



FCC&IC RF Test Report

Product Name: LTE Wireless Gateway

Model Number: B890-66

Report No: SYBH(Z-RF)004092012-2004

FCC ID: QISB890

IC: 6369A-B890

Reliability Laboratory of Huawei Technologies Co., Ltd.

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Notice

1. The laboratory has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L0310.
2. The laboratory has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 97456.
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Applicant: Huawei Technologies Co., Ltd.
Address: Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
Date of Receipt Test Item: Aug.24, 2012
Start Date of Test: Aug.27, 2012
End Date of Test: Sept.10, 2012

Test Result: Pass

Approved By Senior Engineer Sept.12, 2012 Dai Linjun *Dai Linjun*
Date Name Signature

Reviewed By Sept.12, 2012 Cousy Xu *Cousy XU*
Date Name Signature

Operated By Sept.12, 2012 Huang Qiuliang *Huang Qiuliang*
Date Name Signature

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1 General Information

1.1 Applied Standard	
Applied Rules:	47 CFR FCC Part 2:2011, Subpart J 47 CFR FCC Part 27:2011, Subpart C&M ANSI/TIA 603C:2004 IC RSS-Gen Issue 3 IC RSS-199 Issue 1
1.2 Test Location	
Test Location 1:	Reliability Laboratory of Huawei Technologies Co., Ltd.
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C
1.3 Test Environmental Condition	
Ambient Temperature:	20 – 25 °C
Ambient Relative Humidity:	45 – 55 %
Atmospheric Pressure:	101 kPa

2 Summary

Table 1 Summary of Band 7 results

Test Case	FCC Part No.	Requirements	Result
BRS&EBS Band			
Transmitter Output Power	2.1046 & 27.50(h)(2)	Peak EIRP not exceed 2 W Peak-to-average ratio not exceed 13 dB	Pass
Modulation Characteristics	2.1047	Digital modulation	Pass
Occupied Bandwidth	2.1049	(Not specified)	Pass
Band Edges Compliance	2.1051 & 27.53(m)(4) & 27.53(m)(6)	Below -13 dBm/1%*EBW, in 1 MHz range Below -13 dBm/1 MHz, in 1 MHz to 5.5Mhz range	Pass
Spurious Emission at Antenna Terminals	2.1051 & 27.53(m)(4) & 27.53(m)(6)	Below -55 dBm/1 kHz, 9 kHz to 150 kHz Below -45 dBm/10 kHz, 150 kHz to 30 MHz Below -25 dBm/1 MHz, 30 MHz to 10 th harmonics	Pass
Field Strength of Spurious Radiation	2.1053 & 27.53(m)(4) & 27.53(m)(6)	Below -25 dBm/1 MHz	Pass
Frequency Stability	2.1055 & 27.54	Stay within the authorized bands of operation	Pass

Table 2 Summary of Band 7 results

Test Case	IC Standard No.	Requirements	Result
BRS&EBS Band			
Transmitter Output Power	RSS-Gen, §4.8; RSS-199, §4.4	EIRP not exceed 2 W Peak-to-average ratio not exceed 13 dB	Pass
Modulation Characteristics	RSS-199, §4.1	Digital modulation	Pass
Occupied Bandwidth	RSS-Gen, §4.6	(Not specified)	Pass
Band Edges Compliance	RSS-Gen, §4.9; RSS-199, §4.5; RSS-199, §4.2	Below -13 dBm/1%*EBW, in 1 MHz range Below -13 dBm/1 MHz, in 1 MHz to 5.5Mhz range	Pass
Spurious Emission at Antenna Terminals	RSS-Gen, §4.9; RSS-199, §4.5; RSS-199, §4.2	Below -55 dBm/1 kHz, 9 kHz to 150 kHz Below -45 dBm/10 kHz, 150 kHz to 30 MHz Below -25 dBm/1 MHz, 30 MHz to 10 th harmonics	Pass
Field Strength of Spurious Radiation	RSS-Gen, §4.9; RSS-199, §4.5	Below -25 dBm/1 MHz	Pass
Frequency Stability	RSS-Gen, §4.7; RSS-199, §4.3	Maintained within the tolerances of ± 2.5 ppm	Pass
Receiver Spurious Emissions (Conducted)	RSS-Gen, §4.10; RSS-Gen, §6; RSS-199, §4.6	Below 2 nW/4 kHz (-57 dBm/4 kHz), for 30 MHz - 1000 MHz Below 5 nW/MHz (-53 dBm/MHz), for above 1 GHz	Pass

3 Product Description

3.1 Product Information

3.1.1 General Description

HUAWEI LTE Wireless Gateway–B890-66 is subscriber equipment in the WCDMA/LTE system, also supports wireless Internet accessing function, routing function, network address translation (NAT) function. The HSPA+/WCDMA frequency band is Band 2/4/5. The LTE frequency band includes Band 2/4/5/7/12/13/17. And the TX/RX band is 2400MHz~2483MHz for WLAN. B890-66 implements such functions as RF signal receiving/sending, WCDMA and LTE protocol processing, voice and data service etc. Externally it provides USB port interface, SIM card interface, four auto-sensing Ethernet interfaces and external antenna interface.

3.1.2 Board Information

Table 3 Board Information

LTE Wireless Gateway		
B890-66		
Board and Module		
Hardware Version	Software Version	Description
WL1B890I	V100R001	Board

3.1.3 Adapter Technical Data

AC/DCAdapter Model	HW-120200U6W
Input Voltage	~100-240V 50/60Hz
Output Voltage	12V  2A
Rated Power	24W

4 Test Description

4.1 Supported Frequency Range

Characteristics	Description
Downlink	2620 to 2690 MHz;
Uplink	2500 to 2570 MHz;

4.2 Transmitter / Receiver Characteristics

Characteristics	Description
System Type	LTE
TX Output Power (per Antenna Port)	LTE system: 23dBm
Channel Spacing(s) / Bandwidth(s)	LTE system: 5 MHz, 10 MHz, 15 MHz, 20 MHz
Designation of Emissions	LTE system: 4M48G7D (5 MHz ,QPSK modulation), 4M48W7D (5 MHz ,16QAM modulation), 8M96G7D (10 MHz QPSK modulation), 8M95W7D (10 MHz 16QAM modulation), 13M44G7D (15MHz QPSK modulation), 13M43W7D (15MHz 16QAM modulation), 17M88G7D (20 MHz QPSK modulation), 17M89W7D (20 MHz 16QAM modulation)

4.3 Antenna Gain

Antenna Gain(dBi) to LTE Band 7	-1
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4.4 Power Supply

Specification	Description
Power Supply Type	Directly Connected to DC /AC Power Supply
Input to EUT (DC power)	DC Voltage Nominal: $\approx$ 12 V DC Voltage Range: $\approx$ 10.8 V to 13.2 V
Input to EUT (AC power)	AC Voltage Nominal: $\sim$ 120 V (50/60 Hz) AC Voltage Range: $\sim$ 100-240V

5 General Test Conditions / Configurations

5.1 RF Channels under Test

Test Mode	TX / RX	RF Channel		
		Low (B)	Middle (M)	High (T)
LTE Band 7	TX (5M)	Channel 20775	Channel 21100	Channel 21425
		2502.5 MHz	2535 MHz	2567.5 MHz
	TX (10M)	Channel 20800	Channel 21100	Channel 21400
		2505 MHz	2535 MHz	2565 MHz
	TX (15M)	Channel 20825	Channel 21100	Channel 21375
		2507.5 MHz	2535 MHz	2562.5 MHz
	TX (20M)	Channel 20850	Channel 21100	Channel 21350
		2510 MHz	2535 MHz	2560 MHz
	RX (5M)	Channel 2775	Channel 3100	Channel 3425
		2622.5 MHz	2655 MHz	2687.5 MHz
	RX (10M)	Channel 2800	Channel 3100	Channel 3400
		2625 MHz	2655 MHz	2685 MHz
	RX (15M)	Channel 2825	Channel 3100	Channel 3375
		2627.5 MHz	2655 MHz	2682.5 MHz
	RX (20M)	Channel 2850	Channel 3100	Channel 3350
		2630 MHz	2655 MHz	2680 MHz

5.2 Test Modes

Test Mode	Test Modes Description
TM1	LTE QPSK modulation
TM2	LTE 16QAM modulation



5.3 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	10.8V
	VN	12.0V
	VH	13.2V

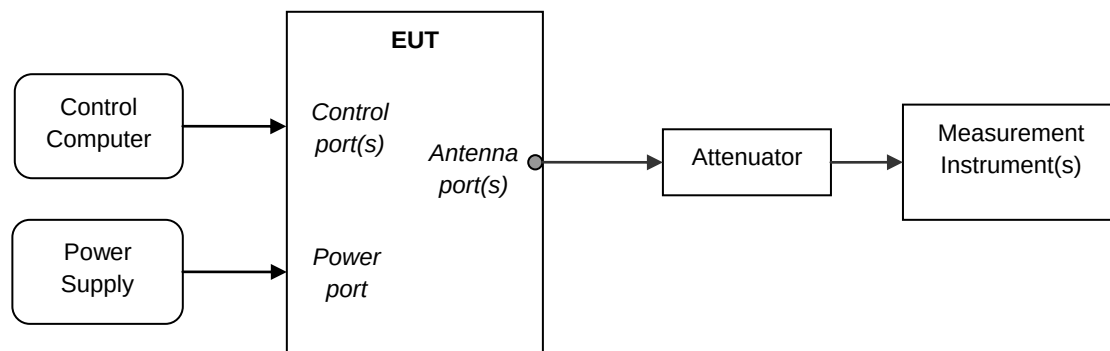
NOTE: VL= lower extreme test voltage
VN= nominal voltage
VH= upper extreme test voltage
TN= normal temperature

5.4 Test Setup

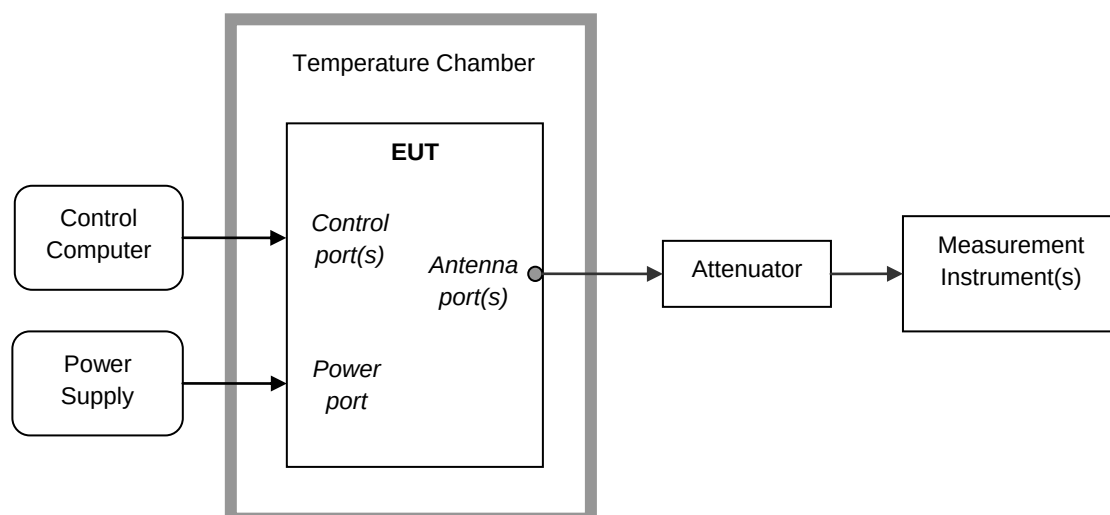
5.4.1 General Test Setup Configurations

Configuration	Description
Test Antenna Ports	Until otherwise declared, all TX tests are ONLY performed at the main Transmitter antenna port (e.g. TRXA, TXA and so on) of the EUT, and all RX tests are ONLY performed at the main Receiver antenna port (e.g. TRXA, RXA and so on) of the EUT.
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.

5.4.2 Test Setup 1



5.4.3 Test Setup 2



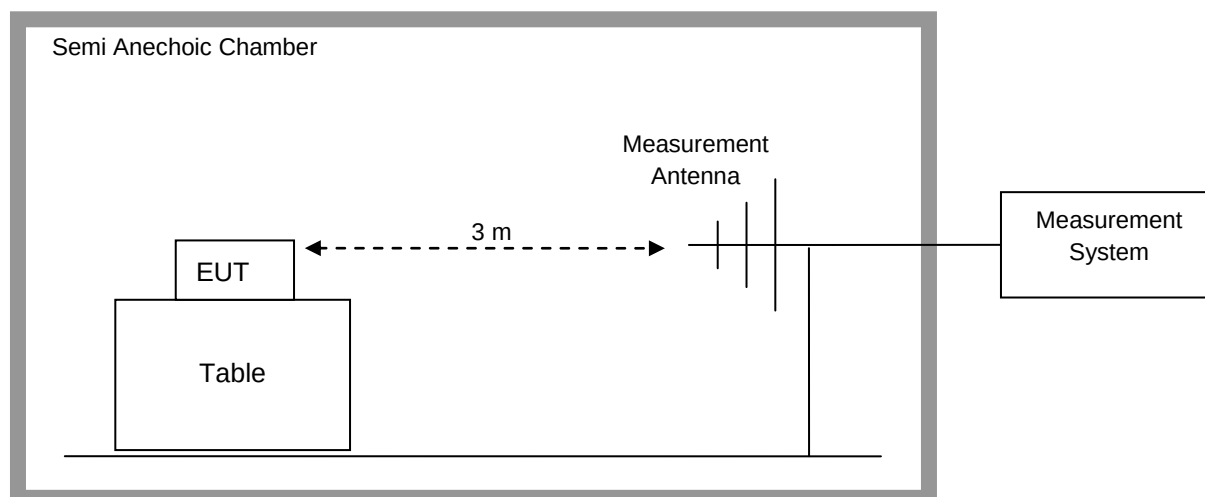
5.4.4 Test Setup 3

NOTE1: Effective radiated power (ERP) or Effective Isotropic radiated power (EIRP) refers to the EUT radiation power output, assuming all emissions are radiated from half-wave dipole antennas or horn antennas.

NOTE2: The EUT was set on insulator 80cm above the Ground Plane. The setup and test methods were according to ANSI-TIA-603C 2004. The measurements were carried through with a Rohde and Schwarz Test Receiver and control software.

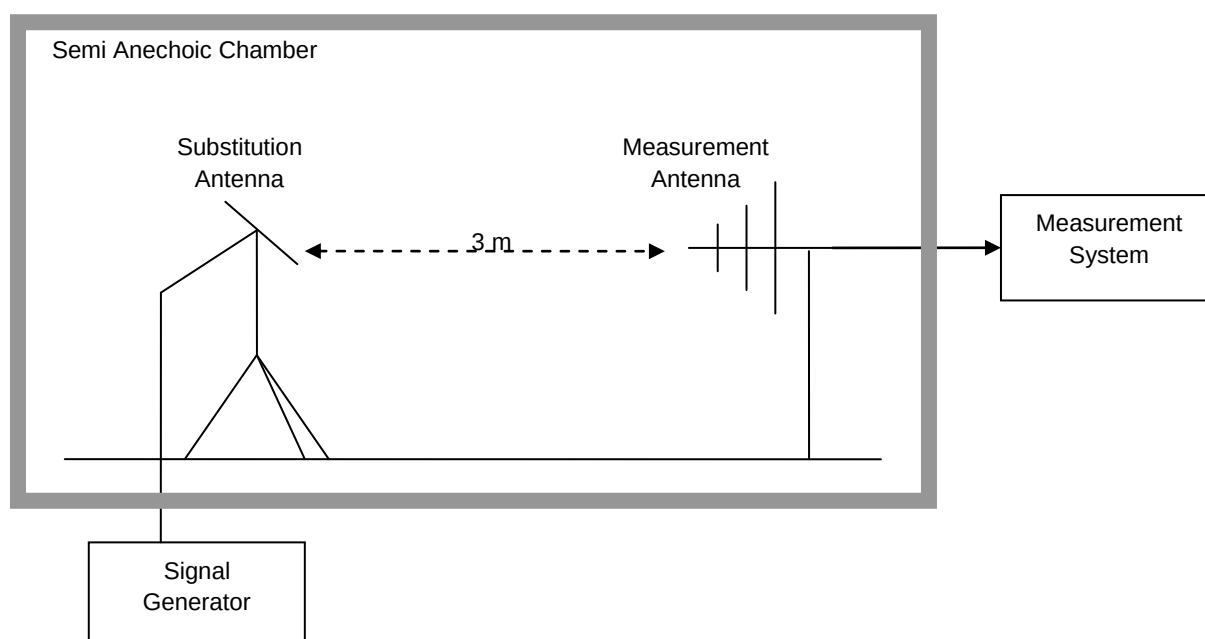
Step 1: Pre-test to find the Maximum ERP or EIRP

1. Connect the test system according to the following figure. EUT is running for 30 minutes before test, and measurement instruments are warming-up for 30 minutes.
2. Set up communication link between Universal radio communication tester and EUT, set EUT working frequency, and control EUT to transmit at maximum power.
3. Set the center frequency of the signal analyzer or receiver to the EUT's operating frequency, the RBW is equal to the emission bandwidth of the signal. Set RMS detector for the test, and the span is equal to 2 times of emission bandwidth, the other settings should remain automatic. Normally, the height range of antenna was 1m to 4m, the azimuth range of turntable was 0° to 360°. The receiver antenna has two polarizations V and H. A portable or small unlicensed wireless device shall be placed on a non-metallic test fixture or other non-metallic support during testing. The supporting fixture shall permit orientation of the EUT in each of three orthogonal (x, y, z) axis positions such that emissions from the EUT are maximized. Measure the EUT maximum RF power and record the result.
4. Changing EUT working frequency and measuring the RF power at channel B, M, T respectively. Complete the test data.



Step 2: Substitution method to verify the maximum ERP or EIRP

1. Measurement setup is according to the following figure. EUT was substituted by antenna, and the polarization is identical with the test antenna; the signal generator was connected to the substitution antenna.
2. The radiated output power, measured by signal analyzer set, is the same as recorded in above. Then this power level is matched by a signal from a calibrated signal generator which is substituted for EUT. The power supplied by the generator is then equal to the ERP or EIRP after corrected by the antenna gain and cable loss.



5.5 Test Conditions

Test Case	Test Conditions	
Transmitter Output Power	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1 & Test Setup 3
	Detector	RMS
	RF Channels (TX)	B, M, T
	Test Mode	TM1/TM2
Modulation Characteristics	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	RF Channels (TX)	M
	Test Mode	TM1/TM2
Occupied Bandwidth	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	RMS
	RF Channels (TX)	B, M, T
	Test Mode	TM1/TM2
Band Edges Compliance	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	RMS
	RF Channels (TX)	B, T
	Test Mode	TM1/TM2
Spurious Emission at Antenna Terminals	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	PK
	RF Channels (TX)	B, M, T
	Test Mode	TM1/TM2
Field Strength of Spurious Radiation	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 3
	Detector	PK
	RF Channels (TX)	M
	Test Mode	TM1/TM2
Frequency Stability	Test Configuration	(1) -30 °C to +50 °C with step 10 °C at Rated Voltage; (2) VL, VN and VH of Rated Voltage at Ambient Temperature.
	Test Setup	Test Setup 2
	RF Channels (TX)	M



Test Case	Test Conditions	
	Test Mode	TM1
Receiver Spurious Emissions	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 3
	Detector	QP,PK, AV
	RF Channels (TX)	M
	Test Mode	TM1/TM2

6 Main Test Instruments

Table 4 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sept., 27,2012
Universal Radio Communication Tester	R&S	CMU200	117341	Jan., 12,2013
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug., 30,2013
Spectrum Analyzer	Agilent	E4440A	MY49420179	Jul., 17,2013
Signal Analyzer	Agilent	N9020A	MY52090652	Jul., 17,2013
Signal Analyzer	R&S	FSQ31	200021	Sept., 27,2012
Temperature Chamber	WEISS	WKL64	24600294	Feb.,13,2013
Signal generator	Agilent	E8257D	MY49281095	Jul.,09,2013
Spectrum analyzer	R&S	FSU3	200474	Mar., 05, 2013
Spectrum analyzer	R&S	FSU43	100144	Mar., 05, 2013
Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100304	Apr., 05, 2013
Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100391	Apr., 05, 2013
Trilog Broadband Antenna (30M~3GHz)	SCHWARZBECK	VULB 9163	9163-521	Jul., 07, 2013
Pyramidal Horn Antenna(26GHz-40GHz)	ETS-Lindgren	3160-10	00123940	Feb., 27, 2013
Pyramidal Horn Antenna(18GHz-26.5GHz)	ETS-Lindgren	3160-09	00125912	Feb., 27, 2013
Universal Radio Communication Tester	R & S	CMW500	20347676	Sept., 06, 2013
Universal Radio Communication Tester	Anritsu	MT8820C	6200971028	May, 04, 2013

Note: All the equipments are calibrated once a year. When it's almost due, we will arrange calibration again before the calibration deadline.

7 Test Results

No.	Test Item	Test Result
1	Transmitter Output Power	Appendix A
2	Modulation Characteristics	Appendix B
3	Occupied Bandwidth	Appendix C
4	Band Edges Compliance	Appendix D
5	Spurious Emission at Antenna Terminals	Appendix E
6	Field Strength of Spurious Radiation	Appendix F
7	Frequency Stability	Appendix G
8	Receiver Spurious Emissions	Appendix H
9	Photos of Test Setup	Appendix I

NOTE: There is no test data in Appendix H, only Photos of Test Setup for Field Strength of Spurious Radiation.

8 Measurement Uncertainty

For a 95% confidence level ($k=2$), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item		Extended Uncertainty
Transmitter Output Power	Power (dBm)	U =0.39 dB
Occupied Bandwidth	Magnitude (%)	U=0.2%
Band Edge Compliance	Disturbance Power (dBm)	U=2.0 dB
Conducted Spurious Emissions	Disturbance Power (dBm)	U=2.0 dB
Field Strength of Spurious Radiation	ERP (dBm)	U=4.6 dB (30 MHz – 1GHz) U=3.0 dB (above 1 GHz)
Frequency Stability	Frequency Accuracy (ppm)	U=0.21 ppm

-----The END-----



Appendix A

Transmitter Output Power

According to FCC Part 2.1046 & FCC Part 27.50(h)
& RSS-199



Conducted Power of Transmitter

Table 1 Measurement Results (LTE) BAND 7

TM1 & TM2 RF Output Power(Conducted) BAND 7				
Test Mode	TN/VN			
	Modulation	RB	Measured (dBm)	Limit (dBm)
Channel (B) 5MHz(BW)	QPSK	1RB#0	23.03	33.0
		1RB#max	23.00	33.0
		12RB#6	21.41	33.0
		Full	21.29	33.0
	16QAM	1RB#0	21.15	33.0
		1RB#max	21.12	33.0
		12RB#6	20.25	33.0
		Full	20.29	33.0
Channel (B) 10MHz(BW)	QPSK	1RB#0	22.99	33.0
		1RB#max	22.94	33.0
		25RB#13	21.24	33.0
		Full	21.09	33.0
	16QAM	1RB#0	21.16	33.0
		1RB#max	21.11	33.0
		25RB#13	20.18	33.0
		Full	20.05	33.0
Channel (B) 15MHz(BW)	QPSK	1RB#0	22.91	33.0
		1RB#max	22.85	33.0
		36RB#18	21.13	33.0
		Full	21.08	33.0
	16QAM	1RB#0	21.09	33.0
		1RB#max	21.05	33.0
		36RB#18	20.17	33.0
		Full	20.07	33.0
Channel (B) 20MHz(BW)	QPSK	1RB#0	22.95	33.0
		1RB#max	22.72	33.0
		50RB#25	21.16	33.0
		Full	21.19	33.0
	16QAM	1RB#0	21.12	33.0
		1RB#max	20.99	33.0
		50RB#25	20.15	33.0



		Full	20.21	33.0
Channel (M) 5MHz(BW)	QPSK	1RB#0	22.53	33.0
		1RB#max	22.62	33.0
		12RB#6	21.19	33.0
		Full	21.06	33.0
	16QAM	1RB#0	20.85	33.0
		1RB#max	20.86	33.0
		12RB#6	20.12	33.0
		Full	20.15	33.0
Channel (M) 10MHz(BW)	QPSK	1RB#0	22.53	33.0
		1RB#max	22.60	33.0
		25RB#13	21.09	33.0
		Full	20.95	33.0
	16QAM	1RB#0	20.58	33.0
		1RB#max	20.68	33.0
		25RB#13	20.14	33.0
		Full	19.96	33.0
Channel (M) 15MHz(BW)	QPSK	1RB#0	22.62	33.0
		1RB#max	22.57	33.0
		36RB#18	21.02	33.0
		Full	20.97	33.0
	16QAM	1RB#0	20.86	33.0
		1RB#max	20.83	33.0
		36RB#18	20.04	33.0
		Full	19.99	33.0
Channel (M) 20MHz(BW)	QPSK	1RB#0	22.56	33.0
		1RB#max	22.61	33.0
		50RB#25	21.06	33.0
		Full	21.03	33.0
	16QAM	1RB#0	20.91	33.0
		1RB#max	21.01	33.0
		50RB#25	19.94	33.0
		Full	20.01	33.0
Channel (T) 5MHz(BW)	QPSK	1RB#0	22.85	33.0
		1RB#max	22.63	33.0
		12RB#6	21.27	33.0
		Full	21.23	33.0
	16QAM	1RB#0	21.15	33.0



		1RB#max	20.87	33.0
		12RB#6	20.18	33.0
		Full	20.24	33.0
Channel (T) 10MHz(BW)	QPSK	1RB#0	22.89	33.0
		1RB#max	22.68	33.0
		25RB#13	21.30	33.0
		Full	21.07	33.0
	16QAM	1RB#0	20.88	33.0
		1RB#max	20.72	33.0
		25RB#13	20.39	33.0
		Full	20.06	33.0
Channel (T) 15MHz(BW)	QPSK	1RB#0	22.71	33.0
		1RB#max	22.66	33.0
		36RB#18	21.11	33.0
		Full	21.08	33.0
	16QAM	1RB#0	20.99	33.0
		1RB#max	20.88	33.0
		36RB#18	20.11	33.0
		Full	19.99	33.0
Channel (T) 20MHz(BW)	QPSK	1RB#0	22.69	33.0
		1RB#max	22.66	33.0
		50RB#25	21.14	33.0
		Full	21.06	33.0
	16QAM	1RB#0	21.05	33.0
		1RB#max	20.97	33.0
		50RB#25	20.02	33.0
		Full	20.09	33.0

Note: RBW > emission bandwidth, VBW > 3 x RBW.



Peak-to-Average Ratio

Table 2 Measurement Results (LTE) BAND 7

Peak-to-Average Ratio				
Test Mode	TN/VN			
	Modulation	RB	Measured (dB)	Limit (dB)
Channel (B) 5MHz(BW)	QPSK	1RB#0	5.56	13
		1RB#max	5.55	13
		12RB#6	5.57	13
		Full	5.61	13
	16QAM	1RB#0	6.16	13
		1RB#max	6.13	13
		12RB#6	6.17	13
		Full	6.22	13
Channel (B) 10MHz(BW)	QPSK	1RB#0	5.32	13
		1RB#max	5.31	13
		25RB#13	5.35	13
		Full	5.35	13
	16QAM	1RB#0	6.22	13
		1RB#max	6.21	13
		25RB#13	6.27	13
		Full	6.29	13
Channel (B) 15MHz(BW)	QPSK	1RB#0	5.54	13
		1RB#max	5.55	13
		36RB#18	5.56	13
		Full	5.67	13
	16QAM	1RB#0	6.14	13
		1RB#max	6.12	13
		36RB#18	6.17	13
		Full	6.26	13
Channel (B) 20MHz(BW)	QPSK	1RB#0	5.27	13
		1RB#max	5.25	13
		50RB#25	5.30	13
		Full	5.31	13
	16QAM	1RB#0	6.23	13
		1RB#max	6.22	13



		50RB#25	6.25	13
		Full	6.28	13
Channel (M) 5MHz(BW)	QPSK	1RB#0	5.51	13
		1RB#max	5.49	13
		12RB#6	5.50	13
		Full	5.54	13
	16QAM	1RB#0	6.40	13
		1RB#max	6.34	13
		12RB#6	6.37	13
		Full	6.41	13
Channel (M) 10MHz(BW)	QPSK	1RB#0	5.36	13
		1RB#max	5.33	13
		25RB#13	5.31	13
		Full	5.38	13
	16QAM	1RB#0	6.29	13
		1RB#max	6.26	13
		25RB#13	6.25	13
		Full	6.31	13
Channel (M) 15MHz(BW)	QPSK	1RB#0	5.63	13
		1RB#max	5.61	13
		36RB#18	5.56	13
		Full	5.64	13
	16QAM	1RB#0	6.15	13
		1RB#max	6.18	13
		36RB#18	6.13	13
		Full	6.25	13
Channel (M) 20MHz(BW)	QPSK	1RB#0	5.31	13
		1RB#max	5.29	13
		50RB#25	5.31	13
		Full	5.35	13
	16QAM	1RB#0	6.25	13
		1RB#max	6.26	13
		50RB#25	6.27	13
		Full	6.31	13
Channel (T) 5MHz(BW)	QPSK	1RB#0	5.46	13
		1RB#max	5.45	13
		12RB#6	5.44	13
		Full	5.50	13



	16QAM	1RB#0	6.36	13
		1RB#max	6.32	13
		12RB#6	6.31	13
		Full	6.37	13
Channel (T) 10MHz(BW)	QPSK	1RB#0	5.33	13
		1RB#max	5.37	13
		25RB#13	5.35	13
		Full	5.37	13
	16QAM	1RB#0	6.26	13
		1RB#max	6.24	13
		25RB#13	6.22	13
		Full	6.24	13
Channel (T) 15MHz(BW)	QPSK	1RB#0	5.53	13
		1RB#max	5.54	13
		36RB#18	5.51	13
		Full	5.55	13
	16QAM	1RB#0	6.18	13
		1RB#max	6.21	13
		36RB#18	6.23	13
		Full	6.24	13
Channel (T) 20MHz(BW)	QPSK	1RB#0	5.35	13
		1RB#max	5.34	13
		50RB#25	5.30	13
		Full	5.36	13
	16QAM	1RB#0	6.23	13
		1RB#max	6.22	13
		50RB#25	6.27	13
		Full	6.29	13

Effective Isotropic Radiated Power of Transmitter (EIRP)

Table 3 Substitution Results (LTE) BAND 7

Test Mode			Meas. Level [dBm]	Substitution Antenna Type	SGP[dBm]	Substitution Gain [dBi]	Cable Loss [dB]	Substitution Level (EIRP) [dBm]	FCC limit [dBm]	Result
Channel	Modulation	RB								
Channel (B) 5MHz(BW)	QPSK	1 RB/#0	22.03	Horn Ant.	18.38	4.5	1	21.88	33	Pass
		1 RB/#max	22.00	Horn Ant.	18.35	4.5	1	21.85	33	Pass
		12 RB/#6	20.41	Horn Ant.	16.76	4.5	1	20.26	33	Pass
		Full	20.29	Horn Ant.	16.64	4.5	1	20.14	33	Pass
	16QAM	1 RB/#0	20.15	Horn Ant.	16.50	4.5	1	20.00	33	Pass
		1 RB/#max	20.12	Horn Ant.	16.47	4.5	1	19.97	33	Pass
		12 RB/#6	19.25	Horn Ant.	15.60	4.5	1	19.10	33	Pass
		Full	19.29	Horn Ant.	15.64	4.5	1	19.14	33	Pass
Channel (B) 10MHz(BW)	QPSK	1 RB/#0	21.99	Horn Ant.	18.34	4.5	1	21.84	33	Pass
		1 RB/#max	21.94	Horn Ant.	18.29	4.5	1	21.79	33	Pass
		25 RB/#13	20.24	Horn Ant.	16.59	4.5	1	20.09	33	Pass
		Full	20.09	Horn Ant.	16.44	4.5	1	19.94	33	Pass
	16QAM	1 RB/#0	20.16	Horn Ant.	16.51	4.5	1	20.01	33	Pass
		1 RB/#max	20.11	Horn Ant.	16.46	4.5	1	19.96	33	Pass
		25 RB/#13	19.18	Horn Ant.	15.53	4.5	1	19.03	33	Pass



		Full	19.05	Horn Ant.	15.40	4.5	1	18.90	33	Pass
Channel (B) 15MHz(BW)	QPSK	1 RB/#0	21.91	Horn Ant.	18.26	4.5	1	21.76	33	Pass
		1 RB/#max	21.85	Horn Ant.	18.20	4.5	1	21.70	33	Pass
		36 RB/#18	20.13	Horn Ant.	16.48	4.5	1	19.98	33	Pass
		Full	20.08	Horn Ant.	16.43	4.5	1	19.93	33	Pass
	16QAM	1 RB/#0	20.09	Horn Ant.	16.44	4.5	1	19.94	33	Pass
		1 RB/#max	20.05	Horn Ant.	16.40	4.5	1	19.90	33	Pass
		36 RB/#18	19.17	Horn Ant.	15.52	4.5	1	19.02	33	Pass
		Full	19.07	Horn Ant.	15.42	4.5	1	18.92	33	Pass
Channel (B) 20MHz(BW)	QPSK	1 RB/#0	21.95	Horn Ant.	18.30	4.5	1	21.80	33	Pass
		1 RB/#max	21.72	Horn Ant.	18.07	4.5	1	21.57	33	Pass
		50 RB/#25	20.16	Horn Ant.	16.51	4.5	1	20.01	33	Pass
		Full	20.19	Horn Ant.	16.54	4.5	1	20.04	33	Pass
	16QAM	1 RB/#0	20.12	Horn Ant.	16.47	4.5	1	19.97	33	Pass
		1 RB/#max	19.99	Horn Ant.	16.34	4.5	1	19.84	33	Pass
		50 RB/#25	19.15	Horn Ant.	15.50	4.5	1	19.00	33	Pass
		Full	19.21	Horn Ant.	15.56	4.5	1	19.06	33	Pass
Channel (M) 5MHz(BW)	QPSK	1 RB/#0	21.53	Horn Ant.	17.88	4.5	1	21.38	33	Pass
		1 RB/#max	21.62	Horn Ant.	17.97	4.5	1	21.47	33	Pass

