



**DATE: 31 July 2016**

**I.T.L. (PRODUCT TESTING) LTD.  
FCC/IC Radio Test Report  
for  
Telrad Networks Ltd.**

**Equipment under test:**

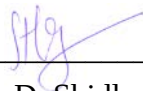
**CPE**

**CPE8000-PRO-1D-3.x**

Tested by:

  
M. Zohar

Approved by:

  
For: D. Shidlow

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This report relates only to items tested.



## Measurement/Technical Report for Telrad Networks Ltd.

### CPE

### CPE8000-PRO-1D-3.x

### FCC ID: ARA-CPE8KPRO3XA

### IC: 899A-CPE8KPRO3XA

This report concerns:

Original Certification: X

Class II change:

Class I change:

Equipment type:

FCC: TNB Licensed Non-Broadcast Station  
Transmitter

IC: Wireless Broadband Access (3650-3700 MHz)  
Unrestricted Contention Protocols

Standards used:

FCC, Part 90, Subpart Z  
FCC, Part 2  
RSS-197, Issue 1, February, 2010  
RSS-GEN, Issue 4, November, 2014  
SRSP-303.65, Issue 2, June 2010

Measurement procedure used is ANSI C63.10- 2013

Substitution Method used as in ANSI/TIA-603-C: 2004

Application for Certification  
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Applicant for this device:  
(different from "prepared by")

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## TABLE OF CONTENTS

|           |                                                                                        |            |
|-----------|----------------------------------------------------------------------------------------|------------|
| <b>1.</b> | <b>GENERAL INFORMATION</b>                                                             | <b>5</b>   |
| 1.1       | Administrative Information                                                             | 5          |
| 1.2       | Abbreviations and Symbols                                                              | 6          |
| 1.3       | List of Accreditations                                                                 | 7          |
| 1.4       | Product Description                                                                    | 8          |
| 1.5       | Test Methodology                                                                       | 8          |
| 1.6       | Test Facility                                                                          | 8          |
| 1.7       | Measurement Uncertainty                                                                | 8          |
| <b>2.</b> | <b>SYSTEM TEST CONFIGURATION</b>                                                       | <b>9</b>   |
| 2.1       | Justification                                                                          | 9          |
| 2.2       | Product Data                                                                           | 9          |
| 2.3       | EUT Exercise Software                                                                  | 9          |
| 2.4       | Special Accessories                                                                    | 9          |
| 2.5       | Equipment Modifications                                                                | 9          |
| 2.6       | Configuration of Tested System                                                         | 10         |
| <b>3.</b> | <b>TEST SET-UP PHOTOS</b>                                                              | <b>11</b>  |
| <b>4.</b> | <b>CHANNEL BANDWIDTH</b>                                                               | <b>15</b>  |
| 4.1       | Test Specification                                                                     | 15         |
| 4.2       | Test Procedure                                                                         | 15         |
| 4.3       | Limit                                                                                  | 15         |
| 4.4       | Test Results                                                                           | 15         |
| 4.5       | Test Equipment Used; Occupied Bandwidth                                                | 35         |
| <b>5.</b> | <b>TRANSMITTER FREQUENCY STABILITY</b>                                                 | <b>36</b>  |
| 5.1       | Test Specification                                                                     | 36         |
| 5.2       | Test Procedure                                                                         | 36         |
| 5.3       | Limit                                                                                  | 36         |
| 5.4       | Test Results                                                                           | 37         |
| 5.5       | Test Instruments Used; Frequency Stability                                             | 45         |
| <b>6.</b> | <b>TRANSMITTER OUTPUT POWER AND EQUIVALENT ISOTROPICALLY RADIATED POWER (E.I.R.P.)</b> | <b>46</b>  |
| 6.1       | Test Specification                                                                     | 46         |
| 6.2       | Test Procedure                                                                         | 46         |
| 6.3       | FCC Limit                                                                              | 46         |
| 6.4       | IC Limit                                                                               | 46         |
| 6.5       | Test Results                                                                           | 47         |
| 6.6       | Test Equipment Used; Transmitter Output Power and EIRP                                 | 90         |
| <b>7.</b> | <b>EMISSION MASKS</b>                                                                  | <b>91</b>  |
| 7.1       | Test Specification                                                                     | 91         |
| 7.2       | Test Procedure                                                                         | 91         |
| 7.3       | Limit                                                                                  | 91         |
| 7.4       | Test Results                                                                           | 91         |
| 7.5       | Test Equipment Used; Transmitter Output Power and EIRP                                 | 110        |
| <b>8.</b> | <b>CONDUCTED TRANSMITTER UNWANTED EMISSIONS</b>                                        | <b>111</b> |
| 8.1       | Test Specification                                                                     | 111        |
| 8.2       | Test Procedure                                                                         | 111        |
| 8.3       | Limit                                                                                  | 111        |
| 8.4       | Test Results                                                                           | 111        |
| 8.5       | Test Equipment Used; Conducted Unwanted Emissions                                      | 172        |
| <b>9.</b> | <b>RADIATED UNWANTED EMISSIONS</b>                                                     | <b>173</b> |
| 9.1       | Test Specification                                                                     | 173        |
| 9.2       | Test Procedure                                                                         | 173        |
| 9.3       | Limit                                                                                  | 174        |
| 9.4       | Test Results                                                                           | 174        |
| 9.5       | Test Instrumentation Used; Spurious Radiated Emission                                  | 176        |



|            |                                                              |            |
|------------|--------------------------------------------------------------|------------|
| <b>10.</b> | <b>RECEIVER SPURIOUS EMISSIONS .....</b>                     | <b>177</b> |
| 10.1       | Test Specification .....                                     | 177        |
| 10.2       | Test Procedure .....                                         | 177        |
| 10.3       | Limit .....                                                  | 177        |
| 10.4       | Test Results.....                                            | 177        |
| 10.5       | Test Instrumentation Used; Receiver Spurious Emissions ..... | 180        |
| <b>11.</b> | <b>ANTENNA GAIN/INFORMATION.....</b>                         | <b>181</b> |
| <b>12.</b> | <b>APPENDIX A - CORRECTION FACTORS .....</b>                 | <b>182</b> |
| 12.1       | Correction factors for CABLE.....                            | 182        |
| 12.2       | Correction factors for Log Periodic Antenna .....            | 183        |
| 12.3       | Correction factors for Biconical Antenna.....                | 184        |
| 12.4       | Correction factors for ACTIVE LOOP ANTENNA .....             | 185        |
| 12.5       | Correction factors for Horn ANTENNA.....                     | 186        |
| 12.6       | Correction factors for Horn Antenna .....                    | 187        |
| 12.7       | Correction factors for Horn Antenna Ka Band.....             | 188        |



# 1. General Information

## 1.1 Administrative Information

|                                |                                                                                                                        |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Manufacturer:                  | Telrad Networks Ltd.                                                                                                   |
| Manufacturer's Address:        | 1 Batsheva St.<br>P.O.B. 6118<br>Lod 711600<br>Israel<br>Tel: +972-73-246-7651<br>Fax: +972-73-246-7504                |
| Manufacturer's Representative: | Klara Milman                                                                                                           |
| Equipment Under Test (E.U.T):  | CPE                                                                                                                    |
| Equipment Product No.:         | CPE8000-PRO-1D-3.x                                                                                                     |
| Serial Number No.:             | Not designated                                                                                                         |
| HVIN:                          | CPE8000PRO3XA                                                                                                          |
| Date of Receipt of E.U.T:      | 14.02.2016                                                                                                             |
| Start of Test:                 | 23.02.2016                                                                                                             |
| End of Test:                   | 20.03.2016                                                                                                             |
| Test Laboratory Location:      | I.T.L (Product Testing) Ltd.<br>1 Batsheva St,<br>Lod, Israel 7116002                                                  |
| Test Specifications:           | FCC Part 90, Subpart Z<br>FCC Part 2<br>RSS-197, Issue 1: 2010<br>RSS-GEN, Issue 4: 2014<br>SRSP-303.65, Issue 2: 2010 |

## 1.2 **Abbreviations and Symbols**

The following abbreviations and symbols are applicable to this test report:

|              |                                             |
|--------------|---------------------------------------------|
| A/m          | ampere per meter                            |
| AC           | alternating current                         |
| AM           | amplitude modulation                        |
| AMN          | Artificial Mains Network                    |
| ARA          | Antenna Research Associates                 |
| Aux          | auxiliary                                   |
| Avg          | average                                     |
| CBW          | channel bandwidth                           |
| CDN          | coupling-decoupling network                 |
| cm           | centimeter                                  |
| dB           | decibel                                     |
| dBm          | decibel referred to one milliwatt           |
| dB $\mu$ V   | decibel referred to one microvolt           |
| dB $\mu$ V/m | decibel referred to one microvolt per meter |
| DC           | direct current                              |
| EFT/B        | electrical fast transient/burst             |
| EMC          | electromagnetic compatibility               |
| ESD          | electrostatic discharge                     |
| E.U.T.       | equipment under test                        |
| GHz          | gigahertz                                   |
| HP           | Hewlett Packard                             |
| Hz           | Hertz                                       |
| kHz          | kilohertz                                   |
| kV           | kilovolt                                    |
| LED          | light emitting diode                        |
| LISN         | line impedance stabilization network        |
| m            | meter                                       |
| mHn          | millihenry                                  |
| MHz          | megahertz                                   |
| msec         | millisecond                                 |
| N/A          | not applicable                              |
| per          | period                                      |
| QP           | quasi-peak                                  |
| PC           | personal computer                           |
| RF           | radio frequency                             |
| RE           | radiated emission                           |
| sec          | second                                      |
| V            | volt                                        |
| V/m          | volt per meter                              |
| VRMS         | volts root mean square                      |



### **1.3 List of Accreditations**

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), FCC Designation Number IL1005.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-3006, R-2729, T-1877, G-245.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025A-1, IC 4025A-2.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

#### **1.4 Product Description**

The E.U.T. is a high performance 4G LTE outdoor CPE product designed to enable quick LTE fixed data service deployment to the remote customers. It provides high data throughput and networking features to end users who need both bandwidth and quality service in the remote area.

#### **1.5 Test Methodology**

Conducted and radiated testing were performed according to the procedures in ANSI C63.10: 2013, FCC Part 90, Subpart Z, RSS-197, Issue 1: 2010, RSS-Gen, Issue 4: 2014 and SRSP-303.65, Issue 2: 2010. Radiated testing was performed at an antenna to EUT distance of 3 meters.

#### **1.6 Test Facility**

Radiated emissions tests were performed at I.T.L.'s testing facility in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FCC Designation Number is IL1005.

#### **1.7 Measurement Uncertainty**

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)

0.15 – 30 MHz:

Expanded Uncertainty (95% Confidence, K=2):

$\pm 3.44$  dB

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):

$\pm 4.96$  dB



## 2. System Test Configuration

### 2.1 Justification

All measurements was performed conducted except for radiated spurious emissions which was performed with the E.U.T in the installation position.

### 2.2 Product Data

|                           |                           |
|---------------------------|---------------------------|
| EUT                       | CPE8000-PRO-1D-3.X        |
| Working voltage           | 115 AC via POE            |
| Mode of operation         | TRANSCIEVER CPE           |
| Modulations               | QPSK, 16QAM, 64QAM        |
| Operation Frequency Range | 3650.0-3700.0 MHz         |
| Antenna Gain              | 15.0dBi                   |
| Modulation BW             | 5MHz, 10MHz, 15MHz, 20MHz |

### 2.3 EUT Exercise Software

CPE8000 V2.1 PACK7 (ver360) software was used.

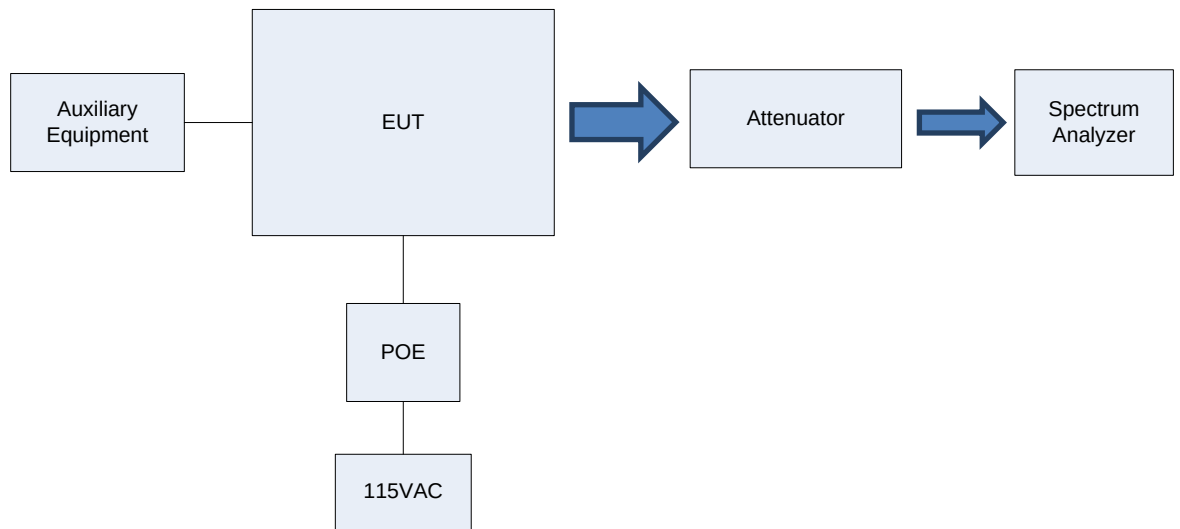
### 2.4 Special Accessories

No special accessories were needed in order to achieve compliance.

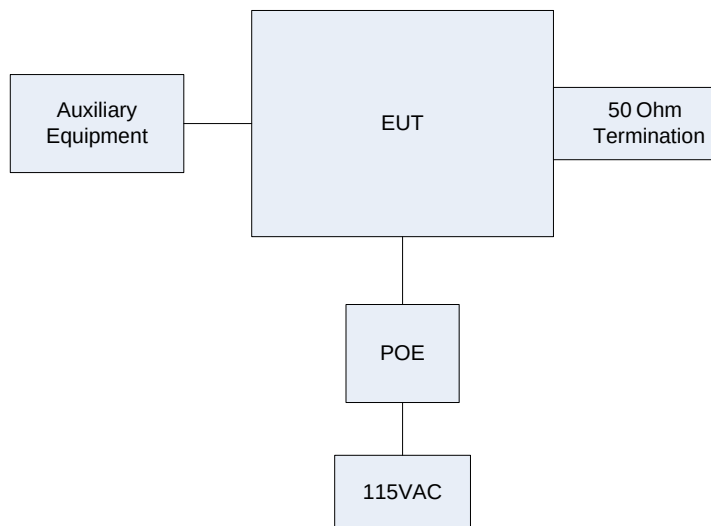
### 2.5 Equipment Modifications

No modifications were necessary in order to achieve compliance.

## 2.6 Configuration of Tested System



**Figure 1. Conducted Emission From Antenna Ports Test Set-up**



**Figure 2. Radiated Emission Test Set-Up**

### 3. Test Set-up Photos

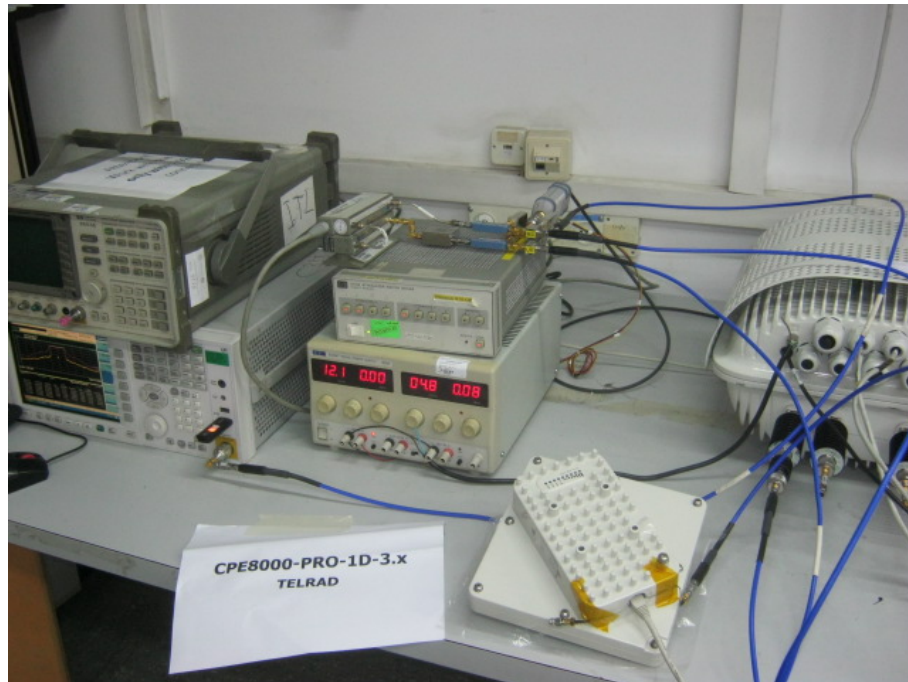


Figure 3. Conducted Emission From Antenna Port Tests

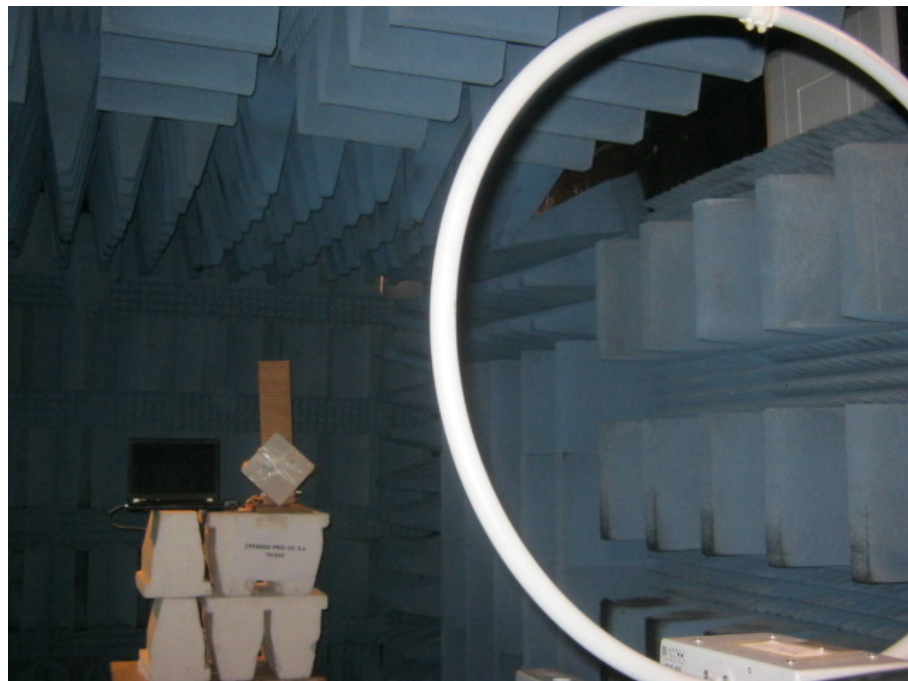


Figure 4. Radiated Emission Test



**Figure 5. Radiated Emission Test**

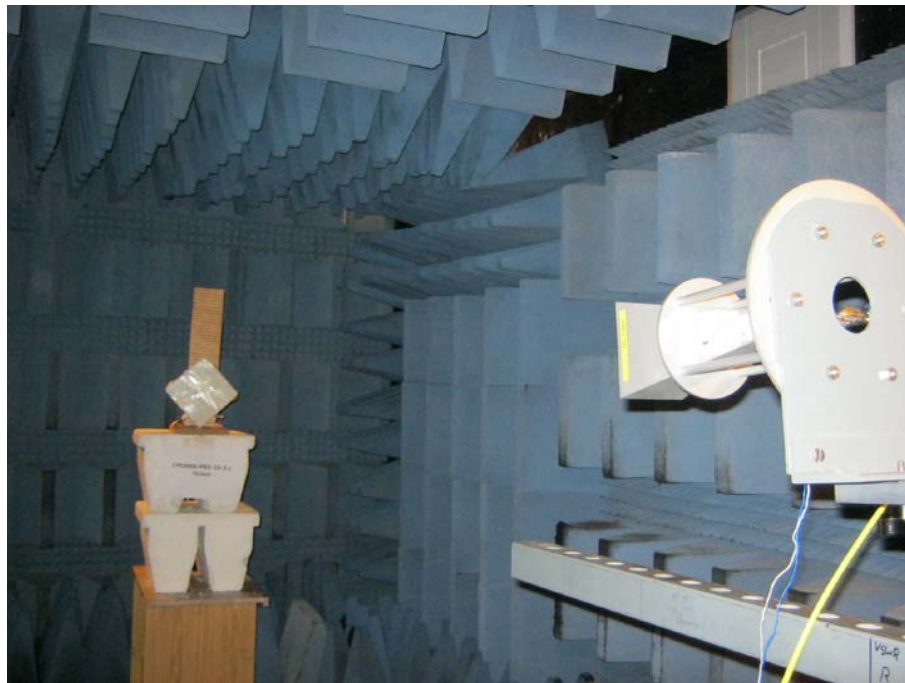


**Figure 6. Radiated Emission Test**





**Figure 7. Radiated Emission Test**



**Figure 8. Radiated Emission Test**



**Figure 9. Radiated Emission Test**

## 4. Channel Bandwidth

### 4.1 Test Specification

RSS 197, Issue 1:2010, Section 5.2

FCC, Part 2, Section 2.1049

### 4.2 Test Procedure

The E.U.T. was set to the applicable test frequency with OFDMA modulations and 5MHz, 10MHz, 15MHz and 20MHz CBW.

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator, an appropriate coaxial cable, coupler, and DC block, (total loss=-35.2 dB). The spectrum analyzer was set to proper resolution B.W. The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limit, the mean powers radiated are each equal to 0.5% of the total mean power radiated by a given emission.

### 4.3 Limit

The channel bandwidth shall be equal or greater than 1 MHz.

### 4.4 Test Results

JUDGEMENT: Passed

See additional information in *Figure 14* to *Figure 49*.

| Operating Frequency | Modulation | Reading | Limit      |
|---------------------|------------|---------|------------|
| (MHz)               |            | (MHz)   | (MHz)      |
| 3652.5              | 64QAM      | 3.6     | $\geq 1.0$ |
|                     | 16QAM      | 3.6     | $\geq 1.0$ |
|                     | QPSK       | 3.6     | $\geq 1.0$ |
| 3675.0              | 64QAM      | 3.6     | $\geq 1.0$ |
|                     | 16QAM      | 3.6     | $\geq 1.0$ |
|                     | QPSK       | 3.6     | $\geq 1.0$ |
| 3697.5              | 64QAM      | 3.6     | $\geq 1.0$ |
|                     | 16QAM      | 3.6     | $\geq 1.0$ |
|                     | QPSK       | 3.6     | $\geq 1.0$ |

Figure 10. Occupied Bandwidth Test Results 5 MHz, CBW

| Operating Frequency | Modulation | Reading | Limit      |
|---------------------|------------|---------|------------|
| (MHz)               |            | (MHz)   | (MHz)      |
| 3655.0              | 64QAM      | 8.6     | $\geq 1.0$ |
|                     | 16QAM      | 8.6     | $\geq 1.0$ |
|                     | QPSK       | 8.6     | $\geq 1.0$ |
| 3675.0              | 64QAM      | 8.6     | $\geq 1.0$ |
|                     | 16QAM      | 8.6     | $\geq 1.0$ |
|                     | QPSK       | 8.6     | $\geq 1.0$ |
| 3695.0              | 64QAM      | 8.6     | $\geq 1.0$ |
|                     | 16QAM      | 8.6     | $\geq 1.0$ |
|                     | QPSK       | 8.6     | $\geq 1.0$ |

**Figure 11. Occupied Bandwidth Test Results 10 MHz, CBW**

| Operating Frequency | Modulation | Reading | Limit      |
|---------------------|------------|---------|------------|
| (MHz)               |            | (MHz)   | (MHz)      |
| 3657.5              | 64QAM      | 12.9    | $\geq 1.0$ |
|                     | 16QAM      | 12.9    | $\geq 1.0$ |
|                     | QPSK       | 12.9    | $\geq 1.0$ |
| 3675.0              | 64QAM      | 12.9    | $\geq 1.0$ |
|                     | 16QAM      | 12.9    | $\geq 1.0$ |
|                     | QPSK       | 12.9    | $\geq 1.0$ |
| 3692.5              | 64QAM      | 12.9    | $\geq 1.0$ |
|                     | 16QAM      | 12.9    | $\geq 1.0$ |
|                     | QPSK       | 12.9    | $\geq 1.0$ |

**Figure 12. Occupied Bandwidth Test Results 15 MHz, CBW**

| Operating Frequency | Modulation | Reading | Limit      |
|---------------------|------------|---------|------------|
| (MHz)               |            | (MHz)   | (MHz)      |
| 3660.0              | 64QAM      | 17.2    | $\geq 1.0$ |
|                     | 16QAM      | 17.2    | $\geq 1.0$ |
|                     | QPSK       | 17.2    | $\geq 1.0$ |
| 3675.0              | 64QAM      | 17.2    | $\geq 1.0$ |
|                     | 16QAM      | 17.2    | $\geq 1.0$ |
|                     | QPSK       | 17.2    | $\geq 1.0$ |
| 3690.0              | 64QAM      | 17.3    | $\geq 1.0$ |
|                     | 16QAM      | 17.2    | $\geq 1.0$ |
|                     | QPSK       | 17.2    | $\geq 1.0$ |

