**HCT CO., LTD.**

PRODUCT COMPLIANCE DIVISION
SAN 136-1, AMI-RI , BUBAL-EUP, ICHEON-SI, KYOUNGKI-DO, 467-701, KOREA
TEL : +82 31 639 8518 FAX : +82 31 639 8525 www.hct.co.kr

# CERTIFICATE OF COMPLIANCE

## FCC PART 27 Certification

**Applicant Name:**

SAMSUNG Electronics Co., Ltd.
416, Maetan-3Dong, Yeongtong-gu, Suwon-si,
Kyungki-do, Korea

**Date of Issue: March 09, 2010**
**Test Site/Location:**
HCT, San 136-1 Ami-ri, Bubal-eup, Icheon-si,
Kyungki-do, Korea
**Test Report No.:** HCTR1003FR03

| | | |
|---|---|---|
| **FCC ID** | : | **A3LSPI-2210012502** |
| **APPLICANT** | : | **SAMSUNG Electronics Co., Ltd.** |

| | | |
|---|---|---|
| EUT Type | : | Mobile WiMAX Indoor RAS |
| Manufacturer | : | SAMSUNG Electronics Co., Ltd. |
| Model name | : | SPI-2210012502 |
| Frequency of Operation | : | 2496 MHz ~ 2596 MHz<br>2624 MHz ~ 2690 MHz<br>2642 MHz ~ 2672 MHz |
| FCC Rule Part(s) | : | FCC Part 27(m) |
| Test Procedure(s) | : | ANSI/TIA-603C-C-2004 |
| Application Type | : | Original Equipment |
| Data of issue | : | March 09, 2010 |

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of FCC Part 27 of the FCC Rules under normal use and maintenance.

Chang Seok Choi

**Report prepared by**
**: Chang Seok Choi**
**Test engineer of RF Team**

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

# C O N T E N T S

# 1. GENERAL INFORMATION

## 1.1. CLIENT INFORMATION

| | |
|---|---|
| **Company** | **Samsung Electronics Co., Ltd.** |
| **Contact Point** | **416, Maetan-3Dong, Yeongtong-gu, Suwon-si, Kyungki-do, Korea** |
| **Contact person** | **Name: JOON-HO LEE / Senior Research Engineer**<br>**E-mail : joonho@samsung.com**<br>**Tel: +82-31-279-3552**<br>**Fax: +82-31-279-7576** |

## 1.2. PRODUCT INFORMATION

| | |
|---|---|
| EUT TYPE | Mobile WiMAX Indoor RAS |
| EMISSION DESIGNATOR | 9M12G7D (QPSK), 9M13W7D(16QAM/64QAM) |
| OPERATING FREQUENCY | 2496 MHz ~ 2596 MHz (BW : 100 MHz)<br>2624 MHz ~ 2690 MHz (BW : 66 MHz)<br>2642 MHz ~ 2672 MHz (BW : 30 MHz) |
| TX OUTPUT POWER | 10 W (40 dBm) / Carrier / Path<br>20 W (43 dBm) / Carrier / Sector |
| CHANNEL BANDWIDTH | 10 MHz |
| MODULATION TYPE | OFDMA(QPSK, 16QAM, 64QAM) |
| NUMBER OF CARRIERS/SECTORS | 3 Carriers / 3 Sectors |
| CHANNEL CARD CAPACITY | 1 Carrier / 1 Sector |
| SYSTEM INPUT VOLTAGE | DC -48V |

## 1.3. INTRODUCTION OF EUT

The Indoor SPI-2210, RAS of Mobile WiMAX, is controlled by ACR and connects Mobile WiMAX calls to MS.

The Indoor SPI-2210 interfaces with MS via a wireless channel observing the Mobile WiMAX standard (IEEE 802.16) and provides high-speed data service and multimedia service in wireless broadband.

To this end, the Indoor SPI-2210 provides the following functions: modulation/demodulation of packet traffic signal, scheduling and radio bandwidth allocation to manage air resources efficiently and ensure Quality of Service (QoS), Automatic Repeat request (ARQ) processing, ranging function, connection control function to transmit the information on the Indoor SPI-2210 and set/hold/disconnect the packet call connection, handover control and ACR interface function and system operation management function.

The Indoor SPI-2210 interfaces with ACR in one way of Fast Ethernet/Gigabit Ethernet and can exchange various control signals and traffic signals stably.

The Indoor SPI-2210 is installed in the Indoor environment and managed in the omni or sector method according to the property of the installed area. In addition, the Indoor SPI-2210 supports the capacity of the maximum 3Carrier/3Sector and MIMO only with the basic cabinet.

The characteristics of the Indoor SPI-2210 are as follows:

- Application of the OFDMA Method
- Support of Broadband Channel Bandwidth
- Support of 3Carrier/3Sector
- Support of MIMO
- Support of Frequency Reuse Pattern (FRP)
- Support of 4-Branch Rx Diversity (Optional)
- Support of Various Frequency Allocation
- Support of Beamforming (Option)

# 2. TEST SUMMARY

## 2.1. STANDARDS

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance With **FCC Part 27**

| SECTION | TEST ITEMS | RESULTS |
|---|---|---|
| 2.1046, 27.50(h) | Conducted Output Power | Compliant |
| 2.1049, 27.53(l) | Occupied Bandwidth | Compliant |
| 2.1051, 27.53(l) | Spurious Emissions at Antenna Terminals | Compliant |
| 2.1051, 27.53(l) | Band edge | Compliant |
| 2.1053, 27.53(l) | Spurious Radiated Emissions. | Compliant |
| 2.1055(a)(1), 27.54 | Frequency Stability over Temperature variation | Compliant |
| 2.1055(d), 27.54 | Frequency stability over Voltage variation | Compliant |

## 2.2. MODE OF OPERATION DURING THE TEST

The EUT was operated in a manner representative of the typical usage of the equipment.
During all testing, system components were manipulated within the confines of typical usage to maximize each emission. All Modulation (QPSK, 16QAM, and 64QAM) modes ware tested, and the worst data was recorded in this test report.
The device does not supply antenna(s) with the system, so the dummy loads were connected to the RF output ports for radiated spurious emission testing.

# 3. STANDARDS ENVIRONMENTAL TEST CONDITIONS

| | |
|---|---|
| **Temperature :** | **+ 15 ℃ to + 35 ℃** |
| **Relative humidity:** | **30 % to 60 %** |
| **Air pressure** | **860 mbar to 1060 mbar** |

# 4. TEST EQUIPMENT

| Manufacturer | Model / Equipment | Serial No. | Calibration Due |
|---|---|---|---|
| Schwarzbeck | BBHA 9120D / Double Ridged Horn Antenna | 296 | 09/23/2010 |
| Schwarzbeck | BBHA 9120D / Double Ridged Horn Antenna | 147 | 03/26/2010 |
| Schwarzbeck | VULB 9160 / TRILOG Antenna | 9160-3150 | 12/18/2010 |
| Schwarzbeck | VULB 9160 / TRILOG Antenna | 3125 | 05/06/2011 |
| HD | MA240 / Antenna Position Tower | 556 | N/A |
| EMCO | 1050 / Turn Table | 114 | N/A |
| HD GmbH | HD 100 / Controller | 13 | N/A |
| HD GmbH | KMS 560 / SlideBar | 12 | N/A |
| MITEQ | AMF-60-0010 1800-35-20P | 1200937 | 05/20/2010 |
| Schwarzbeck | BBHA9170 / SHF-EHF Horn Antenna | BBHA9170342 | 03/20/2011 |
| R&S | ESI40 / EMI TEST Receiver | 831564/003 | 10/30/2010 |
| Wainwright Instrument | WHF3.3/18G-10EF / High Pass Filter | 1 | 06/29/2010 |
| Nang-Yeul | NY-THR18750 / Temp | NY-200912201A | 12/28/2010 |
| Agilent | 87302C / Power Divider | 3239A01051 | 03/16/2010 |
| Agilent | 6674A / DC Power Supply | 3501A00901 | 05/14/2010 |
| WEINSCHEL | 67-30-33 / Attenuator | BU5347 | 01/06/2011 |
| WEINSCHEL | 67-30-33 / Attenuator | BR0530 | 01/14/2011 |
| WEINSCHEL | AF117A-69-43 / STEP ATTENUATOR | 20623 | 01/14/2011 |
| WEINSCHEL | AF117A-69-43 / STEP ATTENUATOR | 21207 | 01/06/2011 |
| Agilent | N9020A / MXA Signal Analyzer | US46220219 | 03/03/2011 |

# 5. CONDUCTED OUTPUT POWER

5.1. Applicable Standard

According to FCC §2.1046 & 27.5(h)

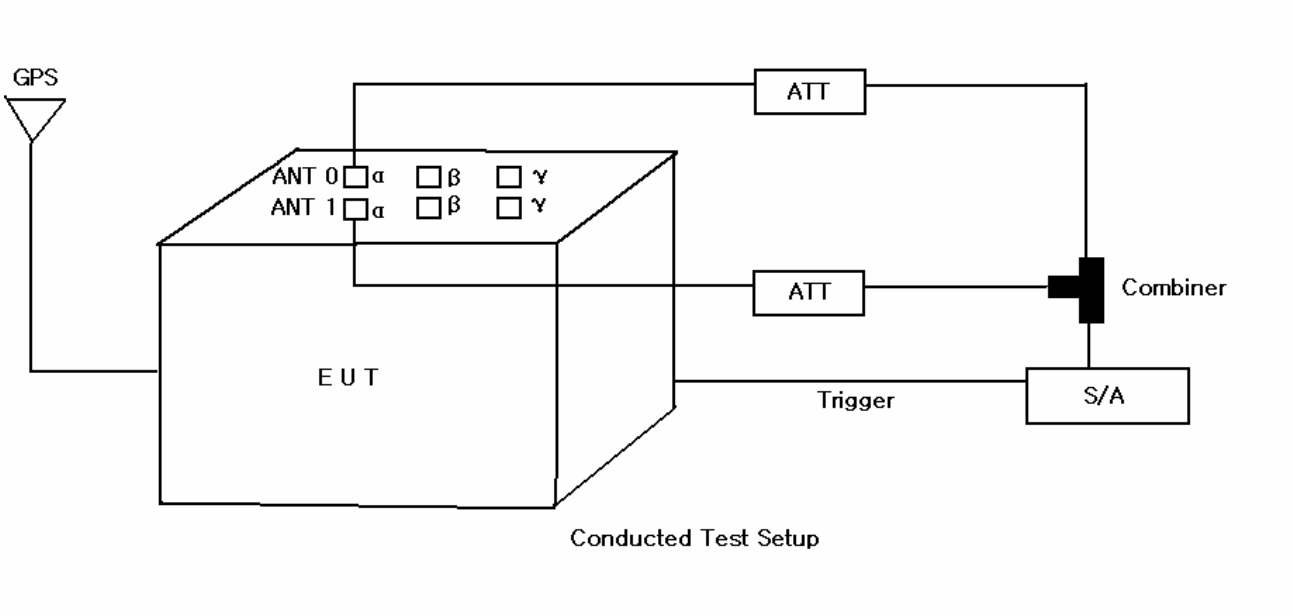
1) *Main, booster and base stations.* (i) The maximum EIRP of a main, booster or base station shall not exceed 33 dBW + 10log(X/Y) dBW, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

5.2. Test Equipment List and Details

| Manufacturer | Model / Equipment | Serial No. | Calibration Due |
|---|---|---|---|
| Agilent | 87302C / Power Divider | 3239A01051 | 03/16/2010 |
| Agilent | 6674A / DC Power Supply | 3501A00901 | 05/14/2010 |
| WEINSCHEL | 67-30-33 / Attenuator | BU5347 | 01/06/2011 |
| WEINSCHEL | 67-30-33 / Attenuator | BR0530 | 01/14/2011 |
| WEINSCHEL | AF117A-69-43 / STEP ATTENUATOR | 20623 | 01/14/2011 |
| WEINSCHEL | AF117A-69-43 / STEP ATTENUATOR | 21207 | 01/06/2011 |
| Agilent | N9020A / MXA Signal Analyzer | US46220219 | 03/03/2011 |

5.3. Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.