		12 RB/#6	20.19	Horn Ant.	16.54	4.5	1	20.04	33	Pass
		Full	20.06	Horn Ant.	16.41	4.5	1	19.91	33	Pass
	16QAM	1 RB/#0	19.85	Horn Ant.	16.20	4.5	1	19.70	33	Pass
		1 RB/#max	19.86	Horn Ant.	16.21	4.5	1	19.71	33	Pass
		12 RB/#6	19.12	Horn Ant.	15.47	4.5	1	18.97	33	Pass
		Full	19.15	Horn Ant.	15.50	4.5	1	19.00	33	Pass
Channel (M) 10MHz(BW)	QPSK	1 RB/#0	21.53	Horn Ant.	17.88	4.5	1	21.38	33	Pass
		1 RB/#max	21.60	Horn Ant.	17.95	4.5	1	21.45	33	Pass
		25 RB/#13	20.09	Horn Ant.	16.44	4.5	1	19.94	33	Pass
		Full	19.95	Horn Ant.	16.30	4.5	1	19.80	33	Pass
	16QAM	1 RB/#0	19.58	Horn Ant.	15.93	4.5	1	19.43	33	Pass
		1 RB/#max	19.68	Horn Ant.	16.03	4.5	1	19.53	33	Pass
		25 RB/#13	19.14	Horn Ant.	15.49	4.5	1	18.99	33	Pass
		Full	18.96	Horn Ant.	15.31	4.5	1	18.81	33	Pass
Channel (M) 15MHz(BW)	QPSK	1 RB/#0	21.62	Horn Ant.	17.97	4.5	1	21.47	33	Pass
		1 RB/#max	21.57	Horn Ant.	17.92	4.5	1	21.42	33	Pass
		36 RB/#18	20.02	Horn Ant.	16.37	4.5	1	19.87	33	Pass
		Full	19.97	Horn Ant.	16.32	4.5	1	19.82	33	Pass
	16QAM	1 RB/#0	19.86	Horn Ant.	16.21	4.5	1	19.71	33	Pass



		1 RB/#max	19.83	Horn Ant.	16.18	4.5	1	19.68	33	Pass
		36 RB/#18	19.04	Horn Ant.	15.39	4.5	1	18.89	33	Pass
		Full	18.99	Horn Ant.	15.34	4.5	1	18.84	33	Pass
Channel (M) 20MHz(B W)	QPSK	1 RB/#0	21.56	Horn Ant.	17.91	4.5	1	21.41	33	Pass
		1 RB/#max	21.61	Horn Ant.	17.96	4.5	1	21.46	33	Pass
		50 RB/#25	20.06	Horn Ant.	16.41	4.5	1	19.91	33	Pass
		Full	20.03	Horn Ant.	16.38	4.5	1	19.88	33	Pass
	16QA M	1 RB/#0	19.91	Horn Ant.	16.26	4.5	1	19.76	33	Pass
		1 RB/#max	20.01	Horn Ant.	16.36	4.5	1	19.86	33	Pass
		50 RB/#25	18.94	Horn Ant.	15.29	4.5	1	18.79	33	Pass
		Full	19.01	Horn Ant.	15.36	4.5	1	18.86	33	Pass
Channel (T) 5MHz(B W)	QPSK	1 RB/#0	21.85	Horn Ant.	17.90	4.8	1	21.70	33	Pass
		1 RB/#max	21.63	Horn Ant.	17.68	4.8	1	21.48	33	Pass
		12 RB/#6	20.27	Horn Ant.	16.32	4.8	1	20.12	33	Pass
		Full	20.23	Horn Ant.	16.28	4.8	1	20.08	33	Pass
	16QA M	1 RB/#0	20.15	Horn Ant.	16.20	4.8	1	20.00	33	Pass
		1 RB/#max	19.87	Horn Ant.	15.92	4.8	1	19.72	33	Pass
		12 RB/#6	19.18	Horn Ant.	15.23	4.8	1	19.03	33	Pass
		Full	19.24	Horn Ant.	15.29	4.8	1	19.09	33	Pass



Channel (T) 10MHz(B W)	QPSK	1 RB/#0	21.89	Horn Ant.	17.94	4.8	1	21.74	33	Pass
		1 RB/#max	21.68	Horn Ant.	17.73	4.8	1	21.53	33	Pass
		25 RB/#13	20.30	Horn Ant.	16.35	4.8	1	20.15	33	Pass
		Full	20.07	Horn Ant.	16.12	4.8	1	19.92	33	Pass
	16QA M	1 RB/#0	19.88	Horn Ant.	15.93	4.8	1	19.73	33	Pass
		1 RB/#max	19.72	Horn Ant.	15.77	4.8	1	19.57	33	Pass
		25 RB/#13	19.39	Horn Ant.	15.44	4.8	1	19.24	33	Pass
		Full	19.06	Horn Ant.	15.11	4.8	1	18.91	33	Pass
Channel (T) 15MHz(B W)	QPSK	1 RB/#0	21.71	Horn Ant.	17.76	4.8	1	21.56	33	Pass
		1 RB/#max	21.66	Horn Ant.	17.71	4.8	1	21.51	33	Pass
		36 RB/#18	20.11	Horn Ant.	16.16	4.8	1	19.96	33	Pass
		Full	20.08	Horn Ant.	16.13	4.8	1	19.93	33	Pass
	16QA M	1 RB/#0	19.99	Horn Ant.	16.04	4.8	1	19.84	33	Pass
		1 RB/#max	19.88	Horn Ant.	15.93	4.8	1	19.73	33	Pass
		36 RB/#18	19.11	Horn Ant.	15.16	4.8	1	18.96	33	Pass
		Full	18.99	Horn Ant.	15.04	4.8	1	18.84	33	Pass
Channel (T) 20MHz(B W)	QPSK	1 RB/#0	21.69	Horn Ant.	17.74	4.8	1	21.54	33	Pass
		1 RB/#max	21.66	Horn Ant.	17.71	4.8	1	21.51	33	Pass
		50 RB/#25	20.14	Horn Ant.	16.19	4.8	1	19.99	33	Pass



	16QAM	Full	20.06	Horn Ant.	16.11	4.8	1	19.91	33	Pass
		1 RB/#0	20.05	Horn Ant.	16.10	4.8	1	19.90	33	Pass
		1 RB/#max	19.97	Horn Ant.	16.02	4.8	1	19.82	33	Pass
		50 RB/#25	19.02	Horn Ant.	15.07	4.8	1	18.87	33	Pass
		Full	19.09	Horn Ant.	15.14	4.8	1	18.94	33	Pass

Note1: a, For getting the EIRP (Efficient Isotropic Radiated Power) in substitution method, the following formula should be taken to calculate it,

$$\text{EIRP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBi]}$$

b, SGP=Signal Generator Level

Note2: RBW > emission bandwidth, VBW > 3 x RBW.

-----END-----



Appendix B

Modulation Characteristics

According to FCC Part 2.1047 & FCC Part 27.Subpart C&M &
RSS-199



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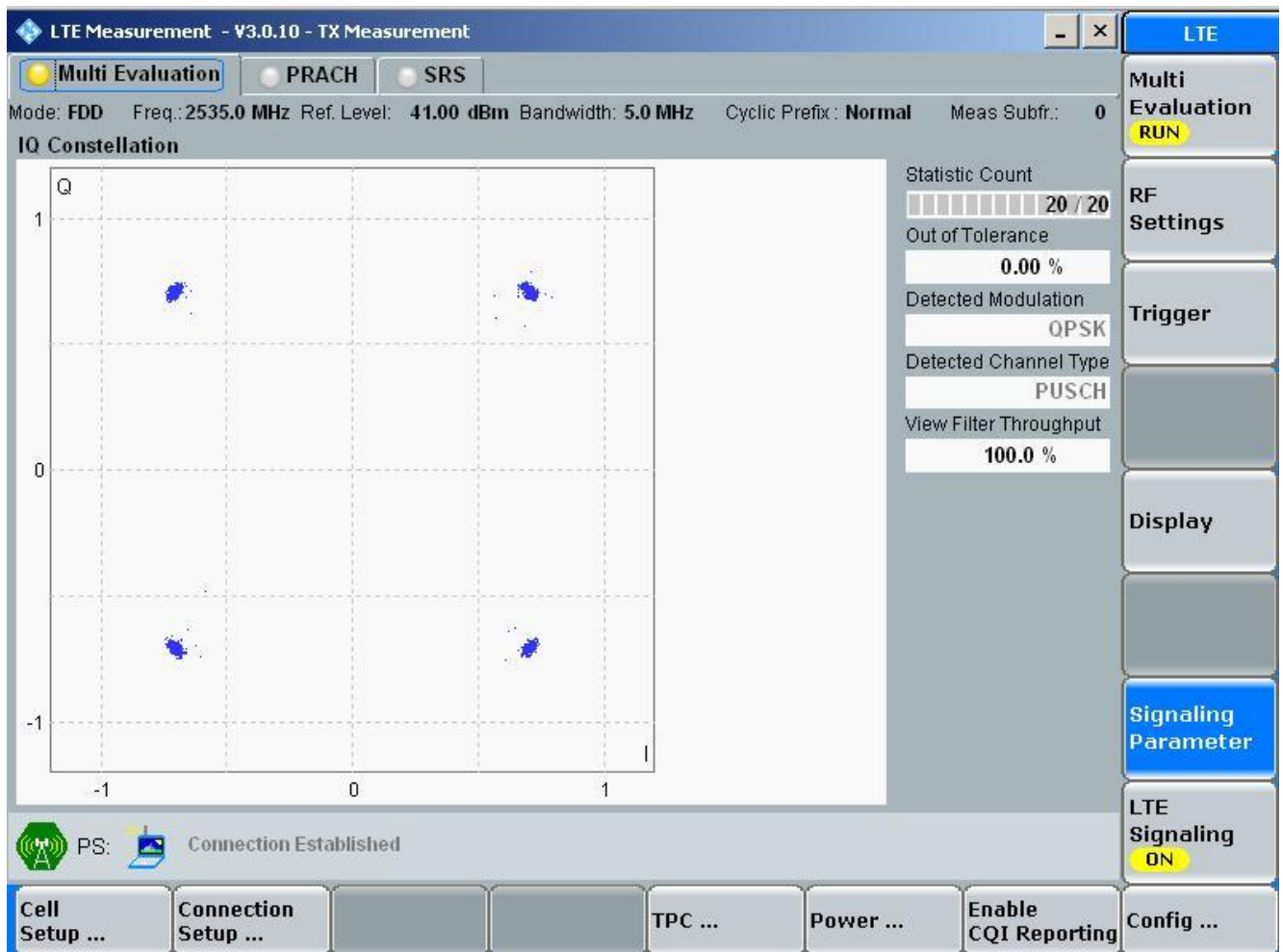
1 For Band 7

1.1 Test Mode=TM1

1.1.1 Channel Bandwidth = 5 MHz

1.1.1.1 Channel =M

1.1.1.1.1 QPSK/full RBs

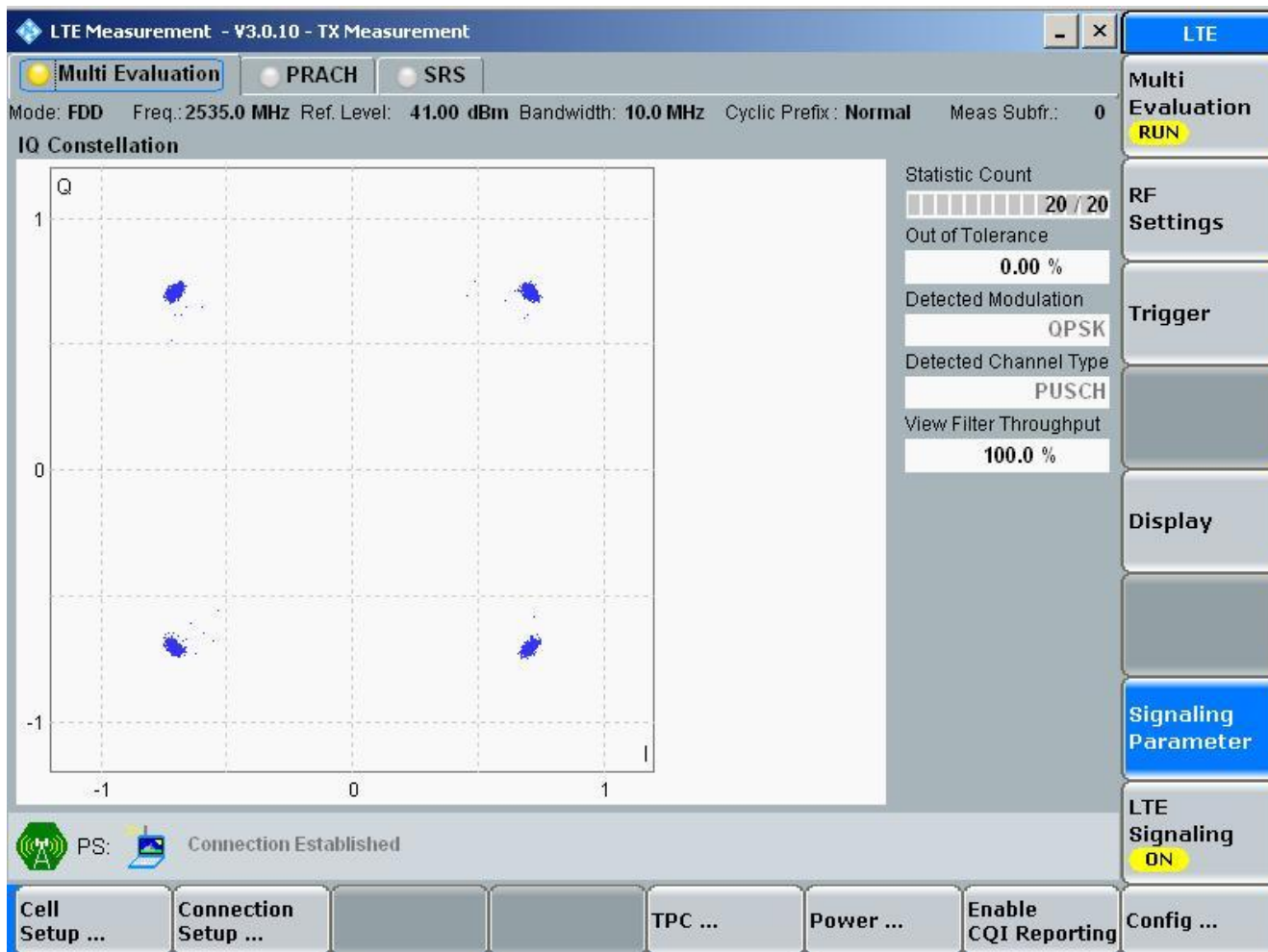




1.1.2 Channel Bandwidth = 10 MHz

1.1.2.1 Channel =M

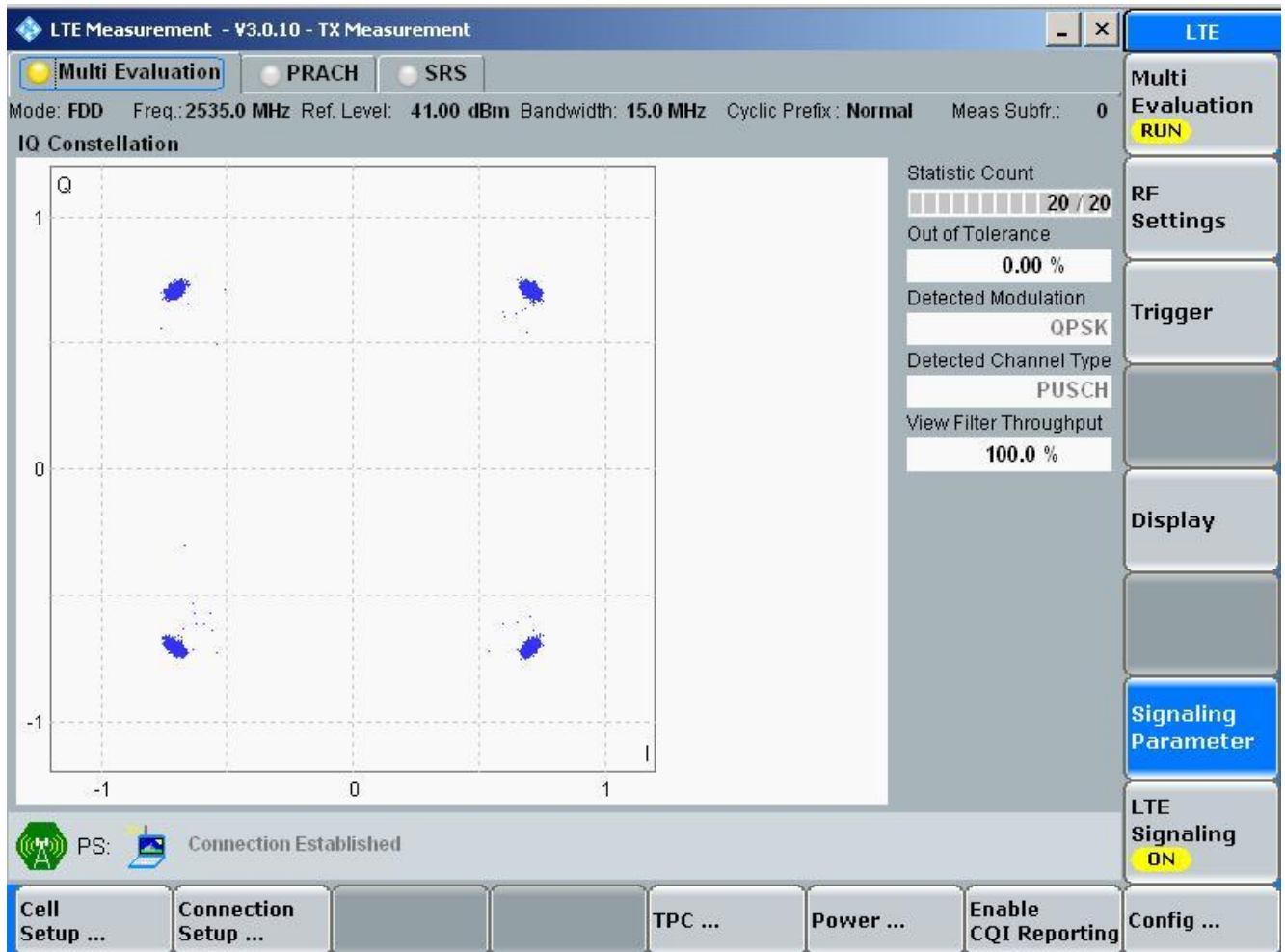
1.1.2.1.1 QPSK/full RBs



1.1.3 Channel Bandwidth = 15 MHz

1.1.3.1 Channel =M

1.1.3.1.1 QPSK/full RBs

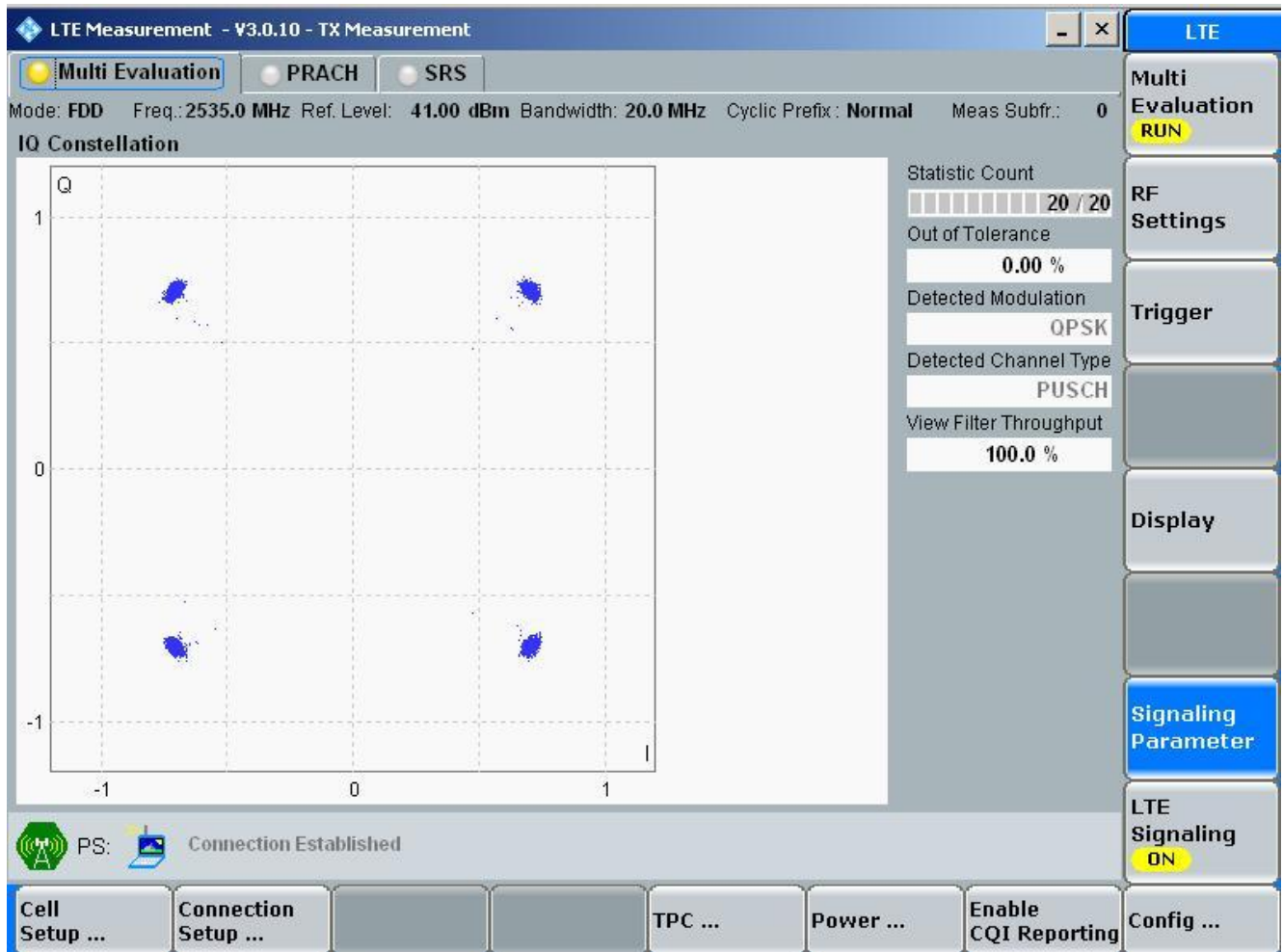




1.1.4 Channel Bandwidth = 20 MHz

1.1.4.1 Channel =M

1.1.4.1.1 QPSK/full RBs

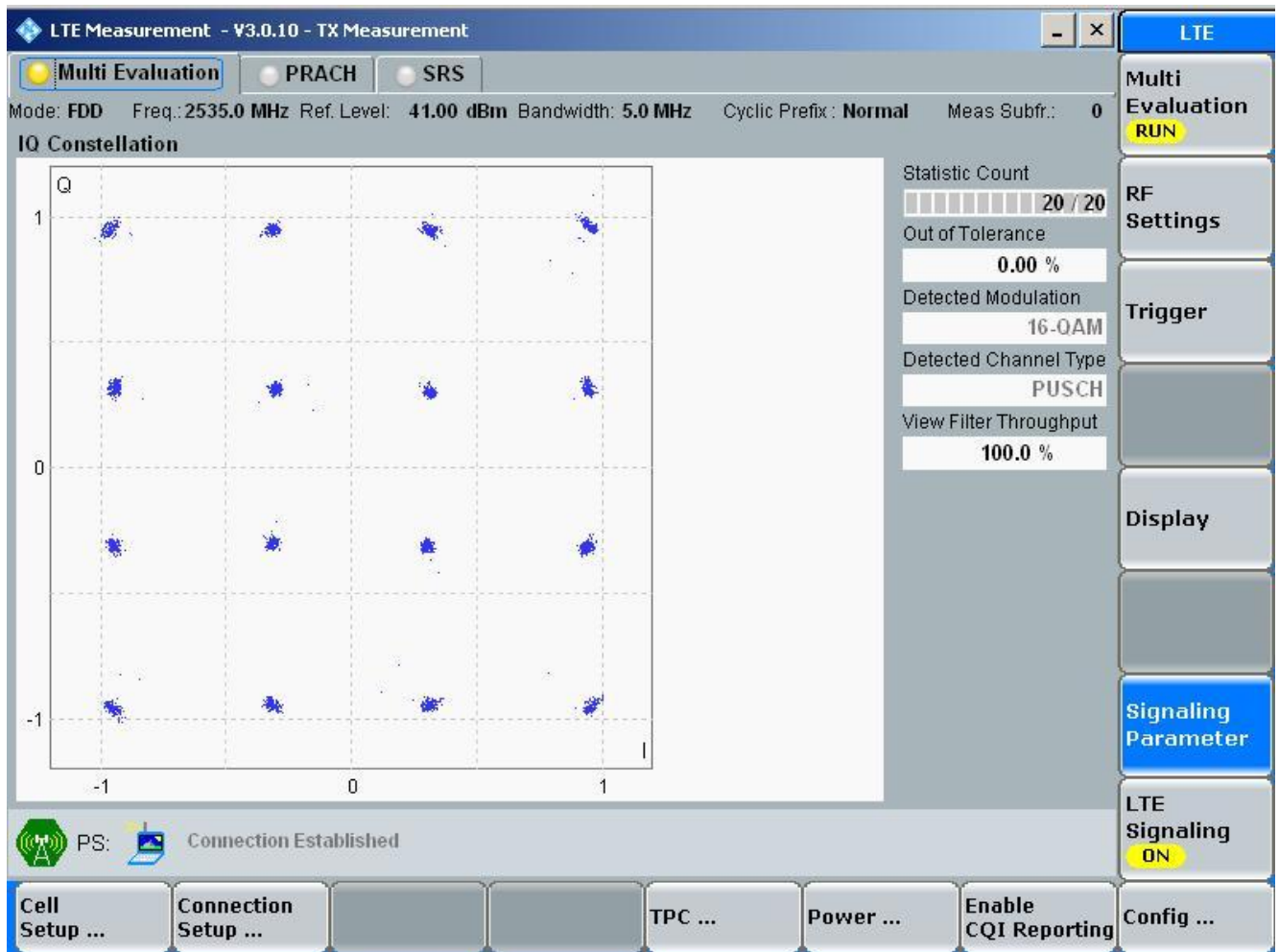


1.2 Test Mode=TM2

1.2.1 Channel Bandwidth = 5 MHz

1.2.1.1 Channel =M

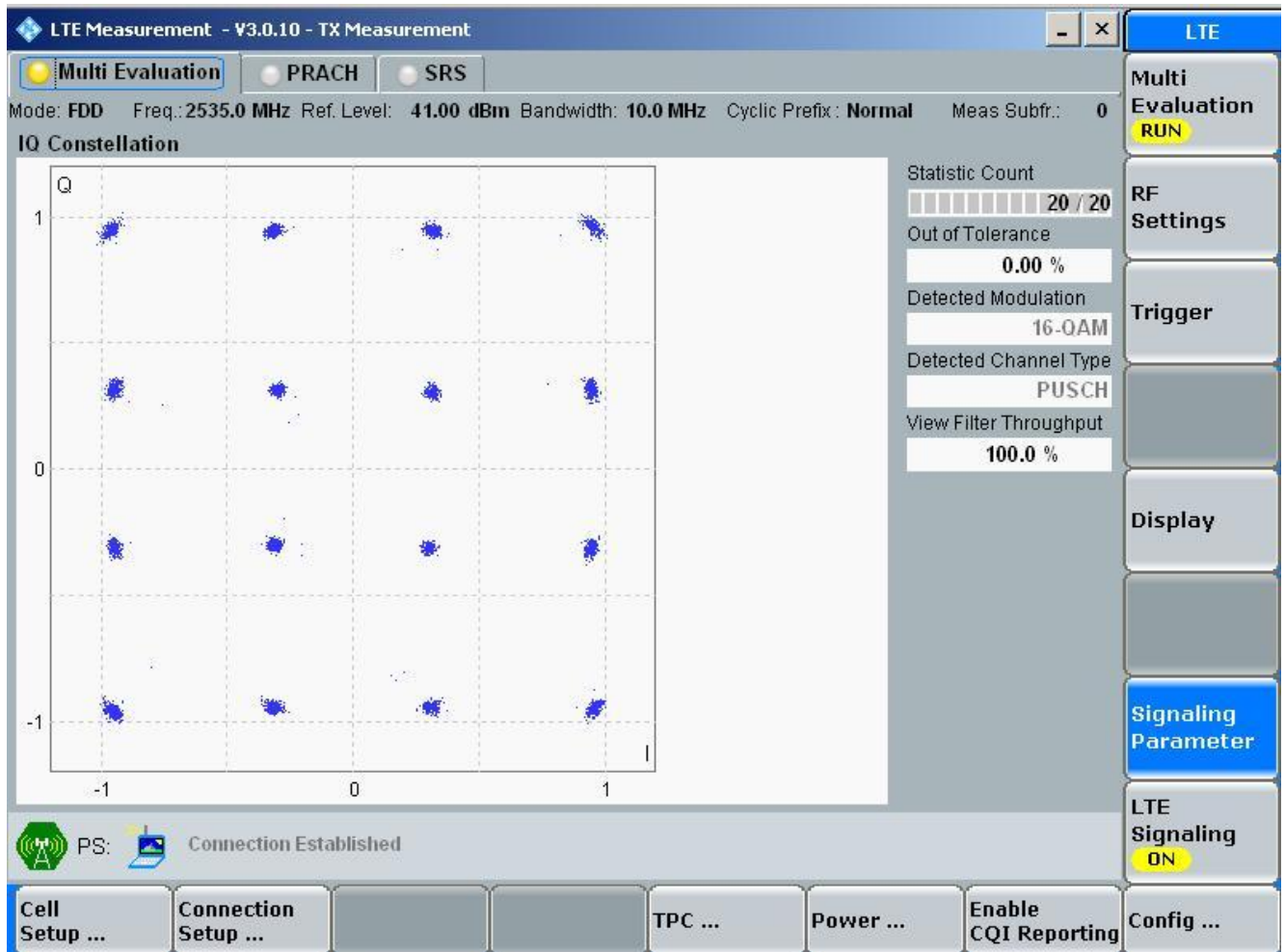
1.2.1.1.1 16QAM/full RBs



1.2.2 Channel Bandwidth = 10 MHz

1.2.2.1 Channel =M

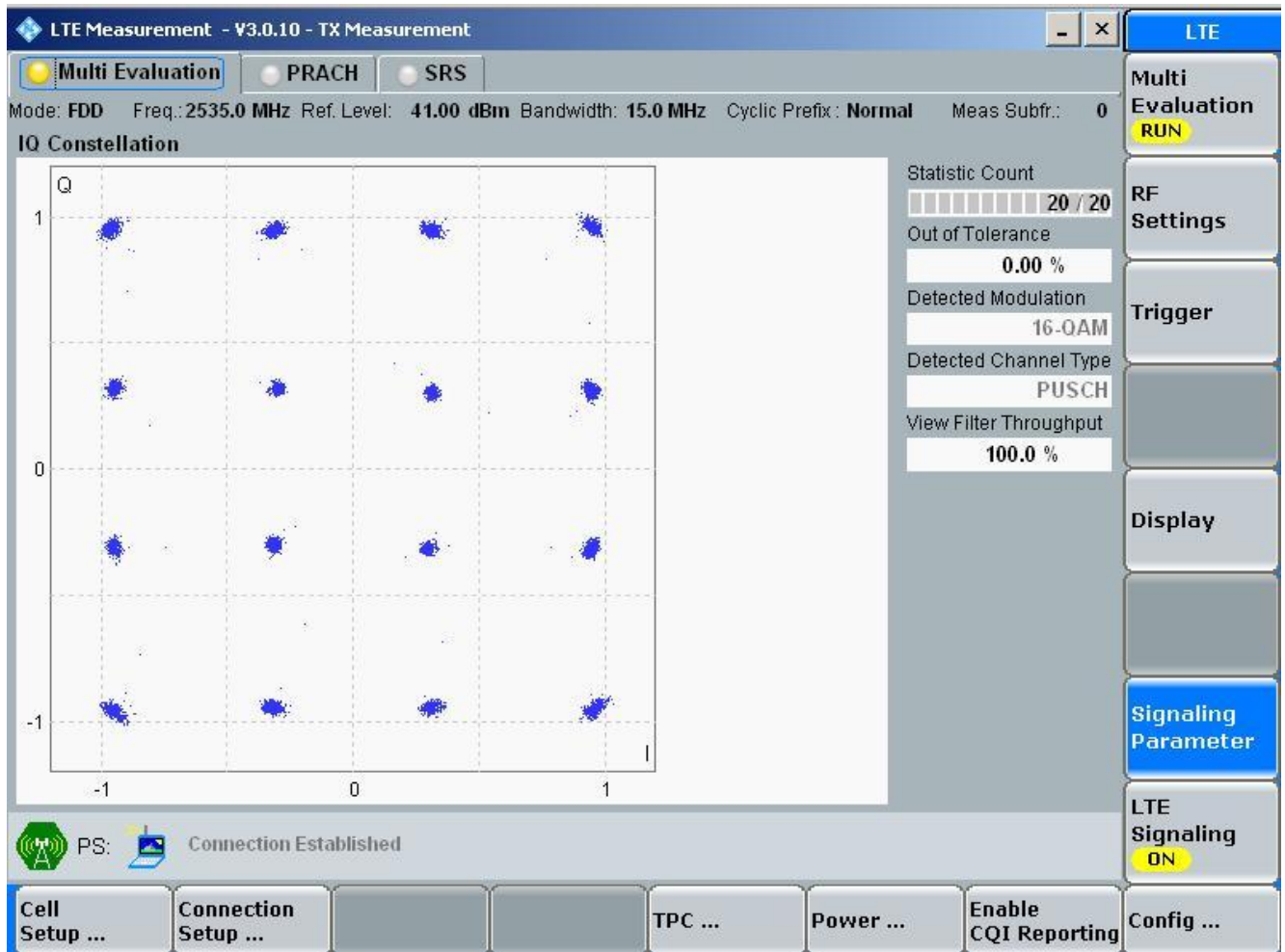
1.2.2.1.1 16QAM/full RBs



1.2.3 Channel Bandwidth = 15 MHz

1.2.3.1 Channel =M

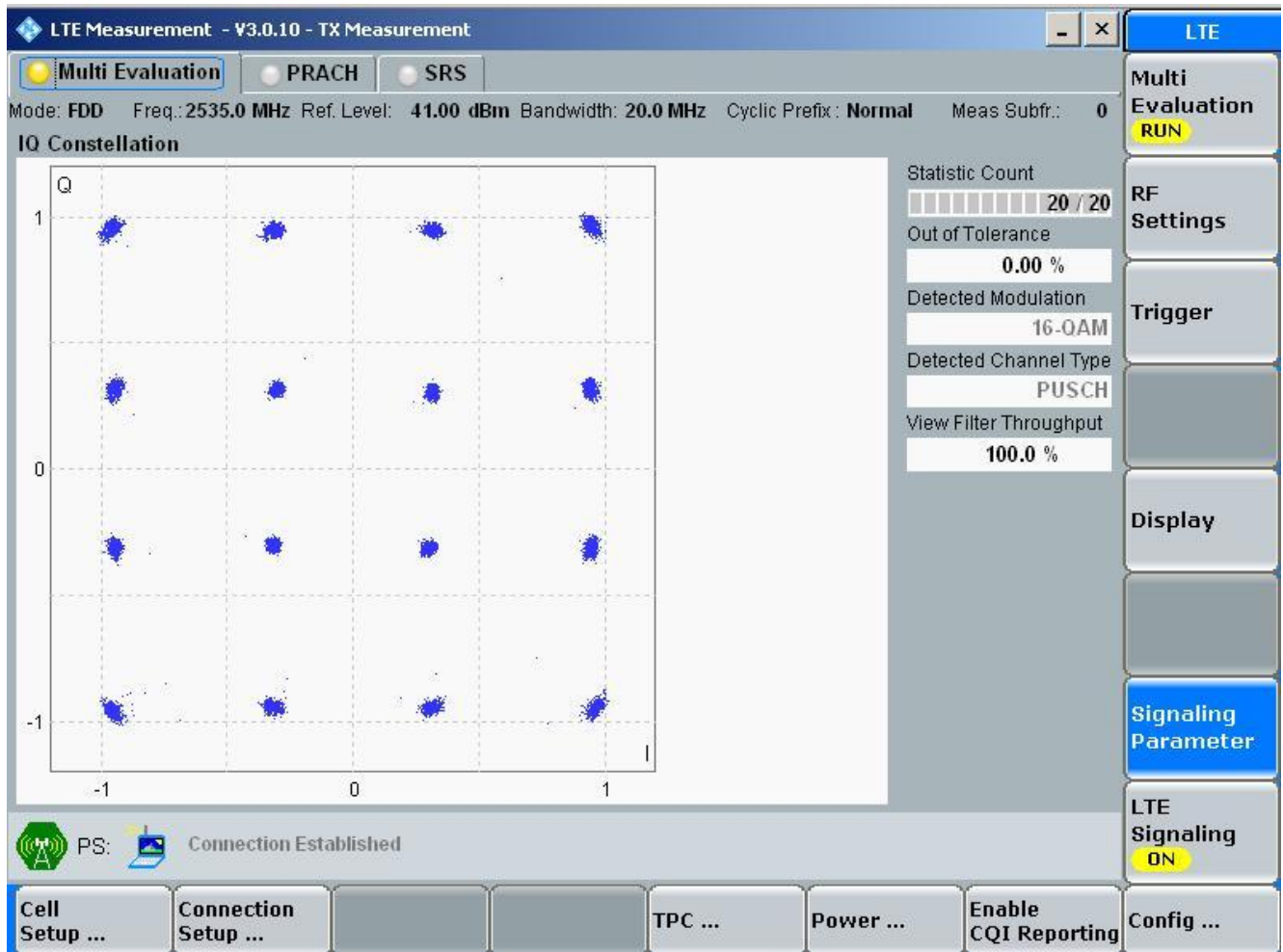
1.2.3.1.1 16QAM/full RBs



1.2.4 Channel Bandwidth = 20 MHz

1.2.4.1 Channel =M

1.2.4.1.1 16QAM/full RBs



-----END-----



Appendix C

Occupied Bandwidth

According to FCC part 2.1049 & FCC Part 27.Subpart C&M &
RSS-199



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1.2.4.3.1	16QAM/1RB # 0	98
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1.2.4.3.4	16QAM /full RBs	101



Result Table

NOTE: All relevant operation modes have been tested, and the full RB data is included in this report.

