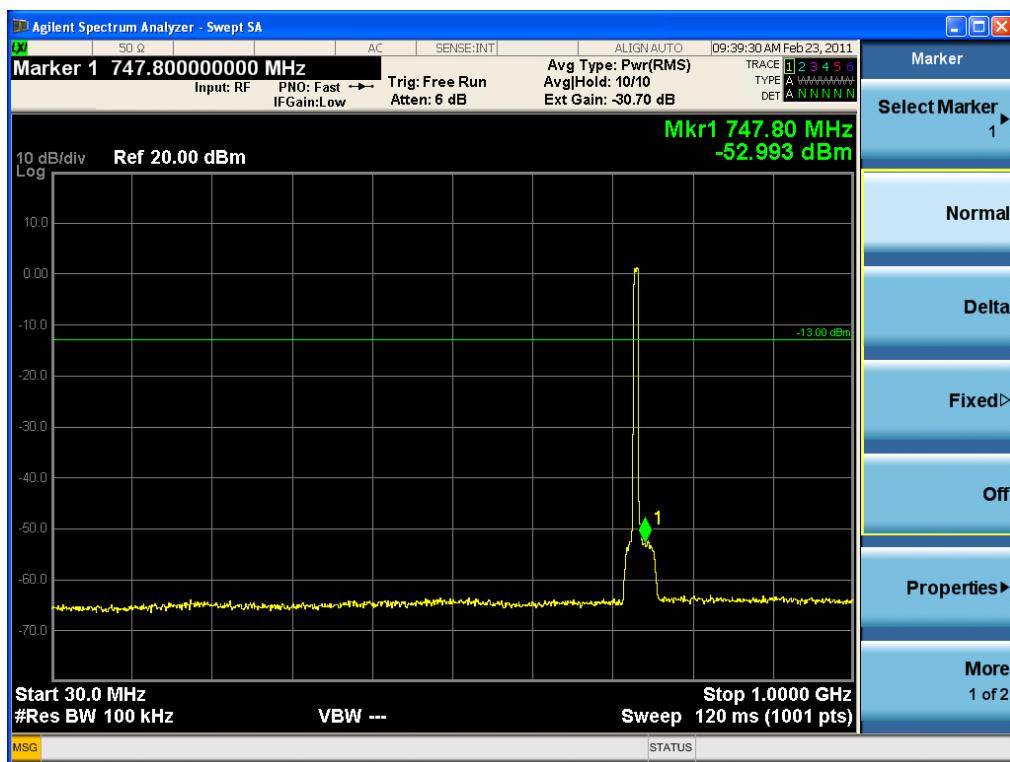
## [Spurious Emission - QPSK]-Down Link



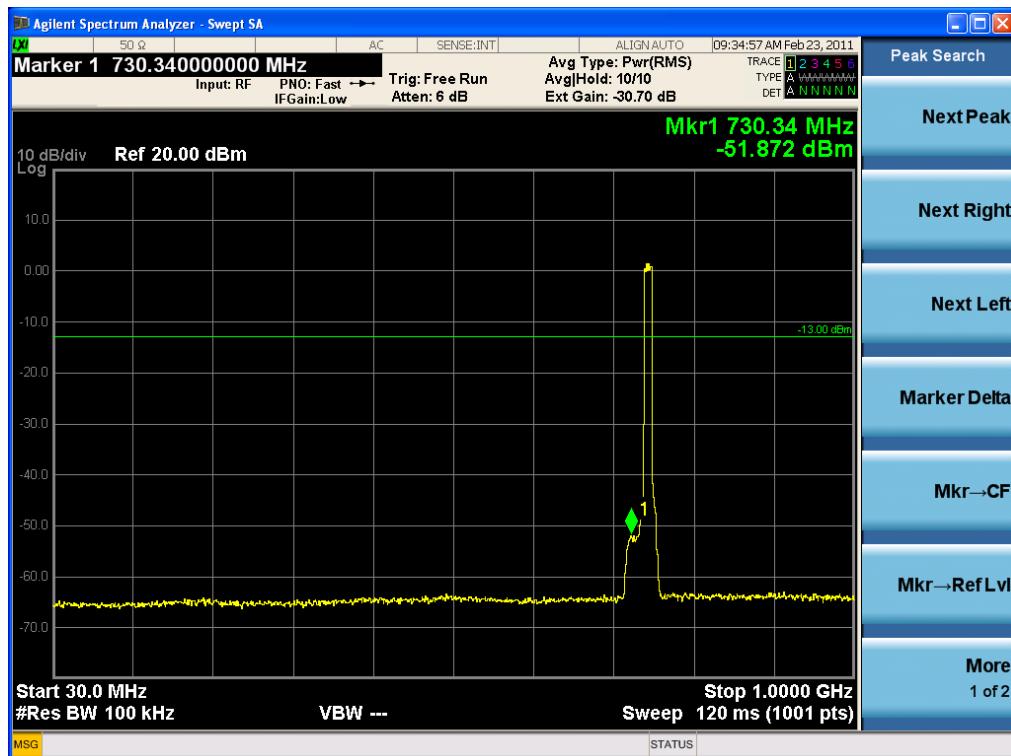
Upper C: (751 MHz)- CH 30 MHz ~ 1 GHz



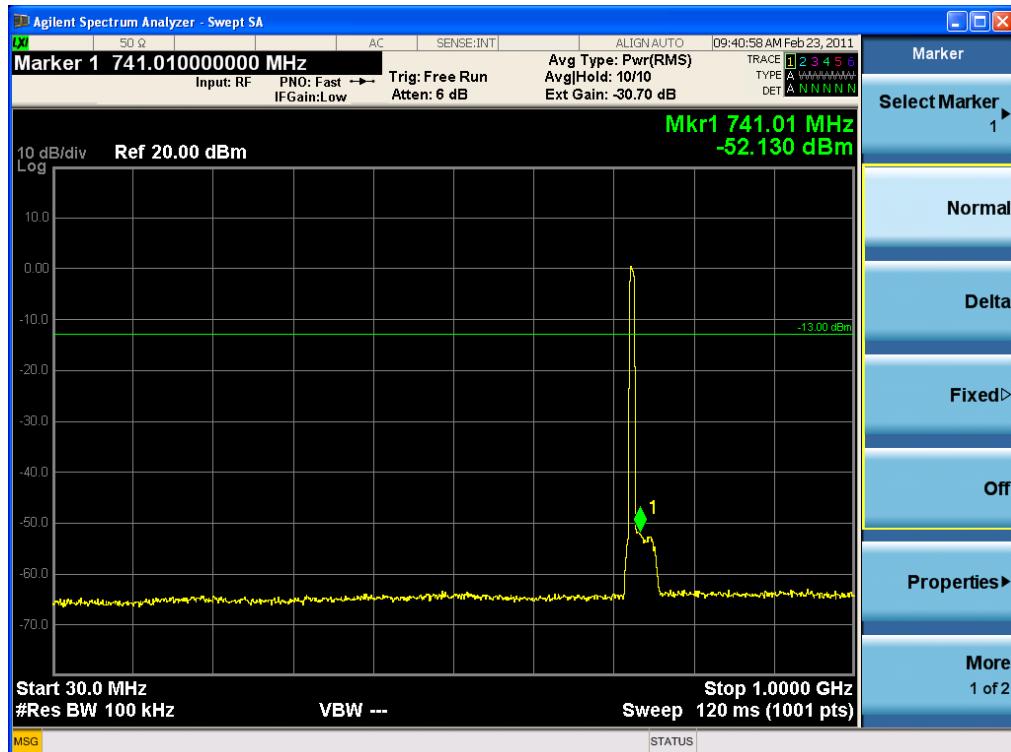
Lower A: (731 MHz) - CH 30 MHz ~ 1 GHz

**Lower B: (737 MHz) - CH 30 MHz ~ 1 GHz**

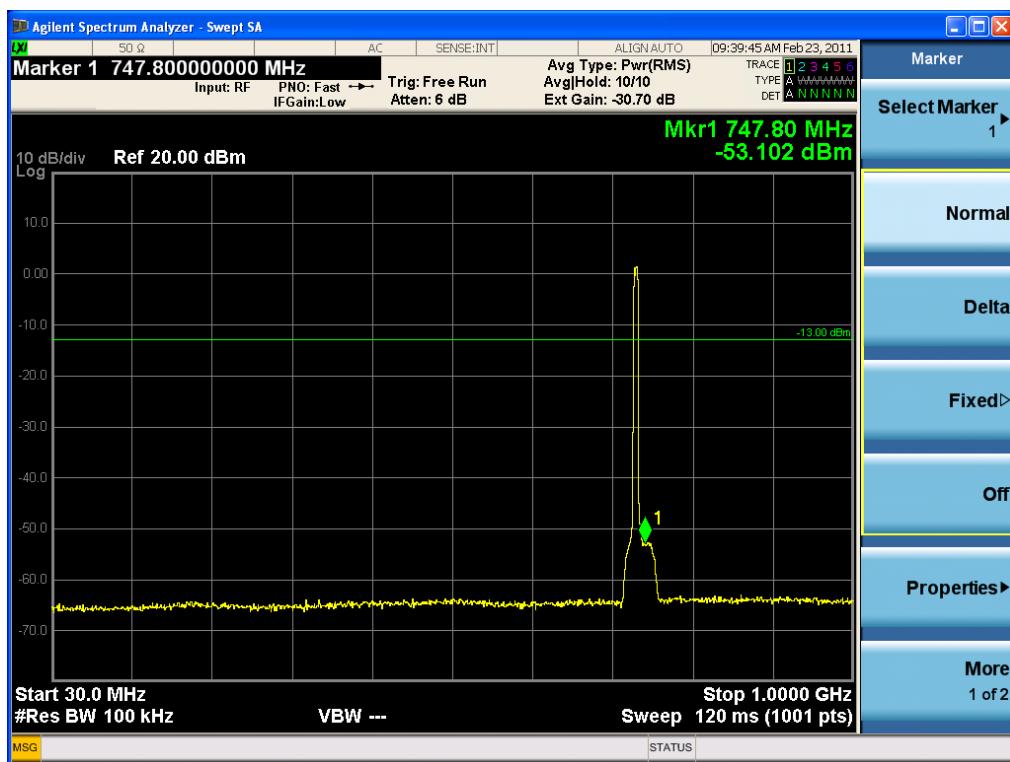
## [Spurious Emission – 16QAM] -Down Link



