



Report Reference ID:	387413-1TRFWL
----------------------	---------------

**Test specification:**

Title 47 – Telecommunication  
Chapter I – Federal Communications Commission  
Subchapter A – General  
Part 24 – Personal Communication Services  
Subpart E – Broadband PCS

Applicant:	TEKO Telecom Srl. Via Meucci, 24/a I-40024 Castel S. Pietro Terme (BO) (Italy)
------------	--

Apparatus:

Cell hub Mid-power Radio Remote Unit

Model:

XR19AX35WM2/48Y

FCC ID:

XM2-X19AX35M2A

Testing laboratory:

**Nemko Italy Spa**  
Via del Carroccio, 4  
20853 Biassono (MB) – Italy  
Telephone: +39 039 2201201  
Facsimile: +39 039 2201221

	Name and title	Date
Tested by:	 P. Barbieri, Wireless/EMC Specialist	11/20/2019
Reviewed by:	 R. Giampaglia, Wireless/EMC Specialist	11/20/2019

**Nemko Spa, 20853 Biassono (MB) - Italy. All rights reserved.**

This publication may be reproduced in whole or in part for non-commercial purposes as long as Nemko Spa is acknowledged as copyright owner and source of the material. Nemko Spa takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context. Nemko Spa accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This test report may not be partially reproduced, except with the prior written permission of Nemko Spa. The test report merely corresponds to the test sample. The phase of sampling / collection of equipment under test is carried out by the customer.

This Test Report, when bearing the Nemko name and logo is only valid when issued by a Nemko laboratory, or by a laboratory having special agreement with Nemko.

## Table of contents

<b>Section 1: Report summary .....</b>	<b>4</b>
1.1 Test specification.....	4
1.2 Statement of compliance .....	4
1.3 Exclusions .....	4
1.4 Registration number .....	4
1.5 Test report revision history .....	4
1.6 Limits of responsibility .....	4
<b>Section 2: Summary of test results .....</b>	<b>5</b>
2.1 FCC Part 24, test results .....	5
<b>Section 3: Equipment under test (EUT) and application details.....</b>	<b>6</b>
3.1 Applicant details .....	6
3.2 Modular equipment.....	6
3.3 Product details .....	6
3.4 Application purpose.....	6
3.5 Composite/related equipment.....	7
3.6 Sample information .....	7
3.7 EUT technical specifications.....	7
3.8 Accessories and support equipment.....	8
3.9 Operation of the EUT during testing .....	9
3.10 EUT setup diagram .....	9
<b>Section 4: Engineering considerations.....</b>	<b>10</b>
4.1 Modifications incorporated in the EUT .....	10
4.2 Deviations from laboratory tests procedures.....	10
4.3 Technical judgment .....	10
<b>Section 5: Test conditions .....</b>	<b>11</b>
5.1 Deviations from laboratory tests procedures.....	11
5.2 Test conditions, power source and ambient temperatures.....	11
5.3 Measurement uncertainty .....	12
5.4 Test equipment .....	13
<b>Appendix A: Test results .....</b>	<b>14</b>
Clause 24.238(b) Occupied bandwidth .....	14
Clause 24.232(a) Peak output power at RF antenna connector.....	39
Clause 24.238(a)(b) Spurious emissions at RF antenna connector .....	80
Clause 24.238(a)(b) Radiated Spurious emissions .....	146
Clause 24.235 Frequency stability.....	292



Appendix B: Block diagrams of test set-ups.....	311
Appendix C: EUT Photos .....	312



## Section 1: Report summary

### 1.1 Test specification

Specifications	Part 24 Subpart E, Broadband PCS
----------------	----------------------------------

### 1.2 Statement of compliance

Compliance	In the configuration tested the EUT was found compliant Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>  Test method: ANSI C63.26-2015, 662911 D01 Multiple Transmitter Output v02r01, 662911 D02 MIMO with Cross-Polarized Antennas v01
------------	---

### 1.3 Exclusions

Exclusions	None
------------	------

### 1.4 Registration number

Test site FCC ID number	682159
-------------------------	--------

### 1.5 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued
R1TRF	----

### 1.6 Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025. Nemko Spa authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

Nemko Spa accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.



## Section 2: Summary of test results

### 2.1 FCC Part 24, test results

Part	Methods	Test description	Verdict
§24.238(b)	2.1049	Occupied bandwidth	Pass
§24.232	2.1046	Peak output power at RF antenna connector (EIRP)	Pass
§24.232(d)	2.1046	Peak output power at RF antenna connector (PAPR)	Pass
§24.238(a)(b)	2.1051	Conducted spurious emissions	Pass
§24.238(a)(b)	2.1053	Radiated spurious emissions	Pass
§24.235	2.1055	Frequency stability	Pass

Notes:



## Section 3: Equipment under test (EUT) and application details

### 3.1 Applicant details

<b>Applicant complete business name</b>	Name: Federal Registration Number (FRN): Grantee code	Teko Telecom Srl 0018963462 XM2
<b>Mailing address</b>	Address: City: Province/State: Post code: Country:	Via Meucci, 24/a Castel S. Pietro Terme Bologna 40024 Italy

### 3.2 Modular equipment

a) Single modular approval	Single modular approval Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
b) Limited single modular approval	Limited single modular approval Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

### 3.3 Product details

<b>FCC ID</b>	Grantee code: Product code:	XM2 -X19AX35M2A
<b>Equipment class</b>	PCB	
<b>Description of product as it is marketed</b>	Base Station Model name/number:	XR19AX35WM2/48Y
	Serial number:	1012991001

### 3.4 Application purpose

<b>Type of application</b>	<input checked="" type="checkbox"/> Original certification <input type="checkbox"/> Change in identification of presently authorized equipment Original FCC ID: <input type="text"/> Grant date: <input type="text"/> <input type="checkbox"/> Class II permissive change or modification of presently authorized equipment
----------------------------	--



## Section 3: Equipment under test

## 3.5 Composite/related equipment

a) Composite equipment	The EUT is a composite device subject to an additional equipment authorization Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
b) Related equipment	The EUT is part of a system that operates with, or is marketed with, another device that requires an equipment authorization Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
c) Related FCC ID	If either of the above is "yes": <input type="checkbox"/> has been granted under the FCC ID(s) listed below: <input checked="" type="checkbox"/> is in the process of being filled under the FCC ID(s) listed below: <input type="checkbox"/> is pending with the FCC ID(s) listed below: <input type="checkbox"/> has a mix of pending and granted statues under the FCC ID(s) listed below: i) FCC ID: XM2-X19AX35M2A ii) FCC ID:

## 3.6 Sample information

Receipt date:	04/01/2019
Nemko sample ID number:	-----

## 3.7 EUT technical specifications

Operating band:	Down Link 1930-1995 MHz; Up Link 1850-1915 MHz
Operating frequency:	Wideband
Modulation type:	LTE (16QAM, 64QAM, 256QAM, QPSK)
Occupied bandwidth:	LTE: 5 MHz, 10 MHz, 15 MHz, 20 MHz
Channel spacing:	standard
Emission designator:	LTE: D7W
RF Output	Down Link: 27dBm (0.5 W)
Antenna type:	External Antenna is not provided, equipment that has an external 50 Ω RF connector
Power source:	48 Vdc



## Section 3: Equipment under test

**3.8 Accessories and support equipment**

The following information identifies accessories used to exercise the EUT during testing:

## Item # 1

Type of equipment:	Server
Brand name:	Dell
Model name or number:	E38S
Serial number:	066JJ5
Nemko sample number:	-----
Connection port:	-----
Cable length and type:	-----

## Item # 2

Type of equipment:	
Brand name:	
Model name or number:	
Serial number:	
Nemko sample number:	
Connection port:	
Cable length and type:	

## Item # 3

Type of equipment:	
Brand name:	
Model name or number:	
Serial number:	
Nemko sample number:	
Connection port:	
Cable length and type:	

## Item # 4

Type of equipment:	
Brand name:	
Model name or number:	
Serial number:	
Nemko sample number:	
Connection port:	
Cable length and type:	

### 3.9 Operation of the EUT during testing

**Details:**

In down-link direction, normal working at max gain with max RF power output.

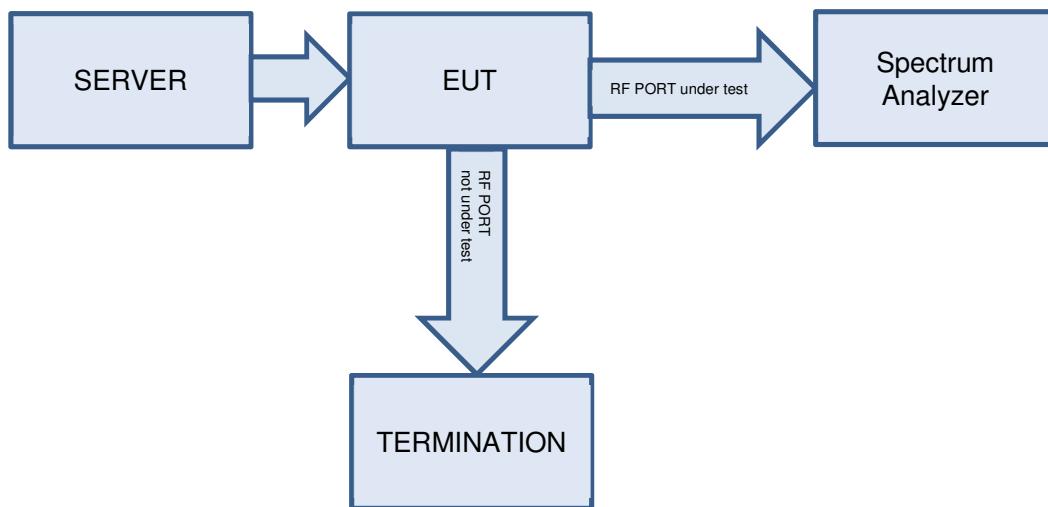
This report refer to measurement both RF port 1 and RF port 2.

