



## HCT CO., LTD.

### CERTIFICATION DIVISION

SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNGKI-DO, 467-701, KOREA

TEL: +82 31 639 8565 FAX: +82 31 639 8525

# CERTIFICATE OF COMPLIANCE TEST REPORT

#### GS Instruments Co., Ltd.

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

Date of Issue: November 25, 2010

Test Report No.: HCTR1011FR10-2

Test Site: HCT CO., LTD.

FCC

:

**U88-CC100K700**

APPLICANT

:

**GS Instruments Co., Ltd.**

EUT Type:

LTE Repeater

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:

30 dBm (1 W)

Trade Name/Model(s):

GS Instruments Co., Ltd. / CoverCell100K700

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):

8M61G7D (QPSK), 8M61D7D (16QAM), 8M61D7D (64QAM)

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

This report only responds to the tested sample and may not be reproduced, except in full, without written approval of the HCT Co., Ltd.

## Version

| TEST REPORT NO. | DATE              | DESCRIPTION                                                               |
|-----------------|-------------------|---------------------------------------------------------------------------|
| HCTR1011FR10    | November 08, 2010 | First Approval Report                                                     |
| HCTR1011FR10-1  | November 11, 2010 | Change the Section 3 RF Exposure test limit.                              |
| HCTR1011FR10-2  | November 25, 2010 | Add Value to provide the calculation the limit is the lowest (698.5 MHz). |
|                 |                   |                                                                           |
|                 |                   |                                                                           |

# Table of Contents

|                                                        |            |
|--------------------------------------------------------|------------|
| <b>1. SCOPE .....</b>                                  | <b>4</b>   |
| <b>2. INTRODUCTION .....</b>                           | <b>5</b>   |
| <b>3. DESCRIPTION OF TESTS .....</b>                   | <b>6</b>   |
| <b>3.1 Conducted RF Power Test .....</b>               | <b>7</b>   |
| <b>3.2 Occupied bandwidth.....</b>                     | <b>2 0</b> |
| <b>3.3 Spurious Emissions at Antenna Terminal.....</b> | <b>4 1</b> |
| <b>3.4 Radiated Spurious Emissions.....</b>            | <b>7 1</b> |
| <b>3.5 Frequency stability .....</b>                   | <b>7 3</b> |
| <b>3.6 RF Exposure Statement .....</b>                 | <b>7 5</b> |
| <b>4. LIST OF TEST EQUIPMENT .....</b>                 | <b>7 7</b> |
| <b>5. CONCLUSION.....</b>                              | <b>7 8</b> |

# 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: | GS Instruments Co., Ltd.                              |
| Address:      | 1385-14, Juan-Dong, Nam-Ku, Incheon,<br>402-200 Korea |
| Tel. / Fax :  | + 82-32-870-5782 / + 82-32-870-5784                   |
| E-Mail:       | excitingbb@gsinstrument.com                           |

|                     |                                                                                                                                                                             |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FCC:                | U88-CC100K700                                                                                                                                                               |
| EUT Type:           | LTE Repeater                                                                                                                                                                |
| Trade Name:         | GS Instruments Co., Ltd.                                                                                                                                                    |
| Model(s):           | CoverCell100K700                                                                                                                                                            |
| Frequency Ranges    | Uplink : 777.00 MHz – 787.0 MHz<br>698.50 MHz - 703.5 MHz<br>704.50 MHz - 709.5 MHz<br>Downlink: 746.00 MHz – 756.0 MHz<br>728.50 MHz - 733.5 MHz<br>734.50 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: 30 dBm<br>Downlink : 30 dBm                                                                                                                                         |

## **2. INTRODUCTION**

### **EUT DESCRIPTION**

The GS Instruments Co., Ltd. CoverCell100K700 LTE 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.

The RF power is rated at 1 W (30 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

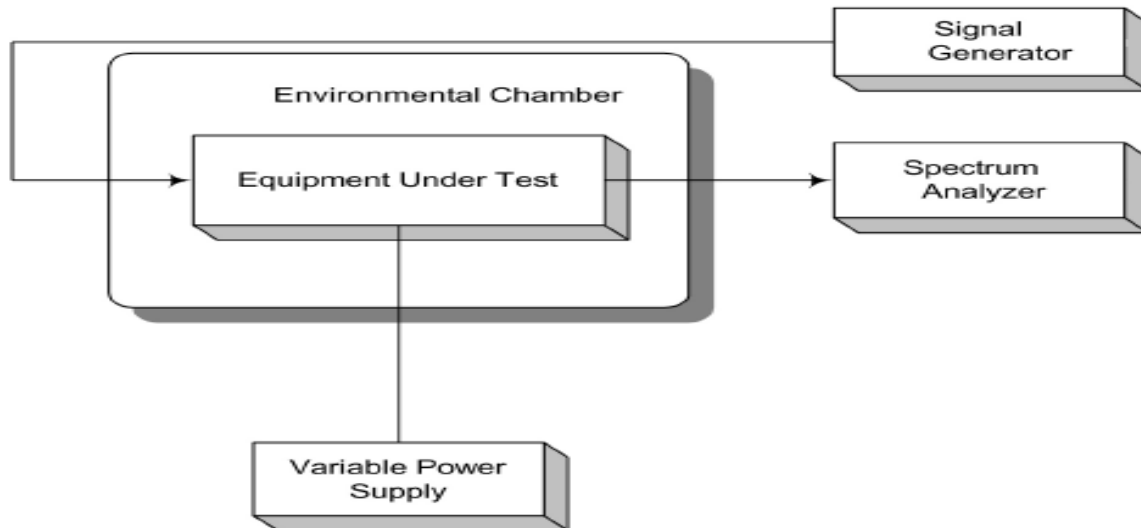
#### Test Summary

| FCC Part Section(s) | Test Description                                  | Test Limit                           | Test Condition | Test Result | Reference |
|---------------------|---------------------------------------------------|--------------------------------------|----------------|-------------|-----------|
| 2.1046<br>27.50(d)  | RF Power Output                                   | N/A                                  | Conducted      | PASS        | 3.1       |
| 2.1049(i)           | Occupied Bandwidth                                | N/A                                  |                | PASS        | 3.2       |
| 2.1051<br>27.53(g)  | Conducted Spurious Emissions at Antenna Terminals | $< 43 + 10\log_{10}(P[\text{Watt}])$ |                | PASS        | 3.3       |
| 2.1053<br>27.53(g)  | Spurious Emissions                                | $< 43 + 10\log_{10}(P[\text{Watt}])$ | Radiated       | PASS        | 3.4       |
| 2.1055<br>27.54     | Frequency Stability                               | Within the allotted band             | Conducted      | PASS        | 3.5       |
| 2.1091<br>2.1093    | RF Exposure                                       | 0.501 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.

**Test Result- Down Link**

| Modulation Type | Cannel  | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit |
|-----------------|---------|-----------------|--------------------|------------------|-------|
| QPSK            | Upper C | 751             | 29.88              | 0.973            | -     |
|                 | Lower A | 731             | 29.54              | 0.899            | -     |
|                 | Lower B | 737             | 29.41              | 0.873            | -     |

| Modulation Type | Cannel  | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit |
|-----------------|---------|-----------------|--------------------|------------------|-------|
| 16QAM           | Upper C | 751             | 29.50              | 0.891            | -     |
|                 | Lower A | 731             | 29.72              | 0.938            | -     |
|                 | Lower B | 737             | 29.38              | 0.867            | -     |

| Modulation Type | Cannel  | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit |
|-----------------|---------|-----------------|--------------------|------------------|-------|
| 64QAM           | Upper C | 751             | 29.57              | 0.906            | -     |
|                 | Lower A | 731             | 29.76              | 0.946            | -     |
|                 | Lower B | 737             | 29.49              | 0.889            | -     |

**Test Result- Up Link**

| Modulation Type | Cannel  | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit |
|-----------------|---------|-----------------|--------------------|------------------|-------|
| QPSK            | Upper C | 782             | 29.54              | 0.899            | -     |
|                 | Lower A | 701             | 29.21              | 0.834            | -     |
|                 | Lower B | 707             | 29.74              | 0.942            | -     |

| Modulation Type | Cannel  | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit |
|-----------------|---------|-----------------|--------------------|------------------|-------|
| 16QAM           | Upper C | 782             | 29.81              | 0.957            | -     |
|                 | Lower A | 701             | 29.19              | 0.830            | -     |
|                 | Lower B | 707             | 29.63              | 0.918            | -     |

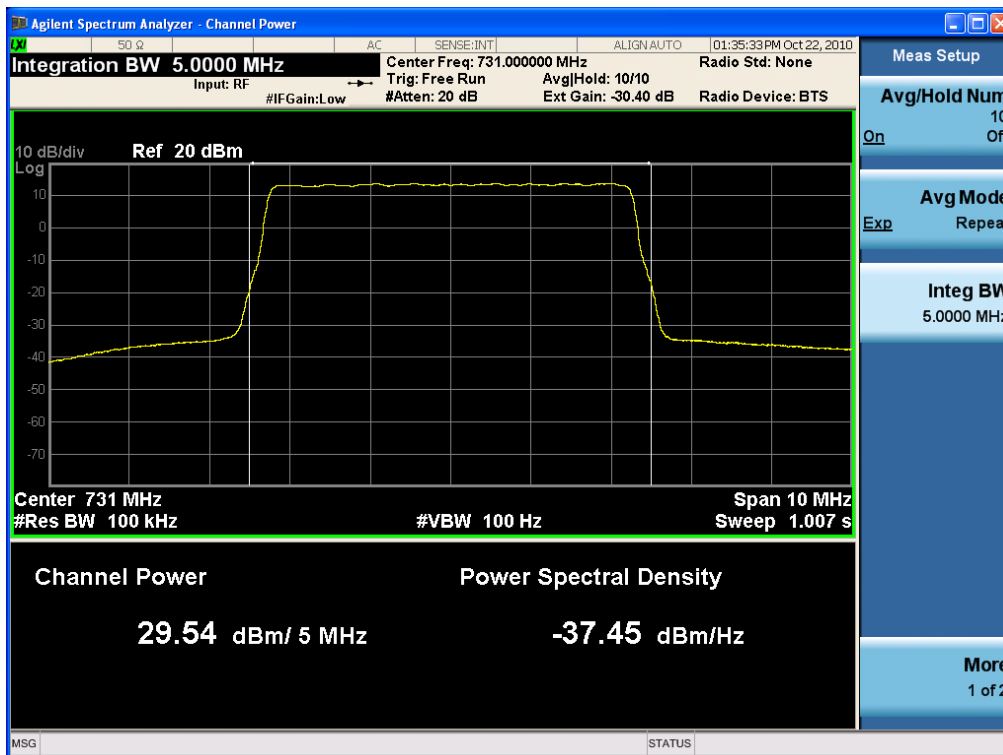
| Modulation Type | Cannel  | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Limit |
|-----------------|---------|-----------------|--------------------|------------------|-------|
| 64QAM           | Upper C | 782             | 29.83              | 0.962            | -     |
|                 | Lower A | 701             | 29.27              | 0.845            | -     |
|                 | Lower B | 707             | 29.64              | 0.920            | -     |

## Test Plots

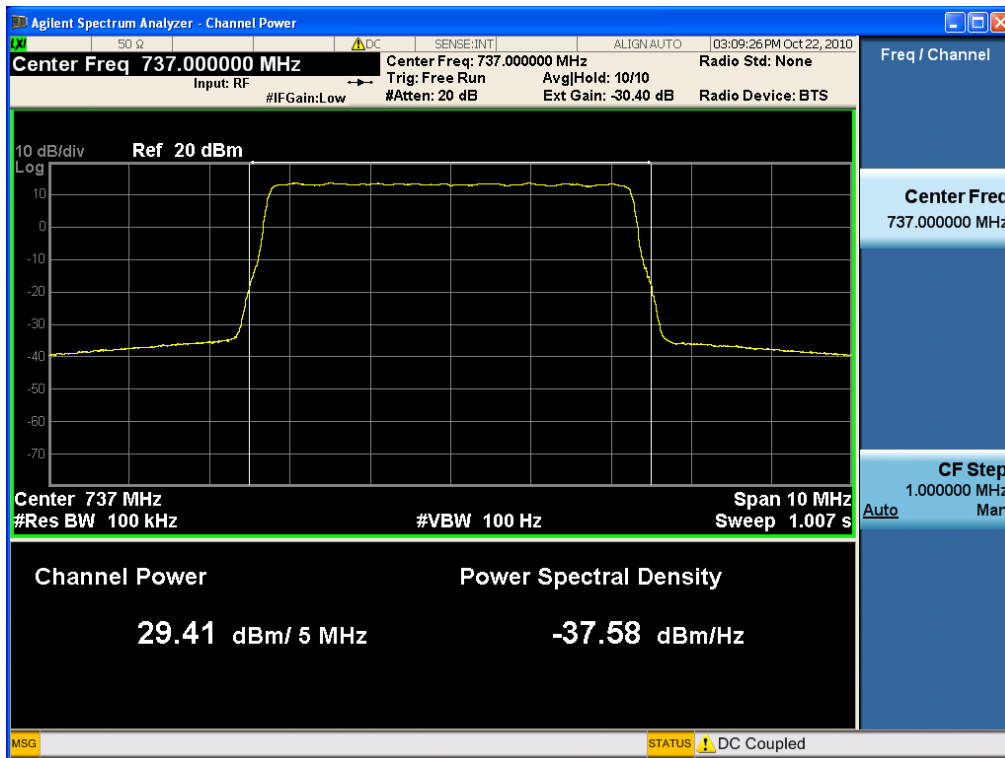
### [QPSK]-Down Link



(751 MHz)

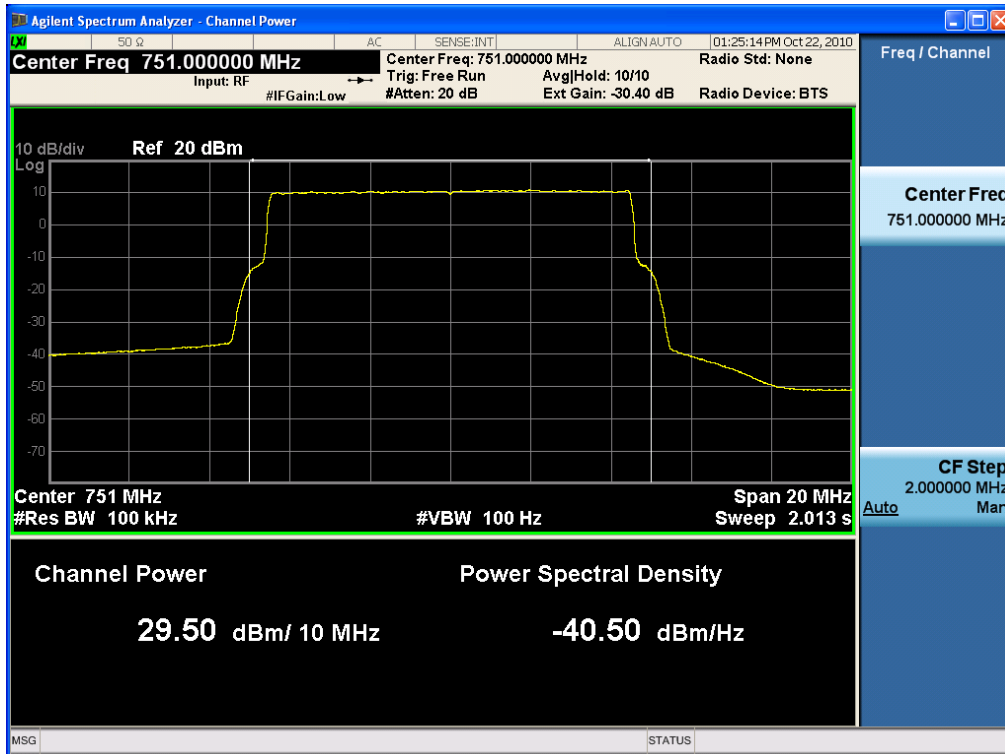


(731 MHz)

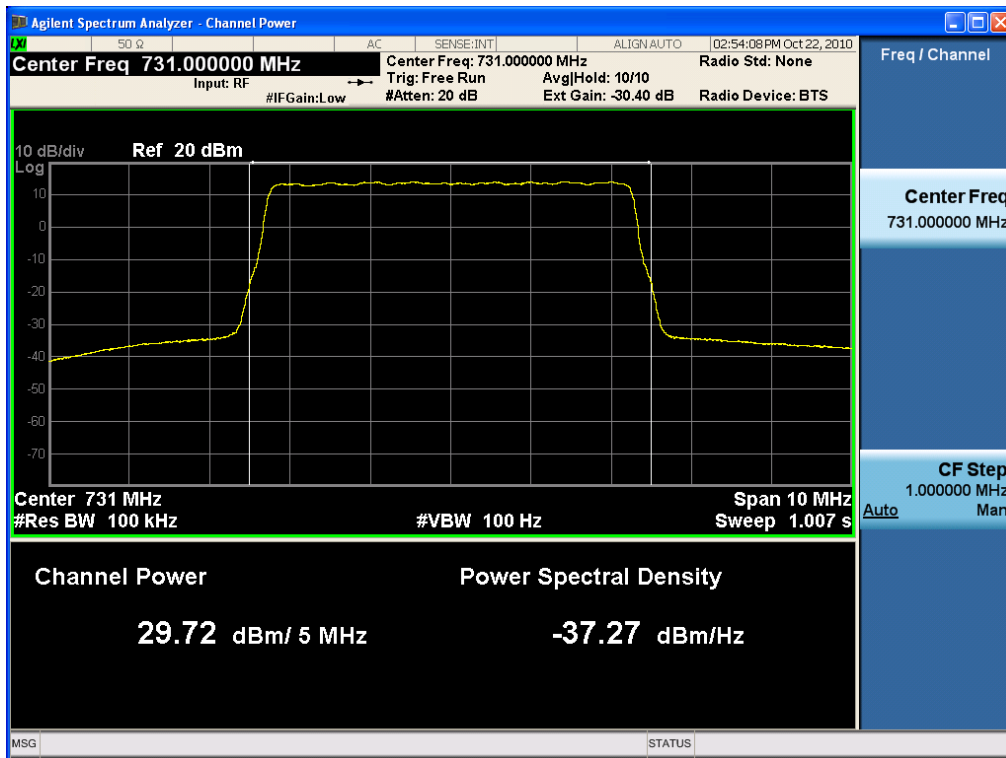


(737 MHz)

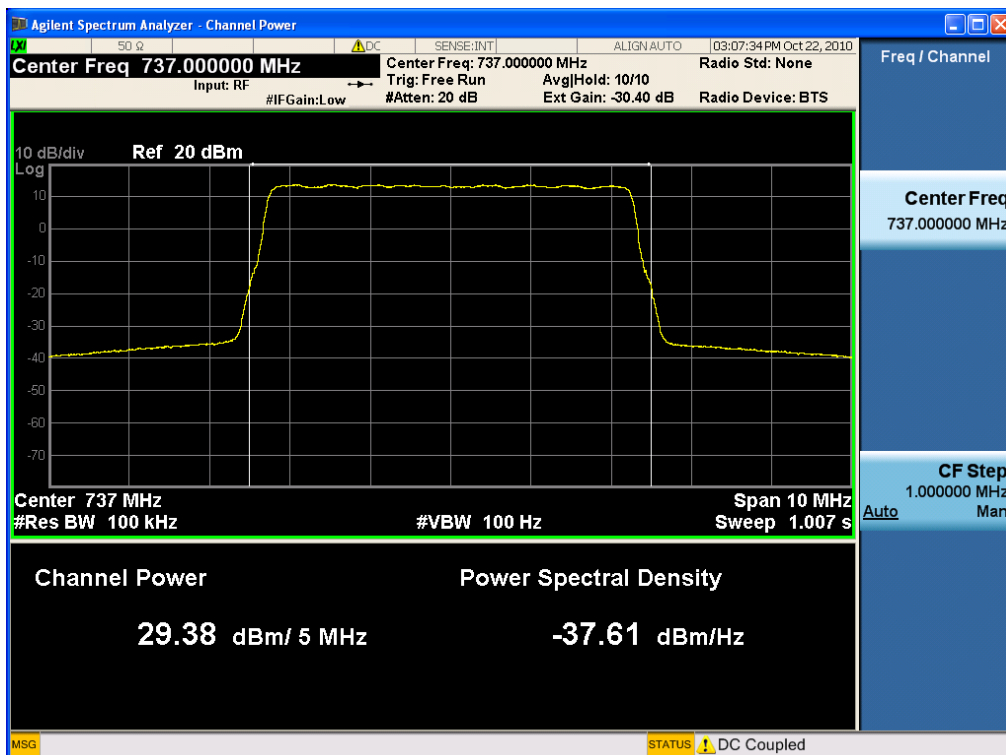
[16QAM] -Down Link



(751 MHz)

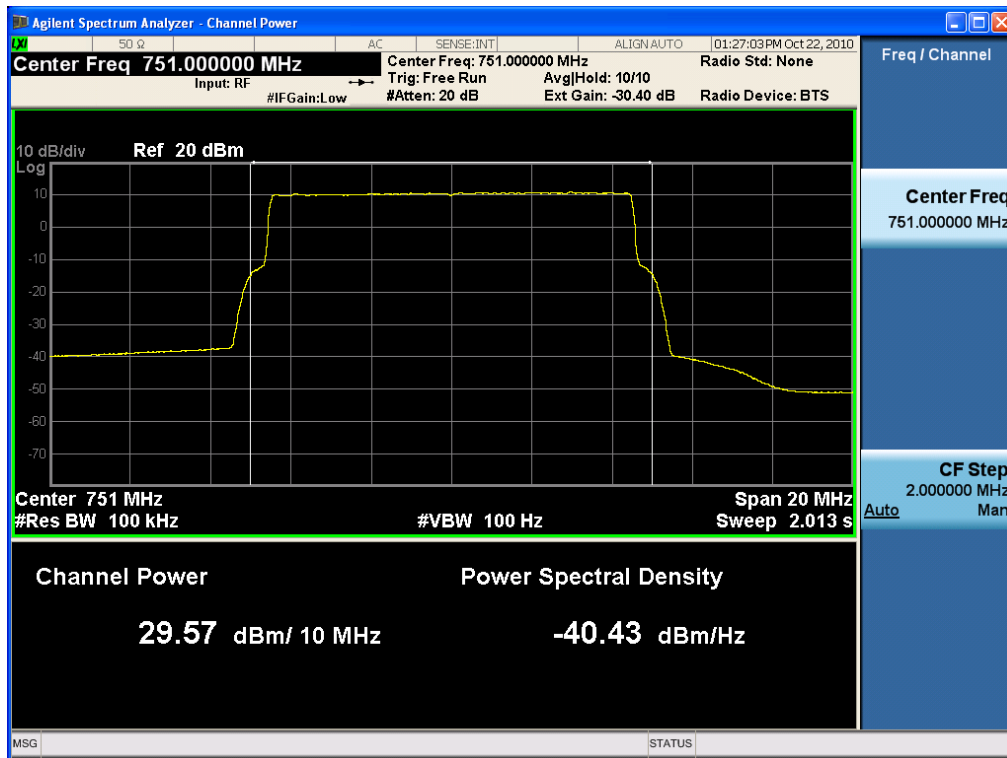


(731 MHz)

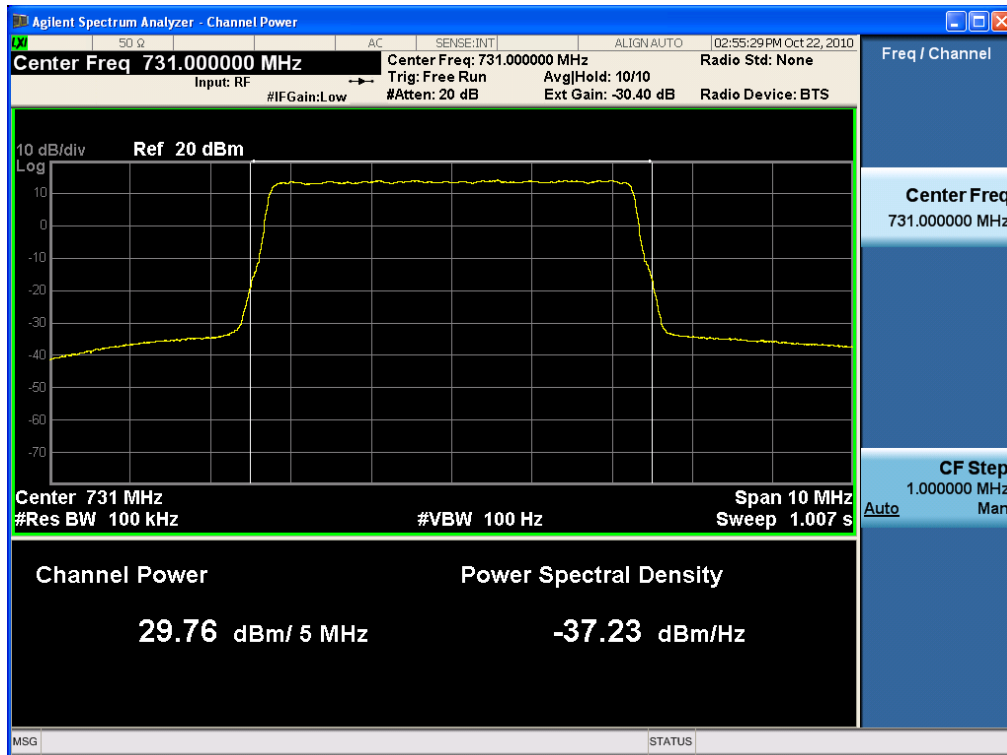


(737 MHz)

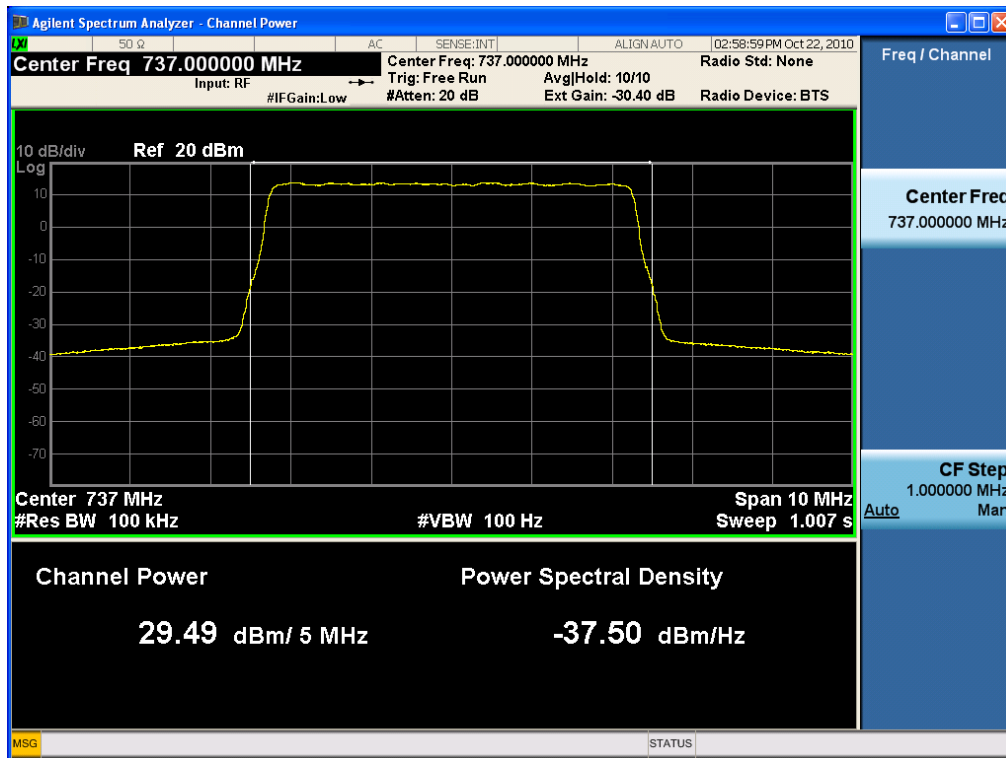
**[64QAM] -Down Link**



**(751 MHz)**

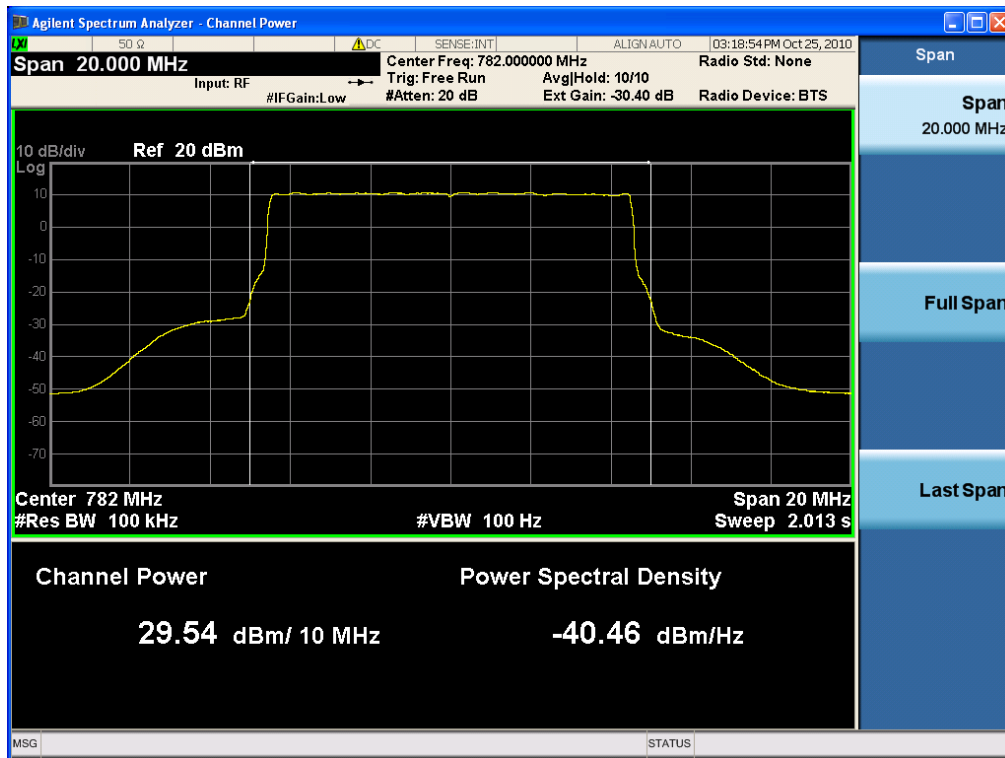


**(731 MHz)**

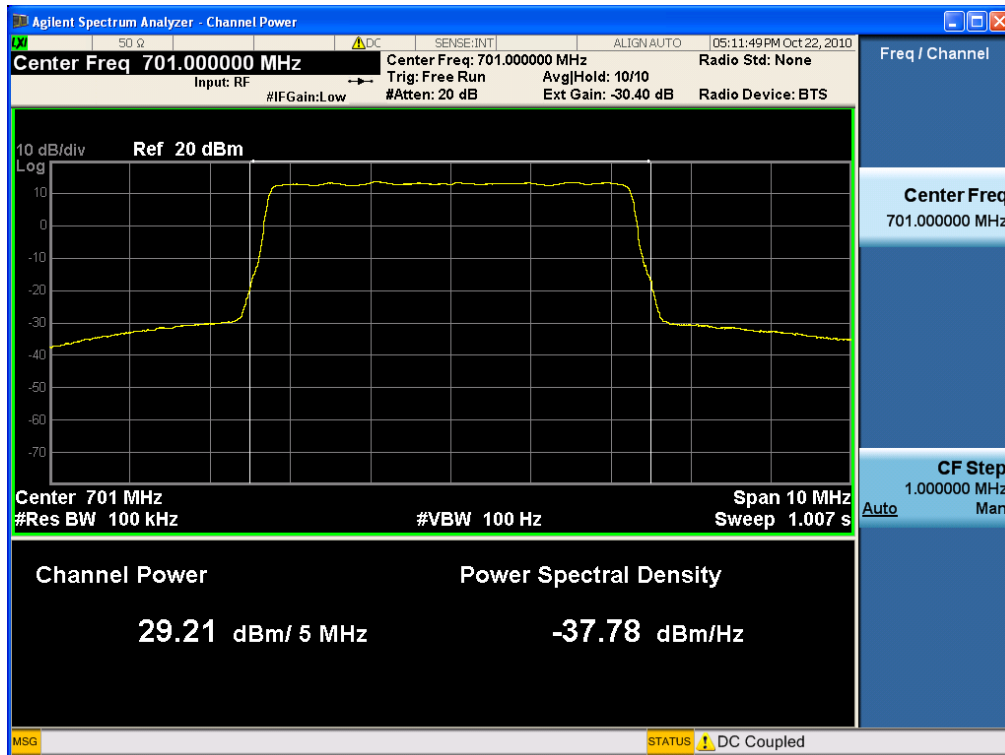


(737 MHz)

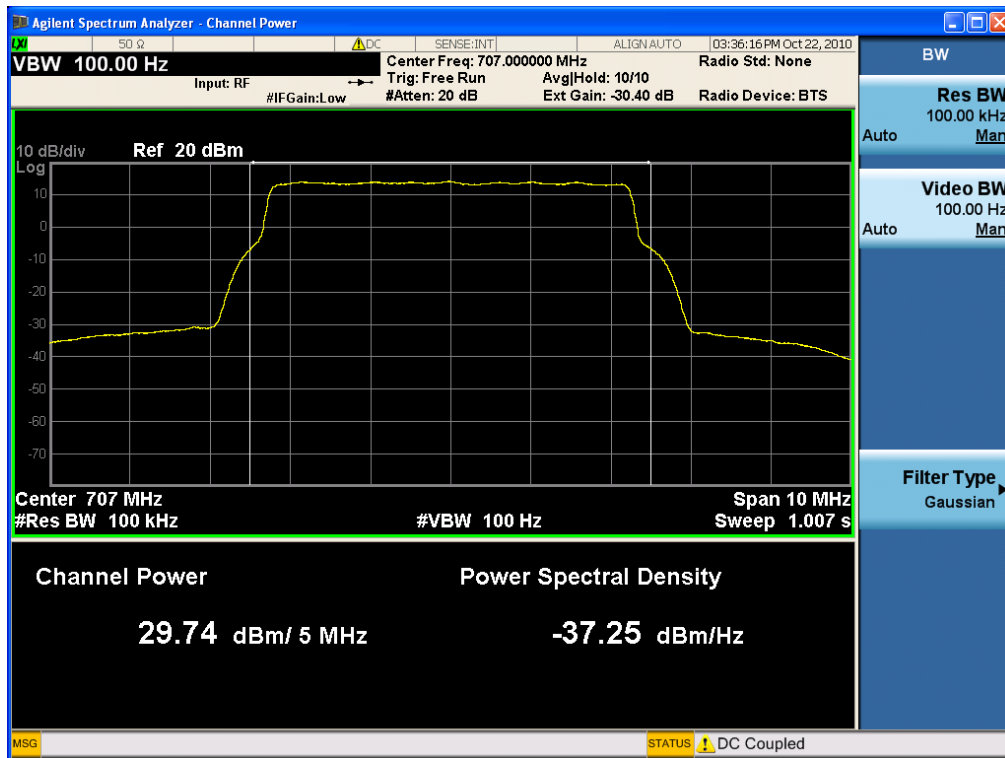
[QPSK]-Up Link



(782 MHz)