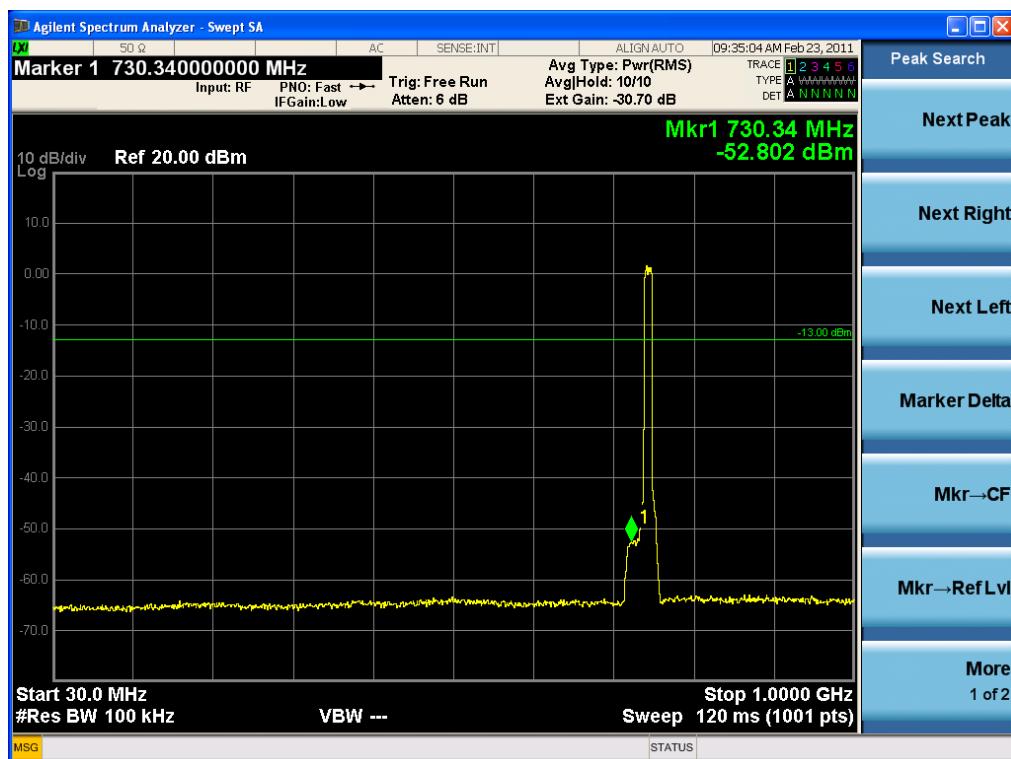
Upper C: (751 MHz) - CH 30 MHz ~ 1 GHz



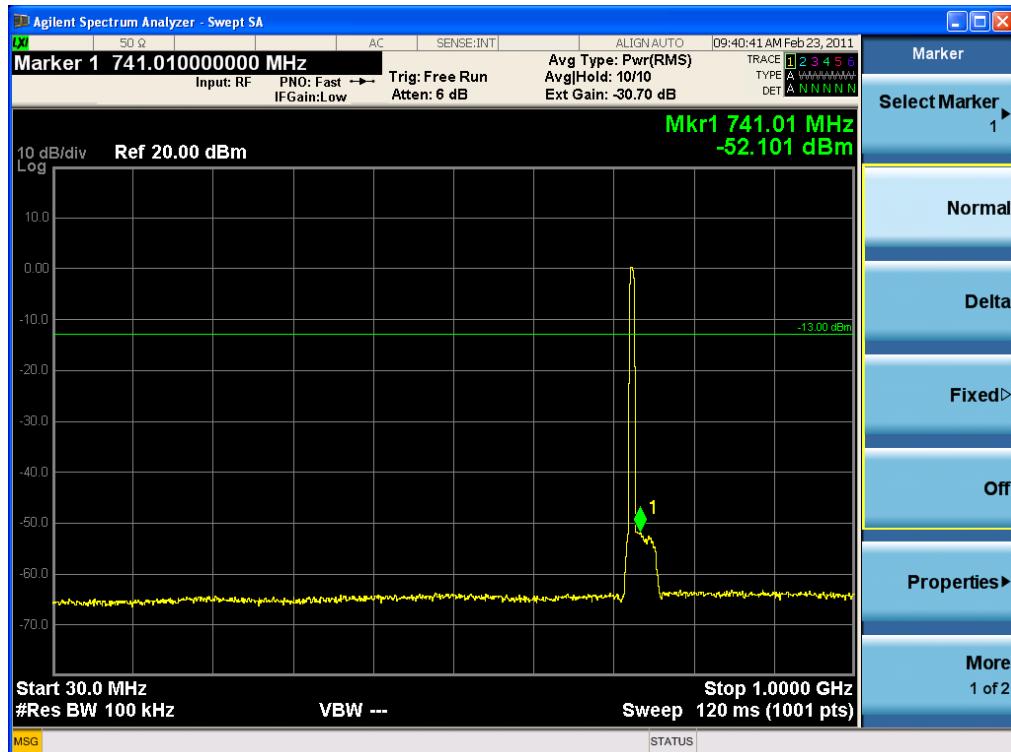
Lower A: (731 MHz) - CH 30 MHz ~ 1 GHz

**Lower B: (737 MHz) - CH 30 MHz ~ 1 GHz**

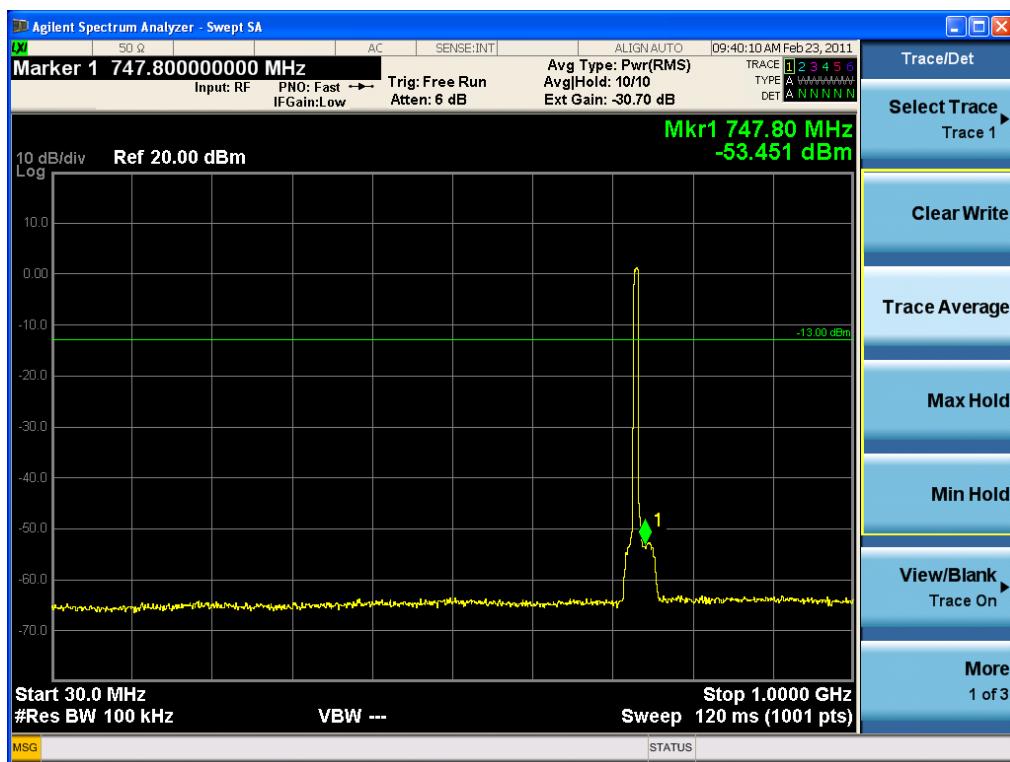
[Spurious Emission – 64QAM] -Down Link



Upper C: (751 MHz) - CH 30 MHz ~ 1 GHz



Lower A: (731 MHz) - CH 30 MHz ~ 1 GHz

**Lower B: (737 MHz) - CH 30 MHz ~ 1 GHz**

[Spurious Emission - QPSK] -Down Link



Upper C: (751 MHz)- CH 1 GHz ~ 26.5 GHz



Lower A: (731 MHz) - CH 1 GHz ~ 26.5 GHz



**Lower B: (737 MHz) - CH 1 GHz ~ 26.5 GHz**

## [Spurious Emission – 16QAM] -Down Link



Upper C: (751 MHz)- CH 1 GHz ~ 26.5 GHz



Lower A: (731 MHz) - CH 1 GHz ~ 26.5 GHz

**Lower B: (737 MHz) - CH 1 GHz ~ 26.5 GHz**

[Spurious Emission – 64QAM] -Down Link



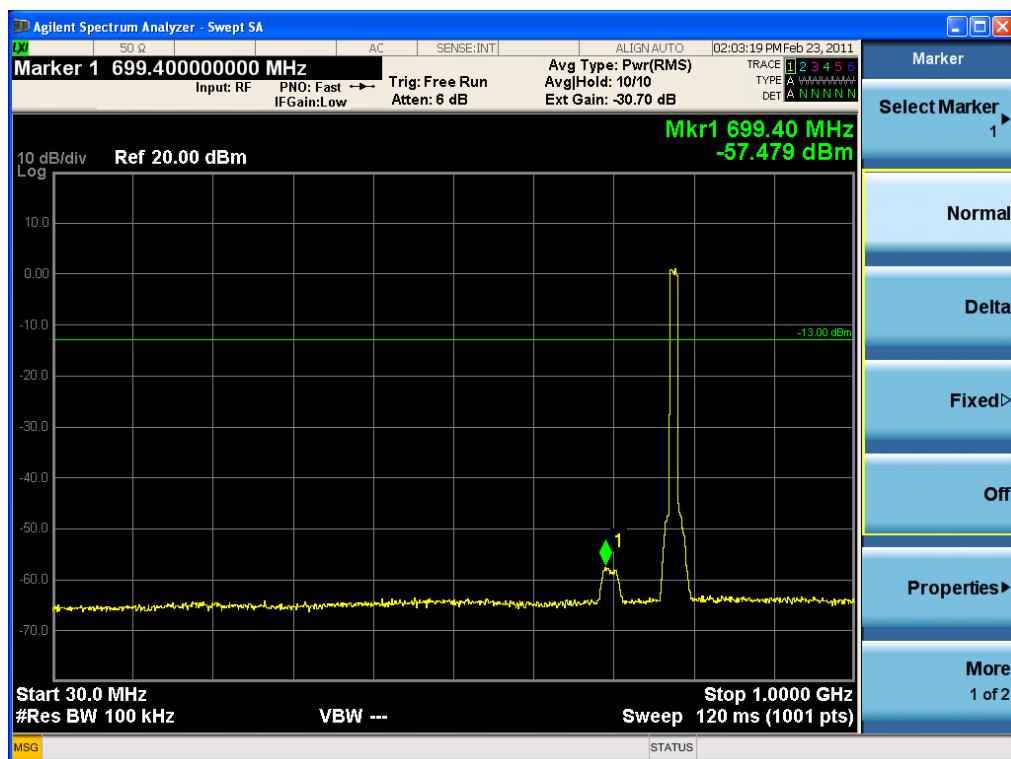
Upper C: (751 MHz)- CH 1 GHz ~ 26.5 GHz



Lower A: (731 MHz) - CH 1 GHz ~ 26.5 GHz

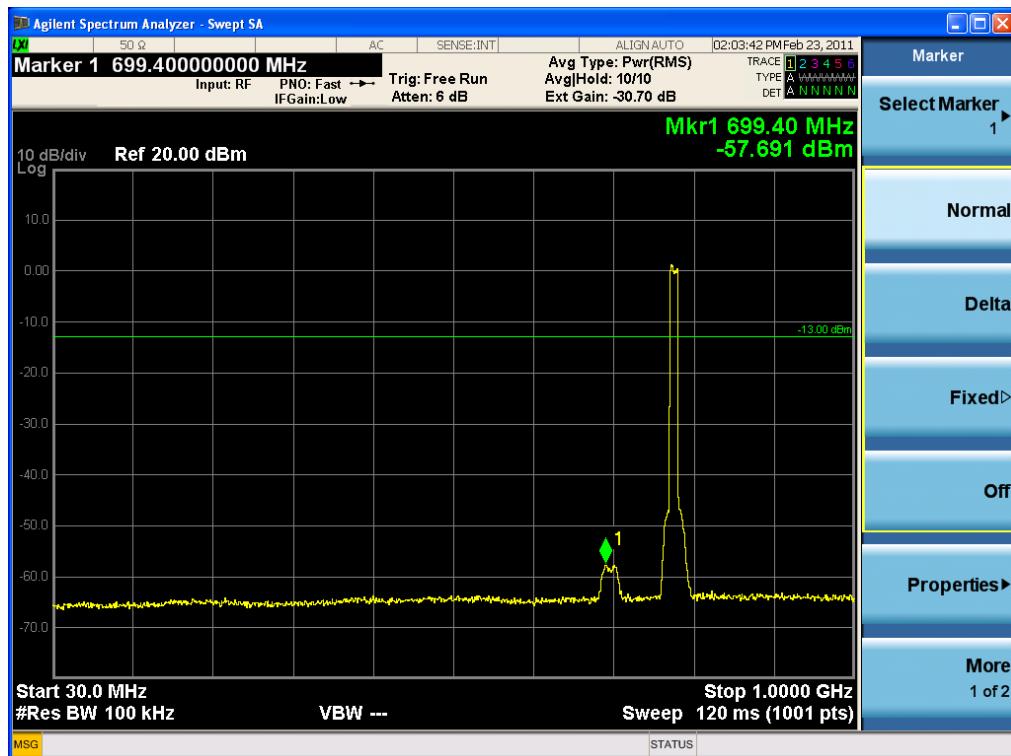
**Lower B: (737 MHz) - CH 1 GHz ~ 26.5 GHz**

