



FCC RF Test Report

Product Name: LTE Wireless Gateway

Model Number: B890-66

**Report No: SYBH(Z-RF)004092012-2006
FCC ID: QISB890**

Reliability Laboratory of Huawei Technologies Co., Ltd.

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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.
3. The laboratory has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 6369A-2.
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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
Date Name Signature

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

Operated By Sept.12, 2012 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&F ANSI/TIA 603C:2004
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 13 results

Test Case	FCC Part No.	Requirements	Result
775-793MHz Band (LTE Band 13)			
Transmitter Output Power	2.1046 & 27.50(b)(10)	Peak EIRP not exceed 3 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(c)(2) & 27.53(c)(5)	Below -13 dBm/1%*EBW, in 1 MHz range	Pass
Spurious Emission at Antenna Terminals	2.1051 & 27.53(c)(2) & 27.53(c)(5)	Below -33 dBm/1 kHz, 9 kHz to 150 kHz Below -23 dBm/10 kHz, 150 kHz to 30 MHz Below -13 dBm/100 kHz, 30 MHz to 10 th harmonics	Pass
Field Strength of Spurious Radiation	2.1051 & 27.53(c)(2) & 27.53(c)(5)	Below -13 dBm/1 MHz	Pass
Frequency Stability	2.1055 & 27.54	Stay within the authorized bands of operation	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 2 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	746 to 756 MHz
Uplink	777 to 787 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
Designation of Emissions	LTE system: 4M48G7D (5 MHz ,QPSK modulation), 4M48W7D (5 MHz ,16QAM modulation), 8M95G7D (10 MHz QPSK modulation), 8M94W7D (10 MHz 16QAM modulation),

4.3 Antenna Gain

Antenna Gain(dBi)	-1
Antenna Gain(dBd)	-3.15

4.4 Power Supply

Specification	Description
Power Supply Type	Directly Connected to DC /AC Power Supply
Input to EUT (DC power)	DC Voltage Nominal:  12 V DC Voltage Range:  10.8 V to 13.2 V
Input to EUT (AC power)	AC Voltage Nominal: ~ 120 V (50/60 Hz) AC Voltage Range: ~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 13	TX (5M)	Channel 23205	Channel 23230	Channel 23255
		779.5 MHz	782 MHz	784.5 MHz
	RX (5M)	Channel 5205	Channel 5230	Channel 5255
		748.5 MHz	751 MHz	753.5 MHz
	TX (10M)	Channel 23230	Channel 23230	Channel 23230
		782 MHz	782 MHz	782 MHz
	RX (10M)	Channel 5230	Channel 5230	Channel 5230
		751 MHz	751 MHz	751 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

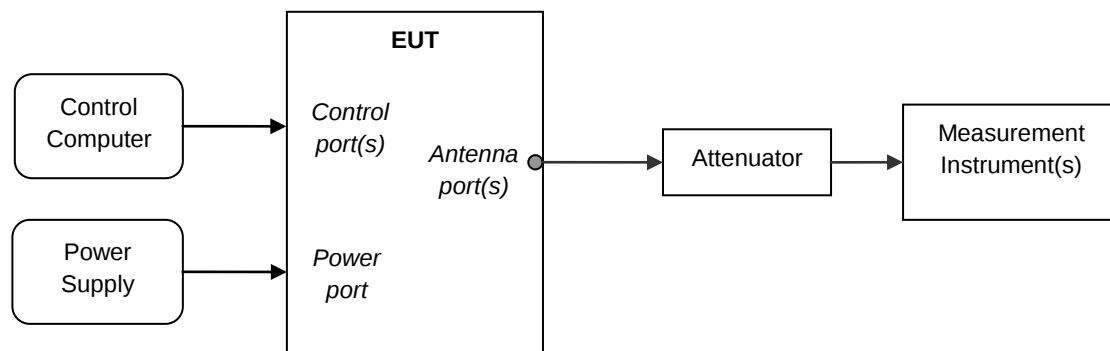
NOTE: VL= lower extreme test voltage
VN= nominal voltage
VH= upper extreme test voltage
TN= normal temperature

5.4 Test Setup

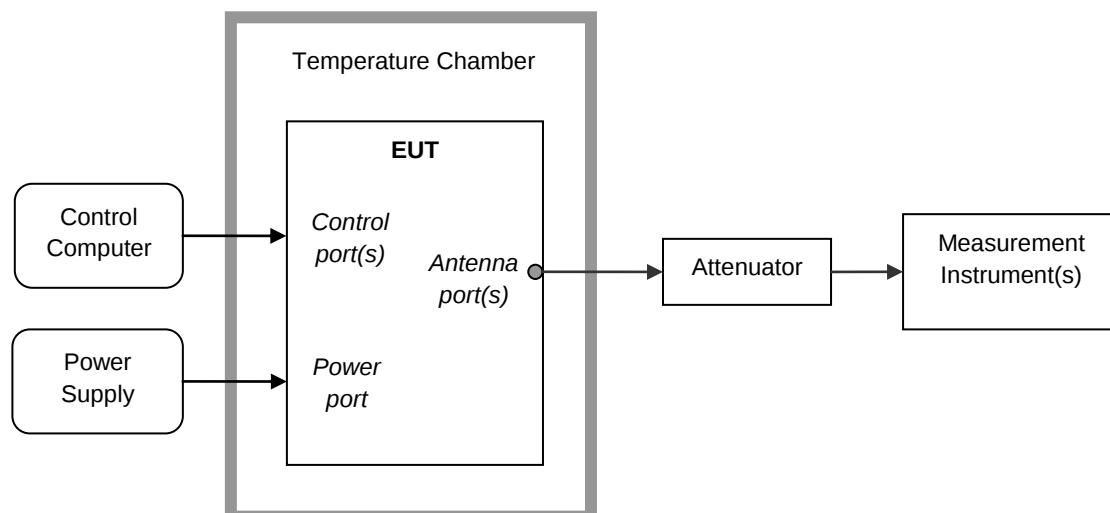
5.4.1 General Test Setup Configurations

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



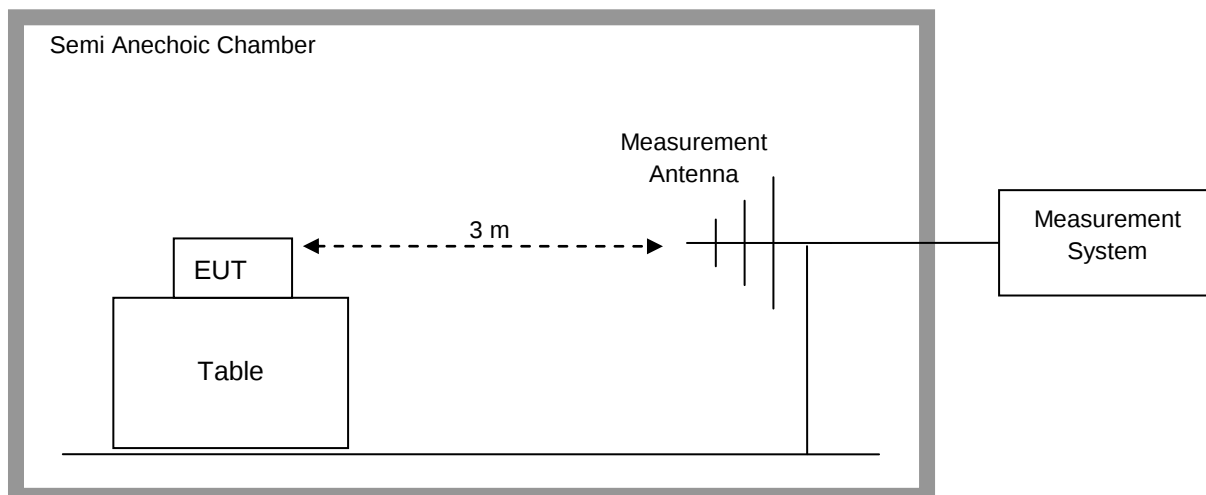
5.4.4 Test Setup 3

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.

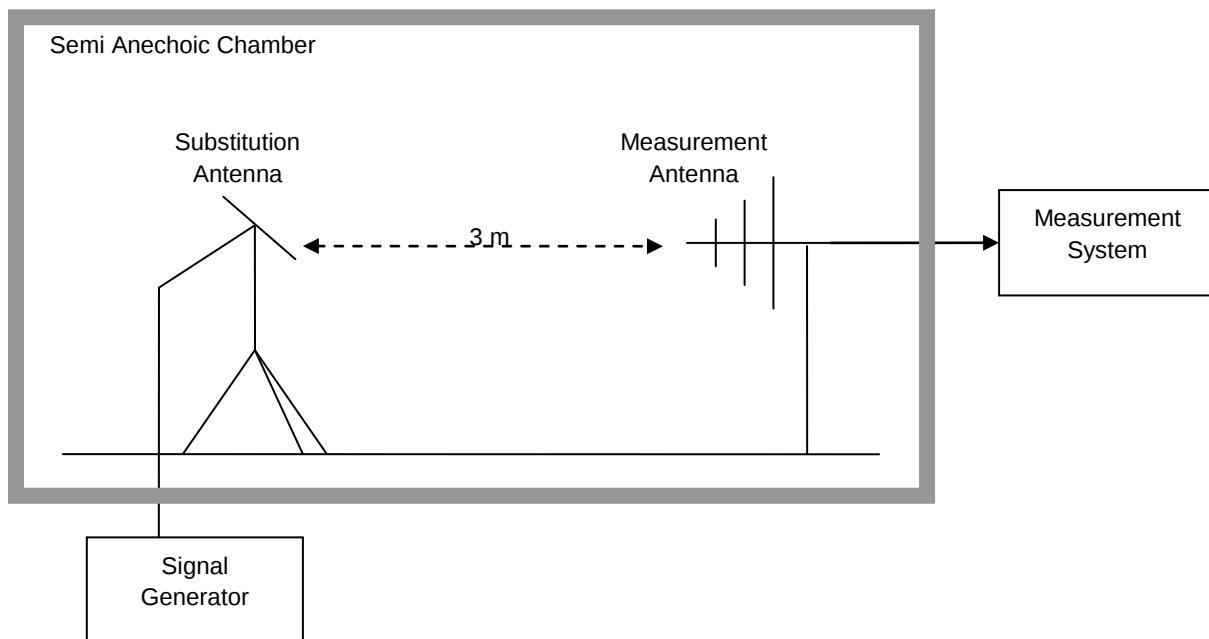
Step 1: Pre-test to find the Maximum ERP or EIRP

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 L, M, H 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

6 Main Test Instruments

Table 3 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	Photos of Test Setup	Appendix H

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(b) (10)



Conducted Power of Transmitter

Table 1 Measurement Results (LTE) BAND 13

TM1 & TM2 RF Output Power(Conducted) BAND 13				
Test Mode	TN/VN			
	Modulation	RB	Measured (dBm)	Limit (dBm)
Channel (B) 5MHz(BW)	QPSK	1RB#0	23.13	34.8
		1RB#max	22.94	34.8
		12RB#6	21.87	34.8
		Full	21.75	34.8
	16QAM	1RB#0	22.22	34.8
		1RB#max	22.08	34.8
		12RB#6	21.00	34.8
		Full	20.81	34.8
Channel (B) 10MHz(BW)	QPSK	1RB#0	22.97	34.8
		1RB#max	22.87	34.8
		25RB#13	21.85	34.8
		Full	21.60	34.8
	16QAM	1RB#0	22.14	34.8
		1RB#max	22.03	34.8
		25RB#13	20.80	34.8
		Full	20.59	34.8
Channel (M) 5MHz(BW)	QPSK	1RB#0	22.92	34.8
		1RB#max	22.98	34.8
		12RB#6	21.80	34.8
		Full	21.69	34.8
	16QAM	1RB#0	22.05	34.8
		1RB#max	22.10	34.8
		12RB#6	21.00	34.8
		Full	20.79	34.8
Channel (M) 10MHz(BW)	QPSK	1RB#0	23.01	34.8
		1RB#max	22.84	34.8
		25RB#13	21.75	34.8
		Full	21.61	34.8
	16QAM	1RB#0	22.14	34.8
		1RB#max	21.95	34.8
		25RB#13	20.73	34.8



		Full	20.56	34.8
Channel (T) 5MHz(BW)	QPSK	1RB#0	22.95	34.8
		1RB#max	22.73	34.8
		12RB#6	21.91	34.8
		Full	21.95	34.8
	16QAM	1RB#0	22.07	34.8
		1RB#max	22.01	34.8
		12RB#6	21.06	34.8
		Full	20.93	34.8
Channel (T) 10MHz(BW)	QPSK	1RB#0	22.95	34.8
		1RB#max	22.85	34.8
		25RB#13	21.71	34.8
		Full	21.64	34.8
	16QAM	1RB#0	22.16	34.8
		1RB#max	21.99	34.8
		25RB#13	20.82	34.8
		Full	20.59	34.8

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



Peak-to-Average Ratio

Table 2 Measurement Results (LTE) BAND 13

Peak-to-Average Ratio				
Test Mode	TN/VN			
	Modulation	RB	Measured (dB)	Limit (dB)
Channel (B) 5MHz(BW)	QPSK	1RB#0	5.25	13
		1RB#max	5.34	13
		12RB#6	5.15	13
		Full	5.43	13
	16QAM	1RB#0	6.13	13
		1RB#max	6.25	13
		12RB#6	6.34	13
		Full	6.15	13
Channel (B) 10MHz(BW)	QPSK	1RB#0	5.35	13
		1RB#max	5.13	13
		25RB#13	5.51	13
		Full	5.31	13
	16QAM	1RB#0	6.35	13
		1RB#max	6.43	13
		25RB#13	6.37	13
		Full	6.37	13
Channel (M) 5MHz(BW)	QPSK	1RB#0	5.58	13
		1RB#max	5.35	13
		12RB#6	5.48	13
		Full	5.18	13
	16QAM	1RB#0	6.24	13
		1RB#max	6.24	13
		12RB#6	6.28	13
		Full	6.29	13
Channel (M) 10MHz(BW)	QPSK	1RB#0	5.23	13
		1RB#max	5.31	13
		25RB#13	5.43	13
		Full	5.12	13
	16QAM	1RB#0	6.35	13
		1RB#max	6.15	13



		25RB#13	6.53	13
		Full	6.44	13
Channel (T) 5MHz(BW)	QPSK	1RB#0	5.28	13
		1RB#max	5.34	13
		12RB#6	5.15	13
		Full	5.38	13
	16QAM	1RB#0	6.45	13
		1RB#max	6.35	13
		12RB#6	6.12	13
		Full	6.35	13
Channel (T) 10MHz(BW)	QPSK	1RB#0	5.23	13
		1RB#max	5.37	13
		25RB#13	5.45	13
		Full	5.21	13
	16QAM	1RB#0	6.35	13
		1RB#max	6.34	13
		25RB#13	6.35	13
		Full	6.28	13

Effective Radiated Power of Transmitter (ERP)

Table 3 Substitution Results (LTE) BAND 13

Test Mode			Meas. Level [dBm]	Substitution Antenna Type	SGP[dBm]	Substitution Gain [dbd]	Cable Loss [dB]	Substitution Level (ERP) [dBm]	FCC limit [dBm]	Result
Channel	Modulation	RB								
Channel (B) 5MHz(BW)	QPSK	1 RB/#0	19.98	Horn Ant.	23.18	-2.75	0.6	19.83	34.8	Pass
		1 RB/#max	19.79	Horn Ant.	22.99	-2.75	0.6	19.64	34.8	Pass
		12 RB/#6	18.72	Horn Ant.	21.92	-2.75	0.6	18.57	34.8	Pass
		Full	18.60	Horn Ant.	21.80	-2.75	0.6	18.45	34.8	Pass
	16QAM	1 RB/#0	19.07	Horn Ant.	22.27	-2.75	0.6	18.92	34.8	Pass
		1 RB/#max	18.93	Horn Ant.	22.13	-2.75	0.6	18.78	34.8	Pass
		12 RB/#6	17.85	Horn Ant.	21.05	-2.75	0.6	17.70	34.8	Pass
		Full	17.66	Horn Ant.	20.86	-2.75	0.6	17.51	34.8	Pass
Channel (B) 10MHz(BW)	QPSK	1 RB/#0	19.82	Horn Ant.	23.02	-2.75	0.6	19.67	34.8	Pass
		1 RB/#max	19.72	Horn Ant.	22.92	-2.75	0.6	19.57	34.8	Pass
		25 RB/#13	18.70	Horn Ant.	21.90	-2.75	0.6	18.55	34.8	Pass
		Full	18.45	Horn Ant.	21.65	-2.75	0.6	18.30	34.8	Pass
	16QAM	1 RB/#0	18.99	Horn Ant.	22.19	-2.75	0.6	18.84	34.8	Pass
		1 RB/#max	18.88	Horn Ant.	22.08	-2.75	0.6	18.73	34.8	Pass
		25 RB/#13	17.65	Horn Ant.	20.85	-2.75	0.6	17.50	34.8	Pass



		Full	17.44	Horn Ant.	20.64	-2.75	0.6	17.29	34.8	Pass
Channel (M) 5MHz(BW)	QPSK	1 RB/#0	19.77	Horn Ant.	23.09	-2.87	0.6	19.62	34.8	Pass
		1 RB/#max	19.83	Horn Ant.	23.15	-2.87	0.6	19.68	34.8	Pass
		12 RB/#6	18.65	Horn Ant.	21.97	-2.87	0.6	18.50	34.8	Pass
		Full	18.54	Horn Ant.	21.86	-2.87	0.6	18.39	34.8	Pass
	16QAM	1 RB/#0	18.90	Horn Ant.	22.22	-2.87	0.6	18.75	34.8	Pass
		1 RB/#max	18.95	Horn Ant.	22.27	-2.87	0.6	18.80	34.8	Pass
		12 RB/#6	17.85	Horn Ant.	21.17	-2.87	0.6	17.70	34.8	Pass
		Full	17.64	Horn Ant.	20.96	-2.87	0.6	17.49	34.8	Pass
Channel (M) 10MHz(BW)	QPSK	1 RB/#0	19.86	Horn Ant.	23.18	-2.87	0.6	19.71	34.8	Pass
		1 RB/#max	19.69	Horn Ant.	23.01	-2.87	0.6	19.54	34.8	Pass
		25 RB/#13	18.60	Horn Ant.	21.92	-2.87	0.6	18.45	34.8	Pass
		Full	18.46	Horn Ant.	21.78	-2.87	0.6	18.31	34.8	Pass
	16QAM	1 RB/#0	18.99	Horn Ant.	22.31	-2.87	0.6	18.84	34.8	Pass
		1 RB/#max	18.80	Horn Ant.	22.12	-2.87	0.6	18.65	34.8	Pass
		25 RB/#13	17.58	Horn Ant.	20.90	-2.87	0.6	17.43	34.8	Pass
		Full	17.41	Horn Ant.	20.73	-2.87	0.6	17.26	34.8	Pass
Channel (T) 5MHz(BW)	QPSK	1 RB/#0	19.80	Horn Ant.	23.10	-2.85	0.6	19.65	34.8	Pass
		1 RB/#max	19.58	Horn Ant.	22.88	-2.85	0.6	19.43	34.8	Pass



		12 RB/#6	18.76	Horn Ant.	22.06	-2.85	0.6	18.61	34.8	Pass
		Full	18.80	Horn Ant.	22.10	-2.85	0.6	18.65	34.8	Pass
	16QAM	1 RB/#0	18.92	Horn Ant.	22.22	-2.85	0.6	18.77	34.8	Pass
		1 RB/#max	18.86	Horn Ant.	22.16	-2.85	0.6	18.71	34.8	Pass
		12 RB/#6	17.91	Horn Ant.	21.21	-2.85	0.6	17.76	34.8	Pass
		Full	17.78	Horn Ant.	21.08	-2.85	0.6	17.63	34.8	Pass
Channel (T) 10MHz(BW)	QPSK	1 RB/#0	19.80	Horn Ant.	23.10	-2.85	0.6	19.65	34.8	Pass
		1 RB/#max	19.70	Horn Ant.	23.00	-2.85	0.6	19.55	34.8	Pass
		25 RB/#13	18.56	Horn Ant.	21.86	-2.85	0.6	18.41	34.8	Pass
		Full	18.49	Horn Ant.	21.79	-2.85	0.6	18.34	34.8	Pass
	16QAM	1 RB/#0	19.01	Horn Ant.	22.31	-2.85	0.6	18.86	34.8	Pass
		1 RB/#max	18.84	Horn Ant.	22.14	-2.85	0.6	18.69	34.8	Pass
		25 RB/#13	17.67	Horn Ant.	20.97	-2.85	0.6	17.52	34.8	Pass
		Full	17.44	Horn Ant.	20.74	-2.85	0.6	17.29	34.8	Pass

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

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

b, SGP=Signal Generator Level

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

-----END-----



Appendix B

Modulation Characteristics

According to FCC Part 2.1047& Part 27 Subpart C&F



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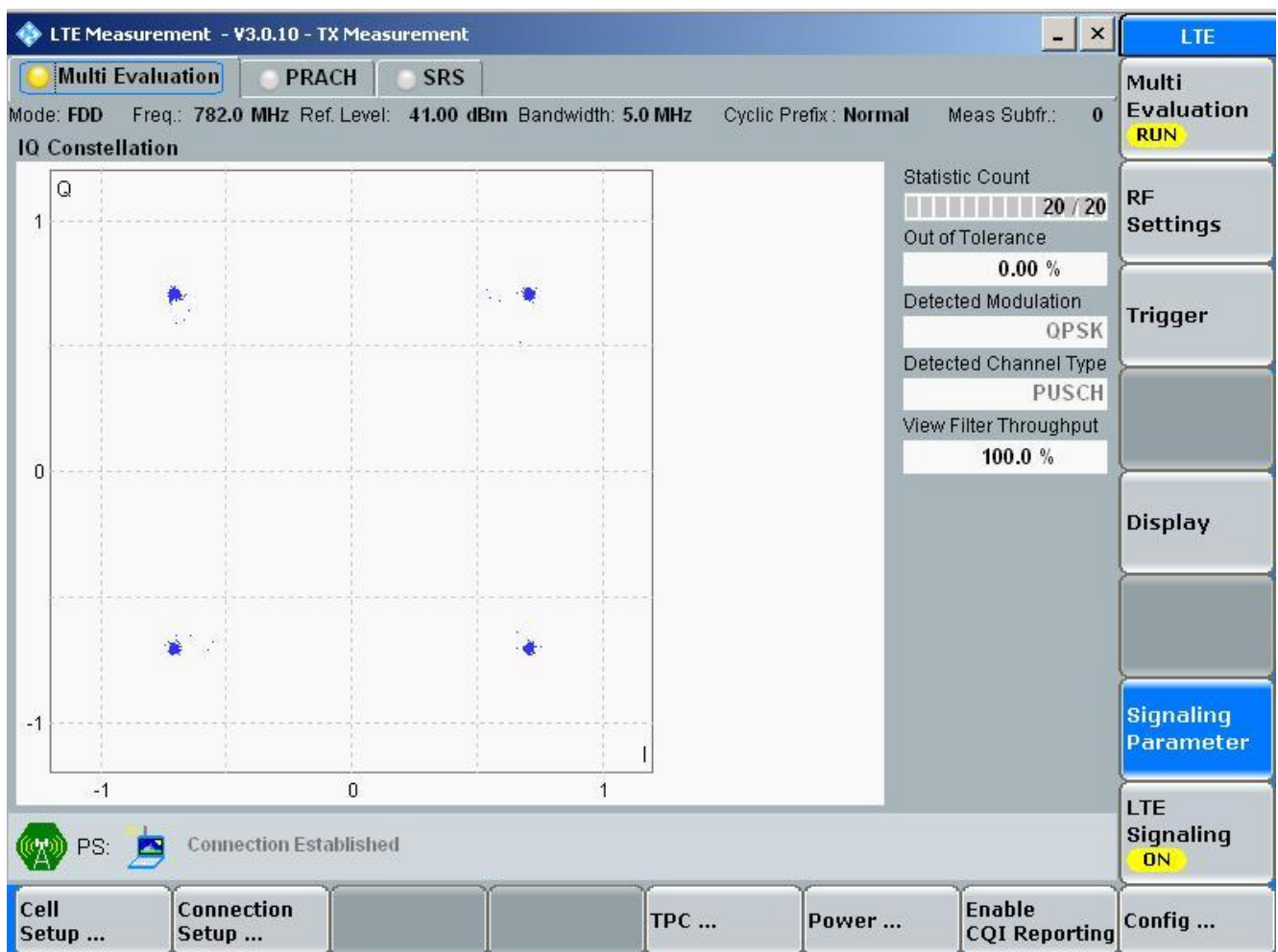
1 For Band 13

1.1 Test Mode=TM1

1.1.1 Channel Bandwidth = 5 MHz

1.1.1.1 Channel =M

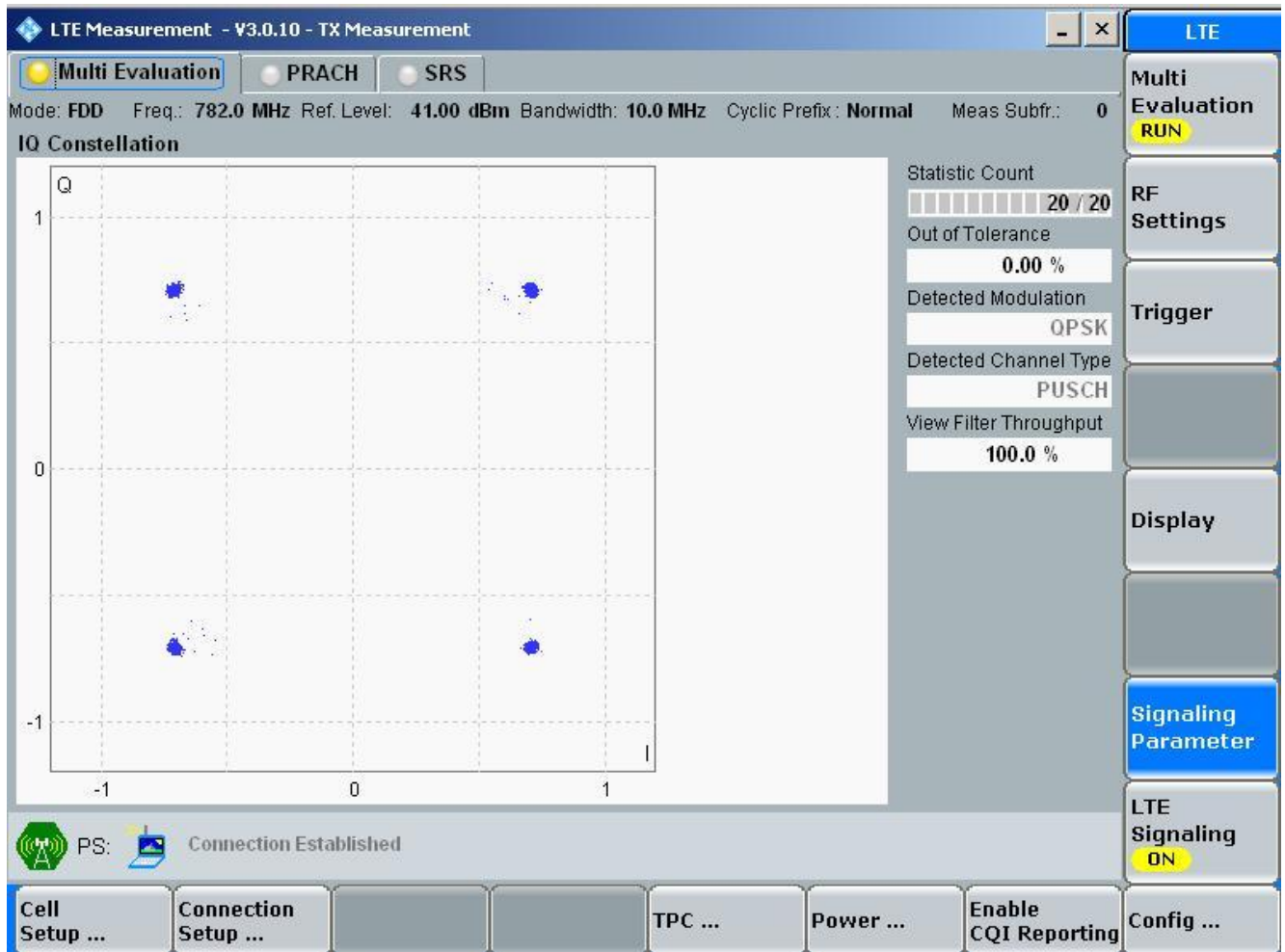
1.1.1.1.1 QPSK/full RBs



1.1.2 Channel Bandwidth = 10 MHz

1.1.2.1 Channel =M

1.1.2.1.1 QPSK/full RBs

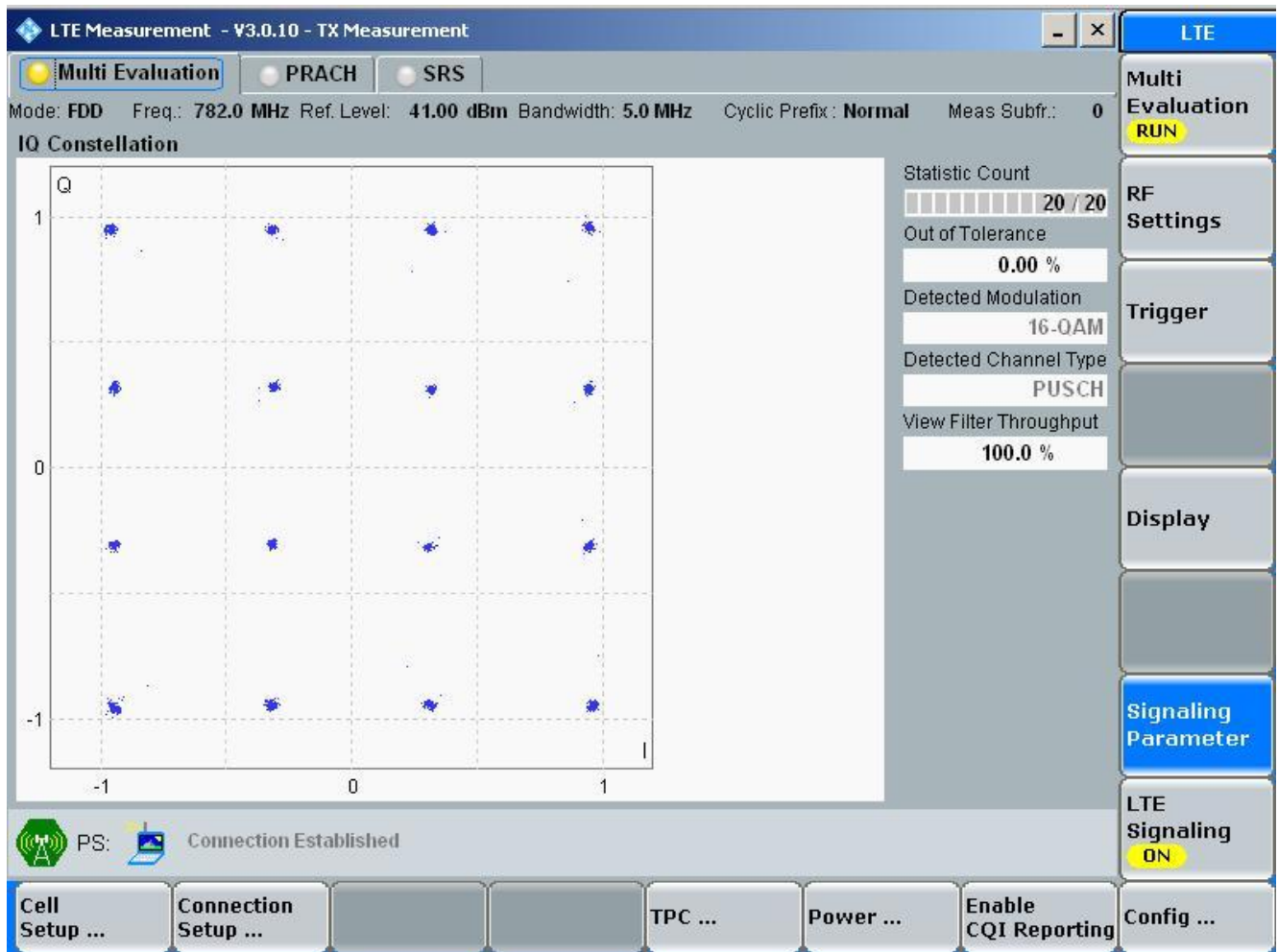


1.2 Test Mode=TM2

1.2.1 Channel Bandwidth = 5 MHz

1.2.1.1 Channel =M

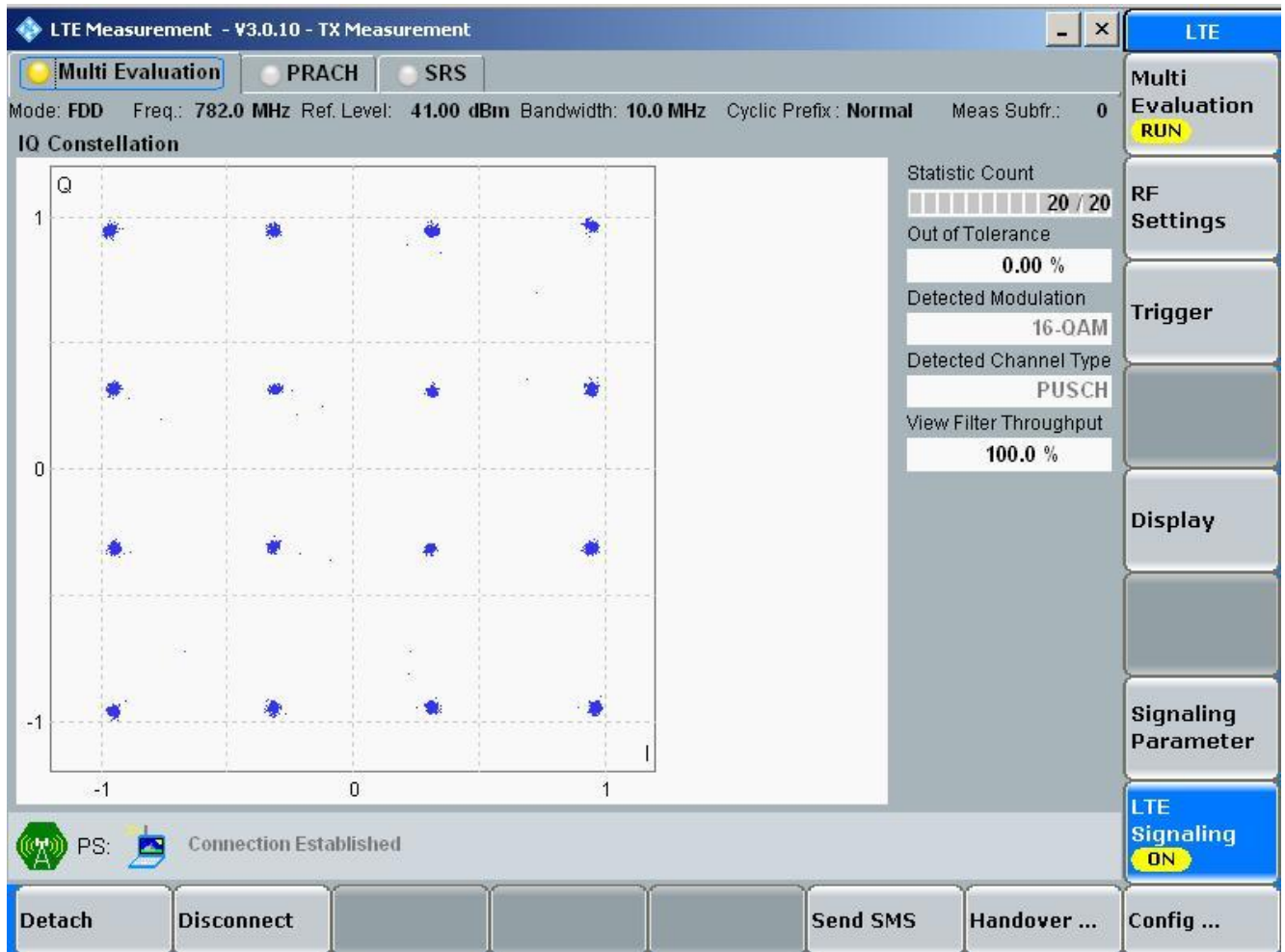
1.2.1.1.1 16QAM/full RBs



1.2.2 Channel Bandwidth = 10 MHz

1.2.2.1 Channel =M

1.2.2.1.1 16QAM/full RBs



-----END-----



Appendix C

Occupied Bandwidth

According to FCC part 2.1049 & Part 27 Subpart C&F



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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 13

Test Mode	Carrier Conf.	RF Ch.	Occupied Bandwidth [MHz]	Verdict
TM1	5 MHz	B	4.4787	Pass
		M	4.4625	Pass
		T	4.4664	Pass
	10 MHz	B	8.9493	Pass
		M	8.9493	Pass
		T	8.9493	Pass
TM2	5 MHz	B	4.4777	Pass
		M	4.4772	Pass
		T	4.4607	Pass
	10 MHz	B	8.9385	Pass
		M	8.9385	Pass
		T	8.9385	Pass