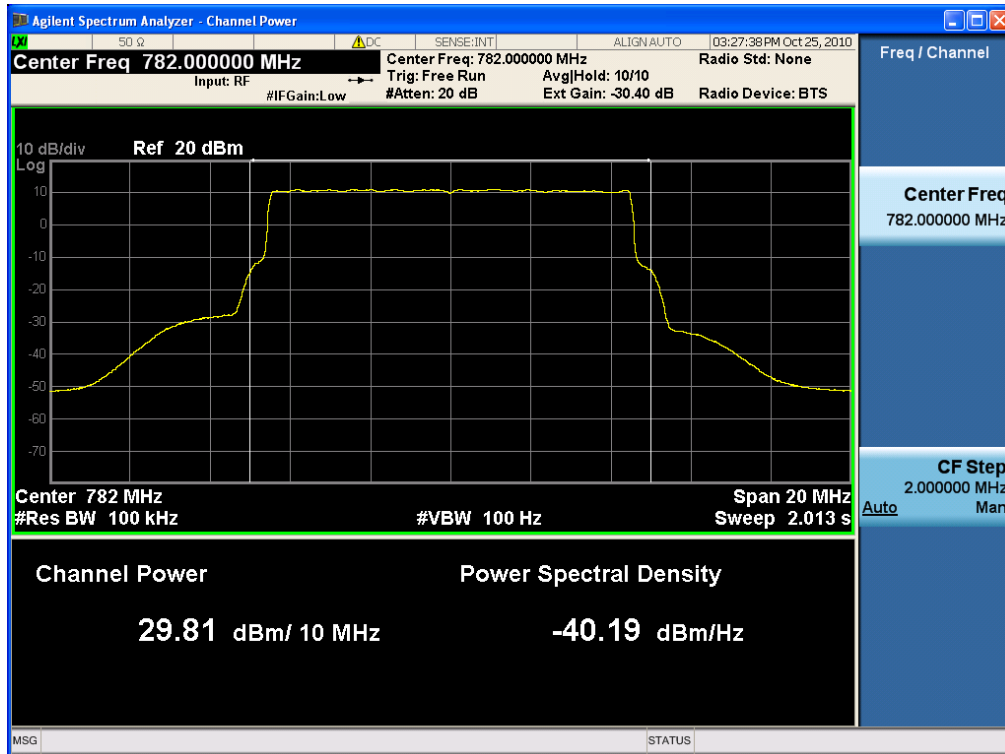


(701 MHz)

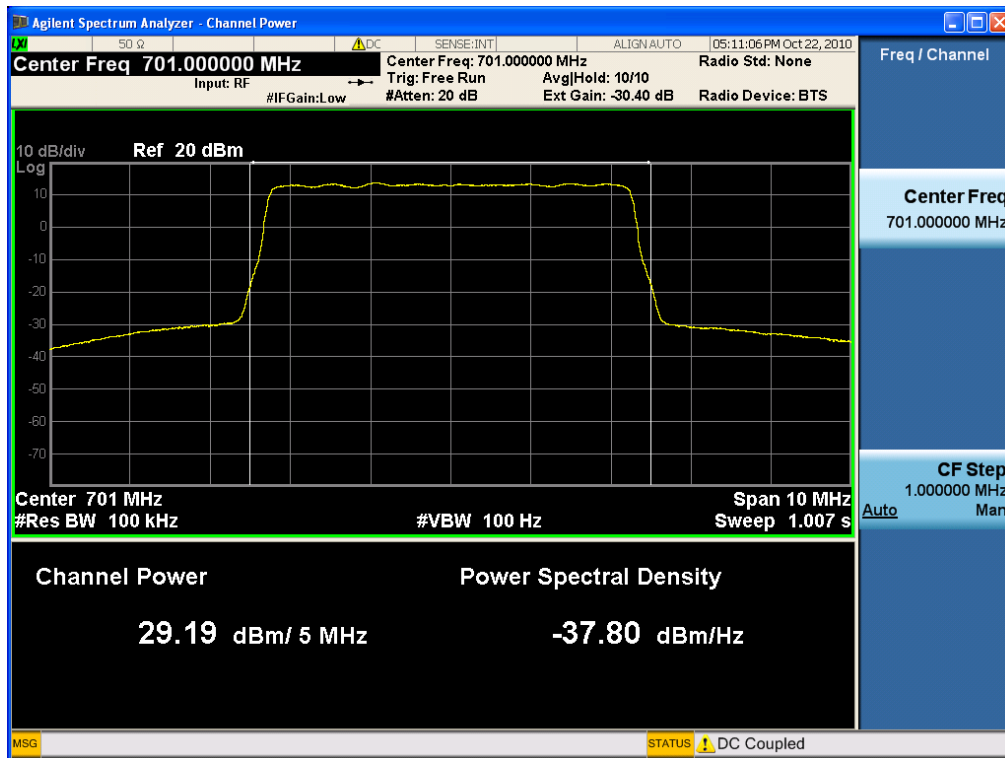


(707 MHz)

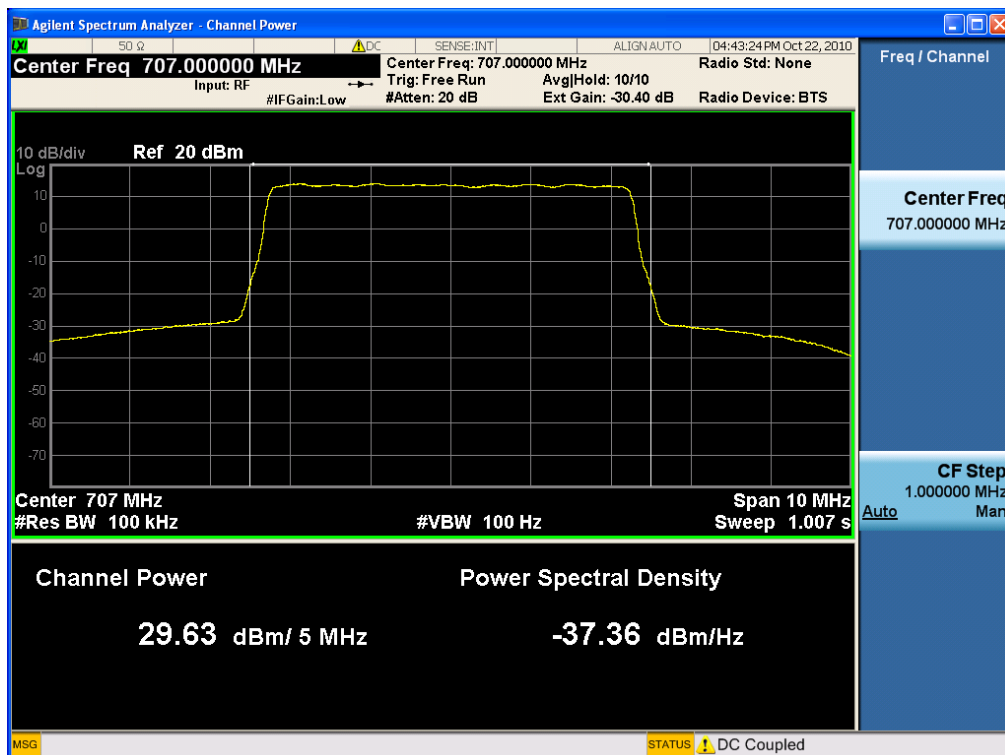
### [16QAM] -Up Link



(782 MHz)

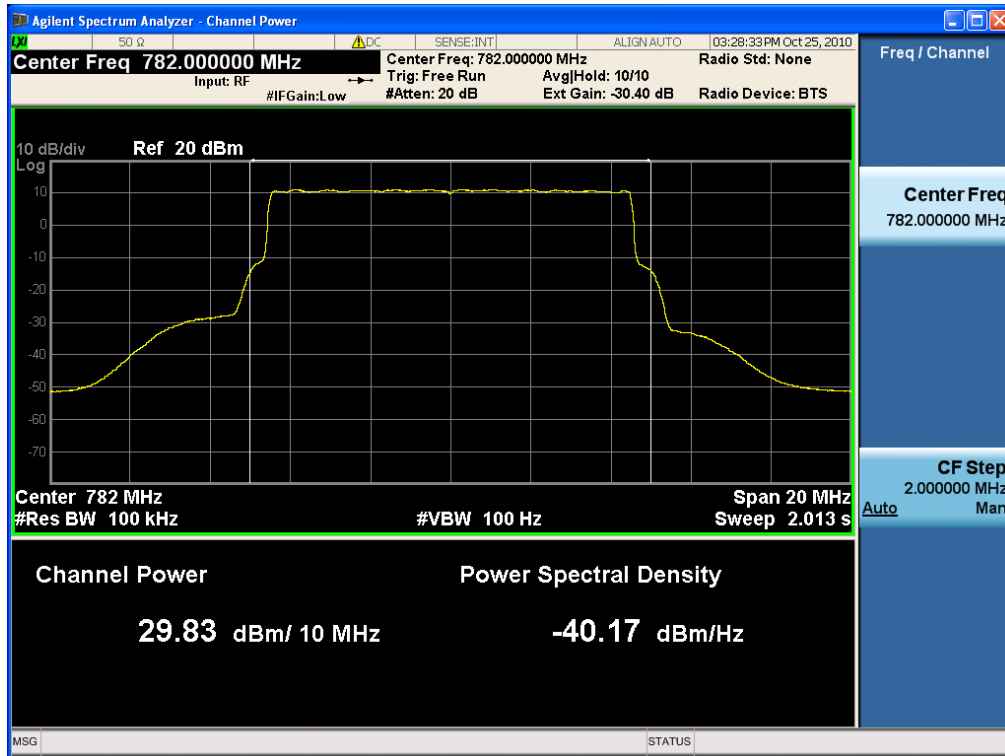


(701 MHz)

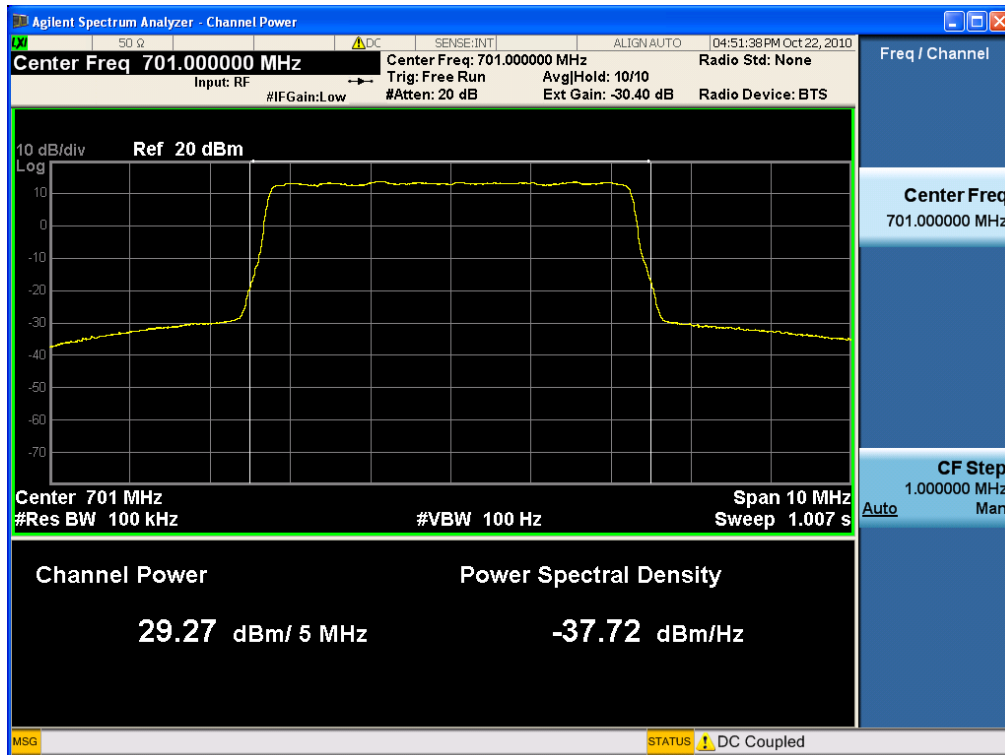


(707 MHz)

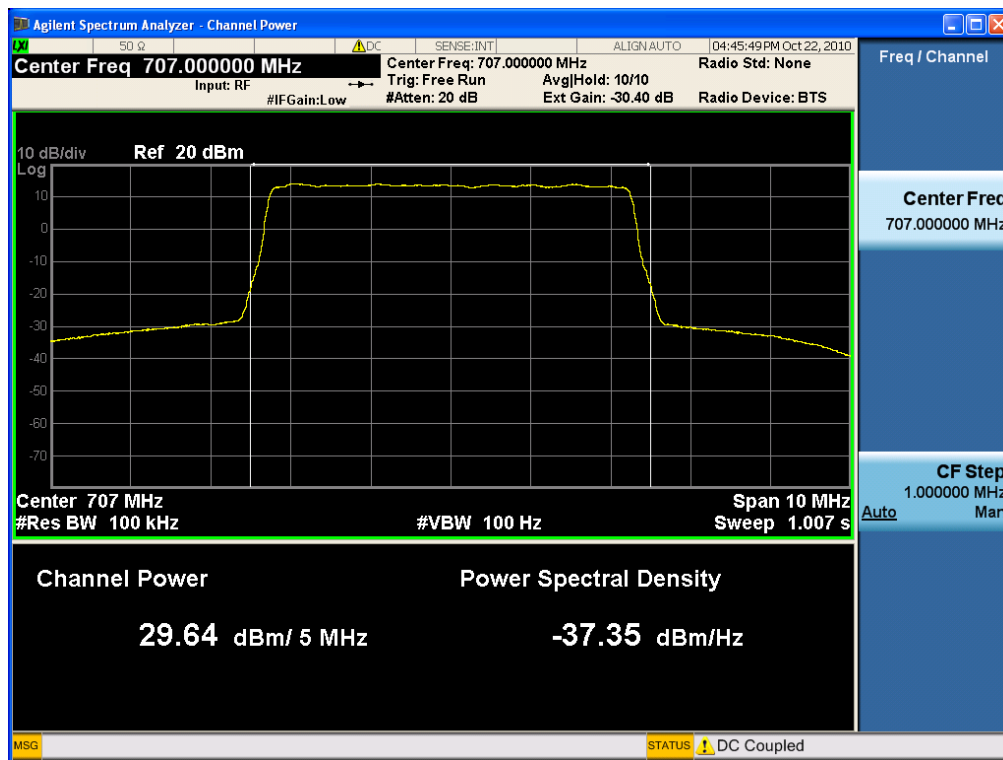
[64QAM] -Up Link



(782 MHz)



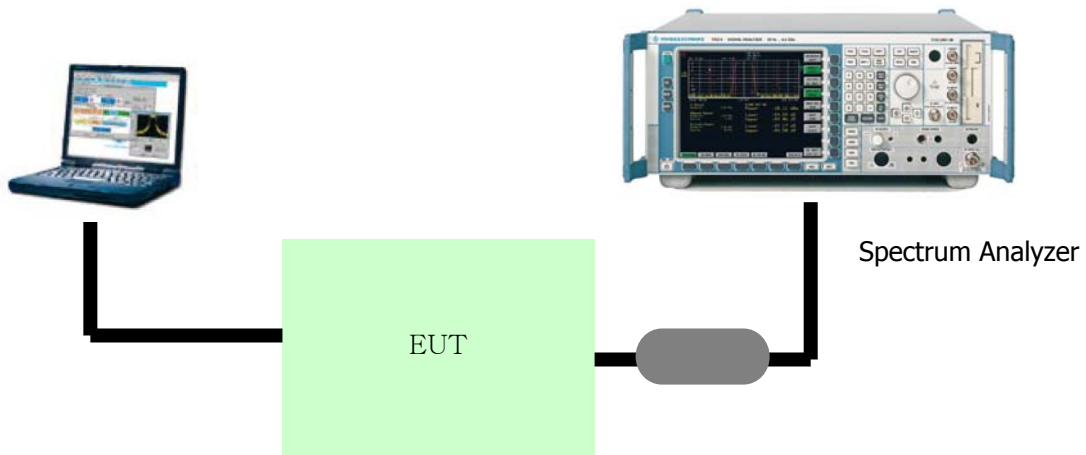
(701 MHz)



(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     | DOWNLINK          | UPLINK            |
|------------------|-------------------|-------------------|
| Source           | LTE Forward Noise | LTE Reverse Noise |
| Power Level      | - 54.7 dBm        | - 53.7 dBm        |
| Amplitude offset | - 30.4 dB         | - 30.4 dB         |

**Test Result- Down Link/ Output**

| Modulation Type | Cannel  | Frequency (MHz) | Occupied BandWidth (MHz) | Limit |
|-----------------|---------|-----------------|--------------------------|-------|
| QPSK            | Upper C | 751             | 10.050                   | -     |
|                 | Lower A | 731             | 4.850                    | -     |
|                 | Lower B | 737             | 4.849                    | -     |

| Modulation Type | Cannel  | Frequency (MHz) | Occupied BandWidth (MHz) | Limit |
|-----------------|---------|-----------------|--------------------------|-------|
| 16QAM           | Upper C | 751             | 10.040                   | -     |
|                 | Lower A | 731             | 4.849                    | -     |
|                 | Lower B | 737             | 4.853                    | -     |

| Modulation Type | Cannel  | Frequency (MHz) | Occupied BandWidth (MHz) | Limit |
|-----------------|---------|-----------------|--------------------------|-------|
| 64QAM           | Upper C | 751             | 10.040                   | -     |
|                 | Lower A | 731             | 4.857                    | -     |
|                 | Lower B | 737             | 4.850                    | -     |

**Test Result- Down Link/ Input**

| Modulation Type | Cannel  | Frequency (MHz) | Occupied BandWidth (MHz) | Limit |
|-----------------|---------|-----------------|--------------------------|-------|
| QPSK            | Upper C | 751             | 11.630                   | -     |
|                 | Lower A | 731             | 4.853                    | -     |
|                 | Lower B | 737             | 4.875                    | -     |

| Modulation Type | Cannel  | Frequency (MHz) | Occupied BandWidth (MHz) | Limit |
|-----------------|---------|-----------------|--------------------------|-------|
| 16QAM           | Upper C | 751             | 11.640                   | -     |
|                 | Lower A | 731             | 4.871                    | -     |
|                 | Lower B | 737             | 4.869                    | -     |

| Modulation Type | Cannel  | Frequency (MHz) | Occupied BandWidth (MHz) | Limit |
|-----------------|---------|-----------------|--------------------------|-------|
| 64QAM           | Upper C | 751             | 11.610                   | -     |
|                 | Lower A | 731             | 4.866                    | -     |
|                 | Lower B | 737             | 4.863                    | -     |

**Test Result- Up Link/ Output**

| Modulation Type | Cannel  | Frequency (MHz) | Occupied BandWidth (MHz) | Limit |
|-----------------|---------|-----------------|--------------------------|-------|
| QPSK            | Upper C | 782             | 9.485                    | -     |
|                 | Lower A | 701             | 4.836                    | -     |
|                 | Lower B | 707             | 4.842                    | -     |

| Modulation Type | Cannel  | Frequency (MHz) | Occupied BandWidth (MHz) | Limit |
|-----------------|---------|-----------------|--------------------------|-------|
| 16QAM           | Upper C | 782             | 10.060                   | -     |
|                 | Lower A | 701             | 4.843                    | -     |
|                 | Lower B | 707             | 4.845                    | -     |

| Modulation Type | Cannel  | Frequency (MHz) | Occupied BandWidth (MHz) | Limit |
|-----------------|---------|-----------------|--------------------------|-------|
| 64QAM           | Upper C | 782             | 10.080                   | -     |
|                 | Lower A | 701             | 4.849                    | -     |
|                 | Lower B | 707             | 4.849                    | -     |

**Test Result- Up Link/ Input**

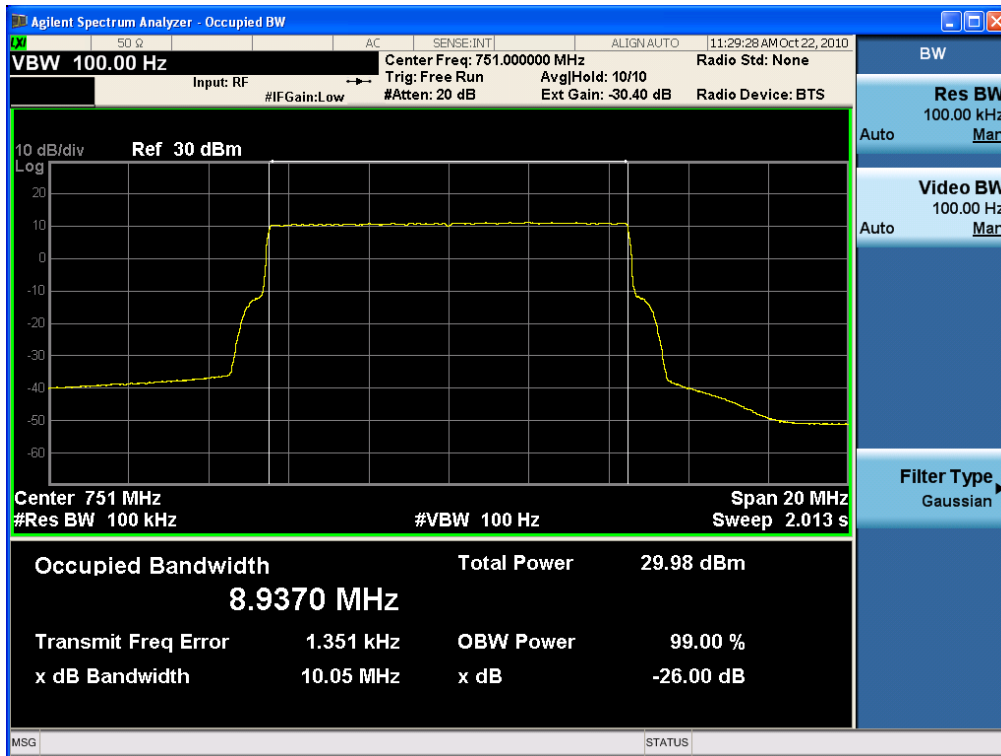
| Modulation Type | Cannel  | Frequency (MHz) | Occupied BandWidth (MHz) | Limit |
|-----------------|---------|-----------------|--------------------------|-------|
| QPSK            | Upper C | 782             | 11.640                   | -     |
|                 | Lower A | 701             | 4.865                    | -     |
|                 | Lower B | 707             | 4.854                    | -     |

| Modulation Type | Cannel  | Frequency (MHz) | Occupied BandWidth (MHz) | Limit |
|-----------------|---------|-----------------|--------------------------|-------|
| 16QAM           | Upper C | 782             | 11.600                   | -     |
|                 | Lower A | 701             | 4.864                    | -     |
|                 | Lower B | 707             | 4.866                    | -     |

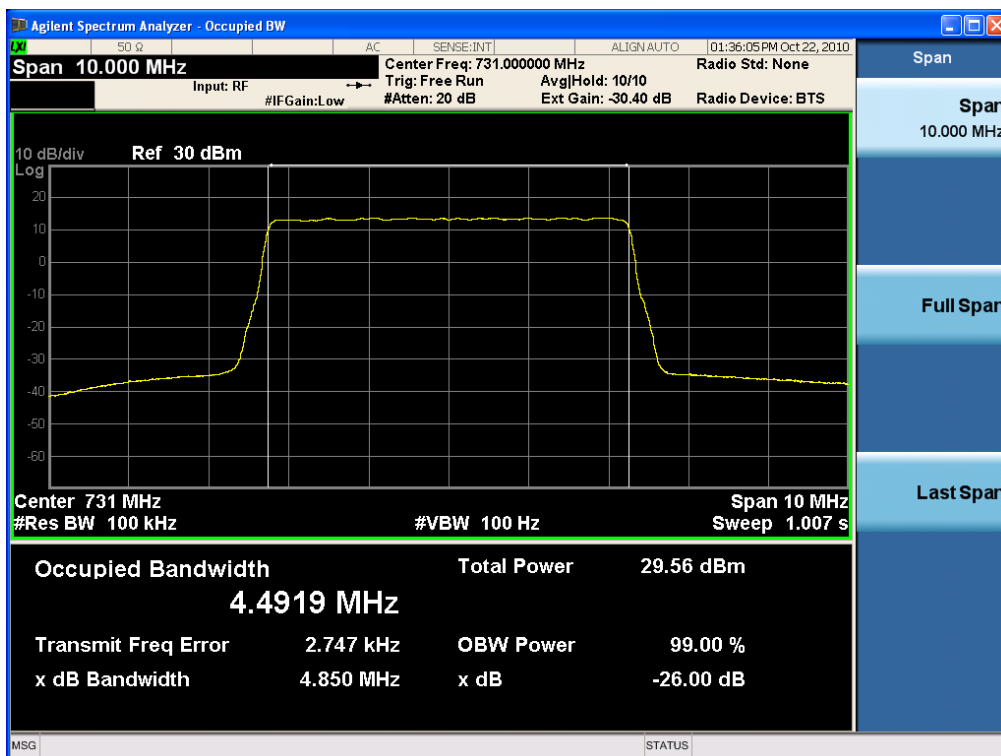
| Modulation Type | Cannel  | Frequency (MHz) | Occupied BandWidth (MHz) | Limit |
|-----------------|---------|-----------------|--------------------------|-------|
| 64QAM           | Upper C | 782             | 11.590                   | -     |
|                 | Lower A | 701             | 4.861                    | -     |
|                 | Lower B | 707             | 4.856                    | -     |

## Test Plots

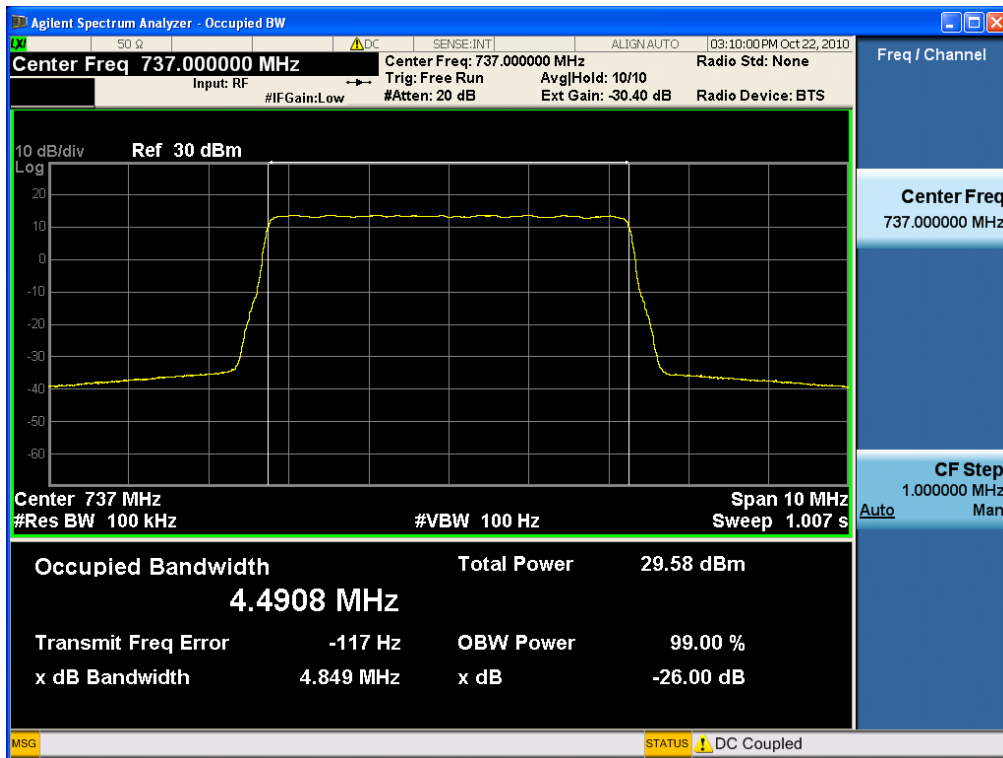
### [QPSK]-Down Link (Output)



(751 MHz)

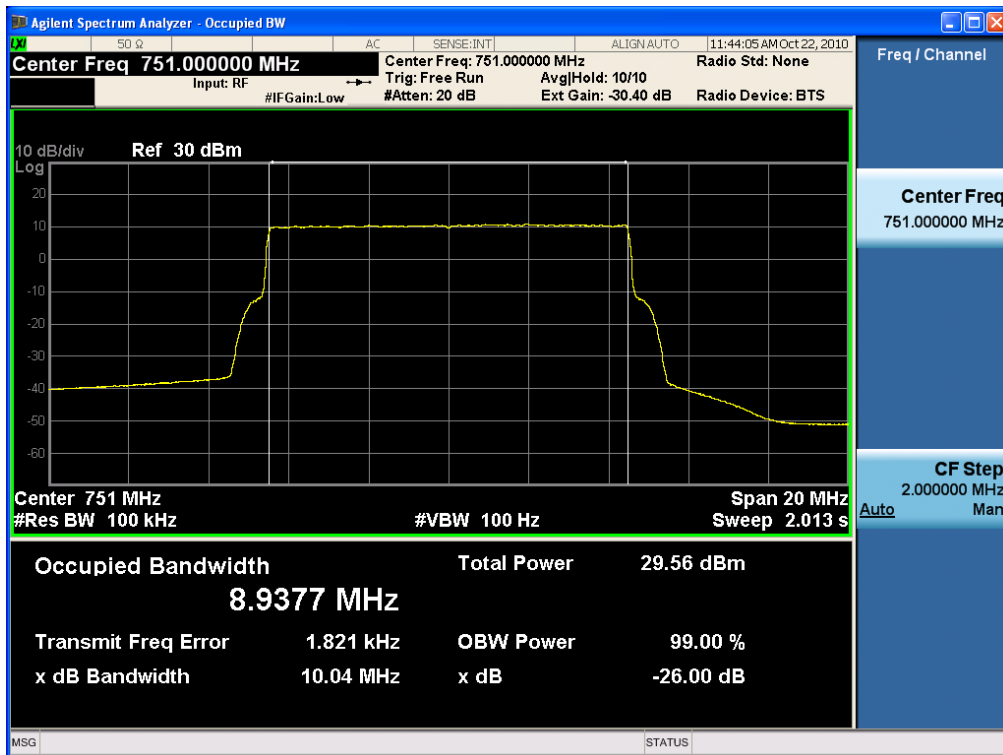


(731 MHz)

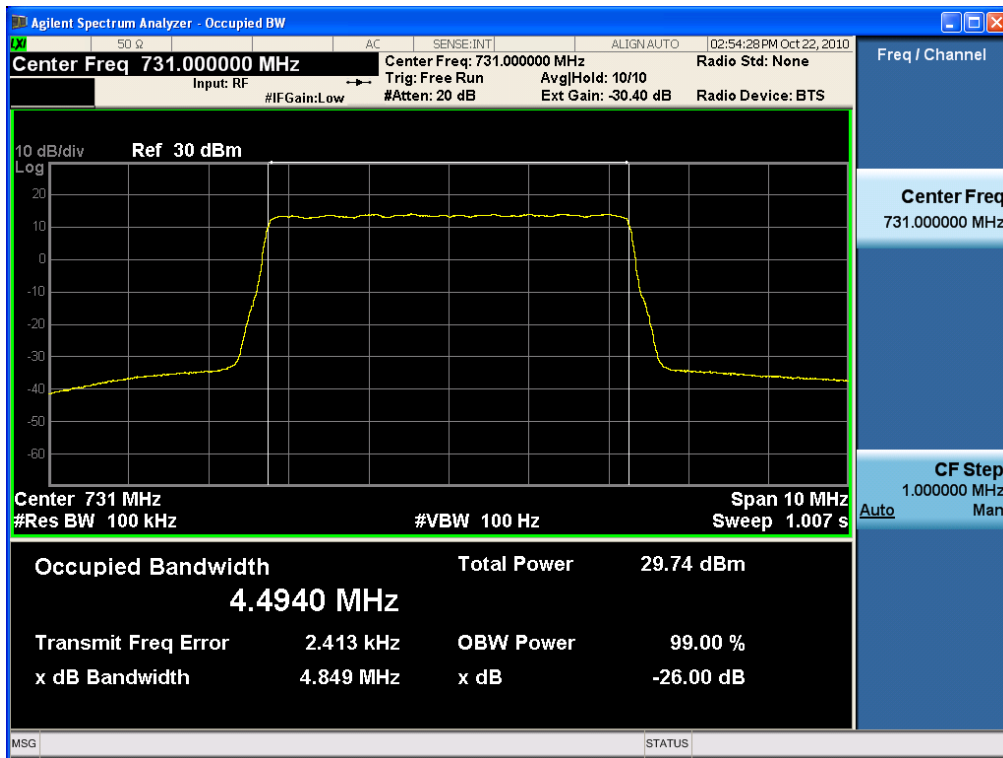


(737 MHz)

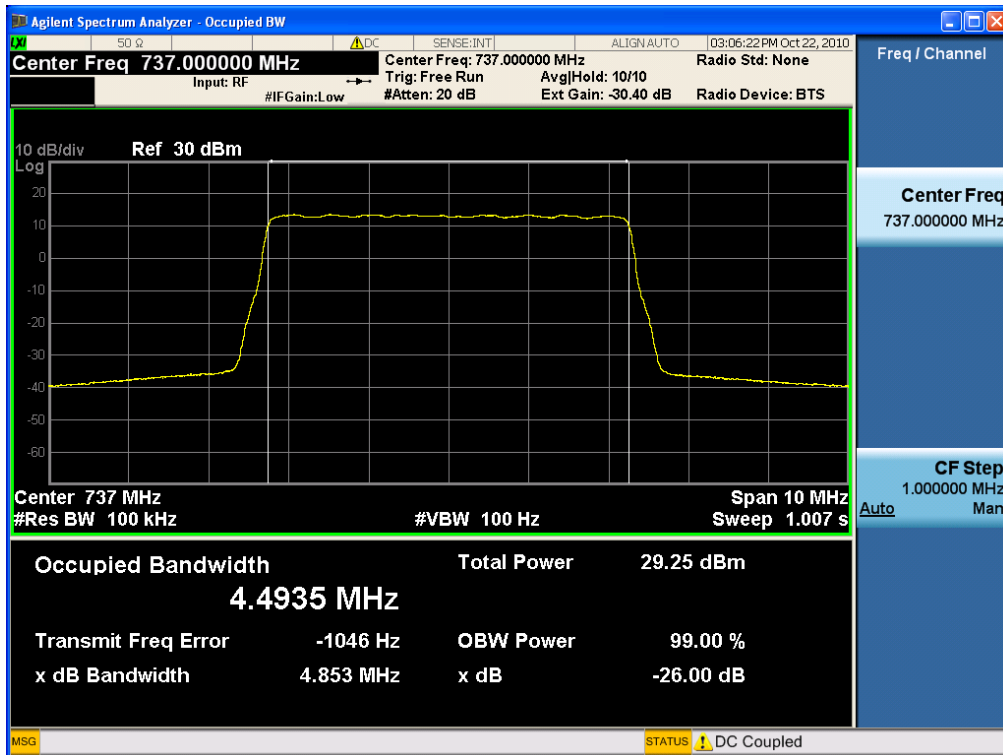
[16QAM] -Down Link (Output)