When a RF port has been tested, the other one has been terminated on 50Ω load.

### 3.10 EUT setup diagram

In this system Cell Hub (Base Station) is the EUT.

The server generates wanted signals in base band frequency and Cell Hub convert the signal to RF band.

**Test setup :**

**Procedure**

Connect the server to the input of EUT by means of optical fiber, so the EUT can works at the maximum power.

Connect the spectrum analyzer to the RF output connector of the EUT.



## Section 4: Engineering considerations

### 4.1 Modifications incorporated in the EUT

<b>Modifications</b>	Modifications performed to the EUT during this assessment None <input checked="" type="checkbox"/> Yes <input type="checkbox"/> , performed by Client <input type="checkbox"/> or Nemko <input type="checkbox"/> Details:
----------------------	---

### 4.2 Deviations from laboratory tests procedures

<b>Deviations</b>	Deviations from laboratory test procedures None <input checked="" type="checkbox"/> Yes <input type="checkbox"/> - details are listed below:
-------------------	---

### 4.3 Technical judgment

<b>Judgment</b>	None
-----------------	------



## Section 5: Test conditions

### 5.1 Deviations from laboratory tests procedures

No deviations were made from laboratory test procedures.

### 5.2 Test conditions, power source and ambient temperatures

Normal temperature, humidity and air pressure test conditions	Temperature: 15–30 °C Relative humidity: 20–75 % Air pressure: 86–106 kPa  When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.
Power supply range:	The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages $\pm 5\%$ , for which the equipment was designed.



## Section 5: Test conditions, continued

## 5.3 Measurement uncertainty

EUT	Type	Test	Range and Setup features	Measurement Uncertainty	Notes
Transmitter	Conducted	Frequency error	0.001 MHz ÷ 40 GHz	0.08 ppm	(1)
		Carrier power RF Output Power	10 kHz ÷ 30 MHz 30 MHz ÷ 18 GHz 18 MHz ÷ 40 GHz	1.0 dB 1.5 dB 3.0 dB	(1) (1) (1)
		Adjacent channel power	1 MHz ÷ 18 GHz	1.6 dB	(1)
		Conducted spurious emissions	10 kHz ÷ 26 GHz 26 GHz ÷ 40 GHz	3.0 dB 4.5 dB	(1) (1)
		Intermodulation attenuation	1 MHz ÷ 18 GHz	2.2 dB	(1)
		Attack time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Attack time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Release time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Release time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Transient behaviour of the transmitter – Transient frequency behaviour	1 MHz ÷ 18 GHz	0.2 kHz	(1)
		Transient behaviour of the transmitter – Power level slope	1 MHz ÷ 18 GHz	9%	(1)
		Frequency deviation - Maximum permissible frequency deviation	0.001 MHz ÷ 18 GHz	1.3%	(1)
		Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz	0.001 MHz ÷ 18 GHz	0.5 dB	(1)
		Dwell time	-	3%	(1)
		Hopping Frequency Separation	0.01 MHz ÷ 18 GHz	1%	(1)
		Occupied Channel Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
		Modulation Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
Receiver	Radiated	Radiated spurious emissions	10 kHz ÷ 26.5 GHz 26.5 GHz ÷ 40 GHz	6.0 dB 8.0 dB	(1) (1)
			10 kHz ÷ 26.5 GHz 26.5 GHz ÷ 40 GHz	6.0 dB 8.0 dB	(1) (1)
		Sensitivity measurement	1 MHz ÷ 18 GHz	6.0 dB	(1)
		Conducted spurious emissions	10 kHz ÷ 26 GHz 26 GHz ÷ 40 GHz	3.0 dB 4.5 dB	(1) (1)

(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor  $k = 2$  which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %



## 5.4 Test equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next cal.
Spectrum Analyzer	Agilent	N9030A PXA	MY53120882	12/2019
Climatic Chambre	Angelantoni	ACS-Hygros 600	7237	09/2020
Trilog Broad Band Antenna 25-8000 MHz	Schwarzbeck	VULB 9162	VULB 9162-25	07/2021
Antenna 1-18 GHz	Schwarzbeck	STLP 9148	STPL 9148-123	07/2021
Double ridge horn antenna (4 ÷ 40 GHz)	RFSpin	DRH40	061106A40	02/2020
Broadband preamplifier (18 ÷ 40 GHz)	Miteq	JS44-18004000-35-8P-R	1.627	09/2019
Broadband preamplifier 1-18 GHz	Schwarzbeck	BBV 9718	9718-137	08/2019
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202	01/2020
EMI receiver 2 Hz ÷ 44 GHz	R&S	ESW44	101620	05/2019
Hydraulic revolving platform	Nemko	RTPL 01	4.233	NCR
Turning-table	R&S	HCT	835 803/03	NCR
Antenna mast	R&S	HCM	836 529/05	NCR
Controller	R&S	HCC	836 620/7	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	09/2021
Shielded room	Siemens	10m control room	1947	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	70	NCR
Shielded Room	Siemens	3m semi-anechoic chamber	3	NCR
Motor controller	Emco	1051-25	9012-1559	NCR
Motor controller	Emco	1061-1.521	9012-1508	NCR
Antenna Tower	Emco	2071-2	9601-1940	NCR
Controller pole/table	Emco	2090	9511-1099	NCR

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use

(\*) Equipment supplied by manufacturer's



## Appendix A: Test results

### Clause 24.238(b) Occupied bandwidth

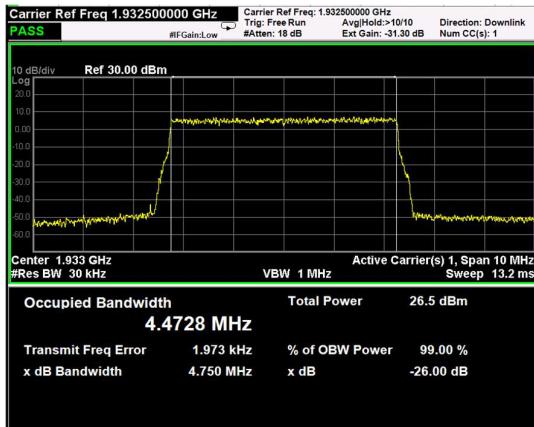
The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

Test date: [04/03/2019 to 05/10/2019](#)

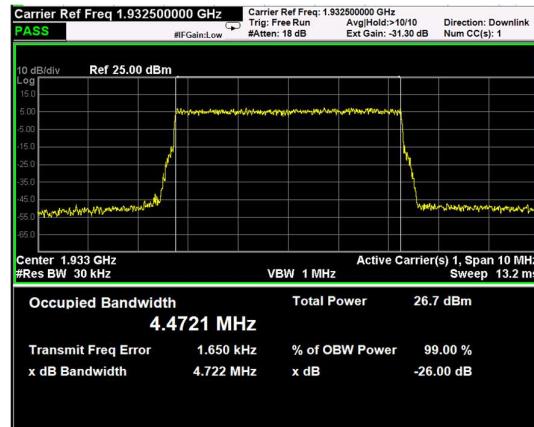
Test results: [Pass](#)

### Special notes

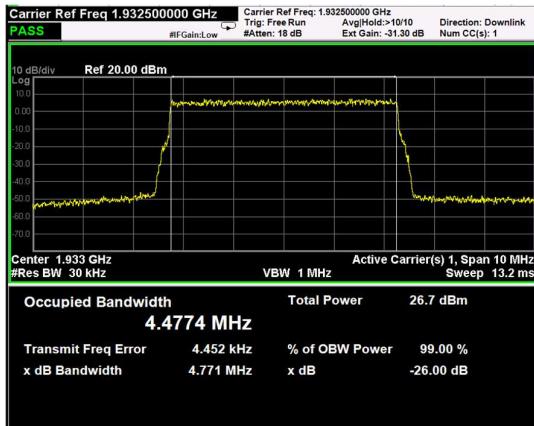
—

**Clause 24.238(b) Occupied bandwidth, continued**
**RF PORT 1**
**Test data**


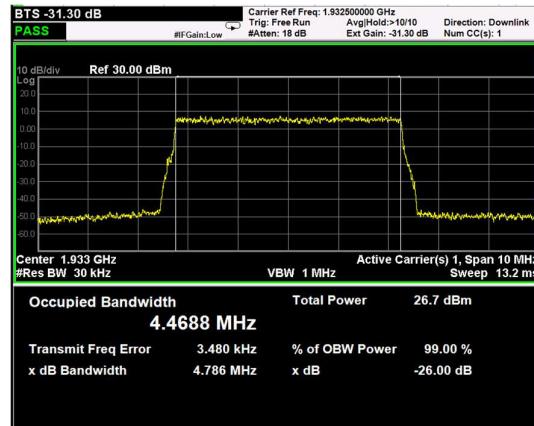
Channel: BOTTOM, Modulation: QPSK,  
BW=5MHz



