



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS

Test Report

Report No EP0152-1

Client Airvana

Address 250 Apollo Drive
Chelmsford, MA 01824

Phone 978-250-2622

Item tested OneCell Radio Point
FCC ID QHYRP-A2014

FRN 0024704082

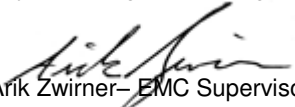
Equipment Type PCS Licensed Transmitter
Equipment Code PCB

FCC Rule Parts 47 CFR 24 Subpart E
47 CFR 27 Subpart C

Test Dates March 16 to July 30, 2015.

Results As detailed within this report

Prepared by 
Tuyen Truong – EMC Engineer

Authorized by 
Arik Zwirner – EMC Supervisor

Issue Date 8/17/2015

Curtis-Straus LLC is accredited by the American Association for Laboratory Accreditation for the specific scope of accreditation under Certificate Number 1627-01. This report may contain data which is not covered by the A2LA accreditation.



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8828



Contents

CONTENTS	2
SUMMARY	4
TEST METHODOLOGY.....	5
PRODUCT TESTED - CONFIGURATION DOCUMENTATION	8
STATEMENT OF CONFORMITY	9
TEST DATA AND RESULTS.....	10
LTE BANDS 25 & 2 (FCC PART 24)	10
<i>Occupied Bandwidth</i>	10
<i>Power and PAPR: 5MHz Operating Bandwidth</i>	12
<i>Power and PAPR: 10MHz Operating Bandwidth</i>	43
<i>Band Edge Measurements</i>	74
<i>Conducted Spurious Emissions at Antenna Port</i>	93
<i>Radiated Spurious Emissions Measurements</i>	102
<i>Conducted Spurious Emissions on AC Mains</i>	104
<i>Frequency Stability</i>	105
LTE BANDS 12 & 17 (FCC PART 27)	127
<i>Occupied Bandwidth</i>	127
<i>Power and PAPR: 5MHz Operating Bandwidth</i>	129
<i>Power and PAPR: 10MHz Operating Bandwidth</i>	138
<i>Band Edge Measurements</i>	169
<i>Conducted Spurious Emissions at Antenna Port</i>	189
<i>Radiated Spurious Emissions Measurements</i>	194
<i>Conducted Spurious Emissions on AC Mains</i>	196
<i>Frequency Stability</i>	197
LTE BAND 13 (FCC PART 27).....	231
<i>Occupied Bandwidth</i>	231
<i>Power and PAPR: 5MHz Operating Bandwidth</i>	232
<i>Power and PAPR: 10MHz Operating Bandwidth</i>	238
<i>Band Edge Measurements</i>	245
<i>Conducted Spurious Emissions at Antenna Port</i>	255
<i>Radiated Spurious Emissions Measurements</i>	291
<i>Conducted Spurious Emissions on AC Mains</i>	293
<i>Frequency Stability</i>	294
LTE BANDS 10 & 4 (FCC PART 27)	306
<i>Occupied Bandwidth</i>	306
<i>Power and PAPR: 5MHz Operating Bandwidth</i>	308
<i>Power and PAPR: 10MHz Operating Bandwidth</i>	317
<i>Band Edge Measurements</i>	348
<i>Conducted Spurious Emissions at Antenna Port</i>	359
<i>Radiated Spurious Emissions Measurements</i>	368
<i>Conducted Spurious Emissions on AC Mains</i>	370
<i>Frequency Stability</i>	371



TEST EQUIPMENT.....	394
CONDITIONS OF TESTING	395



Summary

This technical report supports an application for certification of a transmitter operating pursuant to 47 CFR 24 Subpart E, and 47 CFR 27 Subpart C. The product is OneCell Radio Point (m/n RP-A2014, p/n 800245-00-01) manufactured by Airvana.

Schematics and the Bill of Materials for the OneCell Radio Point are provided with the exhibits that accompany this report.

We found that the product met the above requirements without modification. The test sample was received in good condition. Tests were performed starting on March 16, 2015 and ending on July 30, 2015.

Release Control Record

Issue No.	Reason for change	Date Issued
1	Original Release	August 17, 2015



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8828



Test Methodology

The product can operate in the bands 728-746MHz (LTE band 12), 734-746MHz (LTE Band 17), 746-756MHz (LTE band 13), 2110-2155MHz (LTE Band 4), 2110-2170MHz (LTE Band 10), 1930-1995MHz (LTE Band 25), and 1930-1990MHz (LTE Band 2).

LTE Band 10 (2110-2170MHz) falls within the combined range 2110-2180MHz, which is treated as two distinct bands in FCC Part 27 (2110-2155MHz & 2155-2180MHz). Because the bands are separate in the Part 27 rules, the tests in this report treat LTE Band 10 as having two ranges partitioned at 2155MHz for band edge requirements.

The lowest and highest operating center frequencies are listed by LTE Band and transmit bandwidth in the table below:

LTE Band	Band Range	Tx bandwidth: 5MHz		Tx bandwidth: 10MHz	
		Channel	Center Freq.	Channel	Center Freq.
Band 12	728-746MHz	Low/Mid/High	MHz	Low/Mid/High	MHz
		Low	730.5	Low	733.0
		Mid	737.0	Mid	737.0
		High	743.5	High	741.0
Band 17	734-746MHz	Low/Mid/High	MHz	Low/Mid/High	MHz
		Low	736.5	Low	739.0
		Mid	740.0	Mid	740.0
		High	743.5	High	741.0
Band 13	746-756MHz	Low/Mid/High	MHz	Low/Mid/High	MHz
		Low	748.5	Low	N/A
		Mid	751.0	Mid	751.0
		High	753.5	High	N/A
Band 25	1930-1995MHz	Low/Mid/High	MHz	Low/Mid/High	MHz
		Low	1932.5	Low	1935.0
		Mid	1962.5	Mid	1962.5
		High	1992.5	High	1990.0
Band 2	1930-1990MHz	Low/Mid/High	MHz	Low/Mid/High	MHz
		Low	1932.5	Low	1935.0
		Mid	1960.0	Mid	1960.0
		High	1987.5	High	1985.0
Band 10	2110-2170MHz	Low/Mid/High	MHz	Low/Mid/High	MHz
		Low-1	2112.5	Low-1	2115.0
		Mid-1	2140.0	Mid-1	2140.0
	(1) 2110-2155MHz	High-1	2152.5	High-1	2150.0
		Low-2	2157.5	Low-2	2160.0
		High-2	2167.5	High-2	2165.0
Band 4	2110-2155MHz	Low/Mid/High	MHz	Low/Mid/High	MHz
		Low	2112.5	Low	2115.0
		Mid	2132.5	Mid	2132.5
		High	2152.5	High	2150.0

Per Airvana, the device under test prevents the operation of multiple transmit channels operating on the same frequency at the same time (see Operational Description document).



Modulation is one of QPSK, 16QAM, and 64QAM, for each of the different types of channels. Each type of modulation can operate at 5MHz or 10MHz transmit bandwidths.

EIRP is calculated using the antenna gains (dBi) provided by the manufacturer. This transmitter has two output antennas and only operates on one frequency/channel at a time. The directional gain of these two antennas is calculated using the formula

$$\text{Directional gain} = G_{ANT} + 10 \log(N_{ANT}) \text{ dBi}$$

This formula is from the FCC KDB document 662911, *Emissions Testing of Transmitters with Multiple Outputs in the Same Band*.

Occupied bandwidth measurements were taken with the following spectrum analyzer settings: RBW: 120kHz, VBW: 1MHz, Peak Measurement mode, 10MHz span for 5MHz signals, 40MHz span for 10MHz signals, 401 points.

For Part 24, power measurements were done as follows:

For the 10MHz operating bandwidth, the Channel Power function of the analyzer was used to integrate the peak power over a 30MHz integration bandwidth, with the following settings: Span 40MHz; RBW 1MHz; VBW 50MHz; 1001 points/sweep; Sweep rate 1ms (auto); Avg/Hold counts: 100/100; Detector: peak; Trace: Max Hold.

For 5MHz operating bandwidth, Peak and Average readings were taken with the same method as above except the span was set to 20MHz and the integration bandwidth was set to 15MHz.

For both 5MHz and 10MHz average readings, the above Channel Power integration settings were used with the following exceptions: Detector: Average; Trace: Average (100/100).

For both 5MHz and 10MHz operating bandwidths, PAPR was calculated by the difference in dB between peak and average readings.

For Part 27 power measurements were done as follows:

For the 10MHz operating bandwidth, the Channel Power function of the analyzer was used to integrate the peak power over a 30MHz integration bandwidth, with the following settings: Span 40MHz; RBW 1MHz; VBW 50MHz; 1001 points/sweep; Sweep rate 1ms (auto); Avg/Hold counts: 100/100; Detector: peak; Trace: Max Hold.

For 10MHz average readings, the above Channel Power integration settings were used with the following exceptions: Detector: Average; Trace: Average (100/100).

For 10MHz operating bandwidth, PAPR was calculated by the difference in dB between peak and average readings.

For 5MHz peak readings, the spectrum analyzer was set to the following: RBW:10MHz, VBW: 50MHz; Span 20MHz; 1001 Points; Max Hold (until the trace is stable).



For 5MHz operating bandwidth, PAPR readings were taken with the same bandwidth settings as above under the CCDF function of the spectrum analyzer/receiver (Agilent MXE N9038A).

Note that per FCC 27, separate average readings are not needed. PAPR was measured by CCDF method for 5MHz, and calculated from the difference in peak and average dB values for 10MHz.

For Parts 24 & 27, peak and average power measurements were taken by summing the fundamental transmission from both antenna ports with a calibrated two-to-one RF combiner. The loss factors for the RF combiner and connecting coaxial cables were added to the spectrum analyzer measurements to calculate power at the antenna ports.

Radiated emission testing was performed according to the procedures specified in ANSI C63.4 (2003) and TIA-603-C. Radiated Emissions were maximized by rotating the device around its upright axes as well as varying the test antenna's height and polarity. Radiated spurious emissions tests were done in the frequency range of 30MHz-22GHz.

Conducted measurements at the antenna port were performed. For antenna port conducted spurious emissions testing 30MHz-22GHz range was checked.

AC mains conducted emissions tests were performed using 50 Ω /5 μ H LISN's.

Transmit chain which produced the highest EIRP was used for spurious emission scans. The EUT operating voltage is 120Vac 60Hz.



Product Tested - Configuration Documentation

EUT Configuration											
Work Order: P0152 Company: Airvana Company Address: 250 Apollo Drive Chelmsford MA USA 01824 Contact: Kevin Craig Person Present: Kevin Craig											
		MN		PN				SN			
EUT:		RP-A2014		800245-00-01				1738			
EUT Description: Switched IQ Radio Point Domestic EUT Max Frequency: 200MHz EUT TX Frequency: 728-746MHz, 746-756MHz, 1930-1990MHz, 2110-2155MHz and 2155-2170MHz											
Support Equipment:		MN				SN					
Dell Latitude		D630				20264182597					
Linksys POE		LGS308P				14810C964P4107					
Netgear Router		NETGEAR90				3113465001E94					
EUT Ports:											
Port Label	Port Type	No. of ports	No. Populated	Cable Type	Shielded	Ferrites	Length	Max Length	In/Out NEBS Type	Unpopulated Reason	
POE	RJ45	1	1	Cat.5e	No	No	10m	100m	Indoor	Service Only	
Serial	4-pins	1	0								
Antenna	Coaxial	2	2	Coaxial	N/A	No	NA	NA	Indoor		
Software / Operating Mode Description:											
EUT is set to transmit on selected Band class (12, 17, 13, 10, 4, 25 and 2) on Low, Mid and High channels with 5 MHz bandwidth and 10 MHz bandwidth settings respectively. Telnet to EUT via IP address: 172.16.118.4											



Statement of Conformity

The EUT has been found to conform to the following parts of 47 CFR 24 and 47 CFR 27.

Parts 2 & 15	Parts 24 & 27	Comments
2.1033(c)(4)		QPSK, 16QAM, and 64QAM are the types of RF modulation.
2.1033(c)(6)		RF output power is not adjustable to end users.
2.1049(l)		Occupied bandwidth measured
2.1033(c)(9)		Tune-up procedure statement
	Part 24:	
2.1033(c)(7)	24.232(c,d,e)	Meets power limit: 2W EIRP. Peak-to-average ratio does not exceed 13dB.
2.1051	24.238(a)	Spurious emissions at antenna port below -13dBm
2.1053, 15.209	24.236, 24.238(a)	Radiated spurious emissions meet FCC Class B and are below -13dBm. Meets out of band emissions limits.
2.1055(a)(d)	24.235	Fundamental emission remains within authorized frequency block.
15.207		Meets FCC Class B limits for AC mains conducted emissions.
	Part 27:	
2.1033(c)(7)	27.50(b,c,d)	Meets power limits of 27.50(b)(9), 27.50(c)(9), and 27.50(d)(2)(ii).
2.1051	27.53(c,f,g,h)	Spurious emissions at antenna port below -13dBm
2.1053, 15.209	27.53(c,f,g,h)	Radiated spurious emissions meet FCC Class B and are below -13dBm. . Meets out of band emissions limits.
2.1055(a)(d)	27.54	Fundamental emission remains within authorized frequency block.
15.207		Meets FCC Class B limits for AC mains conducted emissions.

Test Data and Results

LTE Bands 25 & 2 (FCC Part 24)

Occupied Bandwidth

LIMIT

"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." [24.238(b)]



MEASUREMENTS / RESULTS

Occupied Bandwidth

Date: 17-Mar-15			Company: Airvana		
Engineer: Tuyen Truong			EUT: Switched IQ Radio Point Domestic (750748)		
WO# P0152		EUT Operating Voltage: POE			
Temp: 22°C		Humidity: 33%		Pressure: 1005mBar	
Note: FCC 24.238(b):					
Bandwidth			Frequency		
Modulation	Setting (MHz)	Band	Channel	(MHz)	26 dB BW (MHz)
QPSK	5	25	Low	1932.5	4.975
QPSK	5	25	Mid	1962.5	4.966
QPSK	5	25	High	1992.5	4.986
16QAM	5	25	Low	1932.5	4.975
16QAM	5	25	Mid	1962.5	4.947
16QAM	5	25	High	1992.5	4.955
64QAM	5	25	Low	1932.5	4.926
64QAM	5	25	Mid	1962.5	4.875
64QAM	5	25	High	1992.5	4.977
QPSK	10	25	Low	1935	22.627
QPSK	10	25	Mid	1962.5	23.056
QPSK	10	25	High	1990	19.353
16QAM	10	25	Low	1935	21.861
16QAM	10	25	Mid	1962.5	22.939
16QAM	10	25	High	1990	18.958
64QAM	10	25	Low	1935	21.156
64QAM	10	25	Mid	1962.5	22.302
64QAM	10	25	High	1990	19.083
QPSK	5	2	Low	1932.5	see band 25
QPSK	5	2	Mid	1960	4.984
QPSK	5	2	High	1987.5	4.98
16QAM	5	2	Low	1932.5	see band 25
16QAM	5	2	Mid	1960	4.98
16QAM	5	2	High	1987.5	4.977
64QAM	5	2	Low	1932.5	see band 25
64QAM	5	2	Mid	1960	4.908
64QAM	5	2	High	1987.5	4.919
QPSK	10	2	Low	1935	see band 25
QPSK	10	2	Mid	1960	23.191
QPSK	10	2	High	1985	23.086
16QAM	10	2	Low	1935	see band 25
16QAM	10	2	Mid	1960	23.147
16QAM	10	2	High	1985	23.028
64QAM	10	2	Low	1935	see band 25
64QAM	10	2	Mid	1960	22.279
64QAM	10	2	High	1985	22.264



Power and PAPR: 5MHz Operating Bandwidth

Power (EIRP)

FCC Part 24.232:

(c) Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

(d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

Output Power (E.I.R.P.)																	
Date: 30-Jul-15 Engineer: Ryan Brown Temp: 24.5°C				Company: Airvana EUT Desc: Switched IQ Radio Point Domestic Humidity: 54%				Work Order: P0152 EUT Operating Voltage/Frequency: POE Pressure: 1002mBar									
Frequency Range: Low, Mid and High Channels																	
Notes: 2W = 33.0dBm. Multiple antenna calcs using formula from FCC KDB 662911, Section F(2)(a)(i). Two antennas each with gain 5.0dBi in this range are installed on the EUT. For multiple output calculations, N(ant.)=2 is used to calculate overall directional gain: 5.0dBi + 10log(N)/dB = 5.0dBi + 3.0dB = 8.0dBi. Peak-to-Average Ratio (PAPR) must be less than 13dB for average measurements to be applicable to the EIRP limits.																	
Band	Bandwidth (MHz)	Modulation	Channel (MHz)	Frequency (MHz)	Average Power Reading (dBm)	Peak Power Reading (dBm)	Power Combiner (dB)	30dB Attenuator (dB)	Cable Factor (dB)	Average Power Reading (dBm)	PAPR (limit: 13dB) (dB)	Directional Antenna Gain (dBi)	FCC Part 24.232 c & d; Limit: 2W = 33.0dBm				
													Limit (dBm)	ERP (dB)	Margin (dB)	Result	
25	5	QPSK	Low	1932.5	-12.68	-2.26	4.2	29.8	0.6	21.9	10.42	8.0	33.0	29.9	-3.1	Pass	
25	5	QPSK	Mid	1962.5	-12.16	-2.46	4.2	29.8	0.6	22.4	9.70	8.0	33.0	30.4	-2.6	Pass	
25	5	QPSK	High	1992.5	-13.7	-4.32	4.2	29.8	0.6	20.9	9.38	8.0	33.0	28.9	-4.1	Pass	
25	5	16QAM	Low	1932.5	-12.83	-2.82	4.2	29.8	0.6	21.8	10.01	8.0	33.0	29.8	-3.3	Pass	
25	5	16QAM	Mid	1962.5	-12.16	-2.11	4.2	29.8	0.6	22.4	10.05	8.0	33.0	30.4	-2.6	Pass	
25	5	16QAM	High	1992.5	-13.81	-4.46	4.2	29.8	0.6	20.8	9.35	8.0	33.0	28.8	-4.2	Pass	
25	5	64QAM	Low	1932.5	-12.77	-2.76	4.2	29.8	0.6	21.8	10.01	8.0	33.0	29.8	-3.2	Pass	
25	5	64QAM	Mid	1962.5	-12.15	-2.74	4.2	29.8	0.6	22.4	9.41	8.0	33.0	30.4	-2.6	Pass	
25	5	64QAM	High	1992.5	-13.72	-4.31	4.2	29.8	0.6	20.9	9.41	8.0	33.0	28.9	-4.1	Pass	
2	5	QPSK	Low	1932.5	See Band 25												
2	5	QPSK	Mid	1960.0	-11.09	-1.89	4.2	29.8	0.6	23.5	9.20	8.0	33.0	31.5	-1.5	Pass	
2	5	QPSK	High	1987.5	-11.6	-2.35	4.2	29.8	0.6	23.0	9.25	8.0	33.0	31.0	-2.0	Pass	
2	5	16QAM	Low	1932.5	See Band 25												
2	5	16QAM	Mid	1960.0	-11.07	-1.6	4.2	29.8	0.6	23.5	9.47	8.0	33.0	31.5	-1.5	Pass	
2	5	16QAM	High	1987.5	-11.77	-2.35	4.2	29.8	0.6	22.8	9.42	8.0	33.0	30.8	-2.2	Pass	
2	5	64QAM	Low	1932.5	See Band 25												
2	5	64QAM	Mid	1960.0	-11.08	-1.55	4.2	29.8	0.6	23.5	9.53	8.0	33.0	31.5	-1.5	Pass	
2	5	64QAM	High	1987.5	-11.68	-2.06	4.2	29.8	0.6	22.9	9.62	8.0	33.0	30.9	-2.1	Pass	
Table Result: Pass																	
Test Site: ESD-1				Cable: 1509				30dB Attenuator: 1840									
Analyzer: MXE EMI Receiver				Power Combiner: 1939													

Spectrum analyzer plots are on the following pages.

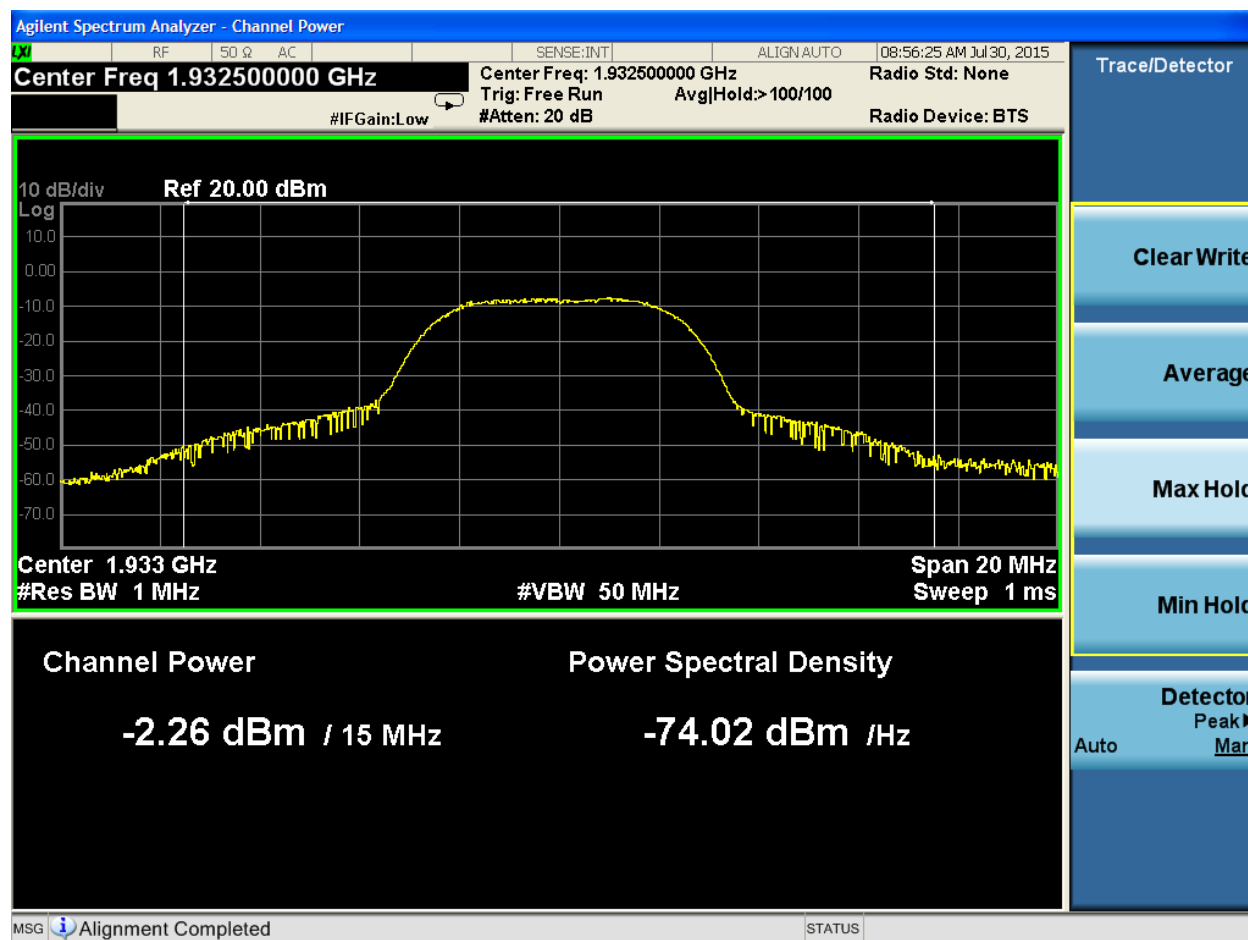


Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-887



page 12 of
396

Peak Measurements at 5MHz:



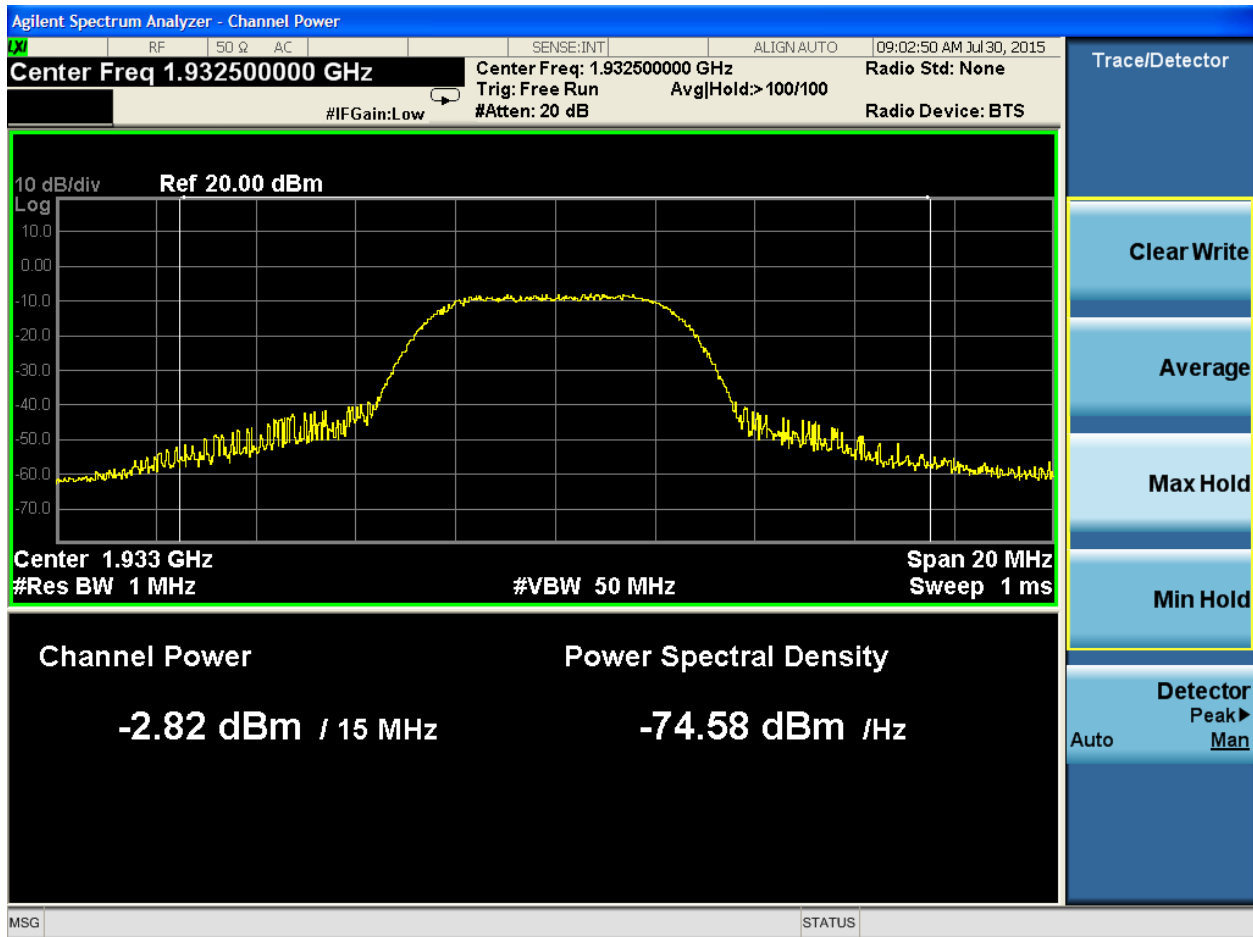
Band 25, Low Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 13 of
396



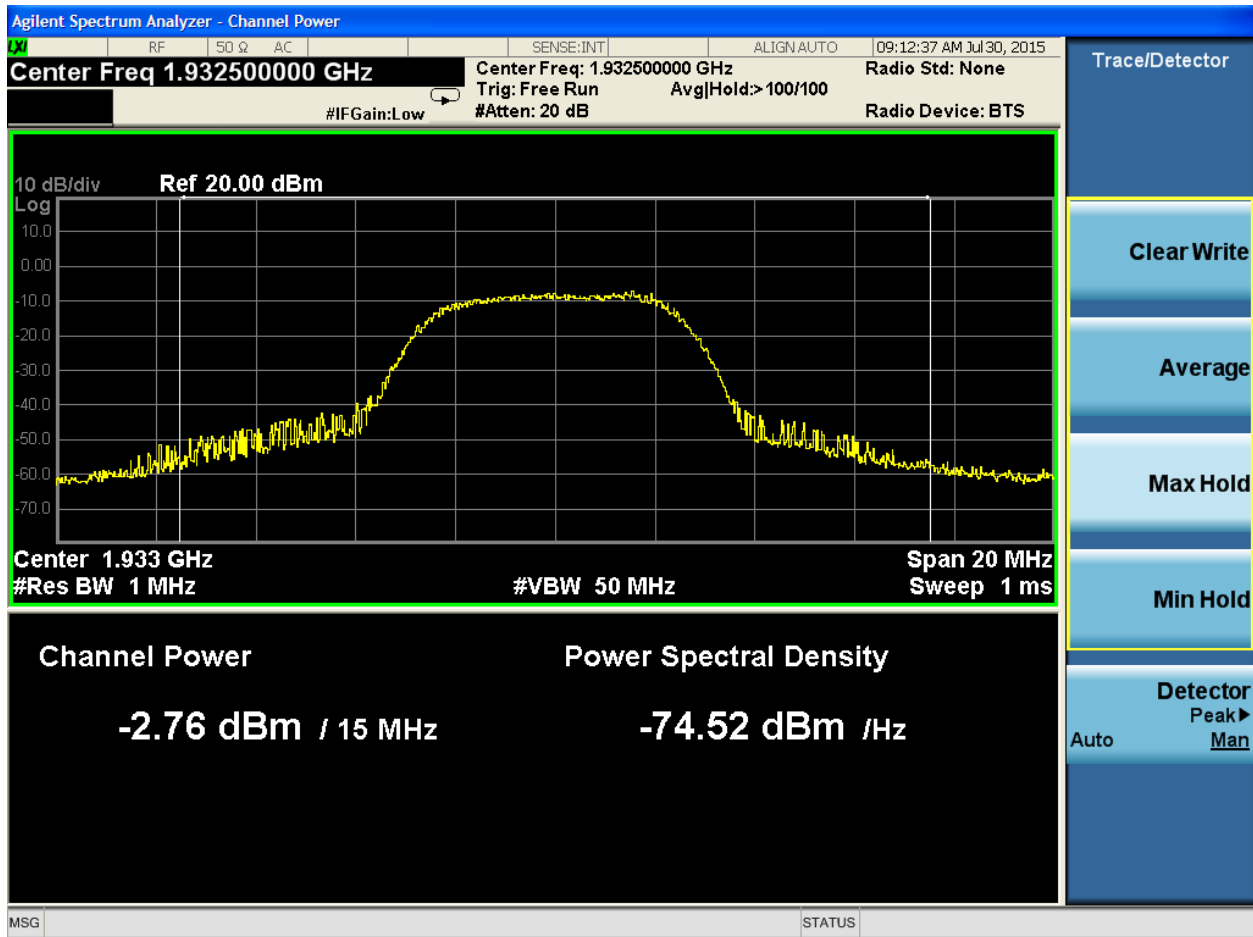
Band 25, Low Channel, 16 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 14 of
396



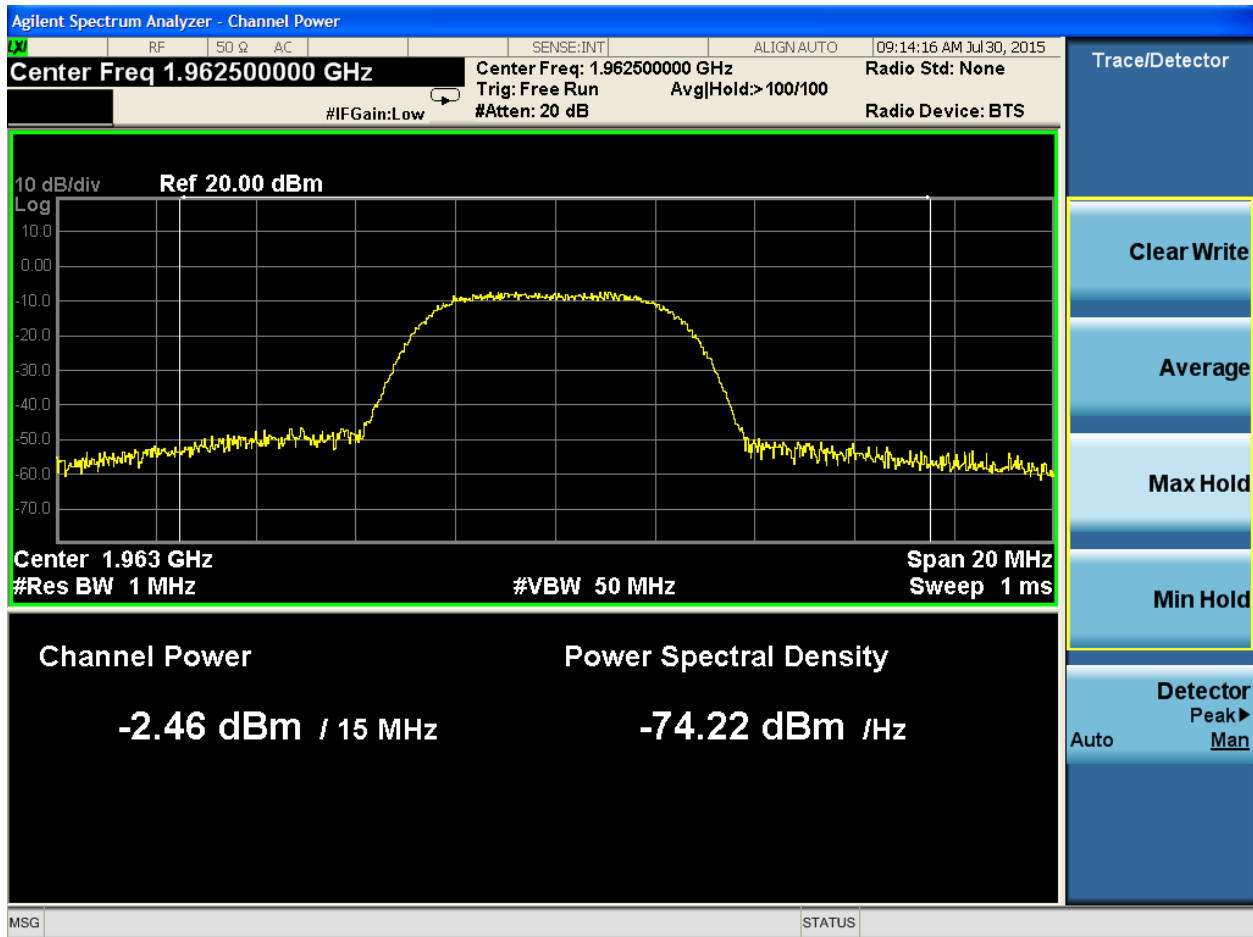
Band 25, Low Channel, 64 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 15 of
396



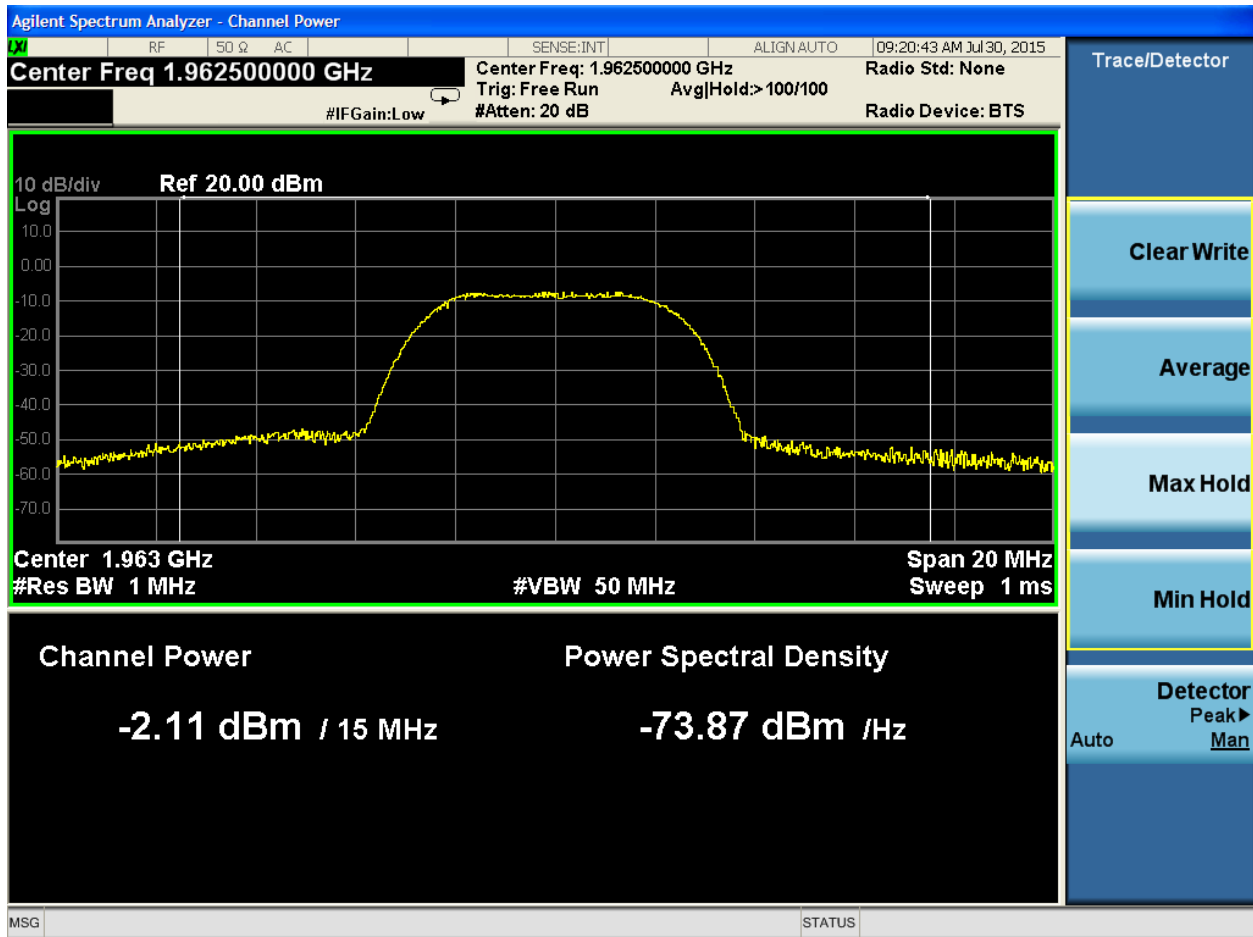
Band 25, Mid Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 16 of
396



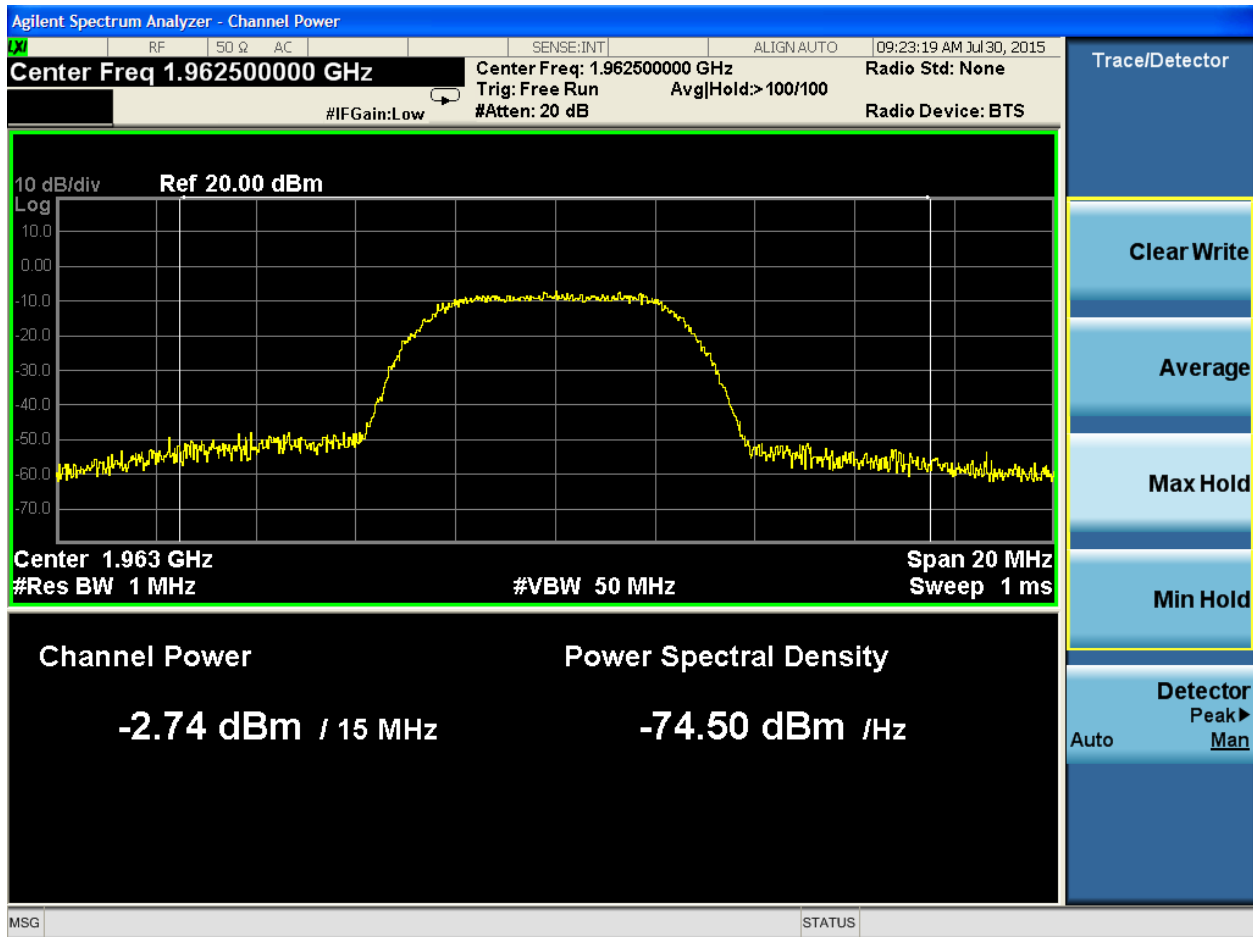
Band 25, Mid Channel, 16 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 17 of
396



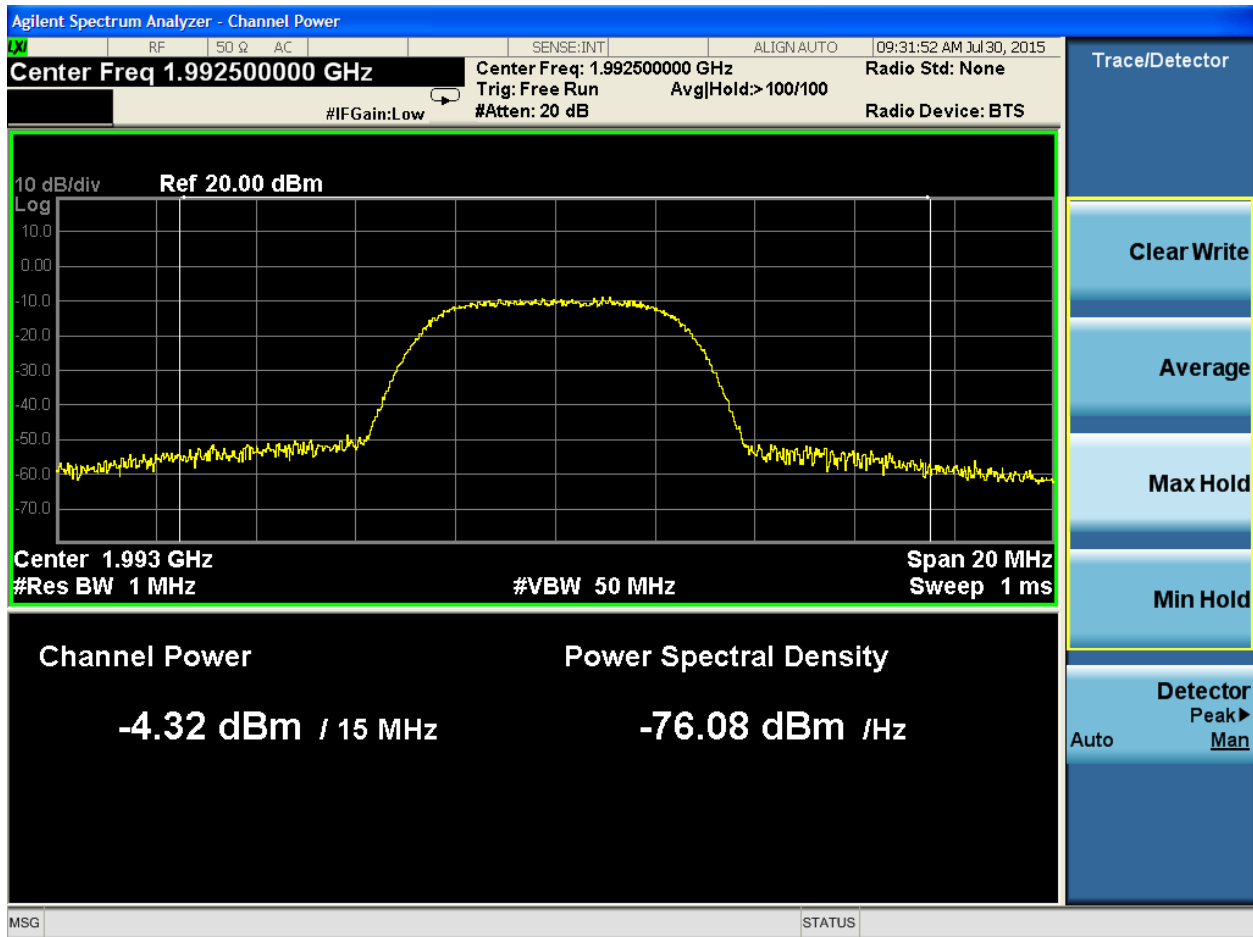
Band 25, Mid Channel, 64QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 18 of
396



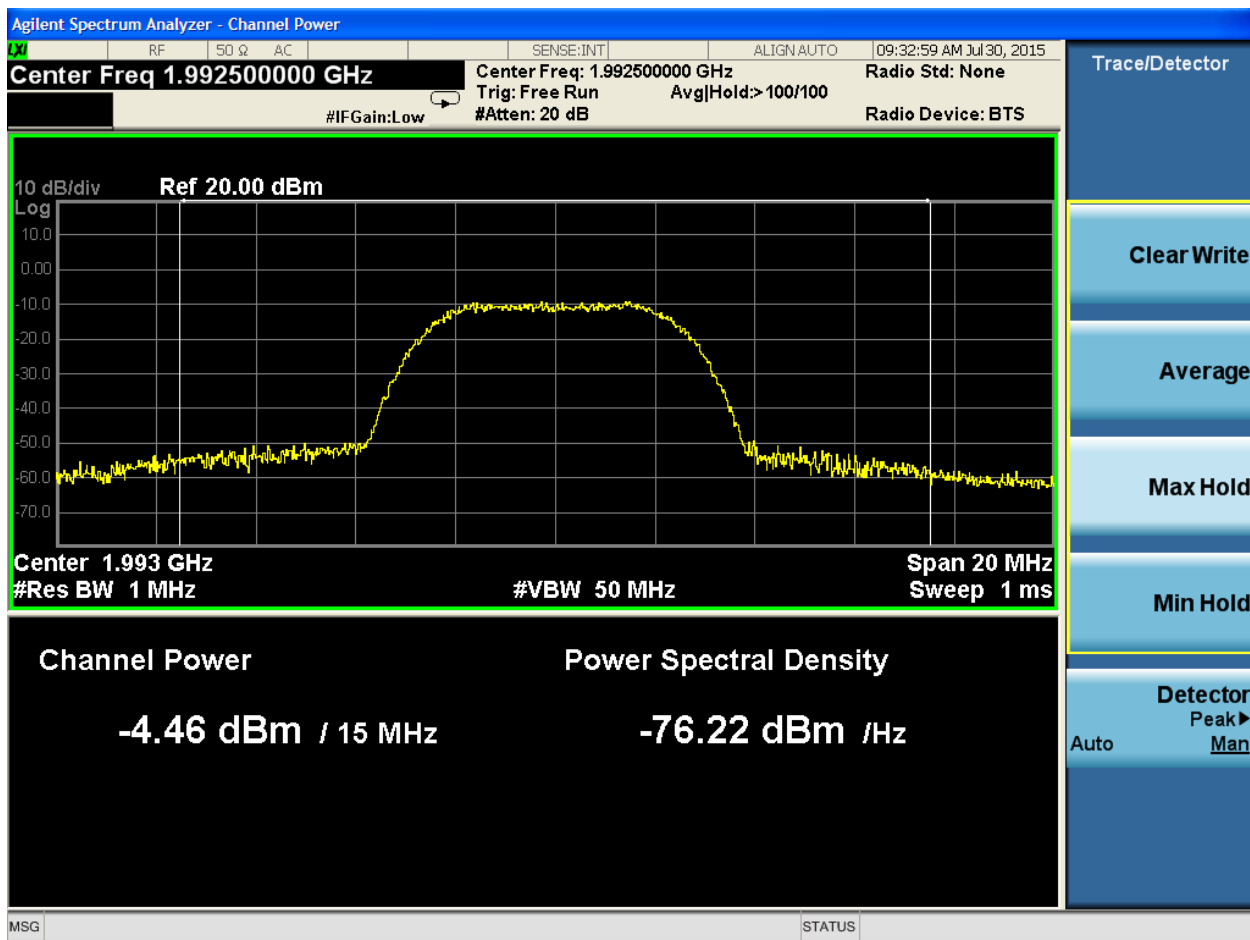
Band 25, High Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8881

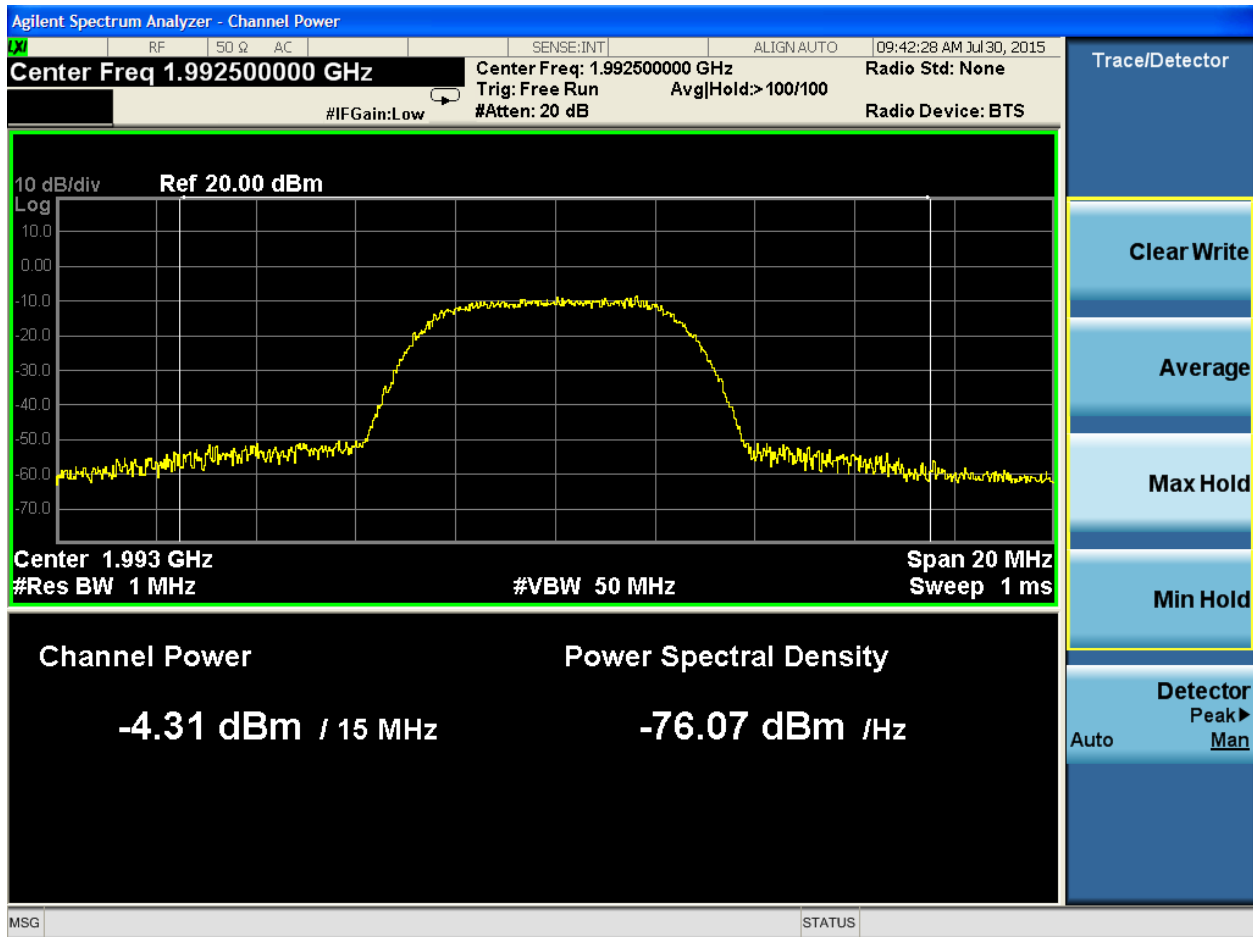


page 19 of
396



Band 25, High Channel, 16 QAM





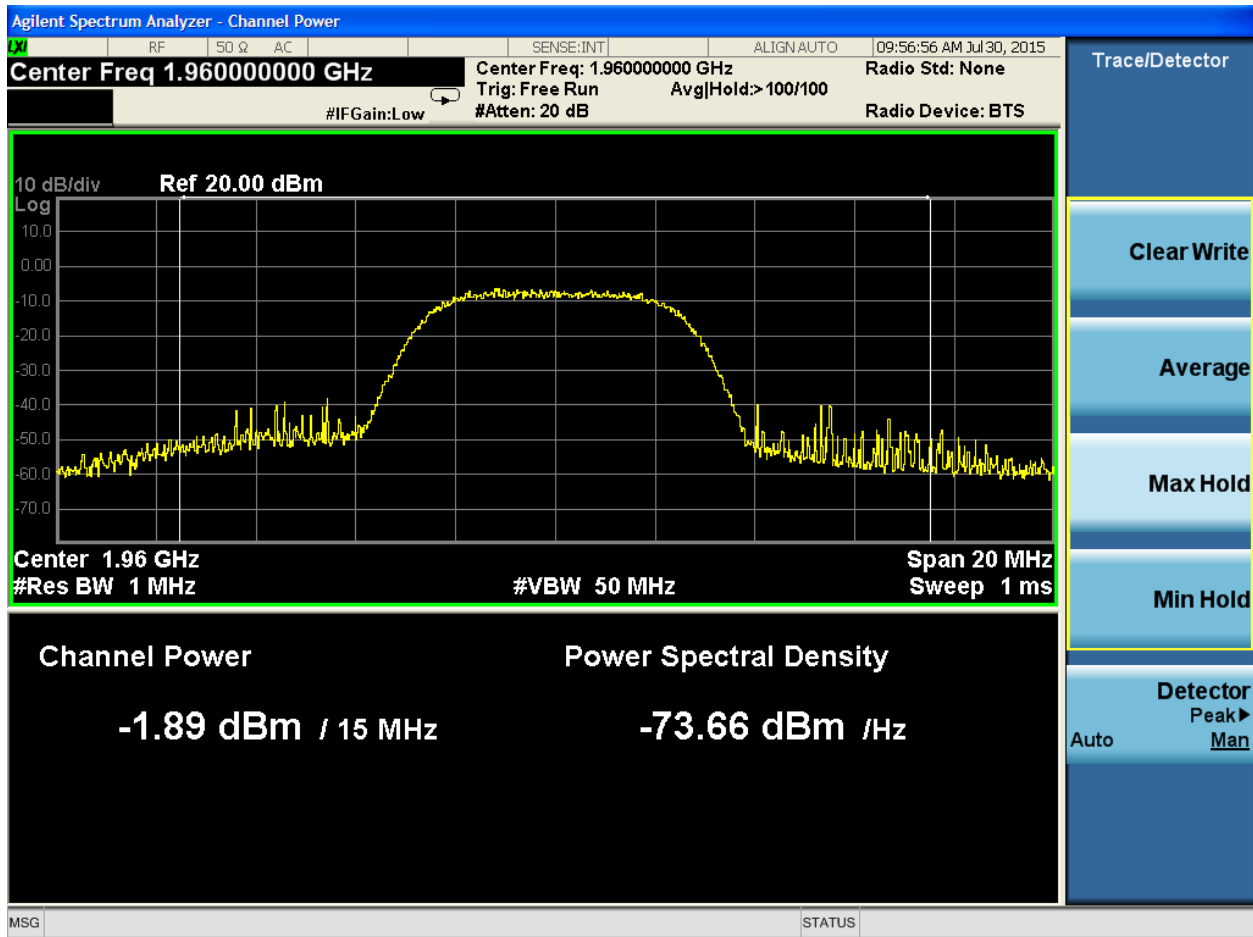
Band 25, High Channel, 64 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 21 of
396