(751 MHz)

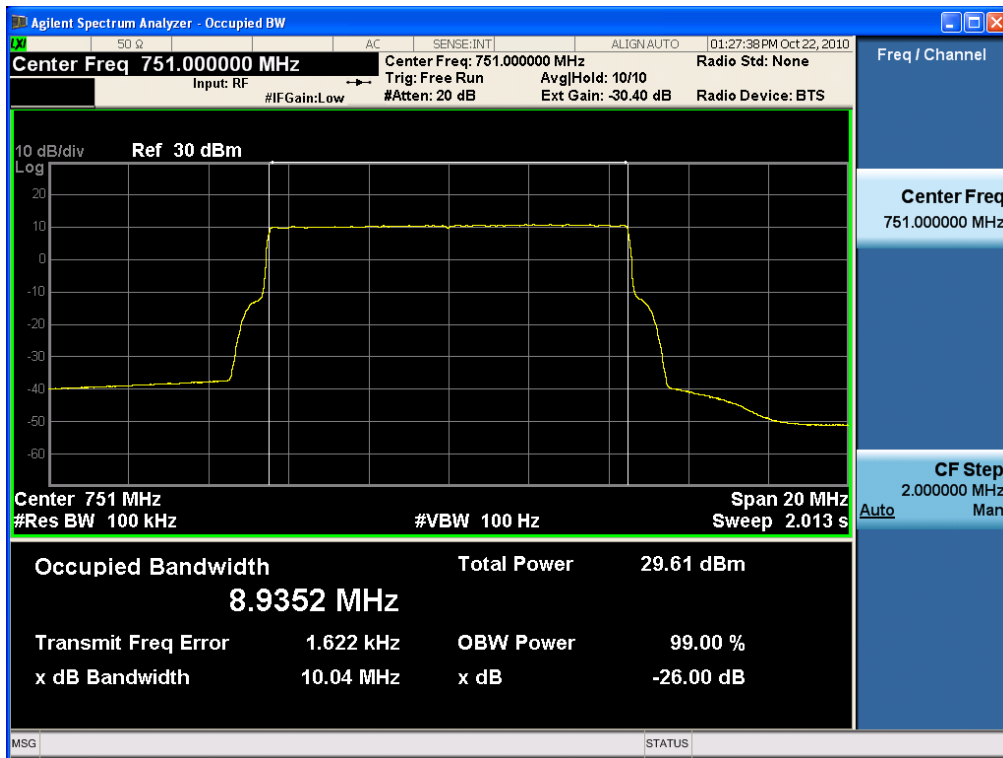


(731 MHz)

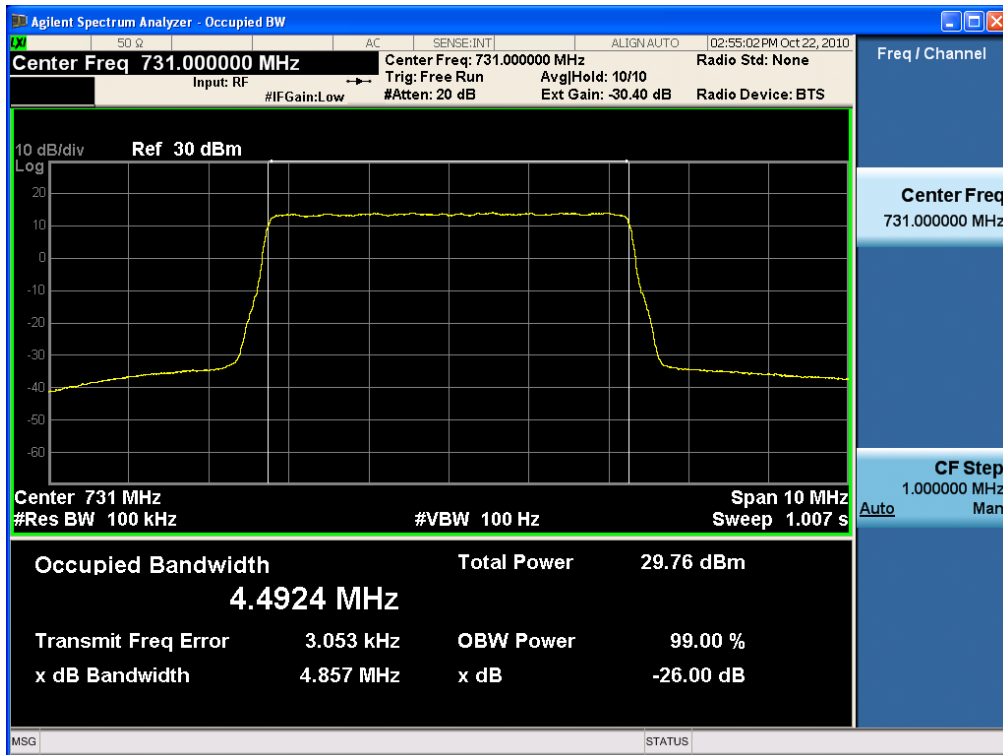


(737 MHz)

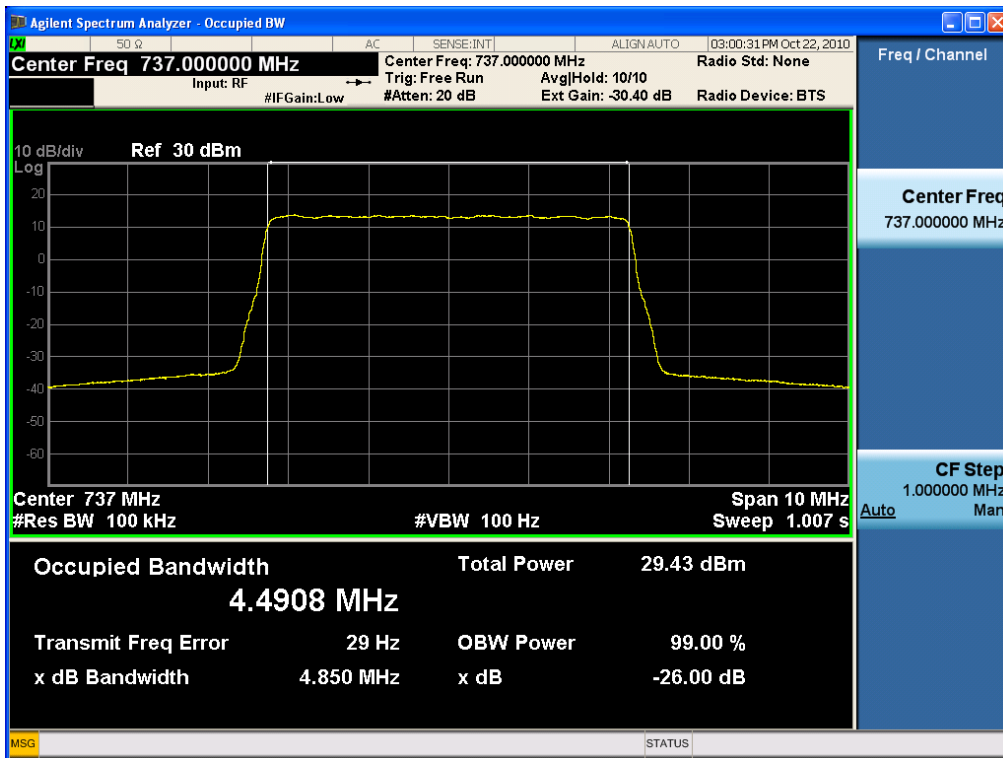
**[64QAM] -Down Link (Output)**



**(751 MHz)**

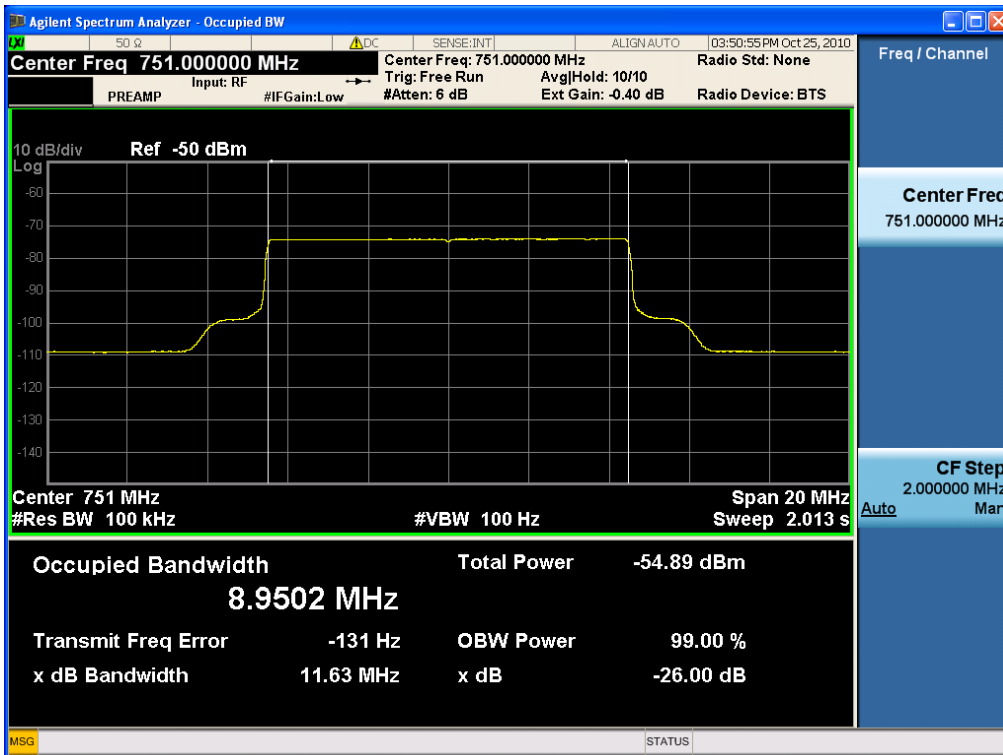


**(731 MHz)**

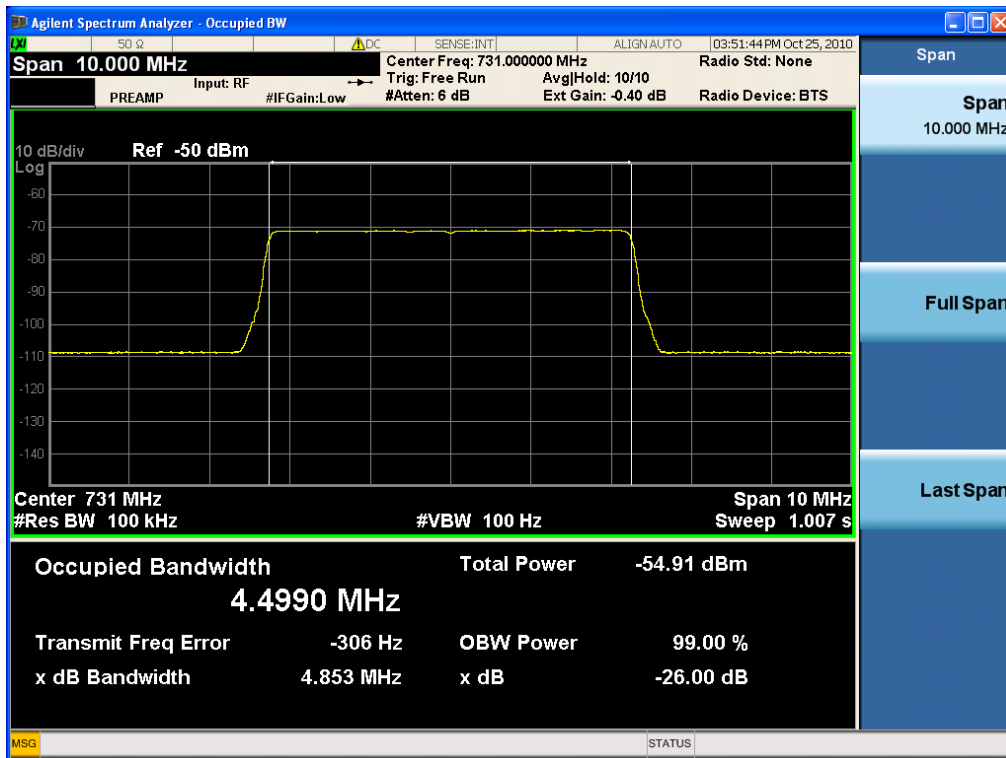


(737 MHz)

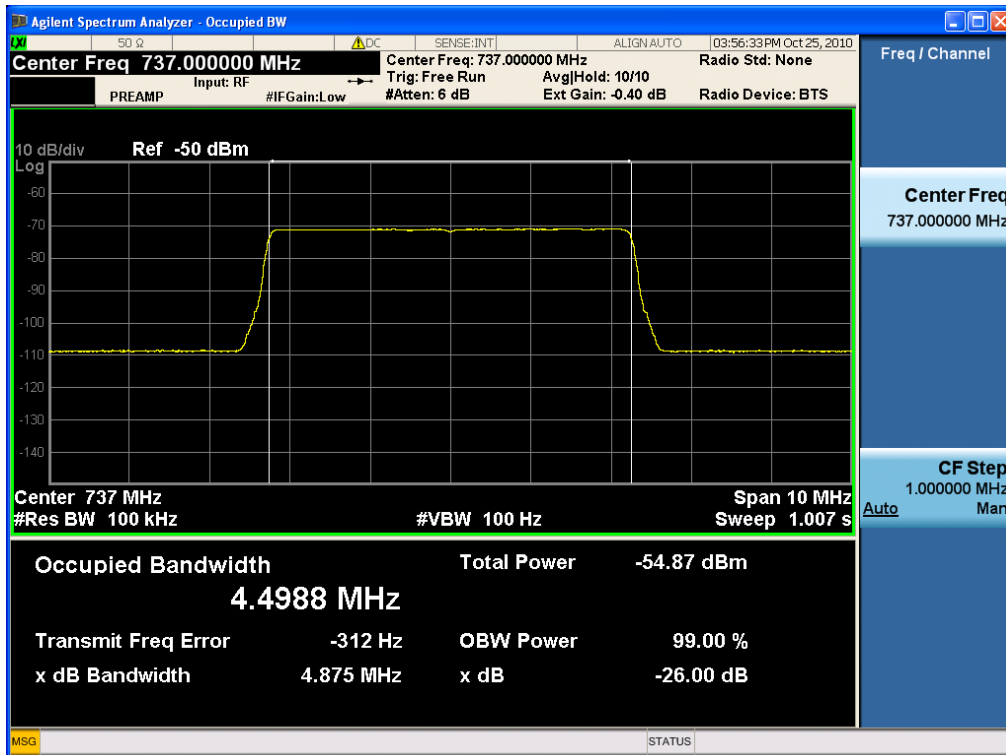
[QPSK]-Down Link (Input)



(751 MHz)

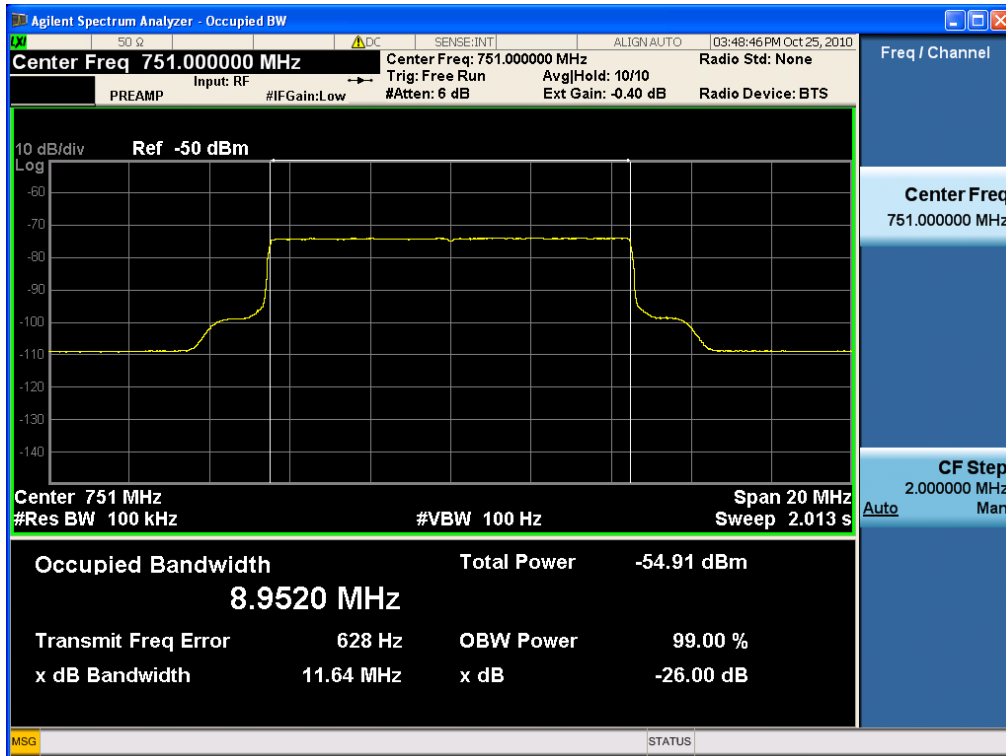


(731 MHz)

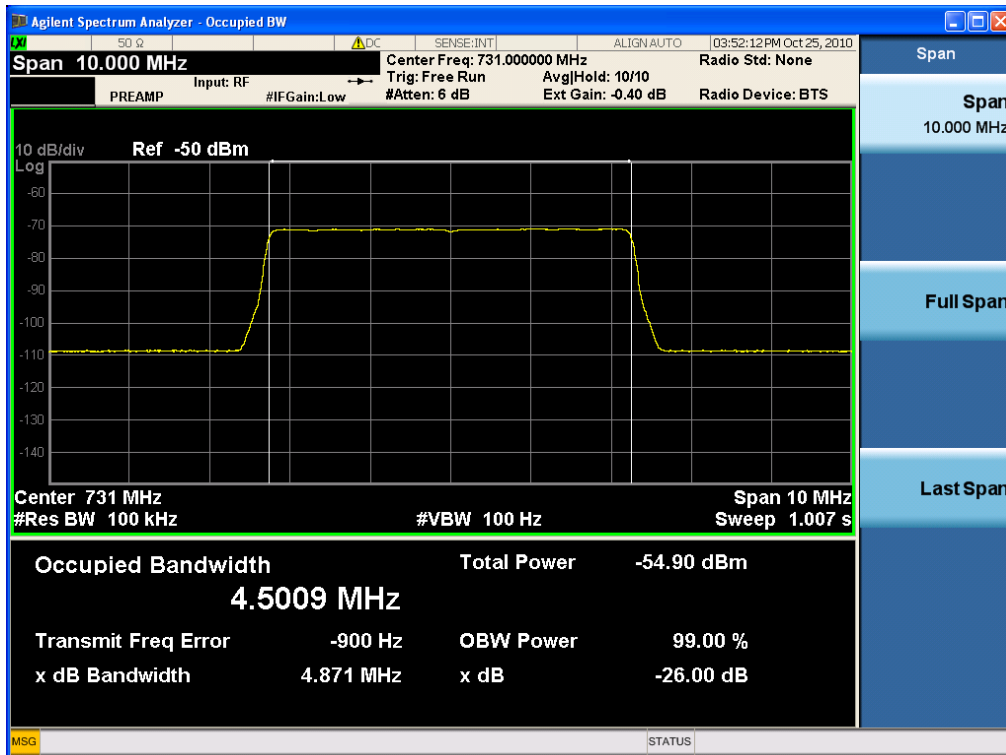


(737 MHz)

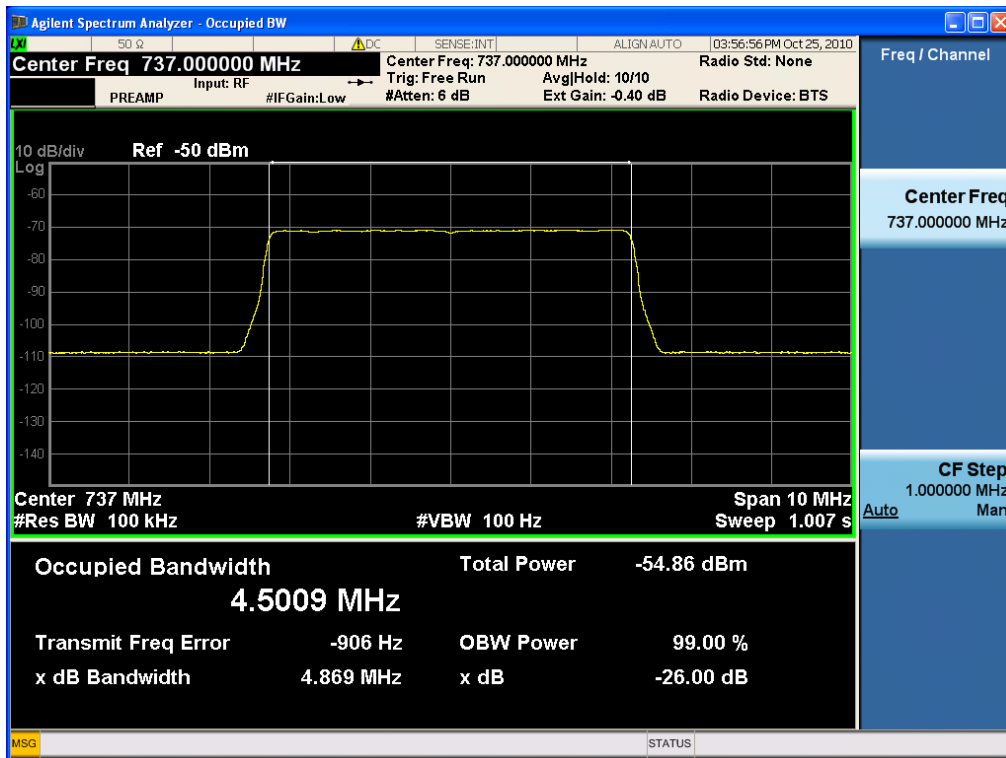
**[16QAM] -Down Link (Input)**



**(751 MHz)**

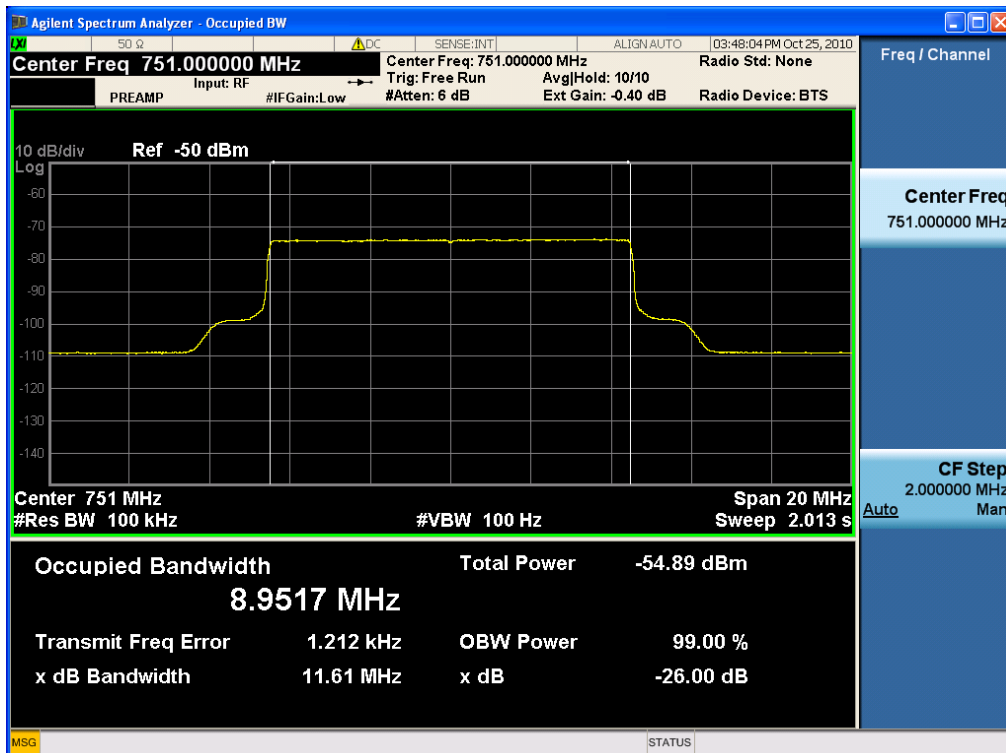


**(731 MHz)**

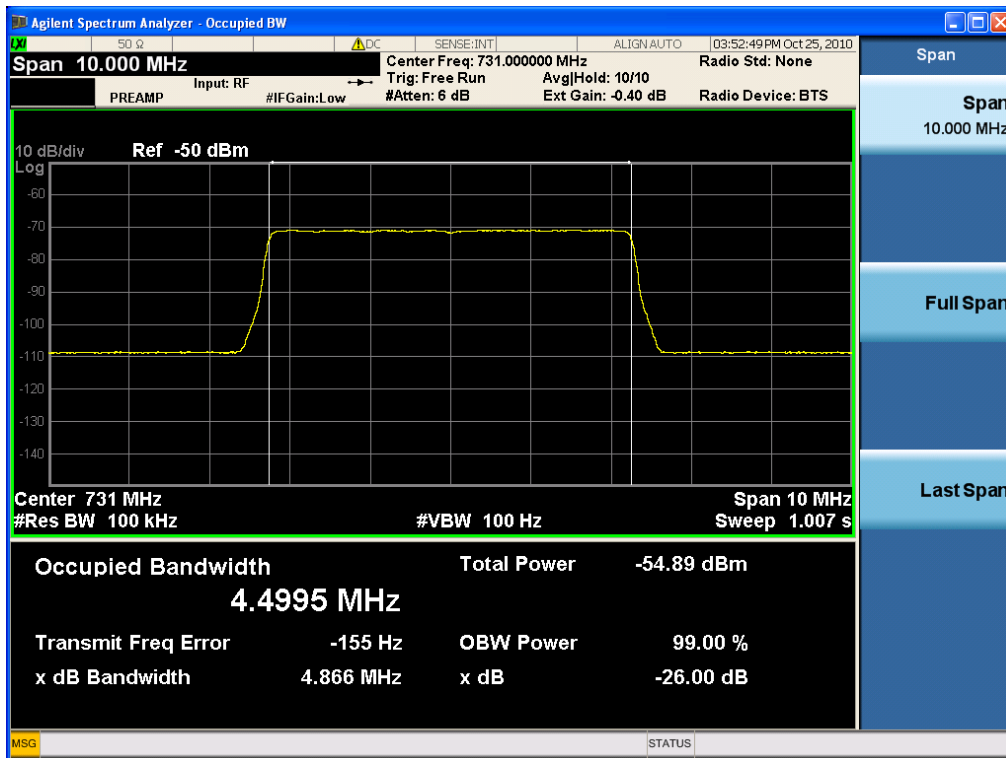


(737 MHz)

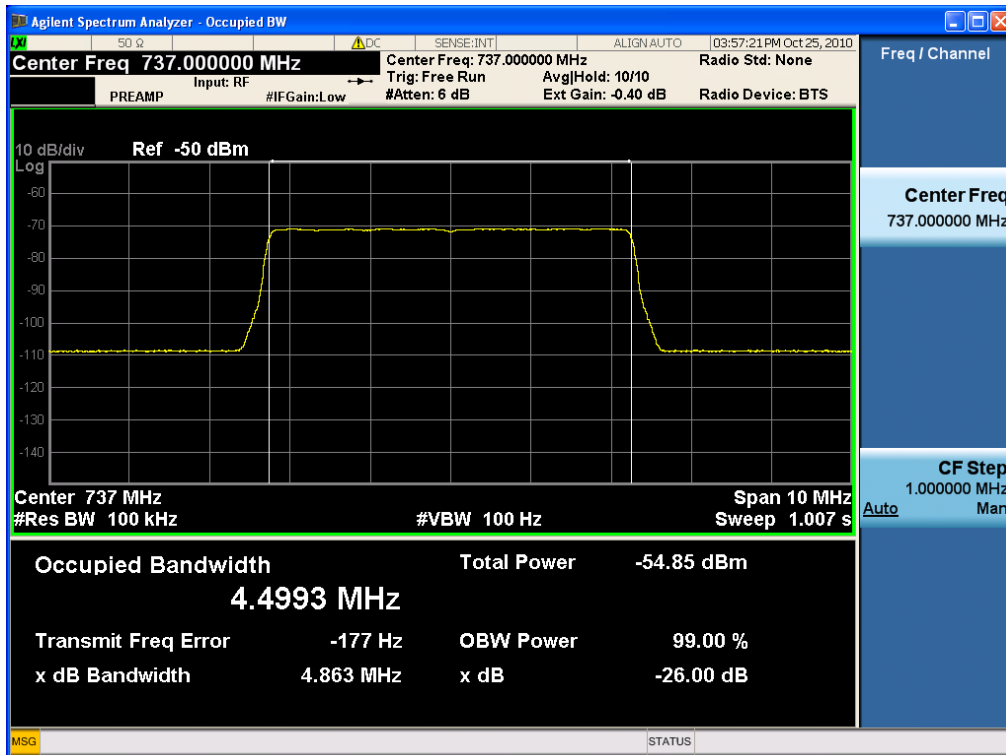
[64QAM] -Down Link (Input)



(751 MHz)

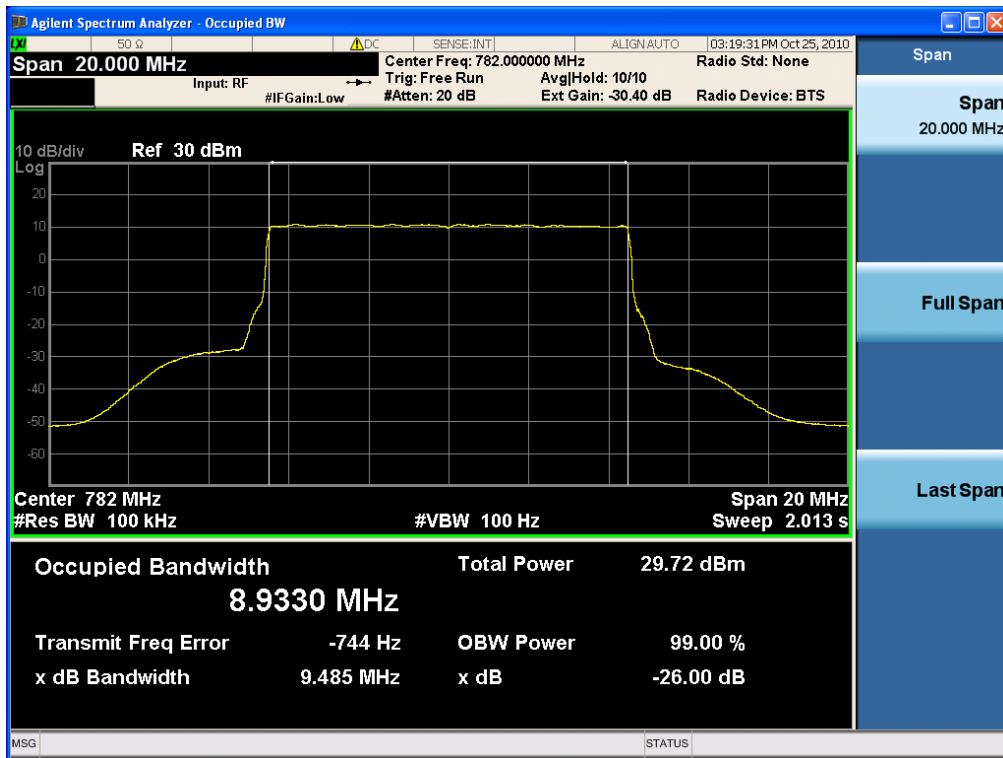


(731 MHz)

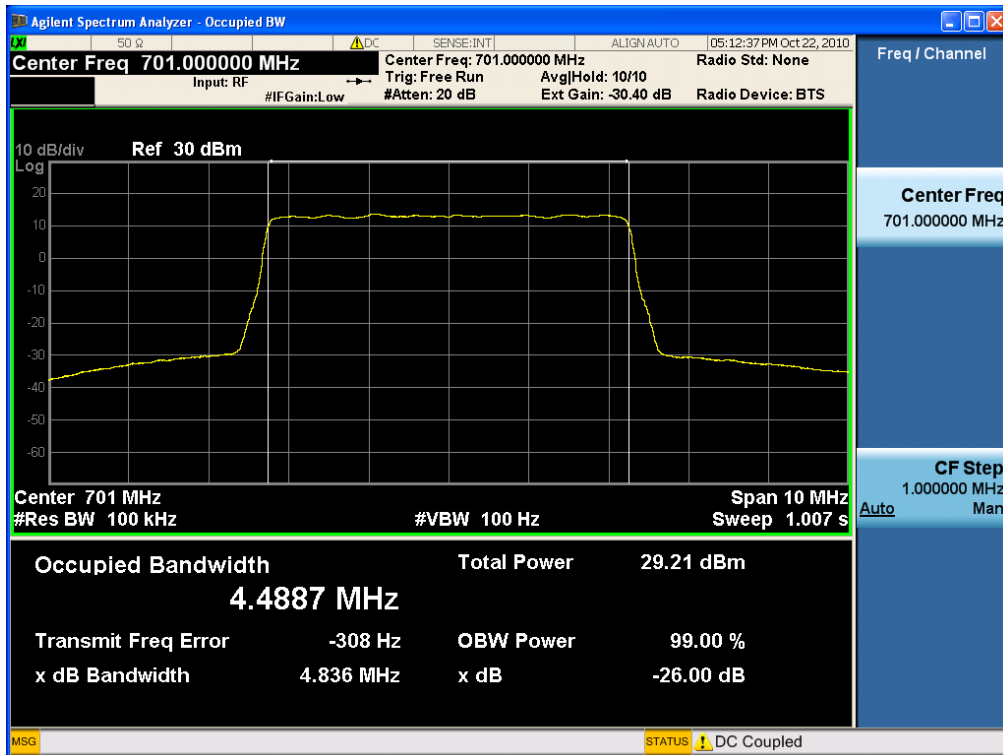


(737 MHz)