## [Spurious Emission - QPSK]-Up Link

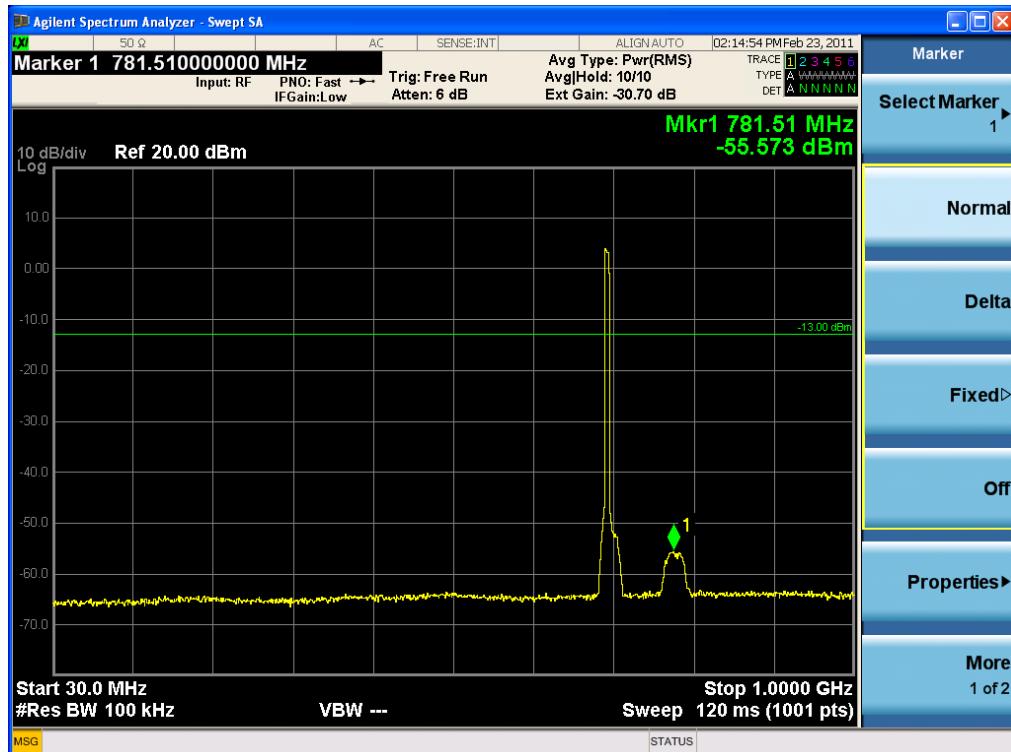
**Upper C: (782 MHz)- CH 30 MHz ~ 1 GHz****Lower A: (701 MHz) - CH 30 MHz ~ 1 GHz**