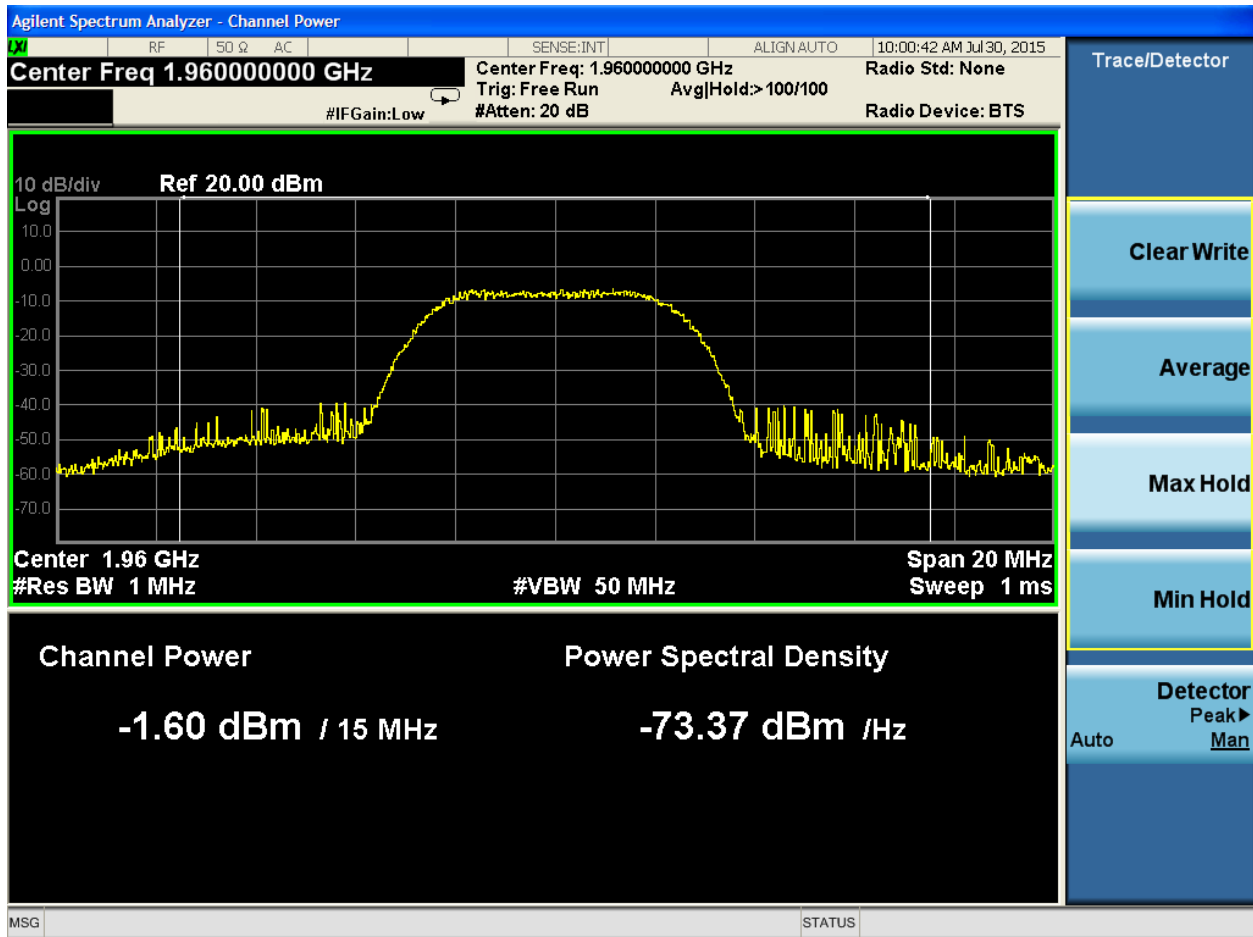
Band 2, Mid Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 22 of
396



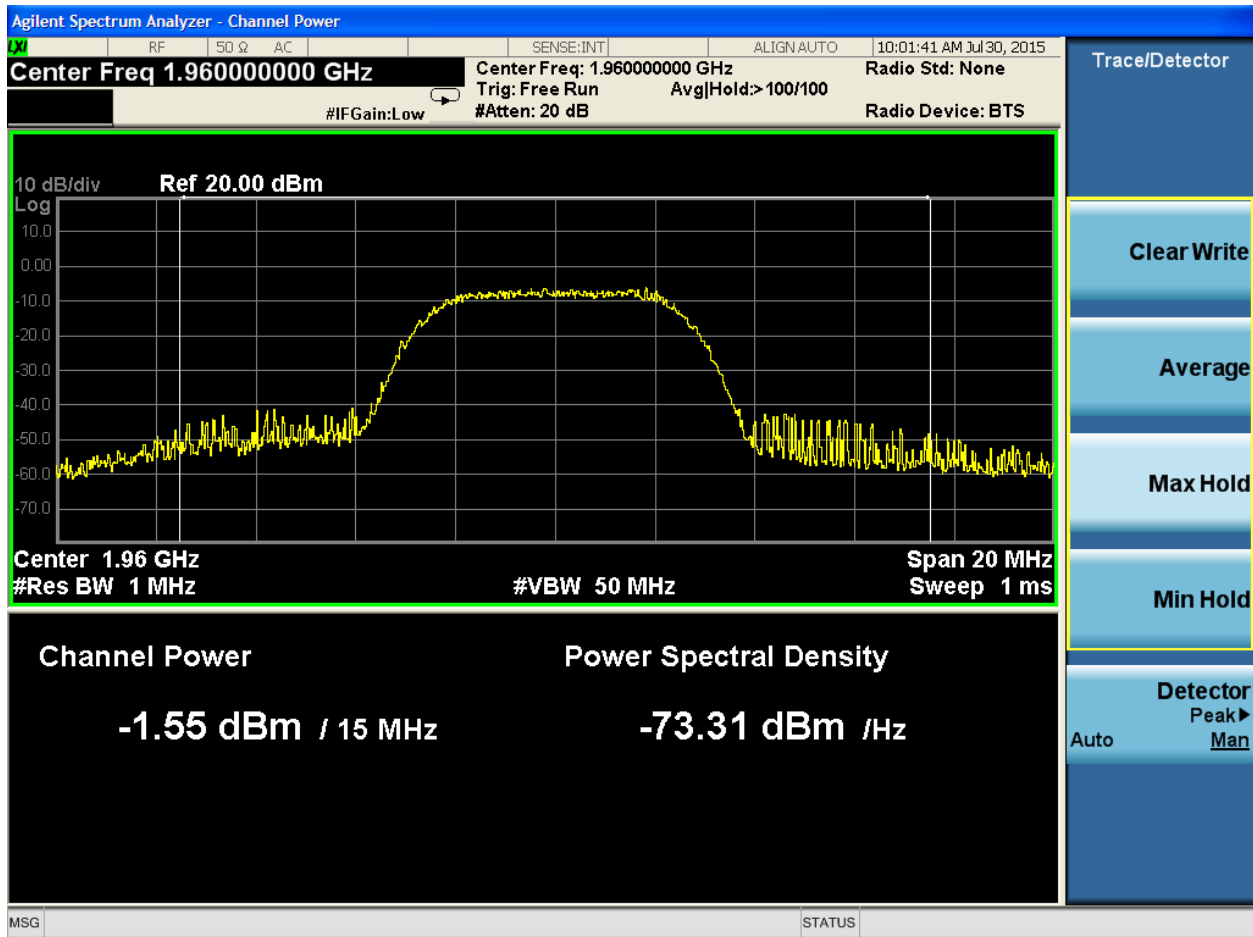
Band 2, Mid Channel, 16 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 23 of
396



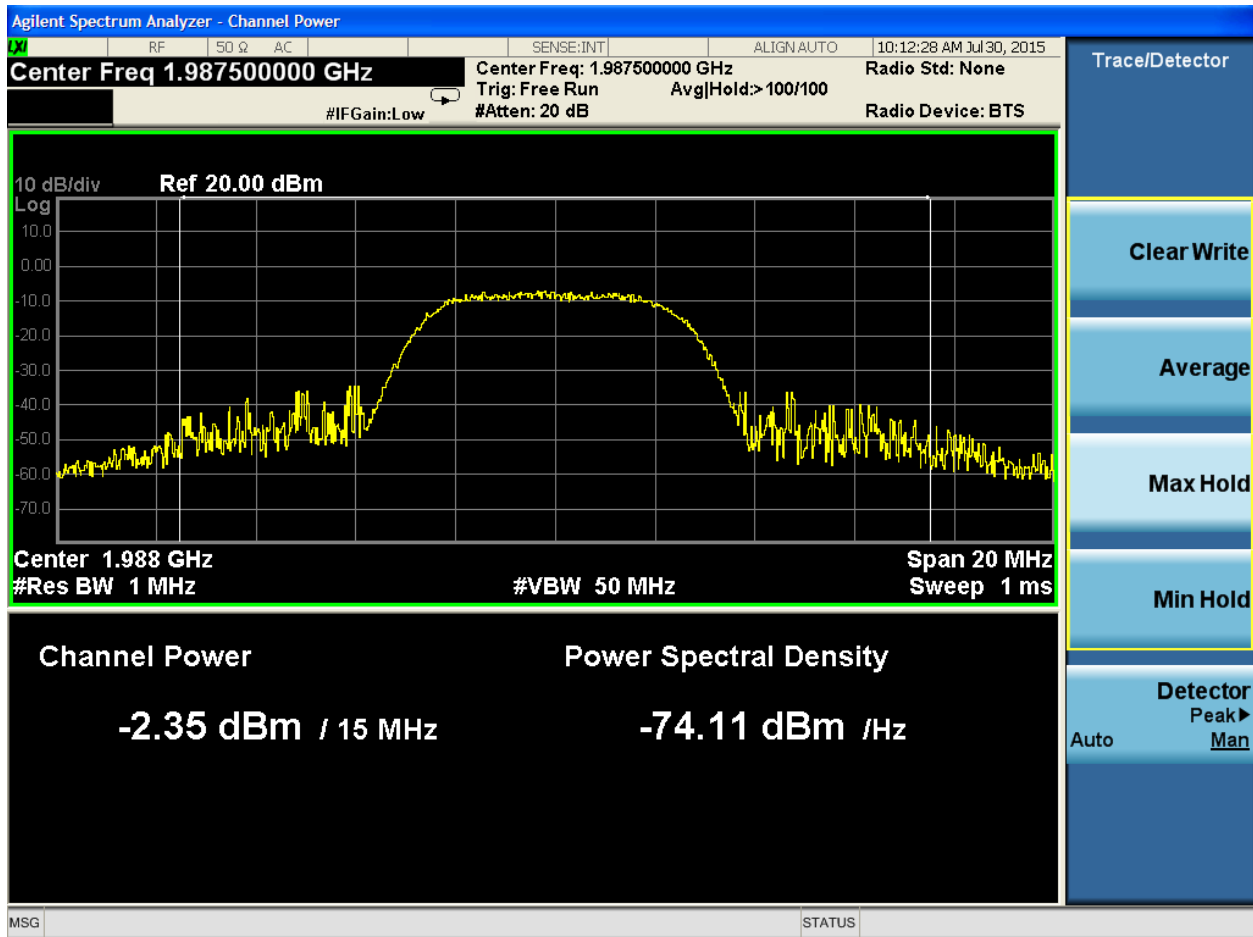
Band 2, Mid Channel, 64 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 24 of
396



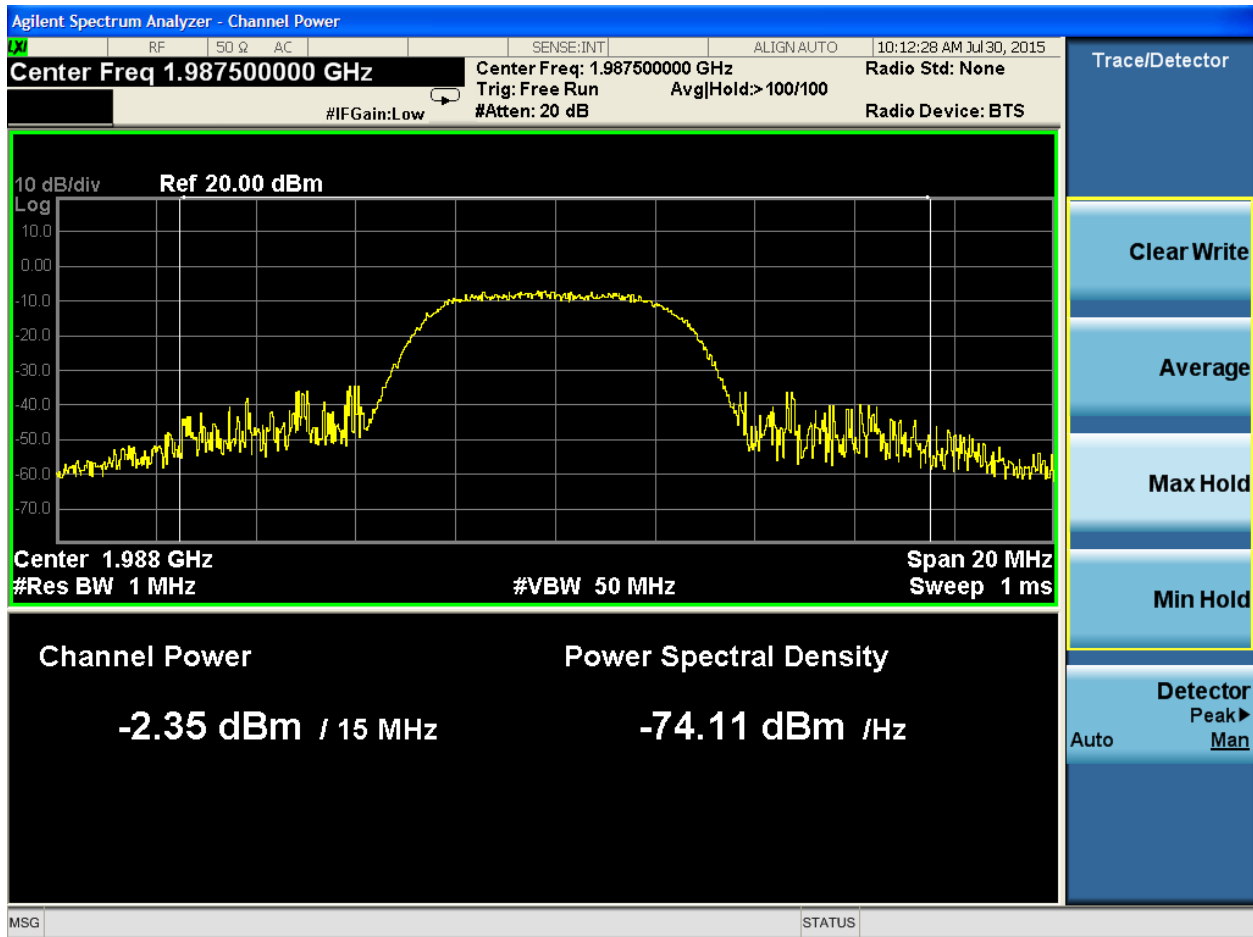
Band 2, High Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 25 of
396



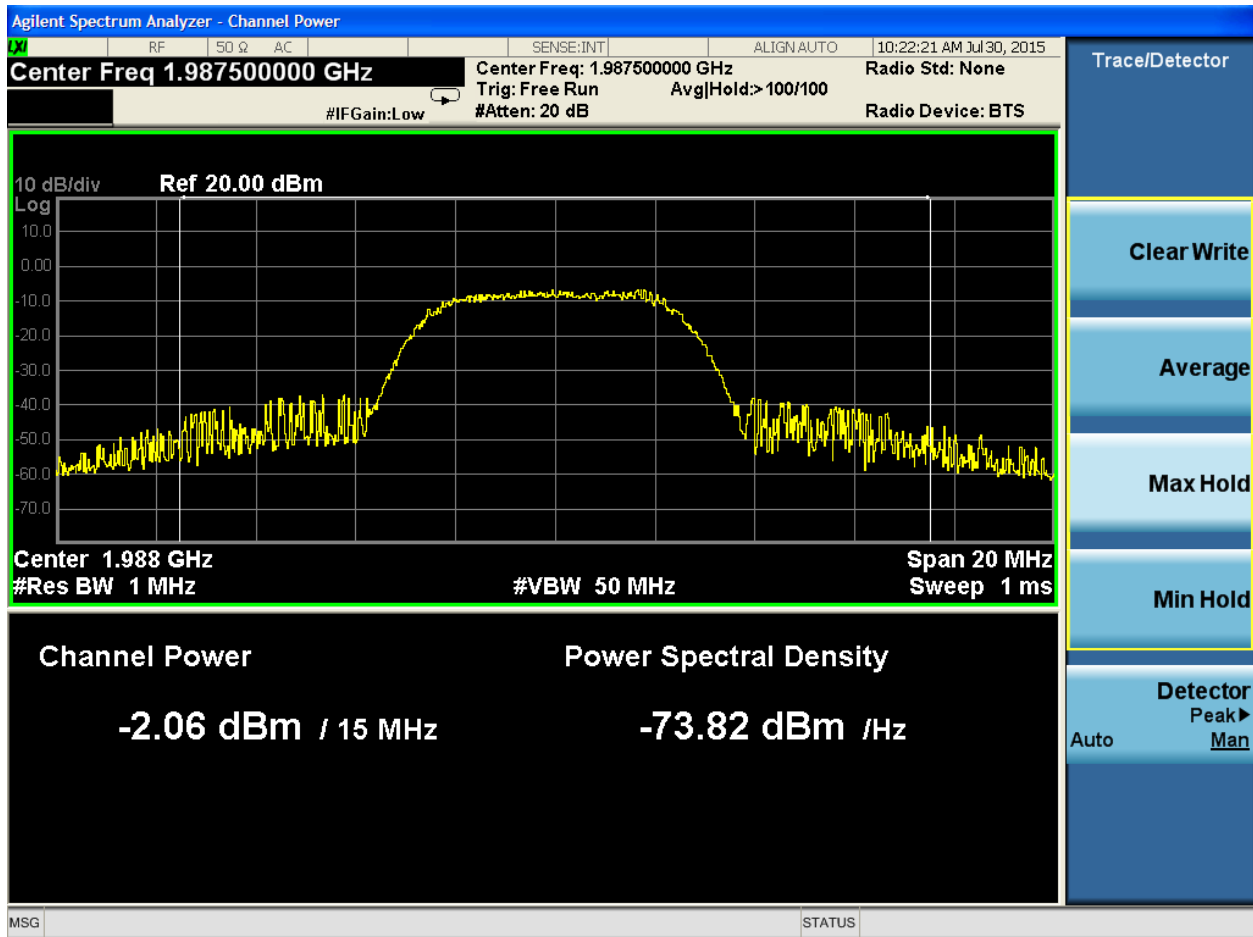
Band 2, High Channel, 16 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 26 of
396



Band 2, High Channel, 64 QAM

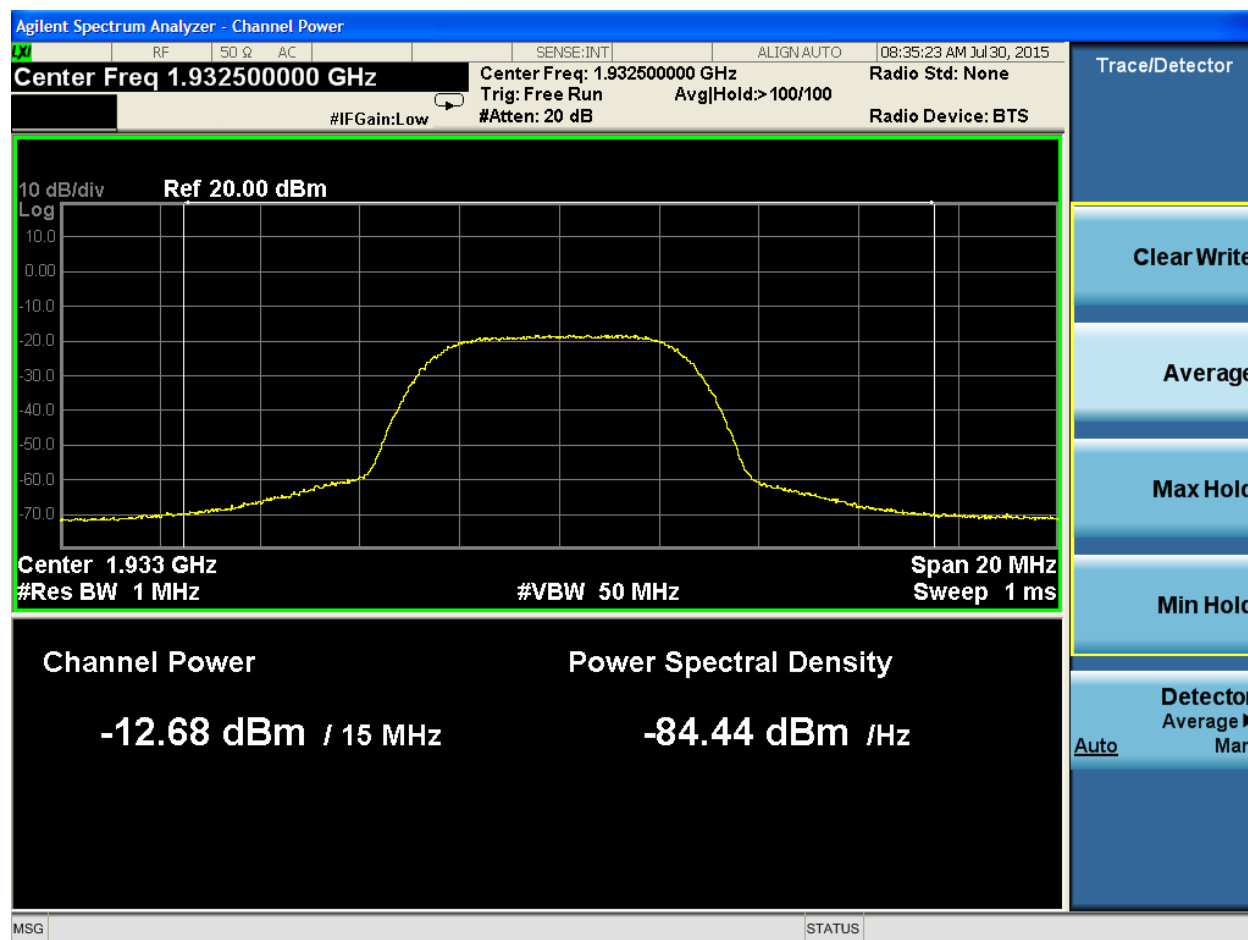


Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 27 of
396

Average Measurements at 5MHz:



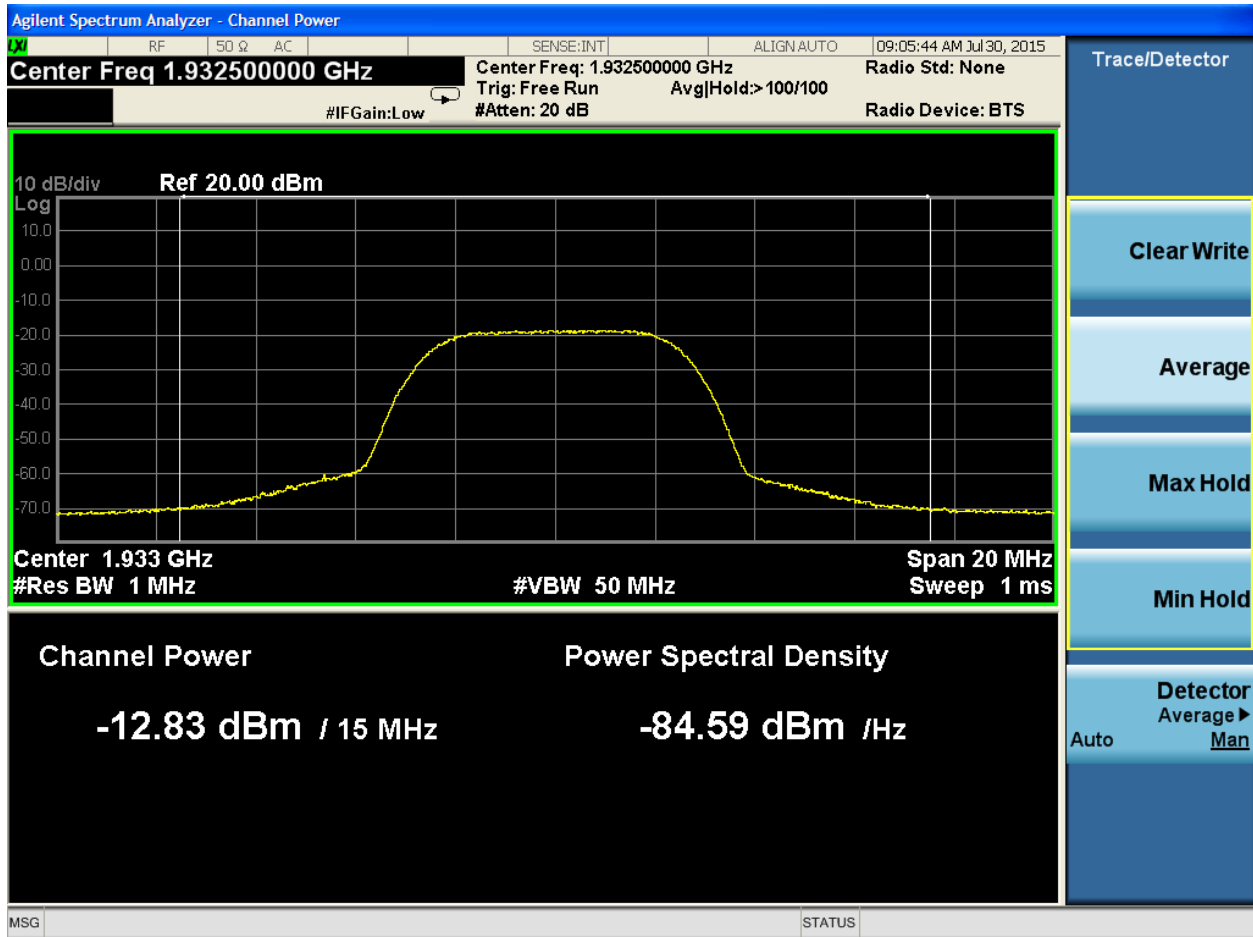
Band 25, Low Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 28 of 396



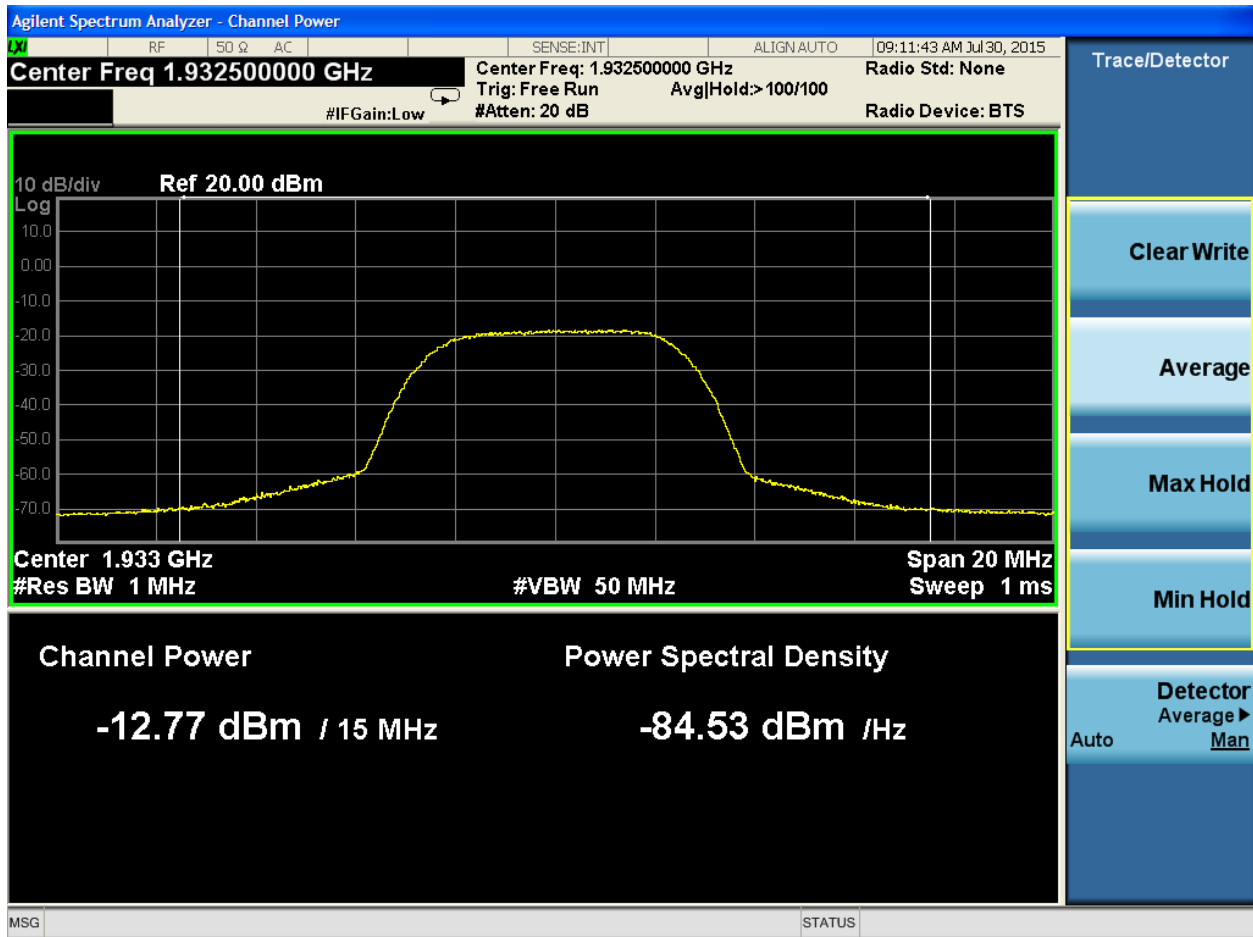
Band 25, Low Channel, 16 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 29 of
396



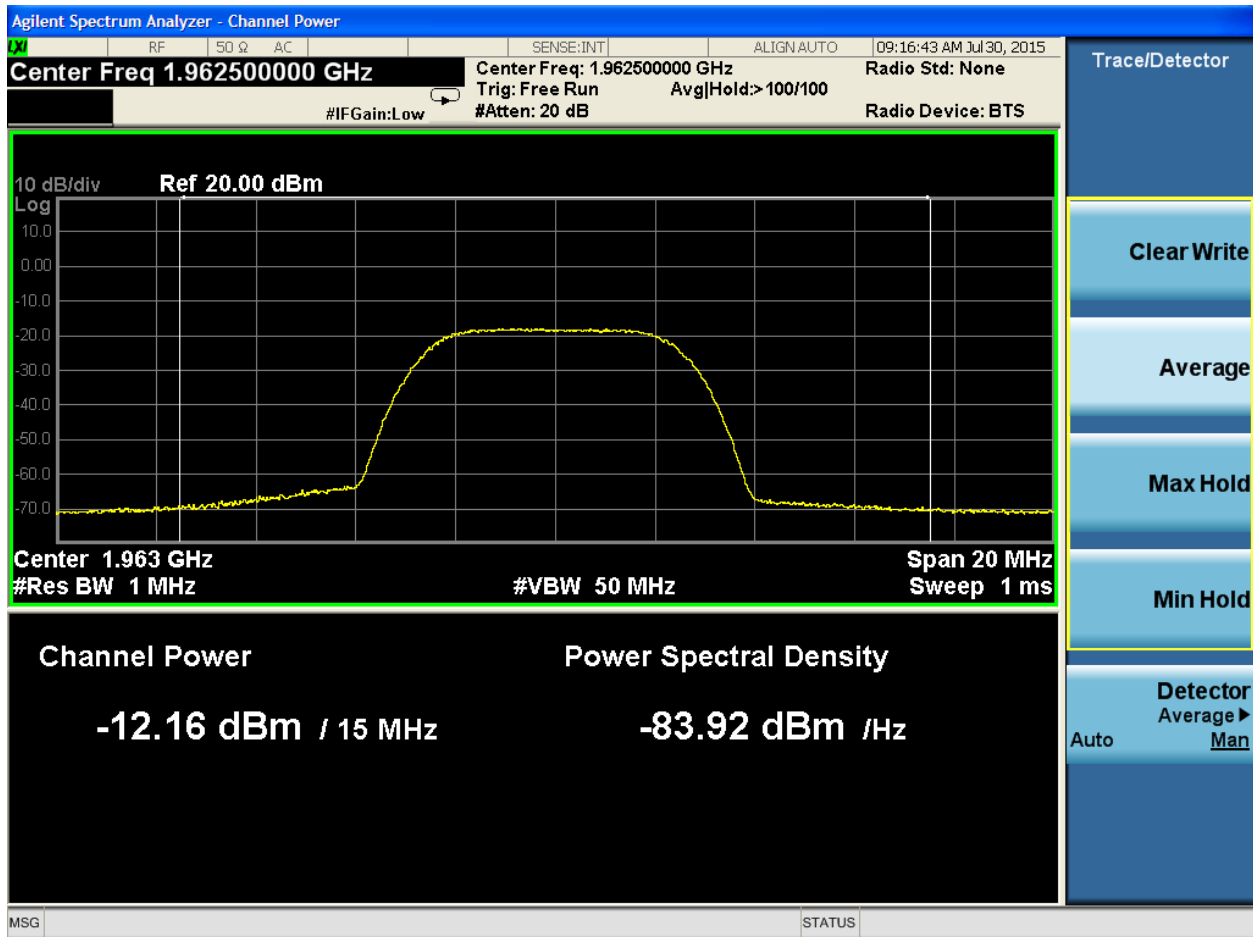
Band 25, Low Channel, 64 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880

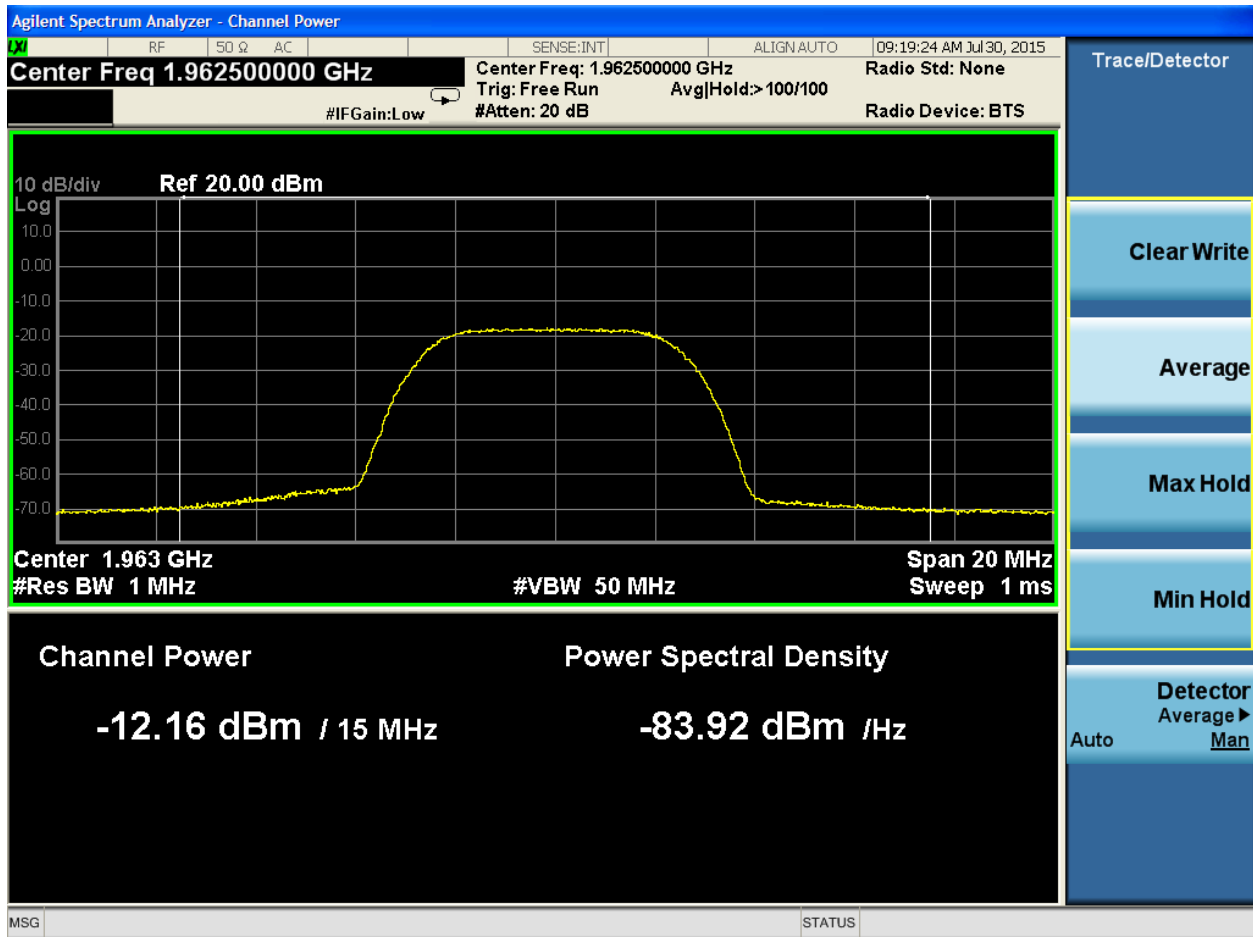


page 30 of
396



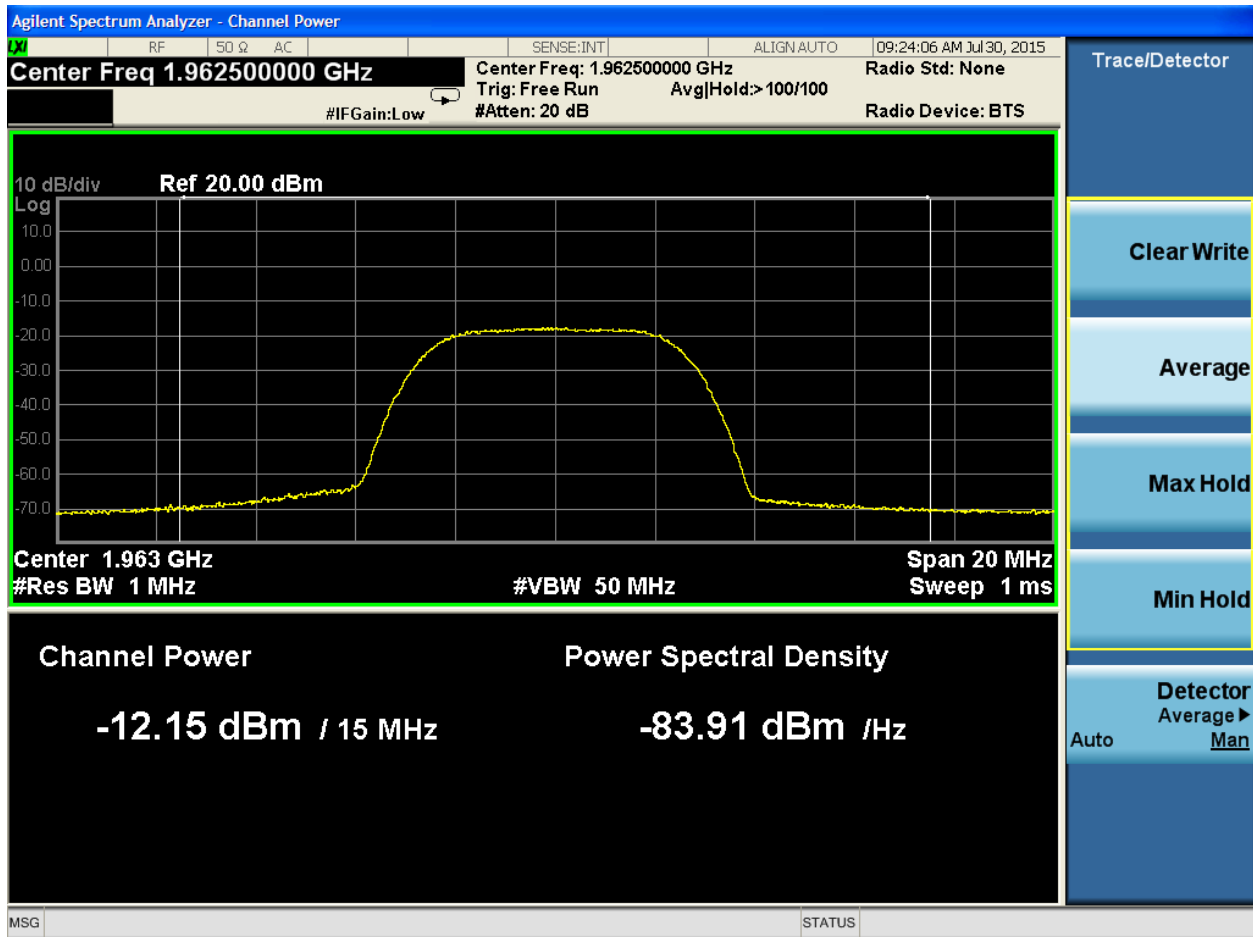
Band 25, Mid Channel, QPSK





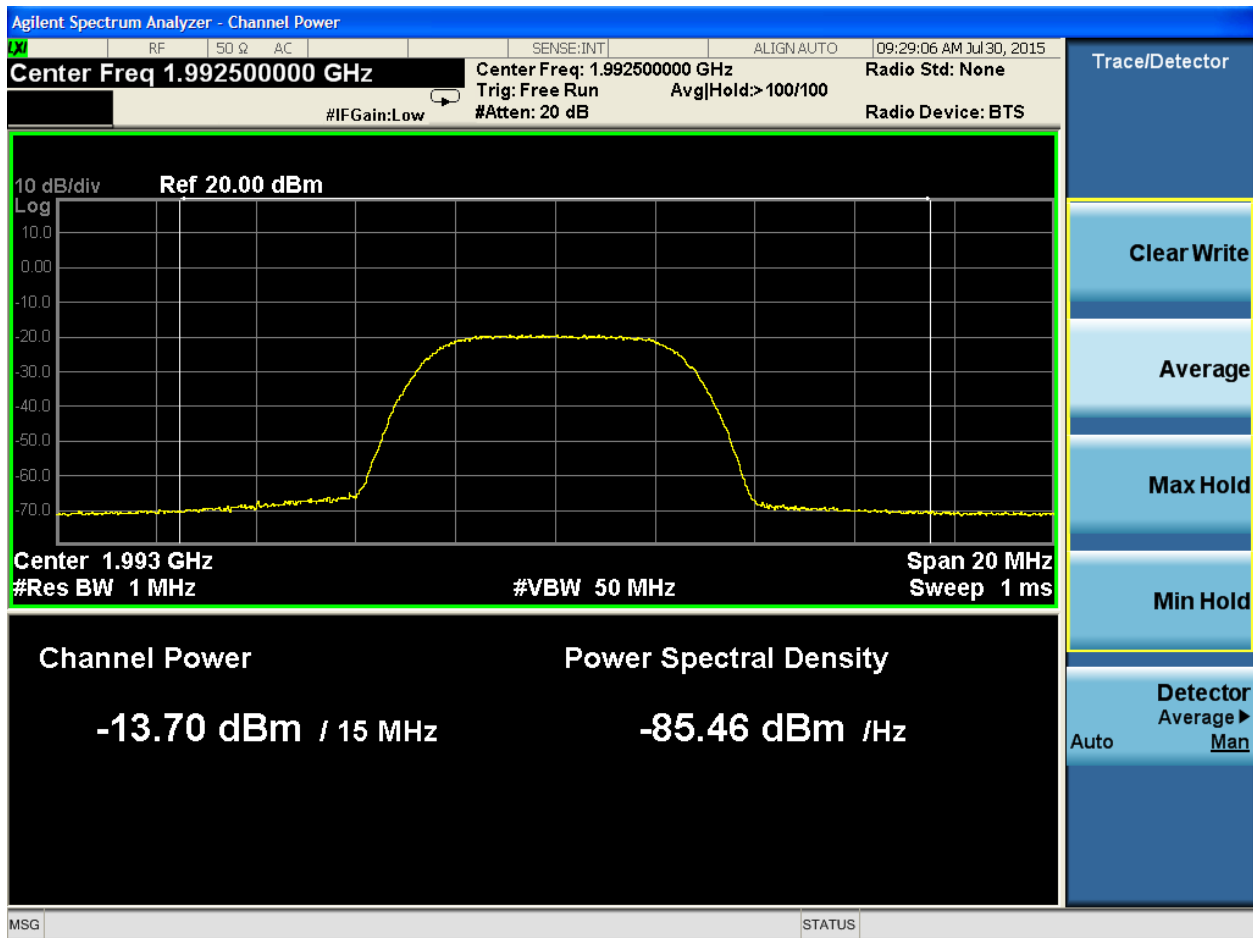
Band 25, Mid Channel, 16 QAM





Band 25, Mid Channel, 64 QAM





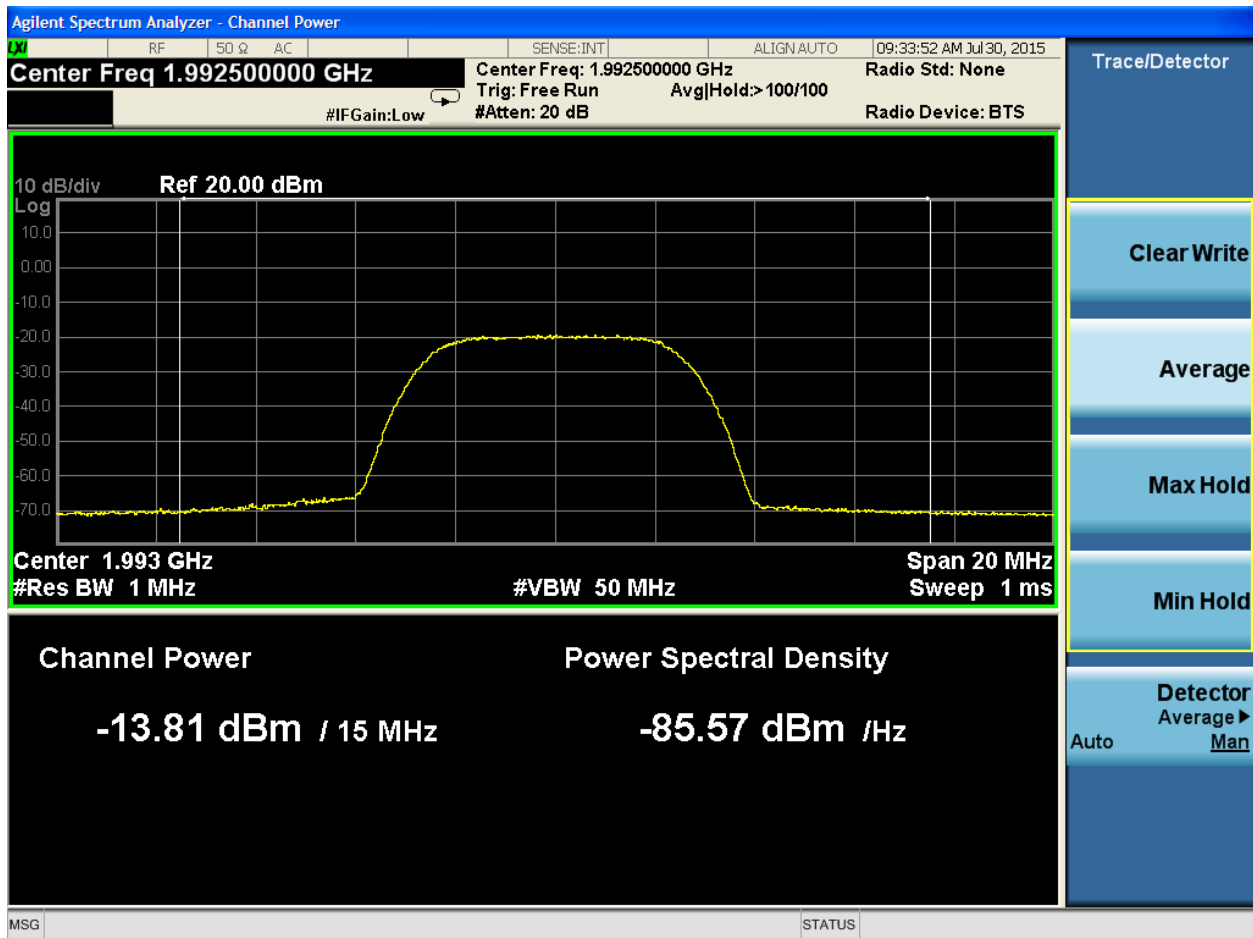
Band 25, High Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 34 of
396



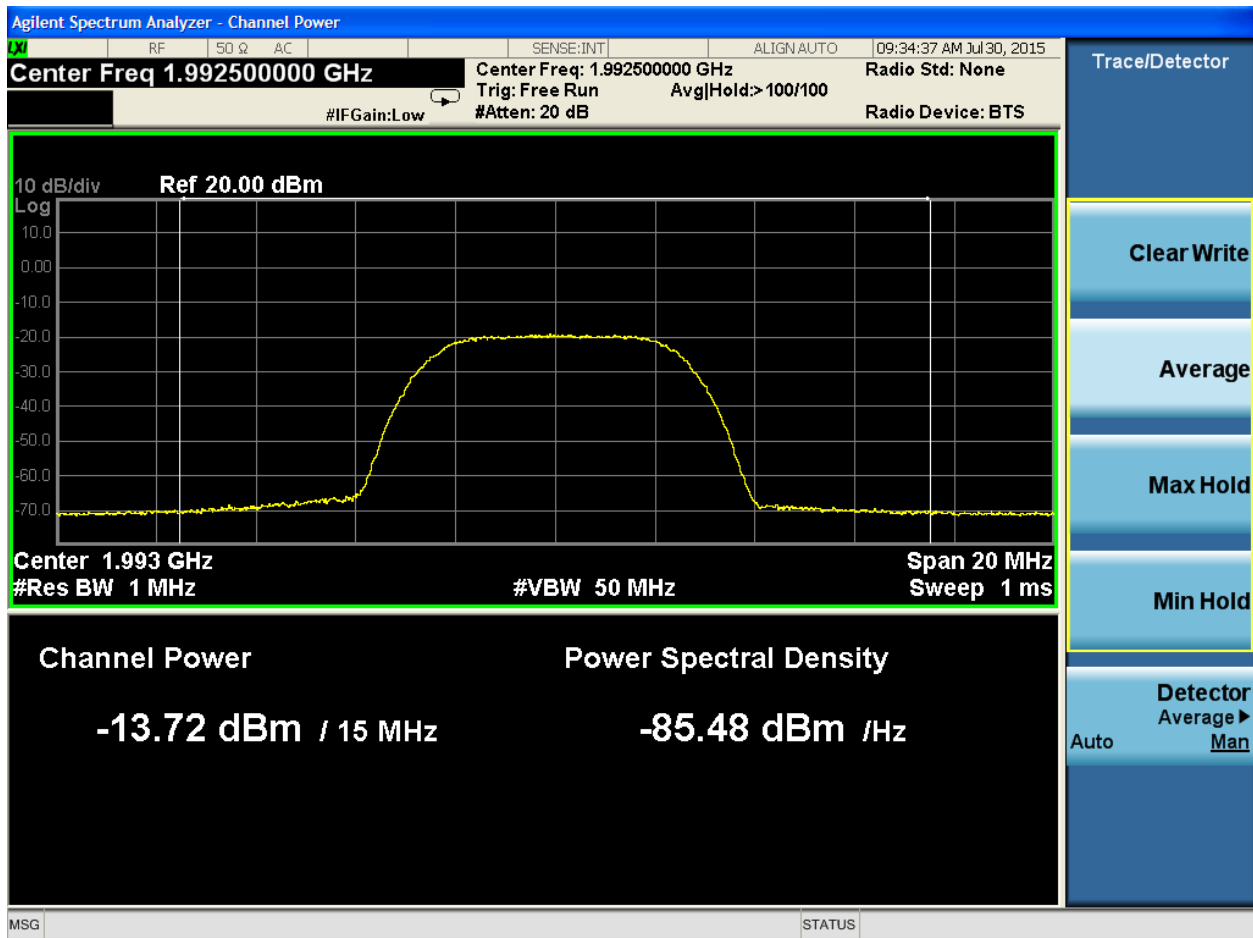
Band 25, High Channel, 16 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880