**Figure 13. Occupied Bandwidth Test Results 20 MHz, CBW**



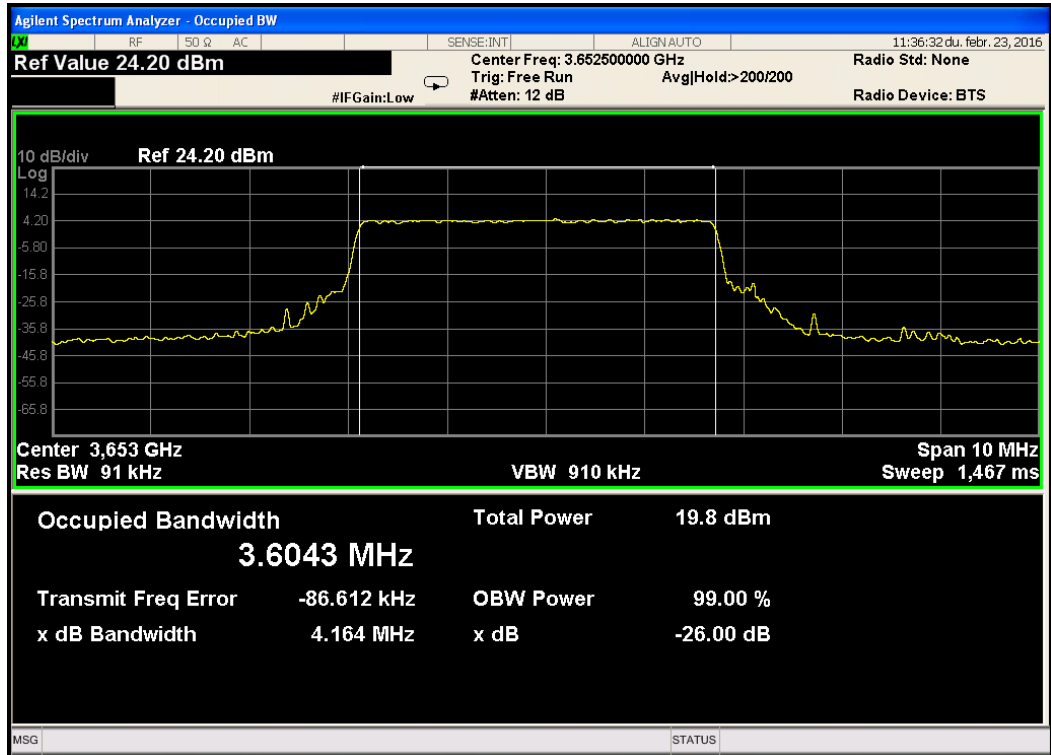


Figure 14. 5MHz CBW – Operating Frequency 3652.5MHz, 64QAM

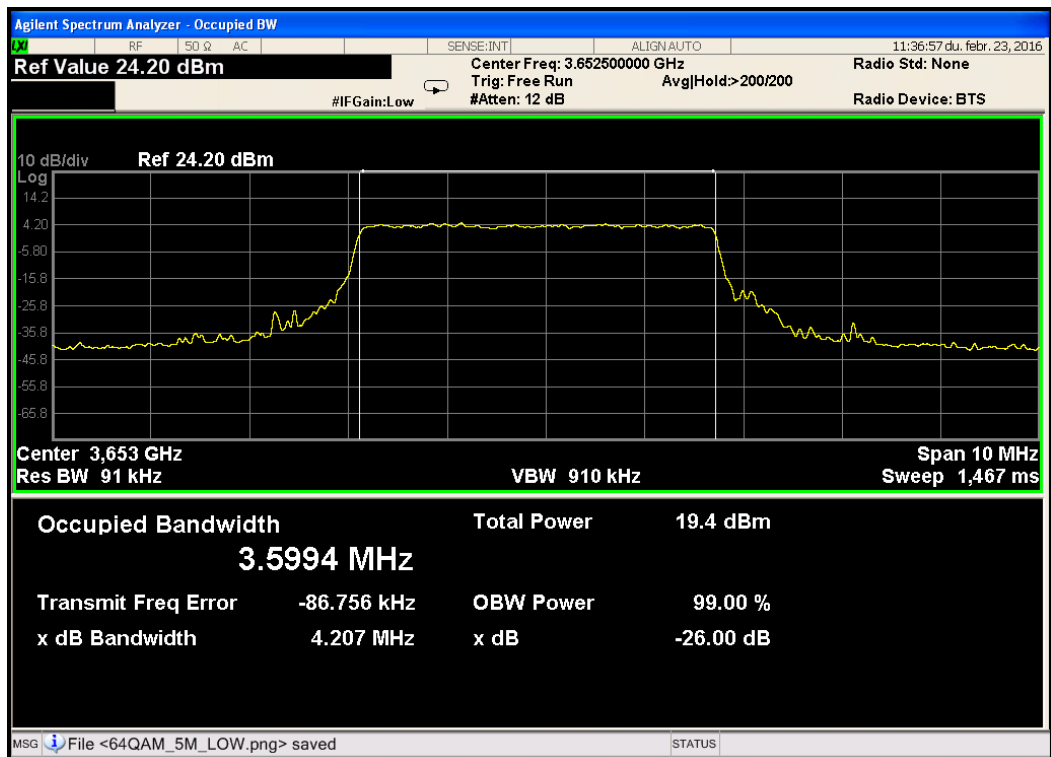


Figure 15. 5MHz CBW – Operating Frequency 3652.5MHz, 16QAM

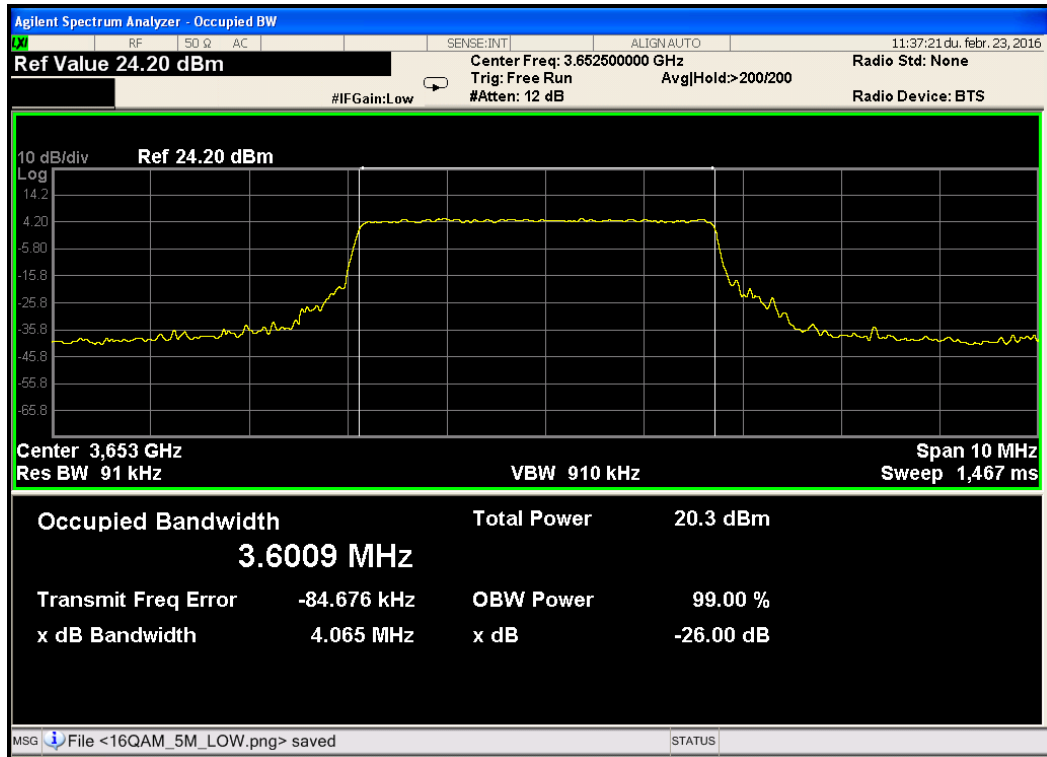


Figure 16. 5MHz CBW – Operating Frequency 3652.5MHz, QPSK

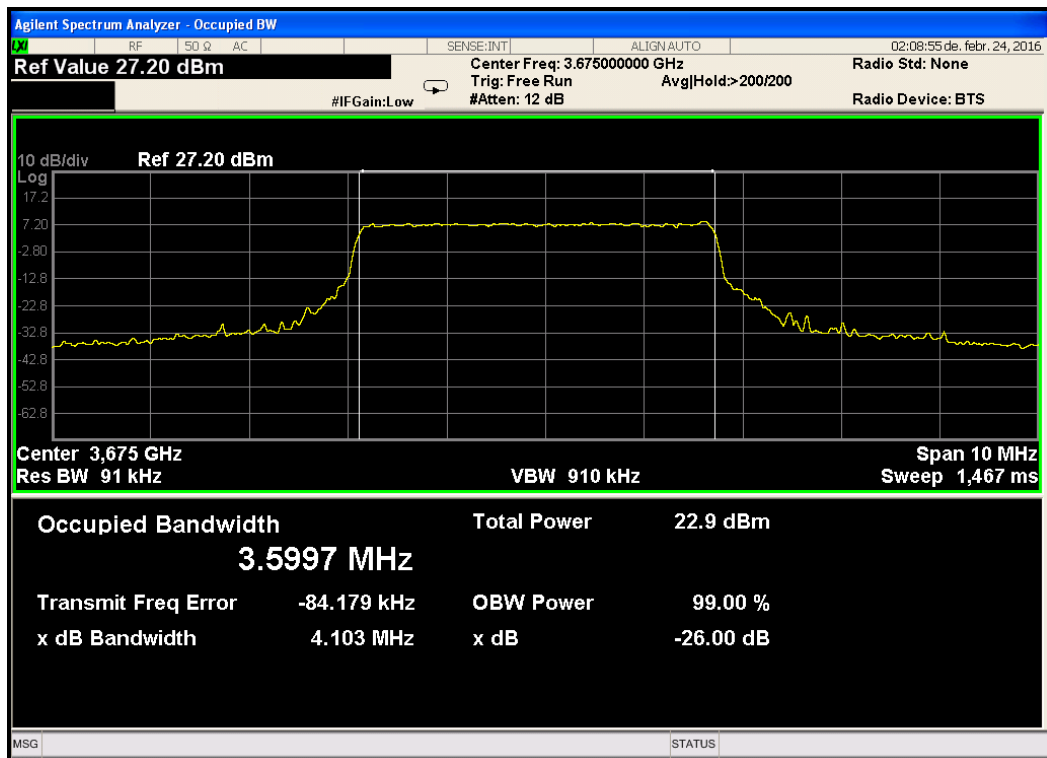


Figure 17. 5MHz CBW – Operating Frequency 3675.0MHz, 64QAM

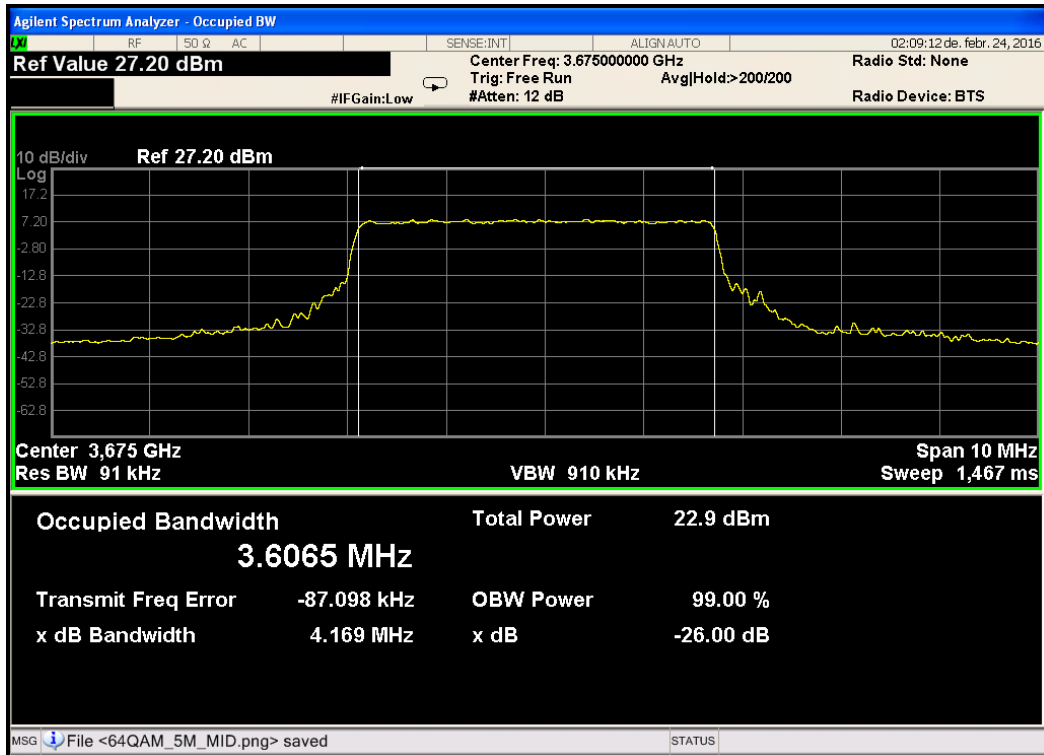


Figure 18. 5MHz CBW – Operating Frequency 3675.0MHz, 16QAM

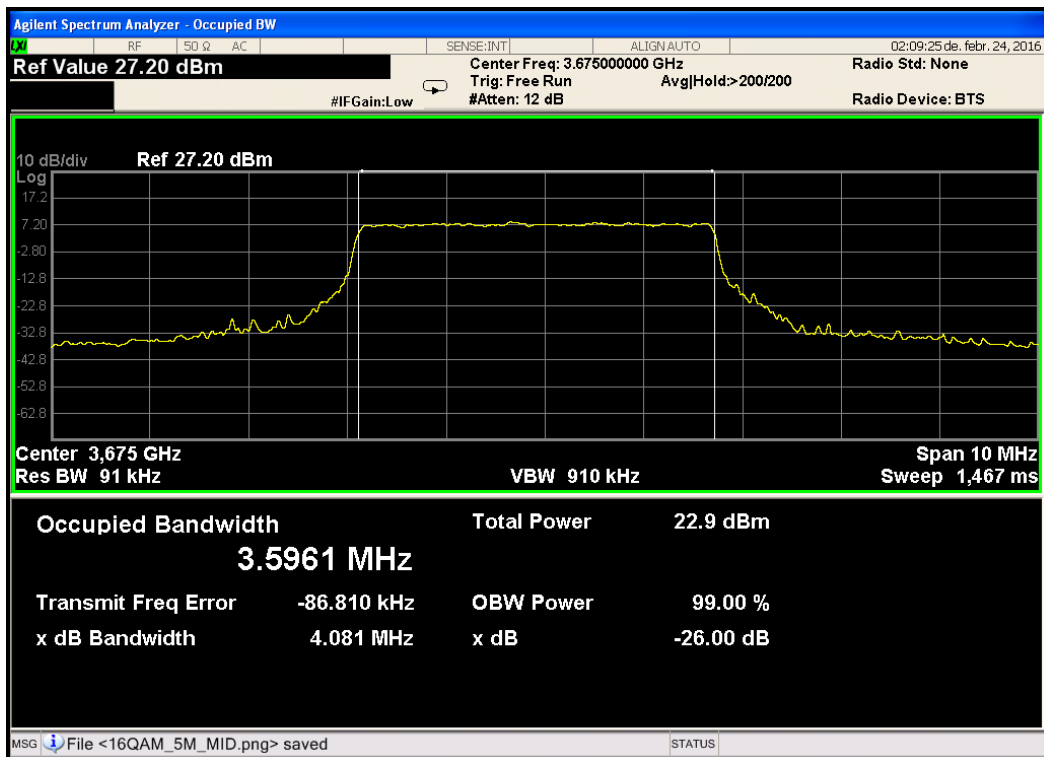


Figure 19. 5MHz CBW – Operating Frequency 3675.0MHz, QPSK

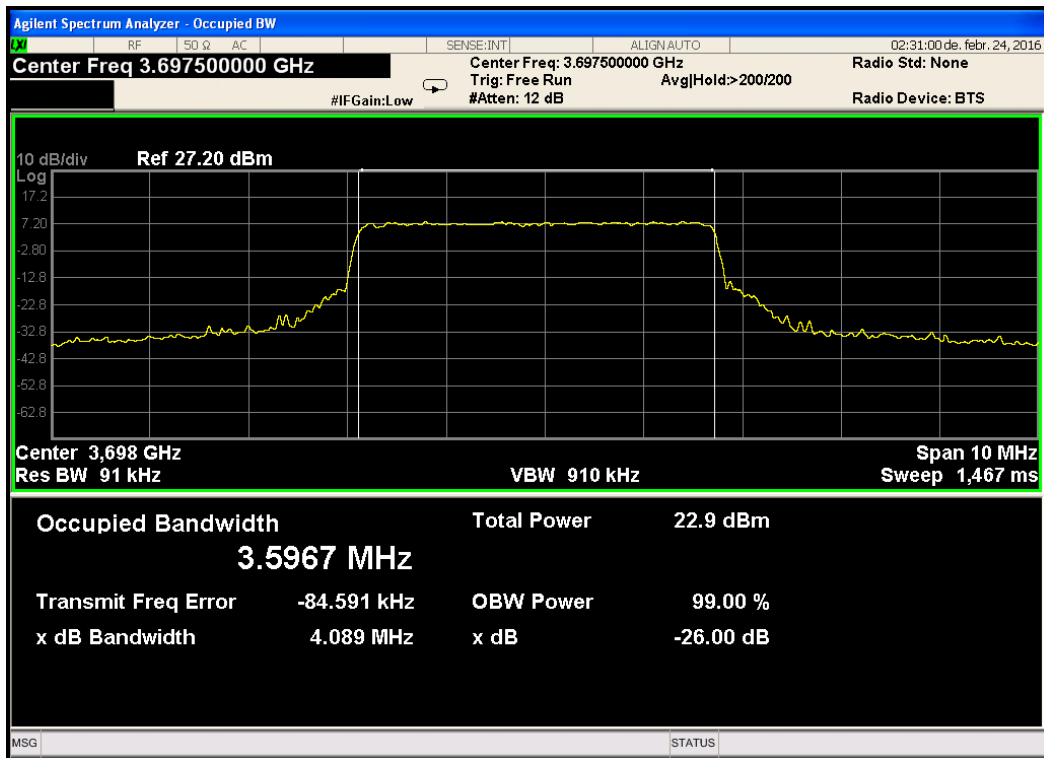


Figure 20. 5MHz CBW – Operating Frequency 3697.5MHz, 64QAM

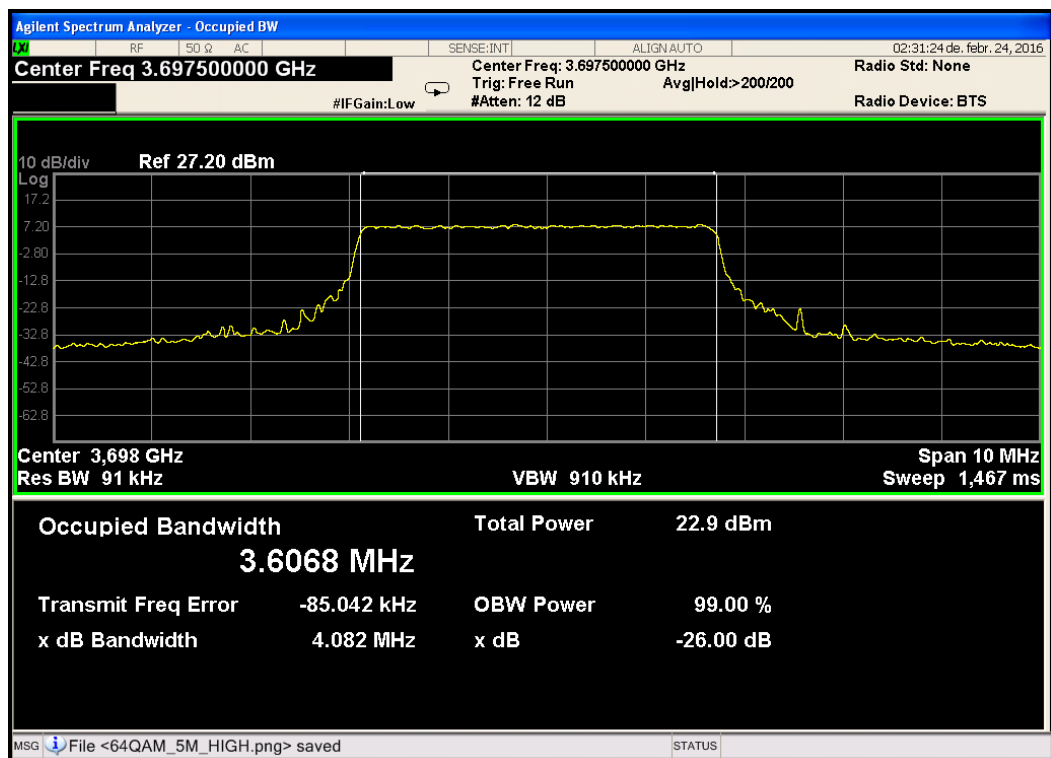


Figure 21. 5MHz CBW – Operating Frequency 3697.5MHz, 16QAM

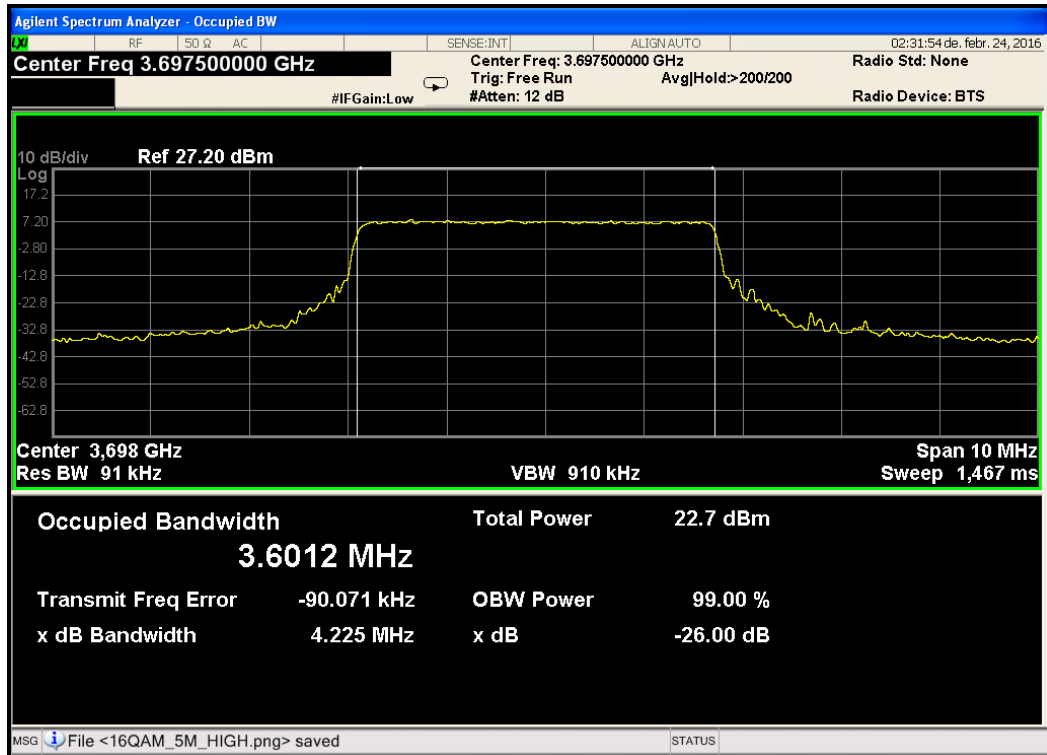


Figure 22. 5MHz CBW – Operating Frequency 3697.5MHz, QPSK

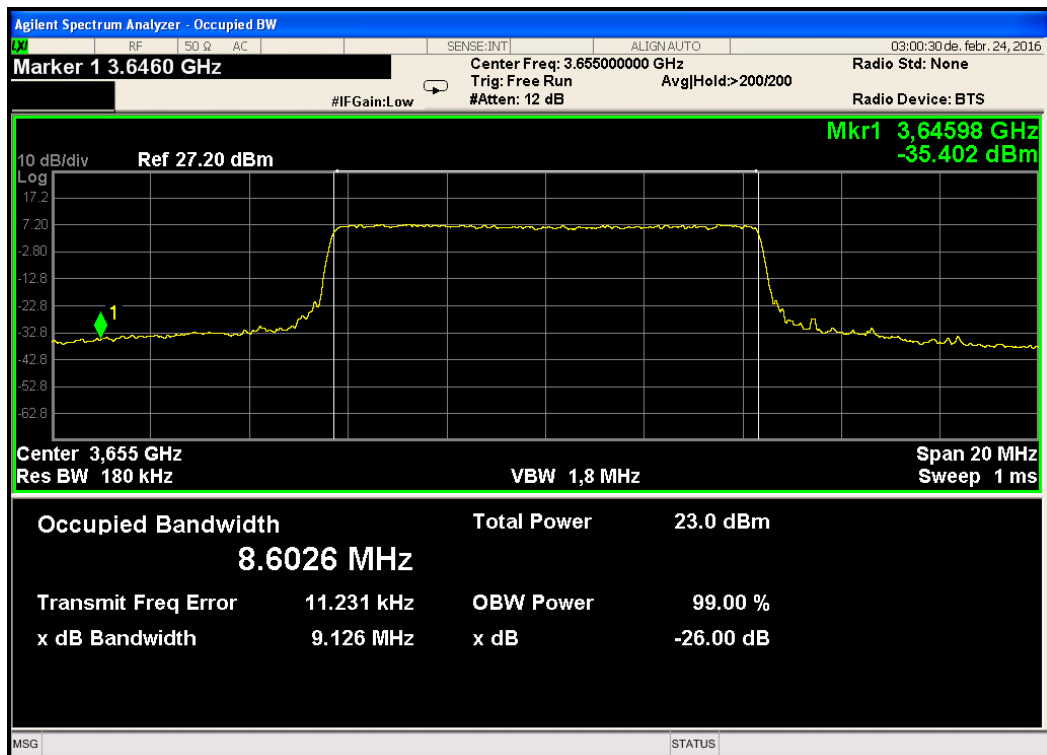


Figure 23. 10MHz CBW – Operating Frequency 3655.0MHz, 64QAM

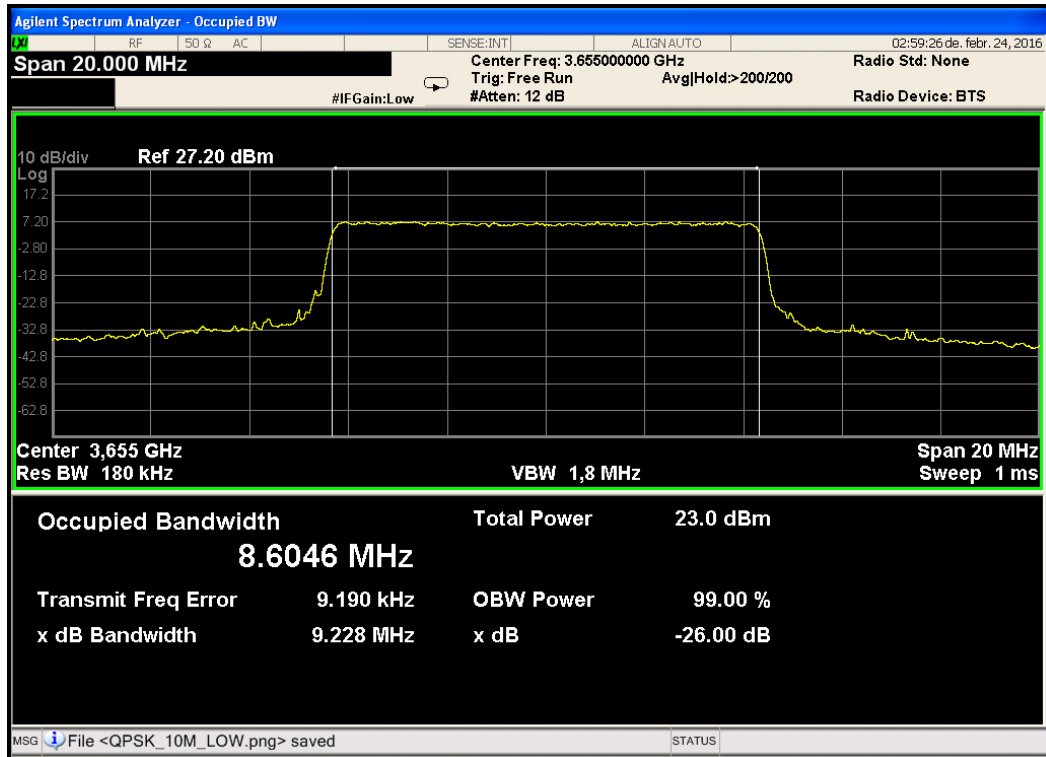


Figure 24. 10MHz CBW – Operating Frequency 3655.0MHz, 16QAM

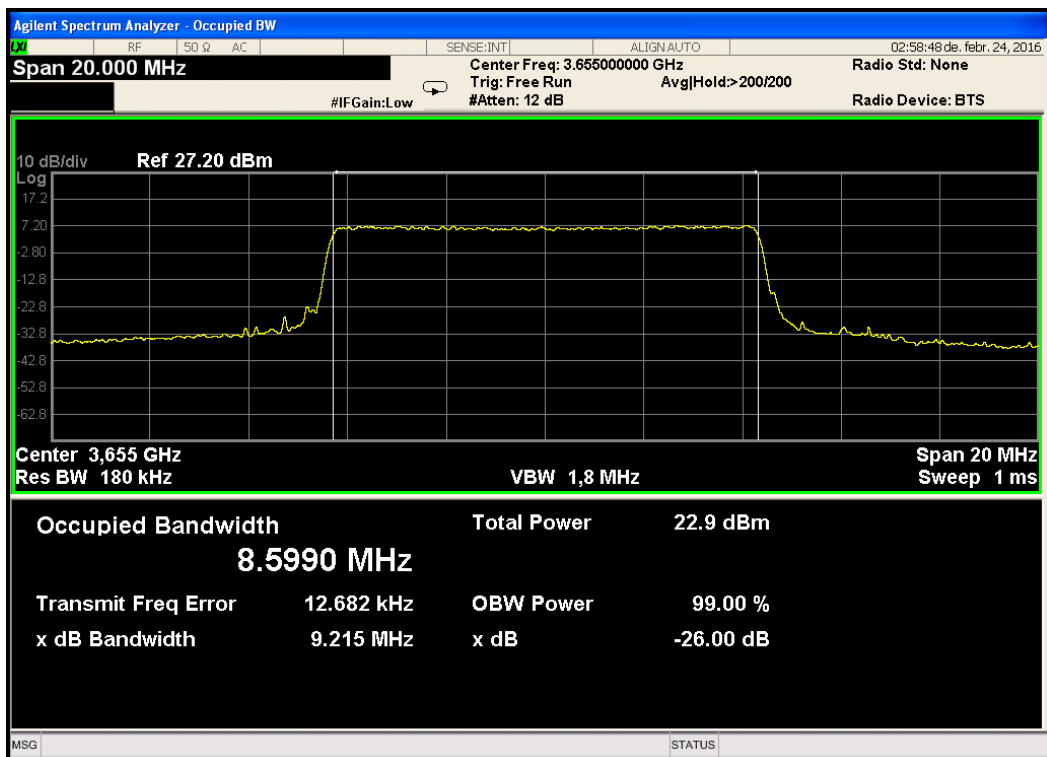


Figure 25. 10MHz CBW – Operating Frequency 3655.0MHz, QPSK

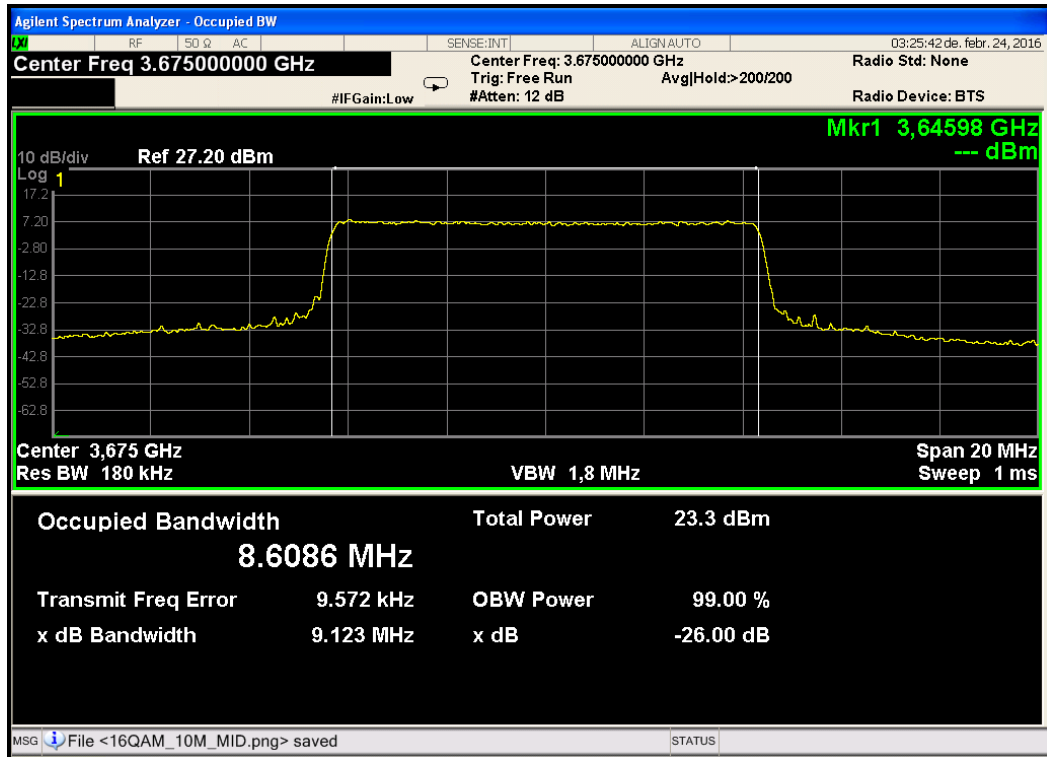


Figure 26. 10MHz CBW – Operating Frequency 3675.0MHz, 64QAM

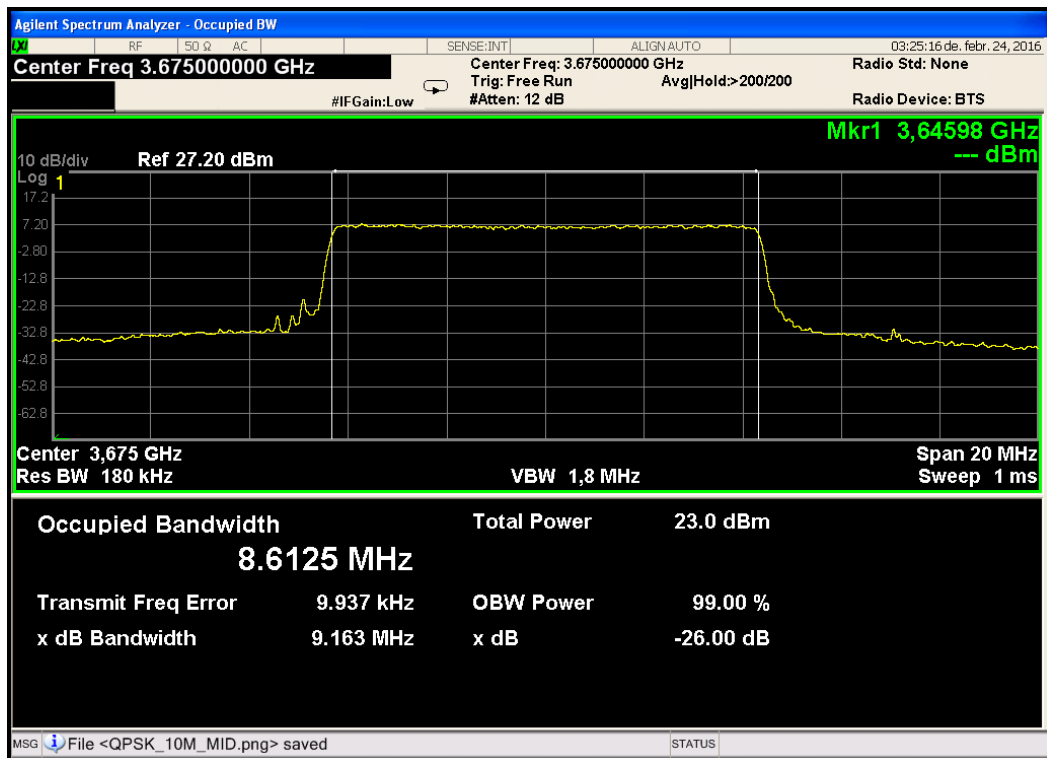


Figure 27. 10MHz CBW – Operating Frequency 3675.0MHz, 16QAM



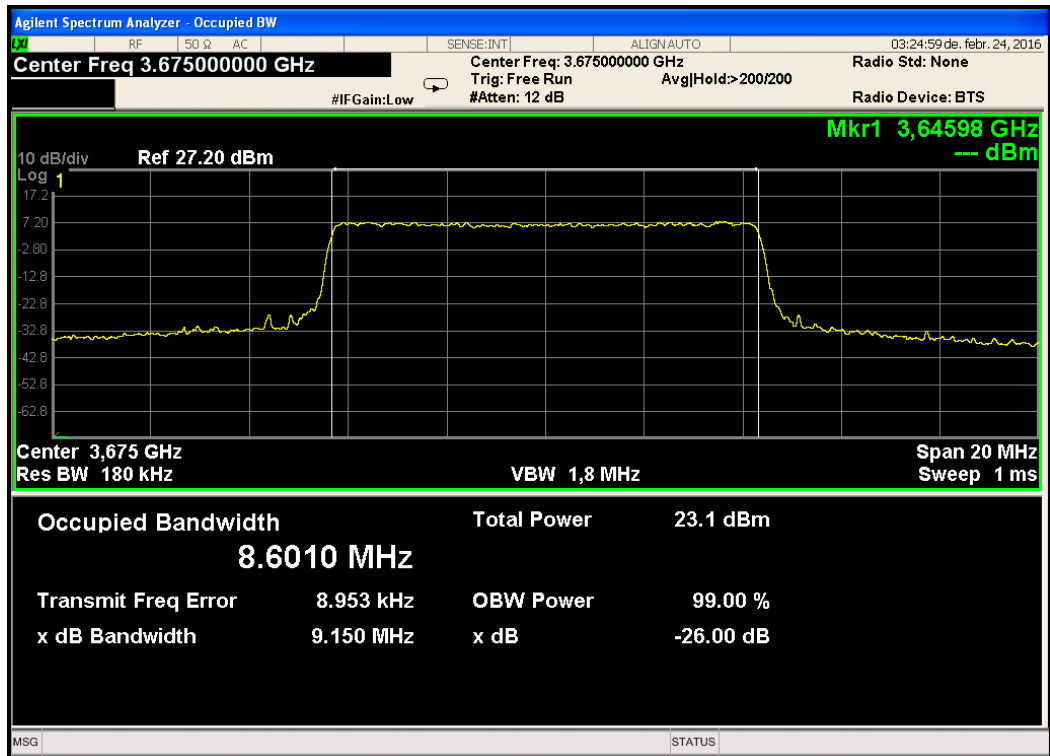


Figure 28. 10MHz CBW – Operating Frequency 3675.0MHz, QPSK

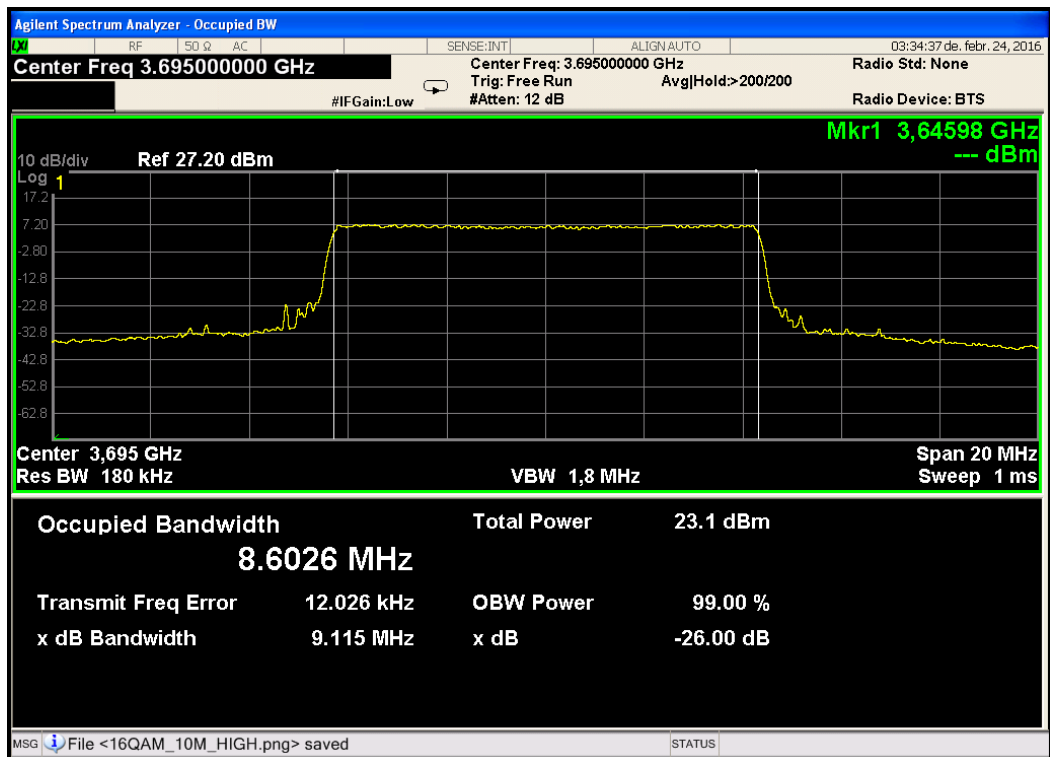


Figure 29. 10MHz CBW – Operating Frequency 3695.0MHz, 64QAM

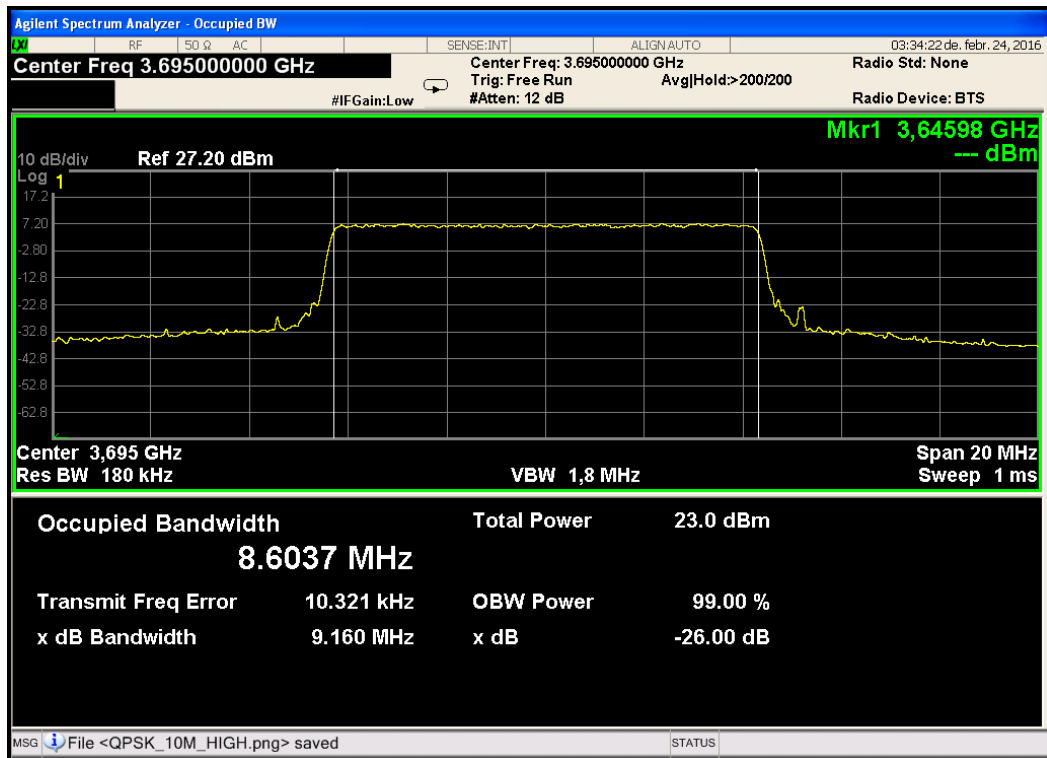


Figure 30. 10MHz CBW – Operating Frequency 3695.0MHz, 16QAM

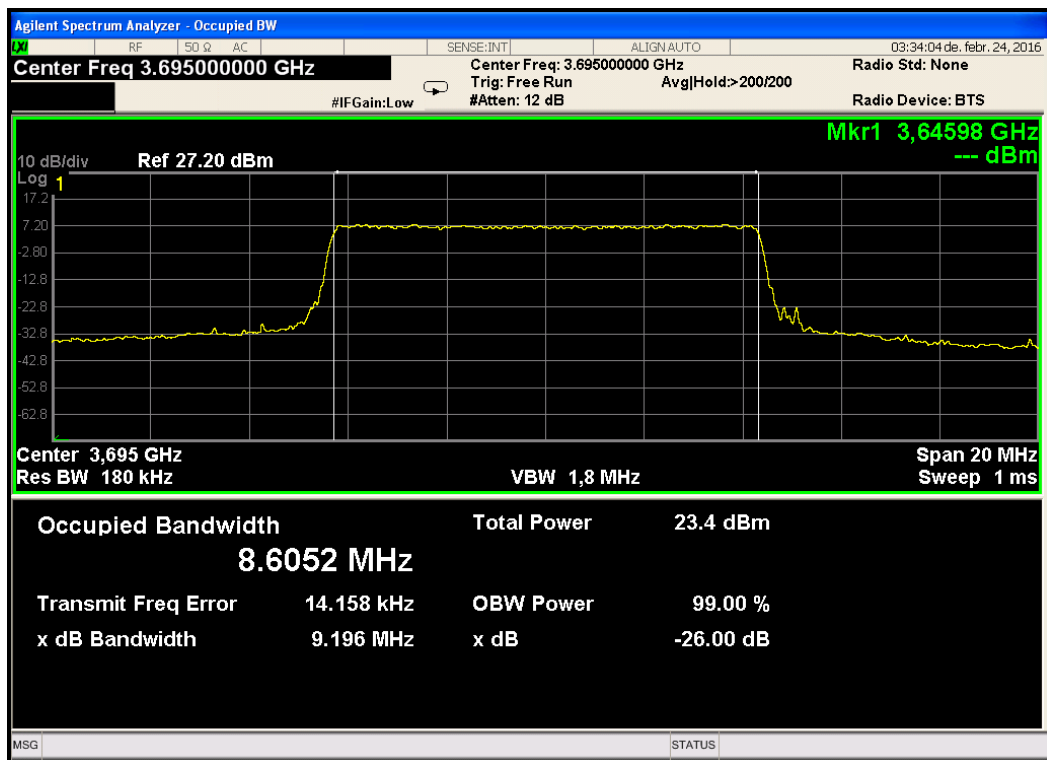


Figure 31. 10MHz CBW – Operating Frequency 3695.0MHz, QPSK

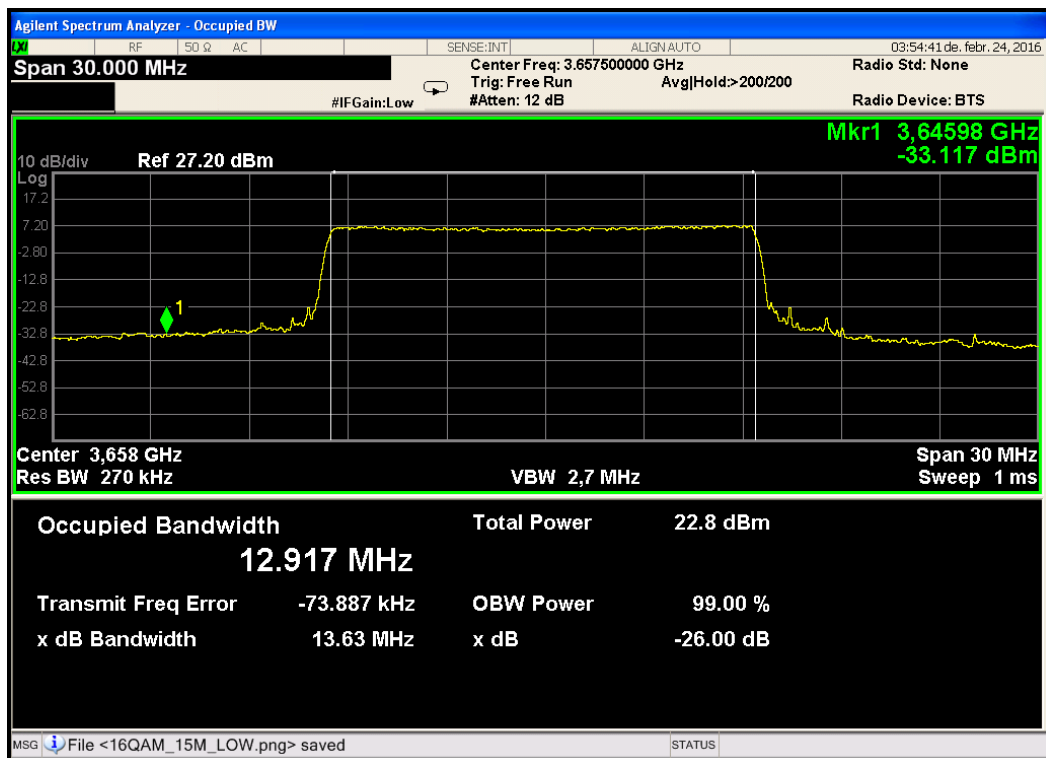


Figure 32. 15MHz CBW – Operating Frequency 3657.5MHz, 64QAM

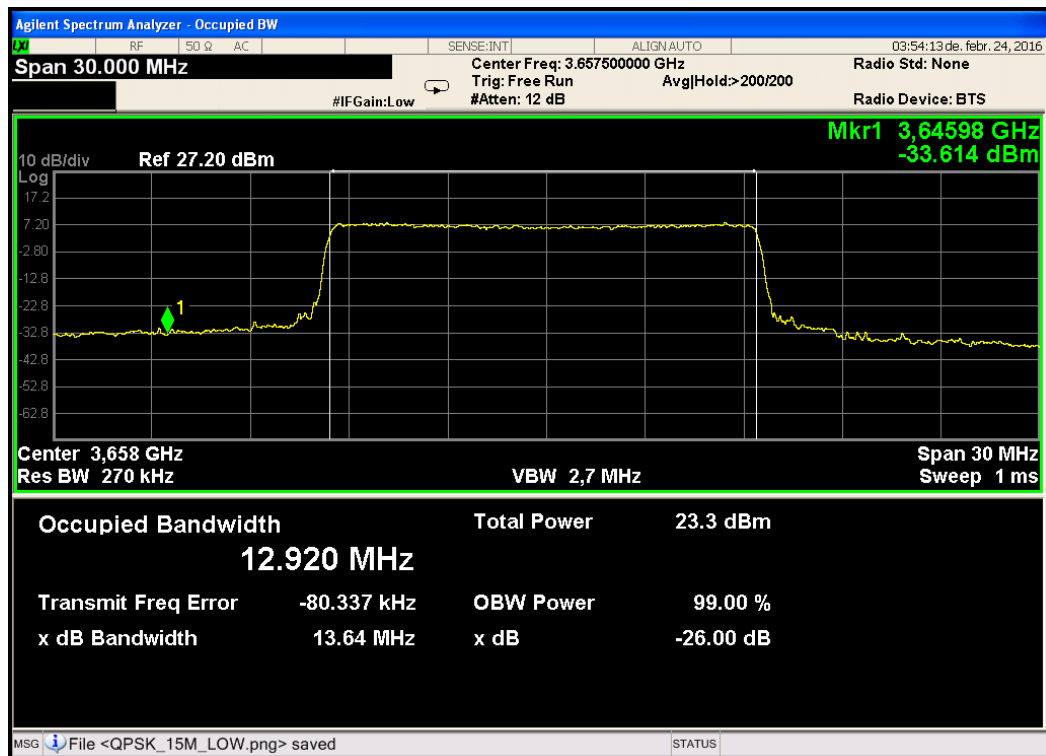


Figure 33. 15MHz CBW – Operating Frequency 3657.5MHz, 16QAM

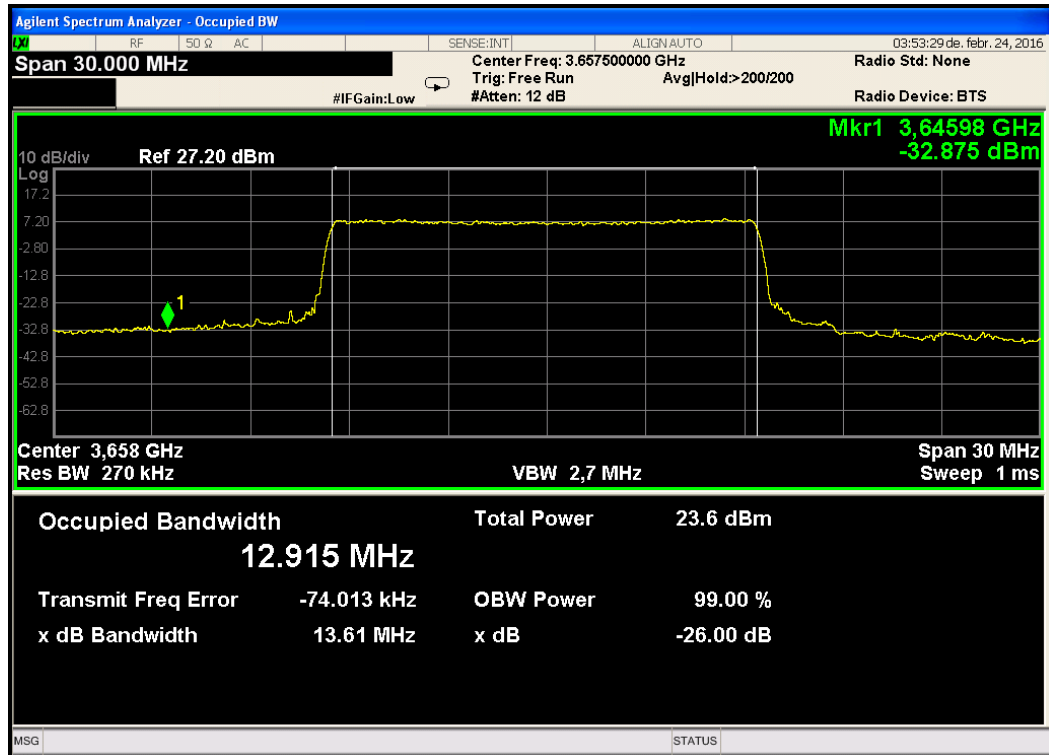


Figure 34. 15MHz CBW – Operating Frequency 3657.5MHz, QPSK

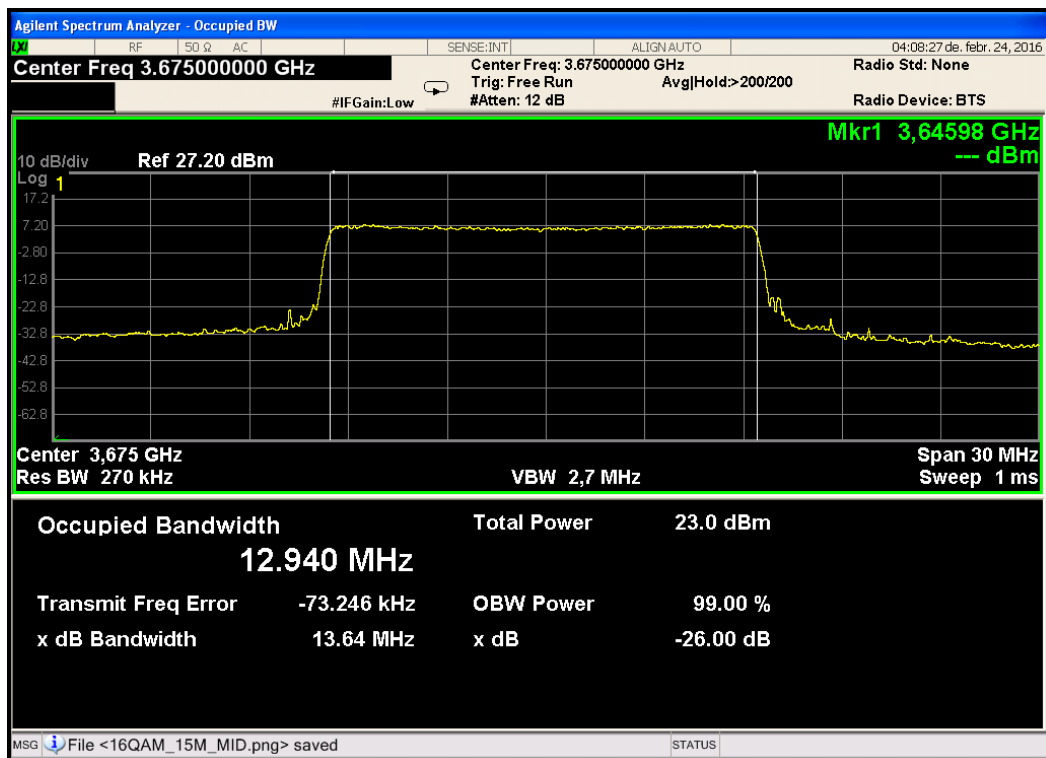


Figure 35. 15MHz CBW – Operating Frequency 3675.0MHz, 64QAM

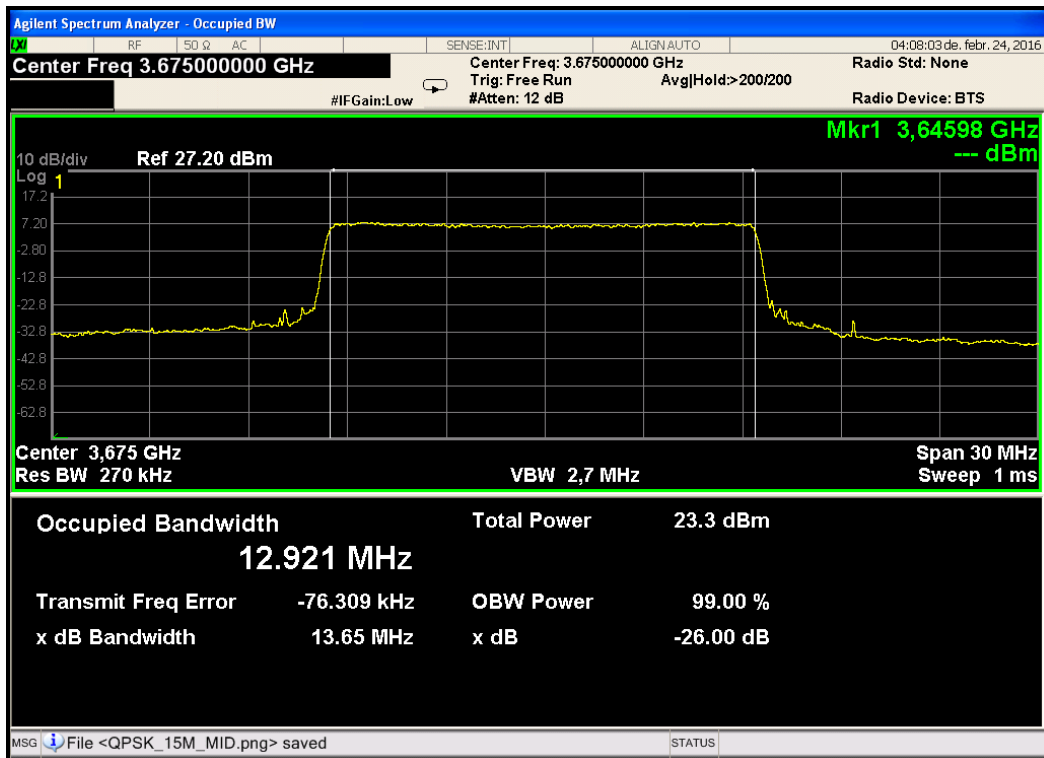


Figure 36. 15MHz CBW – Operating Frequency 3675.0MHz, 16QAM

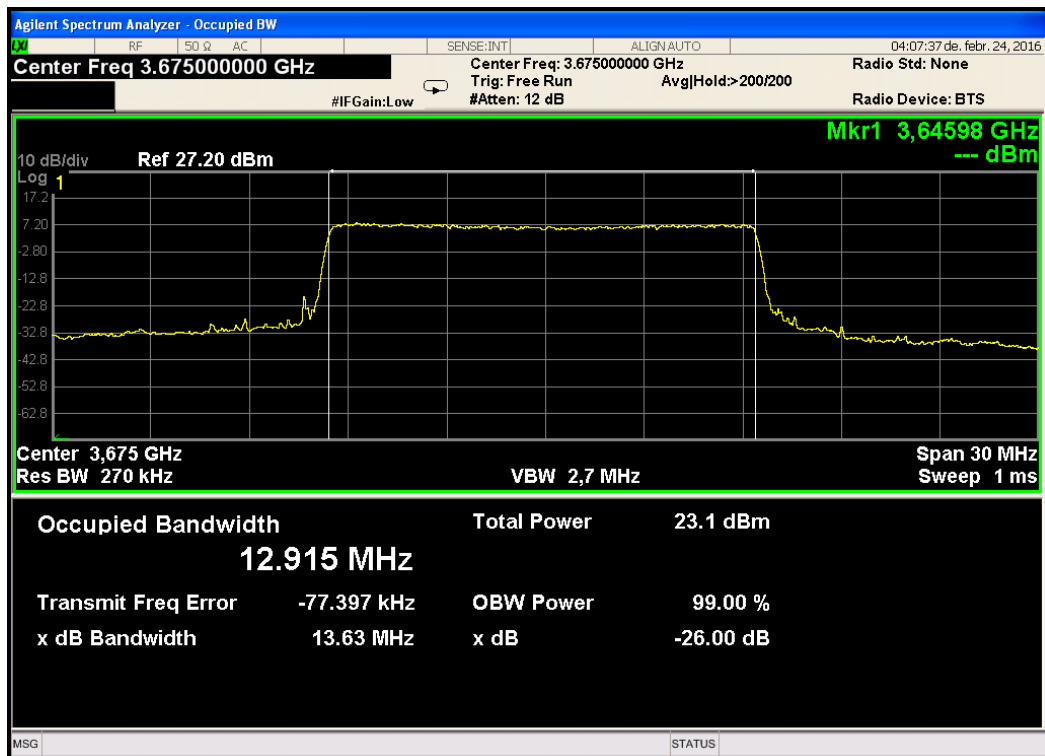


Figure 37. 15MHz CBW – Operating Frequency 3675.0MHz, QPSK

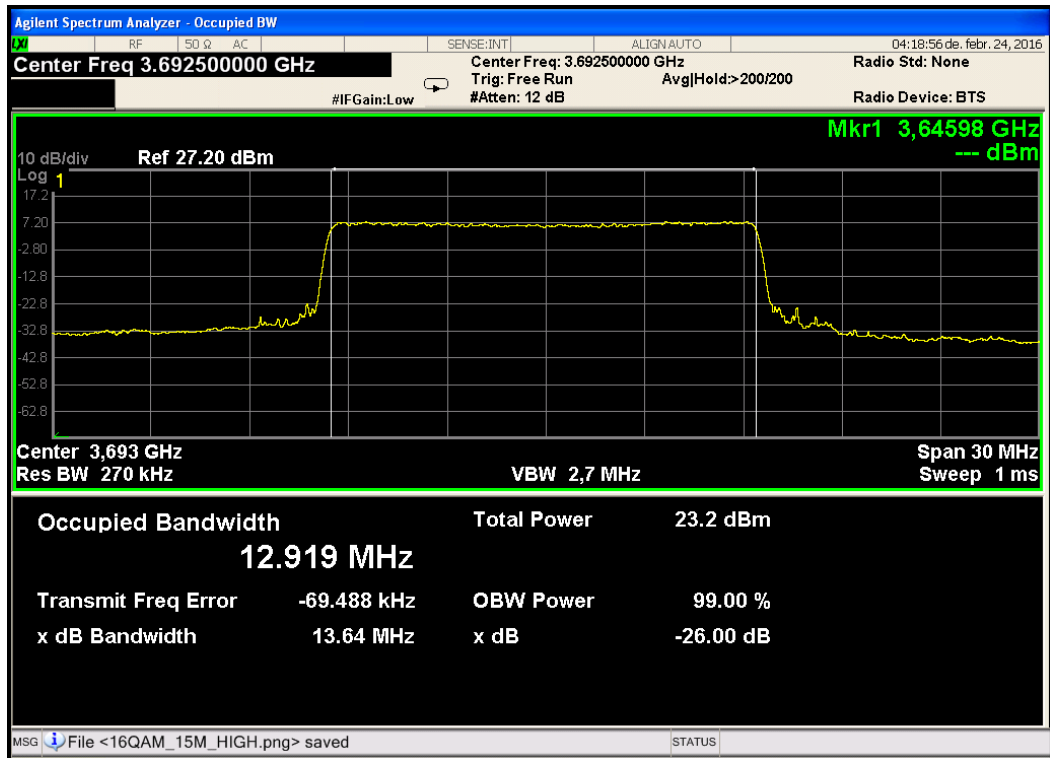


Figure 38. 15MHz CBW – Operating Frequency 3692.5MHz, 64QAM

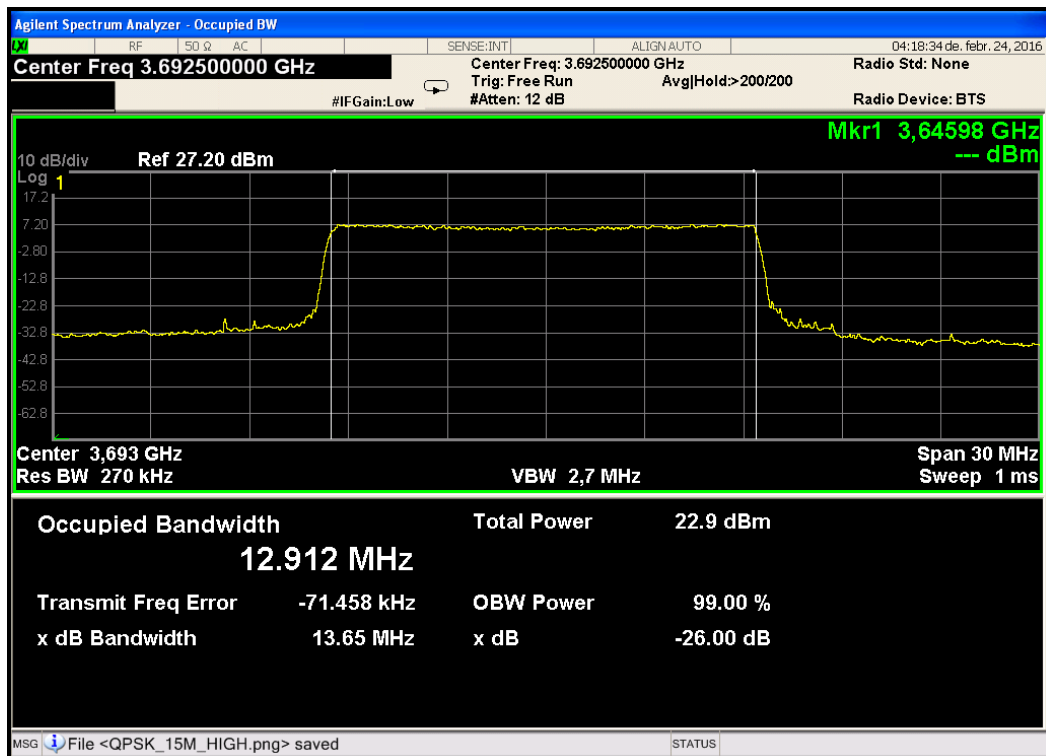


Figure 39. 15MHz CBW – Operating Frequency 3692.5MHz, 16QAM

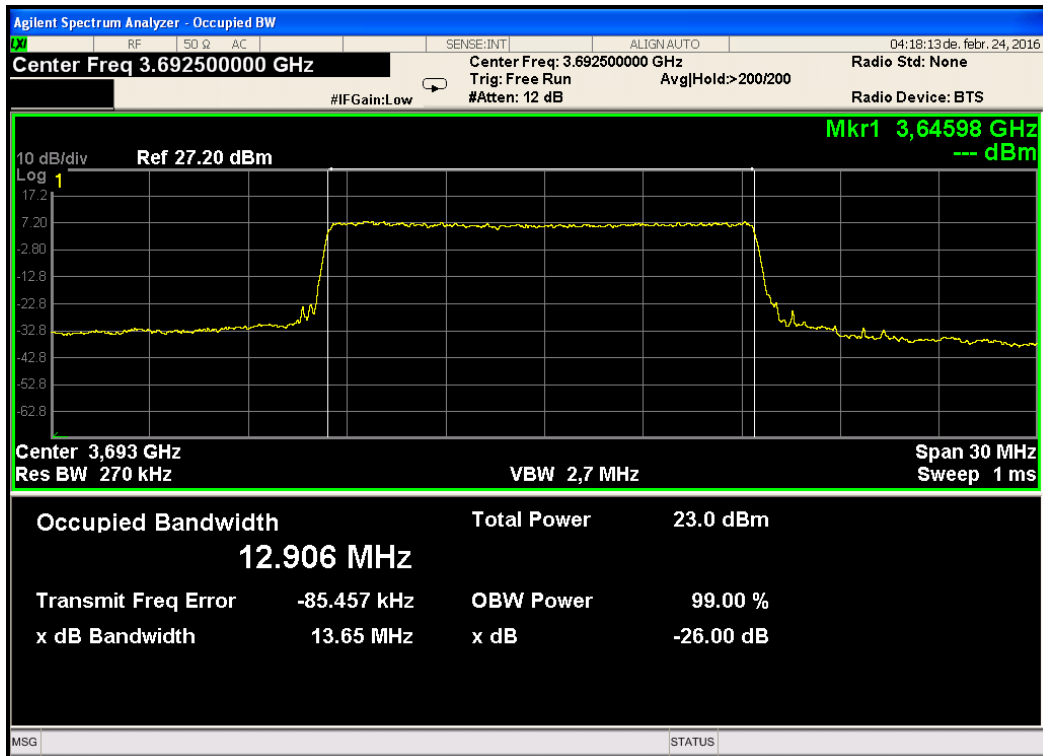


Figure 40. 15MHz CBW – Operating Frequency 3692.5MHz, QPSK

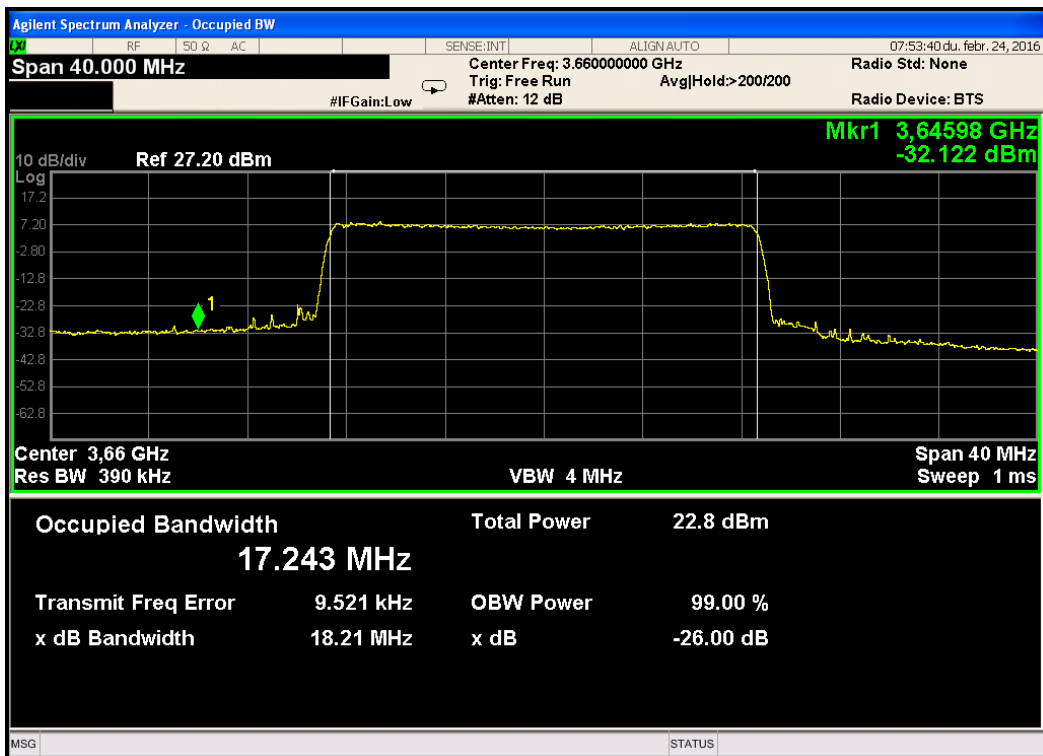


Figure 41. 20MHz CBW – Operating Frequency 3660.0MHz, 64QAM

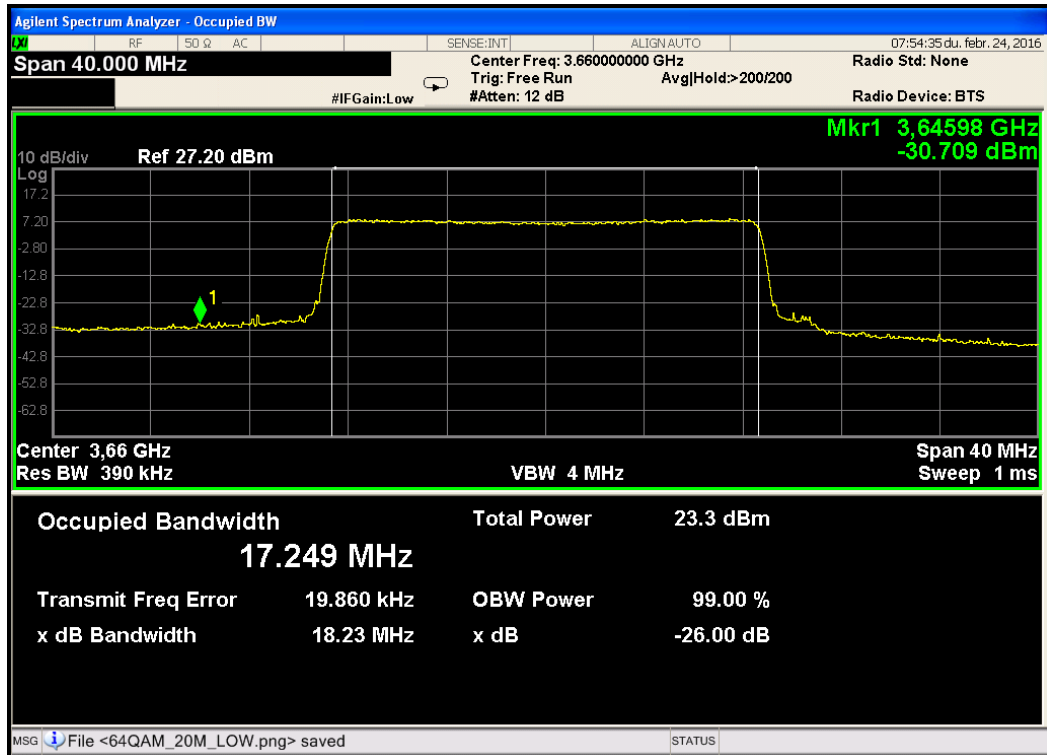


Figure 42. 20MHz CBW – Operating Frequency 3660.0MHz, 16QAM

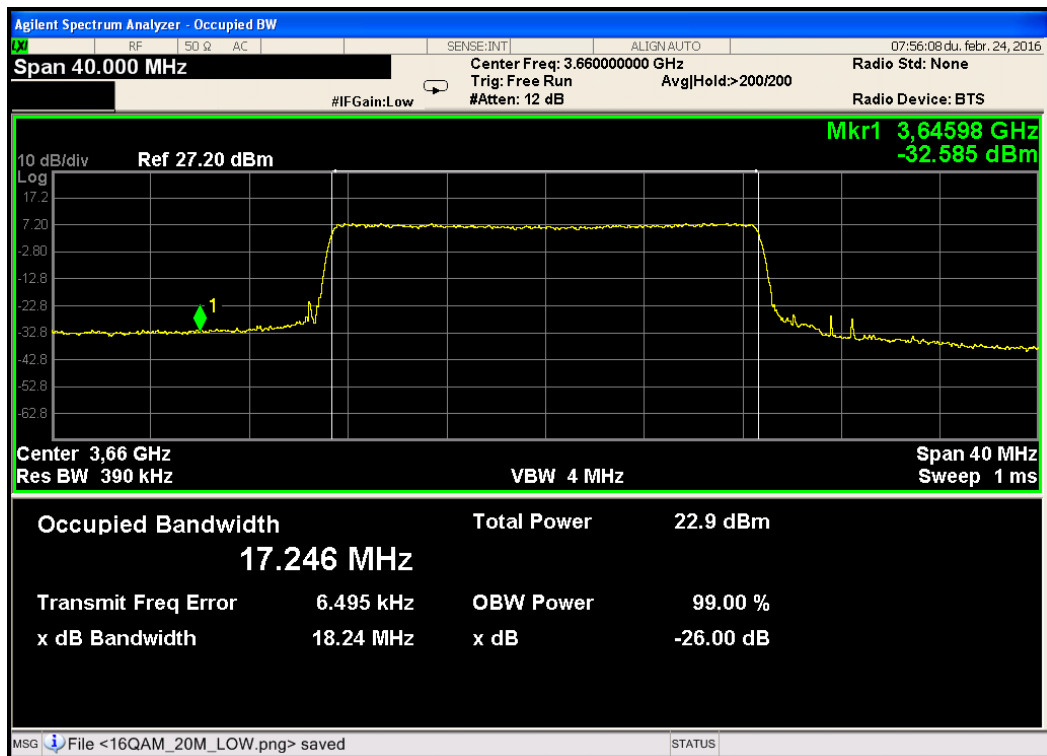


Figure 43. 20MHz CBW – Operating Frequency 3660.0MHz, QPSK



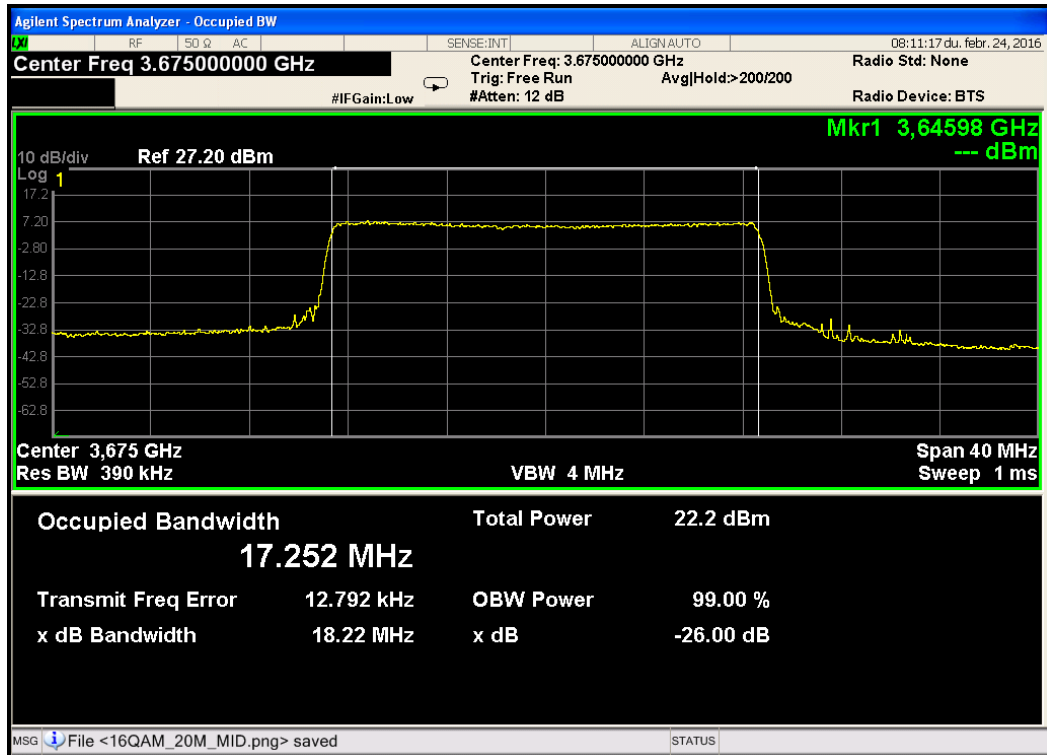


Figure 44. 20MHz CBW – Operating Frequency 3675.0MHz, 64QAM

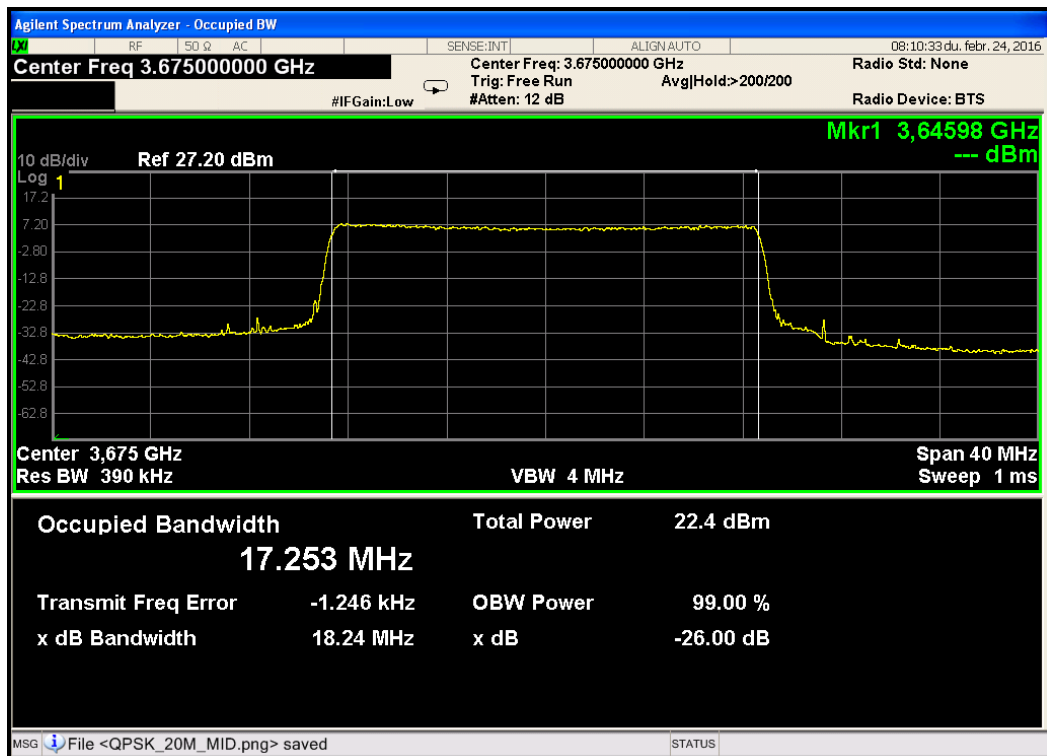


Figure 45. 20MHz CBW – Operating Frequency 3675.0MHz, 16QAM

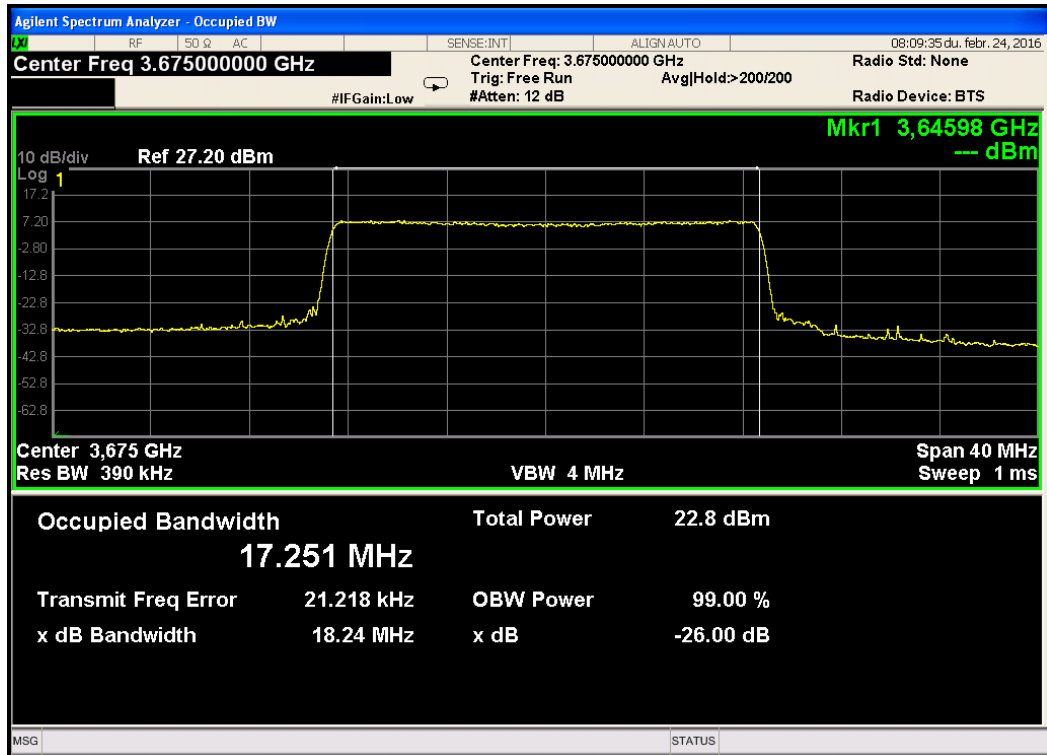


Figure 46. 20MHz CBW – Operating Frequency 3675.0MHz, QPSK

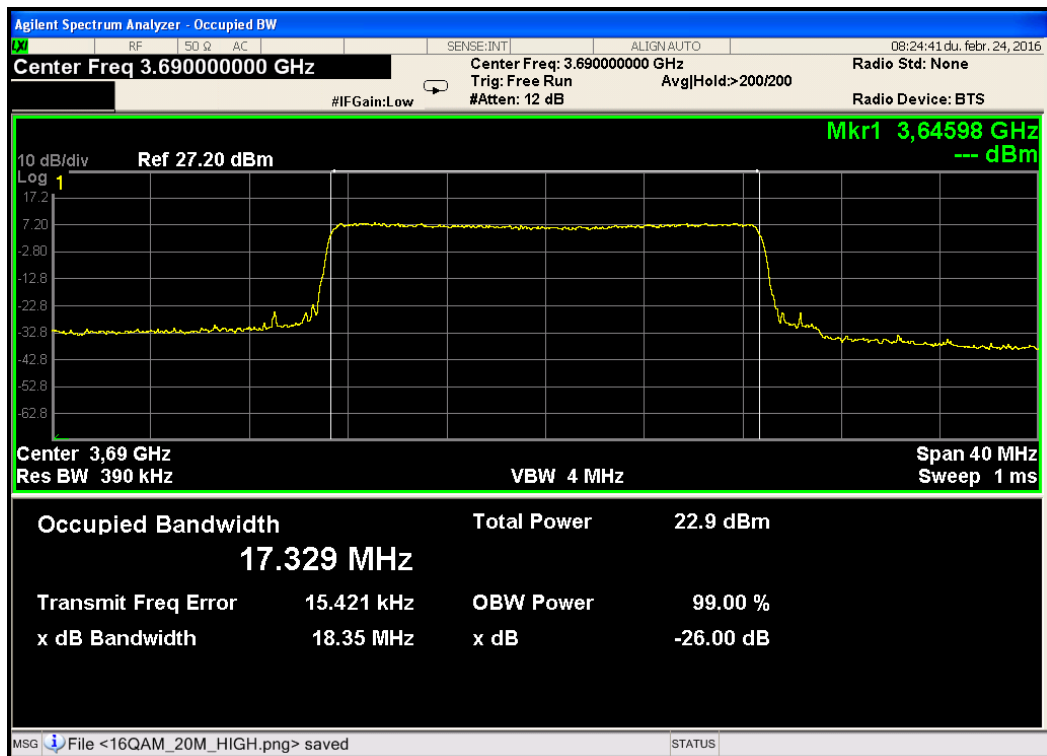


Figure 47. 20MHz CBW – Operating Frequency 3690.0MHz, 64QAM

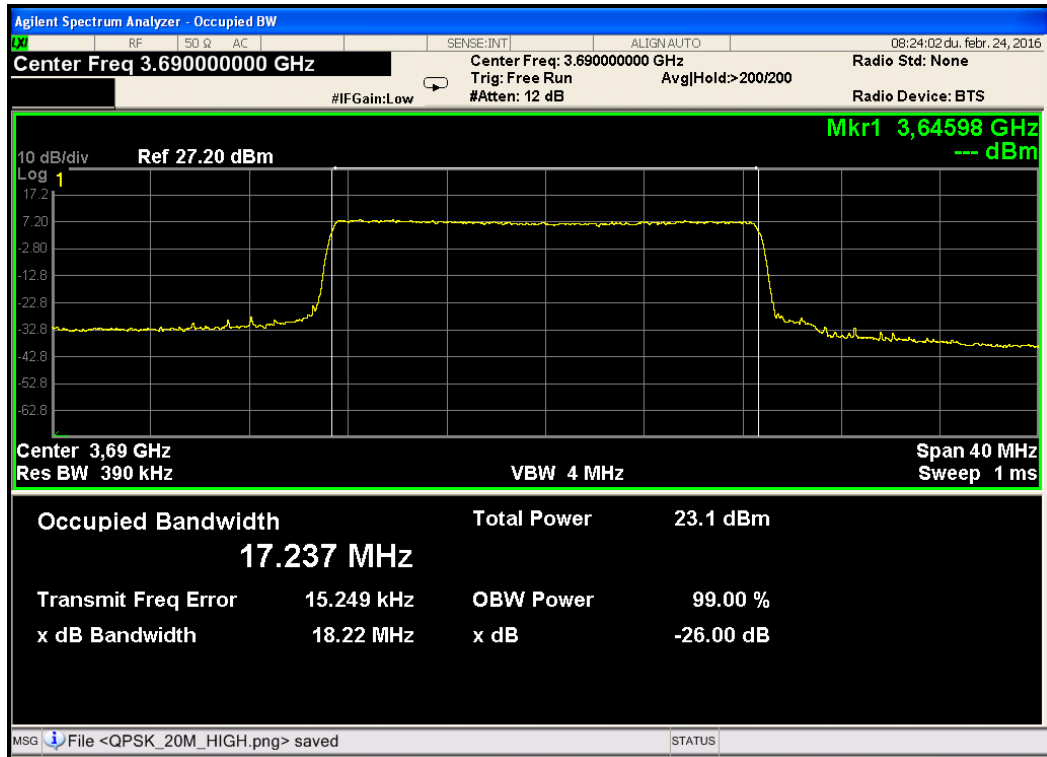


Figure 48. 20MHz CBW – Operating Frequency 3690.0MHz, 16QAM

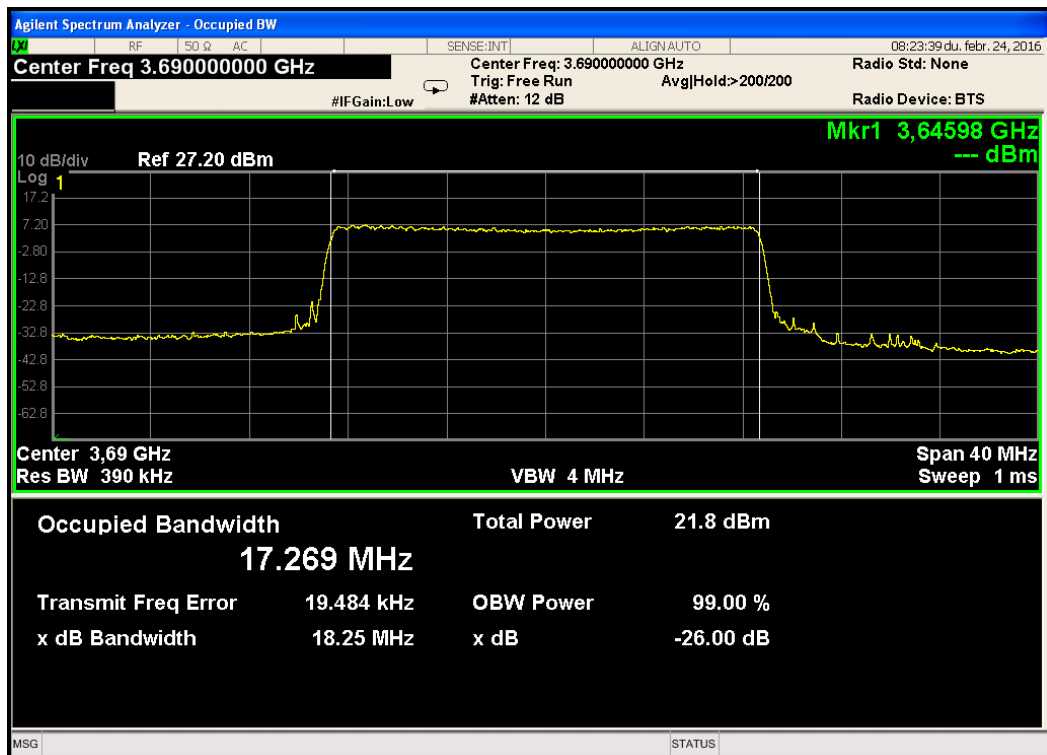


Figure 49. 20MHz CBW – Operating Frequency 3690.0MHz, QPSK

#### 4.5 Test Equipment Used; Occupied Bandwidth

| Instrument          | Manufacturer       | Model            | Serial Number | Calibration      |                      |
|---------------------|--------------------|------------------|---------------|------------------|----------------------|
|                     |                    |                  |               | Last Calibration | Next Calibration Due |
| MXA Signal Analyzer | Agilent            | N9020A           | MY48011785    | July 26 2015     | July 26 2017         |
| DC block            | JFW                | 50DB-007         | 1-23          | N/A              | N/A                  |
| Splitter            | Weinschel<br>93459 | 1515             | MH203         | N/A              | N/A                  |
| Attenuator          | MINI-<br>CIRCUITS  | MCL BW<br>S10W2+ | 0728          | N/A              | N/A                  |

**Figure 50. Test Equipment Used**

## 5. Transmitter Frequency Stability

### 5.1 Test Specification

RSS 197 Section 5.3

RSS Gen Issue 4, November 2014, Section 6.11

FCC Part 2, Section 2.1055

### 5.2 Test Procedure

The E.U.T operation mode and test setup are as described in Section 2 of this report.

Using a resolution bandwidth of 1% of the occupied bandwidth, a reference point at the unwanted emission level specified in Section 5.7 on the emission mask of the lowest and highest channel shall be selected, and the frequency at these points shall be recorded as  $f_L$  and  $f_H$  respectively.

Exploratory testing was performed at 25.0°C and 115.0VAC, to find the “worst case”  $F_L$ ,  $F_H$  for all modulation type each CBW at 2 edge frequencies.

The E.U.T. was operated with a CW signal in the downlink path.

The E.U.T. was placed inside a temperature chamber.

The spectrum analyzer was set to 10.0 kHz span and 1.0 kHz RBW and 1.0 kHz VBW. Counter function was set for this evaluation.

The E.U.T. was operated from 115.0 VAC at nominal temperature (+25.0°C).

The carrier frequency was measured and recorded (reference frequency reading).

Carrier frequency measurement was repeated for:

- (a) +20.0°C and 97.7 VAC
- (b) +20.0°C and 132.2 VAC
- (c). -30.0°C and 115.0 VAC
- (d). -20.0°C and 115.0 VAC
- (e). -10.0°C and 115.0 VAC
- (f). +0.0°C and 115.0 VAC
- (g). +10.0°C and 115.0 VAC
- (h). +20.0°C and 115.0 VAC
- (i). +30.0°C and 115.0 VAC
- (j). +40.0°C and 115.0 VAC
- (k). +50.0°C and 115.0 VAC

The carrier frequency was measured and recorded after at least 20 minutes of exposing the E.U.T. to the temperature.

### 5.3 Limit

The applicant shall ensure frequency stability by showing that  $f_L$  minus the frequency offset and  $f_H$  plus the frequency offset shall be within the 3650-3700 MHz band.

## 5.4 Test Results

JUDGEMENT: Passed

The E.U.T met the requirements of RSS 197, Issue 1:2010, Section 5.3, RSS Gen Issue 4: 2014, Section 6.11 and FCC Part 2, Section 2.1055.

The details of the results are given in *Figure 55* to *Figure 66*.

| Temperature  | Voltage      | F <sub>L</sub><br>"wors case" | F <sub>H</sub><br>"worst case" | Drift<br>Low | Drift<br>High | Within the 3650-<br>3700 MHz band |
|--------------|--------------|-------------------------------|--------------------------------|--------------|---------------|-----------------------------------|
| (°C)         | (VAC)        | (MHz)                         | (MHz)                          | (kHz)        | (kHz)         |                                   |
| <b>+20.0</b> | 97.7         | 3,650.5610                    | 3,699.2810                     | +1.0         | +1.0          | YES                               |
|              | <b>115.0</b> | 3,650.5600                    | 3,699.2800                     | -            | -             | YES                               |
|              | 132.2        | 3,650.5600                    | 3,699.2800                     | 0.0          | 0.0           | YES                               |
| -30.0        | 115.0        | 3,650.5640                    | 3,699.2830                     | +4.0         | +3.0          | YES                               |
| -20.0        | 115.0        | 3,650.5640                    | 3,699.2830                     | +4.0         | +3.0          | YES                               |
| -10.0        | 115.0        | 3,650.5630                    | 3,699.2820                     | +3.0         | +2.0          | YES                               |
| 0.0          | 115.0        | 3,650.5620                    | 3,699.2820                     | +2.0         | +2.0          | YES                               |
| +10.0        | 115.0        | 3,650.5610                    | 3,699.2810                     | +1.0         | +1.0          | YES                               |
| +30.0        | 115.0        | 3,650.5590                    | 3,699.2790                     | -1.0         | -1.0          | YES                               |