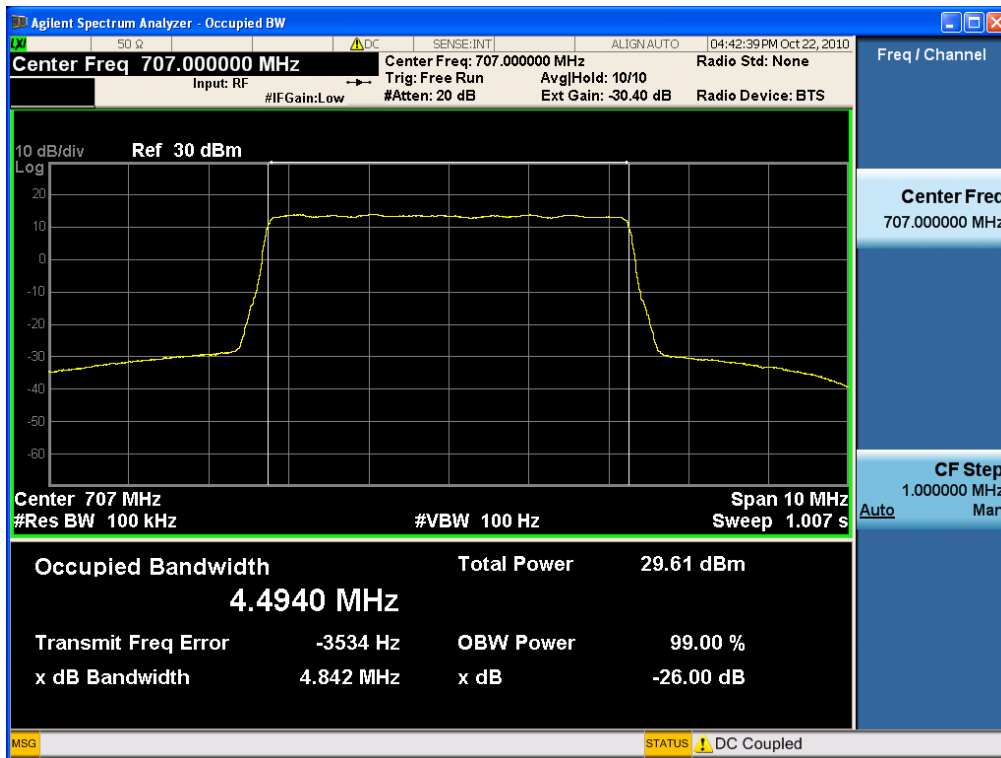
[QPSK]-Up Link (Output)



(782 MHz)

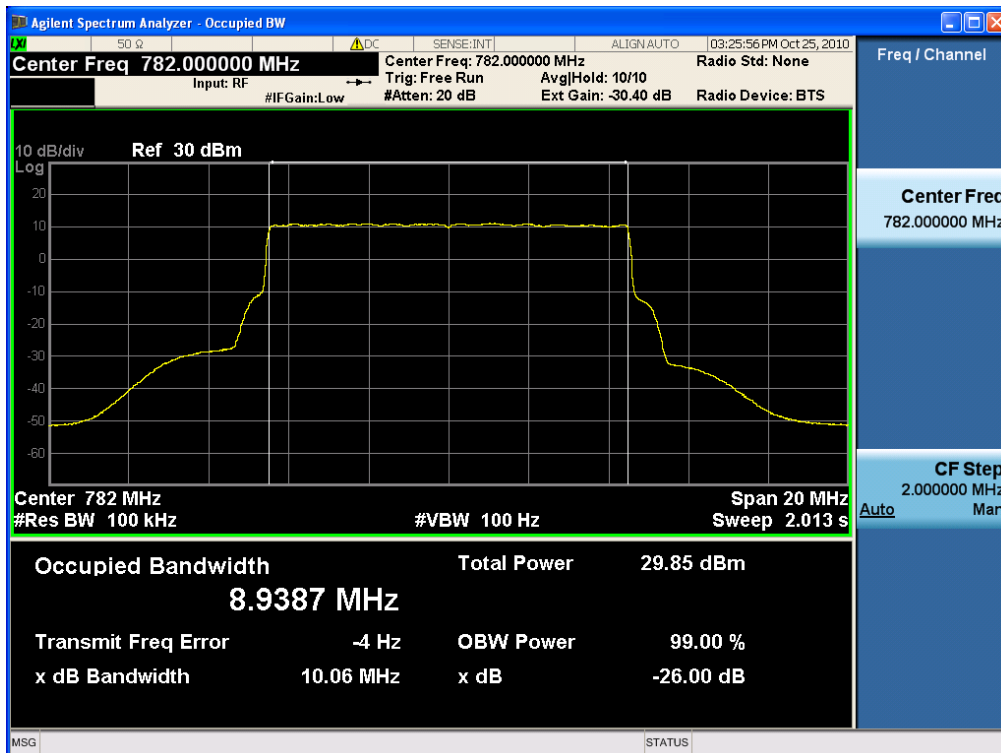


(701 MHz)

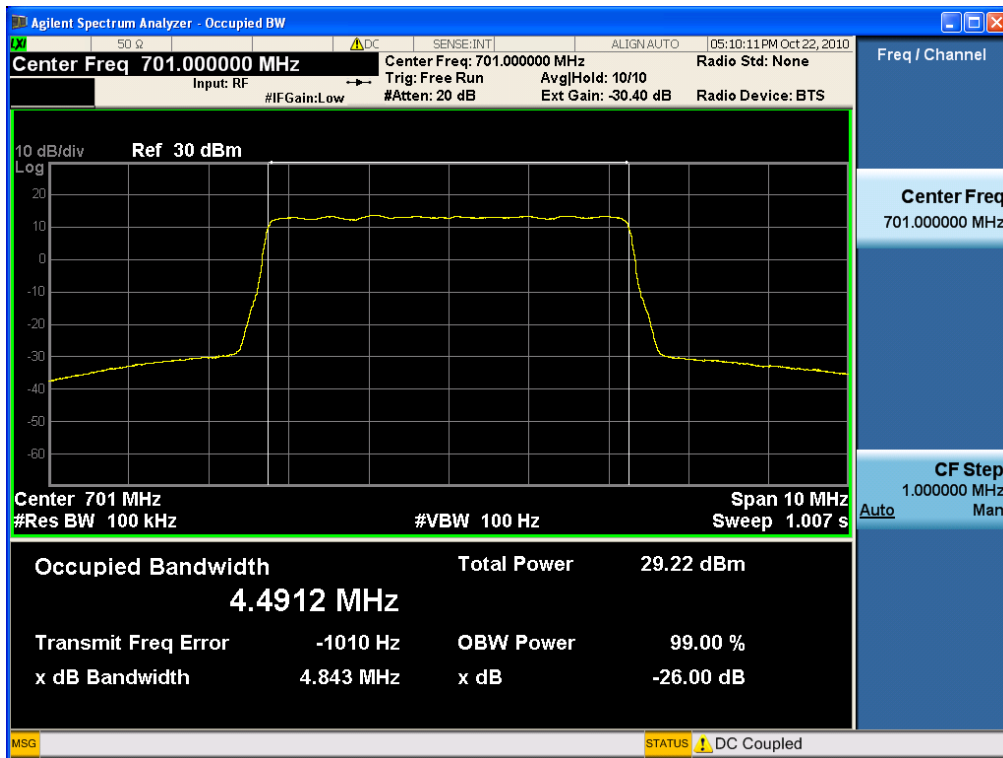


(707 MHz)

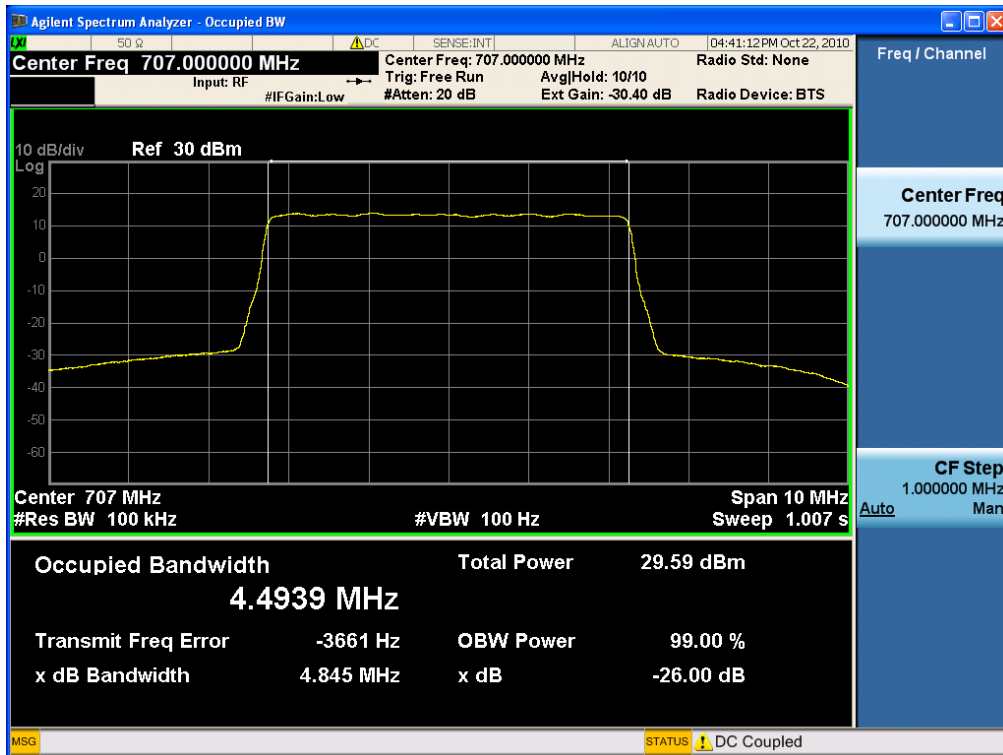
[16QAM] -Up Link (Output)



(782 MHz)

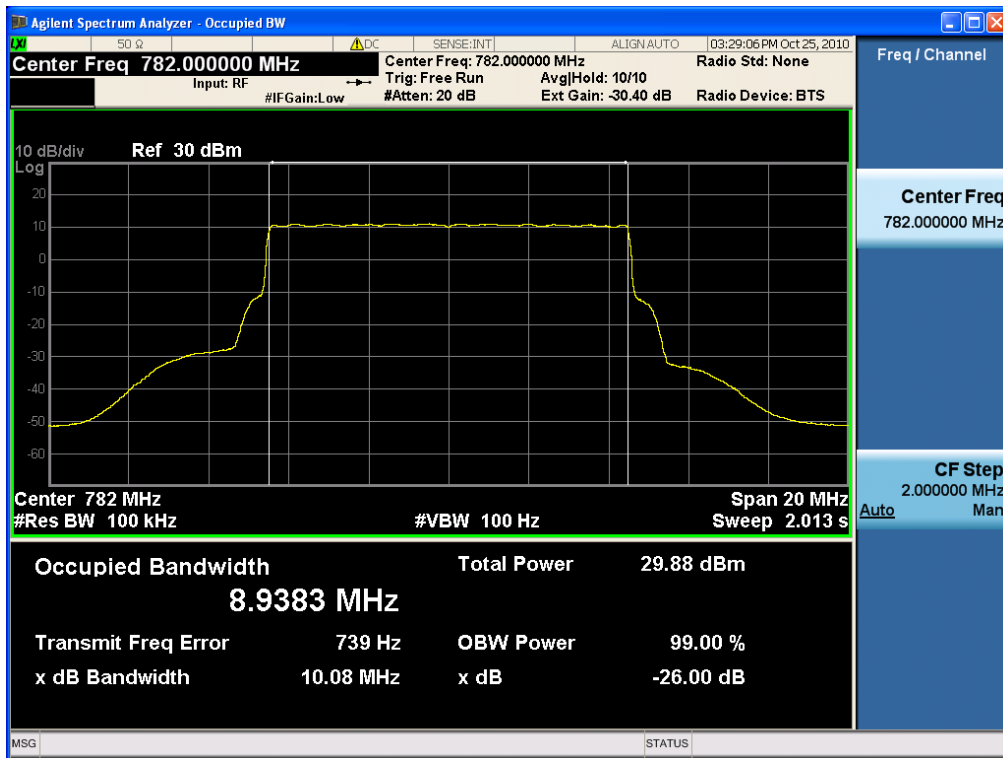


(701 MHz)

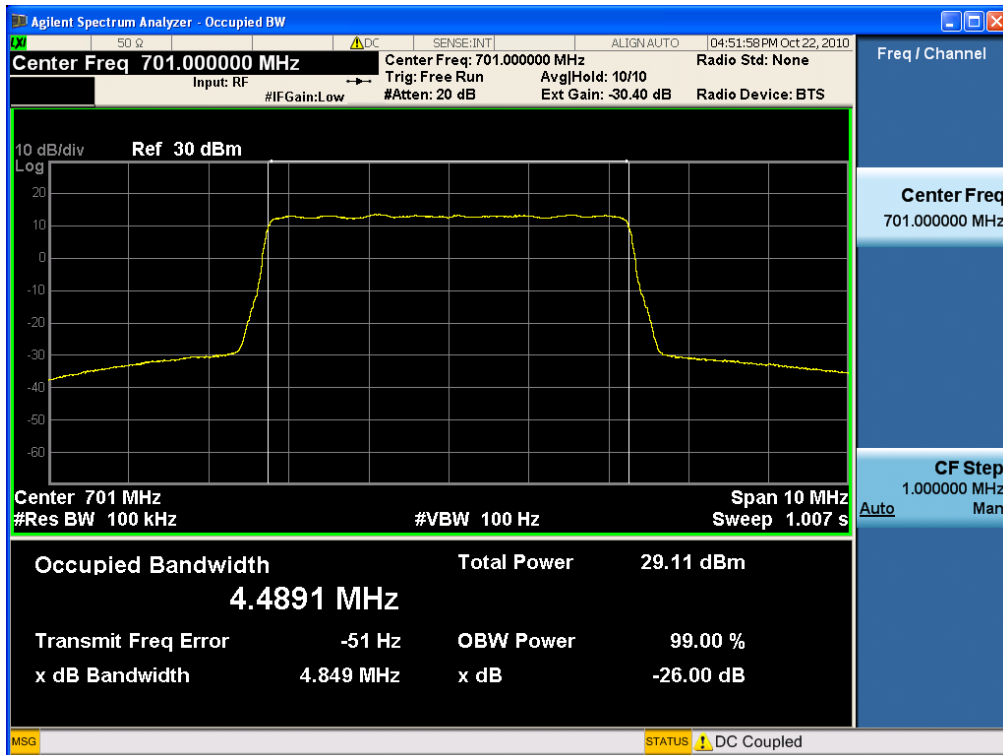


(707 MHz)

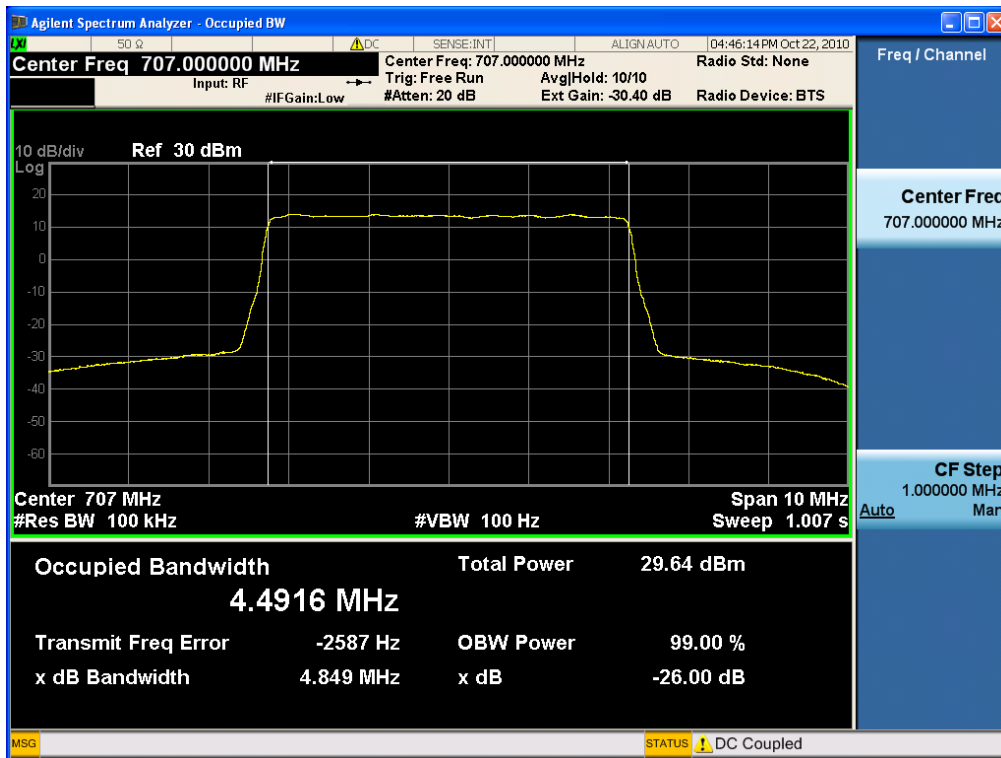
**[64QAM] -Up Link (Output)**



(782 MHz)

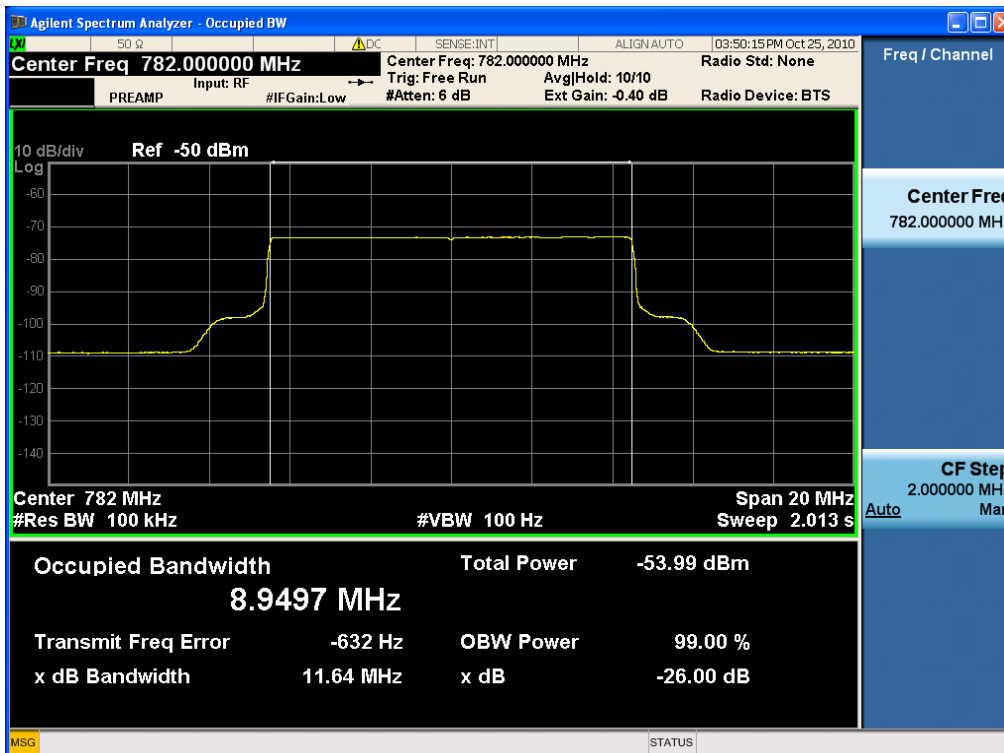


(701 MHz)

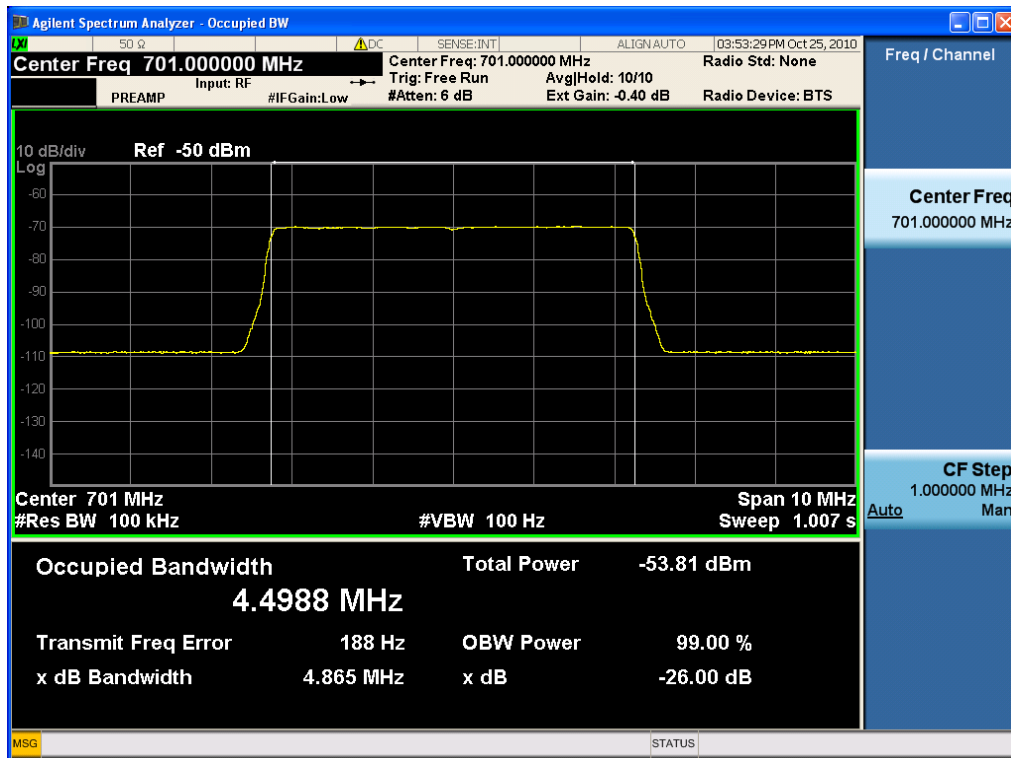


(707 MHz)

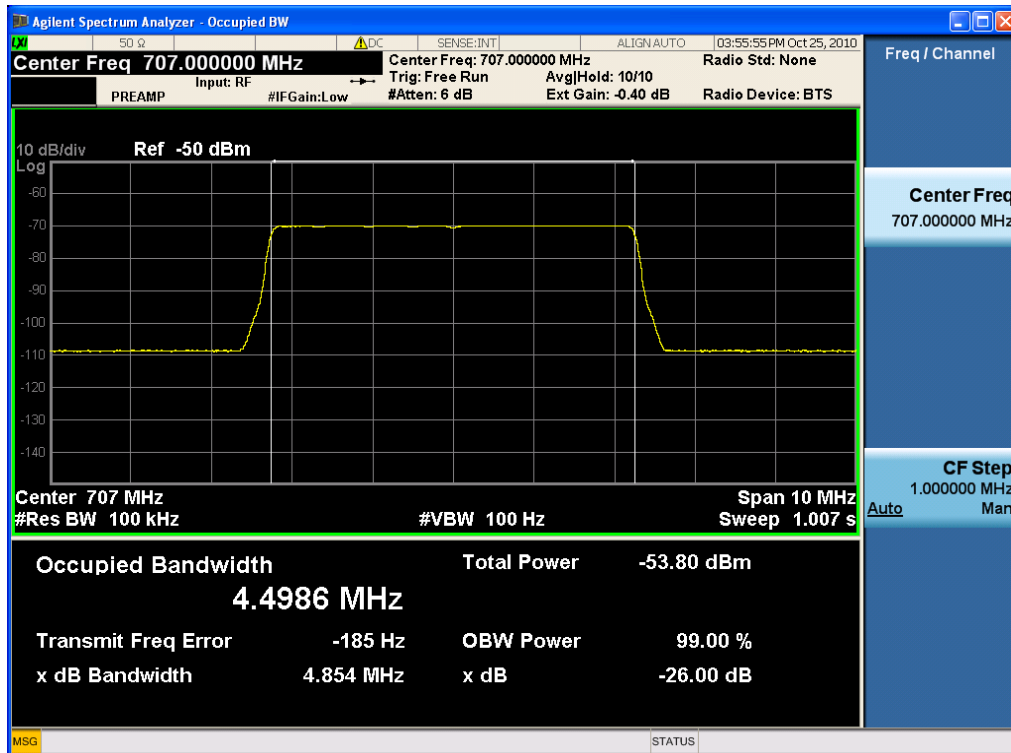
[QPSK]-Up Link (Input)



(782 MHz)

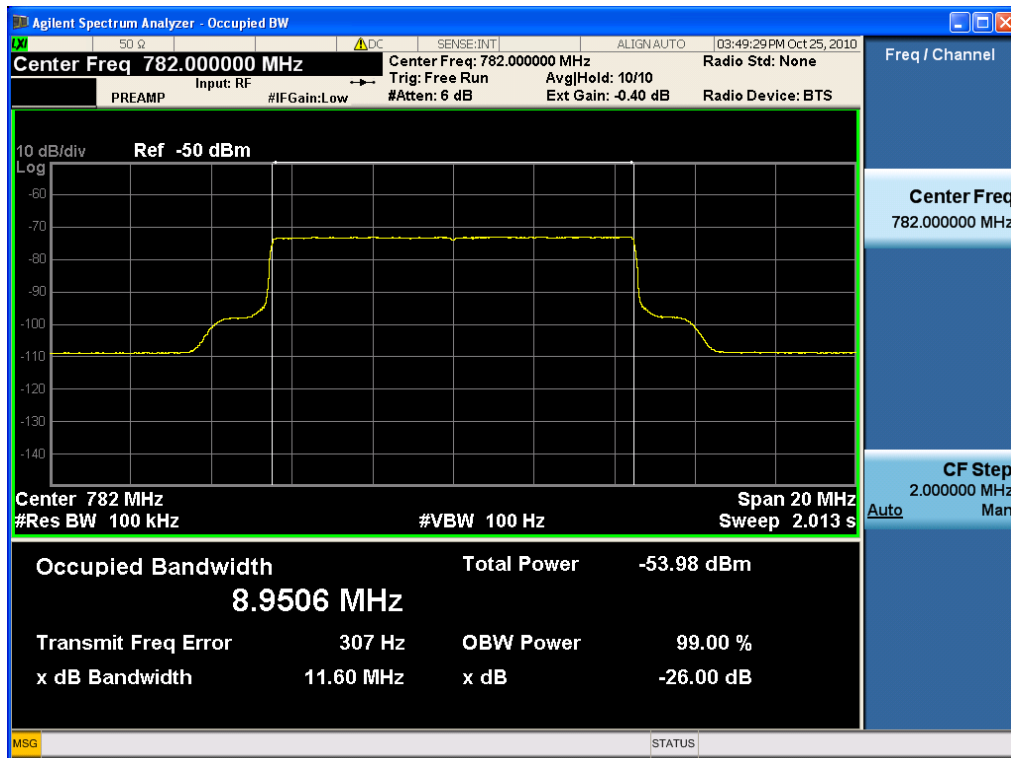


(701 MHz)

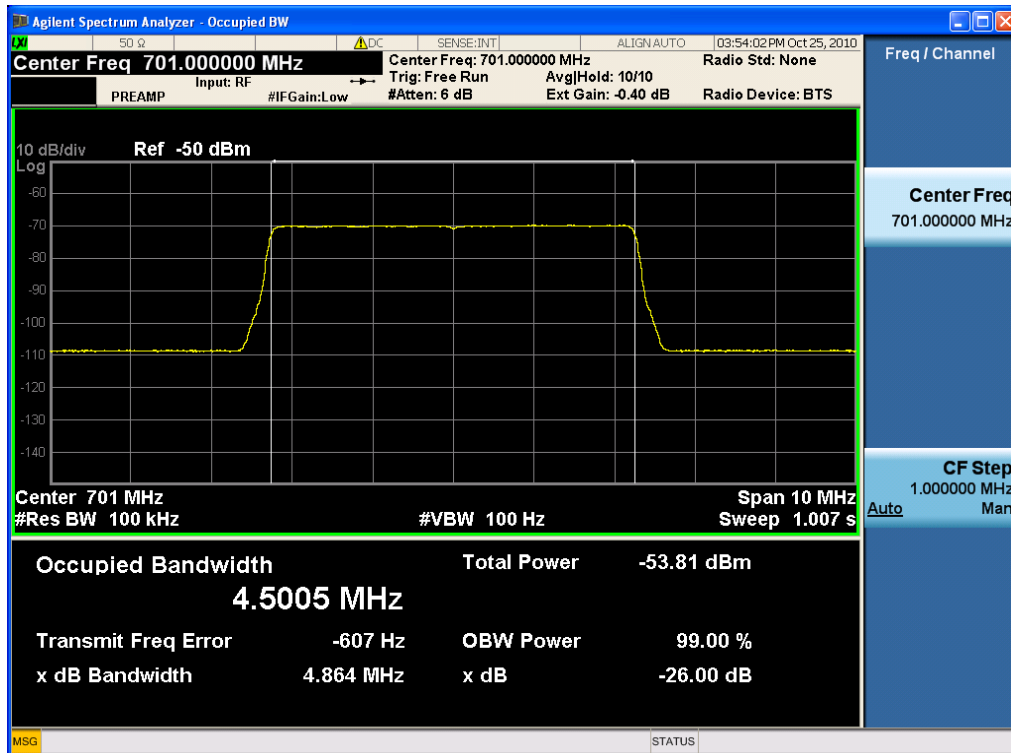


(707 MHz)

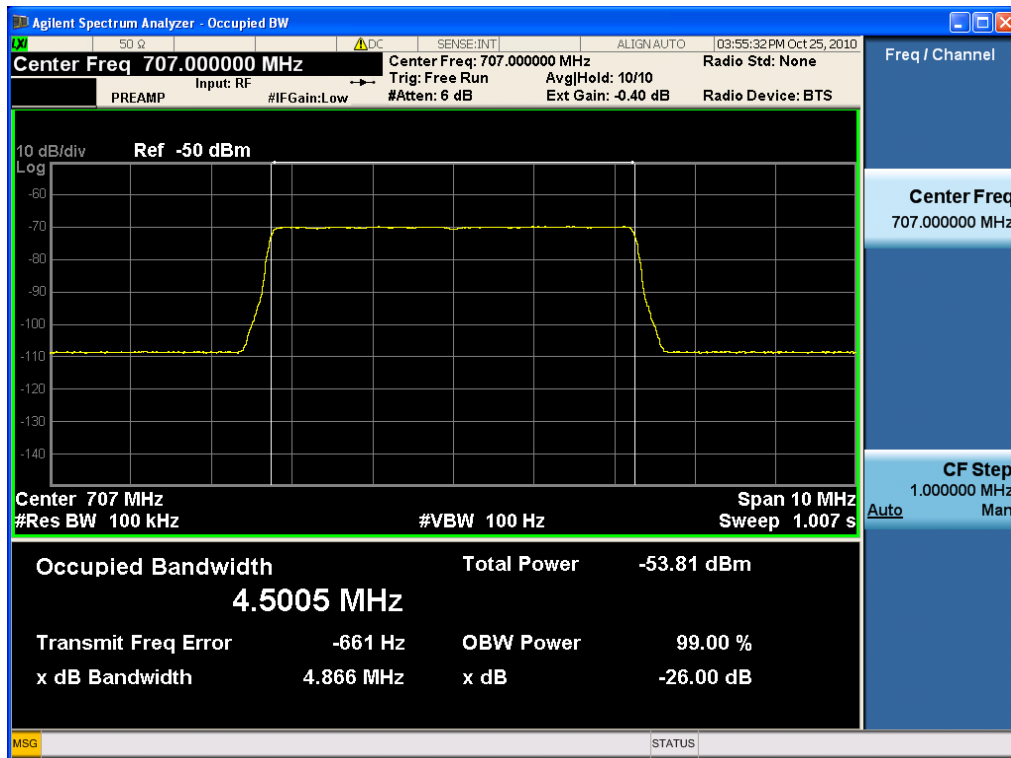
[16QAM] -Up Link (Input)



(782 MHz)

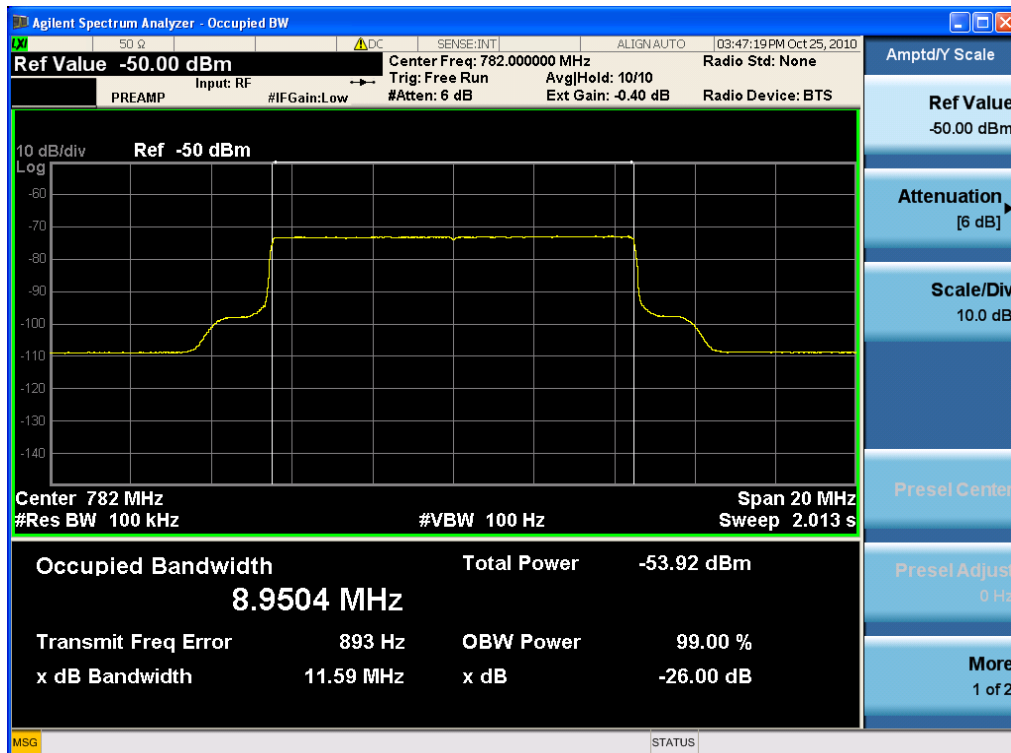


(701 MHz)

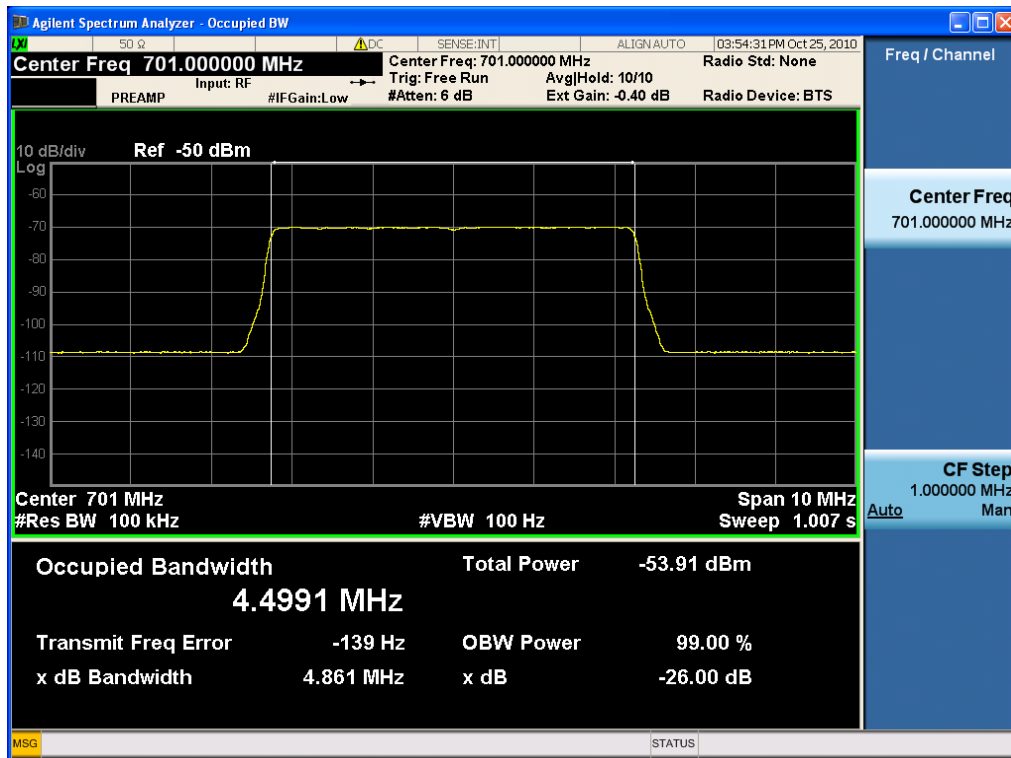


(707 MHz)