Table 1 Measurement Results (LTE) BAND 7

Test Mode	Carrier Conf.	RF Ch.	Occupied Bandwidth [MHz]	Verdict
TM1	5 MHz	B	4.4663	Pass
		M	4.4763	Pass
		T	4.4666	Pass
	10 MHz	B	8.9576	Pass
		M	8.9451	Pass
		T	8.9296	Pass
	15 MHz	B	13.436	Pass
		M	13.417	Pass
		T	13.405	Pass
	20 MHz	B	17.875	Pass
		M	17.861	Pass
		T	17.837	Pass
TM2	5 MHz	B	4.4715	Pass
		M	4.4756	Pass
		T	4.4752	Pass
	10 MHz	B	8.9494	Pass
		M	8.9375	Pass
		T	8.9423	Pass
	15 MHz	B	13.427	Pass
		M	13.407	Pass
		T	13.412	Pass
	20 MHz	B	17.837	Pass
		M	17.890	Pass
		T	17.834	Pass



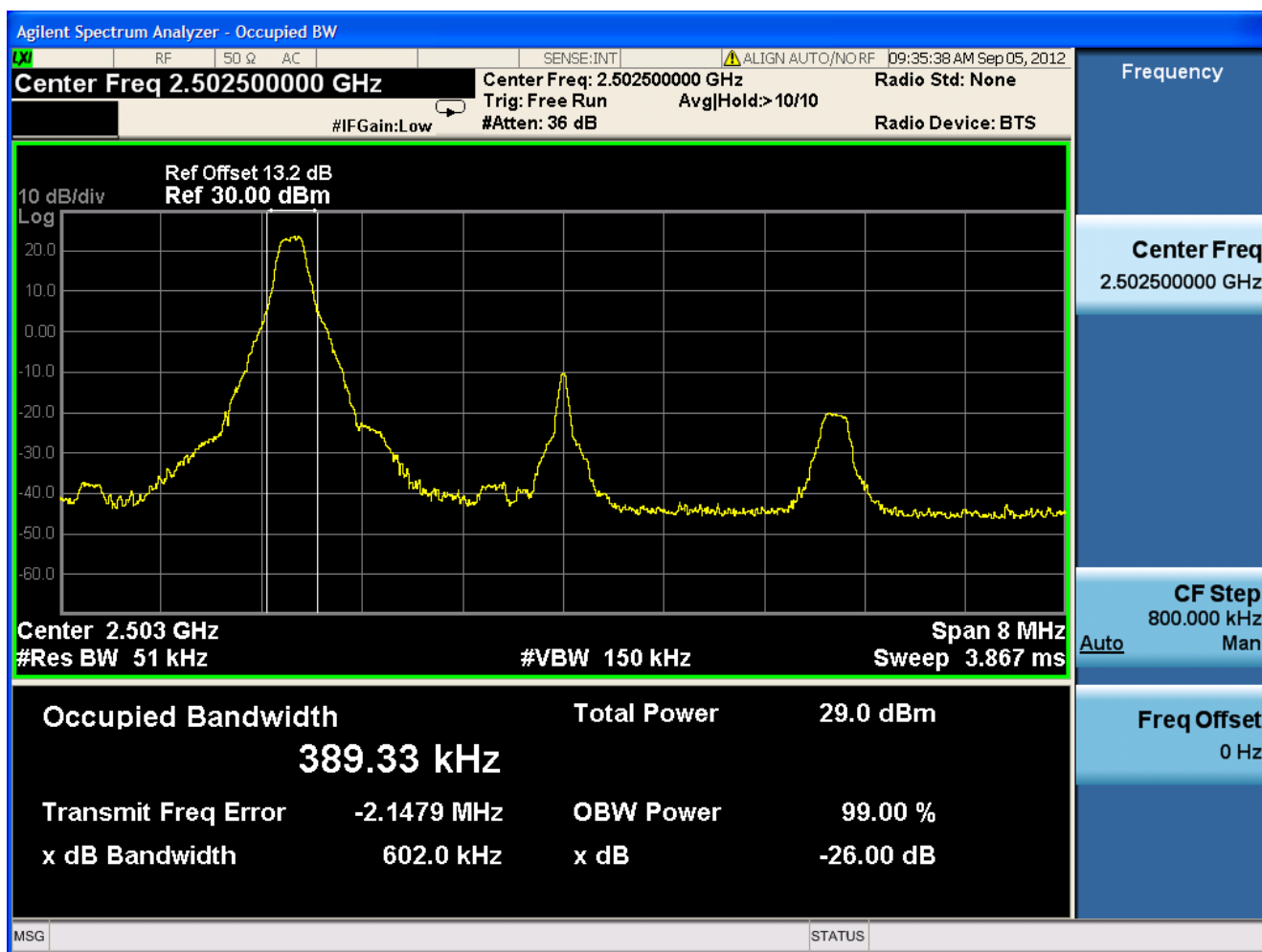
1 For Band 7

1.1 Test Mode=TM1

1.1.1 Channel Bandwidth = 5 MHz

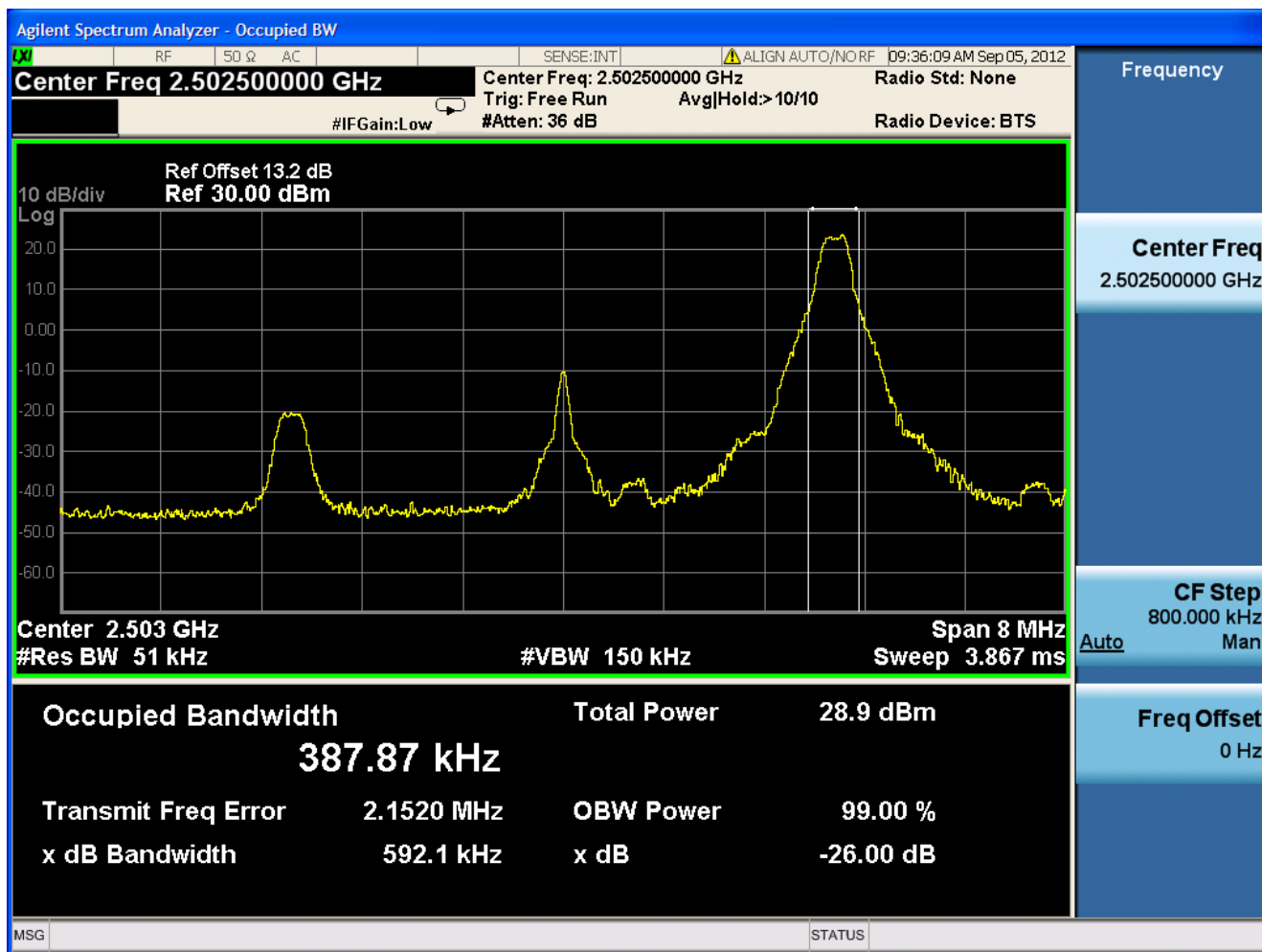
1.1.1.1 Channel = B

1.1.1.1.1 QPSK/1RB # 0



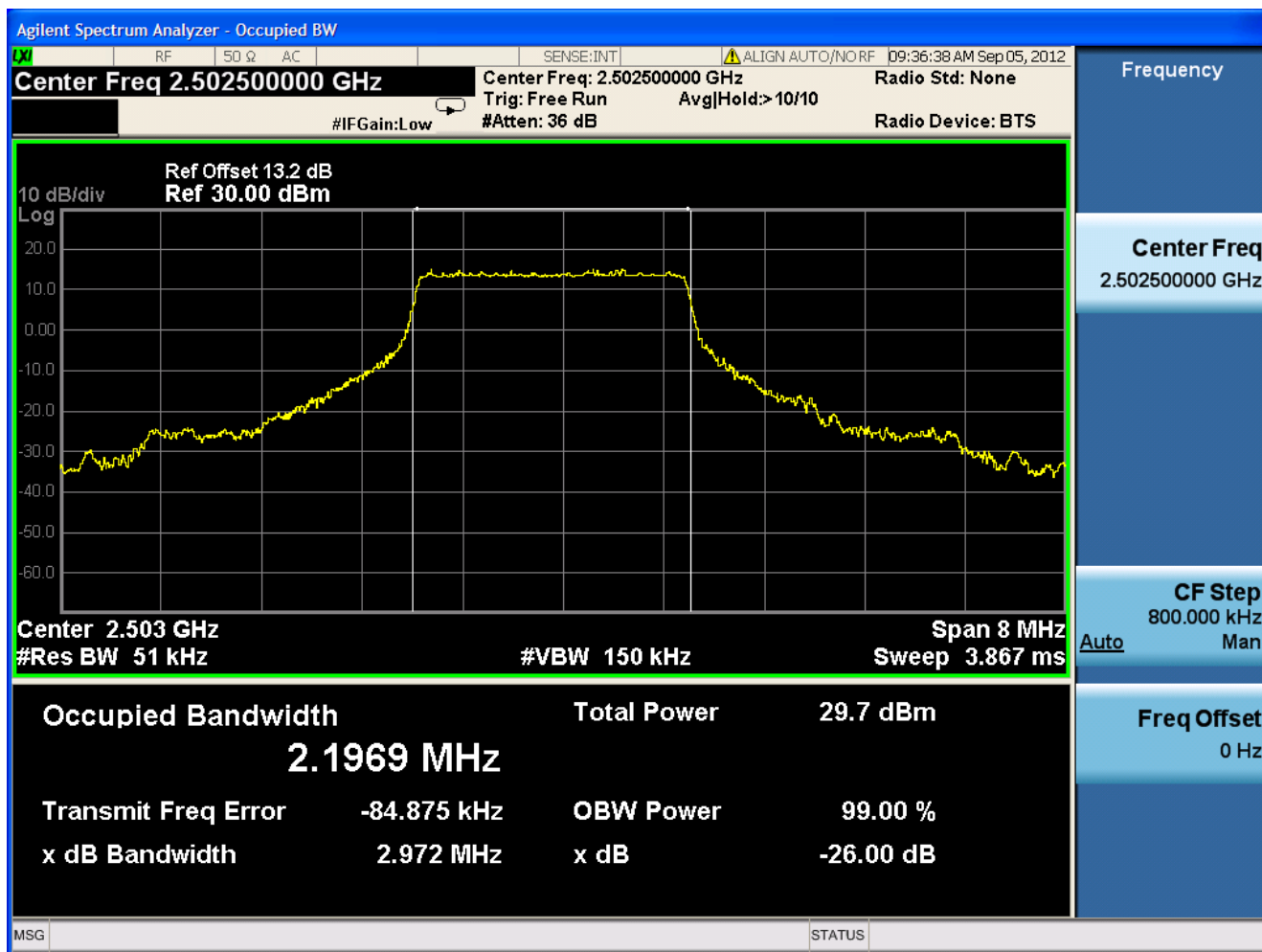


1.1.1.1.2 QPSK/1RB # max