| +40.0        | 115.0        | 3,650.5590                    | 3,699.2780                     | -1.0         | -2.0          | YES                               |
| +50.0        | 115.0        | 3,650.5580                    | 3,699.2770                     | -2.0         | -3.0          | YES                               |

**Figure 51. Frequency Stability Test Results - 5MHz CBW**

| Temperature  | Voltage      | F <sub>L</sub><br>"worst case" | F <sub>H</sub><br>"worst case" | Drift<br>Low | Drift<br>High | Within the 3650-<br>3700 MHz band |
|--------------|--------------|--------------------------------|--------------------------------|--------------|---------------|-----------------------------------|
| (°C)         | (VAC)        | (MHz)                          | (MHz)                          | (kHz)        | (kHz)         |                                   |
| <b>+20.0</b> | 97.7         | 3,650.5810                     | 3,699.4210                     | +1.0         | +1.0          | YES                               |
|              | <b>115.0</b> | <b>3,650.5800</b>              | <b>3,699.4200</b>              | -            | -             | YES                               |
|              | 132.2        | 3,650.5801                     | 3,699.4201                     | +0.1         | +0.1          | YES                               |
| -30.0        | 115.0        | 3,650.5840                     | 3,699.4230                     | +4.0         | +3.0          | YES                               |
| -20.0        | 115.0        | 3,650.5830                     | 3,699.4230                     | +3.0         | +3.0          | YES                               |
| -10.0        | 115.0        | 3,650.5830                     | 3,699.4230                     | +3.0         | +3.0          | YES                               |
| 0.0          | 115.0        | 3,650.5820                     | 3,699.4220                     | +2.0         | +2.0          | YES                               |
| +10.0        | 115.0        | 3,650.5810                     | 3,699.4210                     | +1.0         | +1.0          | YES                               |
| +30.0        | 115.0        | 3,650.5790                     | 3,699.4180                     | -1.0         | -2.0          | YES                               |
| +40.0        | 115.0        | 3,650.5780                     | 3,699.4170                     | -2.0         | -3.0          | YES                               |
| +50.0        | 115.0        | 3,650.5780                     | 3,699.4170                     | -2.0         | -3.0          | YES                               |

**Figure 52. Frequency Stability Test Results - 10MHz CBW**

| Temperature  | Voltage      | F <sub>L</sub><br>"worst case" | F <sub>H</sub><br>"worst case" | Drift<br>Low | Drift<br>High | Within the 3650-<br>3700 MHz band |
|--------------|--------------|--------------------------------|--------------------------------|--------------|---------------|-----------------------------------|
| (°C)         | (VAC)        | (MHz)                          | (MHz)                          | (kHz)        | (kHz)         |                                   |
| <b>+20.0</b> | 97.7         | 3,650.7810                     | 3,699.0710                     | +1.0         | +1.0          | YES                               |
|              | <b>115.0</b> | <b>3,650.7800</b>              | <b>3,699.0700</b>              | -            | -             | YES                               |
|              | 132.2        | 3,650.7801                     | 3,699.0701                     | +0.1         | +0.1          | YES                               |
| -30.0        | 115.0        | 3,650.7840                     | 3,699.0730                     | +4.0         | +3.0          | YES                               |
| -20.0        | 115.0        | 3,650.7840                     | 3,699.0730                     | +4.0         | +3.0          | YES                               |
| -10.0        | 115.0        | 3,650.7820                     | 3,699.0720                     | +2.0         | +2.0          | YES                               |
| 0.0          | 115.0        | 3,650.7810                     | 3,699.0710                     | +1.0         | +1.0          | YES                               |
| +10.0        | 115.0        | 3,650.7810                     | 3,699.0710                     | +1.0         | +1.0          | YES                               |
| +30.0        | 115.0        | 3,650.7790                     | 3,699.0690                     | -1.0         | -1.0          | YES                               |
| +40.0        | 115.0        | 3,650.7780                     | 3,699.0670                     | -2.0         | -3.0          | YES                               |
| +50.0        | 115.0        | 3,650.7780                     | 3,699.0670                     | -2.0         | -3.0          | YES                               |

**Figure 53. Frequency Stability Test Results - 15MHz CBW**



| Temperature  | Voltage      | F <sub>L</sub><br>"worst case" | F <sub>H</sub><br>"worst case" | Drift<br>Low | Drift<br>High | Within the 3650-<br>3700 MHz band |
|--------------|--------------|--------------------------------|--------------------------------|--------------|---------------|-----------------------------------|
| (°C)         | (VAC)        | (MHz)                          | (MHz)                          | (kHz)        | (kHz)         |                                   |
| <b>+20.0</b> | 97.7         | 3,651.1610                     | 3,698.8410                     | +1.0         | +1.0          | YES                               |
|              | <b>115.0</b> | <b>3,651.1600</b>              | <b>3,698.8400</b>              | -            | -             | YES                               |
|              | 132.2        | 3,651.1601                     | 3,698.8401                     | +0.1         | +0.1          | YES                               |
| -30.0        | 115.0        | 3,651.1640                     | 3,698.8430                     | +4.0         | +3.0          | YES                               |
| -20.0        | 115.0        | 3,651.1640                     | 3,698.8430                     | +4.0         | +3.0          | YES                               |
| -10.0        | 115.0        | 3,651.1620                     | 3,698.8410                     | +2.0         | +1.0          | YES                               |
| 0.0          | 115.0        | 3,651.1610                     | 3,698.8410                     | +1.0         | +1.0          | YES                               |
| +10.0        | 115.0        | 3,651.1610                     | 3,698.8410                     | +1.0         | +1.0          | YES                               |
| +30.0        | 115.0        | 3,651.1590                     | 3,698.8390                     | -1.0         | -1.0          | YES                               |
| +40.0        | 115.0        | 3,651.1580                     | 3,698.8380                     | -2.0         | -2.0          | YES                               |
| +50.0        | 115.0        | 3,651.1580                     | 3,698.8370                     | -2.0         | -3.0          | YES                               |

**Figure 54. Frequency Stability Test Results - 20MHz CBW**

# Frequency Stability

E.U.T Description    CPE  
Type                    CPE8000-PRO-1D-3.x  
Part Number:        Not designated

Specification:                    RSS 197 Issue 1: 2010, Section 5.4; RSS Gen Issue 4: 2014, Section 6.11;  
FCC Part 2, Section 2.1055

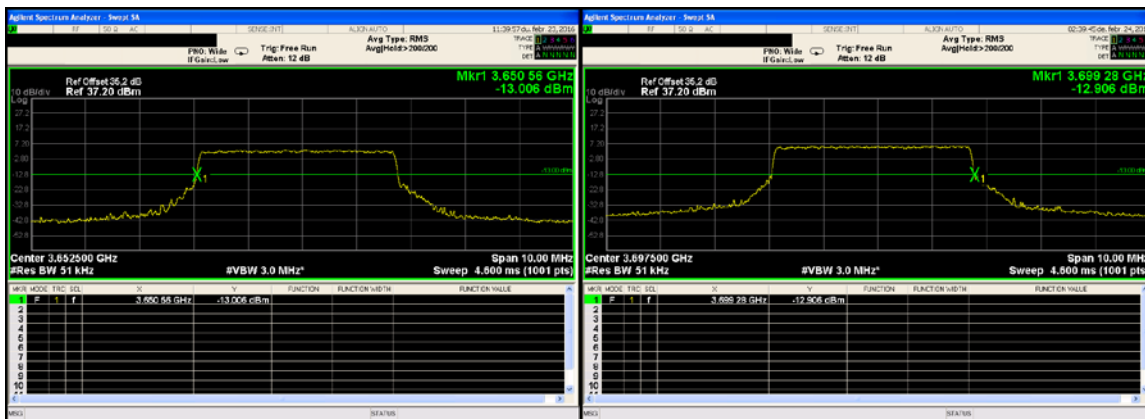


Figure 55. FL, FH for QPSK modulation, 20.0°C/115.0V – 5MHz CBW

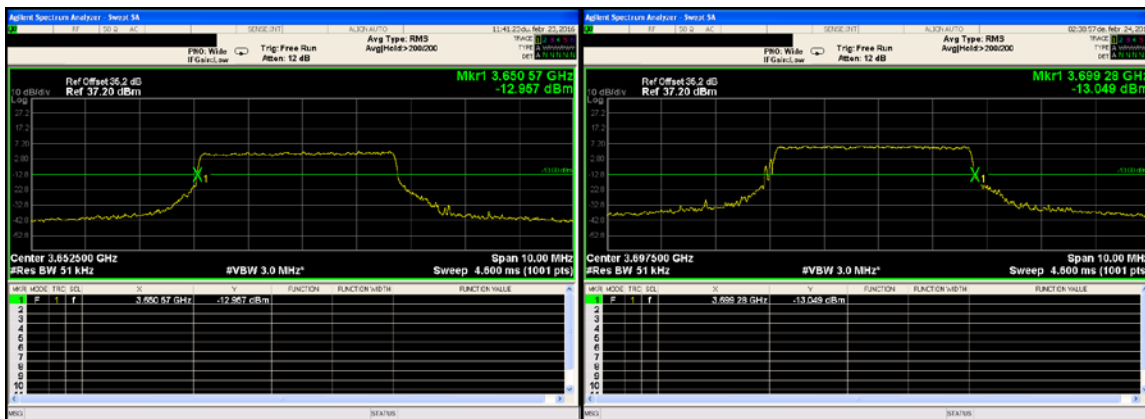


Figure 56. FL, FH for QPSK modulation, 20.0°C/115.0V – 5MHz CBW

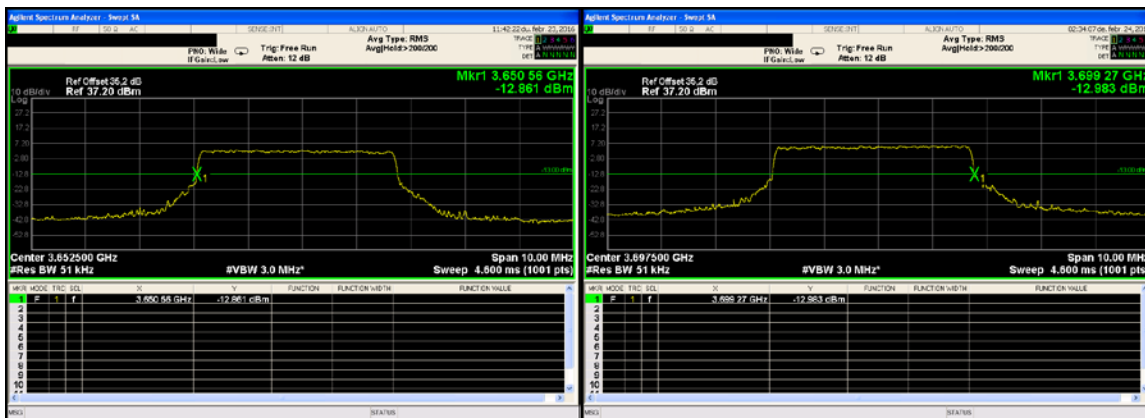


Figure 57. FL, FH for QPSK modulation, 20.0°C/115.0V – 5MHz CBW

# Frequency Stability

E.U.T Description CPE  
Type CPE8000-PRO-1D-3.x  
Part Number: Not designated

Specification: RSS 197 Issue 1: 2010, Section 5.4; RSS Gen Issue 4: 2014, Section 6.11;  
FCC Part 2, Section 2.1055

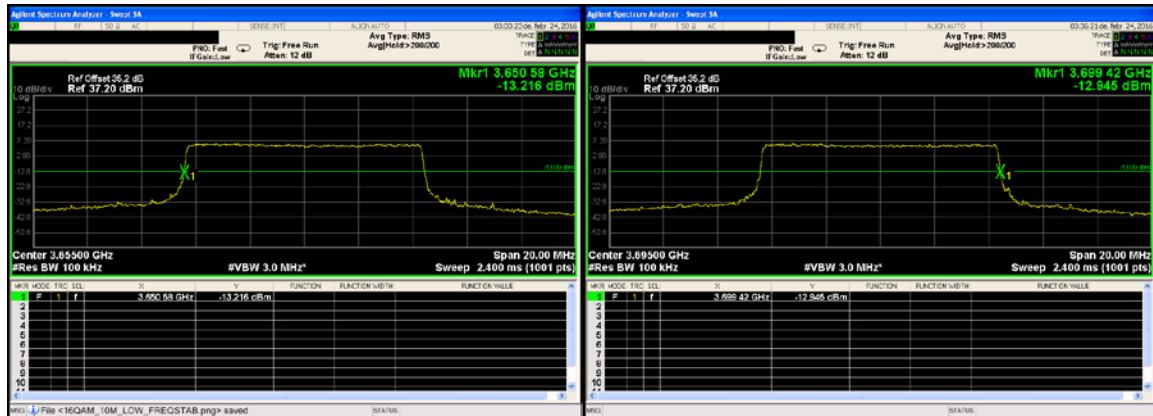


Figure 58. FL, FH for QPSK modulation, 20.0°C/115.0V- 10MHz CBW

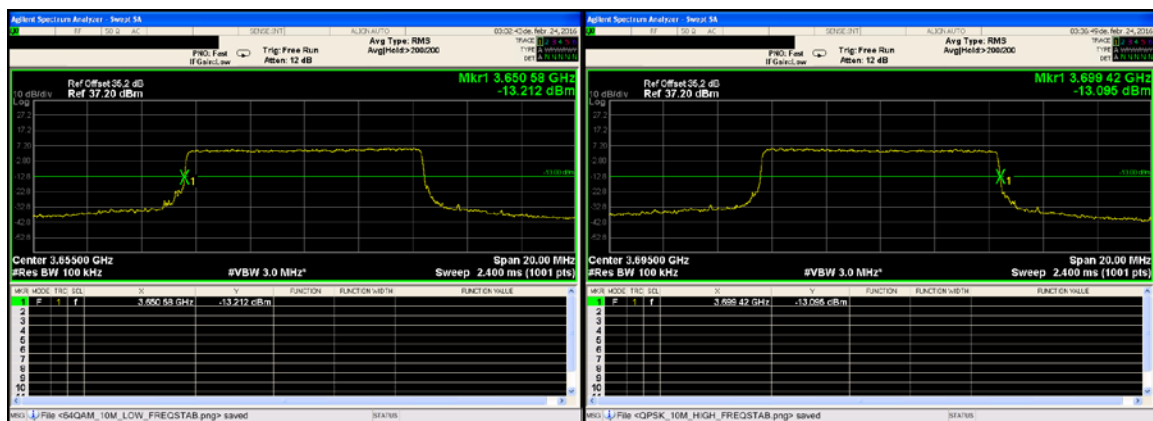


Figure 59. FL, FH for 16QAM modulation, 20.0°C/115.0V- 10MHz CBW

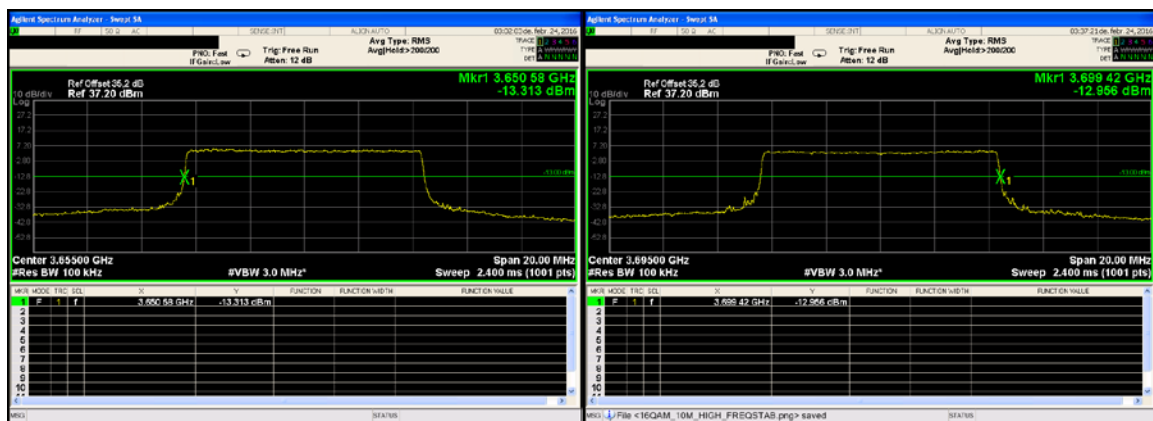


Figure 60. FL, FH for 64QAM modulation, 20.0°C/115.0V- 10MHz CBW

# Frequency Stability

E.U.T Description CPE  
Type CPE8000-PRO-1D-3.x  
Part Number: Not designated

Specification: RSS 197 Issue 1: 2010, Section 5.4; RSS Gen Issue 4: 2014, Section 6.11;  
FCC Part 2, Section 2.1055