**Lower B: (707 MHz) - CH 30 MHz ~ 1 GHz**

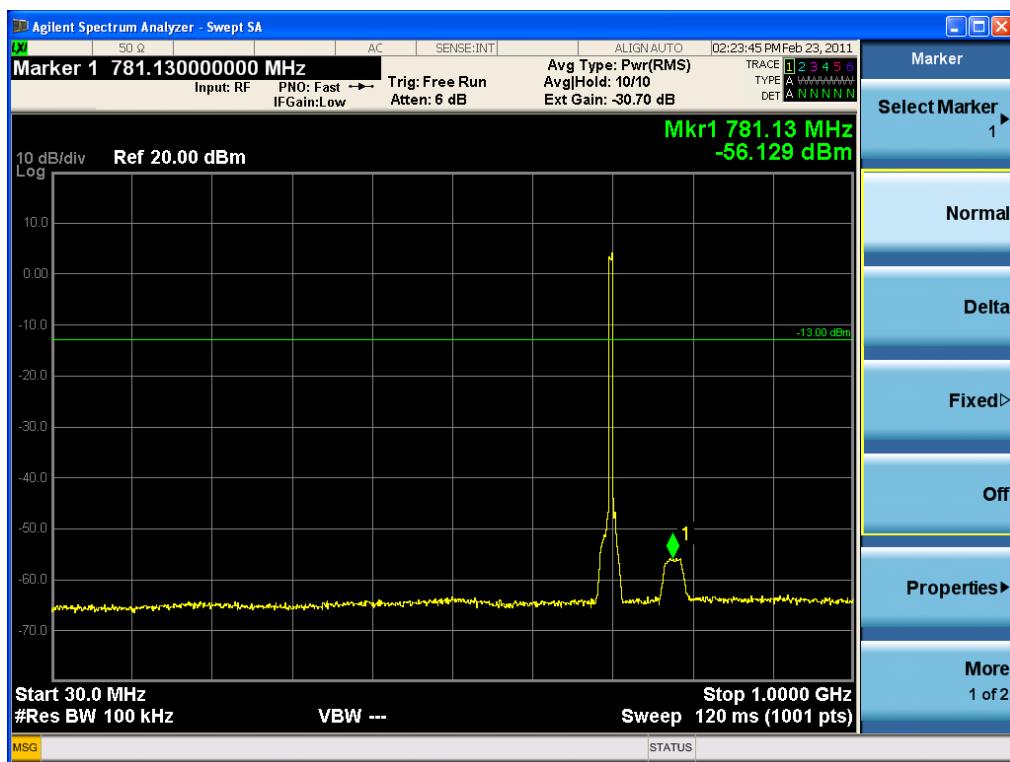
## [Spurious Emission – 16QAM] -Up Link



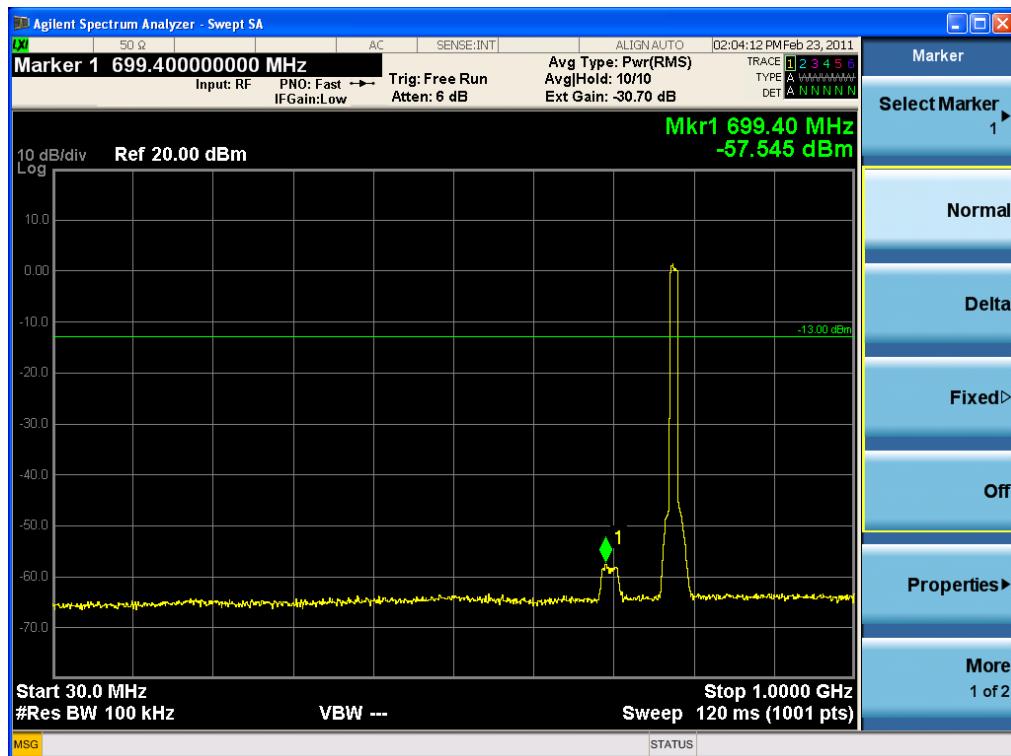
Upper C: (782 MHz) - CH 30 MHz ~ 1 GHz



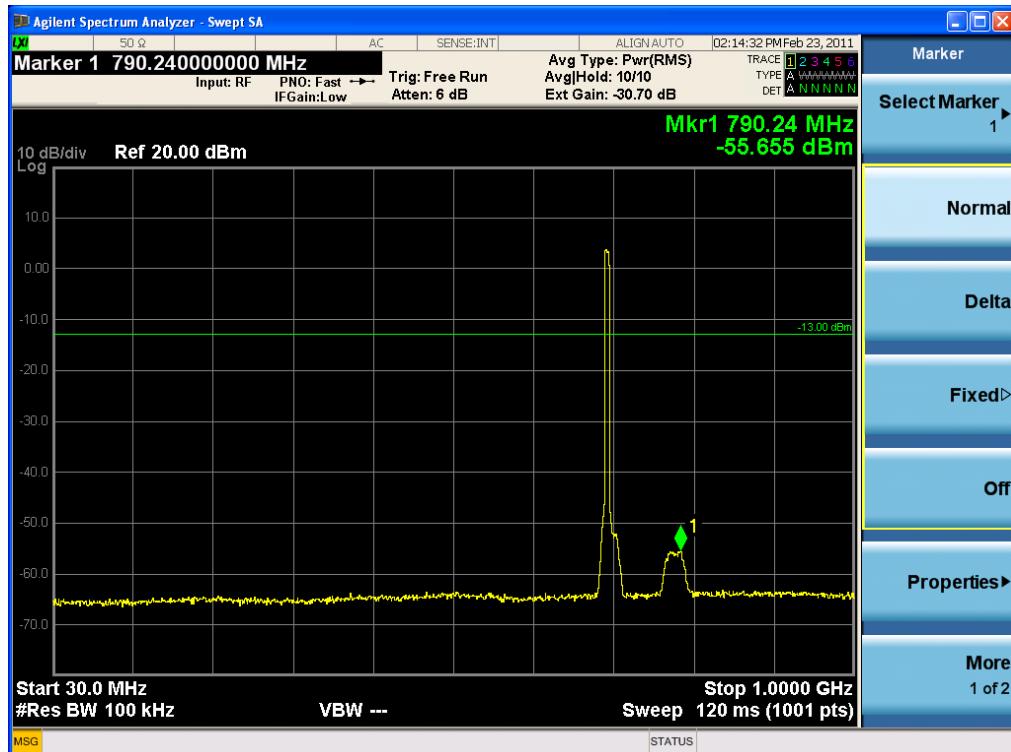
Lower A: (701 MHz) - CH 30 MHz ~ 1 GHz

**Lower B: (707 MHz) - CH 30 MHz ~ 1 GHz**

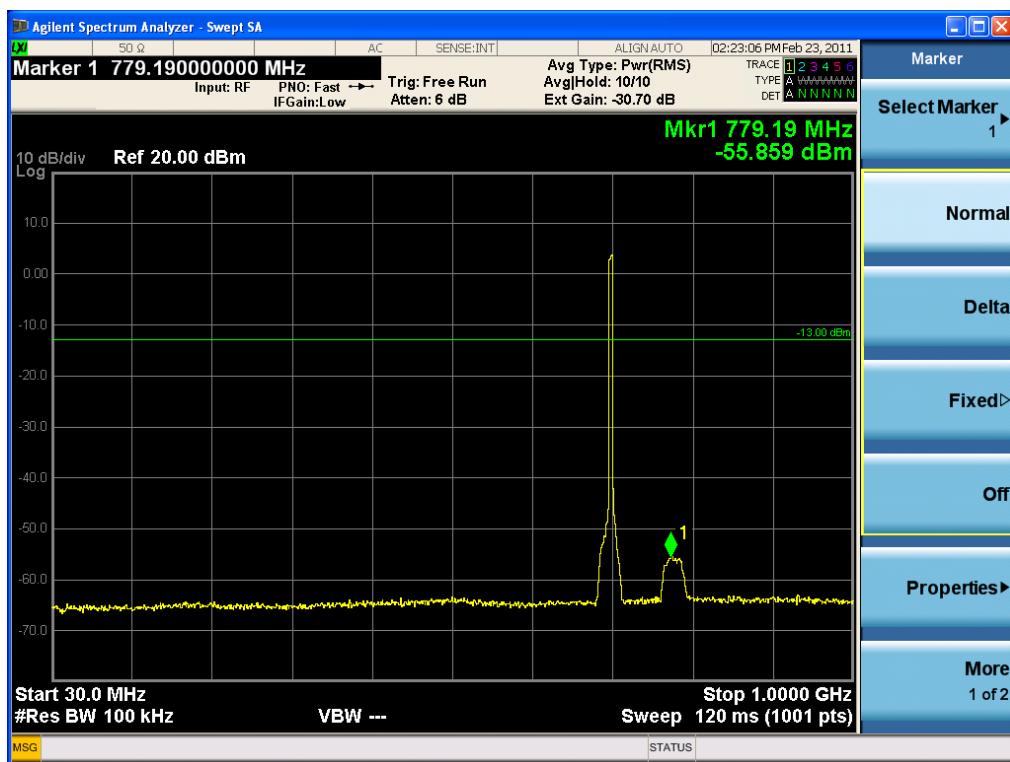
## [Spurious Emission – 64QAM] -Up Link



Upper C: (782 MHz) - CH 30 MHz ~ 1 GHz



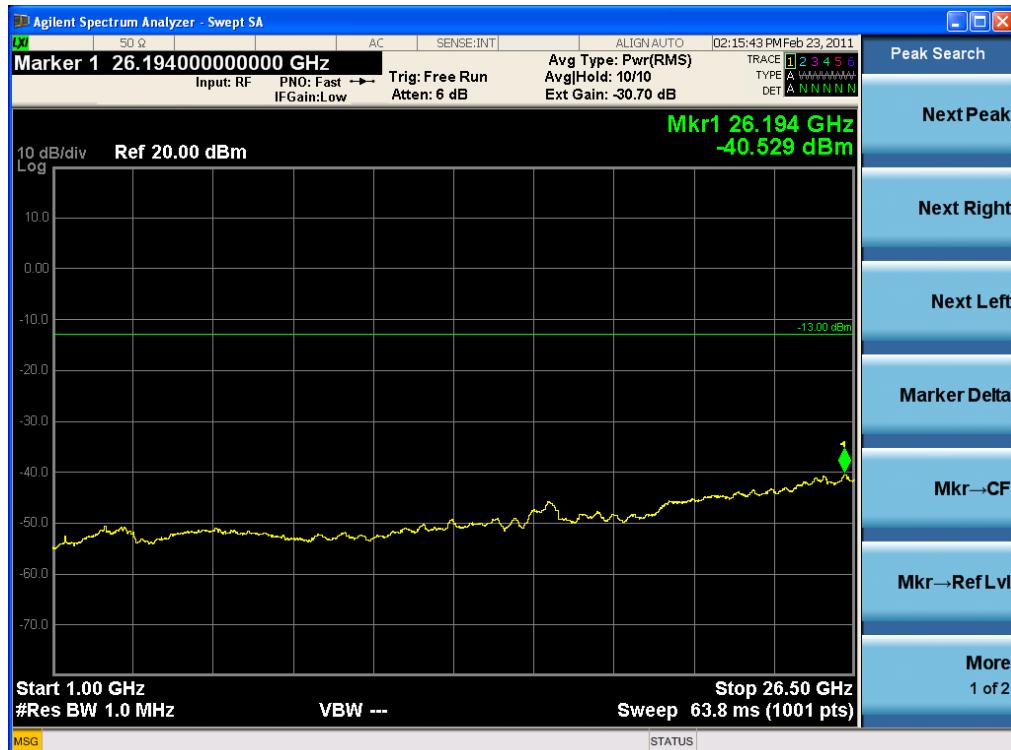
Lower A: (701 MHz) - CH 30 MHz ~ 1 GHz

**Lower B: (707 MHz) - CH 30 MHz ~ 1 GHz**

[Spurious Emission - QPSK] -Up Link



Upper C: (782 MHz)- CH 1 GHz ~ 26.5 GHz



Lower A: (701 MHz) - CH 1 GHz ~ 26.5 GHz



**Lower B: (707 MHz) - CH 1 GHz ~ 26.5 GHz**

[Spurious Emission – 16QAM] -Up Link



Upper C: (782 MHz)- CH 1 GHz ~ 26.5 GHz



Lower A: (701 MHz) - CH 1 GHz ~ 26.5 GHz

**Lower B: (707 MHz) - CH 1 GHz ~ 26.5 GHz**

[Spurious Emission – 64QAM] -Up Link



Upper C: (782 MHz)- CH 1 GHz ~ 26.5 GHz



Lower A: (701 MHz) - CH 1 GHz ~ 26.5 GHz



**Lower B: (707 MHz) - CH 1 GHz ~ 26.5 GHz**

## [Band Edge - QPSK] - Down Link



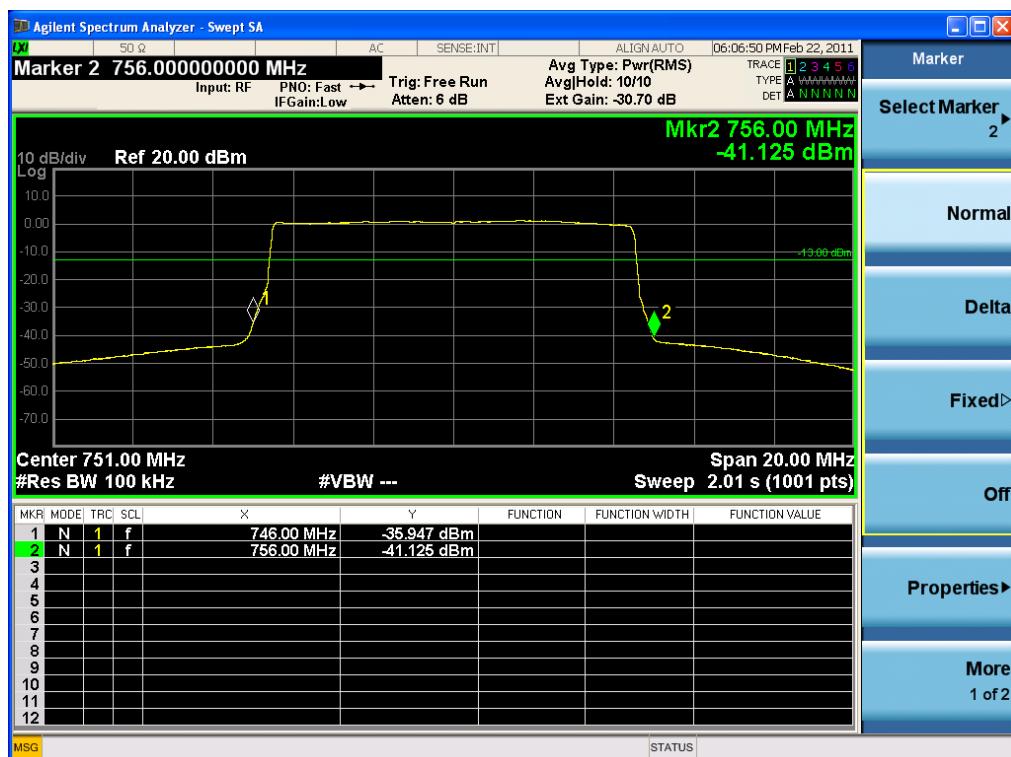
Upper C: (751 MHz)



Upper A: (731 MHz)

**Upper B: (737 MHz)**

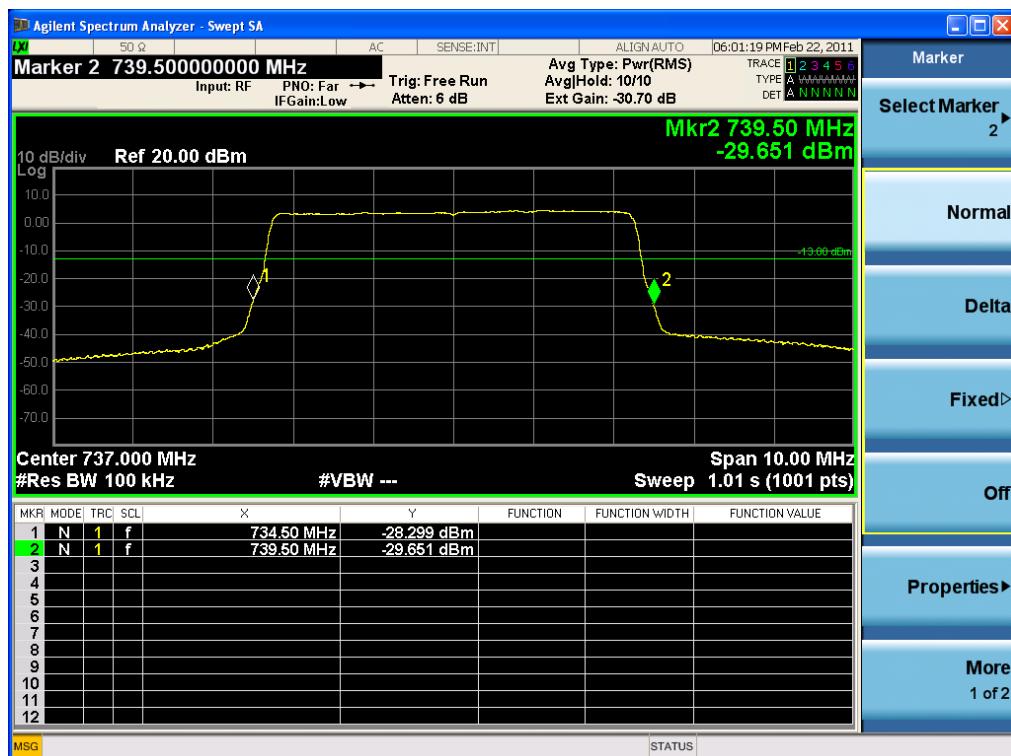
[Band Edge – 16QAM] - Down Link



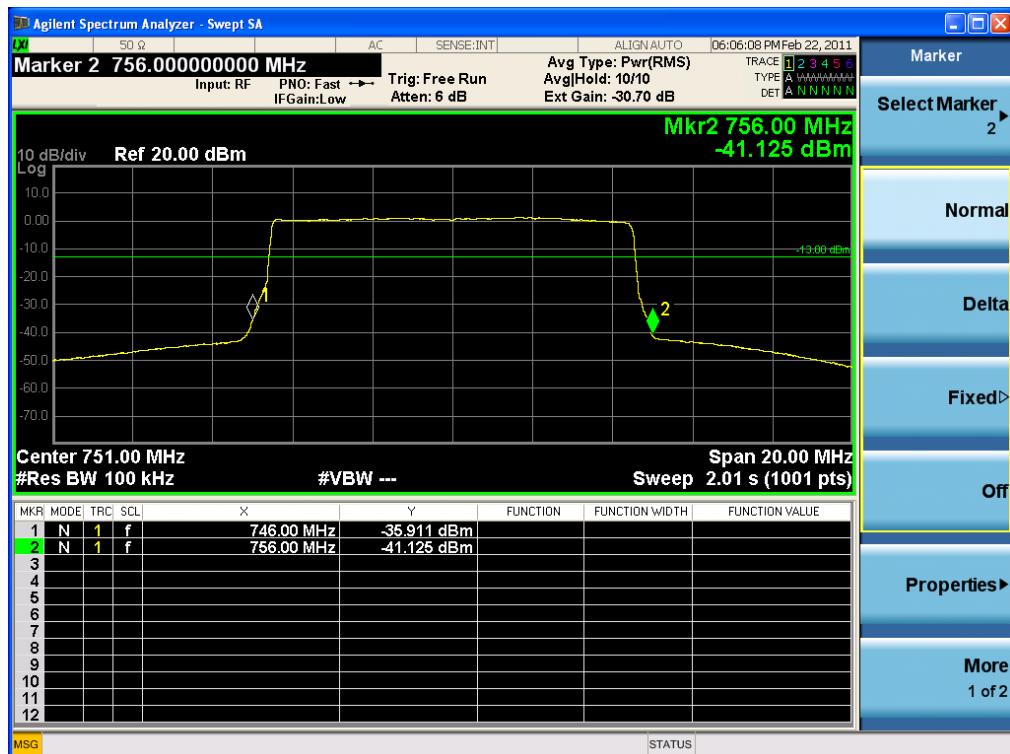
Lower C: (751 MHz)



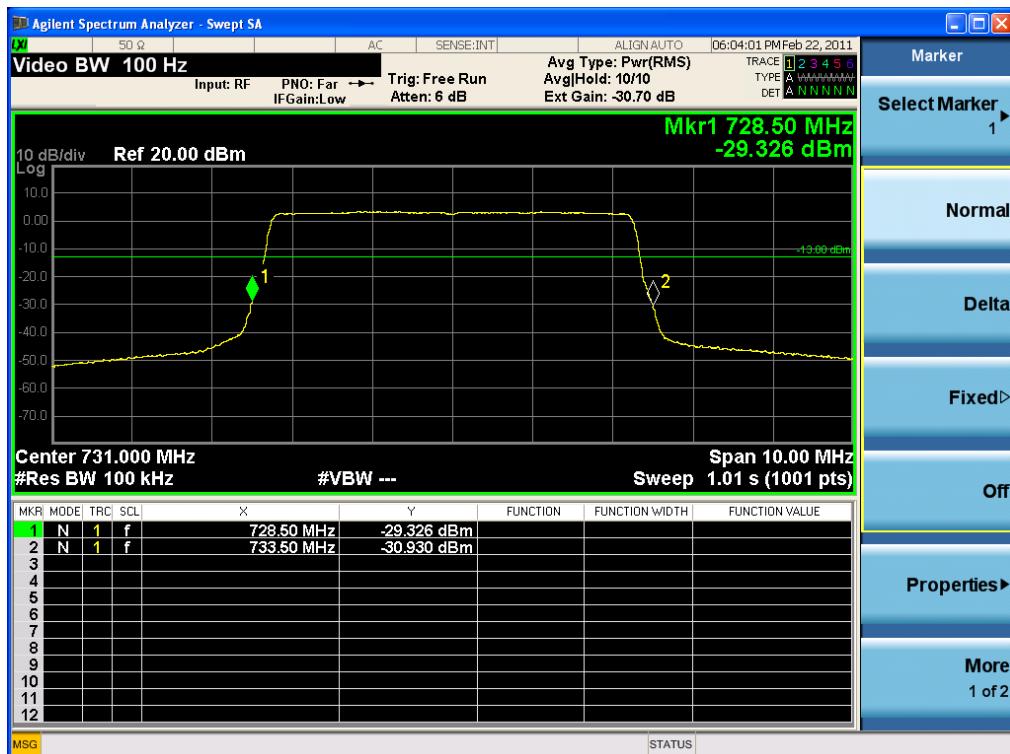
Lower A: (731 MHz)