Channel: BOTTOM, Modulation: 16QAM,  
BW=5MHz



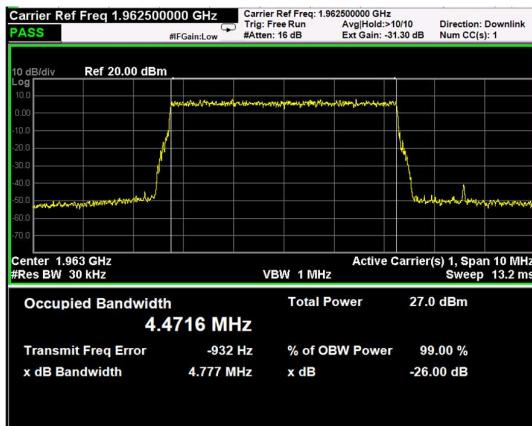
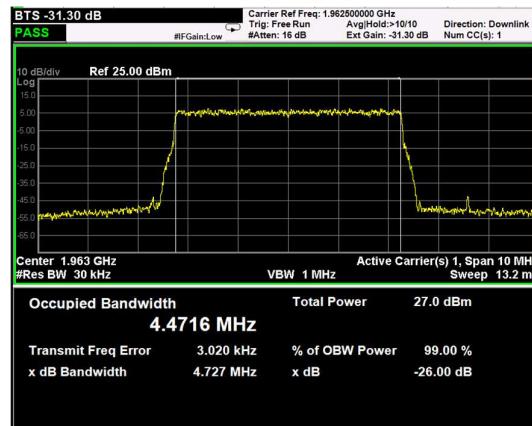
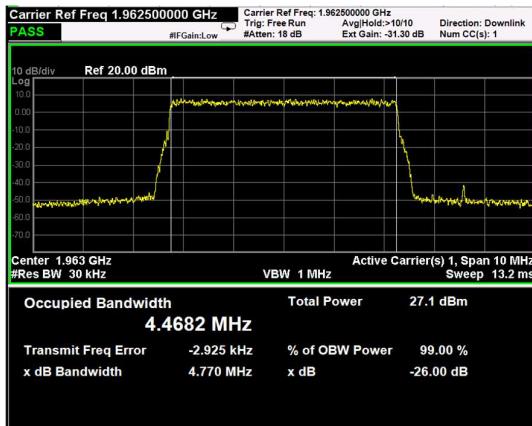
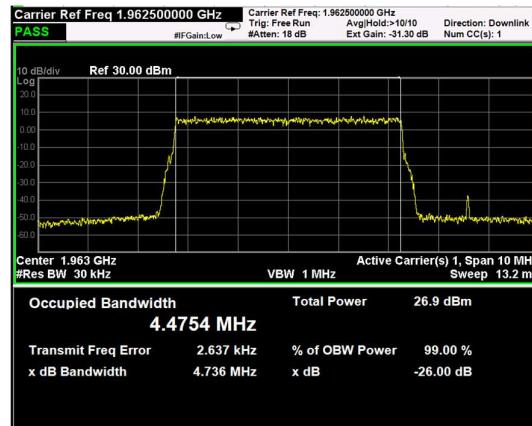
Channel: BOTTOM, Modulation: 64QAM,  
BW=5MHz

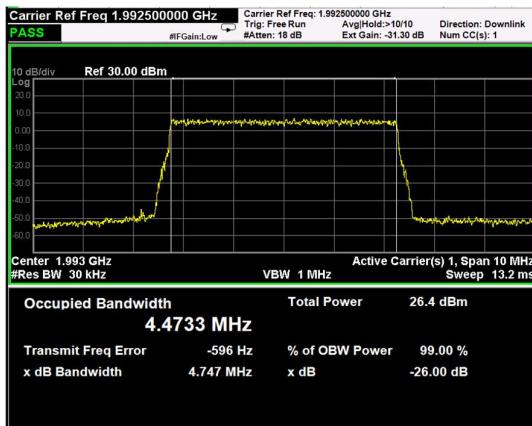


Channel: BOTTOM, Modulation: 256QAM,  
BW=5MHz

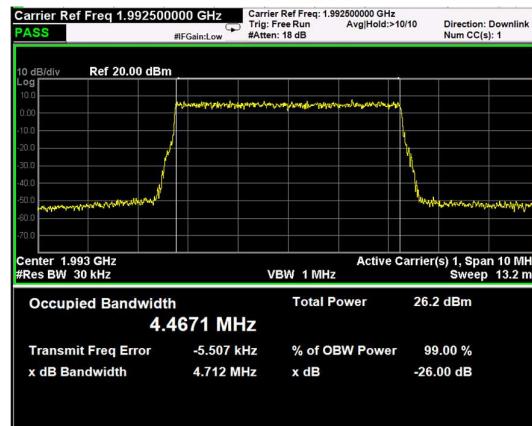


Specification: FCC 24

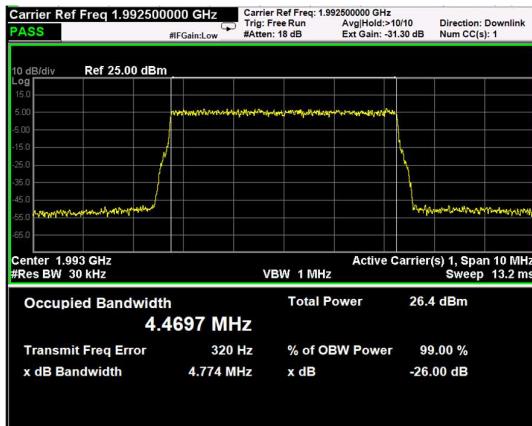
Channel: MIDDLE, Modulation: QPSK,  
BW=5MHzChannel: MIDDLE, Modulation: 16QAM,  
BW=5MHzChannel: MIDDLE, Modulation: 64QAM,  
BW=5MHzChannel: MIDDLE, Modulation: 256QAM,  
BW=5MHz



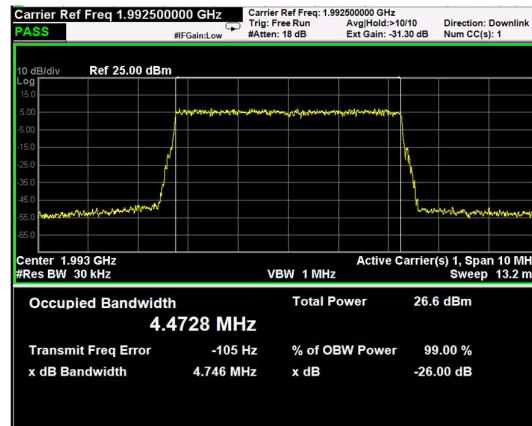
Channel: TOP, Modulation: QPSK,  
BW=5MHz



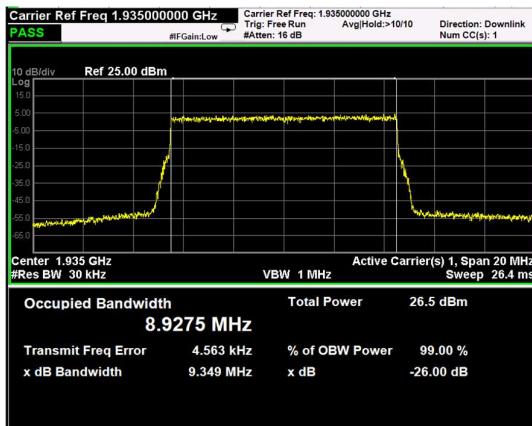
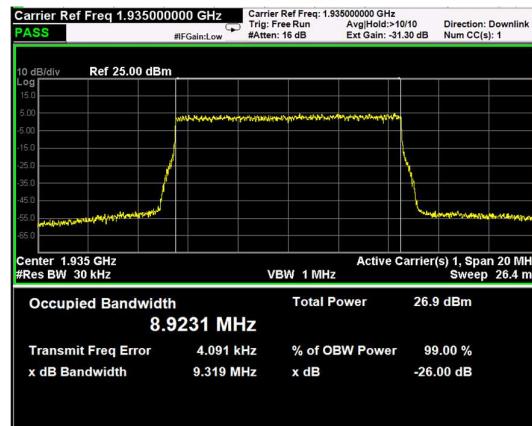
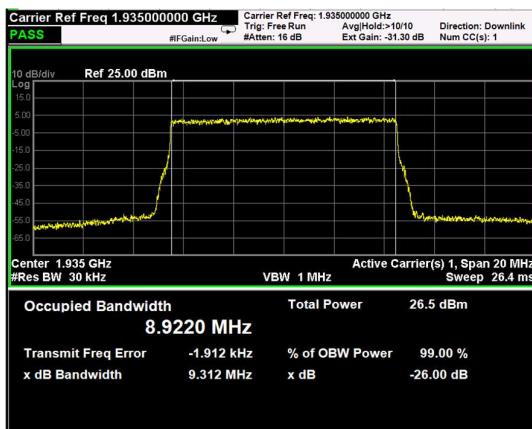
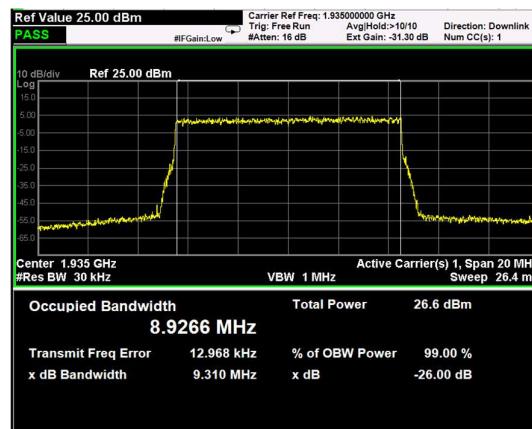
Channel: TOP, Modulation: 16QAM,  
BW=5MHz