Conducted Test Setup

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 radio frequency load attached to the EUT antenna terminal was 50 Ohm. The lost of the cables the test system is calibrated to correct the reading.
2) The spectrum analyzer was set to RMS Detector function and Maximum hold mode.
3) The resolution banswidth of the spectrum analyzer was comparable to the emission bandwidth.
4) PAR is measured by using CCDF function of Spectrum Analyzer. Info BW is equal to EUT's emission bandwidth.

5.3.1. Environmental Conditions:

| | |
|---|---|
| Temperature: | 23 °C |
| Relative Humidity: | 36 % |

5.4. Test Result

: PASS

5.4.1. Test Data at Output Port Alpha 0

| Modulation | Channel | Frequency | Measured Output Power | |
|---|---|---|---|---|
| | | | dBm | W |
| QPSK | Low | 2508.5 | 39.63 | 9.18 |
| | Middle | 2551.5 | 39.51 | 8.93 |
| | High | 2590.0 | 39.89 | 9.75 |
| 16QAM | Low | 2508.5 | 39.90 | 9.77 |
| | Middle | 2551.5 | 39.48 | 8.87 |
| | High | 2590.0 | 39.27 | 8.45 |
| 64QAM | Low | 2508.5 | 39.60 | 9.12 |
| | Middle | 2551.5 | 39.51 | 8.93 |
| | High | 2590.0 | 39.20 | 8.36 |

5.4.2. Combined Test Data at Output Port

| Modulation | Channel | Frequency | Measured Output Power | |
|---|---|---|---|---|
| | | | dBm | W |
| QPSK | Low | 2508.5 | 43.31 | 21.43 |
| | Middle | 2551.5 | 43.19 | 20.84 |
| | High | 2590.0 | 42.83 | 19.19 |
| 16QAM | Low | 2508.5 | 43.26 | 21.18 |
| | Middle | 2551.5 | 43.25 | 21.13 |
| | High | 2590.0 | 42.81 | 19.10 |
| 64QAM | Low | 2508.5 | 43.34 | 21.58 |
| | Middle | 2551.5 | 43.21 | 20.94 |
| | High | 2590.0 | 42.85 | 19.28 |

5.4.3. Test Data at Output Port Beta 0

| Modulation | Channel | Frequency | Measured Output Power | |
|---|---|---|---|---|
| | | | dBm | W |
| QPSK | Low | 2630.5 | 39.60 | 9.12 |
| | Middle | 2650.5 | 39.40 | 8.71 |
| | High | 2683.5 | 39.08 | 8.09 |
| 16QAM | Low | 2630.5 | 39.48 | 8.87 |
| | Middle | 2650.5 | 39.33 | 8.57 |
| | High | 2683.5 | 39.02 | 7.98 |
| 64QAM | Low | 2630.5 | 39.45 | 8.81 |
| | Middle | 2650.5 | 39.34 | 8.59 |
| | High | 2683.5 | 39.11 | 8.15 |

5.4.4. Combined Test Data at Output Port

| Modulation | Channel | Frequency | Measured Output Power | |
|---|---|---|---|---|
| | | | dBm | W |
| QPSK | Low | 2630.5 | 43.13 | 20.56 |
| | Middle | 2650.5 | 42.67 | 18.49 |
| | High | 2683.5 | 41.99 | 15.81 |
| 16QAM | Low | 2630.5 | 43.11 | 20.46 |
| | Middle | 2650.5 | 42.76 | 18.88 |
| | High | 2683.5 | 41.88 | 15.42 |
| 64QAM | Low | 2630.5 | 43.25 | 21.13 |
| | Middle | 2650.5 | 42.82 | 19.14 |
| | High | 2683.5 | 41.77 | 15.03 |

5.4.5. Test Data at Output Port Gamma 0

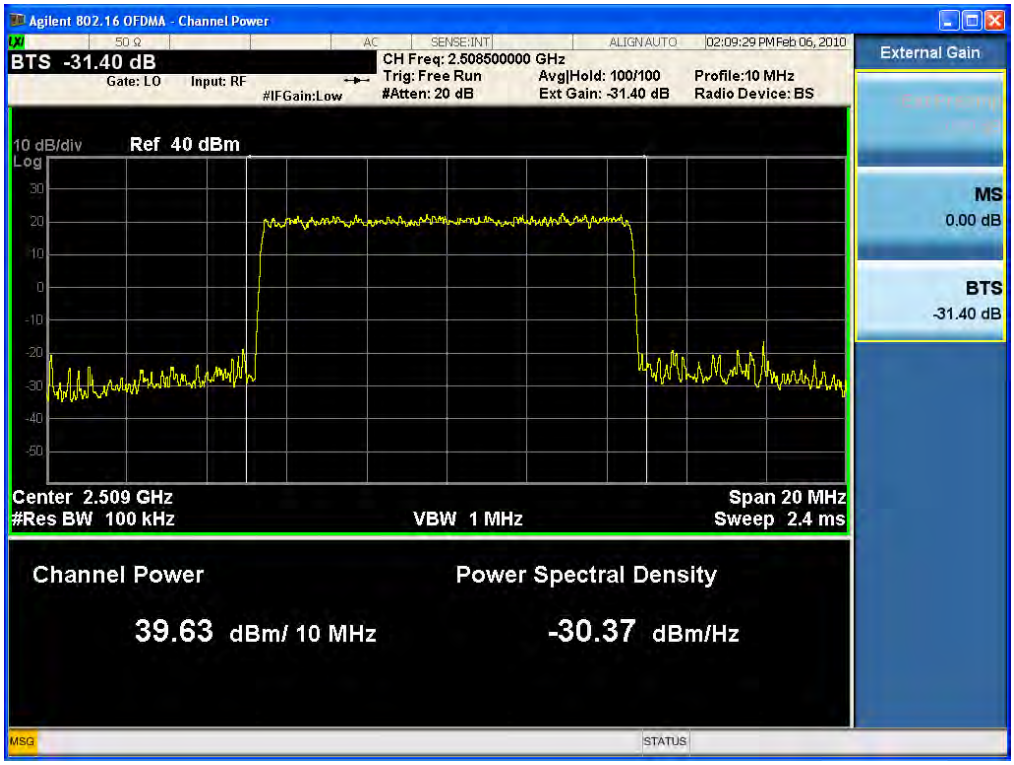
| Modulation | Channel | Frequency | Measured Output Power | |
|---|---|---|---|---|
| | | | dBm | W |
| QPSK | Low | 2647 | 38.97 | 7.89 |
| | Middle | 2657 | 40.15 | 10.35 |
| | High | 2667 | 40.22 | 10.52 |
| 16QAM | Low | 2647 | 38.85 | 7.67 |
| | Middle | 2657 | 40.21 | 10.50 |
| | High | 2667 | 40.39 | 10.94 |
| 64QAM | Low | 2647 | 38.92 | 7.80 |
| | Middle | 2657 | 40.18 | 10.42 |
| | High | 2667 | 40.37 | 10.89 |

5.4.6. Combined Test Data at Output Port

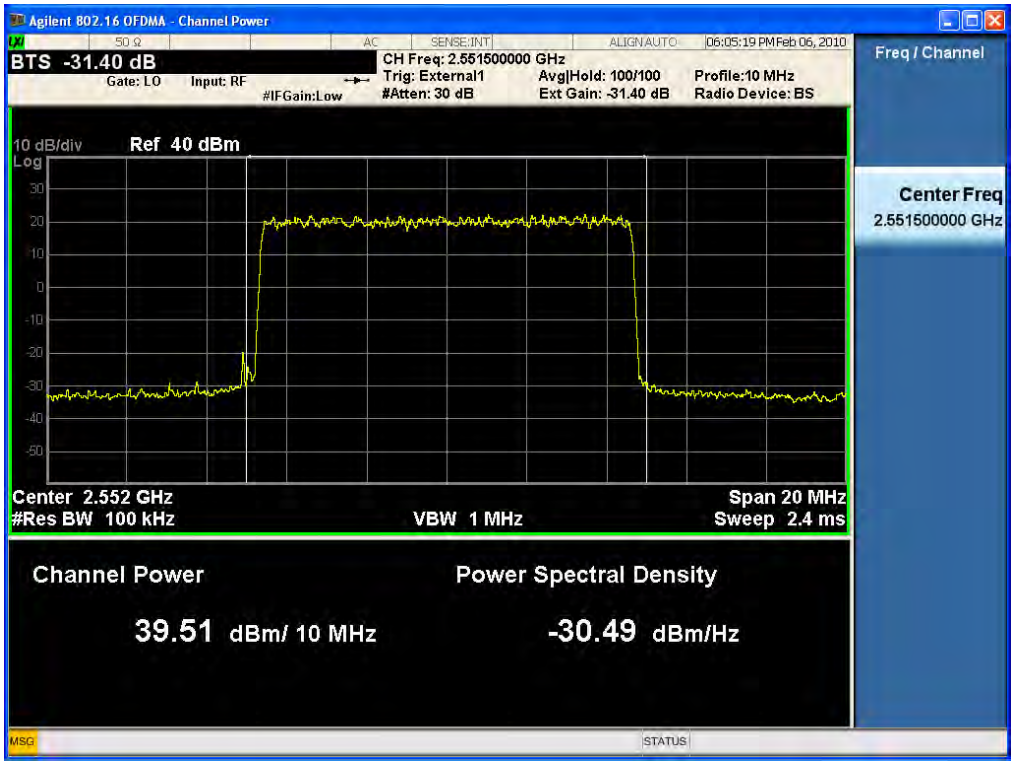
| Modulation | Channel | Frequency | Measured Output Power | |
|---|---|---|---|---|
| | | | dBm | W |
| QPSK | Low | 2647 | 43.29 | 21.33 |
| | Middle | 2657 | 42.92 | 19.59 |
| | High | 2667 | 42.36 | 17.22 |
| 16QAM | Low | 2647 | 43.24 | 21.09 |
| | Middle | 2657 | 42.88 | 19.41 |
| | High | 2667 | 42.32 | 17.06 |
| 64QAM | Low | 2647 | 43.18 | 20.80 |
| | Middle | 2657 | 42.88 | 19.41 |
| | High | 2667 | 42.25 | 16.79 |