**Lower B: (737 MHz)**

## [Band Edge – 64QAM] - Down Link



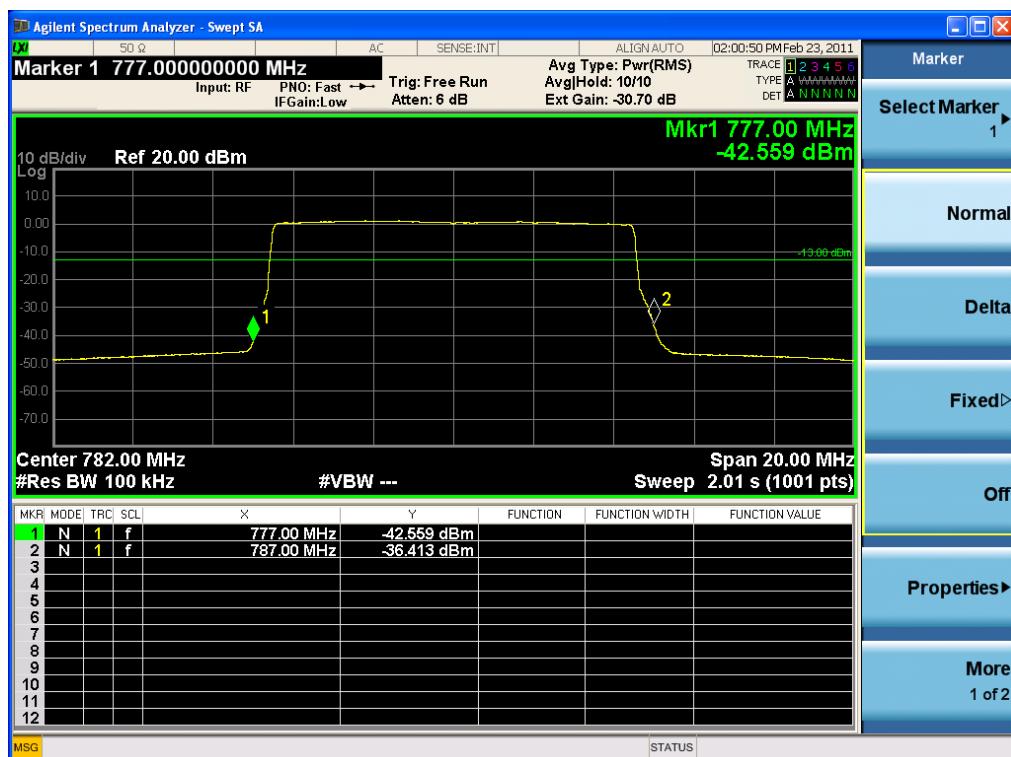
Lower C: (751 MHz)



Lower A: (731 MHz)

**Lower B: (737 MHz)**

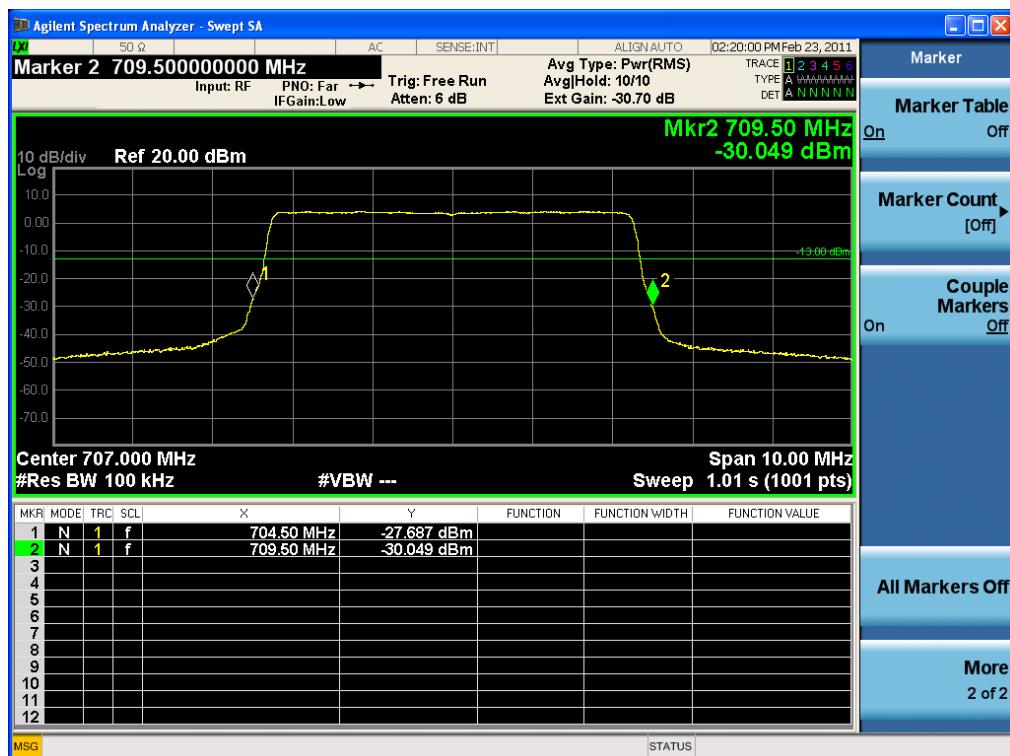
[Band Edge - QPSK]- Up Link



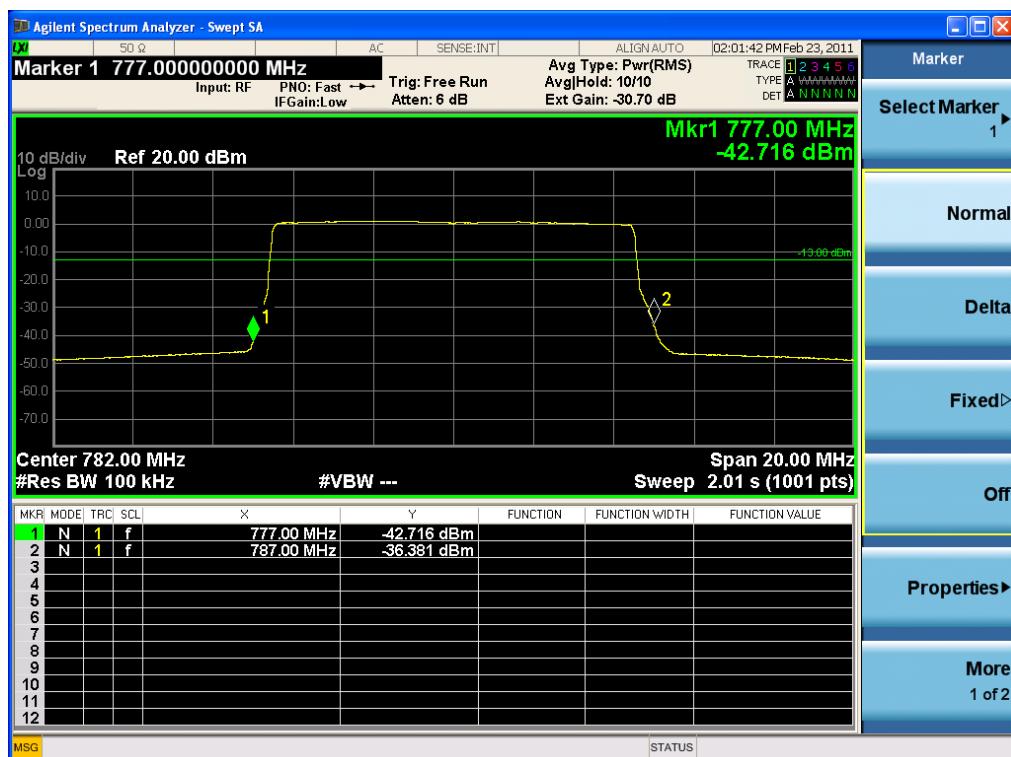
Upper C: (782 MHz)



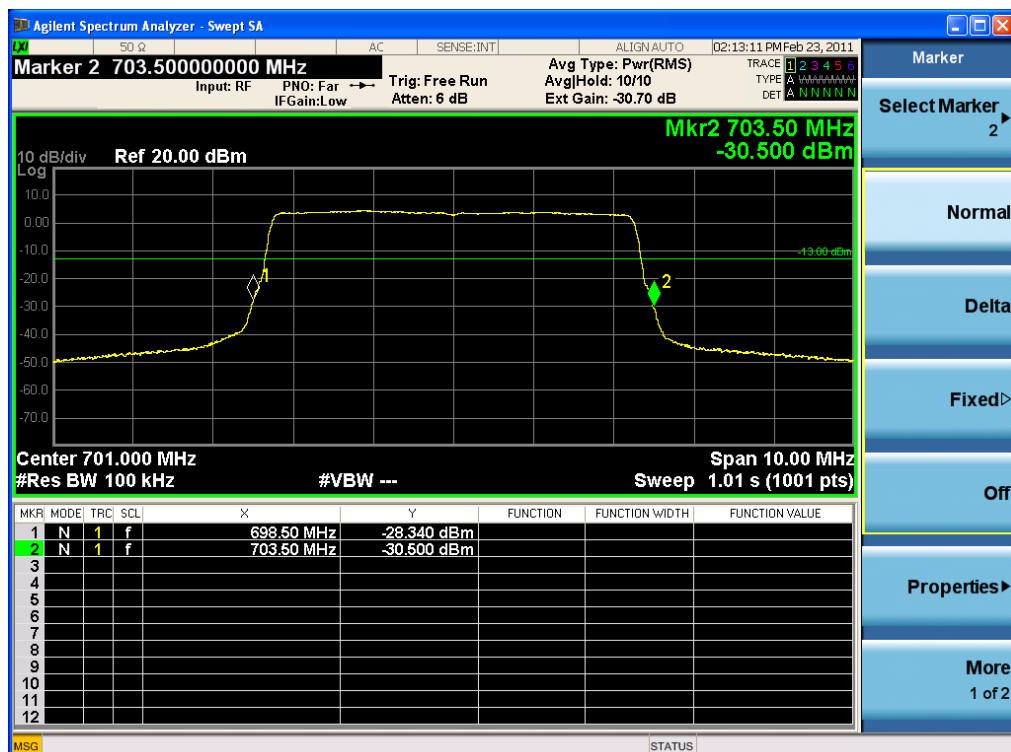
Upper A: (701 MHz)


**Upper B: (707 MHz)**

[Band Edge – 16QAM] - Up Link



Upper C: (782 MHz)



Upper A: (701 MHz)



Upper B: (707 MHz)