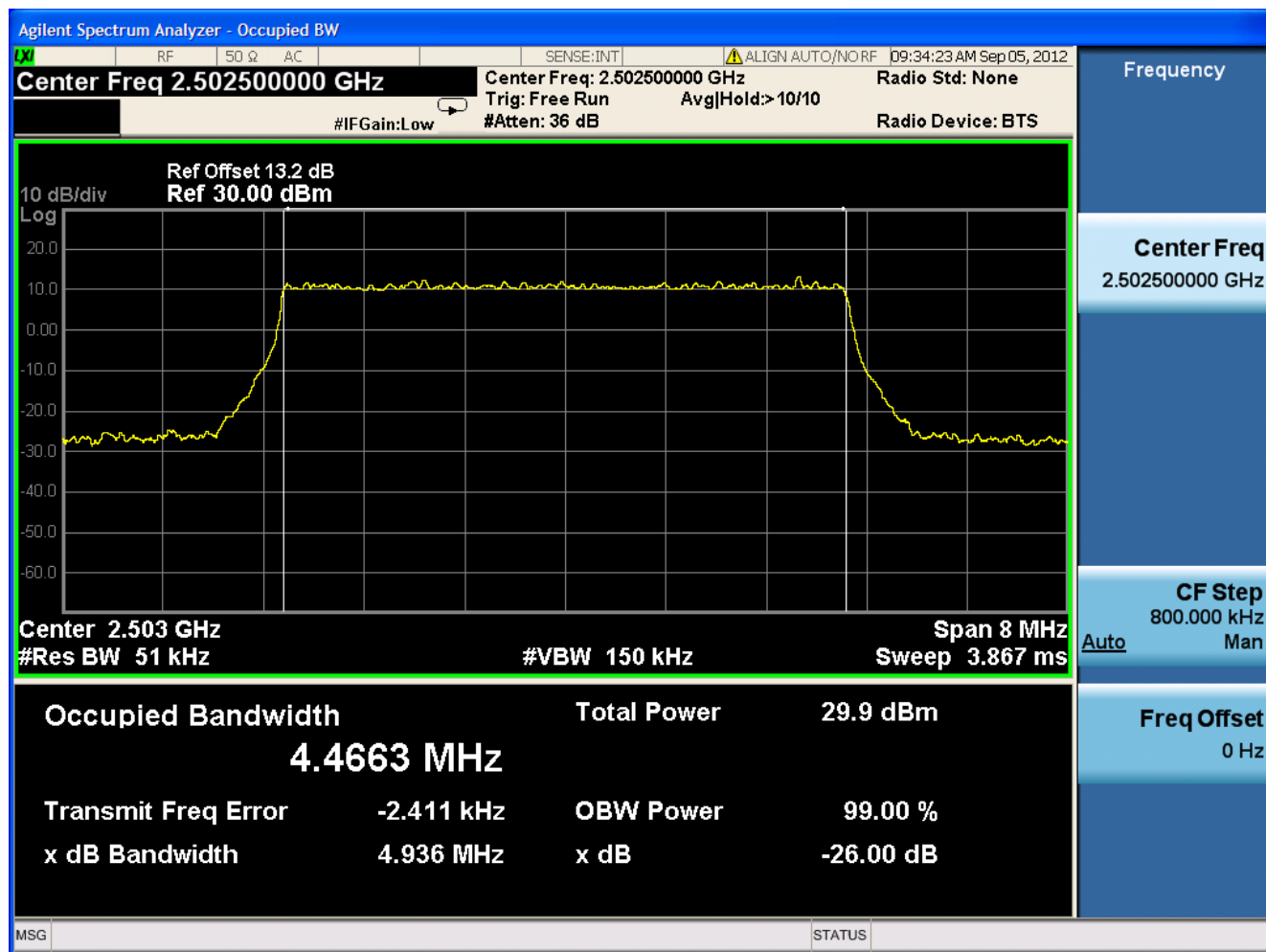


1.1.1.1.3 QPSK/non-1RB #mid/2





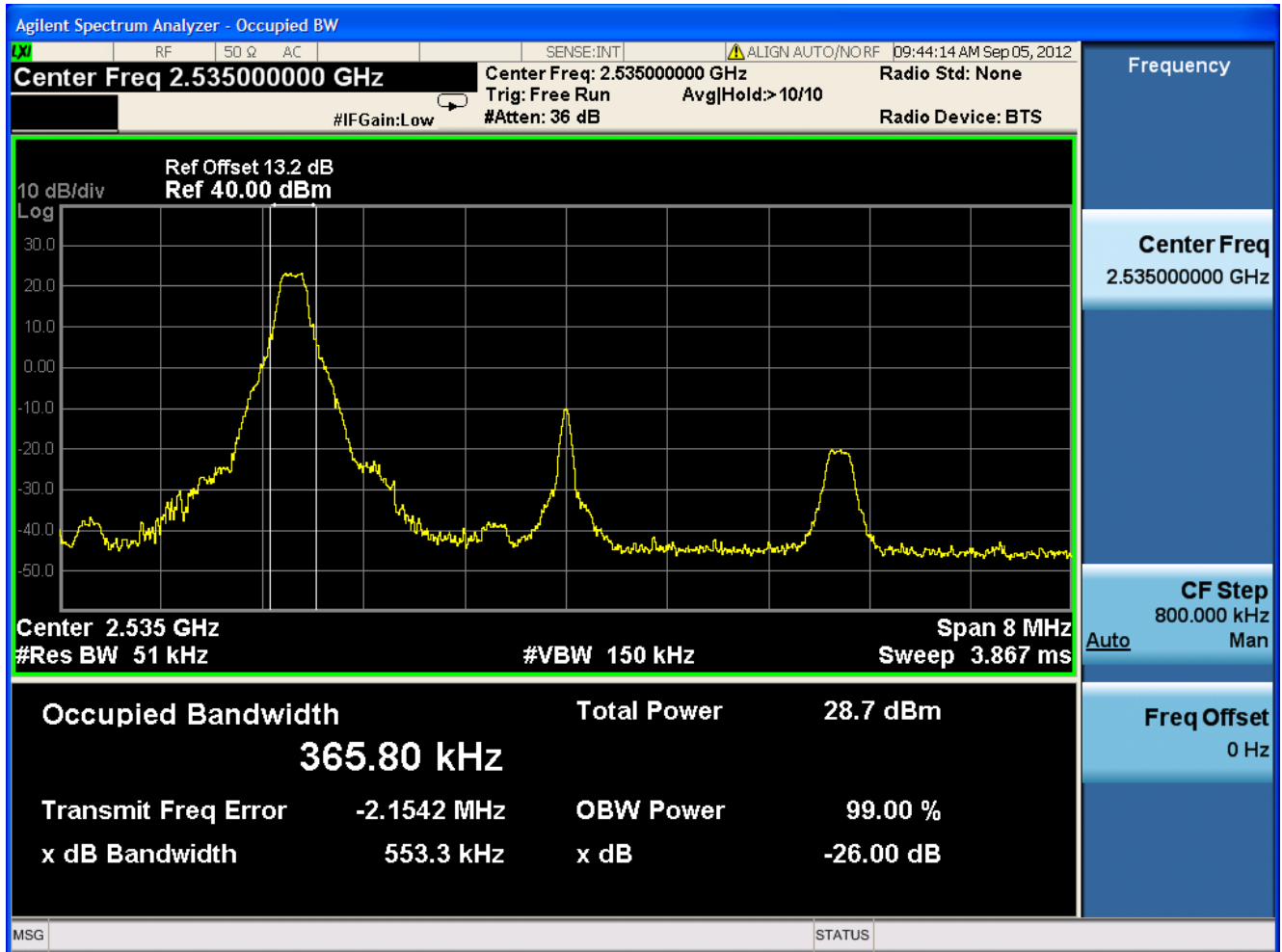
1.1.1.1.4 QPSK/full RBs





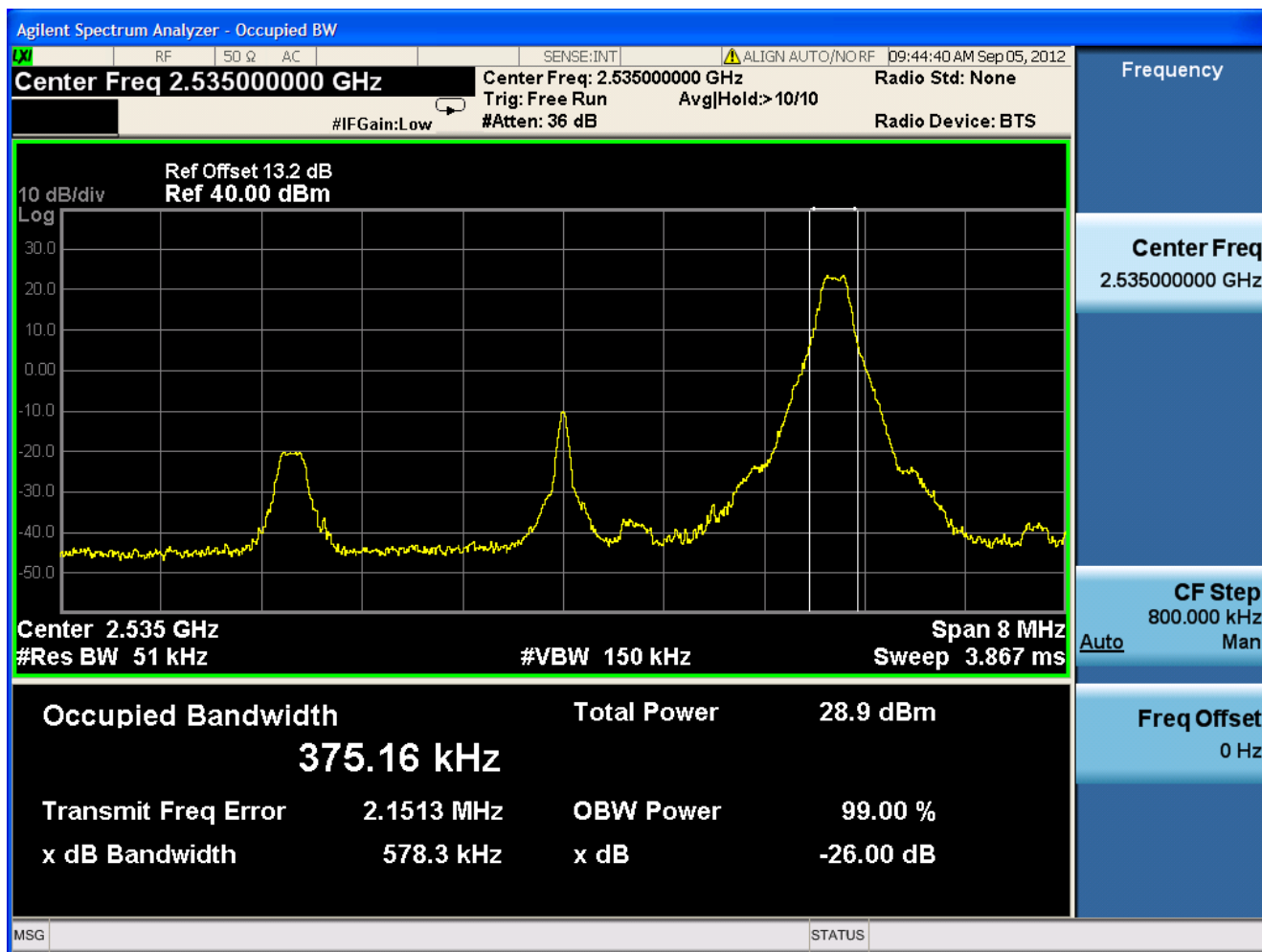
1.1.1.2 Channel =M

1.1.1.2.1 QPSK/1RB # 0



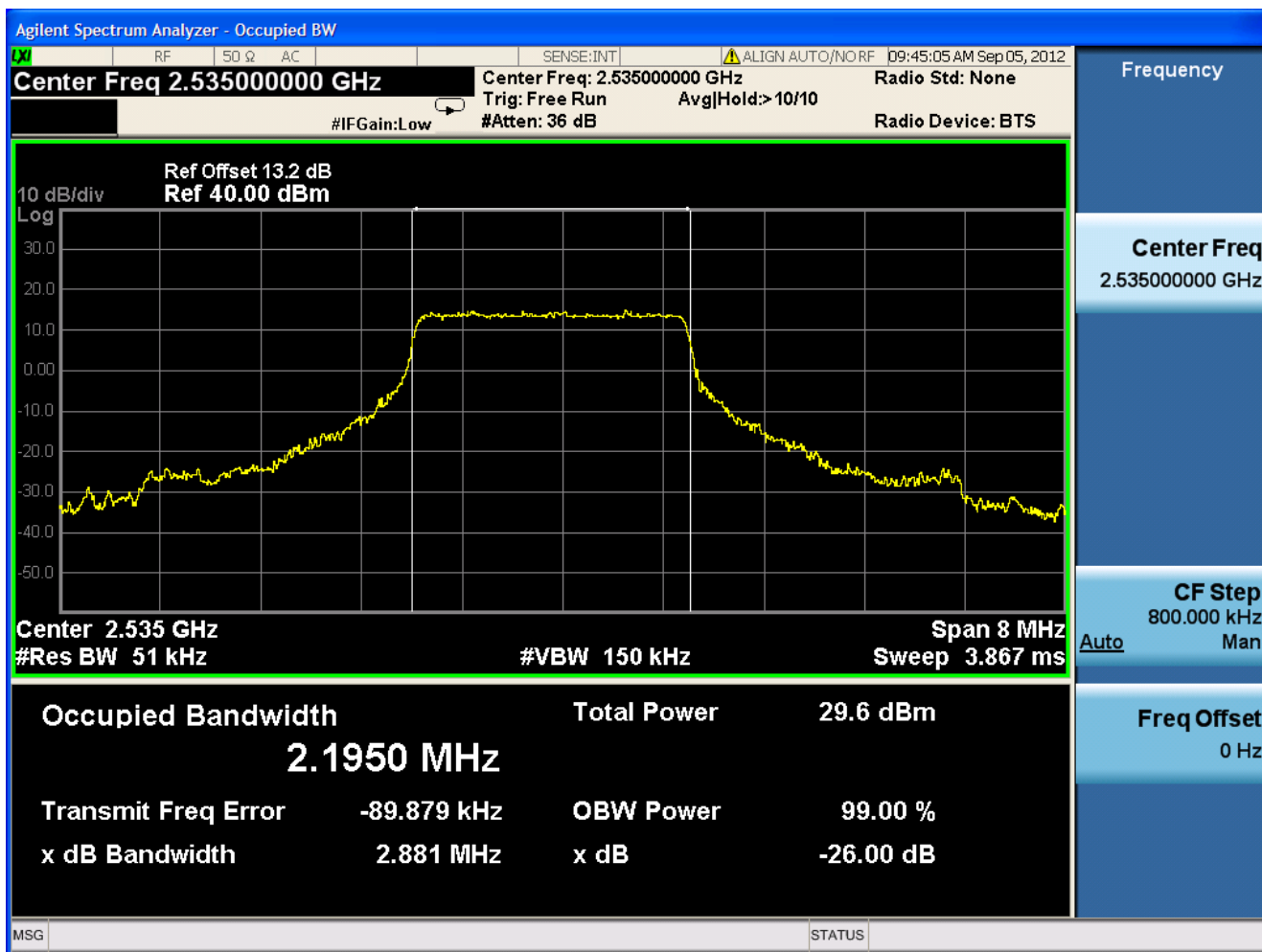


1.1.1.2.2 QPSK/1RB # max



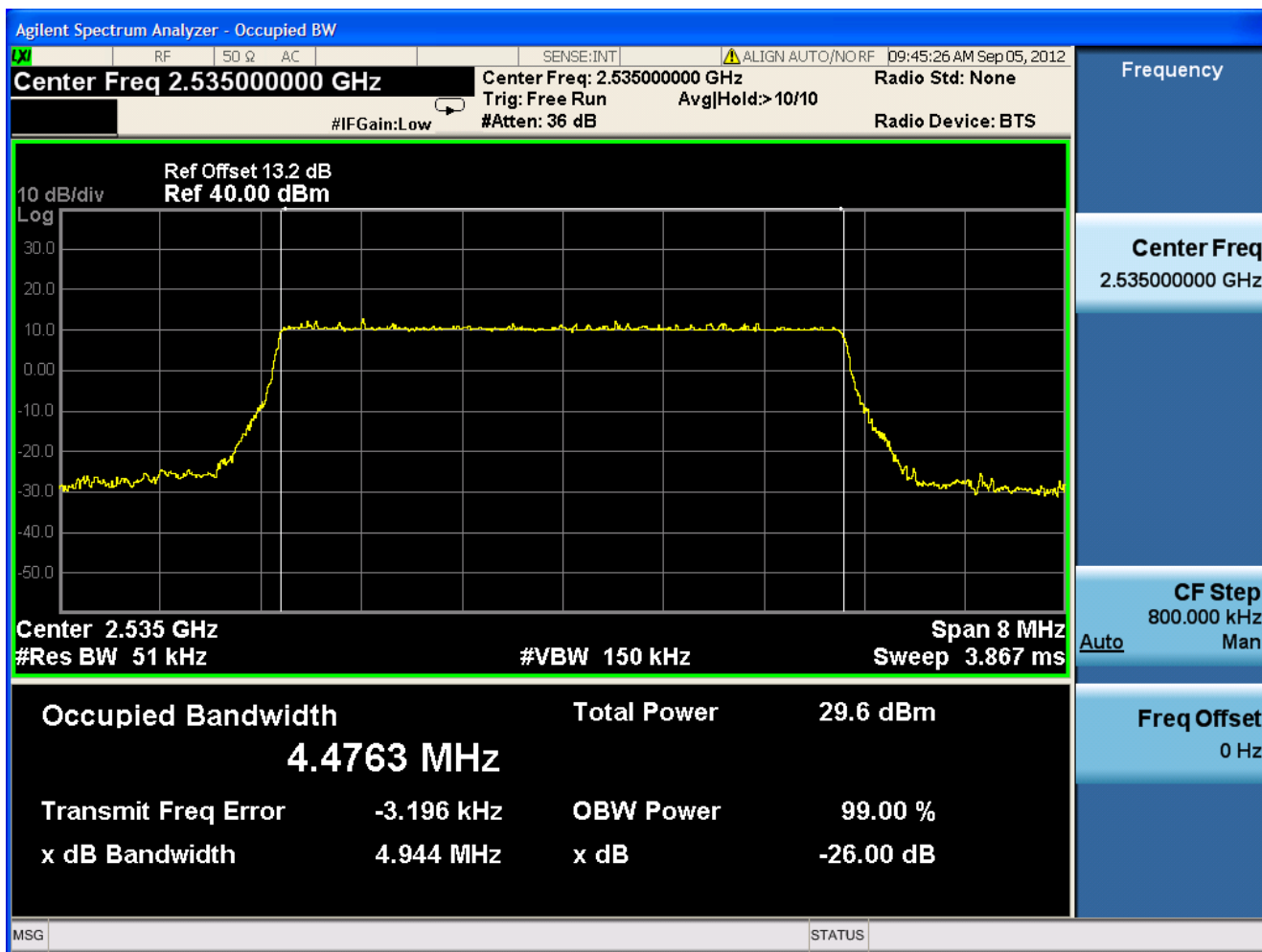


1.1.1.2.3 QPSK/non-1RB #mid/2





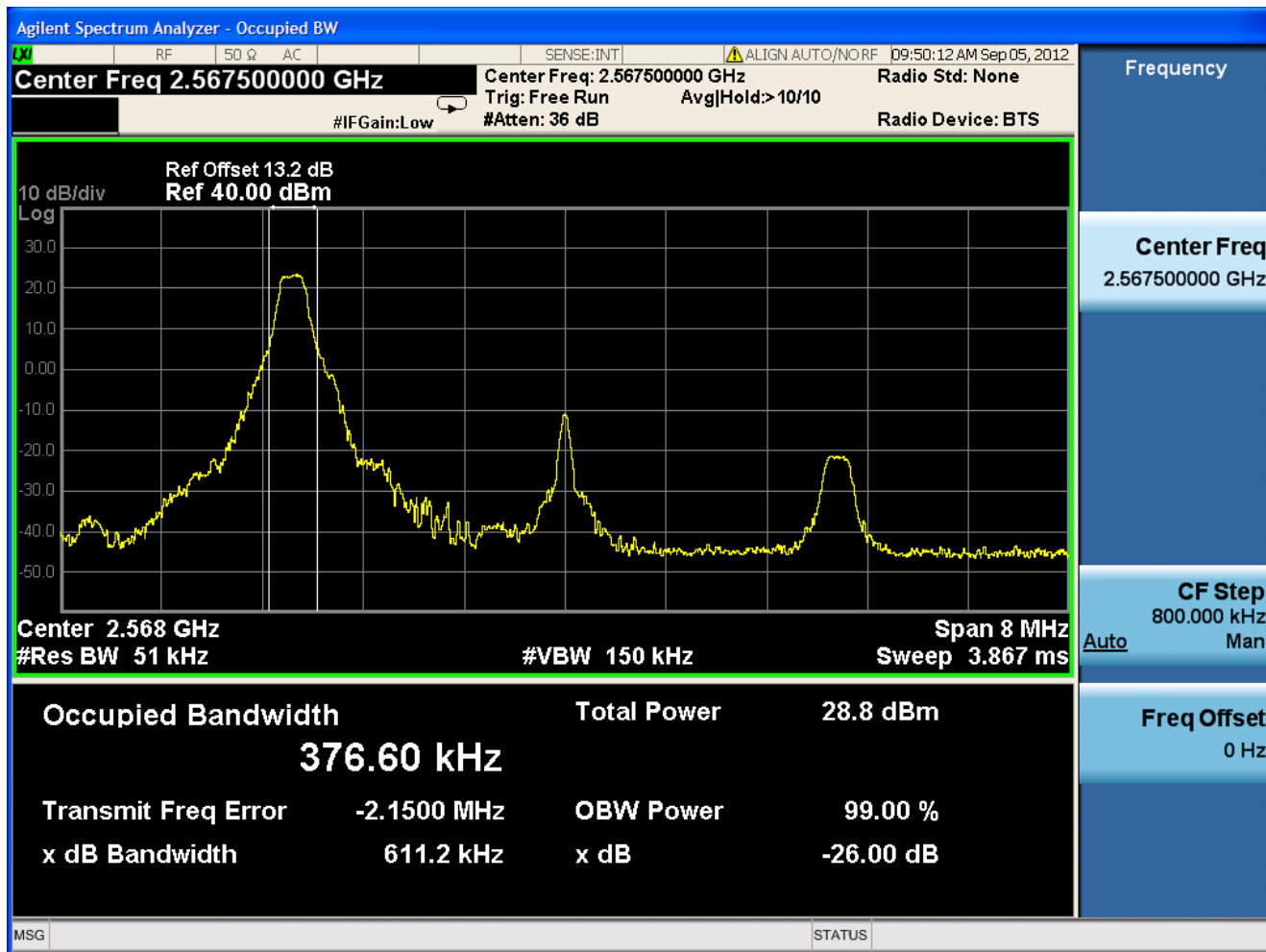
1.1.1.2.4 QPSK/full RBs





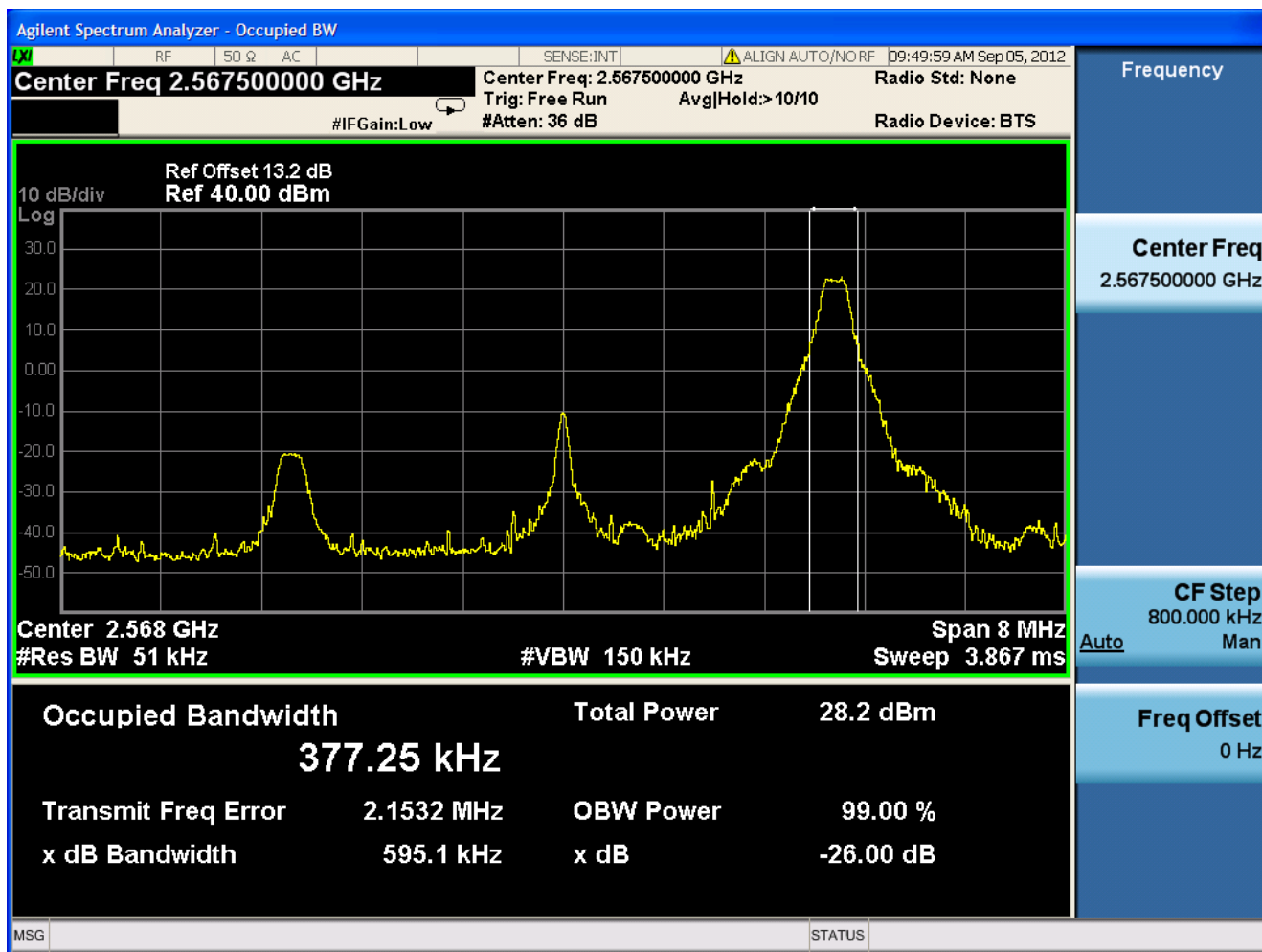
1.1.1.3 Channel =T

1.1.1.3.1 QPSK/1RB # 0



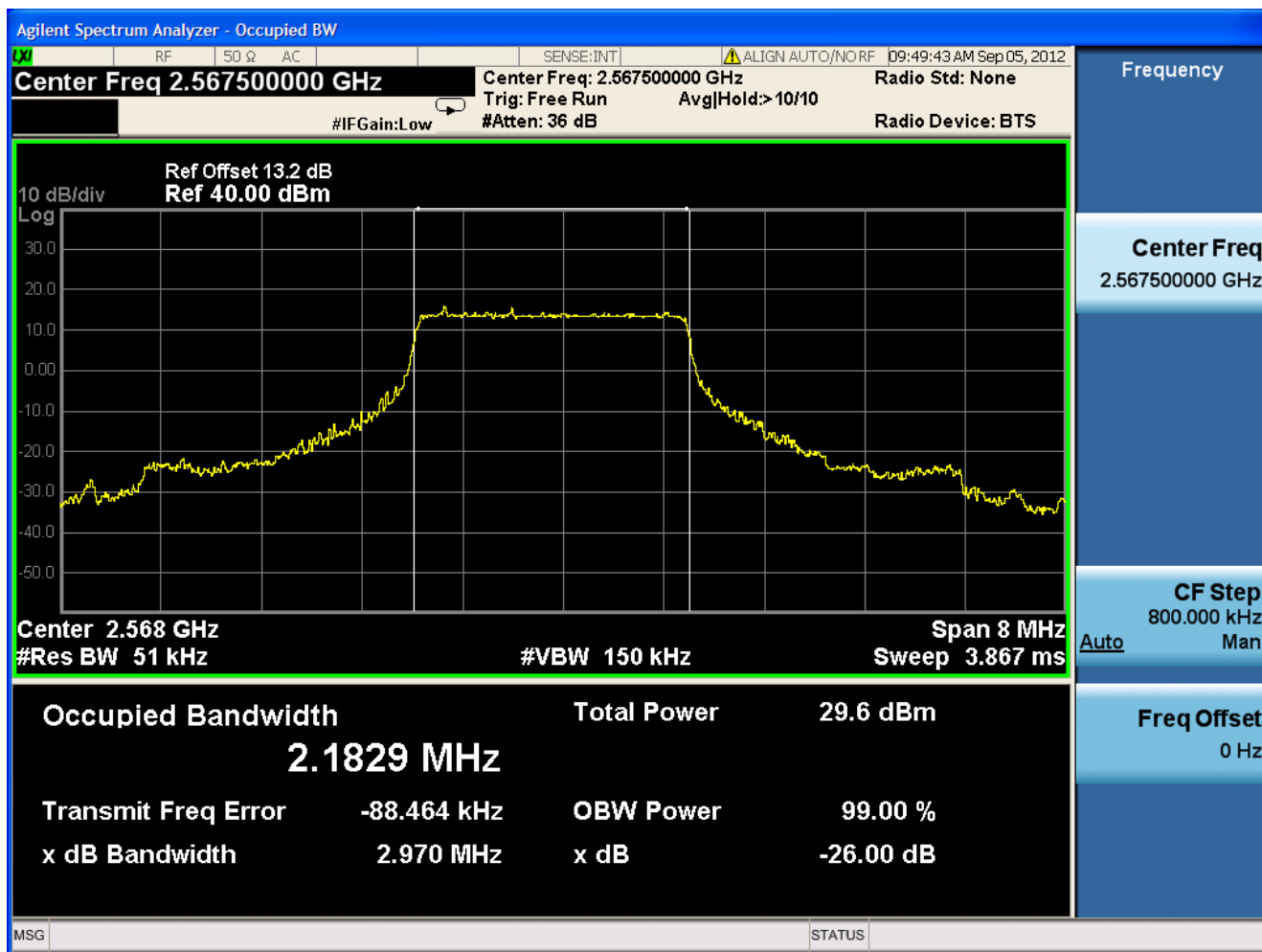


1.1.1.3.2 QPSK/1RB # max



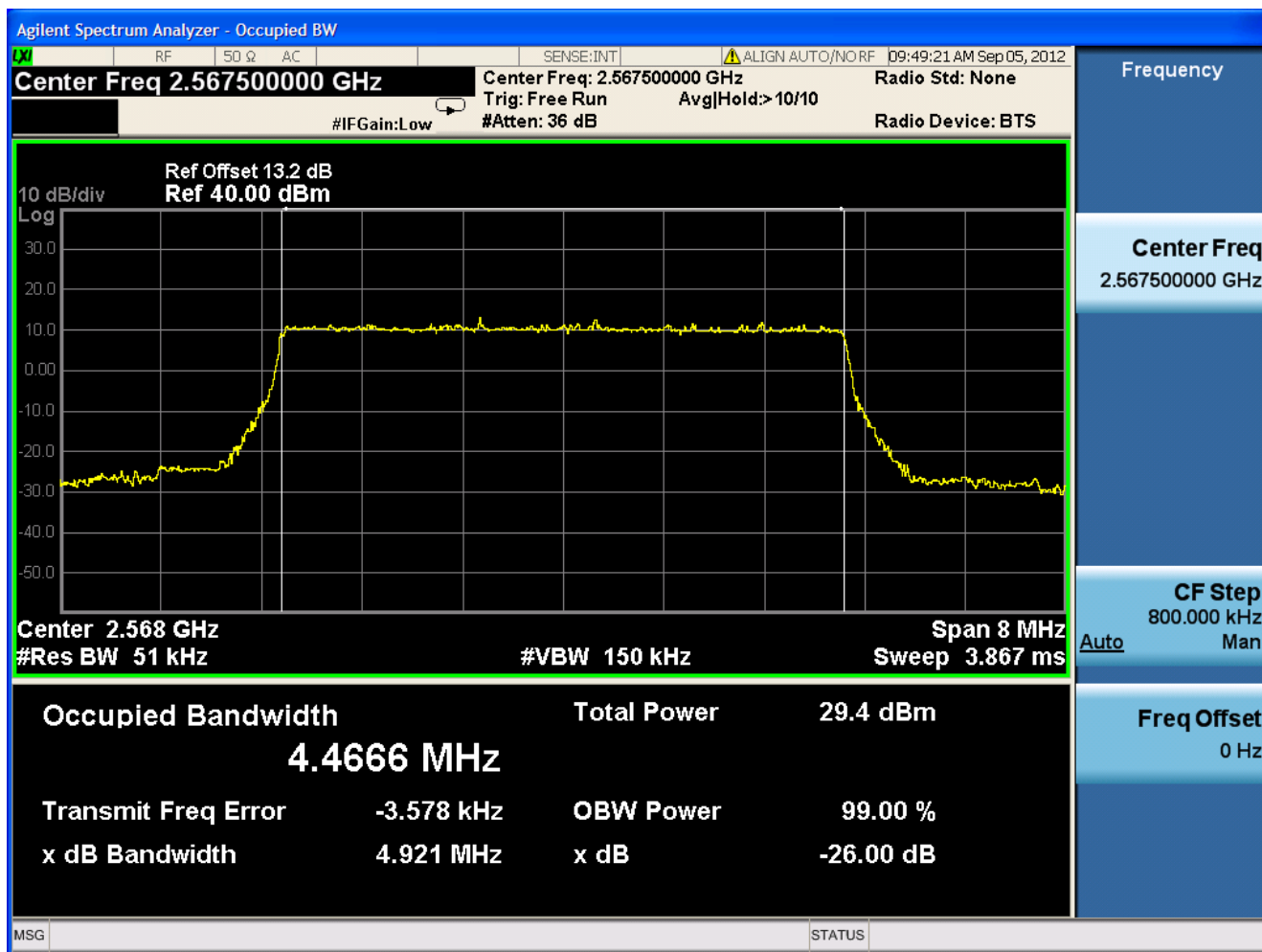


1.1.1.3.3 QPSK/non-1RB #mid/2





1.1.1.3.4 QPSK/full RBs

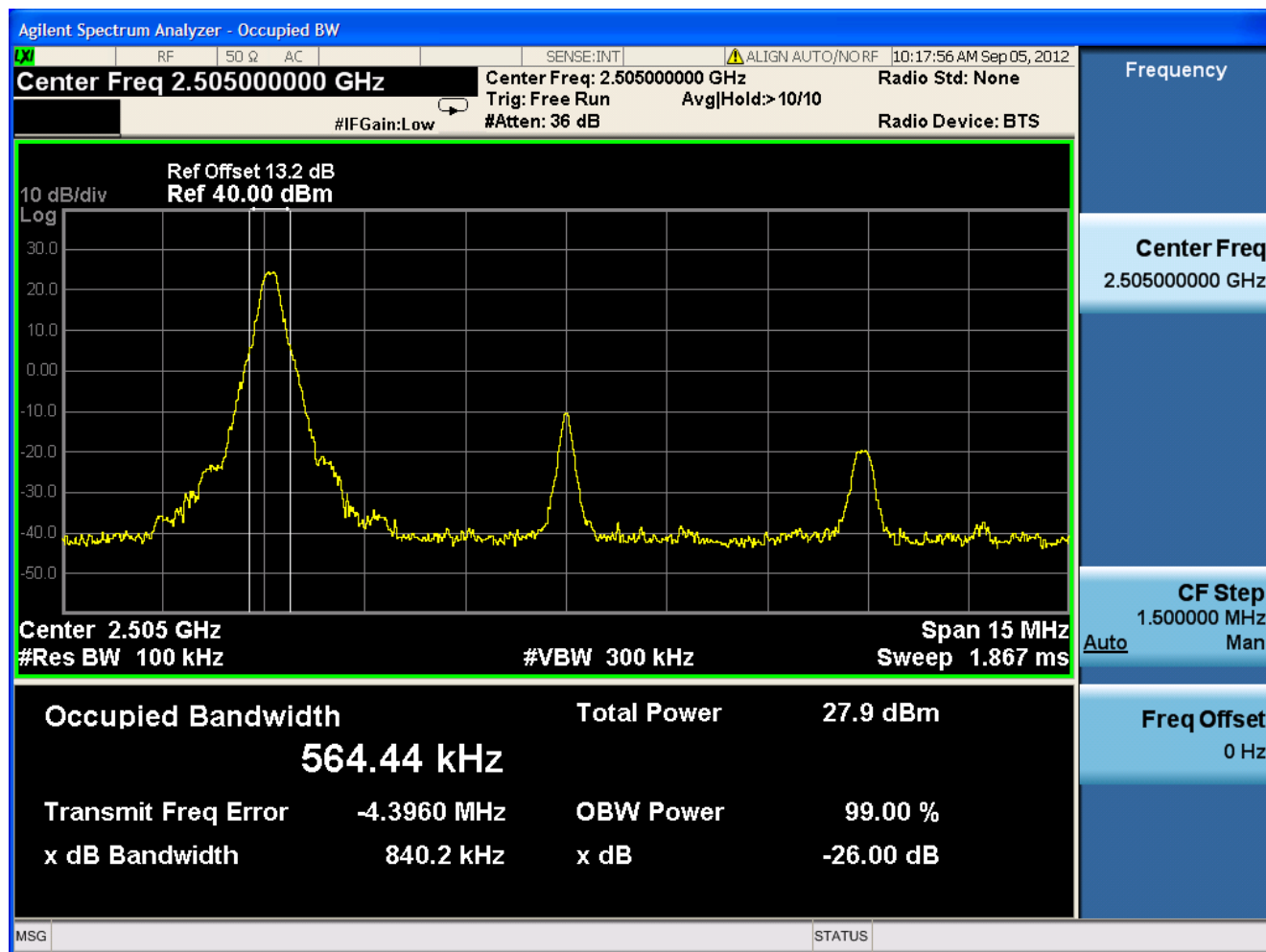




1.1.2 Channel Bandwidth = 10 MHz