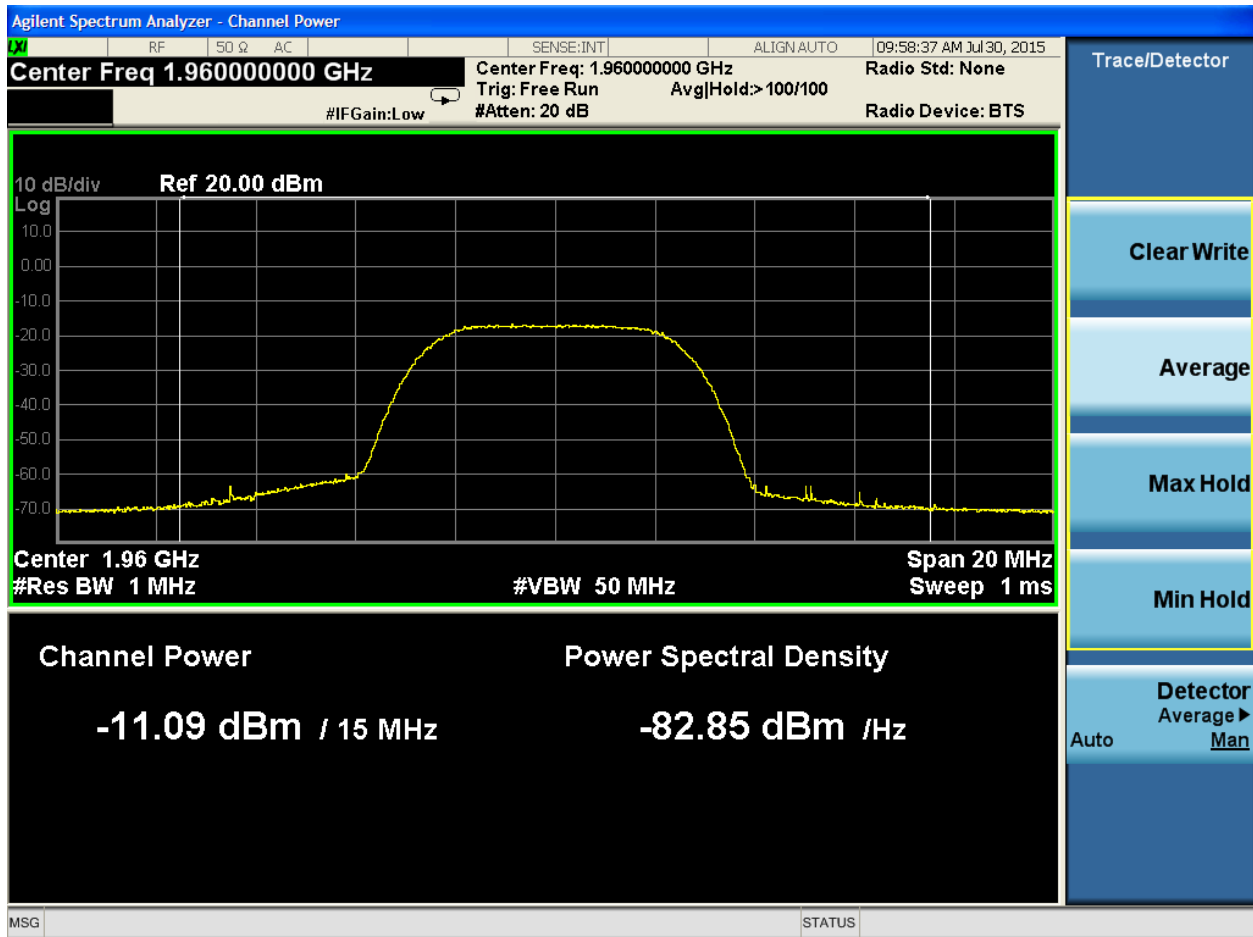


page 35 of
396



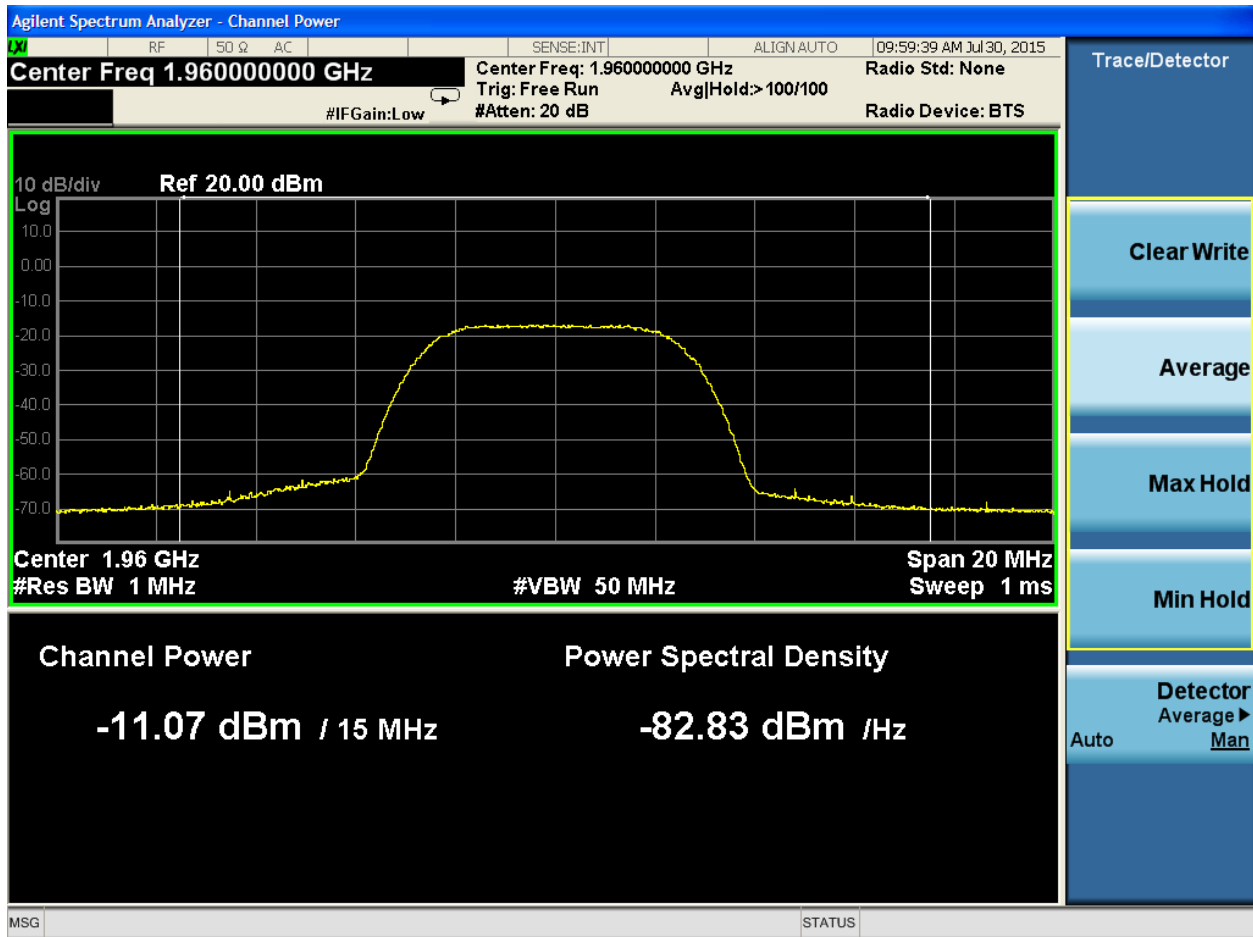
Band 25, High Channel, 64 QAM





Band 2, Mid Channel, QPSK





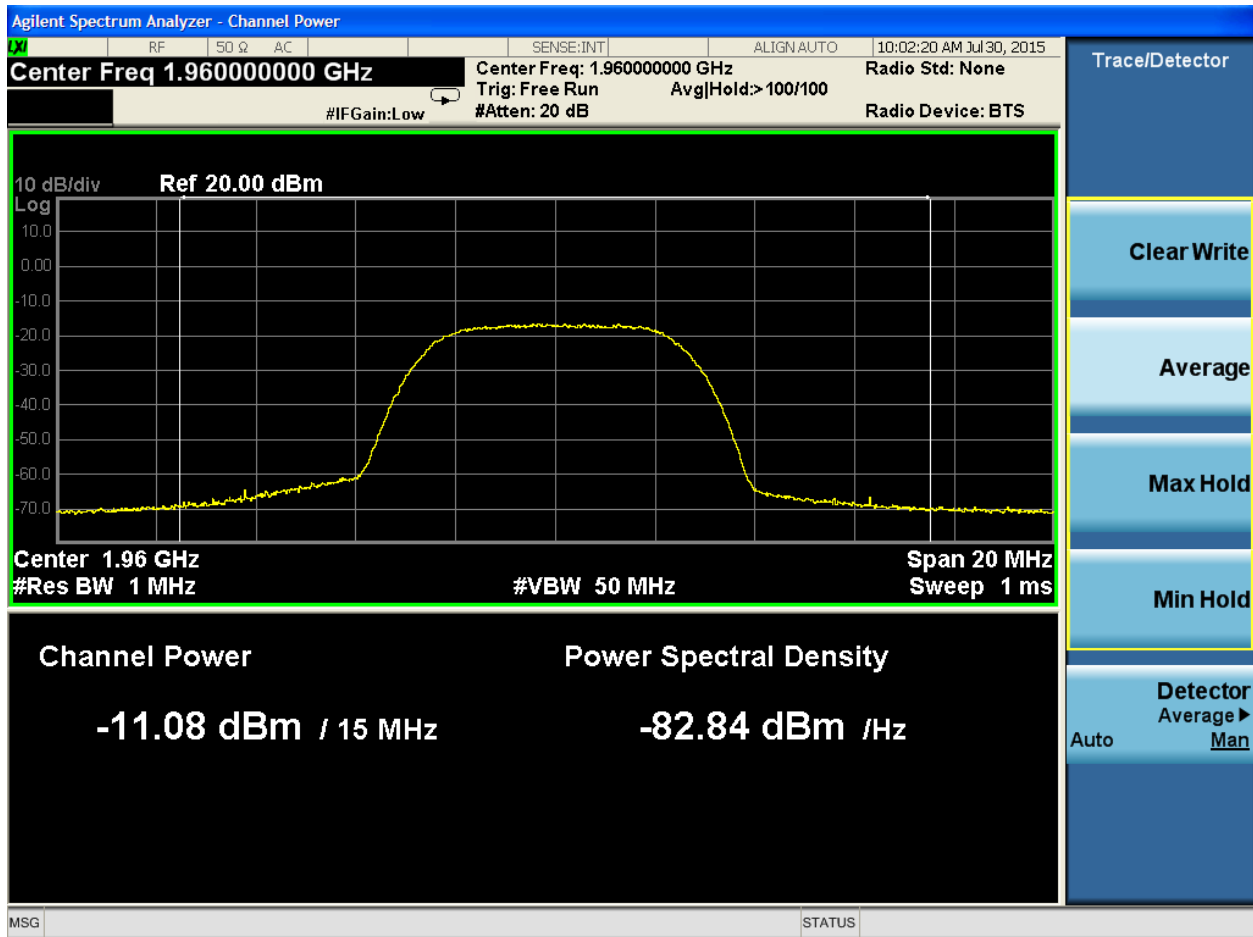
Band 2, Mid Channel, 16 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 38 of
396



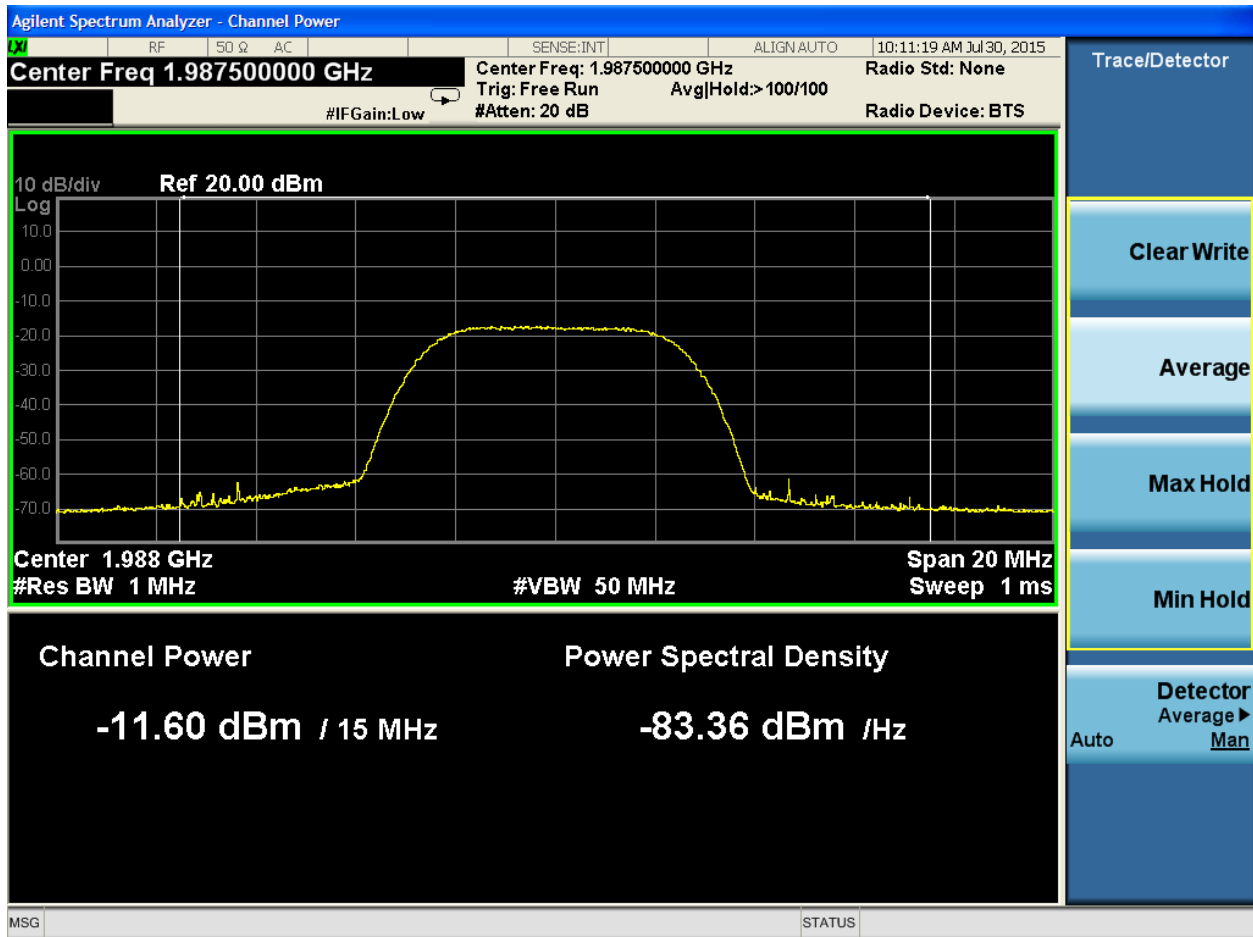
Band 2, Mid Channel, 64 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 39 of
396



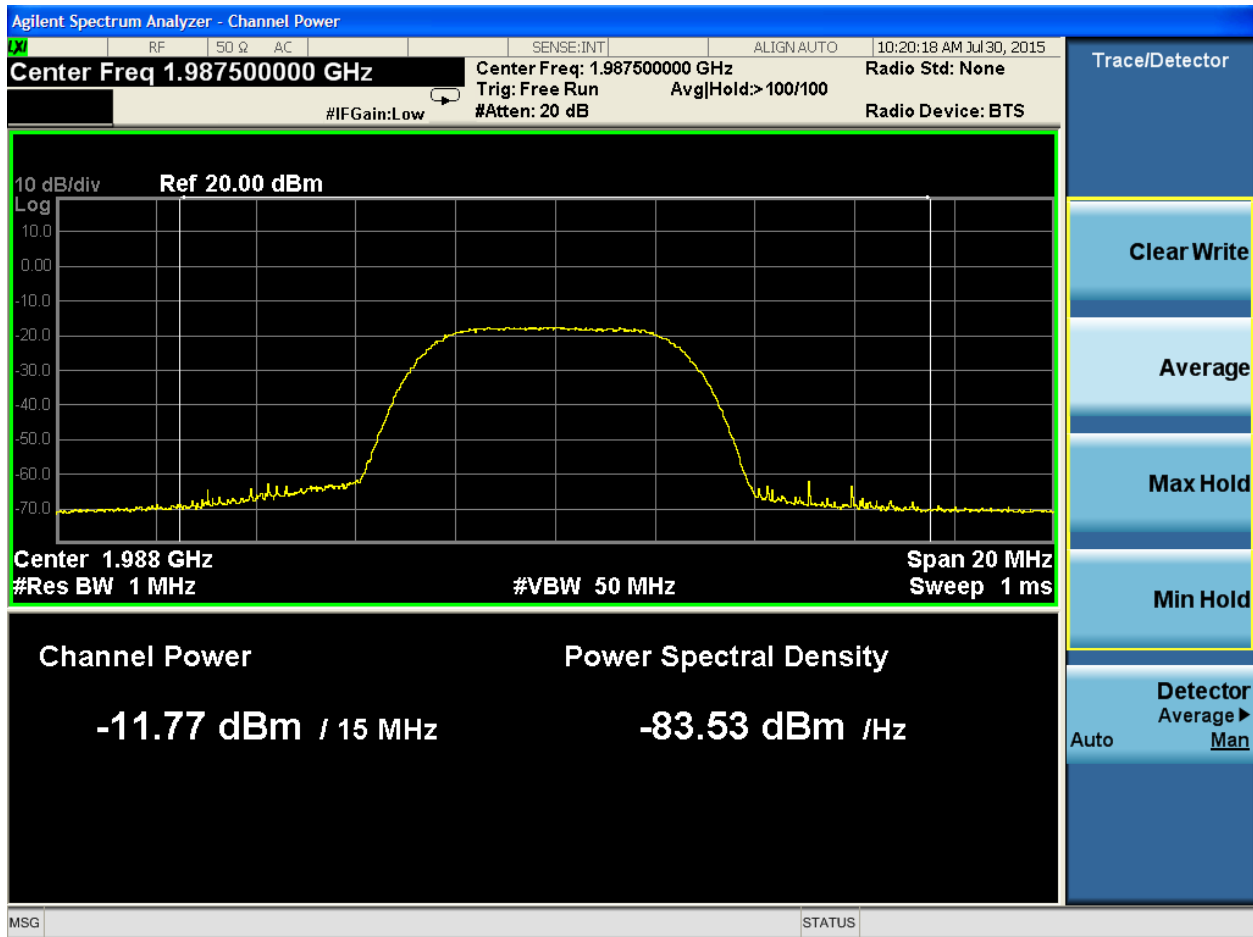
Band 2, High Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 40 of
396



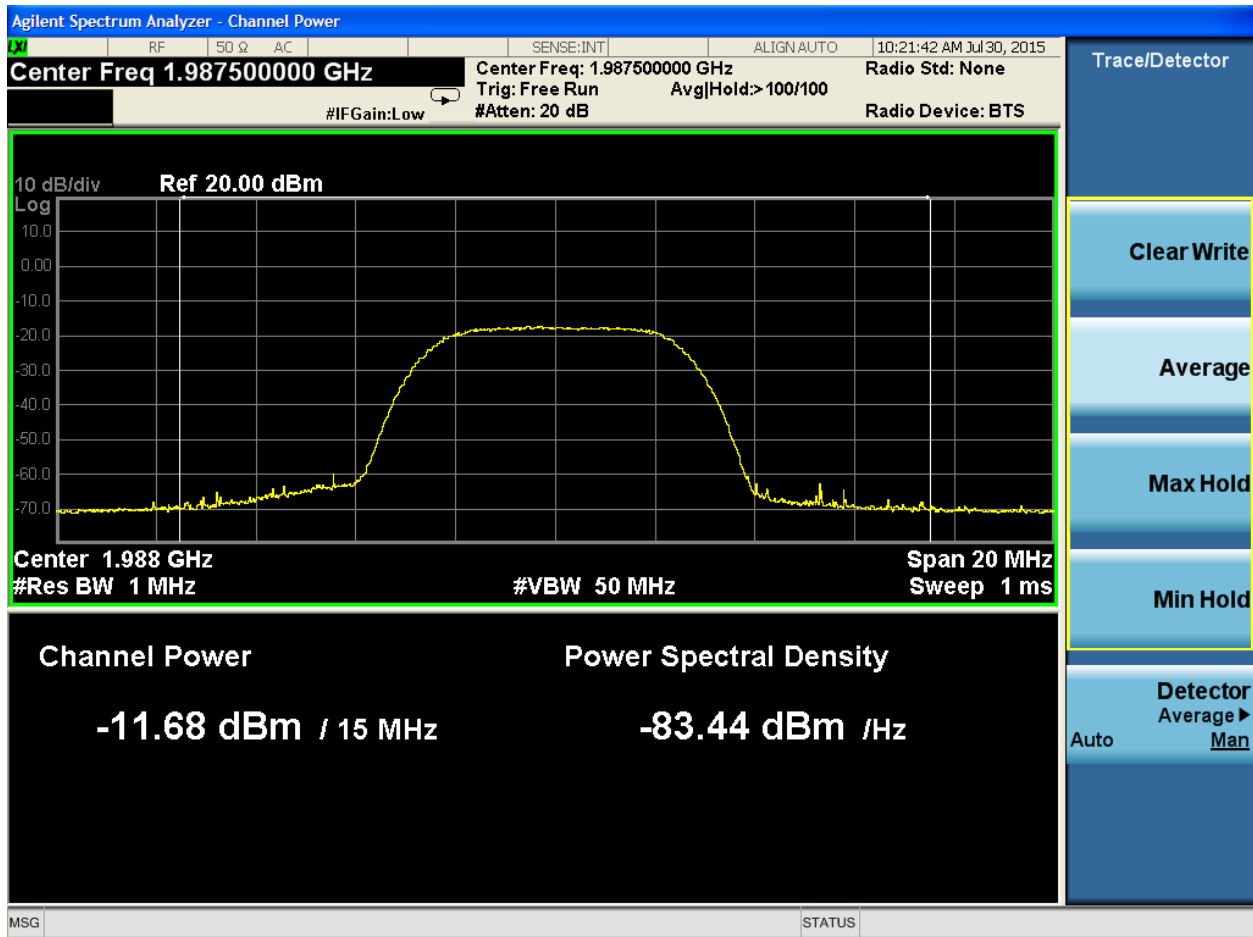
Band 2, High Channel, 16 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 41 of
396



Band 2, High Channel, 64 QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 42 of
396

Power and PAPR: 10MHz Operating Bandwidth

FCC Part 24.232:

(c) Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

(d) Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

Output Power (E.I.R.P.)																
Date: 27-Jul-15			Company: Aivana			Work Order: P0152										
Engineer: Ryan Brown			EUT Desc: Switched IQ Radio Point Domestic			EUT Operating Voltage/Frequency: POE										
Temp: 27°C			Humidity: 51%			Pressure: 1008 mBar										
Frequency Range: Low, Mid and High Channels																
Notes: 2W = 33.0dBm. Multiple antenna calcs using formula from FCC KDB 662911, Section F(2)(a)(i).																
Two antennas each with gain 5.0dBi in this range are installed on the EUT. For multiple output calculations, N(ant.)=2 is used to calculate overall directional gain: 5.0dBi + 10log(N)dB = 5.0dBi + 3.0dB = 8.0dBi.																
Peak-to-Average Ratio (PAPR) must be less than 13dB for average measurements to be applicable to the EIRP limits.																
Band	Bandwidth (MHz)	Modulation	Channel (MHz)	Frequency (MHz)	Average Power Reading (dBm)	Peak Power Reading (dBm)	Power Combiner (dB)	20dB Attenuator (dB)	Cable Factor (dB)	Average Power Reading (dBm)	PAPR (limit: 13dB) (dB)	Directional Antenna Gain (dBi)	FCC Part 24.232 c & d; Limit: 2W = 33.0dBm			
													Limit (dBm)	ERP (dB)	Margin (dB)	Result
25	10	QPSK	Low	1935.0	-1.6	8.22	4.2	19.7	0.6	22.9	9.82	8.0	33.0	30.9	-2.1	Pass
25	10	QPSK	Mid	1962.5	-1.21	8.47	4.2	19.7	0.6	23.3	9.68	8.0	33.0	31.3	-1.7	Pass
25	10	QPSK	High	1990.0	-2.72	7.06	4.2	19.7	0.6	21.8	9.78	8.0	33.0	29.8	-3.2	Pass
25	10	16QAM	Low	1935.0	-1.55	8.4	4.2	19.7	0.6	23.0	9.95	8.0	33.0	31.0	-2.1	Pass
25	10	16QAM	Mid	1962.5	-1.2	8.62	4.2	19.7	0.6	23.3	9.82	8.0	33.0	31.3	-1.7	Pass
25	10	16QAM	High	1990.0	-2.69	7.18	4.2	19.7	0.6	21.8	9.87	8.0	33.0	29.8	-3.2	Pass
25	10	64QAM	Low	1935.0	-1.62	8.67	4.2	19.7	0.6	22.9	10.29	8.0	33.0	30.9	-2.1	Pass
25	10	64QAM	Mid	1962.5	-1.19	8.84	4.2	19.7	0.6	23.3	10.03	8.0	33.0	31.3	-1.7	Pass
25	10	64QAM	High	1990.0	-2.78	7.28	4.2	19.7	0.6	21.7	10.06	8.0	33.0	29.7	-3.3	Pass
2	10	QPSK	Low	1935.0	See Band 25											
2	10	QPSK	Mid	1962.5	-0.96	8.43	4.2	19.7	0.6	23.5	9.39	8.0	33.0	31.5	-1.5	Pass
2	10	QPSK	High	1990.0	-2.2	7.73	4.2	19.7	0.6	22.3	9.93	8.0	33.0	30.3	-2.7	Pass
2	10	16QAM	Low	1935.0	See Band 25											
2	10	16QAM	Mid	1962.5	-0.97	8.66	4.2	19.7	0.6	23.5	9.63	8.0	33.0	31.5	-1.5	Pass
2	10	16QAM	High	1990.0	-2.21	7.54	4.2	19.7	0.6	22.3	9.75	8.0	33.0	30.3	-2.7	Pass
2	10	64QAM	Low	1935.0	See Band 25											
2	10	64QAM	Mid	1962.5	-1	9.29	4.2	19.7	0.6	23.5	10.29	8.0	33.0	31.5	-1.5	Pass
2	10	64QAM	High	1990.0	-2.27	7.54	4.2	19.7	0.6	22.2	9.81	8.0	33.0	30.2	-2.8	Pass
Table Result: Pass																
Test Site: ESD-1			Cable: 1509			20dB Attenuator: 791										
Analyzer: MXE EMI Receiver			Power Combiner: 1939													

Spectrum analyzer plots are on the following pages.

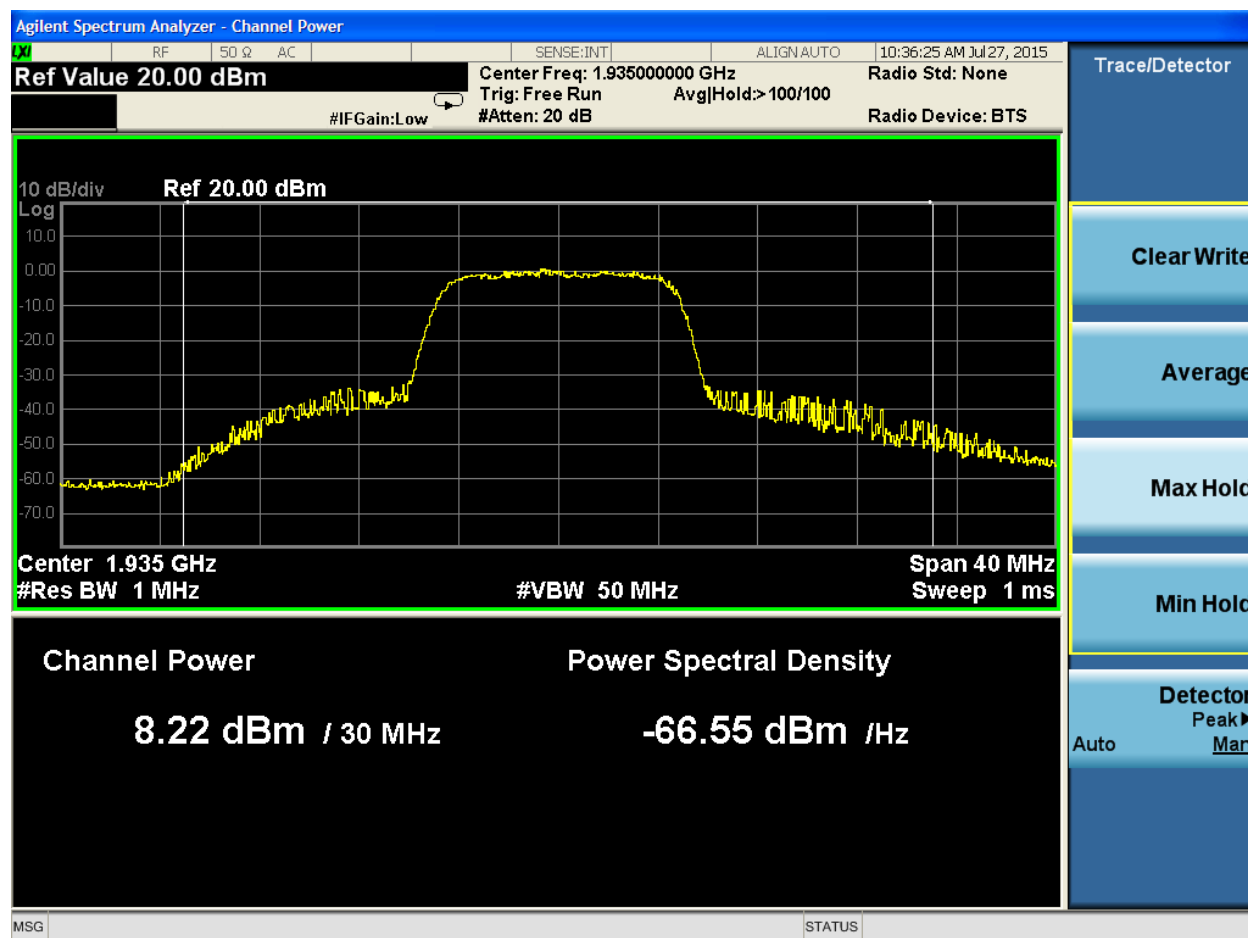


Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-887



page 43 of
396

Peak Measurements at 10MHz:



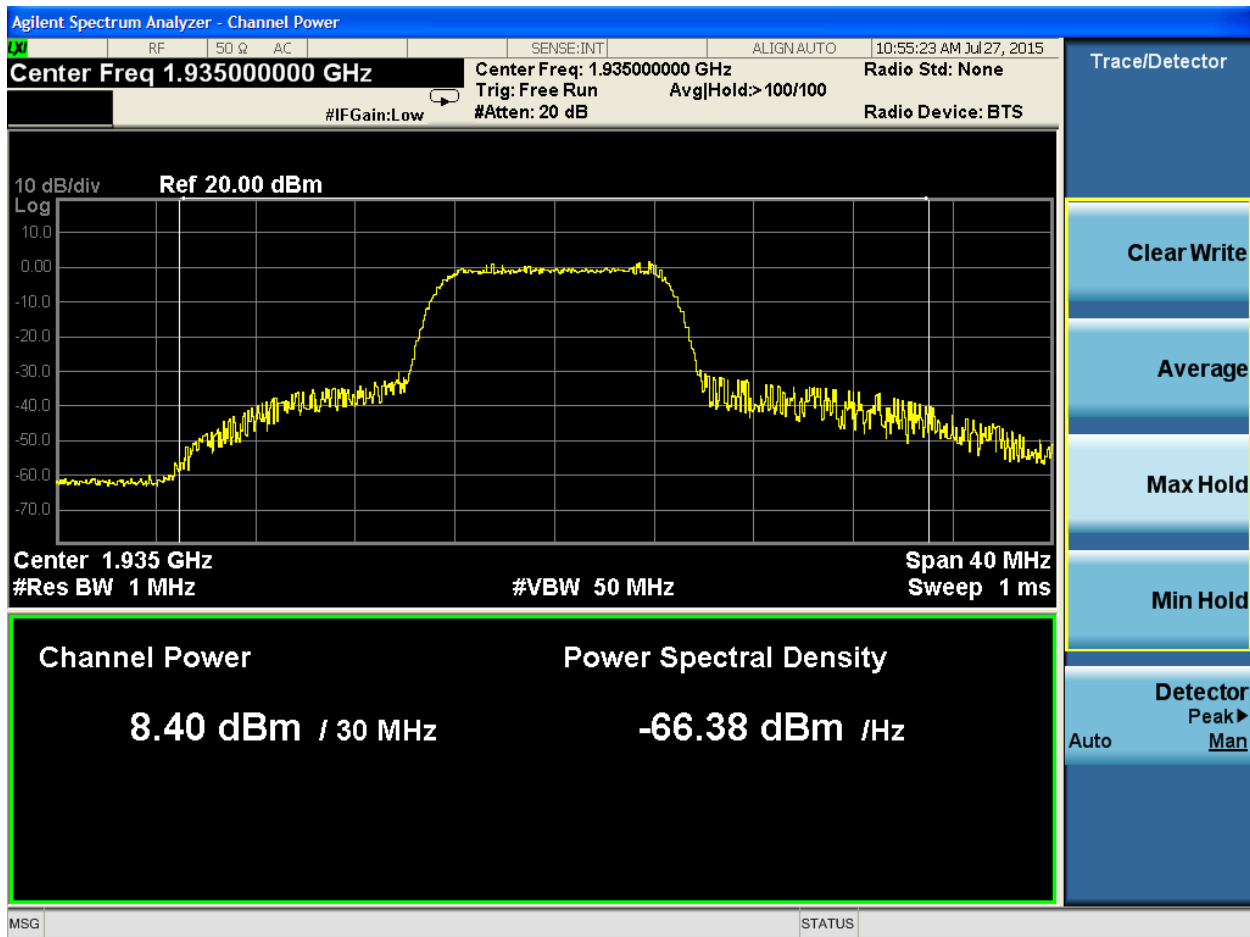
Band 25, Low Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 44 of
396



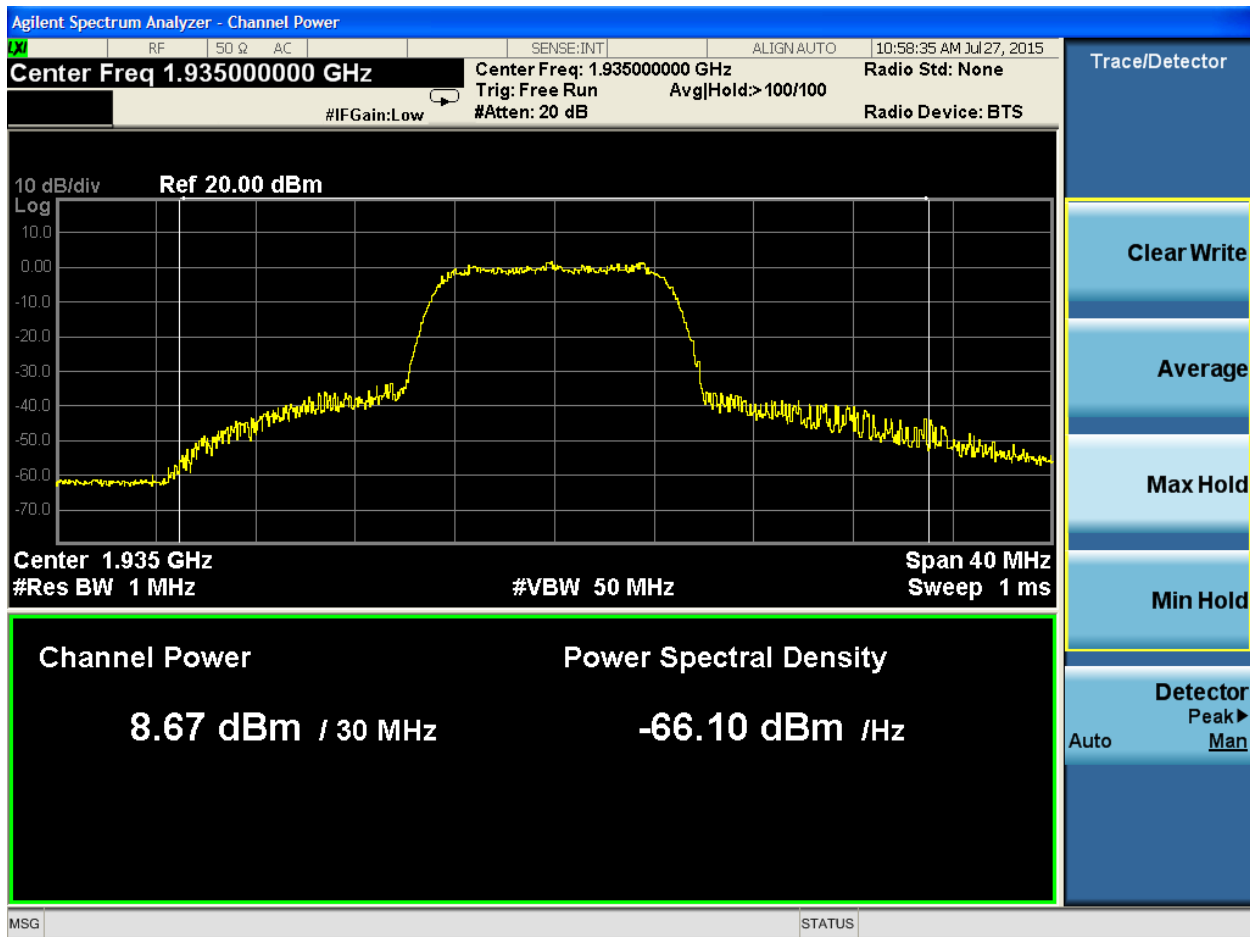
Band 25, Low Channel, 16QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 45 of
396



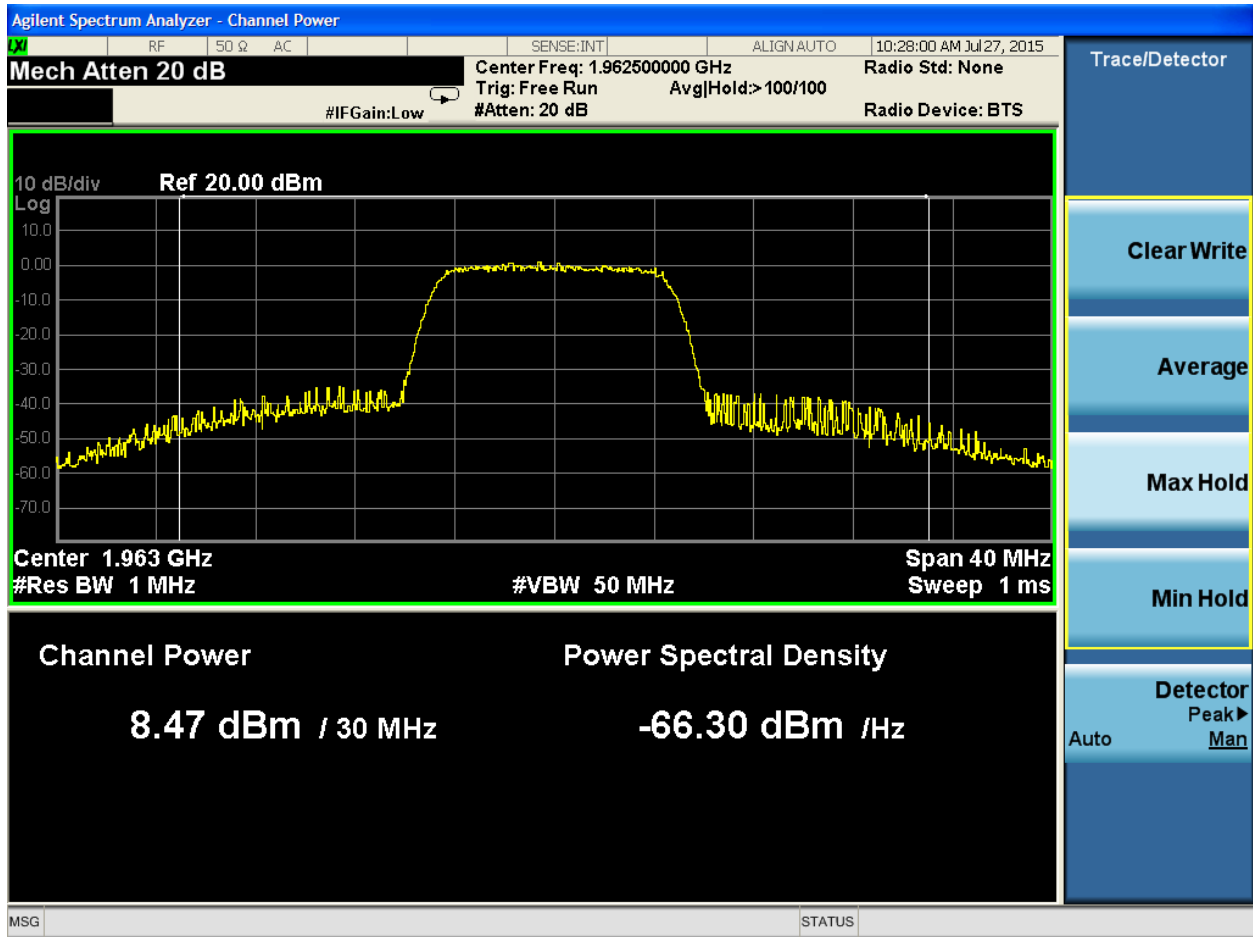
Band 25, Low Channel, 64QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 46 of
396



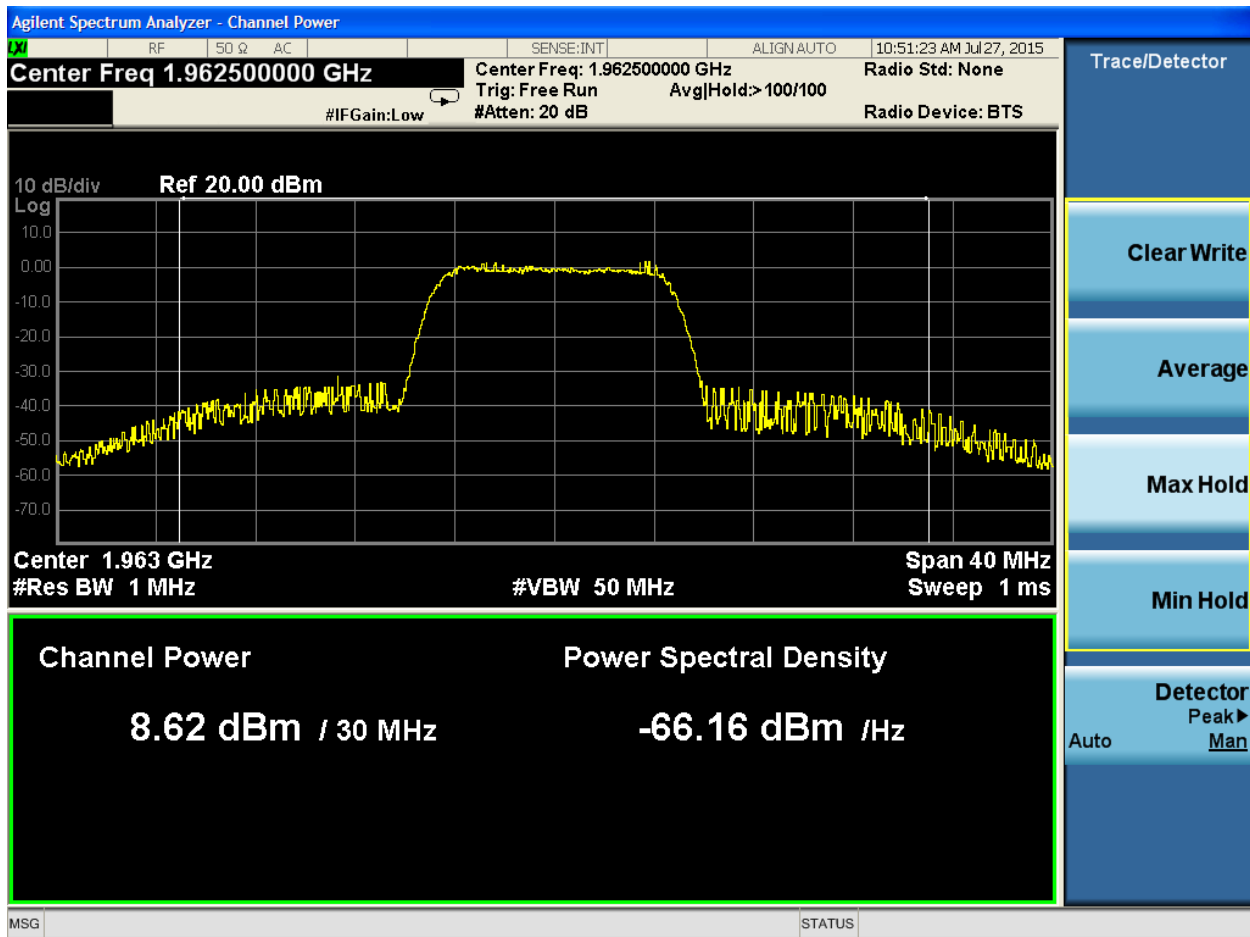
Band 25, Mid Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 47 of
396



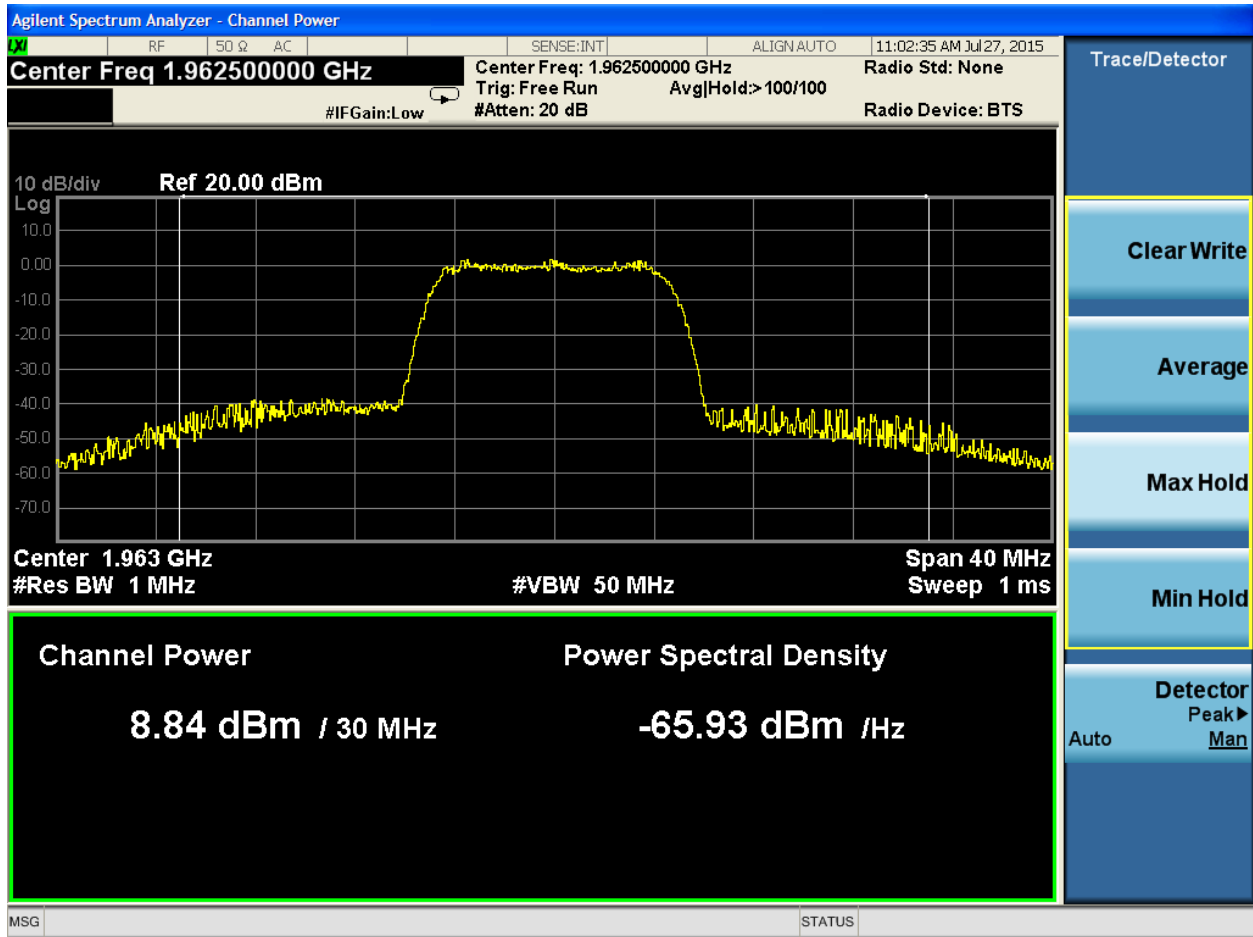
Band 25, Mid Channel, 16QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 48 of
396



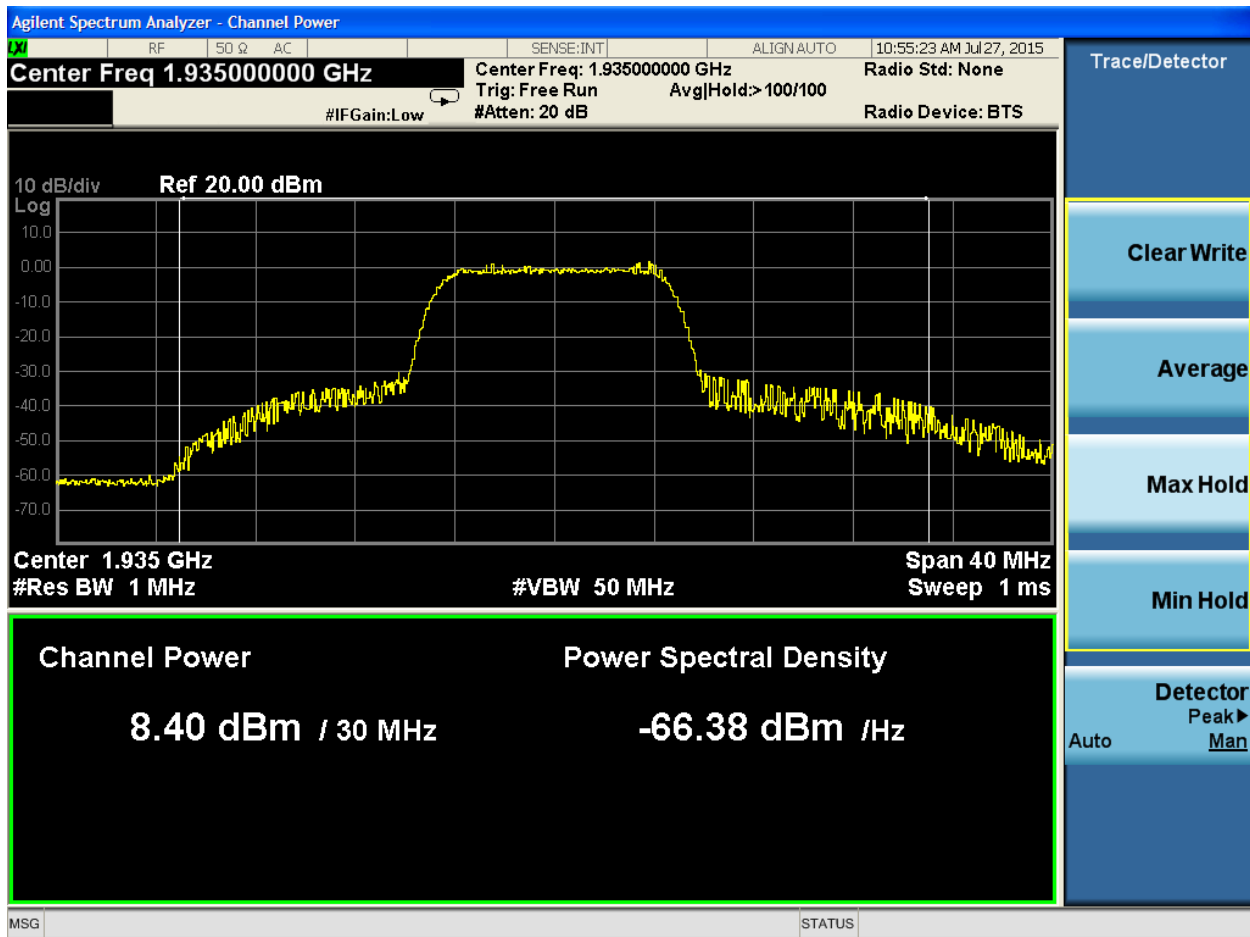
Band 25, Mid Channel, 64QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 49 of
396



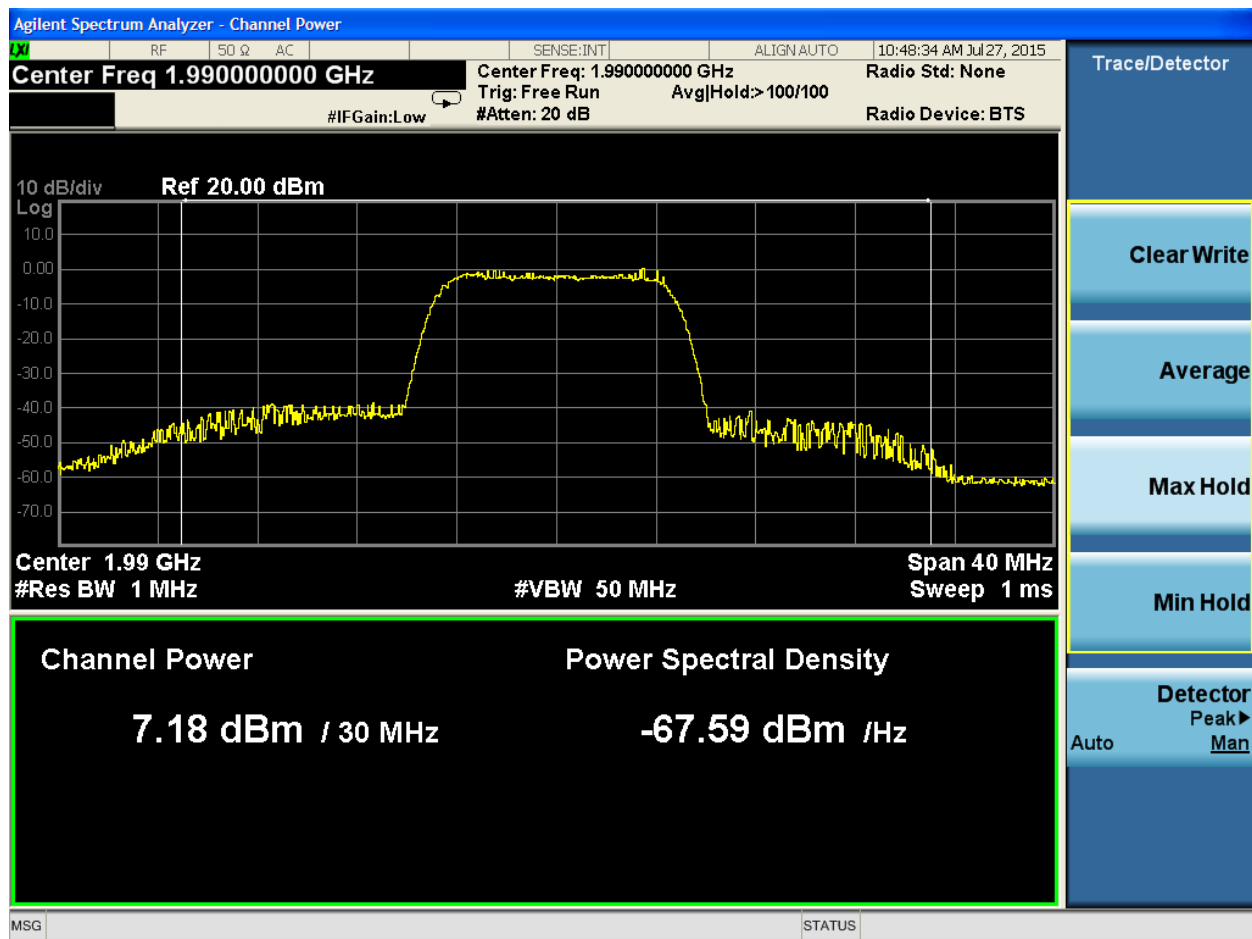
Band 25, High Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 50 of
396



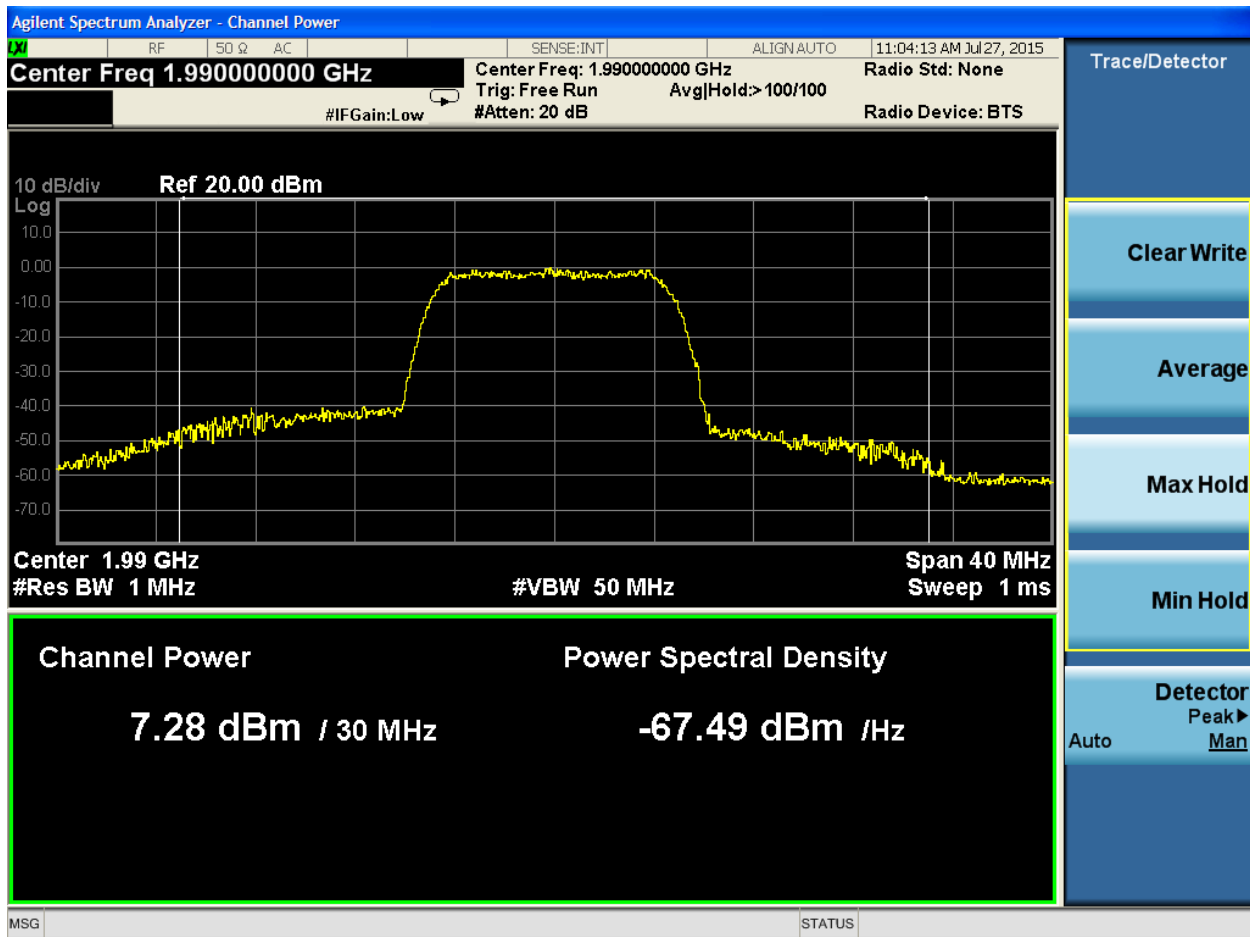
Band 25, High Channel, 16QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 51 of
396