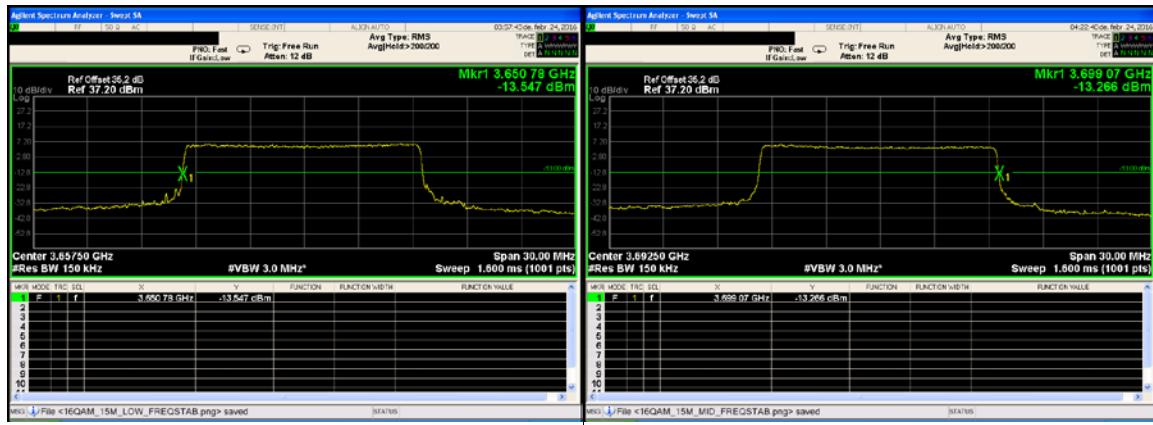


Figure 61. FL, FH for QPSK modulation, 20.0°C/115.0V - 15MHz CBW

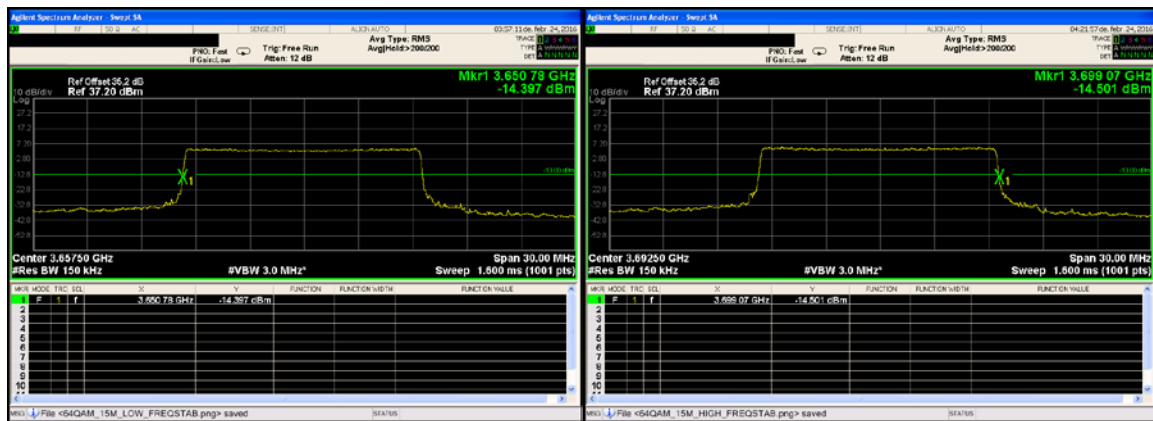


Figure 62. FL, FH for 16QAM modulation, 20.0°C/115.0V - 15MHz CBW

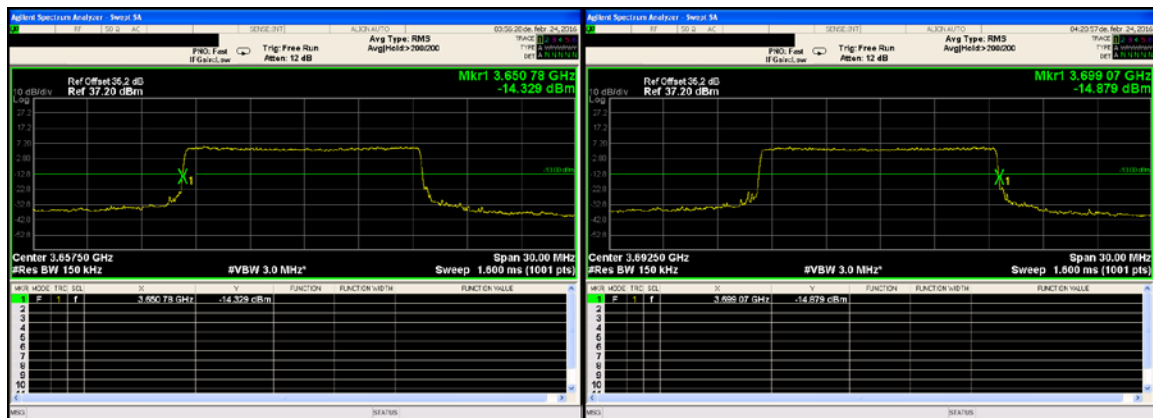


Figure 63. FL, FH for 64QAM modulation, 20.0°C/115.0V - 15MHz CBW

## Frequency Stability

E.U.T Description CPE  
Type CPE8000-PRO-1D-3.x  
Part Number: Not designated

Specification: RSS 197 Issue 1: 2010, Section 5.4; RSS Gen Issue 4: 2014, Section 6.11;  
FCC Part 2, Section 2.1055

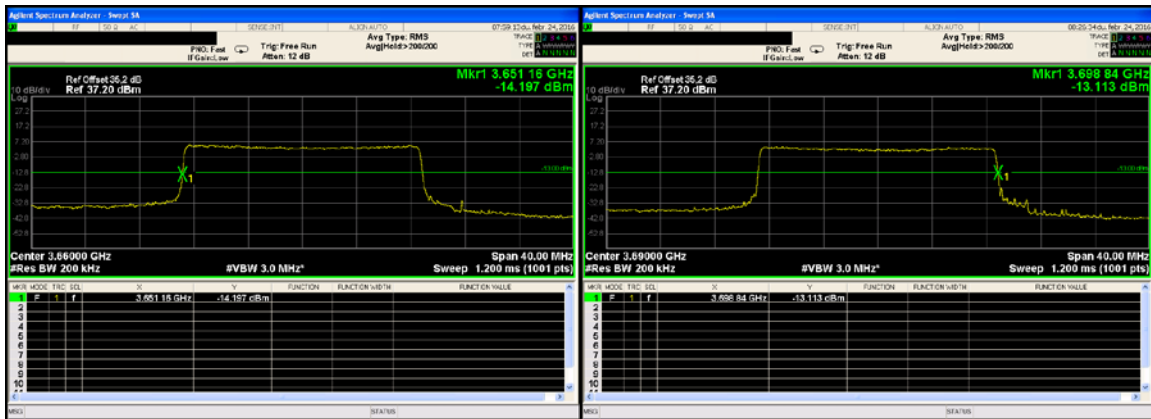


Figure 64. FL, FH for QPSK modulation, 20.0°C/115.0V - 20MHz CBW

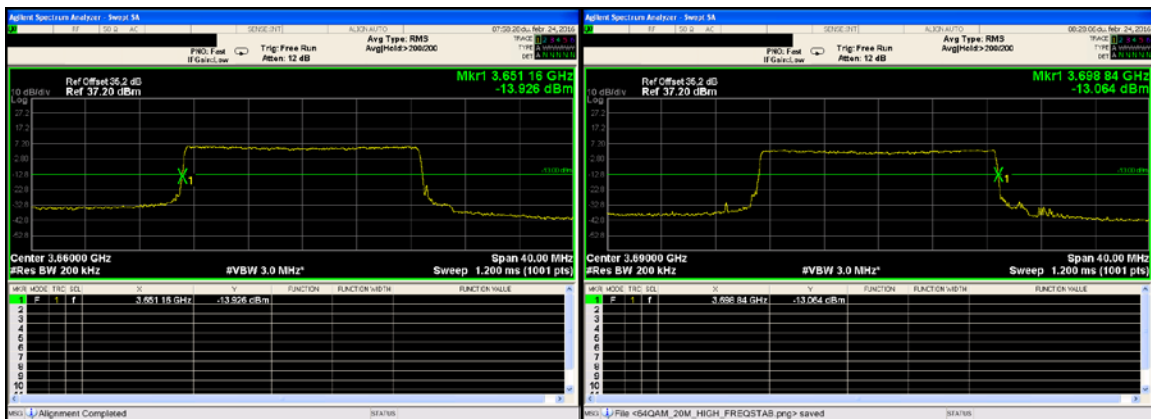


Figure 65. FL, FH for 16QAM modulation, 20.0°C/115.0V - 20MHz CBW

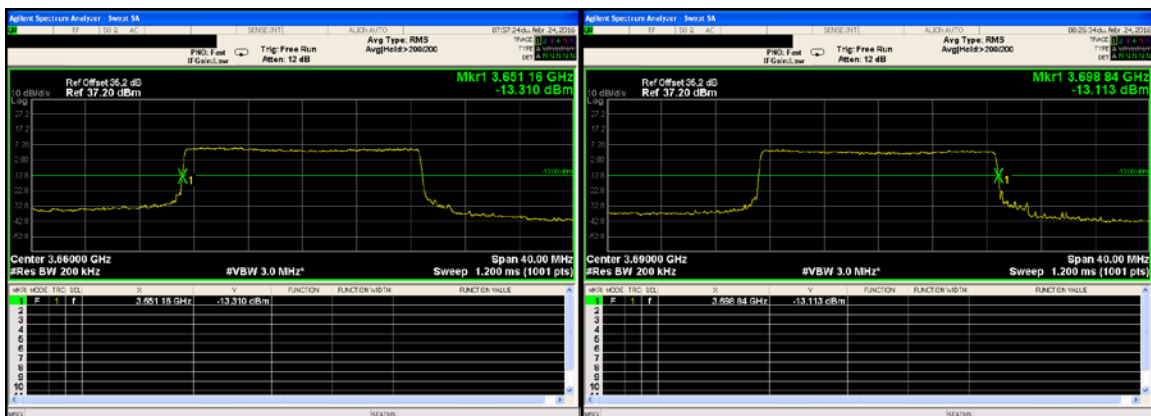


Figure 66. FL, FH for 64QAM modulation, 20.0°C/115.0V - 20MHz CBW



### 5.5 Test Instruments Used; Frequency Stability

| Instrument                 | Manufacturer | Model     | Serial Number | Calibration       |                      |
|----------------------------|--------------|-----------|---------------|-------------------|----------------------|
|                            |              |           |               | Last Calibration  | Next Calibration Due |
| MXA Signal Analyzer        | Agilent      | N9020A    | MY48011785    | July 26 2015      | July 26 2017         |
| Climatic Chamber           | Thermotron   | SM-32C    | 251030        | February 24, 2015 | April 30, 2016       |
| Humidity Temperature Probe | Rotronic     | HC2-IC102 | 60286140      | August 2, 2015    | August 2, 2016       |

**Figure 67. Test Instruments Used Frequency Stability**

## 6. Transmitter Output Power and Equivalent Isotropically Radiated Power (e.i.r.p.)

### 6.1 Test Specification

RSS 197, Issue 1: 2010, Section 5.6  
SRSP-303.65, Issue 2: 2010, Section 5.1  
FCC Part 90, Subpart Z, section 90.1321

### 6.2 Test Procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator, an appropriate coaxial cable, coupler, and DC block. (total loss=35.2dB Including duty cycle factor) The E.U.T. RF output was OFDMA modulated with QPSK, 16QAM and 64QAM, each at 5, 10,15 and 20 MHz CBW and in 2 power modes: low and high population and in 3 operational frequencies. Special attention was taken to prevent Spectrum Analyzer RF input overload. RBW was set to 1MHz.

### 6.3 FCC Limit

Base and fixed stations are limited to 25 watts/25 MHz (44.0dBm) equivalent isotropically radiated power (EIRP). In any event, the peak EIRP power density shall not exceed 1 Watt in any one-megahertz.  
The limits were adjusted for each tested channel bandwidth accordingly as reflected in the test results' tables.

### 6.4 IC Limit

The maximum transmitter output power density of equipment, other than mobile and portable equipment, shall not exceed 1W (30dBm) in any 1 MHz bandwidth. However, in low population areas, a maximum e.i.r.p. density of 60 W/MHz (47.78dBm/MHz) is permitted.

## 6.5 Test Results

Judgment: PASSED

For additional information see *Figure 68* to *Figure 151*.

| Operation Frequency<br>(MHz) | Modulation | PSD Reading<br>(dBm) | Antenna Gain<br>(dBi) | Total PSD<br>(dBm) | PSD Limit<br>(dBm) | Margin<br>(dB) |
|------------------------------|------------|----------------------|-----------------------|--------------------|--------------------|----------------|
| 3652.5                       | QPSK       | 14.4                 | 15.0                  | 29.4               | 30.0               | -0.6           |
|                              | 16QAM      | 14.8                 | 15.0                  | 29.8               | 30.0               | -0.2           |
|                              | 64QAM      | 14.8                 | 15.0                  | 29.8               | 30.0               | -0.2           |
| 3675.0                       | QPSK       | 14.6                 | 15.0                  | 29.6               | 30.0               | -0.4           |
|                              | 16QAM      | 14.6                 | 15.0                  | 29.6               | 30.0               | -0.4           |
|                              | 64QAM      | 14.5                 | 15.0                  | 29.5               | 30.0               | -0.5           |
| 3697.5                       | QPSK       | 14.8                 | 15.0                  | 29.8               | 30.0               | -0.2           |
|                              | 16QAM      | 14.6                 | 15.0                  | 29.6               | 30.0               | -0.4           |
|                              | 64QAM      | 14.5                 | 15.0                  | 29.5               | 30.0               | -0.5           |

**Figure 68. PSD, 5MHz CBW(3.6MHz OBW) - High Population**

| Operation Frequency<br>(MHz) | Modulation | Reading@1MHz<br>(dBm) | Reading@3.6MHz<br>(dBm) | Antenna Gain<br>(dBi) | Total EIRP<br>(dBm) | EIRP Limit<br>(dBm) | Margin<br>(dB) |
|------------------------------|------------|-----------------------|-------------------------|-----------------------|---------------------|---------------------|----------------|
| 3652.5                       | QPSK       | 14.4                  | 20.0                    | 15.0                  | 35.0                | 35.6                | -0.6           |
|                              | 16QAM      | 14.8                  | 20.4                    | 15.0                  | 35.4                | 35.6                | -0.2           |
|                              | 64QAM      | 14.8                  | 20.4                    | 15.0                  | 35.4                | 35.6                | -0.2           |
| 3675.0                       | QPSK       | 14.6                  | 20.2                    | 15.0                  | 35.2                | 35.6                | -0.4           |
|                              | 16QAM      | 14.6                  | 20.2                    | 15.0                  | 35.2                | 35.6                | -0.4           |
|                              | 64QAM      | 14.5                  | 20.1                    | 15.0                  | 35.1                | 35.6                | -0.5           |
| 3697.5                       | QPSK       | 14.8                  | 20.4                    | 15.0                  | 35.4                | 35.6                | -0.2           |
|                              | 16QAM      | 14.6                  | 20.2                    | 15.0                  | 35.2                | 35.6                | -0.4           |
|                              | 64QAM      | 14.5                  | 20.1                    | 15.0                  | 35.1                | 35.6                | -0.5           |

Reading@3.6MHz= Reading@1MHz+ 10 log (3.6M/1M) = 5.56dBm

**Figure 69. EIRP, 5MHz CBW (3.6MHz OBW) , FCC Specification**



| Operation Frequency<br>(MHz) | Modulation | PSD Reading<br>(dBm) | Antenna Gain<br>(dBi) | Total PSD<br>(dBm) | Limit<br>(dBm) | Margin<br>(dB) |
|------------------------------|------------|----------------------|-----------------------|--------------------|----------------|----------------|
| 3655.0                       | QPSK       | 14.0                 | 15.0                  | 29.0               | 30.0           | -1.0           |
|                              | 16QAM      | 14.0                 | 15.0                  | 29.0               | 30.0           | -1.0           |
|                              | 64QAM      | 13.2                 | 15.0                  | 28.2               | 30.0           | -1.8           |
| 3675.0                       | QPSK       | 14.3                 | 15.0                  | 29.3               | 30.0           | -0.7           |
|                              | 16QAM      | 14.2                 | 15.0                  | 29.2               | 30.0           | -0.8           |
|                              | 64QAM      | 14.3                 | 15.0                  | 29.3               | 30.0           | -0.7           |
| 3695.0                       | QPSK       | 14.1                 | 15.0                  | 29.1               | 30.0           | -0.9           |
|                              | 16QAM      | 14.3                 | 15.0                  | 29.3               | 30.0           | -0.7           |
|                              | 64QAM      | 14.1                 | 15.0                  | 29.1               | 30.0           | -0.9           |

Figure 70. PSD, 10 MHz CBW(8.6MHz OBW) - High Population

| Operation Frequency<br>(MHz) | Modulation | Reading@1MHz<br>(dBm) | Reading@8.6MHz<br>(dBm) | Antenna Gain<br>(dBi) | Total EIRP<br>(dBm) | EIRP Limit<br>(dBm) | Margin<br>(dB) |
|------------------------------|------------|-----------------------|-------------------------|-----------------------|---------------------|---------------------|----------------|
| 3655.0                       | QPSK       | 14.0                  | 23.3                    | 15.0                  | 38.3                | 39.3                | -1.0           |
|                              | 16QAM      | 14.0                  | 23.3                    | 15.0                  | 38.3                | 39.3                | -1.0           |
|                              | 64QAM      | 13.2                  | 22.5                    | 15.0                  | 37.5                | 39.3                | -1.8           |
| 3675.0                       | QPSK       | 14.3                  | 23.6                    | 15.0                  | 38.6                | 39.3                | -0.7           |
|                              | 16QAM      | 14.2                  | 23.5                    | 15.0                  | 38.5                | 39.3                | -0.8           |
|                              | 64QAM      | 14.3                  | 23.6                    | 15.0                  | 38.6                | 39.3                | -0.7           |
| 3695.0                       | QPSK       | 14.1                  | 23.4                    | 15.0                  | 38.4                | 39.3                | -0.9           |
|                              | 16QAM      | 14.3                  | 23.6                    | 15.0                  | 38.6                | 39.3                | -0.7           |
|                              | 64QAM      | 14.1                  | 23.4                    | 15.0                  | 38.4                | 39.3                | -0.9           |

Reading@10MHz= Reading@1MHz+ 10 log (8.6M/1M)=9.34dBm

Figure 71. EIRP, 10 MHz CBW, (8.6MHz OBW) FCC Specification

| Operation Frequency | Modulation | PSD Reading | Antenna Gain | Total PSD | Limit | Margin |
|---------------------|------------|-------------|--------------|-----------|-------|--------|
| (MHz)               |            | (dBm)       | (dBi)        | (dBm)     | (dBm) | (dB)   |
| 3657.5              | QPSK       | 12.8        | 15.0         | 27.8      | 30.0  | -2.2   |
|                     | 16QAM      | 12.1        | 15.0         | 27.1      | 30.0  | -2.9   |
|                     | 64QAM      | 12.4        | 15.0         | 27.4      | 30.0  | -2.6   |
| 3675.0              | QPSK       | 12.3        | 15.0         | 27.3      | 30.0  | -2.7   |
|                     | 16QAM      | 12.1        | 15.0         | 27.1      | 30.0  | -2.9   |
|                     | 64QAM      | 12.3        | 15.0         | 27.3      | 30.0  | -2.7   |
| 3692.5              | QPSK       | 12.3        | 15.0         | 27.3      | 30.0  | -2.7   |
|                     | 16QAM      | 12.4        | 15.0         | 27.4      | 30.0  | -2.6   |
|                     | 64QAM      | 12.6        | 15.0         | 27.6      | 30.0  | -2.4   |

Figure 72. PSD, 15 MHz CBW(12.9MHz OBW) - High Population

| Operation Frequency | Modulation | Reading@1MHz | Reading@12.9MHz | Antenna Gain | Total EIRP | EIRP Limit | Margin |
|---------------------|------------|--------------|-----------------|--------------|------------|------------|--------|
| (MHz)               |            | (dBm)        | (dBm)           | (dBi)        | (dBm)      | (dBm)      | (dB)   |
| 3657.5              | QPSK       | 12.8         | 23.9            | 15.0         | 38.9       | 41.1       | -2.2   |
|                     | 16QAM      | 12.1         | 23.2            | 15.0         | 38.2       | 41.1       | -2.9   |
|                     | 64QAM      | 12.4         | 23.5            | 15.0         | 38.5       | 41.1       | -2.6   |
| 3675.0              | QPSK       | 12.3         | 23.4            | 15.0         | 38.4       | 41.1       | -2.7   |
|                     | 16QAM      | 12.1         | 23.2            | 15.0         | 38.2       | 41.1       | -2.9   |
|                     | 64QAM      | 12.3         | 23.4            | 15.0         | 38.4       | 41.1       | -2.7   |
| 3692.5              | QPSK       | 12.3         | 23.4            | 15.0         | 38.4       | 41.1       | -2.7   |
|                     | 16QAM      | 12.4         | 23.5            | 15.0         | 38.5       | 41.1       | -2.6   |
|                     | 64QAM      | 12.6         | 23.7            | 15.0         | 38.7       | 41.1       | -2.4   |

Reading@15MHz= Reading@1MHz+ 10 log (12.9M/1M) = 11.1dBm

Figure 73. EIRP, 15 MHz CBW(12.9MHz OBW) - FCC Specification

| Operation Frequency | Modulation | PSD Reading | Antenna Gain | Total PSD | Limit | Margin |
|---------------------|------------|-------------|--------------|-----------|-------|--------|
| (MHz)               |            | (dBm)       | (dBi)        | (dBm)     | (dBm) | (dB)   |
| 3660.0              | QPSK       | 11.1        | 15.0         | 26.1      | 30.0  | -3.9   |
|                     | 16QAM      | 11.0        | 15.0         | 26.0      | 30.0  | -4.0   |
|                     | 64QAM      | 11.0        | 15.0         | 26.0      | 30.0  | -4.0   |
| 3675.0              | QPSK       | 11.4        | 15.0         | 26.4      | 30.0  | -3.6   |
|                     | 16QAM      | 11.0        | 15.0         | 26.0      | 30.0  | -4.0   |
|                     | 64QAM      | 11.2        | 15.0         | 26.2      | 30.0  | -3.8   |
| 3690.0              | QPSK       | 11.2        | 15.0         | 26.2      | 30.0  | -3.8   |
|                     | 16QAM      | 11.4        | 15.0         | 26.4      | 30.0  | -3.6   |
|                     | 64QAM      | 11.0        | 15.0         | 26.0      | 30.0  | -4.0   |

Figure 74. PSD, 20 MHz CBW (17.2MHz OBW)- High Population

| Operation Frequency | Modulation | Reading@1MHz | Reading@17.2MHz | Antenna Gain | Total EIRP | EIRP Limit | Margin |
|---------------------|------------|--------------|-----------------|--------------|------------|------------|--------|
| (MHz)               |            | (dBm)        | (dBm)           | (dBi)        | (dBm)      | (dBm)      | (dB)   |
| 3660.0              | QPSK       | 11.1         | 23.4            | 15.0         | 38.4       | 42.4       | -4.0   |
|                     | 16QAM      | 11.0         | 23.3            | 15.0         | 38.3       | 42.4       | -4.1   |
|                     | 64QAM      | 11.0         | 23.3            | 15.0         | 38.3       | 42.4       | -4.1   |
| 3675.0              | QPSK       | 11.4         | 23.7            | 15.0         | 38.7       | 42.4       | -3.7   |
|                     | 16QAM      | 11.0         | 23.3            | 15.0         | 38.3       | 42.4       | -4.1   |
|                     | 64QAM      | 11.2         | 23.5            | 15.0         | 38.5       | 42.4       | -3.9   |
| 3690.0              | QPSK       | 11.2         | 23.5            | 15.0         | 38.5       | 42.4       | -3.9   |
|                     | 16QAM      | 11.4         | 23.7            | 15.0         | 38.7       | 42.4       | -3.7   |
|                     | 64QAM      | 11.0         | 23.3            | 15.0         | 38.3       | 42.4       | -4.1   |

Reading@20MHz= Reading@1MHz+ 10 log (17.2M/1M) = 12.3dBm

Figure 75. EIRP, 20 MHz CBW(17.2MHz OBW), FCC Specification

| Operation Frequency | Modulation | PSD Reading | Antenna Gain | Total PSD | Limit | Margin |
|---------------------|------------|-------------|--------------|-----------|-------|--------|
| (MHz)               |            | (dBm)       | (dbi)        | (dbm)     | (dBm) | (dB)   |
| 3652.5              | QPSK       | 17.1        | 15.0         | 32.1      | 47.78 | -15.68 |
|                     | 16QAM      | 17.1        | 15.0         | 32.1      | 47.78 | -15.68 |
|                     | 64QAM      | 17.1        | 15.0         | 32.1      | 47.78 | -15.68 |
| 3675.0              | QPSK       | 17.0        | 15.0         | 32.0      | 47.78 | -15.78 |
|                     | 16QAM      | 17.1        | 15.0         | 32.1      | 47.78 | -15.68 |
|                     | 64QAM      | 17.0        | 15.0         | 32.0      | 47.78 | -15.78 |
| 3697.5              | QPSK       | 17.1        | 15.0         | 32.1      | 47.78 | -15.68 |
|                     | 16QAM      | 17.0        | 15.0         | 32.0      | 47.78 | -15.78 |
|                     | 64QAM      | 17.1        | 15.0         | 32.1      | 47.78 | -15.68 |

**Figure 76. PSD, 5 MHz CBW - Low Population**

| Operation Frequency | Modulation | PSD Reading | Antenna Gain | Total PSD | Limit | Margin |
|---------------------|------------|-------------|--------------|-----------|-------|--------|
| (MHz)               |            | (dBm)       | (dbi)        | (dbm)     | (dBm) | (dB)   |
| 3655.0              | QPSK       | 14.0        | 15.0         | 29.0      | 47.78 | -18.78 |
|                     | 16QAM      | 14.0        | 15.0         | 29.0      | 47.78 | -18.78 |
|                     | 64QAM      | 13.2        | 15.0         | 28.2      | 47.78 | -19.58 |
| 3675.0              | QPSK       | 14.3        | 15.0         | 29.3      | 47.78 | -18.48 |
|                     | 16QAM      | 14.2        | 15.0         | 29.2      | 47.78 | -18.58 |
|                     | 64QAM      | 14.3        | 15.0         | 29.3      | 47.78 | -18.48 |
| 3695.0              | QPSK       | 14.1        | 15.0         | 29.1      | 47.78 | -18.68 |
|                     | 16QAM      | 14.3        | 15.0         | 29.3      | 47.78 | -18.48 |
|                     | 64QAM      | 14.1        | 15.0         | 29.1      | 47.78 | -18.68 |

**Figure 77. PSD, 10 MHz CBW - Low Population**

| Operation Frequency | Modulation | PSD Reading | Antenna Gain | Total PSD | Limit | Margin |
|---------------------|------------|-------------|--------------|-----------|-------|--------|
| (MHz)               |            | (dBm)       | (dbi)        | (dbm)     | (dBm) | (dB)   |
| 3657.5              | QPSK       | 12.8        | 15.0         | 27.8      | 47.78 | -19.98 |
|                     | 16QAM      | 12.1        | 15.0         | 27.1      | 47.78 | -20.68 |
|                     | 64QAM      | 12.4        | 15.0         | 27.4      | 47.78 | -20.38 |
| 3675.0              | QPSK       | 12.3        | 15.0         | 27.3      | 47.78 | -20.48 |
|                     | 16QAM      | 12.1        | 15.0         | 27.1      | 47.78 | -20.68 |
|                     | 64QAM      | 12.3        | 15.0         | 27.3      | 47.78 | -20.48 |
| 3692.5              | QPSK       | 12.3        | 15.0         | 27.3      | 47.78 | -20.48 |
|                     | 16QAM      | 12.4        | 15.0         | 27.4      | 47.78 | -20.38 |
|                     | 64QAM      | 12.6        | 15.0         | 27.6      | 47.78 | -20.18 |

Figure 78. PSD, 15 MHz CBW - Low Population

| Operation Frequency | Modulation | PSD Reading | Antenna Gain | Total PSD | Limit | Margin |
|---------------------|------------|-------------|--------------|-----------|-------|--------|
| (MHz)               |            | (dBm)       | (dbi)        | (dbm)     | (dBm) | (dB)   |
| 3660.0              | QPSK       | 11.1        | 15.0         | 26.1      | 47.78 | -21.68 |
|                     | 16QAM      | 11.0        | 15.0         | 26.0      | 47.78 | -21.78 |
|                     | 64QAM      | 11.0        | 15.0         | 26.0      | 47.78 | -21.78 |
| 3675.0              | QPSK       | 11.4        | 15.0         | 26.4      | 47.78 | -21.38 |
|                     | 16QAM      | 11.0        | 15.0         | 26.0      | 47.78 | -21.78 |
|                     | 64QAM      | 11.2        | 15.0         | 26.2      | 47.78 | -21.58 |
| 3690.0              | QPSK       | 11.2        | 15.0         | 26.2      | 47.78 | -21.58 |
|                     | 16QAM      | 11.4        | 15.0         | 26.4      | 47.78 | -21.38 |
|                     | 64QAM      | 11.0        | 15.0         | 26.0      | 47.78 | -21.78 |