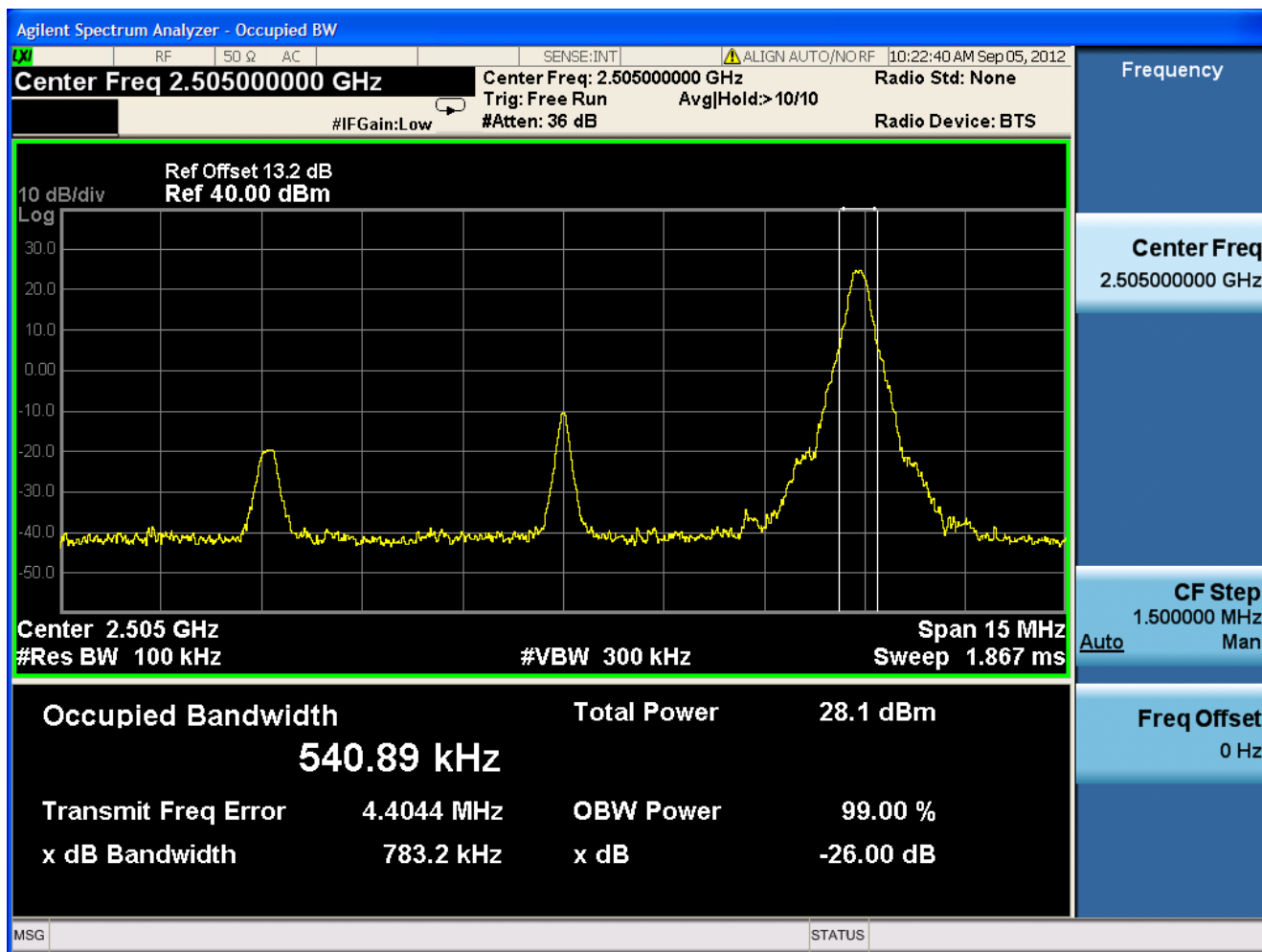
1.1.2.1 Channel = B

1.1.2.1.1 QPSK/1RB # 0



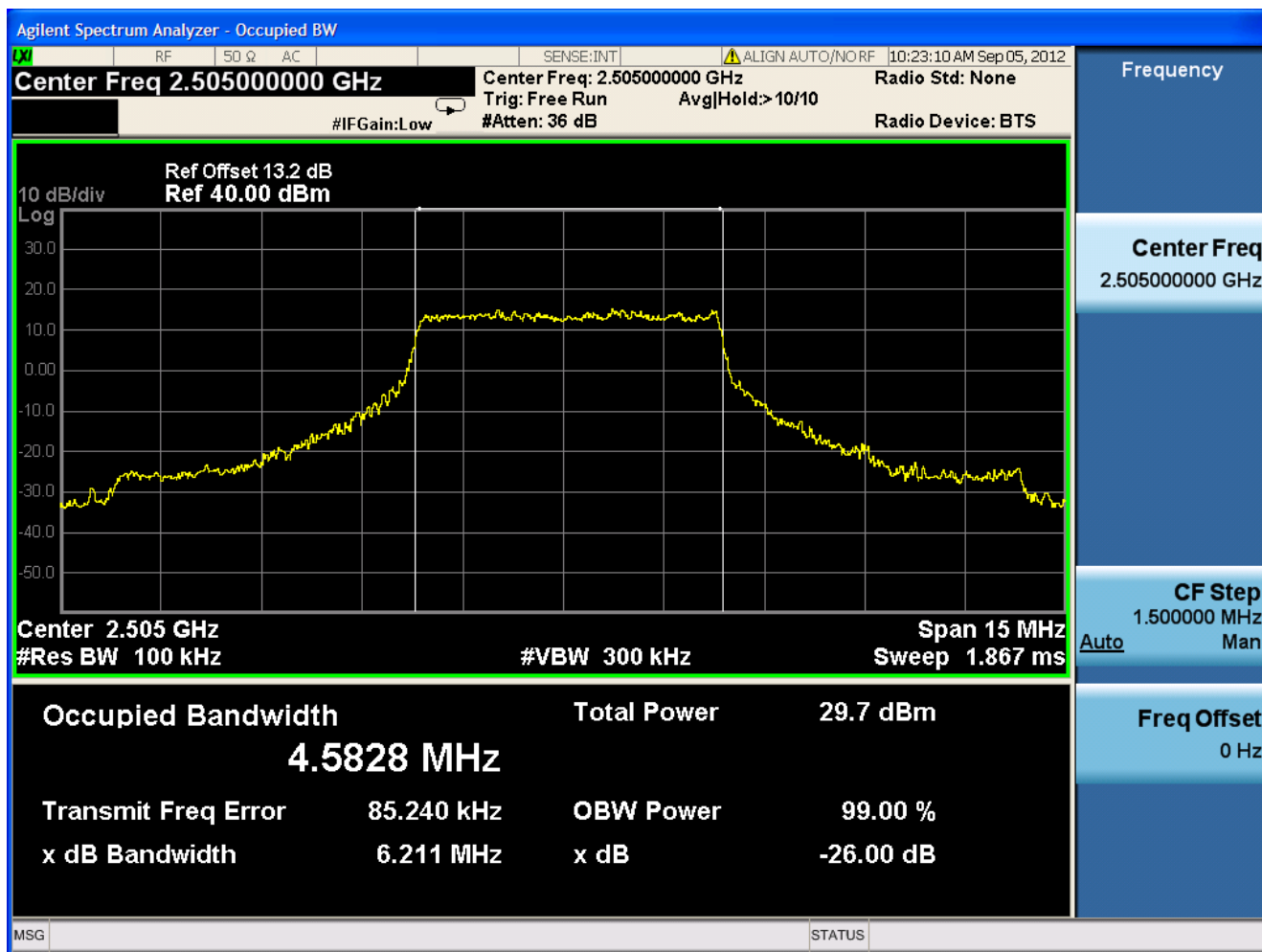


1.1.2.1.2 QPSK/1RB # max



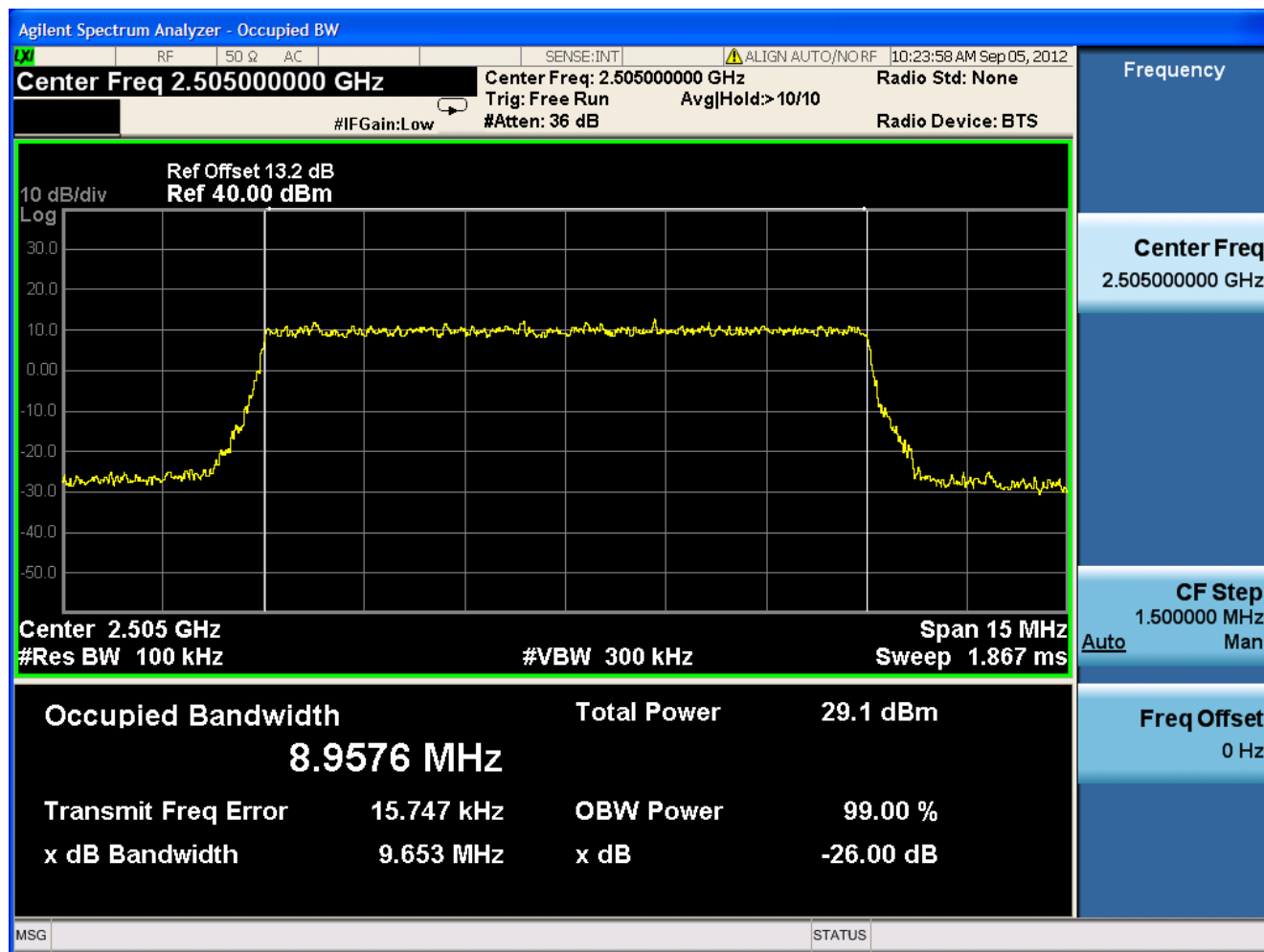


1.1.2.1.3 QPSK/non-1RB #mid/2





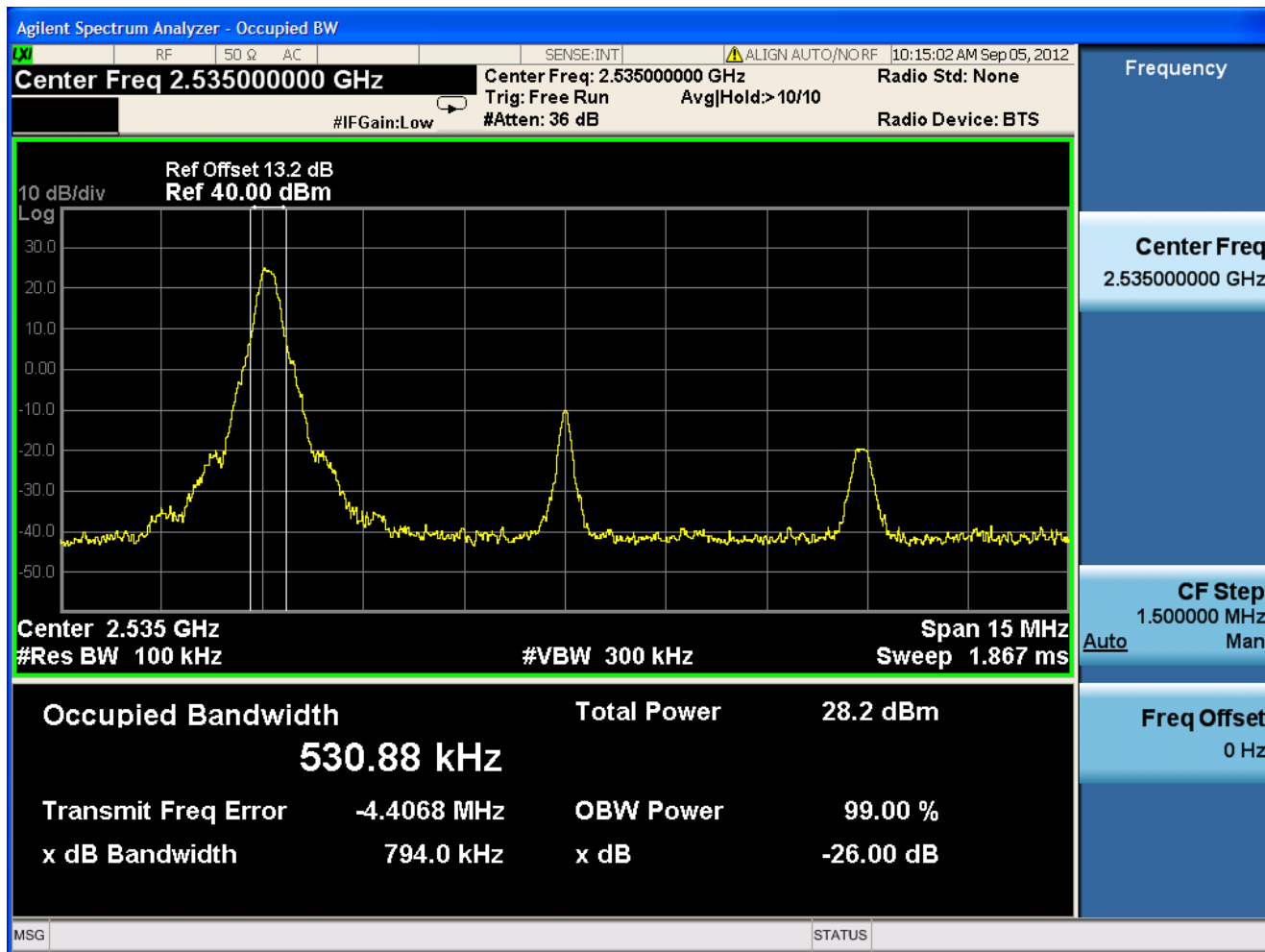
1.1.2.1.4 QPSK/full RBs





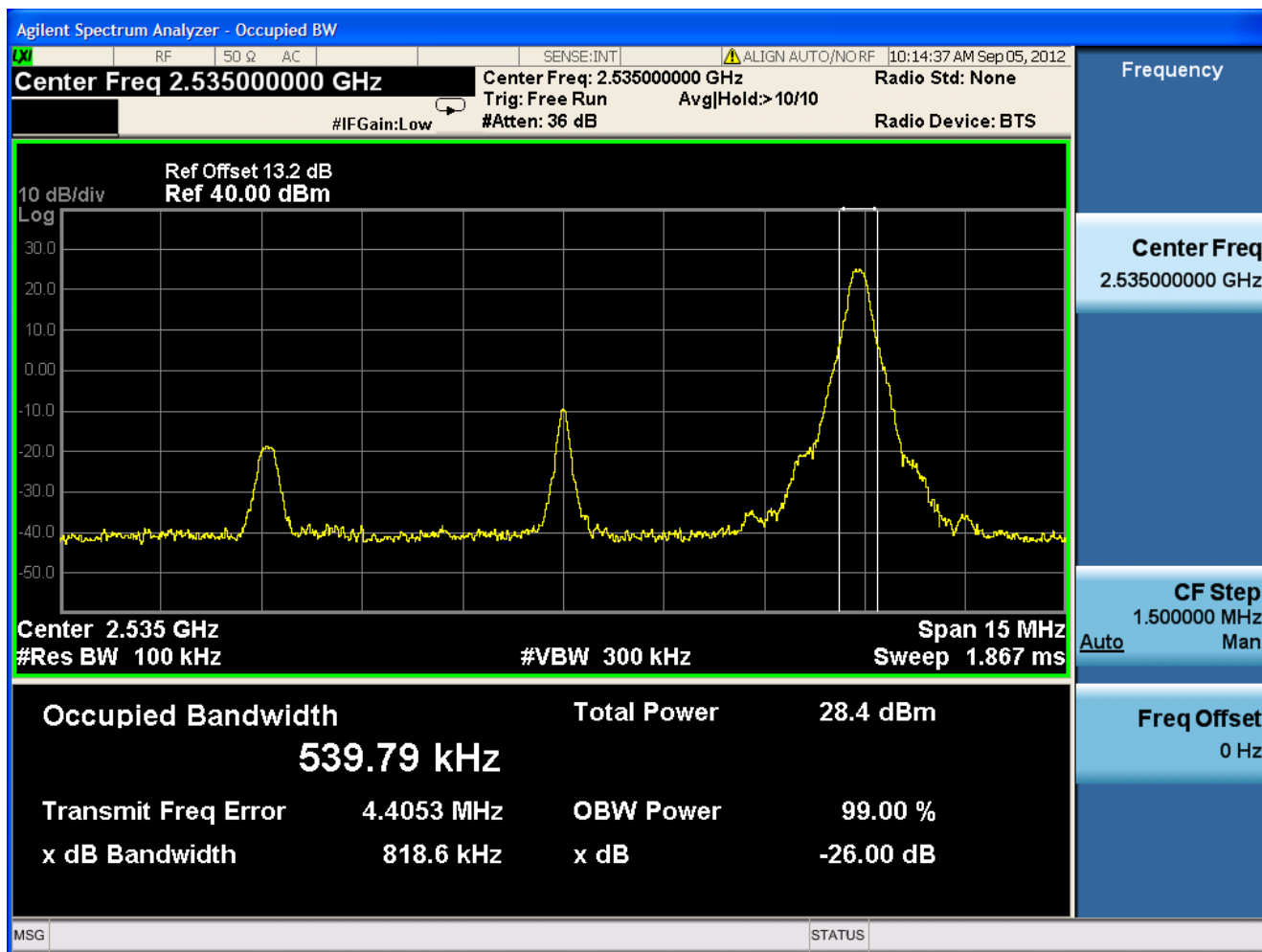
1.1.2.2 Channel =M

1.1.2.2.1 QPSK/1RB # 0



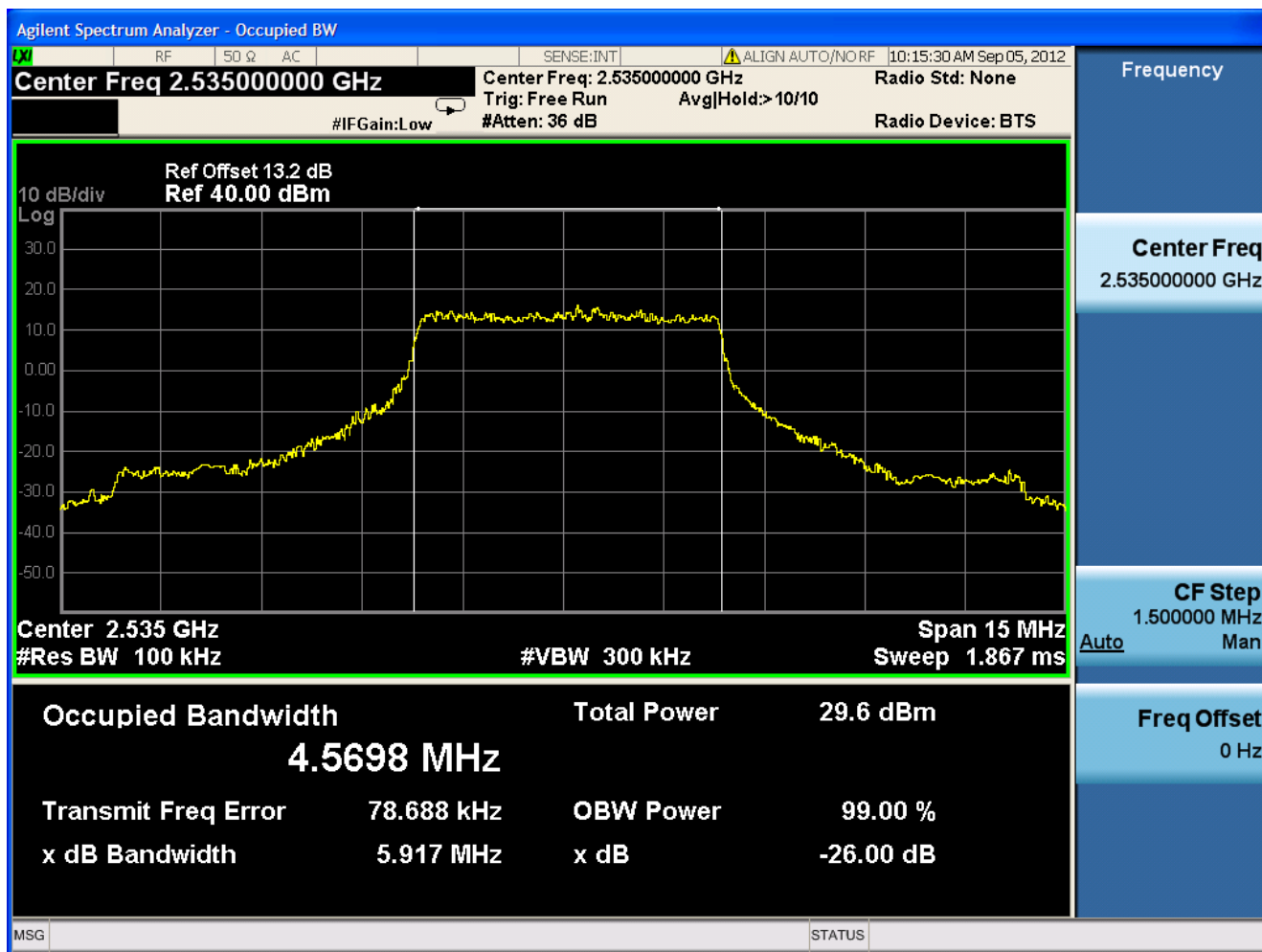


1.1.2.2.2 QPSK/1RB # max



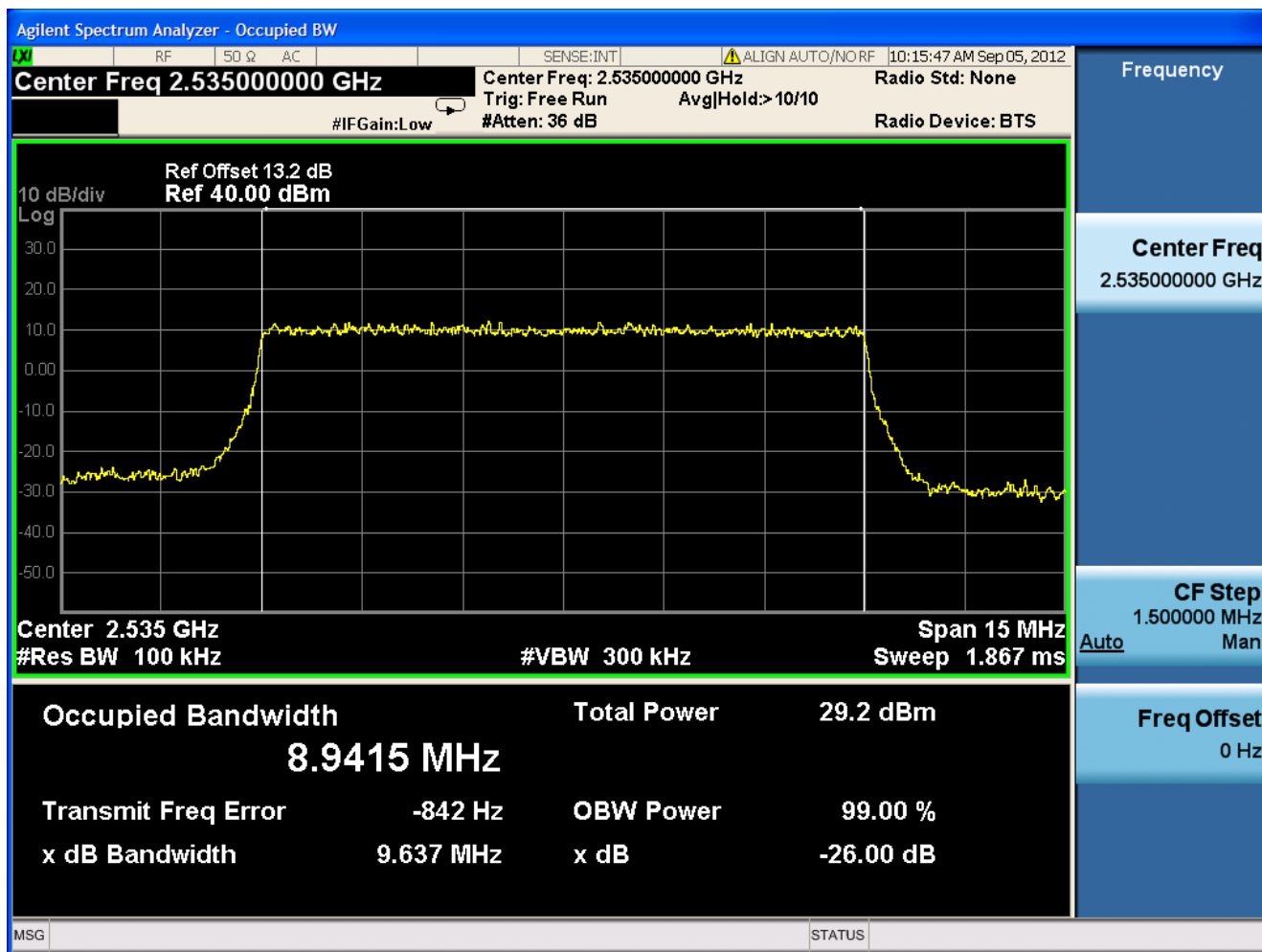


1.1.2.2.3 QPSK/non-1RB #mid/2





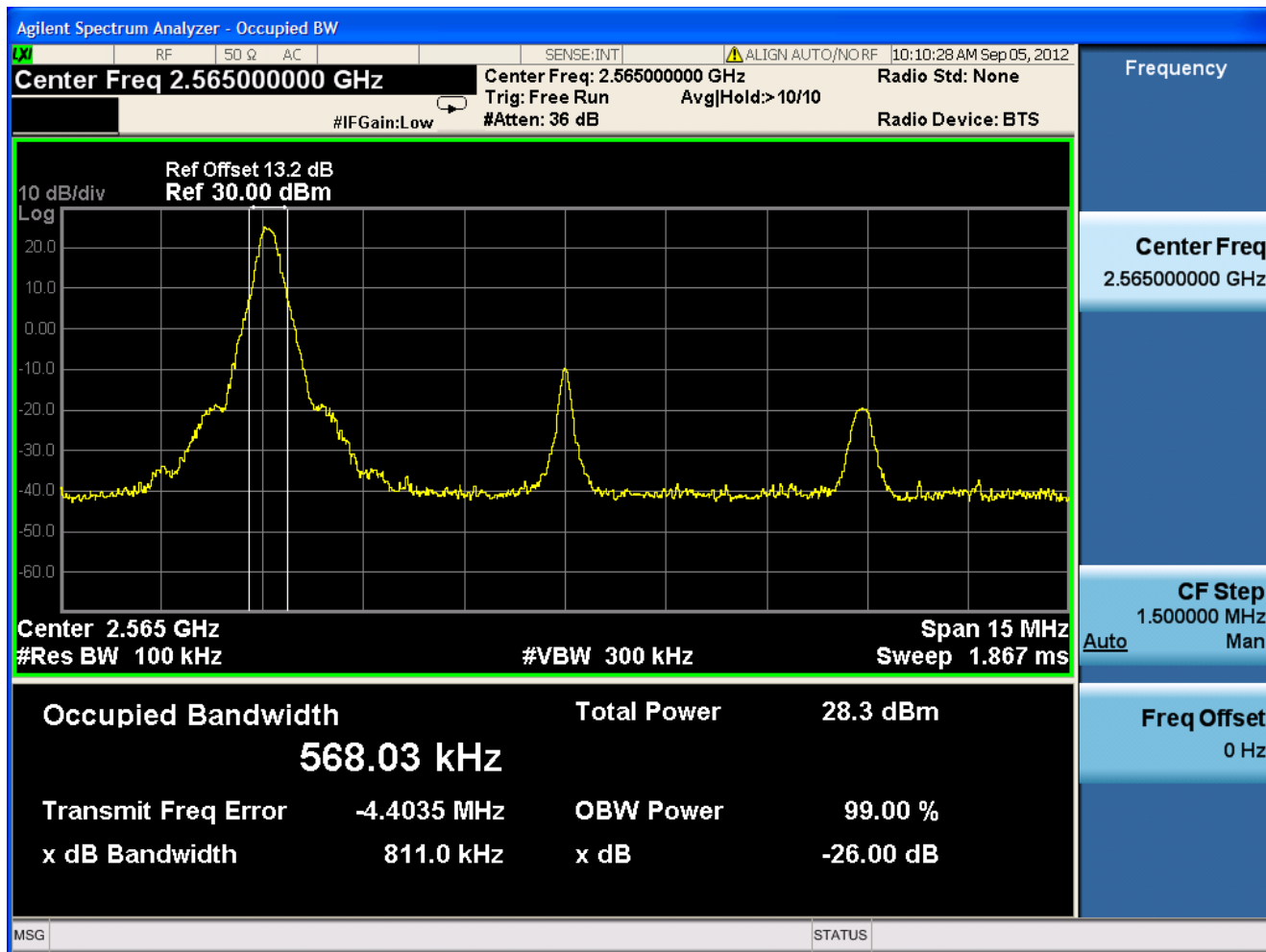
1.1.2.2.4 QPSK/full RBs





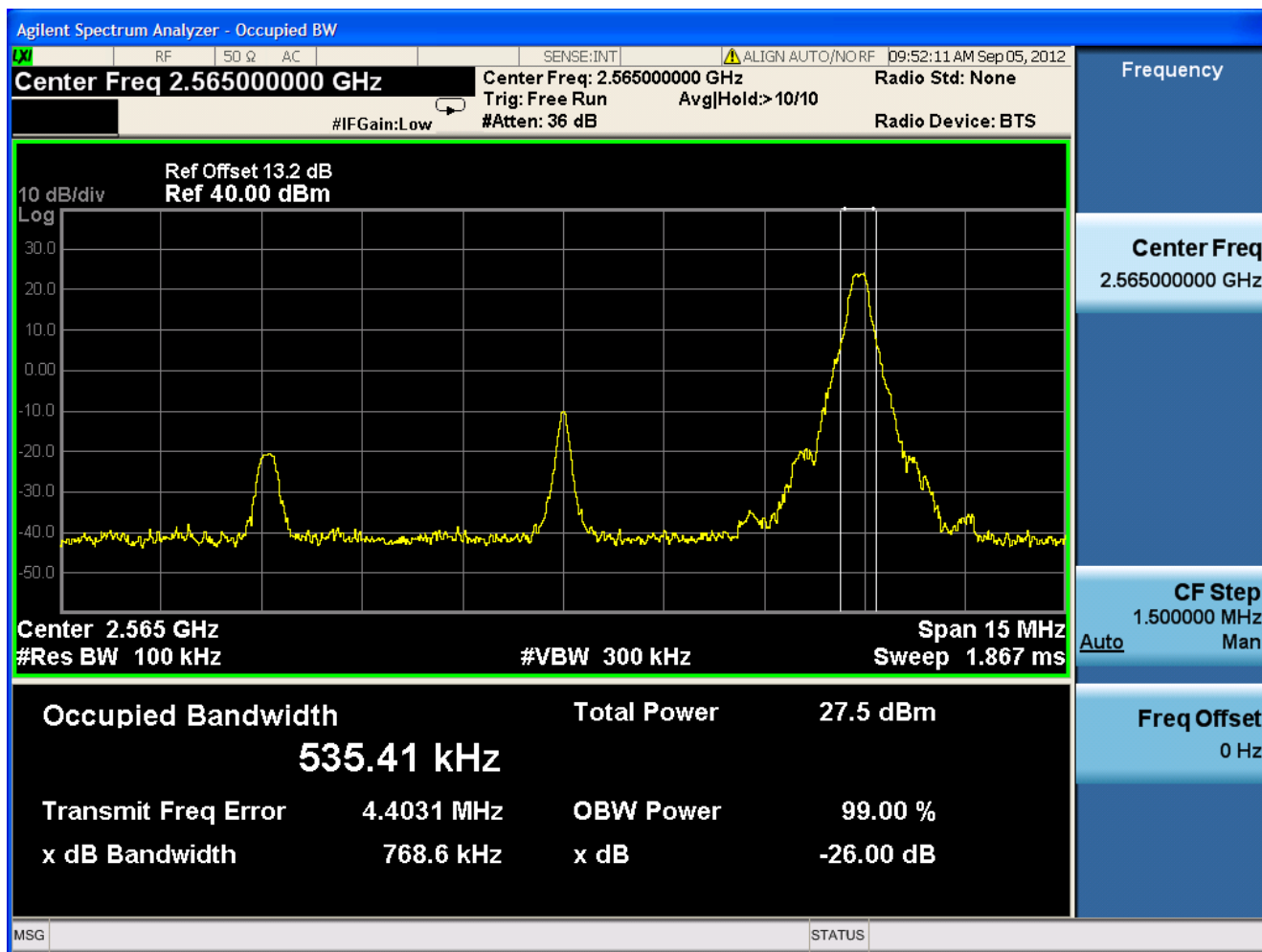
1.1.2.3 Channel =T

1.1.2.3.1 QPSK/1RB # 0



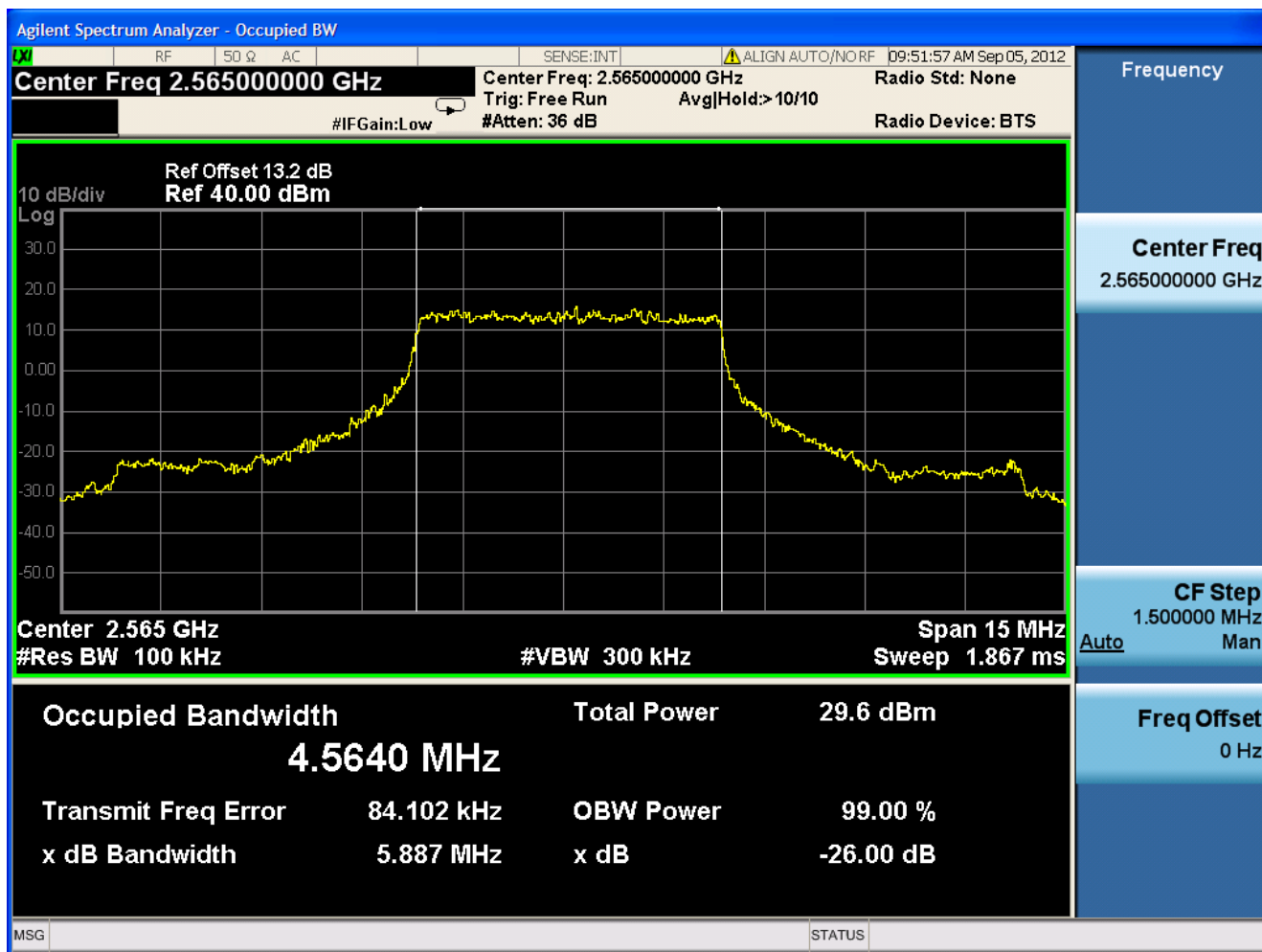


1.1.2.3.2 QPSK/1RB # max



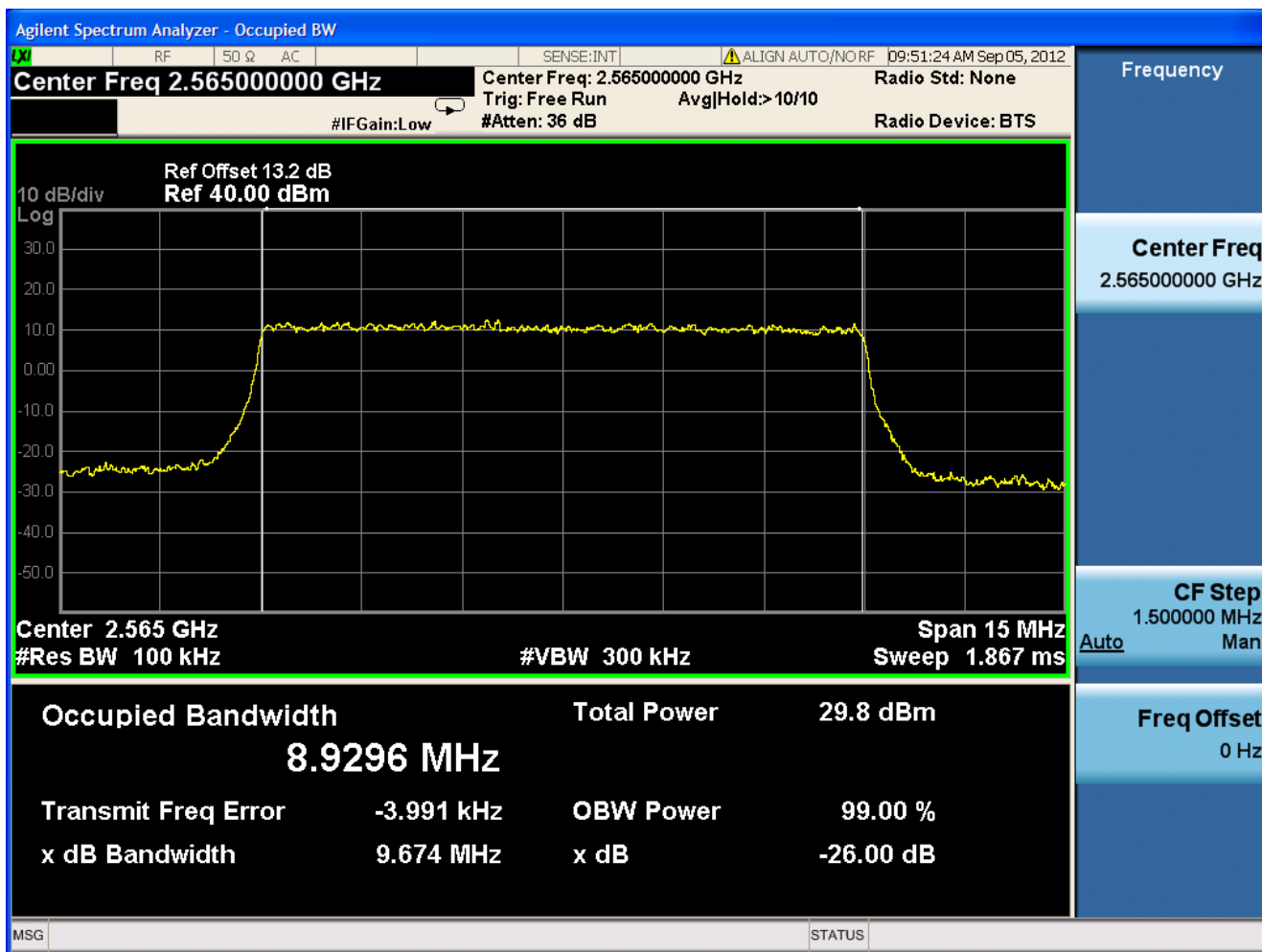