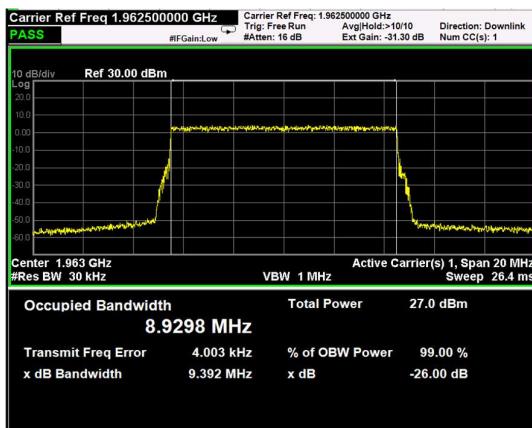


Channel: TOP, Modulation: 64QAM,  
BW=5MHz

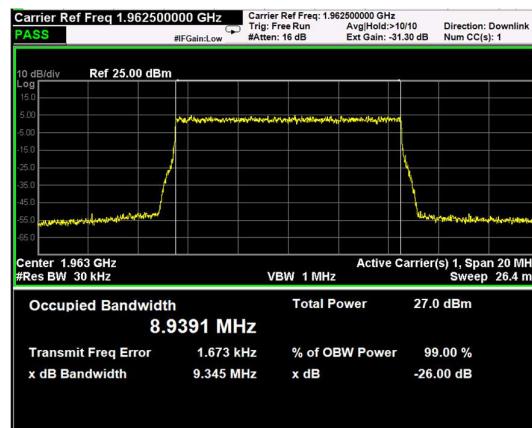


Channel: TOP, Modulation: 256QAM,  
BW=5MHz

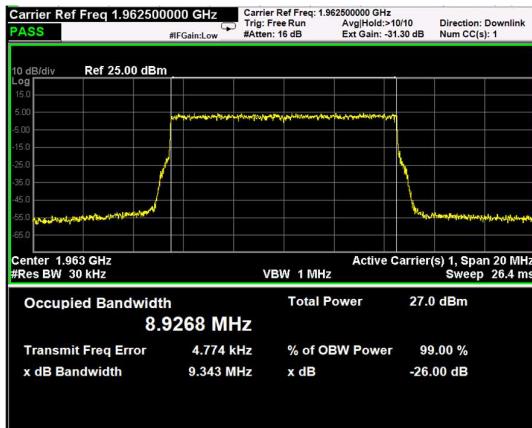
Channel: BOTTOM, Modulation: QPSK,  
BW=10MHzChannel: BOTTOM, Modulation: 16QAM,  
BW=10MHzChannel: BOTTOM, Modulation: 64QAM,  
BW=10MHzChannel: BOTTOM, Modulation: 256QAM,  
BW=10MHz



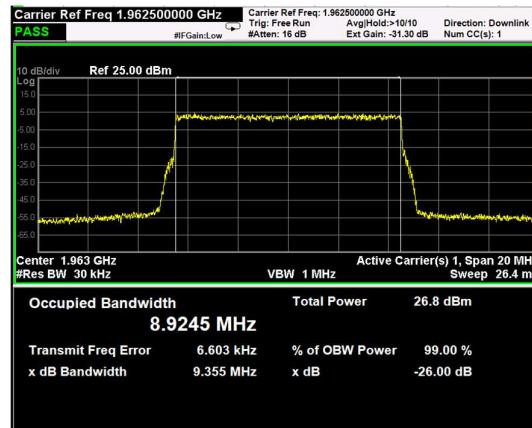
Channel: MIDDLE, Modulation: QPSK,  
BW=10MHz



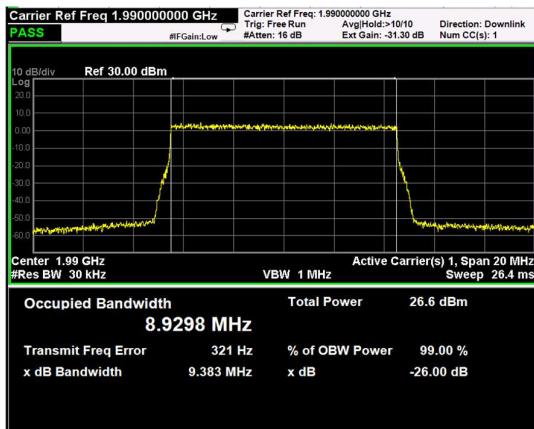
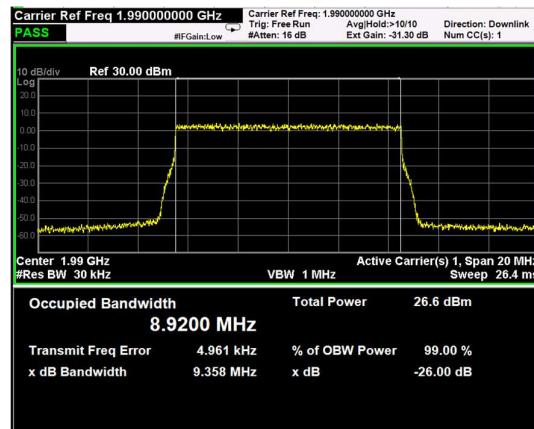
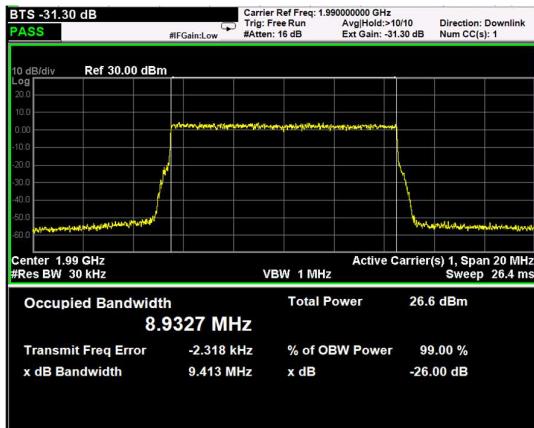
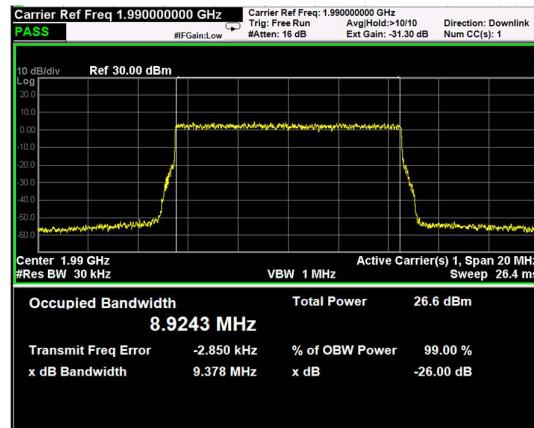
Channel: MIDDLE, Modulation: 16QAM,  
BW=10MHz

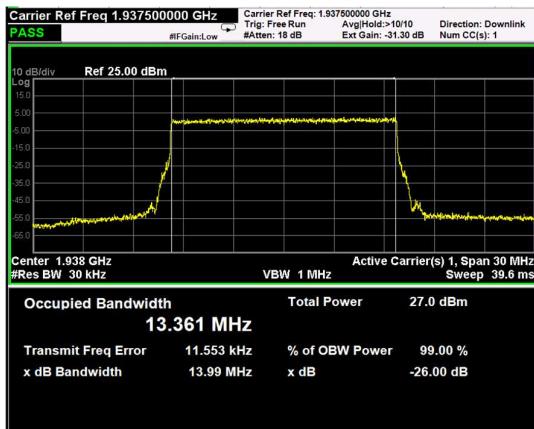
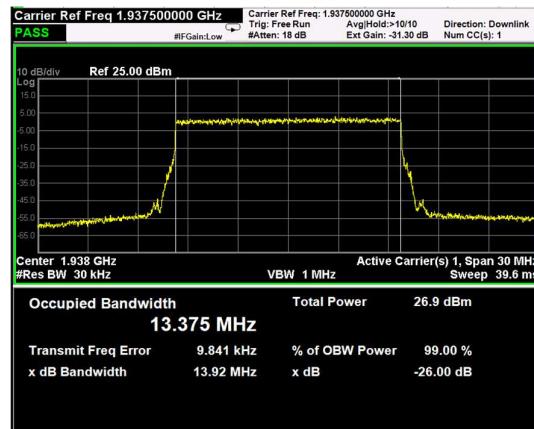
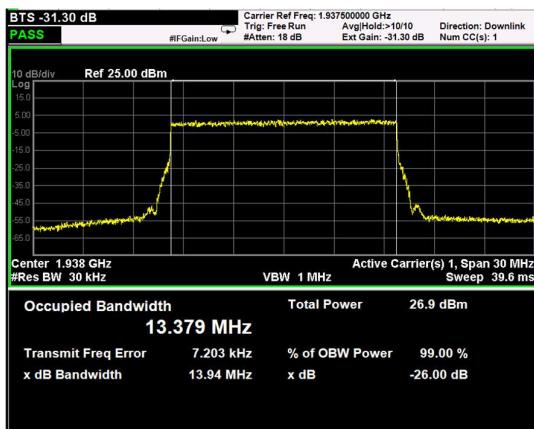
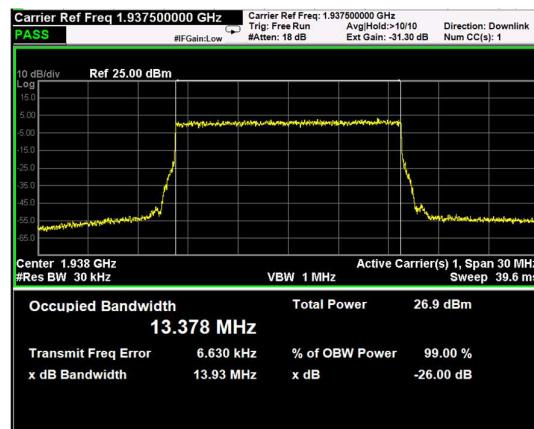