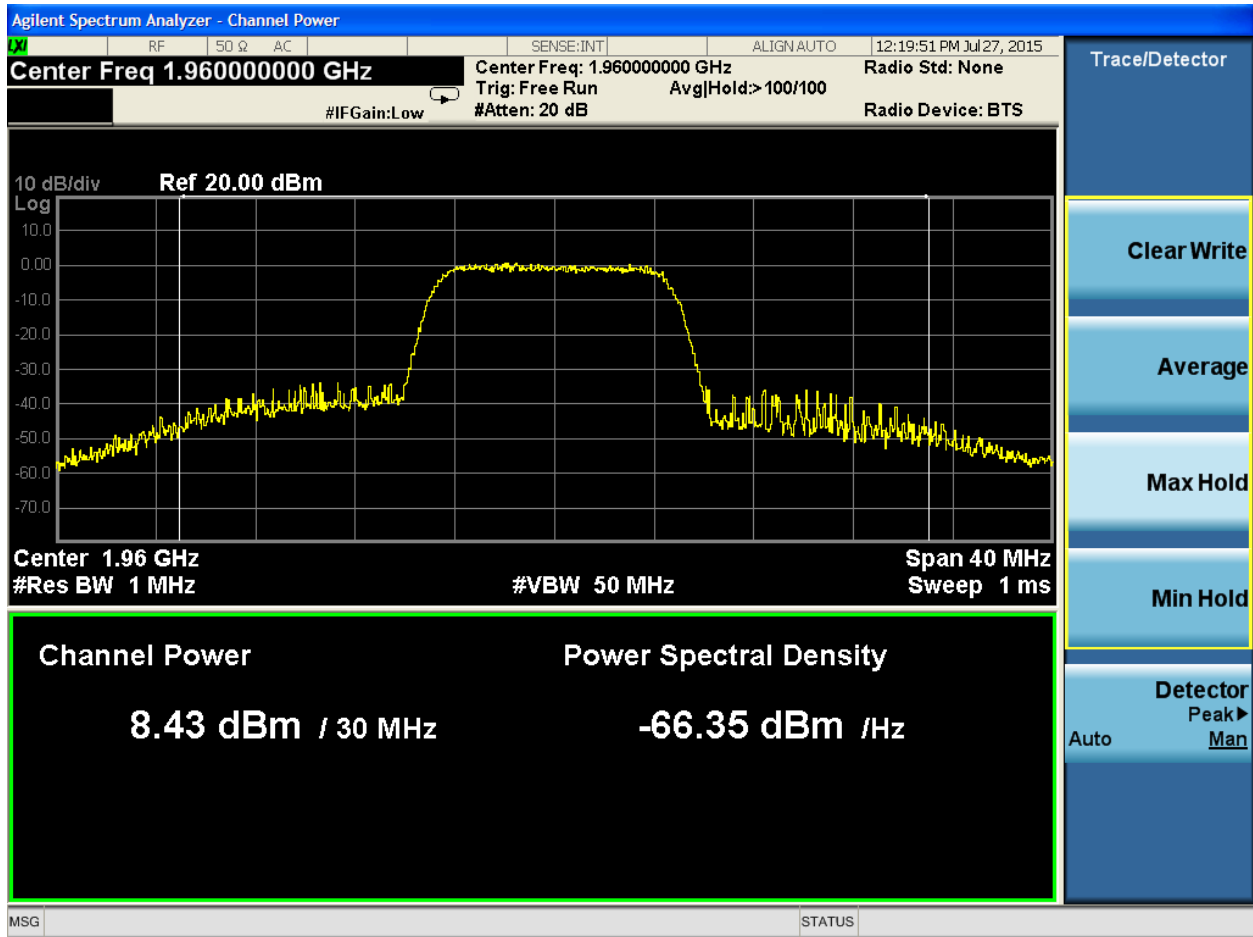
Band 25, High Channel, 64QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 52 of
396



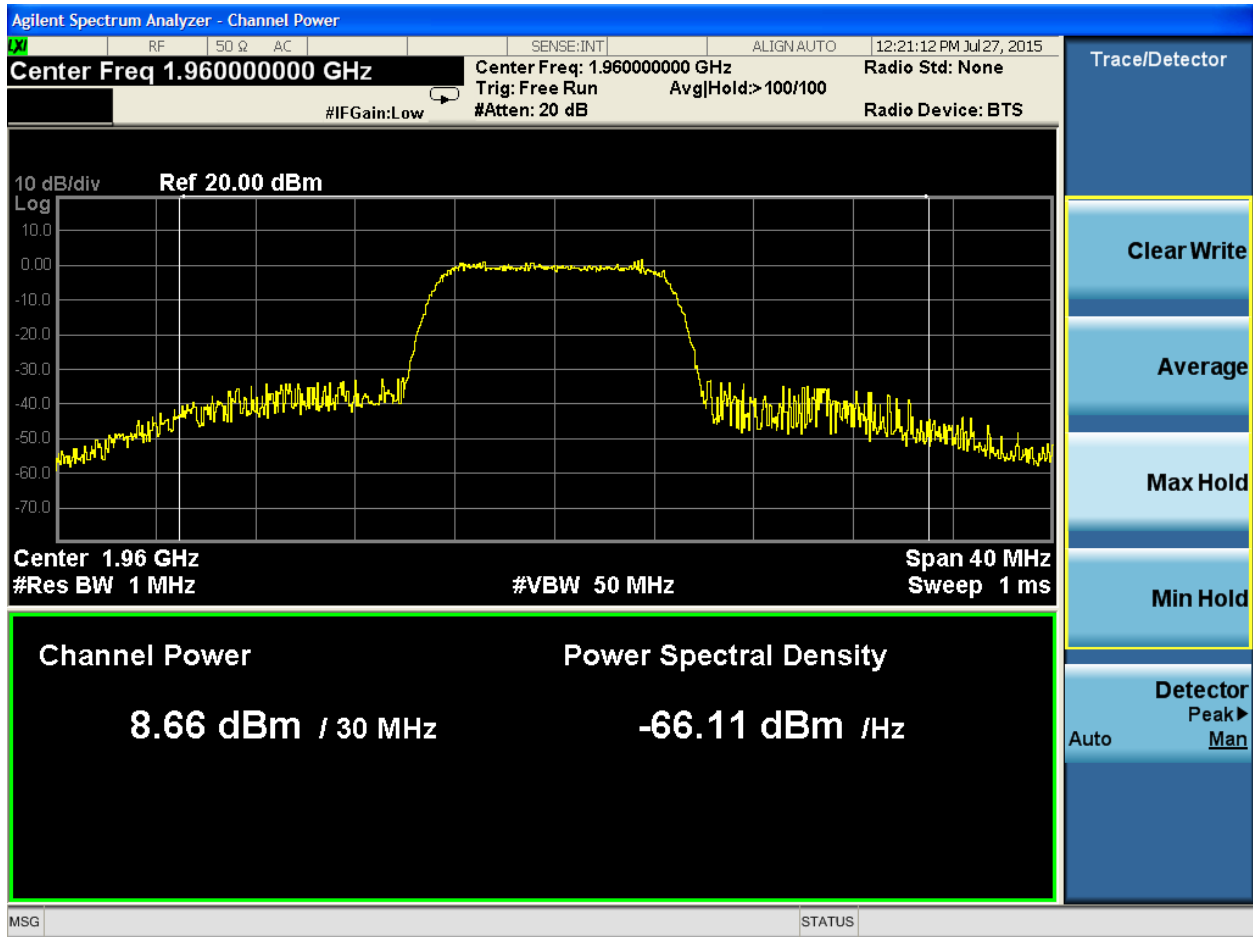
Band 2, Mid Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 53 of
396



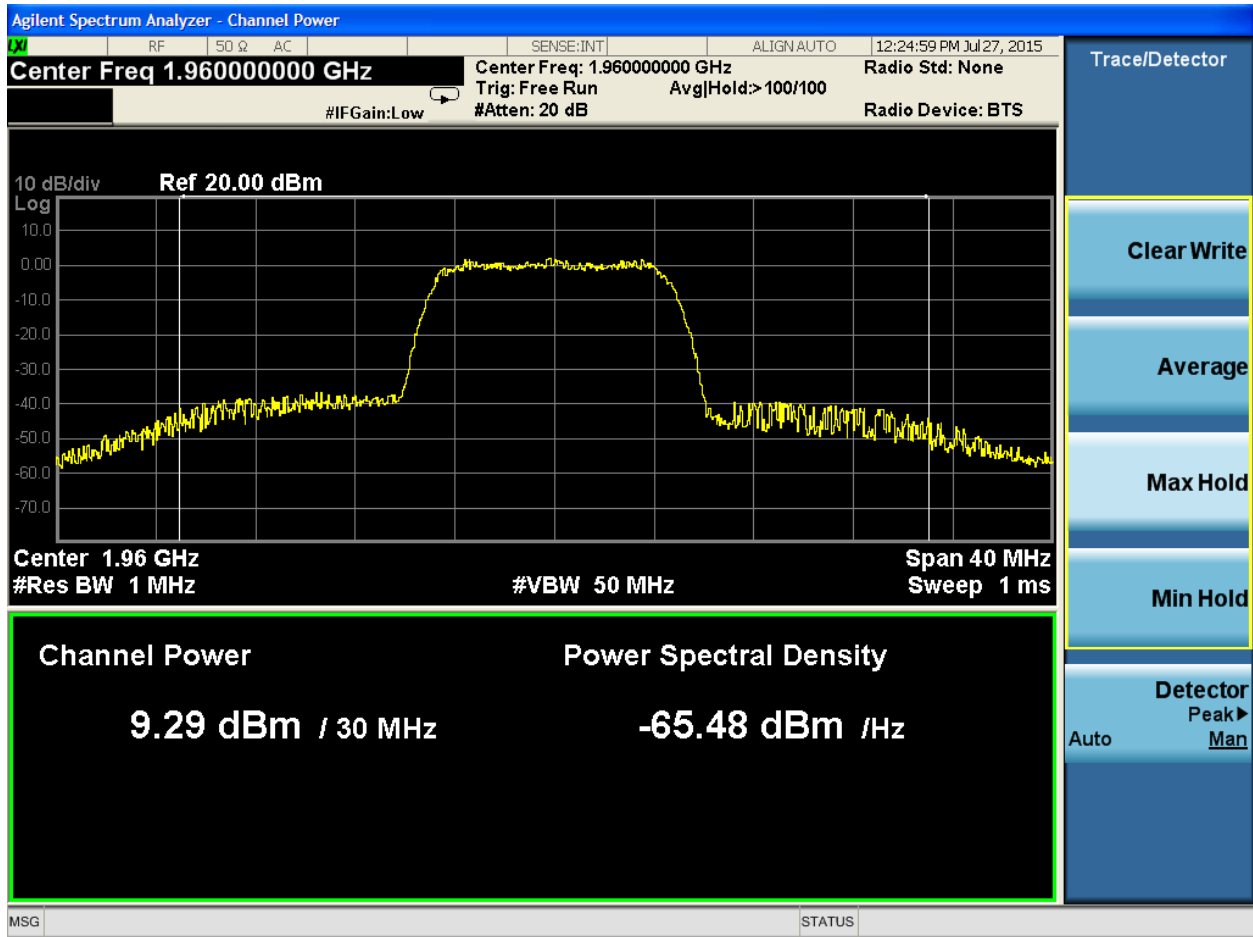
Band 2, Mid Channel, 16QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 54 of
396



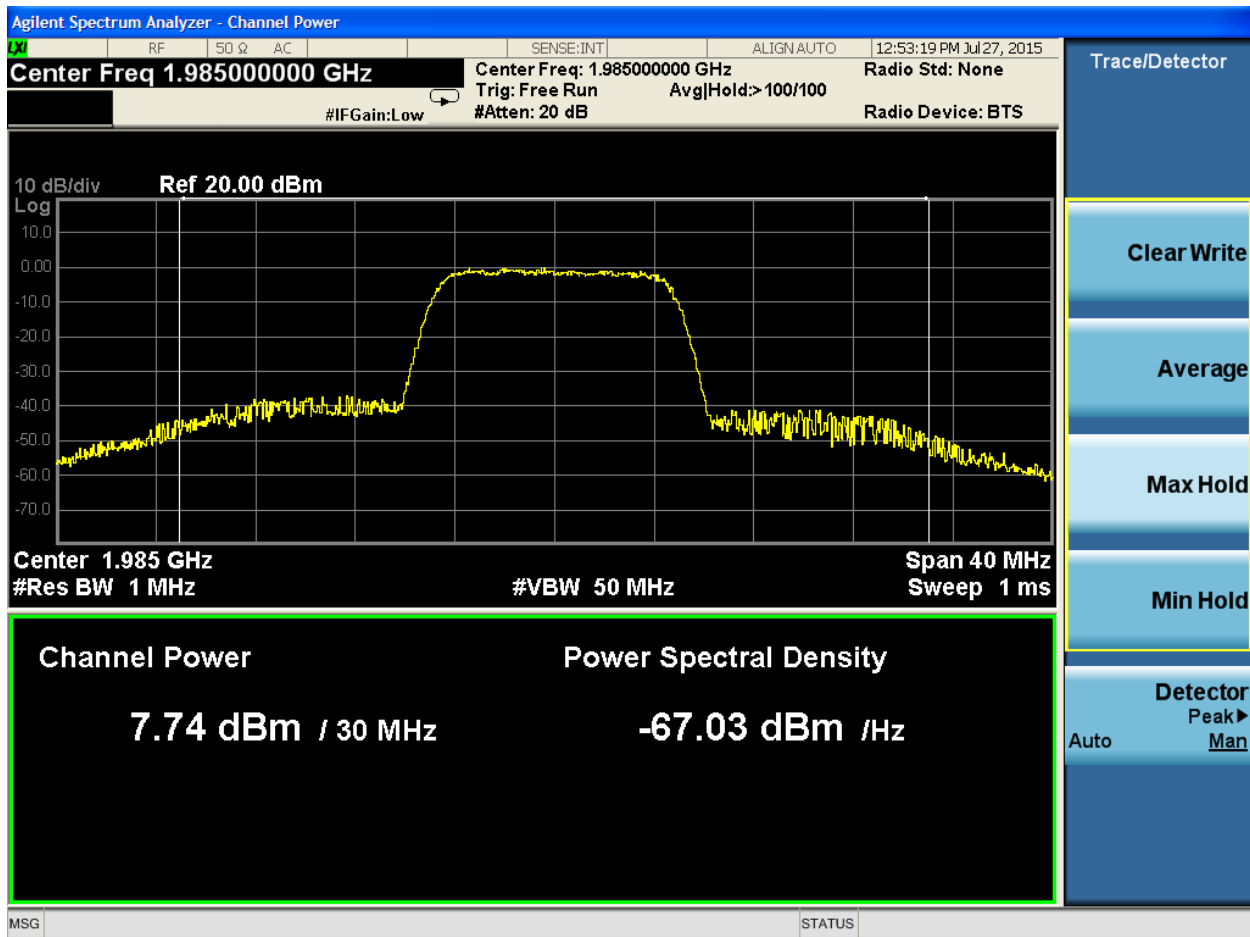
Band 2, Mid Channel, 64QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 55 of
396



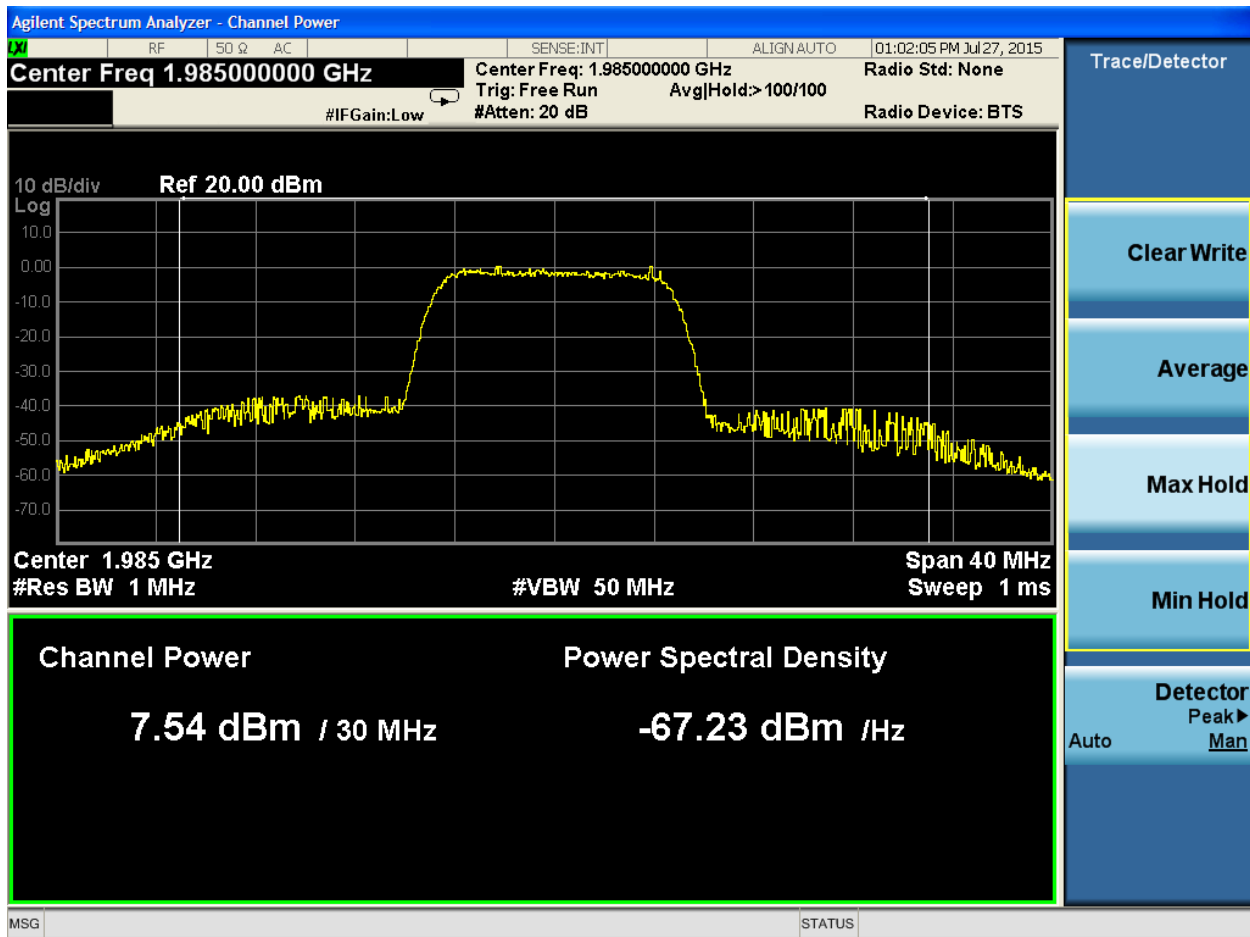
Band 2, High Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 56 of
396



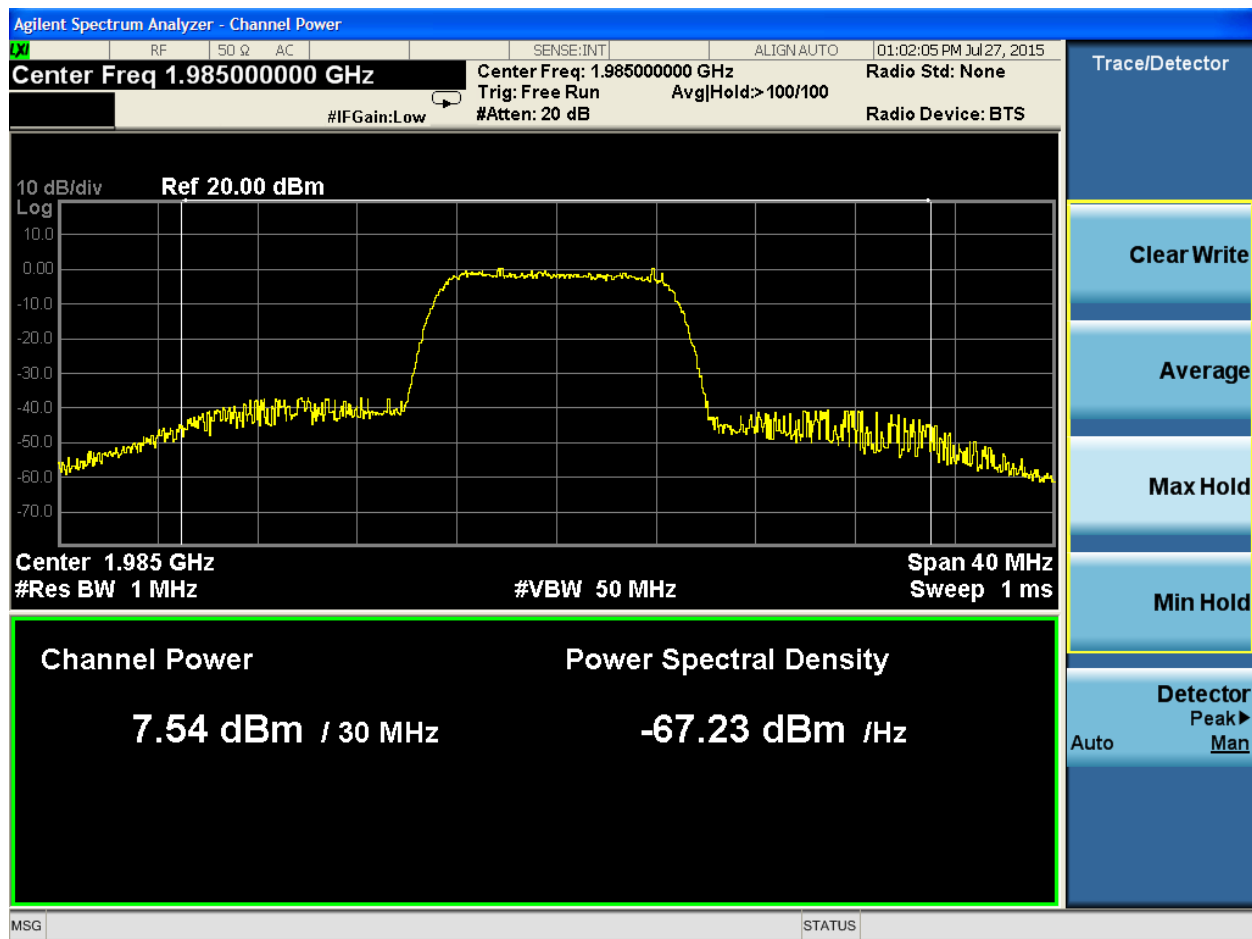
Band 2, High Channel, 16QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 57 of
396



Band 2, High Channel, 64QAM

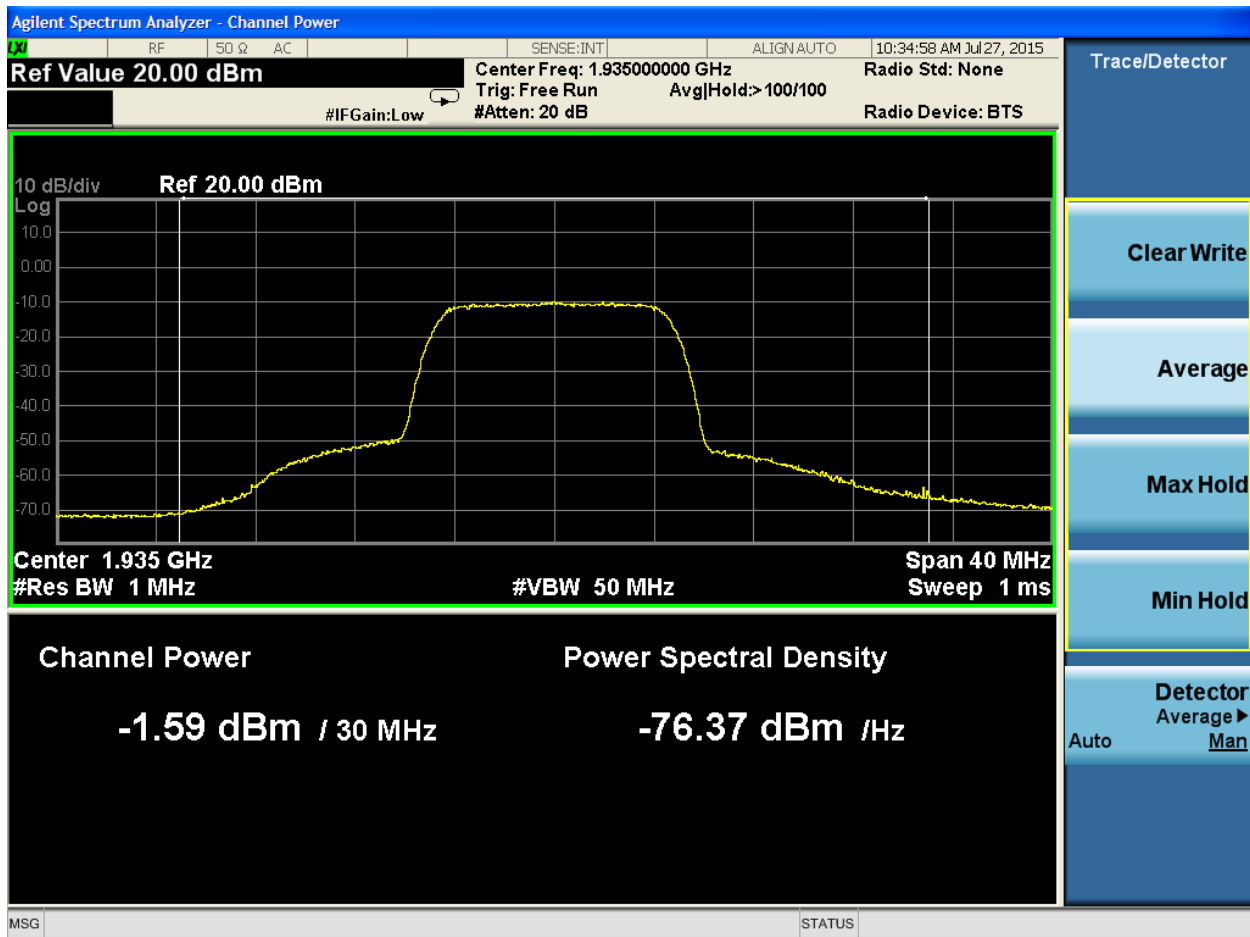
Average Measurements at 5MHz:



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 58 of
396



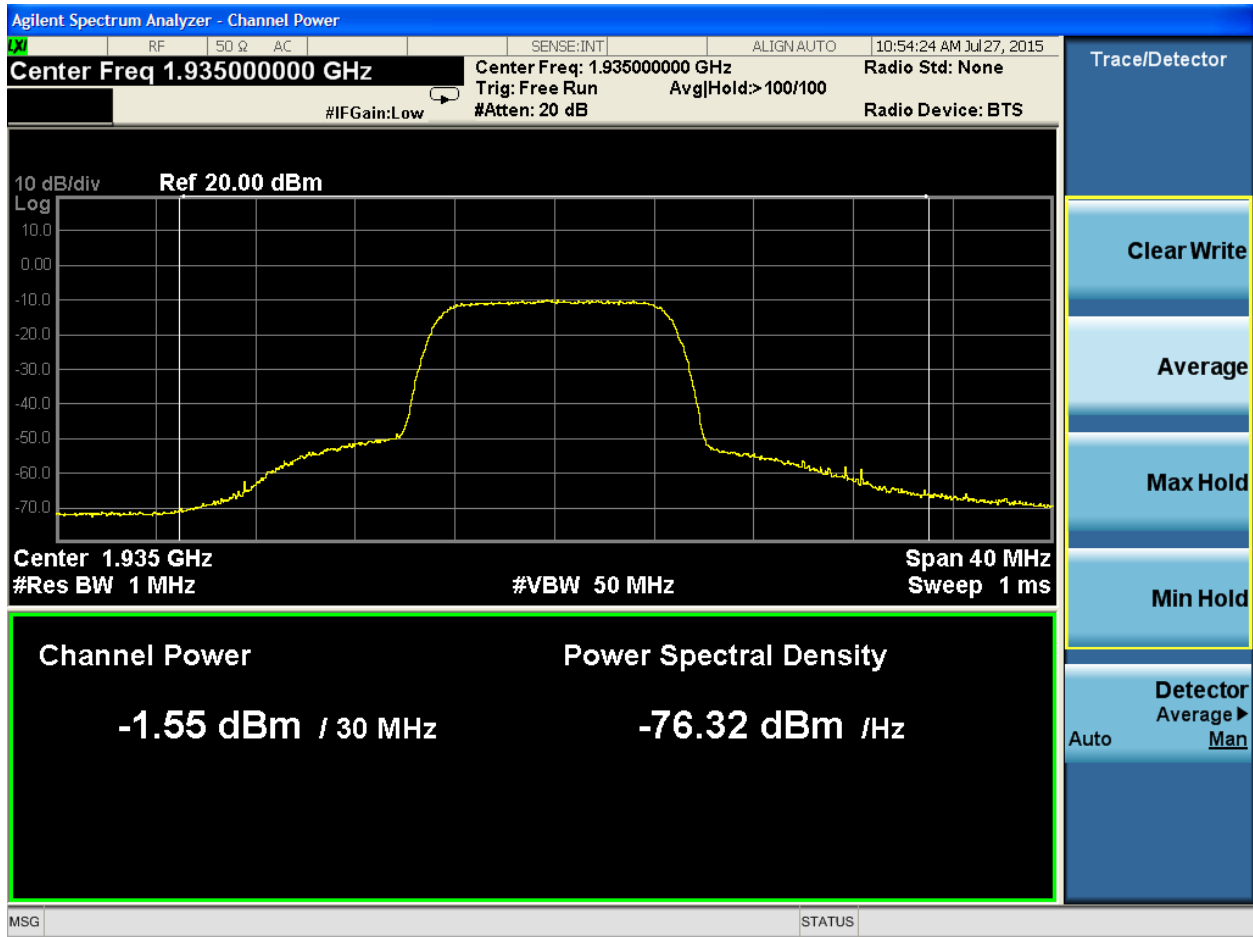
Band 25, Low Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 59 of
396



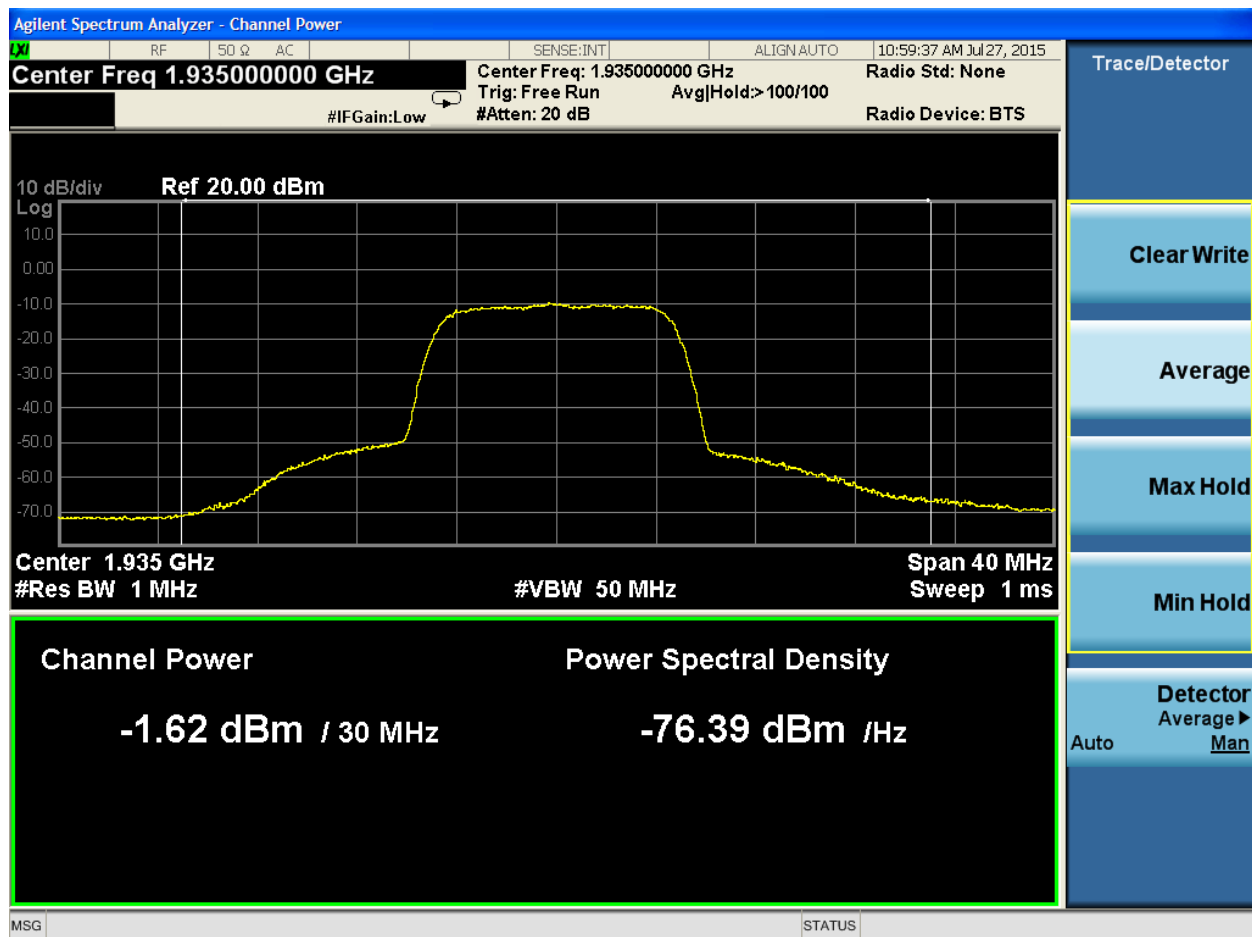
Band 25, Low Channel, 16QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 60 of
396



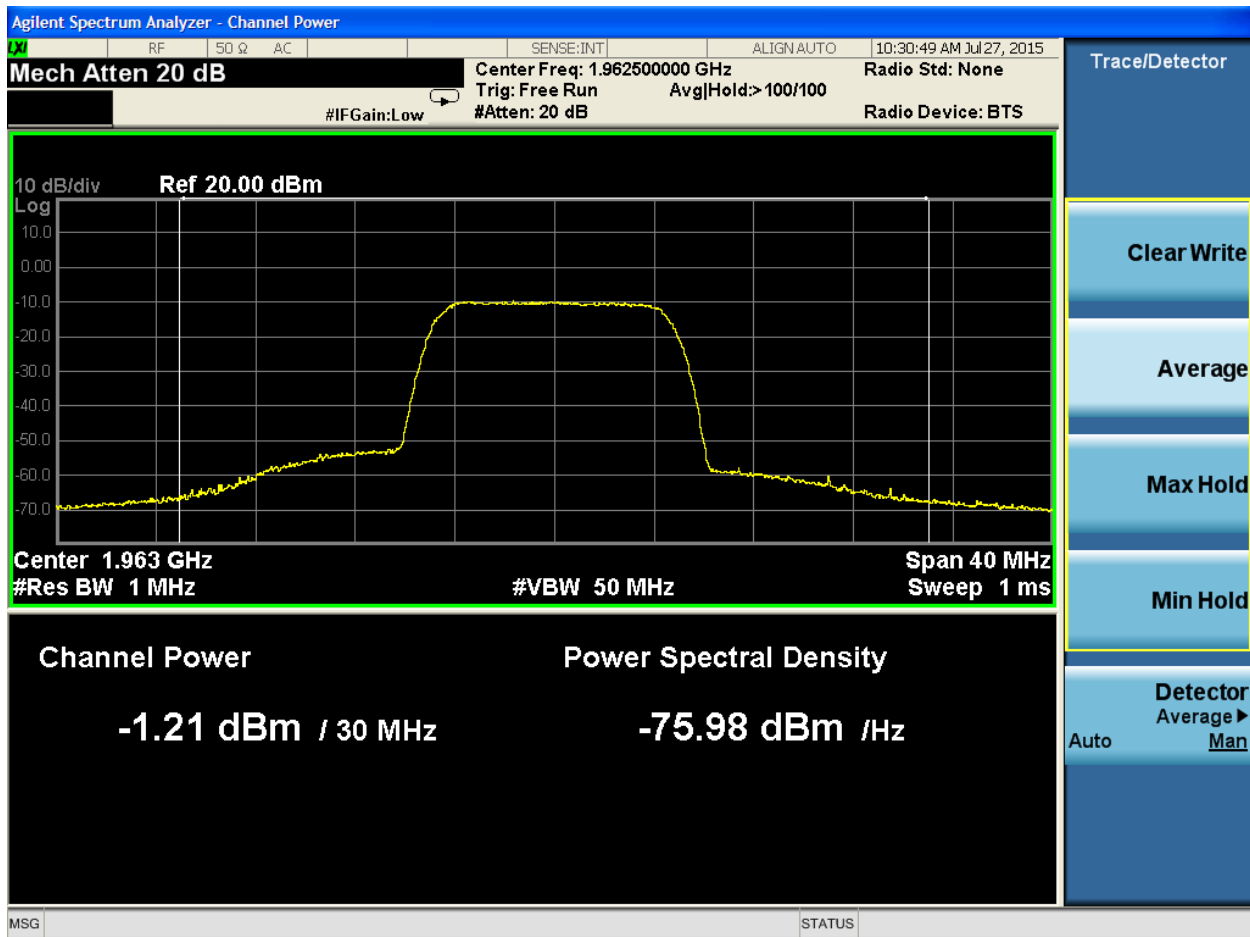
Band 25, Low Channel, 64QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880

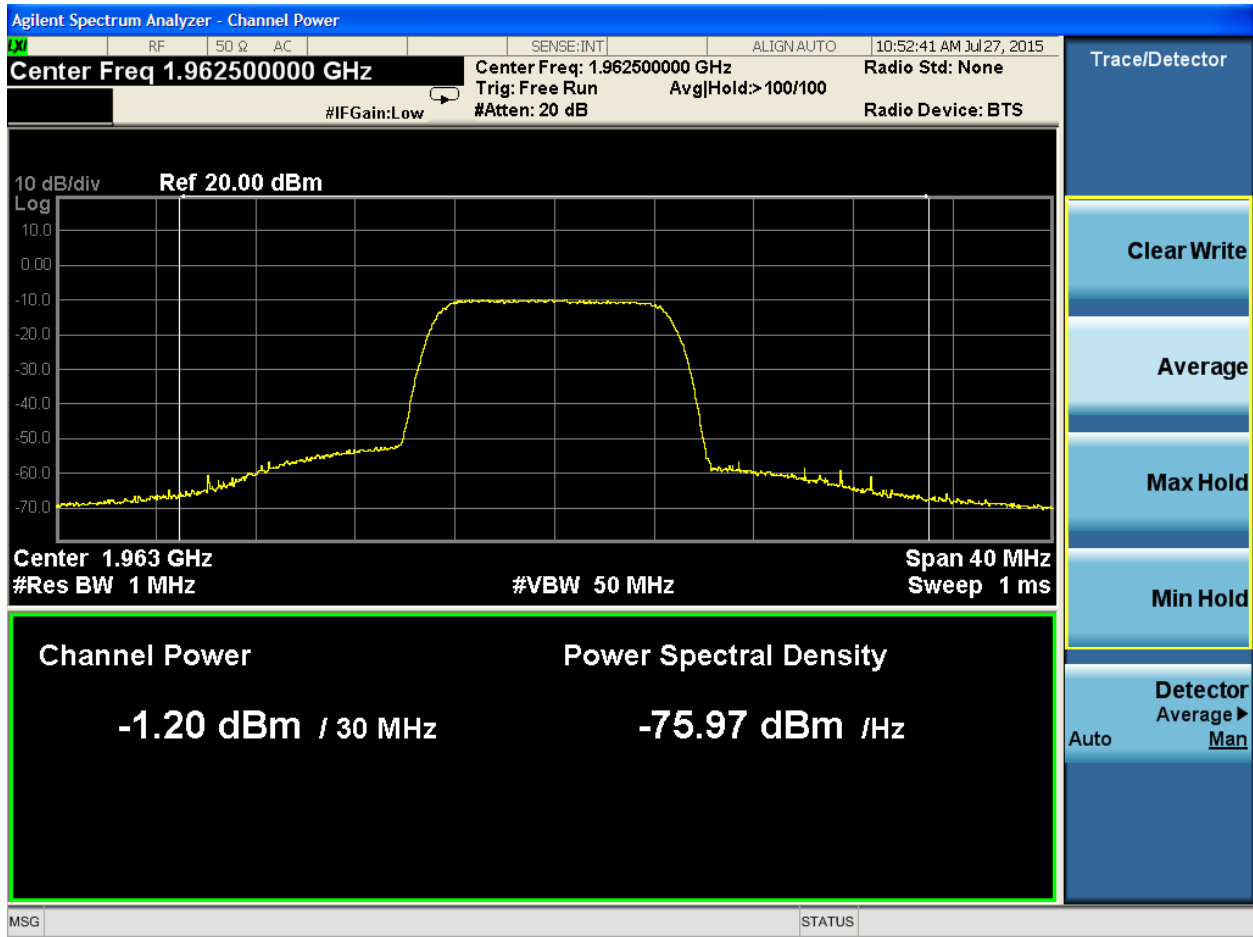


page 61 of
396



Band 25, Mid Channel, QPSK





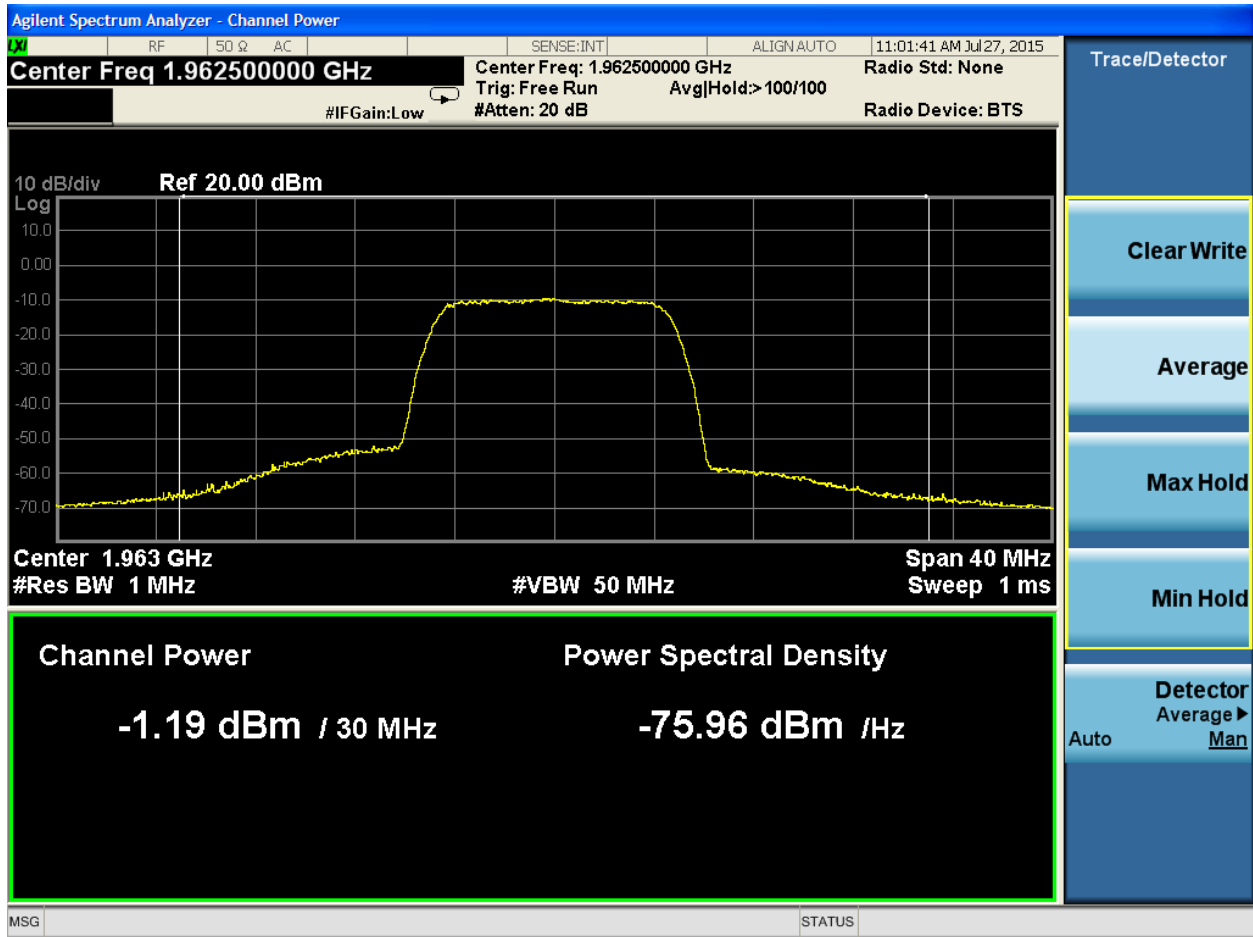
Band 25, Mid Channel, 16QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 63 of
396



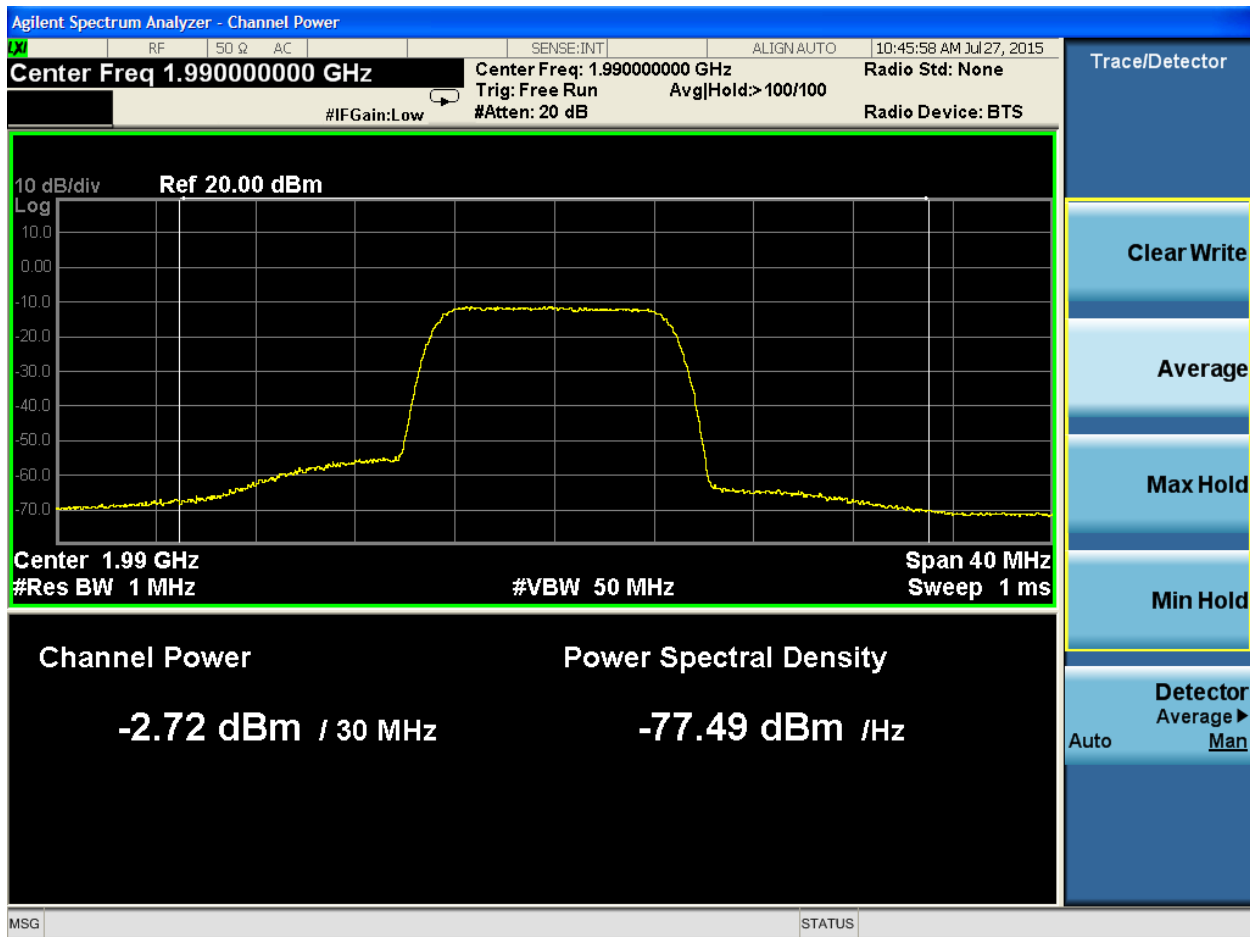
Band 25, Mid Channel, 64QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 64 of
396



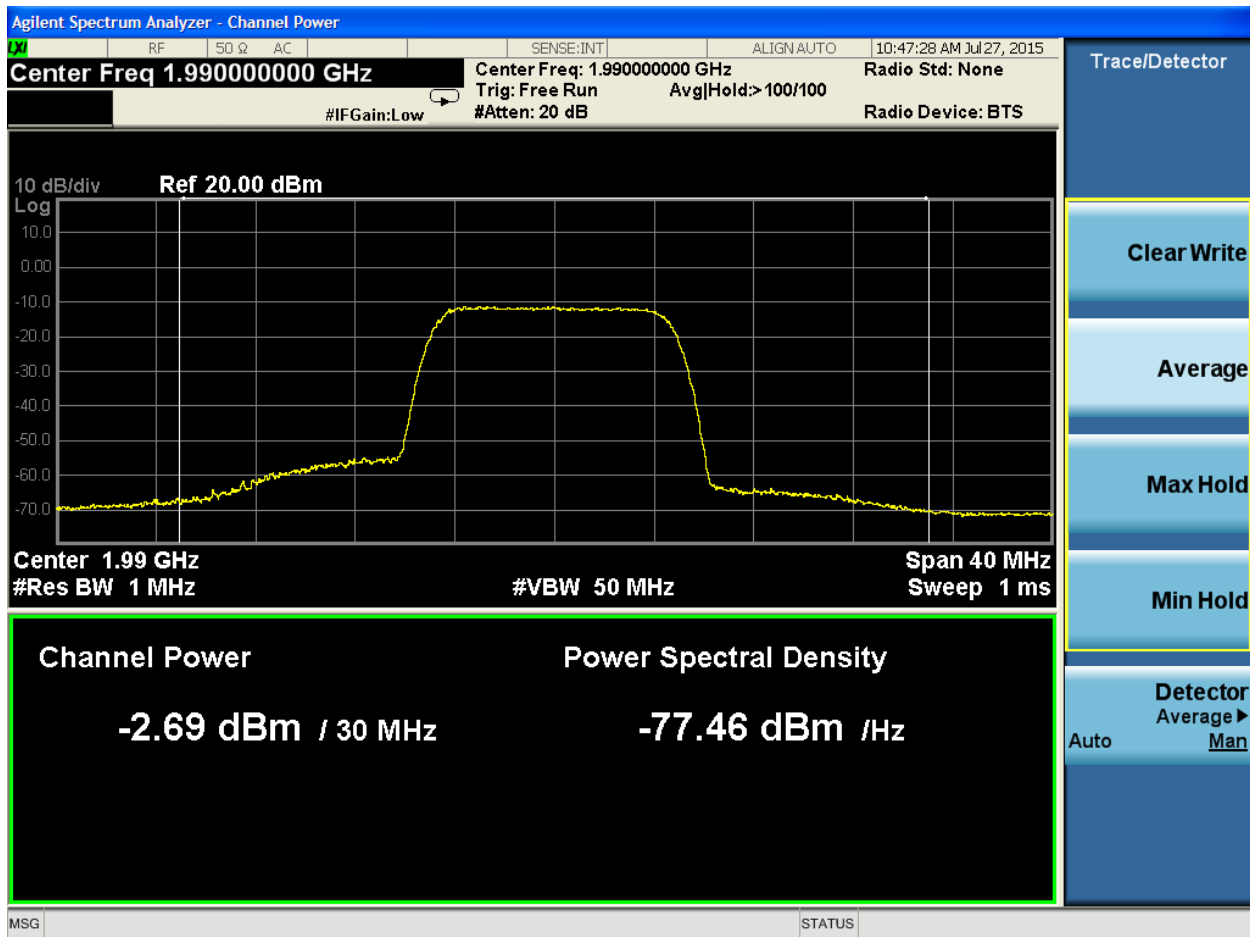
Band 25, High Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 65 of
396



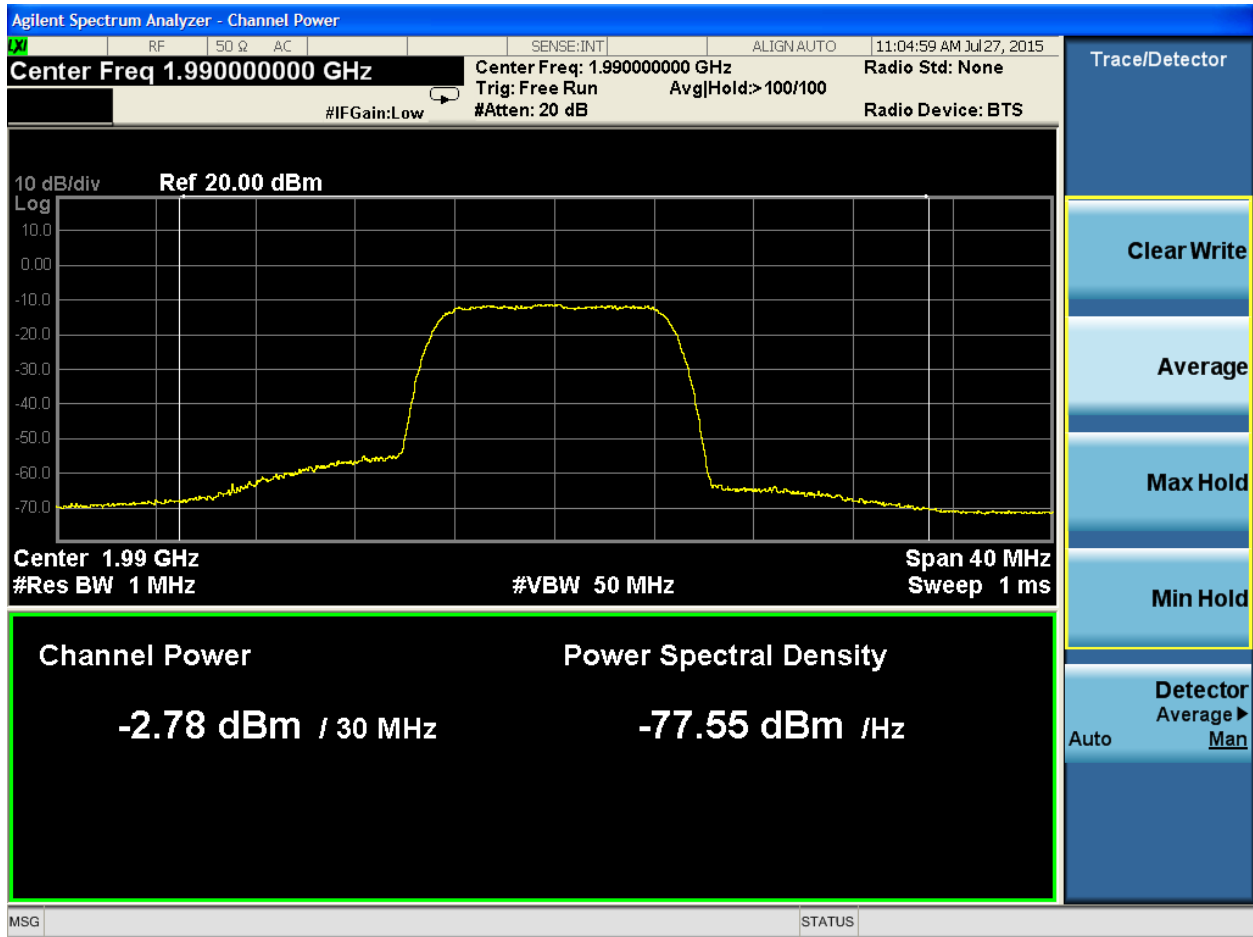
Band 25, High Channel, 16QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 66 of
396