1.1.2.3.3 QPSK/non-1RB #mid/2





1.1.2.3.4 QPSK/full RBs

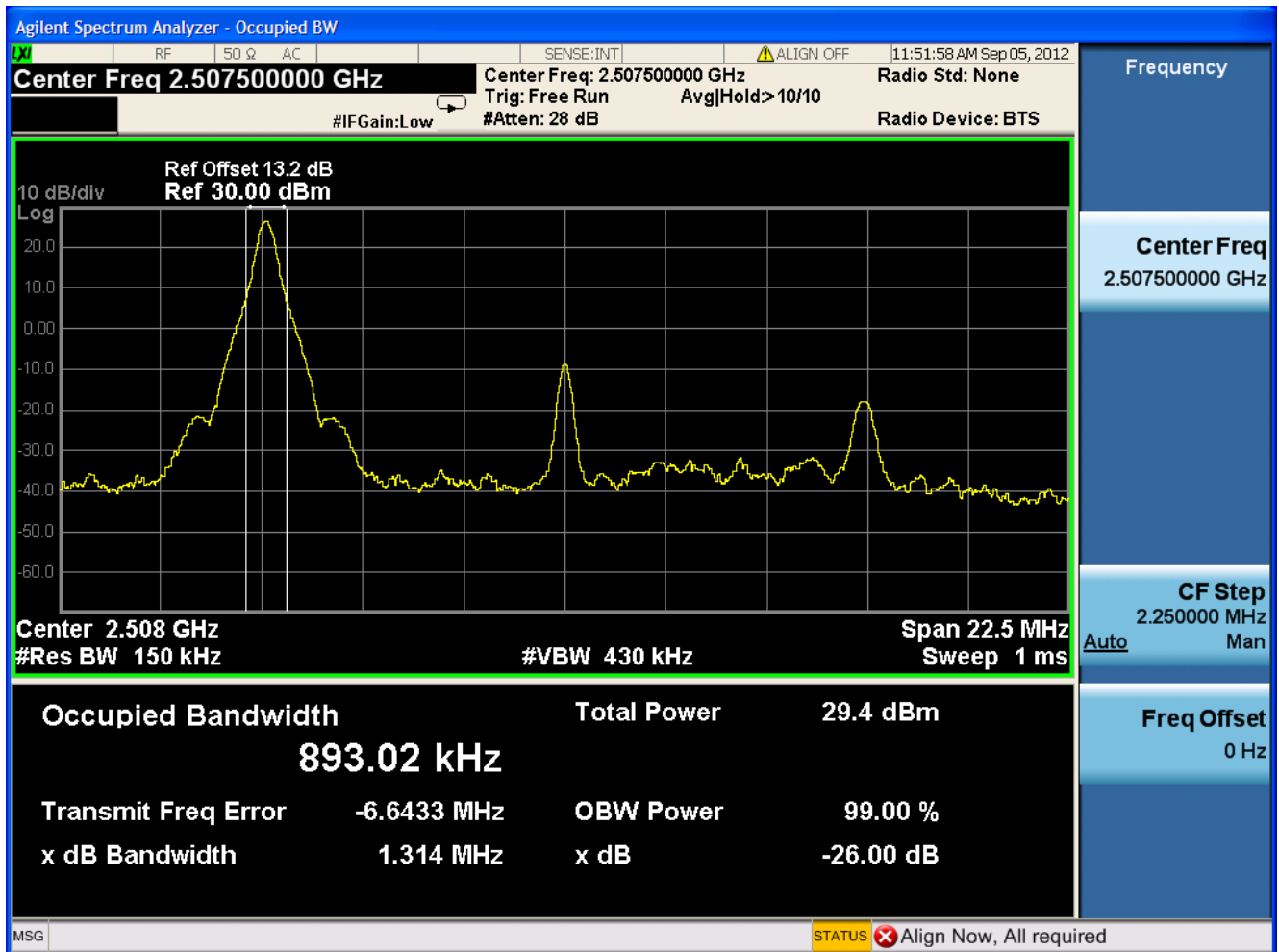




1.1.3 Channel Bandwidth = 15 MHz

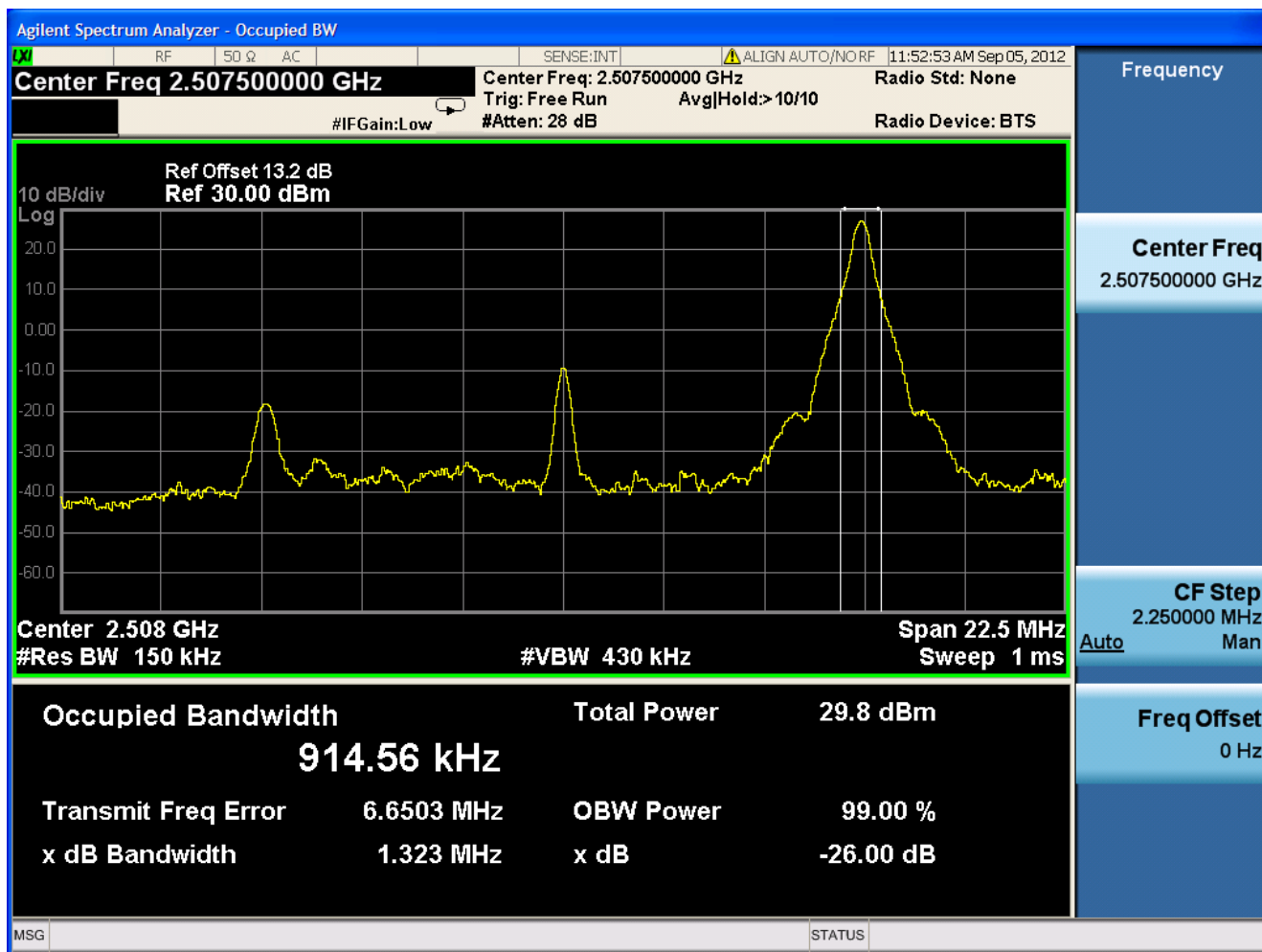
1.1.3.1 Channel = B

1.1.3.1.1 QPSK/1RB # 0



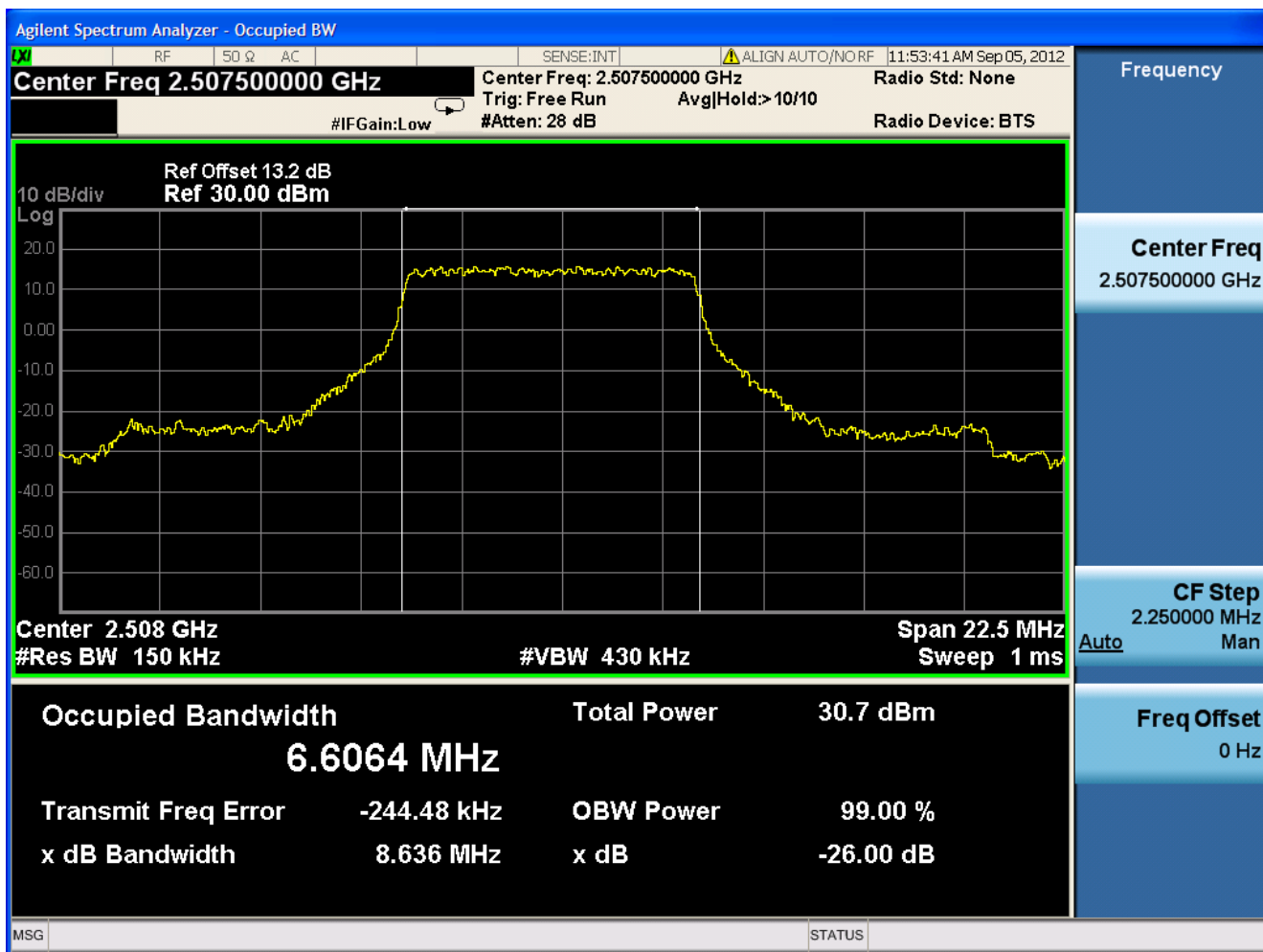


1.1.3.1.2 QPSK/1RB # max



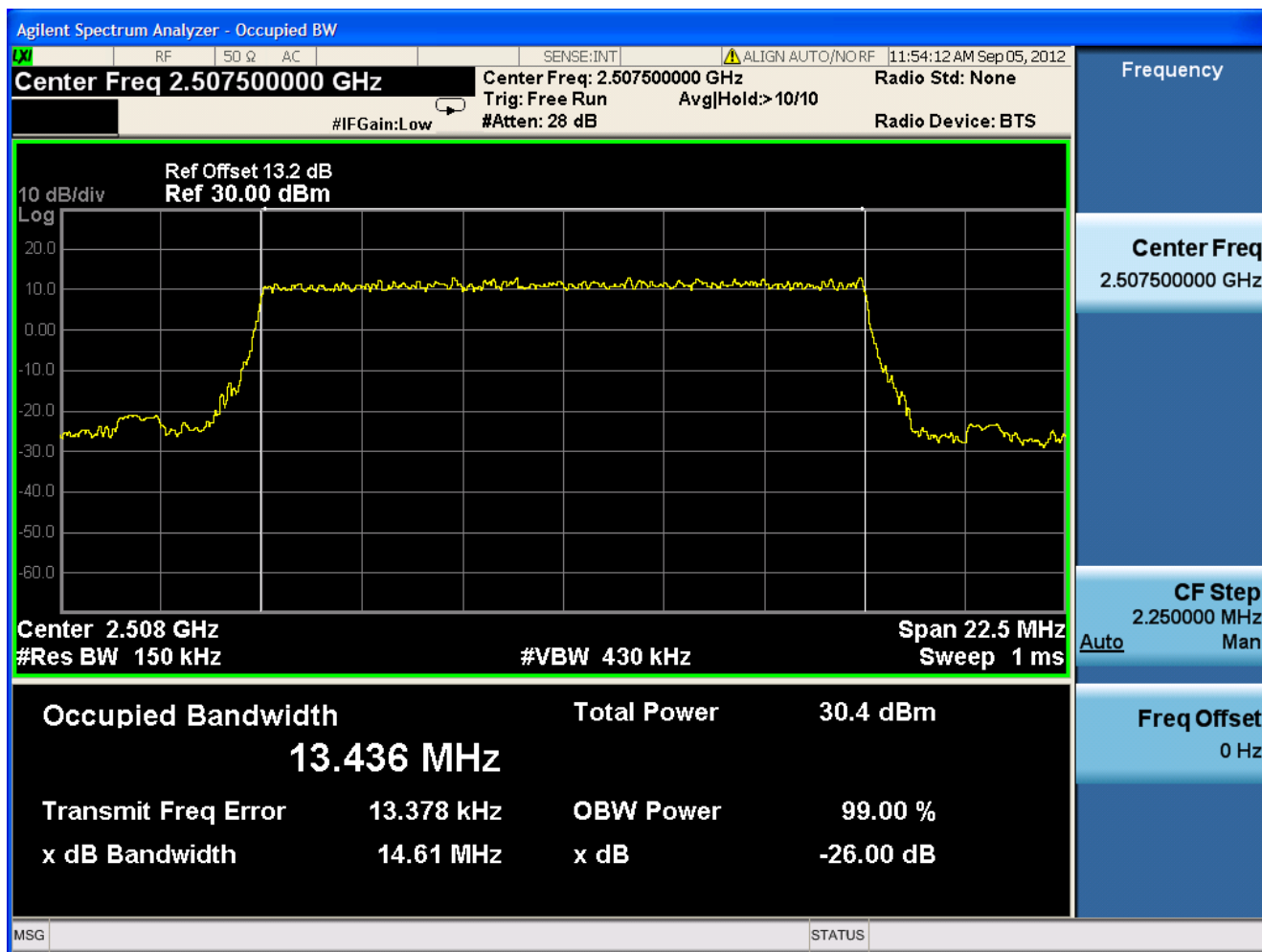


1.1.3.1.3 QPSK/non-1RB #mid/2





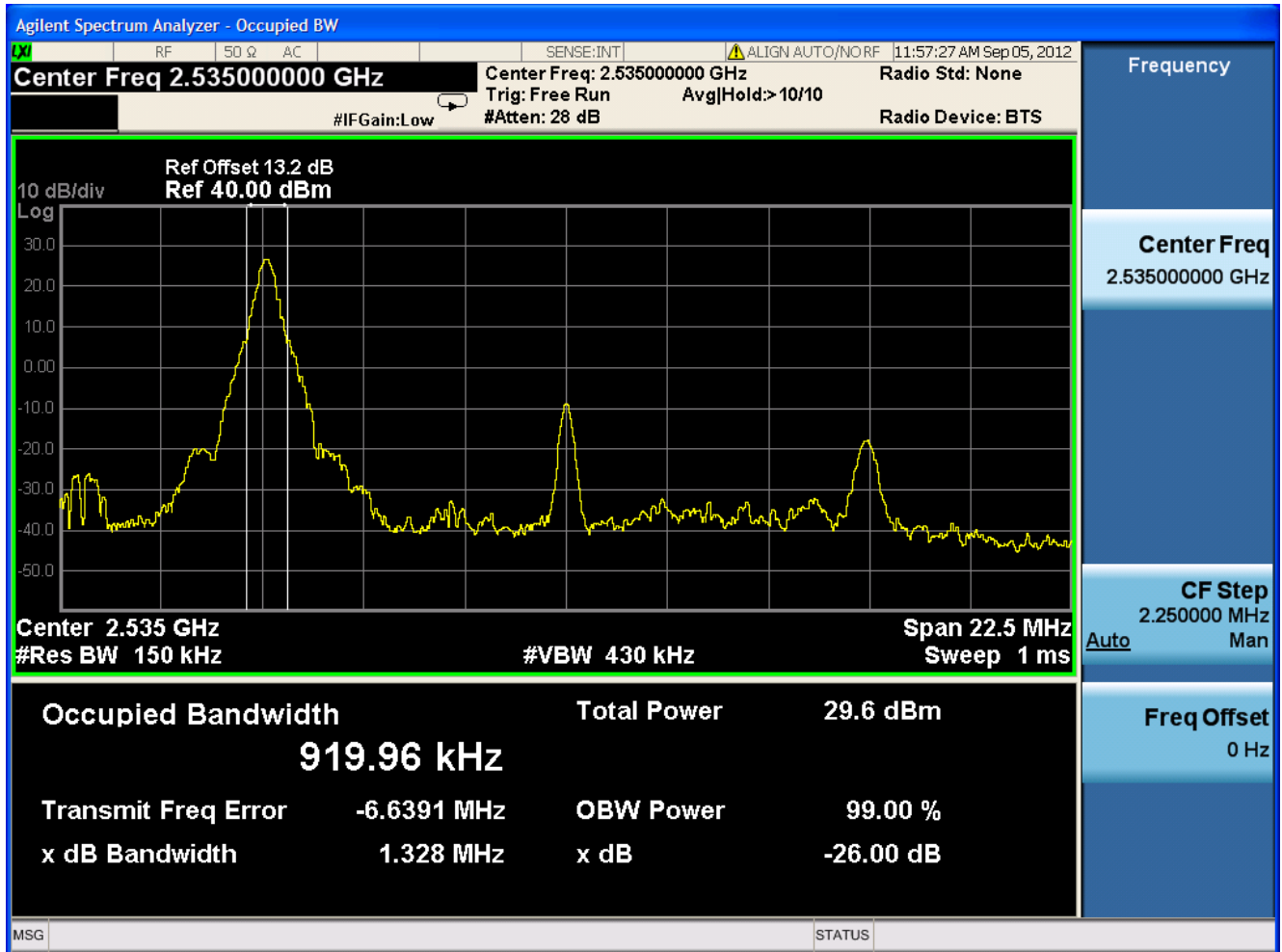
1.1.3.1.4 QPSK/full RBs





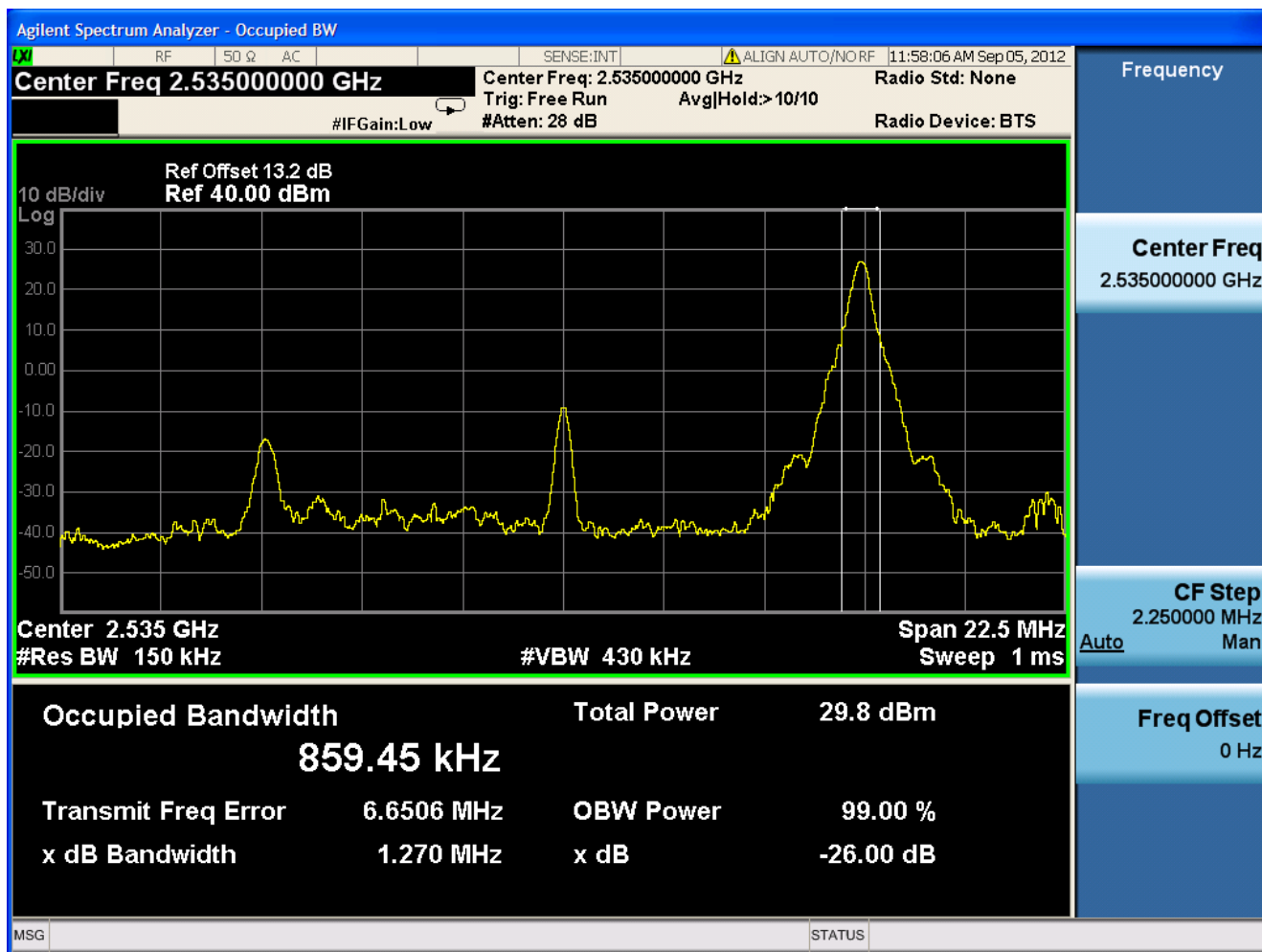
1.1.3.2 Channel =M

1.1.3.2.1 QPSK/1RB # 0



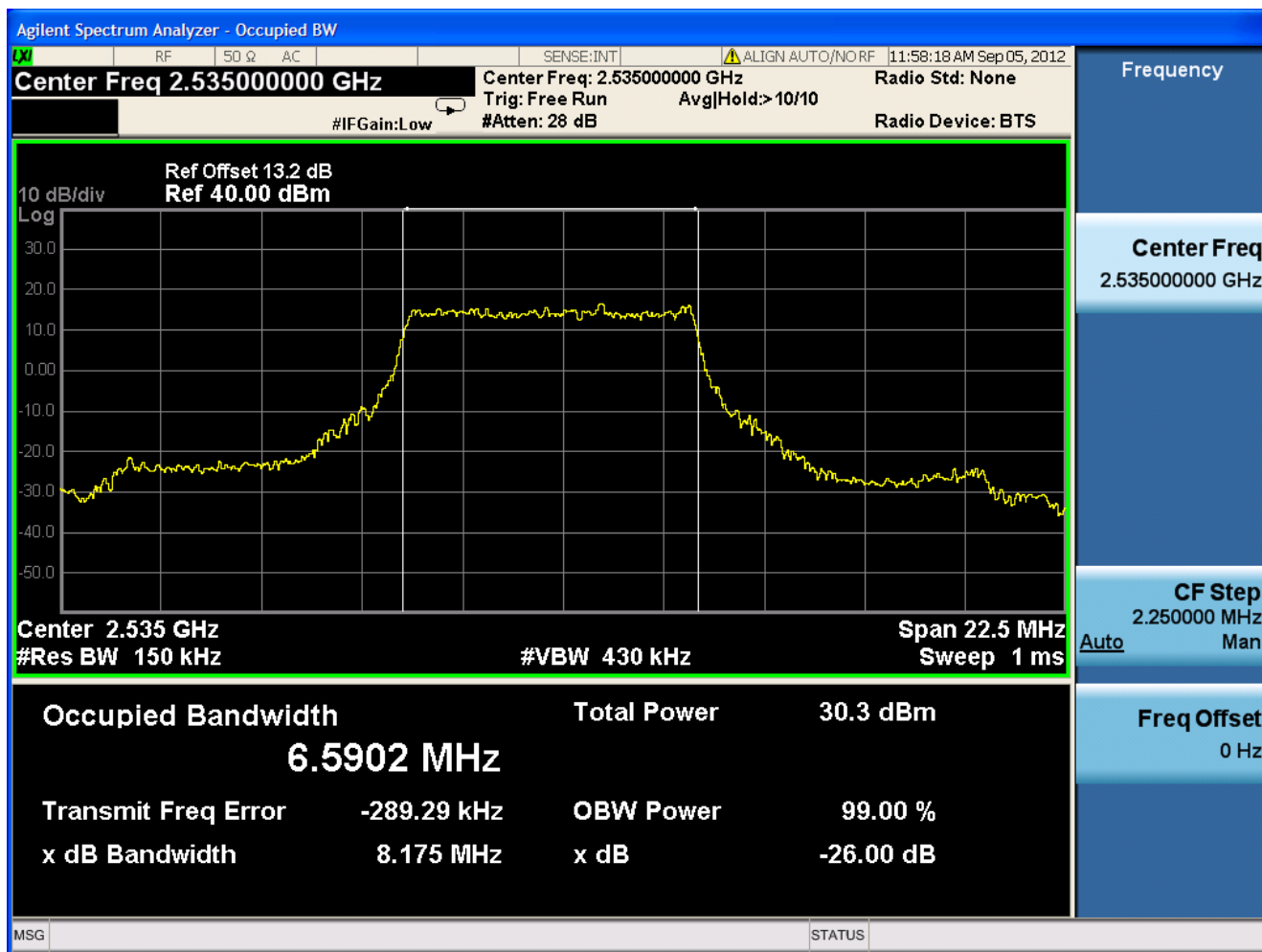


1.1.3.2.2 QPSK/1RB # max



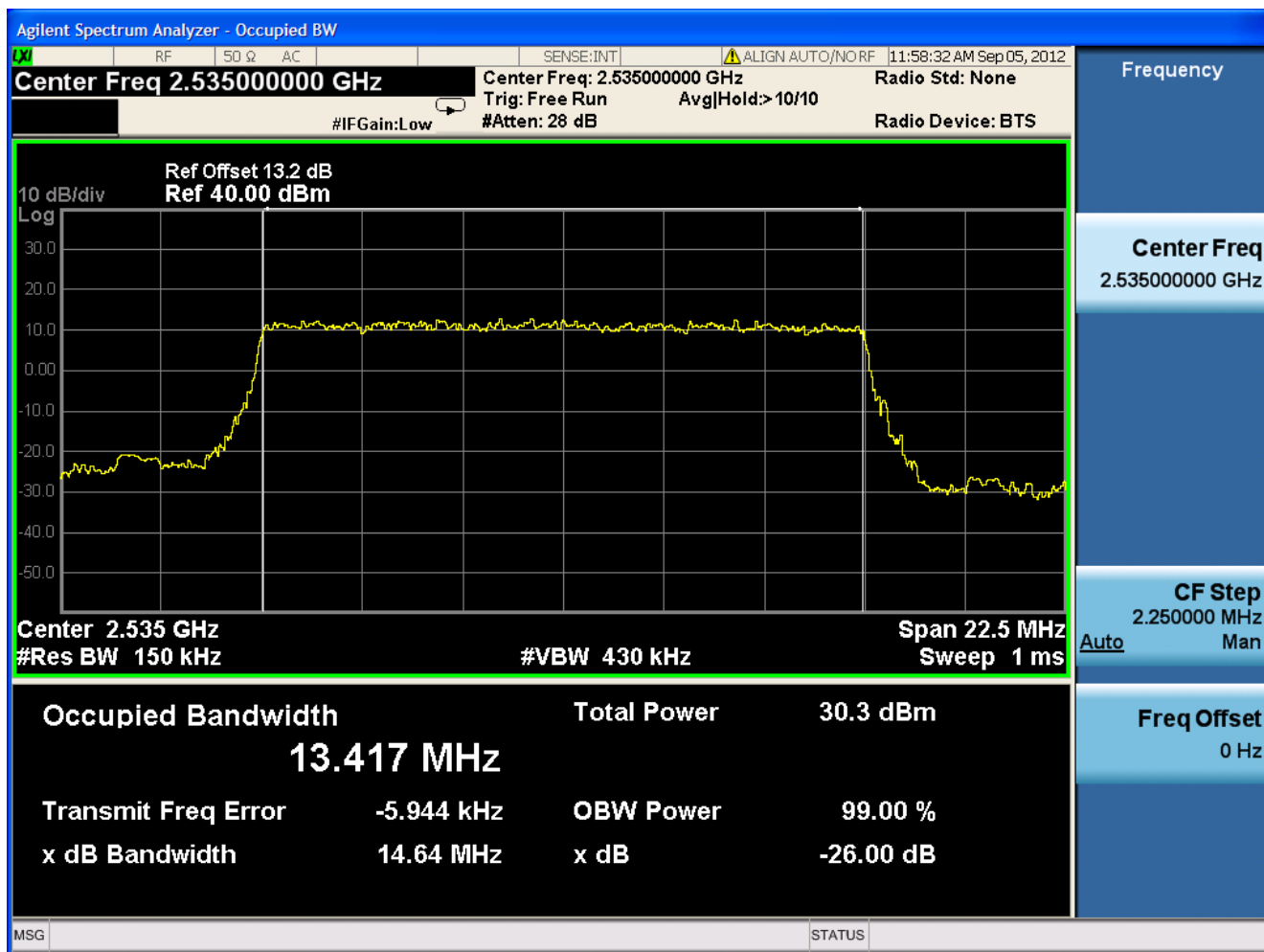


1.1.3.2.3 QPSK/non-1RB #mid/2





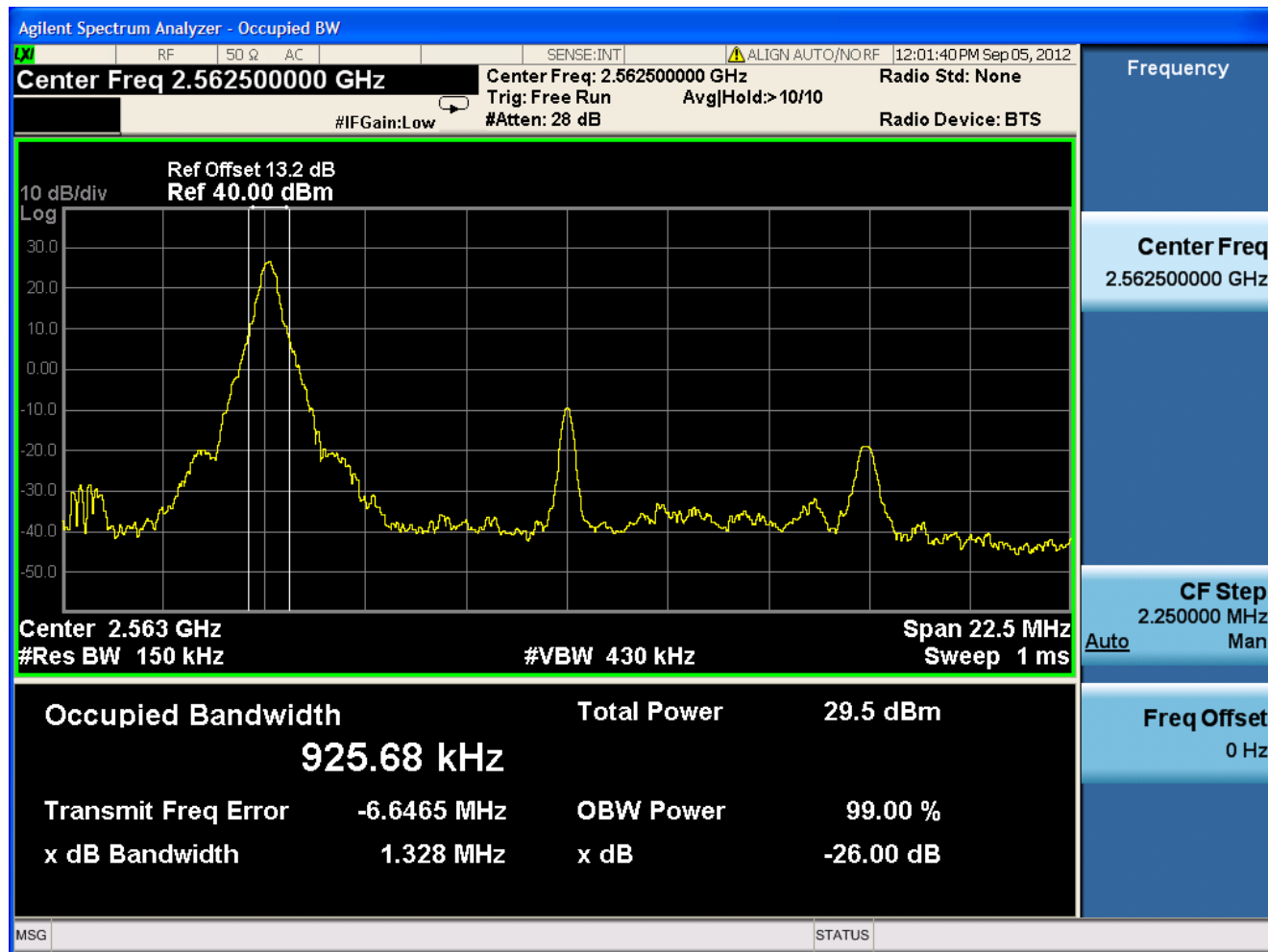
1.1.3.2.4 QPSK/full RBs





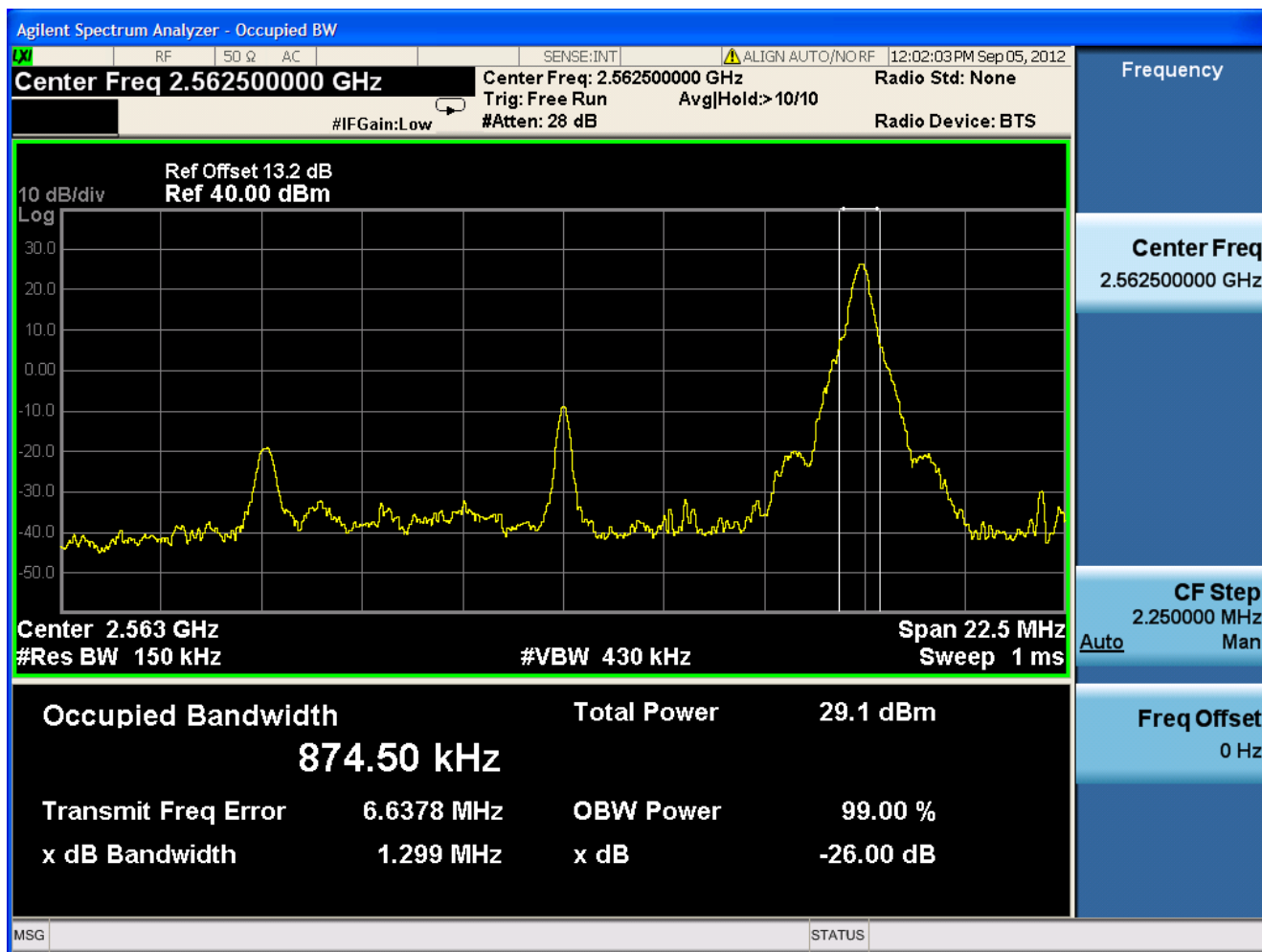
1.1.3.3 Channel =T

1.1.3.3.1 QPSK/1RB # 0