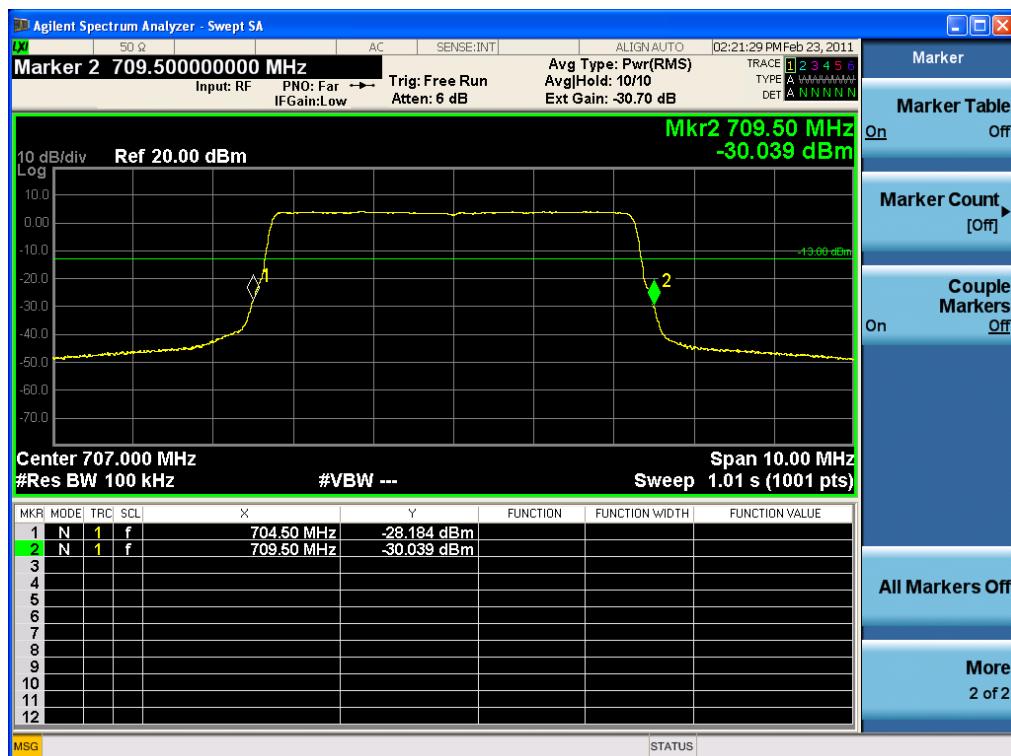
## [Band Edge – 64QAM] - Up Link



Upper C: (782 MHz)

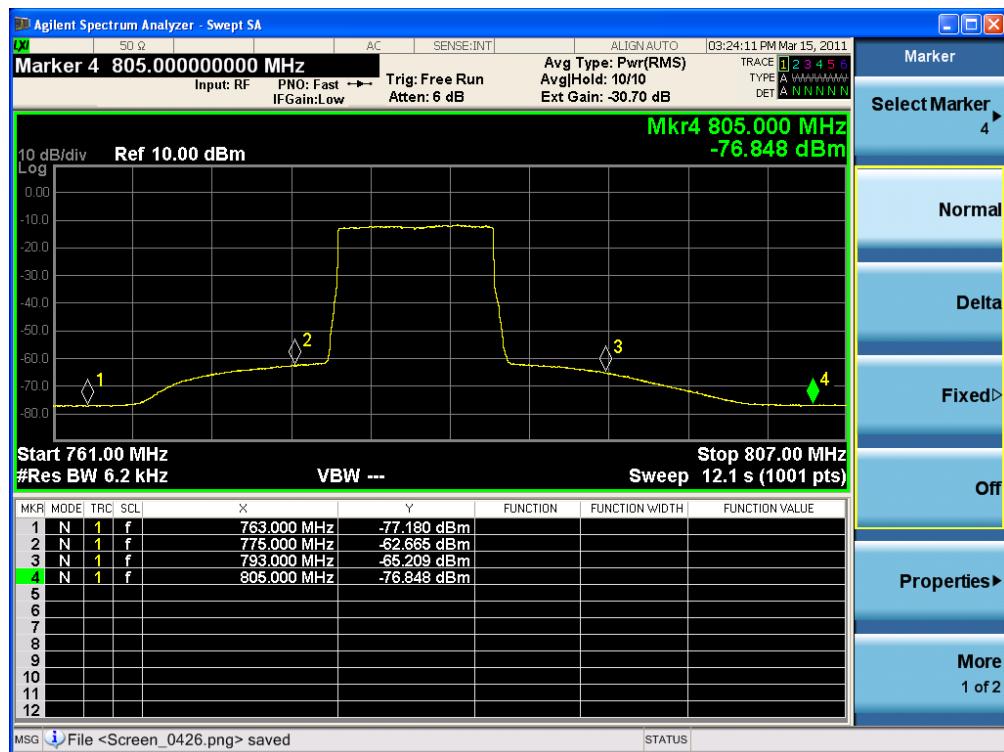


Upper A: (701 MHz)

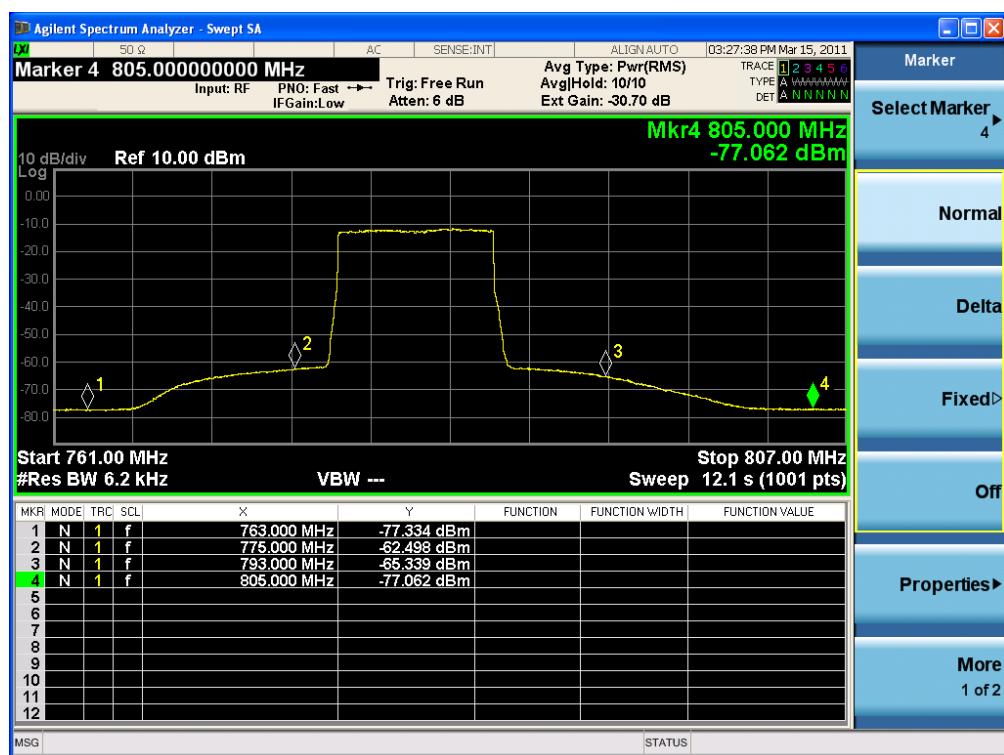


**Upper B: (707 MHz)**

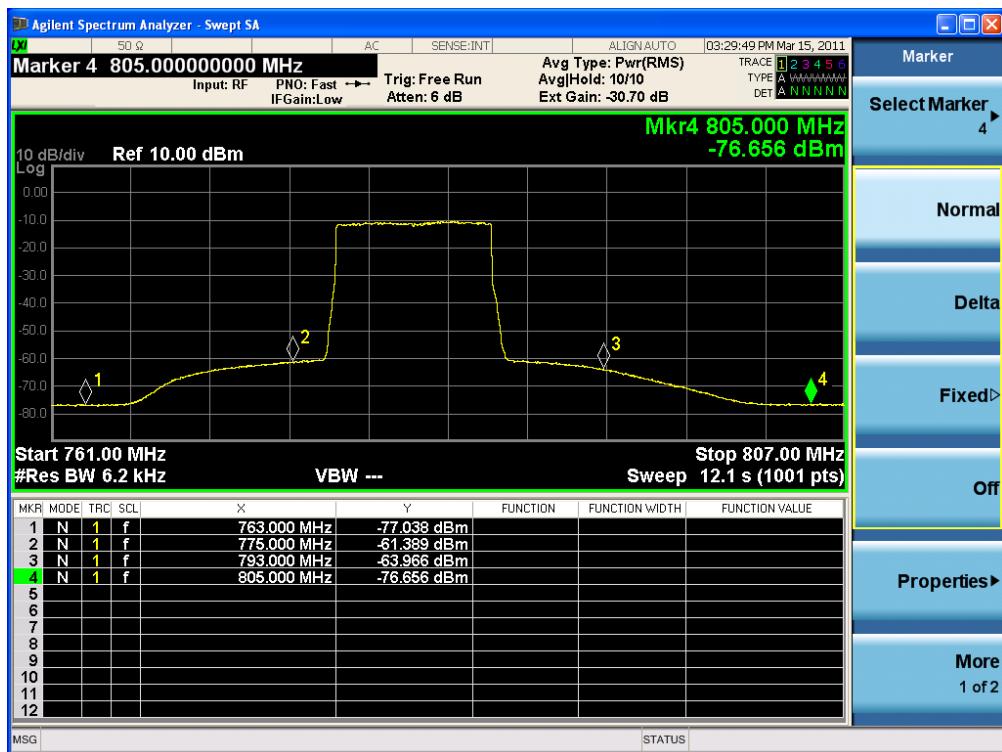
## [Spurious Emissions per Part 27.53 (c) – QPSK] - Up Link



## [Spurious Emissions per Part 27.53 (c) – 16QAM] - Up Link



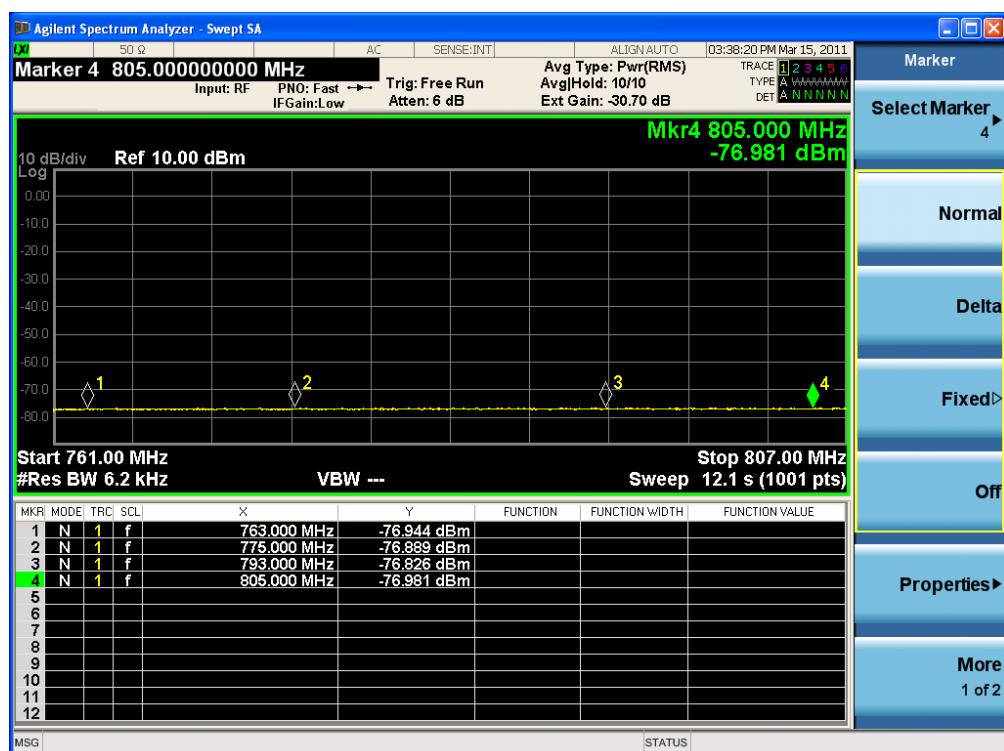
## [Spurious Emissions per Part 27.53 (c) – 64QAM] - Up Link