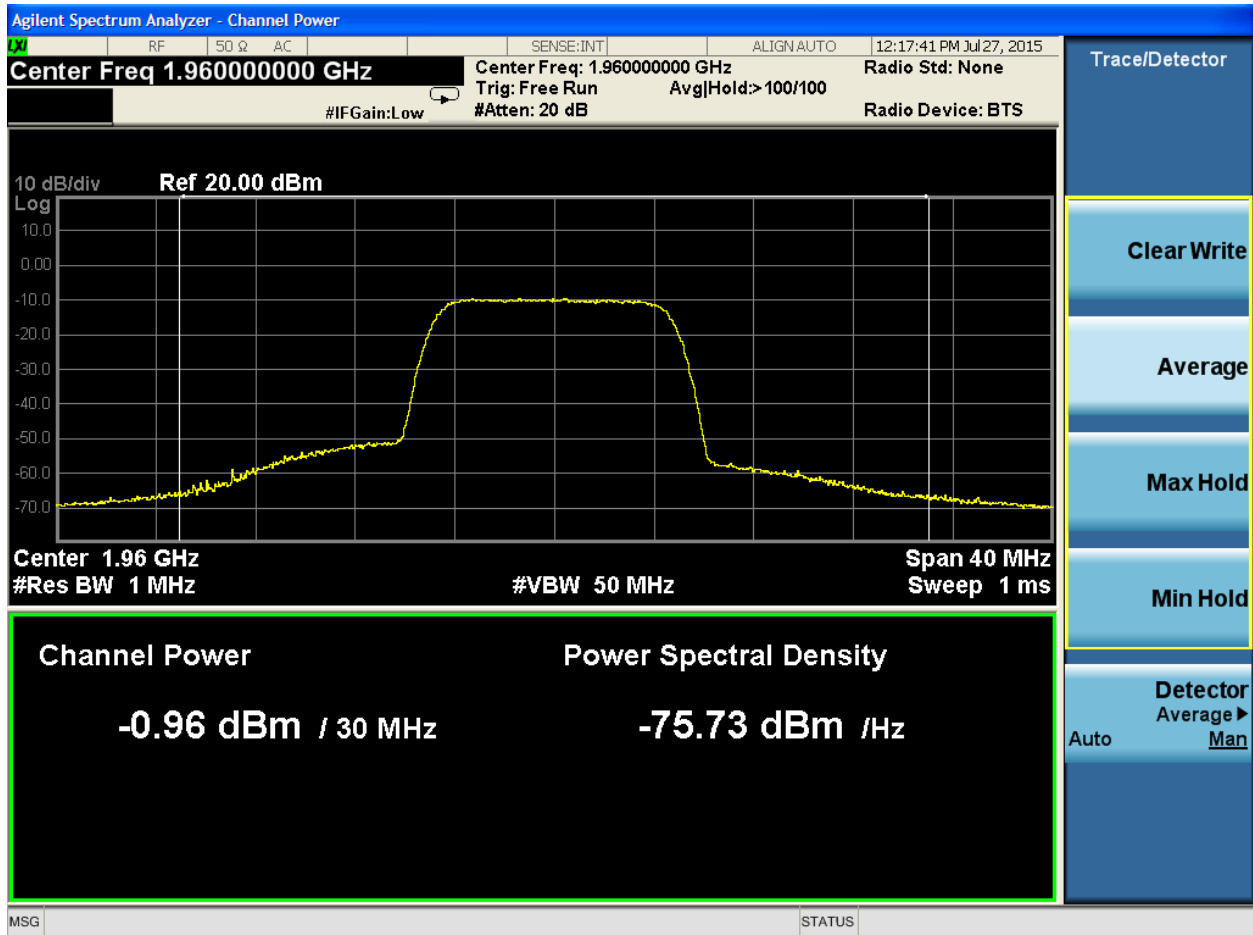
Band 25, High Channel, 64QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 67 of
396



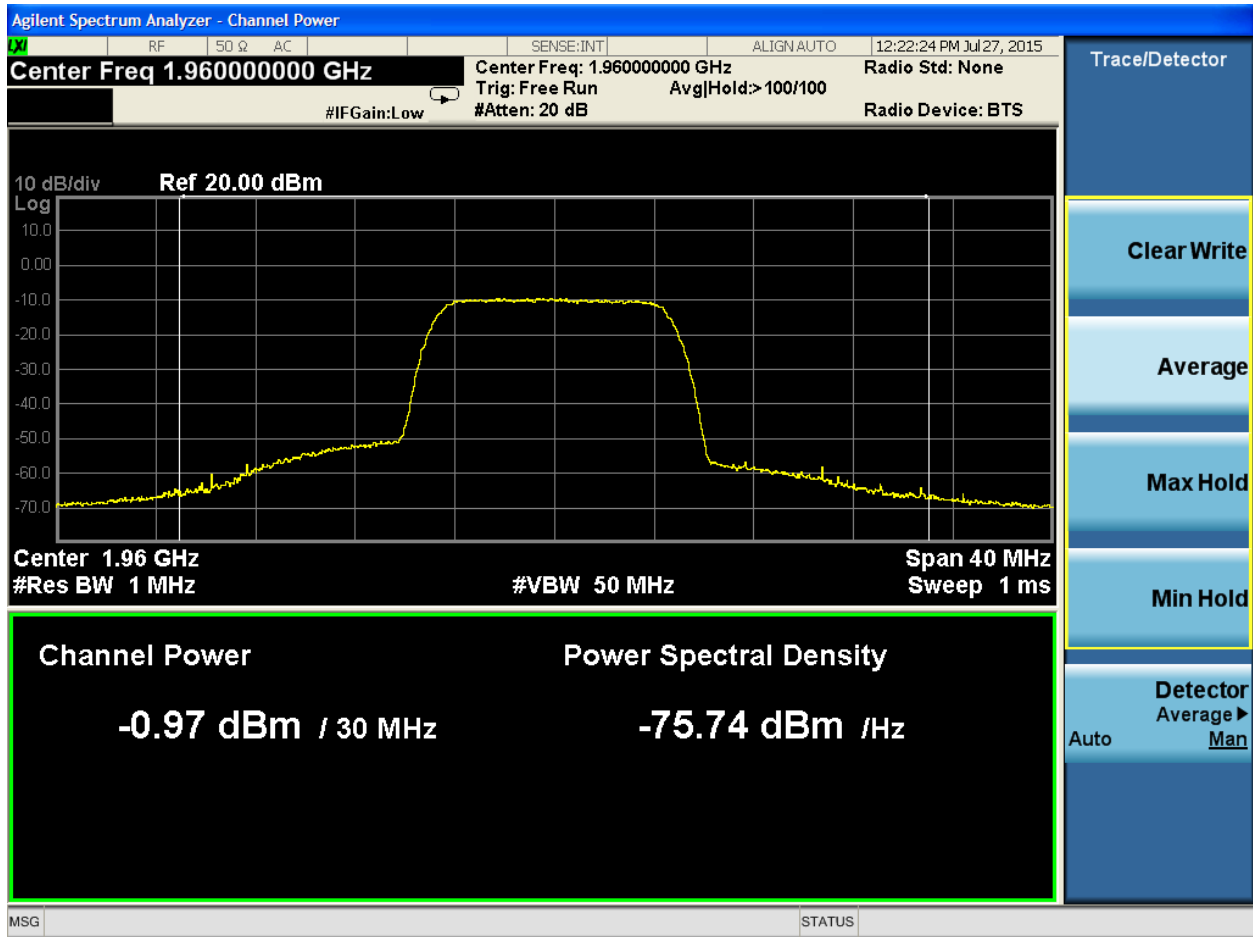
Band 2, Mid Channel, QPSK



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880

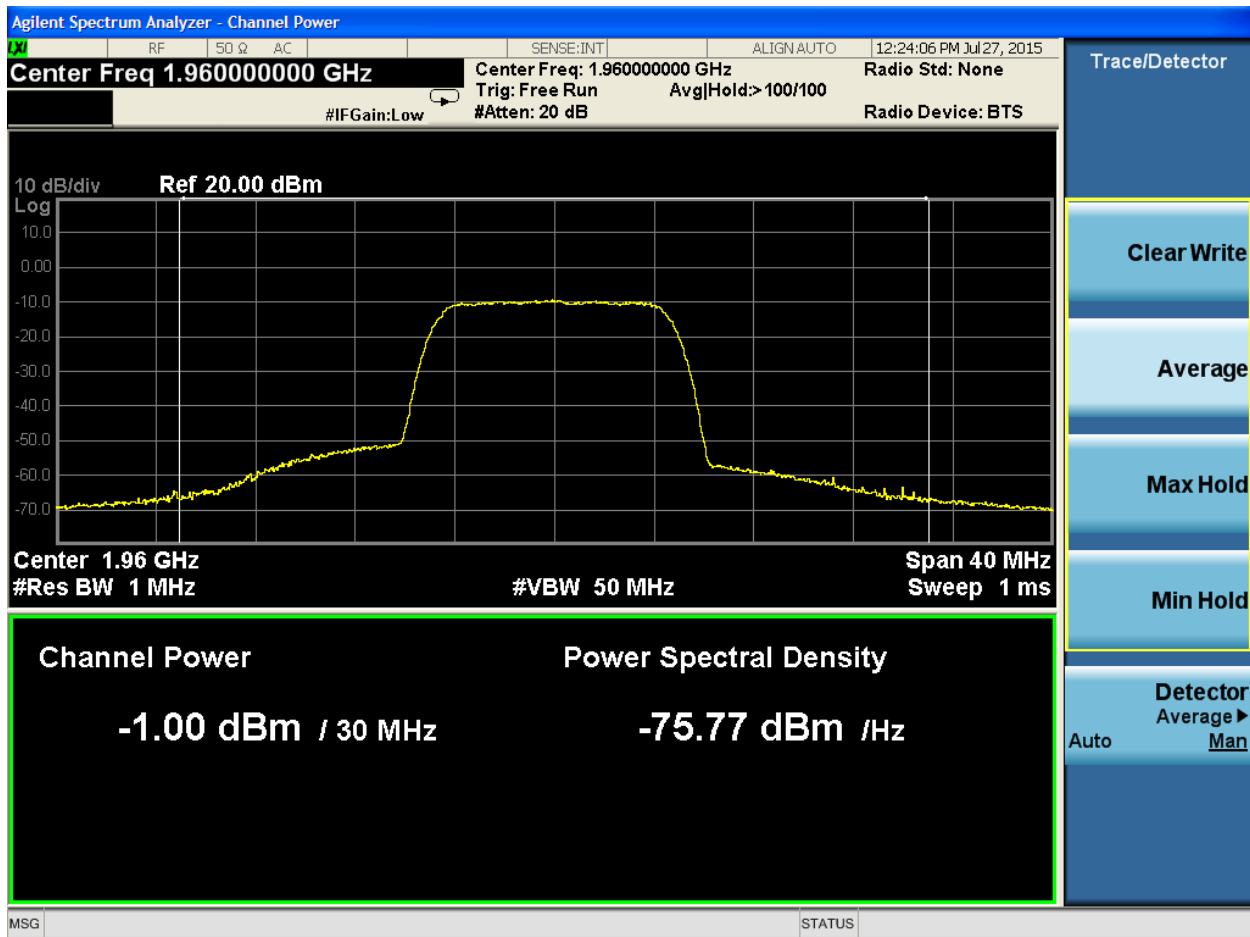


page 68 of
396



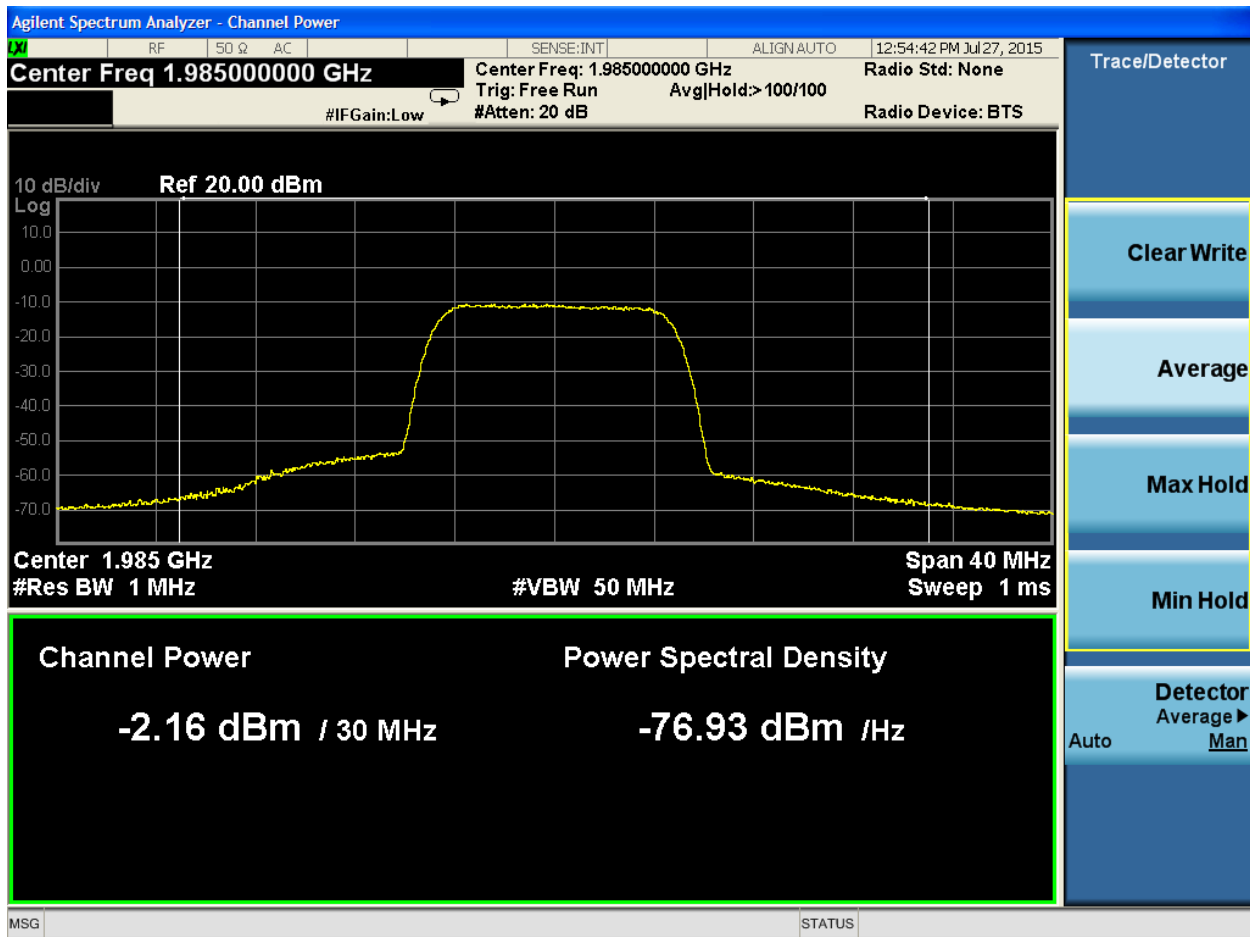
Band 2, Mid Channel, 16QAM





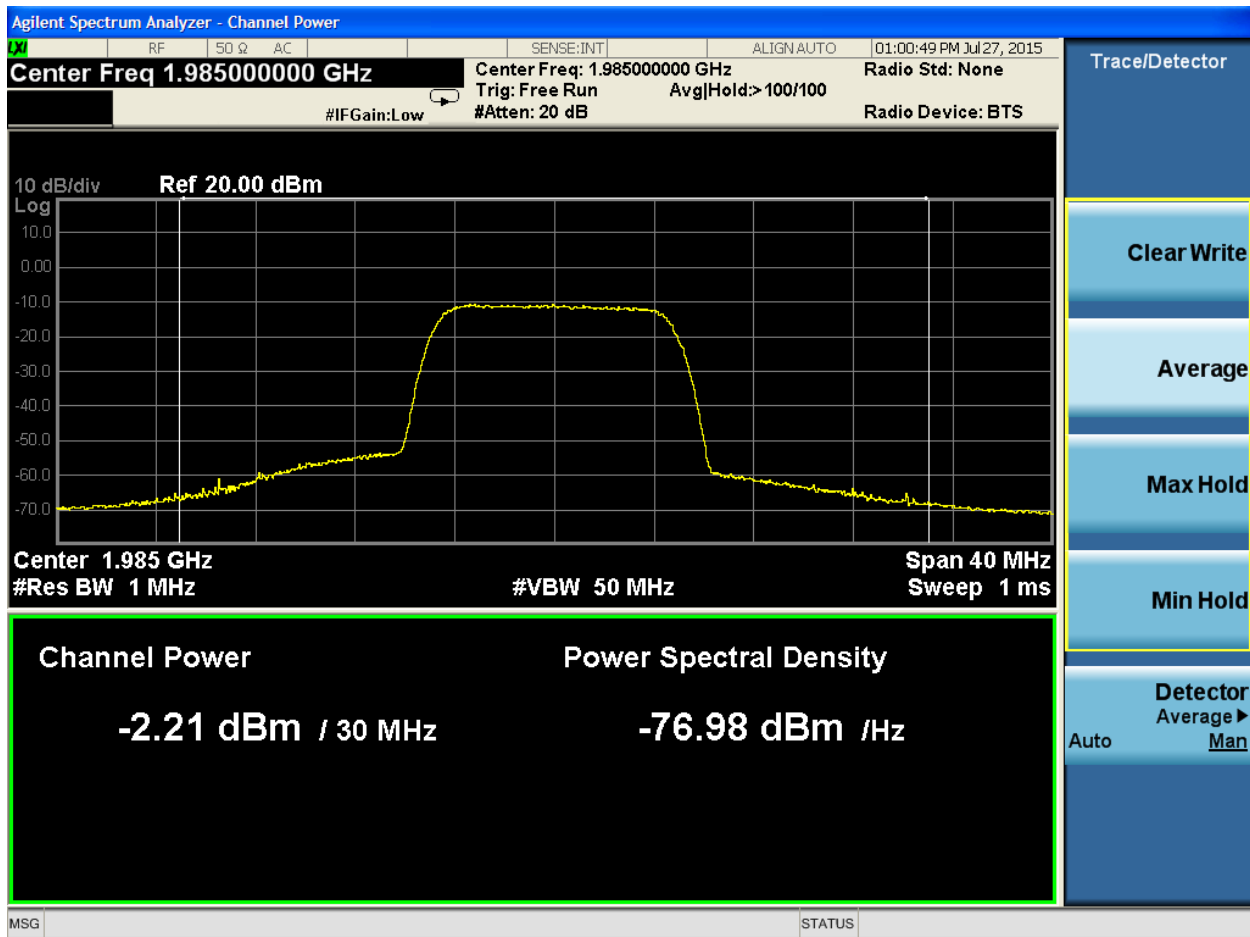
Band 2, Mid Channel, 64QAM





Band 2, High Channel, QPSK





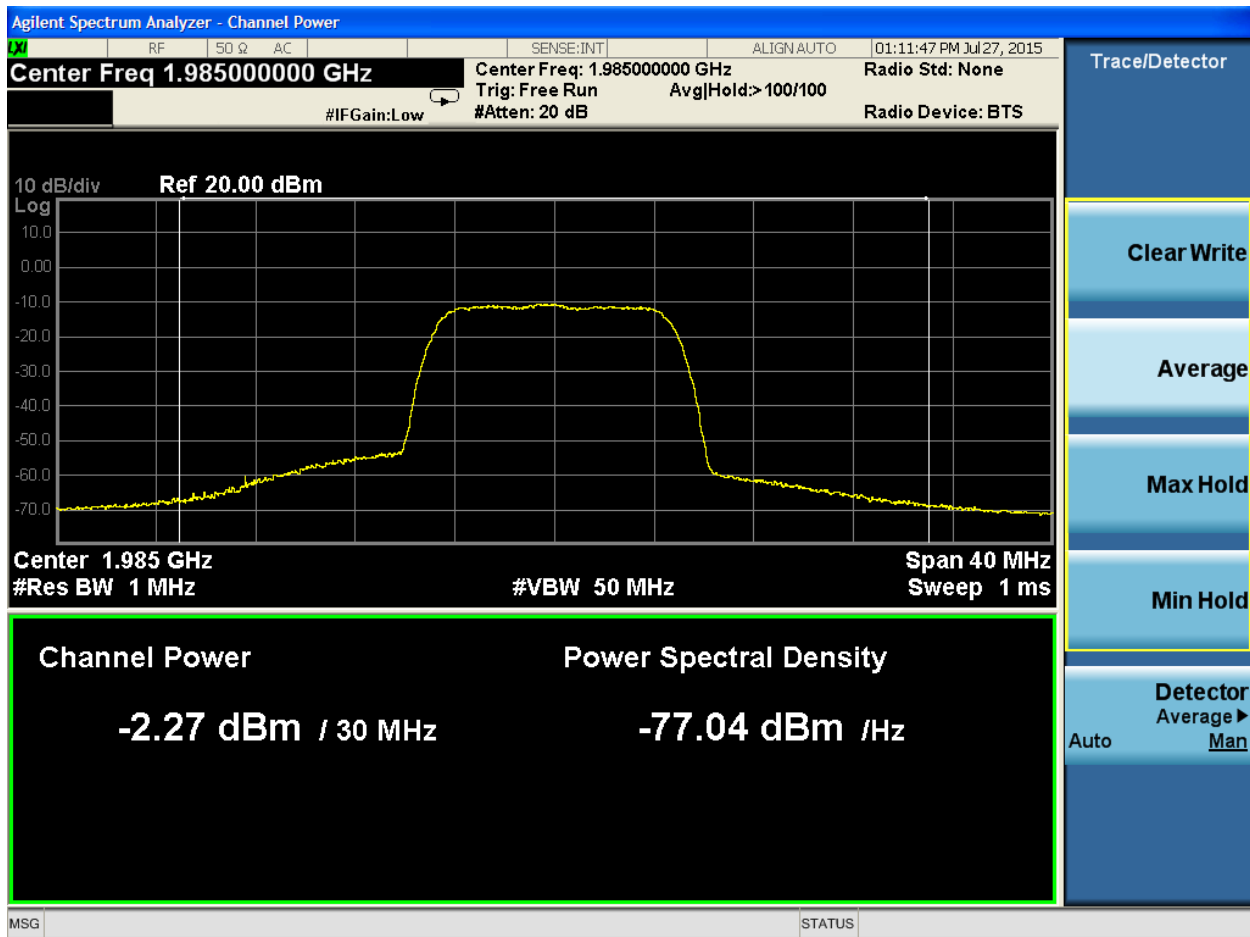
Band 2, High Channel, 16QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 72 of
396



Band 2, High Channel, 64QAM



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 73 of
396

Band Edge Measurements

LIMITS

FCC 24.238:

(a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

(b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). 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.

MEASUREMENTS / RESULTS

Spectrum analyzer screen plots are shown on the following pages. Corrections for the external attenuator and RF cable are included in the displayed values. The mask lines in the plots are set to -13dBm at 1930MHz and 1990MHz. This value is calculated from:

$$\text{Limit} = 10 \cdot \log(P[\text{mW}]) - (43 + 10 \cdot \log(P[\text{W}])) = -13\text{dBm}$$

Note that the measurements were taken at 30kHz resolution bandwidth. To meet the requirement of section 24.238(b), the measured power may be integrated over the required bandwidth, 1% of the 26dB bandwidth. Worst-case calculations for the two operating bandwidths, 5MHz & 10MHz, are as follows.

Correction Factor for RBW in dB: $10 \log(\text{required RBW divided by measurement RBW})$

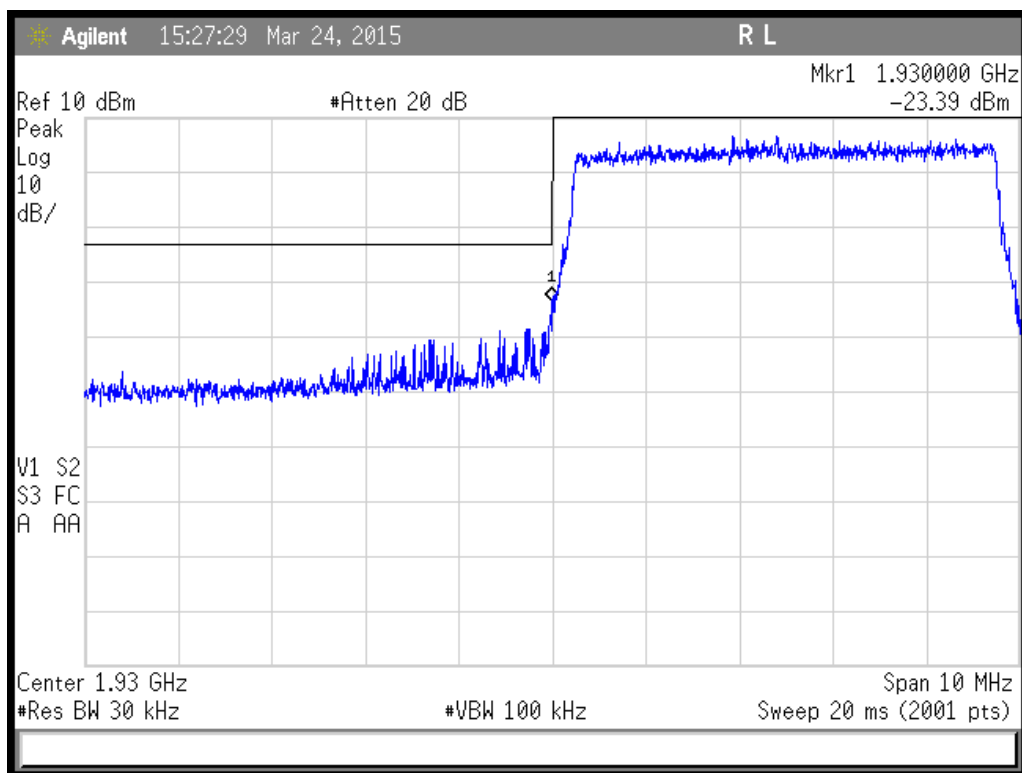
Required RBW: 1% of the 26dB bandwidth (see Occupied Bandwidth results)

The correction factor is added to the highest measurement in the 1MHz range above and below the band edges.

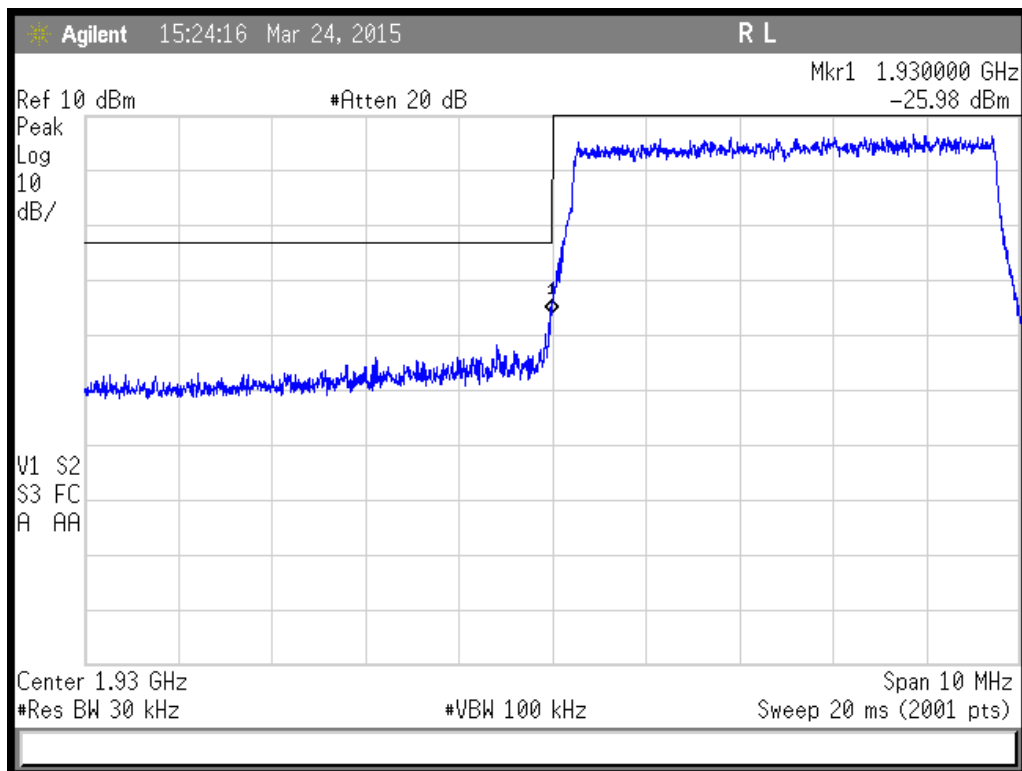
For the 5MHz operating bandwidth, the largest 26dB bandwidth is 4.986MHz. The correction factor is 2.21dB. The highest measurement within 1MHz of the band edges is -19.88dBm, from the following spectrum plots. The sum, -17.67dBm, is below the -13dBm limit.

For the 10MHz operating bandwidth, the largest 26dB bandwidth is 23.191MHz. The correction factor is 8.88dB. The highest measurement within 1MHz of the band edges is -25.79dBm, from the following spectrum plots. The sum, -16.91dBm, is below the -13dBm limit.

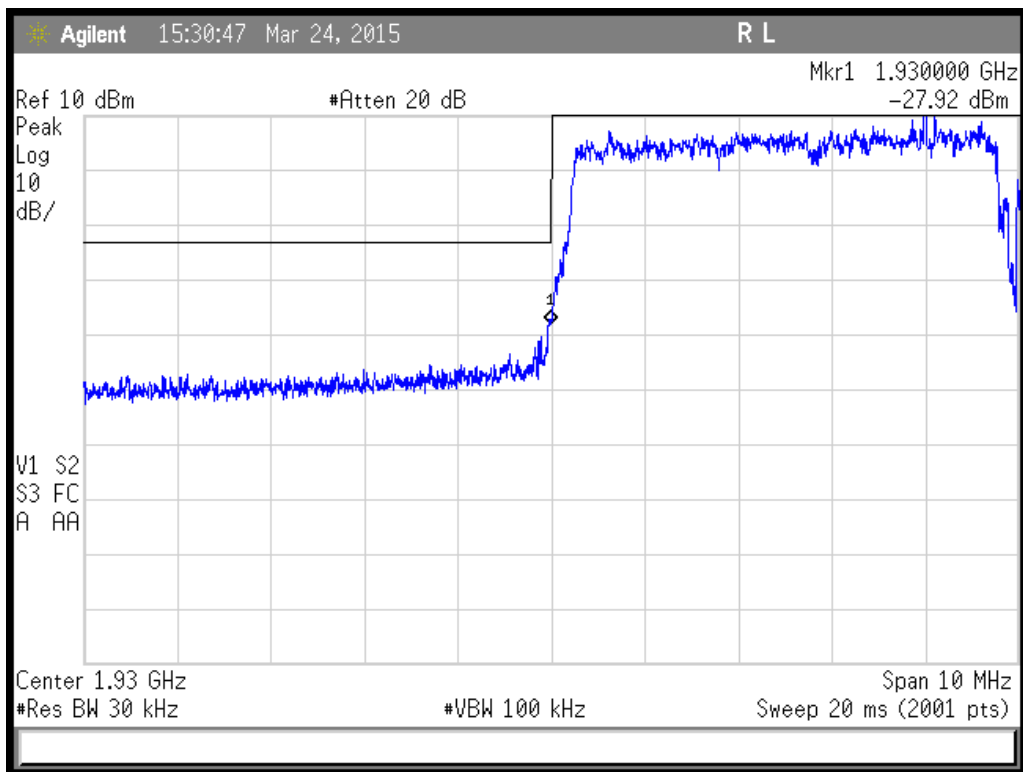




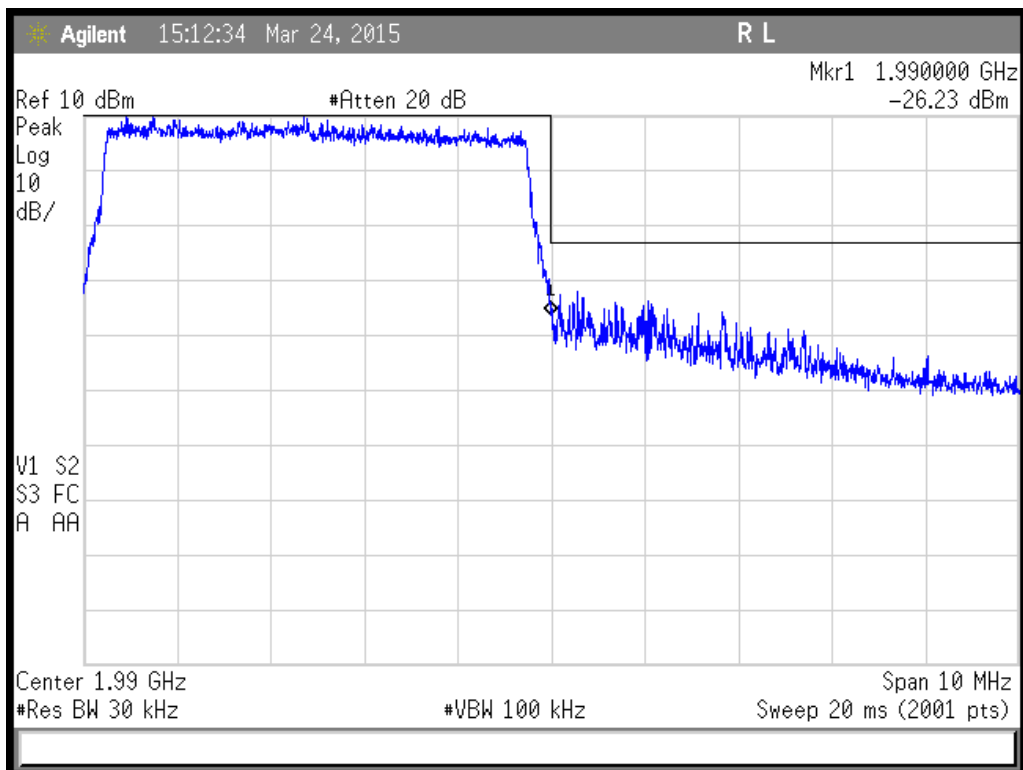
Lower Band Edge - Band 2 – 5MHz BW – QPSK – Port J1



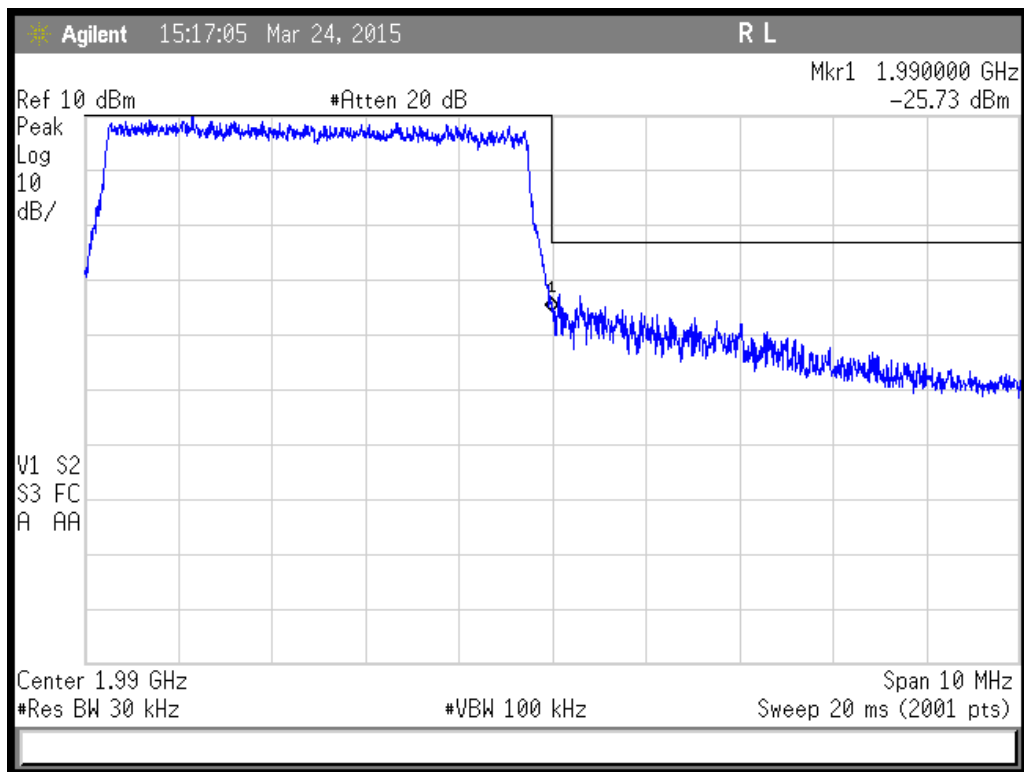
Lower Band Edge - Band 2 – 5MHz BW – 16QAM – Port J1



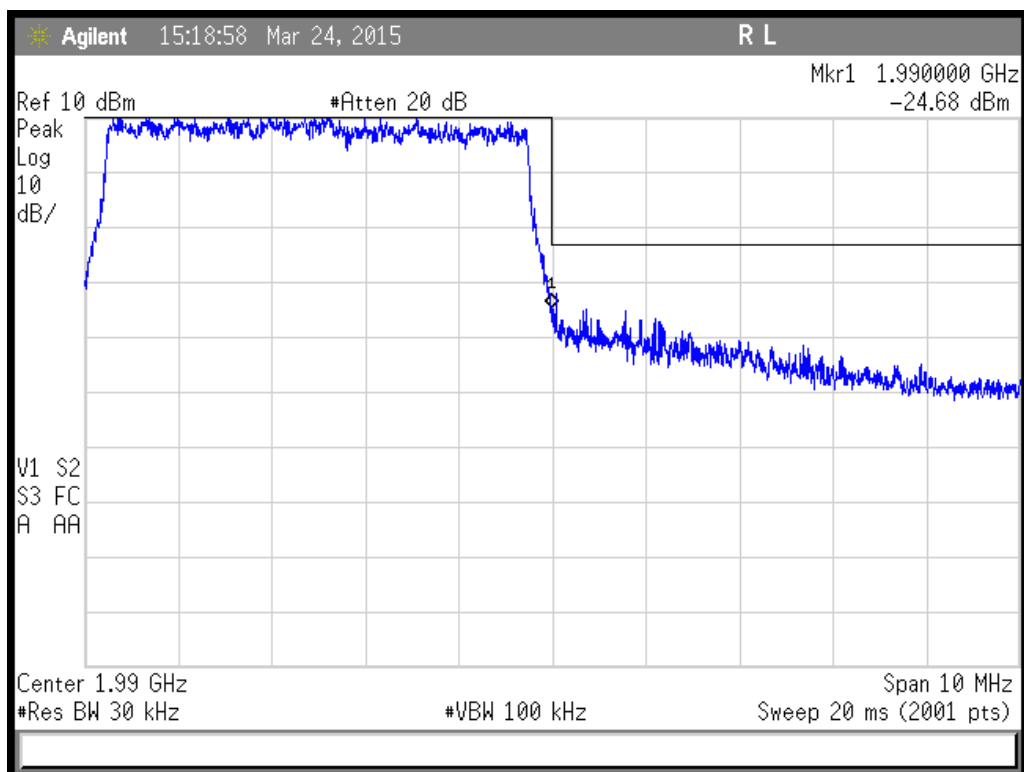
Lower Band Edge - Band 2 – 5MHz BW – 64QAM – Port J1



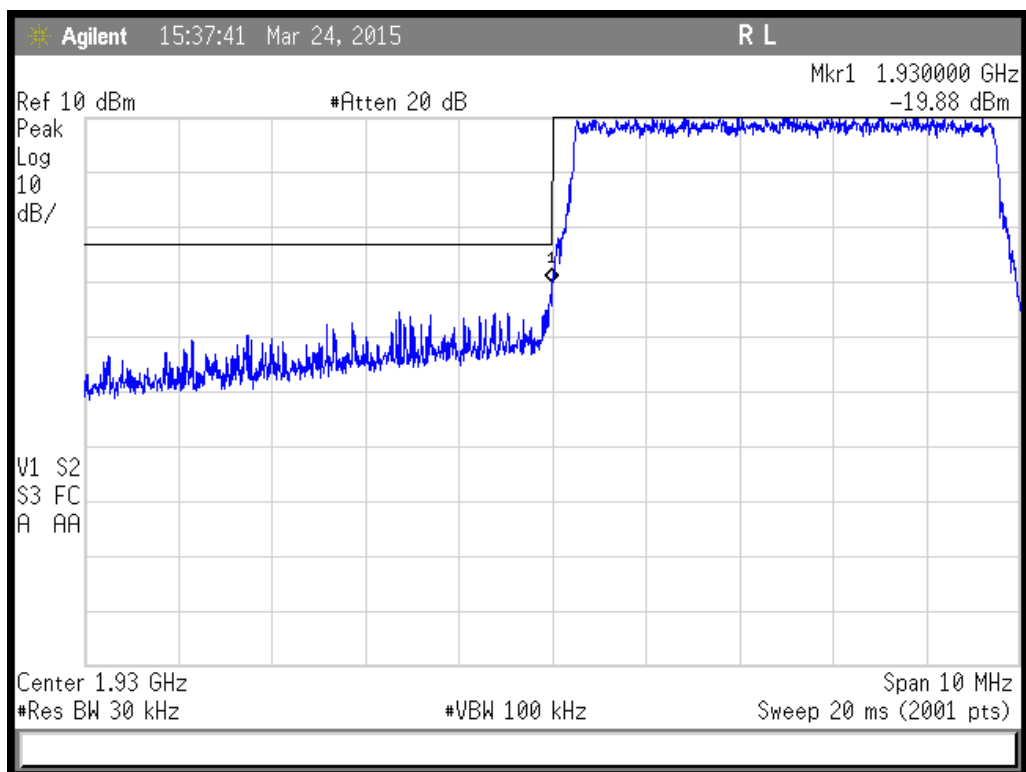
Upper Band Edge - Band 2 – 5MHz BW – QPSK – Port J1



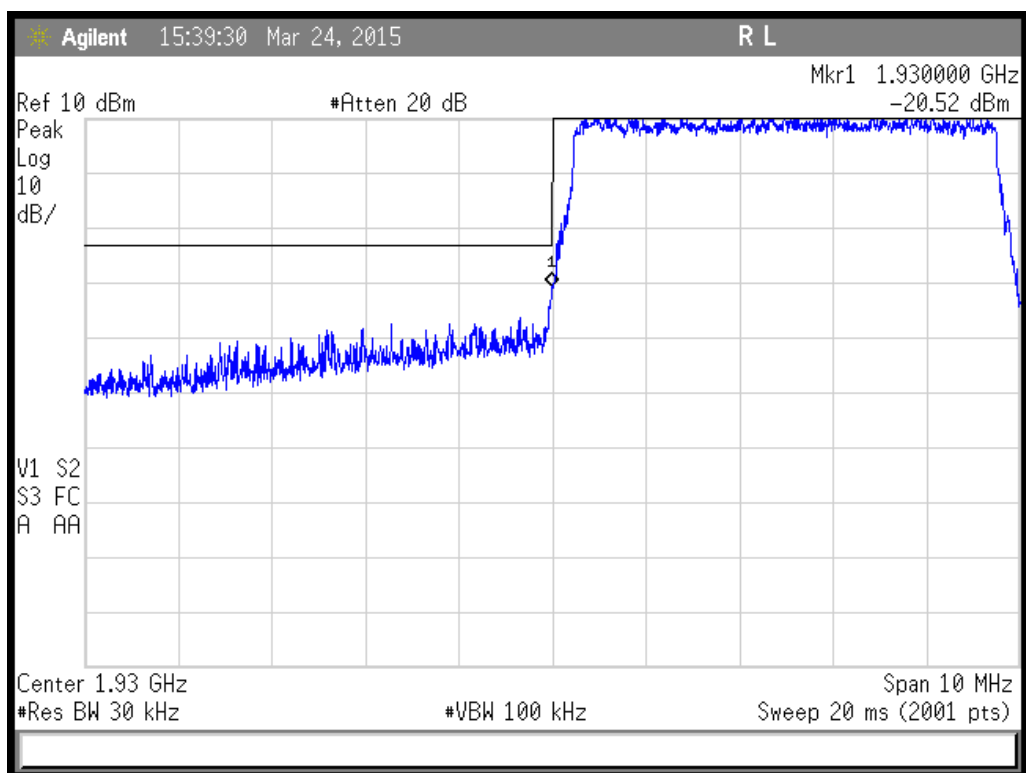
Upper Band Edge - Band 2 – 5MHz BW – 16QAM – Port J1



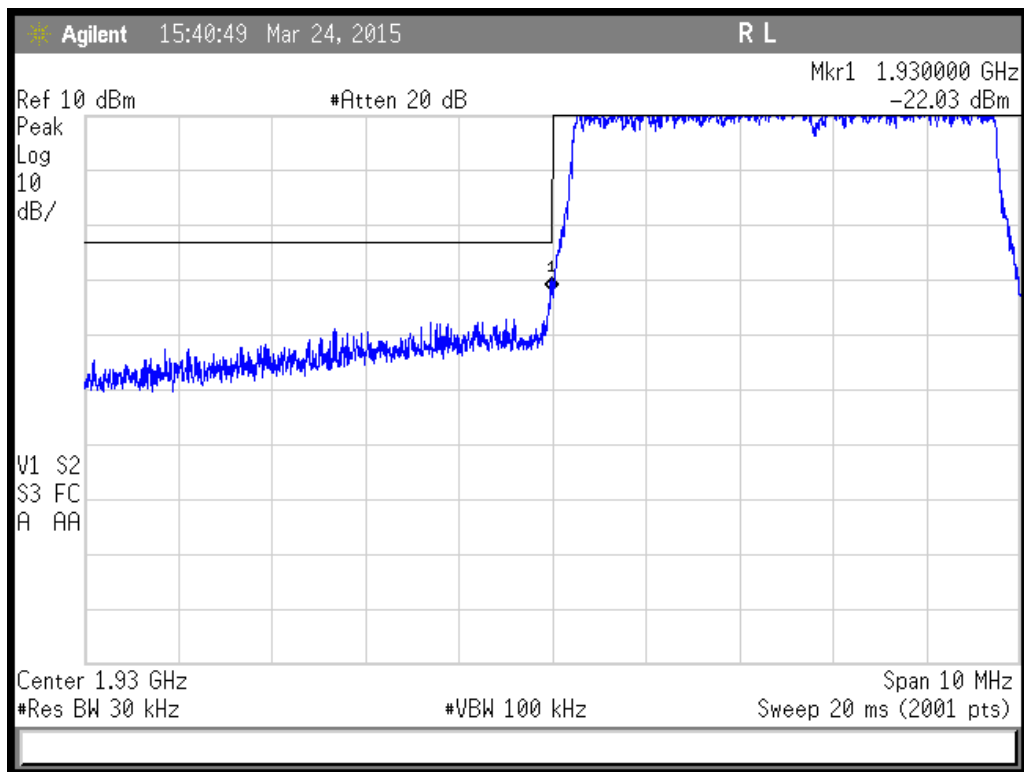
Upper Band Edge - Band 2 – 5MHz BW – 64QAM – Port J1



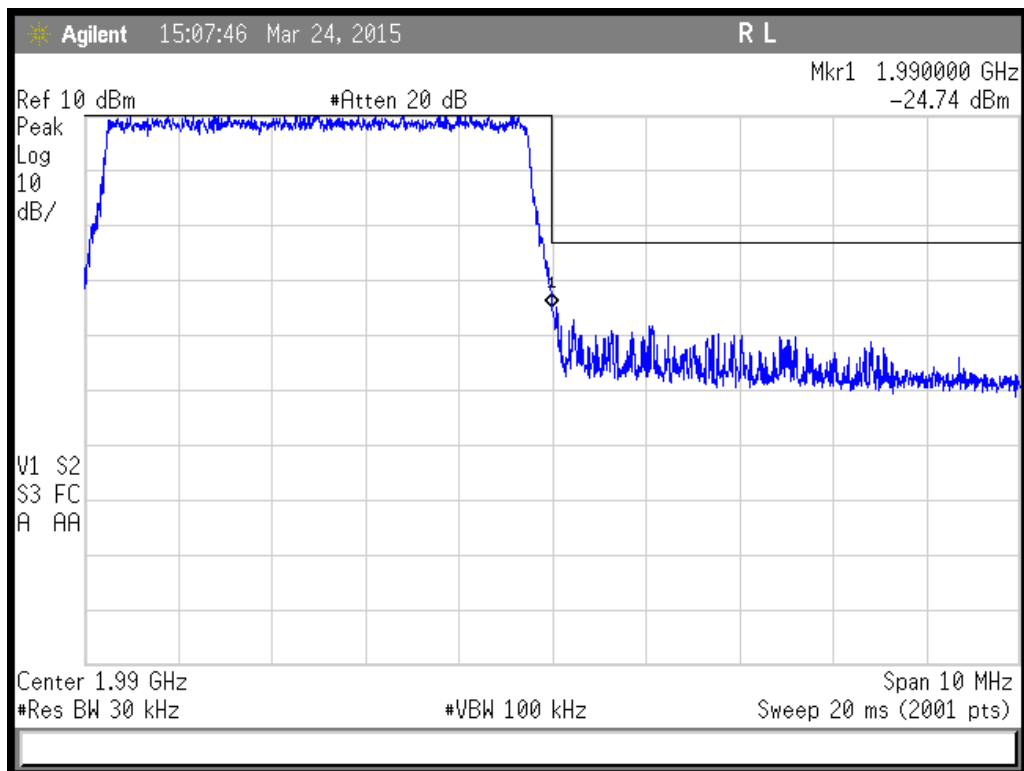
Lower Band Edge - Band 2 – 5MHz BW – QPSK – Port J2



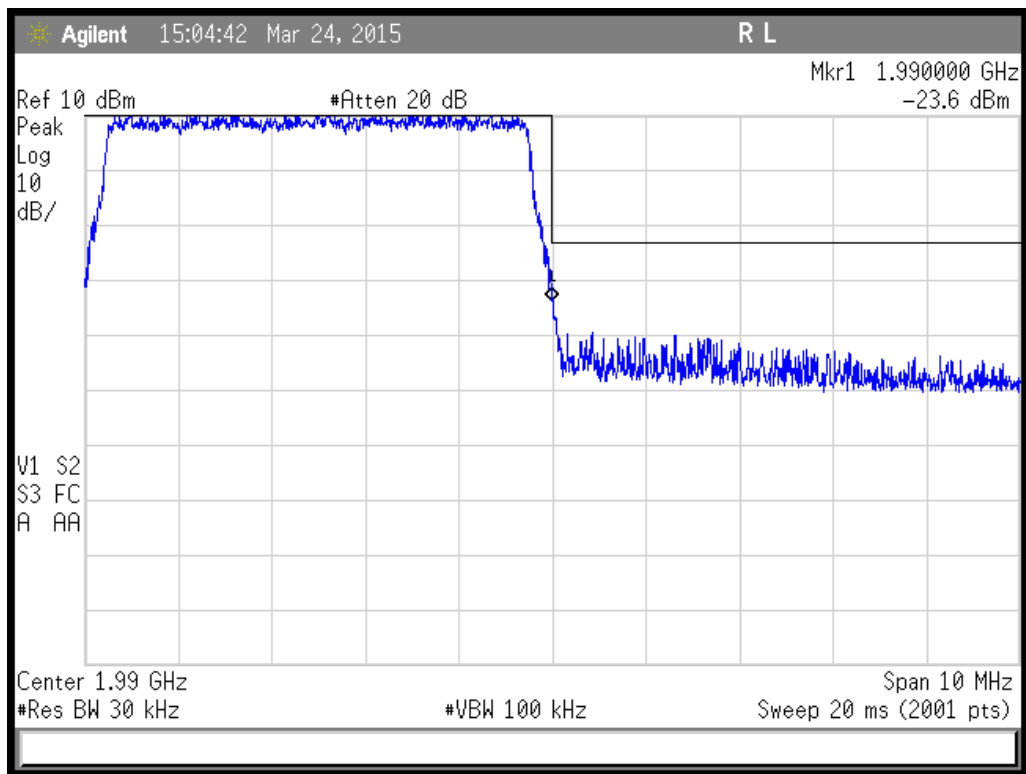
Lower Band Edge - Band 2 – 5MHz BW – 16QAM – Port J2



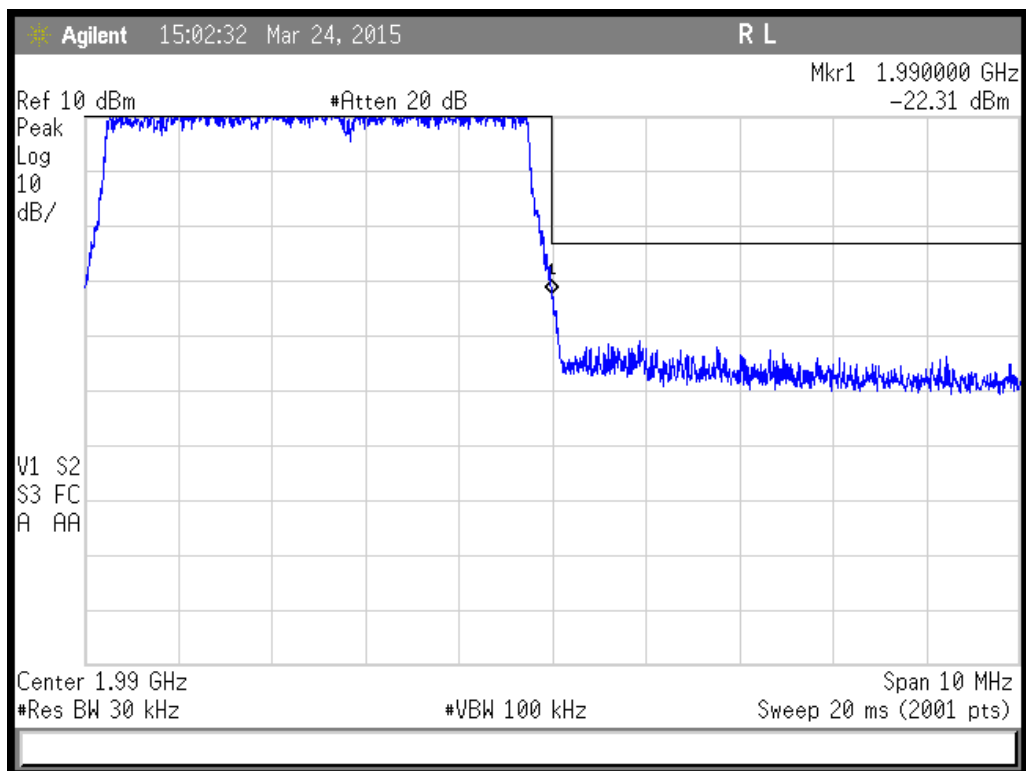
Lower Band Edge - Band 2 – 5MHz BW – 64QAM – Port J2