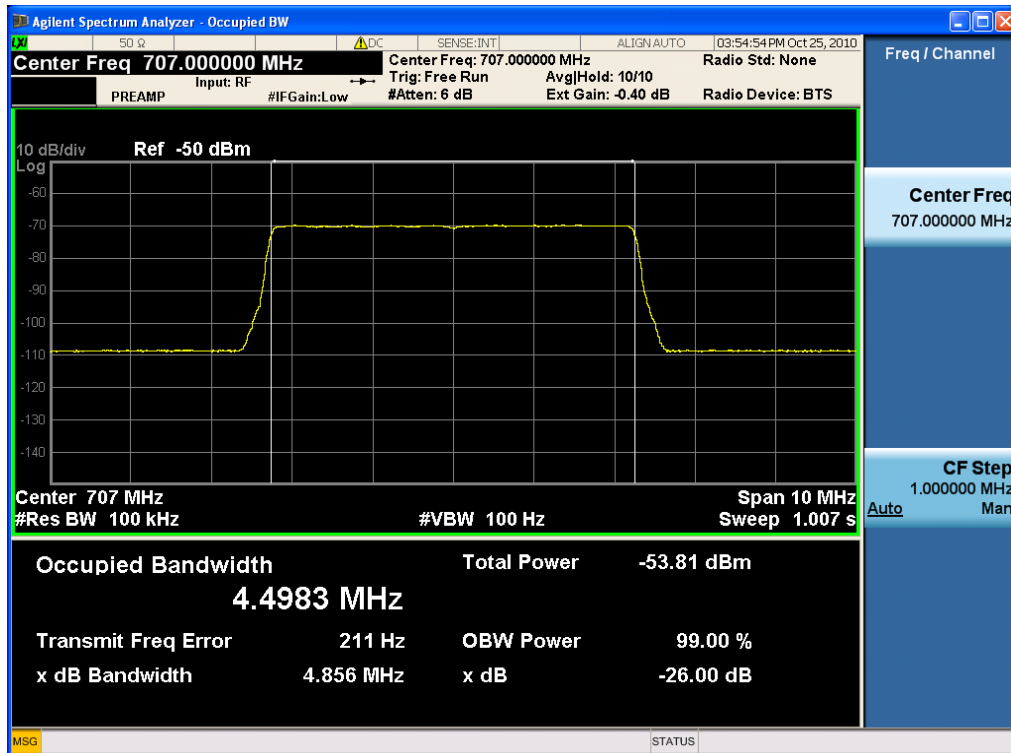
[64QAM] -Up Link (Input)



(782 MHz)



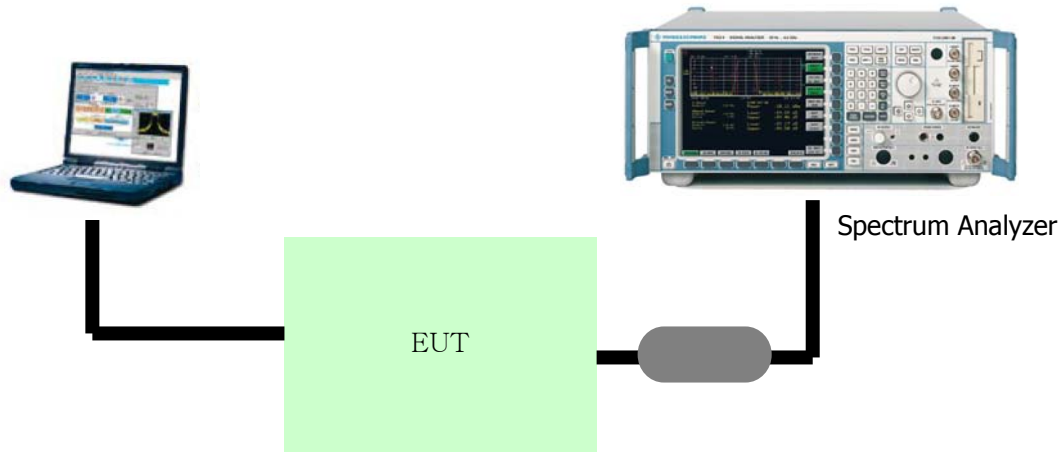
(701 MHz)



(707 MHz)

### 3.3 Spurious Emissions at Antenna Terminal

#### Test Set-up

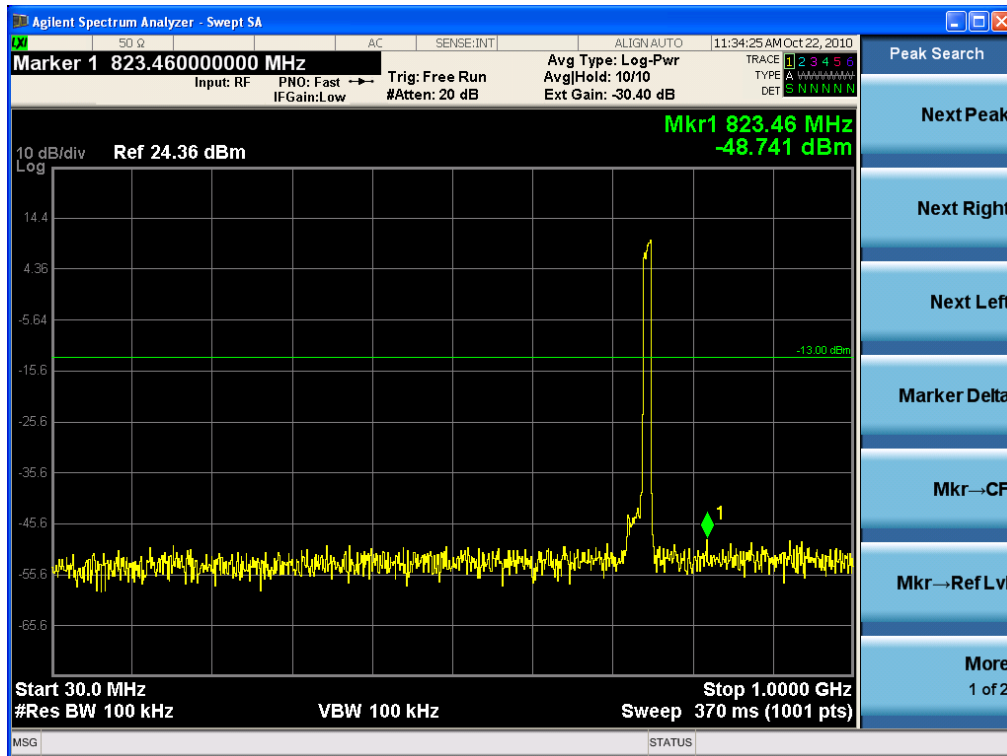


#### Test Procedure

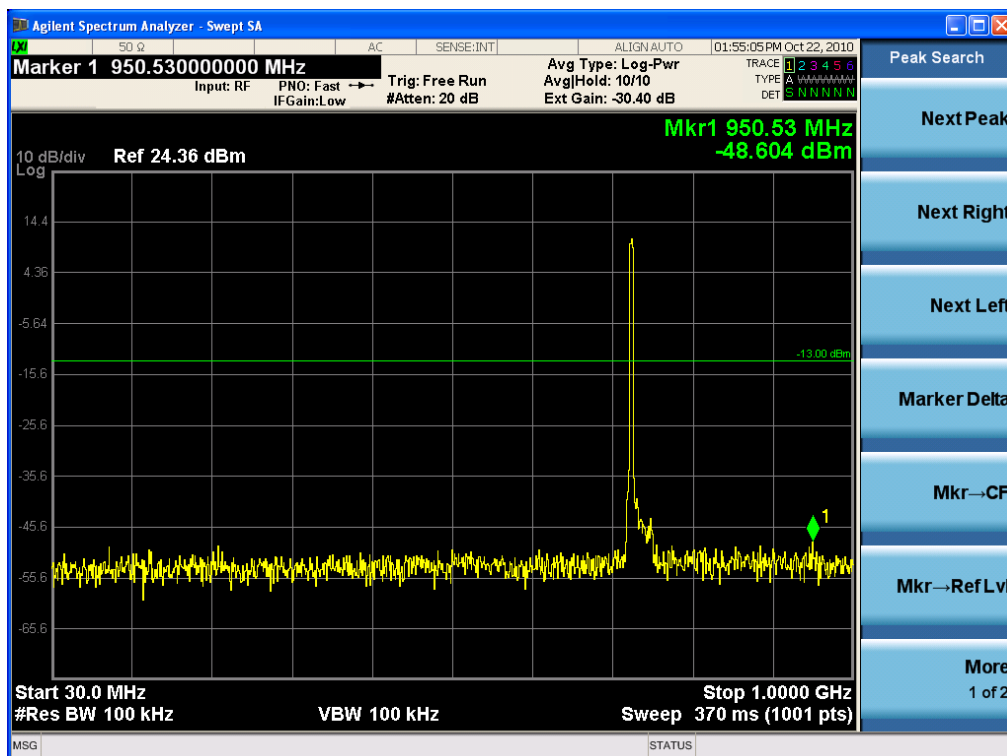
The EUT was setup to maximum output power at its lowest channel. The Resolution BW of the analyzer is set to 1 % of the emission bandwidth to show compliance with the - 13 dBm limit, in the 1 MHz bands immediately outside and adjacent to the edge of the frequency block. The 1 MHz RBW was used to scan 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

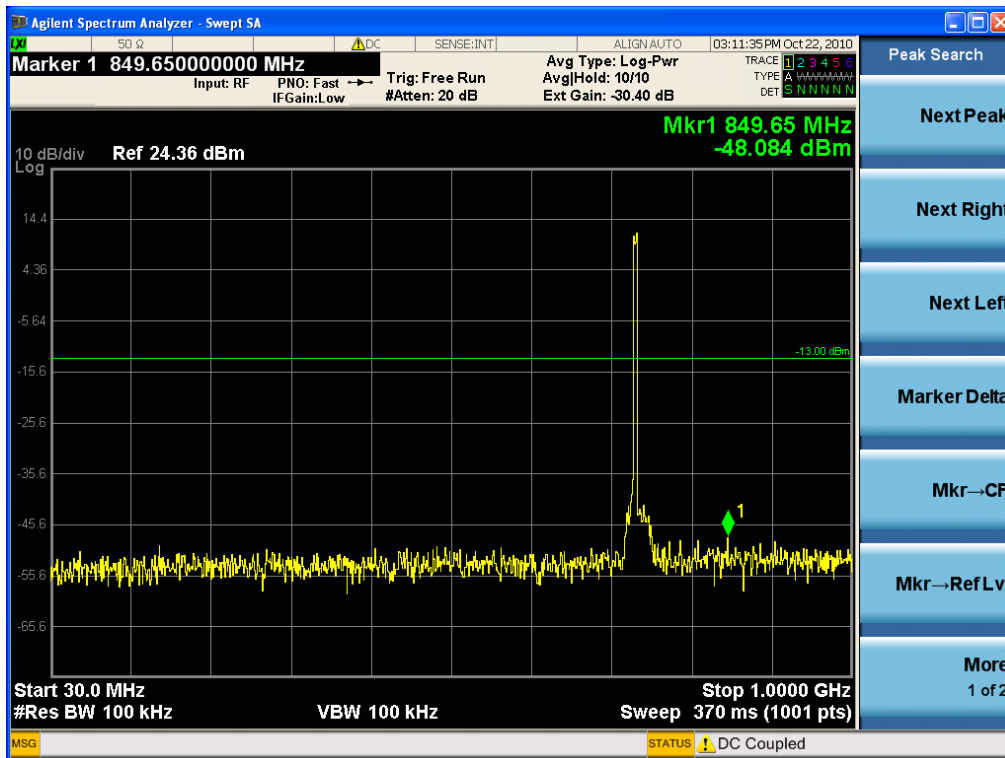
### [Spurious Emission - QPSK]-Down Link



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

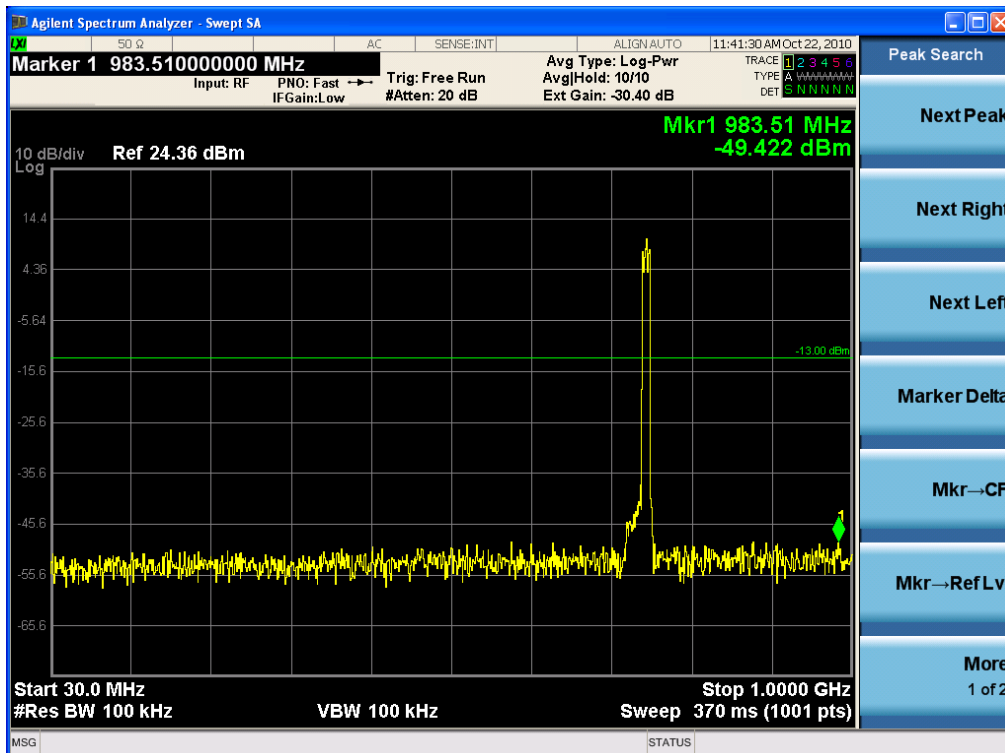


Lower A: (731 MHz) - CH 30 MHz ~ 1 GHz

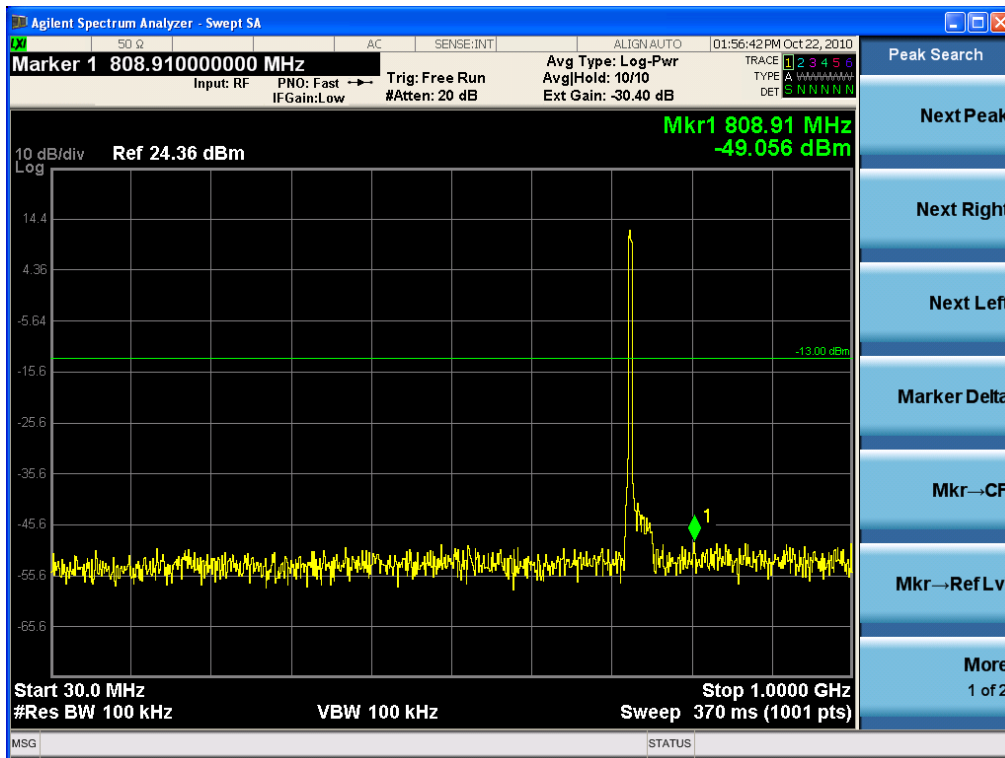


Lower B: (737 MHz) - CH 30 MHz ~ 1 GHz

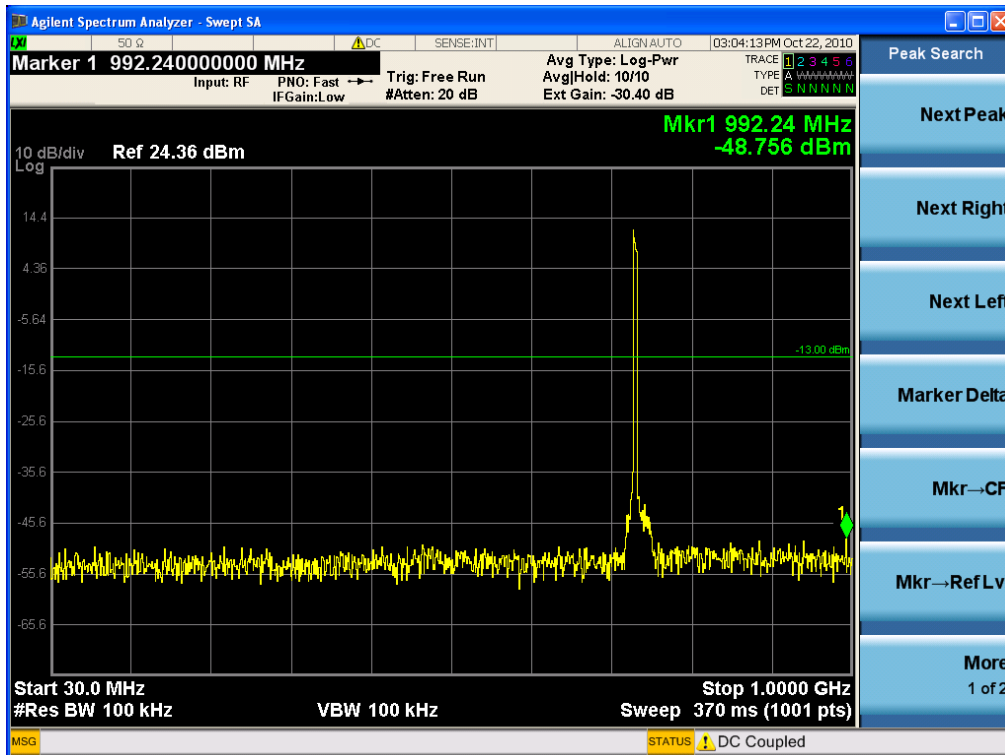
[Spurious Emission – 16QAM] -Down Link



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

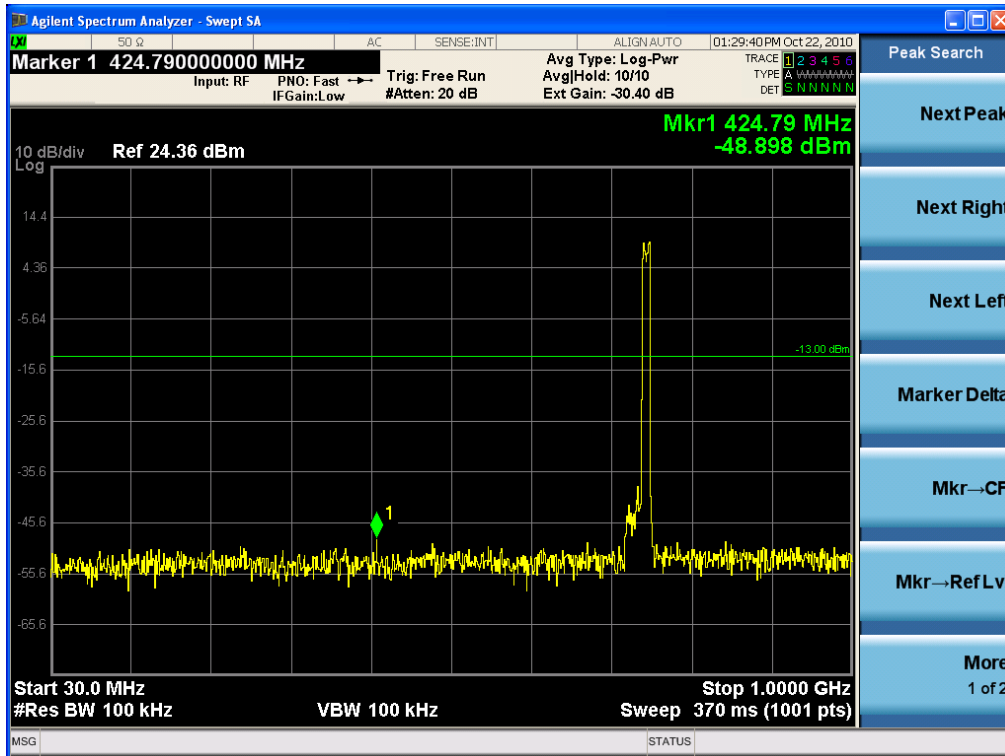


Lower A: (731 MHz) - CH 30 MHz ~ 1 GHz

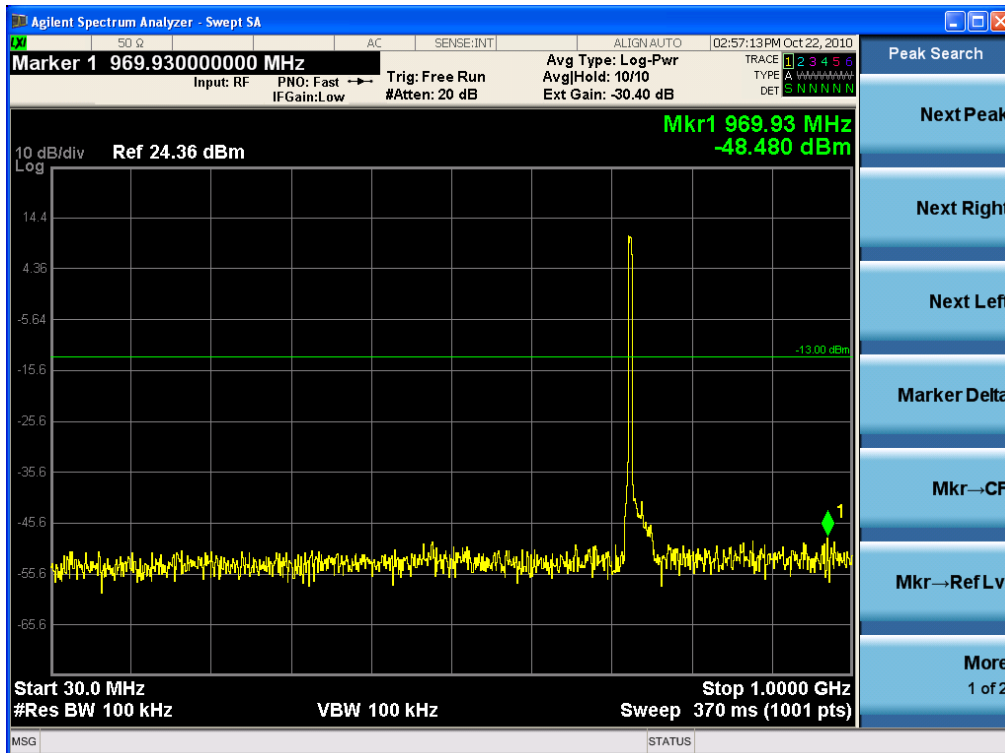


Lower B: (737 MHz) - CH 30 MHz ~ 1 GHz

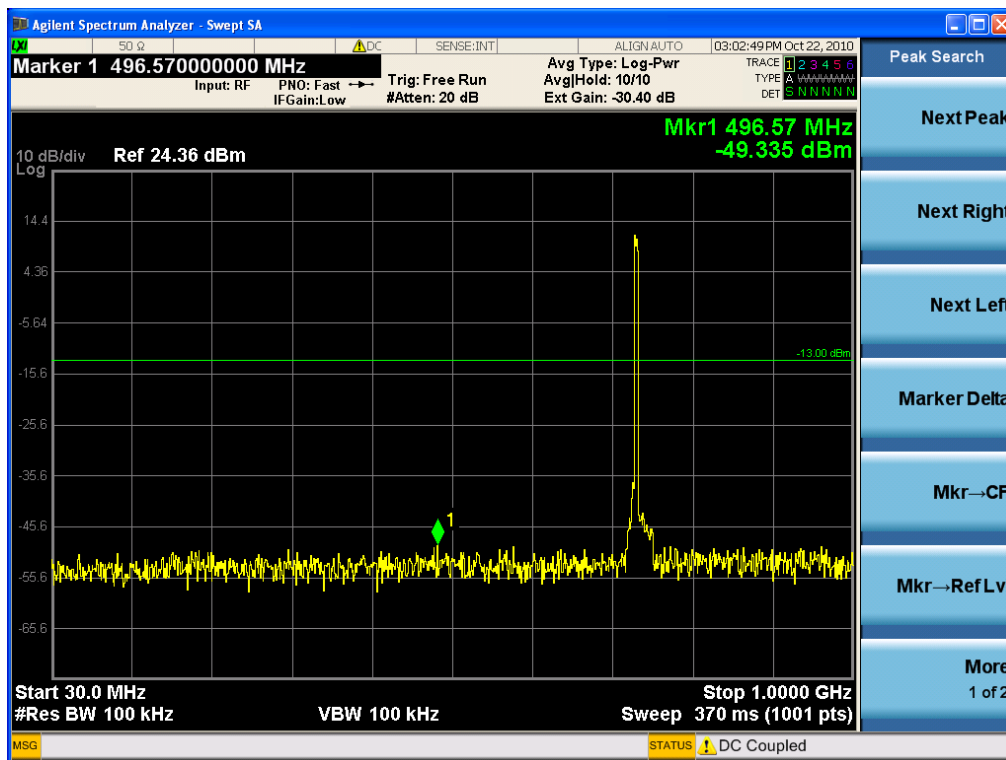
**[Spurious Emission – 64QAM] -Down Link**



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

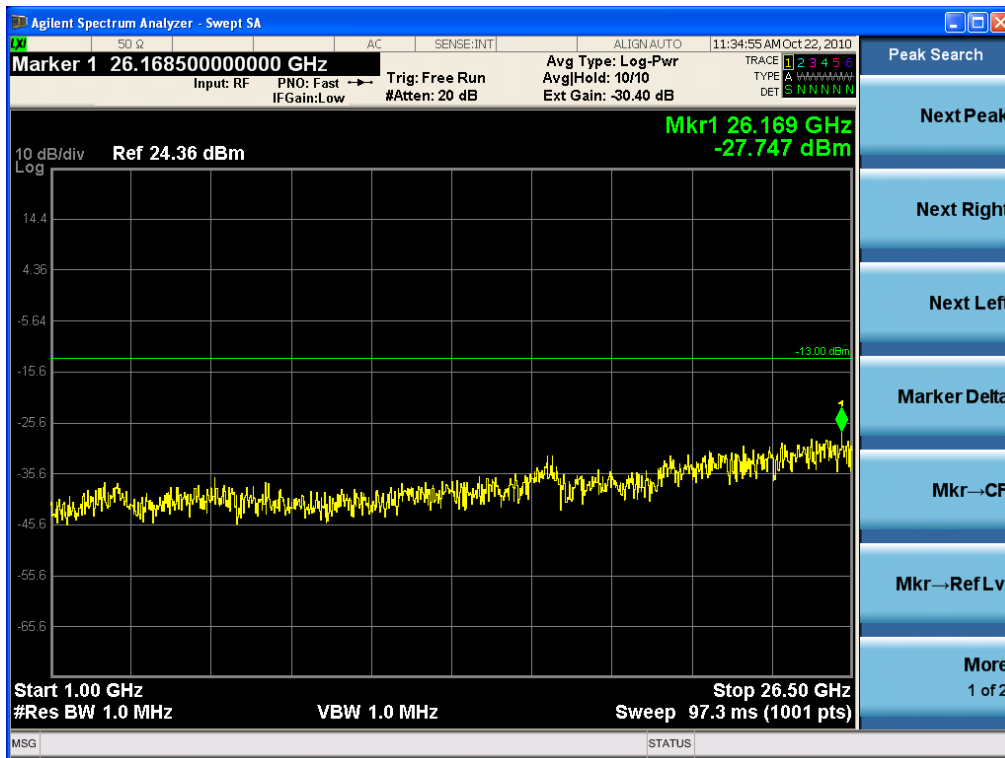


**Lower A: (731 MHz) - CH 30 MHz ~ 1 GHz**

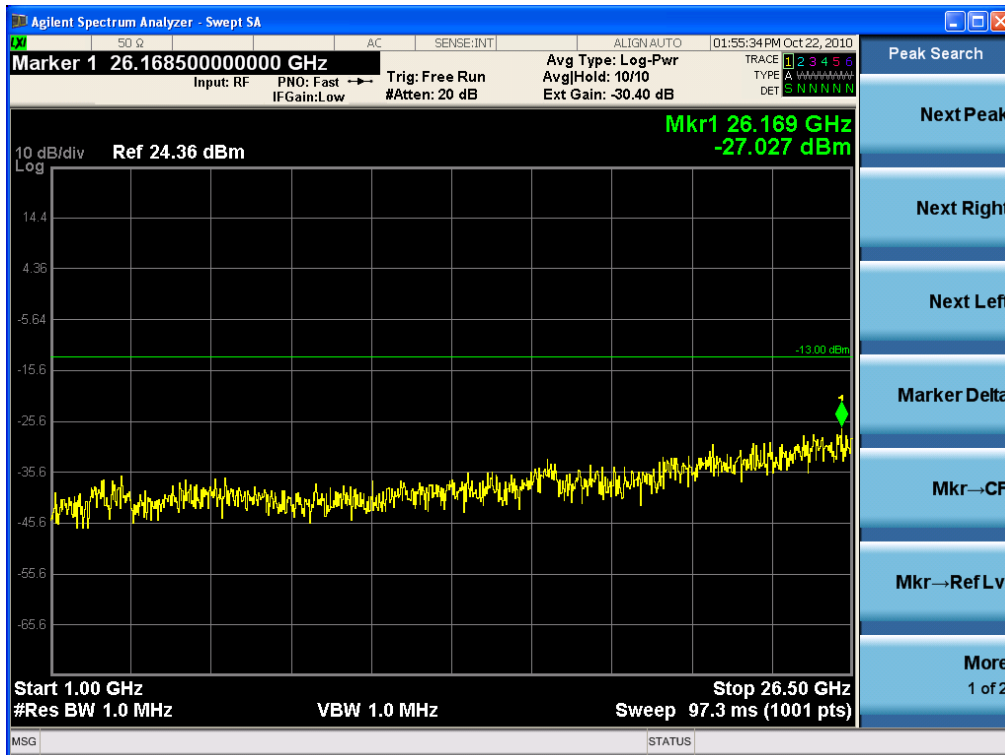


Lower B: (737 MHz) - CH 30 MHz ~ 1 GHz

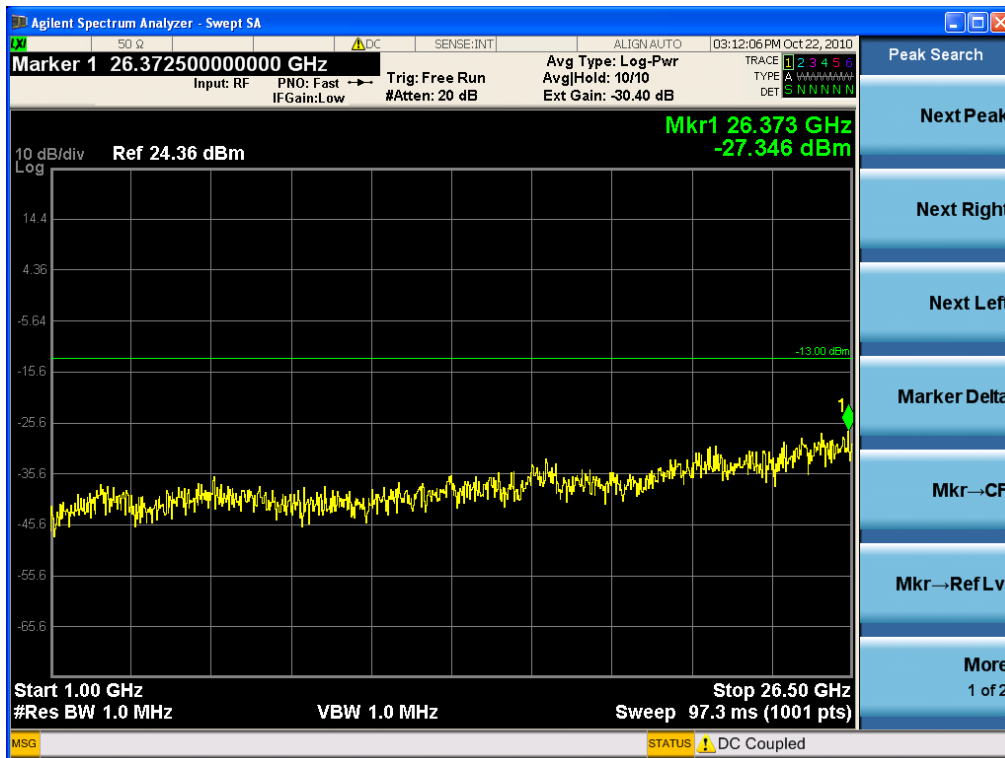
**[Spurious Emission - QPSK] -Down Link**