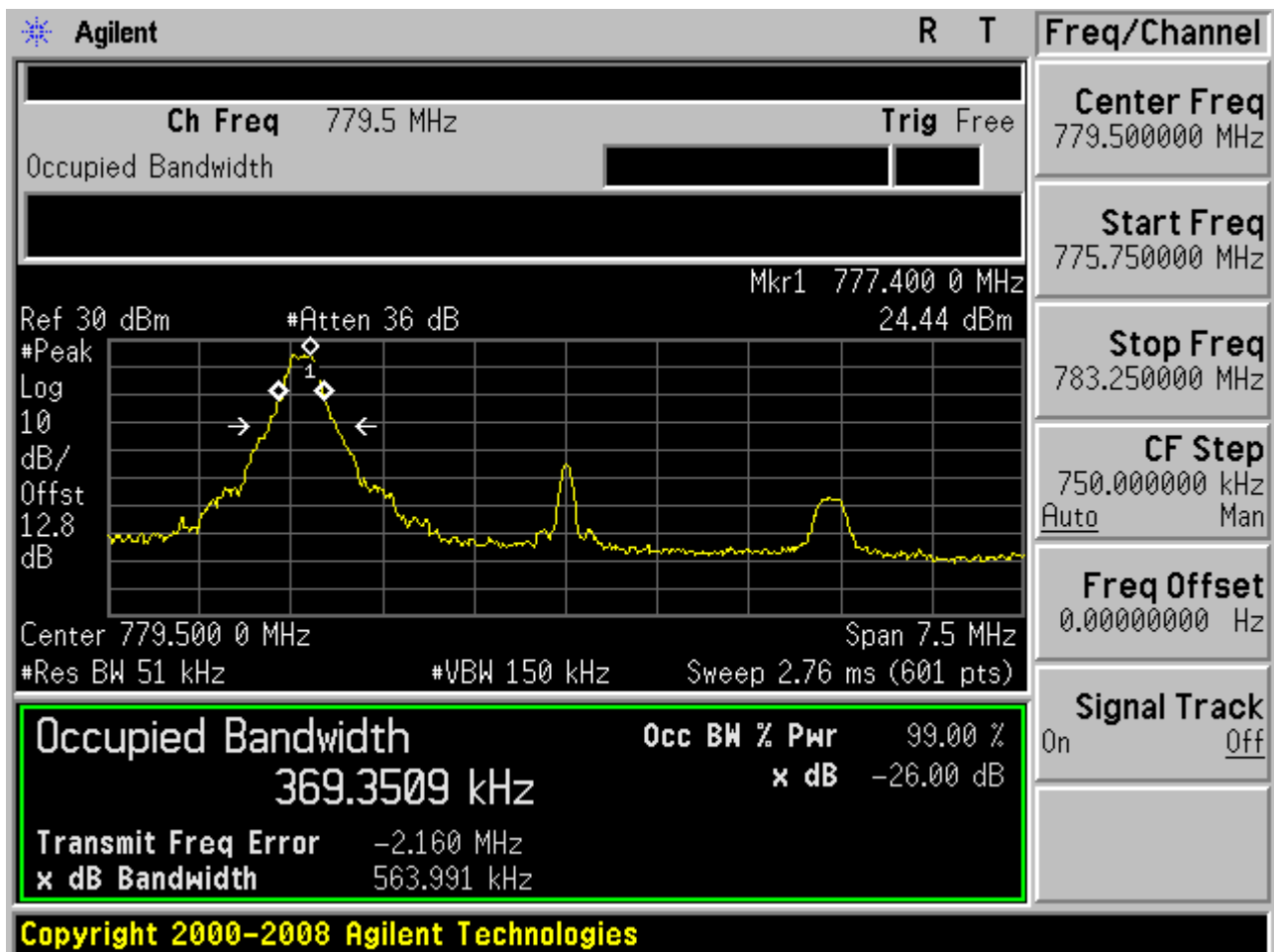
1 For Band 13

1.1 Test Mode=TM1

1.1.1 Channel Bandwidth = 5 MHz

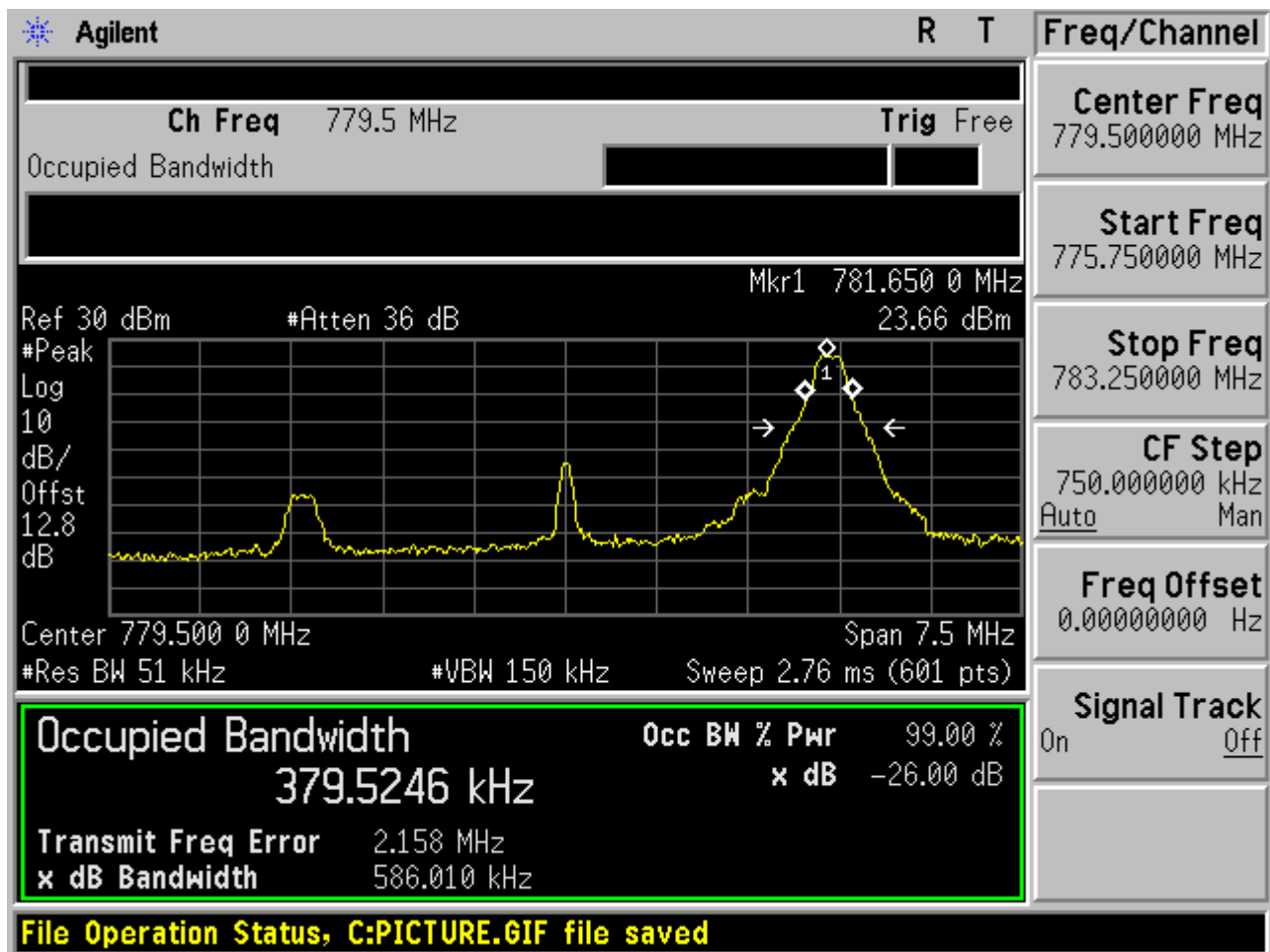
1.1.1.1 Channel = B

1.1.1.1.1 QPSK/1RB # 0

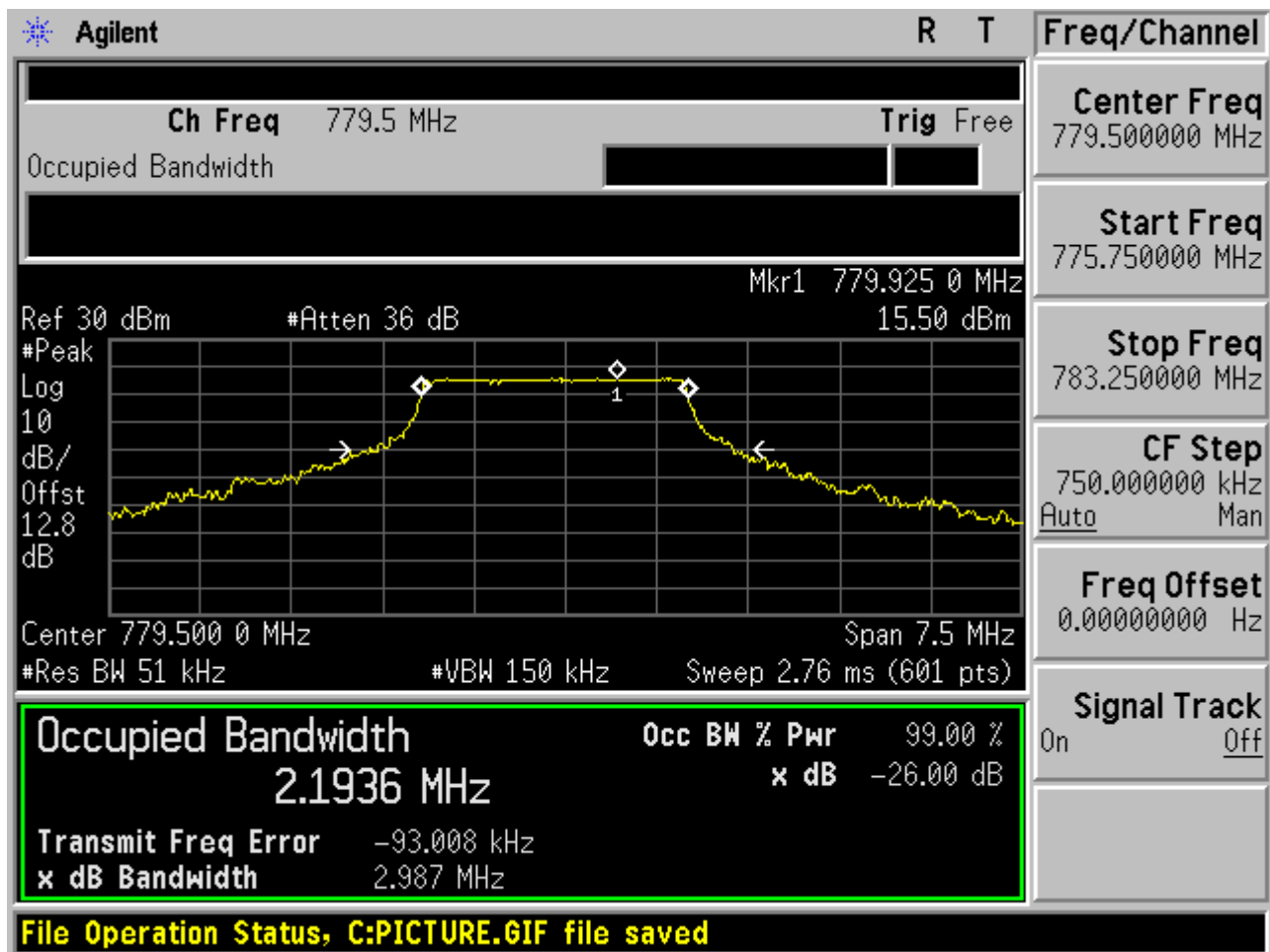




1.1.1.1.2 QPSK/1RB # max

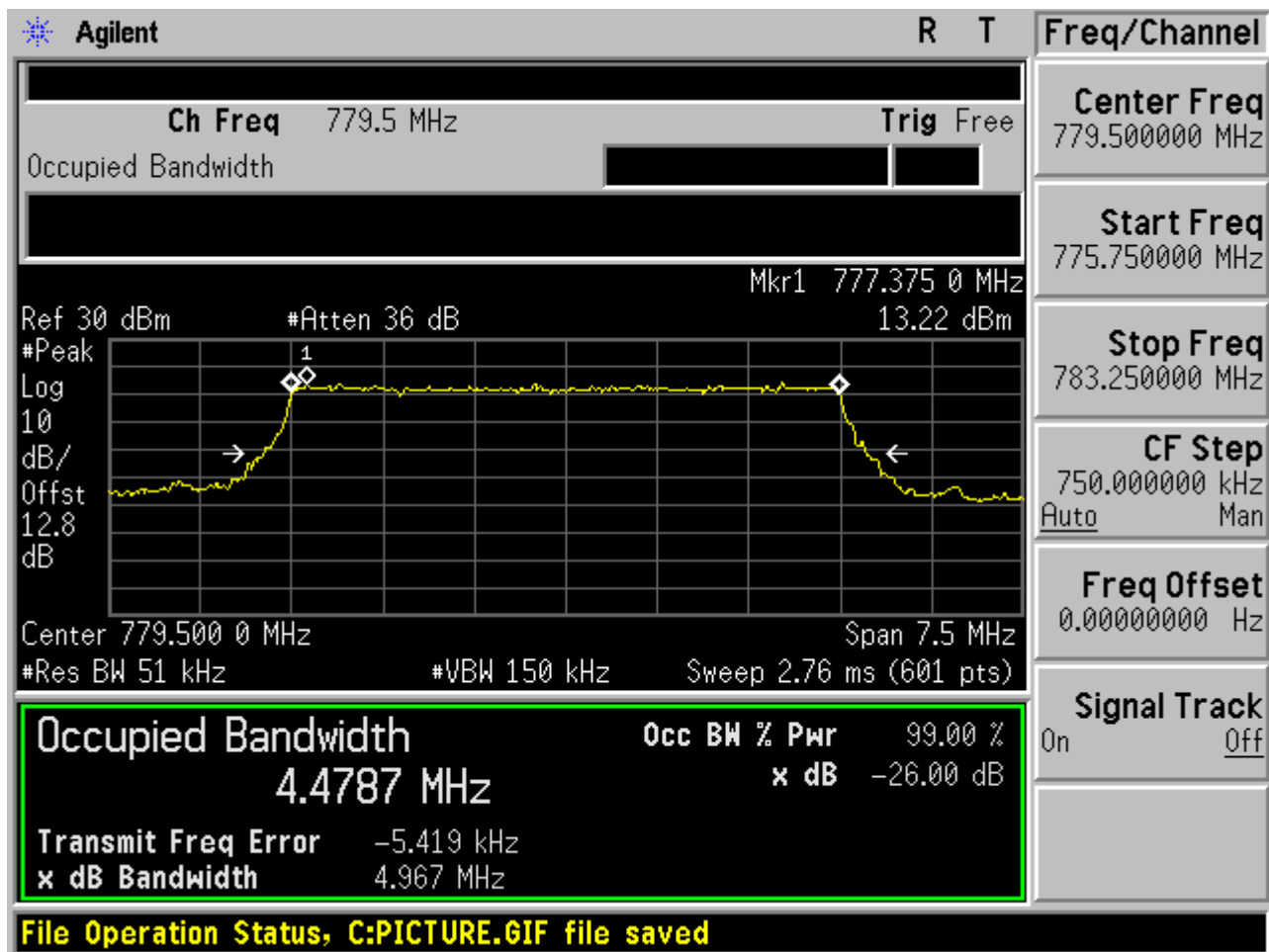


1.1.1.1.3 QPSK/non-1RB #mid/2





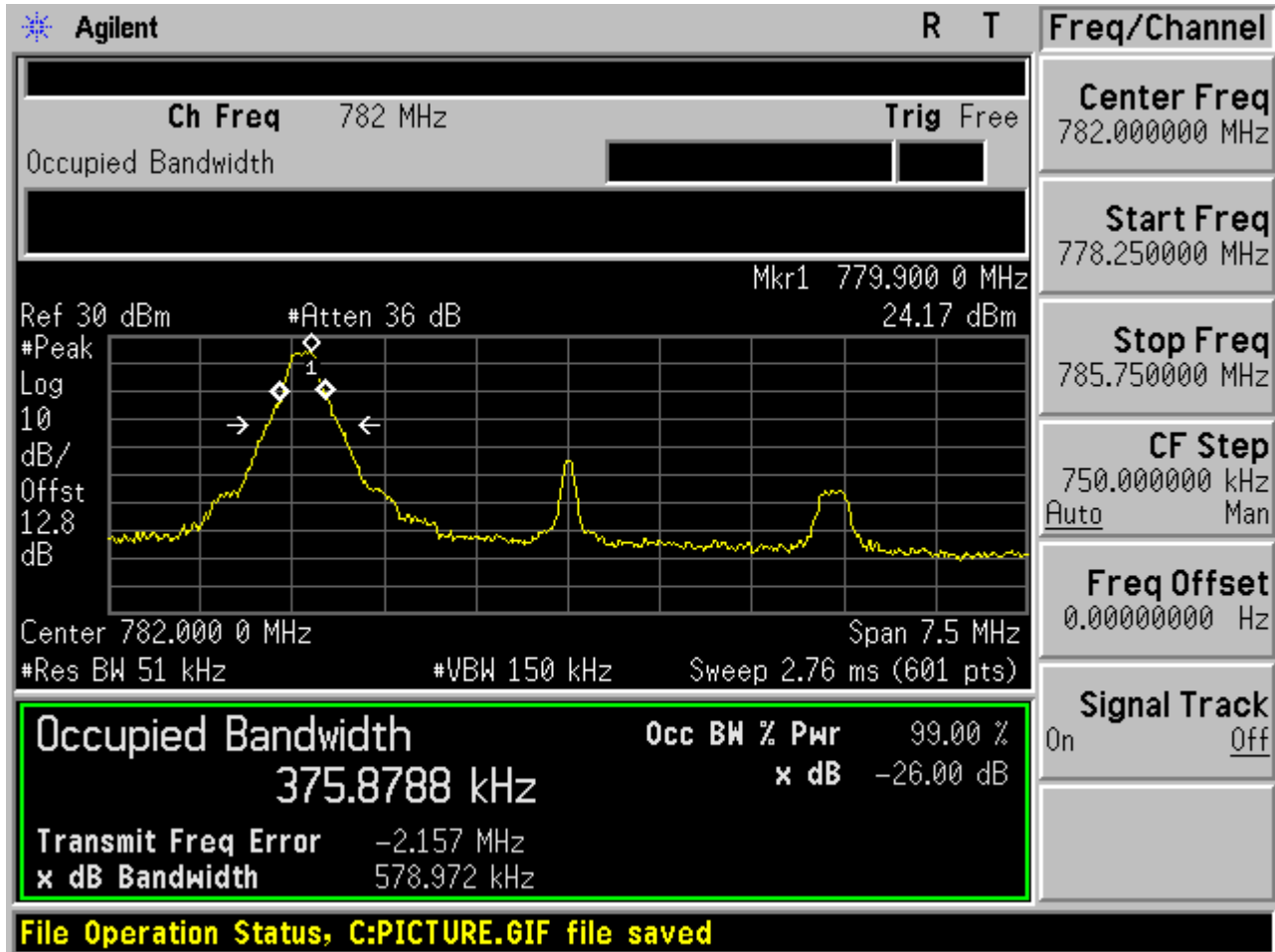
1.1.1.1.4 QPSK/full RBs





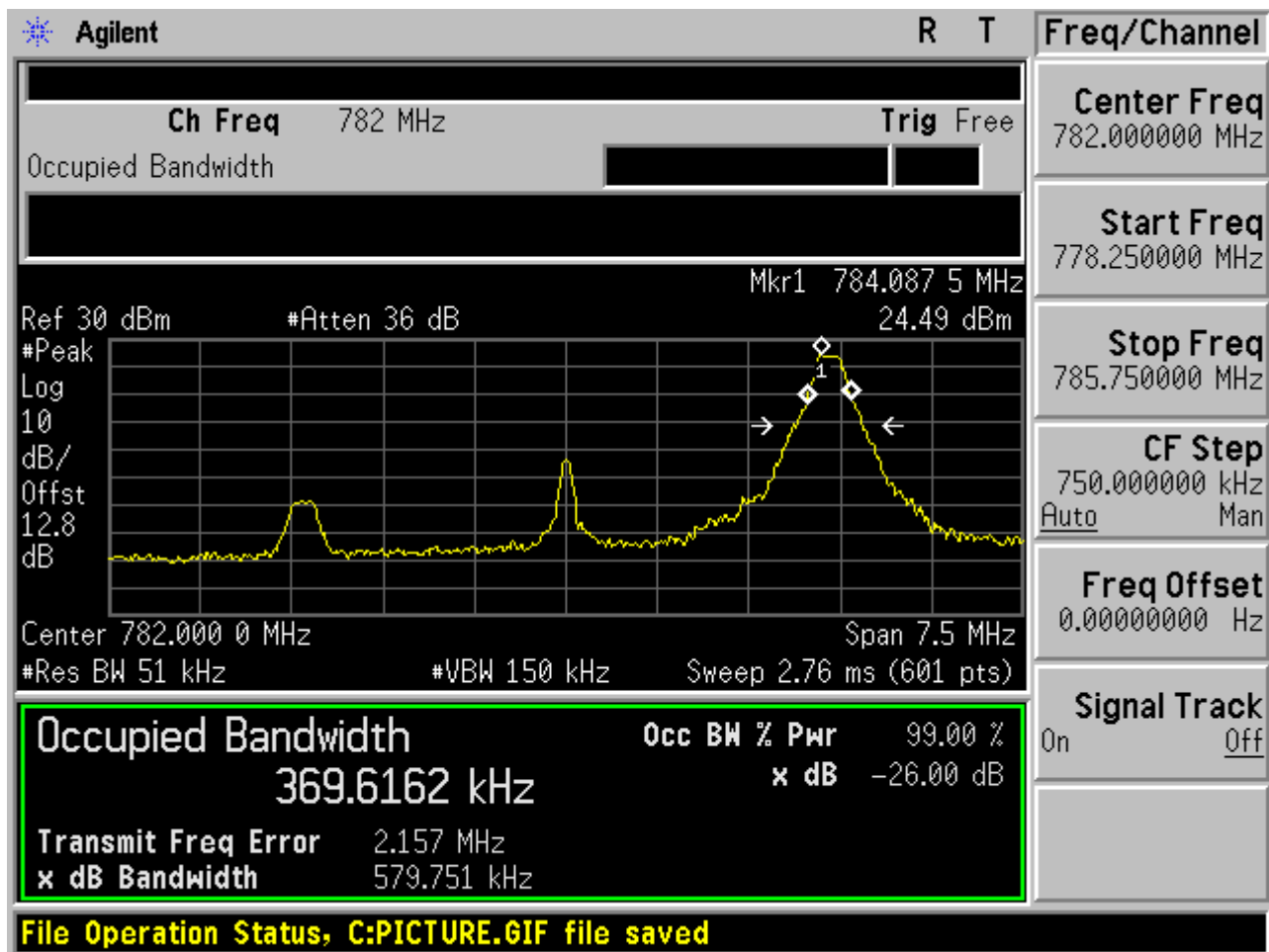
1.1.1.2 Channel =M

1.1.1.2.1 QPSK/1RB # 0



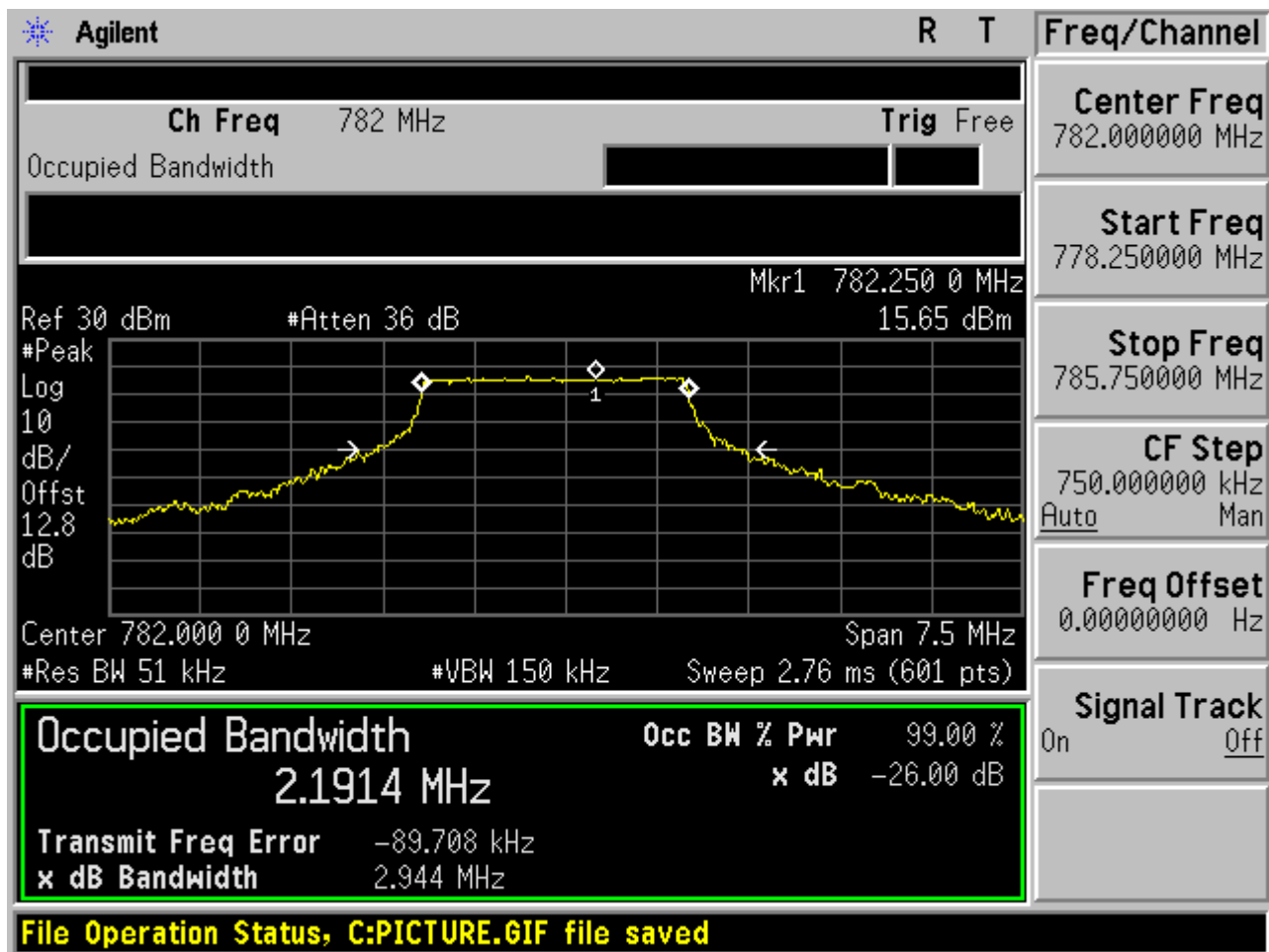


1.1.1.2.2 QPSK/1RB # max

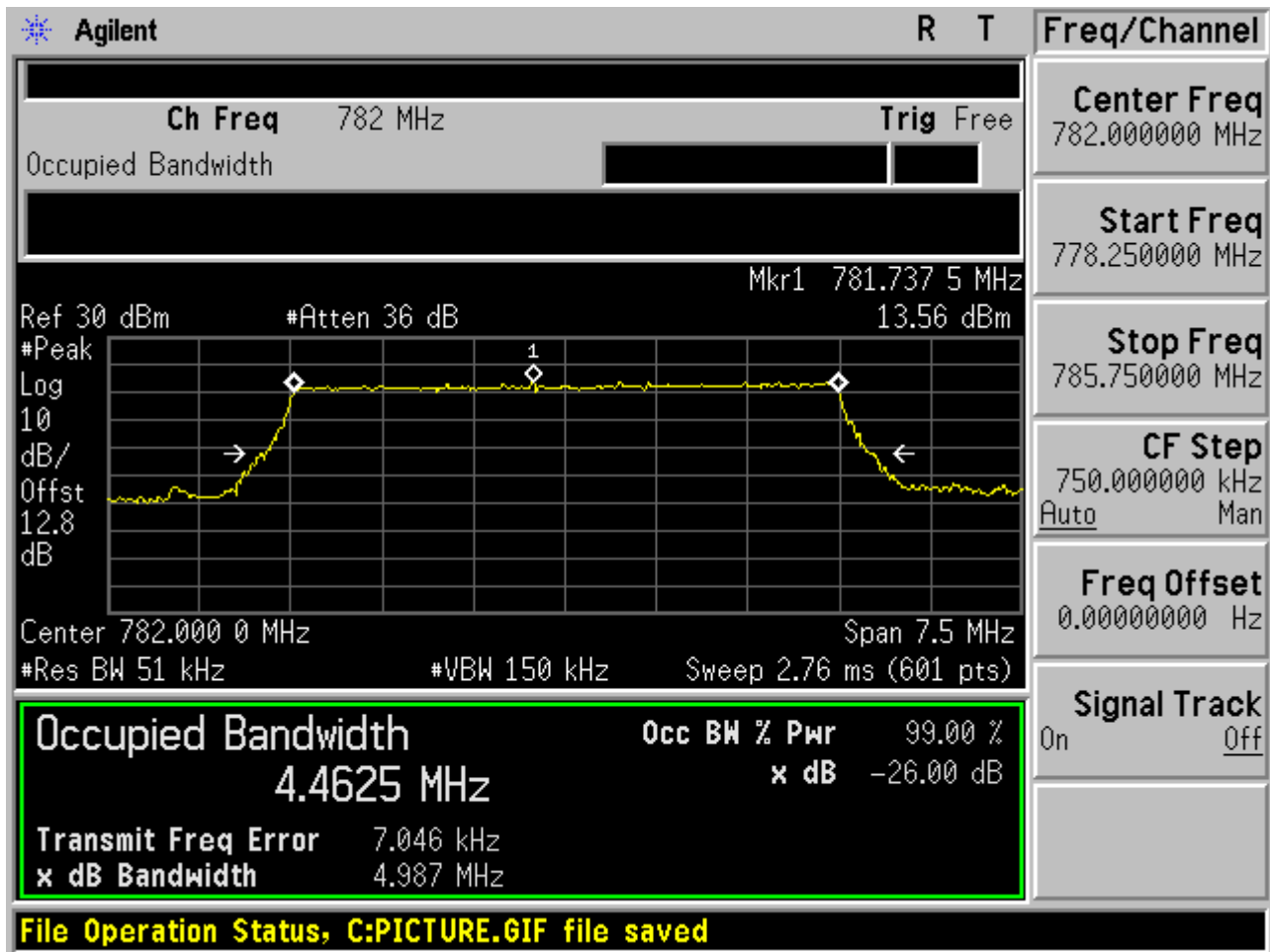




1.1.1.2.3 QPSK/non-1RB #mid/2



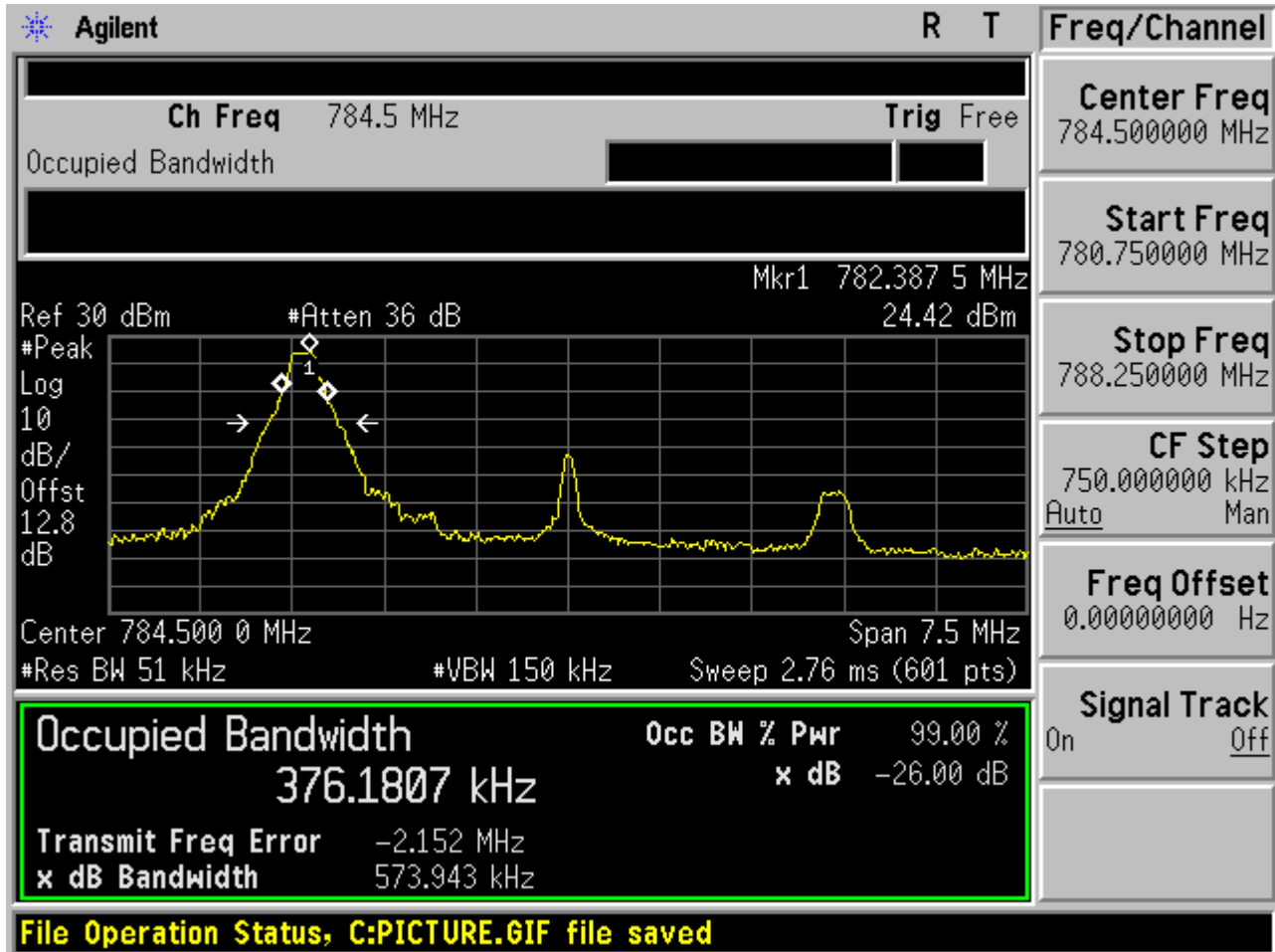
1.1.1.2.4 QPSK/full RBs





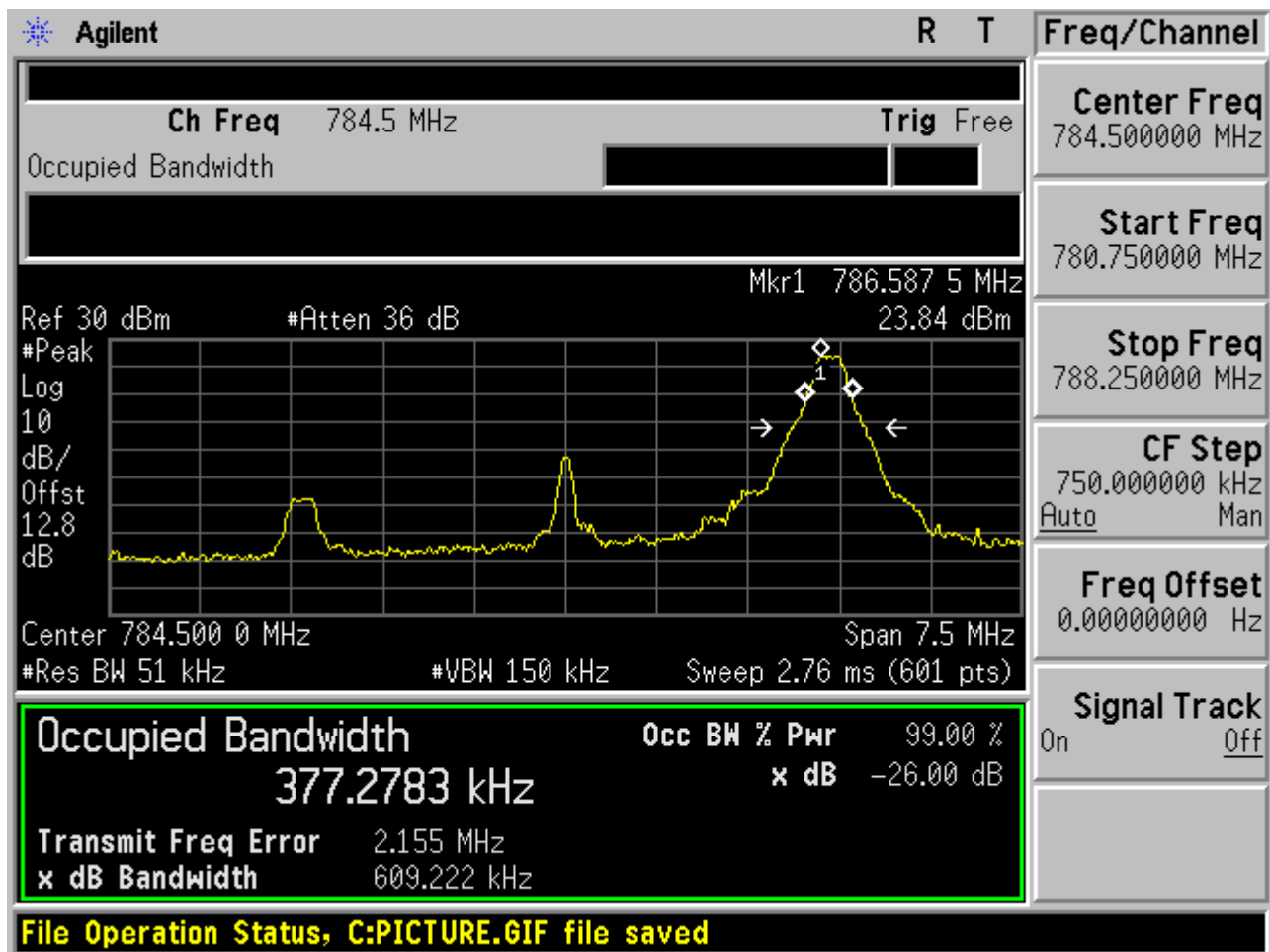
1.1.1.3 Channel =T

1.1.1.3.1 QPSK/1RB # 0



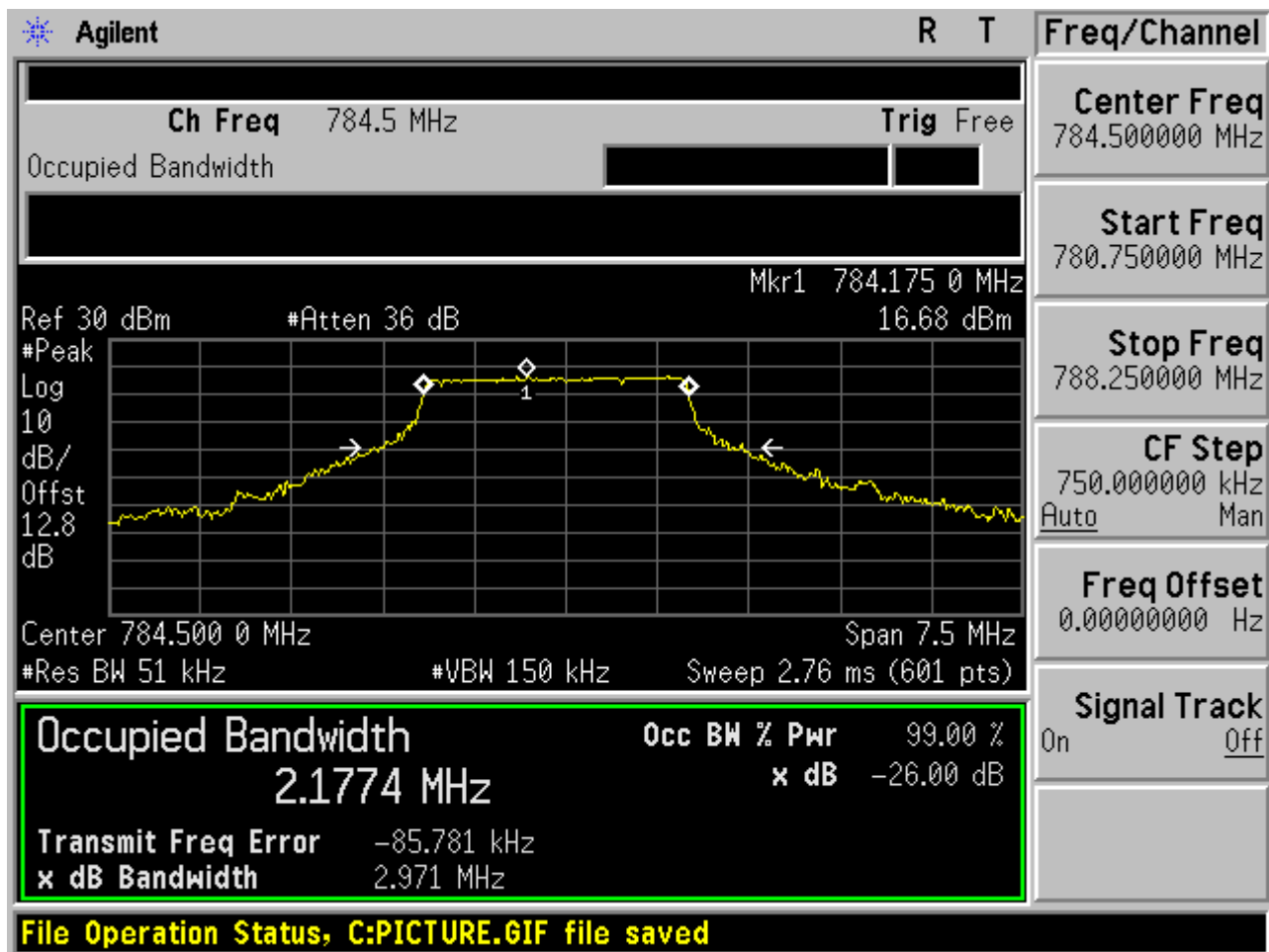


1.1.1.3.2 QPSK/1RB # max

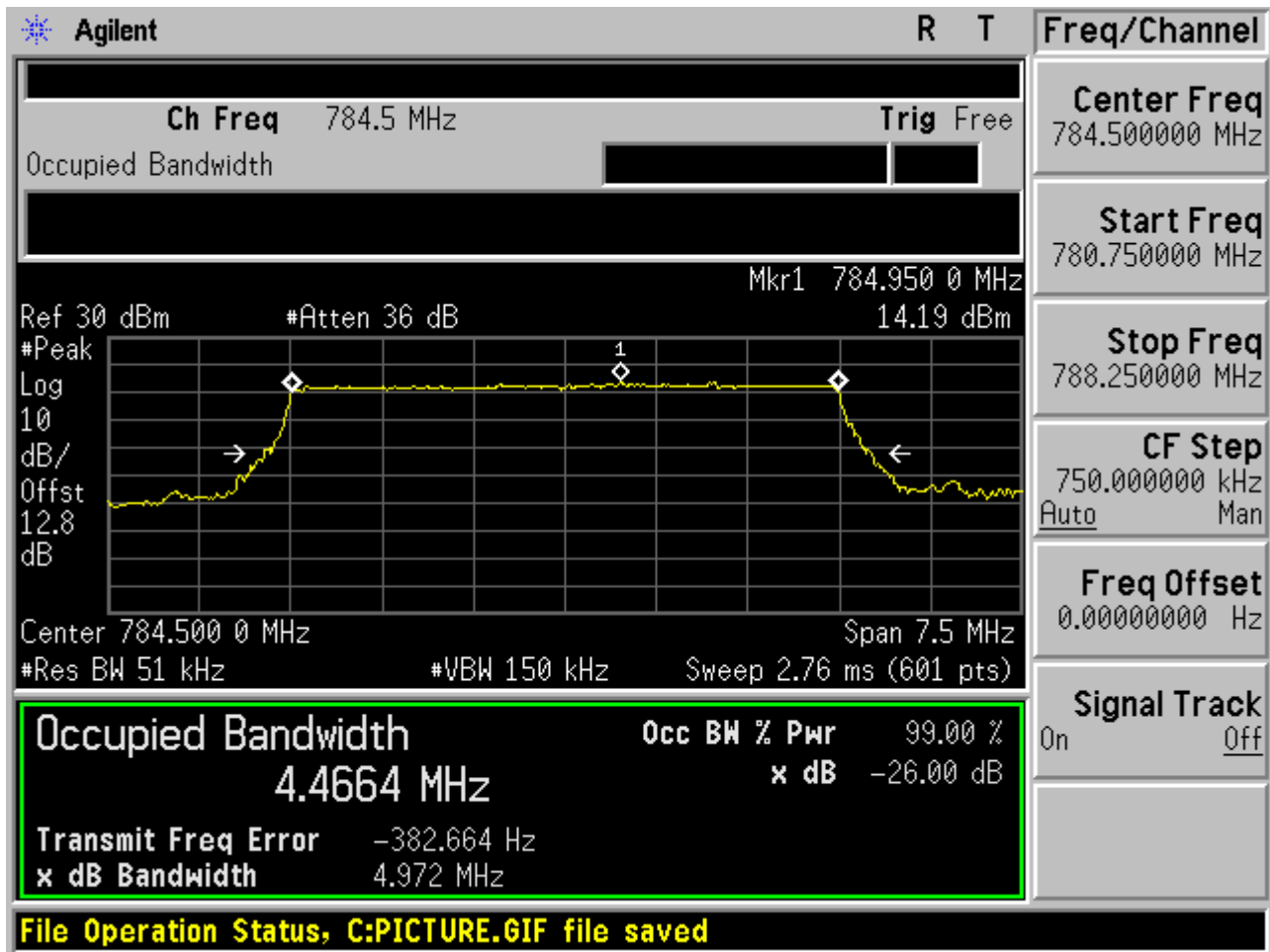




1.1.1.3.3 QPSK/non-1RB #mid/2



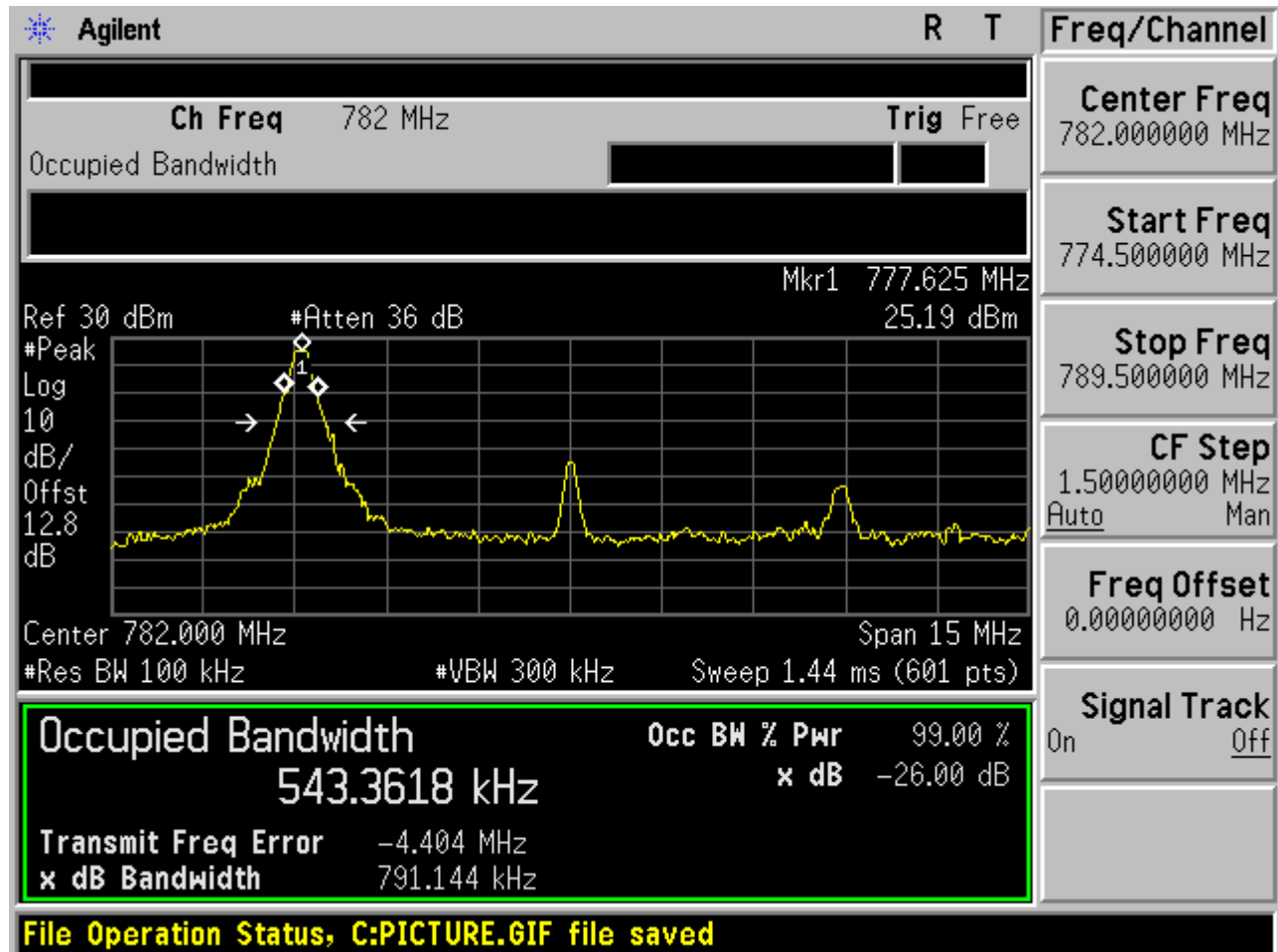