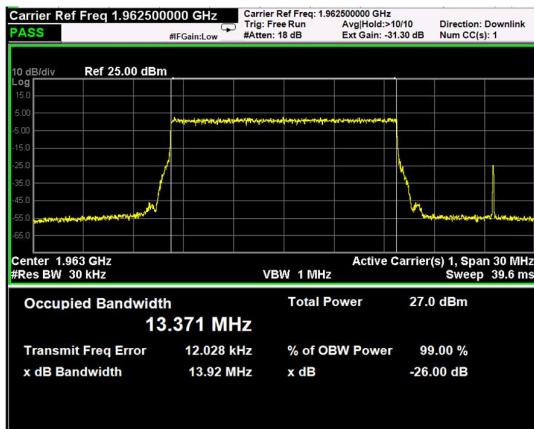
Channel: MIDDLE, Modulation: 64QAM,  
BW=10MHz



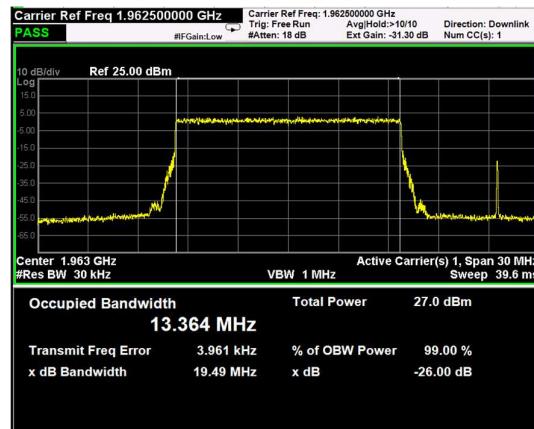
Channel: MIDDLE, Modulation: 256QAM,  
BW=10MHz

Channel: TOP, Modulation: QPSK,  
BW=10MHzChannel: TOP, Modulation: 16QAM,  
BW=10MHzChannel: TOP, Modulation: 64QAM,  
BW=10MHzChannel: TOP, Modulation: 64QAM,  
BW=10MHz

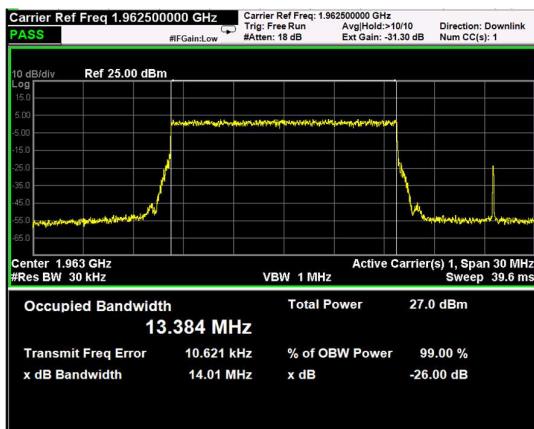
Channel: BOTTOM, Modulation: QPSK,  
BW=15MHzChannel: BOTTOM, Modulation: 16QAM,  
BW=15MHzChannel: BOTTOM, Modulation: 64QAM,  
BW=15MHzChannel: BOTTOM, Modulation: 256QAM,  
BW=15MHz



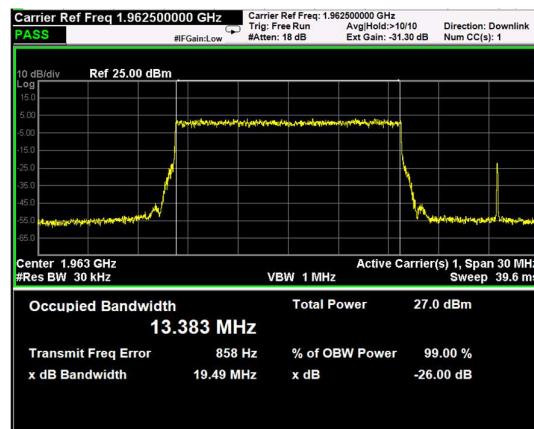
Channel: MIDDLE, Modulation: QPSK,  
BW=15MHz



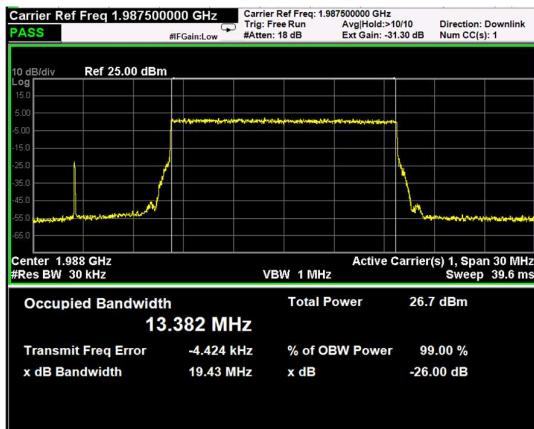
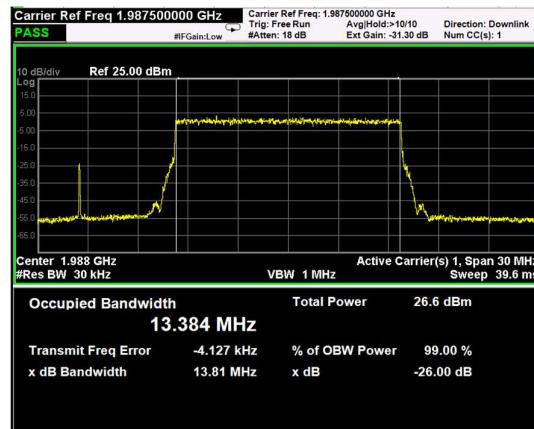
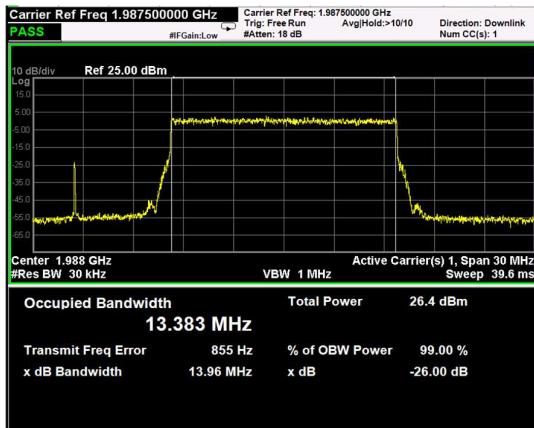
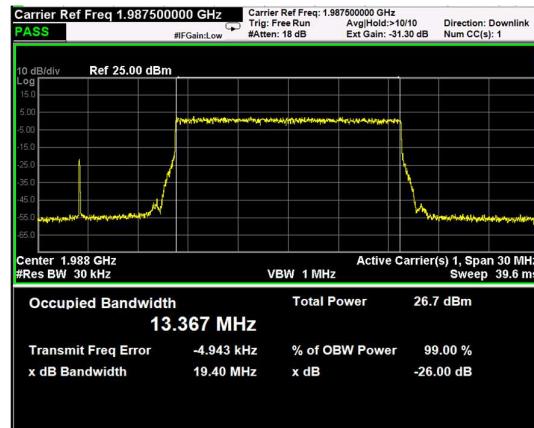
Channel: MIDDLE, Modulation: 16QAM,  
BW=15MHz

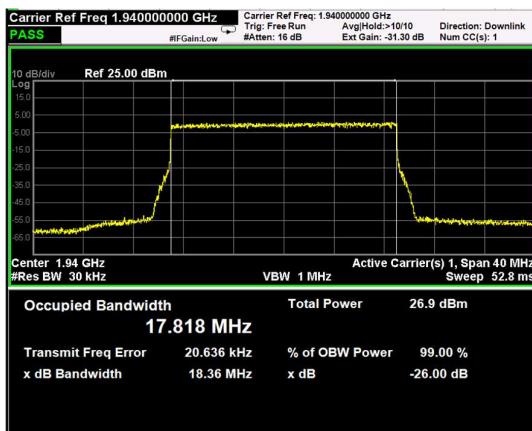


Channel: MIDDLE, Modulation: 64QAM,  
BW=15MHz

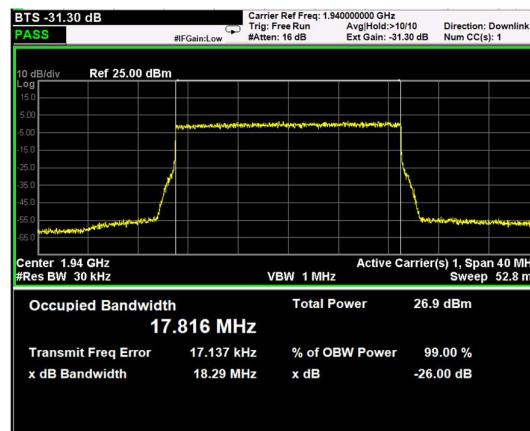


Channel: MIDDLE, Modulation: 256QAM,  
BW=15MHz

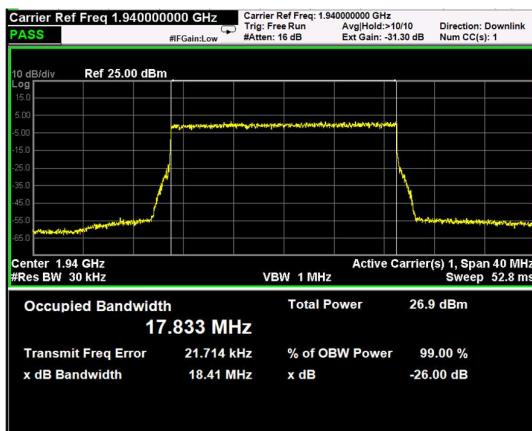
Channel: TOP, Modulation: QPSK,  
BW=15MHzChannel: TOP, Modulation: 16QAM,  
BW=15MHzChannel: TOP, Modulation: 64QAM,  
BW=15MHzChannel: TOP, Modulation: 64QAM,  
BW=15MHz