5.4.7. Plot Data for Output Alpha 0 (Conducted Output Power)

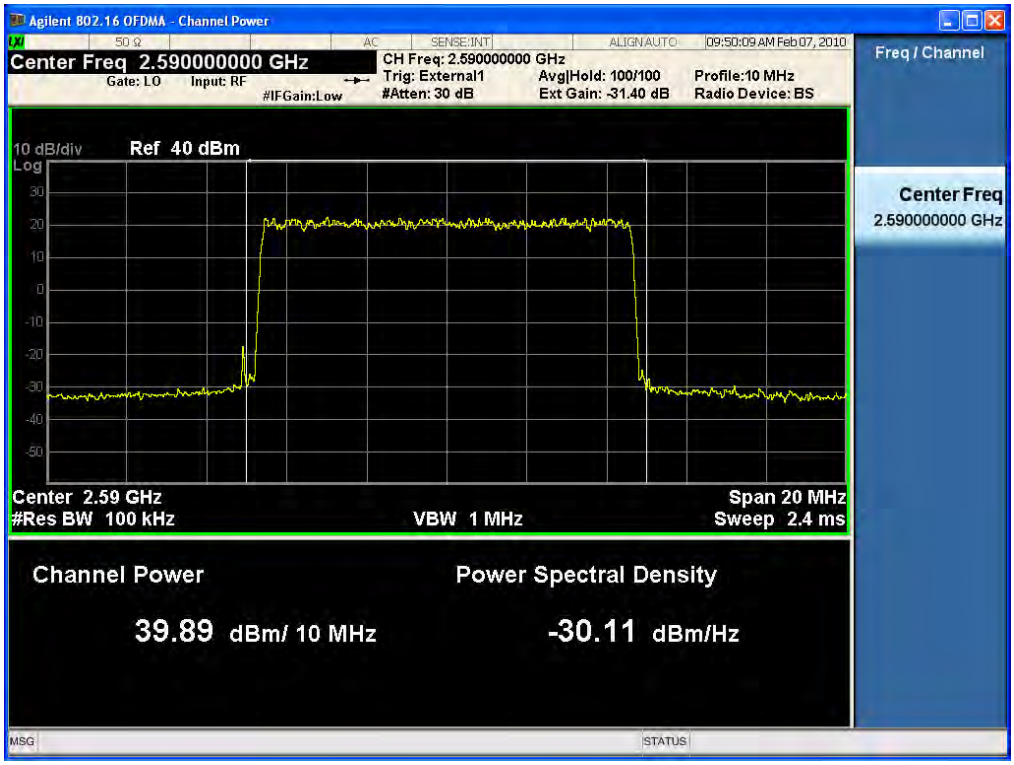
**(QPSK Low Channel)**



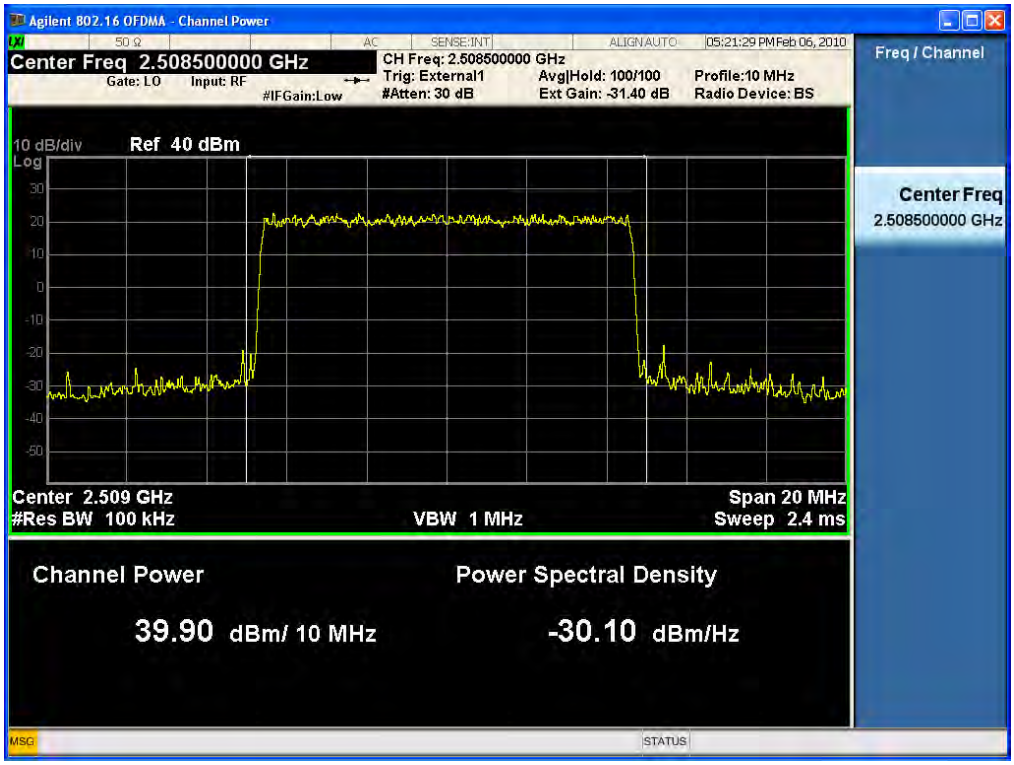

**(QPSK Middle Channel)**



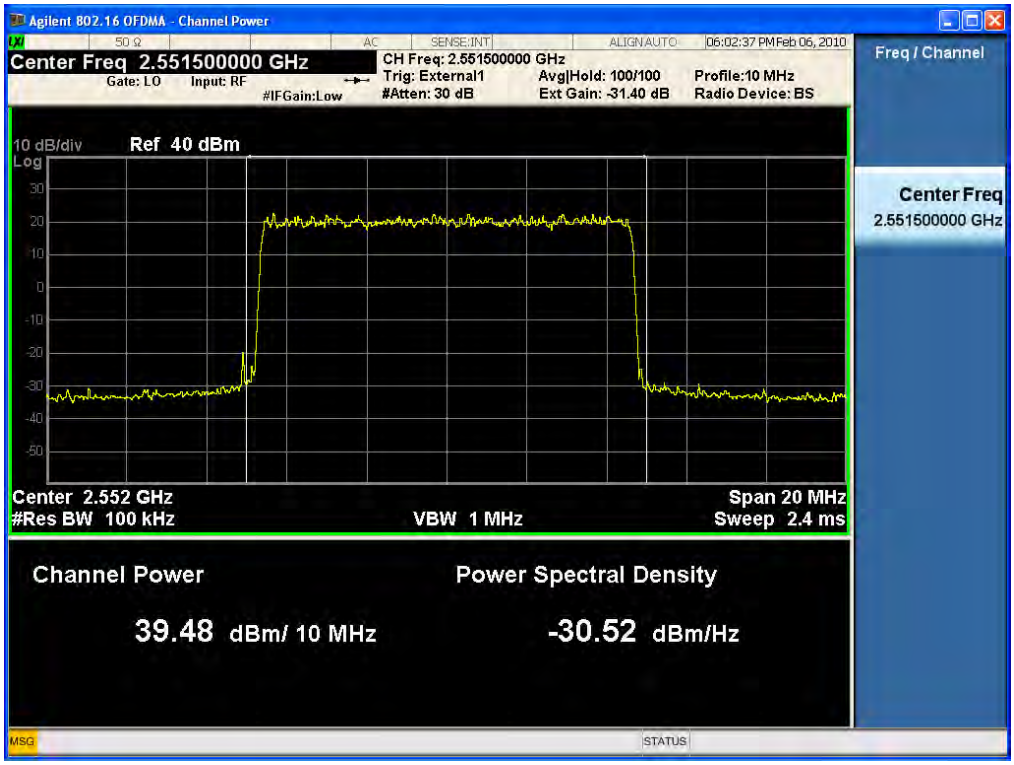
## (QPSK High Channel)



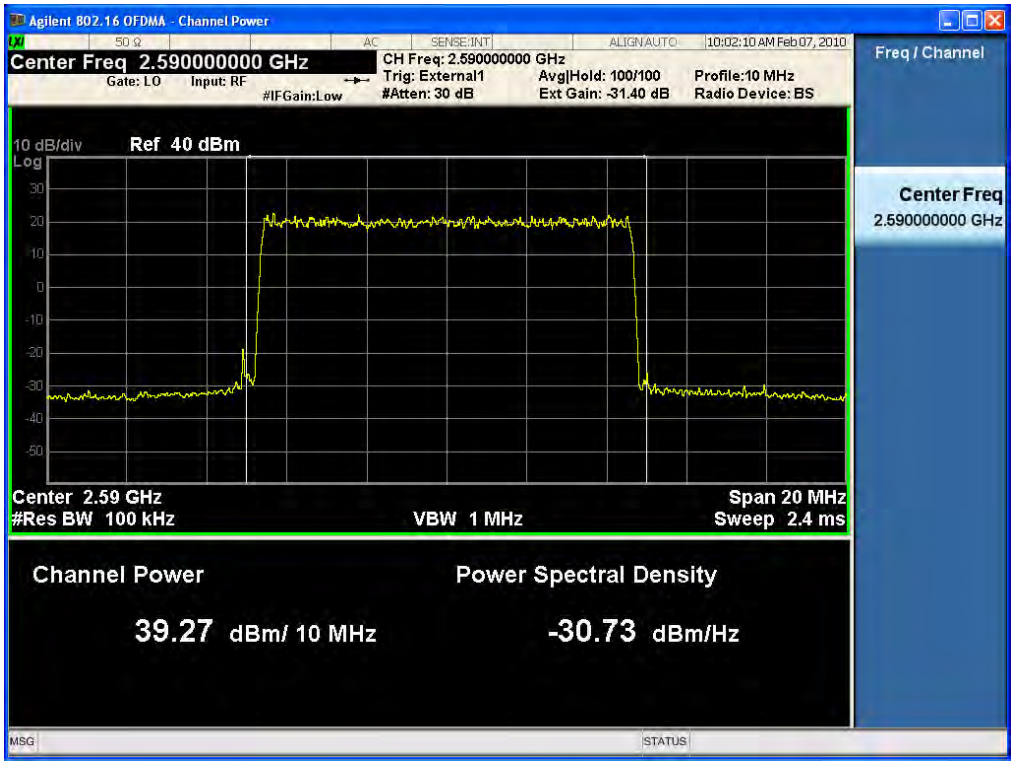

## (16QAM Low Channel)



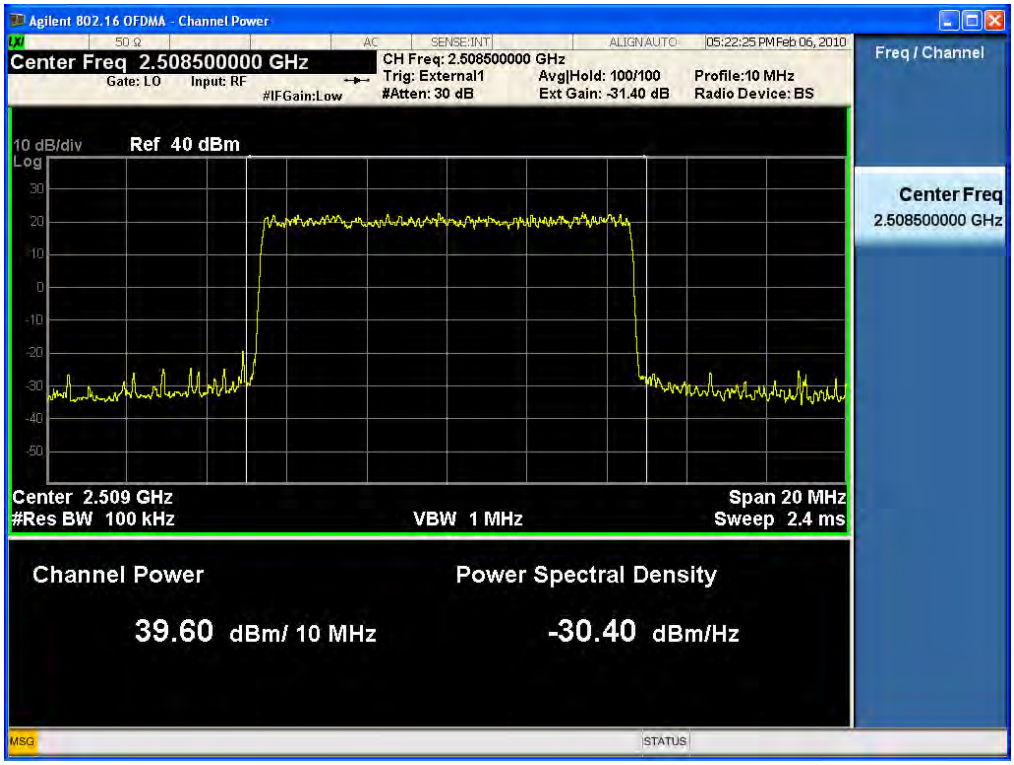
## (16QAM Middle Channel)