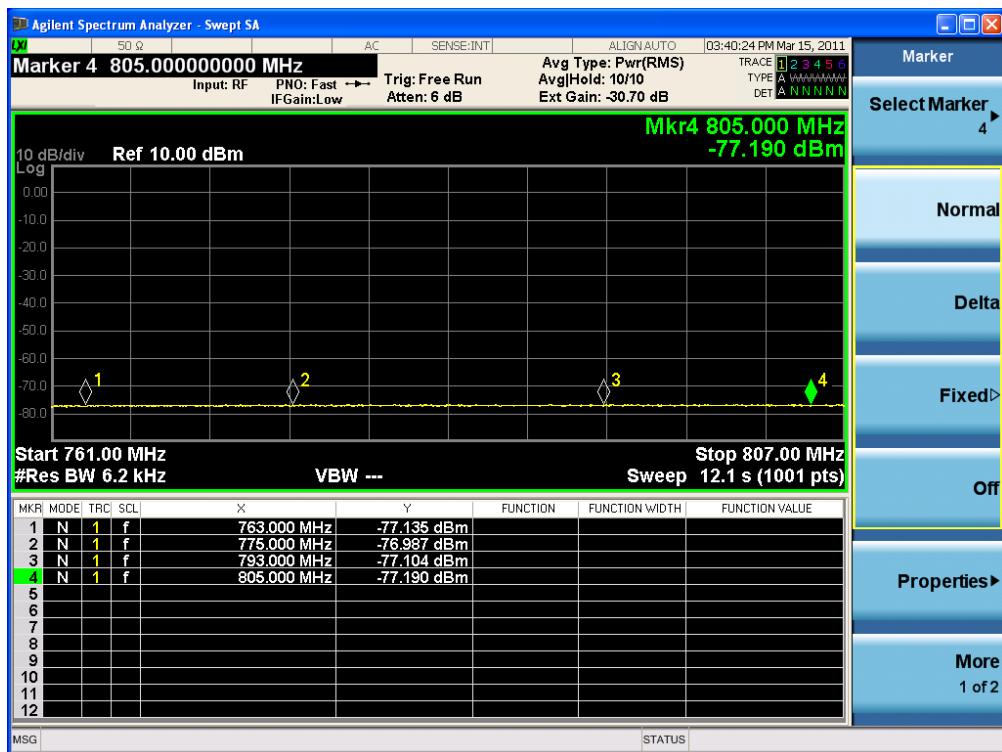
## [Spurious Emissions per Part 27.53 (c) – QPSK] - Down Link



## [Spurious Emissions per Part 27.53 (c) – 16QAM] - Down Link



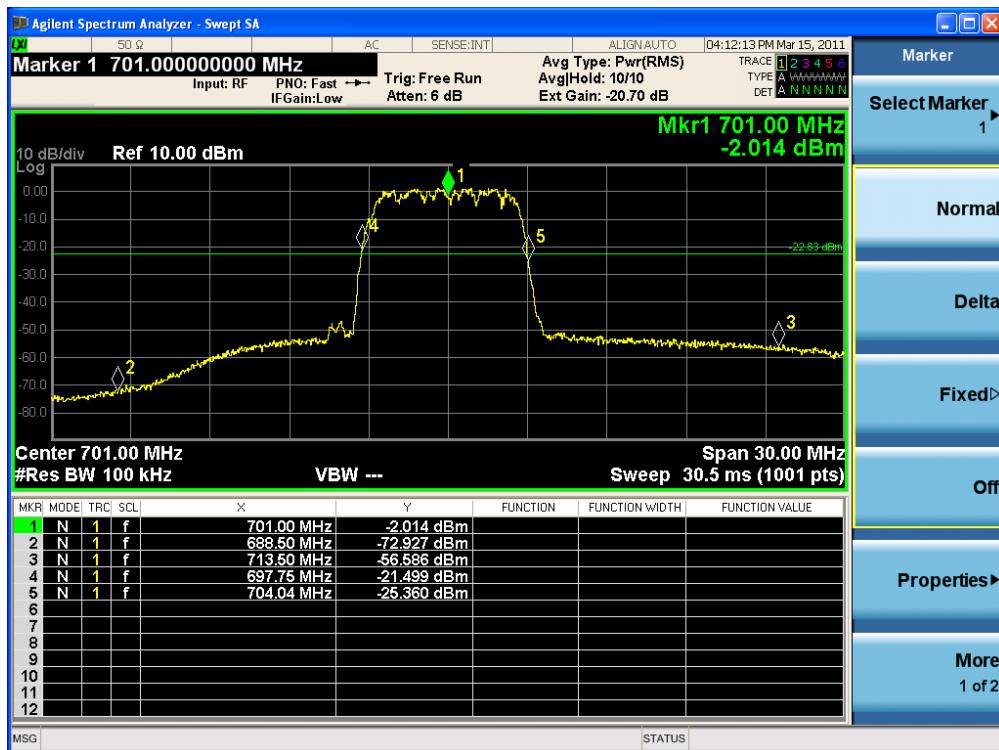
## [Spurious Emissions per Part 27.53 (c) – 64QAM] - Down Link



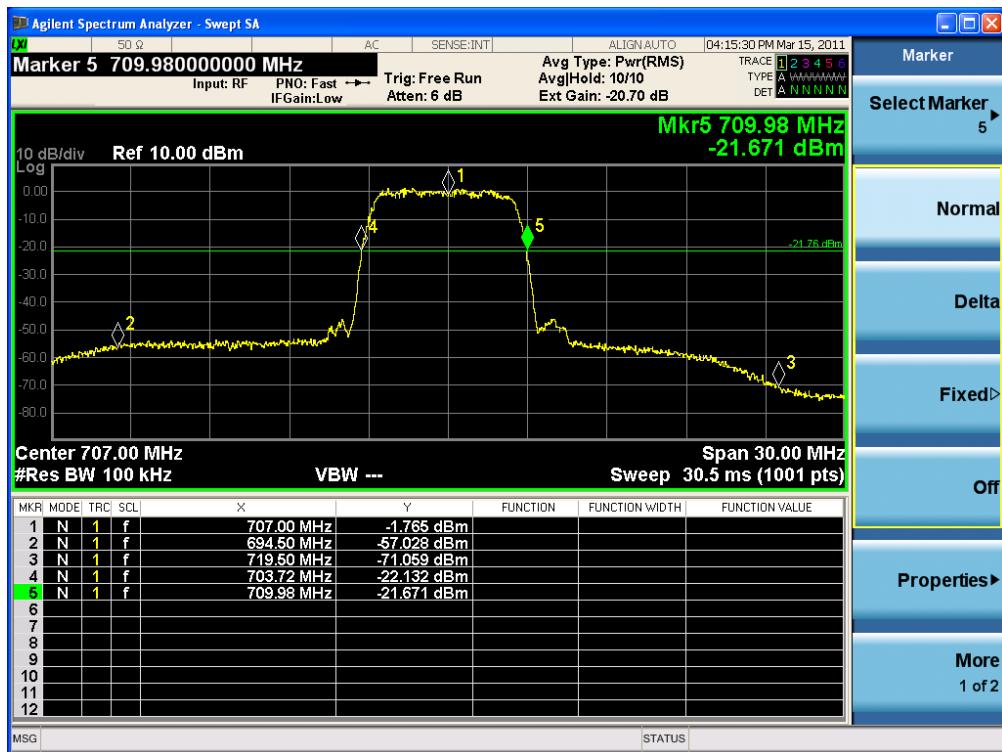
## [Out of Band rejection] - Up Link



Upper C: (782 MHz)

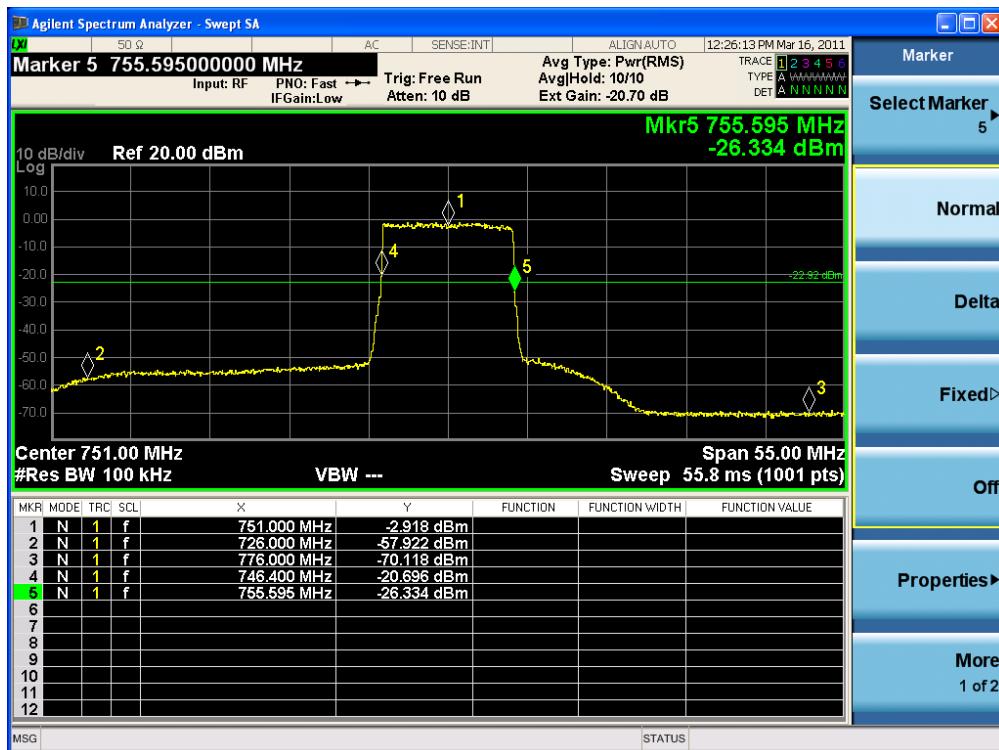
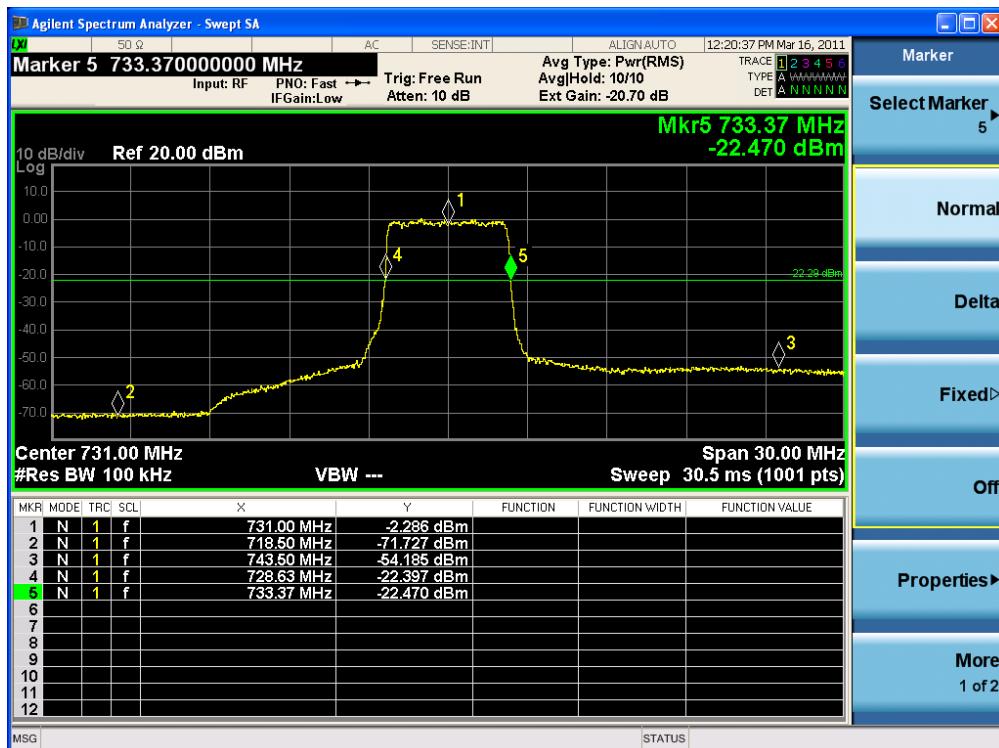