1.1.1.3.4 QPSK/full RBs



1.1.2 Channel Bandwidth = 10 MHz

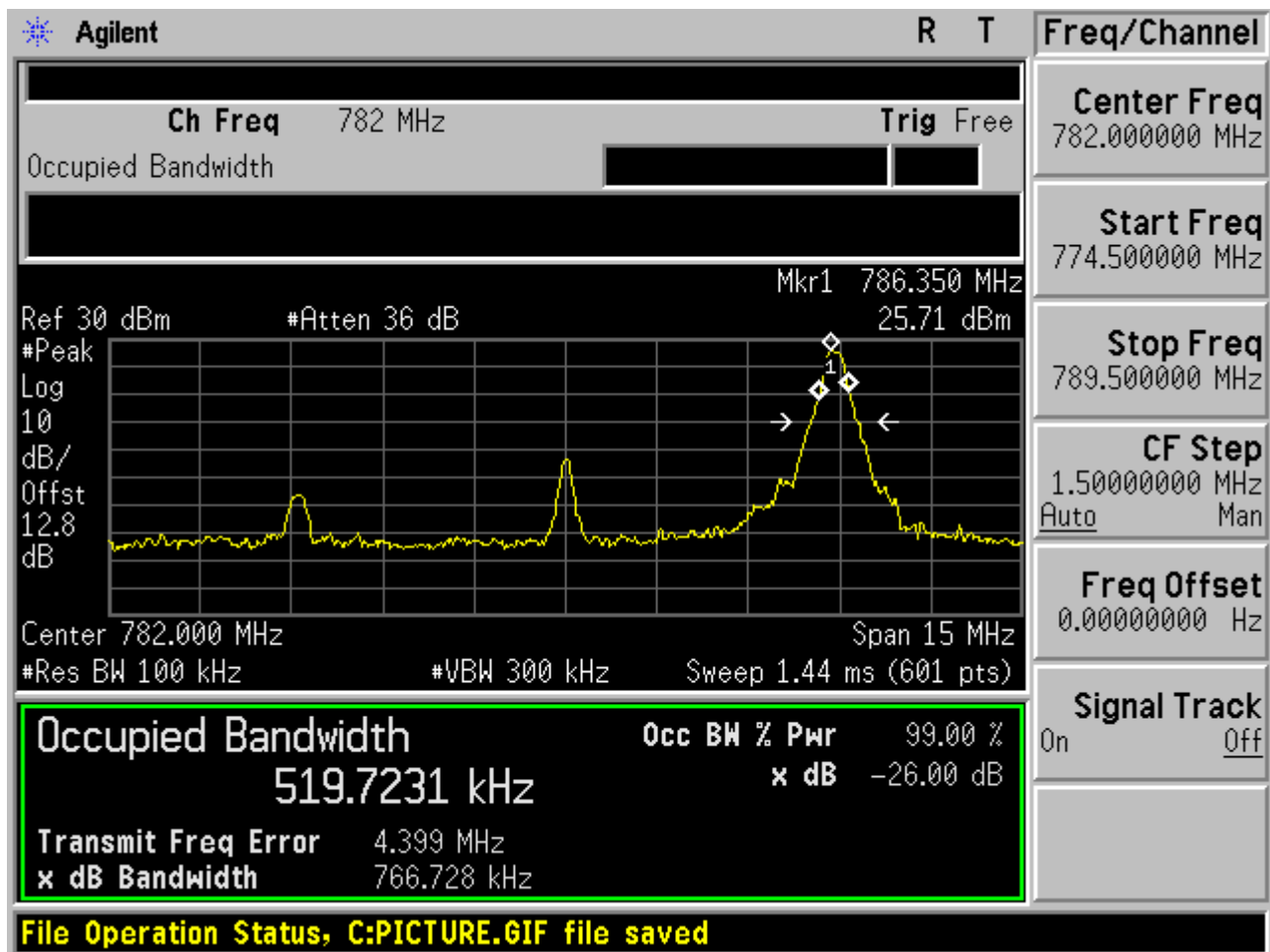
1.1.2.1 Channel = B/M/H

1.1.2.1.1 QPSK/1RB # 0

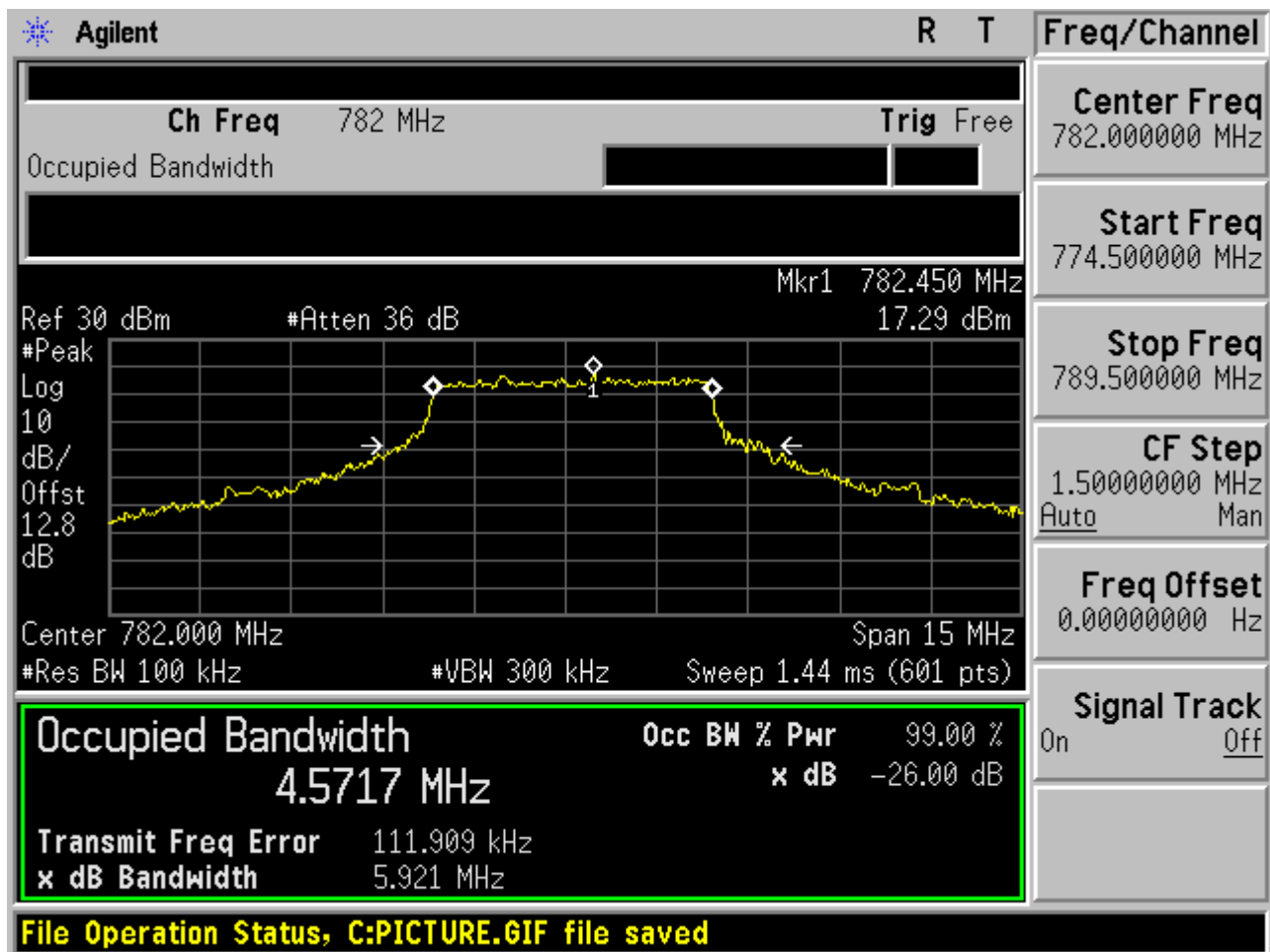




1.1.2.1.2 QPSK/1RB # max

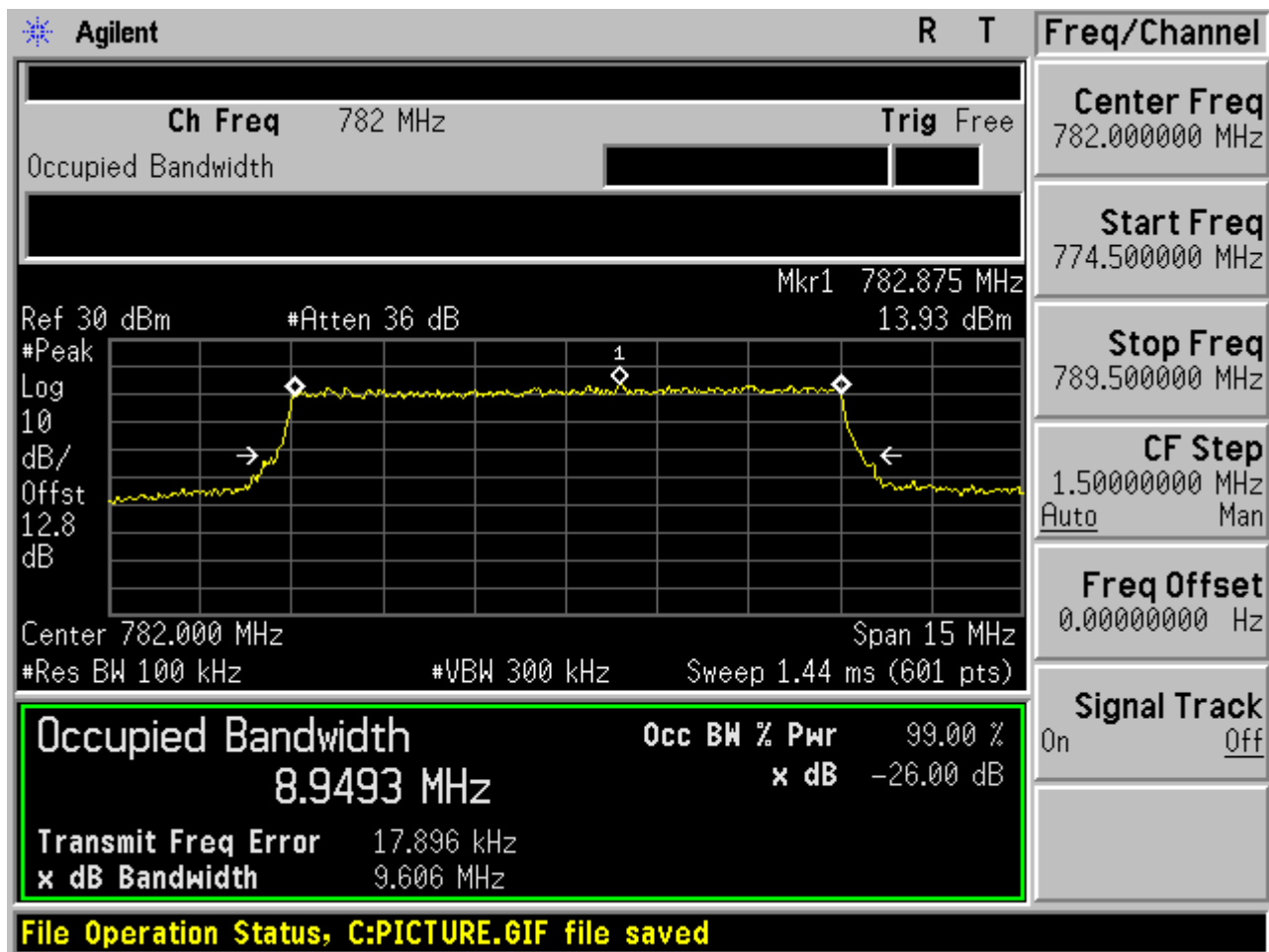


1.1.2.1.3 QPSK/non-1RB #mid/2





1.1.2.1.4 QPSK/full RBs

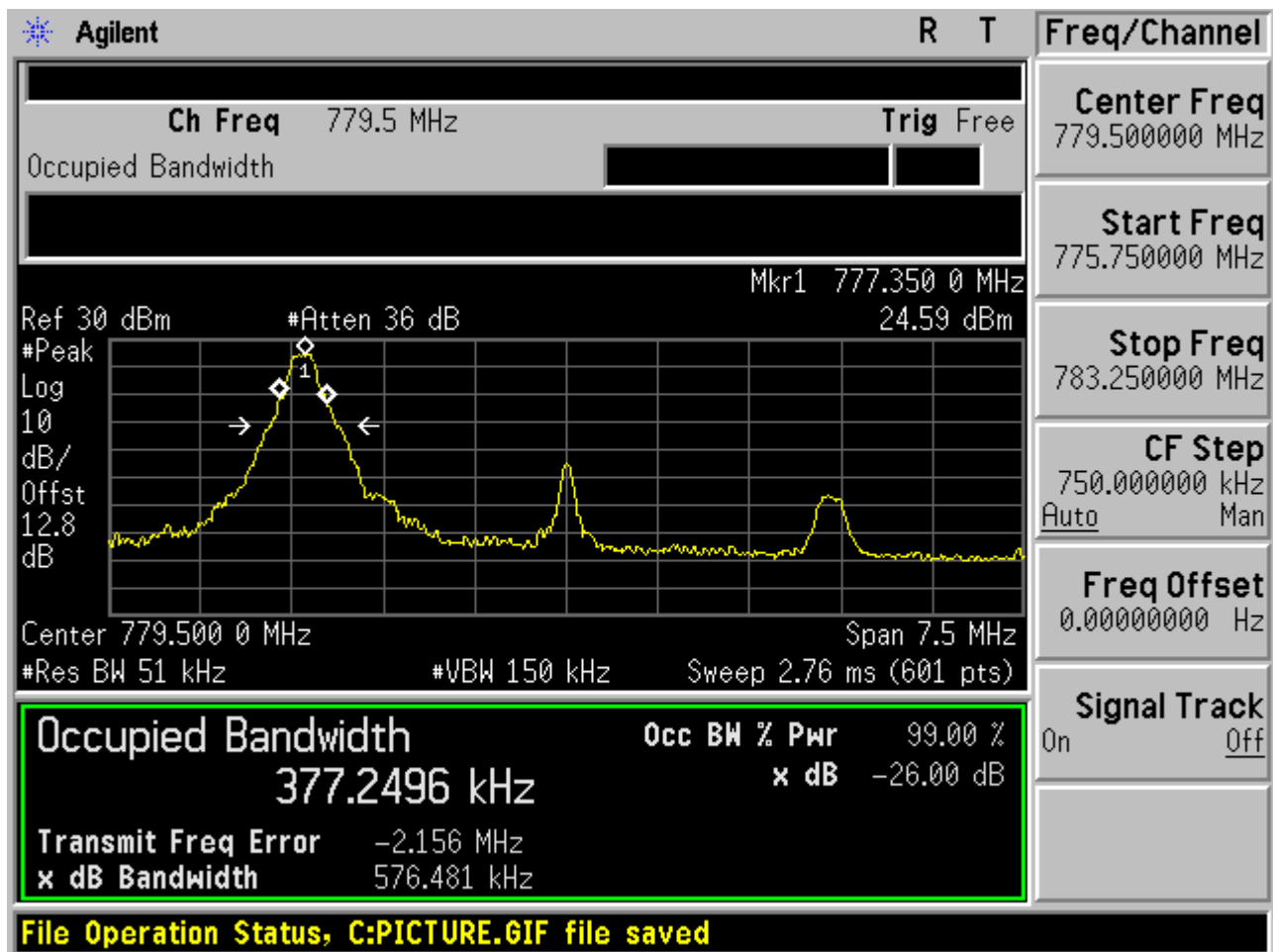


1.2 Test Mode=TM2

1.2.1 Channel Bandwidth = 5 MHz

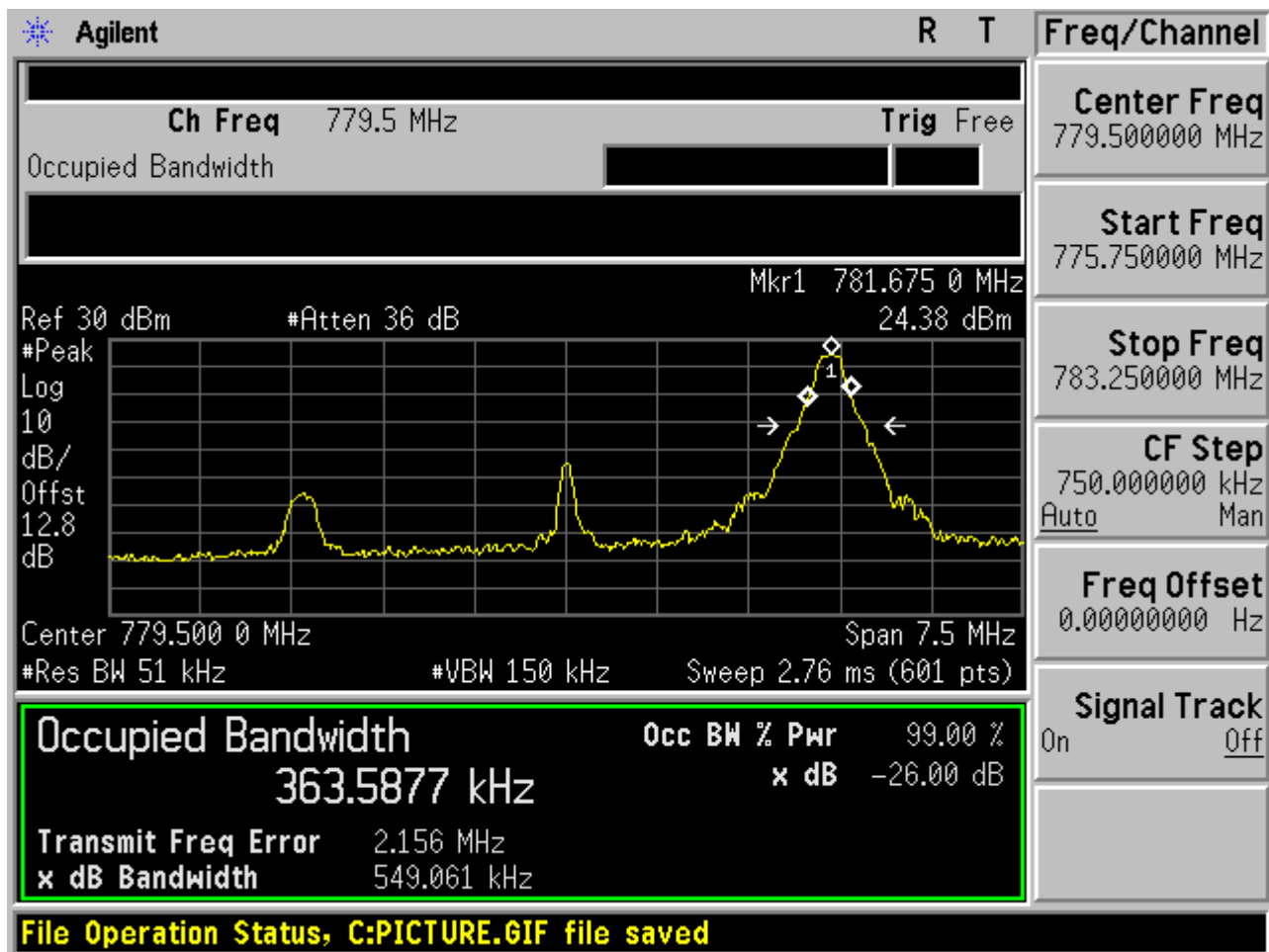
1.2.1.1 Channel =B

1.2.1.1.1 16QAM/1RB # 0



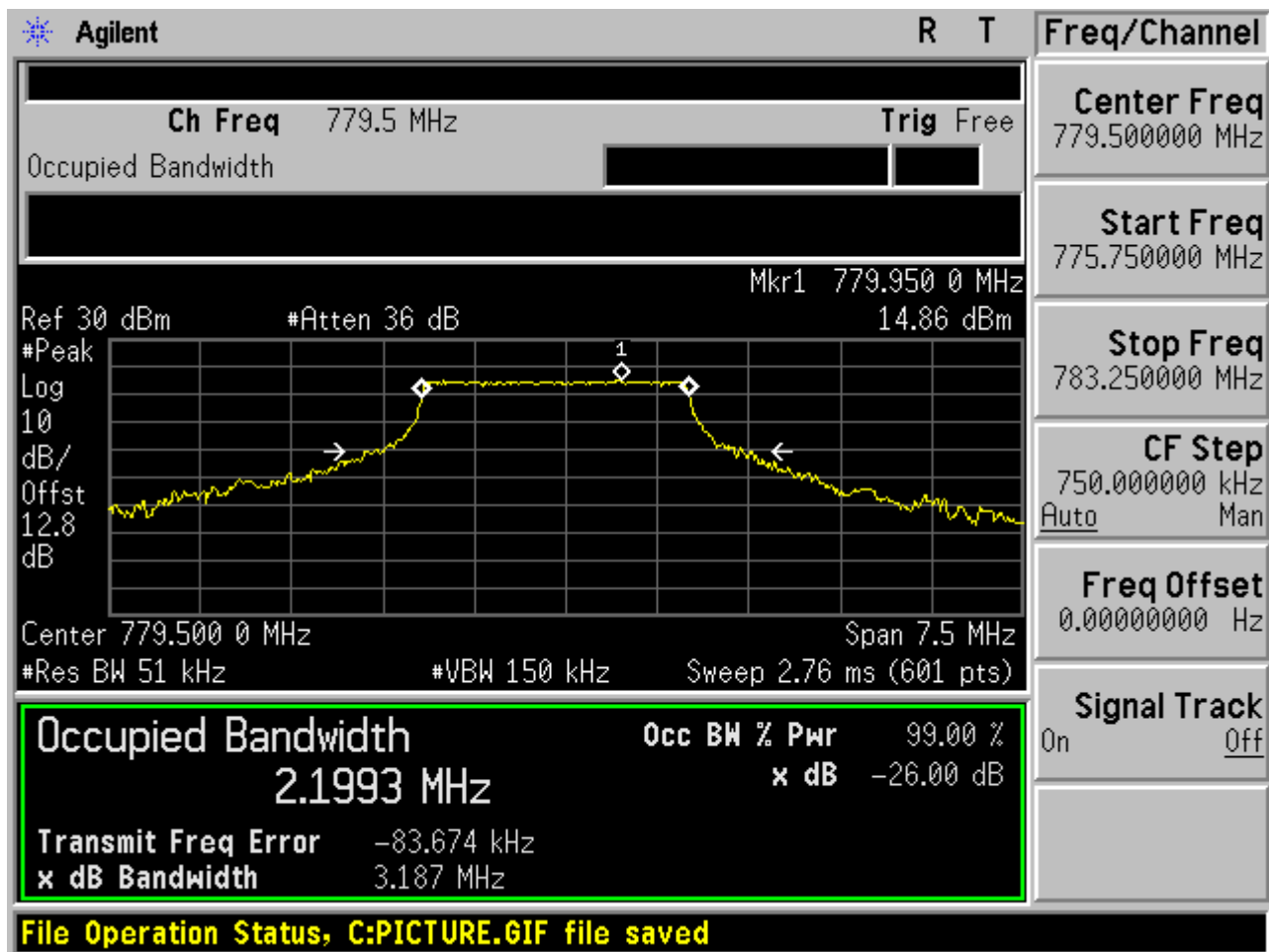


1.2.1.1.2 16QAM /1RB # max



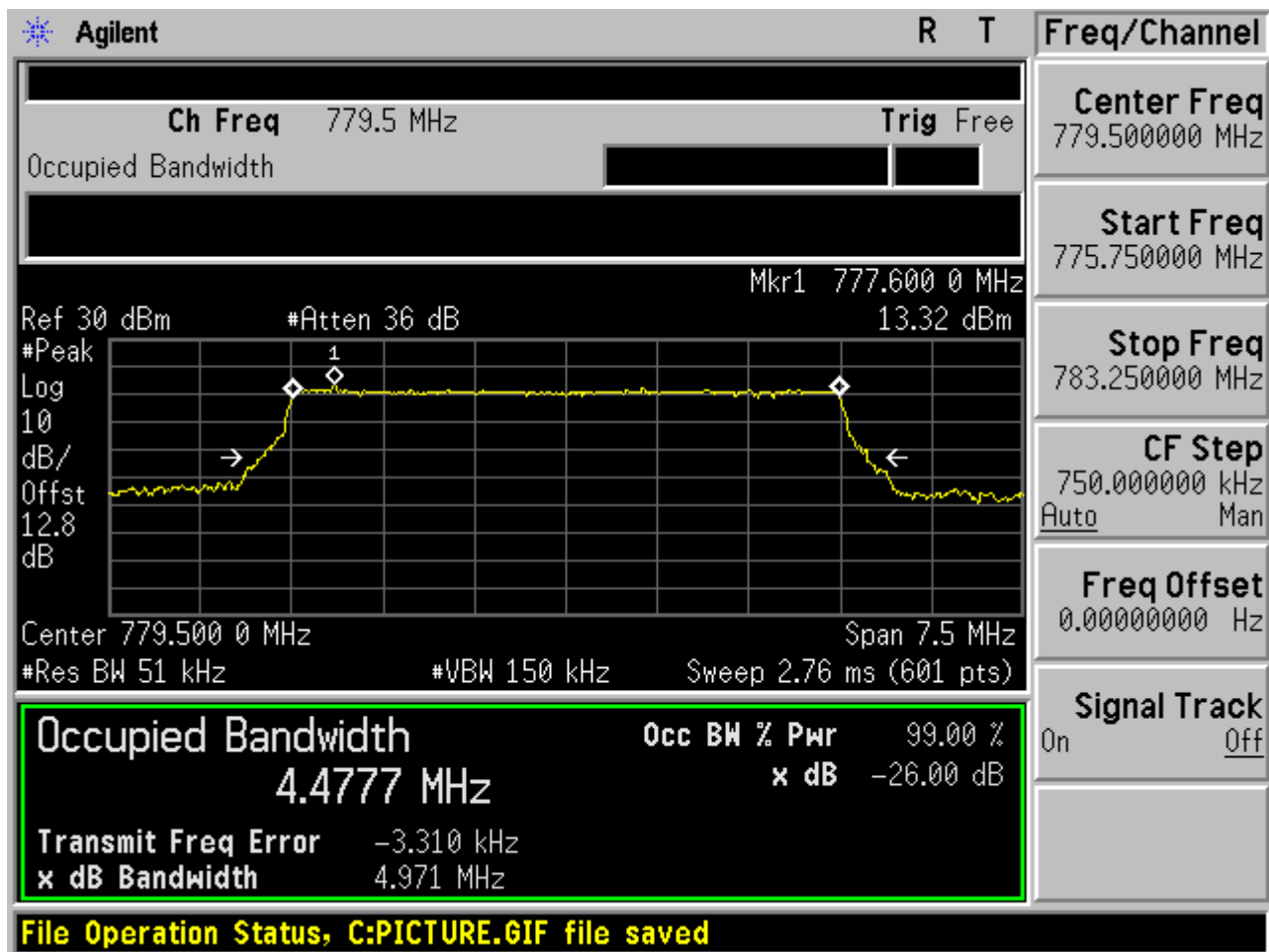


1.2.1.1.3 16QAM /non-1RB #mid/2





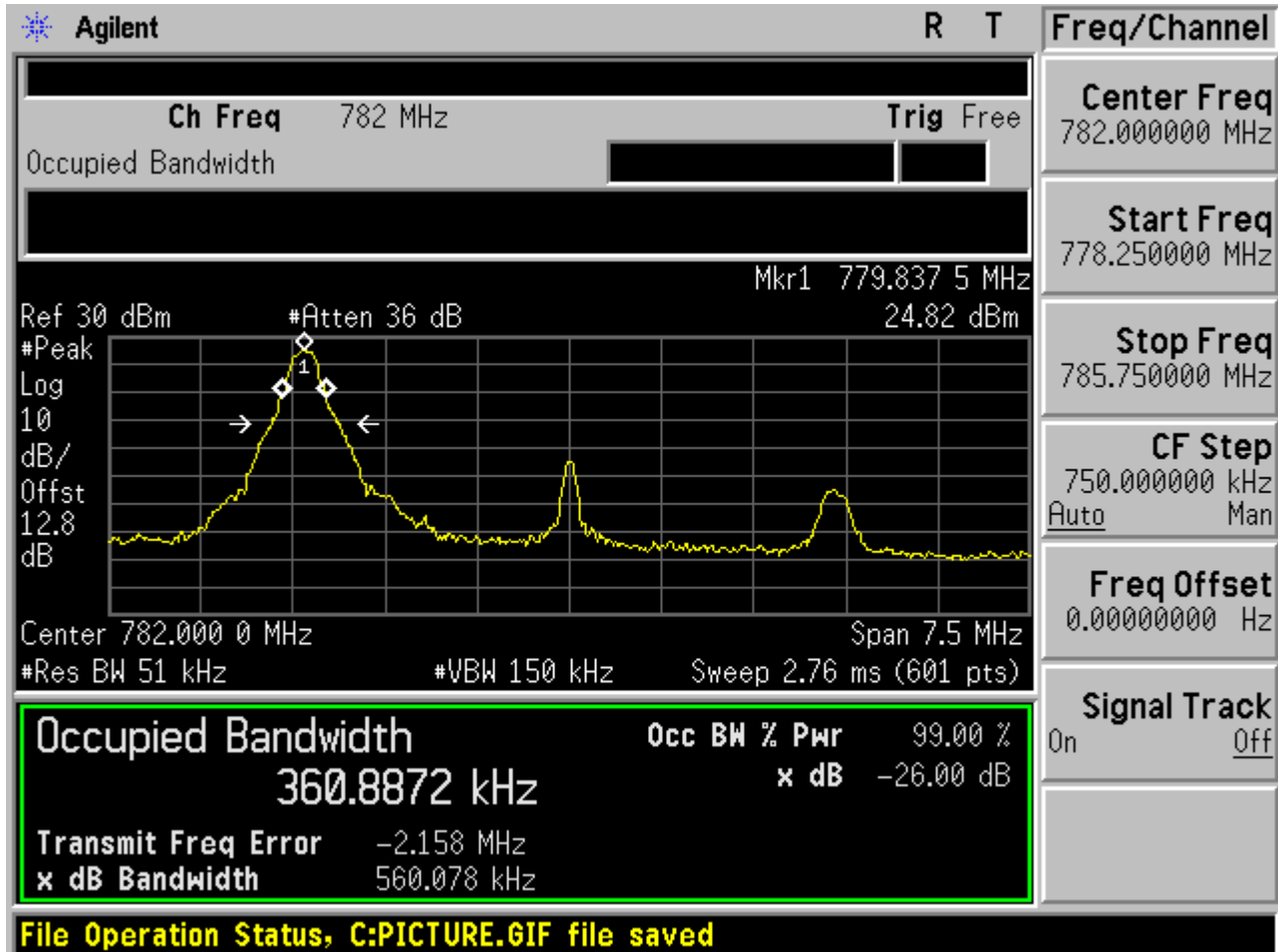
1.2.1.1.4 16QAM /full RBs





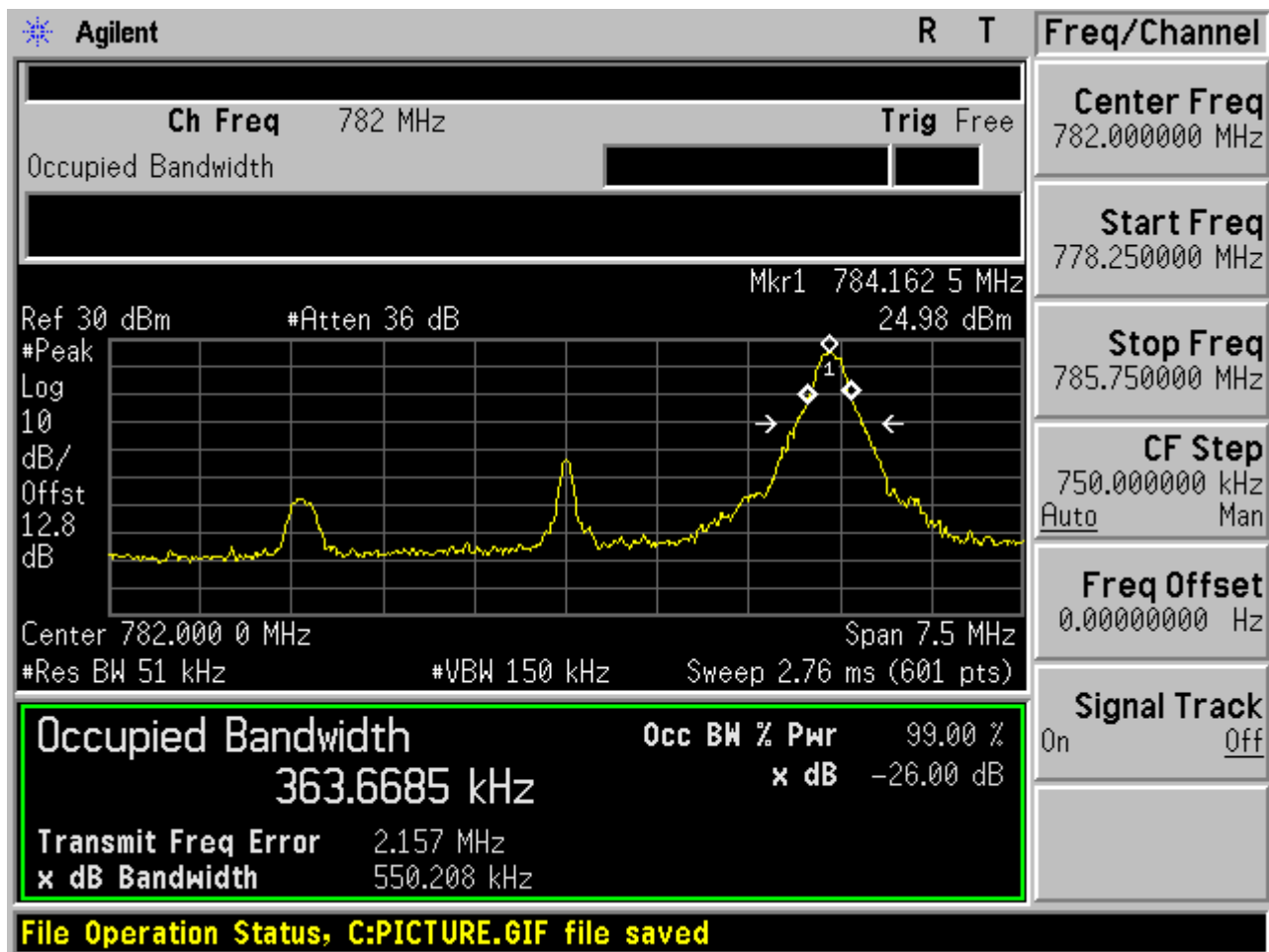
1.2.1.2 Channel =M

1.2.1.2.1 16QAM/1RB # 0

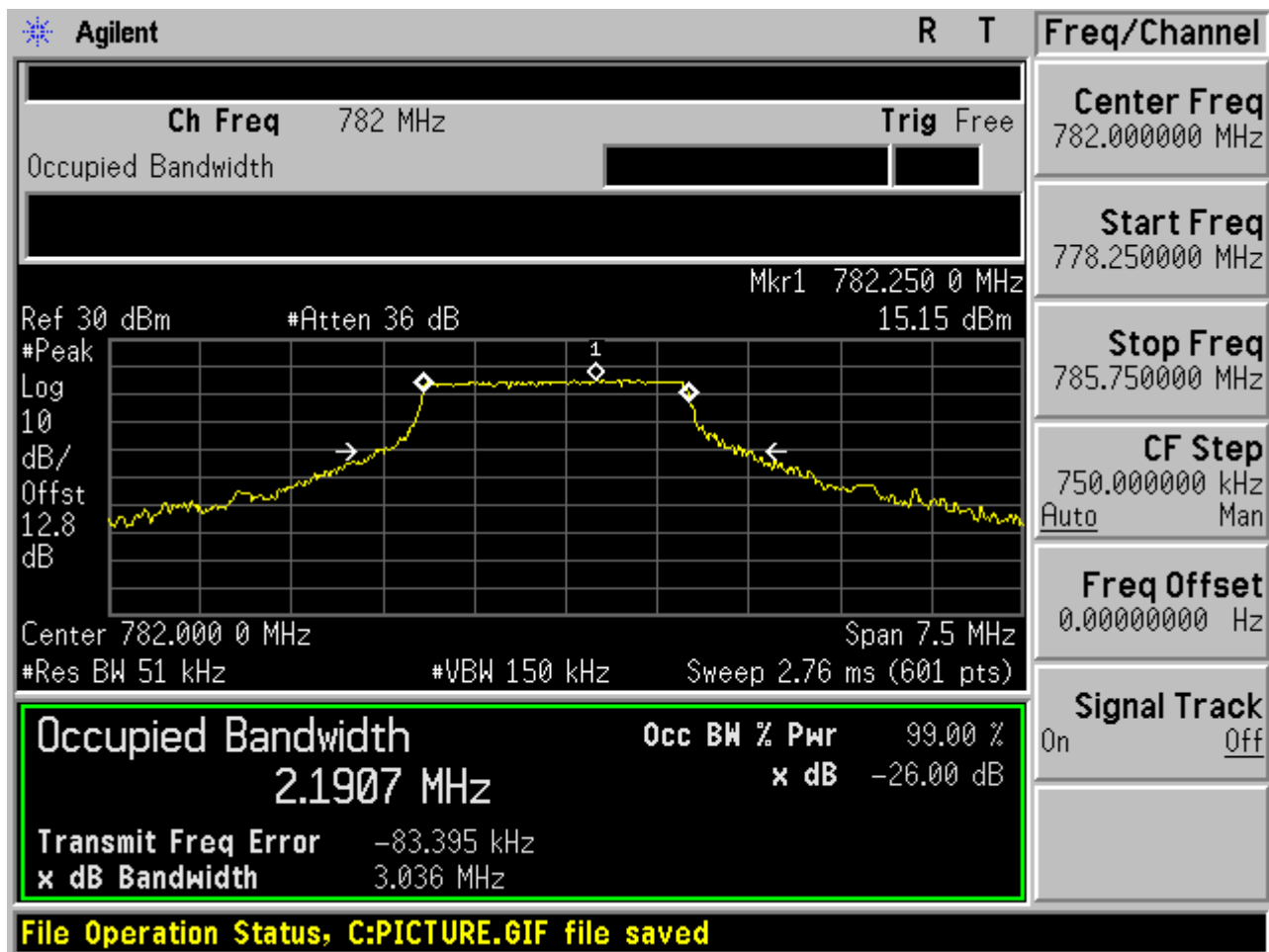




1.2.1.2.2 16QAM /1RB # max

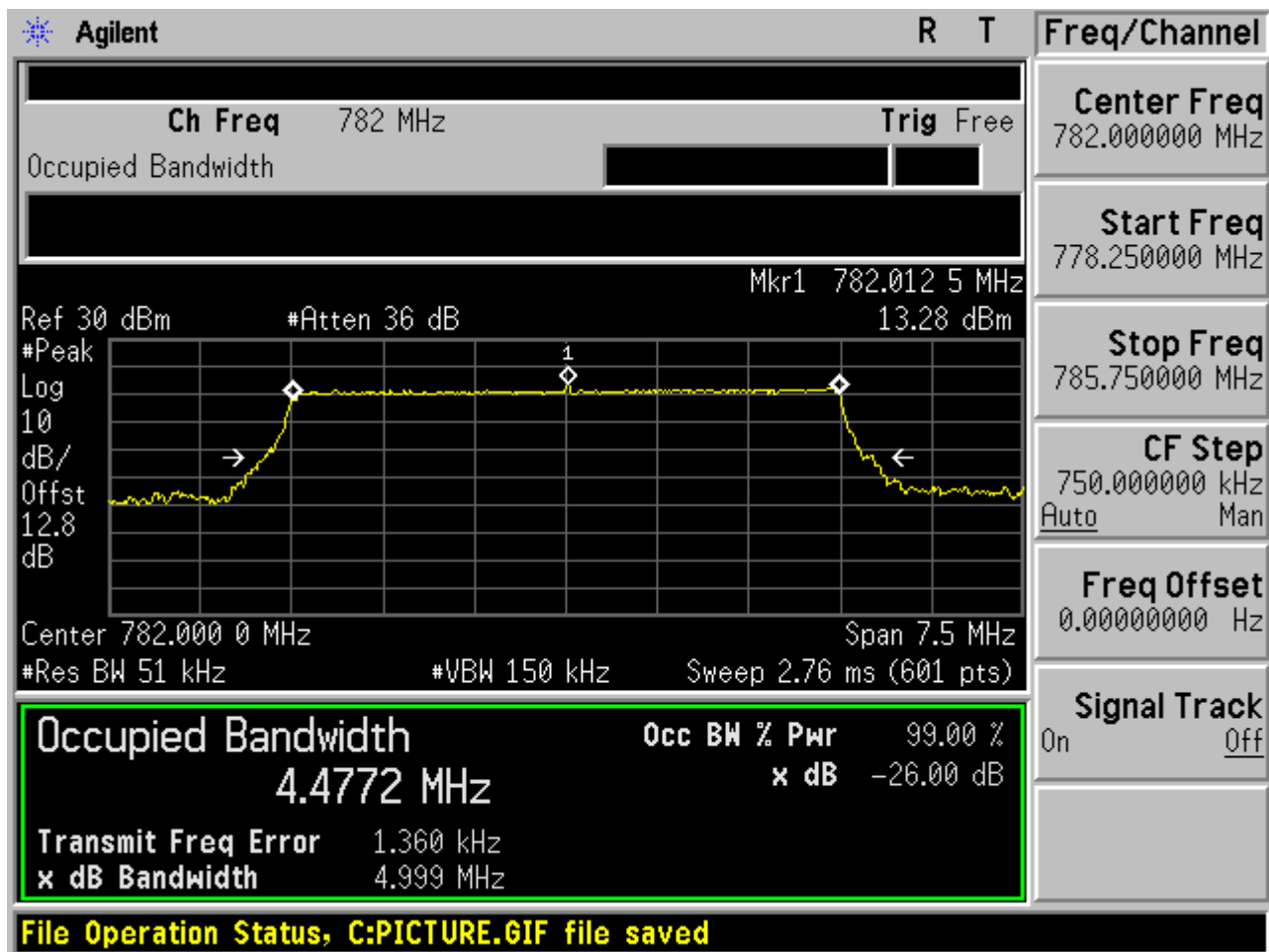


1.2.1.2.3 16QAM /non-1RB #mid/2