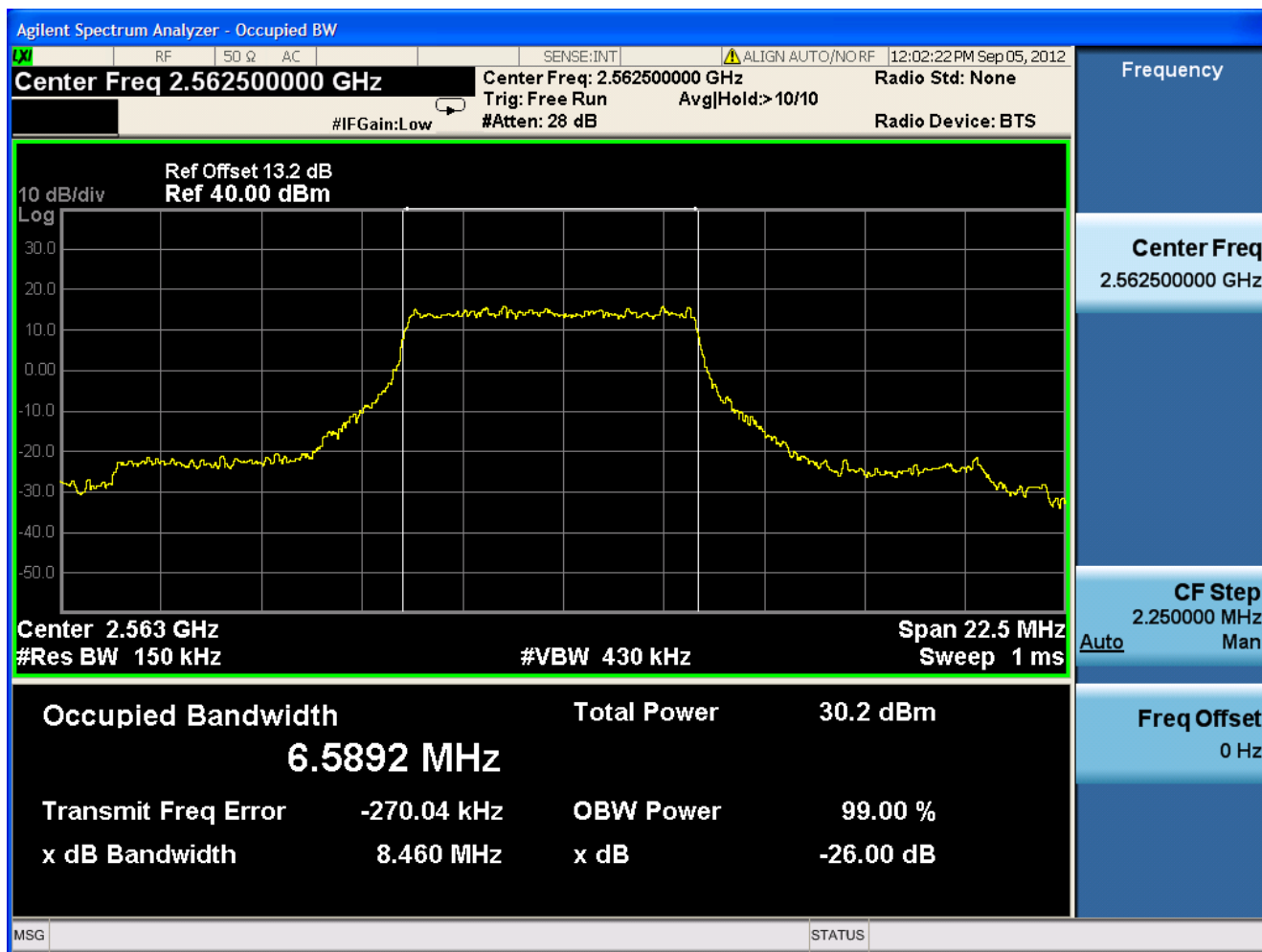


1.1.3.3.2 QPSK/1RB # max



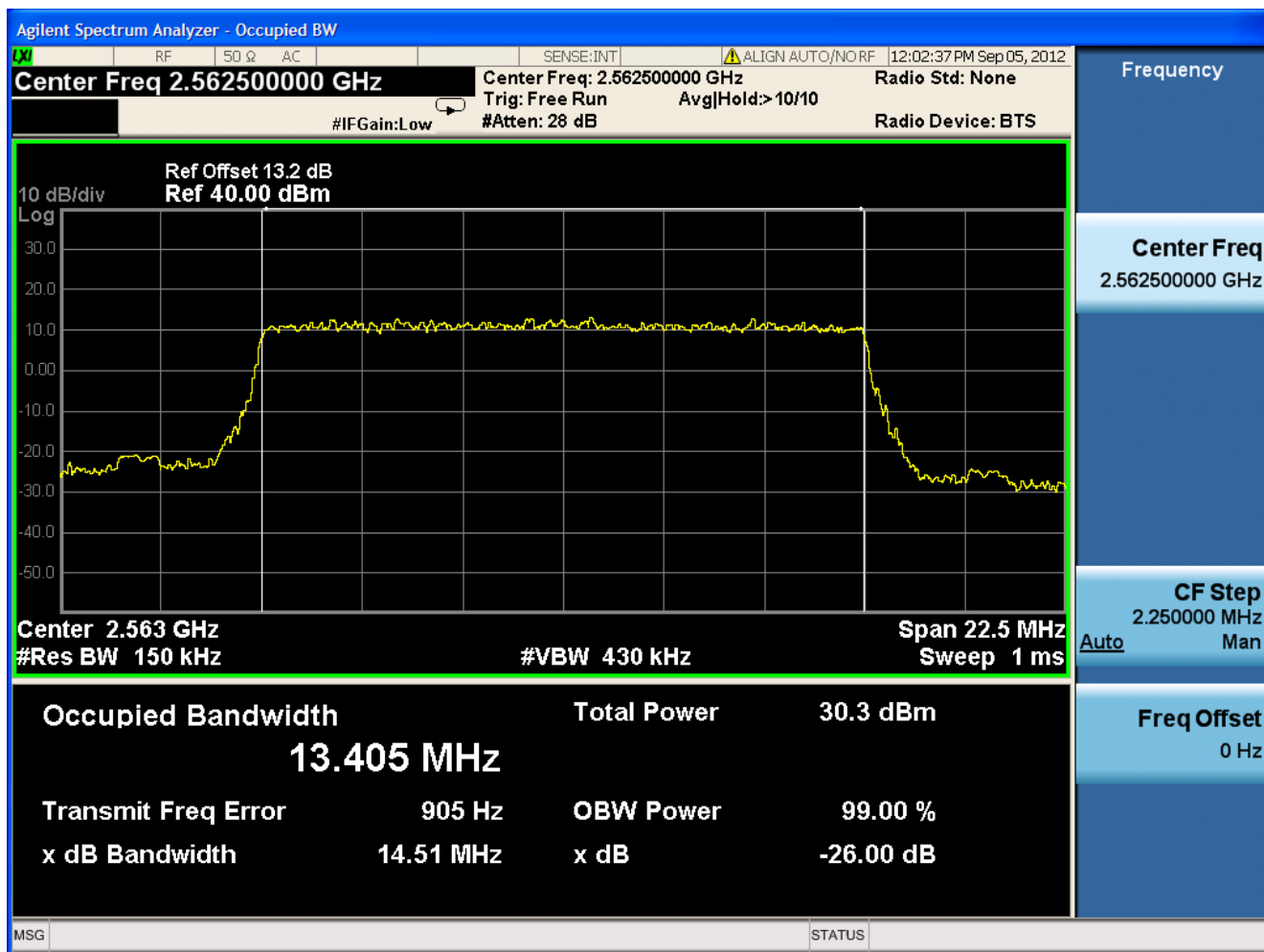


1.1.3.3.3 QPSK/non-1RB #mid/2





1.1.3.3.4 QPSK/full RBs

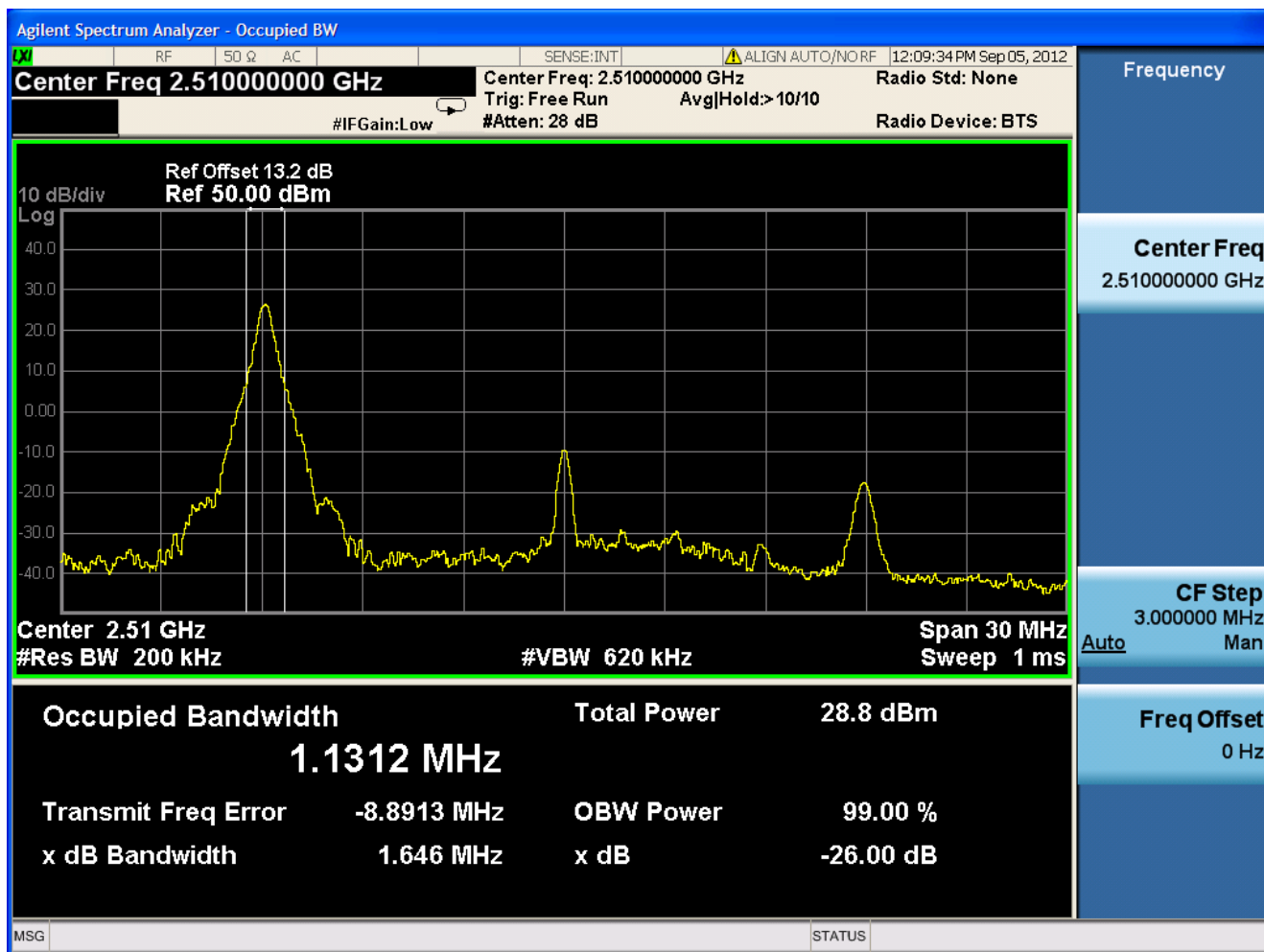




1.1.4 Channel Bandwidth = 20 MHz

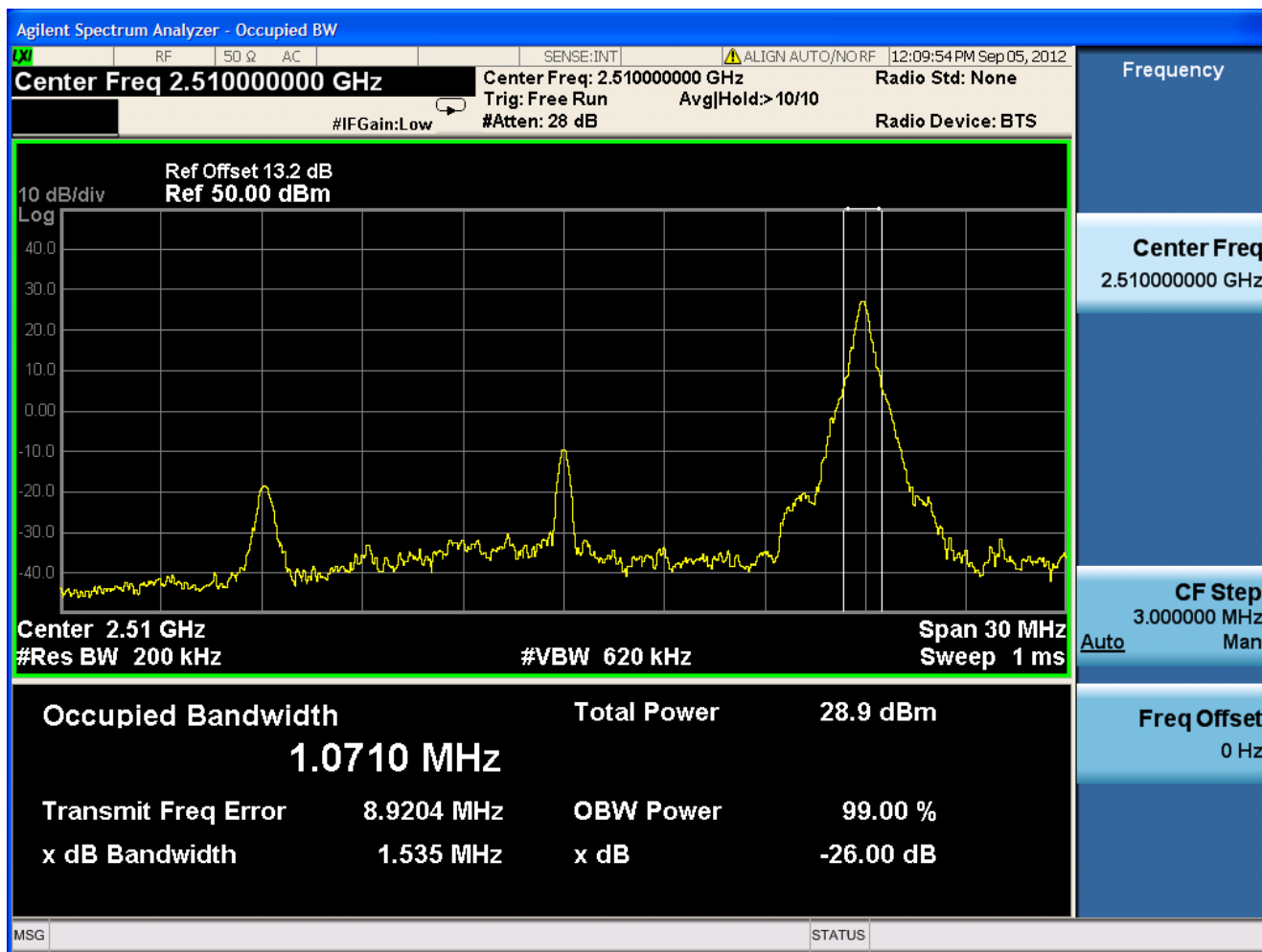
1.1.4.1 Channel = B

1.1.4.1.1 QPSK/1RB # 0



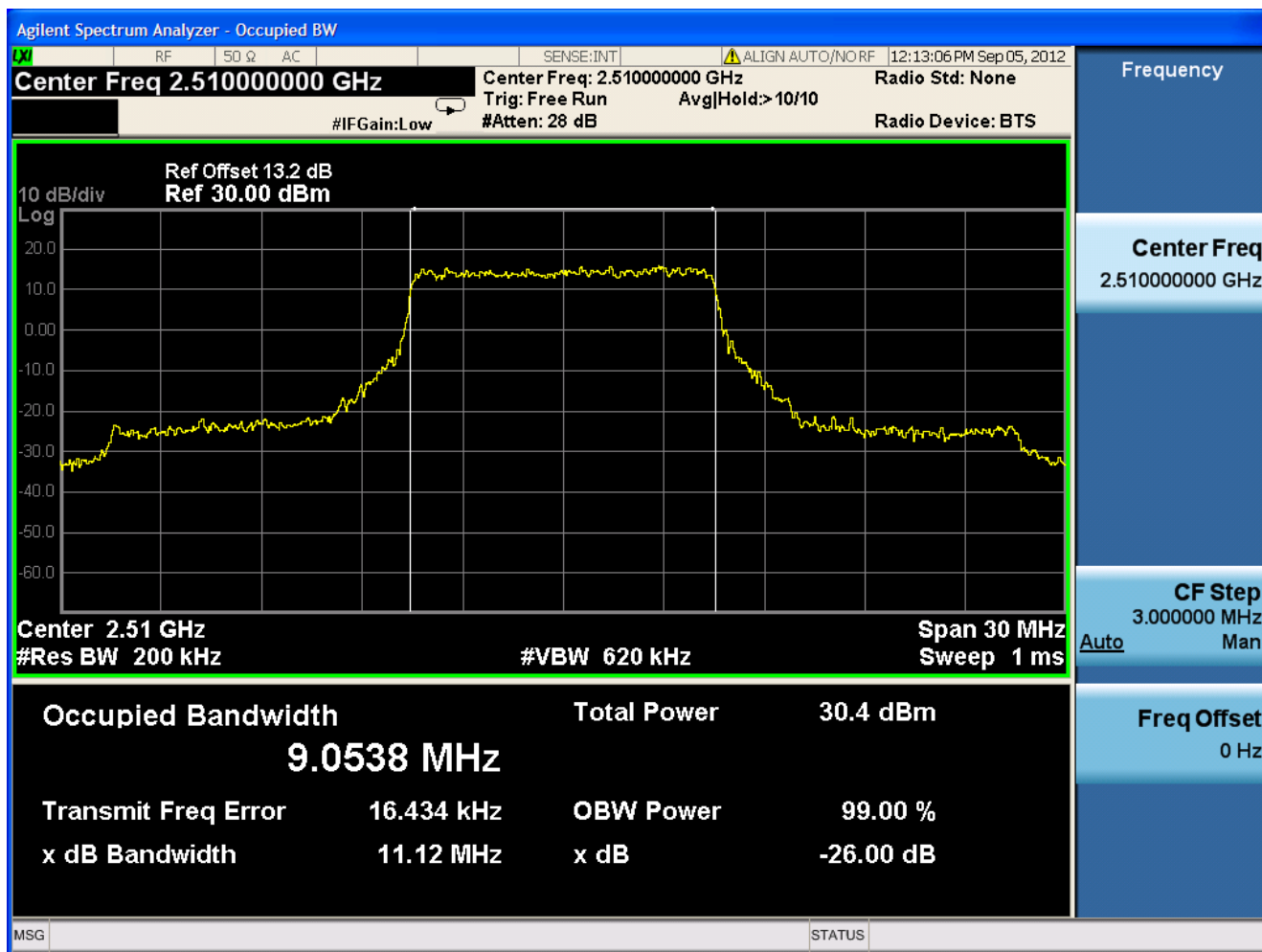


1.1.4.1.2 QPSK/1RB # max



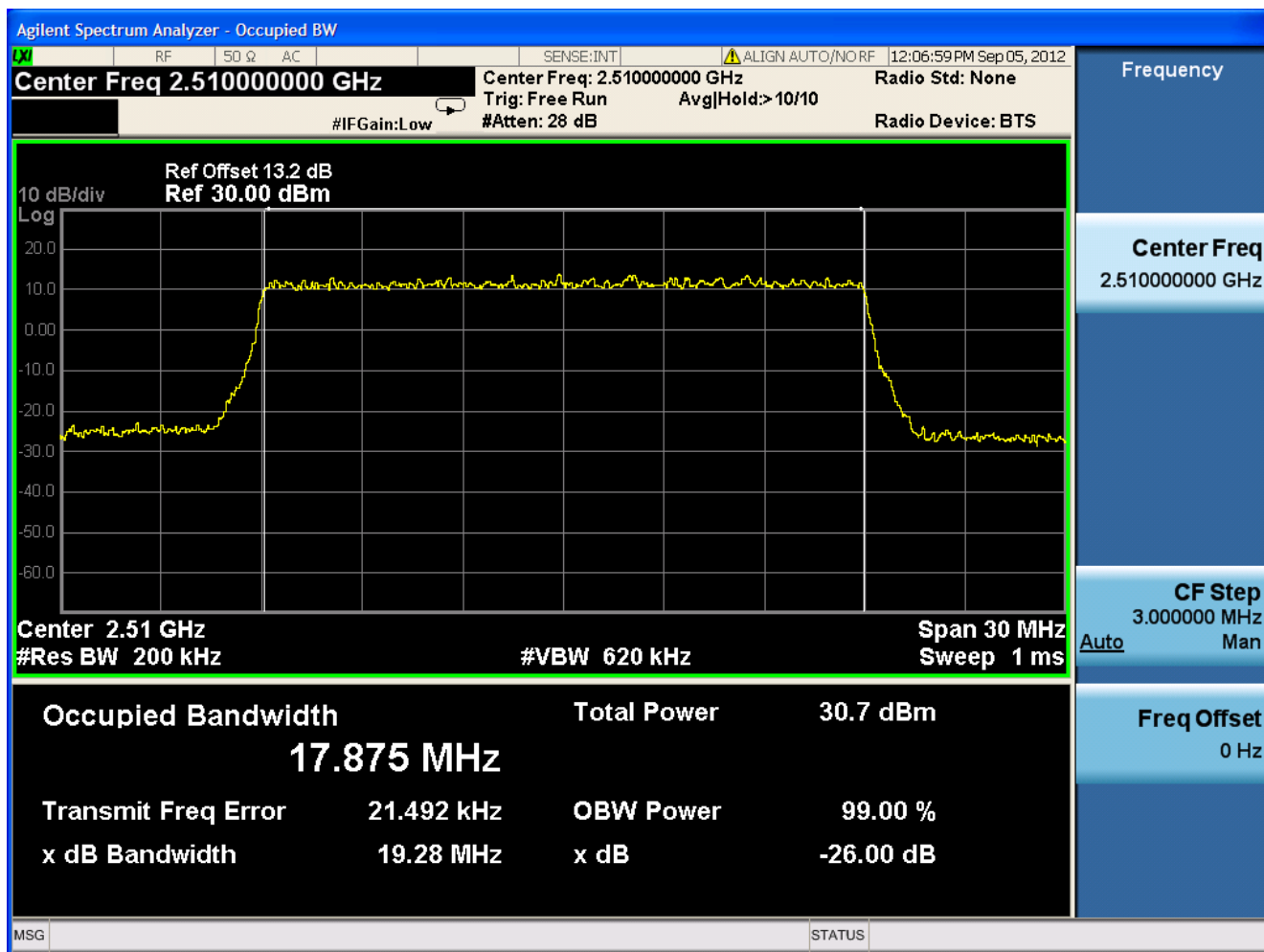


1.1.4.1.3 QPSK/non-1RB #mid/2





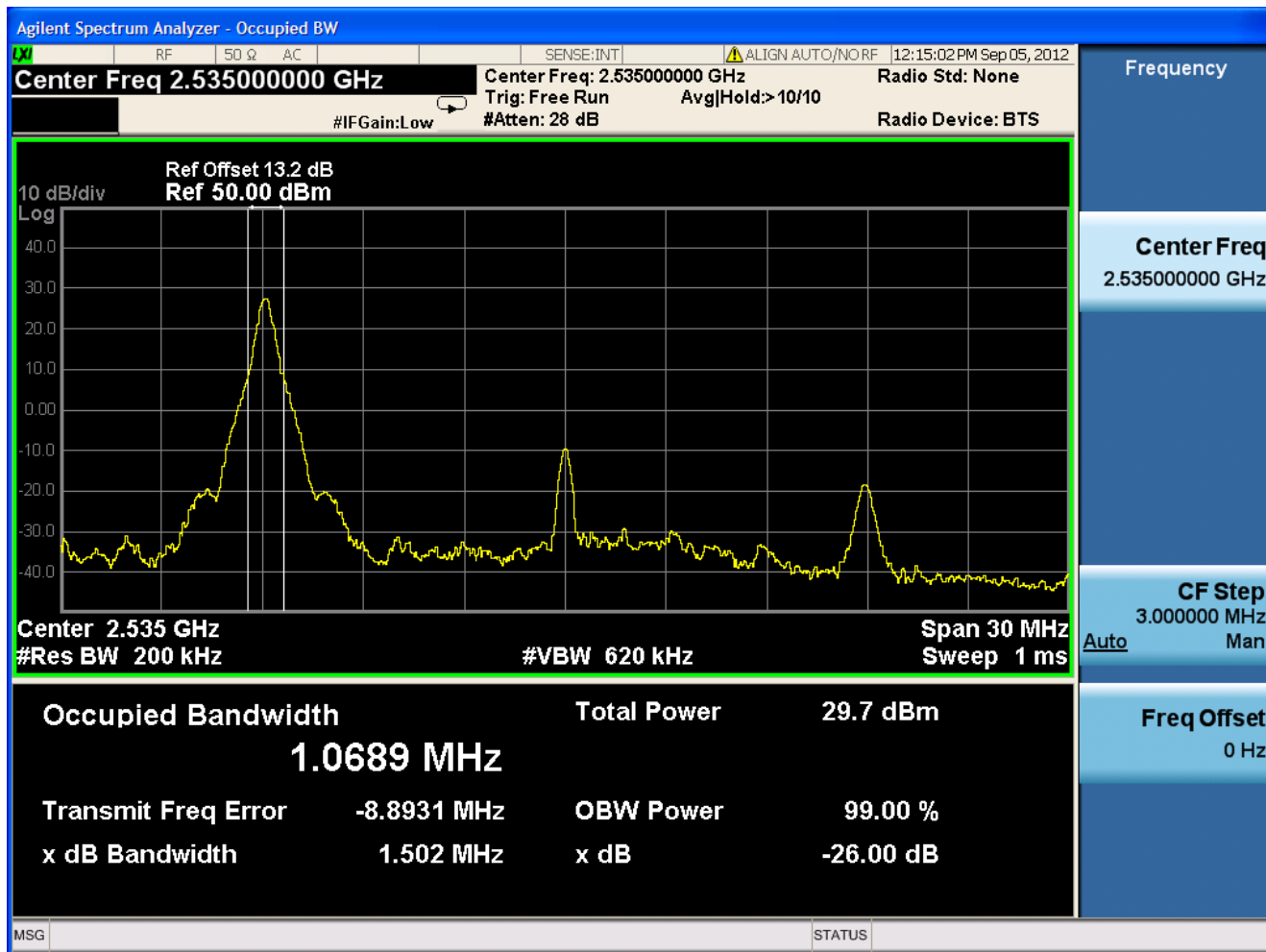
1.1.4.1.4 QPSK/full RBs





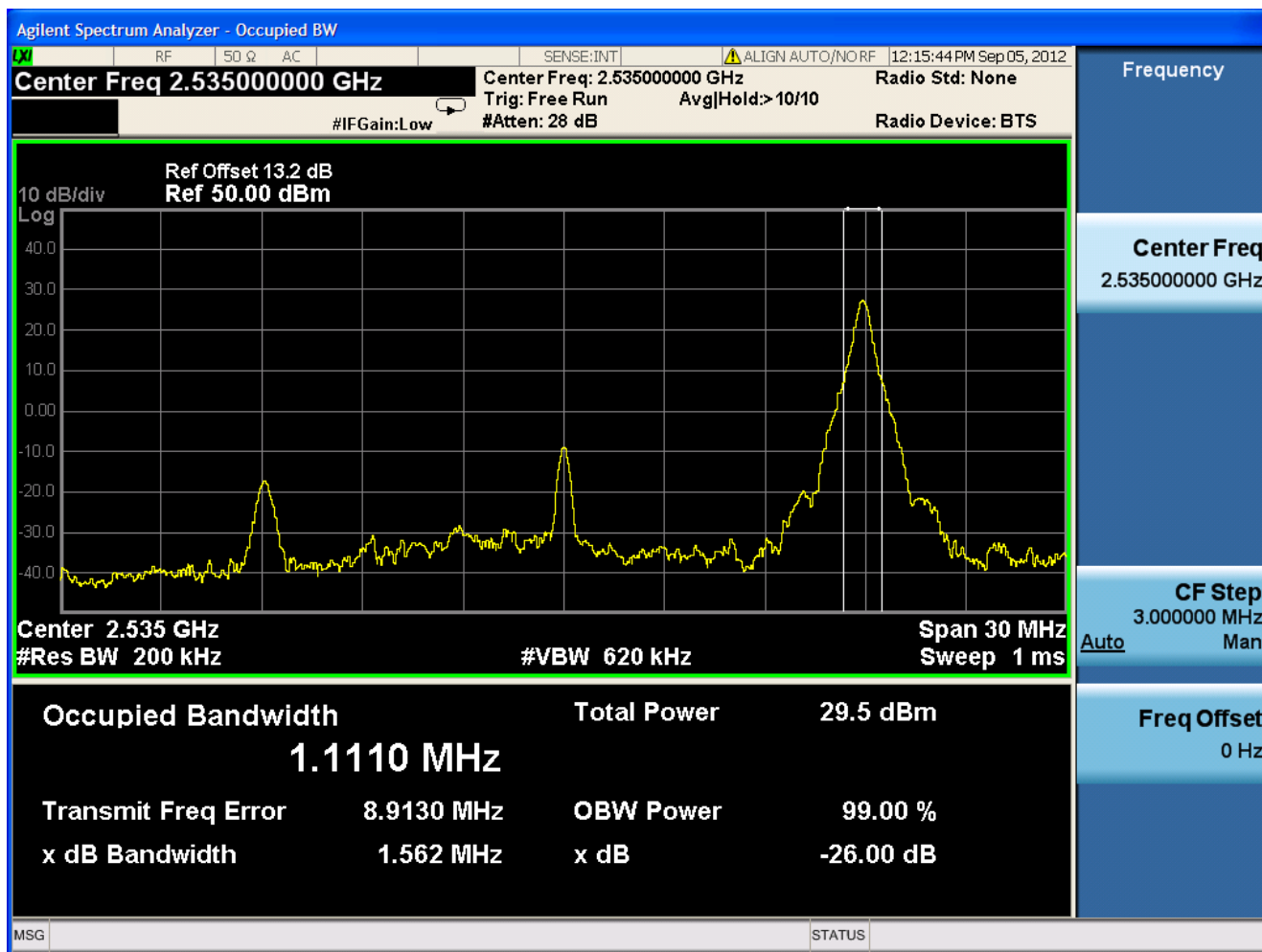
1.1.4.2 Channel =M

1.1.4.2.1 QPSK/1RB # 0



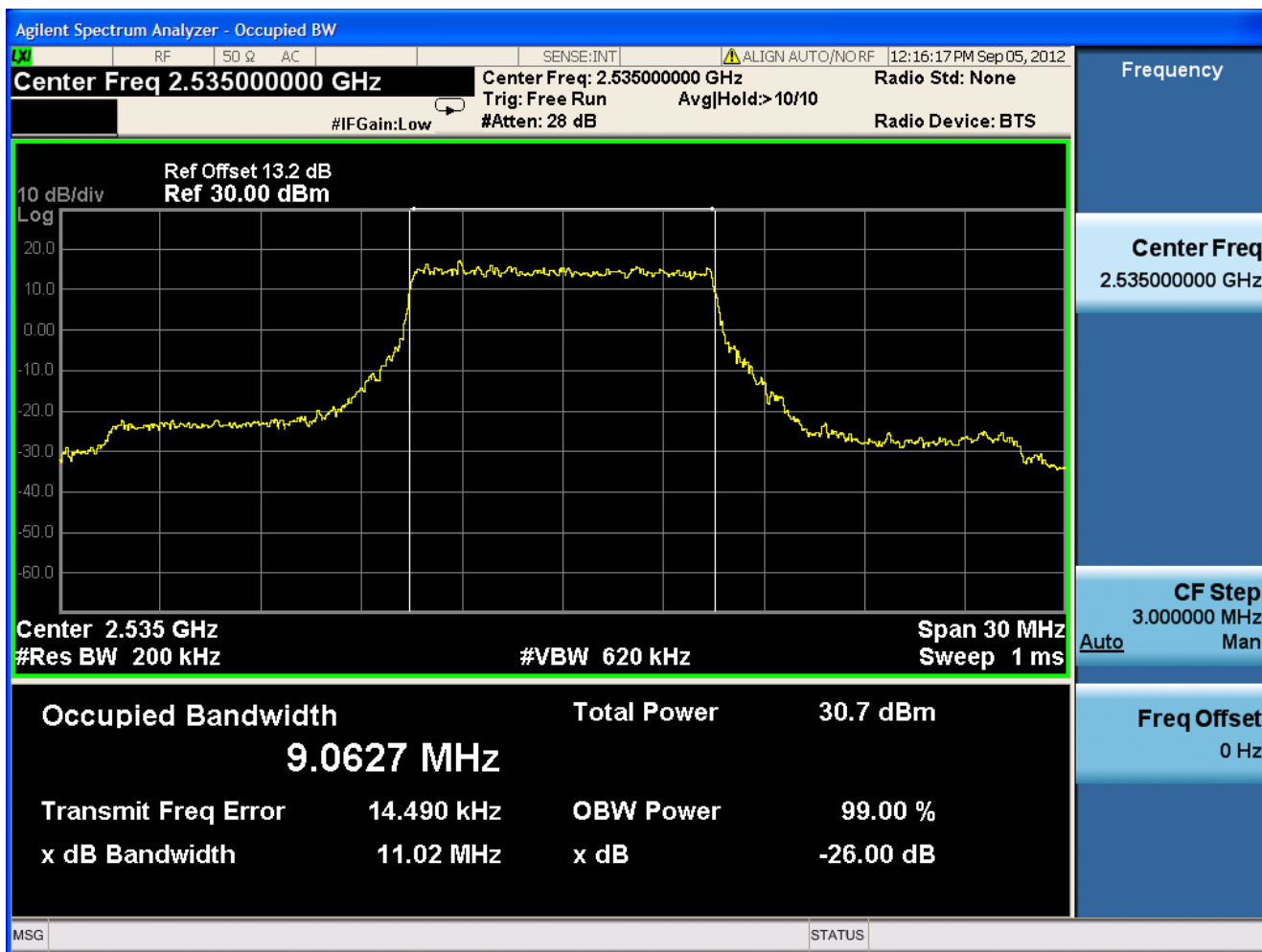


1.1.4.2.2 QPSK/1RB # max



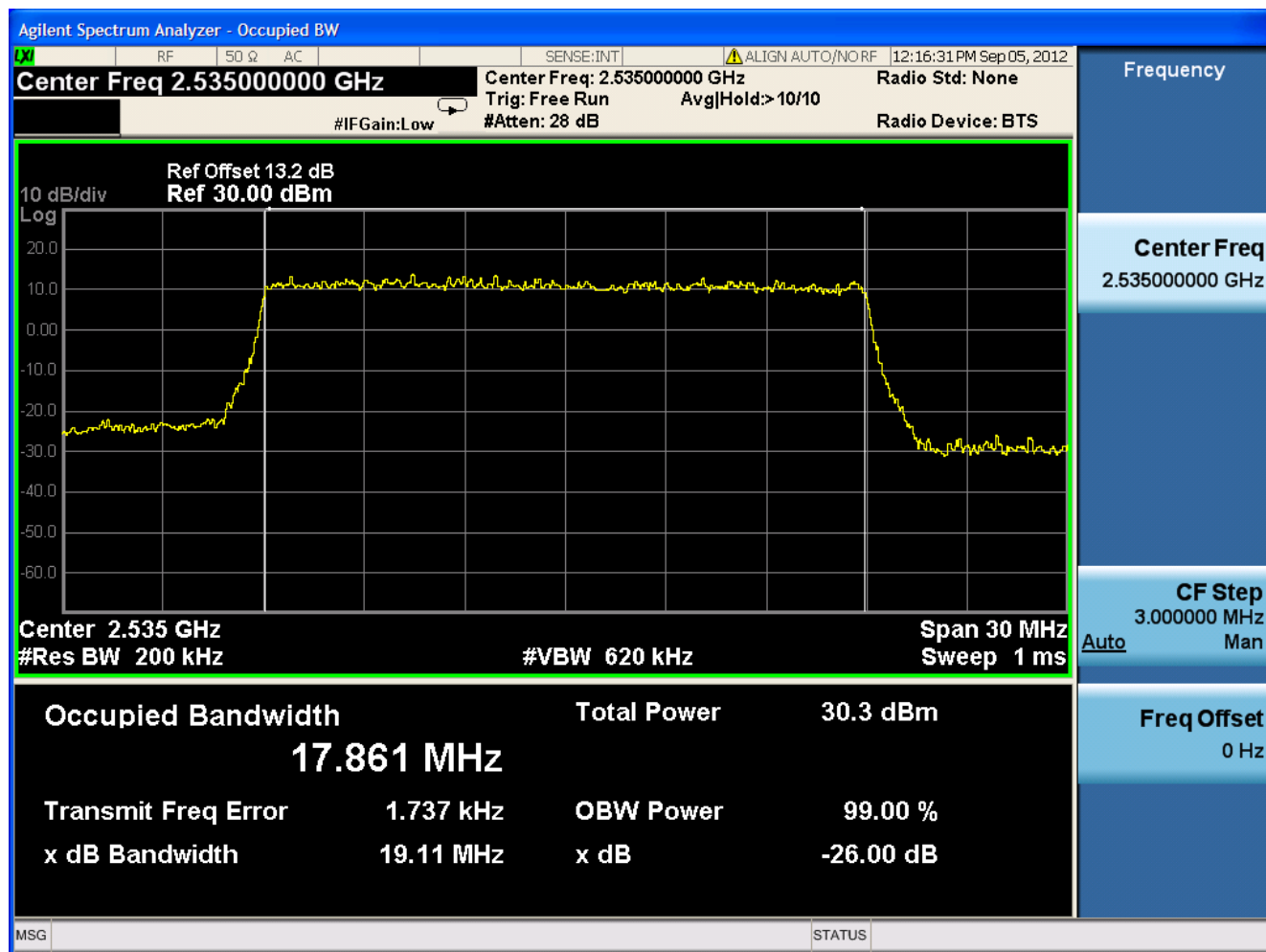


1.1.4.2.3 QPSK/non-1RB #mid/2