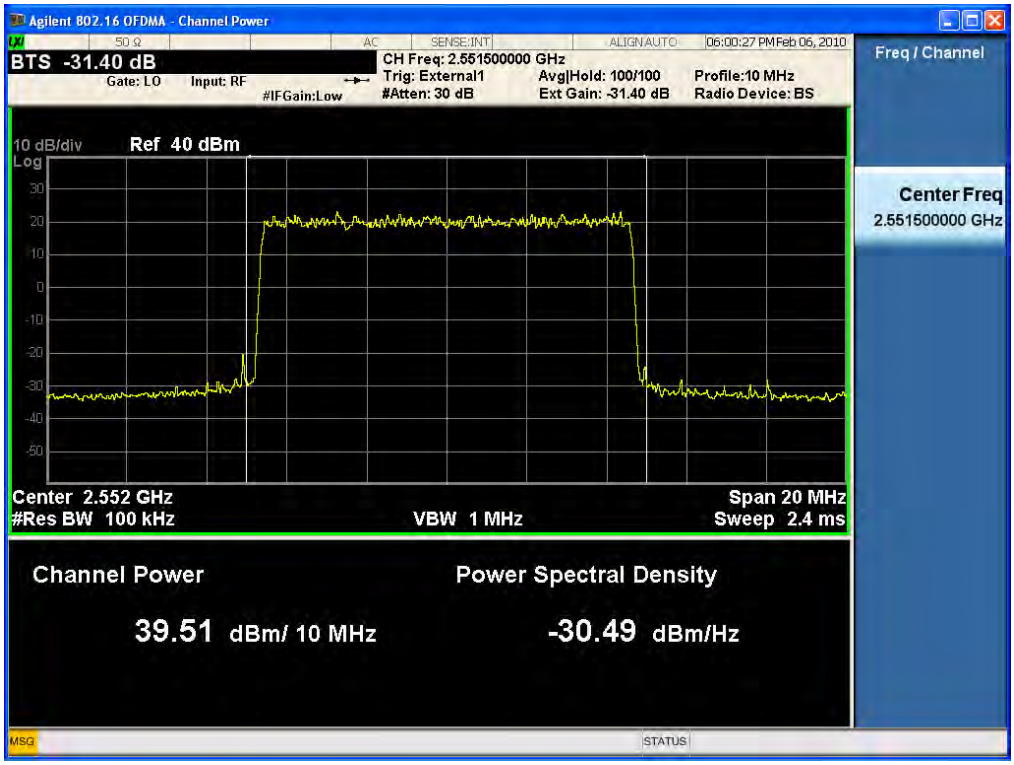

## (16QAM High Channel)



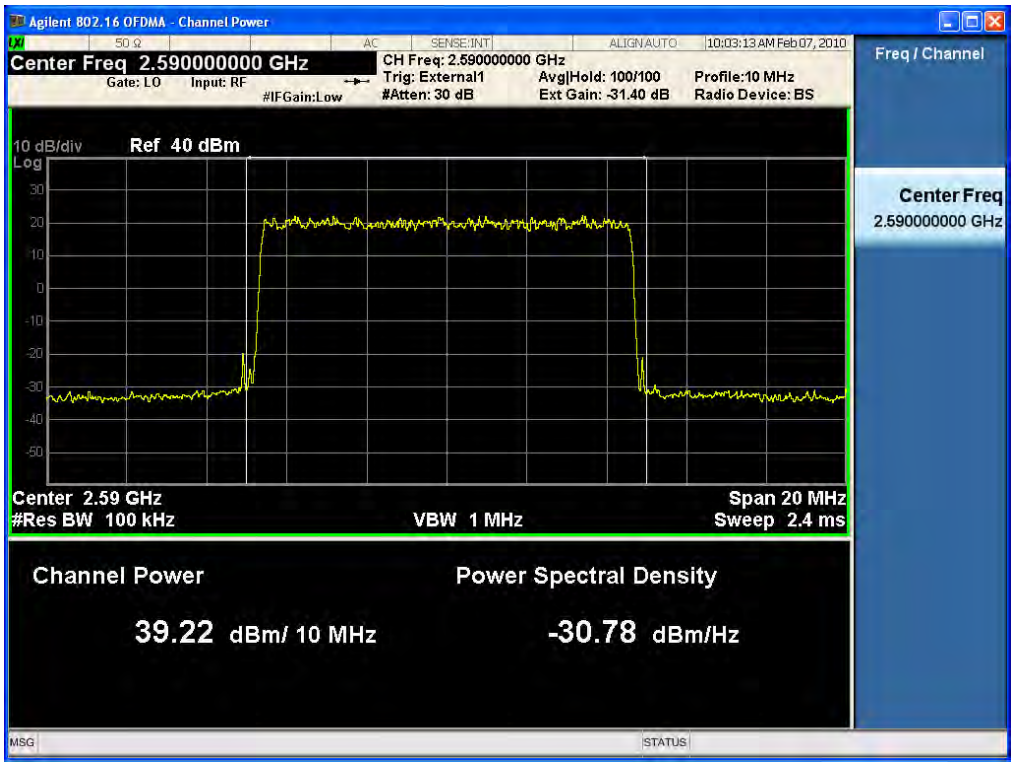
## (64QAM Low Channel)