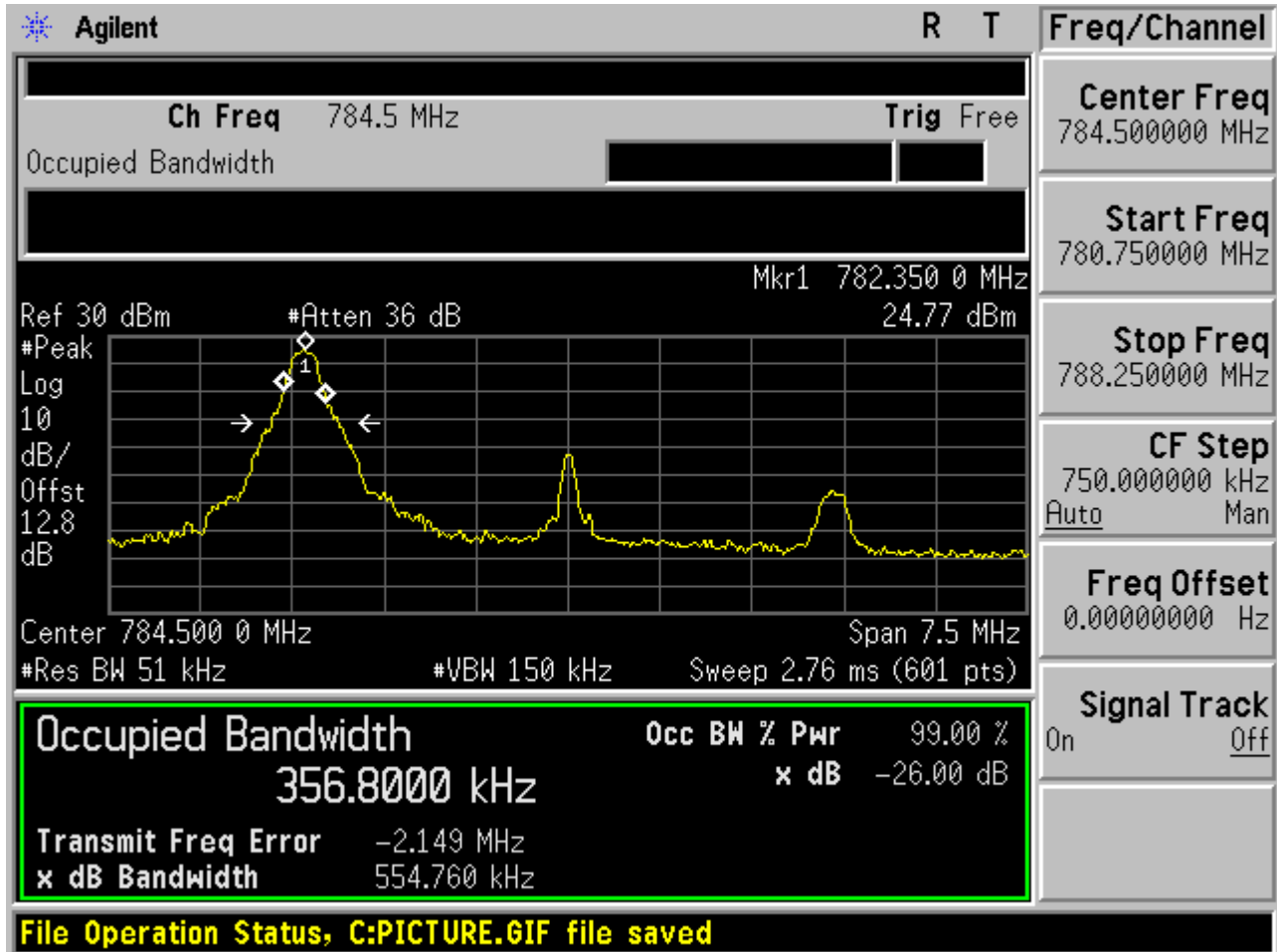
1.2.1.2.4 16QAM /full RBs





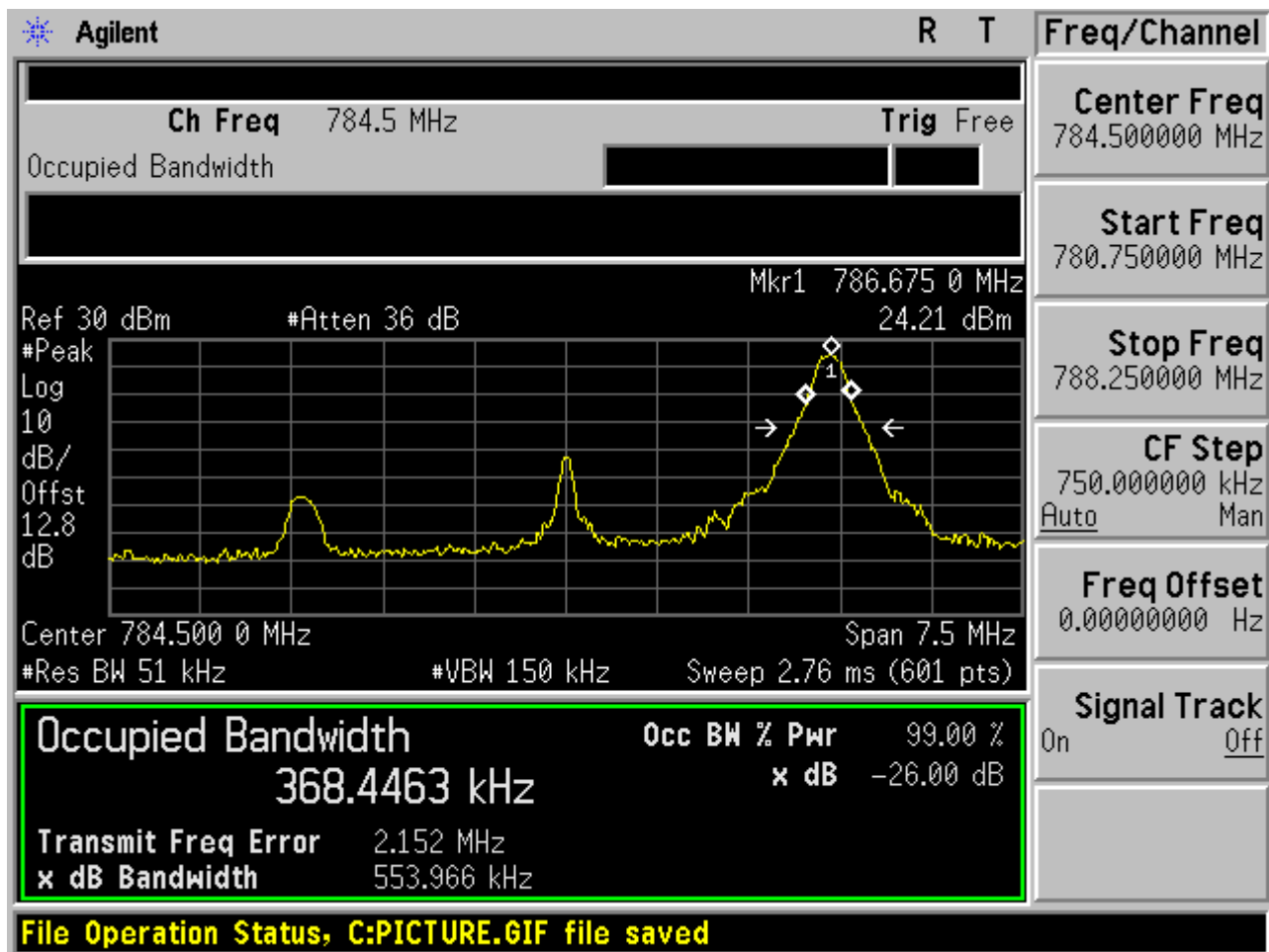
1.2.1.3 Channel =T

1.2.1.3.1 16QAM/1RB # 0

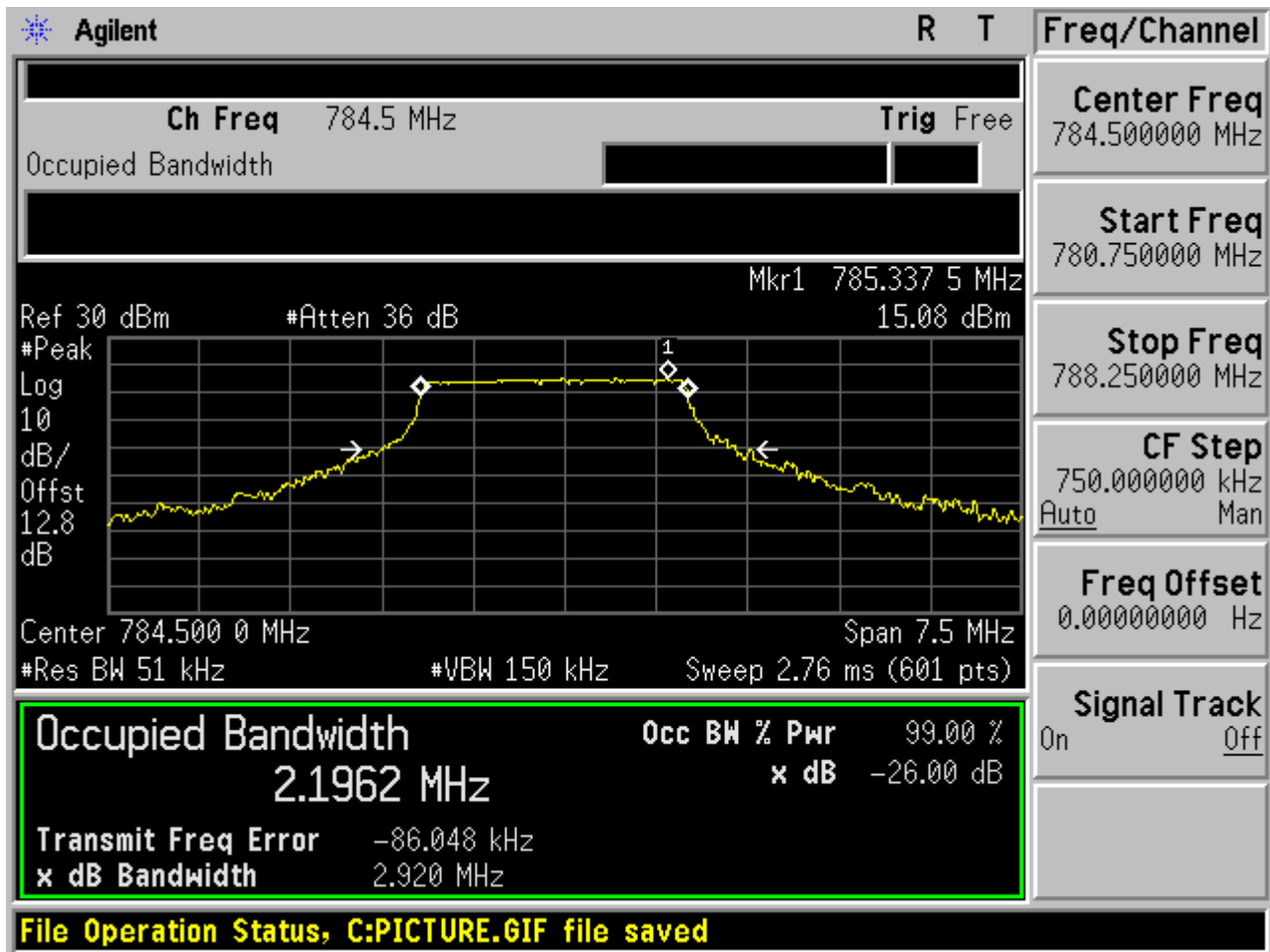




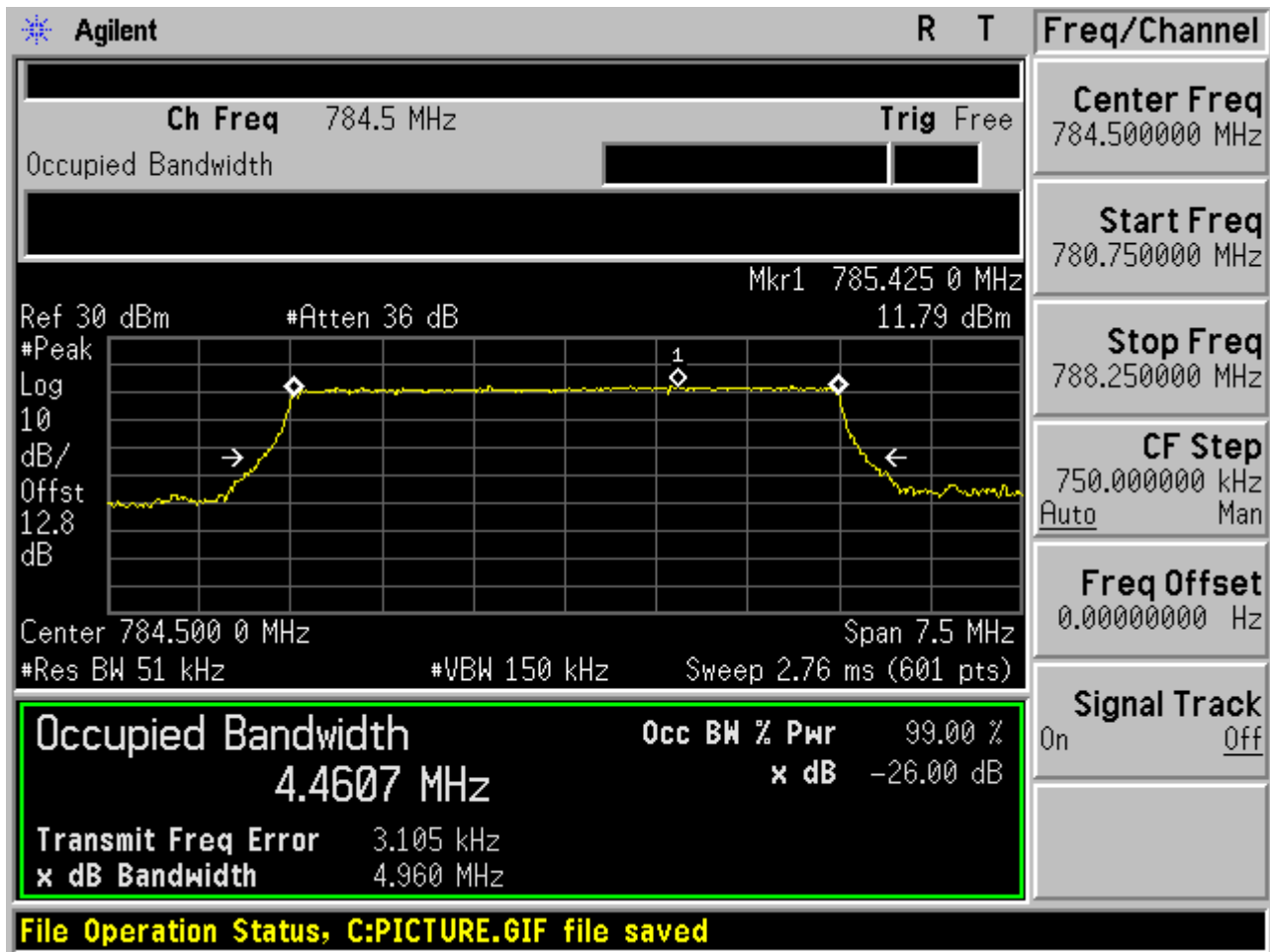
1.2.1.3.2 16QAM /1RB # max



1.2.1.3.3 16QAM /non-1RB #mid/2



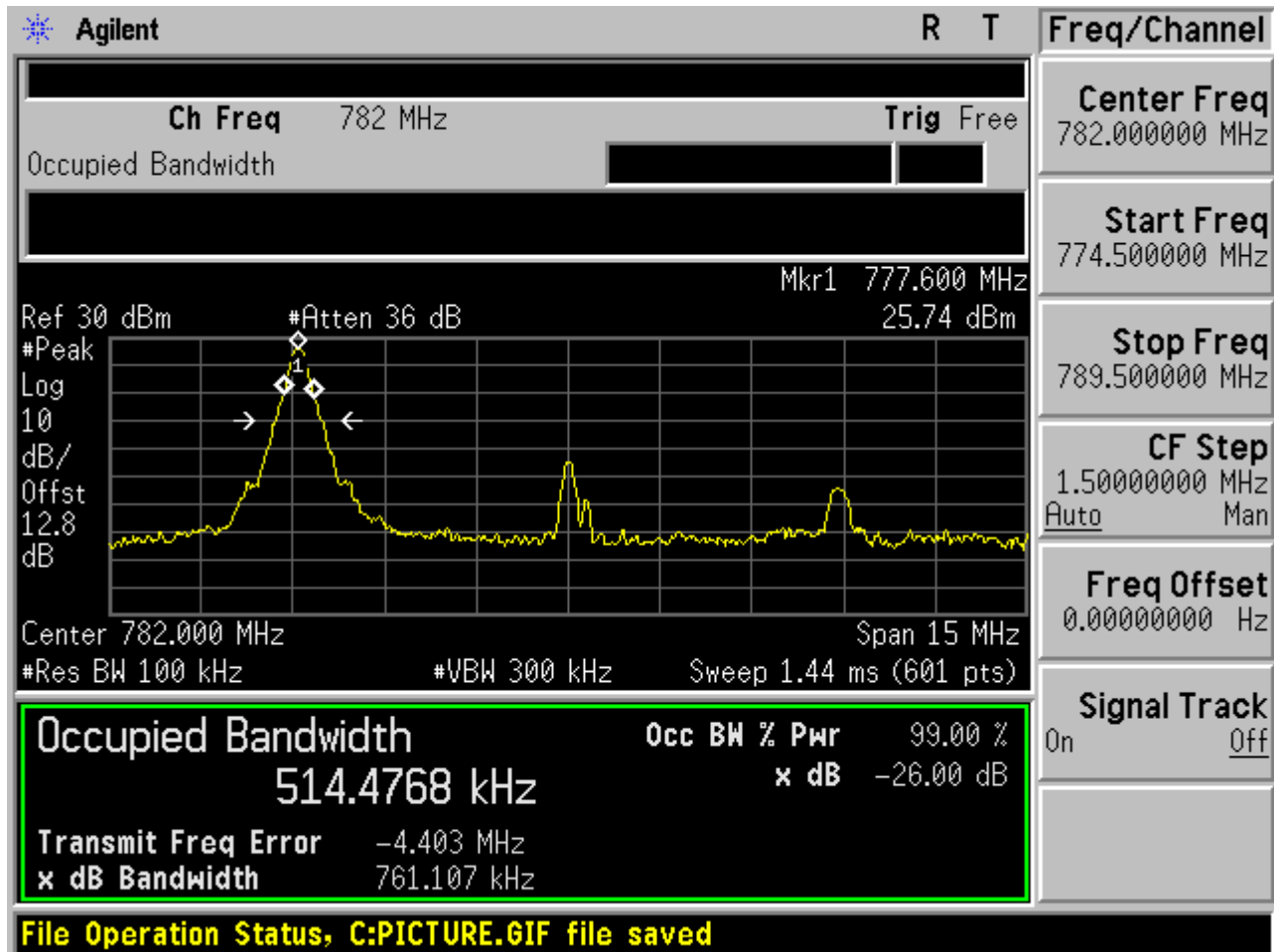
1.2.1.3.4 16QAM /full RBs



1.2.2 Channel Bandwidth = 10 MHz

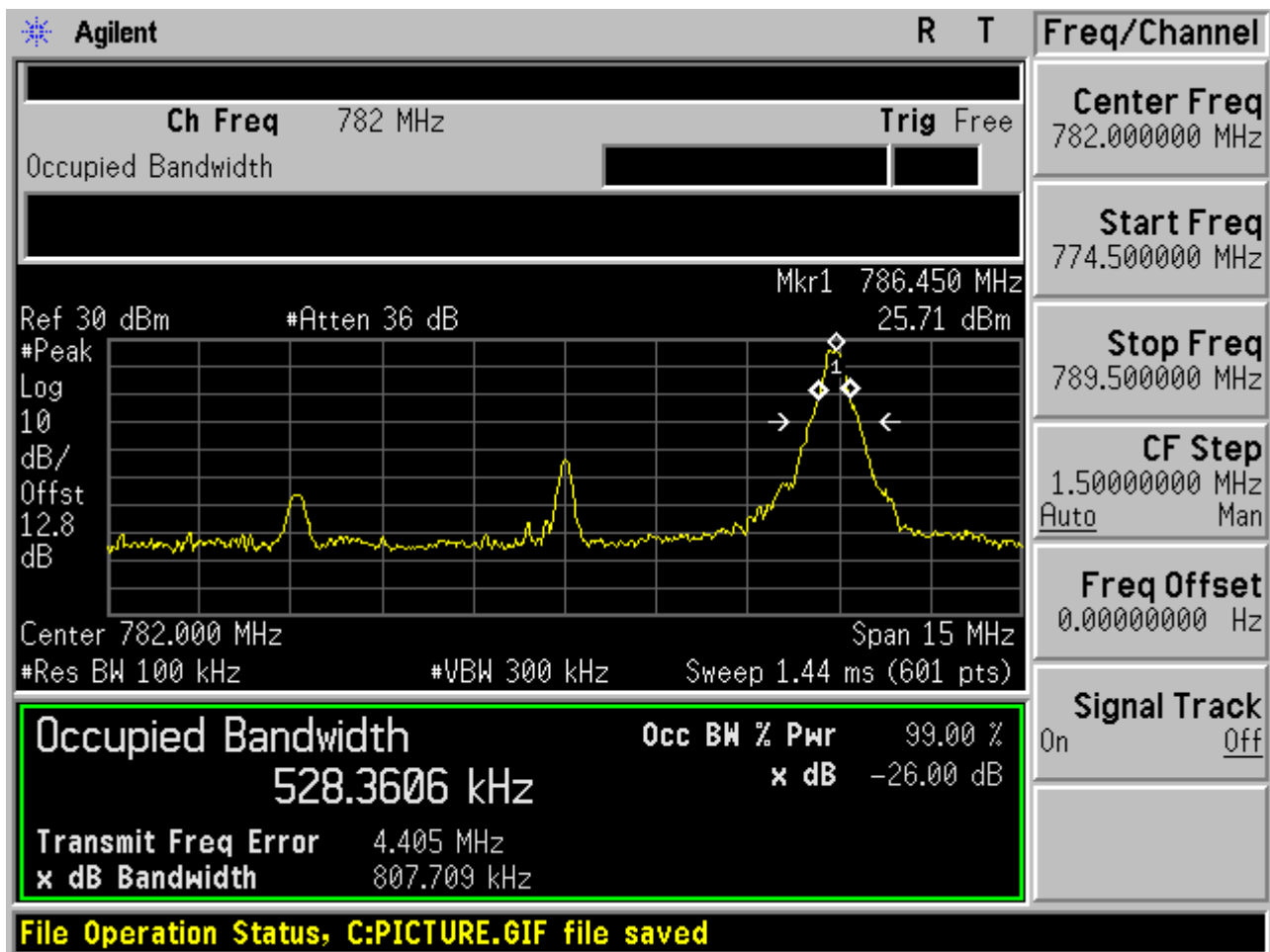
1.2.2.1 Channel =B/M/T

1.2.2.1.1 16QAM/1RB # 0



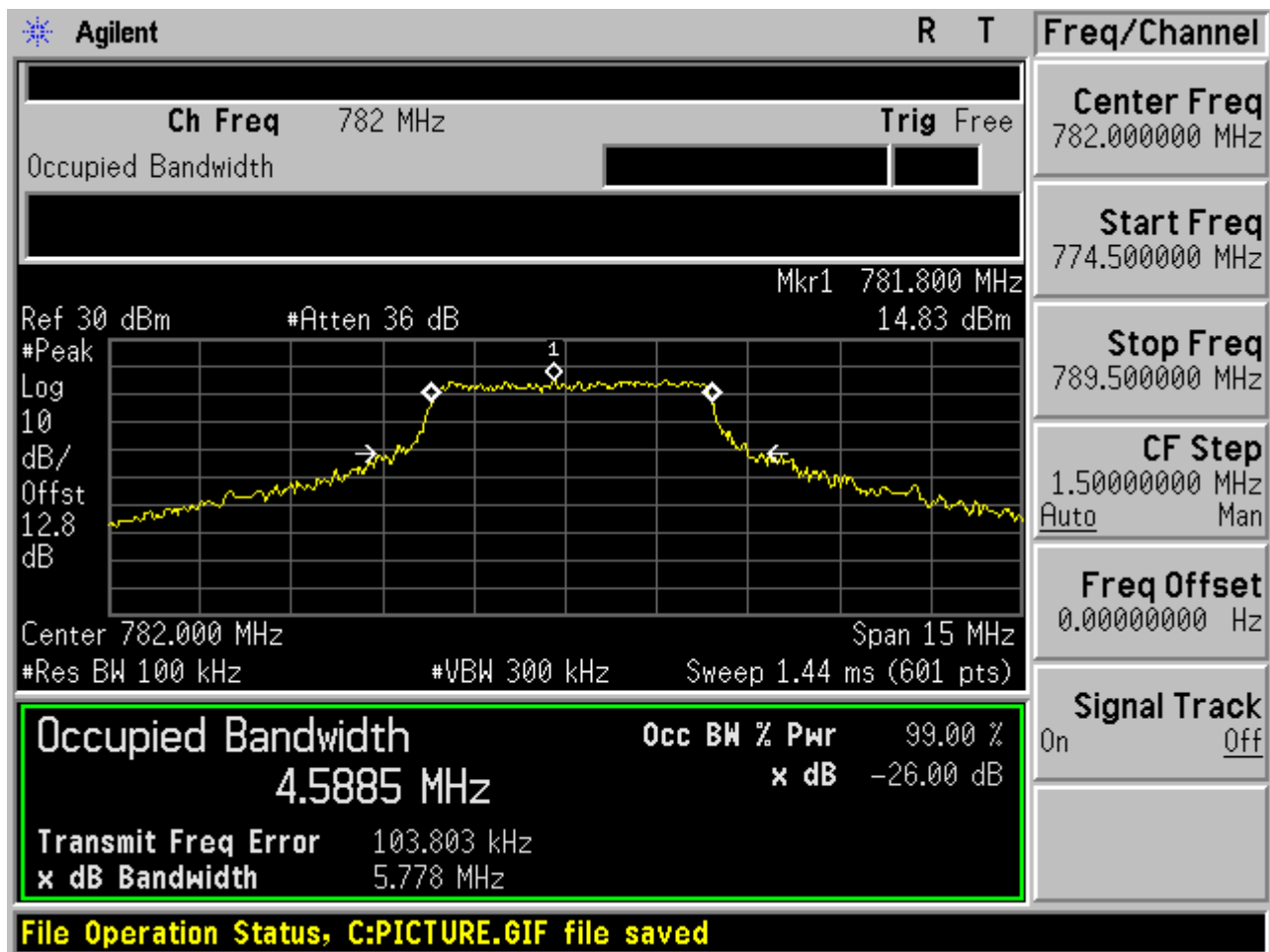


1.2.2.1.2 16QAM /1RB # max



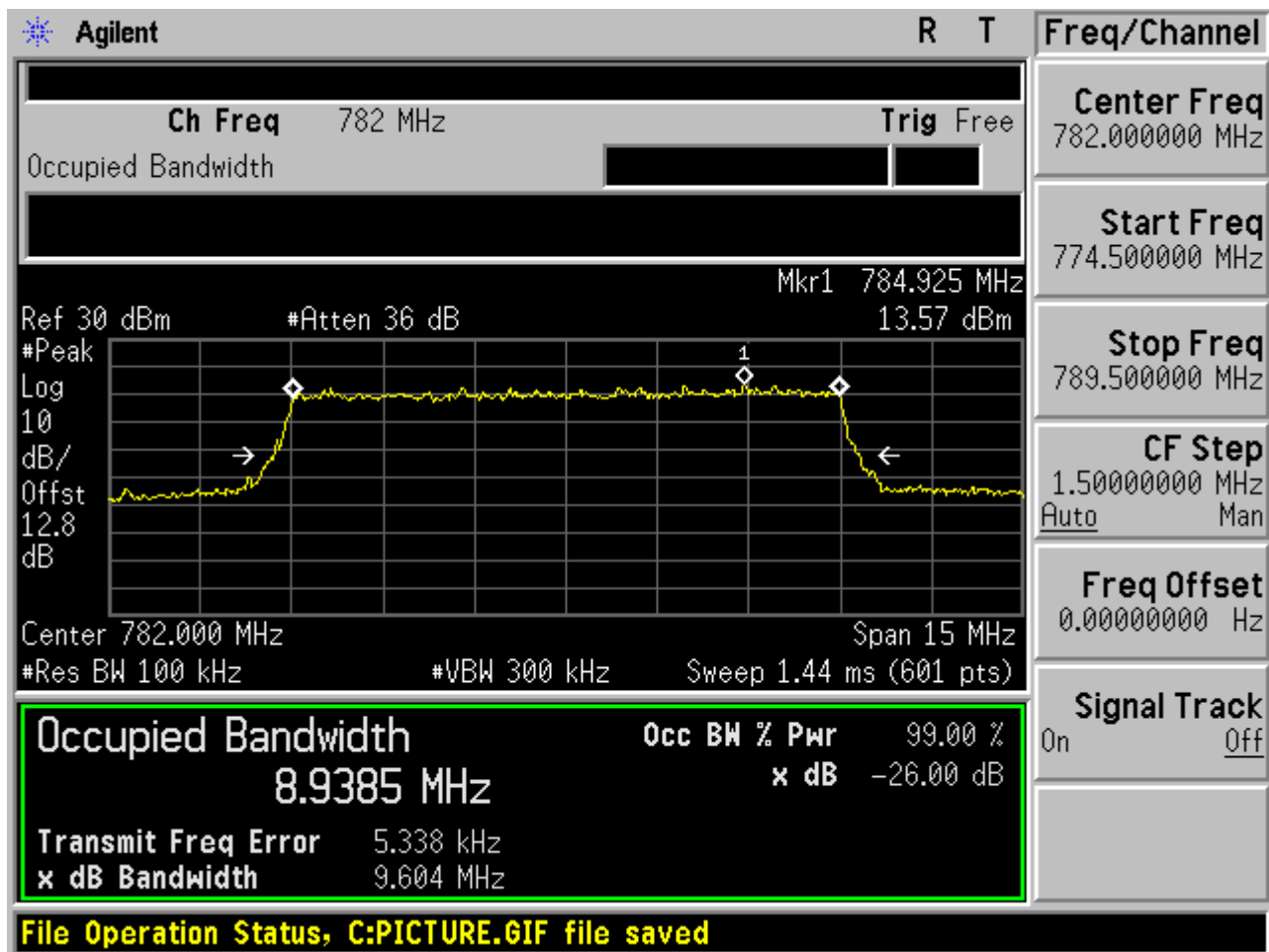


1.2.2.1.3 16QAM /non-1RB #mid/2





1.2.2.1.4 16QAM /full RBs



-----END-----



Appendix D

Band Edges Compliance

According to FCC Part 2.1051 & 27.53(c)(2) &
27.53(c)(5)



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1.2.2.2.3 16QAM / non-1RB #mid/2	33
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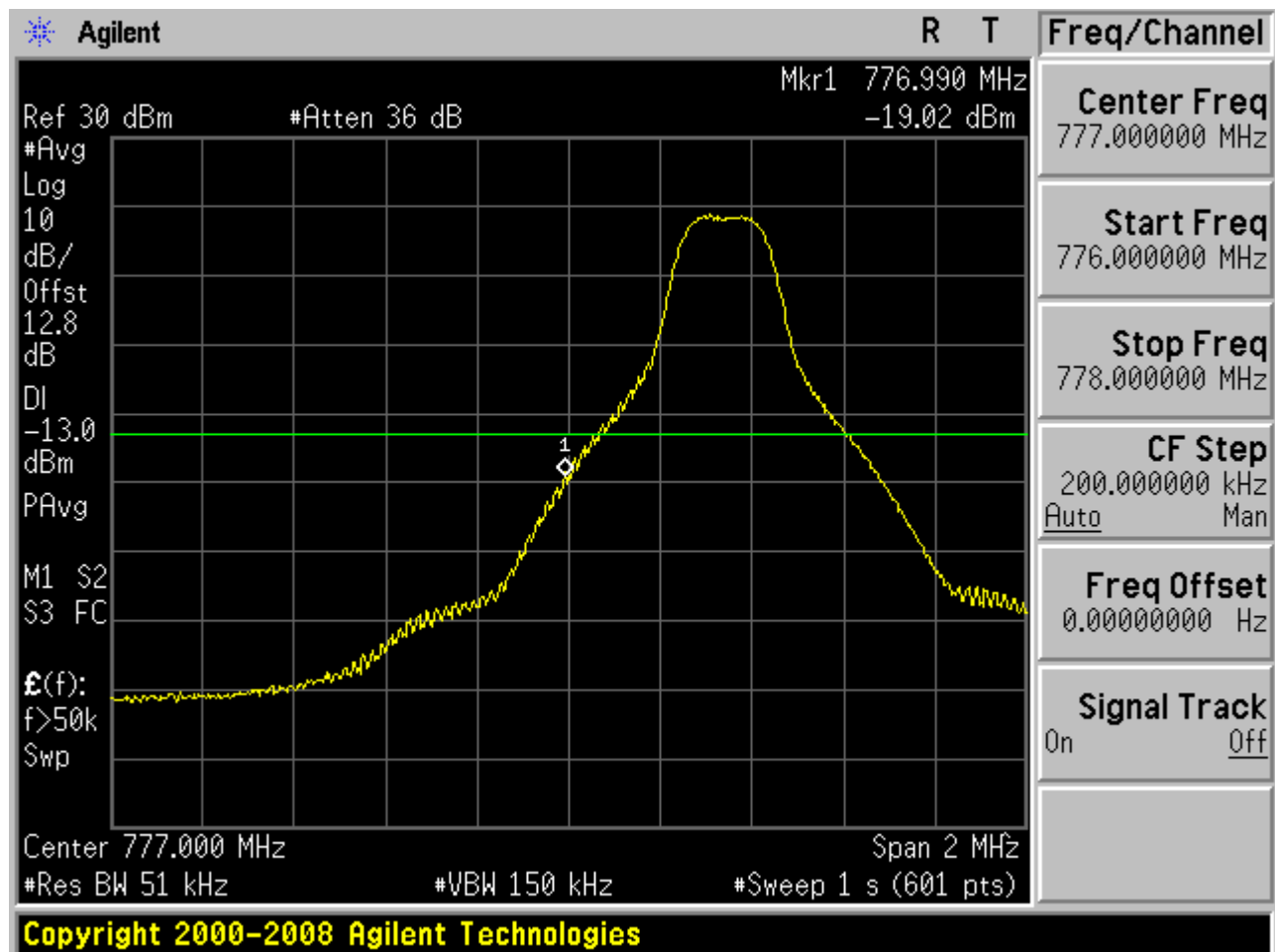
1 For Band 13