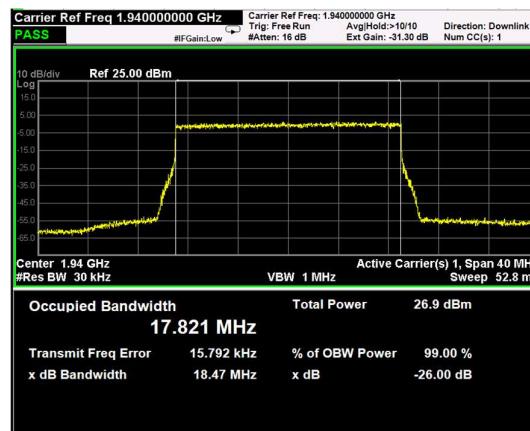
Channel: BOTTOM, Modulation: QPSK,  
BW=20MHz



Channel: BOTTOM, Modulation: 16QAM,  
BW=20MHz



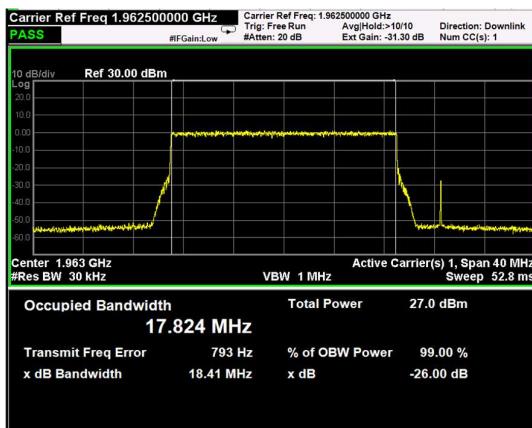
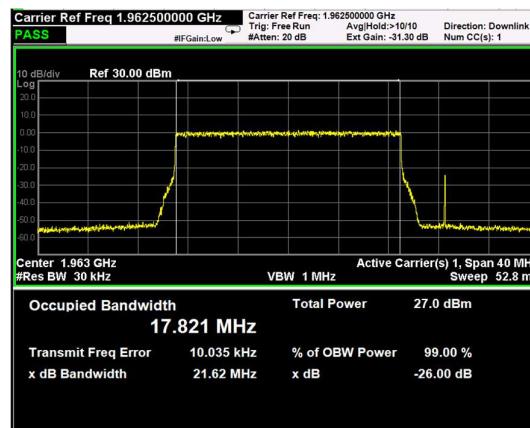
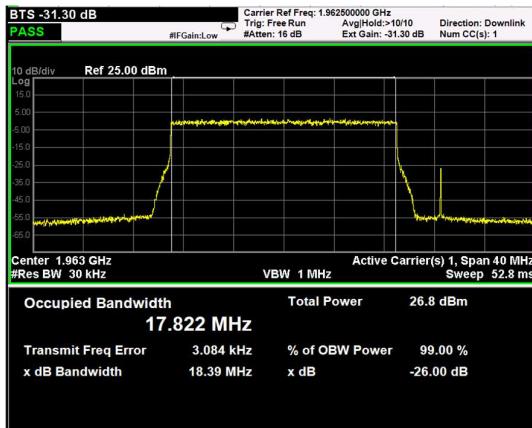
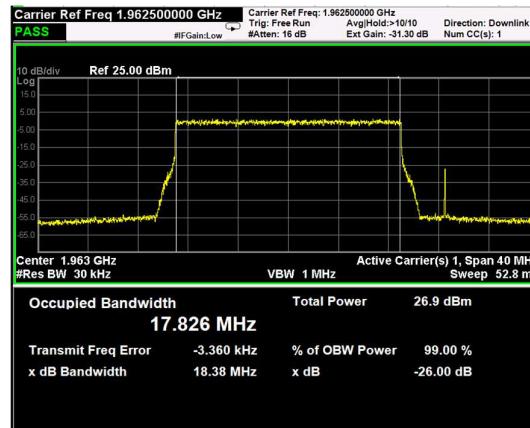
Channel: BOTTOM, Modulation: 64QAM,  
BW=20MHz

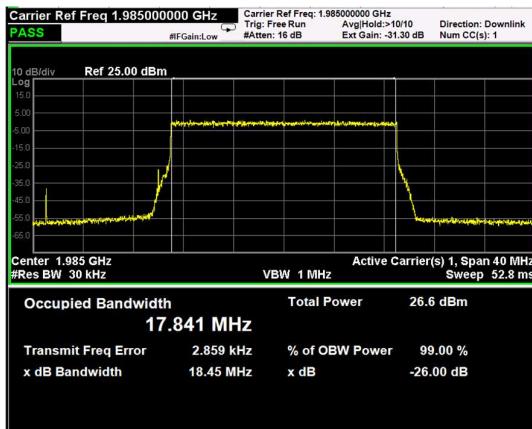
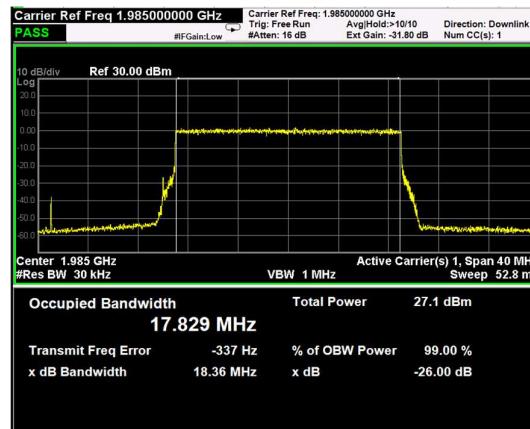
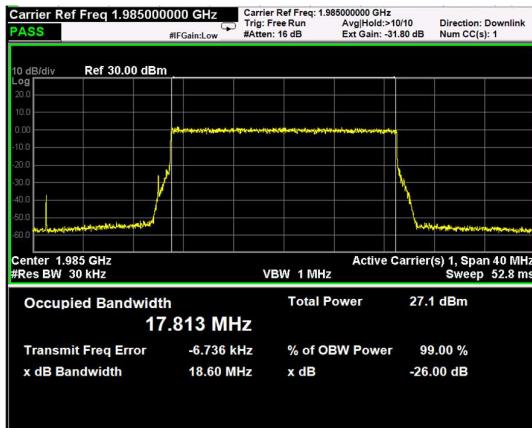
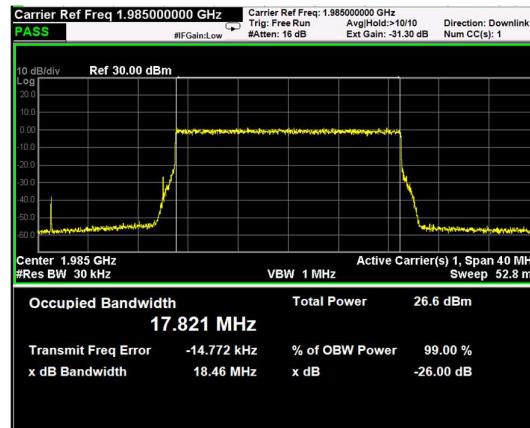


Channel: BOTTOM, Modulation: 256QAM,  
BW=20MHz

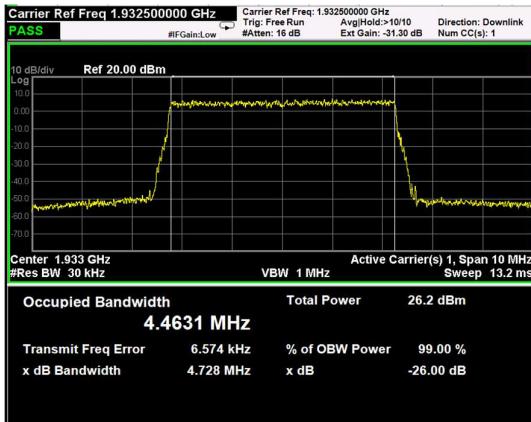


Specification: FCC 24

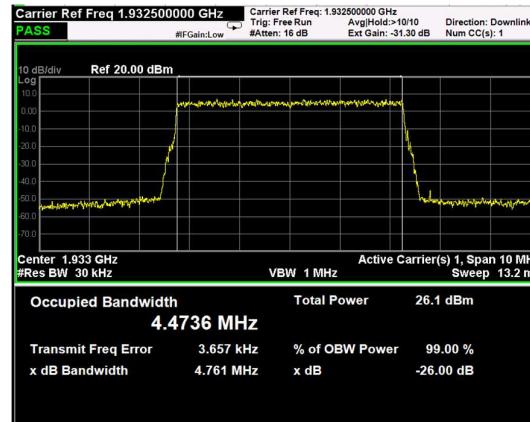
Channel: MIDDLE, Modulation: QPSK,  
BW=20MHzChannel: MIDDLE, Modulation: 16QAM,  
BW=20MHzChannel: MIDDLE, Modulation: 64QAM,  
BW=20MHzChannel: MIDDLE, Modulation: 256QAM,  
BW=20MHz