## (64QAM Middle Channel)

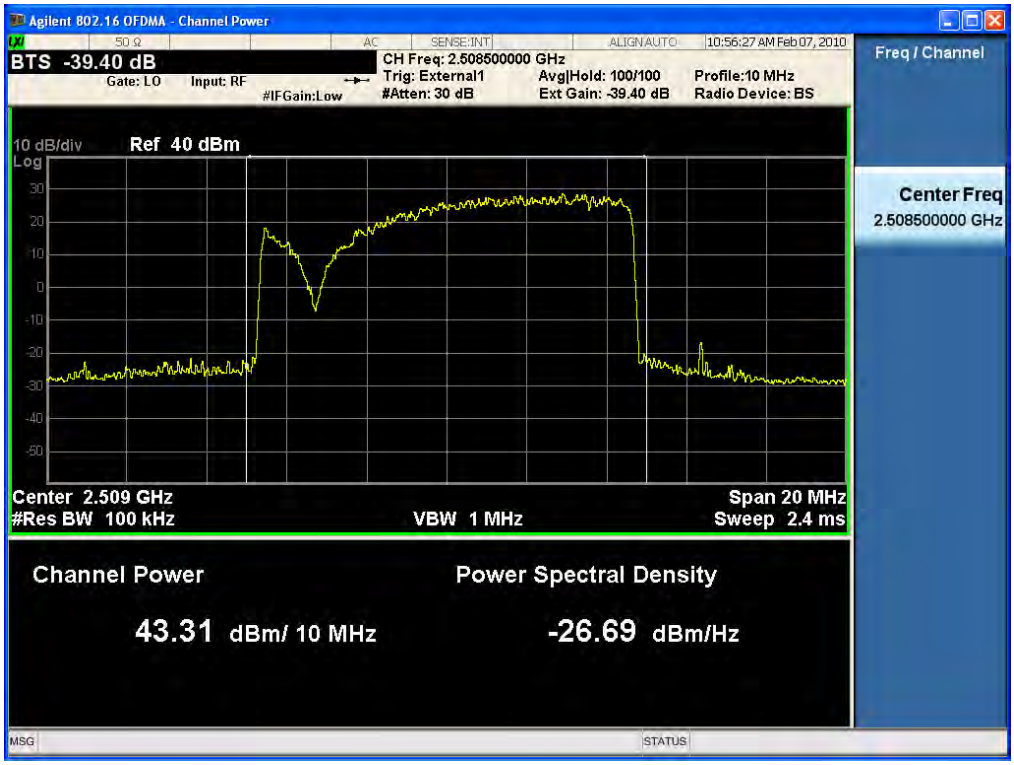


## (64QAM High Channel)

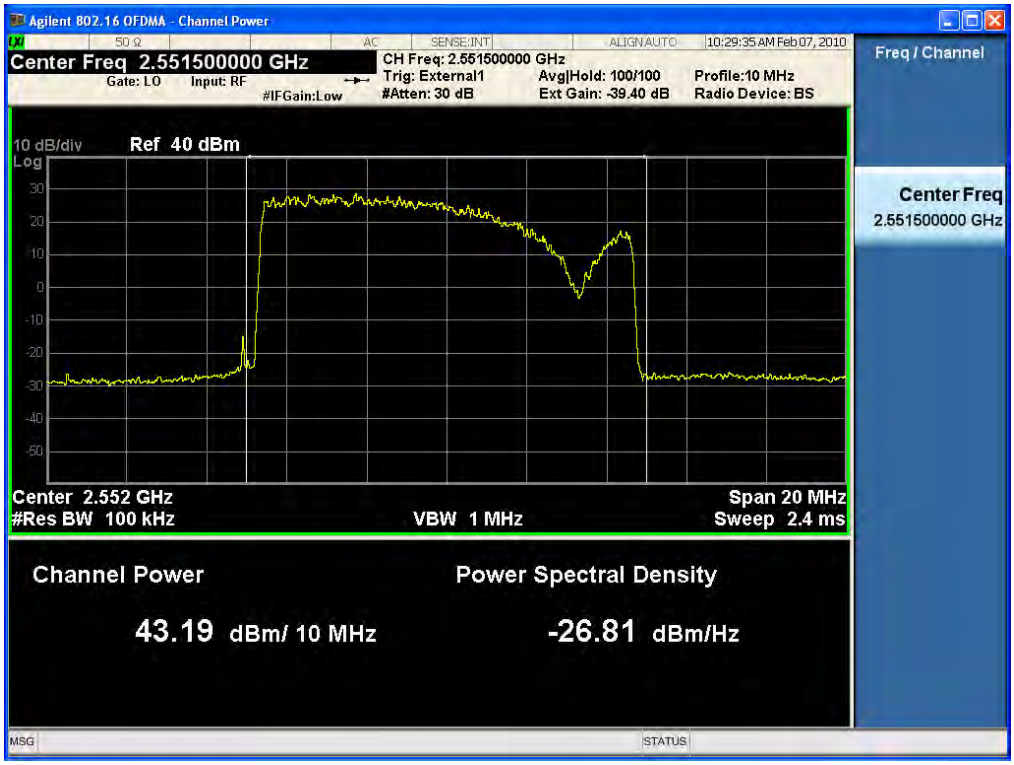


5.4.8. Combined Plot Data for Output (Conducted Output Power)

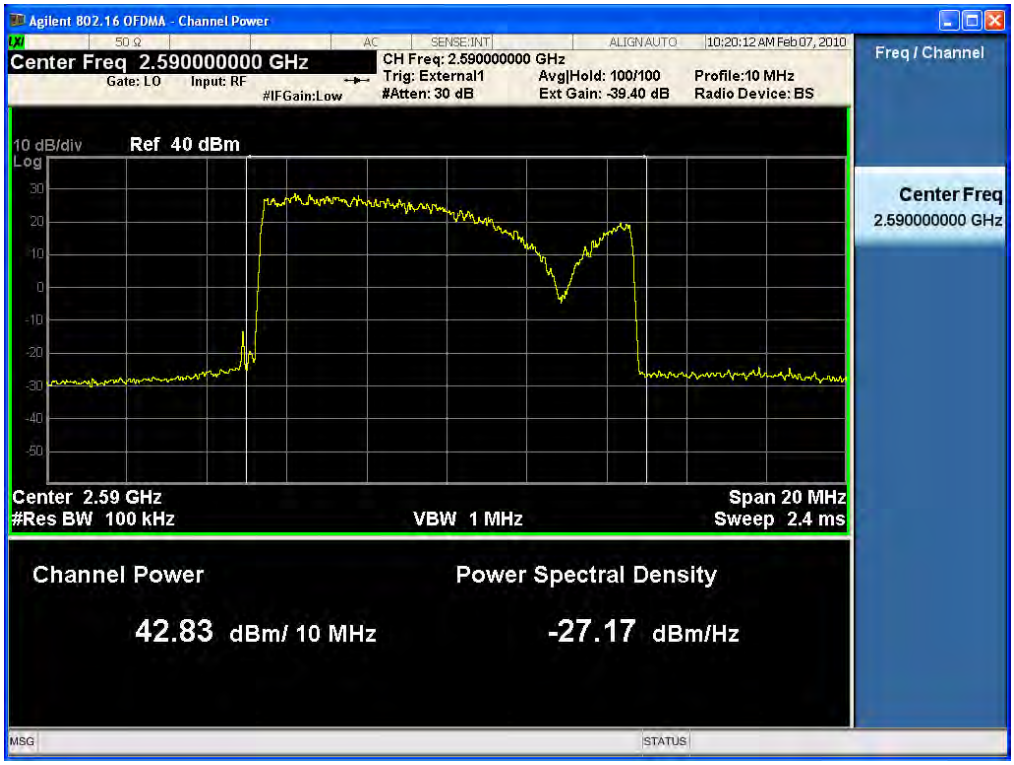
**(QPSK Low Channel)**



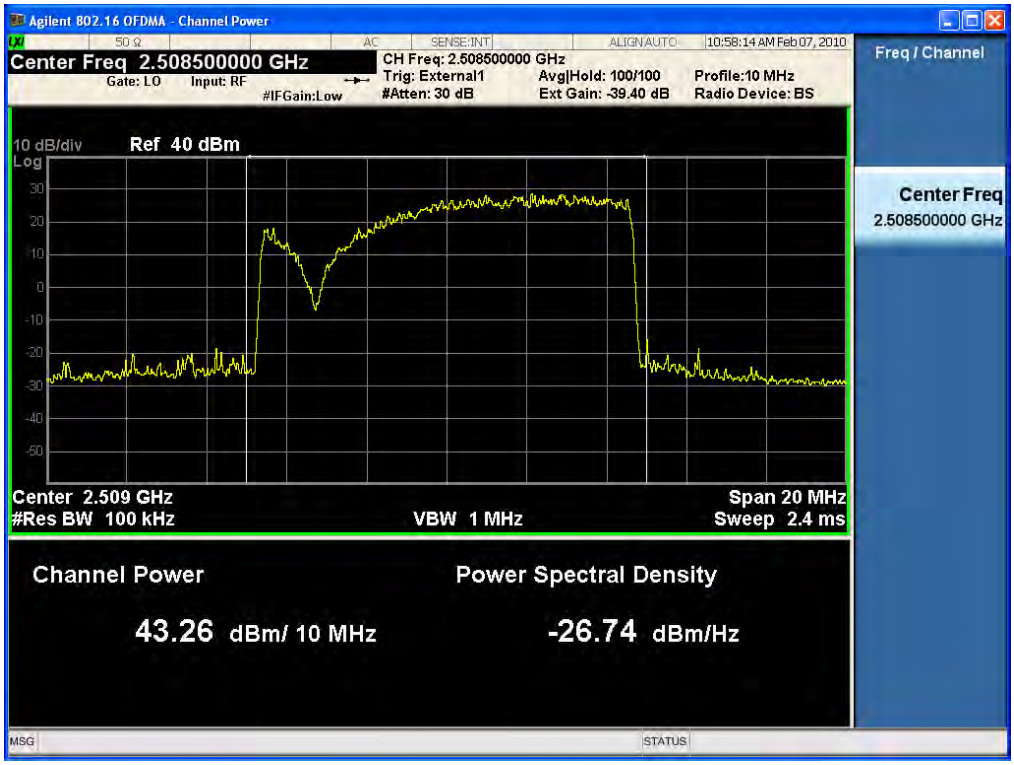

**(QPSK Middle Channel)**



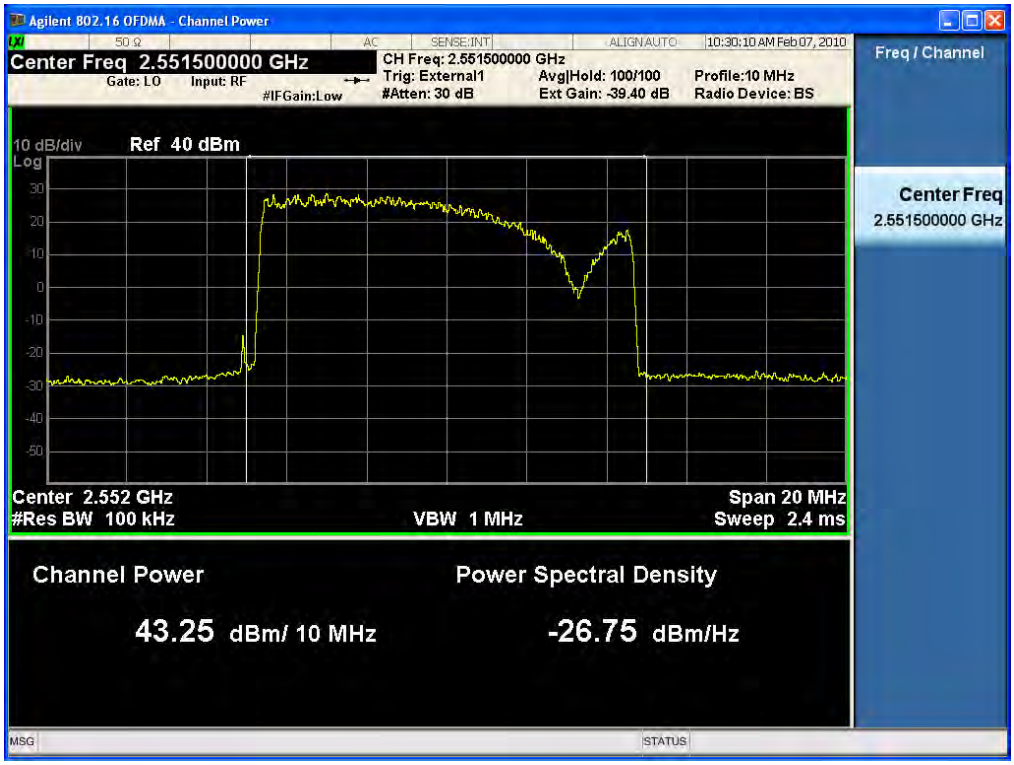
## (QPSK High Channel)