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

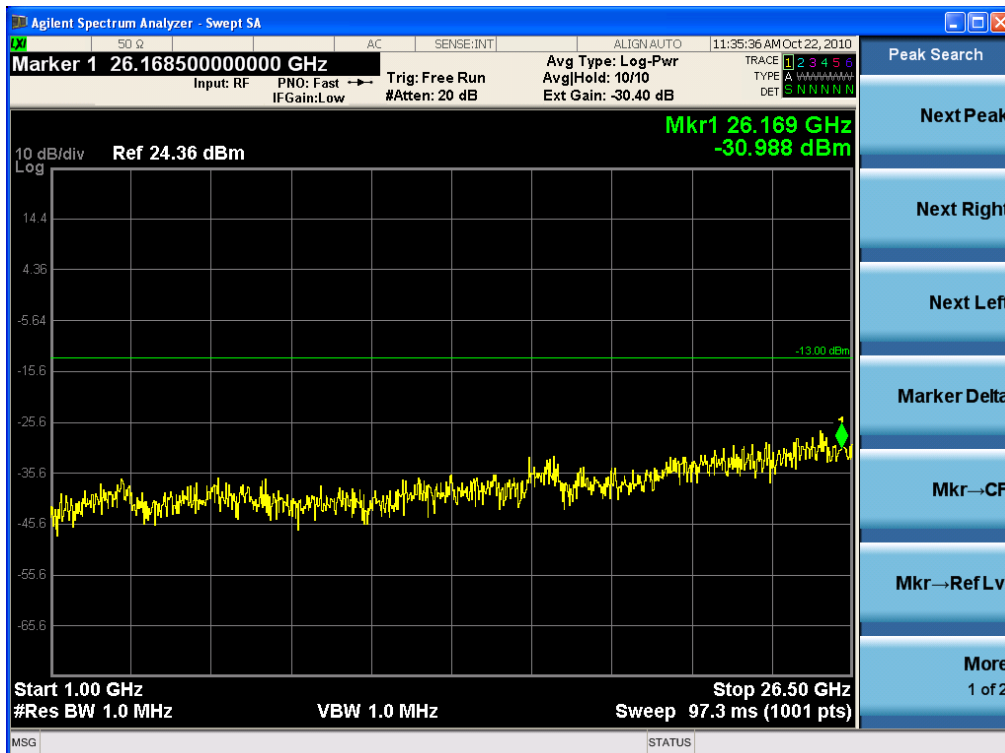


**Lower A: (731 MHz) - CH 1 GHz ~ 26.5 GHz**

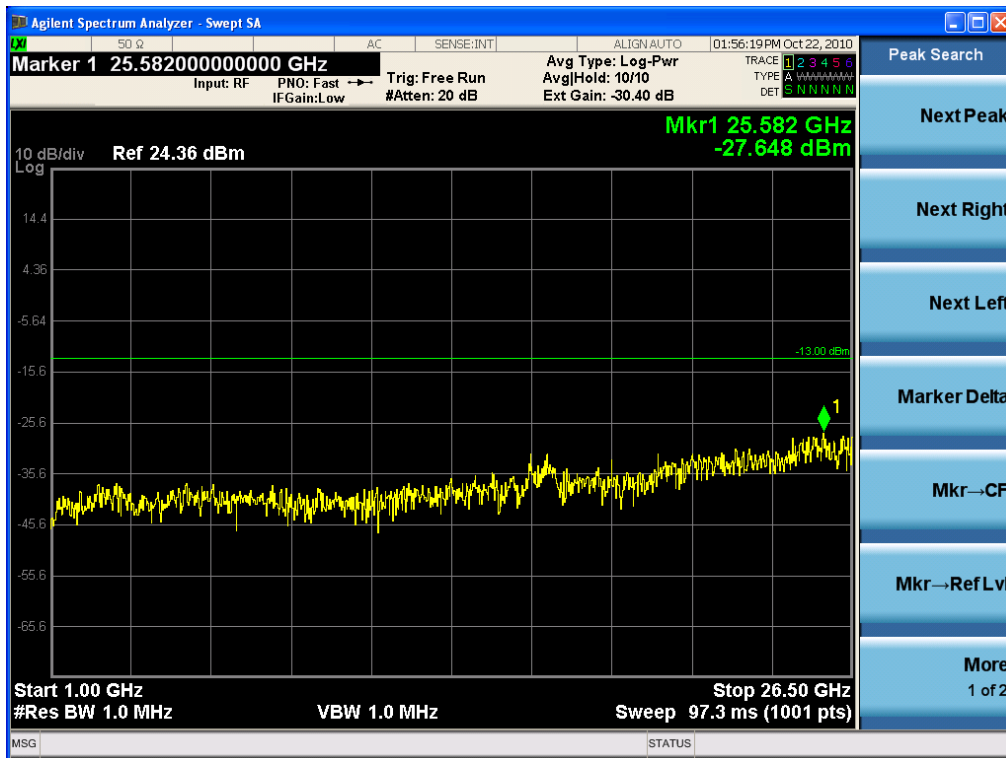


Lower B: (737 MHz) - CH 1 GHz ~ 26.5 GHz

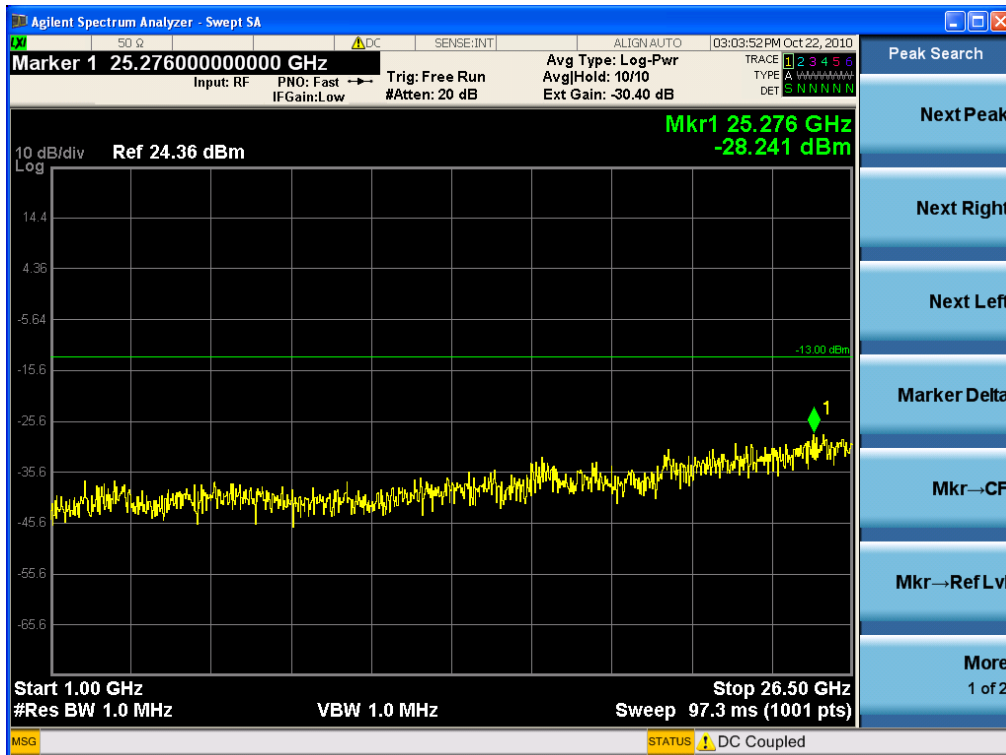
[Spurious Emission – 16QAM] -Down Link



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

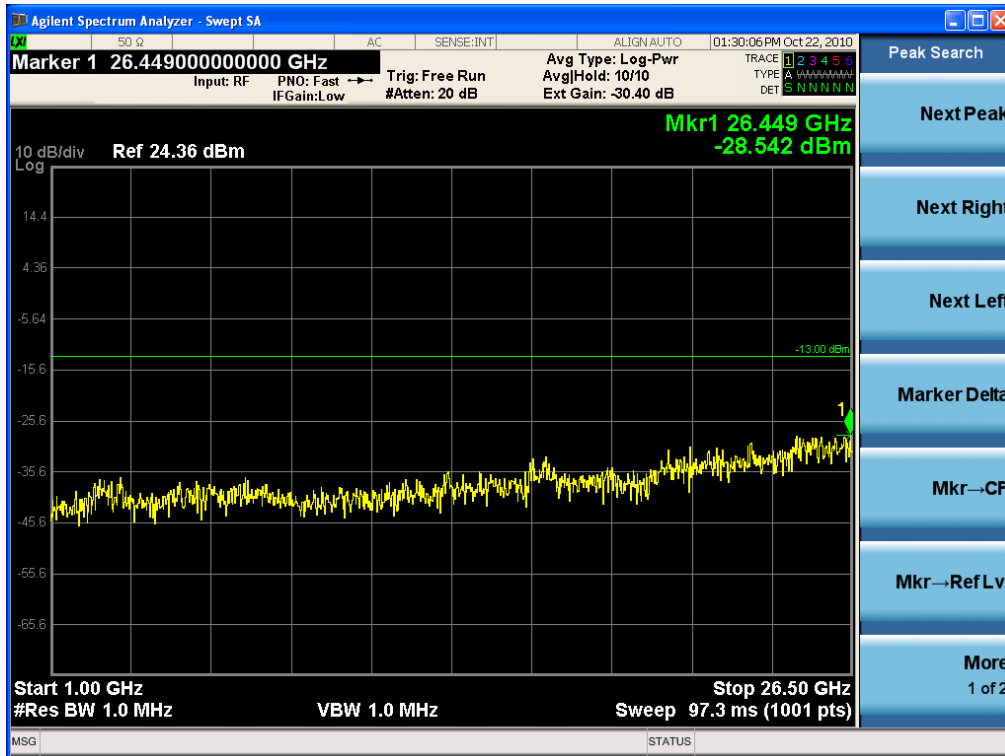


Lower A: (731 MHz) - CH 1 GHz ~ 26.5 GHz

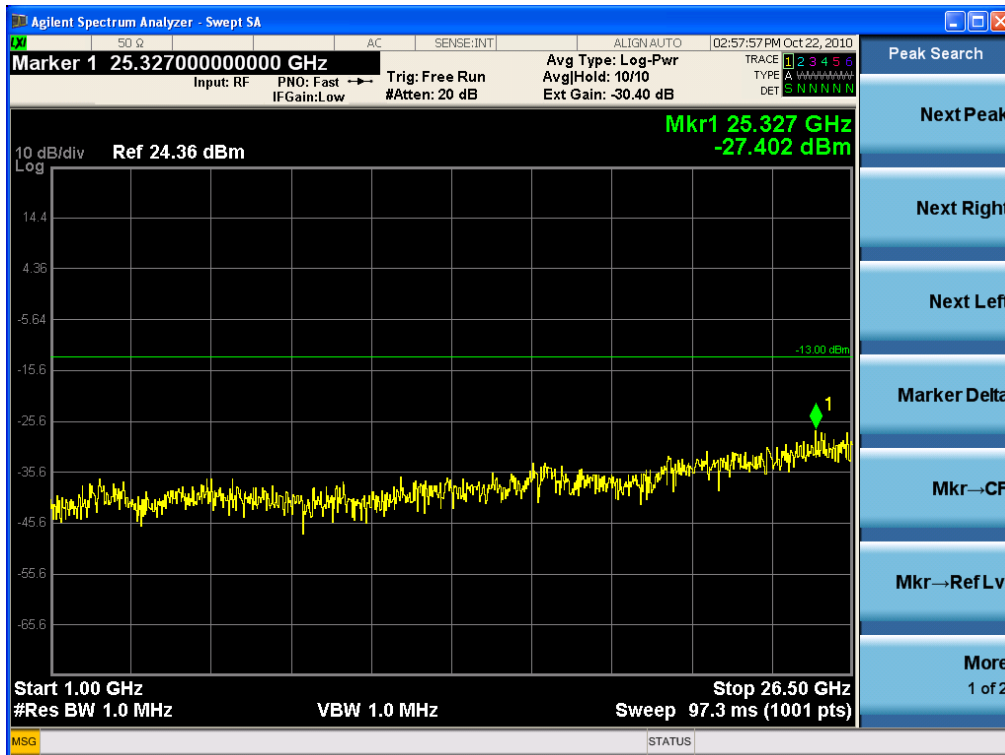


Lower B: (737 MHz) - CH 1 GHz ~ 26.5 GHz

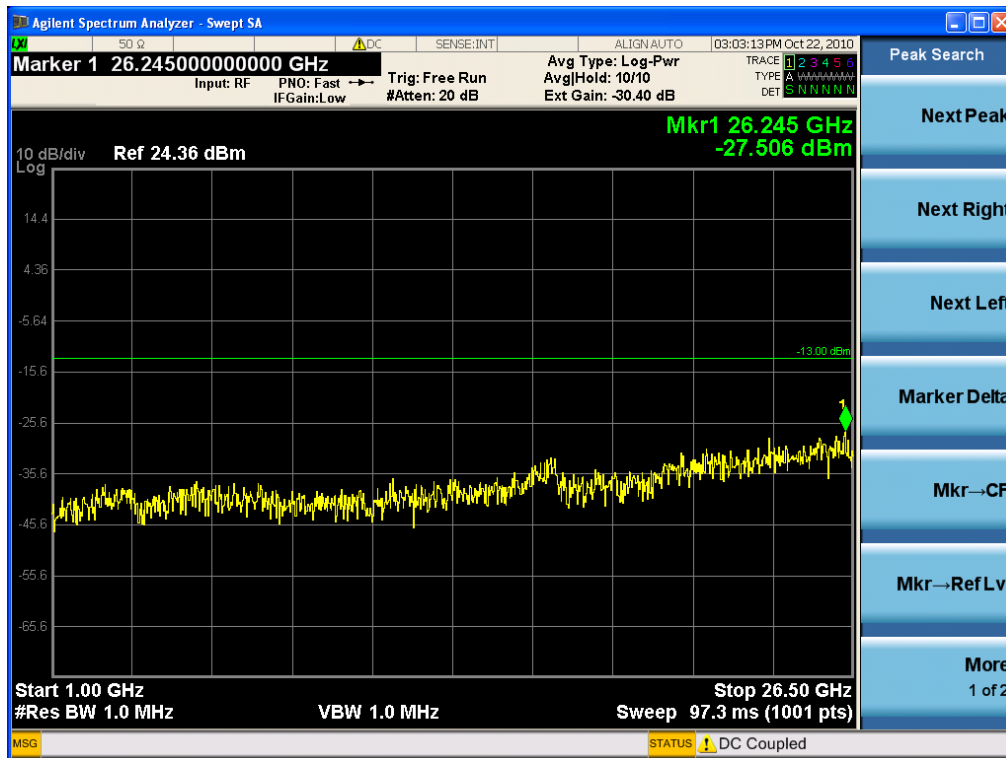
**[Spurious Emission – 64QAM] -Down Link**



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

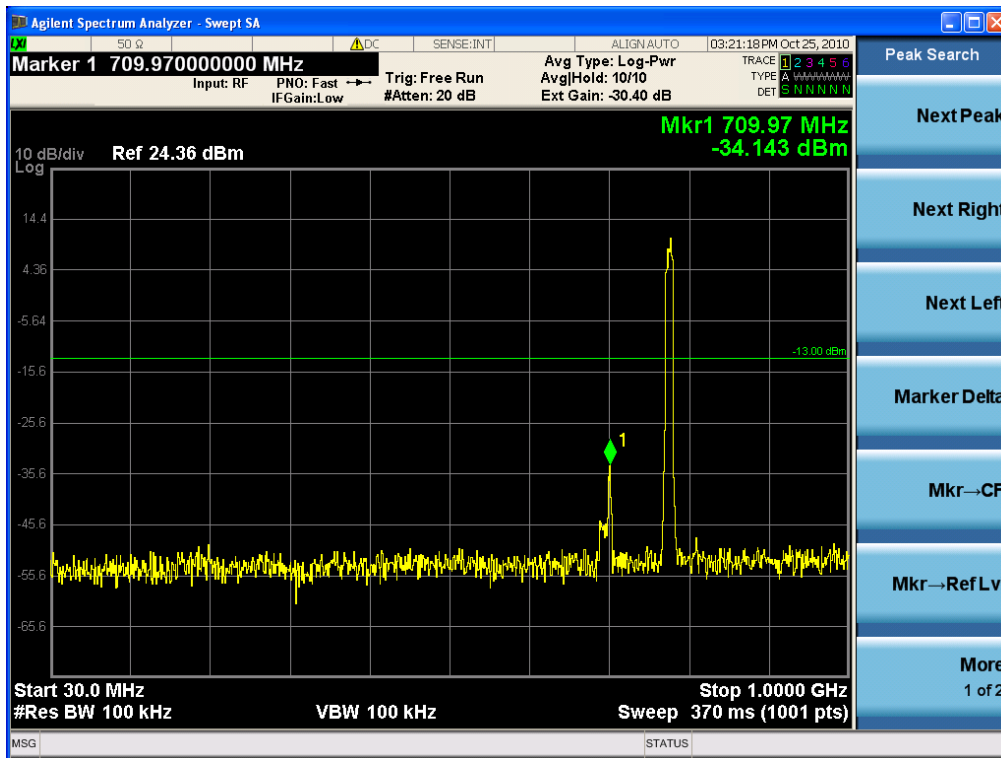


**Lower A: (731 MHz) - CH 1 GHz ~ 26.5 GHz**

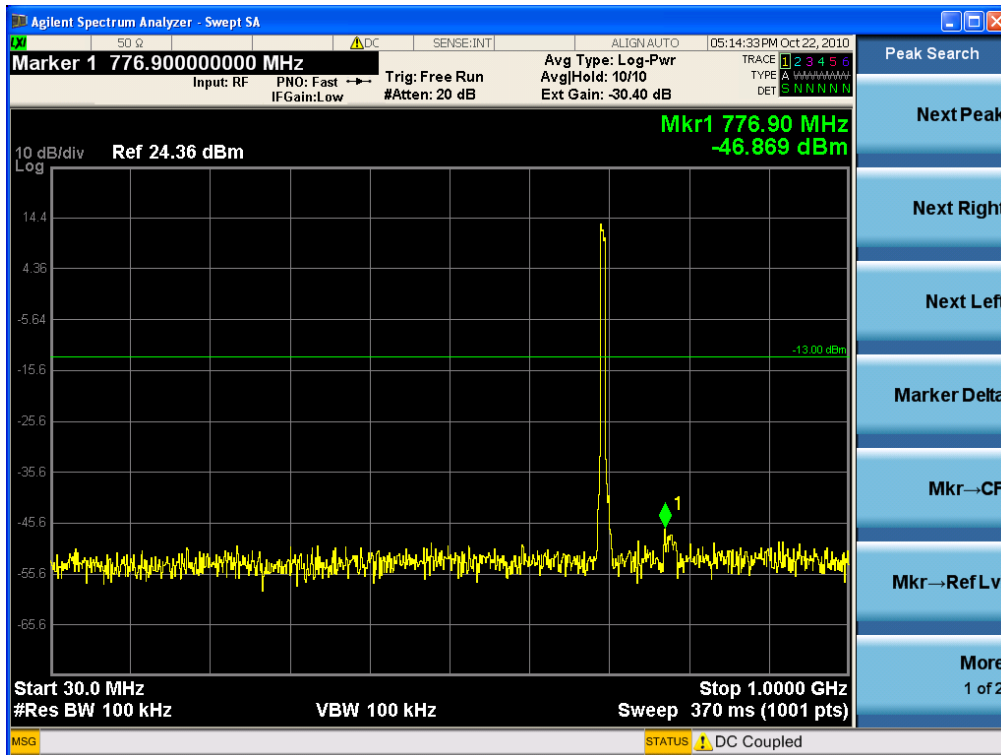


Lower B: (737 MHz) - CH 1 GHz ~ 26.5 GHz

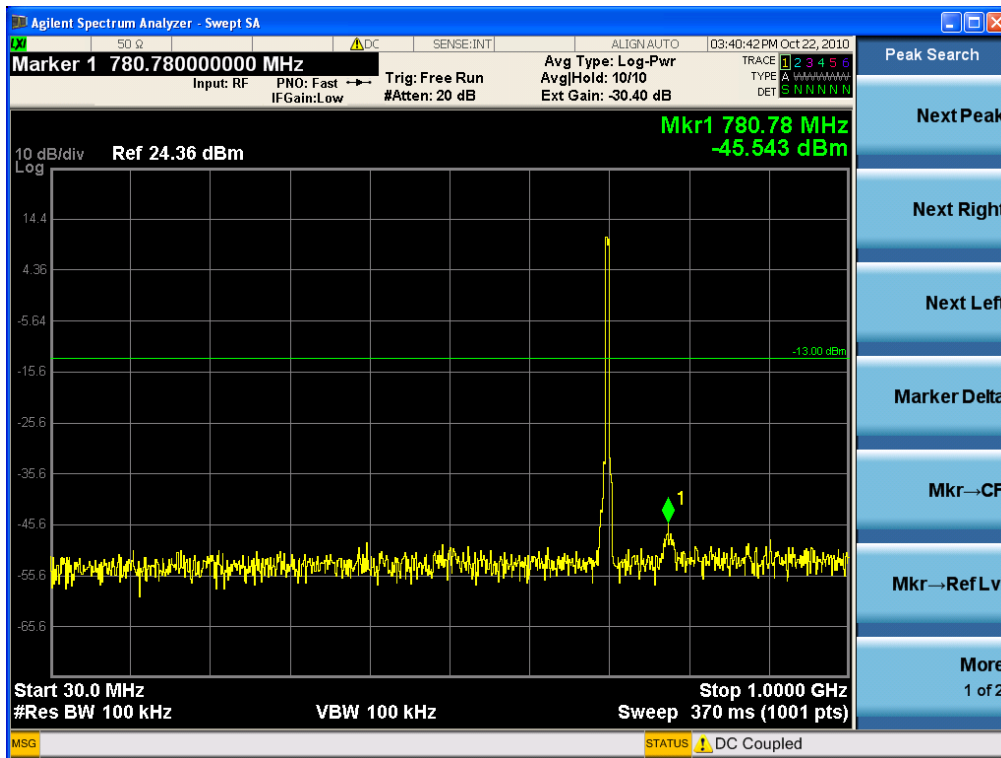
**[Spurious Emission - QPSK]-Up Link**



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

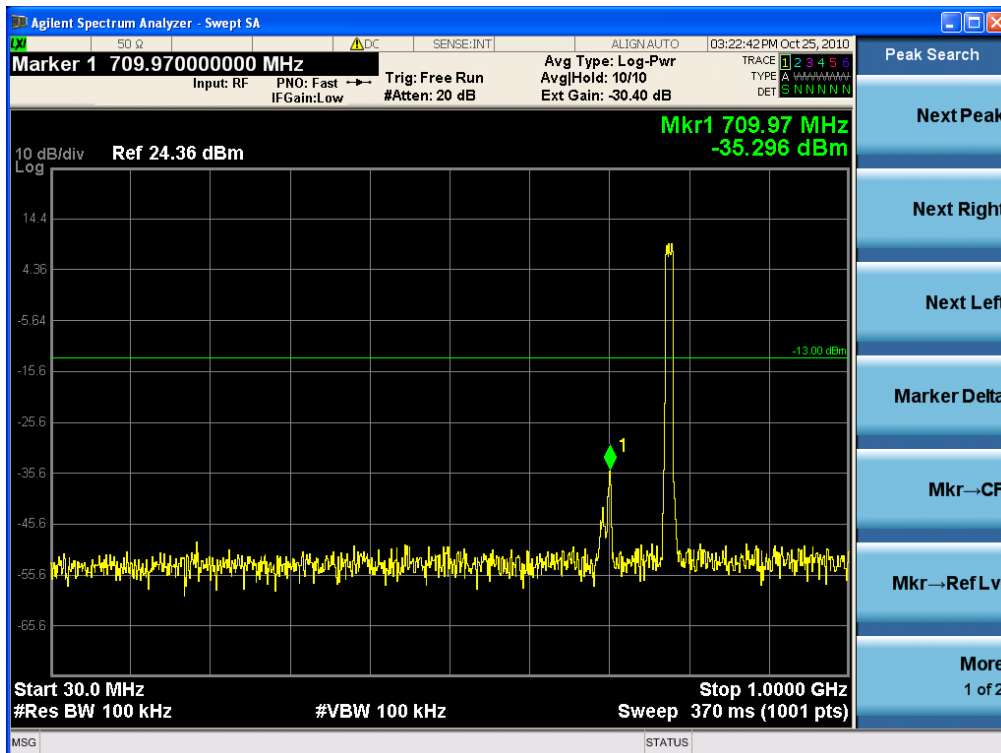


**Lower A: (701 MHz) - CH 30 MHz ~ 1 GHz**

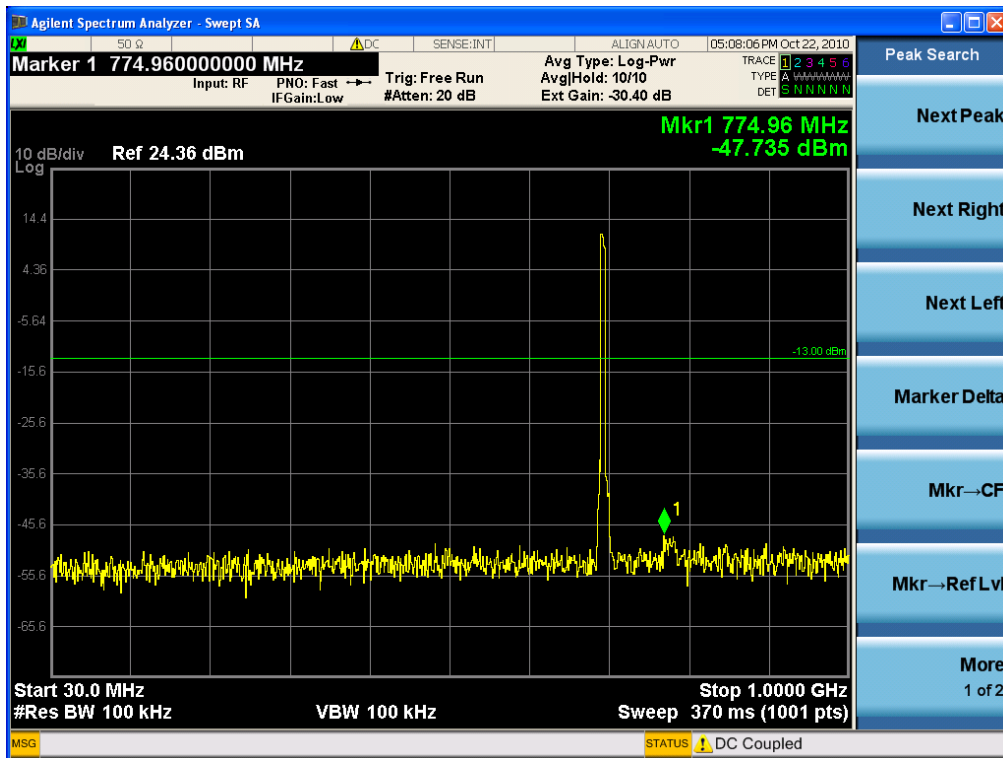


Lower B: (707 MHz) - CH 30 MHz ~ 1 GHz

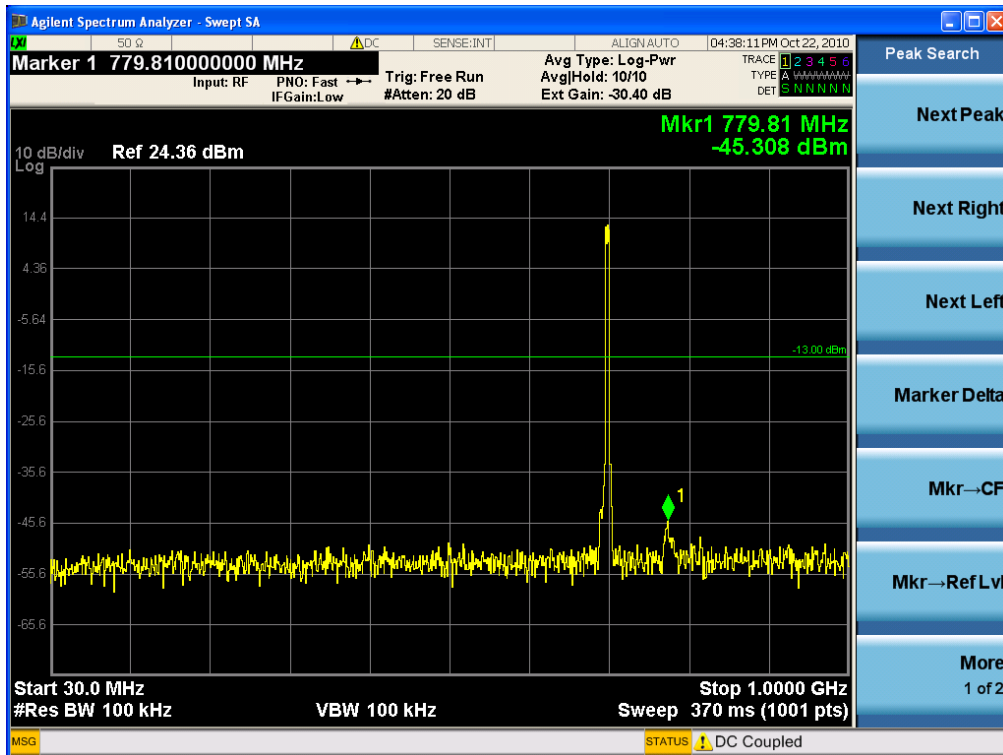
[Spurious Emission – 16QAM] -Up Link



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

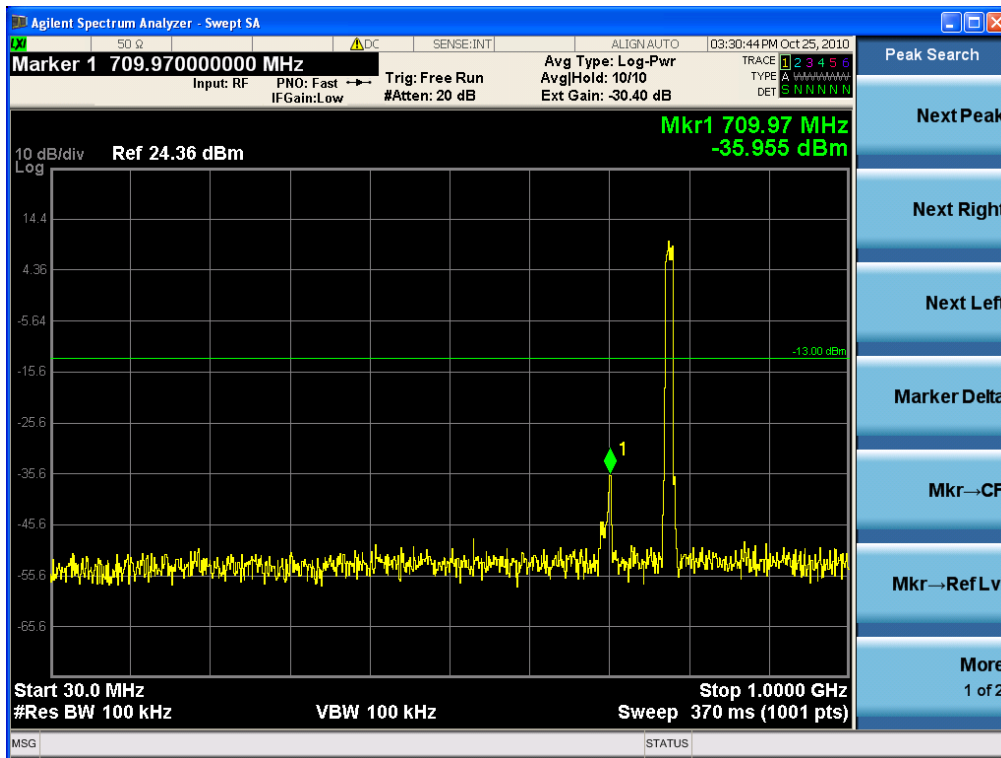


Lower A: (701 MHz) - CH 30 MHz ~ 1 GHz

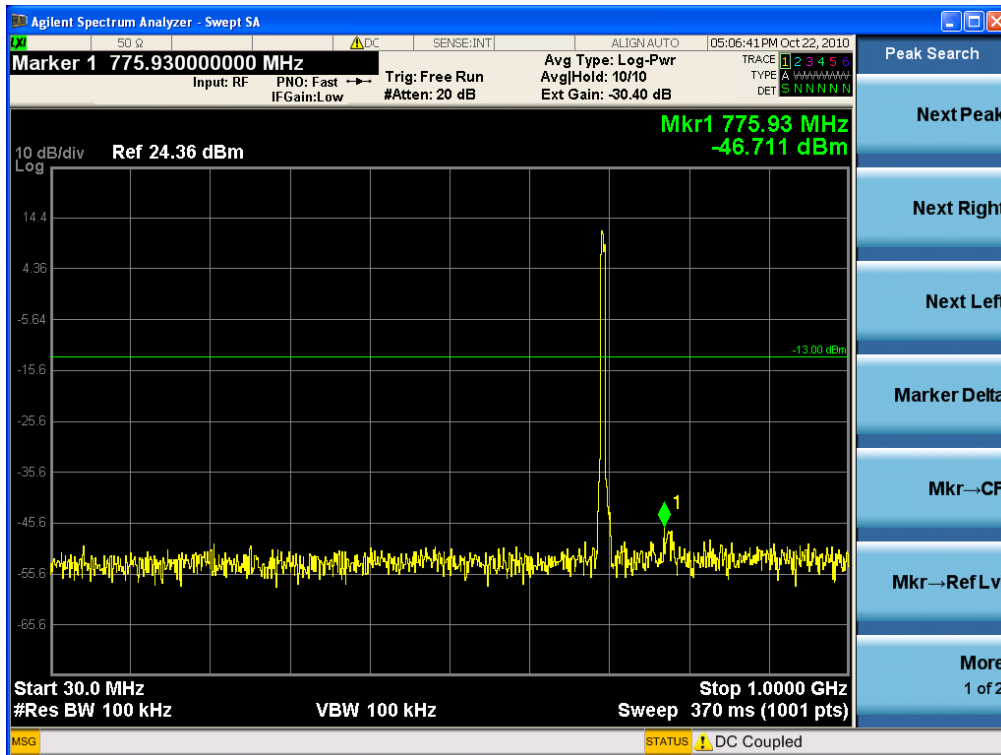


Lower B: (707 MHz) - CH 30 MHz ~ 1 GHz

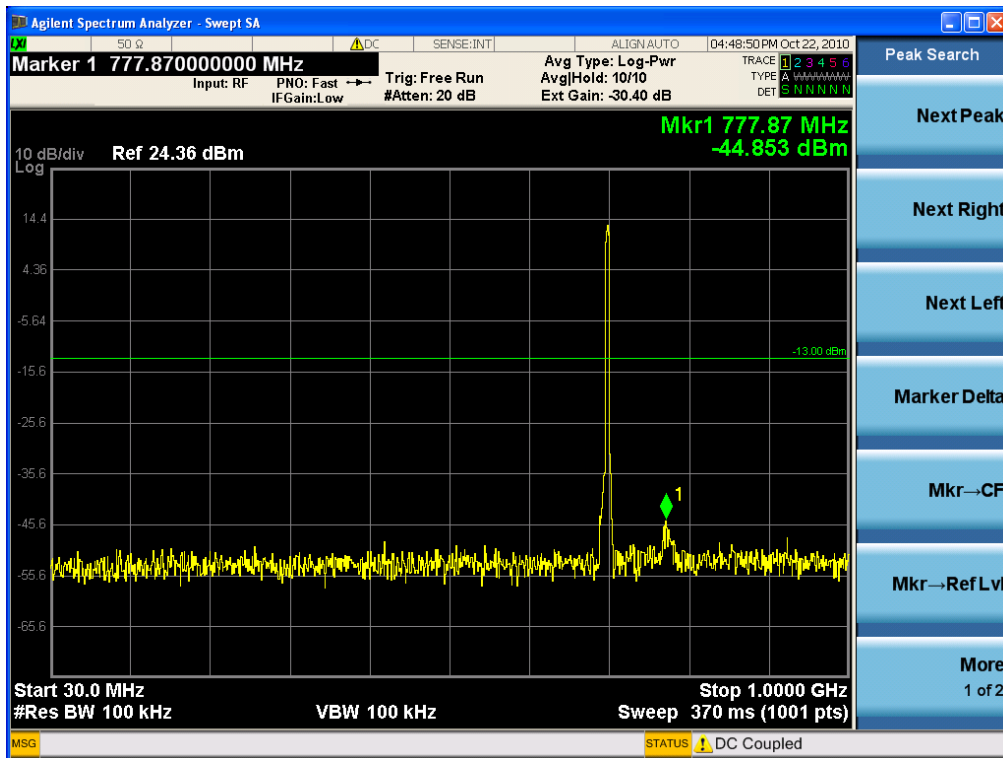
**[Spurious Emission – 64QAM] -Up Link**