Figure 79. PSD, 20 MHz CBW - Low Population

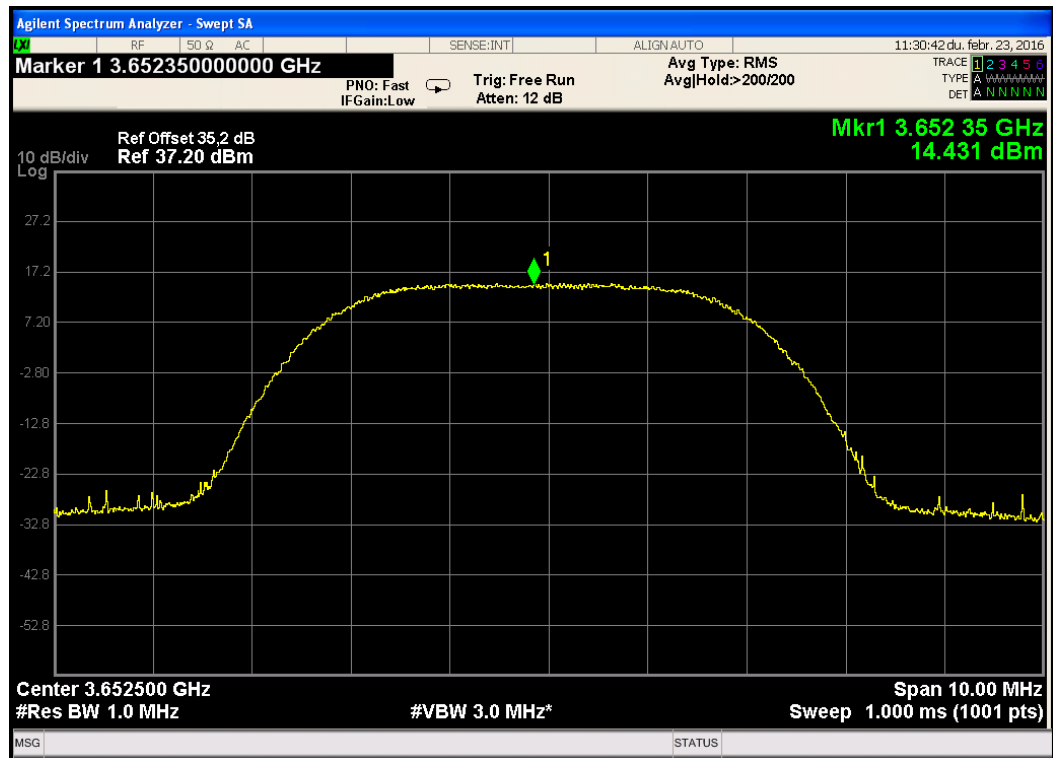


Figure 80. — 3652.5 MHz QPSK - 5MHz CBW, High Population

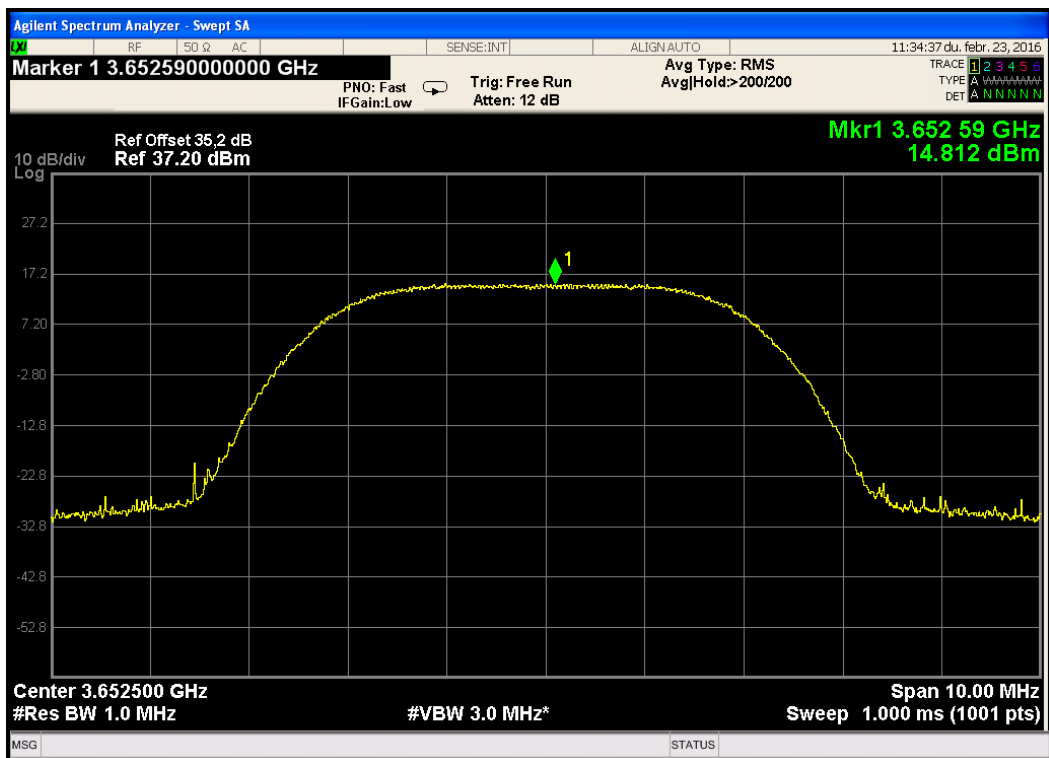


Figure 81. — 3652.5 MHz 16QAM - 5MHz CBW, High Population

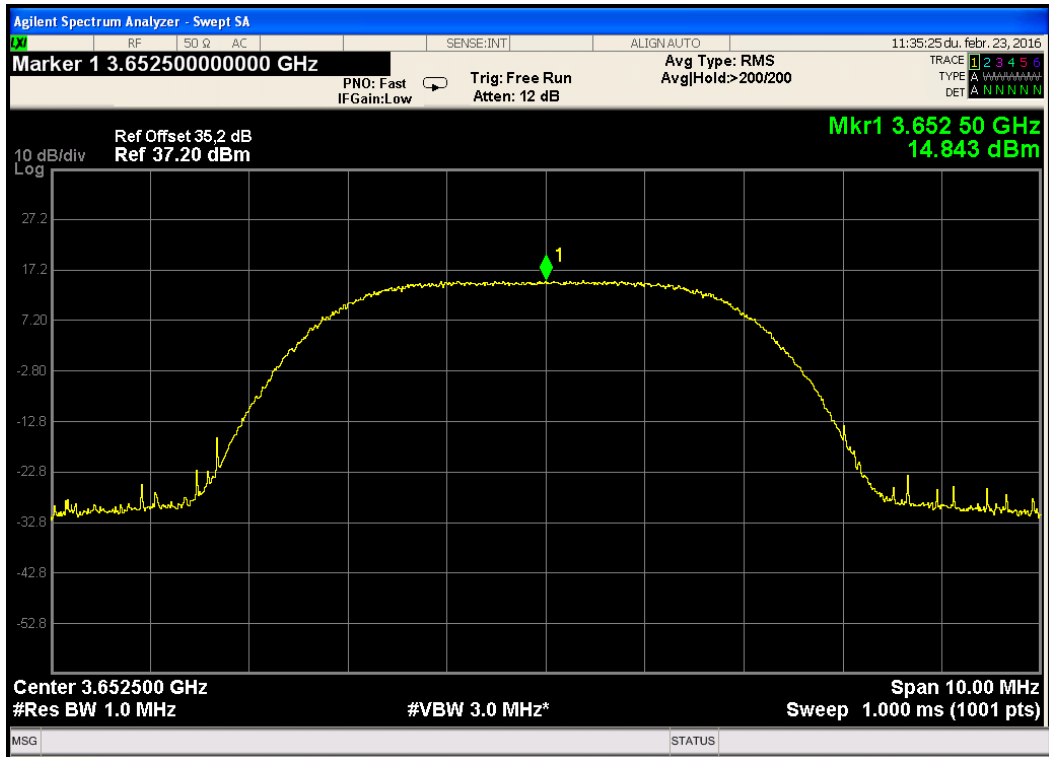


Figure 82. — 3652.5 MHz 64QAM - 5MHz CBW, High Population

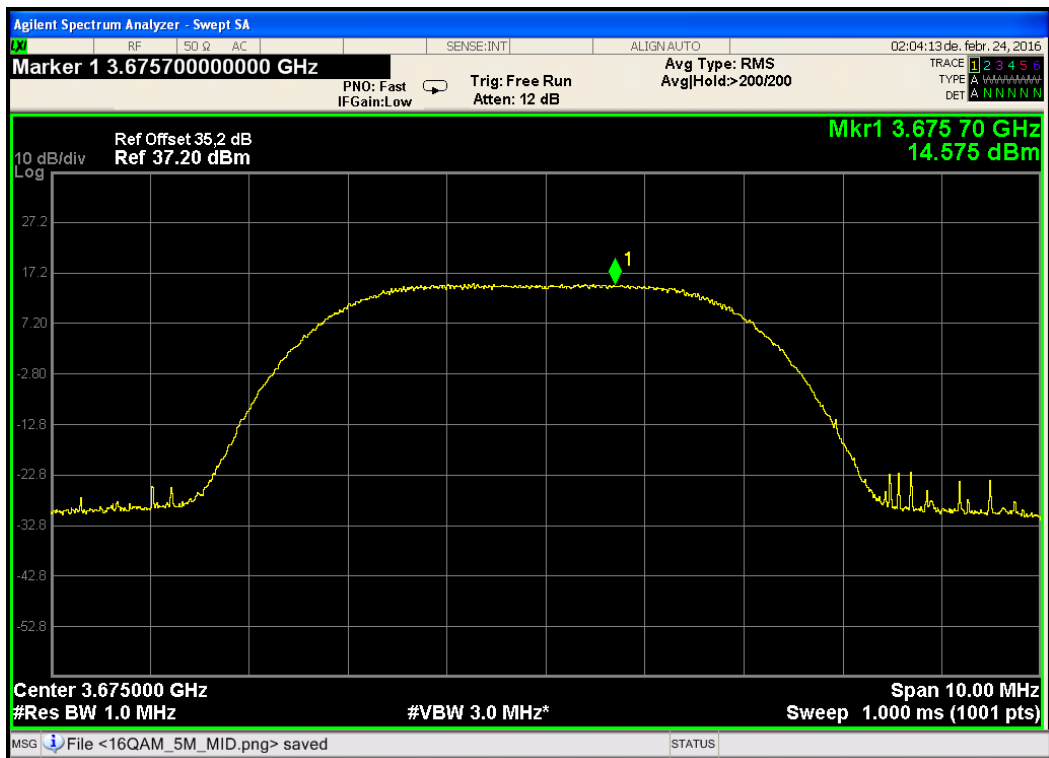


Figure 83. — 3675.0 MHz QPSK- 5MHz CBW, High Population

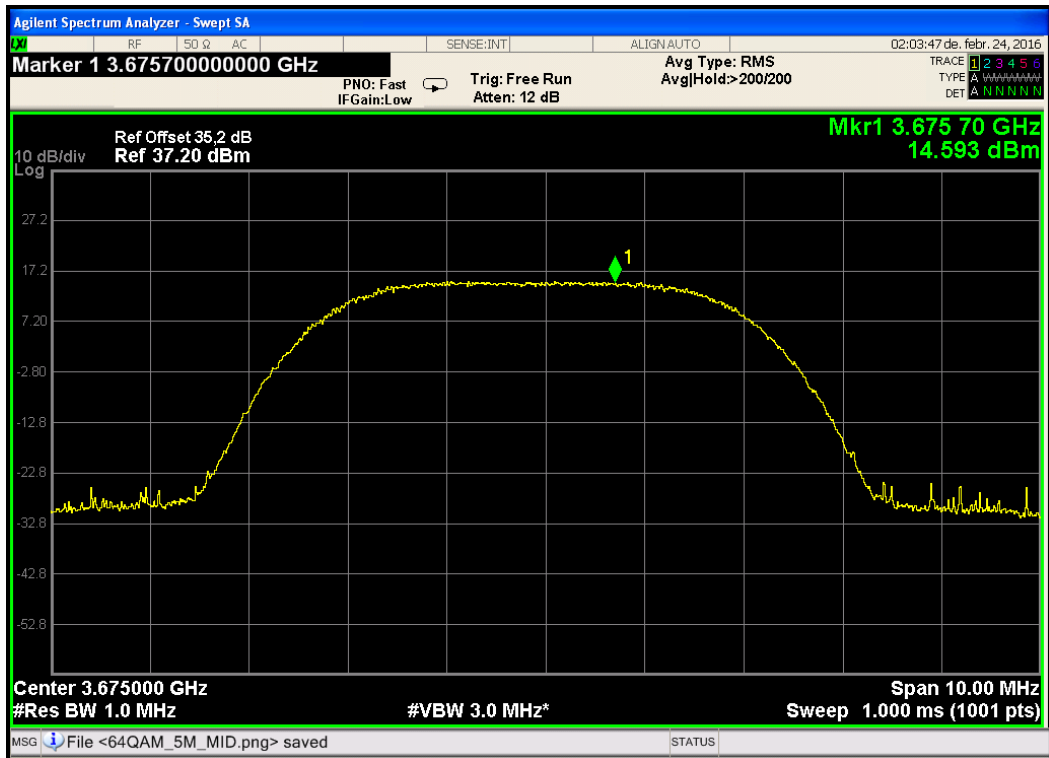


Figure 84. — 3675.0 MHz 16QAM- 5MHz CBW, High Population

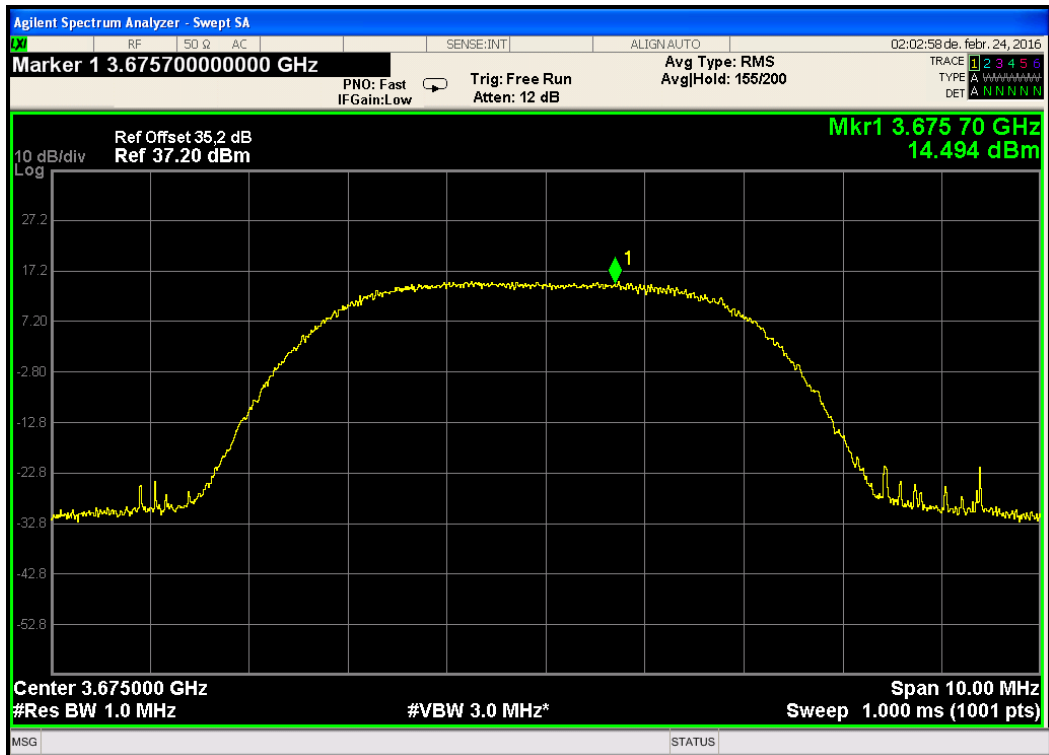


Figure 85. — 3675.0 MHz 64QAM- 5MHz CBW, High Population



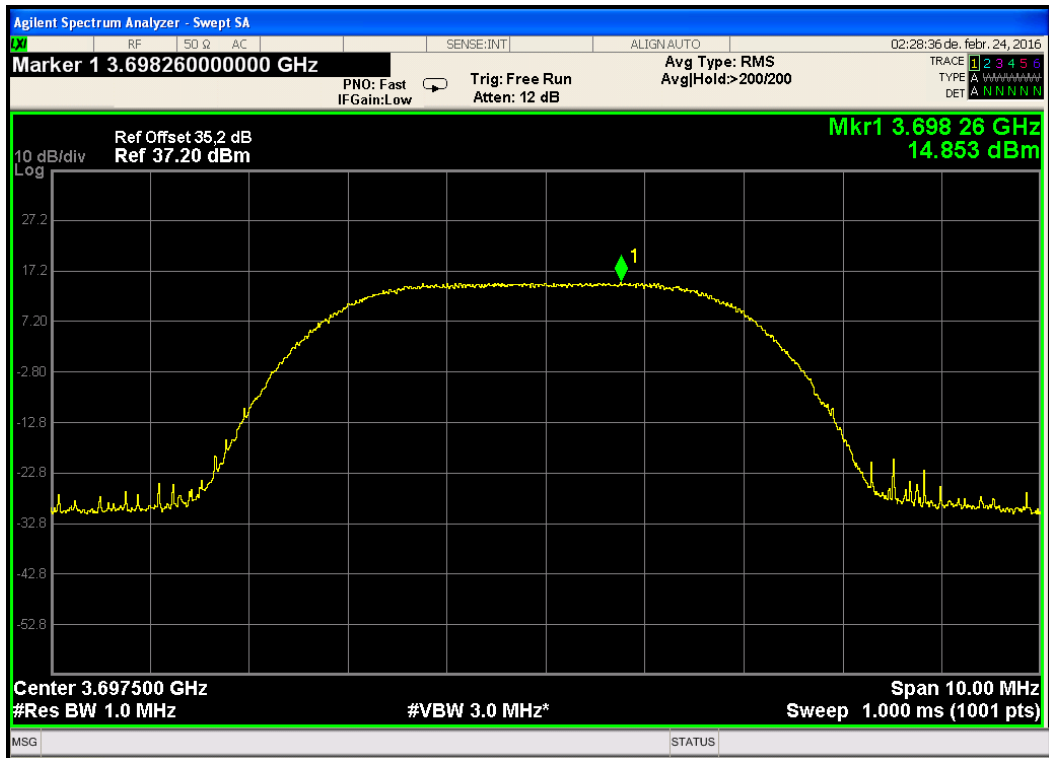


Figure 86. — 3697.5 MHz QPSK- 5MHz CBW, High Population

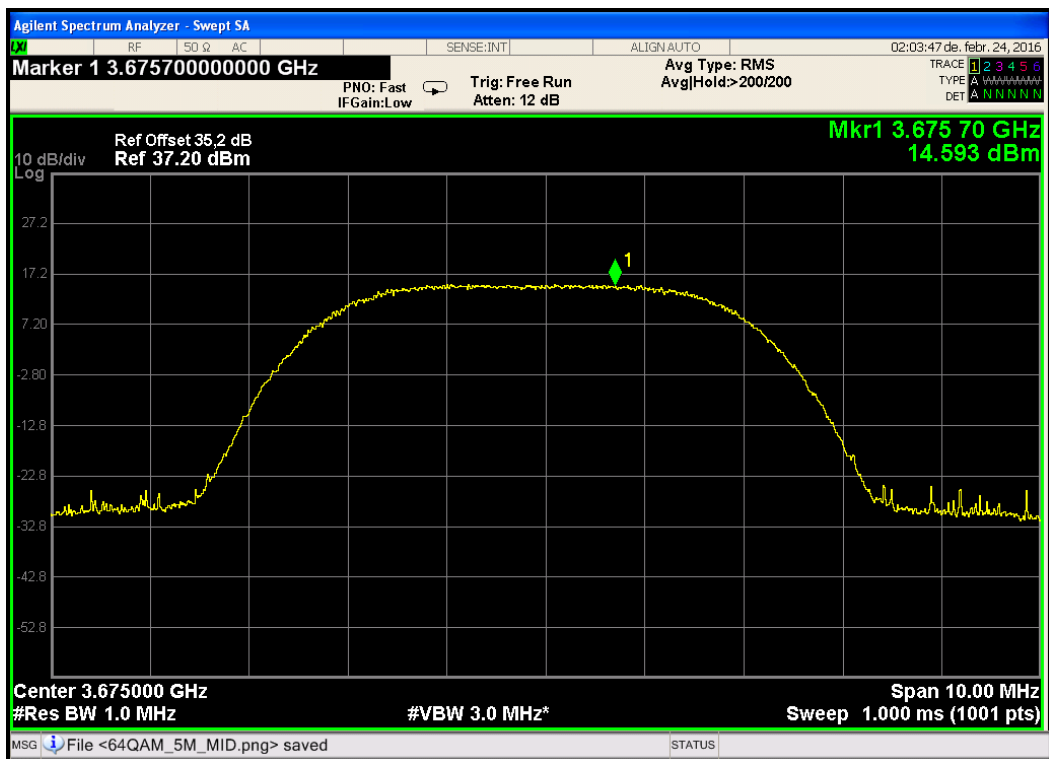


Figure 87. — 3697.5 MHz 16QAM- 5MHz CBW, High Population

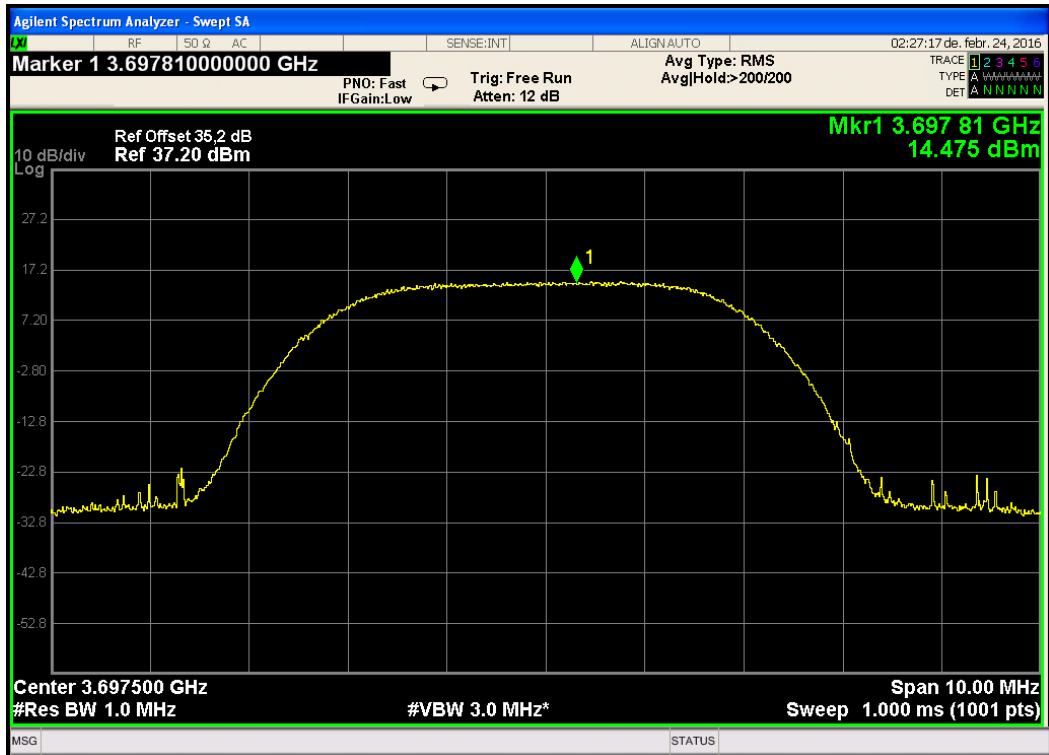


Figure 88. — 3697.5 MHz 64QAM- 5MHz CBW, High Population

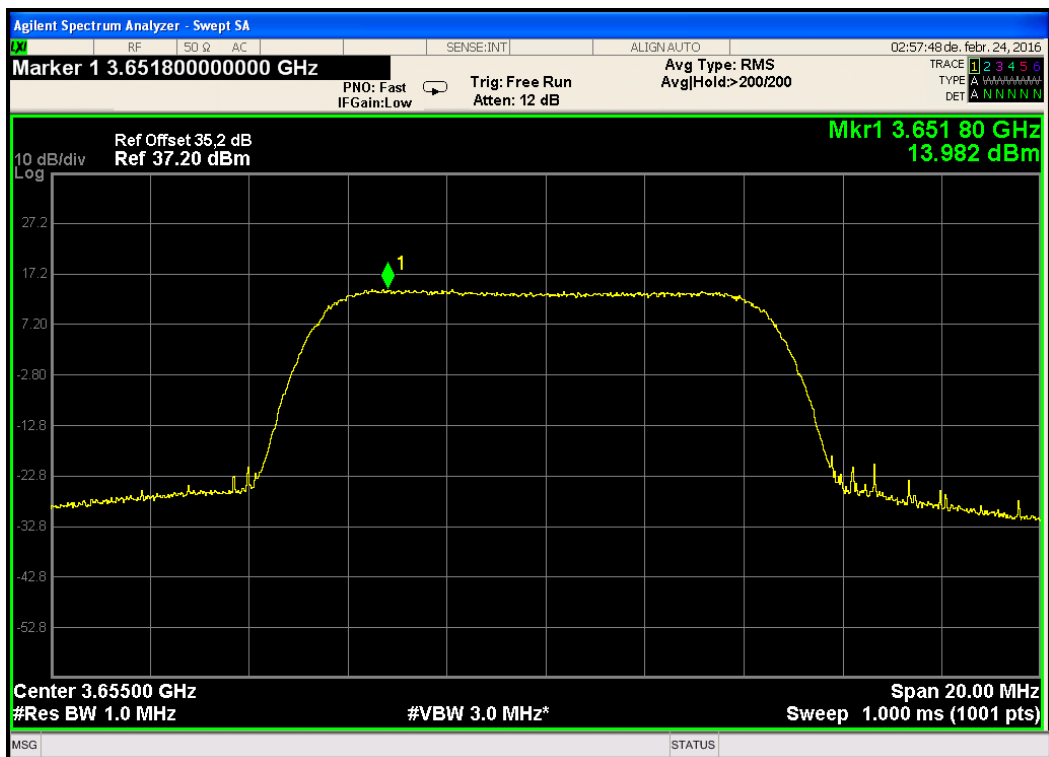


Figure 89. — 3655.0 MHz QPSK - 10MHz CBW, High Population

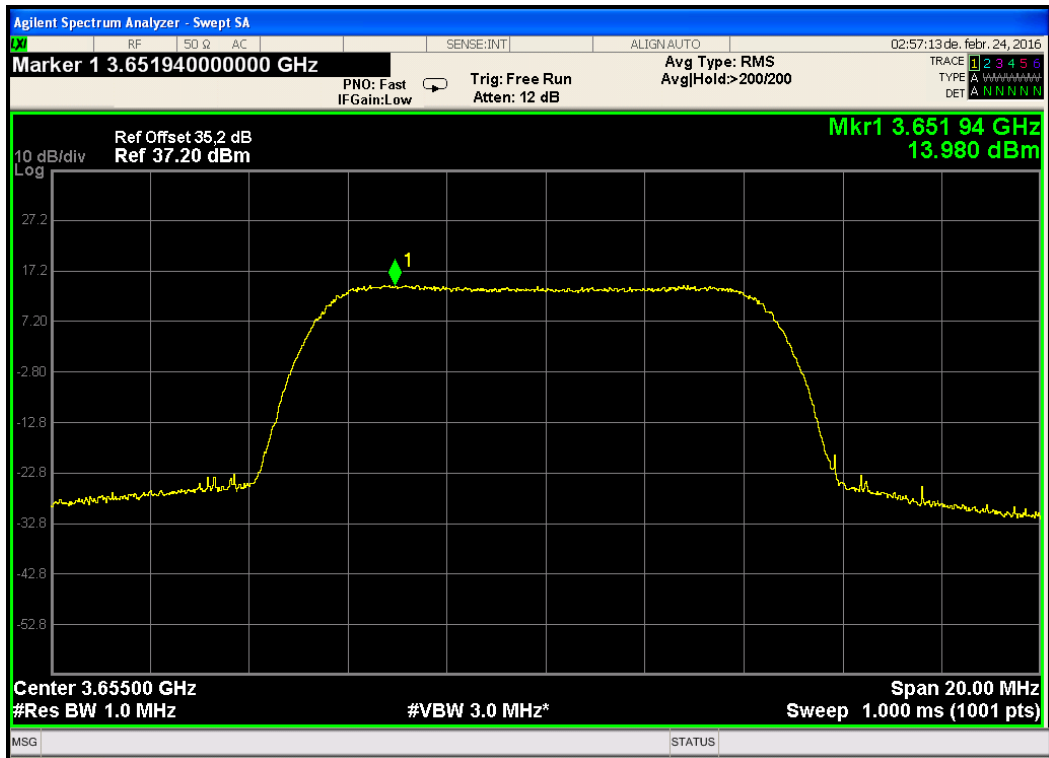


Figure 90. — 3655.0 MHz 16QAM - 10MHz CBW, High Population

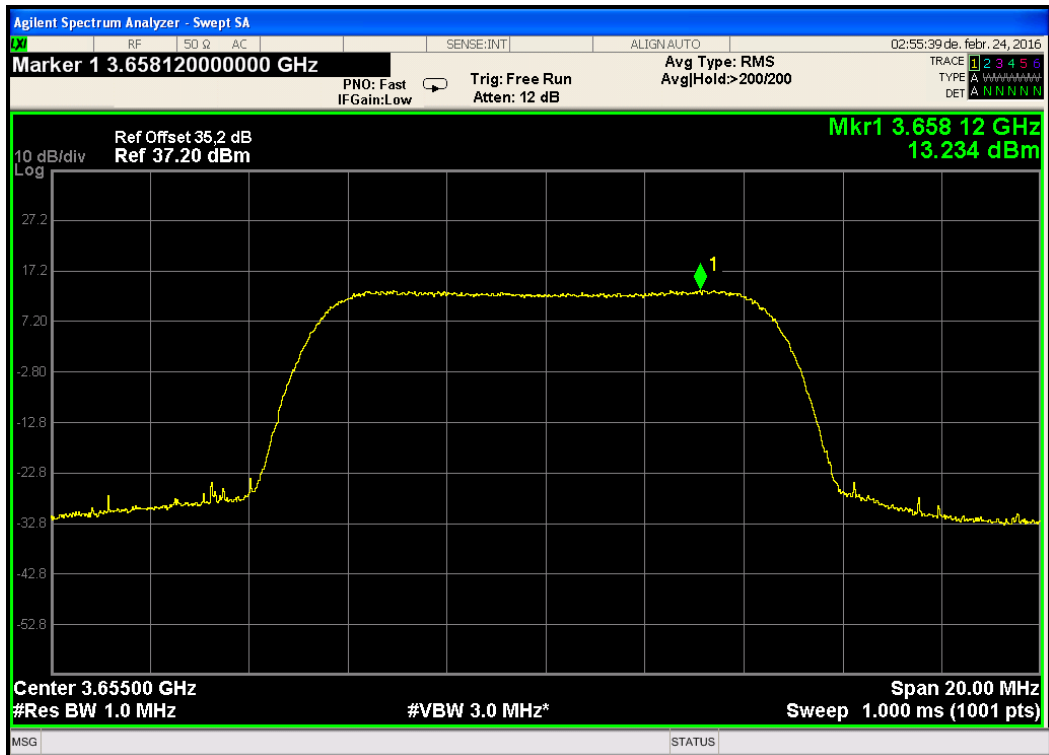


Figure 91. — 3655.0 MHz 64QAM - 10MHz CBW, High Population

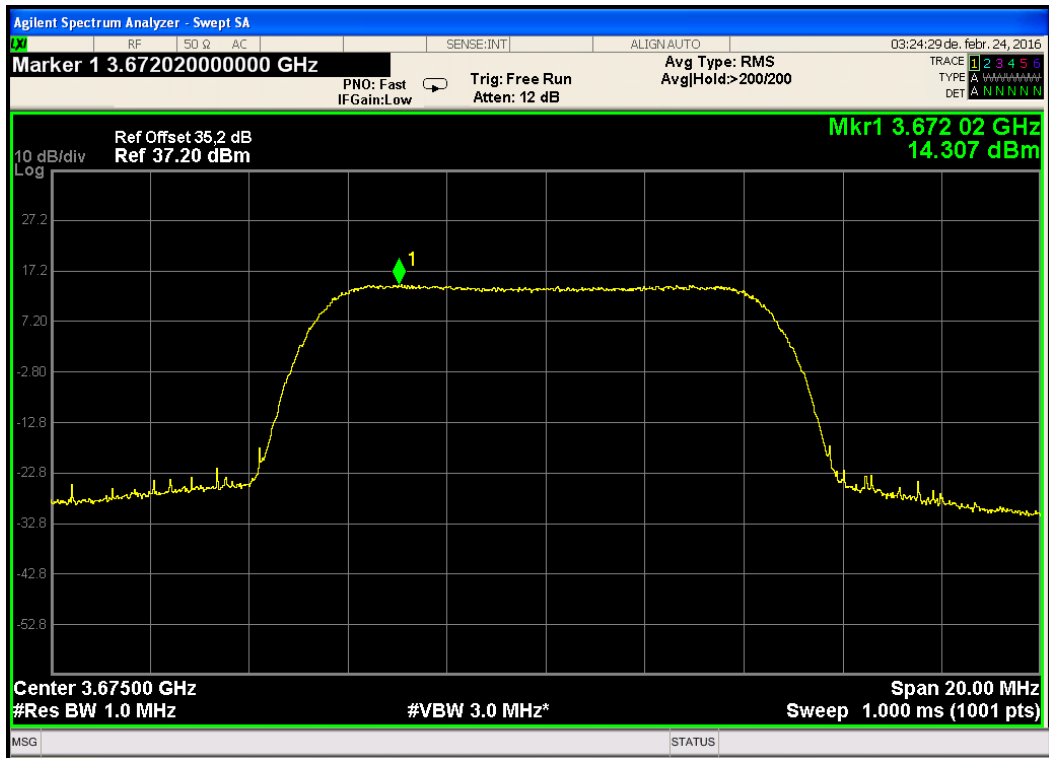


Figure 92. — 3675.0 MHz QPSK - 10MHz CBW, High Population

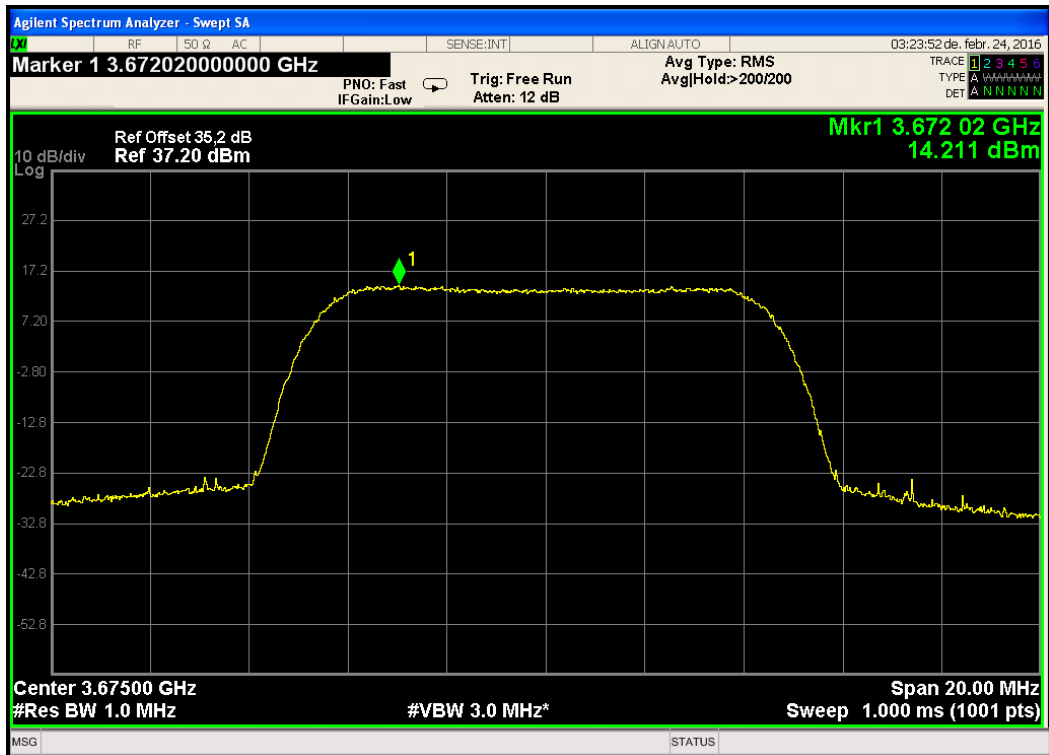


Figure 93. — 3675.0 MHz 16QAM - 10MHz CBW, High Population

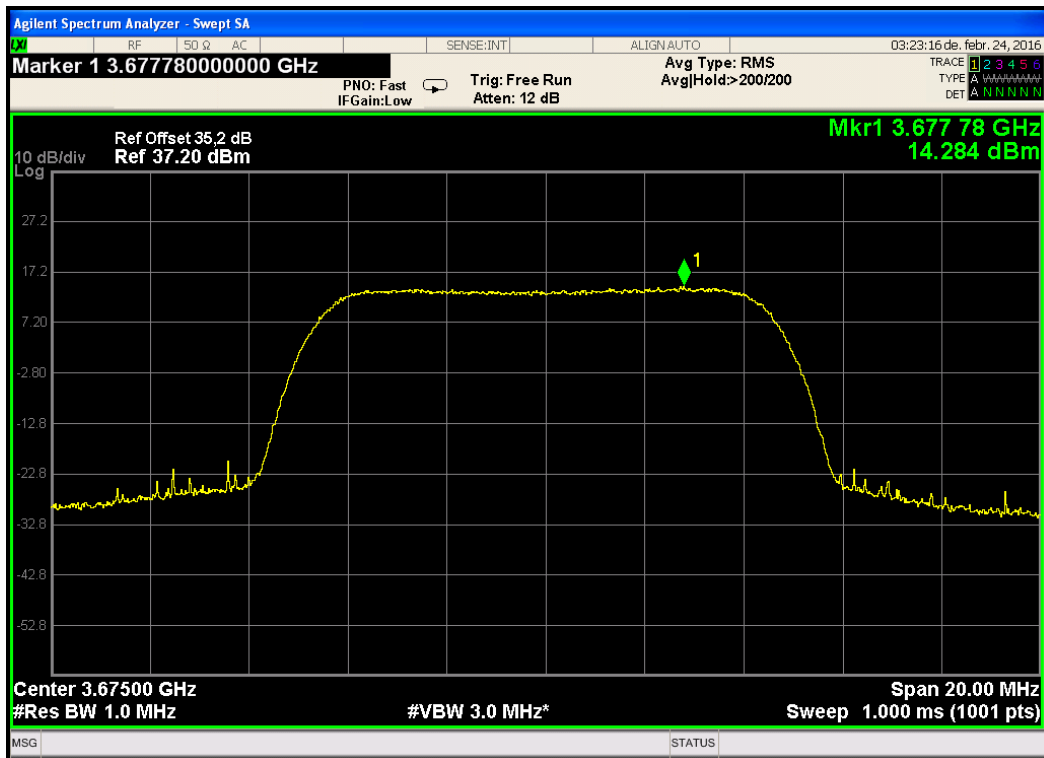


Figure 94. — 3675.0 MHz 64QAM - 10MHz CBW, High Population

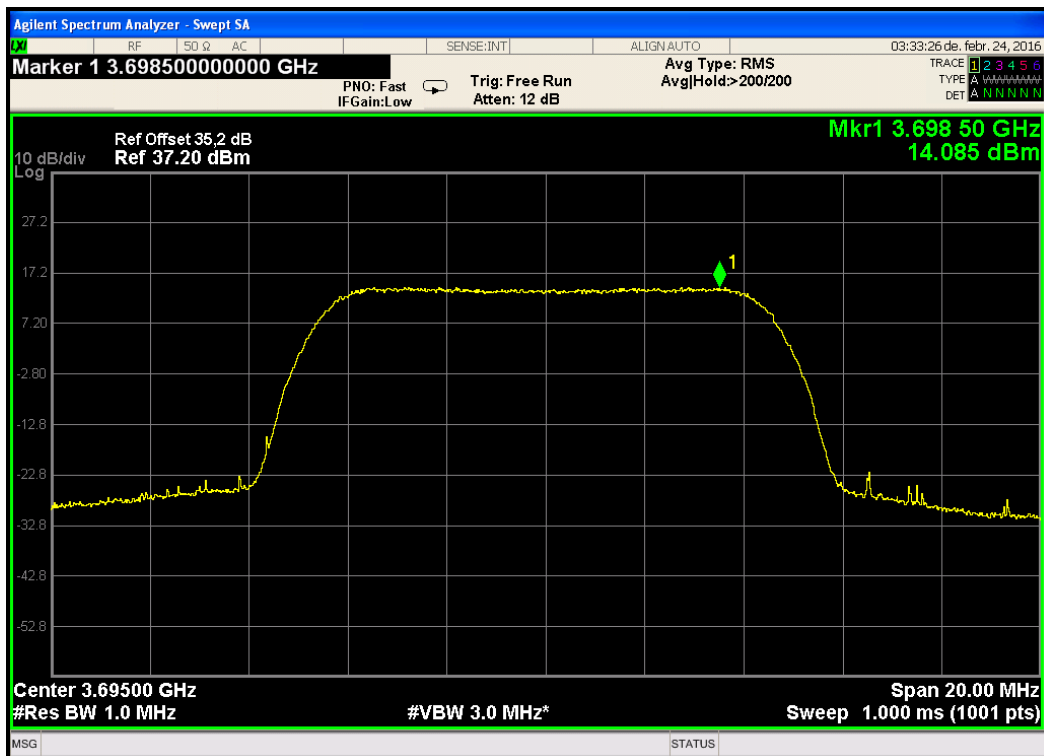


Figure 95. — 3695.0 MHz QPSK - 10MHz CBW, High Population

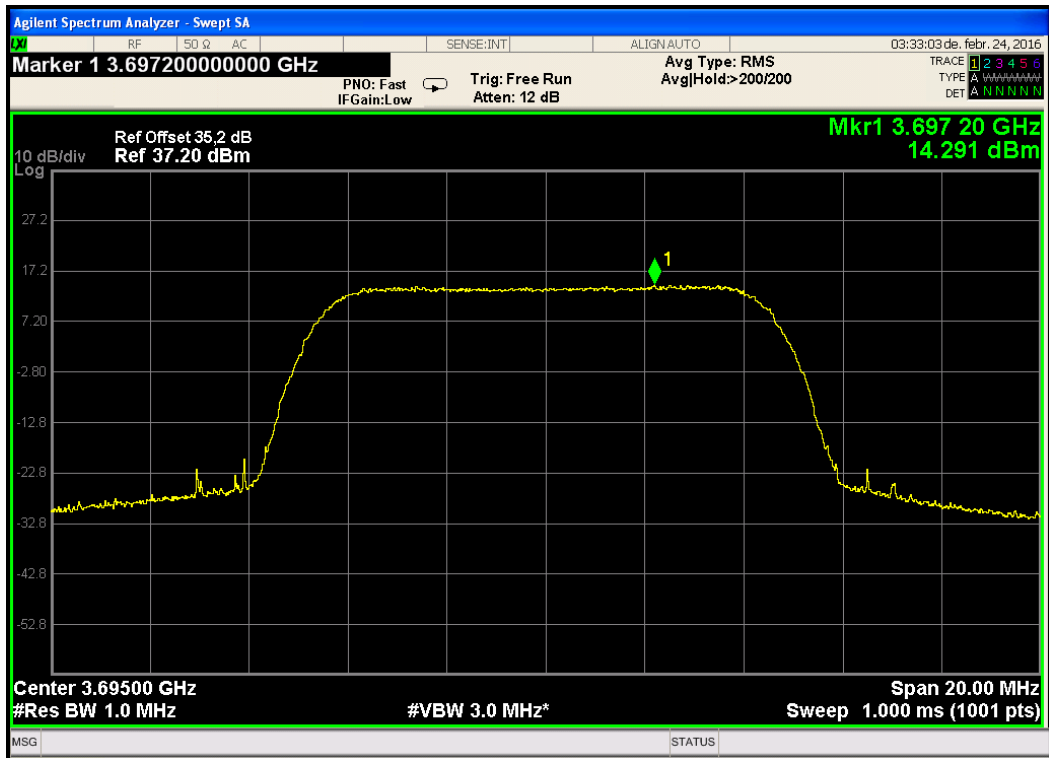


Figure 96. — 3695.0 MHz 16QAM - 10MHz CBW, High Population

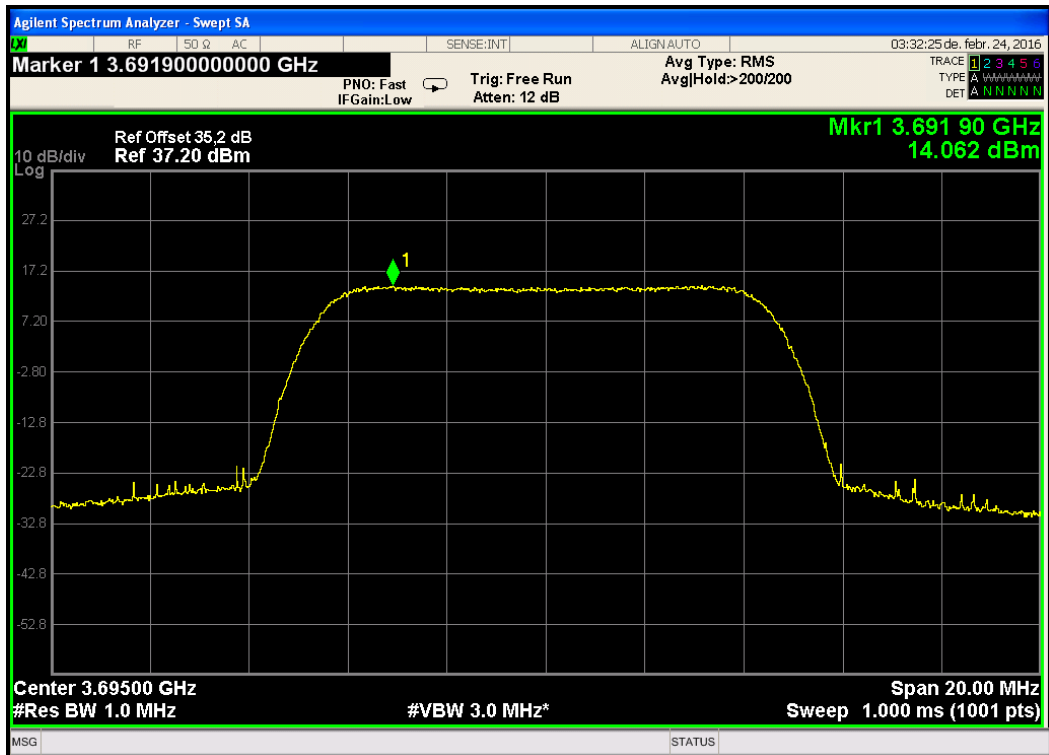


Figure 97. — 3695.0 MHz 64QAM - 10MHz CBW, High Population

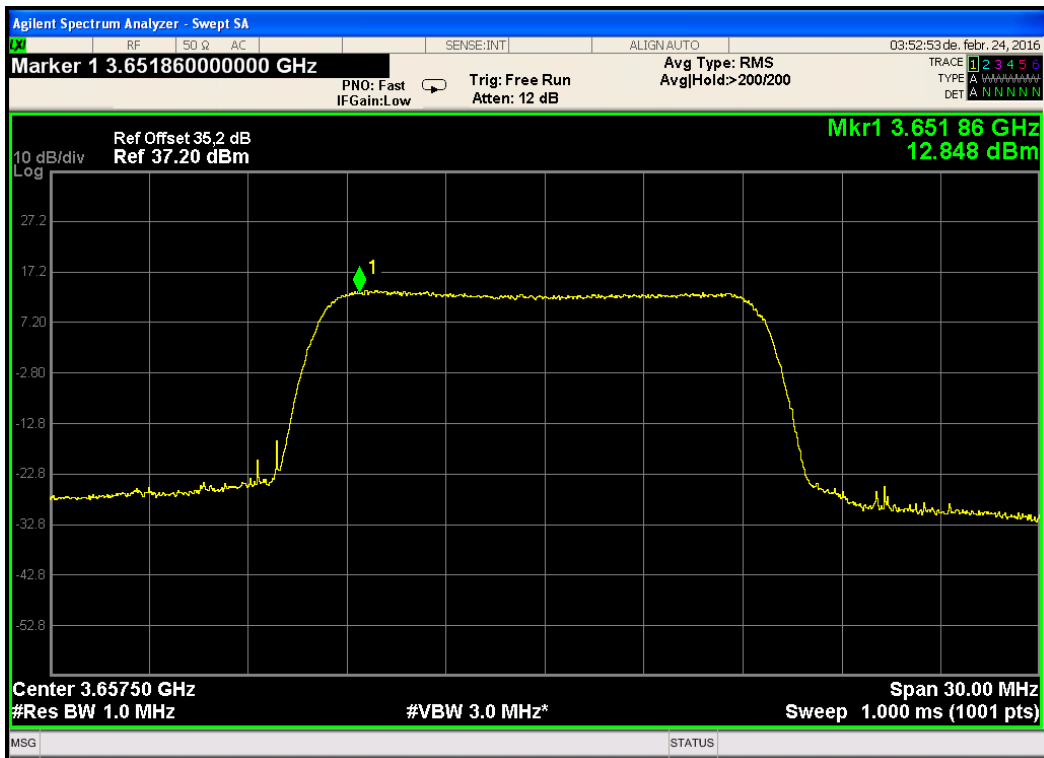


Figure 98. — 3657.5MHz QPSK - 15MHz CBW, High Population

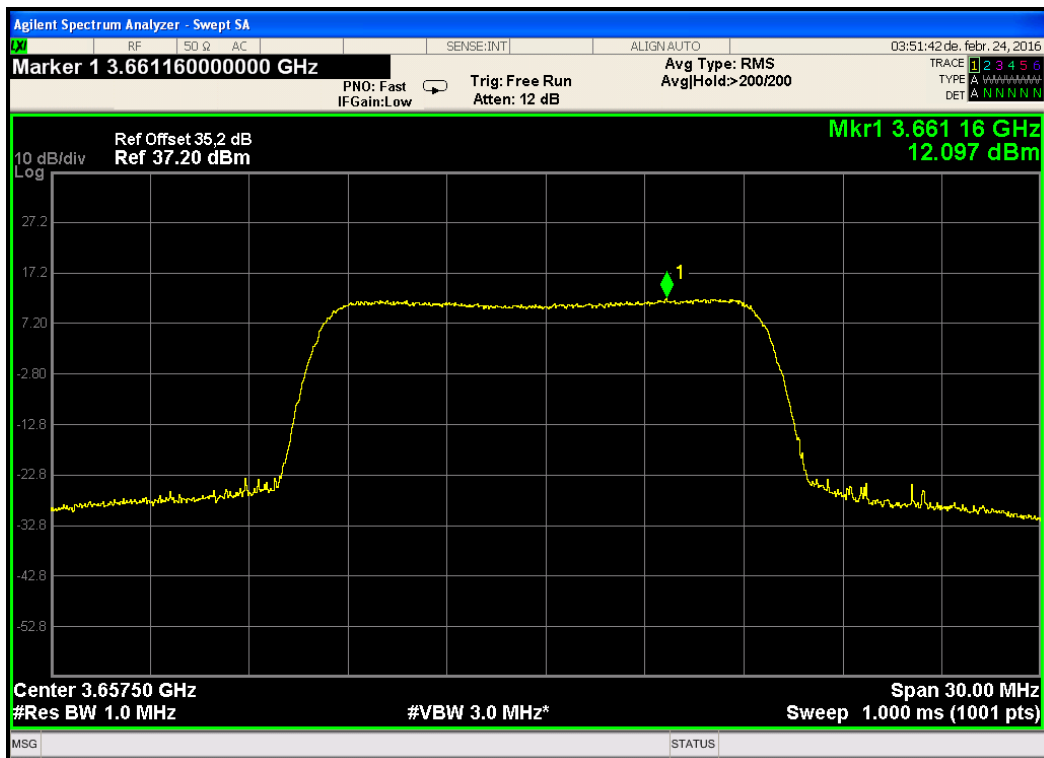


Figure 99. — 3657.5MHz 16QAM - 15MHz CBW, High Population

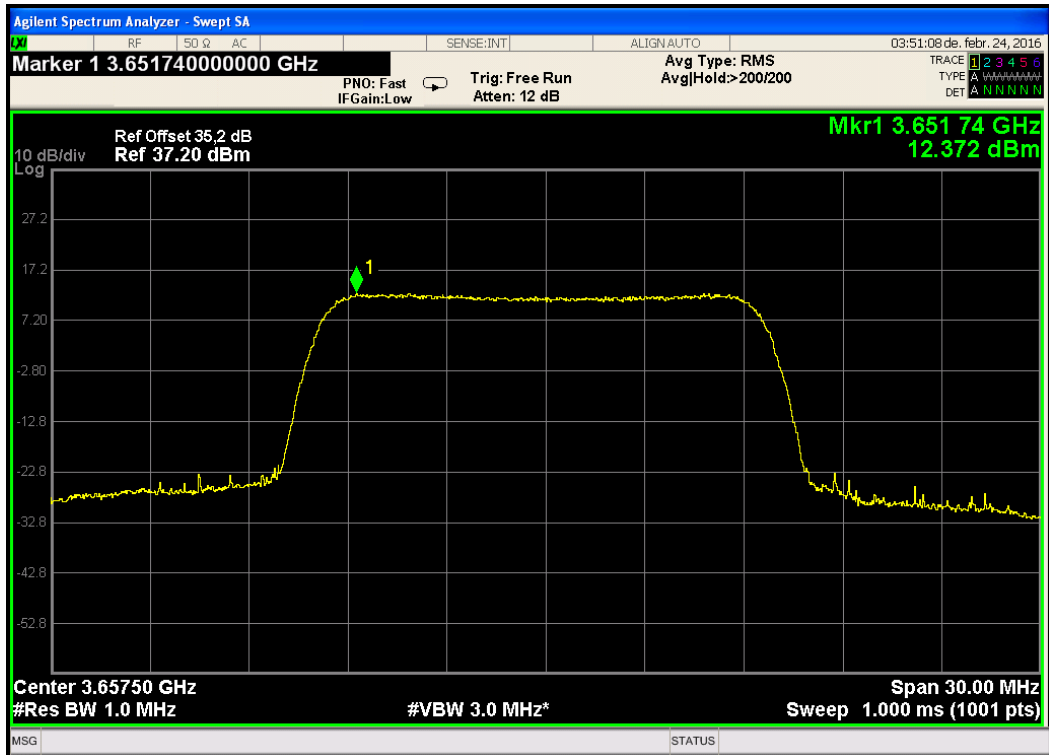


Figure 100. — 3657.5MHz 64QAM - 15MHz CBW, High Population

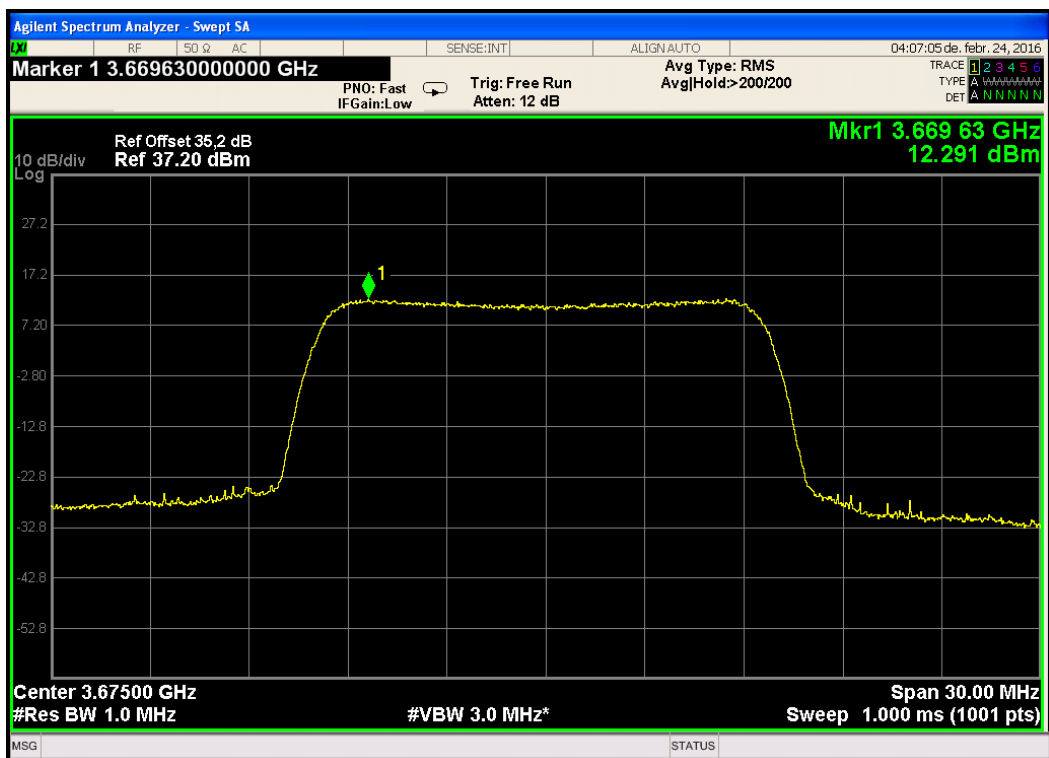


Figure 101. — 3675.0MHz QPSK - 15MHz CBW, High Population



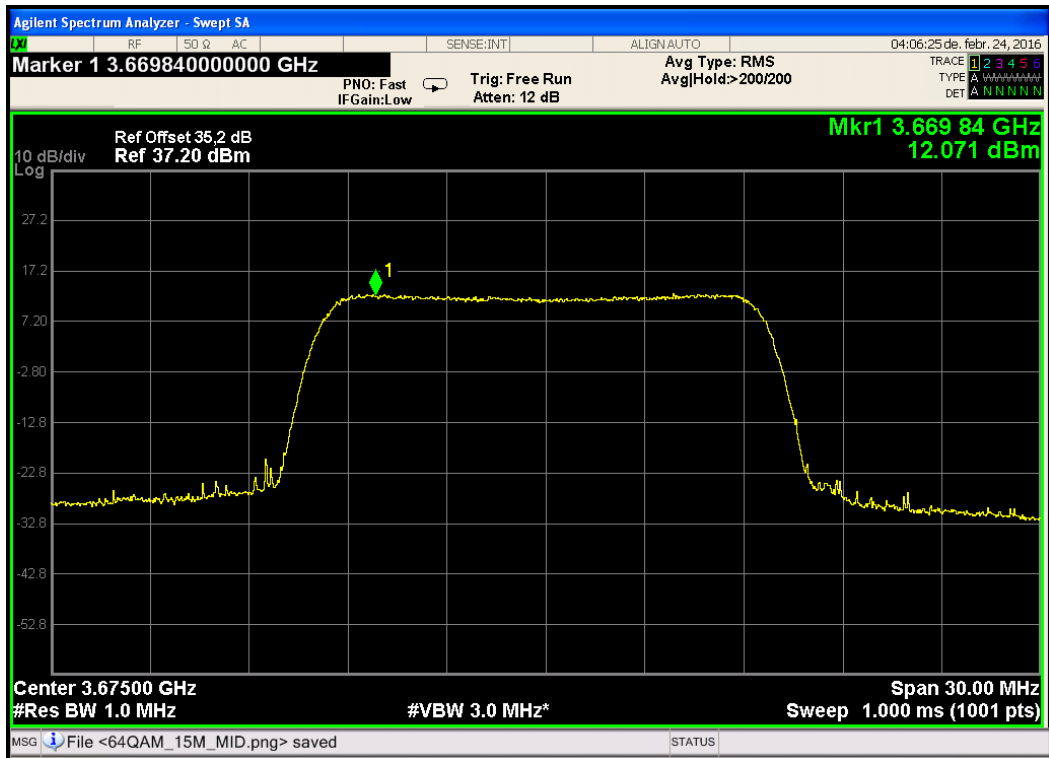


Figure 102. — 3675.0MHz 16QAM - 15MHz CBW, High Population