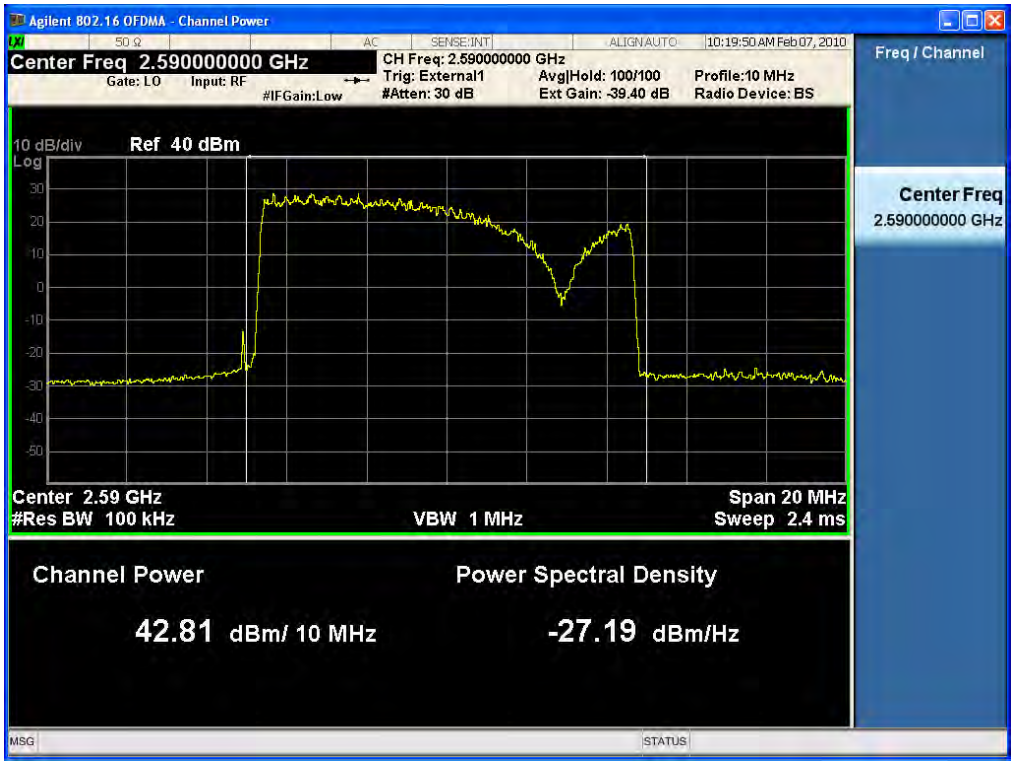

## (16QAM Low Channel)



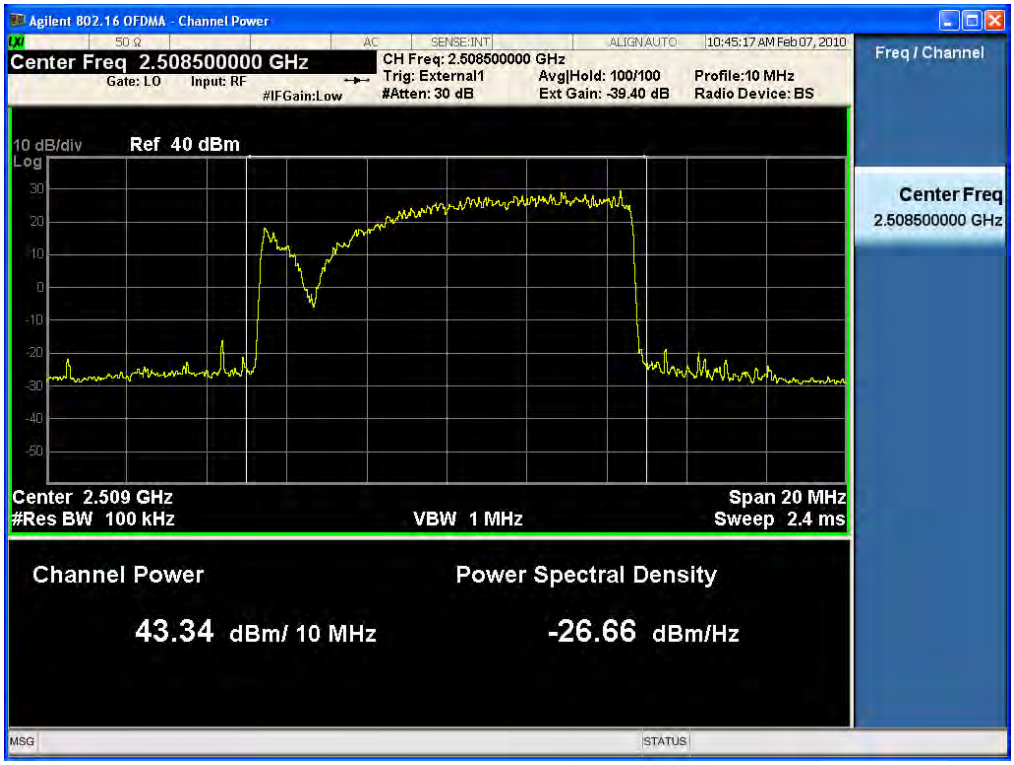
## (16QAM Middle Channel)



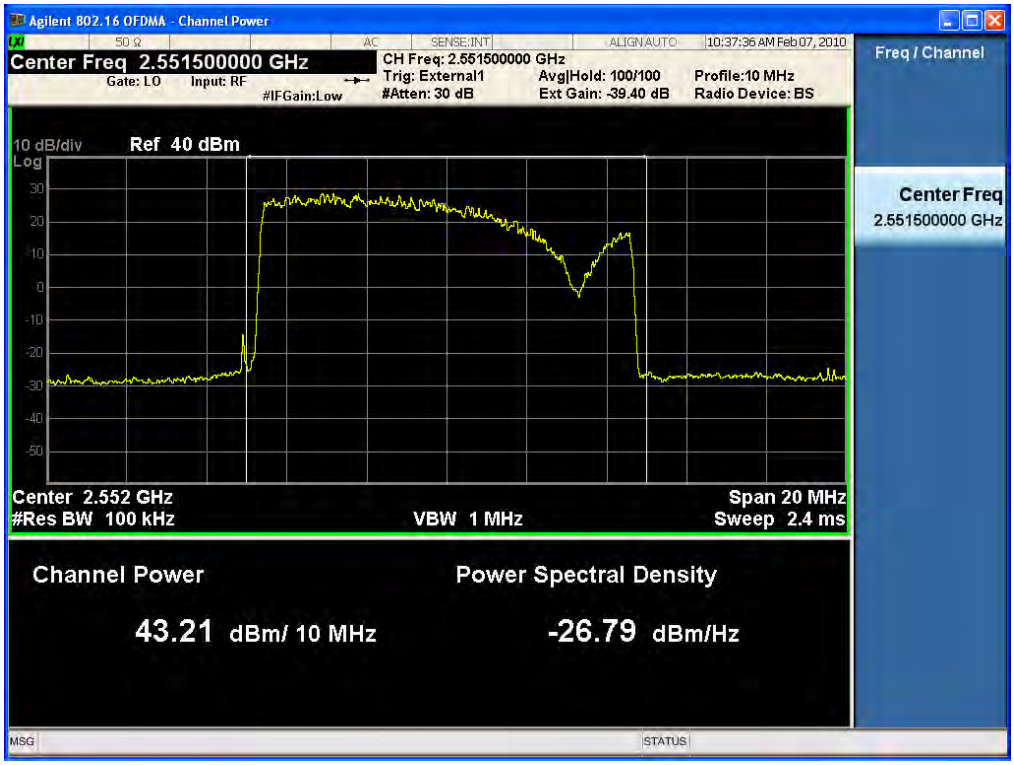

## (16QAM High Channel)



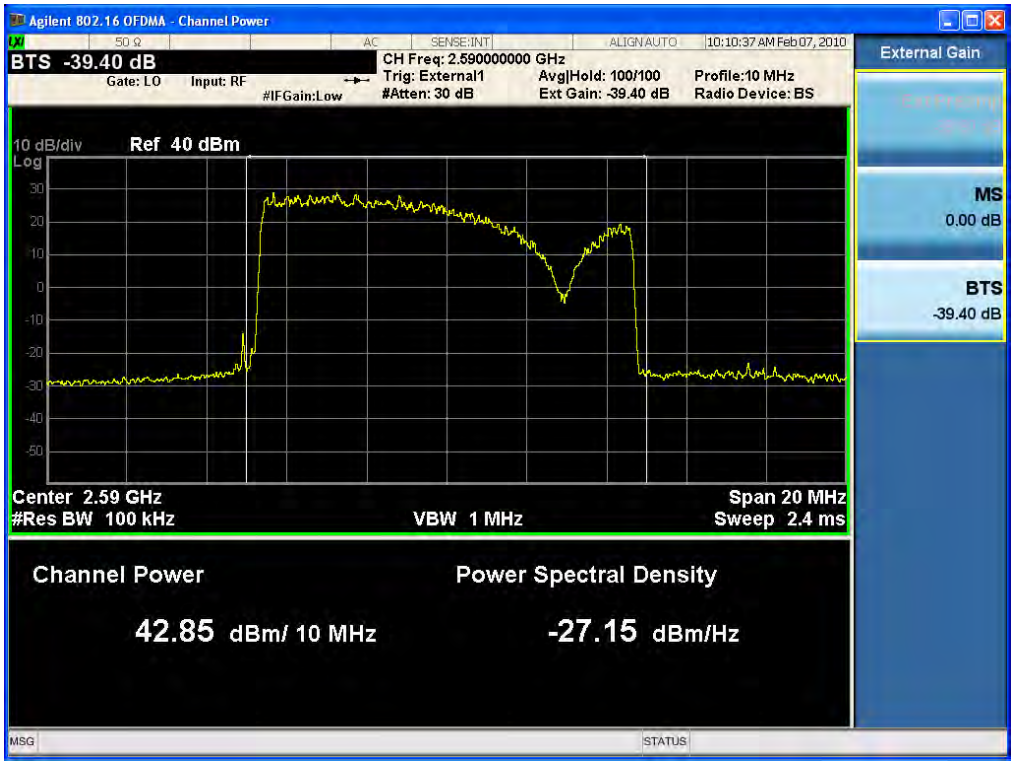
## (64QAM Low Channel)