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

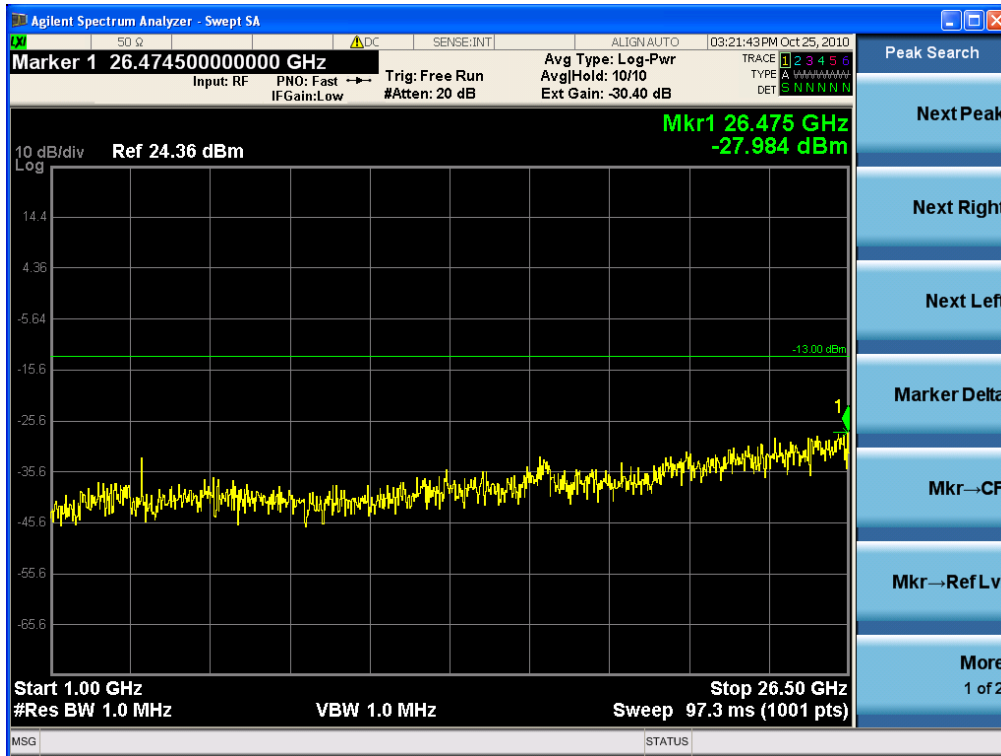


**Lower A: (701 MHz) - CH 30 MHz ~ 1 GHz**

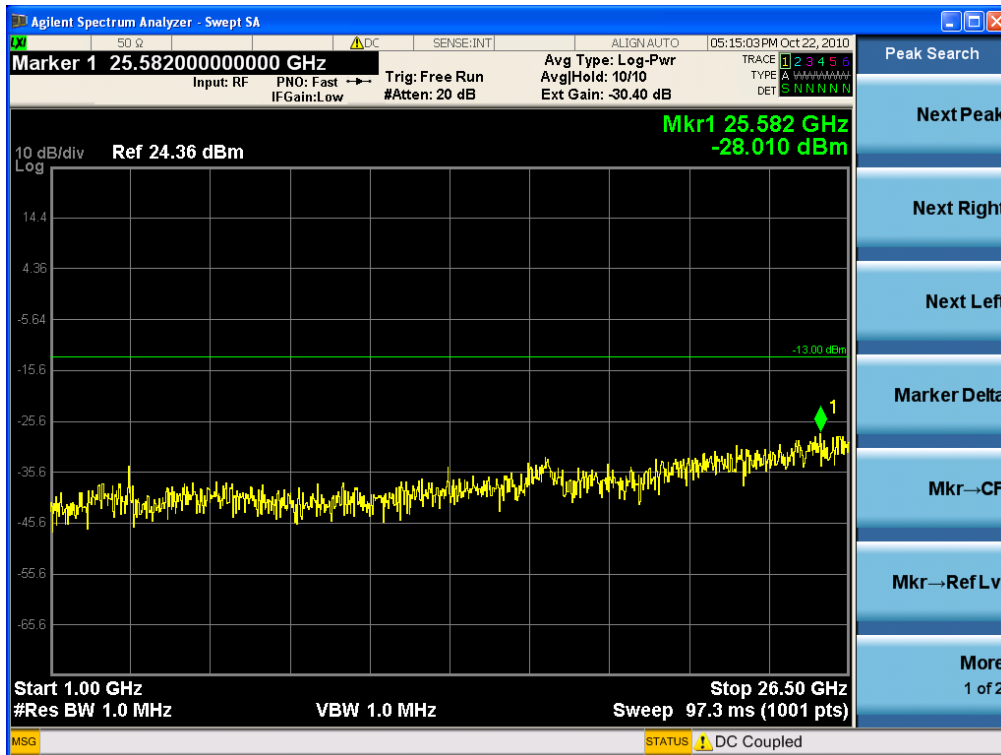


Lower B: (707 MHz) - CH 30 MHz ~ 1 GHz

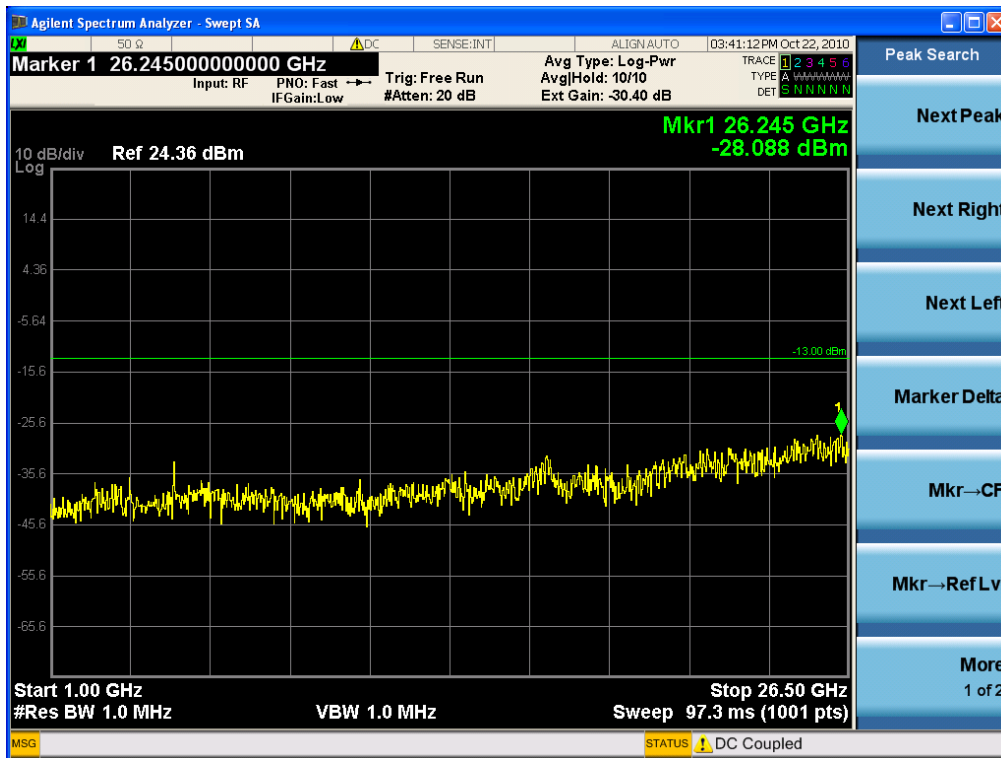
**[Spurious Emission - QPSK] -Up Link**



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

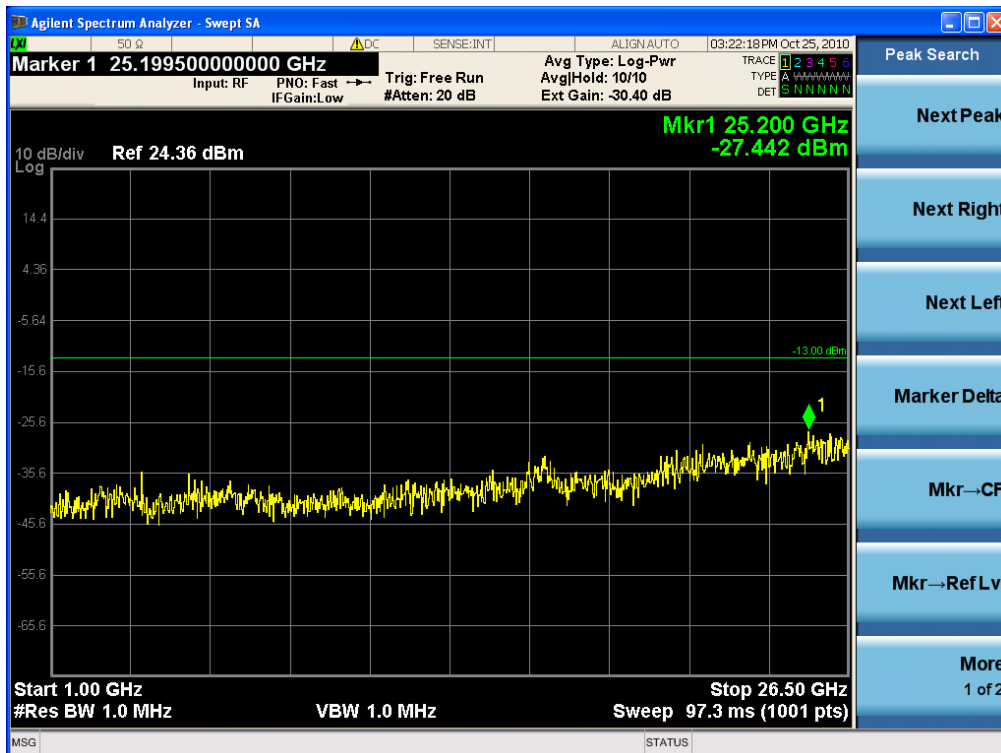


**Lower A: (701 MHz) - CH 1 GHz ~ 26.5 GHz**

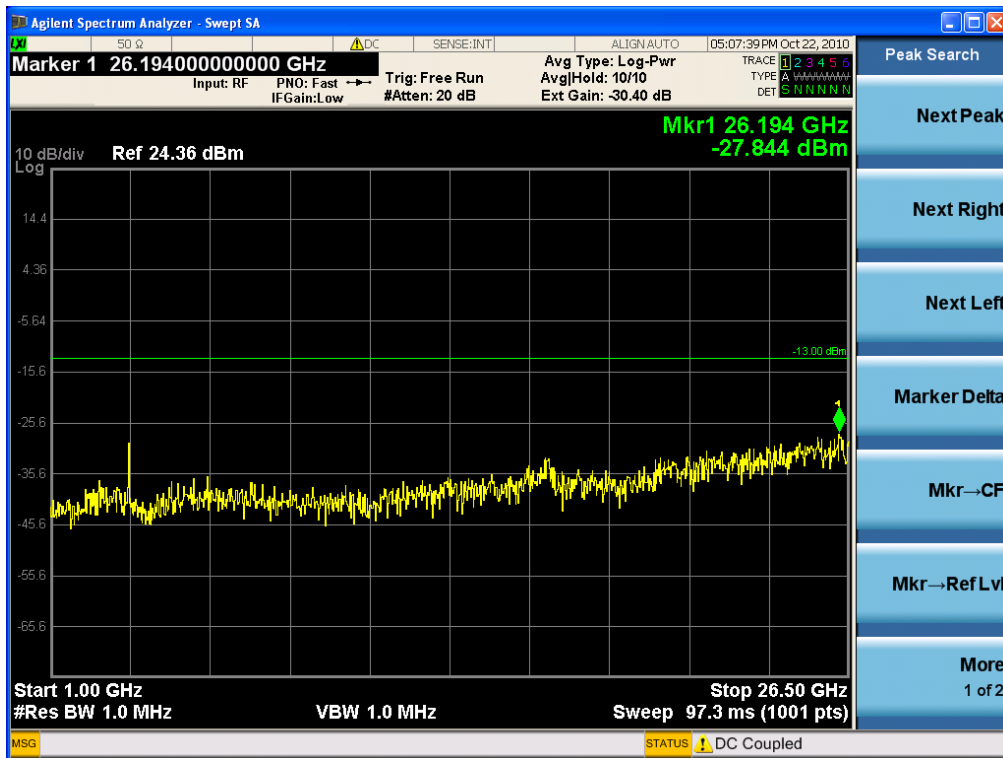


Lower B: (707 MHz) - CH 1 GHz ~ 26.5 GHz

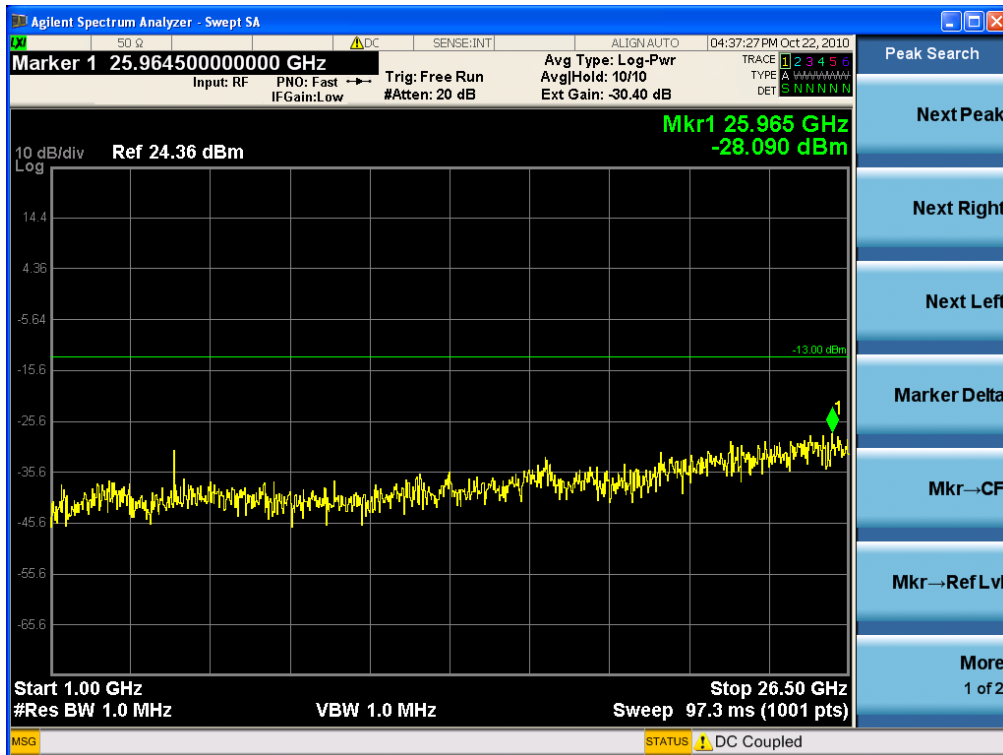
[Spurious Emission – 16QAM] -Up Link



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

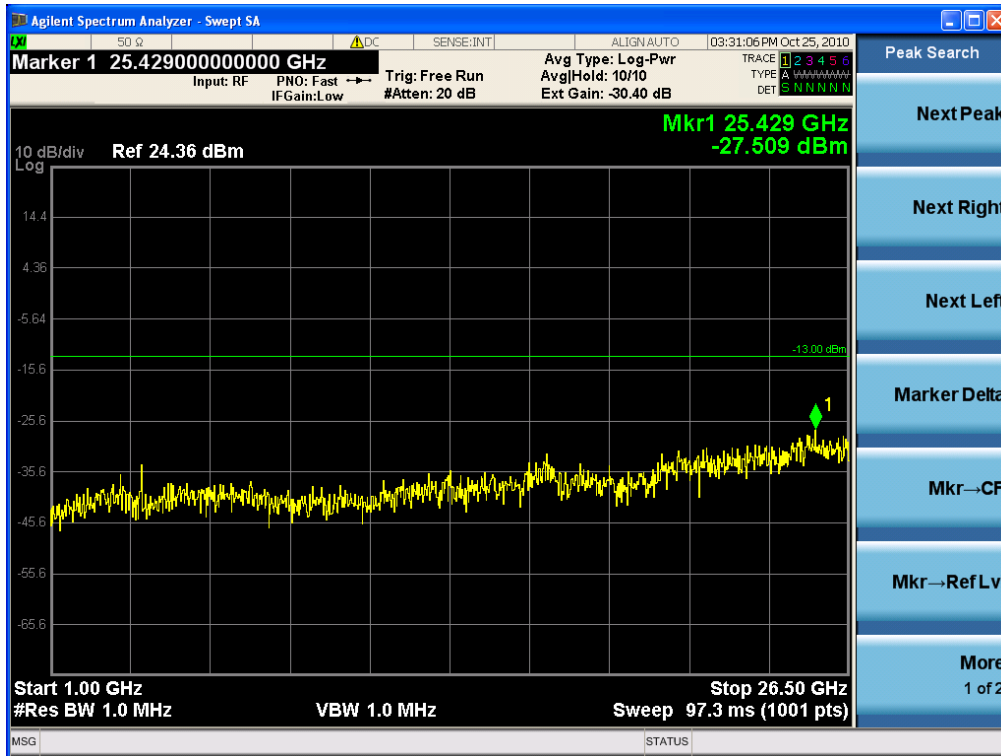


Lower A: (701 MHz) - CH 1 GHz ~ 26.5 GHz

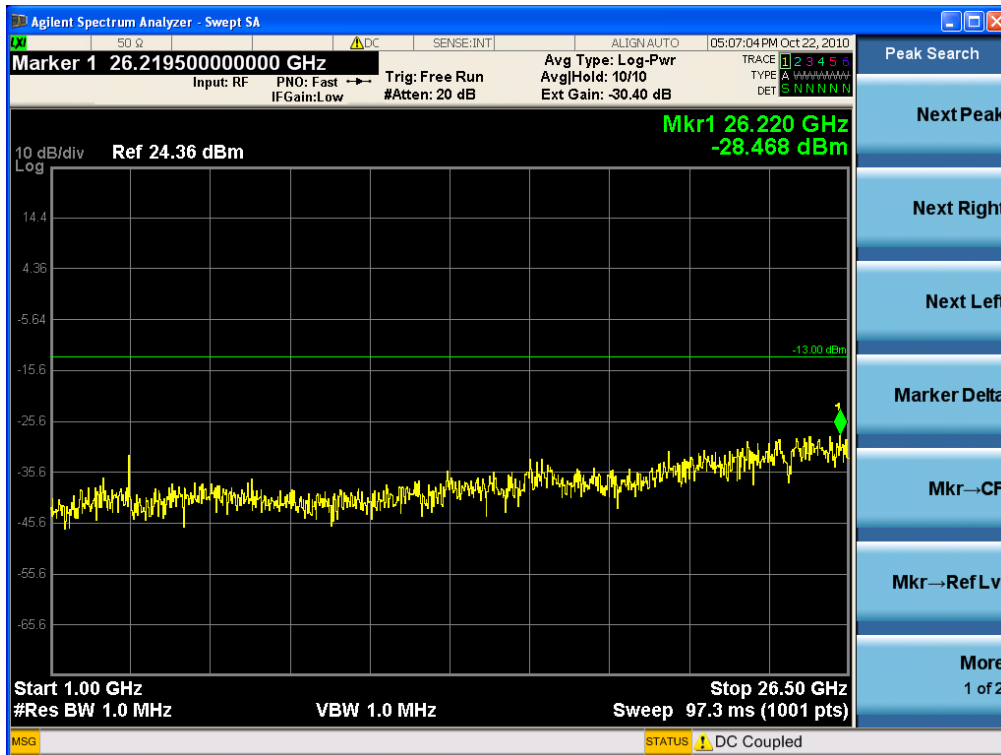


Lower B: (707 MHz) - CH 1 GHz ~ 26.5 GHz

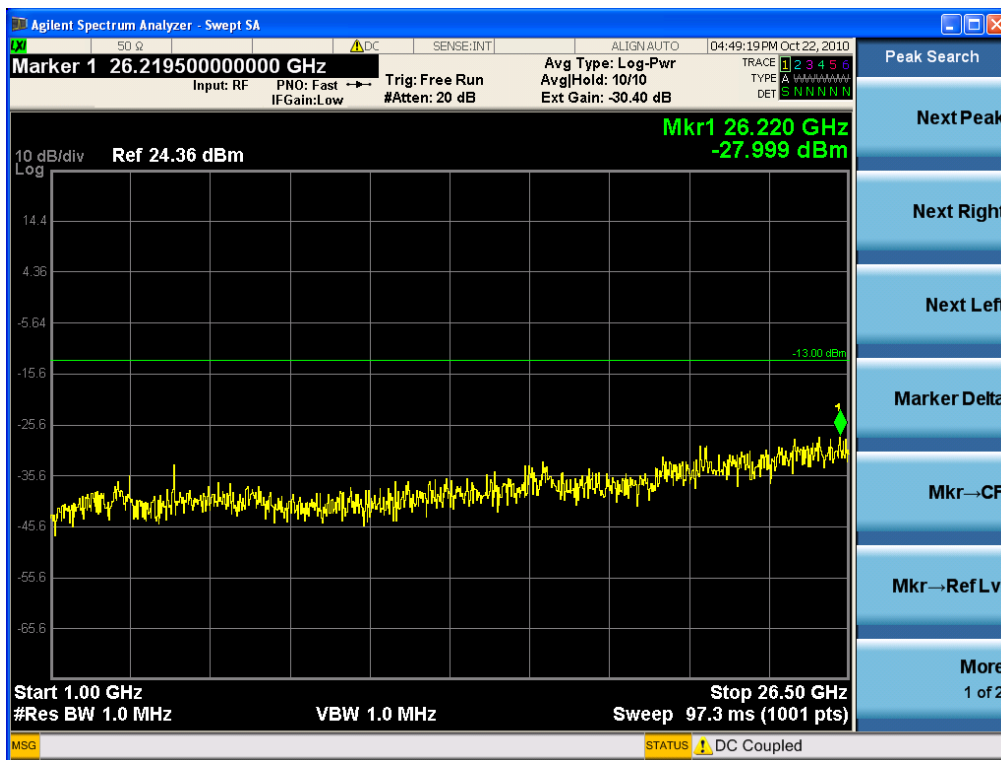
**[Spurious Emission – 64QAM] -Up Link**



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

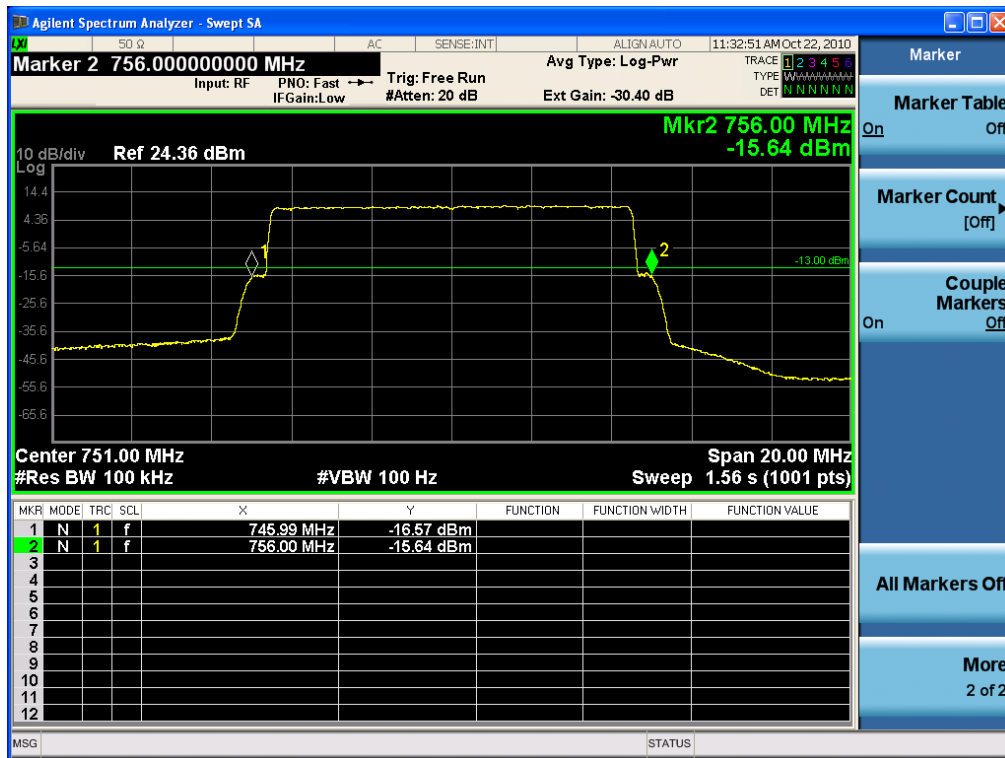


**Lower A: (701 MHz) - CH 1 GHz ~ 26.5 GHz**

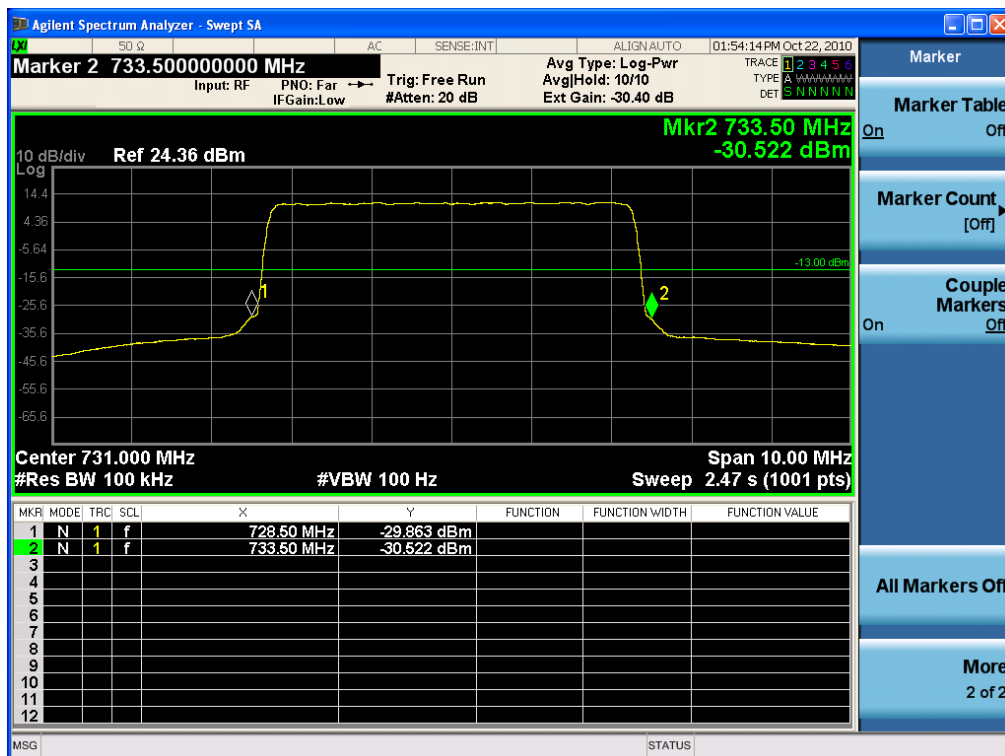


Lower B: (707 MHz) - CH 1 GHz ~ 26.5 GHz

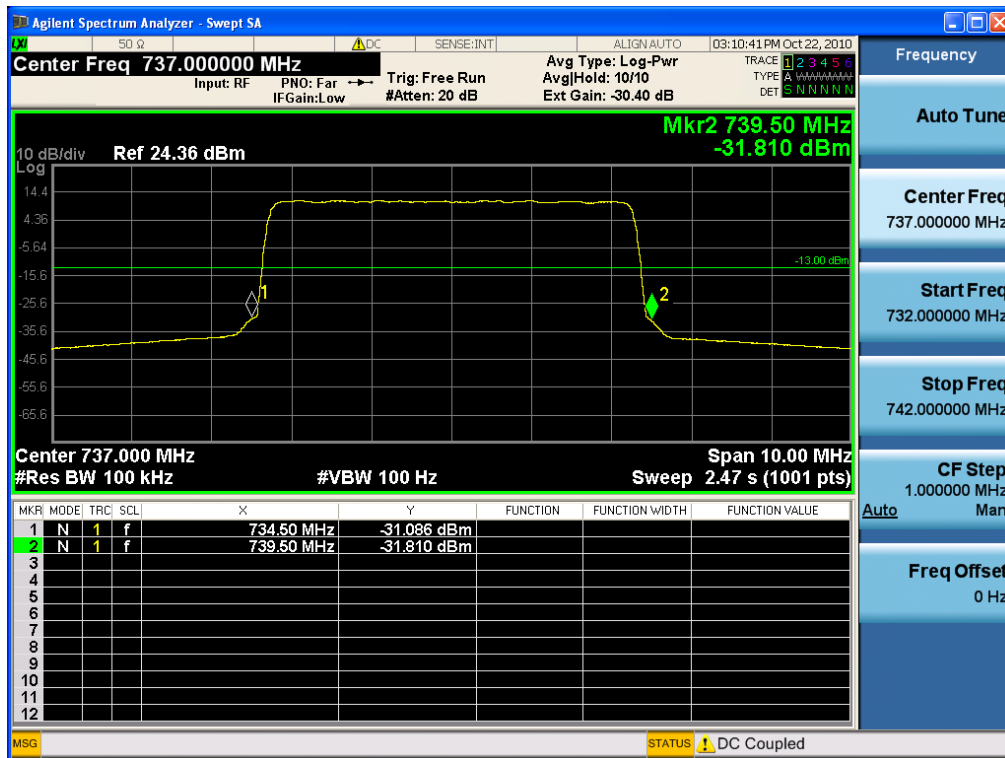
**[Band Edge - QPSK] - Down Link**



**Upper C: (751 MHz)**



**Upper C: (731 MHz)**

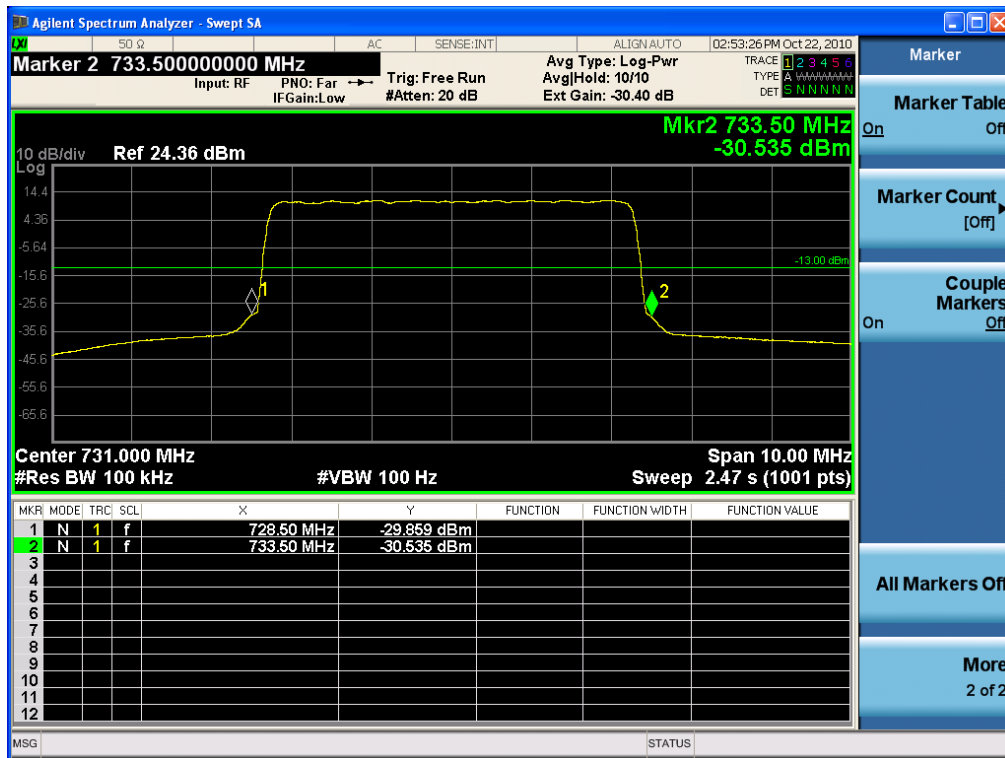


Upper C: (737 MHz)

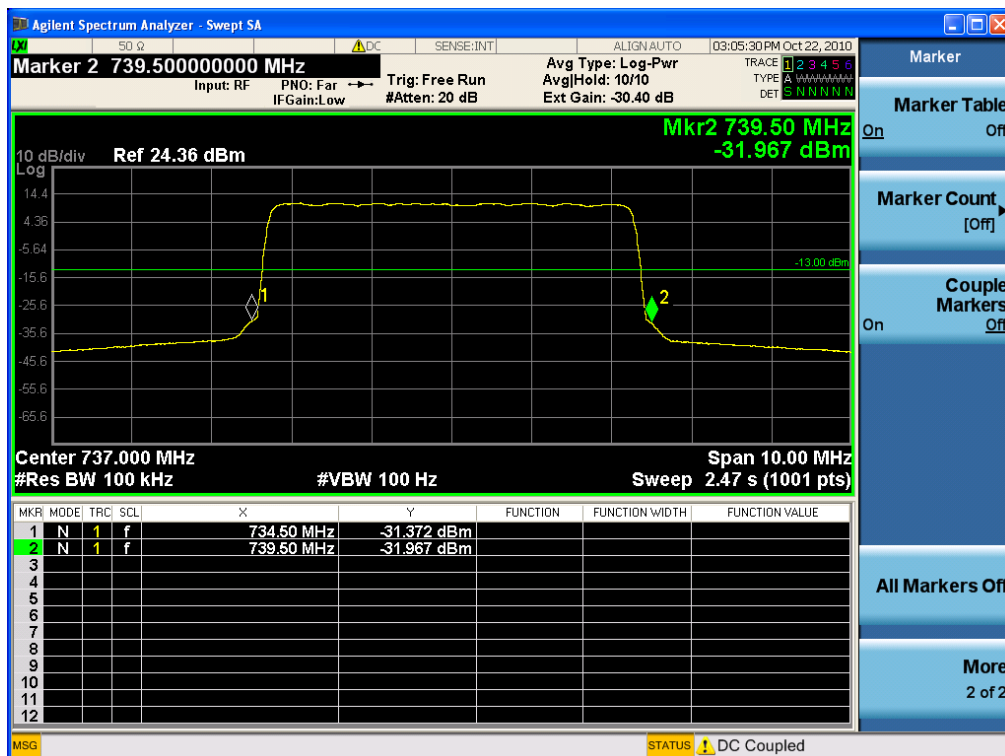
[Band Edge – 16QAM] - Down Link



Lower A: (751 MHz)