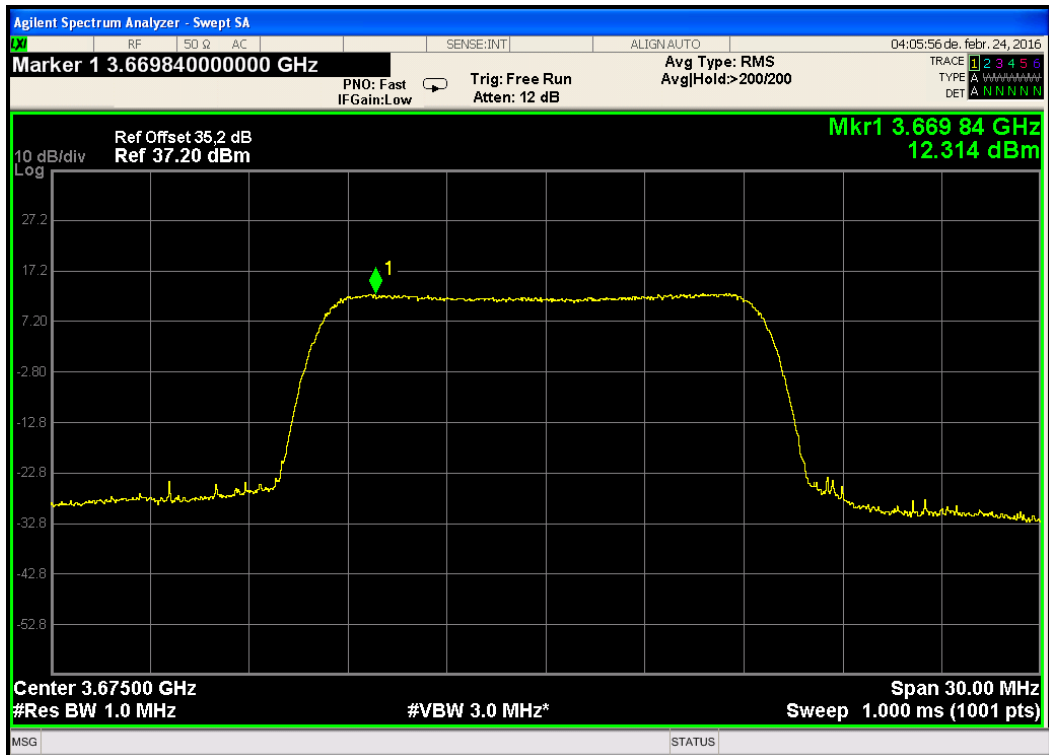


Figure 103. — 3675.0MHz 64QAM - 15MHz CBW, High Population

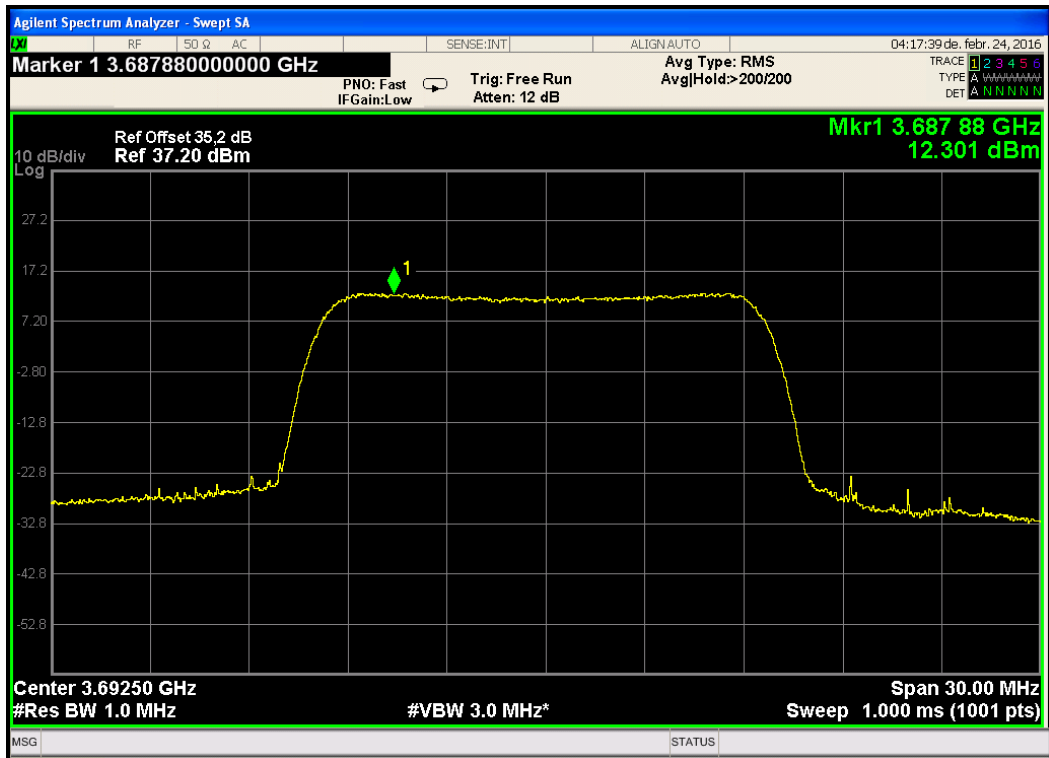


Figure 104. — 3692.5MHz QPSK - 15MHz CBW, High Population

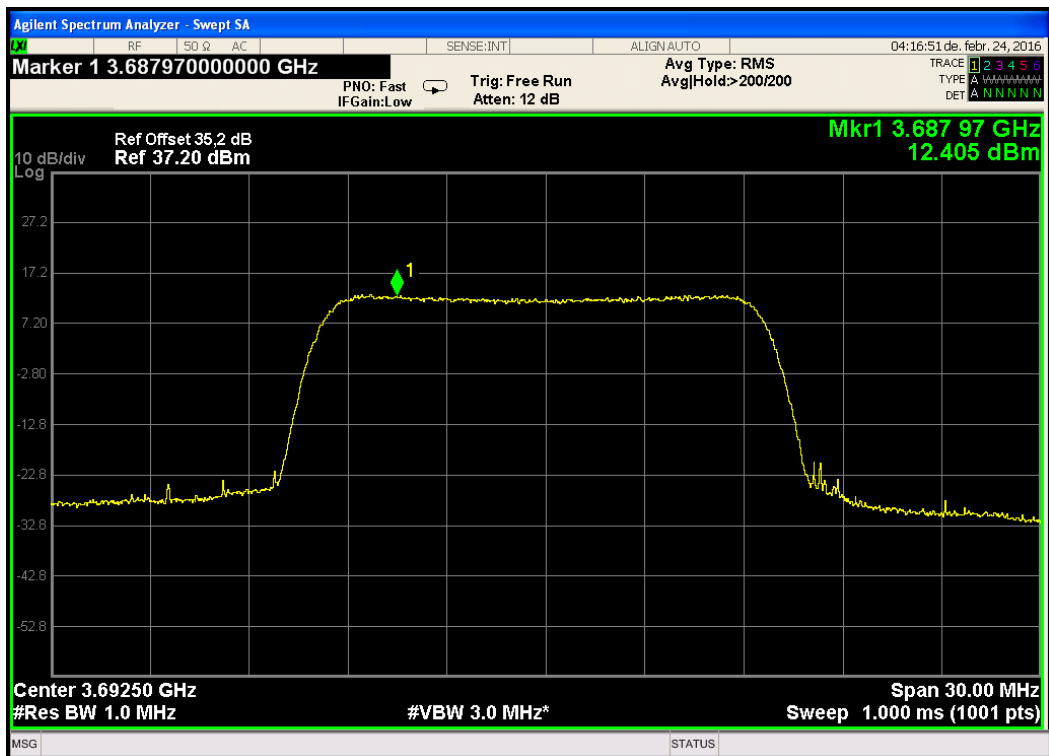


Figure 105. — 3692.5MHz 16QAM - 15MHz CBW, High Population

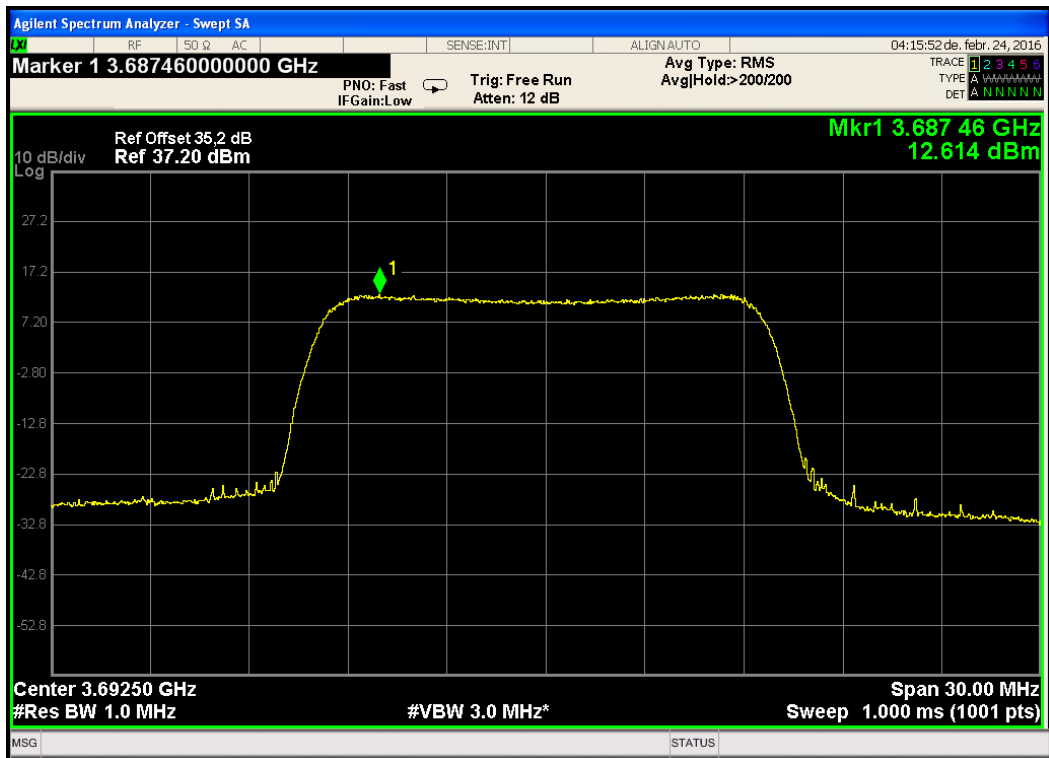


Figure 106. — 3692.5MHz 64QAM - 15MHz CBW, High Population

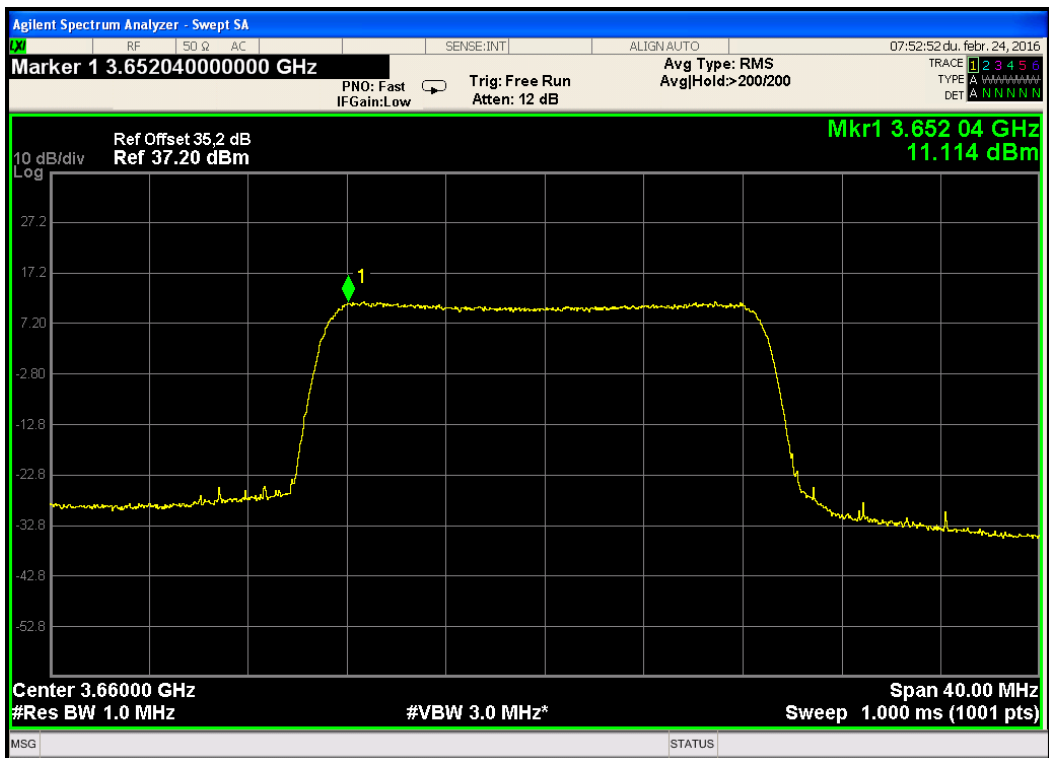


Figure 107. — 3660.0MHz QPSK - 20MHz CBW, High Population

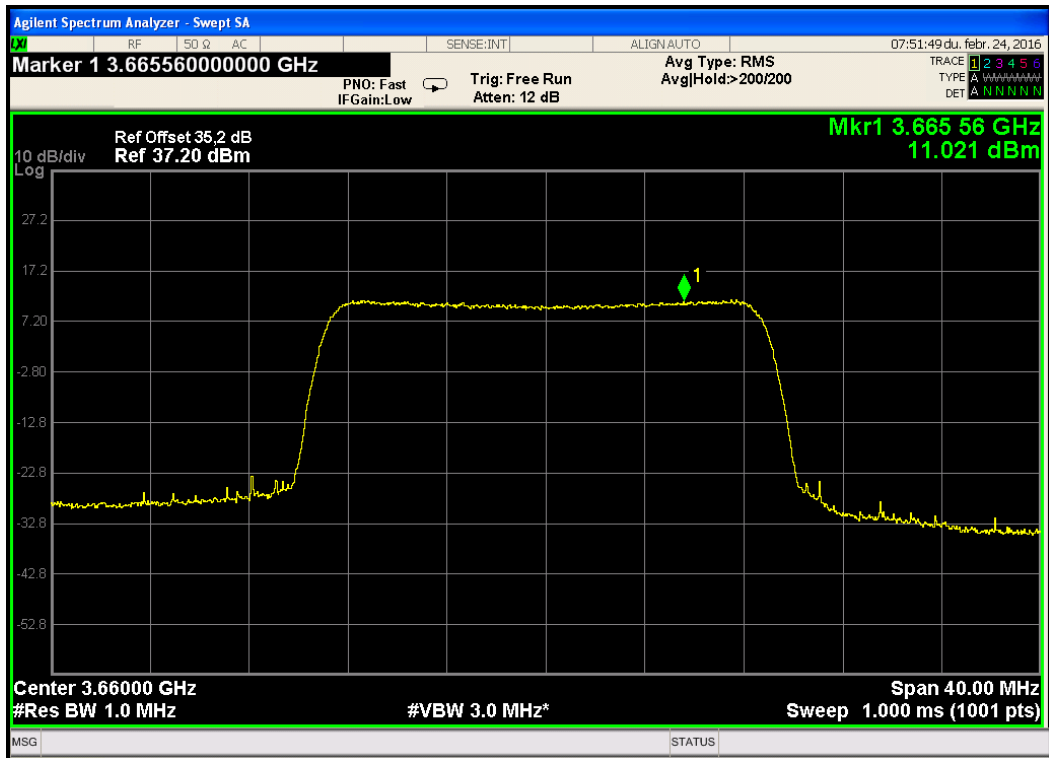


Figure 108. — 3660.0MHz 16QAM - 20MHz CBW, High Population

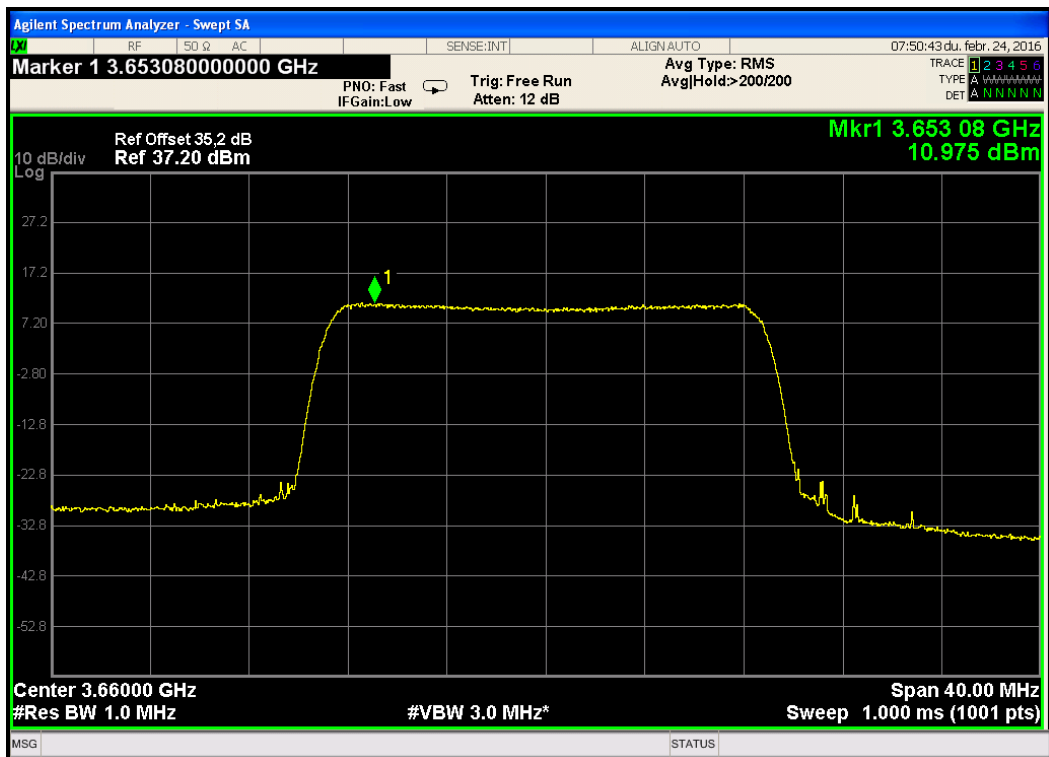


Figure 109. — 3660.0MHz 64QAM - 20MHz CBW, High Population

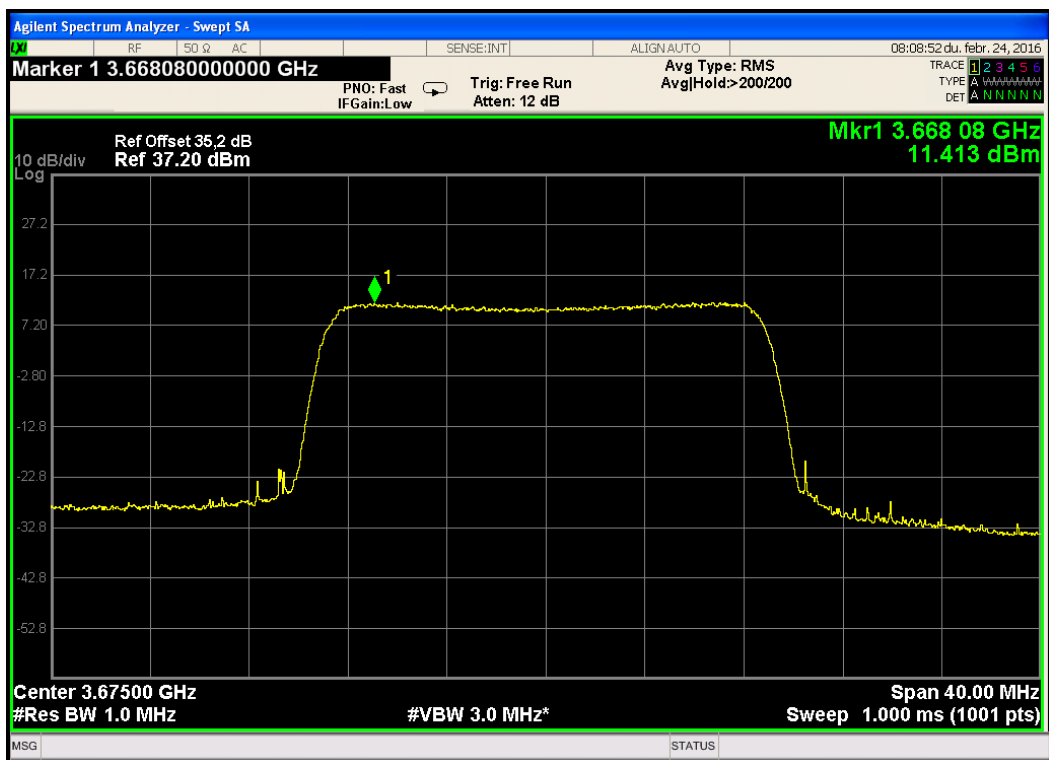


Figure 110. — 3675.0MHz QPSK - 20MHz CBW, High Population

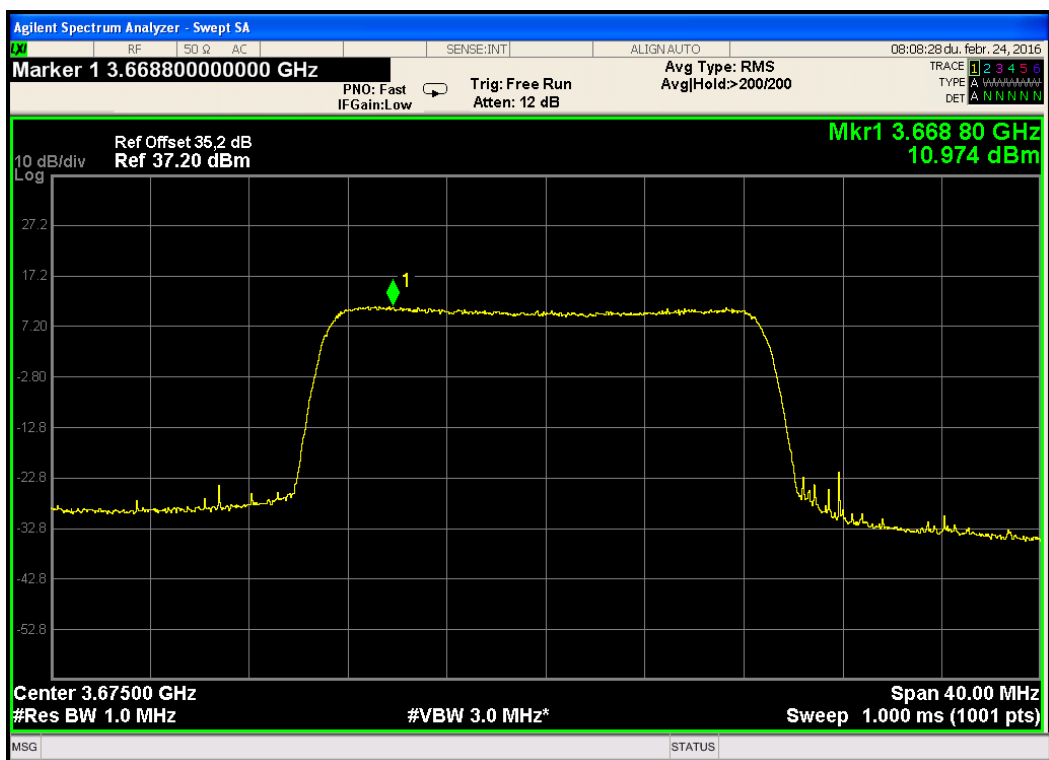


Figure 111. — 3675.0MHz 16QAM - 20MHz CBW, High Population

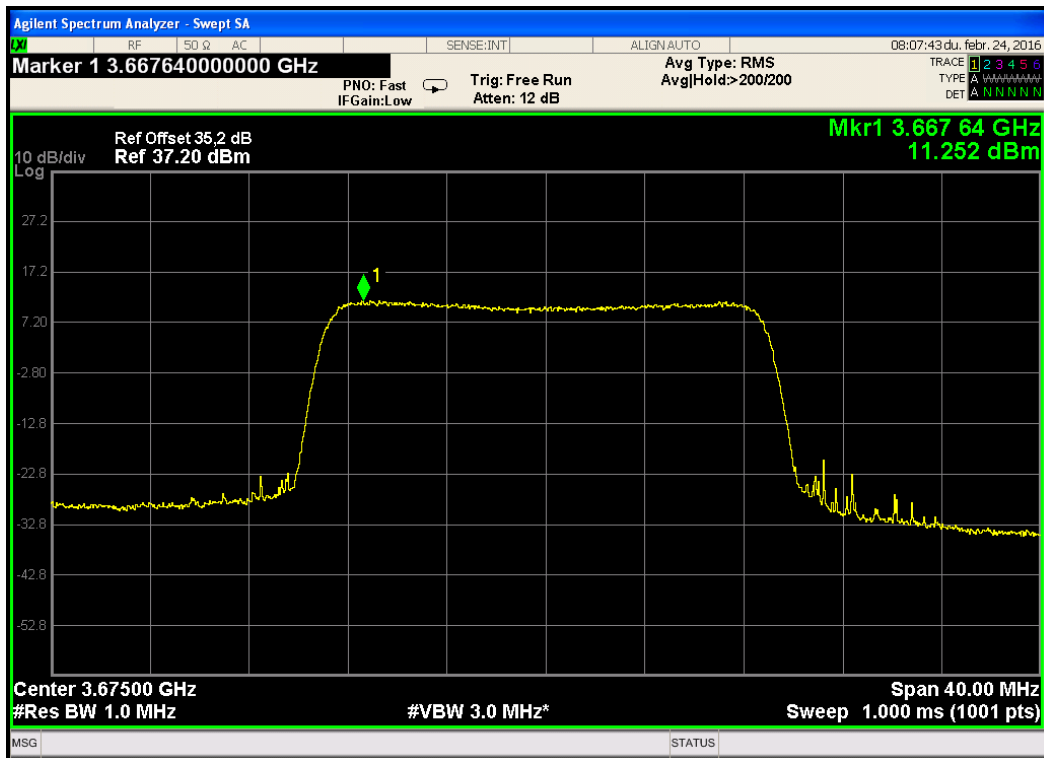


Figure 112. — 3675.0MHz 64QAM - 20MHz CBW, High Population

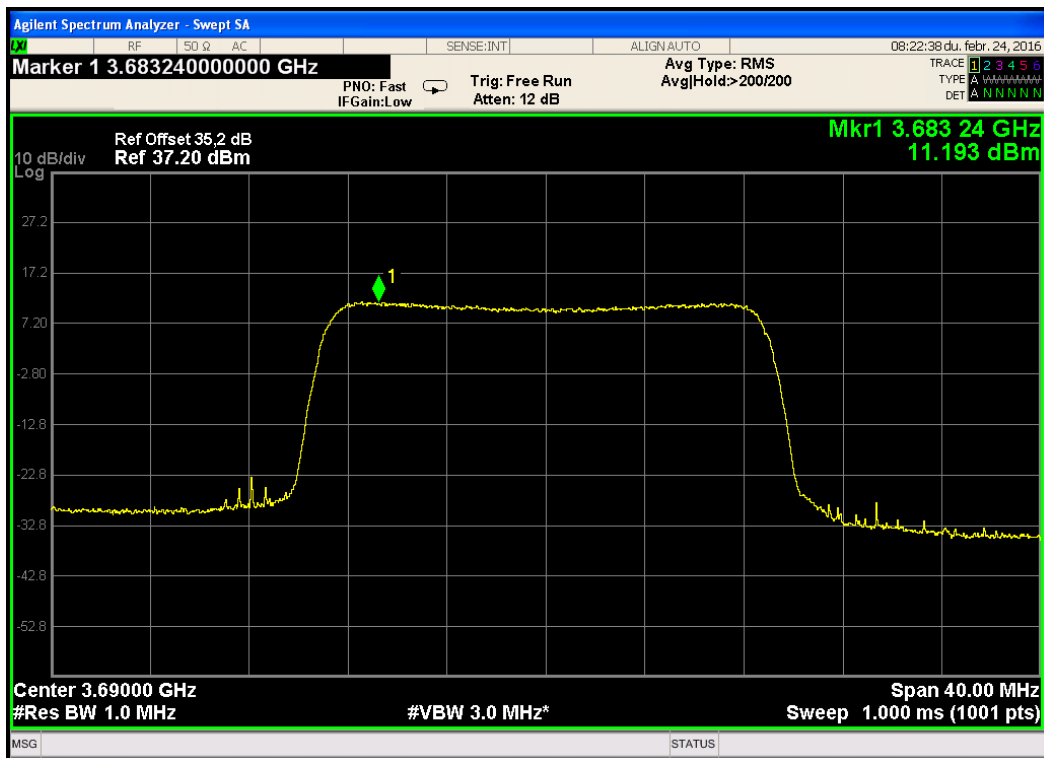


Figure 113. — 3690.0MHz QPSK - 20MHz CBW, High Population

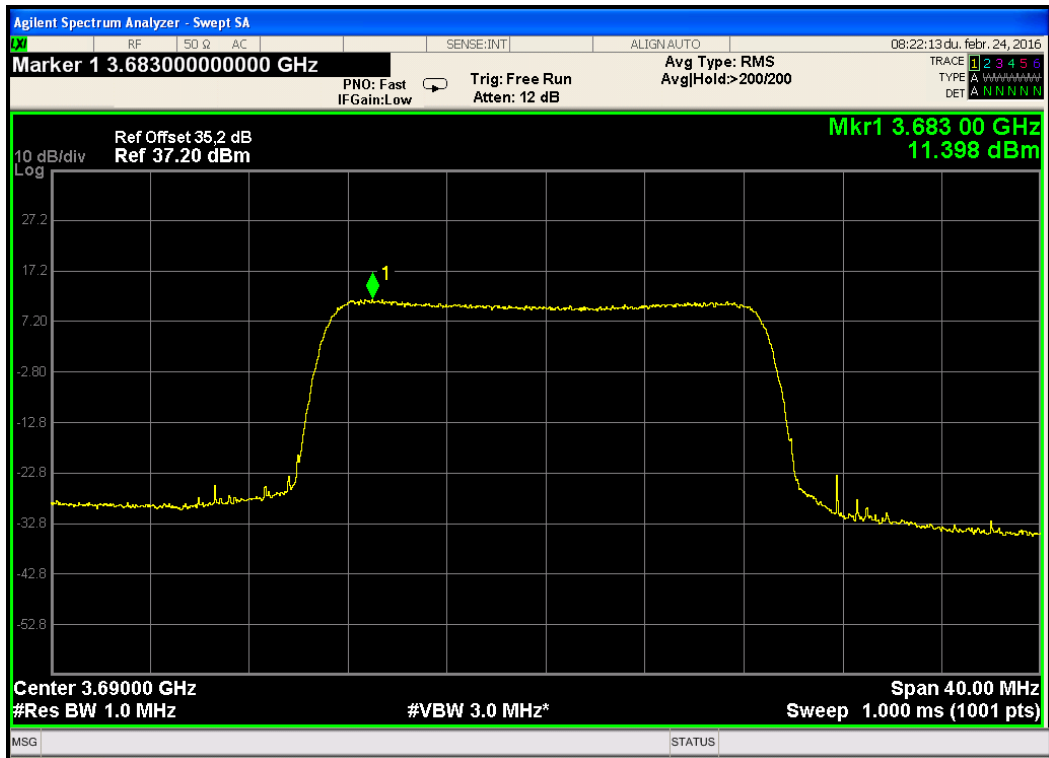


Figure 114. — 3690.0MHz 16QAM - 20MHz CBW, High Population

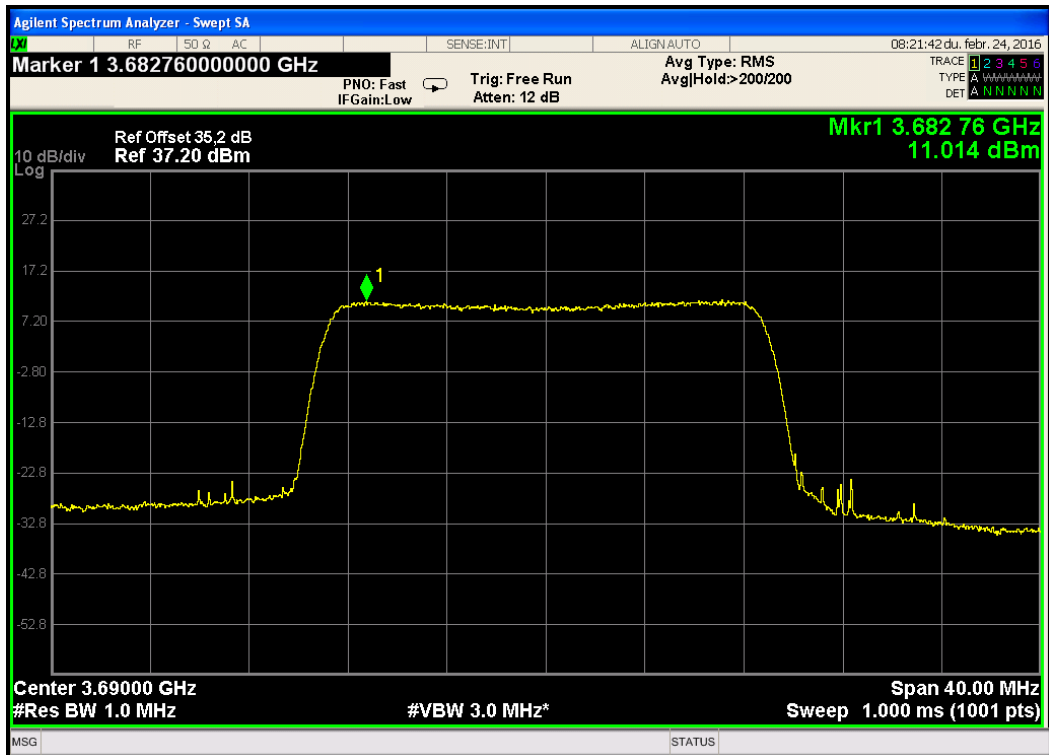


Figure 115. — 3690.0MHz 64QAM - 20MHz CBW, High Population

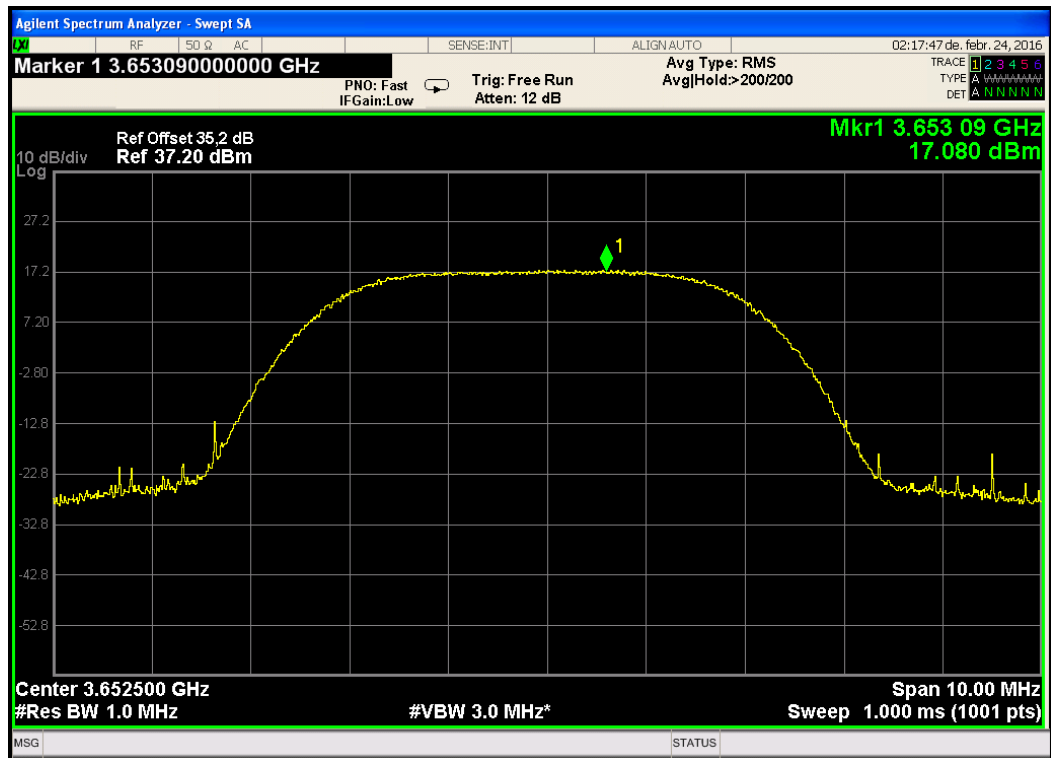


Figure 116. — 3652.5 MHz QPSK - 5MHz CBW, Low Population

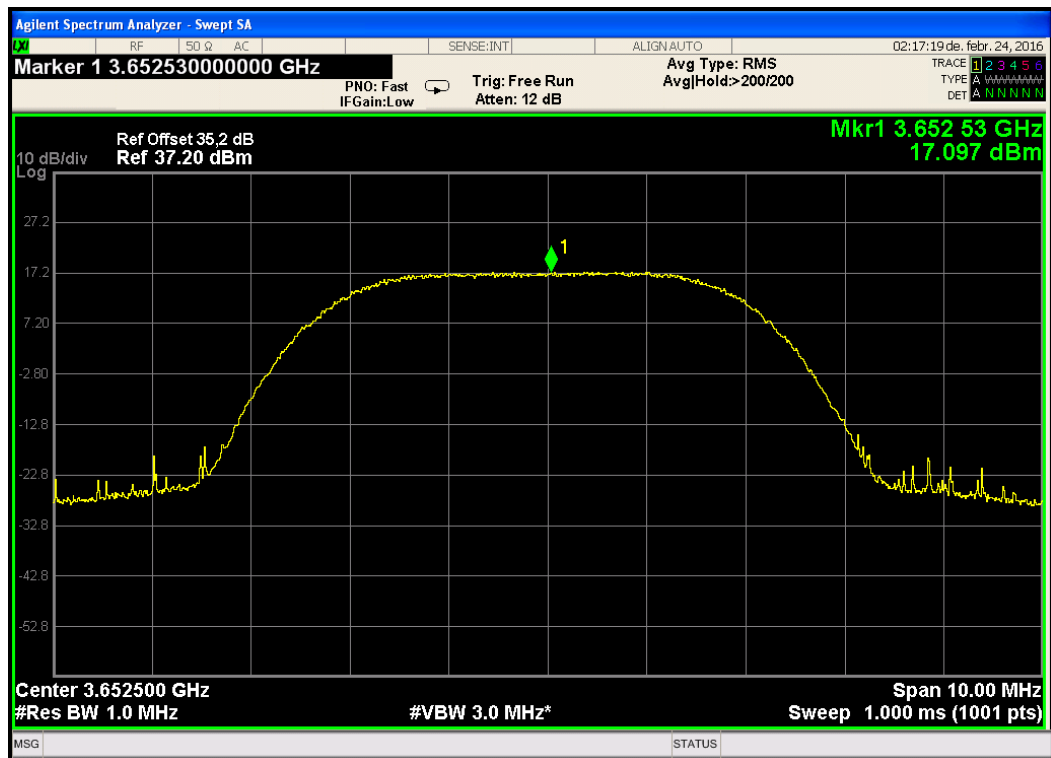


Figure 117. — 3652.5 MHz 16QAM - 5MHz CBW, Low Population



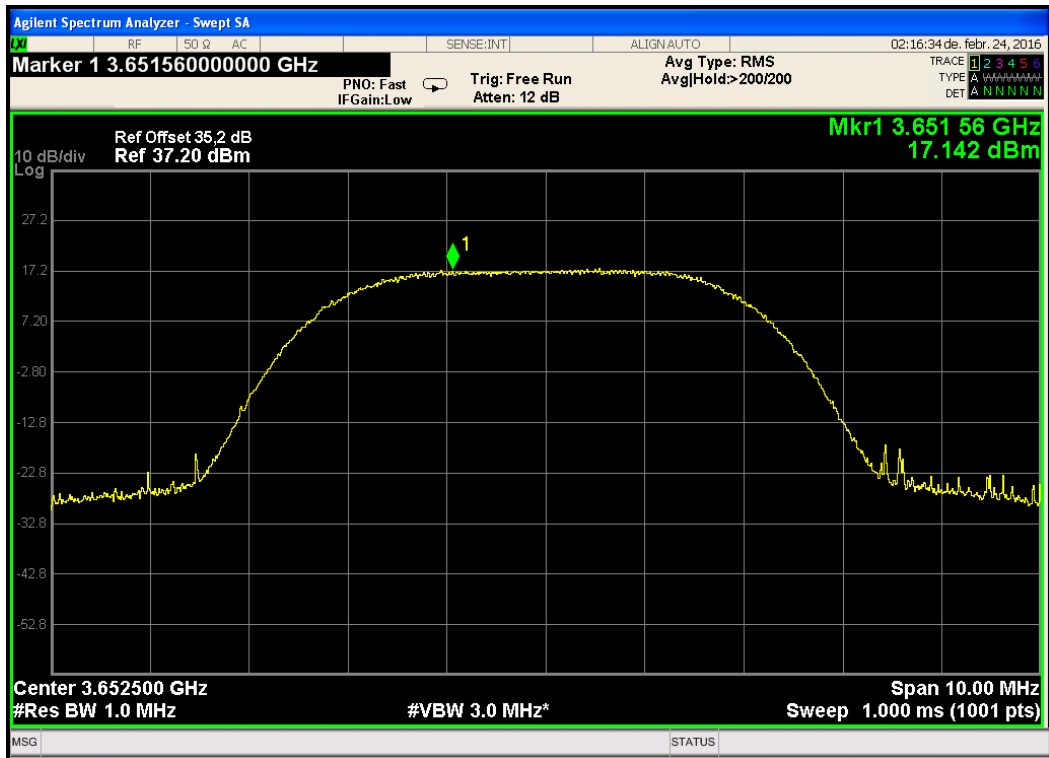


Figure 118. — 3652.5 MHz 64QAM - 5MHz CBW, Low Population

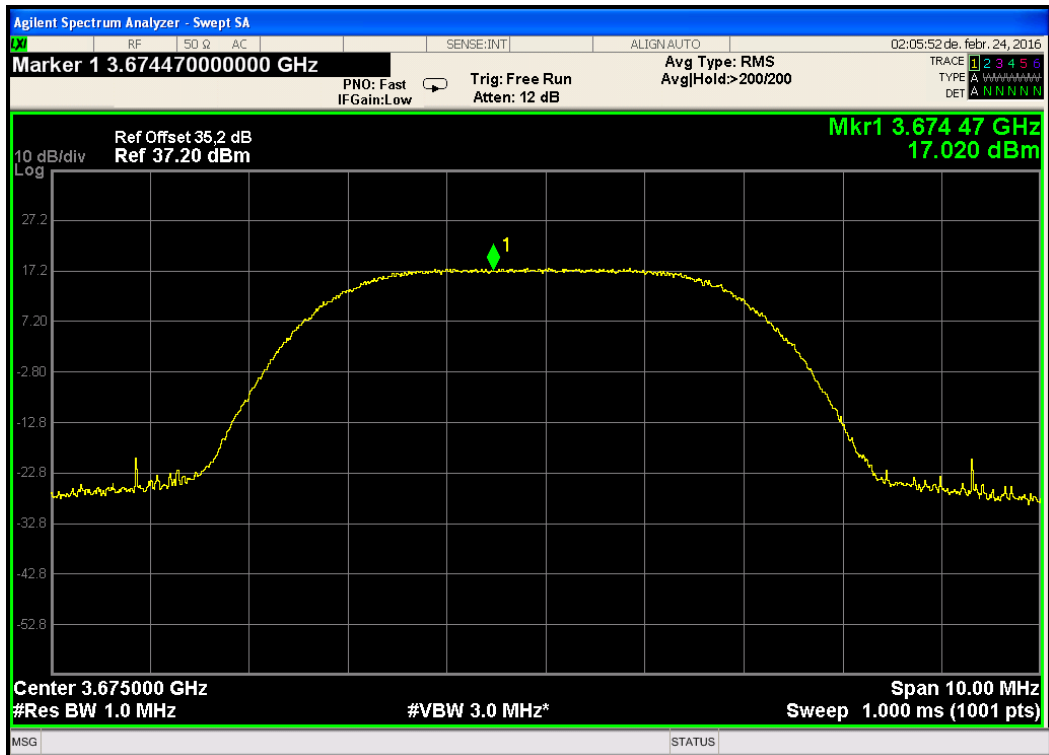


Figure 119. — 3675.0 MHz QPSK - 5MHz CBW, Low Population

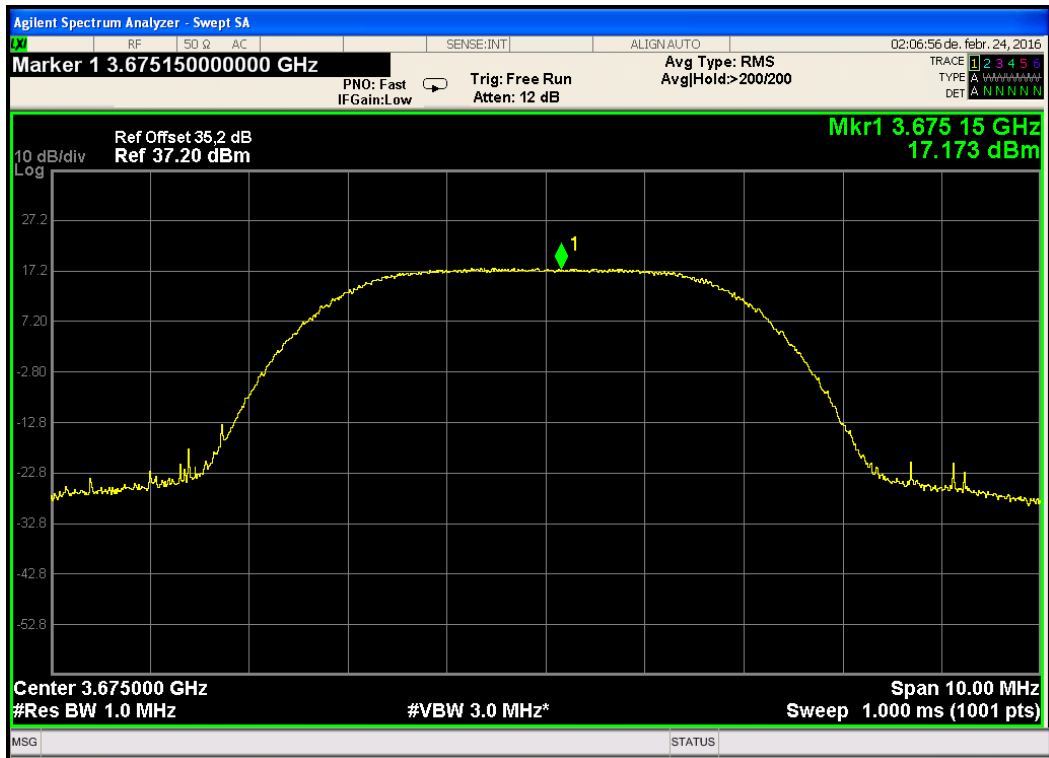


Figure 120. — 3675.0 MHz 16QAM - 5MHz CBW, Low Population

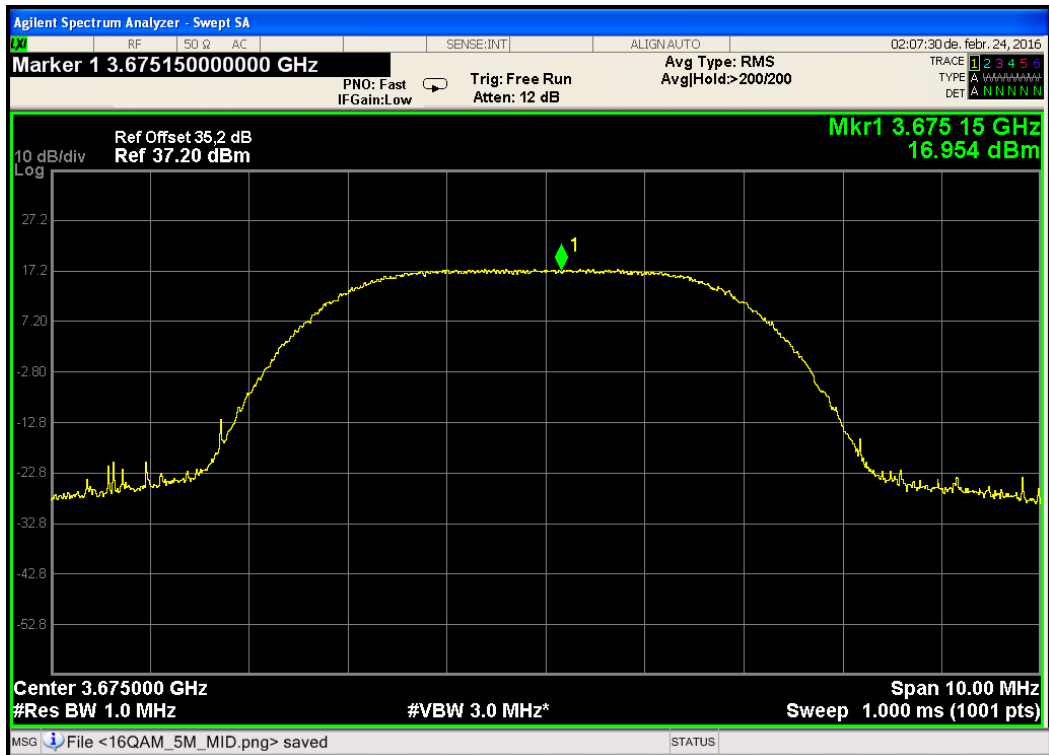


Figure 121. — 3675.0 MHz 64QAM - 5MHz CBW, Low Population

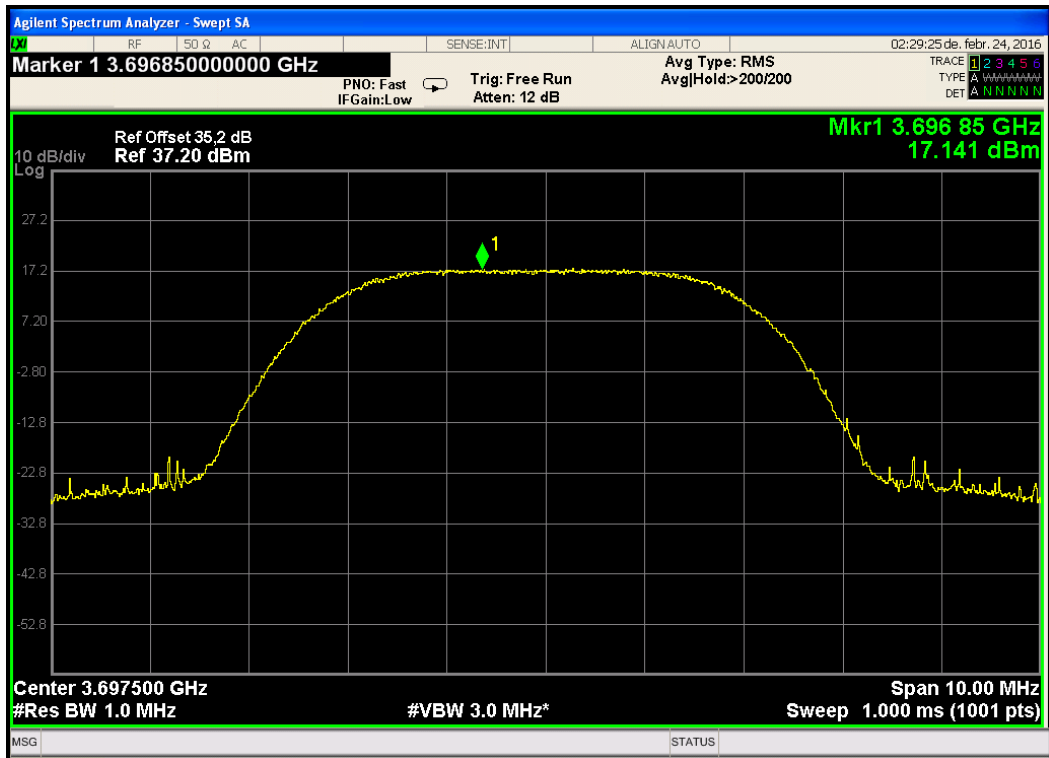


Figure 122. — 3697.5 MHz QPSK - 5MHz CBW, Low Population

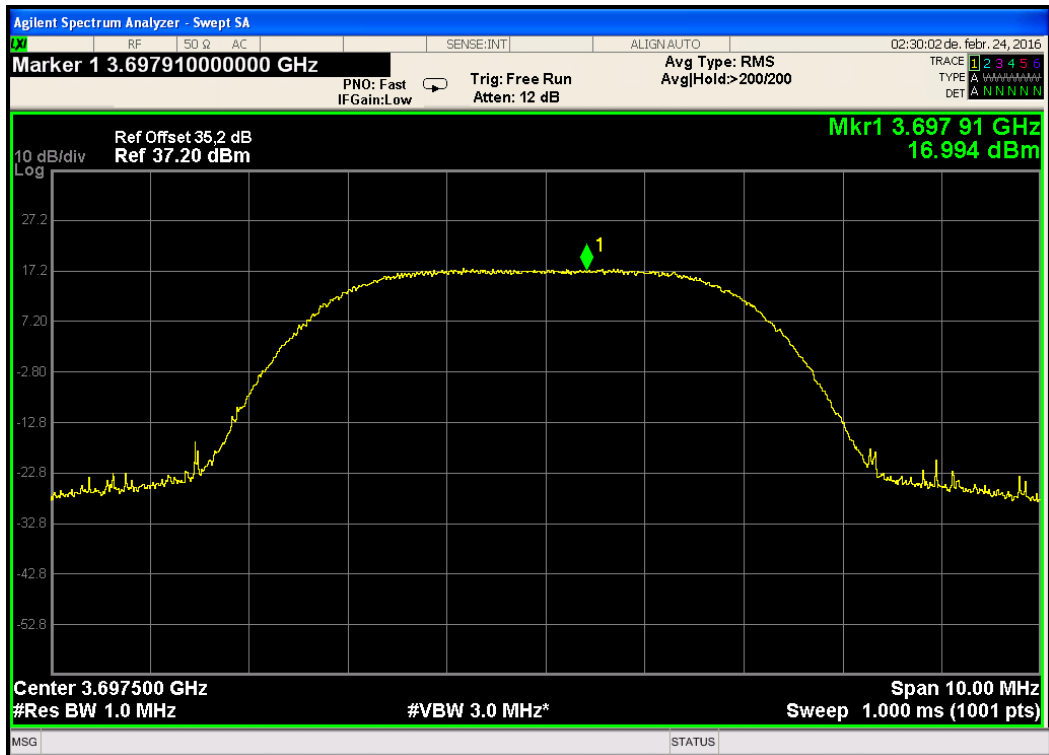


Figure 123. — 3697.5 MHz 16QAM - 5MHz CBW, Low Population

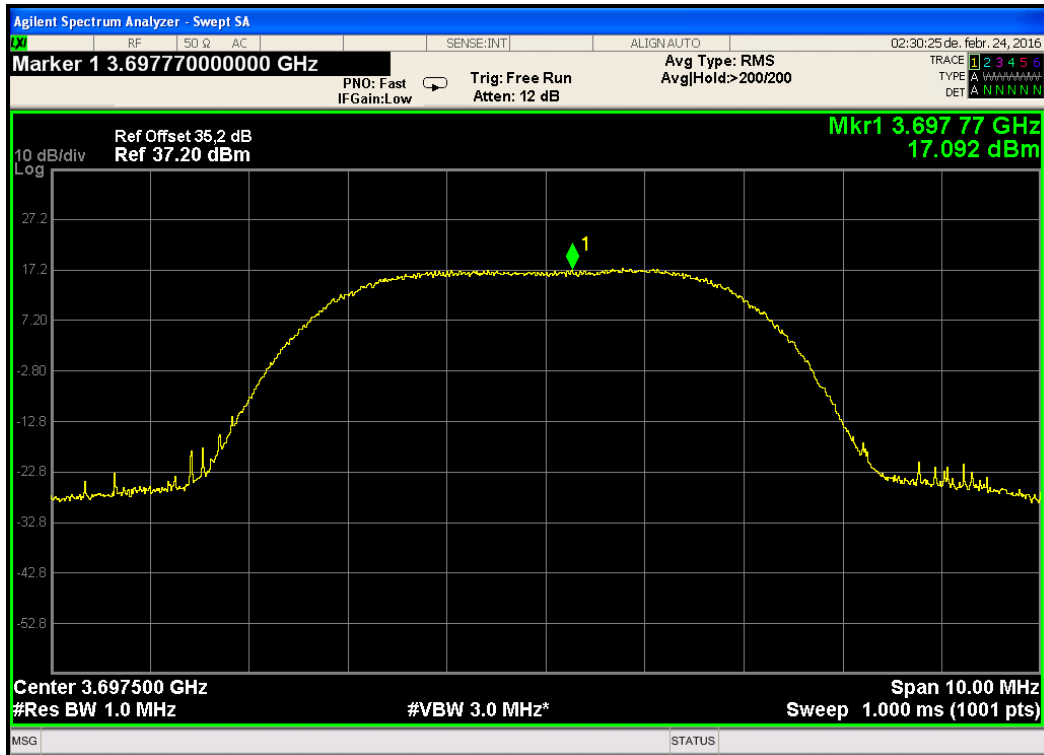


Figure 124. — 3697.5 MHz 64QAM - 5MHz CBW, Low Population

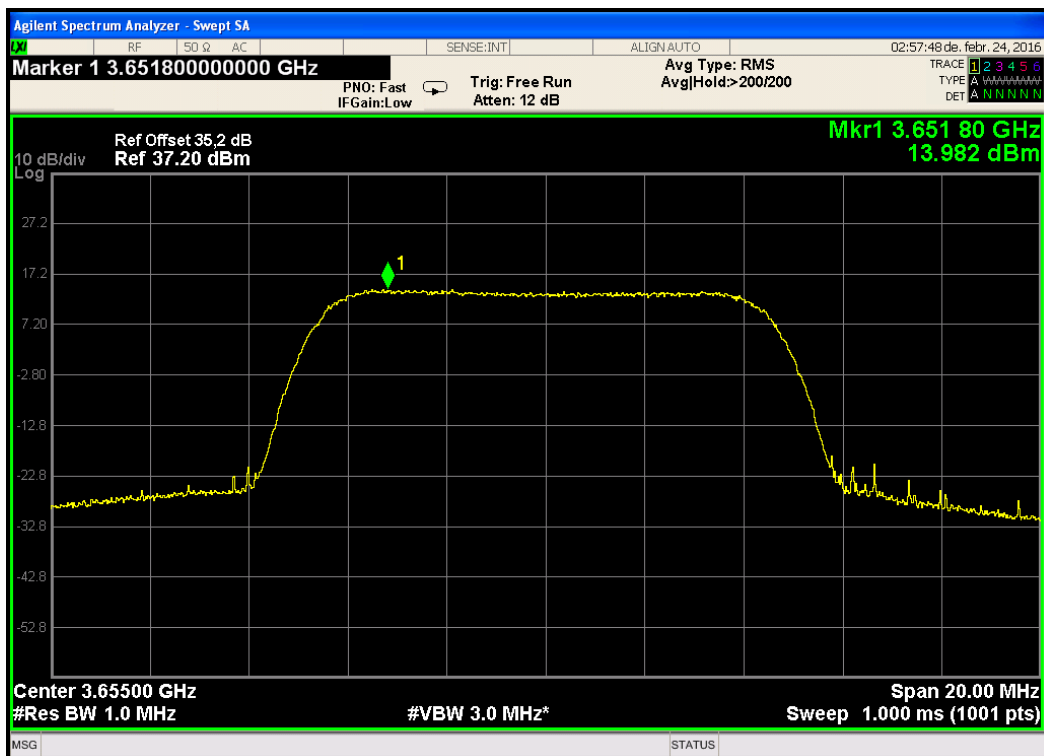


Figure 125. — 3655.0 MHz QPSK - 10MHz CBW, Low Population

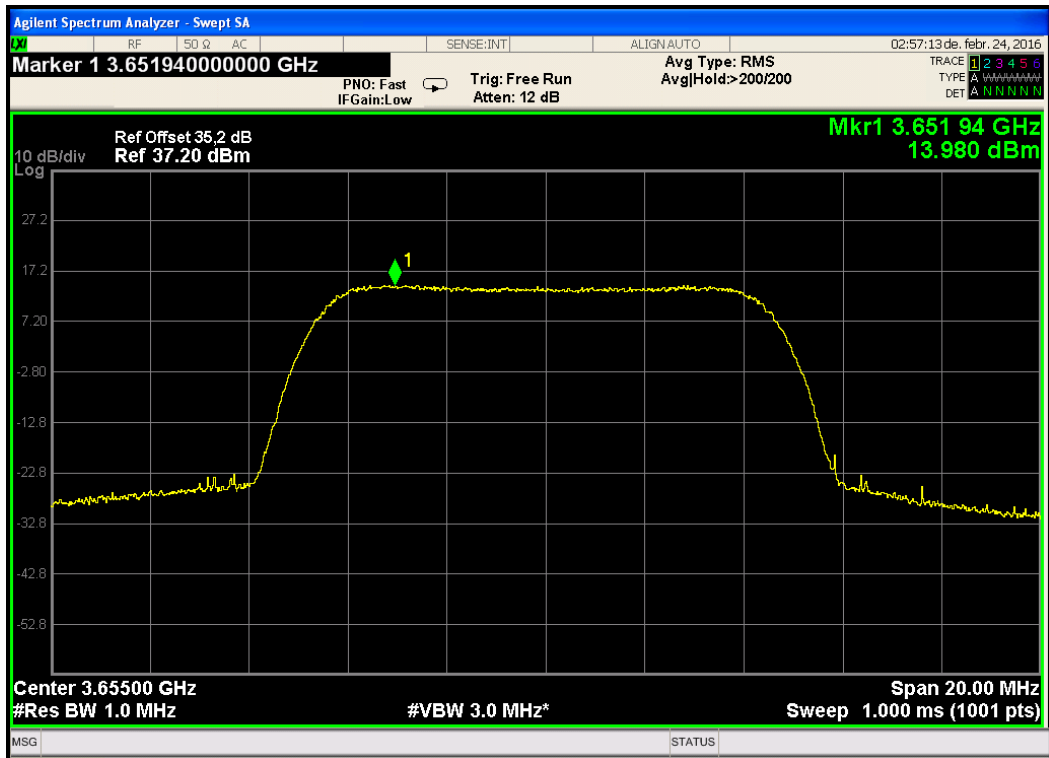