## (64QAM Middle Channel)

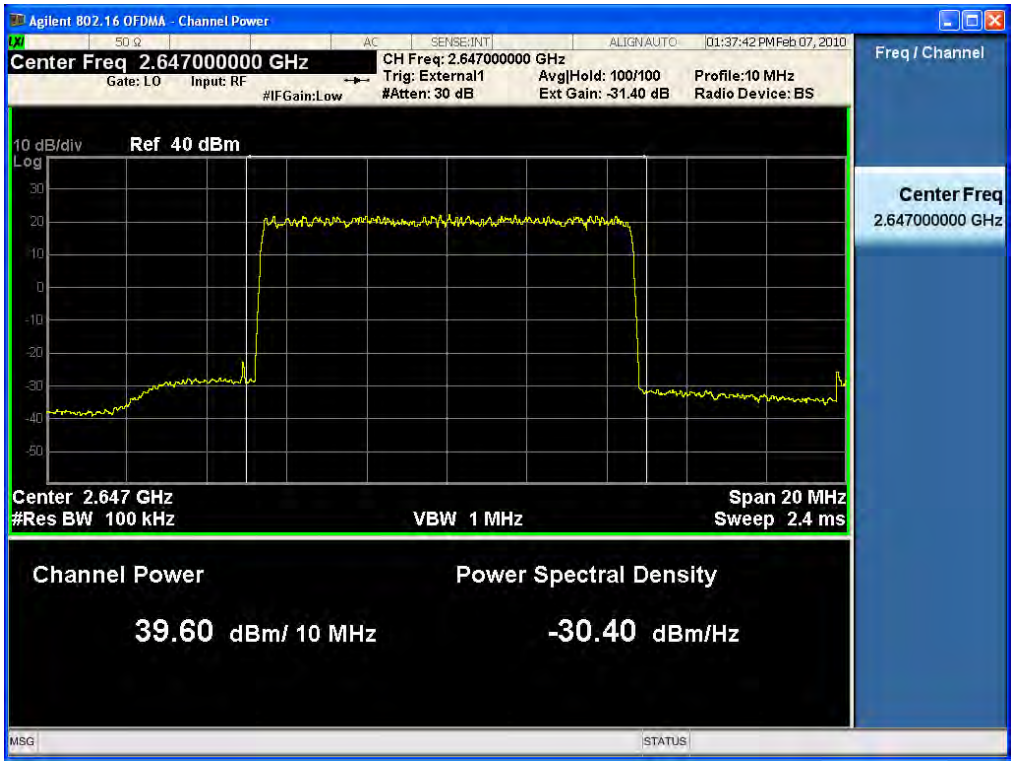


## (64QAM High Channel)

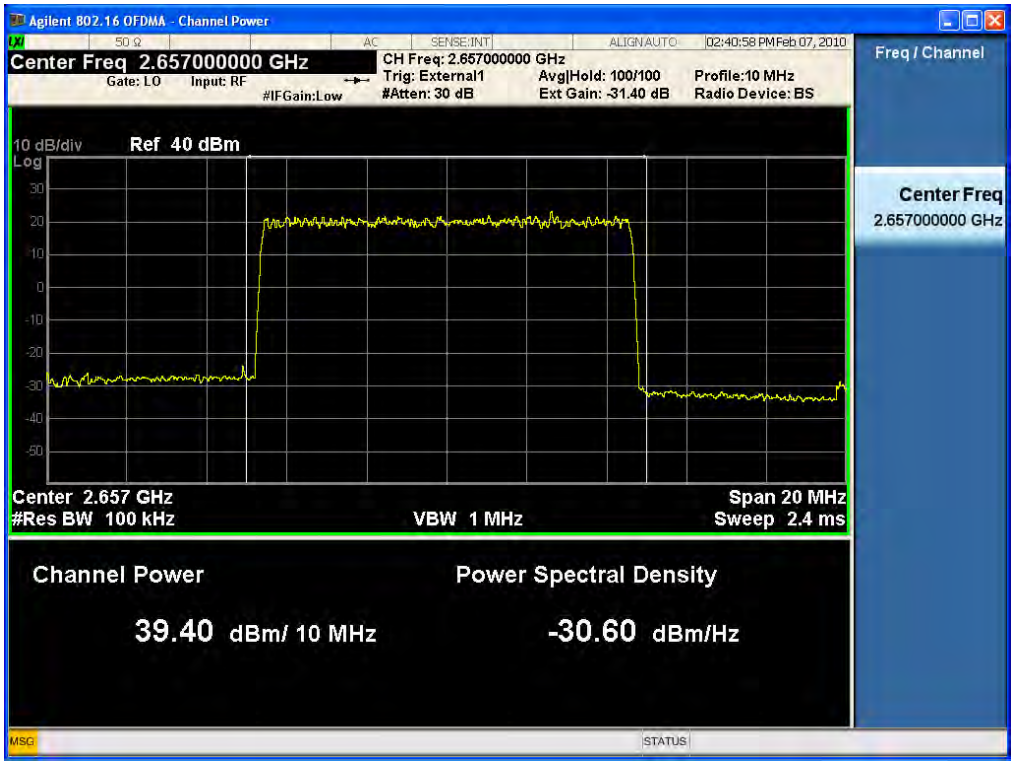


5.4.9. Plot Data for Output Beta 0 (Conducted Output Power)

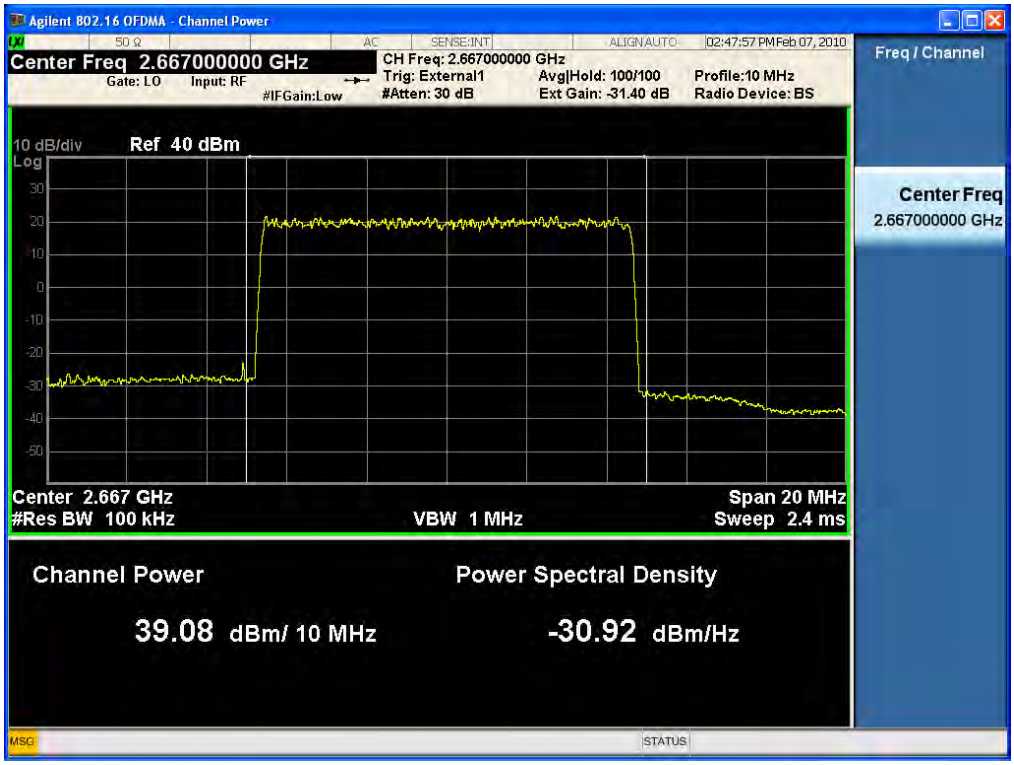
**(QPSK Low Channel)**



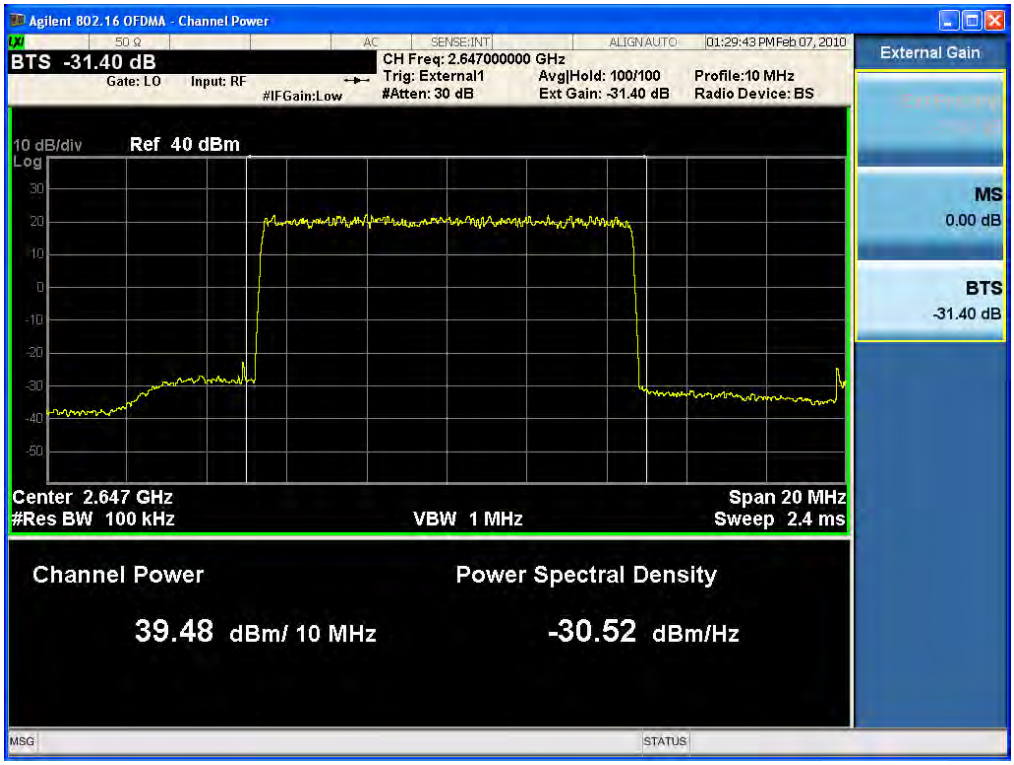

**(QPSK Middle Channel)**



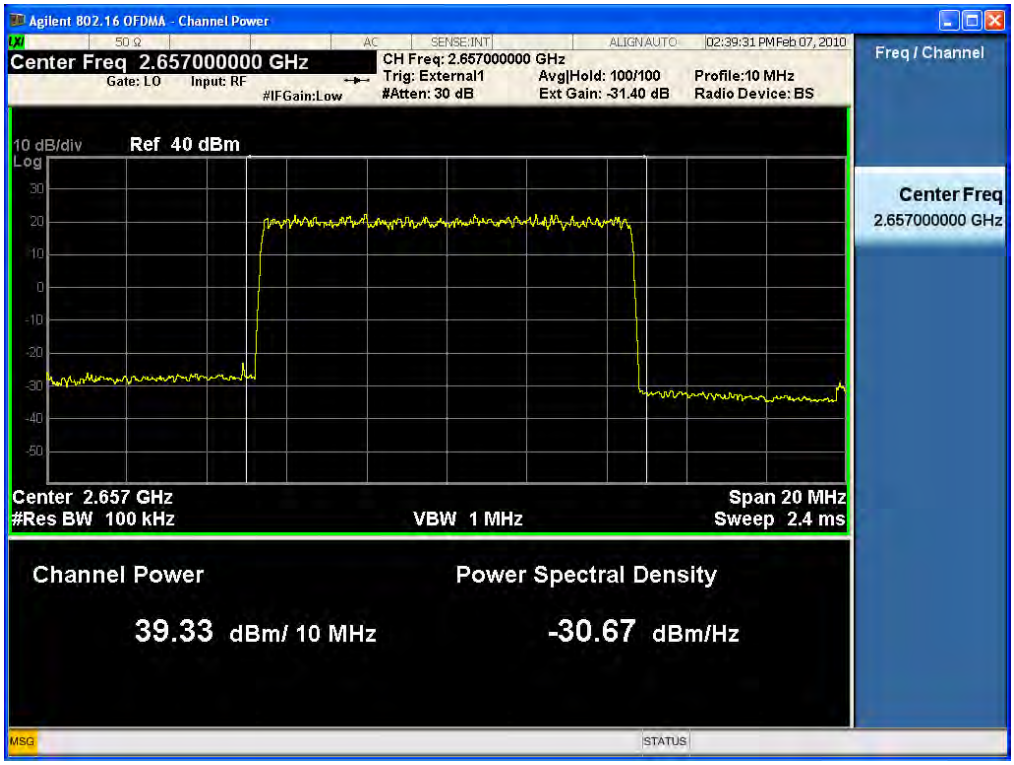
## (QPSK High Channel)