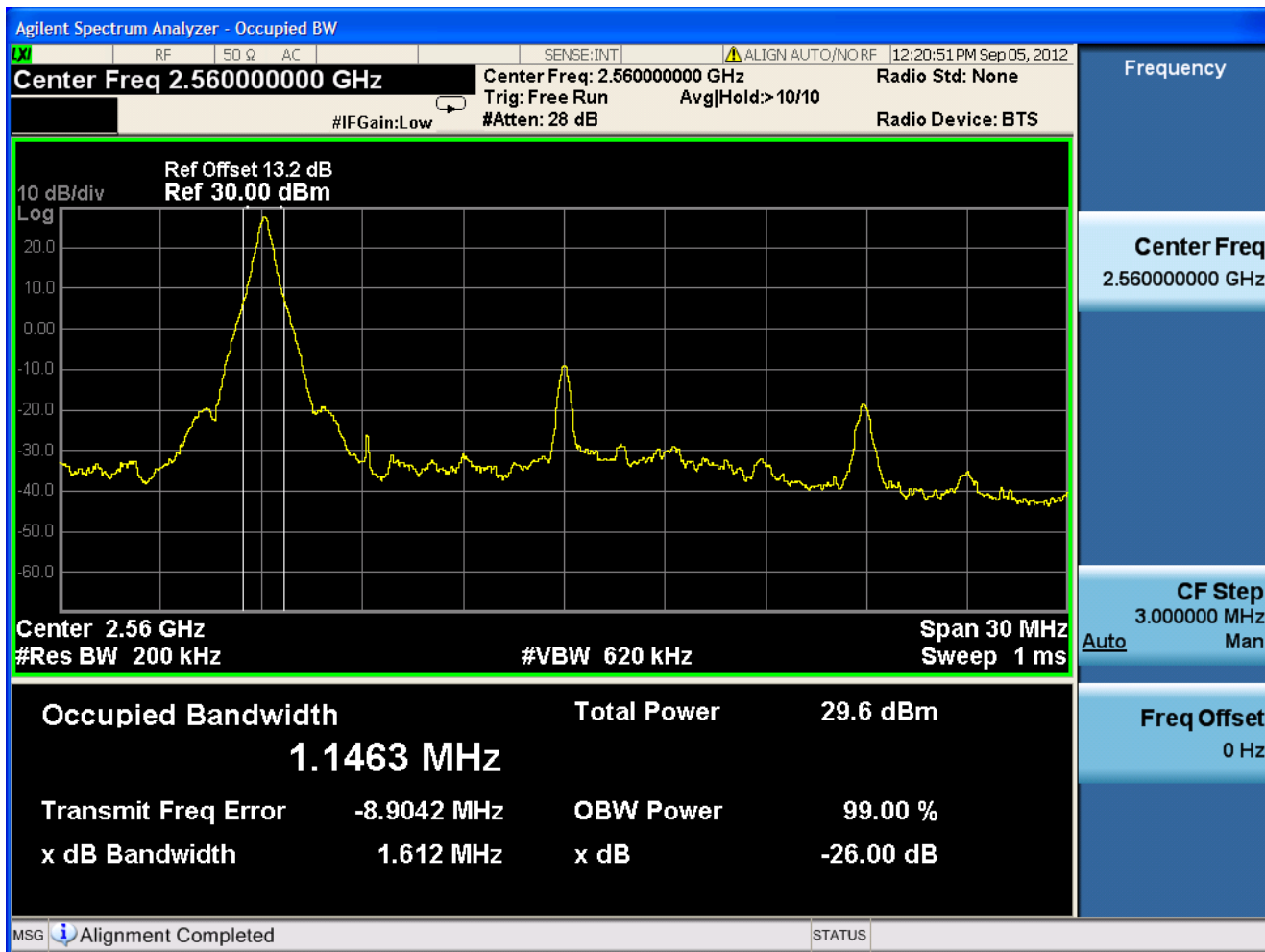
1.1.4.2.4 QPSK/full RBs





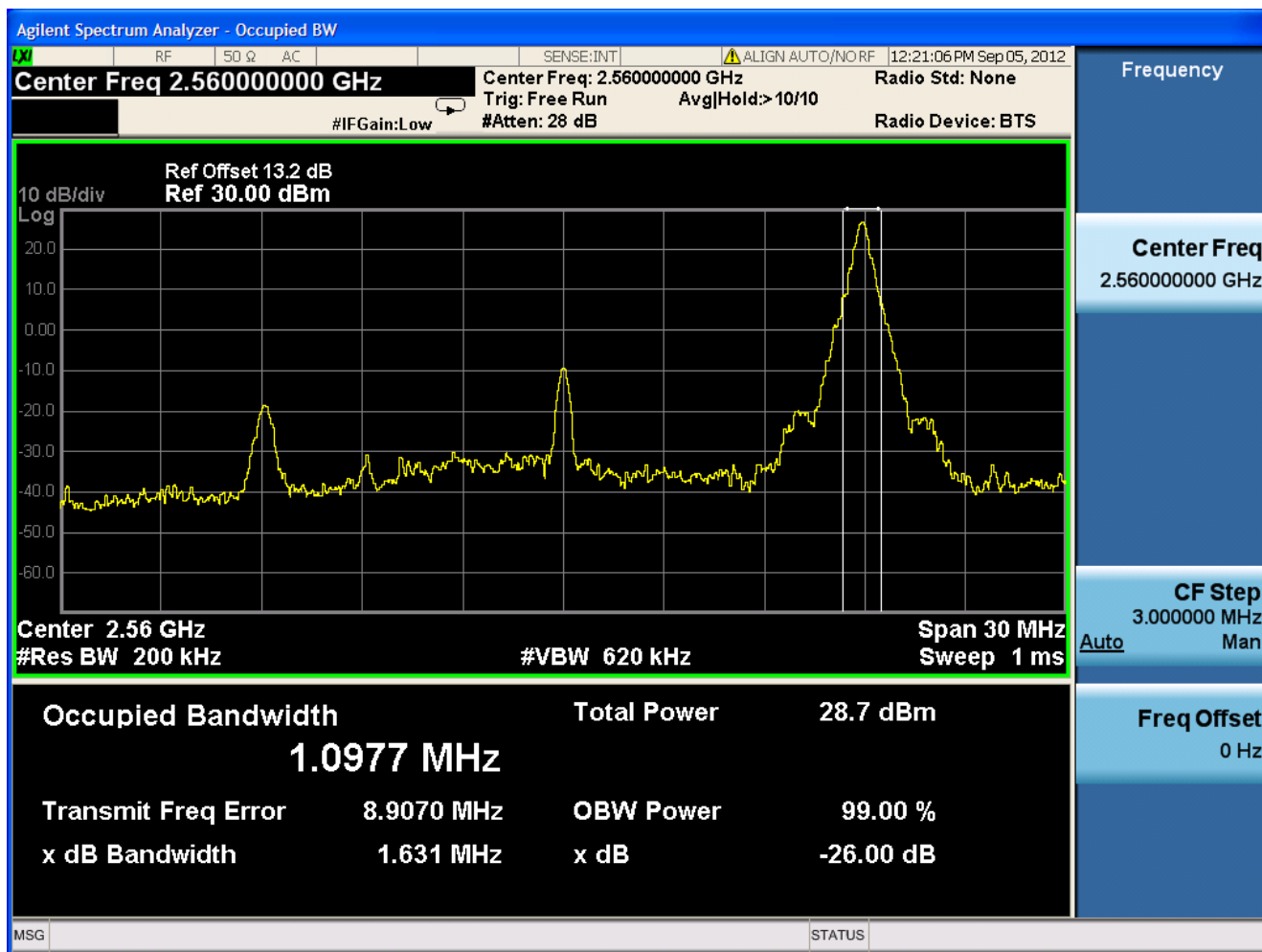
1.1.4.3 Channel =T

1.1.4.3.1 QPSK/1RB # 0



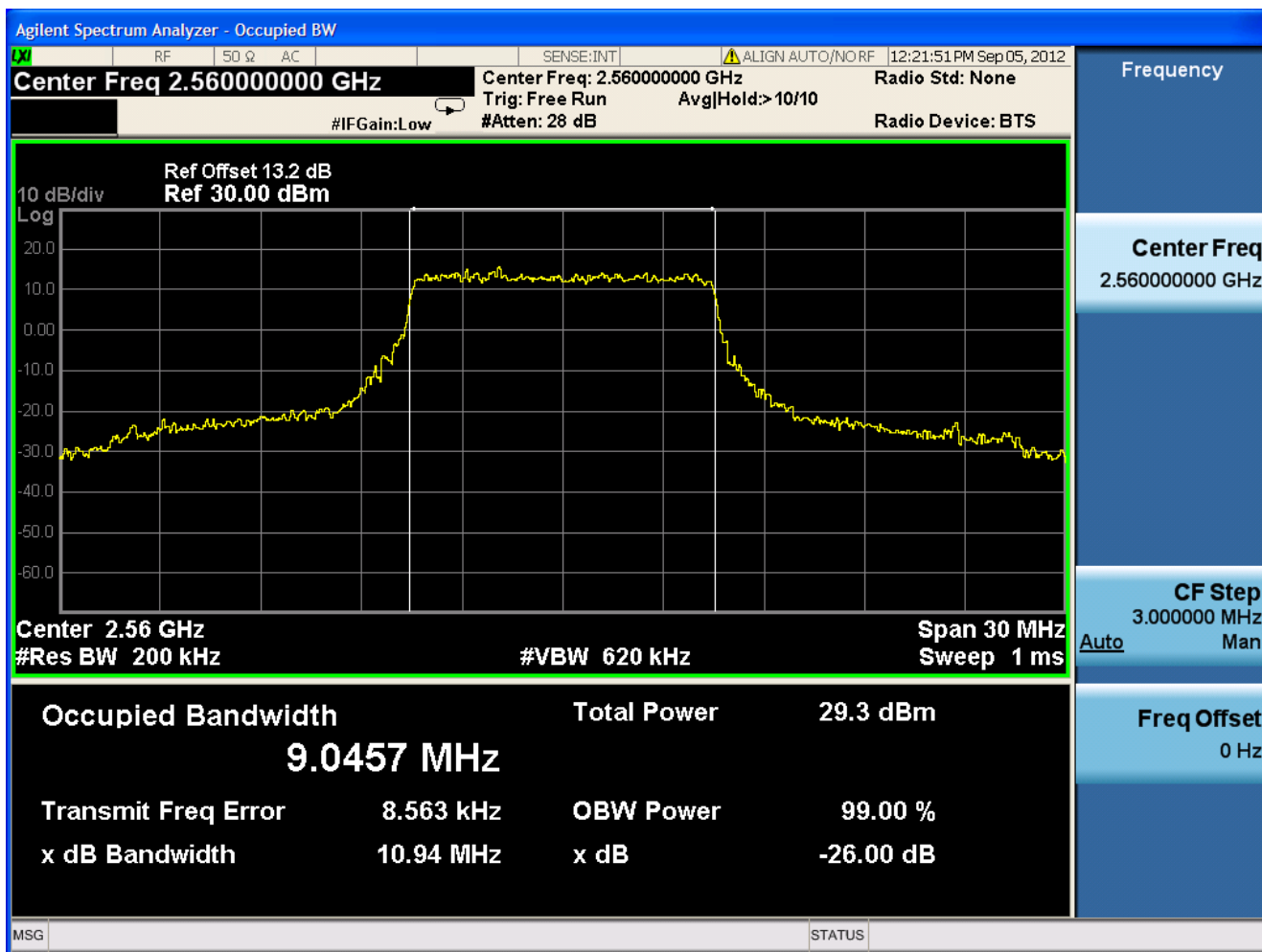


1.1.4.3.2 QPSK/1RB # max



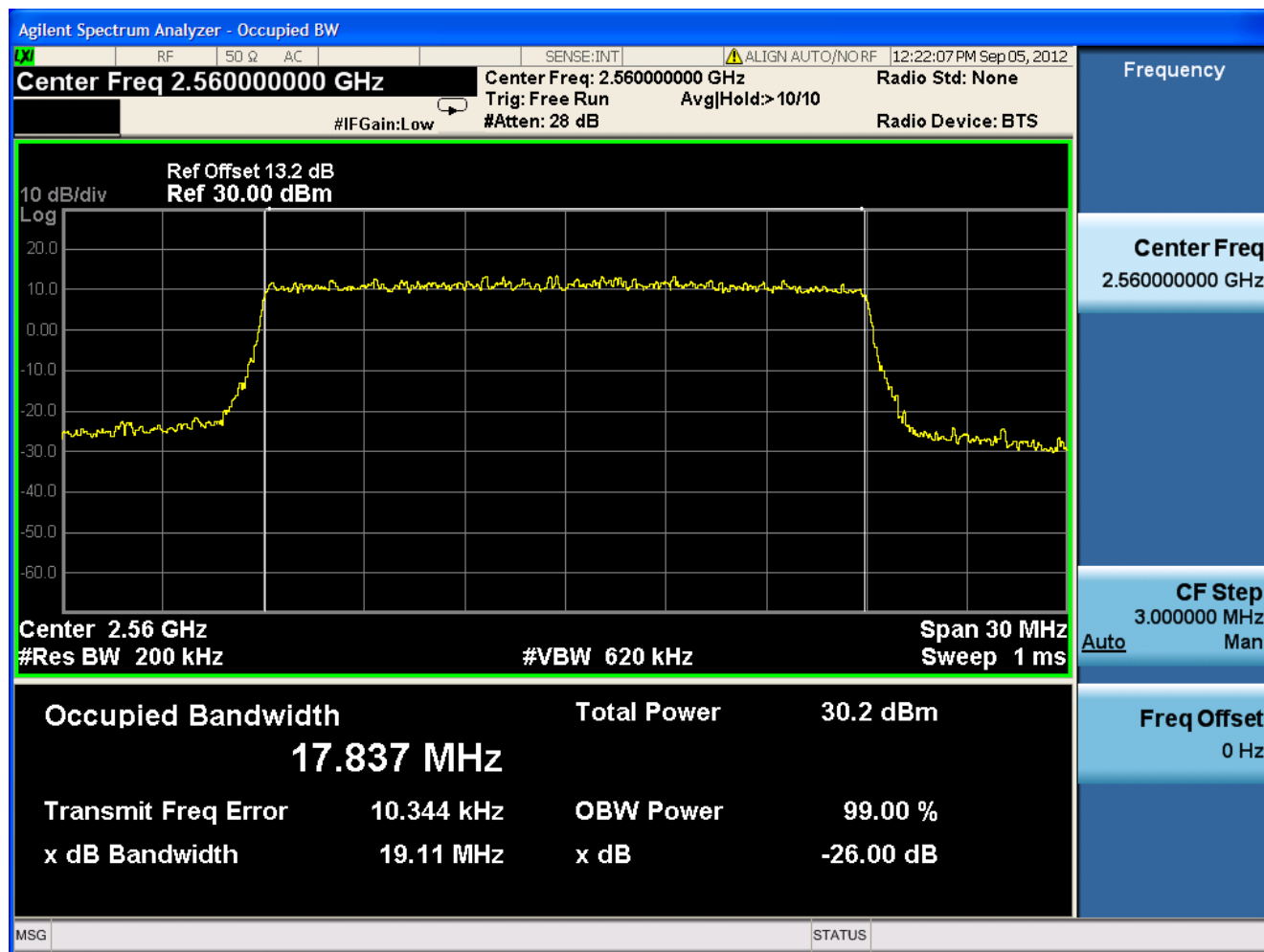


1.1.4.3.3 QPSK/non-1RB #mid/2





1.1.4.3.4 QPSK/full RBs



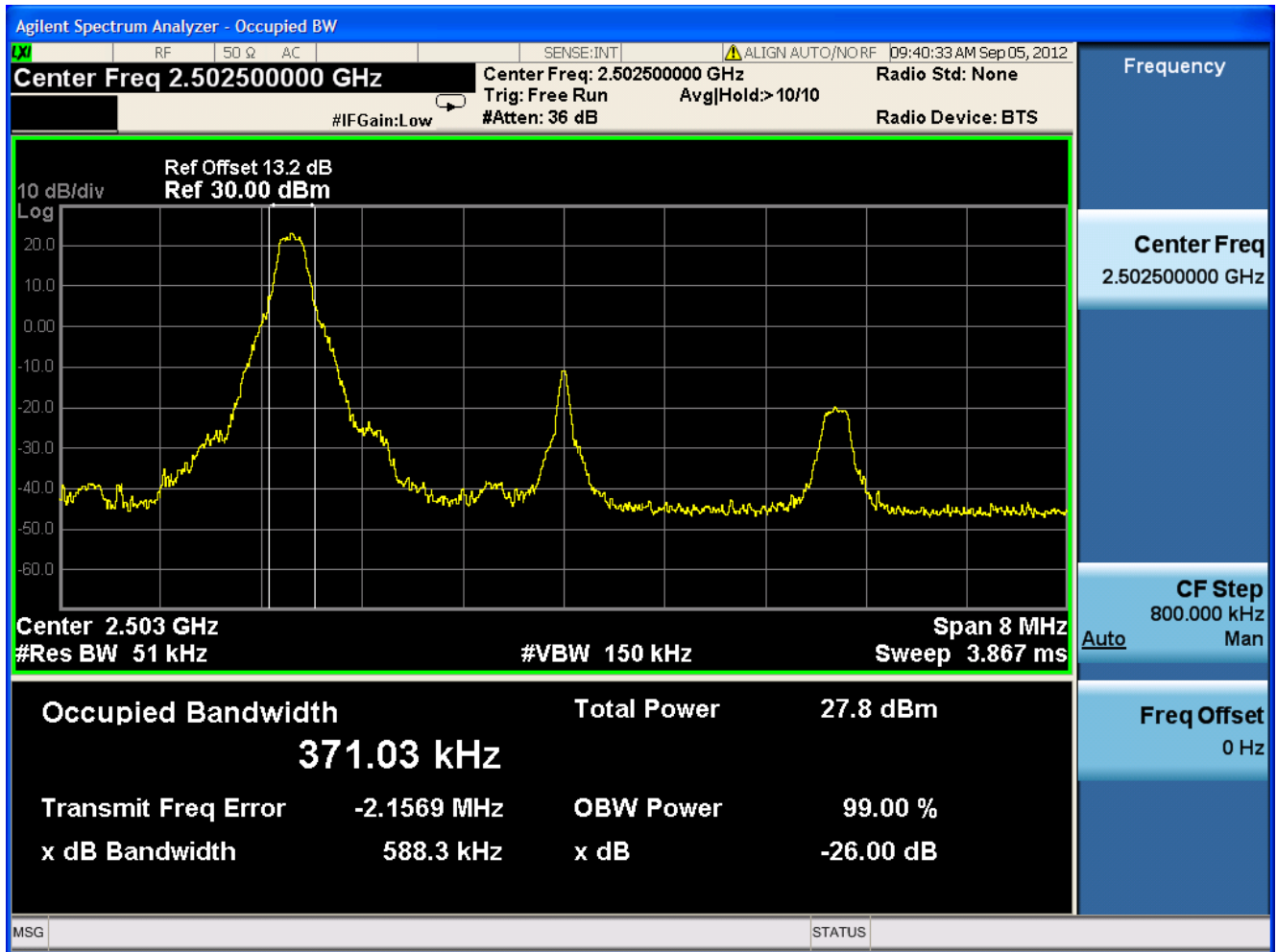


1.2 Test Mode=TM2

1.2.1 Channel Bandwidth = 5 MHz

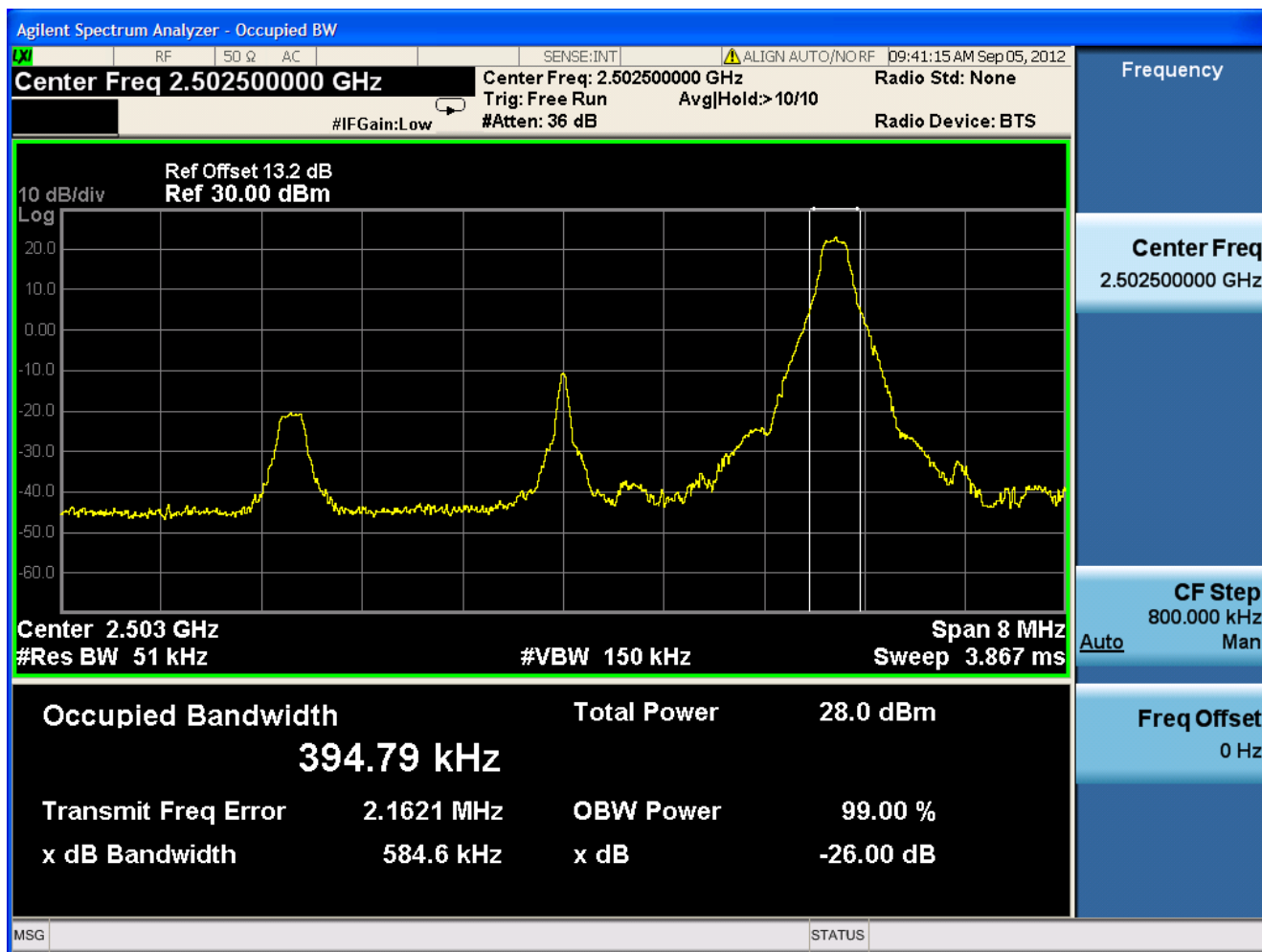
1.2.1.1 Channel =B

1.2.1.1.1 16QAM/1RB # 0



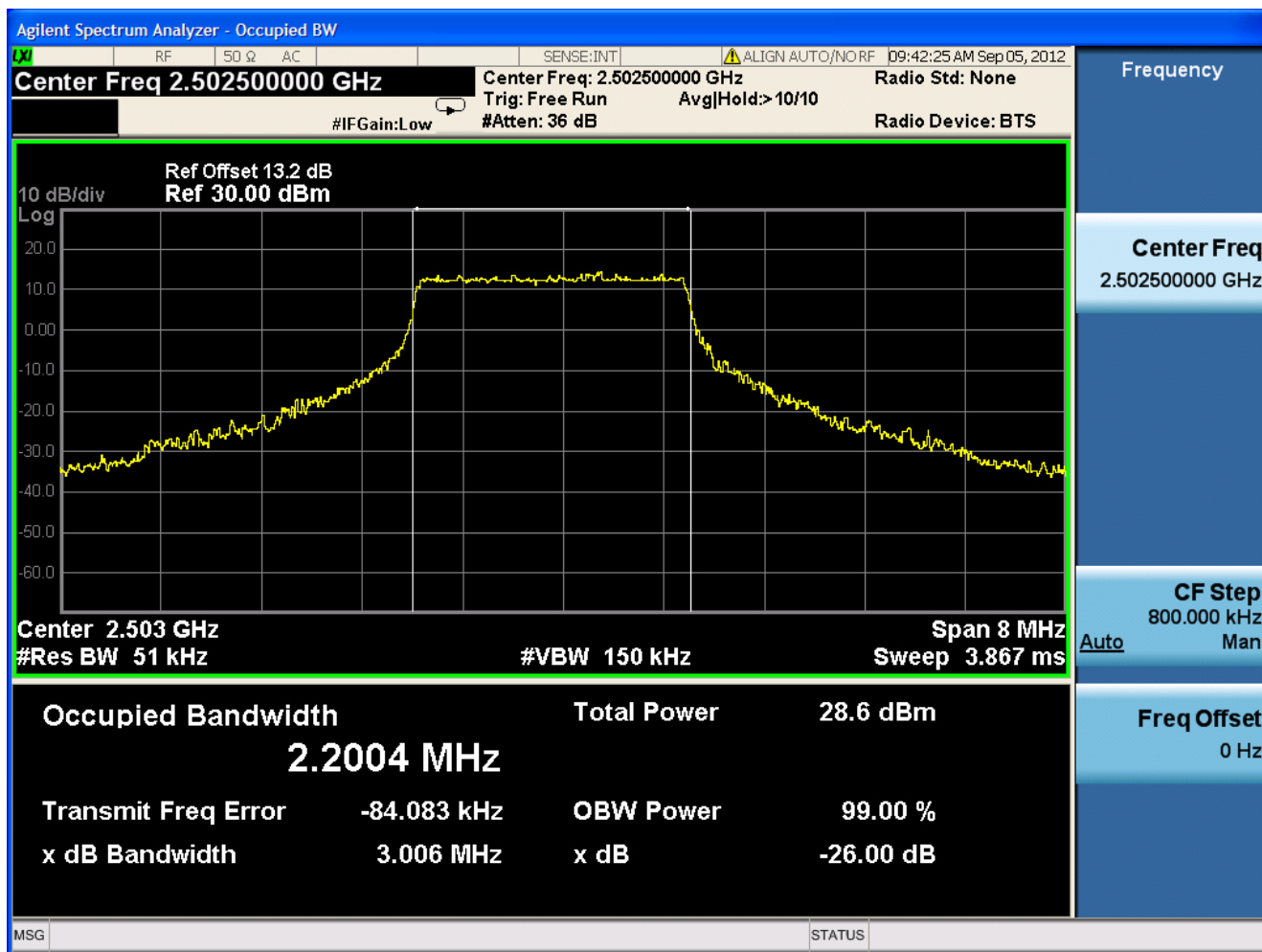


1.2.1.1.2 16QAM /1RB # max



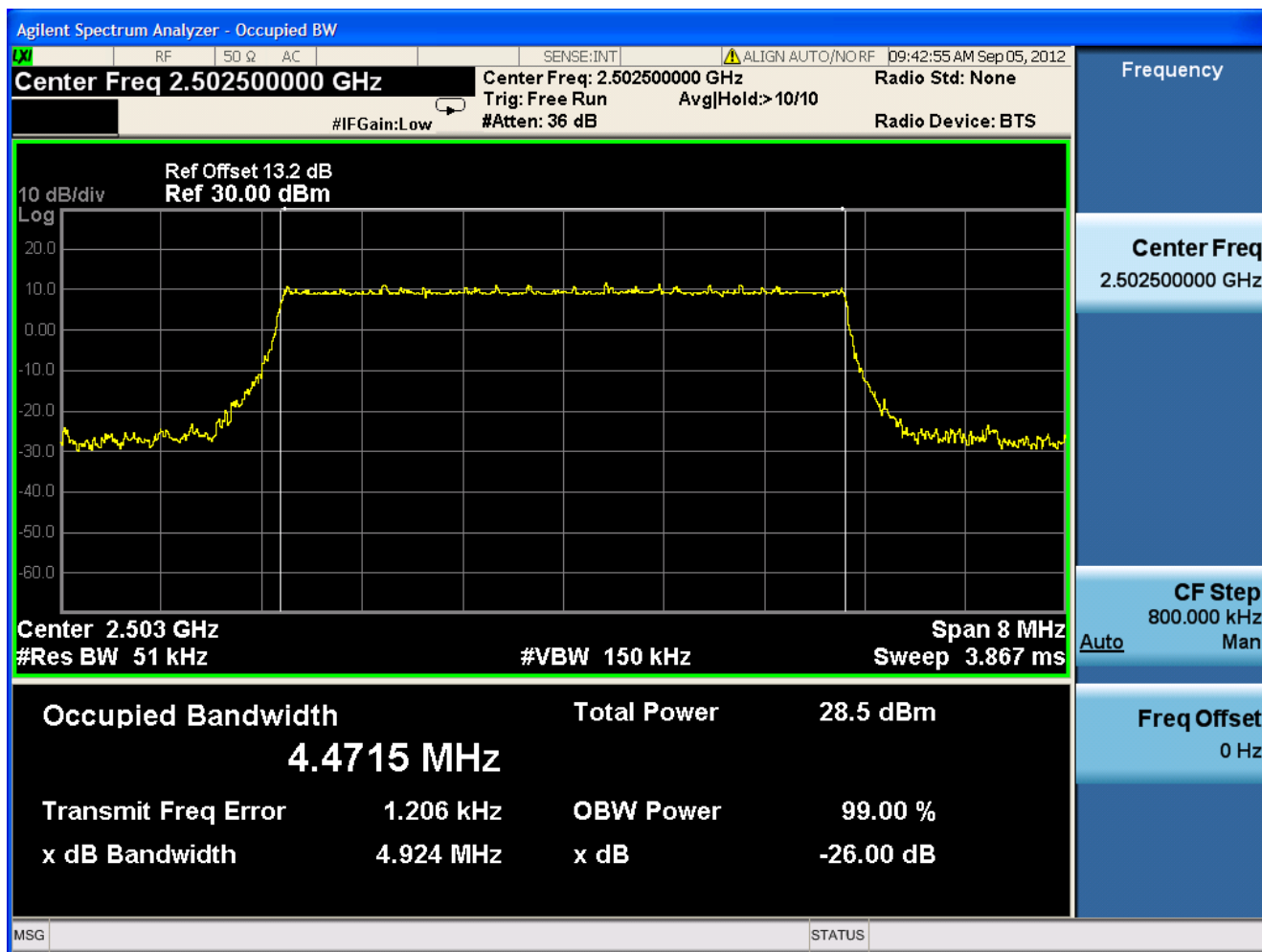


1.2.1.1.3 16QAM /non-1RB #mid/2





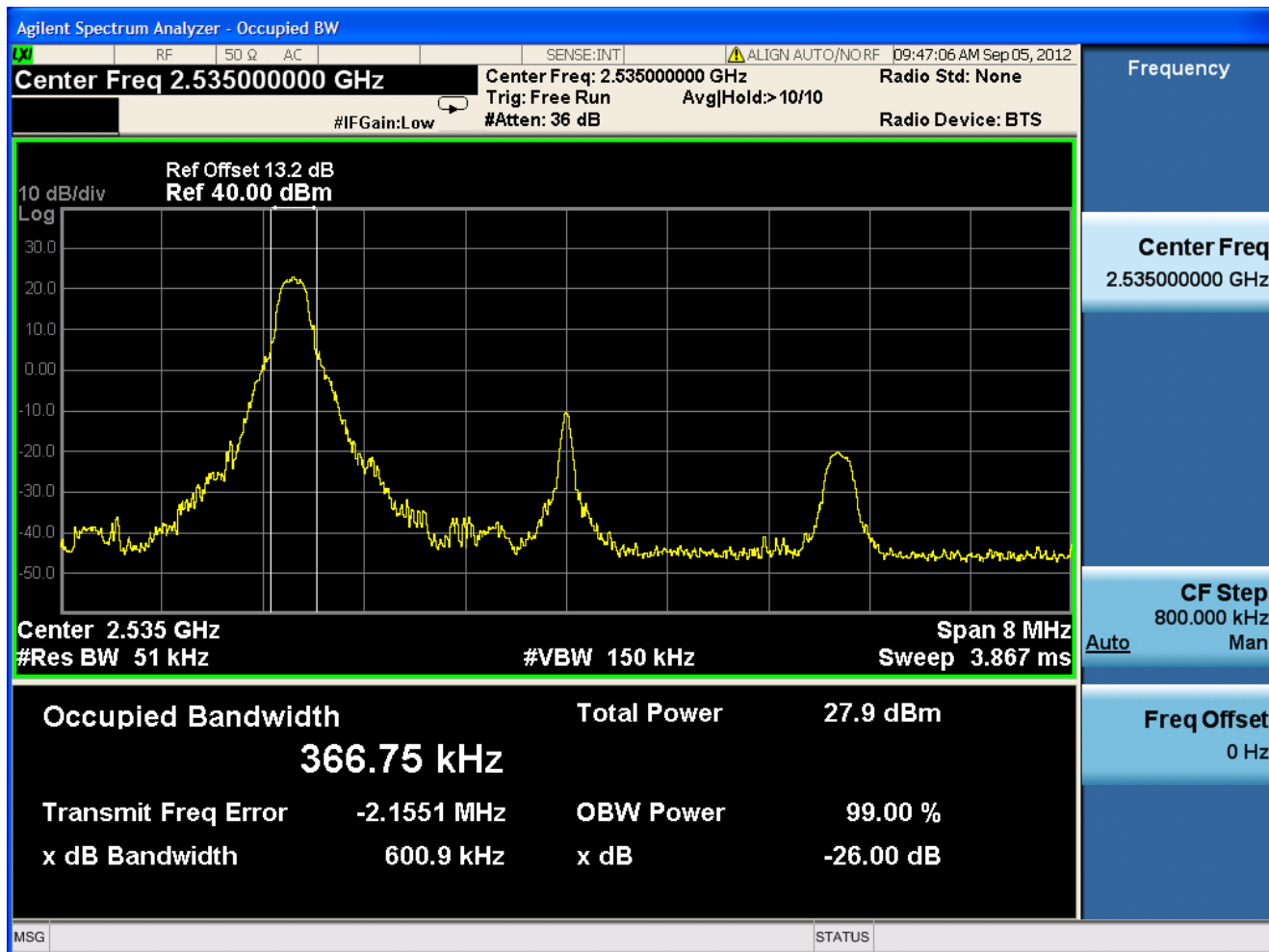
1.2.1.1.4 16QAM /full RBs





1.2.1.2 Channel =M

1.2.1.2.1 16QAM/1RB # 0





1.2.1.2.2 16QAM /1RB # max