Channel: TOP, Modulation: QPSK,  
BW=20MHzChannel: TOP, Modulation: 16QAM,  
BW=20MHzChannel: TOP, Modulation: 64QAM,  
BW=20MHzChannel: TOP, Modulation: 64QAM,  
BW=20MHz

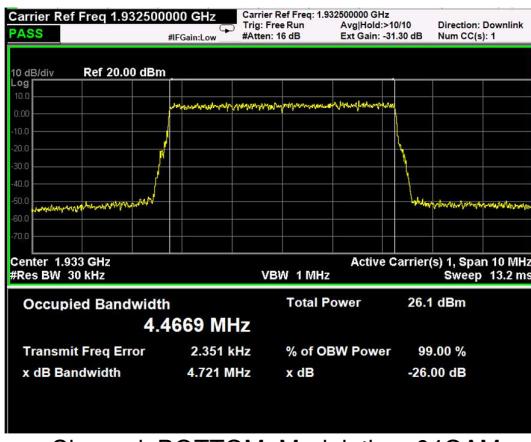
## RF PORT 2



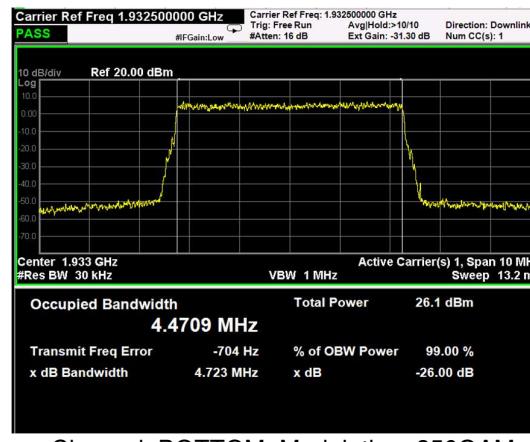
Channel: BOTTOM, Modulation: QPSK,  
BW=5MHz



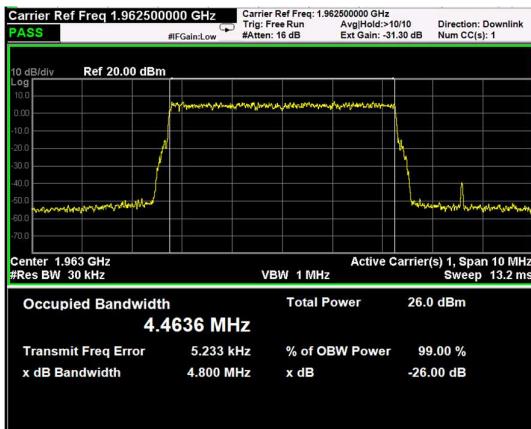
Channel: BOTTOM, Modulation: 16QAM,  
BW=5MHz



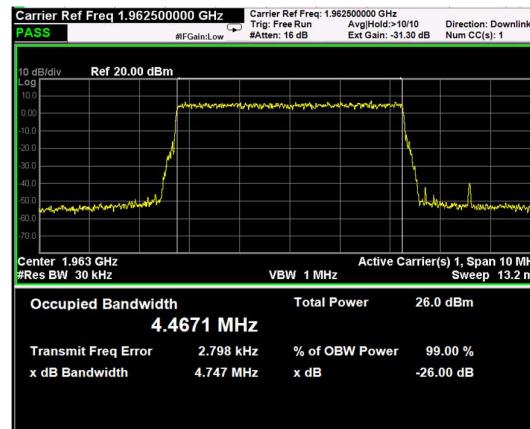
Channel: BOTTOM, Modulation: 64QAM,  
BW=5MHz



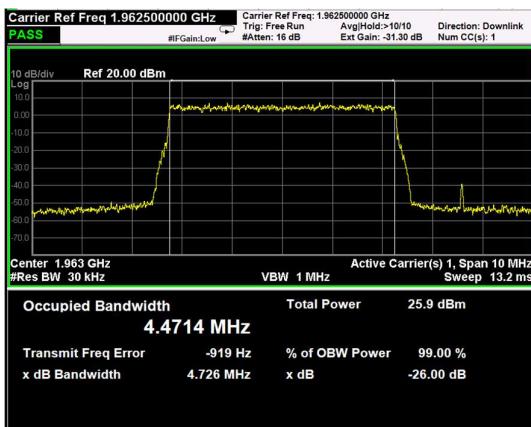
Channel: BOTTOM, Modulation: 256QAM,  
BW=5MHz



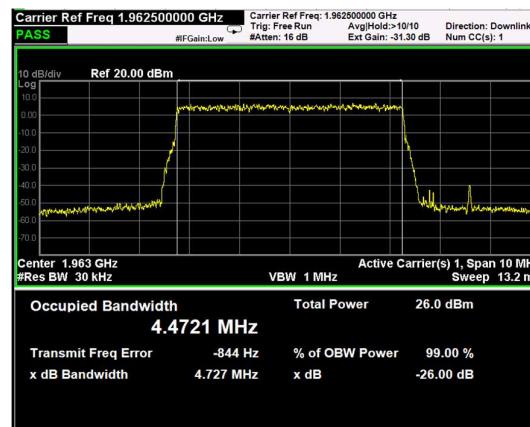
Channel: MIDDLE, Modulation: QPSK,  
BW=5MHz



Channel: MIDDLE, Modulation: 16QAM,  
BW=5MHz



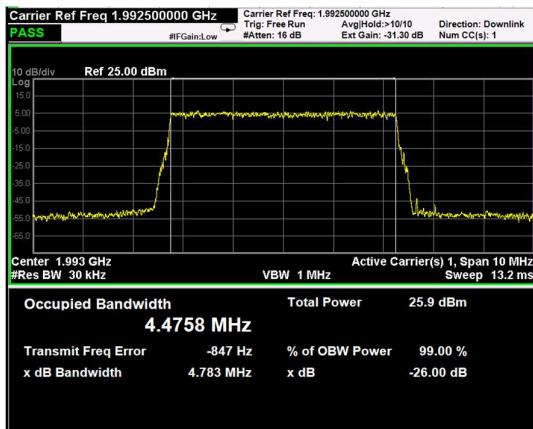
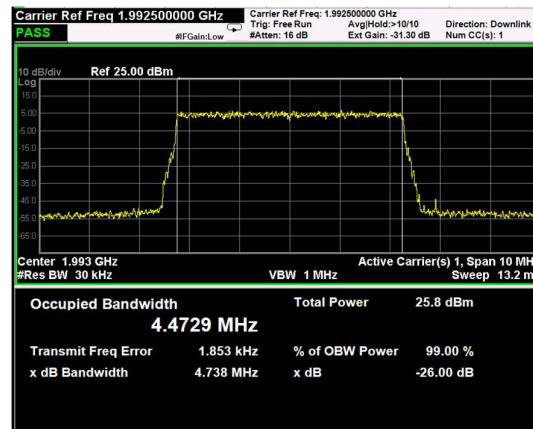
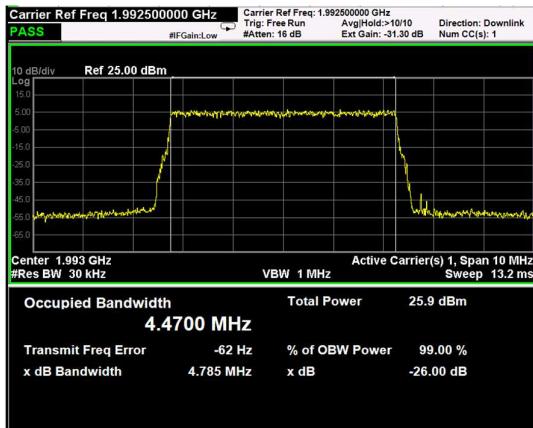
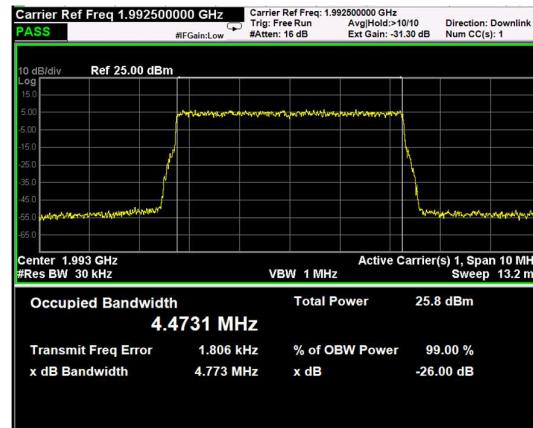
Channel: MIDDLE, Modulation: 64QAM,  
BW=5MHz