1.1 Test Mode=TM1

1.1.1 Channel Bandwidth = 5 MHz

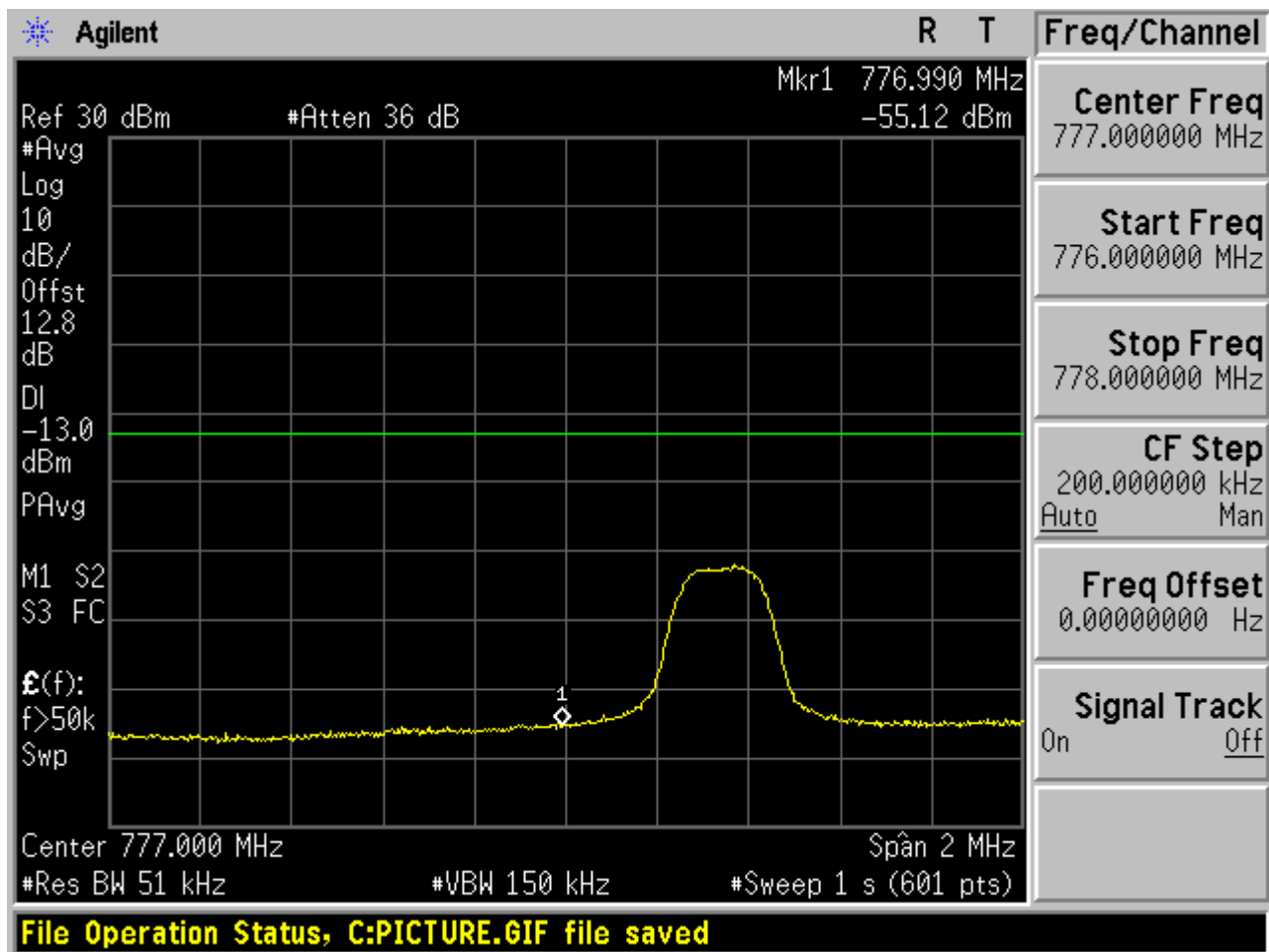
1.1.1.1 Channel= B

1.1.1.1.1 QPSK/1RB # 0



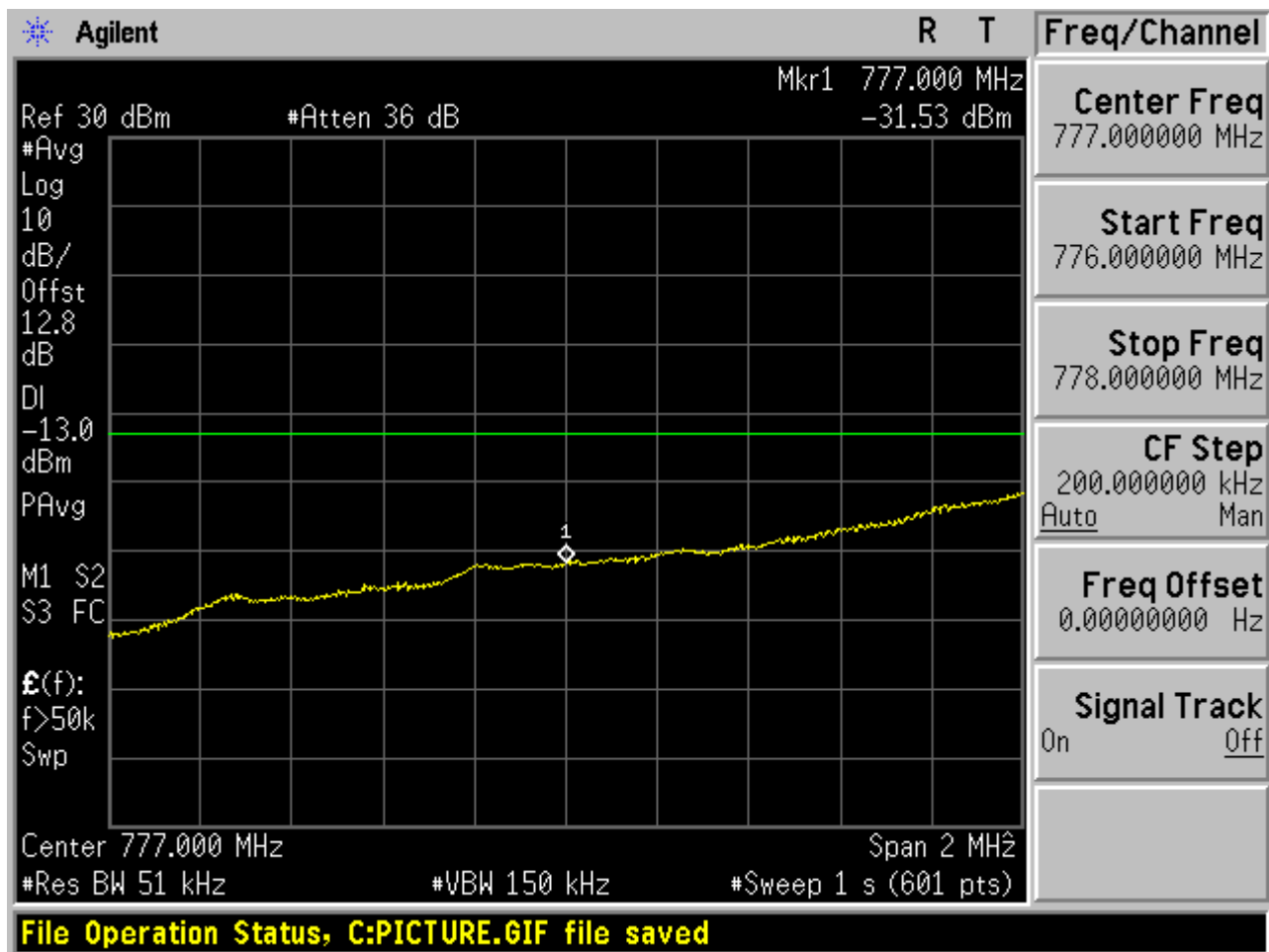


1.1.1.1.2 QPSK/1RB # max



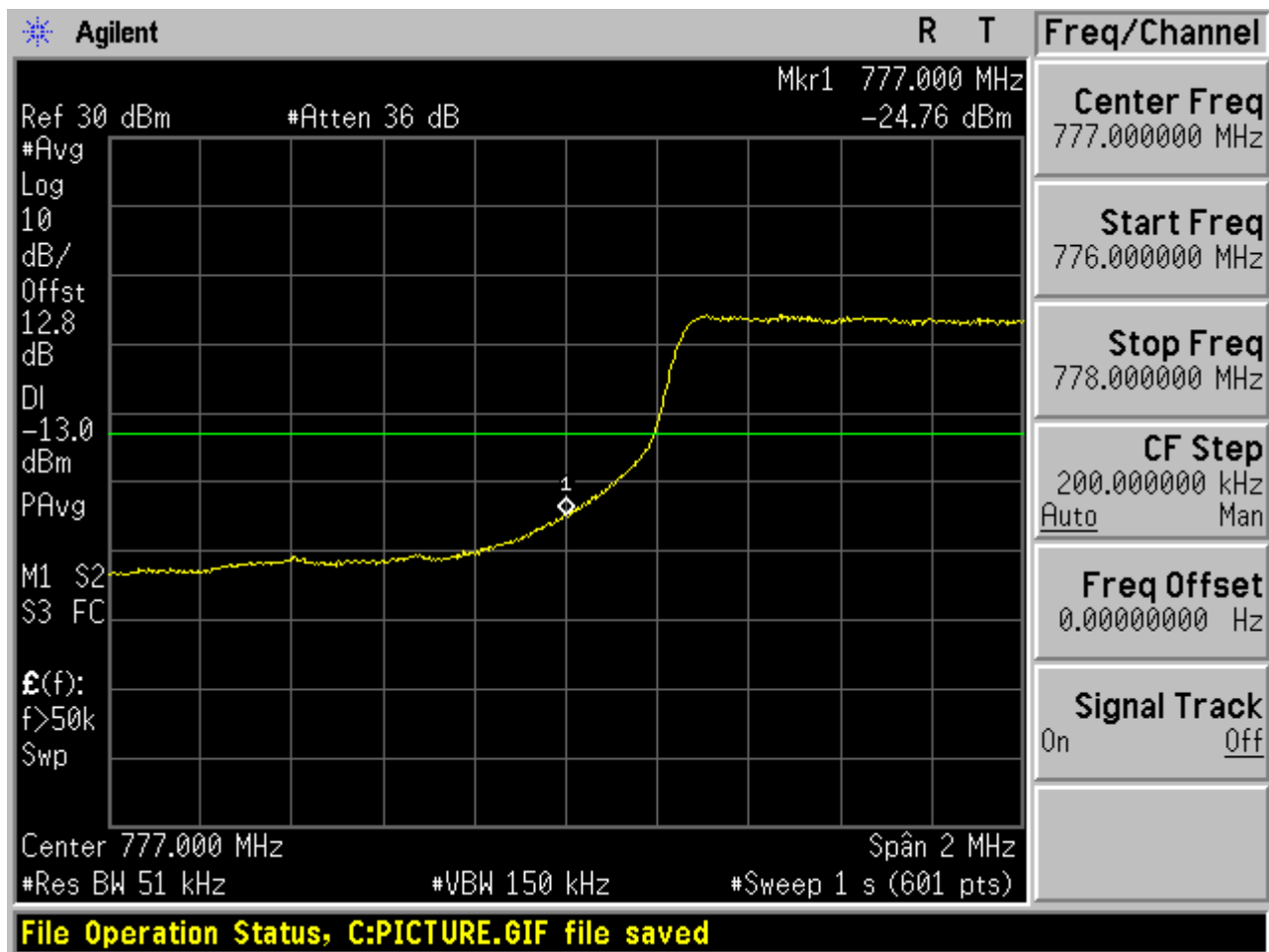


1.1.1.1.3 QPSK/non-1RB #mid/2





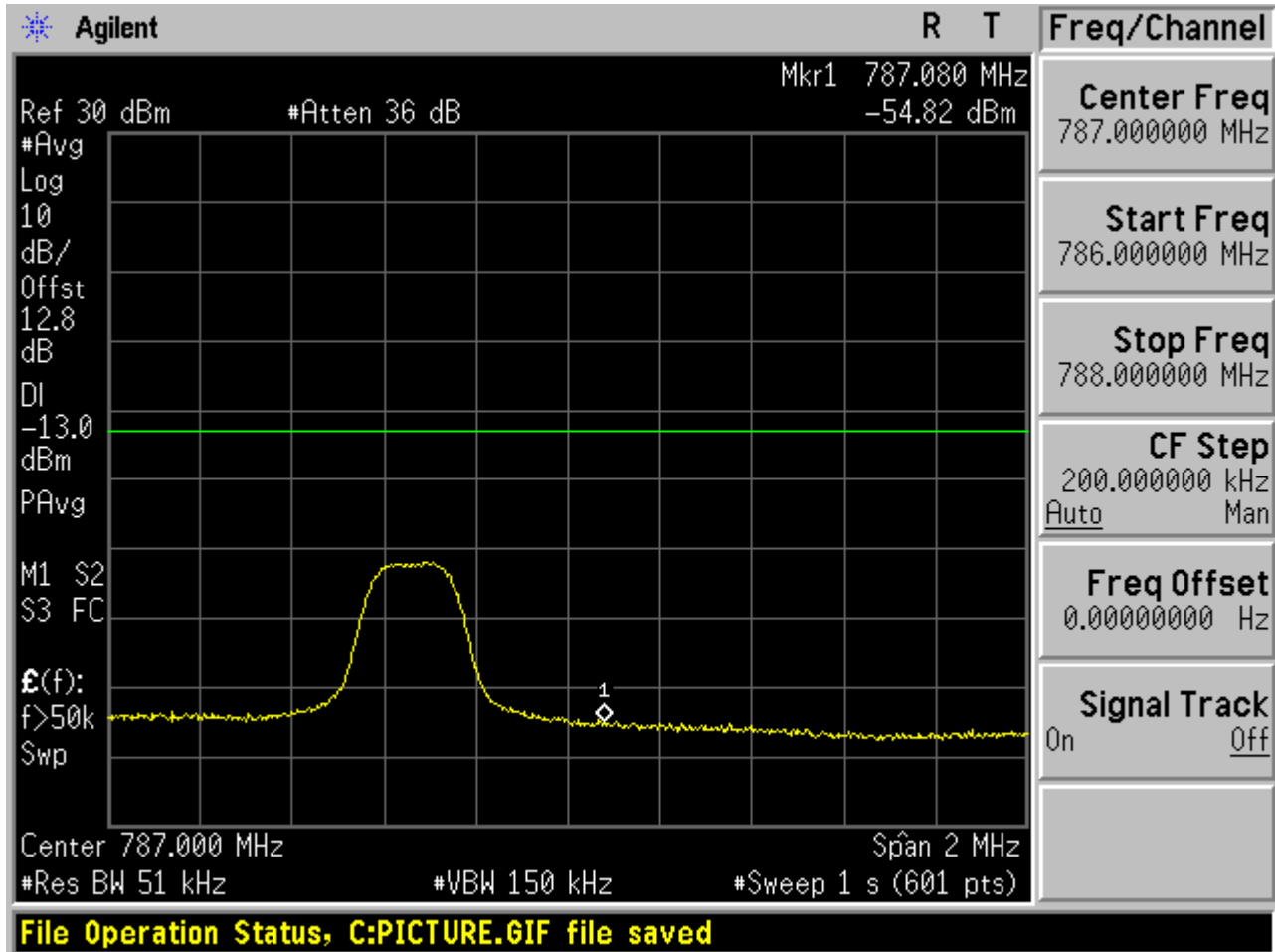
1.1.1.1.4 QPSK/full RBs





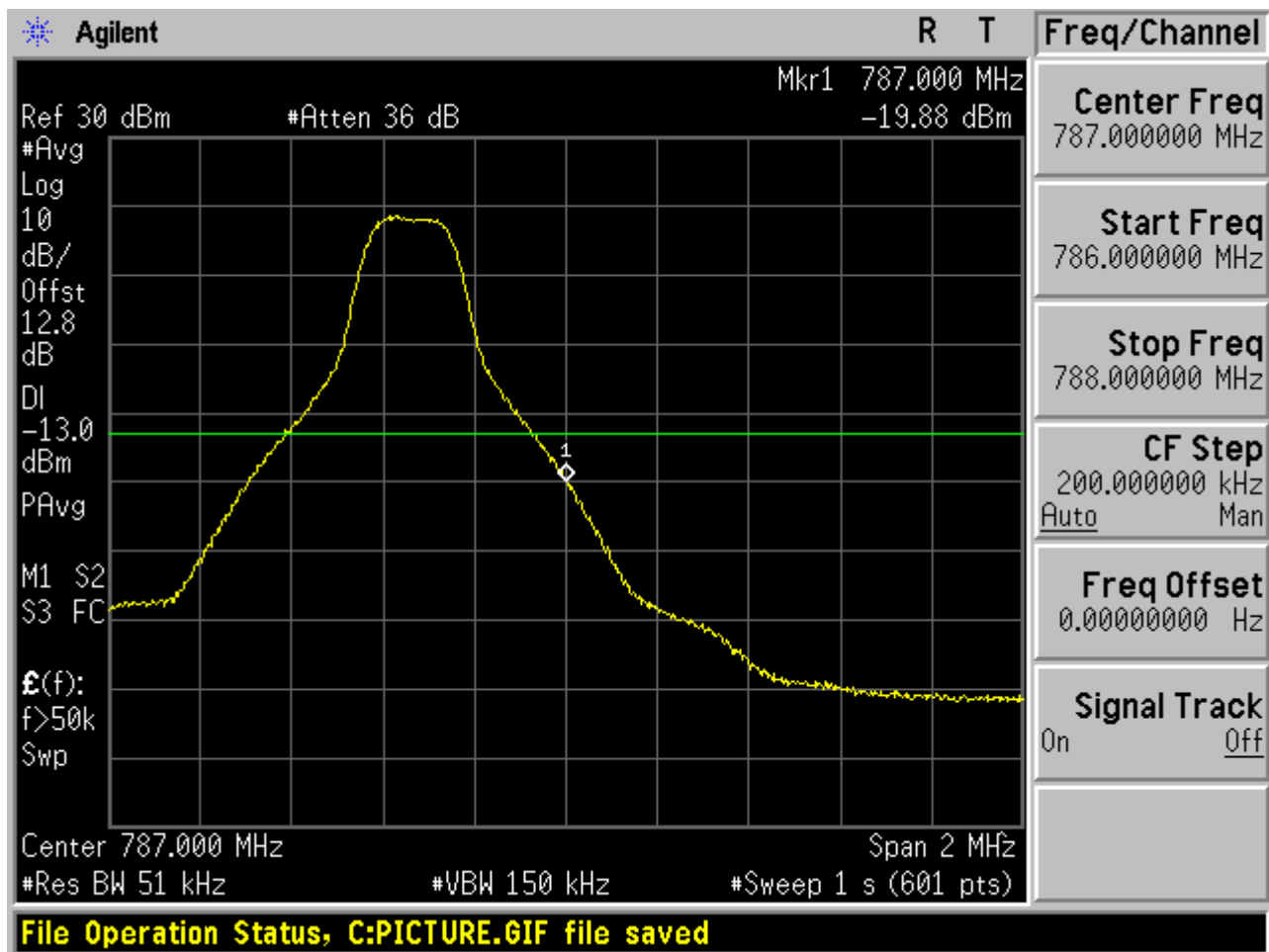
1.1.1.2 Channel= T

1.1.1.2.1 QPSK/1RB # 0



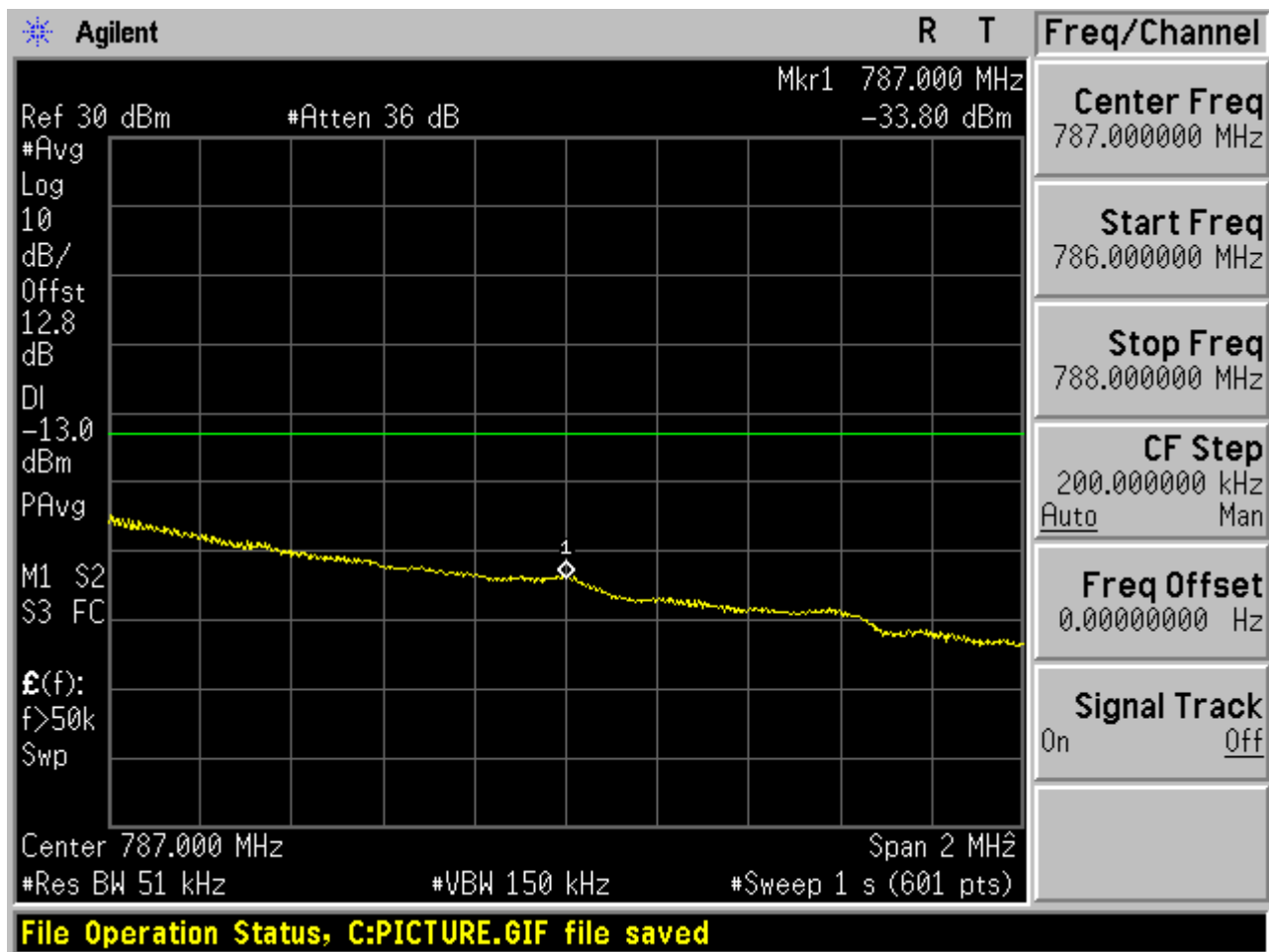


1.1.1.2.2 QPSK/1RB # max



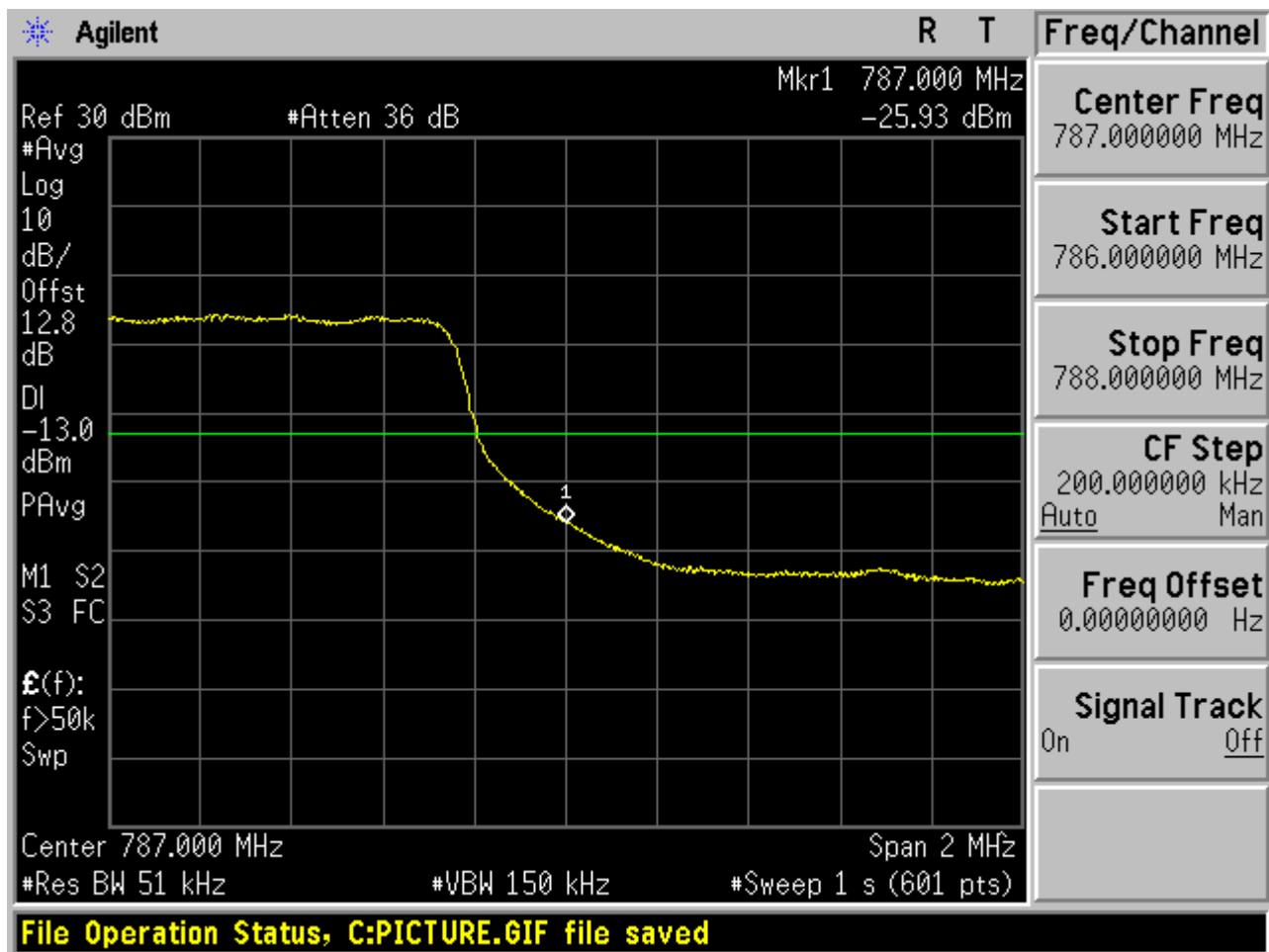


1.1.1.2.3 QPSK/non-1RB #mid/2





1.1.1.2.4 QPSK/full RBs

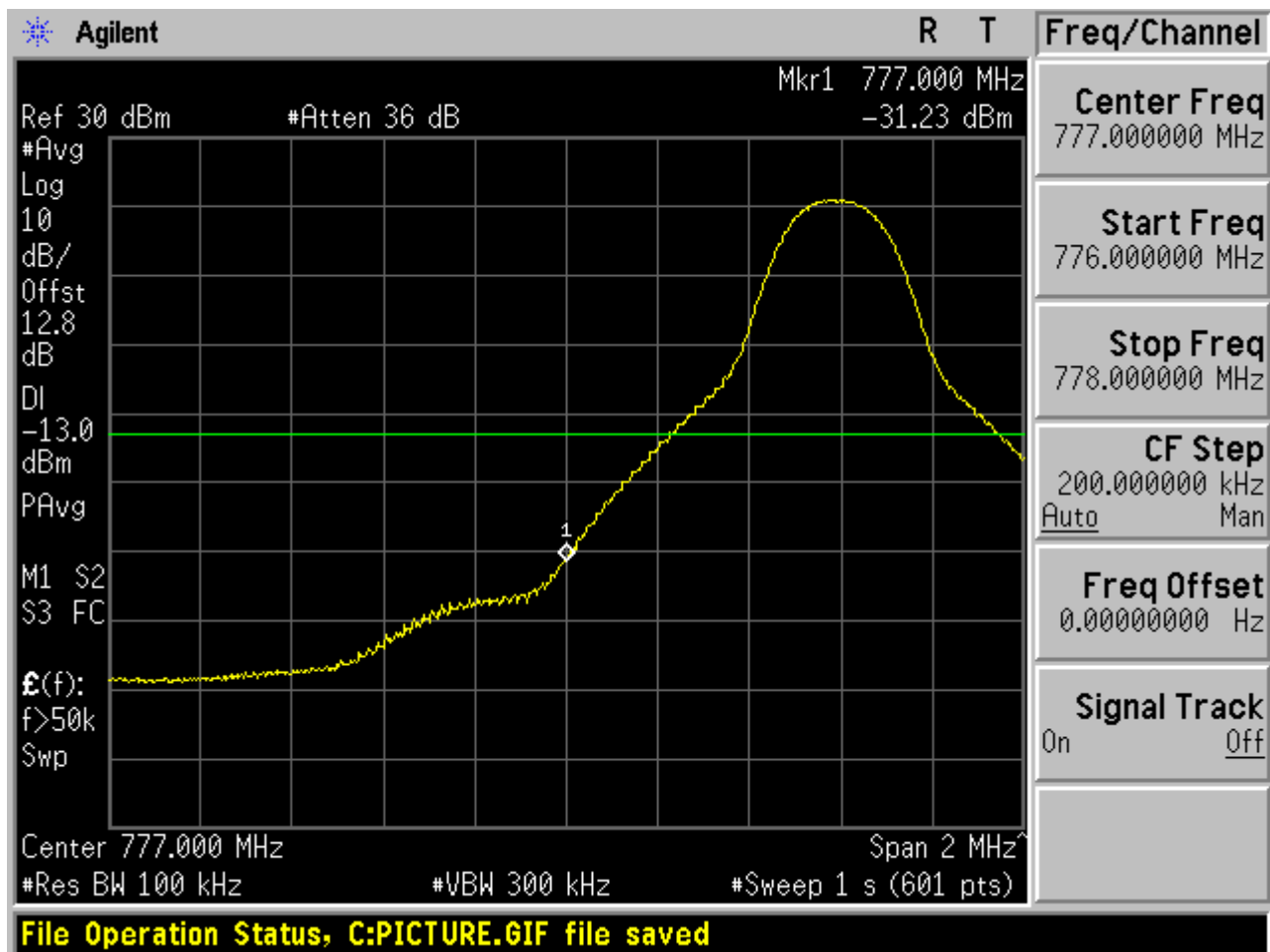




1.1.2 Channel Bandwidth = 10 MHz

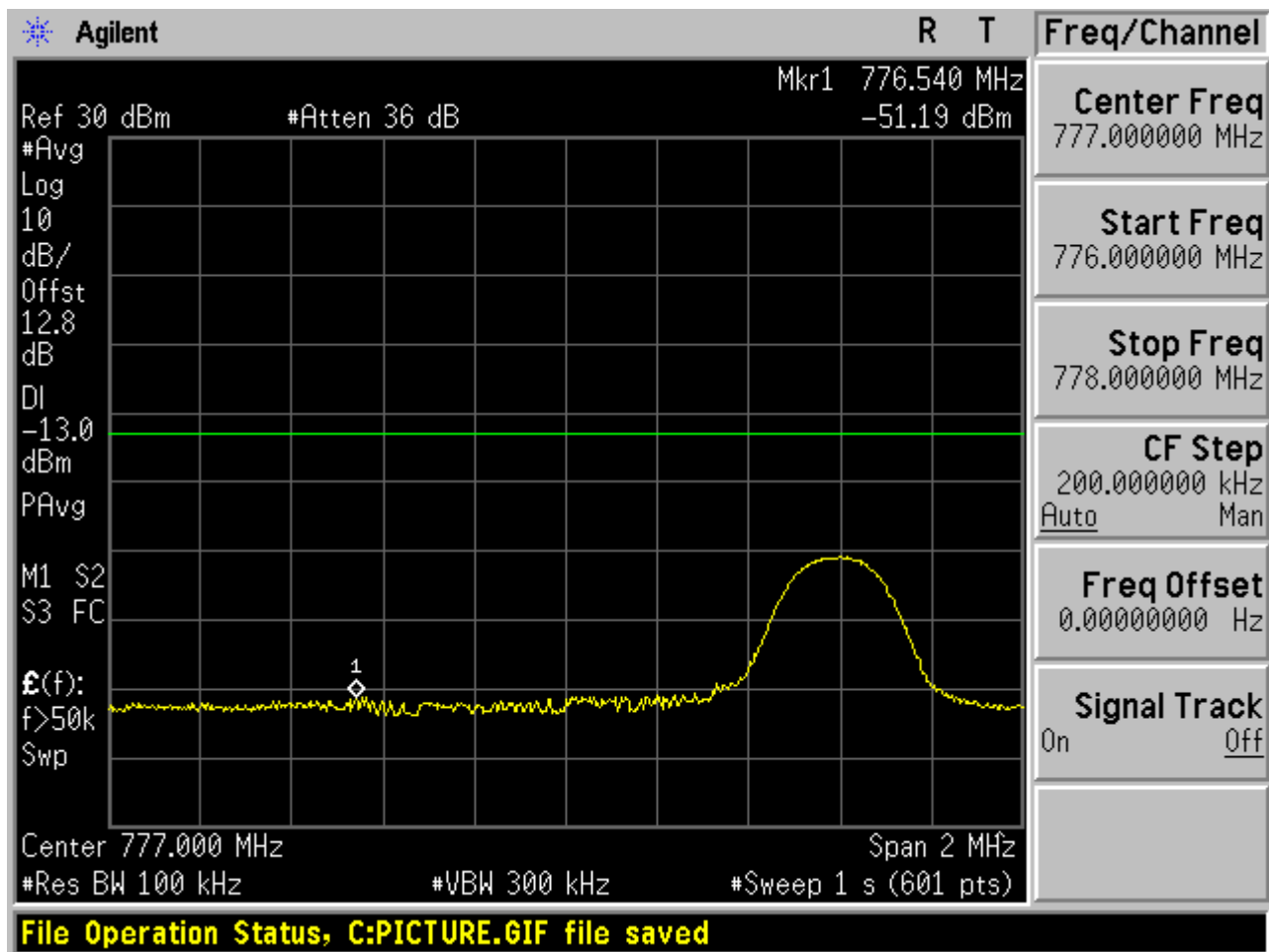
1.1.2.1 Channel= B

1.1.2.1.1 QPSK/1RB # 0



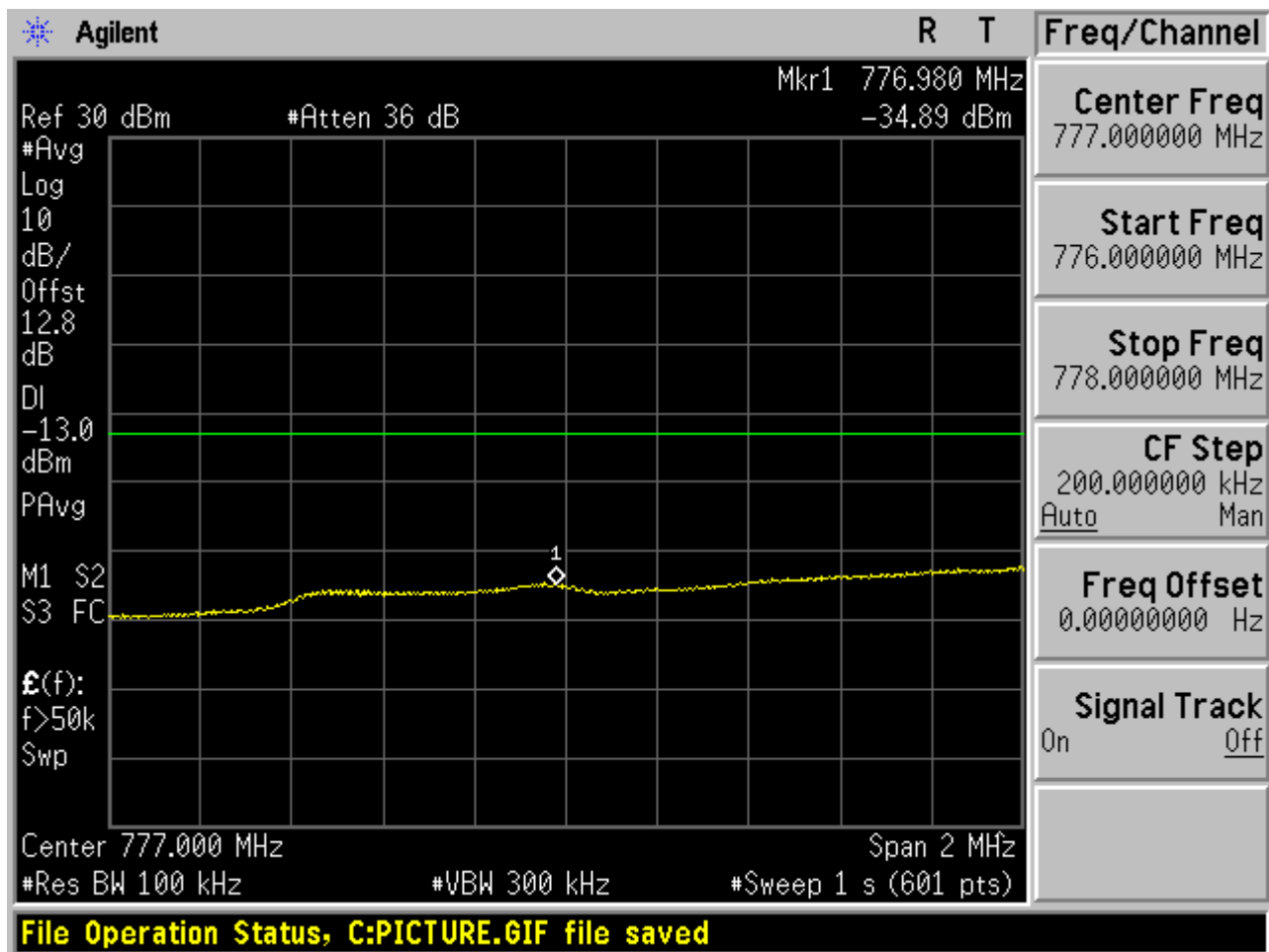


1.1.2.1.2 QPSK/1RB # max



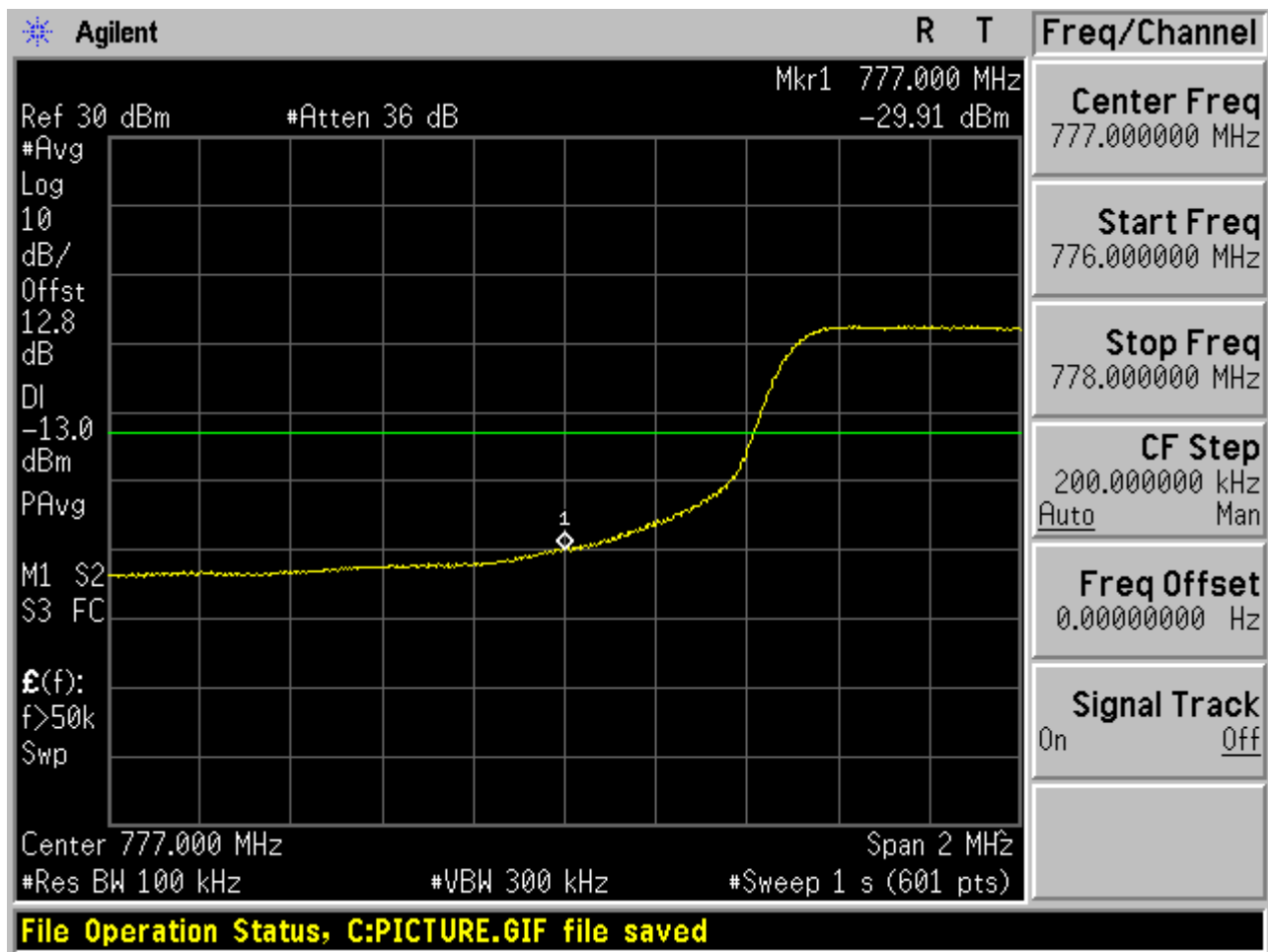


1.1.2.1.3 QPSK/non-1RB #mid/2





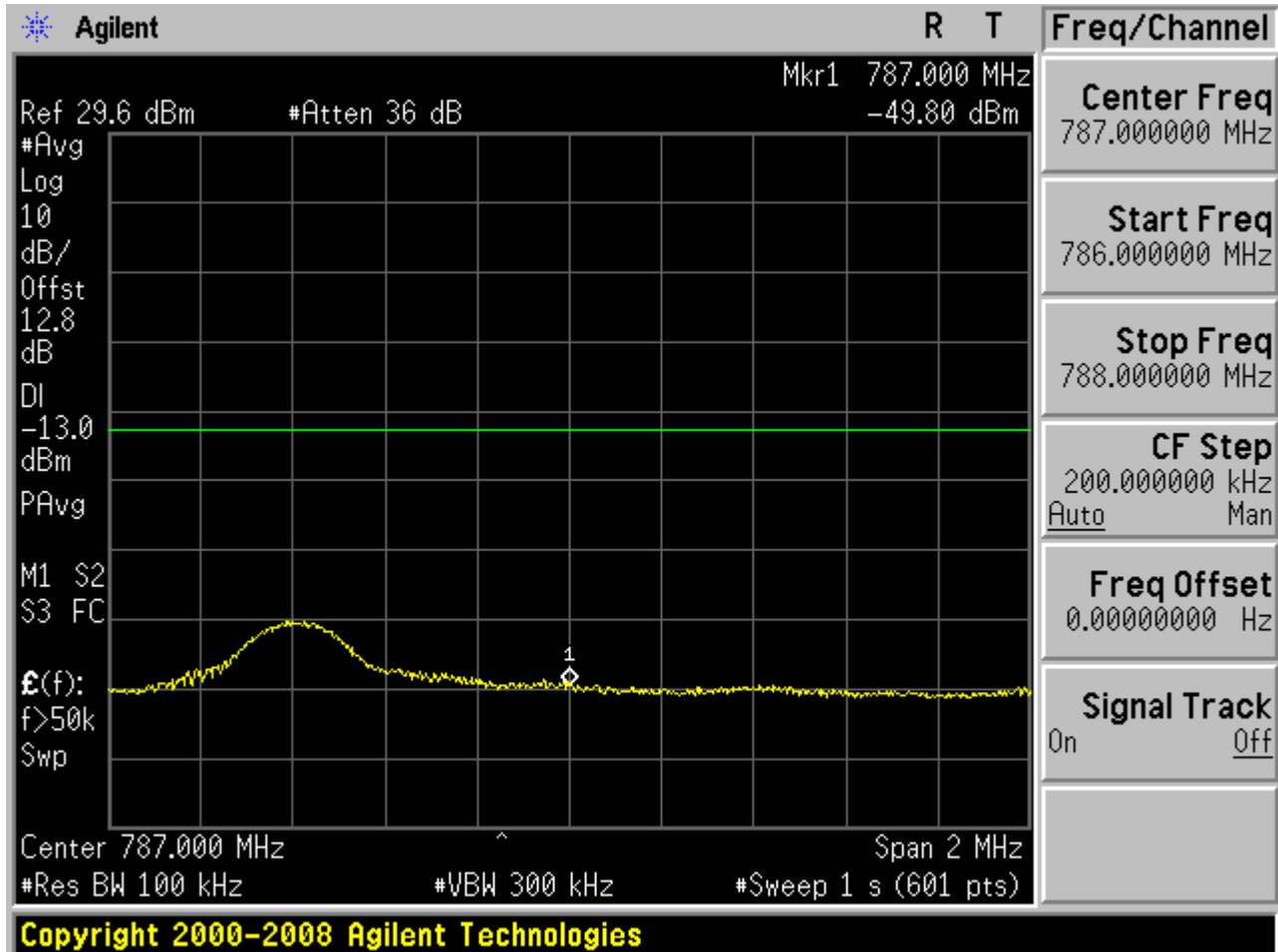
1.1.2.1.4 QPSK/full RBs





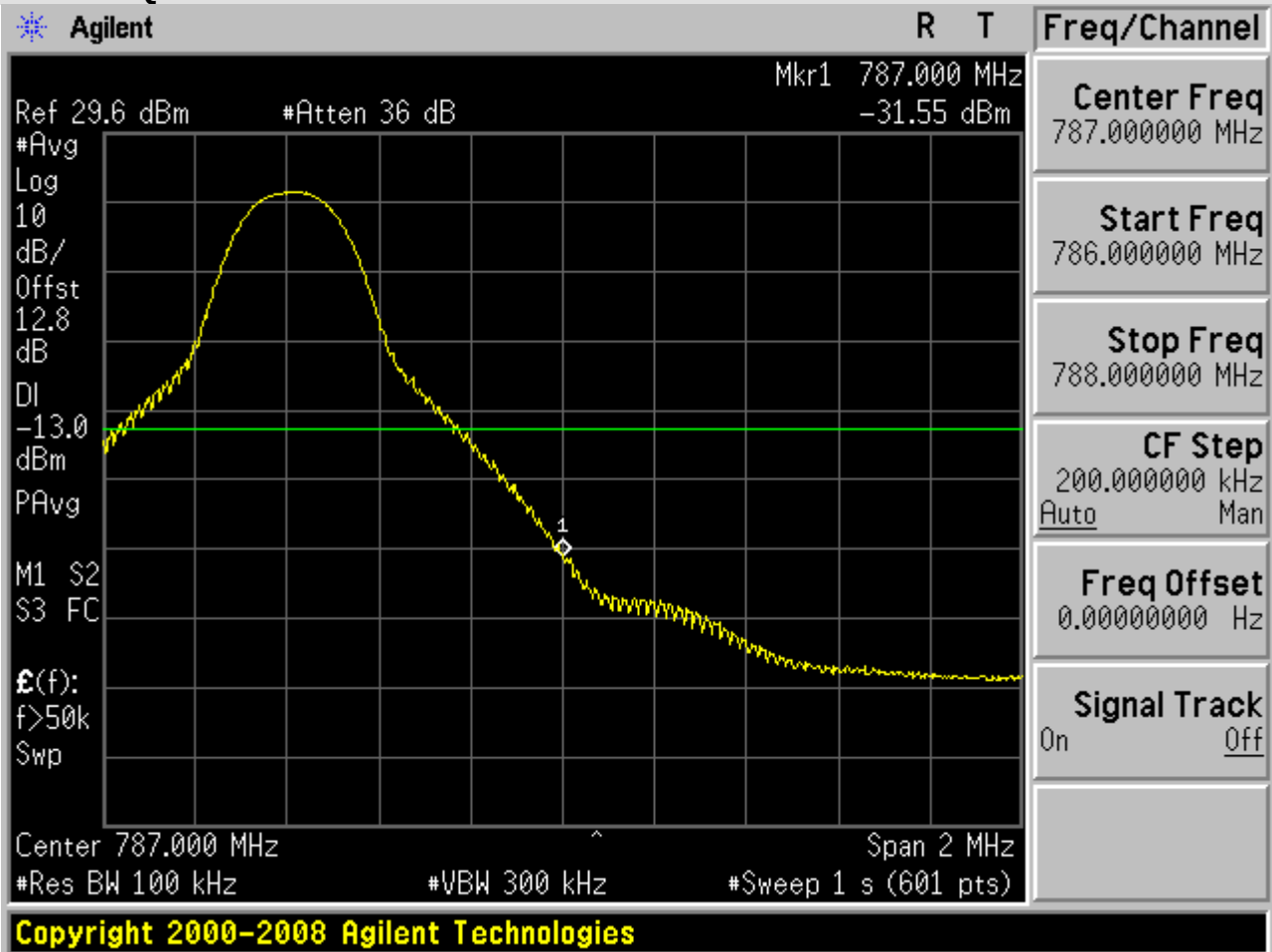
1.1.2.2 Channel= T

1.1.2.2.1 QPSK/1RB # 0



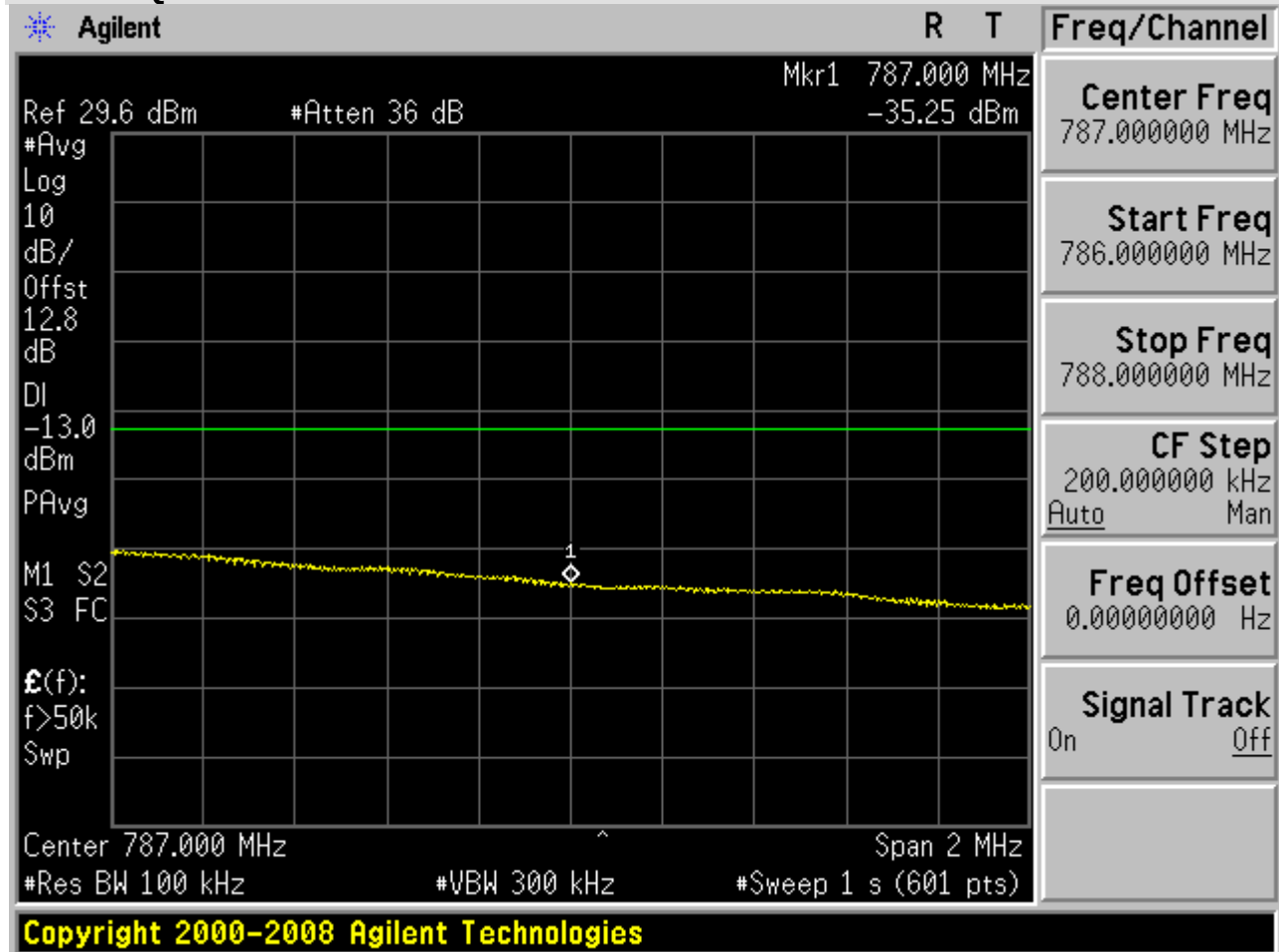


1.1.2.2.2 QPSK/1RB # max



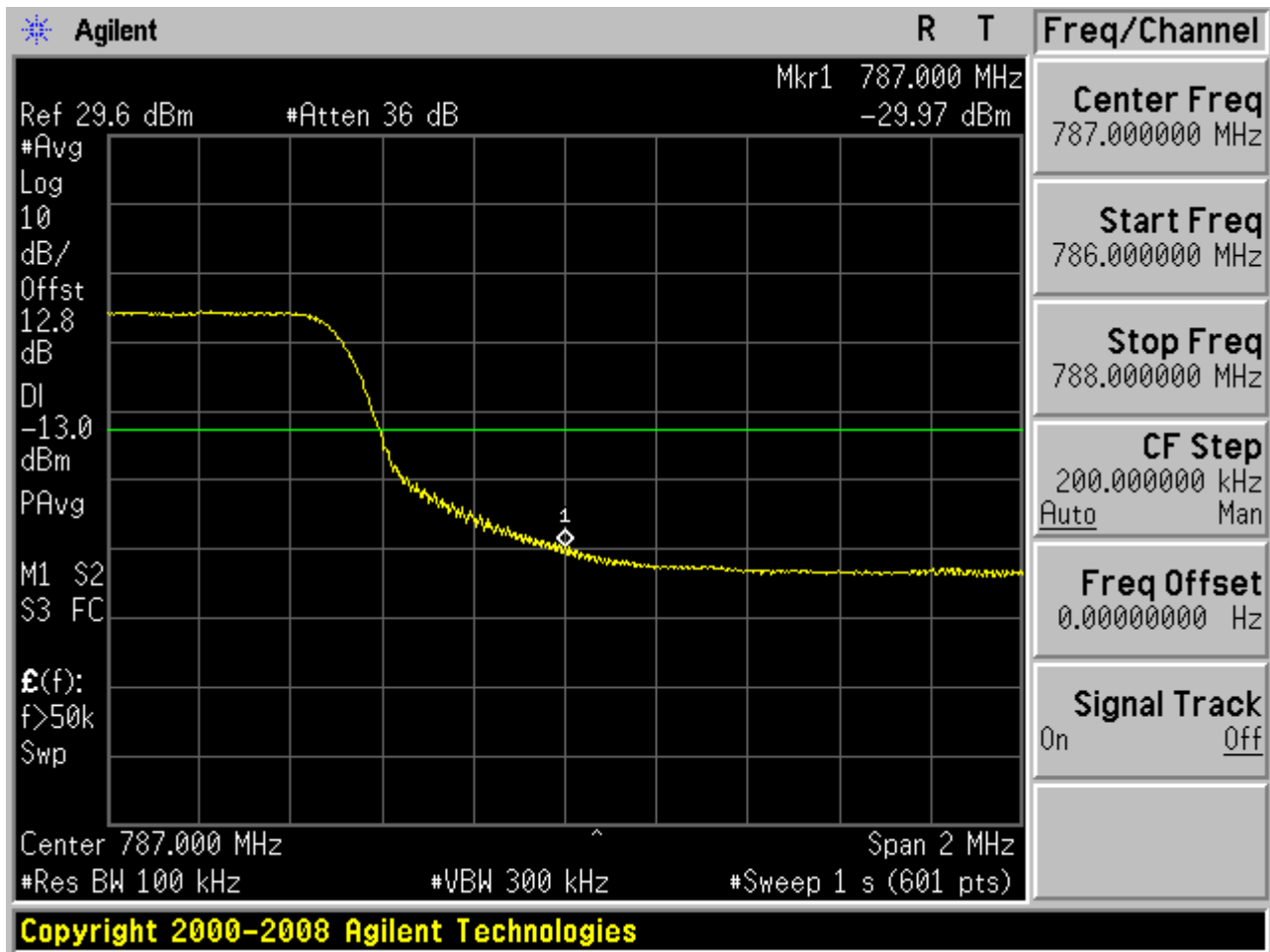


1.1.2.2.3 QPSK/non-1RB #mid/2





1.1.2.2.4 QPSK/full RBs

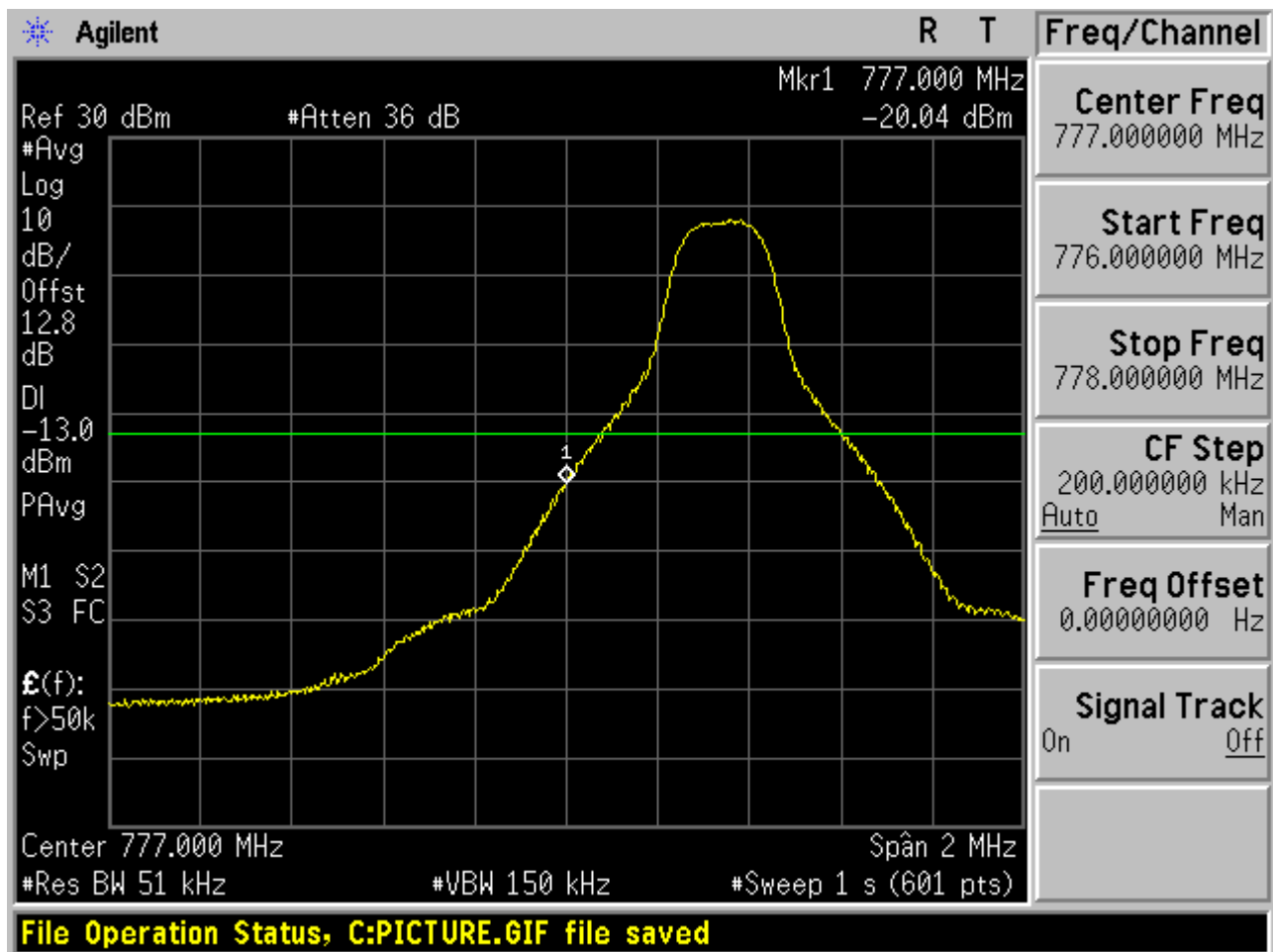


1.2 Test Mode=TM2

1.2.1 Channel Bandwidth = 5 MHz

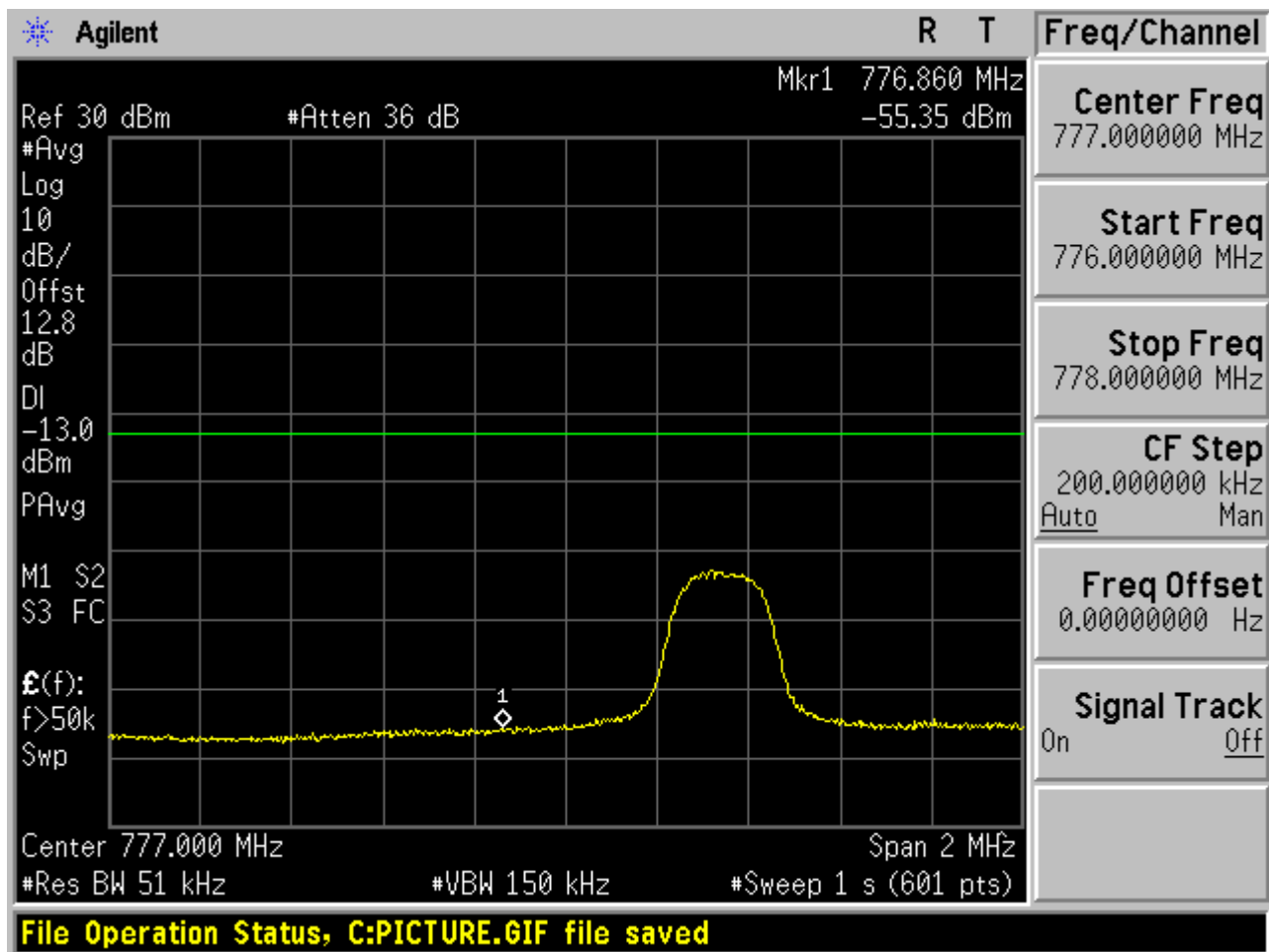
1.2.1.1 Channel= B

1.2.1.1.1 16QAM/1RB #0



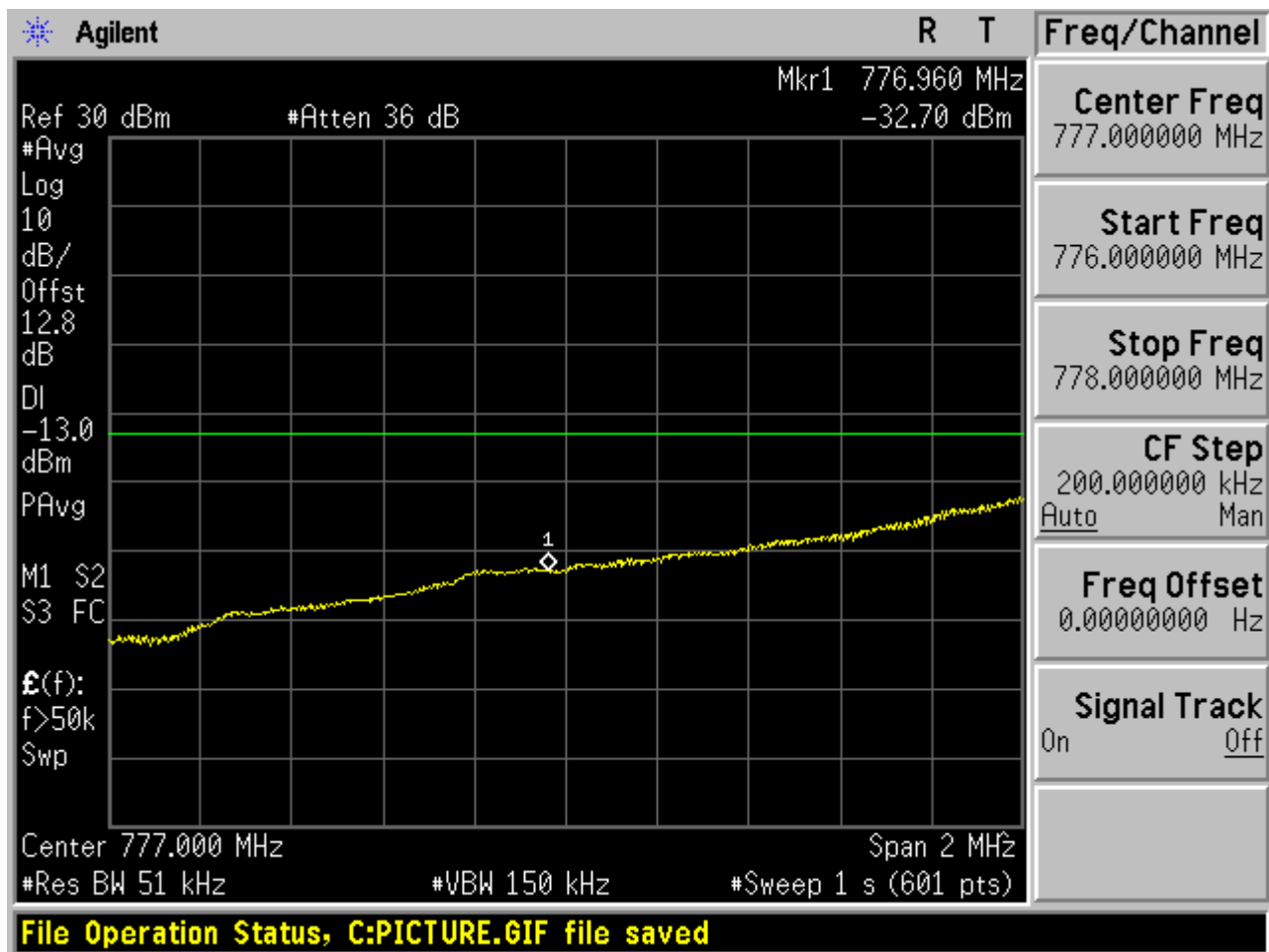