Figure 126. — 3655.0 MHz 16QAM - 10MHz CBW, Low Population

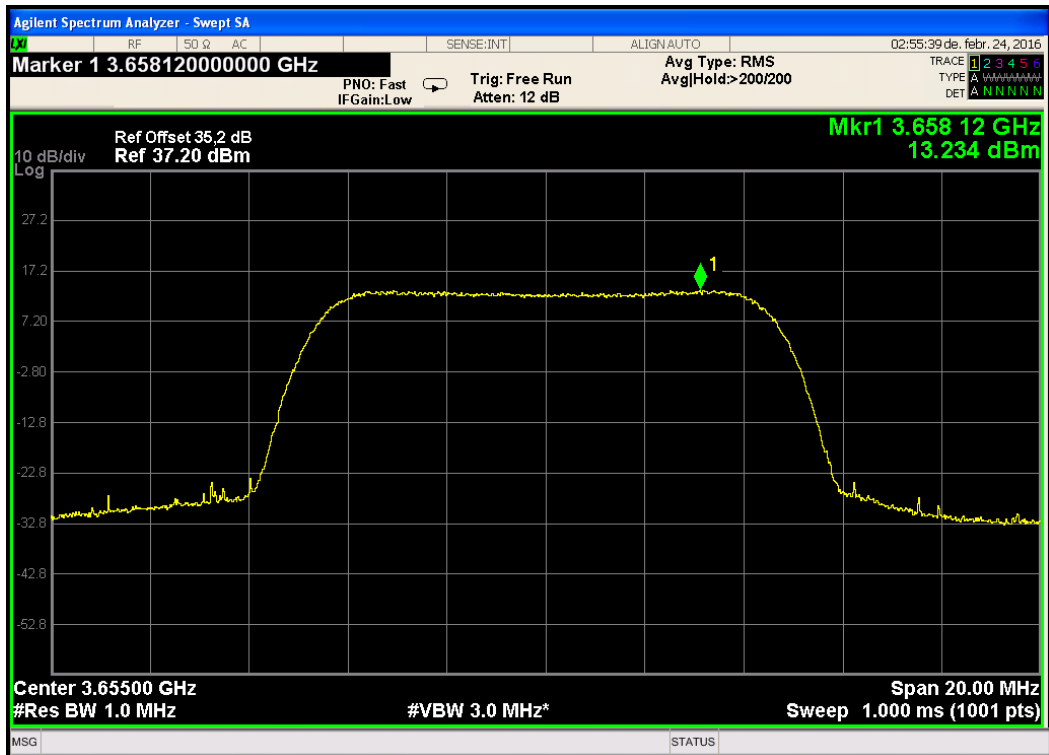


Figure 127. — 3655.0 MHz 64QAM - 10MHz CBW, Low Population

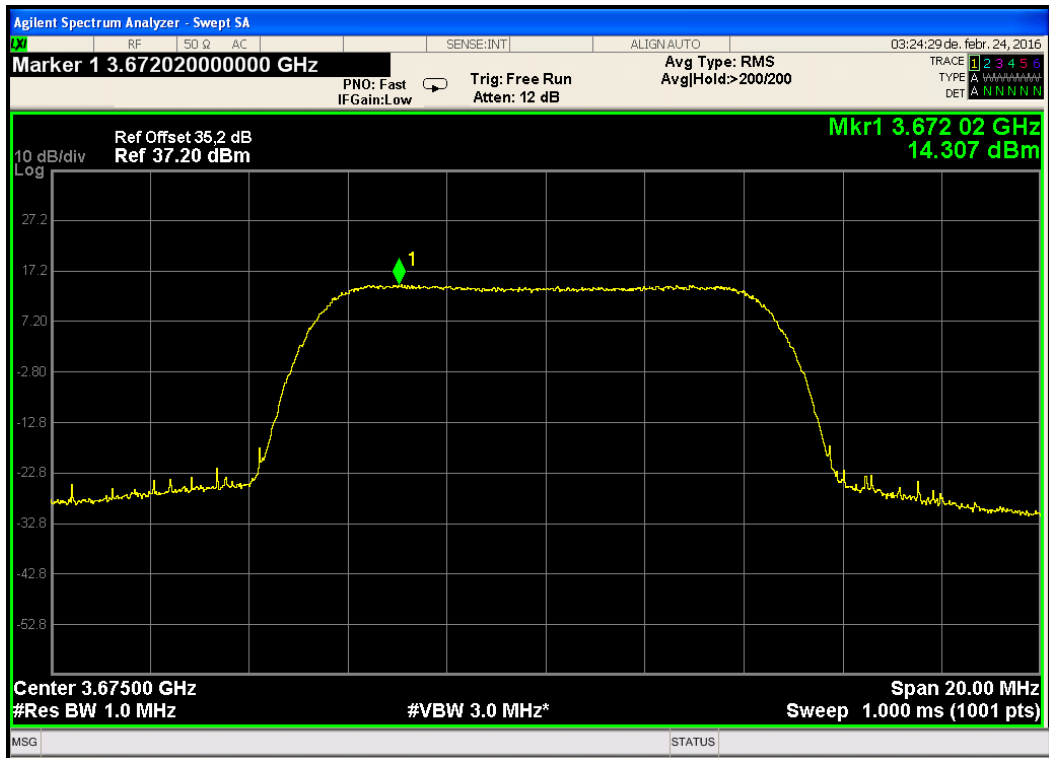


Figure 128. — 3675.0 MHz QPSK - 10MHz CBW, Low Population

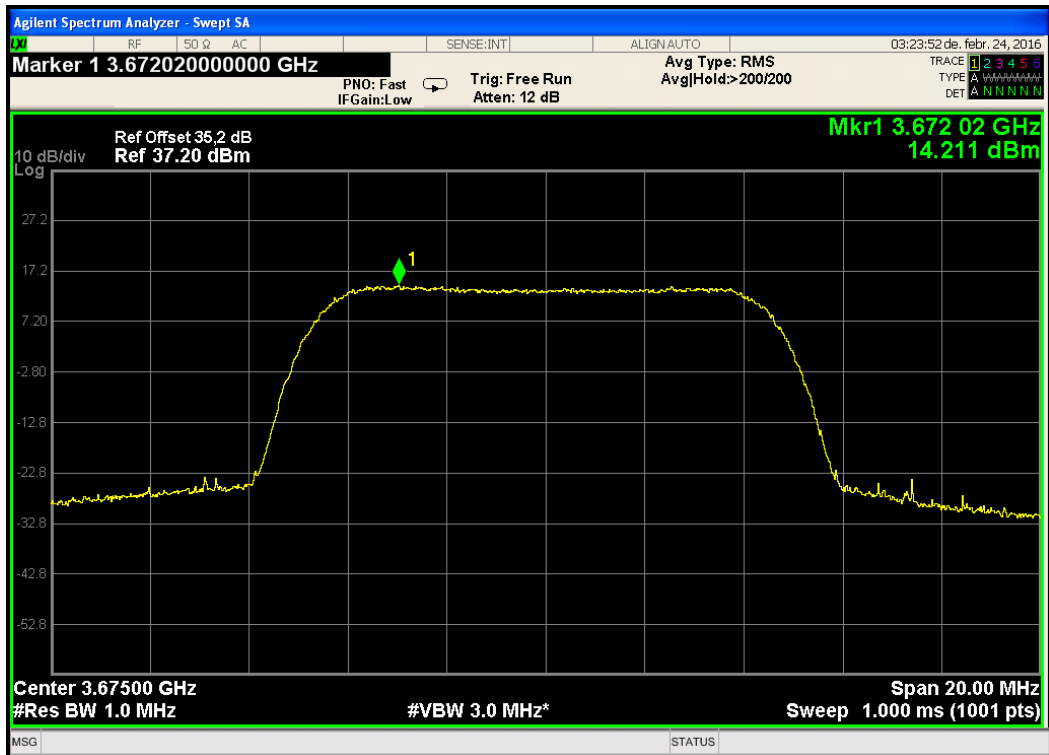


Figure 129. — 3675.0 MHz 16QAM - 10MHz CBW, Low Population

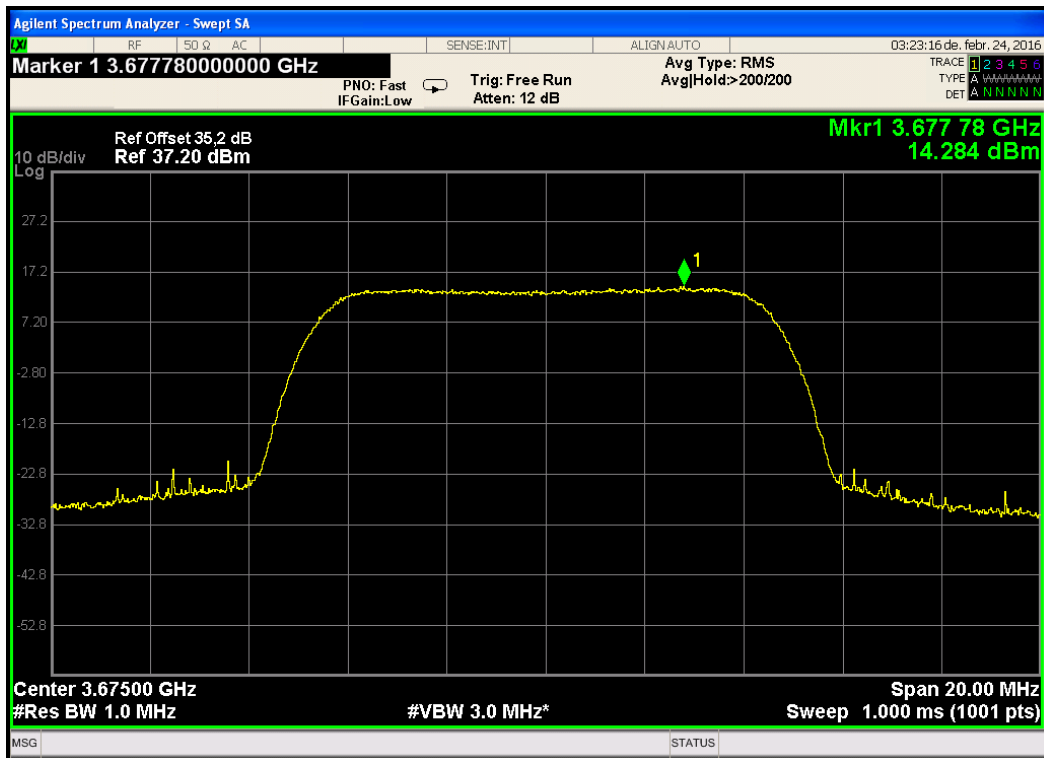


Figure 130. — 3675.0 MHz 64QAM - 10MHz CBW, Low Population

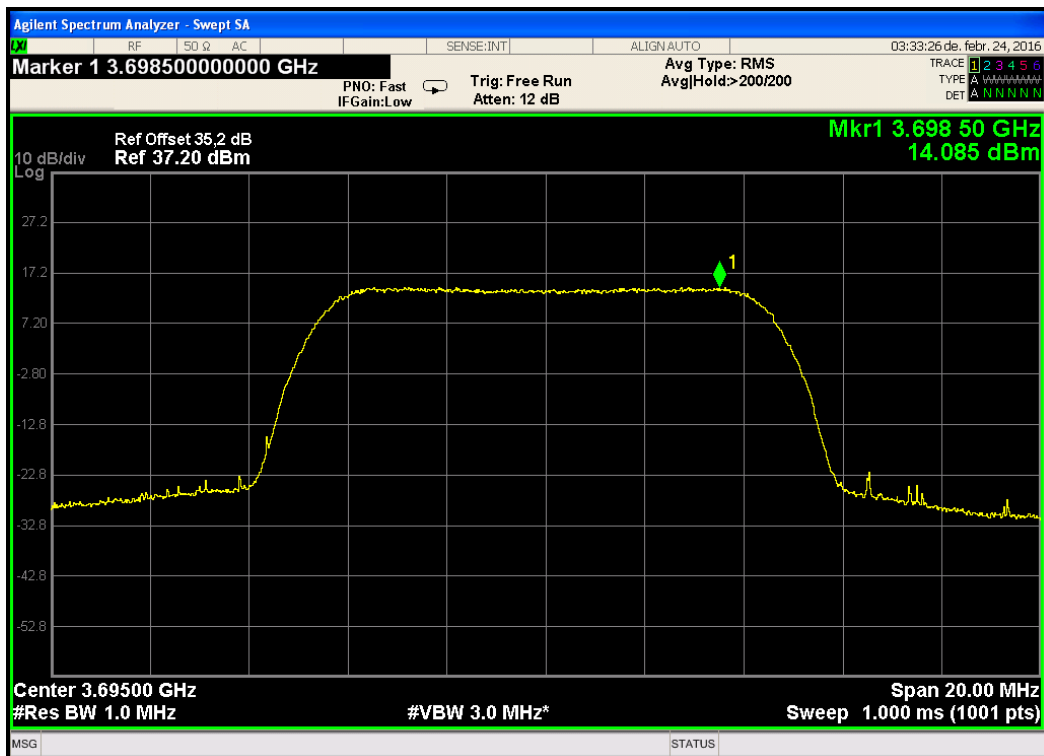


Figure 131. — 3695.0 MHz QPSK - 10MHz CBW, Low Population

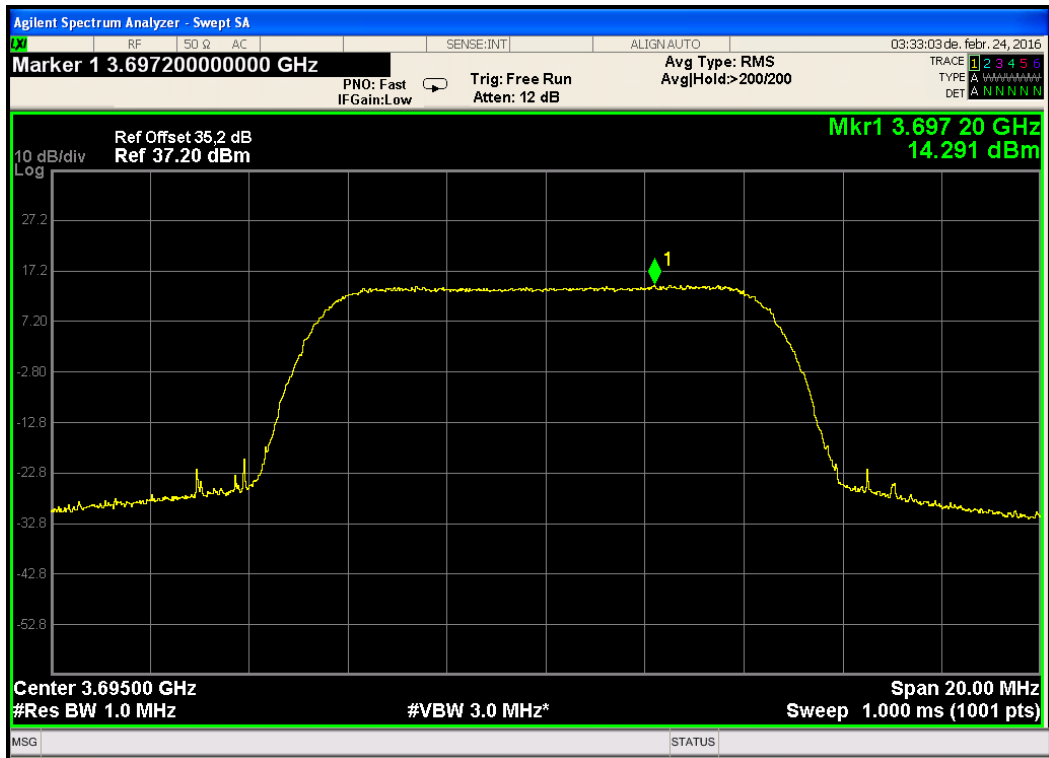


Figure 132. — 3695.0 MHz 16QAM - 10MHz CBW, Low Population

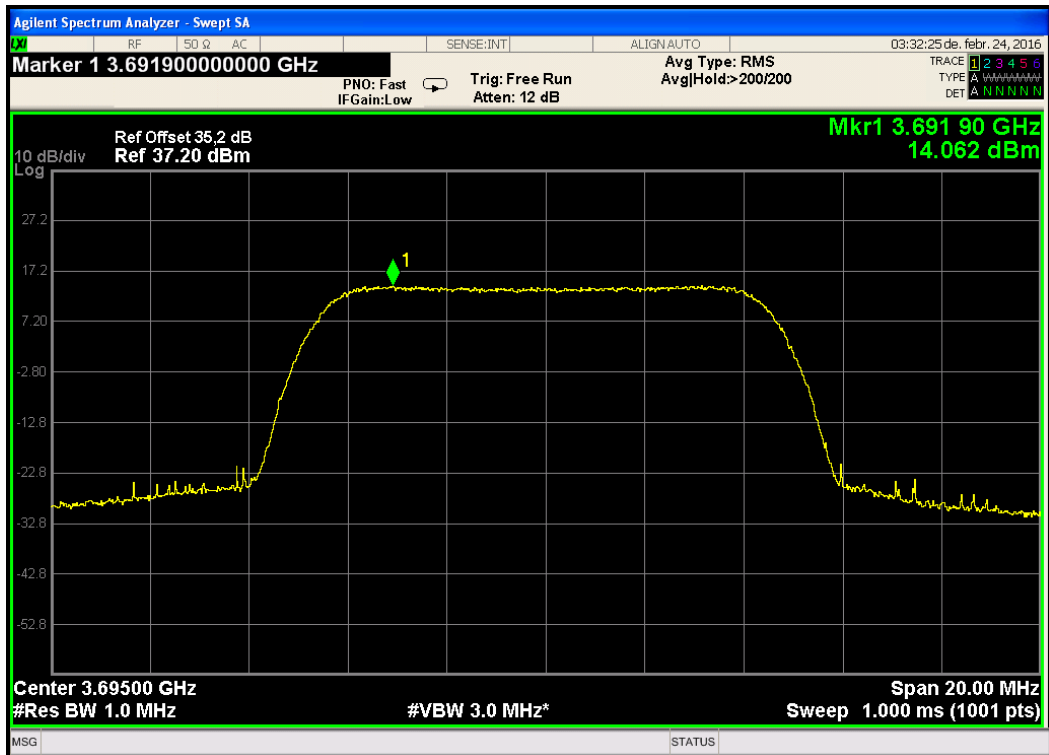


Figure 133. — 3695.0 MHz 64QAM - 10MHz CBW, Low Population



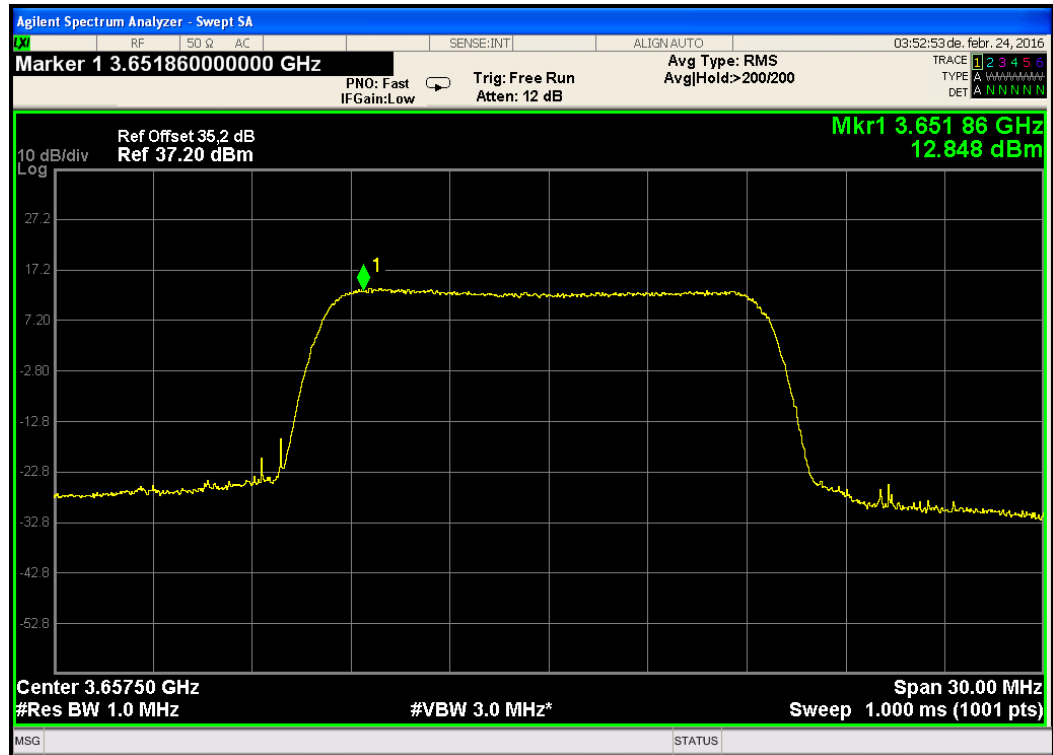


Figure 134. — 3657.5MHz QPSK - 15MHz CBW, Low Population

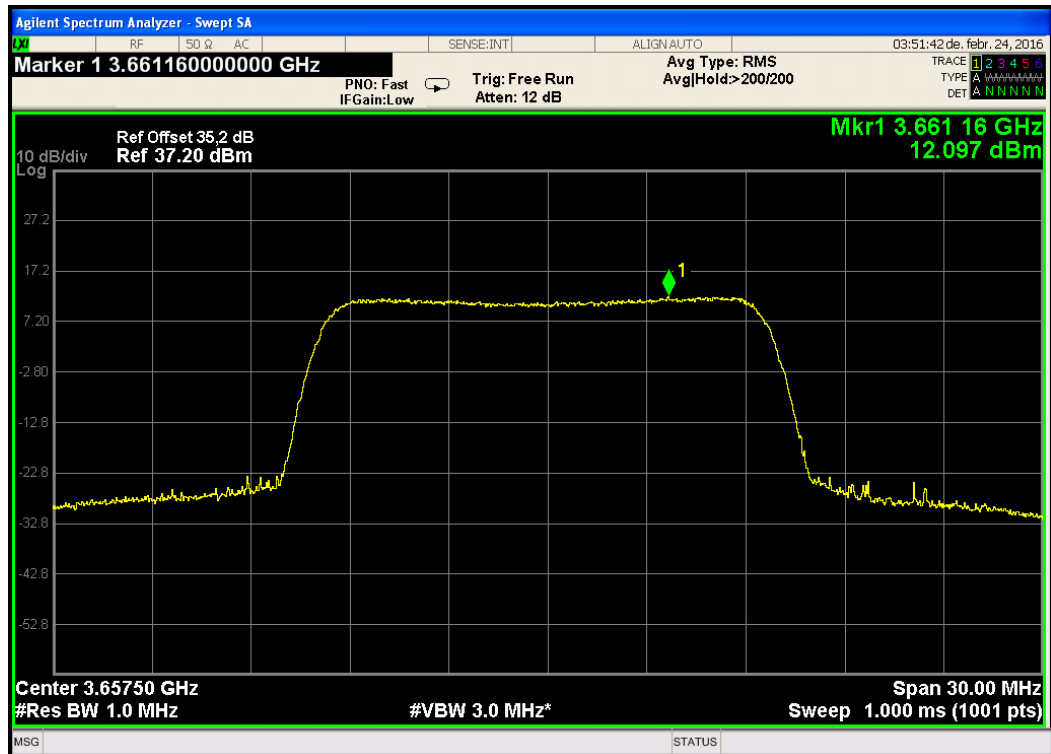


Figure 135. — 3657.5MHz 16QAM - 15MHz CBW, Low Population

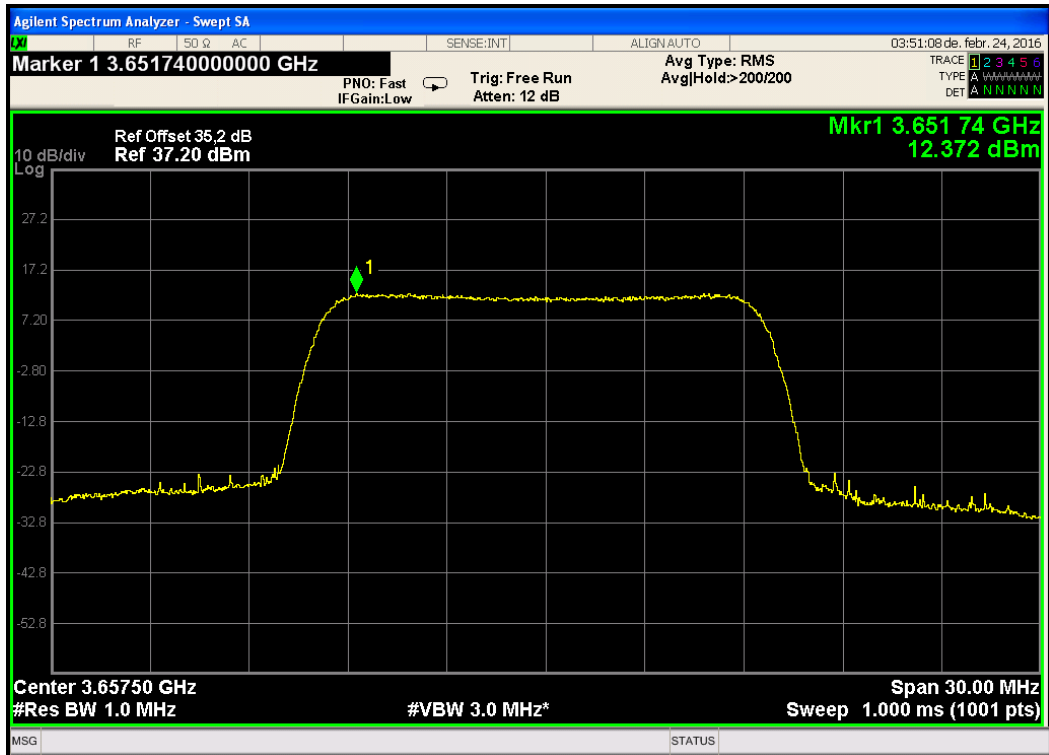


Figure 136. — 3657.5MHz 64QAM - 15MHz CBW, Low Population

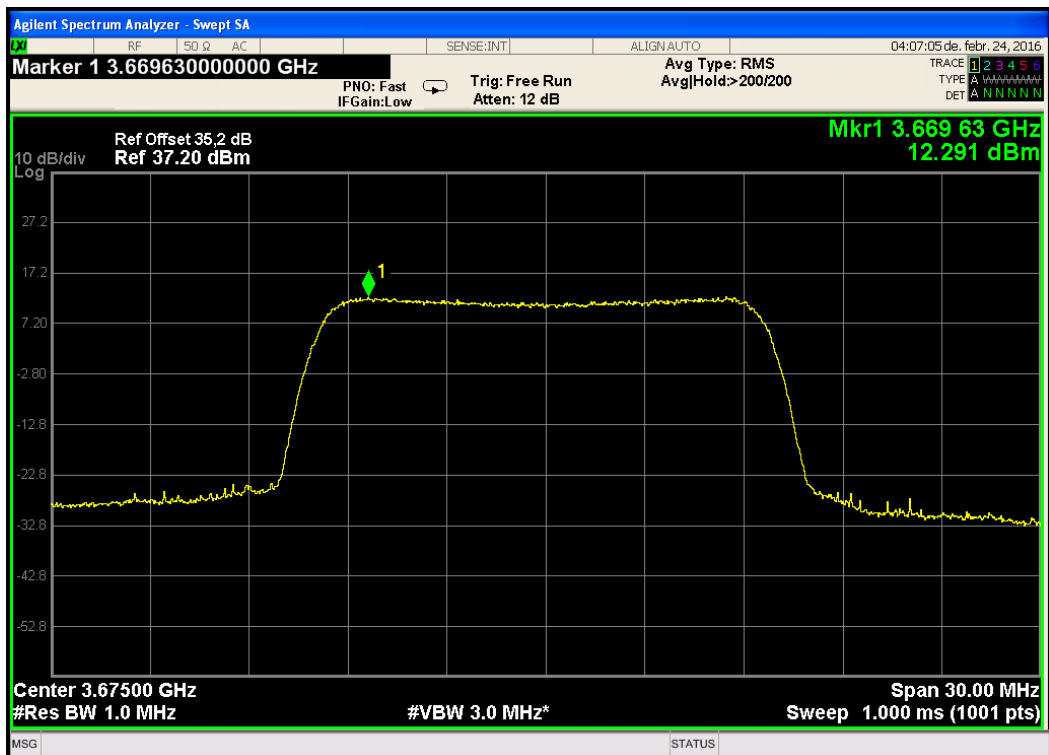


Figure 137. — 3675.0MHz QPSK - 15MHz CBW, Low Population

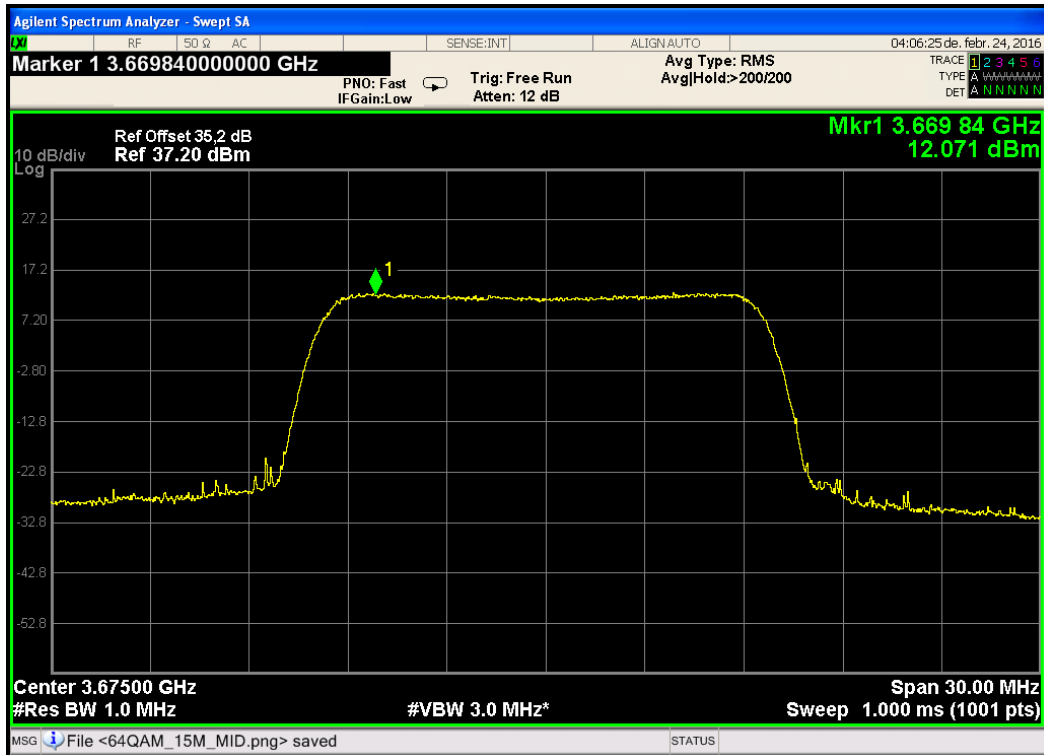


Figure 138. — 3675.0MHz 16QAM - 15MHz CBW, Low Population

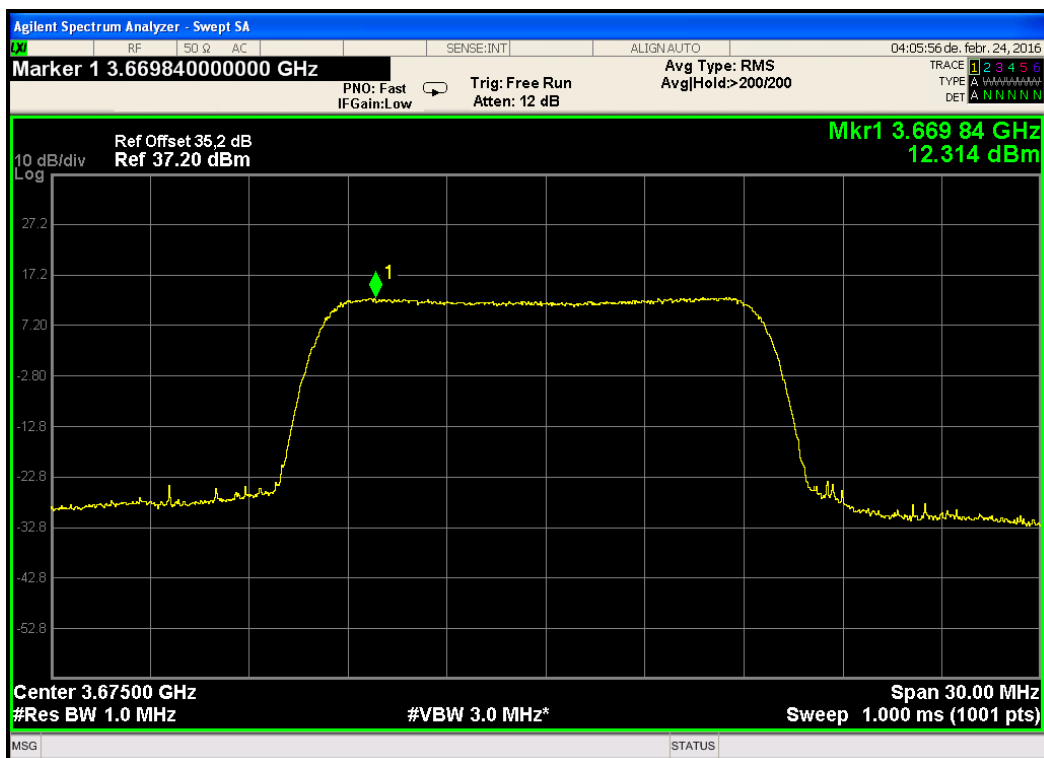


Figure 139. — 3675.0MHz 64QAM - 15MHz CBW, Low Population

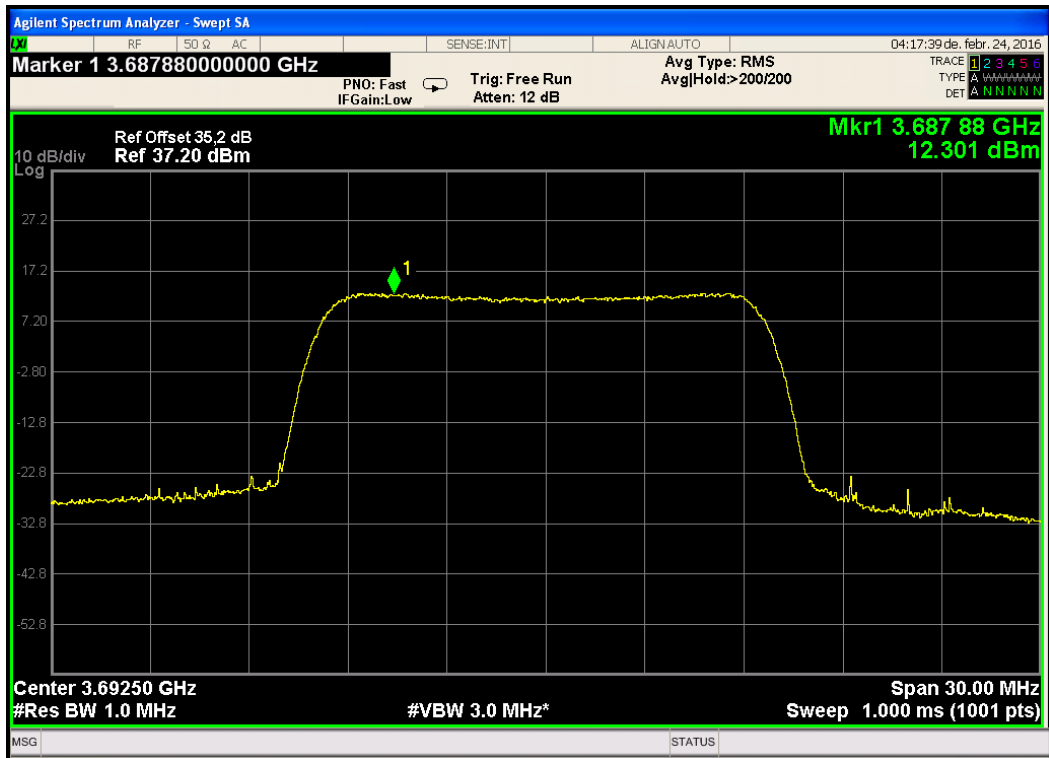


Figure 140. — 3692.5MHz QPSK - 15MHz CBW, Low Population

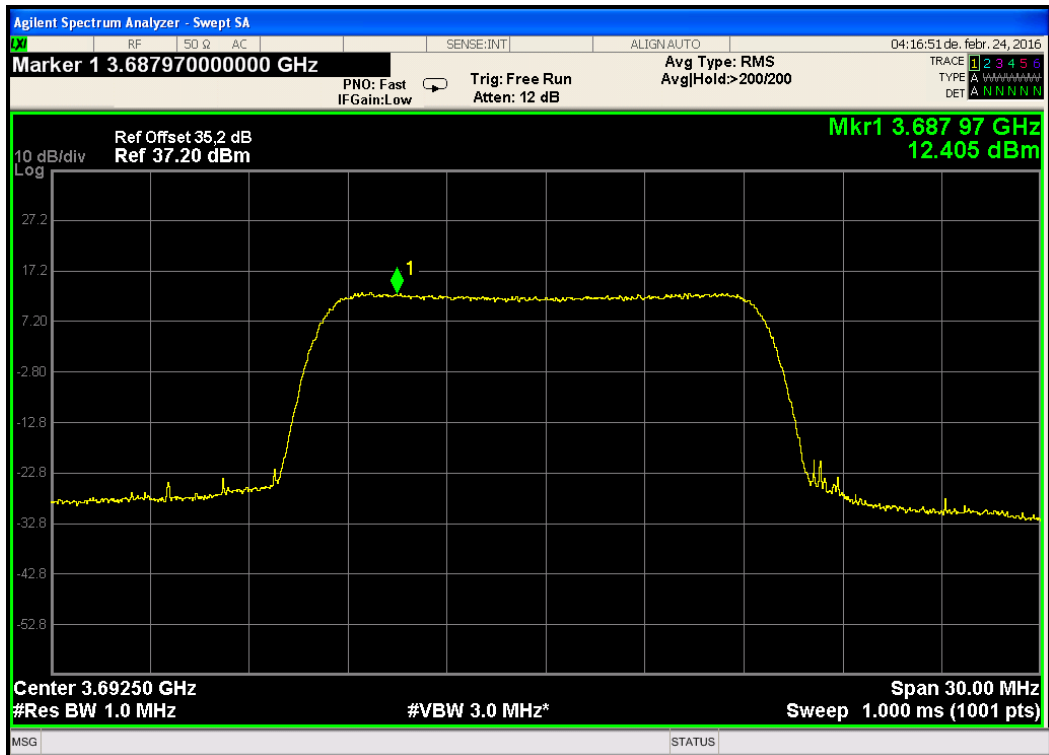


Figure 141. — 3692.5MHz 16QAM - 15MHz CBW, Low Population

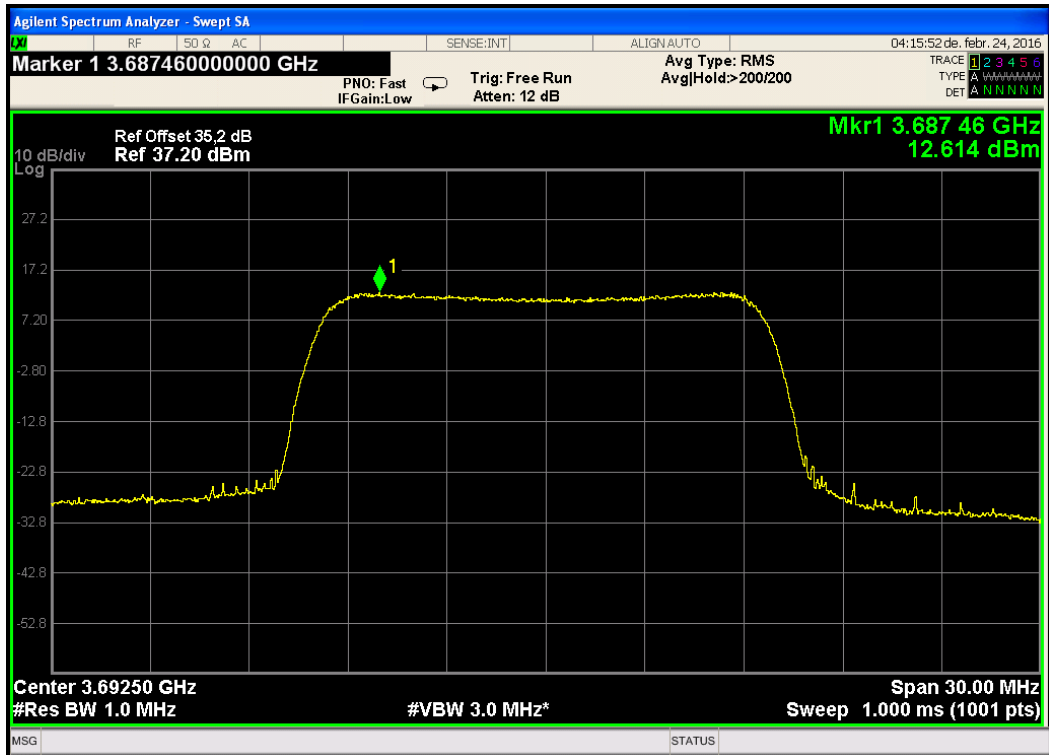


Figure 142. — 3692.5MHz 64QAM - 15MHz CBW, Low Population

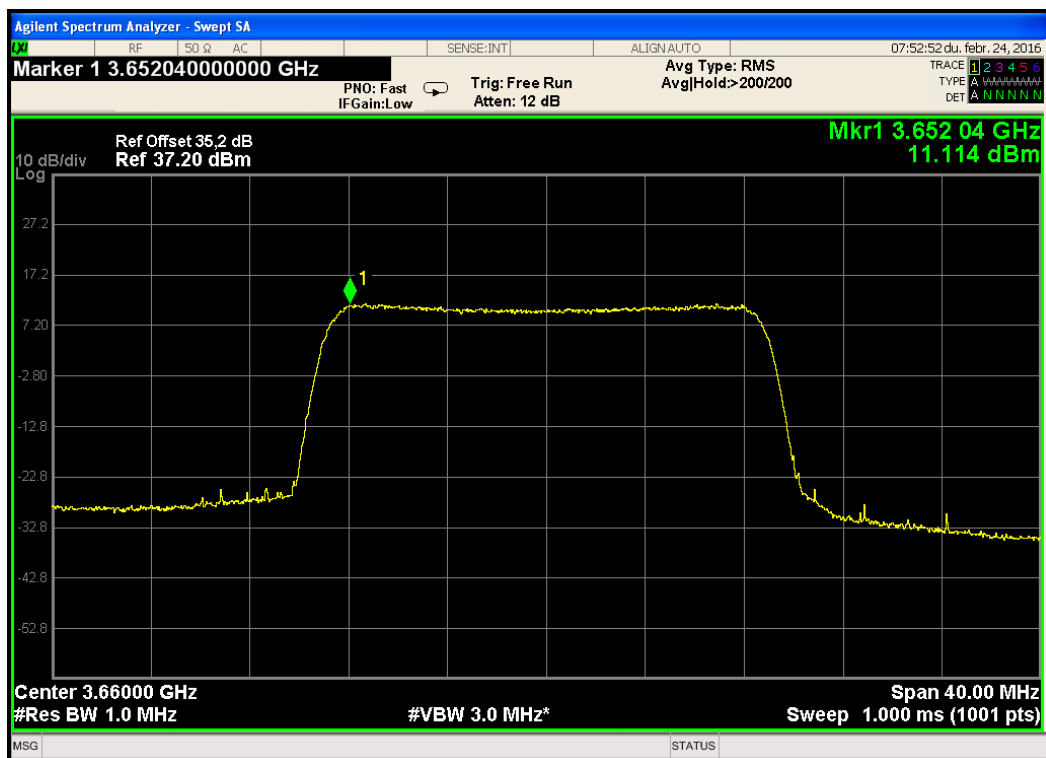


Figure 143. — 3660.0MHz QPSK - 20MHz CBW, Low Population

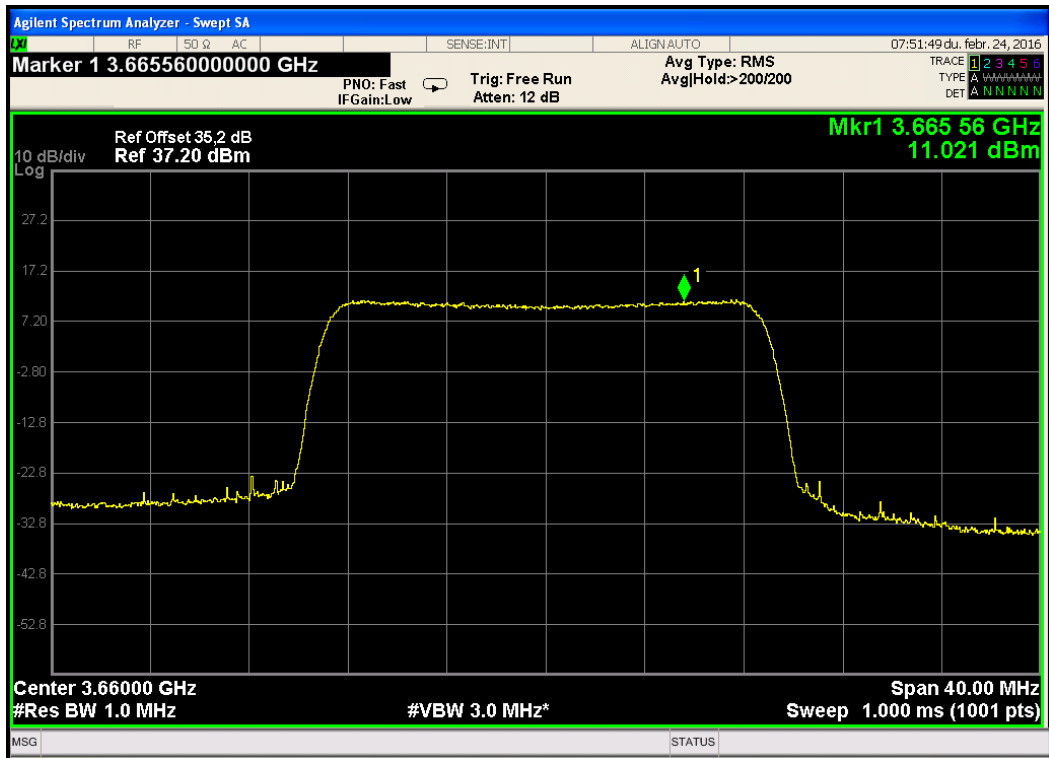


Figure 144. — 3660.0MHz 16QAM - 20MHz CBW, Low Population

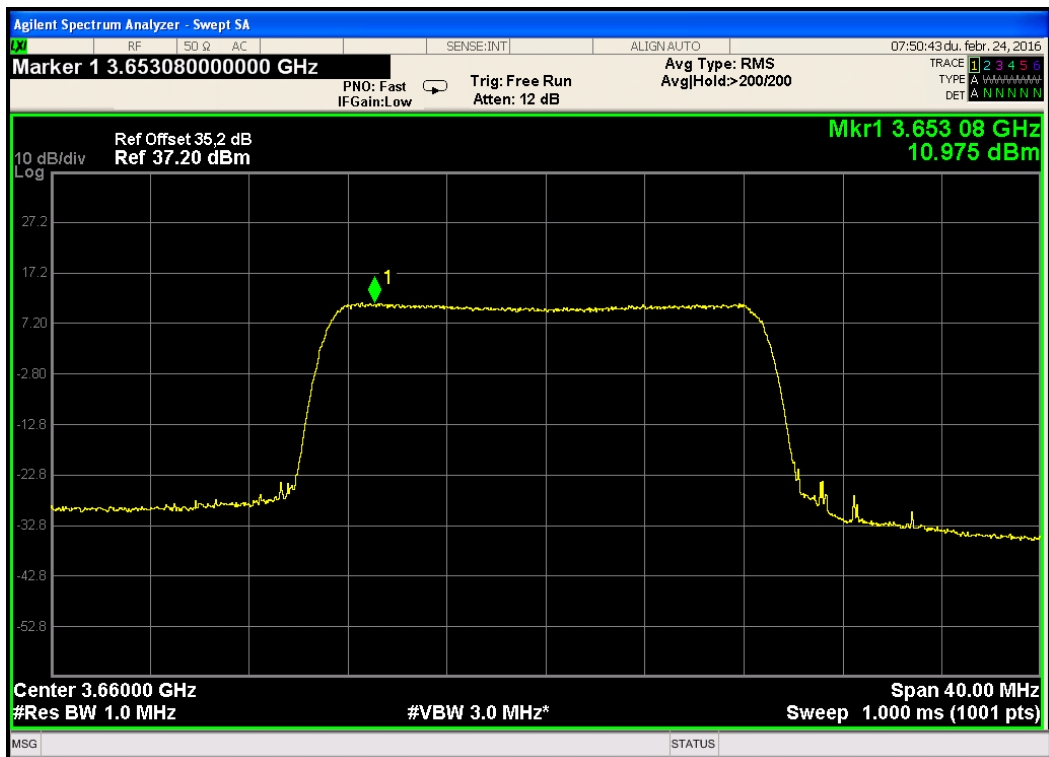


Figure 145. — 3660.0MHz 64QAM - 20MHz CBW, Low Population

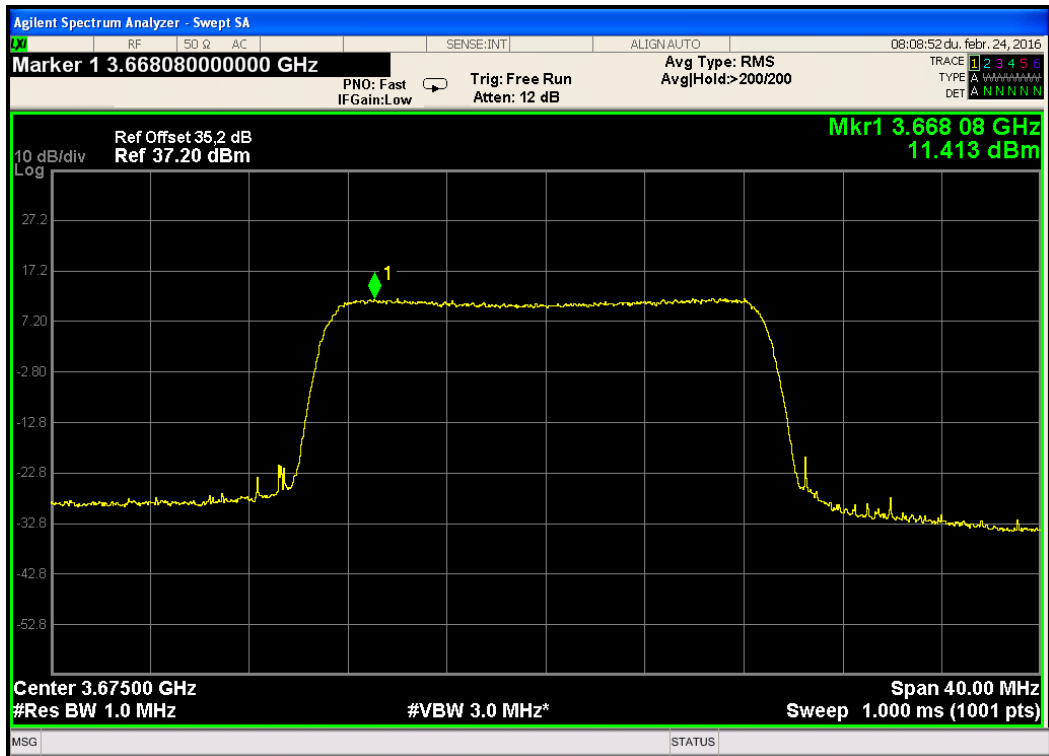


Figure 146. — 3675.0MHz QPSK - 20MHz CBW, Low Population

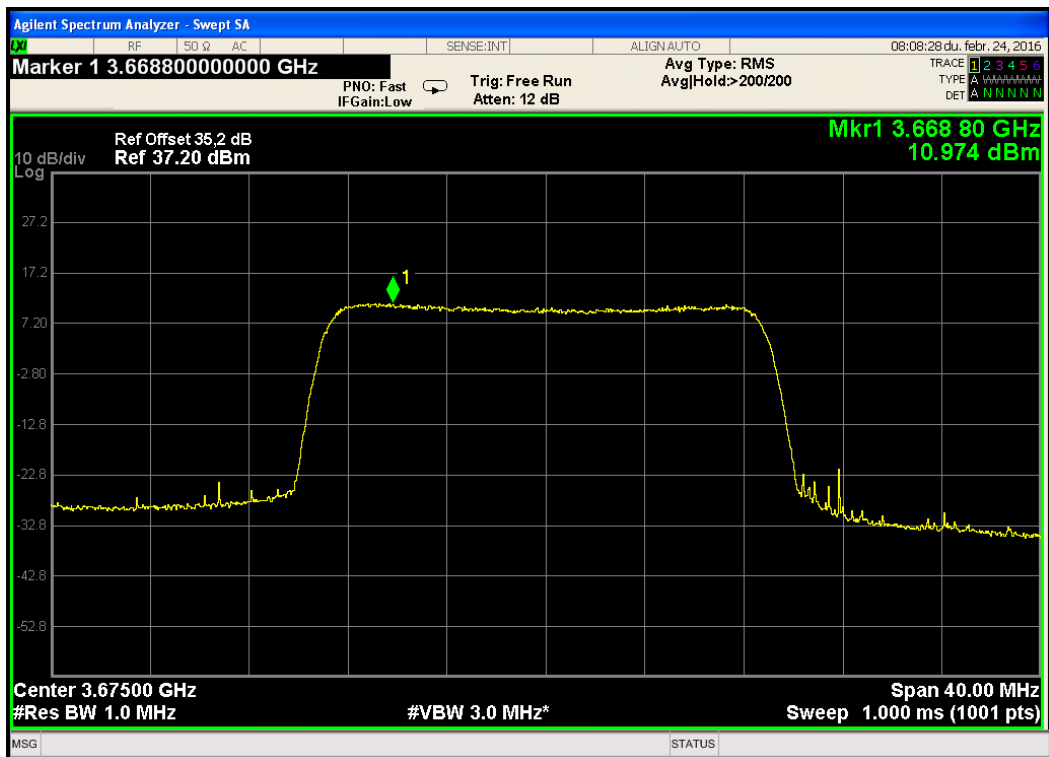


Figure 147. — 3675.0MHz 16QAM - 20MHz CBW, Low Population

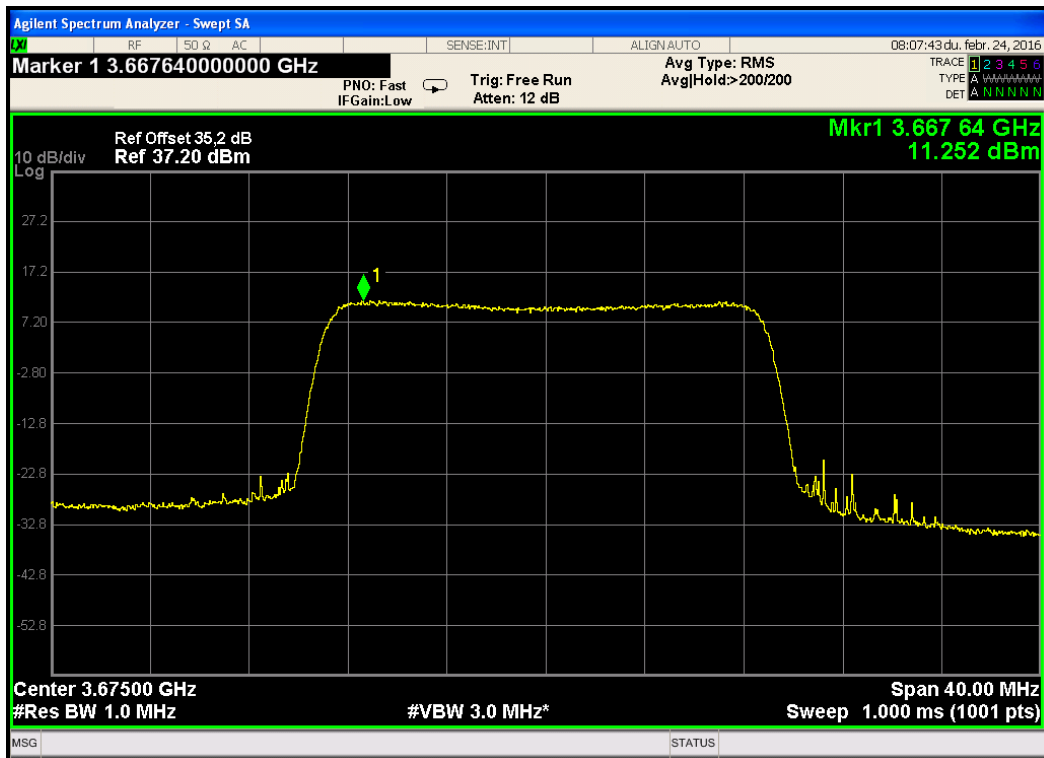


Figure 148. — 3675.0MHz 64QAM - 20MHz CBW, Low Population

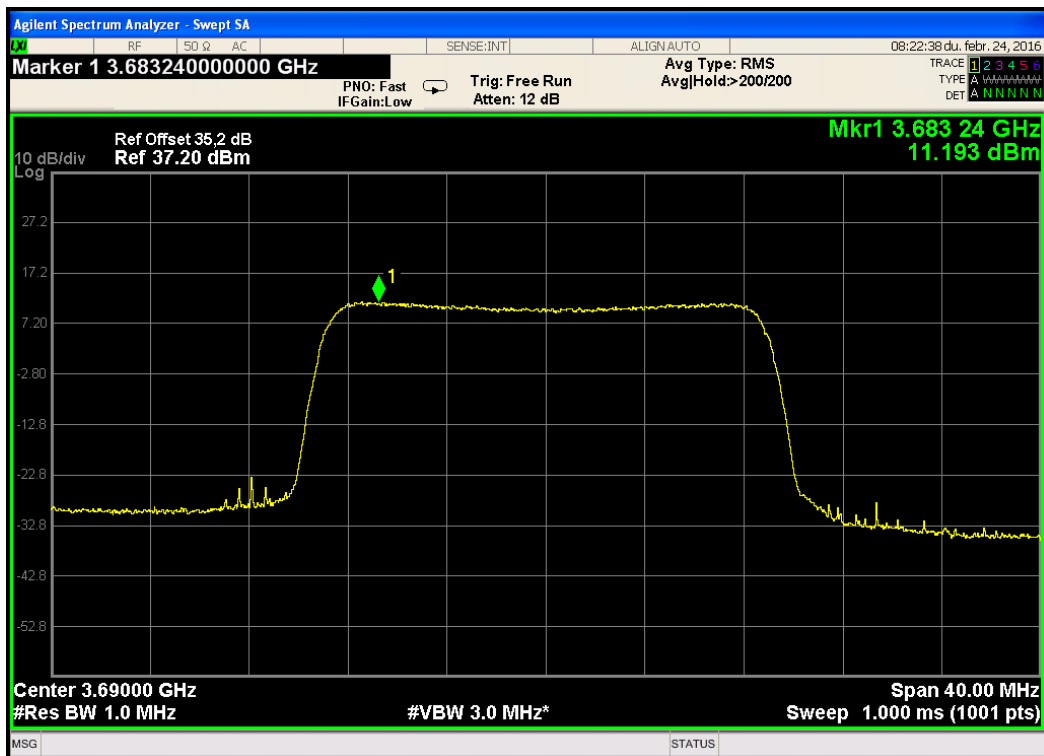


Figure 149. — 3690.0MHz QPSK - 20MHz CBW, Low Population