Upper Band Edge - Band 2 – 5MHz BW – QPSK – Port J2

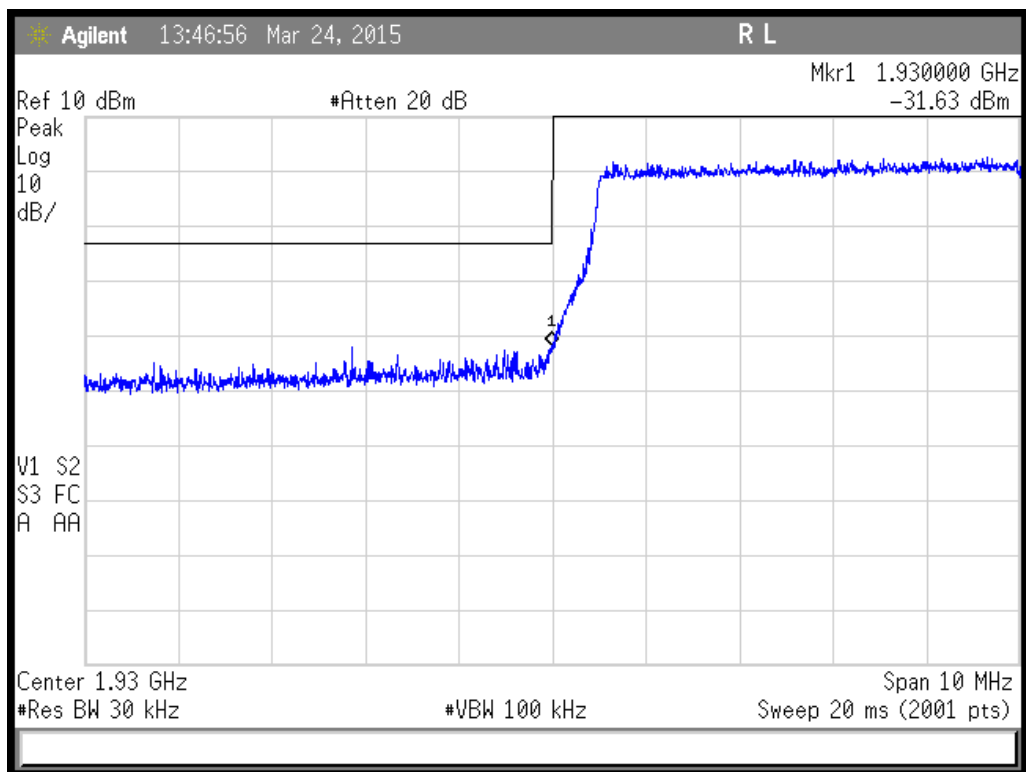


Upper Band Edge - Band 2 – 5MHz BW – 16QAM – Port J2

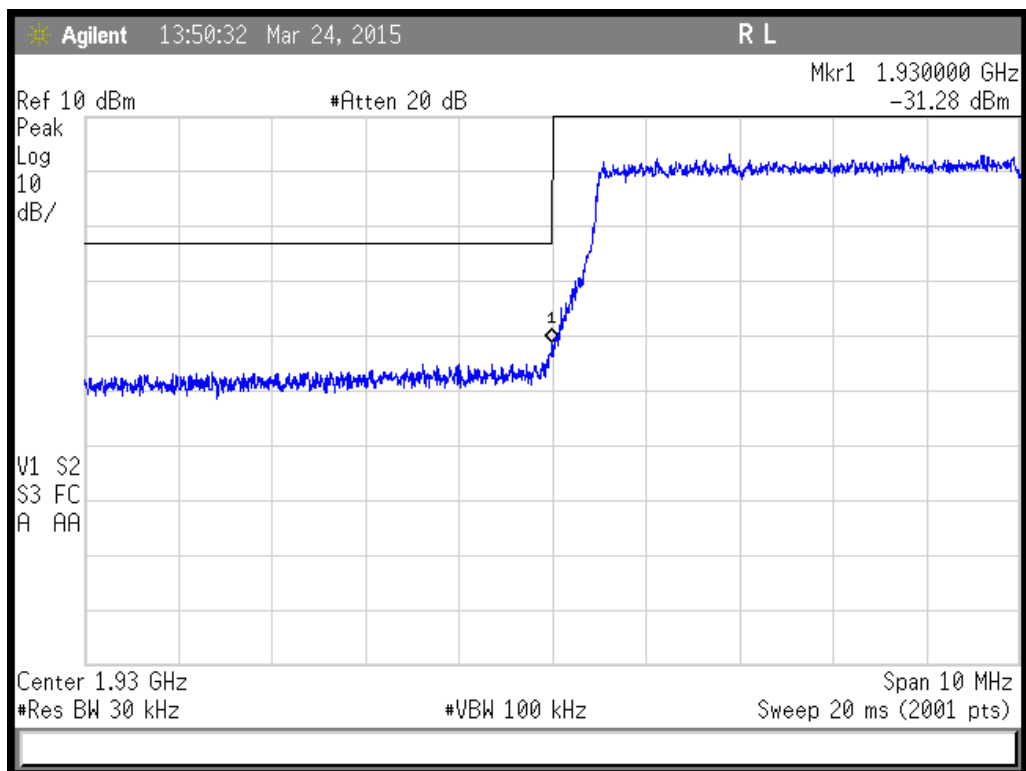


Upper Band Edge - Band 2 – 5MHz BW – 64QAM – Port J2

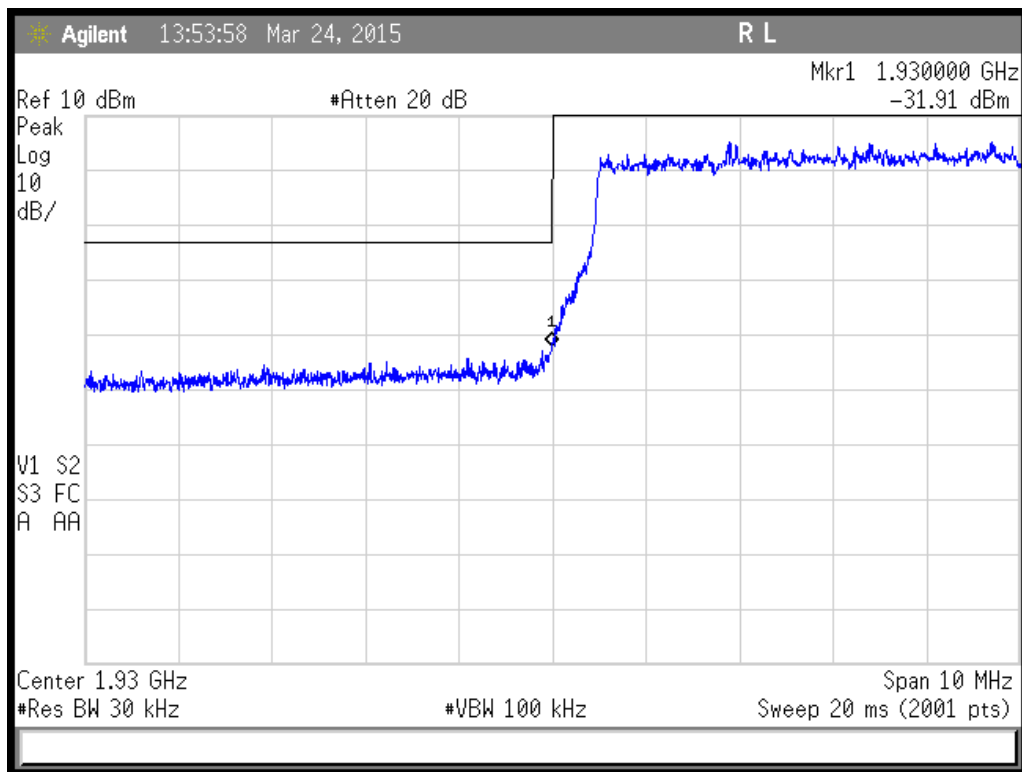




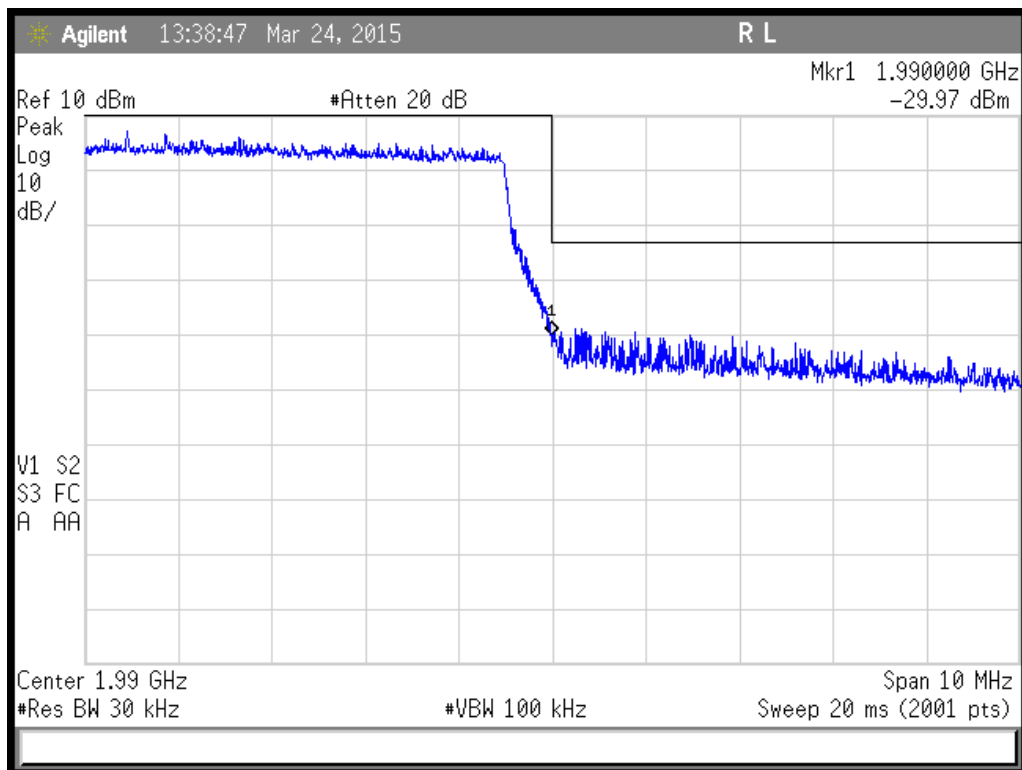
Lower Band Edge - Band 2 – 10MHz BW – QPSK – Port J1



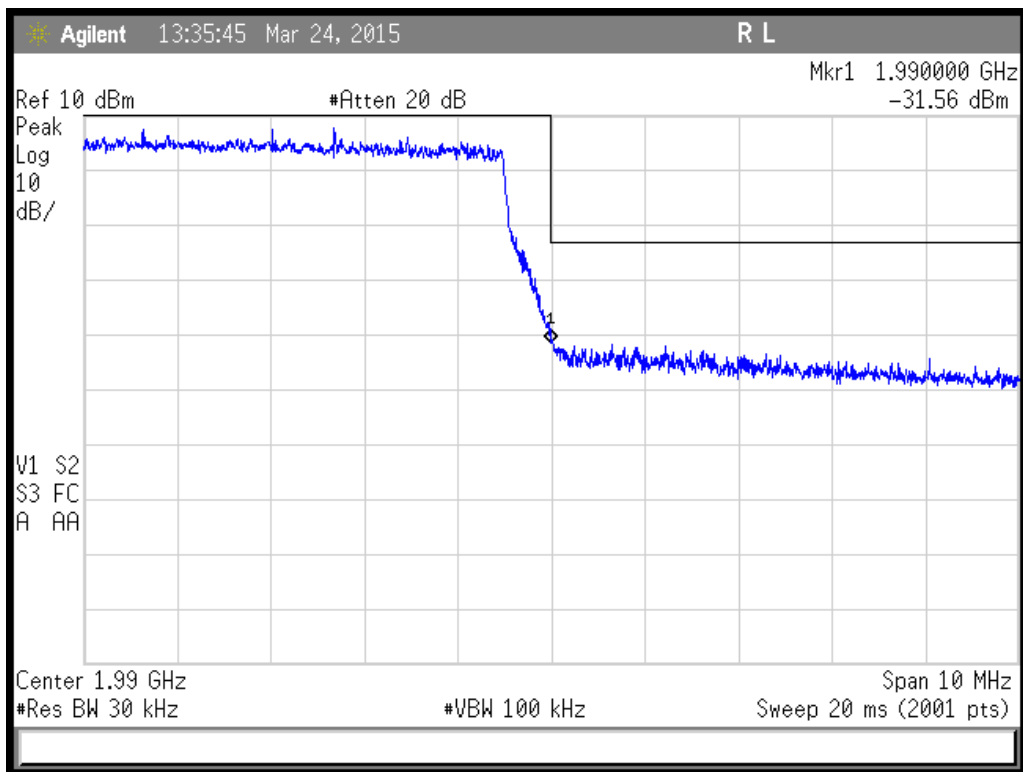
Lower Band Edge - Band 2 – 10MHz BW – 16QAM – Port J1



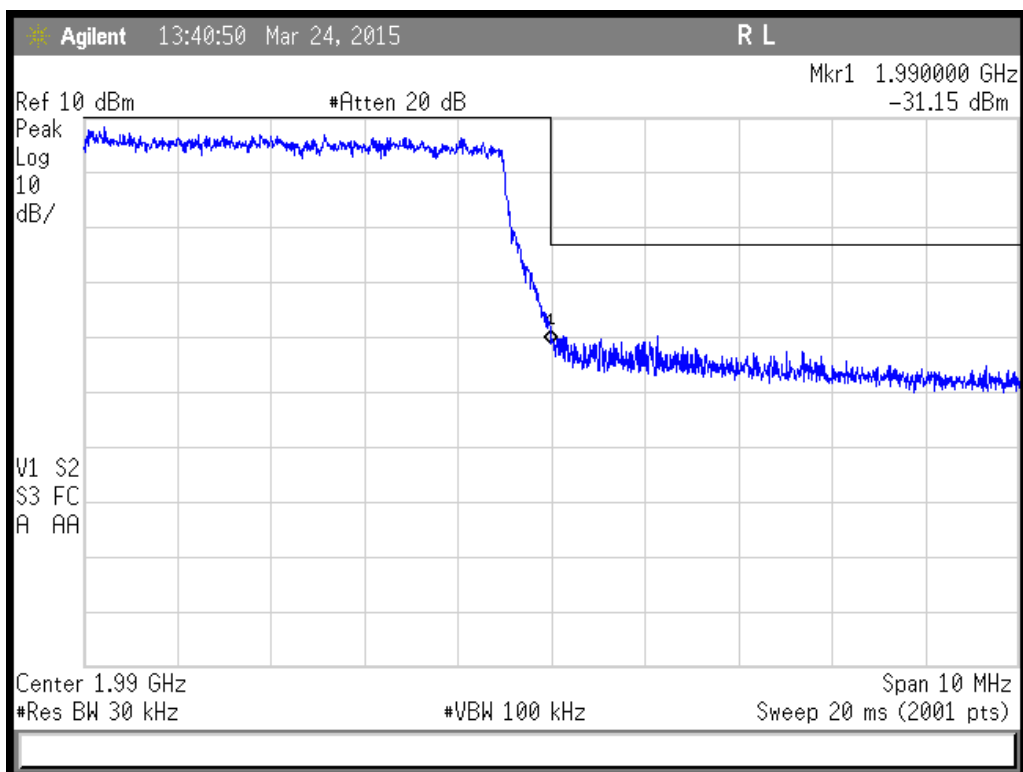
Lower Band Edge - Band 2 – 10MHz BW – 64QAM – Port J1



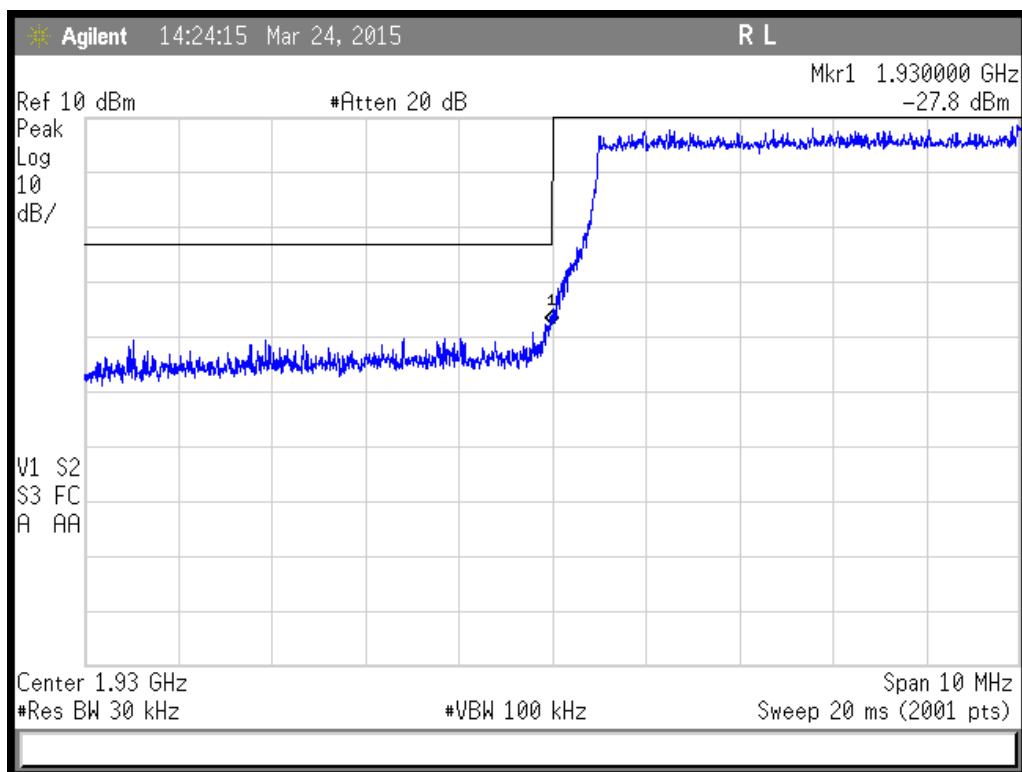
Upper Band Edge - Band 2 – 10MHz BW – QPSK – Port J1



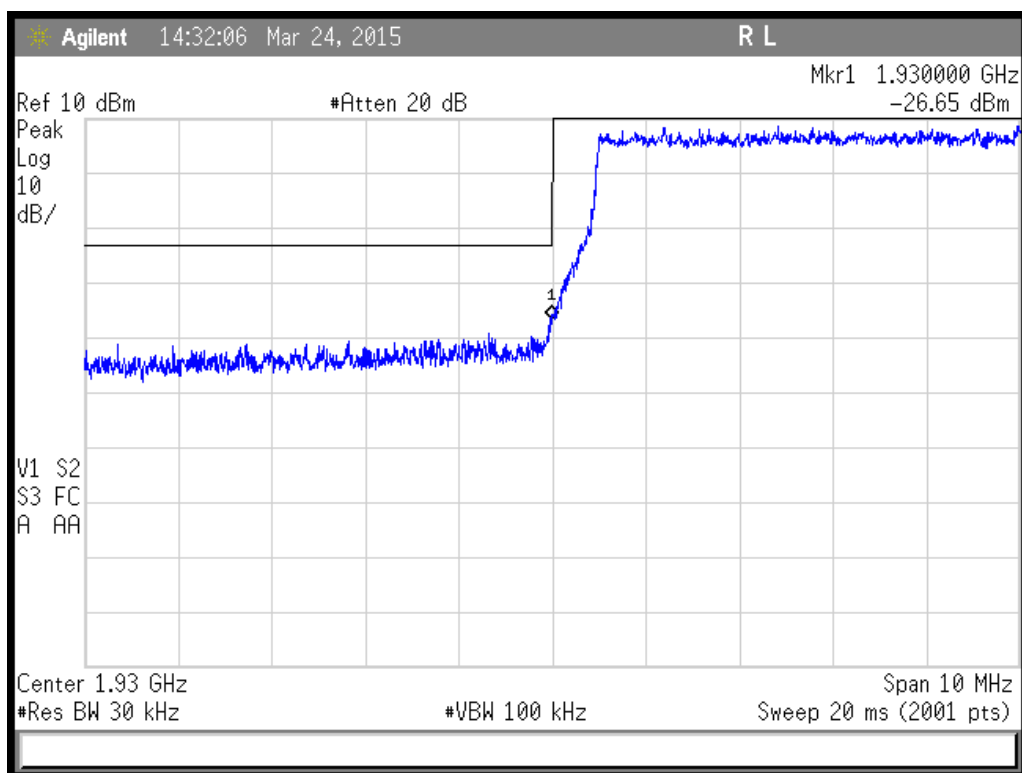
Upper Band Edge - Band 2 – 10MHz BW – 16QAM – Port J1



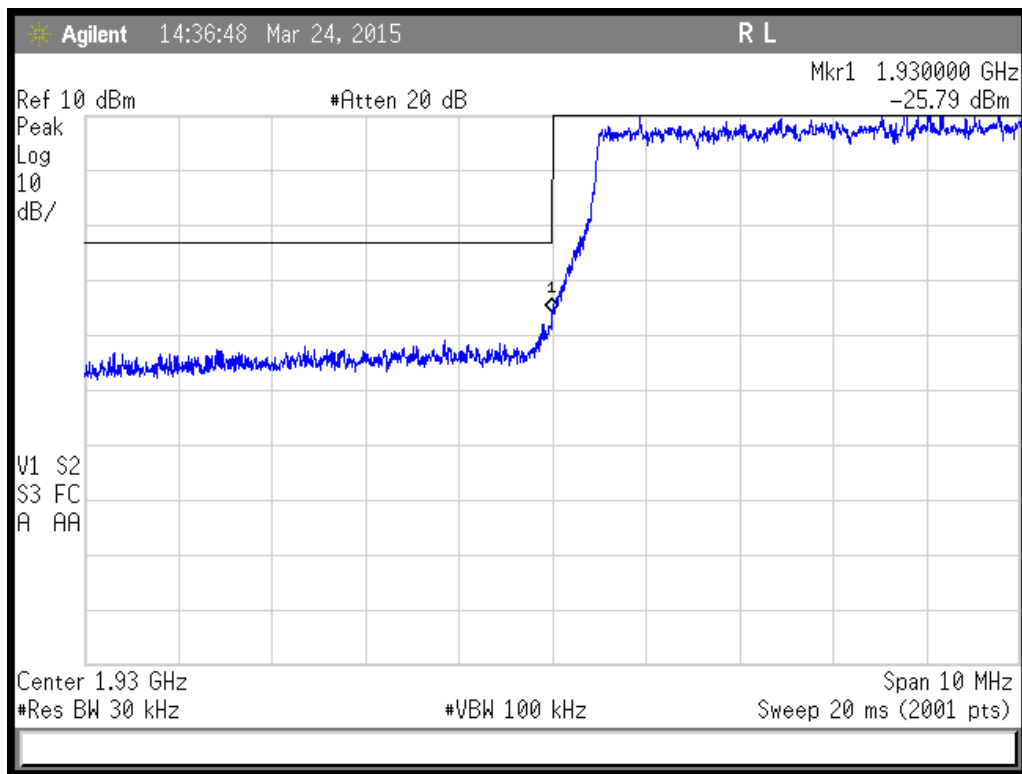
Upper Band Edge - Band 2 – 10MHz BW – 64QAM – Port J1



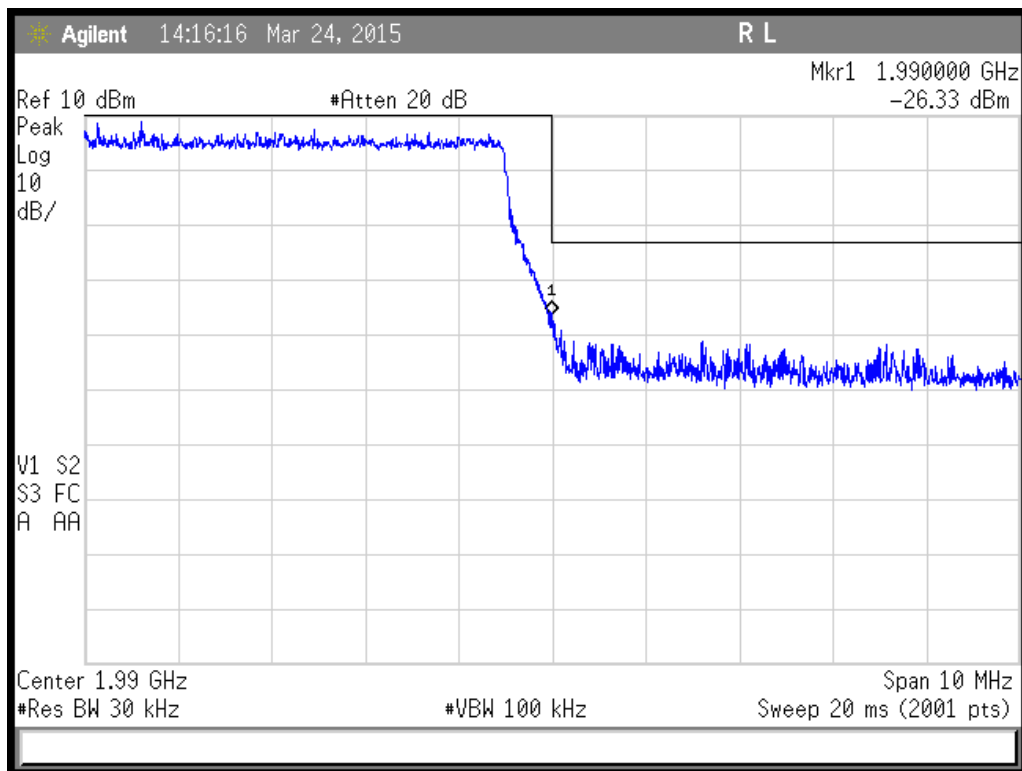
Lower Band Edge - Band 2 – 10MHz BW – QPSK – Port J2



Lower Band Edge - Band 2 – 10MHz BW – 16QAM – Port J2



Lower Band Edge - Band 2 – 10MHz BW – 64QAM – J2

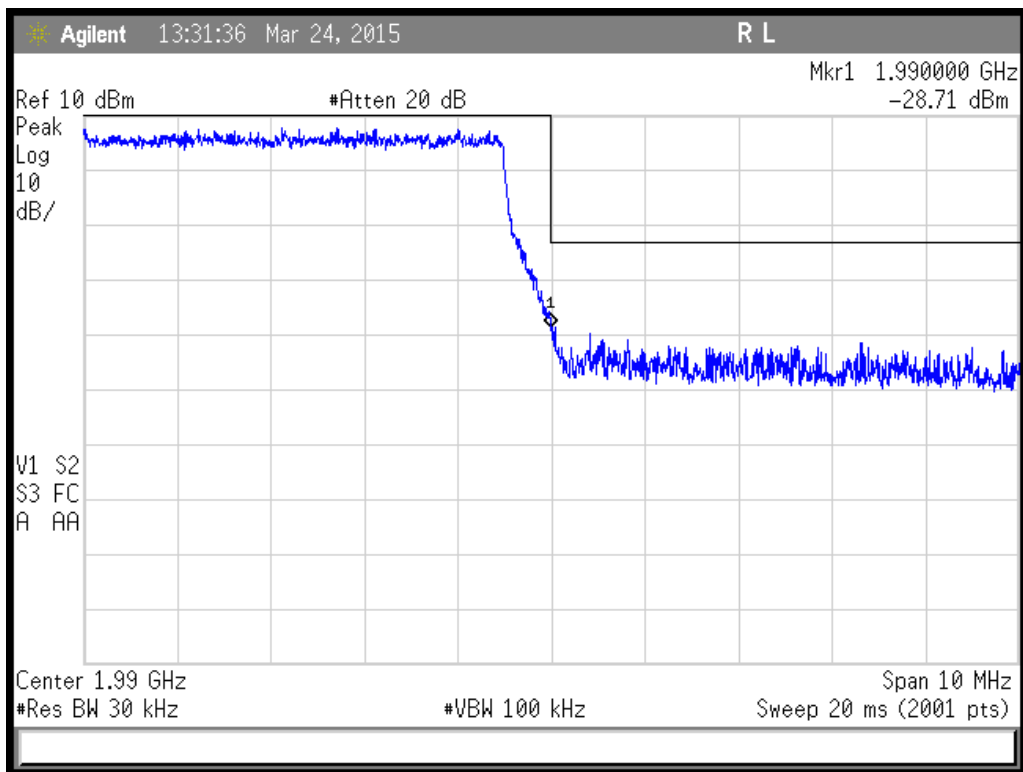


Upper Band Edge - Band 2 – 10MHz BW – QPSK – Port J2

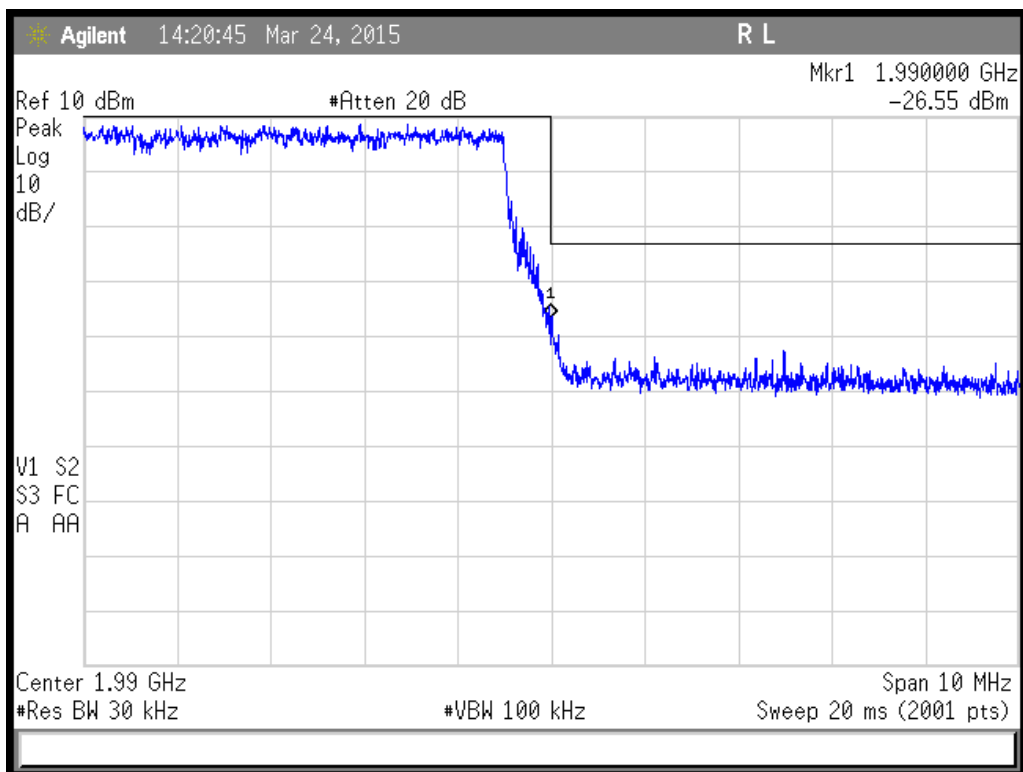


Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8881

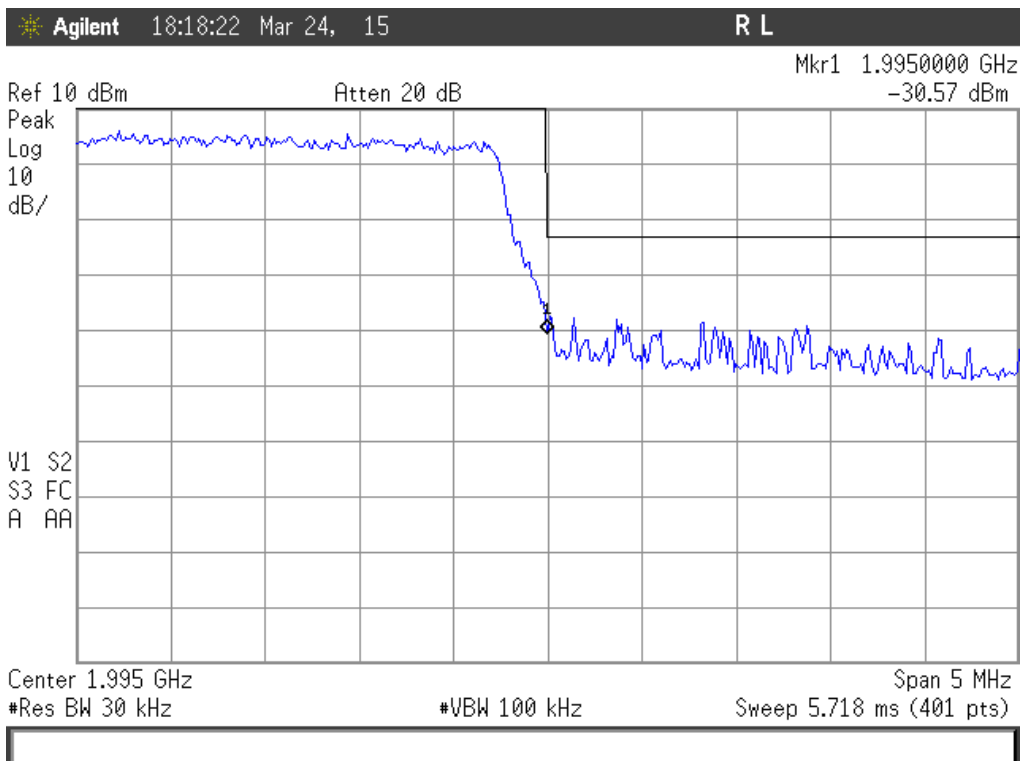




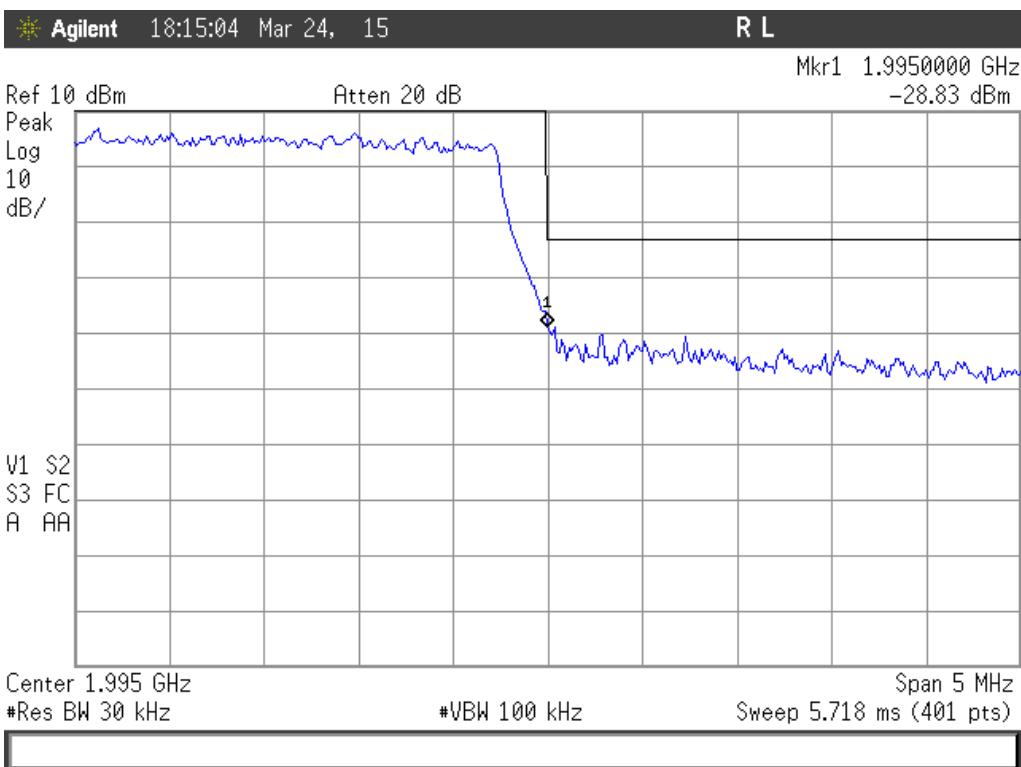
Upper Band Edge - Band 2 – 10MHz BW – 16QAM – Port J2



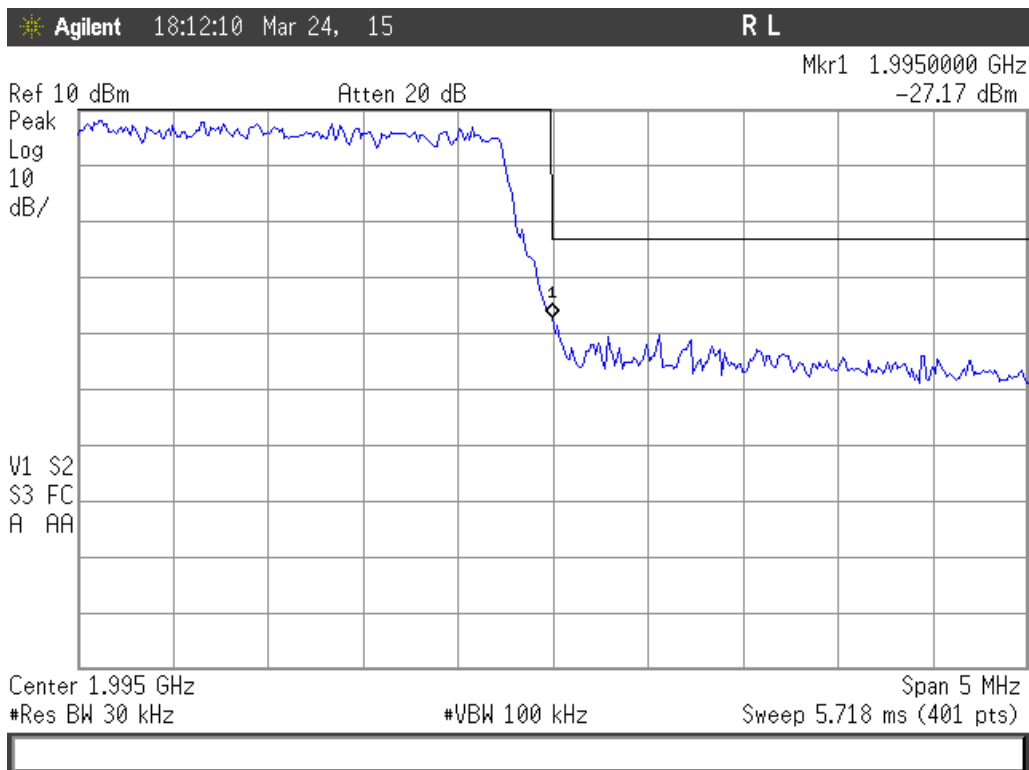
Upper Band Edge - Band 2 – 10MHz BW – 64QAM – Port J2



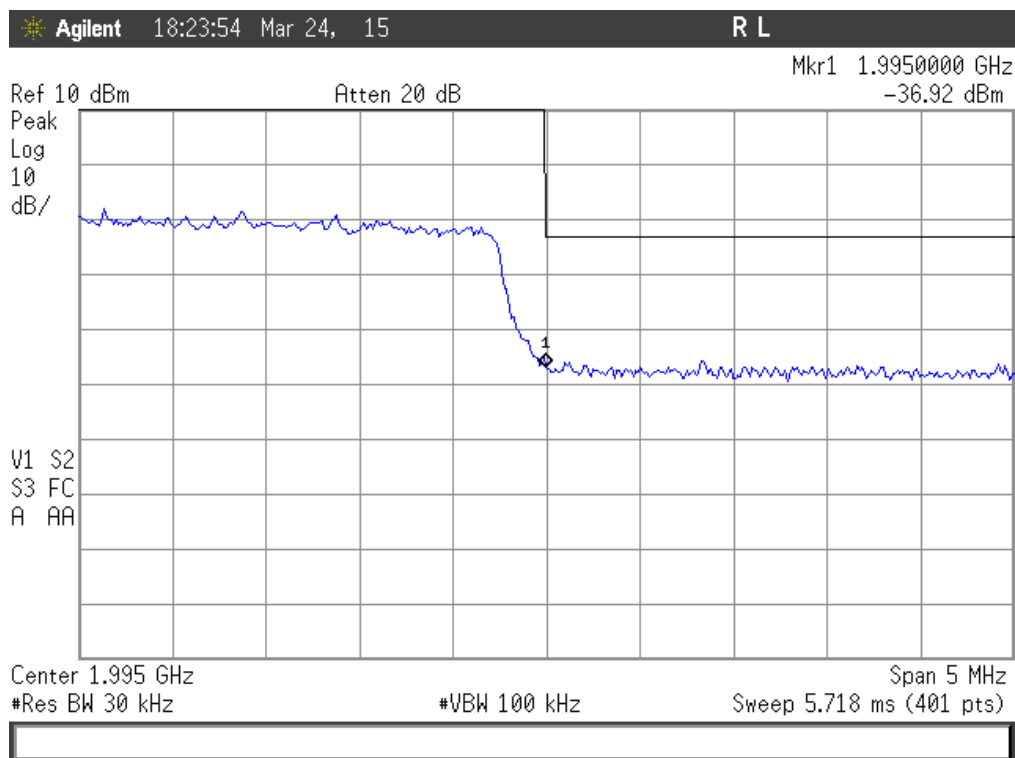
Band 25, Upper Band Edge, 5MHz BW, QPSK, Port J1



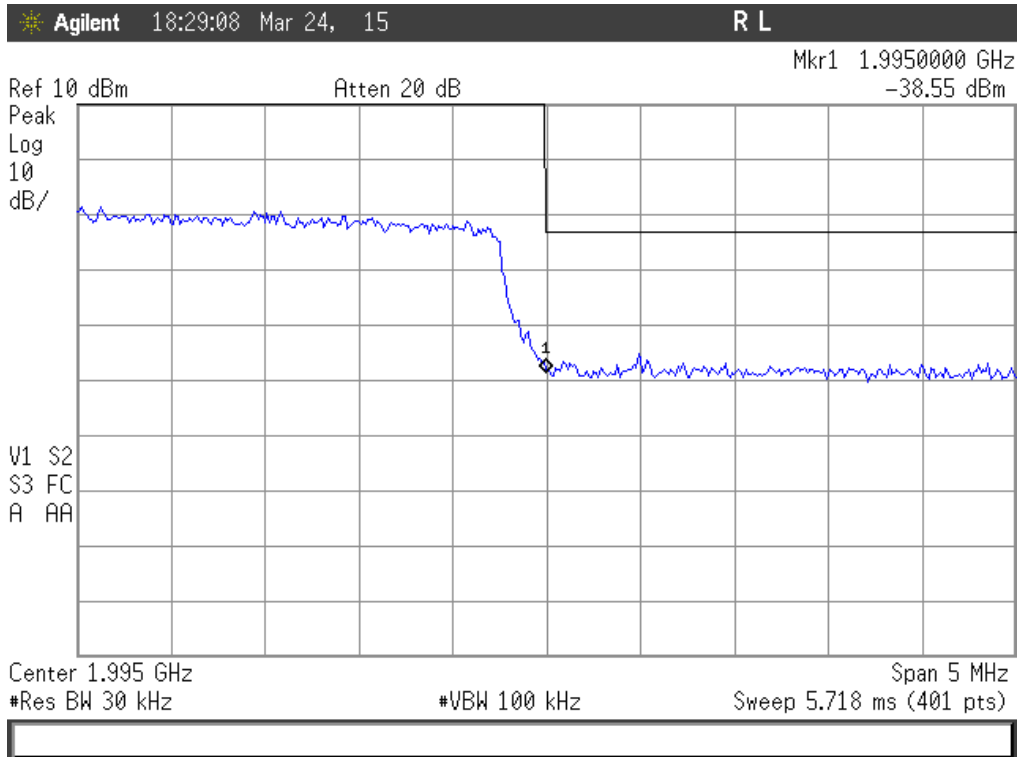
Band 25, Upper Band Edge, 5MHz BW, 16QAM, Port J1



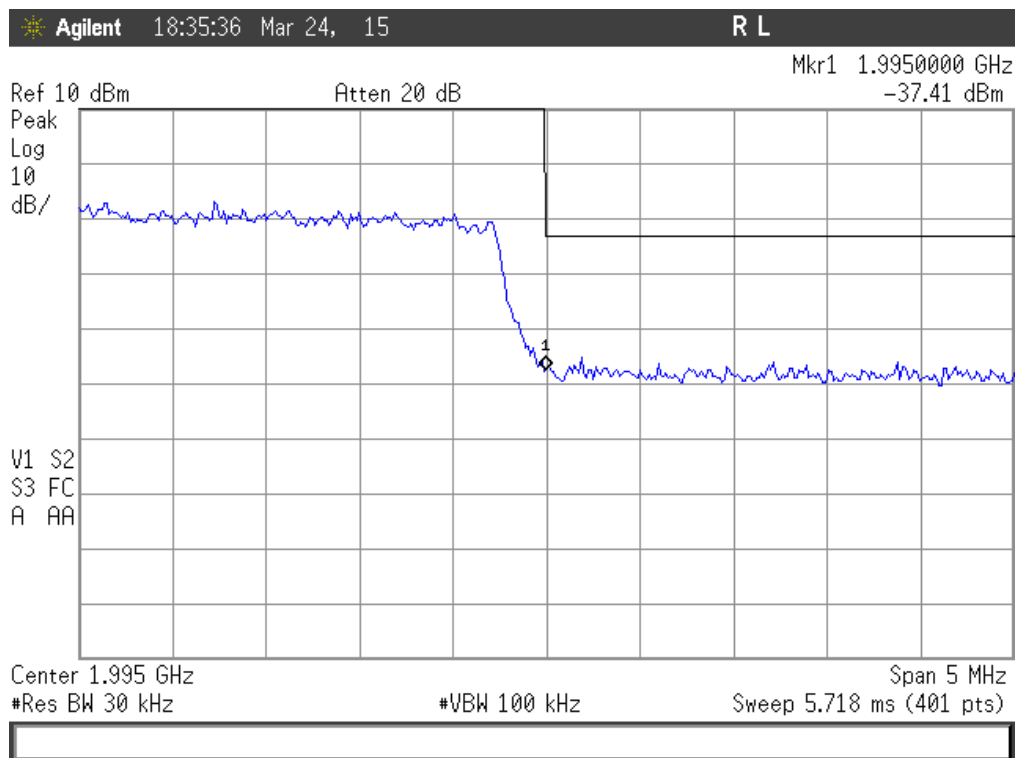
Band 25, Upper Band Edge, 5MHz BW, 64QAM, Port J1



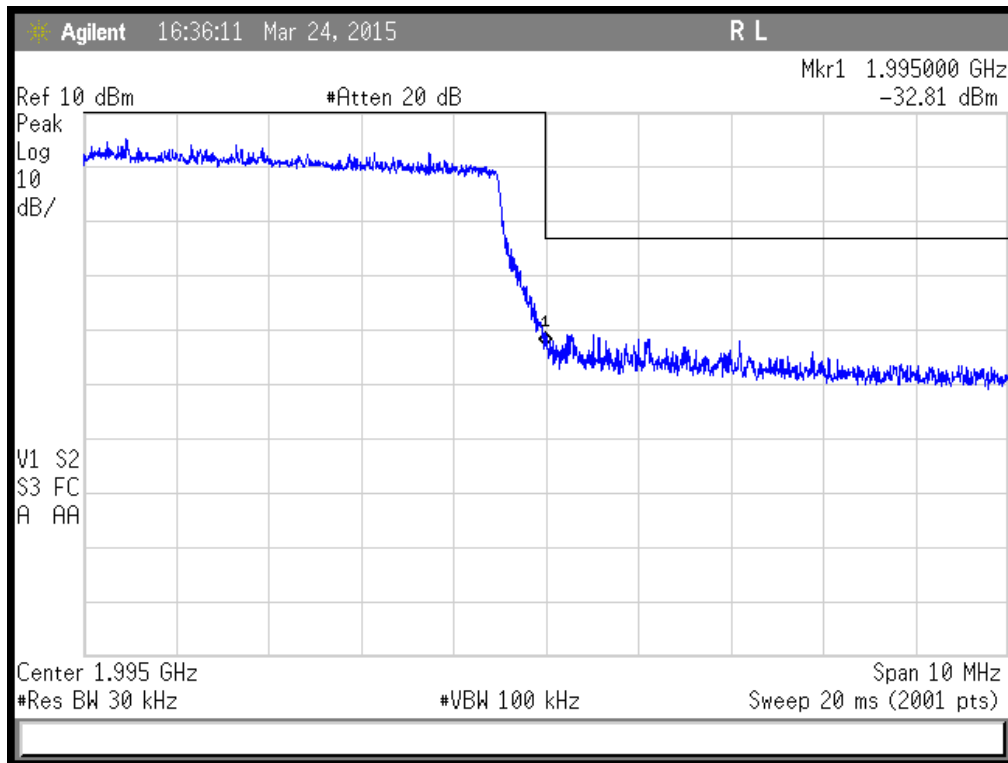
Band 25, Upper Band Edge, 5MHz BW, QPSK, Port J2



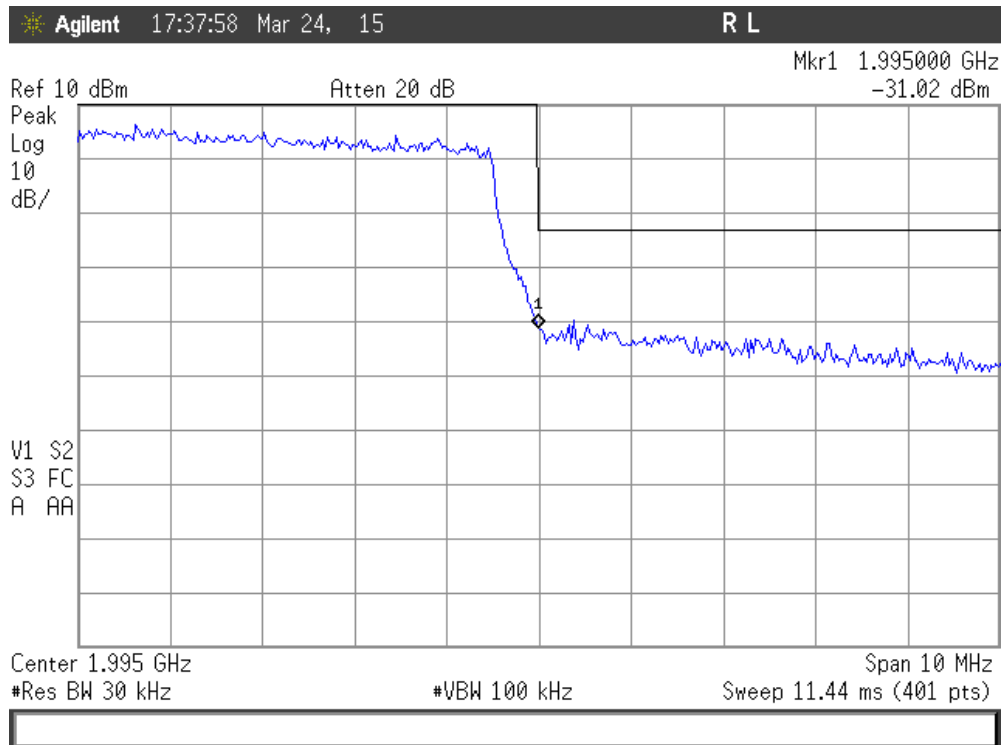
Band 25, Upper Band Edge, 5MHz BW, 16QAM, Port J2



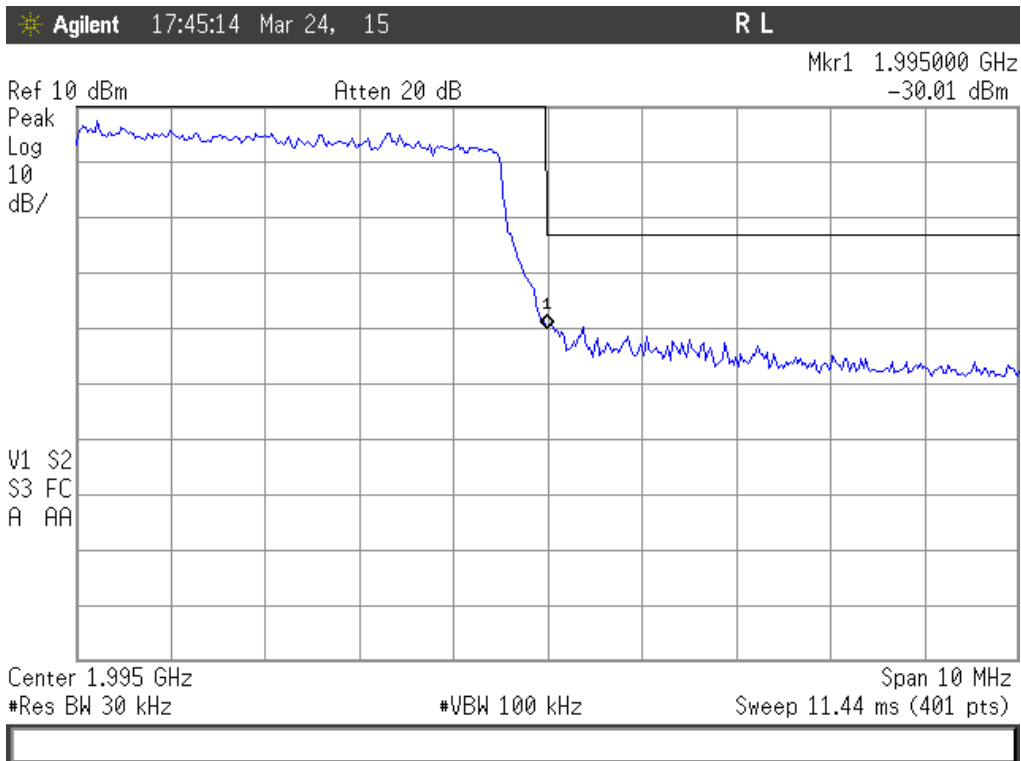
Band 25, Upper Band Edge, 5MHz BW, 64QAM, Port J2



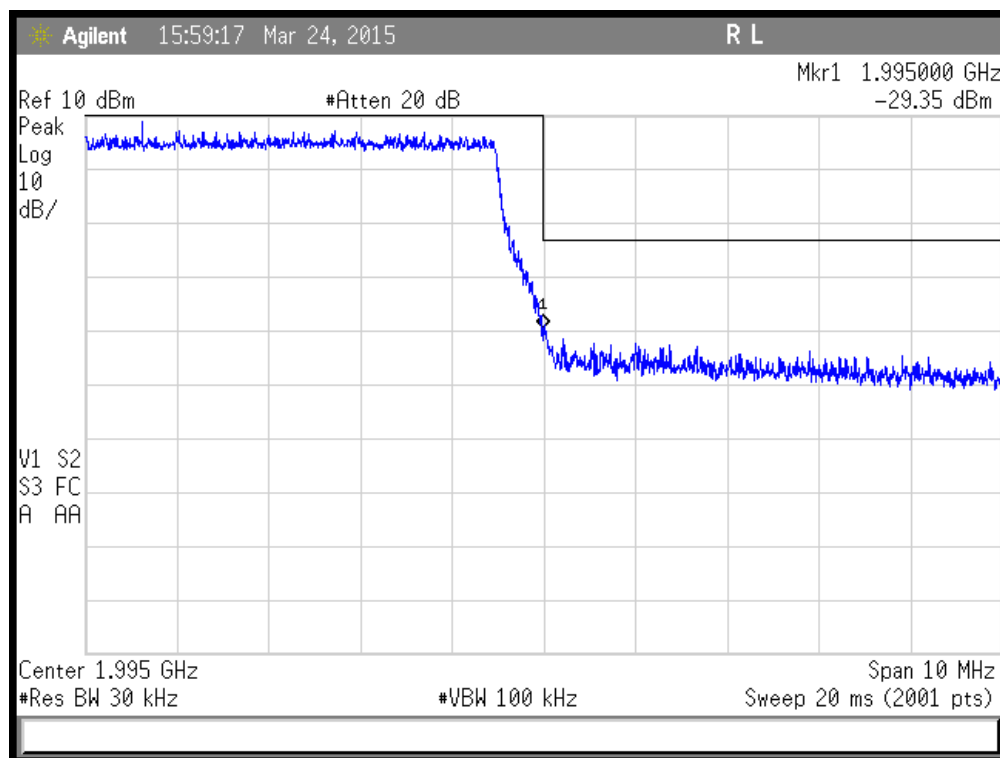
Band 25, Upper Band Edge, 10MHz BW, QPSK, Port J1