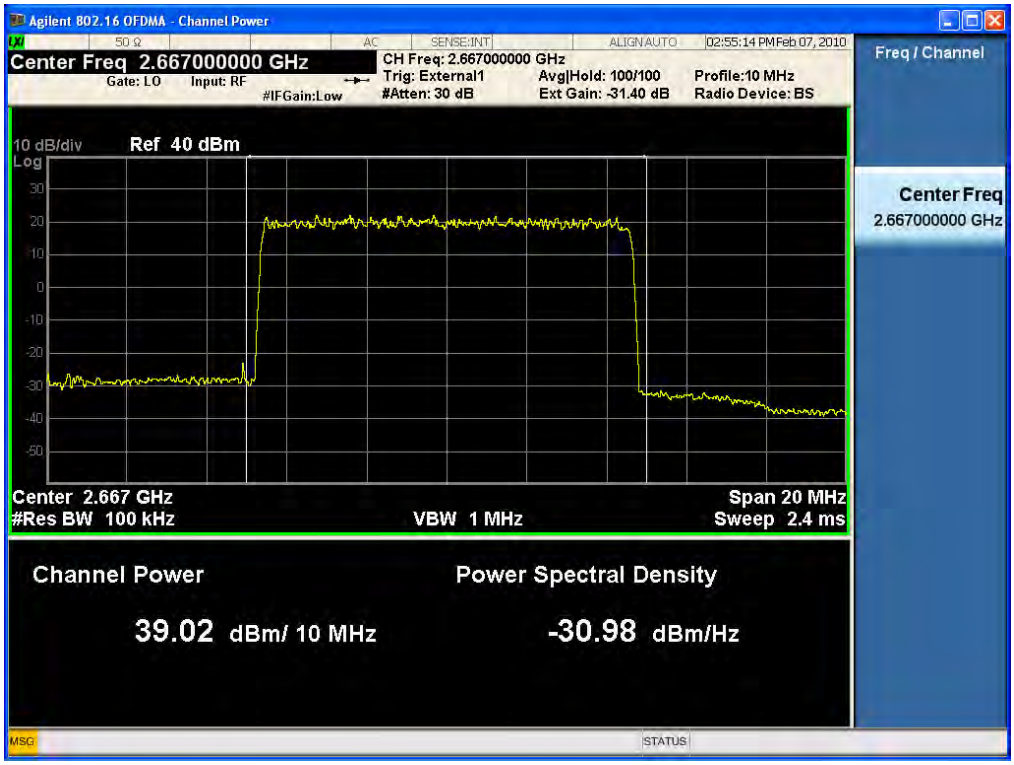

## (16QAM Low Channel)



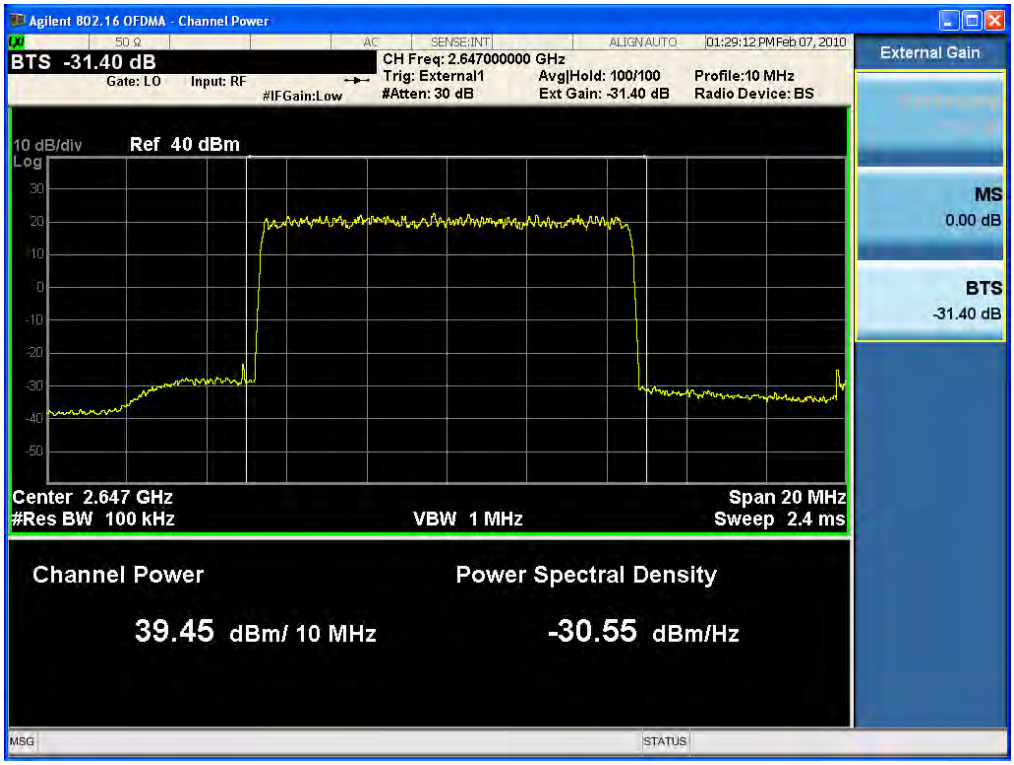
## (16QAM Middle Channel)



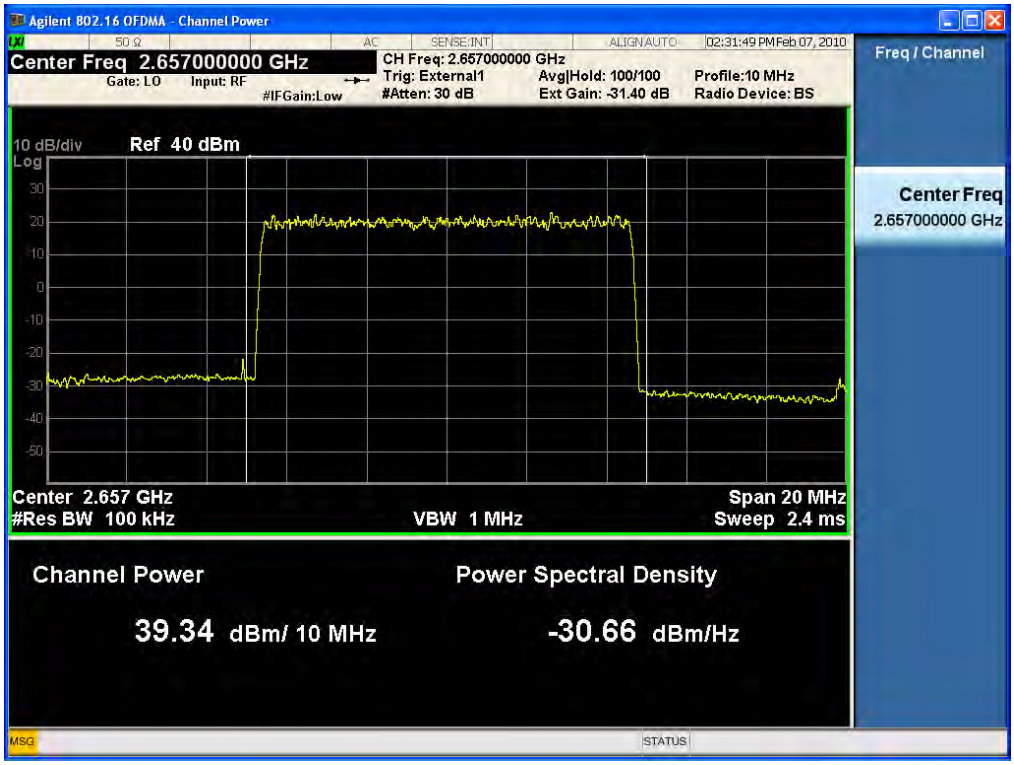

## (16QAM High Channel)



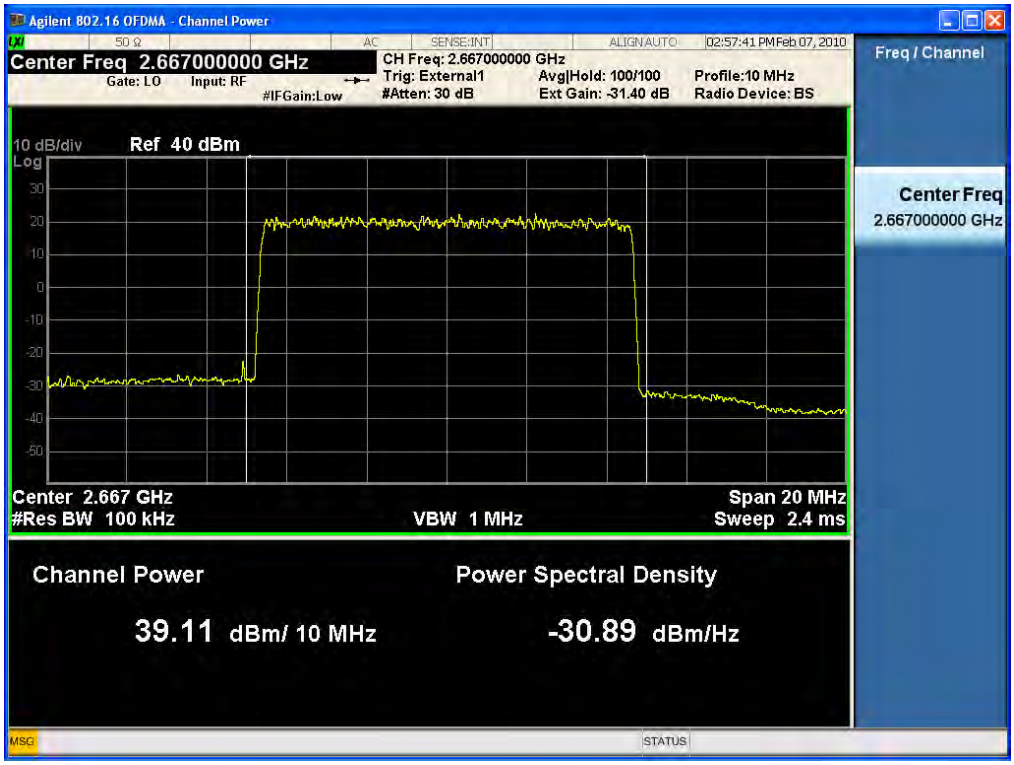
## (64QAM Low Channel)




## (64QAM Middle Channel)

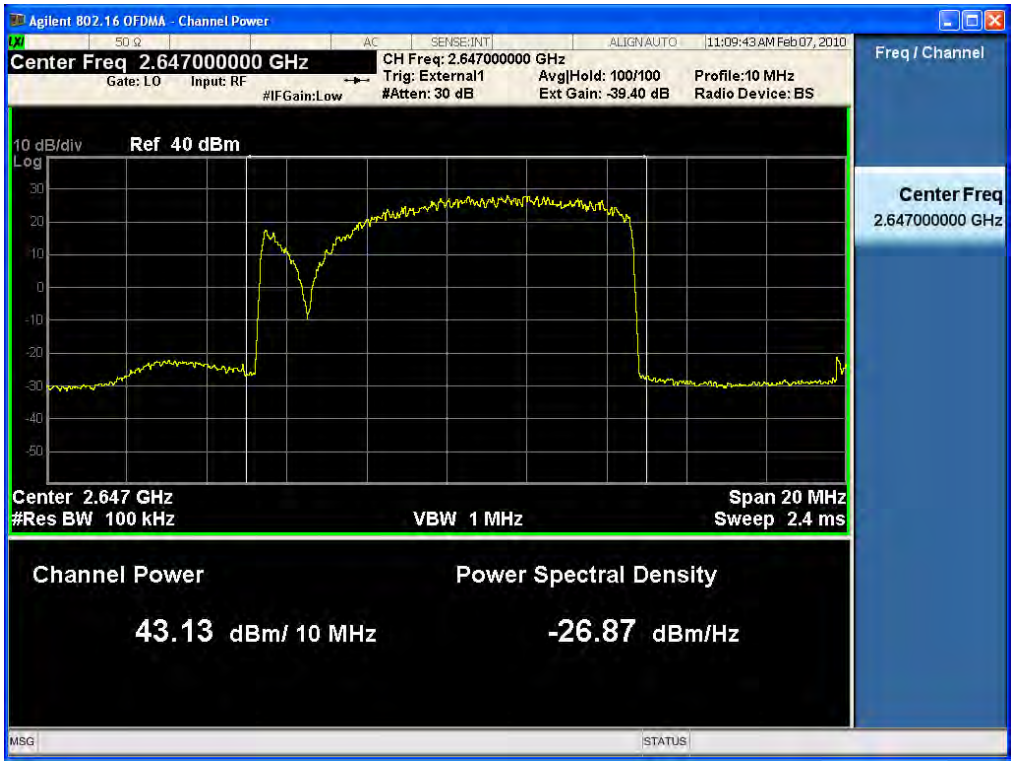


## (64QAM High Channel)



5.4.10. Combined Plot Data for Output (Conducted Output Power)

**(QPSK Low Channel)**




**(QPSK Middle Channel)**