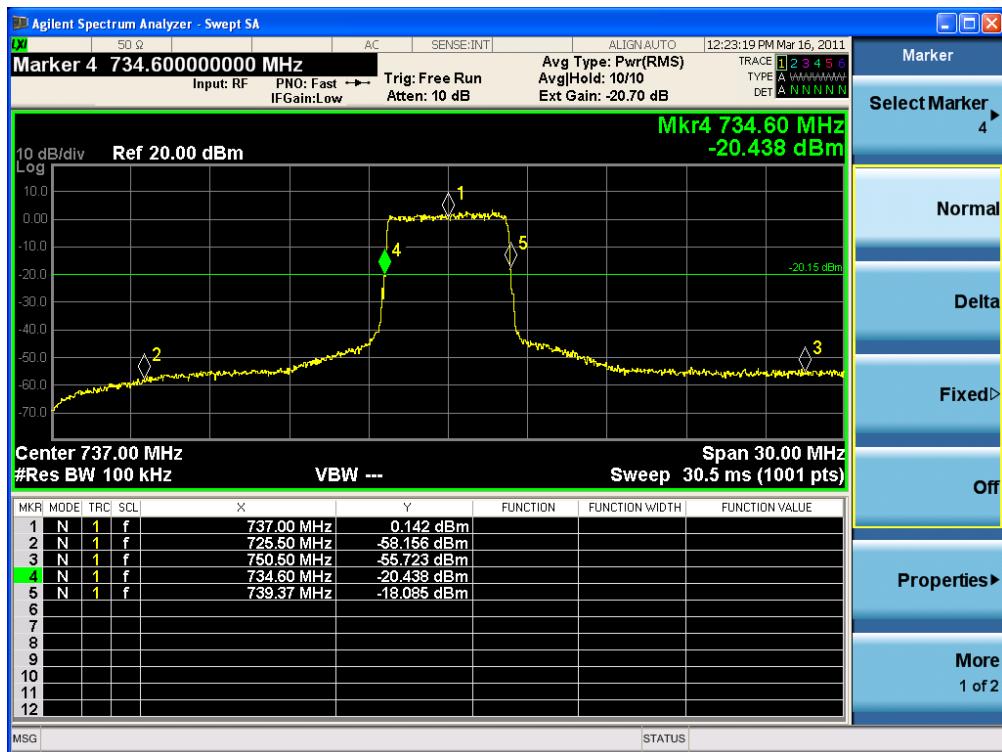
Upper A: (701 MHz)



**Upper B: (707 MHz)**

## [Out of Band rejection] - Down Link

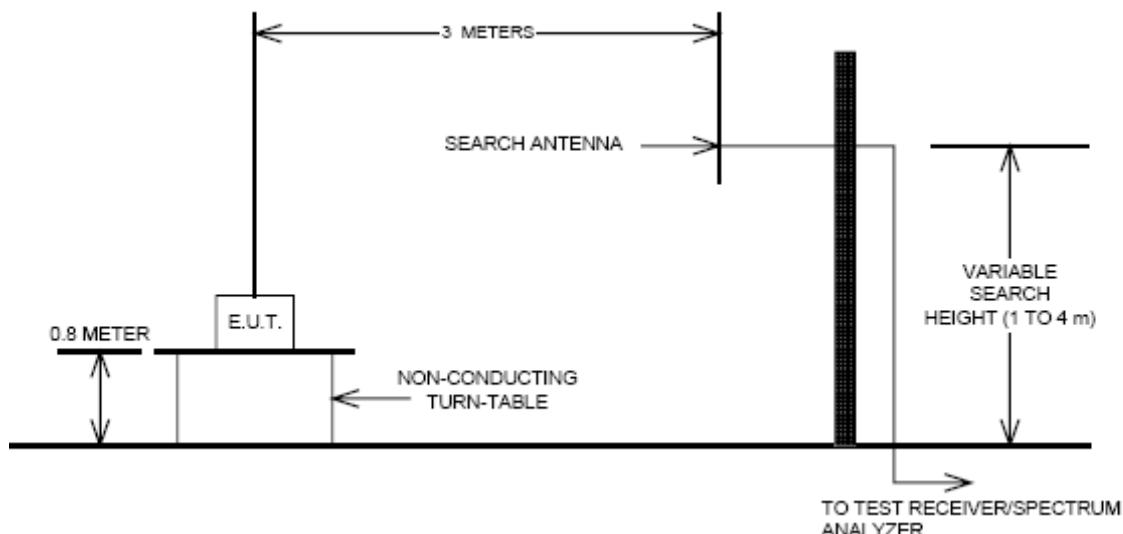
**Upper C: (751 MHz)****Upper A: (731 MHz)**



**Upper B: (737 MHz)**

### 3.4 Radiated Spurious Emissions

#### Test Set-up



#### Test Procedure

As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* were made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 10 meter semi-anechoic chamber.

The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360

and the receiving antenna scanned from 1-4m in order to capture the maximum emission. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10th or 40GHz, whichever was the lesser, were investigated. The test was performed using all selective bands and modulation. There was not much difference between them. The test result is reported using the worst bands.

**Test Result**

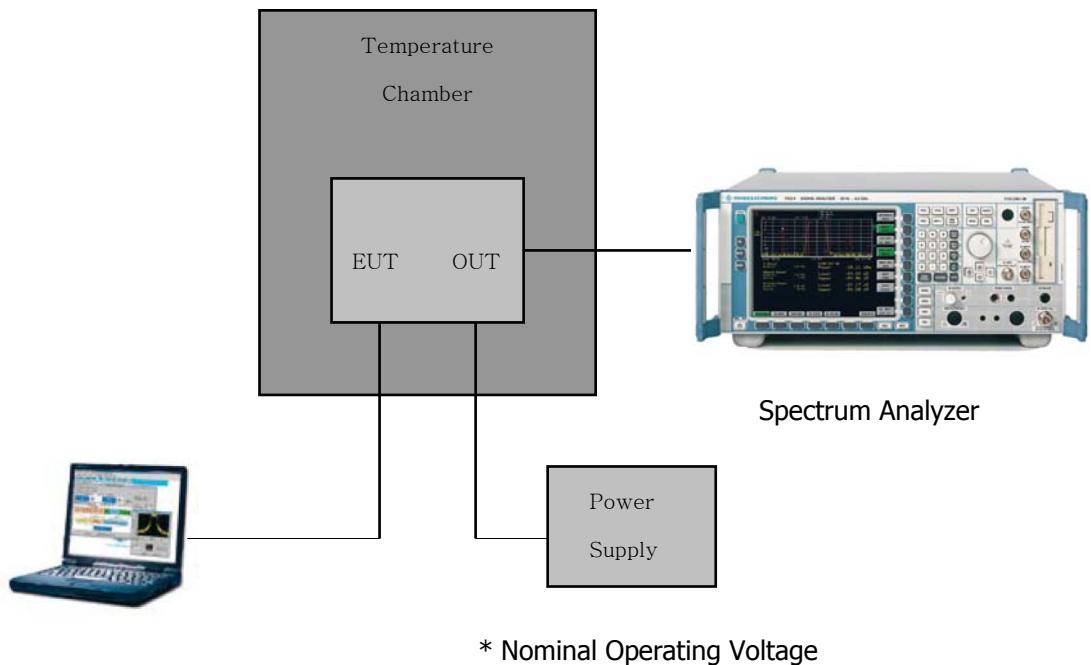
Mode	Frequency	Freq.(MHz)	<u>Substitute Level [dBm]</u>	Ant. Gain (dBd)	C.L	Pol.	ERP (dBm)	Margin (dB)
DOWN -LINK	751.0	1502.0	-54.5	6.2491	2.18	H	-50.4309	37.4309
		2253.0	-51.9	8.0512	2.99	H	-46.8388	33.8388
UPLINK	782.0	1564.0	-53.1	6.6862	2.23	H	-48.6438	35.6438
		2346.0	-49.7	8.0884	3.10	H	-44.7116	31.7116

**[Radiated Spurious Emissions at 27.53(f)]**

Mode	Frequency	Freq.(MHz)	<u>Substitute Level [dBm]</u>	Ant. Gain (dBd)	C.L	Pol.	ERP (dBm)	Margin (dB)
DOWN -LINK	751.0	1598.2	-63.6	6.91	2.24	H	-54.45	14.45
UPLINK	782.0	1563.4	-55.1	6.67	2.23	H	-46.20	6.20

### 3.5 Frequency stability

#### Test Set-up



#### Test Procedure

The frequency stability of the transmitter is measured by:

- Temperature:** The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.
- Primary Supply Voltage:** The primary supply voltage is varied from battery end point to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification — The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within  $\pm 0.000$  25 %( $\pm 2.5$  ppm) of the center frequency.

## Test Result

**NOTE: The EUT is tested 751 MHz, 16QAM.**

Main Power [V]	Freq. Error [Hz]	Difference [Hz]	ppm
10.2	-13.5	-1.0	-0.0013
12.0	-12.5	0.0	0.0000
13.8	-12.5	0.0	0.0000

**(Frequency Drift with Supply Voltage Variation)**

Temp. [Celsius]	Freq. Error [Hz]	Difference [Hz]	Ppm
50	-13.0	-0.5	-0.0007
40	-12.3	0.2	0.0003
30	-12.8	-0.3	-0.0004
10	-13.1	-0.6	-0.0008
0	-12.4	0.1	0.0001
-10	-12.8	-0.3	-0.0004
-20	-12.6	-0.1	-0.0001
-30	-12.4	0.1	0.0001

**(Frequency Drift with Temperature Variation)**

**NOTE: The EUT is tested 782 MHz, 16QAM.**

Main Power [V]	Freq. Error [Hz]	Difference [Hz]	Ppm
10.2	-12.4	-0.1	-0.0001
12.0	-12.3	0.0	0.0000
13.8	-12.8	-0.5	-0.0006

**(Frequency Drift with Supply Voltage Variation)**

Temp. [Celsius]	Freq. Error [Hz]	Difference [Hz]	Ppm
50	-12.2	0.1	0.0001
40	-11.9	0.4	0.0005
30	-12.5	-0.2	-0.0003
10	-12.6	-0.3	-0.0004
0	-12.3	0.0	0.0000
-10	-12.7	-0.4	-0.0005
-20	-12.4	-0.1	-0.0001
-30	-12.8	-0.5	-0.0006

**(Frequency Drift with Temperature Variation)**

### 3.6 RF Exposure Statement

#### 1. LIMITS

According to §1.1310 and §2.1091 RF exposure is calculated.

(B) Limits for General Population/Uncontrolled Exposures

Frequency range (MHz)	Electric field Strength (V/m)	Magnetic field Strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
0.3 - 1.34.....	614	1.63	*(100)	30
1.34 - 30.....	824/f	2.19/f	*(180/ f <sup>2</sup> )	30
30 - 300.....	27.5	0.073	0.2	30
300 - 1500.....	.....	.....	f/1500	30
1500 - 100.000.....	.....	.....	1.0	30

F = frequency in MHz

\* = Plane-wave equivalent power density

#### 2. MAXIMUM PERMISSIBLE EXPOSURE Prediction

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

S = Power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

**2-1 Limit (DownLink)**

Max Peak output Power at antenna input terminal	20.040	dBm
Max Peak output Power at antenna input terminal	100.925	mW
Prediction distance	25.000	cm
Prediction frequency	731.000	MHz
Antenna Gain(typical)	12.000	dBi
Antenna Gain(numeric)	15.849	-
Power density at prediction frequency( S)	0.20366	mW/cm <sup>2</sup>
MPE limit for uncontrolled exposure at prediction frequency	0.487	mW/cm <sup>2</sup>

**2-2 Limit (UpLink)**

Max Peak output Power at antenna input terminal	19.990	dBm
Max Peak output Power at antenna input terminal	99.770	mW
Prediction distance	25.000	cm
Prediction frequency	701.000	MHz
Antenna Gain(typical)	12.000	dBi
Antenna Gain(numeric)	15.849	-
Power density at prediction frequency( S)	0.20133	mW/cm <sup>2</sup>
MPE limit for uncontrolled exposure at prediction frequency	0.467	mW/cm <sup>2</sup>

**3. RESULTS**

The power density level at 25 cm is 0.20366 mW/cm<sup>2</sup>, which is below the uncontrolled exposure limit of 0.487 mW/cm<sup>2</sup> at 731 MHz

The power density level at 25 cm is 0.20133 mW/cm<sup>2</sup>, which is below the uncontrolled exposure limit of 0.467 mW/cm<sup>2</sup> at 701 MHz

Simultaneous MPE at 25 Cm is  $(0.20366/0.487) + (0.20133/0.467) = 0.849307 < 1$

## 4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Interval	Calibration Due
Agilent	N9020A / Spectrum Analyzer	US46220219	Annual	03/03/2012
Agilent	E4416A / Power Meter	GB41291412	Annual	01/04/2012
Agilent	E9327A / Power Sensor	MY4442009	Annual	07/23/2011
MITEQ	AFS44-00102650-42-10P-44-PS	1532439	Annual	04/05/2011
Digital	EP-3010 / Power Supply	3110117	Annual	01/04/2012
Korea Engineering	KR-1005L / Chamber	KRAC05063-3CH	Annual	12/28/2011
Schwarzbeck	VULB9160/ TRILOG Antenna	9160-3150	Biennial	09/13/2012
Schwarzbeck	BBHA 9120D/ Horn Antenna	296	Biennial	09/23/2011

## 5. CONCLUSION

The data collected shows that the LTE User Equipment **FCC ID: YUL-JL20** complies with all the requirements of Parts 27 of the FCC rules.