1.2.1.1.2 16QAM/1RB #max



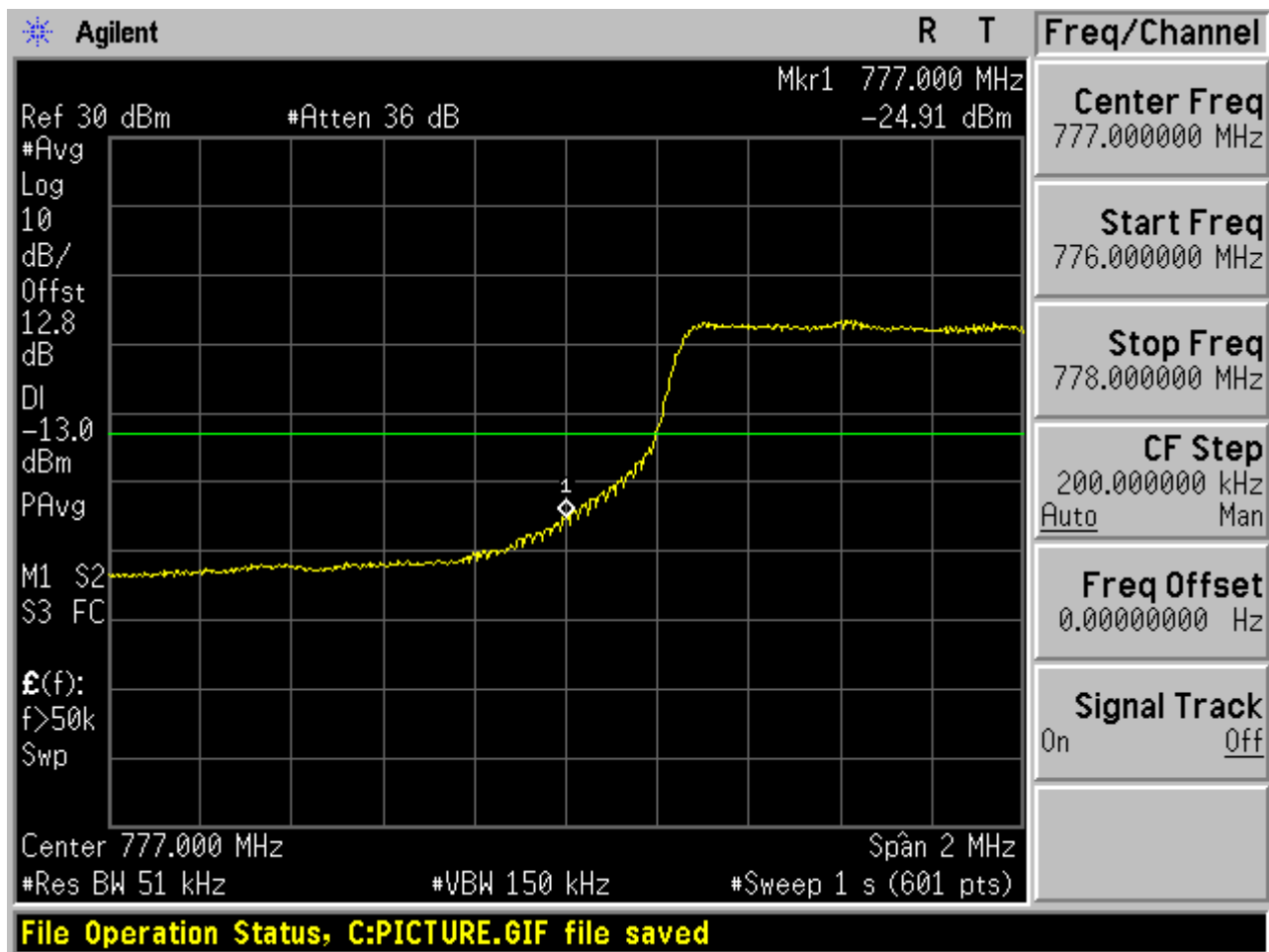


1.2.1.1.3 16QAM / non-1RB #mid/2





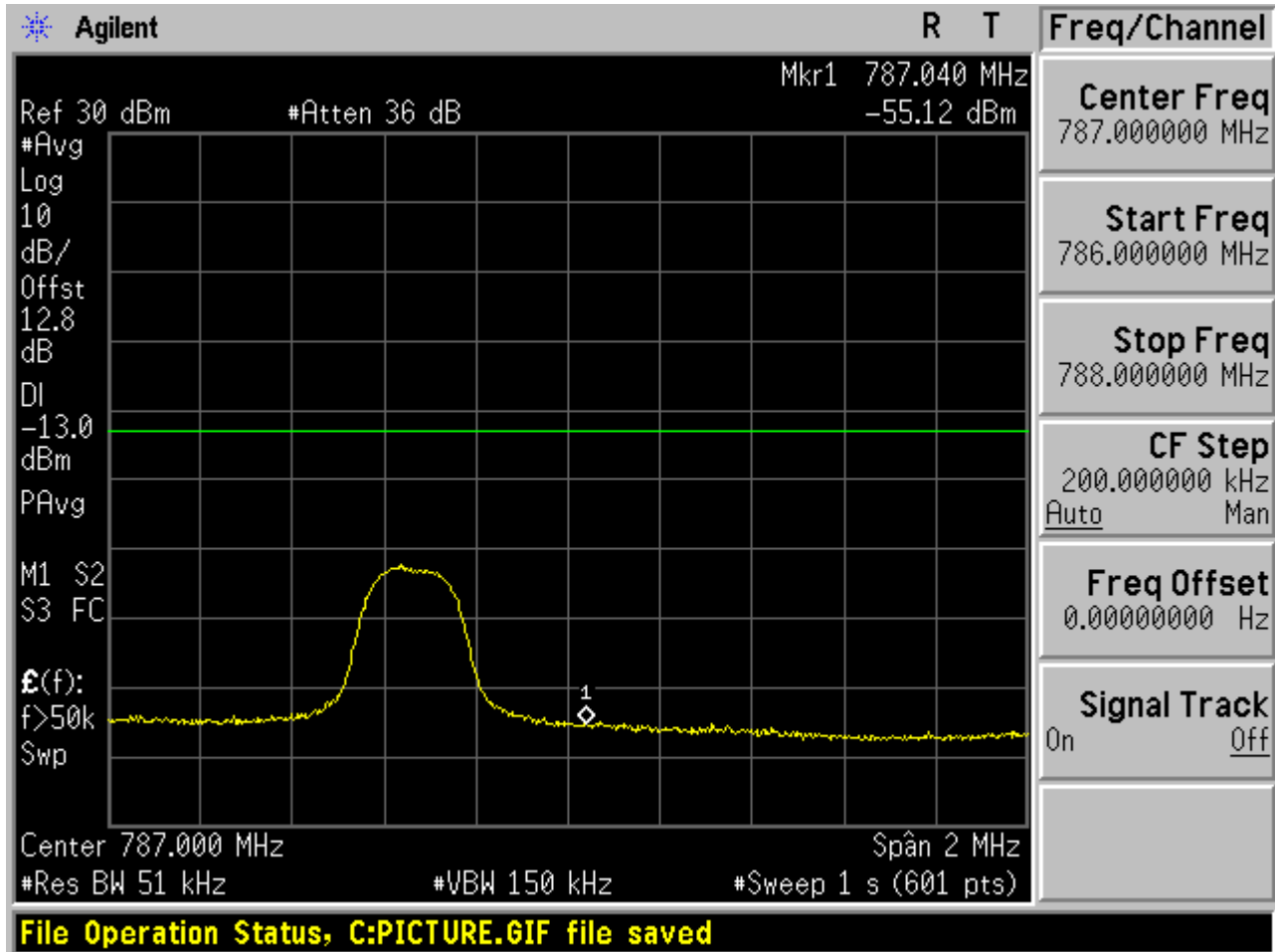
1.2.1.1.4 16QAM /full RBs





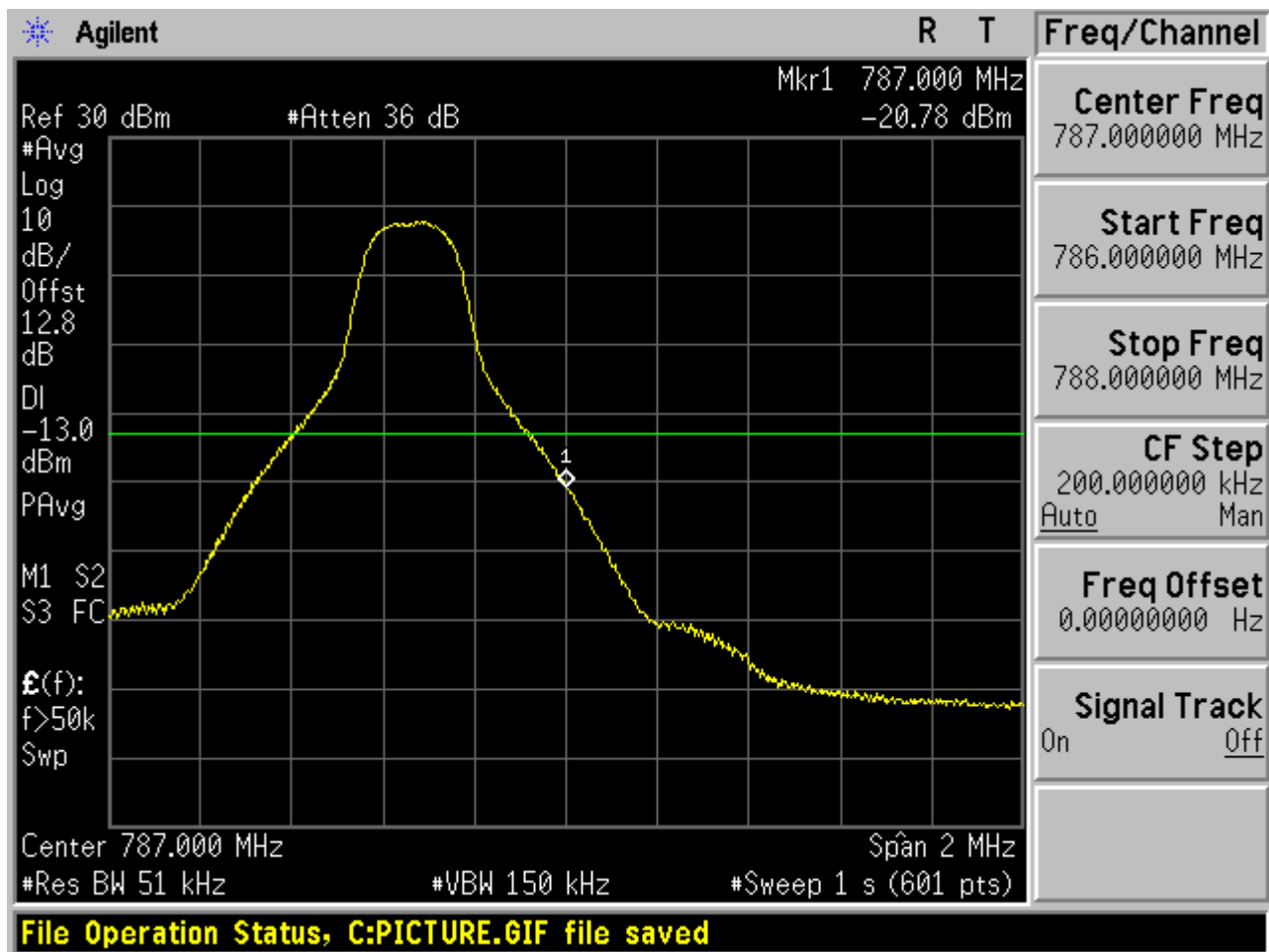
1.2.1.2 Channel= T

1.2.1.2.1 16QAM /1RB #0



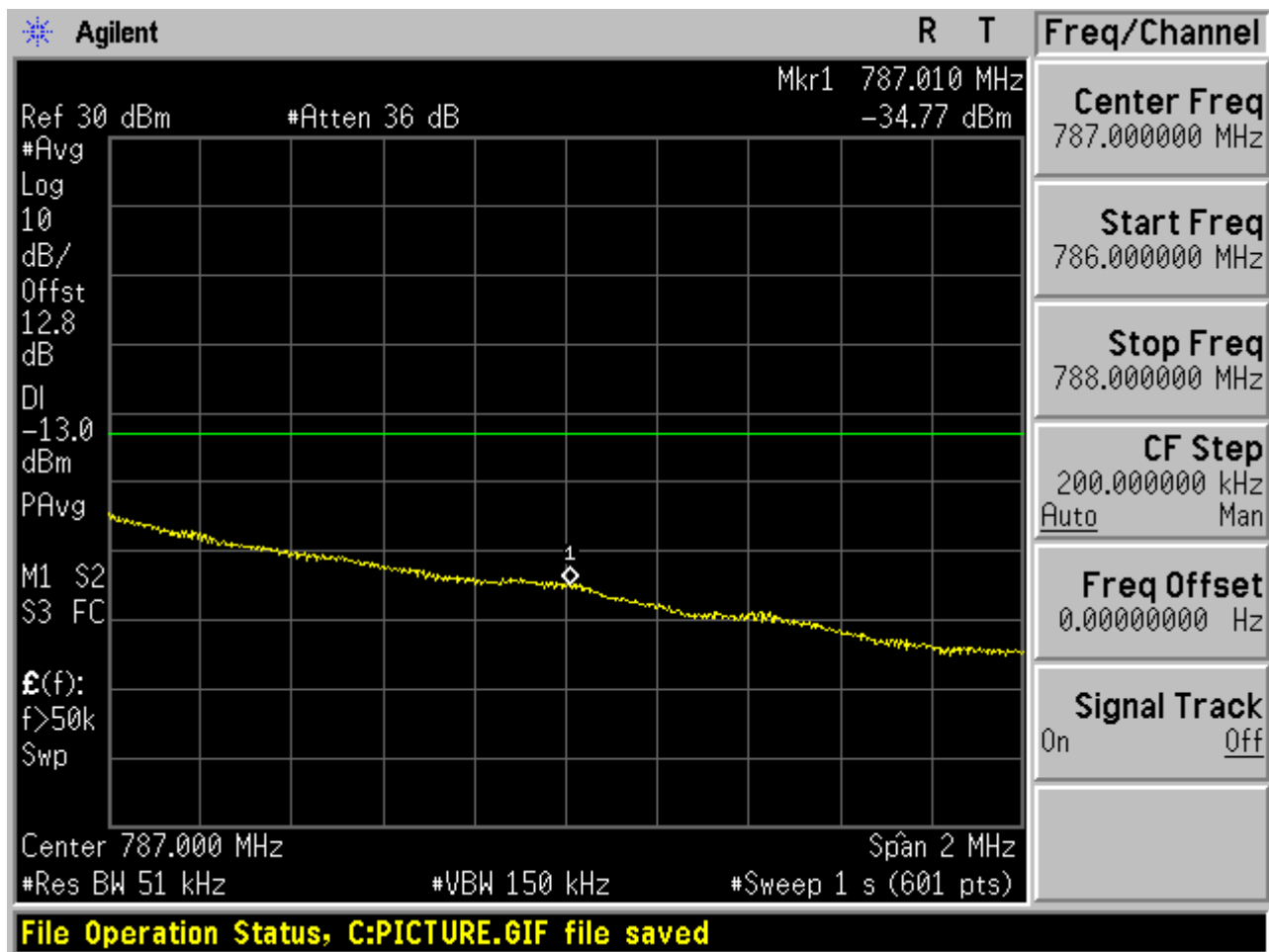


1.2.1.2.2 16QAM /1RB #max



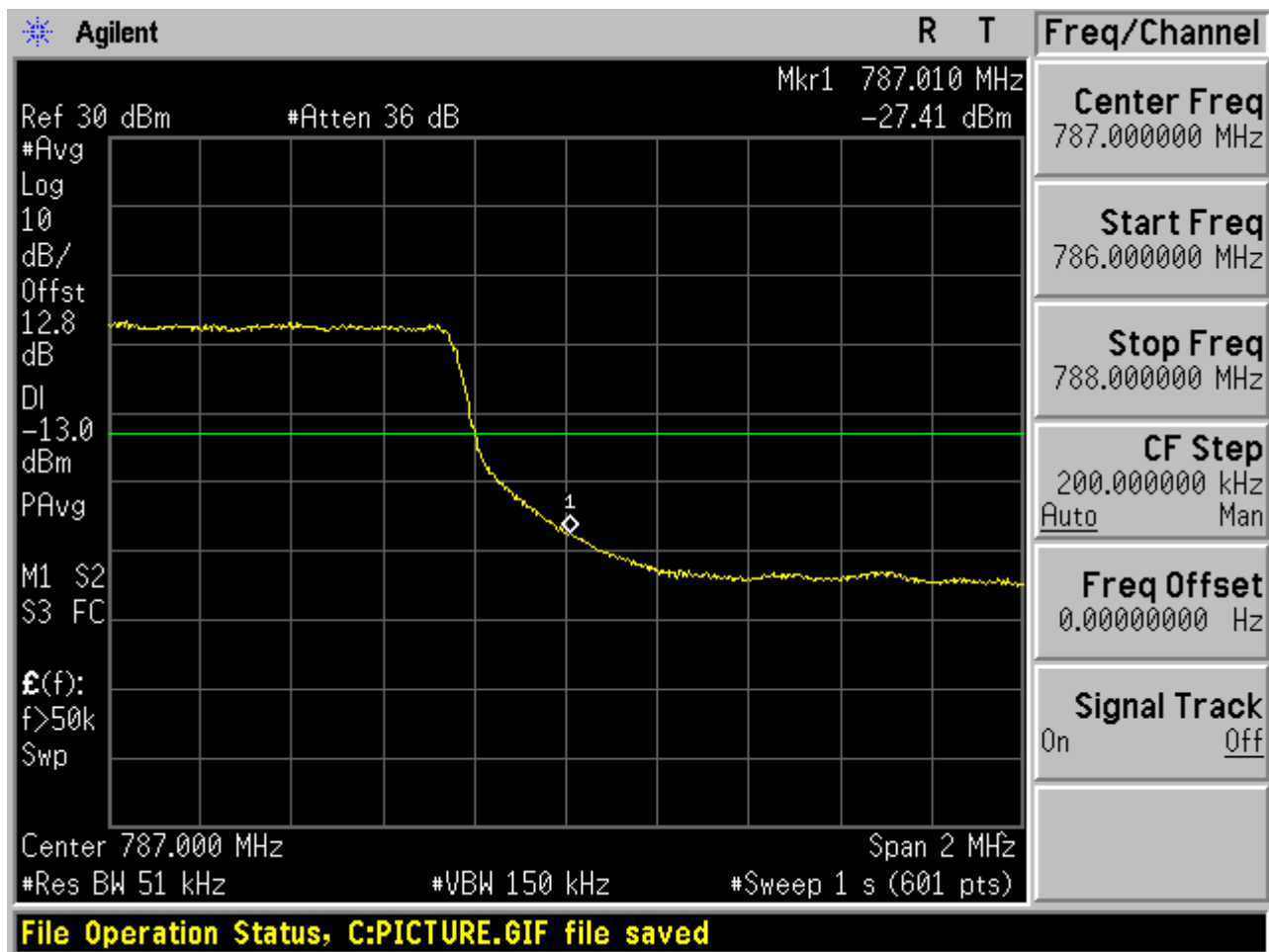


1.2.1.2.3 16QAM / non-1RB #mid/2





1.2.1.2.4 16QAM /full RBs

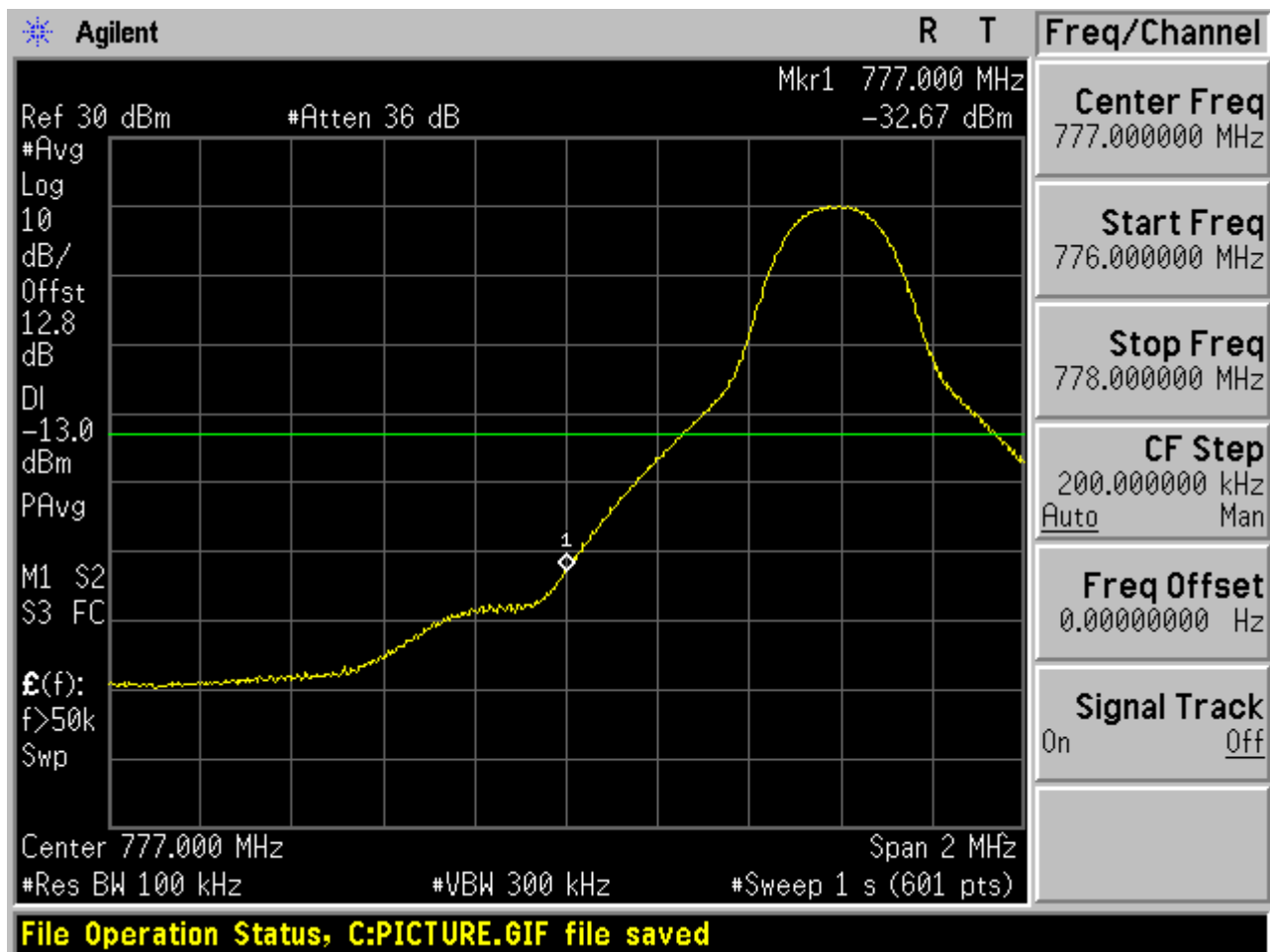




1.2.2 Channel Bandwidth = 10 MHz

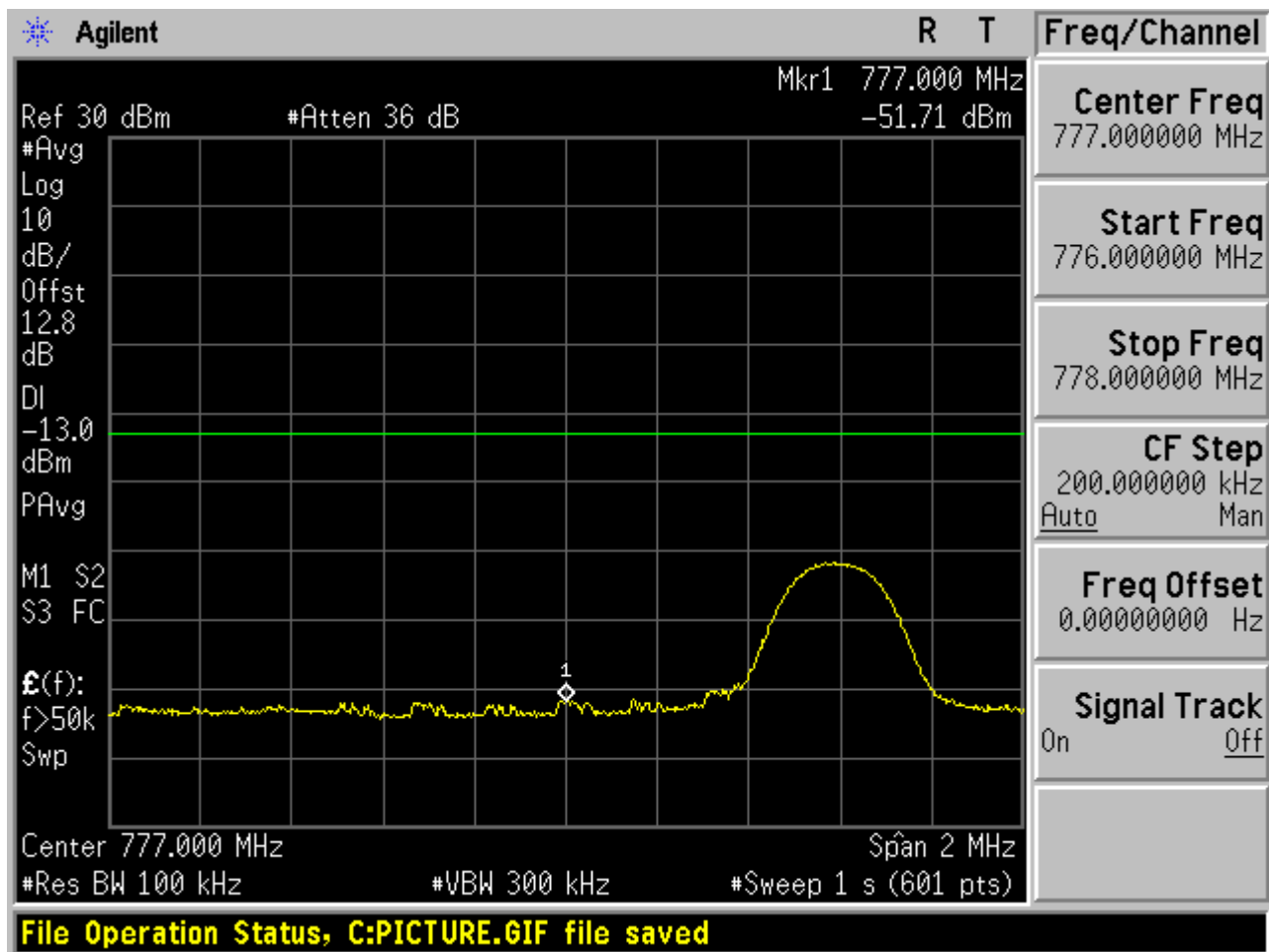
1.2.2.1 Channel= B

1.2.2.1.1 16QAM/1RB #0



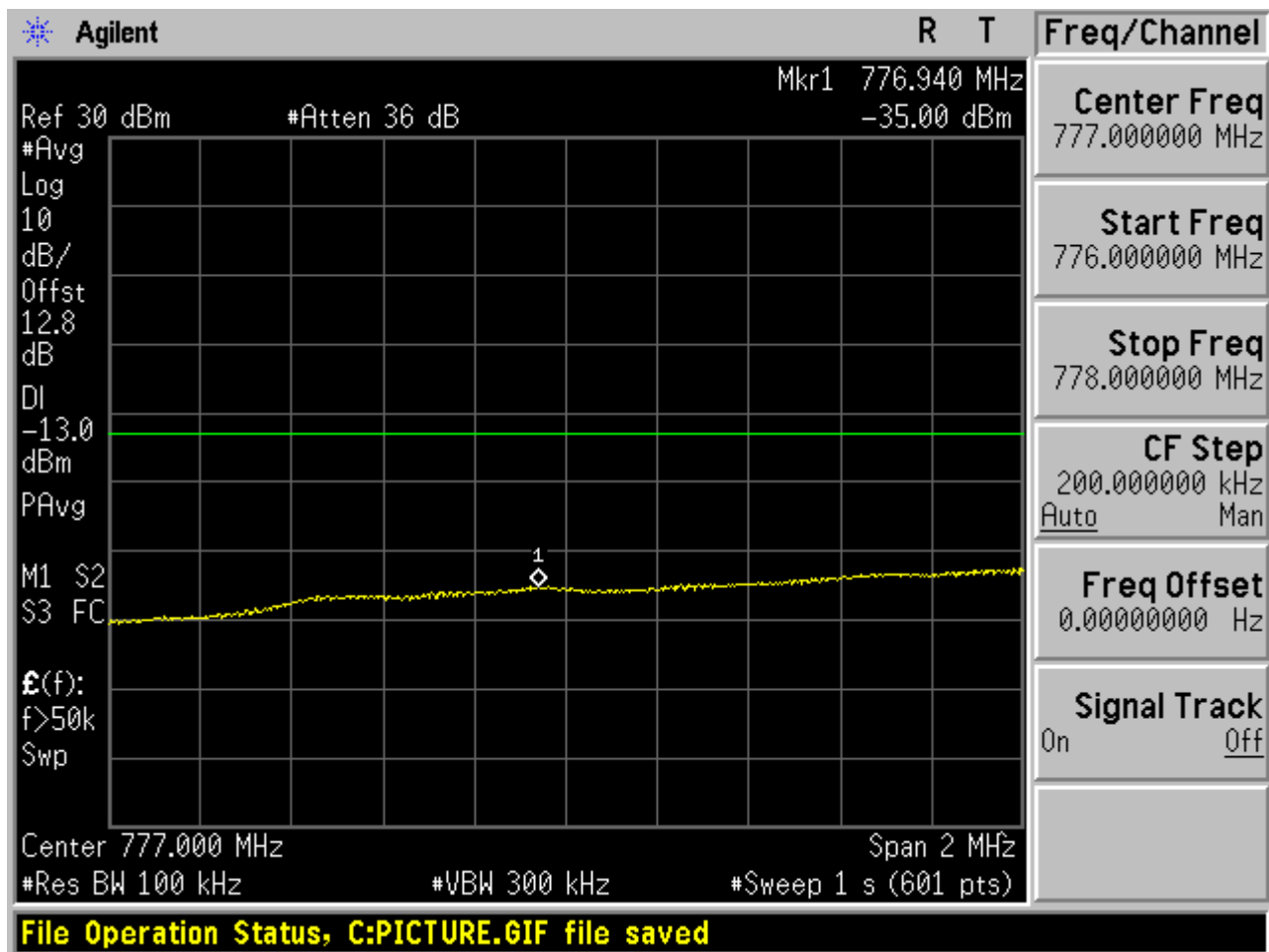


1.2.2.1.2 16QAM/1RB #max

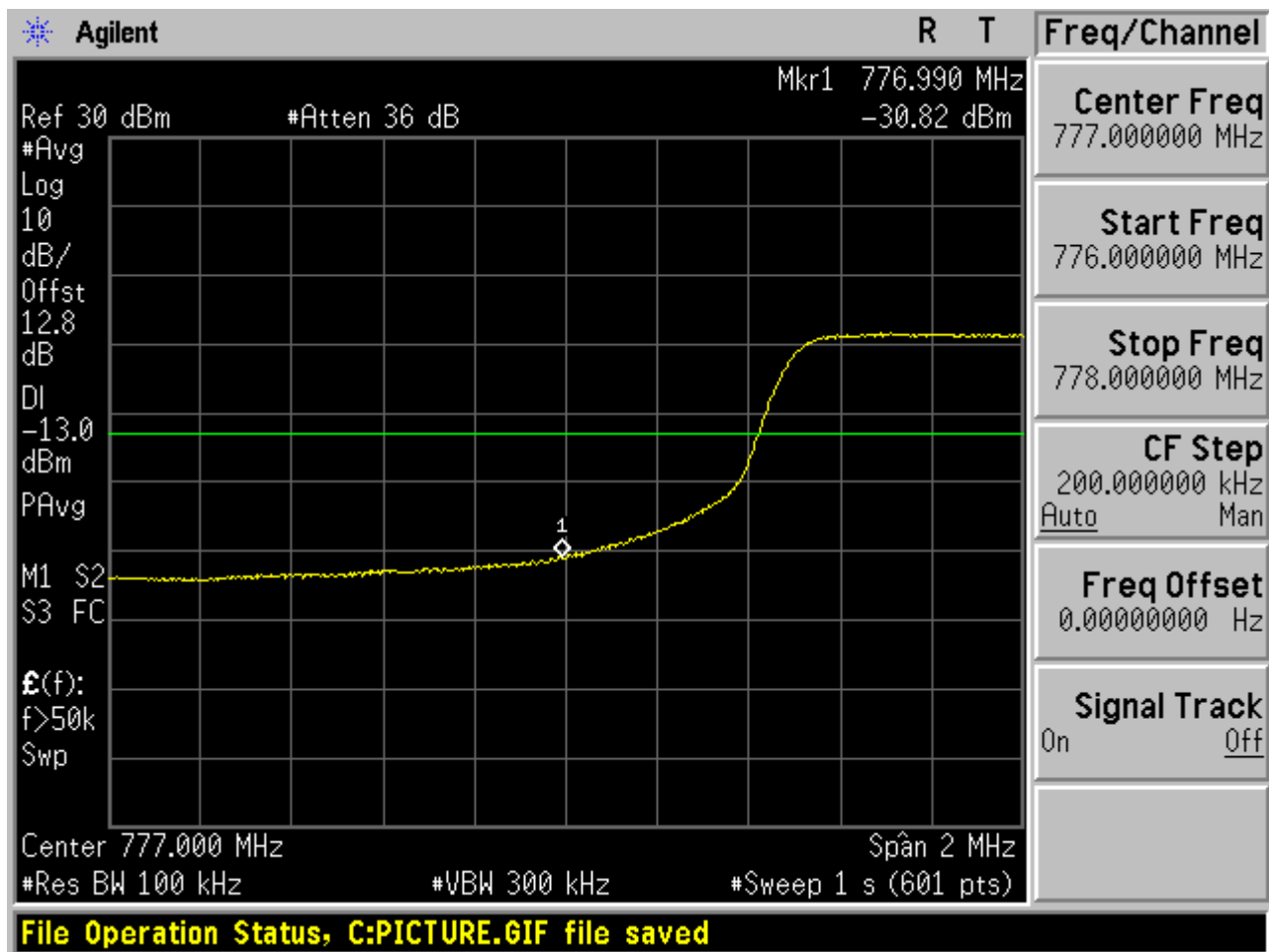




1.2.2.1.3 16QAM / non-1RB #mid/2



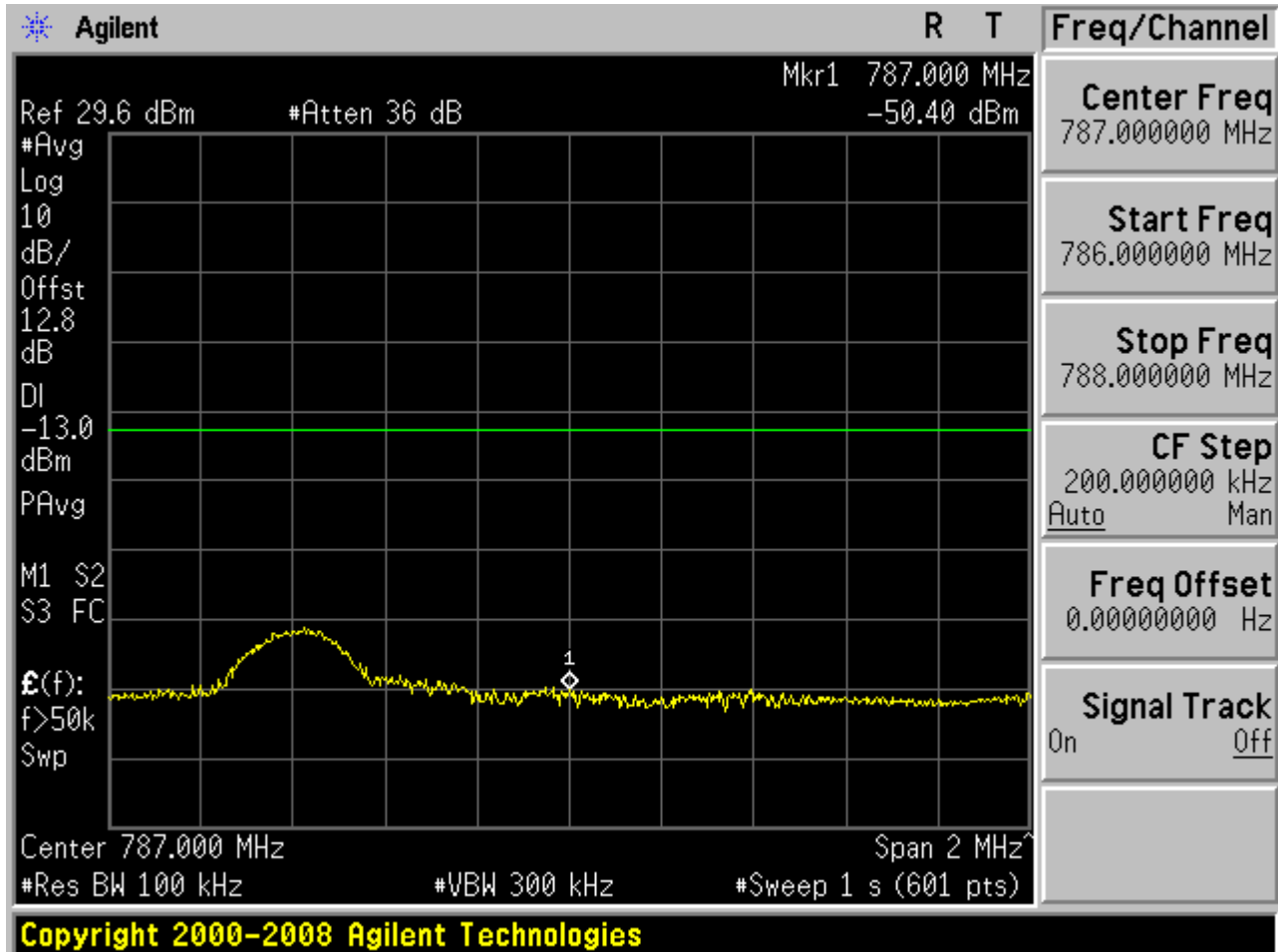
1.2.2.1.4 16QAM /full RBs





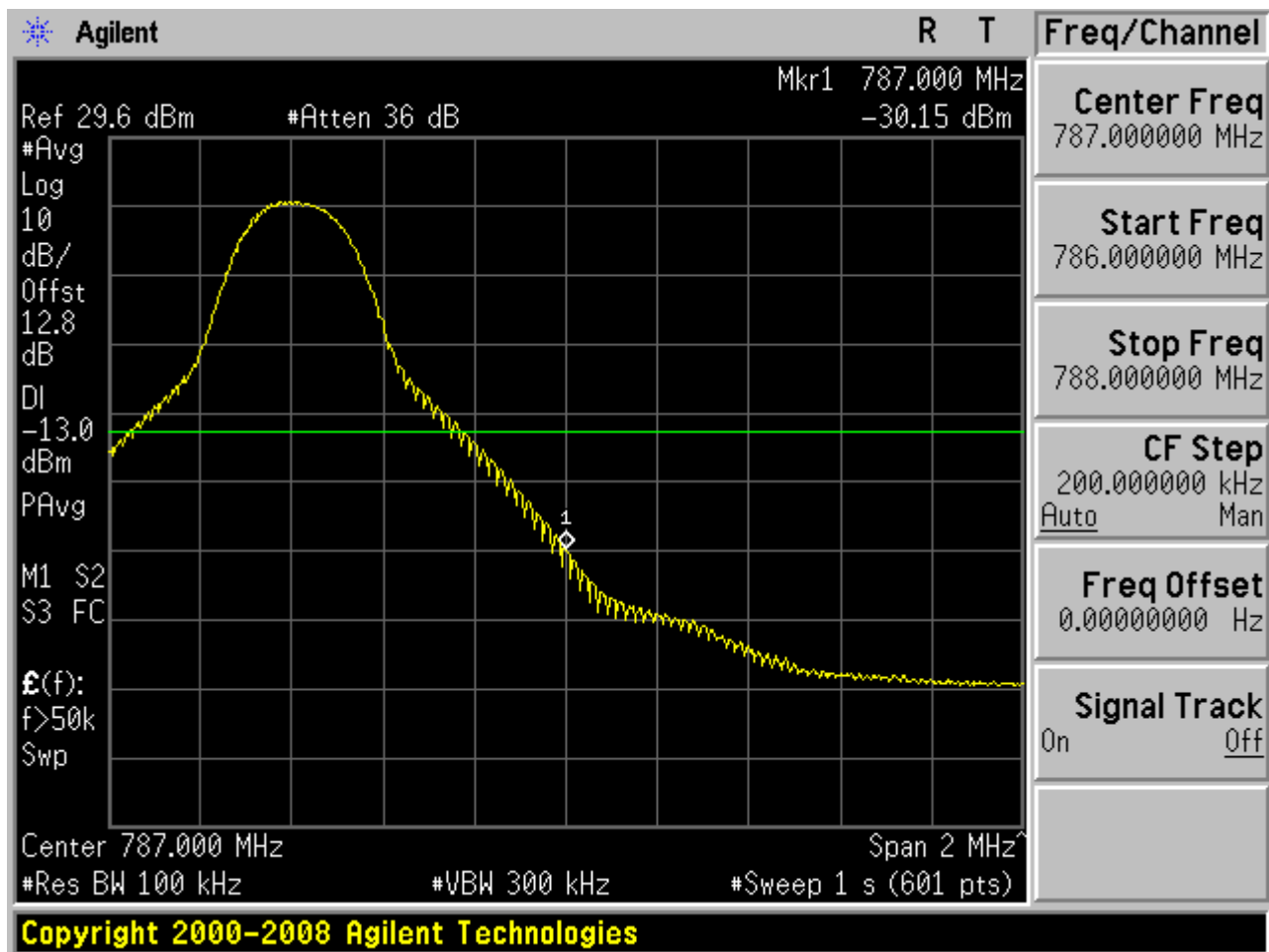
1.2.2.2 Channel= T

1.2.2.2.1 16QAM/1RB #0



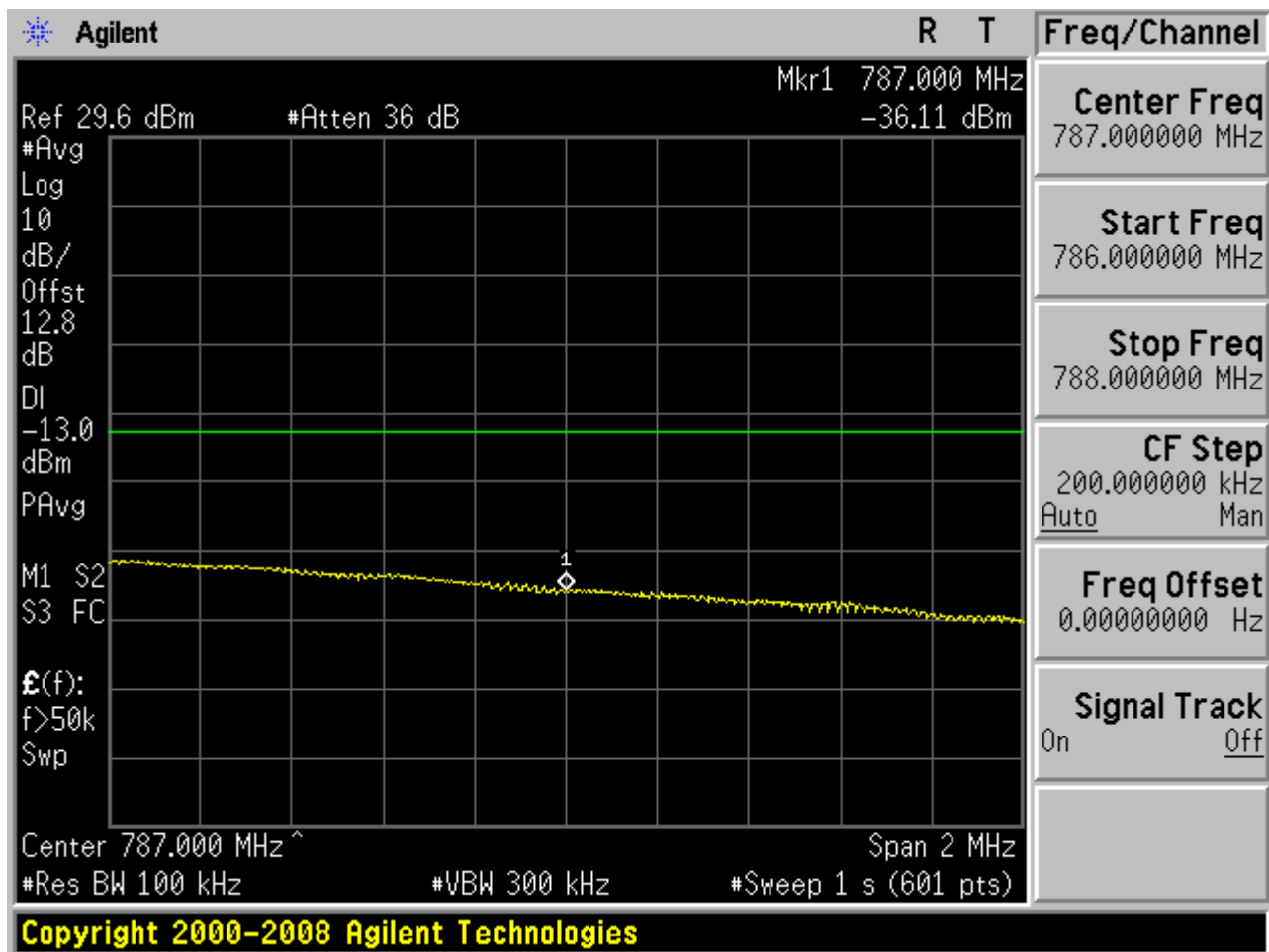


1.2.2.2.2 16QAM/1RB #max

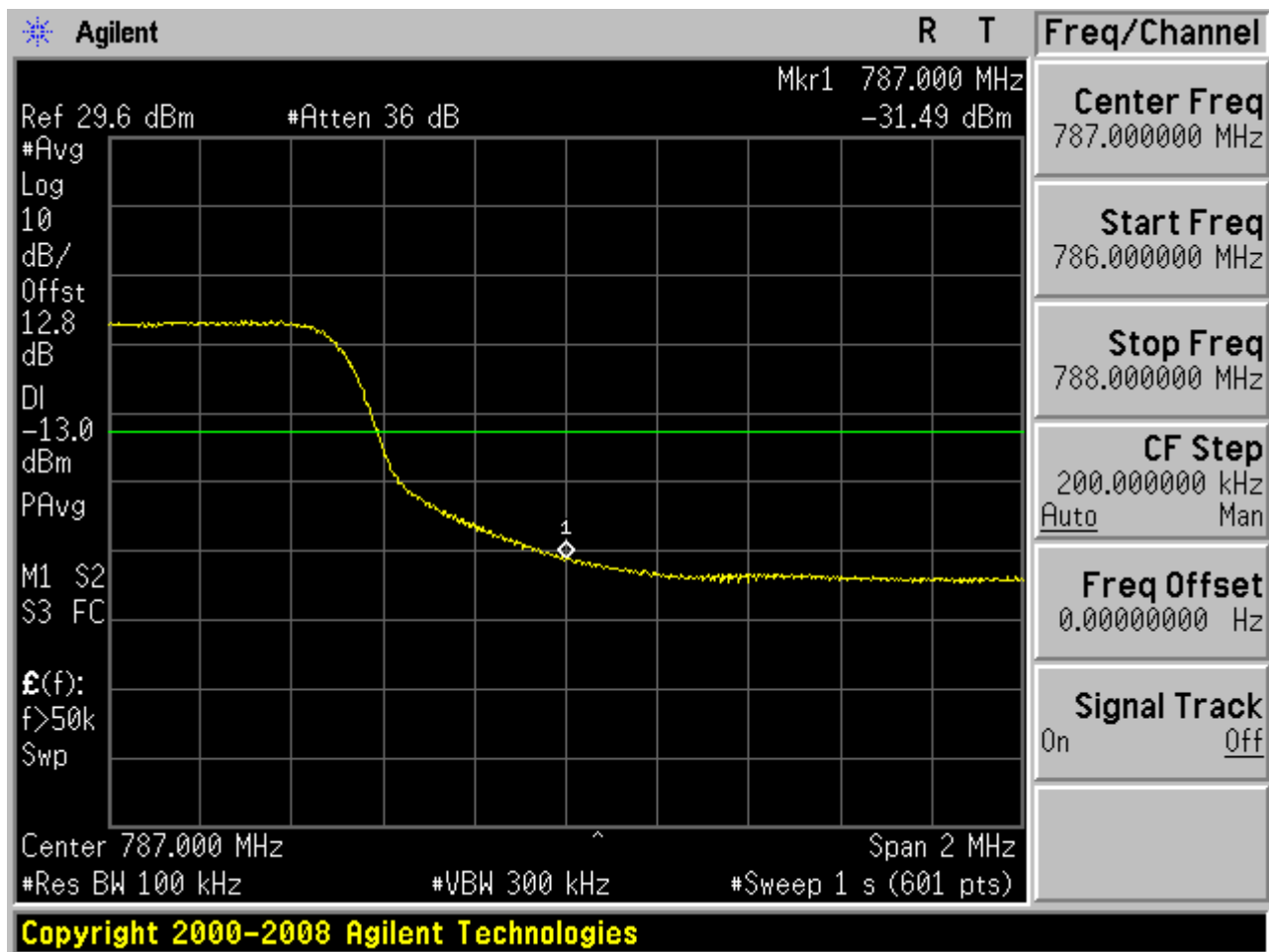




1.2.2.2.3 16QAM / non-1RB #mid/2



1.2.2.2.4 16QAM /full RBs



-----END-----



Appendix E

Spurious Emission at Antenna Terminal

According to FCC Part 2.1051 & Part 27.53(c)(2) &
27.53(c)(5)



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1 For Band 13

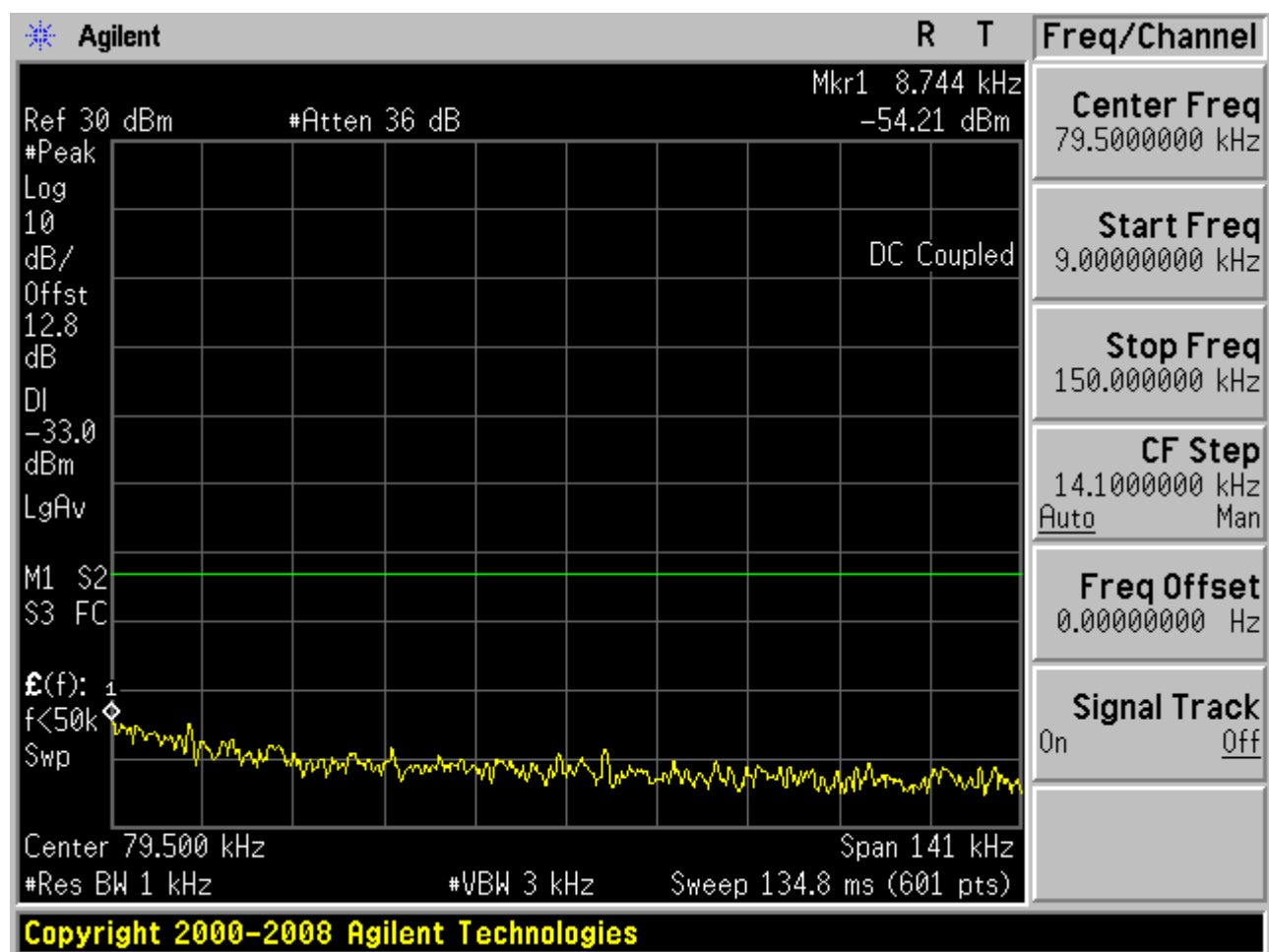
NOTE1: All relevant operation modes have been tested, and the 1RBs /RB#0 case data is included in this report.