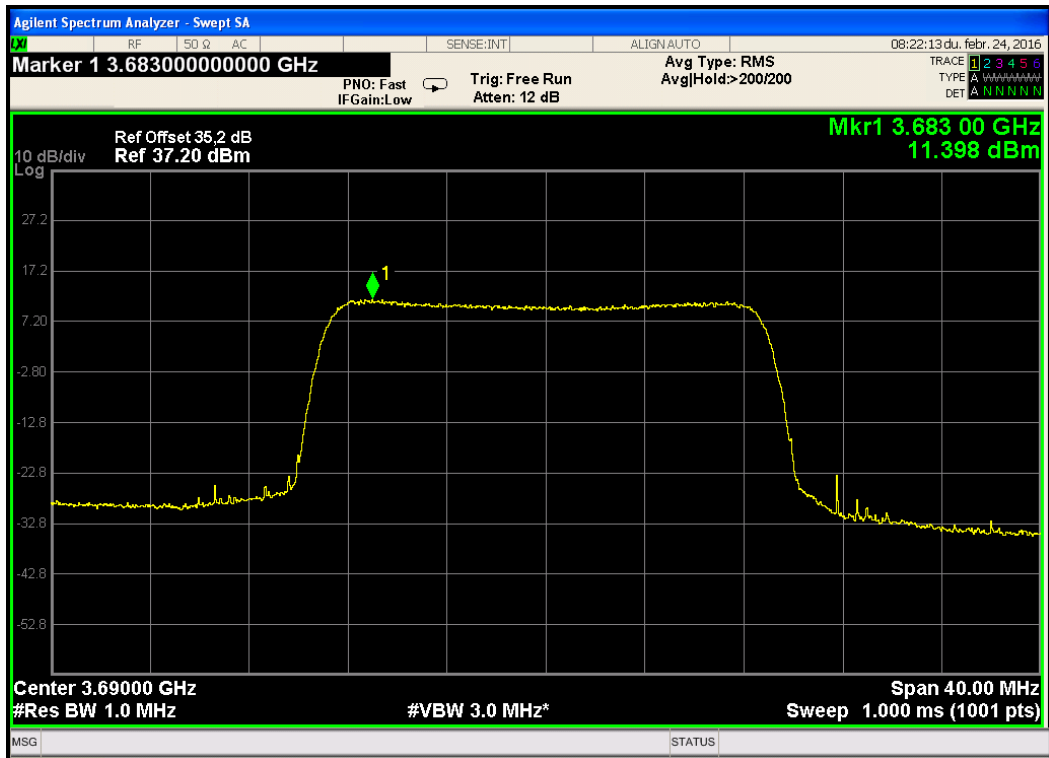


Figure 150. — 3690.0MHz 16QAM - 20MHz CBW, Low Population

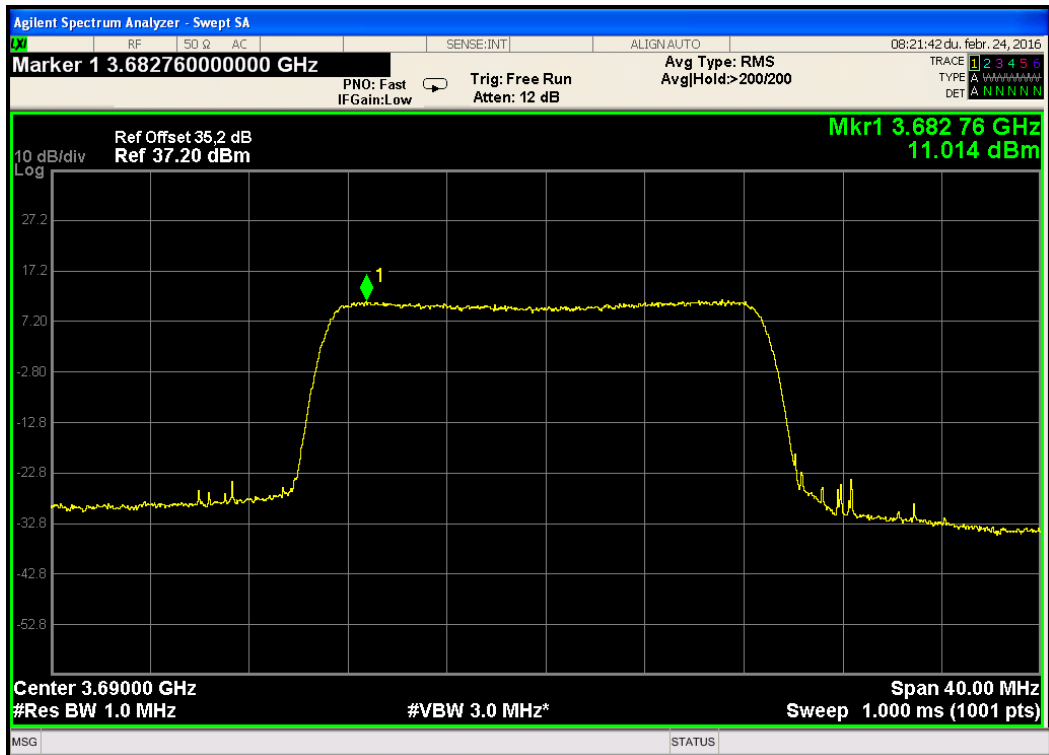


Figure 151. — 3690.0MHz 64QAM - 20MHz CBW, Low Population

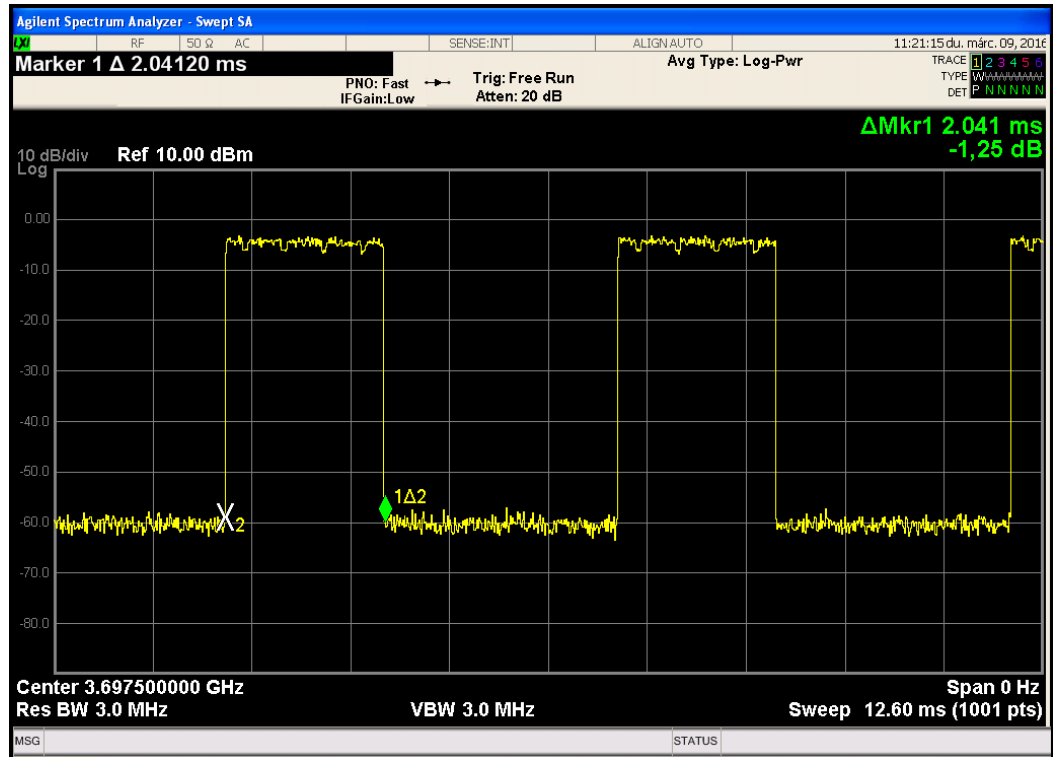


Figure 152. — Time “ON” of Burst

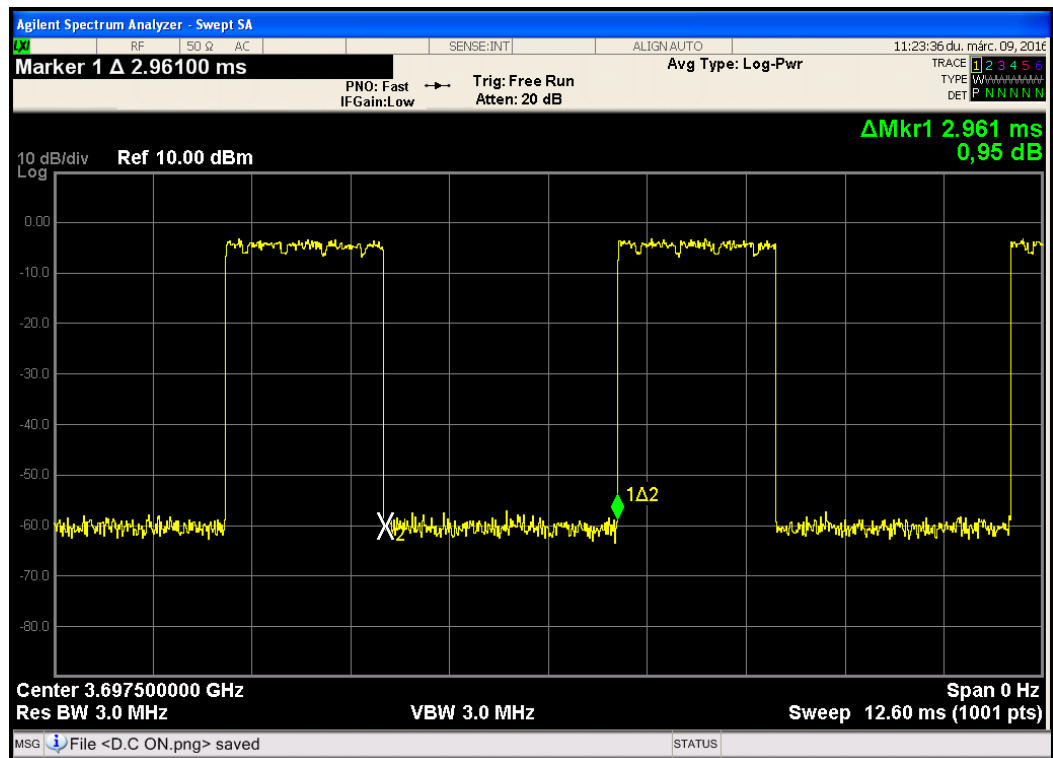


Figure 153. — Time “OFF” of Burst

## 6.6 Test Equipment Used; Transmitter Output Power and EIRP

| Instrument          | Manufacturer       | Model            | Serial Number | Calibration      |                      |
|---------------------|--------------------|------------------|---------------|------------------|----------------------|
|                     |                    |                  |               | Last Calibration | Next Calibration Due |
| MXA Signal Analyzer | Agilent            | N9020A           | MY48011785    | July 26 2015     | July 26 2017         |
| DC block            | JFW                | 50DB-007         | 1-23          | N/A              | N/A                  |
| Splitter            | Weinschel<br>93459 | 1515             | NV756         | N/A              | N/A                  |
| Attenuator          | MINI-<br>CIRCUITS  | MCL BW<br>S10W2+ | 0728          | N/A              | N/A                  |
| Attenuator          | MINI-<br>CIRCUITS  | MCL BW<br>S10W2+ | 6090          | N/A              | N/A                  |

**Figure 154. Test Equipment Used**

## 7. Emission Masks

### 7.1 Test Specification

FCC Part 90, Subpart I, Section 90.210(b)

### 7.2 Test Procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator, an appropriate coaxial cable and DC block.

(max total loss= 35.8 dB).

Three operational frequencies (low, mid and high) were evaluated for all BWs (5MHz, 10MHz, 15MHz, 20MHz) for each modulation type (QPSK, 16QAM and 64QAM).

### 7.3 Limit

For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.

(2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.

(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \log (P)$  dB.

\*NOTE: the emission mask limit was reduced by 10dB to compensate for the RBW.

### 7.4 Test Results

JUDGEMENT: Passed

For additional information see *Figure 155* to *Figure 190*.

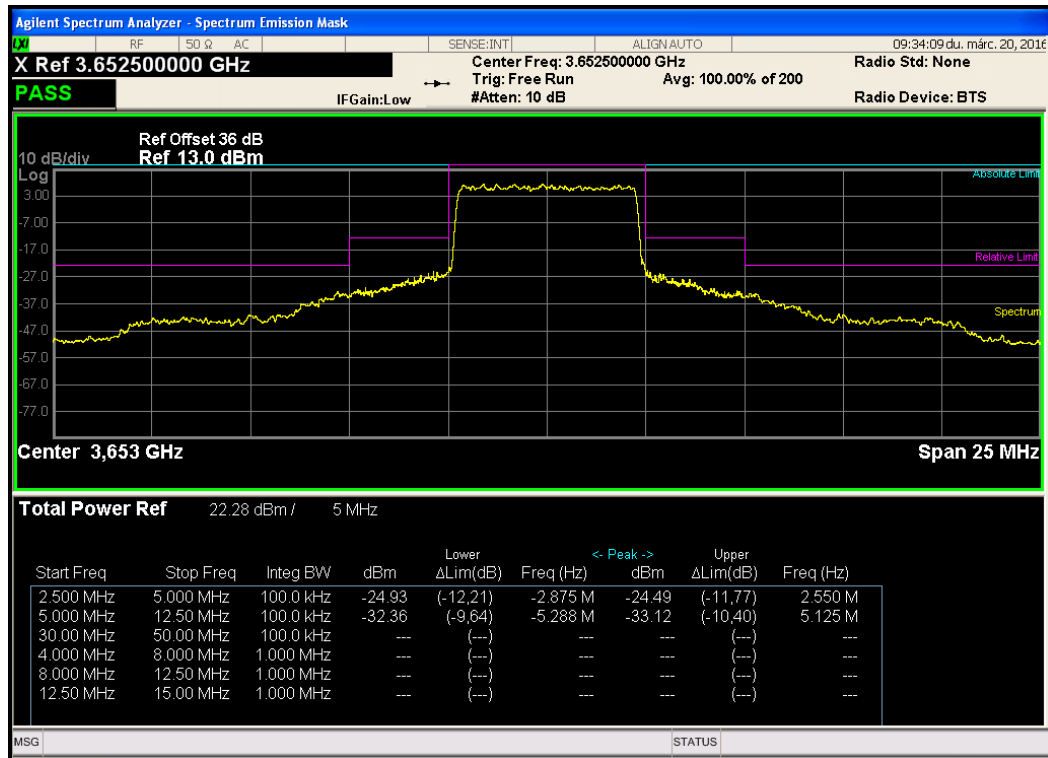


Figure 155. —5MHz CBW – Low Frequency, 64QAM

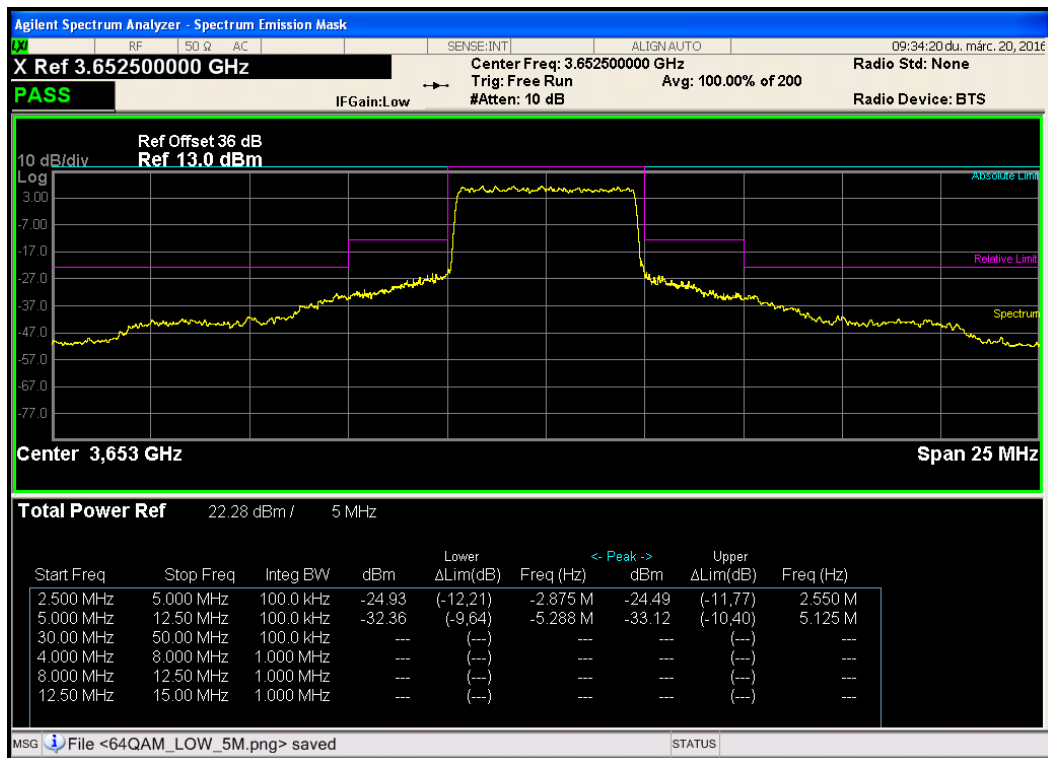


Figure 156. —5MHz CBW – Low Frequency, 16QAM