Channel: MIDDLE, Modulation: 256QAM,  
BW=5MHz

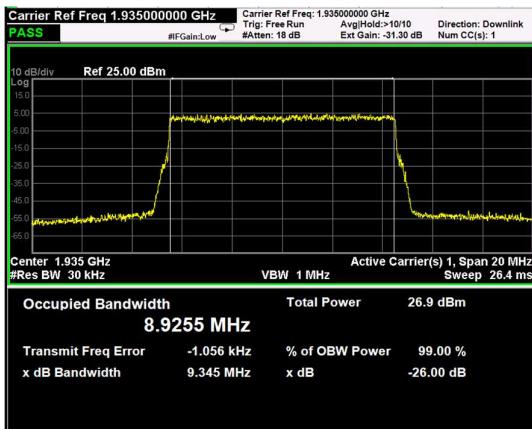
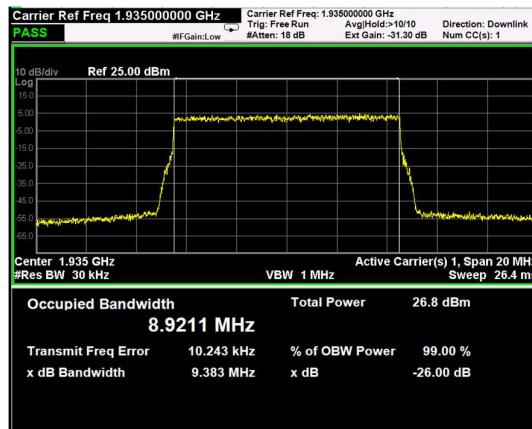
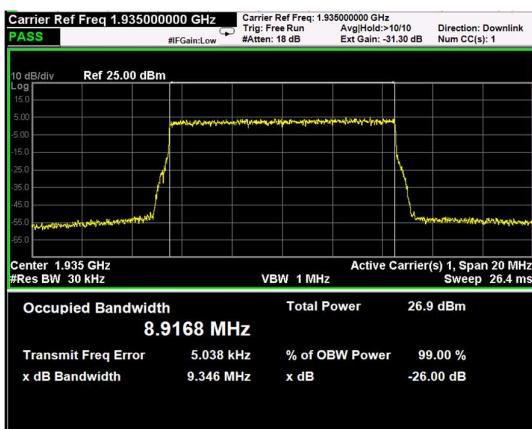
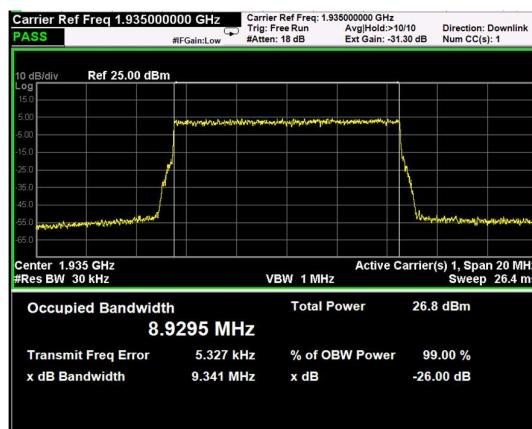


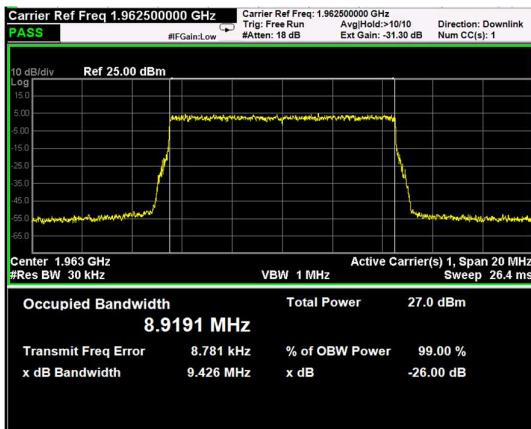
Specification: FCC 24

Channel: TOP, Modulation: QPSK,  
BW=5MHzChannel: TOP, Modulation: 16QAM,  
BW=5MHzChannel: TOP, Modulation: 64QAM,  
BW=5MHzChannel: TOP, Modulation: 256QAM,  
BW=5MHz

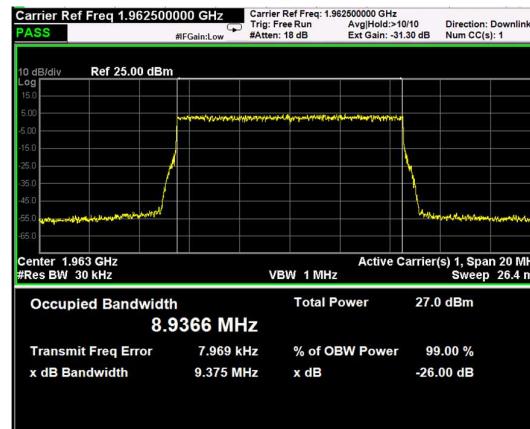


Specification: FCC 24

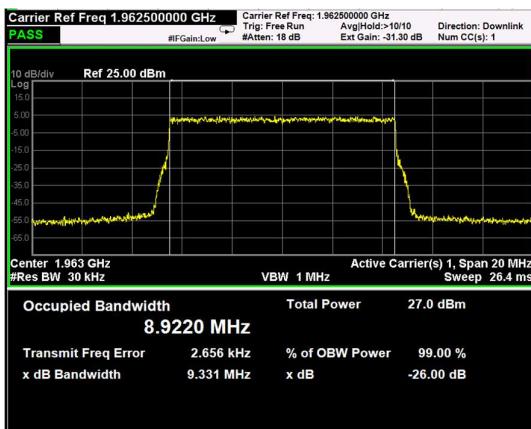
Channel: BOTTOM, Modulation: QPSK,  
BW=10MHzChannel: BOTTOM, Modulation: 16QAM,  
BW=10MHzChannel: BOTTOM, Modulation: 64QAM,  
BW=10MHzChannel: BOTTOM, Modulation: 256QAM,  
BW=10MHz



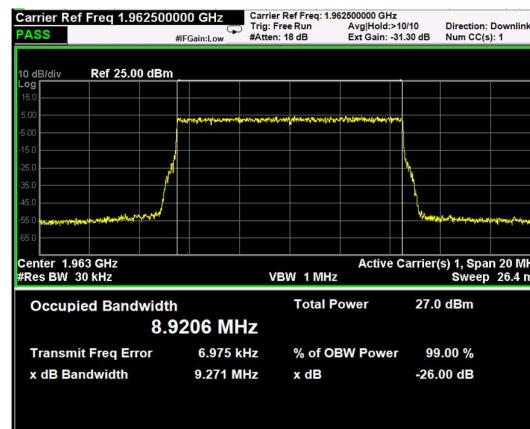
Channel: MIDDLE, Modulation: QPSK,  
BW=10MHz



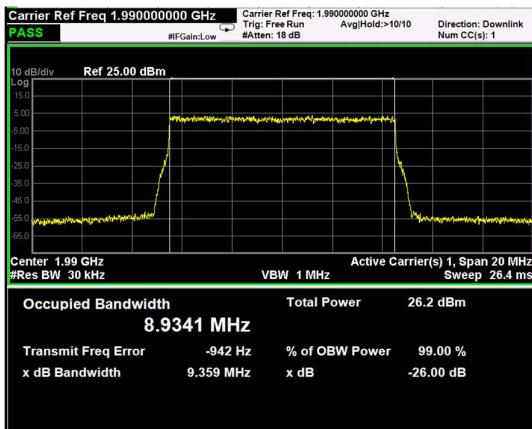
Channel: MIDDLE, Modulation: 16QAM,  
BW=10MHz



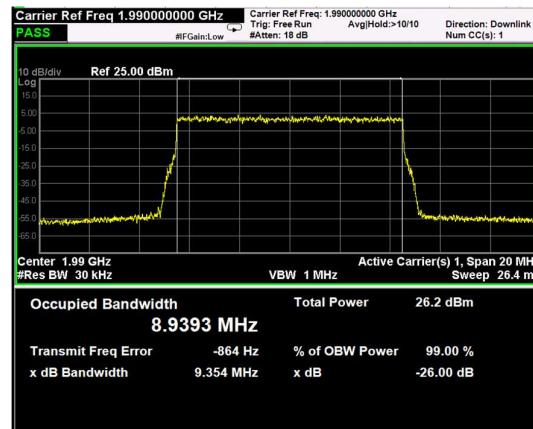
Channel: MIDDLE, Modulation: 64QAM,  
BW=10MHz



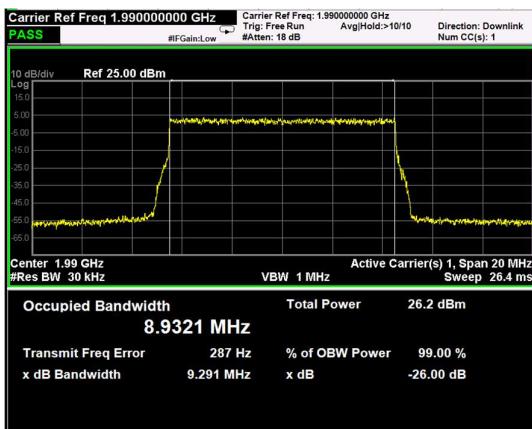
Channel: MIDDLE, Modulation: 256QAM,  
BW=10MHz



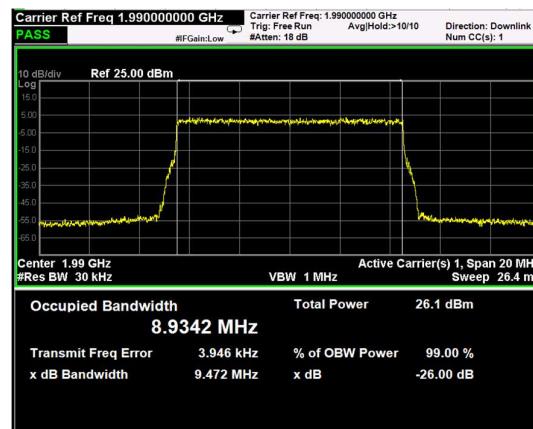
Channel: TOP, Modulation: QPSK,  
BW=10MHz



Channel: TOP, Modulation: 16QAM,  
BW=10MHz



Channel: TOP, Modulation: 64QAM,  
BW=10MHz



Channel: TOP, Modulation: 256QAM,  
BW=10MHz