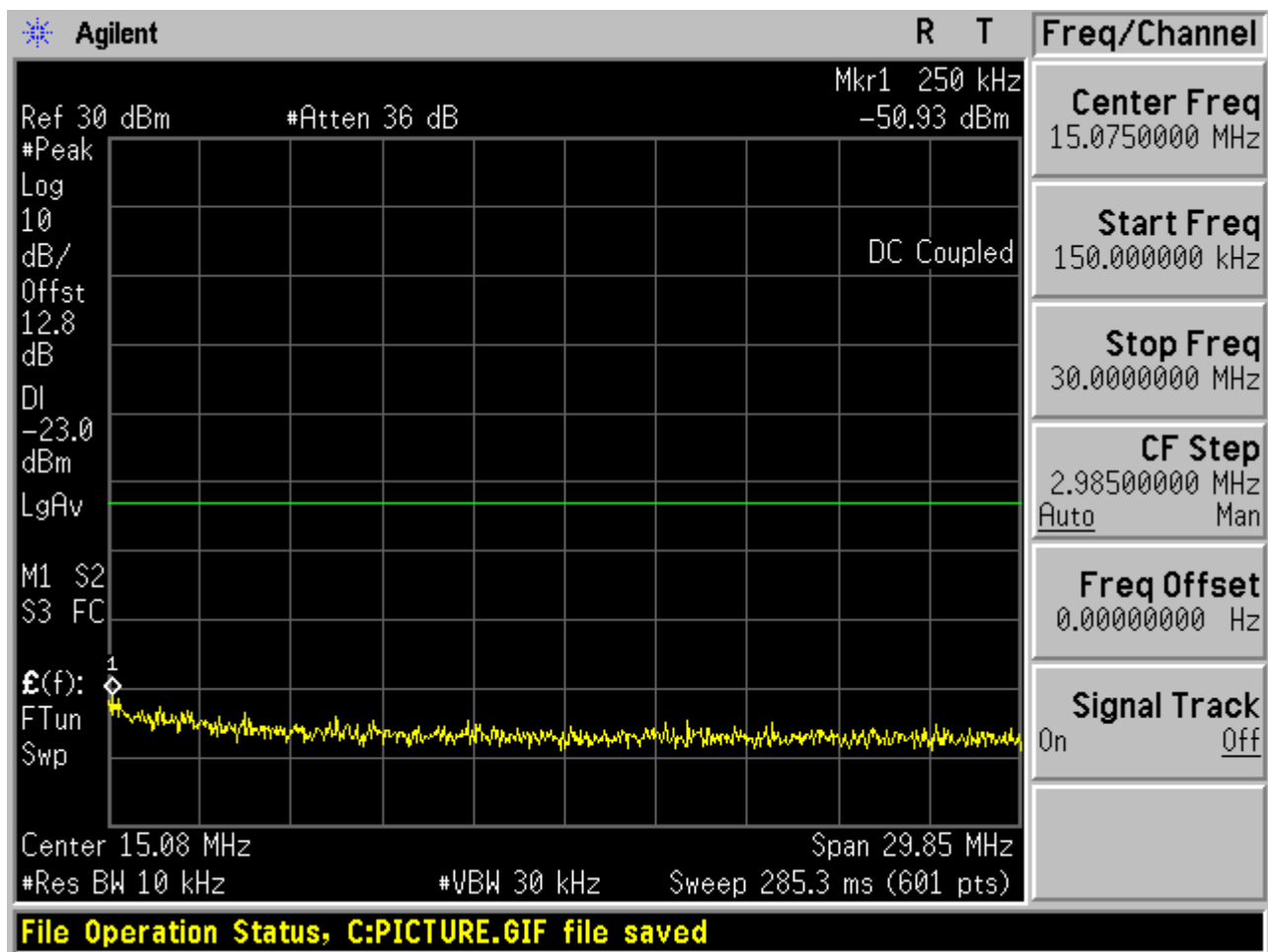
1.1 Test Mode=TM1

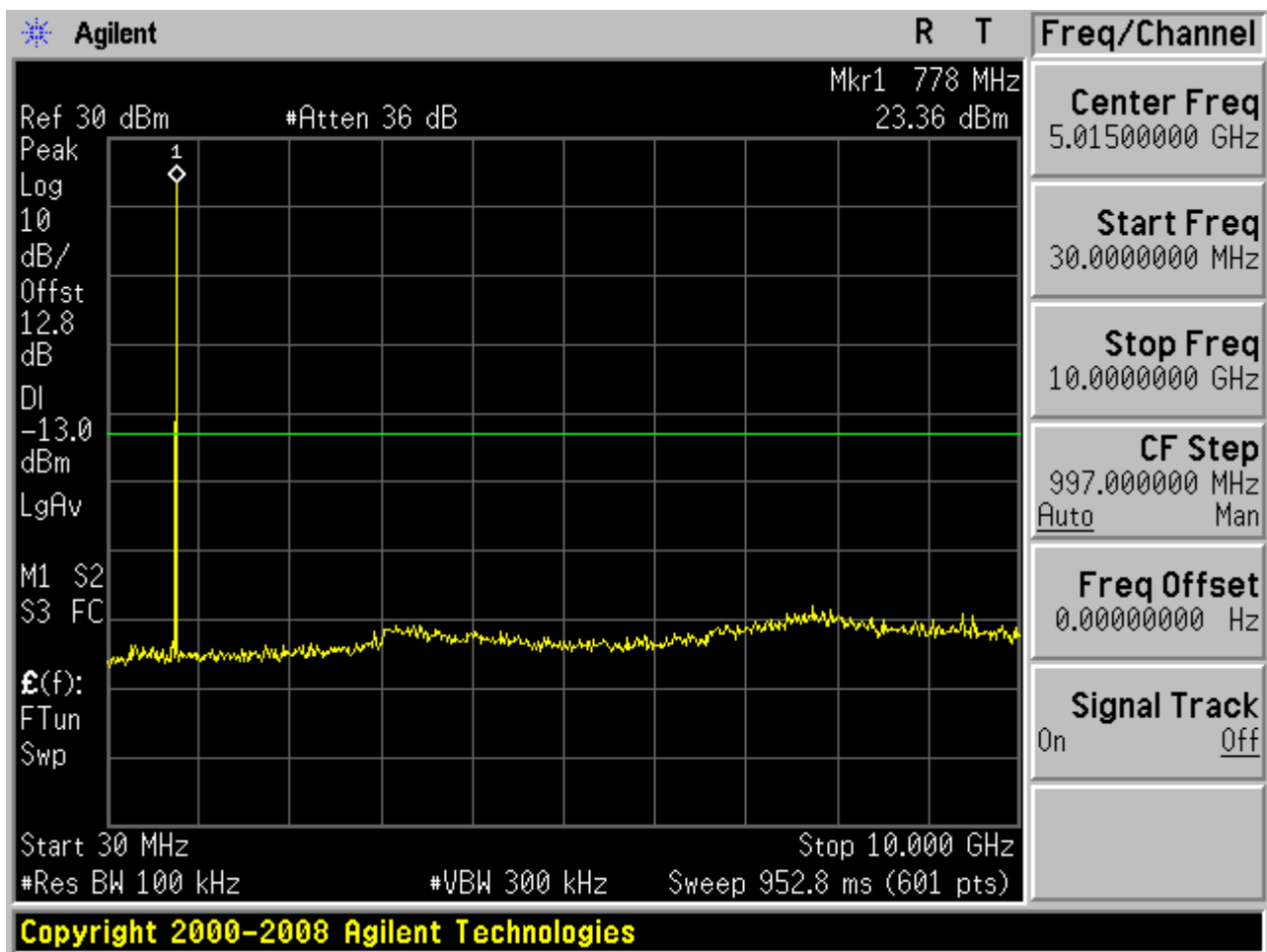
1.1.1 Channel Bandwidth = 5 MHz

1.1.1.1 Channel = B

1.1.1.1.1 QPSK/1RBs /RB #0



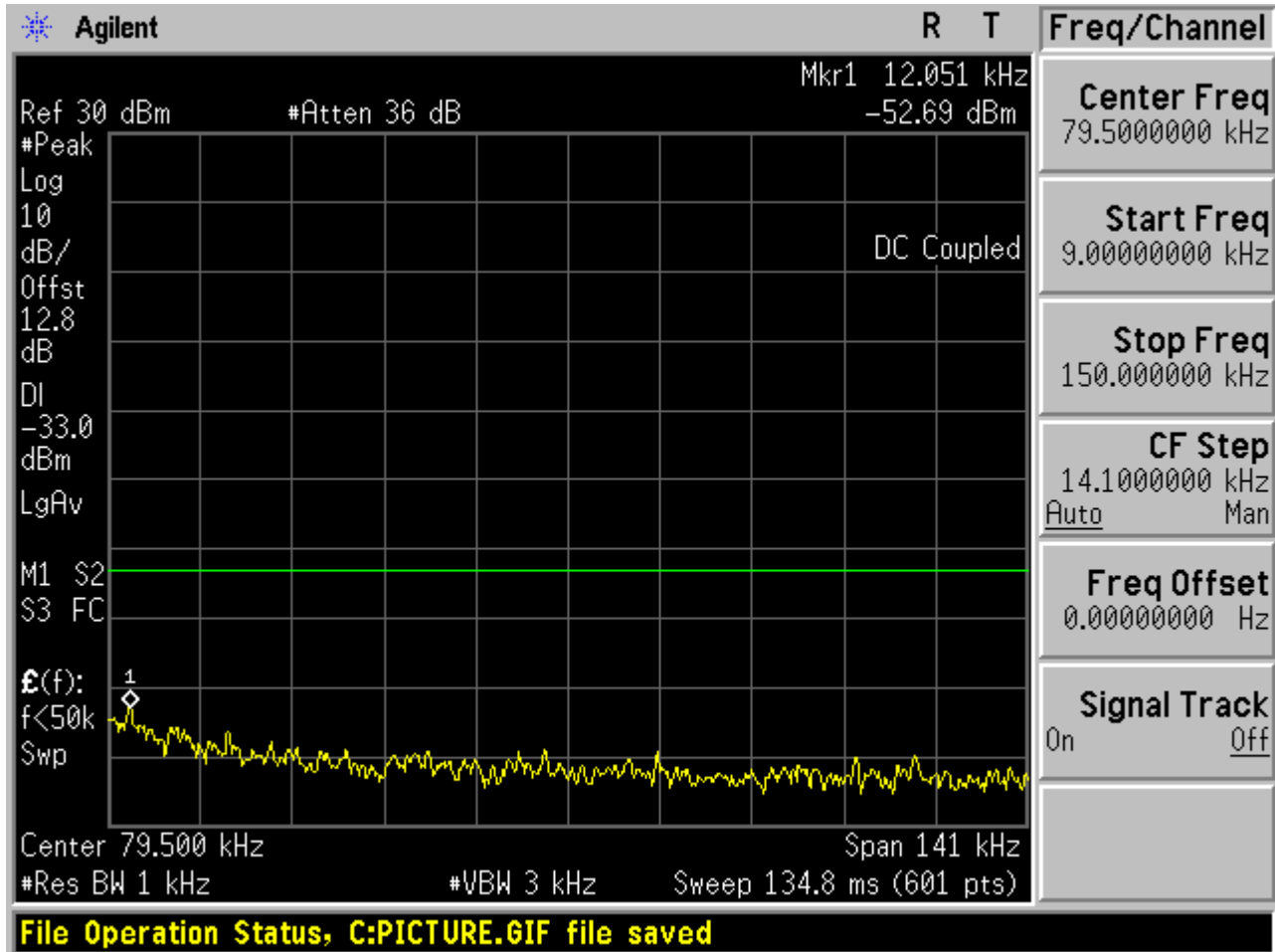


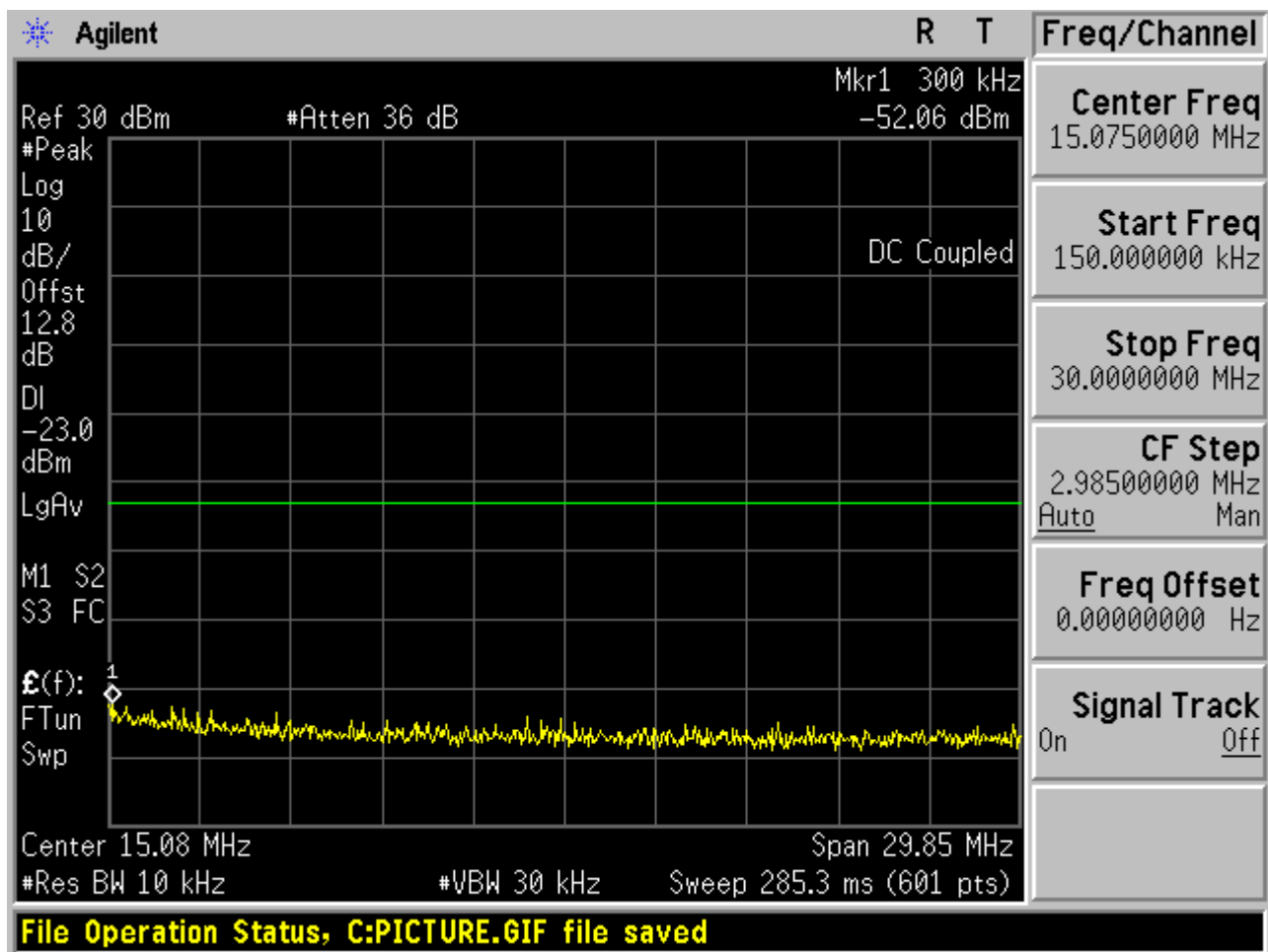


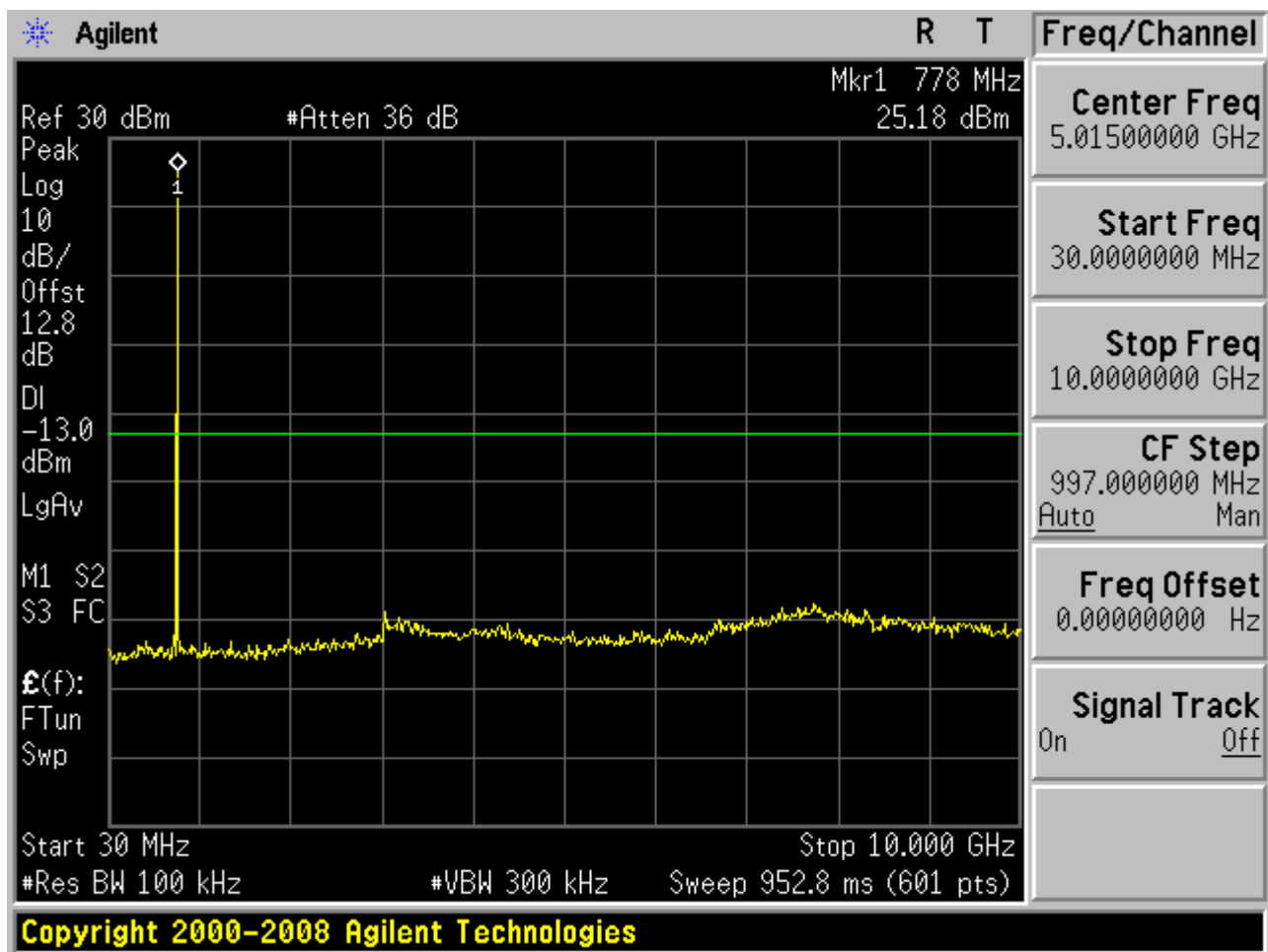


1.1.1.2 Channel = M

1.1.1.2.1 QPSK/1RBs /RB #0



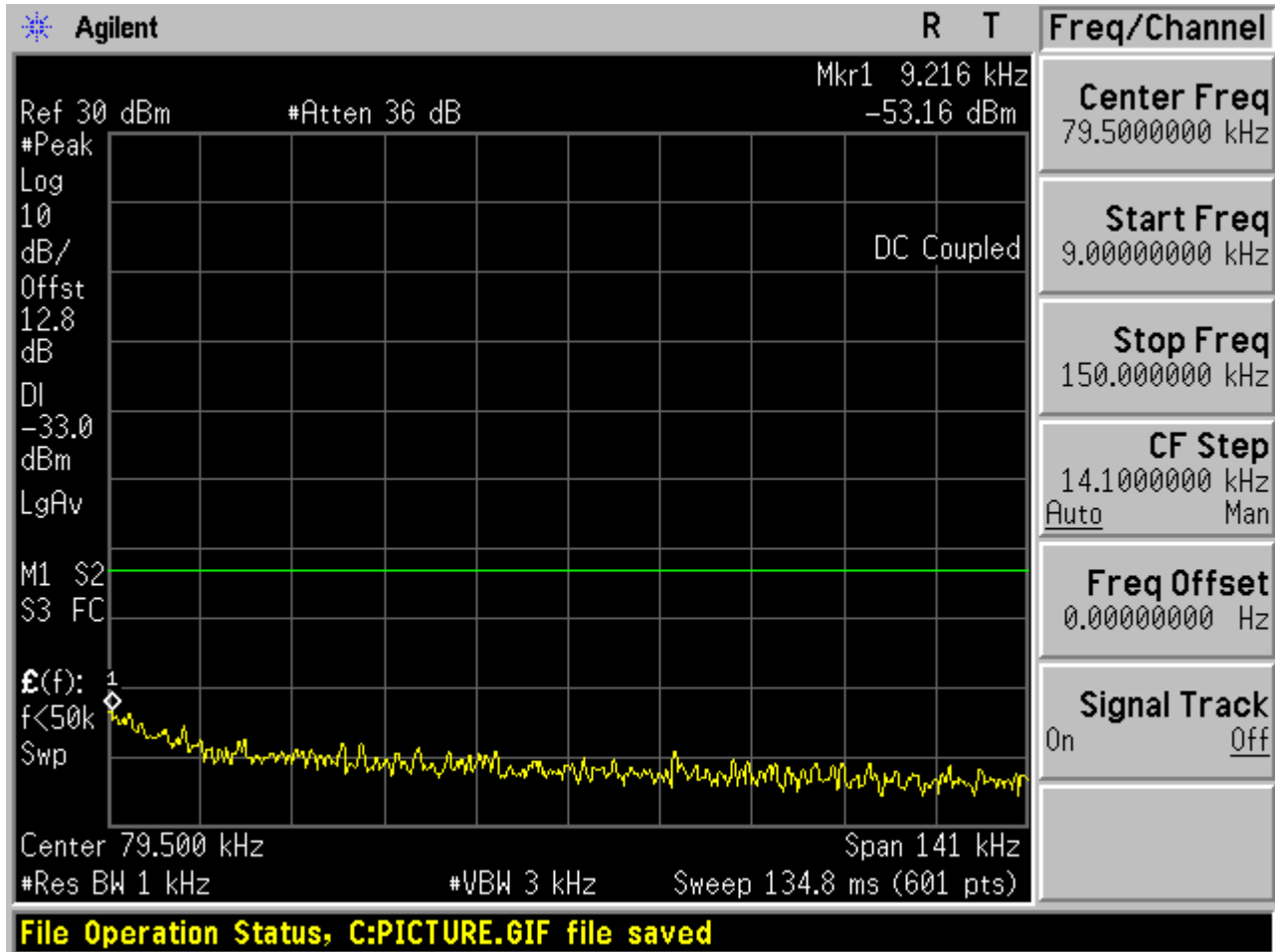


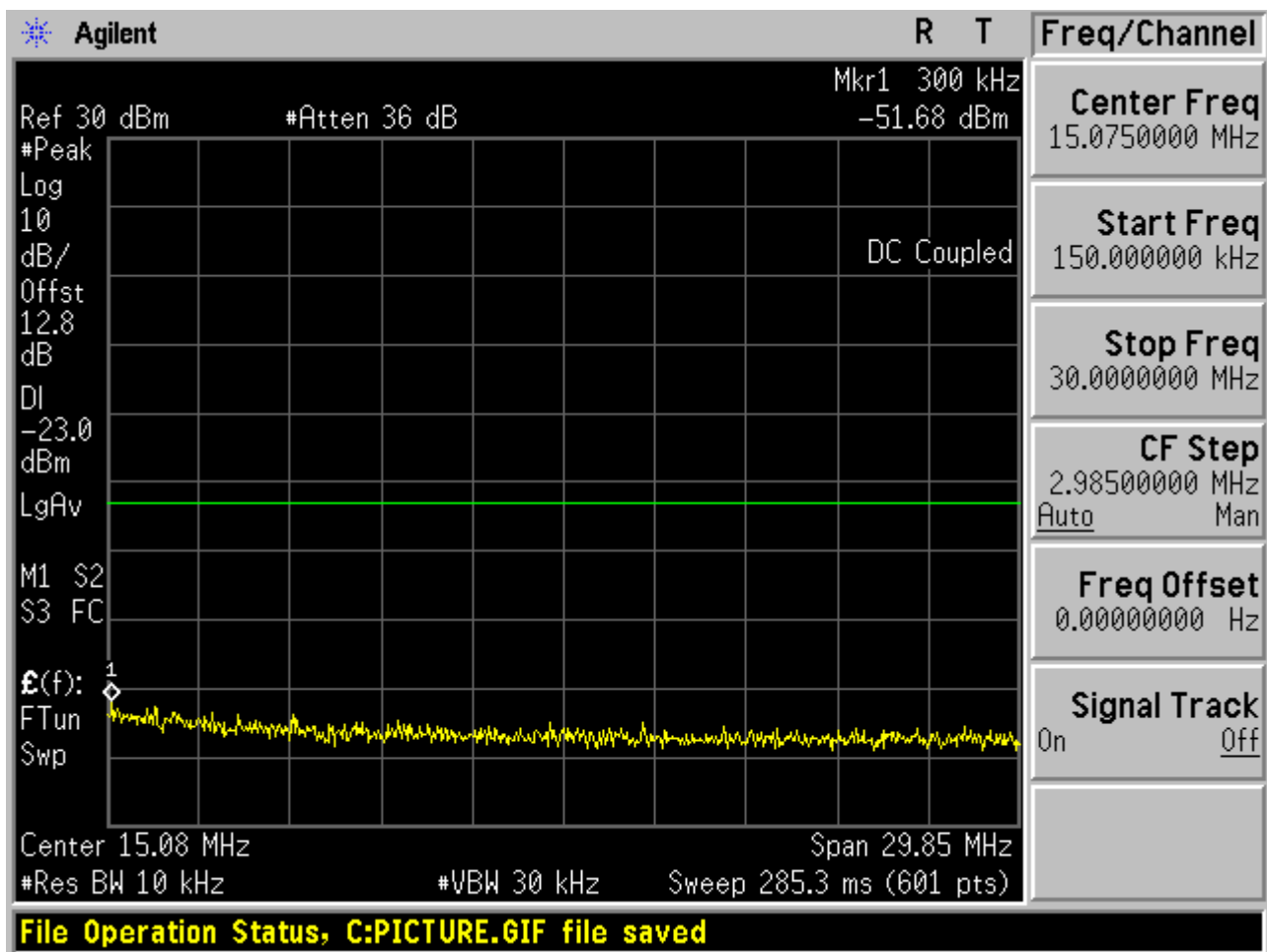


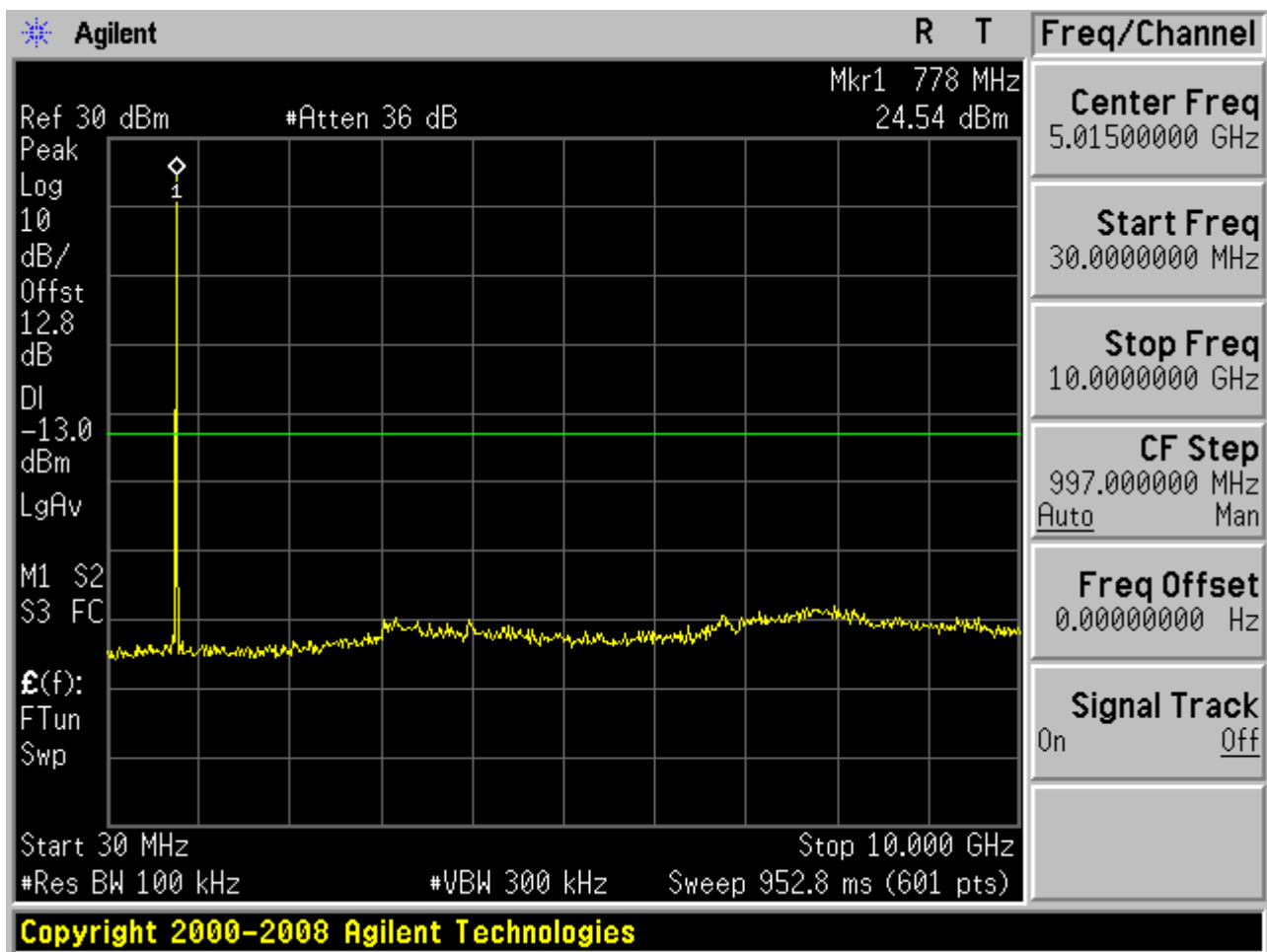


1.1.1.3 Channel = T

1.1.1.3.1 QPSK/1RBs /RB #0





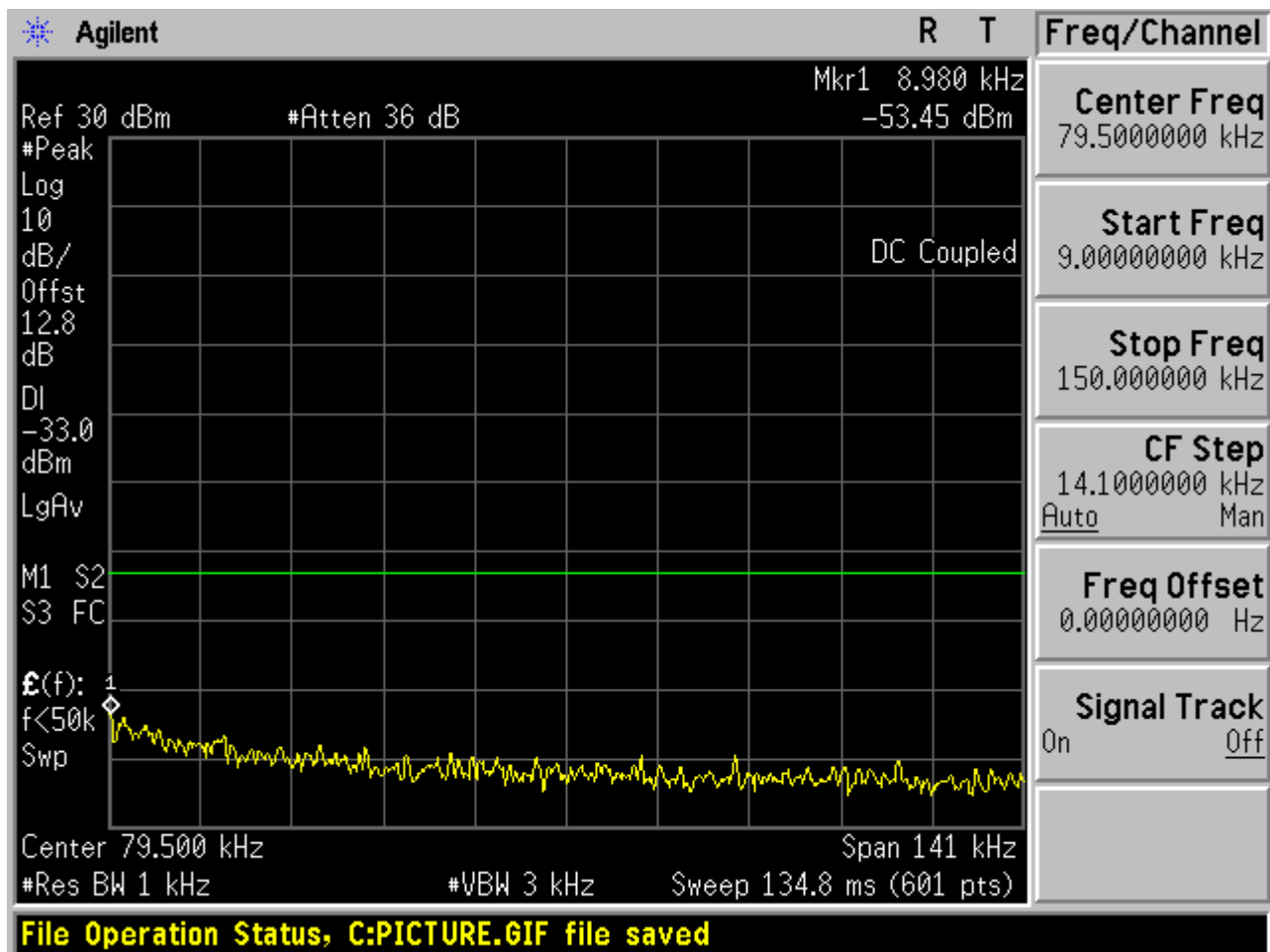


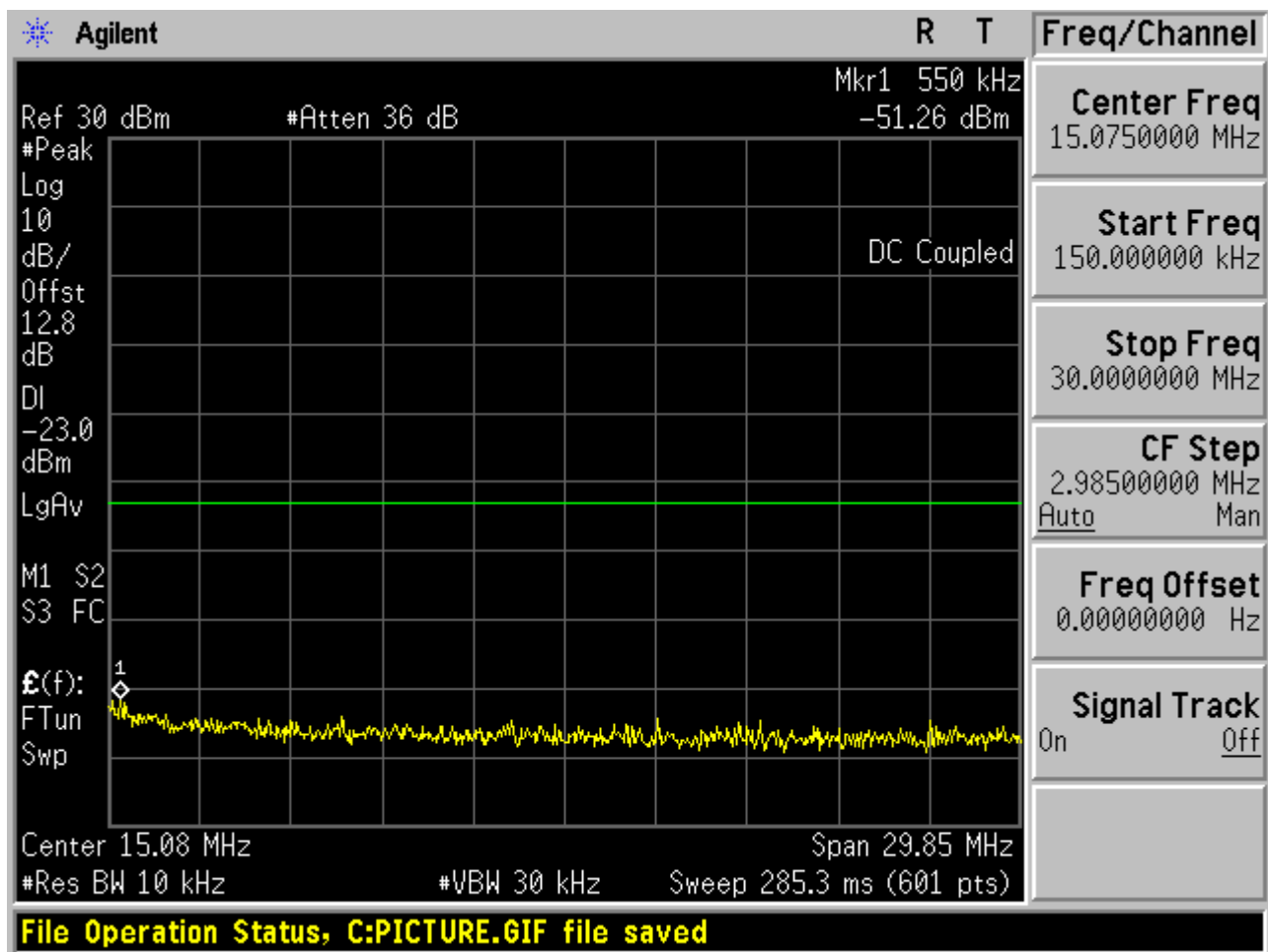


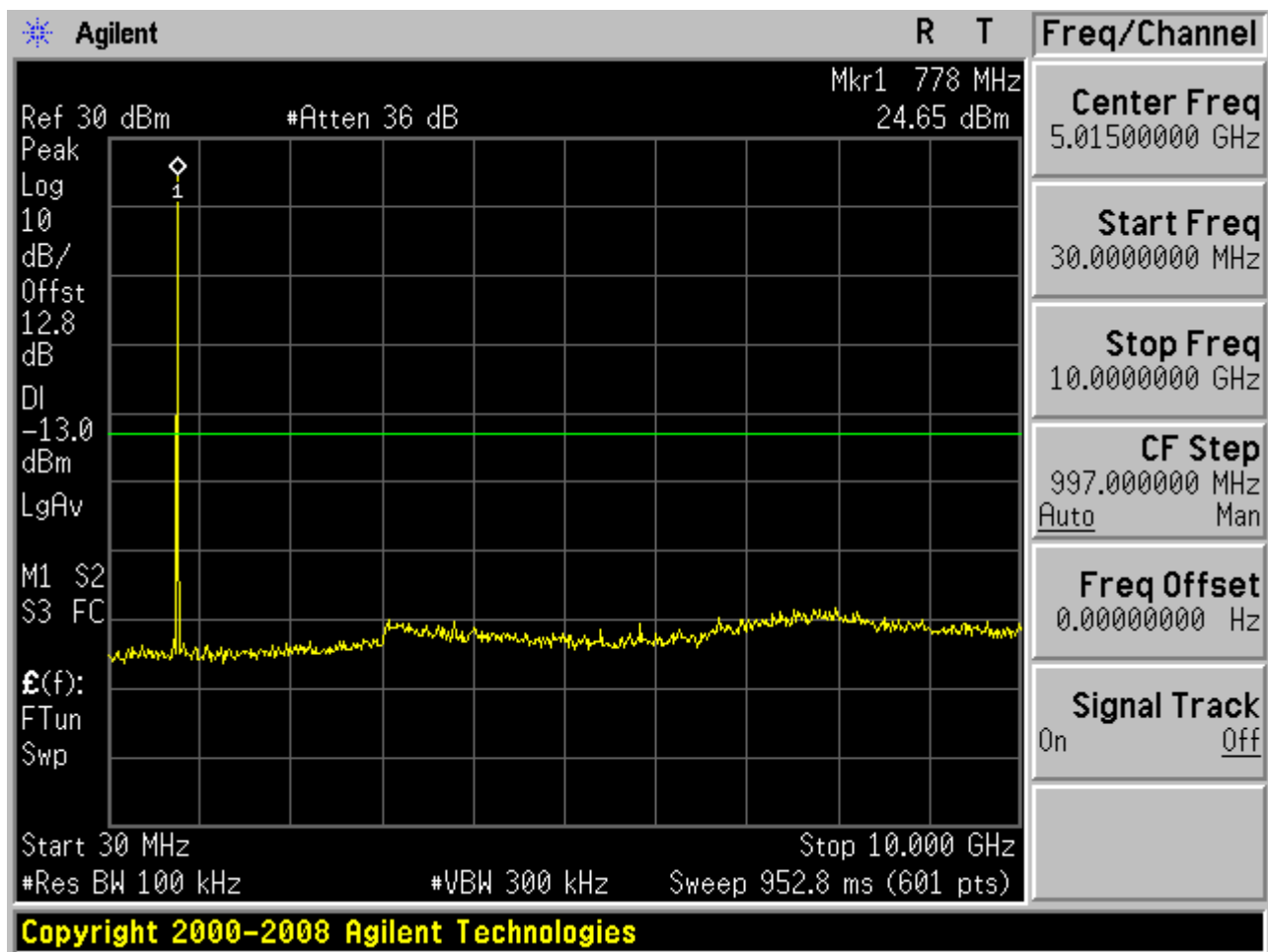
1.1.2 Channel Bandwidth = 10 MHz

1.1.2.1 Channel = (B/M/T)

1.1.2.1.1 QPSK/1RBs /RB #0





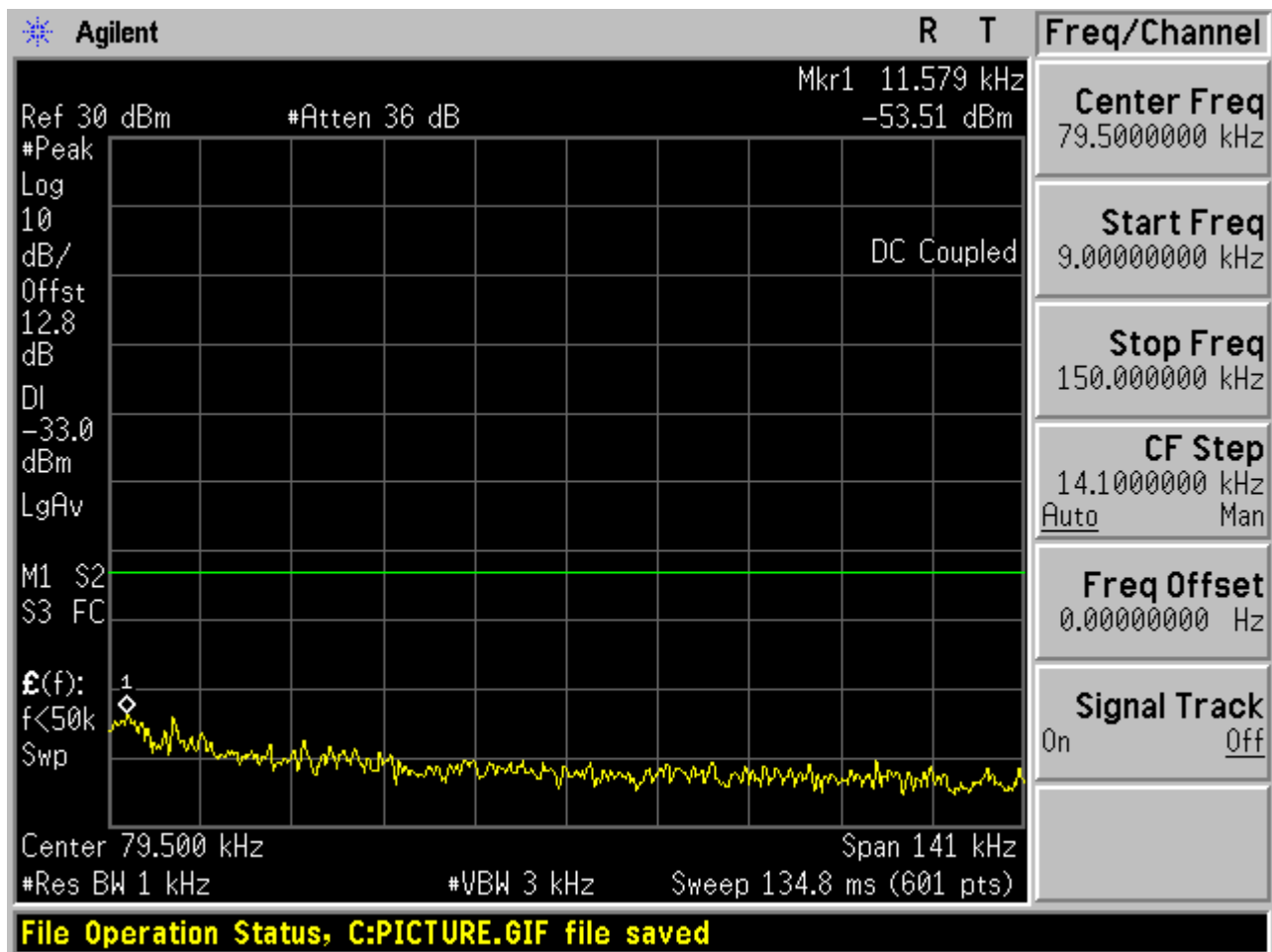


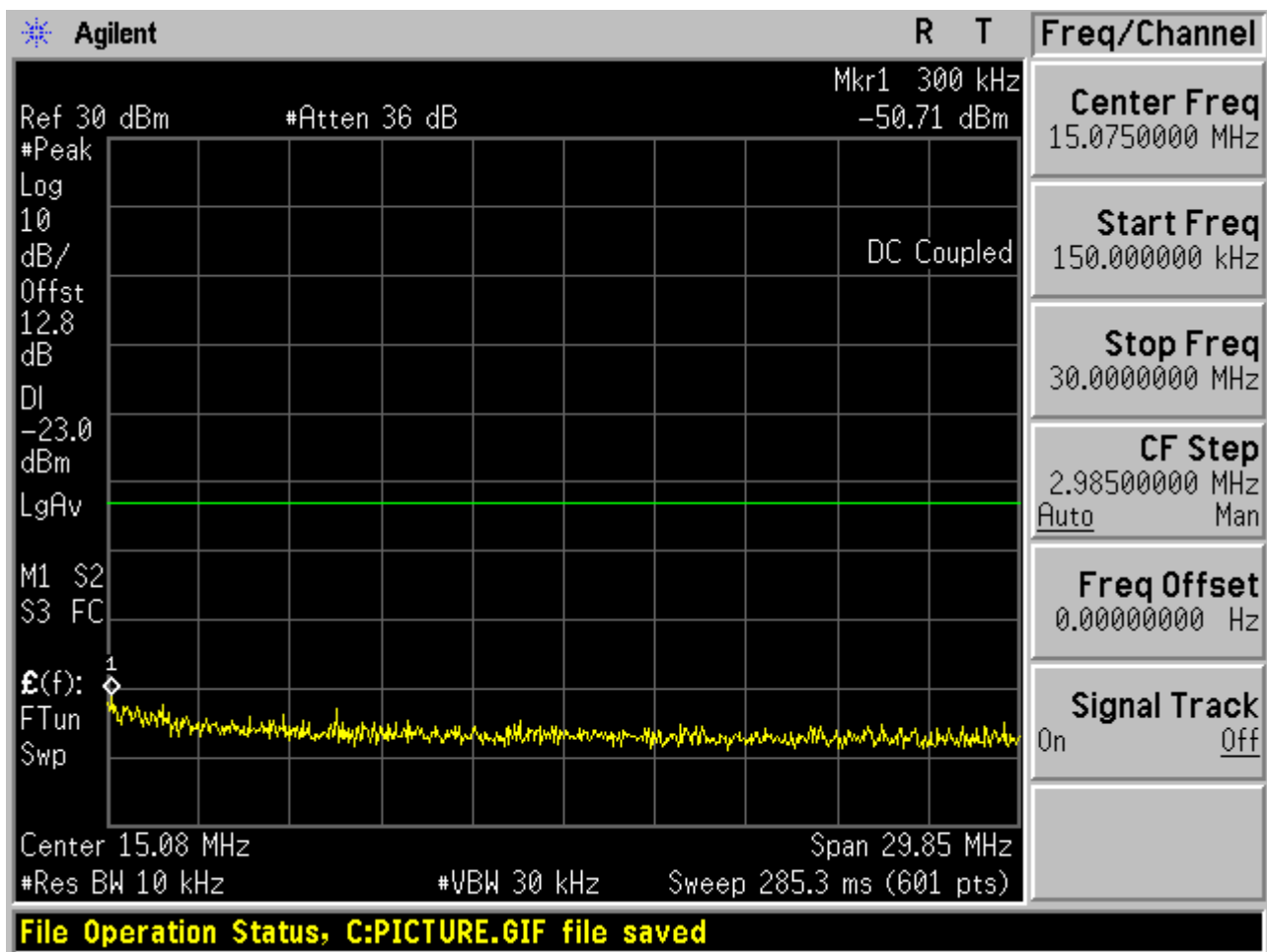
1.2 Test Mode=TM2

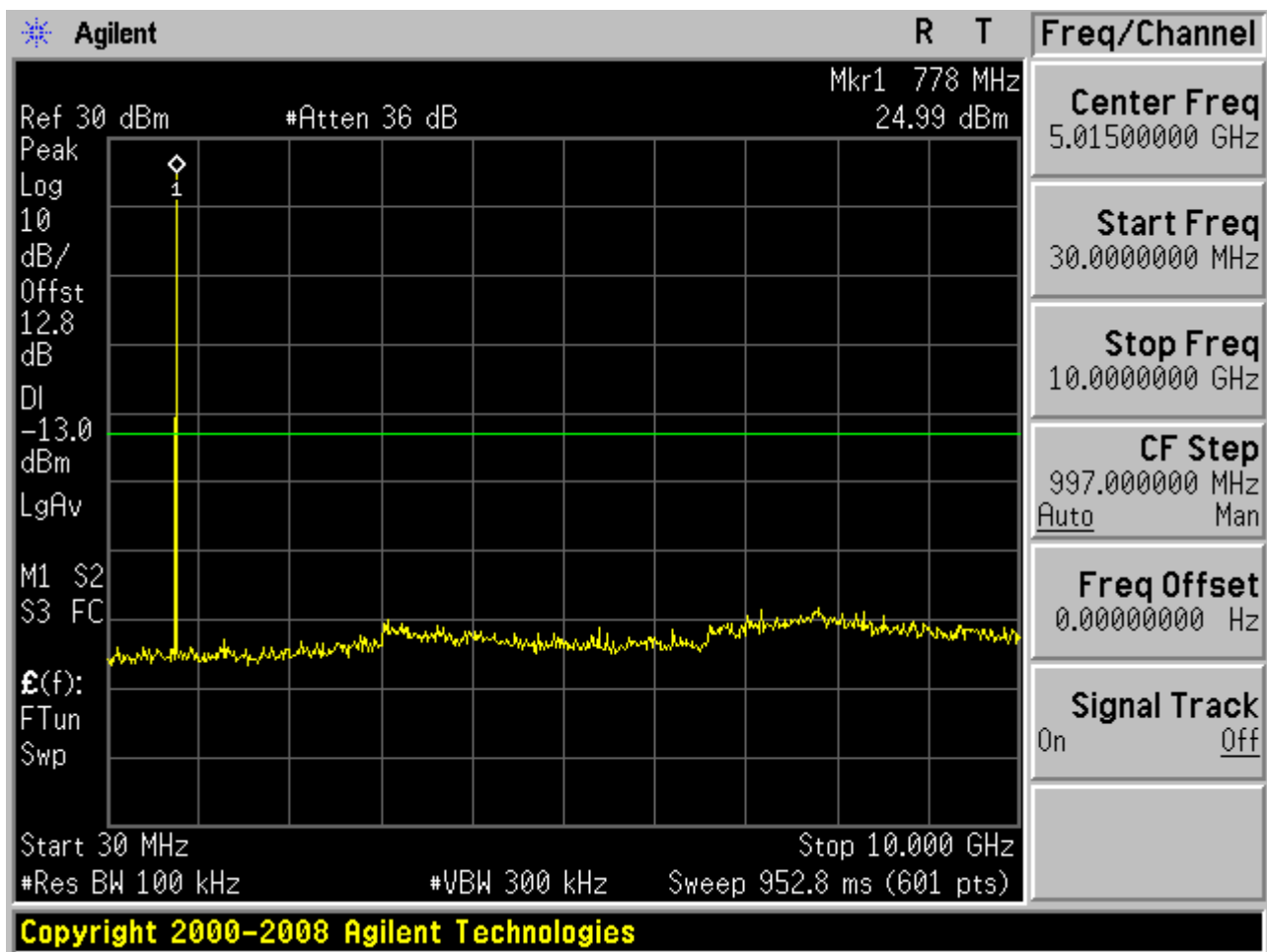
1.2.1 Channel Bandwidth = 5 MHz

1.2.1.1 Channel = B

1.2.1.1.1 16QAM/1RBs /RB #0



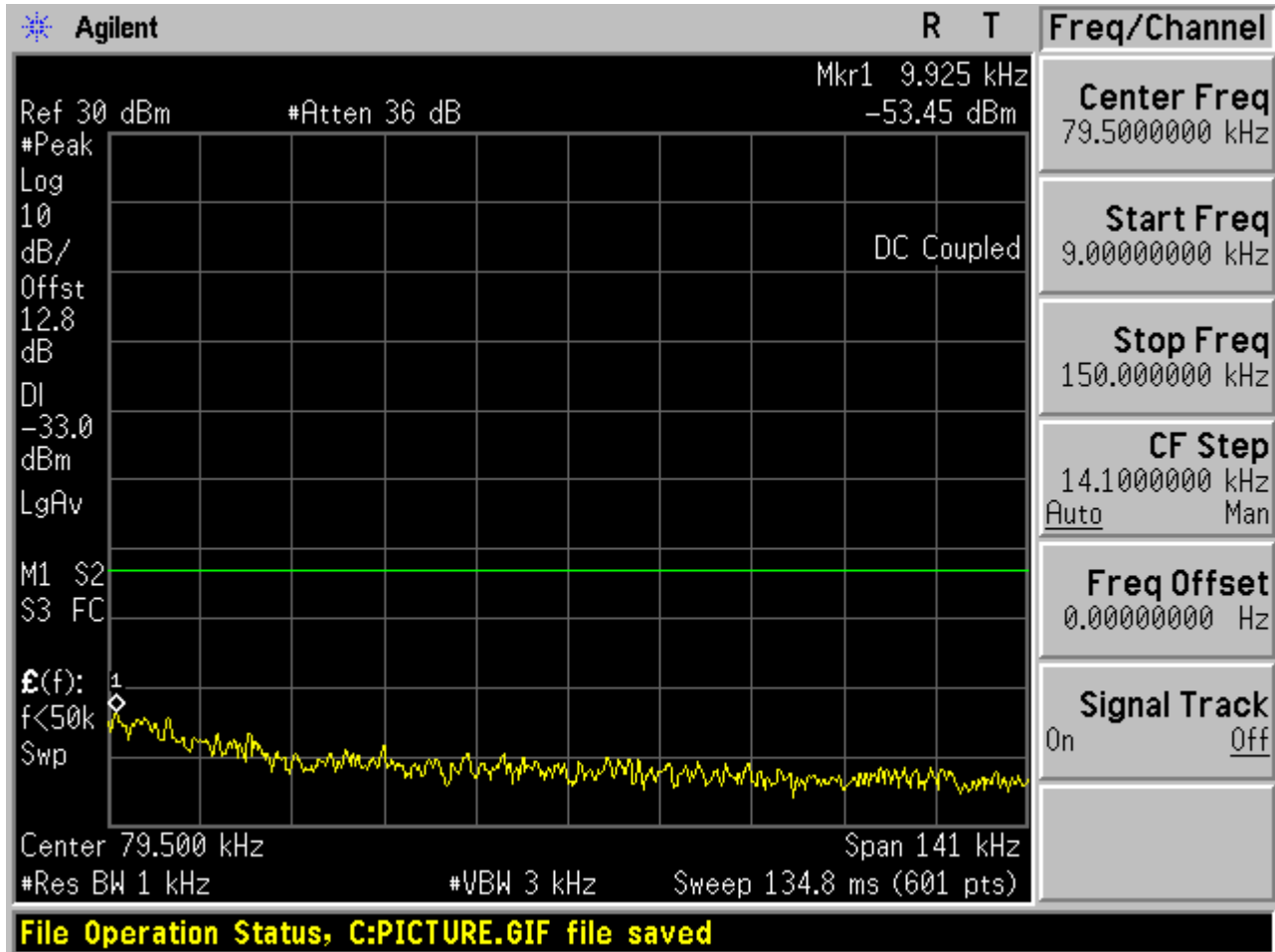


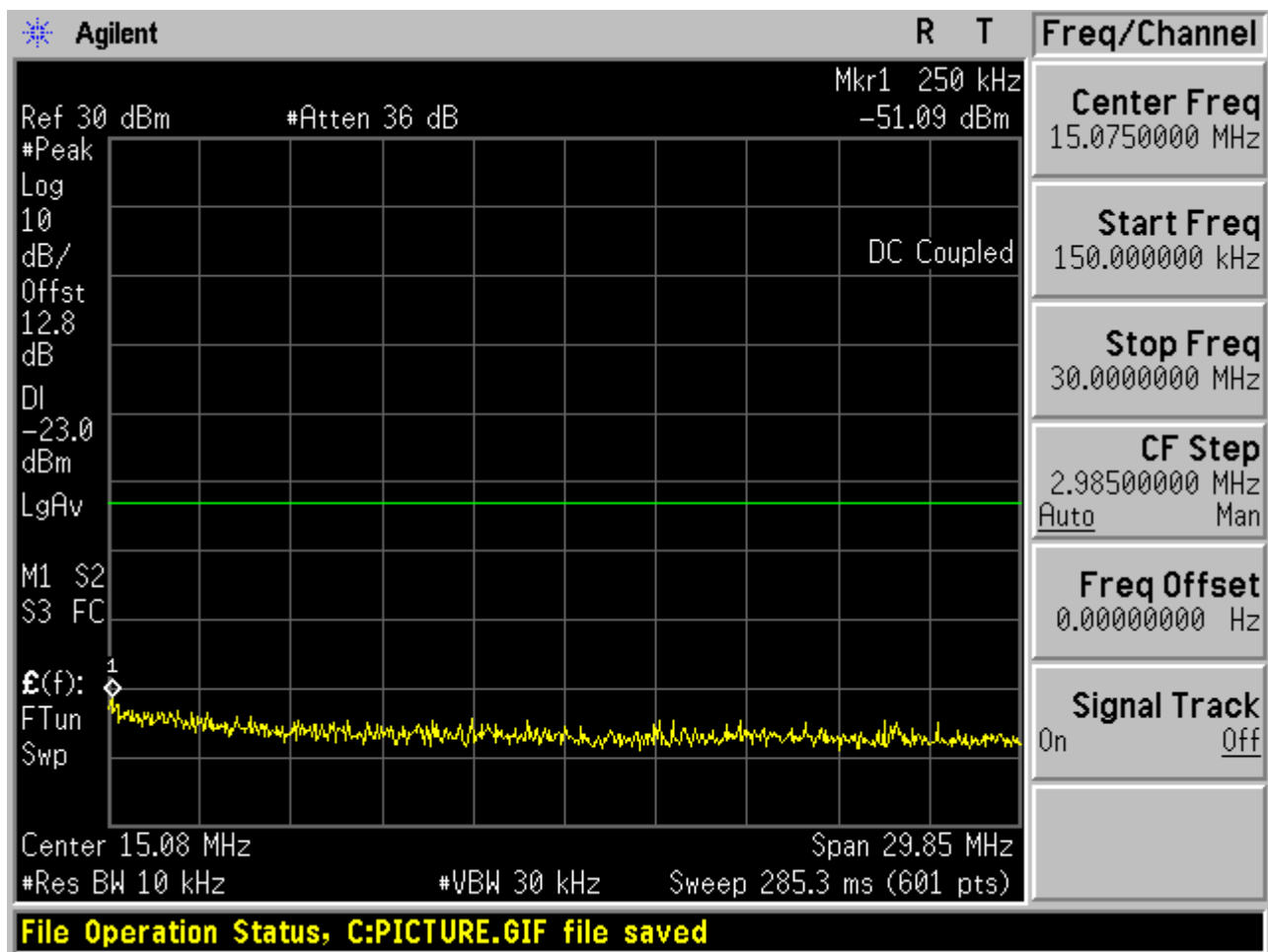


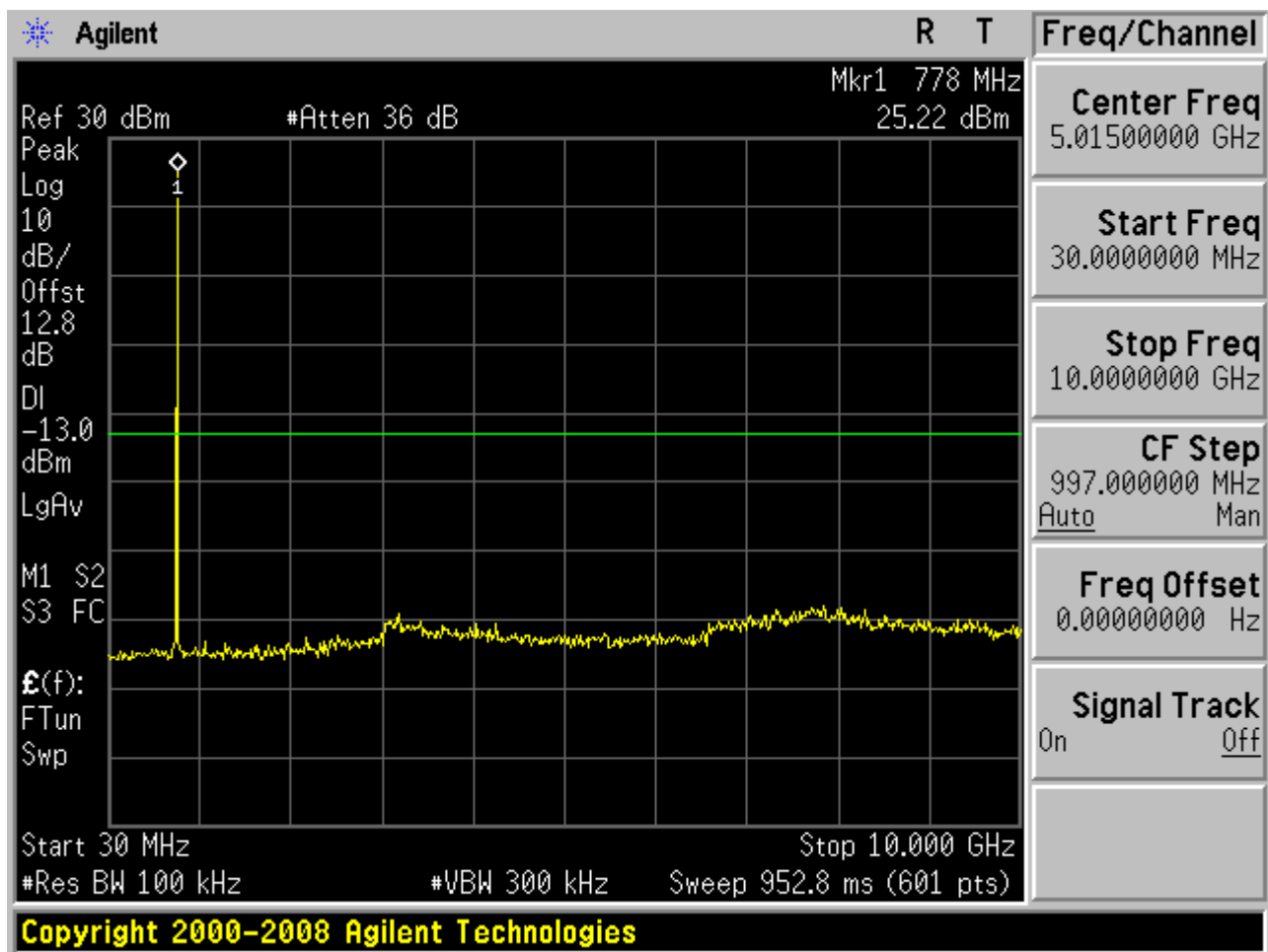


1.2.1.2 Channel = M

1.2.1.2.1 16QAM/1RBs /RB #0



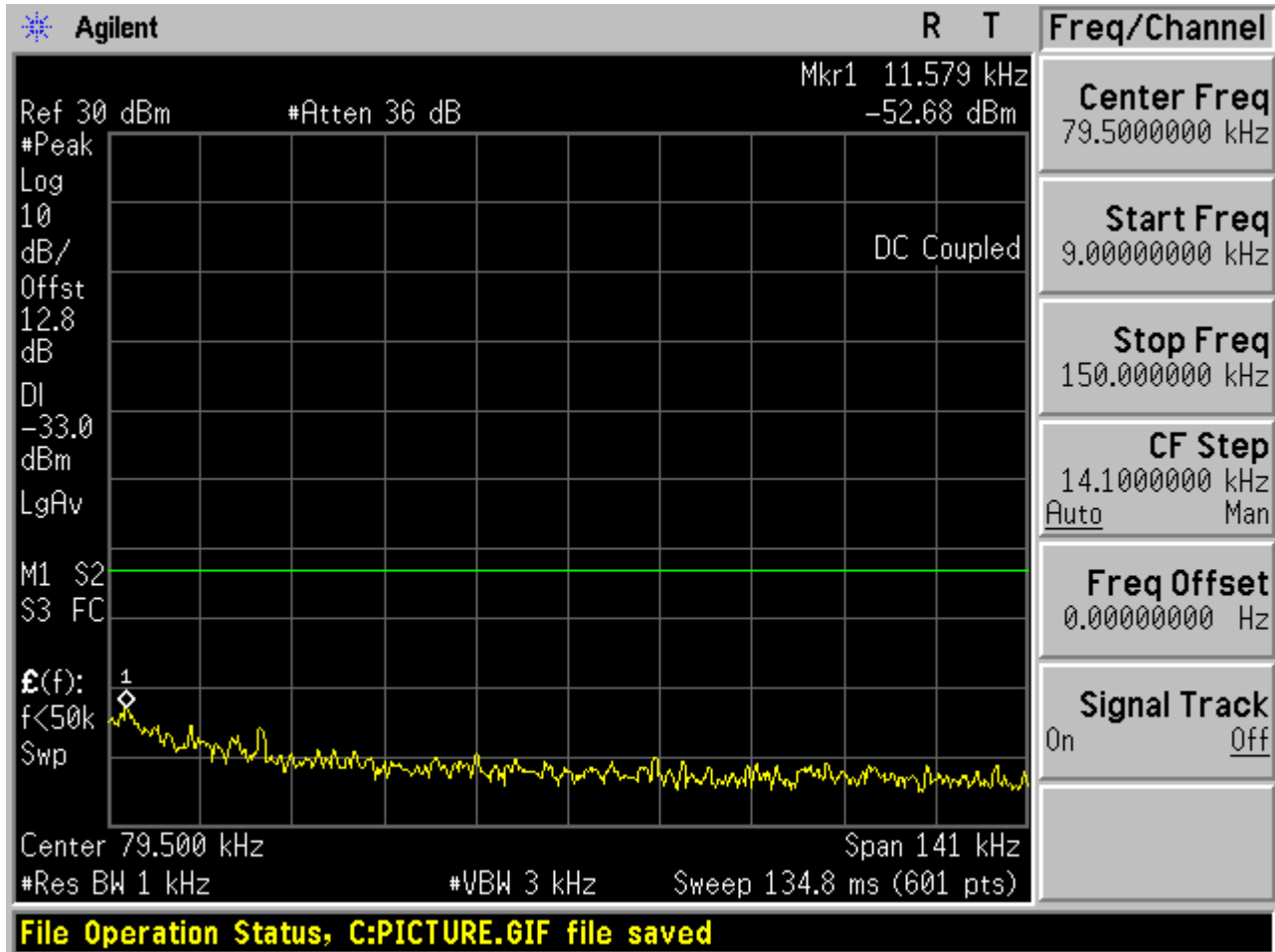


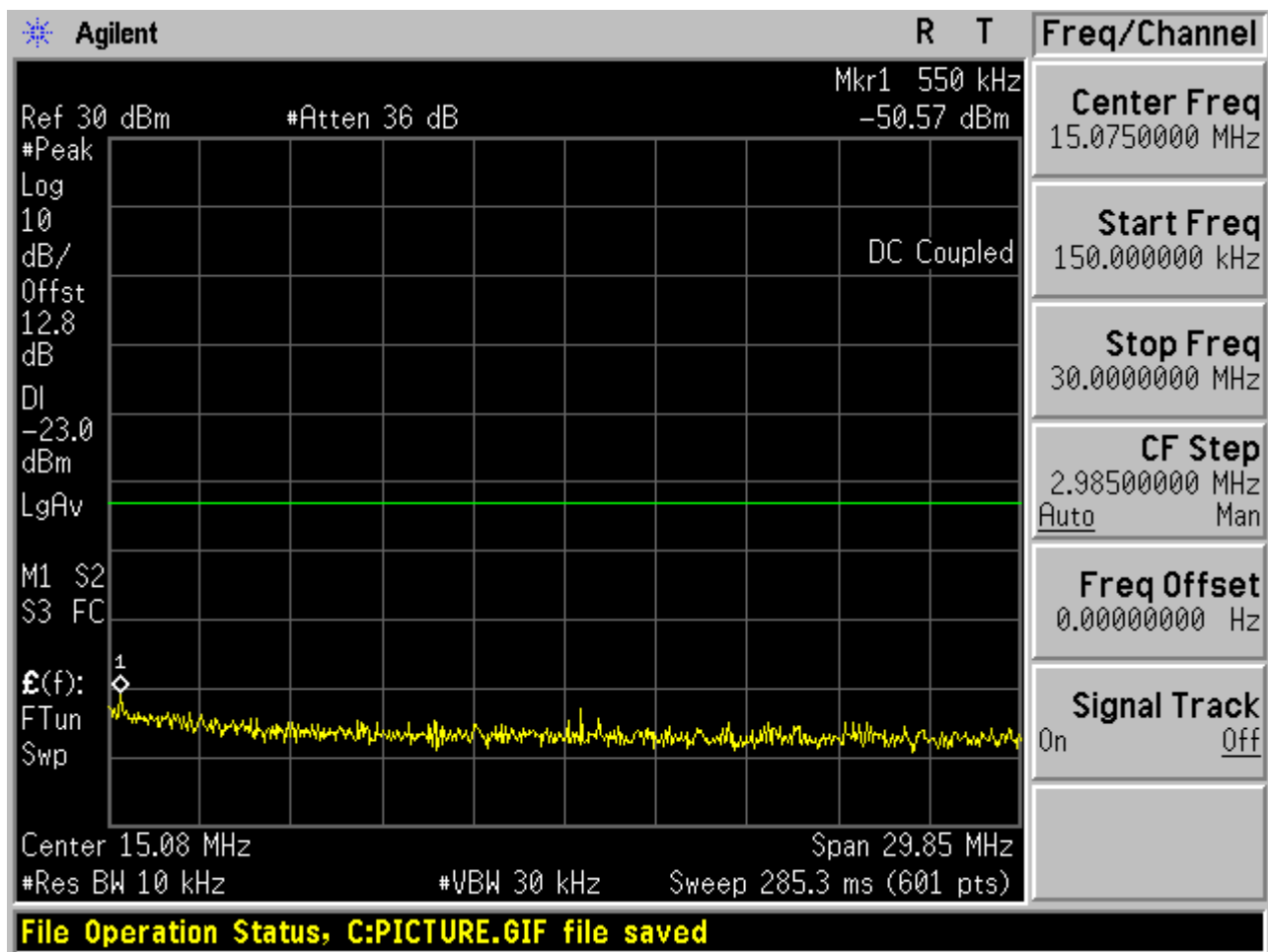


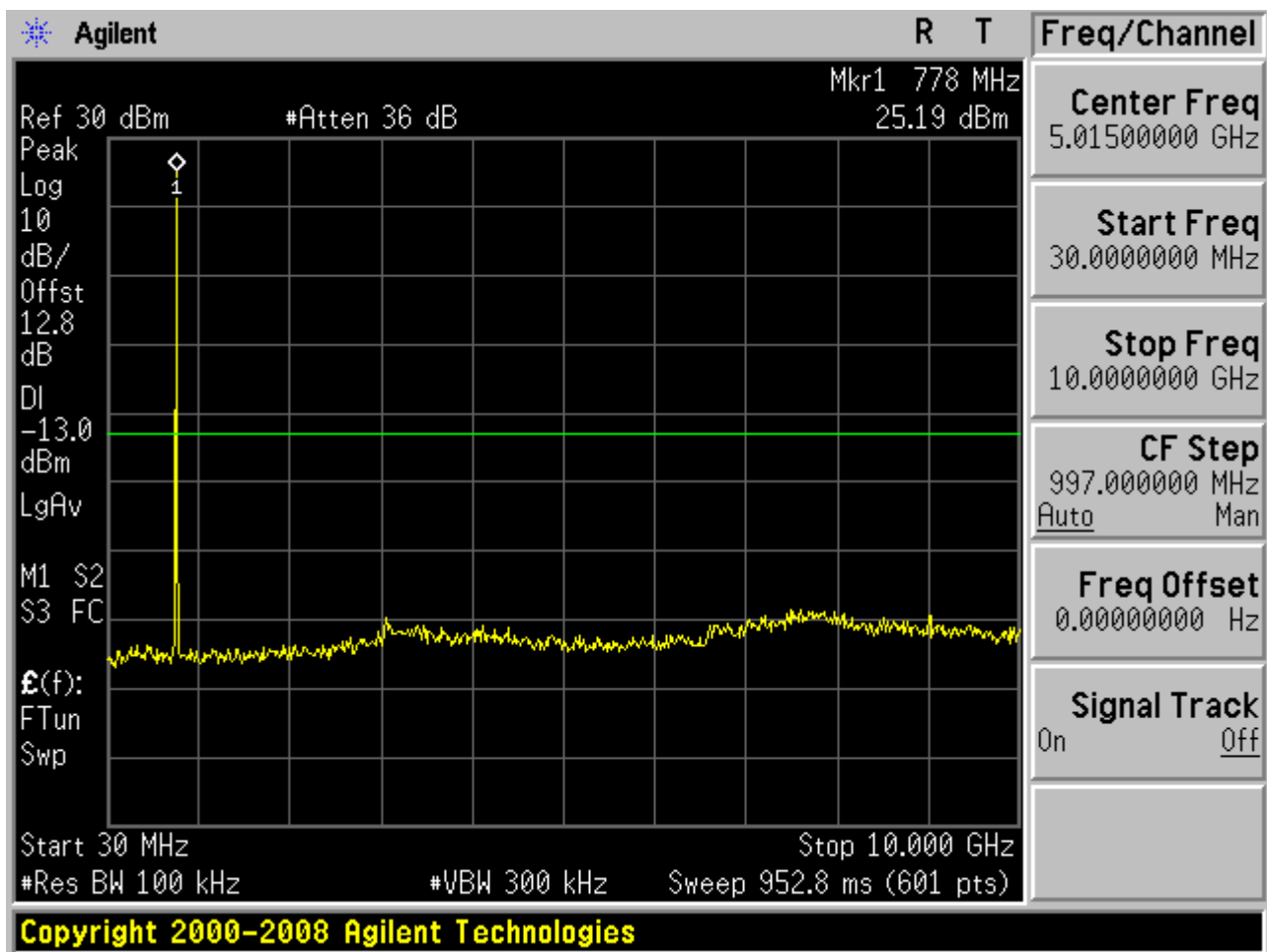


1.2.1.3 Channel = T

1.2.1.3.1 16QAM/1RBs /RB #0





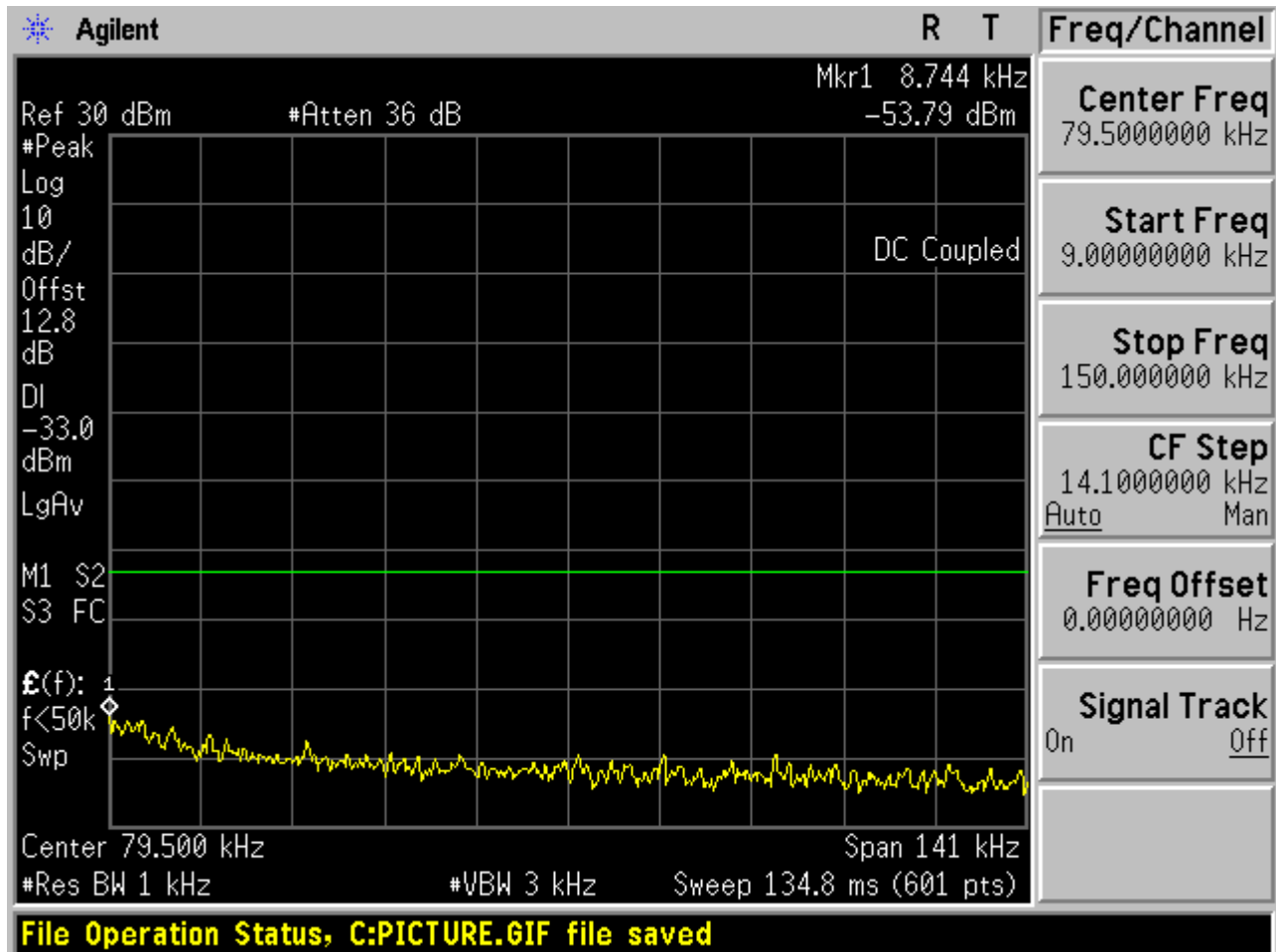


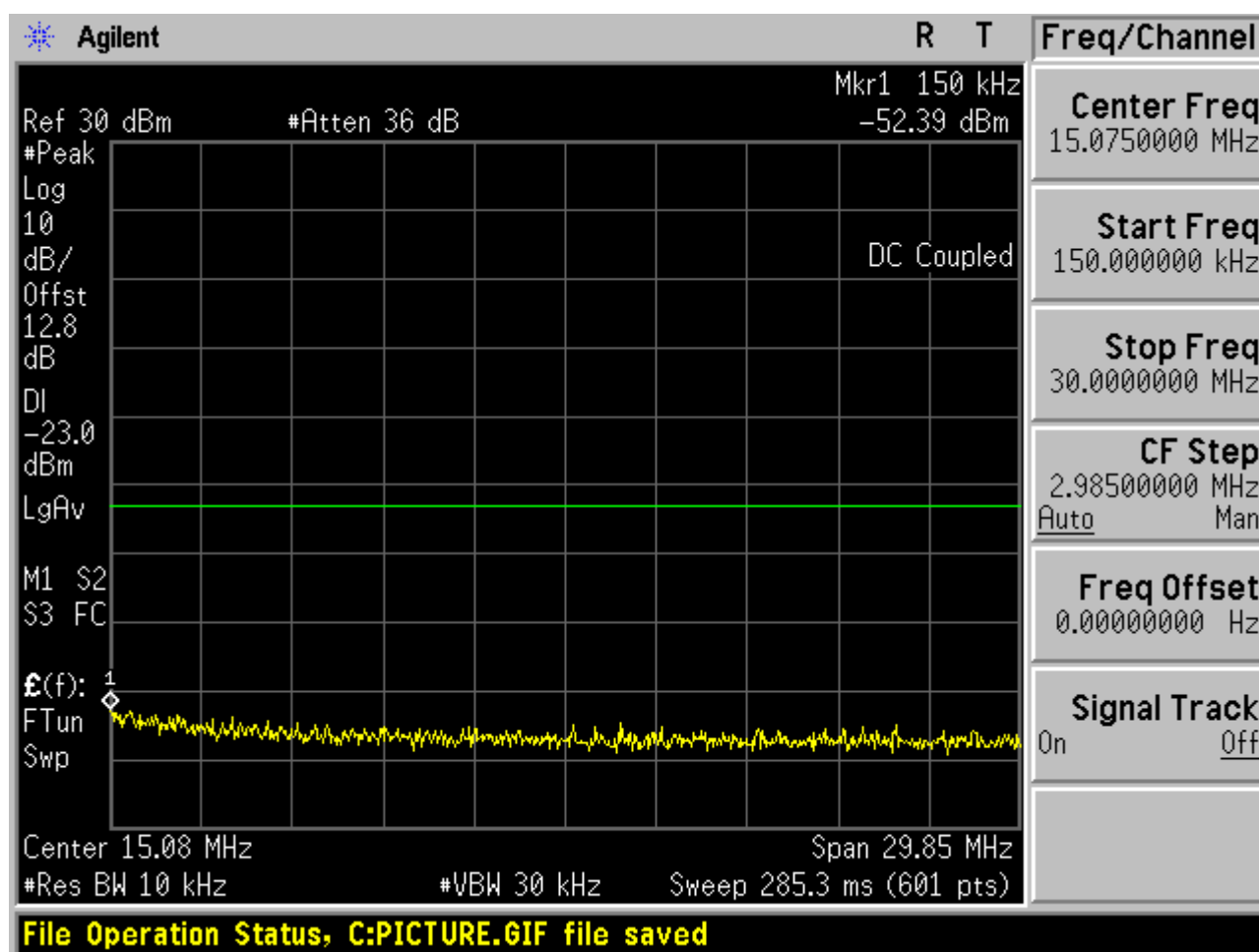


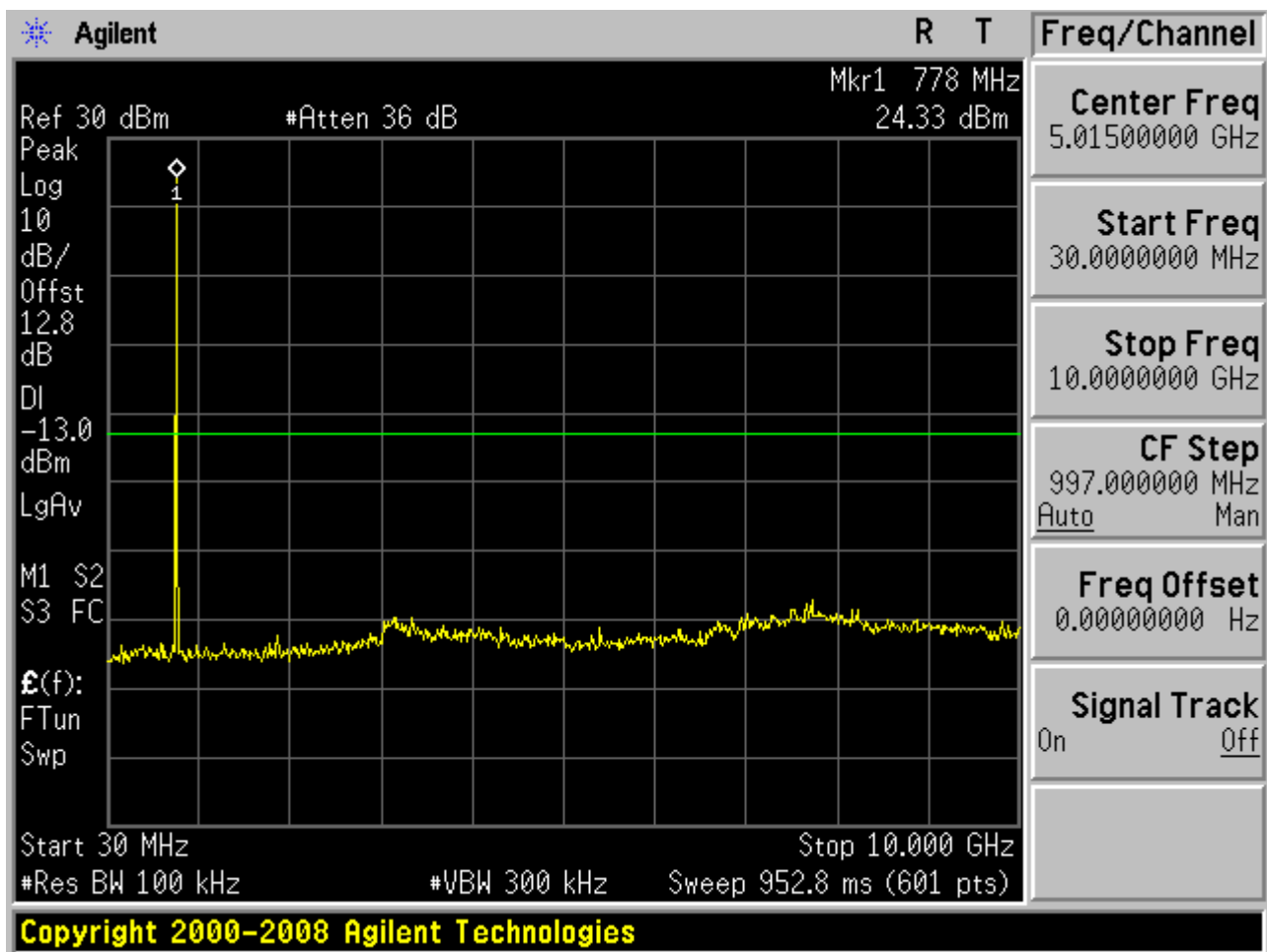
1.2.2 Channel Bandwidth = 10 MHz

1.2.2.1 Channel = (B/M/T)

1.2.2.1.1 16QAM/1RBs /RB #0







END



Appendix E

Radiated spurious emission

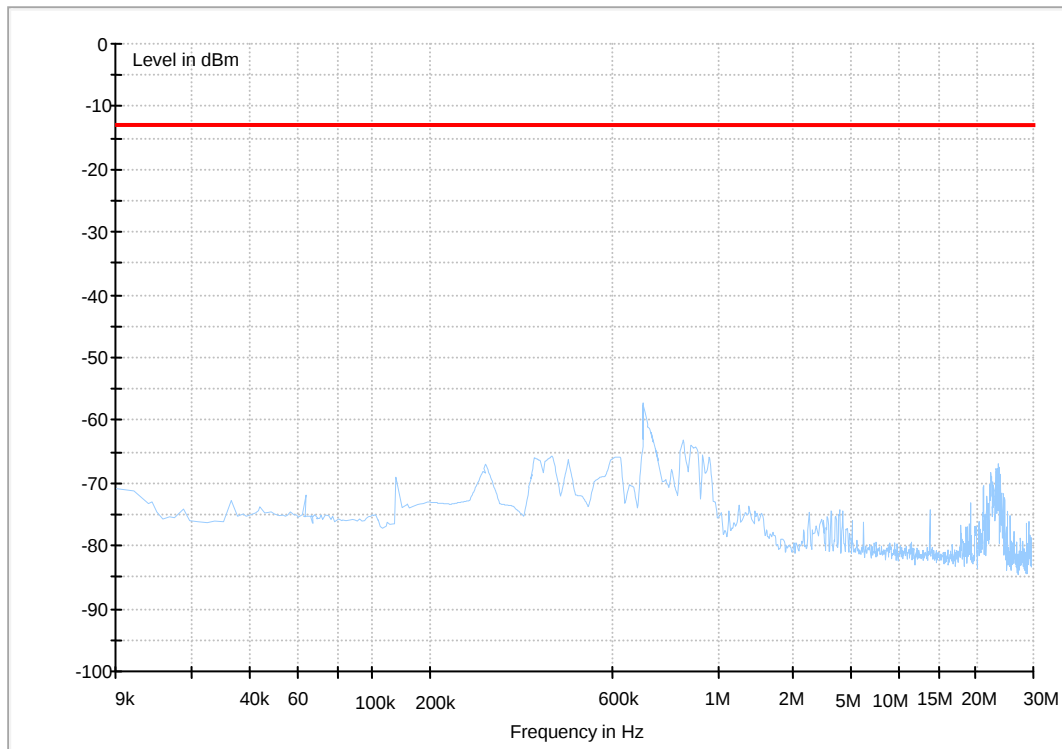
According to FCC Part 2.1053& Part 27.53(c)(2) &
27.53(c)(5)



Note: 1. Simultaneous transmission was investigated and no new emissions were found.
2. $RBW \geq 1\text{MHz}$, $VBW > 3 \times RBW$.

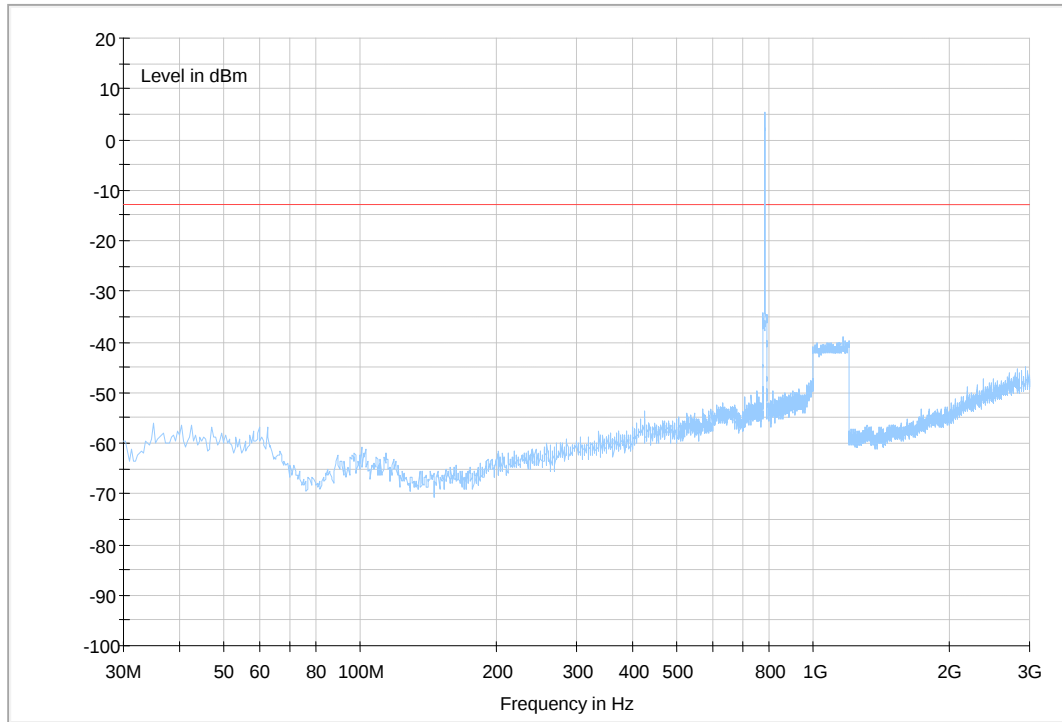
LTE-Band13-5MHz

(9kHz~30MHz)



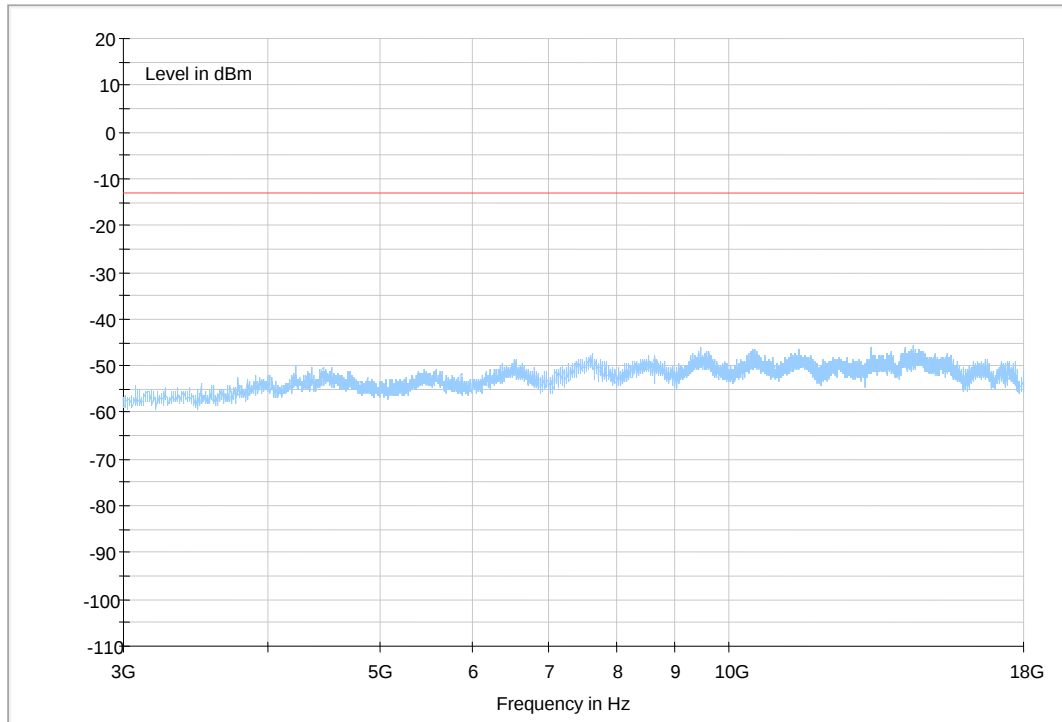


(30MHz~3GHz)



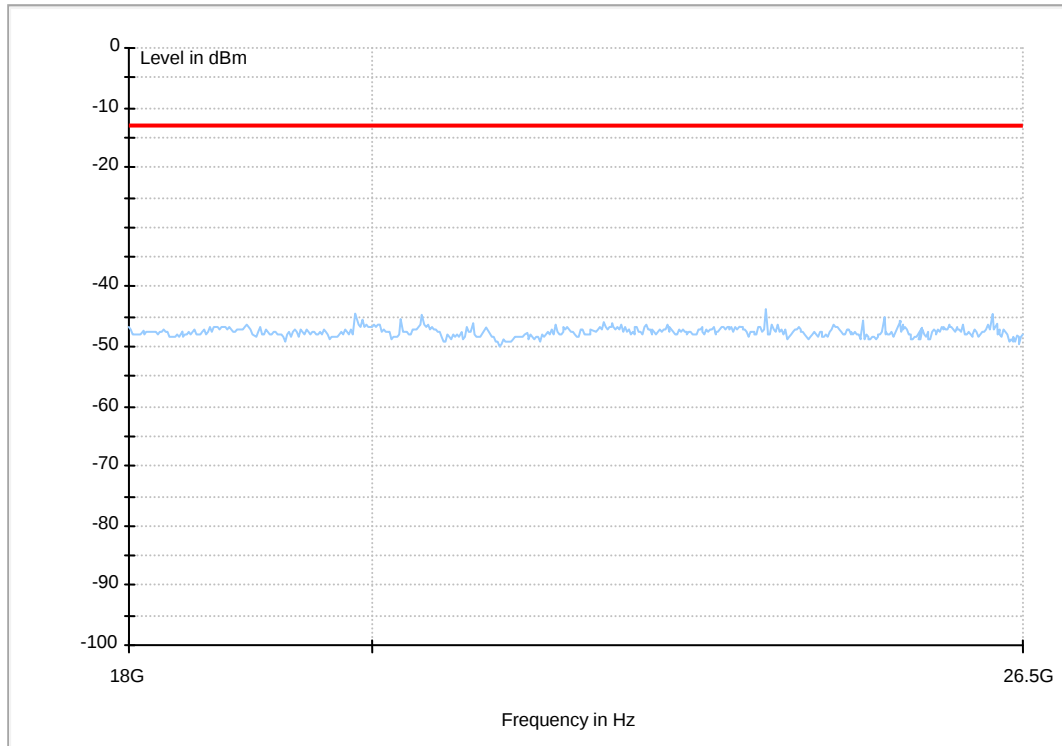


(3GHz~18GHz)





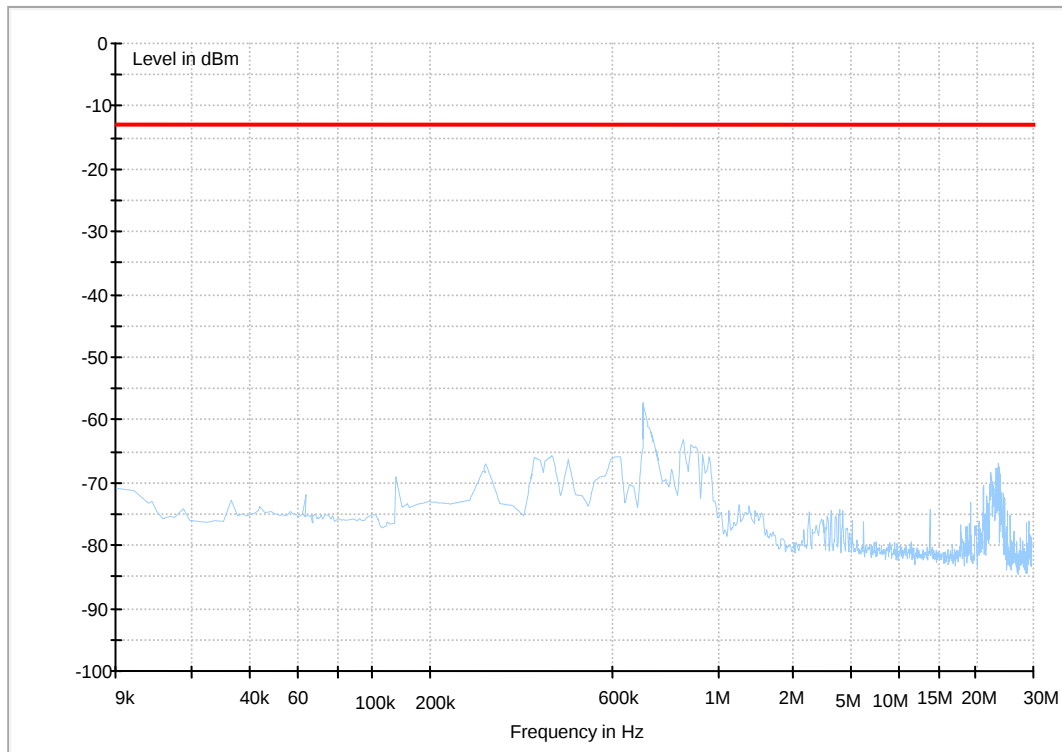
(18GHz~26.5GHz)





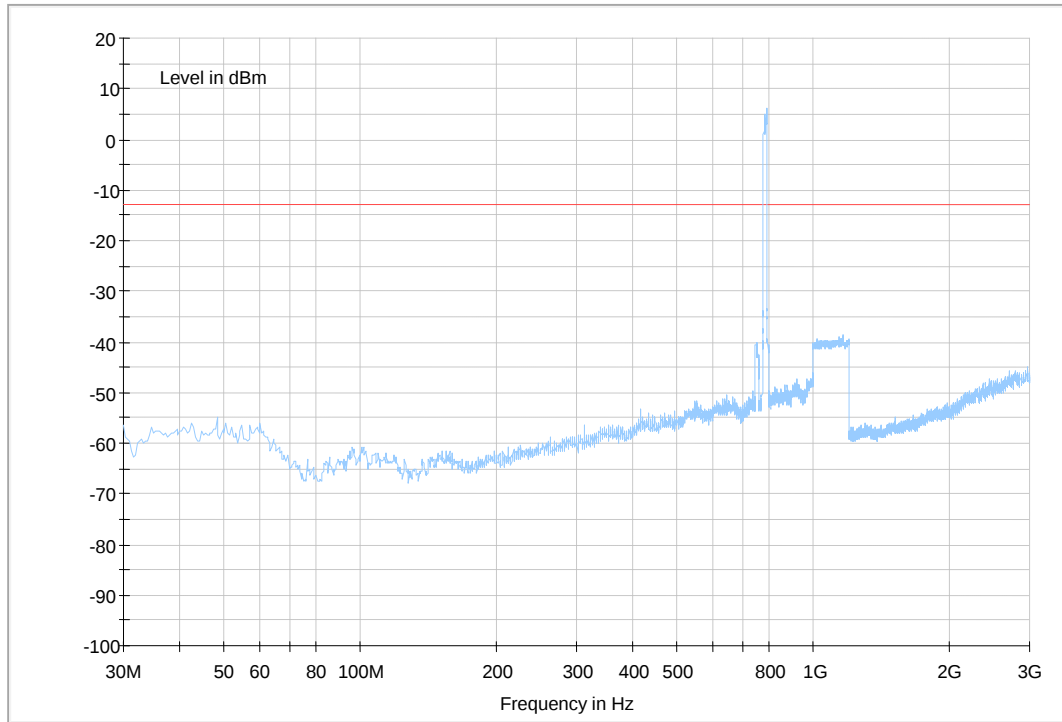
LTE-Band13-10MHz

(9kHz~30MHz)



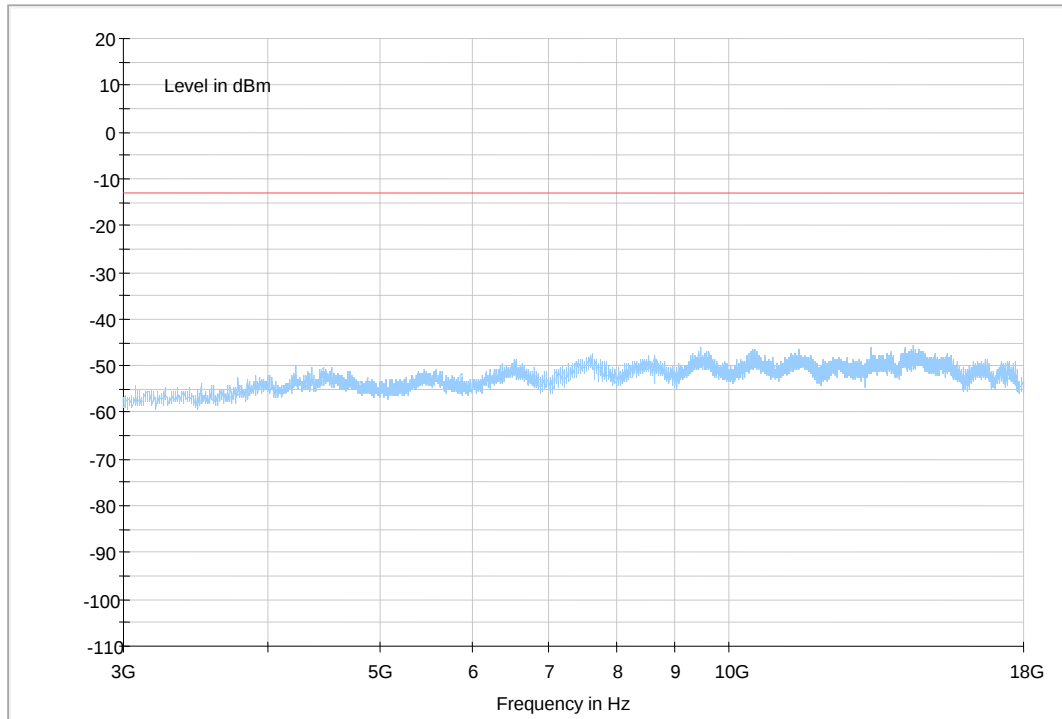


(30MHz~3GHz)



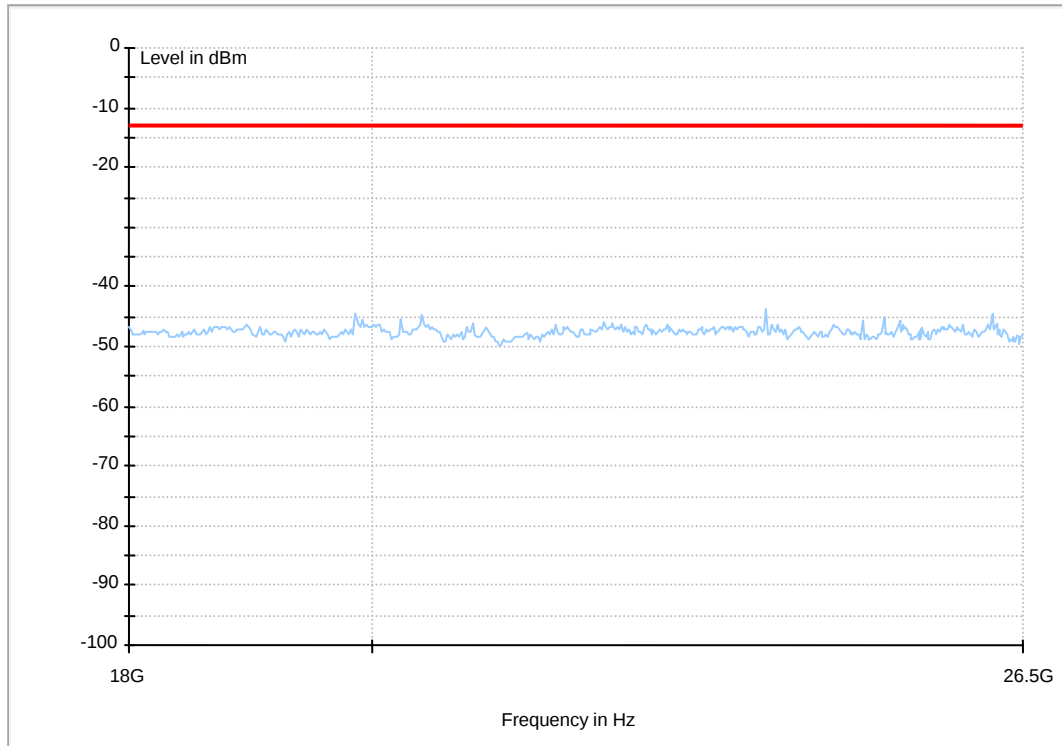