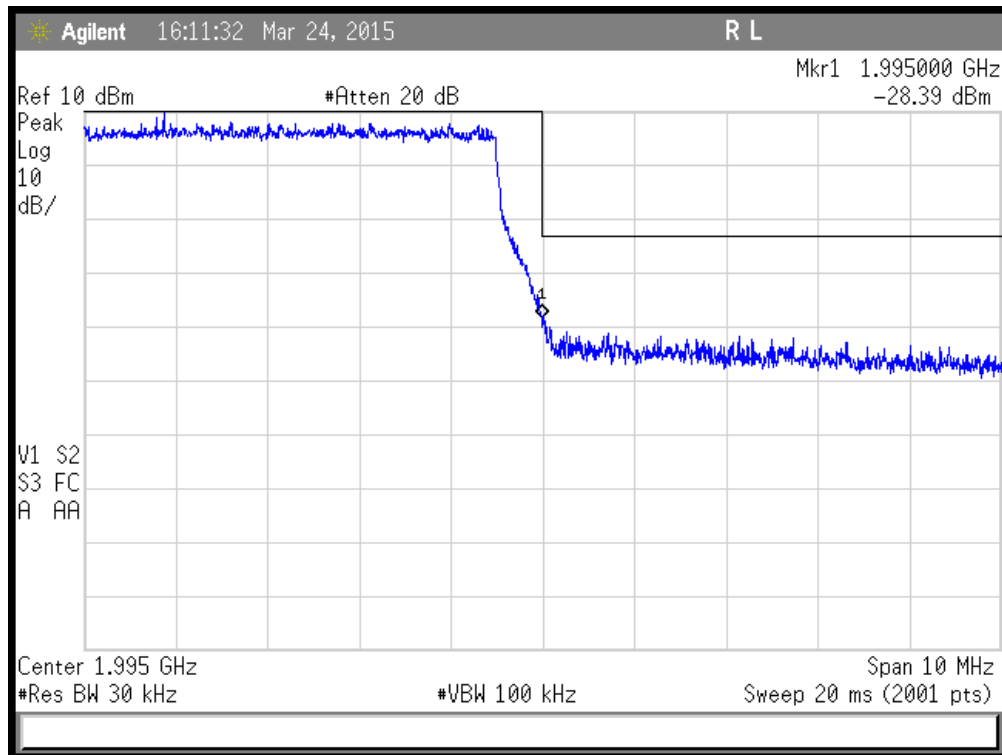
Band 25, Upper Band Edge, 10MHz BW, 16QAM, Port J1



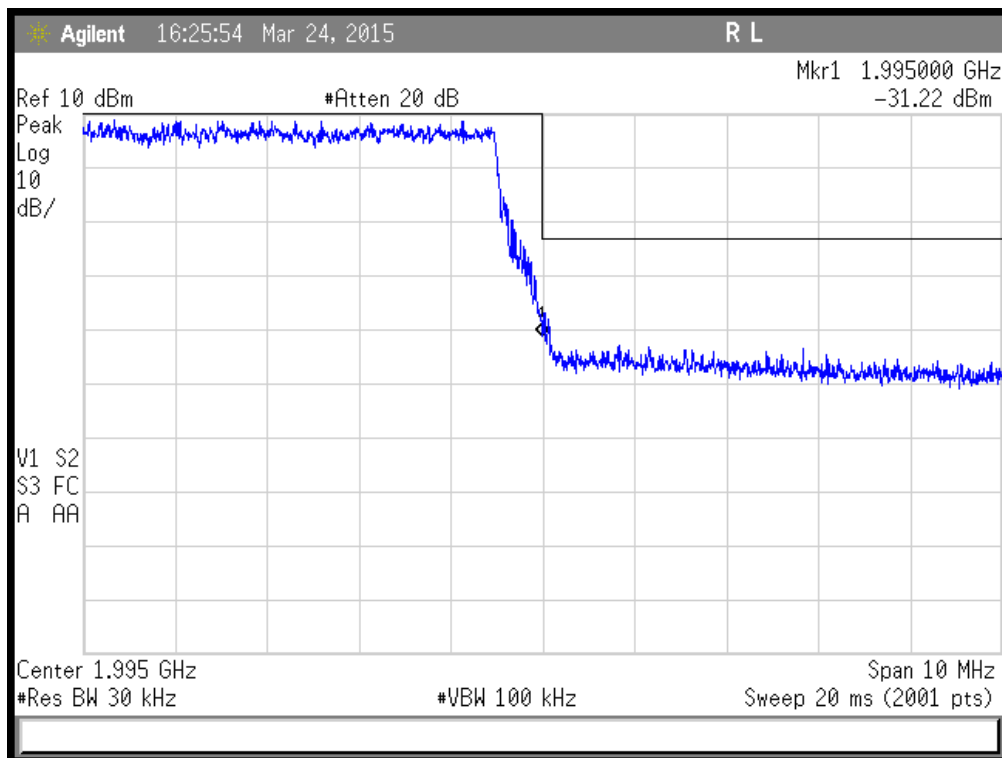
Band 25, Upper Band Edge, 10MHz BW, 64QAM, Port J1



Band 25, Upper Band Edge, 10MHz BW, QPSK, Port J2



Band 25, Upper Band Edge, 10MHz BW, 16QAM, Port J2



Band 25, Upper Band Edge, 10MHz BW, 64QAM, Port J2

Conducted Spurious Emissions at Antenna Port

LIMITS

"The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB."
[24.238(a)]

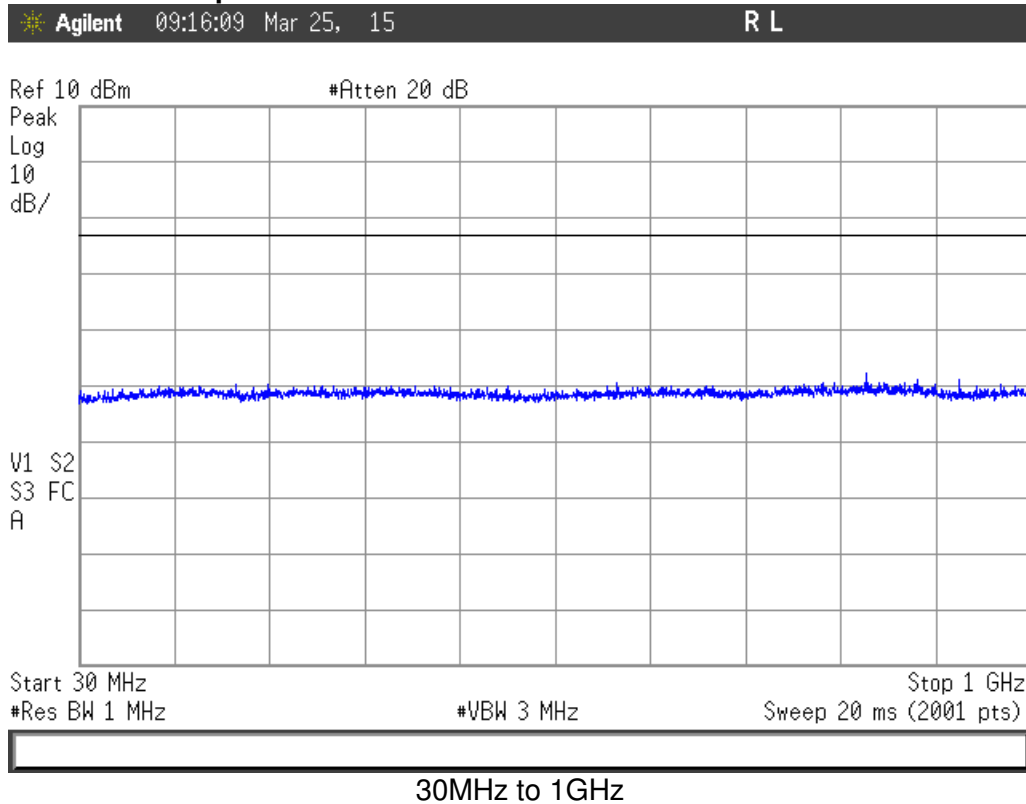
$$\text{Limit} = 10 \cdot \log(P[\text{mW}]) - (43 + 10 \cdot \log(P[\text{W}])) = -13\text{dBm}$$

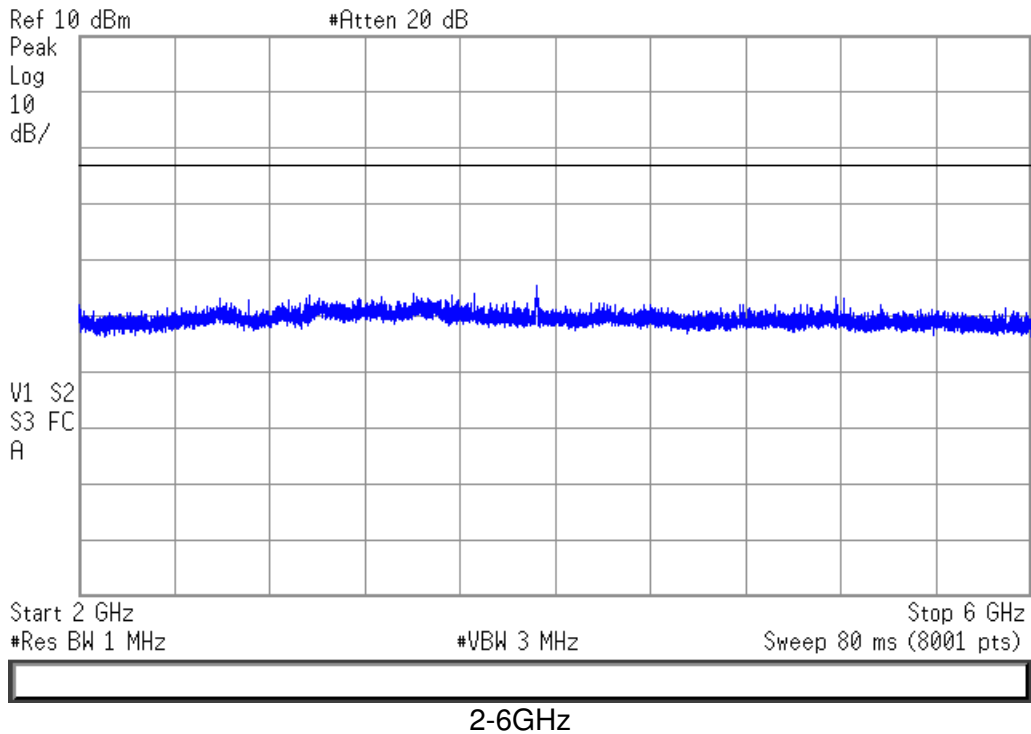
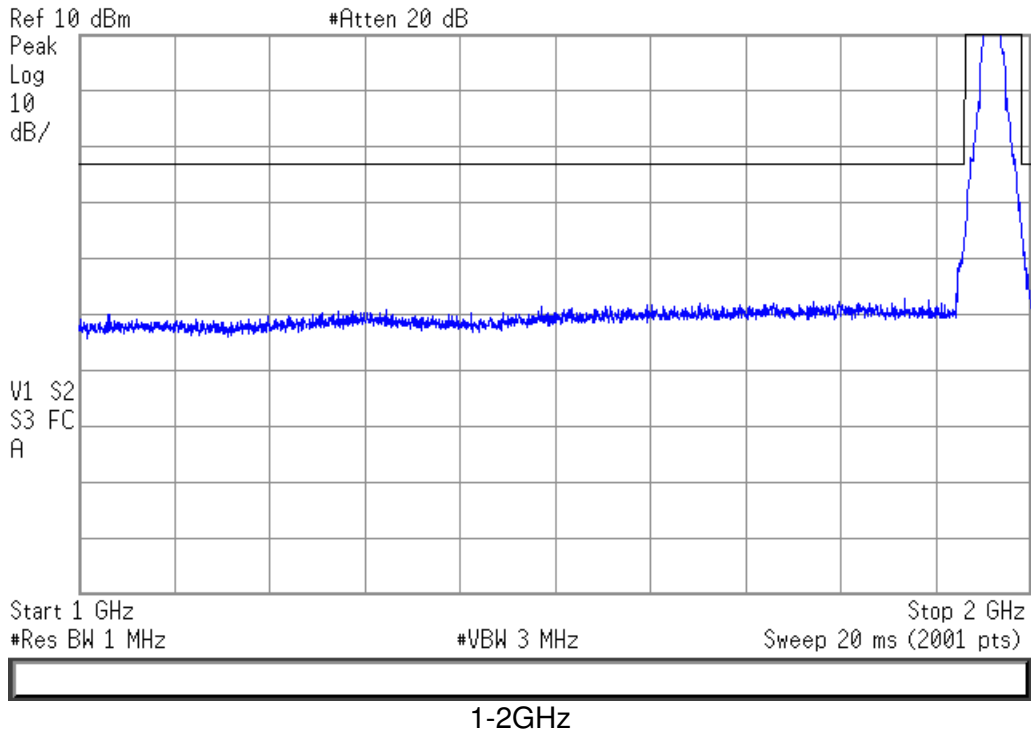
Spectrum analyzer screen plots for LTE Bands 25 & 2 are shown on the following pages. The operating frequencies were 1962.5MHz (Band 25) and 1960MHz (Band 2), which were taken to represent both bands as Band 2 is a subset of Band 25.

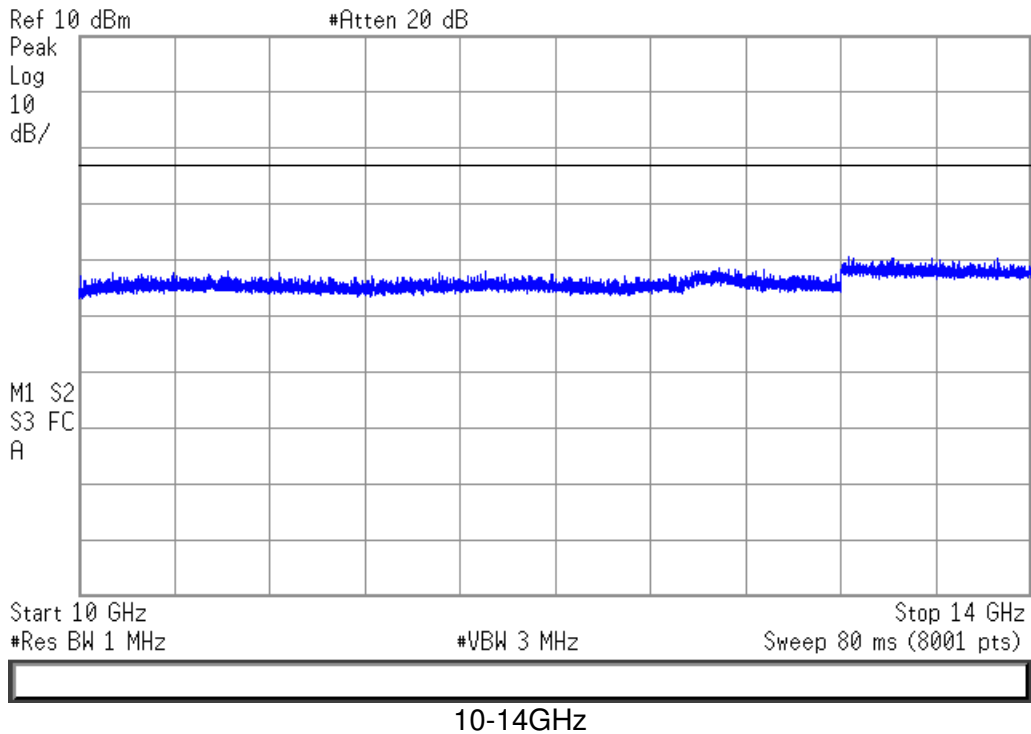
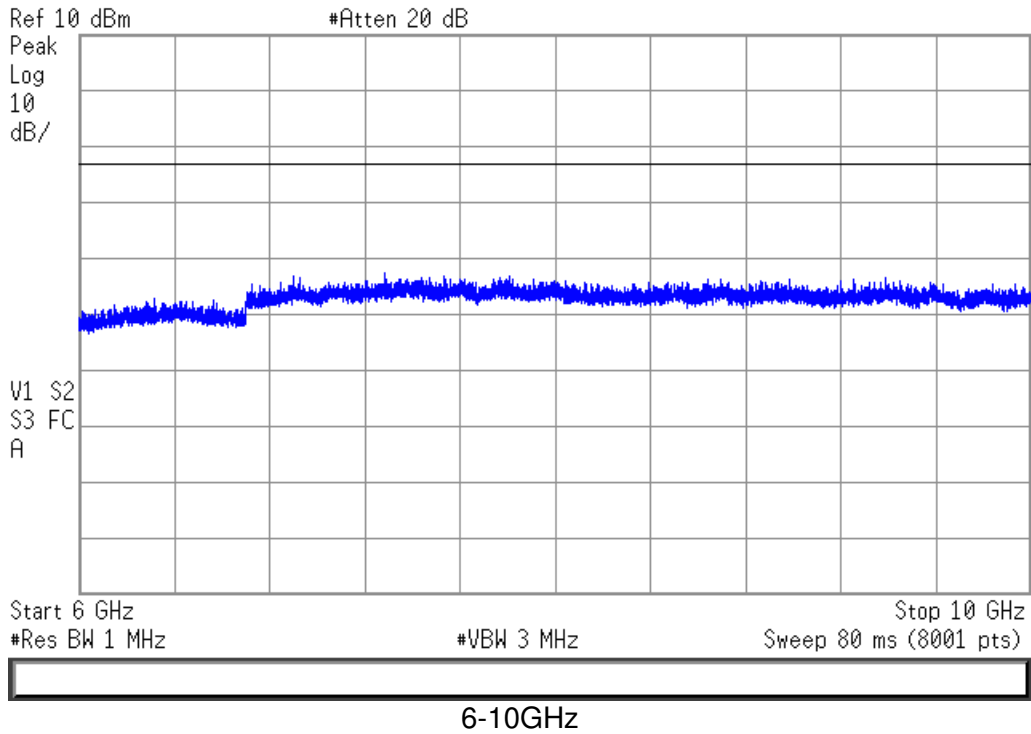


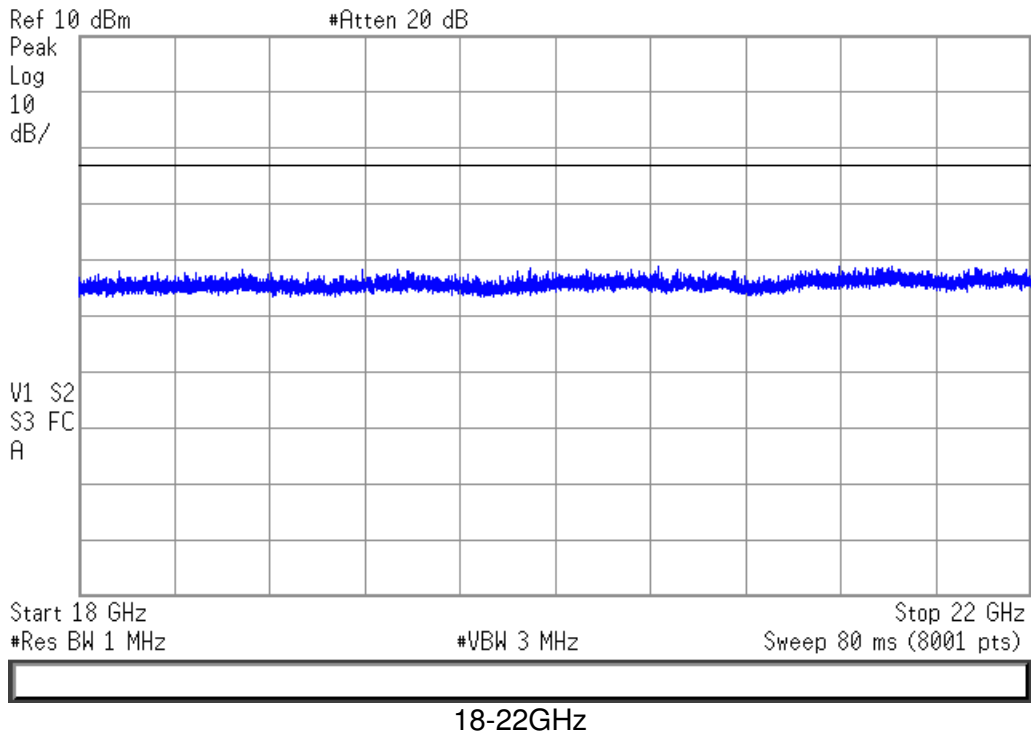
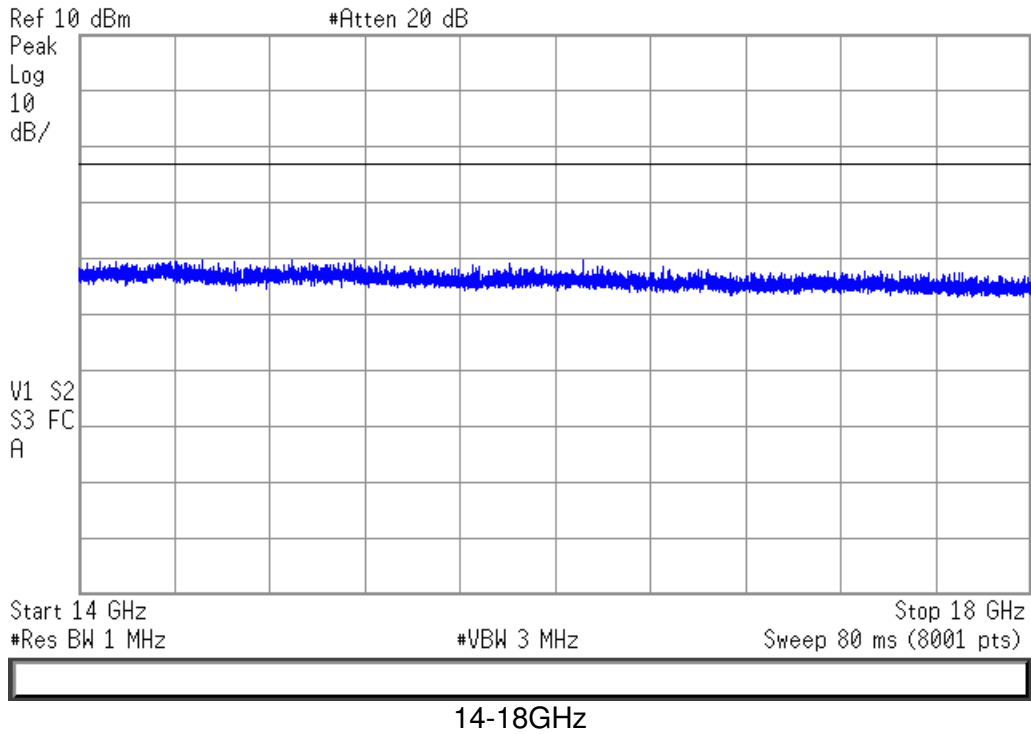
PLOTS

LTE Band 2 – Antenna port J1



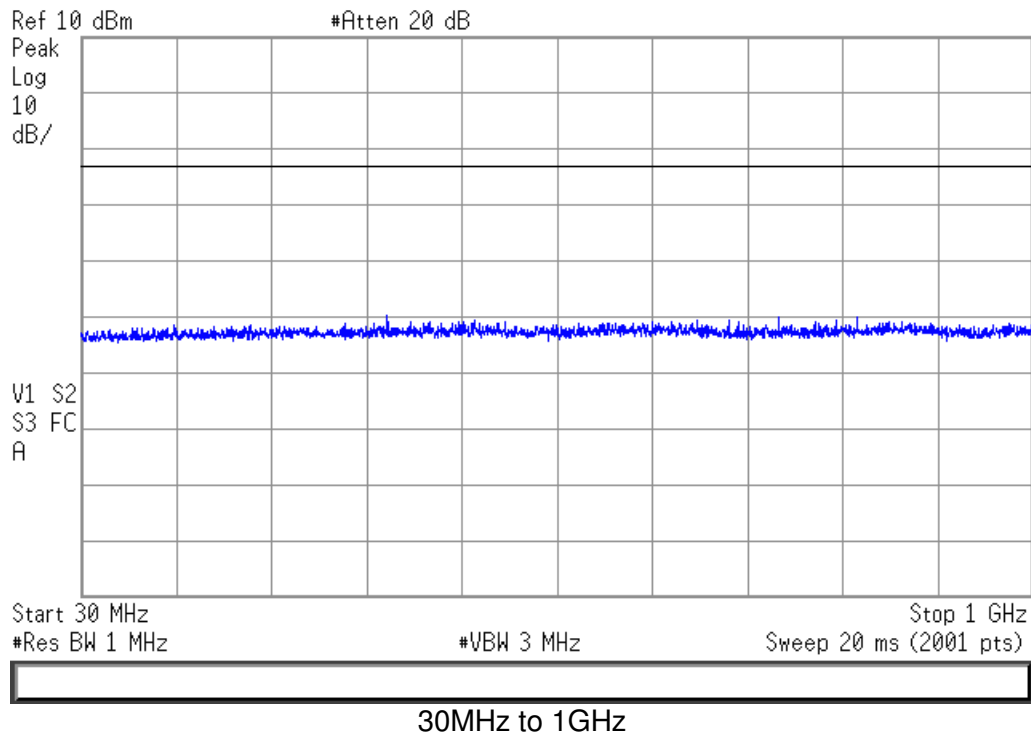






LTE Band 2 – Antenna port J2

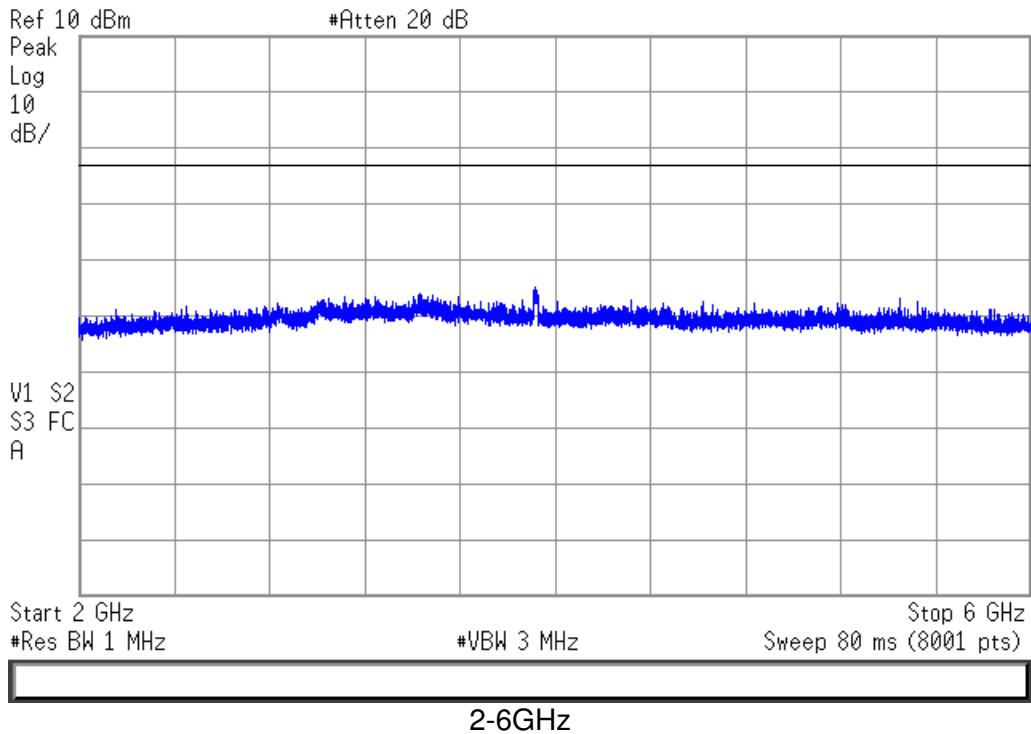
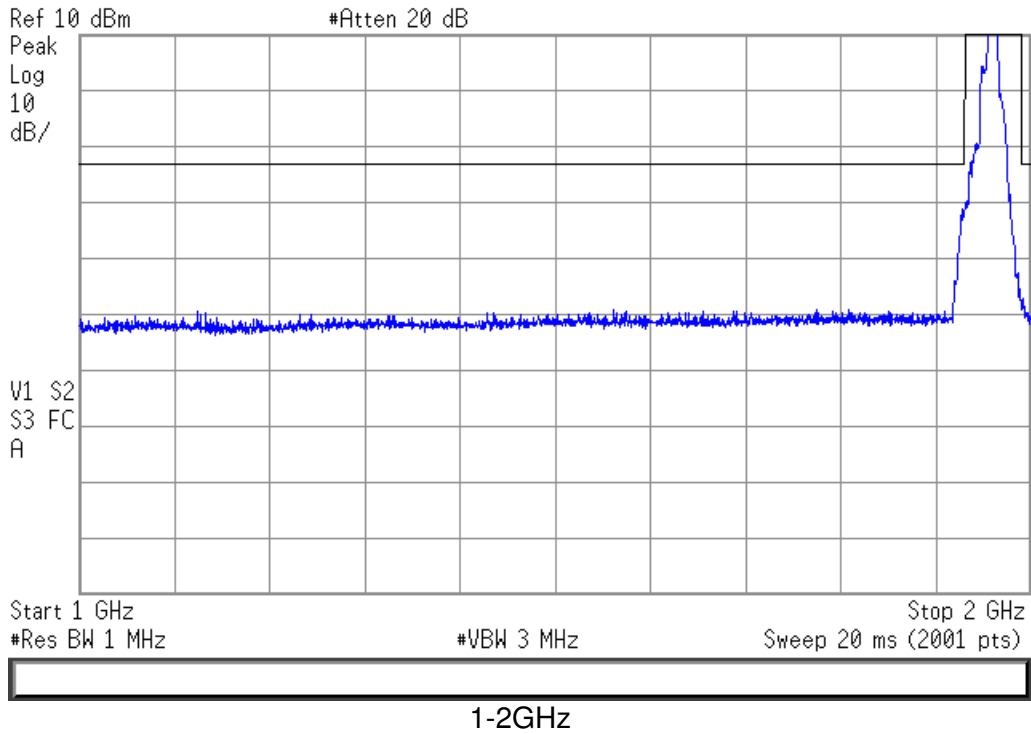
Agilent 08:29:09 Mar 25, 15 R L

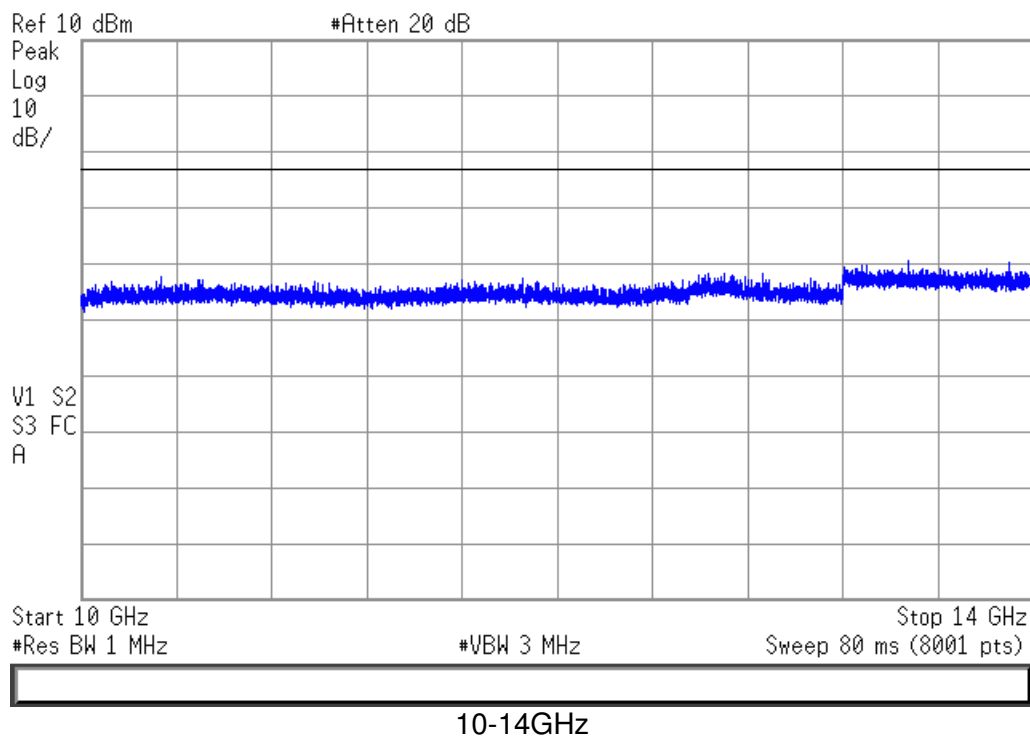
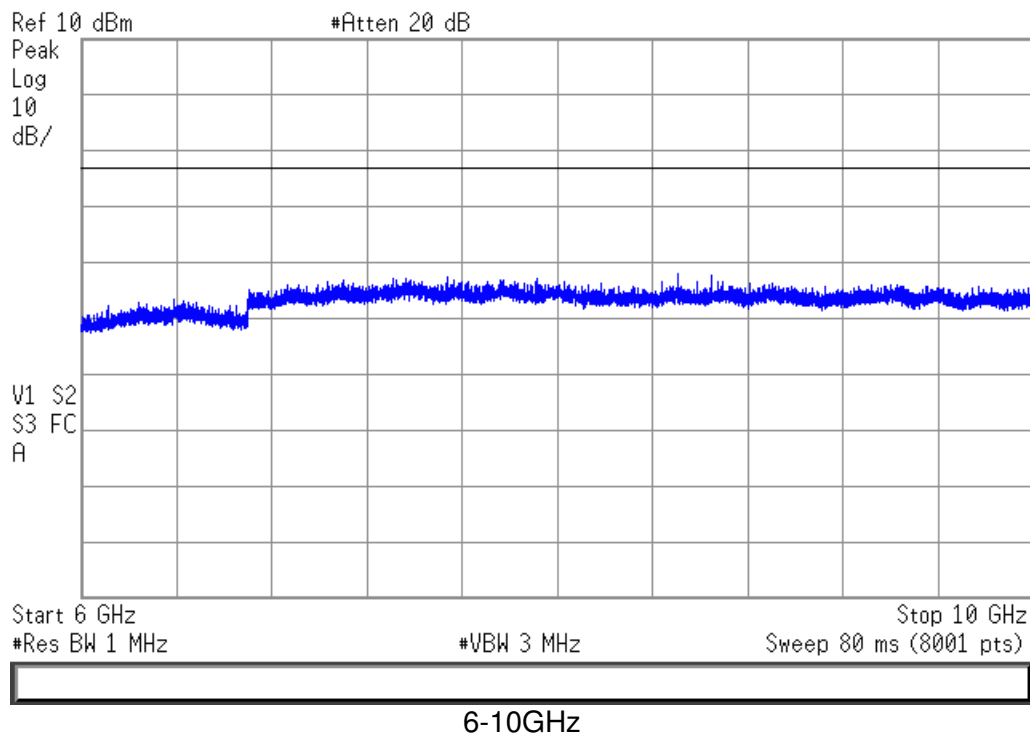


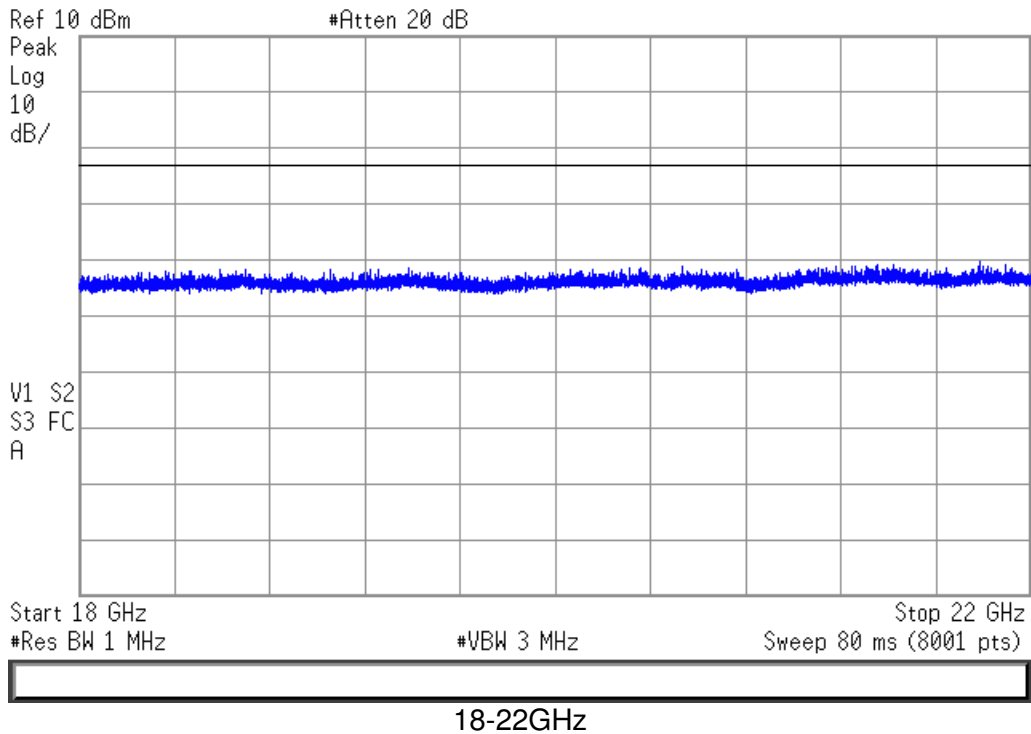
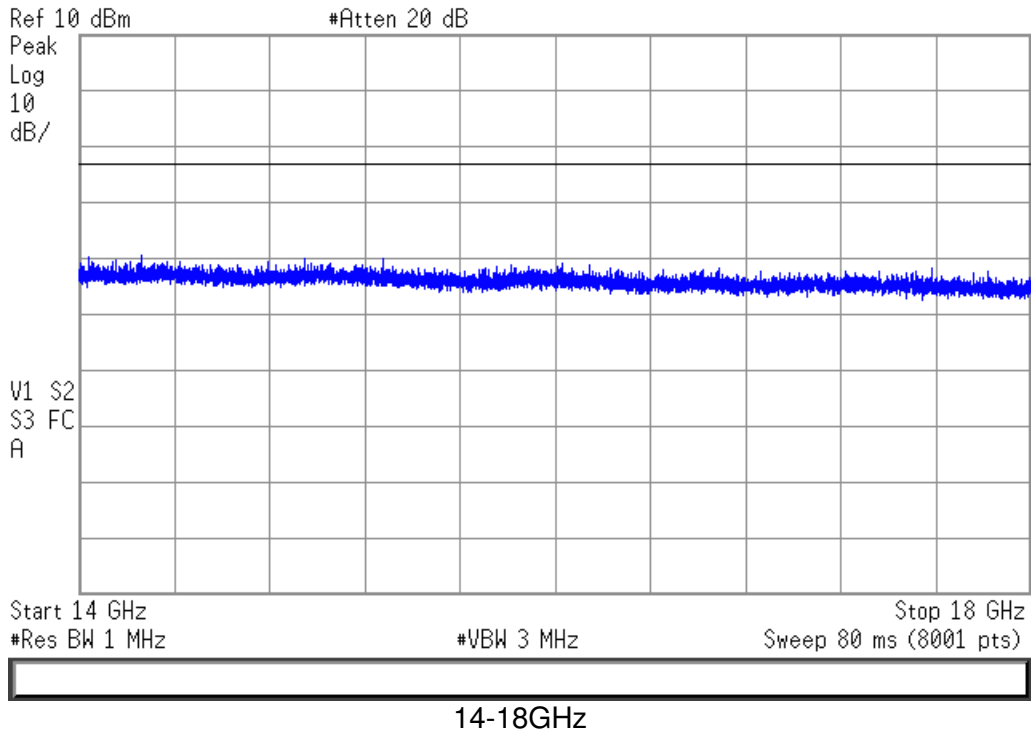
Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 98 of
396







Radiated Spurious Emissions Measurements

MEASUREMENTS / RESULTS

Note that the EUT passes the FCC Class B limit, which is much lower than the -13dBm limit for licensed transmitter spurious emissions.

The EIRP to field strength conversion at the 3 meter measurement distance results in a limit of 82.2dBμV/m, from the equation:

$$E_0(\text{dB}\mu\text{V/m}) = \text{EIRP}(\text{dBm}) - 20\log(\text{distance, meters}) + 104.77\text{dB}.$$

Only worst-case radiated spurious data is presented.

Radiated Emissions Table												
Date: 25-Mar-15			Company: Airvana					Work Order: P0152				
Engineer: Tuyen Truong			EUT Desc: Switched IQ Radio Point Domestic					EUT Operating Voltage/Frequency: POE				
Temp: 24°C			Humidity: 10%			Pressure: 1015mBar						
Frequency Range: 30-1000MHz							Measurement Distance: 3 m					
Notes: BW = 10MHz, Band 2, 16QAM , Mid Channel (1960MHz)							EUT Max Freq: 200MHz					
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBμV/m)				FCC Class B		
										Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
v	62.77	46.0	25.4	8.0	1.5	30.1				40.0	-9.9	Pass
v	33.77	32.2	25.3	19.2	1.6	27.7				40.0	-12.3	Pass
v	177.8	40.6	24.2	11.7	2.5	30.6				43.5	-12.9	Pass
h	200.0	45.7	24.9	13.4	2.7	36.9				43.5	-6.6	Pass
v	250.0	42.1	25.1	12.2	2.8	32.0				46.0	-14.0	Pass
v	333.125	49.5	25.2	14.7	3.0	42.0				46.0	-4.0	Pass
h	333.3	48.7	25.2	14.7	3.0	41.2				46.0	-4.8	Pass
v	500.0	50.2	25.5	17.8	2.7	45.2				46.0	-0.8	Pass
v	600.0	42.9	25.1	19.3	3.1	40.2				46.0	-5.8	Pass
h	625.0	40.2	25.5	19.8	3.0	37.5				46.0	-8.5	Pass
v	750.0	42.3	24.7	21.2	3.8	42.6				46.0	-3.4	Pass
h	750.0	41.0	24.7	21.2	3.8	41.3				46.0	-4.7	Pass
v	875.0	36.6	25.7	22.5	3.6	37.0				46.0	-9.0	Pass
h	875.0	35.1	25.7	22.5	3.6	35.5				46.0	-10.5	Pass
Table Result: Pass by -0.8 dB Worst Freq: 500.0 MHz												
Test Site: EMI Chamber 2			Cable 1: Asset #2052			Cable 2: Asset #2054			Cable 3: ---			
Analyzer: Rental SA#2			Preamp: Blue-Blk			Antenna: Red-White			Preselector: 1511			



Radiated Emissions Table

Date: 4/17/2015 & 4/23/2015				Company: Airvana				Work Order: P0152						
Engineer: Tuyen Truong				EUT Desc: Switched IQ Radio Point Domestic				EUT Operating Voltage/Frequency: POE						
Temp: 22°C				Humidity: 24%				Pressure: 1011mBar						
(April 23) Temp: 23°C				Humidity: 23%				Pressure: 994mBar						
Frequency Range: 1-18GHz								Measurement Distance: 3m (1-6GHz) & 1m (6-18GHz)						
Notes:								EUT Max Freq: 200MHz						
Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dBμV)	Average Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBμV/m)	Adjusted Avg Reading (dBμV/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average		
									Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
BW = 10MHz, Band 2, 16QAM, Mid Channel (1960MHz)														
h, nf	3920.0	36.54	22.9	20.5	33.6	4.7	54.3	40.7	74.0	-19.7	Pass	54.0	-13.3	Pass
h, nf	5880.0	31.73	19.3	19.4	35.4	6.2	53.9	41.5	74.0	-20.1	Pass	54.0	-12.5	Pass
h, nf	7840.0	32.1	20.9	18.9	36.2	7.1	56.5	45.3	83.5	-27.0	Pass	63.5	-18.2	Pass
BW = 5MHz, Band 2, 16QAM, Mid Channel (1960MHz)														
v, nf	3920.0	35.69	24.5	20.5	33.6	4.3	53.1	41.9	74.0	-20.9	Pass	54.0	-12.1	Pass
h	3920.0	42.71	29.3	20.5	33.6	4.3	60.1	46.7	74.0	-13.9	Pass	54.0	-7.3	Pass
vh, nf	7840.0	35.65	24.1	18.9	36.2	5.7	58.7	47.1	83.5	-24.8	Pass	63.5	-16.4	Pass
BW = 10MHz, Band 2, 16QAM, High Channel (1985MHz)														
v, nf	3970.0	28.4	21.6	20.5	33.6	4.3	45.8	39.0	74.0	-28.2	Pass	54.0	-15.0	Pass
h	3970.0	37.57	24.6	20.5	33.6	4.3	55.0	42.0	74.0	-19.0	Pass	54.0	-12.0	Pass
h, nf	5955.0	33.36	20.8	19.4	35.5	5.1	54.6	42.0	74.0	-19.4	Pass	54.0	-12.0	Pass
BW = 10MHz, Band 2, 16QAM, Low Channel (1935MHz)														
v	3870.0	34.27	23.9	20.6	33.5	4.2	51.4	41.0	74.0	-22.6	Pass	54.0	-13.0	Pass
h	3870.0	42.73	28.4	20.6	33.5	4.2	59.8	45.5	74.0	-14.2	Pass	54.0	-8.5	Pass
BW = 10MHz, Band 2, QPSK, Mid Channel (1960MHz)														
h	3920.0	40.34	27.2	20.5	33.6	4.3	57.7	44.6	74.0	-16.3	Pass	54.0	-9.4	Pass
BW = 10MHz, Band 2, 64QAM, Mid Channel (1960MHz)														
h	3920.0	40.61	27.3	20.5	33.6	4.3	58.0	44.7	74.0	-16.0	Pass	54.0	-9.3	Pass
Table Result: Pass by -8.5 dB Worst Freq: 3870.0 MHz														
Test Site: 1DCC-OATS-3M-I					Cable 1: EMIR-HIGH-22					Cable 2: ---				
Analyzer: Rental SA#1					Preamp: Asset #1517					Antenna: Blue Horn				
Test Site: EMI Chamber 2					Cable 1: Asset #2052					Cable 2: Asset #2054				
Analyzer: Rental SA#1					Preamp: Asset #1517					Antenna: Blue Horn				
										Preselector: ---				
										Preselector: ---				

Radiated Emissions Table

Date: 25-Mar-15		Company: Airvana				Work Order: P0152								
Engineer: Tuyen Truong		EUT Desc: Switched IQ Radio Point Domestic				EUT Operating Voltage/Frequency: POE								
Temp: 24°C		Humidity: 10%				Pressure: 1015mBar								
Frequency Range: 18-20GHz						Measurement Distance: 0.1 m								
Notes:						EUT Max Freq: 200MHz								
Antenna Polarization (H / V)	Frequency (MHz)	Peak Reading (dBμV)	Average Reading (dBμV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBμV/m)	Adjusted Avg Reading (dBμV/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average		
									Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBμV/m)	Margin (dB)	Result (Pass/Fail)
NO EMISSIONS FOUND WITHIN 10dB OF THE LIMIT														
Table Result:		---		by		---		dB		Worst Freq: --- MHz				
Test Site: EMI Chamber 2				Cable 1: Asset #1507				Cable 2: ---				Cable 3: ---		
Analyzer: Rental SA#2				Preamp: Asset #1517				Antenna: 18-26.5GHz Horn				Preselector: ---		



Conducted Spurious Emissions on AC Mains

AC Conducted Emissions Data Table

Date: 06-Apr-15				Company: Aivana				Work Order: P0152						
Engineer: Tuyen Truong				EUT Desc: Switched IQ Radio Point Domestic										
Temp: 21.0 °C				Humidity: 27%				Pressure: 1019mBar						
Notes: Tested AC side of DC Power Brick of support POE Linksys Switch (checked both power, 120Vac/60Hz and 230Vac/50Hz)														
Peak readings.														
Frequency Range: 0.15-30MHz						EUT Input Voltage/Frequency: POE								
Frequency (MHz)	Quasi-Peak Readings		Average Readings		LISN Factors		Cable Factor (dB)	ATTN Factor (dB)	FCC/CISPR Class B			FCC/CISPR Class B		
	QP1 (dBµV)	QP2 (dBµV)	AVG1 (dBµV)	AVG2 (dBµV)	L1 (dB)	L2 (dB)			QP Limit (dBµV)	Margin (dB)	Result (Pass/Fail)	AVG Limit (dBµV)	Margin (dB)	Result (Pass/Fail)
BW = 10MHz, Band 2, 16QAM, Mid Channel (1960MHz)														
0.33	13.0	12.1	13.0	12.1	0.0	0.0	0.0	-20.4	59.4	-26.0	Pass	49.4	-16.0	Pass
1.34	10.6	11.5	10.6	11.5	0.0	0.0	0.0	-20.4	56.0	-24.1	Pass	46.0	-14.1	Pass
4.85	10.3	9.7	10.3	9.7	0.0	-0.1	-0.1	-20.4	56.0	-25.2	Pass	46.0	-15.2	Pass
11.94	9.6	10.9	9.6	10.9	-0.1	-0.1	-0.2	-20.3	60.0	-28.5	Pass	50.0	-18.5	Pass
16.19	9.9	10.2	9.9	10.2	-0.1	-0.1	-0.2	-20.4	60.0	-29.1	Pass	50.0	-19.1	Pass
22.61	9.7	8.4	9.7	8.4	-0.1	-0.1	-0.3	-20.4	60.0	-29.5	Pass	50.0	-19.5	Pass
Result: Pass						Worst Margin: -14.1 dB			Frequency: 1.340 MHz					
Measurement Device: LISN ASSET 1726(Line 1) LISN ASSET 1727(Line 2)						Cable: CEMI-09			Spectrum Analyzer: SA EMI Chamber (1328)					
						Attenuator: 20dB Atten-4			Site: CEMI3					



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 104 of
396

Frequency Stability

REQUIREMENTS

Part 24:

"The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." [24.235]

MEASUREMENTS / RESULTS

Note that measurements were done on port J1, since the same frequency-generating circuit is used for J1 and J2.