Lower A: (731 MHz)

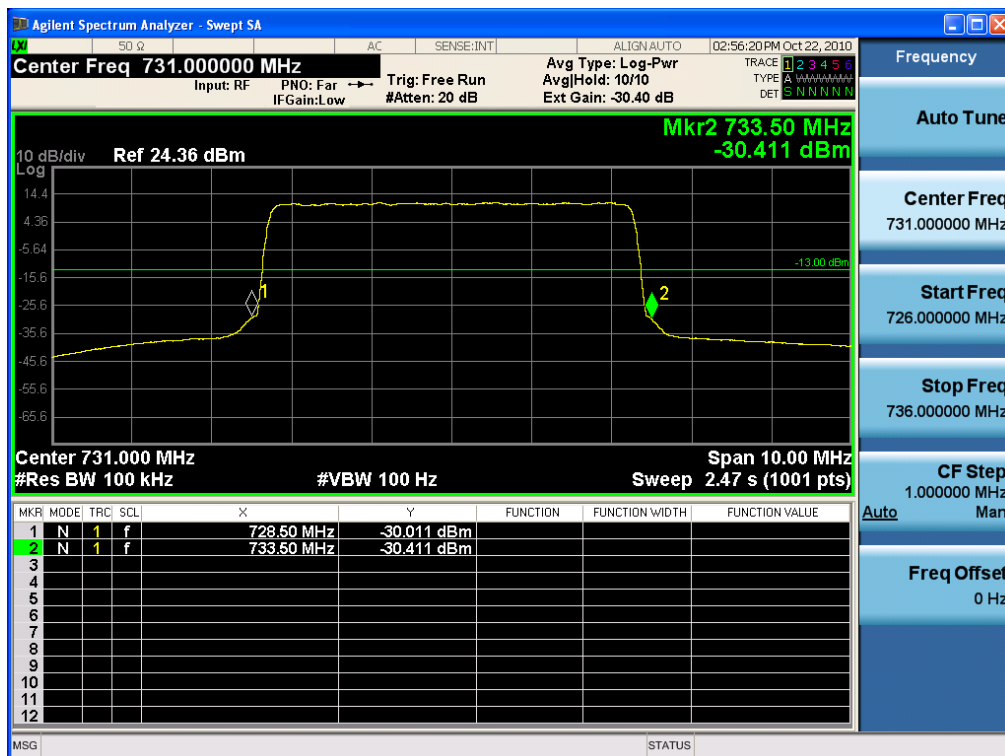


Lower A: (737 MHz)

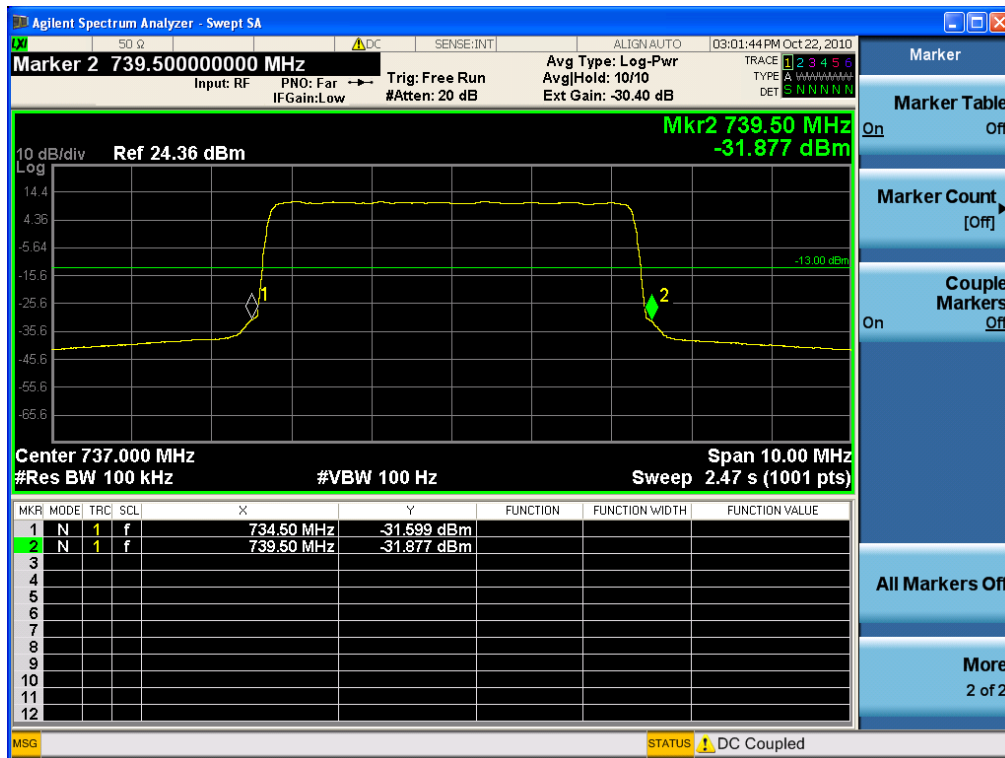
[Band Edge – 64QAM] - Down Link



Lower B: (751 MHz)

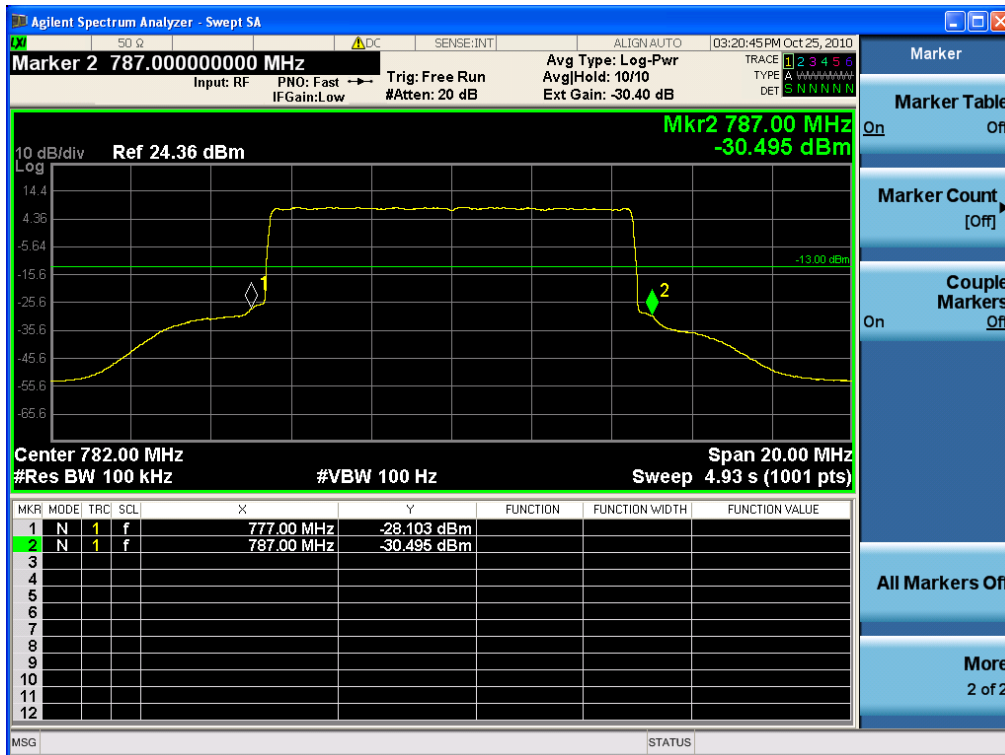


Lower B: (731 MHz)

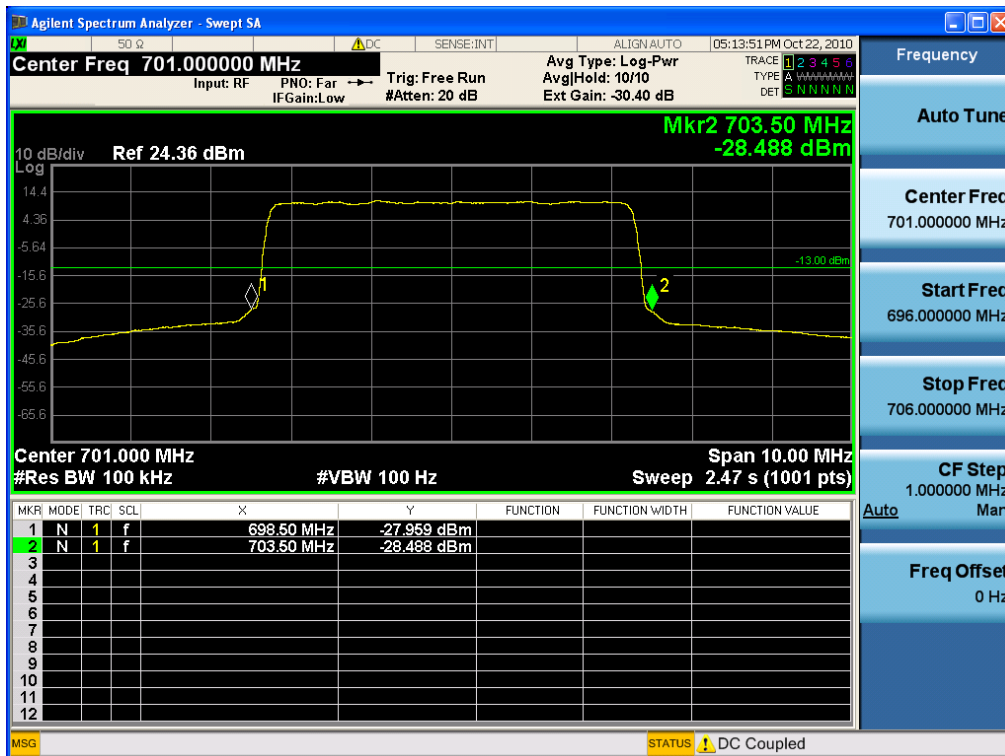


Lower B: (737 MHz)

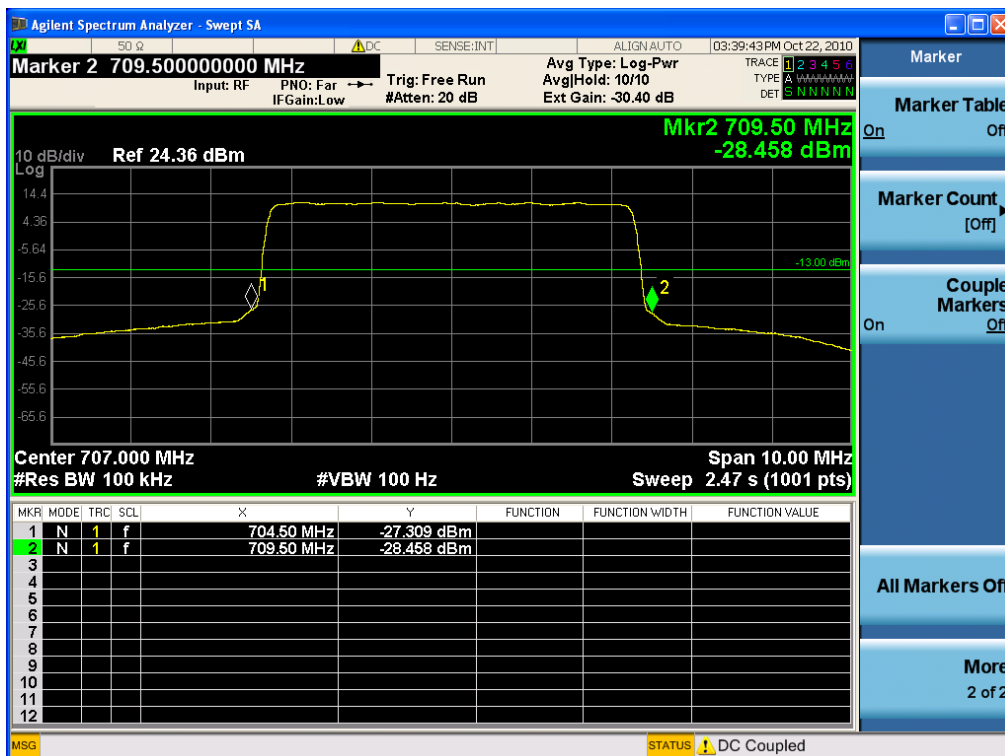
[Band Edge - QPSK]- Up Link



Upper C: (751 MHz)

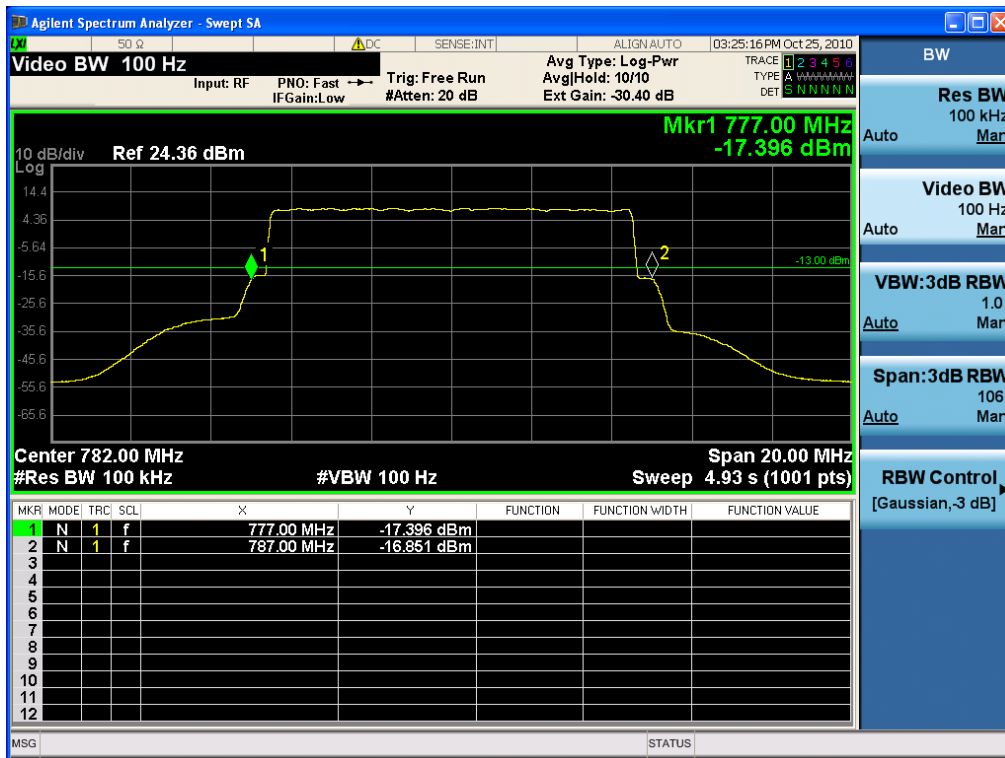


Upper C: (731 MHz)



Upper C: (737 MHz)

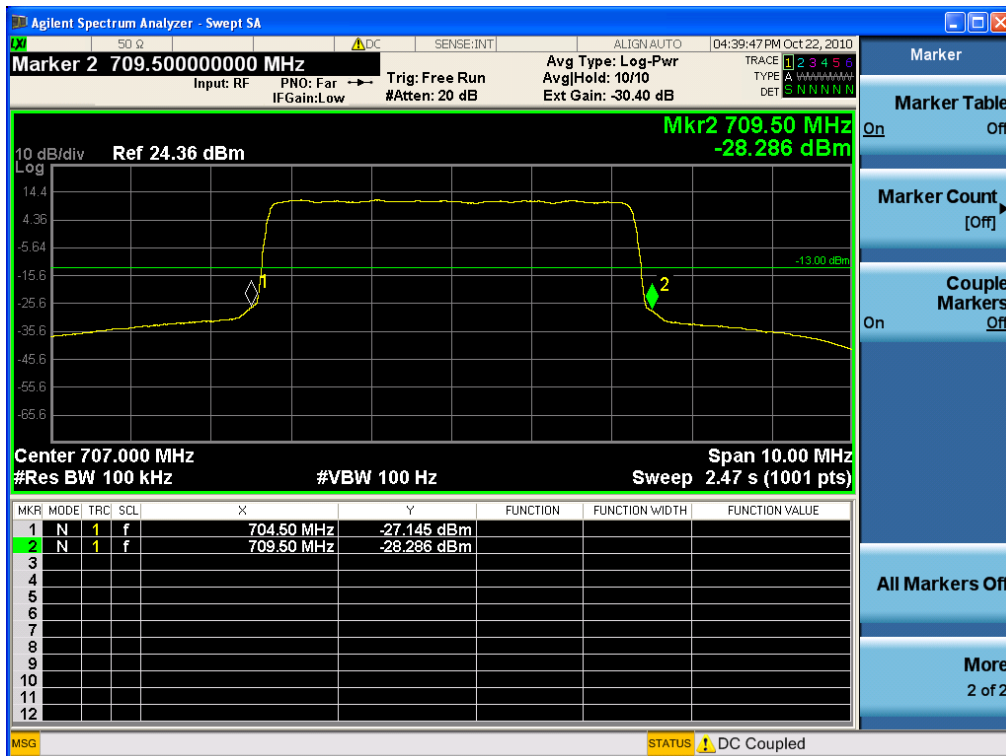
[Band Edge – 16QAM] - Up Link



Lower A: (751 MHz)

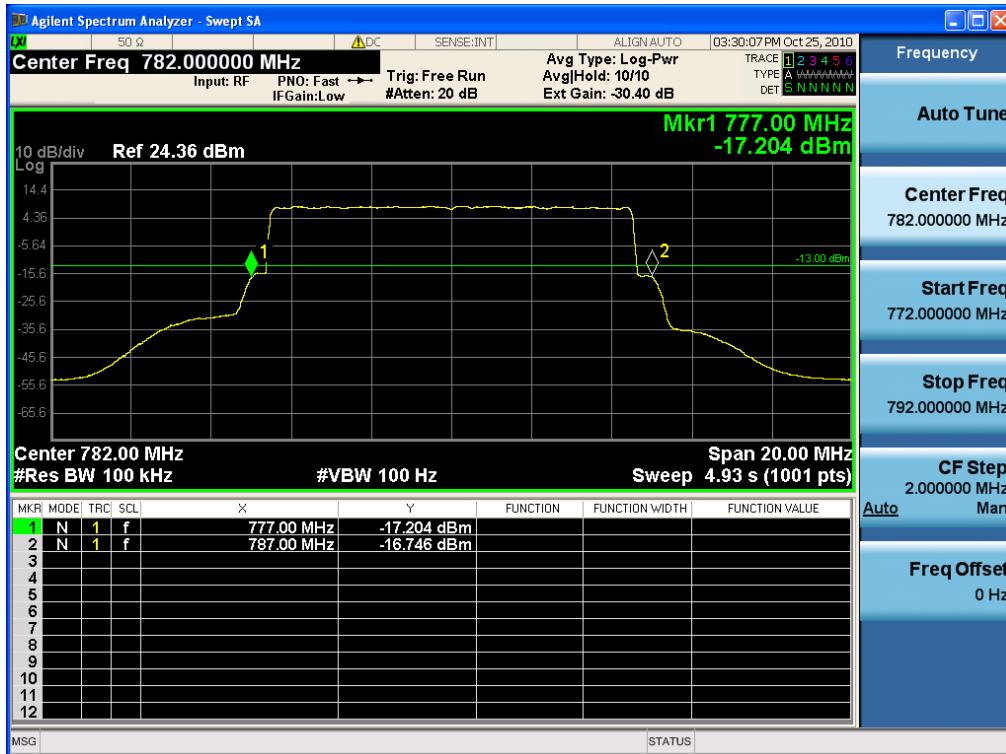


Lower A: (731 MHz)

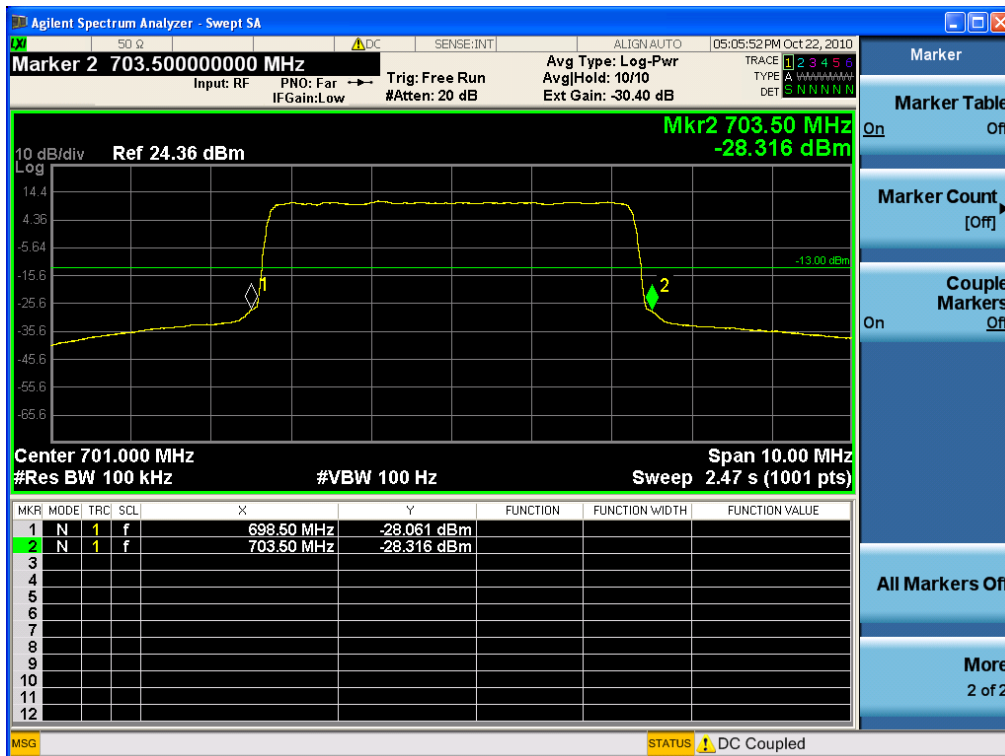


Lower A: (737 MHz)

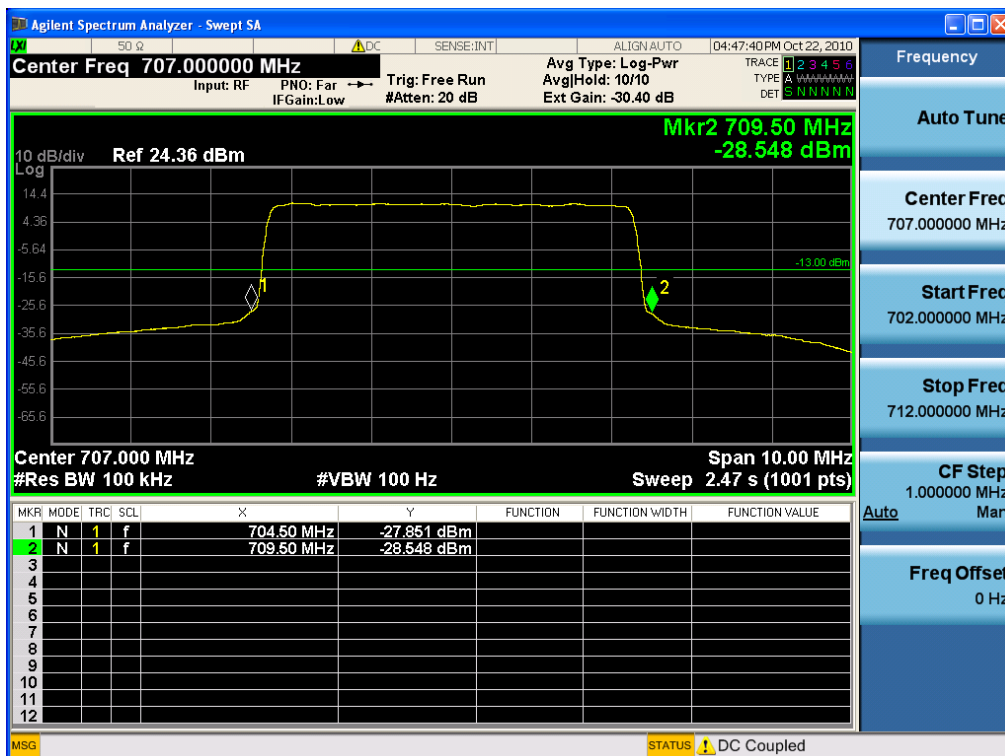
[Band Edge – 64QAM] - Up Link



Lower B: (751 MHz)



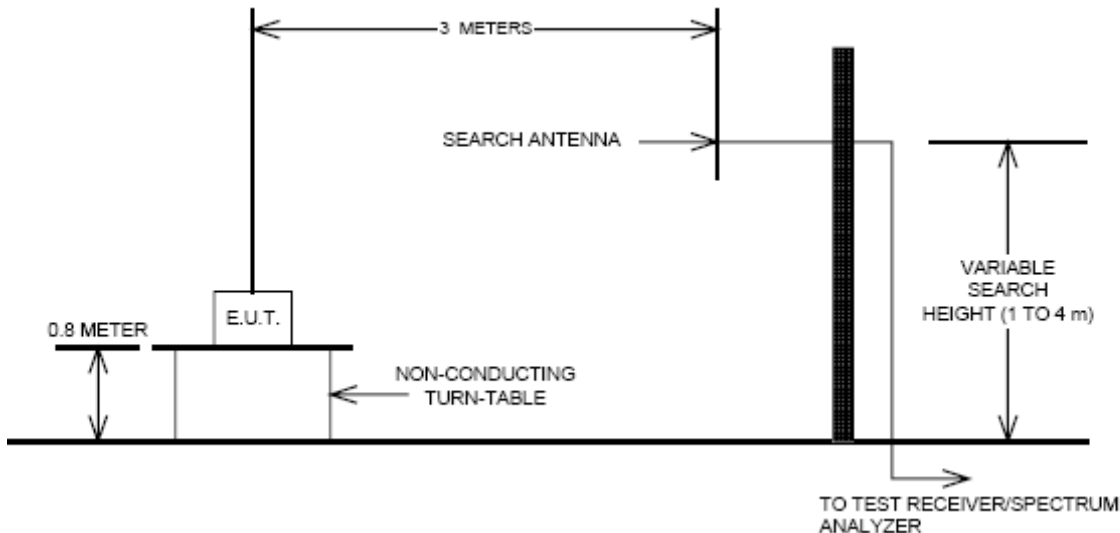
Lower B: (731 MHz)



Lower 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

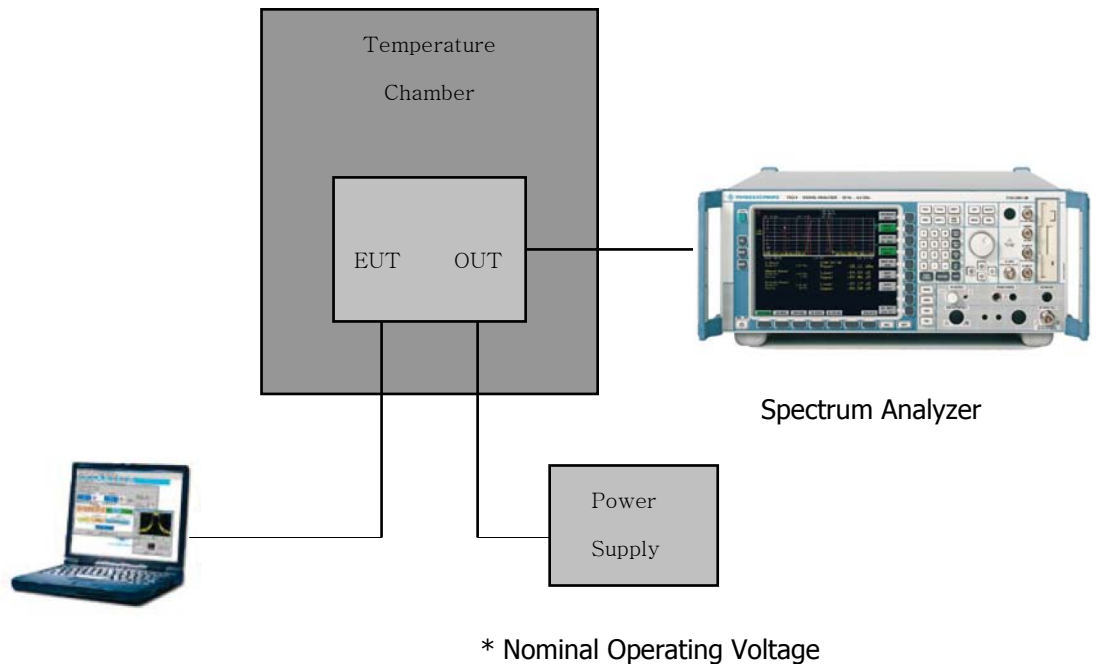
and the receiving antenna scanned from 1-4m in order to capture the maximum emission. A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated. The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source 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</u><br><u>Level</u><br>[dBm] | Ant. Gain<br>(dBd) | C.L  | Pol. | ERP<br>(dBm) | Margin<br>(dB) |
|---------------|-----------|------------|--------------------------------------------|--------------------|------|------|--------------|----------------|
| DOWN<br>-LINK | 751.0     | 1502.0     | -50.2                                      | 6.2491             | 2.18 | H    | -46.1309     | -33.1309       |
|               |           | 2253.0     | -48.7                                      | 8.0512             | 2.99 | H    | -43.6388     | -30.6388       |
| UPLINK        | 782.0     | 1564.0     | -44.4                                      | 6.6862             | 2.23 | H    | -39.9438     | -26.9438       |
|               |           | 2346.0     | -43.6                                      | 8.0884             | 3.10 | H    | -38.6116     | -25.6116       |

### 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  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency.

## Test Result

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

| Main Power [V] | Freq. Error [Hz] | Difference [Hz] | ppm      |
|----------------|------------------|-----------------|----------|
| 10.2           | -13.83           | -17.94          | -0.01134 |
| 12.0           | 7.67             | 0               | 0.011598 |
| 13.8           | -5.35            | -12.37          | -0.00422 |

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

| Temp. [Celsius] | Freq. Error [Hz] | Difference [Hz] | ppm     |
|-----------------|------------------|-----------------|---------|
| 50              | 12.84            | 33.59           | 0.0577  |
| 40              | -24.04           | -2.55           | -0.0398 |
| 30              | -43.11           | -18.34          | 0.0217  |
| 20              | 11.34            | 0               | -0.0541 |
| 10              | -45.22           | -33.88          | 0.0136  |
| 0               | 18.19            | 50.03           | -0.0515 |
| -10             | -33.31           | -73.93          | -0.0287 |
| -20             | 48.23            | 118.24          | 0.0153  |

**(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<br>(MHz) | Electric field<br>Strength (V/m) | Magnetic field<br>Strength (A/m) | Power density<br>(mW/cm <sup>2</sup> ) | Averaging time<br>(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

|                                                             |         |                    |
|-------------------------------------------------------------|---------|--------------------|
| Max Peak output Power at antenna input terminal             | 29.880  | dBm                |
| Max Peak output Power at antenna input terminal             | 972.747 | mW                 |
| Prediction distance                                         | 40.000  | cm                 |
| Prediction frequency                                        | 751.000 | MHz                |
| Antenna Gain(typical)                                       | 8.000   | dBi                |
| Antenna Gain(numeric)                                       | 6.310   | -                  |
| Power density at prediction frequency( S)                   | 0.30526 | mW/cm <sup>2</sup> |
| MPE limit for uncontrolled exposure at prediction frequency | 0.501   | mW/cm <sup>2</sup> |

## 2-2 LOWEST Limit

|                                                             |         |                    |
|-------------------------------------------------------------|---------|--------------------|
| Max Peak output Power at antenna input terminal             | 29.270  | dBm                |
| Max Peak output Power at antenna input terminal             | 845.279 | mW                 |
| Prediction distance                                         | 40.000  | cm                 |
| Prediction frequency                                        | 698.500 | MHz                |
| Antenna Gain(typical)                                       | 8.000   | dBi                |
| Antenna Gain(numeric)                                       | 6.310   | -                  |
| Power density at prediction frequency( S)                   | 0.26526 | mW/cm <sup>2</sup> |
| MPE limit for uncontrolled exposure at prediction frequency | 0.466   | mW/cm <sup>2</sup> |

## 3. RESULTS

The power density level at 40 cm is 0.30526 mW/cm<sup>2</sup>, which is below the uncontrolled exposure limit of 0.501 mW/cm<sup>2</sup> at 751 MHz

The power density level at 40 cm is 0.26526 mW/cm<sup>2</sup>, which is below the uncontrolled exposure limit of 0.466 mW/cm<sup>2</sup> at 698.500 MHz

## 4. LIST OF TEST EQUIPMENT

| Manufacture       | Model/ Equipment            | Serial Number | Calibration Interval | Calibration Due |
|-------------------|-----------------------------|---------------|----------------------|-----------------|
| Agilent           | N9020A / Spectrum Analyzer  | US46220219    | Annual               | 03/03/2011      |
| Agilent           | E4416A / Power Meter        | GB41291412    | Annual               | 01/14/2011      |
| Agilent           | E9327A / Power Sensor       | MY4442009     | Annual               | 07/23/2011      |
| MITEQ             | AFS44-00102650-42-10P-44-PS | 1532439       | Annual               | 04/05/2011      |
| Wainwright        | WHK1.2/15G-10EF/H.P.F       | 2             | Annual               | 06/25/2011      |
| Wainwright        | WHK3.3/18G-10EF/H.P.F       | 1             | Annual               | 06/25/2011      |
| Digital           | EP-3010 / Power Supply      | 3110117       | Annual               | 01/08/2011      |
| Korea Engineering | KR-1005L / Chamber          | KRAC05063-3CH | Annual               | 12/28/2010      |
| Schwarzbeck       | VULB9168/ TRILOG Antenna    | 9168-200      | Biennial             | 01/06/2011      |
| Schwarzbeck       | BBHA 9120D/ Horn Antenna    | 296           | Biennial             | 09/23/2011      |

## 5. CONCLUSION

The data collected shows that the LTE User Equipment **FCC ID: U88-CC100K700** complies with all the requirements of Parts 27 of the FCC rules.