(3GHz~18GHz)





(18GHz~26.5GHz)



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



Appendix G

Frequency Stability

According to FCC Part 2.1055 & Part 27.54



Frequency Error vs. Temperature:

Test Mode	RF Ch.	Volt.	Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Freq. vs. 20 °C [ppm]	Limit [ppm]	Verdict
TM1(5M)	M	VN	-30 °C	15	0.01918	---	±2.5	Pass
			-20 °C	23	0.02941	---	±2.5	Pass
			-10 °C	14	0.01790	---	±2.5	Pass
			0 °C	15	0.01918	---	±2.5	Pass
			10 °C	11	0.01407	---	±2.5	Pass
			20 °C	8	0.01023	---	±2.5	Pass
			30 °C	-24	-0.03069	---	±2.5	Pass
			40 °C	-18	-0.02302	---	±2.5	Pass
TM1(10 M)	M	VN	50 °C	18	0.02302	---	±2.5	Pass
			-30 °C	12	0.01535	---	±2.5	Pass
			-20 °C	18	0.02302	---	±2.5	Pass
			-10 °C	-12	-0.01535	---	±2.5	Pass
			0 °C	17	0.02174	---	±2.5	Pass
			10 °C	-9	-0.01151	---	±2.5	Pass
			20 °C	21	0.02685	---	±2.5	Pass
			30 °C	-18	-0.02302	---	±2.5	Pass
TM2(5M)	M	VN	40 °C	-25	-0.03197	---	±2.5	Pass
			50 °C	-9	-0.01151	---	±2.5	Pass
			-30 °C	-17	-0.00904	---	±2.5	Pass
			-20 °C	19	0.01011	---	±2.5	Pass
			-10 °C	-16	-0.00851	---	±2.5	Pass
			0 °C	-14	-0.00745	---	±2.5	Pass
			10 °C	21	0.01117	---	±2.5	Pass
			20 °C	-16	-0.00851	---	±2.5	Pass
TM2(10 M)	M	VN	30 °C	-10	-0.00532	---	±2.5	Pass
			40 °C	13	0.00691	---	±2.5	Pass
			50 °C	16	0.00851	---	±2.5	Pass
			-30 °C	-8	-0.00426	---	±2.5	Pass
			-20 °C	-14	-0.00745	---	±2.5	Pass
			-10 °C	20	0.01064	---	±2.5	Pass
			0 °C	-8	-0.00426	---	±2.5	Pass
			10 °C	11	0.00585	---	±2.5	Pass
			20 °C	-13	-0.00691	---	±2.5	Pass
			30 °C	-15	-0.00798	---	±2.5	Pass
			40 °C	20	0.01064	---	±2.5	Pass
			50 °C	-11	-0.00585	---	±2.5	Pass



Frequency Error vs. Voltage:

Test Mode	RF Ch.	Temp.	Volt.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Freq. vs. 20 °C [ppm]	Limit [ppm]	Verdict
TM1(5M)	M	20 °C	VL	10	0.01279	---	±2.5	Pass
			VN	-24	-0.03069	---	±2.5	Pass
			VH	-21	-0.02685	---	±2.5	Pass
TM1(10 M)	M	20 °C	VL	-21	-0.02685	---	±2.5	Pass
			VN	-15	-0.01918	---	±2.5	Pass
			VH	-8	-0.01023	---	±2.5	Pass
TM2(5M)	M	20 °C	VL	15	0.00798	---	±2.5	Pass
			VN	10	0.00532	---	±2.5	Pass
			VH	20	0.01064	---	±2.5	Pass
TM2(10 M)	M	20 °C	VL	-12	-0.00638	---	±2.5	Pass
			VN	-23	-0.01223	---	±2.5	Pass
			VH	14	0.00745	---	±2.5	Pass

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