-30°C, Low Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 105 of
396



-30°C, High Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8881



page 106 of 396



-20°C, Low Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 107 of
396



-20°C, High Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8881



page 108 of 396



-10°C, Low Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8881



page 109 of
396



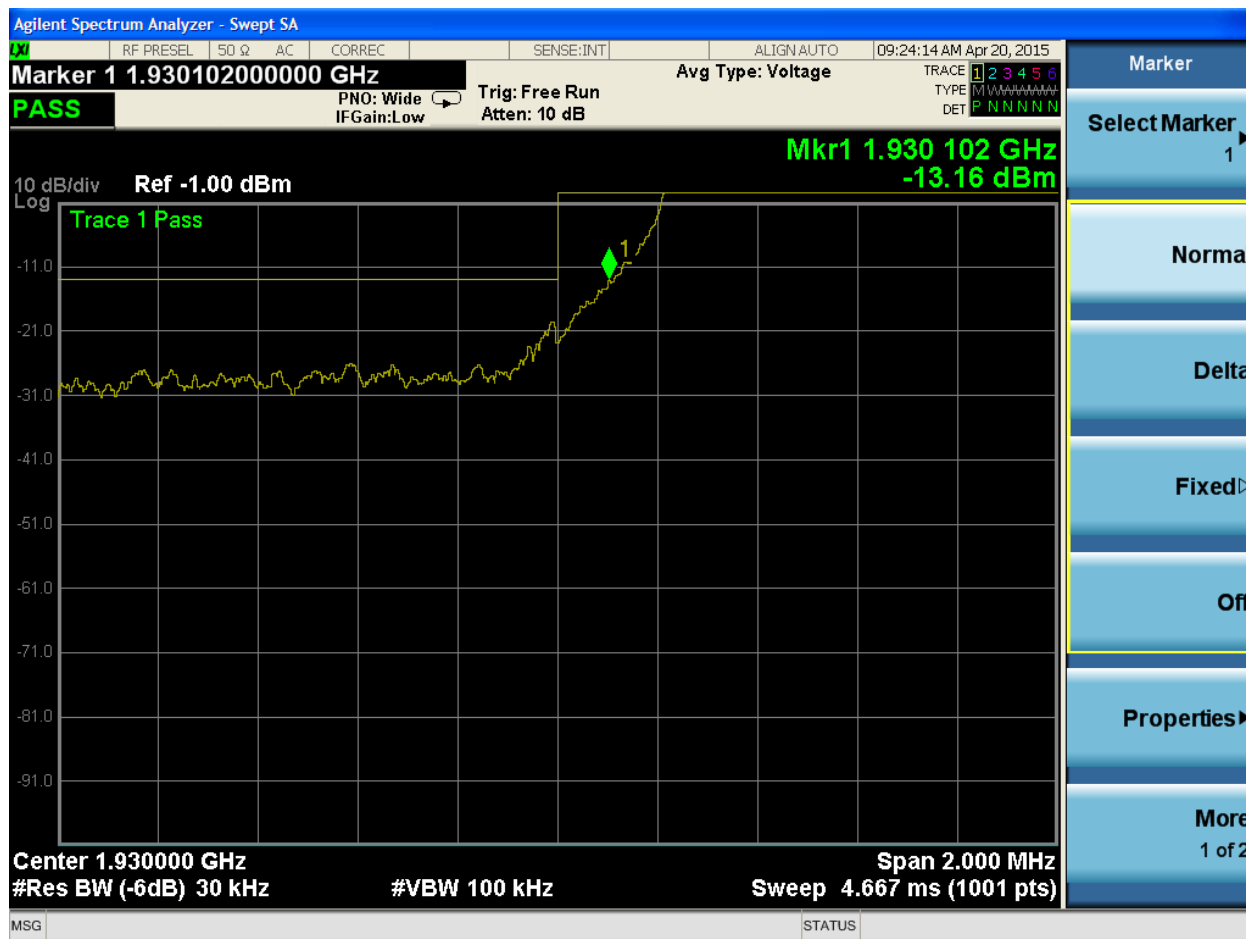
-10°C, High Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 110 of
396



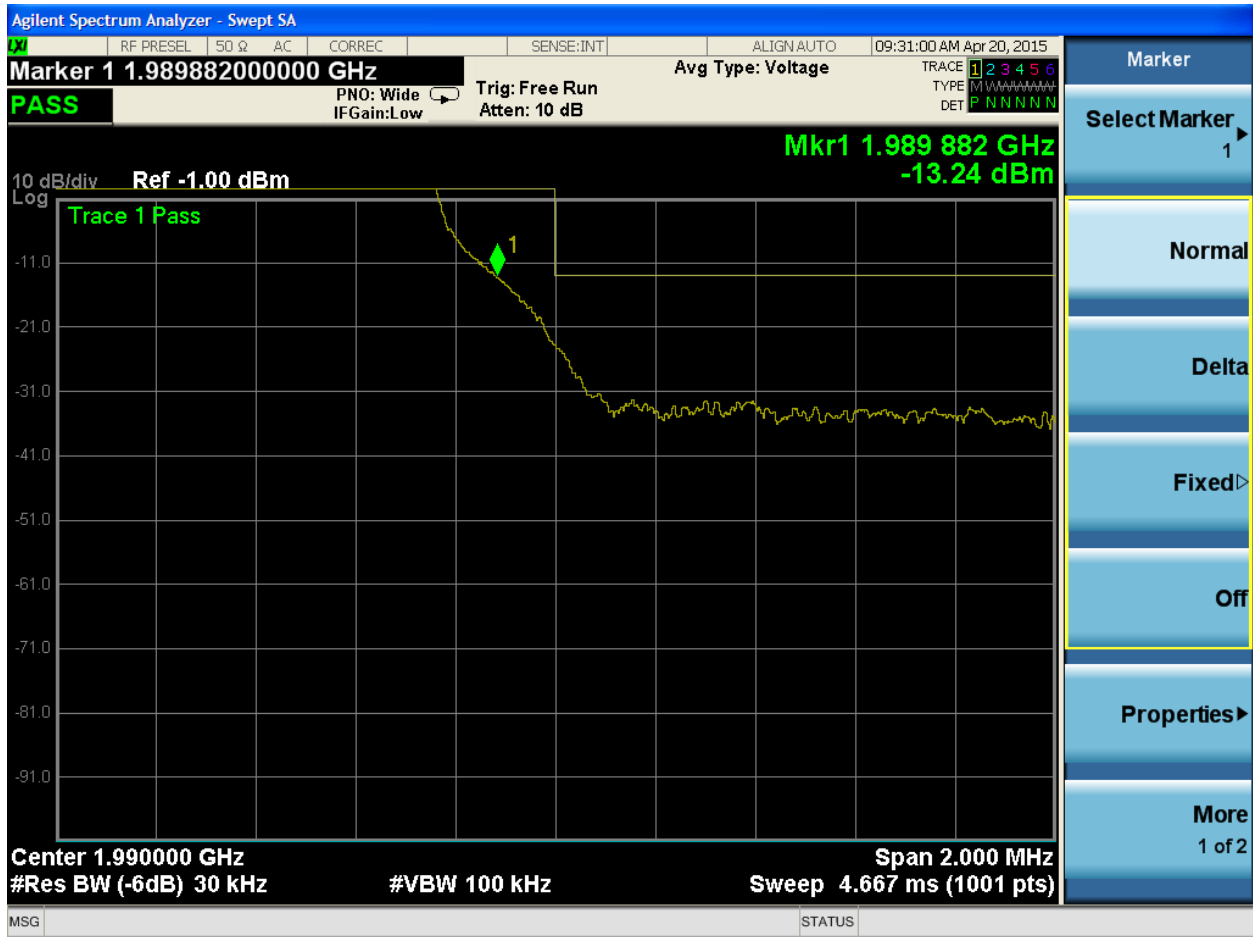
0°C, Low Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-887



page 111 of
396



0°C, High Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8881



page 112 of
396



10°C, Low Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 113 of
396



10°C, High Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 114 of
396



20°C, Low Frequency Edge, 120Vac



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 115 of 396



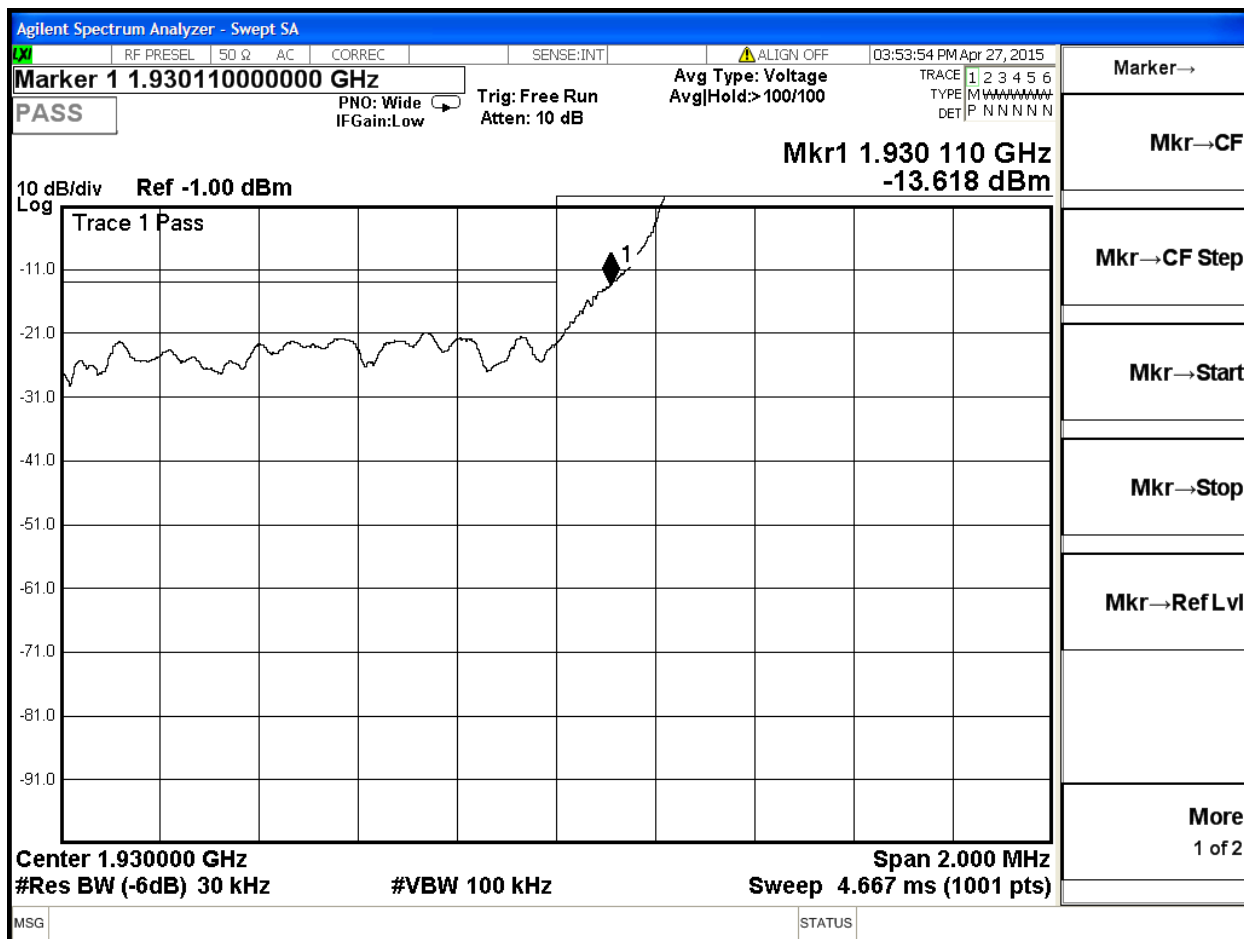
20°C, High Frequency Edge, 120Vac



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 116 of
396



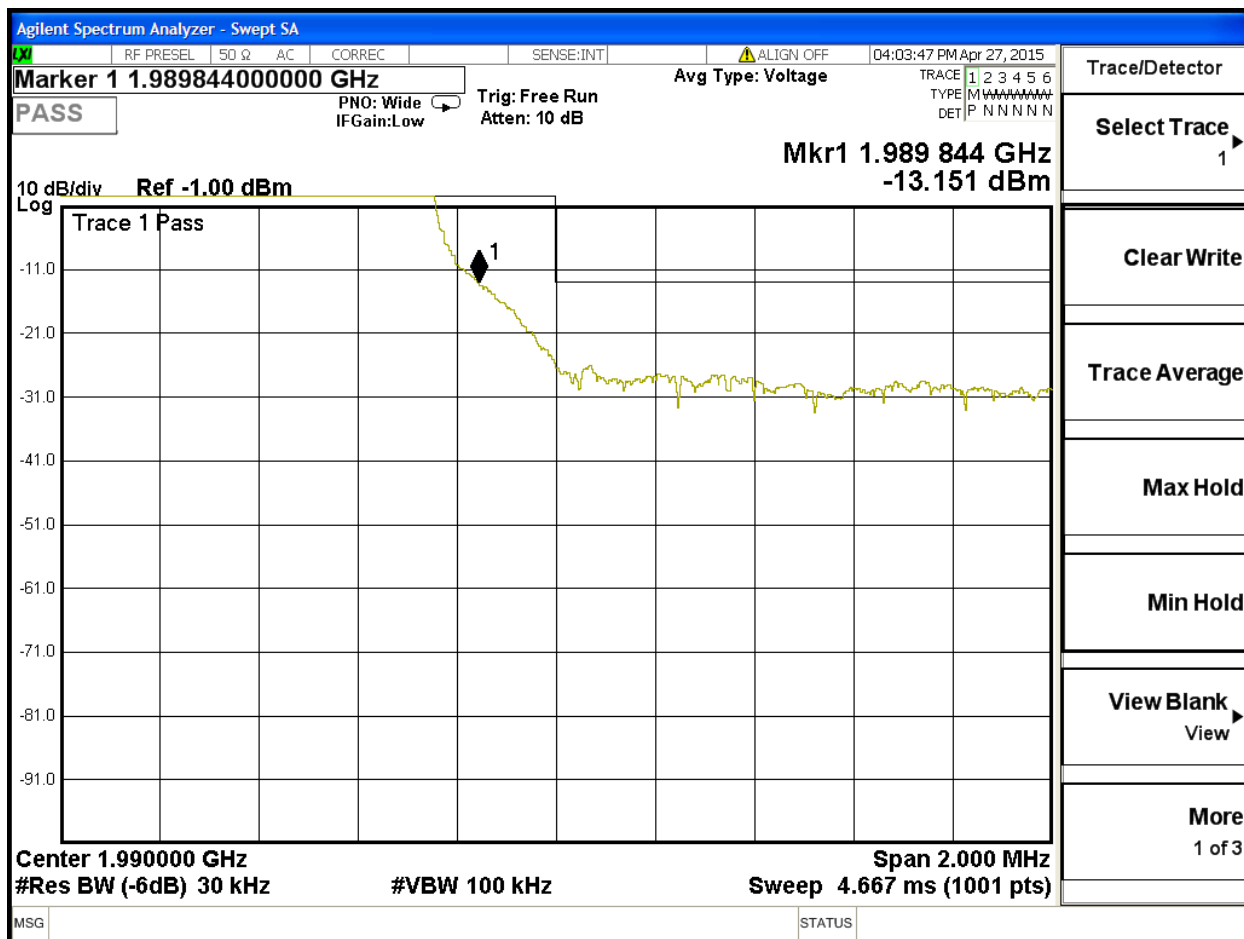
20°C, Low Frequency Edge, 102Vac (-15% from nominal)



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 117 of
396



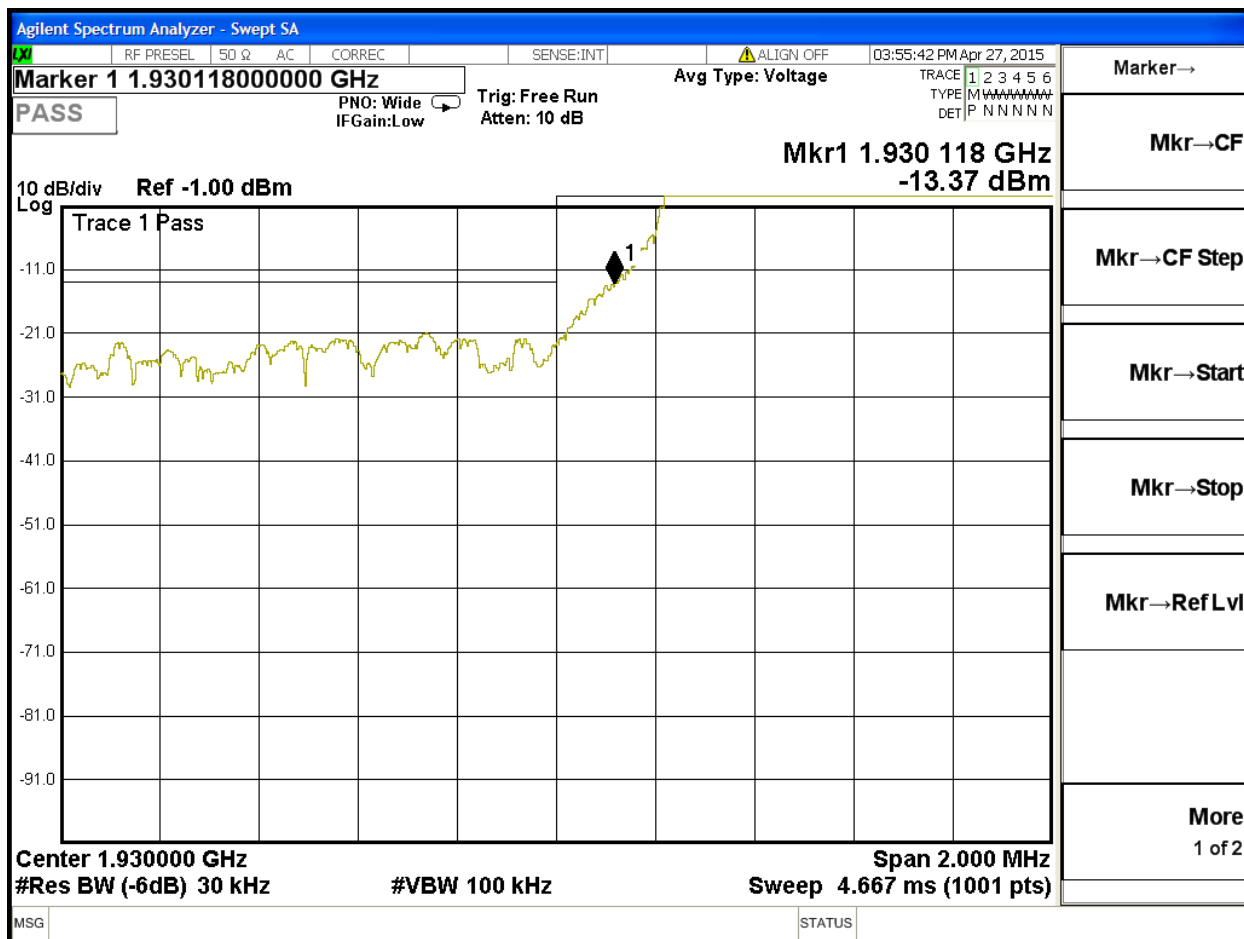
20°C, High Frequency Edge, 102Vac (-15% from nominal)



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8881



page 118 of
396



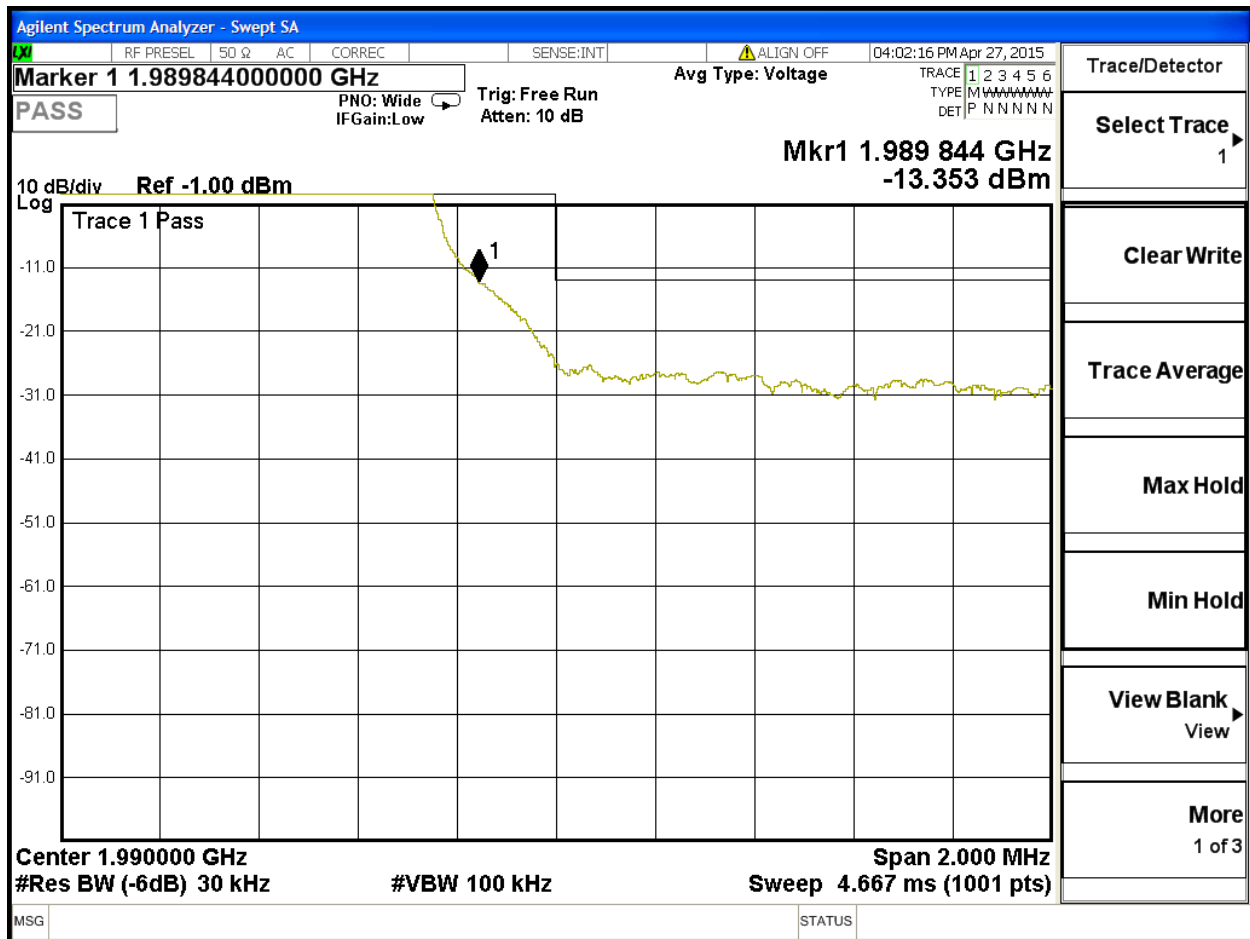
20°C, Low Frequency Edge, 138Vac (+15% from nominal)



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8881



page 119 of 396



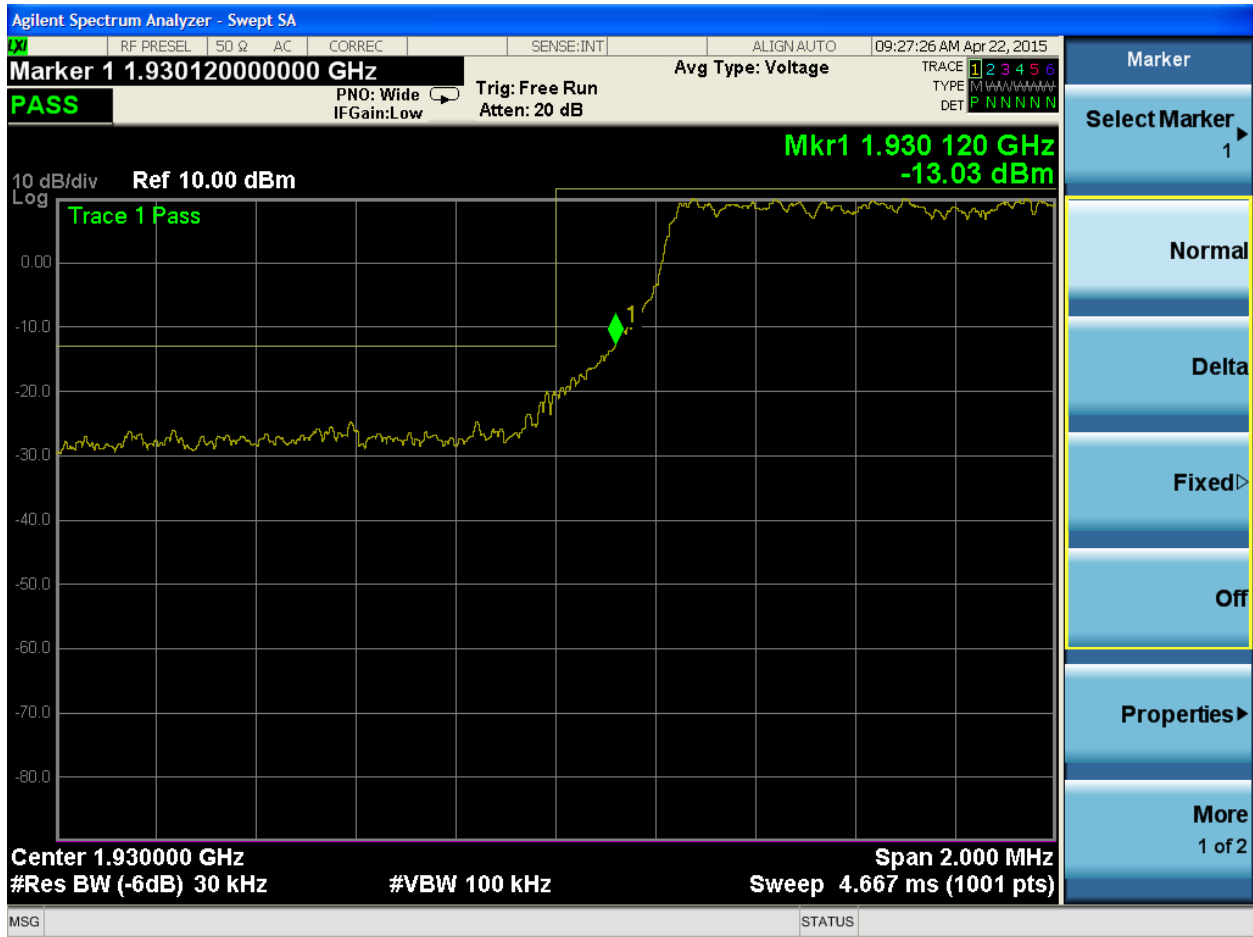
20°C, High Frequency Edge, 138Vac (+15% from nominal)



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8887



page 120 of
396



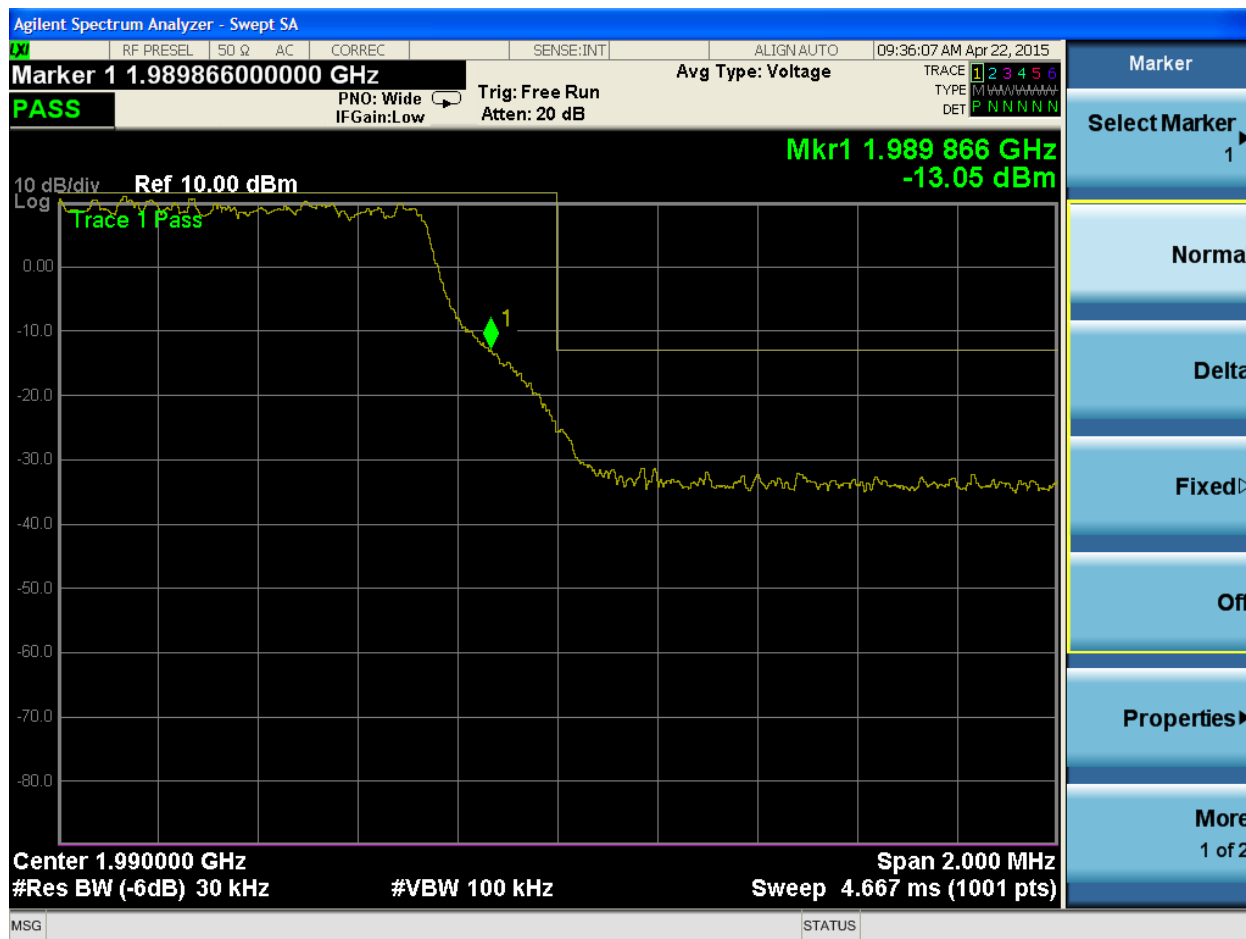
30°C, Low Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 121 of
396



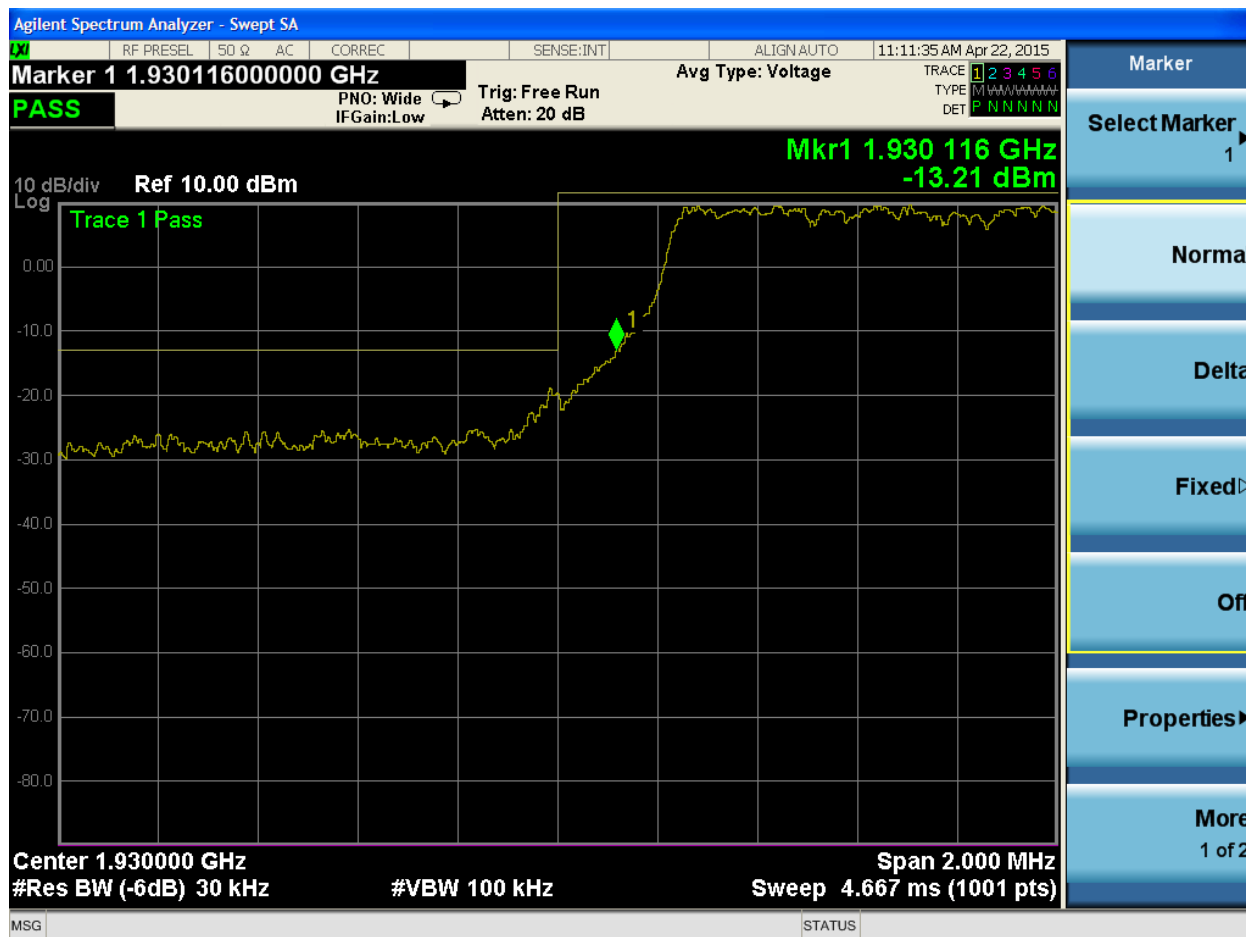
30°C, High Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 122 of
396



40°C, Low Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-887



page 123 of
396



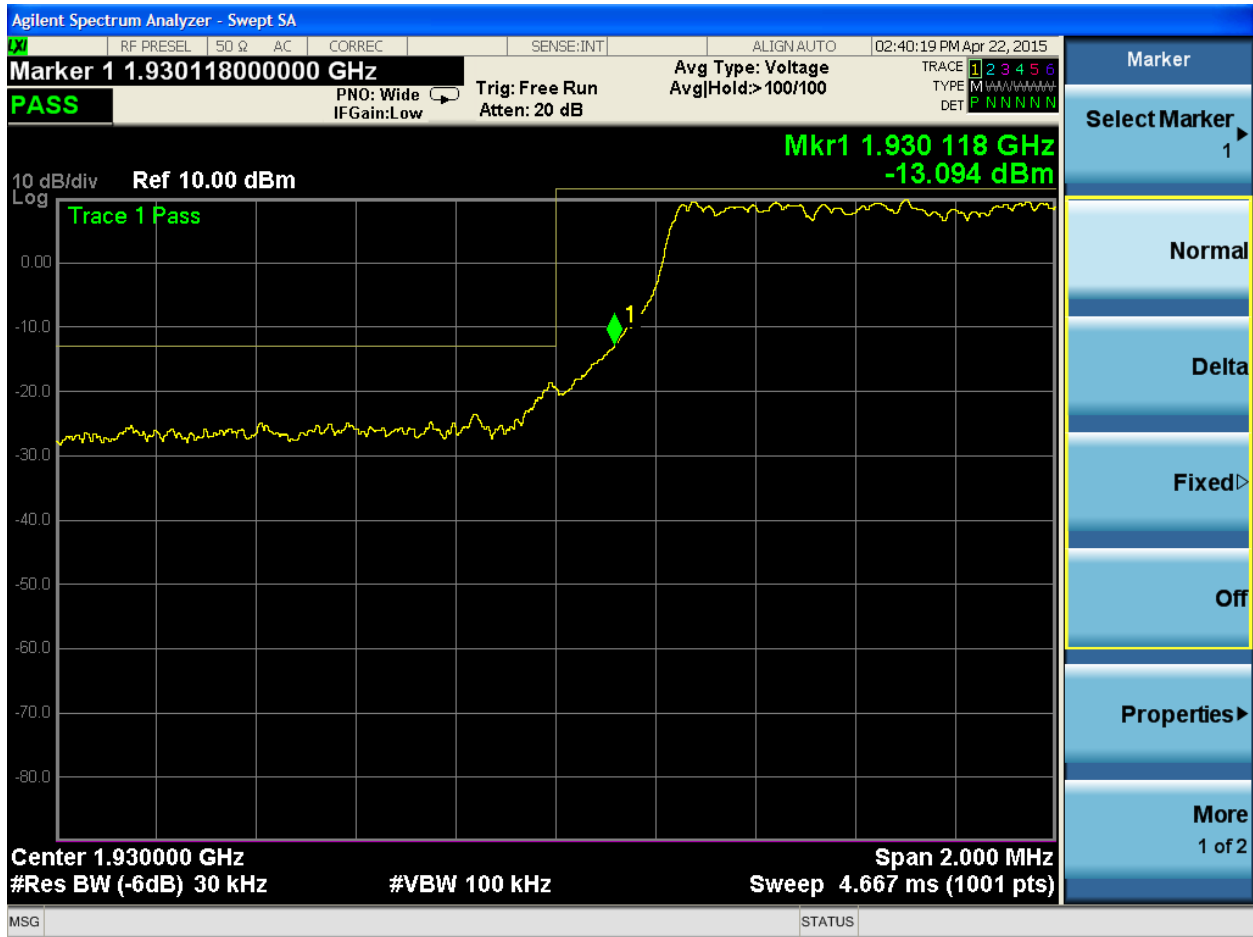
40°C, High Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 124 of
396



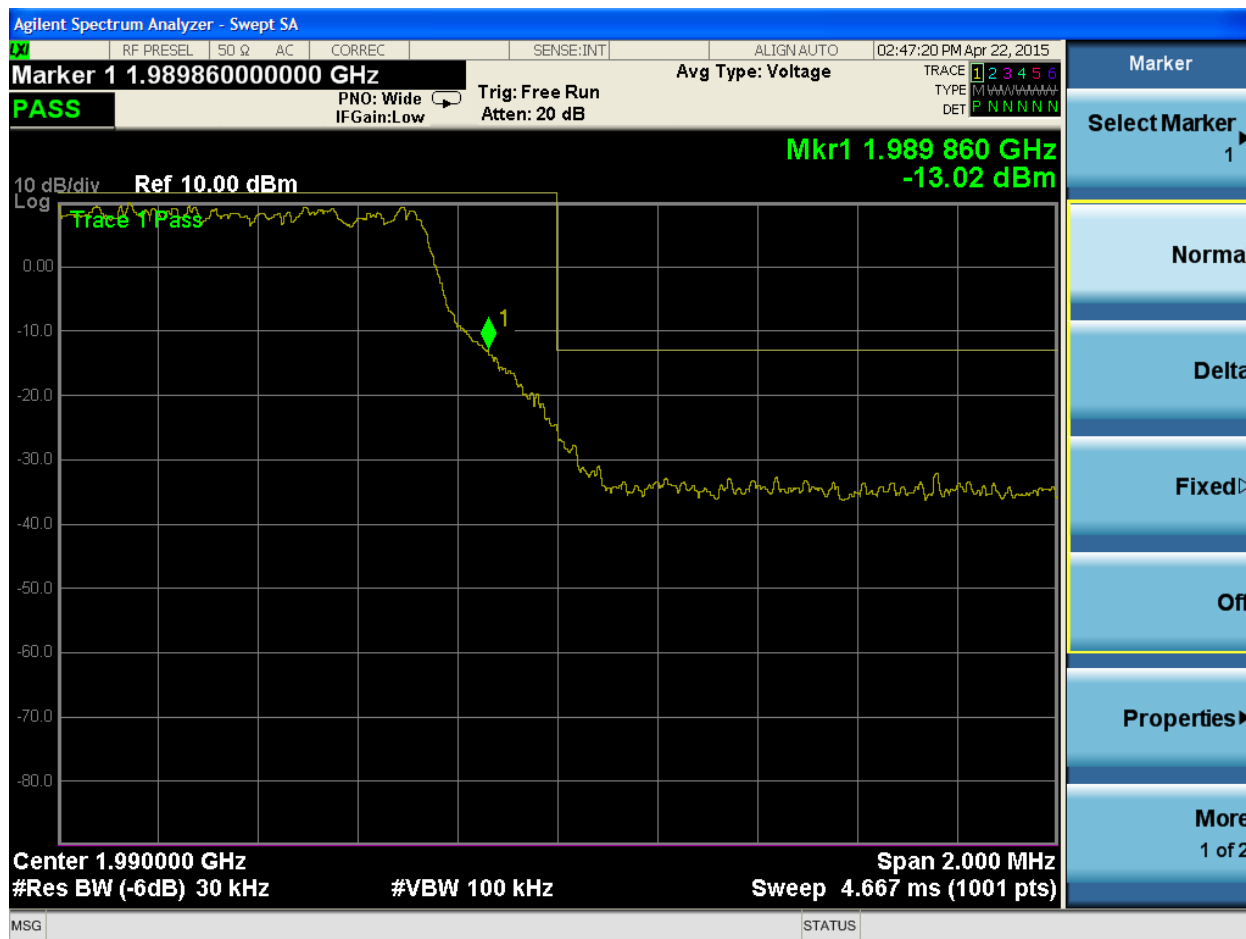
50°C, Low Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8881



page 125 of 396



50°C, High Frequency Edge



Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8880



page 126 of
396

LTE Bands 12 & 17 (FCC Part 27)

Occupied Bandwidth

LIMIT

“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.” [27.53(a)(5)]



MEASUREMENTS / RESULTS

Occupied Bandwidth

Date: 17-Mar-15			Company: Airvana		
Engineer: Tuyen Truong			EUT: Switched IQ Radio Point Domestic (750748)		
WO# P0152		EUT Operating Voltage: POE			
Temp: 22°C		Humidity: 33%		Pressure: 1005mBar	
Note: FCC part 27.53(a)(5)					
Modulation	Bandwidth Setting (MHz)	Band	Channel	Frequency (MHz)	26 dB BW (MHz)
QPSK	5	12	Low	730.5	4.996
QPSK	5	12	Mid	737	4.914
QPSK	5	12	High	743.5	5.017
16QAM	5	12	Low	730.5	4.970
16QAM	5	12	Mid	737	4.923
16QAM	5	12	High	743.5	4.942
64QAM	5	12	Low	730.5	4.939
64QAM	5	12	Mid	737	4.890
64QAM	5	12	High	743.5	4.864
QPSK	10	12	Low	733	17.231
QPSK	10	12	Mid	737	16.184
QPSK	10	12	High	741	17.015
16QAM	10	12	Low	733	16.872
16QAM	10	12	Mid	737	16.288
16QAM	10	12	High	741	16.867
64QAM	10	12	Low	733	16.800
64QAM	10	12	Mid	737	15.259
64QAM	10	12	High	741	18.501
QPSK	5	17	Low	736.5	4.966
QPSK	5	17	Mid	740	4.963
QPSK	5	17	High	743.5	see band 12
16QAM	5	17	Low	736.5	4.935
16QAM	5	17	Mid	740	4.939
16QAM	5	17	High	743.5	see band 12
64QAM	5	17	Low	736.5	4.891
64QAM	5	17	Mid	740	4.906
64QAM	5	17	High	743.5	see band 12
QPSK	10	17	Low	739	15.348
QPSK	10	17	Mid	740	15.342
QPSK	10	17	High	741	see band 12
16QAM	10	17	Low	739	15.156
16QAM	10	17	Mid	740	15.711
16QAM	10	17	High	741	see band 12
64QAM	10	17	Low	739	11.137
64QAM	10	17	Mid	740	11.367
64QAM	10	17	High	741	see band 12



Power and PAPR: 5MHz Operating Bandwidth

FCC 27.50(c)(9): "Control and mobile stations in the 698-746MHz band are limited to 30 watts ERP."

Output Power (E.R.P.)															
Date: 16-Mar-15			Company: Airvana						Work Order: P0152						
Engineer: Tuyen Truong			EUT Desc: Switched IQ Radio Point Domestic						EUT Operating Voltage/Frequency: POE						
Temp: 22°C			Humidity: 33%			Pressure: 1005mBar									
Frequency Range: Low, Mid and High Channels															
Notes: 30W = 44.77dBm. Multiple antenna calcaions using formula from FCC KDB 662911 Section 12(a)(i). ERP = EIRP - 2.15dB Two antennas each with gain 0dBi in this range are installed on the EUT. For MIMO calculations, N(ant.)=2 is used to calculate overall directional gain: 0dBi + 10log(N)dB = 0dBi + 3.0dB = 3.0dBi.															
Band	Bandwidth (MHz)	Modulation	Channel (MHz)	Frequency (MHz)	Peak Power Reading (dBm)	Power Combiner (dB)	20dB Attenuator (dB)	Cable Factor (dB)	Adjusted Peak Power Reading (dBm)	Directional Antenna Gain (dBi)	ERP (dBm)	FCC Part 27.50(c)(9); Limit: 30W = 44.77dBm			
												Limit (dBm)	ERP (dB)	Margin (dB)	Result (Pass/Fail)
12	5	QPSK	Low	730.5	12.1	4.0	19.5	0.6	36.2	3.0	39.2	44.77	37.1	-7.7	Pass
12	5	QPSK	Mid	737.0	12.0	4.0	19.5	0.6	36.1	3.0	39.1	44.77	37.0	-7.8	Pass
12	5	QPSK	High	743.5	11.1	4.0	19.5	0.6	35.2	3.0	38.2	44.77	36.1	-8.7	Pass
12	5	16QAM	Low	730.5	12.3	4.0	19.5	0.6	36.4	3.0	39.4	44.77	37.3	-7.5	Pass
12	5	16QAM	Mid	737.0	12.5	4.0	19.5	0.6	36.6	3.0	39.6	44.77	37.5	-7.3	Pass
12	5	16QAM	High	743.5	11.1	4.0	19.5	0.6	35.2	3.0	38.2	44.77	36.1	-8.7	Pass
12	5	64QAM	Low	730.5	12.2	4.0	19.5	0.6	36.3	3.0	39.3	44.77	37.2	-7.6	Pass
12	5	64QAM	Mid	737.0	12.1	4.0	19.5	0.6	36.2	3.0	39.2	44.77	37.1	-7.7	Pass
12	5	64QAM	High	743.5	11.1	4.0	19.5	0.6	35.2	3.0	38.2	44.77	36.1	-8.7	Pass
17	5	QPSK	Low	736.5	11.2	4.0	19.5	0.6	35.3	3.0	38.3	44.77	36.2	-8.6	Pass
17	5	QPSK	Mid	740.0	11.1	4.0	19.5	0.6	35.2	3.0	38.2	44.77	36.1	-8.7	Pass
17	5	QPSK	High	743.5	See Band 12										
17	5	16QAM	Low	736.5	11.5	4.0	19.5	0.6	35.6	3.0	38.6	44.77	36.5	-8.3	Pass
17	5	16QAM	Mid	740.0	11.8	4.0	19.5	0.6	35.9	3.0	38.9	44.77	36.8	-8.0	Pass
17	5	16QAM	High	743.5	See Band 12										
17	5	64QAM	Low	736.5	11.4	4.0	19.5	0.6	35.5	3.0	38.5	44.77	36.4	-8.4	Pass
17	5	64QAM	Mid	740.0	11.6	4.0	19.5	0.6	35.7	3.0	38.7	44.77	36.6	-8.2	Pass
17	5	64QAM	High	743.5	See Band 12										
Table Result: Pass															
Test Site: EMI Chamber 1				Cable: Asset# 1787				20dB Attenuator: Asset #2053				Asset#791			
Analyzer: Rental SA#2				Power Combiner: Asset# 1939											

PEAK TO AVERAGE RATIO											
Date: March 20, 24, 2015				Company: Airvana				Work Order: P0152			
Engineer: Tuyen Truong / Ryan Brown				EUT Desc: Switched IQ Radio Point Domestic				EUT Operating Voltage/Frequency: POE			
Temp: 22°C				Humidity: 33%				Pressure: 1005mBar			
(March 24) Temp: 24°C				Humidity: 10%				Pressure: 1011mBar			
Test Equipments: Brown SA, Cable (#1787), 20dB Attenuation (#791), Mini Circuit (#1939), 3m Indoor											
Note:											
Band	BW (MHz)	Channel (MHz)	Frequency (MHz)	0.1% Peak to Average Ratio (dB)			Limit (dB)	Margin (dB)			Result Pass / Fail
				QPSK	16QAM	64QAM		QPSK	16QAM	64QAM	
12	5	Low	730.5	8.66	8.75	8.61	13	-4.34	-4.25	-4.39	Pass
12	5	Mid	737	8.49	8.61	8.47	13	-4.51	-4.39	-4.53	Pass
12	5	High	743.5	8.45	8.57	8.42	13	-4.55	-4.43	-4.58	Pass
17	5	Low	736.5	8.47	8.55	8.51	13	-4.53	-4.45	-4.49	Pass
17	5	Mid	740	8.61	8.62	8.53	13	-4.39	-4.38	-4.47	Pass
17	5	High	See band 12	na	na	na	13	na	na	na	na

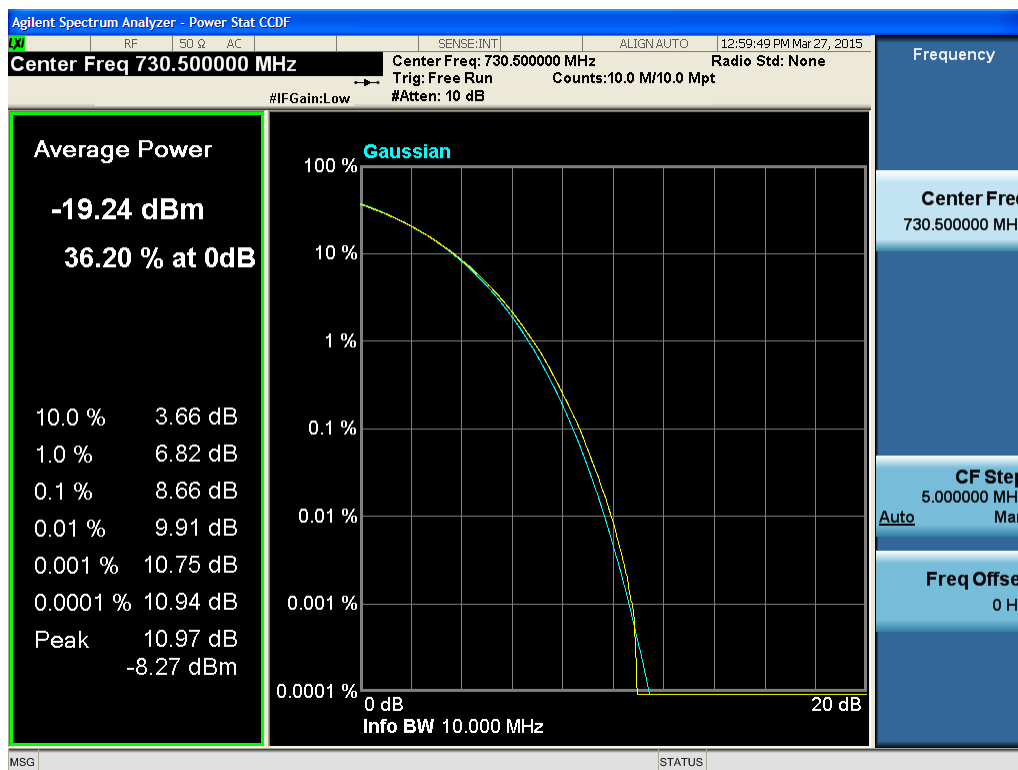


Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8887



page 129 of 396

PLOTS



Band 12 - 5MHz BW – Low Channel – QPSK



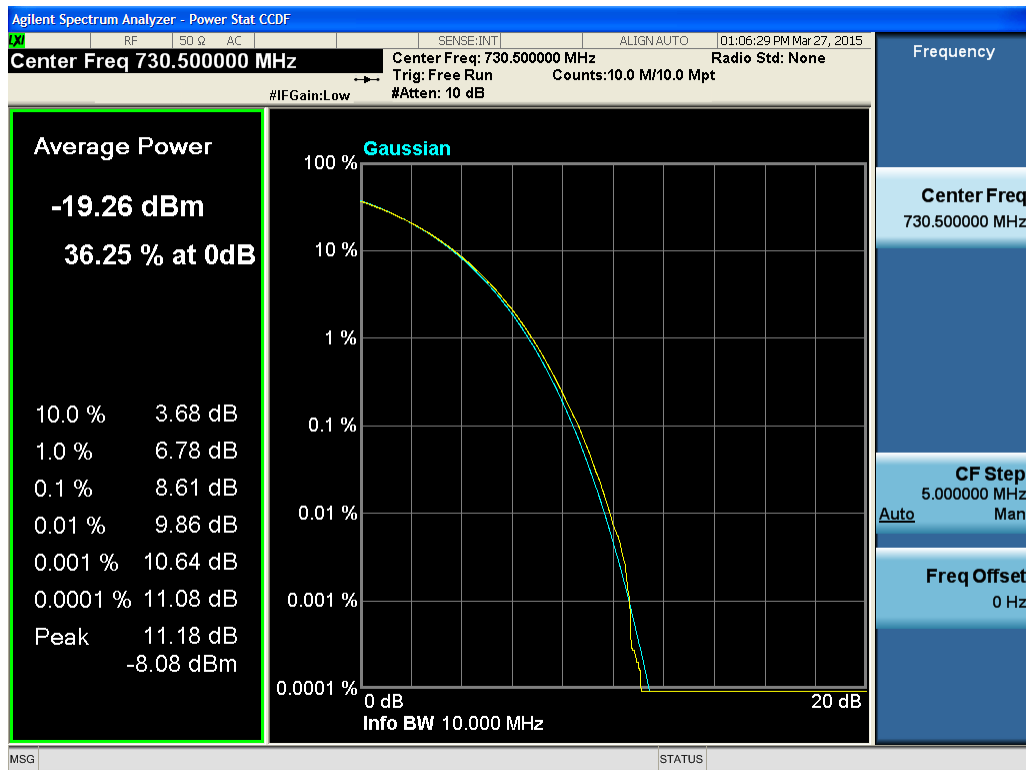
Band 12 - 5MHz BW – Low Channel – 16QAM



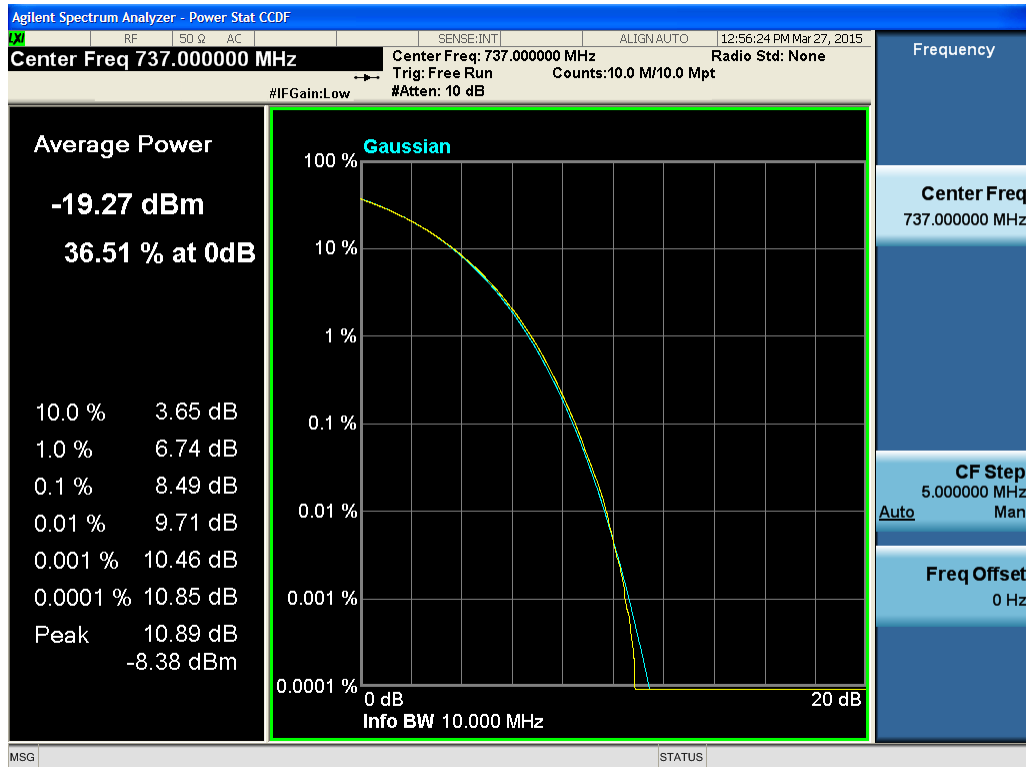
Curtis-Straus LLC, a wholly owned subsidiary of BV CPS
One Distribution Center Circle, #1 • Littleton, MA • TEL (978) 486-8880 • FAX (978) 486-8887



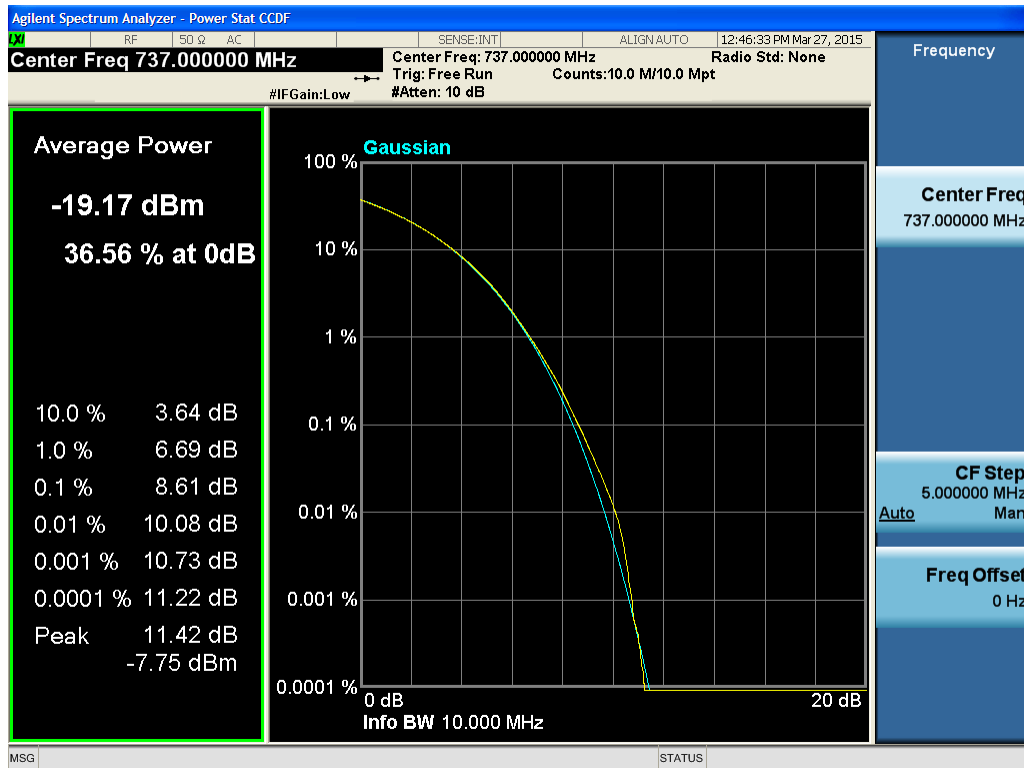
page 130 of
396



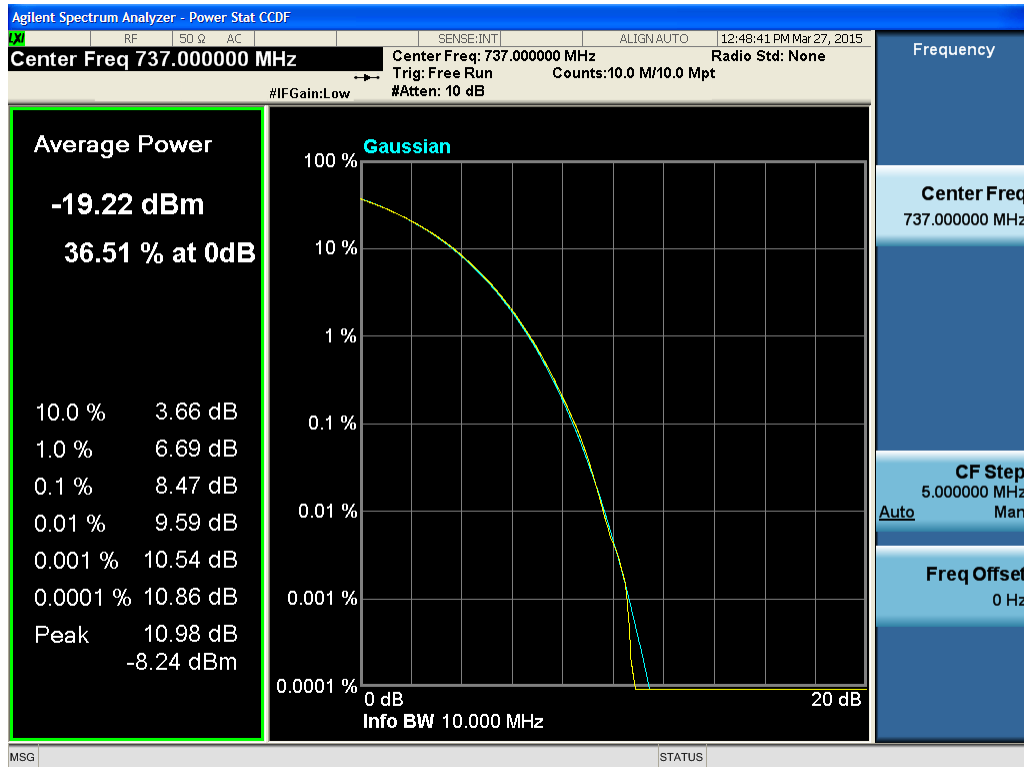
Band 12 - 5MHz BW – Low Channel – 64QAM



Band 12 - 5MHz BW – Mid Channel - QPSK



Band 12 - 5MHz BW – Mid Channel – 16QAM



Band 12 - 5MHz BW – Mid Channel – 64QAM